



Workshop Manual

Golf 2020 ➤, Golf Variant 2021 ➤,
Polo 2018 ➤, T-Cross 2019 ➤,
T-Roc 2018 ➤, T-Roc Cabriolet 2020 ➤

3-cylinder direct injection engine (1.0 l engine, 4V,
EA 211, turbocharger)

Engine ID	DLAA	DLAB	DLA C						
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Edition 09.2020



List of Workshop Manual Repair Groups

Repair Group

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

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



Contents

00 - Technical data	1
1 Safety information	1
1.1 Safety regulations for working on fuel supply	1
1.2 Safety measures when working on vehicles with a start/stop system	1
1.3 Safety precautions when using testers and measuring instruments during a road test	2
1.4 Safety precautions when working on the cooling system	2
1.5 Safety precautions when working on ignition system	2
1.6 Safety precautions when working on exhaust system	3
2 Identification	4
2.1 Engine number/engine data	4
3 Repair notes	7
3.1 Rules for cleanliness	7
3.2 General information	7
3.3 General repair instructions	8
3.4 Foreign objects in engine	8
3.5 Contact corrosion	8
3.6 Pipe/wire routing and attachment	9
3.7 Installing radiators and condensers	9
3.8 Checking vacuum system	9
10 - Removing and installing engine	10
1 Removing and installing motor	10
1.1 Removing motor	10
1.2 Separating engine and gearbox	23
1.3 Securing engine on engine and gearbox support	27
1.4 Installing engine	30
2 Assembly mountings	34
2.1 Assembly overview – assembly mountings	34
2.2 Removing and installing engine mounting	40
2.3 Removing and installing gearbox mounting	43
2.4 Removing and installing pendulum support	47
2.5 Supporting engine in installation position	48
2.6 Adjusting assembly mountings	58
2.7 Checking adjustment of assembly mountings (engine and gearbox mountings)	61
13 - Crankshaft group	62
1 Cylinder block (pulley end)	62
1.1 Assembly overview - poly V-belt drive	62
1.2 Removing and installing poly-V belt	66
1.3 Removing and installing tensioner for poly V-belt	69
1.4 Removing and installing vibration damper	70
1.5 Removing and installing engine support	73
1.6 Renewing crankshaft oil seal - belt pulley end	76
1.7 Removing and installing sealing flange on pulley end	79
2 Cylinder block, gearbox end	83
2.1 Assembly overview - cylinder block, gearbox end	83
2.2 Removing and installing flywheel	85
2.3 Removing and installing sealing flange on gearbox side	87
3 Crankshaft	98
3.1 Crankshaft dimensions	98
3.2 Renewing needle bearing in crankshaft	98
3.3 Measuring axial clearance of crankshaft	101



4	Pistons and conrods	103
4.1	Assembly overview - pistons and conrods	103
4.2	Removing and installing pistons	106
4.3	Checking pistons and cylinder bores	107
4.4	Separating new conrod	109
4.5	Checking radial clearance of conrods	110
4.6	Removing and installing oil spray jets	110
4.7	Setting piston to TDC position	111
15	Cylinder head, valve gear	115
1	Cylinder head	115
1.1	Assembly overview - cylinder head	115
1.2	Assembly overview - camshaft housing	117
1.3	Removing and installing cylinder head	120
1.4	Removing and installing camshaft housing	124
1.5	Checking compression	128
2	Toothed belt drive	131
2.1	Assembly overview - toothed belt cover	131
2.2	Assembly overview - toothed belt	131
2.3	Removing and installing toothed belt guard	134
2.4	Removing and installing toothed belt	135
2.5	Preassembling and installing test tool VAS 611 007	138
2.6	Checking valve timing	146
2.7	Adjusting valve timing	148
2.8	Removing toothed belt from camshaft	159
3	Valve gear	166
3.1	Assembly overview - valve gear	166
3.2	Removing and installing camshaft oil seal	169
3.3	Removing and installing camshaft adjuster	181
3.4	Removing and installing inlet camshaft control valve 1 N727	191
3.5	Removing and installing exhaust camshaft control valve 1 N318	192
3.6	Removing and installing valve stem seals	193
3.7	Removing and installing holder for oil seal	207
4	Inlet and exhaust valves	210
4.1	Checking valve guides	210
4.2	Checking valves	211
4.3	Valve dimensions	211
17	Lubrication	212
1	Sump, oil pump	212
1.1	Assembly overview - sump/oil pump	212
1.2	Engine oil:	216
1.3	Removing and installing sump	216
1.4	Removing and installing oil pump	221
1.5	Removing and installing oil level and oil temperature sender G266	222
2	Engine oil cooler	224
2.1	Assembly overview - engine oil cooler	224
2.2	Removing and installing engine oil cooler	225
3	Crankcase ventilation	226
3.1	Assembly overview - crankcase breather system	226
3.2	Removing and installing oil separator	227
4	Oil filter, oil pressure switch	230
4.1	Assembly overview - oil filter/oil pressure switch	230
4.2	Removing and installing oil pressure sender G10	231
4.3	Checking oil pressure and oil pressure switch	232



4.4	Removing and installing oil filter housing	232
4.5	Removing and installing oil pressure regulating valve N428	233
4.6	Removing and installing piston cooling jet control valve N522	234
19	Cooling	236
1	Cooling system/coolant	236
1.1	Connection diagram - coolant hoses	236
1.2	Checking cooling system for leaks	237
1.3	Draining and adding coolant	240
2	Coolant pump, regulation of cooling system	250
2.1	Assembly overview - coolant pump, thermostat	250
2.2	Assembly overview - electric coolant pump	252
2.3	Assembly overview - coolant temperature sender	252
2.4	Removing and installing electric coolant pump	253
2.5	Removing and installing coolant pump	255
2.6	Removing and installing toothed belt pulley for coolant pump	261
2.7	Removing and installing coolant temperature sender G62	263
2.8	Removing and installing radiator outlet coolant temperature sender G83	265
2.9	Removing and installing engine outlet coolant temperature sender G82	266
2.10	Removing and installing engine temperature regulation module GX33	269
2.11	Checking coolant pump	271
3	Coolant pipes	277
3.1	Assembly overview - coolant pipes	277
3.2	Removing and installing coolant pipes	278
4	Radiator, radiator fan	281
4.1	Assembly overview - radiator	281
4.2	Assembly overview - radiator cowl and radiator fan	286
4.3	Assembly overview - radiator blind	286
4.4	Removing and installing radiator	289
4.5	Removing and installing radiator cowl	306
4.6	Removing and installing radiator fan V7	307
4.7	Removing and installing radiator blind	308
4.8	Removing and installing radiator blind control motor V544	310
21	Turbocharging/supercharging	316
1	Turbocharger	316
1.1	Assembly overview - turbocharger	316
1.2	Removing and installing turbocharger	319
1.3	Removing and installing charge pressure control module GX34	325
1.4	Removing and installing connection for turbocharger	326
2	Charge air system	328
2.1	Assembly overview - charge air system	328
2.2	Removing and installing charge air cooler	330
2.3	Removing and installing charge pressure sender GX26	331
2.4	Checking charge air system for leaks	332
2.5	Removing and installing air pipe	336
24	Mixture preparation - injection	339
1	Injection system	339
1.1	Overview of fitting locations - injection system	339
2	Injectors	346
2.1	Assembly overview - fuel rail with injectors	346
2.2	Removing and installing fuel rail	348
2.3	Removing and installing injectors	349
3	Air filter	357



3.1	Assembly overview - air filter housing	357
3.2	Removing and installing air filter housing	359
3.3	Removing air duct on lock carrier	362
4	Intake manifold	365
4.1	Assembly overview - intake manifold	365
4.2	Removing and installing intake manifold	367
4.3	Removing and installing throttle valve module GX3	369
4.4	Cleaning throttle valve module GX3	370
5	Senders and sensors	372
5.1	Removing and installing fuel pressure sender G247	372
5.2	Checking fuel pressure sender G247	373
5.3	Removing and installing intake manifold sender GX9	375
5.4	Removing and installing exhaust gas pressure sensor 1 G450	375
6	Engine control unit	377
6.1	Assembly overview - engine control unit	377
6.2	Removing and installing engine control unit J623	377
7	High-pressure pump	383
7.1	Assembly overview - high-pressure pump	383
7.2	Removing and installing high-pressure pump	384
7.3	Removing and installing high-pressure pipe	386
8	Lambda probe	388
8.1	Assembly overview - Lambda probe	388
8.2	Removing and installing Lambda probe	389
26	Exhaust system	391
1	Exhaust pipes and silencers	391
1.1	Assembly overview – silencers	391
1.2	Separating exhaust pipes from silencers	395
1.3	Removing and installing silencer	396
1.4	Aligning exhaust system free of stress	401
1.5	Checking exhaust system for leaks	401
1.6	Installation position of clamp	402
2	Emission control	404
2.1	Assembly overview - emission control	404
2.2	Removing and installing catalytic converter	407
2.3	Removing and installing particulate filter	410
28	Ignition system	411
1	Ignition system	411
1.1	Assembly overview - ignition system	411
1.2	Removing and installing ignition coils with output stage	413
1.3	Removing and installing knock sensor 1 G61	416
1.4	Removing and installing engine speed sender G28	417
1.5	Removing and installing inlet camshaft position sender G1002	419
1.6	Removing and installing exhaust camshaft position sender G1003	420



00 – Technical data

1 Safety information

(VRL014638; Edition 09.2020)

⇒ [r1.1 egulations for working on fuel supply", page 1](#)

⇒ [m1.2 easures when working on vehicles with a start/stop system", page 1](#)

⇒ [p1.3 recautions when using testers and measuring instruments during a road test", page 2](#)

⇒ [p1.4 recautions when working on the cooling system", page 2](#)

⇒ [p1.5 recautions when working on ignition system", page 2](#)

⇒ [p1.6 recautions when working on exhaust system", page 3](#)

1.1 Safety regulations for working on fuel supply

Risk of injury from highly pressurised fuel.

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

Before opening the fuel system:

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

Danger of fire caused by escaping fuel

When the battery is connected and the driver door opens, the door contact switch activates the fuel pump. Escaping fuel can ignite and cause a fire.

- Disconnect voltage supply to fuel pump before opening the fuel system.

1.2 Safety measures when working on vehicles with a start/stop system

Risk of injury from engine starting unexpectedly

If the vehicle's start/stop system is activated, the engine can start unexpectedly. A message in the dash panel insert indicates whether the start/stop system is activated.

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



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

Risk of injury caused by unsecured testing and measuring instruments

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

- Secure testing and measuring instruments on the rear seat.

or

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

1.4 Safety precautions when working on the cooling system

Danger of scalding by hot coolant

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

- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.

1.5 Safety precautions when working on ignition system

Risk of injury due to electric shock

The ignition system is under high voltage when the engine is running. Touching the ignition system may result in an electric shock.

- Do not touch or disconnect ignition cables when the engine is running or being turned at starter speed.

Risk of damage to components

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

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



1.6 Safety precautions when working on exhaust system

Risk of poisoning due to chemical substances

Exhaust gas temperature senders may contain chemical substances. There is a risk of poisoning or injuries to respiratory system.

- Never open an exhaust gas temperature sender by cutting, sawing or any other means.

Risk of injury due to hot condensate and particles in the exhaust system.

The exhaust system could contain hot condensate and/or particles. There is a risk of injury to the eyes, skin and respiratory system, as well as poisoning.

- Always wear protective gloves and eye protection when cutting the exhaust system.
- When cutting, use an extraction system or otherwise ensure sufficient ventilation.

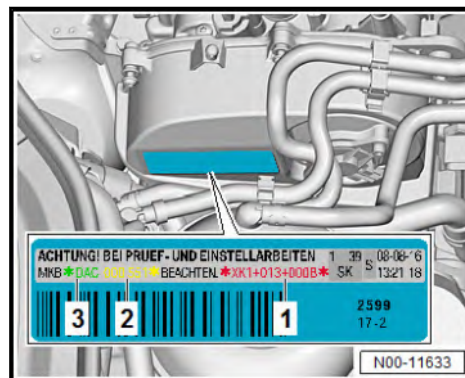


2 Identification

⇒ [n2.1 umber/engine data", page 4](#)

2.1 Engine number/engine data

Vehicle data sticker on toothed belt guard:



There is a sticker on the upper toothed belt guard. It shows various engine data.

Only this vehicle data sticker contains the applicable version data for the respective engine. This data is important for commissioning.

Each engine has an individual vehicle data sticker. Do not replace this vehicle data sticker with another one. The data is not applicable for any other engine.

For new engines, the new vehicle data sticker is attached to the new toothed belt guard.

If a new engine is installed, make sure that only the upper toothed belt guard which was supplied with the engine is installed.

For new engines, compare the data on the vehicle data sticker with the data on the engine identity card. The specified data must match.

Do not replace a toothed belt guard with a new one if it cannot be assured that the vehicle data sticker matches the respective engine.

1 - Crankshaft version data

2 - Engine number

3 - Engine code

Crankshaft version data -1-:

- ◆ Serves as version documentation, and is used for commissioning.
- ◆ For some components, the version data must be transferred to the engine control unit after they have been renewed
⇒ Vehicle diagnostic tester.
- ◆ This is described in the procedures for the relevant components.

Engine code -3-:

- ◆ The engine code is specified on the vehicle data sticker, the type plate and on the crankcase above the gearbox.

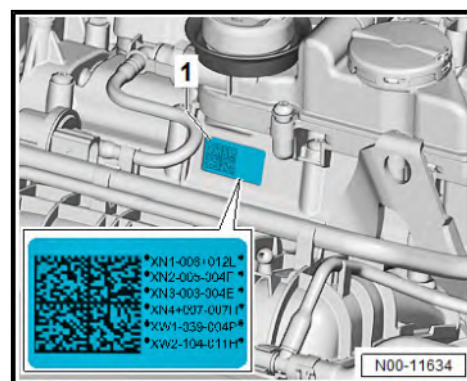


- ◆ The first 3 digits refer to the mechanical configuration of the engine.
- ◆ The fourth digit indicates the output and the torque of the engine.

Engine number -2- and -3-:

- ◆ The engine number consists of up to 9 characters (alphanumeric).
- ◆ The first 3 characters are the "engine code".
- ◆ The subsequent 6 characters are the "serial number".
- ◆ After 999,999 engines with the same code letters have been produced, the first of the six digits is replaced by a letter.

Vehicle data sticker on camshaft housing:



- ◆ Serves as version documentation, and is used for commissioning.
- ◆ The version data must be transferred to the engine control unit after components have been renewed ⇒ Vehicle diagnostic tester.
- ◆ This is described in the procedures for the relevant components.
- ◆ Each engine has an individual vehicle data sticker. The data is not applicable for any other engine.
- ◆ Located on the left side is the »data matrix code«. This data is read ⇒ Vehicle diagnostic tester.
- ◆ On the right side, an alphanumeric version code is indicated. It is used for entering the version data manually during commissioning ⇒ Vehicle diagnostic tester.
- ◆ The specified values are measurement data for the components.

XN1 - Cams of cylinder no. 1

XN2 - Cams of cylinder no. 2

XN3 - Cams of cylinder no. 3

XW1 - Sender wheel of inlet camshaft

XW2 - Sender wheel of exhaust camshaft

Engine specifications:

Engine code		DLAA	DLAB	DLAC
Manufactured from		02.20 ➤	02.20 ➤	07.20 ➤
Exhaust emission standard		EU 6	EU 6	EU 6



Engine code		DLAA	DLAB	DLAC
Displacement	cm ³	999	999	999
Power	kW at rpm	81/5500	66/5500	70/5500
Torque	Nm at rpm	200/1500-4000	175/1500-4000	175/1500-4000
Bore	Diameter, mm	74.5	74.5	74.5
Stroke	mm	76.4	76.4	76.4
Compression ratio		11.5	11.5	11.5
Valves per cylinder		4	4	4
RON	min.	95 unleaded	95 unleaded	95 unleaded
Firing order		1-2-3	1-2-3	1-2-3

Volkswagen Technical Site: <https://vwts.ru>



3 Repair notes

⇒ [f3.1 or cleanliness", page 7](#)

⇒ [i3.2 nformation", page 7](#)

⇒ [r3.3 epair instructions", page 8](#)

⇒ [o3.4 bjects in engine", page 8](#)

⇒ [c3.5 orrosion", page 8](#)

⇒ [r3.6 outing and attachment", page 9](#)

⇒ [r3.7 adiators and condensers", page 9](#)

⇒ [v3.8 acuum system", page 9](#)

3.1 Rules for cleanliness

Even slight soiling can cause faults. When working on the fuel supply, injection and turbocharger system, pay careful attention to the following rules of cleanliness:

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- ◆ Seal open pipes and connections immediately with clean plugs for example from the engine bung set -VAS 6122-.
- ◆ Place removed parts on a clean surface and cover them over. Use lint-free cloths only.
- ◆ If repair work cannot be performed immediately, carefully cover or seal components.
- ◆ Install clean components only. Do not remove replacement parts from packing until immediately before installing. Do not use parts that have been stored outside of their packaging (e.g. in tool boxes).
- ◆ If system is open, do not work with compressed air. Try not to move the vehicle.
- ◆ Make sure that no fuel gets onto the fuel hoses. Should this occur, the fuel hoses must be cleaned immediately.
- ◆ Protect disconnected electrical connectors from dirt and water, and reconnect them only when dry.

3.2 General information

- ◆ The engine control unit has a self-diagnosis capability. Interrogate the event memory before performing repairs and before fault finding. Also check the vacuum hoses and connections (unmetered air).
- ◆ For trouble-free operation of electrical components, a voltage of at least 11.5 volts is necessary.
- ◆ Do not use sealants containing silicone. Particles of silicone drawn into the engine will not be burnt in the engine and damage the Lambda probe.
- ◆ Vehicles are fitted with a crash fuel shut-off circuit. The risk of a fire after a crash is diminished by the fuel pump relay switching off the fuel pump.
- ◆ The system also improves the starting characteristics of the engine. When the driver door is opened, the fuel pump is activated for 2 seconds in order to build up pressure in the fuel system, observe safety precautions ⇒ [r1.1 egulations for working on fuel supply", page 1](#) .



3.3 General repair instructions

- ◆ Clean tools and workbench etc. before working on injection system.
- ◆ If the high-pressure lines are not renewed, the existing high-pressure lines must be labelled before removal.
- ◆ High-pressure fuel lines must always be re-installed in their original positions (i.e. on the same cylinder).
- ◆ Align high-pressure lines so that they are not subjected to stress. First tighten all unions hand-tight and then tighten to torque.
- ◆ Never attempt to reshape high-pressure lines.
- ◆ When working on any parts of the high-pressure fuel system, tools may only be used for loosening and tightening pipe unions. All other removal and installation procedures must be carried out manually without tools or other equipment.
- ◆ All cable ties that are opened or cut through during removal must be fitted/renewed in the same position during installation.
- ◆ Fuel hoses in engine compartment must be secured only with spring-type clips. The use of crimp-type or screw-type clips is not permissible.

3.4 Foreign objects in engine

- ◆ When performing work on the engine, all open passages in the intake and exhaust systems must always be sealed with suitable plugs to prevent foreign particles from entering the engine. Use engine bung set -VAS 6122-.
- ◆ To prevent subsequent damage when a cylinder bank is damaged mechanically, check the intake and exhaust sections as well as the combustion chambers of the opposite cylinder bank for foreign bodies.



Note

In the event of mechanical damage on turbocharger, proceed according to chapter ➔ [a1.2 nd installing turbocharger](#)", page [319](#).

3.5 Contact corrosion

Contact corrosion can occur if unsuitable screws, bolts, nuts or washers are used.

For this reason, only screws, bolts, nuts and washers with a special surface coating have been fitted.

In addition, rubber, plastic and adhesives are made of non-conductive materials.

If there is any doubt about the suitability of parts, a general rule is to use new parts ➔ Electronic Parts Catalogue.

Please note:

- ◆ Use only genuine parts as these have been tested and are compatible with aluminium.
- ◆ The use of genuine parts is always recommended.
- ◆ Damage resulting from contact corrosion is not covered by the warranty.



3.6 Pipe/wire routing and attachment

- ◆ To prevent interchanging and to maintain the original installation position, mark the fuel, hydraulic system, vacuum and ACF system pipes or any wiring for example prior to removal. Make sketches or take photographs if necessary.
- ◆ To avoid damaging pipes and wires, ensure adequate clearance from all moving or hot components in the engine compartment on account of the confined space.

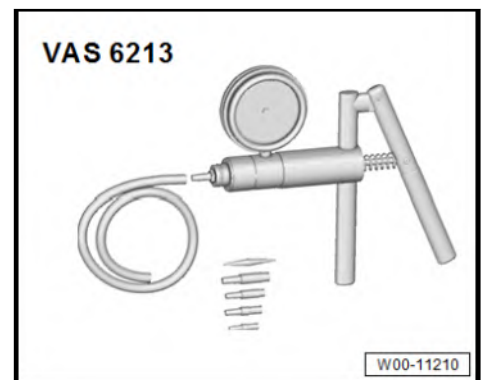
3.7 Installing radiators and condensers

Even when installed correctly, the radiator and condenser could exhibit slight indentations on the fins. This does not mean that these components have been damaged. Minor indentations such as these are not a reason to renew either the radiator or condenser.

3.8 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand operated vacuum pump -VAS 6213-



Procedure

- Check all vacuum lines throughout entire vacuum system for:
 - ◆ Cracks
 - ◆ Marten bites
 - ◆ Crushing
 - ◆ Porous areas and other leaks
- Check vacuum line to solenoid valve and from solenoid valve to relevant component.
- If an entry is stored in the event memory, check all vacuum lines leading to the corresponding component and also check the remaining vacuum lines leading to other components.
- If pressure cannot be built-up using hand vacuum pump -VAS 6213- or pressure immediately drops again, check hand vacuum pump and connecting hoses for leaks.



10 – Removing and installing engine

1 Removing and installing motor

⇒ [m1.1 otor", page 10](#)

⇒ [e1.2 ngine and gearbox", page 23](#)

⇒ [e1.3 ngine on engine and gearbox support", page 27](#)

⇒ [e1.4 ngine", page 30](#)

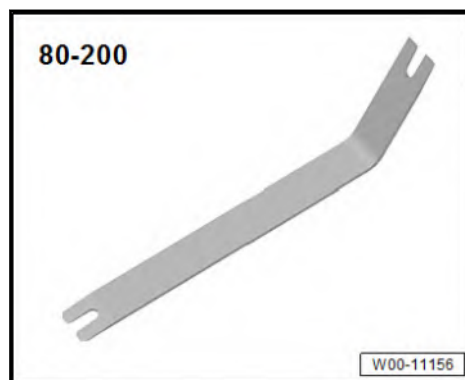
1.1 Removing motor

⇒ [m1.1.1 otor", page 10](#)

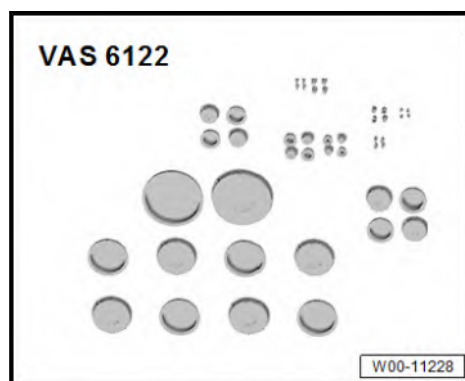
1.1.1 Removing motor

Special tools and workshop equipment required

◆ Release lever -80-200-



◆ Engine bung set -VAS 6122-

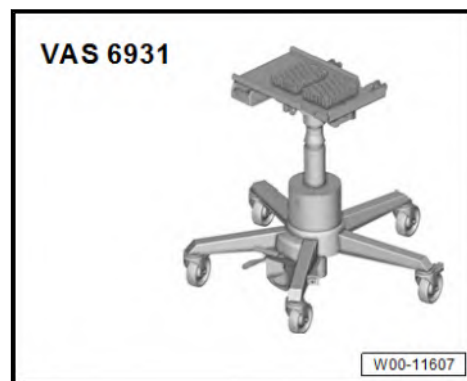


◆ Drip tray for workshop hoist -VAS 6208-

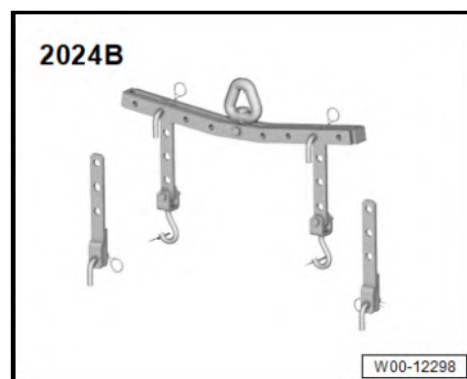




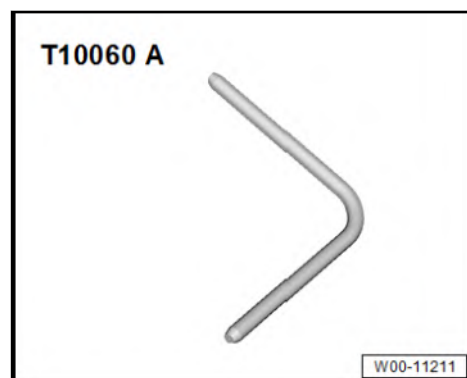
- ◆ Engine and gearbox jack -VAS 6931-



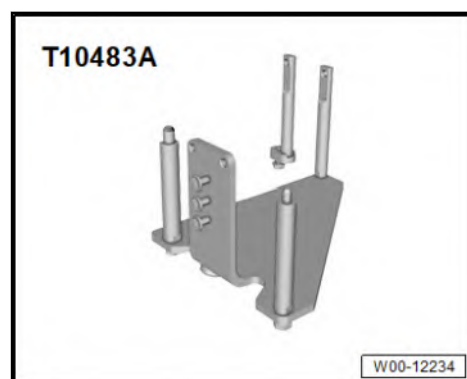
- ◆ Extension -2024 A /1- of lifting tackle -2024B-



- ◆ Locking pin -T10060A-



- ◆ Engine support -T10483A-



- ◆ Protective mat -VAS 531003- (not illustrated)
- ◆ Safety glasses
- ◆ Safety gloves



Procedure



Note

- ♦ *The engine is removed downwards together with the gear-box.*
- ♦ *Attach cable ties in all the same places when installing.*

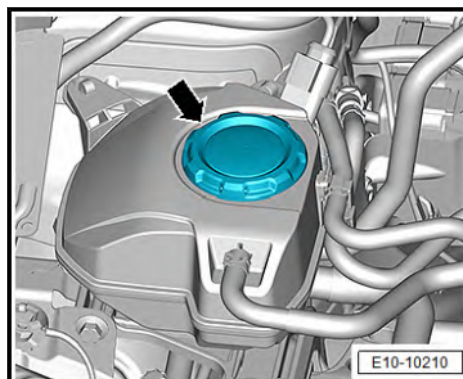


CAUTION

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

Skin and other parts of the body may be scalded.

- Wear protective gloves.
 - Wear protective goggles.
 - Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.
-
- Open filler cap -arrow- for coolant expansion tank.



- Remove air filter housing. ⇒ [a3.2 nd installing air filter housing", page 359](#)
- Disconnect battery ⇒ Electrical system; Rep. gr. 27; Battery; Disconnecting and reconnecting battery.
- Remove battery tray. ⇒ Electrical system; Rep. gr. 27; Battery; Removing and installing battery tray
- Remove air duct on lock carrier ⇒ [page 362](#) .

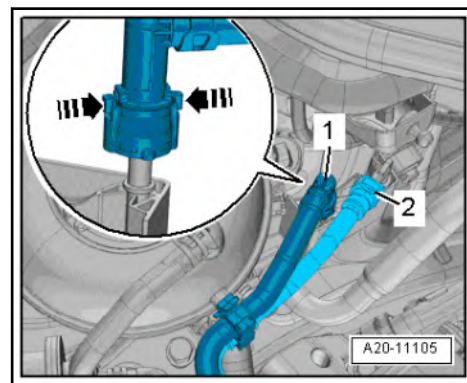


CAUTION

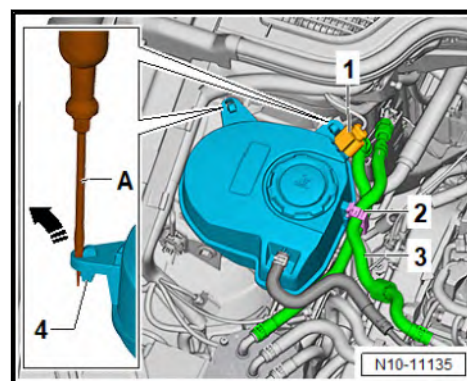
The fuel system is pressurised.

Danger of injury through fuel spray.

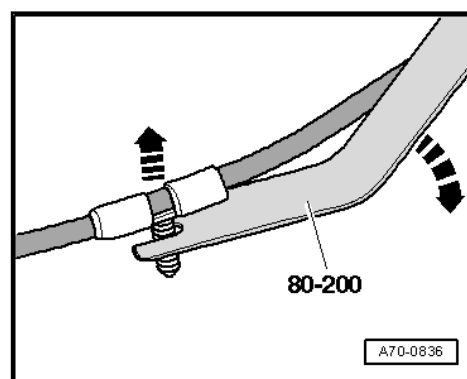
- Wear protective goggles.
 - Wear protective gloves.
 - To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.
-
- Open plug-in connectors -1- and -2- of fuel lines, and pull off fuel lines. Disconnect plug-in connectors ⇒ Rep. gr. 20; Plug-in connectors; Disconnecting plug-in connectors.



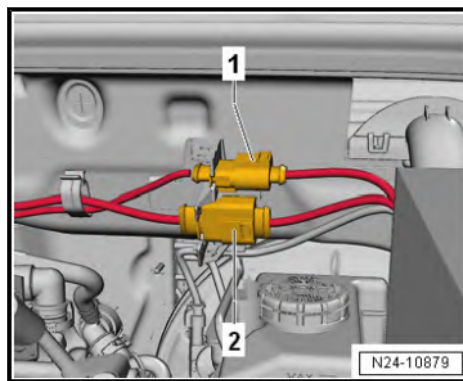
- Release and pull off electrical connector -1-.



- Disconnect bracket -2- with fuel hoses.
- Use a screwdriver to release catch -arrow-, and place coolant expansion tank on engine.
- Seal open lines and unions with clean plugs from engine sealing plug set -VAS 6122-.
- Use removal lever -80 - 200- to detach the clips.



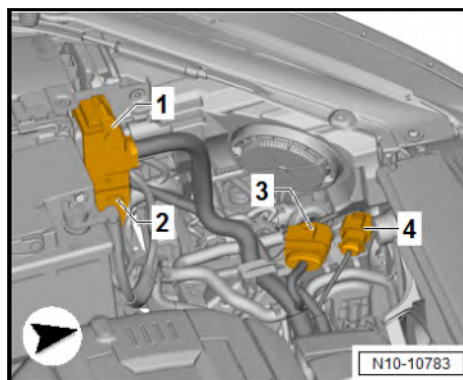
- Disconnect electrical connectors -1- and -2- and unclip wiring harness from retainer.



- Unclip line guides for lambda probes from vehicle.

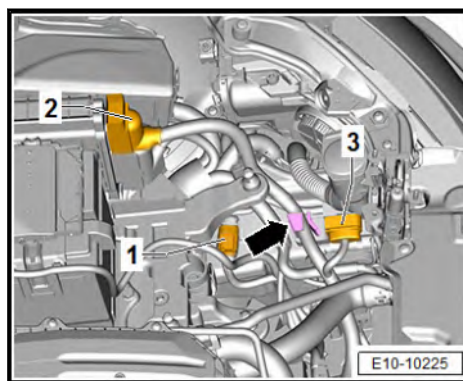
Golf 2020, Golf Estate 2021:

- Release and pull off connectors -2- on engine control unit -J623- ➔ [c6 control unit](#), [page 377](#) .



- Remove electrical connectors -3- and -4- from retainer and disconnect.
- Move electrical lines free.

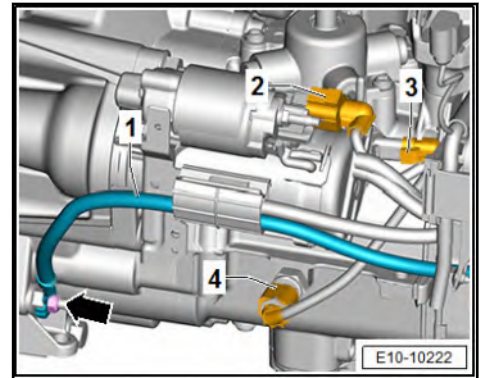
Polo 2018:



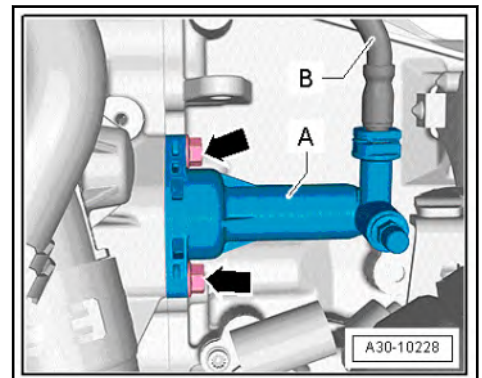
- Release and pull off electrical connector -2- on engine control unit -J623-.
- Disconnect connectors -1- and -3-.
- Detach wiring harness from attachment -arrow-.
- Secure cables to engine using a cable tie.



Vehicles with manual gearbox:

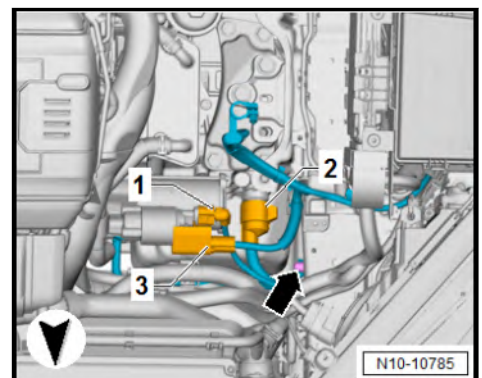


- Detach electrical connectors -2-, -3- and -4-.
- Unscrew nut -arrow- for earth line -1-.
- Secure electrical wires on left longitudinal member using a cable tie.
- Remove selector mechanism from gearbox ⇒ Rep. gr. 34; Selector mechanism; Removing and installing selector mechanism.
- Unscrew bolts -arrows- then raise and tie clutch slave cylinder.



Vehicles with dual clutch gearbox:

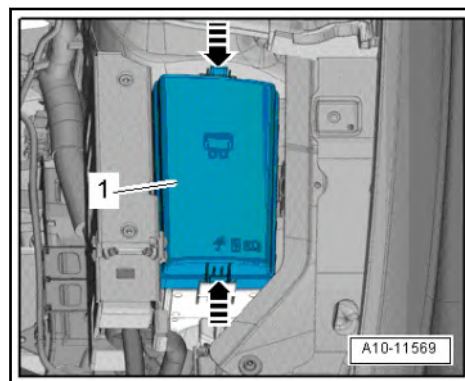
- Unscrew earth wire on body -arrow-.



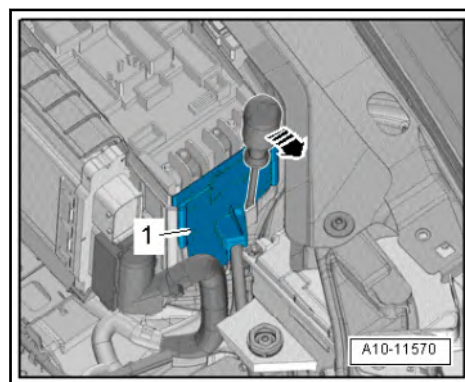
- Detach electrical connectors -1-, -2- and -3-.
- Remove selector mechanism from gearbox ⇒ Rep. gr. 34; Selector mechanism; Removing and installing selector mechanism.



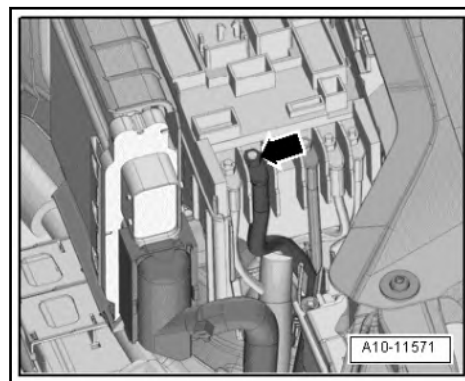
Continued for all vehicles



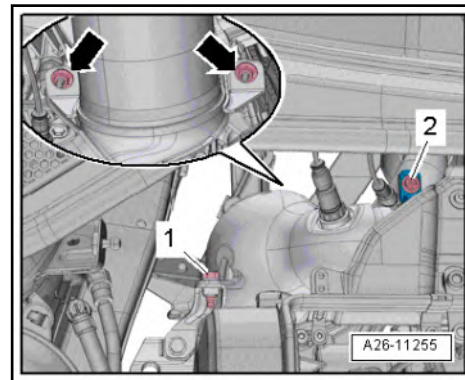
- Release catches -arrows- and detach cover -1- for electronics box in engine compartment.
- Release catch using a screwdriver -arrow- and detach cover -1- for electronics box in engine compartment upwards.



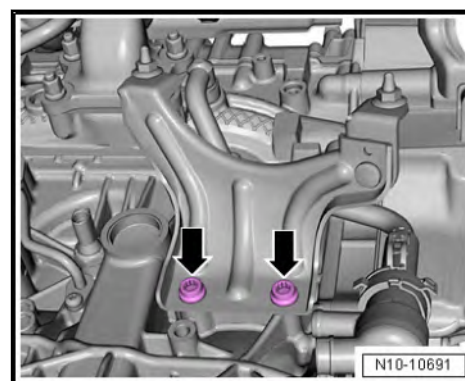
- Remove nut -arrow-, detach electrical wiring and move clear.



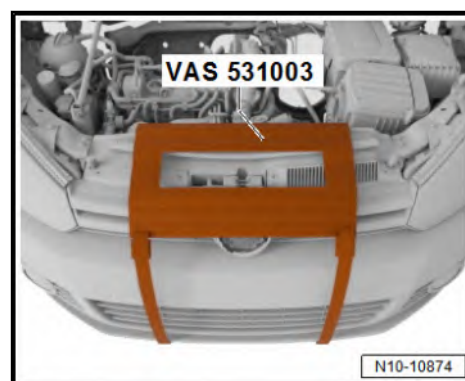
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Remove front wheel on left and right. ⇒ Running gear, axles, steering; Rep. gr. 44; Wheels, tyres; Wheel change.
- Remove left and right front wheel housing liner ⇒ General body repairs, exterior; Rep. gr. 66; Wheel housing liner; Removing and installing front wheel housing liner.
- Unscrew bolt -2- and remove screw-type clip.



- Unscrew bolt -1- and nuts -arrows-, and secure catalytic converter to vehicle.
- Undo bolts -arrow- and remove bracket.



- Remove radiator cowl ⇒ [a4.5 nd installing radiator cowl](#), [page 306](#).
- Attach protective mat -VAS 531003- to vehicle as shown in illustration.



Vehicles with air conditioner compressor

- Remove poly V-belt ⇒ [a1.2 nd installing poly-V belt](#), [page 66](#).

CAUTION

Risk of freezing injury caused by refrigerant.

- Do not open refrigerant circuit of air conditioning system.

- Remove air conditioner compressor with refrigerant lines connected from engine ⇒ Heating, air conditioning; Rep.

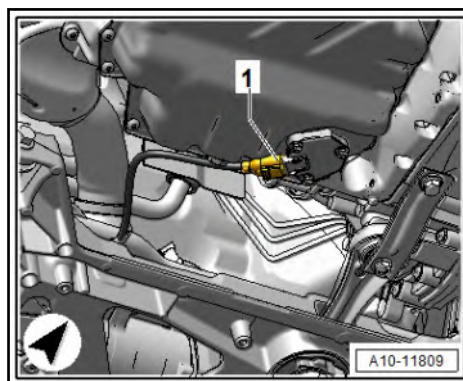


gr. 87; Air conditioner compressor; Removing air conditioner compressor from and installing to bracket.

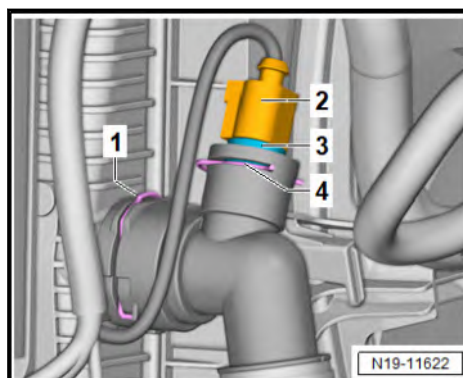
- Remove air conditioner compressor (with refrigerant lines connected), and secure it to longitudinal member.

Continued for all vehicles

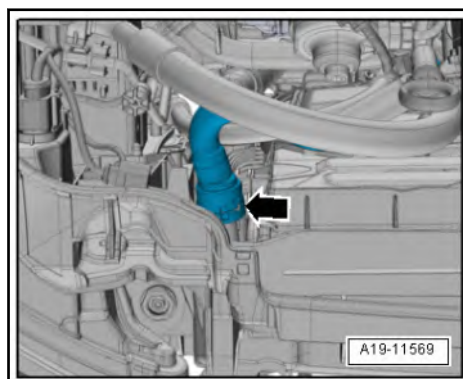
- Release and pull off electrical connector -1-.



- Remove pendulum support ⇒ [a2.4 nd installing pendulum support”, page 47](#) .
- Remove right and left drive shafts ⇒ Rep. gr. 40; Drive shaft; Removing and installing drive shaft.
- Disconnect connector -2- on radiator outlet coolant temperature sender -G83-.

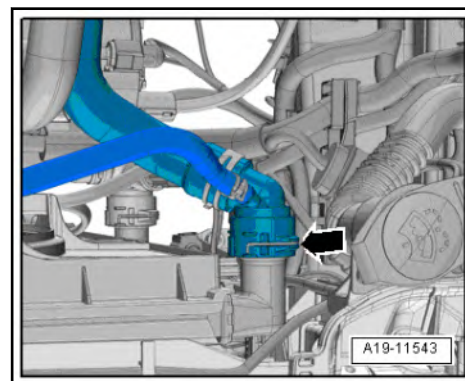


- Place drip tray for workshop hoist -VAS 6208- underneath.
- Drain coolant ⇒ [a1.3.1 nd adding coolant”, page 240](#) .
- Lift retaining clip -arrow- and pull off top right coolant hose from water radiator for charge air cooling circuit.

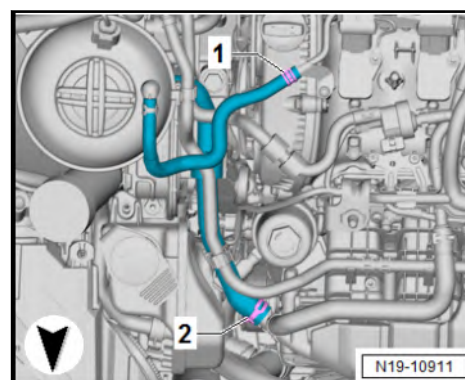




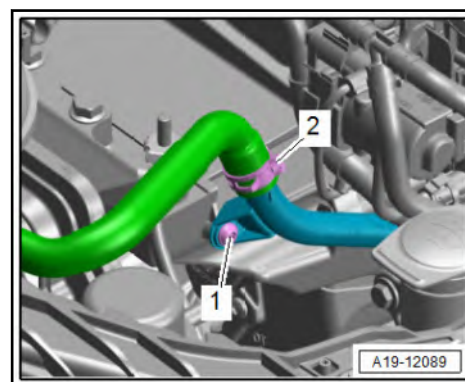
- Lift retaining clip -arrow- and pull off top left coolant hose from radiator.



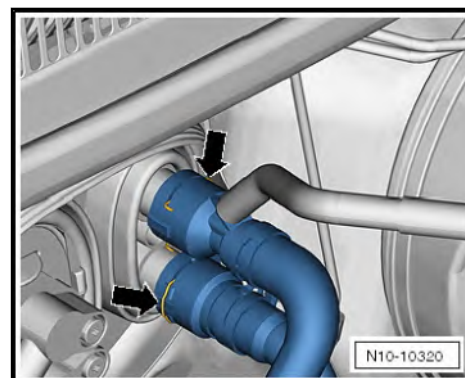
- Loosen clamp for coolant hose -1- and pull off coolant hose on coolant expansion tank.



- Release hose clip -2- and pull off coolant hose.

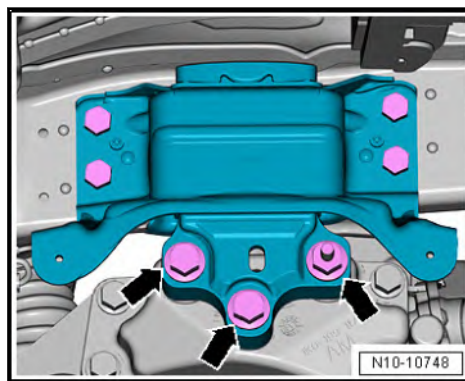


- Lift retaining clips -arrows- and pull off coolant hoses from heat exchanger for heater.





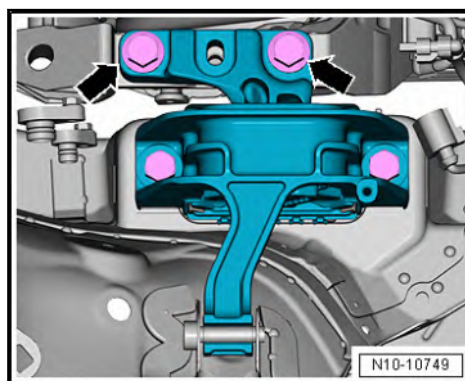
- Unscrew bolts -arrows- for gearbox mounting approx. 2 turns.



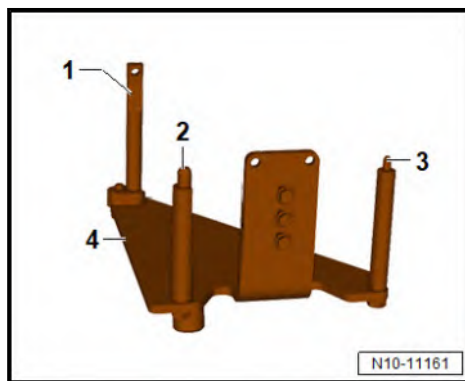
Note

There are two gearbox mountings with two and three threaded connections depending on the model. The procedure, however, is the same.

- Unscrew bolts -arrows- for engine mounting approx. 2 turns.



Engine support -T10483A- with adapters -T10483-/1, -/2 and -/4- are required to lower engine and gearbox.

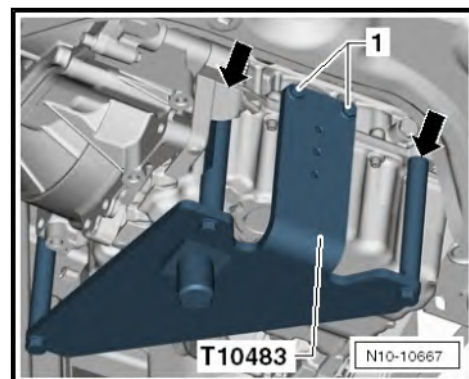


- 1 - Adapter -T10483/4-
- 2 - Adapter -T10483/1-
- 3 - Adapter -T10483/2-
- 4 - Engine support -T10483-

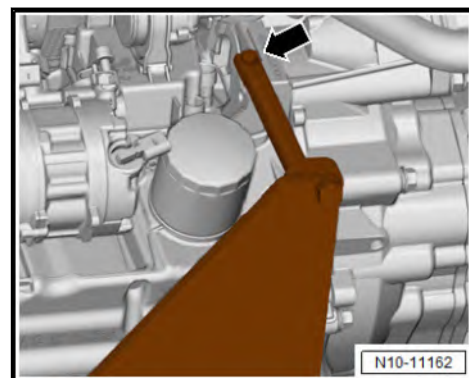


Note

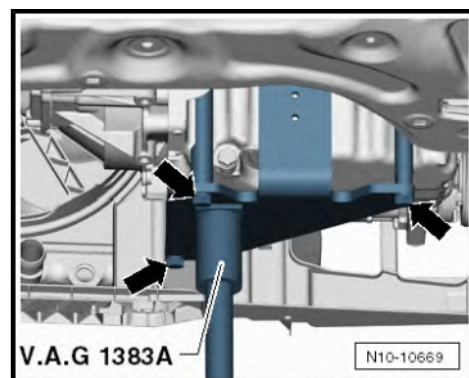
- ◆ *The flat of the adapter -T10483/1- must point in the direction of the oil drain plug when installing.*
- ◆ *Tighten the bolts of the adapters -T10483/1, /2 and /4- by hand first.*
- Push engine support -T10483A- to stop into holes -arrows- in cylinder block.



- Tighten bolts -1- by hand first.
- Tighten bolt -arrow- of adapter -T10483/4- by hand first.



- Tighten bolts -arrows- to 20 Nm.



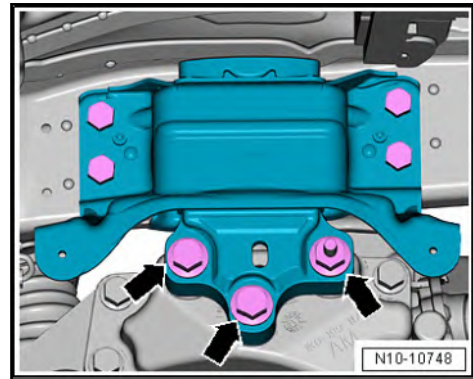
- Tighten all bolts of engine support -T10483A- on cylinder block to 20 Nm.
- Fit engine and gearbox jack -VAS 6931- to engine support -T10483A-, and raise engine/gearbox assembly slightly.



Note

Use a stepladder to unscrew the bolts for engine/gearbox mounting.

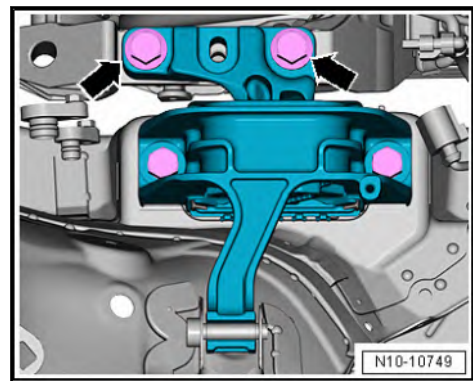
- Unscrew bolts -arrows- for gearbox mounting completely.



Note

There are two gearbox mountings with two and three threaded connections depending on the model. The procedure, however, is the same.

- Unscrew bolts -arrows- for support arm of gearbox mounting completely.



NOTICE

Risk of damage to the vacuum lines, electrical wiring or the engine compartment.

- Check that all vacuum lines and electrical wiring between engine, gearbox, subframe and body have been detached.
- When lowering, carefully guide engine/gearbox assembly with assembly carrier out of engine compartment.
- Pull engine/gearbox assembly as far as possible towards the front, and lower it gradually.



1.2 Separating engine and gearbox

⇒ [e1.2.1 ngine and gearbox, vehicles with manual gearbox](#),
page 23

⇒ [e1.2.2 ngine and gearbox, vehicles with dual clutch gearbox](#),
page 25

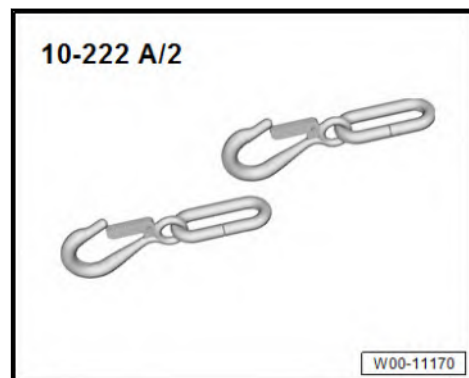
1.2.1 Separating engine and gearbox, vehicles with manual gearbox

Special tools and workshop equipment required

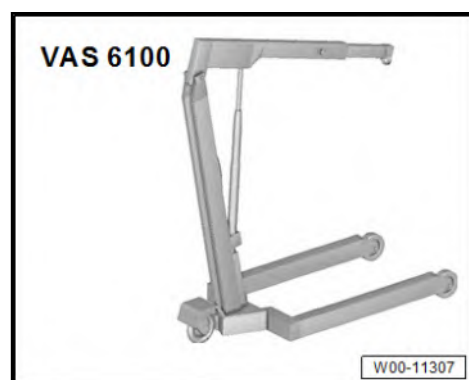
◆ Shackle -10 - 222 A /12-



◆ Hook -10 - 222 A /2-

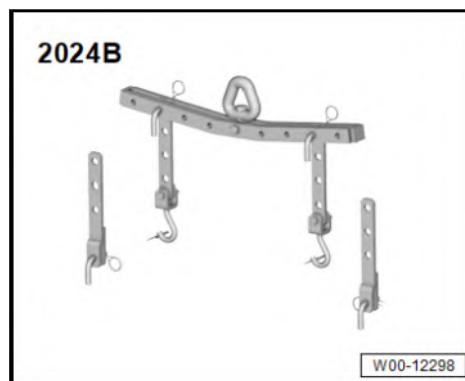


◆ Workshop hoist -VAS 6100-





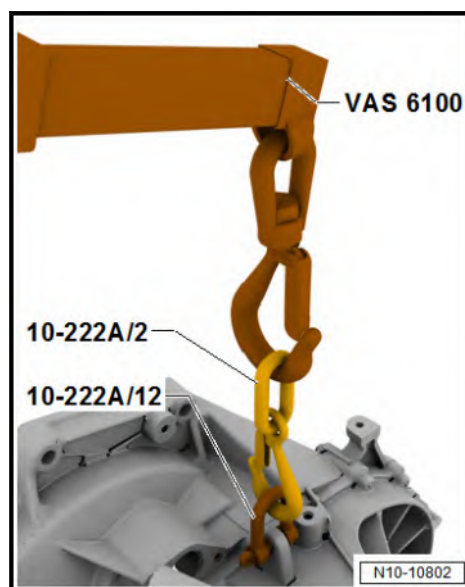
♦ Lifting tackle -2024B-



Procedure

- Engine/gearbox assembly removed and attached to engine bracket -T10483A-.
- Remove starter ⇒ Electrical system; Rep. gr. 27; Starter; Removing and installing starter.
- Make sure that there is sufficient clearance to coolant pump.
- The mounting points on the gearbox may have different diameters and may be at different locations. This results in different versions of the procedure for supporting the gearbox.

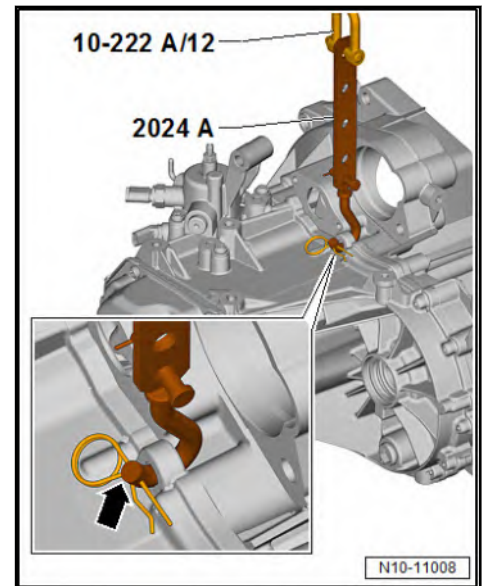
Version 1:



- Bolt shackle -10 - 222 A /12- to gearbox.
- The mounting points on the gearbox may have different diameters and may be at different locations.
- If necessary, remove coolant pump ⇒ [a2.5 nd installing coolant pump", page 255](#) .
- Attach workshop hoist -VAS 6100- with hook -10 - 222 A /2- to shackle -10 - 222 A /12-.
- Raise gearbox slightly with workshop hoist -VAS 6100-.

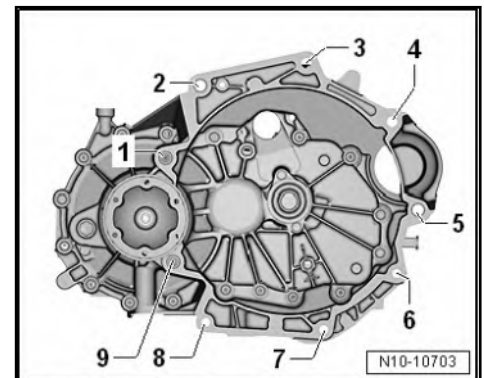


Version 2:



- Detach one hook from lifting tackle -2024B-.
- The mounting points on the gearbox may have different diameters and may be at different locations.
- Fit hook of lifting tackle -2024B- to gearbox as shown in illustration, and secure connection with a split pin -arrow-.
- Shackle -10-222A/12- fitted to hook.
- Attach workshop hoist -VAS 6100- to shackle -10-222A/12-.
- Raise gearbox slightly with workshop hoist -VAS 6100-.

Continued for all versions:



- Unscrew bolts -1- to -3- and -6- to -9- of gearbox and engine connection.
- Pull gearbox off engine.

1.2.2 Separating engine and gearbox, vehicles with dual clutch gearbox

Special tools and workshop equipment required



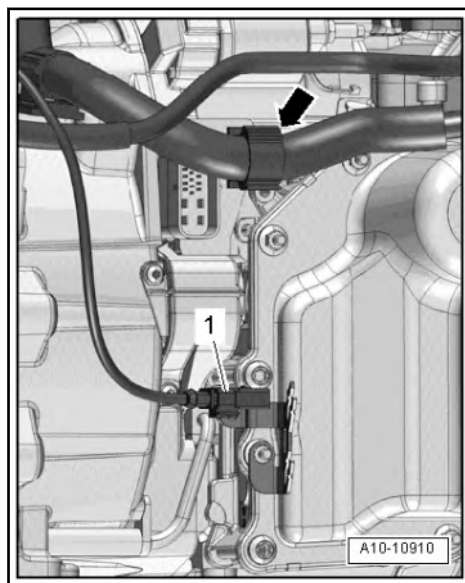
- ◆ Shackle -10 - 222 A /12-



- ◆ Workshop hoist -VAS 6100-



Procedure



- Engine/gearbox assembly removed and attached to engine bracket -T10483A-.
- Move clear wiring harness -arrow-.



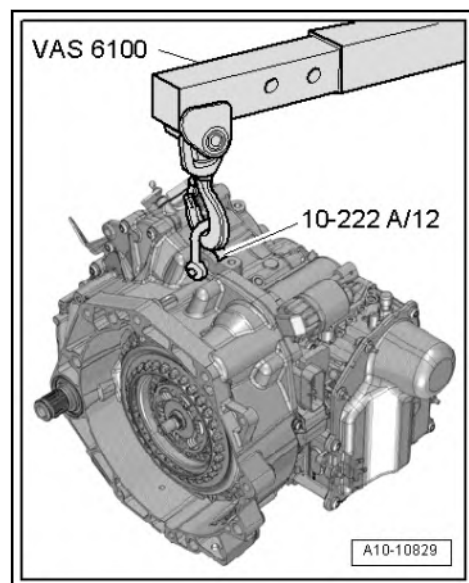
Note

Disregard -item 1-.

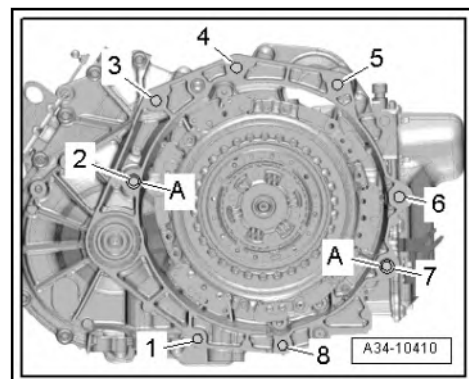
- Remove starter ⇒ Electrical system; Rep. gr. 27; Starter; Removing and installing starter.



- Make sure that there is sufficient clearance to coolant pump.
- Secure gearbox to workshop hoist -10 - 222 A /12- using shackle -VAS 6100-.



- Unscrew bolts -1- to -8- securing gearbox to engine.



Note

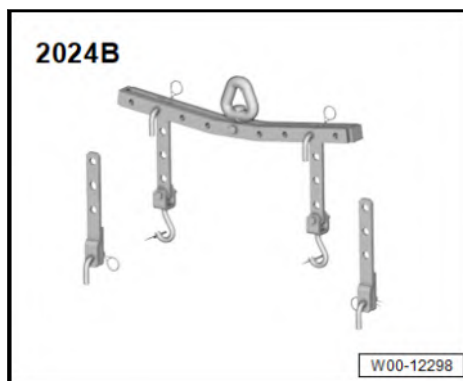
Disregard -item A-.

- Pull gearbox off engine.

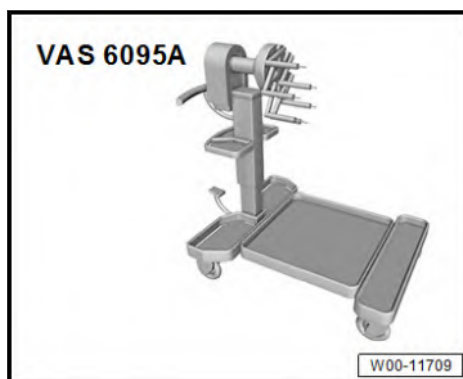
1.3 Securing engine on engine and gear-box support

Special tools and workshop equipment required

- ◆ Lifting tackle -2024 B-



- ◆ Engine and gearbox support -VAS 6095A-

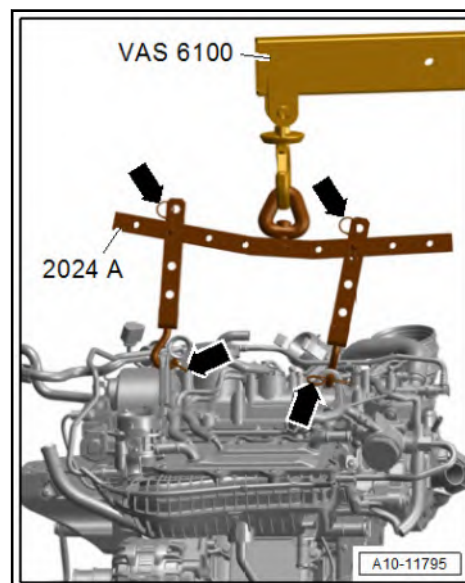


- ◆ Workshop hoist -VAS 6100-



Procedure

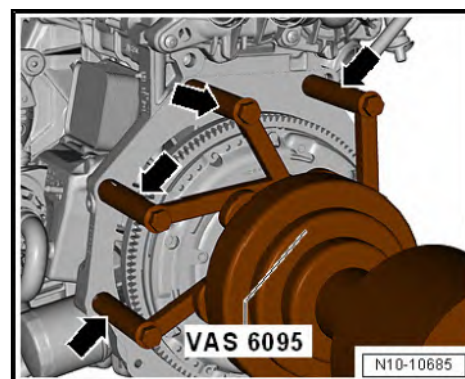
- Engine removed ⇒ [m1.1 otor", page 10](#)
- Gearbox detached from engine ⇒ [e1.2 ngine and gearbox", page 23](#) .
- Secure lifting tackle -2024 B- on engine, and attach it to workshop hoist -VAS 6100- as shown in illustration.



