Workshop Manual

CC 2010 ➤, Eos 2006 ➤, Golf 2009 ➤, Golf Plus 2009 ➤, Passat 2006 ➤, Passat CC 2009 ➤, Scirocco 2009 ➤, Tiguan 2008 ➤

4-cylinder common rail engine (2.0 l, EA189)									
Engine ID	CBAA	CBBB	CBAB	CBBA	CBDB	CBDC	CBAC	CBDA	CJAA

Edition 11.2016

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

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00 – Technical data

1 Identification

(VRL009780; Edition 11.2016)

⇒ “1.1 Engine number/engine data”, page 1

1.1 Engine number/engine data

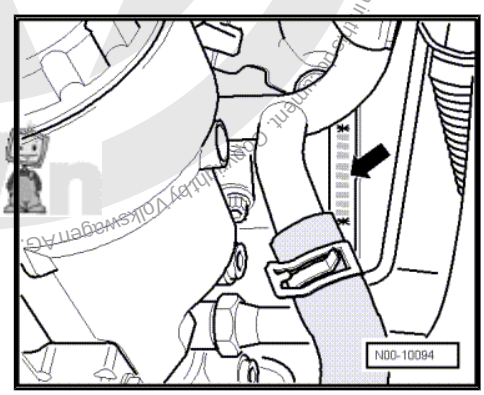
⇒ “1.1.1 Engine number”, page 1

⇒ “1.1.2 Engine data”, page 1

1.1.1 Engine number

Four digit engine codes have been introduced since model year 2008. The first 3 digits 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 type plate, the vehicle data label and on the engine control unit.

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



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

The engine codes can also be found on the vehicle data sticker.

The engine number consists of up to 9 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 with the same engine code are produced, the first of the six characters is replaced with a letter.

1.1.2 Engine data

Code		CBAA	CBAB	CBBA	CBBB	CBDA	CBDB	CBDC	CBAC	CJAA 1)
Manufactured										
	Passat	03.08 ►	03.08 ►	---	03.08 ►		---	---	01.09 ►	---
	Passat CC	02.08 ►	05.08 ►	---	02.08 ►		---	---	05.09 ►	---
	Tiguan	07.07 ►	07.07 ►	07.07 ►	07.07 ►		---	---	---	---
	Eos	---	05.08 ►	---	---		---	---	---	---
	Golf	09.08 ►	09.08 ►	---	09.08 ►		---	09.08 ►	---	09.09 ►
	Scirocco	---	---	---	09.08 ►		09.08 ►	---	---	---
	Golf Plus	---	---	---	---	01.09 ►	01.09 ►	01.09 ►	---	---
Exhaust emissions fulfil		These engines comply with the threshold values of the EU5 exhaust emissions standard.								ULEV2 standard
Displacement	l	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Power	kW at rpm	100/4200	103/4200	120/4200	125/4200	100/4200	103/4200	81/4200	105/4200	103/4200

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Code	CBAA	CBAB	CBBA	CBBB	CBDA	CBDB	CBDC	CBAC	CJAA 1)
Torque Nm at rpm	320/ 1750 … 2500	320/ 1750 … 2500	350/ 1750 to 2500	350/ 1750 to 2500	320/ 1750 to 2500	320/ 1750 … 2500	250/ 1500 … 2500	320/ 1750 … 2500	320/ 1750 … 2500
Bore Diameter, mm	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0	81.0
Stroke mm	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5
Valves per cylinder	4	4	4	4	4	4	4	4	4
Compression ratio	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5	16.5
Fuel, acc. to	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590	DIN EN 590	ASTM D 975 standard 2)
Firing order	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Balancer shaft module	Yes	Yes	Yes	Yes	No	No	No	Yes	No
Catalytic converter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exhaust gas recirculation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Charging	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intercooler	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Particulate filter	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Selective catalytic reduction (SCR system)	No	No	No	No	No	No	No	Yes	No

1) Only vehicles for USA

2) With a sulphur content of less than 15 mg/kg diesel.

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2 Safety information

⇒ “2.1 Safety precautions during work on fuel system”, page 3

⇒ “2.2 Safety precautions when using testers and measuring instruments during a road test”, page 4

⇒ “2.3 Safety measures when working on vehicles with start/stop system”, page 4

⇒ “2.4 Safety precautions when working on the cooling system”, page 4

⇒ “2.5 Safety precautions when working on the SCR system”, page 5

2.1 Safety precautions during work on fuel system



WARNING

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

- ***Route lines of any kind so that the original routing can be restored.***
- ***Ensure 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, wrap a cloth around the connection and carefully loosen to release the pressure!***
- ***Wear eye and hand protection when performing any type of repair work on the fuel system!***

To prevent injuries to persons and/or destruction of the injection and glow plug system, the following must be noted:

- The ignition must be switched off before connecting or disconnecting preglow and injection system wiring as well as test equipment leads.
- Disconnecting and connecting the battery must only be done with the ignition switched off, as otherwise the control unit for diesel direction injection system could become damaged.

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

- Place the suction hose of an activated exhaust gas extraction system close to the assembly opening of the fuel tank to extract any fuel vapours that are released. If no exhaust gas extraction system is available, a radial fan with a displacement greater than 15 m^3/h can be used providing that motor is not in air flow.
- Prevent skin contact with fuel! Wear fuel-resistant gloves!

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2.2 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 equipment must always be secured on the rear seat and operated by a 2nd person.

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 vehicles with start/stop system



WARNING

Risk of injury from engine starting automatically on vehicles with a start/stop system.

- *In vehicles with an activated start/stop system (indicated by a message in the dash panel insert), the engine may start automatically.*
- *When working on the vehicle, make sure that the start/stop system is deactivated (switch off the ignition; switch the ignition on again if necessary).*

2.4 Safety precautions when working on the cooling system



WARNING

The cooling system is under pressure when the engine is hot!

Danger of scalding due to steam and hot coolant.

Reduce excess pressure by covering the cap of the coolant expansion tank with cloths and opening it carefully.



Caution

Danger of overheating due to incorrectly fitted cap.

- *Tighten cap of coolant expansion tank until it engages.*

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2.5 Safety precautions when working on the SCR system

WARNING

- *The reducing agent can irritate skin, eyes and respiratory organs.*
- *In the event of skin contact with this fluid, immediately wash off with plenty of water.*
- *Seek medical attention if necessary.*

Caution

Protect separated electrical connections against wetting from reducing agent by suitable means, e.g. plastic bag and cable ties. Due to the high tendency to creep combined with subsequent crystallisation of the reducing agent, the electrical connections can be damaged.

Caution

Seal all openings of the hose and connections immediately with suitable sealing plugs in order to prevent the ingress of dirt. Even very small particles of dirt can cause considerable damage to the system.

Caution

Make sure that no reducing agent gets onto the trim panels or parts of vehicle body.

If this occurs, wash out reducing agent using clear water and a lint-free cotton cloth.

If the reducing agent has already crystallised, use warm water and a sponge.

Reducing agent residues which are not removed crystallise after a while and may damage the affected surface.

Information concerning storage and disposal ⇒ ServiceNet → Environmental protection → Workshop disposal ! Request country specific information from importer concerning storage and disposal.

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3 Repair notes

⇒ “3.1 Rules for cleanliness”, page 6

⇒ “3.2 Foreign objects in engine”, page 6

⇒ “3.3 Checking vacuum system”, page 6

3.1 Rules for cleanliness

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 lint-free cloths only!
- If repair work cannot be performed immediately, cover new parts which have been removed from their packing.
- Install only clean parts; do not remove new parts from packaging until immediately before installing. Do not use parts that have been kept unpackaged (for example in toolboxes).
- Transportation and protective packaging and sealing caps must be removed only immediately before fitting.
- When making repairs, remove oil from connection and hose ends.
- If system is open, do not work with compressed air. Do not move the vehicle.

3.2 Foreign objects in engine



Note

If large quantities of swarf or metal particles (caused, for example, by partial seizure of the crankshaft or conrod bearings) are found in the engine oil when performing repairs, clean the oil passages thoroughly and renew the engine oil cooler in order to prevent subsequent damage.

3.3 Checking vacuum system

All information on the vacuum system ⇒ page 236

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10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing and installing engine”, page 7

⇒ “1.2 Securing engine on engine and gearbox support”, page 20

⇒ “1.3 Installing engine”, page 21

1.1 Removing and installing engine

⇒ “1.1.1 Removing engine, Passat, Passat CC, Tiguan, Eos”, page 7

⇒ “1.1.2 Removing engine, Golf, Golf Plus, Scirocco”, page 14

1.1.1 Removing engine, Passat, Passat CC, Tiguan, Eos

Note

- *Read-out the anti-theft radio code as the earth strap of the battery has to be disconnected during the next work steps.*
- *The engine is removed downwards together with the gearbox.*
- *All cable ties which are opened or cut through when engine is removed must be replaced in the same position when engine is installed.*

WARNING

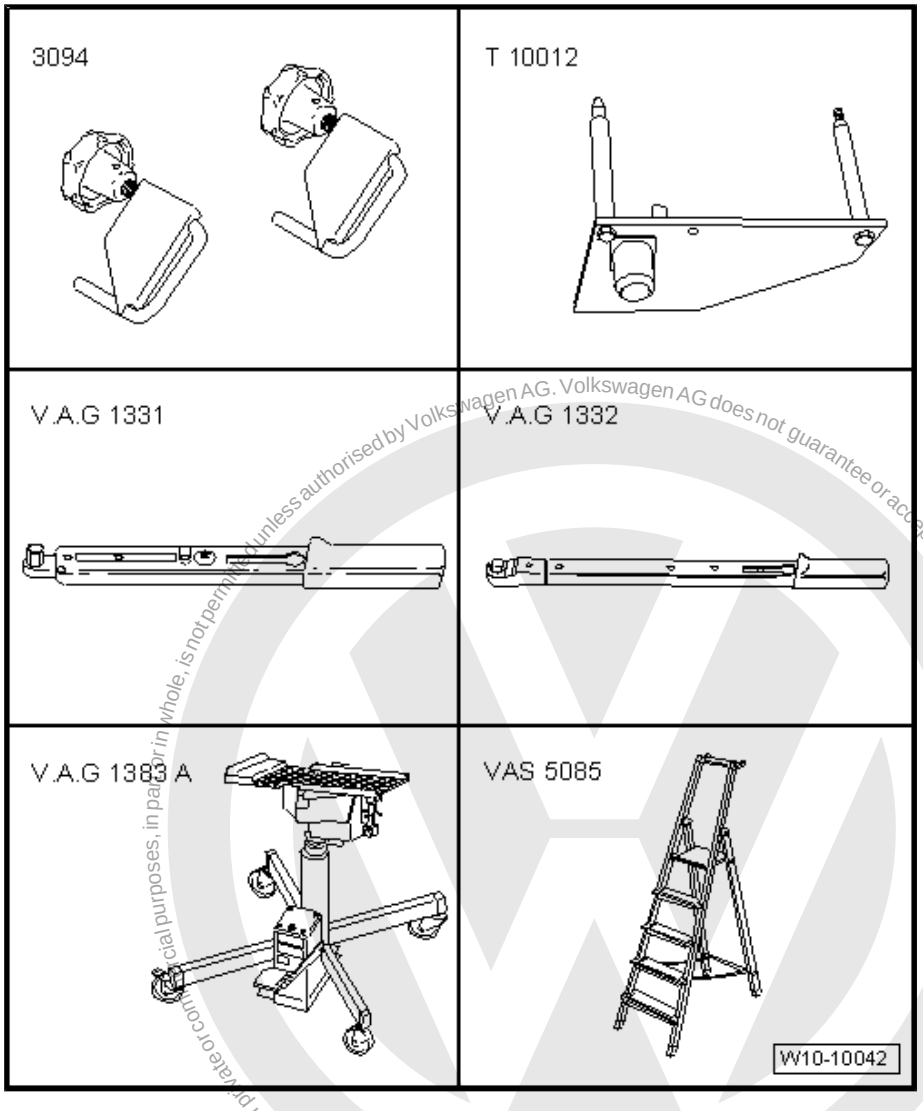
Please observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:

- ***Route lines of any kind so that the original routing can be restored.***
- ***Ensure sufficient clearance to all moving or hot components.***

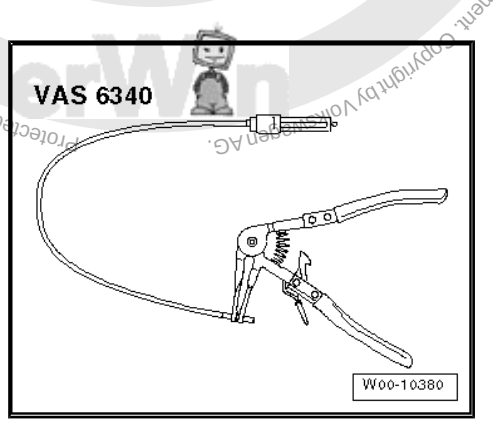
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Special tools and workshop equipment required

- Hose clamps to 25 mm - 3094-
- Engine support - T10012-
- Torque wrench - V.A.G 1331-
- Torque wrench - V.A.G 1332-
- Engine and gearbox jack - V.A.G 1383 A-
- Stepladder - VAS 5085-

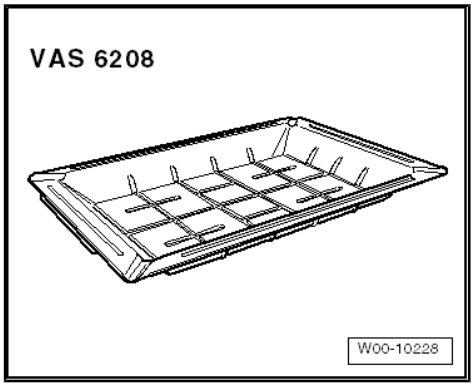


- Hose clamp pliers - VAS 6340-



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♦ Drip tray for workshop hoist - VAS 6208-



Procedure

– With ignition switched off, disconnect battery earth strap. ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery

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

– Remove engine cover panel ⇒ page 39 .

– Remove air filter housing together with air mass meter and connecting pipe ⇒ page 241 .

– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

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

– Remove wiper arms.

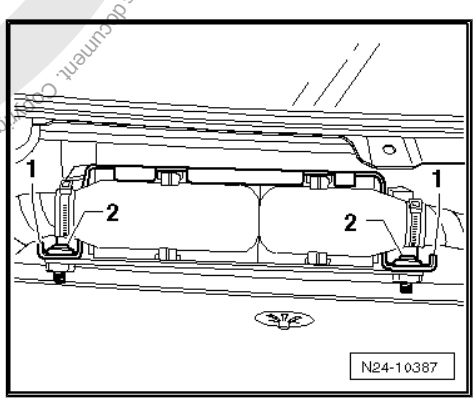
– Remove plenum chamber cover.

Passat, Passat CC and Tiguan:

– Remove plastic cover above engine control unit.

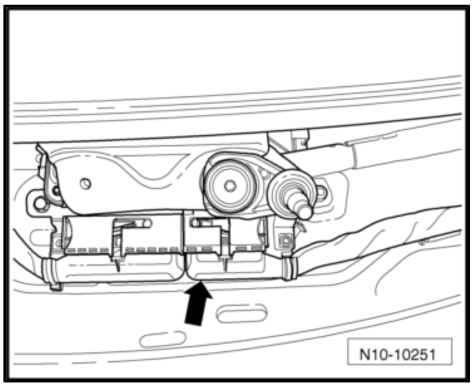
– Bend the upper ends -1- of locking clip outwards.

– Remove shear-head bolts -2- using grip pliers and remove locking clip.



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– Pull engine wiring harness connector -arrow- off control unit.



Eos:

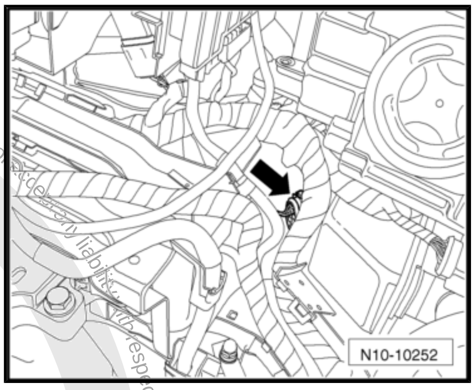
– Remove engine control unit ⇒ page 262 .

– Pull engine wiring harness connector off control unit.

Continuation for all vehicle types:

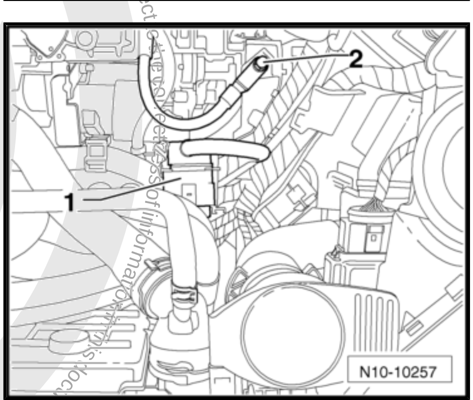
– Open wiring guide catches on longitudinal member.

– Separate connector -arrow- of engine wiring harness below left headlight.

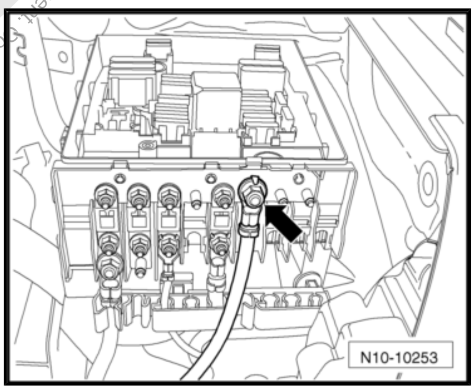


– Remove wiring harness from cable guide and lay to side on engine.

– Disconnect connector -1- and unscrew earth wire -2- from longitudinal member.



– Remove positive wire -arrow- from starter at central electrics and lay wire on engine.



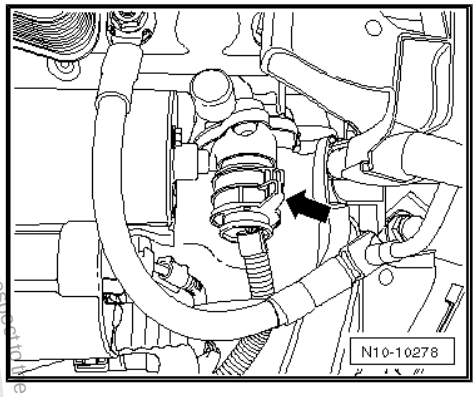
Vehicles with dual clutch gearbox:

– Disconnect selector mechanism from gearbox ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

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– To release, turn catch of mechatronic connector -arrow- and pull connector off.



Vehicles with manual gearbox:

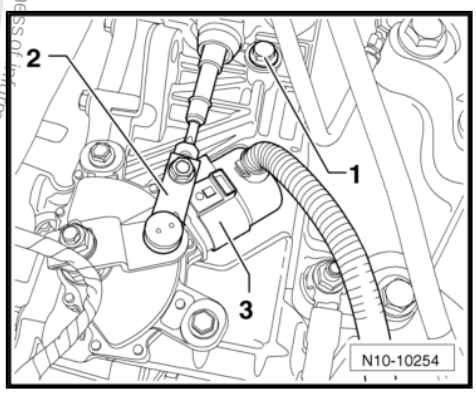
– Disconnect selector mechanism from gearbox ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

– Remove pipe/hose assembly or plastic pipe from clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch control mechanism; Removing and installing lines for clutch control mechanism .

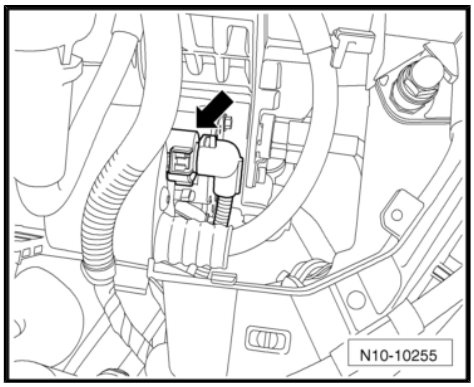
Vehicles with automatic gearbox

– Disconnect selector mechanism from gearbox ⇒ Rep. gr. 37 ; Selector mechanism; Removing and installing selector mechanism .

– Separate connector -3- from gearbox. Disregard items 1 and 2.



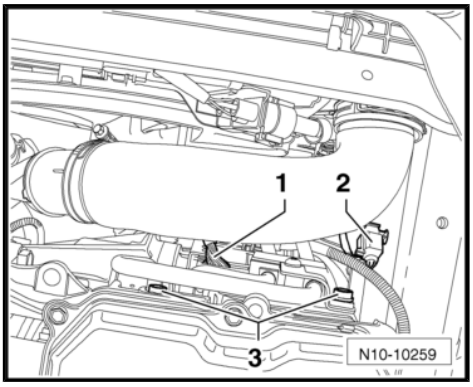
– Separate connector -arrow- from starter.



– Separate connectors -1- and -2-, and unscrew securing bolts of lines to gear oil cooler -3-.

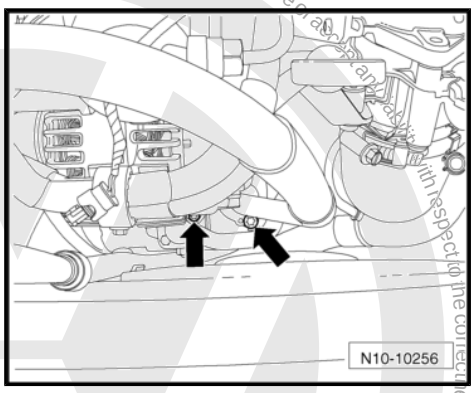
– Pull lines to gear oil cooler off gearbox and collect the gear oil that leaks out.

Continued for all vehicles

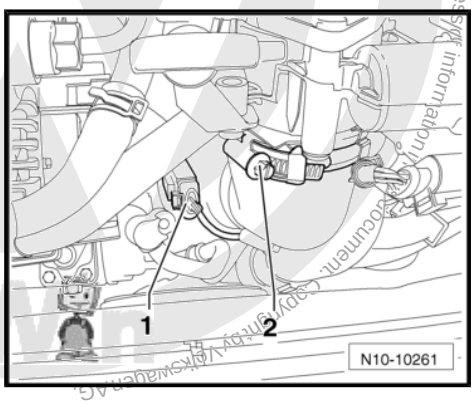


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– Unbolt refrigerant lines -arrows- from air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing refrigerant lines from and to air conditioner compressor .



– Disconnect connector -1-, loosen clamp -2- and pull off connecting hose.
– Remove charge pressure regulating valve from plenum chamber bulkhead and lay it on engine together with vacuum hoses.
– Pull vacuum line off vacuum pump.
– Remove subframe together with steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe with steering rack .
– Pull axle shafts off gearbox ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .
– Remove particulate filter ⇒ page 310 .



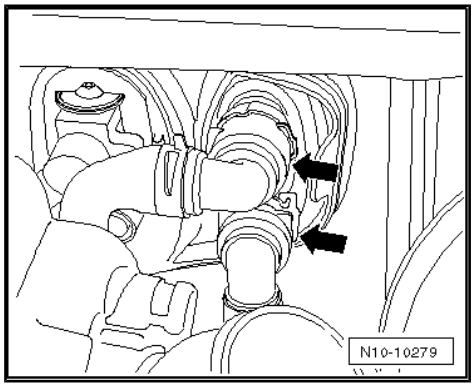
Vehicles with all-wheel drive:

– Remove rear exhaust system ⇒ page 299 .
– Remove propshaft ⇒ Propshaft and rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

Continued for all vehicles:

– Drain coolant ⇒ page 173 .
– Remove charge air lines at bottom of charge air cooler ⇒ page 213 .
– Separate quick-release couplings at radiator.
– Disconnect quick-release couplings for heat exchanger -arrows- on plenum chamber bulkhead.

Passat, Passat CC and Eos

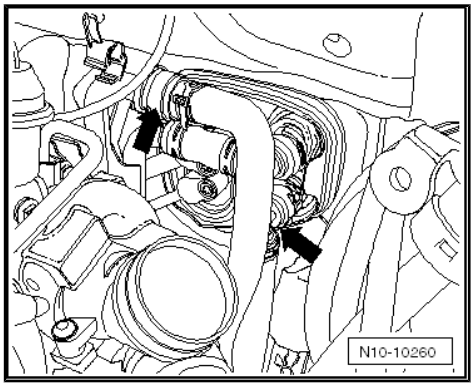


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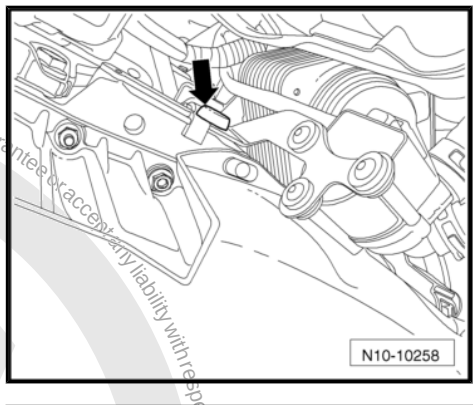
Tiguan

– Remove insulation from sump.

– Unscrew securing bolts of charge air pipe to intake manifold flap and remove charge air pipe.



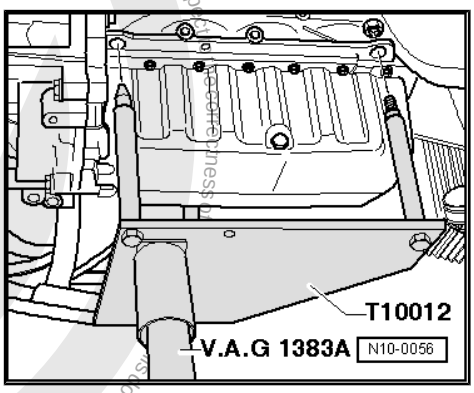
– Unscrew securing bolt -arrow- for continued coolant circulation pump.



– Tighten engine bracket - T10012- on cylinder block with securing nut and M10x25/8.8 bolt to approx. 40 Nm.

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

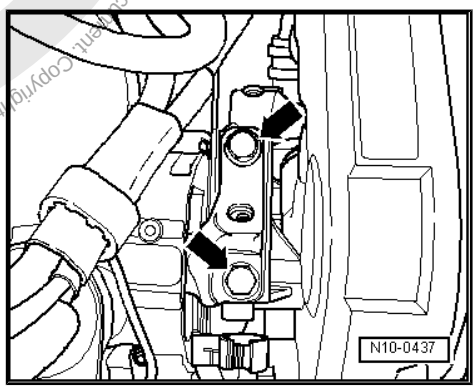
– Lift engine and gearbox slightly using engine and gearbox jack - V.A.G 1383 A- .



Note

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

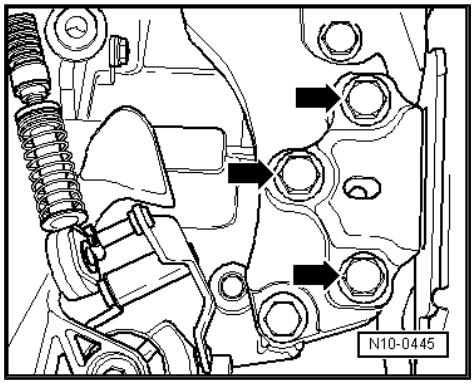
– Unbolt engine side of assembly mounting from engine support -arrows- from above.



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– Unbolt gearbox side of assembly mounting from gearbox bracket -arrows- from above.

– Carefully lower engine with gearbox.



Note

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

1.1.2 Removing engine, Golf, Golf Plus, Scirocco

Special tools and workshop equipment required

- Workshop hoist - VAS 6100-
- Lifting tackle - 3033-

Note

- *Read-out the anti-theft radio code as the earth strap of the battery has to be disconnected during the next work steps.*
- *The engine is removed forwards together with the gearbox.*
- *All cable ties that are opened or cut through when the engine is removed must be renewed/replaced in the same position when the engine is installed.*

WARNING

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

- ***Route lines of any kind so that the original routing can be restored.***
- ***Ensure sufficient clearance to all moving or hot components.***

– Disconnect earth strap at battery with ignition switched off ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

– Remove air filter housing together with air mass meter and connecting pipe ⇒ page 241.

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

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– Remove battery holder, unscrew securing bolts -arrows- for this.

– Remove engine cover panel ⇒ page 39 .

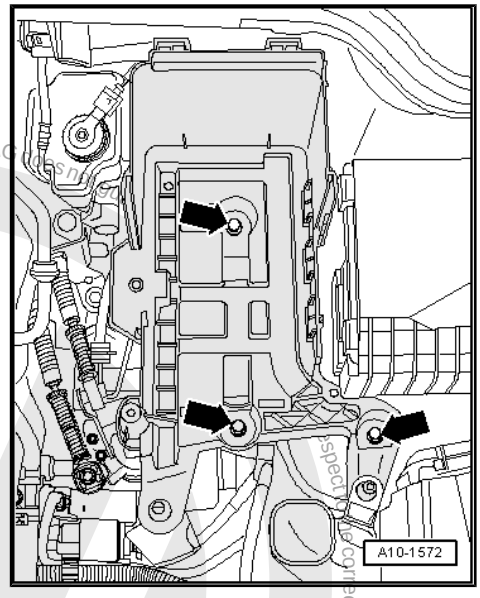
– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

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

– Drain coolant ⇒ page 173 .

– Remove lock carrier ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Removing and installing lock carrier .

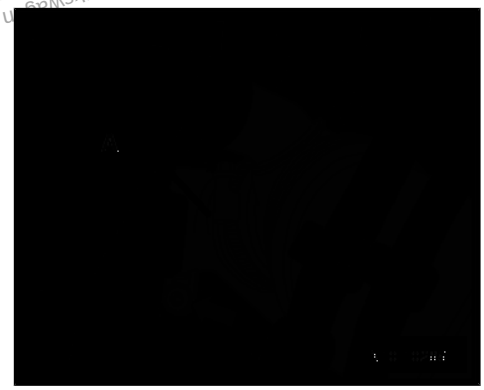


– Unscrew bolt -arrow- and move filler neck for windscreen washer system reservoir to side.

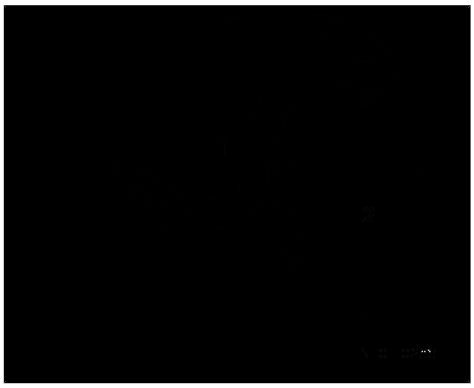
– Remove coolant expansion tank and lay it on engine.



– Unscrew (captive) bolt -arrow-, then unscrew intake hose -A- clockwise and remove it

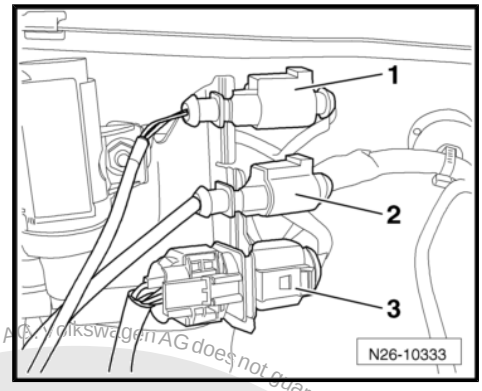


– Pull off vacuum hoses -1- and -2- for charge air control.

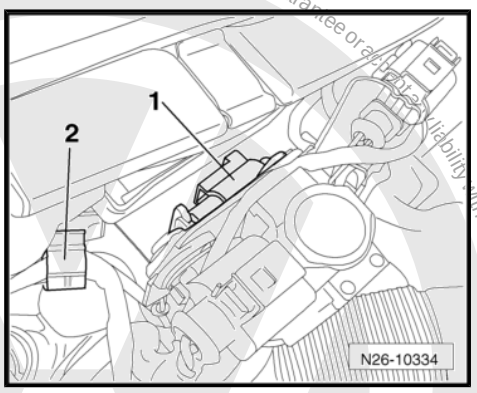


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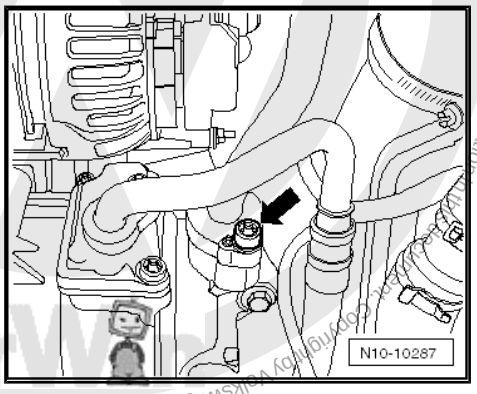
– Separate connectors for exhaust temperature sender 1 - G235- -1-, for Lambda probe - G39- -3- and for exhaust temperature sender 4 - G648- -2-.



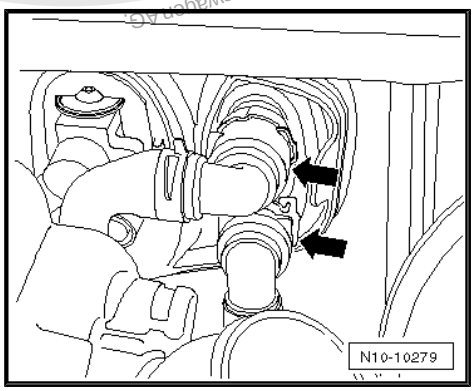
– Disconnect connector for exhaust temperature sender 3 - G495- -1- (secured behind bracket).
– Guide lines out of retainers on plenum chamber bulkhead and on turbocharger.
– Pull vacuum line off vacuum pump.



– Unscrew securing bolt for refrigerant line -arrow- from air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing refrigerant lines from and to air conditioner compressor .
– Separate refrigerant line at air conditioner compressor and lay it to side without kinking.

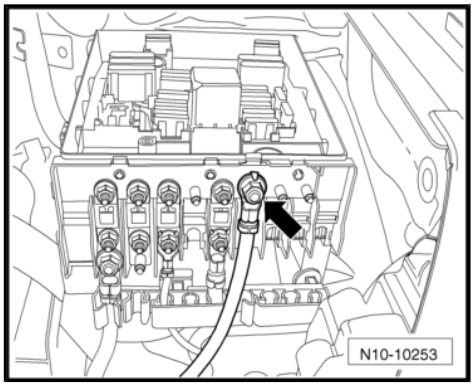


– Disconnect quick-release couplings for heat exchanger -arrows- on plenum chamber bulkhead.



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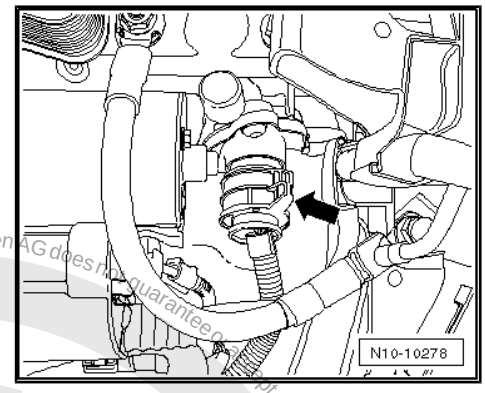
– Remove positive wire -arrow- from starter at central electrics and lay wire on engine.



Vehicles with dual clutch gearbox

– Disconnect selector mechanism from gearbox ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

– To release, turn catch of mechatronic connector -arrow- and pull connector off.



Vehicles with manual gearbox

– Disconnect selector mechanism from gearbox ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

– Remove pipe/hose assembly or plastic pipe from clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch control mechanism; Removing and installing lines for clutch control mechanism .

Continued for all vehicles

– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .

– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .

– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

– Remove engine control unit from its bracket:

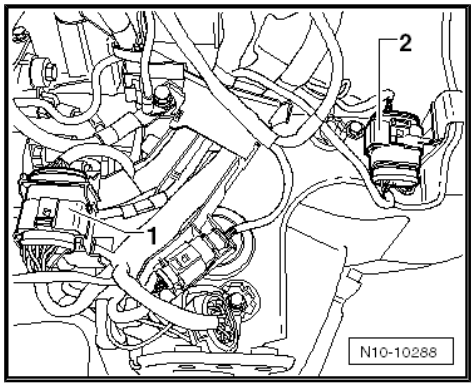
⇒ page 262

– Release connector for engine wiring harness -arrow- and pull it off engine control unit.



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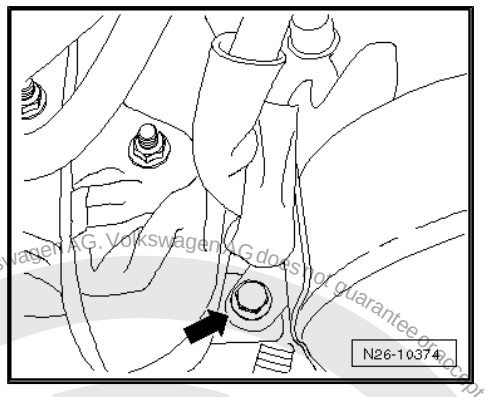
– Disconnect connectors -1- and -2- on left longitudinal member.
– Unscrew earth wire on gearbox.
– Open locking mechanism -A- of feed-through in plenum chamber bulkhead.



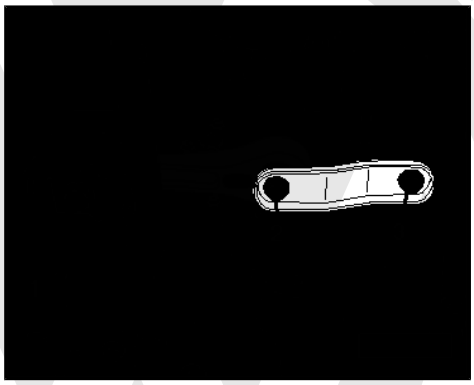
– Pull out upper part upwards and remove engine wiring harness from cable guide.
– Separate all connectors between starter, gearbox and body.



– Unscrew securing bolt -arrow- on upper bracket for particulate filter and loosen securing bolt of bracket on cylinder head one turn.
– Disconnect connector on oil level and oil temperature sender - G266- .
– Remove drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .



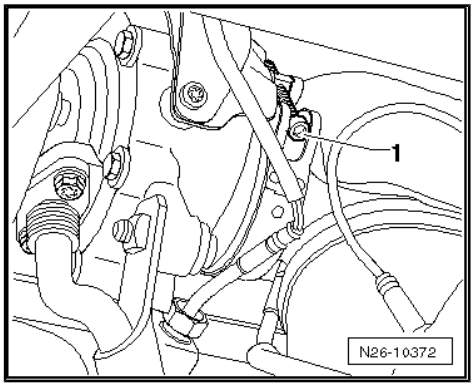
– Unscrew bolts -1…3- and remove pendulum support.



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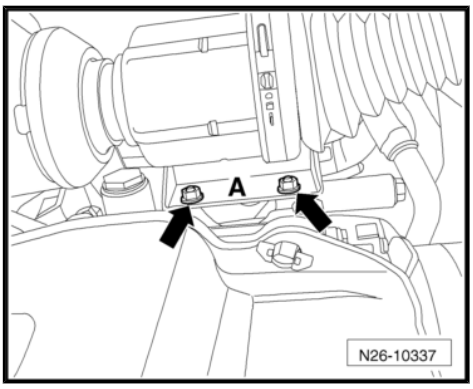
– Loosen securing clamp -1- between particulate filter and turbocharger.

– Unscrew securing nuts above particulate filter bracket using ratchet wrench - T10384- .



– Unscrew securing nuts -arrows- of particulate filter bracket -A- on crankcase and remove bracket.

– Push particulate filter aside and fix it in position on plenum chamber bulkhead using suitable means.



Note

Check that all hose and line connections between engine, gearbox and body have been detached.

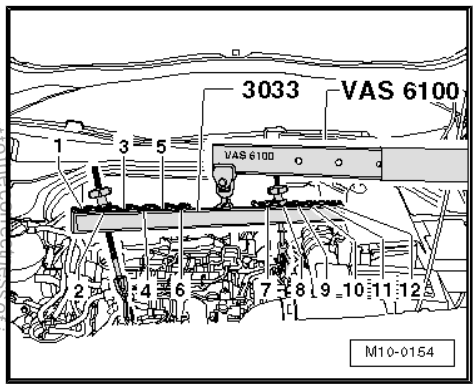
– Attach lifting tackle - 3033- as follows and take up weight of »engine/gearbox assembly« in installation position using workshop crane - VAS 6100- .

Vibration damper end:

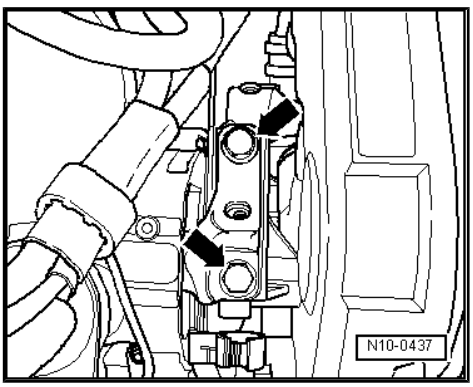
• Position 2.

Flywheel end:

• Position 8.

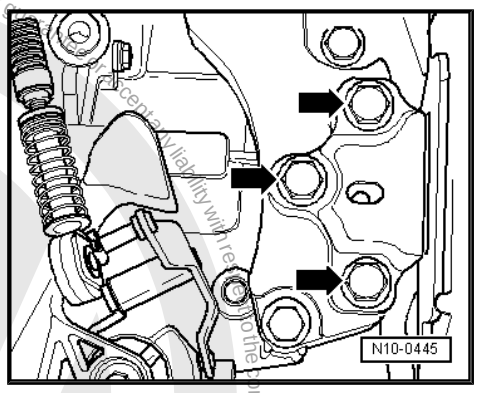


– Unscrew securing bolts -arrows- of assembly mounting on engine.



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– Unscrew securing bolts -arrows- of assembly mounting on gearbox.



Note

Carefully guide »engine/gearbox assembly« when removing to avoid damage to body.

– Lower »engine/gearbox assembly« slightly and remove forwards.

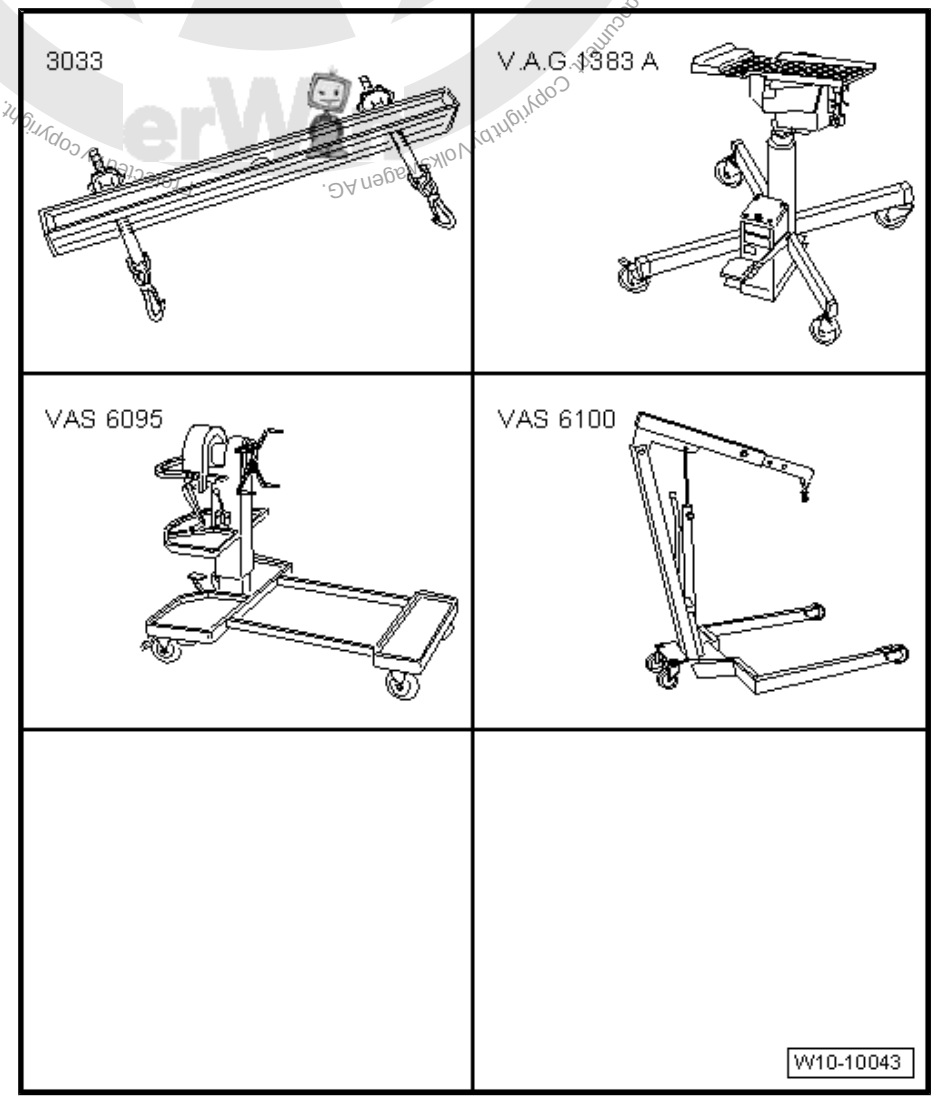
Secure engine to engine and gearbox support - VAS 6095- to carry out repairs ⇒ page 20 .

1.2 Securing engine on engine and gearbox support

Before carrying out repair work, secure engine in engine and gearbox support - VAS 6095/1- using universal mounting - VAS 6095- .

Special tools and workshop equipment required

- Lifting tackle - 3033-
- Engine and gearbox jack - V.A.G 1383 A-
- Workshop hoist - VAS 6100-
- Engine and gearbox support - VAS 6095-



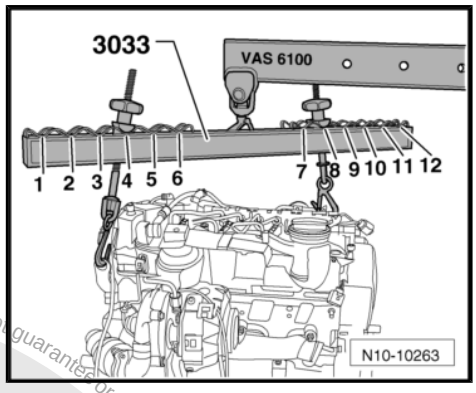
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Procedure

– Unbolt gearbox.

– On vehicles with automatic gearbox, secure torque converter against “falling out” after separating engine from gearbox.

– Attach lifting tackle - 3033- as follows and lift from engine and gearbox jack - VAS 6100- using workshop crane - V.A.G 1383 A- .



Flywheel end: position 4.

Vibration damper end: position 8.

– Secure engine on engine and gearbox support - VAS 6095/1- using universal mounting - VAS 6095- .

1.3 Installing engine

⇒ “1.3.1 Notes on installing, Passat, Passat CC, Tiguan and Eos”, page 21

⇒ “1.3.2 Notes on installing, Golf, Golf Plus, Scirocco”, page 22

1.3.1 Notes on installing, Passat, Passat CC, Tiguan and Eos

Install in reverse order of removal, observing the following.

– For vehicles with manual gearbox check clutch release bearing for wear and renew if necessary. Lightly grease input shaft splines with G 000 100 grease.

– Check whether dowel sleeves for aligning engine and gearbox are fitted in cylinder block and install if necessary.

– Align engine mountings tension free by shaking, then adjust ⇒ page 34 .

Note

- *Specified torques for engine/gearbox assembly mountings ⇒ page 25*
- *Electrical connections and routing ⇒ Electrical system; Rep. gr. 97*

– Install drive shaft. ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

Vehicles with all-wheel drive

– Install propshaft ⇒ Propshaft and rear final drive; Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

– Install rear exhaust system ⇒ page 299 .

Continued for all vehicles

– Install particulate filter ⇒ page 310 .

– Install subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe with steering rack .

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Vehicles with manual gearbox

– Install hydraulic line for the hydraulic clutch ⇒ Rep. gr. 30 ; Clutch control mechanism; Removing and installing lines for clutch control mechanism .

– Install selector mechanism and adjust cables if necessary ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

Vehicles with automatic gearbox

– Install selector lever cable on gearbox and adjust if necessary ⇒ Rep. gr. 37 ; Selector mechanism; Removing and installing selector lever cable .

– Check ATF level and top up if necessary ⇒ Rep. gr. 37 ; ATF; Checking ATF level .

Vehicles with dual clutch gearbox

– Install selector lever cable on gearbox and adjust if necessary ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector lever cable .

Continued for all vehicles

– Add coolant ⇒ page 173 .

– Fill air conditioning system.

– Install battery and battery holder ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

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

– Carry out road test and read all event memories ⇒ Vehicle diagnostic tester.

Torque settings

Bolted connection		Torque setting
Nuts and bolts	M6	10 Nm
	M8	20 Nm
	M10	45 Nm
	M12	60 Nm

1.3.2 Notes on installing, Golf, Golf Plus, Scirocco

Install in reverse order of removal. During this step, observe the following:

Repairing the clutch:

- Vehicles with manual gearbox ⇒ Rep. gr. 30 ; Clutch; Removing and installing clutch .
- Vehicles with dual clutch gearbox ⇒ Rep. gr. 30 ; Clutch; Removing and installing dual clutch .

– Check whether dowel sleeves for aligning engine and gearbox are fitted in cylinder block and install if necessary.

– When installing »engine/gearbox assembly«, ensure sufficient clearance to subframe and radiator.

– Adjusting assembly mountings ⇒ page 34 .

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Note

- *Specified torques for engine/gearbox assembly mountings ⇒ page 25*
- *Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 .*

Vehicles with manual gearbox:

– Install hydraulic line for the hydraulic clutch ⇒ Rep. gr. 30 ; Clutch control mechanism; Removing and installing lines for clutch control mechanism .

– Install gearbox selector mechanism and adjust if necessary ⇒ Rep. gr. 34 ; Manual gearbox; Removing and installing manual gearbox .

Vehicles with dual clutch gearbox:

– Install lay selector lever and adjust if necessary ⇒ Rep. gr. 34 ; Manual gearbox; Removing and installing lay selector lever .

Continued for all vehicles:

Note

- *After working on the particulate filter, ensure it is installed free of stress.*
- *Renew self-locking nuts, seals, gaskets and securing clamps.*

Caution

Avoid damage of flexible joint behind particulate filter. When removing and installing:

- ***Do not allow the decoupling element to kink by more than 10°.***
- ***Install decoupling element so that it is not under tension.***
- ***Do not damage wire mesh on decoupling element.***

Install particulate filter:

Engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA ⇒ page 310

Engine code CJAA ⇒ page 318

– Bolt drive shafts to gearbox ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

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– Install heat shield for drive shaft (right-side) -arrows-.

Specified torque ⇒ Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft

– Install lock carrier ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Removing and installing lock carrier .
– Secure refrigerant lines free of stress to air conditioner compressor and to condenser ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing refrigerant lines from and to air conditioner compressor .
– Fill air conditioning system.
– Install battery and battery holder ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .
– Observe notes after connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
– Fill coolant system with coolant ⇒ page 173 .
– Filling fuel system ⇒ page 223 .
– Read the event memories of all control units. Delete all event entries, which might have been stored during assembly ⇒ Vehicle diagnostic tester.
– Check headlight adjustment and correct if necessary ⇒ Maintenance ; Booklet 20.1 .

Torque settings

Bolted connection		Torque setting
Nuts and bolts	M6	10 Nm
	M7	15 Nm
	M8	20 Nm
	M10	40 Nm
	M12	65 Nm [1]

1) Specified torque for M12 flange bolts: 75 Nm

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2 Assembly mountings

⇒ “2.1 Assembly overview - assembly mountings”, page 25

⇒ “2.2 Supporting engine in installation position”, page 26

⇒ “2.3 Adjusting assembly mountings”, page 34

2.1 Assembly overview - assembly mountings

⇒ “2.1.1 Assembly mountings, Passat, Passat CC, Eos, Golf, Golf Plus and Scirocco”, page 25

⇒ “2.1.2 Assembly mountings, Tiguan”, page 26

2.1.1 Assembly mountings, Passat, Passat CC, Eos, Golf, Golf Plus and Scirocco

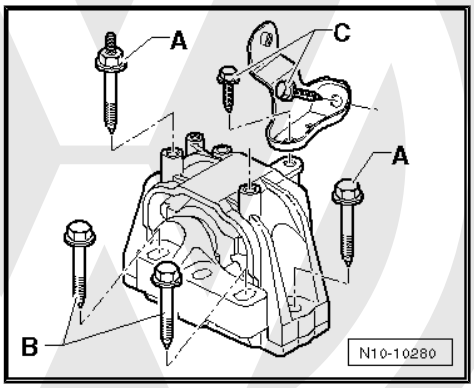
Engine mounting

A [1] = 40 Nm + turn 90° further

B [1] = 60 Nm + 90° further

C [1] = 20 Nm + 90° further

[1] Renew

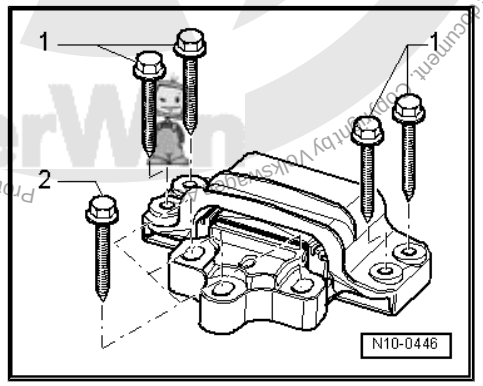


Gearbox mounting

1 [1] = 40 Nm + 90° further

2 [1] = 60 Nm + 90° further

[1] Renew



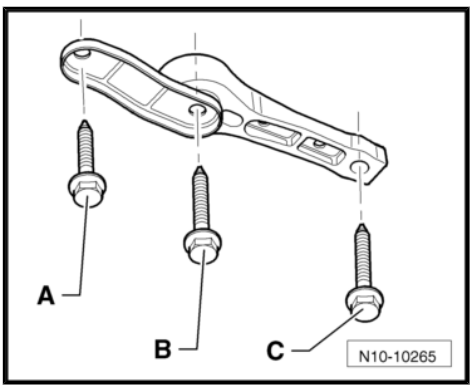
Pendulum support

A [1] = 50 Nm + turn 90° further

B [1] = M10: 50 Nm + turn 90° further; M12: 60 Nm +turn 90° further

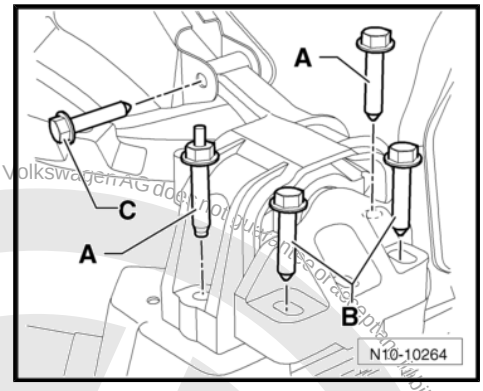
C [1] = 100 Nm + 90° further

[1] Renew



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2.1.2 Assembly mountings, Tiguan



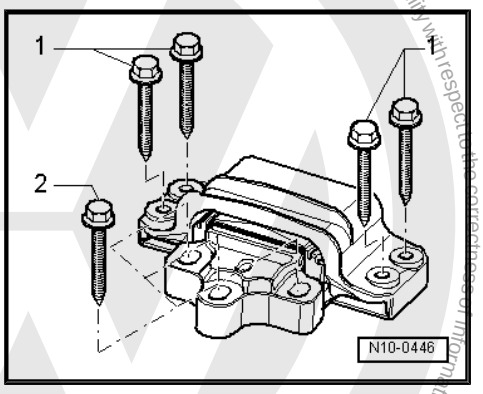
Engine mounting

A [1] = 40 Nm + turn 90° further

B [1] = 60 Nm + 90° further

C [1] = 20 Nm + 90° further

[1] Renew

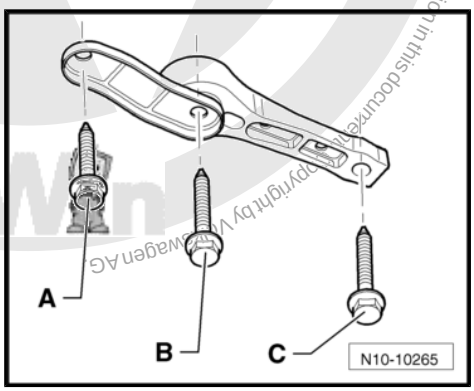


Gearbox mounting

1 [1] = 40 Nm + 90° further

2 [1] = 60 Nm + 90° further

[1] Renew



Pendulum support

A [1] = M10: 50 Nm + turn 90° further; M12: 60 Nm + turn 90° further

B [1] = M10: 50 Nm + turn 90° further; M12: 60 Nm +turn 90° further

C [1] = 100 Nm + 90° further

[1] Renew

2.2 Supporting engine in installation position

⇒ “2.2.1 Supporting engine in installation position, Passat, Passat CC, Eos, Golf and Scirocco”, page 26

⇒ “2.2.2 Supporting engine in installation position, Tiguan”, page 29

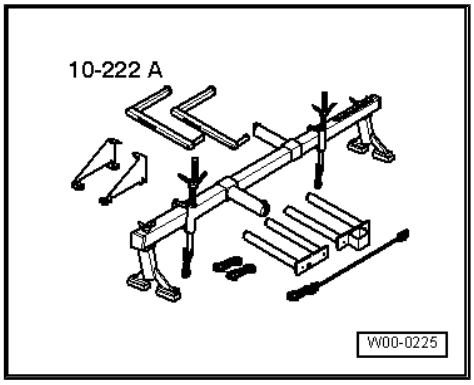
⇒ “2.2.3 Supporting engine in installation position, Golf Plus”, page 31

2.2.1 Supporting engine in installation position, Passat, Passat CC, Eos, Golf and Scirocco

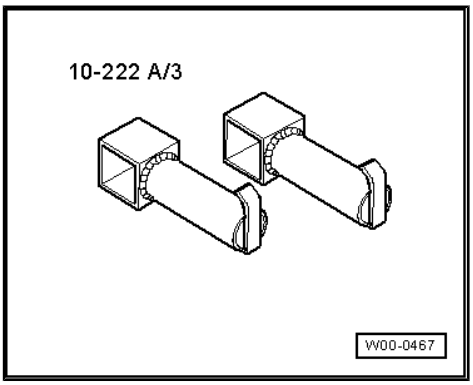
Special tools and workshop equipment required

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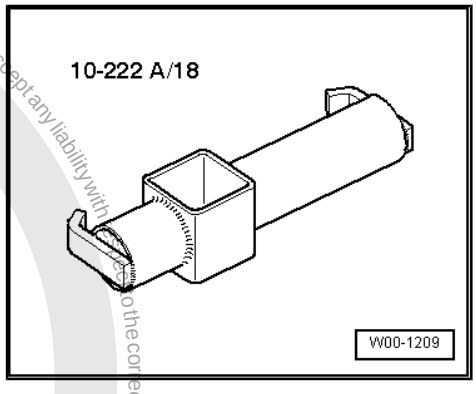
- Support bracket - 10-222 A-



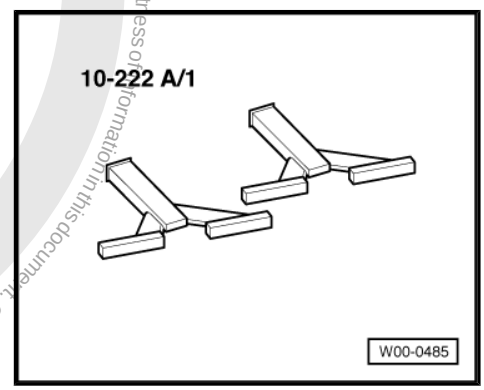
- Adapter - 10-222 A/3-



- Adapter - 10-222 A/18-



- Adapter - 10-222 A/1-



- Torque wrench - V.A.G 1331-
- Pliers for spring-type clips - VAS 6362-

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Procedure

WARNING

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

- *Route lines of any kind so that the original routing can be restored.*
- *Ensure sufficient clearance to all moving or hot components.*

– Remove engine cover panel ⇒ page 39 .

– Remove air filter housing ⇒ page 243 .

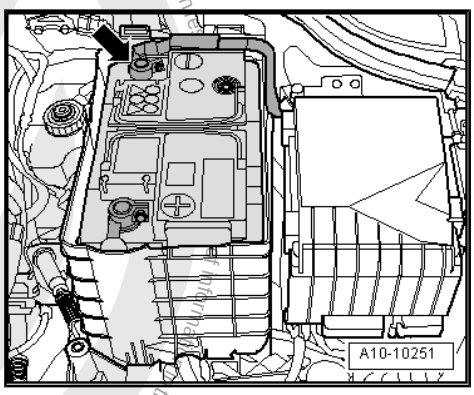
– Remove intake hose between air mass meter - G70- and intake connecting pipe.

Caution

To prevent damage to the electronic components when disconnecting the battery :

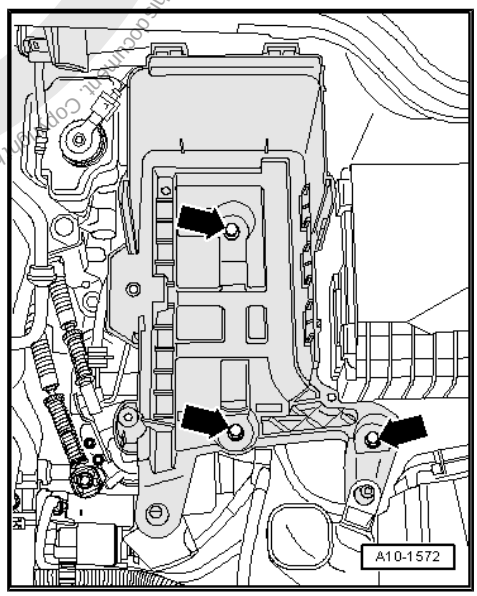
- *Comply with precautions when disconnecting battery .*

– Disconnect earth wire -arrow- from battery with ignition switched off ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .



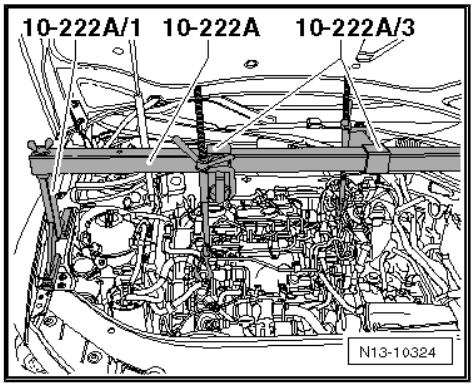
– Remove battery and battery tray -arrows- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- (fuel lines remain connected) ⇒ Fuel supply - diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .



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– Set up support bracket - 10-222 A- with necessary adapters as illustrated and support engine in installation position.



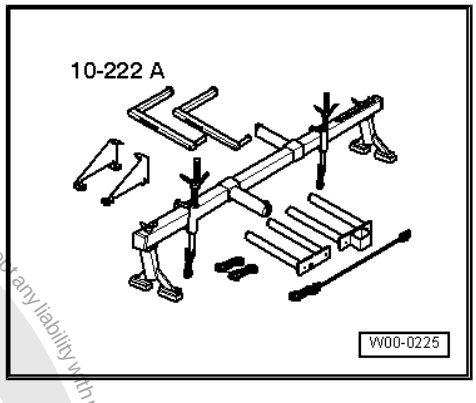
Note

It is only permissible to loosen the securing bolts for the assembly mountings if the engine is supported on the support bracket - 10-222 A- .

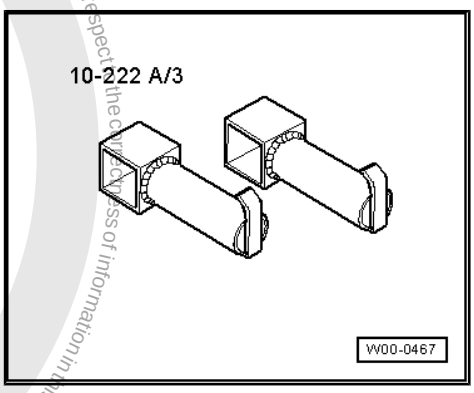
2.2.2 Supporting engine in installation position, Tiguan

Special tools and workshop equipment required

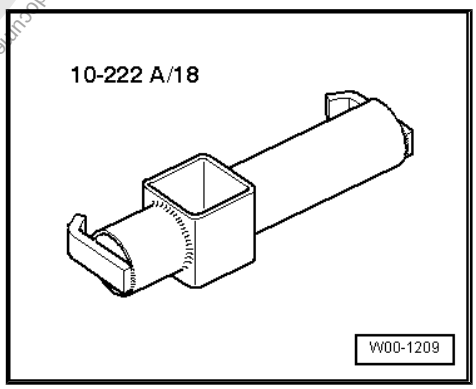
- Support bracket - 10-222 A-



- Adapter - 10-222 A/3-

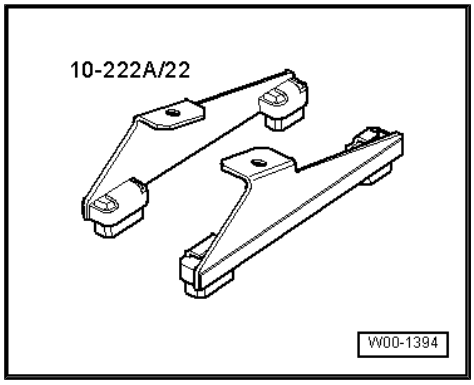


- Adapter - 10-222 A/18-



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- Adapter - 10-222 A/22-



- Torque wrench - V.A.G 1331-
- Pliers for spring-type clips - VAS 6362-

Procedure

WARNING

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

- *Route lines of any kind so that the original routing can be restored.*
- *Ensure sufficient clearance to all moving or hot components.*

– Remove engine cover panel ⇒ page 39 .

– Remove air filter housing ⇒ page 243 .

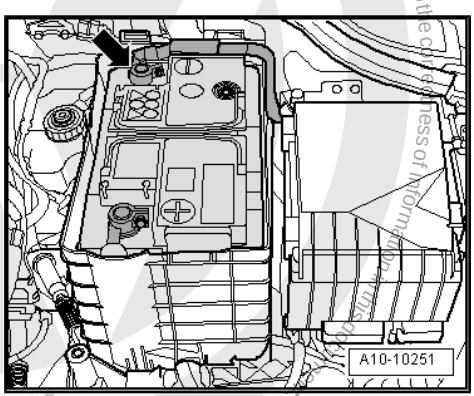
– Remove intake hose between air mass meter - G70- and intake connecting pipe.

Caution

To prevent damage to the electronic components when disconnecting the battery :

- *Comply with precautions when disconnecting battery .*

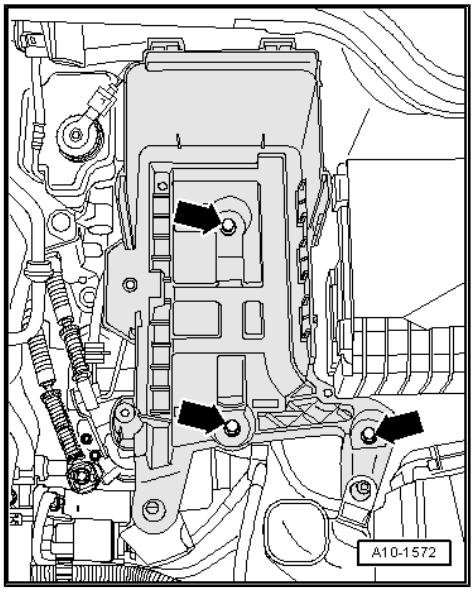
– Disconnect earth wire -arrow- from battery with ignition switched off ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery.



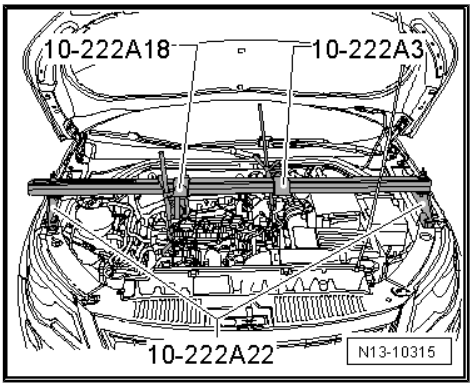
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– Remove battery and battery tray -arrows- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- (fuel lines remain connected) ⇒ Fuel supply - diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .



– Set up support bracket - 10-222 A- with necessary adapters as illustrated and support engine in installation position.



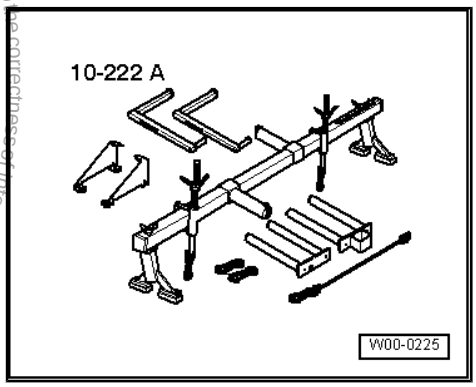
Note

It is only permissible to loosen the securing bolts for the assembly mountings if the engine is supported on the support bracket - 10-222 A-.

2.2.3 Supporting engine in installation position, Golf Plus

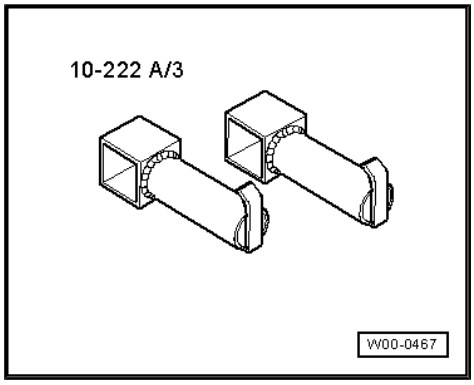
Special tools and workshop equipment required

♦ Support bracket - 10-222 A-

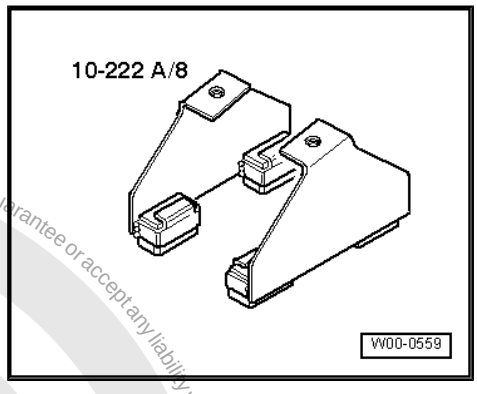


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- Adapter - 10-222 A/3-



- Adapter - 10-222 A/8-



- Torque wrench - V.A.G 1331-
- Pliers for spring-type clips - VAS 6362-

Procedure

WARNING

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

- ***Route lines of any kind so that the original routing can be restored.***
- ***Ensure sufficient clearance to all moving or hot components.***

– Remove engine cover panel ⇒ page 39 .
– Remove air filter housing ⇒ page 243 .
– Remove intake hose between air mass meter - G70- and intake connecting pipe.

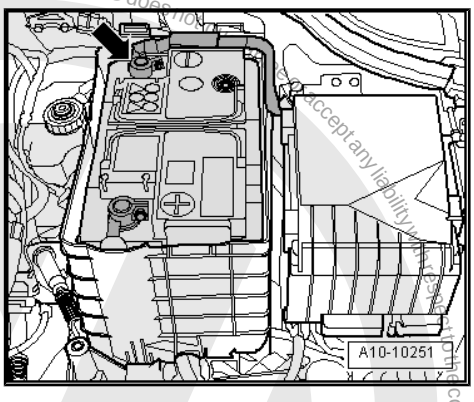
Caution

To prevent damage to the electronic components when disconnecting the battery :

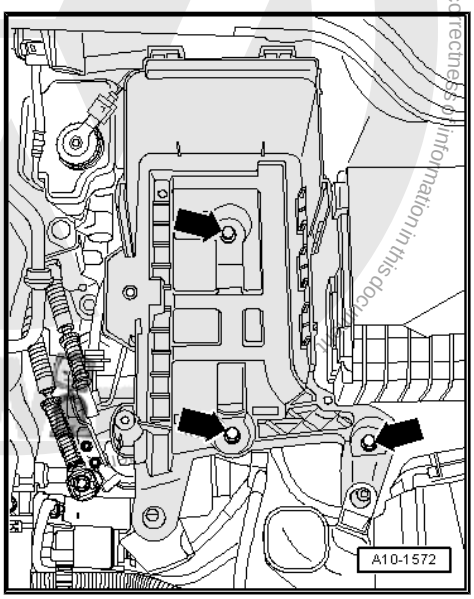
- ***Comply with precautions when disconnecting battery .***

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– Disconnect earth wire -arrow- from battery with ignition switched off ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .



– Remove battery and battery tray -arrows- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .
– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .
– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Assembly overview – plenum chamber bulkhead .



– Set up support bracket - 10-222 A- with necessary adapters as illustrated and support engine in installation position.



Note

It is only permissible to loosen the securing bolts for the assembly mountings if the engine is supported on the support bracket - 10-222 A- .

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2.3 Adjusting assembly mountings

⇒ "2.3.1 Adjusting assembly mountings, Passat, Passat CC, Eos, Golf and Scirocco", page 34

⇒ "2.3.2 Adjusting assembly mountings, Tiguan", page 35

⇒ "2.3.3 Adjusting assembly mountings, Golf Plus", page 37

2.3.1 Adjusting assembly mountings, Passat, Passat CC, Eos, Golf and Scirocco

Procedure

WARNING

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

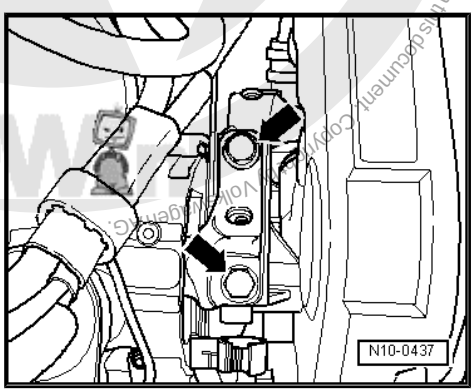
- *Route lines of any kind so that the original routing can be restored.*
- *Ensure sufficient clearance to all moving or hot components.*

– Support engine in its installation position ⇒ page 26 .

Note

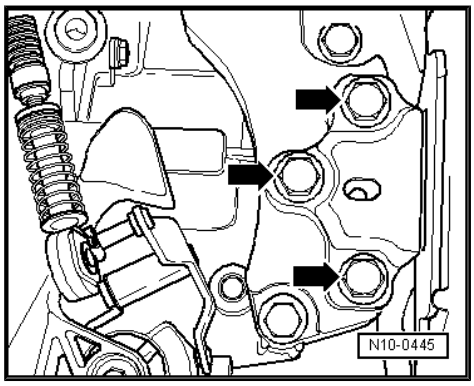
It is only permissible to loosen the securing bolts for the assembly mountings if the engine is supported on the support bracket -10-222 A- .

– Renew engine mounting bolts -arrows- in succession (if not already carried out) and screw in hand-tight.



– Renew gearbox mounting bolts -arrows- in succession (if not already carried out) and screw in hand-tight.

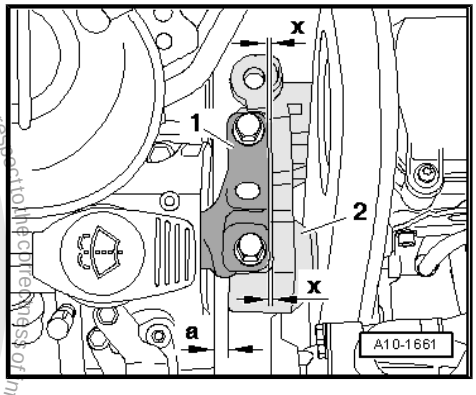
– Loosen bolts for support arms on engine side and on gearbox side by about two turns each.



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Engine mounting

- There must be a distance -a- of at least 10 mm between engine bracket and longitudinal member (right side).
- The side surface of the engine bracket -2- should be located parallel to the support arm -1-.



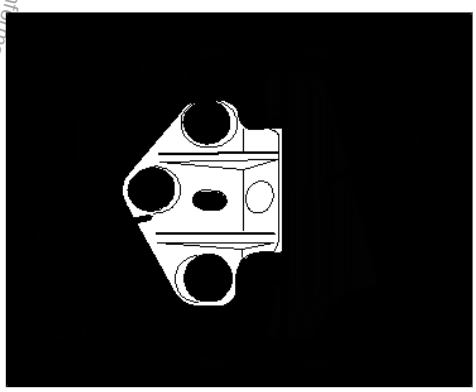
Gearbox mounting

– Ensure that edges of support arm (on gearbox side) -1- and gearbox mounting -2- are parallel.

- Dimension -x- must be identical on both sides of mounting.

– Tighten bolts for assembly mountings:

- Specified torques ⇒ page 25 .



The remaining installation steps are carried out in the reverse order of removal. During this step, observe the following:

- Ensure that fuel lines are tight.
- Do not interchange supply and return lines (return line blue or with blue markings, supply line black).

– Observe notes after connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

2.3.2 Adjusting assembly mountings, Tiguan

Procedure

WARNING

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

- ***Route lines of any kind so that the original routing can be restored.***
- ***Ensure sufficient clearance to all moving or hot components.***

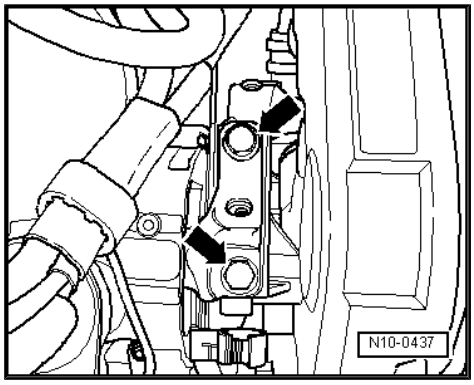
– Support engine in its installation position ⇒ page 29 .

Note

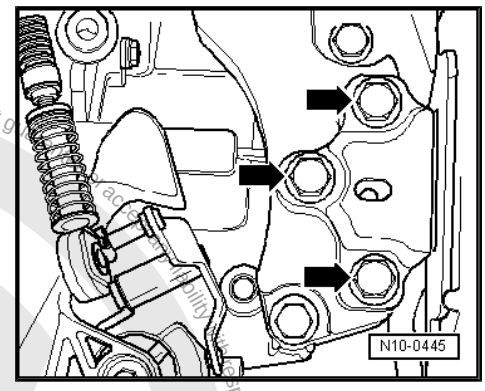
It is only permissible to loosen the securing bolts for the assembly mountings if the engine is supported on the support bracket -10-222 A- .

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– Renew engine mounting bolts -arrows- in succession (if not already carried out) and screw in hand-tight.

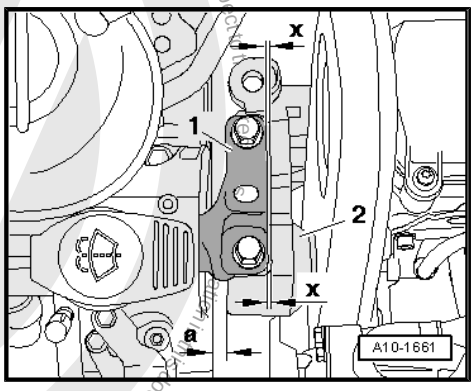


– Renew gearbox mounting bolts -arrows- in succession (if not already carried out) and screw in hand-tight.
– Loosen bolts for support arms on engine side and on gearbox side by about two turns each.



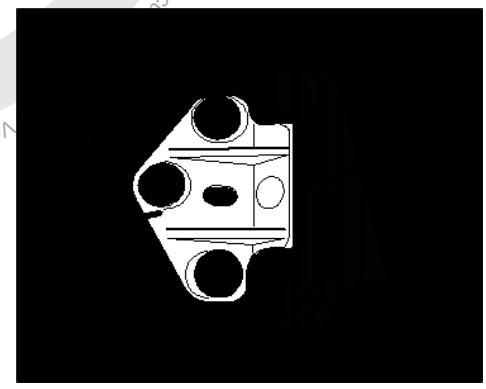
Engine mounting

- There must be a distance -a- of at least 10 mm between engine bracket and longitudinal member (right side).
- The side surface of the engine bracket -2- should be located parallel to the support arm -1-.



Gearbox mounting

– Ensure that edges of support arm (on gearbox side) -1- and gearbox mounting -2- are parallel.
- Dimension -x- must be identical on both sides of mounting.
– Tighten bolts for assembly mountings:
- Specified torques ⇒ page 25 .



The remaining installation steps are carried out in the reverse order of removal. During this step, observe the following:

- Ensure that fuel lines are tight.
- Do not interchange supply and return lines (return line blue or with blue markings, supply line black).
– Observe notes after connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

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2.3.3 Adjusting assembly mountings, Golf Plus

Procedure

WARNING

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

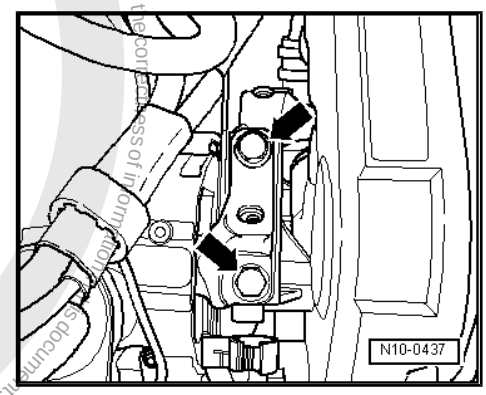
- ***Route lines of any kind so that the original routing can be restored.***
- ***Ensure sufficient clearance to all moving or hot components.***

– Support engine in its installation position ⇒ page 31 .

Note

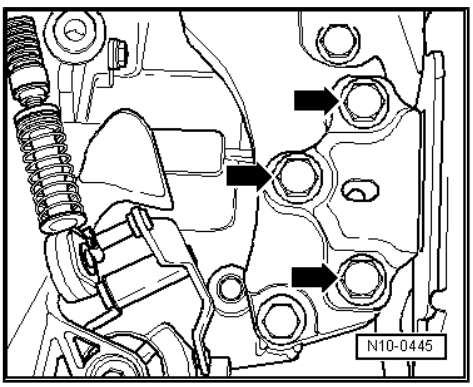
It is only permissible to loosen the securing bolts for the assembly mountings if the engine is supported on the support bracket -10-222 A- .

– Renew engine mounting bolts -arrows- in succession (if not already carried out) and screw in hand-tight.



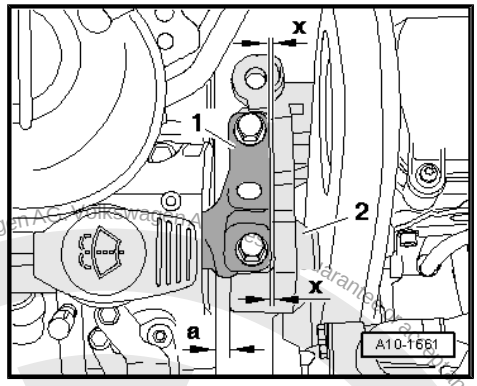
– Renew gearbox mounting bolts -arrows- in succession (if not already carried out) and screw in hand-tight.

– Loosen bolts for support arms on engine side and on gearbox side by about two turns each.



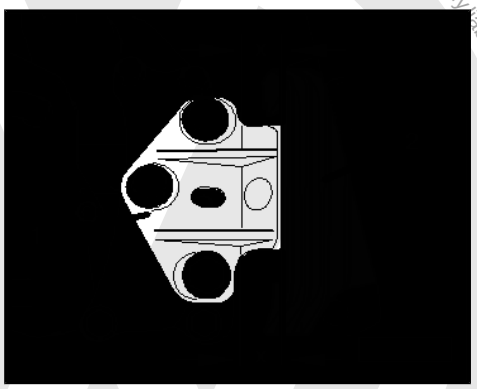
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Engine mounting



- There must be a distance -a- of at least 10 mm between engine bracket and longitudinal member (right side).
- The side surface of the engine bracket -2- should be located parallel to the support arm -1-.

Gearbox mounting



– Ensure that edges of support arm (on gearbox side) -1- and gearbox mounting -2- are parallel.

- Dimension -x- must be identical on both sides of mounting.

– Tighten bolts for assembly mountings.

- Specified torques ⇒ page 25 .

The remaining installation steps are carried out in the reverse order of removal. During this step, observe the following:

- Ensure that fuel lines are tight.
- Do not interchange supply and return lines (return line blue or with blue markings, supply line black).

– Observe notes after connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

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3 Motor cover

⇒ “3.1 Removing and installing engine cover”, page 39

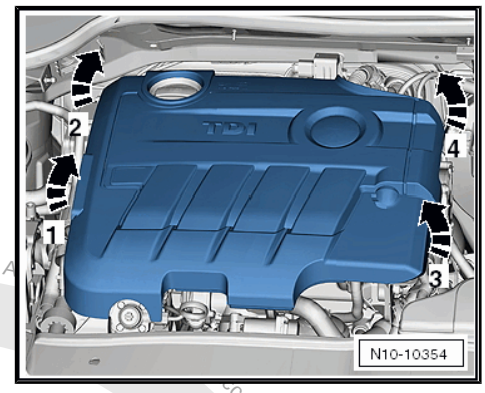
3.1 Removing and installing engine cover

Removing

Caution

The engine cover retainer on the cylinder head cover can break if not removed correctly. Always remove engine cover according to following instructions.

– Pull engine cover panel upwards out of fasteners in areas of -arrows- and in sequence shown. To do this, grip as far beneath engine cover panel as possible.



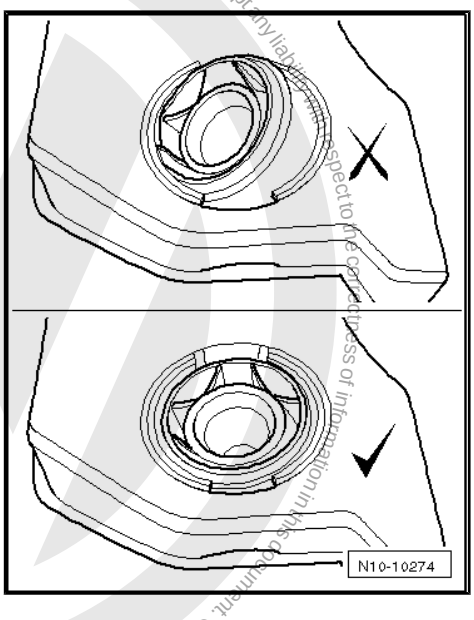
Installing

Caution

Ensure that the 4 fasteners (ball sockets) are correctly positioned before installing the engine cover panel. Position them correctly if necessary. Otherwise the engine cover panel will be damaged.

– If necessary, press ball sockets of engine cover panel into correct position.

– First fit engine cover panel onto mounting points, then press into fasteners at corners.



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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ “1.1 Assembly overview - poly V-belt drive”, page 40

⇒ “1.2 Removing and installing poly-V belt”, page 44

⇒ “1.3 Removing and installing tensioner for poly V-belt”, page 48

⇒ “1.4 Removing and installing bracket for ancillaries”, page 49

⇒ “1.5 Removing and installing engine bracket”, page 51

⇒ “1.6 Assembly overview - cylinder block (pulley end)”, page 61

⇒ “1.7 Removing and installing sealing flange on pulley end”, page 62

⇒ “1.8 Renewing crankshaft oil seal - belt pulley end”, page 64

1.1 Assembly overview - poly V-belt drive

⇒ “1.1.1 Assembly overview - poly V-belt drive with tensioning element and air conditioner compressor”, page 40

⇒ “1.1.2 Assembly overview - poly V-belt drive with tensioning roller and air conditioner compressor”, page 42

⇒ “1.1.3 Assembly overview - poly V-belt drive without air conditioner compressor”, page 44

1.1.1 Assembly overview - poly V-belt drive with tensioning element and air conditioner compressor

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1 - Belt pulley and vibration damper

- ❑ Offset holes make assembly possible in one position only

2 - 25 Nm

3 - Alternator

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

4 - Holder

- ❑ For ancillaries
- ❑ Removing and installing ⇒ page 49

5 - 20 Nm + turn 90° further

6 - Poly V-belt tensioning element

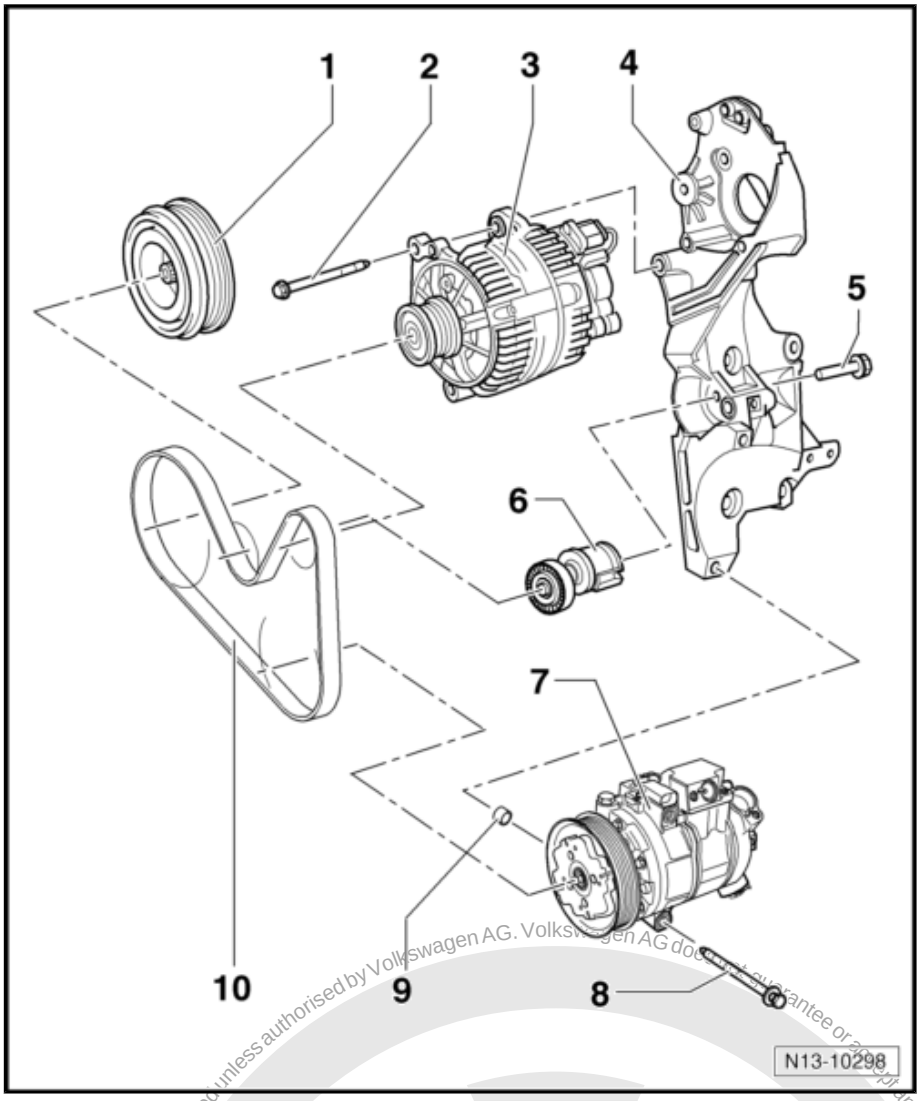
7 - Air conditioner compressor

8 - 25 Nm

9 - Dowel sleeves

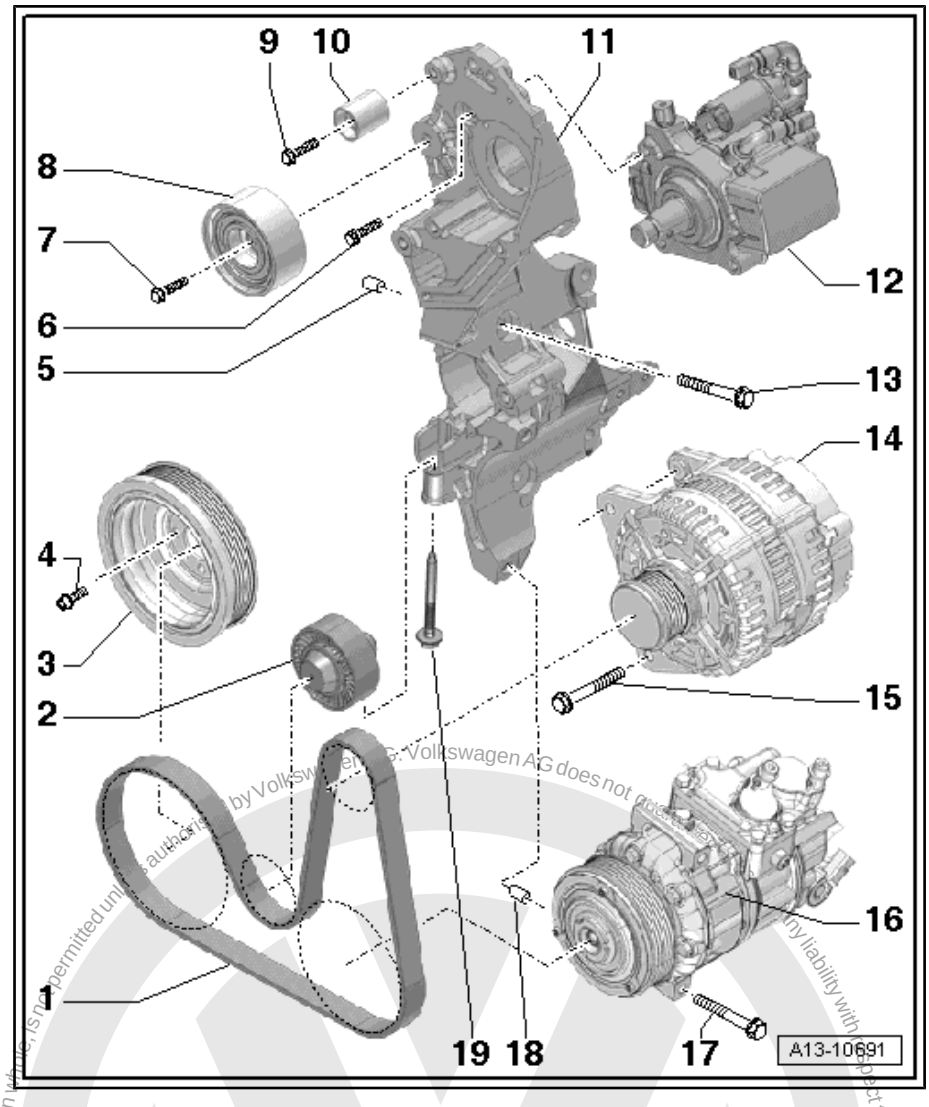
10 - Poly V-belt

- ❑ Mark direction of rotation before removing
- ❑ Check for wear
- ❑ Do not kink
- ❑ Removing and installing ⇒ page 44



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1.1.2 Assembly overview - poly V-belt drive with tensioning roller and air conditioner compressor



1 - Poly V-belt

- ❑ Check for wear
- ❑ Before removing, mark direction of rotation with chalk or felt-tipped marker pen.
- ❑ Removing and installing ⇒ page 46
- ❑ Do not kink
- ❑ When installing, make sure it is properly seated on poly V-belt pulleys.

2 - Tensioning roller for poly V-belt

- ❑ Removing and installing ⇒ page 46
- ❑ Coat guide surfaces with lubricating paste; lubricating paste ⇒ Electronic Parts Catalogue .

3 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Offset holes make assembly possible in one position only
- ❑ Installation position: hole in vibration damper must align over protrusion on crankshaft pulley.

4 - 10 Nm + 90°

- ❑ Renew
- ❑ Use only genuine bolts ⇒ Parts Catalogue .

5 - Dowel sleeve

- ❑ Check for correct seating in ancillary bracket.

6 - 20 Nm + 90°

7 - 50 Nm + 90°

8 - Idler roller

- ❑ For toothed belt

9 - 15 Nm

10 - Idler roller

- ❑ For toothed belt

11 - Ancillary bracket

- ❑ Removing and installing ⇒ page 49

12 - High-pressure pump

- ❑ Removing and installing ⇒ page 259

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13 - Bolt

❑ Specified torque and tightening sequence ⇒ page 50

14 - Alternator

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

15 - 25 Nm

16 - Air conditioner compressor

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

17 - 25 Nm

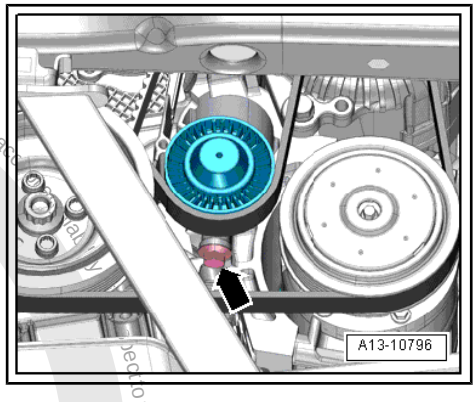
18 - Dowel sleeve

❑ Check for correct seating in ancillary bracket.

19 - Bolt

❑ Specified torque and tightening sequence ⇒ page 43

Tensioning roller for poly V-belt - specified torque and tightening sequence



Note

- *Renew bolt for tensioning roller.*
- *Coat guide surfaces of tensioning roller with solid lubricating paste with a brush; solid lubricating paste ⇒ Parts Catalogue .*

– Tighten bolt in 5 stages.

Stage	Bolt	Specified torque/turning further angle
1.	-Arrow-	Screw in by hand as far as stop • the poly V-belt is tensioned
2.	-Arrow-	turn until tensioning roller bolt reaches stop • the poly V-belt is tensioned further
3.	-Arrow-	Turn back 90°
4.	-Arrow-	30 Nm
5.	-Arrow-	Turn 90° further

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1.1.3 Assembly overview - poly V-belt drive without air conditioner compressor

1 - Vibration damper

- ❑ Installation position: hole in vibration damper must align over protrusion on crankshaft pulley.

2 - 25 Nm

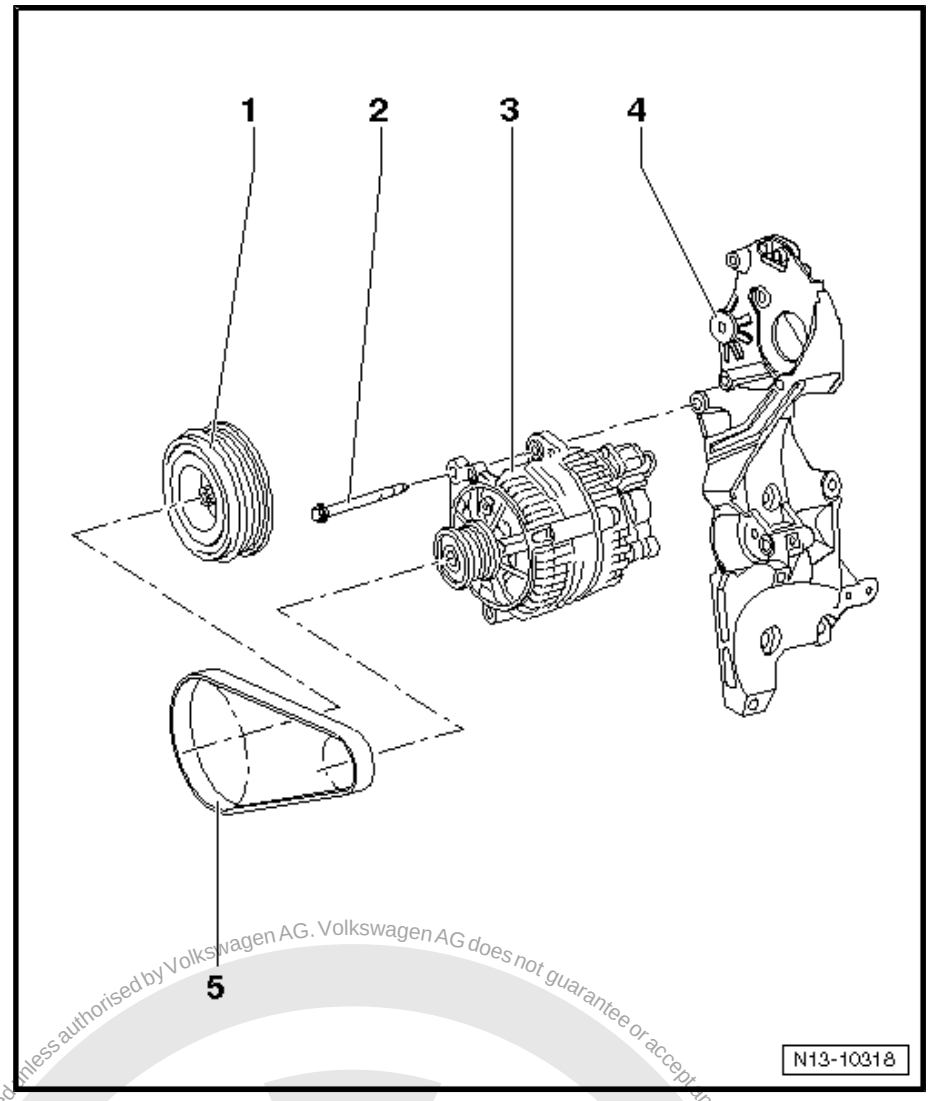
3 - Alternator

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

4 - Ancillary bracket

5 - Poly V-belt

- ❑ Renew
- ❑ Removing and installing ⇒ page 47



1.2 Removing and installing poly-V belt

⇒ “1.2.1 Removing and installing poly V-belt with tensioning element and air conditioner compressor”, page 44

⇒ “1.2.2 Removing and installing poly V-belt with tensioning roller and air conditioner compressor”, page 46

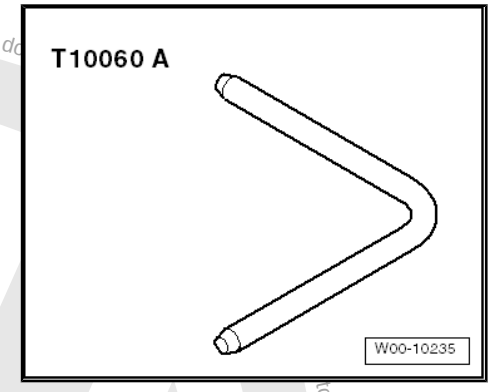
⇒ “1.2.3 Removing and installing poly V-belt without air conditioner compressor”, page 47

1.2.1 Removing and installing poly V-belt with tensioning element and air conditioner compressor

Special tools and workshop equipment required

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- Pin - T10060 A-

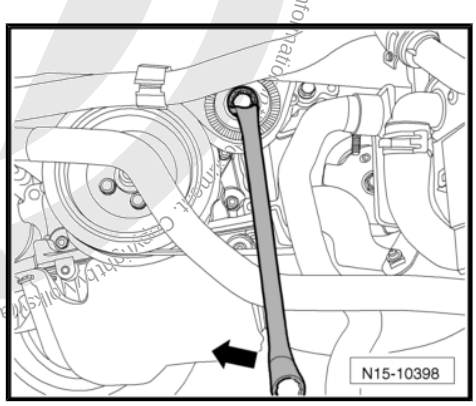


Removing

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

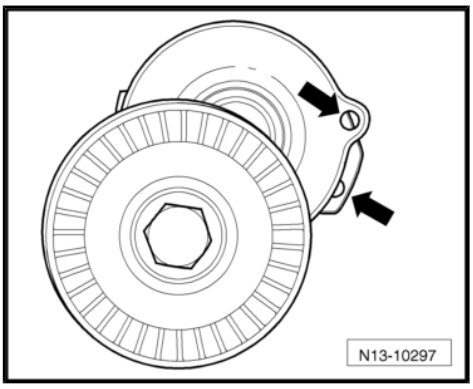
– Mark poly V-belt direction of rotation.

– Swing tensioning element in direction of arrow to remove tension from poly V-belt.



– Align holes -arrows- and lock tensioning element in position with locking pin - T10060 A- .

– Remove poly V-belt.



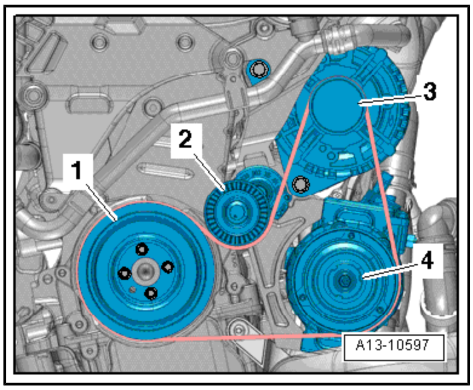
Installing

– Install in reverse order of removal.

Note

- *Before installing poly V-belt, ensure that all ancillaries (alternator, air conditioning compressor) are secure.*
- *When fitting the poly V-belt observe belt direction of rotation and that the belt is seated correctly in the belt pulleys.*

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– Fit poly V-belt on pulleys.

1 - Crankshaft

2 - Tensioning element

3 - Alternator

4 - Air conditioner compressor

On completing work:

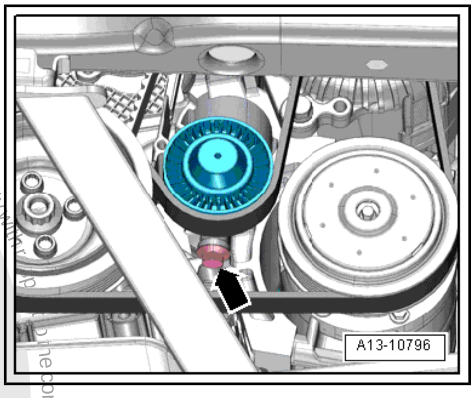
– Start engine and check belt running.

1.2.2 Removing and installing poly V-belt with tensioning roller and air conditioner compressor

Removing

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

> **Caution**
>
> *Danger of destruction due to reverse running direction in the case of a poly V-belt that has already run.*
>
> ♦ *Before removing the poly V-belt, use a piece of chalk or a felt pen to mark the running direction.*



– To slacken poly V-belt, unscrew tensioning screw -arrow-, remove tensioning roller.

– Remove poly V-belt.

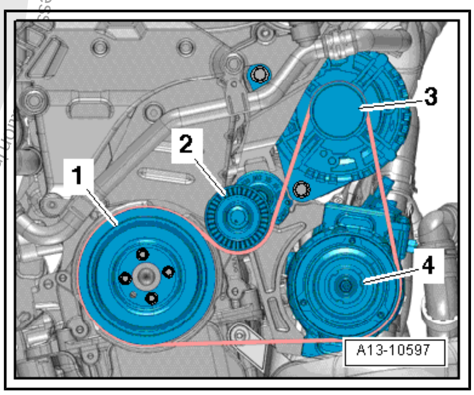
Installing

Install in reverse order of removal, observing the following.

Note

♦ *Renew bolt for tensioning roller.*

♦ *Before installing poly V-belt, ensure that all ancillaries (alternator and air conditioner compressor) are secured tightly.*



– Fit poly V-belt on poly V-belt pulley:

1 - Vibration damper

2 - Tensioning pulley

3 - Alternator

4 - Air conditioner compressor

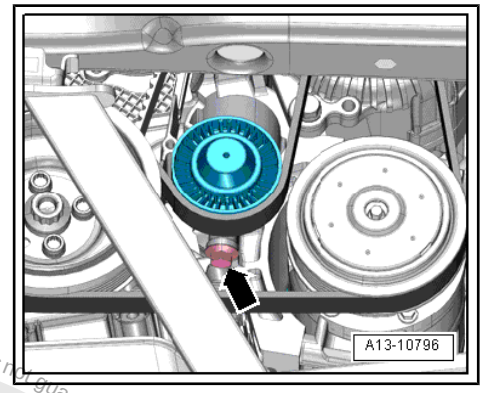
– Coat guide surfaces of tensioning roller with solid lubricating paste with a brush; solid lubricating paste ⇒ Parts Catalogue .

– Insert tensioning roller with its pin into guide on bracket for ancillaries.

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– Tighten bolt for tensioning roller ⇒ page 43 .



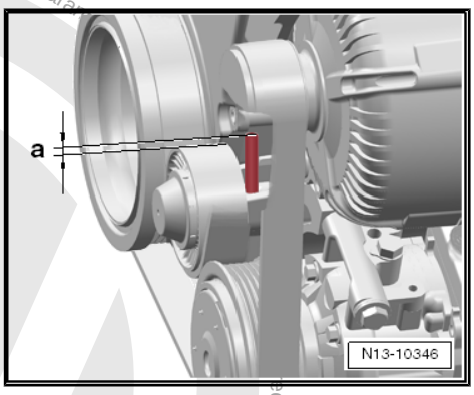
– Check whether end of bolt for tension roller projects over tensioning roller running surface by dimension -a-.

• Dimension -a- = about 2.5 mm.

• This ensures that the bolt has been tightened to its end stop.

– Start engine, and check if belt runs properly.

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



1.2.3 Removing and installing poly V-belt without air conditioner compressor

Special tools and workshop equipment required

♦ Poly V-belt repair kit with assembly tools ⇒ Parts Catalogue

Procedure

Note

The poly V-belt repair kit with tools contains tool -T10367- and illustrated instructions.

– Remove noise insulation or skid plate ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

– Loosen right wheel housing liner in front area.

– Cut through the poly V-belt.

– Proceed as described in illustrated instructions.

– Secure front part of right wheel housing liner again.

– Install noise insulation or skid plate ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

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1.3 Removing and installing tensioner for poly V-belt

⇒ "1.3.1 Removing and installing poly V-belt tensioner", page 48

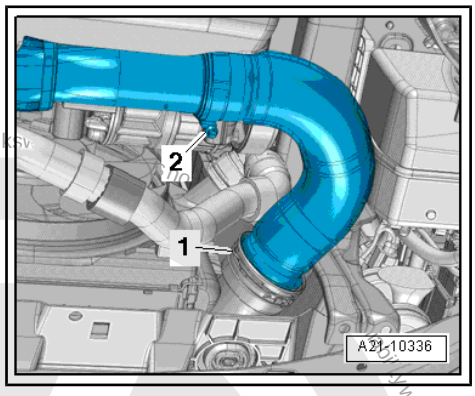
1.3.1 Removing and installing poly V-belt tensioner

Removing

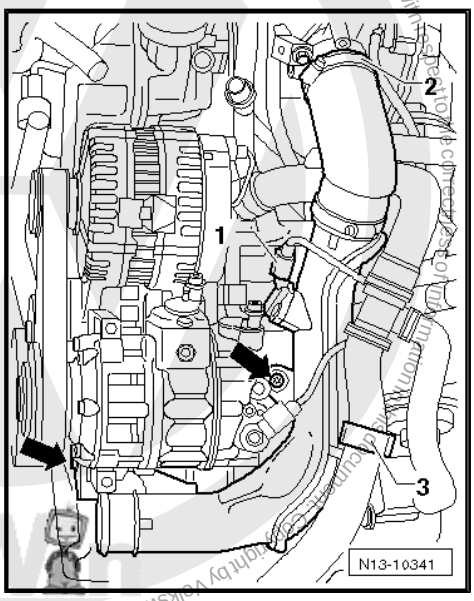
– Remove poly V-belt ⇒ page 44 .

– Loosen clamp -2-, raise retaining clip -1- and remove connecting hose on »cold side«.

– Remove cowling together with radiator fan - V7- and radiator fan on right of radiator - V35- ⇒ page 194 .

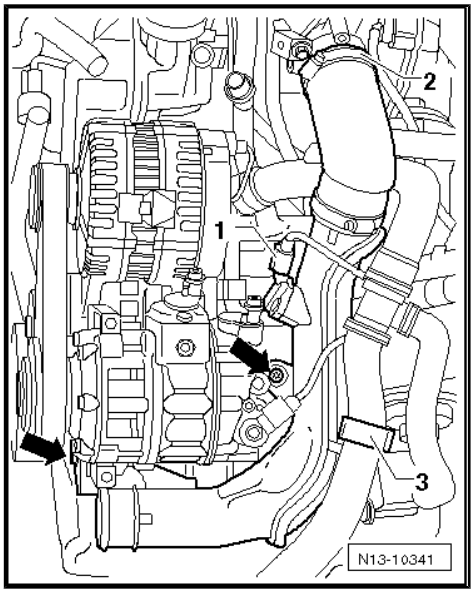


– Remove securing bolts -arrows- from charge air pipe and separate connector -1- from charge air pressure sender - G31- .

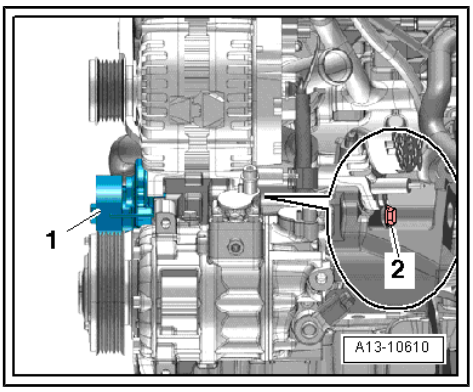


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– Open clamp -2-, lay coolant hose -3- to side and remove charge air pipe.



– Unscrew securing bolt -2- and remove poly V-belt tensioner -1-.



Installing

Install in reverse order of removal. During this step, observe the following:

- Specified torques ⇒ page 40
- Install poly V-belt ⇒ page 44 .

1.4 Removing and installing bracket for ancillaries

Special tools and workshop equipment required

- Support bracket - 10 - 222 A-

Removing

– Remove engine bracket ⇒ page 51 .

– Remove high-pressure pump ⇒ page 259 .

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

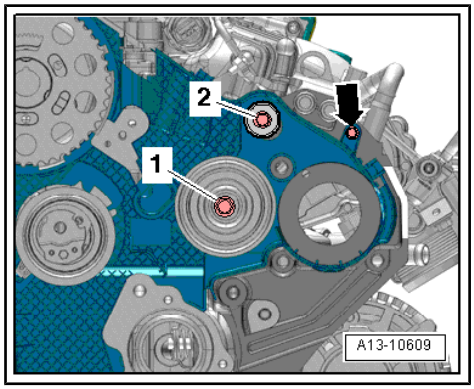
WARNING

The air conditioner refrigerant circuit must not be opened.

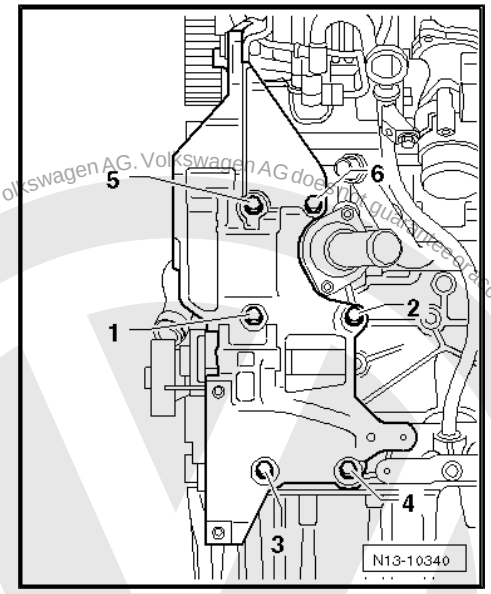
– Unbolt air conditioner compressor from ancillary bracket and attach it to lock carrier.

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– Unbolt idler pulleys -1- and -2-, and remove bolt of toothed belt guard -arrow-.



– Unscrew bolts -6 … 1- and remove bracket for ancillaries.



Installing

Install in reverse order of removal. During this step, observe the following:

- Take note of any dowel sleeves in ancillary bracket and replace missing ones if necessary.
- Renew all bolts that must be tightened with specified tightening angle.

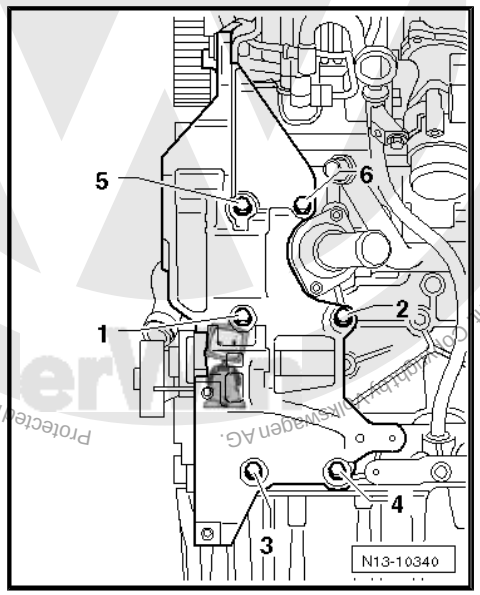
Ancillary bracket - specified torques and tightening sequence

– Insert securing bolts for ancillary bracket as follows:

- Bolts -1- and -2- M10 x 52.
- Bolts -5- and -6- M10 x 60.
- Bolts -3- and -4- M10 x 30.

– Tighten securing bolts for ancillary bracket in sequence -1 … 6- in 2 stages as follows:

1. Screw all bolts in to stop by hand.
2. Tighten all bolts to 40 Nm.
3. Turn bolts -3- and -4- 45° further.
4. Turn bolts -1, 2, 5 and 6- 90° further.



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

– Install high-pressure pump ⇒ page 259 .

– Install engine bracket ⇒ page 51 .

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1.5 Removing and installing engine bracket

⇒ “1.5.1 Removing and installing engine bracket, Passat, Passat CC, Eos, Golf and Scirocco”, page 51

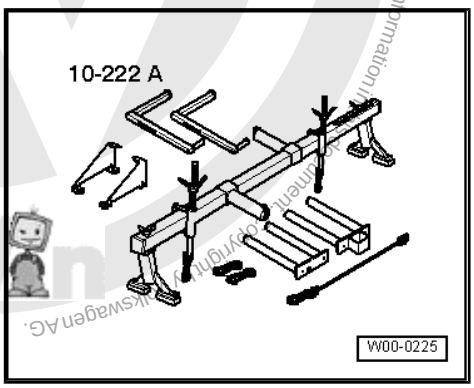
⇒ “1.5.2 Removing and installing engine bracket, Tiguan”, page 54

⇒ “1.5.3 Removing and installing engine bracket, Golf Plus”, page 57

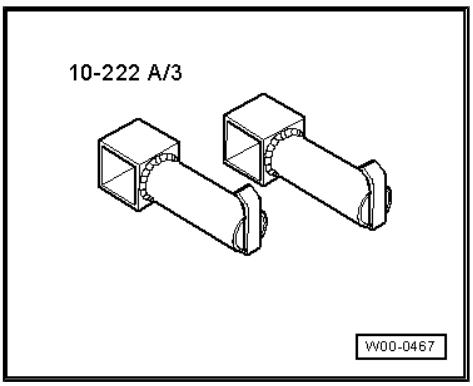
1.5.1 Removing and installing engine bracket, Passat, Passat CC, Eos, Golf and Scirocco

Special tools and workshop equipment required

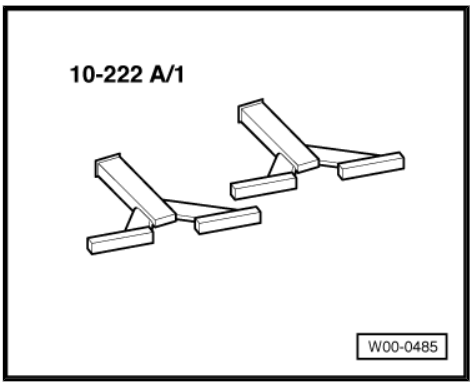
- Support bracket - 10 - 222 A-



- Adapter - 10 - 222 A /3-

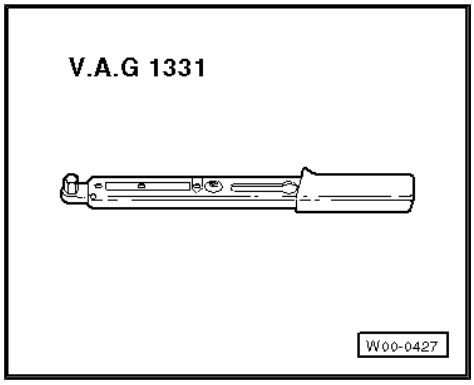


- Adapter - 10 - 222 A /1-



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- Torque wrench - V.A.G 1331-



Removing

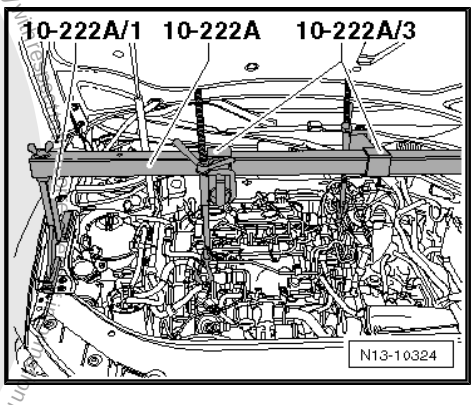
– Remove engine cover panel ⇒ page 39 .

– Remove intake line between air mass meter - G70- and turbocharger.

– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

– Set up support bracket - 10 - 222 A- with necessary adapters as illustrated and support engine in installation position.

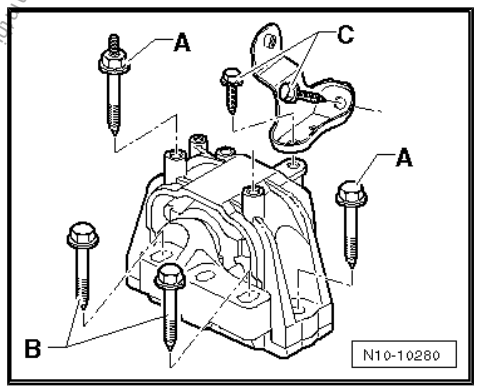


Note

- *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.*

– Unscrew bolts -B- and -C-.

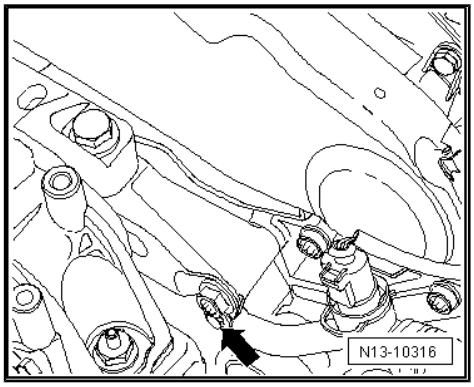
– Unbolt bolts -A- and remove engine assembly mounting.



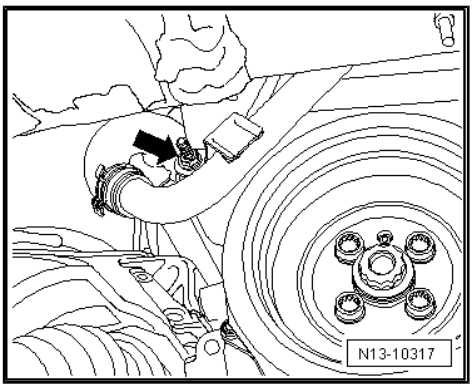
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– Remove bolt securing coolant line -arrow-.

– Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner .



– Remove securing bolt of lower coolant line -arrow-.



WARNING

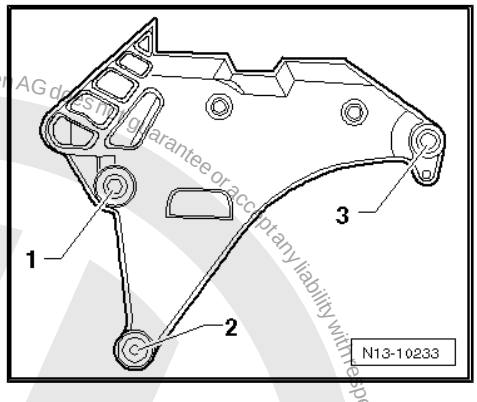
When raising and lowering engine using support bracket - 10-222A- , ensure that no components or hoses are damaged, overstretched or torn off.

Note

The securing bolt -1- is accessible through an aperture in the wheel housing. If necessary, raise and lower engine using spindle of support bracket - 10 - 222 A- to remove or start bolts -2- and -3-.

– Remove securing bolts from engine bracket in sequence -3 … 1-.

– Remove engine bracket upwards.



Installing

Install in reverse order of removal. During this step, observe the following:

Caution

The tightening sequence and specified torques for the engine bracket securing bolts must always be followed. Otherwise the engine bracket can be stressed, causing it to break.

– Insert engine bracket from above.

Note

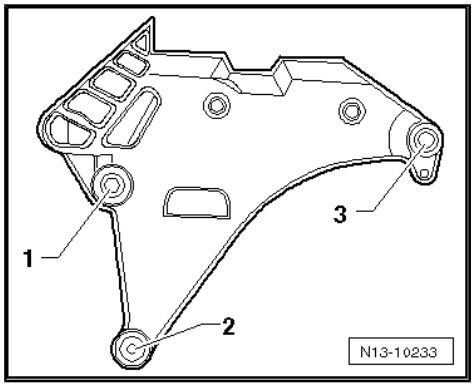
The securing bolt -1- is accessible through an aperture in the wheel housing. If necessary, raise and lower engine using spindle of support bracket - 10 - 222 A- to remove or start bolts -2- and -3-.

– First tighten new securing bolts hand-tight in sequence -1 … 3-.

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Tightening sequence for engine bracket

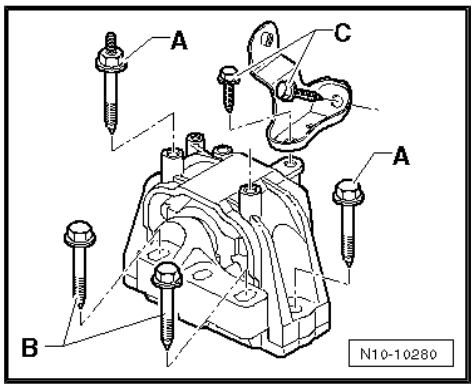
– Retighten securing bolts in tightening sequence to prescribed specified torque ⇒ Item 32 (page 105) .



– Position engine assembly mounting and first tighten bolts -A-, then -C-. Specified torque ⇒ page 25

– Bring engine bracket into contact with assembly mounting using spindle.

– Fit bolts -B- and tighten. Specified torque ⇒ page 25



Further assembly is basically a reverse of the dismantling sequence. During this step, observe the following:

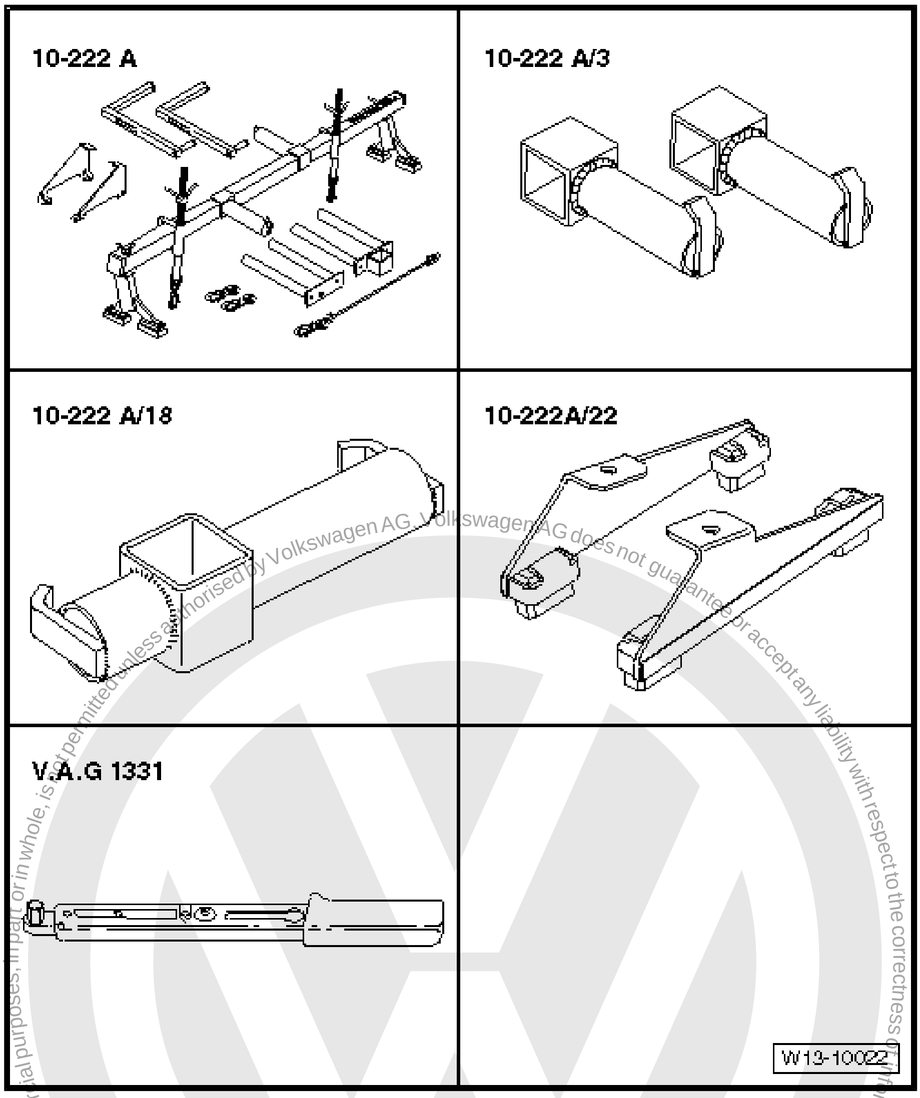
- Ensure fuel hoses are seated correctly.
- Do not interchange supply and return lines (return line blue or with blue markings, supply line black).

1.5.2 Removing and installing engine bracket, Tiguan

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Special tools and workshop equipment required

- ♦ Support bracket - 10 - 222 A-
- ♦ Adapter - 10 - 222 A /3-
- ♦ Adapter - 10 - 222 A /18-
- ♦ Adapter - 10 - 222 A /22-
- ♦ Torque wrench - V.A.G 1331-



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Removing

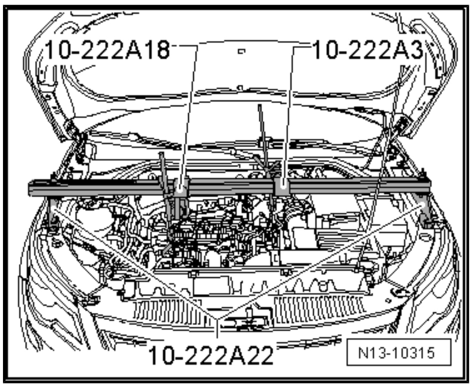
– Remove engine cover panel ⇒ page 39 .

– Remove intake line between air mass meter - G70- and turbocharger.

– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

– Set up support bracket - 10 - 222 A- with necessary adapters as illustrated and support engine in installation position.

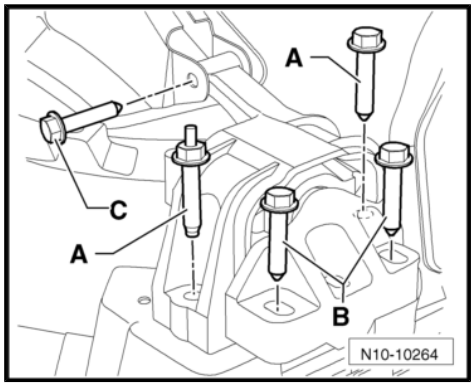


Note

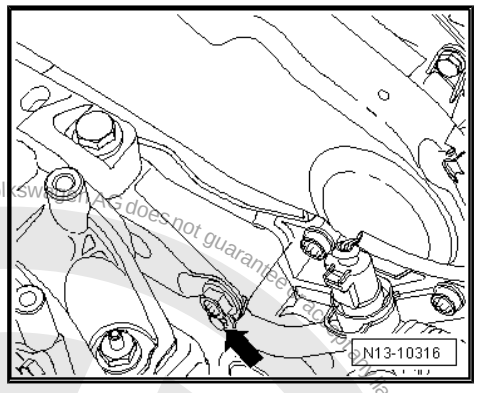
- ♦ *The assembly mounting may only be removed if the engine is supported with support bracket 10-222A!*
- ♦ *The engine bracket must be loosened only when the assembly mounting has been removed.*

– Loosen bolts -B-. Remove bolts -A- and -C-.

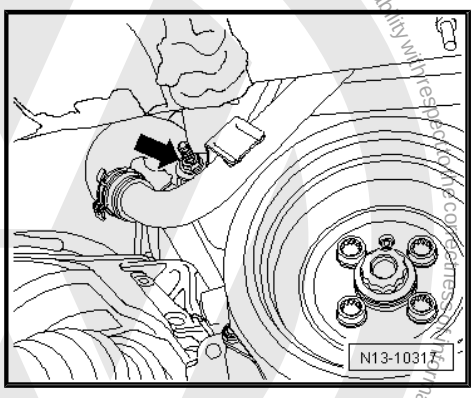
– Unscrew bolts -B- and remove engine assembly mounting.



– Remove bolt securing coolant line -arrow-.
– Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner .



– Remove securing bolt of lower coolant line -arrow-.



WARNING

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

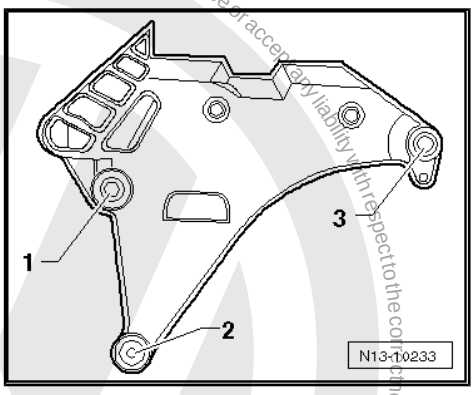
Note

The securing bolt -1- is accessible through an aperture in the wheel housing. If necessary, raise and lower engine using spindle of support bracket - 10 - 222 A- to remove or start bolts -2- and -3-.

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– Remove securing bolts from engine bracket in sequence -3 … 1-.

– Remove engine bracket upwards.



Installing

Install in reverse order of removal. During this step, observe the following:

Caution

The tightening sequence and specified torques for the engine bracket securing bolts must always be followed. Otherwise the engine bracket can be stressed, causing it to break.

– Insert engine bracket from above.

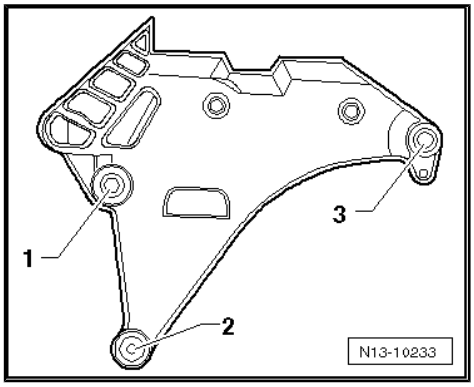
Note

The securing bolt -1- is accessible through an aperture in the wheel housing. If necessary, raise and lower engine using spindle of support bracket - 10 - 222 A- to remove or start bolts -2- and -3-.

– First tighten new securing bolts hand-tight in sequence -1 … 3-.

Tightening sequence for engine bracket

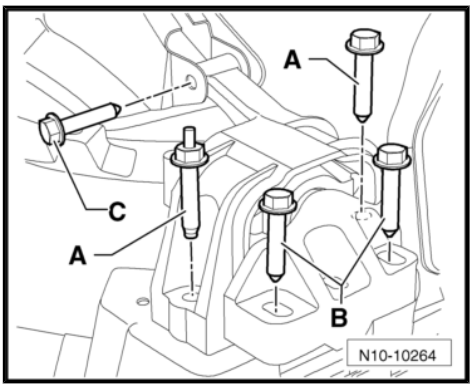
– Retighten securing bolts in tightening sequence to prescribed specified torque ⇒ Item 32 (page 105) .



– Position engine assembly mounting and first tighten bolts -A-, then -C-. Specified torque ⇒ page 25

– Bring engine bracket into contact with assembly mounting using spindle.

– Fit bolts -B- and tighten. Specified torque ⇒ page 25



Further assembly is basically a reverse of the dismantling sequence. During this step, observe the following:

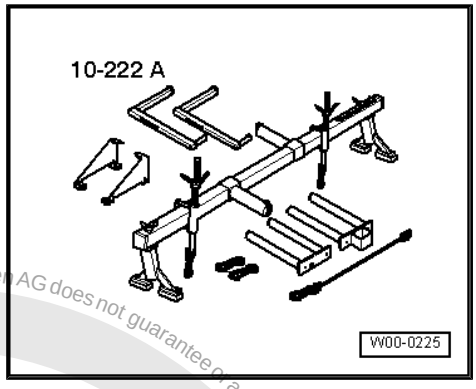
- Ensure fuel hoses are seated correctly.
- Do not interchange supply and return lines (return line blue or with blue markings, supply line black).

1.5.3 Removing and installing engine bracket, Golf Plus

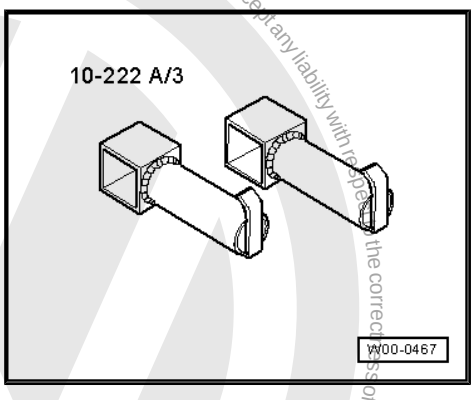
Special tools and workshop equipment required

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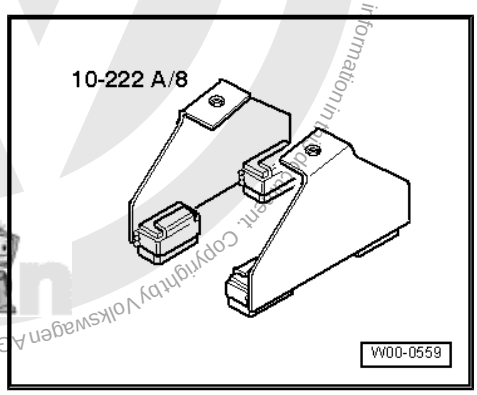
- Support bracket - 10 - 222 A-



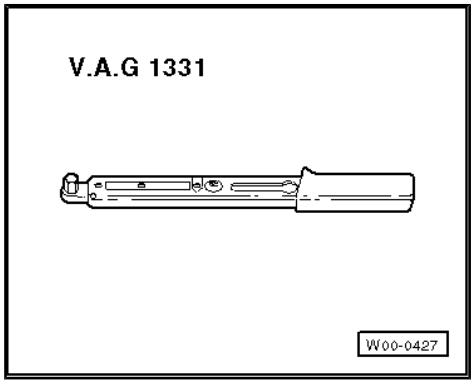
- Adapter - 10 - 222 A /3-



- Adapter - 10 - 222 A /8-



- Torque wrench - V.A.G 1331-



Removing

– Remove engine cover panel ⇒ page 39 .

– Remove intake line between air mass meter - G70- and turbocharger.

– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

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– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Assembly overview – plenum chamber bulkhead .

– Set up support bracket - 10 - 222 A- with necessary adapters as illustrated and support engine in installation position.

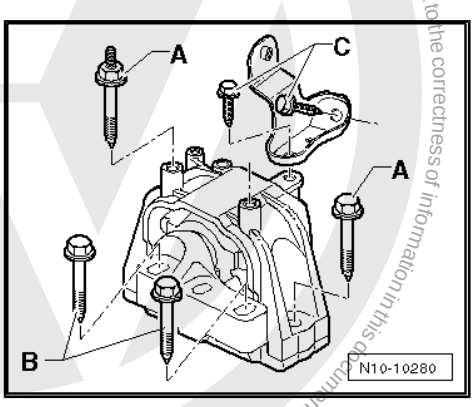


Note

- *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.*

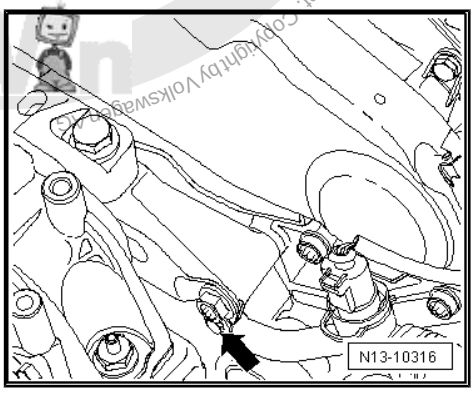
– Unscrew bolts -B- and -C-.

– Unbolt bolts -A- and remove engine assembly mounting.



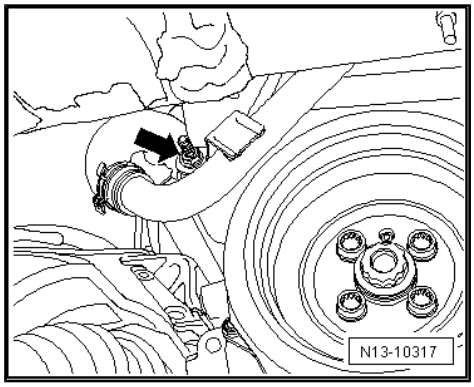
– Remove bolt securing coolant line -arrow-.

– Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner .



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– Remove securing bolt of lower coolant line -arrow-.



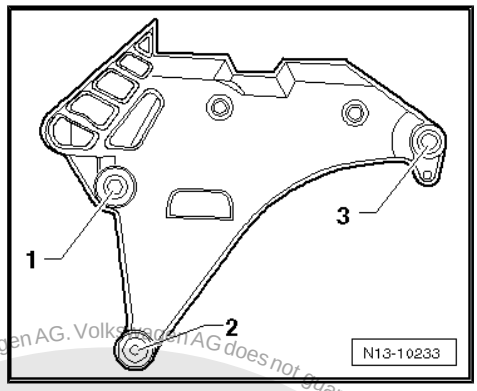
WARNING

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

Note

The securing bolt -1- is accessible through an aperture in the wheel housing. If necessary, raise and lower engine using spindle of support bracket - 10 - 222 A- to remove or start bolts -2- and -3-.

– Remove securing bolts from engine bracket in sequence -3 … 1-.



– Remove engine bracket upwards.

Installing

Install in reverse order of removal. During this step, observe the following:

Caution

The tightening sequence and specified torques for the engine bracket securing bolts must always be followed. Otherwise the engine bracket can be stressed, causing it to break.

– Insert engine bracket from above.

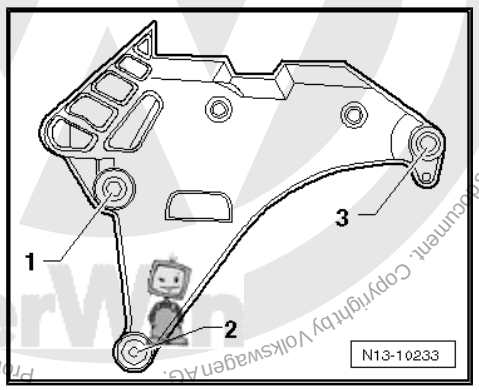
Note

The securing bolt -1- is accessible through an aperture in the wheel housing. If necessary, raise and lower engine using spindle of support bracket - 10 - 222 A- to remove or start bolts -2- and -3-.

– First tighten new securing bolts hand-tight in sequence -1 … 3-.

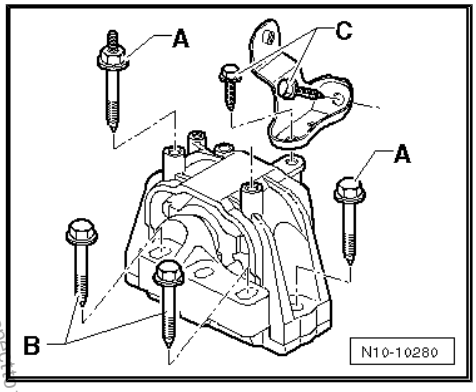
Tightening sequence for engine bracket

– Retighten securing bolts in tightening sequence to prescribed specified torque ⇒ Item 32 (page 105) .



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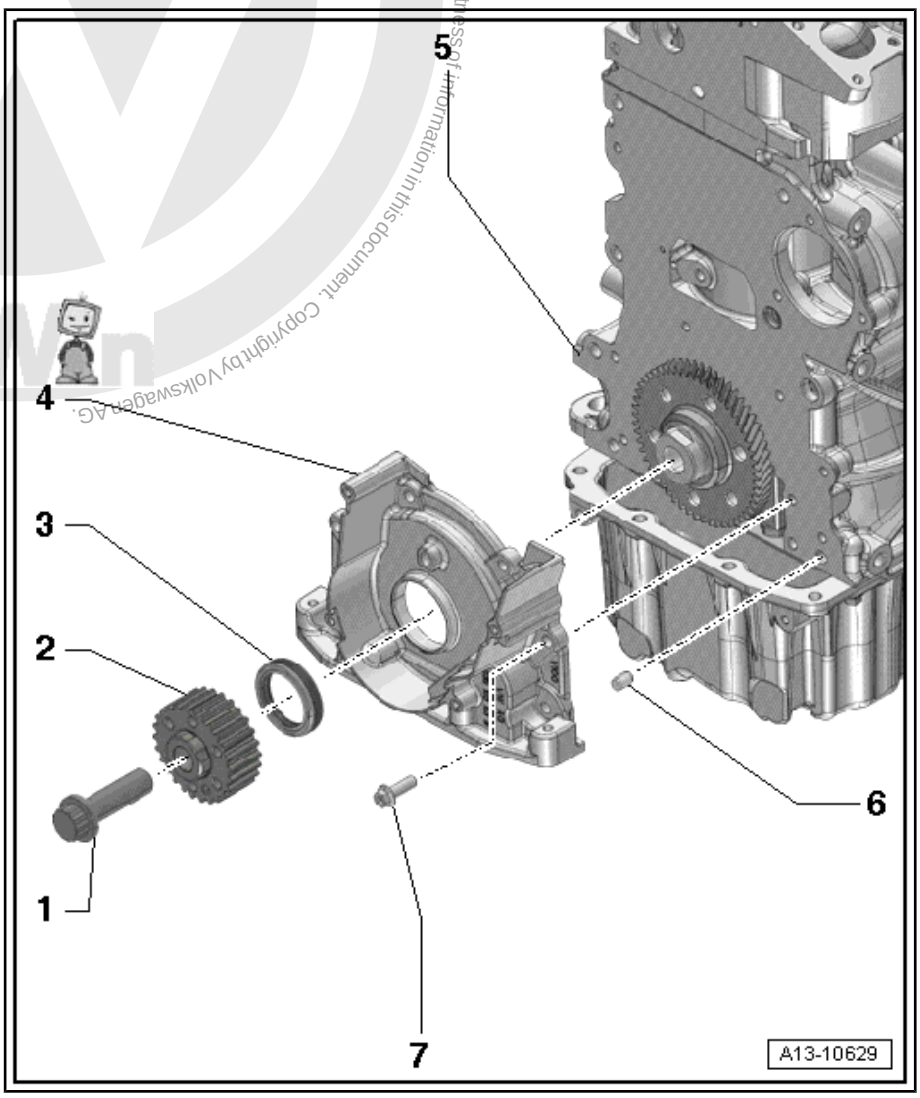
– Position engine assembly mounting and first tighten bolts -A-, then -C-. Specified torque ⇒ page 25
– Bring engine bracket into contact with assembly mounting using spindle.
– Fit bolts -B- and tighten. Specified torque ⇒ page 25



Further assembly is basically a reverse of the dismantling sequence. During this step, observe the following:

- Ensure fuel hoses are seated correctly.
- Do not interchange supply and return lines (return line blue or with blue markings, supply line black).

1.6 Assembly overview - cylinder block (pulley end)



1 - Bolt
- ❑ Renew after removal
- ❑ Loosen and tighten with counterhold - 3415-
- ❑ Do not additionally oil the thread and shoulder
- ❑ 180 Nm +135° (turning further to torque angle can be performed in stages, e.g. 90° + 45°)

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

3 - Sealing ring
- ❑ 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 64 .

4 - Sealing flange
- ❑ Must seat on dowel pins.
- ❑ Removing and installing ⇒ page 62
- ❑ Install with silicone sealant - D 176 404 A2- ⇒ page 62 .

5 - Cylinder block
- ❑ Removing and installing crankshaft ⇒ page 77 .
- ❑ Dismantling and assembling pistons and conrods ⇒ page 81

6 - Dowel pin
- ❑ Qty. 2

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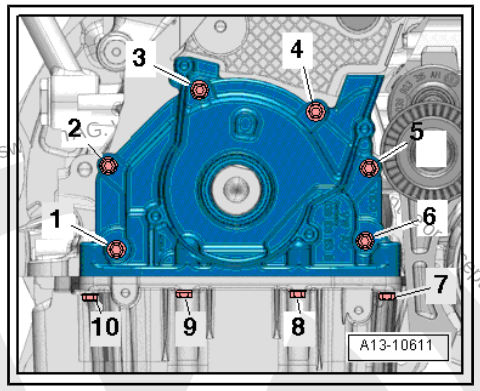
7 - Bolt

❑ Specified torque and tightening sequence ⇒ page 62

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

– Tighten bolts in 3 stages in the sequence shown:

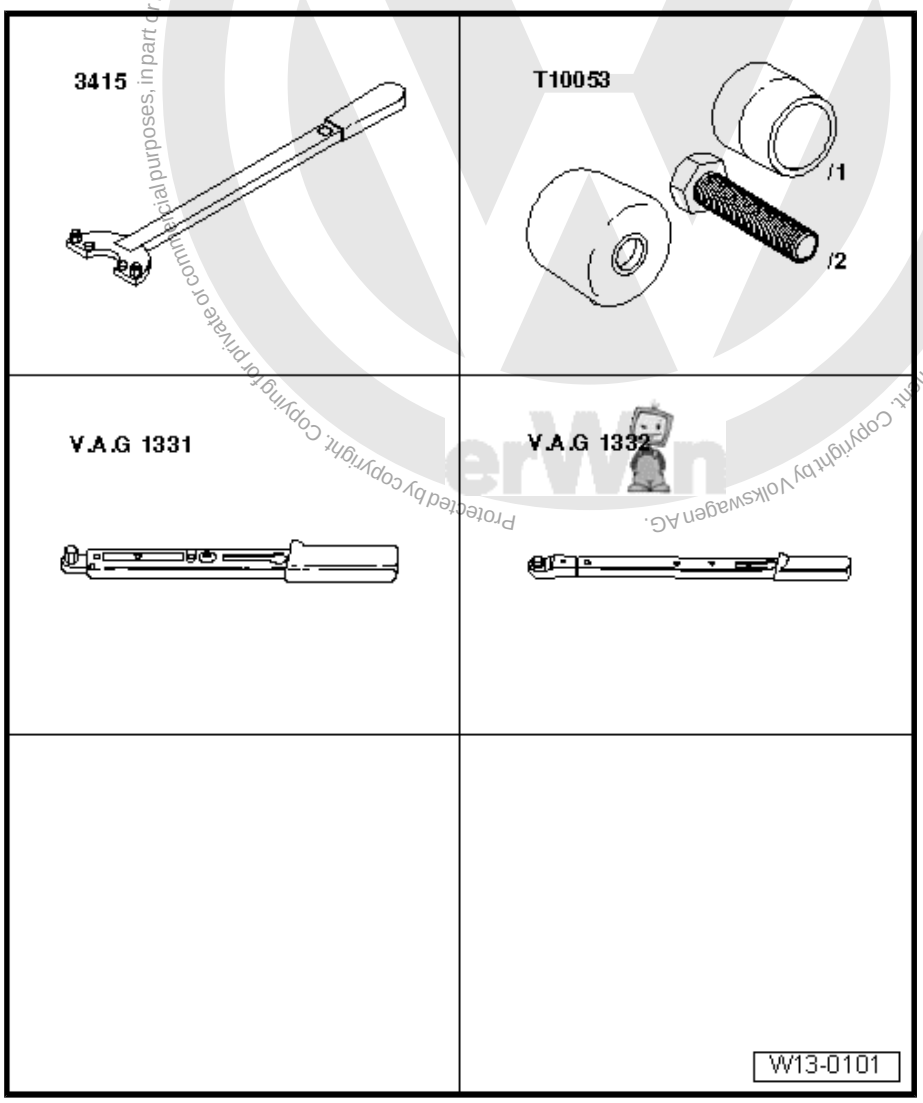
Stage	Bolts	Torque setting
1.	-1 to 10-	Screw in by hand as far as stop
2.	-1 to 6-	diagonally in stages; final torque 15 Nm
3.	-7 to 10-	15 Nm



1.7 Removing and installing sealing flange on pulley end

Special tools and workshop equipment required

- Counter-hold tool - 3415-
- Assembly tool - T10053-
- Torque wrench (5 … 50 Nm) - V.A.G 1331-
- Torque wrench (40 to 200 Nm) - V.A.G 1332-
- Hand drill with plastic brush
- Silicone sealant - D 176 404 A-
- Scraper

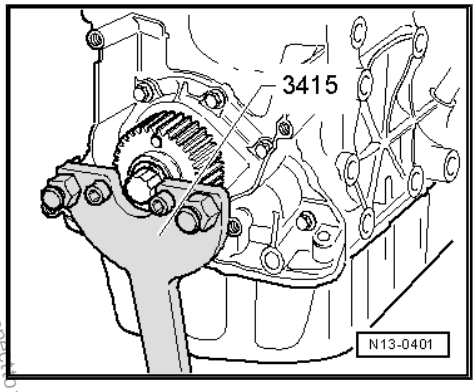


Removing

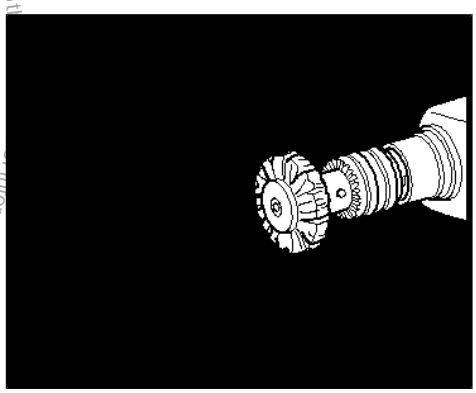
– Remove toothed belt ⇒ page 106 .

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– Remove crankshaft sprocket. To do this, lock toothed belt pulley using counterhold - 3415- .



– Drain engine oil.
– Remove sump ⇒ page 136 .
– Pull off front sealing flange.
– Remove sealing flange; if necessary, loosen by applying light blows with a rubber-headed hammer.
– Remove sealant residue from cylinder block with a flat scraper.



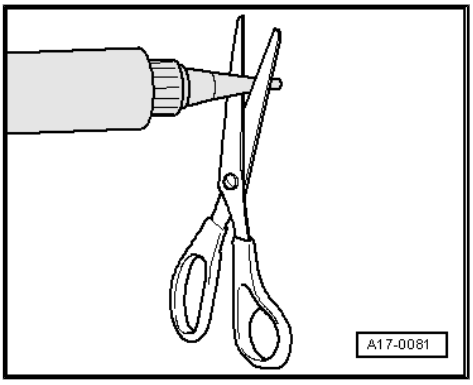
– Remove residual sealant from sealing flange using a plastic rotary brush (wear eye protection).
– Clean sealing surfaces. They must be free of oil and grease.

Installing

Note

- *Check the expiry date of the sealant.*
- *The sealing flange must be installed within 5 minutes of applying the silicone sealant.*

– Cut off tube nozzle at forward marking (approx. 3 mm ∅ of nozzle).

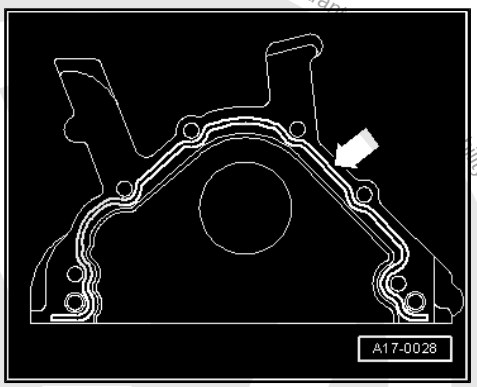


Note

- *The sealant bead must be no thicker than 2…3 mm. Excess sealant can find its way into the sump and block the strainer in the suction line or drip on the sealing surface of the crankshaft seal.*
- *Before applying sealant bead, cover sealing surface of oil seal with a clean cloth.*

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



Note

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

– Tighten securing bolts for sealing flange to 15 Nm using alternate and diagonal sequence.
– Install crankshaft sprocket.
– Specified torque of new centre bolt ⇒ Item 1 (page 61) .
– Install sump ⇒ page 136 .

Note

Leave the sealant to dry for approx. 30 minutes after assembly. Only then fill with engine oil.

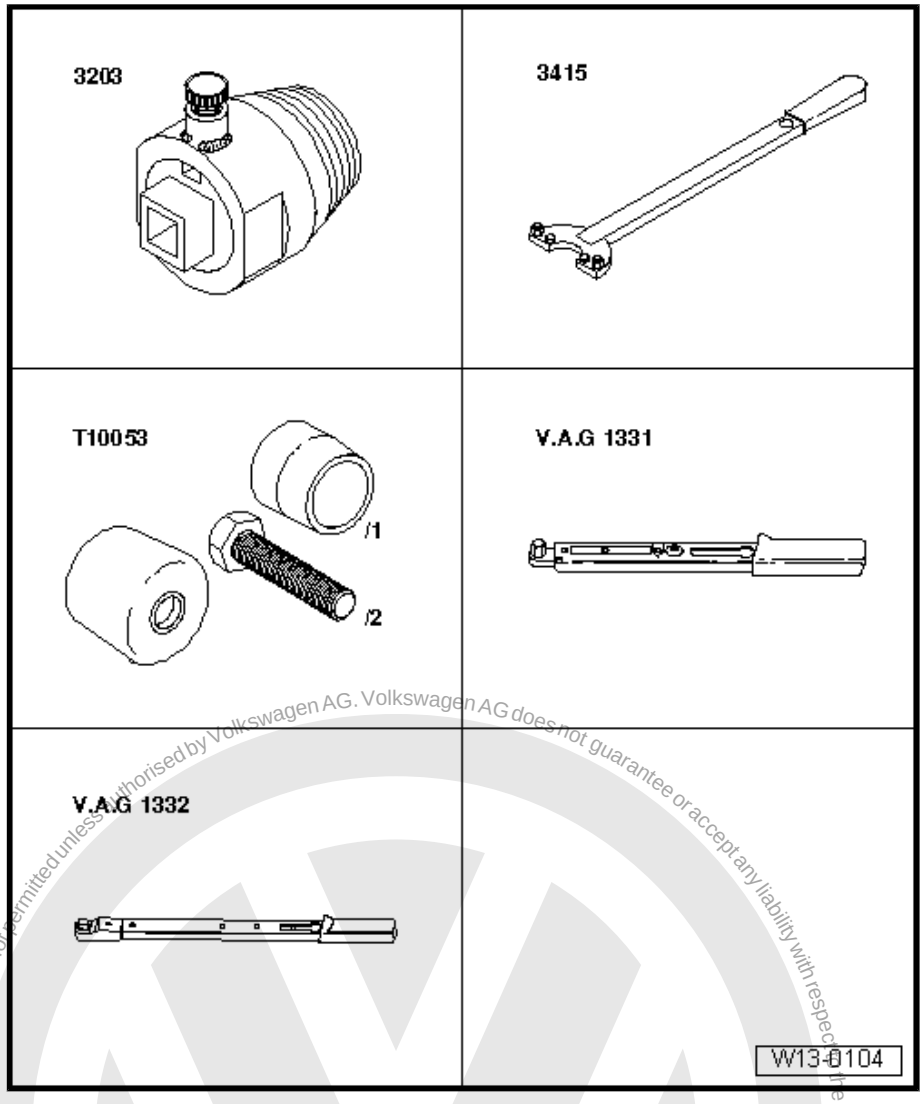
Installing toothed belt and adjusting valve timing ⇒ page 106 .

1.8 Renewing crankshaft oil seal - belt pulley end

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Special tools and workshop equipment required

- Seal puller - 3203-
- Counter-hold tool - 3415-
- Assembly tool - T10053-
- Torque wrench (5 … 50 Nm) - V.A.G 1331-
- Torque wrench (40 to 200 Nm) - V.A.G 1332-



Removing

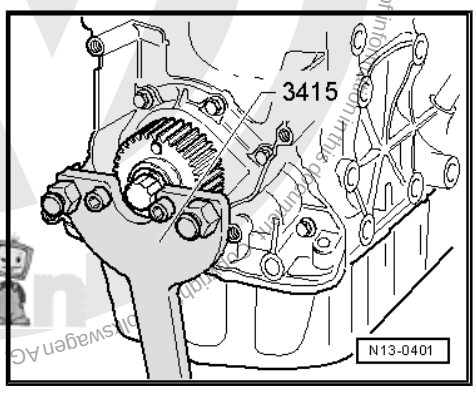
– Remove toothed belt ⇒ page 106 .

– 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.

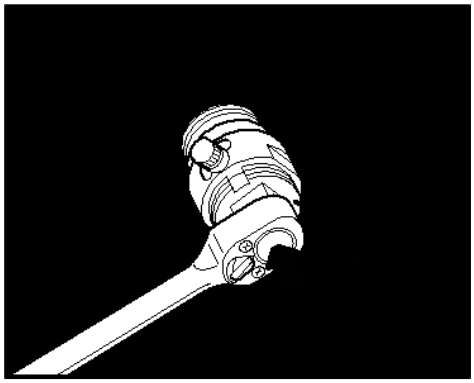
– Unscrew inner part of oil seal extractor 2 turns (approx. 3 mm) out of outer part and lock with knurled screw.

– Oil threaded head of oil seal extractor.



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– 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.

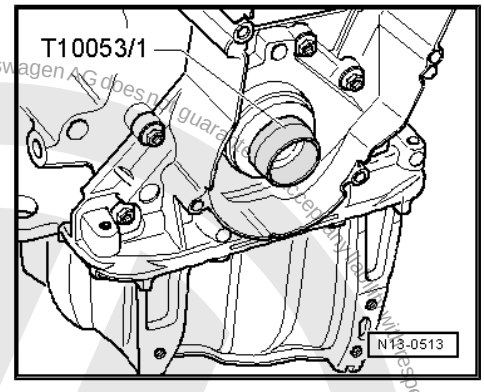


Installing

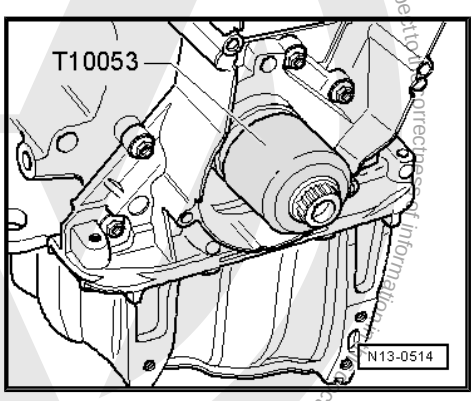
Note

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

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



– Press oil seal in to stop using assembly tool - T10053- and centre bolt.
– Install crankshaft sprocket.
– Specified torque of new centre bolt ⇒ Item 1 (page 61) .
– How to install and tension toothed belt ⇒ page 106 .



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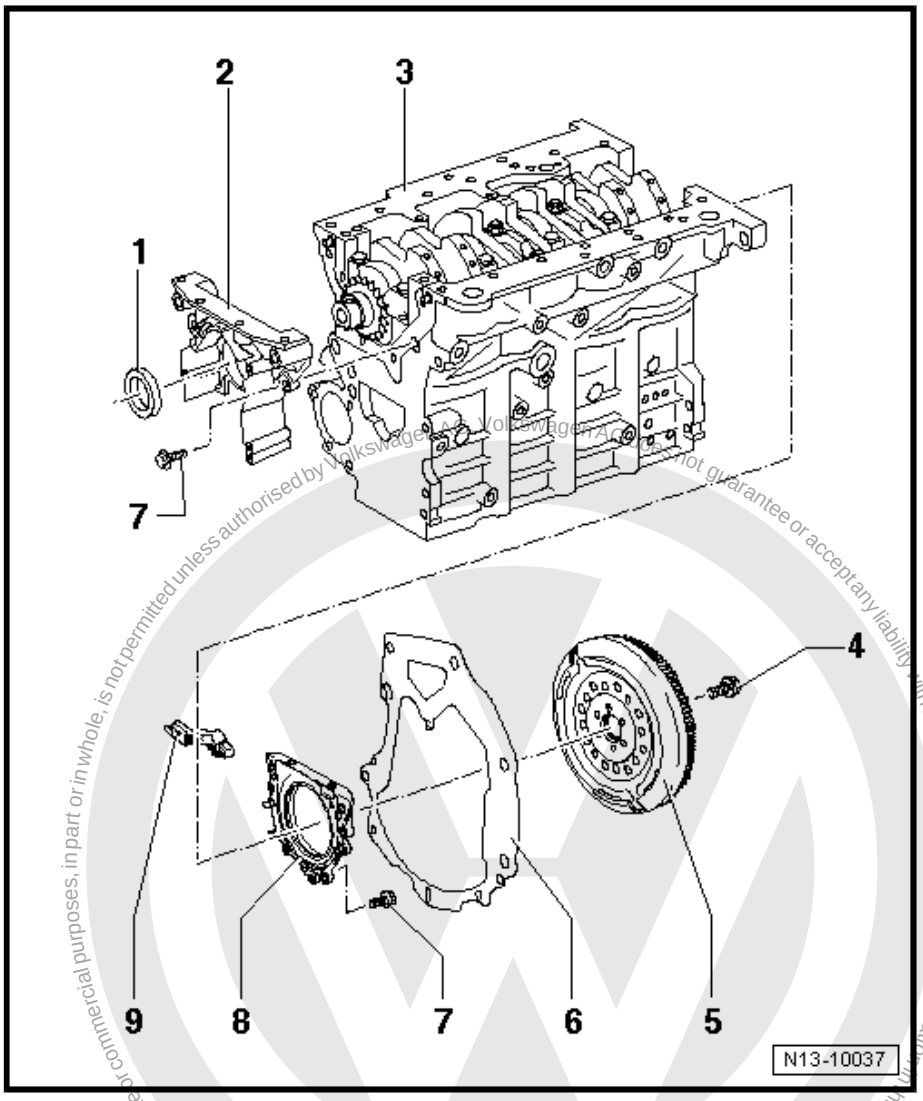
2 Cylinder block, gearbox end

⇒ "2.1 Assembly overview - cylinder block, gearbox end", page 67

⇒ "2.2 Removing and installing sealing flange on gearbox side", page 68

2.1 Assembly overview - cylinder block, gearbox end

Repairing the clutch:



1 - Sealing ring

- ❑ 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 64 .

2 - Sealing flange

- ❑ Must sit on dowel sleeves
- ❑ Removing and installing ⇒ page 62
- ❑ Install with silicone sealant - D 176 404 A2- ⇒ page 62 .

3 - Cylinder block

- ❑ Removing and installing crankshaft ⇒ page 77 .
- ❑ Dismantling and assembling pistons and conrods ⇒ page 81

4 - 60 Nm + turn 90° further

- ❑ Renew

5 - Flywheel

- ❑ To loosen securing bolts, lock using 3067.

6 - Adapter

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

7 - 15 Nm

8 - Sealing flange with oil seal

- ❑ Removing and installing ⇒ page 68
- ❑ With sender wheel for engine speed
- ❑ Renew only as complete unit
- ❑ Do not additionally oil or grease the oil seal sealing lip.
- ❑ Before installing, remove oil residue from crankshaft journal using a clean cloth.
- ❑ Use support sleeve supplied when installing.

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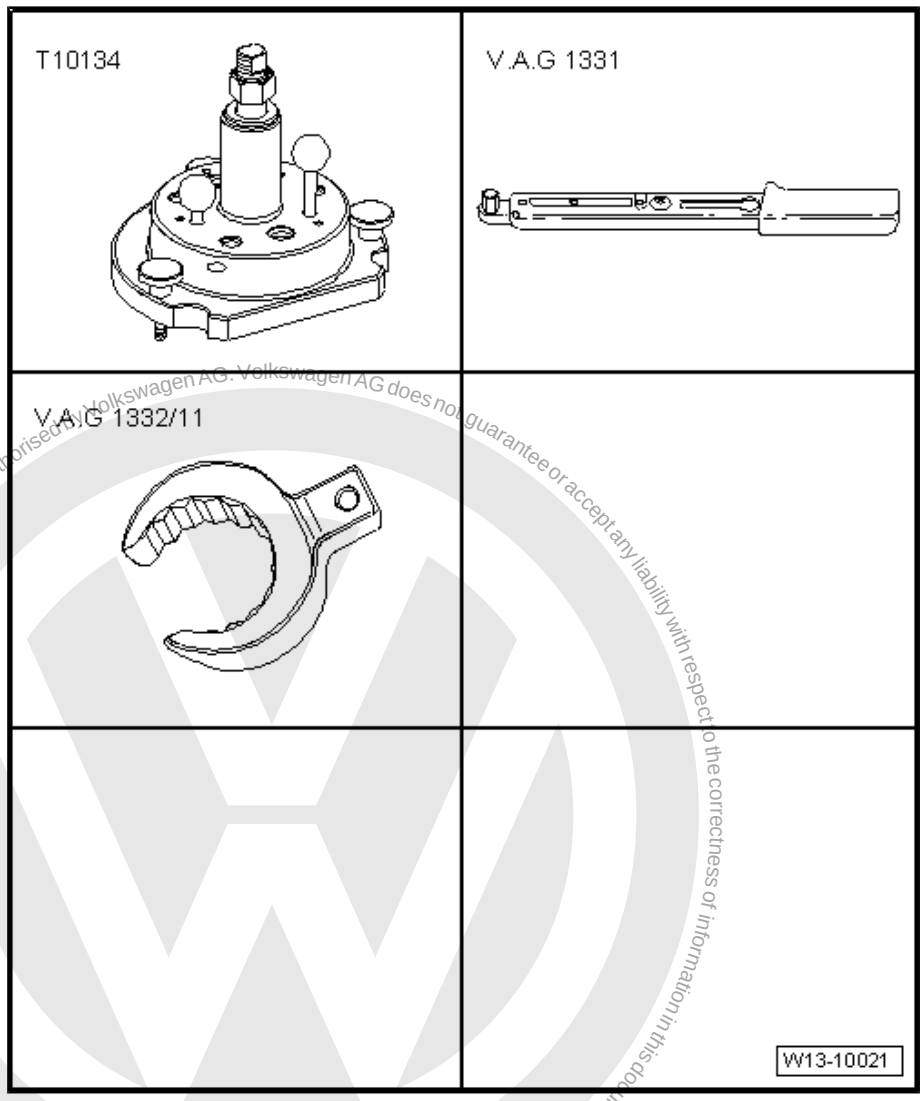
9 - Engine speed sender - G28- , 5 Nm

❑ Removing and installing ⇒ page 372

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-
- Tool insert 24 mm - V.A.G 1332/11-



- Depth gauge
- 3 hexagon bolts M6 x 35 mm
- 2 hexagon bolts M7 x 35 mm

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⇒ “2.2.1 Pressing out sealing flange with sender wheel”, page 69

⇒ “2.2.2 Pressing in sealing flange with sender wheel”, page 70

⇒ “2.2.3 A - Assembling seal with sender wheel on assembly tool T10134 ”, page 71

⇒ “2.2.4 B - Fitting assembly tool T10134 with sealing flange to crankshaft flange”, page 72

⇒ “2.2.5 C - Screwing assembly tool T10134 on crankshaft flange”, page 73

⇒ “2.2.6 D - Pressing sender wheel onto crankshaft flange using assembly tool T10134 ”, page 74

⇒ “2.2.7 E - Checking sender wheel installation position on crankshaft”, page 74

⇒ “2.2.8 F - Re-pressing sender wheel”, page 75

2.2.1 Pressing out sealing flange with sender wheel

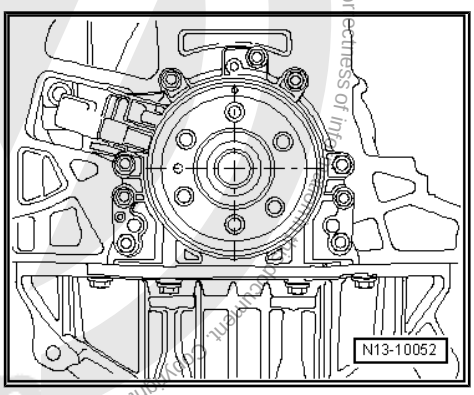
– Remove gearbox ⇒ Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox .

– Remove flywheel.

– Remove intermediate plate.

– Rotate crankshaft as shown to TDC No. 1 cylinder.

– Remove sump ⇒ page 136 .

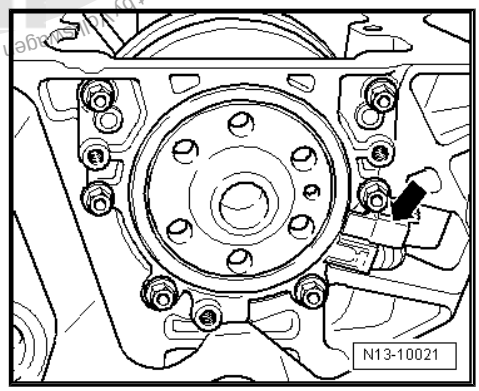


Note

- *For reasons of clarity, the work is performed with the engine removed.*
- *The procedure is identical whether the engine is installed or removed.*

– Remove engine speed sender - G28- -arrow-.

– Unscrew sealing flange securing bolts.

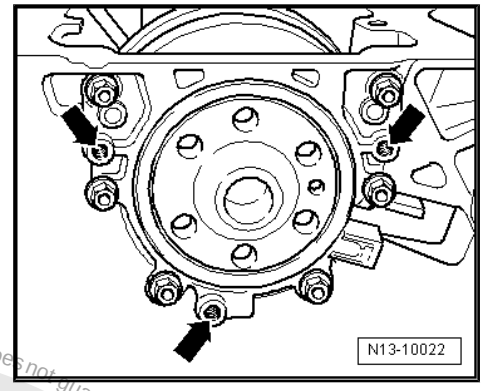


Note

Sealing flange and sender wheel are pressed off the crankshaft together with 3 x M6 × 35 mm bolts.

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– Screw 3 M6 x 35 mm bolts into threaded holes -arrows- of sealing flange.
– Screw bolts (max. 180° per bolt) in sealing flange alternately and press it 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 - Lock nut

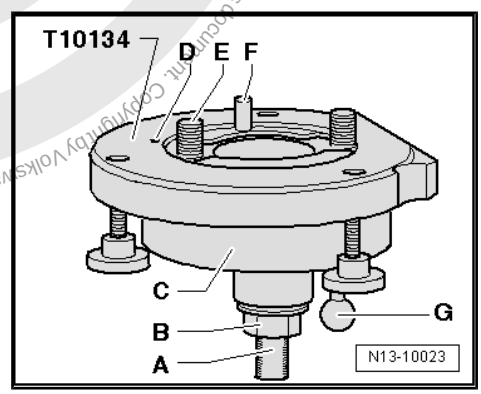
C - Assembly housing

D - Locating pin

E - Hexagon socket head bolt

F - Guide pin for diesel engines (black knob)

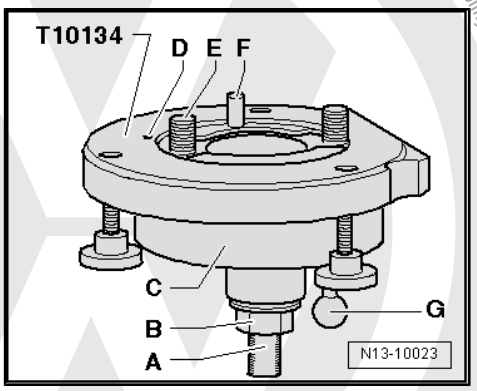
G - Guide pin for petrol engines (red knob)



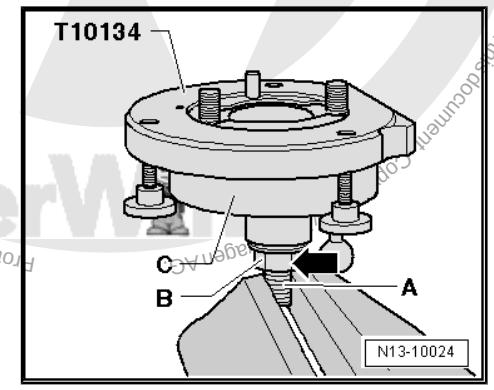
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2.2.3 A - Assembling seal with sender wheel on assembly tool - T10134-

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



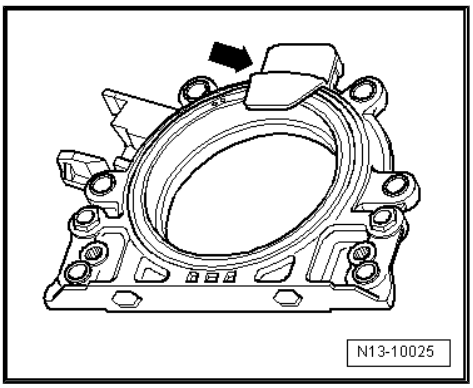
– Clamp assembly device - T10134- in a vice on clamping surface -A- of threaded spindle.
– Press assembly housing -C- downwards until it lies on hexagon nut -B- -arrow-.
– Screw hexagon nut onto threaded spindle until inner part of assembly device and assembly housing are at same height.



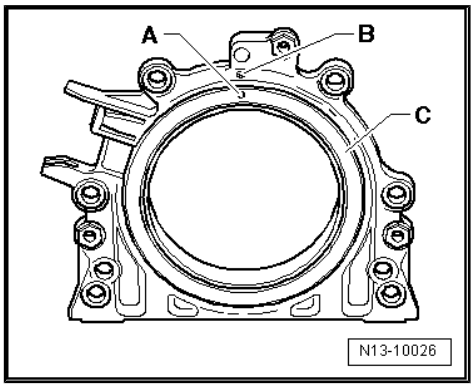
– Remove securing clip -arrow- from new sealing flange.

Note

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

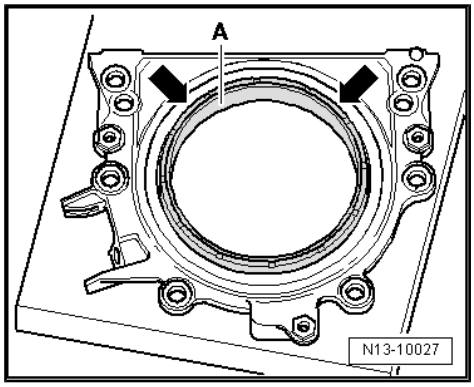


– Locating hole -A- on sender wheel -C- must align with marking -B- on sealing flange.
– Place sealing flange with front side downwards on a clean flat surface.

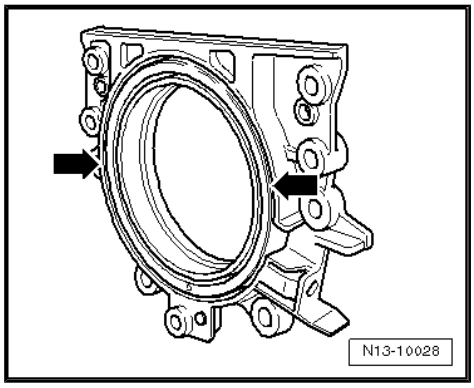


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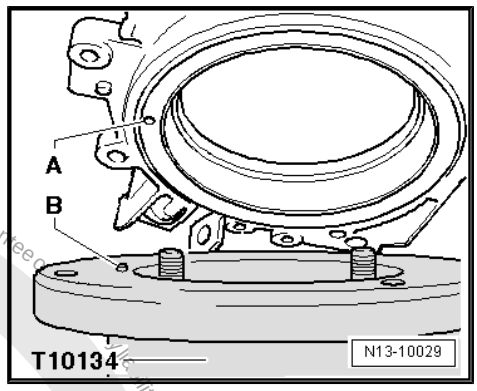
– Push sealing lip support ring -A- downwards in direction of arrow until it lies on flat surface.



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



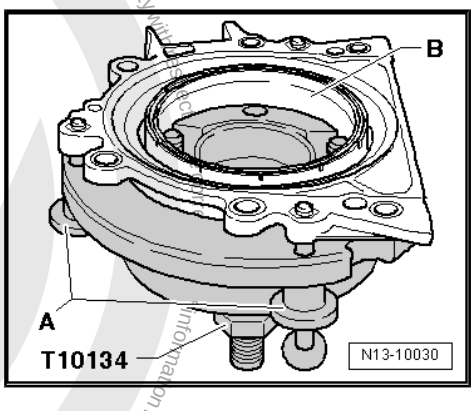
– Place sealing flange with front side on assembly tool - T10134- so that locating pin -B- can be inserted in sender wheel hole -A-.



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

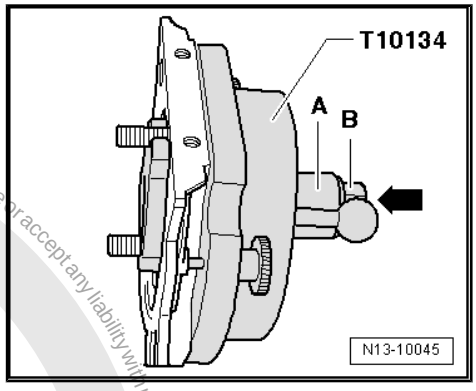
When installing sealing flange, ensure that sender wheel remains fixed in assembly device.

2.2.4 B - Fitting assembly tool - T10134- with sealing flange to crankshaft flange

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

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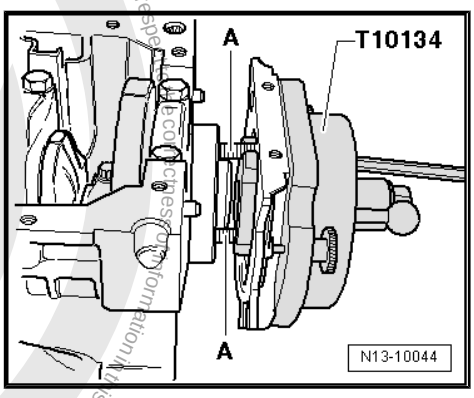
– Screw hexagon nut -B- to end of threaded spindle.
– Press threaded spindle of assembly tool - T10134- in direction of arrow, until hexagon nut -B- lies against assembly housing -A-.
– Align flat side of assembly housing on sump side of crankcase sealing surface.



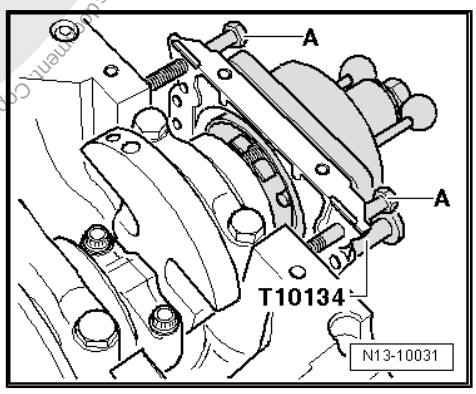
– Secure assembly tool - T10134- to crankshaft flange using hexagon socket head bolts -A-.

Note

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

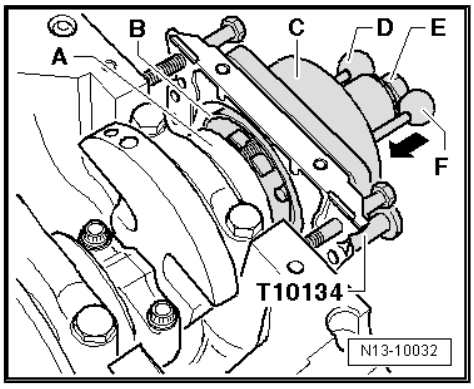


– To guide sealing flange into cylinder block, screw in two M7×35 mm bolts -A- (or bolts of a comparable length ⇒ Electronic Parts Catalogue).



2.2.5 C - Screwing assembly tool - T10134- on 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.



Note

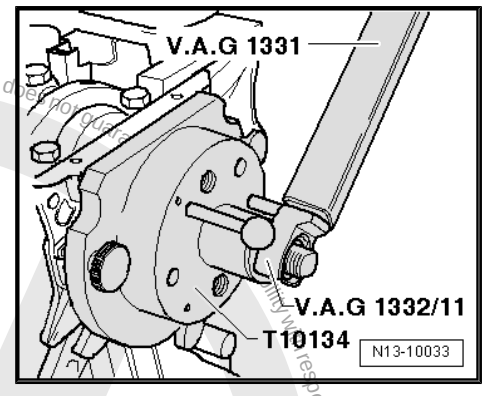
The guide pin for petrol engines (red knob) -F- must not be inserted in threaded hole of crankshaft.

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

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

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



Note

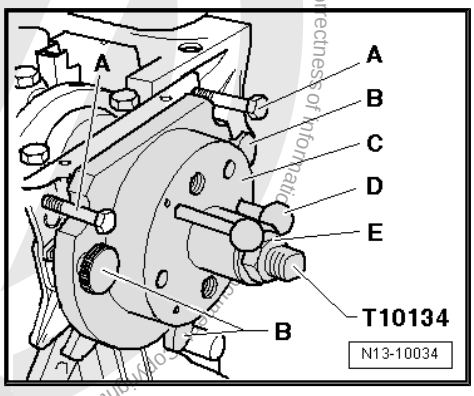
After hexagon nut is tightened to 35 Nm, a small air gap must still be present between cylinder block and sealing flange.

2.2.7 E - Checking sender wheel installation position on crankshaft

– Screw hexagon nut -E- to end of threaded spindle.

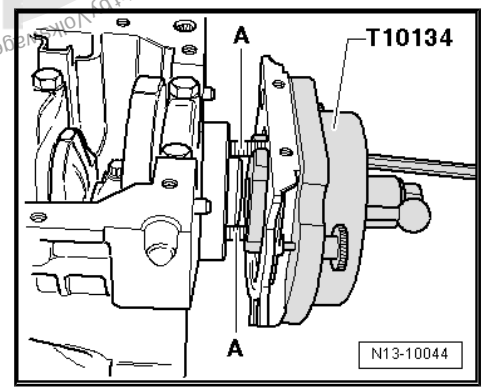
– Remove the two bolts -A- from cylinder block.

– Screw the three knurled screws -B- out of sealing flange.

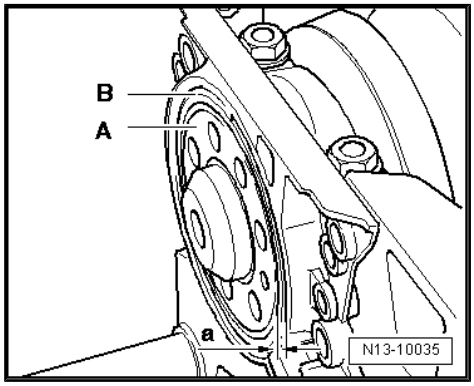


– Unscrew Allen head bolts -A- and remove assembly tool - T10134- .

– Remove sealing lip support ring.



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



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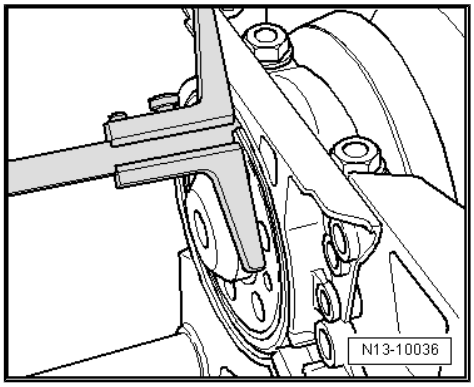
– Set vernier gauge on crankshaft flange.
– Measure distance -a- between crankshaft flange and sender wheel.

If dimension -a- is too small:

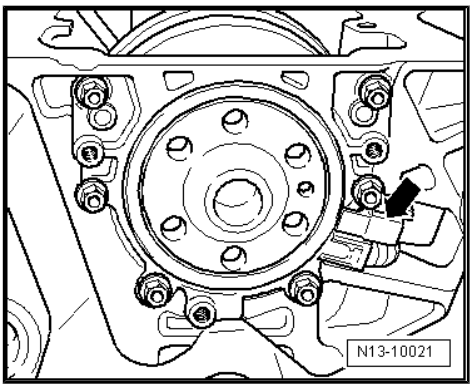
– Re-press sender wheel ⇒ page 75 .

If dimension -a- is attained:

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

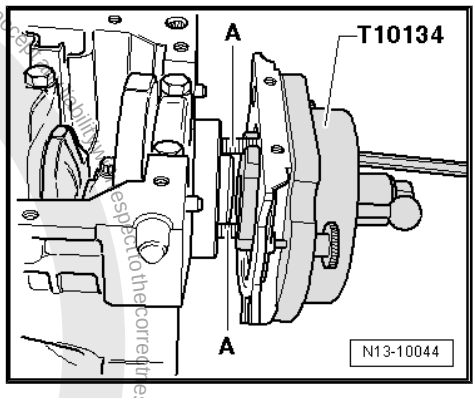


– Install engine speed sender - G28- -arrow-, and tighten securing bolt to 5 Nm.
– Install sump ⇒ page 136 .
– Install intermediate plate.
– Install flywheel using new bolts. Tighten securing bolts to 60 Nm + 90 .

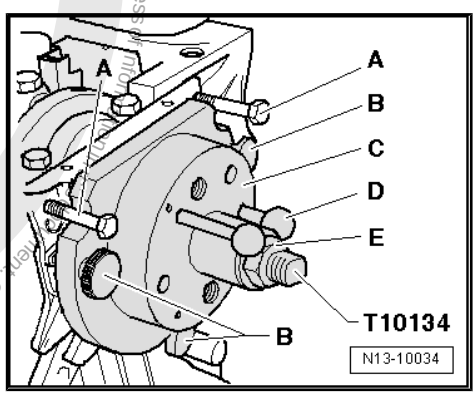


2.2.8 F - Re-pressing sender wheel

– 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-.

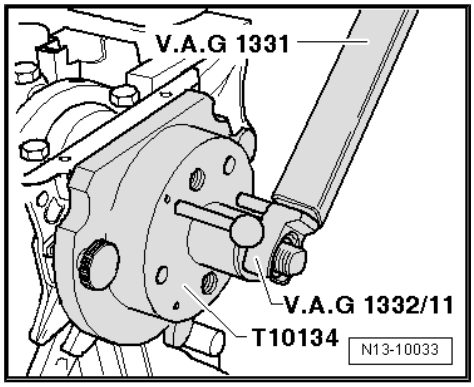


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– Tighten hexagon nut of assembly tool - T10134- to 40 Nm using torque wrench - V.A.G 1331- and tool insert, 24 mm - V.A.G 1332/11- .
– Check installation position of sender wheel on crankshaft again. ⇒ page 74

If dimension -a- is still too small:

– Tighten hexagon nut for assembly tool - T10134- to 45 Nm.
– Check installation position of sender wheel on crankshaft again. ⇒ page 74



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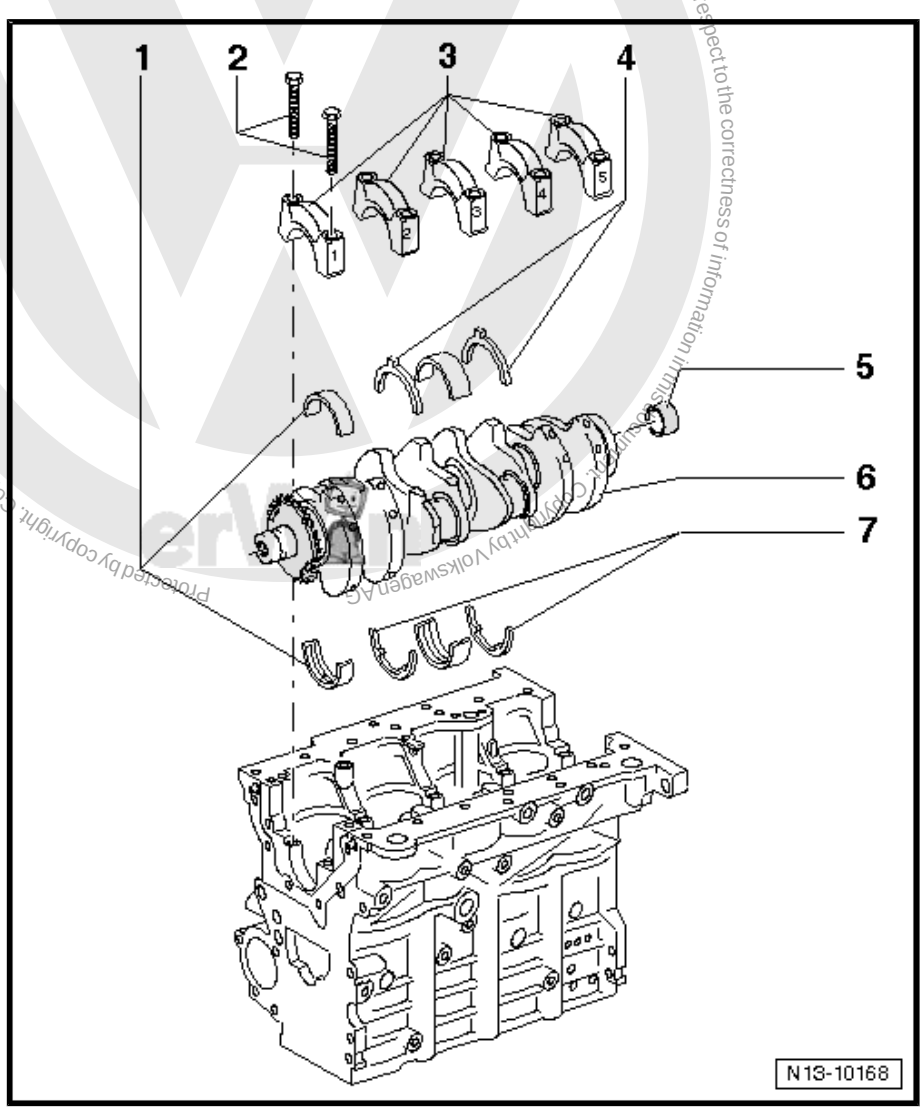
3 Crankshaft

⇒ "3.1 Assembly overview - crankshaft", page 77

⇒ "3.2 Renewing needle bearing in crankshaft", page 78

⇒ "3.3 Crankshaft dimensions", page 80

3.1 Assembly overview - crankshaft



1 - Bearing shell

- ❑ For bearings 1, 2, 4 and 5.
- ❑ Do not interchange used bearing shells (mark).

2 - 65 Nm + turn 90° further

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

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

- ❑ Only vehicles with dual clutch gearbox.
- ❑ Removing and installing ⇒ page 78

6 - Crankshaft

- ❑ Axial clearance new: 0.07 to 0.17 mm; wear limit: 0.37 mm
- ❑ Check radial clearance with Plastigage
- ❑ New: 0.03 … 0.08 mm; Wear limit 0.17 mm
- ❑ Do not rotate crankshaft when checking radial clearance
- ❑ Crankshaft dimensions ⇒ page 80 .

7 - Thrust washer

- ❑ For cylinder block, bearing 3

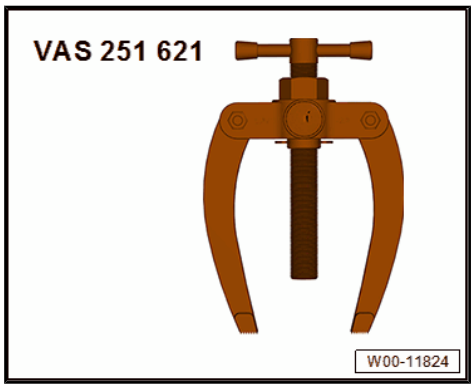
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3.2 Renewing needle bearing in crankshaft

Only vehicles with a dual clutch gearbox

Special tools and workshop equipment required

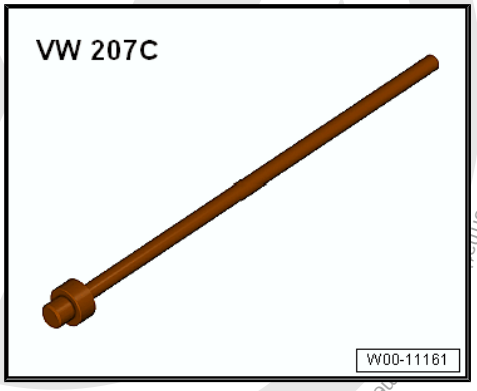
- Counter support, e.g. KUKKO 22-1 - VAS 251 621-



- Internal puller - VAS 251 635-



- Pin - VW 207 C-



Condition:

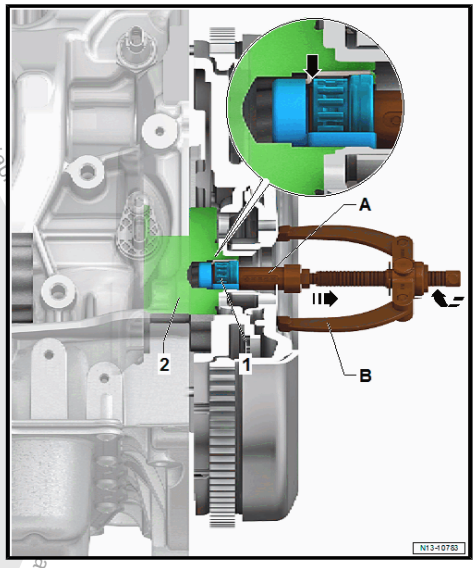
- The front edges of the inner puller must not be chipped.
- Gearbox has been removed.

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Pulling out needle roller bearing

– Pull out needle bearing -1- with internal puller - VAS 251 635- -A- and counter support, e.g. KUKKO 22-1 - VAS 251 621- -B- from crankshaft -2-.

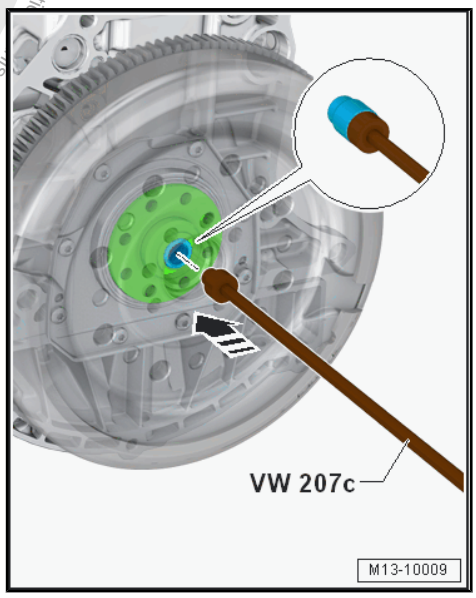
– The internal puller must be positioned behind the needle-and-cage assembly -arrow-.



Installing

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

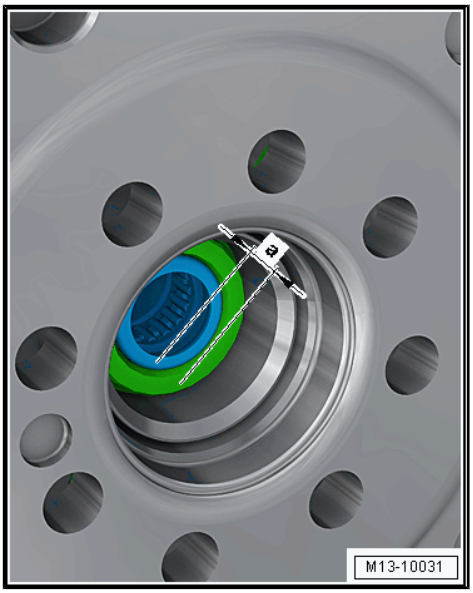
– Drive needle bearing into crankshaft to installation depth using drift - VW 207 C- .



Installation depth: dimension -a- = 2 mm

Note

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



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3.3 Crankshaft dimensions

(Dimensions in mm)

	Crankshaft main journal ∅	Conrod journal ∅
Basic dimension	54.00 -0.022 -0.042	50.90 -0.022 -0.042

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4 Pistons and conrods

⇒ “4.1 Assembly overview - pistons and conrods”, page 81

⇒ “4.2 Measuring piston projection at TDC”, page 84

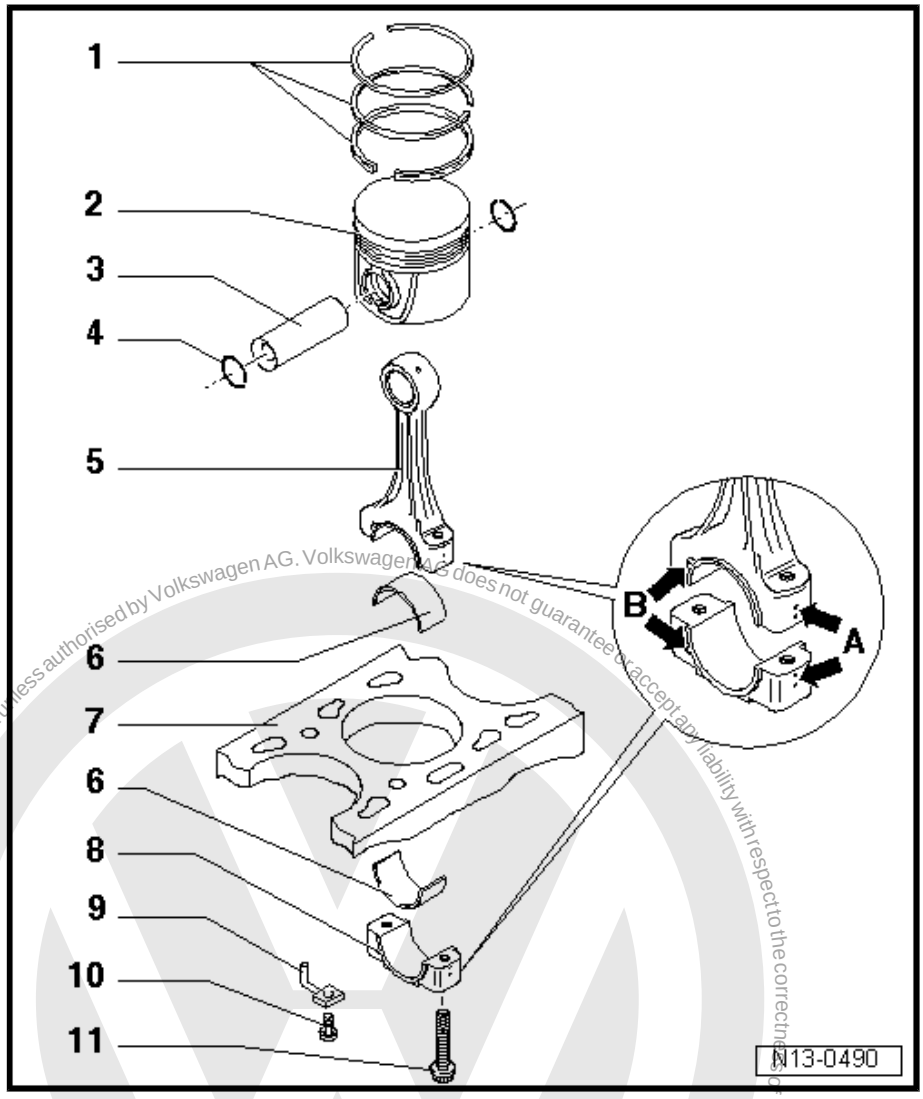
⇒ “4.3 Separating new conrod”, page 85

4.1 Assembly overview - pistons and conrods

⇒ “4.1.1 Assembly overview - pistons and conrods”, page 81

⇒ “4.1.2 Piston and cylinder dimensions”, page 84

4.1.1 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 82 .
- ❑ Checking ring-to-groove clearance ⇒ page 83 .

2 - Piston

- ❑ With combustion chamber.
- ❑ Mark installation position and cylinder number.
- ❑ Installation position and allocation of piston to cylinder ⇒ page 84 .
- ❑ 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 84 .

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 cylinder allocation -A- with coloured pen.
- ❑ Installation position: Marking -B- faces towards pulley end.
- ❑ With industrially cracked conrod cap.
- ❑ Separate new conrod ⇒ page 85 .

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6 - Bearing shell

- ❑ Note installation position ⇒ page 84
- ❑ Note version: Upper bearing shell (towards piston) is made of a more wear resistant material. Identification: Black line on bearing surface in area of joint.
- ❑ Do not interchange used bearing shells.
- ❑ Insert bearing shells centrally.
- ❑ 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.

7 - Cylinder block

- ❑ Checking cylinder bores ⇒ page 83 .
- ❑ Piston and cylinder dimensions ⇒ page 84 .

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 conrod.

9 - Oil spray jet

- ❑ For piston cooling

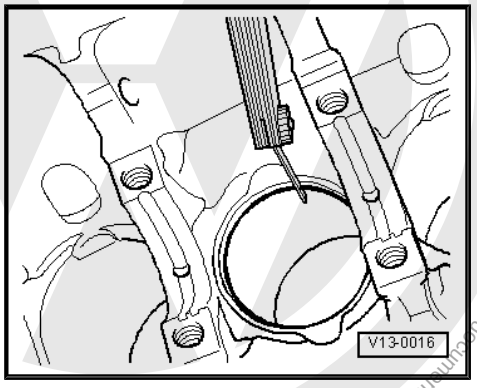
10 - 25 Nm

- ❑ Insert without sealant.

11 - Conrod bolt, 30 Nm + 90° further

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

Checking piston ring gap



Special tools and workshop equipment required

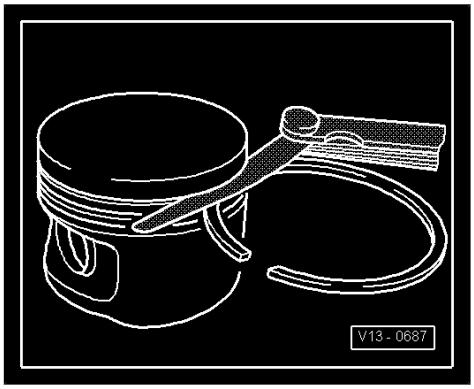
- ♦ Feeler gauge

– 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 to 0.40	1.0
2nd compression ring	0.20 to 0.40	1.0
Oil scraper ring	0.25 to 0.50	1.0

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Checking ring-to-groove clearance



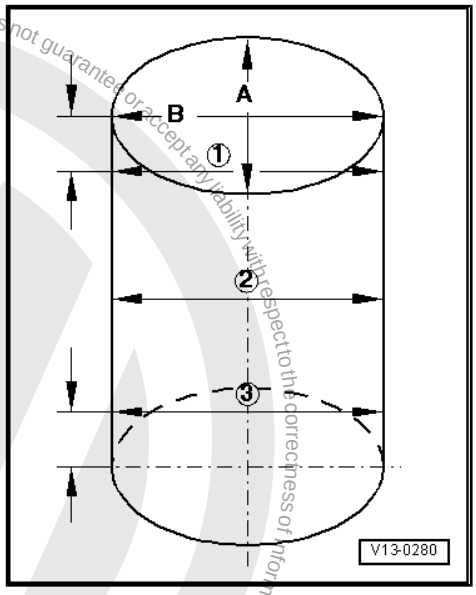
Special tools and workshop equipment required

- ♦ Feeler gauge

– Clean ring groove before checking.

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

Checking cylinder bores



Special tools and workshop equipment required

- ♦ Cylinder gauge 50 ... 100 mm

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

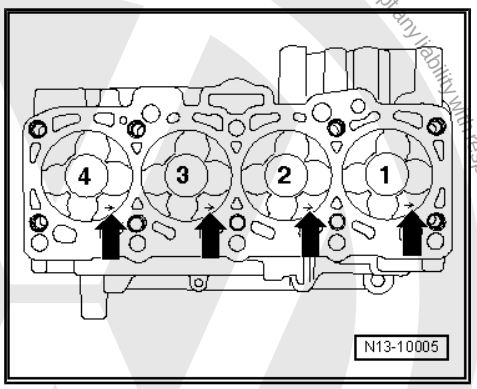
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Note

Cylinder bores must not be measured when the cylinder block is secured to engine and gearbox support - VAS 6095- , as measurements may be incorrect.

Installation position and allocation of piston to cylinder

Arrow on piston crown -arrows- points in direction of cylinder 1.



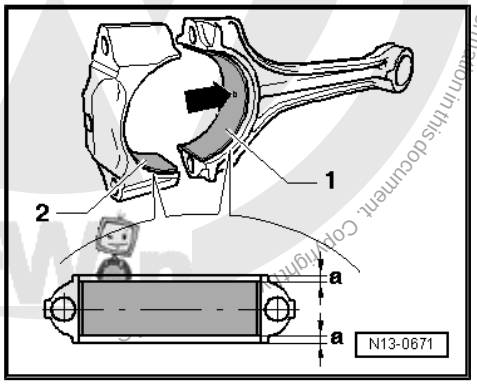
Installation position of conrod bearing shells

Bearing shell -1- with oil hole -arrow- for conrod.

Bearing shell -2- without oil hole for conrod bearing cap.

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

Distance -a- must be identical on both sides.



4.1.2 Piston and cylinder dimensions

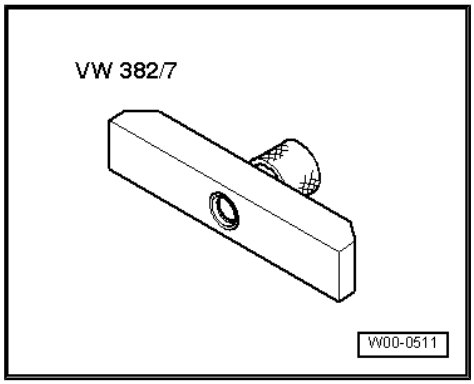
		Piston ∅	Cylinder bore ∅
Basic dimension	mm	80.96	81.01

4.2 Measuring piston projection at TDC

⇒ “4.2.1 Cylinder head gasket identification”, page 85

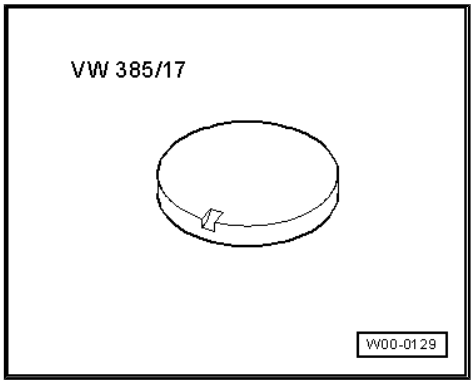
Special tools and workshop equipment required

- Measuring bridge - VW 382/7-



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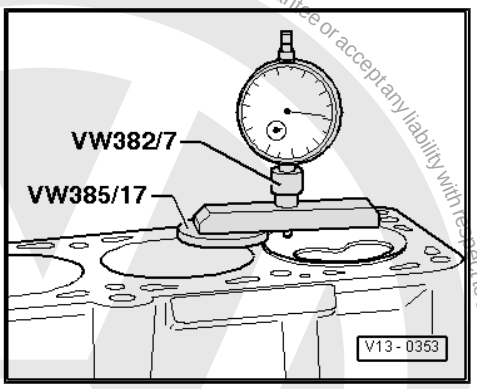
- End dimension plate - VW 385/17-



- Dial gauge

Test sequence

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



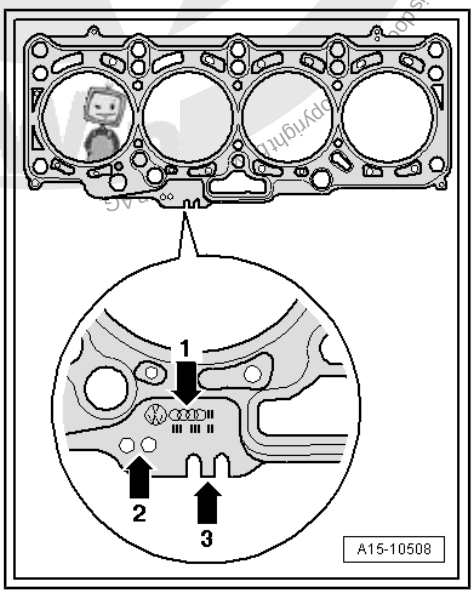
Note

- *To measure the piston projection at top dead centre, turn the engine clockwise.*
- *If different values are determined during the projection measurement, use the largest dimension for selecting the gasket.*

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

4.2.1 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 the seal is renewed, ensure that the designation matches.*
- *Piston projection at TDC must be determined when installing new pistons or a short engine* ⇒ page 84 .

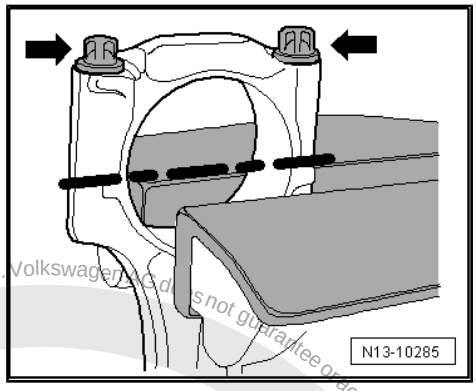
4.3 Separating new conrod

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

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– Mark cylinder allocation of conrod.

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

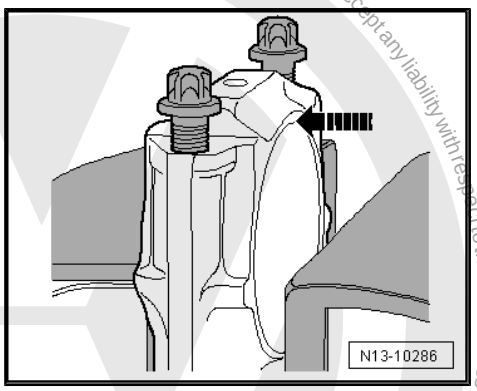


Note

- *To prevent damage to the conrod, only clamp conrod in lightly.*
- *Conrod is clamped below the dashed line.*

– Unscrew the two bolts -arrows- approx. 5 turns.

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



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15 – Cylinder head, valve gear

1 Cylinder head

⇒ “1.1 Assembly overview - cylinder head”, page 87

⇒ “1.3 Assembly overview - cylinder head cover”, page 97

⇒ “1.2 Removing and installing cylinder head”, page 89

⇒ “1.4 Removing and installing cylinder head cover”, page 98

⇒ “1.5 Removing and installing vacuum pump”, page 101

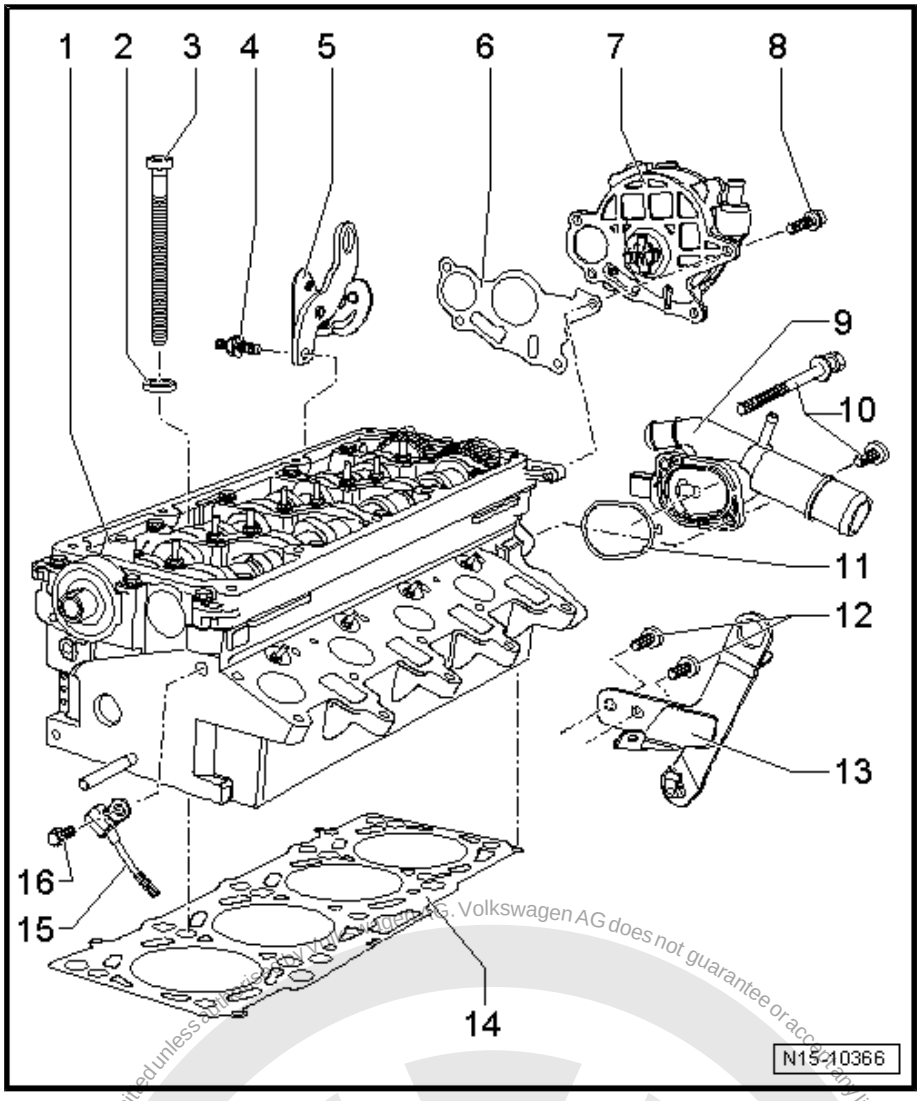
⇒ “1.6 Checking compression”, page 102

1.1 Assembly overview - cylinder head

Note

- *The plastic packing pieces for protecting the open valves must not be removed until immediately before fitting cylinder head.*
- *If the cylinder head is renewed, all the coolant in the system must also be renewed.*

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1 - Cylinder head

- ❑ Removing and installing ⇒ page 89 .
- ❑ After renewing, renew entire coolant.

2 - Washer

- ❑ For cylinder head bolt.

3 - Cylinder head bolt

- ❑ Observe sequence when loosening and tightening ⇒ page 89 .
- ❑ Before installing, place washers in cylinder head ⇒ Item 2 (page 88) .

4 - 25 Nm

5 - Lifting eye

6 - Seal

- ❑ Renew

7 - Vacuum pump

- ❑ Removing and installing ⇒ page 101

8 - 10 Nm

9 - Coolant hose connection

10 - 10 Nm

11 - Seal

- ❑ Renew

12 - 25 Nm

13 - Lifting eye

14 - Cylinder head gasket

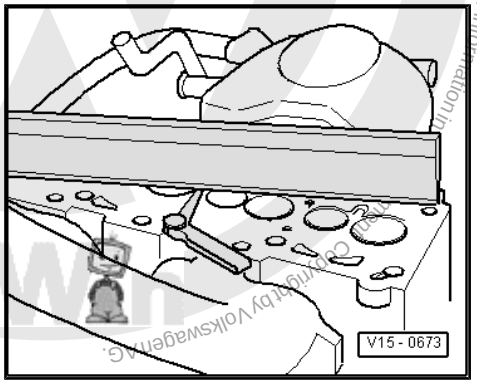
- ❑ Renew
- ❑ Observe identification ⇒ page 85 .
- ❑ After renewing, renew entire coolant.

15 - Hall sender - G40-

- ❑ For camshaft position.

16 - 10 Nm

Checking cylinder head for distortion



Special tools and workshop equipment required

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- Straightedge 500 mm - VAS 6075-
- Feeler gauge

Max. permissible distortion: 0.1 mm

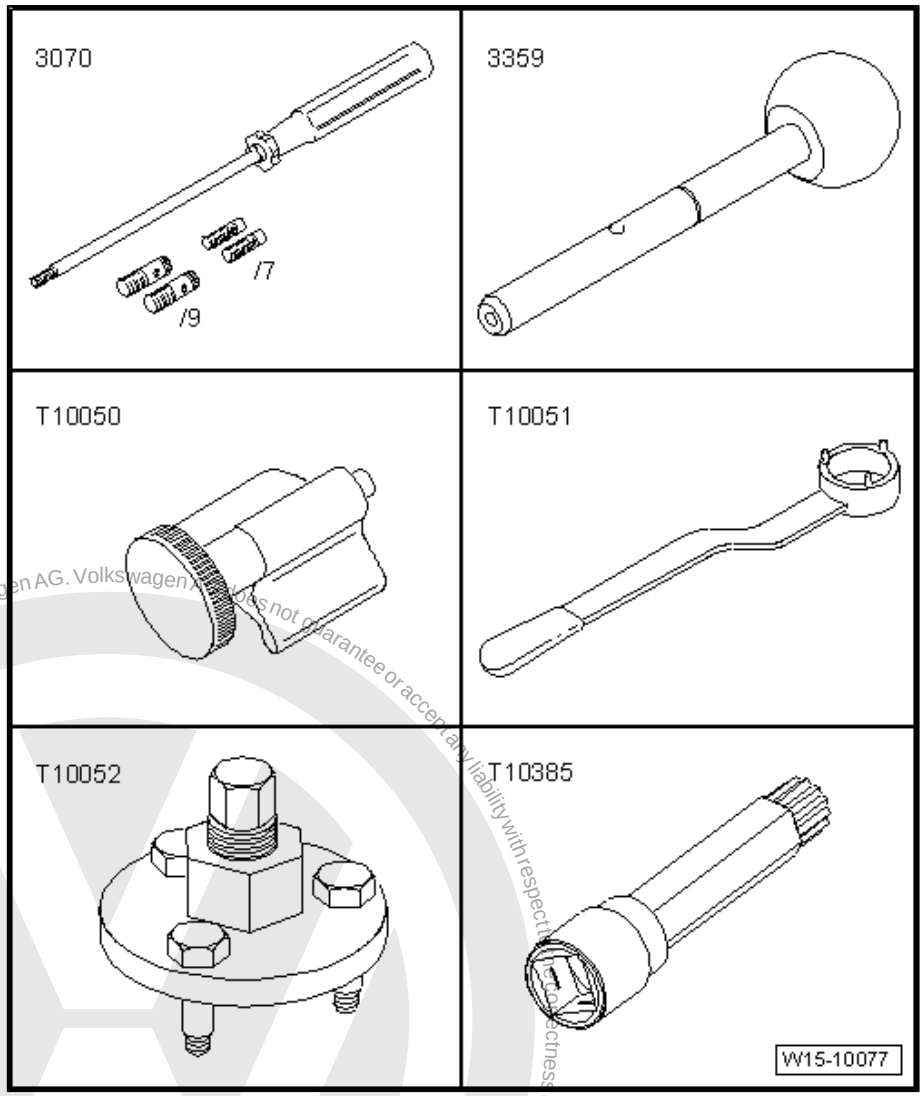
Note

Reworking diesel cylinder heads is not permissible.

1.2 Removing and installing cylinder head

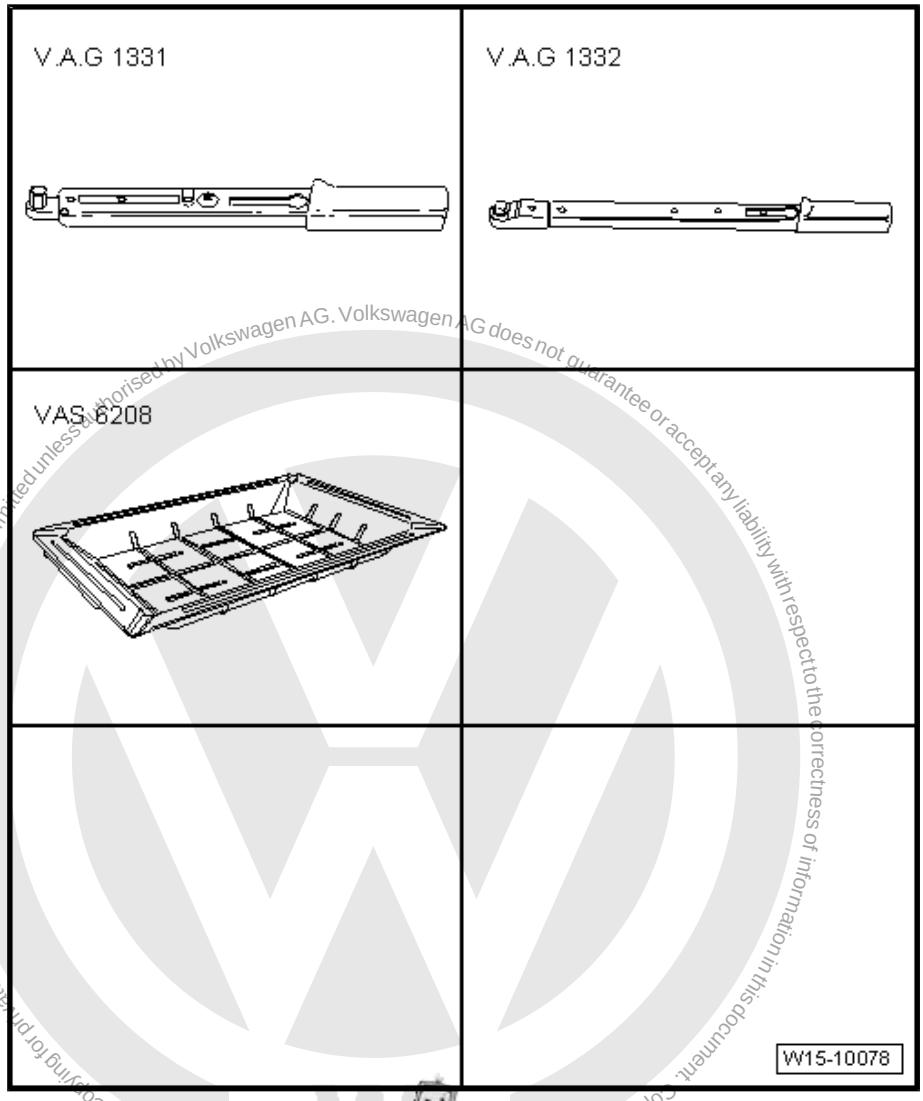
Special tools and workshop equipment required

- Guide bolt - 3070-
- Diesel injection pump locking pin - 3359-
- Crankshaft stop - T10050-
- Counter-hold tool - T10051-
- Puller - T10052-
- Bit XZN 10 - T10385-



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- Torque wrench - V.A.G 1331-
- Torque wrench - V.A.G 1332-
- Drip tray for workshop hoist - VAS 6208-



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Note

- *Read-out the anti-theft radio code as the earth strap of the battery has to be disconnected during the next work steps.*
- *All cable ties which are opened or cut through when cylinder head is removed must be renewed/replaced in the same position when the cylinder head is installed.*

WARNING

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

- ***Route lines of any kind so that the original routing can be restored.***
- ***Ensure sufficient clearance to all moving or hot components.***

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Removing

– With ignition switched off, disconnect battery earth strap. ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery

– Remove engine cover panel ⇒ page 39 .

– Remove air filter housing ⇒ page 241 .

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

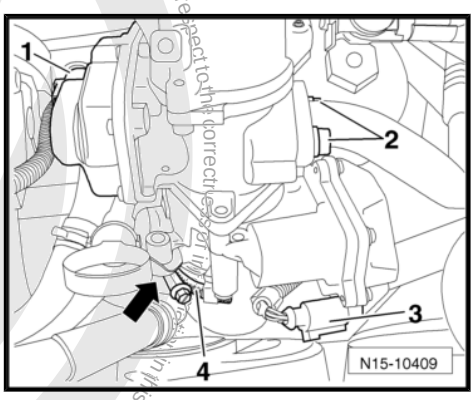
– Remove cowling together with radiator fan - V7- and radiator fan on right of radiator - V35- ⇒ page 194 .

– Remove connecting hose on »cold side« ⇒ Item 4 (page 214) from charge air cooler.

– Remove cylinder head cover ⇒ page 98 .

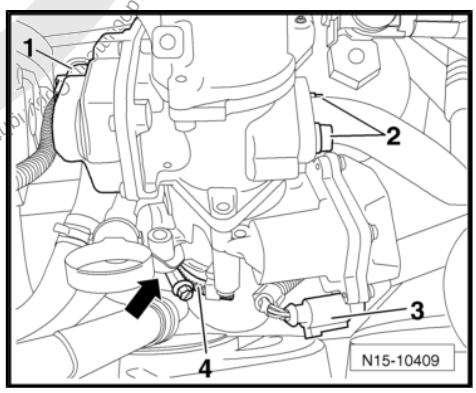
– Take toothed belt off camshaft ⇒ page 106 .

– Pull connectors off exhaust gas recirculation valve - N18- -1- and off throttle valve module - J338- -3-.



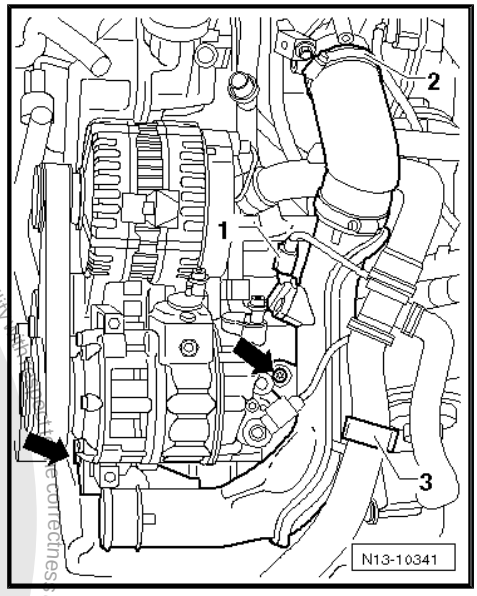
– Unscrew bolts from oil dipstick attachment -arrow- and from connecting pipe for exhaust gas recirculation -2-.

– Remove radiator cowl together with radiator fans ⇒ page 194 .



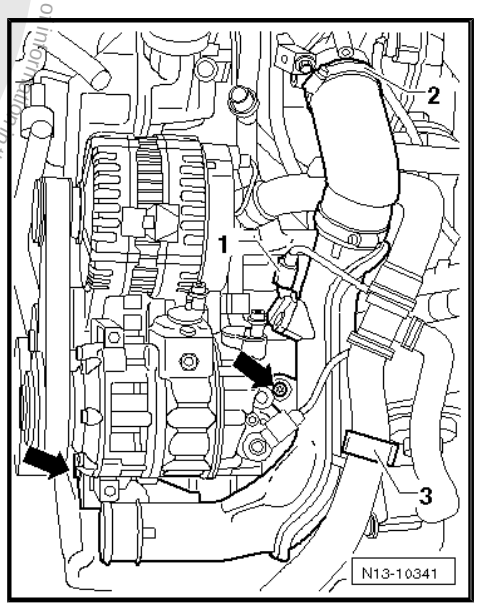
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– Remove securing bolts -arrows- from charge air pipe and separate connector -1- from charge air pressure sender - G31- .

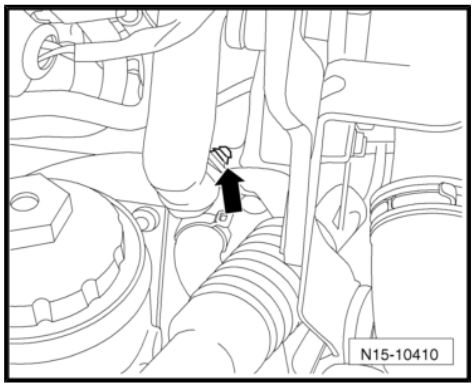


– Open clamp -2-, lay coolant hose -3- to side and remove charge air pipe.

– Disconnect vacuum line from vacuum pump.

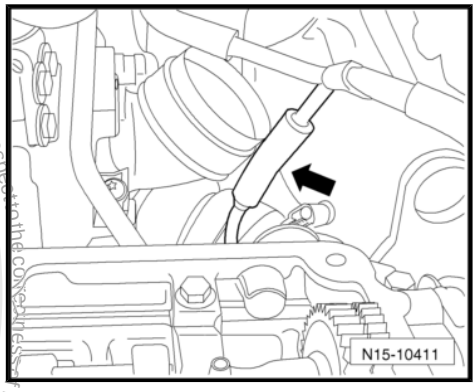


– Unclip engine pre-wiring harness from retainer -arrow-.

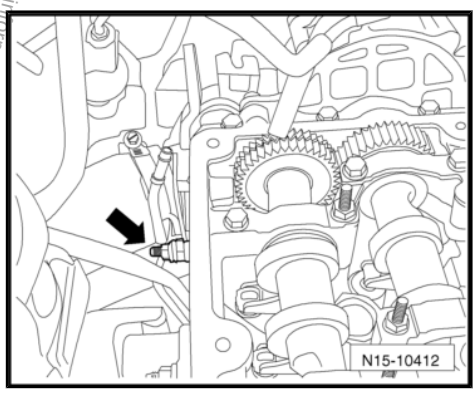


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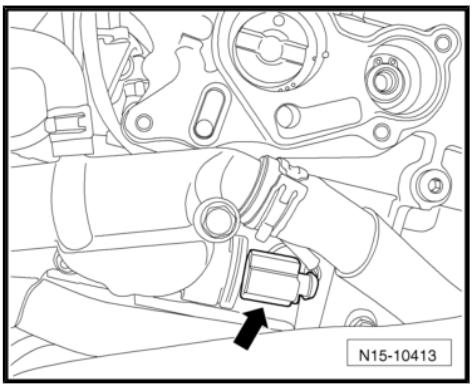
– Pull off vacuum line -arrow-.



– Unscrew vacuum line attachment -arrow-.
– Unscrew securing bolts of charge air pipe ⇒ Item 15 (page 214) and pull connecting hose off turbo-charger.
– Remove vacuum pump from cylinder head ⇒ page 101 .



– Disconnect connector -arrow- from coolant temperature sender - G62- and guide line out.



Caution

Ensure that flexible joint of connecting pipe is not bent and thus stretched. There is a danger of cracking.

– Remove exhaust gas recirculation connecting pipe ⇒ Item 2 (page 345) .

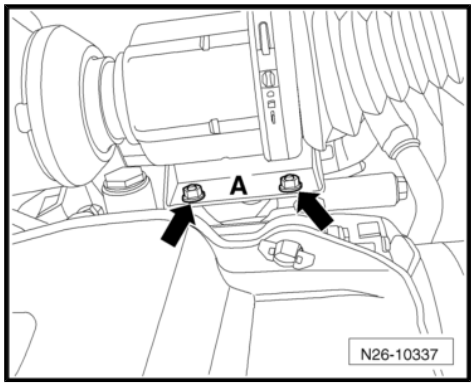
Note

The lower bolt on the exhaust gas recirculation cooler can be unscrewed with the special wrench, long reach - T10385- .

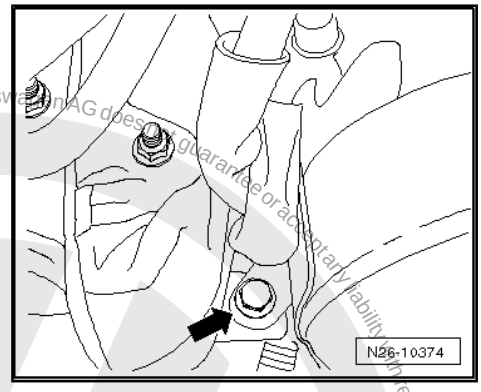
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
– Drain coolant ⇒ page 173 .

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– Loosen securing nuts -arrows- of bracket for diesel particulate filter -A- at crankcase.
– Release connecting clamp between turbocharger and diesel particulate filter.



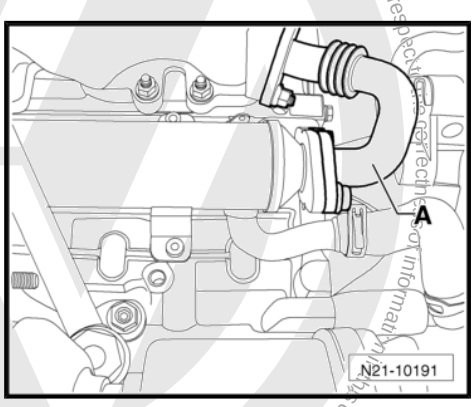
– Unscrew securing bolt from bracket on cylinder head -arrow- and push diesel particulate filter to side.



– Remove connecting pipe -A- to exhaust gas recirculation cooler.

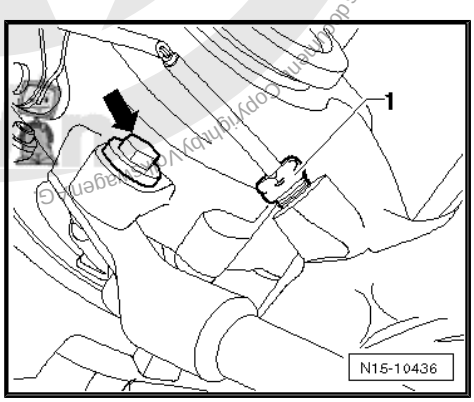
Caution

The exhaust gas temperature sender 1 - G235- covers the upper threaded connection of the turbocharger support and must not be bent. It must therefore be removed.



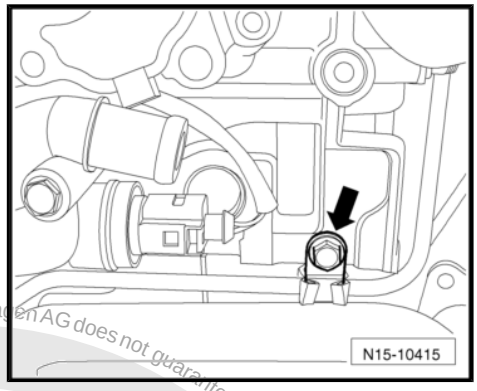
– Remove exhaust gas temperature sender 1 - G235- -1-.

– Unscrew bolt -arrow- from support on turbocharger.
– Pull coolant hoses off coolant connection of cylinder head.

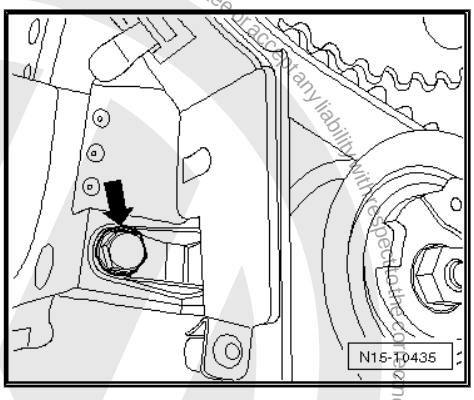


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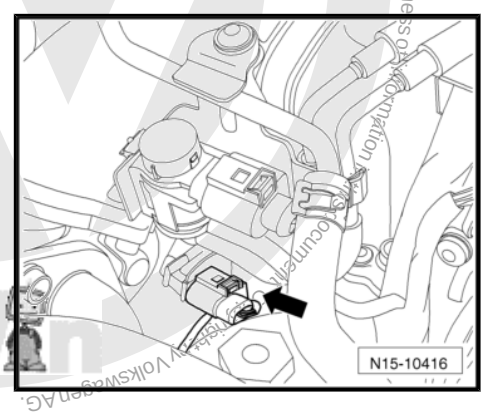
– Unscrew bolt of oil supply line -arrow- and remove oil supply line.
– Remove camshaft toothed belt pulley and pull off camshaft hub using puller - T10052- .



– Unscrew securing bolt -arrow- for toothed belt guard.
– Unscrew securing nut of toothed belt tensioning roller.

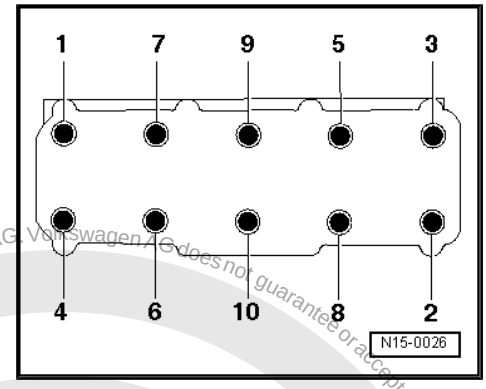


– Separate connector for Hall sender - G40- -arrow-.



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– Maintain sequence when loosening cylinder head bolts.



Note

- *A second mechanic is required for the removal of the cylinder head.*
- *The toothed belt tensioning roller is pulled off the stud when the cylinder head is lifted out.*
- *The oil return line of the turbocharger is pulled out of the support when the cylinder head is lifted out.*

– First lift cylinder head on gearbox side and guide it out of toothed belt guard. Prevent toothed belt tensioning roller from falling down.

– Place cylinder head down taking care not to bend oil return line. If necessary, place a piece of wood under exhaust manifold.

Installing

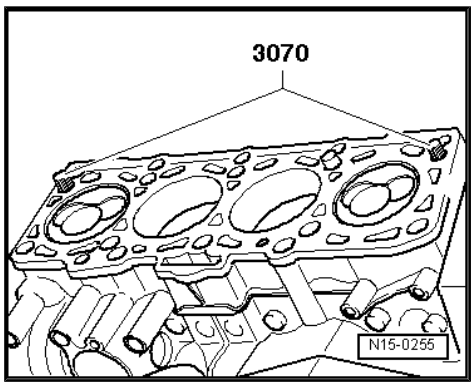
Note

- *Always renew cylinder head bolts.*
- *In cases of repair, carefully remove gasket remains from cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces. When using abrasive paper do not use a grade less than 100.*
- *Carefully remove emery and abrasive remains.*
- *Do not remove new cylinder head gasket from packaging until it is ready to be fitted.*
- *Handle gasket very carefully. Damage to the silicone coating or the indented area will lead to leaks.*

– Before fitting cylinder head, remove crankshaft stop - T10050- , and turn crankshaft in opposite direction of engine rotation until all pistons are nearly uniformly below TDC.

– Cylinder head gasket must lie with identification facing upwards.

– To centre, screw guide pins - 3070- into outer threaded holes on intake side.



Note

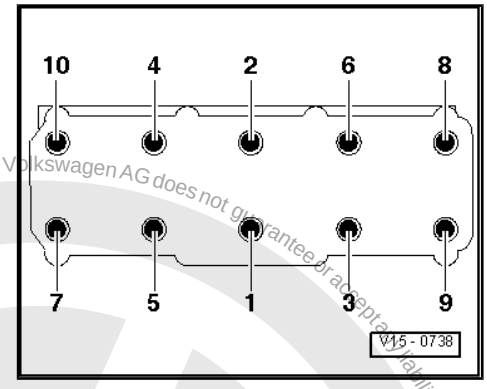
Tensioning roller must be pushed onto studs when fitting cylinder head.

– Fit cylinder head, start 8 cylinder head bolts and hand-tighten.

– Remove guide pins through bolt holes using removal tool from 3070 and install cylinder head bolts.

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– Tighten cylinder head in 4 stages in sequence shown as follows:



1 - Tighten initially with torque wrench:

Stage I = 30 Nm

Step II = 50 Nm

2 - Turn further with rigid spanner:

Stage III = 90°

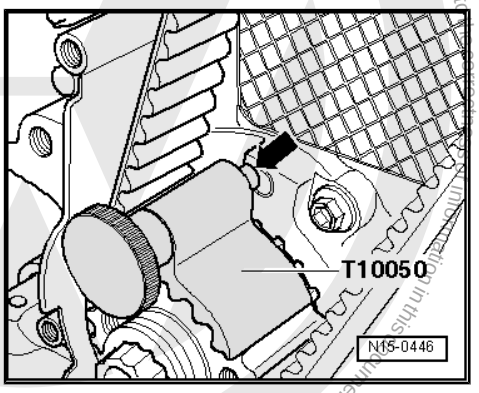
Stage IV = 90°

– Secure toothed belt rear guard to cylinder head.

– Install hub and camshaft pulley.

– Lock camshaft and high-pressure pump with diesel injection pump locking pin - 3359-

– Now rotate crankshaft in direction of rotation to TDC and lock crankshaft using crankshaft stop - T10050- .



– Fit toothed belt ⇒ page 106 .

Continue installation in reverse order of removal. During this step, observe the following:

– Install cylinder head cover ⇒ page 98 .

– Install poly V-belt ⇒ page 40 .

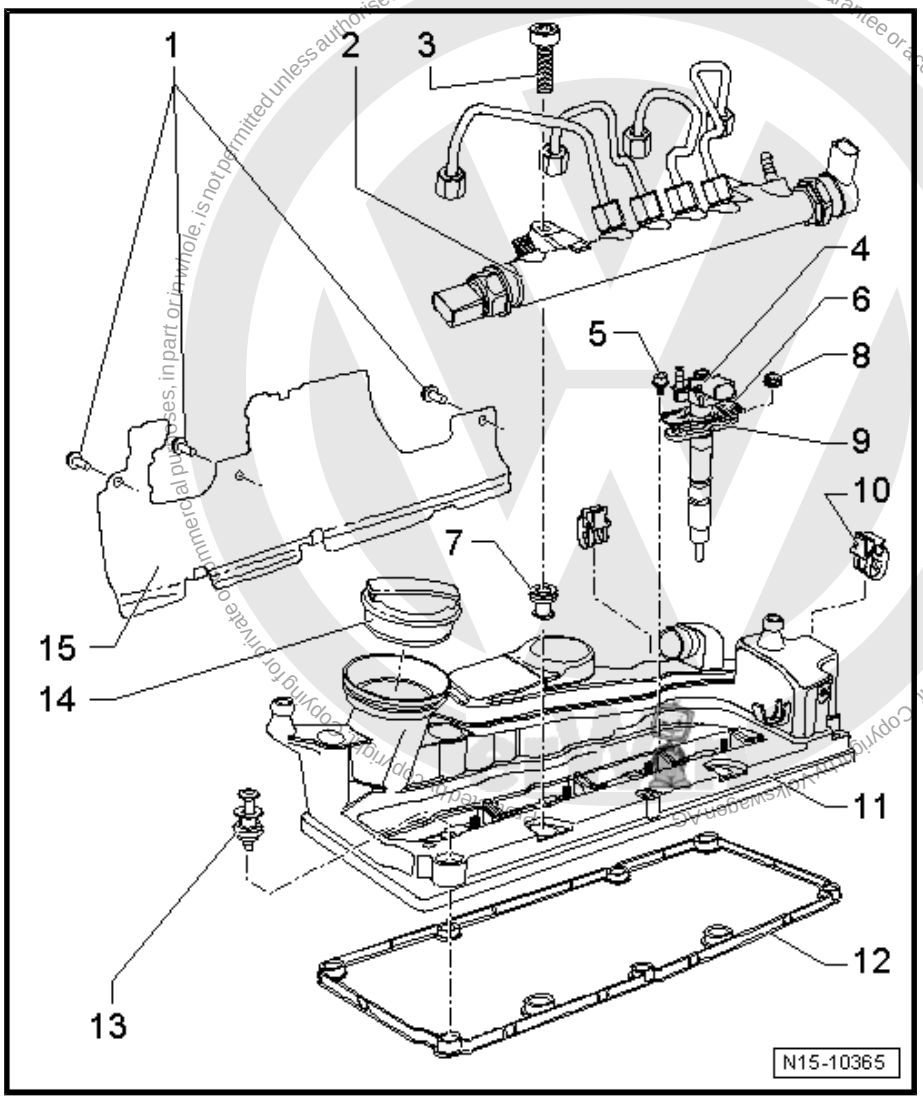
– Add coolant ⇒ page 173 .