CAUTION

Be aware of danger from loose lifting tackle components.

- In order to match the lifting tackle to the centre of gravity of the engine, the holes in the hook rail must be allocated as shown in the illustration.
 - The support hooks and retaining pins on the lifting tackle must be secured with locking pins -arrows-.
-
- Lift engine off T10483A using workshop hoist -VAS 6100-.
 - Secure engine to engine and gearbox bracket -VAS 6095A- using pins -arrows- as shown in illustration.





1.4 Installing engine

⇒ [e1.4.1 engine", page 30](#)

1.4.1 Installing engine

Procedure

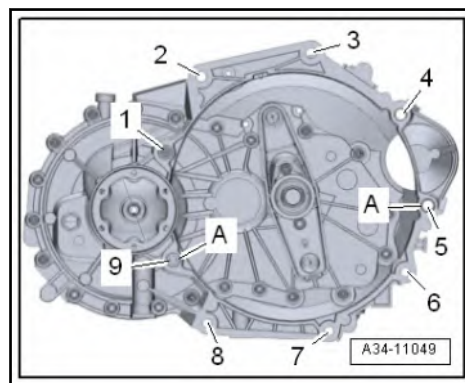


Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Renew self-locking nuts and bolts, and seals, O-rings and gaskets.*
- ◆ *Secure all hose connections with the hose clips corresponding to original equipment ⇒ [Electronic Parts Catalogue](#).*
- ◆ *Attach cable ties in all the same places when installing.*

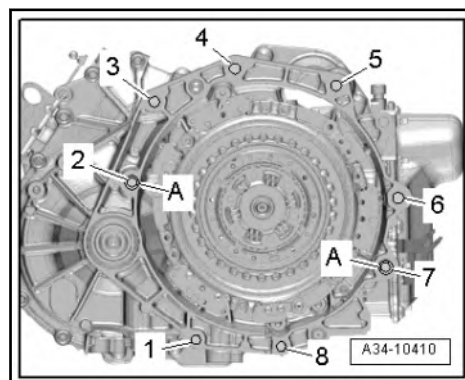
– Install intermediate plate ⇒ [page 85](#) .

Vehicles with manual gearbox:



- If there are no dowel sleeves -A- in the cylinder block for centring the engine and gearbox, insert new dowel sleeves.
- If a needle bearing is fitted in crankshaft, remove needle bearing ⇒ [n3.2 eedle bearing in crankshaft", page 98](#) .

Vehicles with dual clutch gearbox:

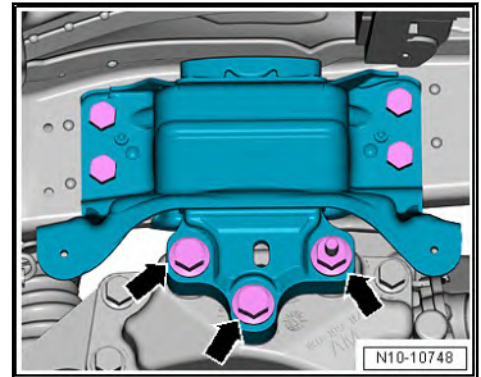


- If there are no dowel sleeves -A- in the cylinder block for centring the engine and gearbox, insert new dowel sleeves.
- If no needle bearing is fitted in crankshaft, install needle bearing ⇒ [n3.2 eedle bearing in crankshaft", page 98](#) .



Continued for all vehicles:

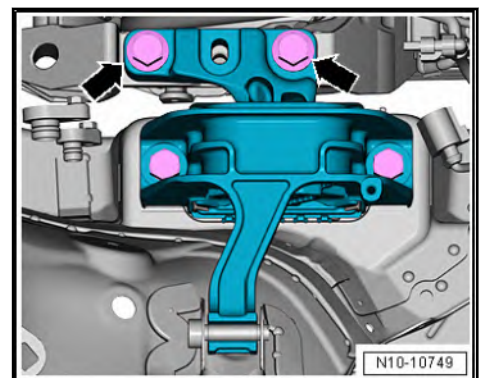
- Tighten gearbox to engine.
- Install gearbox support ⇒ [o2.1 overview – assembly mountings”, page 34](#) .
- Take up engine/gearbox assembly with engine support T10483A.
- Guide engine/gearbox assembly into body.
- First screw in bolts -arrows- for support arm of engine mounting as far as stop by hand.



Note

There are two gearbox mountings with two and three threaded connections depending on the model. The procedure, however, is the same.

- First screw bolts -arrows- for gearbox mountings into stop by hand.



- Remove engine bracket -T10483A- from engine.
- Install starter ⇒ Electrical system; Rep. gr. 27; Starter; Assembly overview - starter.

Vehicles with manual gearbox:

- Bleed clutch mechanism ⇒ Rep. gr. 30; Clutch mechanism; Bleeding clutch mechanism.
- Install cables with cable support bracket ⇒ Rep. gr. 34; Selector mechanism; Assembly overview - selector cables.

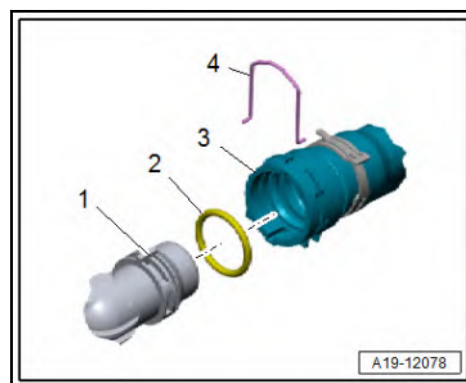


Vehicles with dual clutch gearbox

- Install selector lever cable, fit mechatronics connector and install all retainers on gearbox ⇒ Rep. gr. 34; Removing and installing gearbox.

Continued for all vehicles:

- Install catalytic converter ⇒ [a2.2 nd installing catalytic converter", page 407](#) .
- Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40; Drive shaft; Assembly overview - drive shaft.
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87; Air conditioner compressor; Assembly overview - drive unit of air conditioner compressor.
- Install poly V-belt ⇒ [a1.2 nd installing poly-V belt", page 66](#) .
- Electrical connections and routing ⇒ Electrical system; Rep. gr. 97; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Connect coolant hoses with plug-in connector.



- Moisten new O-ring -2- with coolant and insert in coolant hose -3-.
- Install radiator cowl ⇒ [a4.5 nd installing radiator cowl", page 306](#) .
- Install pendulum support ⇒ [a2.4 nd installing pendulum support", page 47](#) .
- Install wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66; Wheel housing liner; Assembly overview - front wheel housing liner.
- Install front wheels.
- Install battery tray. ⇒ Electrical system; Rep. gr. 27; Battery; Removing and installing battery tray
- Observe measures required after connecting battery ⇒ Electrical system; Rep. gr. 27; Battery; Disconnecting and connecting battery.
- Install engine control unit -J623- ⇒ [c6 ontrol unit", page 377](#) .
- Install air filter housing ⇒ [a3.2 nd installing air filter housing", page 359](#) .
- If removed beforehand, install vacuum pump for brakes -V192- ⇒ Brake system; Rep. gr. 47; Vacuum system; Assembly overview – vacuum pump.



- Check oil level ⇒ Maintenance; Booklet 819.



Note

- ◆ *Risk of damage to control units caused by overvoltage.*
- ◆ *Never use battery charging equipment for boost starting.*
- ◆ *Do not reuse coolant which has been drained off.*
- Add coolant ⇒ [a1.3 nd adding coolant", page 240](#) .

Torque settings



Note

- ◆ *The specified torques are only valid for nuts and bolts which have been slightly greased, oiled, phosphate-treated or black-oxidized.*
- ◆ *Additional lubricant such as engine oil or gear oil may be used, but do not use lubricant containing graphite.*
- ◆ *Do not use degreased parts.*
- ◆ *Tolerance for specified torques ± 15%.*

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

- ◆ Assembly mountings ⇒ [o2.1 verview – assembly mountings", page 34](#) .
- ◆ Securing gearbox to engine ⇒ Rep. gr. 34; Removing and installing gearbox; Specified torques for gearbox.



2 Assembly mountings

⇒ [o2.1 verview – assembly mountings”, page 34](#)

⇒ [a2.2 nd installing engine mounting”, page 40](#)

⇒ [a2.3 nd installing gearbox mounting”, page 43](#)

⇒ [a2.4 nd installing pendulum support”, page 47](#)

⇒ [e2.5 ngine in installation position”, page 48](#)

⇒ [a2.6 ssembly mountings”, page 58](#)

⇒ [a2.7 djustment of assembly mountings \(engine and gearbox mountings\)”, page 61](#)

2.1 Assembly overview – assembly mountings

⇒ [o2.1.1 verview – assembly mountings, Golf 2020, Golf Estate 2021 ”, page 34](#)

⇒ [o2.1.2 verview – assembly mountings, Polo 2018, T-Roc, T-Cross, T-Roc Cabrio”, page 37](#)

2.1.1 Assembly overview – assembly mountings, Golf 2020, Golf Estate 2021



1 - Engine mounting

- ☐ With support arm
- ☐ Removing and installing ⇒ [a2.2 nd installing engine mounting", page 40](#)

2 - Bolt

- ☐ Renew
- ☐ 23 Nm +90°

3 - Hanger bolt

- ☐ Renew
- ☐ 40 Nm +90°

4 - Bracket

5 - Bolt

- ☐ 9 Nm

6 - Nut

- ☐ 9 Nm

7 - Earth strap

8 - Hanger bolt

- ☐ Renew
- ☐ 60 Nm +90°

9 - Bolt

- ☐ Renew
- ☐ 60 Nm +90°

10 - Gearbox mounting

- ☐ With support arm
- ☐ Removing and installing ⇒ [a2.3 nd installing gearbox mounting", page 43](#)

11 - Bolt

- ☐ Renew
- ☐ 60 Nm +90°



Note

There are two gearbox mountings with two and three threaded connections depending on the model. The procedure, however, is the same.

12 - Bolt

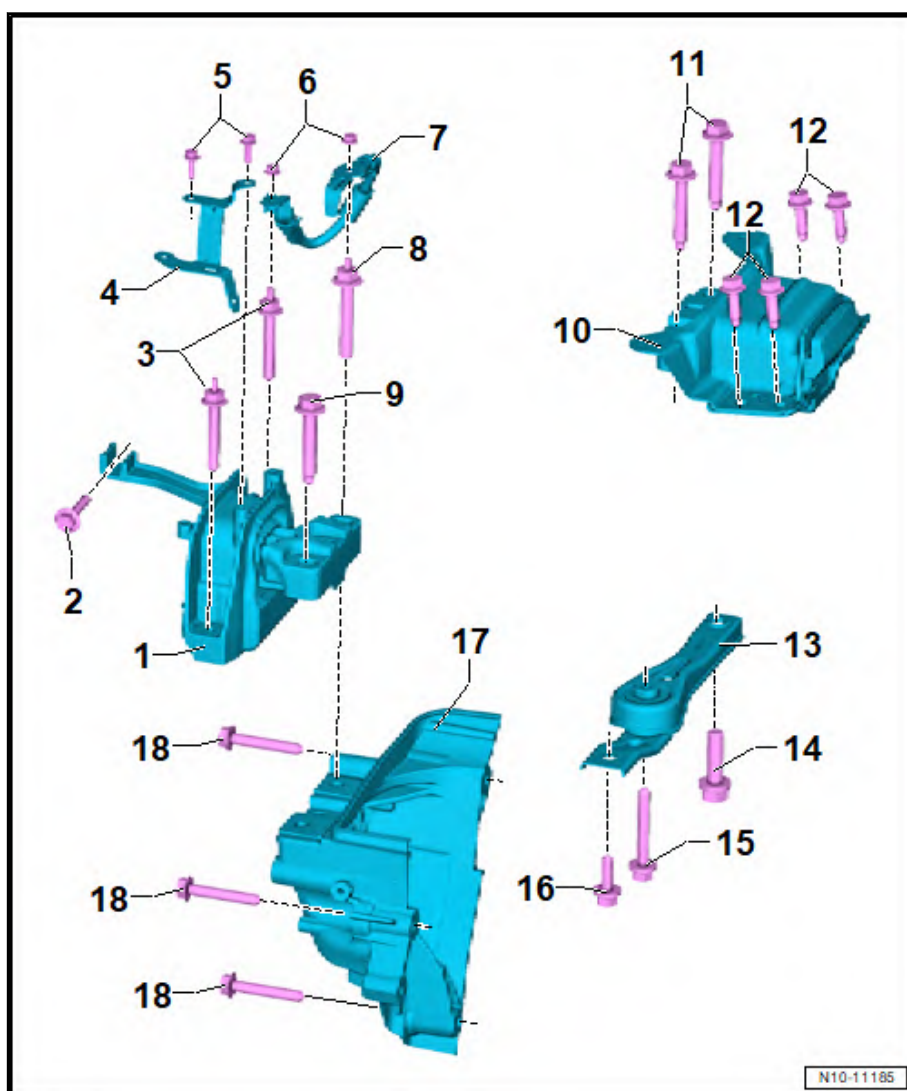
- ☐ Renew
- ☐ 50 Nm +90°

13 - Pendulum support

- ☐ Removing and installing ⇒ [page 47](#)

14 - Bolt

- ☐ Renew
- ☐ Specified torque and tightening sequence ⇒ [page 36](#)



N10-11185



15 - Bolt

- ☐ Renew
- ☐ Specified torque and tightening sequence ➤ [page 36](#)

16 - Bolt

- ☐ Renew
- ☐ Specified torque and tightening sequence ➤ [page 36](#)

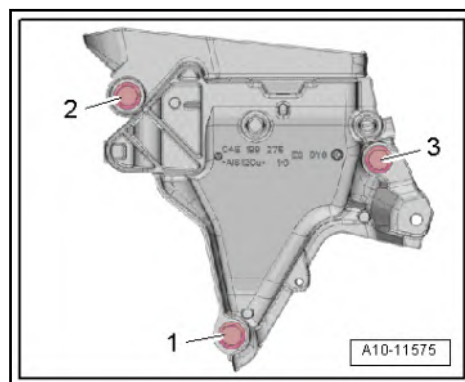
17 - Engine support

- ☐ Due to restricted space, push engine support to one side
- ☐ Removing and installing ➤ [page 73](#)
- ☐ Specified torque and tightening sequence ➤ [page 36](#)

18 - Bolt

- ☐ Renew
- ☐ Specified torque and tightening sequence ➤ [page 36](#)

Engine support - specified torque and installation sequence



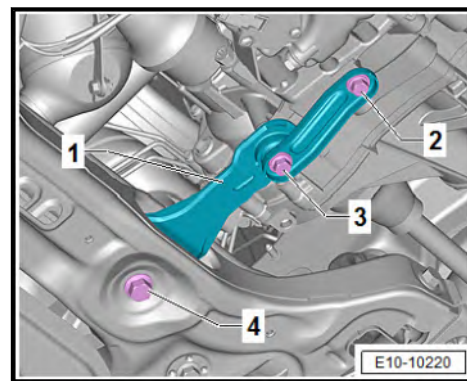
Note

- ◆ *If specified torque and tightening sequence are not adhered to, used bolts may become loose.*
- ◆ *Renew bolts that are tightened with turning further angle.*

– Tighten bolts in stages in the sequence shown.

Stage	Bolts	Specified torque/turning further angle
1st	-1- to -3-	7 Nm
2nd	-1- to -3-	40 Nm
3rd	-1- to -3-	Turn 90° further

Pendulum support - specified torque and tightening sequence



Note

Renew bolts that are tightened with turning further angle.

- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Specified torque/turning further angle
1st	-2-, -3-	50 Nm
2nd	-4-	130 Nm
3rd	-2- to -4-	Turn 90° further

2.1.2 Assembly overview – assembly mountings, Polo 2018, T-Roc, T-Cross, T-Roc Cabrio



1 - Bolt

- ☐ Renew
- ☐ Specified torque and tightening sequence ⇒ [page 39](#) ⇒ [page 39](#)

2 - Engine support

- ☐ Due to restricted space, push engine support to one side
- ☐ Removing and installing ⇒ [page 73](#)
- ☐ Specified torque and tightening sequence ⇒ [page 39](#)

3 - Engine mounting

- ☐ Removing and installing ⇒ [a2.2 nd installing engine mounting", page 40](#)

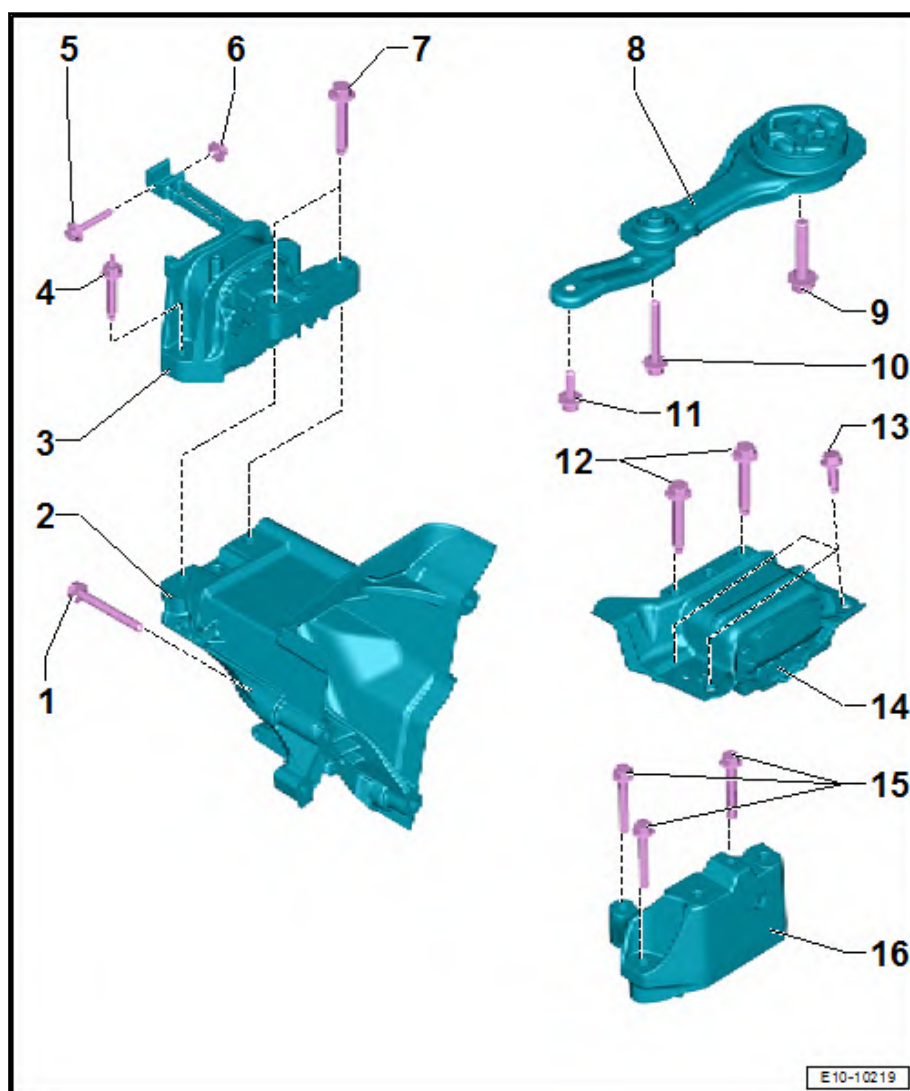
4 - Bolt

- ☐ Renew
- ☐ 40 Nm +90°

5 - Bolt

- ☐ Renew

6 - Nut



Note

If nut is firmly welded, do not renew it. Tighten to specified torque via bolt ⇒ [Item 5 \(page 38\)](#) .

- ☐ Renew
- ☐ 20 Nm +90°

7 - Bolt

- ☐ Renew
- ☐ 60 Nm +90°

8 - Pendulum support

- ☐ Removing and installing ⇒ [page 47](#)

9 - Bolt

- ☐ Renew
- ☐ 130 Nm +90°
- ☐ Tightening sequence ⇒ [page 39](#)

10 - Bolt

- ☐ Renew
- ☐ 50 Nm +90°



- ☐ Tightening sequence ➔ [page 39](#)

11 - Bolt

- ☐ Renew
- ☐ 50 Nm +90°
- ☐ Tightening sequence ➔ [page 39](#)

12 - Bolt

- ☐ Renew
- ☐ 60 Nm +90°



Note

There are two gearbox mountings with two and three threaded connections depending on the model. The procedure, however, is the same.

13 - Bolt

- ☐ Renew
- ☐ 50 Nm +90°

14 - Gearbox mounting

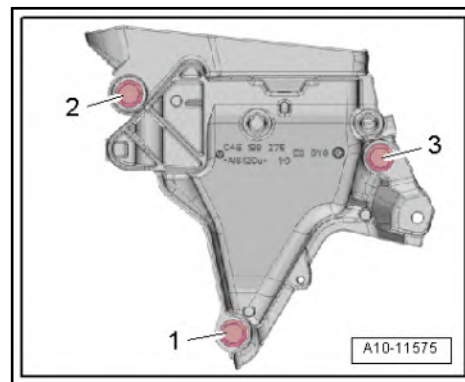
- ☐ Removing and installing ➔ [a2.3 nd installing gearbox mounting", page 43](#)

15 - Bolt

- ☐ Renew
- ☐ 40 Nm +90°

16 - Gearbox bracket

Engine support - specified torque and tightening sequence



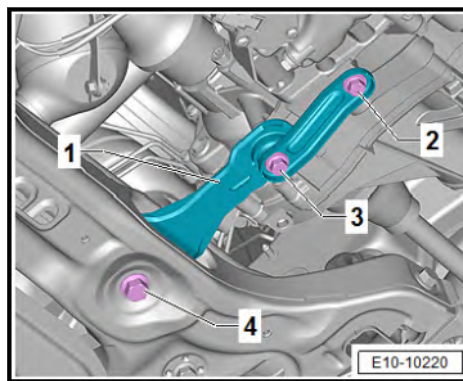
Note

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

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Specified torque/turning further angle
1st	-1- to -3-	7 Nm
2nd	-1- to -3-	40 Nm
3rd	-1- to -3-	Turn 90° further

Pendulum support - specified torque and tightening sequence



Note

Renew bolts that are tightened with turning further angle.

- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Specified torque/turning further angle
1st	-2-, -3-	50 Nm
2nd	-4-	130 Nm
3rd	-2- to -4-	Turn 90° further

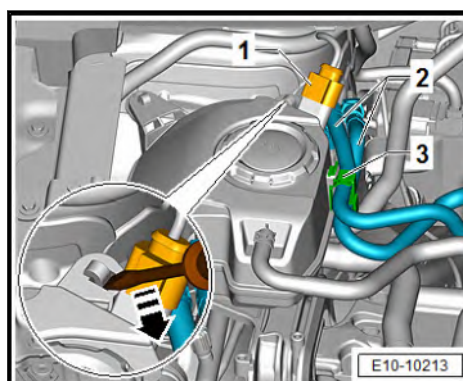
2.2 Removing and installing engine mounting

⇒ [a2.2.1 nd installing engine mounting, Golf 2020, Golf Estate 2021", page 40](#)

⇒ [a2.2.2 nd installing engine mountings, Polo 2018, T-Roc, T-Cross, T-Roc Cabrio", page 41](#)

2.2.1 Removing and installing engine mounting, Golf 2020, Golf Estate 2021

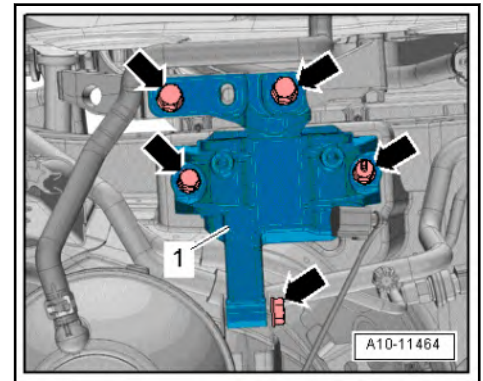
Removing



- Open retainer -3-.
- Lay fuel hoses -2- to one side.
- Disconnect electrical connector -1-.
- Release retaining tabs in direction of -arrow- and place coolant expansion tank aside.
- Unscrew earth wire from engine mounting.



- Support engine in installation position. ⇒ [e2.5 engine in installation position](#), page 48



- Unscrew bolts -arrows- and remove engine mounting -1-.

Installing



Note

- ◆ *If specified torque and tightening sequence are not adhered to, used bolts may become loose.*
- ◆ *Renew bolts that are tightened with turning further angle.*

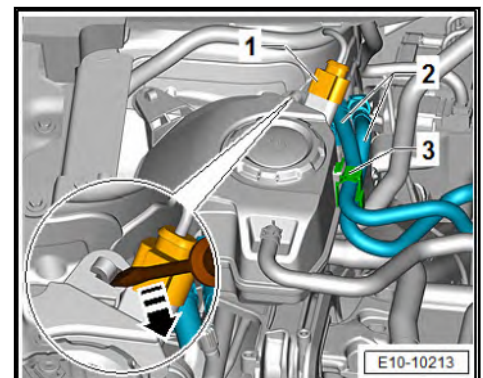
Install in reverse order of removal.

Torque settings

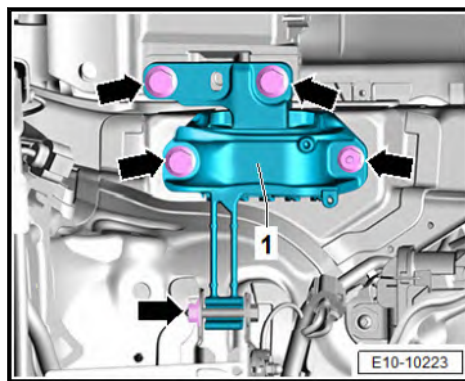
- ◆ ⇒ [o2.1 overview – assembly mountings](#), page 34

2.2.2 Removing and installing engine mountings, Polo 2018, T-Roc, T-Cross, T-Roc Cabrio

Removing



- Open locking device -3-, and move aside lines -2- of fuel supply system and activated charcoal filter.
- Disconnect electrical connector -1-.
- Seal open lines and connections with suitable plugs from engine bung set -VAS 6122-.
- Release catches in direction of -arrow- with a screwdriver and move coolant expansion tank to one side.
- Support engine in its installation position ⇒ [page 48](#).
- Unscrew bolts -arrows- and remove engine mounting -1-.



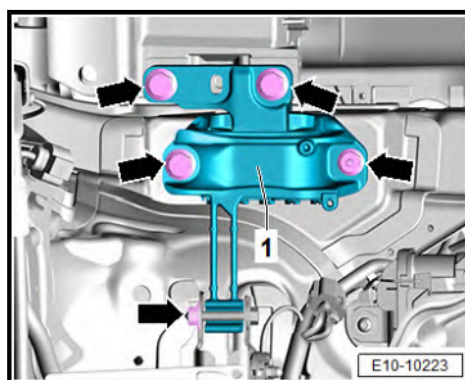
Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Renew bolts that are tightened with turning further angle.*
 - ◆ *Risk of damage to threads by starting bolts at an angle.*
 - ◆ *Do not remove support bracket -10 - 222 A- until the bolts securing the assembly mounting have been tightened to specified torque.*
- First screw in bolts -arrows- for engine mounting -1- onto stop by hand.



- Tighten bolts -arrows- ⇒ [o2.1 verview – assembly mountings](#), page 34 .
- Checking adjustment of assembly mountings ⇒ [a2.7 djustment of assembly mountings \(engine and gearbox mountings\)](#), page 61 .
- Remove support bracket -10 - 222 A- from engine.

Torque settings

- ◆ ⇒ [o2.1 verview – assembly mountings](#), page 34



2.3 Removing and installing gearbox mounting

⇒ [a2.3.1 nd installing gearbox mounting, Golf 2020, Golf Estate 2021", page 43](#)

⇒ [a2.3.2 nd installing gearbox mounting, Polo 2018 , T-Roc, T-Cross, T-Roc Cabrio", page 45](#)

2.3.1 Removing and installing gearbox mounting, Golf 2020, Golf Estate 2021

Removing

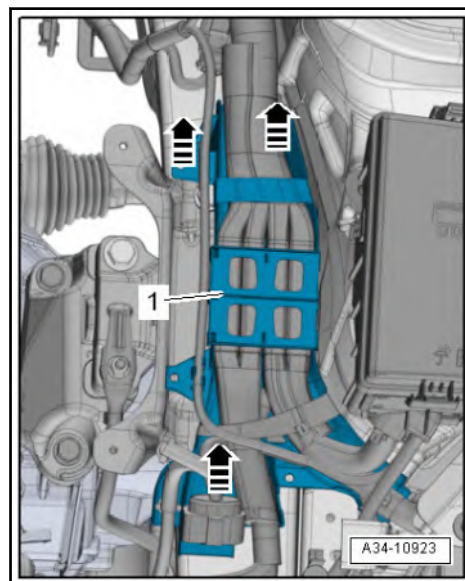
- Remove air filter housing ⇒ [a3.2 nd installing air filter housing", page 359](#) .
- Remove battery tray ⇒ Electrical system; Rep. gr. 27; Battery; Removing and installing battery tray.
- Remove engine control unit ⇒ [a6.2 nd installing engine control unitJ623", page 377](#) .
- Unscrew nuts -arrows- and remove bracket -1-.



Note

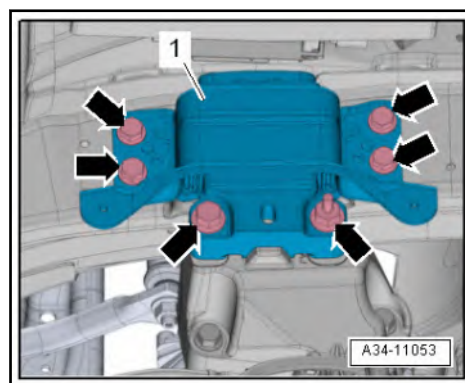
Different types of brackets are fitted depending on version.

- Unclip wire guide -1- upwards -arrows-, and push it slightly to one side.



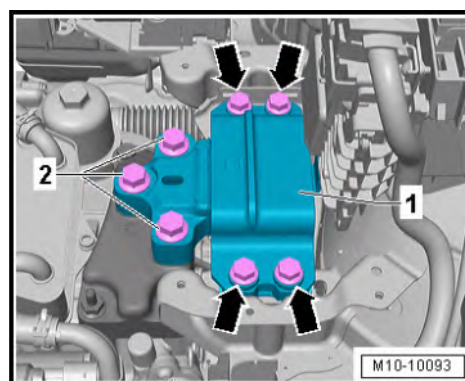
- Support engine in its installation position ⇒ [e2.5 engine in installation position](#), page 48 .

Vehicles with 2 gearbox securing bolts:



- Remove bolts -arrows- and detach gearbox mounting -1-.

Vehicles with 3 gearbox securing bolts:



- Unscrew bolts -2-. Then unscrew bolts -arrows-, and remove gearbox mounting -1-.

Installing

Install in reverse order of removal, observing the following:



Note

Renew bolts that are tightened with specified further tightening angle.

- Gearbox support and support arm of gearbox mounting must be perfectly parallel to each other before screwing in bolts.
- If necessary, lift gearbox at rear using trolley jack.
- Do not remove support bracket -10 - 222 A- until the bolts securing the assembly mounting have been tightened to specified torque.
- Lift gearbox with spindle of support bracket until gearbox support makes contact with support arm of gearbox mounting.
- Remove support bracket -10 - 222 A- from engine.

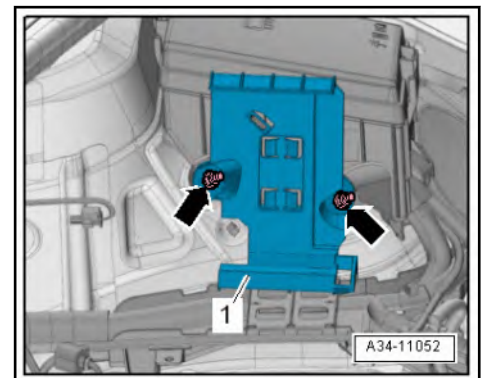
Torque settings

- ◆ [⇒ o2.1 verview – assembly mountings”, page 34](#)
- ◆ [⇒ o3.1 verview - air filter housing”, page 357](#)
- ◆ ⇒ Electrical system; Rep. gr. 27; Battery; Assembly overview - battery
- ◆ [⇒ a6.2 nd installing engine control unitJ623”, page 377](#)

2.3.2 Removing and installing gearbox mounting, Polo 2018 , T-Roc, T-Cross, T-Roc Cabrio

Removing

- Remove air filter housing [⇒ page 359](#) .
- Disconnect earth wire from battery terminal ⇒ Electrical system; Rep. gr. 27; Battery, Disconnecting and connecting battery.
- Remove battery tray ⇒ Electrical system; Rep. gr. 27; Battery; Removing and installing battery tray.
- Remove engine control unit -J623- [⇒ a6.2 nd installing engine control unitJ623”, page 377](#) .
- Unscrew nuts -arrows- and remove bracket -1-.

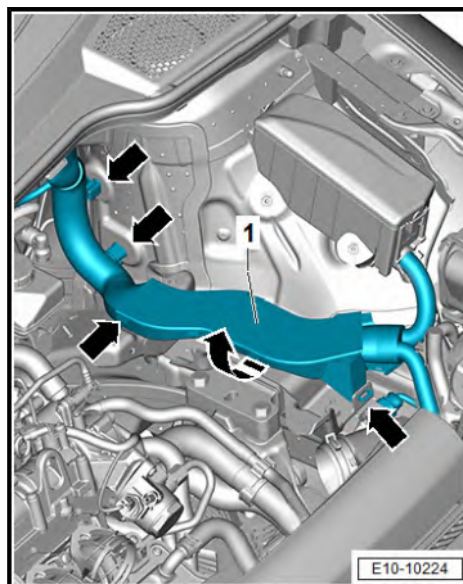




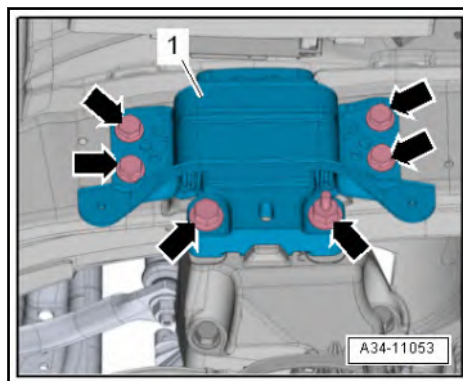
Note

Different types of brackets are fitted depending on version.

- Detach line guide -1- from its anchorage points -arrows-, push upwards in direction of -arrow- and secure to one side.



- Support engine in its installation position ⇒ [page 48](#) .
- Tighten spindle slightly to take up weight of engine/gearbox assembly; do not lift.
- Unscrew bolts -arrows- and remove gearbox mounting -1-.



Installing

Install in reverse order of removal, observing the following:



Note

- ♦ *Risk of damage to threads by starting bolts at an angle.*
- ♦ *Renew bolts that are tightened with turning further angle after each removal.*
- Lift gearbox with spindle of support bracket until gearbox support makes contact with support arm of gearbox mounting.



- Checking adjustment of assembly mountings ⇒ [a2.7 adjustment of assembly mountings \(engine and gearbox mountings\)", page 61](#) .
- Install engine control unit -J623- ⇒ [page 377](#) .
- Install battery tray ⇒ Electrical system; Rep. gr. 27; Battery; Removing and installing battery tray.
- Connect earth wire to battery terminal ⇒ Electrical system; Rep. gr. 27; Battery, Disconnecting and connecting battery.
- Remove support bracket -10 - 222 A- from engine.

Torque settings

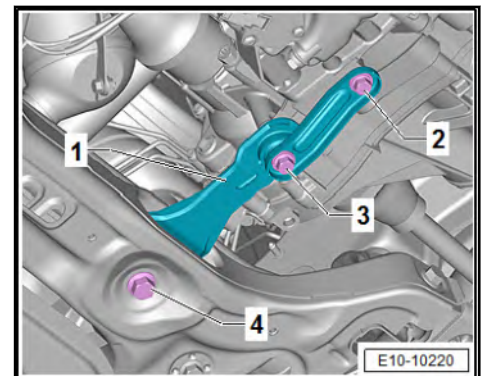
- ◆ ⇒ [o2.1 overview – assembly mountings", page 34](#)
- ◆ ⇒ Electrical system; Rep. gr. 27; Battery; Assembly overview - battery

2.4 Removing and installing pendulum support

⇒ [a2.4.1 nd installing pendulum support", page 47](#)

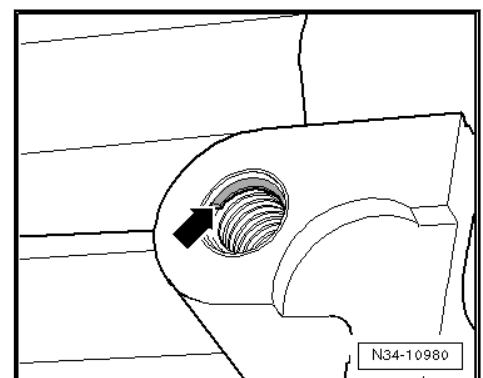
2.4.1 Removing and installing pendulum support

Removing



- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Unscrew bolts -2, 3, 4-.
- Pull out pendulum support -1- from subframe.

Installing



Install in reverse order of removal, observing the following:



Note

- ◆ *There are threaded inserts, e.g. "Heli-Coil" in the bolting holes for the pendulum support.*
- ◆ *The shoulder on the first thread pitch -arrow- is an identifying feature.*

Torque settings

- ◆ [⇒ o2.1 verview – assembly mountings", page 34](#)

2.5 Supporting engine in installation position

[⇒ e2.5.1 ngine in installation position, Golf 2020, Golf Estate 2021 ", page 48](#)

[⇒ e2.5.2 ngine in installation position, Polo 2018 ", page 51](#)

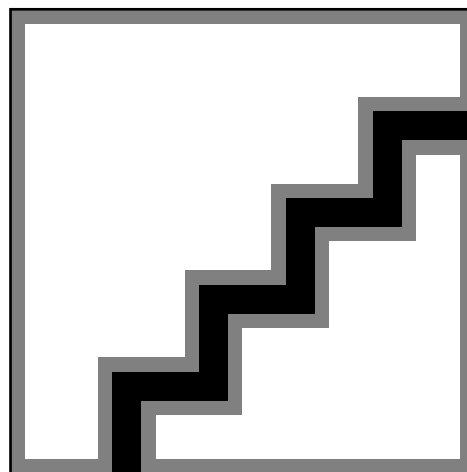
[⇒ e2.5.3 ngine in installation position, T-Roc, T-Roc Cabrio", page 52](#)

[⇒ e2.5.4 ngine in installation position, T-Cross", page 56](#)

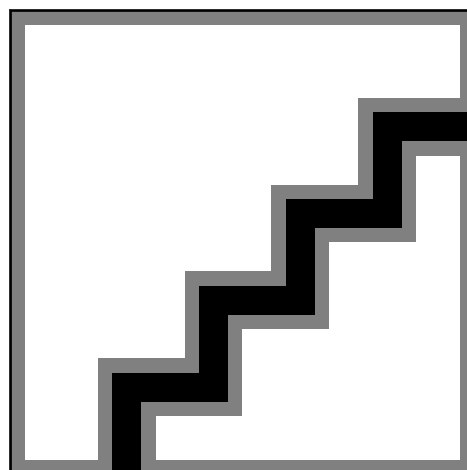
2.5.1 Supporting engine in installation position, Golf 2020, Golf Estate 2021

Special tools and workshop equipment required

- ◆ Support bracket -10-222B-

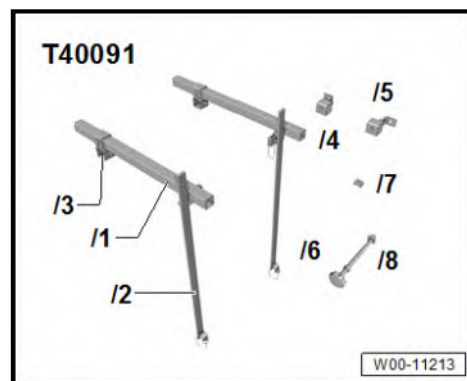


- ◆ Adapter -10-222A/1A-

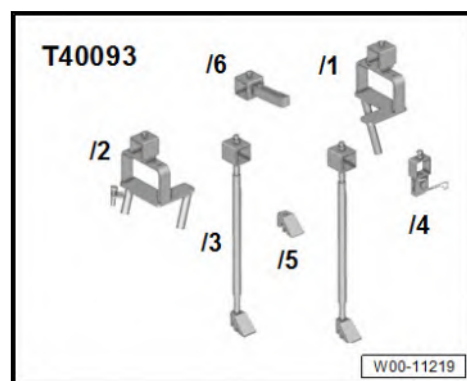




- ◆ Square tube -T40091/1-, qty. 1



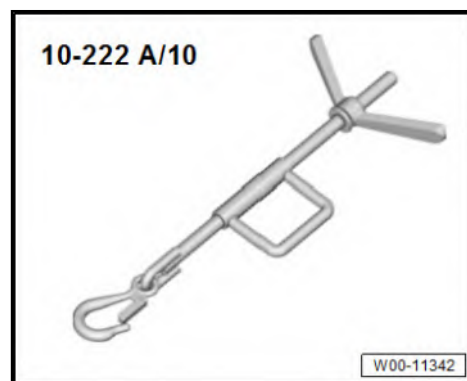
- ◆ Connecting piece -T40091/3-, qty. 1
- ◆ Spindle from engine support supplementary set -T40093 /3-, qty. 1



- ◆ Adapter -T40093/3-6A-, qty. 1



- ◆ Spindles -10-222A/10-, qty. 2





- ◆ Shackle -10-222A/12-, qty. 1

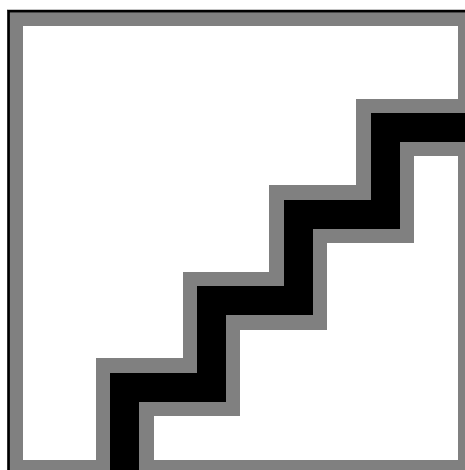
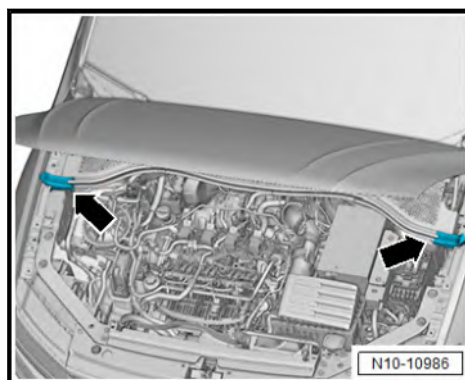


Procedure

WARNING

Risk of injury due to improper handling of the support bracket. Improper handling can lead to damage of the tool and subsequent injuries.

- Never loosen and dismantle the engine and gearbox mountings at the same time to avoid overloading of the support bracket.
- Remove air intake pipe. ➔ [a2.5 nd installing air pipe", page 336](#)
- Remove foam elements -arrows- for plenum chamber seal on left and right.
- Bolt adapter -10-222A/1A- -A- to right of support bracket -10-222B- -B-.



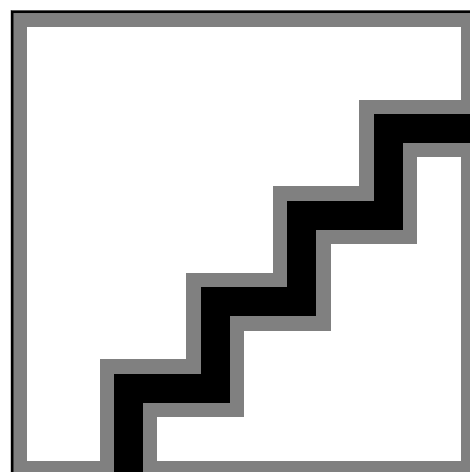


- Push connecting piece -T40091/3- -D- onto square tube of support bracket -10-222B- -B-.
- Bolt adapter -10-222A/1A- -A- to support bracket -10-222B- on left and place on vehicle.
- Fit adapter-T40093/3-6A- -H- with adapter -T40093/3- -G- on right longitudinal member.
- Push square tube -T40091/1- -E- in adapter -T40093/3- -G- on right-hand side.
- Guide two spindles -10-222A/10- -C- on square tube -T40091/1- -E- as shown in diagram.
- Push square tube -T40091/1- -E- into connector -T40091/3- -D-.
- Attach right spindle -10-222A/10- -C- to right lifting eye of engine with aid of shackle -10-222A/12- -F-.
- Attach left spindle -10-222A/10- -C- to left lifting eye of engine.
- Align support bracket.
- Tighten all threaded connections of support bracket.
- Tighten spindle slightly to take up weight of engine/gearbox assembly; do not lift.

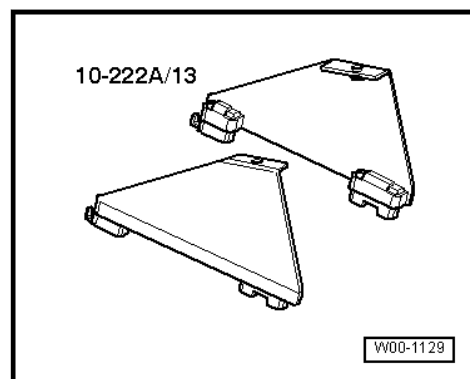
2.5.2 Supporting engine in installation position, Polo 2018

Special tools and workshop equipment required

- ◆ Support bracket -10-222B-

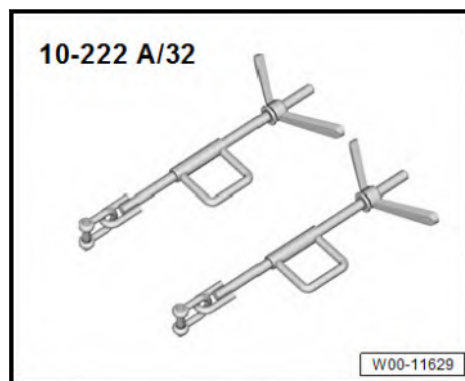


- ◆ Adapter -10-222A/13-





♦ Adapter -10-222A/32-

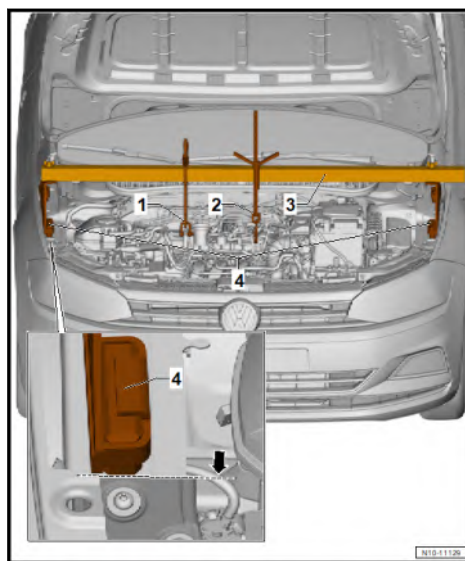


⚠ WARNING

Risk of injury due to improper handling of the support bracket. Improper handling can lead to damage of the tool and subsequent injuries.

- Never loosen and dismantle the engine and gearbox mountings at the same time to avoid overloading of the support bracket.

Procedure



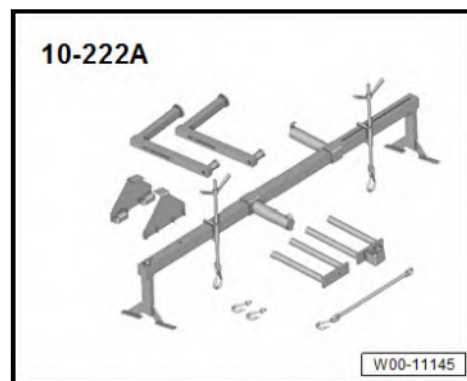
- Secure support bracket -10 - 222 A- -3- with adapters -10-222A/13- -4-, adapter -10-222A/32- -1- and spindle -10-222A/11- -2- on cylinder head as shown.
- Take up weight of engine/gearbox assembly.

2.5.3 Supporting engine in installation position, T-Roc, T-Roc Cabrio

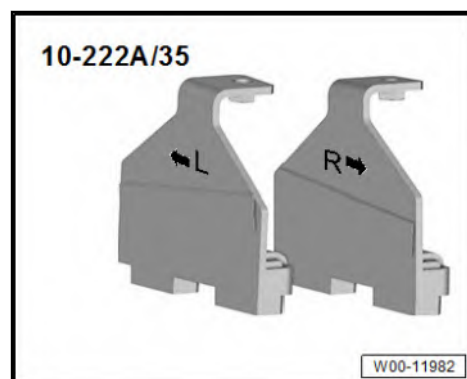
Special tools and workshop equipment required



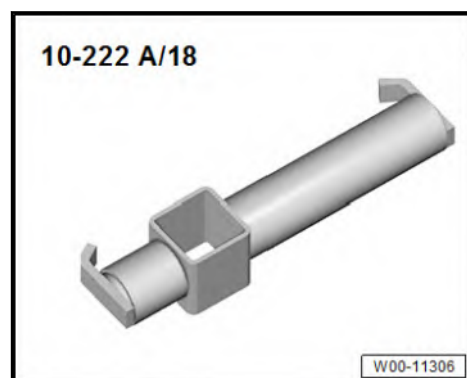
◆ Support bracket -10 - 222 A-



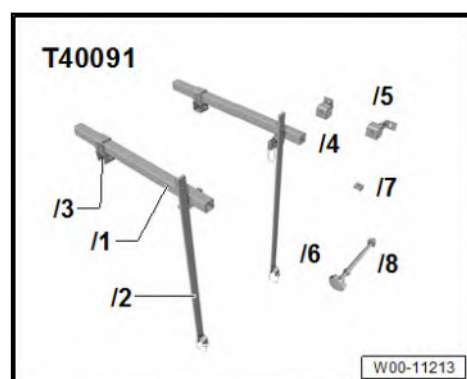
◆ Adapter -10-222A/35-



◆ Adapter -10-222A/18-

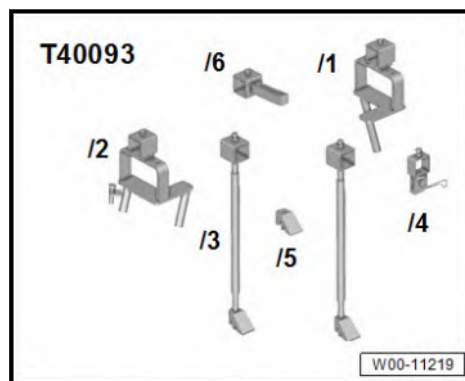


◆ Engine support basic set -T40091-





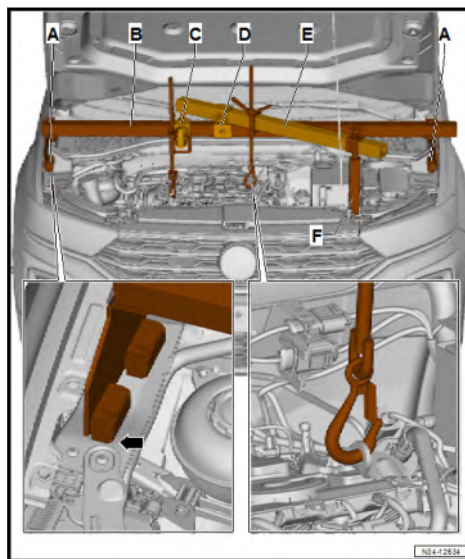
◆ Spindle -T40093/3-



◆ Adapter -T40093/3-6A-



Procedure



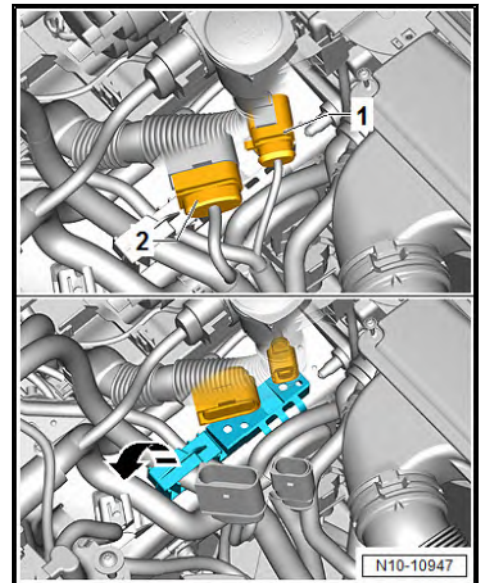
WARNING

Risk of injury due to improper handling of the support bracket. Improper handling can lead to damage of the tool and subsequent injuries.

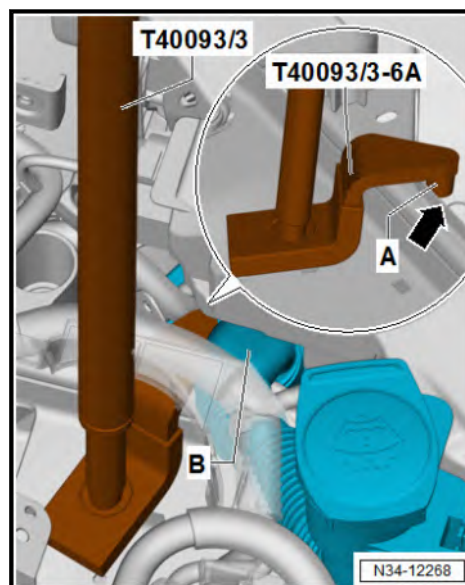
- Never loosen and dismantle the engine and gearbox mountings at the same time to avoid overloading of the support bracket.
- Remove air filter housing ⇒ [a3.2.1 nd installing air filter housing", page 359](#) .
- Remove air pipe ⇒ [a2.5 nd installing air pipe", page 336](#) .



- Fit support bracket -10-222 A- as follows:
 - A - Adapter -10-222A/35-
 - B - Support bracket -10 - 222 A-
 - C - Adapter -10-222A/18-
 - D - Engine support basic set -T40091/3-
 - E - Engine support basic set -T40091/1-
 - F - Spindle -T40093/3- with adapter -T40093/3-6A-
- Release and pull off connectors -1- and -2- on left longitudinal member.



- Release connector on retainer and unclip.
- Open locking element on retainer -arrow- on longitudinal member.
- Expose wiring harness leading to engine control unit on bracket.
- Expose positive wire to fuse carrier on bracket.
- Unclip wiring harness leading to engine control unit from bracket and on battery tray. Use release tool -T10236- for this.
- Lay wiring harnesses aside.
- Use release tool -T10236- to unclip bracket on longitudinal member and swivel to right.
- Place adapter -T40093/3-6A- onto left longitudinal member, right behind filler pipe for washer fluid reservoir.



- Adapter -T40093/3-6- is locked with pin -A- behind flange of longitudinal member -arrow-.
- Take up weight of engine/gearbox assembly and support bracket on spindles.

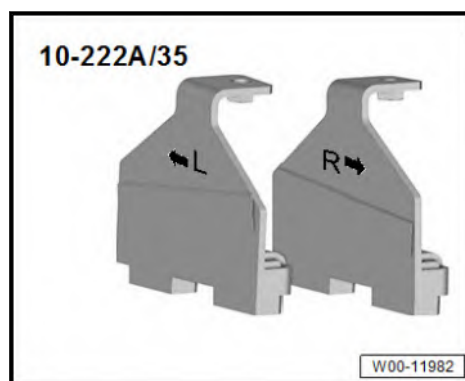
2.5.4 Supporting engine in installation position, T-Cross

Special tools and workshop equipment required

- ♦ Support bracket -10 - 222 A-

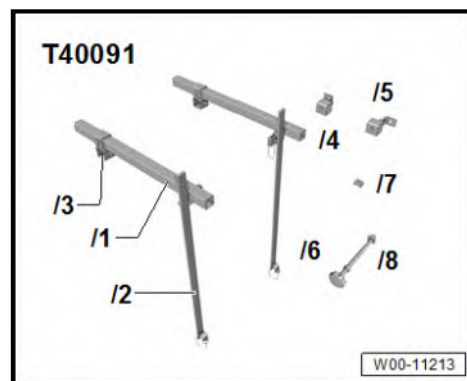


- ♦ Adapter -10-222A/35-

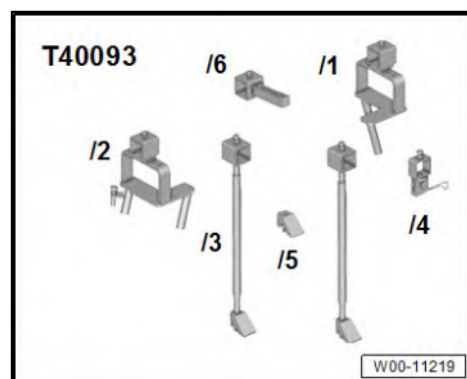




◆ Engine support basic set -T40091-



◆ Spindle -T40093/3-



◆ Adapter -T40093/3-6A-



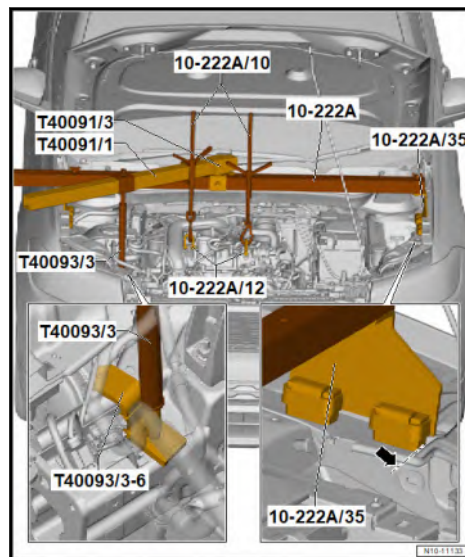
Setting up support bracket:



WARNING

Risk of injury due to improper handling of the support bracket. Improper handling can lead to damage of the tool and subsequent injuries.

- Never loosen and dismantle the engine and gearbox mountings at the same time to avoid overloading of the support bracket.
- Remove air filter housing. ➔ [a3.2 nd installing air filter housing", page 359](#)
- Unclip refrigerant line from right longitudinal member and from retainer.
- Push connecting piece -T40091/3- and hook -10-222A/10- onto support bracket -10-222 A-.



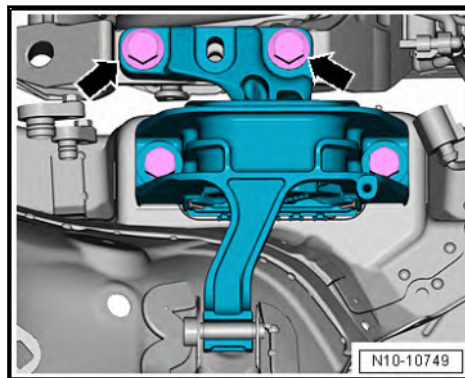
- Bolt support bracket -10-222 A- to adapter -10 - 222 A /35-, and fit it on vehicle.
- Push adapters -10 - 222 A /35- up to bead -arrow- of head-light carrier.
- Fit adapter -T40093/3-6A- with support -T40093/3- onto right longitudinal member.
- Push square tube -T40091/1- into mounting -T40093/3-.
- Push hook -10-222A/10- onto square tube -T40091/1-.
- Push square tube -T40091/1- into connecting piece - T40091/3-.
- Attach shackles -10 - 222 A /12- to lifting eyes of engine.
- Attach hooks -10-222A/10- to shackles -10 - 222 A /12-.

2.6 Adjusting assembly mountings

⇒ [a2.6.1 ssembly mountings", page 58](#)

2.6.1 Adjusting assembly mountings

Procedure

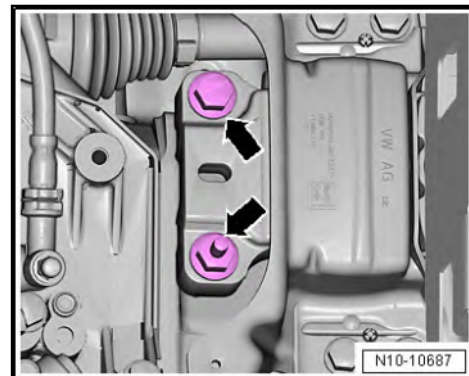


- Remove battery tray ⇒ Electrical system; Rep. gr. 27; Battery; Removing and installing battery tray.
- Remove air filter housing ⇒ [a3.2 nd installing air filter housing", page 359](#) .
- Support engine in its installation position ⇒ [e2.5.1 ngine in installation position, Golf 2020, Golf Estate 2021 ", page 48](#) .



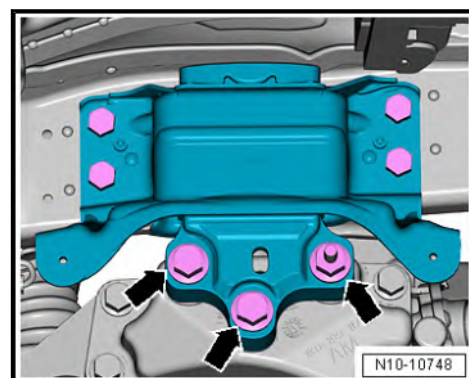
- Unscrew engine mounting bolts -arrows- one after the other and renew them (if not already renewed when installing engine).
- First screw bolts in loosely.

Vehicles with 2 gearbox securing bolts:



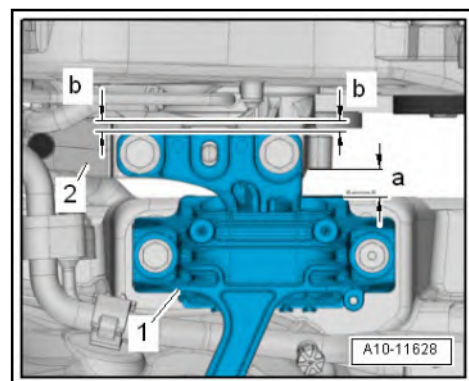
- Unscrew bolts -arrows- for gearbox mounting -1- in succession and renew (if not already carried out on installing engine).
- First screw bolts in loosely.

Vehicles with 3 gearbox securing bolts:



- Unscrew gearbox mounting bolts -arrows- one after the other, and renew them (if not already renewed when installing engine).
- First screw bolts in loosely.

Continued for all vehicles:



- Using assembly lever, adjust engine/gearbox assembly so that specifications listed below are attained:



- Distance -a- between engine support -2- and engine mounting -1- must be 10 mm.
- Side surface of engine support -2- must be located parallel to support arm of engine mounting -1-.
- Dimension -b- must be identical at front and rear.

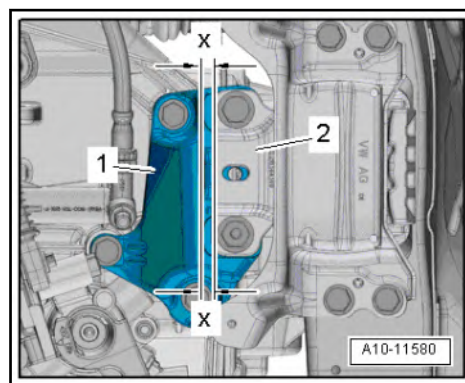


Note

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

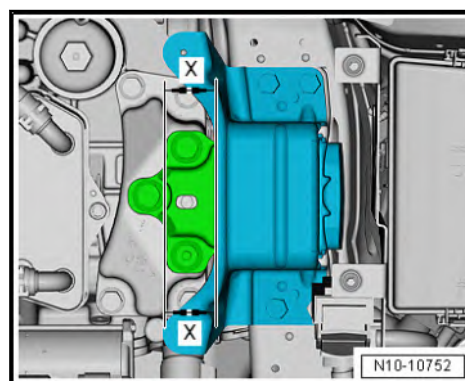
- Tighten bolts for engine mounting.

Vehicles with 2 gearbox securing bolts:



- On the gearbox side, ensure that the edges of the support arm -2- and gearbox support -1- are parallel.
- Distance -x- = distance -x-.
- Tighten bolts for gearbox mounting.

Vehicles with 3 gearbox securing bolts:



- On the gearbox side, ensure that the edges of the support arm and gearbox support are parallel.
- Distance -x- = distance -x-.

Installing:

Install in reverse order of removal.

Torque settings

- ♦ ⇒ [o2.1 verview – assembly mountings”, page 34](#)
- ♦ ⇒ [o2.1 verview - charge air system”, page 328](#)



◆ ⇒ Electrical system; Rep. gr. 27; Battery; Assembly overview
- battery

◆ ⇒ [o3.1 verview - air filter housing", page 357](#)

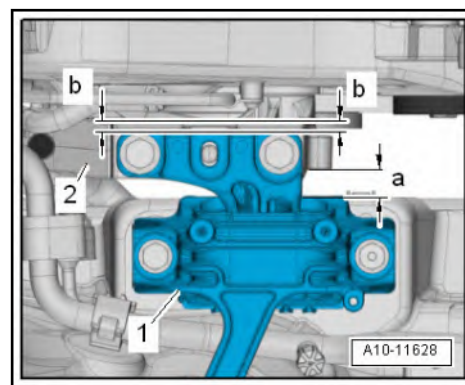
◆ ⇒ [o2.1 verview – assembly mountings", page 34](#)

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

⇒ [a2.7.1 djustment of assembly mountings \(engine and gearbox mountings\)", page 61](#)

2.7.1 Checking adjustment of assembly mountings (engine and gearbox mountings)

Procedure



The following specifications must be obtained:

- Distance -a- between engine support -2- and engine mounting -1- must be 10 mm.
- Side surface of engine support -2- must be located parallel to support arm of engine mounting -1-.
- Dimension -b- must be identical at front and rear.



Note

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

- If the dimension is too small or too high, adjust assembly mountings ⇒ [a2.6 ssembly mountings", page 58](#) .



13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ [o1.1 verview - poly V-belt drive", page 62](#)

⇒ [a1.2 nd installing poly-V belt", page 66](#)

⇒ [a1.3 nd installing tensioner for poly V-belt", page 69](#)

⇒ [a1.4 nd installing vibration damper", page 70](#)

⇒ [a1.5 nd installing engine support", page 73](#)

⇒ [c1.6 rankshaft oil seal - belt pulley end", page 76](#)

⇒ [a1.7 nd installing sealing flange on pulley end", page 79](#)

1.1 Assembly overview - poly V-belt drive

⇒ [o1.1.1 verview - poly V-belt drive, vehicles with air conditioner compressor", page 62](#)

⇒ [o1.1.2 verview – poly V-belt drive, vehicles with air conditioner compressor and starter-alternator", page 64](#)

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



1 - Poly V-belt

- ☐ Check for wear
- ☐ Before removing, mark direction of rotation with chalk or felt-tipped pen
- ☐ The length of the poly V-belt must be determined according to the ⇒ Electronic Parts Catalogue depending on the version of overrunning alternator pulley.
- ☐ Do not kink
- ☐ Poly V-belt routing ⇒ [page 67](#)
- ☐ When installing, make sure it is properly seated on pulleys.
- ☐ Removing and installing ⇒ [page 66](#)

2 - Bolt

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

3 - Vibration damper

- ☐ Removing and installing ⇒ [a1.4 nd installing vibration damper", page 70](#)

4 - Tensioning device for poly V-belt

- ☐ Pivot with socket to slacken poly V-belt
- ☐ Lock with locking pin -T10060 A-.
- ☐ Removing and installing ⇒ [a1.3 nd installing tensioner for poly V-belt", page 69](#)

5 - Bolt

- ☐ Renew
- ☐ 20 Nm +90°

6 - Bolt

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

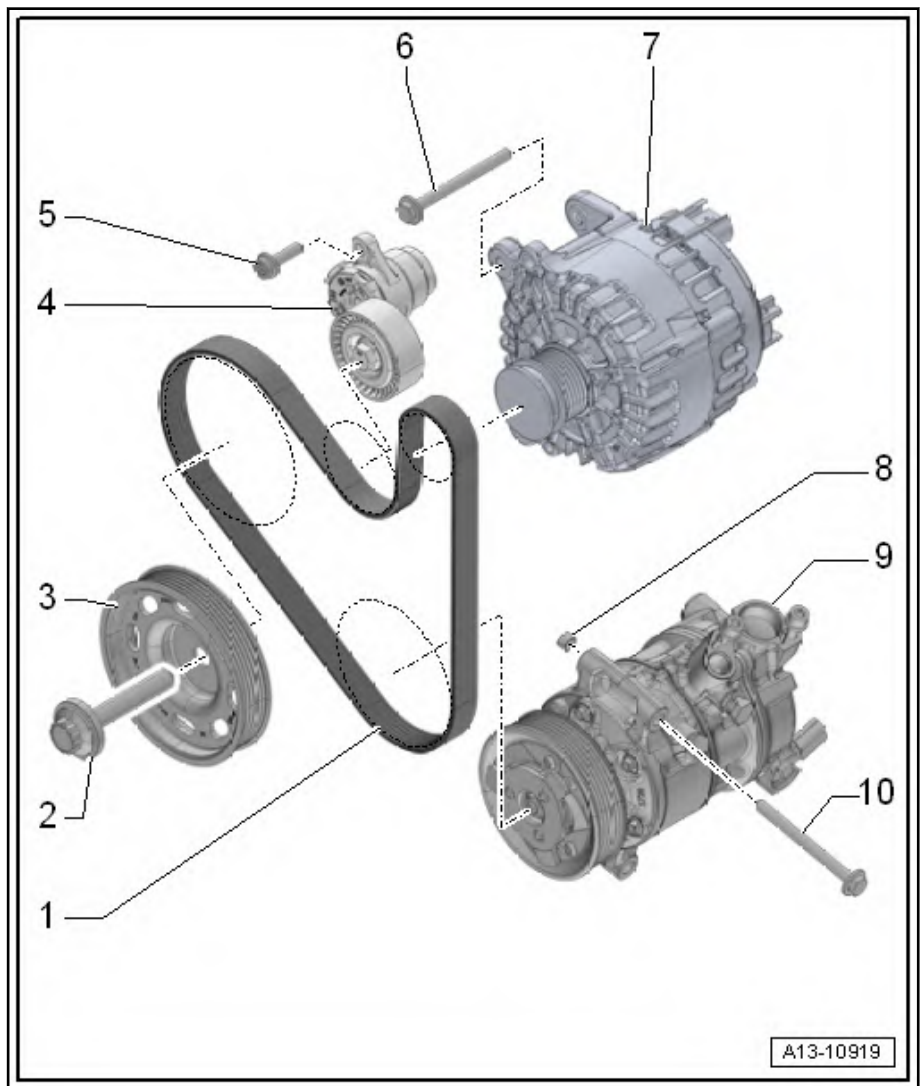
7 - Alternator

- ☐ With freewheel
- ☐ Various versions of the overrunning alternator pulley, -A- or -B-, may be fitted depending on the type and version of alternator. Allocation ⇒ [page 64](#) .
- ☐ The length of the poly V-belt must be determined according to the ⇒ Electronic Parts Catalogue depending on the version of overrunning alternator pulley.
- ☐ Removing and installing ⇒ Electrical system; Rep. gr. 27; Alternator; Removing and installing alternator

8 - Dowel sleeve

- ☐ For air conditioner compressor

9 - Air conditioner compressor



A13-10919

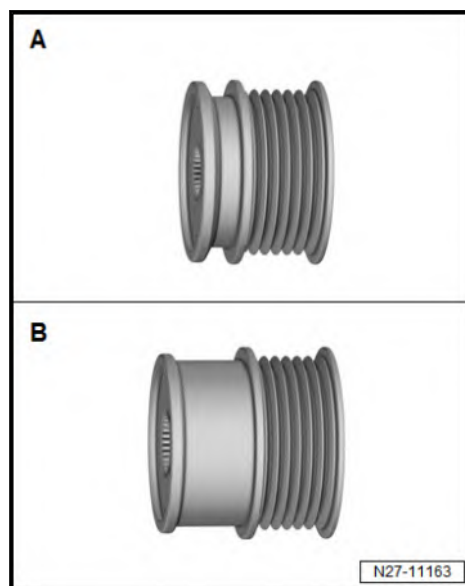


- ☐ Do not unscrew or disconnect refrigerant lines
- ☐ Removing and installing ⇒ Heating, air conditioning system; Rep. gr. 87; Air conditioner compressor; Removing and installing air conditioner compressor from and to bracket

10 - Bolt

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

Allocation of overrunning alternator pulley



1.1.2 Assembly overview – poly V-belt drive, vehicles with air conditioner compressor and starter-alternator



1 - Poly V-belt

- ☐ Check for wear
- ☐ Before removing, mark direction of rotation with chalk or felt-tipped pen
- ☐ Do not kink
- ☐ Removing and installing ⇒ [a1.2 nd installing poly-V belt", page 66](#)
- ☐ Poly V-belt routing ⇒ [page 65](#)
- ☐ When installing, make sure it is properly seated on pulleys.

2 - Vibration damper

- ☐ Different versions
⇒ Electronic parts catalogue
- ☐ Removing and installing ⇒ [a1.4 nd installing vibration damper", page 70](#)

3 - Bolt

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

4 - Bolt

- ☐ Renew after removal
- ☐ 8 Nm +90° diagonally in stages

5 - Bolt

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

6 - Starter-alternator -C29-

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

7 - Tensioning device for poly V-belt

- ☐ Removing and installing ⇒ [a1.3 nd installing tensioner for poly V-belt", page 69](#)

8 - Dowel sleeve

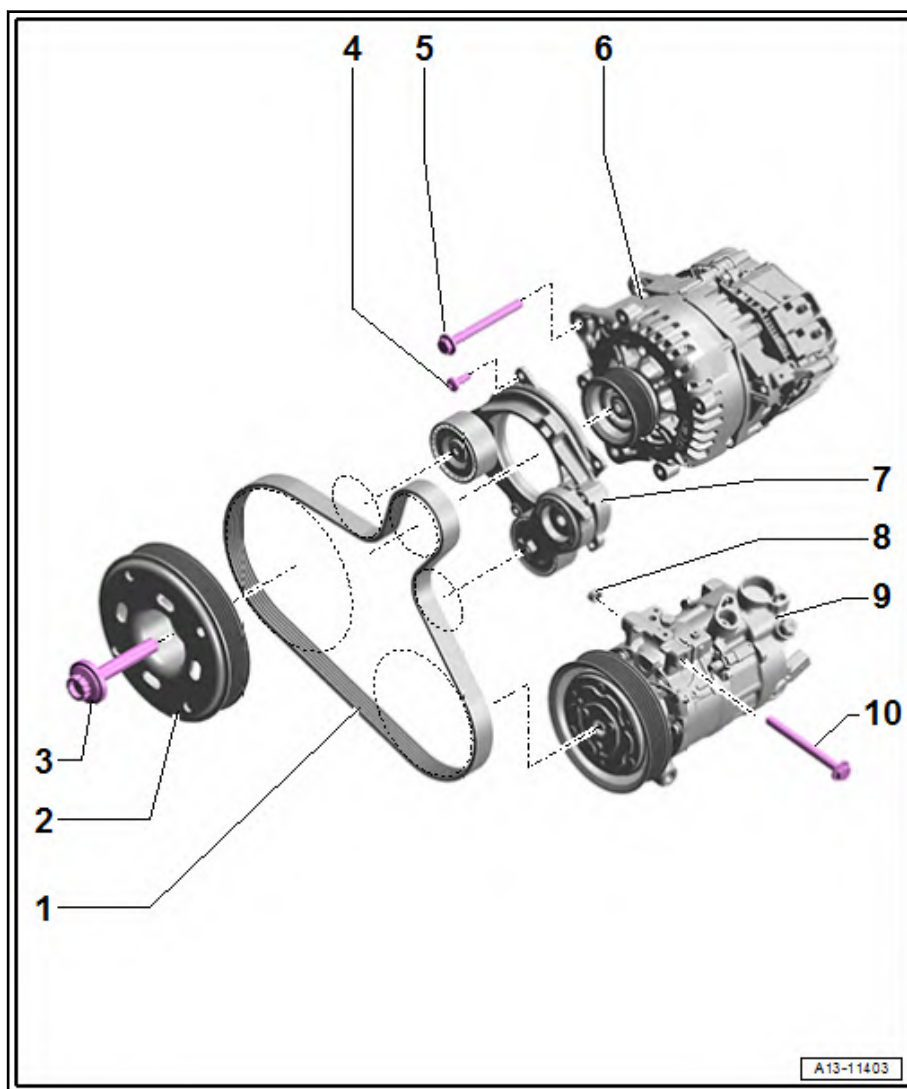
- ☐ For air conditioner compressor
- ☐ Qty. 2

9 - Air conditioner compressor

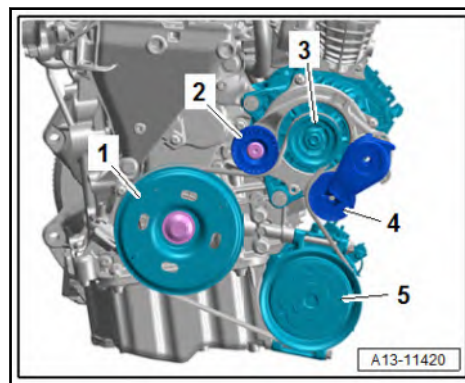
- ☐ Do not unscrew or disconnect refrigerant lines
- ☐ Removing and installing ⇒ Heating, air conditioning system; Rep. gr. 87; Air conditioner compressor; Removing and installing air conditioner compressor from and to bracket

10 - Bolt

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



Poly V-belt routing



- 1 - Vibration damper
- 2 - Idler roller
- 3 - Starter-alternator -C29-
- 4 - Tensioning device for poly V-belt
- 5 - Air conditioner compressor

1.2 Removing and installing poly-V belt

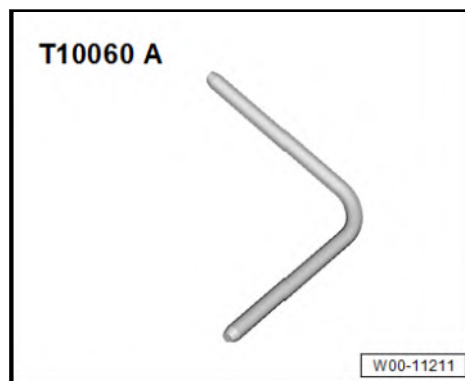
⇒ [a1.2.1 nd installing poly V-belt, vehicles with air conditioner compressor”, page 66](#)

⇒ [a1.2.2 nd installing poly V-belt, vehicles with air conditioner compressor and starter-alternator”, page 68](#)

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

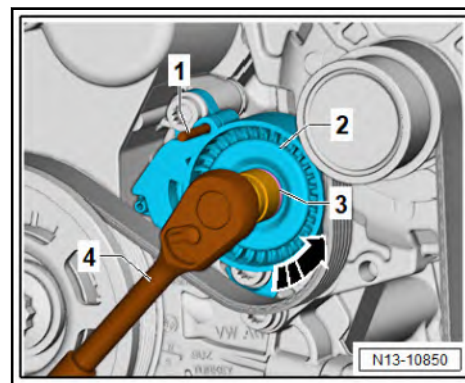
Special tools and workshop equipment required

- ◆ Locking pin -T10060 A-



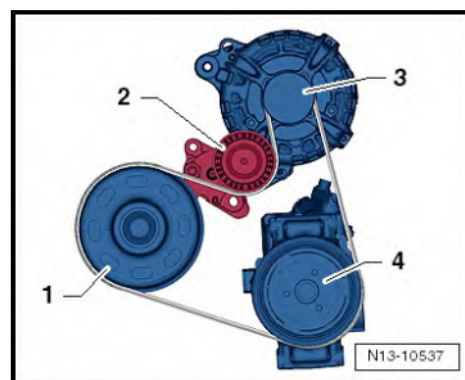
Removing

- Before removing, mark direction of rotation of poly V-belt with chalk or felt-tipped pen for re-installation.
- Fit tool -4- onto bolt of tensioner -3-.



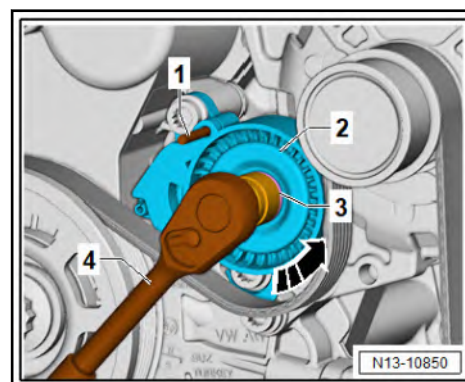
- To slacken poly V-belt push tool -4- in -direction of arrow-.
- Lock tensioner -2- in place with locking pin -T10060 A- -1-.
- Remove poly V-belt.

Installing



Install in reverse order of removal, observing the following:

- Fit poly V-belt as shown in illustration.
- 1 - Pulley
- 2 - Tensioning device for poly V-belt
- 3 - Alternator
- 4 - Air conditioner compressor
- Turn tensioning device -2- in direction of -arrow- and pull out locking pin -T10060 A-.



- Release tensioner.
- Check that poly V-belt is properly seated.
- Start engine and check that poly V-belt runs properly.



1.2.2 Removing and installing poly V-belt, vehicles with air conditioner compressor and starter-alternator

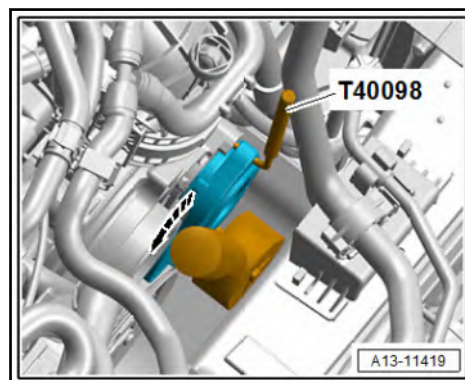
Special tools and workshop equipment required

- ◆ Locking tool -T40098-



Removing

- If poly V-belt is to be reinstalled, mark direction of rotation on belt using chalk or felt tip pen before removing.
- To relieve tension of poly V-belt, turn tensioner anti-clockwise -arrow-.

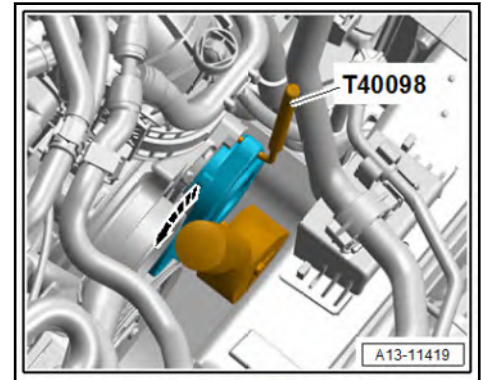


- Lock tensioner with locking tool -T40098-.
- Remove poly V-belt.

Installing

Install in reverse order of removal, observing the following:

- Fit poly V-belt ➤ [page 65](#) .
- Turn tensioning device in -direction of arrow- and withdraw locking tool -T40098-.



- Release tensioner.
- Check that poly V-belt is properly seated.
- Start engine and check that poly V-belt runs properly.

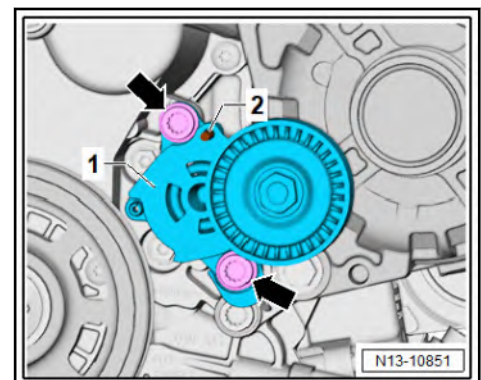
1.3 Removing and installing tensioner for poly V-belt

⇒ [a1.3.1 nd installing tensioner for poly V-belt, vehicles with air conditioner compressor](#), page 69

⇒ [a1.3.2 nd installing poly V-belt tensioner, vehicles with air conditioner compressor and starter-alternator](#), page 70

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

Removing



- Remove poly V-belt from tensioner ⇒ [a1.2.1 nd installing poly V-belt, vehicles with air conditioner compressor](#), page 66 .
- Remove bolts -arrows- and detach poly V-belt tensioner -1-.

Installing

Install in reverse order of removal, observing the following:

- Install poly V-belt ⇒ [a1.2.1 nd installing poly V-belt, vehicles with air conditioner compressor](#), page 66 .

Torque settings

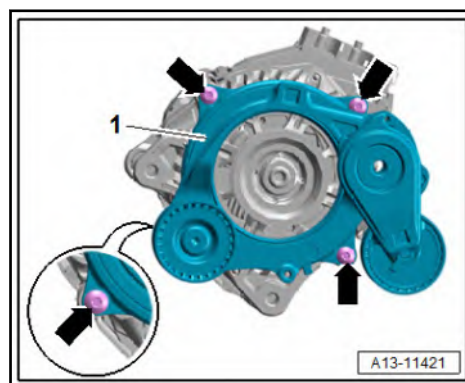
- ◆ Securing bolts ⇒ [o1.1.1 verview - poly V-belt drive, vehicles with air conditioner compressor](#), page 62



1.3.2 Removing and installing poly V-belt tensioner, vehicles with air conditioner compressor and starter-alternator

Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Remove poly V-belt ⇒ [a1.2 nd installing poly-V belt", page 66](#).
- Unscrew bolts -arrows- and remove tensioning device -1-.



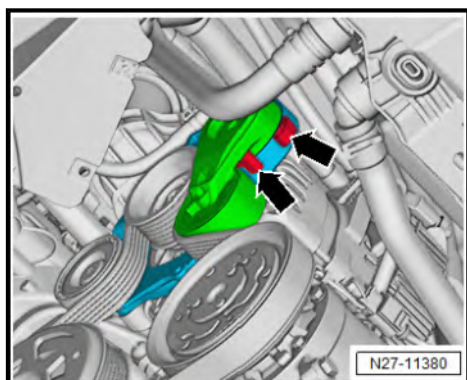
Installing

Install in reverse order of removal, observing the following:



Note

If one of the attachment points -arrows- is broken off, cracked or fractured, the entire omega bracket and the poly-V belt must be renewed.



If this is the case, the air-conditioner compressor pulley must also be checked for damage.

- Install poly V-belt. ⇒ [a1.2 nd installing poly-V belt", page 66](#)

Specified torques

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

1.4 Removing and installing vibration damper

Special tools and workshop equipment required



◆ Counter-hold tool -T10475-



Preparing counterhold tool -T10475-

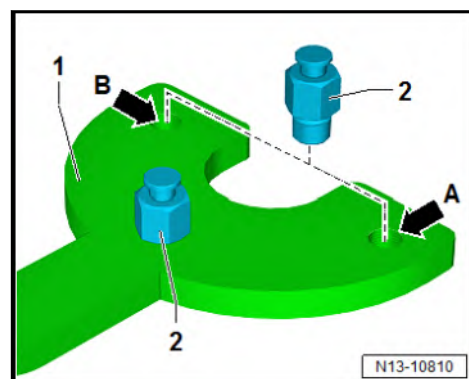


Note

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

Version 1

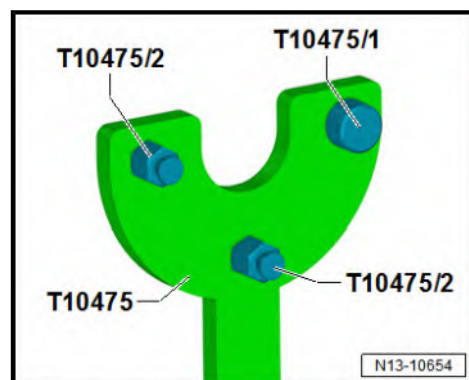
- Convert counterhold tool -T10475- -1- with inserts - T10475/2- -2-.



- To do this, use hole -A- or -B- of counter-hold tool -T10475- -1- depending on type of vibration damper.

Version 2

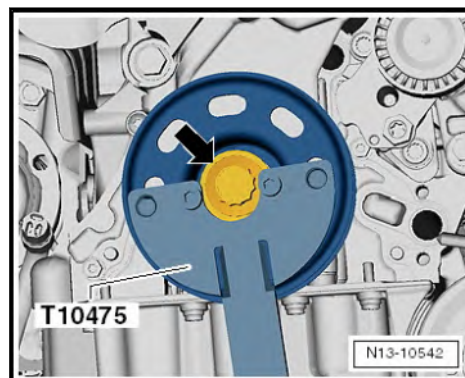
- Reassemble counterhold tool -T10475- with inserts - T10475/1- and -T10475/2- as shown in illustration.





Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Remove poly V-belt ⇒ [a1.2 nd installing poly-V belt", page 66](#) .
- Set engine to "TDC for cylinder no. 1" ⇒ [p4.7 iston to TDC position", page 111](#) .
- Loosen bolt -arrow- for vibration damper using counterhold -T10475-.



- Unscrew bolt and remove vibration damper.



NOTICE

Risk of damage to engine.

- To avoid disturbing valve timing, do not turn the crankshaft when the vibration damper has been removed.

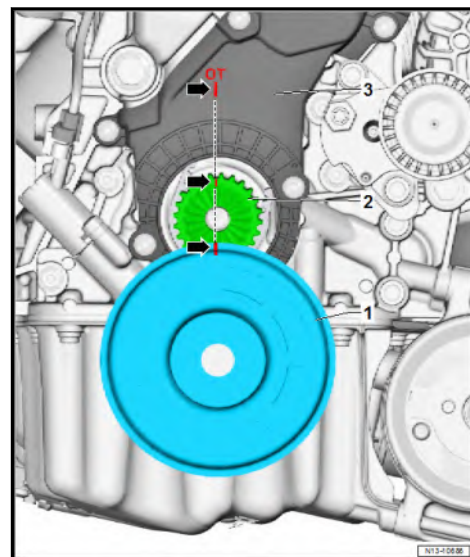
Installing



Note

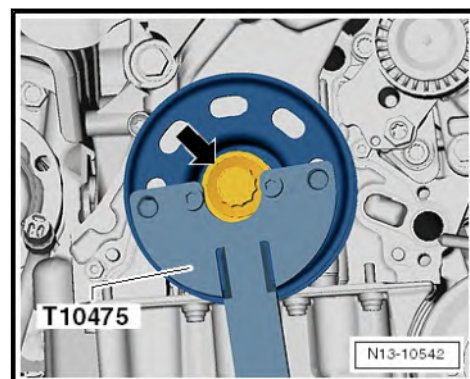
- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *All contact surfaces between bolt, vibration damper and crankshaft toothed belt pulley must be free of oil and grease.*

Check the position of the crankshaft before fitting the vibration damper -1-.



The marking on the crankshaft pulley -2- must be properly aligned with the »TDC marking« on the lower toothed belt guard -3-.

- Fit vibration damper, oil threads of bolt for vibration damper and screw it in to stop by hand.



- Tighten bolt -arrow- for vibration damper using counterhold -T10475-.

Continue installation in reverse order of removal. Observe the following when doing this:

- Install poly V-belt ⇒ [a1.2 nd installing poly-V belt”, page 66](#) .

Torque settings

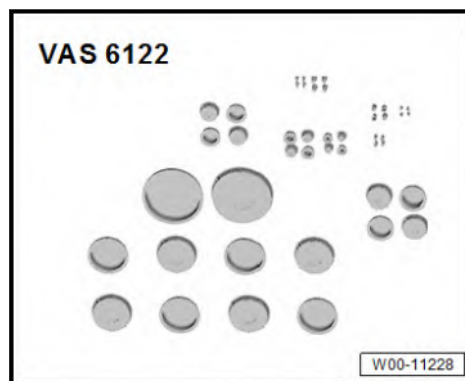
- ◆ Securing bolt for vibration damper ⇒ [o1.1 verview - poly V-belt drive”, page 62](#)
- ◆ Securing bolts for noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation

1.5 Removing and installing engine support

Special tools and workshop equipment required

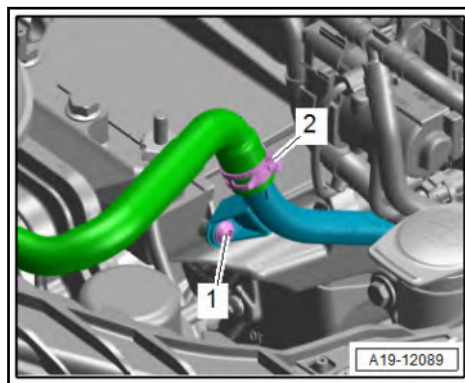


♦ Engine bung set -VAS 6122-



Removing

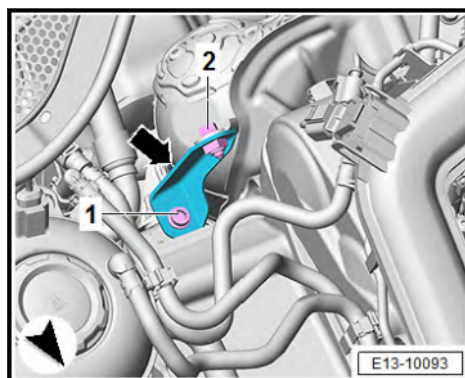
- Remove tensioner for poly V-belt ⇒ [a1.3 nd installing tensioner for poly V-belt](#), page 69 .
- Remove upper part of toothed belt guard ⇒ [page 134](#) .
- Unscrew bolt -1-.



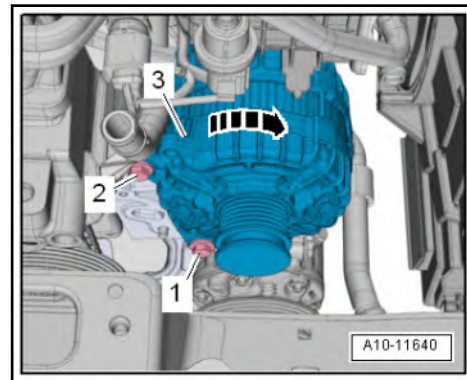
Note

-Item 2- is not loosened in this work step.

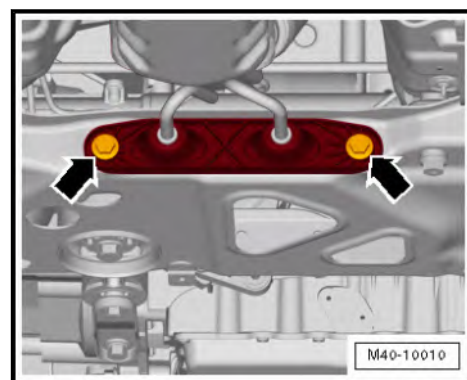
- Unscrew bolts -1- and -2-.



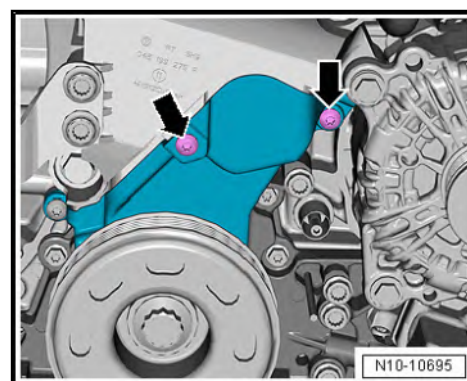
- Remove bracket -arrow-.
- Loosen bolt -1- but do not remove.



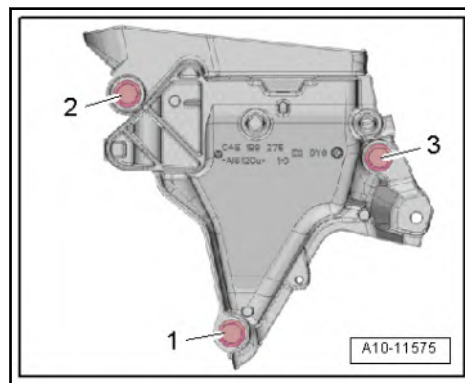
- Unscrew bolt -2-.
- Swivel alternator -3- in -direction of arrow- towards front.
- Unscrew bolts -arrows- from bracket for front exhaust pipe.



- Remove pendulum support ⇒ [a2.4 nd installing pendulum support](#), page 47 .
- Removing engine mounting ⇒ [a2.2 nd installing engine mounting](#), page 40 .
- Remove bolts -arrows- for toothed belt cover (bottom) -1-.



- Unscrew bolts -1-, -2- and -3-.



- Remove engine support.

Installing

Install in reverse order of removal.

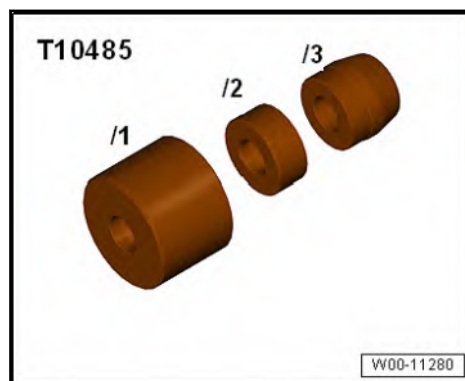
Torque settings

- ◆ Securing bolts for engine mounting and console for engine mounting ⇒ [o2.1 verview – assembly mountings](#), [page 34](#)
- ◆ Securing bolts for tensioning roller ⇒ [o1.1 verview - poly V-belt drive](#), [page 62](#)
- ◆ Securing bolts for toothed belt guard ⇒ [o2.1 verview - tooth-ed belt cover](#), [page 131](#)
- ◆ Securing bolts for coolant pipe ⇒ [o3.1 verview - coolant pipes](#), [page 277](#)
- ◆ Securing bolts for bracket ⇒ [o2.1 verview - emission control](#), [page 404](#)
- ◆ Securing bolts for alternator ⇒ Electrical system; Rep. gr. 27; Alternator; Assembly overview - alternator
- ◆ Securing bolts for noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation

1.6 Renewing crankshaft oil seal - belt pulley end

Special tools and workshop equipment required

- ◆ Assembly tool -T10485-





◆ Extractor hook -T20143/1-



Procedure

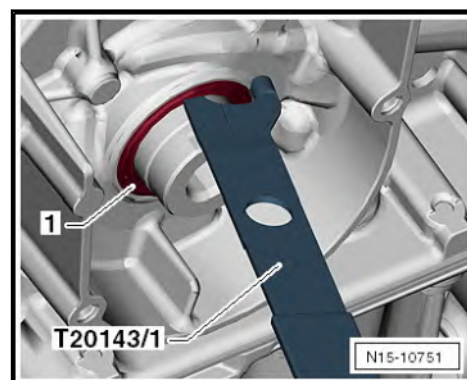
- Remove toothed belt ⇒ [a2.4 nd installing toothed belt", page 135](#).



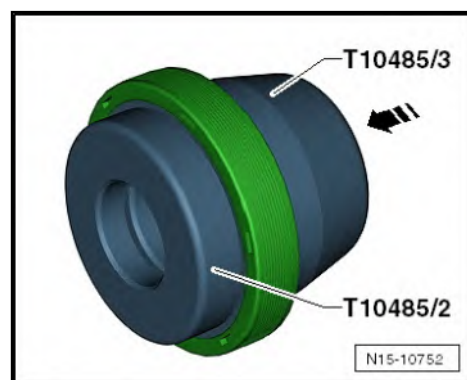
NOTICE

Risk of damage to engine caused by incorrect valve timing.

- Do not turn crankshaft out of TDC position.
- Remove seal -1- using extractor hook -T20143/1-.



Installing



- Clean contact surface and sealing surface.



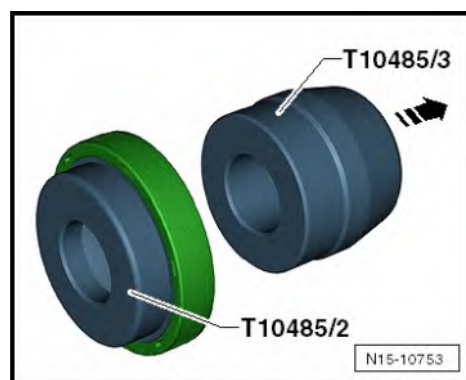
Note

Do not lubricate new oil seal.

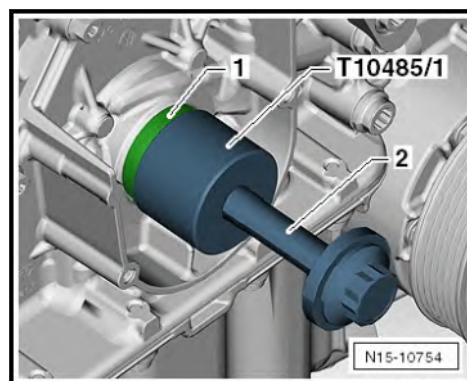
- Put together assembly sleeves -T10485/2- and -T10485/3- in -direction of arrow-.



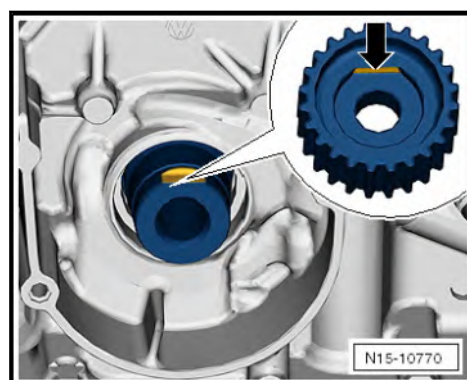
- Fitting position: closed side of oil seal faces guide sleeve.
- Fit new seal in direction of -arrow- over fitting sleeve - T10485/3- onto assembly sleeve - T10485/2-.
- Pull off assembly sleeve -T10485/3- in -direction of arrow-.



- Fit assembly sleeve -T10485/2- with seal -1- onto crankshaft stub.



- Draw in thrust piece -T10485/1- to stop with securing bolt of vibration damper -2-.
- Fit crankshaft sprocket onto crankshaft.



- The machined surface -arrow- of crankshaft pulley must be positioned over the machined surface of the crankshaft journal.
- Contact surface between poly V-belt pulley and crankshaft toothed belt pulley must be free of oil and grease.
- Install toothed belt ➔ [a2.4 nd installing toothed belt", page 135](#) .



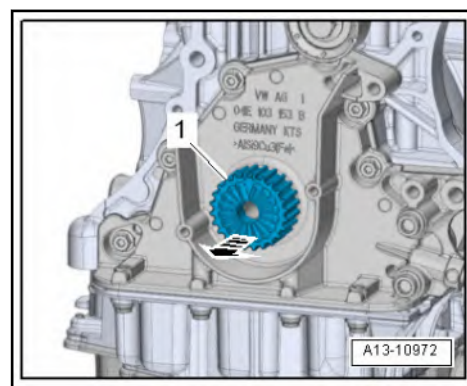
1.7 Removing and installing sealing flange on pulley end

Special tools and workshop equipment required

- ◆ Scraper
- ◆ Sealant ⇒ Electronic Parts Catalogue

Removing

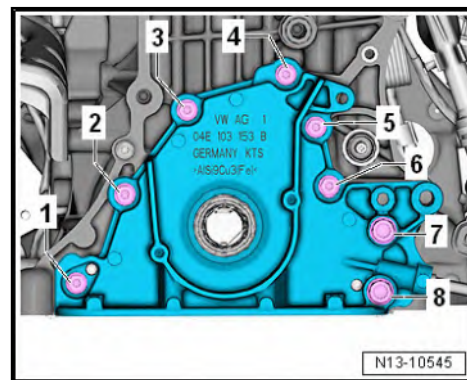
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Remove air conditioner compressor with refrigerant lines connected, raise and tie on right side ⇒ Heating, air conditioning; Rep. gr. 87; Air conditioner compressor; Removing and installing air conditioner compressor.
- Remove toothed belt ⇒ [page 135](#) .
- Remove valve for oil pressure control -N428- ⇒ [page 233](#) .
- Detach crankshaft pulley -1- -arrow-.



! NOTICE

Risk of damage to engine caused by incorrect valve timing.

- Do not turn crankshaft out of TDC position.
- Unscrew bolts -1- to -8- and carefully remove sealing flange from the bonded joint.



- Drive out seal with sealing flange removed.

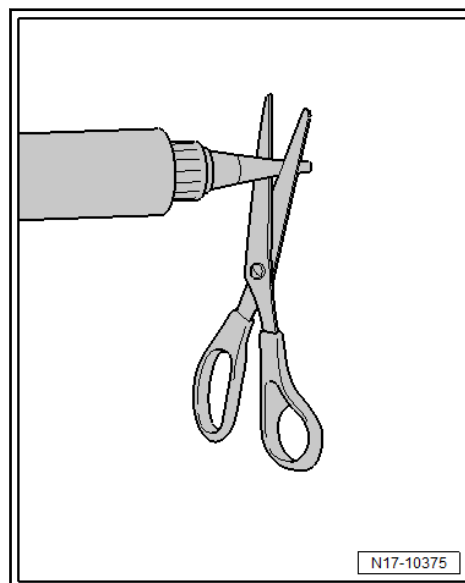
Installing

Install in reverse order of removal, observing the following:

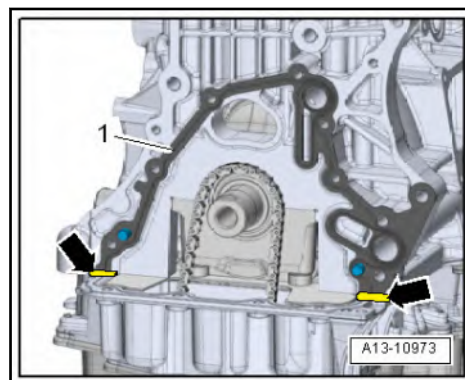
- The lubrication system can be soiled by sealant residue.



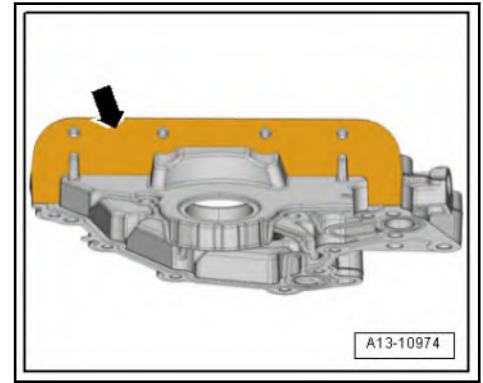
- Cover open section of sump with clean clothes.
- Remove sealant residue from sealing flange and sump (top section).
- Remove any oil and grease from sealing surfaces.
- Observe use-by-date of sealant.



- Cut off nozzle on tube at front marking (\varnothing of nozzle approx. 2 mm).
- Slide gasket -1- onto dowel pins in cylinder block.



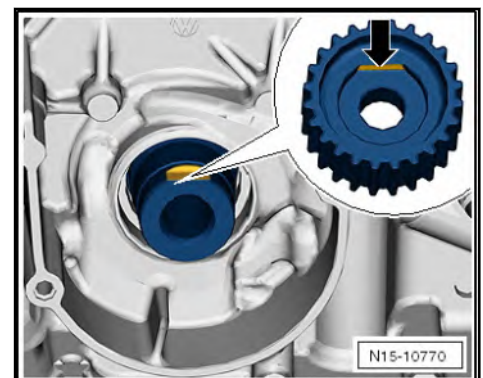
- Apply a thin bead of sealant at the edge of the joint between the cylinder block and the sump -arrows-.
- Thinly coat lower sealing surface -arrow- on sealing flange with sealant.



Note

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

- Carefully fit gasket sealing flange onto dowel pins on cylinder block.
- Tighten bolts for sealing flange ⇒ [Fig. “Sealing flange at belt pulley end - Prescribed torque and tightening sequence”](#), [page 214](#) .
- Install crankshaft oil seal on belt pulley end ⇒ [c1.6 crankshaft oil seal - belt pulley end](#), [page 76](#) .
- Fit crankshaft sprocket onto crankshaft.



- The contact surface between vibration damper and crankshaft toothed belt pulley must be free of oil and grease.
- The machined surface -arrow- of crankshaft pulley must be positioned over the machined surface of the crankshaft journal.
- Install valve for oil pressure control -N428- ⇒ [page 233](#) .
- Install toothed belt ⇒ [page 135](#) .
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87; Air conditioner compressor; Removing and installing air conditioner compressor.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview – noise insulation.

Torque settings

- ◆ ⇒ [Fig. “Sealing flange at belt pulley end - Prescribed torque and tightening sequence”](#), [page 214](#)



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



2 Cylinder block, gearbox end

⇒ [o2.1 verview - cylinder block, gearbox end", page 83](#)

⇒ [a2.2 nd installing flywheel", page 85](#)

⇒ [a2.3 nd installing sealing flange on gearbox side", page 87](#)

2.1 Assembly overview - cylinder block, gearbox end



Note

For assembly work, secure engine to engine and gearbox support ⇒ [e1.3 ngine on engine and gearbox support", page 27](#) .



1 - Bolt

- ☐ Renew
- ☐ 60 Nm +90°

2 - Flywheel

- ☐ Can only be fitted in one position
- ☐ Removing and installing ⇒ [a2.2 nd installing flywheel", page 85](#)

3 - Sender wheel

- ☐ For engine speed sender -G28-
- ☐ Removing and installing ⇒ [a2.3 nd installing sealing flange on gearbox side", page 87](#)

4 - Engine speed sender - G28-

- ☐ Removing and installing ⇒ [a1.4 nd installing engine speed sender G28", page 417](#)
- ☐ Assembly overview ⇒ [o1.1 verview - ignition system", page 411](#)

5 - Bolt

- ☐ Specified torque ⇒ [Item 16 \(page 413\)](#)

6 - Dowel pin

- ☐ Qty. 2

7 - Adapter

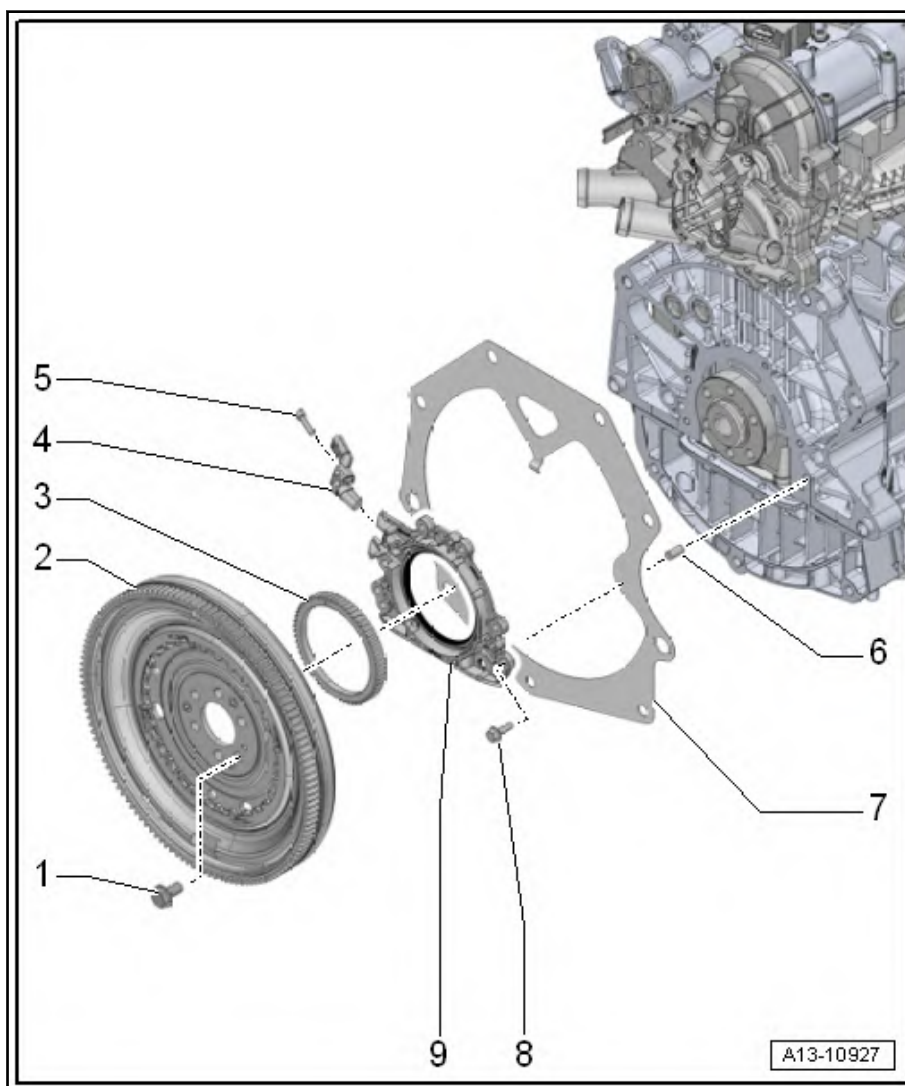
- ☐ Do not damage or bend when assembling.
- ☐ Installing ⇒ [page 85](#)

8 - Bolt

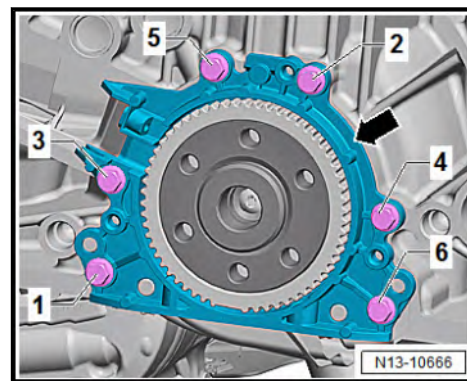
- ☐ Specified torque and tightening sequence ⇒ [page 84](#)

9 - Sealing flange, gearbox side

- ☐ With shaft seal
- ☐ Renewing ⇒ [a2.3 nd installing sealing flange on gearbox side", page 87](#)



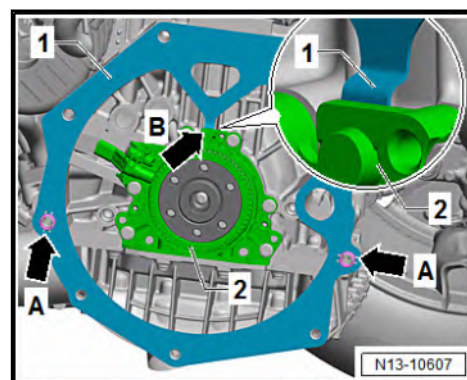
Sealing flange on gearbox side - specified torque and tightening sequence



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

Stage	Bolts	Specified torque
1st	-1- to -6-	Screw onto stop by hand
2nd	-1- to -6-	In diagonal sequence and in stages; final torque 10 Nm

Install intermediate plate.

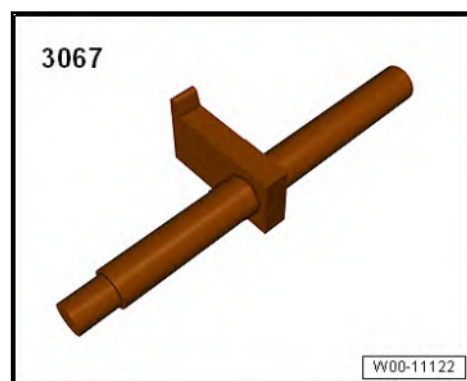


- Attach intermediate plate -1- to sealing flange -2- -arrow B-.
- Slide intermediate plate onto dowel sleeves -arrows A-.

2.2 Removing and installing flywheel

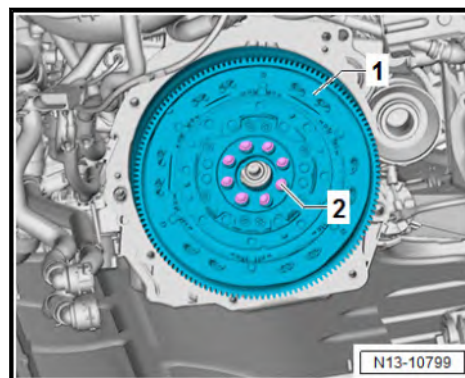
Special tools and workshop equipment required

- ◆ Counter-hold tool -3067-





Removing

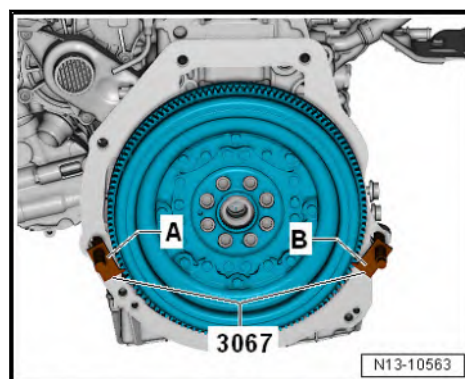


- Gearbox is removed.

NOTICE

Risk of serious damage to flywheel.

- ◆ Do not unscrew bolts -2- with an air wrench or power impact wrench. Unscrew them by hand.
 - ◆ When removing the bolts, make sure that the bolt heads do not come into contact with the flywheel.
 - ◆ Rotate flywheel -1- so that bolts -2- align centrally with the holes.
- Remove clutch ⇒ Rep. gr. 30; Removing and installing clutch.
 - Insert counterhold -3067- in hole on cylinder block -B-.



- Loosen and remove flywheel bolts.

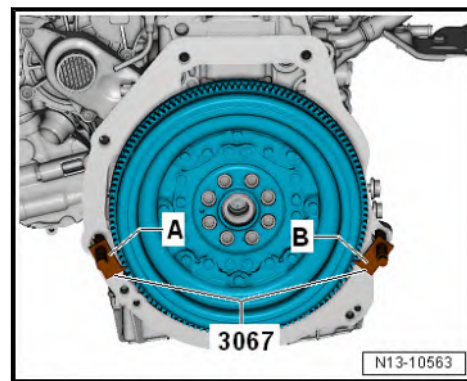
Installing

Install in reverse order of removal, observing the following:



Note

- ◆ Renew bolts that are tightened with turning further angle.
 - ◆ Flywheel with sender wheel can only be fitted in one position.
- Insert counter-hold tool -3067- in hole of cylinder block -A- to tighten bolts.



Torque settings

- ◆ Securing bolts for flywheel ⇒ [o2.1 verview - cylinder block, gearbox end", page 83](#)

2.3 Removing and installing sealing flange on gearbox side

Special tools and workshop equipment required

- ◆ Ring spanner insert -V.A.G 1332/11-

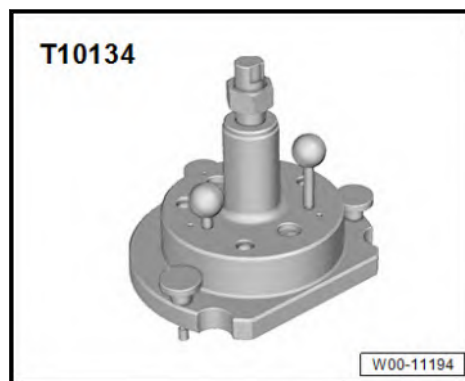


- ◆ Depth gauge -VAS 6082-





- ◆ Assembly tool -T10134-



- ◆ Bolt M6×35 (qty. 3)
- ◆ Hexagon key

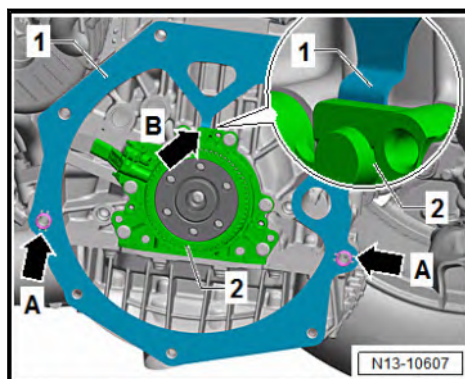
Procedure



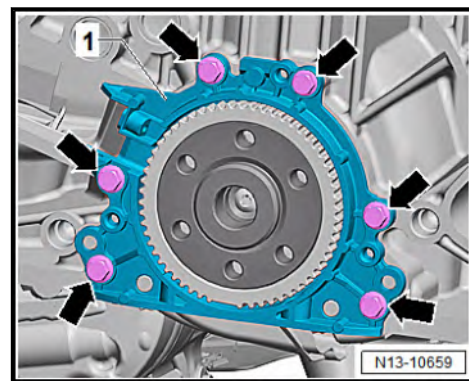
Note

For reasons of clarity, illustration shows work procedure with engine removed.

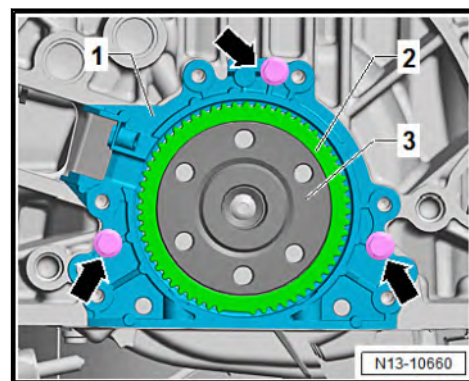
- Remove flywheel ⇒ [page 85](#) .
- Remove intermediate plate -1- from dowel sleeves -arrows A-.



- Guide intermediate plate -1- upwards.
- While doing so, pull retaining lug -arrow B- of intermediate plate -1- out of recess behind sealing flange.
- Set piston of cylinder no. 1 to "TDC" position ⇒ [page 111](#) .
- Remove sump ⇒ [page 216](#) .
- Remove engine speed sender -G28- ⇒ [page 417](#) .
- Unscrew bolts -arrows- for sealing flange -1-.



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

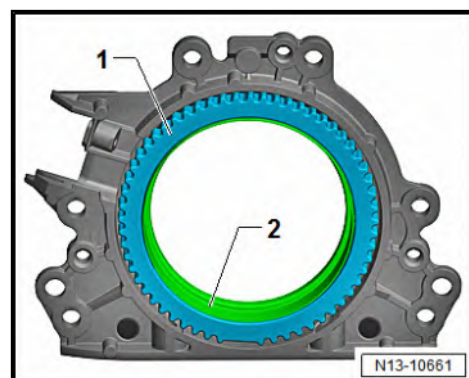


Note

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

- Screw bolts alternately into sealing flange no more than $\frac{1}{2}$ turn at a time.
- Remove sealing flange -1- together with sender wheel -2-.

Pressing in sealing flange with sender ring

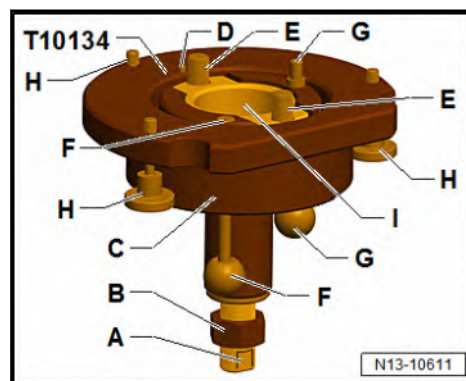




Note

- ◆ The sealing flange with a PTFE seal is equipped with a sealing lip support ring -2-. This support ring serves as a fitting sleeve and must not be removed prior to installation.
- ◆ Sealing flange and sender wheel -1- must not be separated after removal from packaging.
- ◆ The sender wheel -1- is held in its installation position on the locating pin of the assembly tool -T10134- ➔ [page 90](#).
- ◆ Sealing flange and oil seal form one unit and may only be renewed together with the sender wheel.
- ◆ The assembly tool -T10134- is held in its position relative to the crankshaft by a guide pin inserted into a hole in the crankshaft ➔ [page 90](#).

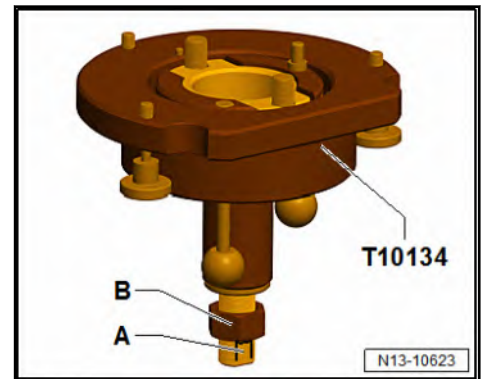
Set-up of assembly tool -T10134-:



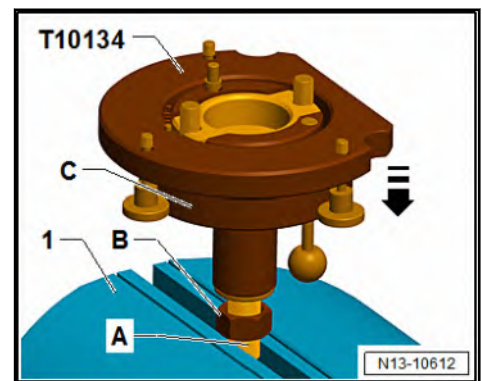
- A - Clamping surface
- B - Nut
- C - Assembly housing
- D - Locating pin
- E - Hexagon socket head bolt (qty. 2)
- F - Guide pin (red shaft)
- G - Guide pin (black shaft)
- H - Knurled screws (qty. 3)
- I - Inside



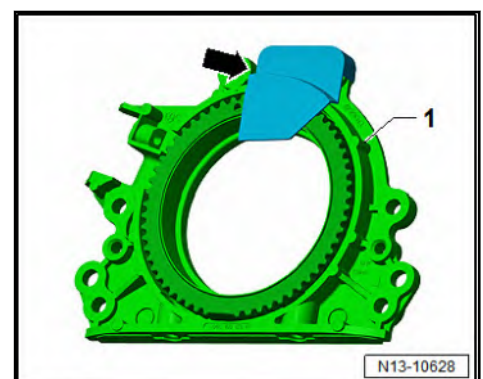
Fitting sealing flange with sender wheel on assembly tool - T10134-:



- Screw on nut -B- and stop just before it comes into contact with clamping surface -A- of threaded spindle.
- Clamp assembly device -T10134- at clamping surface -A- of threaded spindle in a vice -1-.



- Push assembly housing -C- downwards until it rests against nut -B-.
- Inner part of assembly tool and assembly housing must be at same height.
- If fitted, remove securing clip -arrow- from new sealing flange.