– Carry out road test and read event memory ⇒ Vehicle diagnostic tester.

1.3 Assembly overview - cylinder head cover

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1 - 5 Nm

2 - High-pressure accumulator (rail)

- ❑ With injection pipes.
- ❑ Do not attempt to bend injector pipes to a different shape.

3 - 22 Nm

4 - Injector (piezo injectors)

- ❑ Removing and installing ⇒ page 226

5 - 5 Nm

6 - Injector cover

7 - Bush

- ❑ For securing fuel rail
- ❑ Renew if damaged

8 - 10 Nm

9 - Clamping piece

- ❑ Note installation position ⇒ page 222

10 - Wiring guide

11 - Cylinder head cover

- ❑ Removing and installing ⇒ page 98

12 - Seal

- ❑ Renew if damaged or leaking

13 - 10 Nm

- ❑ Note tightening sequence ⇒ page 98

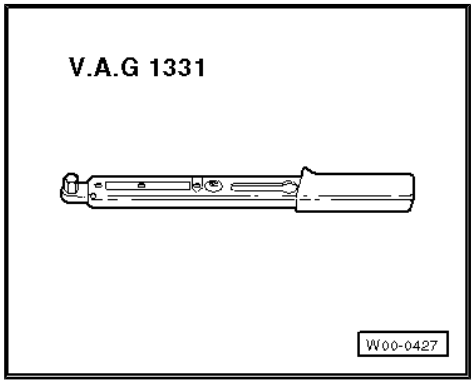
14 - Sealing cap

15 - Heat shield

1.4 Removing and installing cylinder head cover

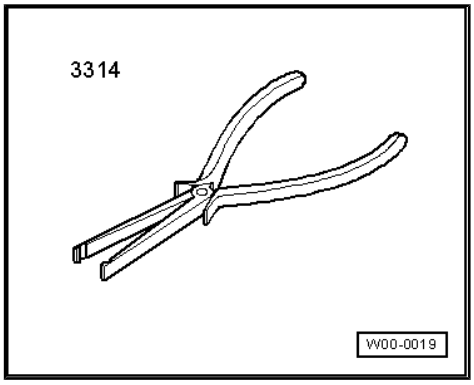
Special tools and workshop equipment required

- ♦ Torque wrench - V.A.G 1331-



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♦ Pliers - 3314-



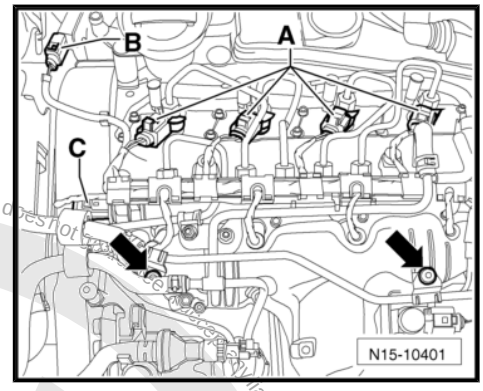
Removing

– Remove engine cover panel ⇒ page 39 .

– Remove noise insulation from injectors.

– Pull connectors off injectors -A-, exhaust gas pressure sensor 1 - G450- -B- and fuel rail pressure sensor -C-.

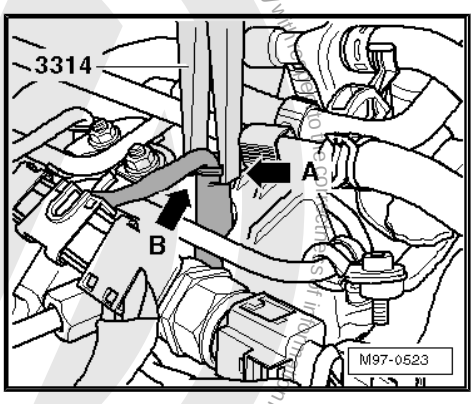
– Unscrew securing bolts of coolant line -arrows- from intake manifold and set down coolant line in front of intake manifold.



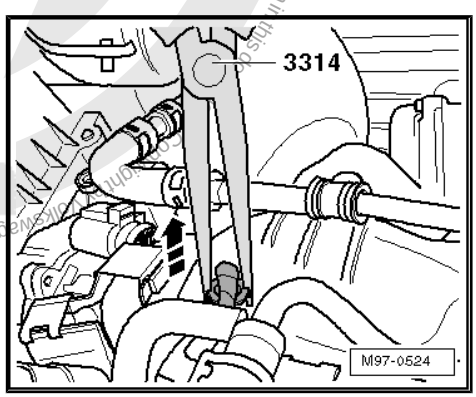
Caution

Make sure that no wiring connections are damaged when disconnecting the connectors. Otherwise the whole wiring harness will need to be renewed. Do not compress the pliers - 3314- too firmly to separate the connectors, otherwise the support sleeve may be damaged.

– Position pliers - 3314- with groove -arrow A- on support sleeve shoulder -arrow B- and pull plugs off glow pin plugs.

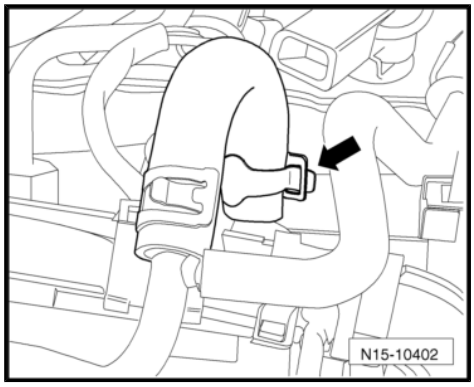


– Carefully pull connector off glow plug in direction of -arrow-.

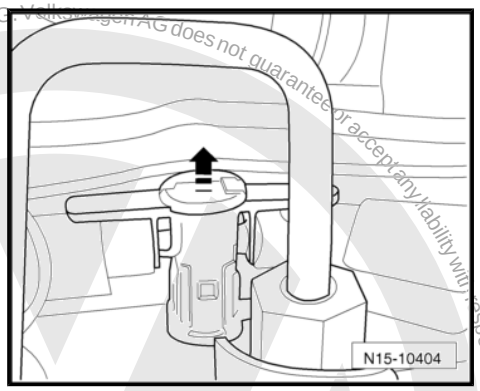


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– Unscrew securing nut of fuel return line from intake manifold, open clamp -arrow- and pull line off fuel rail.



– Pull fuel return line connections off injectors. To do this, push down connection at tabs and pull up centre piece to release.

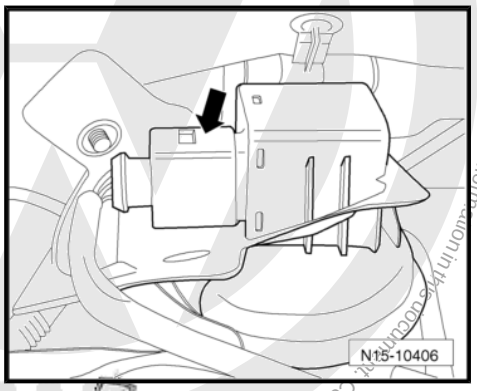


Note

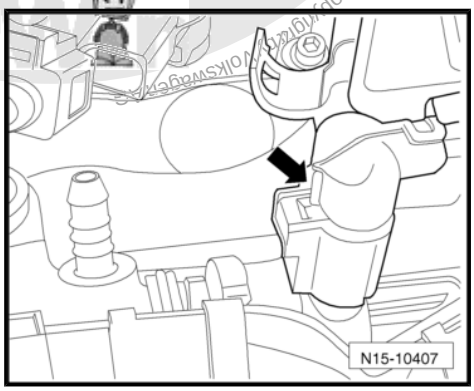
Adhere strictly to rules of cleanliness. No dirt must be allowed to get into the disconnected fuel return lines or the open connections on the injectors.

– Remove entire fuel return line and set it down in front of intake manifold.

– Pull connector of position sender for charge pressure positioner - G581- -arrow- off turbocharger and guide wiring out of retainers.



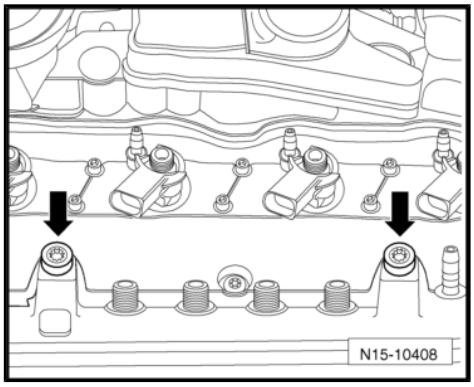
– Pull connector off fuel pressure regulating valve - N276- -arrow-.



– Remove wiring harness from rail and lay to one side.
– Pull vacuum line off cylinder head cover. Remove remaining vacuum hoses from bracket on cylinder head cover.
– Remove upper toothed belt guard.
– Remove breather line between cylinder head cover and intake hose. Press quick-release fasteners to do this.
– Remove high-pressure line between high-pressure pump and fuel rail.
– Remove high-pressure lines between fuel rail and injectors.

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– Unscrew bolts -arrows- and remove fuel rail.



– Remove injectors ⇒ page 226 .
– Remove securing bolts for cylinder head cover and take off cylinder head cover.

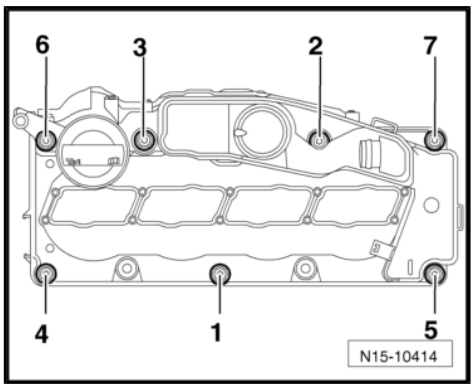
Installing

Install in reverse order of removal. During this step, observe the following:

Note

Renew seal for bolts if damaged.

– Screw on cylinder head cover hand-tight in the sequence -1 … 7-.
– Tighten bolts to 10 Nm in the sequence -1 … 7-.

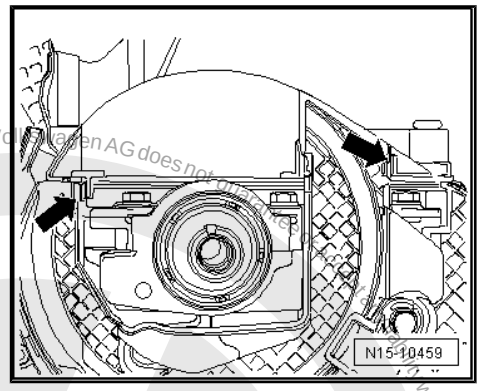


– Ensure that cylinder head cover is correctly clipped to toothed belt guard.

Note

For reasons of clarity, the camshaft sprocket has been left out.

– To do this, press toothed belt guard (using a screwdriver if necessary) against cylinder head cover in area of clips -arrows- until clips audibly engage in each other.



– Check that there is sufficient clearance between hub and toothed belt guard.
– Install high-pressure lines ⇒ page 230 .

1.5 Removing and installing vacuum pump

DANGER!

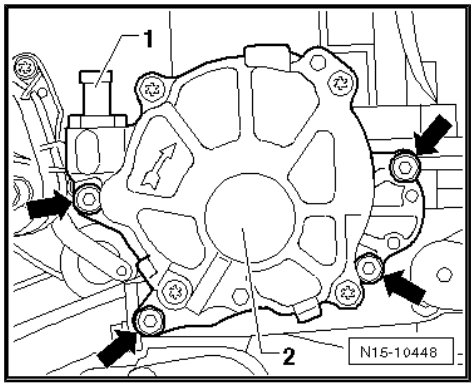
The vacuum pump may, under no circumstances, be dismantled as the vacuum part could otherwise malfunction. This would result in failure of the brake servo.

Removing

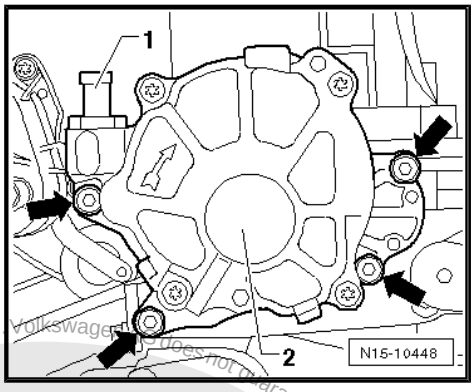
– Remove air filter housing ⇒ page 241 .

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– Pull vacuum line -1- off vacuum pump -2-.
– Unscrew securing bolts of charge air pipe ⇒ Item 15 (page 214) .
– Then push charge air pipe down slightly to gain access to the rear bolt(s) of the vacuum pump.



– Remove securing bolts -arrows-.
– Remove vacuum pump -2- from cylinder head.



Installing

Install in reverse order of removal, observing the following.

Note

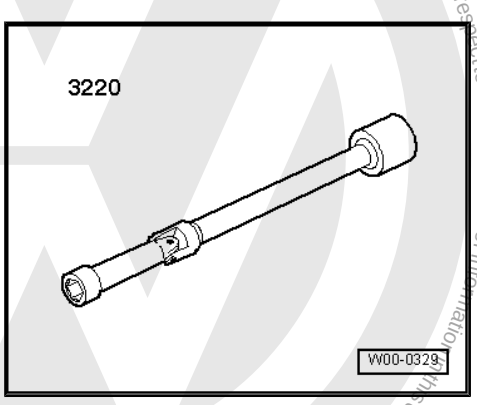
- *Ensure that vacuum pump coupling seats properly in camshaft.*
- *The seal must be renewed.*

– Install vacuum pump and tighten securing bolts to 10 Nm.
– Connect vacuum line -1- from brake servo to vacuum pump.

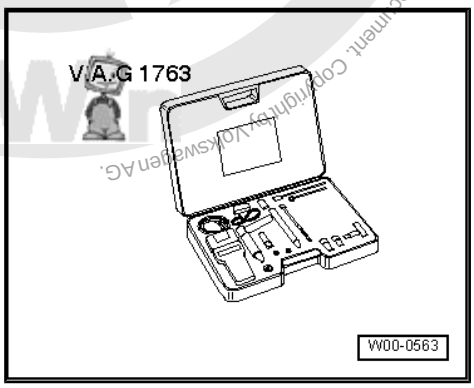
1.6 Checking compression

Special tools and workshop equipment required

- Jointed spanner - 3220-



- Compression tester - V.A.G 1763- with adapter - V.A.G 1763/8-



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

Prerequisites for check

• Engine oil temperature min. 30 °C

Test sequence

– Remove glow plug from relevant cylinder using U/J extension and 10 mm socket - 3220- ⇒ page 360 .

– Screw in adapter - V.A.G 1763/8- in place of glow plug.

– Check compression using compression tester - V.A.G 1763- .

Note

Using the compression tester ⇒ Operating manual.

– Turn over engine until tester shows no further pressure increase.

Compression pressures:

New: 25…31 bar

Wear limit: 19 bar

Permissible difference between all cylinders: 5 bar

– Install glow plug using U/J extension and socket, 10 mm - 3220- ⇒ page 360 .

– Read event memory of engine control unit ⇒ Vehicle diagnostic tester.

Note

Events will have been stored in the engine control unit because the connectors for injectors have been disconnected. Therefore, read event memory and delete if necessary ⇒ Vehicle diagnostic tester.

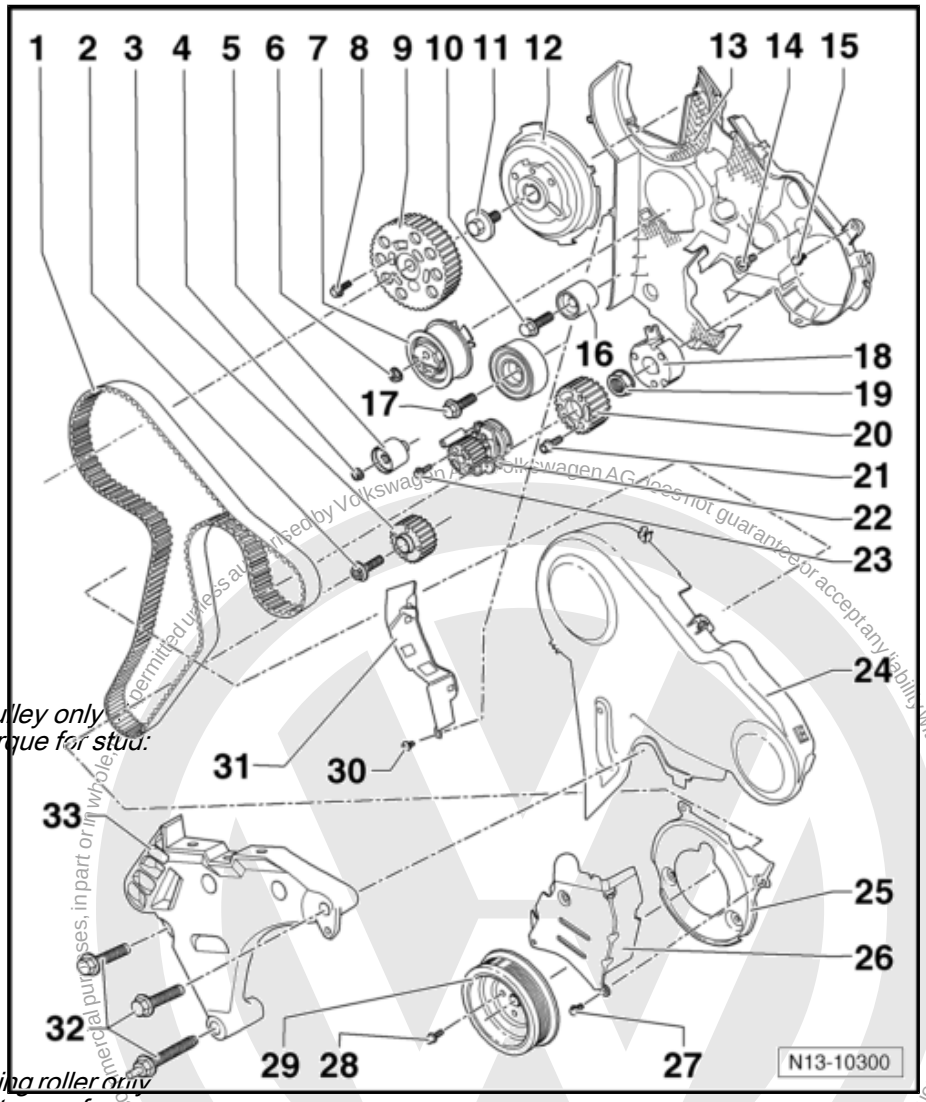
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2 Toothed belt drive

⇒ “2.1 Assembly overview - toothed belt”, page 104

⇒ “2.2 Removing and installing toothed belt”, page 106

2.1 Assembly overview - toothed belt



1 - Toothed belt

- ❑ Mark direction of rotation before removing
- ❑ Check for wear
- ❑ Do not kink
- ❑ Removing, installing and tensioning ⇒ page 106 .

2 - Bolt

- ❑ Renew after removing
- ❑ Specified torque ⇒ Item 1 (page 61) (1)
- ❑ Use counterhold - 3415- to loosen and tighten.

3 - Crankshaft pulley

4 - 20 Nm

5 - Idler roller

Note

Renew stud for idler pulley only if damaged. Specified torque for stud: 15 Nm.

6 - 20 Nm + turn 45° further

7 - Tensioning pulley

- ❑ Remove engine bracket in order to remove and install ⇒ page 51 .

Note

Renew stud for tensioning roller only if damaged. Specified torque for stud: 15 Nm.

8 - 20 Nm + turn 45° further

9 - Camshaft sprocket

10 - 20 Nm

11 - 100 Nm

12 - Hub

- ❑ Use counterhold - T10051- to loosen and tighten.
- ❑ To remove, use puller - T10052- .
- ❑ Removing and installing ⇒ page 118

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13 - Rear toothed belt guard

14 - 20 Nm

15 - 10 Nm

- ❑ Renew

16 - Idler roller

17 - 50 Nm + turn 90° further

- ❑ Renew

18 - Hub

- ❑ Use counterhold - T10051- to loosen and tighten.
- ❑ To remove, use puller - T40064- .
- ❑ Removing and installing ⇒ page 259

19 - 95 Nm

20 - Toothed belt pulley on high-pressure pump

21 - 20 Nm

22 - Coolant pump

- ❑ Removing and installing ⇒ page 181

23 - 15 Nm

24 - Toothed belt guard upper part

25 - Toothed belt guard lower part

26 - Toothed belt guard centre part

27 - 10 Nm

- ❑ Renew

28 - 10 Nm + turn 90° further

- ❑ Renew

29 - Belt pulley and vibration damper

- ❑ Offset holes make assembly possible in one position only

30 - 5 Nm

31 - Protective plate

32 - 40 Nm + turn 180° further

- ❑ Renew
- ❑ Note tightening sequence ⇒ page 51

33 - Engine support

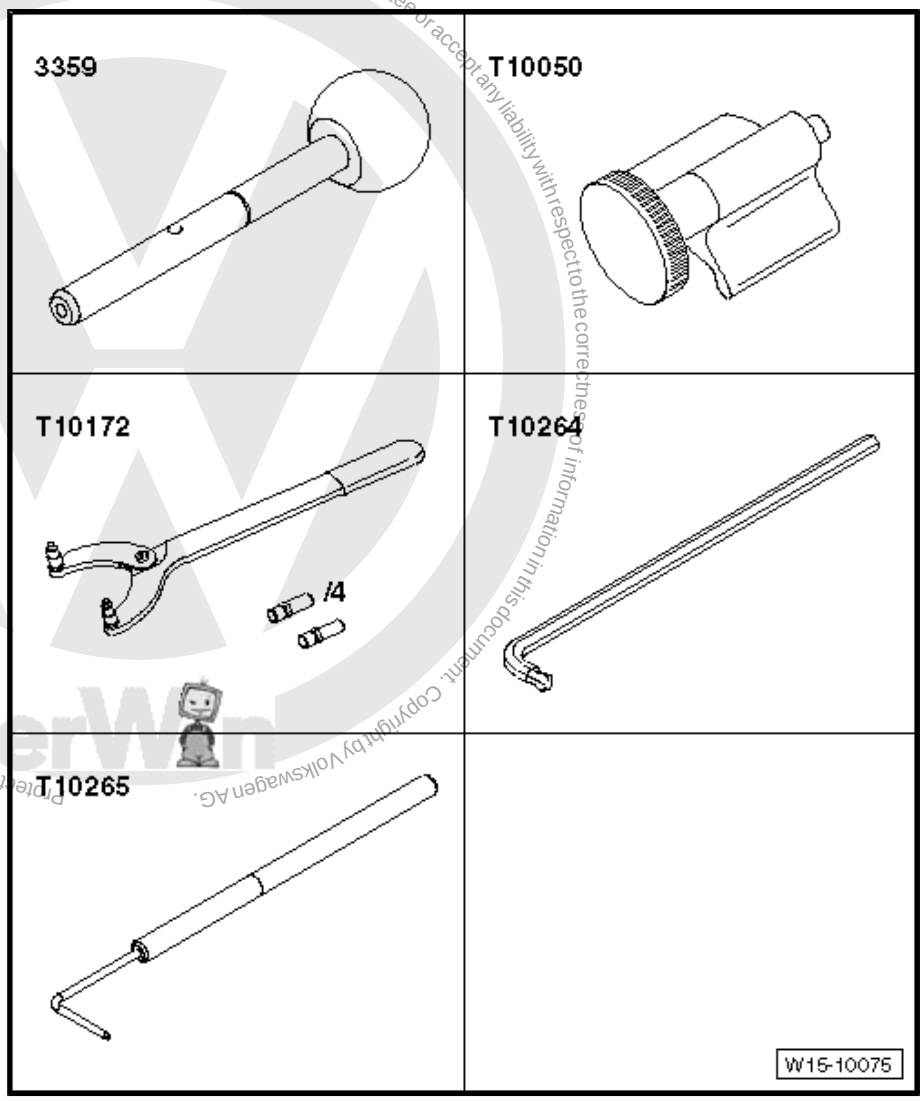
- ❑ Removing and installing ⇒ page 51

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2.2 Removing and installing toothed belt

Special tools and workshop equipment required

- Locking pin - 3359-
- Crankshaft stop - T10050-
- Counter-hold tool - T10172-
- Angled screwdriver - T10264-
- Locking tool - T10265-



Not illustrated:

- Torque wrench - V.A.G 1331-
- Torque wrench - V.A.G 1332-

Removing

Note

The toothed belt may only be adjusted on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.

– Remove engine cover panel ⇒ page 39 .

– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

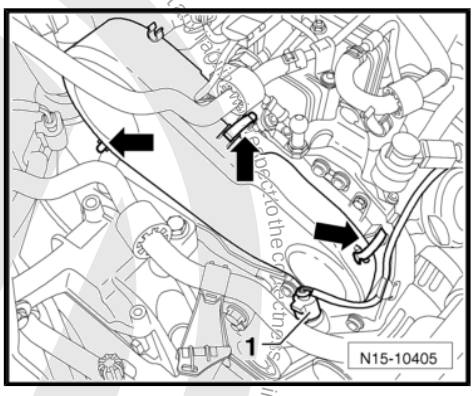
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– Pull connector off radiator outlet coolant temperature sender - G83- , open clips -arrows- and remove toothed belt guard.

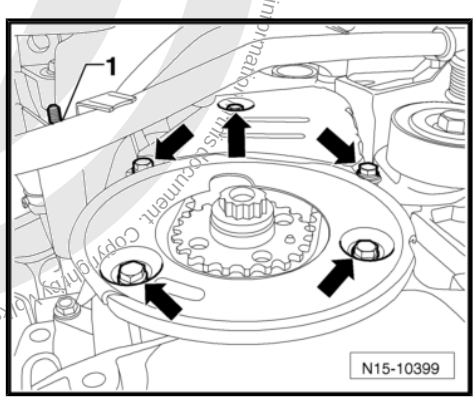
– Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Removing and installing wheel housing liner.

– Remove poly V-belt ⇒ page 40 .

– Remove vibration damper ⇒ Item 29 (page 105) .



– Remove lower and centre toothed belt guard -arrows- and unscrew securing nut of coolant pipe -1-.



– Position crankshaft at TDC and lock crankshaft toothed belt pulley with crankshaft stop - T10050- . To do this, push crankshaft stop into teeth of belt pulley from face side. The toothed segment of the camshaft must be at the »12 o'clock position«.

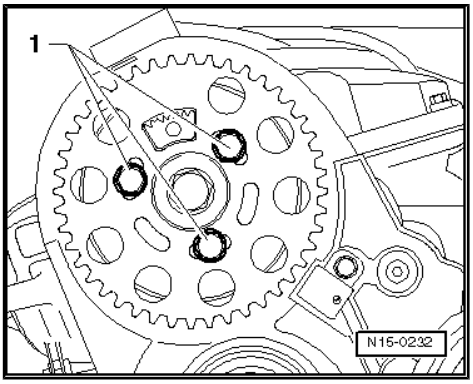


Note

The markings on the crankshaft pulley -2- and the crankshaft stop - T10050- -1- must align. At the same time, the pin of the crankshaft stop - T10050- must engage in the drilling in the sealing flange.

– Mark direction of rotation of toothed belt.

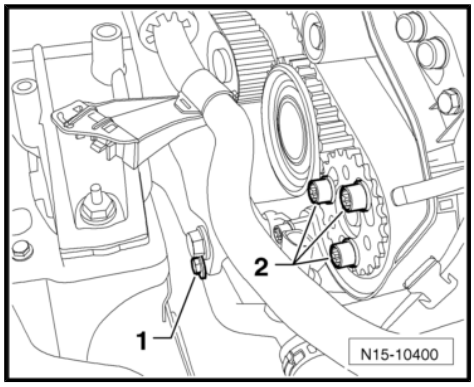
– Loosen securing bolts -1- for camshaft toothed belt pulley.



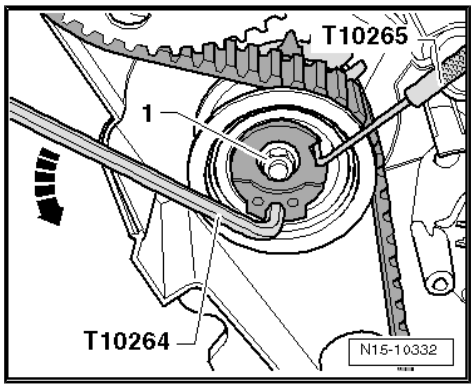
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– Loosen securing bolt of coolant pipe -1- and then securing bolts of toothed belt pulley for high-pressure pump -2-.

– Loosen tensioning roller securing nut -1-.

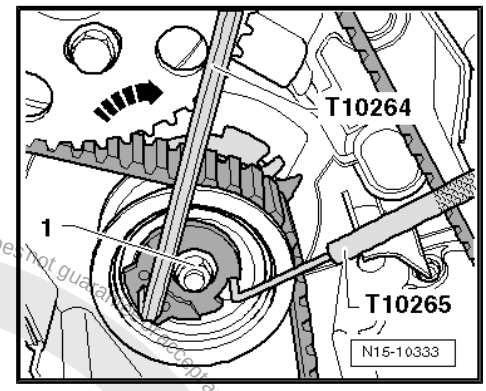


– Turn eccentric of tensioning roller anti-clockwise -arrow- using socket - T10264- , until the tensioning roller can be locked with locking tool - T10265- .



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

– Remove toothed belt first from idler pulley and then from remaining pulleys.



Installing

Note

- *The toothed belt may only be adjusted on cold engines, as the indicator position on the tensioning element varies depending on the engine temperature.*
- *If the tensioning roller is to be renewed, the engine bracket must be removed ⇒ page 51 .*

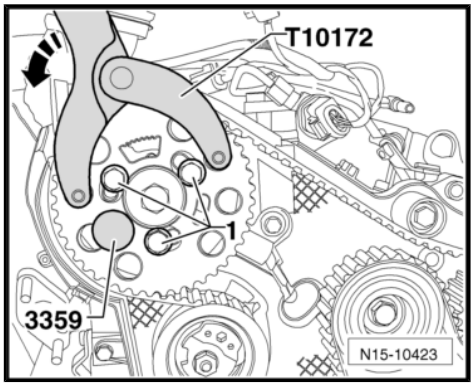
- Tensioning roller must be locked with locking tool - T10265- and secured to right stop.
- Crankshaft is locked using crankshaft stop - T10050- .

Note

If necessary, turn camshaft hub with counterhold - T10172- and adapters - T10172/4- until camshaft can be secured in position. To do this, hand-tighten at least one securing bolt -1-.

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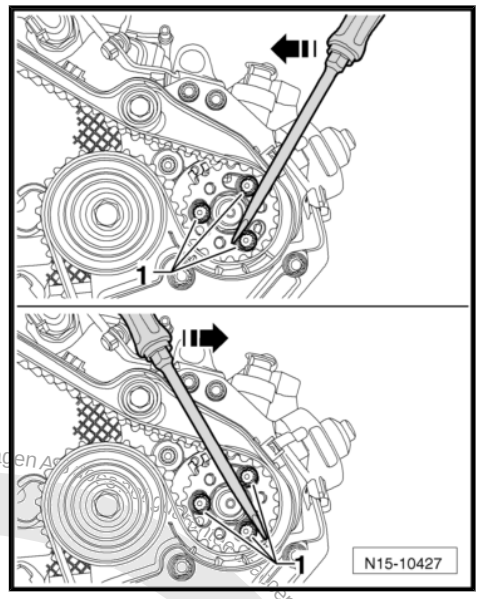
– Lock camshaft hub with locking pin - 3359- . To do this, slide locking pin through outer free elongated hole into hole in cylinder head.
– Loosen bolts which had been tightened only hand-tight.



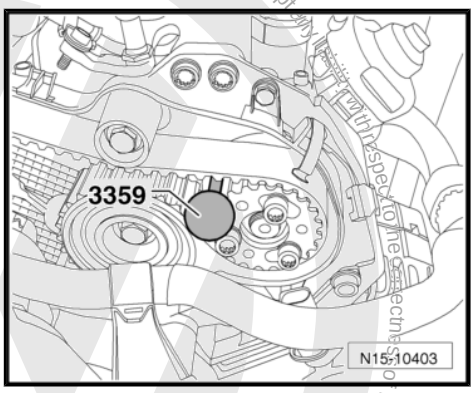
Note

If necessary, turn hub of high-pressure pump at bolt heads with screwdriver until it can be secured in position.

Positioning hub of high-pressure pump

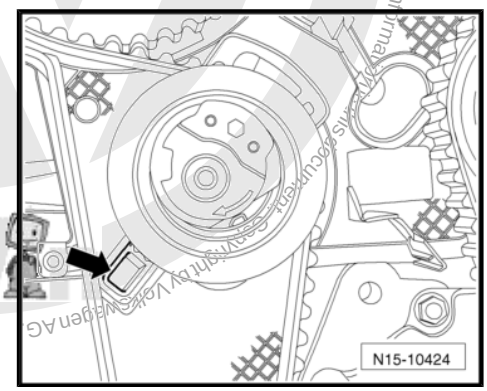


– Lock hub of high-pressure pump with locking pin - 3359- . To do this, slide locking pin into adjustment hole outside toothed belt pulley.
– Turn camshaft toothed belt pulley and toothed belt pulley of high-pressure pump in their elongated holes clockwise to stop.
– Fit toothed belt to crankshaft pulley, tensioning roller, camshaft pulley, toothed belt pulley of coolant pump and toothed belt pulley of high-pressure pump.
– Finally, fit toothed belt to idler pulley.
– Loosen tensioning roller securing nut and pull out locking tool - T10265- .



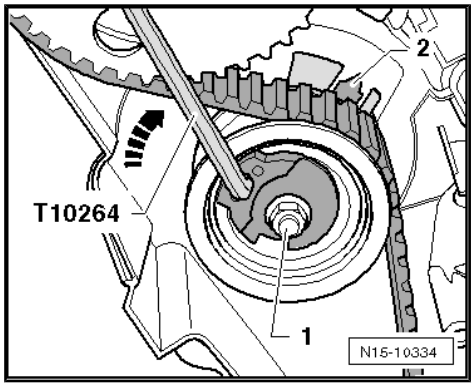
Note

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



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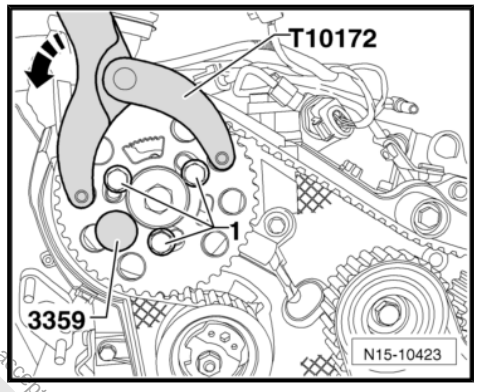
– Screw eccentric of tensioning roller clockwise carefully using angled screwdriver - T10264- . Indicator -2- must be roughly past the centre of the gap in the base plate (corrects itself during pretensioning).



Ensure that securing nut -1- does not turn as well.

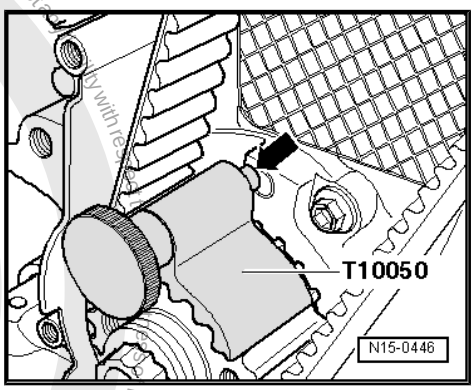
– Hold tensioning roller in this position and tighten securing nut for tensioning roller as follows: 20 Nm and 45° further.

– Apply counterhold - T10172- as shown. Press counterhold - T10172- in direction of arrow, keeping camshaft toothed belt pulley under tension.

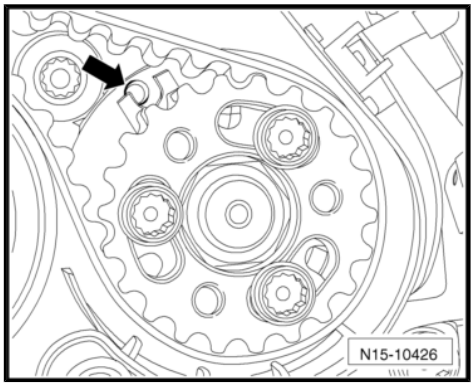


– In this position, first tighten securing bolts -1- of camshaft pulley and of toothed belt pulley for high pressure pump by hand and then tighten to 20 Nm.
– Remove locking pins - 3359- and crankshaft stop - T10050- .
– Turn crankshaft at least 2 rotations in engine direction of rotation and set again to TDC no. 1 cylinder.
– Fit crankshaft stop - T10050- again to crankshaft belt pulley.

– Now turn crankshaft in engine direction of rotation until pin of crankshaft stop -arrow- engages in sealing flange from rotational movement.



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Note

During the following checking procedure, only the camshaft and crankshaft must be secured in position. It is very difficult to find the securing position of the high-pressure pump hub again. A minor deviation -arrow-, though, does not influence engine operation.

– Check whether:

♦ Camshaft hub can be locked with locking pin - 3359- .

♦ Tensioning roller indicator is centred or maximum 5 mm to right of base plate notch.

If camshaft hub cannot be locked:

– Pull crankshaft stop - T10050- back until pin uncovers hole.

– Turn crankshaft in opposite direction of engine rotation slightly past TDC.

– Now turn crankshaft slowly in direction of engine rotation until camshaft hub can be secured in position.

– After locking, loosen securing nuts of camshaft pulley.

If pin of crankshaft stop - T10050- is standing on left next to hole:

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– Turn crankshaft in engine direction of rotation until crankshaft stop pin engages in sealing flange whilst turning.

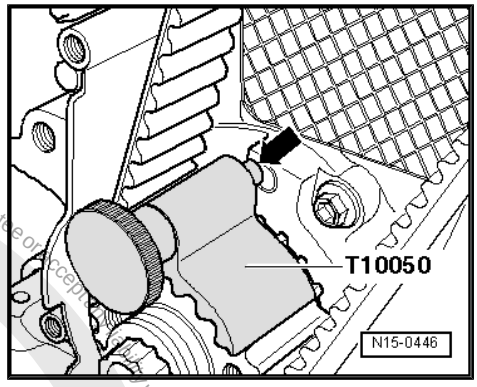
– Tighten securing bolts of camshaft toothed belt pulley by hand first and then tighten to 20 Nm.

If pin of crankshaft stop - T10050- is standing on right next to hole:

– Slightly turn crankshaft in opposite direction of engine rotation.

– Now turn crankshaft in engine direction of rotation until crankshaft stop pin engages in sealing flange whilst turning.

– Tighten securing bolts of camshaft toothed belt pulley by hand first and then tighten to 20 Nm.



Continuation

– Remove locking pin - 3359- and crankshaft stop - T10050- .

– Turn crankshaft at least 2 rotations in engine direction of rotation and set again to TDC no. 1 cylinder.

– Repeat check.

– If camshaft hub can be secured in position, tighten securing bolts as follows:

♦ Camshaft sprocket: 45° further. Counterhold with counterhold - T10172- and adapters - T10172/4- .

– Install centre and lower parts of toothed belt guard.

– Install belt pulley vibration damper: specified torque 10 Nm + turn 90° further.

– Install poly V-belt ⇒ page 40 .

– Install upper toothed belt guard.

Further assembly is basically a reverse of the dismantling sequence. During this step, observe the following:

♦ Ensure fuel hoses are seated correctly.

♦ Do not interchange fuel supply and return lines (return line is blue or with blue markings and supply line is white).

– Install wheel housing liner.

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

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3 Valve gear

⇒ “3.1 Assembly overview - valve gear”, page 113

⇒ “3.2 Removing and installing camshaft oil seal”, page 114

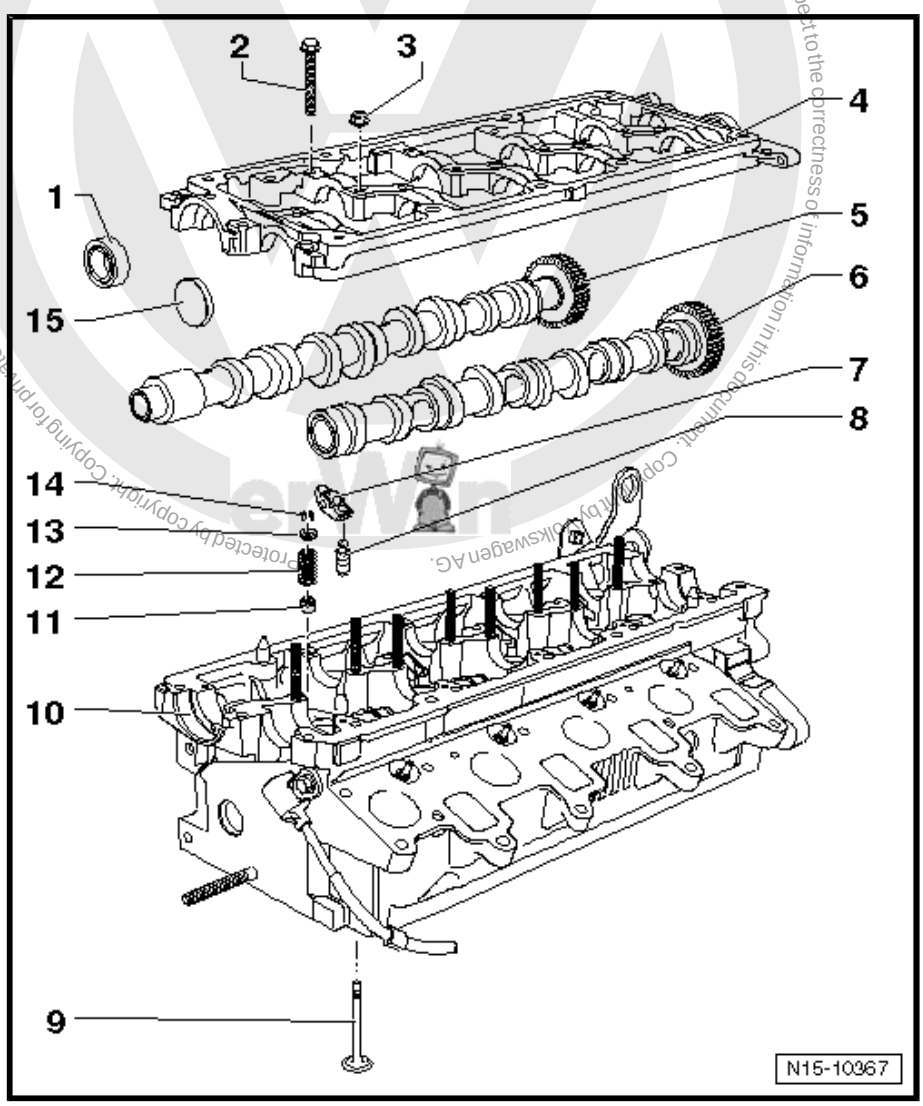
⇒ “3.3 Removing and installing camshaft”, page 118

⇒ “3.4 Removing and installing valve stem seals”, page 125

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 - Sealing ring

- ❑ Do not additionally oil or grease the oil seal sealing lip.
- ❑ Before installing, remove residual oil from camshaft journal using a clean cloth
- ❑ To install, mask off groove on camshaft taper (e.g. using Sellotape)
- ❑ Removing and installing ⇒ page 114

2 - 10 Nm

3 - 10 Nm

4 - Bearing frame

- ❑ Observe sequence for loosing and tightening ⇒ page 118
- ❑ Seal using silicone adhesive sealant - D 176 501 A1- .

5 - Exhaust camshaft

6 - Inlet camshaft

7 - Roller rocker fingers

- ❑ Mark installation position
- ❑ Do not interchange
- ❑ Check roller bearing for ease of movement.
- ❑ Oil contact surface

8 - Hydraulic compensation element

- ❑ Mark installation position
- ❑ Lubricate contact surfaces before installing.

9 - Valve

- ❑ Do not rework. Only lapping in is permitted.
- ❑ Mark installation position for re-installation.

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- ❑ Valve dimensions ⇒ page 129
- ❑ Checking valve guides ⇒ page 129 .

10 - Cylinder head

- ❑ See note ⇒ page 87 .
- ❑ Removing and installing ⇒ page 89

11 - Valve stem seal

12 - Valve springs

13 - Valve spring plate

14 - Valve cotter

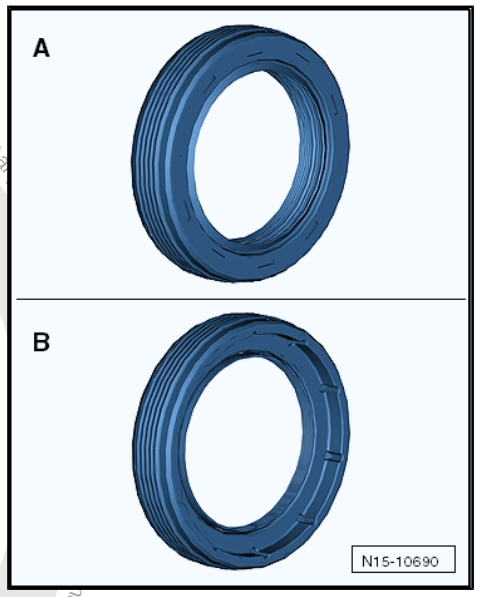
15 - Sealing cap

- ❑ Renew

3.2 Removing and installing camshaft oil seal

Note

As of 09.09, a new gasket -B- will be used, which visually has no closed surface between the camshaft and cylinder head but rather a fillet. A different procedure has to be followed here ⇒ page 116 .

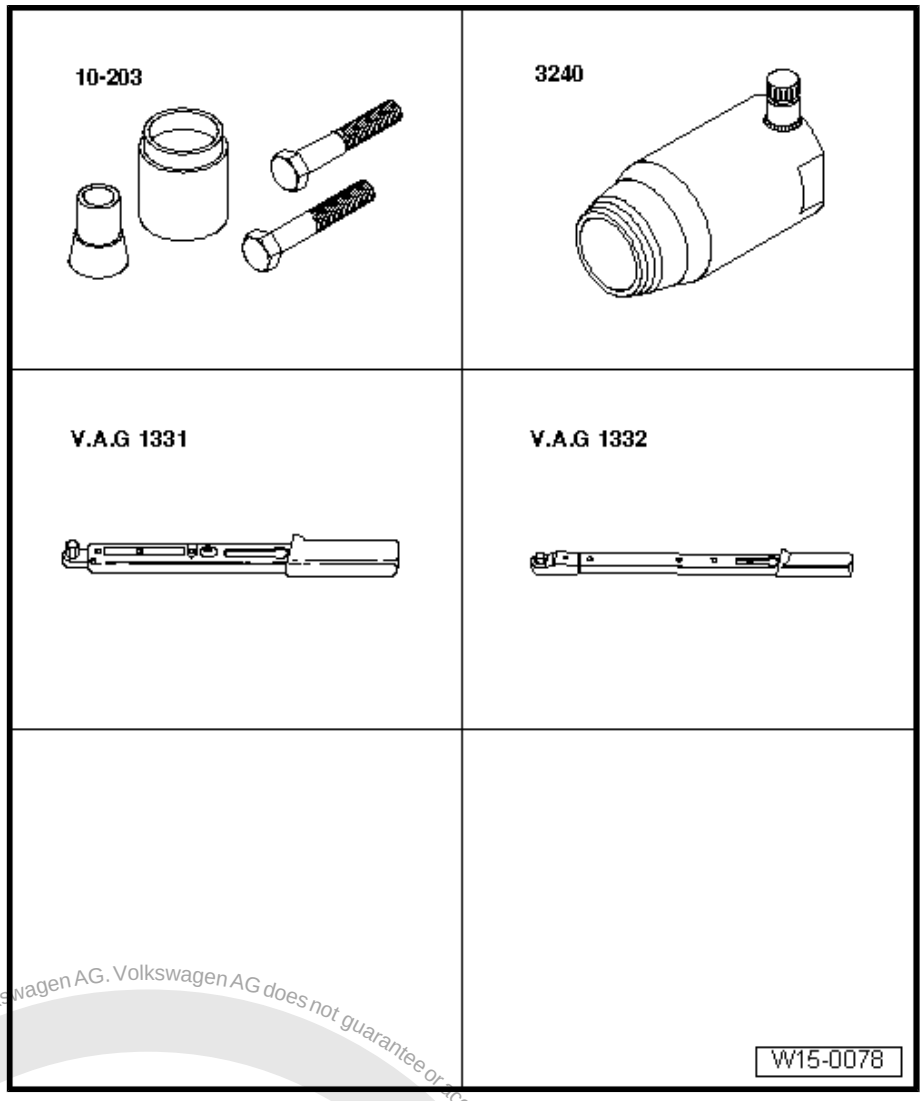


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3.2.1 Vehicles to 08.09

Special tools and workshop equipment required

- Fitting tool - V.A.G 10-203-
- Seal puller - 3240-
- Torque wrench - V.A.G 1331/-
- Torque wrench - V.A.G 1332/-
- Bolt M12 x 1.5 x 75



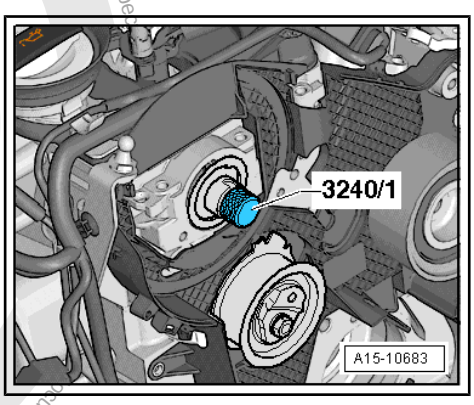
Removing

– Take toothed belt off camshaft and high-pressure pump ⇒ page 106 .

– Remove camshaft pulley and hub ⇒ page 118 .

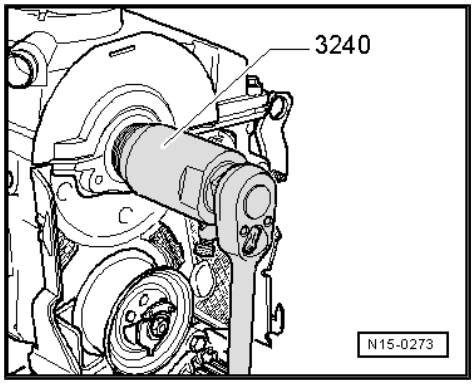
– Insert thrust piece -3240/1- into camshaft.

– Unscrew inner part of oil seal extractor -3240- 2 turns (approx. 3 mm) from outer part, and lock it in place using knurled screw.



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

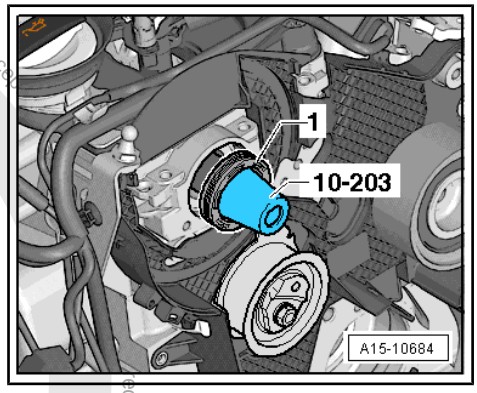


Installing

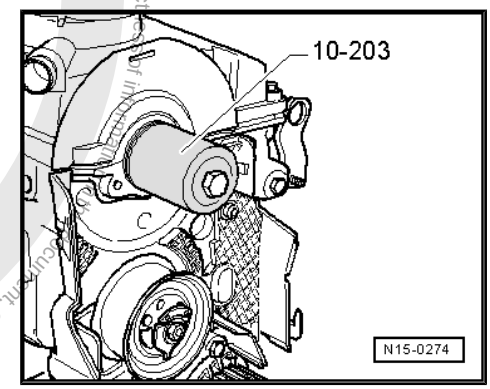
Note

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

– Remove oil residue from camshaft journal using a clean cloth.
– Fit guide sleeve of fitting tool - 10 - 203- onto camshaft as shown in illustration.
– Carefully slide oil seal -1- over guide sleeve onto camshaft.



– Press seal in to stop using thrust piece from fitting tool 10-203 and bolt M12×1.5x75.
– Install camshaft pulley and hub ⇒ page 118 .
– Install toothed belt and adjust valve timing ⇒ page 106 .

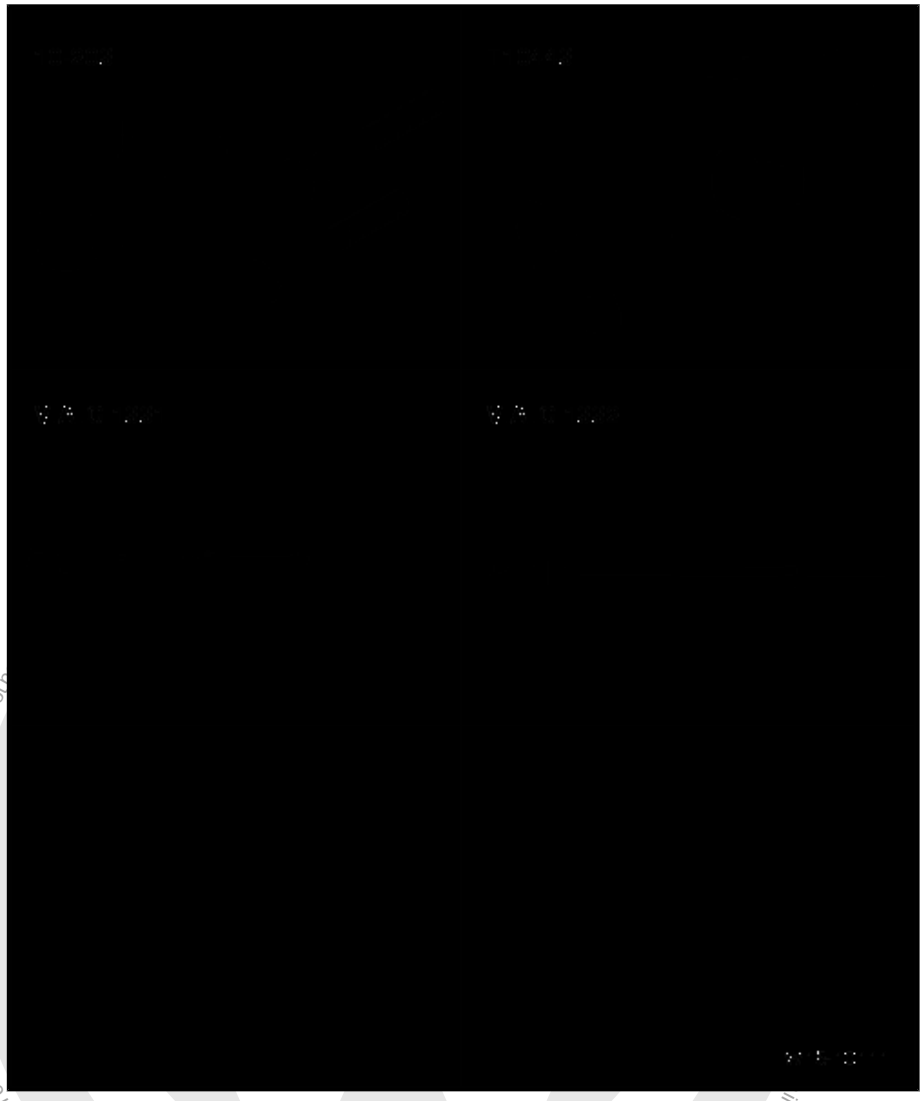


3.2.2 Vehicles from 09.09

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Special tools and workshop equipment required

- Fitting tool - V.A.G 10-203-
- Seal puller - T10443-
- Torque wrench - V.A.G 1331/-
- Torque wrench - V.A.G 1332/-
- Bolt M12 x 1.5 x 75



Removing

– Take toothed belt off camshaft and high-pressure pump ⇒ page 106 .

– Remove camshaft pulley and hub ⇒ page 118 .

Caution

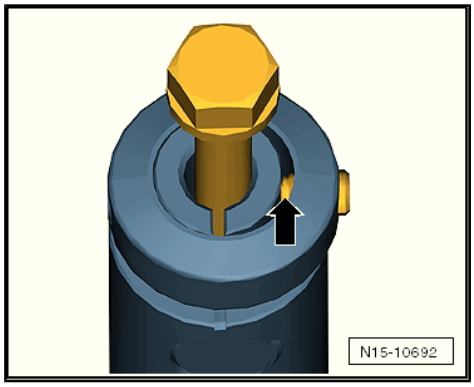
If turned too far anti-clockwise, the inner thrust plate becomes detached from the pressure screw. In this case, the thrust plate must be pushed back onto the pressure screw.

– Turn pressure screw of oil seal extractor anti-clockwise »very carefully« until slight resistance can be felt.

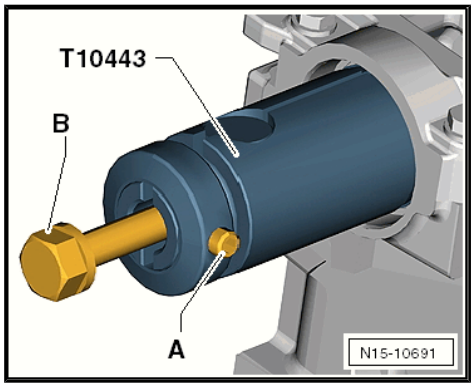
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Note

The clamping sleeves of the oil seal extractor are fitted with grub screws. However, only one of these grub screws -arrow- effects clamping, the other is fixed.



– Fit oil seal extractor as shown and screw in grub screw -A- to clamp it in place.
– Screw pressure screw -B- in until oil ring has been pulled out.



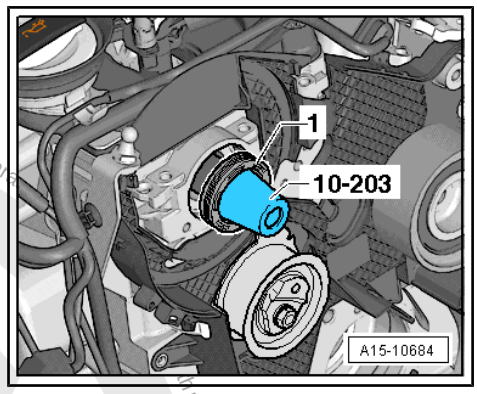
Installing

Note

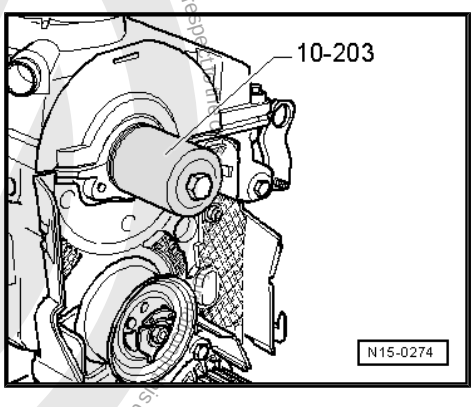
The oil seal sealing lip must not be additionally oiled or greased.

– Remove oil residue from camshaft journal using a clean cloth.

– Fit guide sleeve of fitting tool - 10 - 203- onto camshaft as shown in illustration. The lettering on the oil seal faces outwards.
– Carefully slide oil seal -1- over guide sleeve onto camshaft.



– Press seal in to stop using thrust piece from fitting tool 10-203 and bolt M12×1.5x75.
– Install camshaft pulley and hub ⇒ page 118 .
– Install toothed belt and adjust valve timing ⇒ page 106 .

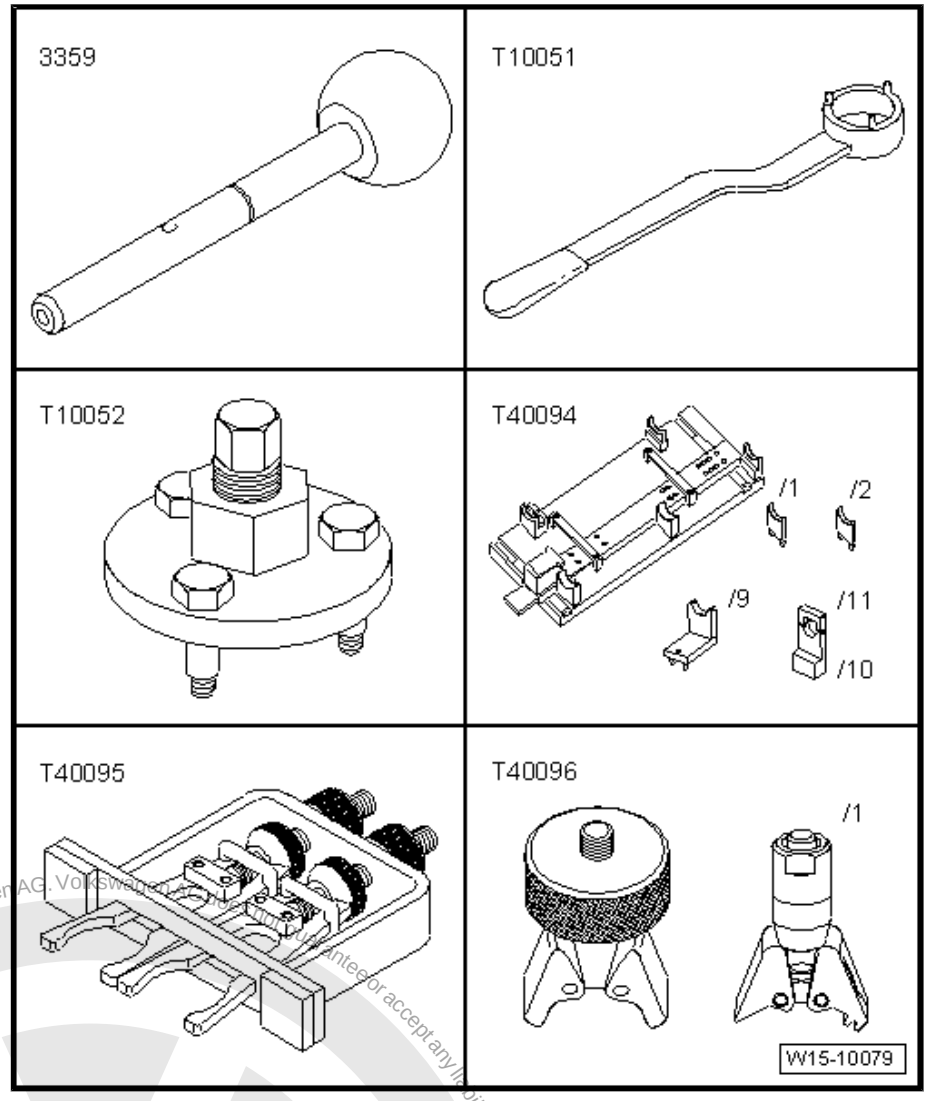


3.3 Removing and installing camshaft

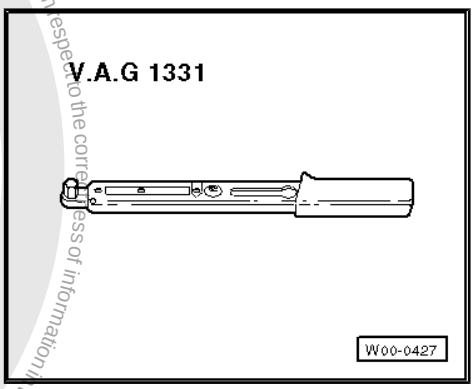
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Special tools and workshop equipment required

- Diesel injection pump locking pin - 3359-
- Counter-hold tool - T10051-
- Puller - T10052-
- Camshaft fitting tool - T40094-
- Camshaft clamping tool - T40095-
- Camshaft fitting tool - T40096-

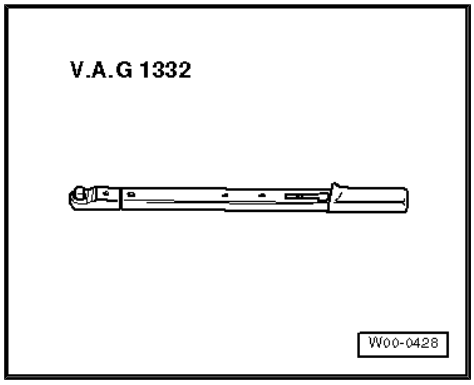


- Torque wrench - V.A.G 1331/-



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♦ Torque wrench - V.A.G 1332/-



♦ Silicone adhesive sealant - D 176501 A1-

Removing

– Remove engine cover panel ⇒ page 39 .

– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

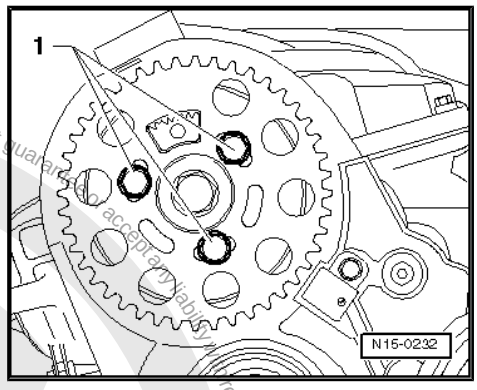
– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

– Take toothed belt off camshaft and high-pressure pump ⇒ page 106 .

– Remove cylinder head cover ⇒ page 98 .

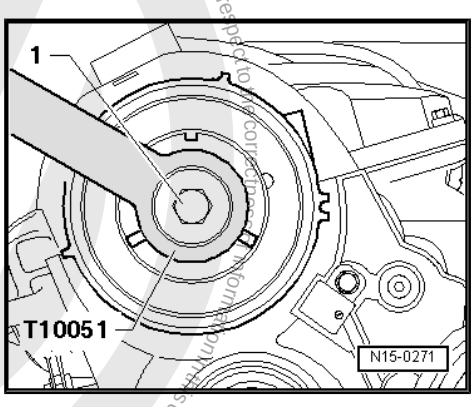
– Remove securing bolts for camshaft toothed belt pulley -1-.

– Detach camshaft pulley from hub.



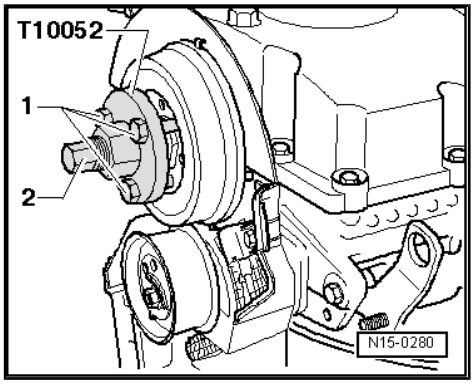
– Counterhold hub with counterhold - T10051- and loosen securing bolt -1- of hub.

– Loosen hub securing bolt about 2 turns.



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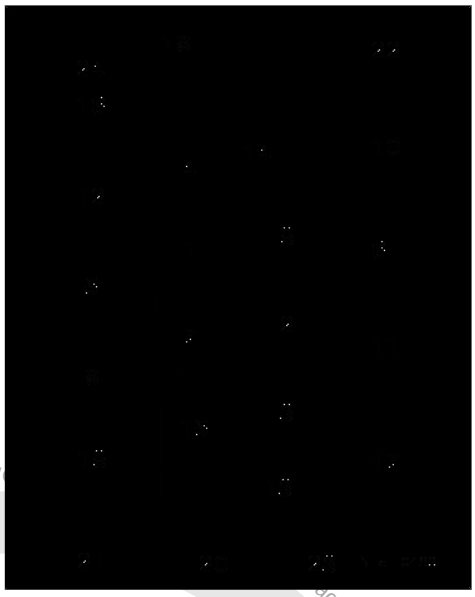
– Fit puller - T10052- and align it with holes in hub.
– Tighten securing bolts -1-.
– Apply tension to hub by evenly tightening puller -2- until hub separates from taper of camshaft.



Note

When doing this, hold puller with 30 mm spanner.

– Remove hub from taper of camshaft.
– Remove vacuum pump ⇒ page 101 .
– Remove securing bolts of retaining frame in sequence -24 … 1-.
– Remove retaining frame.
– Carefully take out camshafts.



Installing

Note

Seal parting surface between retaining frame and cylinder head using silicone adhesive sealant - D 176 501 A1- .

Caution

The camshafts may be installed only with the camshaft fitting tool - T40094- as described below. The axial bearings in the retaining frame will otherwise be damaged beyond repair and the cylinder head will have to be renewed.

– Remove sealant residues on cylinder head and retaining frame, e.g. using a plastic rotary brush.

Caution

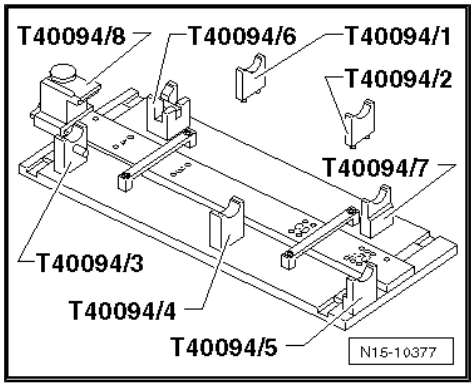
Make sure that no sealant residue gets into the cylinder head or the bearings.

– Clean sealing surfaces; they must be free of oil and grease.
– Lubricate running surfaces of camshafts.

Set up camshaft fitting tool - T40094- as follows:

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– Remove supports -T40094/3-, -T40094/4- and -T40094/5- from base plate. Threaded connection is accessible from below.



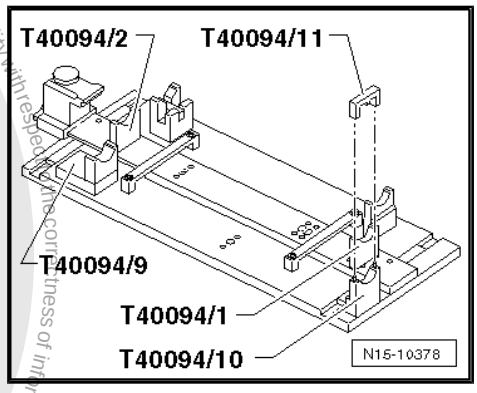
Note

If the supports of the camshaft fitting tool - T40094- are not marked at present, mark the removed supports, e.g. with number stamps, so they can be fitted in the original positions later.

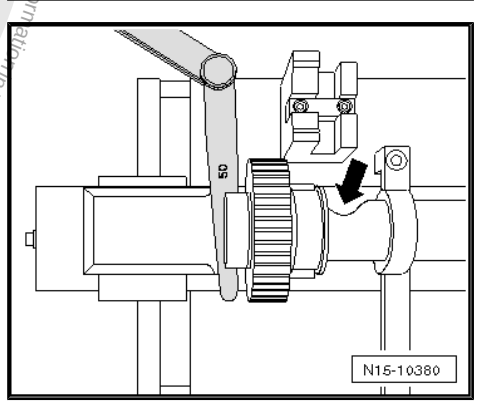
– Install supports -T40094/9- and -T40094/10- instead at vacant outer places.

Place support -T40094/2- at position labelled “A” and support -T40094/1- at position labelled “F”.

– First position inlet camshaft as illustrated. Ensure that indentation -arrow- for cylinder head bolt faces »outwards«.



Set 0.50 mm feeler gauge in place and push support -T40094/8- into groove on inlet camshaft.



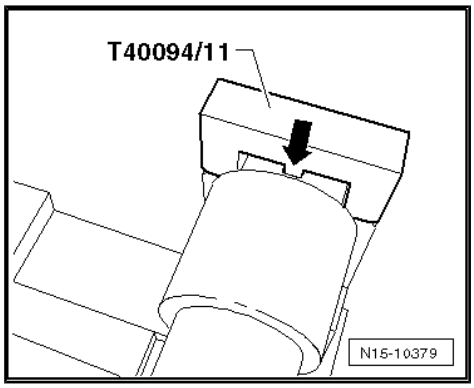
– Now set exhaust camshaft in place and lock by inserting -cover T40094/11- into groove -arrow-.

For exhaust camshafts with a two-piece gear wheel

– Fit clamping tool - T40096/1- onto exhaust camshaft gears.

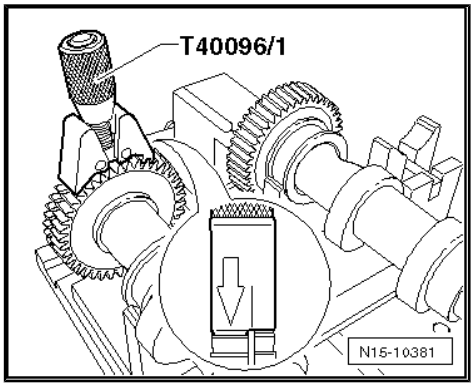
Caution

Ensure that the clamping jaw marked with an arrow is seated on the wider gear.



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– Tighten clamping tool - T40096/1- using knurled thumb wheel so that faces of gear teeth are in alignment. If necessary, use 13 mm open-end spanner.



Continuation for all

– Slide exhaust camshaft towards inlet camshaft until gear teeth engage.

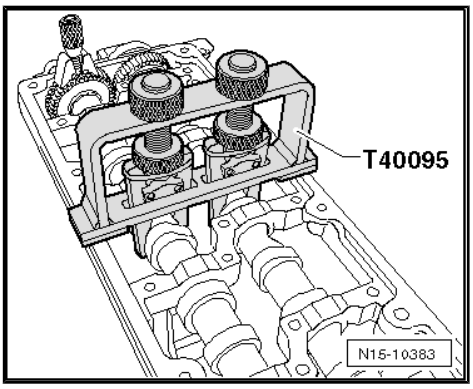
– Fit retaining frame onto camshafts.

• All camshaft bearings must be seated on the camshafts.

– Set clamping tool - T40095- in place as illustrated in order to hold camshafts in position in retaining frame.

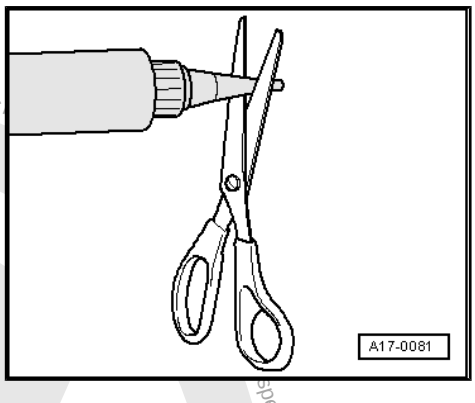
– Remove cover - T40094/11- .

– Pull support - T40094/8- out of inlet camshaft groove.



– Cut off nozzle on tube at front marking (∅ of nozzle approx. 2 mm).

– Apply beads of sealant (approx. 2…3 mm wide) -arrows- onto clean sealing surfaces of cylinder head as illustrated.



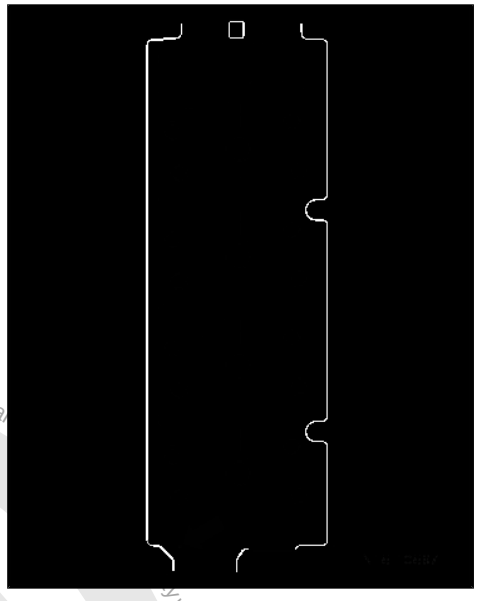
Caution

Risk of soiling camshaft bearings due to surplus sealant and risk of sealing oil supply bores.

- ***Do not apply sealant beads thicker than specified.***
- ***In area of oil supply bores -arrow- for retaining frame, make sure that these are not sealed due to surplus sealant.***

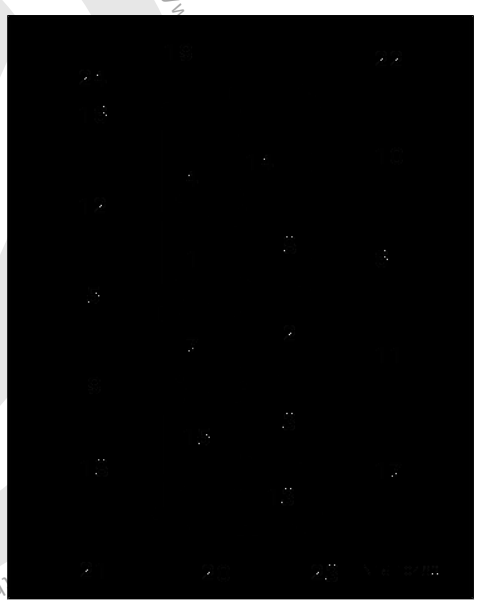
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Sealant bead for retaining frame



– Take camshafts out of camshaft fitting tool - T40095- together with retaining frame and clamping tool - T40094- .

– Carefully position camshafts and retaining frame in cylinder head.



– First tighten securing bolts of retaining frame hand-tight in sequence -1 … 24-.

• The retaining frame should make contact with the cylinder head over the complete surface.

– Tighten retaining frame bolts to final torque in the sequence -1 … 24-. Specified torque: 10 Nm

– Remove the clamping tool - T40095- and (for exhaust camshafts with a two-piece gear wheel) the camshaft fitting tool - T40096/1- .

– Renew camshaft oil seal ⇒ page 114 .

– Using a suitable drift, knock new sealing cap (core plug) ⇒ Item 15 (page 114) in cylinder head until flush.

Perform further installation in reverse order, paying attention to the following:

Caution

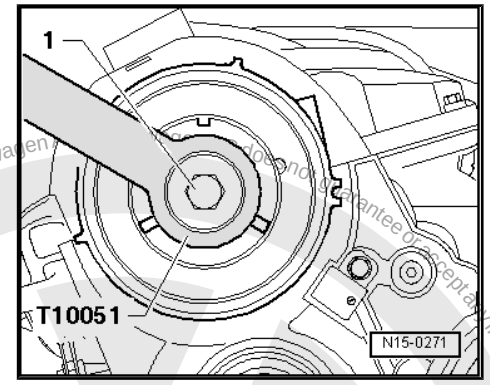
Avoid damage to valves and piston crowns after working on valve gear.

- ***Because hydraulic compensation elements have to settle, engine must not be started for approx. 30 minutes after installing camshafts.***
- ***Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.***

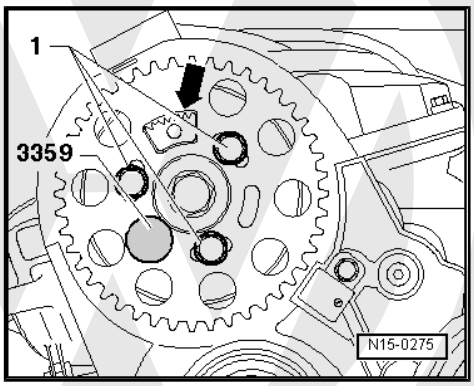
– Fit hub onto camshaft.

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– Tighten hub securing bolt -1- to 100 Nm. 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.

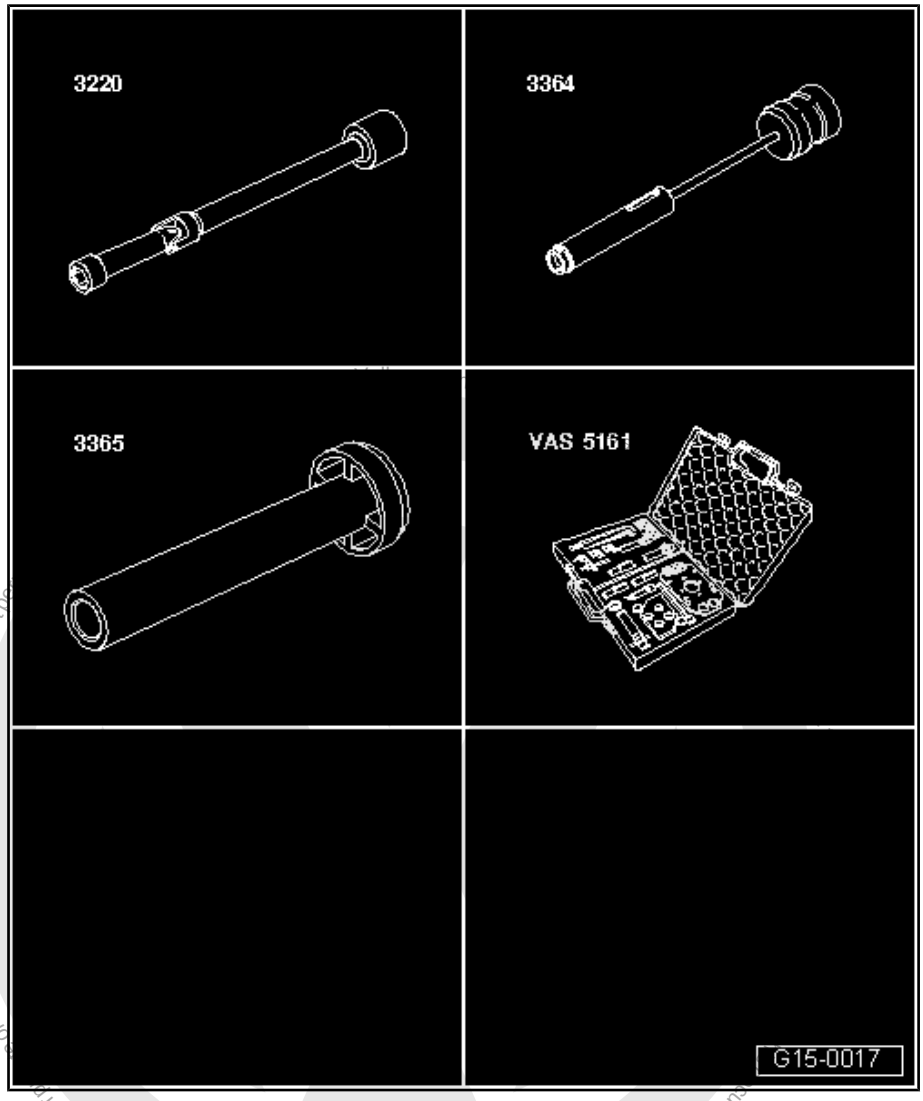
– Hand tighten securing bolts -1- to camshaft toothed belt pulley so that there is no play.
– Lock hub using locking pin - 3359- .
– Install toothed belt and adjust valve timing ⇒ page 106 .
– Install vacuum pump ⇒ page 101 .
– Install cylinder head cover ⇒ page 98 .
– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .
– Remove supplementary fuel pump - V393- or fuel pump 2 - V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

3.4 Removing and installing valve stem seals

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Special tools and workshop equipment required

- U/J extension and socket 10 mm - 3220-
- Valve stem seal puller - 3364-
- Valve stem seal fitting tool - 3365-
- Removal and installation device for valve cotters - VAS 5161- with guide plate - VAS 5161/23- and knurled spacer ring - VAS 5161/23-1-



Procedure

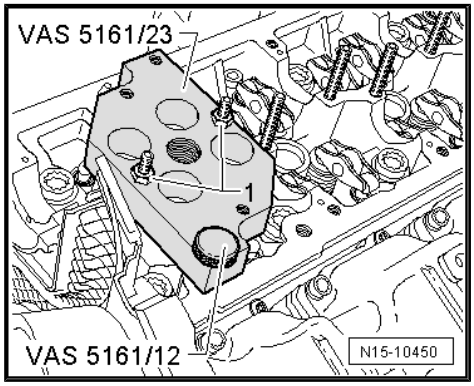
– Remove all glow plugs using U/J extension and socket - 3220- ⇒ page 360 .

– Remove camshafts ⇒ page 118 .

– Fit guide plate - VAS 5161/23- onto cylinder head.

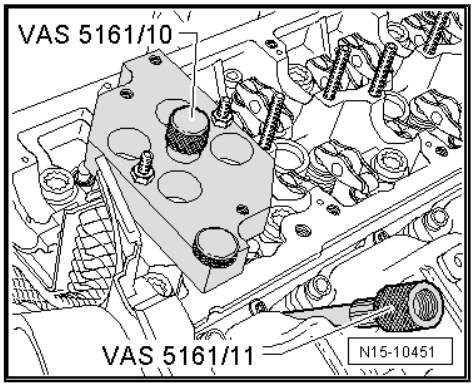
– Secure guide plate on intake manifold side with knurled screw - VAS 5161/12- and tighten it hand-tight to studs using M6 collarless nuts -1-.

– Screw sealing pin - VAS 5161/10- into guide plate.

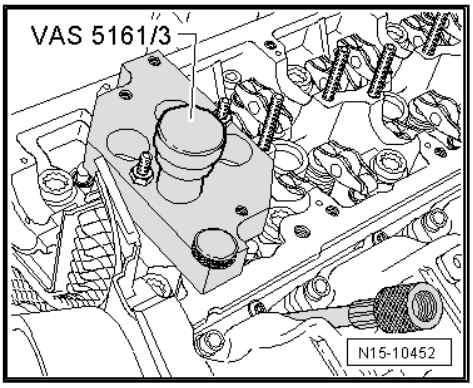


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– Screw adapter - VAS 5161/11- hand-tight into glow plug hole of relevant cylinder.



– Insert drift - VAS 5161/3- into guide plate and knock valve cotters loose using a plastic hammer.



– Screw engaging fork - VAS 5161/5- with snap-in device - VAS 5161/6- into guide plate .

– Slide knurled spacer ring - VAS 5161/23-1- onto assembly cartridge - VAS 5161/8- .

– Connect adapter - VAS 5161/11- to compressed air line using a commercially available connection piece, and apply constant air pressure.

• Minimum pressure: 6 bar.

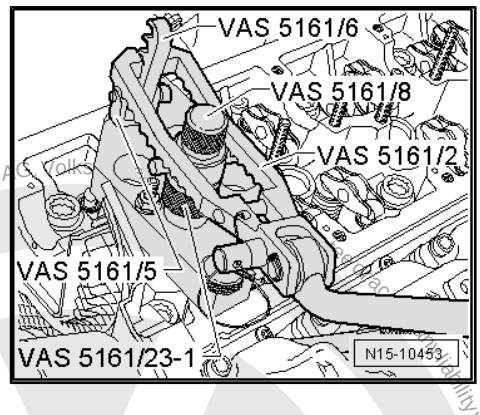
– Attach pressure fork - VAS 5161/2- to snap-in device and push assembly cartridge down.

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

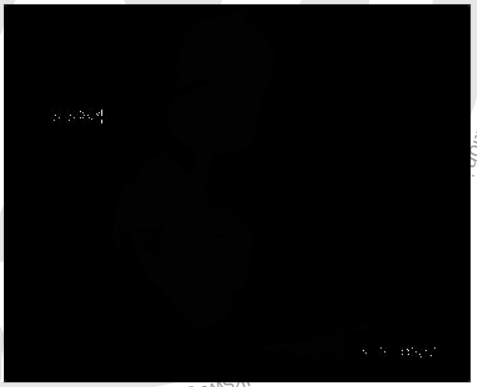
– Move knurled screw back and forth lightly to press apart valve cotters and capture them in the assembly piece.

– Release pressure fork.

– Take out assembly cartridge with knurled spacer ring, valve plate and valve spring.



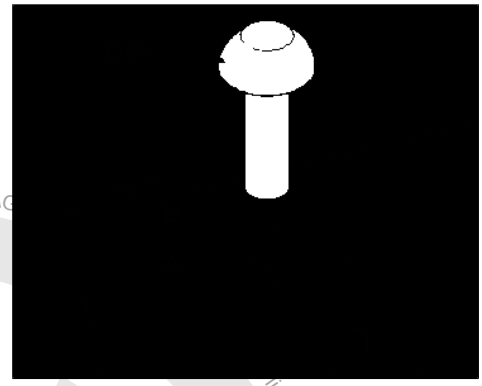
– Remove valve stem oil seals using valve stem seal puller - 3364- .



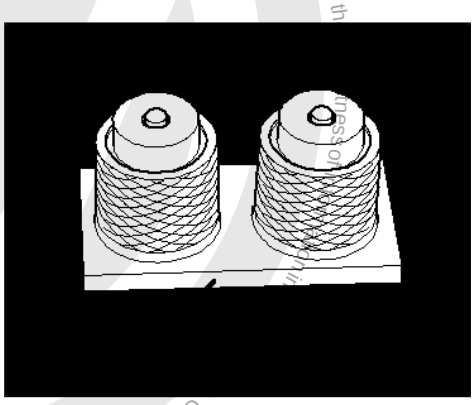
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Note

A plastic sleeve -A- is included with the new valve stem oil seals.



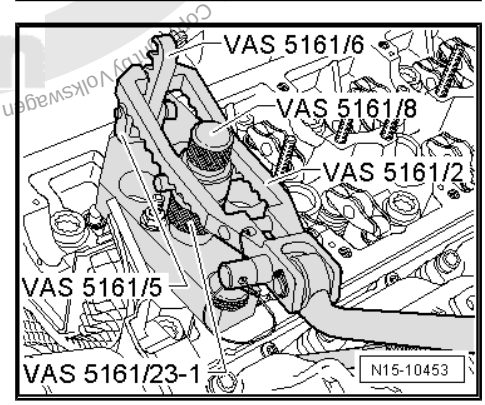
- Fit plastic sleeve -A- onto valve stem to prevent damage to new valve stem oil seal -B-.
- Lightly lubricate sealing lip of valve stem oil seal.
- Slip valve stem oil seal over plastic sleeve.
- Carefully press valve stem oil seal onto valve guide using valve stem seal fitting tool - 3365- .
- If necessary, use a plastic head hammer and tap lightly on fitting tool until valve stem oil seal is fitted to stop.
- Remove plastic sleeve.
- Insert valve spring and valve spring plate into cylinder head.
- If valve cotters have been removed from assembly cartridge , they need to be put into insertion device - VAS 5161/18- first.



Note

Larger diameter of valve cotters faces upwards.

- Press assembly cartridge onto insertion device from above and pick up valve cotters.
- Re-insert assembly cartridge - VAS 5161/8- into guide plate .
- Push pressure fork down, and pull knurled screw upwards while turning to left and right - this will insert the valve cotters.
- Release pressure fork with knurled screw still in pulled position.



Installation is carried out in the reverse order; note the following:

- Install glow plugs ⇒ page 360 .
- Install camshafts ⇒ page 118 .

Note

- *Engine is not to be rotated for approx. 30 minutes after installing camshafts. The hydraulic compensation elements must settle (otherwise valves will strike pistons).*
- *After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*

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4 Inlet and exhaust valves

⇒ “4.1 Valve dimensions”, page 129

⇒ “4.2 Reworking valve seats”, page 129

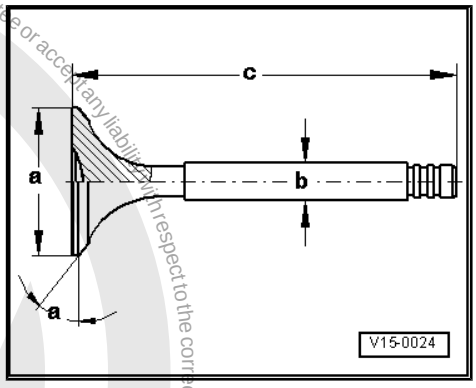
⇒ “4.3 Checking valve guides”, page 129

4.1 Valve dimensions

Note

Valves must not be reworked. Only lapping-in is permitted.

Dimension		Inlet valve	Outlet valve
∅ a	mm	26.60	26.00
∅ b	mm	5.940	5.940
c	mm	99.30	99.10
α	∠°	45	45



4.2 Reworking valve seats

Note

Valve seats must not be reworked due to the very small tolerances.

4.3 Checking valve guides

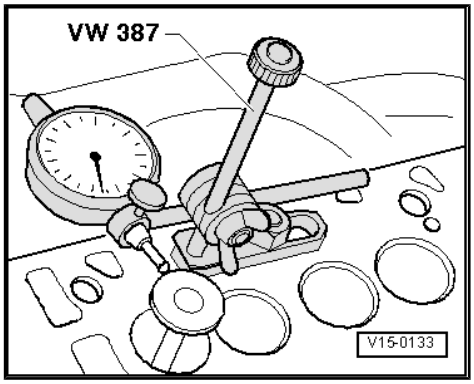
Special tools and workshop equipment required

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

– 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.



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17 – Lubrication

1 Sump, oil pump

⇒ “1.1 Assembly overview - sump/oil pump”, page 130

⇒ “1.2 Removing and installing oil sump”, page 136

⇒ “1.3 Removing and installing oil pump”, page 139

⇒ “1.4 Engine oil:”, page 140

1.1 Assembly overview - sump/oil pump

⇒ “1.1.1 Assembly overview - sump / oil pump, engine codes CBAA, CBAB, CBAC, CBBA, CBBB”, page 130

⇒ “1.1.2 Assembly overview - sump / oil pump, engine codes CBDA, CBDC, CBDB, CJAA”, page 133

1.1.1 Assembly overview - sump / oil pump, engine codes CBAA, CBAB, CBAC, CBBA, CBBB

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 avoid any subsequent damage, the following work must be carried out following the repair:

Thoroughly clean oil channels.

Renew oil cooler

Renew oil filter element

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1 - Oil pan

- ❑ Removing and installing ⇒ page 136

2 - 10 Nm

3 - Intake connecting pipe

- ❑ Clean strainer if soiled

4 - 10 Nm

5 - O-ring

- ❑ Renew

6 - Oil pump

- ❑ Removing and installing ⇒ page 139
- ❑ Before installing, check that the two dowel sleeves for centring oil pump on balancer shaft module are fitted.

7 - Drive shaft for oil pump

8 - Retaining ring

- ❑ Must lie in base of groove.
- ❑ Renew damaged or over-tensioned circlip.

9 - Spur gear for balancer shaft

10 - 20 Nm + turn 90° further

- ❑ Renew

11 - Hub

- ❑ For intermediate gear wheel.
- ❑ Renew

12 - 90 Nm + turn 90° further

- ❑ Renew

13 - Thrust washer

- ❑ For intermediate gear wheel.
- ❑ Renew
- ❑ Note installation position ⇒ page 153

14 - Intermediate gear

- ❑ Renew
- ❑ A coating is applied to the new intermediate gear wheel which sets the correct tooth backlash through wear.

Caution

When installing the intermediate gear wheel, ensure that the thrust washer is seated correctly ⇒ page 153 .

- ❑ Installation position: Part number must be visible.
- ❑ Installing ⇒ page 154

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15 - Thrust washer

- ❑ For intermediate gear wheel.
- ❑ Renew
- ❑ Note installation position ⇒ page 153
- ❑ If necessary, attach to housing with grease when installing intermediate gear wheel

16 - Spur gear for crankshaft

- ❑ Renew if signs of wear are found ⇒ page 161

17 - Balancer shaft module

- ❑ Removing ⇒ page 154
- ❑ Installing new balancer shaft module ⇒ page 155 .
- ❑ Reinstalling previously run balancer shaft module ⇒ page 159 .
- ❑ Before installing, check that the two dowel sleeves for centring balancer shaft module on cylinder block are fitted.

18 - M7 = 13 Nm + turn 90° further; M8: 20 Nm + turn 90° further

- ❑ Renew
- ❑ Note tightening sequence: installing new balancer shaft module ⇒ page 155 , reinstalling previously run balancer shaft module ⇒ page 159 .

19 - Oil extraction pipe

20 - 10 Nm

21 - 40 Nm

22 - 45 Nm

23 - 15 Nm

- ❑ Tighten in stages and in diagonal sequence.

24 - Sealing ring

- ❑ Permanently attached to drain plug

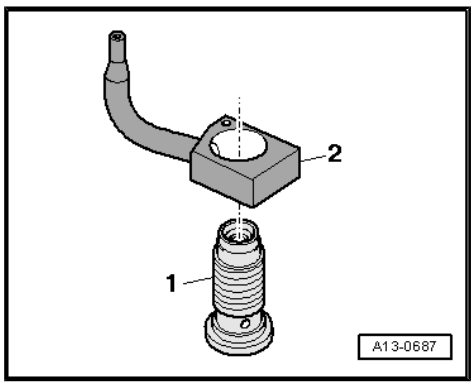
25 - Oil drain plug, 30 Nm

- ❑ With seal
- ❑ Renew

Oil spray jet and pressure relief valve

1 - Bolt with pressure relief valve, 27 Nm

2 - Oil spray jet (for cooling of pistons)



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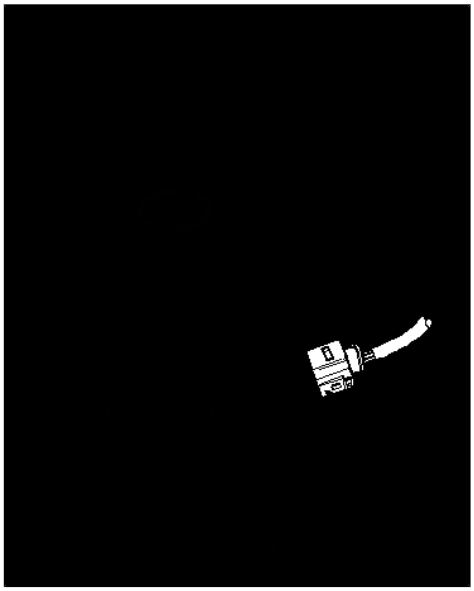
Removing and installing oil level and oil temperature sender - G266-

1 - Bolt, 10 Nm, self-locking, renew

2 - Seal; renew

3 - Electrical connector

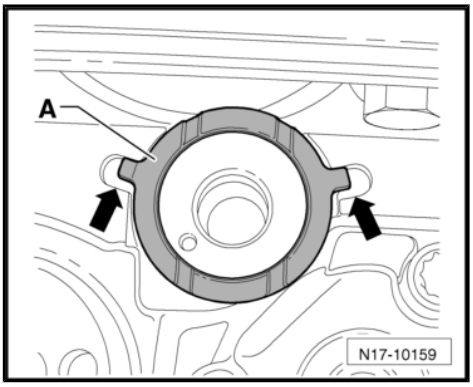
4 - Oil level and oil temperature sender - G266-



Thrust washer installation position

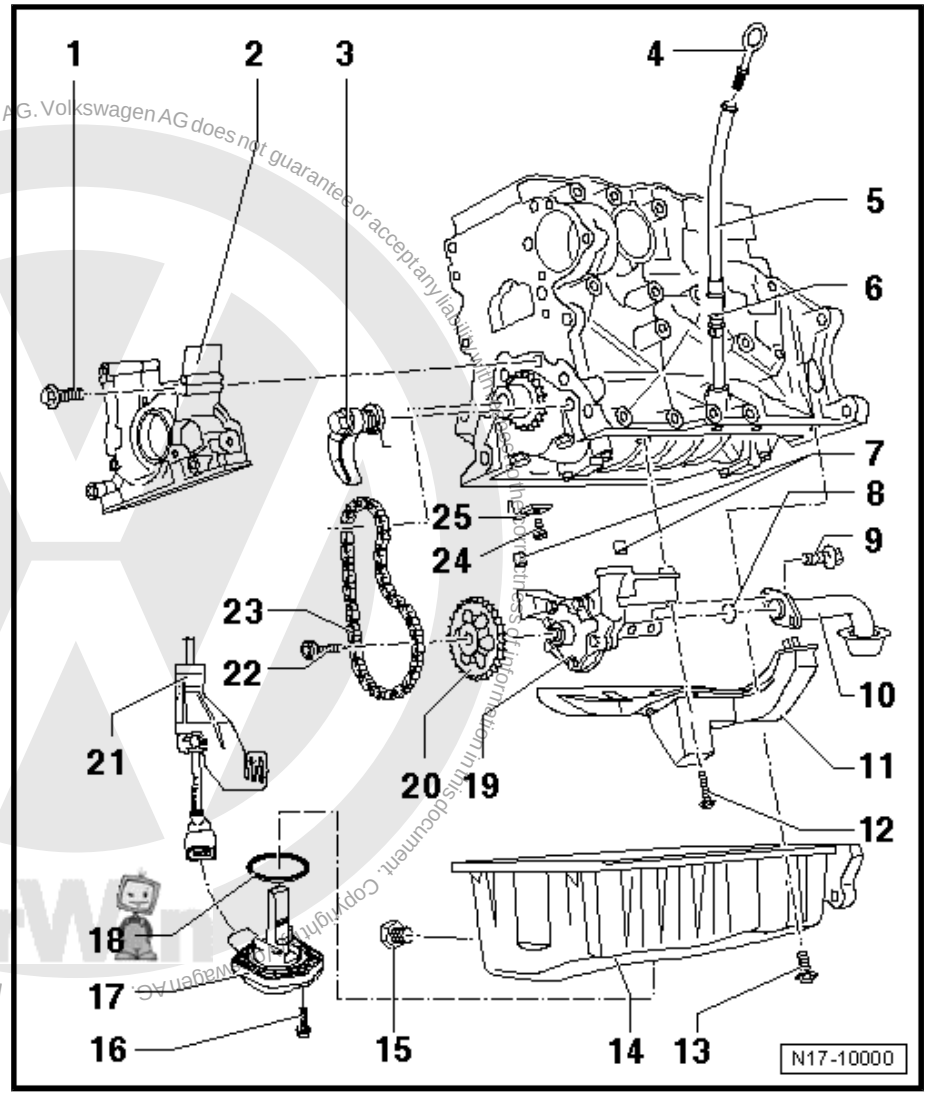
Caution

When installing intermediate gear wheel, ensure that thrust washer -A- does not slip out of indentations in balance shaft assembly -arrows- and becomes jammed. If necessary, fix in place with grease on balance shaft assembly.



1.1.2 Assembly overview - sump / oil pump, engine codes CBDA, CBDC, CBDB, CJAA

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1 - 15 Nm

2 - Sealing flange

- ❑ With seal
- ❑ Must seat on dowel sleeves.
- ❑ Removing and installing ⇒ page 62 .
- ❑ Install with silicone sealant - D 176 404 A2- .
- ❑ Do not additionally oil or grease the oil seal sealing lip.
- ❑ Before installing, remove oil residue from crankshaft journal using a clean cloth.

3 - Chain tensioner with tensioning rail, 15 Nm

- ❑ When installing, pretension spring and fit.

4 - Oil dipstick

- ❑ The oil level must not be above the max. mark!
- ❑ Markings ⇒ page 141 .

5 - Piston fitting tool

6 - Guide tube

7 - Dowel sleeves

8 - O-ring

- ❑ Renew

9 - 15 Nm

10 - Suction line

- ❑ Clean strainer if soiled

11 - Baffle plate

12 - 15 Nm

13 - 15 Nm

14 - Oil pan

- ❑ Removing and installing ⇒ page 136
- ❑ Clean sealing surface before fitting.
- ❑ Install with silicone sealant D 176 404 A2

15 - Oil drain plug, 30 Nm

- ❑ Renew

16 - 10 Nm

17 - Oil level and oil temperature sender - G266-

- ❑ Black 3-pin connector
- ❑ Check ⇒ Vehicle diagnostic tester

18 - Sealing ring

- ❑ Renew

19 - Oil pump

- ❑ With 12 bar pressure relief valve

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- ❑ 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 - Holder

- ❑ For oil level and oil temperature sender - G266- wiring harness.

22 - 20 Nm + turn 90° further

23 - Chain

24 - 25 Nm

- ❑ Insert without sealant.

25 - Oil spray jet

- ❑ For piston cooling

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1.2 Removing and installing oil sump

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 avoid any subsequent damage, the following work must be carried out following the repair:

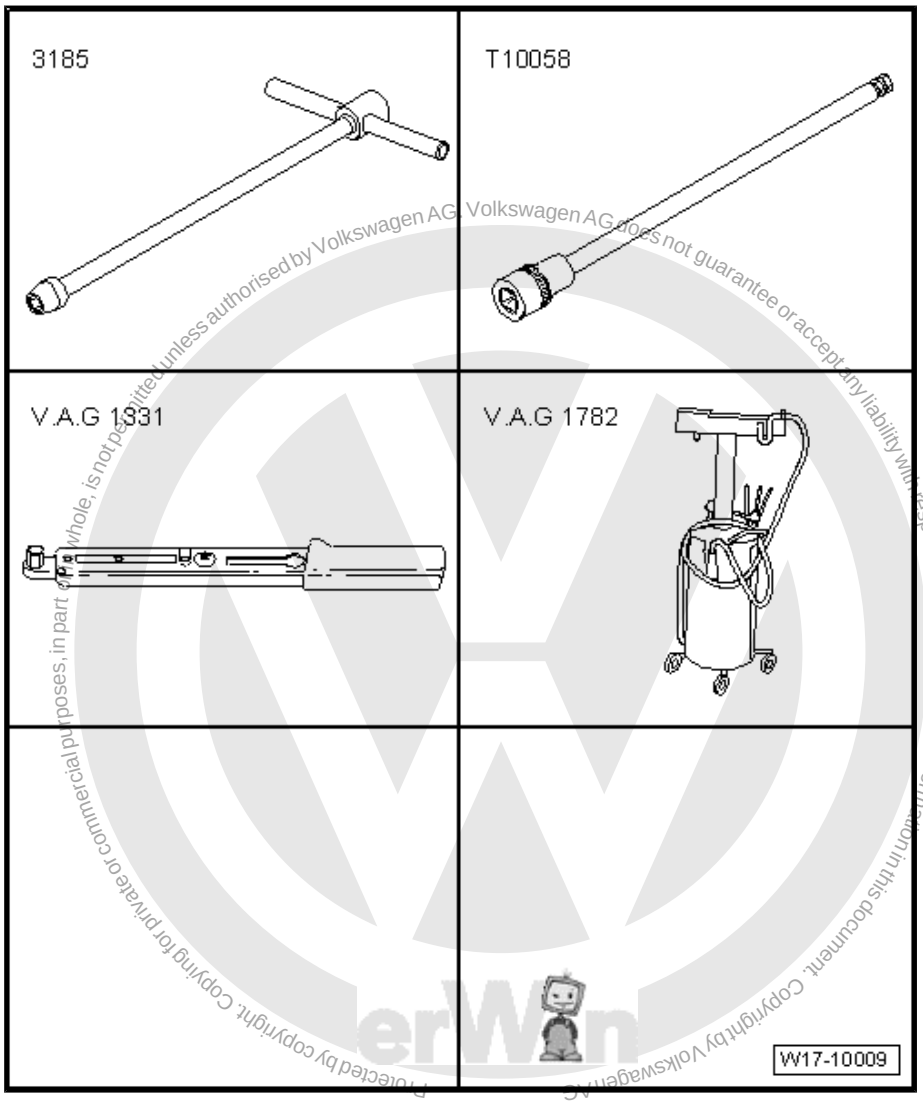
Thoroughly clean oil channels.

Renew oil cooler

Renew oil filter element

Special tools and workshop equipment required

- U/J extension and socket 10 mm - VAS 3185-
- Multi-point bit - T10058-
- Torque wrench (5 … 50 Nm) - V.A.G 1331-
- Used oil collector and extractor - V.A.G 1782-



- Silicone sealant - D176404A2-
- Hand drill with plastic brush
- Safety glasses
- Scraper

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Removing

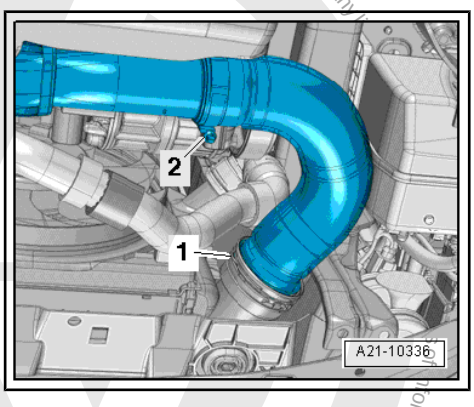
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

– Place used oil collection and extraction unit - V.A.G 1782- under engine and drain engine oil.

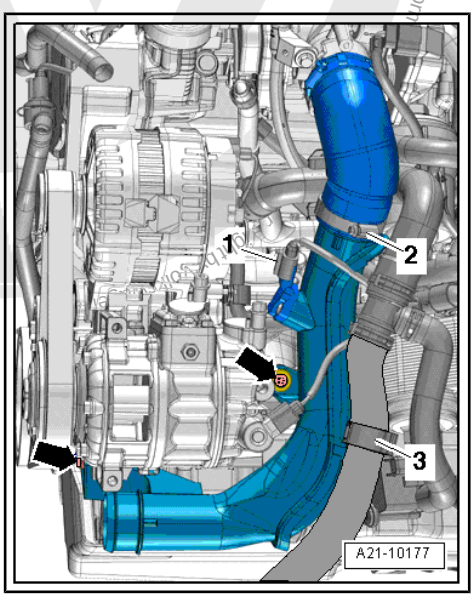
Note

Observe disposal instructions!

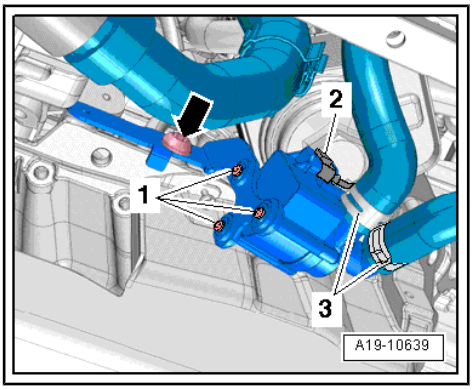
– Loosen clamp -2-, raise retaining clip -1- and remove connecting hose on »cold side« ⇒ Item 4 (page 214) .



– Remove securing bolts -arrows- of charge air pipe and press pipe aside.

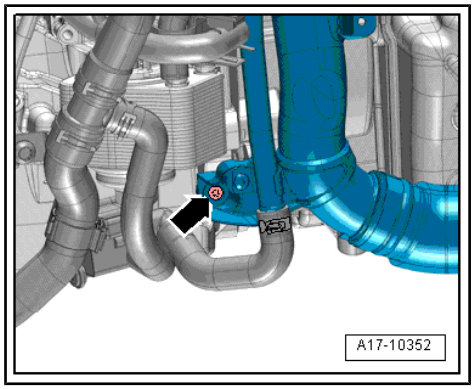


– Remove securing bolt -arrow- and push coolant circulation pump 2 - V178- aside.



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– Remove securing bolt -arrow- of charge air pipe on »hot side«.
– Pull connector off oil level and oil temperature sender - G266- .
– Remove connecting bolts for sump to gearbox.
– Remove oil sump securing bolts in diagonal sequence.
– Loosen sump with light blows of a rubber headed hammer if necessary.
– Remove sealant residue from cylinder block using a flat scraper.



WARNING

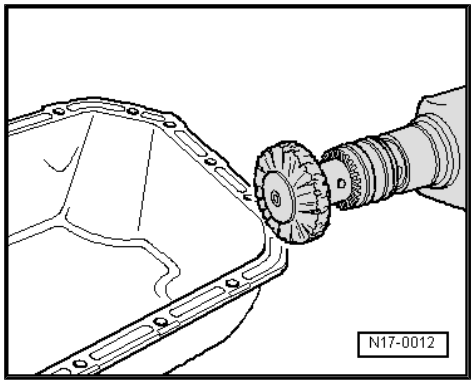
Wear safety goggles.

– Remove sealant residue on sump with a rotating brush, e.g. a hand drill with a plastic brush.
– Clean sealing surfaces. They must be free of oil and grease.

Installing

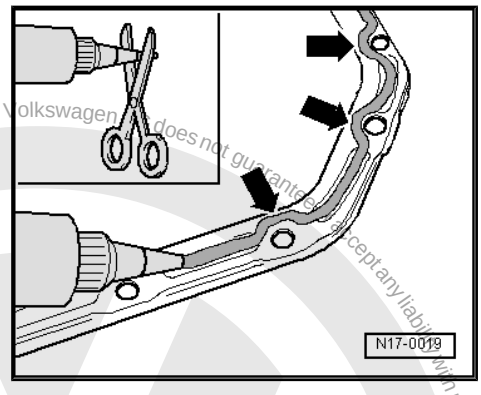
Note

- *Check the expiry date of the sealant.*
- *The sump must be installed within 5 minutes of applying silicone sealing compound.*



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

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



Caution

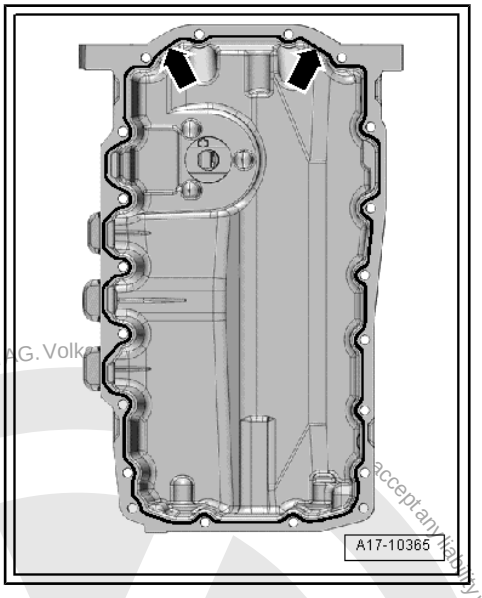
Danger of blocking lubrication system with excess sealant.

- ***Do not apply sealant bead thicker than specified.***

– Apply bead of sealant onto clean sealing surface of sump as illustrated.

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- Thickness of sealant bead: 2…3 mm.



Note

- *Take particular care when applying sealant bead in area of rear sealing flange -arrows-.*
- *Oil sump must be installed within 5 minutes after applying sealant.*

– Install sump immediately and tighten connecting bolts for sump to gearbox and all sump bolts lightly. Ensure that sump is flush against intermediate plate and gearbox flange.

Note

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

– Tighten sump bolts in diagonal sequence to 15 Nm.
– Tighten bolts securing sump to gearbox to 40 Nm.

Note

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

Further assembly is basically a reverse of the dismantling sequence.

1.3 Removing and installing oil pump

⇒ "1.3.1 Removing and installing oil pump, engine codes CBAA, CBAB, CBAC, CBBA, CBBB", page 139

1.3.1 Removing and installing oil pump, engine codes CBAA, CBAB, CBAC, CBBA, CBBB

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 avoid any subsequent damage, the following work must be carried out following the repair:

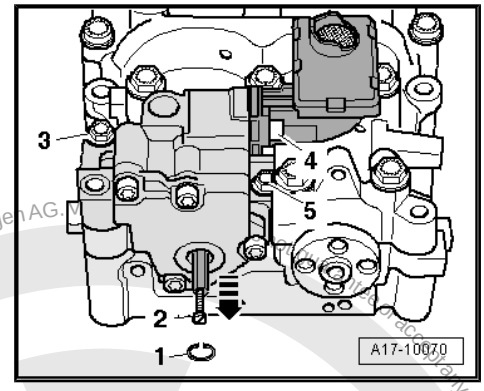
Thoroughly clean oil channels.

Renew oil cooler

Renew oil filter element

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Removing



– Remove sump ⇒ page 136 .
– Remove circlip -1- using circlip pliers.
– Screw in a M3 bolt -2- and pull drive shaft out of oil pump -arrow-.
– Unscrew bolt -4- and pull intake connecting pipe off oil pump.
– Remove bolts -3- and -5-, and remove oil pump.

Caution

Bolt on intermediate gear wheel must not be loosened.

Installing

Install in reverse order of removal, observing the following.

Note

- *Renew O-ring.*
- *Renew damaged or over-tensioned circlip.*
- *The retaining ring must seat in the base of the groove.*

– Ensure both dowel sleeves are in place before installing oil pump.
– Install sump ⇒ page 136 .

1.4 Engine oil:

⇒ "1.4.1 Oil capacities, engine codes CBAA, CBAB, CBAC, CBBA, CBBB", page 140

⇒ "1.4.2 Oil capacities, engine codes CBDA, CBDB, CBDC, CJAA", page 141

⇒ "1.4.3 Checking engine oil level", page 141

1.4.1 Oil capacities, engine codes CBAA, CBAB, CBAC, CBBA, CBBB

Note

The oil level must remain below the max. mark - danger of damage to catalytic converter! Markings ⇒ page 141 .

Engine oil specifications ⇒ Maintenance ; Booklet ; Service tables .

With oil filter change: 4.0 l

Without oil filter change: 3.7 l

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1.4.2 Oil capacities, engine codes CBDA, CBDB, CBDC, CJAA

Note

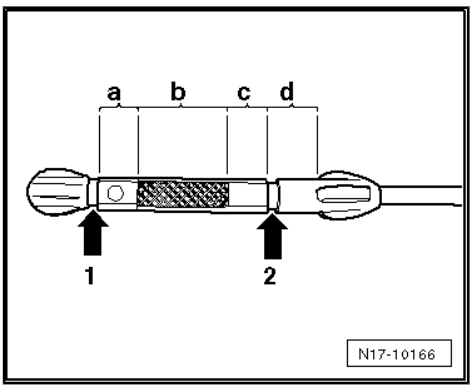
The oil level must remain below the max. mark - danger of damage to catalytic converter! Markings ⇒ page 141 .

Engine oil specifications ⇒ Maintenance ; Booklet ; Service tables .

With oil filter change: 4.3 l

Without oil filter change: 4.0 l

1.4.3 Checking engine oil level



Note

- *The oil level may be in area -d- due to the infiltration of fuel in the engine oil as a result of unfavourable driving conditions after filling. This is a perfectly normal and self-regulating characteristic. It is not necessary to adjust the engine oil level.*
- *The oil level must remain below the max. mark - danger of damage to catalytic converter! Markings ⇒ page 141 .*

1 - Min. mark

2 - Max. mark

a - Oil level in min. mark area: replenish engine oil!

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

c - Oil level in max. mark area: Do not replenish engine oil!

d - The oil level may be in this area as a result of particular driving conditions.

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2 Engine oil cooler

⇒ “2.1 Assembly overview - engine oil cooler”, page 142

2.1 Assembly overview - engine oil cooler

1 - Seal

- ❑ Renew

2 - 15 Nm + turn 90° further

- ❑ Renew
- ❑ First fit upper left and lower right bolts and then tighten all 4 bolts in diagonal sequence.

3 - Oil filter bracket

- ❑ Ensure clearance to adjacent components

4 - Sealing ring

- ❑ Renew

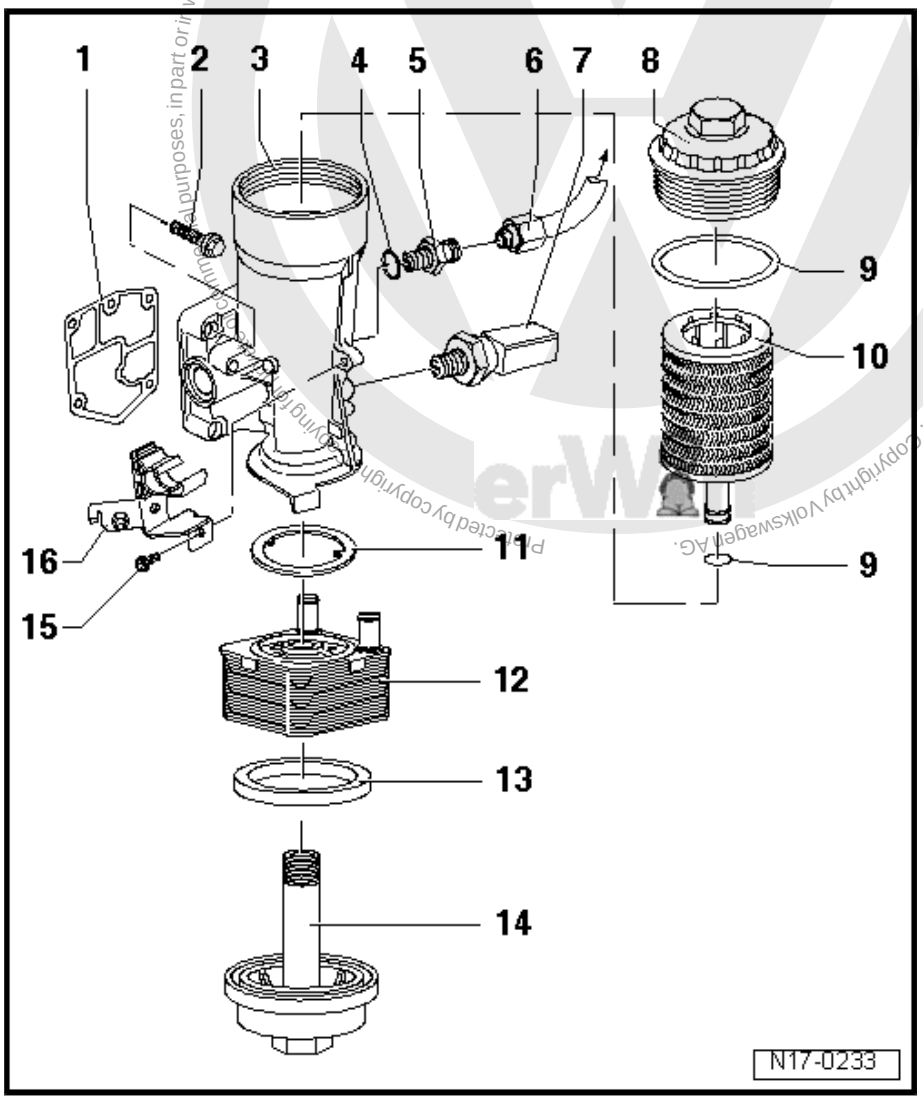
5 - Connecting piece, 30 Nm

6 - Oil supply line, 22 Nm

- ❑ Removing and installing ⇒ page 150
- ❑ To turbocharger.

7 - Oil pressure switch - F1- , 22 Nm

- ❑ Identification: brown.
- ❑ 0.7 bar
- ❑ If seal is leaking, nip



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open and renew.

- ❑ Checking ⇒ page 148

8 - Cap, 25 Nm

9 - O-ring

- ❑ Renew

10 - Oil filter element

- ❑ Observe change intervals.

11 - Sealing ring

- ❑ Renew
- ❑ Lubricate before assembling.
- ❑ Fit into lugs on oil cooler.