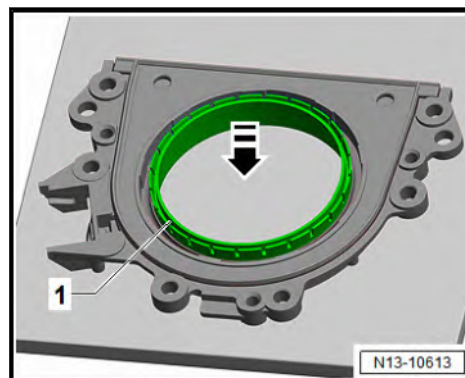


Note

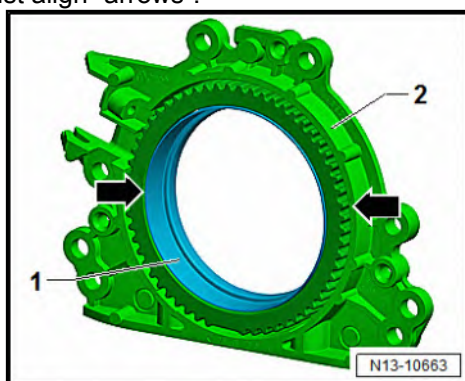
Do not take the sender wheel and support ring out of the sealing flange.



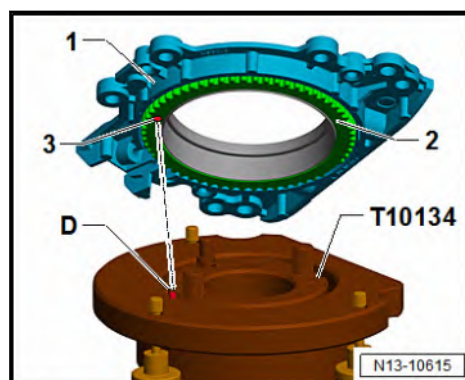
- Place sealing flange with front side facing down on a clean level surface.



- Push sealing lip support ring -1- downwards in -direction of arrow- until it rests against flat surface.
- Upper edge of sealing lip support ring -1- and front edge of sealing flange -2- must align -arrows-.



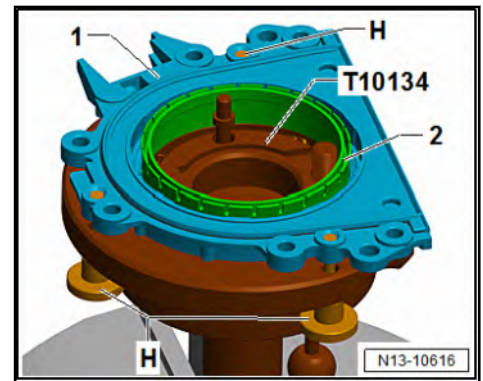
- Place sealing flange -1- with front side facing downwards on to assembly tool -T10134- so that locating pin -D- is seated in hole -3- in sender wheel hole -2-.



Note

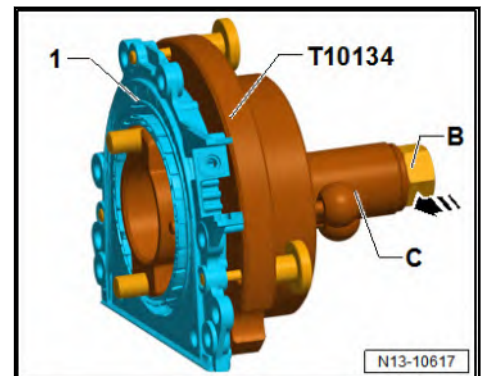
- ♦ The sealing flange can be supplied in different versions.
- ♦ On some versions, the »TDC position hole« -3- is not in the requisite TDC position -D-.
- If the position -3- is not correct in relation to the locating pin -D-, carefully rotate the sender wheel -2- with support ring.
- The sealing flange must rest flat against the assembly tool.

- Screw knurled screws -H- into sealing flange -1-.

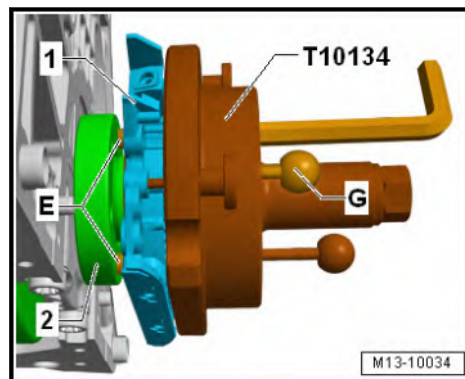


- Press sealing flange -1- and sealing lip support ring -2- against surface of assembly tool -T10134- whilst tightening knurled screws.
- This prevents the locating pin from slipping out of the sender wheel hole.
- When installing sealing flange, ensure that sender wheel remains fixed in assembly tool.

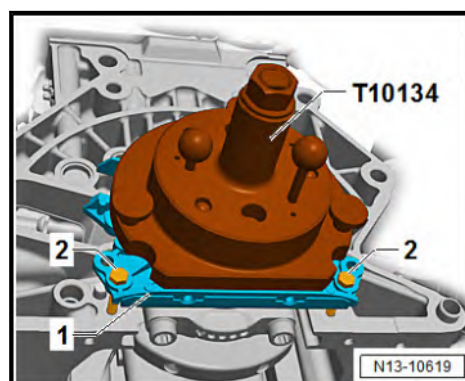
Mounting assembly tool -T10134- with sealing flange -1- on crankshaft flange:



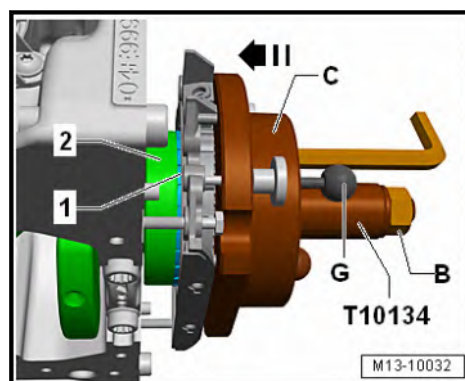
- Crankshaft flange must be free of oil and grease.
- Engine is at "TDC" position.
- Screw on nut -B- until it reaches end of threaded spindle.
- Press threaded spindle of assembly tool -T10134- in -direction of arrow-, until nut -B- rests against assembly housing -C-.
- Align flat side of assembly housing to sealing surface of cylinder block on oil sump side.
- Attach assembly tool -T10134- together with sealing flange -1- to crankshaft flange -2-.



- To do this, screw hexagon socket head bolts -E- approx. 5 turns into crankshaft flange using a hexagon key.
- Push guide pin (black knob) -G- into crankshaft flange.
- To guide sealing flange -1-, screw two M6×35 mm bolts -2- into cylinder block.



Bolting assembly tool -T10134- onto crankshaft flange:



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



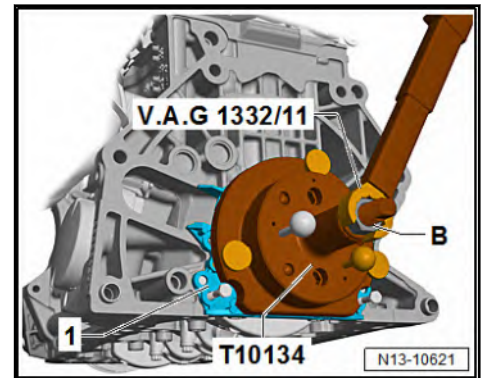
Note

Do not insert the guide pin (red knob) -F- into the threaded hole of crankshaft.



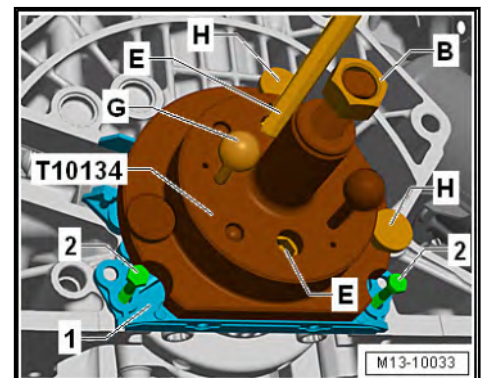
- Tighten the two hexagon socket head bolts of assembly tool hand-tight.
- Screw nut -B- by hand onto threaded spindle until it rests against assembly housing -C-.

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

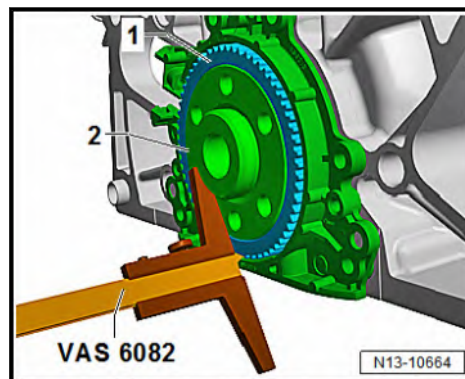


- Tighten nut -B- of assembly tool -T10134- to 35 Nm.
- After the nut has been tightened to 35 Nm, a small gap must still be present between cylinder block and sealing flange -1-.

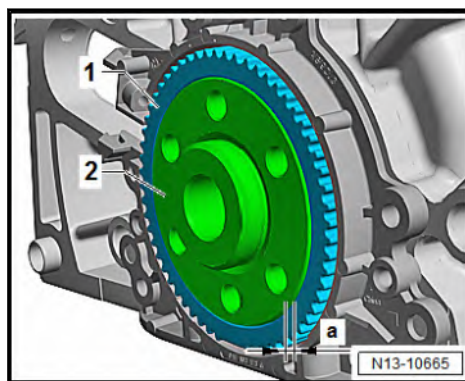
Checking sender wheel installation position on crankshaft:



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

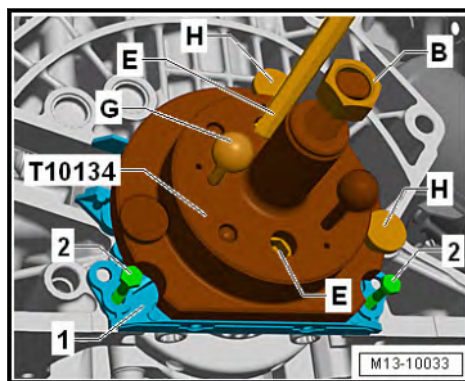


- Measure distance -a- between crankshaft flange -2- and sender wheel -1-.



- Specification: dimension -a- = 0.5 mm
- If specification is not achieved, press sender wheel further in ➔ [page 96](#) .
- If specification is achieved, proceed with subsequent work steps ➔ [page 97](#) .

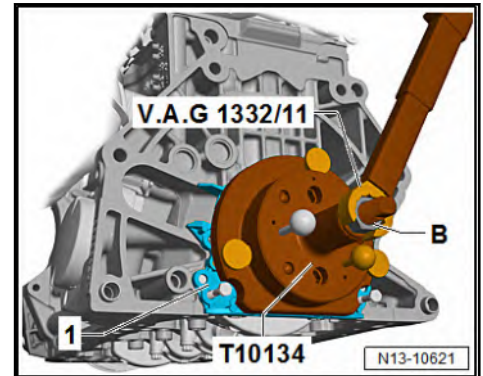
Re-pressing sender wheel:



- Secure assembly tool -T10134- on crankshaft flange -1-.
- Make sure that locating pin of assembly tool -T10134- is properly seated in sender wheel hole.
- Tighten hexagon socket head bolts -E- by hand.
- Push assembly tool -T10134- by hand against sealing flange -1-.
- Screw nut -B- by hand onto threaded spindle until it rests against assembly tool -T10134-.
- Push guide pin (black knob) -G- into crankshaft flange.



- Screw knurled screws -H- into sealing flange.
- To guide sealing flange, screw two M6×35 mm bolts -2- into cylinder block.
- Tighten nut -B- of assembly tool -T10134- to 40 Nm.



- Check sender wheel installation position on the crankshaft again ⇒ [page 95](#) .
- If the specification is not achieved, tighten nut of assembly tool -T10134- to 45 Nm.
- Check sender wheel installation position on the crankshaft again ⇒ [page 95](#) .

Assembling

- Tighten bolts for sealing flange (vehicles with manual gearbox) ⇒ [page 84](#) .
- Install sump ⇒ [page 216](#) .
- Install intermediate plate (vehicles with manual gearbox) ⇒ [page 85](#) .
- Install flywheel (vehicles with manual gearbox) ⇒ [page 85](#) .
- Install gearbox ⇒ Rep. gr. 34; Removing and installing gearbox.

Torque settings

- ◆ ⇒ [page 84](#)
- ◆ ⇒ [o2.1 verview - cylinder block, gearbox end", page 83](#)
- ◆ ⇒ [o1.1 verview - ignition system", page 411](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation
- ◆ ⇒ Rep. gr. 34; Removing and installing gearbox; Specified torques for gearbox



3 Crankshaft

⇒ [d3.1 imensions", page 98](#)

⇒ [n3.2 eedle bearing in crankshaft", page 98](#)

⇒ [a3.3 xial clearance of crankshaft", page 101](#)

3.1 Crankshaft dimensions



Note

- ♦ *Risk of deformation of bearing pedestals.*
- ♦ *The crankshaft must not be removed.*
- ♦ *Just loosening the bolts of the crankshaft bearing cap will cause deformation of the cylinder block bearing pedestals.*
- ♦ *This deformation will cause a reduction of the bearing clearance.*
- ♦ *Even if the bearing shells are not renewed, bearing damage could occur due to a different bearing clearance.*
- ♦ *If the bearing cap bolts are loosened, the cylinder block must be renewed complete with the crankshaft.*
- ♦ *Measuring the main bearing clearance is not possible with normal workshop equipment.*

Honing dimension	Conrod journal diameter mm
Basic dimension	42 -0.022 -0.037

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-



◆ Drift -VW 207 C-



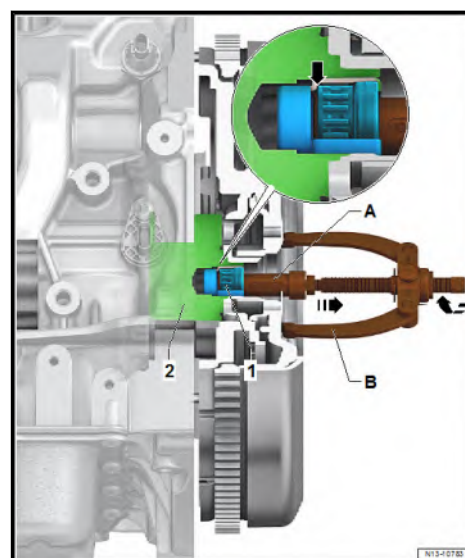
Removing

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

Condition:

- The front edges of the inner puller must be free of chips.

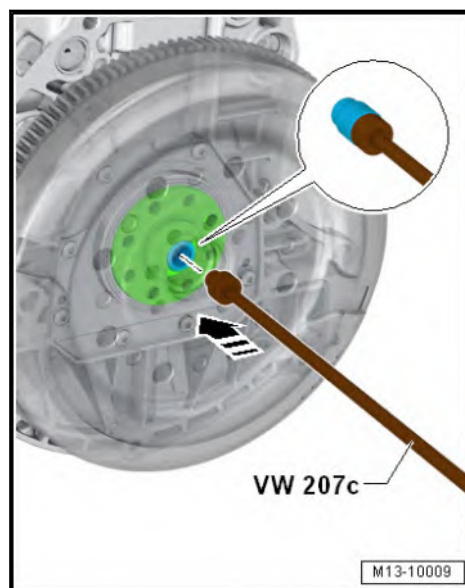
Pulling out needle roller bearing



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

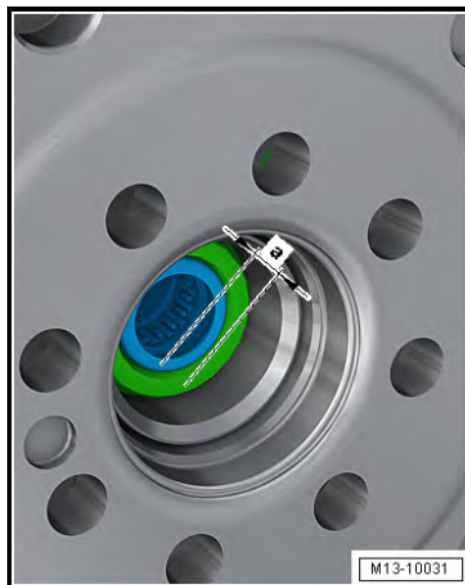


Installing



- Clean bearing seat in crankshaft and apply as thin coating of grease.
- Drive needle bearing into crankshaft to installation depth using drift -VW 207 C-.

Installation depth: dimension -a- = 2.0 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.



3.3 Measuring axial clearance of crankshaft

NOTICE

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

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

- Never remove the crankshaft.

Special tools and workshop equipment required

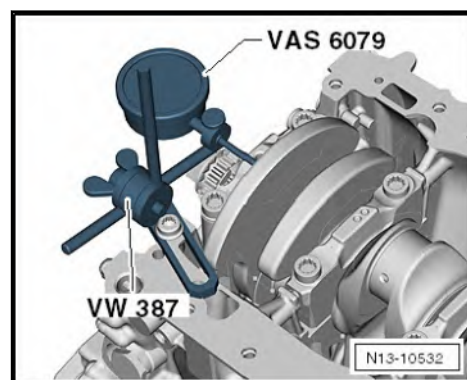
- ◆ Universal dial gauge holder -VW 387-



- ◆ Dial gauge -VAS 6079-



Procedure



- Screw dial gauge -VAS 6079- with universal dial gauge bracket -VW 387- to cylinder block as shown in the illustration.
- Position dial gauge against crank web.



- Press crankshaft against dial gauge by hand and set gauge to “0”.
- Push crankshaft away from dial gauge and read off measured value.
- Axial clearance: 0.066 to 0.233 mm



4 Pistons and conrods

⇒ [o4.1 verview - pistons and conrods", page 103](#)

⇒ [a4.2 nd installing pistons", page 106](#)

⇒ [p4.3 istons and cylinder bores", page 107](#)

⇒ [n4.4 ew conrod", page 109](#)

⇒ [r4.5 adial clearance of conrods", page 110](#)

⇒ [a4.6 nd installing oil spray jets", page 110](#)

⇒ [p4.7 iston to TDC position", page 111](#)

4.1 Assembly overview - pistons and conrods



Note

All bearing points and running surfaces must be oiled before assembly.



1 - Retaining ring

- ☐ Renew

2 - Piston pin

- ☐ If difficult to remove, heat piston to 60°C.
- ☐ Removing and installing ⇒ [a4.2 nd installing pistons](#), page 106

3 - Piston

- ☐ Install using piston ring clamp.
- ☐ Mark installation position and cylinder number ⇒ [page 105](#)
- ☐ Checking ⇒ [p4.3 istons and cylinder bores](#), page 107

4 - Compression rings

- ☐ Offset gaps by 120°
- ☐ Remove and install compression rings with piston ring pliers.
- ☐ "TOP" faces towards piston crown.
- ☐ Checking ring gap ⇒ [page 107](#).
- ☐ Checking ring-to-groove clearance ⇒ [page 108](#).

5 - Oil scraper rings

- ☐ Carefully remove and install 3-part oil scraper rings by hand.
- ☐ Ring-to-groove clearance not measurable.
- ☐ Checking ring gap ⇒ [page 107](#).

6 - Conrod bolt

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

7 - Conrod bearing cap

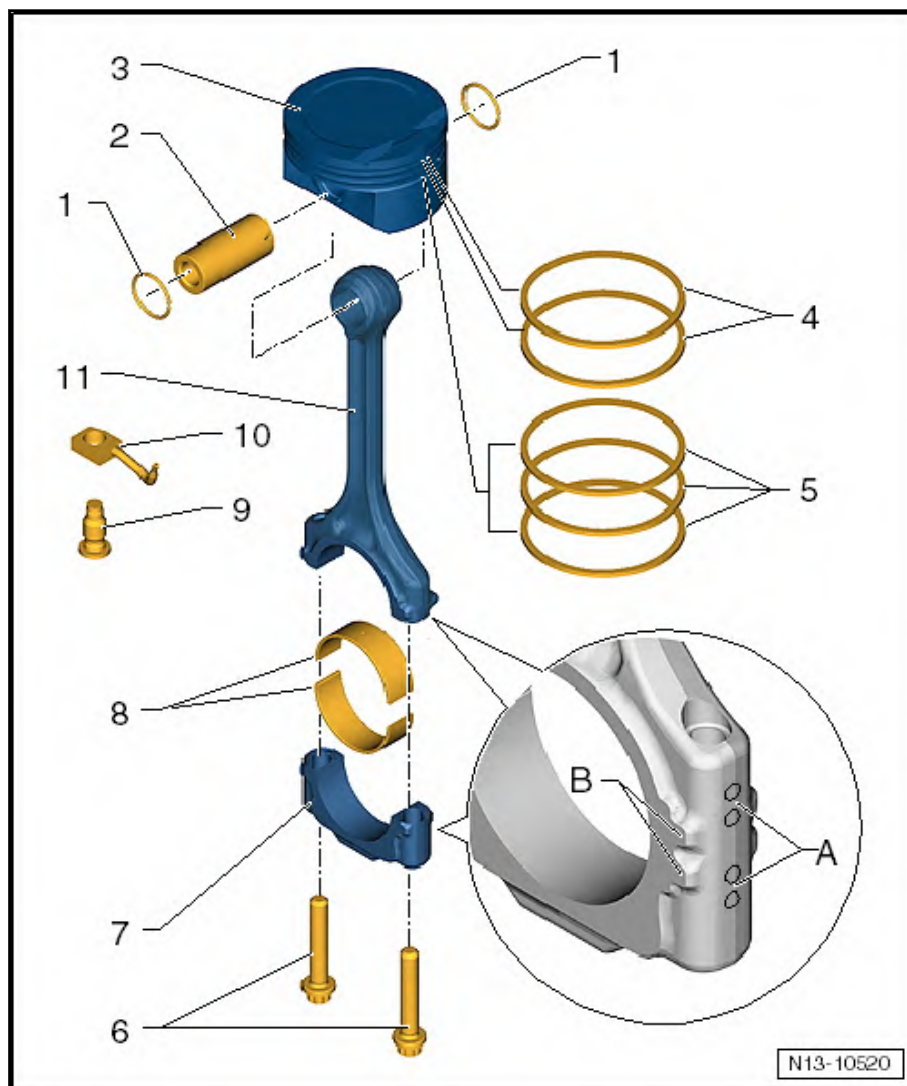
- ☐ Observe installation position
- ☐ The caps only fit in one position and only on the appropriate conrod due to the breaking procedure (cracking) separating the cap from the conrod.
- ☐ Mark with cylinder number prior to removal -A-.
- ☐ Installation position: Mark -B- points to belt pulley end (if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

8 - Bearing shell

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

Checking radial clearance with Plastigage:

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





- ☐ Fitting position ➔ [page 105](#)

9 - Bolt

- ☐ 8 Nm

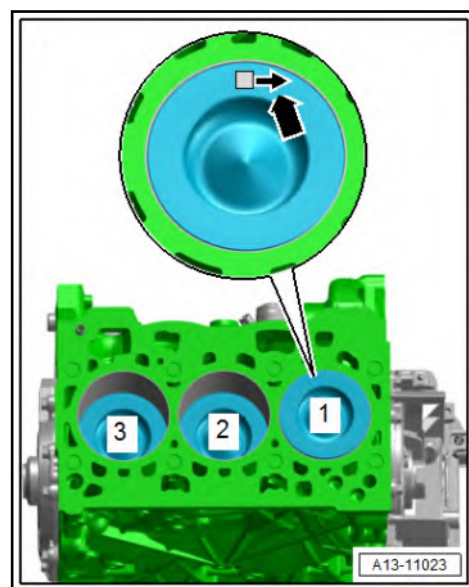
10 - Oil spray jet

- ☐ For piston cooling.

11 - Connecting rod

- ☐ Renew as set only.
- ☐ Mark with cylinder number -A-.
- ☐ Installation position: Mark -B- points to belt pulley end (if mark is missing, mark before removing).
- ☐ Guided axially by piston.
- ☐ Separating new conrod ➔ [n4.4 ew conrod", page 109](#) .

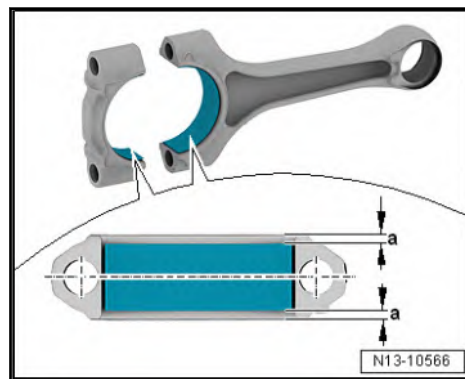
Installation position and allocation of piston to cylinder



Note

- ◆ *Risk of damage to piston crown.*
- ◆ *If worn pistons are to be reinstalled, mark their allocation to the cylinder on the piston crown. Use paint for this.*
- ◆ *Do not use indentation, scratches, notches, or similar to mark piston crown.*
- Arrow on piston crown points to pulley end -arrow-.

Bearing shells - installation position



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

4.2 Removing and installing pistons

Special tools and workshop equipment required

- ◆ Drift -VW 222 A-



- ◆ Piston ring clamp, commercially available

Removing

- Removing cylinder head. ⇒ [a1.3 nd installing cylinder head", page 120](#)
- Remove sump ⇒ [a1.3 nd installing sump", page 216](#) and baffle plate.
- Mark piston installation position and corresponding cylinder number.
- Mark installation position and matching of cylinder and conrod bearing cap to conrod ⇒ [Item 7 \(page 104\)](#) .
- Remove conrod bearing cap and withdraw piston and conrod upwards.



Note

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

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

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Arrow on piston crown points to belt pulley end.*
- Oil running surfaces of bearing shells.
- Install piston with commercially available piston ring clamp, noting installation position ⇒ [page 105](#) .
- Install conrod bearing cap, noting installation position ⇒ [Item 7 \(page 104\)](#) .
- Install cylinder head ⇒ [a1.3 nd installing cylinder head"](#), [page 120](#) .
- Install sump ⇒ [a1.3 nd installing sump"](#), [page 216](#) .

Torque settings

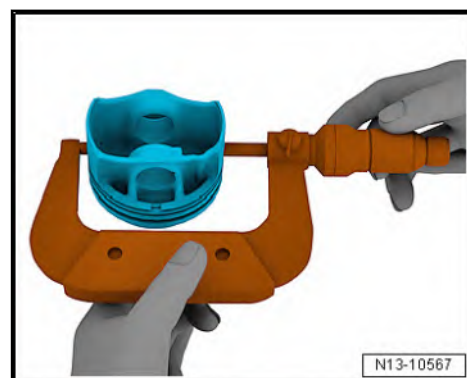
- ◆ ⇒ [o4.1 verview - pistons and conrods"](#), [page 103](#)

4.3 Checking pistons and cylinder bores

Special tools and workshop equipment required

- ◆ External micrometer 50-75 mm -VAS 6070-

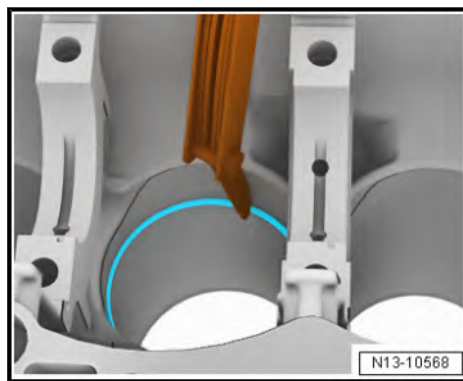
Checking piston



- Using an external micrometre, measure approx. 10 mm from lower edge, offset 90° from piston pin axis.
- Maximum deviation from nominal dimension: 0.04 mm.

Piston diameter, mm	
Specification	74.42 ¹⁾
<ul style="list-style-type: none"> • ¹⁾ Dimensions not including coating (thickness 0.018 mm on each side). 	

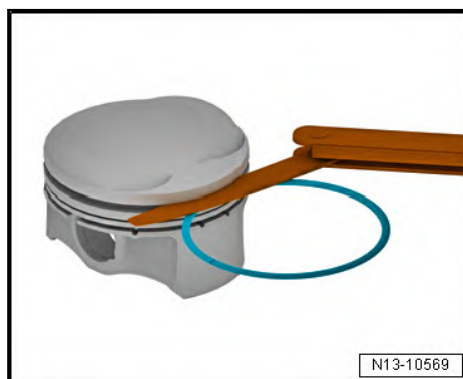
Measuring piston ring gap



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

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

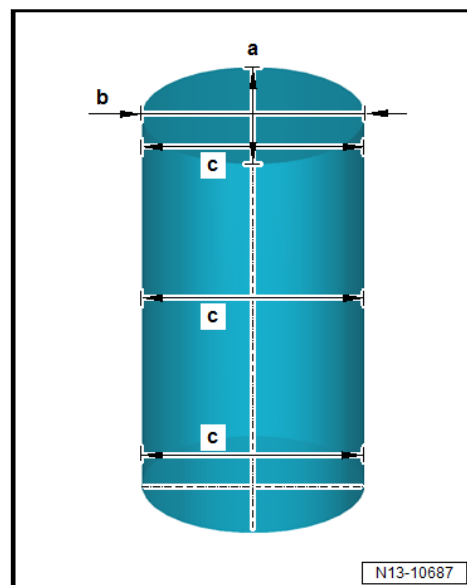
Measuring ring-to-groove clearance



- Clean annular groove of piston before check.

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

Measuring cylinder bore



! NOTICE

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

- **Do not machine cylinder bore (reboring, honing, grinding) with workshop equipment.**
- Using cylinder gauge -VAS 6078-, take measurements at 3 positions -c- diagonally, in lateral direction -a- and longitudinal direction -b-.
- Maximum deviation from nominal dimension: 0.05 mm.

	Cylinder bore diameter, mm
Specification	74.5
Maximum dimension	74.515
Minimum dimension	74.505



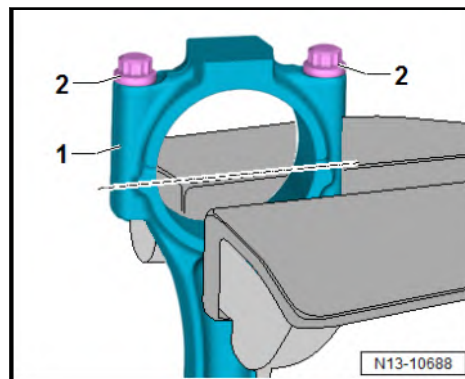
Note

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

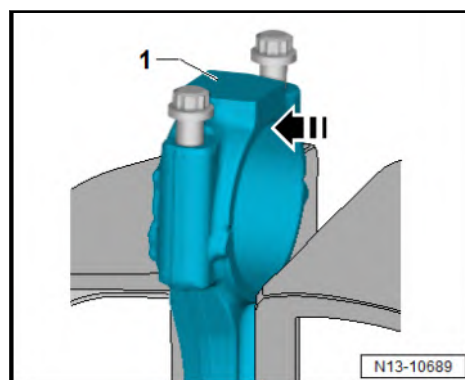
4.4 Separating new conrod

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

- Mark allocation of conrod to cylinder.
- Clamp conrod -1- in a vice below the dashed line using aluminium vice clamps.



- Unscrew both bolts -2- about 5 turns.
- Using a plastic hammer, carefully knock against conrod bearing cap in -direction of arrow- until it is loose.



4.5 Checking radial clearance of conrods

Special tools and workshop equipment required

- ◆ Plastigage

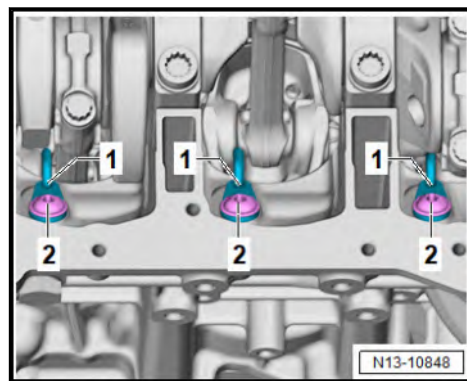
Procedure

- Remove conrod bearing cap.
- Clean bearing cap and bearing journal.
- Place a Plastigage corresponding to the width of the bearing on the journal or into the bearing shells.
- Fit conrod bearing cap and tighten it using old bolts ⇒ [Item 6 \(page 104\)](#) . When tightening, make sure not to rotate crankshaft.
- Remove conrod bearing cap again.
- Compare width of Plastigage with the measurement scale.
 - Radial clearance: 0.028 to 0.065 mm.
- Renew conrod bolts.

4.6 Removing and installing oil spray jets

Removing

- Remove sump ⇒ [a1.3 nd installing sump”, page 216](#) .
- Turn crankshaft via vibration damper securing bolt in direction of engine rotation until the respective bolt is accessible.
- Unscrew bolts -1-.



- Remove oil spray jets -2-.

Installing

Install in reverse order of removal, observing the following:



NOTICE

Risk of damage to oil spray jets caused by deformation.

- Do not bend oil spray jets.
- Install sump ⇒ [a1.3 nd installing sump", page 216](#) .

Torque settings

- ♦ ⇒ [o4.1 verview - pistons and conrods", page 103](#)

4.7 Setting piston to TDC position

Special tools and workshop equipment required

- ♦ Locating bolt -T10340-



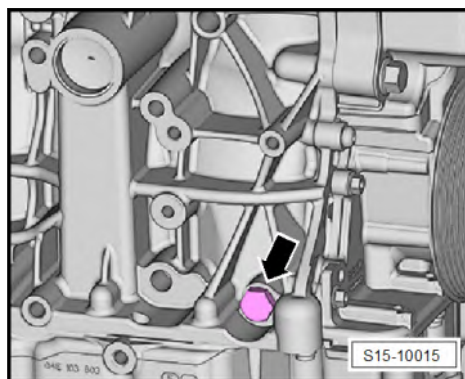


Procedure

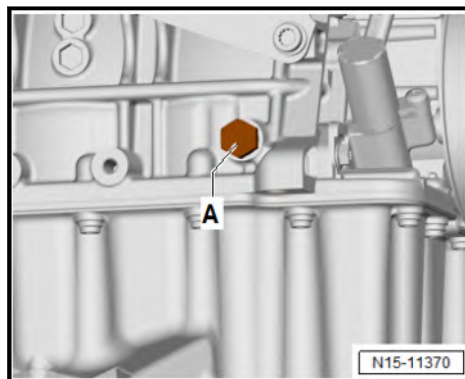
Setting piston from cylinder no. 1 to TDC position ⇒ [page 112](#)

Setting piston from cylinder no. 1 to TDC position for repair work on toothed belt drive and for setting valve timing ⇒ [page 113](#)

Setting piston from cylinder no. 1 to TDC position



- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Place a cloth underneath to catch any engine oil which may drain out.
- Unscrew plug -arrow- from back of cylinder block.
- Screw locking pin -T10340- -A- into cylinder block as far as stop and tighten to 30 Nm.



- Bolt head of locking pin -T10340- -A- must contact cylinder block when doing this.



Note

If the locking pin -T10340- -A- cannot be screwed in as far as stop, this indicates that the crankshaft is not in the correct position.

- Unscrew locking pin -T10340- -A-.
- Turn crankshaft 90° in direction of rotation of engine.
- Screw locking pin -T10340- -A- into cylinder block as far as stop and tighten to 30 Nm.
- Rotate crankshaft in normal direction of rotation as far as stop. The locking pin -T10340- -A- now rests against the crank web.

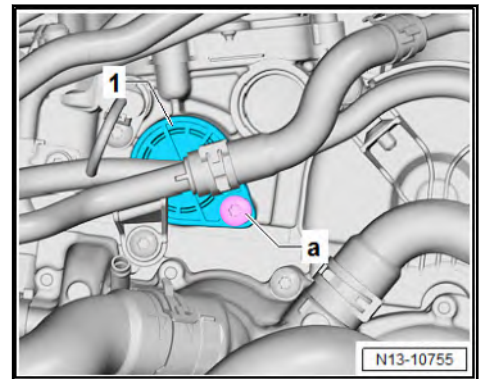


Note

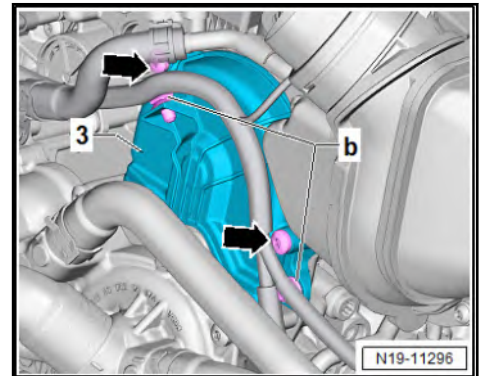
Locking pin -T10340- -A- locks crankshaft in direction of engine rotation only.

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

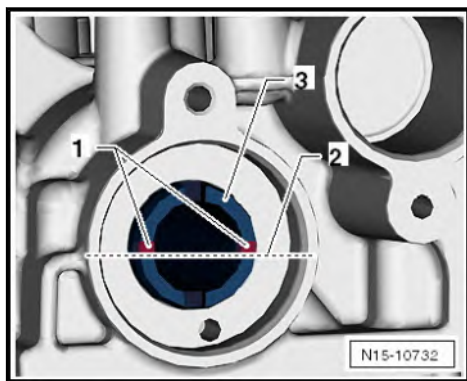
- Set piston from cylinder no. 1 to TDC position ➔ [page 112](#) .
- Remove air filter housing ➔ [a3.2 nd installing air filter housing](#), [page 359](#) .
- Unscrew securing bolt -a- of cover -1- on inlet camshaft side.



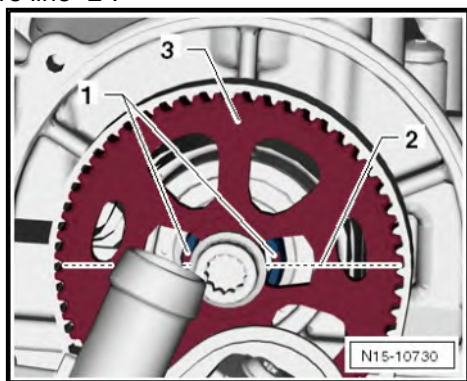
- Place a cloth underneath to catch any oil which may drain out.
- Detach cover -1-.
- Unclip clips for wiring harness -b- from toothed belt guard for coolant pump -3-.



- Unscrew bolts -arrows-, and remove toothed belt guard -3-.
- Grooves -1- of inlet camshaft -3- are positioned above the horizontal camshaft centre line -2-.



- Grooves -1- of exhaust camshaft are positioned above horizontal camshaft centre line -2-.



- The centre-line of the holes close to hub of the gear -3- is slightly above the grooves.

Torque settings

- ◆ ⇒ [o1.2 verview - camshaft housing", page 117](#)
- ◆ ⇒ [o2.1 verview - coolant pump, thermostat", page 250](#)
- ◆ ⇒ [o3.1 verview - air filter housing", page 357](#)



15 – Cylinder head, valve gear

1 Cylinder head

⇒ [o1.1 verview - cylinder head", page 115](#)

⇒ [o1.2 verview - camshaft housing", page 117](#)

⇒ [a1.3 nd installing cylinder head", page 120](#)

⇒ [a1.4 nd installing camshaft housing", page 124](#)

⇒ [c1.5 ompression", page 128](#)

1.1 Assembly overview - cylinder head



Note

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



1 - Camshaft case

- ❑ Removing and installing ⇒ [a1.4 nd installing camshaft housing](#), page 124

2 - Bolt

- ❑ Specified torque and tightening sequence ⇒ [page 119](#)

3 - Seal

- ❑ Renew

4 - Dowel pins

5 - Cylinder head

- ❑ Removing and installing ⇒ [a1.3 nd installing cylinder head](#), page 120
- ❑ Check for distortion ⇒ [page 117](#) .

6 - Cylinder head gasket

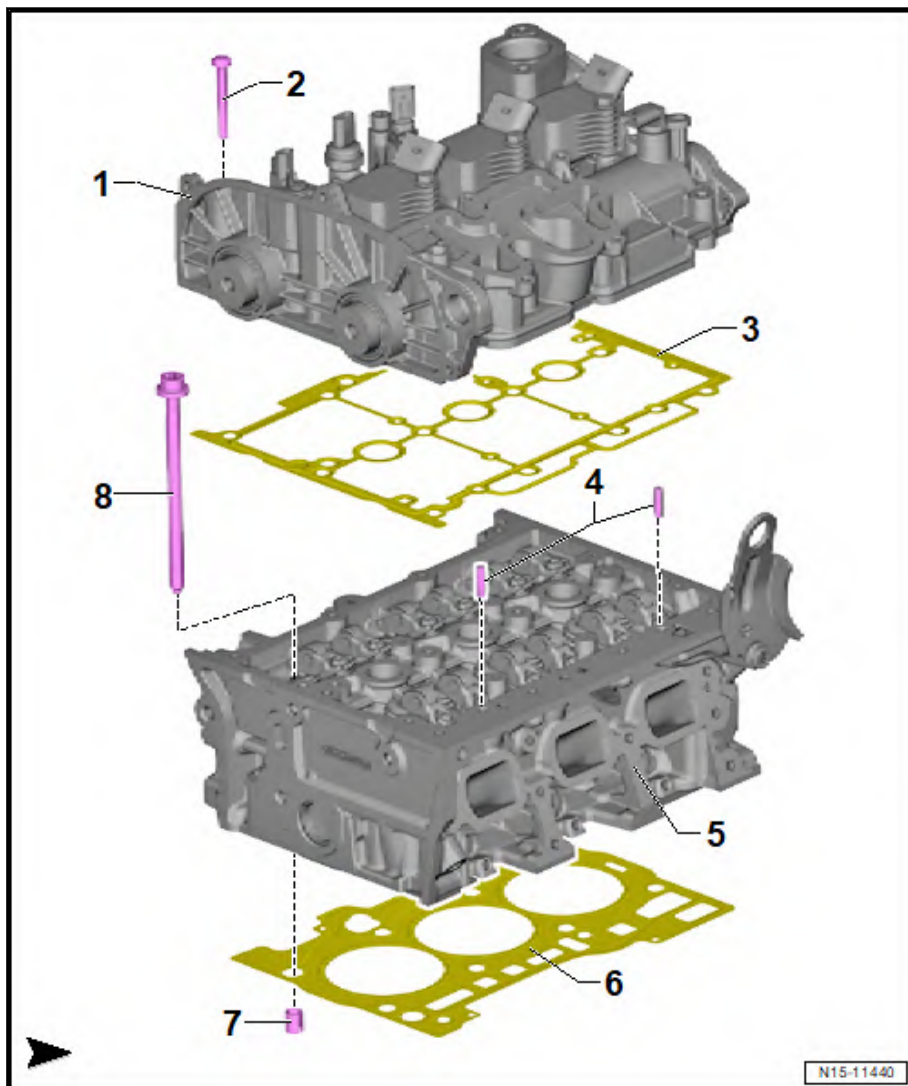
- ❑ Observe installation position: part number faces towards cylinder head
- ❑ Renewing ⇒ [a1.3 nd installing cylinder head](#), page 120

7 - Dowel sleeve

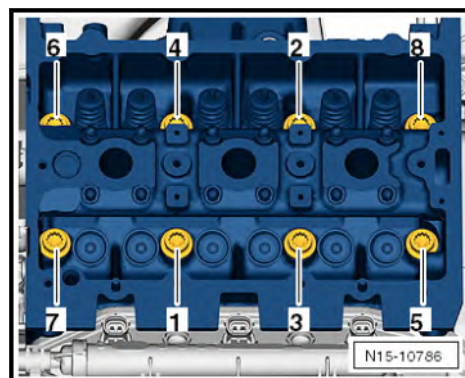
- ❑ Qty. 2

8 - Bolt

- ❑ Renew
- ❑ Note sequence when loosening ⇒ [page 121](#) .
- ❑ Specified torque and tightening sequence ⇒ [page 116](#)



Cylinder head - specified torque and sequence



Note

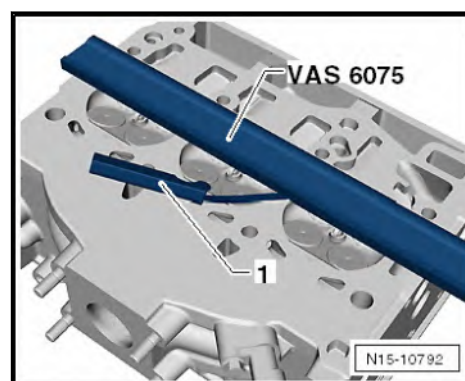
Bolts that are tightened with turning further angle must be renewed after each removal.



Stage	Specified torque	Note
1st	40 Nm	Renew bolts
2nd	Turn 90° further	With rigid spanner
3rd	Turn 90° further	With rigid spanner
4th	Turn 90° further	With rigid spanner

- Tighten bolts in stages and in the sequence as shown:

Checking cylinder head for distortion



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

1.2 Assembly overview - camshaft housing



1 - Camshaft case

- ❑ Removing and installing ⇒ [a1.4 nd installing camshaft housing](#), page 124

2 - Bolt

- ❑ Renew
- ❑ Specified torque and tightening sequence ⇒ [page 119](#)

3 - O-ring

- ❑ Check O-ring for damage.
- ❑ O-ring not available as a separate part. Renew together with camshaft control valve 1 -N205- if damaged.

4 - Camshaft adjustment valve

- ❑ Exhaust side camshaft control valve 1 -N318-
- ❑ Removing and installing ⇒ [a3.5 nd installing exhaust camshaft control valve 1N318](#), page 192

5 - Bolt

- ❑ 8 Nm

6 - Exhaust gas pressure sensor 1 -G450-

- ❑ Only fitted in vehicles with particulate filter
- ❑ Removing and installing ⇒ [a5.4 nd installing exhaust gas pressure sensor 1G450](#), page 375
- ❑ Renew
- ❑ 25 Nm

7 - Seal

- ❑ Only fitted in vehicles with particulate filter
- ❑ To be renewed only in conjunction with exhaust gas pressure sensor 1 -G450-

8 - Hall sender

- ❑ Outlet side exhaust camshaft position sender -G1003-
- ❑ Assembly overview ⇒ [o1.1 verview - ignition system](#), page 411

9 - Bolt

- ❑ 8 Nm

10 - Hall sender

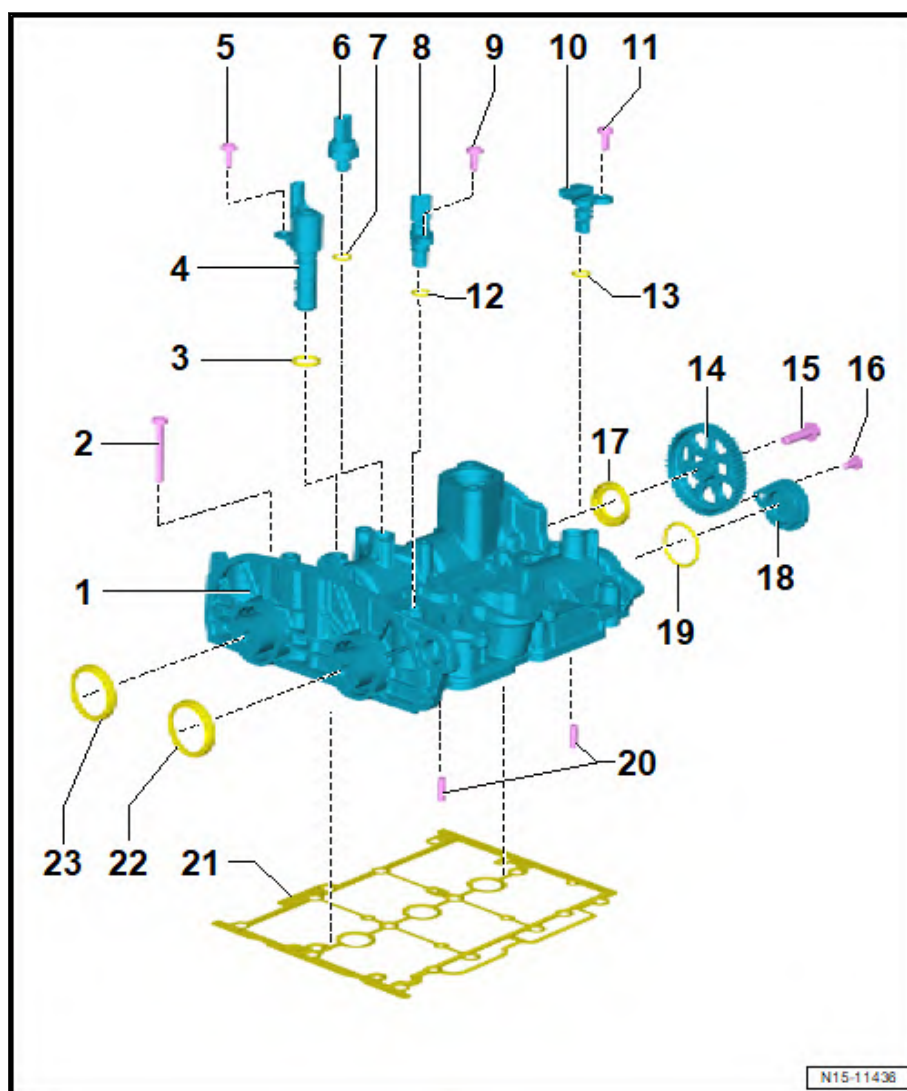
- ❑ Inlet side inlet camshaft position sender -G1002-
- ❑ Assembly overview ⇒ [o1.1 verview - ignition system](#), page 411

11 - Bolt

- ❑ 8 Nm

12 - O-ring

- ❑ Renew





13 - O-ring

- ☐ Renew

14 - Crankshaft

- ☐ For coolant pump
- ☐ Removing and installing ⇒ [a2.6 nd installing toothed belt pulley for coolant pump", page 261](#)

15 - Bolt

- ☐ Renew
- ☐ 20 Nm +90°

16 - Bolt

- ☐ 8 Nm

17 - Seal

- ☐ For exhaust camshaft, gearbox end
- ☐ Renewing ⇒ [a3.2.4 nd installing camshaft oil seal, exhaust camshaft, gearbox end", page 178](#)

18 - Cap

19 - O-ring

- ☐ Renew

20 - Dowel pins

21 - Seal

- ☐ Renew

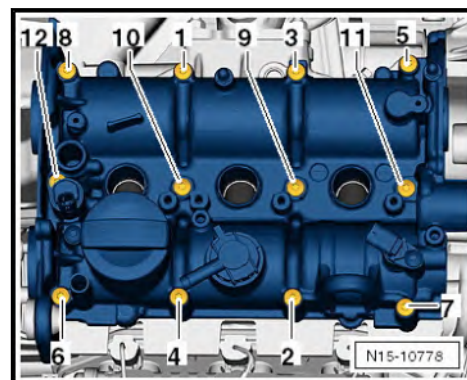
22 - Seal

- ☐ For inlet camshaft (pulley end)
- ☐ Renewing ⇒ [a3.2.2 nd installing camshaft oil seal, inlet camshaft", page 172](#)

23 - Seal

- ☐ For exhaust camshaft (pulley end)
- ☐ Renewing ⇒ [a3.2.3 nd installing camshaft oil seal, exhaust camshaft, pulley end", page 176](#)

Camshaft housing - specified torque and tightening sequence



Note

Renew bolts (stretch bolts) that are tightened with turning further angle after each removal.

– Tighten bolts in stages and in the sequence as shown:

Component	Specified torque	Note
Bolts -1- to -12-	10 Nm	Renew

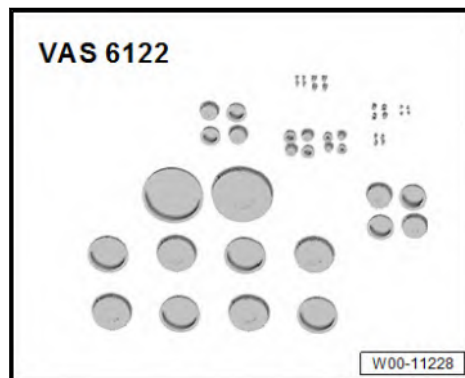


Component	Specified torque	Note
Bolts -1- to -12-	Turn +120° further	

1.3 Removing and installing cylinder head

Special tools and workshop equipment required

- ♦ Engine bung set -VAS 6122-

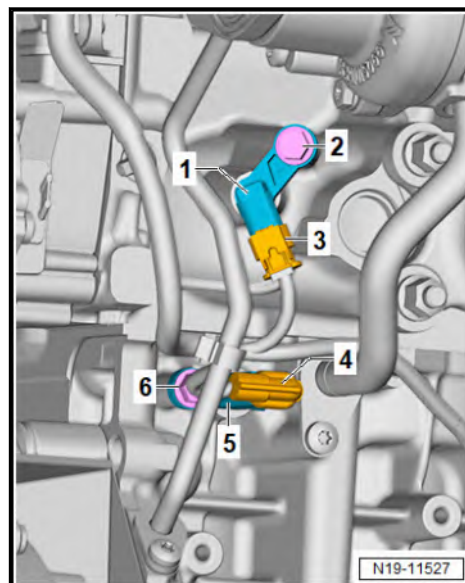


Removing

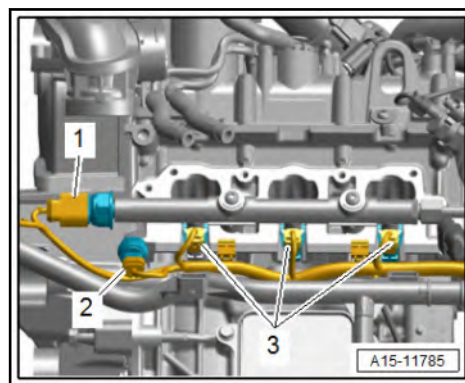


Note

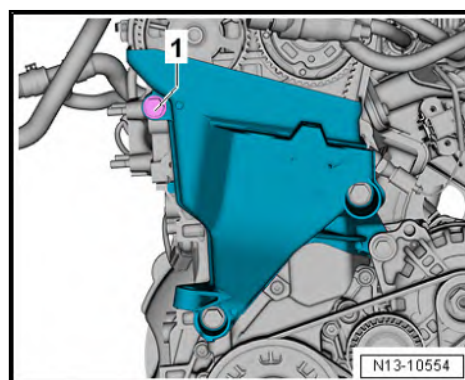
- ♦ Seal open channels of intake and exhaust system with suitable plugs from engine bung set -VAS 6122-.
- ♦ Cover the openings in the gearbox with a cloth to prevent any coolant or other liquids from getting into the clutch housing.
- ♦ Fit the cable ties in the original position when installing.
- ♦ All heat insulation sleeves must be secured in the same position on installation.
- Remove charge air cooler ⇒ [a2.2.1 nd installing charge air cooler", page 330](#) .
- Remove camshaft housing ⇒ [a1.4 nd installing camshaft housing", page 124](#) .
- Remove coolant pump ⇒ [a2.5 nd installing coolant pump", page 255](#) .
- Remove turbocharger. ⇒ [a1.2 nd installing turbocharger", page 319](#)
- Pull off electrical connector -3- for coolant temperature sender -G62- -1-.



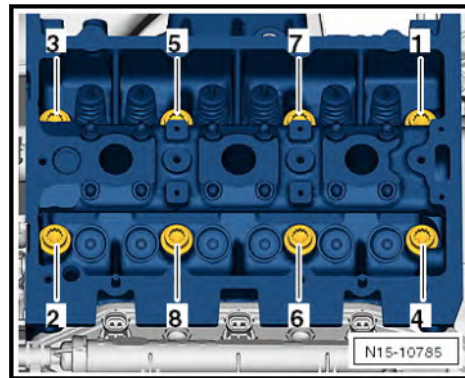
- Disconnect connectors:



- 1 - On fuel pressure sender -G247-
- 2 - On oil pressure sender -G10-
- 3 - At injectors -N30-, -N31- and -N32-
- Unscrew bolt -1- from engine support.



- Loosen and unscrew bolts for cylinder head in the sequence -1- to -8-.



Note

Avoid any damage to the cylinder head and valves. Place the cylinder head on a soft foam surface.

- Remove cylinder head, and place it on a soft surface. Use a suitable foam surface for this.
- Remove any coolant residue on the pistons and cylinder wall immediately with a cloth.

Installing



Note

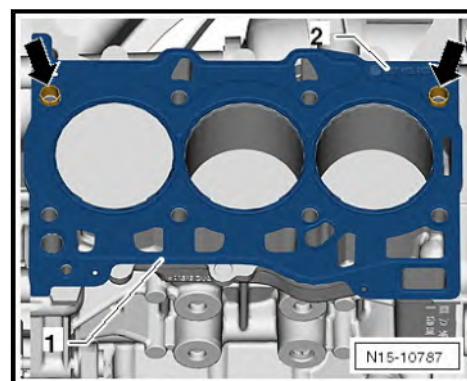
- ◆ *Do not use sandpaper, grinding wheels, abrasive or scour pads or any other sanding or abrasive media.*
- ◆ *Sealing surface (see photo) must not project.*
- ◆ *Discolouration (dark spots, see photo) need not be removed.*



- ◆ *When removing the sealant residue, make sure no loose particles get into the open channels of the engine.*
- ◆ *Ensure that all adjacent workspaces are clean, and that none of the above mentioned sanding or abrasive media are used.*
- ◆ *Using unauthorised sanding or abrasive media may lead to secondary damage such as, for example, damage to the turbocharger or the conrod bearings.*
- Do not use any other means rather than the contour blade set -VAS 852 005- or a commercially available razor blade scraper to remove the sealant residue from the cylinder head and cylinder block.



- The sealing surfaces must not be damaged.
- There must be no oil or coolant in the bolt pockets.
- Do not remove new cylinder head gasket from packaging until it is ready to be fitted.
- If a new cylinder head is installed, contact surfaces between roller rocker fingers and running surface of cam must be oiled.
- Handle the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.
- Turn the crankshaft carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.
- When the cylinder head or cylinder head gasket is renewed, the entire coolant and the engine oil must be changed.
- Remove any loose remains using a lint-free cloth.
- Renew self-locking nuts as well as gaskets, seals and O-rings.
- Renew cylinder head gasket.
- Fit cylinder head gasket -1-.



- ◆ Pay attention to dowel sleeves -arrows- in cylinder block.
- ◆ Check installation position of cylinder head gasket. The part number -2- should be legible from the inlet side.
- If crankshaft has since been turned, position cylinder number 1 piston to TDC and then turn crankshaft back slightly.
- Fit cylinder head.
- Insert cylinder head bolts, and tighten them by hand.
- Tighten bolts for cylinder head ⇒ [page 116](#) .



Note

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

Continue installation in reverse order of removal. Observe the following when doing this:

- Install turbocharger. ⇒ [a1.2 nd installing turbocharger", page 319](#)
- Install coolant pump ⇒ [a2.5 nd installing coolant pump", page 255](#) .



- Install camshaft housing ⇒ [a1.4 nd installing camshaft housing", page 124](#) .
- Install charge air cooler ⇒ [a2.2.1 nd installing charge air cooler", page 330](#) .
- Electrical connections and routing ⇒ Electrical system; Rep. gr. 97; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Change engine oil ⇒ Maintenance; Booklet 819.
- Fill cooling system with fresh coolant ⇒ [a1.3 nd adding coolant", page 240](#) .

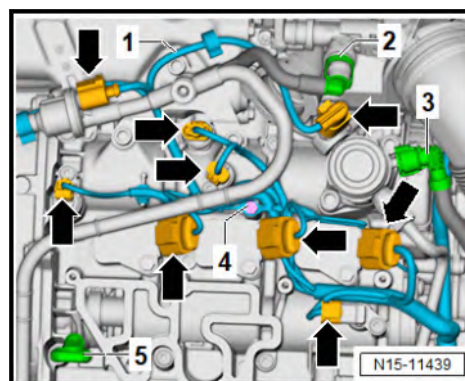
Torque settings

- ♦ ⇒ [o2.1 verview – assembly mountings", page 34](#)
- ♦ ⇒ [o1.1 verview - cylinder head", page 115](#)
- ♦ ⇒ [o1.1 verview - turbocharger", page 316](#)
- ♦ ⇒ [o4.1 verview - intake manifold", page 365](#)

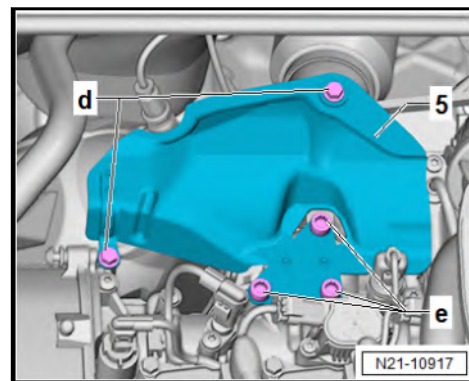
1.4 Removing and installing camshaft housing

Removing

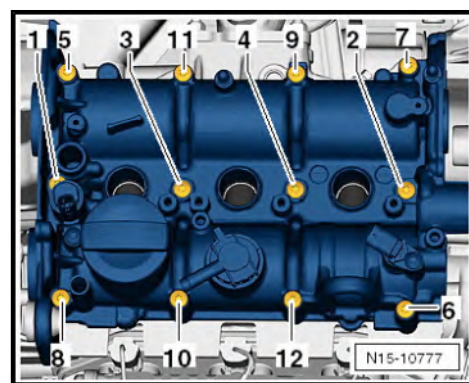
- Remove toothed belt pulley for coolant pump ⇒ [a2.6 nd installing toothed belt pulley for coolant pump", page 261](#) .
- Remove ignition coils ⇒ [a1.2 nd installing ignition coils with output stage", page 413](#) .
- Remove toothed belt from camshafts ⇒ [t2.8 oothed belt from camshaft", page 159](#) .
- Remove high-pressure pipe ⇒ [a7.3 nd installing high-pressure pipe", page 386](#) .
- Remove oil separator at top ⇒ [a3.2.2 nd installing oil separator, upper", page 228](#) .
- Disconnect electrical connector -arrows-.



- Unscrew bolt -4-.
- Move clear electrical wiring harness, and lay it to the left side.
- Pull off breather line -2- and fuel line -3-.
- Pull out oil dipstick -5-.
- Remove upper heat shield above turbocharger and catalytic converter.

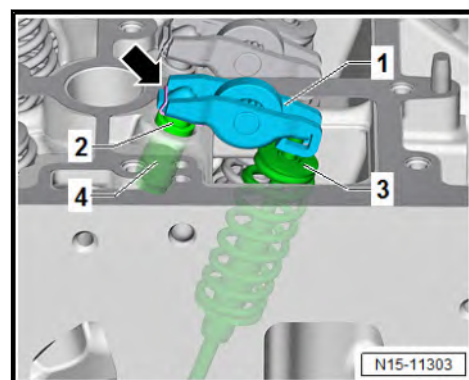


- To do this, unscrew bolts -d- and -e-, and remove heat shield -5-.
- Loosen and unscrew bolts for camshaft housing in the sequence -1- to -12-.



- Lift camshaft housing until it is completely detached from dowel pins.
- Remove gasket.

If the roller rocker fingers and hydraulic compensation elements are removed:



- Mark allocation of roller rocker fingers -1-, hydraulic compensation element -4- and valves -3- for reinstallation.
- Remove roller rocker fingers together with compensation elements and place them on a clean surface.

Installing

Install in reverse order of removal, observing the following:



Note

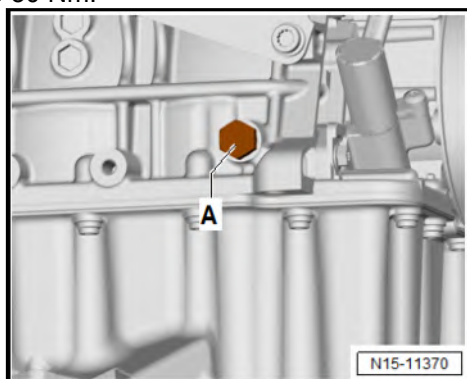
Renew bolts that are tightened with turning further angle.



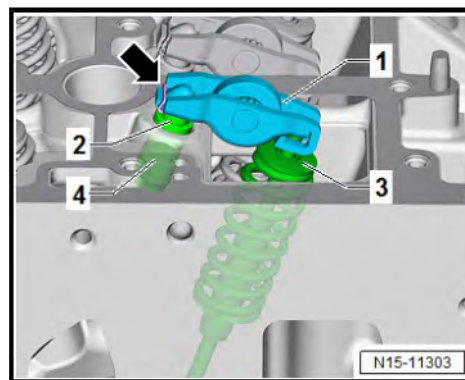
NOTICE

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

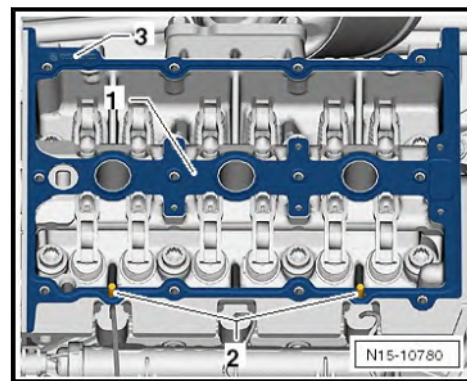
- Never move camshafts in axial direction when turning them.
- Locking pin -T10340- screwed into cylinder block as far as stop and tightened to 30 Nm.



- Crankshaft has been turned in direction of engine rotation until it rests against locking pin -T10340- -A- = "TDC" position ➔ [page 112](#) .
- Make sure that all roller rocker fingers -1- rest properly against end of valve stem -3-.



- Make sure that all roller rocker fingers -1- are clipped into the respective hydraulic compensation element -4-.
- Make sure that camshafts are set to »TDC« position for piston of cylinder no. 1 ➔ [page 113](#) .
- Fit new gasket -1- on dowel pins -2-.



- Part number -3- of gasket must be readable from above.
- Check »TDC« position of camshafts and crankshaft ⇒ [p4.7 iston to TDC position”, page 111](#) .



Note

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



Note

Note different bolt lengths.

- Tighten bolts for camshaft housing ⇒ [page 119](#) .

Continue installation in reverse order of removal, observing the following:

- Install upper oil separator ⇒ [a3.2.2 nd installing oil separator, upper”, page 228](#) .
- Install high-pressure pipe ⇒ [a7.3 nd installing high-pressure pipe”, page 386](#) .
- Install toothed belt ⇒ [a2.4 nd installing toothed belt”, page 135](#) .
- Install ignition coils ⇒ [a1.2 nd installing ignition coils with output stage”, page 413](#) .
- Install toothed belt pulley for coolant pump ⇒ [a2.6 nd installing toothed belt pulley for coolant pump”, page 261](#) .
- Electrical connections and routing ⇒ Electrical system; Rep. gr. 97; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

Torque settings

- ◆ ⇒ [o3.1 verview - valve gear”, page 166](#)
- ◆ ⇒ [o1.1 verview - turbocharger”, page 316](#)
- ◆ ⇒ [o3.1 verview - air filter housing”, page 357](#)



1.5 Checking compression



Note

In addition to the compression test, a pressure loss test can also be performed using pressure loss tester -VAS 522 001-. The corresponding procedure is described in the operating manual of the pressure loss tester.

Special tools and workshop equipment required

- ◆ Spark plug socket -3122B-



- ◆ Compression tester -V.A.G 1763-



- ◆ Adapter -V.A.G 1381/5A-



- ◆ Adapter -V.A.G 1381/1- (not shown)
- ◆ Sensor -V.A.G 1763/10- (not shown)

Procedure

- Engine oil temperature at least 30°C.
- Battery voltage at least 12.5 V.



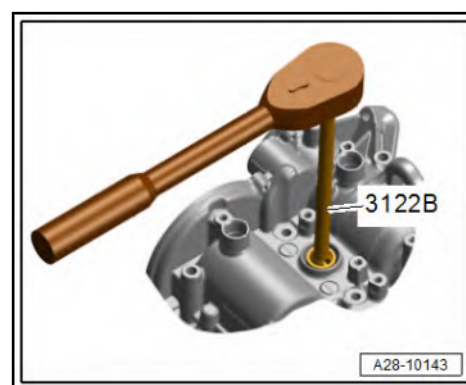
- Remove fuse for fuel pump control unit from fuse holder.
Fuse assignment ⇒ Current flow diagrams, Electrical fault finding and Fitting locations



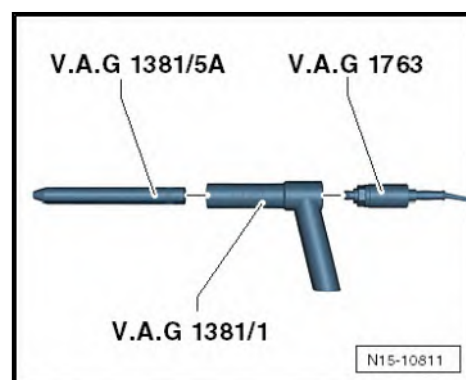
Note

Removing fuse interrupts voltage supply for fuel pump control unit.

- Start engine and allow it to run until the engine turns off.
- Deactivate vehicle's drive system and switch off all electrical consumers.
- Removing ignition coils with output stages ⇒ [a1.2 nd installing ignition coils with output stage", page 413](#) .
- Unscrew spark plugs using spark plug socket and extension -3122 B-.



- Check compression using compression tester -V.A.G 1763-, adapter -V.A.G 1381/1- and adapter -V.A.G 1381/5A-. Using compression tester: ⇒ Operating instructions.



- Have a 2nd mechanic fully depress the accelerator pedal and, at the same time, actuate the starter until the tester shows no further pressure increase.
- Repeat procedure on each cylinder.

Compression pressures	Pressure
Bar (gauge), new	16.0 to 22.0
Wear limit, bar (gauge)	13.0
Maximum difference between cylinders, bar (gauge)	3.0



Assembling

Install in reverse order of removal, observing the following:

- Install spark plugs ⇒ Maintenance; Booklet ; Spark plugs: Renewing.
- Install ignition coils with output stages ⇒ [a1.2 nd installing ignition coils with output stage", page 413](#) .
- Entries will have been made in the event memory of the engine control unit because connectors were separated and the engine was started ⇒ Vehicle diagnostic tester.



2 Toothed belt drive

⇒ [o2.1 verview - toothed belt cover", page 131](#)

⇒ [o2.2 verview - toothed belt", page 131](#)

⇒ [a2.3 nd installing toothed belt guard", page 134](#)

⇒ [a2.4 nd installing toothed belt", page 135](#)

⇒ [a2.5 nd installing test tool/VAS 611 007", page 138](#)

⇒ [v2.6 alve timing", page 146](#)

⇒ [v2.7 alve timing", page 148](#)

⇒ [t2.8 oothed belt from camshaft", page 159](#)

2.1 Assembly overview - toothed belt cover

1 - Upper toothed belt guard

- ❑ Removing and installing ⇒ [page 134](#)

2 - Bolts for upper toothed belt guard

- ❑ 8 Nm

3 - Bolt for front coolant pipe

- ❑ Torque ⇒ [Item 1 \(page 277\)](#)

4 - Bolts for engine support

- ❑ Specified torque and tightening sequence ⇒ [page 36](#)

5 - Lower toothed belt guard

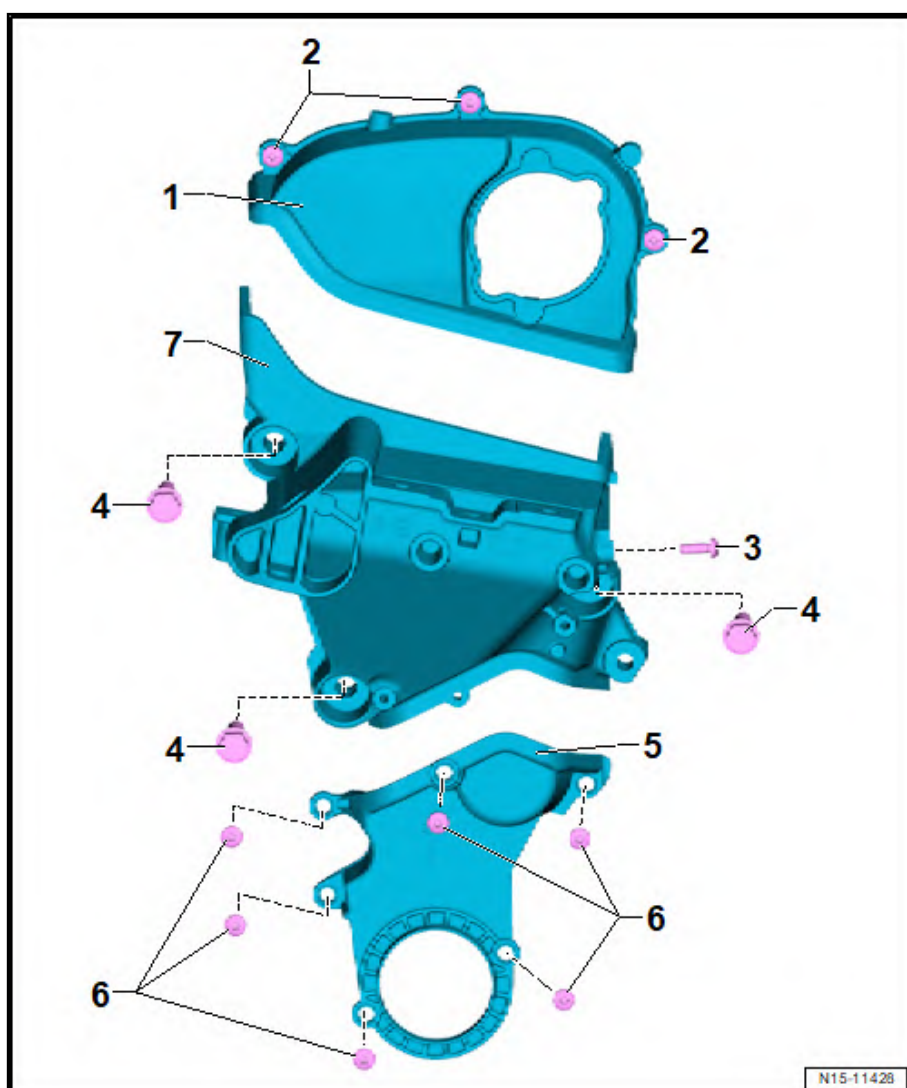
- ❑ Removing and installing ⇒ [page 134](#)

6 - Bolts for lower toothed belt guard

- ❑ 8 Nm

7 - Engine support

- ❑ Removing and installing ⇒ [page 73](#)



2.2 Assembly overview - toothed belt



1 - Toothed belt

- ☐ Before removing, mark direction of rotation with chalk or felt-tipped marker pen.
- ☐ Check for wear
- ☐ Removing ⇒ [page 135](#)
- ☐ Adjusting valve timing ⇒ [page 148](#)

2 - Securing bolt

- ☐ Qty. 1
- ☐ M10 × 1.25 × 90
- ☐ Renew
- ☐ 50 Nm +135°

3 - Camshaft adjuster, exhaust camshaft

- ☐ With guide sleeve
- ☐ Removing and installing camshaft adjuster ⇒ [page 181](#)

4 - Camshaft adjuster, inlet camshaft

- ☐ Removing and installing camshaft adjuster ⇒ [page 181](#)

5 - Timing valve

- ☐ Checking ⇒ [Fig. "Checking control valve", page 133](#)
- ☐ 140 Nm

6 - Radial oil seal

- ☐ Removing and installing ⇒ [a3.2.1 nd installing camshaft oil seal for holder of inlet camshaft control valve 1N727", page 169](#)

7 - Bracket for idler roller

8 - Idler roller

- ☐ Removal and installation involve removing engine support ⇒ [a1.5 nd installing engine support", page 73](#).

9 - Securing bolt

- ☐ Renew
- ☐ 40 Nm +90°

10 - Securing bolt

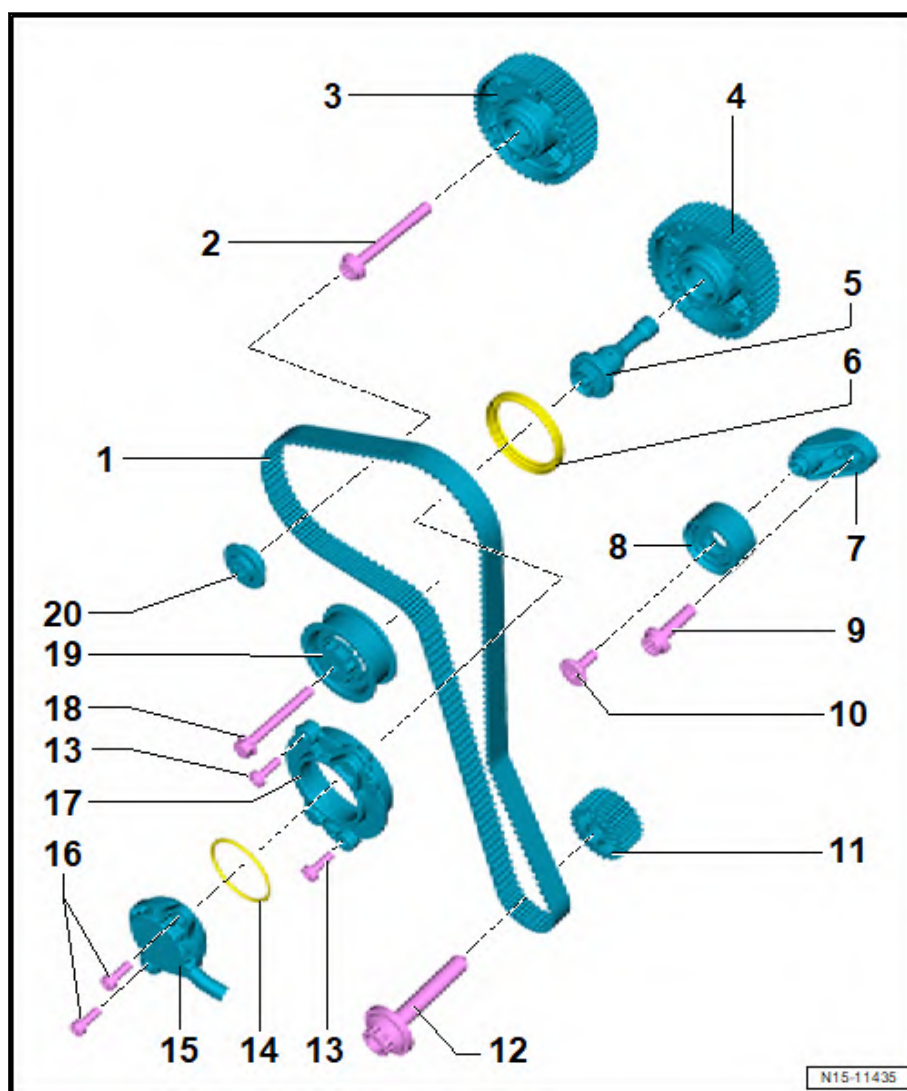
- ☐ Included in scope of supply for idler roller
- ☐ Qty. 1
- ☐ M10 x 40
- ☐ 40 Nm

11 - Crankshaft pulley

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

12 - Bolt

- ☐ Use counter-hold tool -T10475- to loosen and tighten





- ☐ Renew
- ☐ 150 Nm +180°

13 - Securing bolt

- ☐ Qty. 2
- ☐ M6 x 20
- ☐ 8 Nm

14 - Seal

- ☐ Renew

15 - Inlet camshaft control valve 1 -N727-

- ☐ Removing and installing ⇒ [page 191](#)

16 - Securing bolt

- ☐ Qty. 2
- ☐ M6 x 20
- ☐ 8 Nm

17 - Oil seal holder

- ☐ Removing and installing ⇒ [a3.7 nd installing holder for oil seal", page 207](#)

18 - Securing bolt

- ☐ Qty. 1
- ☐ M8 x 70
- ☐ 25 Nm

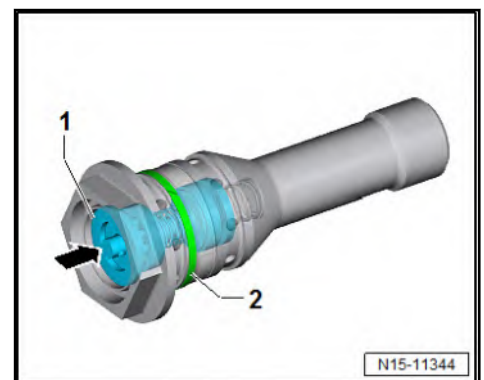
19 - Tensioning pulley

- ☐ Removal and installation involve removing engine support ⇒ [a1.5 nd installing engine support", page 73](#).

20 - Plug

- ☐ Check O-ring for damage and if necessary renew with plug.
- ☐ 35 Nm

Checking control valve



- It must be possible to press in the piston -arrow- approx. 3 mm against the spring force. The piston must not be jammed when doing this.
- Press in piston carefully.
- Check whether control valve -1- is soiled, and clean it as necessary.
- Make sure that seal -2- is correctly seated.
- If the seal is damaged, the control valve must be renewed
⇒ Electronic parts catalogue (ETKA).



2.3 Removing and installing toothed belt guard

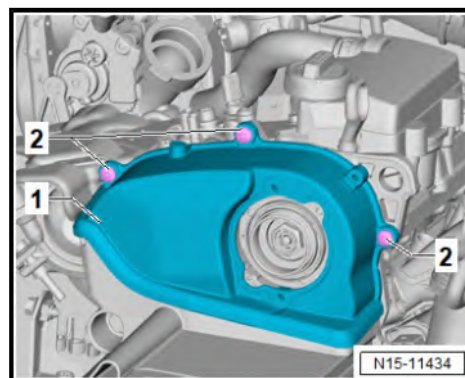
⇒ [a2.3.1 nd installing upper toothed belt guard", page 134](#)

⇒ [a2.3.2 nd installing lower toothed belt guard", page 134](#)

2.3.1 Removing and installing upper toothed belt guard

Removing:

- Remove holder for oil seal ⇒ [a3.7 nd installing holder for oil seal", page 207](#) .



- Unscrew bolts -2-.
- Remove upper toothed belt guard -1-.

Installing:

Install in reverse order of removal, observing the following:

- Observe information about vehicle data sticker ⇒ [page 4](#) .
- Install holder for oil seal ⇒ [a3.7 nd installing holder for oil seal", page 207](#) .

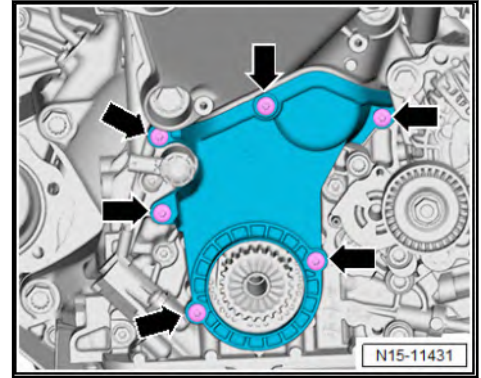
Specified torques:

- ♦ ⇒ [o2.1 verview - toothed belt cover", page 131](#)
- ♦ ⇒ [o2.2 verview - toothed belt", page 131](#)

2.3.2 Removing and installing lower toothed belt guard

Removing:

- Remove vibration damper ⇒ [a1.4 nd installing vibration damper", page 70](#) .
- Unscrew bolts -arrows-.



- Remove lower part of toothed belt guard.

Installing:

Install in reverse order of removal, observing the following:

- Install vibration damper ⇒ [a1.4 nd installing vibration damper](#), page 70 .

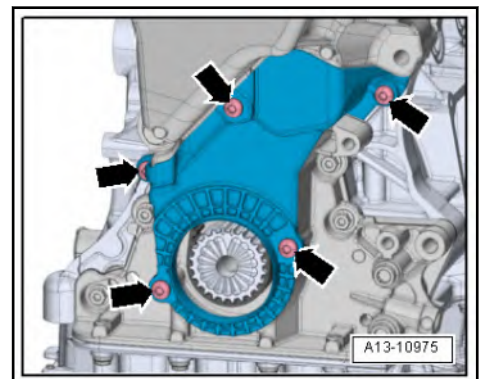
Specified torques:

- ♦ ⇒ [o2.1 verview - toothed belt cover](#), page 131
- ♦ ⇒ [o1.1 verview - poly V-belt drive](#), page 62

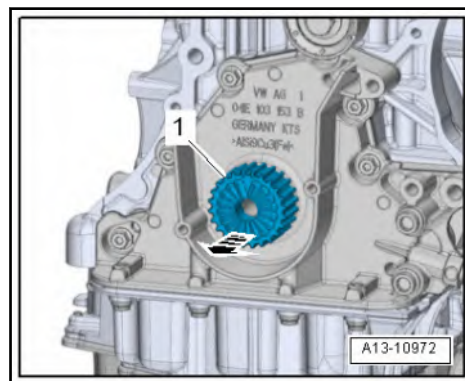
2.4 Removing and installing toothed belt

Removing

- Mark direction of rotation of toothed belt with marker.
- Remove toothed belt from camshaft ⇒ [t2.8 oothed belt from camshaft](#), page 159
- Remove vibration damper. ⇒ [a1.4 nd installing vibration damper](#), page 70
- Unscrew bolts -arrows- and remove toothed belt guard.

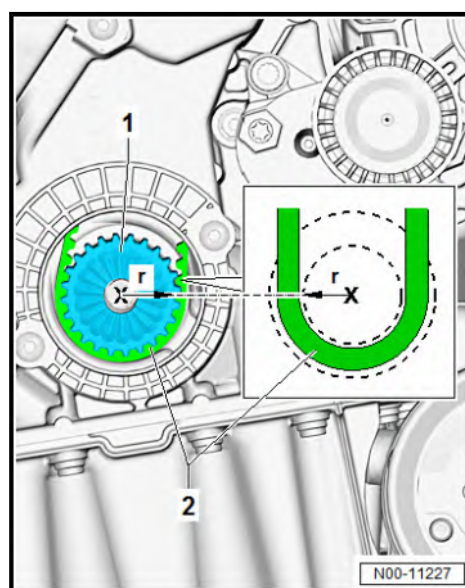


- Detach crankshaft pulley -1- -arrow-.



Installing

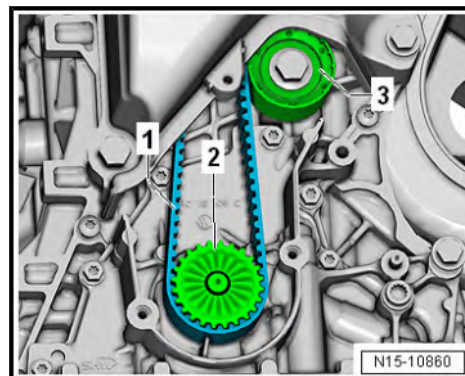
Bend radius of toothed belt



NOTICE

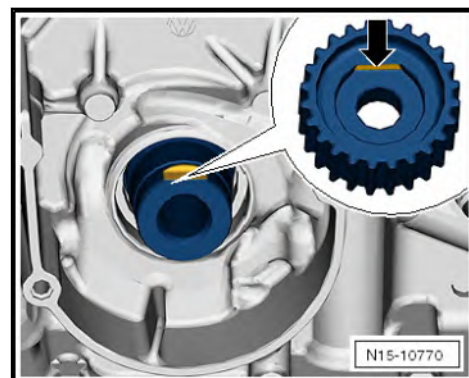
Risk of damage to toothed belt by bending it excessively.
The toothed belt is made of glass fibre fabric which will be damaged if it is bent excessively.

- Never bend toothed belt to a radius less than $r = 25 \text{ mm}$.
- Pull toothed belt upwards through engine support, and fit it onto camshafts.
- Fit toothed belt -1- together with crankshaft pulley -2- onto crankshaft journal.

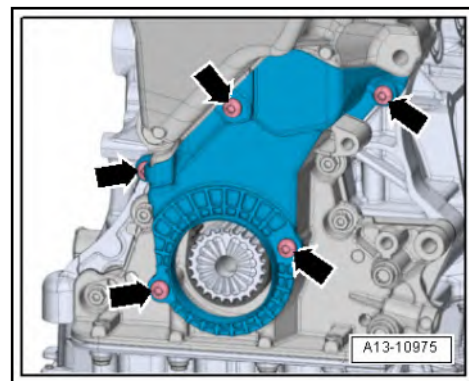




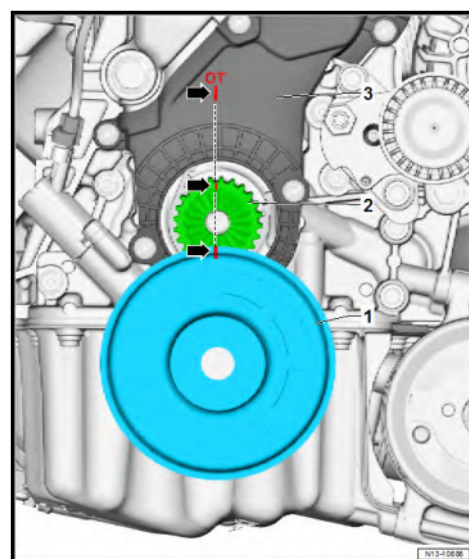
- Observe the following when fitting crankshaft pulley:



- Contact surface between poly V-belt pulley and crankshaft toothed belt pulley must be free of oil and grease.
- The machined surface -arrow- of crankshaft pulley must be positioned over the machined surface of the crankshaft journal.
- Install lower toothed belt guard -arrows-.



- Check the position of the crankshaft before fitting the vibration damper -1-.



- The marking on the crankshaft pulley -2- must be properly aligned with the »TDC marking« on the lower toothed belt guard -3-.



- Install vibration damper ⇒ [a1.4 nd installing vibration damper", page 70](#) .
- Adjust valve timing ⇒ [v2.7 alve timing", page 148](#) .

Torque settings

- ◆ ⇒ [o1.1 verview - poly V-belt drive", page 62](#)
- ◆ ⇒ [o2.1 verview - toothed belt cover", page 131](#)

2.5 Preassembling and installing test tool -VAS 611 007-

⇒ [t2.5.1 est toolVAS 611 007", page 138](#)

⇒ [t2.5.2 est toolVAS 611 007", page 141](#)

⇒ [t2.5.3 est toolVAS 611 007 electronically and performing basic setting", page 144](#)

2.5.1 Preassembling test tool -VAS 611 007-

Special tools and workshop equipment required

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



Procedure

Test tool -VAS 611 007-



A - Angle sensor -VAS 611 007/1-

- ❑ Specified torque brake:
11 Nm

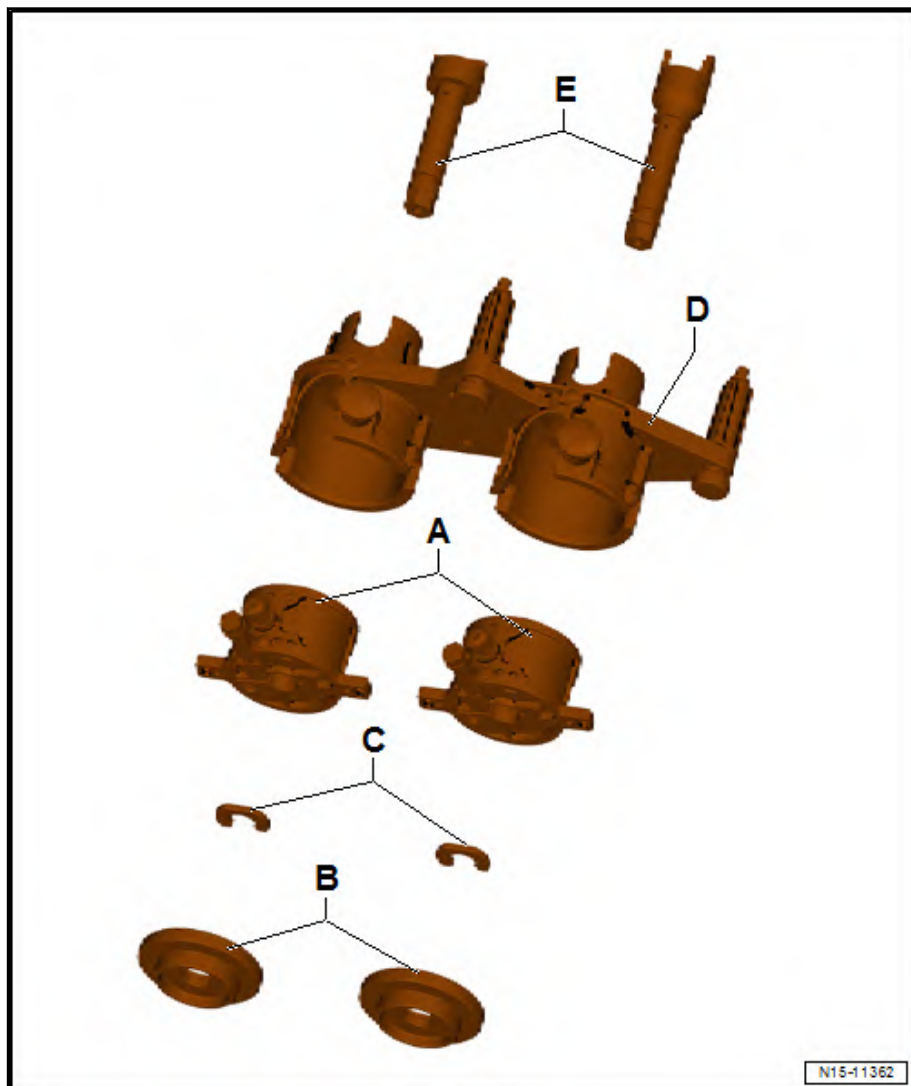
B - Lock ring -VAS 611 007/2-

C - Clamping ring -VAS 611 007/3-

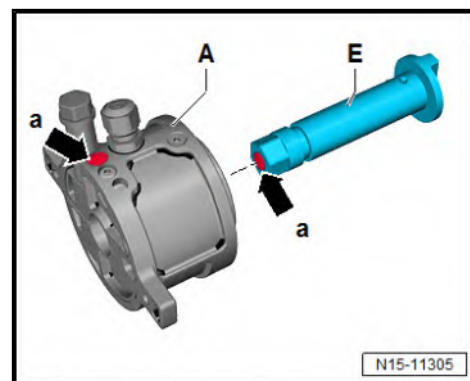
D - Adapter for camshaft housing -VAS 611 007/15-

E - Adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17-

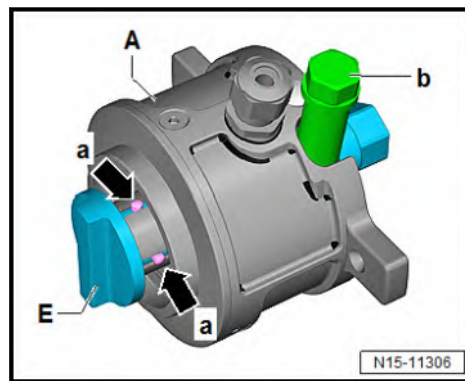
- ❑ Adapter for angle sensor -VAS 611 007/16- blue
- ❑ Adapter for angle sensor -VAS 611 007/17- red



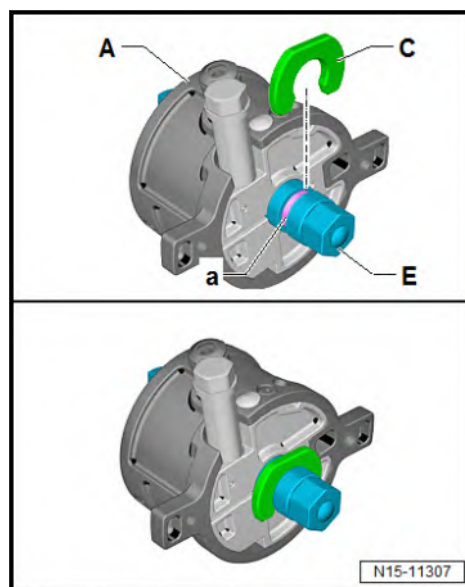
Preassembling test tool -VAS 611 007-



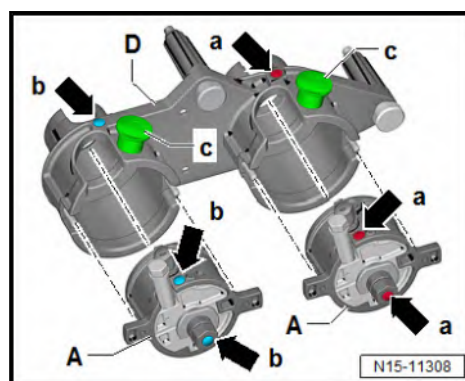
- Before inserting adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- -E- in angle sensor -VAS 611 007/1- -A-, verify correct allocation in accordance with colour coding -a-.
- Insert adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- -E- in angle sensor -VAS 611 007/1- -A-.
- Note position of dowel pins -a- when installing.



- Adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- -E- only fit in one position.
- Make sure that brake -b- is released. Do not apply force.
- Insert adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- -E- as far as stop in angle sensor -VAS 611 007/1- -A-.
- Secure clamping ring -VAS 611 007/3- -C- in groove -a- from adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- -E-.

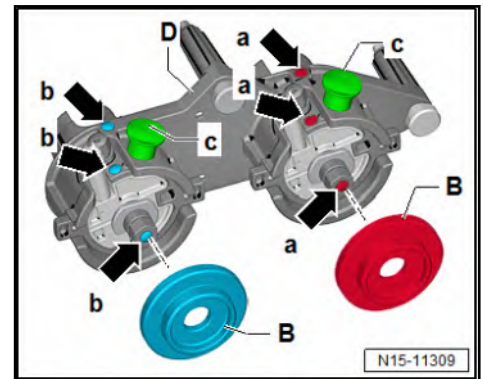


- Insert angle sensor -VAS 611 007/1- -A- with red colour coding on side marked red -arrows a- of adapter for camshaft housing -VAS 611 007/15- -D-. To do this, release locking pins -c- by pulling them upwards.

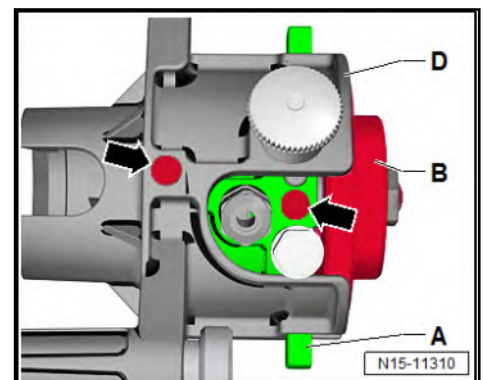




- Insert angle sensor -VAS 611 007/1- -A-, and push it in until locking pin can be heard to engage.
- Repeat procedure with angle sensor -VAS 611 007/1- -A- with blue colour coding -arrows b-.
- Screw in locking ring -VAS 611 007/2- red and blue -B- approx. 2 turns. Note colour coding -arrows a- and -arrows b- when doing this.



- Screw in lock ring -VAS 611 007/2- -B- max. 2 turns by hand.



- Make sure that the shaft is free to move.
- Adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- should turn easily.

2.5.2 Installing test tool -VAS 611 007-

Special tools and workshop equipment required

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



Procedure

- Preassemble test tool -VAS 611 007- ➔ [t2.5.1 est tool VAS 611 007", page 138](#) .



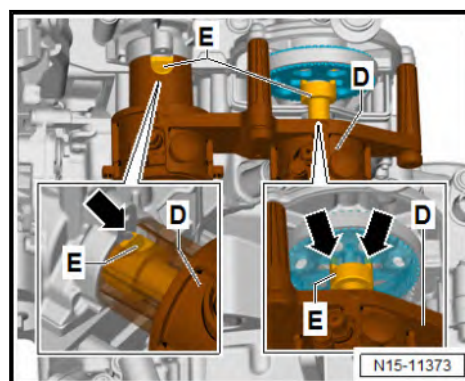
- Teach-in test tool -VAS 611 007- electronically and perform basic setting ⇒ [t2.5.3 test tool VAS 611 007 electronically and performing basic setting](#), page 144
- Turn adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- until display is set to approx. 0°.
- Perform the preliminary work for checking the valve timing ⇒ [v2.6 valve timing](#), page 146 .
- Make sure that the piston in cylinder no. 1 is at TDC position ⇒ [p4.7 piston to TDC position](#), page 111 .
- Make sure that brakes on angle sensor -VAS 611 007/1- are released on both sides ⇒ [page 140](#) .



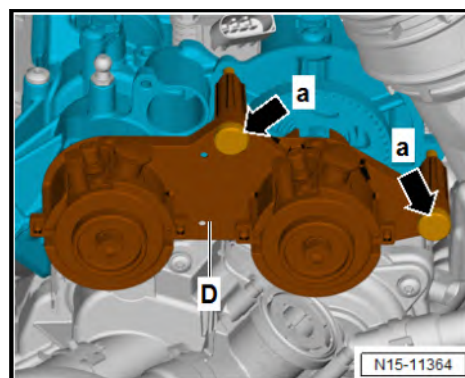
Note

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

- Align adapter for angle sensor -E- by hand with grooves of camshafts -arrows-.



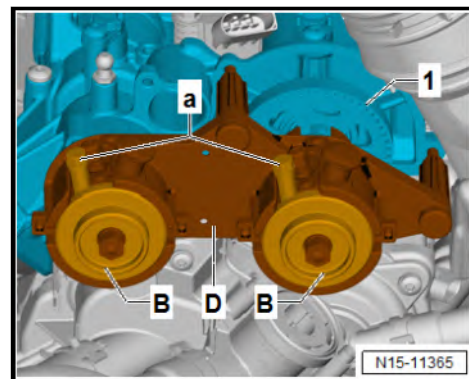
- Check proper alignment through recess, and adapt position by turning.
- Fit adapter for camshaft housing -VAS 611 007/15- -D- to camshaft housing, and slide it on.



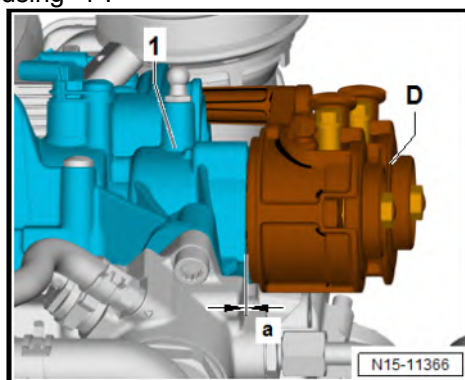
- Tighten knurled screws -arrows a- alternately by hand.
- Make sure that adapter for camshaft housing -VAS 611 007/15- -D- is properly seated.
- Test tool -VAS 611 007- must rest flush against camshaft housing.



- Make sure that brakes on angle sensor -VAS 611 007/1- are released on both sides ➔ [page 140](#) .
- Tighten locking ring -VAS 611 007/2- -B- on both sides evenly by hand. When doing this, ensure that camshaft housing adapter -VAS 611 007/15- -D- always lies flat against camshaft housing -1-.



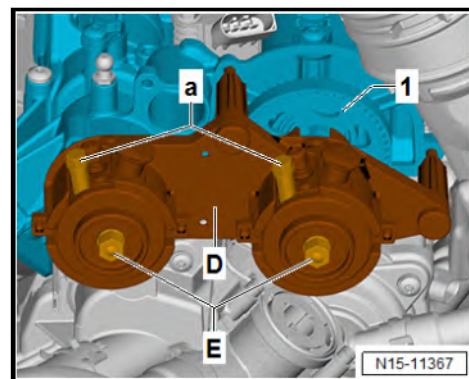
- Camshaft housing adapter -VAS 611 007/15- -D- should not lift off of camshaft housing -1-.



Note

The correct preload is achieved when the camshaft housing adapter -VAS 611 007/15- lies flat -a- against the camshaft housing.

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





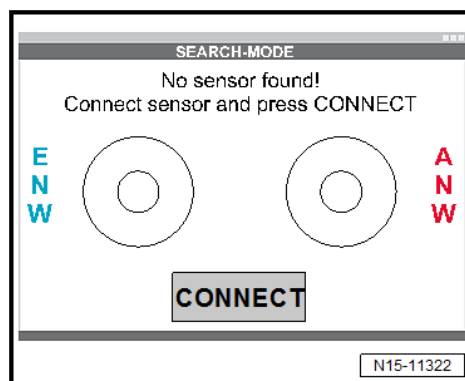
2.5.3 Teaching-in test tool -VAS 611 007- electronically and performing basic set- ting

Special tools and workshop equipment required

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



Procedure

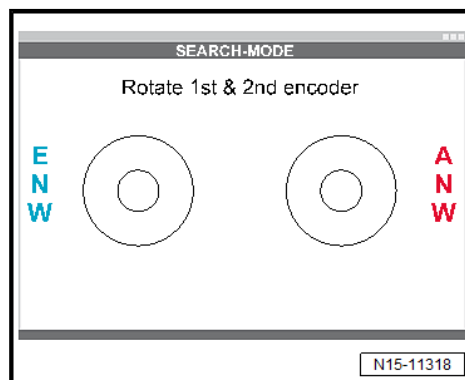


- Connect electronic measuring equipment of test tool -VAS 611 007- → Operating manual.
- Perform software installation of test tool -VAS 611 007- → Operating manual.
- Start test program → Operating manual.

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

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

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

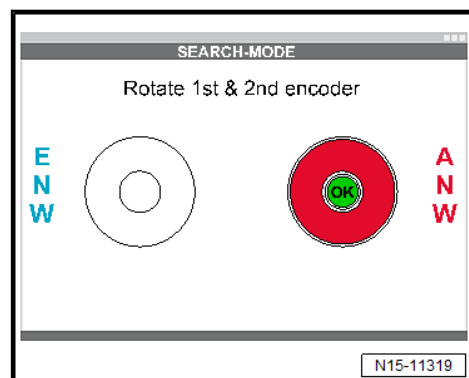


ANW - Exhaust camshaft, red



ENW - Inlet camshaft, blue

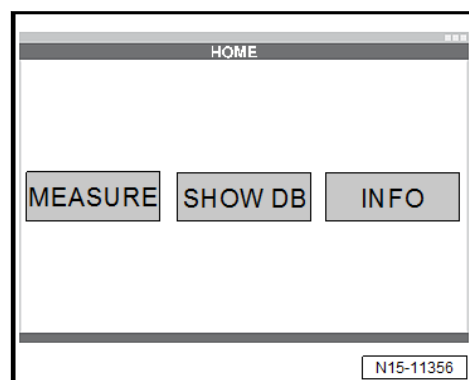
- Turn adapter for angle sensor -VAS 611 007/17- red -E- for exhaust camshaft.



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

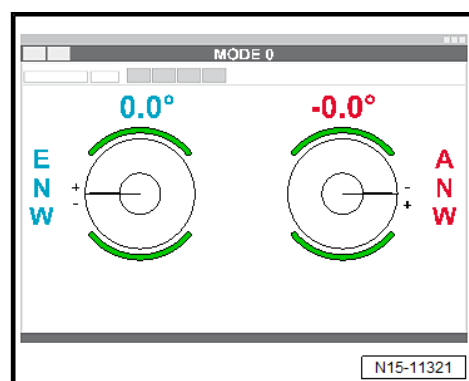
- Turn adapter for angle sensor -VAS 611 007/16- blue -E- for inlet camshaft.

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

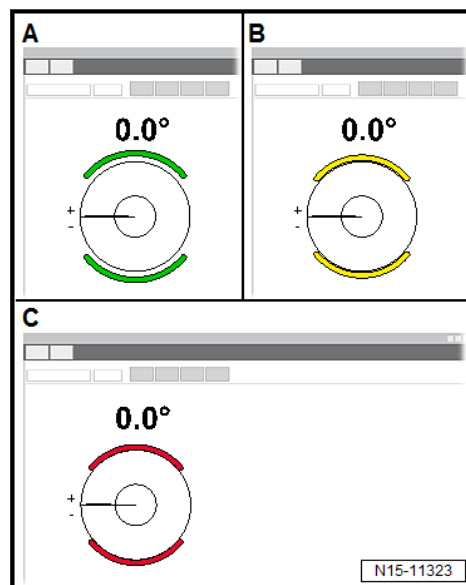


- Select function **MEASURE**.

If display is as follows:



- Check valve timing ⇒ [v2.6 alve timing", page 146](#) .
- Make sure that brake indicator on display is green.



- It must not be yellow or red.

A - Green, brake is released

B - Yellow, brake is applied

C - Red, brake has been tightened to torque

2.6 Checking valve timing

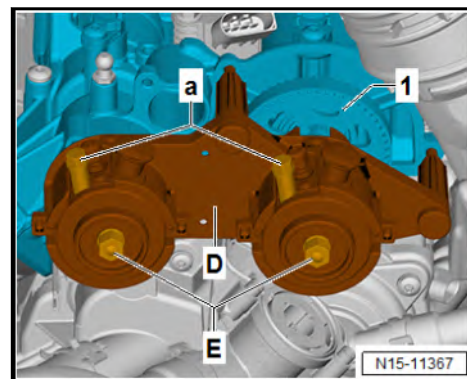
Special tools and workshop equipment required

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

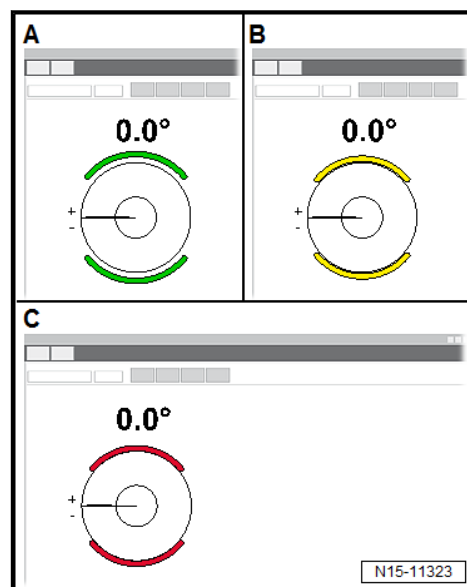


Procedure

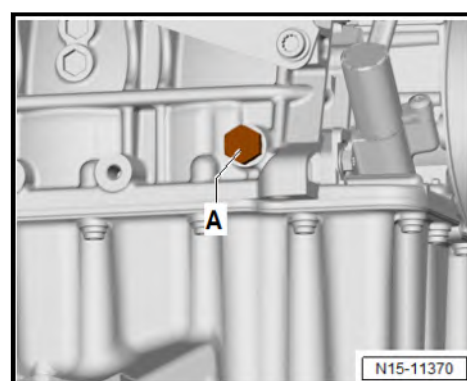
- Set piston for cylinder no. 1 to TDC position ➔ [p4.7 iston to TDC position", page 111](#) .
- Preassemble test tool -VAS 611 007- ➔ [t2.5.1 est toolVAS 611 007", page 138](#) .
- Install test tool -VAS 611 007- ➔ [t2.5.2 est toolVAS 611 007", page 141](#) .
- Make sure that brakes -a- are released on both sides.



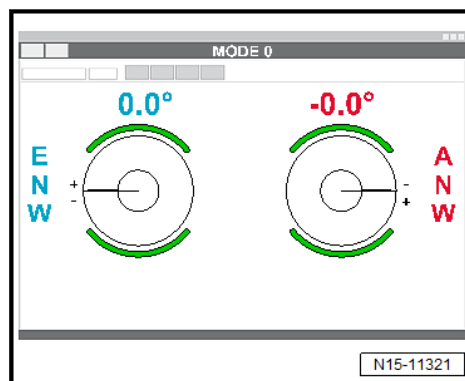
- Make sure that brake indicator on display is green -A-.



- It must not be yellow or red.
- Unscrew locking pin -T10340- -A-.



- Turn crankshaft 2 turns in direction of rotation of engine.
- Screw in locking pin -T10340- -A-.
- Set piston for cylinder no. 1 to TDC position ⇒ p4.7 iston to TDC position", page 111 .
- Read valve timing angles on display, and compare values with specifications.



Specified values

Inlet camshaft	Exhaust camshaft
$-1.0^{\circ} \pm 1.2^{\circ}$	$-1.0^{\circ} \pm 1.2^{\circ}$

NOTICE

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

The valve timing must not be outside the tolerance limits.

- If necessary, adjust timing ⇒ [v2.7 alve timing](#)", page 148 .

Install in reverse order of removal, observing the following:

Torque settings

- ♦ ⇒ [o3.1 verview - air filter housing](#)", page 357

Component	Specified torque
Bolt for TDC hole in cylinder block	30 Nm

2.7 Adjusting valve timing

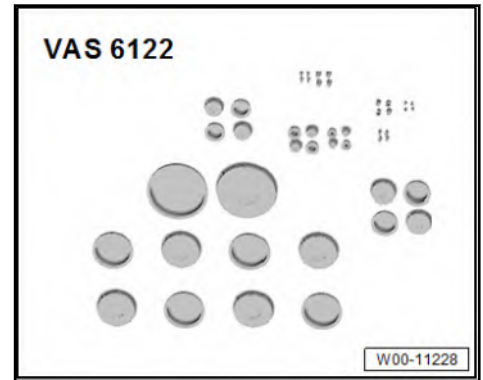
Special tools and workshop equipment required

- ♦ Locating bolt -T10340-





◆ Engine bung set -VAS 6122-



Procedure

- Toothed belt installed.

If the toothed belt has already been removed and reinstalled in the context of another repair measure:

- Camshaft adjuster securing bolts are not pre-tightened.
- Tighten exhaust camshaft securing bolt to specified initial torque. ⇒ [page 190](#)
- Tighten inlet camshaft securing bolt to specified initial torque. ⇒ [page 185](#)



Note

If the securing bolt for the exhaust camshaft has already been replaced, the replacement of the securing bolt can be ignored in the following procedure.

Checking valve timing without removal of toothed belt

- Check valve timing ⇒ [v2.6 alve timing", page 146](#) .
- Set piston for cylinder no. 1 to TDC position ⇒ [page 111](#) .
- Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster.
- Loosen camshaft adjuster on inlet side ⇒ [a3.3.1 nd installing camshaft adjuster for inlet camshaft", page 181](#) .
- Loosen camshaft adjuster on exhaust side ⇒ [a3.3.2 nd installing camshaft adjuster for exhaust camshaft", page 186](#) .



NOTICE

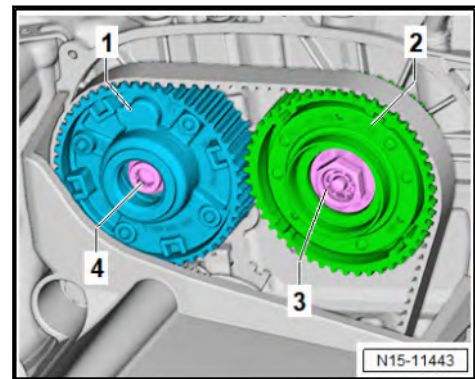
Risk of damage to engine caused by incorrect valve timing.

- Do not turn crankshaft out of TDC position.



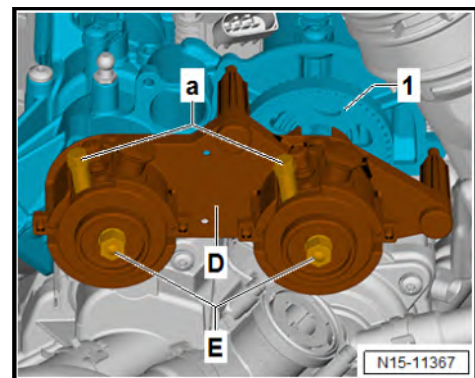
Note

- ◆ *Place a cloth under the camshaft adjusters and over tensioning roller to catch the engine oil which runs out.*
- ◆ *The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.*
- ◆ *Catch any engine oil which runs out immediately, and remove it.*
- ◆ *Remove any engine oil which ran out from camshaft adjusters after the engine has been cranked.*
- Place a cloth under the camshaft adjusters and over tensioning roller to catch the engine oil which runs out.
- Make sure that the piston in cylinder no. 1 is at TDC position
⇒ [p4.7 piston to TDC position", page 111](#) .

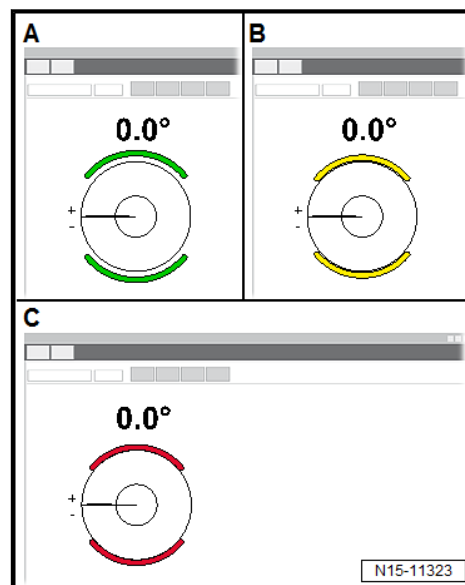


- Screw in control valve -3- and new bolt -4- loosely ⇒ [a3.3 nd installing camshaft adjuster", page 181](#) .
- It should still be possible to turn camshaft adjusters -1- and -2- on camshafts.

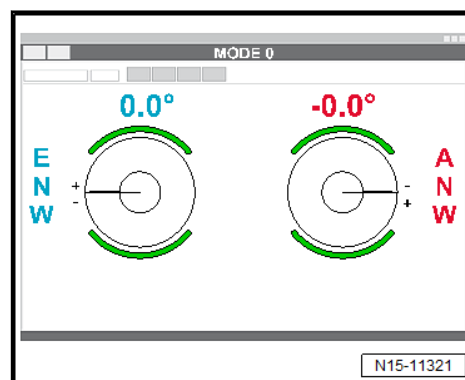
Setting camshafts to 0°



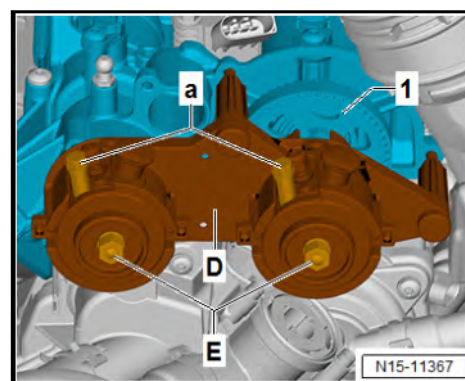
- Make sure that bolts -a- for brakes are released on both sides.
- Make sure that brake indicator on display is green -A-.



- It must not be yellow or red.
- Set both camshafts to 0.0°.



- To do this, turn camshafts with adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- -E-.

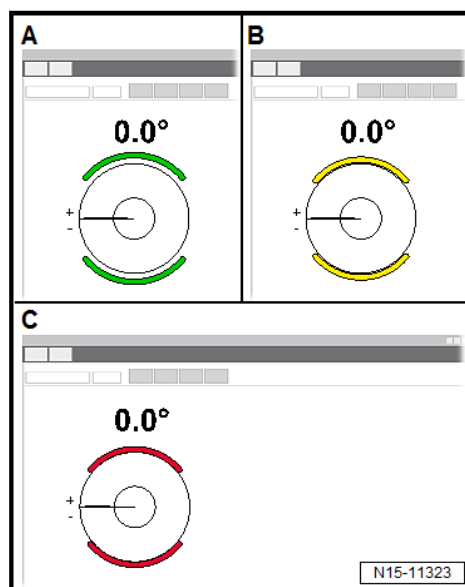


- Hold camshafts via adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- -E- in 0.0° position with a wrench.

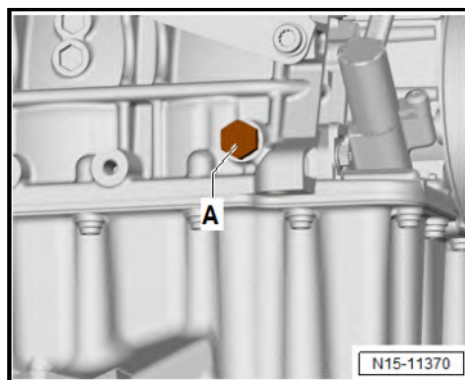


Note

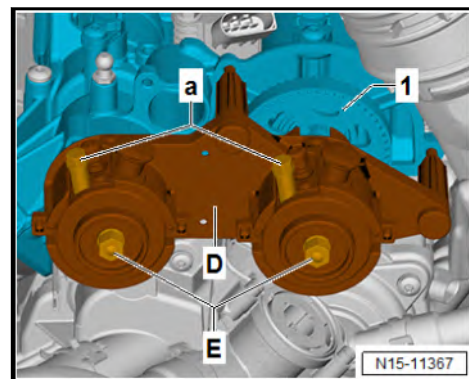
- ◆ *The camshafts tend to turn.*
- ◆ *Use a hexagon key to hold the camshafts in 0.0° position.*
- ◆ *Always remove the hexagon key after the camshafts have been tightened.*
- Tighten bolts -a- for brakes to 11 Nm on both sides after adjusting.
- Make sure that brake indicator on display is red -C-.



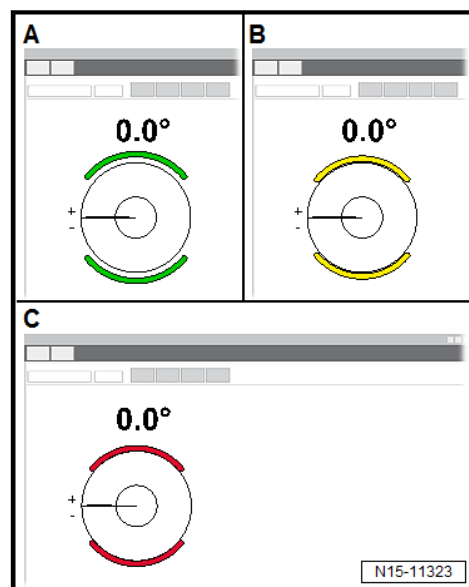
- It must not be yellow or green.
- Unscrew locking pin -T10340- -A-.



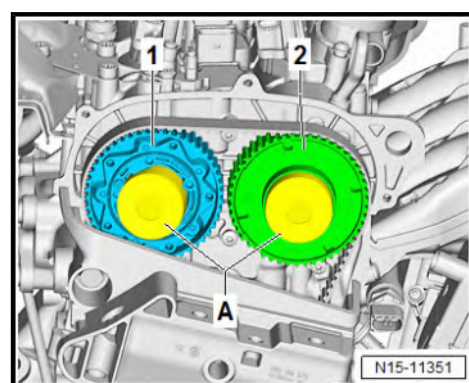
- Tighten camshaft adjuster on inlet camshaft to specified initial torque ➔ [page 185](#) .
- Tighten camshaft adjuster on exhaust camshaft to specified initial torque ➔ [page 190](#) .
- Make sure that bolts -a- for brakes are released on both sides.



- Make sure that brake indicator on display is green -A-.



- It must not be yellow or red.
- Seal camshaft adjusters -1- and -2- using suitable plugs -A- from engine bung set -VAS 6122-.



- Fit a piece of paper -A- into plugs to catch the engine oil.
- The plug for the camshaft adjuster -1- on exhaust side must be pushed in slightly.
- Turn crankshaft 2 turns in direction of rotation of engine.

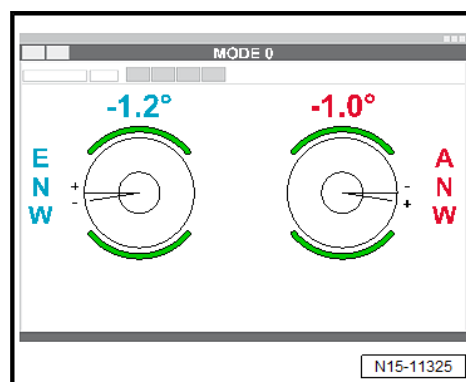
Determining correction angle

- Screw in locking pin -T10340-.



- Set piston for cylinder no. 1 to TDC position ⇒ [p4.7 iston to TDC position](#), [page 111](#) .
- Read valve timing on display and write down values.

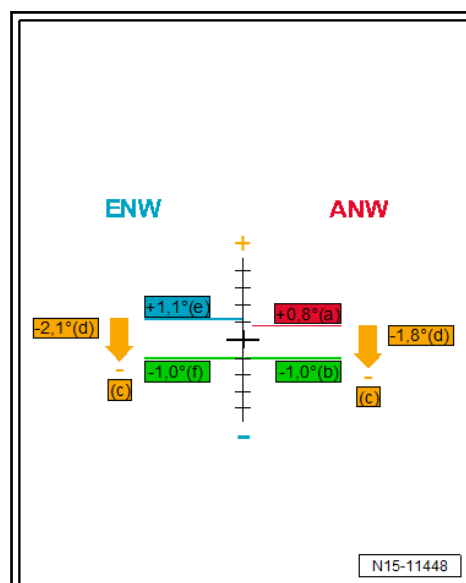
1) Measurement example: value reading



Note

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

Example:





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

Angle in °	Inlet camshaft	Exhaust camshaft
Specified value	$-1.0^{\circ} \pm 1.2^{\circ}$	$-1.0^{\circ} \pm 1.2^{\circ}$

- Set determined correction angle for camshafts.

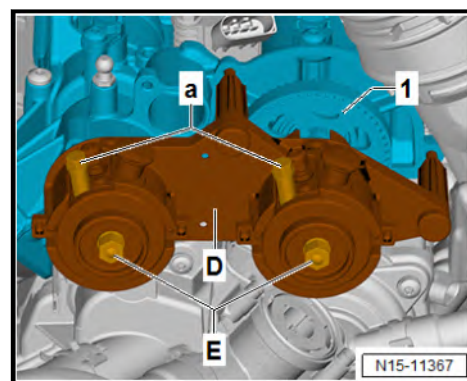
Setting valve timing with correction angle

- Place a cloth underneath camshaft adjuster to catch any engine oil which runs out.
- Remove plug taken from engine bung set -VAS 6122- from camshaft adjusters.
- Remove paper from plugs and camshaft adjusters.
- Clean camshaft adjusters with a cleaning cloth, and remove as much engine oil as possible.
- Loosen camshaft adjuster on inlet side ➔ [page 182](#) .
- Loosen camshaft adjuster on exhaust side ➔ [page 187](#) .

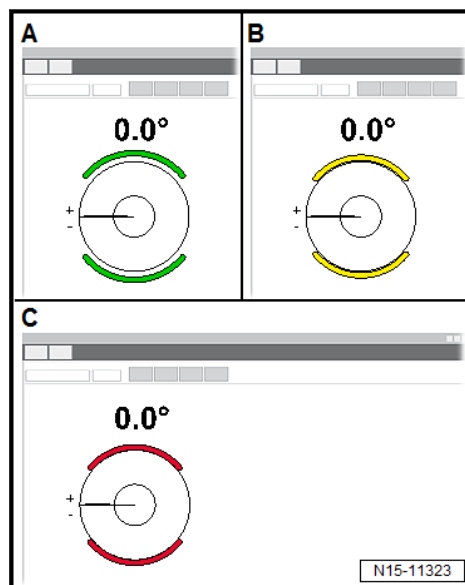
NOTICE

Risk of damage to engine caused by incorrect valve timing.