12 - Oil cooler

- ❑ Ensure clearance to adjacent components
- ❑ See note.
- ❑ Checking oil cooler for leaks ⇒ page 171
- ❑ Connection diagram for coolant hoses ⇒ page 166

13 - Sealing ring

- ❑ Renew

14 - Plug, 25 Nm

15 - 10 Nm

16 - Holder

- ❑ For wiring harness

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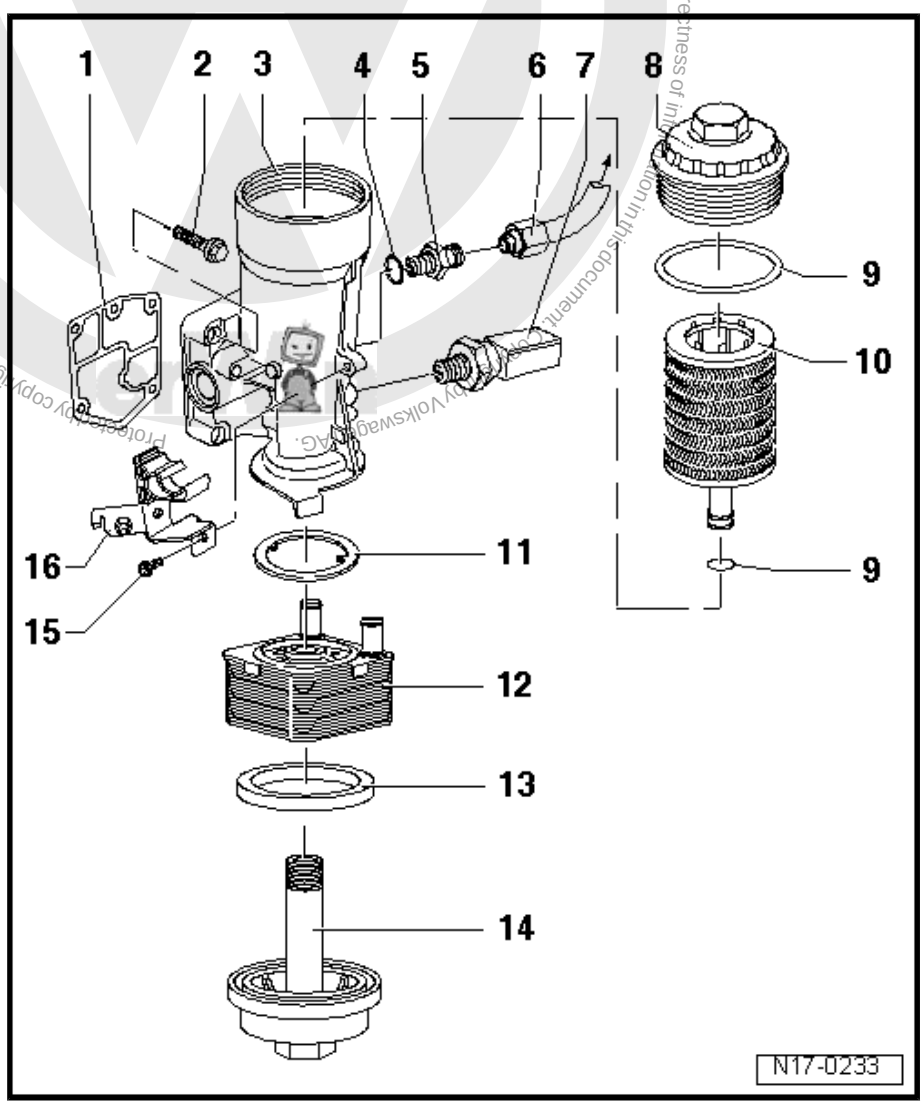
3 Oil filter, oil pressure switch

⇒ “3.1 Assembly overview - oil filter/oil pressure switch”, page 144

⇒ “3.2 Removing and installing oil filter housing”, page 145

⇒ “3.3 Checking oil pressure and oil pressure switch”, page 148

3.1 Assembly overview - oil filter/oil pressure switch



1 - Seal

- ❑ Renew

2 - 15 Nm + turn 90° further

- ❑ Renew
- ❑ First fit upper left and lower right bolts and then tighten all 4 bolts in diagonal sequence.

3 - Oil filter bracket

- ❑ Ensure clearance to adjacent components

4 - Sealing ring

- ❑ Renew

5 - Connecting piece, 30 Nm

6 - Oil supply line, 22 Nm

- ❑ Removing and installing ⇒ page 150
- ❑ To turbocharger.

7 - Oil pressure switch - F1- , 22 Nm

- ❑ Identification: brown.
- ❑ 0.7 bar
- ❑ If seal is leaking, nip

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open and renew.

- ❑ Checking ⇒ page 148

8 - Cap, 25 Nm

9 - O-ring

- ❑ Renew

10 - Oil filter element

- ❑ Observe change intervals.

11 - Sealing ring

- ❑ Renew
- ❑ Lubricate before assembling.
- ❑ Fit into lugs on oil cooler.

12 - Oil cooler

- ❑ Ensure clearance to adjacent components
- ❑ See note.
- ❑ Checking oil cooler for leaks ⇒ page 171
- ❑ Connection diagram for coolant hoses ⇒ page 166

13 - Sealing ring

- ❑ Renew

14 - Plug, 25 Nm

15 - 10 Nm

16 - Holder

- ❑ For wiring harness

3.2 Removing and installing oil filter housing

Special tools and workshop equipment required

- ♦ Assembly tool - T10118-
- ♦ Oil drip tray

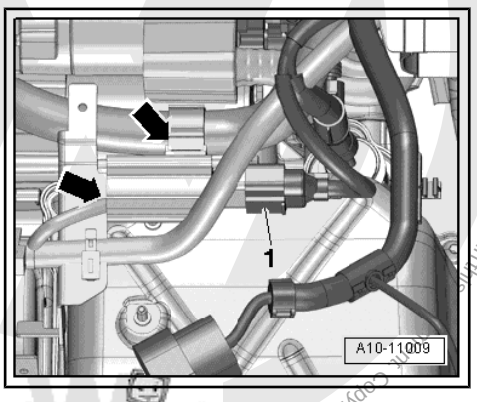
Removing

– Remove air filter housing ⇒ page 241.

– Drain coolant ⇒ page 173 .

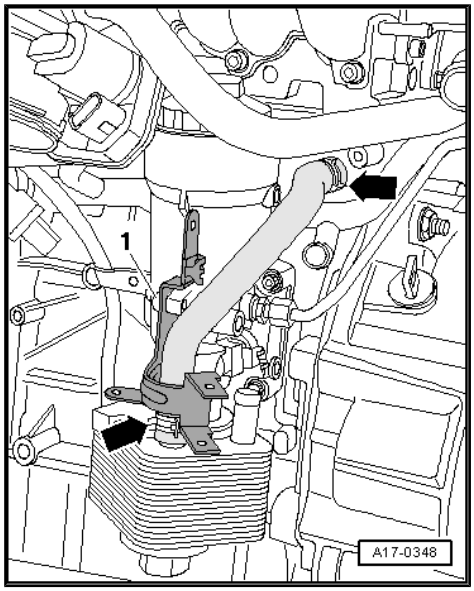
– Remove radiator cowl ⇒ page 194 .

– Free wiring harnesses -arrows- and connector -1- at charge air pipe on »hot side«.

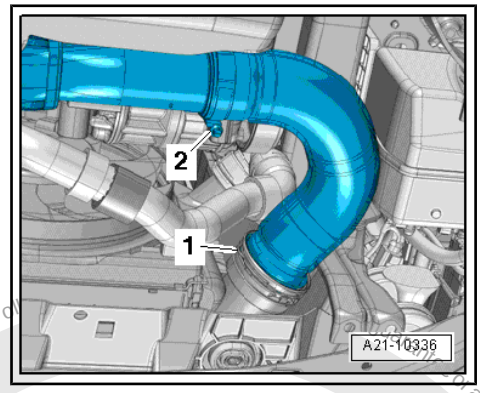


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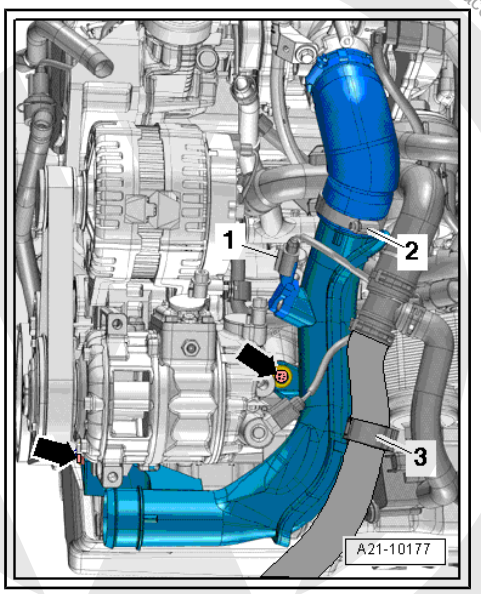
– Unscrew securing bolt -1- and remove bracket.
– Pull coolant hoses off oil cooler.



– Loosen clamp -2-, raise retaining clip -1- and remove connecting hose from charge air cooler on »cold side«.
– Remove securing bolts -arrows- from charge air pipe and separate connector -1- from charge air pressure sender - G31- .

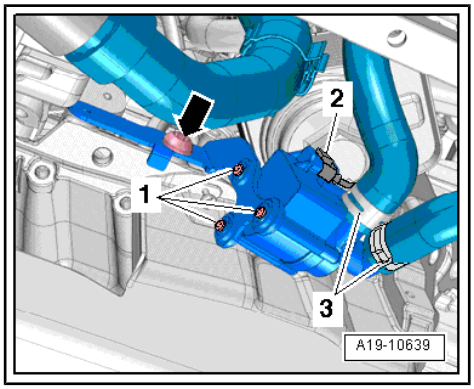


– Open clamp -2-, lay coolant hose -3- to side and remove charge air pipe.

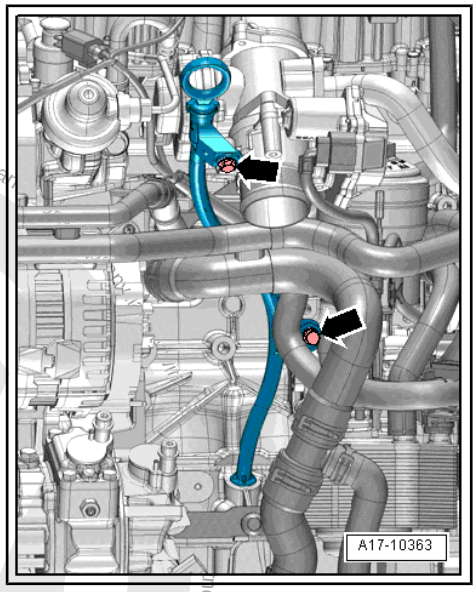


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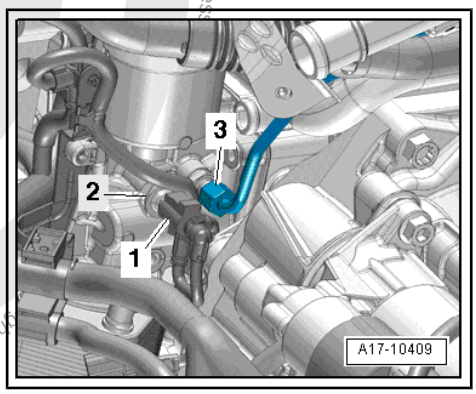
– Remove securing bolt -arrow- and push coolant circulation pump 2 - V178- aside.
– Remove connecting hose ⇒ Item 13 (page 214) .



– Remove securing bolts -arrows- of oil dipstick guide tube.
– Pull guide tube upwards out of crankcase and press it slightly aside.

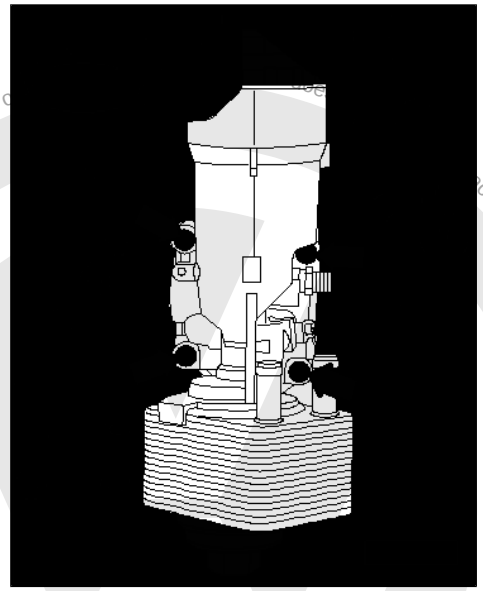


– Separate connector -1- from oil pressure switch - F1- using assembly tool - T10118- and unscrew oil pressure switch.
– Remove oil supply line -3- from oil filter bracket. If necessary, counterhold with a suitable open-end spanner.
– Place oil drip tray below engine.



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– Unscrew securing bolts -arrows- and remove oil filter bracket.



Installing

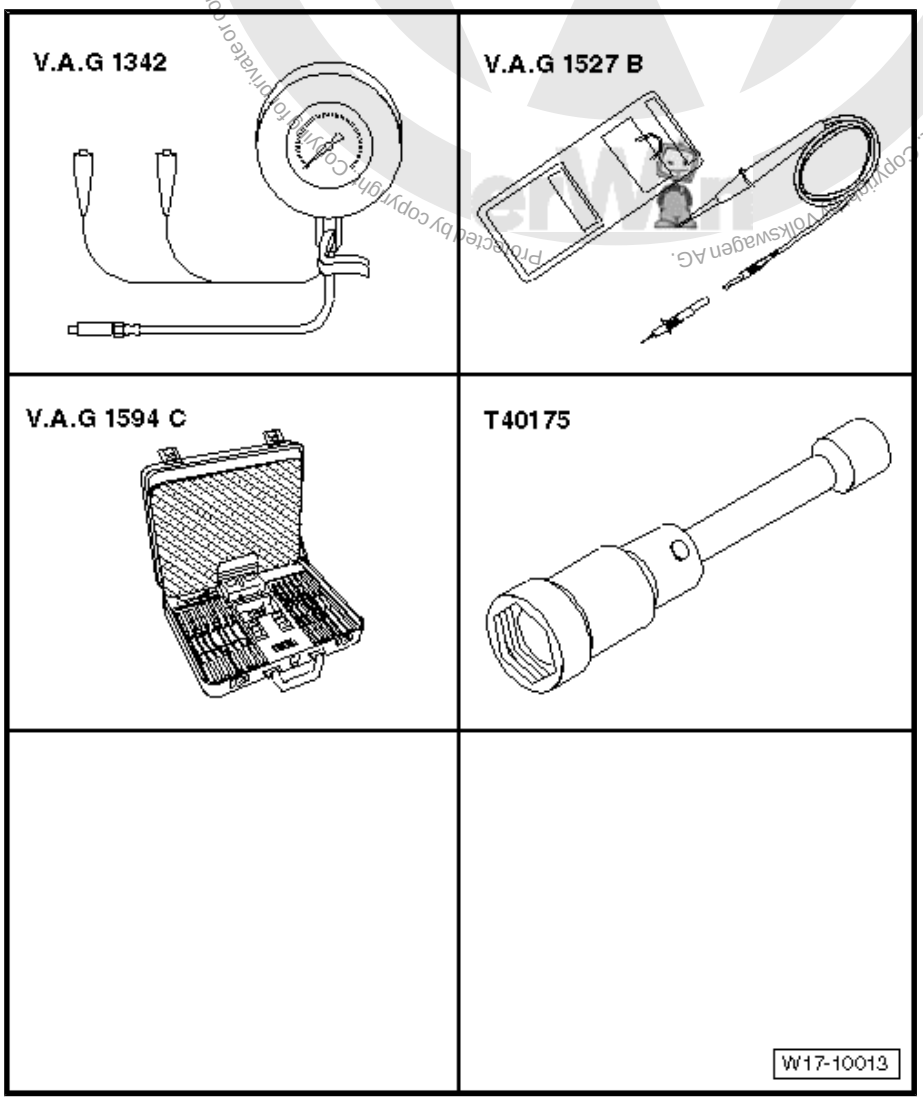
Install in reverse order of removal, observing the following.

- Renew gaskets, seals and O-rings.
- Specified torques for oil filter bracket ⇒ page 142
- Specified torques for charged air routing ⇒ page 213
- Filling with coolant ⇒ page 173

3.3 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/C-
- Articulated wrench 24 mm - T40175-



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3.3.1 Checking oil pressure switch

Test conditions

- Oil level OK, checking ⇒ page 141
- Engine oil temperature at least 80°C (radiator fan must have run once)

Note

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

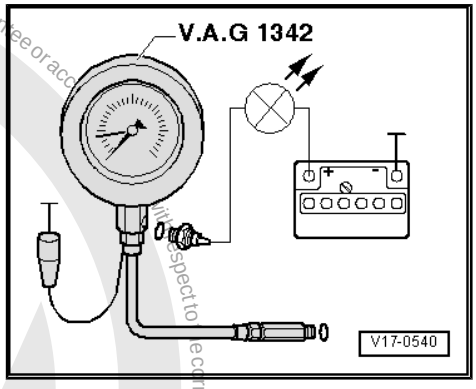
– Remove oil pressure switch - F1- -brown insulation- using articulated wrench 24 mm - T40175- and screw into tester.

– Screw tester into oil filter bracket in place of oil pressure switch.

– Connect brown wire of tester to earth (-).

– Connect voltage tester - V.A.G 1527B- to battery positive (+) and oil pressure switch using auxiliary cables from - V.A.G 1594 A- . LED must not light up.

– Start engine and increase speed slowly. At 0.55 to 0.85 bar the LED must light up; otherwise renew oil pressure switch.



3.3.2 Checking oil pressure

– Increase engine speed further. Oil pressure must be at least 2.0 bar at 2,000 rpm and 80°C oil temperature.

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

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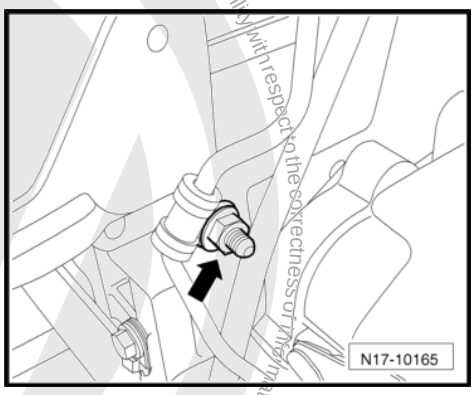
4 Oil circuit

⇒ "4.1 Removing and installing oil supply line for turbocharger", page 150

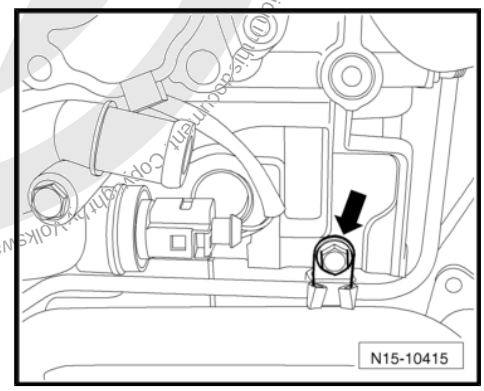
4.1 Removing and installing oil supply line for turbocharger

Removing

- Remove air filter housing ⇒ page 241 .
- Remove charge air pipe ⇒ Item 15 (page 214) .
- Remove connecting pipe to exhaust gas recirculation cooler ⇒ Item 2 (page 345) .
- Unscrew securing nut -arrow- of vacuum line at rear side of cylinder head.
- Loosen union nuts on oil filter bracket and turbocharger.



- Loosen securing bolt -arrow- for retaining clip.
- Remove oil supply line.



Installing

Note

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

- Start union nuts for oil supply line on connections.
- Tighten union nut on oil filter bracket hand-tight.
- Now tighten union nut on turbocharger hand-tight.
- First tighten union nut on oil filter bracket and then union nut on turbocharger to 22 Nm.
- Position retaining clip and tighten securing bolt to 10 Nm.
- Install connecting pipe to exhaust gas recirculation cooler ⇒ Item 2 (page 345) .
- Install charge air pipe ⇒ Item 15 (page 214) .
- Install air filter housing ⇒ page 241 .

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5 Balancer shaft module

⇒ "5.1 Assembly overview - balancer shaft module", page 151

⇒ "5.2 Removing and installing balance shaft module", page 154

5.1 Assembly overview - balancer shaft module

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 avoid any subsequent damage, the following work must be carried out following the repair:

Thoroughly clean oil channels.

Renew oil cooler

Renew oil filter element



1 - Oil pan

- ❑ Removing and installing ⇒ page 136

2 - 10 Nm

3 - Intake connecting pipe

- ❑ Clean strainer if soiled

4 - 10 Nm

5 - O-ring

- ❑ Renew

6 - Oil pump

- ❑ Removing and installing ⇒ page 139
- ❑ Before installing, check that the two dowel sleeves for centring oil pump on balancer shaft module are fitted.

7 - Drive shaft for oil pump

8 - Retaining ring

- ❑ Must lie in base of groove.
- ❑ Renew damaged or over-tensioned circlip.

9 - Spur gear for balancer shaft

10 - 20 Nm + turn 90° further

- ❑ Renew

11 - Hub

- ❑ For intermediate gear wheel.
- ❑ Renew

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12 - 90 Nm + turn 90° further

- ❑ Renew

13 - Thrust washer

- ❑ For intermediate gear wheel.
- ❑ Renew
- ❑ Note installation position ⇒ page 153

14 - Intermediate gear

- ❑ Renew
- ❑ A coating is applied to the new intermediate gear wheel which sets the correct tooth backlash through wear.

> **Caution**
>
> *When installing the intermediate gear wheel, ensure that the thrust washer is seated correctly ⇒ page 153 .*

- ❑ Installation position: Part number must be visible.
- ❑ Installing ⇒ page 154

15 - Thrust washer

- ❑ For intermediate gear wheel.
- ❑ Renew
- ❑ Note installation position ⇒ page 153
- ❑ If necessary, attach to housing with grease when installing intermediate gear wheel

16 - Spur gear for crankshaft

- ❑ Renew if signs of wear are found ⇒ page 161

17 - Balancer shaft module

- ❑ Removing ⇒ page 154
- ❑ Installing new balancer shaft module ⇒ page 155 .
- ❑ Reinstalling previously run balancer shaft module ⇒ page 159 .
- ❑ Before installing, check that the two dowel sleeves for centring balancer shaft module on cylinder block are fitted.

18 - M7 = 13 Nm + turn 90° further; M8: 20 Nm + turn 90° further

- ❑ Renew
- ❑ Note tightening sequence: installing new balancer shaft module ⇒ page 155 , reinstalling previously run balancer shaft module ⇒ page 159 .

19 - Oil extraction pipe

20 - 10 Nm

21 - 40 Nm

22 - 45 Nm

23 - 15 Nm

- ❑ Tighten in stages and in diagonal sequence.

24 - Sealing ring

- ❑ Permanently attached to drain plug

25 - Oil drain plug, 30 Nm

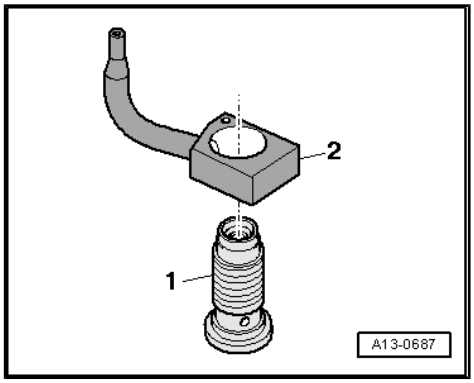
- ❑ With seal
- ❑ Renew

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Oil spray jet and pressure relief valve

1 - Bolt with pressure relief valve, 27 Nm

2 - Oil spray jet (for cooling of pistons)



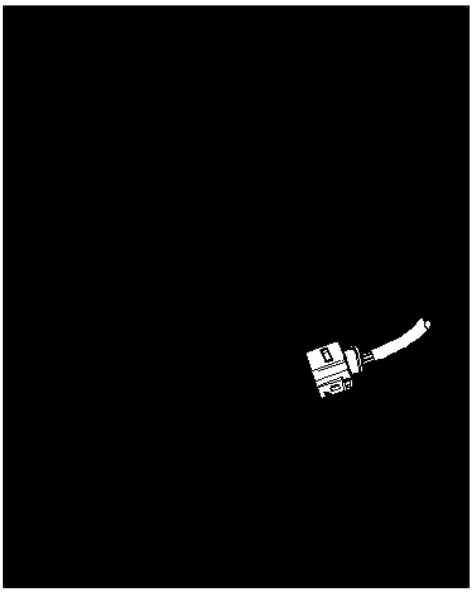
Removing and installing oil level and oil temperature sender - G266-

1 - Bolt, 10 Nm, self-locking, renew

2 - Seal; renew

3 - Electrical connector

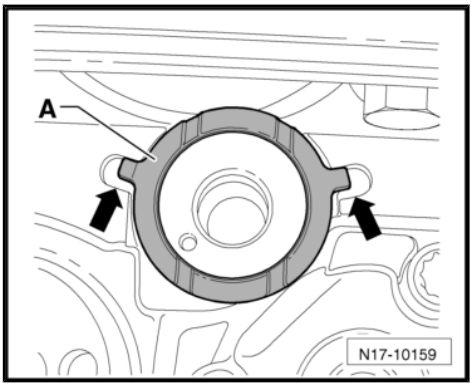
4 - Oil level and oil temperature sender - G266-



Thrust washer installation position

Caution

When installing intermediate gear wheel, ensure that thrust washer -A- does not slip out of indentations in balance shaft assembly -arrows- and becomes jammed. If necessary, fix in place with grease on balance shaft assembly.



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5.2 Removing and installing balance shaft module

⇒ “5.2.1 Removing balancer shaft module”, page 154

⇒ “5.2.2 Installing a new balancer shaft module”, page 155

⇒ “5.2.3 Installing a previously used balancer shaft module again”, page 159

⇒ “5.2.4 Renewing spur gear for crankshaft, engine codes CBAA, CBAB, CBAC, CBBA, CBBB”, page 161

5.2.1 Removing balancer shaft module

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 avoid any subsequent damage, the following work must be carried out following the repair:

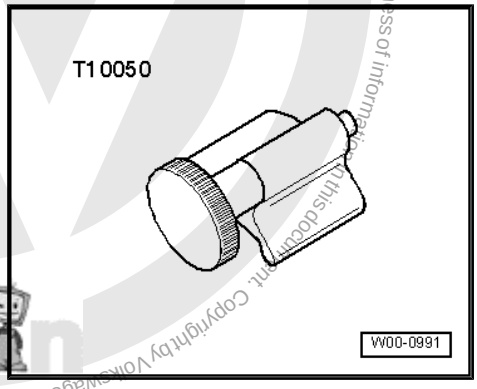
Thoroughly clean oil channels.

Renew oil cooler

Renew oil filter element

Special tools and workshop equipment required

- Crankshaft stop - T10050- for engines with round crankshaft pulley



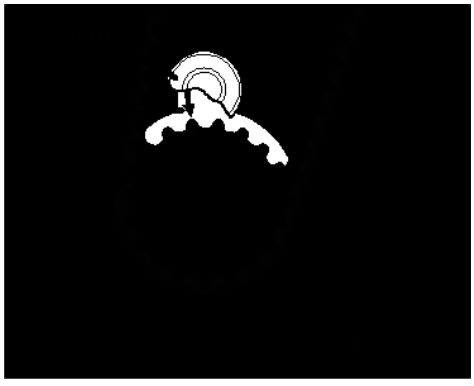
Procedure

– Remove sump ⇒ page 136 .

– Remove poly V-belt ⇒ page 40 .

– Remove vibration damper.

– Rotate crankshaft to TDC and lock in position with crankshaft stop - T10050- .



Note

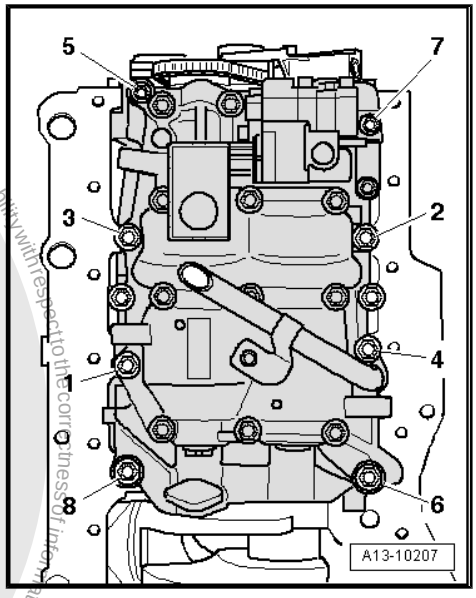
The markings on the crankshaft pulley -2- and the crankshaft stop - T10050- -1- must align. At the same time, the pin of the crankshaft stop - T10050- must engage in the drilling in the sealing flange.

– Unscrew bolts in sequence -8 … 1- respectively -6 … 1-, and remove balancer shaft module with oil pump.

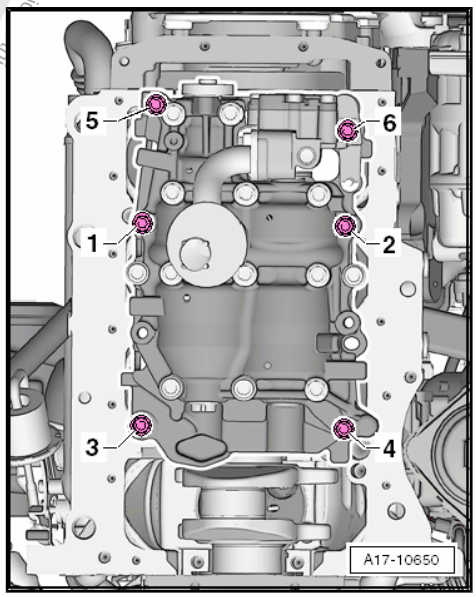
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Balancer shaft module with 8 threaded connection points



Balancer shaft module with 6 threaded connection points



5.2.2 Installing a new balancer shaft module

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 avoid any subsequent damage, the following work must be carried out following the repair:

Thoroughly clean oil channels.

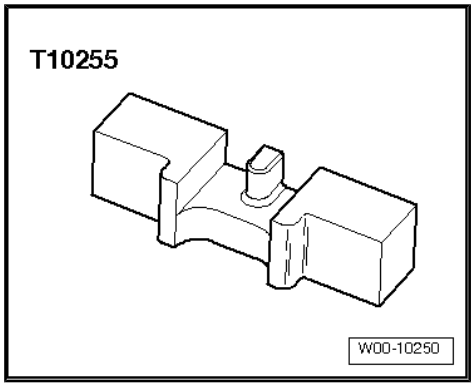
Renew oil cooler

Renew oil filter element

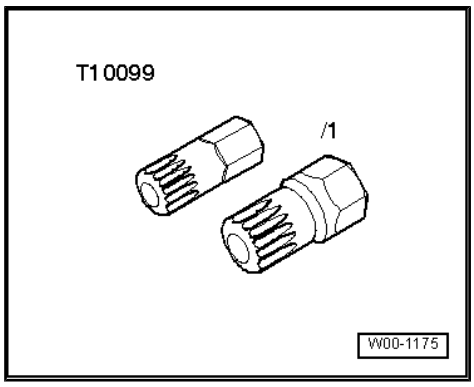
Special tools and workshop equipment required

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- Locking device - T10255-



- Bits - T10099-



Procedure

Note

- *The spur gear drive of the balancer shaft module must be installed with correct tooth backlash.*
- *A coating is applied to the new intermediate gear wheel to set the correct tooth backlash.*
- *Intermediate gear wheels that have a white point are partly coated around the circumference. Intermediate gear wheels without a white spot are fully coated around the circumference*
- *The coating wears off after a short time. This thereby sets the tooth backlash.*
- *For this reason a new balancer shaft module must always be installed with a new intermediate gear wheel with special coating.*
- *A white spot is positioned only on partly coated intermediate gear wheel to ensure correct installation position.*
- *For intermediate gear wheels with coating around the complete circumference the installation position is not relevant.*
- *Renew the bolts tightened with specified tightening angle.*

- Crankshaft locked in position with crankshaft stop - T10100- .

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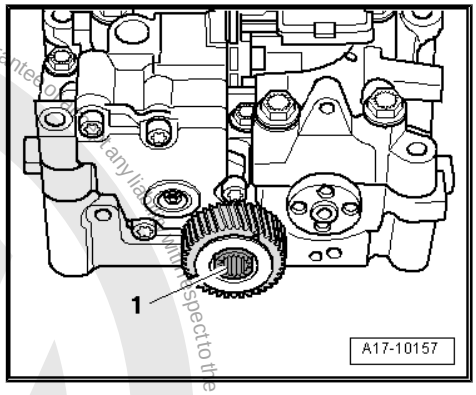
Caution

The threaded connection of the intermediate gear wheel must be loosened to position the balancer shaft module. When doing this, do not loosen the bolt fully to prevent that the thrust washer does not slip behind the intermediate gear wheel. Thrust washer installation position ***⇒ page 153***

Note

For illustration purposes the following procedure is described with sealing flange removed.

– Before positioning balancer shaft module on cylinder block, loosen bolt -1- for intermediate gear wheel approx. 45°.
– Ensure both dowel sleeves are in place to correctly position the balancer shaft module on the cylinder block.
– Position balancer shaft on cylinder block.



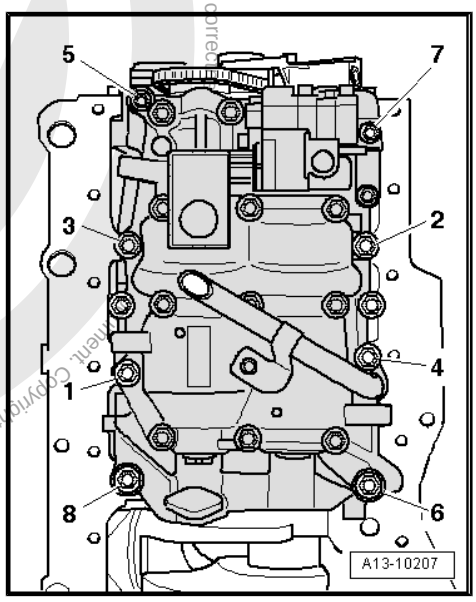
Note

Take care not to damage the coating on the intermediate gear wheel.

Tightening sequence - balancer shaft module with 8 bolted connection points

– Tighten bolts of balancer shaft module as follows:

Stage	Bolts	Specified torque/turning further angle
1.	-1 to 8-	Hand-tighten in sequence
2.	-1 to 8-	Initially tighten in sequence to 6 Nm
3.	-1 ...4-	Tighten to 20 Nm
4.	-5-	Tighten to 13 Nm
5.	-6-	Tighten to 20 Nm
6.	-7-	Tighten to 13 Nm
7.	-8-	Tighten to 20 Nm
8.	-1 to 8-	Turn bolts 90° further in sequence using a fixed wrench

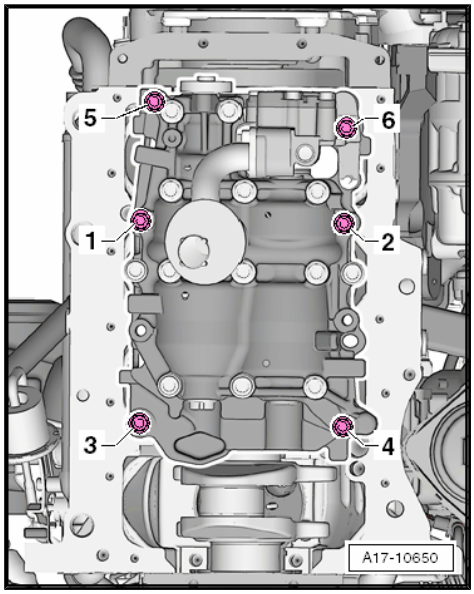


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Tightening sequence - balancer shaft module with 6 bolted connection points

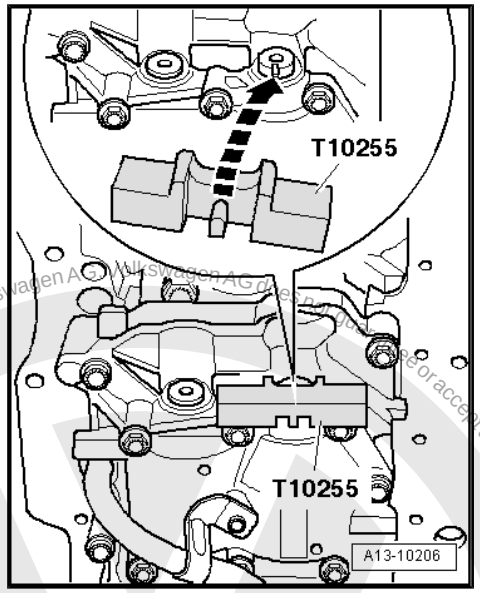
– Tighten bolts of balancer shaft module as follows:

Stage	Bolts	Specified torque/turning further angle
1.	-1 to 6-	Hand-tighten in sequence
2.	-1 to 6-	Initially tighten bolts in sequence to 6 Nm
3.	-1 … 4-	Tighten to 20 Nm.
4.	-5 and 6-	Tighten to 13 Nm
5.	-1 to 6-	Turn bolts 90° further in sequence using a fixed wrench



– Lock balancer shaft using locking tool - T10255- , turn balancer shaft if necessary.

• Locking tool pin must engage in groove in balancer shaft when doing this.

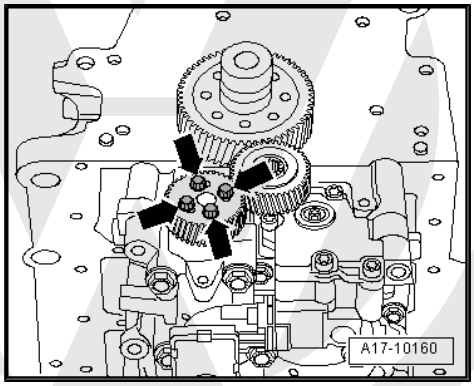


– Carefully fit balancer shaft gear wheel onto balancer shaft, push intermediate gear wheel slightly to side for this.

Note

♦ *Ensure threaded holes in balancer shaft are central within elongated holes of balancer shaft gear wheel.*

♦ *If elongated holes in balancer shaft gear wheel cannot be aligned to threaded holes, then balancer shaft gear wheel must be turned by respective number of teeth and fitted again.*

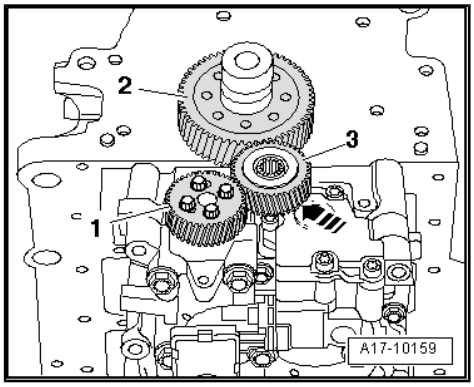


– Tighten bolts for balancer shaft gear wheel -arrows-.

– Remove locking tool - T10255- .

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The following 3 procedures must be performed simultaneously (2nd mechanic required):



- Press intermediate gear wheel -3- forcefully (with assistance of a wooden rod if necessary) in direction of -arrow- into teeth of drive gear wheel -2- and balancer shaft gear wheel -1- (meshing together).
- Turn balancer shaft gear wheel lightly anti-clockwise for this.
- Tighten bolt for intermediate gear wheel using Bits XZN12 - T10099- and tool insert - T10393- ⇒ Item 12 (page 152) .
- Remove crankshaft stop.

Note

No backlash may be perceptible after installing intermediate gear wheel. This can be checked by hand using light force.

Now continue installing in reverse order of removal, observing the following:

- Install sump ⇒ page 136 .
- Install belt pulley vibration damper (renew securing bolts). Specified torque: 10 Nm + turn 90° further.
- Install poly V-belt ⇒ page 40 .

5.2.3 Installing a previously used balancer shaft module again

Caution

If the intermediate gear wheel bolt was loosened, the drive gear wheel on the crankshaft was renewed or the crankshaft was removed, a new intermediate gear wheel with coating must be installed and the hub ⇒ Item 11 (page 131) with bolt ⇒ Item 12 (page 152) and thrust washers must be renewed. Otherwise, the tooth backlash will be incorrect. Procedure when installing ⇒ page 155 .

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 avoid any subsequent damage, the following work must be carried out following the repair:

Thoroughly clean oil channels.

Renew oil cooler

Renew oil filter element

Note

- *If the previously used balancer shaft module is to be reinstalled and the drive gear wheel on crankshaft was renewed or the crankshaft was removed, proceed as follows. The intermediate gear wheel must also not have been loosened.*
- *Renew the bolts tightened with specified tightening angle.*

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– Lock balancer shaft using locking tool - T10255- , turn balancer shaft if necessary.

• Locking tool pin must engage in groove in balancer shaft when doing this.

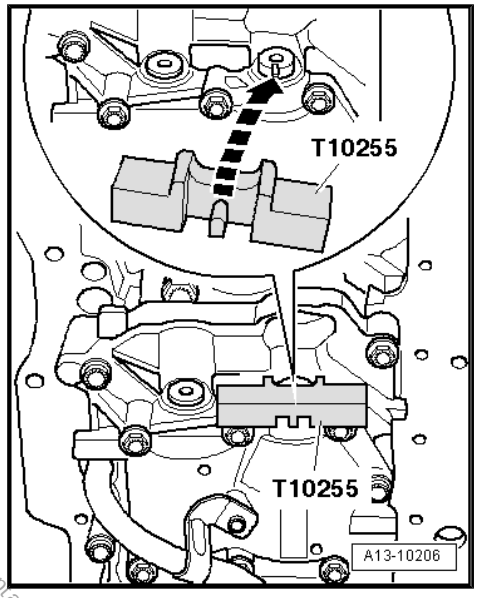
– Ensure both dowel sleeves are in place to correctly position the balancer shaft module on the cylinder block.

– Position balancer shaft on cylinder block.

• The intermediate gear wheel must mesh in the crankshaft drive gear wheel when the balancer shaft is locked.

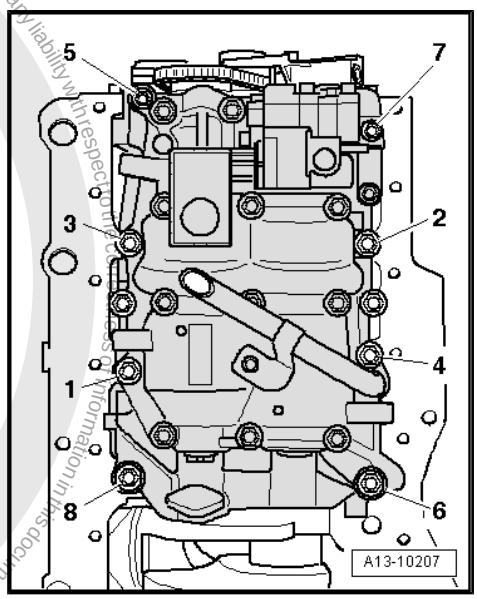
• The intermediate gear wheel must have a slight tooth backlash.

– Tighten bolts of balancer shaft module as follows:



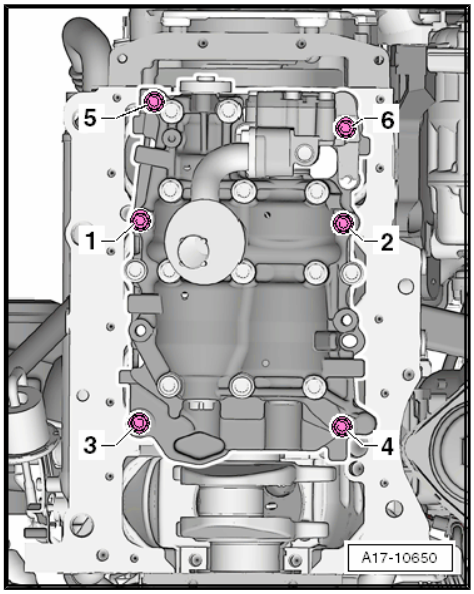
Tightening sequence - balancer shaft module with 8 bolted connection points

Stage	Bolts	Specified torque/turning further angle
1.	-1 to 8-	Hand-tighten in sequence
2.	-1 to 8-	Initially tighten in sequence to 6 Nm
3.	-1 … 4-	Tighten to 20 Nm
4.	-5-	Tighten to 13 Nm
5.	-6-	Tighten to 20 Nm
6.	-7-	Tighten to 13 Nm
7.	-8-	Tighten to 20 Nm
8.	-1 to 8-	Turn bolts 90° further in sequence using a fixed wrench



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Tightening sequence - balancer shaft module with 6 bolted connection points



– Tighten bolts of balancer shaft module as follows:

Stage	Bolts	Specified torque/turning further angle
1.	-1 to 6-	Hand-tighten in sequence
2.	-1 to 6-	Initially tighten bolts in sequence to 6 Nm
3.	-1 … 4-	Tighten to 20 Nm.
4.	-5 and 6-	Tighten to 13 Nm
5.	-1 to 6-	Turn bolts 90° further in sequence using a fixed wrench

– Remove crankshaft stop.

Now continue installing in reverse order of removal, observing the following:

– Install sump ⇒ page 136 .

– Install belt pulley vibration damper (renew securing bolts). Specified torque: 10 Nm + turn 90° further.

5.2.4 Renewing spur gear for crankshaft, engine codes CBAA, CBAB, CBAC, CBBA, CBBB

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 avoid any subsequent damage, the following work must be carried out following the repair:

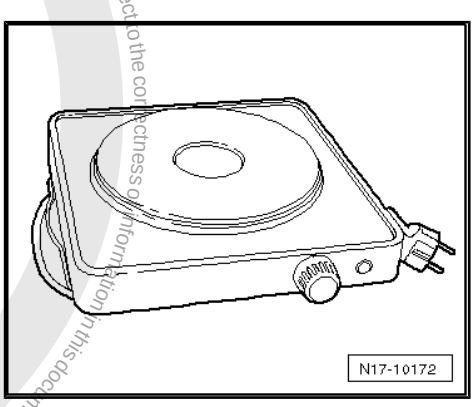
Thoroughly clean oil channels.

Renew oil cooler

Renew oil filter element

Special tools and workshop equipment required

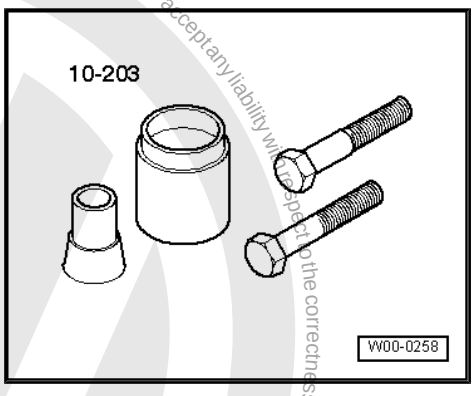
♦ Commercially available hotplate



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- Fitting tool - 10 - 203-



- Puller -T10392-
- Press tool -T10392/1-
- Temperature gauge - VAS 6519- or hand-held multimeter - V.A.G 1526D- in combination with temperature sensor - V.A.G 1526D/1-

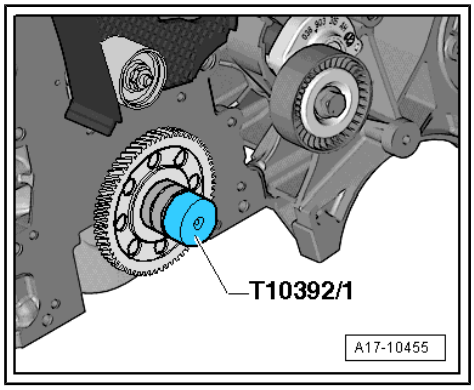
– Remove sealing flange (belt pulley end) ⇒ page 62 .

– Remove sump ⇒ page 136 .

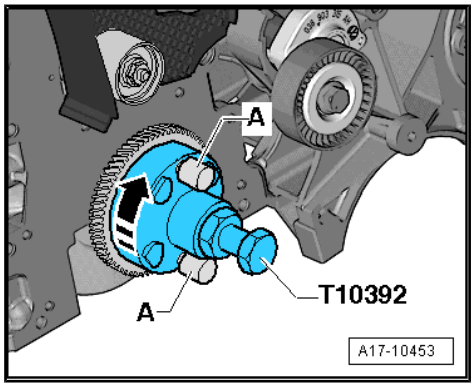
– Remove balancer shaft module ⇒ page 154

Pulling off spur gear

– Insert thrust piece -T10392/1- in crankshaft end.

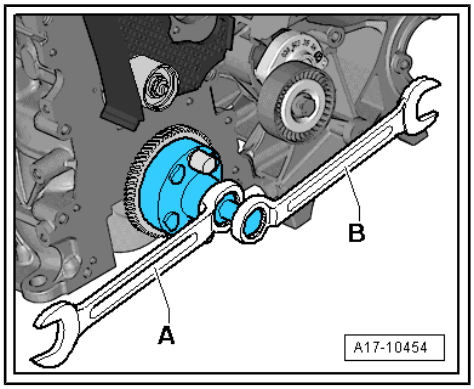


– Insert puller -T10392- into holes of spur gear and turn clockwise -arrow-, screw in locating pins -A-.



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– Counterhold crankshaft with ring spanner -A-, pull spur gear off crankshaft journal by screwing spindle in using ring spanner -B- or ratchet.



Shrink-fitting spur gear

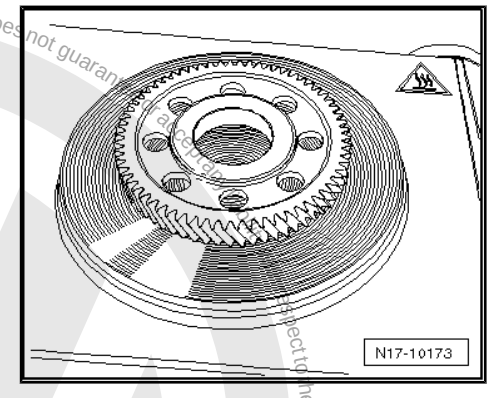
Note

- *Check temperature when heating the new drive pulley using temperature gauge - VAS 6519- , or hand-held multimeter - V.A.G 1526D- in combination with temperature sensor - V.A.G 1526D/1- . To do this, push measuring tip of temperature sensor onto drive pulley.*
- *At a temperature of 200°C, the drive pulley must be driven onto crankshaft within approx. 4 seconds.*
- *A higher temperature increases the available time (220°C = approx. 6 seconds).*
- *Ensure absolute cleanliness on crankshaft end.*

Caution

The maximum temperature of 240°C must not be exceeded as this would lead to discolouring and distortion of the drive pulley.

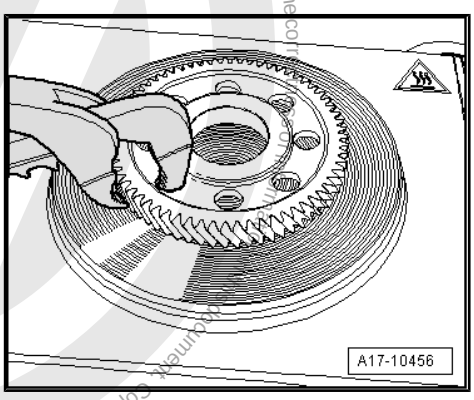
– Place new spur gear onto a commercially available hot plate and heat to at least 200 °C, maximum 240 °C. The lettering faces upwards.



WARNING

There is a risk of burning. Wear suitable protective gloves for further procedure.

– When the temperature is reached, take spur gear up using pliers, as shown in illustration.



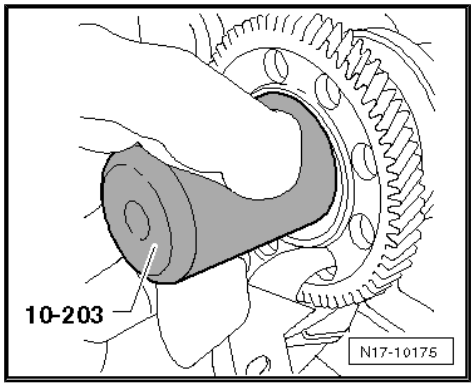
Note

Take care not to damage the splines on the spur gear.

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– Slide spur gear quickly by hand without canting onto crankshaft end until stop using fitting tool - 10 - 203- .

– Allow the spur gear to cool down a few minutes and then install balancer shaft module ⇒ page 154 .



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19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram for coolant hoses”, page 165

⇒ “1.2 Checking cooling system for leaks”, page 169

⇒ “1.3 Draining and adding coolant”, page 173

⇒ “1.4 Assembly overview - engine preheater”, page 177

1.1 Connection diagram for coolant hoses

⇒ “1.1.1 Coolant hose schematic diagram, vehicles with 4/2-way valve, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 165

⇒ “1.1.2 Coolant hose schematic diagram, vehicles without 4/2-way valve, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 166

⇒ “1.1.3 Coolant hose schematic diagram, engine code CJAA”, page 168

1.1.1 Coolant hose schematic diagram, vehicles with 4/2-way valve, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

WARNING

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

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).*

Test for leaks in cooling system using cooling system tester - V.A.G 1274/- and adapter for expansion tank - V.A.G 1274/8- and adapter for sealing cap - V.A.G 1274/9- .

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1 - Radiator/cooler

2 - Coolant circulation pump - V178-

3 - Engine oil cooler

4 - 4/2-way valve

- ❑ With thermostat
- ❑ Removing and installing ⇒ page 184

5 - Coolant pump

6 - Cylinder head/cylinder block

7 - Expansion tank

8 - Radiator/cooler

- ❑ For exhaust gas recirculation

9 - Supplementary heater/auxiliary heater

- ❑ Depending on equipment

10 - Circulation pump - V55-

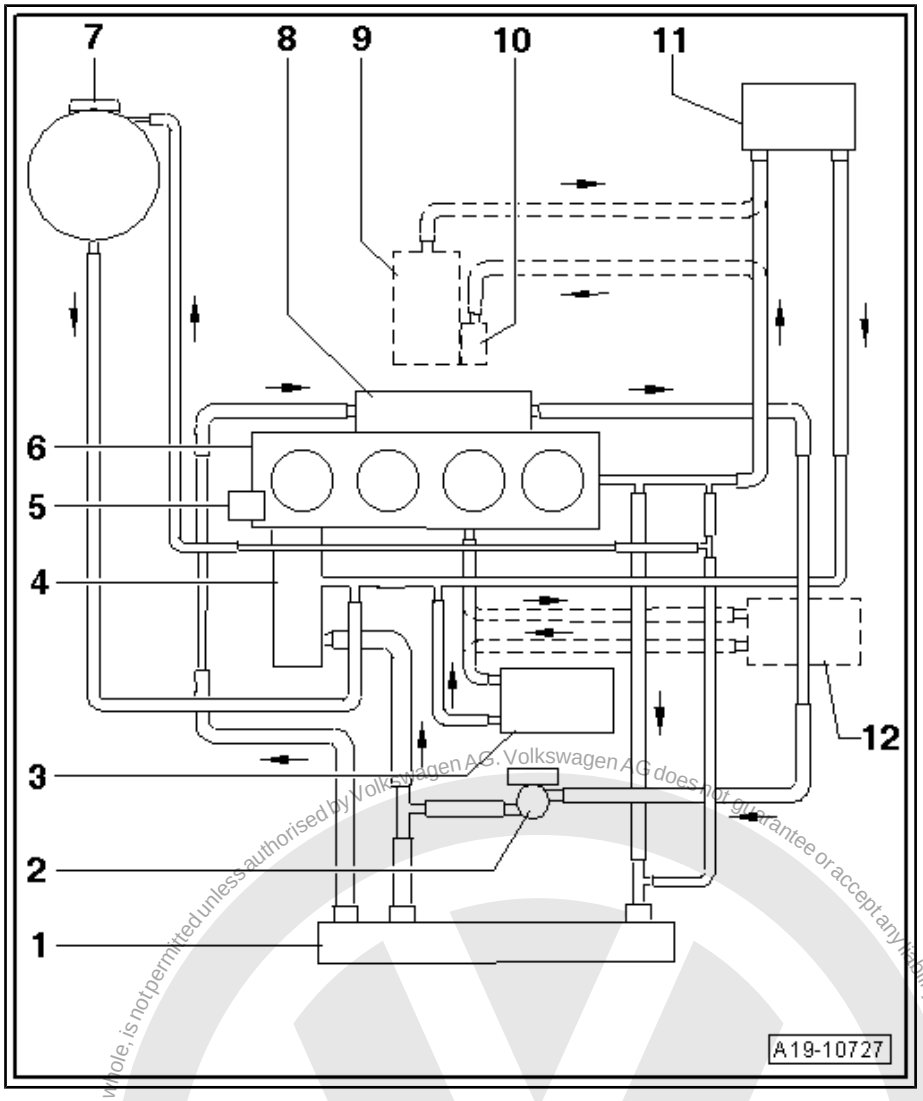
- ❑ Depending on equipment

11 - Heat exchanger for heater

- ❑ With quick-release coupling

12 - Gear oil cooler

- ❑ Only vehicles with dual clutch gearbox/automatic gearbox.



1.1.2 Coolant hose schematic diagram, vehicles without 4/2-way valve, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

WARNING

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

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).*

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Test for leaks in cooling system using cooling system tester - V.A.G 1274/- and adapter for expansion tank - V.A.G 1274/8- and adapter for sealing cap - V.A.G 1274/9- .

Note

As of week 22/09 a 4/2-way valve has been introduced; this contains the thermostat and ensures an improved flow of coolant through the cylinder head. Schematic diagram for vehicles with 4/2-way valve ⇒ page 165 .

1 - Radiator/cooler

2 - Coolant circulation pump - V178-

3 - Engine oil cooler

4 - Thermostat

5 - Coolant pump

6 - Cylinder head/cylinder block

7 - Expansion tank

8 - Radiator/cooler

- ❑ For exhaust gas recirculation
- ❑ Checking exhaust gas recirculation cooler for leaks ⇒ page 353

9 - Supplementary heater/auxiliary heater

- ❑ Depending on equipment

10 - Circulation pump - V55-

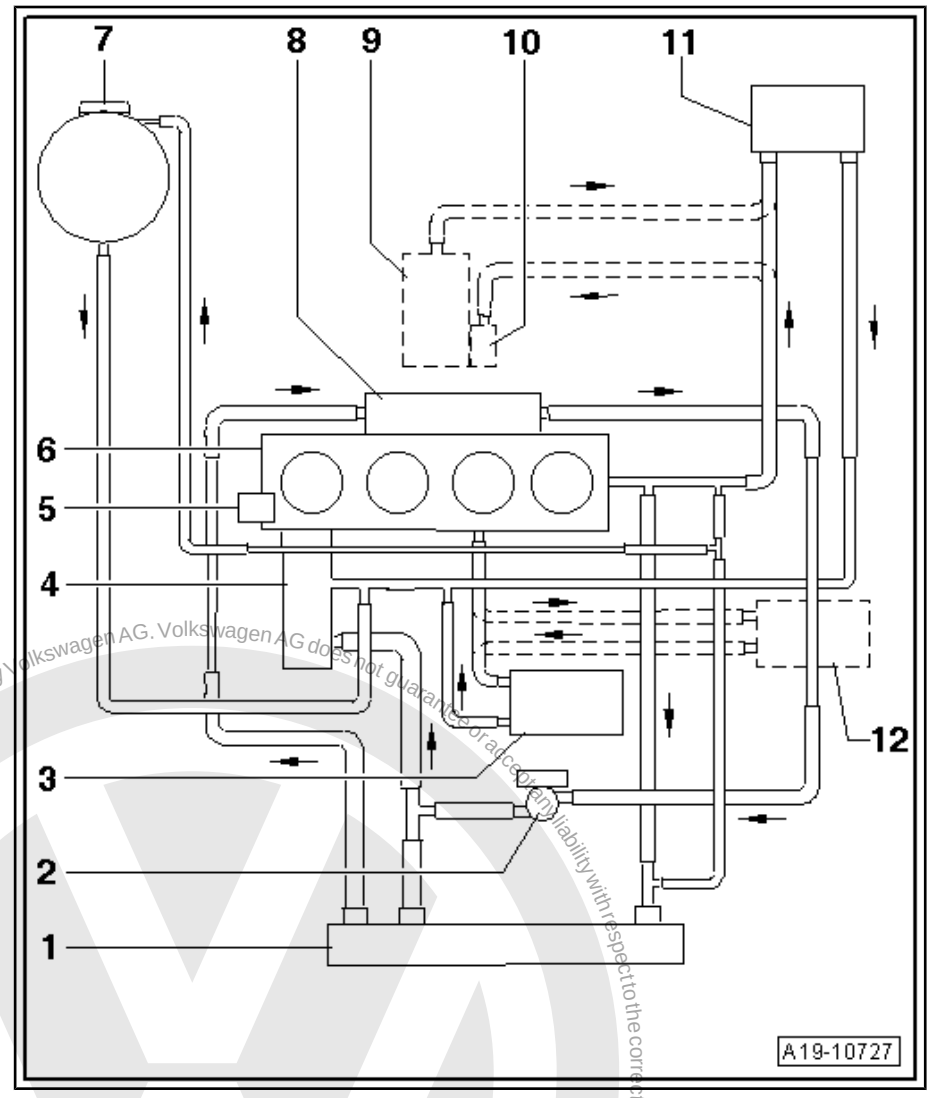
- ❑ Depending on equipment

11 - Heat exchanger for heater

- ❑ With quick-release coupling

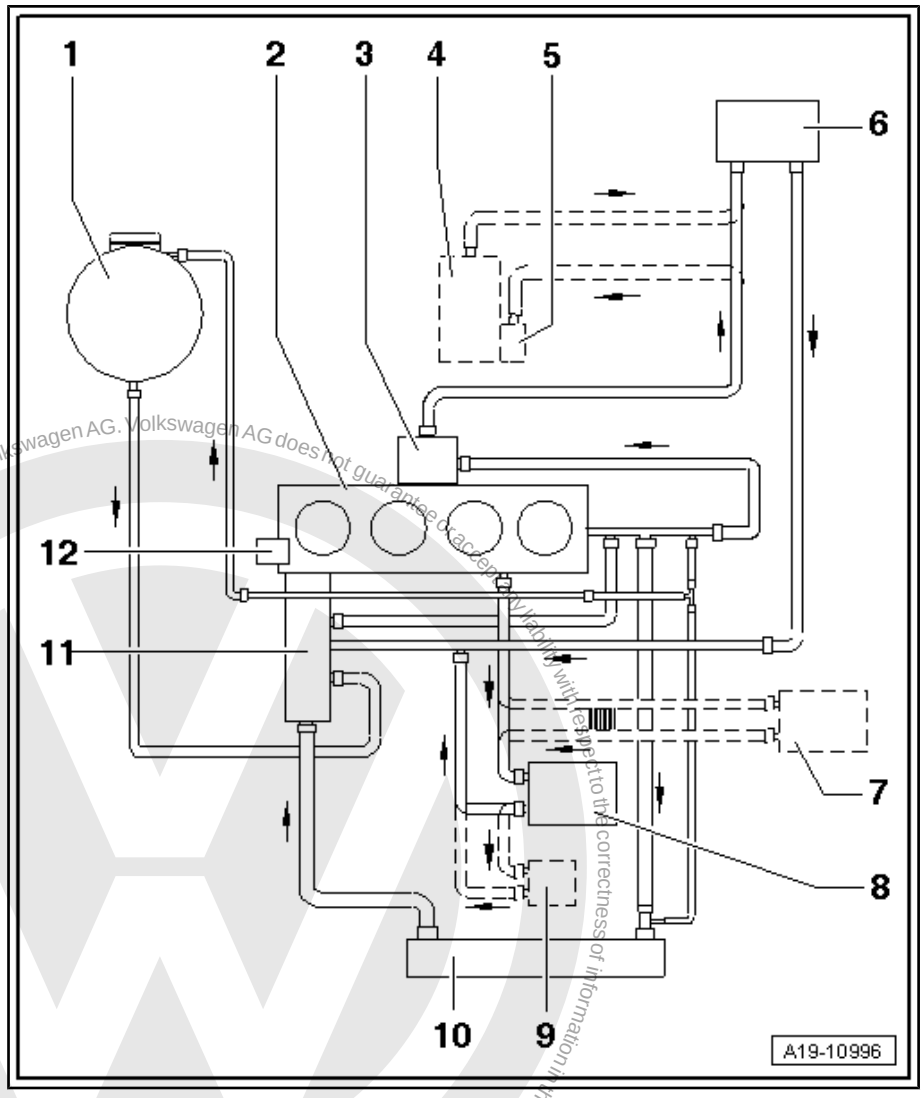
12 - Gear oil cooler

- ❑ Only vehicles with dual clutch gearbox/automatic gearbox.



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1.1.3 Coolant hose schematic diagram, engine code CJAA



1 - Coolant expansion tank

- ❑ With cap
- ❑ Checking pressure relief valve in filler cap ⇒ page 169 .

2 - Cylinder head and cylinder block

- ❑ Renew coolant after replacing

3 - Exhaust gas recirculation cooler

- ❑ Renew coolant after replacing
- ❑ Removing and installing ⇒ page 344
- ❑ Checking exhaust gas recirculation cooler for leaks ⇒ page 353

4 - Auxiliary heater

5 - Circulation pump - V55-

6 - Heat exchanger for heater

- ❑ Renew coolant after replacing

7 - Gear oil cooler

- ❑ For double clutch gearbox.
- ❑ Renew coolant after replacing

8 - Engine oil cooler

9 - Engine preheater

- ❑ Removing and installing ⇒ page 179

10 - Radiator/cooler

- ❑ Renew coolant after replacing

11 - 4/2-way valve with thermostat

- ❑ Removing and installing ⇒ page 184

12 - Coolant pump

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1.2 Checking cooling system for leaks

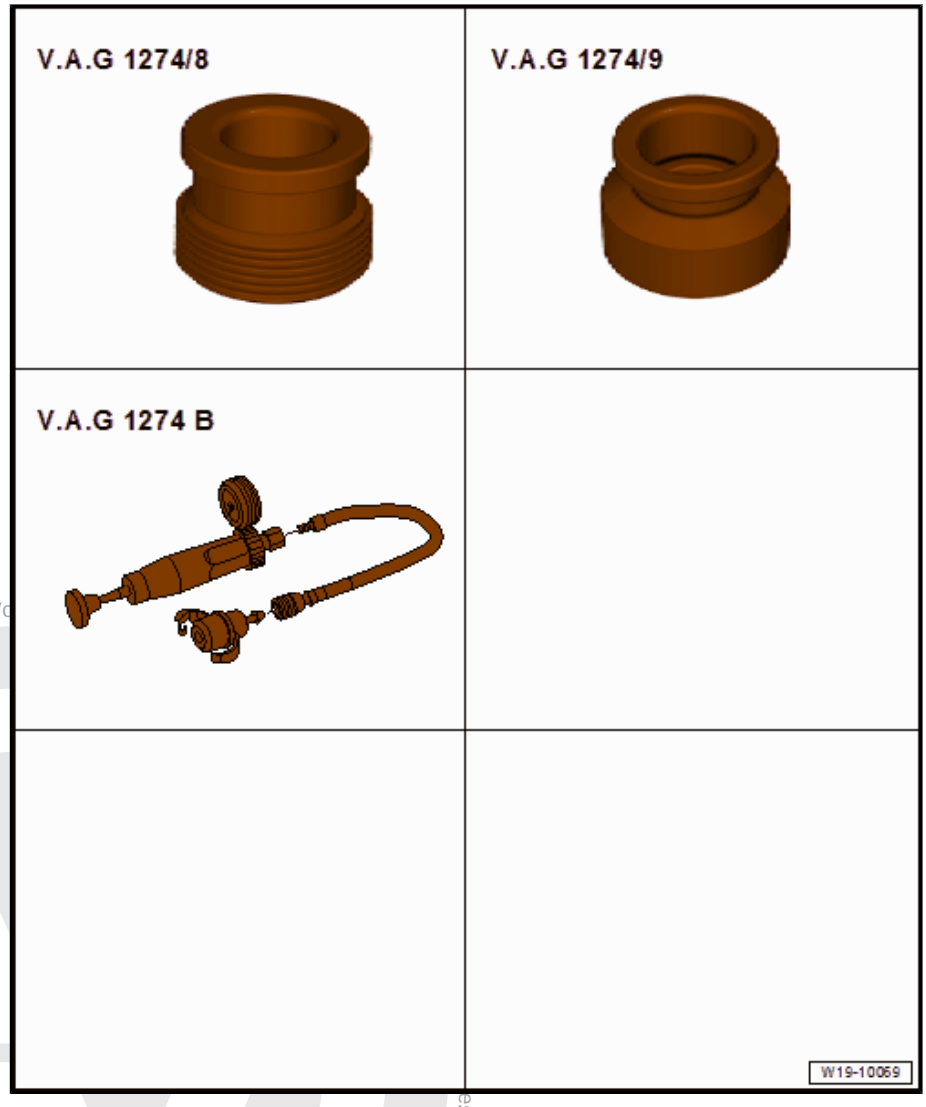
⇒ “1.2.1 Checking cooling system for leaks”, page 169

⇒ “1.2.2 Checking oil cooler for leaks”, page 171

1.2.1 Checking cooling system for leaks

Special tools and workshop equipment required

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



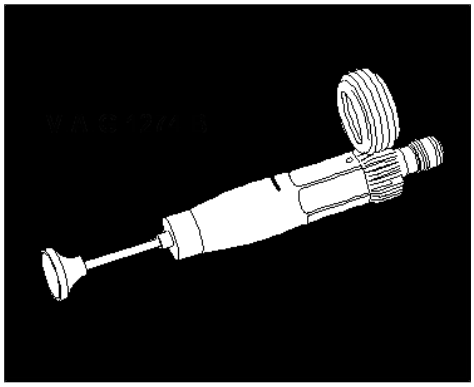
Note

To perform the leakage test correctly, first run a self-test on the cooling system tester - V.A.G 1274 B- .

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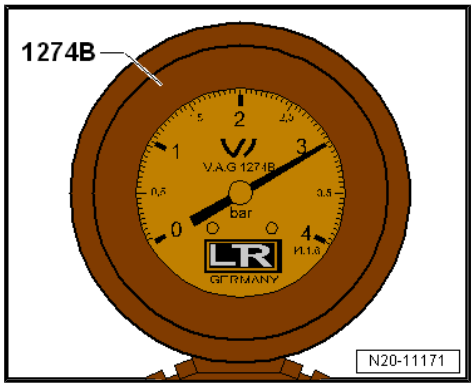
Self-test of cooling system tester - V.A.G 1274 B-

– Operate cooling system tester - V.A.G 1274 B- several times.



– Build up a pressure of 3.0 bar on cooling system tester .

– Observe pressure on pressure gauge of cooling system tester for 30 seconds.



If no pressure builds up or if the pressure drops again:

The cooling system tester - V.A.G 1274 B- is leaking and should not be used.

Checking cooling system for leaks

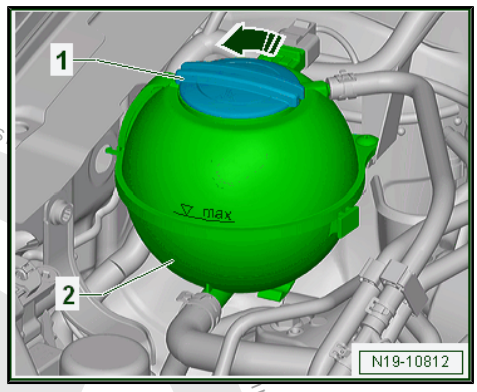
- Coolant temperature at least 40 °C

WARNING

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

There is a risk of injury to the skin and parts of the body due to scalding.

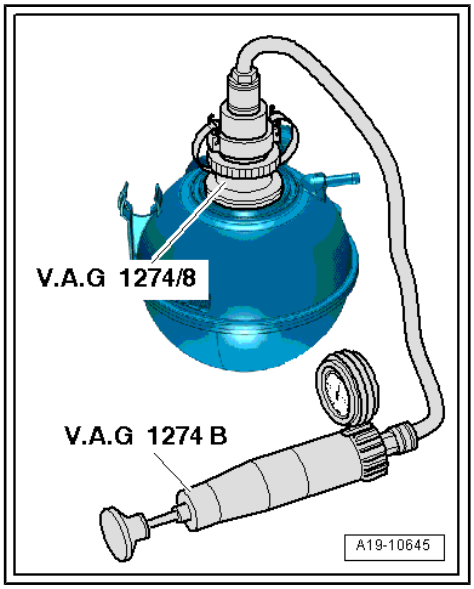
- ***Wear protective gloves.***
- ***Wear safety goggles.***
- ***Reduce excess pressure by covering the cap of the coolant expansion tank with cloths and opening it carefully.***



– Open cap -1- on coolant expansion tank.

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– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- to coolant expansion tank.
– Build up pressure of approx. 1.5 bar using hand pump of cooling system tester.
• The pressure must not drop by more than 0.2 bar within 10 minutes.
– If the pressure drops by more than 0.2 bar, locate and rectify leaks.



Note

The pressure drop of 0.2 bar within 10 minutes depends on the how far the coolant can cool down. The colder the engine, the lower the pressure drop.

WARNING

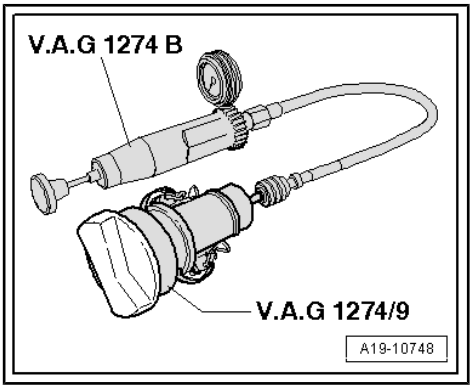
Danger of scalding due to steam and hot coolant.

There is a risk of injury to the skin and parts of the body due to scalding.

- ***Release pressure by pressing pressure relief valve on cooling system tester until the gauge shows a pressure of 0.***

Check pressure relief valve in cap.

– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto coolant filler cap.
– Using hand pump of cooling system tester, build up pressure and check the opening pressure of the filler cap.



Colour of filler cap	Opening pressure
blue	1.4 … 1.6 bar
black	1.6 … 1.8 bar

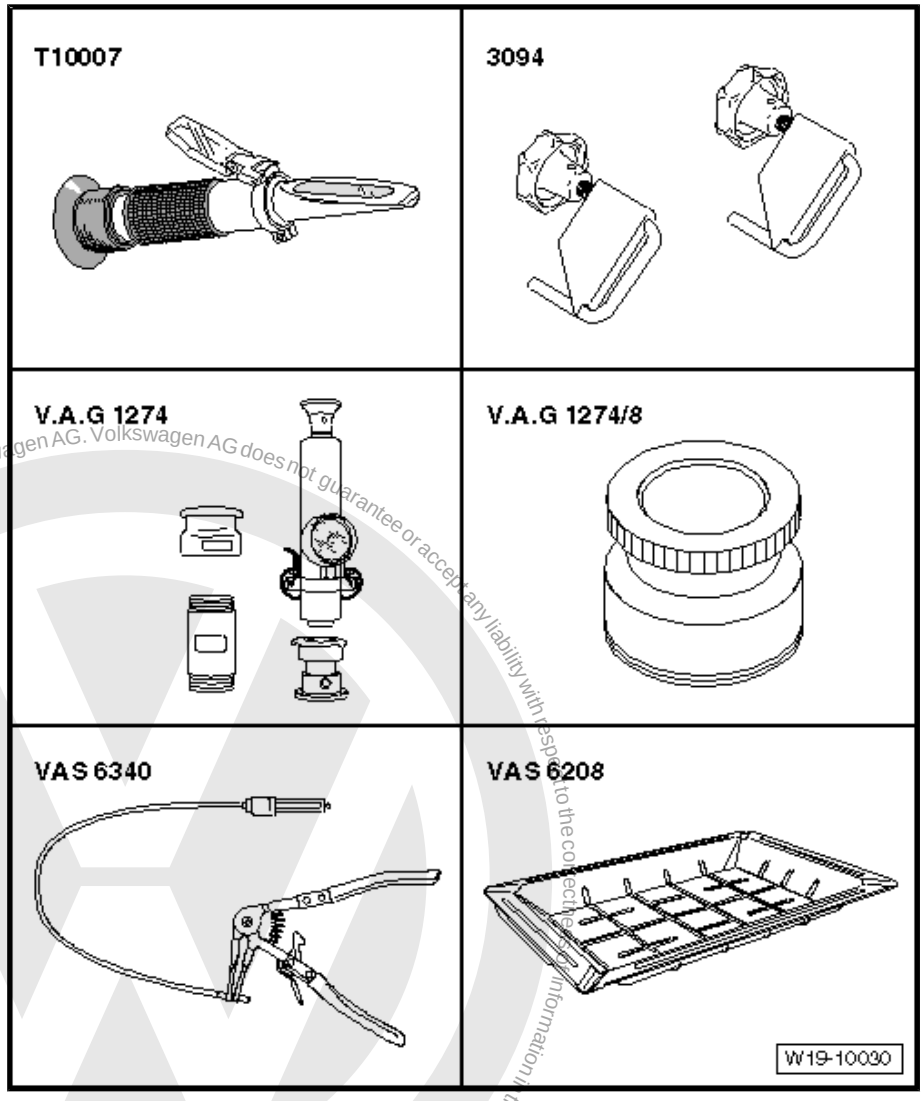
– Renew filler cap, if pressure relief valve does not open as described.

1.2.2 Checking oil cooler for leaks

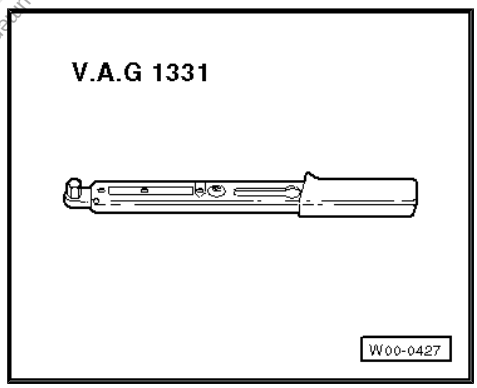
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Special tools and workshop equipment required

- Refractometer - T10007-
- Hose clamps up to 25 mm - 3094-
- Cooling system tester - V.A.G 1274-
- Adapter for cooling system tester - V.A.G 1274/8-
- Hose clamp pliers - VAS 6340-
- Drip tray - VAS 6208-



- Torque wrench - V.A.G 1331-



Without illustration:

- Expansion tank - 1K0 121 407 A- or expansion tank - 1J0 121 407 B-
- Plugs - 191 121 343-
- Cap - 1J0 121 324-
- Coolant hose - 251 265 056-

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Condition:

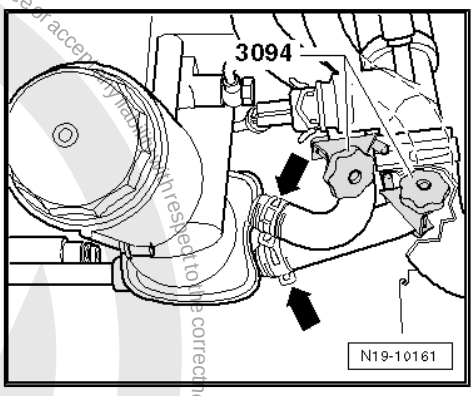
- Engine cold

Test sequence

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

– Clamp off supply and return lines to oil cooler using hose clips, up to 25 mm - VAS 3094- .

– Release hose clips -arrows- using hose clip pliers - VAS 6340- .



Note

Collect escaping coolant with drip tray - V.A.G 1306- or drip tray - VAS 6208- .

– Pull coolant hoses off oil cooler.

– Slide cover -5- onto rear connection of oil cooler -4-.

– Secure sealing plug -2- to breather connection of expansion tank -1-.

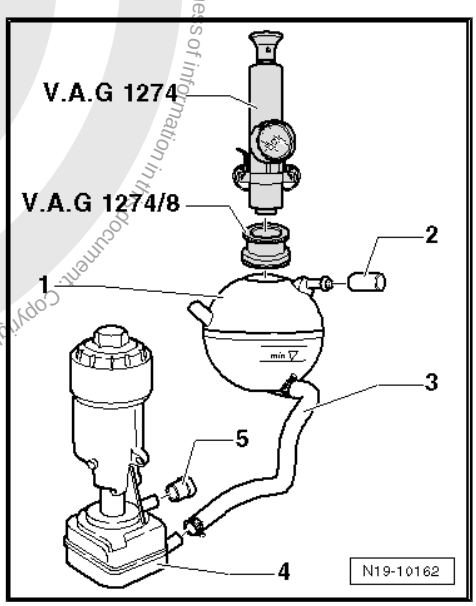
– Secure coolant hose -3- to oil cooler and expansion tank.

– Fill expansion tank up to “Max” marking.

– Attach cooling system tester - V.A.G 1274- with cooling system tester adapter - V.A.G 1274/8- to expansion tank.

– Use hand pump on tester to create a pressure of about 1.4 bar.

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



If the pressure drops:

– Renew oil cooler ⇒ page 142 .

Install in reverse order of removal, observing the following.

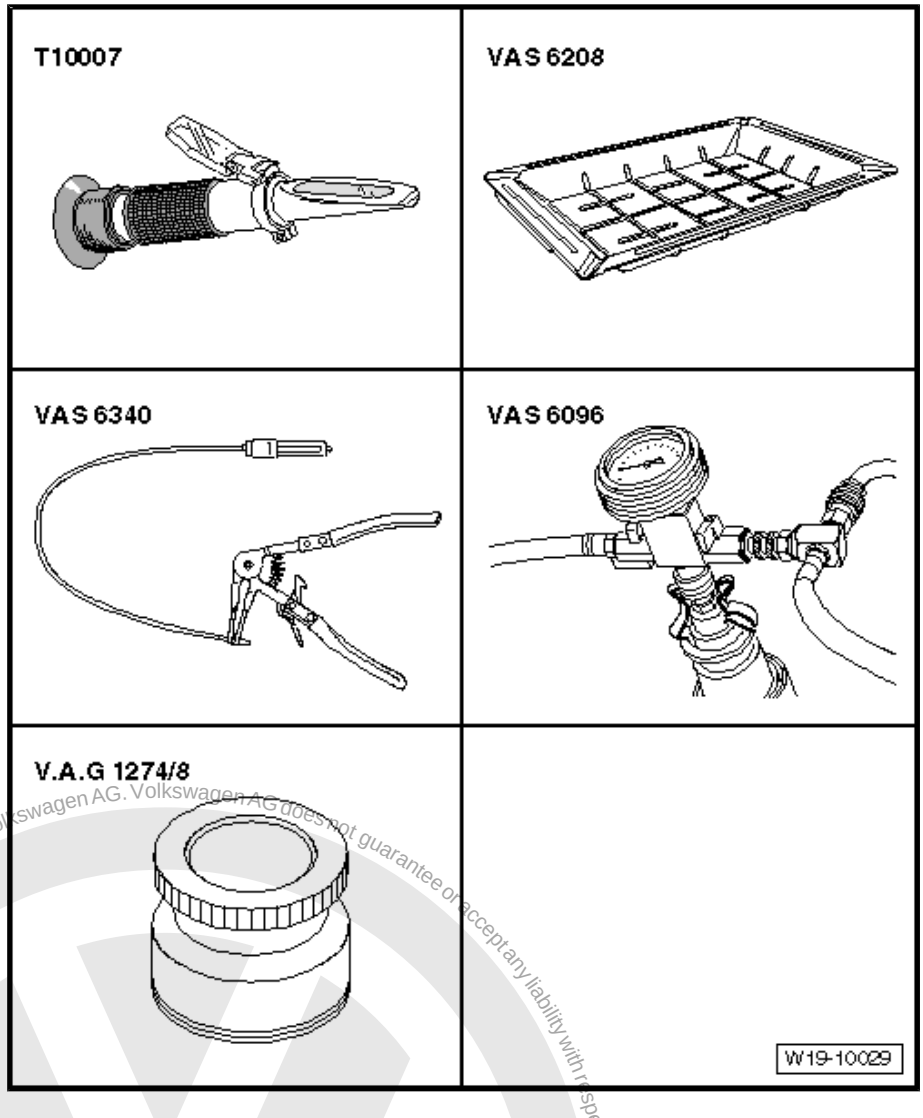
– Check coolant level, replenish coolant if necessary ⇒ page 173 .

1.3 Draining and adding coolant

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Special tools and workshop equipment required

- Refractometer - T10007-
- Drip tray for workshop hoist - VAS 6208-
- Hose clamp pliers - VAS 6340-
- Coolant system charge unit - VAS 6096-
- Adapter for cooling system tester - V.A.G 1274/8-



1.3.1 Draining

WARNING

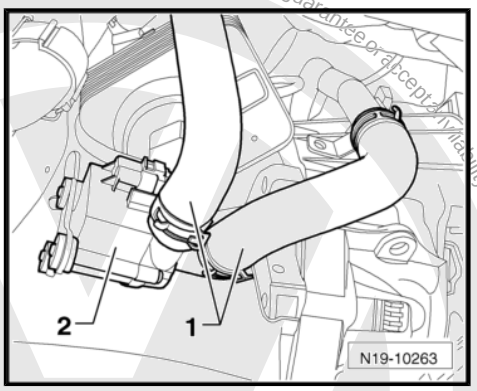
Hot steam may escape when expansion tank is opened. Cover sealing cap with a cloth and open it carefully.

– Open filler cap on coolant expansion tank.

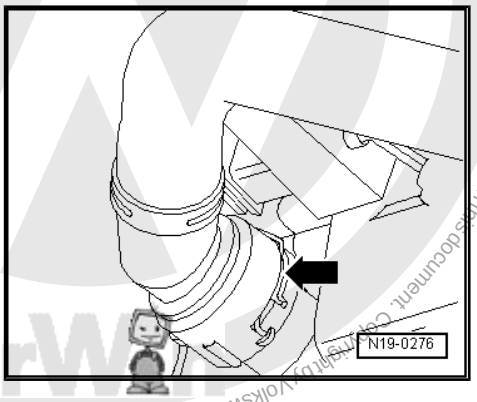
Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

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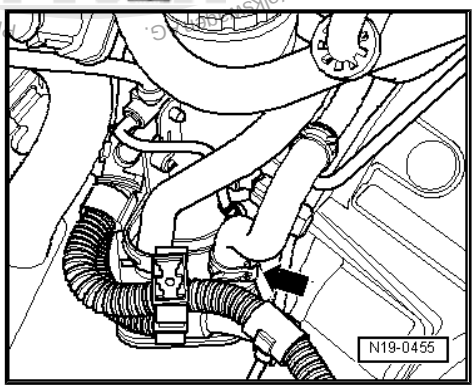
– Pull coolant hoses -1- off coolant circulation pump - V178- -2-.



– 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 oil cooler -arrow-.



Note

Observe disposal instructions!

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1.3.2 Filling



Note

- *The water used for mixing has a major influence on the effectiveness of the coolant. Because the water quality differs from country to country and even from region to region, the quality of the water to be used in the cooling system has been specified by Volkswagen. Distilled water fulfils all requirements. It is therefore recommended to use distilled water when mixing coolant for topping up or replacing coolant.*
- *Use only coolant additives which conform with the ⇒ Electronic parts catalogue (ETKA) . Other coolant additives may reduce corrosion protection substantially. The resulting damage could lead to loss of coolant and subsequent severe damage to the motor.*
- *Mixed in the proper proportions, coolant inhibits frost and corrosion damage as well as scaling. Such additives also raise the boiling point of the coolant. For this reason, the cooling system must be filled all-year-round with coolant additives.*
- *Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.*
- *ONLY refractometer - T10007A- may be used for determining current anti-freeze value.*
- *Frost protection must be guaranteed down to -25°C as a minimum and, in countries with arctic conditions, down to approx. -36°C. Increasing the frost protection is permissible only if climatic conditions require stronger frost protection. It may, however, be increased only to a maximum of -48 °C. Otherwise, the cooling effect will be impaired.*
- *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be guaranteed down to at least -25°C.*
- *Read off 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.*

Recommended mixing ratios (use only distilled water for mixing):

Frost protection to	Anti-freeze proportion	Coolant additive 1)	Distilled water 1)
-25°C -36°C	40% 50%	3.2 l 4.0 l	4.8 l 4.0 l

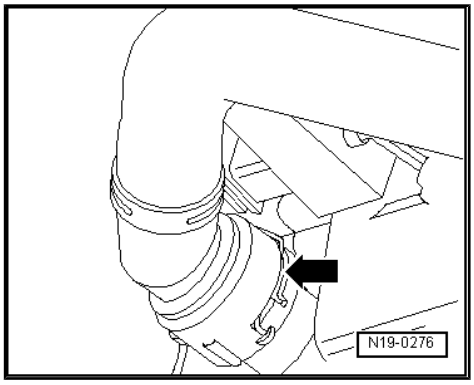
1) The quantity of coolant can vary depending on the vehicle equipment.

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– Install lower coolant hose and secure with retaining clip -arrow-.

– Connect coolant hoses to oil cooler and coolant circulation pump - V178- .

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



With cooling system charge unit - VAS 6096- :

– Screw adapter for cooling system tester - V.A.G 1274/8- onto expansion tank.

– Fill coolant circuit using cooling system charge unit - VAS 6096- ⇒ Operating instructions for cooling system charge unit VAS 6096.

Without cooling system charge unit - VAS 6096- :

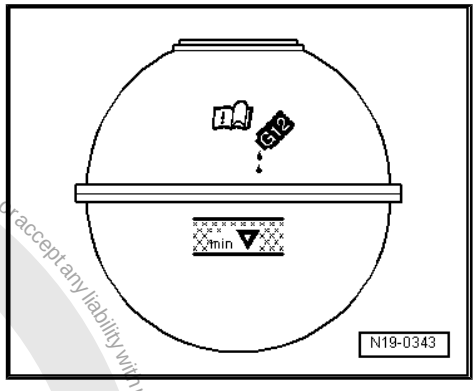
– Slowly fill coolant to upper marking of shaded field on expansion tank.

– Fit expansion tank cap.

– Start engine and maintain an engine speed of about 2,000 rpm for about 3 minutes.

– Then run engine at idling speed until radiator fan cuts in.

– Check coolant level and top up as needed. When engine is at normal operating temperature, the coolant level must be at the upper mark; when engine is cold, in the middle of the shaded field.



1.4 Assembly overview - engine preheater

⇒ “1.4.1 Assembly overview - engine preheater”, page 177

⇒ “1.4.2 Removing and installing engine preheater”, page 179

1.4.1 Assembly overview - engine preheater

Engine code CJAA

Connection diagram for coolant hoses ⇒ page 168

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1 - Coolant pipe for engine preheater

2 - Coolant hose from union on cylinder block to gear oil cooler

3 - Coolant hose from gear oil cooler to engine oil cooler

4 - Coolant hose from coolant pipe for engine preheater to engine preheater

5 - Lock

6 - Connection cable for external current source

7 - Left air intake grille

– Removing and installing air intake grille ⇒ Rep. gr. 63

8 - Holder

9 - Engine preheater

❑ Removing and installing ⇒ page 179

10 - Clamp for engine preheater

❑ Secured to bracket

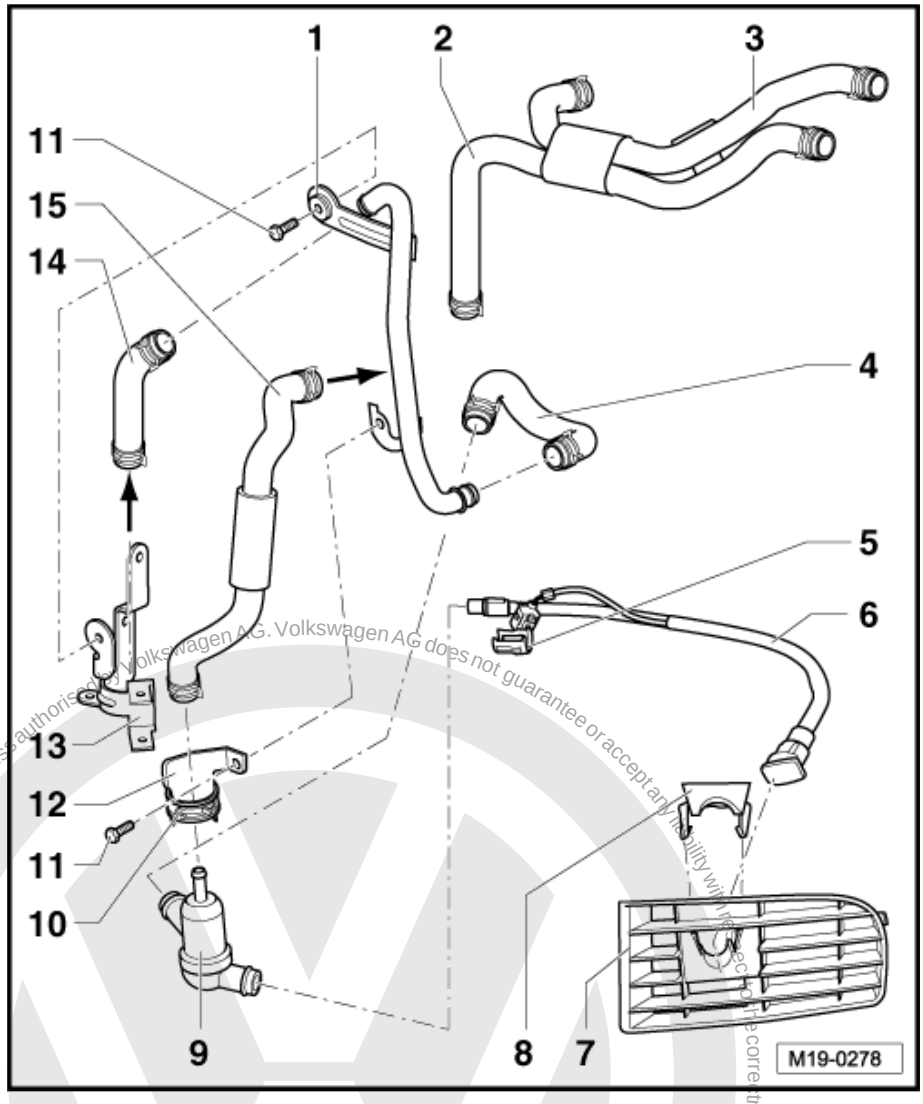
11 - 10 Nm

12 - Bracket for engine preheater

13 - Bracket for wiring harness and coolant pipe

14 - Coolant hose from engine oil cooler to coolant pipe for engine preheater

15 - Coolant hose from engine preheater to coolant pipe on cylinder block

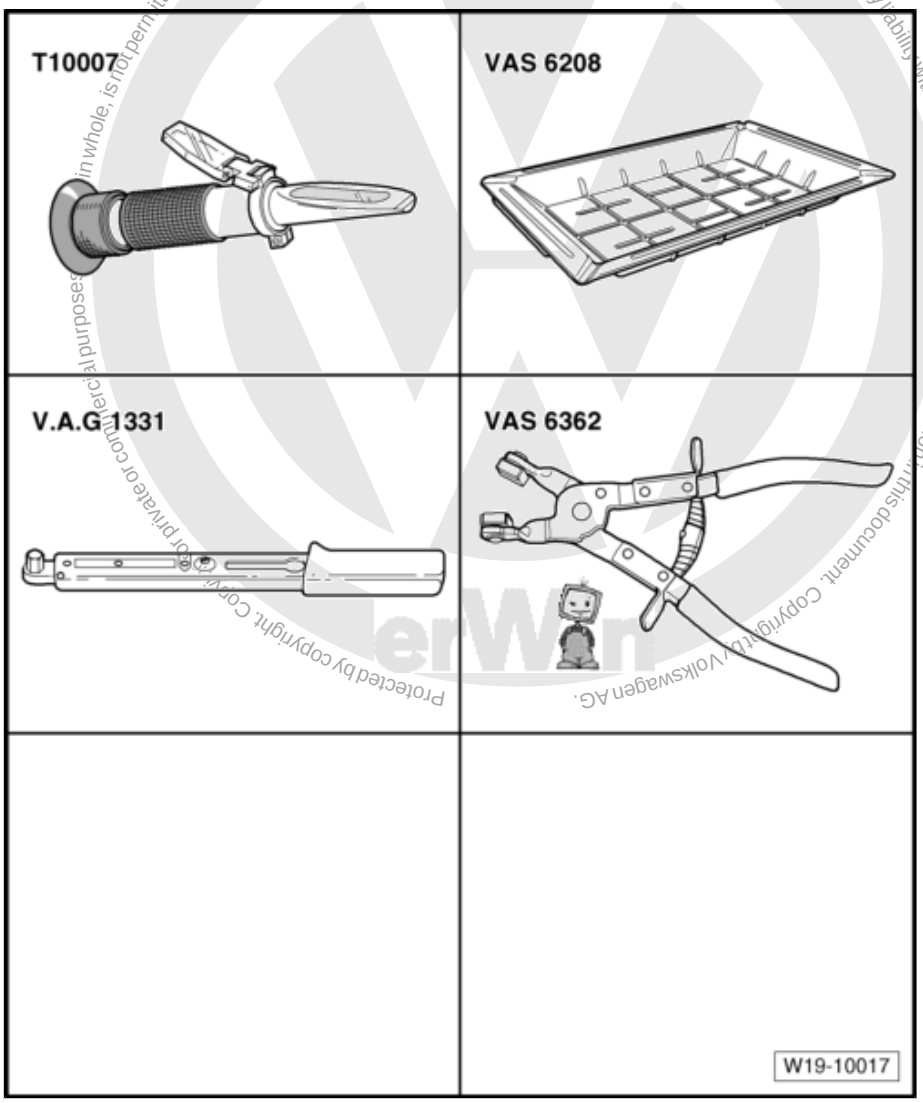


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1.4.2 Removing and installing engine preheater

Special tools and workshop equipment required

- Refractometer - T10007-
- Drip tray for workshop hoist - VAS 6208-
- Torque wrench - V.A.G 1331-
- Pliers for spring-type clips - VAS 6362-



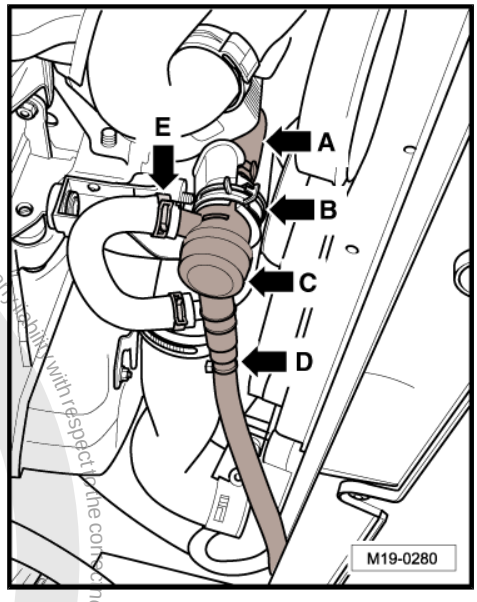
Removing:

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

– Drain coolant ⇒ page 173 .

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– Loosen coolant hose clip and pull coolant hose off union -arrow A-.
– Unclip connector locking device and pull off connector for engine preheater -arrow D-.
– Loosen coolant hose clip and pull coolant hose off union -arrow E-.
– Loosen clamp -arrow B- and pull out engine preheater -arrow C- downwards



Installing:

Install in reverse order of removal.

– Fill coolant system with coolant ⇒ page 173 .
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

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2 Coolant pump, regulation of cooling system

⇒ “2.1 Removing and installing coolant pump”, page 181

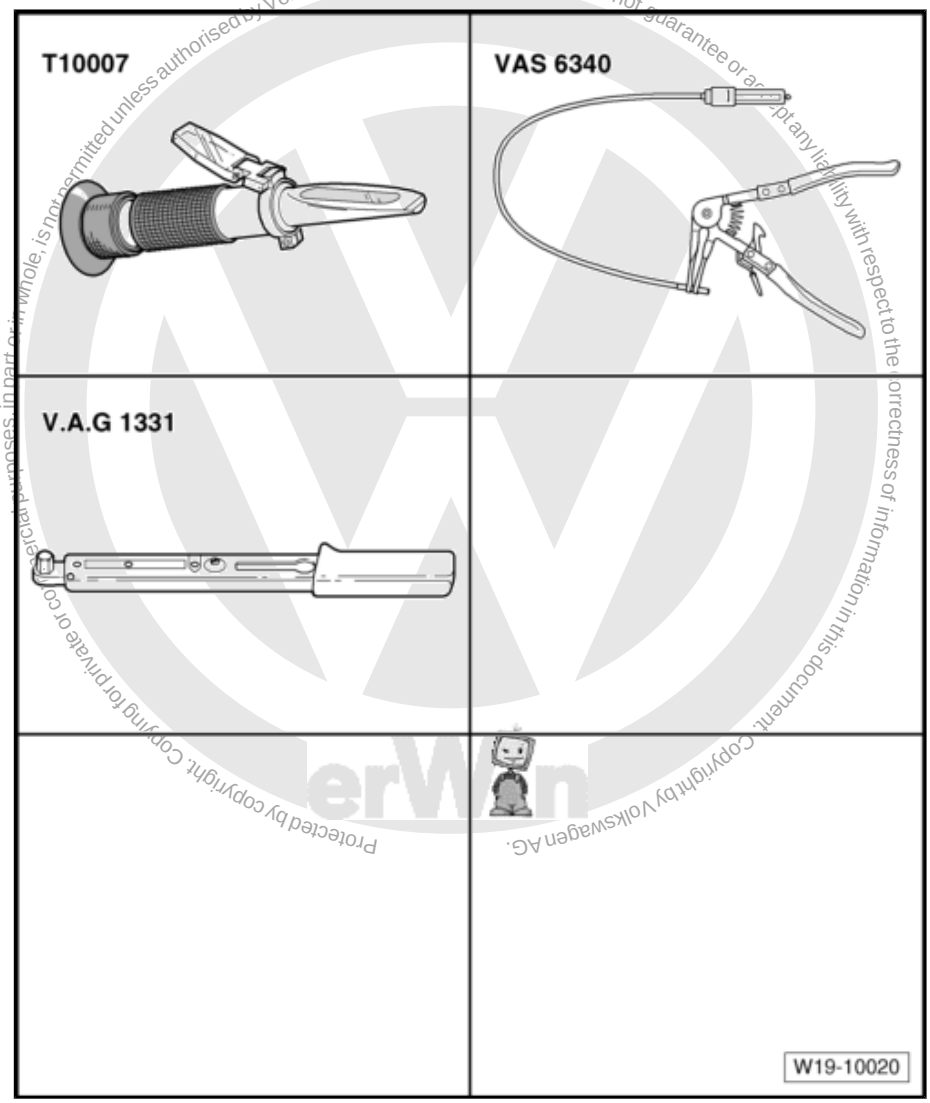
⇒ “2.2 Removing and installing thermostat”, page 182

⇒ “2.3 Removing and installing 4/2-way valve with thermostat”, page 184

2.1 Removing and installing coolant pump

Special tools and workshop equipment required

- Refractometer - T10007-
- Torque wrench (5 … 50 Nm) - V.A.G 1331-
- Hose clamp pliers - VAS 6340-



Removing

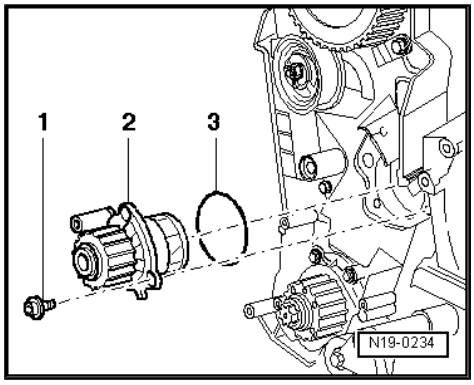
Note

Renew gaskets and seals.

– Drain coolant ⇒ page 173 .
– Remove poly V-belt ⇒ page 40 .
– Remove toothed belt ⇒ page 106 .

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

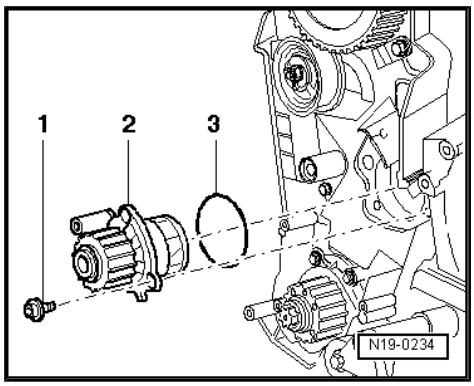


Installing

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- to 15 Nm.



Note

The coolant pump plug faces downwards.

– Install toothed belt ⇒ page 106 .

– Install poly V-belt ⇒ page 40 .

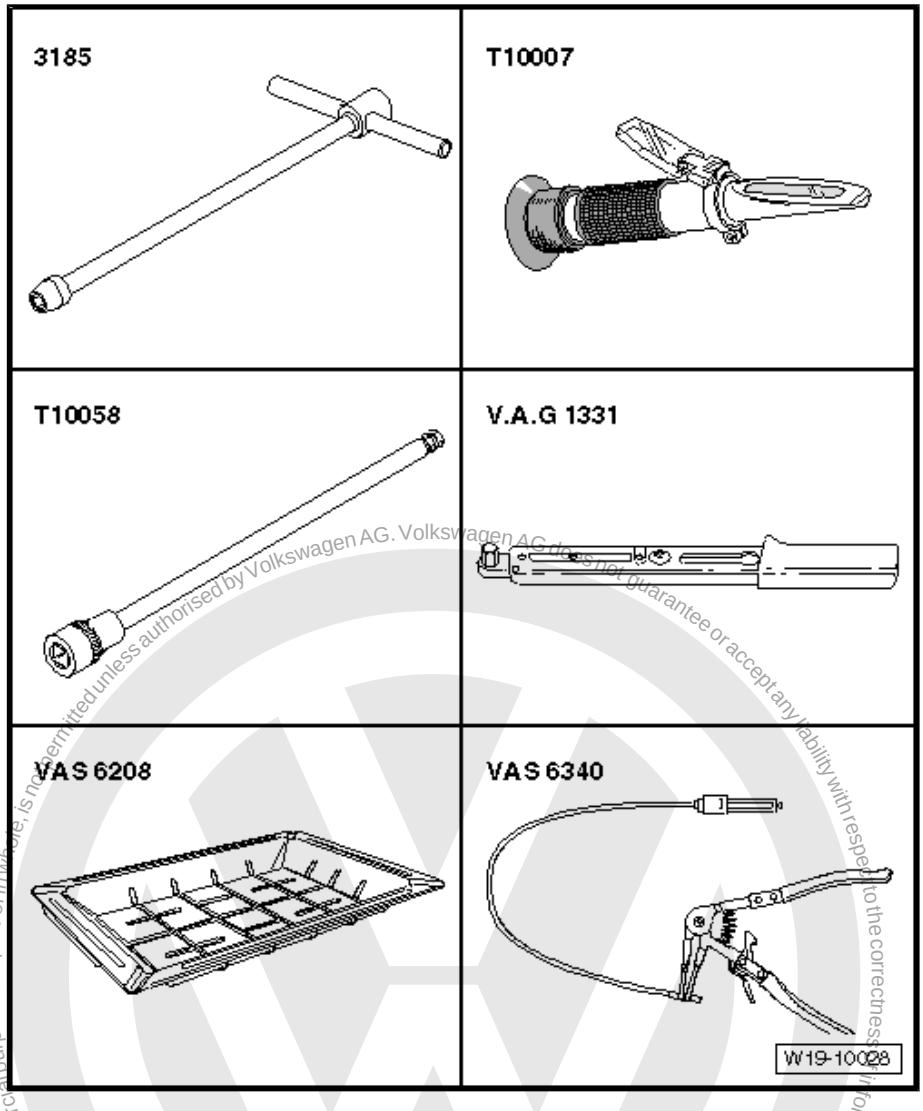
– Fill coolant system with coolant ⇒ page 173 .

2.2 Removing and installing thermostat

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Special tools and workshop equipment required

- U/J extension and socket 10 mm - 3185-
- Refractometer - T10007-
- Multi-point bit - T10058-
- Torque wrench - V.A.G 1331/-
- Drip tray for workshop hoist - VAS 6208-
- Hose clamp pliers - VAS 6340-



Removing

Note

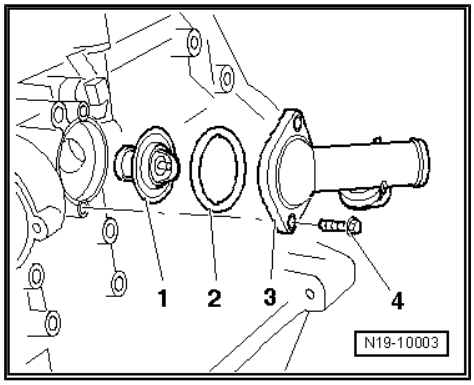
Renew gaskets and seals.

– Drain coolant ⇒ page 173 .
– Remove throttle valve module - J338- ⇒ page 248 .
– Pull coolant hose off connection.

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– Loosen securing bolts -4- of connection -3- using T-bar and socket 10 mm - 3185- and remove using Allen key, long reach - T10058- and remove connection -3- together with thermostat -1-.

– Turn thermostat -1- 90° anticlockwise and remove from connection -3-.



Installing

Install in reverse order of removal, observing the following.

– Moisten new O-ring -2- with coolant.

– Insert thermostat -1- in connection -3- and turn 90° clockwise.

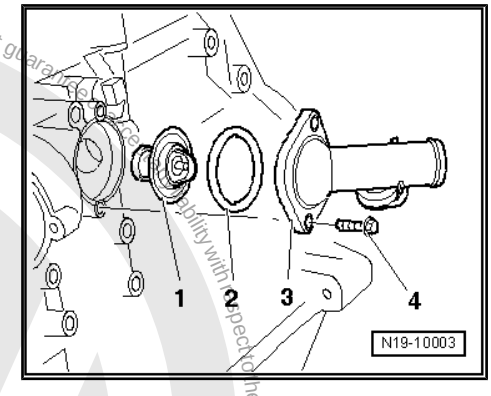
Note

The brace on the thermostat must be almost vertical.

– Fit connection -3- with thermostat -1- into cylinder block.

– Tighten securing bolts -4- using T-bar and 10 mm socket - 3185- . Specified torque: 15 Nm

– Add coolant ⇒ page 173 .

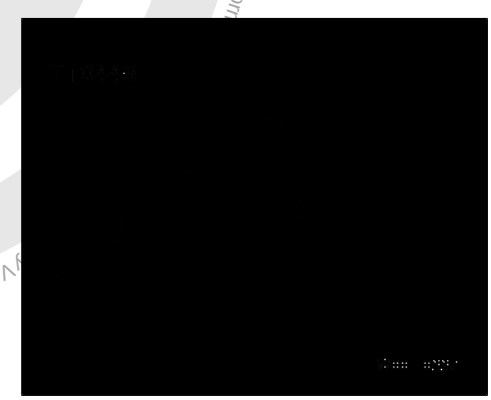


2.3 Removing and installing 4/2-way valve with thermostat

Removing

Special tools and workshop equipment required

♦ Flex-head socket wrench XZN 8 - T10445-



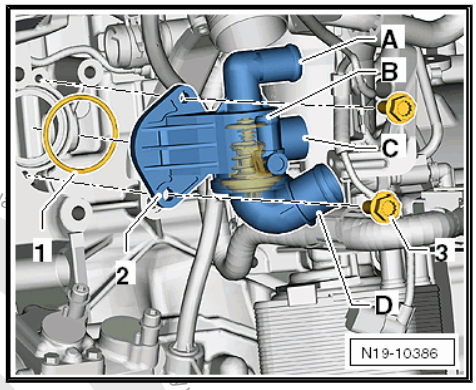
Note

The thermostat is located within the 4/2-way valve and cannot be renew individually.

– Drain coolant ⇒ page 173 .

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– Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
– Remove throttle valve module - J338- ⇒ page 248 .
– Pull coolant hoses off connections -A, B and D-.
– Release the fixing screw of the coolant pipe behind the oil filter by a few revolutions with flex-head socket wrench XZN 8 - T10445- .
– Pull coolant pipe out of connection -C-.
– Remove securing bolts -3- for 4/2-way valve -2-.
– Pull valve out of cylinder block and then to the left to subsequently separate connection -C- from coolant pipe.

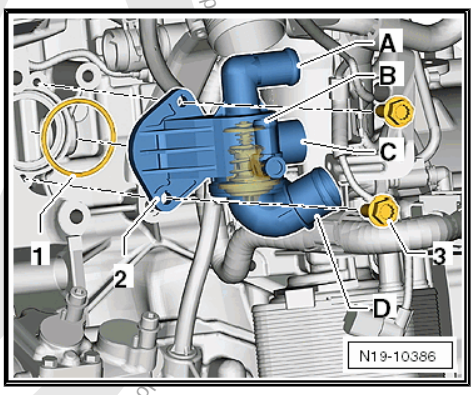


Installing

Note

Renew gaskets and seals.

– First seat 4/2-way valve with connection -C- on coolant pipe then insert into cylinder block.



– Insert securing bolts -3-, and tighten them to 15 Nm.
– Connect coolant hoses as follows:
♦ -A-: Bypass line to cylinder head
♦ -B-: Expansion tank
♦ -D-: Radiator return line
– Tighten the screw of the coolant pipe behind the oil filter with flex-head socket wrench XZN 8 - T10445- . Specified torque: 10 Nm.
– Fill cooling system ⇒ page 173 .
– Install throttle valve module - J338- ⇒ page 248 .
– Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .

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3 Coolant pipes

⇒ “3.1 Assembly overview - coolant pipes”, page 186

3.1 Assembly overview - coolant pipes

⇒ “3.1.1 Assembly overview - coolant pipes, engine side, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 186

⇒ “3.1.2 Assembly overview - coolant pipes, engine side, engine code CJAA”, page 187

⇒ “3.1.3 Assembly overview - coolant pipes, gearbox side, engine code CJAA”, page 189

3.1.1 Assembly overview - coolant pipes, engine side, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

WARNING

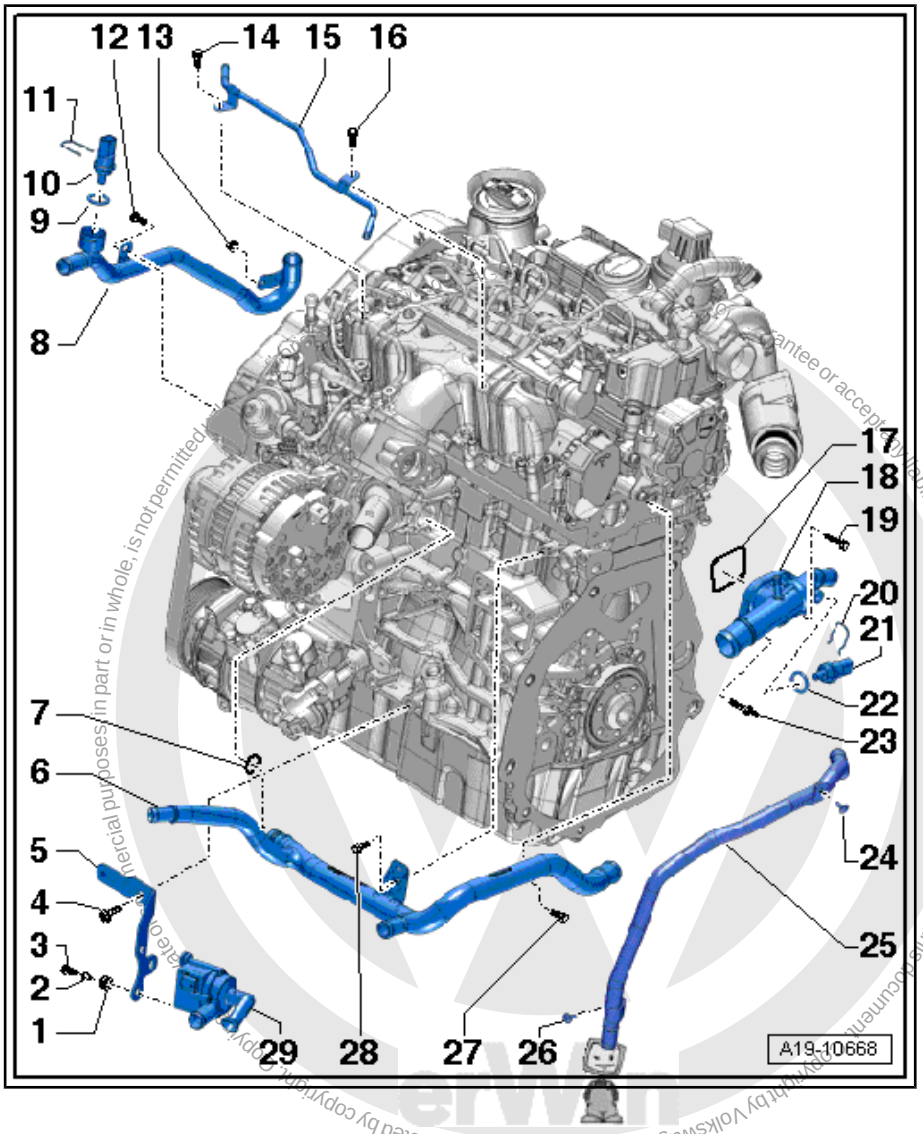
Please observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:

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).*

Test for leaks in cooling system using cooling system tester - V.A.G 1274/- and adapter for expansion tank - V.A.G 1274/8- and adapter for sealing cap - V.A.G 1274/9- .

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1 - Grommet
- ❑ Not sold separately.

2 - Sleeve
- ❑ Not sold separately.

3 - 2.7 Nm

4 - 40 Nm

5 - Holder
- ❑ For coolant circulation pump 2 - V178-

6 - Front coolant pipe

7 - O-ring
- ❑ Renew

8 - Right coolant pipe

9 - O-ring
- ❑ Renew

10 - Radiator outlet coolant temperature sender - G83-

11 - Retaining clip

12 - 9 Nm

13 - 9 Nm

14 - 9 Nm

15 - Coolant line

16 - 9 Nm

17 - Seal
- ❑ Renew

18 - Union

19 - 9 Nm

20 - Retaining clip

21 - Radiator outlet coolant - G62-

22 - O-ring
- ❑ Renew

23 - Double stud 9 Nm
- ❑

24 - 9 Nm

25 - Left coolant pipe

26 - 9 Nm

27 - 40 Nm

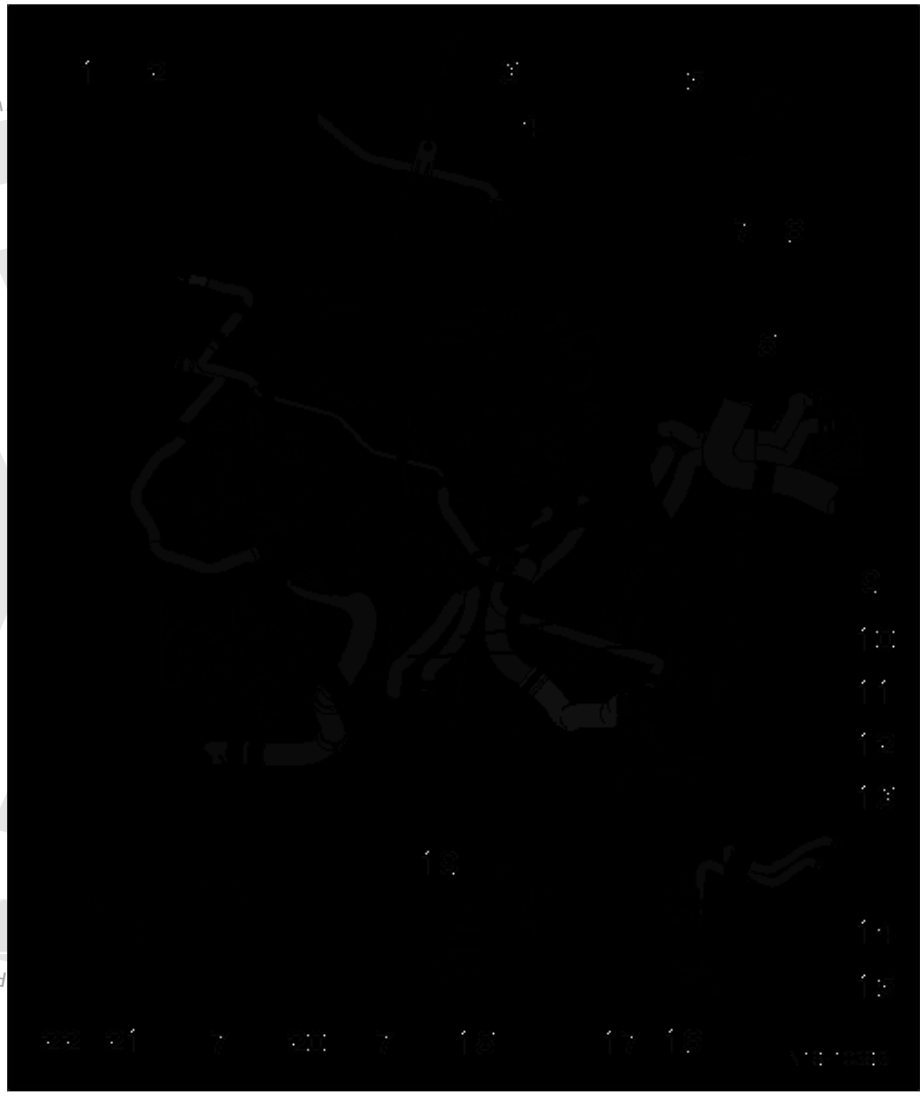
28 - 13 Nm

29 - Coolant circulation pump 2 - V178-

3.1.2 Assembly overview - coolant pipes, engine side, engine code CJAA

Connection diagram for coolant hoses ⇒ page 168

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1 - Coolant hose, bottom of expansion tank

2 - Coolant hose, top of expansion tank

3 - 10 Nm

4 - Breather pipe

5 - Radiator outlet coolant - G62-

6 - Retaining clip

7 - O-ring

- ❑ Renew

8 - Gear oil cooler

- ❑ Only vehicles with dual clutch gearbox.

9 - Coolant hose, radiator supply

- ❑ For vehicles with gear oil cooler.
- ❑ In vehicles with gear oil cooler: Coolant hose, gear oil cooler return.

10 - Coolant hose, engine oil cooler return

- ❑ Connection diagram for coolant hoses ⇒ page 168

11 - To top of radiator

12 - Bracket for wiring harness and coolant pipe

13 - Coolant hose

- ❑ To coolant pipe on cylinder block.

14 - Coolant hoses

- ❑ For gear oil cooler
- ❑ Only vehicles with dual clutch gearbox.
- ❑ Fitted depending on vehicle equipment.