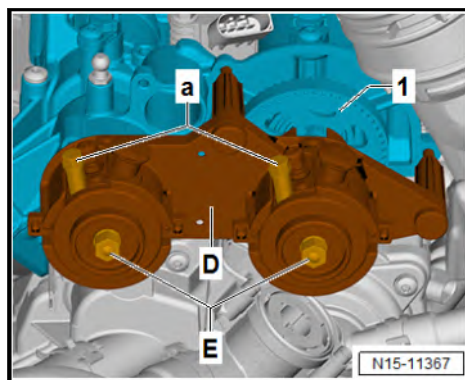
- Do not turn crankshaft out of TDC position.
- Make sure that the piston in cylinder no. 1 is at TDC position
➔ [p4.7 piston to TDC position", page 111](#) .



- Make sure that bolts -a- for brakes are released on both sides.
- Make sure that brake indicator on display is green -A-.



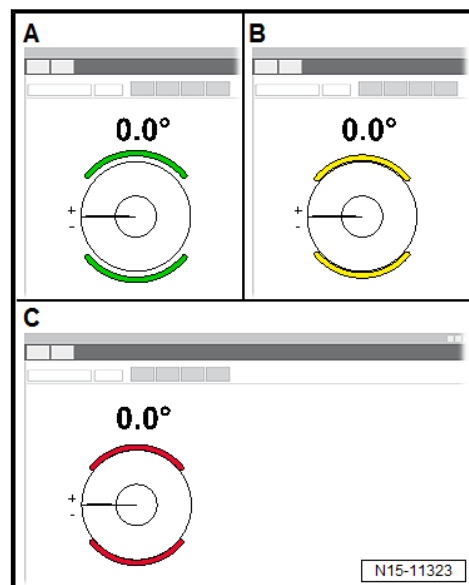
- It must not be yellow or red.
- Set the two camshafts to the determined correction angle ➤ [page 153](#).



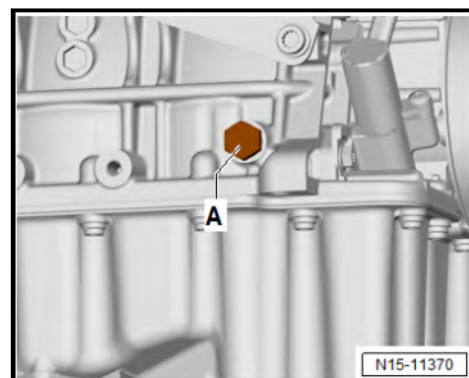
- To do this, turn camshafts with adapter for angle sensor -VAS 611 007/16- and adapter for angle sensor -VAS 611 007/17- -E-.

If the valve timing has been set:

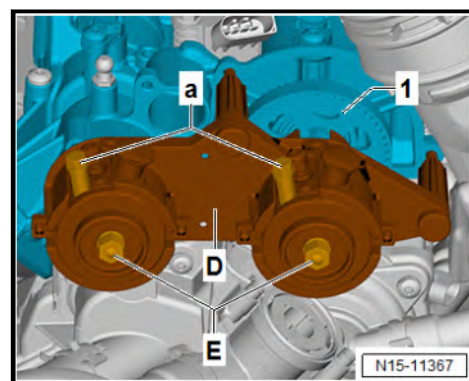
- Tighten bolts -a- for brakes to 11 Nm on both sides.
- Make sure that brake indicator on display is red -C-.



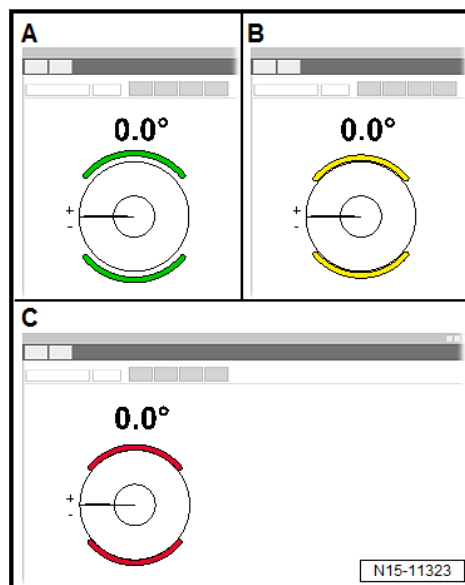
- It must not be yellow or green.
- Unscrew locking pin -T10340- -A-.



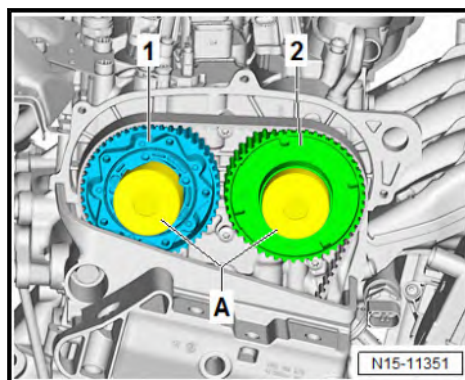
- Tighten camshaft adjuster on inlet camshaft to specified initial torque ➤ [page 185](#) .
- Tighten camshaft adjuster on exhaust camshaft to specified initial torque ➤ [page 190](#) .
- Release brakes -a- on both sides.



- Make sure that brake indicator on display is green -A-.



- It must not be yellow or red.
- Seal camshaft adjusters -1- and -2- using suitable plugs -A- from engine bung set -VAS 6122-.



- Fit a new piece of paper into plugs -A- to catch the engine oil.
- The plug for the camshaft adjuster -1- on exhaust side must be pushed in slightly.
- Turn crankshaft 2 turns in direction of rotation of engine.
- Screw in locking pin -T10340-.
- Set piston for cylinder no. 1 to TDC position ⇒ [p4.7 iston to TDC position](#), [page 111](#) .
- Check valve timing ⇒ [v2.6 alve timing](#), [page 146](#) .

NOTICE

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

The valve timing must not be outside the tolerance limits.

- Read valve timing, and compare it with specifications.

Specified angle in °

Inlet camshaft	Exhaust camshaft
$-1.0^{\circ} \pm 1.2^{\circ}$	$-1.0^{\circ} \pm 1.2^{\circ}$



- If necessary, adjust timing again ➔ [v2.7 alve timing](#)", [page 148](#) .

Install in reverse order of removal, observing the following:

- Unscrew locking pin -T10340-.
- Make sure that brakes are released on both sides.
- Tighten camshaft adjuster on inlet camshaft to specified final torque ➔ [page 186](#) .
- Tighten camshaft adjuster on exhaust camshaft to specified final torque ➔ [page 191](#) .

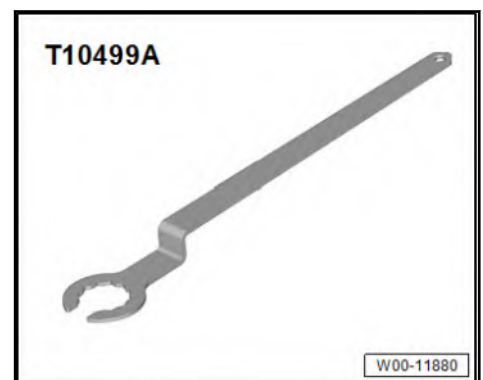
Torque settings

- ◆ ➔ [o2.2 verview - toothed belt](#)", [page 131](#)
- ◆ ➔ [o3.1 verview - valve gear](#)", [page 166](#)
- ◆ ➔ [o2.1 verview - coolant pump, thermostat](#)", [page 250](#)
- ◆ ➔ [o3.1 verview - air filter housing](#)", [page 357](#)

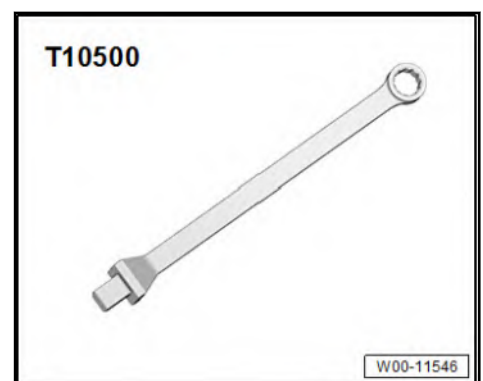
2.8 Removing toothed belt from camshaft

Special tools and workshop equipment required

- ◆ Special wrench -T10499A-

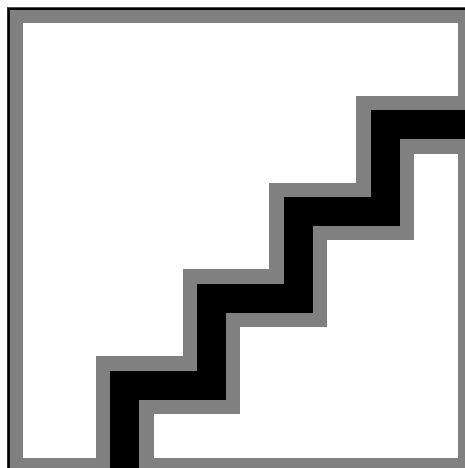


- ◆ Insert tool -T10500-





- ◆ Torque wrench -VAS 6583A-



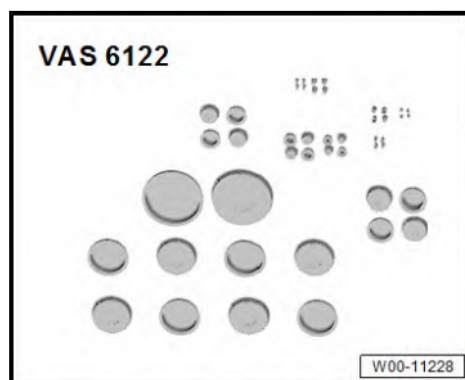
- ◆ Counter-hold tool -T10575A-



- ◆ Counter-hold tool -T10172A-



- ◆ Engine bung set -VAS 6122-



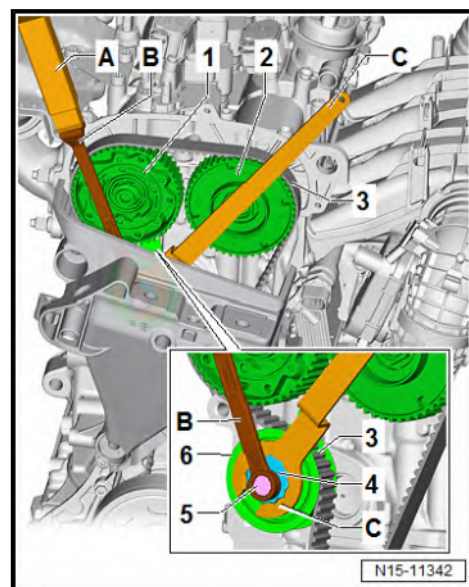


Procedure



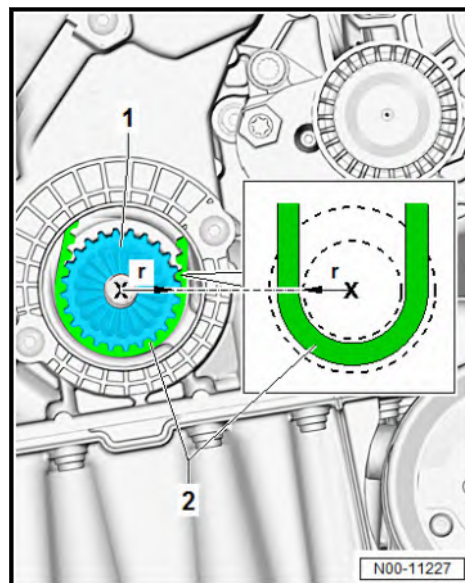
Note

- ◆ *Protect the toothed belt from escaping engine oil.*
- ◆ *Seal camshaft adjusters immediately using suitable plug from engine bung set -VAS 6122-.*
- Loosen camshaft adjuster, inlet camshaft ➤ [page 182](#) .
- Loosen camshaft adjuster, exhaust camshaft ➤ [page 187](#) .
- Make sure that the piston in cylinder no. 1 is at "TDC" position for repair work on toothed belt drive ➤ [page 111](#) .
- Place ring spanner AF 30 -T10499A- -C- on eccentric adjuster -4- of tensioning roller -6-.



- Loosen bolt -5- with insert tool -T10500- -B-.
- Relieve tension from tensioning roller -6- on eccentric adjuster -4- using special wrench, 30 mm -T10499A- -C-.

Bend radius of toothed belt



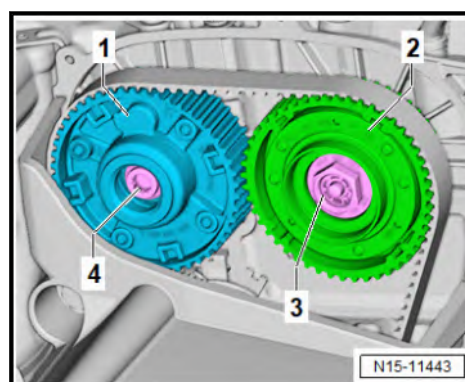
NOTICE

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

- Never bend toothed belt to a radius less than $r = 25$ mm.
- The bend radius - r - on the toothed belt -2- should therefore never be below 25 mm (approx. half the diameter of gear -1- on crankshaft).
- Remove toothed belt from camshaft pulleys.

Installing:

- Renew bolt -4- and screw in loosely.



- Screw in control valve -3- to stop.

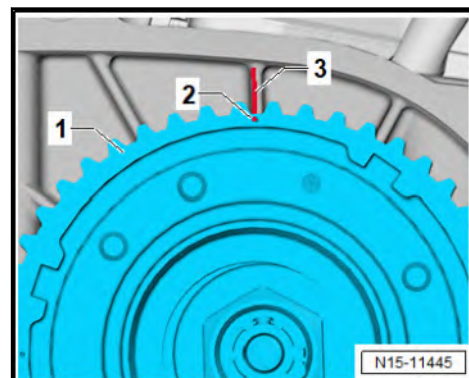


Note

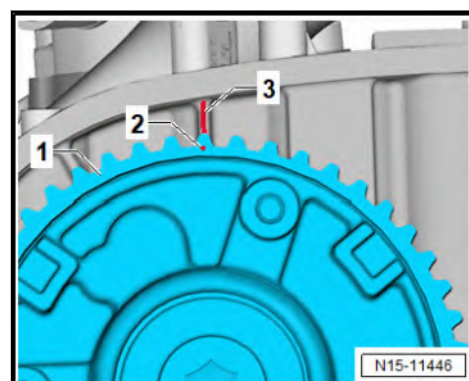
- ◆ It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.
- ◆ Renew bolts that are tightened with turning further angle.
- ◆ Check O-ring of plug for damage, and renew if necessary; see ⇒ Electronic parts catalogue (ETKA).
- ◆ Ensure that the guide sleeve is reinstalled.



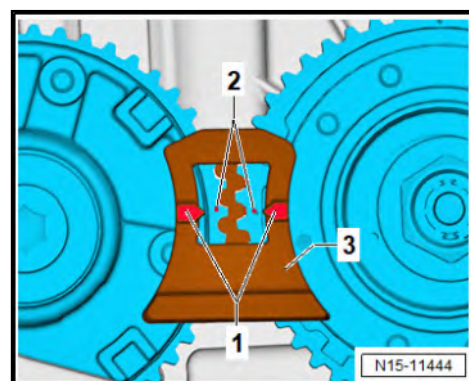
- Find marking -2- of inlet camshaft adjuster -1- to web -3- on camshaft housing.



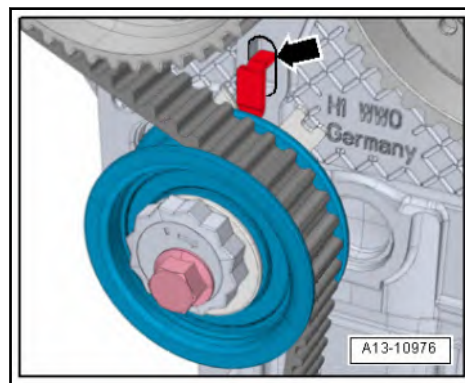
- Find marking -2- of exhaust camshaft adjuster -1- to web -3- on camshaft housing.



- Insert assembly tool -T10618- -3- between camshaft pulleys.



- The markings -1- on the assembly tool -T10618- must be aligned with markings -2- on the camshaft pulleys.
- Insert assembly tool -T10618- to stop.
- Hand-tighten belt tensioner on cylinder head.



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



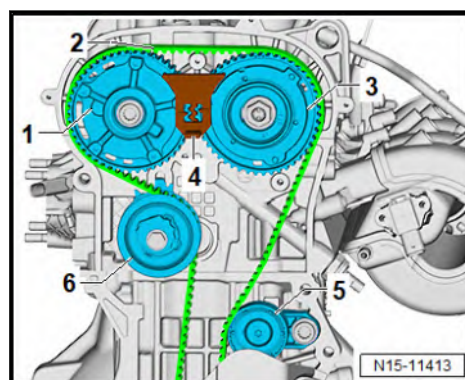
Note

When installing the toothed belt, ensure that the assembly tool -T10618- is correctly positioned between the camshaft pulleys.

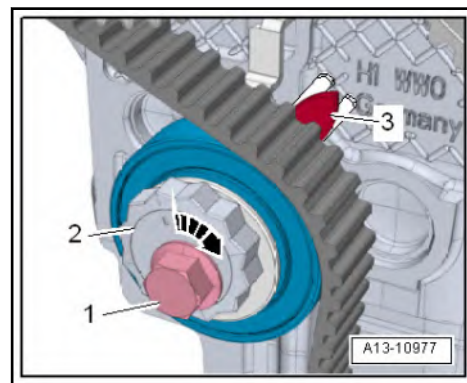
- Toothed belt must make full contact with crankshaft pulley.
- Check that crankshaft is set to TDC for No. 1 cylinder.

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

- Fit toothed belt -2- onto tensioning roller -6- and camshaft adjuster -1-.



- Fit toothed belt on camshaft adjuster -3-, then push onto idler or guide pulley -5-.
- Pull assembly tool -T10618- -4- out of camshaft pulleys.
- Rotate eccentric -2- of belt tensioner using tensioning spanner -T10499A- in -direction of arrow- until adjustment pointer -3- is located approx. 10 mm to the right from adjustment window.



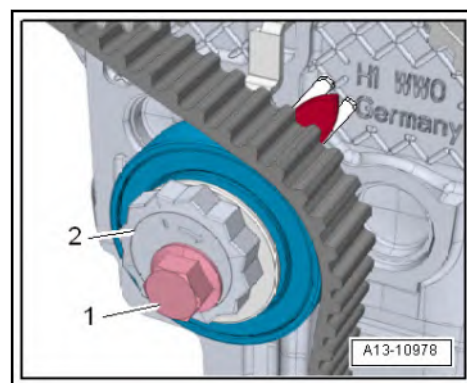
- Then rotate eccentric of belt tensioner back on 12-point surface -2- until adjustment pointer -3- is exactly centred in adjustment window.
- Hold eccentric on 12-point surface -2- in this position.



Note

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

- Tighten securing bolt -1- to 25 Nm.



Note

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

- Adjust valve timing ⇒ [page 148](#) .

Specified torques

- ◆ ⇒ [o2.2 overview - toothed belt](#), page 131
- ◆ ⇒ [o3.1 overview - valve gear](#), page 166
- ◆ ⇒ [o3.1 overview - crankcase breather system](#), page 226
- ◆ ⇒ [o1.1 overview - turbocharger](#), page 316
- ◆ ⇒ [o2.1 overview - charge air system](#), page 328



3 Valve gear

⇒ [o3.1 verview - valve gear", page 166](#)

⇒ [a3.2 nd installing camshaft oil seal", page 169](#)

⇒ [a3.3 nd installing camshaft adjuster", page 181](#)

⇒ [a3.4 nd installing inlet camshaft control valve 1N727", page 191](#)

⇒ [a3.5 nd installing exhaust camshaft control valve 1N318", page 192](#)

⇒ [a3.6 nd installing valve stem seals", page 193](#)

⇒ [a3.7 nd installing holder for oil seal", page 207](#)

3.1 Assembly overview - valve gear



1 - Valve

- ☐ Do not rework. Only lapping in is permitted.
- ☐ Inlet or exhaust valve
- ☐ For allocation, refer to ⇒ Electronic Parts Catalogue
- ☐ Valve dimensions ⇒ [d4.3 imensions", page 211](#)
- ☐ Checking valve guides ⇒ [v4.1 alve guides", page 210](#)

2 - Hydraulic compensation element

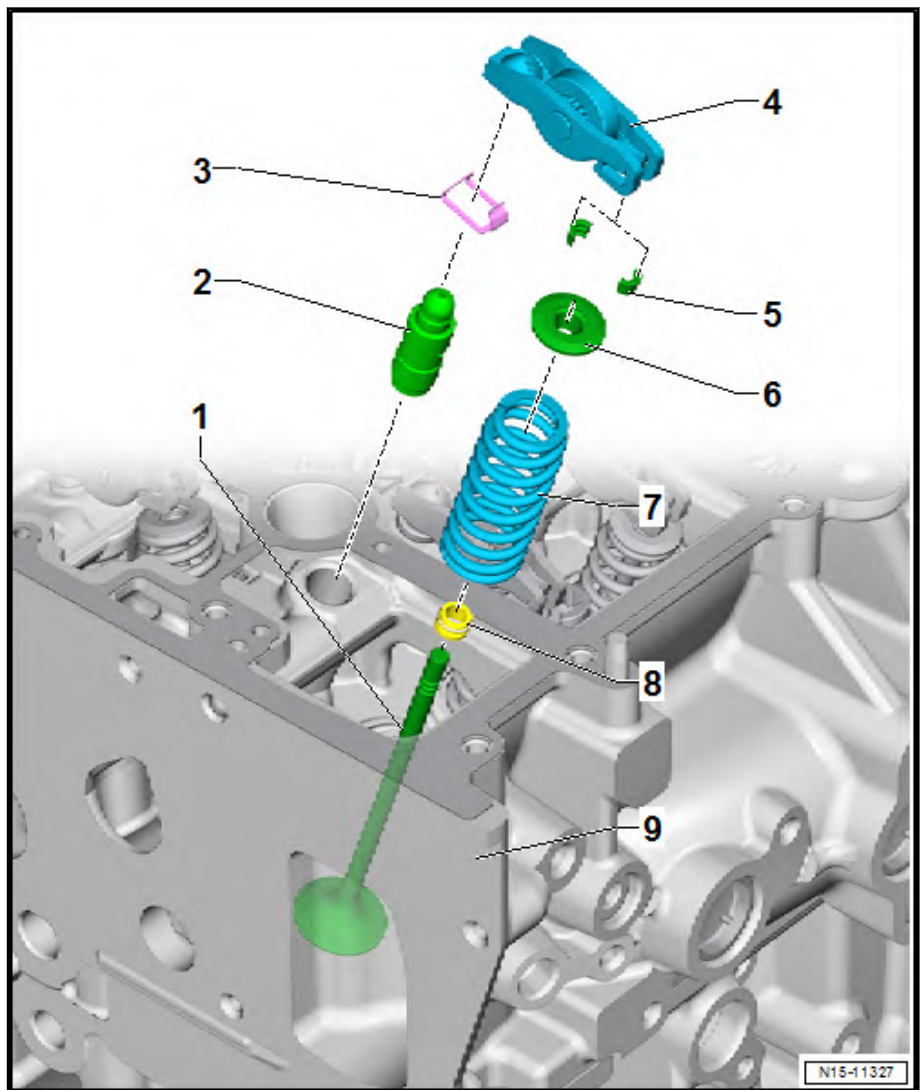
- ☐ Do not interchange
- ☐ Oil contact surface

3 - Retaining clip

- ☐ For hydraulic compensation element.

4 - Roller rocker fingers

- ☐ Mark installation position for re-installation.
- ☐ Check roller bearing for ease of movement.
- ☐ Lubricate contact surfaces before installing.
- ☐ Removing and installing ⇒ [a1.4 nd installing camshaft housing", page 124](#)
- ☐ Fitting position ⇒ [Fig. "Installation position of roller rocker fingers", page 168](#)



5 - Valve cotter

- ☐ Removing and installing ⇒ [a3.6 nd installing valve stem seals", page 193](#)

6 - Valve spring plate

- ☐ Removing and installing ⇒ [a3.6 nd installing valve stem seals", page 193](#)

7 - Valve springs

- ☐ Fitting position ⇒ [Fig. "Installation position of valve spring", page 168](#)
- ☐ Removing and installing ⇒ [a3.6 nd installing valve stem seals", page 193](#)
- ☐ For allocation, refer to ⇒ Electronic Parts Catalogue

8 - Valve stem seal

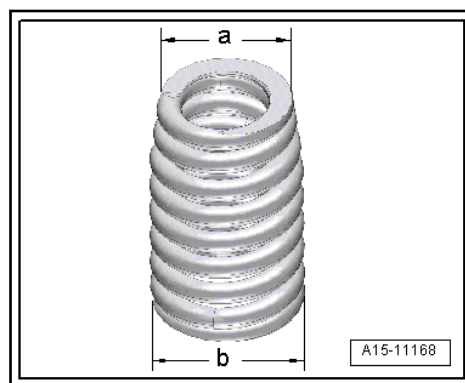
- ☐ Note different versions
- ☐ For allocation, refer to ⇒ Electronic Parts Catalogue
- ☐ Fitting position ⇒ [Fig. "Installation position of valve stem oil seal", page 168](#)
- ☐ Renewing ⇒ [a3.6 nd installing valve stem seals", page 193](#)

9 - Cylinder head

- ☐ Assembly overview ⇒ [page 115](#)
- ☐ Removing and installing ⇒ [page 120](#)

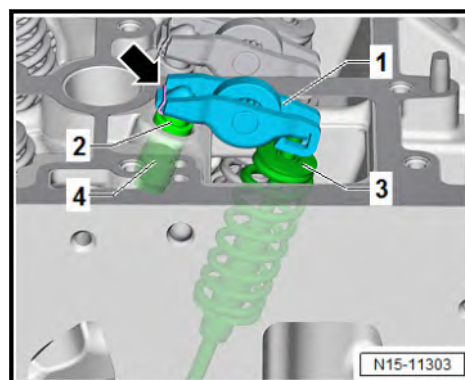


Installation position of valve spring



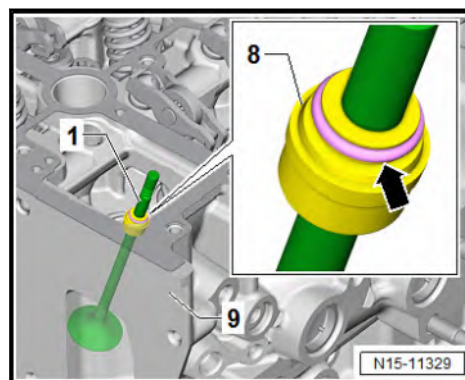
- End with small diameter -a- points towards valve spring plate.
- End with diameter -b- points towards cylinder head.

Installation position of roller rocker fingers



- 1 - Roller rocker fingers
- 2 - Hydraulic compensation element
- 3 - Valve
- 4 - Cylinder head
- Pfeil - Retaining clip

Installation position of valve stem oil seal



When installing the valve stem oil seal, make sure that the upper coil spring -arrow- is seated as shown in illustration.

- 1 - Valve
- 8 - Valve stem seal



9 - Cylinder head

Pfeil - Coil spring

3.2 Removing and installing camshaft oil seal

⇒ [a3.2.1 nd installing camshaft oil seal for holder of inlet camshaft control valve 1N727", page 169](#)

⇒ [a3.2.2 nd installing camshaft oil seal, inlet camshaft", page 172](#)

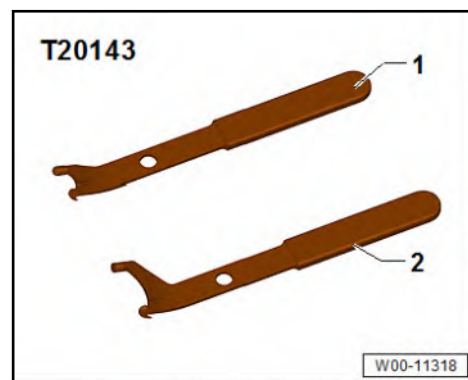
⇒ [a3.2.3 nd installing camshaft oil seal, exhaust camshaft, pulley end", page 176](#)

⇒ [a3.2.4 nd installing camshaft oil seal, exhaust camshaft, gear-box end", page 178](#)

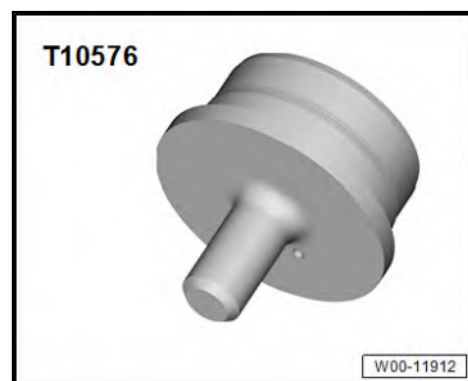
3.2.1 Removing and installing camshaft oil seal for holder of inlet camshaft control valve 1 -N727-

Special tools and workshop equipment required

◆ Extractor hook -T20143/-



◆ Centring mandrel -T10576-





◆ Thrust piece -T10582-



Procedure

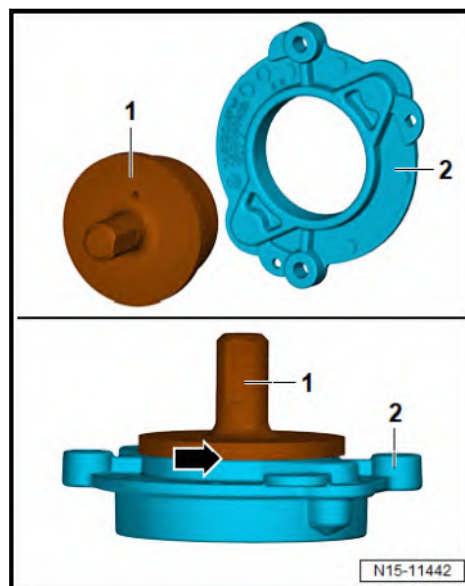
Removing

- Remove holder for oil seal. ⇒ [a3.7 nd installing holder for oil seal", page 207](#)
- Fit protective jaw cover to vice.

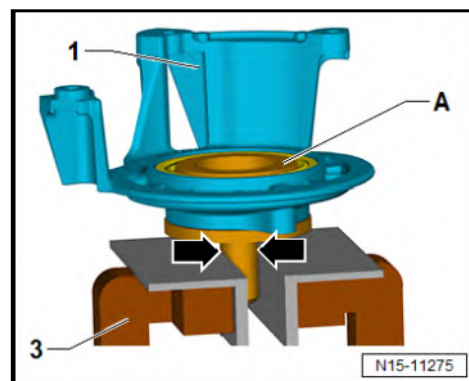


Note

- ◆ *The holder is a component made of die-cast aluminium. The component may burst or break of if too much force is applied.*
- ◆ *Therefore, never clamp the holder without a centring mandrel.*
- Insert centring mandrel -T10576- -1- from sensor end into holder -2-.



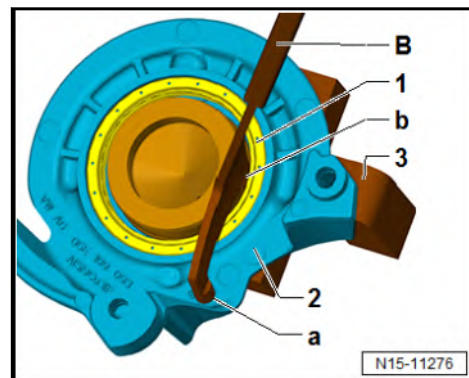
- The centring mandrel -T10576- -1- is properly seated, if the shoulder on the tool makes full contact with holder -2- -arrow-.
- Clamp centring mandrel -T10576- -A- with holder for oil seal -1- in a vice -3- at point indicated by -arrows-.



Note

The shape of the oil seal retainer -1- may differ depending on the vehicle. However, the procedure is the same.

- Fit pointed side of extractor hook -T20143/2- -B- to point -b- behind oil seal -1-.



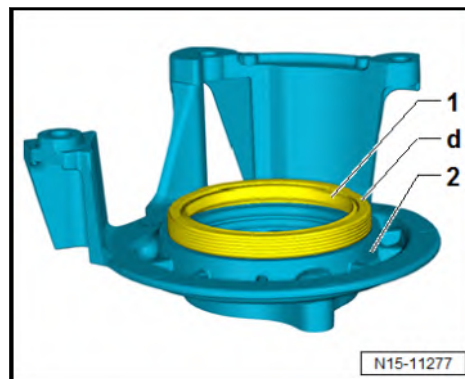
- Support blunt end of extractor hook -T20143/2- -B- at point -a- on holder -2-.
- Remove seal -1- using extractor hook -T20143/2- -B-.

Renewing seal



Note

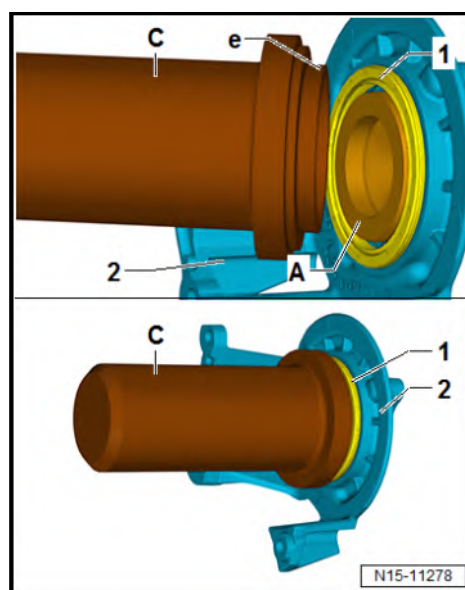
- ♦ *The sealing surfaces and contact surfaces of the oil seal holder must not be scratched.*
- ♦ *Do not lubricate new seal.*
- Fit oil seal -1- evenly onto holder -2-.



Installation position:

- The closed side -d- of the oil seal faces upwards.

Driving in seal



- Chamfer -e- of thrust piece -T10582- -C- must engage between seal -1- and centring mandrel -T10576- -A-.
- Use a hammer and thrust piece -T10582- -C- to drive in new seal -1-. Drive seal carefully and evenly to stop into holder -2-.

Installing:

Install in reverse order of removal, observing the following:

- Install holder for oil seal ⇒ [a3.7 nd installing holder for oil seal", page 207](#) .
- Install inlet camshaft control valve 1 -N727- ⇒ [page 191](#) .

Specified torques:

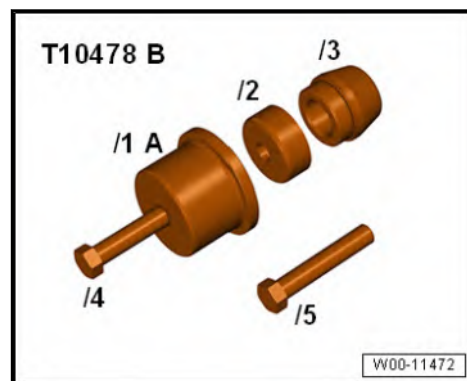
- ♦ ⇒ [o2.1 verview - toothed belt cover", page 131](#)
- ♦ ⇒ [o2.2 verview - toothed belt", page 131](#)

3.2.2 Removing and installing camshaft oil seal, inlet camshaft

Special tools and workshop equipment required



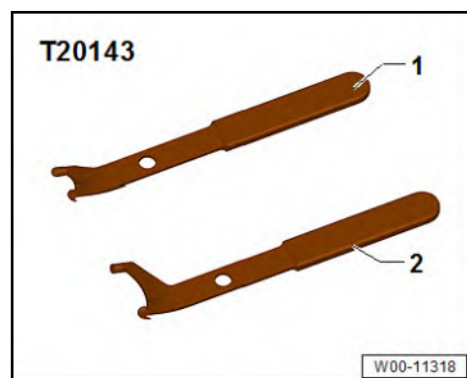
◆ Assembly tool -T10478 B-



◆ Spindle -T10585-

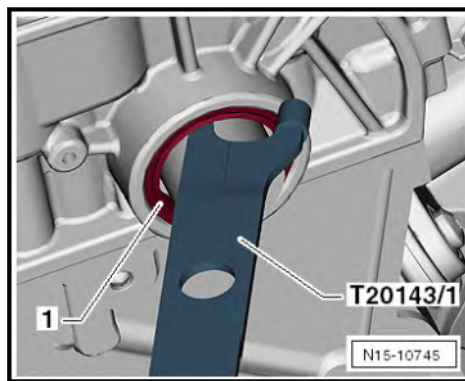


◆ Extractor hook -T20143/1-



Removing:

- Remove holder for oil seal ⇒ [a3.7 nd installing holder for oil seal", page 207](#) .
- Remove camshaft adjuster for inlet camshaft ⇒ [a3.3.1 nd installing camshaft adjuster for inlet camshaft", page 181](#) .
- Carefully pull out seal -1- using extractor hook -T20143/1-.



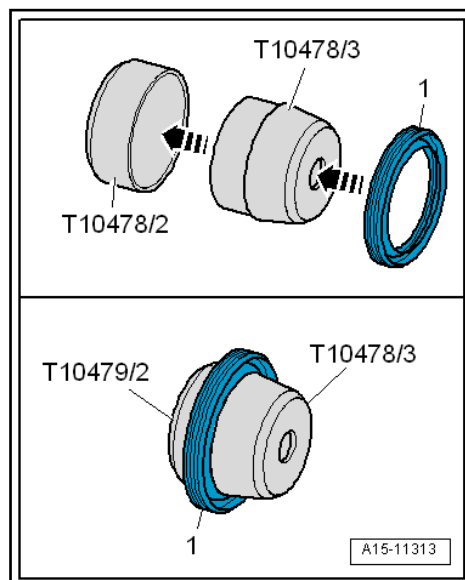
Installing



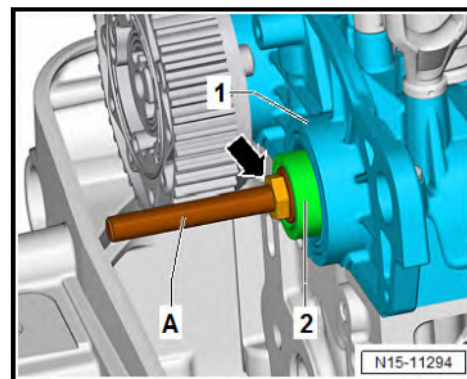
Note

Do not lubricate new seal.

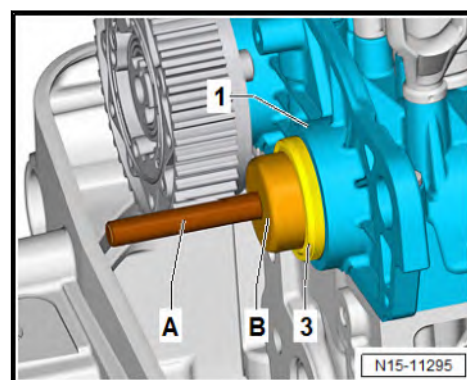
- Join fitting sleeve -T10478/3- and guide sleeve -T10478/2-.



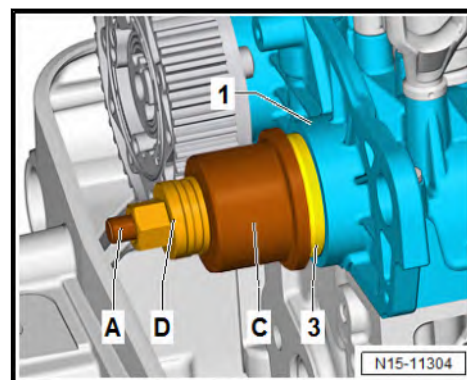
- Slide seal -1- over fitting sleeve -T10478/3- onto guide sleeve -T10478/2-.
- Installation position: closed end of seal faces fitting sleeve.
- Separate fitting sleeve -T10478/3- and guide sleeve -T10478/2-.
- Screw spindle -T10585- -A- into camshaft -2-, and tighten it by hand.



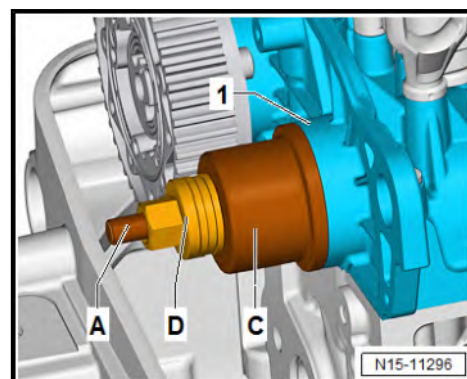
- Fit guide sleeve -T10478/2- -B- with seal -3- onto camshaft -2-.



- Slide on thrust piece -T10478/1A- -C- until it rests against seal -3-.

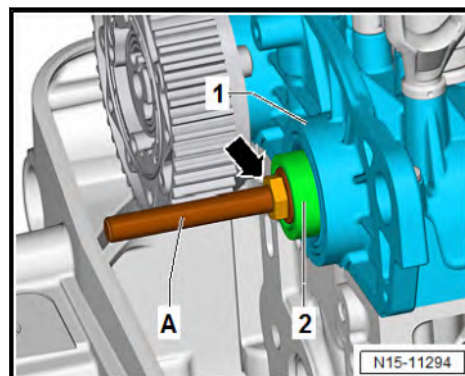


- Screw nut -D- onto spindle -T10585-.
- Tighten nut until thrust piece -T10478/1A- rests against camshaft housing.





- Make sure that seal has been properly pressed into camshaft housing using thrust piece -T10478/1A-.
- If necessary, loosen spindle -T10585- -A- via hexagon -arrow-.



- Install camshaft adjuster on inlet side ⇒ [a3.3.1 nd installing camshaft adjuster for inlet camshaft](#), page 181 .

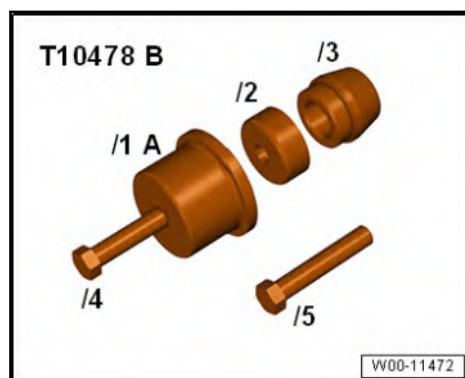
Specified torque:

- ♦ ⇒ [o2.2 verview - toothed belt](#)", page 131
- ♦ ⇒ [o1.2 verview - camshaft housing](#)", page 117

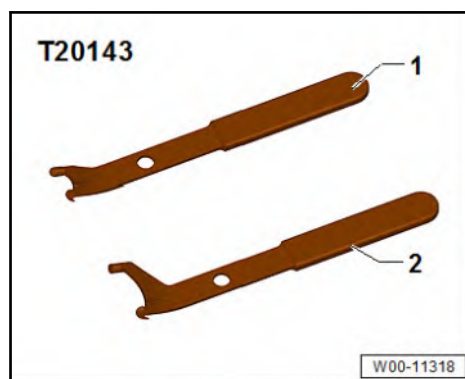
3.2.3 Removing and installing camshaft oil seal, exhaust camshaft, pulley end

Special tools and workshop equipment required

- ♦ Assembly tool -T10478 B-

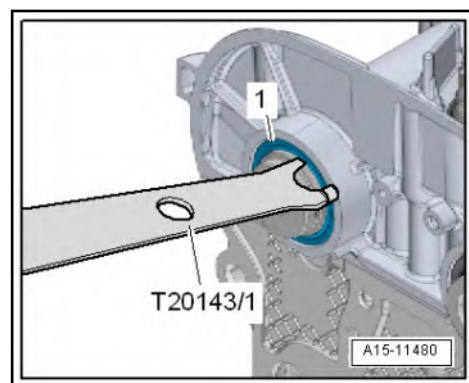


- ♦ Extractor hook -T20143/1-



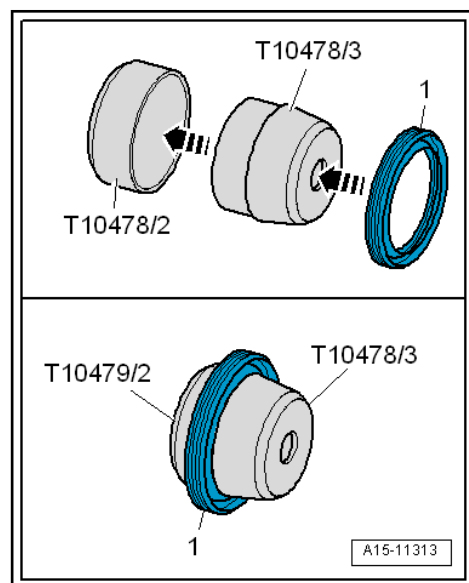


Removing



- Remove camshaft adjuster for exhaust camshaft ➤ [a3.3.2 nd installing camshaft adjuster for exhaust camshaft](#), page 186 .
- Pull out oil seal -1- using extractor tool -T20143/1-.

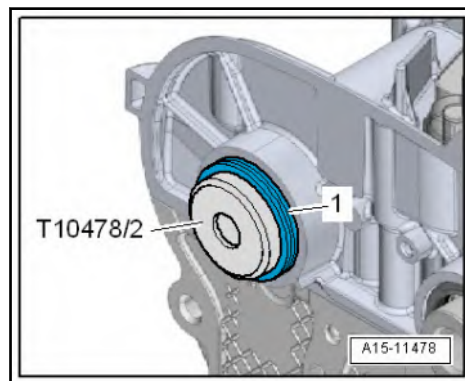
Installing



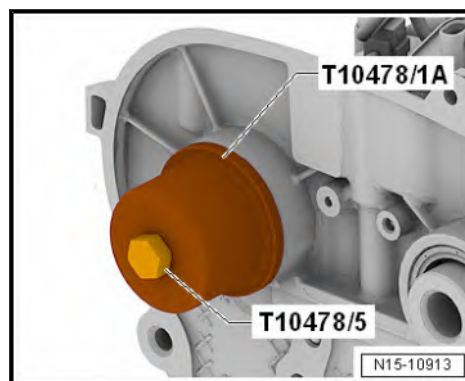
Note

Do not lubricate new oil seal.

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



- Pull in thrust piece -T10478/1A- with bolt -T10478/5- as far as stop.

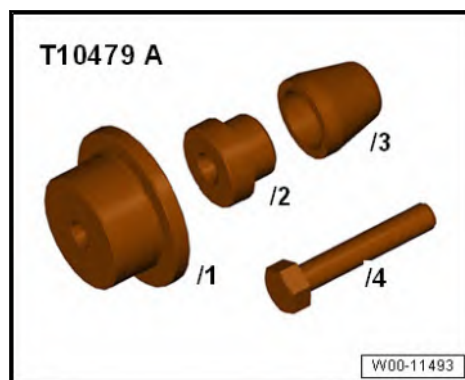


- Install toothed belt ⇒ [a2.4 nd installing toothed belt](#)”, page [135](#) .
- Install camshaft adjuster for exhaust camshaft ⇒ [a3.3.2 nd installing camshaft adjuster for exhaust camshaft](#)”, page [186](#) .

3.2.4 Removing and installing camshaft oil seal, exhaust camshaft, gearbox end

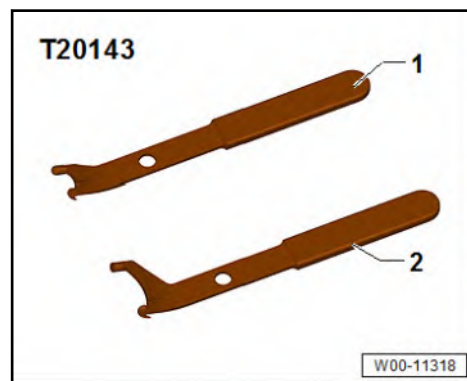
Special tools and workshop equipment required

- ♦ Assembly tool -T10479A-

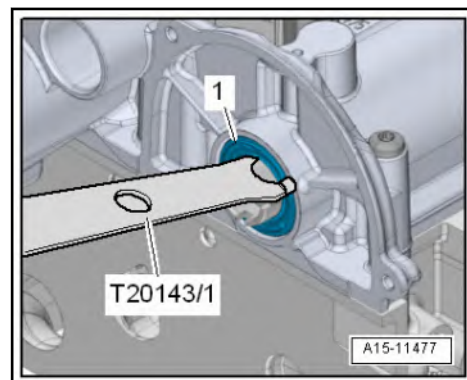




◆ Extractor hook -T20143/1-



Removing



- Remove toothed belt pulley for coolant pump. ⇒ [a2.6 nd installing toothed belt pulley for coolant pump](#), page 261
- Carefully slide extractor tool -T20143/1- between camshaft and oil seal -1-.
- Pry out oil seal.

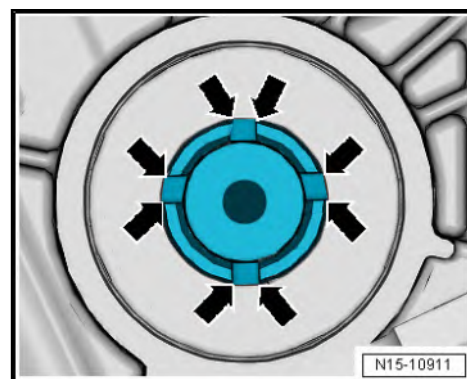


Note

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

- Cover coolant pump with a cloth.

Installing



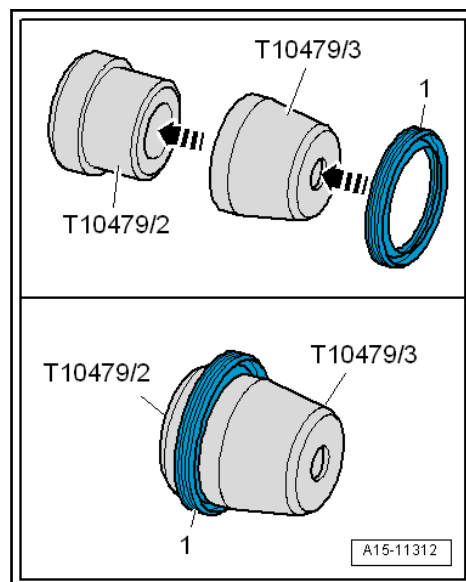
- Remove any burrs in outer area of grooves in exhaust camshaft -arrows- using fine sandpaper “220 to 1000 grade”.



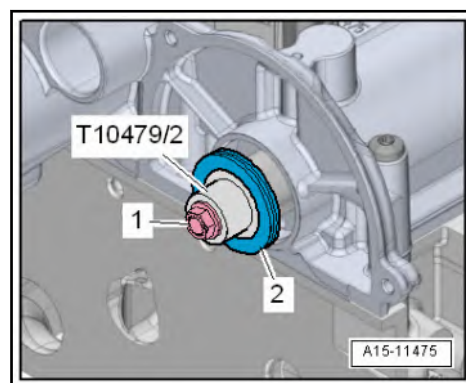
Note

Do not lubricate new oil seal.

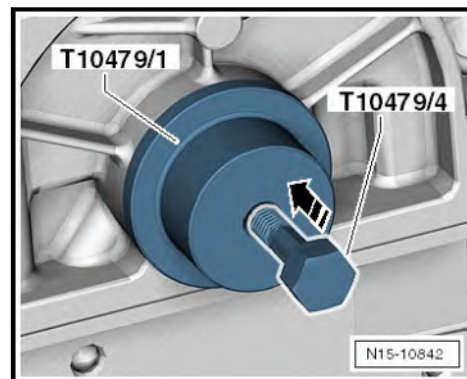
- Slide seal -1- over fitting sleeve -T10479/3- onto guide sleeve -T10479/2-.



- Installation position: closed side of oil seal faces towards guide sleeve -T10479/2-.
- Separate fitting sleeve -T10479/3- from guide sleeve -T10479/2-.
- Fit guide sleeve -T10479/2- together with oil seal centrally on camshaft.
- Secure guide sleeve onto camshaft using bolt -1- for coolant pump drive sprocket.



- Slide oil seal onto camshaft and unbolt guide sleeve.
- Pull in oil seal onto stop using press tool -T10479/1- and bolt -T10479/4-.



- Install toothed belt pulley for coolant pump ⇒ [a2.6 nd installing toothed belt pulley for coolant pump](#), page 261 .

3.3 Removing and installing camshaft adjuster

⇒ [a3.3.1 nd installing camshaft adjuster for inlet camshaft](#), page 181

⇒ [a3.3.2 nd installing camshaft adjuster for exhaust camshaft](#), page 186

3.3.1 Removing and installing camshaft adjuster for inlet camshaft

Special tools and workshop equipment required

- ◆ Counter-hold tool -T10575A-



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



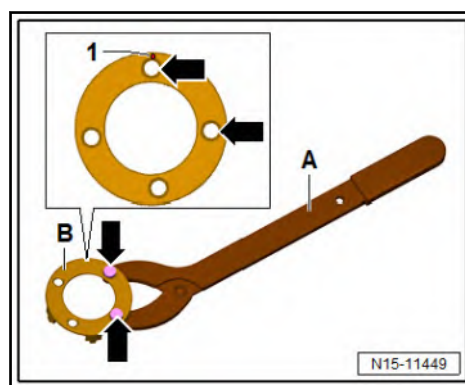


- ◆ Socket, 24 mm -T10580-



- ◆ Assembly tool -T10618-

Preparing tool for camshaft adjuster of inlet camshaft



- Bolt counter-hold tool -T10172A- -A- and counter-hold tool -T10575A- -B- together using knurled screws -T10554/2- in holes -arrows-.
- Marking -1- must still face upwards (TDC).

Procedure

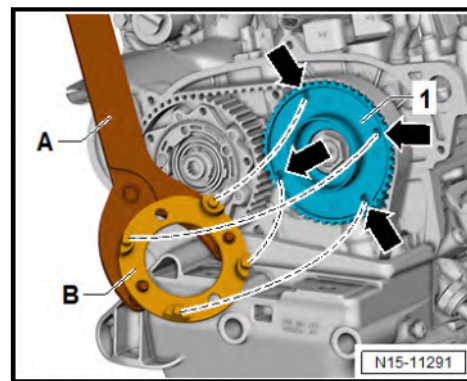


Note

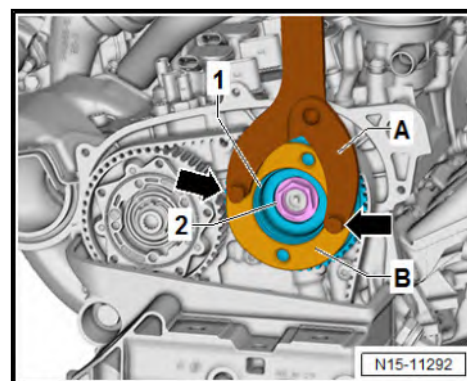
- ◆ Place a cloth under the camshaft adjuster and tensioning roller to catch the engine oil which runs out.
- ◆ The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.

Loosening camshaft adjuster on inlet side:

- Remove upper toothed belt guard ⇒ [a2.3.1 nd installing upper toothed belt guard](#), page 134 .
- Set engine to “TDC for cylinder no. 1” ⇒ [p4.7 iston to TDC position](#), page 111 .
- Place a cloth underneath camshaft adjuster to catch any engine oil which runs out.
- Thoroughly clean camshaft adjuster using a cleaning cloth.
- Fit counter-hold tool -T10575A- -B- with counter-hold tool -T10172A- -A- to camshaft pulley -1- as shown in illustration.



- The pins on counter-hold tool -T10575A- -B- are not distributed evenly on the bolt circle.
- The pins correspond to the contour of the bolt circle in the camshaft adjuster.
- The pins must be inserted properly into holes -arrows-.
- Fit counter-hold tool -T10575A- -B- so that it rests flat against camshaft adjuster -1-.



- Use counter-hold tool -T10575A- -B- and counter-hold tool -T10172A- -A- to lock camshaft in position (push in »clockwise direction«).
- Loosen control valve -2- using socket, 24 mm -T10580-.

Removing camshaft adjuster of inlet camshaft:

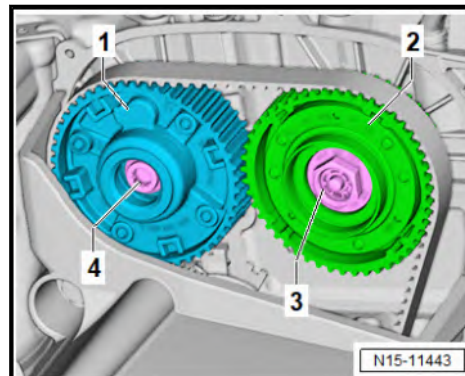
- Loosen camshaft adjuster of exhaust camshaft ➤ [page 187](#) .
- Remove toothed belt from camshafts ➤ [t2.8 oothed belt from camshaft](#), [page 159](#) .
- Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster.
- Unscrew control valve -2-, and remove camshaft adjuster -1-.
- Use a cleaning cloth to remove engine oil from camshaft and camshaft housing.
- Seal camshaft adjusters immediately using suitable plug from engine bung set -VAS 6122-.

Installing

- Check "TDC" position of camshafts and crankshaft ➤ [page 111](#) .
- The camshaft pulleys are properly aligned with each other.



- Renew bolts that are tightened with turning further angle.
- Clean camshaft adjuster thoroughly with a cleaning cloth before installing it.
- Check control valve -3- before installing it ➔ [Fig. “Checking control valve”](#), page 133 .

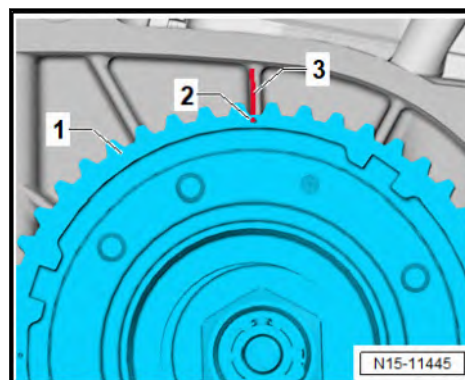


- Screw in bolt -4- for camshaft adjuster of exhaust camshaft -1- to stop.
- Screw in control valve -3- to stop.

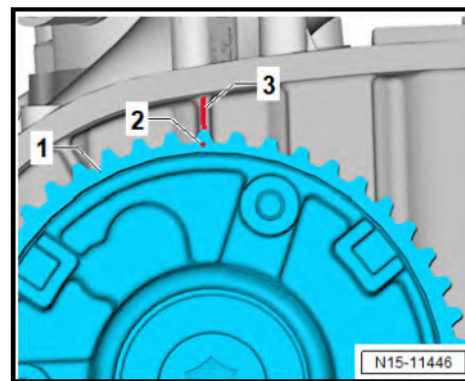


Note

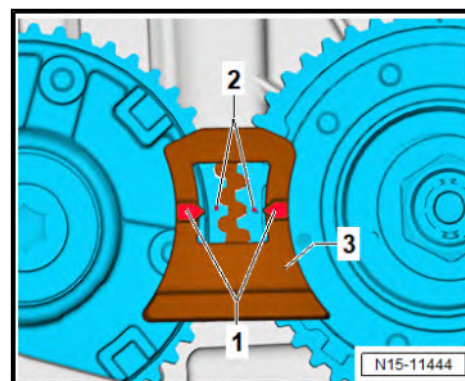
- ◆ *It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.*
- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Check O-ring of plug for damage, and renew if necessary; see ➔ Electronic parts catalogue (ETKA).*
- ◆ *Ensure that the guide sleeve is reinstalled.*
- Find marking -2- of inlet camshaft adjuster -1- to web -3- on camshaft housing.



- Find marking -2- of exhaust camshaft adjuster -1- to web -3- on camshaft housing.

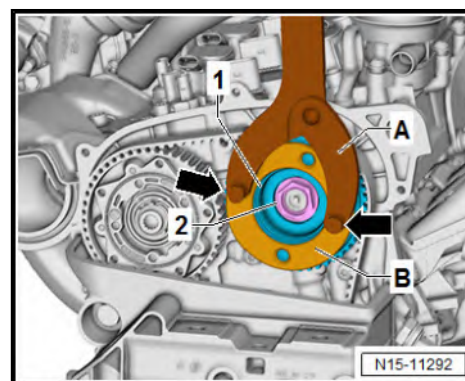


- Insert assembly tool -T10618- -3- between camshaft pulleys.



- The markings -1- on the assembly tool -T10618- must be aligned with markings -2- on the camshaft pulleys.
- Insert assembly tool -T10618- to stop.
- Fit toothed belt onto camshafts ➤ [page 159](#) .
- Adjust valve timing ➤ [page 148](#) .

Tightening camshaft adjuster of inlet camshaft to specified initial torque:

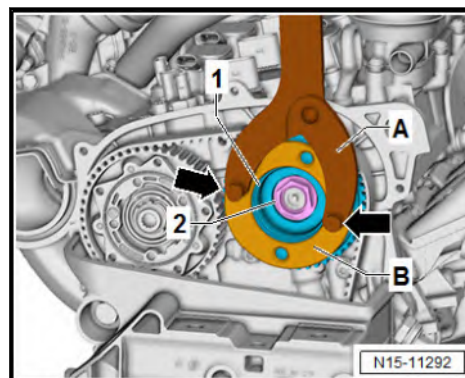


- Hold inlet camshaft in position using counter-hold tool - T10575A- and counter-hold tool -T10172A-.
- Tighten control valve -2- to specified initial torque.

Stage	Control valve, camshaft adjuster of inlet camshaft	Specified torque
1st	-2-	18 Nm



Tightening camshaft adjuster of inlet camshaft to specified final torque:



- Hold inlet camshaft in position using counter-hold tool - T10575A- and counter-hold tool -T10172A-.
- Tighten control valve -2- for camshaft adjuster to final torque in two stages.

Stage	Control valve, camshaft adjuster of inlet camshaft	Specified torque
2nd	-2-	50 Nm
3rd	-2-	140 Nm

- Tighten exhaust camshaft to final torque ➔ [page 191](#) .

Assembling

Install in reverse order of removal, observing the following:

- Make sure to remove the camshaft clamp and the crankshaft locking pin before cranking the engine.
- Renew gasket for cover of exhaust camshaft adjuster.