15 - Coolant pipe

- ❑ Fitted depending on vehicle equipment.
- ❑ For engine preheater.
- ❑ Assembly overview ⇒ page 177

16 - Engine preheater

- ❑ Fitted depending on vehicle equipment.
- ❑ Assembly overview ⇒ page 177
- ❑ Removing and installing ⇒ page 179

17 - Engine oil cooler

18 - 4/2-way valve

- ❑ With thermostat
- ❑ Removing and installing ⇒ page 184

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19 - 15 Nm

20 - Hose to bottom of radiator

21 - Coolant pump

22 - 40 Nm

❑

3.1.3 Assembly overview - coolant pipes, gearbox side, engine code CJAA

Connection diagram for coolant hoses ⇒ page 168

1 - Coolant hose, radiator supply

2 - Coolant hose to breather pipe

3 - Coolant hose, exhaust gas recirculation cooler return

4 - Coolant hose, radiator return

5 - Coolant hose, heater heat exchanger supply

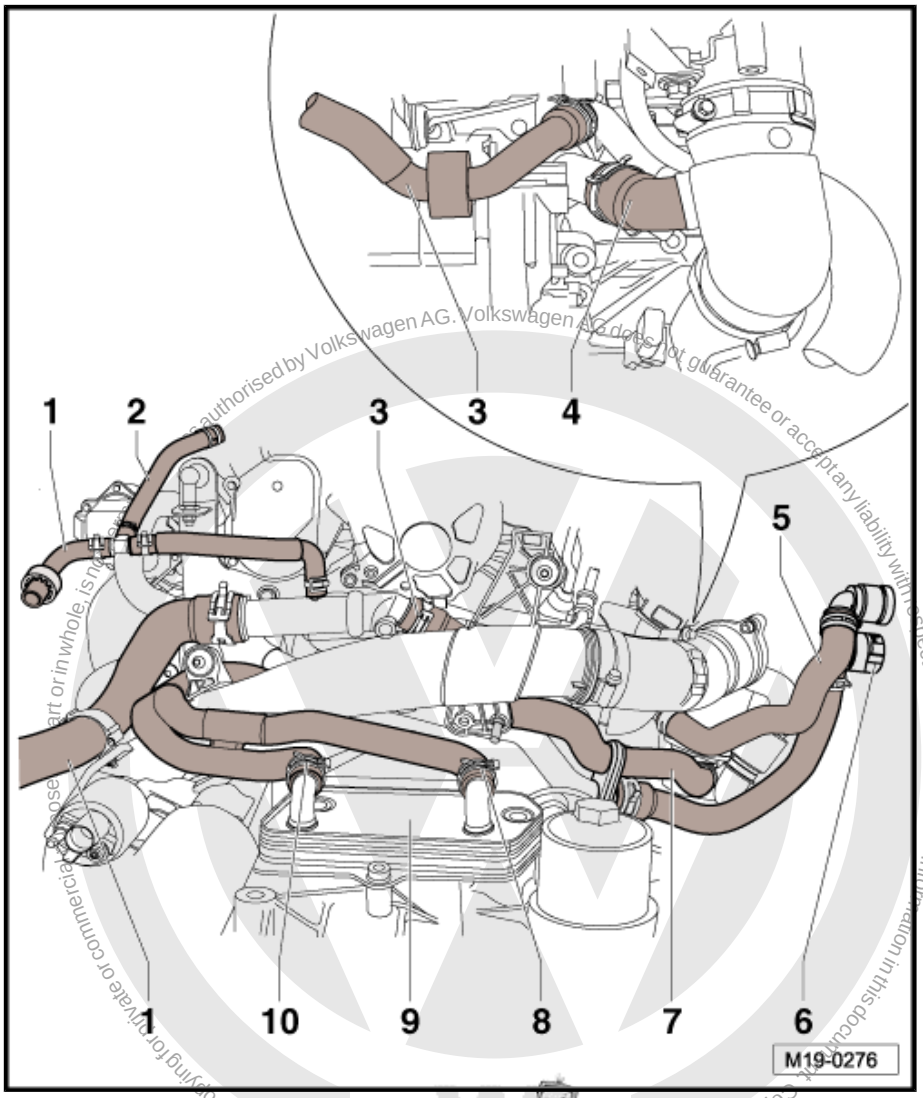
6 - Coolant hose, heater heat exchanger return

7 - Coolant hose, exhaust gas recirculation cooler supply

8 - Coolant hose, gear oil cooler supply

9 - Gear oil cooler

10 - Coolant hose, »gear oil cooler return«



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4 Radiator, radiator fan

⇒ “4.1 Assembly overview - radiator/radiator fan”, page 190

⇒ “4.2 Removing and installing radiator”, page 193

⇒ “4.3 Removing and installing radiator cowl with radiator fan”, page 194

4.1 Assembly overview - radiator/radiator fan

⇒ “4.1.1 Assembly overview - radiator/radiator fan, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 190

⇒ “4.1.2 Assembly overview - radiator/radiator fan, engine code CJAA”, page 192

4.1.1 Assembly overview - radiator/radiator fan, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

WARNING

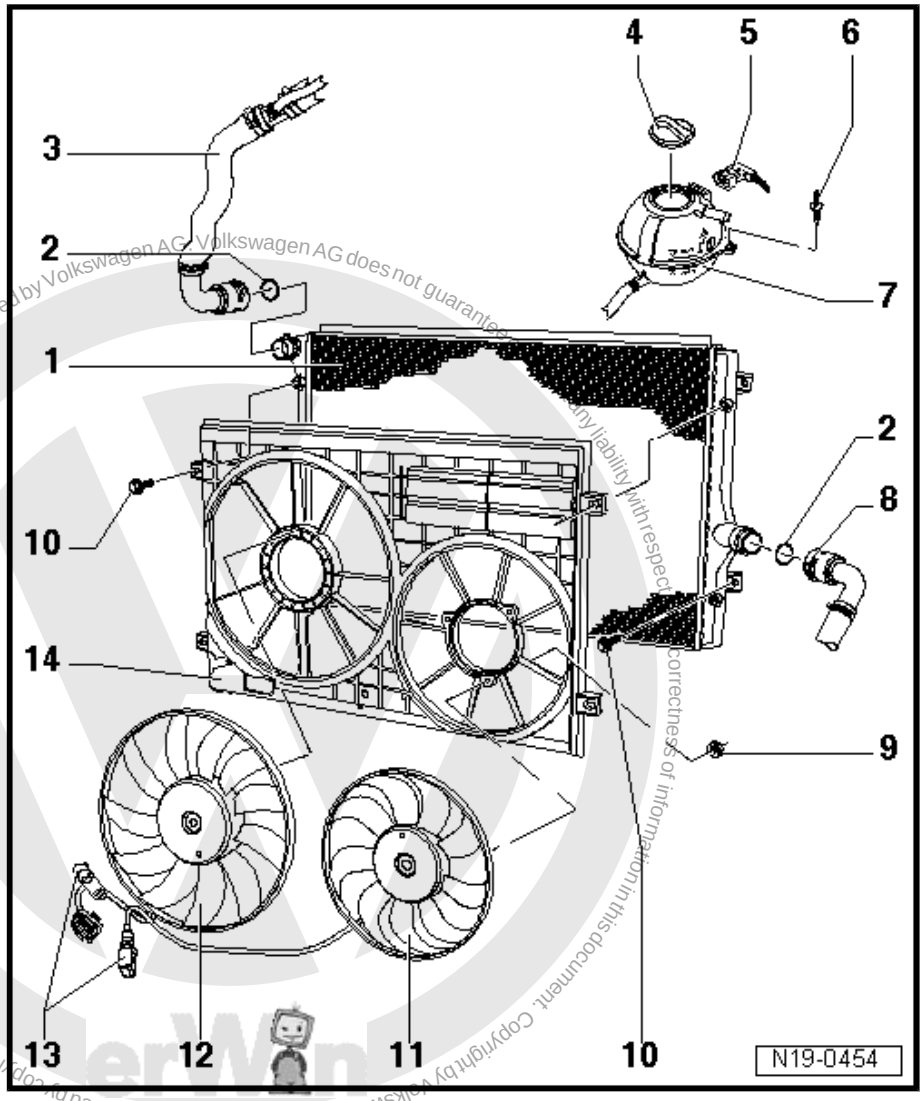
Please observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:

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).*

Test for leaks in cooling system using cooling system tester - V.A.G 1274/- and adapter for expansion tank - V.A.G 1274/8- and adapter for sealing cap - V.A.G 1274/9- .

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1 - Radiator/cooler

- ❑ Removing and installing ⇒ page 193
- ❑ After renewing, renew entire coolant.

2 - O-ring

- ❑ Renew if damaged

3 - Upper coolant hose

- ❑ Connection diagram for coolant hoses ⇒ page 166

4 - Sealing cap

- ❑ Check using cooling system tester - V.A.G 1274- and adapter - V.A.G 1274/9- ⇒ page 169 .

5 - Connector

6 - 5 Nm

7 - Expansion tank

- ❑ Checking cooling system for leaks with cooling system tester - V.A.G 1274- and adapter - V.A.G 1274/8- ⇒ page 169

8 - Lower coolant hose

- ❑ Connection diagram for coolant hoses ⇒ page 166

9 - 5 Nm

10 - 5 Nm

11 - Radiator fan - V7-

12 - Right radiator fan - V35-

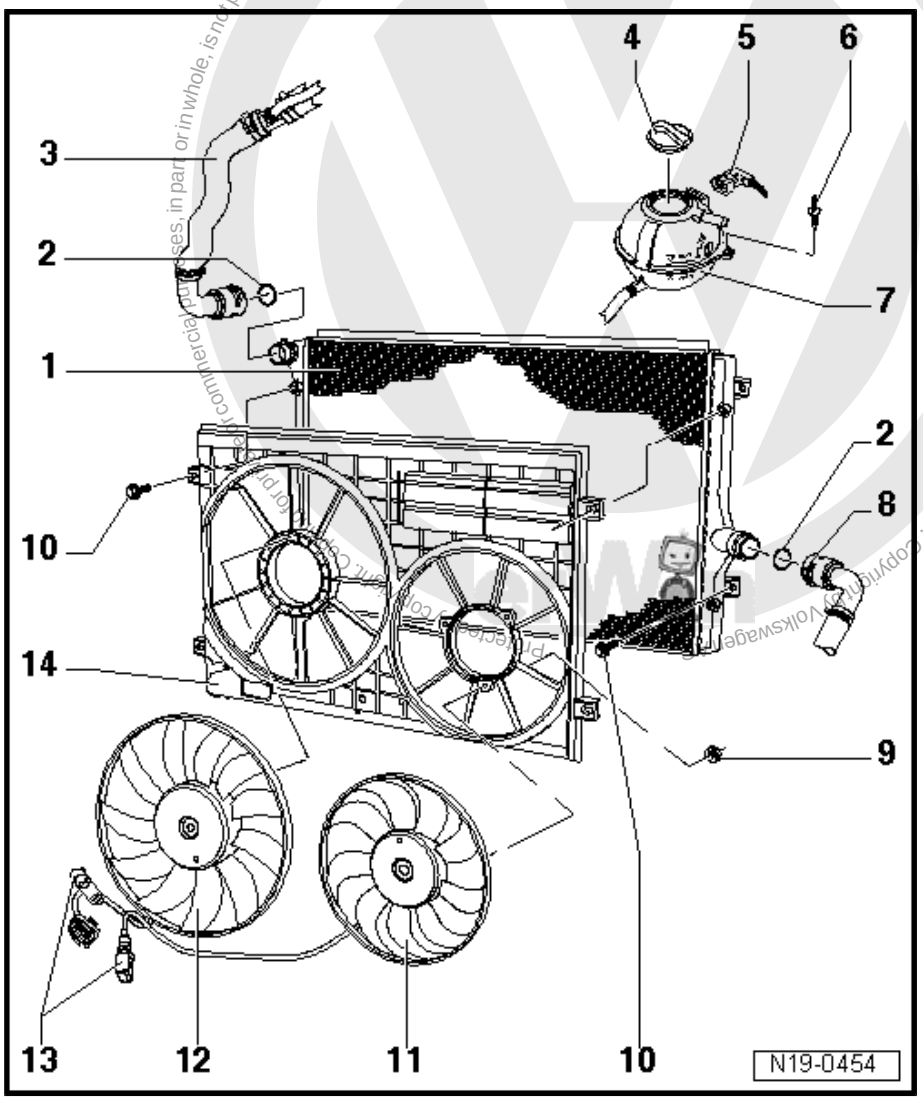
13 - Connector

14 - Radiator cowl

- ❑ Removing and installing ⇒ page 194

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4.1.2 Assembly overview - radiator/radiator fan, engine code CJAA



1 - Radiator/cooler

- ❑ Removing and installing ⇒ page 193
- ❑ After renewing, renew entire coolant.

2 - O-ring

- ❑ Renew if damaged

3 - Upper coolant hose

- ❑ Connection diagram for coolant hoses ⇒ page 168

4 - Sealing cap

- ❑ Check using cooling system tester - V.A.G 1274- and adapter - V.A.G 1274/9- ⇒ page 169 .

5 - Connector

6 - 5 Nm

7 - Expansion tank

- ❑ Checking cooling system for leaks with cooling system tester - V.A.G 1274- and adapter - V.A.G 1274/8- ⇒ page 169

8 - Lower coolant hose

- ❑ Connection diagram for coolant hoses ⇒ page 168

9 - 5 Nm

10 - 5 Nm

11 - Radiator fan - V7-

12 - Right radiator fan - V35-

13 - Connector

14 - Radiator cowl

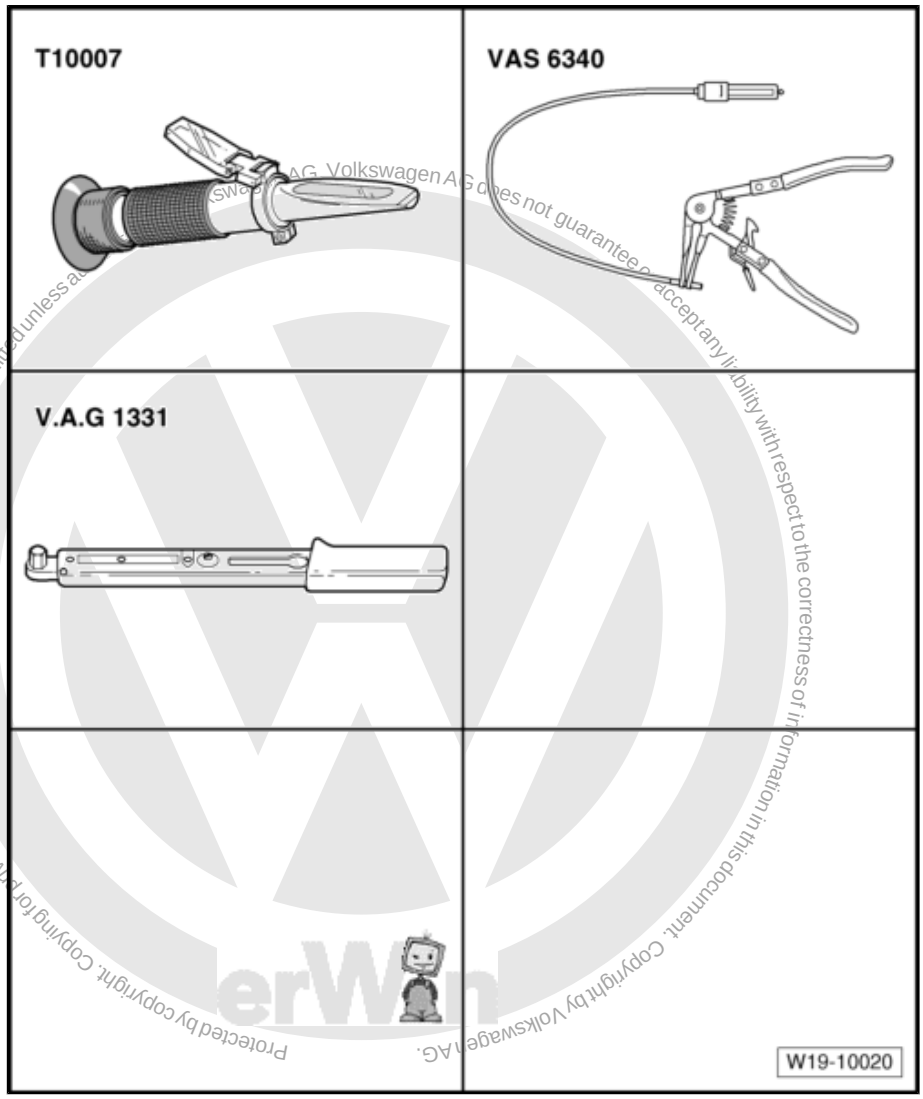
- ❑ Removing and installing ⇒ page 194

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4.2 Removing and installing radiator

Special tools and workshop equipment required

- Refractometer - T10007-
- Torque wrench - V.A.G 1331/-
- Hose clamp pliers - VAS 6340-



Removing

– Drain coolant ⇒ page 173 .
– Pull coolant hoses off radiator.
– Pull off connector for radiator fan.
– Remove radiator cowl with fans ⇒ page 194 .
– Remove radiator securing bolts ⇒ Item 10 (page 191) and remove radiator upwards.

Installing

Install in reverse order of removal, observing the following.

– Add coolant ⇒ page 173 .

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4.3 Removing and installing radiator cowl with radiator fan

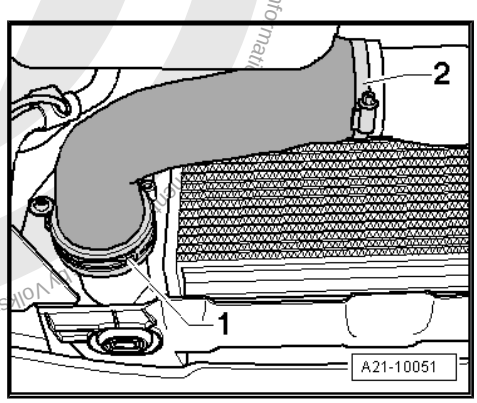
Removing

– Remove upper securing bolts -upper arrows- of radiator cowl.



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

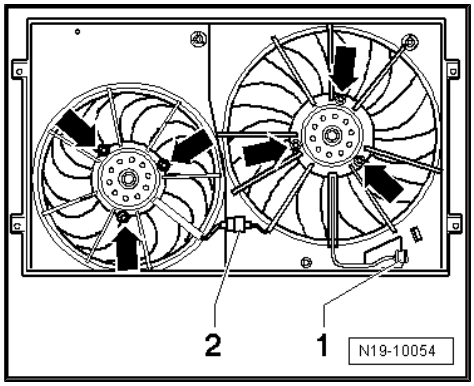
– Remove connecting hose on »hot side« from charge air pipe. To do this, release hose clip -2- and raise retaining clip -1-.



– Separate connector -1-.
– Remove lower bolts -lower arrows-.
– Remove radiator cowl with radiator fans upwards.



– Separate connection -1- and (if fitted) -2-, then free wiring.
– Unscrew nuts -arrows- and remove radiator fan.



Installing

Install in reverse order of removal.

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21 – Turbocharging/supercharging

1 Exhaust turbocharger

⇒ “2 Safety information”, page 3

⇒ “3.1 Rules for cleanliness”, page 6

⇒ “1.1 Assembly overview - turbocharger”, page 195

⇒ “1.2 Removing and installing turbocharger”, page 201

⇒ “1.3 Renewing vacuum unit for turbocharger”, page 205

1.1 Assembly overview - turbocharger

⇒ “1.1.1 Assembly overview - turbocharger, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 195

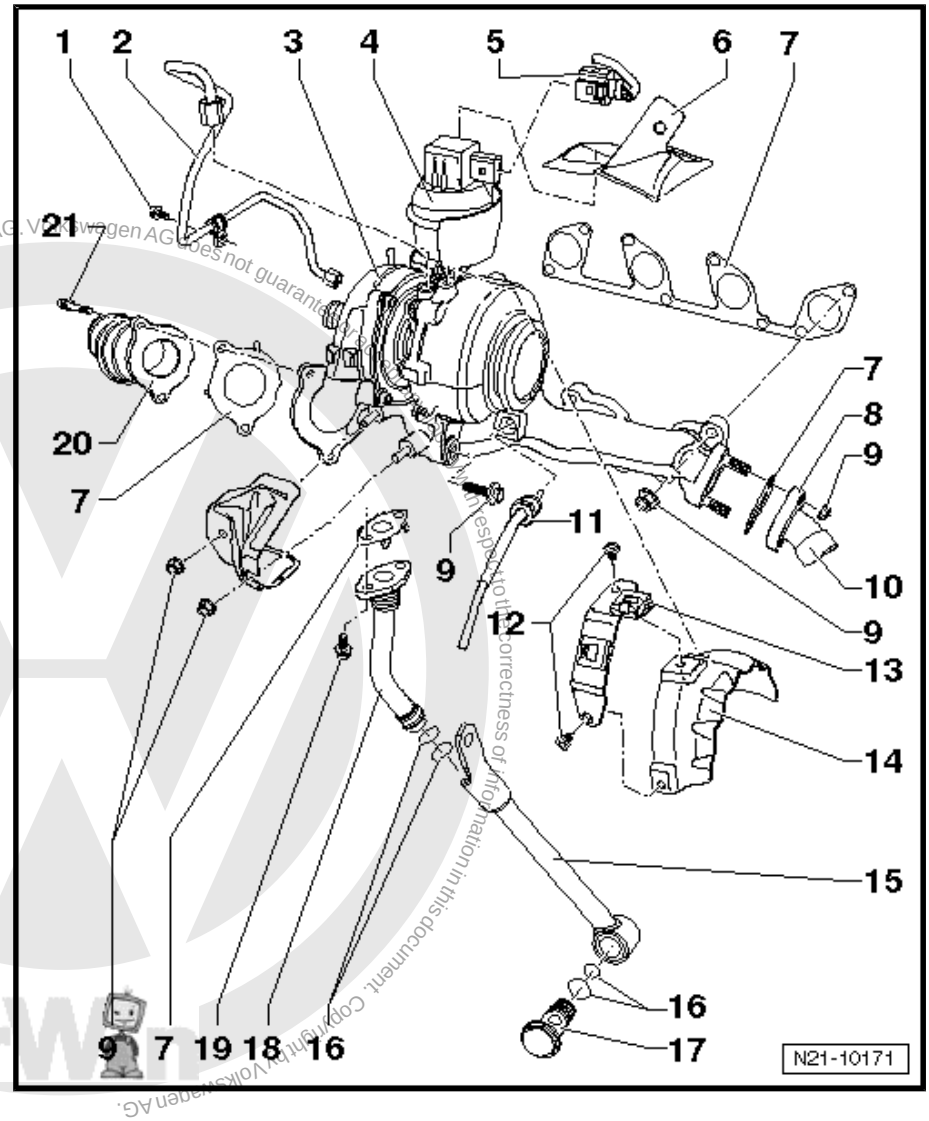
⇒ “1.1.2 Assembly overview - turbocharger, engine code CJAA”, page 197

1.1.1 Assembly overview - turbocharger, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

Note

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

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1 - 10 Nm

2 - Oil supply line

- ❑ Removing and installing ⇒ page 150
- ❑ Before installing oil supply line, ensure that it is not blocked.
- ❑ Before installing, fill turbocharger with engine oil through oil supply line connection.

3 - Exhaust turbocharger

- ❑ Can only be renewed together with exhaust manifold and vacuum unit.
- ❑ Removing and installing ⇒ page 201

4 - Pressure canister

- ❑ With position sender for charge pressure positioner - G581- .

5 - Connector

- ❑ To position sender for charge pressure positioner - G581- .

6 - Heat protection

- ❑ Renew if damaged

7 - Seal

- ❑ Renew

8 - Connecting pipe

- ❑ To exhaust gas recirculation cooler.

9 - 20 Nm

10 - Flexible joint

- ❑ Do not bend or stretch.

11 - Exhaust gas temperature sender 1 - G235-

- ❑ 45 Nm
- ❑ Remove and install with 17 mm tool set - T10395- .
- ❑ Lubricate thread of sender using high-temperature paste - G 052 112 A3-
- ❑ Note installation position ⇒ page 197

12 - 10 Nm

13 - Holder

- ❑ For oil supply line.

14 - Heat shield

15 - Support

- ❑ Between turbocharger and cylinder block.

16 - Sealing ring

- ❑ Renew

17 - Banjo bolt, 60 Nm

- ❑ Renew

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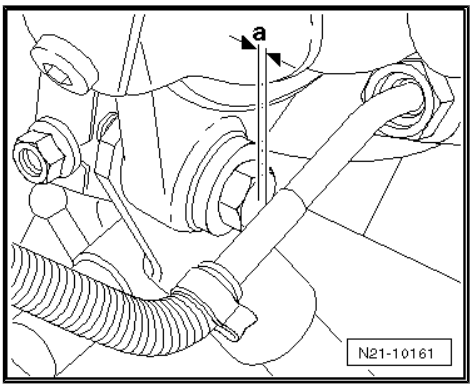
18 - Oil return pipe

19 - 15 Nm

20 - Pulsation damper

21 - 10 Nm

Installation position of exhaust gas temperature sender with angled cable guide



Note

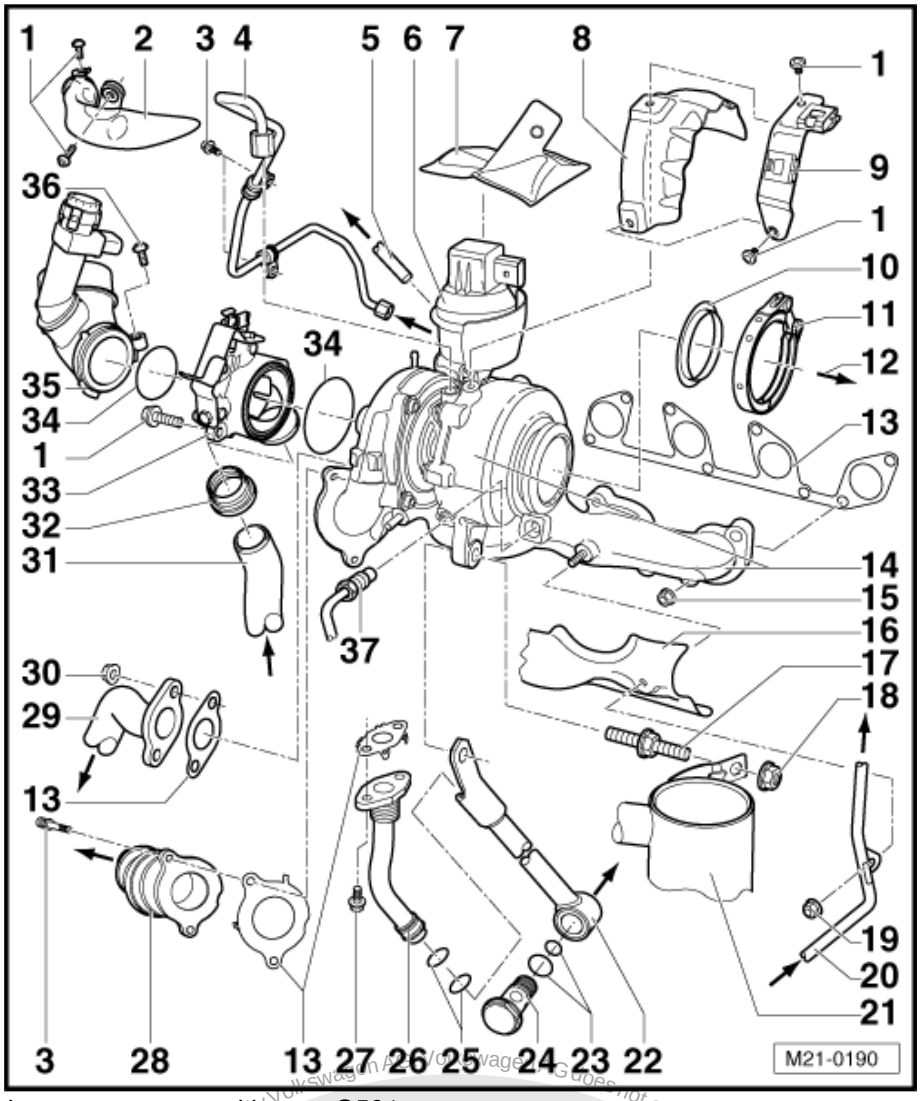
When installing the exhaust temperature sender with angled cable guide, adhere to dimension -a- of 3 … 5 mm from the turbocharger support threaded connection.

1.1.2 Assembly overview - turbocharger, engine code CJAA

Note

Assembly overview - particulate filter with NOx storage catalytic converter ⇒ page 299 .

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1 - 8 Nm

2 - Warm air collector plate

- To connecting hose for warm air collection on air filter ⇒ Item 12 (page 242) .

3 - 10 Nm

4 - Oil supply line, 22 Nm

- Do not attempt to bend oil supply line to a different shape.
- Install so that component is not under tension
- From oil filter bracket
- Removing and installing ⇒ page 150
- Before installing oil supply line, ensure that it is not blocked.
- Before screwing on oil supply line, fill turbocharger at union with engine oil.

5 - Vacuum hose

- Ensure seated securely and routed free of kinks.
- To charge pressure control solenoid valve - N75- .
- Vacuum hose connection diagram ⇒ page 236

6 - Pressure canister

- With position sender for charge pressure positioner - G581- .
- One unit with turbocharger and exhaust manifold (cannot be replaced individually).

7 - Heat insulation

- Renew if damaged

8 - Heat shield

9 - Holder

- For wiring harness

10 - Sealing ring

- Renew

11 - Securing clamp, 7 Nm

- Renew
- Note installation position ⇒ page 299

12 - To particulate filter

- ⇒ page 299

13 - Seal

- Renew
- Observe installation position

14 - Exhaust turbocharger

- One unit with exhaust manifold and vacuum unit (cannot be replaced individually).

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- ❑ Removing and installing ⇒ page 203

15 - 23 Nm

- ❑ Renew
- ❑ Grease exhaust manifold studs with high-temperature paste - G 052 112 A3- .

16 - Heat shield

17 - Hex stud, 20 Nm

18 - 23 Nm

- ❑ Screwed to hexagon drive stud ⇒ Item 17 (page 199) on turbocharger.

19 - 23 Nm

- ❑ Secured with heat shield ⇒ Item 16 (page 199) on exhaust manifold.

20 - Control line, 23 Nm

- ❑ Do not attempt to bend control line to a different shape.
- ❑ Between exhaust gas recirculation housing ⇒ Item 16 (page 347) and exhaust gas pressure sensor 2 - G451- ⇒ Item 1 (page 302)
- ❑ To loosen at housing ⇒ Item 16 (page 347) , remove filter for exhaust gas recirculation ⇒ Item 9 (page 346) .
- ❑ Install so that component is not under tension

21 - Filter

- ❑ For exhaust gas recirculation
- ❑ ⇒ Item 9 (page 346)

22 - Support

- ❑ For turbocharger

23 - Sealing ring

- ❑ Renew

24 - Banjo bolt, 60 Nm

- ❑ Renew

25 - O-ring

- ❑ Renew

26 - Oil return pipe

- ❑ Install so that component is not under tension

27 - 15 Nm

28 - Pulsation damper

- ❑ To connecting hose, »hot« side uppermost ⇒ Item 13 (page 214) .

29 - Connecting pipe

Caution

Ensure that flexible joint of connecting pipe is not bent and thus stretched. There is a danger of cracking.

- ❑ Between exhaust manifold and intake manifold.
- ❑ Renew
- ❑ Install so that component is not under tension

30 - 20 Nm

- ❑ Grease exhaust manifold studs with high-temperature paste - G 052 112 A3- .

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31 - Connecting pipe

- ❑ From exhaust gas recirculation housing ⇒ Item 2 (page 346) .
- ❑ To remove and install, additionally loosen connections ⇒ Item 33 (page 200) on turbocharger.

32 - Sealing ring

- ❑ Renew if damaged

33 - Union

34 - O-ring

- ❑ Renew if damaged

35 - Intake connecting pipe

- ❑ Ensure firm seating.
- ❑ Clean if soiled.
- ❑ From intake hose on air filter ⇒ Item 1 (page 242) .
- ❑ With heater element for crankcase breather .

Removing:

– Pull crankcase breather hose off intake connecting pipe.

Note

Crankcase breather hose is destroyed during removal.

– Remove securing bolt ⇒ Item 36 (page 200) .

– Turn intake connecting pipe clockwise and pull off connection ⇒ Item 33 (page 200) .

Installing:

– Clean intake connecting pipe, it must be free of oil and grease.

– Slide intake connecting pipe onto connection ⇒ Item 33 (page 200) and turn anti-clockwise until it engages in connection.

– Tighten securing bolt ⇒ Item 36 (page 200) .

– Install new crankcase breather hose.

36 - 8 Nm

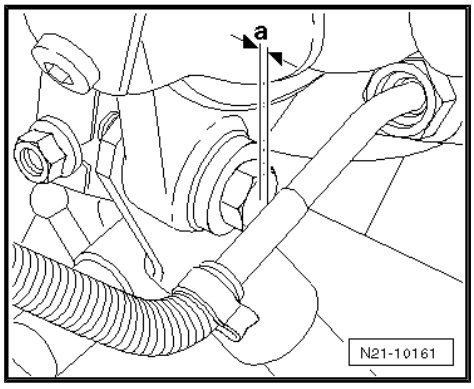
37 - Exhaust gas temperature sender 1 - G235- 45 Nm

- ❑ Note installation position ⇒ page 200
- ❑ Grease only thread with high-temperature paste - G 052 112 A3- .

Installation position of exhaust gas temperature sender with angled cable guide

Note

When installing the exhaust temperature sender with angled cable guide, adhere to dimension -a- of 3 … 5 mm from the turbocharger support threaded connection.



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1.2 Removing and installing turbocharger

⇒ "1.2.1 Removing and installing turbocharger, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA", page 201

⇒ "1.2.2 Removing and installing turbocharger, engine code CJAA", page 203

1.2.1 Removing and installing turbocharger, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

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:

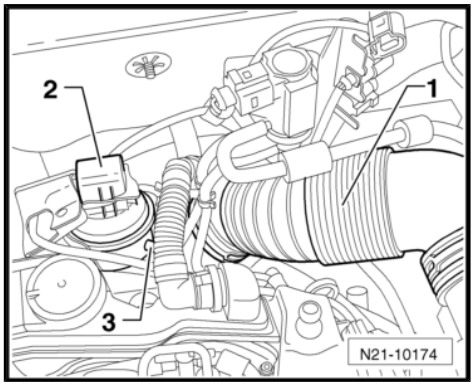
- *Check air filter housing, air filter element and intake hoses for soiling.*
- *Check complete charged air routing and charge air cooler for foreign objects.*

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.

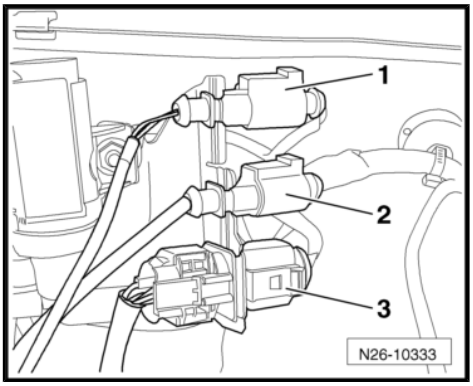
Removing

– Remove intake pipe -1- and disconnect connector of position sender for charge pressure positioner - G581- -2- from turbocharger.

– Pull vacuum line -3- off turbocharger.

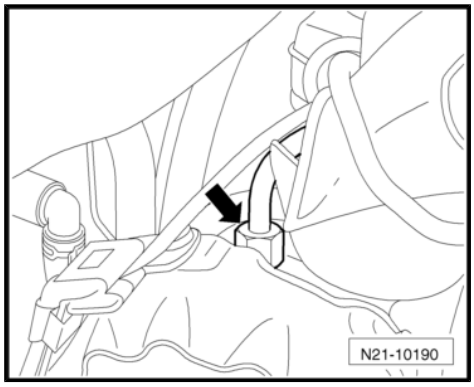


– Disconnect connector for exhaust gas temperature sender 1 - G235- -1- from plenum chamber bulkhead and guide wire out of retainers.

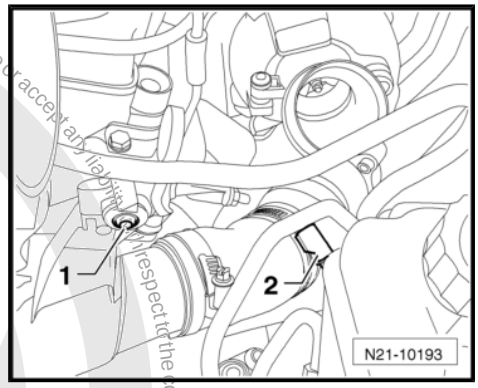


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– Unscrew oil supply line -arrow- from turbocharger.

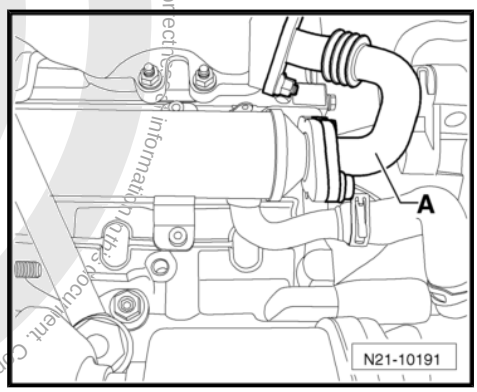


– Remove securing bolt -1- from charge air pipe, loosen clamp -2- and pull off connecting hose at turbocharger as far as it will go.



– Remove particulate filter ⇒ page 310 .

– Remove connecting pipe -A- to exhaust gas recirculation cooler.



Caution

Exhaust gas temperature sender 1 - G235- conceals the upper bolt of the exhaust gas turbocharger support. The temperature sender must not be bent. It must therefore be removed.

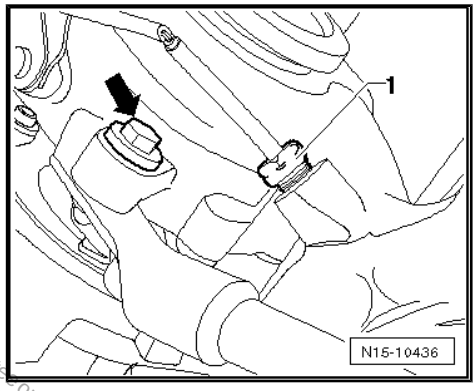
– Remove exhaust gas temperature sender 1 - G235- .

– Pull right axle shaft off bevel box ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Remove banjo bolt ⇒ Item 17 (page 196) of turbocharger support.

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– Unscrew upper bolt -arrow- from support on turbocharger.
– Turn lower part of support 90° and pull support downwards off upper part.
– Remove heat shield from exhaust manifold.
– Unscrew securing nuts for exhaust manifold.
– Take off turbocharger, turn it so that intake side faces downwards and remove turbocharger downwards.



Installing

Caution

Before installing, check whether decoupling element of oil return line is bent and thus stretched. If this is the case, micro-fractures may have been caused and this will cause leaks. If necessary, renew oil return line before installing turbocharger.

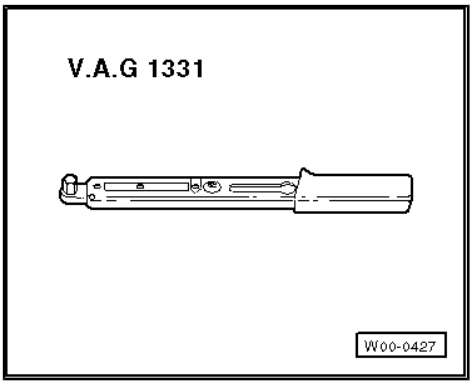
– Install in reverse order of removal. During this step, observe the following:

♦ Fit turbocharger with pressure side facing upwards.
♦ Position connecting hose of charge air pipe before bolting on turbocharger.
♦ Note installation position of exhaust temperature sender 1 - G235- ⇒ page 197 .
♦ Renew banjo bolt for turbocharger support and O-rings for oil return line.
♦ Do not overstretch decoupling element of oil return line when installing turbocharger support.

1.2.2 Removing and installing turbocharger, engine code CJAA

Special tools and workshop equipment required

♦ Torque wrench - V.A.G 1331-



Caution

♦ ***Observe safety precautions when working on charge air system and turbocharger*** ***⇒ page 3*** ***.***
♦ ***Observe rules for cleanliness*** ***⇒ page 6*** ***.***

These instructions must always be complied with before and during work!

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Removing

Caution

When a mechanical fault is found on the turbocharger, e.g. a destroyed compressor wheel, it is not sufficient to renew the turbocharger only. To prevent this from causing further damage, perform the following repairs:

Check air filter housing, air filter element and intake hoses for soiling ⇒ page 241 , Assembly overview - air filter.

If foreign objects are found in the charge air system:

- *Check complete charged air routing and charge air cooler for foreign objects ⇒ page 213 , Assembly overview - parts of charge air cooling.*
- *Renew connecting pipe between exhaust manifold and intake manifold ⇒ Item 29 (page 199) .*
- *Clean complete charged air routing and if necessary, renew charge air cooler.*
- *Check housing and cooler for exhaust gas recirculation for foreign objects ⇒ page 344 , Assembly overview - parts of exhaust gas recirculation system.*
- *Check oil lines on turbocharger for soiling and foreign objects ⇒ page 197 , Assembly overview - turbocharger with exhaust manifold and attachments.*

– Remove particulate filter with NOx storage catalytic converter ⇒ page 310 .

Caution

Exhaust gas temperature sender 1 - G235- conceals the upper bolt of the exhaust gas turbocharger support. It must not be bent. It must therefore be removed.

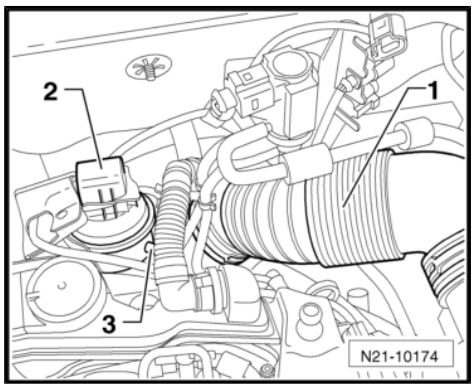
– Remove exhaust gas temperature sender 1 - G235- .

– Remove control line between exhaust gas recirculation housing and exhaust gas pressure sensor 2 - G451- ⇒ Item 8 (page 346) .

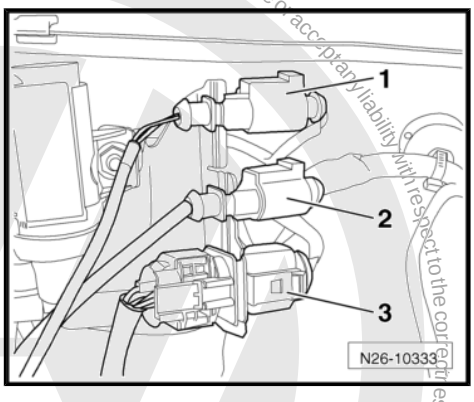
– Remove housing with cooler for exhaust gas recirculation ⇒ page 344 , Assembly overview - parts of exhaust gas recirculation system.

– Pull off connector for position sender for charge pressure positioner - G581- -2- at vacuum unit.

– Pull vacuum hose -3- off turbocharger vacuum unit.



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- Disconnect »black« connector for exhaust temperature sender 1 - G235- -2- at plenum chamber bulkhead.
- Guide lines out of retainers on plenum chamber bulkhead and on turbocharger.
- Remove connecting pipe ⇒ Item 31 (page 200) .
- Remove oil supply line ⇒ page 150 .
- Remove banjo bolt ⇒ Item 17 (page 196) of turbocharger support.
- Unscrew hexagon drive stud ⇒ Item 17 (page 199) from support on turbocharger.
- Turn lower part of support 90° and pull support downwards off upper part.
- Remove heat shield ⇒ Item 16 (page 199) from exhaust manifold.
- Unscrew securing nuts ⇒ Item 15 (page 199) for exhaust manifold.
- Remove turbocharger with exhaust manifold from cylinder head, turning so that intake side points down. Remove turbocharger and exhaust manifold downwards.

Installing

Caution

Before installing, check whether decoupling element of oil return pipe is bent and thus stretched. If this is the case, micro-fractures may have been caused and this will cause leaks. If necessary, renew oil return pipe before installing turbocharger.

Install in reverse order of removal. During this step, observe the following:

- Renew self-locking nuts, seals, gaskets and securing clamps.
- Fit turbocharger with pressure side facing upwards.
- Position connecting hose of charge air pipe before bolting on turbocharger.
- Note installation position of exhaust gas temperature sender 1 - G235- ⇒ page 200 .
- Renew turbocharger support banjo bolt along with seals and O-rings for oil return pipe.
- Do not overstretch decoupling element of oil return pipe when installing turbocharger support.

1.3 Renewing vacuum unit for turbocharger

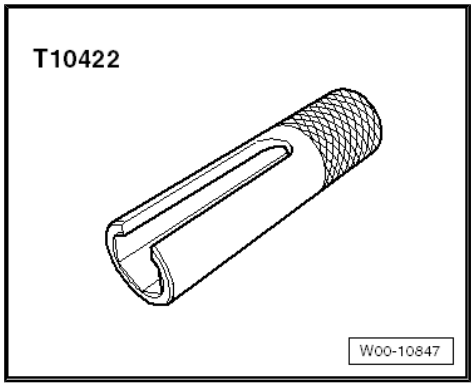
Note

Socket 10 mm - T10422 A- replaces the previous socket 10 mm - T10422- . Existing sockets without the suffix »A« may continue to be used. However, socket 10 mm - T10422 A- must always be used for engine code CJAA.

Special tools and workshop equipment required

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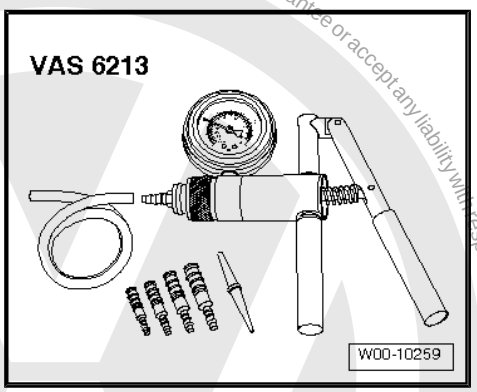
- Socket 10 mm - T10422- or socket 10 mm - T10422 A-



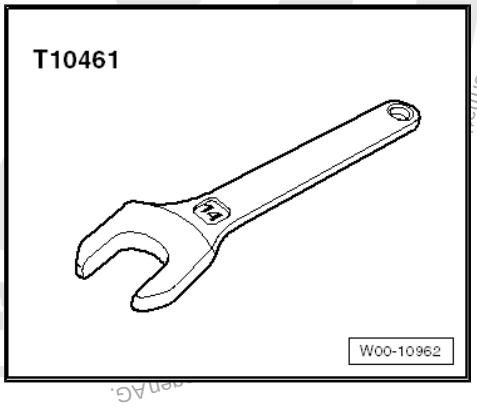
- Ring spanner - T10423-



- Hand operated vacuum pump - VAS 6213-



- Open-end spanner, 14 mm - T10461-



- Vehicle diagnostic tester

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Caution

The special tools indicated, in particular socket 10 mm - T10422- or socket 10 mm - T10422 A- . are designed solely to be used in accordance with the following procedures and must not be used for other threaded connections. There is a danger of deformation if high torques are applied.

Note

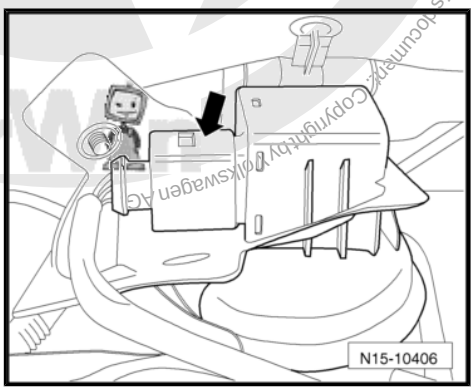
In order to change the vacuum unit with position sender for charge pressure positioner, - G581- a spare-parts kit is available ⇒ ETKA (Electronic Parts Catalogue) .

Removing

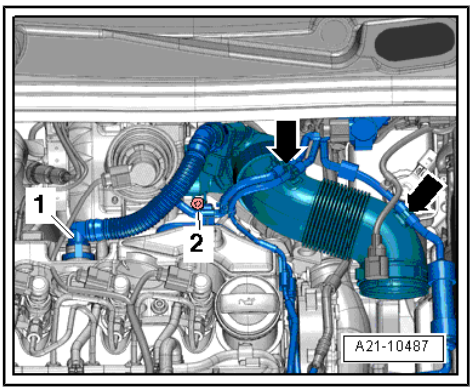
– Remove air filter housing with air mass meter and connecting pipe ⇒ page 241 .

– Open heat-protection mat and disconnect electrical connector -arrow- at position sender for charge pressure positioner - G581- .

– Remove crankcase breather connecting pipe-1- from cylinder head cover; press release buttons to do this.



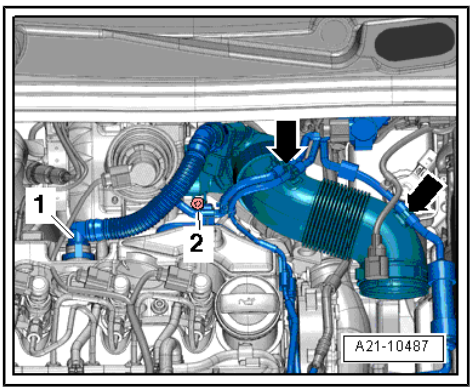
– Move clear vacuum hoses -arrows-.



– Unscrew bolt -2- (captive), swing air pipe with inlet connection to rear and pull off from turbocharger.

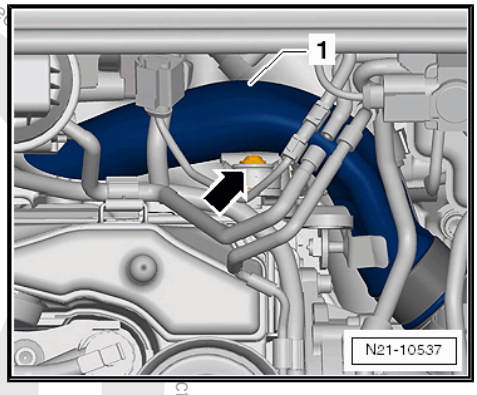
– Seal opening in turbocharger with the sealing cap from the spare-parts kit.

Engine code CJAA



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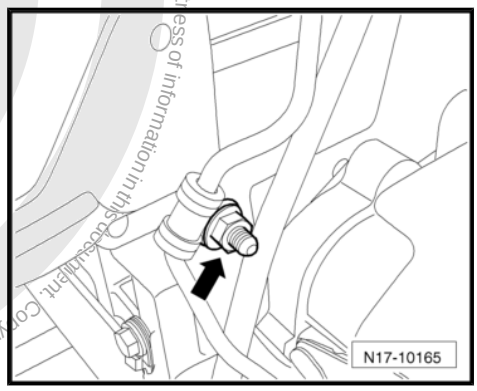
– Remove bolt -arrow- and remove hot air intake -1-.



Continued for all vehicles

– Pull off vacuum line at turbocharger.

– Unscrew securing nut -arrow- where the oil supply line/vacuum line is connected to the cylinder head.

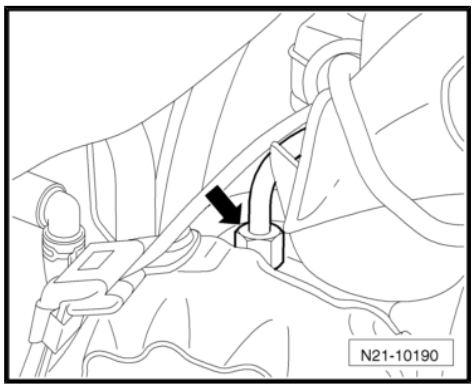


Caution

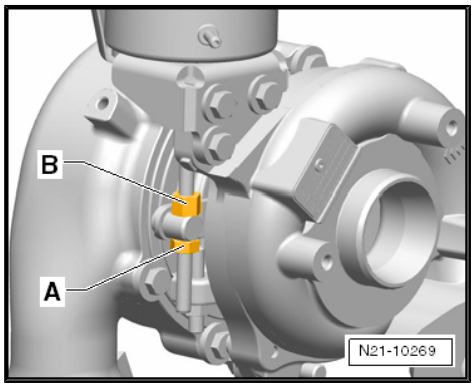
When detaching the oil supply line, counterhold the connection. Risk of damage as a consequence!

– Counterhold connecting pieces with open-end spanner - T10461- and unscrew oil supply line -arrow- from turbocharger.

– Seal oil supply opening in turbocharger with the plug from the spare-parts kit.

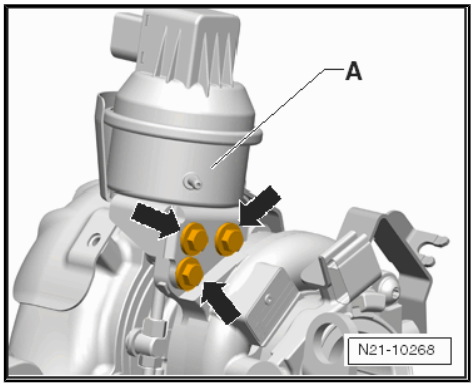


– Counterhold lock nut -B- with ring spanner - T10423- and unscrew securing nut -A- from the control rod using socket 10 mm - T10422- or socket 10 mm - T10422 A- .



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– Unscrew securing bolts of the vacuum unit -arrows- and remove the vacuum unit -A-.



Installing

Caution

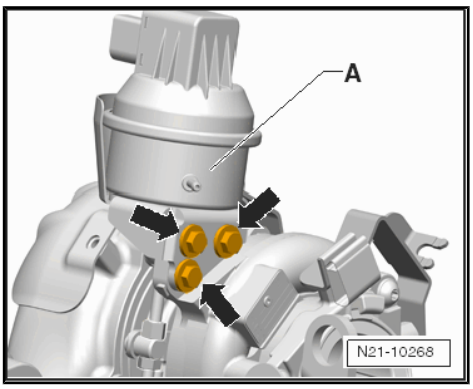
Only use new bolts and nuts from the spare-parts kit!

– If necessary, remove lower securing nut of the control rod from the new vacuum unit.

– Screw locknut by hand onto the control rod as far as possible in the direction of the vacuum unit.

– Push control rod through the adjusting lever, fit vacuum unit -A- and tighten fastening bolt.

– Tighten securing bolts -arrows- to 8 Nm.



Note

Make sure that the guiding element moves easily along the control rod.

– Connect hand vacuum pump - VAS 6213- to vacuum unit.

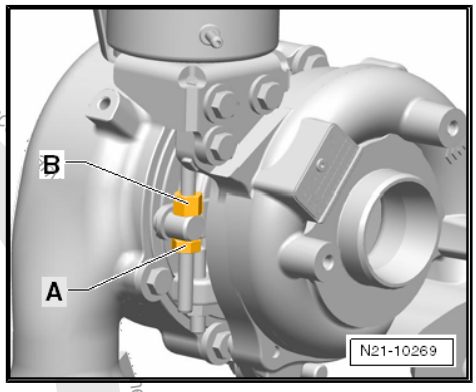
Note

Because of its high degree of alloying, the securing nut is not magnetic. A magnet can be used for support.

– Fit securing nut by hand -A-.

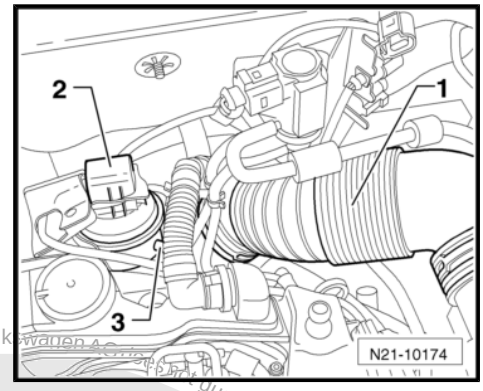
– Allow partial vacuum to escape from the vacuum unit.

– Remove protective cap, fit oil supply line to turbocharger and tighten to 22 Nm.



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the correctness of information in this document.

– Connect connector -2- to the position sender for the charge pressure positioner - G581- and close the heat protection mat.
– Connect vehicle diagnostic tester .



Select operating mode:

– Click the “Vehicle self-diagnosis” button on the display.

Select vehicle system:

– Click the “01 - Engine electronics” button on the display.

The display indicates the control unit identification and the coding of the engine control unit.

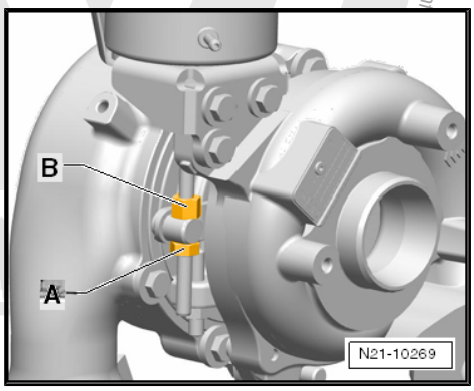
Selecting diagnostic function:

– Click the “011 - Measured values” button on the display.
– Use the numeric keypad to enter the block of measured values “120” and acknowledge entry with the “Q” key.
– Connect hand vacuum pump - VAS 6213- to vacuum unit.
– Observe the lowest value of the measured value block and set a voltage of 0.760 V by causing a partial vacuum.

Caution

During the following procedure for adjusting the control rod, keep the partial vacuum and thus the voltage of 0.760 V constant.

– Slowly screw locknut -B- of control rod downwards by hand. Adjusting lever is resting on the lower »stop«.
– Counterhold locknut -B- and screw securing nut -A- onto control rod towards adjusting lever. Tighten slightly with a ring spanner - T10423- .
– Allow partial vacuum to escape from the vacuum unit.
– Observe the lowest value of the measured value block. At no pressure the value should be 3.30 to 3.90 V.
– Fit socket 10 mm - T10422- or socket 10 mm - T10422 A- . Counterhold lock nut -B- with ring spanner - T10423- and tighten securing nut -A-.



Caution

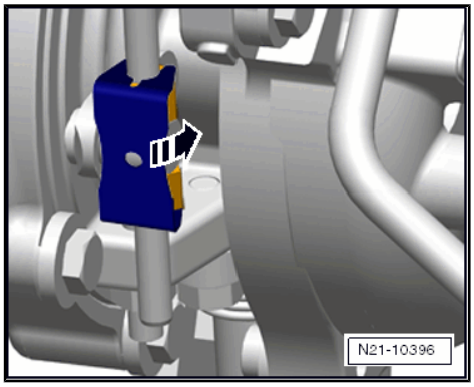
Cause a partial vacuum of 0.75 ± 0.05 bar to act on the vacuum unit to ensure that the adjusting lever rests against the »stop«. When this is done, the voltage should automatically be set to 0.760 V.

Voltage OK.

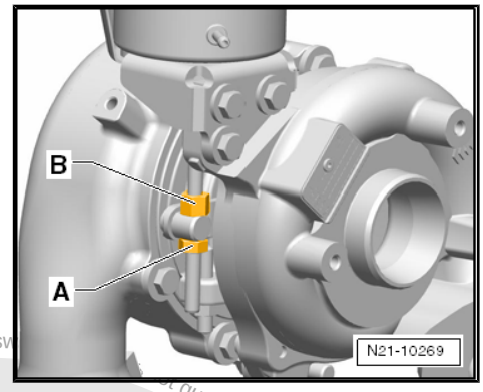
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– Press locking plate by hand onto the control rod and, if possible, turn 90° in the -direction of the arrow-.
– Seal connection between control rod and securing nut with sealing paint from the spare-parts kit.

Voltage not OK.

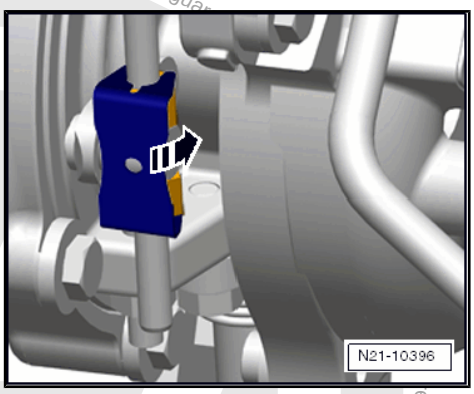


– Counterhold locknut -B-, undo securing nut -A- of the control rod and correct the voltage by turning the locknut -B-.
– Counterhold lock nut -B-, turn securing nut -A- in opposite direction and tighten it with socket 10 mm - T10422- or socket 10 mm - T10422 A- .



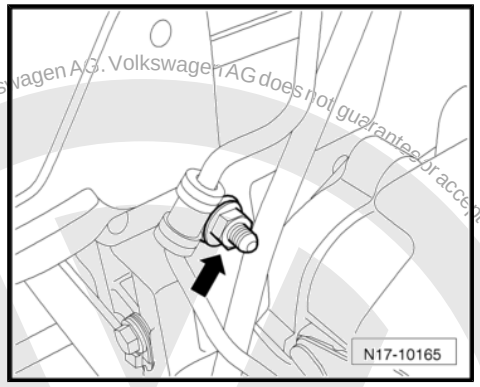
– Press locking plate by hand onto the control rod and, if possible, turn 90° in the -direction of the arrow-.
– Seal connection between control rod and securing nut with sealing paint from the spare-parts kit.

Continuation



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ectness of information in this document.

– Fit securing nut -arrow- connecting the oil supply line/vacuum line to the cylinder head and tighten it.
– Remove sealing cap from turbocharger.
– Re-install all engine components.
– Start engine, and clear event memory ⇒ Vehicle diagnostic tester.
– Check setting as follows:



Selecting diagnostic function:

– Click the button “006 - Basic setting” on the display.
– Use the numeric keypad to enter the block of measured values “120” and acknowledge entry with the “Q” key.
– Click the “Activate” button in the lower half of the screen.
– Observe value in lower part of screen. It must fluctuate between 0.65 to 0.85 V and 3.30 to 3.90 V (vacuum unit travels to both end stops alternately).

If voltage values are OK:

– End basic setting procedure.

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2 Charge air system

⇒ “2 Safety information”, page 3

⇒ “3.1 Rules for cleanliness”, page 6

⇒ “2.1 Assembly overview - charge air system”, page 213

⇒ “2.2 Assembly overview - charge-air hose connections”, page 215

⇒ “2.3 Checking charge air system for leaks”, page 216

2.1 Assembly overview - charge air system

Note

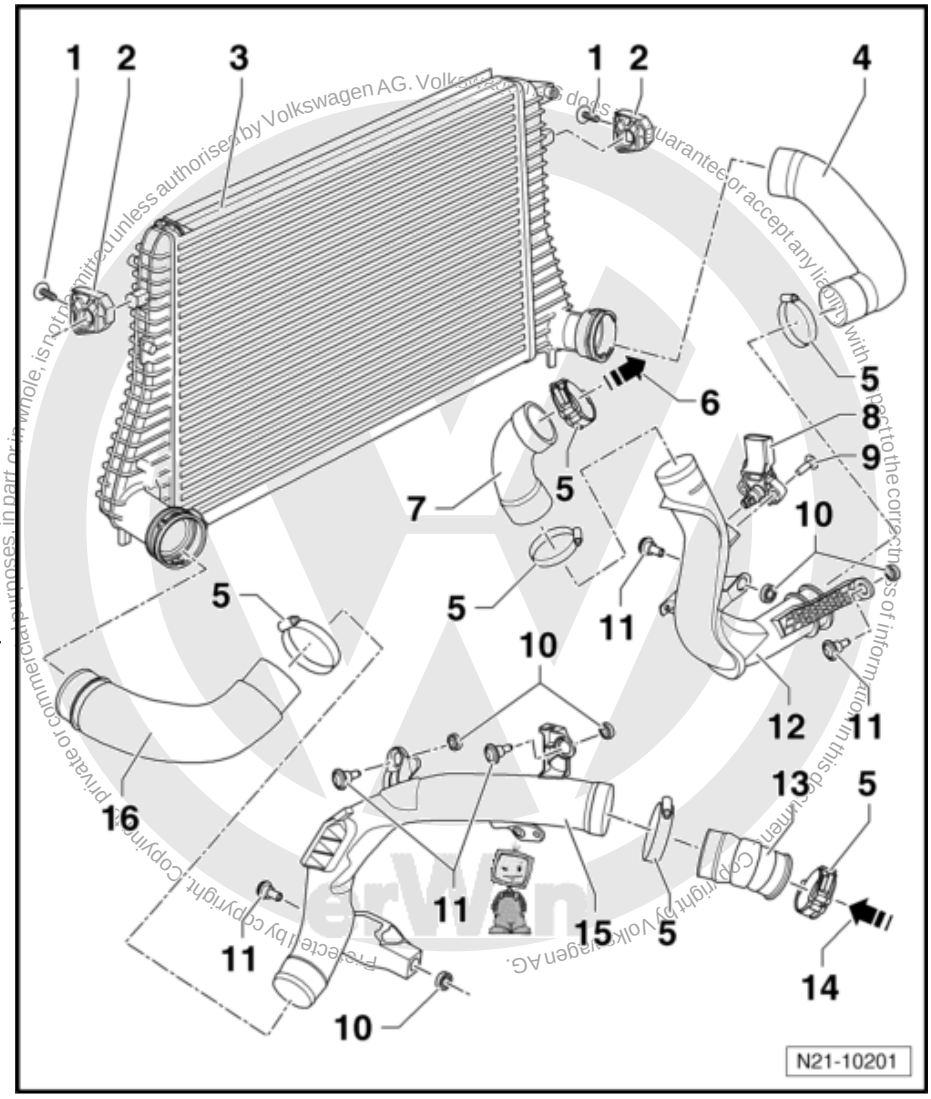
- *All hose connections of charge air system are secured by spring-type clips, plug-in connectors or spring band rings. When installing, observe installation instructions for plug-in connector ⇒ page 215 .*
- *The charge air system must be free of leaks.*
- *Checking charge air system for leaks ⇒ page 216 .*

Caution

It is essential that the screw-type clamps on the charge air lines are tightened to 5.5 Nm. If the tightening torque is too low or too high, the charge air hose may slip off the charge air pipe when the vehicle is being driven.

⇒ “2.2.1 Assembly overview - charge-air hose connections with plug-in connectors”, page 215

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1 - 5 Nm

2 - Bearings

- ❑ For charge air cooler

3 - Intercooler

- ❑ To remove, bring lock carrier into service position ⇒ General body repairs, exterior; Rep. gr. 50 ; Lock carrier; Service position .

4 - Connection hose

- ❑ »Cold« side, bottom.

5 - Screw-type clip, 5.5 Nm

6 - To throttle valve module - J338-

7 - Connection hose

- ❑ »Cold« side, top.

8 - Charge air pressure sender - G31- with intake air temperature sender - G42-

9 - 2 Nm

10 - Rubber grommet

- ❑ Renew if damaged

11 - 8 Nm

12 - Charge air pipe

- ❑ »Cold« side.

13 - Connection hose

- ❑ »Hot« side, top.

14 - From turbocharger

15 - Charge air pipe

- ❑ »Hot« side.

16 - Connection hose

- ❑ »Hot« side, bottom.

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2.2 Assembly overview - charge-air hose connections

⇒ “2.2.1 Assembly overview - charge-air hose connections with plug-in connectors”, page 215

⇒ “2.2.2 Assembly overview - charge-air hose connections with corrugated pipe connection”, page 216

2.2.1 Assembly overview - charge-air hose connections with plug-in connectors

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 securing clip -1-. Pull hose/pipe-2- off without the use of tools.

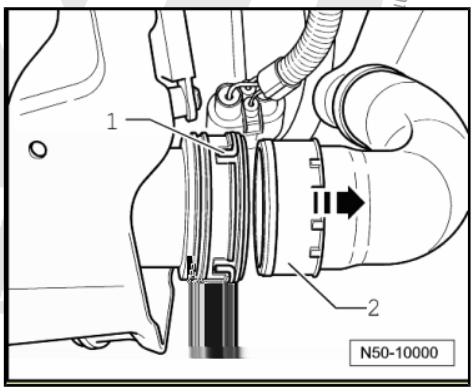
Installing

– If renewed, place seal in groove of charge air hose. Ensure the seal is correctly seated in the groove.

– Lubricate sealing surface and seal with oil.

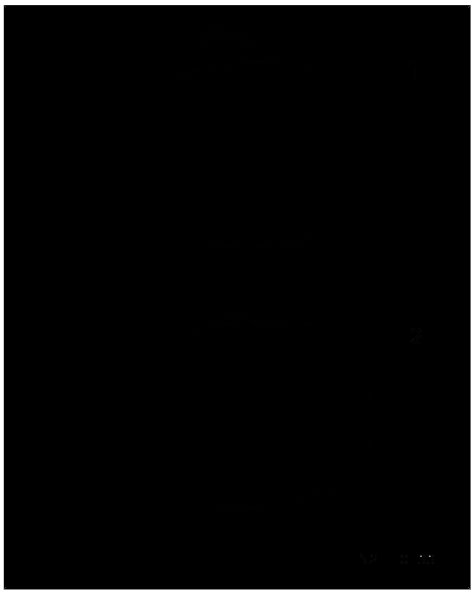
– Bring retaining clip to release position -1-.

– Push charge air hose into coupling to stop.



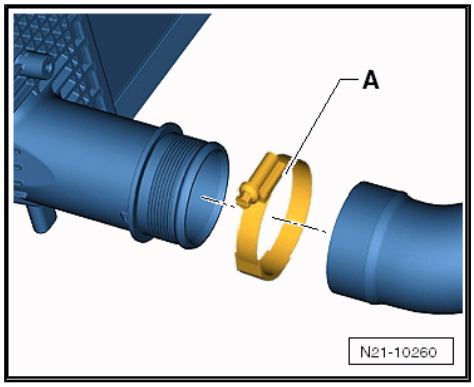
– Bring securing clip to locking position -2- and then push charge air hose again.

– Check if plug-in connector seats correctly and is properly engaged by pulling hose.



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2.2.2 Assembly overview - charge-air hose connections with corrugated pipe connection



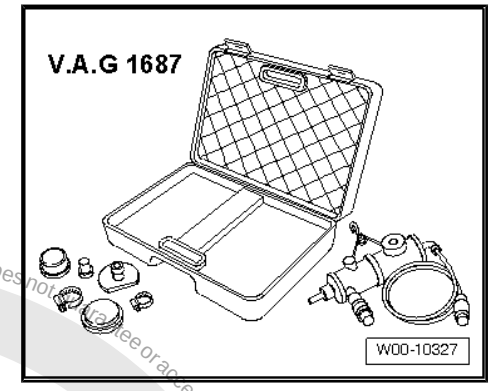
Caution

The screw-type clips -A- on the charge air lines must always be tightened to 5.5 Nm. If the torque is too low or too high, the charge air hose may slip off the corrugated pipe connection or the charge air pipe when the vehicle is used.

2.3 Checking charge air system for leaks

Special tools and workshop equipment required

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

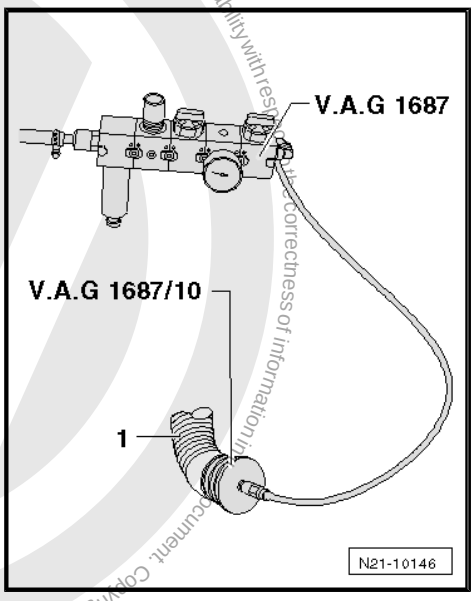


- Adapter - V.A.G 1687/10-

– Remove intake hose -1- from air filter.

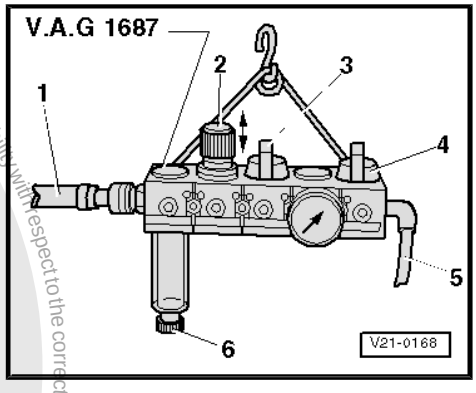
– Insert adapter - 1687/10- in intake hose -1- and secure with clip.

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



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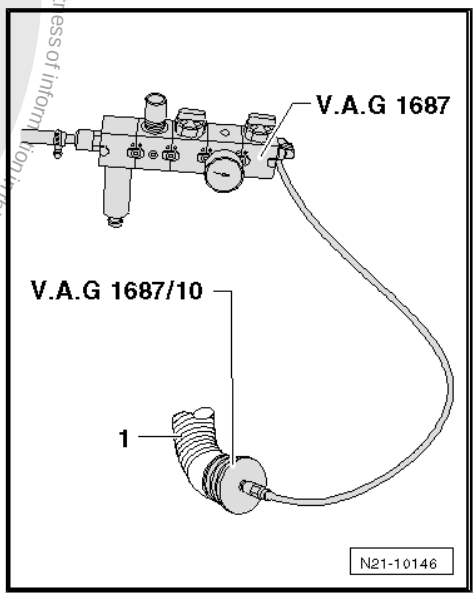
– Unscrew pressure regulating valve -2- and close valves -3- and -4-.



Note

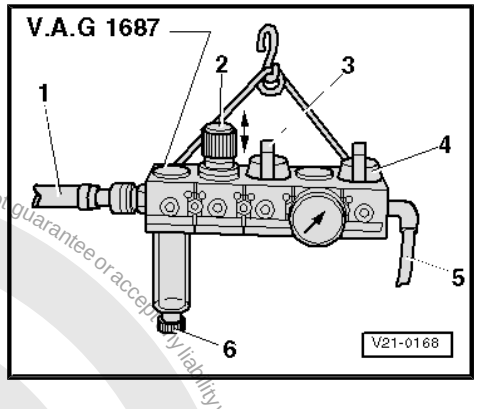
To turn the pressure regulating valve -2- the knob must be pulled upwards.

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



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– 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 charge air system for leaks by:

- listening
- feeling
- using standard leak detecting spray
- Ultrasonic tester - V.A.G 1842-

Note

- *Slight leaks on the intake side of turbocharger are permissible, as the intake hoses are not designed for high-pressure.*
- *A small amount of air escapes through the valves and enters the engine. Therefore a holding pressure test is not possible.*
- *Ultrasonic tester - V.A.G 1842- ⇒ operating instructions*
- *If leaks occur, when doing any repair work observe notes for charge air system ⇒ page 215 .*
- *Depressurise test circuit by detaching coupling from adapter - 1687/10- before removing adapter.*

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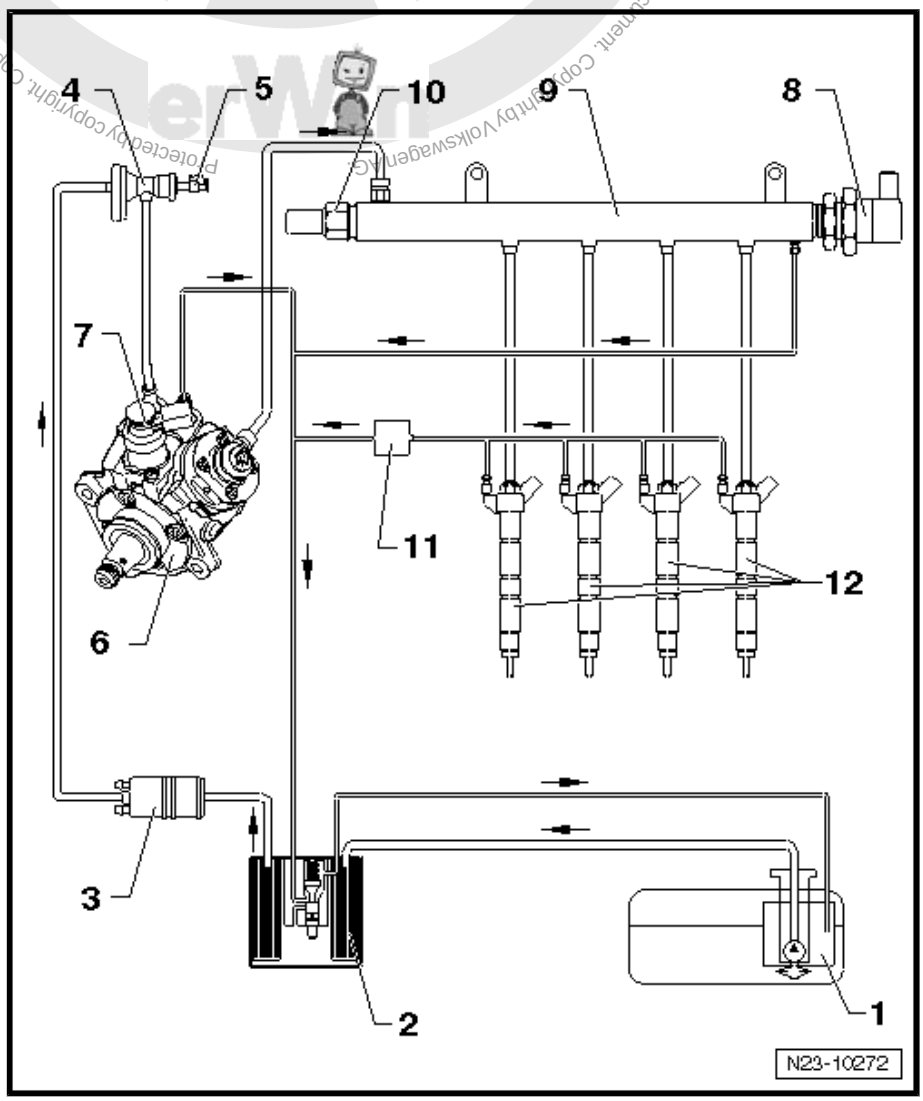
23 – Mixture preparation - injection

1 Injection system

⇒ “2.1 Safety precautions during work on fuel system”, page 3
⇒ “3.1 Rules for cleanliness”, page 6
⇒ “1.1 Schematic overview - fuel system”, page 219
⇒ “1.2 Assembly overview - fuel system”, page 220
⇒ “1.3 Filling/bleeding fuel system”, page 223
⇒ “1.4 Checking fuel system for leaks”, page 224

1.1 Schematic overview - fuel system

WARNING



1 - Fuel tank

- With fuel system pressurisation pump - G6- .

2 - fuel filter.

- With pre-heating valve
- Assembly overview - fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Assembly overview - fuel filter .
- Removing and installing ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .

3 - Supplementary fuel pump - V393- or fuel pump 2 - V277-

Removing and installing ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .

4 - Filter strainer

5 - Fuel temperature sender - G81-

6 - High-pressure pump

- After renewing, a first fuel filling must be performed (never allow the pump to run while it is still empty) ⇒ page 223 .
- Removing and installing ⇒ page 259

7 - Fuel metering valve - N290-

- Must not be removed.

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8 - Fuel pressure regulating valve - N276-

- ❑ Installing and removing ⇒ page 253

9 - High-pressure accumulator (rail)

10 - Fuel pressure sender - G247-

- ❑ Installing and removing ⇒ page 255

11 - Pressure retention valve

- ❑ The pressure retention valve maintains a residual pressure of approx. 10 bar in the return lines.
- ❑ This residual pressure is required for the control function of the piezo injectors.
- ❑ The pressure retention valve may only be renewed complete with the fuel return lines.
- ❑ After renewal, engine must be run at idling speed for approx. 2 minutes to bleed fuel system.
- ❑ Check pressure retention valve ⇒ page 225 .

12 - Injectors (piezo injectors)

- ❑ Injector, cylinder 1 - N30-
- ❑ Injector, cylinder 2 - N31-
- ❑ Injector, cylinder 3 - N32-
- ❑ Injector, cylinder 4 - N33-
- ❑ Installing and removing ⇒ page 226

1.2 Assembly overview - fuel system

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.

WARNING

- *Follow the rules for all work on the fuel system ⇒ page 3 .*
- *Observe rules for cleanliness ⇒ page 6 .*
- *Always follow these rules for cleanliness and instructions before starting work and while working on the fuel system.*

To prevent the high-pressure fuel pump from running while it is empty and to ensure that the engine starts quickly after parts have been renewed, it is important to observe the following:

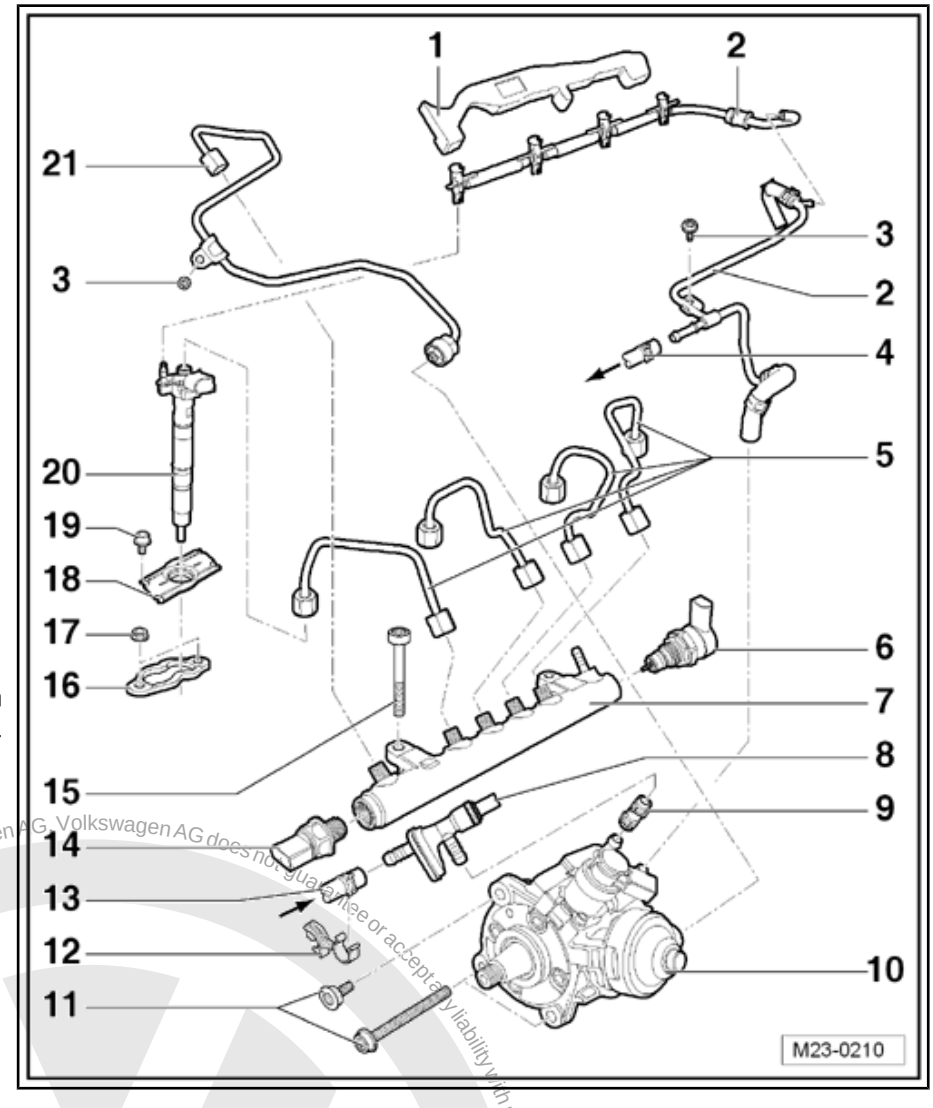
- If a fuel pump, fuel line or fuel filter are removed or renewed, the basic setting “Checking fuel system pressurisation pump” must be performed »once« to bleed the fuel system before the engine is started for the 1st time.
- If the high-pressure fuel pump is removed or renewed, the basic setting “Checking fuel system pressurisation pump” must be performed »three times« to bleed the fuel system before the engine is started for the 1st time.

Caution

Observe rules of cleanliness. No dirt must be allowed to get into the disconnected fuel return lines or the open connections on the injectors under any circumstances.

Protect open fuel connections from dirt entrainment using suitable methods under all circumstances.

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1 - Protective strip

- ❑ For fuel rail and high-pressure lines.
- ❑ For engine code CJAA only.

2 - Fuel return lines

- ❑ With pressure retention valve
- ❑ Check pressure retention valve ⇒ page 225 .
- ❑ Note various versions ⇒ page 223 .

3 - Connection, 8 Nm

- ❑ Allocation ⇒ page 223

4 - Fuel return line

- ❑ Blue or with blue marking
- ❑ Ensure firm seating.
- ❑ To fuel filter

5 - High-pressure lines, 28 Nm

- ❑ Between fuel rail and injectors.

Caution

The high-pressure lines may be re-used after the following checks:
Check taper seat of respective high-pressure line for damage and deformation.

The line bore must not be deformed or constricted

Corroded lines should no longer be used.

- ❑ Installing free of stress ⇒ page 230 .
- ❑ Install vibration damper ⇒ page 232 .

6 - Fuel pressure regulating valve - N276- , 80 Nm.

- ❑ Checking ⇒ page 252
- ❑ Removing and installing ⇒ page 253

7 - High-pressure accumulator (rail)

8 - Fuel temperature sender - G81-

9 - Fuel supply line

- ❑ Ensure firm seating.
- ❑ Between fuel temperature sender - G81- and high-pressure pump.

10 - High-pressure pump

- ❑ Removing and installing ⇒ page 259
- ❑ Specified torques for toothed belt drive ⇒ page 104

11 - 20 Nm

- ❑ Renew
- ❑ Turn long bolts 180° further.

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- ❑ Turn short bolt 45° further.

12 - Holder

- ❑ For fuel temperature sender - G81- .

13 - Fuel supply line

- ❑ White or with white marking.
- ❑ Ensure firm seating.
- ❑ From supplementary fuel pump - V393- or fuel pump 2 - V277-

14 - Fuel pressure sender - G247- , 100 Nm

- ❑ Removing and installing ⇒ page 255

15 - 22 Nm

16 - Clamping piece

- ❑ Renew
- ❑ Note installation position ⇒ page 222

17 - 10 Nm

18 - Injector cover

19 - 5 Nm

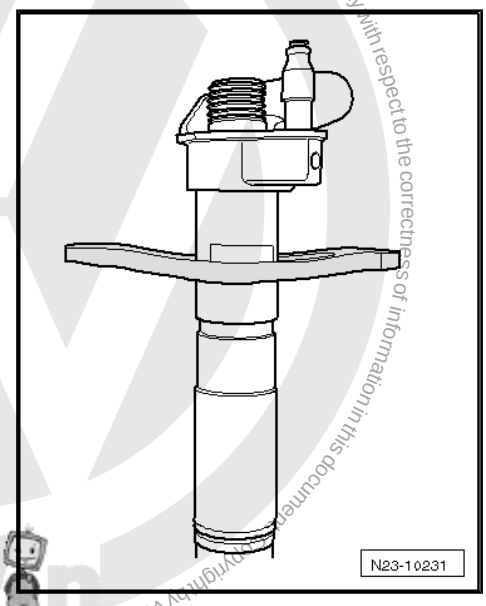
20 - Injector (piezo injectors)

- ❑ When removing and installing or replacing an injector, always renew the following components and seals/ O-rings: “copper seal”, “O-ring for injector bore” and “O-ring for injector return connection”.
- ❑ If they are to be re-installed, the injectors must always be re-fitted in their original positions (i.e. on the same cylinder).
- ❑ Before installing, clean injector bore using cleaning set - VAS 6811-
- ❑ Removing and installing ⇒ page 226

21 - High-pressure line, 28 Nm

- ❑ Between high-pressure pump and fuel rail.

Installation position of clamping piece

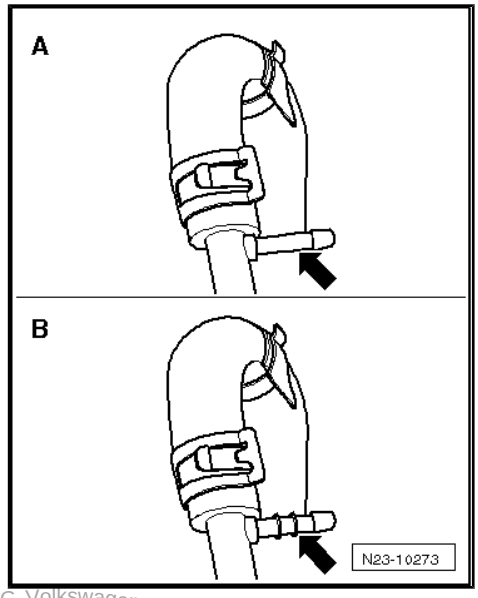


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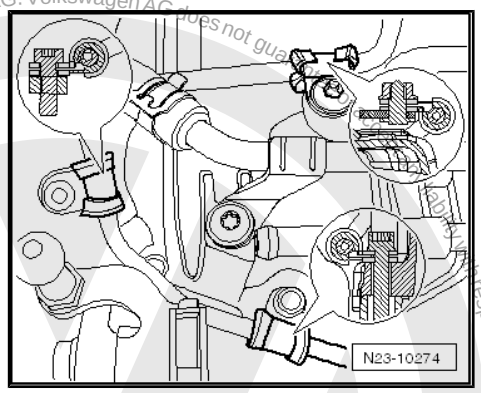
Differences on fuel return line

-A-, no riffled section: use clamp according to ⇒ ETKA (Electronic Parts Catalogue) to connect overflow oil line.

-B-, with riffled section: DO NOT use a clamp to connect overflow oil line.



High-pressure fuel line fixtures between high-pressure pump and rail.



1.3 Filling/bleeding fuel system

Caution

After installation, the high pressure pump must be filled with fuel before the engine is started the 1st time (the pump must NOT be allowed to run while still empty).

Note

- *When installing the high-pressure pump, it is essential to ensure that no dirt enters the fuel system.*
- *Only remove sealing plugs immediately prior to installation of fuel lines.*
- *Vehicle must have fuel.*

Proceed as follows to fill high-pressure pump with fuel:

– Switch ignition on.

– Connect vehicle diagnostic tester and perform the guided function “Bleeding fuel system” or “Filling/bleeding fuel system” depending on software version.

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Note

The fuel pumps will now be actuated for a total of three minutes.

– Then start engine.

– After filling fuel system, leave engine running at moderate speed for a few minutes and then switch off again.

– Check fuel system for leaks.

– Read event memory and erase stored event entry if necessary ⇒ Vehicle diagnostic tester.

– Then test drive the vehicle over a distance greater than 20 km with at least one full acceleration. Then check high-pressure part of fuel system again for leakage.

Note

If there is still air in the fuel system, the engine can change to emergency running mode during road test. Switch engine off and clear event memory. Then continue road test.

– Read event memory again.

1.4 Checking fuel system for leaks

– Clean all removed and re-installed fuel connections with brake cleaner and then dry them.

– Run engine at idling speed for several minutes (do not press accelerator) and then switch off. Fuel system will bleed itself automatically.

– Check the entire fuel system for leaks.

Renew the affected component if leakage still occurs after tightening to the correct torque.

– Then test drive the vehicle with at least one full acceleration. Then thoroughly check high-pressure part of fuel system again for leakage.

Note

If there is still air in the fuel system, the engine can change to emergency running mode during road test. Switch engine off and clear event memory. Then continue road test.

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2 Injectors/high-pressure accumulator (rail)

⇒ "2.1 Safety precautions during work on fuel system", page 3

⇒ "3.1 Rules for cleanliness", page 6

⇒ "2.1 Check pressure retention valve in fuel return line", page 225

⇒ "2.2 Removing and installing injectors", page 226

⇒ "2.3 Removing and installing high-pressure lines", page 230

⇒ "2.4 Removing and installing fuel rail", page 232

2.1 Check pressure retention valve in fuel return line

The pressure retention valve maintains a residual pressure (control volume) of approx. 10 bar in the return line.

This residual pressure is required for the control function of the piezo injectors.

Special tools and workshop equipment required

- VAS pressure gauge - 6330-

WARNING

- *Follow the rules for all work on the fuel system ⇒ page 3 .*
- *Observe rules for cleanliness ⇒ page 6 .*
- *Always follow these rules for cleanliness and instructions before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 39 .

– Clean return line connection of cylinder no. 1 (e.g. with commercially available cold cleaning solvent) before removing.

– Dry return line connection of cylinder no. 1.

– Cover return line connection on cylinder no. 1 with a cloth.

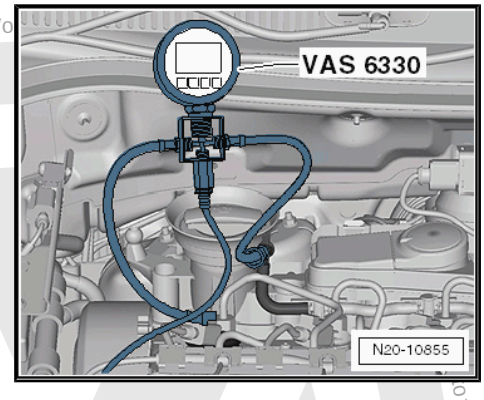
– Pull of return line connection at no. 1 cylinder. To do this, push down connection at tabs and pull up centre piece to release.

Note

Adhere strictly to rules of cleanliness. No dirt must be allowed to get into the disconnected fuel return lines or the open connections on the injectors under any circumstances.

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– Install fuel return system tester - VAS 6330- between return line connection on injector and return line.
– Start engine.
– Run engine at idling speed until pressure gauge has been bled completely.



Note

Pressure gauge lines must be completely free of air before starting tests. Bleeding process is complete when no air bubbles are visible in transparent union block.

– Check pressure on pressure gauge.
♦ Specification: 8 to 14 bar

If specification is not obtained

– Renew pressure retention valve.

If reading matches specification:

– Stop engine. Value in display of pressure gauge must remain constant.

If the pressure drops:

– Renew pressure retention valve.

2.2 Removing and installing injectors

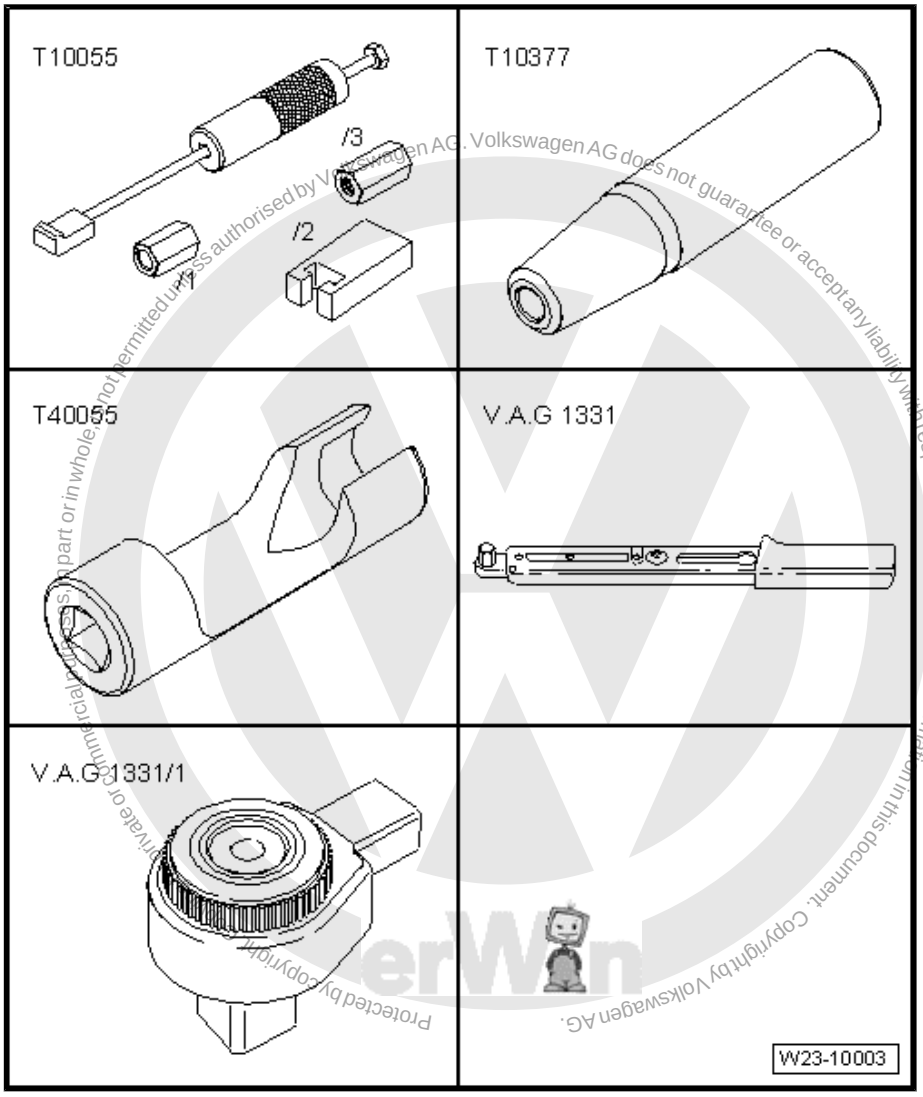
⇒ “2.2.1 Removing injectors”, page 226
⇒ “2.2.2 Installing injectors”, page 229

2.2.1 Removing injectors

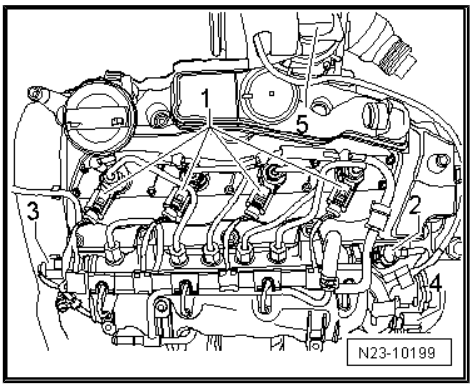
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Special tools and workshop equipment required

- Puller - T10055-
- Assembly sleeve - T10377-
- Socket - T40055-
- Torque wrench - V.A.G 1331-
- Ratchet wrench - V.A.G 1331/1-

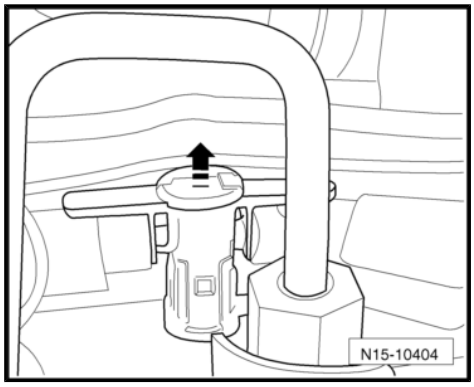


– Observe rules for cleanliness ⇒ page 6 .
– Remove engine cover panel ⇒ page 39 .
– Remove protective strip (if fitted) ⇒ Item 1 (page 221) .
– Take noise insulation off cylinder head cover.
– Disconnect connector -1- from injectors to be removed.
– Clean return line union on injectors to be removed (e.g. with commercial cleaning solution) before removing.
– Dry return line union.
– Cover return line union with a cloth.



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– Pull fuel return line connections off injectors to be removed. To do this, push down connection at tabs and pull up centre piece to release.



Caution

Adhere strictly to rules of cleanliness. No dirt must be allowed to get into the disconnected fuel return lines or the open connections on the injectors under any circumstances.

Protect all open fuel connections from dirt entrainment using suitable methods under all circumstances.

Note

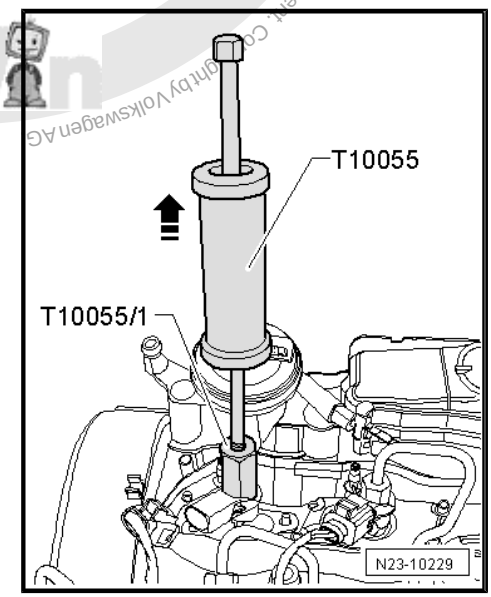
For some vehicle types, e.g. Golf Plus, the plenum chamber bulkhead must be removed in order to create space for the puller - T10055- ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Assembly overview - plenum chamber bulkhead .

– Unscrew high-pressure line ⇒ Item 5 (page 221) between fuel rail and injectors to be removed.
– Unscrew securing bolts for cover ⇒ Item 18 (page 222) of injectors to be removed.
– Slightly lift cover and turn it 90° to have access to injector securing nuts.

Caution

When removing securing nuts from injector there is a risk that the relevant nut will fall into the cylinder head. Proceed very carefully to prevent unnecessary dismantling or further damage.

– Unscrew securing nuts from respective injector.
– Apply puller - T10055- with adapter - T10055/1- as shown in illustration and pull injector out upwards by tapping gently.



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2.2.2 Installing injectors

Important instructions for installing injectors

- Clean empty injector bores and sealing surfaces in cylinder head using cleaning set - VAS 6811- before fitting injectors ⇒ Instructions
- When removing and installing or replacing an injector, always renew the following components and seals/O-rings: “clamping piece”, “copper seal”, “O-ring for injector bore” and “O-ring for injector return connection”.
- Used injectors may only be re-installed on the same cylinder.
- Make sure that the injectors and the installation area are clean before installing.
- The injectors must be completely undamaged.
- Lubricate all O-rings with engine oil or assembly oil before installing.

If a used injector is being re-installed:

– Spray tip of injector nozzle with rust-releasing spray. Wait approx. 5 minutes and wipe off soot particles and oil with a cloth.

– To remove the old copper seal from the injector, clamp the seal carefully in a vice so that it is just held between the jaws without turning. Then carefully pull and twist the injector out of the copper seal by hand.

– Use a plastic bush to fit the new copper seal.

– Carefully slide new O-ring over fuel return connection.

– To remove carbon deposits from the injector sealing surface, clean the injector seat in the cylinder head with a cloth soaked in engine oil or rust solvent. Take care not to damage the sealing surface.

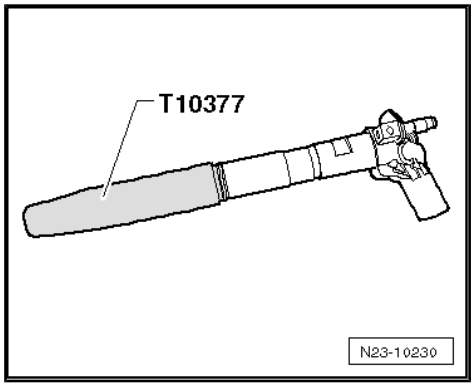
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– Renew O-ring for injector bore using assembly sleeve - T10377- .

– Fit injector cover.

– Slide clamping piece onto injector and note its installation position ⇒ page 222 .

– Insert injector into injector bore.



Caution

When removing securing nuts from injector there is a risk that the relevant nut will fall into the cylinder head. Proceed very carefully to prevent unnecessary dismantling or further damage.

– Carefully position securing nuts of clamping piece by hand and tighten. Torque setting ⇒ Item 17 (page 222) .

– Turn injector cover onto installation position and bolt. Torque setting ⇒ Item 19 (page 222) .

– Install high-pressure lines ⇒ page 230 .

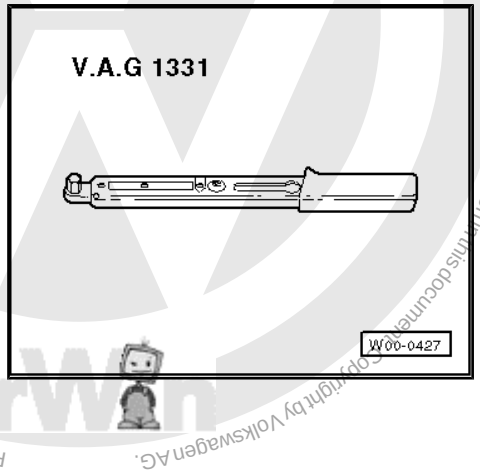
Note

After renewing one or more injectors, the "injector delivery calibration values" and "injector voltage calibration values" for the new injectors must be entered in the engine control unit ⇒ Vehicle diagnostic tester.

2.3 Removing and installing high-pressure lines

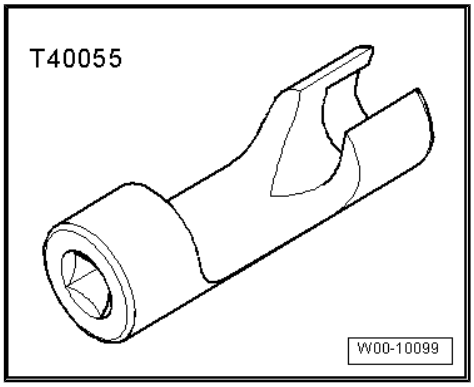
Special tools and workshop equipment required

♦ Torque wrench - V.A.G 1331-



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- Socket - T40055-



Caution

To ensure the injector lines are fitted free of stress, loosen fuel rail and, if necessary, move rail slightly. The lines must never be bent or tensioned. Tension would otherwise cause the respective line to break in the long-term.

Note

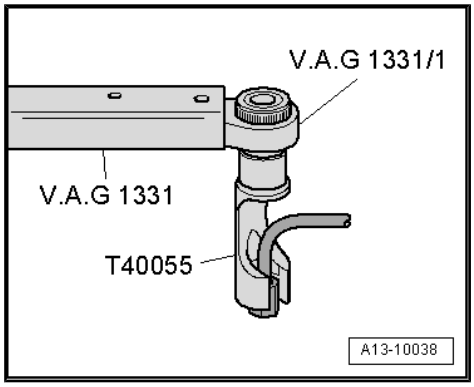
This section describes how to install new injection lines. If you wish to re-use existing injection lines, you must check the points listed under ⇒ Item 5 (page 221) . Apart from that the procedure is identical.

Installing individual injection lines (cylinders 1 to 4, between rail and injector)

– Remove the new injector line from the packaging. Remove the sealing plugs and install the line just by itself between fuel rail and injector.
– Ensure that line is inserted correctly into seat.
– Screw injection line union nuts on “fully” hand-tight without any tool to start with.
– If necessary, proceed in the same way with other injection lines.
– Retighten fuel rail if necessary. Torque setting ⇒ Item 15 (page 222) .

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– Tighten union nuts of all new injection lines using torque wrench - V.A.G 1331- and socket bit - T40055- . Torque setting ⇒ Item 5 (page 221) .



Installing fuel line (between high pressure pump and fuel rail) or a complete set of lines

– If it has not been done yet, loosen securing bolts of fuel rail and ensure that fuel rail can be moved.

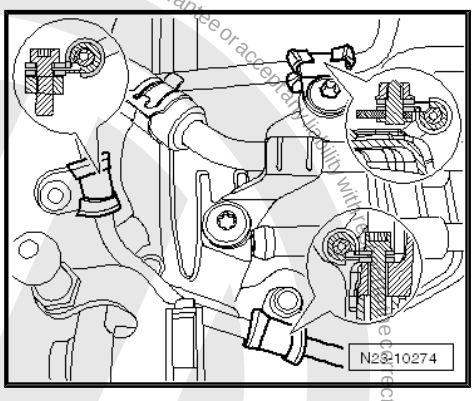
– Remove the packaging from the fuel line between high pressure pump and fuel rail. Remove the sealing plugs and install the line just by itself.

– Ensure that line is inserted correctly into seat.

– Screw injection line union nuts “fully” onto high-pressure pump hand-tight without any tool to start with.

– If a complete set needs to be installed, adopt the same procedure for all 4 injection lines.

– Slide all 3 securing clamps over fuel line and observe alignment.

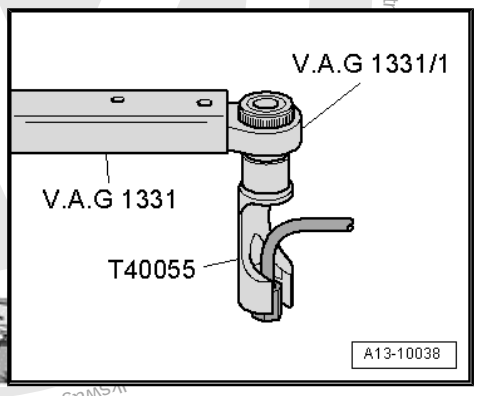


– Screw in clamp securing bolts about 3 turns.

– Retighten fuel rail. Torque setting ⇒ Item 15 (page 222) .

– Tighten securing clamp at top of intake manifold to 8 Nm.

– Tighten union nuts of all new injection lines using torque wrench - V.A.G 1331- and socket bit - T40055- . Torque setting ⇒ Item 5 (page 221) .



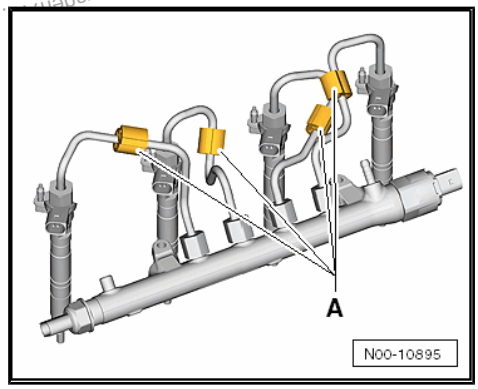
– Now tighten remaining 2 securing clamps to 8 Nm.

– Fit vibration dampers to high-pressure lines as shown in illustration ⇒ page 232 .

Vibration damper positions

– Press return line connections carefully over the seals and onto the injectors (check seal for damage). You should hear them click into place. Then press the release pin downwards carefully.

– Filling fuel system ⇒ page 223 .

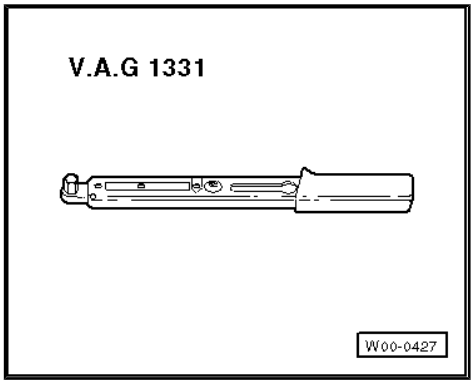


2.4 Removing and installing fuel rail

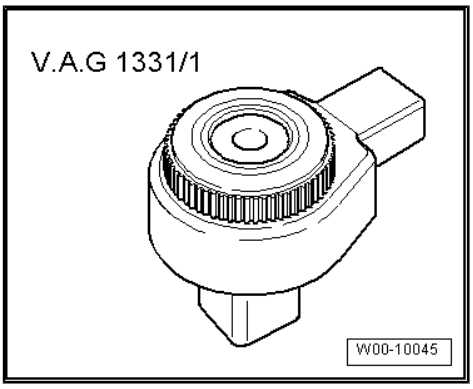
Special tools and workshop equipment required

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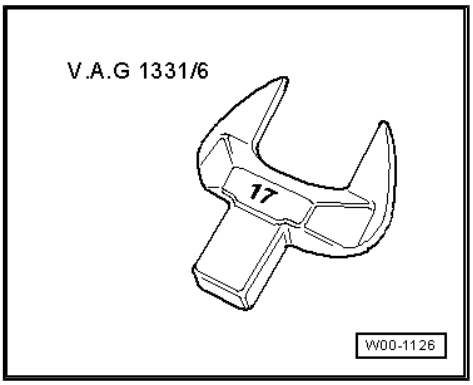
- Torque wrench - V.A.G 1331-



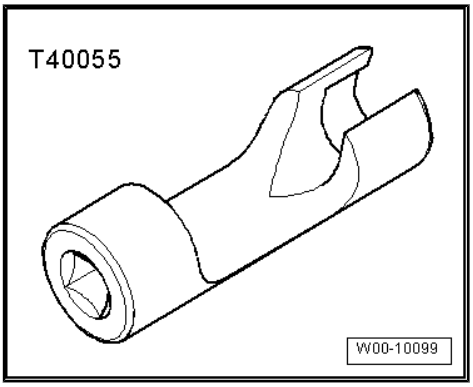
- Ratchet wrench - V.A.G 1331/1-



- Tool insert 17 mm - V.A.G 1331/6-



- Socket - T40055-



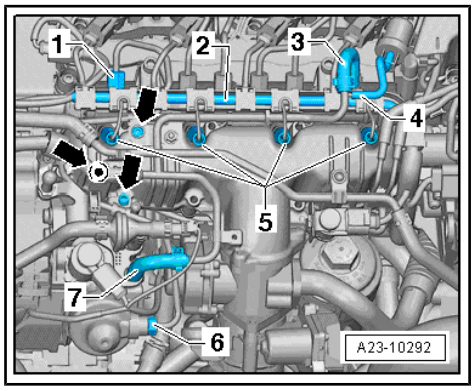
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Removing

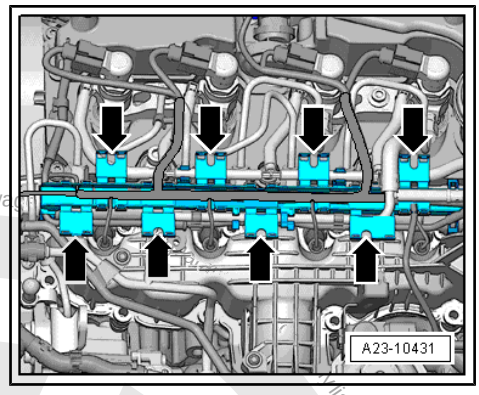
WARNING

- *Always read rules for cleanliness and instructions for working on fuel system ⇒ page 6 .*
- *Always follow these rules for cleanliness and instructions before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 39 .
– Take noise insulation off cylinder head cover.
– Open union nuts on high-pressure pump -6- and fuel rail -1- and remove high-pressure line.
– Remove bolts -arrows- for high-pressure line.
– Pull off fuel return hose -3-.



– Open retaining clips -arrows- and move wiring clear.



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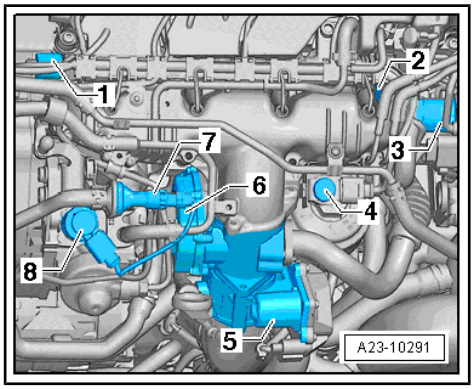
– To do this, disconnect following electrical connectors.

1 - Fuel pressure sender - G247-

2 - Fuel pressure regulating valve - N276-

- Injectors

- Glow plugs



Caution

- *Mark allocation of high-pressure lines to cylinders. Injectors must always be re-installed on the same cylinders.*
- *Observe rules for cleanliness when working on the injection system.*
- *Plug open connections with suitable sealing caps immediately.*

– Loosen union nuts of high-pressure lines on injectors using tool insert - T40055- , AF 17.

– Loosen union nuts of high-pressure lines on fuel rail using tool insert - V.A.G 1331/6- , AF 17.

– After removal, lay high-pressure lines on a clean cloth.

– Unscrew the two bolts and remove fuel rail.

Installing

Install in reverse order of removal, observing the following.

– Install high-pressure lines tension-free.

Note

- *Observe cylinder-specific markings if reusing high-pressure lines.*
- *The high-pressure lines may be re-used after the following checks:*
- *Check taper seat of respective high-pressure line for deformation and cracks.*
- *The inside of the line must not be deformed, constricted or damaged.*
- *Corroded lines should no longer be used.*

• Specified torques: assembly overview - fuel system
⇒ page 220 .

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3 Vacuum system

⇒ “3.1 Assembly overview - vacuum system”, page 236

⇒ “3.2 Checking vacuum system”, page 237

3.1 Assembly overview - vacuum system

Caution

Do not kink, twist or crush the vacuum lines when routing vacuum lines. This may cause breakdowns.

⇒ “3.1.1 Assembly overview - vacuum system, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 236

⇒ “3.1.2 Assembly overview - vacuum system, engine code CJAA”, page 237

3.1.1 Assembly overview - vacuum system, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

1 - Pressure canister
- ❑ On turbocharger.
- ❑ With position sender for charge pressure positioner - G581- .

2 - Charge pressure control solenoid valve - N75-

3 - Silencer

4 - Air filter

5 - To brake servo

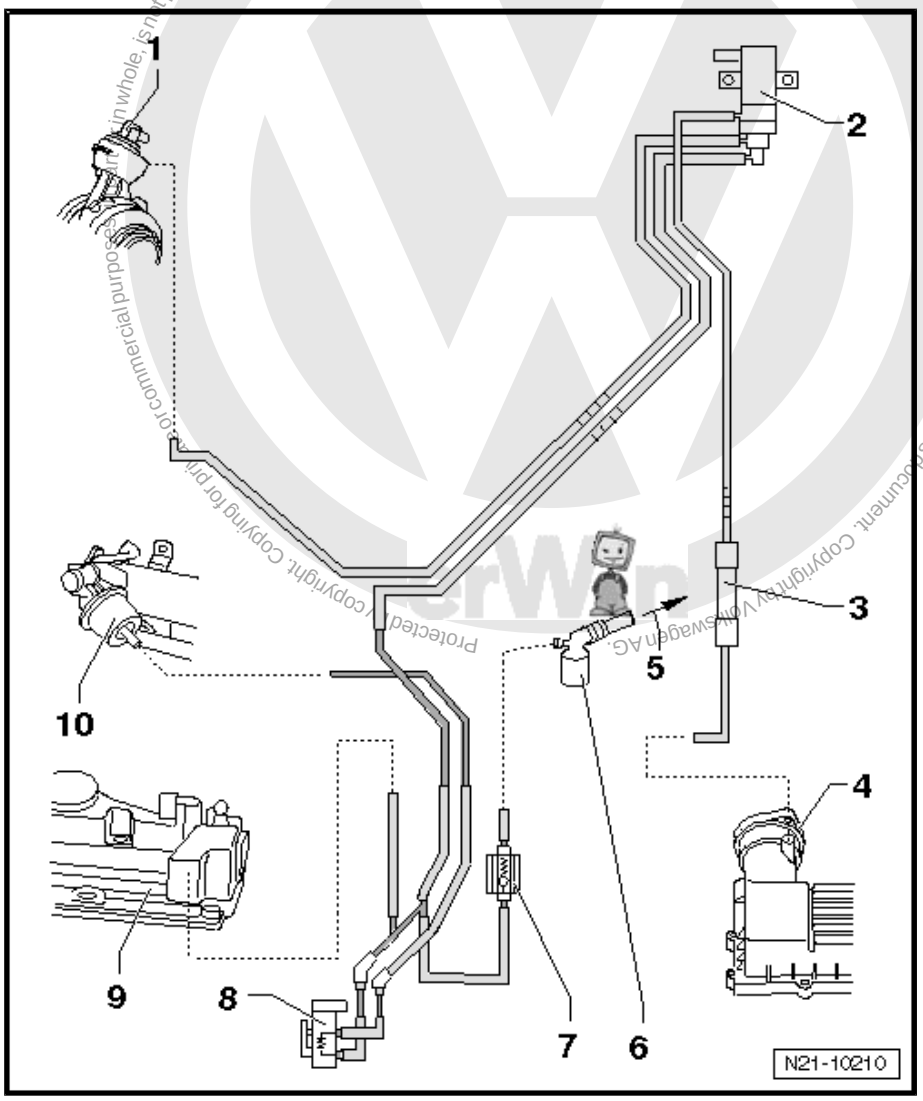
6 - Connection piece
- ❑ On vacuum pump

7 - Non-return valve
- ❑ Observe installation position

8 - Exhaust gas recirculation cooler changeover valve - N345-

9 - Cylinder head cover

10 - Vacuum unit
- ❑ For changeover for exhaust gas recirculation cooler.



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3.1.2 Assembly overview - vacuum system, engine code CJAA

1 - Pressure canister
- ❑ On turbocharger.
- ❑ With position sender for charge pressure positioner - G581- .

2 - Charge pressure control solenoid valve - N75-

3 - From brake servo

4 - To vacuum pump

5 - Connection piece
- ❑ On vacuum pump

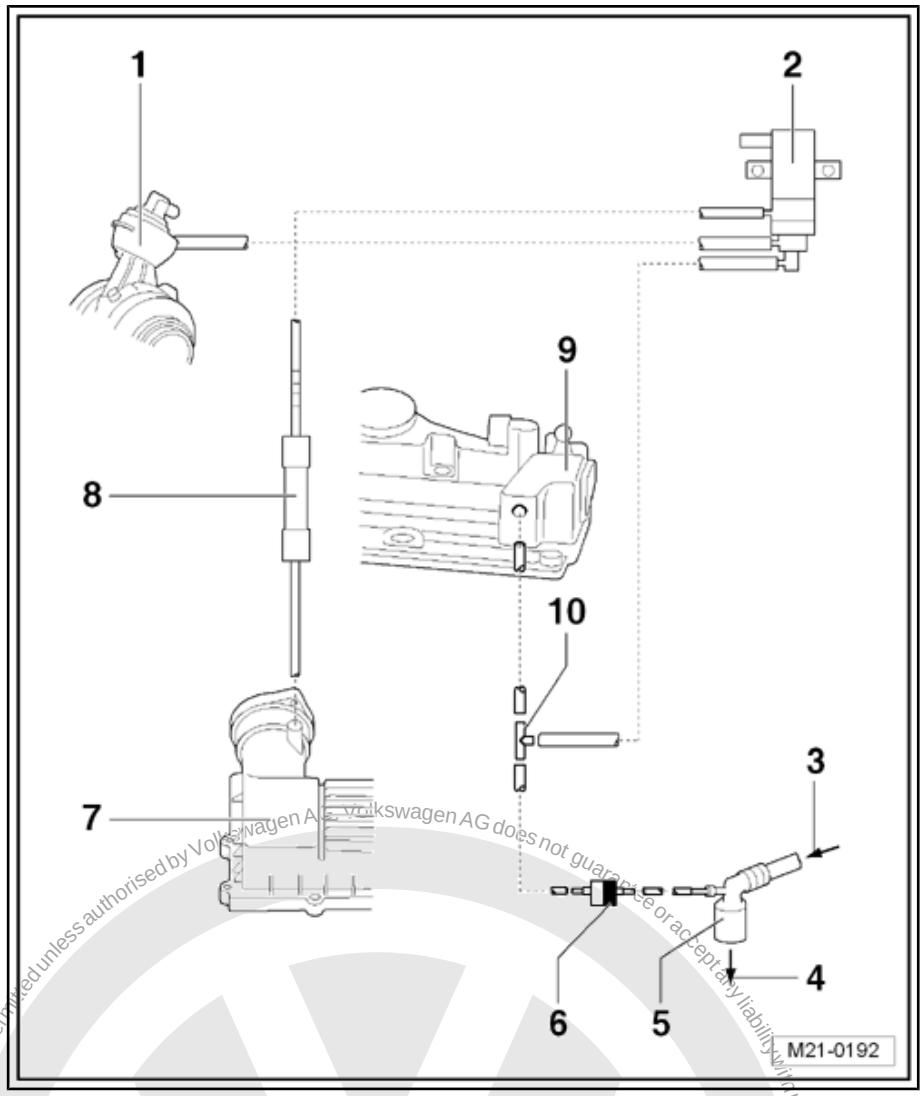
6 - Non-return valve
- ❑ Note installation position: white connection points to junction ⇒ Item 10 (page 237) .
- ❑ Testing vacuum system ⇒ page 237 .