Torque settings

- ♦ ➔ [o2.2 verview - toothed belt", page 131](#)
- ♦ ➔ [o3.1 verview - valve gear", page 166](#)

3.3.2 Removing and installing camshaft adjuster for exhaust camshaft

Special tools and workshop equipment required

- ♦ Assembly tool -T10618-
- ♦ Counter-hold tool -T10575-



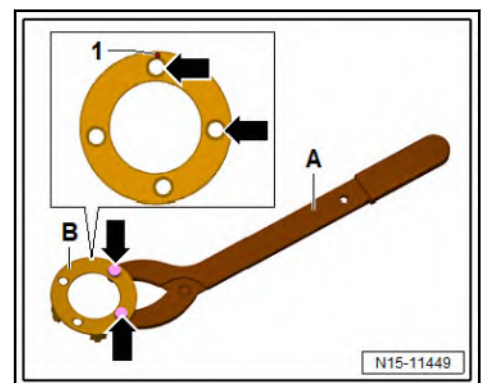


◆ Counter-hold tool -T10172A-



◆ Assembly tool -T10618-

Preparing tool for camshaft adjuster of inlet camshaft



- Bolt counter-hold tool -T10172A- -A- and counter-hold tool -T10575A- -B- together using knurled screws -T10554/2- in holes -arrows-.
- Marking -1- must still face upwards (TDC).

Procedure

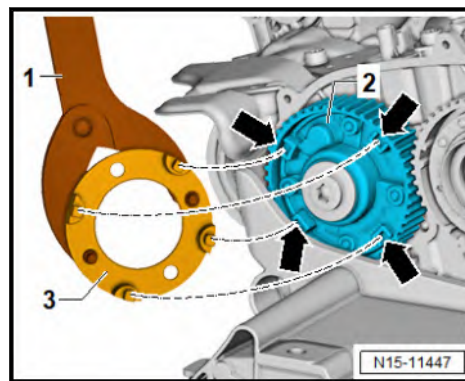


Note

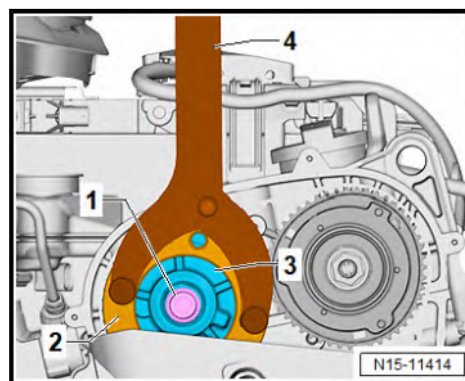
- ◆ Place a cloth under the camshaft adjuster and tensioning roller to catch the engine oil which runs out.
- ◆ The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.

Loosening camshaft adjuster of exhaust camshaft:

- Loosen camshaft adjuster of inlet camshaft ➔ [page 182](#) .
- Remove upper toothed belt guard ➔ [a2.3.1 nd installing upper toothed belt guard](#), [page 134](#) .
- Set engine to “TDC for cylinder no. 1” ➔ [p4.7 iston to TDC position](#), [page 111](#) .
- Place a cloth underneath camshaft adjuster to catch any engine oil which runs out.
- Thoroughly clean camshaft adjuster using a cleaning cloth.
- Fit counter-hold tool -T10575A- -3- with counter-hold tool -T10172A- -1- on camshaft pulley -2- as shown in illustration.



- Pins of counter-hold tool -T10575A- -3- are not distributed evenly on bolt circle.
- The pins correspond to the contour of the bolt circle in the camshaft adjuster.
- The pins must be inserted properly into holes -arrows-.
- Fit counter-hold tool -T10575A- -2- so that it rests flat against camshaft adjuster -3-.



- Use counter-hold tool -T10575A- -2- and counter-hold tool -T10172A- -4- to lock camshaft in position (push in »clock-wise direction«).
- Loosen securing bolt -1- of camshaft adjuster -3-.

Removing camshaft adjuster of exhaust camshaft:

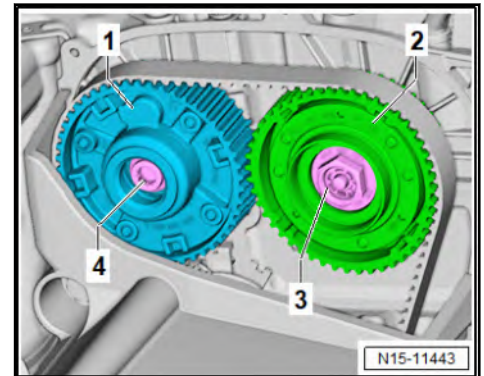
- Remove toothed belt from camshafts ➔ [t2.8 oothed belt from camshaft](#), [page 159](#) .
- Do not relieve tension from toothed belt, and do not remove toothed belt from camshafts when adjusting valve timing. Only loosen camshaft adjuster.
- Loosen camshaft adjuster of inlet camshaft ➔ [page 182](#) .
- Unscrew bolt -1- and remove camshaft adjuster -3-.
- Use a cleaning cloth to remove engine oil from camshaft and camshaft housing.
- Seal camshaft adjusters immediately using suitable plug from engine bung set -VAS 6122-.

Installing

- Check “TDC” position of camshafts and crankshaft ➔ [page 111](#) .
- The camshaft pulleys are properly aligned with each other.
- Renew bolts that are tightened with turning further angle.



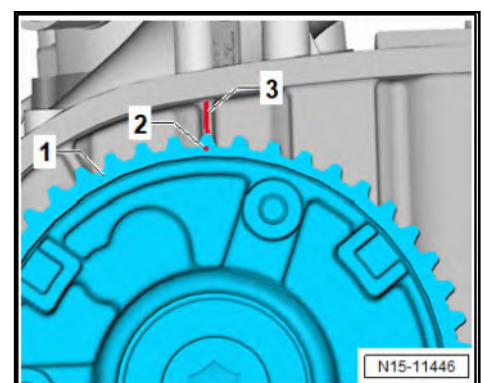
- Clean camshaft adjuster thoroughly with a cleaning cloth before installing it.
- Check control valve -3- before installing it ⇒ [Fig. “Checking control valve”](#), [page 133](#) .



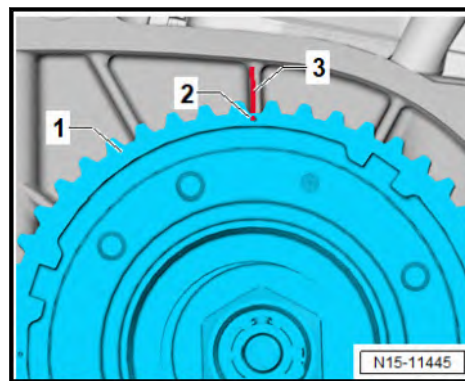
- Screw in bolt -4- for camshaft adjuster of exhaust camshaft -1- to stop.
- Screw in control valve -3- to stop.
- It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.

Note

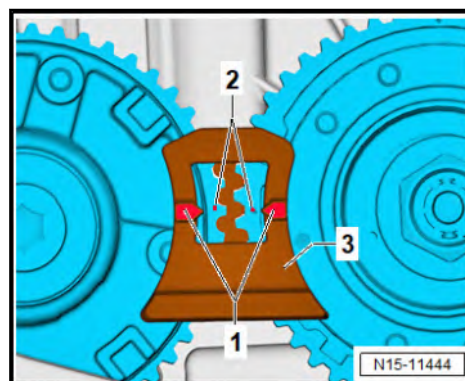
- ◆ *It should just be possible to turn camshaft pulleys on camshafts but no rocking is permissible.*
- ◆ *Renew bolts that are tightened with turning further angle.*
- ◆ *Check O-ring of plug and cap for damage, and renew if necessary; see ⇒ [Electronic parts catalogue \(ETKA\)](#).*
- ◆ *Ensure that the guide sleeve is reinstalled.*
- Find marking -2- of inlet camshaft pulley -1- to web -3- on camshaft housing.



- Find marking -2- of exhaust camshaft pulley -1- to web -3- on camshaft housing.

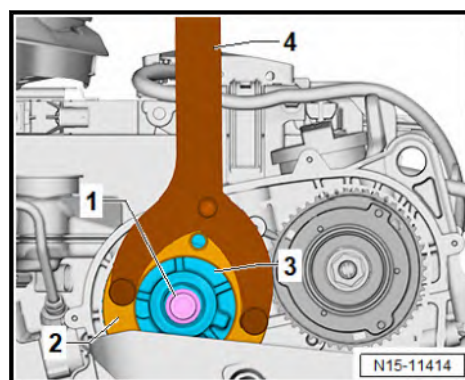


- Insert assembly tool -T10618- -3- between camshaft pulleys.



- The markings -1- on the assembly tool -T10618- must be aligned with markings -3- on the camshaft pulleys.
- Insert assembly tool -T10618- to stop.
- Fit toothed belt onto camshafts ⇒ [t2.8 oothed belt from camshaft](#), [page 159](#) .

Tightening camshaft adjuster of exhaust camshaft to pre-tightening torque

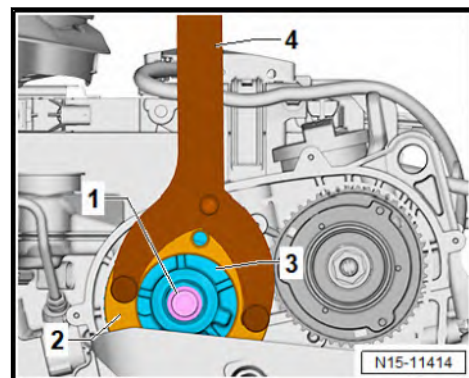


- Hold inlet camshaft in position using counter-hold tool -T10575A- -2- and counter-hold tool -T10172A- -4-.
- Tighten bolt -1- to initial torque.

Stage	Bolt for camshaft adjuster, exhaust camshaft	Specified torque
1st	-2-	18 Nm



Tightening camshaft adjuster of exhaust camshaft to final torque



- Tighten bolt -1- for camshaft adjuster to final torque in two stages.

Stage	Bolt for camshaft adjuster, exhaust camshaft	Specified torque
2nd	-2-	50 Nm
3rd	-2-	135°

- Tighten inlet camshaft to final torque ➔ [page 186](#) .

Assembling

Install in reverse order of removal, observing the following:



Note

Make sure to remove the camshaft clamp and the crankshaft locking pin before cranking the engine.

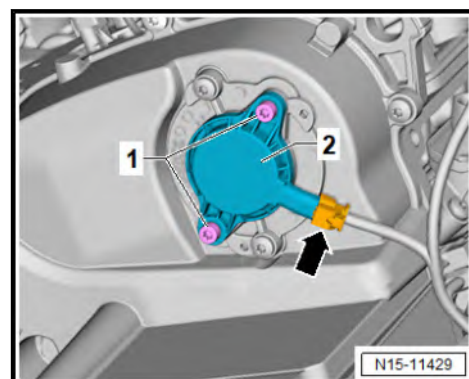
Torque settings

- ◆ ➔ [o2.2 verview - toothed belt", page 131](#)
- ◆ ➔ [o3.1 verview - valve gear", page 166](#)

3.4 Removing and installing inlet camshaft control valve 1 -N727-

Removing

- Remove air intake pipe ➔ [page 336](#) .
- Release and pull off electrical connector -2-.





Note

The contact points between the toothed belt and components - such as camshaft pulleys, tensioning roller and idler pulley - must be kept free of oil.

- Place a cloth underneath camshaft adjuster to catch any oil which runs out.
- Unscrew bolts -1- and remove inlet camshaft control valve 1 -N727-.



Note

- ♦ *The bolts -1- are guided through sleeves in the inlet camshaft control valve 1 -N727-.*
- ♦ *If the sleeve comes off along with the bolt when the bolt is unscrewed, both the bolt and the sleeve can still be reused.*

Installing

Install in reverse order of removal, observing the following:

- Renew seal ⇒ [Item 14 \(page 133\)](#) .
- Install air pipe ⇒ [page 336](#) .

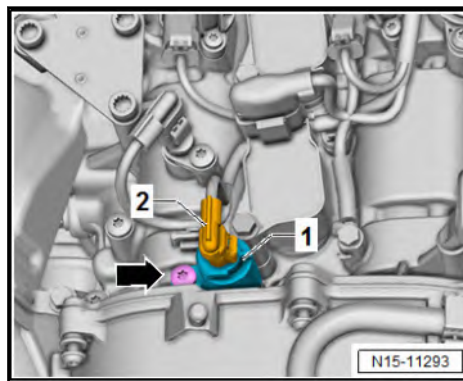
Torque settings

- ♦ ⇒ [o2.2 verview - toothed belt", page 131](#)

3.5 Removing and installing exhaust camshaft control valve 1 -N318-

Removing

- Release and pull off electrical connector -2-.



- Unscrew bolt -arrow- and remove exhaust camshaft control valve 1 -N318- -1-.

Installing

Install in reverse order of removal, observing the following:

- Check O-ring for damage.
- If O-ring is damaged, renew it together with exhaust camshaft control valve 1 -N318-.

Torque settings

- ♦ ⇒ [o1.2 verview - camshaft housing", page 117](#)



3.6 Removing and installing valve stem seals

⇒ [a3.6.1 nd installing valve stem seals \(cylinder head installed\)", page 193](#)

⇒ [a3.6.2 nd installing valve stem seals \(cylinder head removed\)", page 200](#)

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

Special tools and workshop equipment required

- ◆ Spark plug socket -3122 B-
- ◆ Removal and installation device for valve cotters -VAS 5161A- with guide plate -VAS 5161A/40-.
- ◆ Valve stem seal fitting tool -3365-





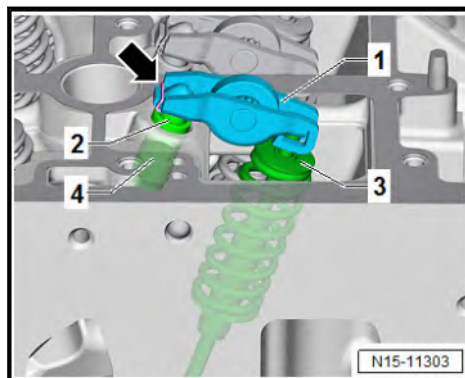
- ◆ Valve stem pliers -VAS 6770-



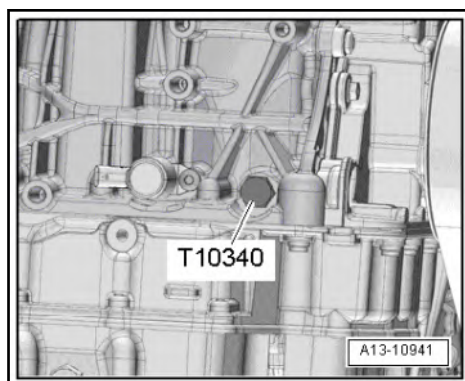
- ◆ Adapter -VAS 5161A/35- (not shown)

Procedure

- Remove camshaft housing ➔ [a1.4 nd installing camshaft housing", page 124](#) .
- Unscrew spark plugs with spark plug socket and extension -3122 B-.
- Mark allocation of roller rocker fingers -1-, hydraulic compensation element -4- and valves -3- for reinstallation.



- Unscrew locking pin -T10340-.

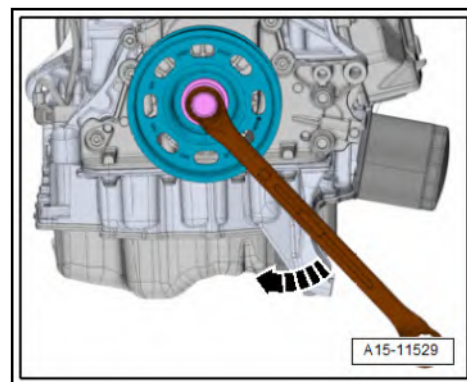


- Set piston of respective cylinder to "bottom dead centre".



Note

- ◆ *The piston of cylinder no. 1 is in »TDC« position after the camshaft housing has been removed.*
- ◆ *Crank engine via crankshaft 120° in direction of engine rotation. Pistons will then be at »BDC« one after the other.*
- ◆ *When cranking the engine, hold and guide the toothed belt by hand to prevent it from being damaged.*
- Insert a screwdriver with a shaft length of at least 250 mm into spark plug hole so that it contacts piston crown.
- Turn crankshaft in direction of engine rotation -arrow- until piston of respective cylinder is at "BDC".



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

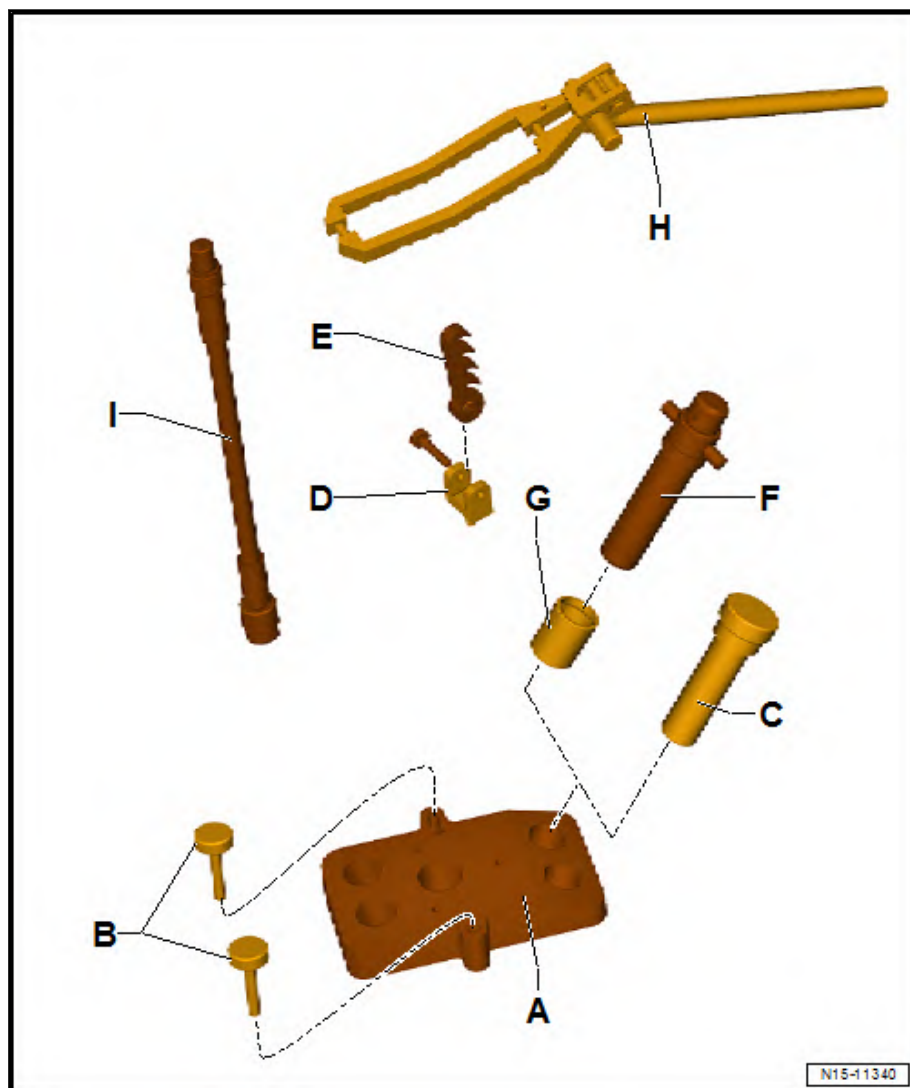


- The "BDC" has been reached before the screwdriver starts moving back in opposite direction.

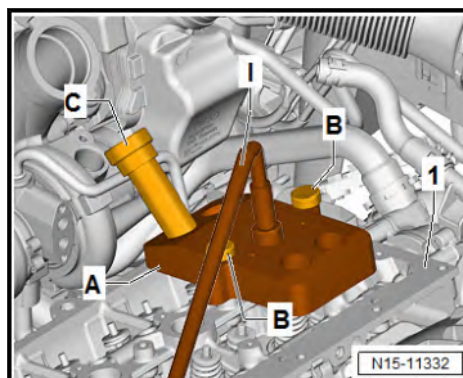
Removal and installation device for valve cotters -VAS 5161A-



- A - Guide plate -VAS 5161A/40-
- B - Knurled screws - VAS 5161/12-
- C - Punch -VAS 5161/3A-
- D - Guide fork -VAS 5161/5-
- E - Retainer -VAS 5161/6-
- F - Assembly cartridge - VAS 5161A/32-1-
- G - Sleeve -VAS 5161A/40-1-
- H - Pressure fork - VAS 5161/2-
- I - Compressed air adapter - VAS 5161 A/35-



- Fit guide plate -VAS 5161A/40- -A- on cylinder head -1-.
- Tighten guide plate -VAS 5161A/40- with knurled screws -VAS 5161/12- -B- by hand.

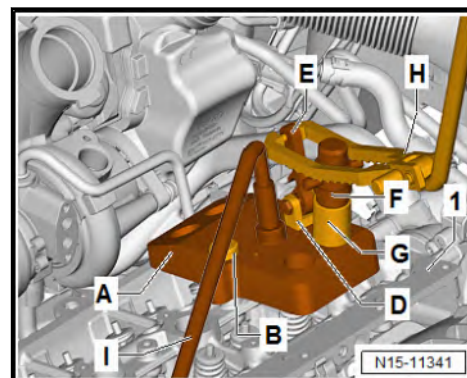


- Screw hose adapter -VAS 5161 A/35- -I- into the respective spark plug thread, and tighten it by hand.
- Connect adapter to compressed air supply using a commercially available union and apply pressure continuously.
- Minimum pressure: 6 bar.



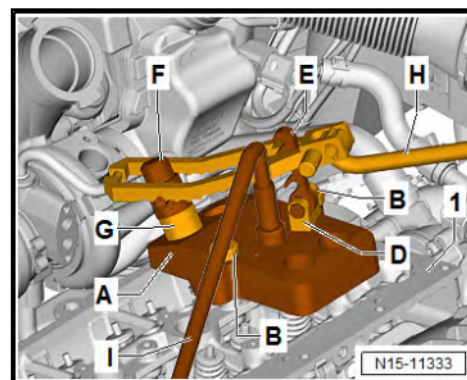
- Insert punch -VAS 5161/3A- -C- in guide plate -VAS 5161A/40- -A-. Use a plastic hammer to knock loose the firmly seated valve cotters.

Inlet side:



- Screw retainer -VAS 5161/6- -E- with guide fork -VAS 5161/5- -D- into guide plate -VAS 5161A/40- -A-.
- Insert assembly cartridge -VAS 5161A/32-1- -F- with fitted sleeve -VAS 5161A/40-1- -G- in guide plate -VAS 5161A/40- -A-.
- Attach pressure fork -VAS 5161/2- -H- to retainer -VAS 5161/6- -E-, and place it on assembly cartridge.
- Move handle of pressure fork -VAS 5161/2- -H- to an appropriate position, and lock it in place using the pin.
- Fit pressure fork -VAS 5161/2- -H- in such a way that assembly cartridge -VAS 5161A/32-1- -F- can be pressed down completely to stop as easily as possible.

Exhaust side:



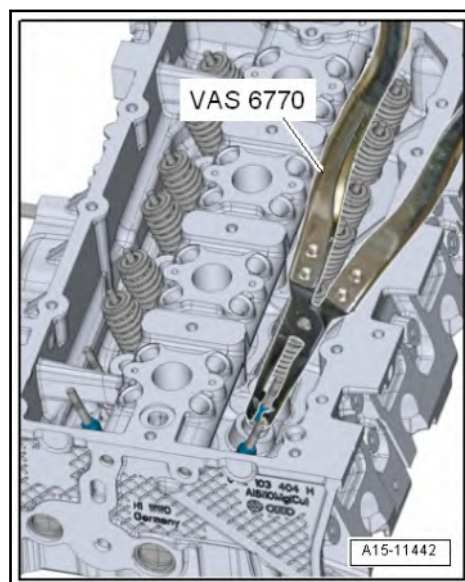
- Screw retainer -VAS 5161/6- -E- with guide fork -VAS 5161/5- -D- into one of the two threads at front.
- The front threads are the two threads located near marking »E«.
- Insert assembly cartridge -VAS 5161A/32-1- -F- with fitted sleeve -VAS 5161A/40-1- -G- in guide plate -VAS 5161A/40- -A-.
- Attach pressure fork -VAS 5161/2- -H- to retainer -VAS 5161/6-, and place it on assembly cartridge.
- Move handle of pressure fork -VAS 5161/2- to an appropriate position, and lock it in place using the pin.



- Fit pressure fork -VAS 5161/2- in such a way that assembly cartridge -VAS 5161A/32-1- -F- can be pressed down completely to stop as easily as possible.

Continuation for both sides:

- Press down assembly cartridge -VAS 5161A/32-1- with pressure fork -VAS 5161/2-.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
- Move knurled screw back and forth to press apart valve cotters and capture them in assembly cartridge.
- Release pressure fork.
- Remove installation cartridge.
- Unbolt guide plate -VAS 5161A/40-, and turn it sideways.
- The compressed air hose remains connected.
- Remove valve spring and valve spring plate.
- Pull off valve stem seal using valve stem pliers -VAS 6770-.



Installing:

Install in reverse order of removal, observing the following:

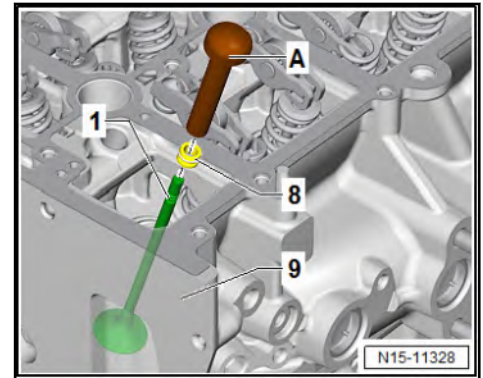


Note

Risk of damage when installing valve stem seals.

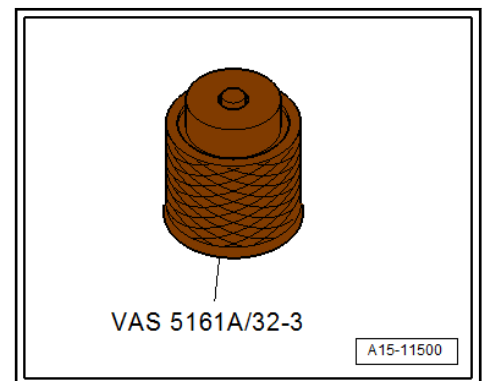


Installing valve stem oil seal:



- Lightly oil sealing lip of valve stem oil seal -8-.
- Note installation position of valve stem oil seal ⇒ [Fig. “Installation position of valve stem oil seal”](#), page 168 .
- Use valve stem oil seal fitting tool -3365- -A- to carefully push valve stem oil seal -8- onto valve -1-.
- Use valve shaft seal fitting tool -3365- -A- to carefully push valve stem oil seal -8- onto valve guide until it rests against cylinder head -9-.
- Insert valve spring and valve spring plate. For installation position of valve spring refer to ⇒ [Fig. “Installation position of valve spring”](#), page 168 .

If valve cotters have been removed from assembly cartridge:



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

Installing valve cotters:

- Bolt guide plate -VAS 5161A/40- to cylinder head again.
- Insert assembly cartridge -VAS 5161A/32-1- with sleeve - VAS 5161A/40-1- into guide plate.



Inlet side:

- Screw retainer -VAS 5161/6- with guide fork -VAS 5161/5- into guide plate ➔ [page 197](#) .
- Attach pressure fork -VAS 5161/2- to retainer, and place it on assembly cartridge.

Exhaust side:

- Screw retainer -VAS 5161/6- with guide fork -VAS 5161/5- into guide plate ➔ [page 197](#) .
- Attach pressure fork -VAS 5161/2- to retainer, and place it on assembly cartridge.

Continuation for both sides:

- Move handle of pressure fork to an appropriate position, and lock it in place using the pin.
- Press pressure fork downwards and pull knurled screw upwards, turning it clockwise and anticlockwise. This inserts the valve cotters.
- Reduce pressure on pressure fork whilst pulling on knurled screw.
- Repeat procedure on each valve.

Assembling

Install in reverse order of removal, observing the following:

- Install camshaft housing ➔ [a1.4 nd installing camshaft housing", page 124](#) .
- Install spark plugs ➔ [o1.1 verview - ignition system", page 411](#) .

Torque settings

- ◆ ➔ [o1.1 verview - turbocharger", page 316](#)
- ◆ ➔ Running gear, axles, steering; Rep. gr. 40; Drive shaft; Assembly overview - drive shaft

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

Special tools and workshop equipment required

- ◆ Valve stem seal fitting tool -3365-

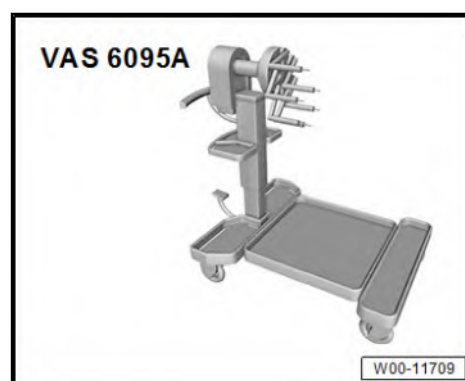




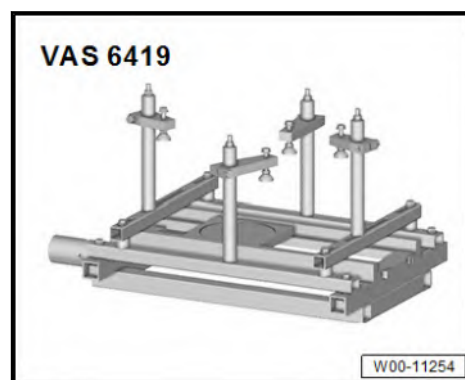
- ◆ Removal and installation device for valve cotters -VAS 5161 A- with set -VAS 5161/40-



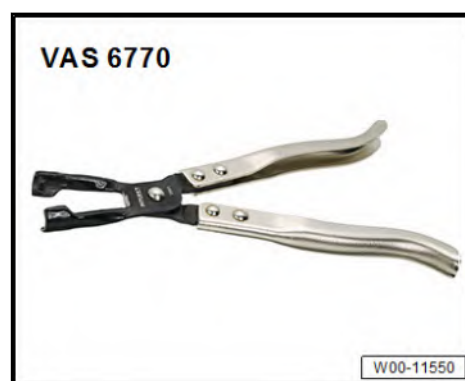
- ◆ Engine and gearbox support -VAS 6095A-



- ◆ Cylinder head tensioning device -VAS 6419-



- ◆ Valve stem pliers -VAS 6770-



Cylinder head clamping device -VAS 6419-:



A - Support -VAS 6419-

B - Clamping arm -VAS 6419/2-

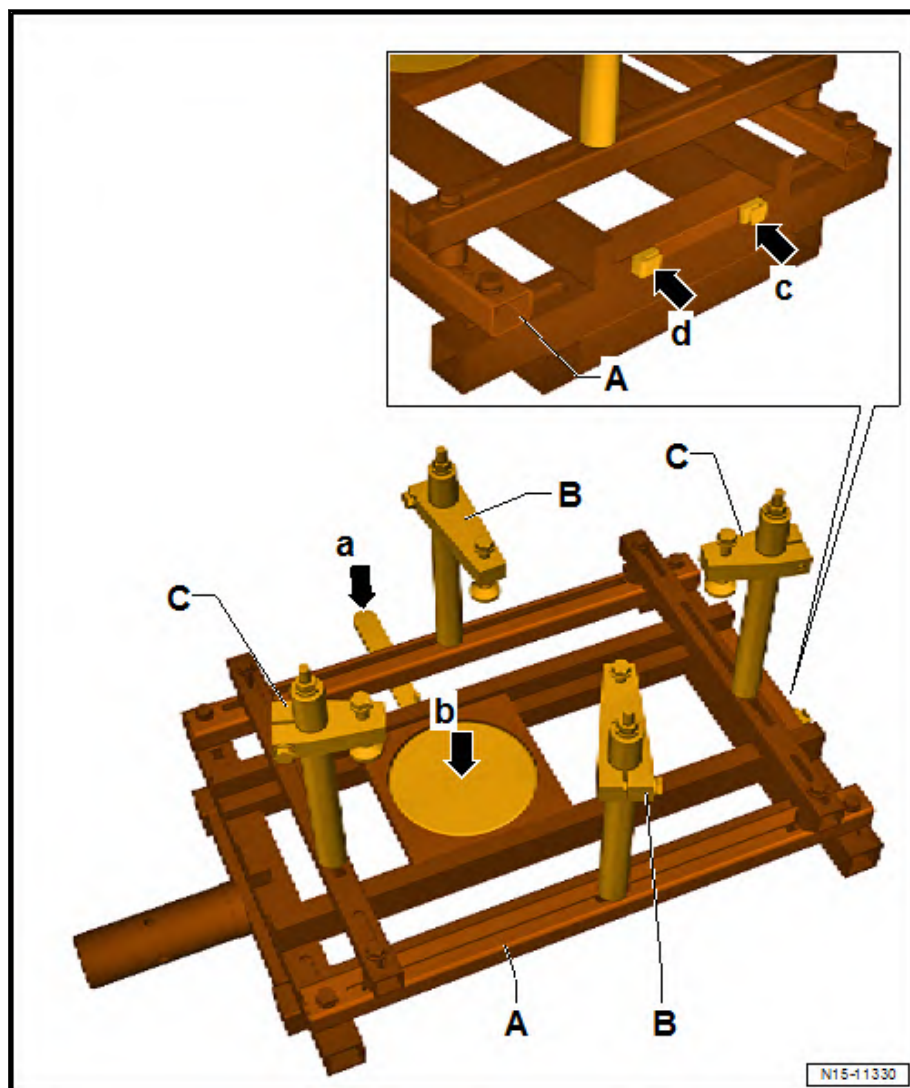
C - Clamping arm -VAS 6419/1-

a - Lever for moving air cushion

b - Air cushion

c - »On« button for filling with compressed air

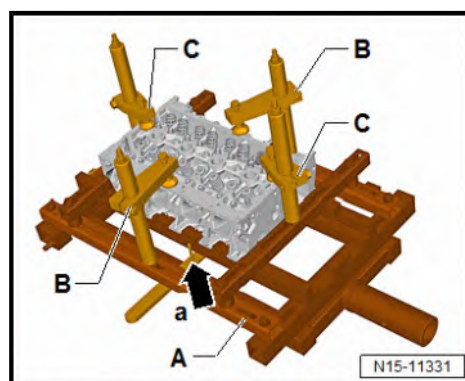
d - »Off« button for releasing compressed air



Procedure

- Remove cylinder head ➔ [a1.3 nd installing cylinder head", page 120](#).

Supporting cylinder head on cylinder head clamping device - VAS 6419-:



- Insert cylinder head tensioning device -VAS 6419- into engine and gearbox support -VAS 6095A-.
- Screw clamping arms -VAS 6419/1- -C- and -VAS 6419/2- -B- into sliding blocks of support -A-.

- To do this, screw in 15 mm threaded rods.
- Tension cylinder head on cylinder head tensioning device as shown in illustration.
- Secure cylinder head with clamps.
- Connect cylinder head tensioning device to compressed air. The pressure must be 2.0 bar.
- Use lever -arrow a- to slide air cushion under combustion chamber from which valve stem oil seals are to be removed.
- The marking on the lever is then positioned centrally in front of the respective cylinder.
- Fill air cushion using the respective button ➔ [Item c \(page 202\)](#) .
- Allow compressed air to flow into air cushion until it lies against valve disc.

Removing valve cotters:

A - Guide plate -VAS 5161A/40-

B - Knurled screws - VAS 5161/12-

C - Punch -VAS 5161/3A-

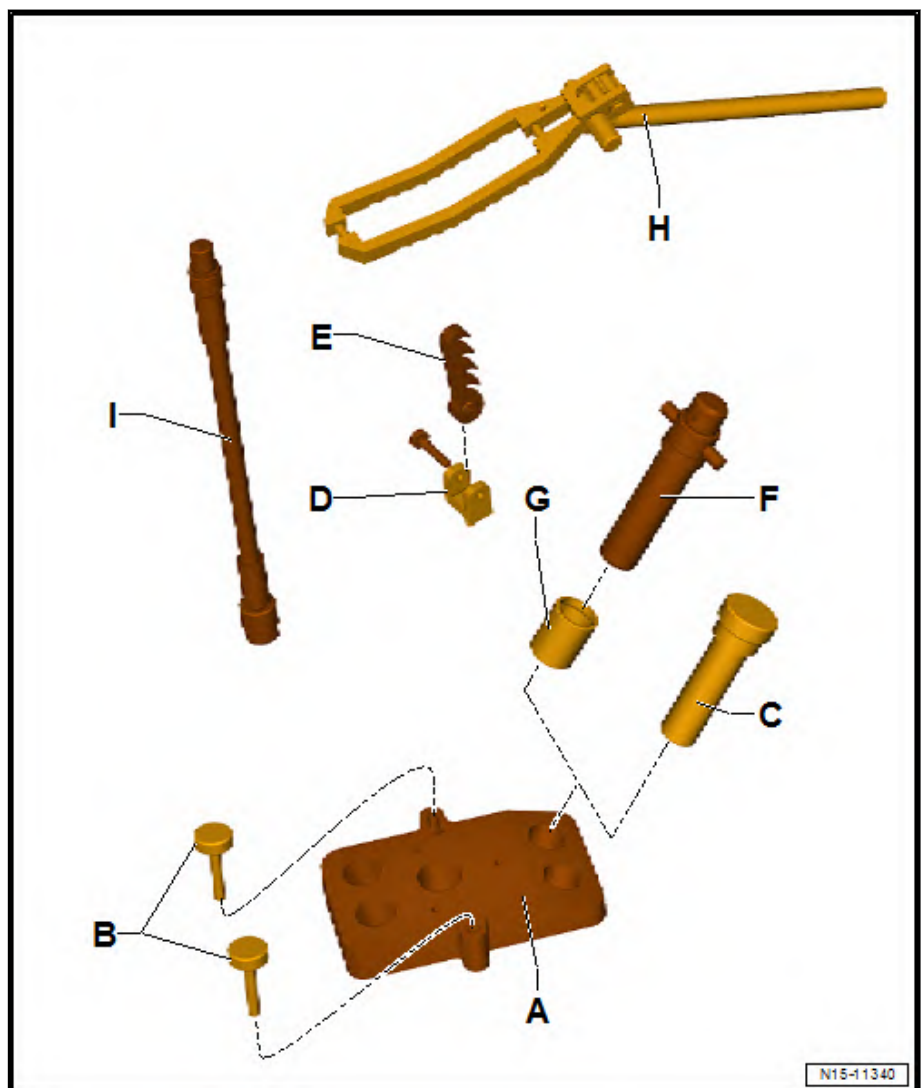
D - Guide fork -VAS 5161/5-

E - Retainer -VAS 5161/6-

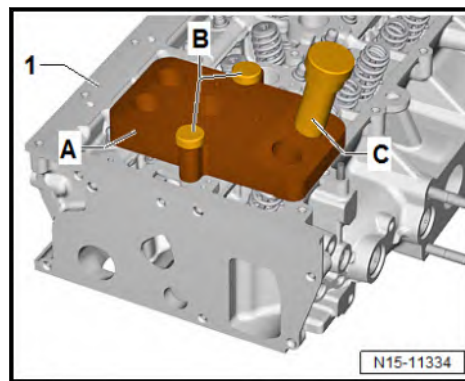
F - Assembly cartridge - VAS 5161A/32-1-

G - Sleeve -VAS 5161A/40-1-

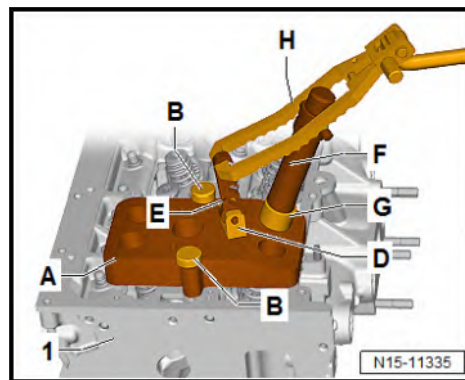
H - Pressure fork - VAS 5161/2-



- Fit guide plate -VAS 5161A/40- -A- on cylinder head -1-. Tighten guide plate -VAS 5161A/40- with knurled screws -VAS 5161/12- -B- by hand.



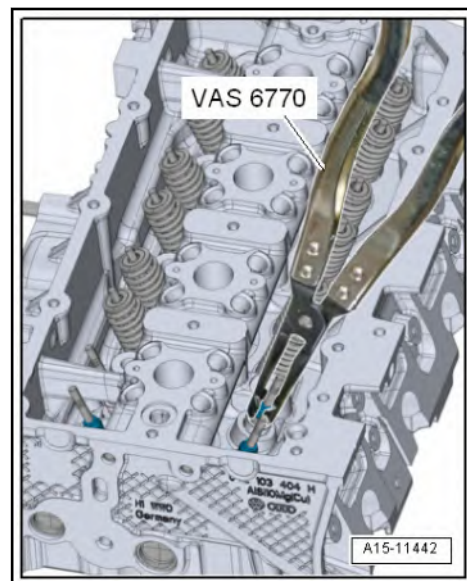
- Insert punch -VAS 5161/3A- -C- in guide plate -VAS 5161A/40- -A-. Use a plastic hammer to knock loose the firmly seated valve cotters.
- Screw retainer -VAS 5161/6- -E- with guide fork -VAS 5161/5- -D- into guide plate -VAS 5161A/40- -A-.



- Select a suitable bolting point in guide plate -VAS 5161A/40- -A- for this.
- Insert assembly cartridge -VAS 5161A/32-1- -F- with fitted sleeve -VAS 5161A/40-1- -G- in guide plate.
- Attach pressure fork -VAS 5161/2- -H- to retainer -VAS 5161/6- -E-. Place pressure fork -VAS 5161/2- -H- onto assembly cartridge -VAS 5161A/32-1- -F-.
- Move handle of pressure fork -VAS 5161/2- -H- to an appropriate position, and lock it in place using the pin.
- Fit pressure fork -VAS 5161/2- -H- in such a way that assembly cartridge -VAS 5161A/32-1- can be pressed down completely to stop as easily as possible.
- Press down assembly cartridge -VAS 5161A/32-1- -F- with pressure fork -VAS 5161/2-.
- At the same time, turn knurled screw of assembly cartridge -VAS 5161A/32-1- -F- clockwise until tips engage in valve cotters.
- Turn knurled screw of assembly cartridge -VAS 5161A/32-1- -F- back and forth. This causes the valve cotters to be pressed apart and taken into assembly cartridge -VAS 5161A/32-1- -F-.
- Release pressure fork -VAS 5161/2- -H-.
- Remove assembly cartridge -VAS 5161A/32-1- -F-.
- Unbolt guide plate -VAS 5161A/40- -A-, and turn it sideways.
- Remove valve spring and valve spring plate.



Removing valve stem oil seal:



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

Removing valves:

- Turn cylinder head clamping device -VAS 6419- by 90°.
- Use respective button to release pressure from air cushion of cylinder head clamping device -VAS 6419-.
- Move air cushion, and remove valves.

Installing:

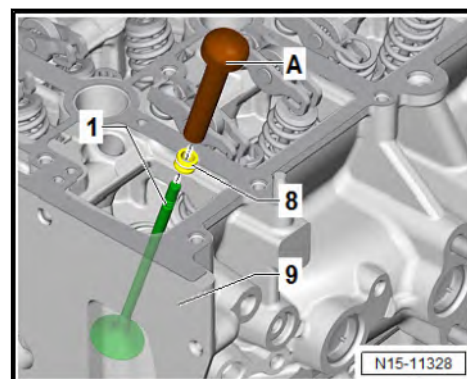
Install in reverse order of removal, observing the following:



Note

Risk of damage when installing valve stem seals.

Installing valve stem oil seal:

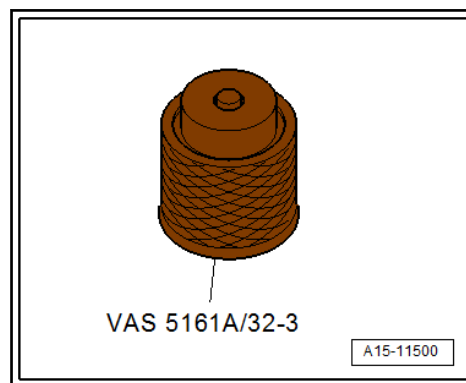


- Lightly oil sealing lip of valve stem oil seal -8-.
- Note installation position of valve stem oil seal ⇒ [Fig. "Installation position of valve stem oil seal", page 168](#).
- Use valve stem oil seal fitting tool -3365- -A- to carefully push valve stem oil seal -8- onto valve -1-.



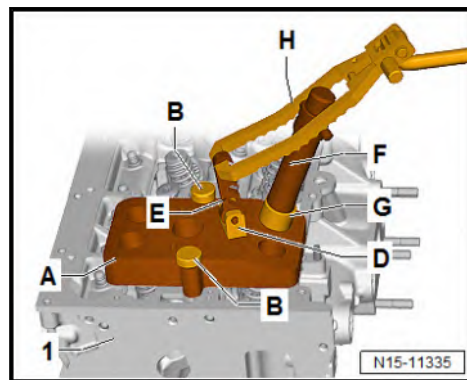
- Use valve shaft seal fitting tool -3365- -A- to carefully push valve stem oil seal -8- onto valve guide until it rests against cylinder head -9-.
- Insert valve spring and valve spring plate. For installation position of valve spring refer to ➤ [Fig. "Installation position of valve spring", page 168](#).

If valve cotters have been removed from assembly cartridge:



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

Installing valve cotters:



- Bolt guide plate -VAS 5161A/40- -A- back to cylinder head -1- using knurled screws -VAS 5161/12- -B-.
- Insert assembly cartridge -VAS 5161A/32-1- -F- with sleeve -VAS 5161A/40-1- -G- in guide plate.
- Screw retainer -VAS 5161/6- -E- with guide fork -VAS 5161/5- -D- into guide plate.
- Attach pressure fork -VAS 5161/2- -H- to retainer -VAS 5161/6- -E-. Place pressure fork -VAS 5161/2- -H- onto retainer -VAS 5161/6- -E-.

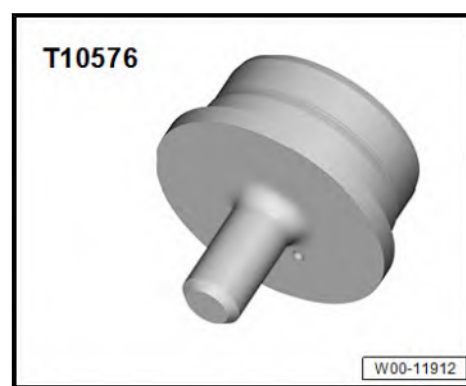


- Move handle of pressure fork -VAS 5161/2- -H- to an appropriate position, and lock it in place using the pin.
- Press down pressure fork -VAS 5161/2- -H-. Turn knurled screw of assembly cartridge -VAS 5161A/32-1- -F- back and forth, and pull it upwards at the same time. When doing this, the valve cotters will be inserted.
- Reduce pressure on pressure fork whilst pulling on knurled screw.
- Repeat procedure on each valve.
- Install cylinder head ➔ [a1.3 nd installing cylinder head", page 120](#).

3.7 Removing and installing holder for oil seal

Special tools and workshop equipment required

- ◆ Centring mandrel -T10576-



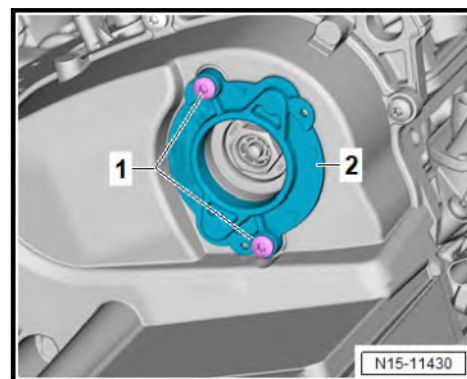
Removing



Note

The toothed belt, toothed belt tensioning roller and idler roller must not come in contact with engine oil.

- Remove inlet camshaft control valve 1 -N727- ➔ [page 191](#).
- Place a cloth underneath to catch any oil which may drain out.
- Unscrew bolts -1-, and remove holder for oil seal -2-.

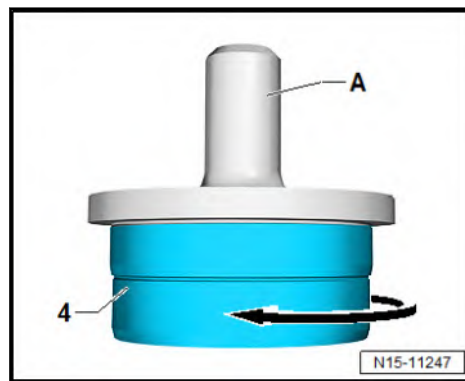


Installing:

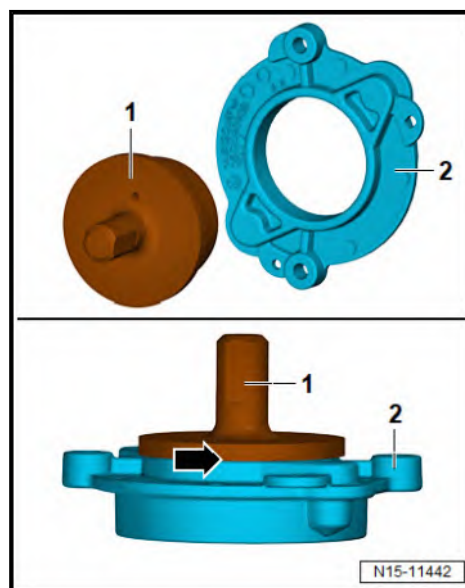
Install in reverse order of removal, observing the following:



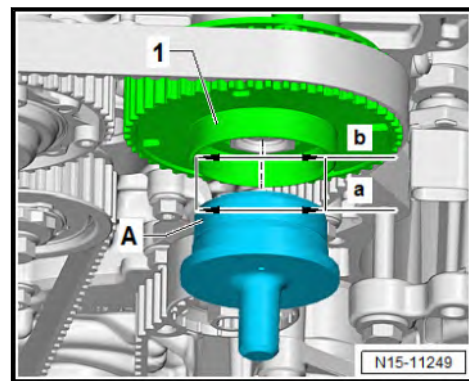
- Check oil seal for damage, and renew it if necessary ➤ [a3.2.1 nd installing camshaft oil seal for holder of inlet camshaft control valve 1N727", page 169](#) .
- The holder must be centred so that the oil seal can be fitted onto camshaft adjuster without being damaged.
- Always use centring mandrel -T10576- to centre the holder.
- Lightly oil entire surface -4- of centring mandrel -T10576- -A- all round -arrow-.



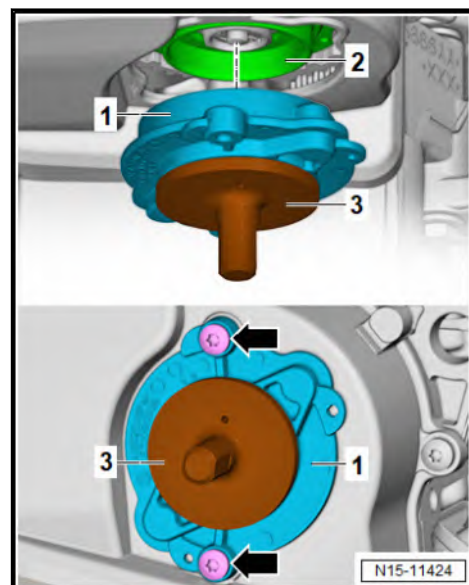
- Also lightly oil area where centring mandrel engages.
- Insert centring mandrel -T10576- -1- from sensor end into holder -2-.



- The centring mandrel -T10576- -1- is properly seated, if the shoulder on the tool makes full contact with holder -2- -arrow-.
- The chamfer with the smaller diameter -arrow a- on centring mandrel -T10576- -A- is fitted into inner collar -arrow b- of camshaft adjuster -1-.



- Guide holder -1- with centring mandrel -T10576- -3- towards camshaft adjuster -2-.



- Screw in securing bolts -arrows- and tighten to specified torque. ⇒ [o2.2 verview - toothed belt", page 131](#)
- Pull out centring mandrel -T10576- -3- from holder -1-.
- Install inlet camshaft control valve 1 -N727- ⇒ [page 191](#) .

Specified torques:

- ◆ ⇒ [o2.2 verview - toothed belt", page 131](#)



4 Inlet and exhaust valves

⇒ [v4.1 alve guides", page 210](#)

⇒ [v4.2 alves", page 211](#)

⇒ [d4.3 imensions", page 211](#)

4.1 Checking valve guides

Special tools and workshop equipment required

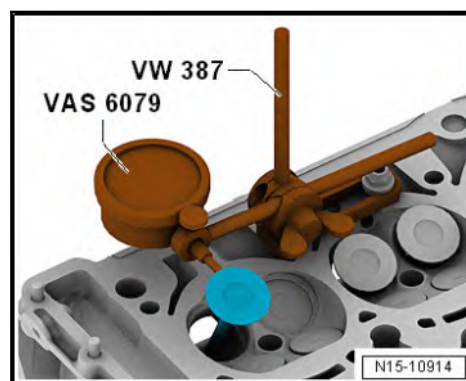
◆ Universal dial gauge bracket -VW 387-



◆ Dial gauge -VAS 6079-



Test sequence



- Insert valve in guide. Valve stem end must be flush with guide. On account of differing stem diameters, only use inlet valve in inlet valve guide and exhaust valve in exhaust valve guide.
- Determine rock.
- Wear limit: 0.5 mm.



- If the wear limit is exceeded, repeat the measurement with new valves.
- Renew cylinder head if wear limit is still exceeded.



Note

Valve guides cannot be exchanged.

4.2 Checking valves

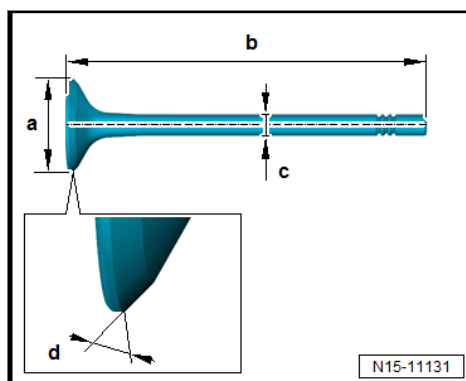
- Check for scoring on valve stems and valve seat surfaces.
- Exchange valve if significant scoring can be seen.

4.3 Valve dimensions



Note

Never rework the inlet and exhaust valves. Only lapping-in is permitted.



Dimension		Inlet valve	Outlet valve
Ø a	mm	29.0	25.0
Diameter c	mm	4.973	4.963
b	mm	112.6	110.09
d	°	45	30

Volkswagen Technical Site: <https://vwts.ru>



17 – Lubrication

1 Sump, oil pump

⇒ [o1.1 verview - sump/oil pump", page 212](#)

⇒ [o1.2 il:", page 216](#)

⇒ [a1.3 nd installing sump", page 216](#)

⇒ [a1.4 nd installing oil pump", page 221](#)

⇒ [a1.5 nd installing oil level and oil temperature senderG266", page 222](#)

1.1 Assembly overview - sump/oil pump



Note

- ◆ *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: carefully clean oil channels and re-new oil spray jets, engine oil cooler and oil filter.*
- ◆ *Oil spray jet and pressure relief valve ⇒ [a4.6 nd installing oil spray jets", page 110](#) .*



1 - Engine

2 - Oil dipstick

3 - Seal

- ☐ For oil separator ➤ [Item 7 \(page 226\)](#)

4 - Oil separator

- ☐ ➤ [Item 8 \(page 226\)](#)

5 - Bolt

- ☐ Torque ➤ [Item 9 \(page 226\)](#)

6 - Baffle plate

7 - Oil pump

- ☐ Removing and installing ➤ [a1.4 nd installing oil pump", page 221](#)

8 - Bolt

- ☐ Renew
- ☐ 8 Nm +90°

9 - Sump

- ☐ Removing and installing ➤ [a1.3 nd installing sump", page 216](#)
- ☐ Tighten loosened union for oil filter ➤ [page 231](#)

10 - Oil filter

- ☐ Removing and installing ➤ [a4.4 nd installing oil filter housing", page 232](#)
- ☐ 20 Nm

11 - Sealing plug chain

12 - Bolt

- ☐ 9 Nm

13 - Oil level and oil temperature sender -G266-

- ☐ Removing and installing ➤ [a1.5 nd installing oil level and oil temperature senderG266", page 222](#)

14 - Bolt

- ☐ Renew
- ☐ Tightening sequence ➤ [page 214](#)

15 - Seal

- ☐ Renew in the case of oil drain plug with non-captive seal

16 - Oil drain plug

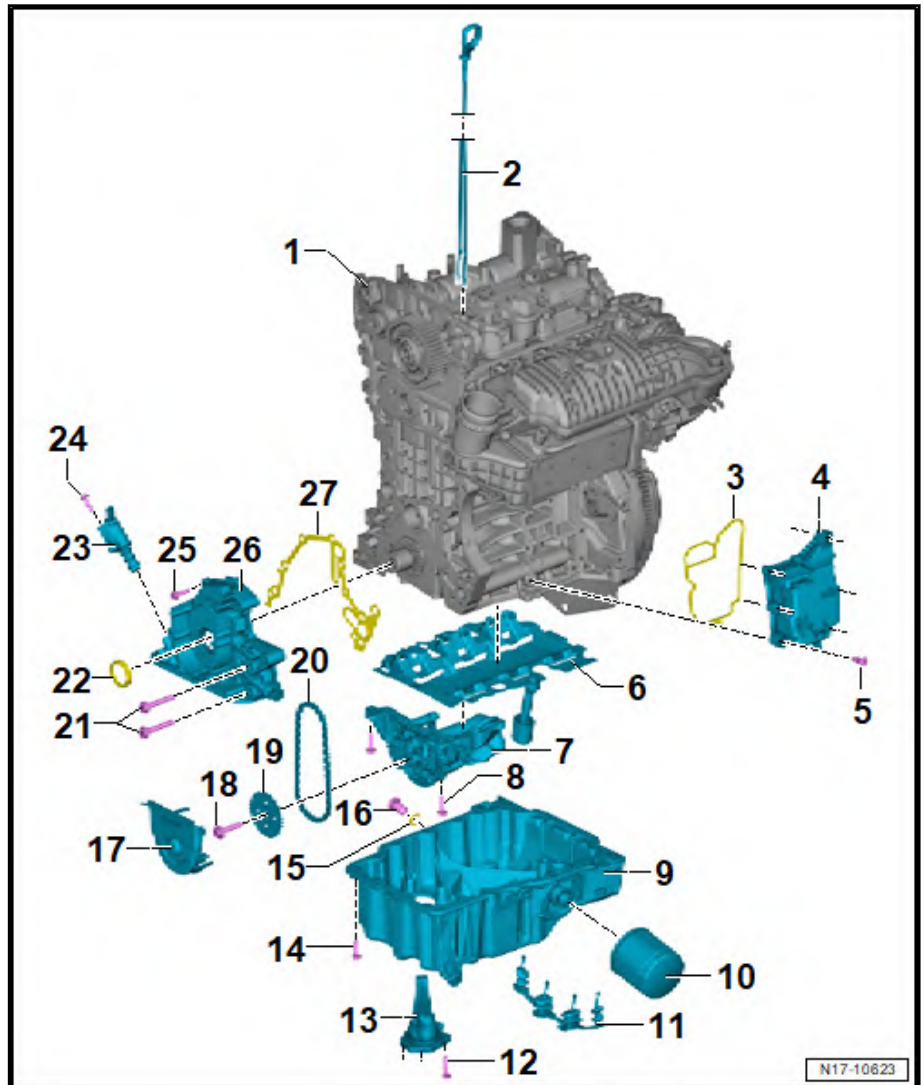
- ☐ With captive seal on new vehicles ➤ [page 215](#)
- ☐ To be renewed on 1st oil change ➤ [page 216](#)
- ☐ Oil drain plug with non-captive seal installed on first oil change is to be reused ➤ [page 216](#)
- ☐ 30 Nm

17 - Cover

- ☐ For chain sprocket

18 - Bolt

- ☐ Renew





- ❑ 20 Nm +90°

19 - Chain sprocket for oil pump

20 - Chain for oil pump

21 - Bolt

- ❑ Specified torques and installation sequence ⇒ [page 214](#) .

22 - Seal

- ❑ Renewing ⇒ [c1.6 crankshaft oil seal - belt pulley end](#)", [page 76](#)

23 - Valve for oil pressure control -N428-

- ❑ Removing and installing ⇒ [a4.5 nd installing oil pressure regulating valveN428](#)", [page 233](#)

24 - Bolt

- ❑ 8 Nm

25 - Bolt

- ❑ Specified torques and installation sequence ⇒ [page 214](#) .

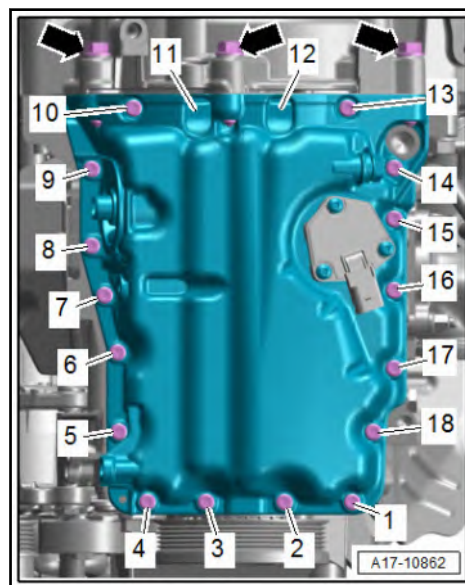
26 - Sealing flange at belt pulley end

- ❑ Removing and installing ⇒ [page 79](#)

27 - Seal

- ❑ Renew

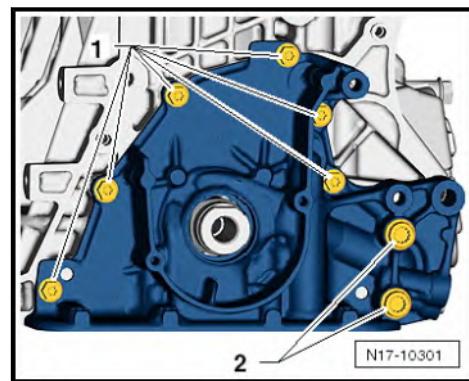
Sump - specified torque and tightening sequence



- Tighten bolts in stages in the sequence shown.

Stage	Bolts	Specified torque
1st	-1- to -18-	Screw onto stop by hand
2nd	-1- to -18-	8 Nm
3rd	-1- to -18-	Turn 90° further
4th	-Arrows-	⇒ Rep. gr. 34; Removing and installing gearbox; Specified torques for gearbox

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



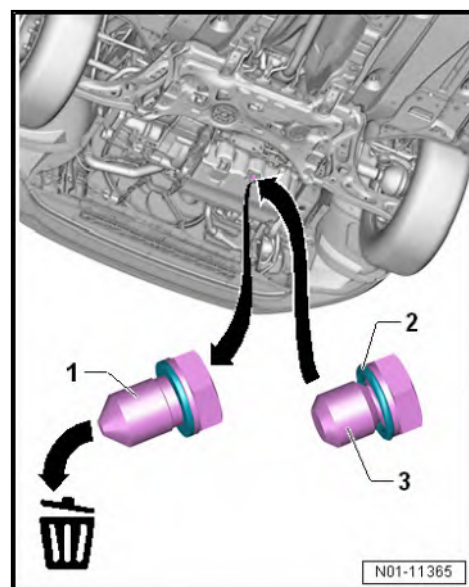
Note

Renew bolts that are tightened with turning further angle.