7 - Air filter

8 - Silencer

9 - Cylinder head cover

10 - Junction



3.2 Checking vacuum system

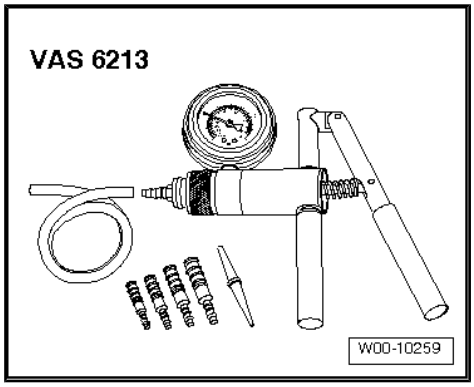
Caution

Do not kink, twist or crush the vacuum lines when routing vacuum lines. This may cause breakdowns.

Special tools and workshop equipment required

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♦ Hand operated vacuum pump - VAS 6213-



⇒ “3.2.1 Checking supply line, vacuum reservoir and non-return valve”, page 238

⇒ “3.2.2 Checking control line to turbocharger”, page 239

⇒ “3.2.3 Checking control line to vacuum unit for exhaust gas re-circulation cooler changeover, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 239

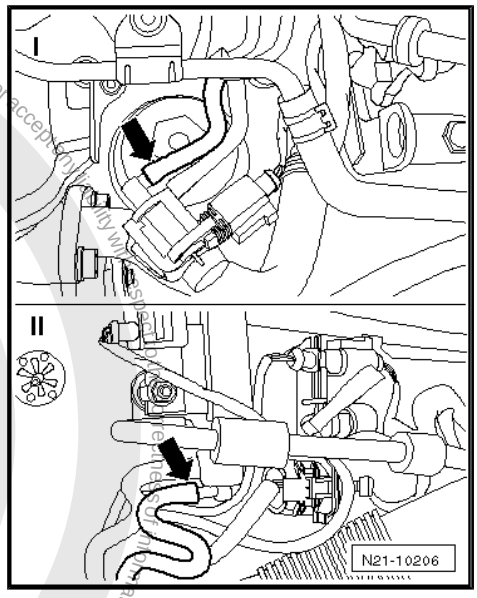
3.2.1 Checking supply line, vacuum reservoir and non-return valve

– Remove engine cover panel ⇒ page 39 .

Engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

– Unclip exhaust gas recirculation cooler changeover valve - N345- from retainer located on front of intake manifold.

– Pull vacuum hose at lower connection -arrow in I- off exhaust gas recirculation cooler changeover valve - N345- and off charge pressure control solenoid valve - N75- -arrow in II-.



Continuation for all engine codes

– Seal open hose ends with suitable blanking plugs.

Note

Do not use screws or threaded bolts.

– Pull vacuum hose -arrow- off connection piece of vacuum pump.

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– Connect hand vacuum pump - VAS 6213- to disconnected hose and generate a vacuum of 0.6 bar.
– Observe hand vacuum pump pressure gauge for approx. 30 seconds.

• Vacuum must not drop.

If vacuum drops:

– Locate damage or leak in hose and renew that section of hose.

If pressure does not drop:

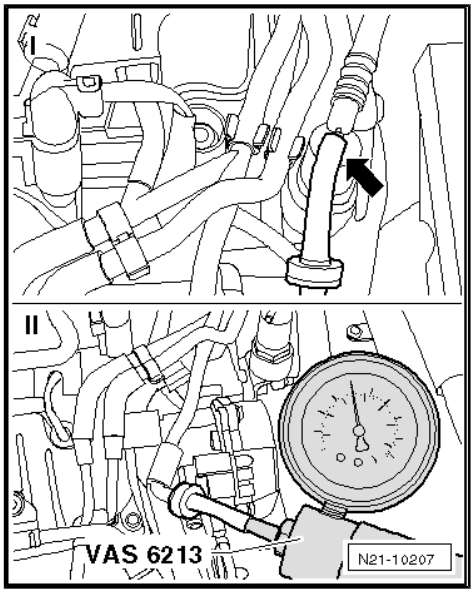
– First pull hose off hand vacuum pump - VAS 6213- .
– Remove one of the blanking plugs from hose ends.
– If the non-return valve functions properly, a clear hiss is audible when vacuum in vacuum reservoir is released.

If no hiss is audible:

– Renew non-return valve.

If a hiss is audible:

– Reconnect all disconnected vacuum hoses.
– Check control line to turbocharger ⇒ page 239 .



3.2.2 Checking control line to turbocharger

– Pull hose off middle connection of charge pressure control solenoid valve - N75- -arrow in I- and off turbocharger vacuum unit -arrow in II-.
– Seal one hose opening using a suitable blanking plug.

Note

Do not use screws or threaded bolts.

– Connect hand vacuum pump - VAS 6213- to other hose end and generate a vacuum of 0.6 bar.
– Observe hand vacuum pump pressure gauge for approx. 30 seconds.

• Vacuum must not drop.

If vacuum drops:

– Renew vacuum hose.

If pressure does not drop:

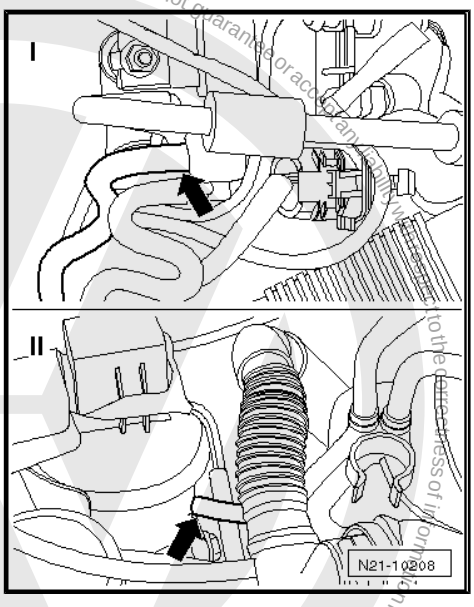
– Reconnect all disconnected vacuum hoses.

Engine code CJAA

– Install engine cover panel ⇒ page 39 .

Engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

– Checking control line to vacuum unit for exhaust gas recirculation cooler changeover function ⇒ page 239 .



3.2.3 Checking control line to vacuum unit for exhaust gas recirculation cooler changeover, engine codes CBAA,

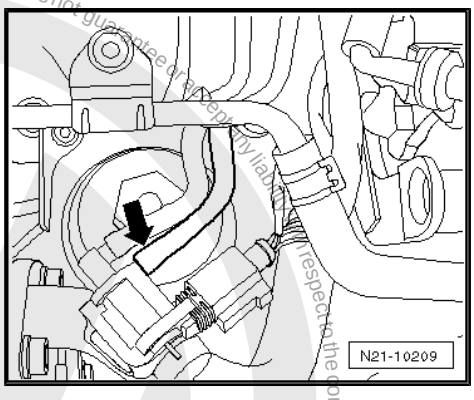
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CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

– Pull hose off middle connection of exhaust gas recirculation cooler changeover valve - N345- -arrow-.

– Connect hand vacuum pump -VAS 6213- to disconnected hose and generate a vacuum of 0.6 bar.

– Observe pressure gauge of hand vacuum pump for approx. 30 seconds. Vacuum must not drop.



If the pressure drops:

– Pull vacuum hose off vacuum unit for exhaust gas recirculation cooler changeover function.

– Connect hand vacuum pump - VAS 6213- to vacuum unit with test hose supplied and generate a vacuum of 0.6 bar.

Note

- *The vacuum unit control range must be perceptible and the vacuum must not drop. If this is not the case, renew the exhaust gas recirculation cooler* ⇒ page 344 .
- *If no fault can be detected on the vacuum unit, renew the vacuum line from the exhaust gas recirculation cooler changeover valve - N345- .*

– Install engine cover panel ⇒ page 39 .

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4 Air filter

⇒ “4.1 Assembly overview - air filter housing”, page 241

⇒ “4.2 Removing and installing air filter housing”, page 243

⇒ “4.3 Checking changeover flap for intake air preheating”, page 244

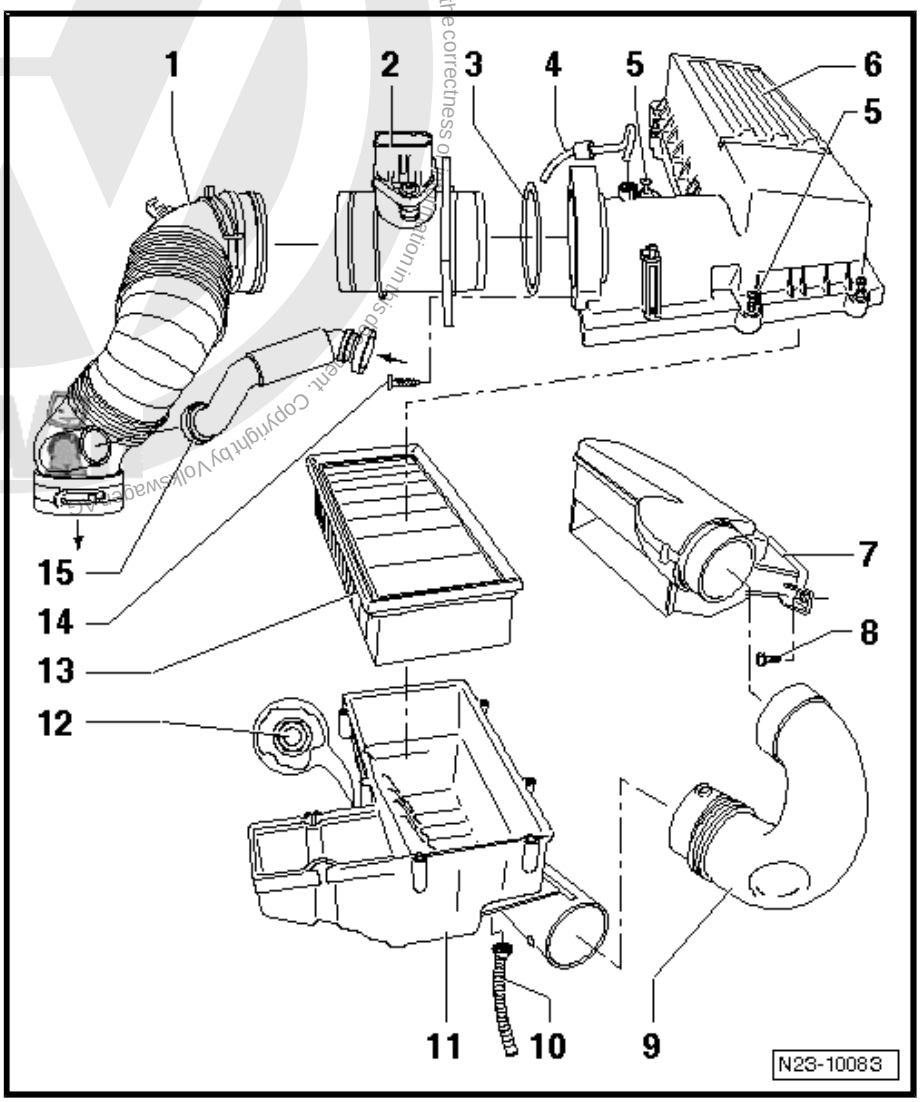
⇒ “4.4 Removing and installing changeover flap for intake air preheating”, page 245

4.1 Assembly overview - air filter housing

⇒ “4.1.1 Assembly overview - air filter, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 241

⇒ “4.1.2 Assembly overview - air filter, engine code CJAA”, page 242

4.1.1 Assembly overview - air filter, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA



1 - Intake hose
- ❑ To turbocharger.

2 - Air mass meter - G70-

3 - O-ring
- ❑ Renew if damaged

4 - Vacuum hose
- ❑ To charge pressure control solenoid valve - N75- .
- ❑ Vacuum hose connection diagram ⇒ page 236

5 - 2 Nm

6 - Air filter upper part

7 - Intake air guide
- ❑ Bolted to lock carrier.

8 - 2 Nm

9 - Air intake hose

10 - Water drainage pipe

11 - Air filter lower part
- ❑ On vehicles for cold climate zones with changeover flap for intake air preheating ⇒ page 244

12 - 8 Nm

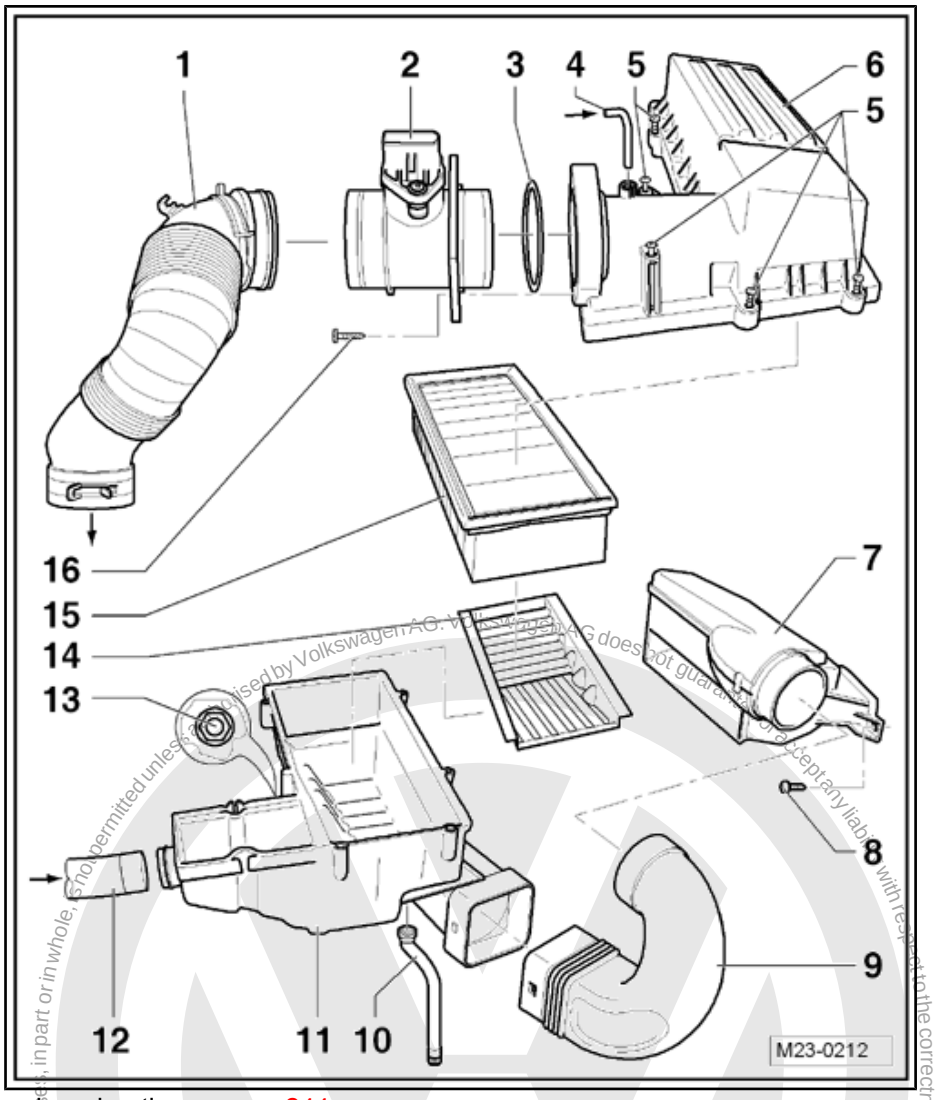
13 - Filter element

14 - 2 Nm

15 - Connecting pipe
- ❑ From cylinder head cover
- ❑ For crankcase ventilation.

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4.1.2 Assembly overview - air filter, engine code CJAA



1 - Intake hose

- ❑ Ensure firm seating.
- ❑ Clean if soiled.
- ❑ To intake connecting pipe on turbo charger ⇒ Item 35 (page 200) .

2 - Air mass meter - G70-

3 - O-ring

- ❑ Renew if damaged

4 - Vacuum hose

- ❑ Ensure seated securely and routed free of kinks.
- ❑ From silencer.
- ❑ Vacuum hose connection diagram ⇒ page 237

5 - 2 Nm

6 - Air filter upper part

7 - Intake air guide

- ❑ Bolted to bumper carrier

8 - 5 Nm

9 - Air intake hose

- ❑ Ensure firm seating.
- ❑ Clean if soiled.

10 - Water drain hose

- ❑ Clean if soiled.

11 - Air filter lower part

- ❑ On vehicles for cold climate zones with changeover flap for intake air preheating ⇒ page 244

12 - Connection hose

- ❑ For hot air intake.
- ❑ Ensure firm seating.
- ❑ Clean if soiled.
- ❑ From warm air collection plate on exhaust manifold ⇒ Item 2 (page 198) .

13 - 8 Nm

- ❑ Captive bolt.

14 - Snow screen

- ❑ Clean if soiled.

15 - Filter element

- ❑ Always use genuine part for air filter element ⇒ Electronic parts catalogue “ETKA”
- ❑ Observe change intervals ⇒ Maintenance ; Booklet 20.1 ; Service work “Service tables”.

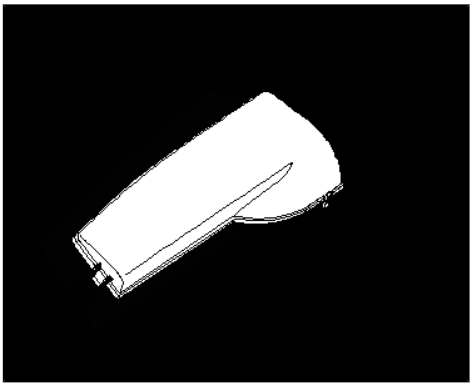
16 - 3.5 Nm

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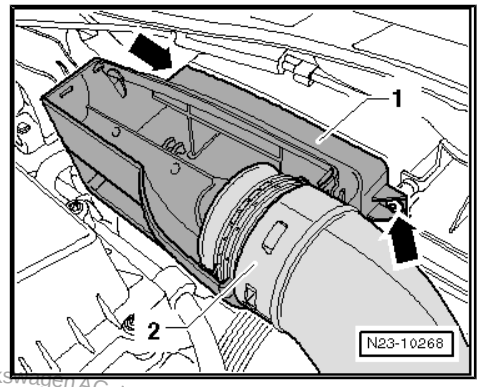
4.2 Removing and installing air filter housing

Removing

– Open intake system cover by carefully releasing fasteners -arrows-.

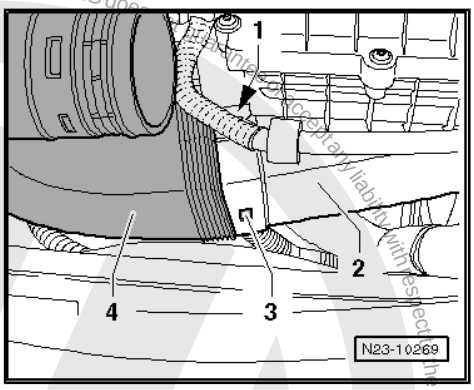


– Remove securing bolts -arrows- for intake system -1- and take connecting hose -2- out of guide.

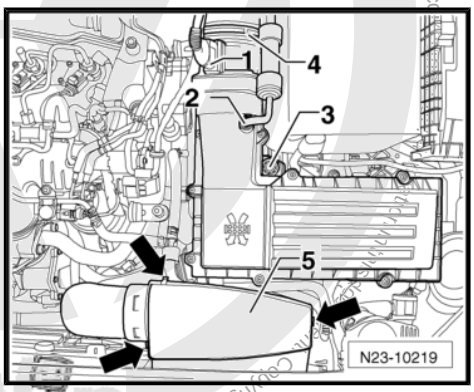


– Press locking lugs -1- and -3- in and pull connecting hose -4- off air filter housing -2-.

– Disconnect connector from air mass meter - G70- -1- and pull off vacuum line -2-.



– Loosen threaded connection on air filter housing -3-.

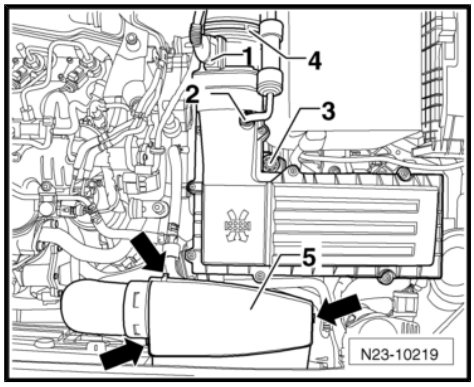


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– Open clamp -4- and pull off hose to turbocharger.
– Remove entire air filter housing.

Installing

Install in reverse order of removal.



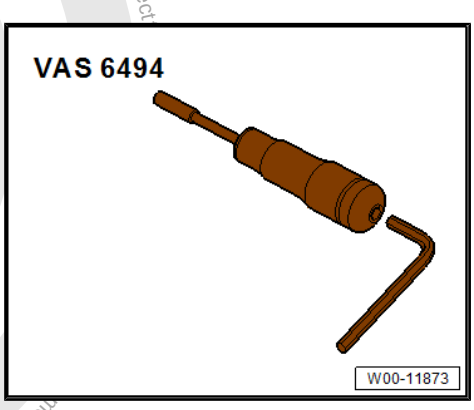
4.3 Checking changeover flap for intake air preheating

Note

Only installed on vehicles for cold climate zones.

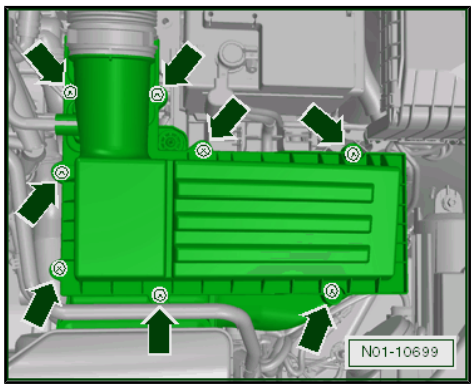
Special tools and workshop equipment required

- Chilling spray (commercially available)
- Torque screwdriver - VAS 6494-



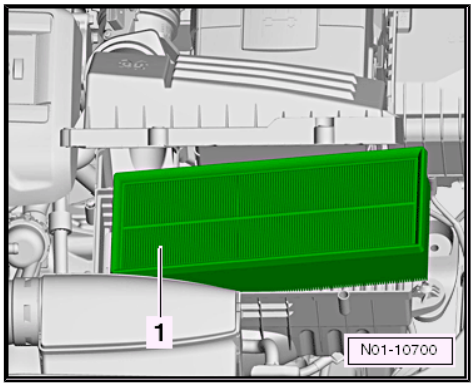
Check changeover flap for intake air preheating:

– Unscrew bolts -arrows- from air filter upper part.



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– Raise air filter upper part and take out air filter element -1-.

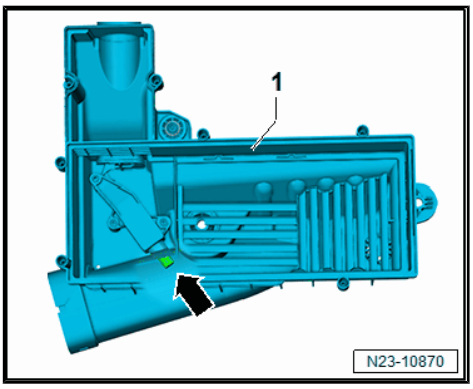


– Remove snow screen.

– Spray thermal element -arrow- with cold spray.

♦ At above +12°C, the changeover flap for intake air preheating must have completely closed the hot air connection.

♦ At below +2°C, the changeover flap for intake air preheating must have completely opened the hot air connection.



Note

The changeover flap for intake air preheating opens and closes with a slight delay as the expansion element first needs to cool down or warm up.

Test not OK

Renew changeover flap for intake air preheating ⇒ page 245 .

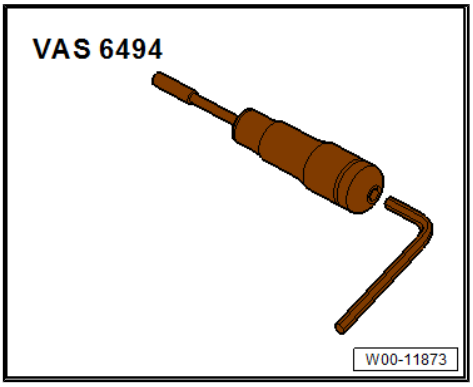
4.4 Removing and installing changeover flap for intake air preheating

Note

Only installed on vehicles for cold climate zones.

Special tools and workshop equipment required

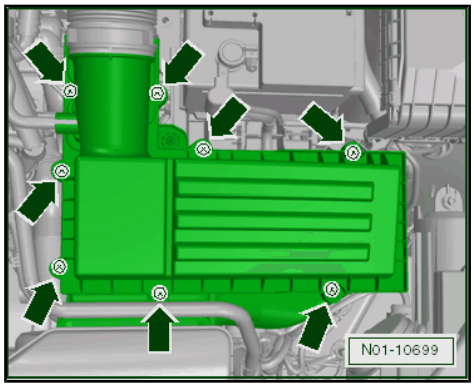
♦ Torque screwdriver - VAS 6494-



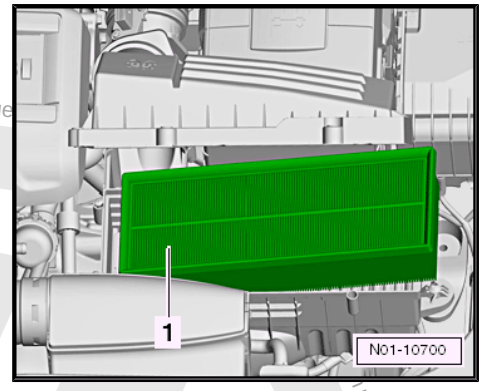
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Removing

– Unscrew bolts -arrows- from air filter upper part.

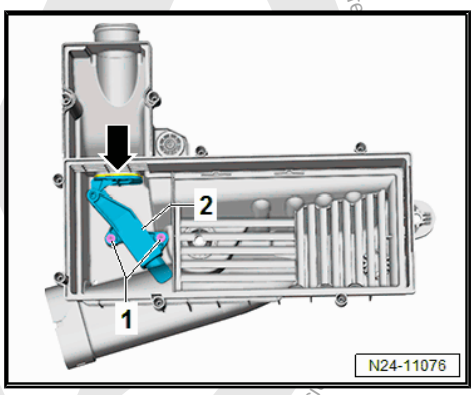


– Raise air filter upper part and take out air filter element -1-.



– Unscrew bolts -1-.

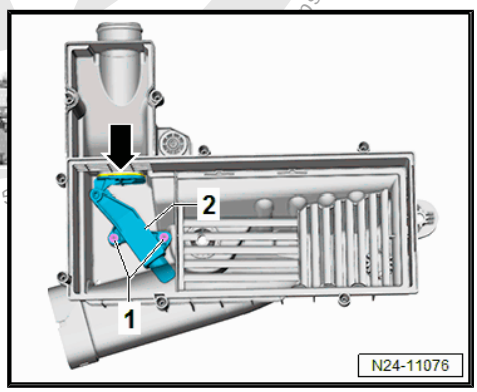
– Remove changeover flap for intake air preheating -2-. To do this, press changeover flap in direction of -arrow- slightly.



Installing

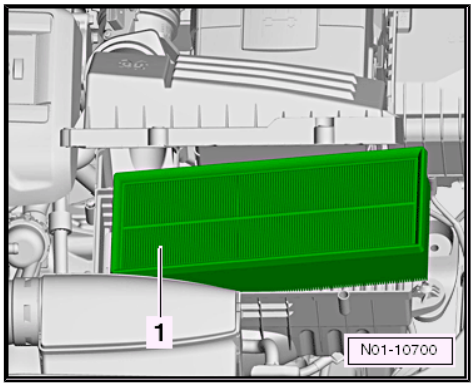
– Install changeover flap for intake air preheating -2-. To do this, press changeover flap in direction of -arrow- slightly.

– Screw in bolts -1- and tighten to 1.6 Nm.

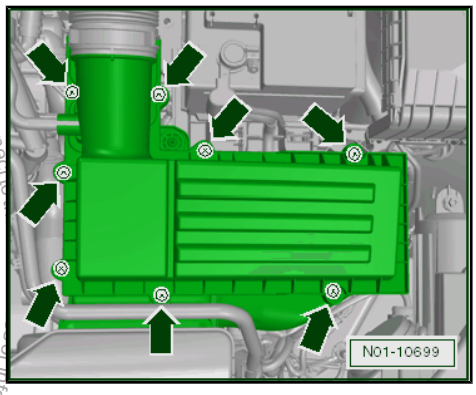


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– Install air filter element -1-.



– Fit upper part of air filter, screw in bolts -arrows- and tighten to 2 Nm.



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5 Intake manifold

⇒ “2.1 Safety precautions during work on fuel system”, page 3

⇒ “3.1 Rules for cleanliness”, page 6

⇒ “5.1 Assembly overview - intake manifold”, page 248

⇒ “5.2 Removing and installing intake manifold”, page 248

5.1 Assembly overview - intake manifold

1 - Intake manifold

- ❑ With intake manifold flap motor - V157- .
- ❑ With optimised intake air swirl.
- ❑ Must not be dismantled.

2 - 8 Nm

3 - Seal

- ❑ Renew

4 - Sealing ring

- ❑ Renew

5 - Connecting pipe

- ❑ To exhaust gas recirculation cooler

6 - 20 Nm

7 - Seal

- ❑ Renew

8 - 10 Nm

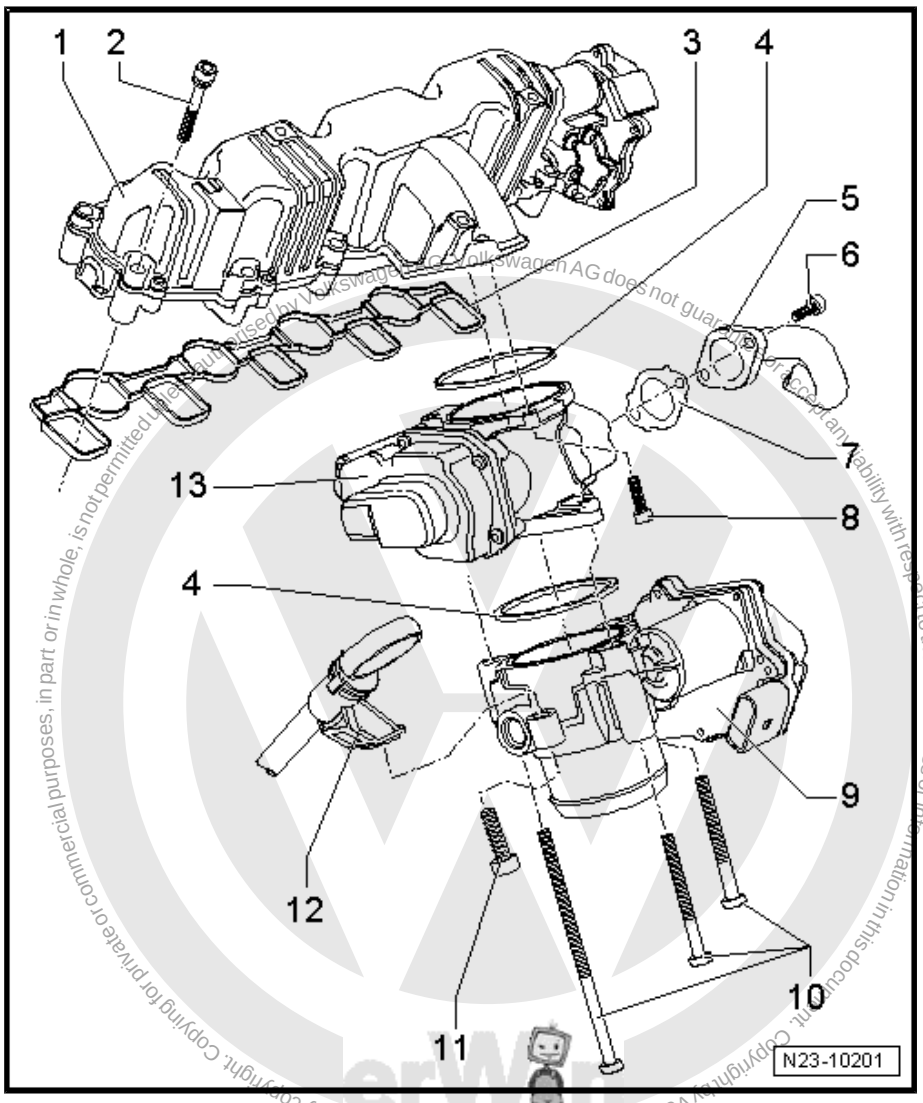
9 - Throttle valve module - J338-

10 - 10 Nm

11 - 10 Nm

12 - Oil dipstick

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

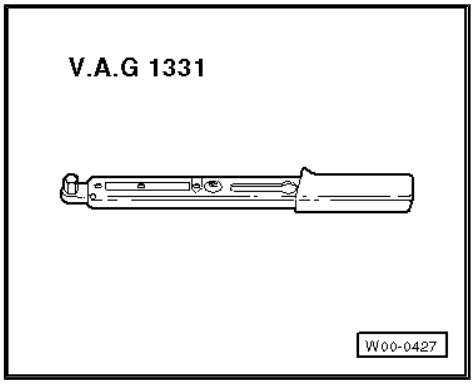


5.2 Removing and installing intake manifold

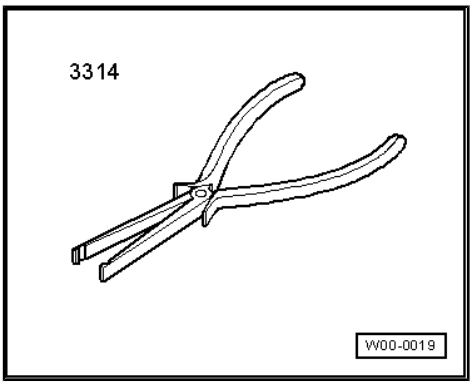
Special tools and workshop equipment required

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♦ Torque wrench - V.A.G 1331-

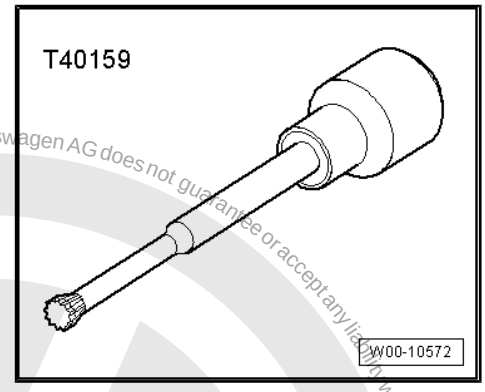


♦ Pliers - 3314-



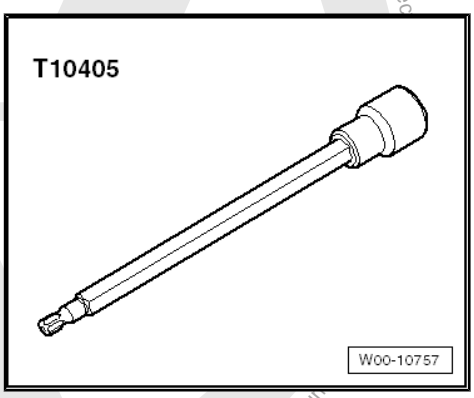
Vehicles with aluminium intake manifold

♦ Bit XZN 8 - T40159-



Vehicles with plastic intake manifold

♦ Socket T 30 - T10405-



Removing

– Remove engine cover panel ⇒ page 39 .

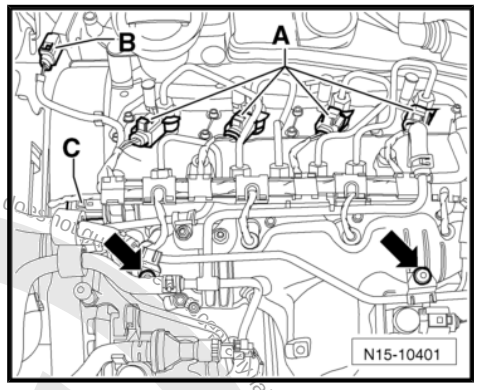
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Caution

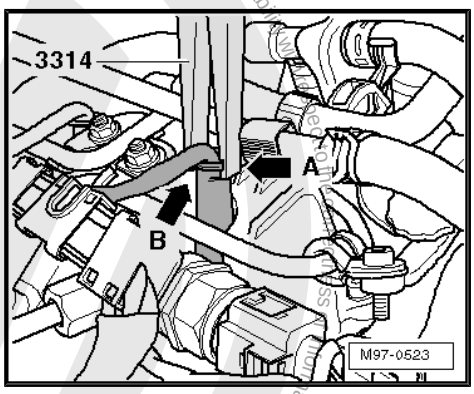
Make sure that no wiring connections are damaged when disconnecting the connectors. Otherwise the whole wiring harness will need to be renewed. Do not compress the pliers - 3314- too firmly to separate the connectors, otherwise the support sleeve may be damaged.

– Pull connectors off injectors -A-, exhaust gas pressure sensor 1 - G450- -B- and fuel pressure sender - G247- -C-.

– Unscrew securing bolts -arrows- of coolant line from intake manifold and set coolant line down in front of intake manifold.

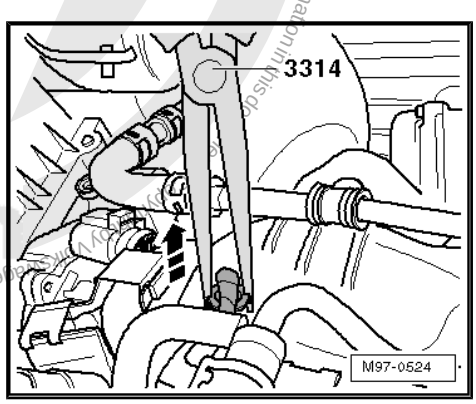


– Position pliers - 3314- with groove -arrow A- on support sleeve shoulder -arrow B-.



– Carefully pull connector off glow plug in direction of -arrow-.

– Pull fuel return lines off fuel rail, injectors and high-pressure pump.



– Unscrew securing bolt -arrow- and remove fuel return line.

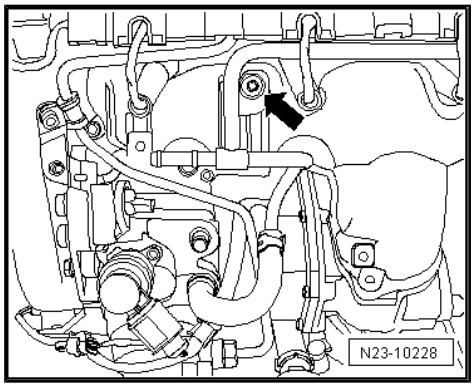
– Remove high-pressure line between high-pressure pump and fuel rail.

Vehicles with plastic intake manifold

– Remove injection lines to injectors ⇒ page 220 .

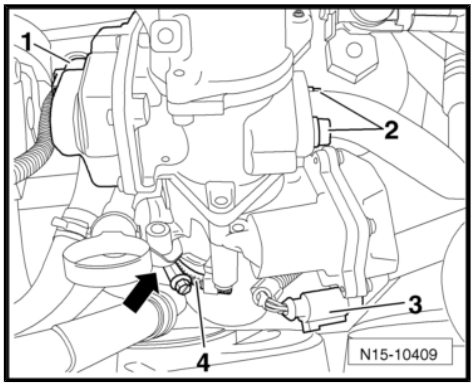
– Remove fuel rail ⇒ page 220 .

Continued for all vehicles

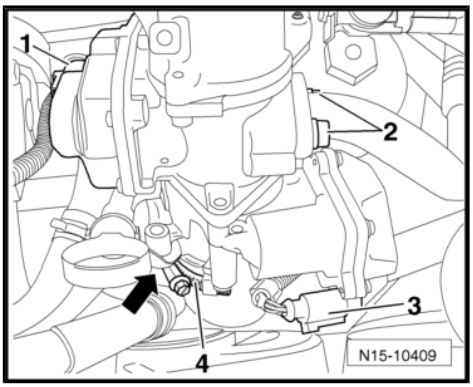


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– Pull connectors off exhaust gas recirculation valve - N18- -1- and off throttle valve module - J338- -3-.
– Open clamp -4- and pull off charge air hose.



– Unscrew bolts from oil dipstick attachment -arrow- and from connecting pipe for exhaust gas recirculation -2-.
– If a support is fitted between throttle valve module and crankcase, remove it.
– Unscrew the securing bolts from the intake manifold from the outside to the inside in diagonal sequence with socket inset - T40159- respectively Torx T 30 socket insert - T10405- .
– Remove intake manifold.



Installing

Install in reverse order of removal, observing the following.

– Renew gaskets.
– Tighten securing bolts of intake manifold from inside out in diagonal sequence. Torque setting ⇒ Item 2 (page 248) .

Vehicles with plastic intake manifold

– Install fuel rail ⇒ page 220 .
– Install injection lines to injectors ⇒ page 220 .

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6 Senders and sensors

⇒ “2.1 Safety precautions during work on fuel system”, page 3

⇒ “3.1 Rules for cleanliness”, page 6

⇒ “6.1 Checking fuel pressure regulating valve”, page 252

⇒ “6.2 Removing and installing fuel pressure regulating valve N276 ”, page 253

⇒ “6.3 Removing and installing fuel pressure sender”, page 255

⇒ “6.4 Assembly overview - actuator for structure-borne sound and control unit for structure-borne sound”, page 256

6.1 Checking fuel pressure regulating valve

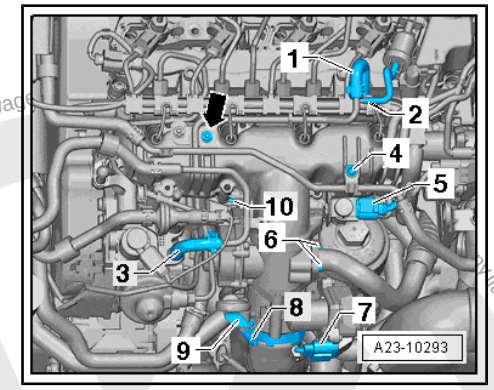
WARNING

- *Follow the rules for all work on the fuel system ⇒ page 3 .*
- *Observe rules for cleanliness ⇒ page 6 .*
- *Always follow these rules for cleanliness and instructions before starting work and while working on the fuel system.*

– Remove engine cover panel ⇒ page 39 .

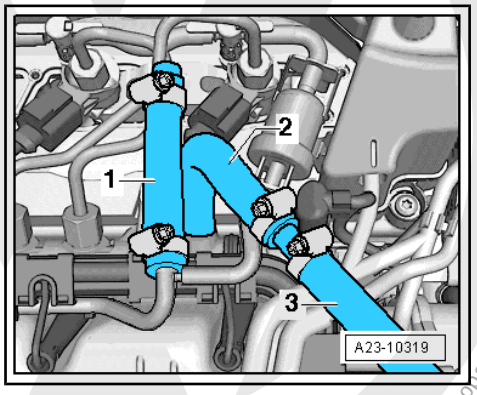
– Take noise insulation out of injectors.

– Pull off fuel return line -1-.



– Seal open fuel return line connection with a blanking plug -1-.

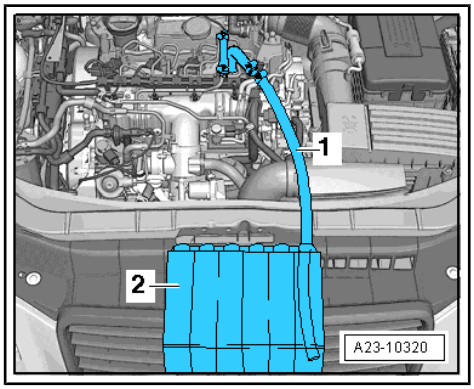
– Connect fuel return line -2- to suitable hose -3-.



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– Hold the end of this hose -1- in a suitable container -2- to measure the return flow rate.
– Start engine and run at idling speed.
• Specification after 30 seconds: return volume 100 ml

If the specification is not attained, the fuel pressure regulating valve - N276- is defective.



6.2 Removing and installing fuel pressure regulating valve - N276-

Special tools and workshop equipment required

♦ Torque wrench
♦ Insert tool, 30 mm - T10553-



♦ Open-end spanner, AF 33

The fuel pressure regulating valve is located in the fuel rail. The valves ensure that pressure is constant in the fuel rail and in the injector lines (fuel high pressure circuit).

If pressure is too high in the fuel high pressure circuit, the regulating valve will open. A small amount of fuel from the fuel rail will thereby make its way back to the fuel tank via the return line.

If pressure is too low in the fuel high pressure circuit, the regulating valve will close. The valve seals the high pressure side against the low pressure side in this way.

Caution

Follow the rules for all work on the fuel system ⇒ page 3 .

Observe rules for cleanliness ⇒ page 6 .

Follow these instructions before starting work and while working on the fuel system.

– Remove engine cover panel ⇒ page 39 .
– Remove fuel rail ⇒ page 232 .

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Note

The fuel rail may be clamped into a vice to allow for removing the pressure regulating valve. Always use protective jaw covers when clamping the fuel rail into a vice. Position the fuel rail in such a way that no force is exerted on the threaded connections for the high-pressure lines or the retaining tabs for securing the fuel rail to the cylinder head.

– Clean threaded area around regulating valve (e.g. with commercially available cold cleaning solvent) before removing. Under no circumstances may dirt enter the hole of the fuel rail.

Note

- *Do not allow any cleaning agent to get into the connector, clean it carefully.*
- *The fuel pressure regulating valve - N276- cannot be re-used.*

– Dry off fuel pressure regulating valve - N276- .

– Counterhold at housing hexagon and loosen union nut. Then unscrew and remove by hand.

– Extract dirt from fuel rail bore (threads and sealing surface). Do not use tools or other instruments for this purpose.

Note

Seal off fuel rail bore immediately with a suitable plug to prevent dirt from entering.

Installing

Note

- *Check that sealing surfaces (deformable sealing lip) and threads on fuel pressure regulating valve - N276- are undamaged.*
- *Also check sealing surface at fuel rail bore.*
- *Thread on fuel pressure regulating valve - N276- must be free of oil and grease.*

– Screw on union nut by hand.

– Align fuel pressure regulating valve - N276- so that connecting wire is free of mechanical tension after electrical connector is attached.

– Counterhold at housing hexagon and tighten union nut. Specified torque ⇒ Item 6 (page 221)

– Install fuel rail ⇒ page 232 .

– Install high-pressure lines ⇒ page 230 .

– After installation, run engine at moderate speed for several minutes and then switch off.

– Check fuel system for leaks.

– Read event memory ⇒ Vehicle diagnostic tester.

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– Then test drive the vehicle with at least one full acceleration. Check high pressure part of fuel system again for leaks.

– Read event memory again ⇒ Vehicle diagnostic tester.

6.3 Removing and installing fuel pressure sender

The fuel pressure sender - G247- (fuel rail pressure sensor) is located in the fuel rail and continuously measures the current fuel pressure in the high-pressure system. It transmits a corresponding voltage signal to the diesel direct injection system control unit - J248- .

In the event of sender failure, pressure regulation is controlled using a map from the engine control unit. In back-up function, the maximum engine speed is limited to approx. 3,000 rpm.

Removing

Caution

Follow the rules for all work on the fuel system *⇒ page 3* *.*

Observe rules for cleanliness *⇒ page 6* *.*

Follow these instructions before starting work and while working on the fuel system.

– Remove engine cover panel ⇒ page 39 .

– Clean threaded area around sender (e.g. with commercially available cold cleaning solvent) before removing. Under no circumstances should dirt enter the hole of the fuel rail.

Note

Do not allow any cleaning agent to get into the connector, clean it carefully.

– Dry off fuel pressure sender - G247- .

– Disconnect electrical connector at fuel pressure sender - G247- .

– Unscrew and remove fuel pressure sender - G247- .

– Extract dirt from fuel rail bore (threads and sealing surface). Do not use tools or other instruments for this purpose.

Note

Seal off fuel rail bore immediately with a suitable plug to prevent dirt from entering.

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Installing

Note

- *Check that sealing surfaces (deformable sealing lip) and threads on fuel pressure sender - G247- are undamaged.*
- *Also check sealing surface at fuel rail bore.*
- *The thread of the fuel pressure sender - G247- is coated with a lubricating lacquer. The thread must therefore be free of oil and grease.*

– Screw in fuel pressure sender - G247- by hand.
– Tighten sender. Specified torque ⇒ Item 14 (page 222)
– After installation, run engine at moderate speed for several minutes and then switch off.
– Check fuel system for leaks.
– Read event memory.
– Then test drive the vehicle with at least one full acceleration. Check high pressure part of fuel system again for leaks.
– Read event memory ⇒ Vehicle diagnostic tester.

6.4 Assembly overview - actuator for structure-borne sound and control unit for structure-borne sound

⇒ “6.4.1 Assembly overview - actuator for structure-borne sound R214 and control unit for structure-borne sound J869 (left-hand drive vehicles)”, page 256 .

⇒ “6.4.2 Assembly overview - actuator for structure-borne sound R214 and control unit for structure-borne sound J869 (right-hand drive vehicles)”, page 257 .

6.4.1 Assembly overview - actuator for structure-borne sound - R214- and control unit for structure-borne sound - J869- (left-hand drive vehicles)

Note

Actuator for structure-borne sound - R214- and control unit for structure-borne sound - J869- are not fitted in all vehicles!

To remove and install, plenum chamber cover and plenum chamber bulkhead must be removed ⇒ Body - front; Rep. gr. 50 .

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1 - Control unit for structure-borne sound - J869-

- ❑ Fitting location: in plenum chamber
- ❑ To remove and install, plenum chamber cover and plenum chamber bulkhead must be removed.

2 - 8 Nm

3 - 8 Nm

4 - Bracket for actuator for structure-borne sound - R214-

5 - 15 Nm

6 - 8 Nm

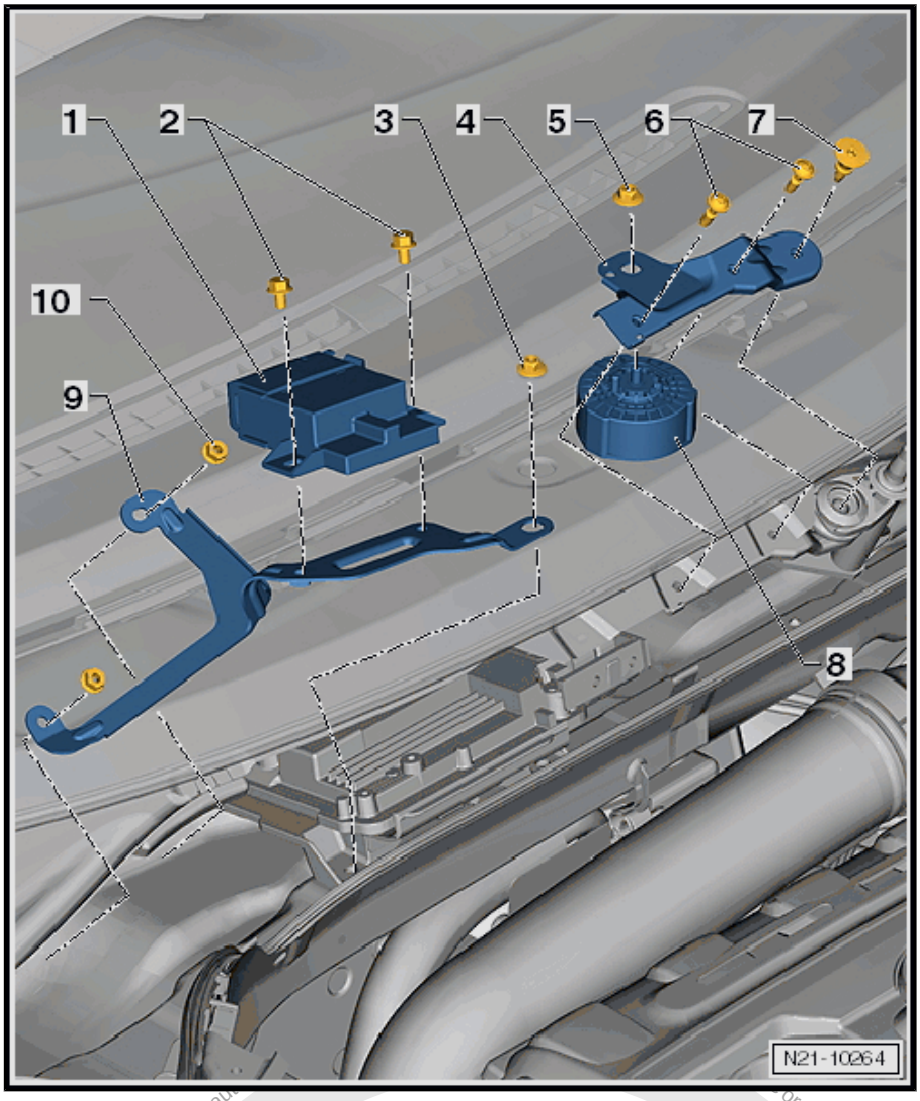
7 - 8 Nm

8 - Actuator for structure-borne sound - R214-

- ❑ Fitting location: in plenum chamber
- ❑ To remove and install, plenum chamber cover and plenum chamber bulkhead must be removed.

9 - Bracket for control unit for structure-borne sound - J869-

10 - 8 Nm



6.4.2 Assembly overview - actuator for structure-borne sound - R214- and control unit for structure-borne sound - J869- (right-hand drive vehicles)

Note

Actuator for structure-borne sound - R214- and control unit for structure-borne sound - J869- are not fitted in all vehicles!

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To remove and install, plenum chamber cover and plenum chamber bulkhead must be removed ⇒ Body - front; Rep. gr. 50 .

1 - Bracket for control unit for structure-borne sound - J869-

2 - 8 Nm

3 - 8 Nm

4 - 15 Nm

5 - 8 Nm

6 - Bracket for actuator for structure-borne sound - R214-

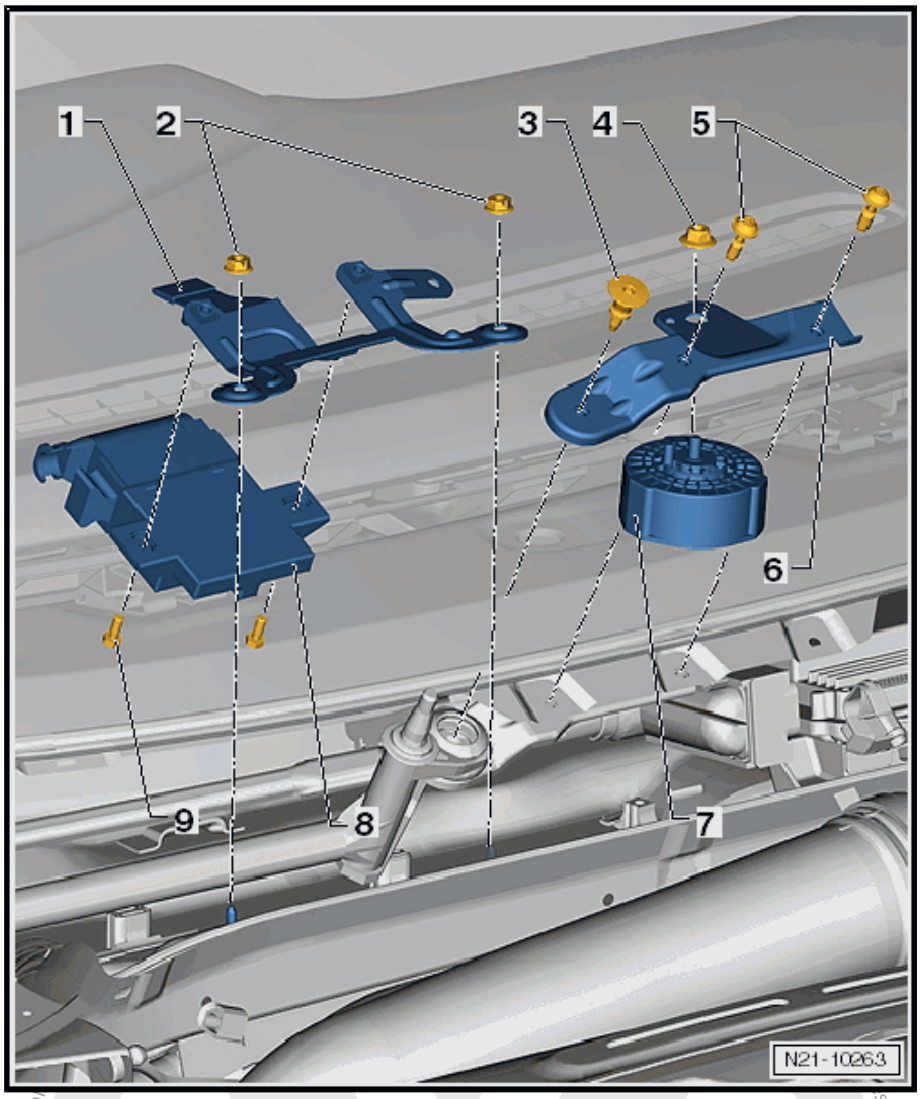
7 - Actuator for structure-borne sound - R214-

- ❑ Fitting location: in plenum chamber
- ❑ To remove and install, plenum chamber cover and plenum chamber bulkhead must be removed.

8 - Control unit for structure-borne sound - J869-

- ❑ Fitting location: in plenum chamber
- ❑ To remove and install, plenum chamber cover and plenum chamber bulkhead must be removed.

9 - 8 Nm



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7 High-pressure pump

⇒ “2.1 Safety precautions during work on fuel system”, page 3

⇒ “3.1 Rules for cleanliness”, page 6

⇒ “7.1 Removing and installing high-pressure pump”, page 259

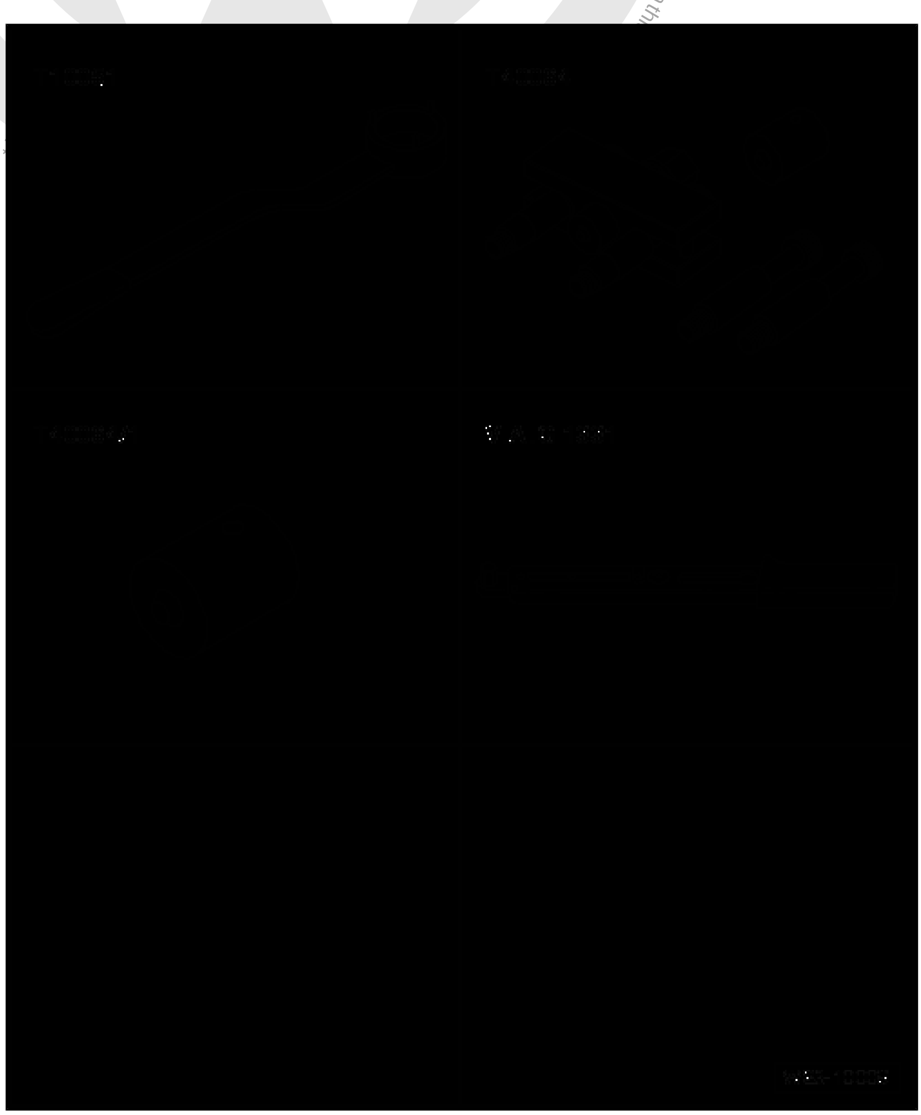
7.1 Removing and installing high-pressure pump

Caution

- *Risk of irreparable damage to high-pressure pump if allowed to run dry.*
- *The high pressure pump must be filled with fuel before the engine is started the 1st time ⇒ page 223 . (It is important not to allow the high-pressure pump to run while still empty.)*
- *Protect open fuel connections from dirt entrainment using suitable methods under all circumstances.*

Special tools and workshop equipment required

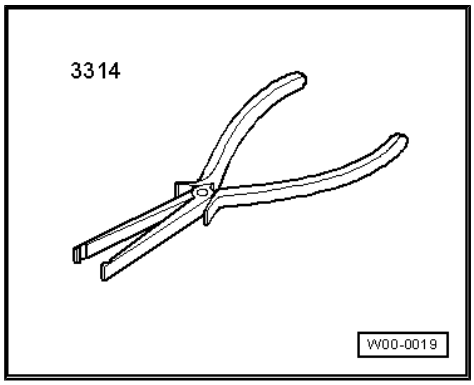
- Counter-hold tool - T10051-
- Puller - T40064-
- Press tool - T40064/1-
- Torque wrench - V.A.G 1331-



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♦ Pliers - 3314-

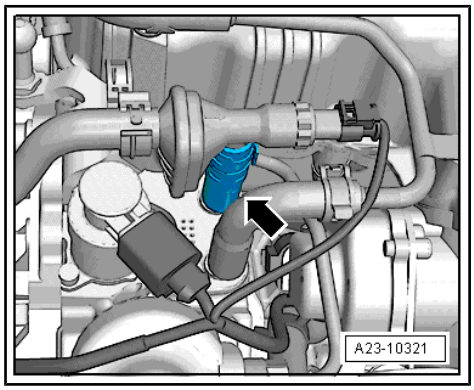


Removing

– Observe rules for cleanliness ⇒ page 6 .

– Remove toothed belt from camshaft and high-pressure pump ⇒ page 106 .

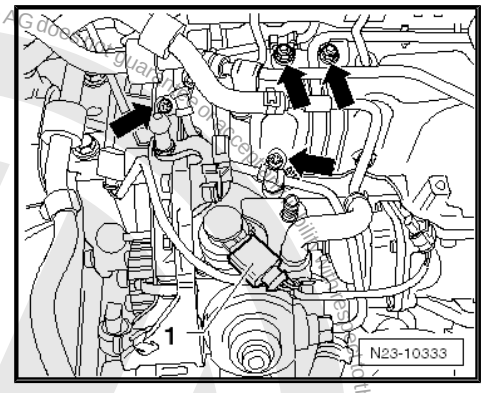
– Pull fuel supply line -arrow- off high-pressure pump.



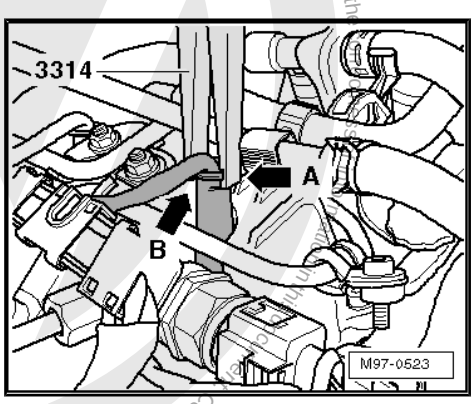
– Disconnect connector -1- and remove bolts -arrows-.

Caution

Make sure that no wiring connections are damaged when disconnecting the connectors. Otherwise the whole wiring harness will need to be renewed. Do not compress the pliers -3314- too firmly to separate the connectors, otherwise the support sleeve may be damaged.

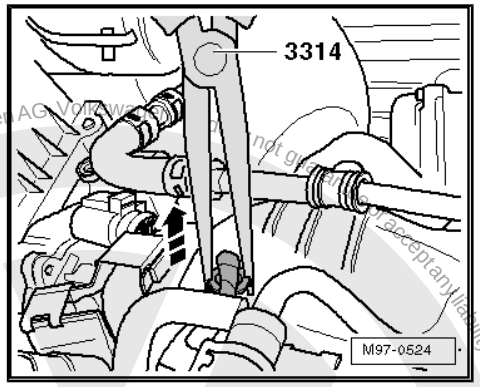


– Position pliers - 3314 - with groove -arrow A- on support sleeve shoulder -arrow B- and pull plugs off glow pin plugs.

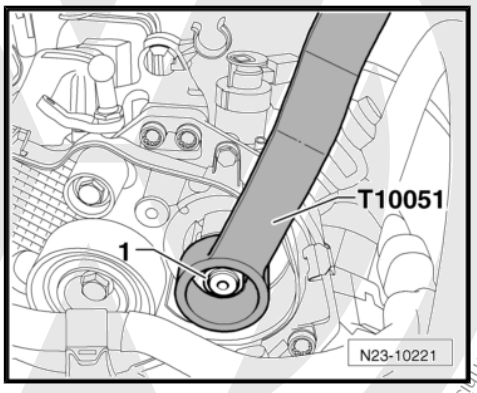


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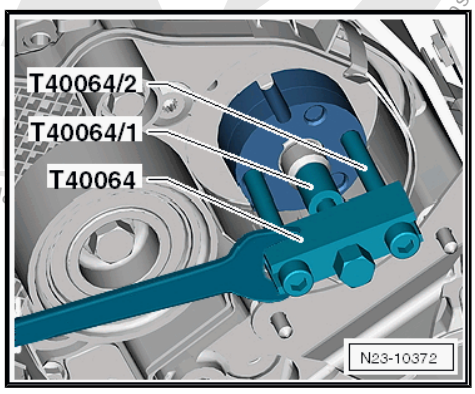
– Carefully pull connector off glow plug in direction of -arrow-.
– Unscrew securing bolts of coolant line from intake manifold and lay coolant line to side.
– Pull fuel return line off high-pressure pump.
– Pull fuel return line off fuel rail and lay it to side.
– Remove fuel supply line between high-pressure pump and fuel rail.
– Remove toothed belt pulley from high-pressure pump.



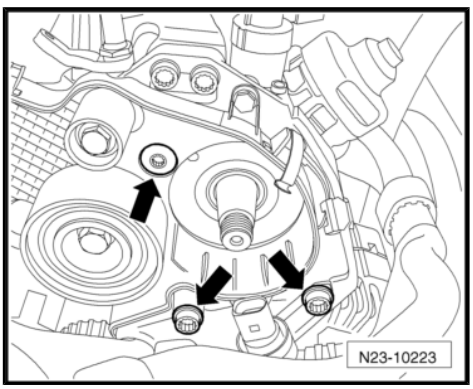
– Counterhold hub of high-pressure pump using counterhold - T10051- and unscrew securing nut -1-.



– Apply puller - T40064- with thrust piece - T40064/1- and pin - T40064/2- as shown in illustration and pull hub off high-pressure pump. If necessary, counterhold with a 24 mm open-end spanner.



– Unscrew securing bolts -arrows- for high-pressure pump.
– Remove high-pressure pump.



Installing

Install in reverse order of removal.

Specified torques for fuel system ⇒ page 220

Specified torques for toothed belt drive ⇒ page 104

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8 Engine (motor) control unit

⇒ “8.1 Removing and installing engine control unit”, page 262

8.1 Removing and installing engine control unit

⇒ “8.1.1 Removing and installing anti-theft engine control unit J623 , Scirocco”, page 262

⇒ “8.1.3 Removing and installing anti-theft engine control unit J623 , Passat, Passat CC and Tiguan”, page 265

⇒ “8.1.4 Removing and installing engine control unit J623 , Passat, Passat CC and Tiguan”, page 267

⇒ “8.1.5 Removing and installing engine control unit, Golf Plus”, page 268

⇒ “8.1.6 Removing and installing anti-theft engine control unit, Golf Plus”, page 269

⇒ “8.1.2 Removing and installing engine control unit J623 , Scirocco”, page 264

⇒ “8.1.7 Removing and installing engine control unit J623 , Golf”, page 271

⇒ “8.1.8 Removing and installing anti-theft engine control unit J623 , Golf”, page 272

⇒ “8.1.9 Removing and installing engine control unit, Eos”, page 275

⇒ “8.1.10 Removing and installing anti-theft engine control unit, Eos”, page 276

8.1.1 Removing and installing anti-theft engine control unit - J623- , Scirocco

If you wish to renew the engine control unit, connect the vehicle diagnostic tester and perform the guided function “Renewing control unit”.

Removing

– Switch off ignition.

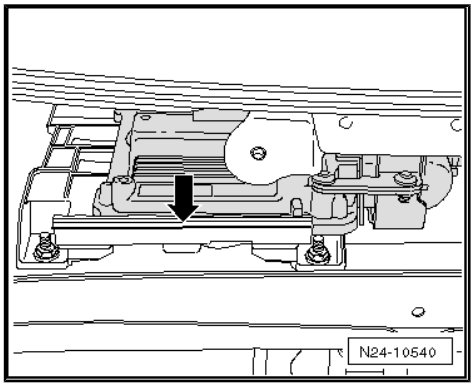
– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .

– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .

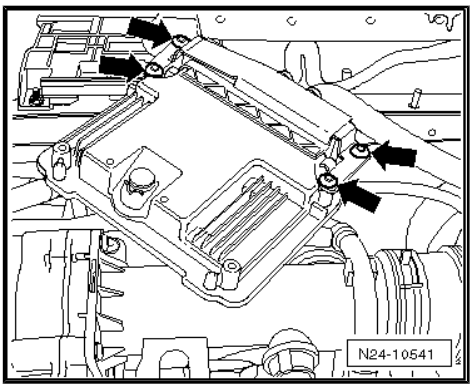
– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

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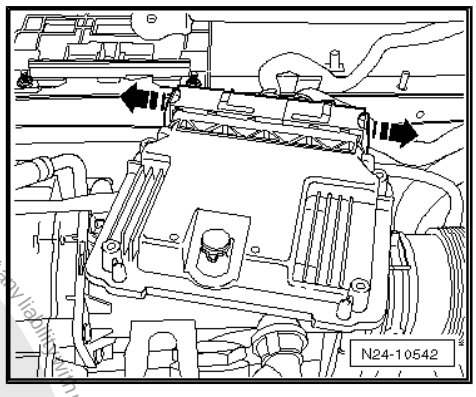
– Press retaining frame down in -direction of arrow- and remove engine control unit.



– Remove shear-head bolts -arrows- using pliers and remove locking clips.

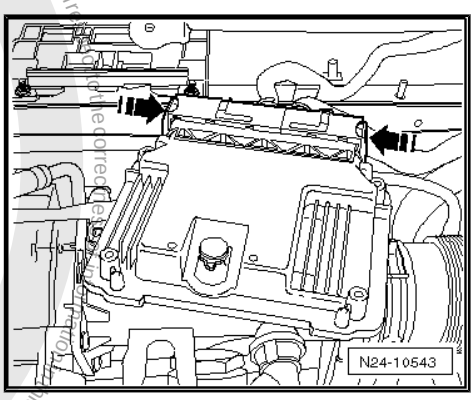


– Push connector locking devices in direction of -arrow-, and pull connectors off.



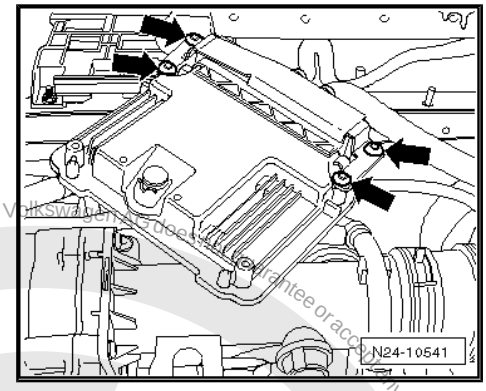
Installing

– Fit connectors to engine control unit and slide locking devices onto stop in direction of -arrow-.

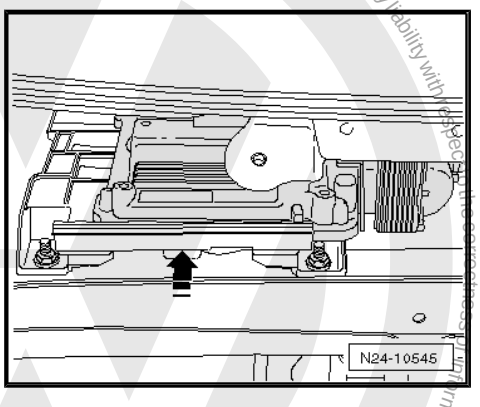


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– Fit the two locking clips over the connector and secure with new shear-head bolts -arrows-.
– Tighten shear-head bolts evenly until heads shear-head off -arrows-.



– Insert engine control unit into retaining frame and press retaining frame upwards in -direction of arrow-
– Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

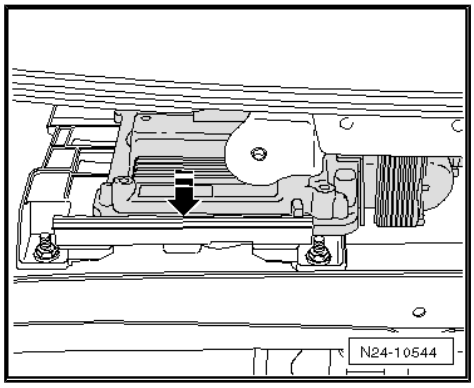


8.1.2 Removing and installing engine control unit - J623- , Scirocco

If you wish to renew the engine control unit, connect the vehicle diagnostic tester and perform the guided function “Renewing control unit”.

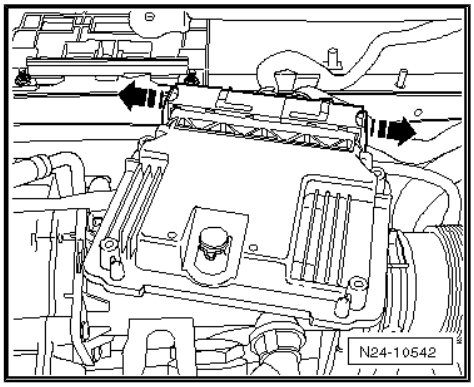
Removing

– Switch off ignition.
– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .
– Press retaining frame down in -direction of arrow- and remove engine control unit.



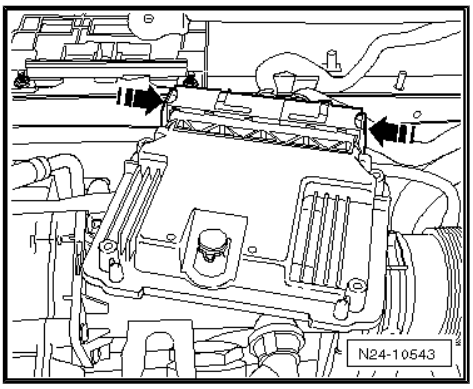
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– Push connector locking devices in direction of -arrow-, and pull connectors off.

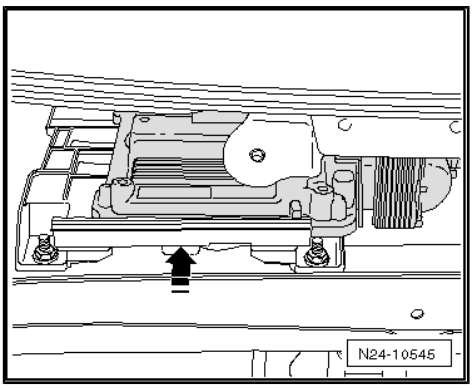


Installing

– Fit connectors to engine control unit and slide locking devices onto stop in direction of -arrow-.



– Insert engine control unit into retaining frame and press retaining frame upwards in -direction of arrow-



– Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .

– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .

– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

8.1.3 Removing and installing anti-theft engine control unit - J623- , Passat, Passat CC and Tiguan

If you wish to renew the engine control unit, connect the vehicle diagnostic tester and perform the guided function “Renewing control unit”.

Special tools and workshop equipment required

◆ Grip pliers

Removing

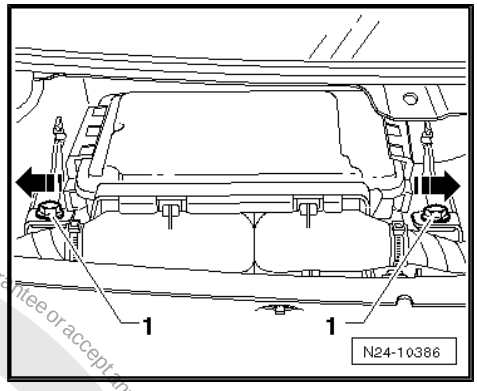
– Switch off ignition.

– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .

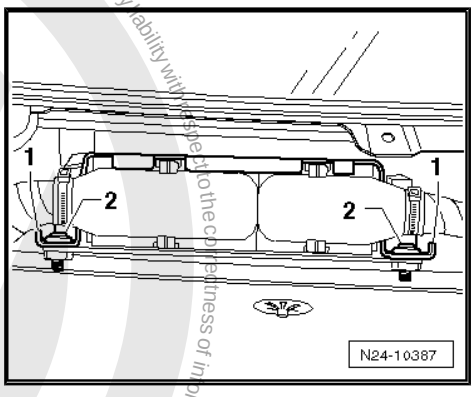
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .

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– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .
– Unscrew bolts -1-.
– Cover the plenum chamber with a clean cloth so that it is not scratched.
– Raise engine control unit with retaining frame slightly.
– Release engine control unit in direction of -arrow- and pull out slightly.

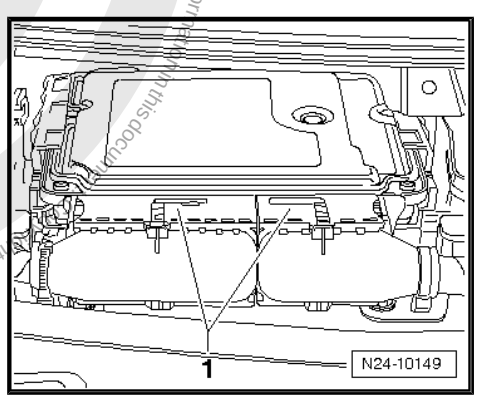


– Bend the upper ends -1- of locking clip outwards.
– Remove shear-head bolts -2- using grip pliers and remove locking clip.



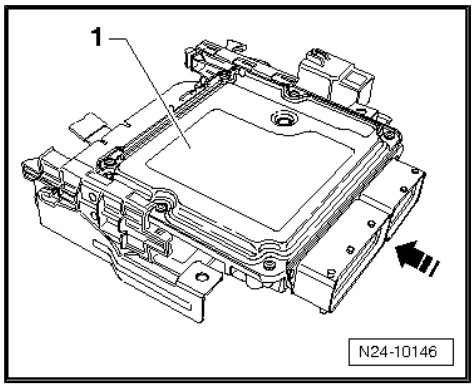
– Slide connector locking devices -1- on engine control unit outwards and pull off both connectors.
– Remove engine control unit.

Installing:



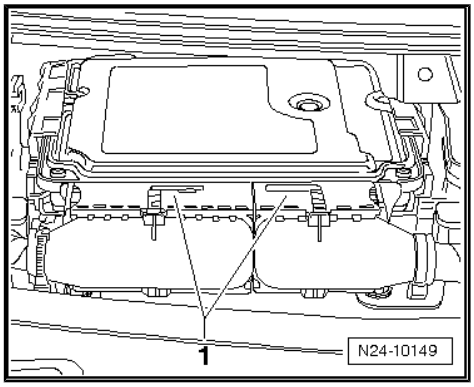
– Slide engine control unit -1- into retaining frame in -direction of arrow- until it engages.
– Tighten the retaining frame.

  Specified torque: 6 Nm



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– Fit connectors to engine control unit and slide locking devices -1- inwards.
– Take a new locking clip and tighten new shear-head bolts evenly until heads shear off.

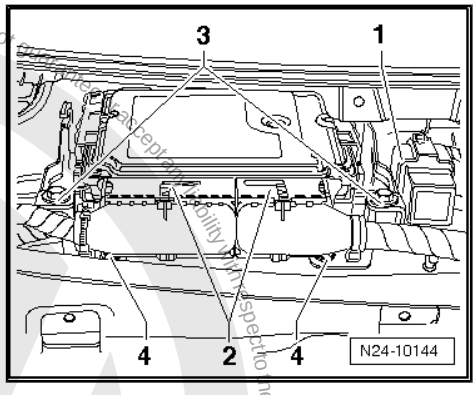


8.1.4 Removing and installing engine control unit - J623- , Passat, Passat CC and Tiguan

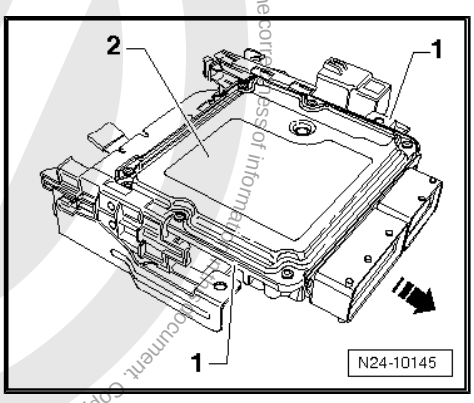
If you wish to renew the engine control unit, connect the vehicle diagnostic tester and perform the guided function “Renewing control unit”.

Removing

– Switch off ignition.
– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .
– Pull connector -1- off heated windscreen control unit - J505- .
– Slide connector locking devices -2- on engine control unit outwards and pull off both connectors.
– Remove securing bolts -3-.
– Remove retainer frame with engine control unit from plenum chamber.



– Press locking device -1- outwards and slide engine control unit -2- in -direction of arrow-.

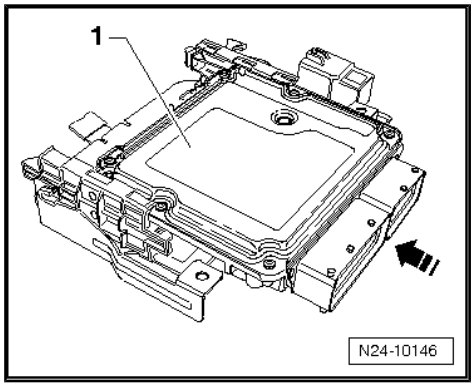


Installing

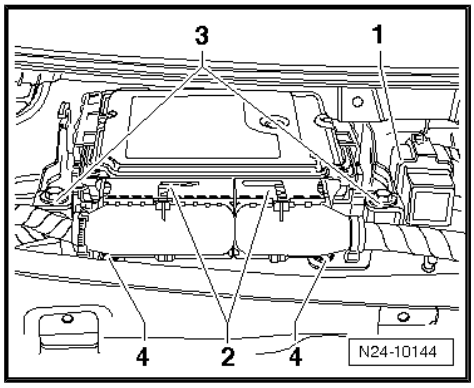
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– Slide engine control unit -1- into retaining frame in -direction of arrow-.
– Fit retainer frame with engine control unit onto retainer -4-.

Specified torque of securing nuts for retainer -4-: 6 Nm.



– Tighten securing bolts -3- to 7 Nm.
– Fit connectors to engine control unit and slide locking devices -2- inwards.
– Fit connector -1- to heated windscreen control unit - J505- .
– Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .



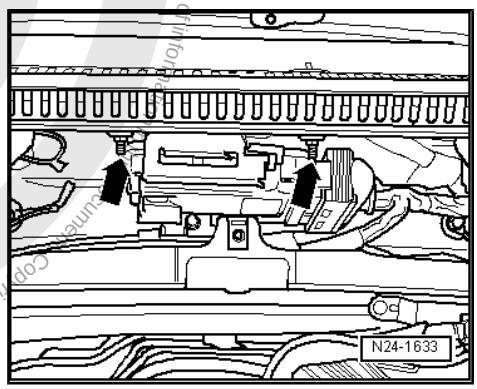
8.1.5 Removing and installing engine control unit, Golf Plus

Note

If you wish to renew the engine control unit, connect the vehicle diagnostic tester and perform the guided function "Renewing engine control unit".

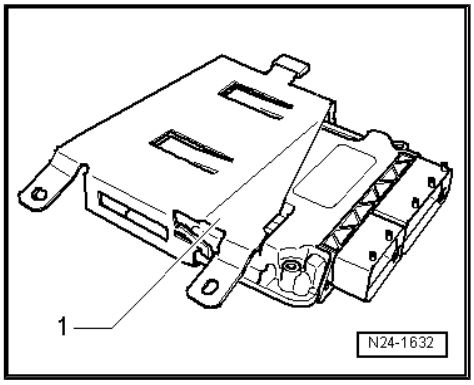
Removing engine control unit

– Switch off ignition.
– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .
– Loosen securing nuts -arrows-.
– Release connectors on engine control unit and pull off connector.



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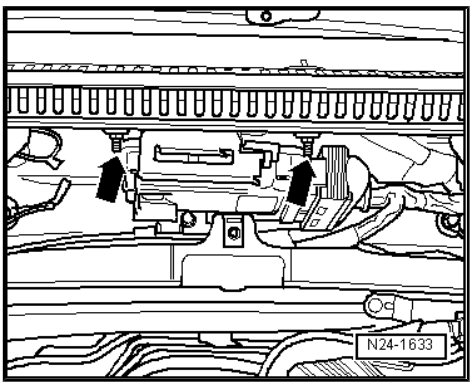
– Push bracket -1- off engine control unit in direction of arrow.



Installing engine control unit

– Push bracket onto engine control unit.

– Tighten securing nuts -arrows- to 10 Nm.



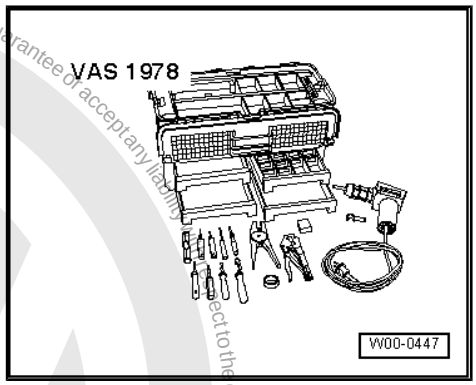
– Fit connectors and lock in position.

– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

8.1.6 Removing and installing anti-theft engine control unit, Golf Plus

Special tools and workshop equipment required

- Grip pliers
- Hot air blower from wiring harness repair set - VAS 1978-



Note

- *If the engine control unit is to be renewed, connect vehicle diagnostic, testing and information system - VAS 5051B- and perform "Renewing engine control unit" in guided functions.*
- *The shear-head bolt threads are coated with locking compound. Heating the shear-head bolt with a hot air blower releases the locking effect of the locking compound.*

Removing:

– Switch off ignition.

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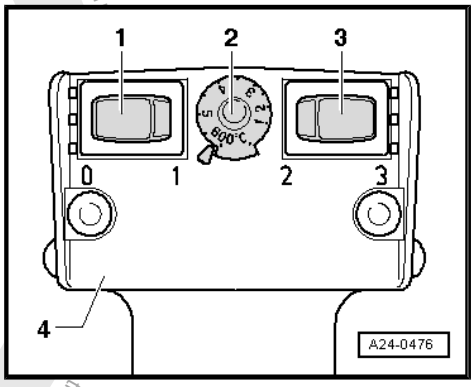
– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

Caution

Cover lines, connections and control units in the vicinity of the engine control unit to prevent damage through heat.

Perform settings on hot air blower -4- as shown:

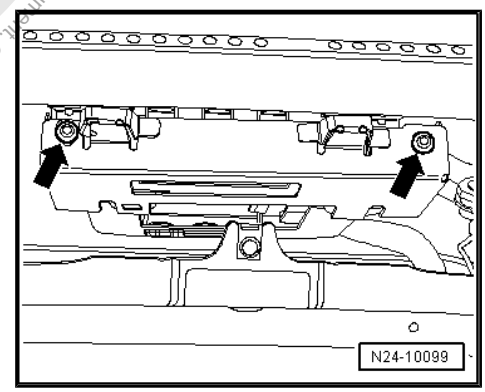
– Turn temperature setting potentiometer -2- to maximum heat output (600°C).
– Set two-stage switch for volume of air -3- to position 3.
– Place nozzle of hot air blower close to shear-head bolt.
– Switch on hot air blower and heat the bolts.



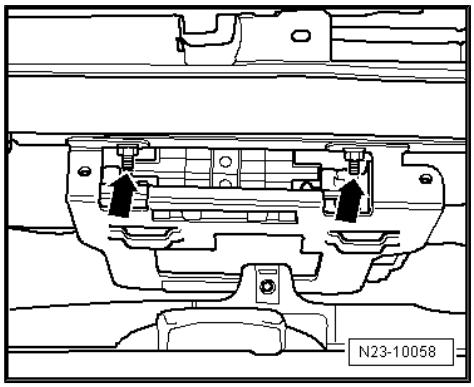
WARNING

When shear-head bolts are heated up, parts of the protective housing will be subjected to a large amount of heat. Wear protective gloves to avoid possible injury.

– Twist shear-head bolts -arrows- out using grip pliers and remove cover from protective housing.

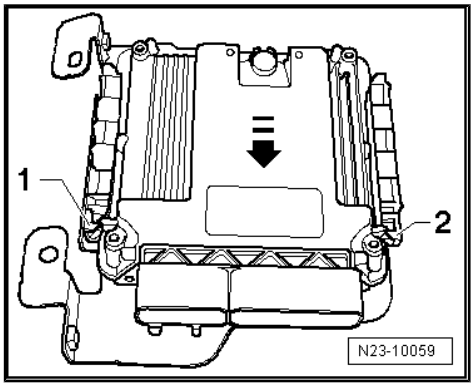


– Then remove securing nuts for control unit bracket -arrows-.
– Release connectors on engine control unit and pull off connector.



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

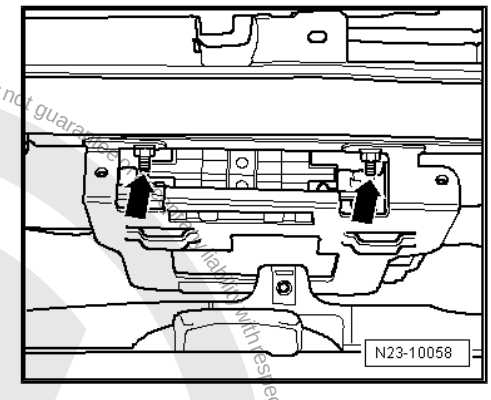


Installing:

– Push engine control unit onto control unit bracket until it engages in catches.

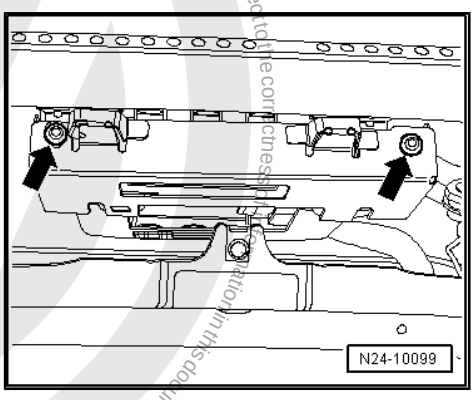
– Fit connectors to engine control unit and lock in position.

– Tighten securing bolts -arrows- to 10 Nm.



– Install cover of protective housing.

– Tighten new shear-head bolts -arrows- evenly until heads shear off.



– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

8.1.7 Removing and installing engine control unit - J623- , Golf

If you wish to renew the engine control unit, connect the ⇒ Vehicle diagnostic tester and carry out the guided function “Renew control unit”.

Removing

– Switch off ignition.

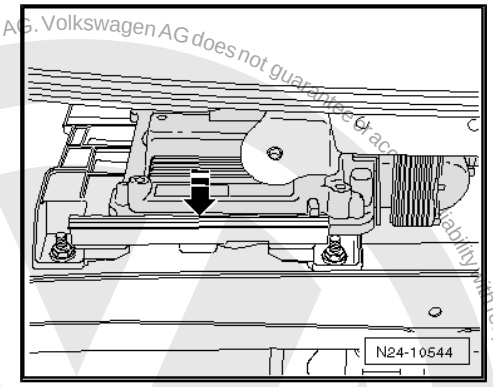
– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .

– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .

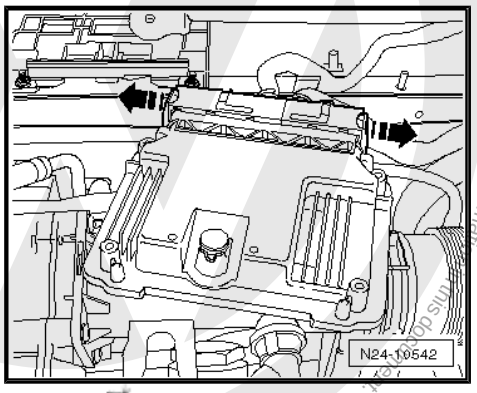
– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

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– Press retaining frame down in -direction of arrow- and remove engine control unit.

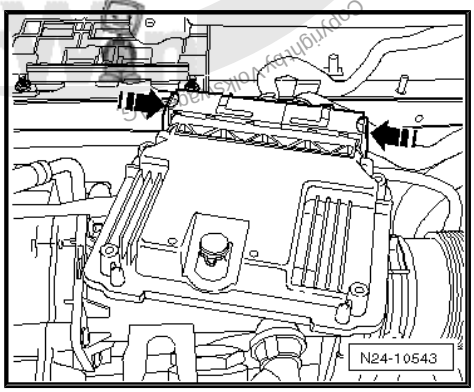


– Push connector locking devices in direction of -arrow-, and pull connectors off.

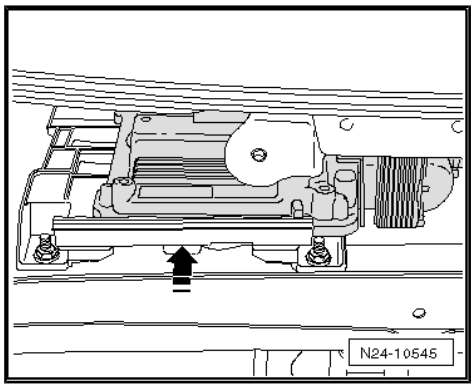


Installing

– Fit connectors to engine control unit and slide locking devices onto stop in direction of -arrow-.



– Insert engine control unit into retaining frame and press retaining frame upwards in -direction of arrow-
– Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .



8.1.8 Removing and installing anti-theft engine control unit - J623- , Golf

If you wish to renew the engine control unit, connect the ⇒ Vehicle diagnostic tester and carry out the guided function “Renew control unit”.

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Removing

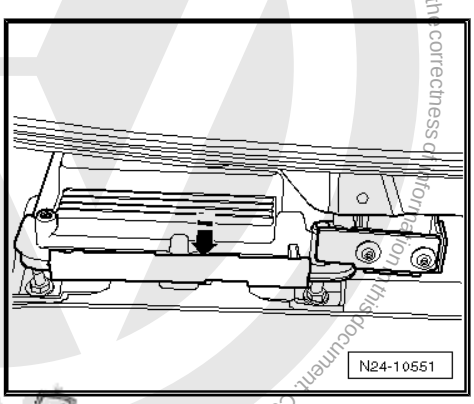
– Switch off ignition.

– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .

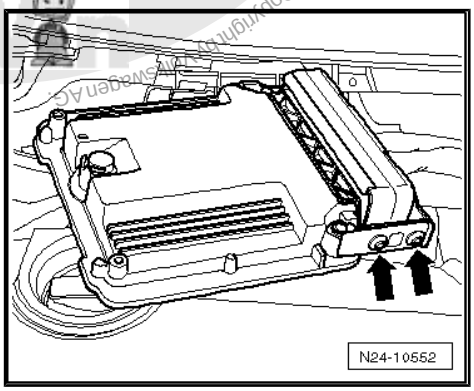
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .

– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

– Press retaining frame down in -direction of arrow- and remove engine control unit.

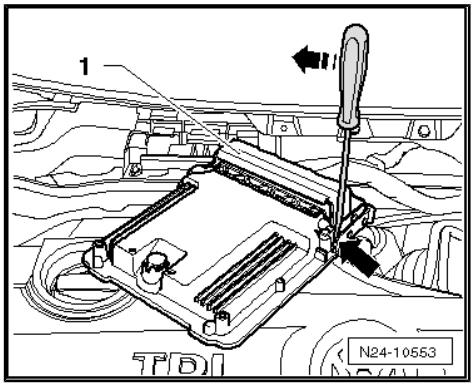


– Unscrew shear-head bolts -arrows- using pliers.



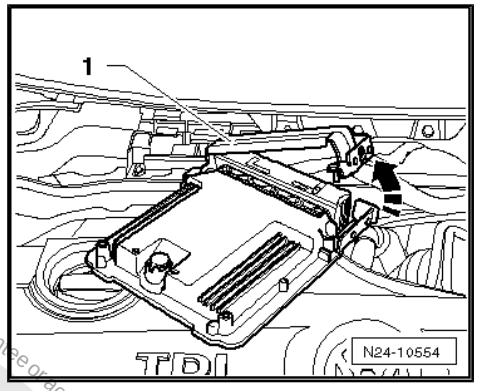
– Insert screwdriver between both locking plates -arrow-.

– Carefully press screwdriver in direction of -arrow- and bend retaining bow -1- upwards at the same time.

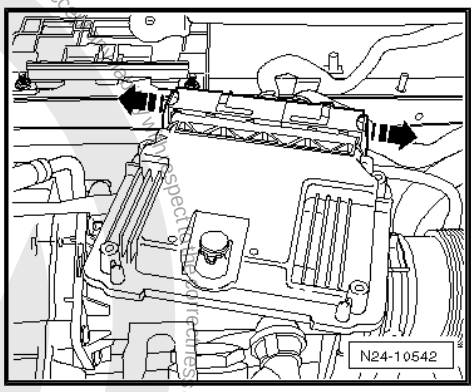


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– Bend retaining bow -1- in direction of -arrow- until it can be pulled off connectors.

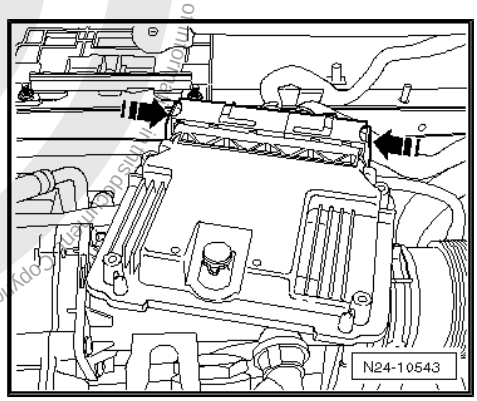


– Push connector locking devices in direction of -arrow-, and pull connectors off.

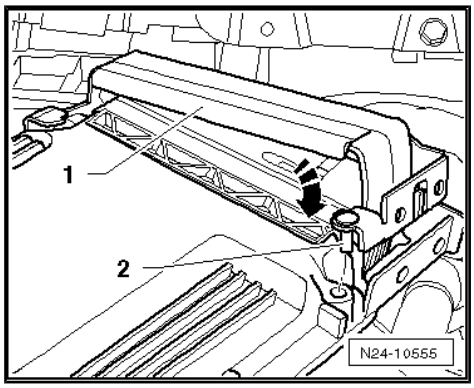


Installing

– Fit connectors to engine control unit and slide locking devices onto stop in direction of -arrow-.

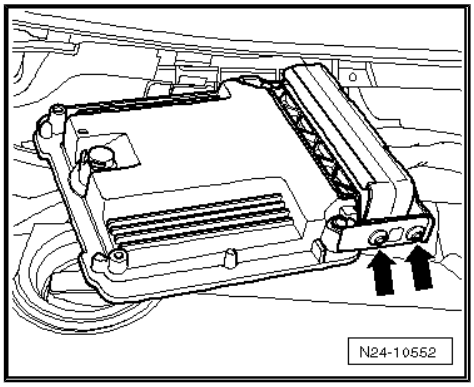


– Fit retaining bow -1- onto connectors and press it in direction of -arrow-.
– Guide pin -2- to stop into hole on valve timing housing.

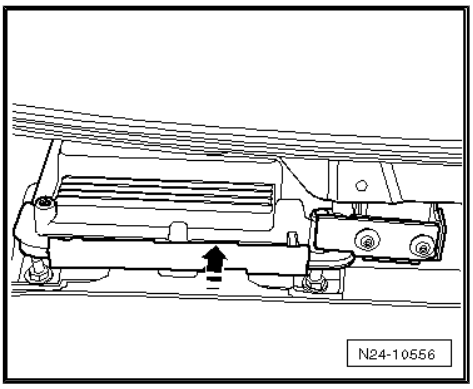


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– Secure retaining bow with shear-head bolts to engine control unit -arrows-.
– Tighten shear-head bolts evenly until heads shear-head off -arrows-.



– Insert engine control unit into retaining frame and press retaining frame upwards in -direction of arrow-



– Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

8.1.9 Removing and installing engine control unit, Eos

Note

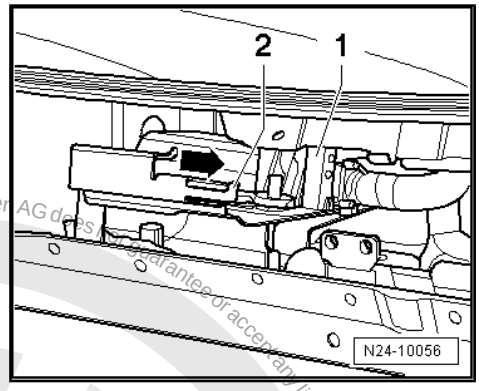
If you wish to renew the engine control unit, connect the vehicle diagnostic tester and perform the guided function "Renewing engine control unit".

Removing

– Switch off ignition.
– Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

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– Release front connector -1- from engine control unit and pull it off.
– Lever up catch -2- slightly.
– Then push engine control unit out of retainer -arrow-.
– Then release rear connector on engine control unit and pull it off.



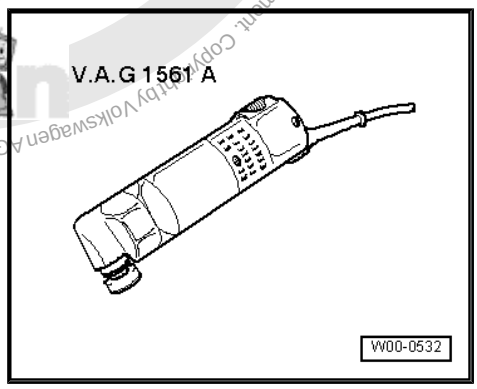
Installing

– Fit rear connector to engine control unit and lock in position.
– Push engine control unit onto bracket.
– Fit front connector to engine control unit and lock it in position.
– Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

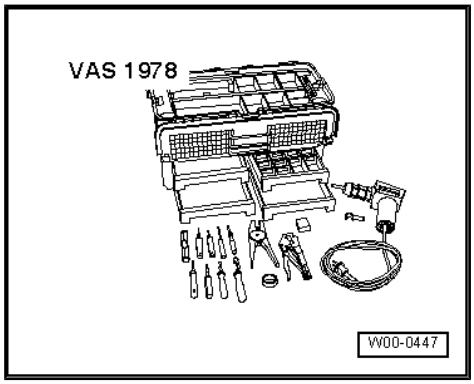
8.1.10 Removing and installing anti-theft engine control unit, Eos

Special tools and workshop equipment required

- Electric cutter - V.A.G 1561 A-
- Saw set - V.A.G 1561/14-
- Grip pliers



- Hot air blower from wiring harness repair set - VAS 1978-



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Note

If you wish to renew the engine control unit, connect the vehicle diagnostic tester and perform the guided function "Renewing engine control unit".

Removing

- Switch off ignition.
- Remove wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
- Remove plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
- Remove plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .

Note

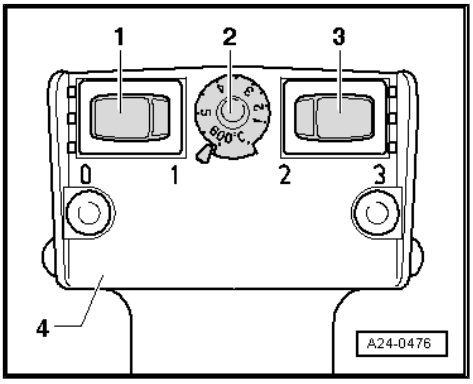
The shear-head bolt threads are coated with locking compound. Heating the shear-head bolt with a hot air blower releases the locking effect of the locking compound.

Caution

Cover lines, connections and control units in the vicinity of the engine control unit to prevent damage through heat.

Perform settings on hot air blower -4- as shown:

- Turn temperature setting potentiometer -2- to maximum heat output (600°C).
- Set two-stage switch for volume of air -3- to position 3.



WARNING

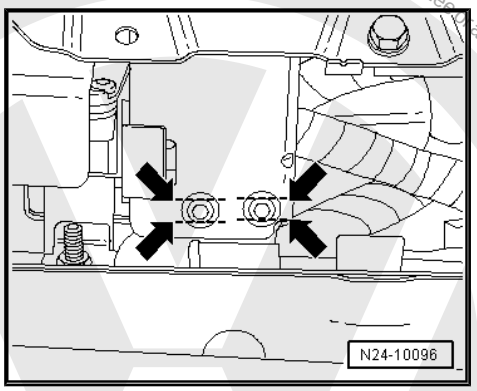
When shear-head bolts are heated up, parts of the protective housing will be subjected to a large amount of heat. Wear protective gloves to avoid possible injury.

- Place nozzle of hot air blower close to shear-head bolt.
- Switch on hot air blower and heat the bolts.
- Remove bolts with grip pliers .

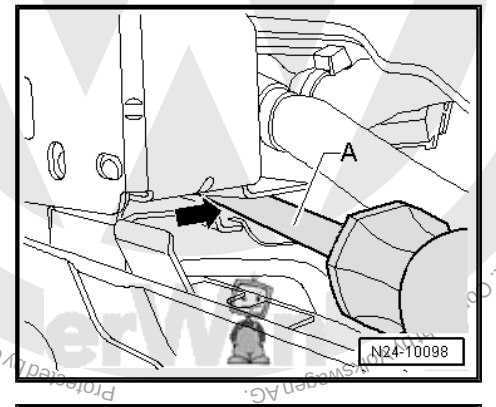
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Note

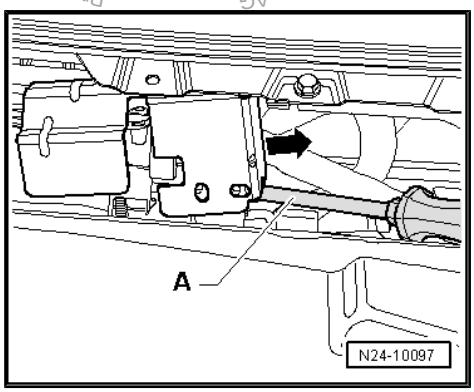
If the bolts will not move, saw into heads of shear-head bolts so that 2 parallel slots are created -arrows-. Then unscrew them.



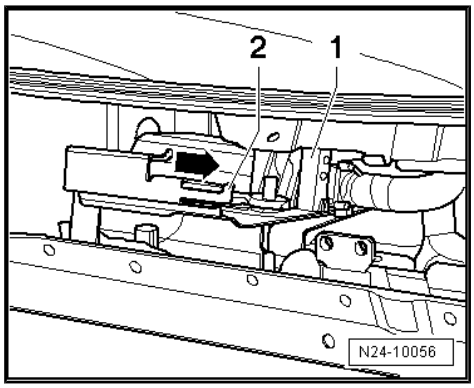
– Insert a screwdriver between protective housing -A- and bracket -arrow-.



– Lever up protective housing using screwdriver -A- and pull to side off bracket -arrow-.



– Release front connector -1- from engine control unit and pull it off.
– Lever up catch -2- slightly.
– Then push engine control unit out of retainer -arrow-.
– Then release rear connector on engine control unit and pull it off.

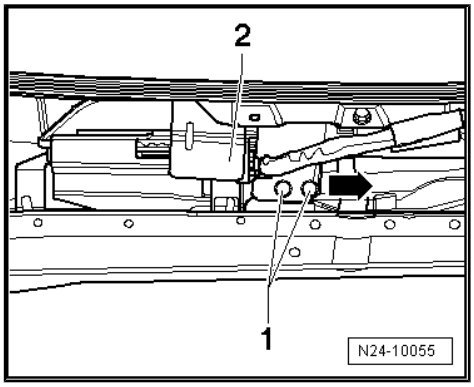


Installing

– Fit rear connector to engine control unit and lock in position.
– Push engine control unit onto bracket.
– Fit front connector to engine control unit and lock it in position.
– Push protective housing onto bracket.

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– Tighten new shear-head bolts -1- evenly until heads shear off.
– Install wiper arms ⇒ Electrical system; Rep. gr. 92 ; Windscreen wiper system; Removing and installing wiper arms .
– Install plenum chamber cover ⇒ General body repairs, exterior; Rep. gr. 50 ; Plenum chamber bulkhead; Removing and installing plenum chamber cover .
– Install plenum chamber bulkhead ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Assembly overview - bulkhead .



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9 Lambda probe

9.1 Removing and installing lambda probe

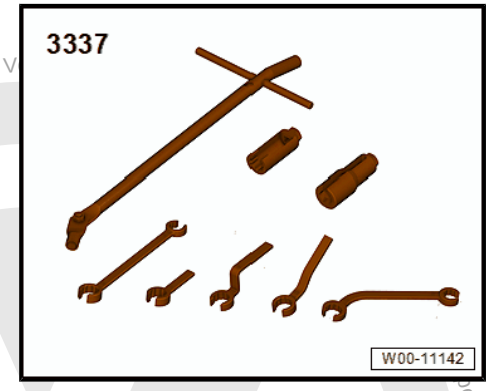
⇒ “9.1.1 Removing and installing lambda probe G39 ”, page 280

⇒ “9.1.2 Removing and installing lambda probe after catalytic converter G130 , engine code CJAA”, page 281

9.1.1 Removing and installing lambda probe - G39-

Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-



Removing

WARNING

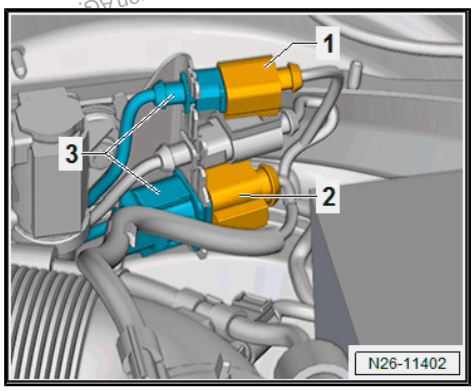
Please observe the following points during all installation work, in particular in the engine compartment, due to the space limitations:

- *Route all the various lines and electrical wiring so that they are in their original positions.*
- *Ensure that there is sufficient clearance to all moving or hot components*

– Remove motor cover panel ⇒ page 39 .

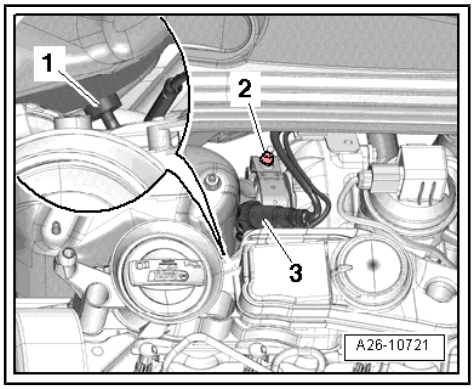
– Disconnect »black« connector for lambda probe -G39- -2- at plenum chamber bulkhead.

– Remove wire -3- from retainer and move clear.



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– Unscrew lambda probe - G39- -3-, using tool from lambda probe open ring spanner set - 3337- .



Installing

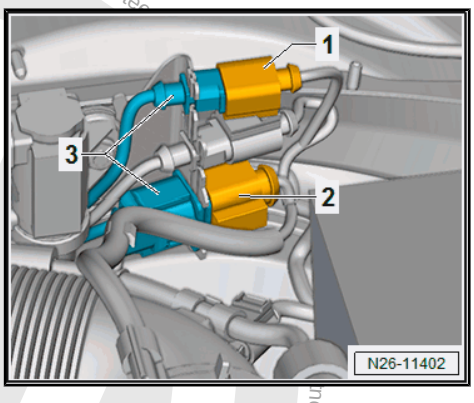
Note

- *New lambda probes are coated with an assembly paste. Do not allow any paste to enter the slots on the probe body.*
- *When installing, the lambda probe's electrical wiring connection must always be re-attached in the same locations to prevent the lambda probe cable from coming into contact with the exhaust pipe.*

– Remove protective cap on thread of lambda probe.

– Screw in lambda probe by hand then tighten using a tool from lambda probe open ring spanner set - 3337- . Torque setting ⇒ page 299 .

– Route wire to plenum chamber bulkhead, fit connector -2- and secure in retainer as shown.



– Fit engine cover panel ⇒ page 39 .

9.1.2 Removing and installing lambda probe after catalytic converter - G130- , engine code CJAA

Special tools and workshop equipment required

- Socket 22 mm - T10491-

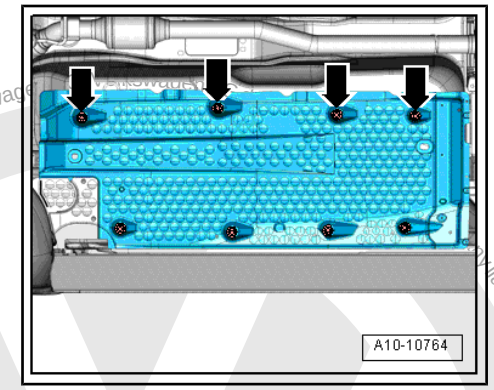


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Removing

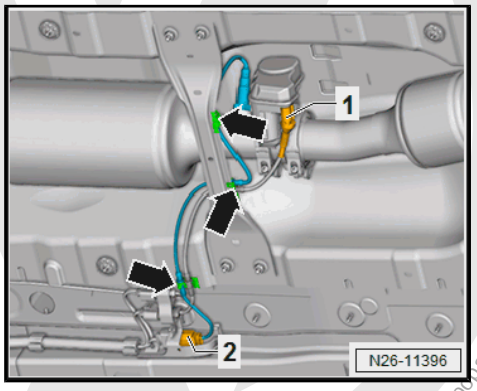
– Unscrew nuts -arrows- and pull down underbody cladding on right slightly.

– Separate »brown« connector for lambda probe after catalytic converter - G130- -2-. Remove plug from retainer.



– Open fasteners of heat insulation and guide out wiring from clips -arrows-.

– Unscrew lambda probe after catalytic converter - G130- using socket 22 mm - T10491- .



Installing

WARNING

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

- ***Route all the various lines and electrical wiring so that they are in their original positions.***
- ***Ensure that there is sufficient clearance to all moving or hot components***

Note

- *New lambda probes are coated with an assembly paste. Do not allow any paste to enter the slots on the probe body.*
- *When installing, the lambda probe's electrical wiring connection must always be re-attached in the same locations to prevent the lambda probe cable from coming into contact with the exhaust pipe.*

– If necessary, remove protective cap on thread of lambda probe.

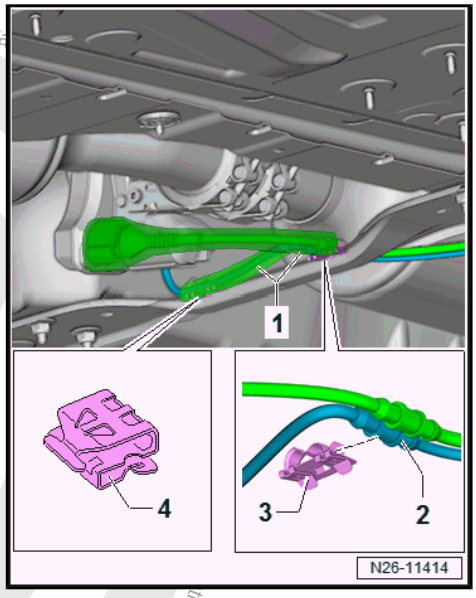
– Screw in lambda probe by hand then tighten using socket 22mm - T10491- . Torque setting ⇒ page 302 .

– Fit »brown« connector for lambda probe after catalytic converter - G130- -2- and attach to retainer.

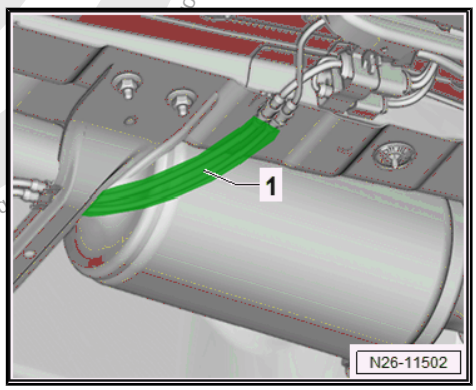
– Wrap heat insulation mats -1- around wiring, as shown, and close fasteners.

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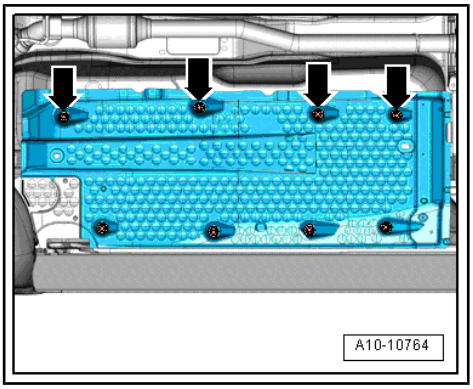
– Place wires -2- in clips -3- and -4-.



– Wrap heat insulation mat -1- around wiring and close fasteners.



– Press underbody cladding upward and tighten nuts -arrows- to 2 Nm.



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26 – Exhaust system

1 Exhaust pipes, silencers

⇒ “1.1 Assembly overview - silencers”, page 284

⇒ “1.2 Separating exhaust pipes, silencers”, page 292

⇒ “1.3 Aligning exhaust system free of stress”, page 294

⇒ “1.4 Check exhaust system for leaks”, page 296

⇒ “1.5 Installation position of clamp”, page 297

1.1 Assembly overview - silencers

⇒ “1.1.1 Assembly overview - silencer, vehicles with front-wheel drive, Passat, Passat CC”, page 284

⇒ “1.1.2 Assembly overview - silencer, vehicles with four-wheel drive, Passat, Passat CC”, page 286

⇒ “1.1.3 Assembly overview - silencer, vehicles with SCR system, Passat, Passat CC”, page 287

⇒ “1.1.4 Assembly overview - silencers, Tiguan”, page 288

⇒ “1.1.5 Assembly overview - silencer, vehicles with front-wheel drive, Eos, Golf, Scirocco, Golf Plus”, page 289

⇒ “1.1.6 Assembly overview - silencer, vehicles with four-wheel drive, Golf”, page 290

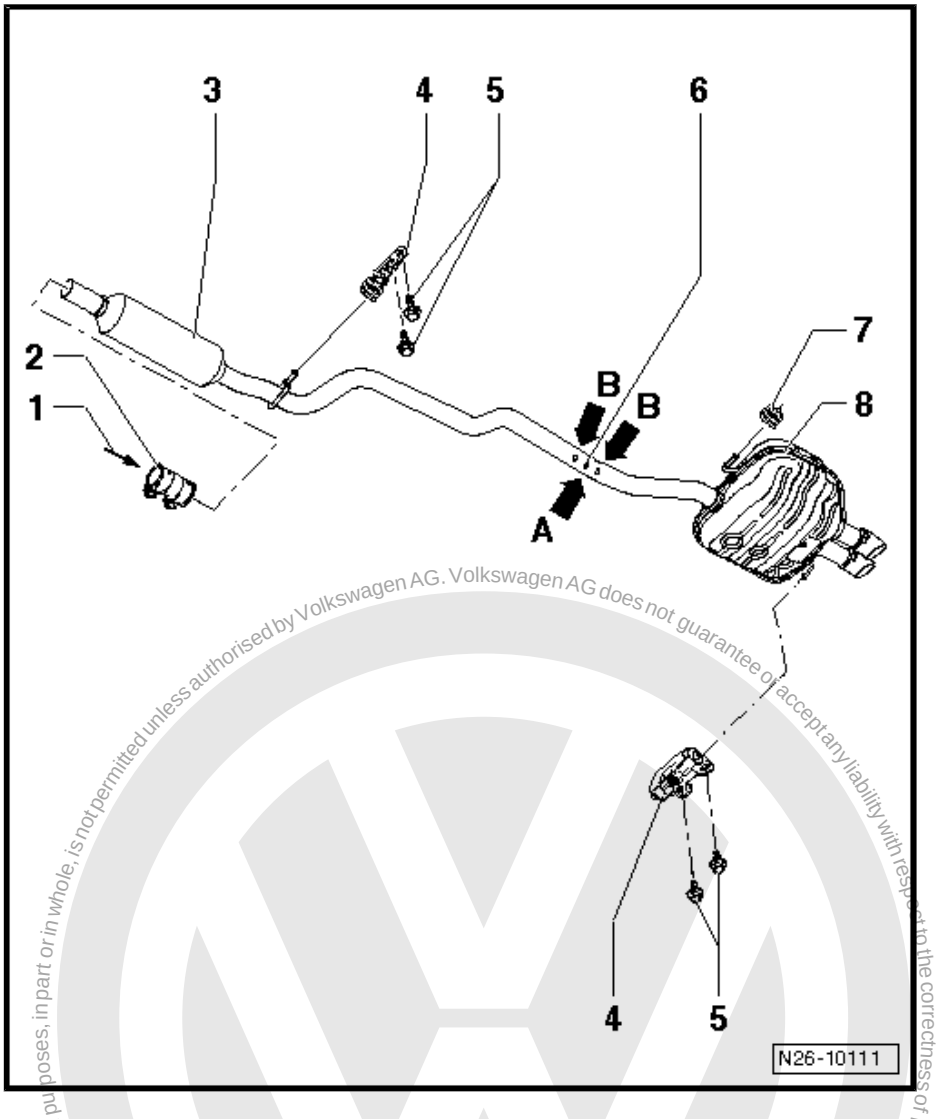
⇒ “1.1.7 Assembly overview - silencer, engine code CJAA”, page 291

1.1.1 Assembly overview - silencer, vehicles with front-wheel drive, Passat, Passat CC

Note

- *Removing and installing exhaust manifold ⇒ page 201 .*
- *Mounting position and specified torque of the clamping sleeve ⇒ page 297*
- *After working on the exhaust system, ensure that the system is not under stress and that there is sufficient clearance to the bodywork. If necessary, loosen clamping sleeve and align silencer and exhaust pipe so that sufficient clearance is maintained to the bodywork and the support rings are evenly loaded.*
- *Renew self-locking nuts.*

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1 - From front exhaust pipe

2 - Clamping sleeve

- ❑ Before tightening, align cold exhaust system free of tension ⇒ page 294
- ❑ Tighten bolted connections evenly.
- ❑ Specified torque ⇒ page 297

3 - Front silencer

4 - Mounting

- ❑ Renew if damaged

5 - 25 Nm

- ❑ Renew

6 - Separation point

- ❑ Marked by impressions on exhaust pipe.
- ❑ Centre and rear silencers are installed as a single component during production. In cases of repair, the centre and rear silencer are supplied separately, with a clamp for connecting.
- ❑ Cut through exhaust pipe at right angles at separating point -arrow A- using e.g. body saw - V.A.G 1523- (wear eye protection).
- ❑ When installing, position repair clamp at side markings -arrows B-.
- ❑ Evenly tighten threaded connections of clamping sleeve (repair clamping sleeve)
- ❑ Specified torque of the clamping sleeve (repair clamping sleeve) ⇒ page 297
- ❑ Before tightening, align cold exhaust system free of tension ⇒ page 294

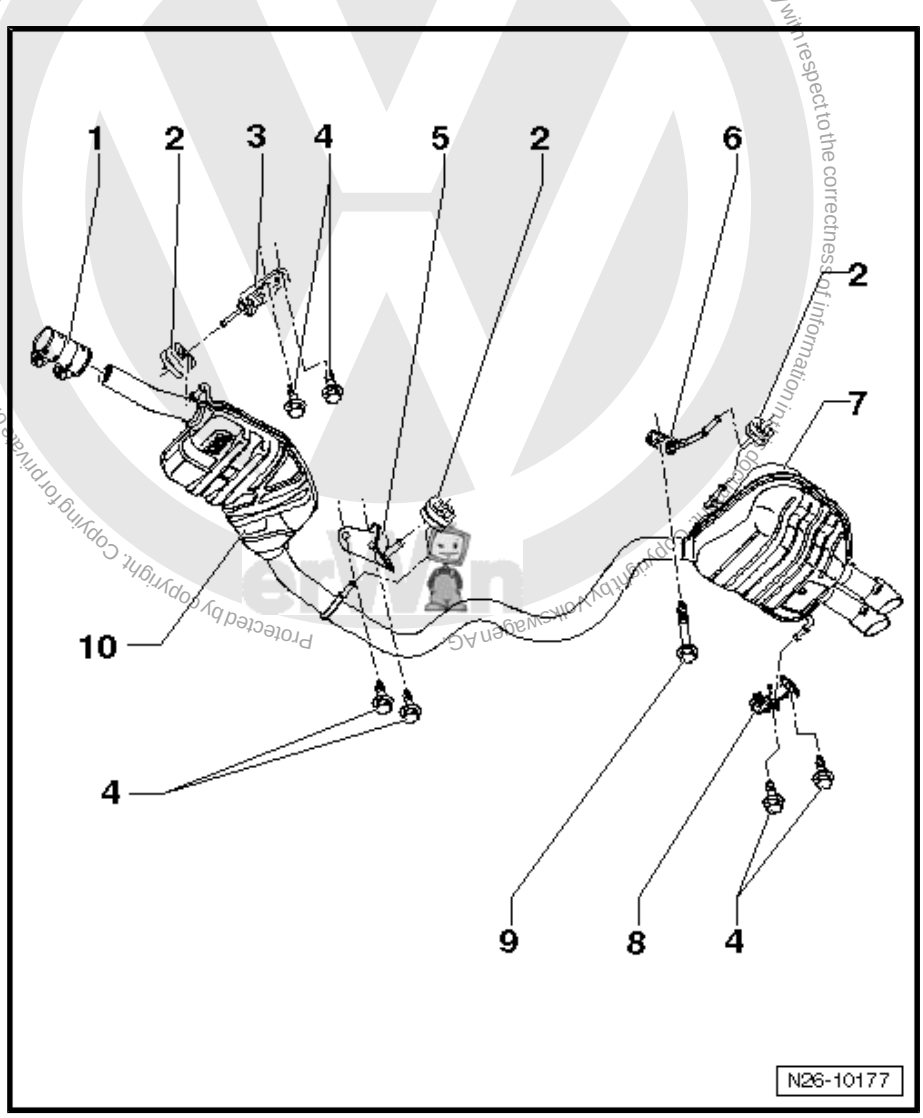
7 - Retaining ring

- ❑ Renew if damaged

8 - Rear silencer

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1.1.2 Assembly overview - silencer, vehicles with four-wheel drive, Passat, Passat CC



1 - Clamping sleeve

- ❑ Before tightening, align cold exhaust system free of tension ⇒ page 294
- ❑ Tighten bolted connections evenly.
- ❑ Specified torque ⇒ page 297

2 - Retaining ring

- ❑ Renew if damaged

3 - Front mounting

- ❑ Renew if damaged

4 - 25 Nm

- ❑ Renew

5 - Centre mounting

- ❑ Renew if damaged

6 - Rear left mounting

- ❑ Renew if damaged

7 - Rear silencer

8 - Rear right mounting

- ❑ Renew if damaged

9 - Securing bolt

- ❑ Specified torque ⇒ Running gear, axles, steering; Rep. gr. 42 ; Rear axle; Overview - rear axle .

10 - Front silencer

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1.1.3 Assembly overview - silencer, vehicles with SCR system, Passat, Passat CC

1 - From reducing agent catalytic converter

2 - Clamping sleeve

- ❑ Before tightening, align cold exhaust system free of tension ⇒ page 294
- ❑ Tighten bolted connections evenly.
- ❑ Specified torque ⇒ page 297

3 - Mounting

- ❑ Renew if damaged

4 - 25 Nm

- ❑ Renew

5 - Exhaust pipe

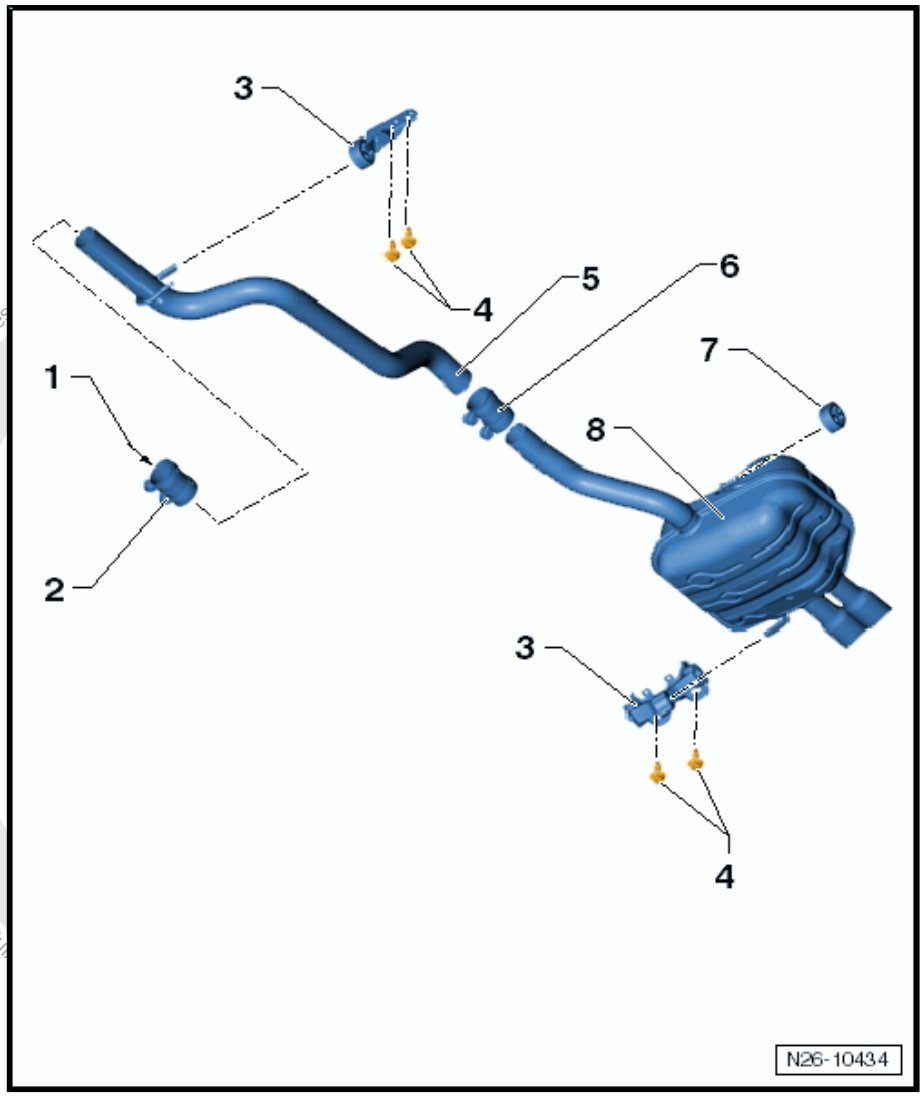
6 - Clamping sleeve

- ❑ Before tightening, align cold exhaust system free of tension ⇒ page 294
- ❑ Tighten bolted connections evenly.
- ❑ Specified torque ⇒ page 297

7 - Retaining ring

- ❑ Renew if damaged

8 - Rear silencer



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1.1.4 Assembly overview - silencers, Tiguan

Note

- *Removing and installing exhaust manifold* ⇒ page 201 .
- *Installation position and specified torque of clamp* ⇒ page 297 .
- *After working on the exhaust system, ensure that the system is not under stress and that there is sufficient clearance to the bodywork. If necessary, loosen clamping sleeve and align silencer and exhaust pipe so that sufficient clearance is maintained to the bodywork and the support rings are evenly loaded.*
- *Renew self-locking nuts.*

1 - 25 Nm

2 - Exhaust pipe

3 - Rear silencer

- ❑ Aligning exhaust system free of tension ⇒ page 294 .

4 - Mounting

- ❑ With retaining ring
- ❑ Renew if damaged

5 - 25 Nm

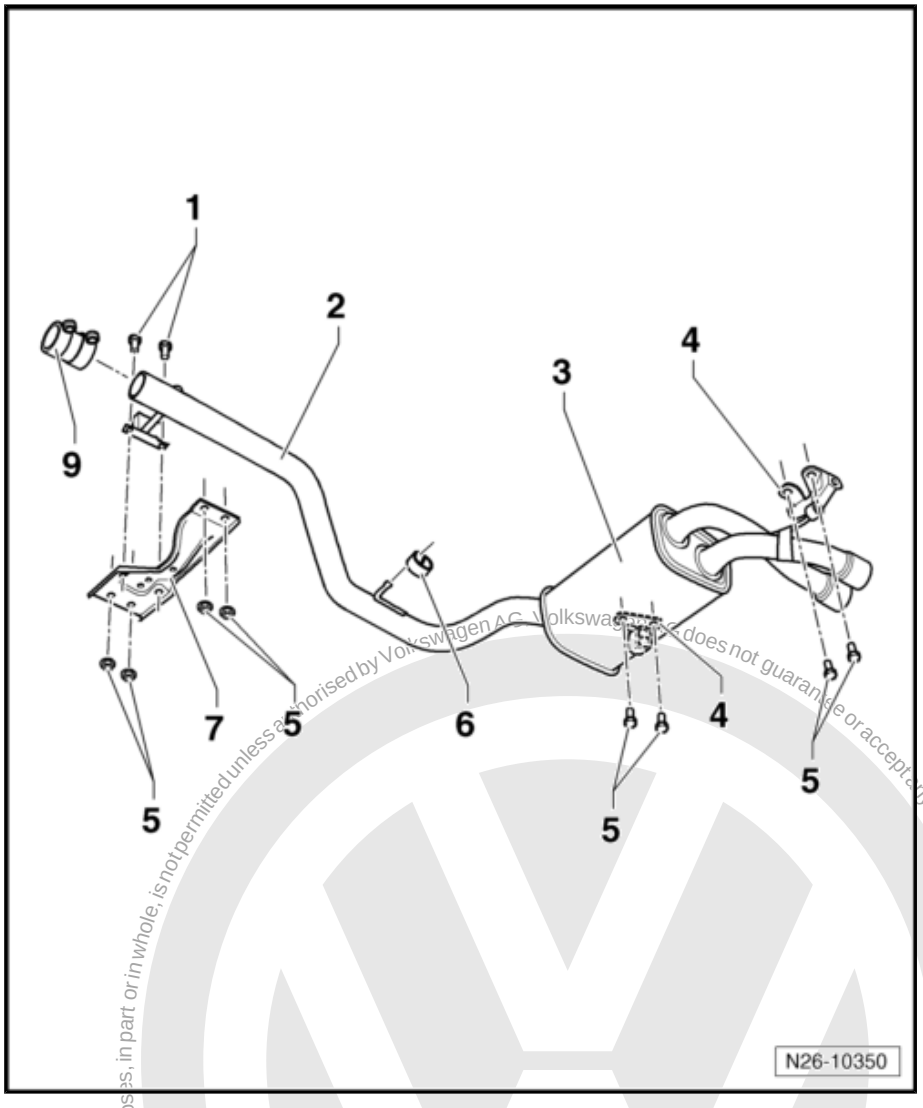
6 - Tunnel cross-piece

7 - Mounting

- ❑ Renew if damaged

8 - Clamping sleeve

- ❑ Installation position and specified torque ⇒ page 297



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1.1.5 Assembly overview - silencer, vehicles with front-wheel drive, Eos, Golf, Scirocco, Golf Plus

1 - 25 Nm
- ❑ Renew

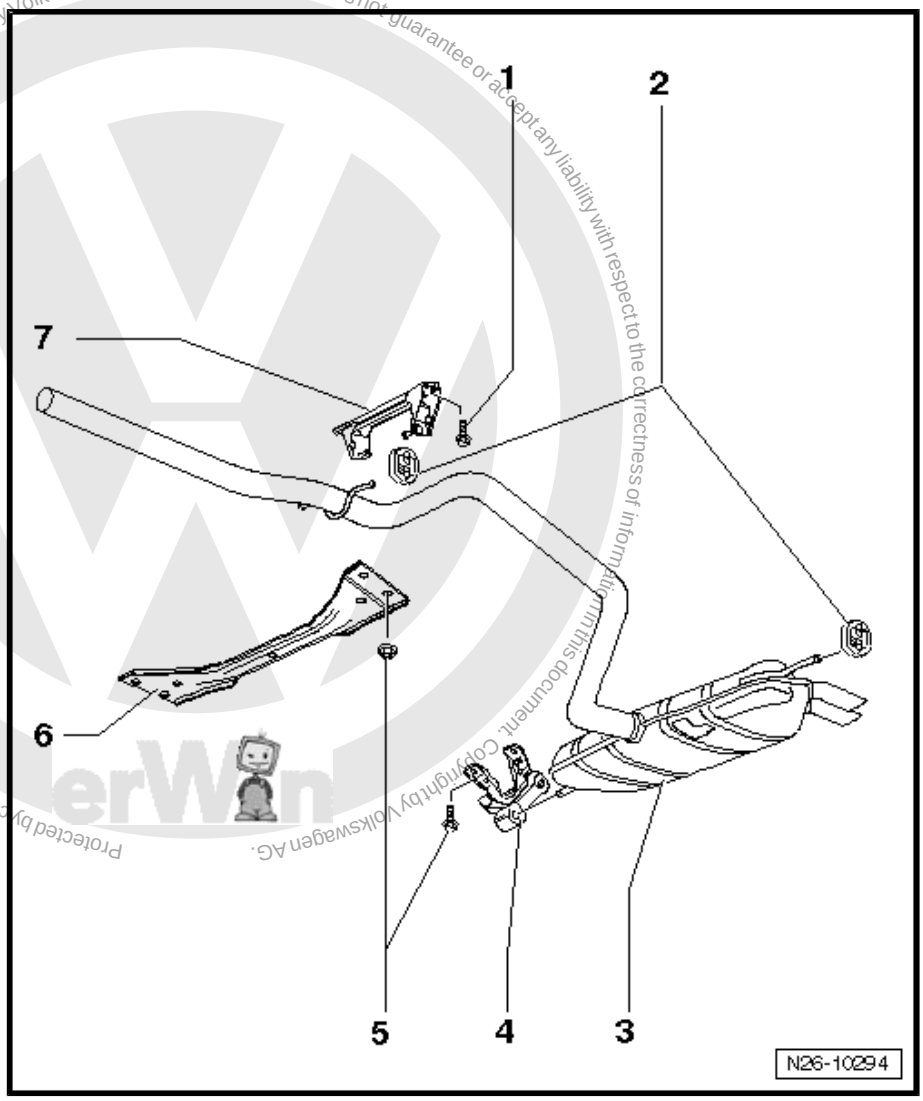
2 - Retaining ring
- ❑ Renew if damaged

3 - Rear silencer

4 - Mounting
- ❑ Renew if damaged

5 - 25 Nm

6 - Tunnel cross-piece



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1.1.6 Assembly overview - silencer, vehicles with four-wheel drive, Golf

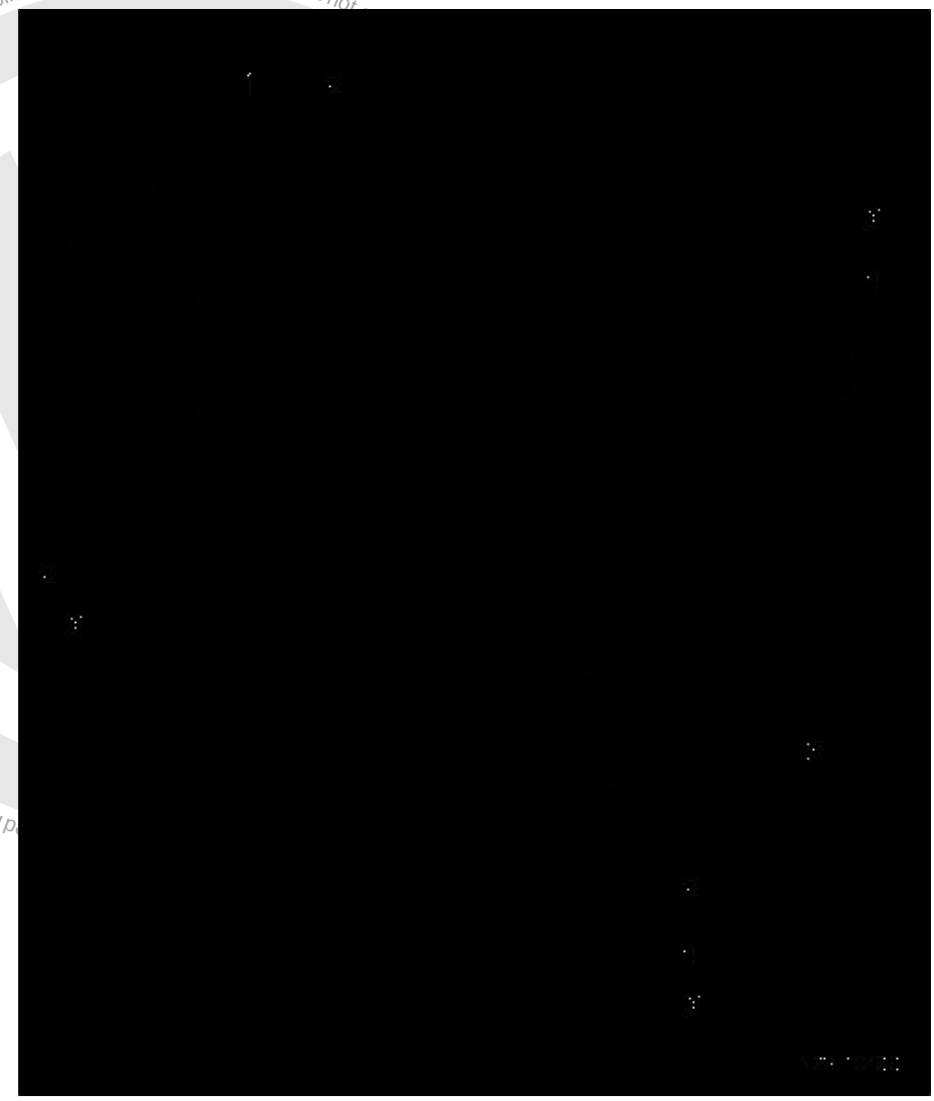
1 - Front mounting

2 - Retaining ring
- ❑ Renew if damaged

3 - 25 Nm

4 - Rear mounting

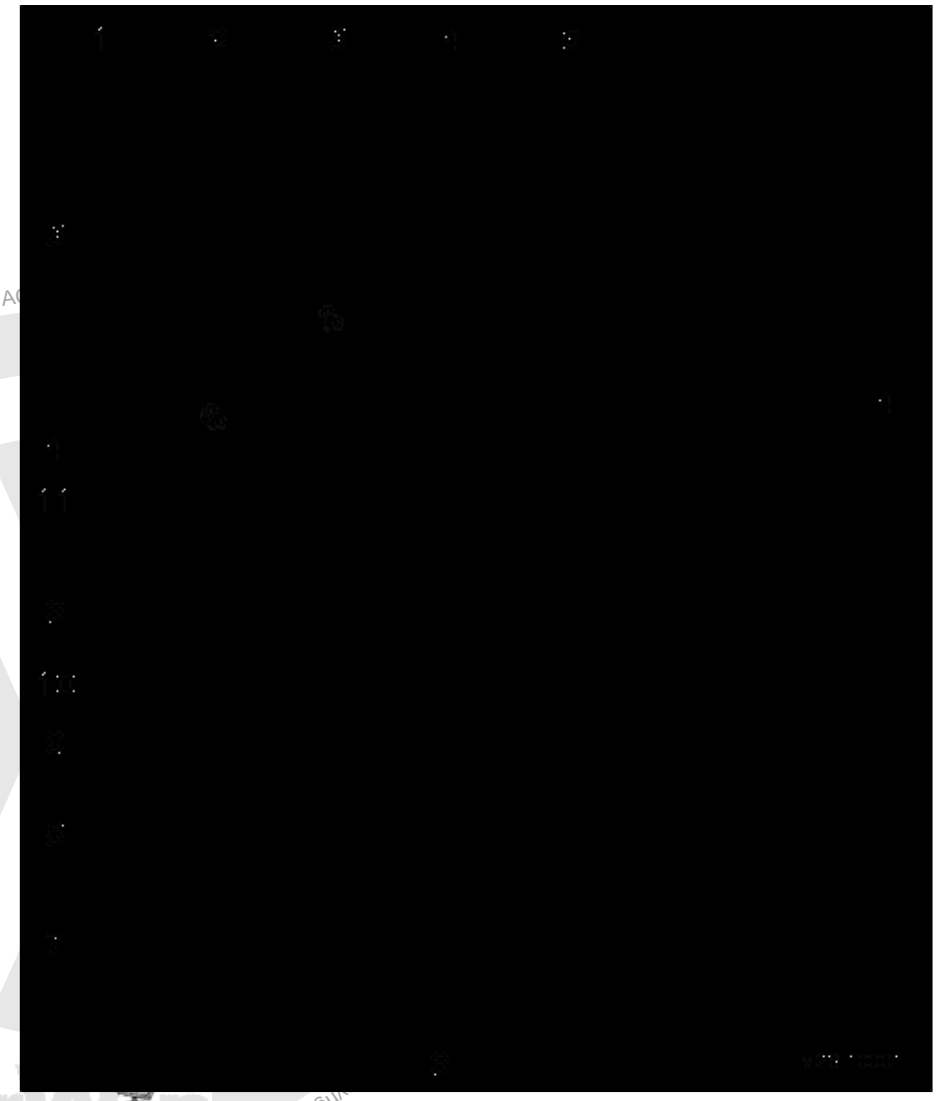
5 - Rear silencer



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1.1.7 Assembly overview - silencer, engine code CJAA



1 - Securing strap
- ❑ For fuel tank

2 - Mounting
- ❑ Renew if damaged

3 - 23 Nm
- ❑ Renew

4 - Retaining loop
- ❑ Renew if damaged

5 - Exhaust pipe

6 - 23 Nm

7 - Mounting
- ❑ Renew if damaged

8 - Rear silencer
- ❑ For repairs, renew individually.
- ❑ Separating and joining exhaust system ⇒ page 293 .
- ❑ Aligning exhaust system free of stress ⇒ page 294 .
- ❑ Checking exhaust system for leaks ⇒ page 296

9 - Threaded union
- ❑ Tighten bolted connections evenly. Specified torque ⇒ page 297

10 - Repair sleeve
- ❑ For separate replacement of exhaust pipe and rear silencer.
- ❑ Note installation position ⇒ page 297.
- ❑ Separating and joining exhaust system ⇒ page 293 .
- ❑ Aligning exhaust system free of stress ⇒ page 294 .
- ❑ Tighten bolted connections evenly.

11 - Tunnel cross-piece

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1.2 Separating exhaust pipes, silencers

⇒ "1.2.2 Separating exhaust pipe/silencer, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA", page 293

⇒ "1.2.1 Separating and joining exhaust system, engine code CJAA", page 292

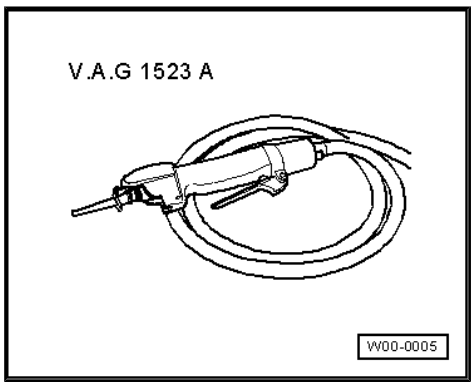
1.2.1 Separating and joining exhaust system, engine code CJAA

Note

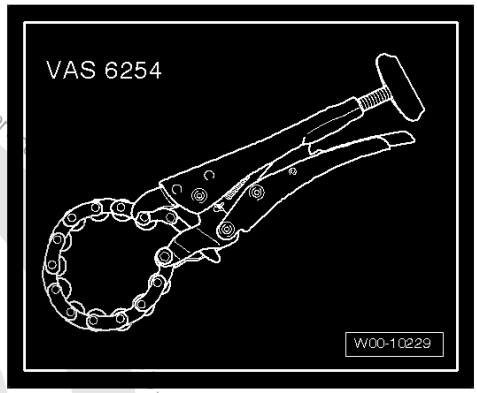
- *The connecting pipe can be cut through at the cutting location in order to remove and install or renew the centre and rear silencers separately.*
- *Cutting location is marked by an indentation on the circumference of exhaust pipe.*

Special tools and workshop equipment required

- Body repair saw - V.A.G 1523 A- or



- Chain-type pipe cutter - VAS 6254-



- Torque wrench - V.A.G 1331- (not illustrated)
- Safety glasses
- Protective clothing

Disconnecting

Condition

- Engine must be cold.

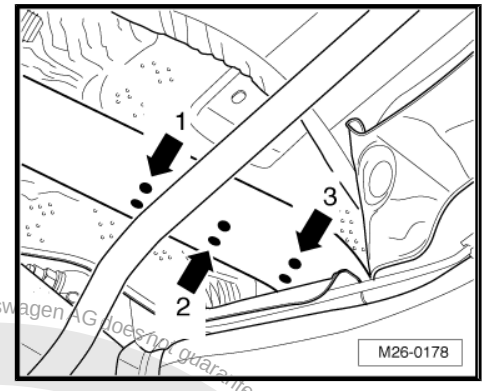
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Procedure

WARNING

To avoid injury from metal shavings, wear eye protection and protective clothing.

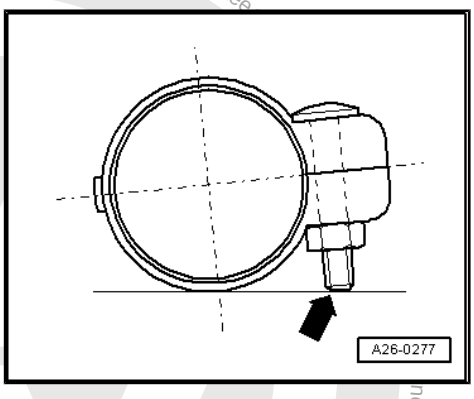
– Cut through exhaust pipe at separating point -arrow 2- at right angles e.g. with pneumatic sabre saw - V.A.G 1523 A- or chain pipe cutter - VAS 6254- .



Connecting

– Positioning the repair clamping sleeve during mounting ⇒ page 297 .

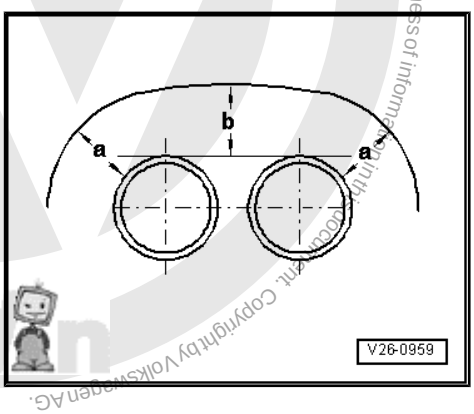
– Install clamp so that end of bolt does not extend beyond lower edge of clamp -arrow-:



- Bolted connection faces to right.
- Tighten threaded connections evenly.
- Specified torque ⇒ page 297

Aligning tailpipes

– Align rear silencer so that distance -a- between bumper cut-out and left and right tailpipes is even.

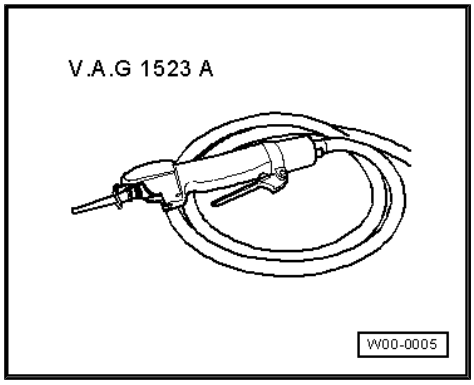


1.2.2 Separating exhaust pipe/silencer, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

Special tools and workshop equipment required

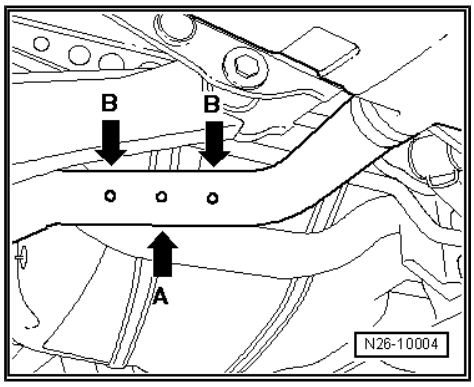
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♦ Pneumatic sabre saw - V.A.G 1523/A-



– Cut exhaust pipe at right angles at separating point -A-.

– When mounting, position repair clamping sleeve at side markings -B- ⇒ page 297 .



1.3 Aligning exhaust system free of stress

⇒ "1.3.1 Aligning exhaust system free of stress, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA", page 294

⇒ "1.3.2 Aligning exhaust system free of stress, engine code CJAA", page 295

1.3.1 Aligning exhaust system free of stress, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

• Engine must be cold

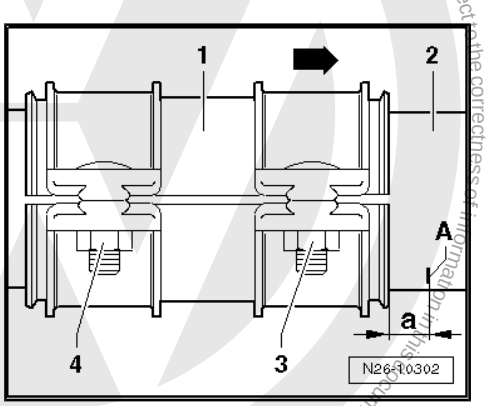
– Loosen bolts -3 and 4- on front clamp -1-.

– Align front clamp -1- to marking -A- on front exhaust pipe -2- (-arrow- points forwards).

• Dimension -a- = ⇒ page 297

• The bolts must be on the right and the ends of the bolts must not protrude beyond the lower edge of the clamp.

– Tighten front clamp bolts -3- hand-tight.



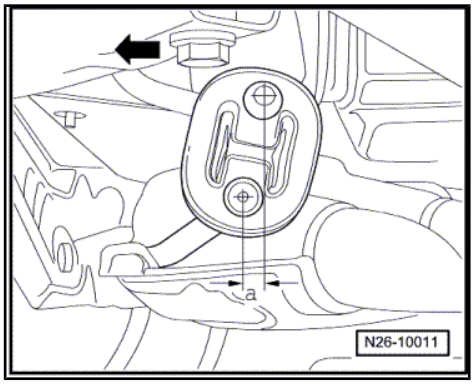
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– Push rear silencer forwards until dimension -a- = 15…17 mm is attained between mountings for body and rear silencer. -Arrow- points in direction of travel.

– Align rear silencer horizontally.

– Tighten clamp bolts in this position. Specified torque ⇒ page 297

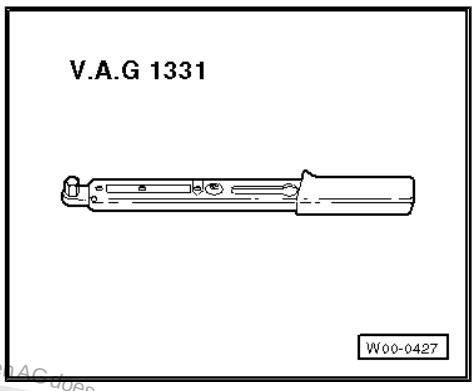
– Once bolts have been tightened, check distance -a- and correct if necessary.



1.3.2 Aligning exhaust system free of stress, engine code CJAA

Special tools and workshop equipment required

♦ Torque wrench - V.A.G 1331-



Condition

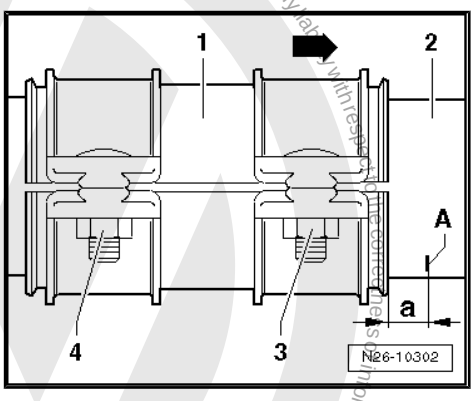
• Engine must be cold.

Procedure

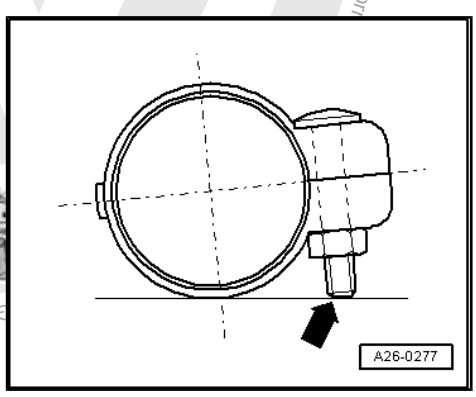
– Loosen threaded connections -3 and 4- of repair sleeve -1- between SCR catalytic converter -2- and front silencer (-arrow- point forwards).

– Align repair sleeve -1- to marking -A- on SCR catalytic converter -2-:

• Dimension -a- = 5 mm

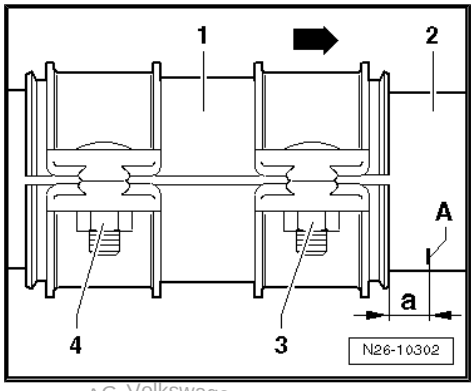


• The bolts must be on the right and the ends of the bolts must not protrude beyond the lower edge of the clamp -arrow-.



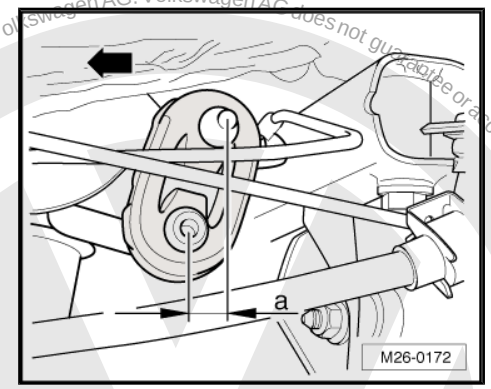
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– Tighten front bolts -3- of clamp -1- hand-tight.



– Push exhaust system forwards into clamping sleeve until dimension -a- at retaining loop is achieved (-arrow- points forwards).

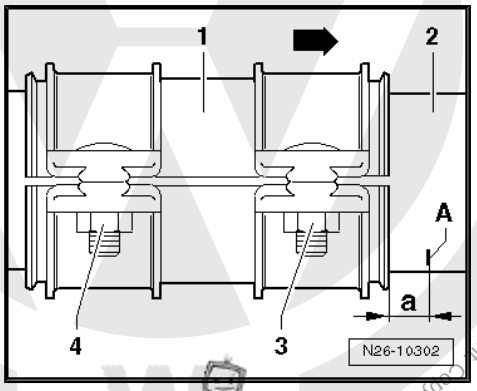
• Dimension -a- = 15 … 17 mm.



– In this position, tighten bolts -3 and 4- of clamp -1- evenly.

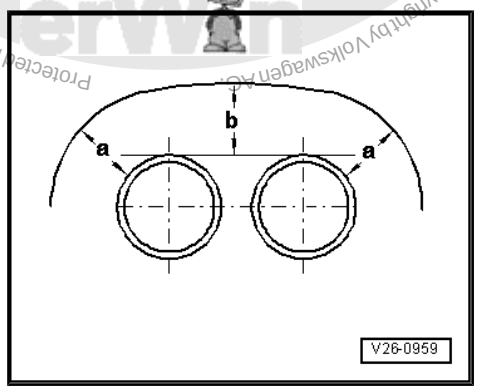
• Torque setting ⇒ page 297 .

– Once bolts have been tightened, check distance -a- and correct if necessary.



Aligning tailpipes

– Align rear silencer so that distance -a- between bumper cut-out and left and right tailpipes is even.



1.4 Check exhaust system for leaks

Test sequence

– Start engine and allow to idle.

– Seal tailpipes (e.g. with cloths or sealing plugs) and leave sealed until the check is complete.

– Audibly check connections of exhaust system for leaks.

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– Repair any leaks found.

1.5 Installation position of clamp

Note

Gradual introduction of clamp with continuous clip.

Specified torque and installation dimensions of clamp

Clamp -A- with 2 individual clips:

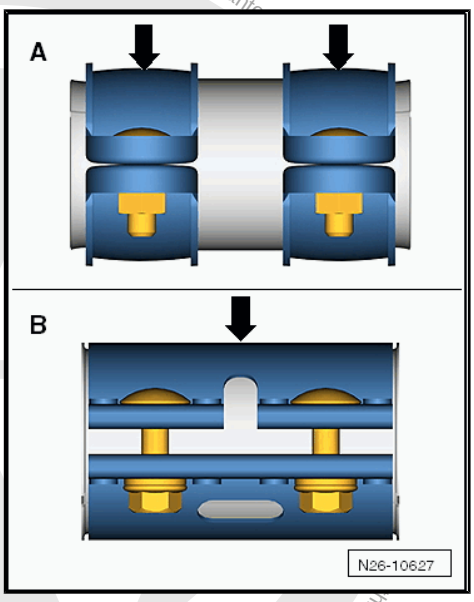
Specified torque: 25 Nm

Installation dimensions -a- 5 mm (only for front clamp)

Clamp -B- with continuous clip:

Specified torque: 35 Nm

Installation dimensions -a- 8.5 mm (only for front clamp)



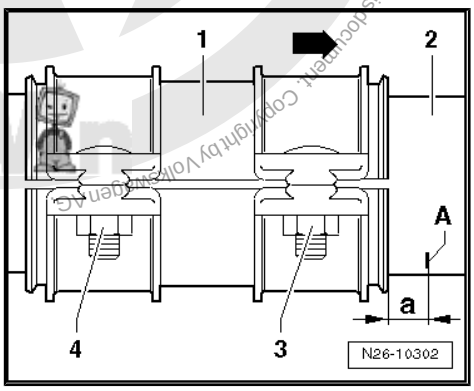
Installation dimension -a- for vehicles with marking on front exhaust pipe

1 - Clamping sleeve

2 - Front exhaust pipe

a - Installation dimension

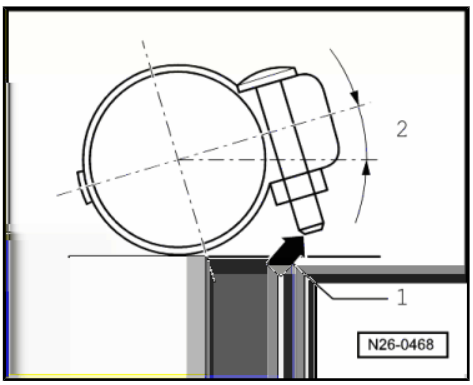
A - Marking



Installation position of front clamp

– Install clamp so that end of bolt -arrow- does not extend beyond lower edge of clamp.

• Threaded connection faces right

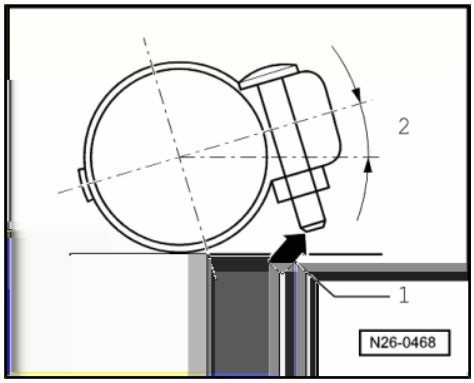


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Installation position of rear clamp

– Install clamp so that end of bolt -arrow- does not extend beyond lower edge of clamp.

• Threaded connection faces to rear.



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2 Exhaust gas cleaning

⇒ “2.1 Assembly overview - emission control”, page 299

⇒ “2.2 Removing and installing particulate filter”, page 310

⇒ “2.3 Removing and installing particulate filter with NOx storage catalytic converter”, page 318

⇒ “2.4 Removing and installing NOx storage catalytic converter”, page 325

2.1 Assembly overview - emission control

⇒ “2.1.1 Assembly overview - front exhaust pipe with particulate filter, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 299

⇒ “2.1.2 Assembly overview - particulate filter with NOx storage catalytic converter, engine code CJAA”, page 302

⇒ “2.1.3 Assembly overview - exhaust flap control unit J883 with SCR catalytic converter”, page 305

⇒ “2.1.4 Note installation position of securing clamps and exhaust gas temperature sender”, page 306

⇒ “2.1.5 Routing cables/lines of exhaust system components, engine code CJAA”, page 307

2.1.1 Assembly overview - front exhaust pipe with particulate filter, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

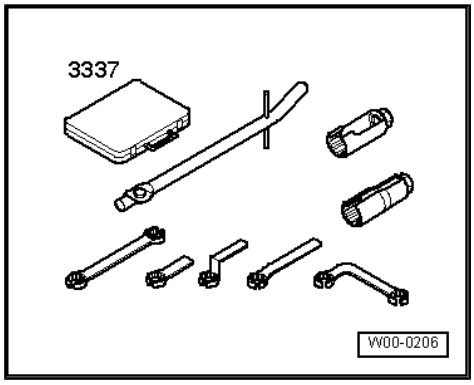
Note

- *Removing and installing exhaust manifold ⇒ page 201 .*
- *Mounting position and specified torque of the clamping sleeve ⇒ page 297*
- *After working on the exhaust system, ensure that the system is not under stress and that there is sufficient clearance to the bodywork. If necessary, loosen clamping sleeve and align silencer and exhaust end pipe so that sufficient clearance is maintained to the bodywork and the support rings are evenly loaded.*
- *Renew self-locking nuts.*
- *The flexible joint of the front exhaust pipe must be secured with transportation lock - T10404- to stop overstretching.*

Special tools and workshop equipment required

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- Lambda probe open ring spanner set - 3337-



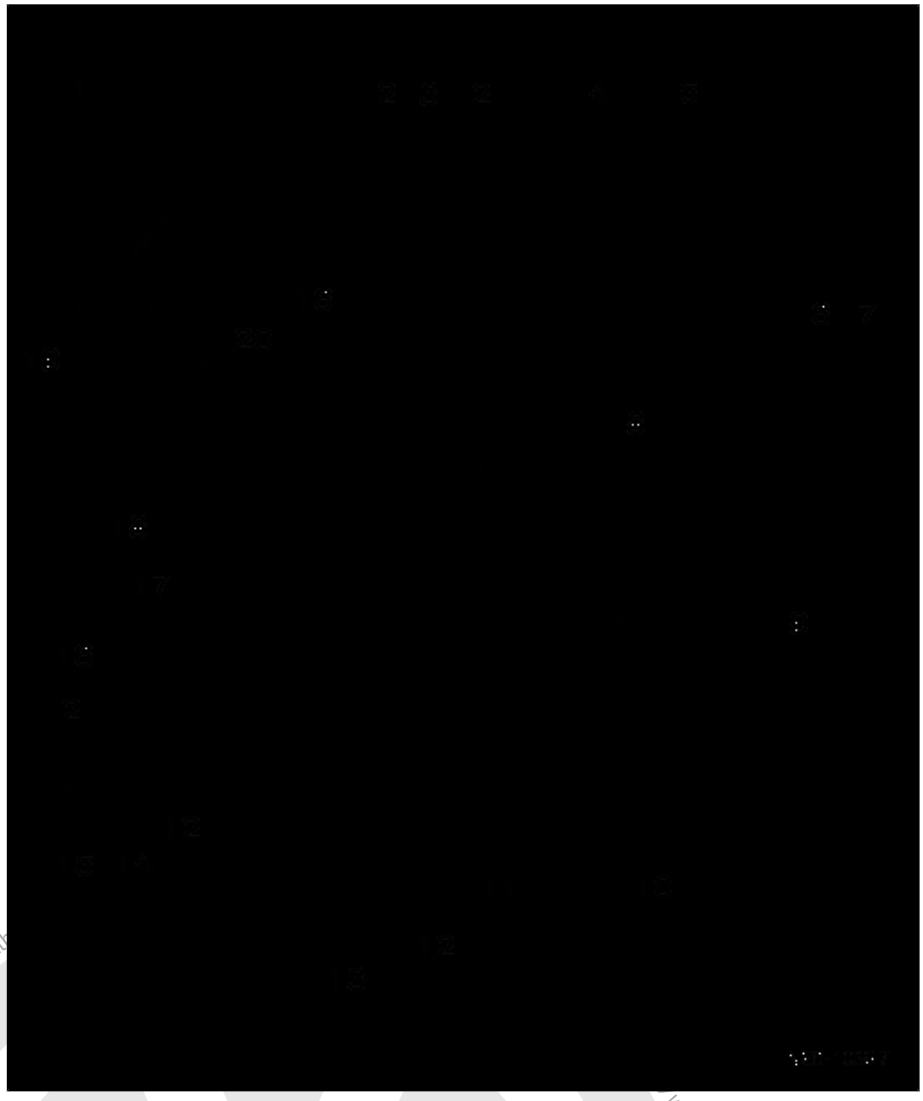
- Transport lock - T10404-



Note

If the particulate filter or the exhaust gas pressure sensor 1 - G450- is changed, the exhaust gas pressure sensor 1 - G450- must always be adapted using diagnosis tester : Guided functions; Adapting exhaust pressure sensor 1 - G450-.

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1 - Exhaust gas pressure sensor 1 - G450-

2 - 10 Nm

3 - Shield

4 - Lambda probe - G39-

- ❑ 50 Nm
- ❑ Grease only the thread with high-temperature paste - G 052 112 A3- . High-temperature paste - G 052 112 A3- must not get into the slots of probe body.
- ❑ To remove use Lambda probe open ring spanner set - 3337- .

5 - Exhaust gas temperature sender 4 - G648-

- ❑ 45 Nm
- ❑ Lubricate thread of sender using high-temperature paste - G 052 112 A3-

6 - Seal

- ❑ Renew
- ❑ Observe installation position

7 - Clip, 7 Nm

8 - Exhaust gas temperature sender 3 - G495-

- ❑ 45 Nm
- ❑ Lubricate thread of sender using high-temperature paste - G 052 112 A3-

9 - 25 Nm

10 - Mounting

- ❑ Renew if damaged

11 - Particulate filter

- ❑ With oxidation catalytic converter and front exhaust pipe.
- ❑ After renewing, the adaption of ash mass comparison must be set to zero with the vehicle diagnostic tester under “Guided functions”.
- ❑ Removing and installing ⇒ page 310

12 - 25 Nm

13 - Holder

- ❑ Bolted to cylinder head.

14 - Control line, 45 Nm

- ❑ If not fitted, seal with dummy plugs.

15 - Holder

- ❑ Bolted to diesel particulate filter.

16 - Clamp

- ❑ Renew

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17 - Holder

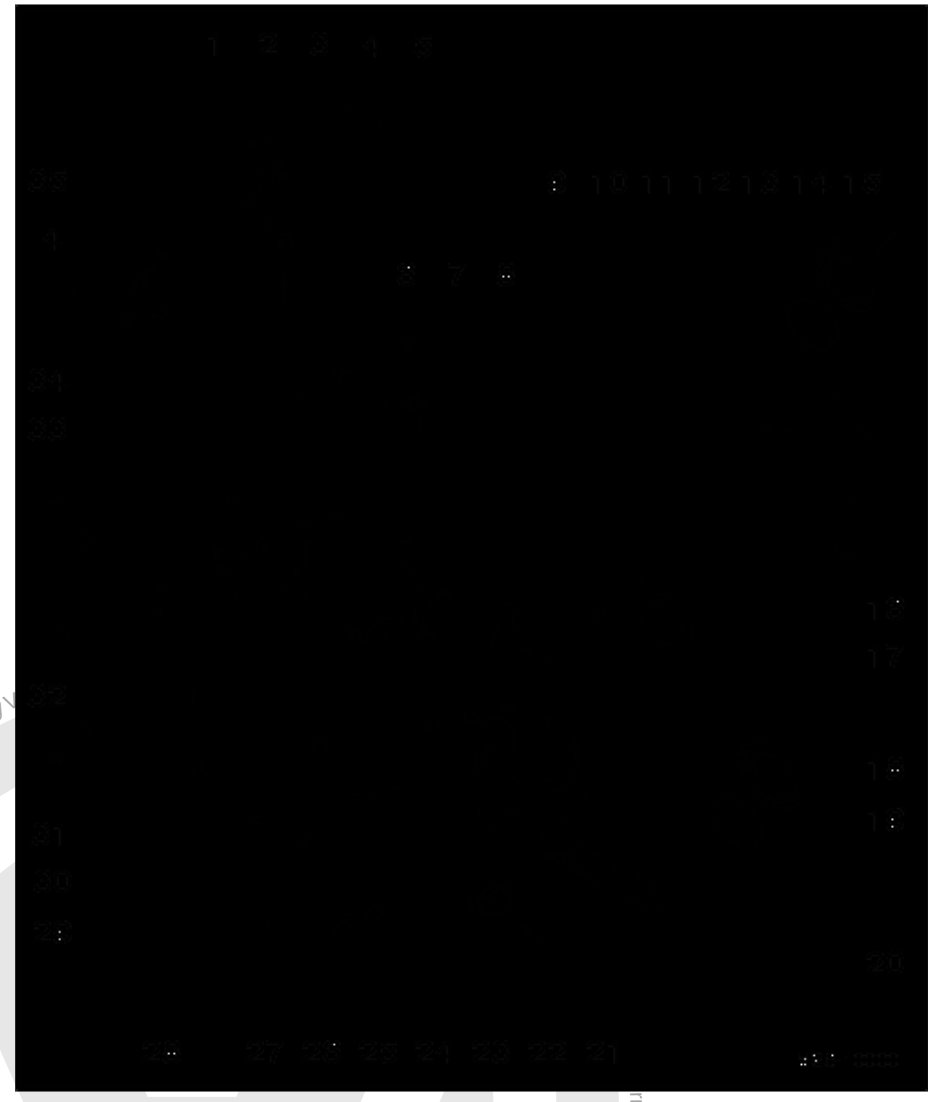
- ❑ Bolted to cylinder head.

18 - 25 Nm

19 - 8 Nm

20 - 25 Nm

2.1.2 Assembly overview - particulate filter with NOx storage catalytic converter, engine code CJAA



1 - Exhaust gas pressure sensor 1 - G450-

- ❑ Bolted close to oil filling point.

2 - Heat insulation

- ❑ Renew if damaged

3 - 8 Nm

4 - 4 Nm

5 - Control cable

- ❑ Ensure firm seating.
- ❑ From exhaust gas recirculation housing ⇒ Item 8 (page 346) .

6 - 10 Nm

7 - Shield

- ❑ Observe installation position

8 - Lambda probe - G39- , 52 Nm

- ❑ Use Lambda probe open ring spanner set - 3337- to loosen and tighten.
- ❑ Grease only the thread with high-temperature paste - G 052 112 A3- . High-temperature paste - G 052 112 A3- must not get into the slots of probe body.

9 - Sealing ring

- ❑ Renew

10 - Securing clamp, 7 Nm

- ❑ Renew
- ❑ Note installation position ⇒ page 306

11 - From turbocharger

- ❑ ⇒ Item 14 (page 198)

12 - Exhaust gas temperature sender 4 - G648- 45 Nm

- ❑ Mark installation position before removing.
- ❑ Grease only thread with high-temperature paste - G 052 112 A3- .
- ❑ Cable routing ⇒ page 307

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13 - Sealing ring

- ❑ Renew
- ❑ Installing ⇒ page 306

14 - Securing clamp, 7 Nm

- ❑ Renew
- ❑ Note installation position ⇒ page 306

15 - To exhaust flap control unit - J883-

- ❑ ⇒ Item 4 (page 305)

16 - Lambda probe after catalytic converter - G130- , 52 Nm

- ❑ Use Lambda probe open ring spanner set - 3337- to loosen and tighten.
- ❑ Grease only the thread with high-temperature paste - G 052 112 A3- . High-temperature paste - G 052 112 A3- must not get into the slots of probe body.
- ❑ Cable routing ⇒ page 307

17 - NOx storage catalytic converter

Caution

Danger of damaging decoupling element between particulate filter and NOx storage catalytic converter. When removing and installing:

Do not allow the decoupling element to kink by more than 10°.

Install decoupling element so that it is not under tension.

Do not damage wire mesh on decoupling element.

The decoupling element must be secured with transportation lock - T10404- to stop overstretching.

- ❑ Removing and installing ⇒ page 310

18 - Securing clamp, 7 Nm

- ❑ Renew
- ❑ Note installation position ⇒ page 306

19 - Sealing ring

- ❑ Renew

20 - 25 Nm

21 - Mounting

- ❑ Install so that component is not under tension

22 - From exhaust gas recirculation filter

- ❑ ⇒ Item 9 (page 346)

23 - Securing clamp, 3.5 Nm

- ❑ Renew
- ❑ Note installation position ⇒ page 306

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24 - Exhaust gas temperature sender 2 - G448- 45 Nm

- ❑ Note installation position ⇒ page 306
- ❑ Grease only thread with high-temperature paste - G 052 112 A3- .

25 - Exhaust gas temperature sender 3 - G495- , 45 Nm

- ❑ Note installation position ⇒ page 306
- ❑ Grease only thread with high-temperature paste - G 052 112 A3- .

26 - 23 Nm

27 - 23 Nm

28 - Holder

- ❑ Observe installation position
- ❑ For particulate filter.
- ❑ Bolted to cylinder block.
- ❑ Install so that component is not under tension

29 - Particulate filter

Caution

Danger of damaging decoupling element between particulate filter and NOx storage catalytic converter. When removing and installing:

Do not allow the decoupling element to kink by more than 10°.

Install decoupling element so that it is not under tension.

Do not damage wire mesh on decoupling element.

The decoupling element must be secured with transportation lock - T10404- to stop overstretching.

- ❑ Removing and installing ⇒ page 310
- ❑ After renewing, adaptation of ash mass comparison must be set to “0” ⇒ Vehicle diagnostic tester “Guided functions”.

30 - Control line, 45 Nm

- ❑ Do not attempt to bend control line to a different shape.
- ❑ Install so that component is not under tension

31 - 9 Nm

32 - Holder

- ❑ For control line
- ❑ Install so that component is not under tension

33 - Holder

- ❑ Observe installation position
- ❑ For particulate filter.
- ❑ Bolted to cylinder head.
- ❑ Install so that component is not under tension

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34 - 23 Nm

35 - Pressure differential sender - G505-

- ❑ Bolted to bracket of supplementary fuel pump - V393- or fuel pump 2 - V277-

2.1.3 Assembly overview - exhaust flap control unit - J883- with SCR catalytic converter

1 - From storage catalytic converter

2 - Sealing ring

- ❑ Renew
- ❑ Installing ⇒ page 306

3 - Securing clamp, 7 Nm

- ❑ Renew
- ❑ Note installation position ⇒ page 306

4 - Exhaust flap control unit - J883-

- ❑ Observe installation position
- ❑ Heat shield and routing of wiring for connector ⇒ page 307 .

5 - SCR catalytic converter

- ❑ Checking exhaust system for leaks ⇒ page 296

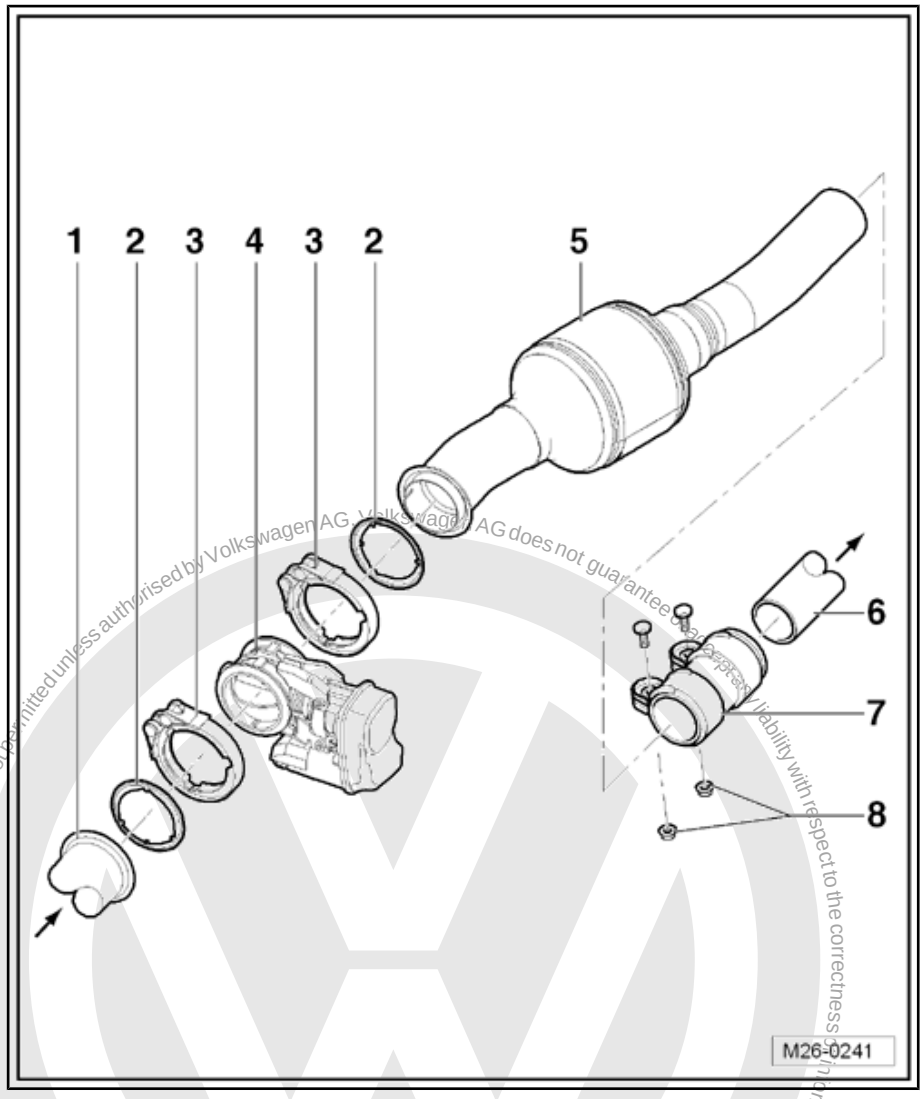
6 - Front silencer

7 - Clamping sleeve

- ❑ Tighten bolted connections evenly. Specified torque and installation position ⇒ page 297
- ❑ Aligning exhaust system free of stress ⇒ page 294 .

8 - Threaded union

- ❑ Tighten bolted connections evenly. Specified torque and installation position ⇒ page 297

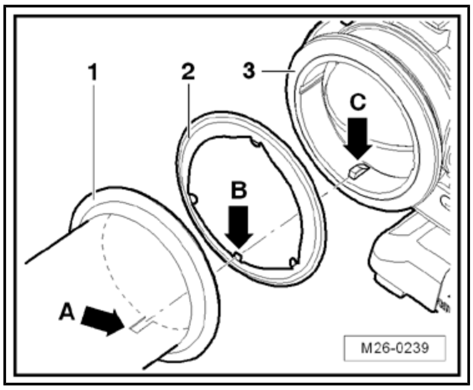


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Installing seal between exhaust flap control unit - J883- and NOx storage catalytic converter/SCR catalytic converter.

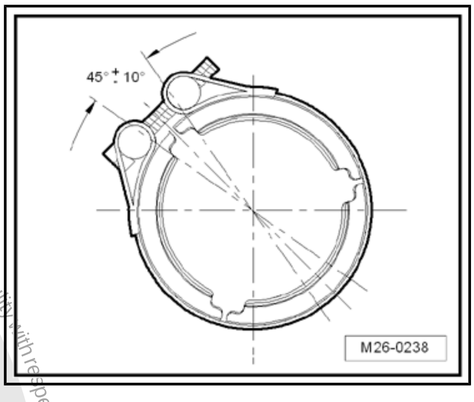
– Seat seal -2- with angular tab -B- in notch -A- of NOx storage catalytic converter or SCR catalytic converter -1-.

– Install exhaust flap control unit -3- with retaining lug -C- in notch -A-.



Installation position of securing clamp between exhaust flap control unit - J883- and NOx storage catalytic converter/SCR catalytic converter.

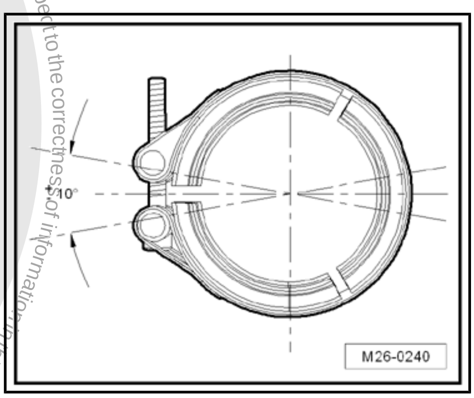
– Install new securing clamp so that the clamping bolt is positioned on the opposite side of the housing for exhaust flap control unit and points downwards at an angle of -45° ± 10°-.



2.1.4 Note installation position of securing clamps and exhaust gas temperature sender

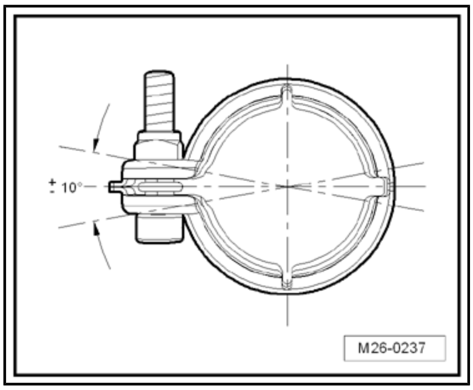
Installation position of securing clamp between particulate filter and turbocharger

– Install new securing clamp so that the clamping bolt points downwards at an angle of -± 10°-.



Installation position of securing clamp between particulate filter and filter for exhaust gas recirculation

– Install new securing clamp so that the clamping bolt points downwards at an angle of -± 10°-.

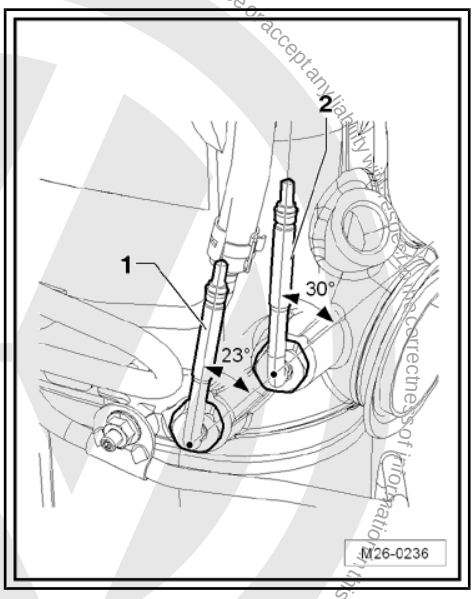


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Installation position of exhaust temperature sender

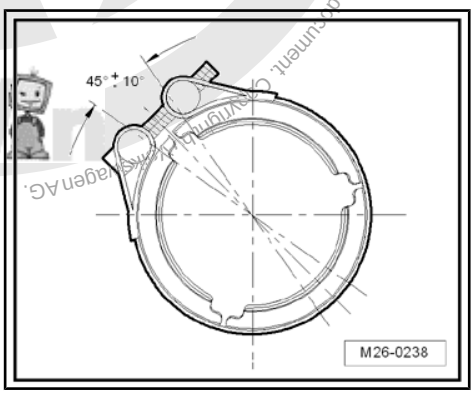
– Install exhaust temperature sender adhering to specified angle:

- Exhaust temperature sender 3 - G495- -1-: angle -23°-
- Exhaust temperature sender 2 - G448- -1-: angle -30°-



Installation position of securing clamp between particulate filter and NOx storage catalytic converter

– Install new securing clamp adhering to specified angle of -45° ± 10°-.



2.1.5 Routing cables/lines of exhaust system components, engine code CJAA

Routing cables/lines on exhaust flap control unit -J883-
⇒ page 307 .

Routing lines from Lambda probe after catalytic converter -G130- and exhaust temperature sender 4 -G648- ⇒ page 308 .

Routing cables/lines to exhaust flap control unit.

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1 - SCR catalytic converter

2 - NOx storage catalytic converter

3 - Direction of travel

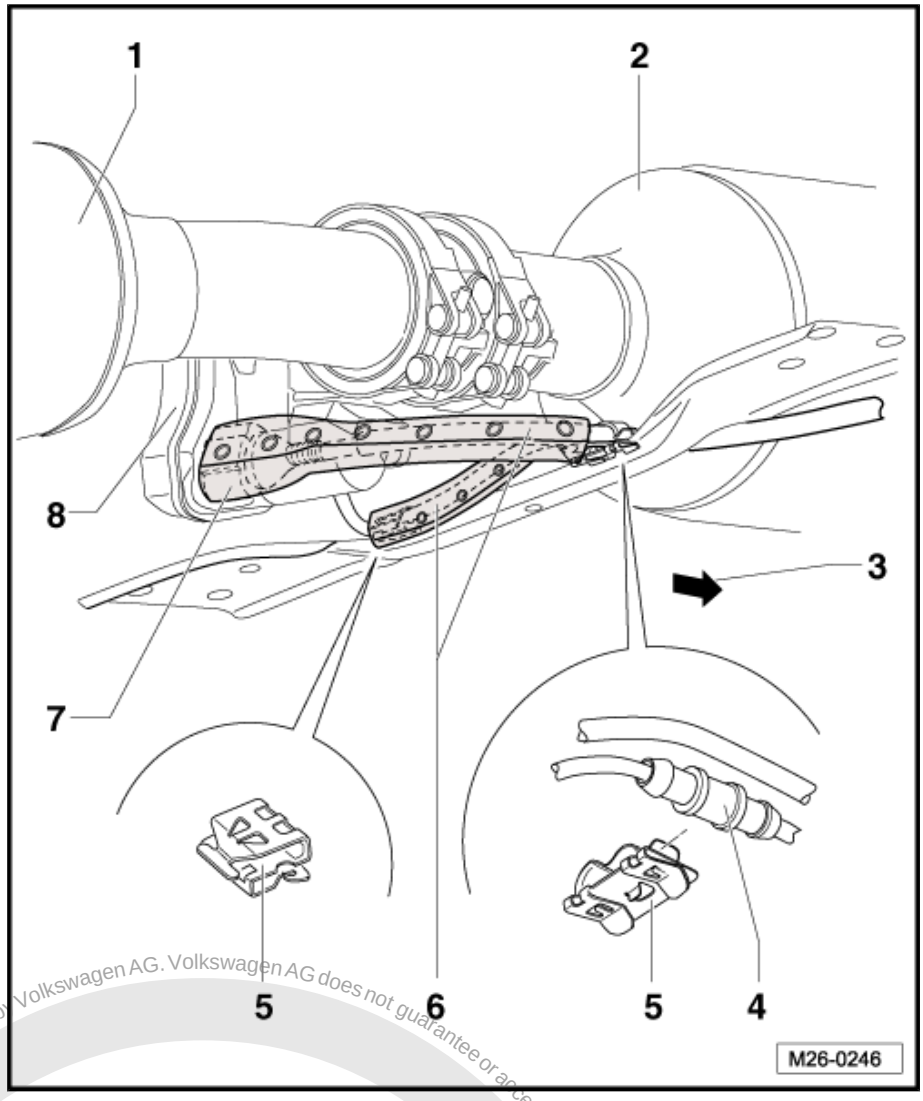
4 - Line
- ❑ Observe installation position
- ❑ Ensure firm seating.

5 - Cable bracket

6 - Heat insulation
- ❑ Observe installation position
- ❑ Renew if damaged

7 - Connector for exhaust flap control unit - J883-

8 - Exhaust flap control unit - J883-



Routing lines from Lambda probe after catalytic converter -G130- and exhaust temperature sender 4 -G648-

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1 - Lambda probe after catalytic converter - G130-

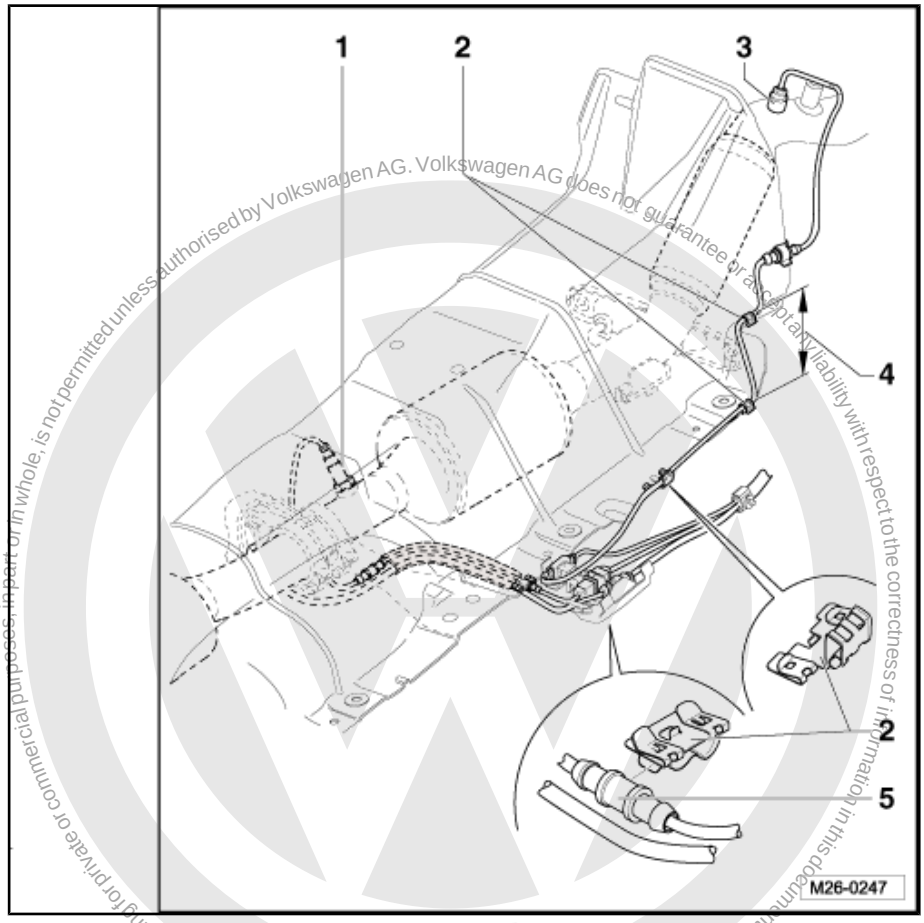
2 - Cable bracket

3 - Exhaust gas temperature sender 4 - G648-

4 - Distance apart: 100 mm

5 - Line

- ❑ Observe installation position
- ❑ Ensure firm seating.



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2.2 Removing and installing particulate filter

⇒ “2.2.1 Removing and installing particulate filter, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 310

⇒ “2.2.2 Removing and installing particulate filter, Tiguan with front-wheel drive”, page 314

2.2.1 Removing and installing particulate filter, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

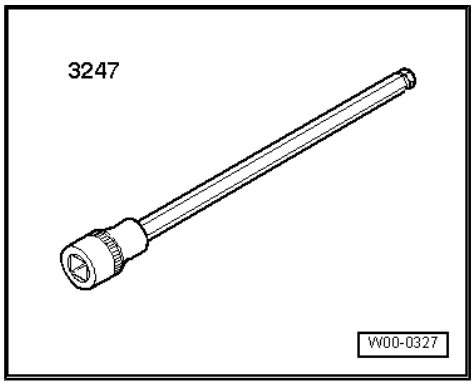
⇒ “2.2.2 Removing and installing particulate filter, Tiguan with front-wheel drive”, page 314

Note

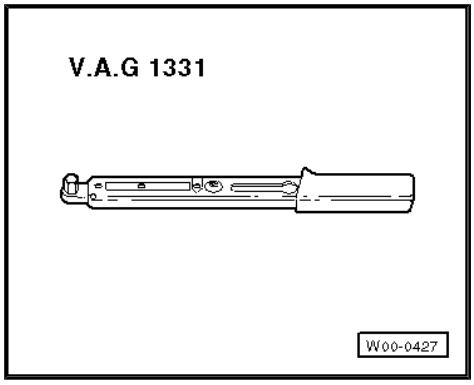
- *Installation position and specified torque of clamp ⇒ page 297 .*
- *After working on the exhaust system, ensure that the system is not under stress and that there is sufficient clearance to the bodywork. If necessary, loosen clamping sleeve and align silencer and exhaust pipe so that sufficient clearance is maintained to the bodywork and the support rings are evenly loaded.*
- *Renew self-locking nuts.*
- *If the particulate filter or the exhaust gas pressure sensor 1 - G450- is changed, the exhaust gas pressure sensor 1 - G450- must always be adapted using diagnosis tester : Guided functions; Adapting exhaust pressure sensor 1 - G450- .*

Special tools and workshop equipment required

- Socket AF 8 - 3247-

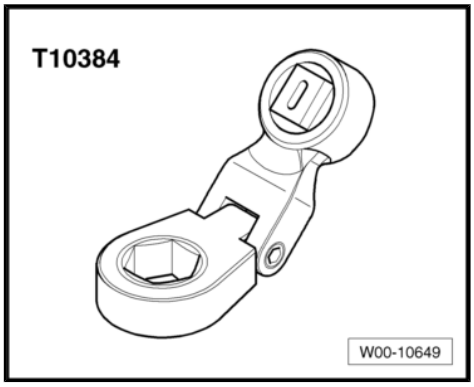


- Torque wrench - V.A.G 1331-



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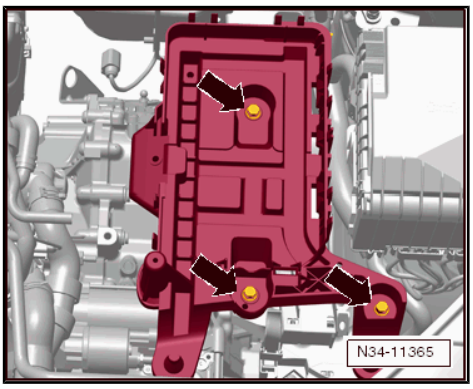
♦ Ratchet ring spanner - T10384-



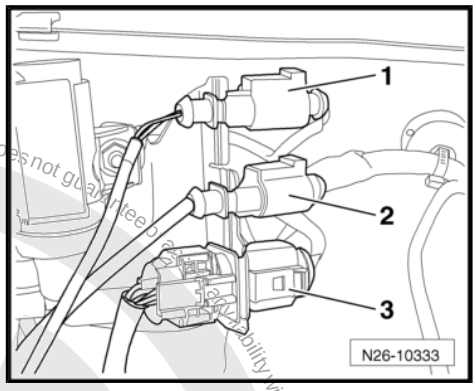
– Remove battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

– Unscrew bolts -arrows- and remove battery mounting bracket -1-.

– Remove air filter housing ⇒ page 241 .



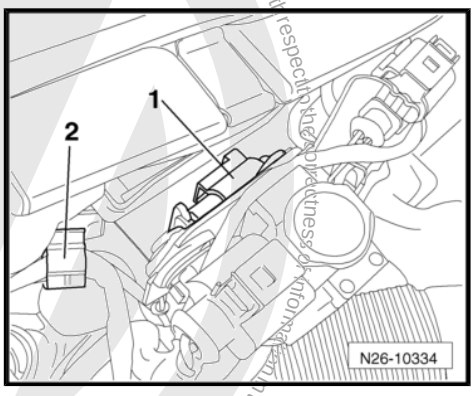
– Disconnect connector for Lambda probe - G39- -3- and connector for exhaust gas temperature sender 4 - G648- -2-.



– Disconnect connector for exhaust temperature sender 3 - G495- -1- (secured behind bracket).

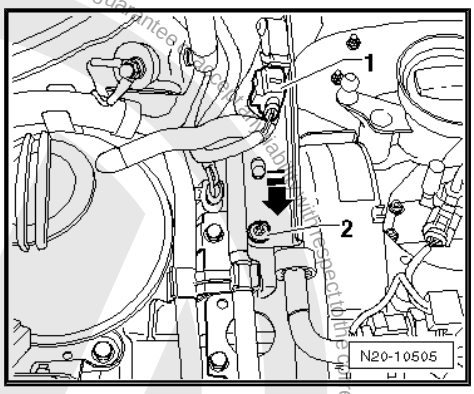
– Pull connector out of retainers and guide wiring out of retainers on plenum chamber bulkhead -2- and on turbocharger.

– Disconnect connector -1- and remove bolt -2-.

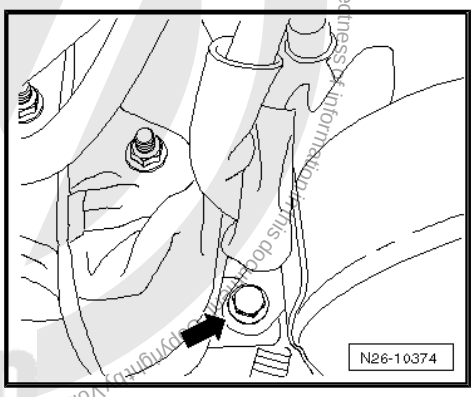


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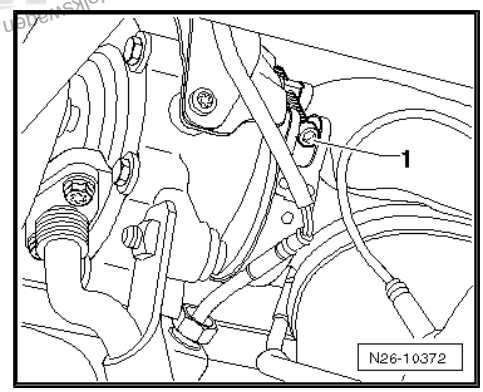
– Remove bracket for exhaust gas pressure sensor 1 - G450- including sensor by pushing in direction of (normal) travel.
– Place exhaust gas pressure sensor 1 - G450- on particulate filter.



– Unscrew securing bolt -arrow- at upper bracket for diesel particulate filter.
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
– Remove subframe together with steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe with steering rack .

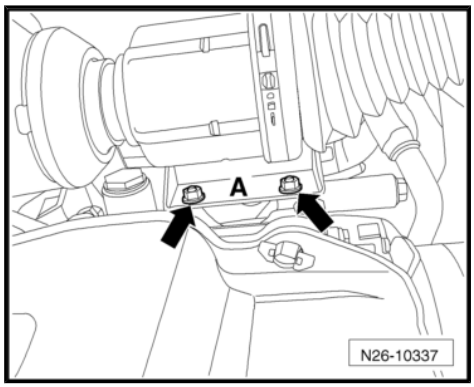


– Loosen securing clamp -1- between particulate filter and turbocharger.
– Unscrew securing nuts above particulate filter bracket using ratchet wrench - T10384- .



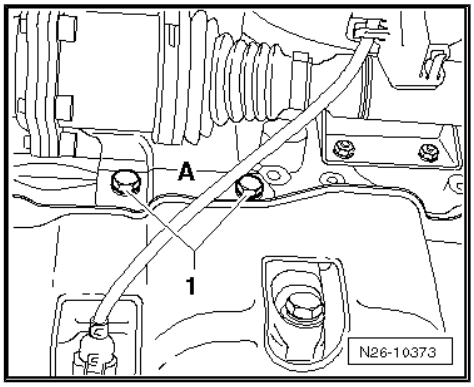
– Loosen securing nuts -arrows- of bracket for diesel particulate filter -A- at crankcase. Leave bracket on crankcase.

Vehicles with front-wheel drive:



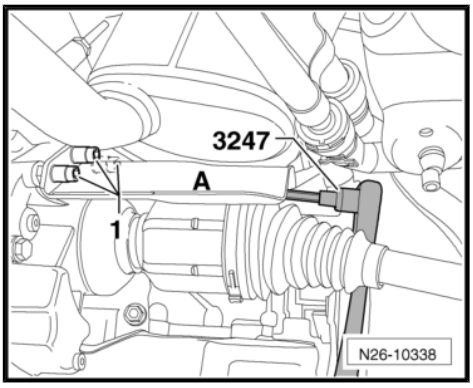
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– If fitted, unscrew bolts -1- for heat shield -A- above right axle shaft and remove heat shield.



Vehicles with all-wheel drive:

– Unscrew bolts -1- for heat shield -A- above right axle shaft using hexagon key extension, 8 mm - 3247- . If necessary, push diesel particulate filter up slightly to gain access to rear threaded connection.



Continued for all vehicles:

– Secure decoupling element of front exhaust pipe with transportation lock - T10404- .

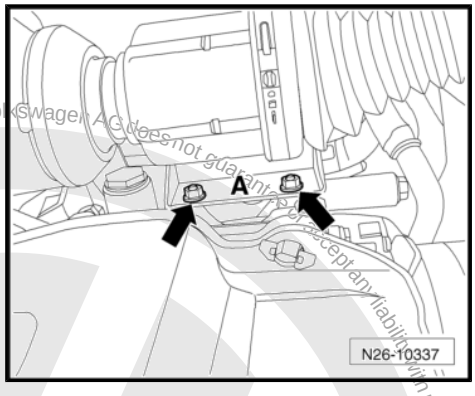
– Release connecting clamp on exhaust pipe. Leave it in position.

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– Remove bracket for diesel particulate filter -A-.

– Slide connecting clamp in direction of exhaust pipe.

– Take out diesel particulate filter with exhaust pipe downwards. Note electrical wiring and components when doing this.



Installing

– Secure decoupling element of front exhaust pipe with transportation lock - T10404- .

– Position bracket for diesel particulate filter at bottom of crankcase and fit securing nut by hand.

– Fit diesel particulate filter onto bracket.

– Hold exhaust pipe in position on propshaft or body using suitable means.

– Fit bolt at top of bracket for diesel particulate filter by hand.

– Slide clamping sleeve onto exhaust pipe in position.

– Guide electrical wiring of temperature senders upwards.

– Position clamp on turbocharger and tighten.

– Tighten securing bolts in the following sequence:

1. Lower bracket for diesel particulate filter to crankcase
2. Diesel particulate filter to lower bracket for diesel particulate filter (use ratchet ring spanner - T10384-).
3. Diesel particulate filter to upper bracket for diesel particulate filter.

– Install heat shield for axle shaft using hexagon key extension, 8 mm - 3247- .

– Install joint of right axle shaft on bevel box ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft .

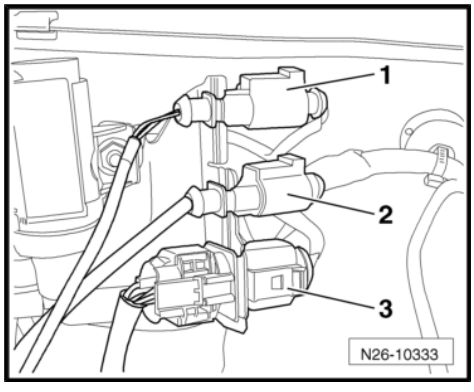
– Install subframe together with steering rack ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe with steering rack .

– Install exhaust pipe mounting on subframe.

– Firmly tighten clamping sleeve of exhaust system ⇒ page 297 .

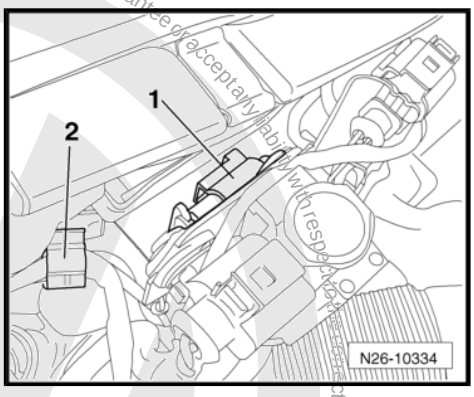
2.2.2 Removing and installing particulate filter, Tiguan with front-wheel drive

– Disconnect connector for Lambda probe - G39- -3- and connector for exhaust gas temperature sender 4 - G648- -2-.

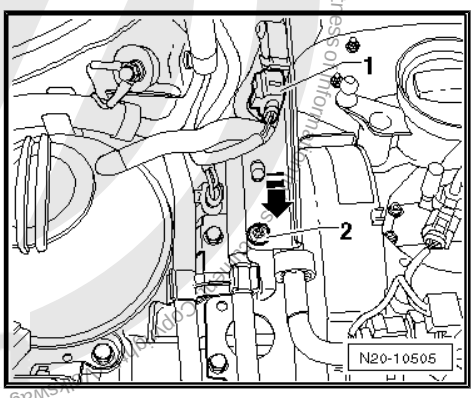


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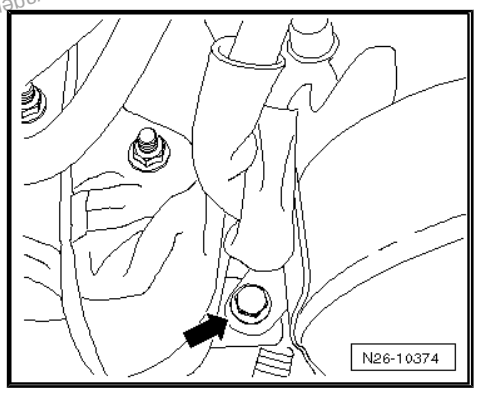
– Disconnect connector for exhaust temperature sender 3 - G495- -1- (secured behind bracket).
– Pull connector out of retainers and guide wiring out of retainers on plenum chamber bulkhead -2- and on turbocharger.



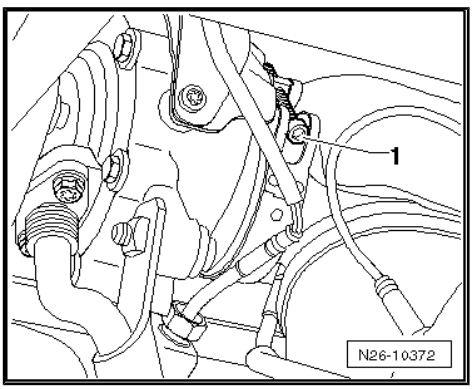
– Separate connector -1-, unscrew bolt -2- and remove bracket for exhaust gas pressure sensor 1 - G450- and sensor by pushing forwards.
– Remove exhaust gas pressure sensor 1 - G450- from its bracket.
– Place exhaust gas pressure sensor 1 - G450- on particulate filter.
– Remove Lambda probe - G39- ⇒ Item 4 (page 301) .
– Remove exhaust gas temperature sender 3 - G495- ⇒ Item 8 (page 301) using 17 mm spanner set - T10395- .



– Unscrew securing bolt -arrow- at upper bracket for diesel particulate filter.
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
– Remove exhaust gas temperature sender 4 - G648- ⇒ Item 5 (page 301) using 17 mm spanner set - T10395- .

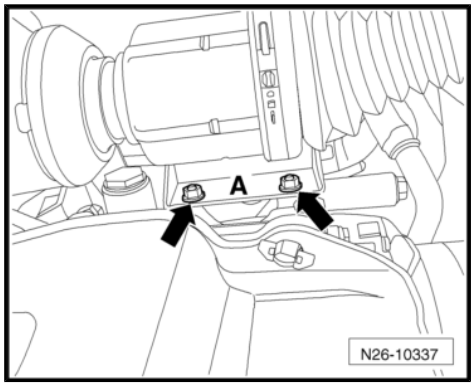


– Loosen securing clamp -1- between particulate filter and turbocharger.
– Unscrew securing nuts above particulate filter bracket using ratchet wrench - T10384- .

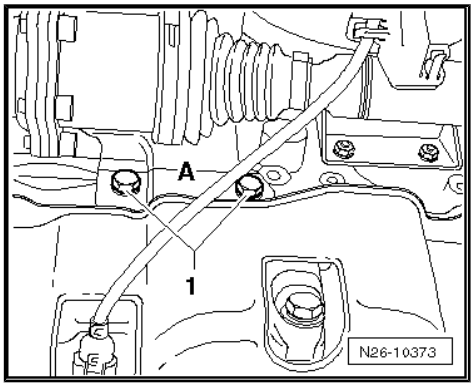


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– Unscrew securing nuts -arrows- of particulate filter bracket -A- on crankcase and remove bracket.



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- Unscrew bolts -1- for heat shield -A- above right axle shaft and remove heat shield.
- Secure decoupling element of front exhaust pipe with transportation lock - T10404- .
- Loosen clamping sleeve on exhaust pipe. Leave it in position.
- Remove heat shield under vehicle tunnel.
- Slide connecting clamp in direction of exhaust pipe.
- Turn particulate filter, with assistance of a 2nd mechanic, so that filter can be removed downwards. Note electrical wiring and components when doing this.

Installing

- Secure decoupling element of front exhaust pipe with transportation lock - T10404- .
- Turn particulate filter with assistance of 2nd mechanic so that filter can be installed upwards. Note electrical wiring and components when doing this.
- Slide clamping sleeve onto exhaust pipe in position.
- Position bracket for diesel particulate filter at bottom of crankcase and fit securing nut by hand.
- Fit diesel particulate filter onto bracket.
- Fit bolt at top of bracket for diesel particulate filter by hand.
- Install Lambda probe - G39- ⇒ Item 4 (page 301) .
- Install exhaust gas temperature sender 3 - G495- ⇒ Item 8 (page 301) using 17 mm spanner set - T10395- .
- Install exhaust gas temperature sender 4 - G648- ⇒ Item 5 (page 301) using 17 mm spanner set - T10395- .
- Guide electrical wiring of temperature senders upwards.
- Position clamp on turbocharger and tighten.
- Tighten securing bolts in the following sequence:

1. Lower bracket for diesel particulate filter to crankcase
2. Diesel particulate filter to lower bracket for diesel particulate filter (use ratchet ring spanner - T10384-).
3. Diesel particulate filter to upper bracket for diesel particulate filter.

- Install heat shield for axle shaft.
- Install exhaust pipe mounting on subframe.
- Firmly tighten clamping sleeve of exhaust system ⇒ page 297 .

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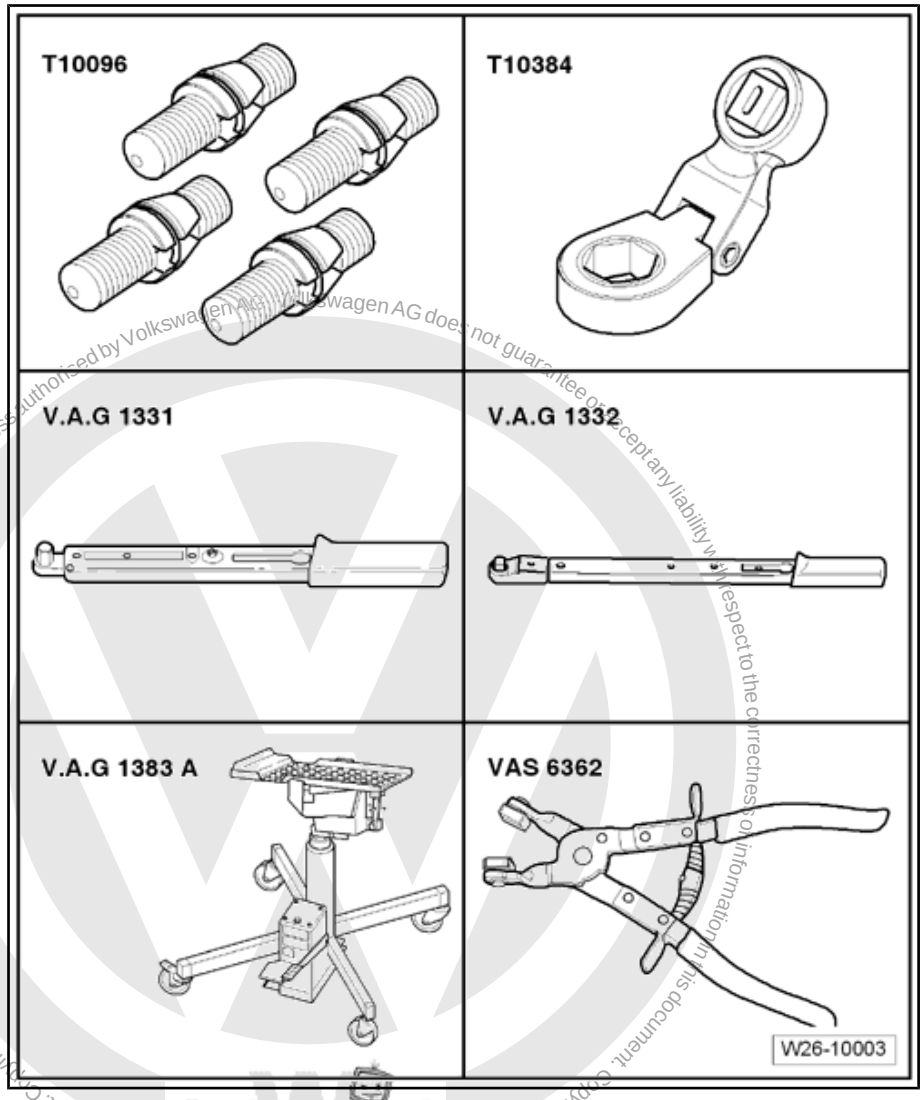
2.3 Removing and installing particulate filter with NOx storage catalytic converter

Note

- *Procedure is for vehicles without coupling point between particulate filter and NOx storage catalytic converter.*
- *On vehicles with coupling point, NOx storage catalytic converter can be removed individually* ⇒ page 325 .
- *After working on the particulate filter with NOx storage catalytic converter, ensure it is installed free of stress.*
- *Renew self-locking nuts, seals, gaskets and securing clamps.*
- *Hose connections are secured with either spring-type or clamp-type clips.*
- *Renew clamp-type clips with spring-type clips.*
- *It is recommended that spring-type clips should be installed using spring-type clip pliers - VAS 6362- or hose clamp pliers - VAS 6340- .*

Special tools and workshop equipment required

- Locating pins - T10096-
- Ratchet ring spanner - T10384-
- Torque wrench - V.A.G 1331-
- Torque wrench - V.A.G 1332-
- Engine and gearbox jack - V.A.G 1383 A-
- Pliers for spring-type clips - VAS 6362-



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Special tools and workshop equipment required

- Transportation lock - T10404-



Note

- *Subframe must be lowered to remove and install particulate filter with NOx trap. Locating pins - T10096- are required to secure the subframe.*
- *Assembly overview - turbocharger with exhaust manifold and attachments ⇒ page 197 .*
- *Assembly overview - particulate filter with NOx storage catalytic converter ⇒ page 299 .*
- *Assembly overview - exhaust flap control unit - J883- with SCR catalytic converter ⇒ page 305*
- *Hose connections are secured with either spring-type or clamp-type clips.*
- *Renew clamp-type clips with spring-type clips.*
- *It is recommended that spring-type clips should be installed using spring-type clip pliers - VAS 6362- or hose clamp pliers - VAS 6340- .*

⇒ "2.3.1 Removing particulate filter with NOx storage catalytic converter", page 319

⇒ "2.3.2 Installing particulate filter with NOx storage catalytic converter", page 323

2.3.1 Removing particulate filter with NOx storage catalytic converter

WARNING

Please 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, refrigerant, brake fluid and vacuum) and electrical wiring in their original positions.***
- ***Ensure sufficient clearance to all moving or hot components.***

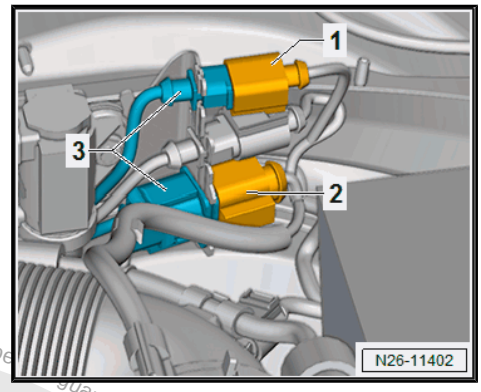
– Remove engine cover panel ⇒ page 39 .

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– Remove intake hose ⇒ Item 1 (page 242) between air mass meter - G70- and intake connecting pipe. Loosen spring-type clips using spring-type clip pliers - VAS 6362- .

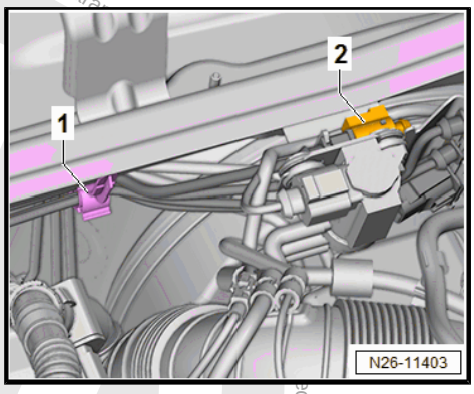
– Separate »orange« connector for exhaust temperature sender 2 - G448- -1- and »black« connector for lambda probe - G39- -2- on plenum chamber bulkhead.

– Remove wiring -3- from retainer and move clear.



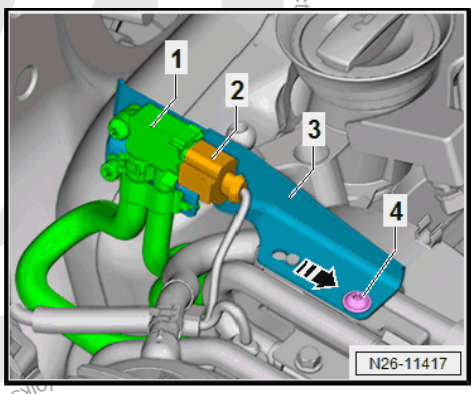
– Separate »brown« connector for exhaust temperature sender 3 - G495- -2- (secured behind bracket).

– Guide wiring/lines out of retainers -1- on plenum chamber bulkhead and on turbocharger.



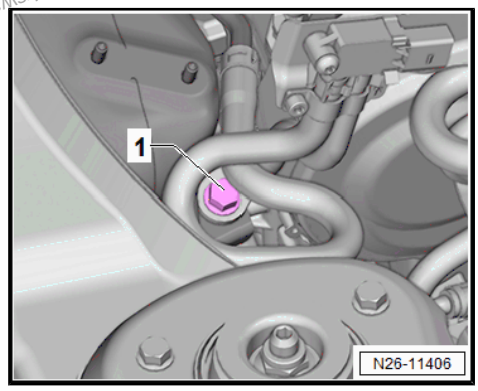
– Pull connector -2- off differential pressure sensor - G505- -1-.

– Unscrew securing bolt -4- and remove retainer -3- with differential pressure sender - G505- -1- in direction of -arrow- and move aside (control wiring remains connected).



– Unscrew securing bolt -1- on upper bracket for particulate filter.

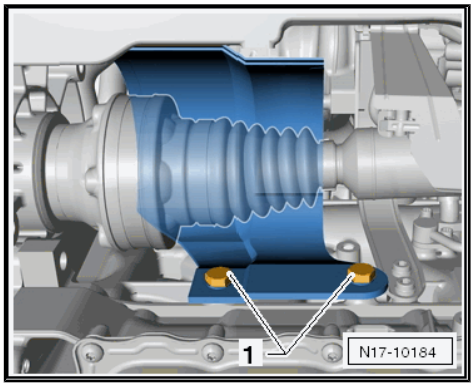
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



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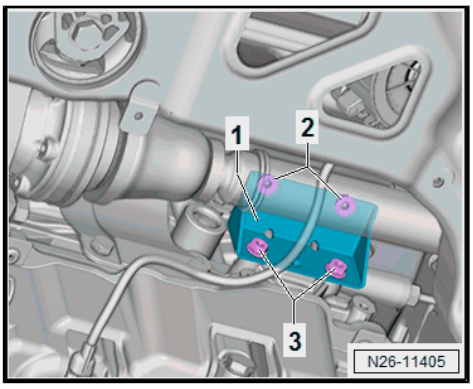
– Unscrew bolts -1- and remove heat shield for right drive shaft.

– Remove nuts -2- and -3- and remove lower bracket for particulate filter -1-.



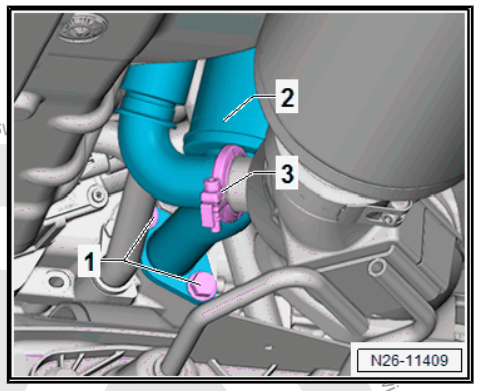
Note

Unscrew securing nuts above bracket -2- with ratchet wrench -T10384- . In some cases, the bracket cannot be removed until the particulate filter has been detached.



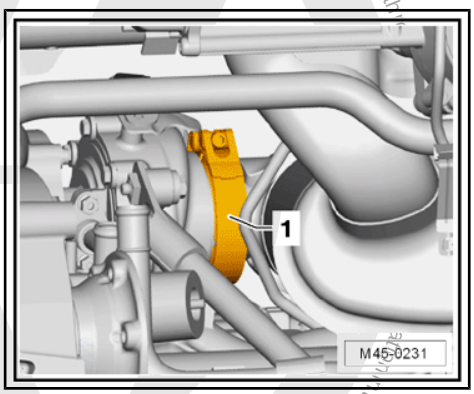
– Open clamp -3- and remove it.

– Loosen and remove clamp -1- connecting turbocharger and particulate filter.



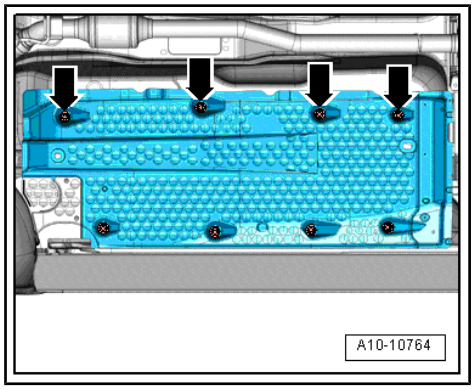
Note

Clamp -1- may be installed in a different position. If necessary, use 5 mm bit with ball head (e.g. T10058).

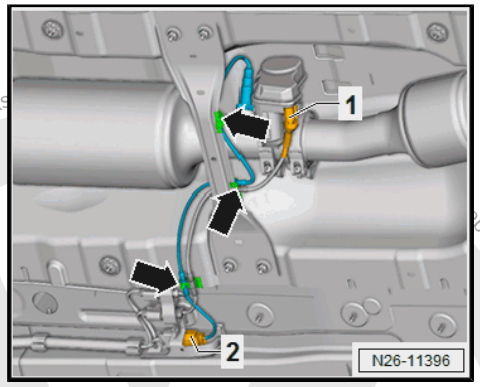


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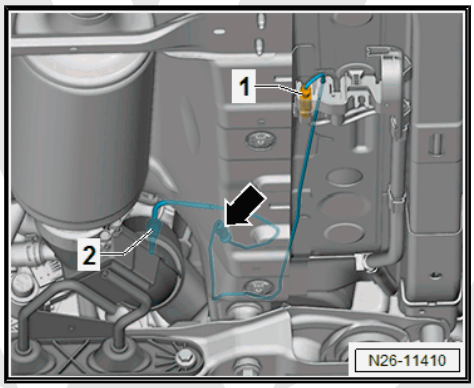
– Unscrew nuts -arrows- and pull underbody cover down slightly.
– Separate »brown« connector for lambda probe after catalytic converter - G130- -2-. Remove plug from retainer.



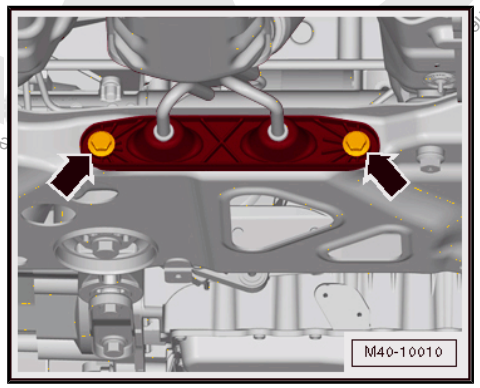
– Open fasteners for heat shield and pull connector -1- off exhaust flap control unit - J883- and guide wiring out of retainers -arrows-.



– Disconnect connector -1-. Take electrical wire from exhaust gas temperature sender 4 - G648- -2- on heat shield out of clip -arrow- and bracket and move to side.



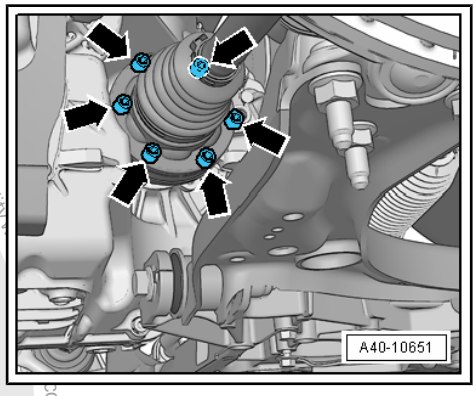
– Remove bolts -arrows- from exhaust system bracket on subframe.



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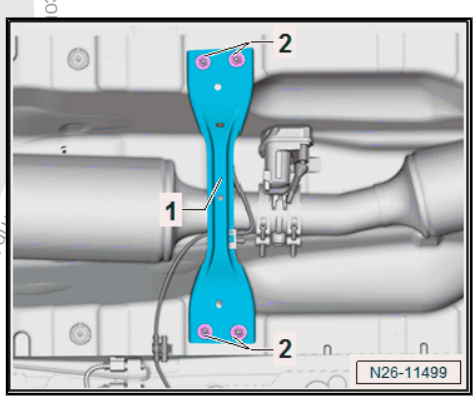
– Remove bolts -arrows- and remove right drive shaft from transmission. Rest drive shaft on front axle.

– Lower subframe approx. 6 cm ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Assembly overview - subframe.



– Remove hexagon nuts -2- from front tunnel cross-piece -1- and remove tunnel cross-piece.

– Remove securing clamp between NOx storage catalytic converter and exhaust flap control unit - J883- .

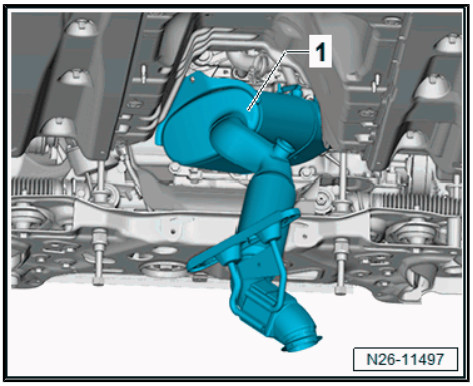


Caution

Danger of damaging decoupling element between particulate filter and NOx storage catalytic converter. When removing and installing:

- ***Do not allow the decoupling element to kink by more than 10°.***
- ***Install decoupling element so that it is not under tension.***
- ***Do not damage wire mesh on decoupling element.***
- ***The decoupling element must be secured with transportation lock - T10404- to stop overstretching.***

– Remove particulate filter with NOx storage catalytic converter with aid of second mechanic. Do this by »turning« particulate filter -1- out of centre tunnel. Note electrical wiring and components when doing this.



2.3.2 Installing particulate filter with NOx storage catalytic converter

Note

- *After working on the particulate filter with NOx storage catalytic converter, ensure it is installed free of stress.*
- *Renew self-locking nuts, seals, gaskets and securing clamps.*

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Caution

Danger of damaging decoupling element between particulate filter and NOx storage catalytic converter. When removing and installing:

- ***Do not allow the decoupling element to kink by more than 10°.***
- ***Install decoupling element so that it is not under tension.***
- ***Do not damage wire mesh on decoupling element.***
- ***The decoupling element must be secured with transportation lock - T10404- to stop overstretching.***

– Bring particulate filter to installation position. Note electrical wiring and components when doing this.

– Install subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Assembly overview - subframe, anti-roll bar, suspension links .

– Install new seal between NOx storage catalytic converter and exhaust flap control unit - J883- ⇒ page 306 .

– Install new securing clamp between NOx storage catalytic converter and exhaust flap control unit - J883- :

Note installation position of securing clamp ⇒ page 306 .

Torque setting ⇒ page 299 .

– Install new seal between NOx storage catalytic converter and particulate filter.

– Install new securing clamp between NOx storage catalytic converter and particulate filter.

Note installation position of securing clamp ⇒ page 306 .

Torque setting ⇒ Item 18 (page 303) .

– Install tunnel cross-piece:

• Torque setting ⇒ page 291 .

The numbered procedure must be adhered to, this will ensure that the particulate filter with NOx storage catalytic converter are installed free of stress.

1. Position lower bracket on cylinder block and on particulate filter with securing nuts. (Do not tighten securing nuts yet).
2. Position new securing clamp with new seal between particulate filter and turbocharger (do not tighten securing clamp yet):

• Note installation position of securing clamp ⇒ page 306 .

3. Install exhaust gas recirculation filter ⇒ Item 9 (page 346) .
4. Position new securing clamp between particulate filter and filter for exhaust gas recirculation (do not tighten securing clamp yet):

• Note installation position of securing clamp ⇒ page 306 .

5. Position particulate filter on upper bracket with securing bolt. (Do not tighten securing bolt yet).

– Tighten fasteners in the following sequence:

6. Hanger for NOx storage catalytic converter on subframe:

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7. Securing clamp between particulate filter and turbocharger.
8. Lower bracket to cylinder block:
9. Lower bracket to particulate filter:
10. Upper bracket to particulate filter:
11. Upper bracket to cylinder head:
12. Securing clamp between particulate filter and filter for exhaust gas recirculation:

- Specified torque ⇒ page 299

If particulate filter was renewed:

– Remove transportation and protective packaging on decoupling element between particulate filter and NOx storage catalytic converter.

The remaining installation steps are carried out in the reverse order of removal. During this step, observe the following:

- Ensure that line connections are tight.
- Specified torques ⇒ page 299 ; Assembly overview - particulate filter with NOx storage catalytic converter.

– Install heat shield for drive shaft (right-side) -arrows-.

Specified torque ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft .



Note

If the particulate filter was renewed, the adaption of ash mass comparison must be set to "0" ⇒ Vehicle diagnostic tester "Guided functions".

– Carry out a road test. If the steering wheel spokes are »offset«, the vehicle geometry must be measured ⇒ Running gear, axles, steering; Rep. gr. 44 .

– Install engine cover panel ⇒ page 39 .

2.4 Removing and installing NOx storage catalytic converter

Note

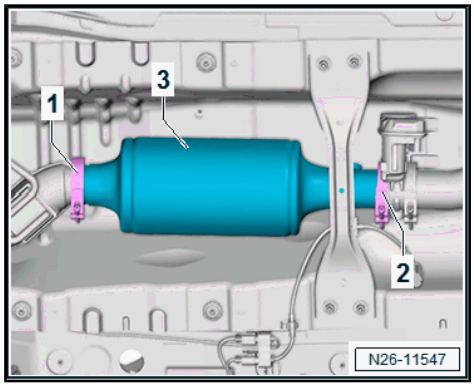
- *Procedure is for vehicles with coupling point between particulate filter and NOx storage catalytic converter.*
- *On vehicles without coupling point between particulate filter and NOx storage catalytic converter, both components must be removed together ⇒ page 318 .*

Removing

– Remove lambda probe after catalytic converter - G130- ⇒ page 281 .

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– Loosen clamps -1- and -2- and remove NOx storage catalytic converter.



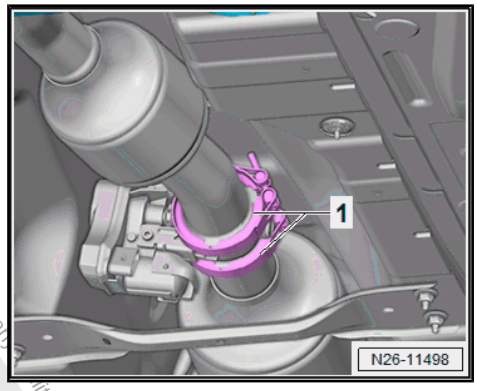
Installing

Note

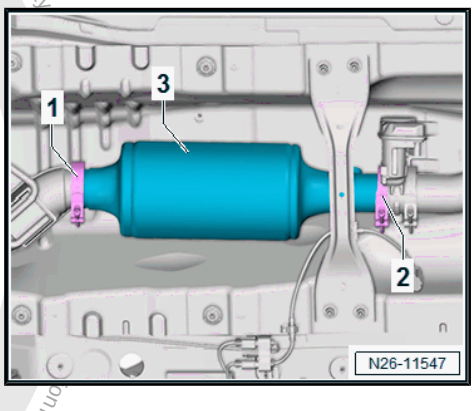
Renew all clamps and seals. The clamps before and after the exhaust flap control unit are narrower than the clamp connecting the particulate filter to the NOx storage catalytic converter. Ensure that they are correctly allocated.

– Place NOx storage catalytic converter with new seals in installation position. Note notches at rear connection.

Installation position of clamps



– Position all clamps -1- so that they will not collide with underbody.



– Set clamp -2- in place and engage. Then tighten to 7 Nm.
– Set clamp -1- in place and engage. Then tighten to 7 Nm.
– Install lambda probe after catalytic converter - G130- ⇒ page 281 .

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3 SCR system (selective catalytic reduction)

⇒ “3.1 Assembly overview - tank for reducing agent”, page 327

⇒ “3.2 Draining reducing agent tank”, page 328

⇒ “3.3 Removing and installing reducing agent tank”, page 331

⇒ “3.4 Assembly overview - delivery module for reducing agent”, page 333

⇒ “3.5 Assembly overview - reducing agent delivery line”, page 335

⇒ “3.6 Removing and installing reducing agent supply line”, page 336

⇒ “3.7 Removing and installing injector for reducing agent”, page 338

⇒ “3.8 Removing and installing heater element (heater cup)”, page 339

3.1 Assembly overview - tank for reducing agent

Note

- *To keep the following description as short as possible, the “NO_X reducing agent AUS 32” (AdBlue®) is just called “reducing agent”.*
- *The design and function of the SCR systems is described in ⇒ Self-study programme No. 424 ; Selective Catalytic Reduction .*

WARNING

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1 - Upper insulation

2 - Control unit for reducing agent heater - J891-

3 - Delivery module

- ❑ With pump for reducing agent - V437- .
- ❑ Removing and installing ⇒ page 339

4 - Reducing agent tank

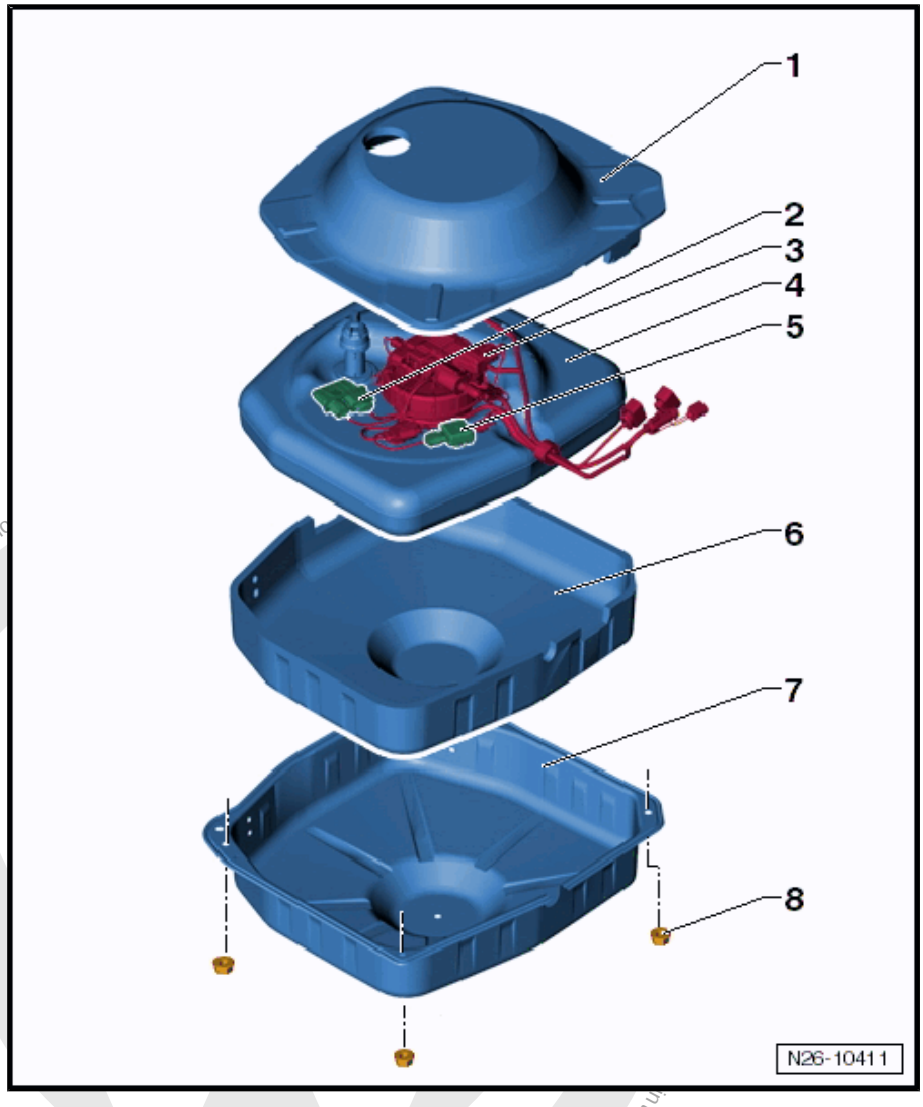
- ❑ Removing and installing ⇒ page 331

5 - Evaluation unit for reducing agent level - G698-

6 - Lower insulation

7 - Sheet metal tray

8 - 20 Nm



3.2 Draining reducing agent tank

Note

To keep the following description as short as possible, the "NO_x reducing agent AUS 32" (AdBlue®) is just called "reducing agent".

WARNING

- ***The reducing agent can irritate skin, eyes and respiratory organs.***
- ***In the event of skin contact with this fluid, immediately wash off with plenty of water.***
- ***Seek medical attention if necessary.***

Special tools and workshop equipment required

- Vacuum box - VAS 6557-

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Note

Tank for reducing agent is emptied via filler neck.

Caution

Always ensure that no reducing agent contacts clothing or bodywork.

If this occurs, wash out reducing agent using clear water and a lint-free cotton cloth.

If the reducing agent has already crystallised, use warm water and a sponge.

Reducing agent residues which are not removed crystallise after a while and may damage the affected surface.

Information concerning storage and disposal ⇒ ServiceNet → Environmental protection → Workshop disposal ! Request country specific information from importer concerning storage and disposal.

The reducing agent tank's filler aperture is located under the floor covering in the luggage compartment.

– Lift floor covering -1- and slide it back.

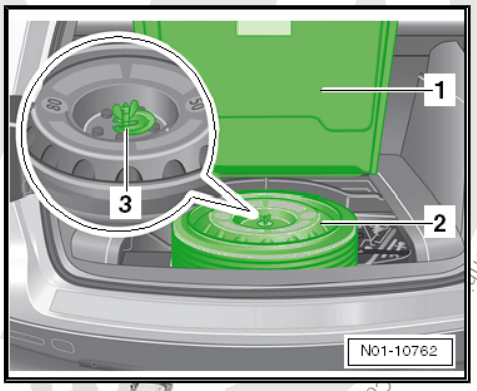
– Remove spare wheel -2-, if available, by unscrewing wing nut -3-.

– Remove foam part, if fitted.

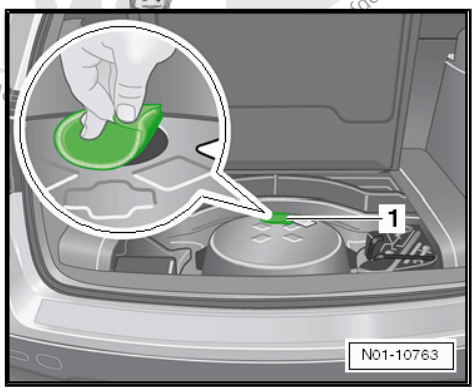
WARNING

Protect hands when removing cap from tank filler neck.

Risk of injury from sharp-edged body parts.

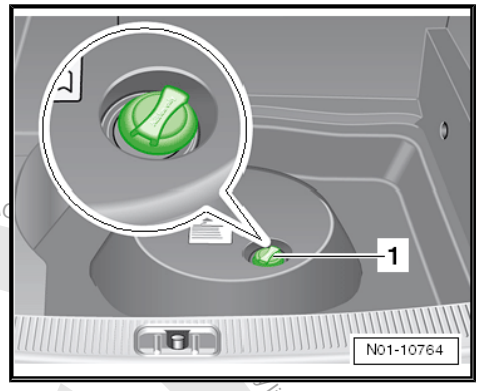


– Remove tank filler neck sealing plug -1-.



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– Open cover of tank -1- in luggage compartment.



Prepare vacuum box - VAS 6557- as follows:

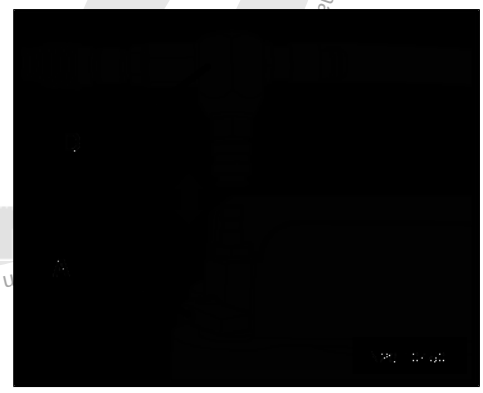
– Close shut-off taps -A-, -B- and -C-.



– Connect coupling -D- with connection to shut-off tap -A- and pressurize compressed air hose with compressed air.
– Open shut-off tap -A-.

A vacuum is now created in the vacuum box - VAS 6557- .

– Close shut-off valve -A- as soon as the pressure gauge registers a pressure of 0.8 bar.



– Disconnect coupling -D- from connection on shut-off tap -A- and interrupt compressed air from compressed air hose.



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– Guide end of hose -E- into filler neck to bottom of tank for reduction agent then open shut-off tap -B-.



Note

The reducing agent is then drawn from the tank and into the vacuum box - VAS 6557- by the vacuum. The capacity of the vacuum box - VAS 6557- is 11 litres. This extracted volume is sufficient for removal of the reducing agent tank. If the reducing agent tank holds a greater amount and the tank is to be emptied, then repeat the process.

– To empty the vacuum box - VAS 6557- , hold shut-off tap -C- over a suitable container and open shut-off valves -A- and -C-.

Caution

Extracted reducing agent must never be used again. Information concerning storage and disposal ⇒ ServiceNet → Environmental protection → Workshop disposal ! Request country specific information from importer concerning storage and disposal.

– Flush out vacuum box - VAS 6557- carefully using water when work sequence is complete.

3.3 Removing and installing reducing agent tank

Note

To keep the following description as short as possible, the "NO_X reducing agent AUS 32" (AdBlue®) is just called "reducing agent".

WARNING

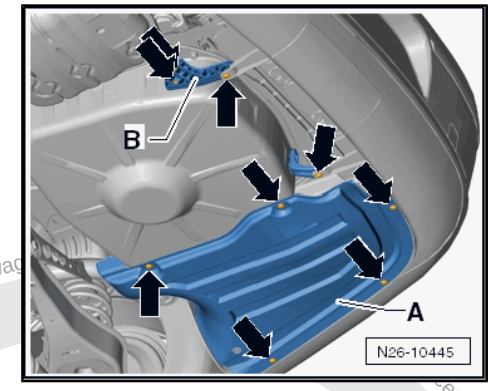
- ***The reducing agent can irritate skin, eyes and respiratory organs.***
- ***In the event of skin contact with this fluid, immediately wash off with plenty of water.***
- ***Seek medical attention if necessary.***

Removing

– Emptying tank for reduction agent ⇒ page 328 .

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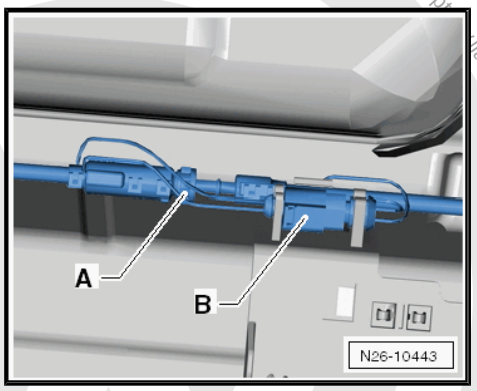
– Remove bolts -arrows- and remove cover -A- and retainer -B-.



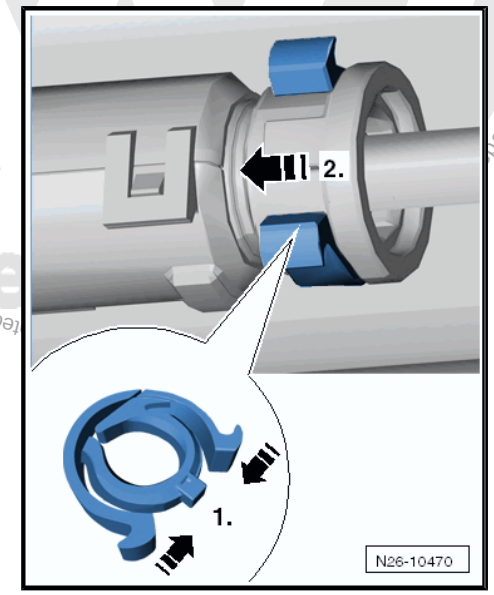
Caution

Protect separated electrical connections against wetting from reducing agent by suitable means, e.g. plastic bag and cable ties. Due to the high tendency to creep combined with subsequent crystallisation of the reducing agent, the electrical connections can be damaged.

– Unclip wiring connections -A- and -B- from retainer above rear axle and disconnect electrical connector of delivery line -B-.



– First press securing clip for line connection together in direction of -arrow 1.- as shown, and pull off delivery line in direction of -arrow 2.- without tools and without »jerking«.

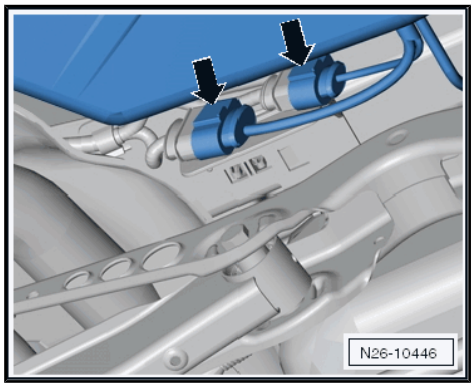


Caution

Immediately seal all openings and connections using suitable plugs to stop ingress of dirt. Even very small particles of dirt can cause considerable damage to the system.

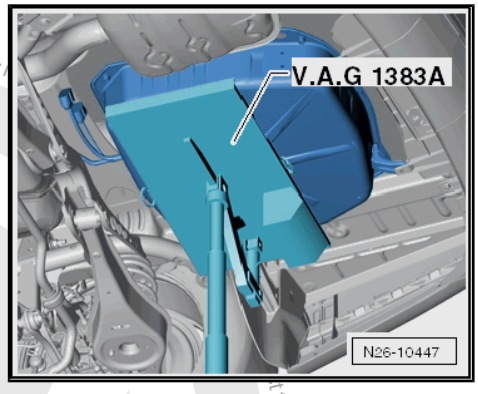
Protect separated electrical connections against wetting from reducing agent by suitable means, e.g. plastic bag and cable ties. Due to the high tendency to creep combined with subsequent crystallisation of the reducing agent, the electrical connections can be damaged.

– Remove delivery module wiring connections -A- and -B- from their retainer above rear axle and disconnect electrical connectors.

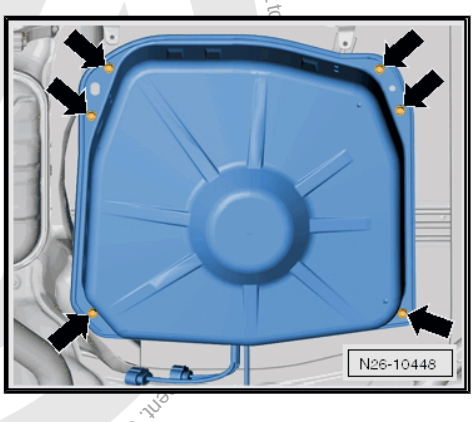


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– Position engine and gearbox jack - V.A.G 1383 A- under reduction agent tank.



– Remove bolts -arrows- and carefully lower tank for reduction agent.



Installing

Note

Ensure all components are installed on tank for reduction agent, the upper insulation is fitting exactly and that no lines are squashed.

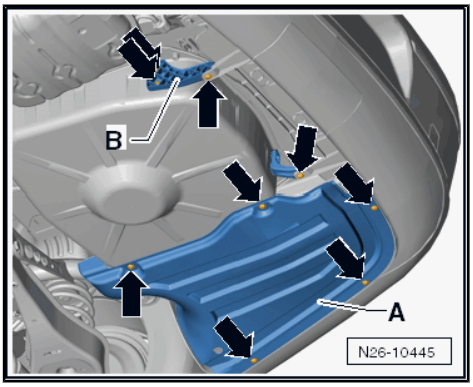
– Carefully raise tank for reduction agent using engine and gearbox jack - V.A.G 1383 A- until securing nuts can be fitted.

– Tighten securing nuts. Specified torque ⇒ Item 8 (page 328)

– Reconnect electrical wiring and delivery line, and clip them into respective retainers.

– Install cover -A- and retainer -B-.

– Fill tank for reduction agent ⇒ Maintenance ; Booklet .



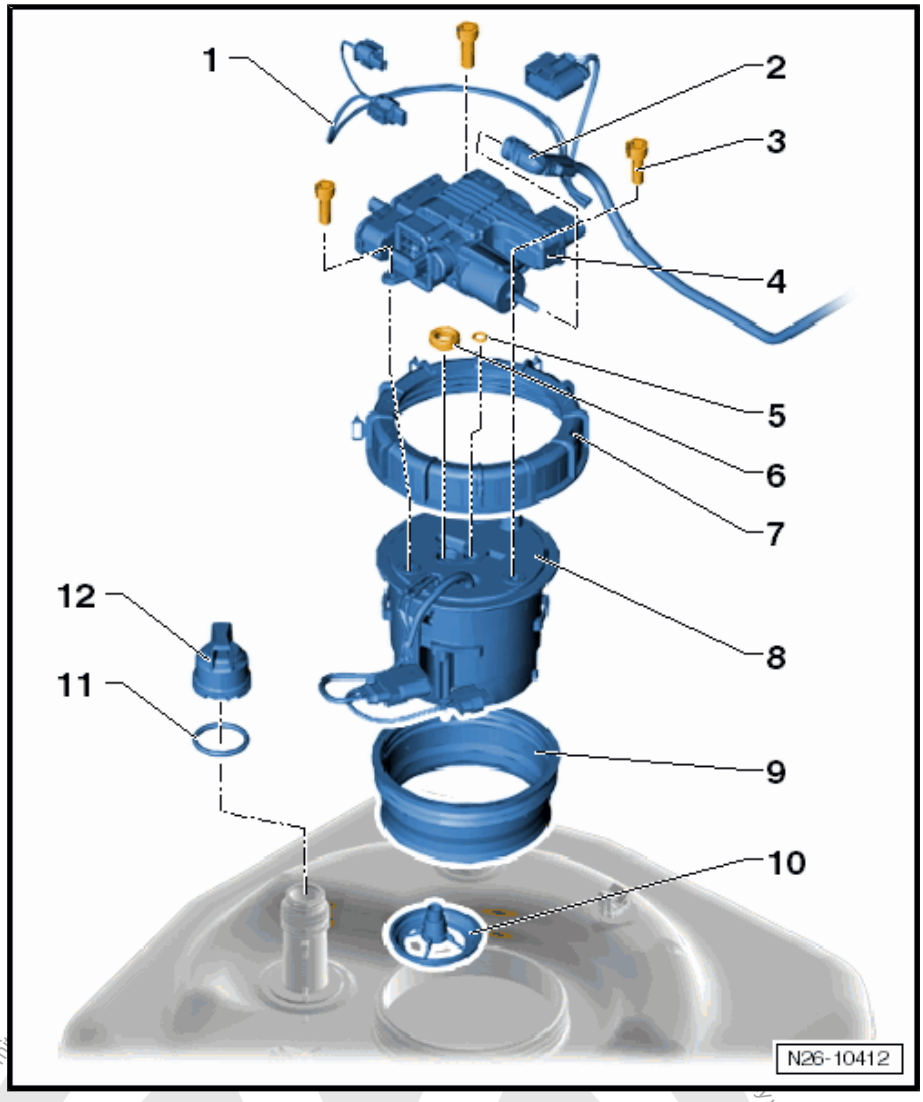
3.4 Assembly overview - delivery module for reducing agent

Note

- *To keep the following description as short as possible, the "NO_X reducing agent AUS 32" (AdBlue®) is just called "reducing agent".*
- *The design and function of the SCR systems is described in ⇒ Self-study programme No. 424 ; Selective Catalytic Reduction .*

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1 - Wiring harness

2 - Delivery line

- ❑ For reducing agent
- ❑ With heater for reducing agent line - Z104- .
- ❑ Assembly overview ⇒ page 335

3 - 5 Nm

4 - Pump for reducing agent - V437-

- ❑ With heater for reducing agent pump - Z103- .
- ❑ With pressure sender for reducing agent metering system - G686- .
- ❑ With reversal valve for reducing agent - N473- .

5 - Sealing ring

- ❑ Renew

6 - Seal

- ❑ Renew

7 - Locking ring 80 Nm

- ❑ Remove and install using wrench - T50014- .

8 - Heater element (heater cup)

- ❑ With heater for reducing agent tank - Z102- .
- ❑ With reducing agent level sender - G697-
- ❑ With temperature sender for reducing agent - G685-
- ❑ Removing and installing ⇒ page 339

9 - Seal

- ❑ Renew if damaged

10 - Filter

11 - Sealing ring

- ❑ Renew if damaged

12 - Sealing cap

- ❑ For filling
- ❑ Accessible from luggage compartment

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3.5 Assembly overview - reducing agent delivery line

Note

- *To keep the following description as short as possible, the "NO_X reducing agent AUS 32" (AdBlue®) is just called "reducing agent".*
- *The design and function of the SCR systems is described in ⇒ Self-study programme No. 424 ; Selective Catalytic Reduction .*

WARNING

1 - Quick-release fastener
- ❑ For delivery line.

2 - Connector
- ❑ For heater for reducing agent breather line - Z104- .

3 - Reducing agent supply line
- ❑ Removing and installing ⇒ page 336

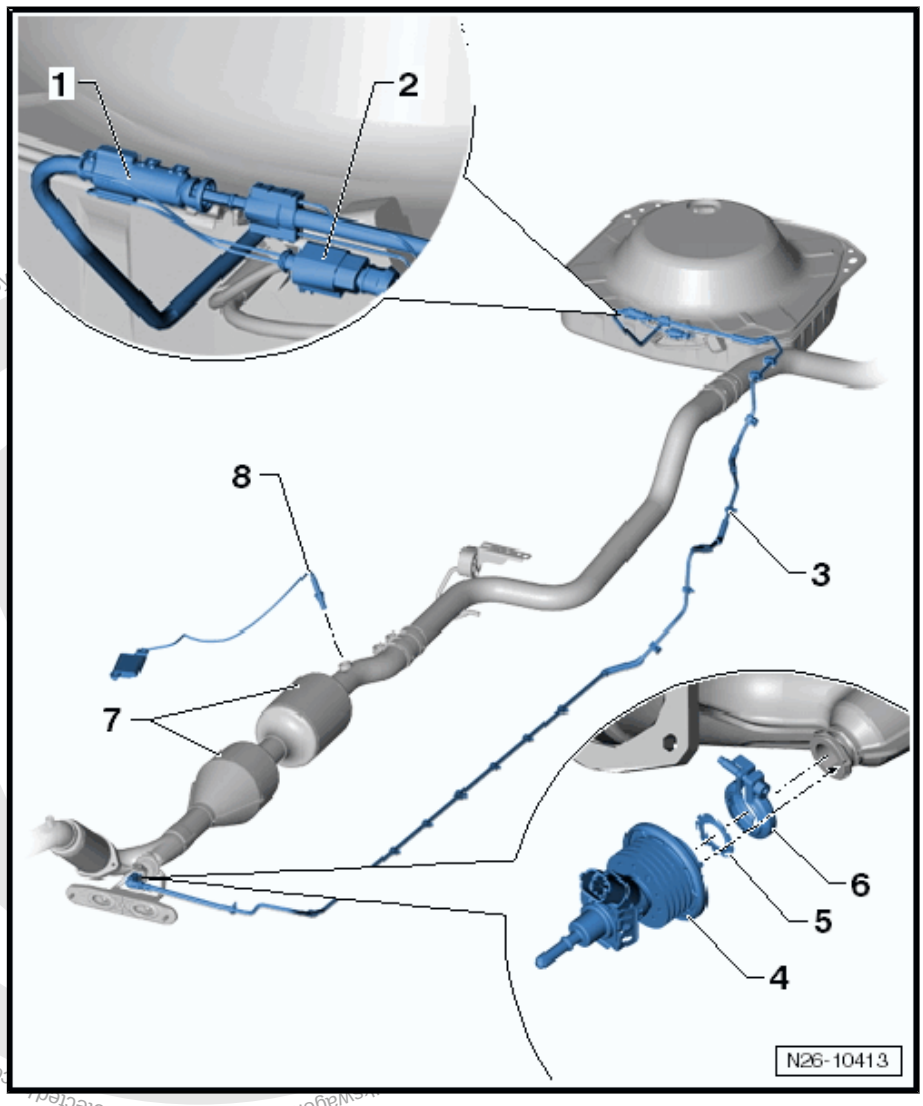
4 - Injector for reducing agent - N474-
- ❑ Removing and installing ⇒ page 338

5 - Seal
- ❑ Renew

6 - Clip, 5 Nm
- ❑ Renew

7 - Reduction catalytic converter

8 - NOx sender 2 - G687-
- ❑ 50 Nm
- ❑ With NOx sender 2 control unit - J881- .
- ❑ Remove right underbody panel in order to remove and install.



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3.6 Removing and installing reducing agent supply line

Note

To keep the following description as short as possible, the "NO_X reducing agent AUS 32" (AdBlue®) is just called "reducing agent".

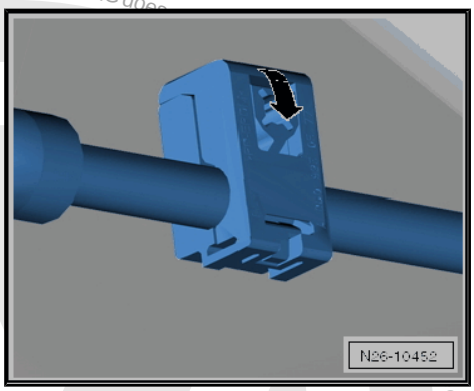
WARNING

- *The reducing agent can irritate skin, eyes and respiratory organs.*
- *In the event of skin contact with this fluid, immediately wash off with plenty of water.*
- *Seek medical attention if necessary.*

– Remove left underbody panel.

– Remove heat shield above rear axle.

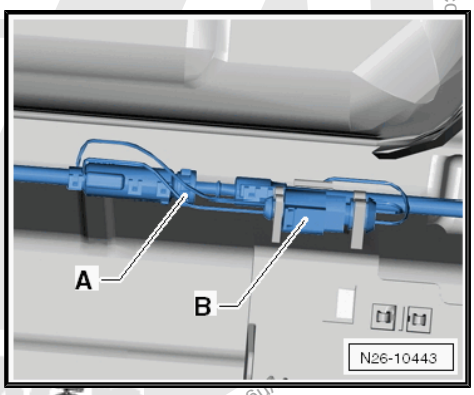
– Open clips of delivery line, open upper part in direction of -arrow- for this.



Caution

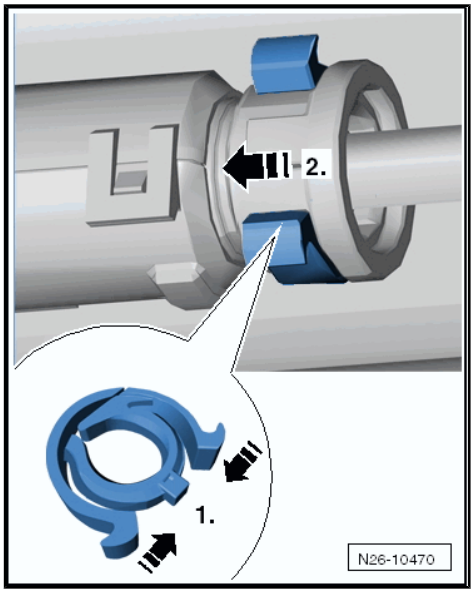
Protect separated electrical connections against wetting from reducing agent by suitable means, e.g. plastic bag and cable ties. Due to the high tendency to creep combined with subsequent crystallisation of the reducing agent, the electrical connections can be damaged.

– Unclip wiring connection from retainer above rear axle and disconnect electrical connector -B- of delivery line.



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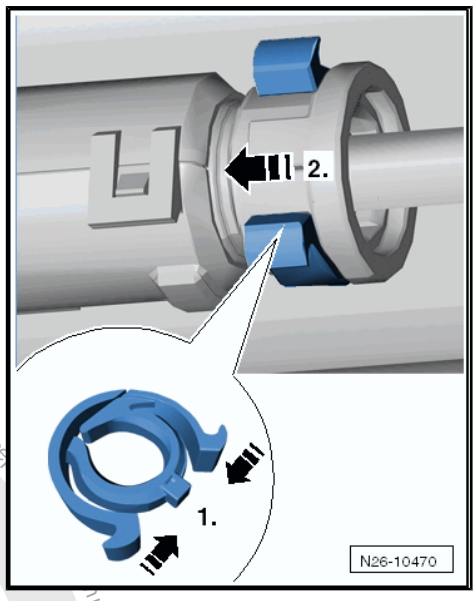
– First press securing clip for line connection together in direction of -arrow 1.- as shown, and pull off delivery line in direction of -arrow 2.- without tools and without »jerking«.



Caution

Immediately seal all openings and connections using suitable plugs to stop ingress of dirt. Even very small particles of dirt can cause considerable damage to the system.

– First press securing clip for line connection on injector for reduction agent - N474- together in direction of -arrow 1.- as shown, and pull off delivery line in direction of -arrow 2.- without tools and without »jerking«.



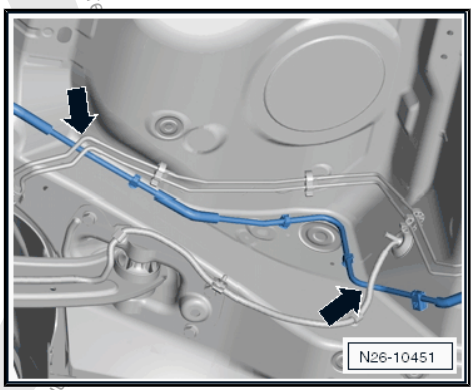
– Carefully release delivery line, pull it out of remaining clips and remove it.

Installing

Caution

The delivery line is pre-formed and is equipped with a heater element over the complete length. Ensure the line is not kinked, twisted or stretched. Otherwise, the heater element and thereby the supply line will be damaged.

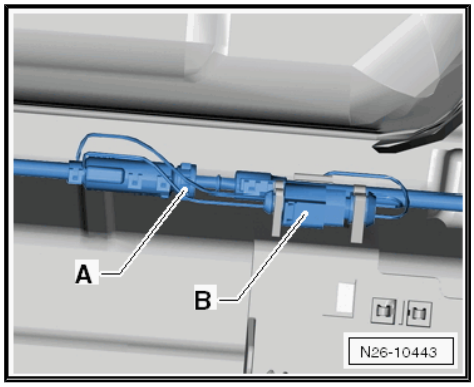
– Guide delivery line carefully behind brake lines and wiring harness for electromechanical parking brake -arrows- above rear axle.



– Remove sealing plugs and connect delivery line to injector for reduction agent - N474- .
– Press delivery line into respective clips, working from front to rear.
– Close securing clips.
– Remove blanking plugs.

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– Connect wire -B- and supply line -A- above rear axle. Secure both in their brackets on the body.
– Reinstall heat shield above rear axle.
– Reinstall underbody panel on driver's side.



3.7 Removing and installing injector for reducing agent

Note

To keep the following description as short as possible, the "NO_X reducing agent AUS 32" (AdBlue®) is just called "reducing agent".

WARNING

- *The reducing agent can irritate skin, eyes and respiratory organs.*
- *In the event of skin contact with this fluid, immediately wash off with plenty of water.*
- *Seek medical attention if necessary.*

Removing

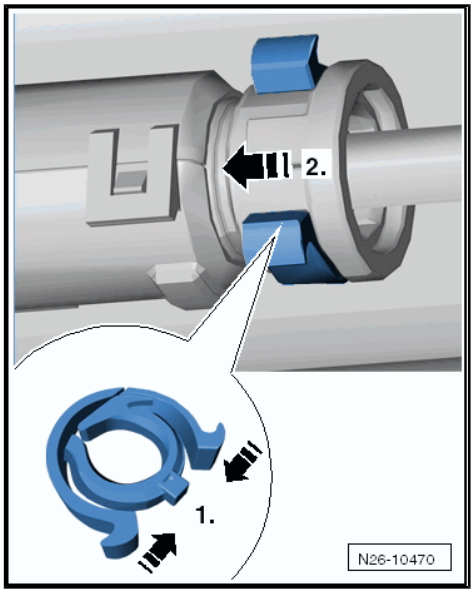
Caution

Protect separated electrical connections against wetting from reducing agent by suitable means, e.g. plastic bag and cable ties. Due to the high tendency to creep combined with subsequent crystallisation of the reducing agent, the electrical connections can be damaged.

– Disconnect electrical connector on injector for reduction agent - N474- .

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– First press securing clip for line connection on injector for reduction agent - N474- together in direction of -arrow 1.- as shown, and pull off delivery line in direction of -arrow 2.- without tools and without »jerking«.



Caution

Immediately seal all openings and connections using suitable plugs to stop ingress of dirt. Even very small particles of dirt can cause considerable damage to the system.

– Open clamp ⇒ Item 6 (page 335) and remove injector for reduction agent - N474- .

Installing

– Install injector for reduction agent - N474- with a new sealing washer, observing lug on reducer catalytic converter (electrical connector faces upwards).

– Place new securing clamp over connection and press it together until it engages. This action locates the injector for reducing agent - N474- .

– Fit bolt and tighten to prescribed torque ⇒ Item 6 (page 335) .

– First reconnect electrical connector, then reconnect delivery line.

3.8 Removing and installing heater element (heater cup)

Note

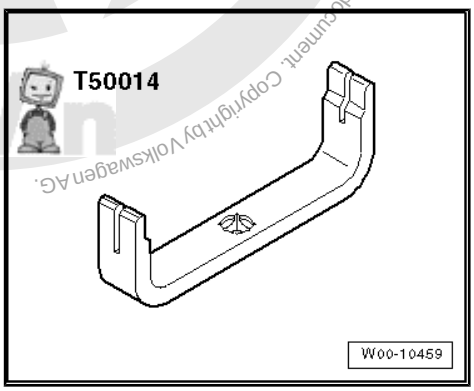
To keep the following description as short as possible, the "NO_X reducing agent AUS 32" (AdBlue®) is just called "reducing agent".

WARNING

- ***The reducing agent can irritate skin, eyes and respiratory organs.***
- ***In the event of skin contact with this fluid, immediately wash off with plenty of water.***
- ***Seek medical attention if necessary.***

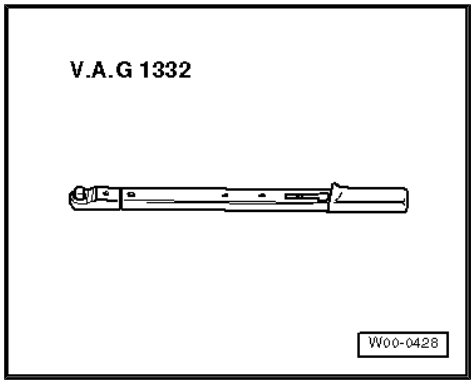
Special tools and workshop equipment required

- Special wrench - T50014-



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♦ Torque wrench - V.A.G 1332/-



Removing

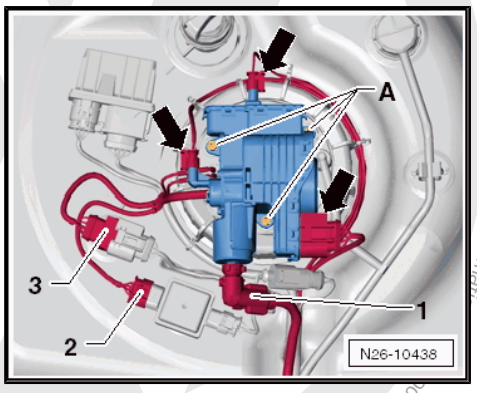
– Remove tank for reduction agent ⇒ page 339 .

– Remove upper part of insulation ⇒ Item 1 (page 328) .

Caution

Protect separated electrical connections against wetting from reducing agent by suitable means, e.g. plastic bag and cable ties. Due to the high tendency to creep combined with subsequent crystallisation of the reducing agent, the electrical connections can be damaged.

– Pull connectors -arrows- off pump for reduction agent - V437- .

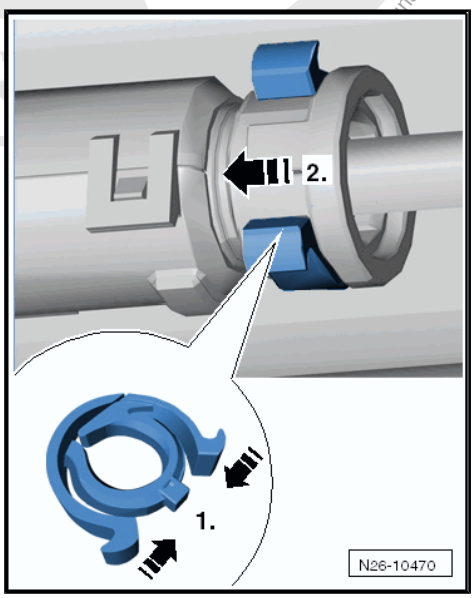


– First press securing clip for line connection together in direction of -arrow 1.- as shown, and pull off delivery line in direction of -arrow 2.- without tools and without »jerking«.

Caution

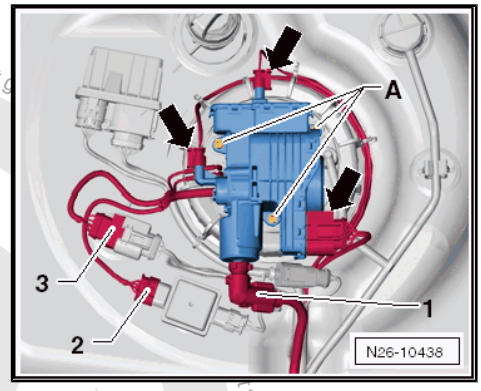
Immediately seal all openings and connections using suitable plugs to stop ingress of dirt. Even very small particles of dirt can cause considerable damage to the system.

Protect separated electrical connections against wetting from reducing agent by suitable means, e.g. plastic bag and cable ties. Due to the high tendency to creep combined with subsequent crystallisation of the reducing agent, the electrical connections can be damaged.

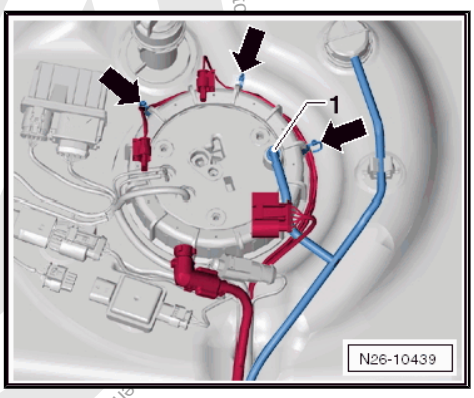


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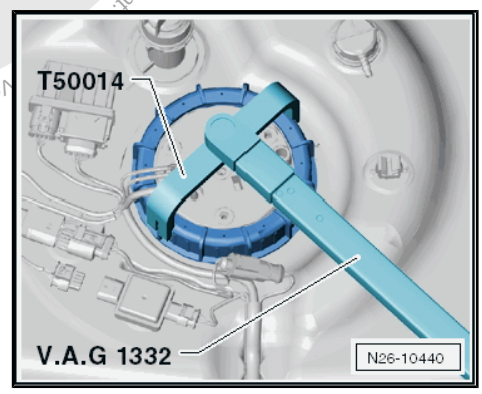
– Disconnect connectors -2- and -3-, remove securing bolts -A- and pull pump for reduction agent - V437- out upwards.



– Cut through cable ties -arrows- on locking ring and pull breather line -1- off upwards.



– Fit special wrench - T50014- onto locking ring as shown and unscrew it.



Caution

When open, only tilt cover a max. of 30° this prevents damage to electrical cables and suction probe of delivery module.

– Open cover of delivery module, if necessary use wedge - 3409- .

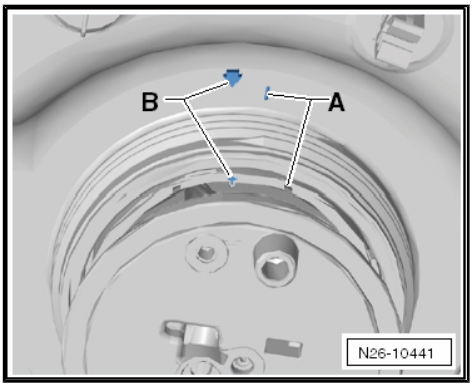
– Carefully grasp in cup of delivery module and release it from the locking device by turning it anti-clockwise.

– Remove delivery module upwards out of tank for reduction agent.

Installing

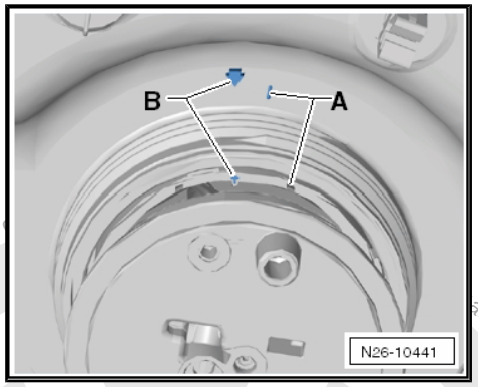
– Fit seal ⇒ Item 9 (page 334) to opening of tank for reduction agent.

– Fit delivery module into tank for reduction agent, note markings -A-. The marks -A- must align when inserting.



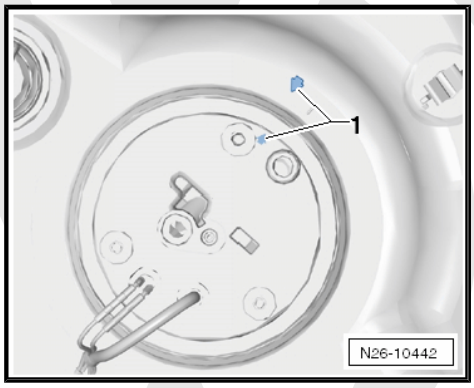
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– Carefully grasp in cup of delivery module and engage it by turning it clockwise. The marks -B- must align when engaged correctly.



– Moisten sealing pin of cover with water and press it carefully into seal. The marks -1- must align.

– Fit locking ring and tighten it hand-tight.

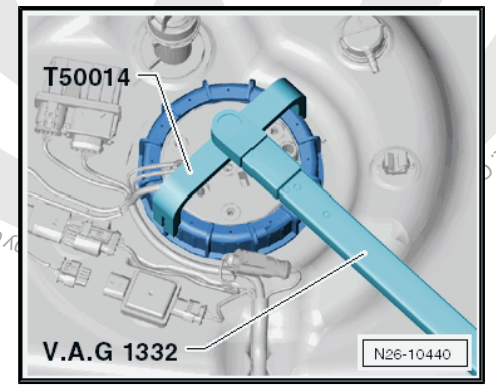


Caution

Ensure locking ring is not cross threaded on threads of tank for reducing agent. If the locking ring does not sit properly, the consequence will be leaks and considerable corrosion damage.

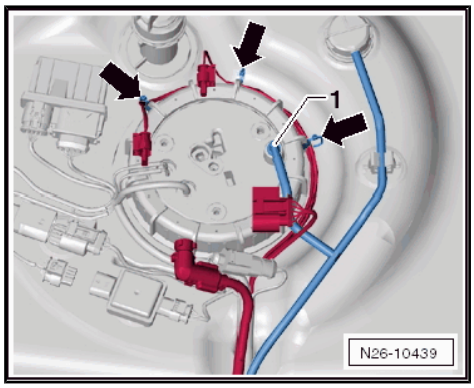
– Fit special wrench - T50014- onto locking ring as shown and tighten it. Torque setting ⇒ Item 7 (page 334) .

– Wash off excessive reduction agent using water.



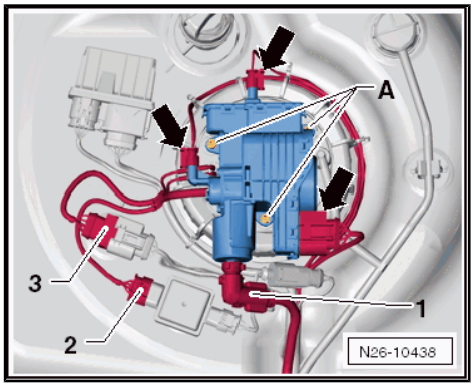
– Secure cable ties -arrows- on locking ring and reconnect breather line -1-.

– Fit pump for reduction agent - V437- , reconnect connectors -2- and -3-, tighten securing bolts -A-. Torque setting ⇒ Item 3 (page 334) .



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– Fit connectors -arrows- on pump for reducing agent - V437- and connect supply line -1-.
– Install upper part of insulation ⇒ Item 1 (page 328) .
– Install tank for reduction agent ⇒ page 339 .
– Check for leaks ⇒ Vehicle diagnostic tester.



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4 Exhaust gas recirculation

⇒ “4.1 Assembly overview - exhaust gas recirculation”, page 344

⇒ “4.2 Removing and installing exhaust gas recirculation filter”, page 347

⇒ “4.3 Removing and installing exhaust gas recirculation cooler”, page 349

⇒ “4.4 Checking exhaust gas recirculation cooler for leaks”, page 353

⇒ “4.5 Removing and installing temperature sensor for exhaust gas recirculation”, page 356

4.1 Assembly overview - exhaust gas recirculation

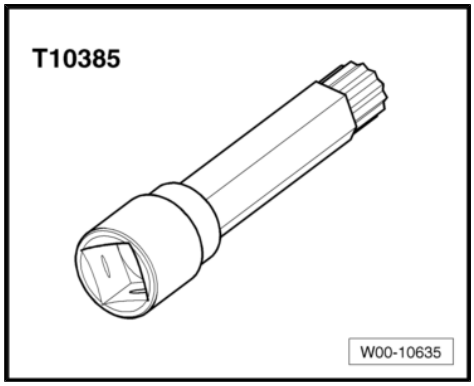
⇒ “4.1.1 Assembly overview - exhaust gas recirculation system, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA”, page 344

⇒ “4.1.2 Assembly overview - exhaust gas recirculation system, engine code CJAA”, page 346

4.1.1 Assembly overview - exhaust gas recirculation system, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

Special tools and workshop equipment required

- Bit XZN 10 - T10385-



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1 - 20 Nm

2 - Connecting pipe

- ❑ Remove and install with socket - T10385-

> **Caution**
>
> *Ensure that flexible joint of connecting pipe is not bent and thus stretched. There is a danger of cracking.*

3 - 10 Nm

4 - To exhaust gas recirculation valve - N18- .
⇒ Item 13 (page 248)

5 - Seal

- ❑ Renew

6 - Wiring guide

7 - Radiator/cooler

- ❑ For exhaust gas recirculation
- ❑ With bypass flap
- ❑ Checking exhaust gas recirculation cooler for leaks ⇒ page 353

8 - From exhaust manifold

9 - Connecting pipe

10 - Vacuum line

- ❑ Vacuum hose connection diagram ⇒ page 236

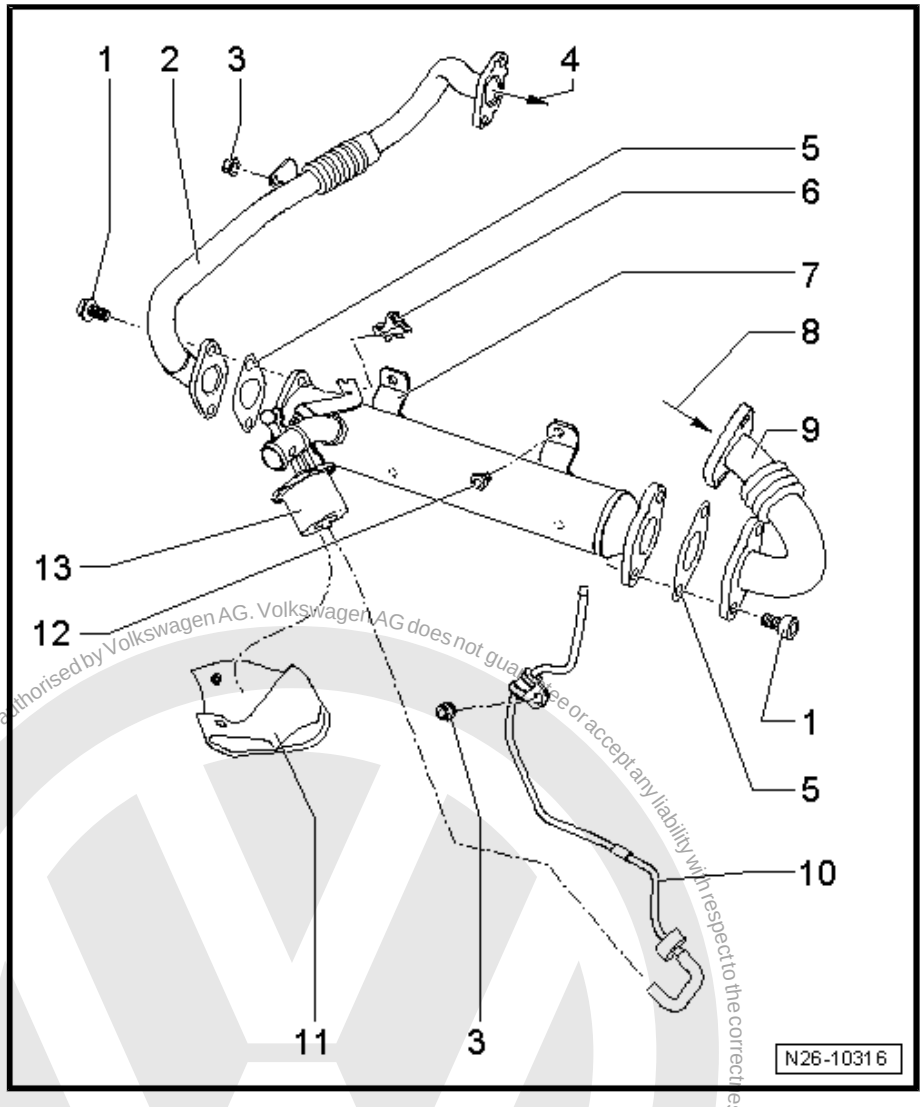
11 - Heat insulation

- ❑ Renew if damaged

12 - 10 Nm

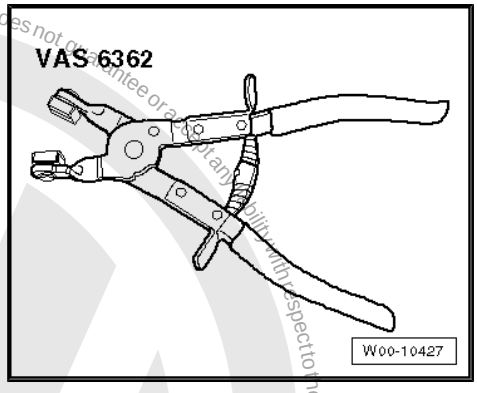
13 - Vacuum unit

- ❑ To switch bypass flap over.



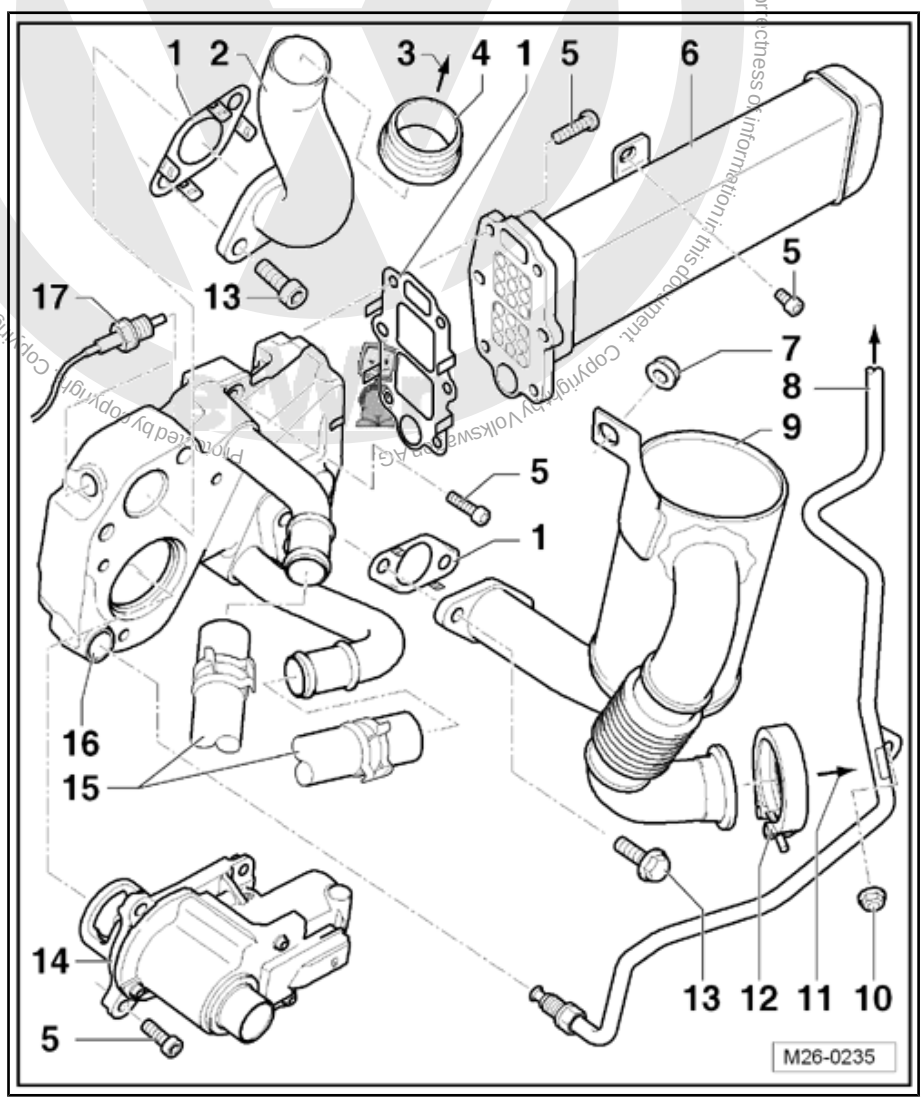
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4.1.2 Assembly overview - exhaust gas recirculation system, engine code CJAA



Note

- *Renew self-locking nuts, seals, gaskets and securing clamps.*
- *Hose connections are secured with spring-type clips.*
- *It is recommended that spring-type clips should be installed using spring-type clip pliers - VAS 6362- or hose clamp pliers - VAS 6340- .*



1 - Seal

- ❑ Renew
- ❑ Observe installation position

2 - Connecting pipe

- ❑ To remove and install, additionally loosen connections ⇒ Item 33 (page 200) on turbocharger.

3 - To connection on turbocharger

- ❑ ⇒ Item 33 (page 200)

4 - Sealing ring

- ❑ Renew if damaged

5 - 8 Nm

6 - Radiator/cooler

- ❑ For exhaust gas recirculation
- ❑ Checking exhaust gas recirculation cooler for leaks ⇒ page 353

7 - 23 Nm

- ❑ Screwed to hexagon drive stud ⇒ Item 17 (page 199) on turbocharger.

8 - Control line, 23 Nm

- ❑ Do not attempt to bend control line to a different shape.
- ❑ To exhaust gas pressure sensor 1 - G450- , location: in the area of the oil filler neck.
- ❑ To loosen at housing ⇒ Item 16 (page 347) , remove filter for exhaust gas recirculation ⇒ Item 9 (page 346) .
- ❑ Install so that component is not under tension

9 - Filter

- ❑ For exhaust gas recirculation

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10 - 23 Nm

- ❑ Secured with heat shield ⇒ Item 16 (page 199) on exhaust manifold.

11 - To particulate filter

12 - Securing clamp, 3.5 Nm

- ❑ Renew
- ❑ Note installation position ⇒ page 306

13 - 23 Nm

14 - Exhaust gas recirculation valve 2 - N213-

- ❑ Mark installation position before removing.
- ❑ Before installation, thoroughly clean fitting area on valve and housing, oil lightly as required.

15 - Coolant hose

- ❑ Check for firm seating
- ❑ Connection diagram for coolant hoses ⇒ page 166

16 - Housing

- ❑ For exhaust gas recirculation

17 - Exhaust gas recirculation temperature sensor - G98- , 20 Nm

- ❑ If seal is damaged/leaking, nip open and renew.
- ❑ Always adhere to specified torques.
- ❑ Removing and installing exhaust gas recirculation temperature sensor - G98- ⇒ page 356 .

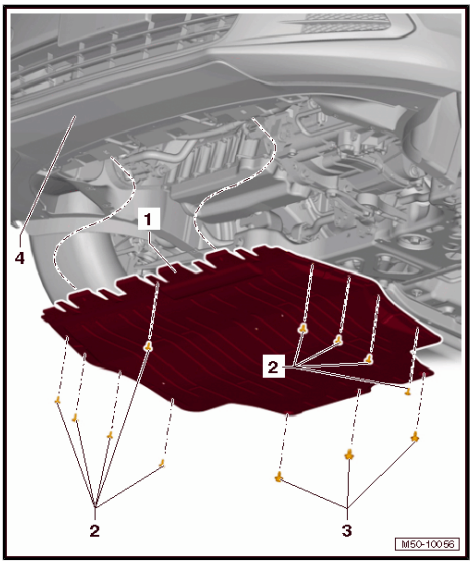
4.2 Removing and installing exhaust gas recirculation filter

Note

Procedure describes removal of previous exhaust gas recirculation filter and replacing it with new one. The new one does not need to be attached to the turbocharger.

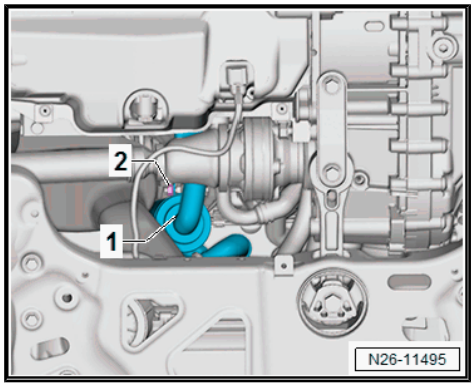
– Unscrew bolts -2- and -3-.

– Pull noise insulation -1- backwards out of front bumper cover -4-.

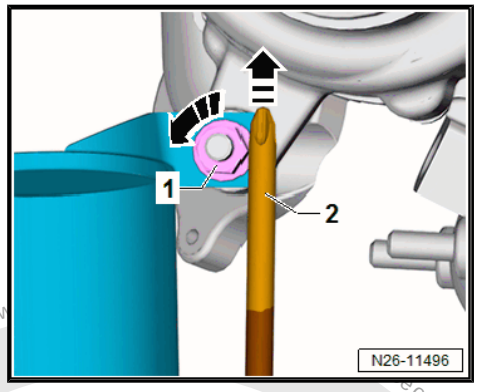


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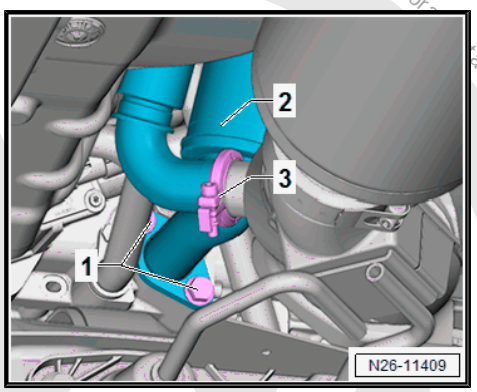
– Remove nut -2- from exhaust gas recirculation filter -1- from below using 13 mm ratchet box wrench.
– Wrap tape around the tip of a long screwdriver.



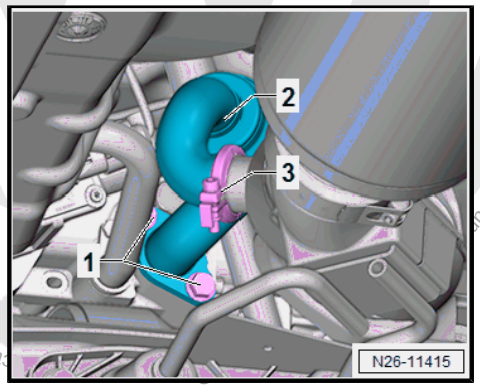
– Apply screwdriver -2- on side of nut -1- and unscrew nut while simultaneously pressing up on nut.
– Open clamp -3- and remove it.



– Unscrew bolts -1- and remove exhaust gas recirculation filter -2-.



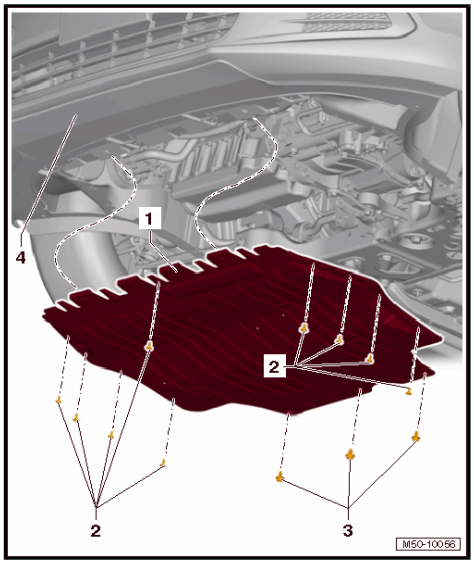
– Set exhaust gas recirculation filter with new seals in place, screw in bolts -1- and tighten to 9 Nm.
– Position clamp -3- and tighten to 3.5 Nm.



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– Push noise insulation -1- forward into front bumper cover -4-.
– Screw in bolts -2- as well as new bolts -3- and tighten as follows:

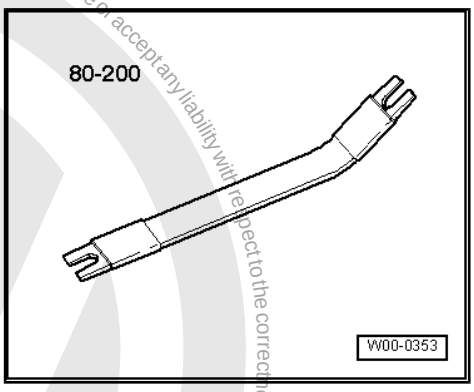
♦ Bolt -2-: 2 Nm
♦ Bolt -3-: 6 Nm (renew)



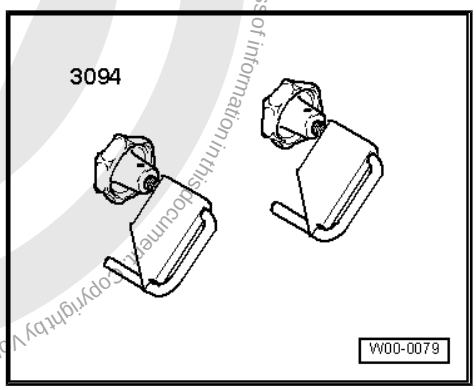
4.3 Removing and installing exhaust gas recirculation cooler

Special tools and workshop equipment required

♦ Removal lever - 80 - 200-

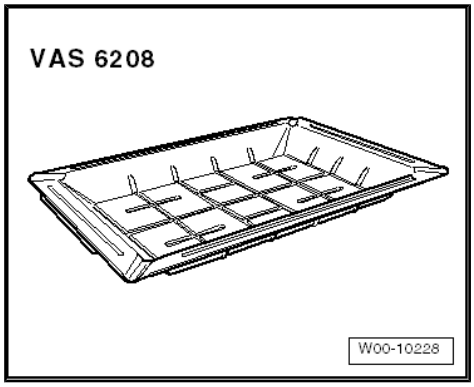


♦ Hose clamps to 25 mm - 3094-

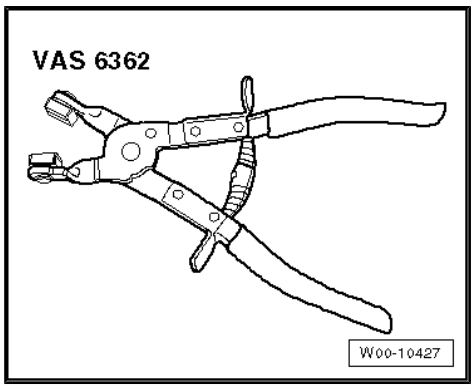


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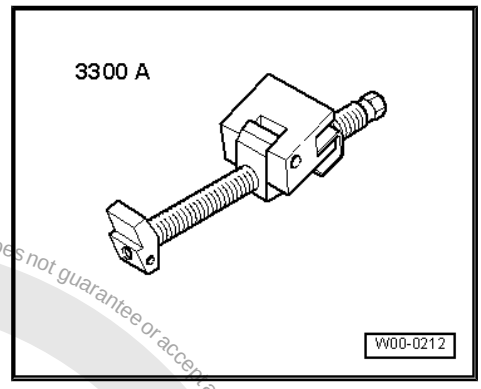
- Drip tray for workshop hoist - VAS 6208-



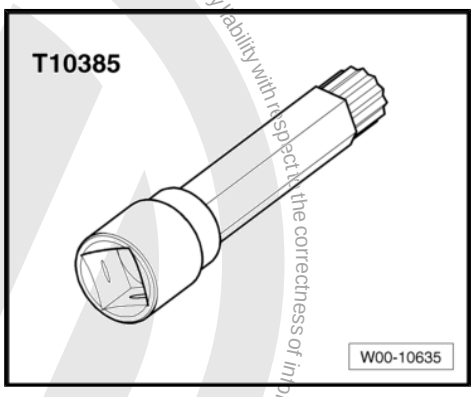
- Spring-type clip pliers - VAS 6362-



- Engine support - 3300 A-



- Bit XZN 10 - T10385-



If the exhaust gas recirculation cooler is to be removed or renewed

– First test pump 2 for coolant circulation - V178- in “function/component selection” on ⇒ Vehicle diagnostic tester.

If coolant circulation pump 2 - V178- is not OK, this may be the cause of the faulty exhaust gas recirculation cooler.

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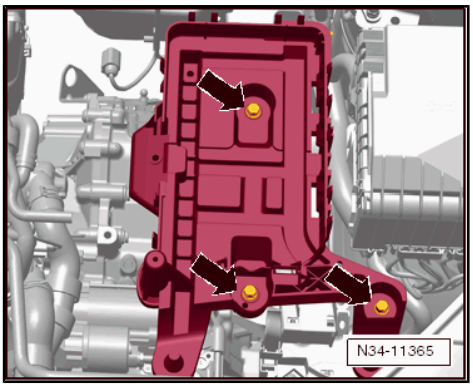
Removing

– Remove air filter housing ⇒ page 243 .

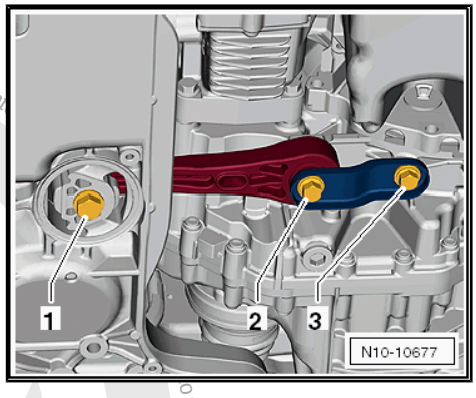
– Remove battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

– Unscrew bolts -arrows- and remove battery mounting bracket -1-.

– Disconnect particulate filter and secure to bulkhead by suitable means ⇒ page 310 .

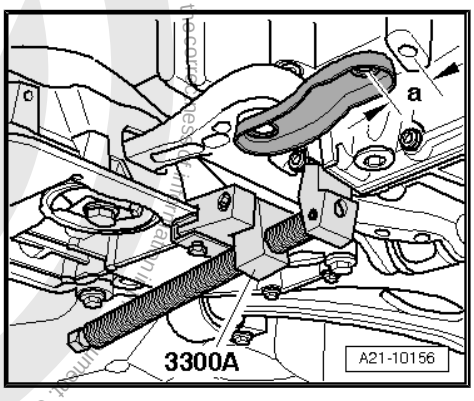


– Unscrew bolts -1…3- and remove pendulum support.



– Push engine using engine support device - 3300 A- forwards by dimension -a-.

♦ Dimension -a- = 35 mm.



– Remove nuts -2- and bolts -3-.

– Remove exhaust gas recirculation pipe.

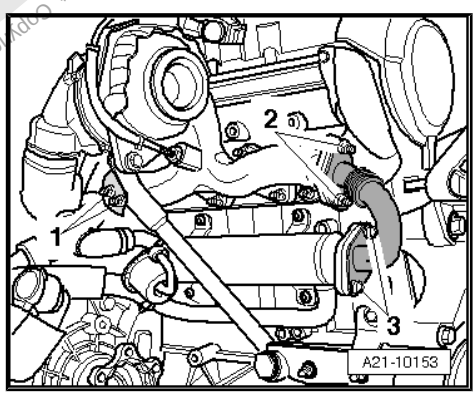
Vehicles with all-wheel drive

– Remove right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

– Pull right flange shaft from bevel box ⇒ Rep. gr. 39 ; Front final drive, Assembly overview - front final drive .

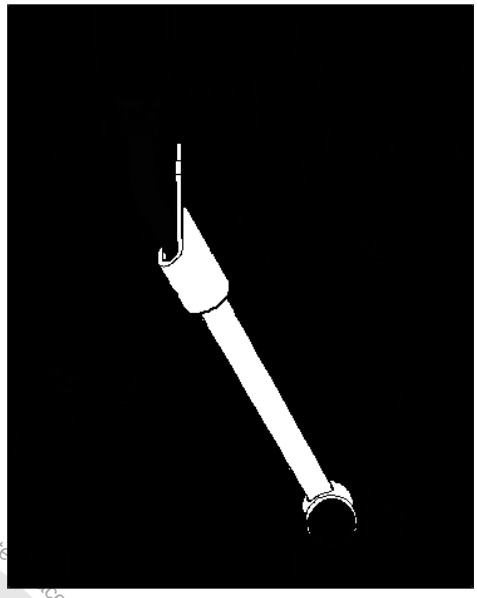
Continued for all vehicles

– Place drip tray - VAS 6208- beneath engine.

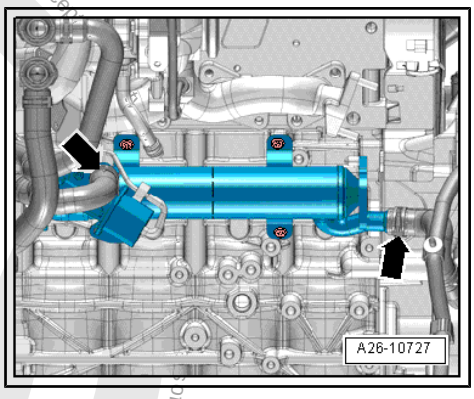


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– Remove bolts -1, 2- and banjo bolt -3-.
– Remove turbocharger support with oil return pipe.



– Clamp off coolant hoses with hose clamps -3094- and remove from exhaust gas recirculation cooler, release hose clips -arrows- for this.
– Remove heat shield gaiter from vacuum control element.

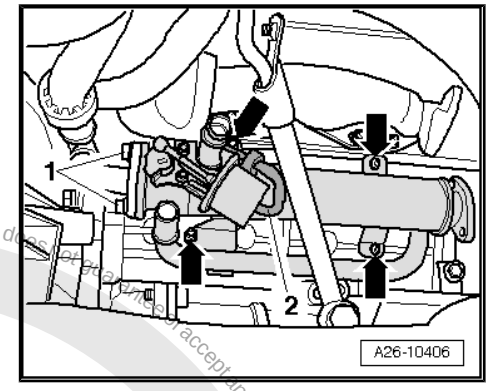


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– Remove bolts -1- for exhaust gas recirculation pipe using bit XZN 10 - T10385- .

– Remove vacuum hose -2- from vacuum unit and move lines clear.

– Unscrew bolts -arrows- and remove exhaust gas recirculation cooler.



Installing

Install in reverse order of removal, observing the following.

- Torque setting ⇒ page 344 .

Note

- *Renew gaskets, seals and self-locking nuts.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic Parts Catalogue (ETKA) .*
- *Reinstall heat insulation sleeve in original position when installing.*

– Install turbocharger support.

– Install battery mounting and battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery .

– Install air filter housing ⇒ page 243 .

– Install particulate filter ⇒ page 310 .

– Check coolant level.

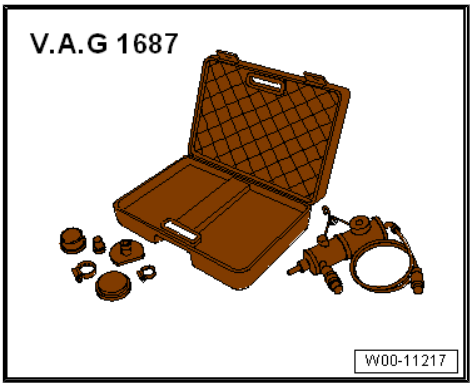
4.4 Checking exhaust gas recirculation cooler for leaks

Note

A pressure of 0.8 bar is applied to the exhaust side of the exhaust gas recirculation cooler. While so, the pressure in the cooling system is measured.

Special tools and workshop equipment required

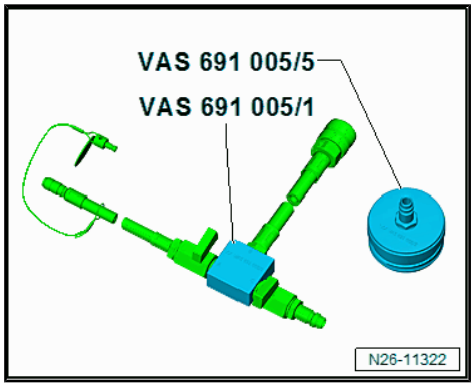
- Charge air system tester - V.A.G 1687-



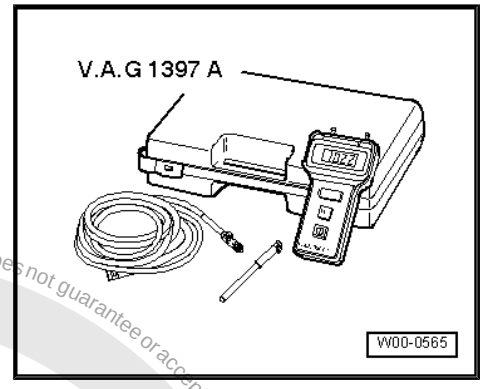
- Adapter - V.A.G 1687/11-
- Adapter - V.A.G 1687/15- for exhaust pipes of 60 mm and 65 mm in diameter

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- Adapter - V.A.G 1687/16- for exhaust pipes of 55 mm in diameter
- Y-branch - VAS 691 005/1-



- Test adapter - VAS 691 005/5-
- Turbocharger tester - V.A.G 1397A-



Test specification:

- Coolant temperature must be at least 40 °C.

Connecting turbocharger tester - V.A.G 1397A- :

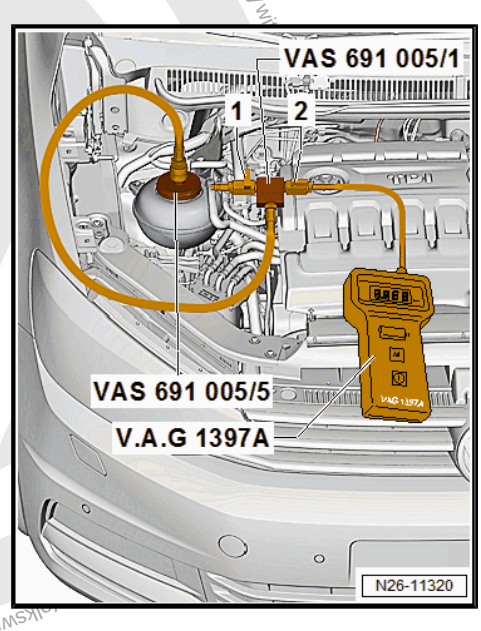
– Screw adapter - VAS 691 005/5- onto coolant expansion tank.

– Fit Y-branch - VAS 691 005/1- onto adapter - VAS 691 005/5- .

– Close valve -1- for connection »C«, and open valve -2- for connection »A«.

– Connect hose from connection »A« of Y-branch to connection »II« of turbocharger tester - V.A.G 1397A- .

– Set turbocharger tester - V.A.G 1397A- to switch position »II« (gauge pressure measurement), and switch it on. The setting »II« must be visible.

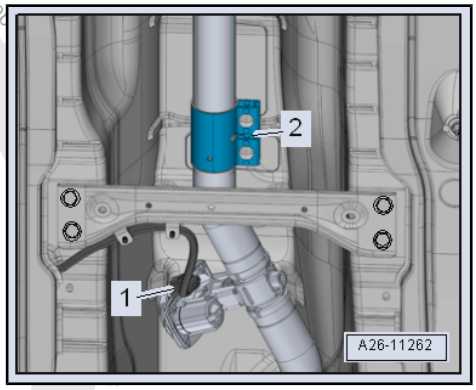


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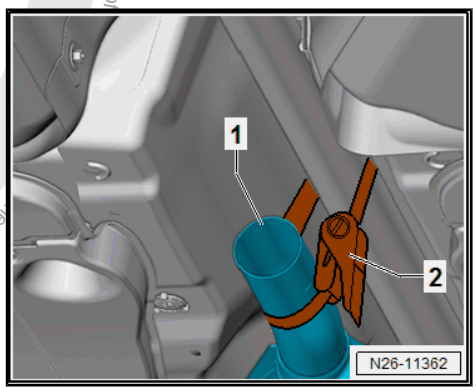
Connecting charge air system tester - V.A.G 1687- :

– If fitted, unclip wire to exhaust flap control unit -1-.

– Loosen clamp -2- on exhaust pipe, and push it towards rear.



– On vehicles without a tunnel cross-piece, use a tensioning strap -2- to tie up exhaust pipe -1-.

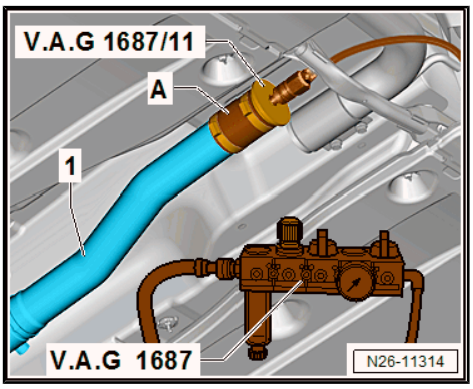


– Connect adapter - V.A.G 1687/11- with hose -A- to exhaust pipe (engine side). Secure hose with hose clips.

Use hose -A- for exhaust pipes of 55 mm in diameter = hose - V.A.G 1687/16- .

Use hose -A- for exhaust pipes of 60 mm and 65 mm in diameter = hose - V.A.G 1687/15- .

– Connect charge air system tester - V.A.G 1687- to adapter - V.A.G 1687/11- .

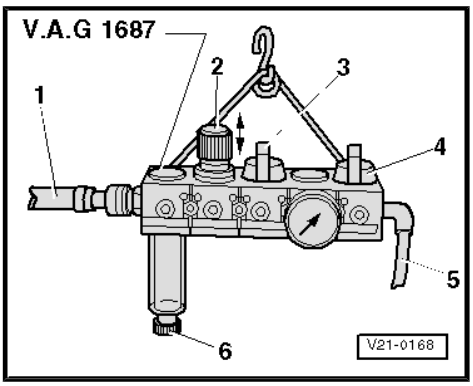


Prepare charge air system tester - V.A.G 1687- as follows:

– Completely unscrew pressure regulating valve -2-, close valves -3- and -4-.

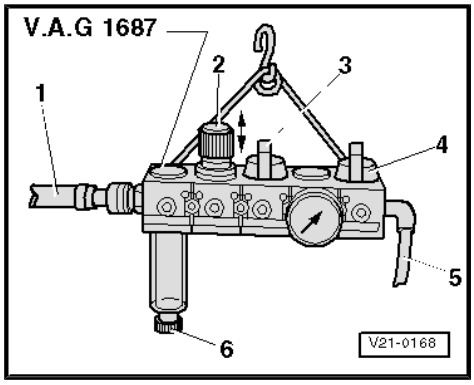
• To turn pressure regulating valve -2-, rotary knob must be pulled upwards.

– Apply compressed air -1- to charge air system tester - V.A.G 1687- .



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– Open valve -3-.
– Adjust pressure to 0.8 bar with pressure control valve -2-.
– Open valve -4- and wait until test circuit is full. If necessary, adjust pressure to 0.8 bar.



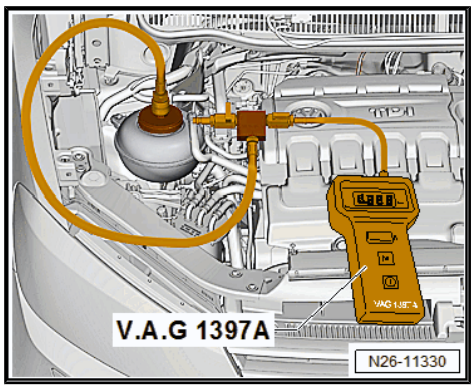
Note

A small amount of air escapes through the valves and enters the engine. Therefore a holding pressure test is not possible.

Reading turbocharger tester - V.A.G 1397A- :

- Observe turbocharger tester for approx. 5 minutes.
- The pressure indicated on the turbocharger tester must not exceed 0.025 bar.

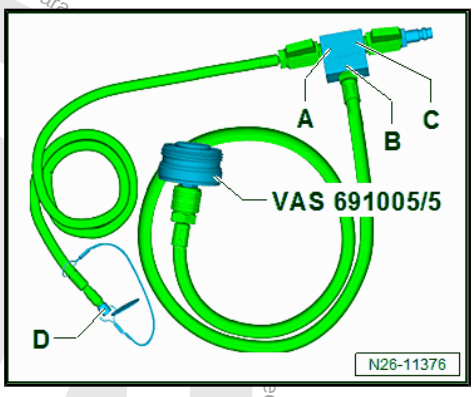
– If the pressure on the turbocharger tester rises above 0.025 bar, compressed air is leaking from the exhaust side into the cooling system. The exhaust gas recirculation cooler has a leak. Renew exhaust gas recirculation cooler.



Note

When coolant cools down, a vacuum may build up. The vacuum is indicated by a »minus« symbol on the turbocharger tester . Values preceded by a »minus« symbol do not indicate a leak! If you are uncertain, equalise the pressure in the cooling system and repeat the test.

Cleaning Y-branch - VAS 691 005/1- :



Note

After the leakage test has been completed, the Y-branch - VAS 691 005/1- must be cleaned and any moisture which may have entered must be removed.

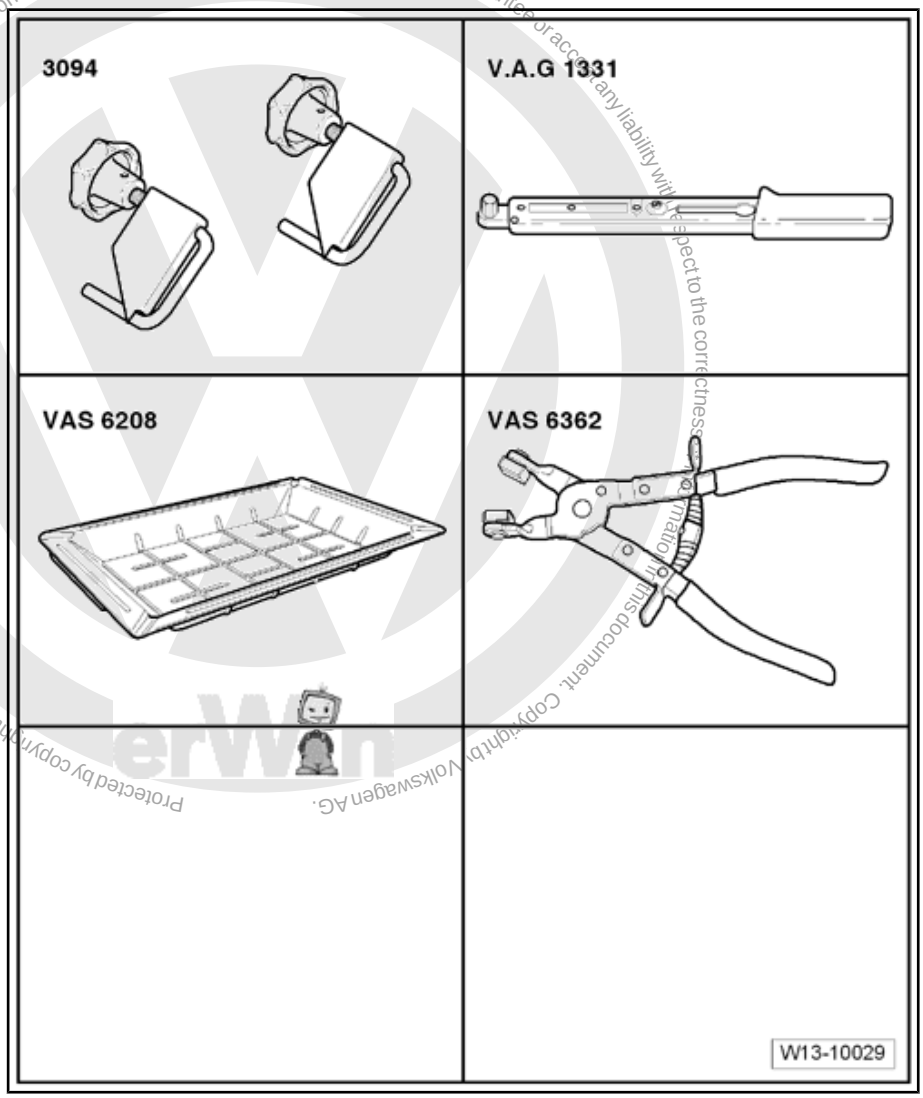
– Insert cleaning nozzle -D- into hose on connection -A- of Y junction .
– Fit adapter - VAS 691 005/5- onto hose of connection -B-.
– Fit compressed air hose to connection -C-.
– Open shut-off taps, and blow out hose for approx. 15 seconds.

4.5 Removing and installing temperature sensor for exhaust gas recirculation

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Special tools and workshop equipment required

- Hose clamps up to 25 mm - 3094-
- Torque wrench - V.A.G 1331-
- Drip tray - VAS 6208-
- Pliers for spring-type clips - VAS 6362-
- 14 mm socket - T10401 - (not shown)



Conditions

- Ignition switched off
- Engine must be cold.

Procedure

- View of vehicle from below:

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

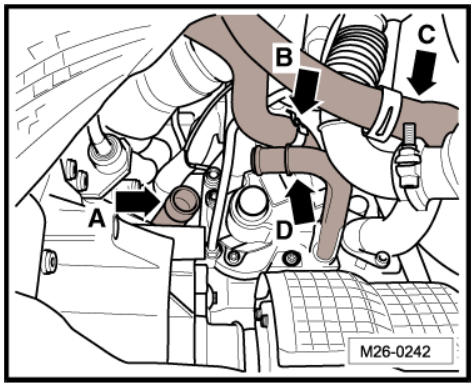
– Drain coolant ⇒ page 173 .

Note

To access exhaust gas recirculation temperature sensor - G98- , pull off coolant hoses as shown and move them aside.

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– Separate coolant hoses at both unions -arrow A- and -arrow D-.
– Move both coolant hoses to side -arrow B- and -arrow C-.



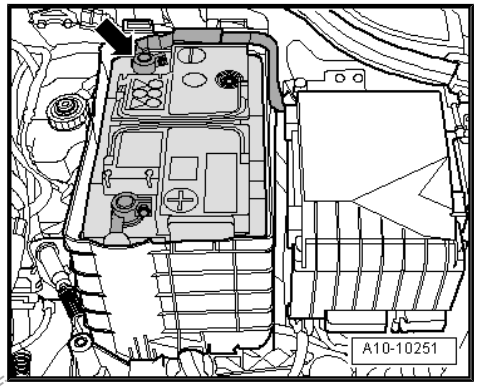
• View of engine compartment from above:
– Remove engine cover panel ⇒ page 39 .

Caution

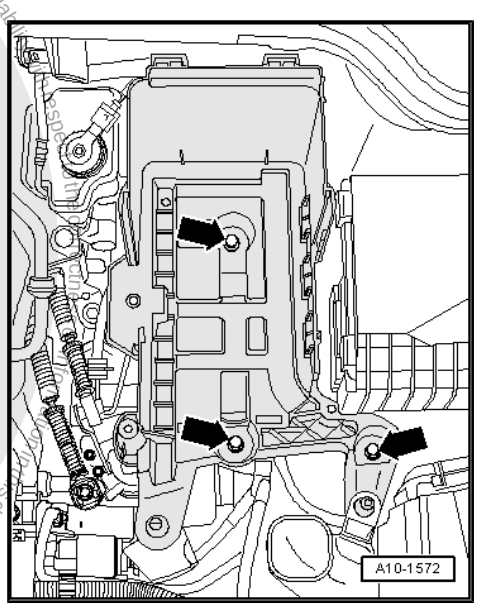
To prevent damage to the electronic components when disconnecting the battery :

- *Comply with precautions when disconnecting battery .*

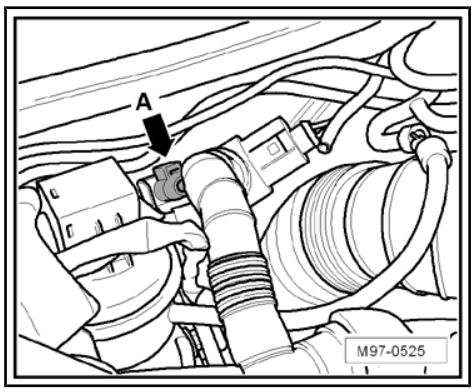
– With ignition switched off, disconnect battery earth cable -arrow-.
– Remove air filter housing ⇒ page 241 .



– Remove battery and battery tray -arrows-.



– Pull connector off exhaust gas recirculation temperature sensor - G98- -arrow A- and guide line out.

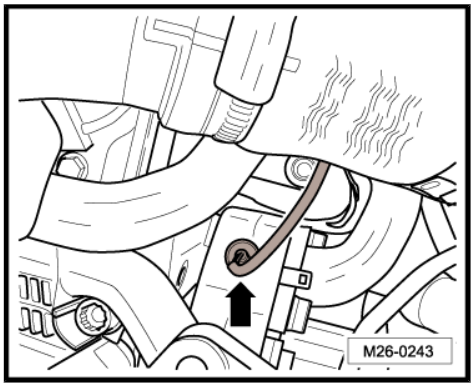


Note

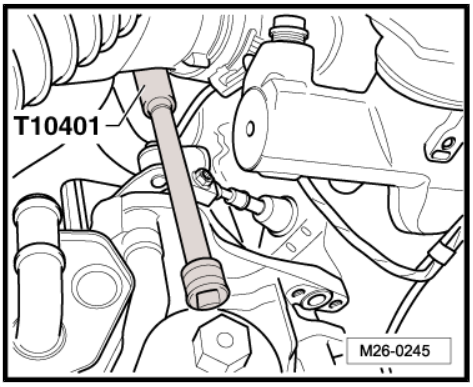
Note installation position of heat shield and routing of wiring.

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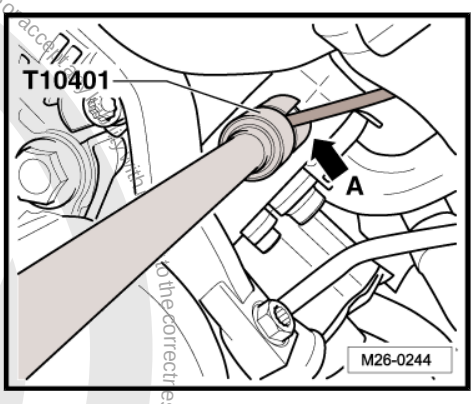
Figure shows exhaust gas recirculation temperature sensor - G98- from engine compartment, below brake master cylinder from gearbox side -arrow-.



– Carefully guide 14 mm socket - T10401 - with ratchet extension onto exhaust gas recirculation temperature sensor - G98- .



– Ensure that cable of exhaust gas recirculation temperature sensor - G98- is routed in groove of 14 mm socket - T10401 - -arrow A-.



– Loosen exhaust gas recirculation temperature sensor - G98- and remove it.

Install in reverse order of removal. During this step, observe the following:

Note

- *Specified torque for exhaust gas recirculation temperature sensor - G98- , 20 Nm.*
- *If seal is damaged or leaking, nip open and renew.*
- *Always adhere to specified torques.*

Caution

Heat shield mats must be reinstalled in original positions.

Check all connectors for secure seating.

Renew self-locking nuts, seals, gaskets and securing clamps.

Hose connections are secured with spring-type clips.

It is recommended that spring-type clips should be installed using spring-type clip pliers - VAS 6362- or hose clamp pliers - VAS 6340- .

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28 – Glow plug system

1 Glow plug system

⇒ “1.1 Removing and installing automatic glow period control unit J179 ”, page 360

⇒ “1.2 Removing and installing glow plug”, page 361

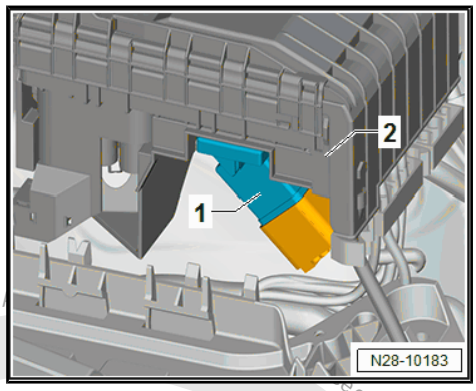
⇒ “1.3 Removing and installing Hall sender”, page 368

⇒ “1.4 Removing and installing engine speed sender”, page 372

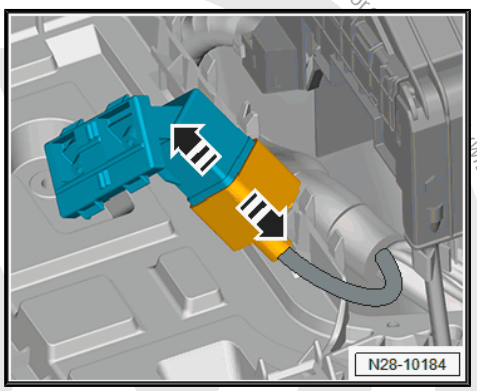
1.1 Removing and installing automatic glow period control unit - J179-

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

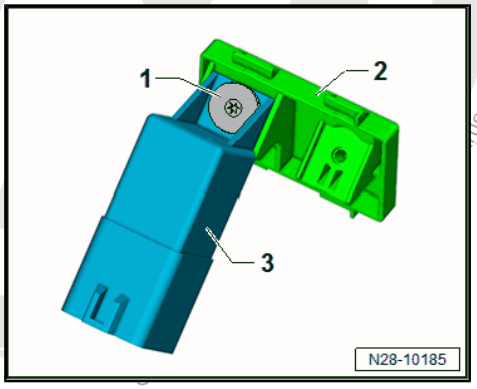
– Pull out automatic glow period control unit - J179- -1- from bottom part of E-box -2- in direction of engine compartment.



– Release and separate connector, remove glow period control unit with bracket.



– Unscrew bolt -1- from bracket -2-, replace glow period control unit -3-, screw in bolt and tighten to 2 Nm.

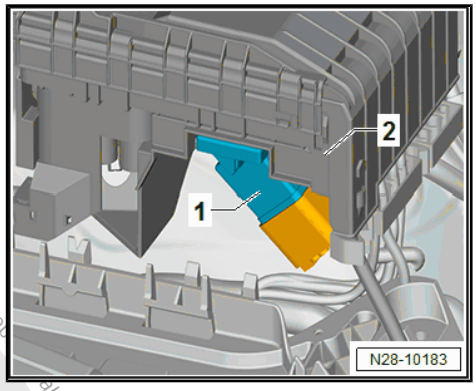


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– Attach new glow period control unit -1- to wiring harness and push into bottom part of E-box -2- until it engages.

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

– Install battery box or bag and close.



1.2 Removing and installing glow plug

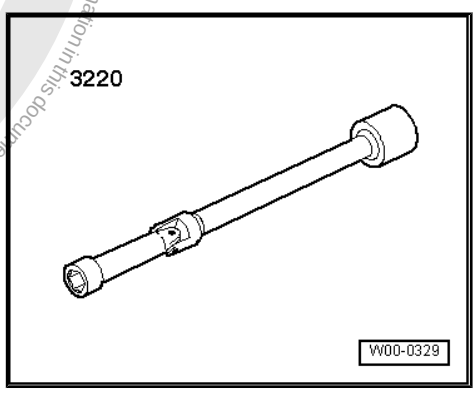
⇒ "1.2.1 Removing and installing glow plugs, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA", page 361

⇒ "1.2.2 Removing and installing glow plugs, engine code CJAA", page 363

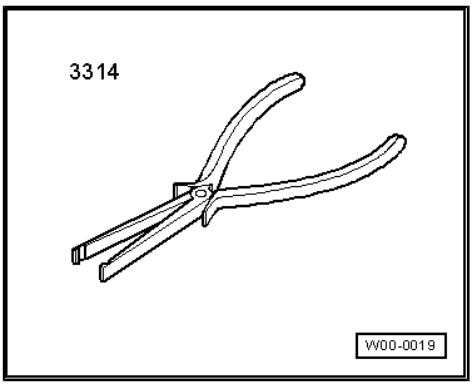
1.2.1 Removing and installing glow plugs, engine codes CBAA, CBBB, CBAB, CBBA, CBDB, CBDC, CBAC, CBDA

Special tools and workshop equipment required

♦ U/J extension and socket 10 mm - 3220-



♦ Pliers - 3314-



Removing

– Switch off ignition.

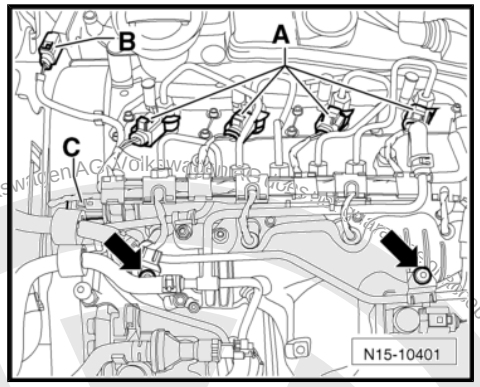
– Remove engine cover panel ⇒ page 39 .

– Remove noise insulation from injectors.

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– Pull connectors off injectors -A-, exhaust gas pressure sensor 1 - G450- -B- and fuel rail pressure sensor -C-.

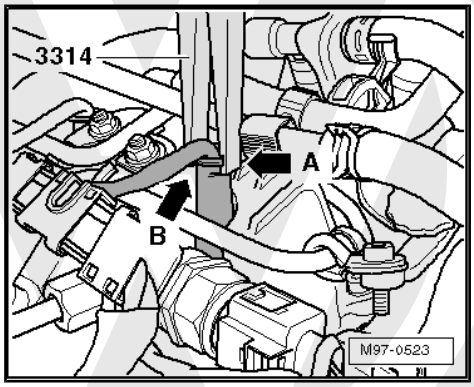
– Unscrew securing bolts of coolant line -arrows- from intake manifold and set down coolant line in front of intake manifold.



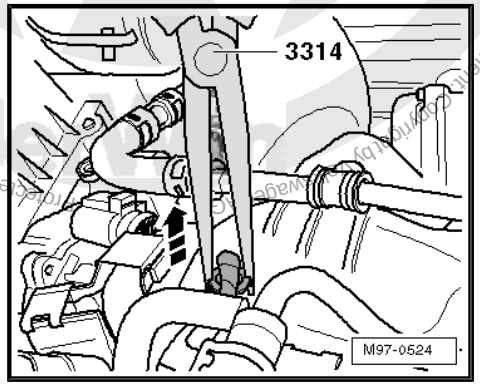
Caution

Make sure that no wiring connections are damaged when disconnecting the connectors. Otherwise the whole wiring harness will need to be renewed. Do not compress the pliers -3314- too firmly to separate the connectors, otherwise the support sleeve may be damaged.

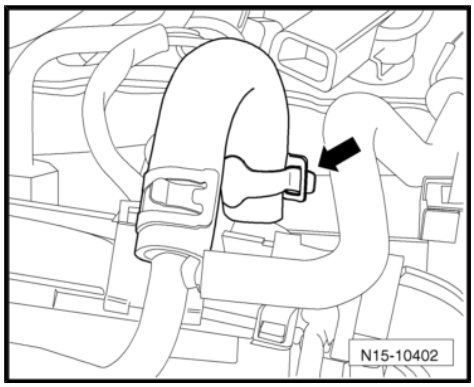
– Position pliers - 3314- with groove -arrow A- on support sleeve shoulder -arrow B- and pull plugs off glow pin plugs.



– Carefully pull connector off glow plug in direction of -arrow-.

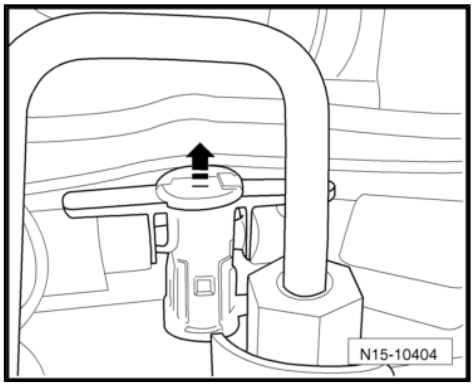


– Unscrew securing nut of fuel return line from intake manifold, open clamp -arrow- and pull line off fuel rail.



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– Pull fuel return line connections off injectors. To do this, push down connection at tabs and pull up centre piece to release.



Note

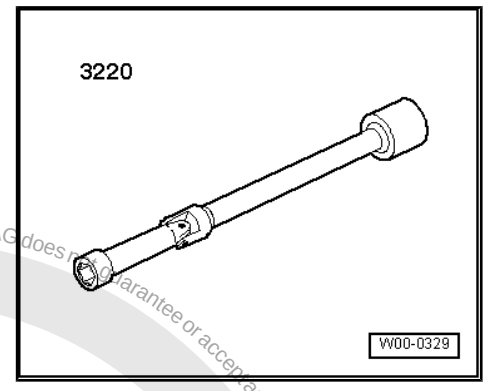
Adhere strictly to rules of cleanliness. No dirt must be allowed to get into the disconnected fuel return lines or the open connections on the injectors under any circumstances.

– Remove entire fuel return line and set it down in front of intake manifold.
– Remove wiring harness and lay to one side.
– Clean glow plug opening in cylinder head, ensuring no dirt makes its way into the cylinder.

Note

- *Cleaning procedure:*
- *Use a vacuum cleaner to remove coarse dirt.*
- *Spray brake cleaner or suitable cleaning agent into glow plug opening, let it work in briefly, and blow out with compressed air.*
- *Then clean glow plug opening using a cloth moistened with oil.*

– To loosen glow plugs use special tool U/J extension and socket 10 mm - 3220-



Installing

– To tighten glow plugs use special tool U/J extension and socket 10 mm - 3220- with a suitable torque wrench.
– Then tighten glow plugs to specified torque.
- Specified torque is 18 Nm
– Attach glow plug connectors correctly and make sure they are securely fitted.

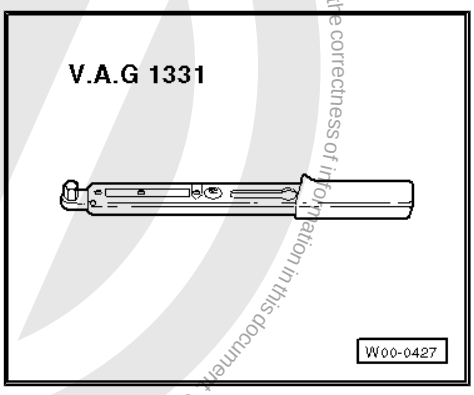
Continue installation in reverse order of removal.

– Clear engine control unit event memory.

1.2.2 Removing and installing glow plugs, engine code CJAA

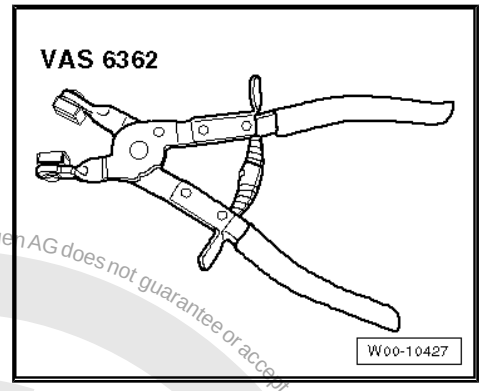
Special tools and workshop equipment required

- Torque wrench - V.A.G 1331-

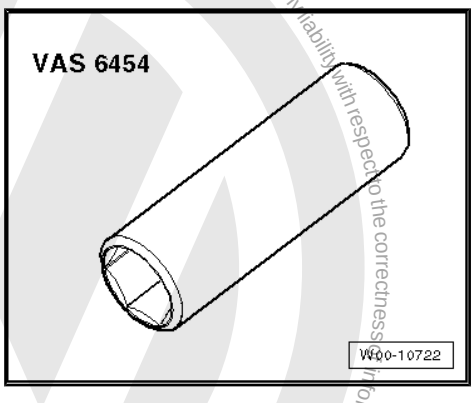


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- Engine bung set - VAS 6122- (not shown)
- Pliers for spring-type clips - VAS 6362-



- Socket 12 mm - VAS 6454-



DANGER!

- *Observe safety precautions when working on diesel direct injection fuel system ⇒ page 3 .*
- *Observe rules for cleanliness ⇒ page 6 .*

These instructions must always be complied with before and during work!

Removing

Note

- *When removing the glow pin plug it is essential to ensure that no dirt enters the fuel system and the glow plug channel.*
- *Seal unions of fuel system with bungs from engine bung set - VAS 6122- .*

Conditions

- Ignition switched off
- Engine must be cold.

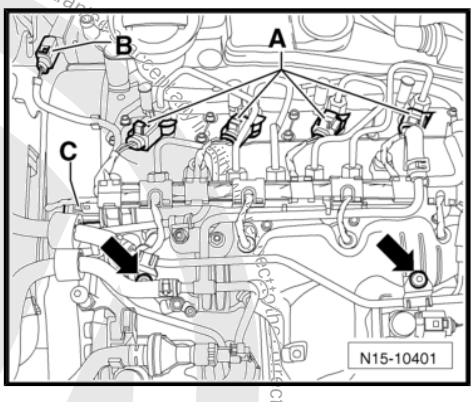
– Remove engine cover panel ⇒ page 39 .

– Remove protective strip (if fitted) ⇒ Item 1 (page 221) .

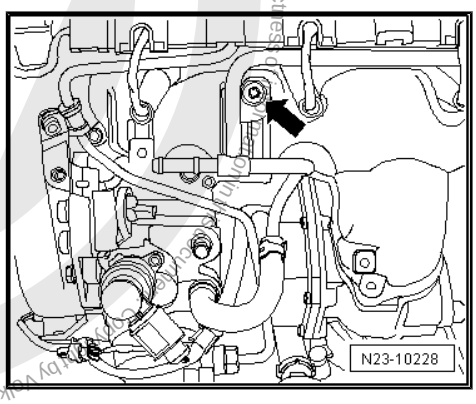
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– Pull connectors off injectors -A-, exhaust gas pressure sensor 1 - G450- -B- and fuel pressure sender - G247- -C-.

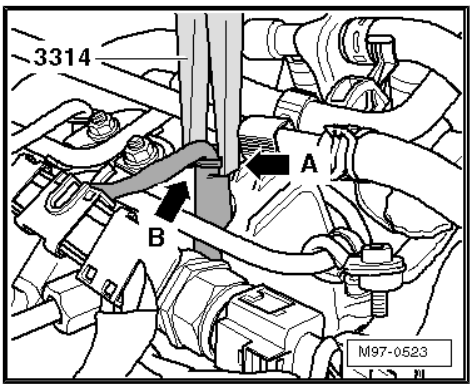
– Unscrew securing bolts -arrows- of coolant line from intake manifold and set coolant line down in front of intake manifold.



– Unscrew fuel return line securing bolt -arrow- from intake manifold.



– Position groove -arrow A- in pliers - 3314- over upper edge of connector -arrow B- and press lightly together.



Caution

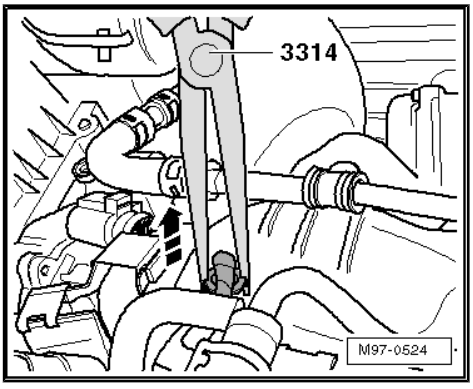
Position pliers so that it does not contact the cable or cause damage.

Only use tool shown.

Other, non-suitable tools may damage the connector.

If the connector is damaged when pulling it off, renew the complete wiring harness including connector (an individual connector cannot be renewed).

– Using pliers - 3314- , carefully pull connector off glow plug in -direction of arrow-.



Caution

Do not jerk connector off.

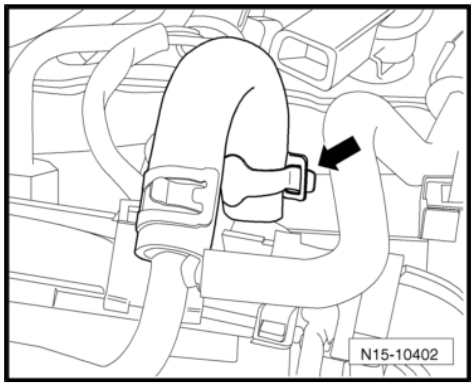
The connector cable must not be damaged under any circumstances.

Do not press pliers forcefully together, otherwise connector will be damaged.

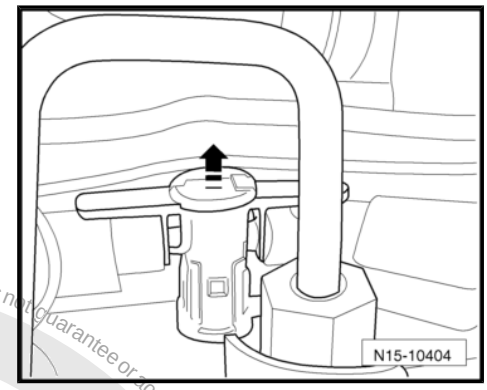
Connector is surrounded by a protective sleeve. If damaged, protective sleeve can be renewed.

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– Loosen spring-type clip -arrow- using spring-type clip pliers - VAS 6362- and pull line off fuel rail.
– Clean return line union on injectors to be removed (e.g. with commercial cleaning solution) before removing.
– Dry return line unions.
– Cover return line union with a cloth.



– Pull fuel return line connections off injectors. Pull upwards to release -arrow-.

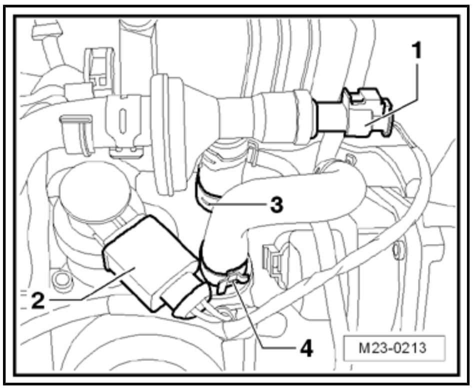


Note

Adhere strictly to rules of cleanliness. No dirt must be allowed to get into the disconnected fuel return lines or the open connections on the injectors.

– Loosen spring-type clip using spring-type clip pliers - VAS 6362- and pull off fuel return line ⇒ Item 4 (page 221) .

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– Loosen spring-type clip -4- using spring-type clip pliers - VAS 6362- and pull fuel return line off high-pressure fuel pump.

– Seal lines so that fuel system is not contaminated by dirt.

– Remove fuel return lines and set them down in front of intake manifold.

– Remove wiring from glow pin plugs and move it aside.

Caution

♦ *Ensure when cleaning the channel for the glow pin plug that no dirt and no cleanser gets onto the contacts of the connector for the glow pin plug!*

♦ *Connector may not be cleaned using a cleaner or blown out using compressed air!*

– Clean glow plug channel in cylinder head; make sure no dirt gets into cylinder.

Note

♦ *Use a vacuum cleaner to remove coarse dirt.*

♦ *Clean glow plugs using commercially available cleaning solution.*

♦ *Dry off glow pin plug using compressed air.*

♦ *Then clean glow pin plug channel using a cloth moistened with oil.*

– Remove glow pin plug using 12 mm socket insert - VAS 6454- .

Installing

Install in reverse order of removal. During this step, observe the following:

• When installing the glow pin plug it is essential to ensure that no dirt enters the fuel system and the glow plug channel.

• Only remove sealing plugs immediately prior to installation of fuel return line.

• Ensure that line connections are tight.

– Tighten glow pin plug using 12 mm socket insert - VAS 6454- .

• Specified torque: 12 Nm.

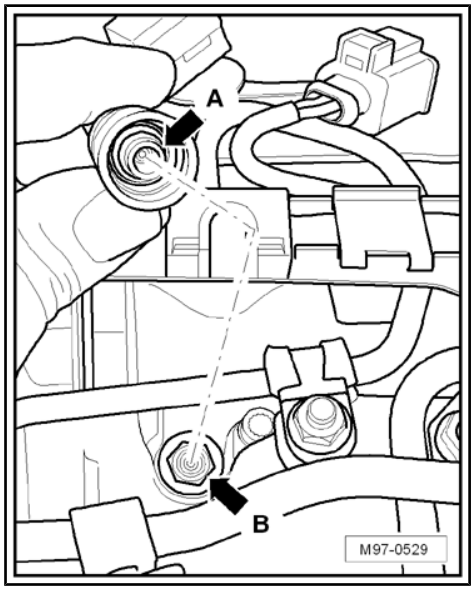
– Secure to fuel return line to intake manifold.

• Specified torque: 8 Nm.

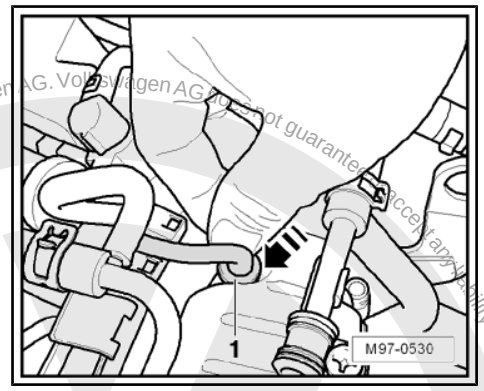
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– Guide centre contact -arrow A- onto connector on glow pin plug -arrow B-, by hand.



– Push glow pin connector -1- on by hand until it audibly engages.
– Install fuel return lines.
– Read engine control unit event memory and clear all event entries ⇒ Vehicle diagnostic tester.

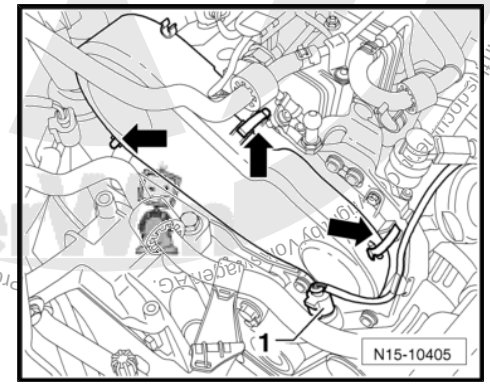


1.3 Removing and installing Hall sender

– Remove engine cover panel ⇒ page 39 .
– Remove fuel filter ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel filter; Removing and installing fuel filter .
– Remove supplementary fuel pump -V393- or fuel pump 2 -V277- ⇒ Fuel supply - Diesel engines; Rep. gr. 20 ; Fuel pump; Removing and installing fuel pump .
– Pull connector off radiator outlet coolant temperature sender - G83- , open clips -arrows- and remove toothed belt guard.

Note

Only the Tiguan is equipped with 2 different types of rear toothed belt guard having different apertures for the Hall sender G40. With the old version -I-, which has since been discontinued, the G40 and its connector cannot be fed through the toothed belt guard. This toothed belt guard must be removed to renew the Hall sender G40.



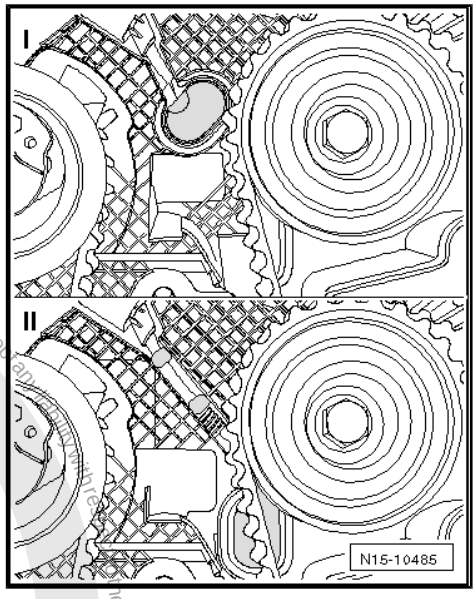
– Determine which type of rear toothed belt guard is installed.

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Differences on the rear toothed belt guard

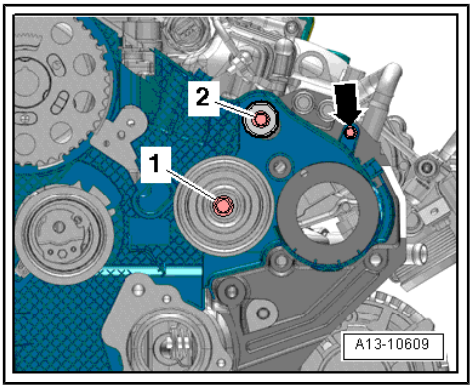
-I-: type available up to 12.07 ⇒ page 369

-II-: type available from 01.08 ⇒ page 370

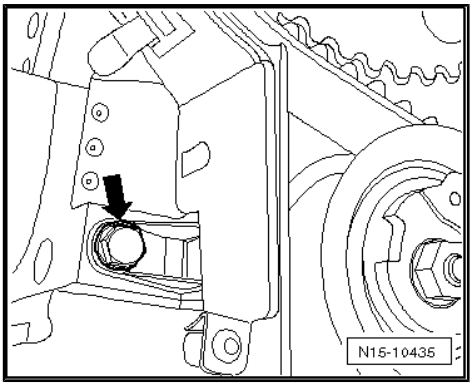


1.3.1 Vehicles to 12.07

– Remove engine bracket ⇒ page 51 .
– Remove toothed belt ⇒ page 106 .
– Remove tensioning roller.
– Unscrew all idler pulleys from engine ⇒ page 104 .
– Remove camshaft pulley together with hub from camshaft ⇒ page 118 .
– Remove coolant pump ⇒ page 181 .
– Remove upper securing bolt of high-pressure pump.
– Remove securing bolt -arrow- of toothed belt guard above high-pressure pump.

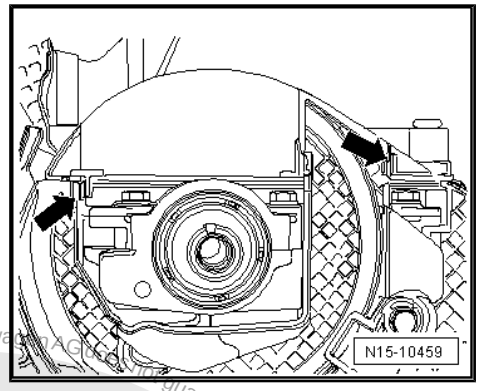


– Remove rear securing bolt -arrow- of toothed belt guard.

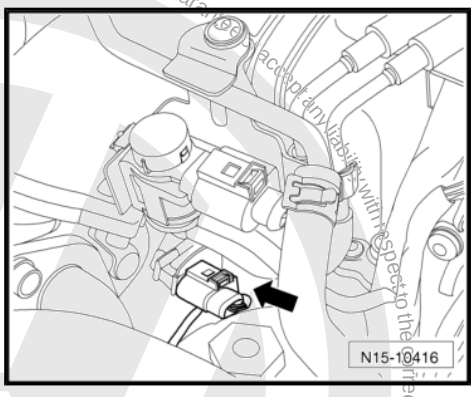


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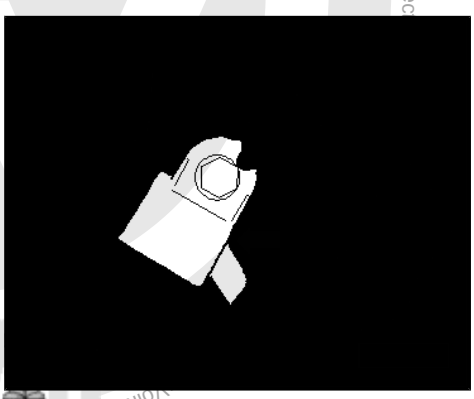
– Carefully unclip toothed belt guard from cylinder head cover -arrows-.



– Separate connector for Hall sender - G40- -arrow-.
– Detach plug from its retainer.



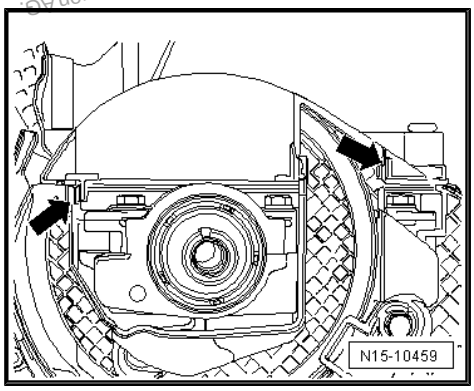
– Unscrew Hall sender - G40- -arrow-.
– Slightly pull toothed belt guard upwards and tilt it away from engine.
– Remove Hall sender - G40-.



Installing

Install in reverse order of removal. During this step, observe the following:

– Fit toothed belt and adjust valve timing ⇒ page 106 .
– Ensure that cylinder head cover is correctly clipped to toothed belt guard.
– To do this, press toothed belt guard (using a screwdriver if necessary) against cylinder head cover in area of clips -arrows- until clips audibly engage in each other.
– Check that there is sufficient clearance between hub and toothed belt guard.



1.3.2 Vehicles from 01.08

– Remove front right wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66 .
– Remove poly V-belt ⇒ page 40 .
– Remove vibration damper ⇒ Item 29 (page 105) .

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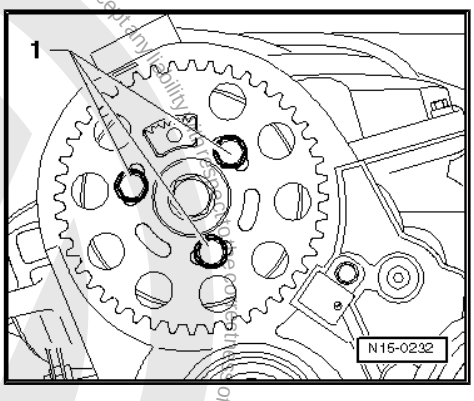
– Position crankshaft at TDC and lock crankshaft toothed belt pulley with crankshaft stop - T10050- . To do this, push crankshaft stop into teeth of belt pulley from face side. The toothed segment of the camshaft must be at the »12 o'clock position«.



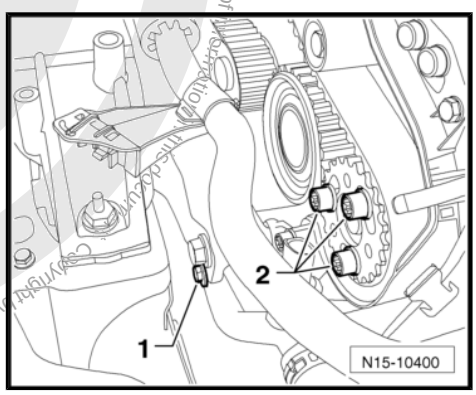
Note

The markings on the crankshaft pulley -2- and the crankshaft stop - T10050- -1- must align. At the same time, the pin of the crankshaft stop - T10050- must engage in the drilling in the sealing flange.

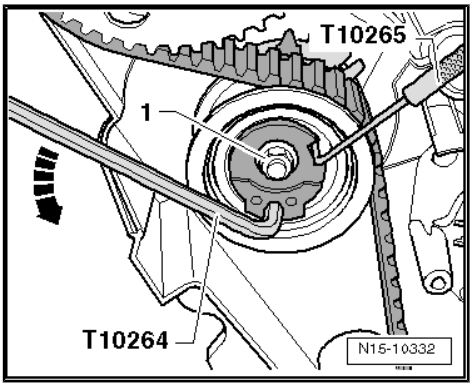
– Loosen securing bolts -1- for camshaft toothed belt pulley.



– Loosen securing bolt of coolant pipe -1- and then securing bolts of toothed belt pulley for high-pressure pump -2-.
– Loosen tensioning roller securing nut -1-.

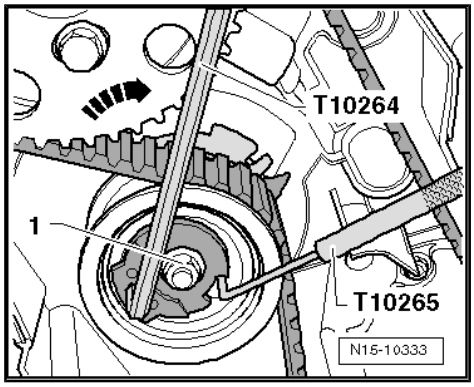


– Turn eccentric of tensioning roller anti-clockwise -arrow- using socket - T10264- , until the tensioning roller can be locked with locking tool - T10265- .

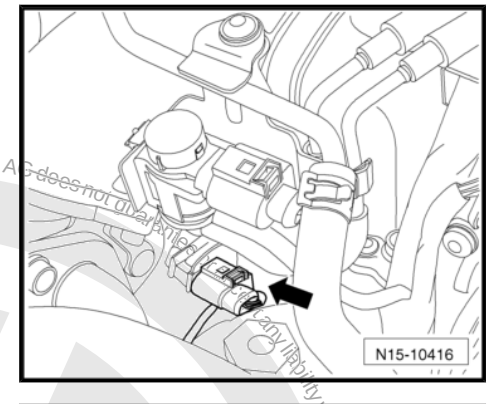


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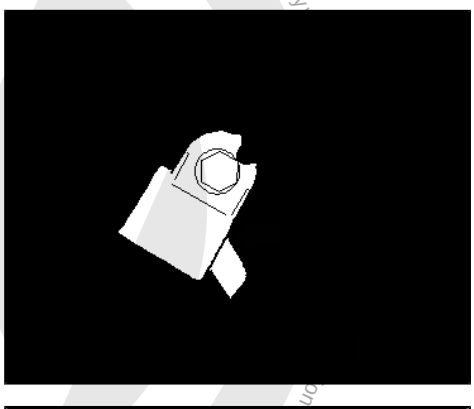
– Now turn tensioning roller eccentric clockwise -arrow- onto stop and tighten securing nut -1- hand-tight.
– Remove toothed belt from idler pulley and high-pressure pump.



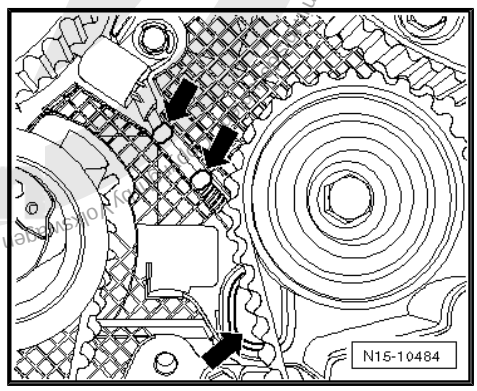
– Separate connector for Hall sender - G40- -arrow-.
– Detach plug from its retainer.



– Unscrew Hall sender - G40- -arrow-.



– Remove webs and repair aperture cover -arrows- with a screwdriver.
– Remove Hall sender - G40- from cylinder head and guide its plug through repair aperture in toothed belt guard.



Installing

Install in reverse order of removal. During this step, observe the following:

♦ Seal repair aperture in toothed belt guard with rubber plugs as specified in ⇒ Electronic parts catalogue (ETKA) .
– Fit toothed belt and adjust valve timing ⇒ page 106 .

1.4 Removing and installing engine speed sender

Removing

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

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– Clamp off coolant hoses from oil cooler with hose clips, up to 25 mm in diameter - 3094- .

– Loosen spring-type clips -arrows- using spring-type clip pliers - VAS 6362- .

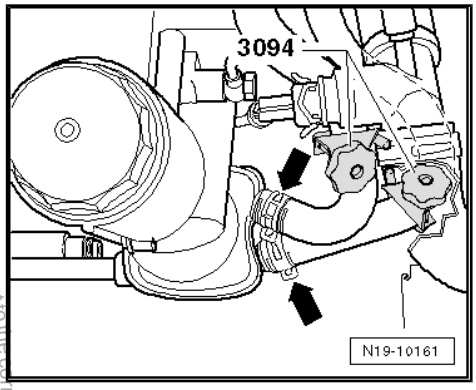


Note

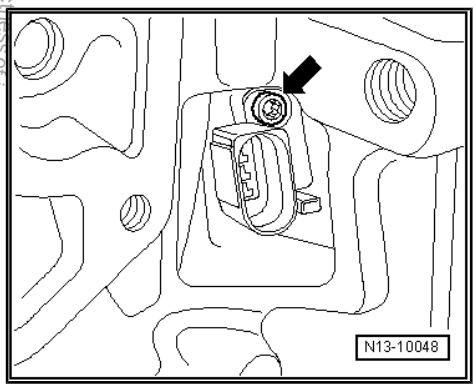
Collect escaping coolant with drip tray - VAS 6208- .

– Pull coolant hoses off oil cooler.

– Remove oil filter bracket ⇒ page 142 .



– Loosen securing bolt -arrow- (socket AF 4 mm - T10370-) and pull out speed sender.



Installing

Install in reverse order of removal, observing the following:

- Specified torque for engine speed sender - G28- ⇒ Item 9 (page 68)
- Specified torques for oil filter bracket ⇒ page 142 .

– Check coolant level, replenish coolant if necessary ⇒ page 173 .

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