- Tighten bolts in stages in the sequence shown.

Stage	Bolts	Specified torque/turning further angle
1st	-1-, -2-	8 Nm
2nd	-1-	Turn 90° further
3rd	-2-	20 Nm +90° further

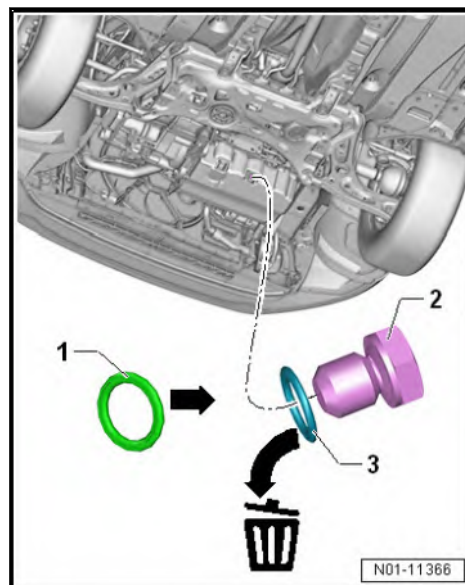
Oil drain plug with captive seal (factory-installed)



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



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



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

1.2 Engine oil:



Note

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

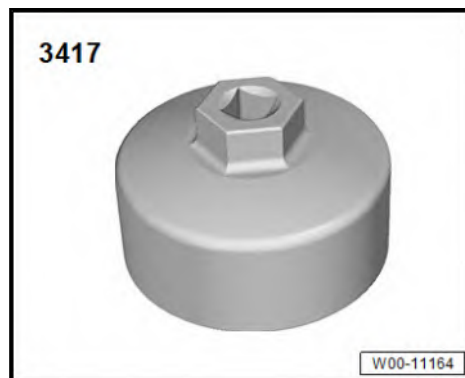
Capacities and specifications ⇒ Maintenance; Booklet ; Engine oil: Capacities and specifications.

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

1.3 Removing and installing sump

Special tools and workshop equipment required

- ◆ Oil filter tool -3417-





- ◆ Hexagon key -T10058-



- ◆ Applicator gun -VAS 6966-



- ◆ Hand drill with plastic brush
- ◆ Scraper
- ◆ Silicone sealant⇒ Electronic parts catalogue

Removing

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Drain engine oil ⇒ Maintenance; Booklet 819.

NOTICE

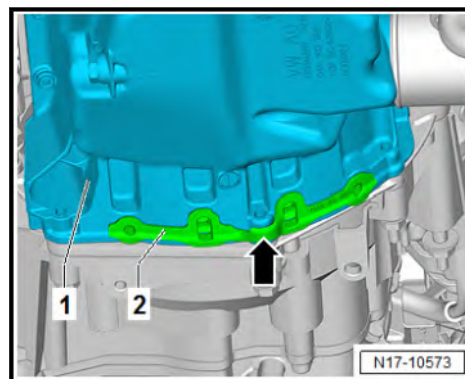
Risk of damage to refrigerant lines from rupture of inner foil.

- **Never bend refrigerant lines to a radius tighter than $r < 100$ mm.**

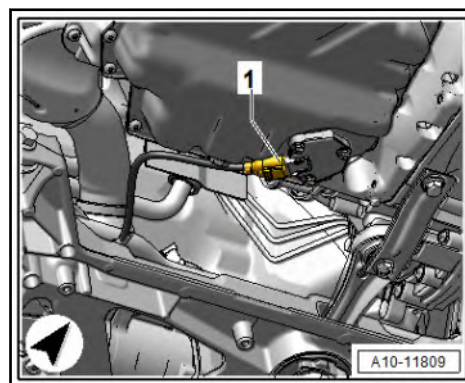
Note

The air conditioning system lines must not be opened.

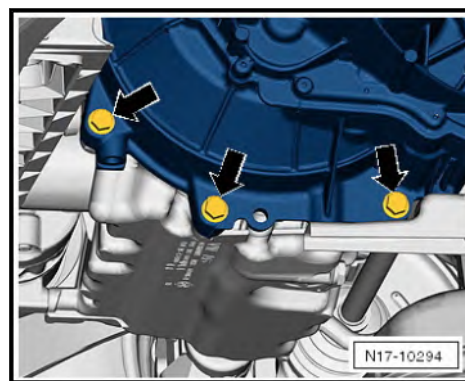
- Remove poly V-belt. ⇒ [a1.2 nd installing poly-V belt", page 66](#)
- Detach air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87; Air conditioner compressor; Removing and installing air conditioner compressor.
- Secure air conditioner compressor on lock carrier.
- Remove sealing plug chain -2- from sump -1-.



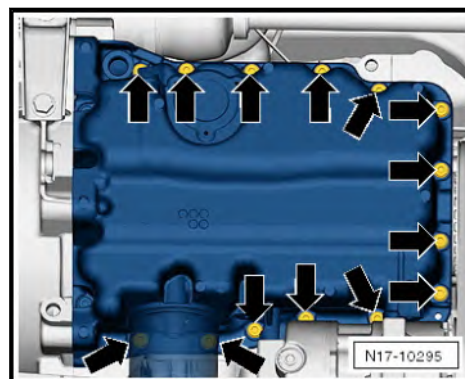
- Disconnect electrical connector -1- on oil level and oil temperature sender -G266-.



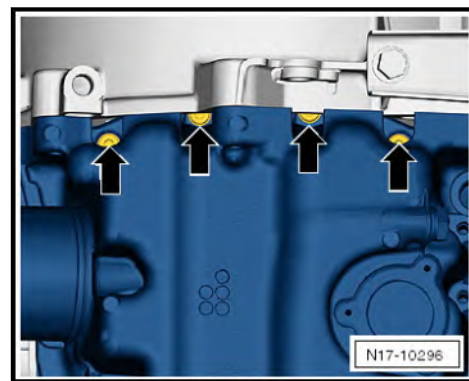
- Remove securing bolts -arrows- for gearbox.



- Unscrew all sump securing bolts -arrows-.

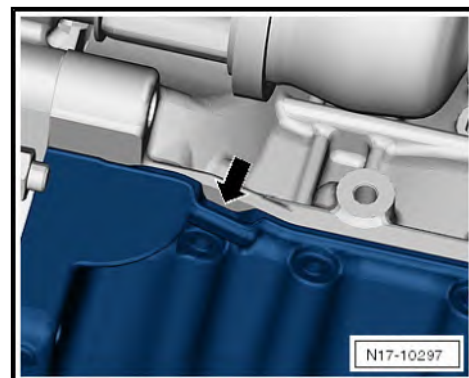


- Unscrew sump securing bolts on gearbox side -arrows- using Allen key, long reach 5 mm -T10058-.



i Note

- ◆ The sump is sealed with liquid sealant.
- ◆ When hardened, the sealant has a high adhesive strength.
- ◆ Carefully separate sump from cylinder block.
- Carefully lever off sump from cylinder block at recess -arrow- using assembly lever.

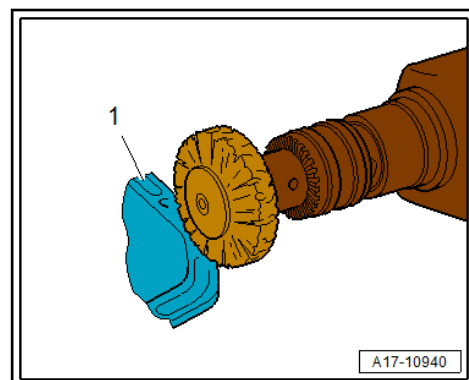


- Remove sump. Loosen sump with light blows of a rubber headed hammer if necessary.

i Note

To prevent particles from entering the lubrication system, cover the open parts of the engine.

Installing





CAUTION

Risk of eye injury caused by sealant residue.

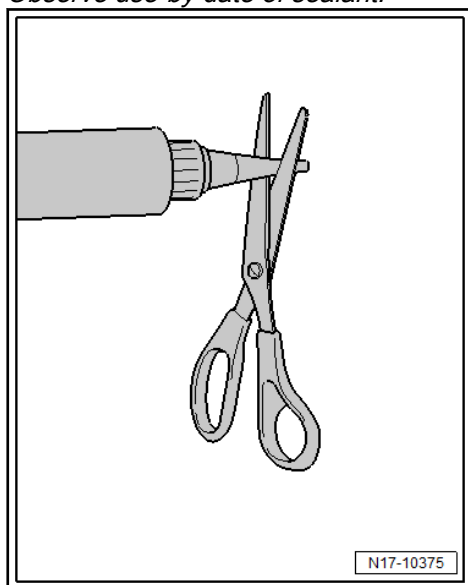
- **Wear protective goggles.**

- Remove sealant residue from sump using rotating plastic brush.
- Remove any oil and grease from sealing surfaces.

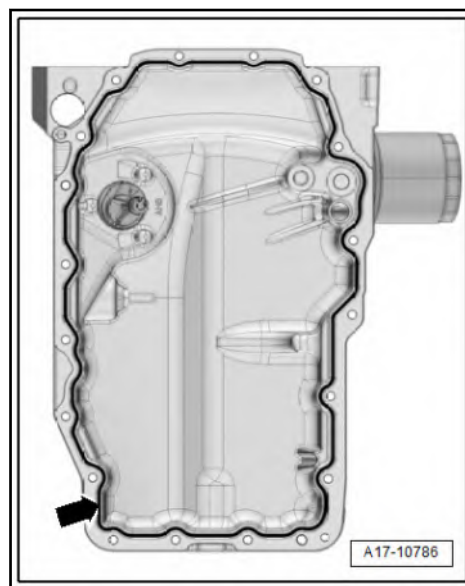


Note

Observe use-by date of sealant.



- Cut off nozzle on tube at front marking (Ø of nozzle approx. 2 mm).



- Apply sealant in a bead -arrow- to clean sealing surface of bottom section of sump using applicator gun -VAS 6966-.



! NOTICE

Danger of blocking lubrication system with excess sealant.

- **Do not apply sealant bead thicker than specified.**
- Thickness of sealant bead: 2 to 3 mm.
- Run bead along inner side of bolt holes -arrows-.
- Apply the sealant bead with particular care around the sealing flange.
- Oil sump must be installed within 5 minutes after applying sealant.
- Position oil sump and tighten bolts . ➔ [page 214](#)
- Allow sealant to dry for approx. 30 minutes after installing sump. Only then fill with engine oil.

Oil capacities ➔ Maintenance; Booklet "Capacities and specifications"

Engine oil specifications ➔ Maintenance; Booklet "Capacities and specifications"

- Replenish engine oil and check oil level.



Note

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

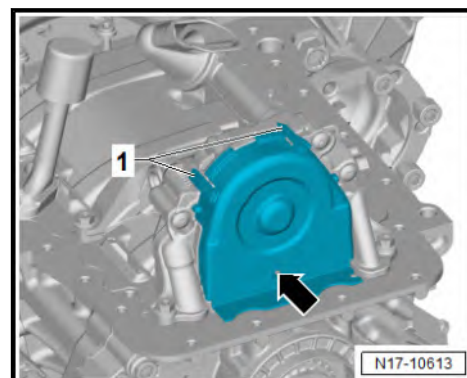
Torque settings

- ◆ Securing bolts for air conditioner compressor ➔ Heating, air conditioning system; Rep. gr. 87; Air conditioner compressor; Removing and installing air conditioner compressor

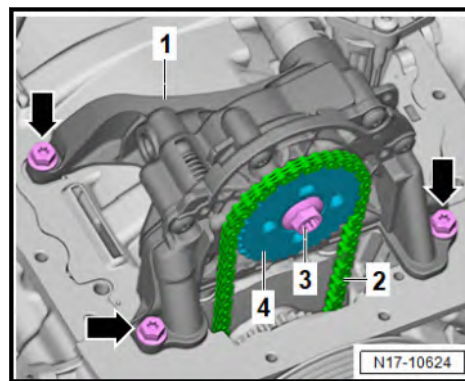
1.4 Removing and installing oil pump

Removing

- Remove sump. ➔ [a1.3 nd installing sump", page 216](#)
- Unclip cover for chain sprocket, releasing fasteners -1- to do so.



- If present, release fastener -arrow- by inserting a small screwdriver through hole.
- Unscrew bolt -3- while counterholding shaft of oil pump with an open-end spanner AF14 behind chain sprocket -4-.



- Pull off chain sprocket -4- from oil pump -1- and remove chain for oil pump -2-.
- Unscrew bolts -arrows- and remove oil pump -1-.

Installing

Install in reverse order of removal, observing the following:



Note

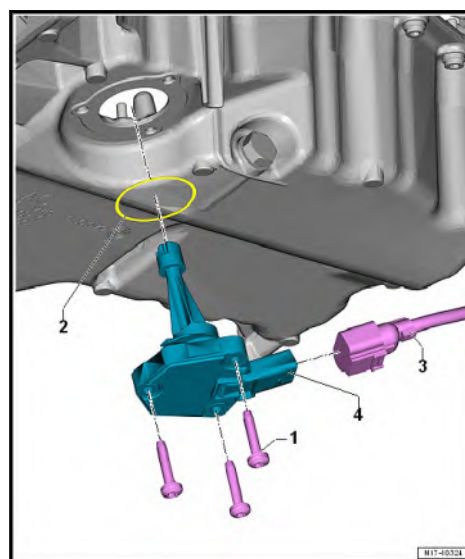
- ♦ *Renew bolts that are tightened with turning further angle after each removal.*
- ♦ *Renew seals.*
- Install sump ⇒ [a1.3 nd installing sump", page 216](#) .
- Replenish engine oil, and check oil level ⇒ Maintenance; Booklet ; Engine oil: capacities and specifications.

Torque settings

- ♦ Securing bolts for sump ⇒ [o1.1 verview - sump/oil pump", page 212](#)

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

Removing



- Engine oil drained ⇒ Maintenance; Booklet 819.



- Disconnect electrical connector -3-.
- Unscrew bolts -1- and remove oil level and oil temperature sender -G266- -item 4-.

Installing

Install in reverse order of removal, observing the following:



Note

Renew oil seal -2-.

- Replenish engine oil, and check oil level ⇒ Maintenance; Booklet ; Engine oil: capacities and specifications.

Torque settings

- ◆ Securing bolts ⇒ [o1.1 verview - sump/oil pump", page 212](#)



2 Engine oil cooler

⇒ [o2.1 verview - engine oil cooler", page 224](#)

⇒ [a2.2 nd installing engine oil cooler", page 225](#)

2.1 Assembly overview - engine oil cooler

1 - Bolt

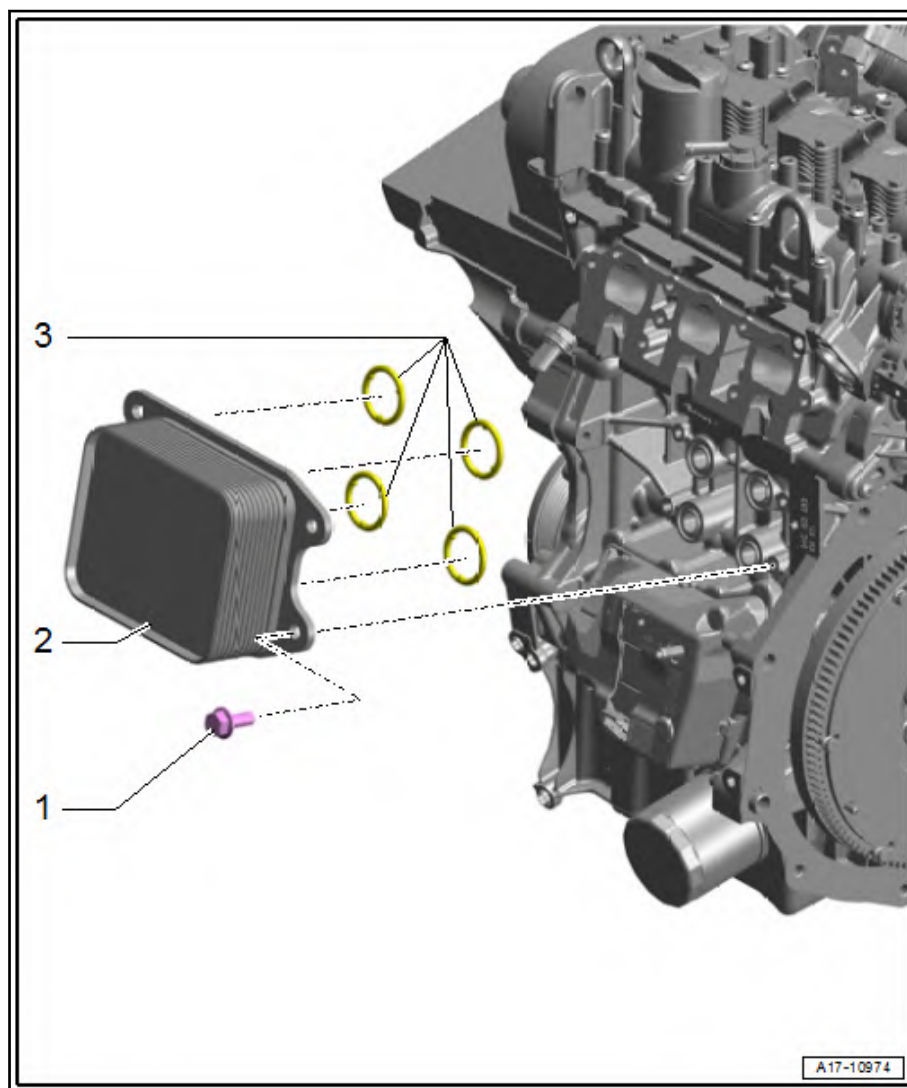
- ☐ Renew
- ☐ 8 Nm +90°

2 - Engine oil cooler

- ☐ Use new coolant after renewing
- ☐ Observe notes ⇒ [a2.2 nd installing engine oil cooler", page 225](#)
- ☐ Removing and installing ⇒ [a2.2 nd installing engine oil cooler", page 225](#)

3 - Oil seals

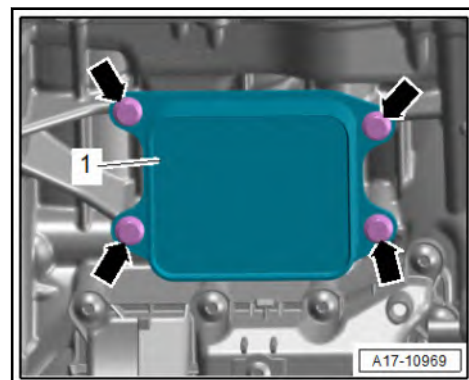
- ☐ Renew





2.2 Removing and installing engine oil cooler

Removing



- Remove charge air cooler ⇒ [page 330](#) .
- Unscrew bolts -arrows- and detach engine oil cooler -1-.

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Renew oil seals.*
 - ◆ *Do not reuse old coolant.*
 - Install charge air cooler ⇒ [page 330](#) .
 - Add coolant ⇒ [a1.3 nd adding coolant", page 240](#) .
- Check engine oil level and top up as necessary ⇒ Maintenance; Booklet ; Engine oil level: check.
- #### Torque settings
- ◆ Securing bolts for engine oil cooler ⇒ [o2.1 verview - engine oil cooler", page 224](#)
 - ◆ Securing bolts for intake manifold ⇒ [o4.1 verview - intake manifold", page 365](#)



3 Crankcase ventilation

⇒ [o3.1 verview - crankcase breather system", page 226](#)

⇒ [a3.2 nd installing oil separator", page 227](#)

3.1 Assembly overview - crankcase breather system

1 - Bolt

- ☐ Specified torque and tightening sequence ⇒ [page 227](#)

2 - Cap

3 - Cover

- ☐ For oil separator

4 - Bleeder hose

- ☐ From turbocharger

5 - Upper oil separator

- ☐ Removing and installing ⇒ [a3.2 nd installing oil separator", page 227](#)
- ☐ Renew if damaged

6 - Seal

- ☐ Renew

7 - Seal for oil separator

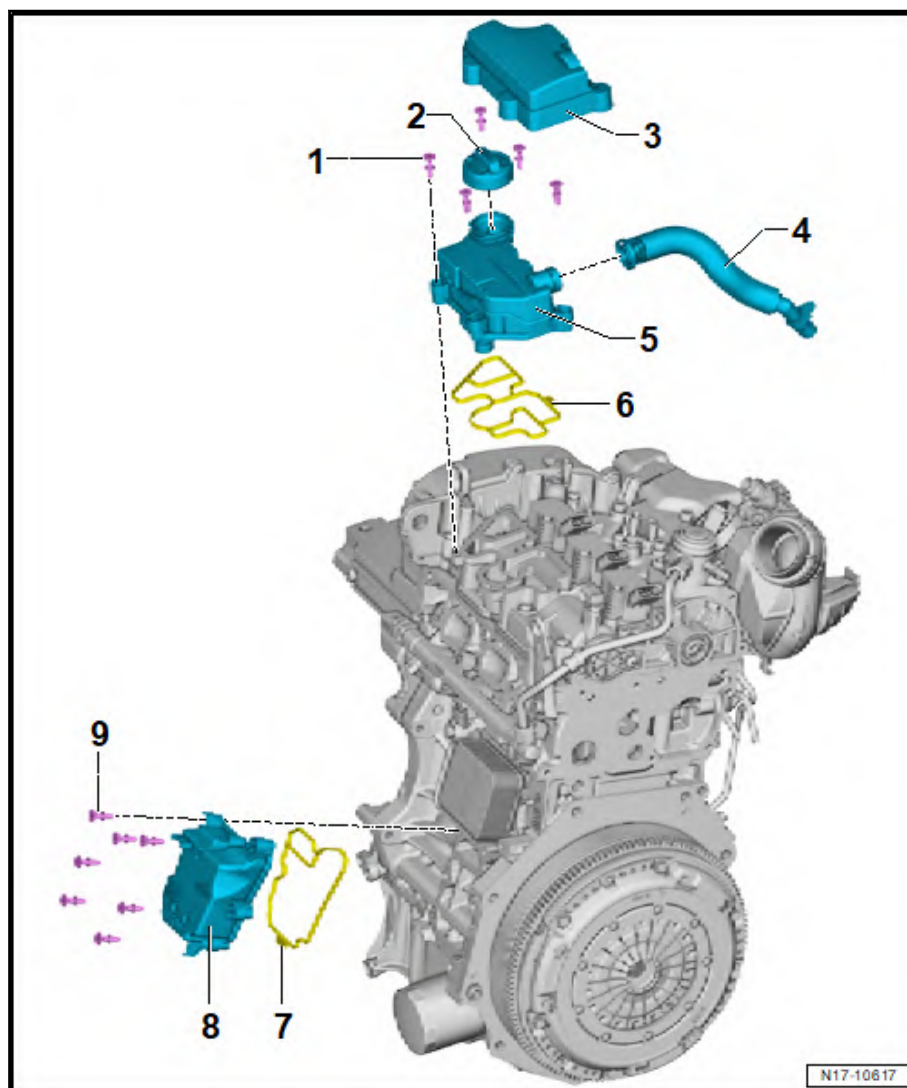
- ☐ Renew

8 - Oil separator

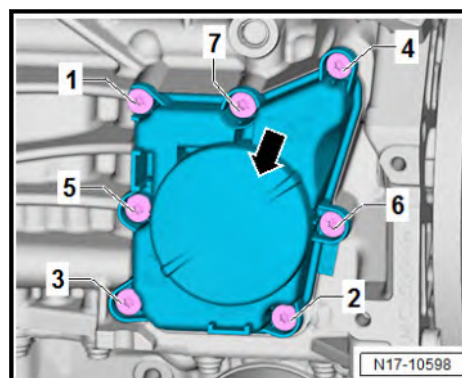
- ☐ Removing and installing ⇒ [page 227](#)
- ☐ Renew if damaged

9 - Bolt

- ☐ Specified torque and tightening sequence ⇒ [page 226](#)



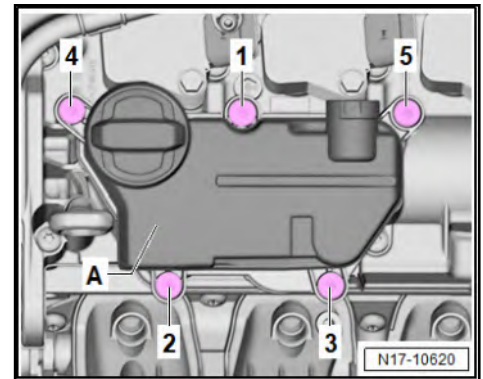
Lower oil separator - specified torque and tightening sequence





- Tighten bolts in the sequence -1- to -7- to 8 Nm.

Upper oil separator - specified torque and tightening sequence:



- Tighten bolts in the sequence -1- to -5- to 8 Nm.

3.2 Removing and installing oil separator

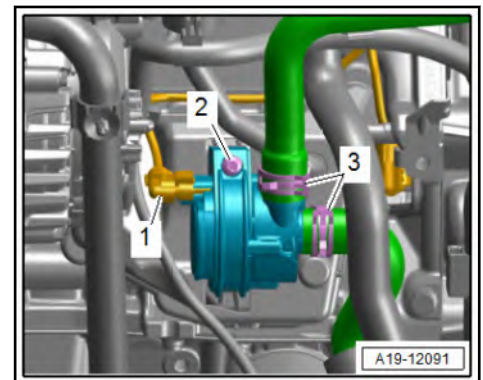
⇒ [a3.2.1 nd installing oil separator, lower", page 227](#)

⇒ [a3.2.2 nd installing oil separator, upper", page 228](#)

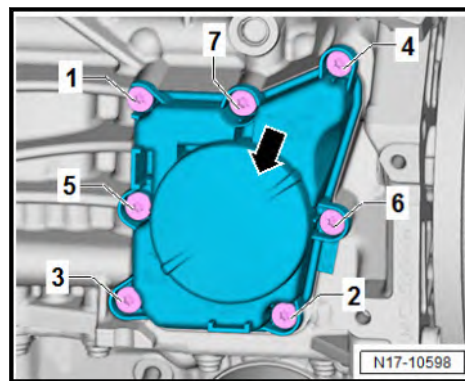
3.2.1 Removing and installing oil separator, lower

Removing

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



- Release and pull off electrical connector -1-.
- Unscrew bolt -2- and press charge air cooling pump -V188- to one side.
- Unclip electrical wires from oil separator.
- Loosen and unscrew bolts in the sequence -7- to -1-.



- Carefully detach oil separator.

Installing

Install in reverse order of removal, observing the following:



Note

- ♦ *Risk of soiling the lubrication system.*
 - ♦ *Make sure to proceed with care to avoid any damage to the sealing surfaces leading to leaks.*
 - ♦ *To ensure this, never clean the sealing surfaces with mechanical means such as a flat scraper, for example.*
 - ♦ *Cover open parts of engine.*
- Remove any oil and grease from sealing surfaces.
 - Use new seal.
 - Tighten bolts to specified torque observing specified tightening sequence. ➔ [page 226](#)
 - Install noise insulation ➔ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview – noise insulation.

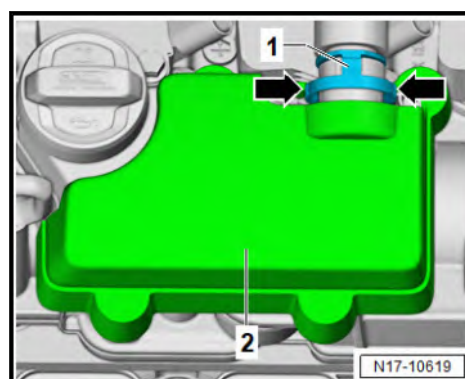
Specified torques:

- ♦ Securing bolts for oil separator ➔ [page 226](#) .

3.2.2 Removing and installing oil separator, upper

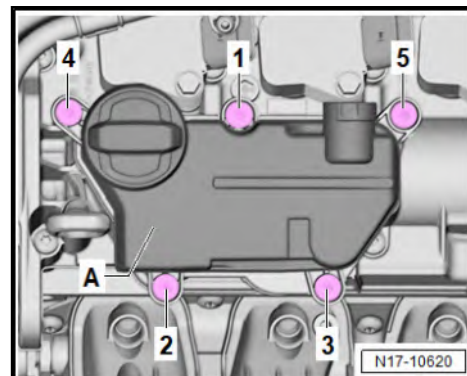
Removing

- Press catches -arrows- and pull off breather line -1-.





- Carefully lever off cover for upper oil separator -2-.
- Loosen bolts in the sequence -5- to -1-.



- Remove oil separator.

Installing

Install in reverse order of removal, observing the following:

- Renew seal.
- Oil separator – specified torque and tightening sequence ⇒ [Fig. “Upper oil separator - specified torque and tightening sequence:”, page 227](#) .

Torque settings

- ◆ ⇒ [Fig. “Upper oil separator - specified torque and tightening sequence:”, page 227](#)



4 Oil filter, oil pressure switch

⇒ [o4.1 verview - oil filter/oil pressure switch", page 230](#)

⇒ [a4.2 nd installing oil pressure senderG10", page 231](#)

⇒ [o4.3 il pressure and oil pressure switch", page 232](#)

⇒ [a4.4 nd installing oil filter housing", page 232](#)

⇒ [a4.5 nd installing oil pressure regulating valveN428", page 233](#)

⇒ [a4.6 nd installing piston cooling jet control valveN522", page 234](#)

4.1 Assembly overview - oil filter/oil pressure switch

1 - Bolt

- ❑ 8 Nm

2 - Piston cooling jet control valve -N522-

- ❑ Removing and installing ⇒ [page 234](#)
- ❑ Renew piston cooling jet control valve -N522- if there is swarf in the engine oil system ⇒ Electronic parts catalogue

3 - O-ring

- ❑ Not available as individual part.
- ❑ In case of leakage, renew valve ⇒ [Item 2 \(page 230\)](#)

4 - Seal

- ❑ Renew, see ⇒ Electronic parts catalogue for allocation

5 - Oil pressure sender -G10-

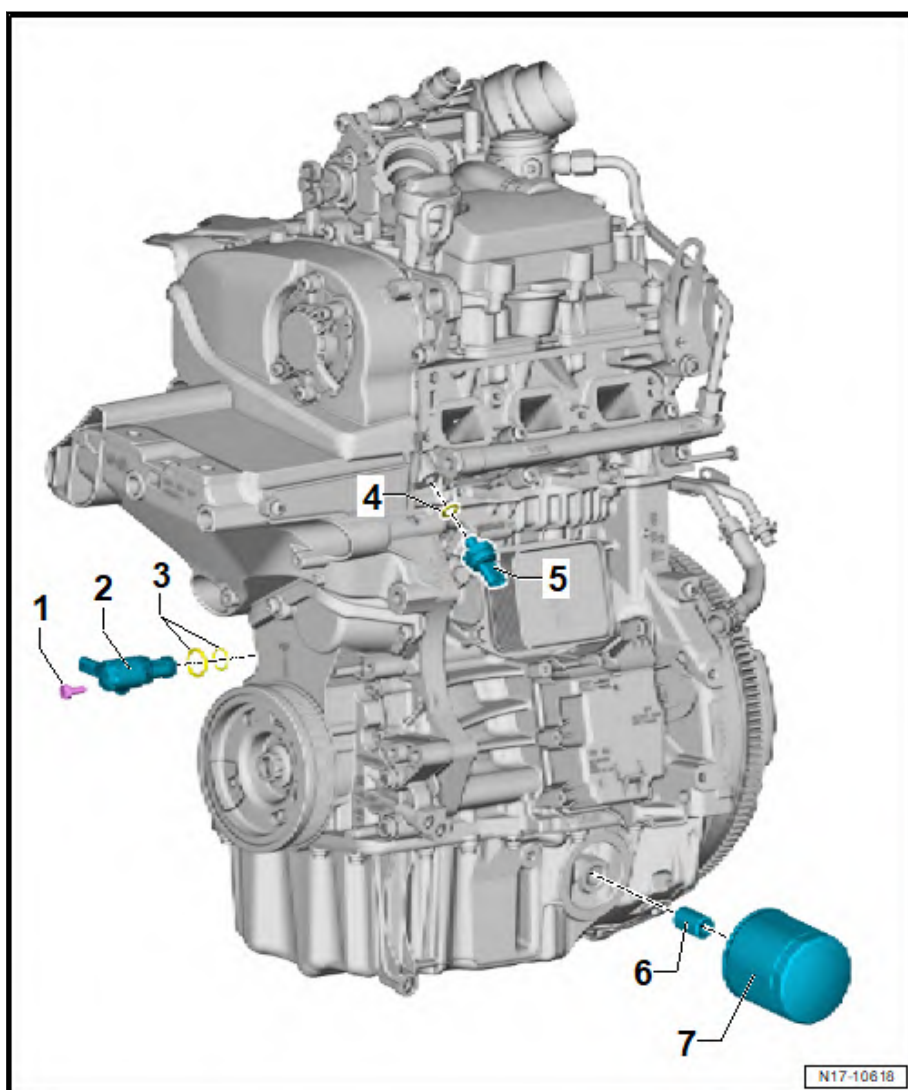
- ❑ Insulation, black
- ❑ Check in [Guided fault finding](#) ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ [a4.2 nd installing oil pressure senderG10", page 231](#)
- ❑ Switch pressure 0.3 to 0.6 bar
- ❑ 20 Nm

6 - Connecting union

- ❑ If the connecting union for oil filter in sump became loose ⇒ [page 231](#)

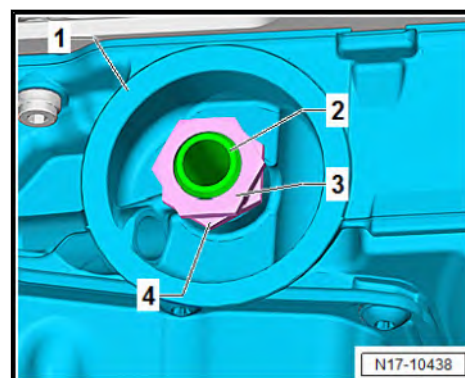
7 - Oil filter

- ❑ Observe notes ⇒ [o1.1 verview - sump/oil pump", page 212](#)
- ❑ Removing and installing ⇒ [a4.4 nd installing oil filter housing", page 232](#)
- ❑ Tighten loosened connecting union for oil filter ⇒ [page 231](#)





Tightening connecting union for oil filter



- If the connecting union -2- in the top section of sump -1- is loose, retighten it as described below.

Always use both nuts -3- and -4- for this procedure

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

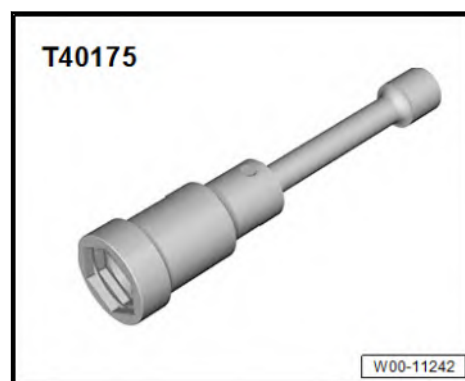
Specified torque

Connecting union	Specified torque
-2-	50 Nm

4.2 Removing and installing oil pressure sender -G10-

Special tools and workshop equipment required

- ◆ T-bar and socket, 24 mm -T40175-



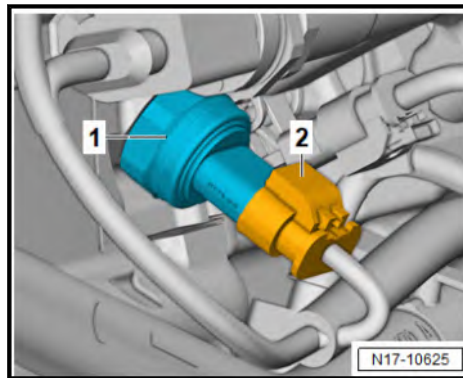
Removing



Note

Attach all heat-shielding sleeves in the same places when installing.

- Remove charge air cooler ⇒ [page 330](#).
- Disconnect electrical connector -2-.



- Place a cloth underneath to catch escaping engine oil.
- Unscrew oil pressure sender -G10- -1- using T-bar and socket, 24 mm -T40175-.

Installing

Install in reverse order of removal, observing the following:



Note

- ♦ *Always renew the seal of the oil pressure sender -G10- after disassembly. ⇒ Electronic parts catalogue*
- ♦ *Insert the new oil pressure sender -G10- immediately in bore to avoid loss of oil.*
- Install charge air cooler ⇒ [page 330](#) .
- Check oil level ⇒ Maintenance; Booklet 819.

Torque settings

- ♦ Specified torque for oil pressure switch ⇒ [o4.1 verview - oil filter/oil pressure switch](#), [page 230](#)

4.3 Checking oil pressure and oil pressure switch



Note

- ♦ *The oil pressure sender -G10- is installed to the engine.*
- ♦ *The oil pressure sender -G10- can be diagnosed.*
- ♦ *The oil pressure sender is checked using ⇒ Vehicle diagnostic tester.*
- ♦ *Any issues are stored in the event memory.*

4.4 Removing and installing oil filter housing

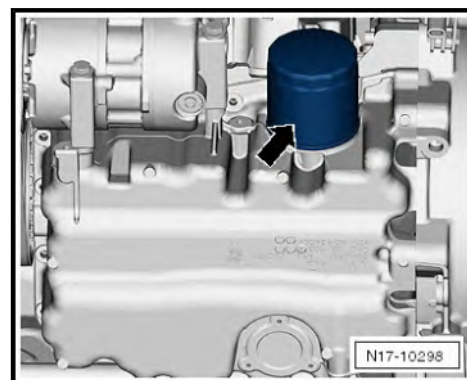
Special tools and workshop equipment required



◆ Oil filter tool -3417-



Removing



- Drain engine oil.
- Remove oil filter -arrow- using oil filter tool -3417-.

Installing

- Fill oil filter with engine oil and tighten it to specified torque using oil filter tool -3417- ➔ [page 233](#) .



Note

If the connecting union for oil filter in sump became loose ➔ [page 231](#) .

- Replenish engine oil, and check oil level ➔ Maintenance; Booklet ; Engine oil: capacities and specifications.

Specified torque for oil filter

Component	Specified torque	Conditions
Oil filter	20 Nm	Coat gasket with engine oil.

4.5 Removing and installing oil pressure regulating valve -N428-

Removing

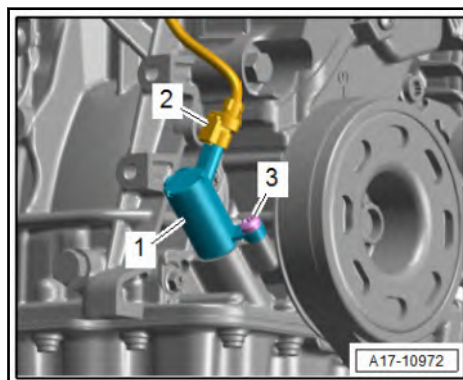


Note

Attach all heat-shielding sleeves in the same places when installing.



- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Removing and installing noise insulation.
- Detach heat insulation sleeves.



- Disconnect electrical connector -2-.



Note

Place a cloth underneath to catch escaping engine oil.

- Unscrew bolt -3-, and pull off valve for oil pressure control -N428- -1-.

Installing

Install in reverse order of removal, observing the following:



Note

- ♦ *In case of leaks, valve for oil pressure control -N428- must be renewed.*
- ♦ *Seals are not available separately.*
- Check engine oil level and top up as necessary ⇒ Maintenance; Booklet ; Engine oil level: check.

Torque settings

- ♦ ⇒ [o4.1 verview - oil filter/oil pressure switch", page 230](#)

4.6 Removing and installing piston cooling jet control valve -N522-

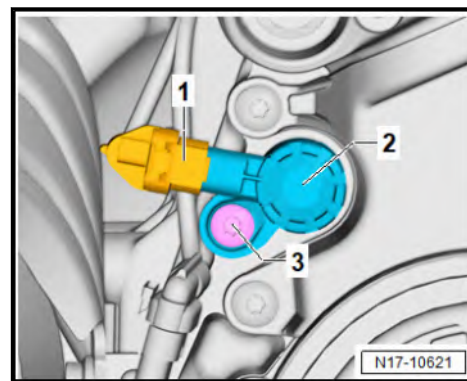
Removing



Note

Attach all heat-shielding sleeves in the same places when installing.

- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Removing and installing noise insulation.
- Detach heat insulation sleeves.



- Disconnect electrical connector -1-.



Note

Place a cloth underneath to catch escaping engine oil.

- Unscrew bolt -3-, and remove piston cooling jet control valve -N522- -2-.

Installing

Install in reverse order of removal, observing the following:

- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Removing and installing noise insulation.
- Check engine oil level and top up as necessary ⇒ Maintenance; Booklet ; Engine oil level: check.

Torque settings

- ◆ ⇒ [o4.1 verview - oil filter/oil pressure switch", page 230](#)

19 – Cooling

1 Cooling system/coolant

⇒ [d1.1 iagram - coolant hoses](#), page 236

⇒ [c1.2 ooling system for leaks](#), page 237

⇒ [a1.3 nd adding coolant](#), page 240

1.1 Connection diagram - coolant hoses

1 - Cap

- ☐ For coolant expansion tank
- ☐ Check pressure relief valve ⇒ [page 239](#)

2 - Coolant expansion tank

- ☐ With cap

3 - Heat exchanger for heater

4 - Cylinder head/cylinder block

5 - Turbocharger

6 - Integrated exhaust manifold

7 - Coolant pump

- ☐ With engine temperature regulation module -GX33-
- ☐ Assembly overview ⇒ [page 250](#)

8 - Engine oil cooler

- ☐ Assembly overview ⇒ [o2.1 veriew - engine oil cooler](#), page 224
- ☐ Removing and installing ⇒ [a2.2 nd installing engine oil cooler](#), page 225

9 - Charge air cooler

- ☐ Assembly overview ⇒ [page 328](#)

10 - Non-return valve

11 - Radiator for engine coolant

- ☐ Assembly overview ⇒ [page 281](#)

12 - Charge air cooling pump -V188-

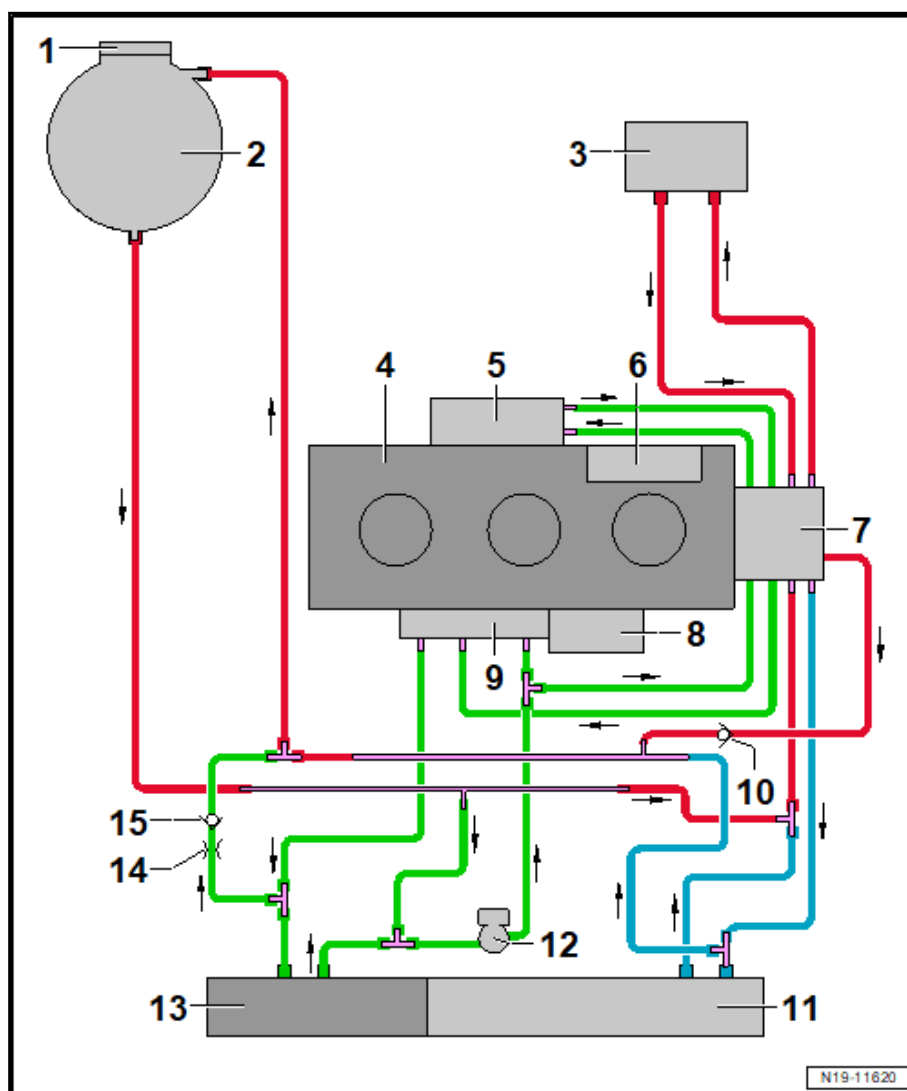
- ☐ Assembly overview ⇒ [page 252](#)

13 - Radiator for charge air cooling circuit

- ☐ Assembly overview ⇒ [page 281](#)

14 - Restrictor

15 - Non-return valve





1.2 Checking cooling system for leaks

Special tools and workshop equipment required

- ◆ Cooling system tester -V.A.G 1274 B-



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



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

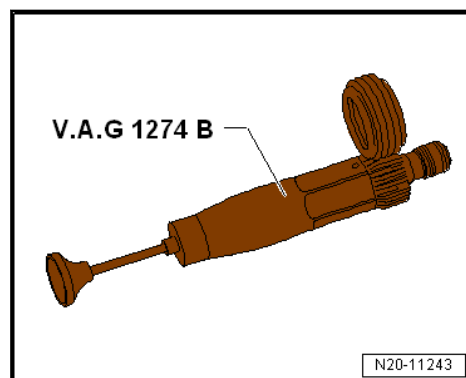


Note

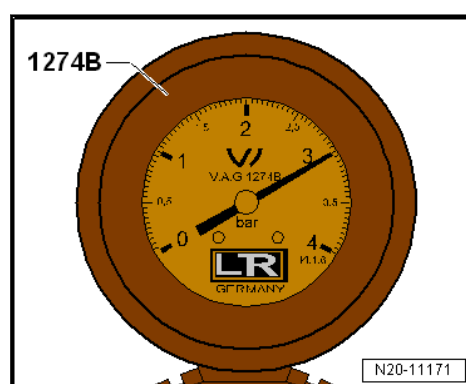
To perform the leakage test correctly, first run a self-test on the cooling system tester -V.A.G 1274 B-.



Self-test of cooling system tester -V.A.G 1274 B-



- Operate cooling system tester -V.A.G 1274 B- several times.
- Build up a pressure of 3.0 bar on cooling system tester.



- Observe pressure on pressure gauge of cooling system tester for 30 seconds.

If no pressure builds up or if the pressure drops again:

The cooling system tester -V.A.G 1274 B- is leaking and should not be used.

Prerequisites for check

- Engine at operating temperature.

Test sequence

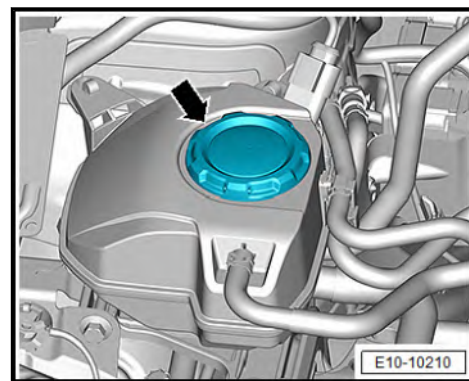
CAUTION

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

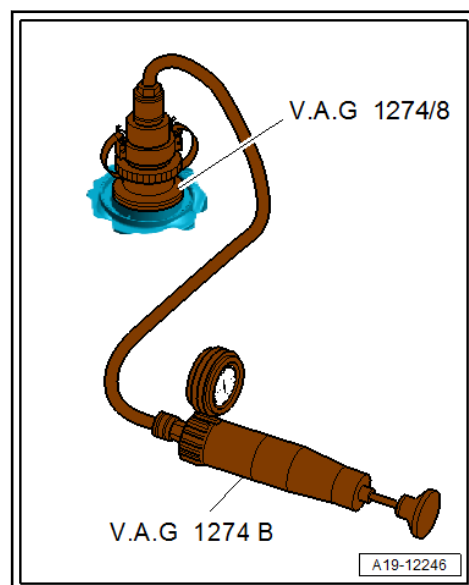
Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.

- Carefully open filler cap -arrow- of coolant expansion tank.



- Fit cooling system tester -V.A.G 1274 B- with adapter - V.A.G 1274/8- to coolant expansion tank.



- Using hand pump on tester, build up a pressure of approx. 1.5 bar.
- The pressure must not drop by more than 0.2 bar within 10 minutes.
- If pressure drops by more than 0.2 bar, locate leaks and rectify faults.



Note

- ◆ *A pressure drop of 0.2 bar within 10 minutes is caused by the coolant cooling down.*
- ◆ *The colder the engine, the lower the pressure loss.*
- ◆ *If necessary, repeat the check while the engine is cold.*

Check pressure relief valve in cap.

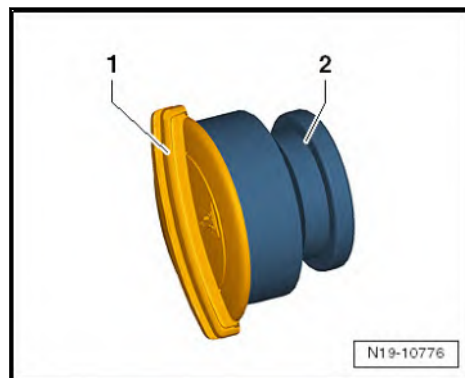


Note

The cap may have a different shape depending on the model year.



- Screw cap -1- into adapter for cooling system tester -V.A.G 1274/9- -2-.



- Connect adapter for cooling system tester -V.A.G 1274/9- to cooling system tester -V.A.G 1274 B- using connecting hose supplied.
- Build up pressure using hand pump of cooling system tester.

Blue cap

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

Black cap

- ♦ The pressure relief valve must open at a pressure of 1.6 to 1.8 bar.

If the pressure relief valve opens prematurely:

- Renew cap.

1.3 Draining and adding coolant

⇒ [a1.3.1 nd adding coolant", page 240](#)

1.3.1 Draining and adding coolant

Special tools and workshop equipment required

- ♦ Refractometer -T10007A-

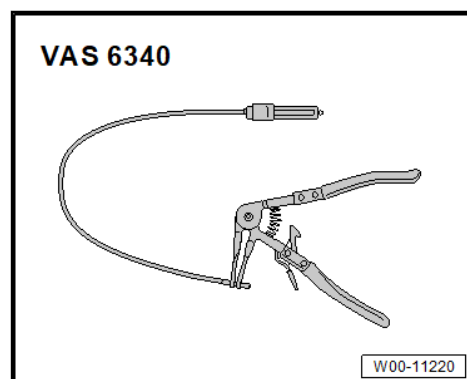




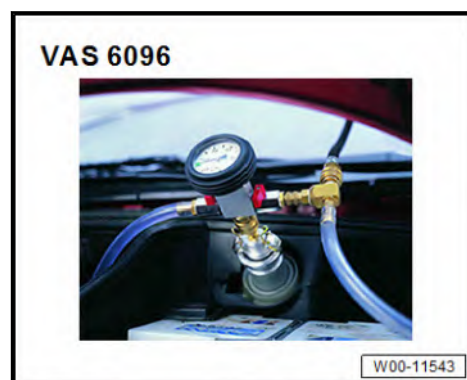
- ◆ Drip tray for workshop hoist -VAS 6208-



- ◆ Hose clamp pliers -VAS 6340-



- ◆ Cooling system charge unit -VAS 6096-



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





- ◆ Cooling system tester -V.A.G 1274 B-



- ◆ Safety glasses
- ◆ Safety gloves

Draining

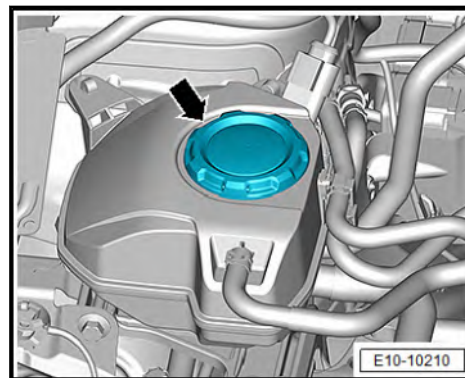
CAUTION

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

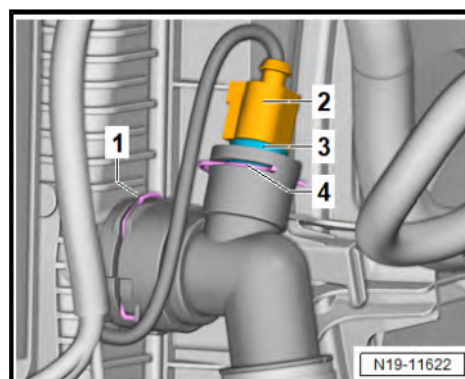
Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.

- Open cap -arrow-.

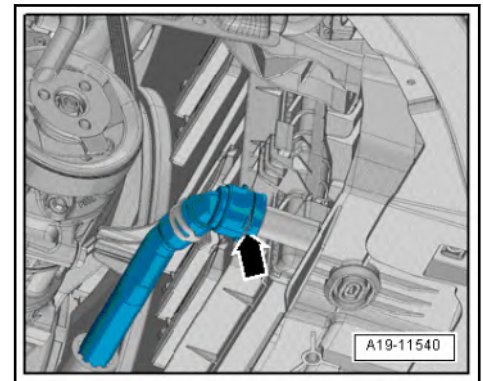


- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.





- Place drip tray for workshop hoist -VAS 6208- underneath.
- Disconnect connector -2- from radiator outlet coolant temperature sender -G83- -3-.
- Lift retaining clip -1- and pull off lower left coolant hose from radiator.
- Drain coolant.
- Release retaining clip -arrow- and pull off bottom right coolant hose from water radiator for charge air cooling circuit.



- Allow remaining coolant to drain out.

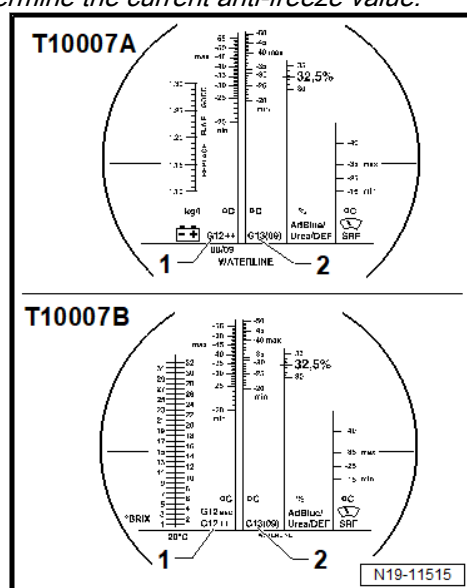


Filling



Note

- ◆ The water used for mixing has a major influence on the effectiveness of the coolant. Because the water quality differs from country to country and even from region to region, the quality of the water to be used in the cooling system has been specified by Volkswagen. Distilled water fulfils all requirements. Therefore, only ever use distilled water when mixing coolant for topping up or renewing coolant.
- ◆ Use only coolant additives which conform with the ⇒ Electronic parts catalogue (ETKA). Other coolant additives may reduce corrosion protection substantially. The resulting damage could lead to loss of coolant and subsequent severe damage to the engine.
- ◆ Mixed in the proper proportions, coolant inhibits frost and corrosion damage as well as scaling. Such additives also raise the boiling point of the coolant. For this reason, the cooling system must be filled all-year-round with coolant additives.
- ◆ Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ◆ The refractometer -T10007A- or refractometer -T10007B- must be used to determine the current anti-freeze value.



- ◆ Scale -1- of the refractometer is calibrated for the coolant additives G12++ and G12evo.
- ◆ Scale -2- of the refractometer is calibrated for the coolant additive G13.
- ◆ If it is not possible to ensure that the same type of coolant additive is filled: always determine anti-freeze protection using the scale for G13.
- ◆ Frost protection must be guaranteed down to -25°C as a minimum and, in countries with arctic conditions, down to approx. -36°C. Increasing the frost protection is permissible only if climatic conditions require stronger frost protection. It may, however, be increased only to a maximum of -48°C. Otherwise, the cooling effect will be impaired.



- ◆ *Do not reduce the coolant concentration by adding water even in warmer seasons and in warmer countries. Frost protection must be guaranteed down to at least -25°C.*
- ◆ *The temperature reading on the refractometer corresponds to the »ice flocculation point«. Flakes of ice may start forming in the coolant below this temperature.*
- ◆ *Do not reuse old coolant.*
- ◆ *Use only a water/coolant additive mixture as a slip agent for coolant hoses.*

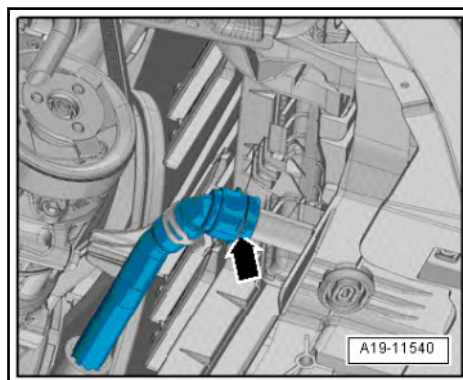
Coolant mixture ratio

Frost protection to	Coolant additive concentration	Coolant additive ¹⁾	Distilled water ¹⁾
-25°C	40%	3.2 l	4.8 l
-36°C	50%	4.0 l	4.0 l

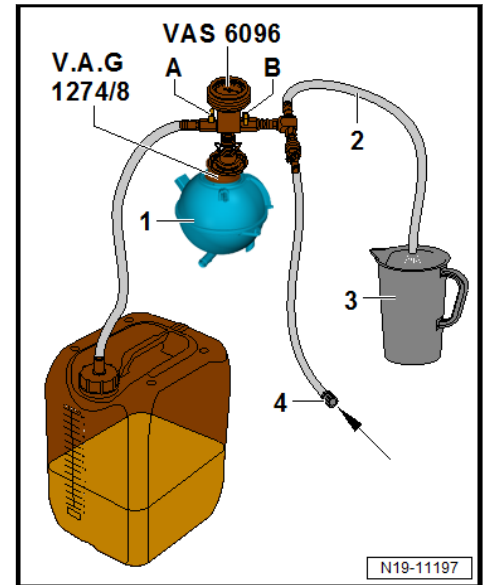
¹⁾ The quantity of coolant can vary depending on the vehicle equipment.

- Coolant: ⇒ Electronic Parts Catalogue.

Procedure



- Connect coolant hose with plug-in connector to radiator (bottom left) ⇒ [o4.1 verview – radiator](#), page 281 .
- Connect coolant hose to water radiator for charge air cooling circuit (bottom right) -arrow-.
- Select and carry out function [0001 - Fill/bleed cooling system] on ⇒ Vehicle diagnostic tester.
- Fill coolant reservoir of -VAS 6096- with at least 10 litres of pre-mixed coolant in correct mixture ratio:

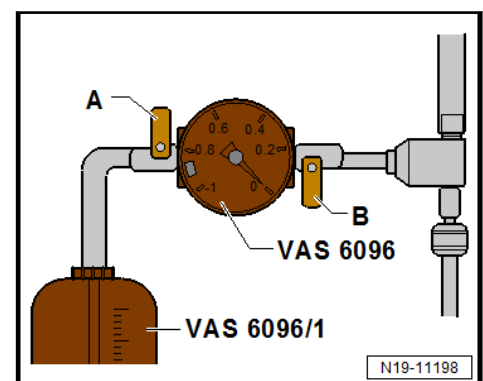


- Screw adapter for cooling system tester -V.A.G 1274/8- onto coolant expansion tank.
- Connect cooling system charge unit -VAS 6096- to adapter -V.A.G 1274/8-.
- Feed vent hose -2- into a small container -3-.

i Note

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

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



- The suction-jet pump reduces pressure in the cooling system to below atmospheric pressure. The needle on the gauge must remain in the green zone.
- Also briefly open valve -A- (turn lever in direction of flow to do this) so that hose on -VAS 6096- coolant reservoir fills with coolant.
- Close valve -A- again.

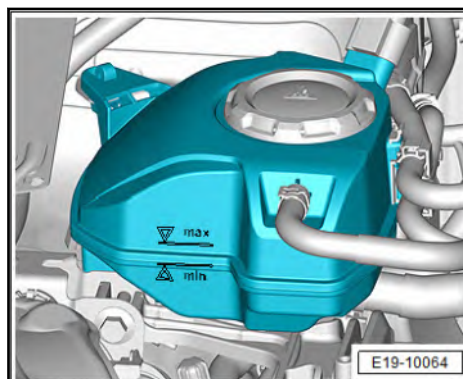


- Leave valve -B- open for a further 2 minutes.
- The suction-jet pump will continue generating a vacuum in the cooling system. The needle on the gauge must remain in the green zone.
- Close valve -B-.
- The needle on the gauge must stay in the green zone. The vacuum in the cooling system is then sufficient for subsequent filling.

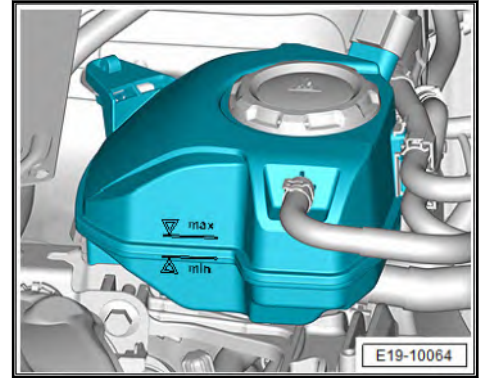


Note

- ◆ *If the needle does not reach the green zone, repeat the process.*
- ◆ *If the vacuum drops, the cooling system must be checked for leaks.*
- Pull off compressed air hose.
- Open valve -A-.
- Vacuum in cooling system causes coolant to be extracted from -VAS 6096- coolant reservoir and coolant system to be filled.
- Remove cooling system charge unit -VAS 6096- from coolant expansion tank.
- Fill coolant up to “max.” mark.



- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview – noise insulation.
- Screw on cap of coolant expansion tank until it engages.
- Continue to carry out function 0001 - Fill/bleed cooling system on ⇒ Vehicle diagnostic tester, and complete it.
- Switch off engine and let it cool off.
- Check coolant level.



- Screw adapter for cooling system tester -V.A.G 1274/8- again onto expansion tank.
- Use cooling system tester -V.A.G 1274 B- to apply a pressure of 1 bar to the cooling system.
- Use tester to relieve pressure and remove cooling system tester -V.A.G 1274 B-.
- With the engine running, fill coolant up to approx. 5 mm above max. mark.
- The coolant level must be between the “min. mark” and the “max. mark” when the engine is cold.
- When the engine is at operating temperature, it is permissible that the coolant level is at the “max. mark” or above.



2 Coolant pump, regulation of cooling system

- ⇒ [o2.1 verview - coolant pump, thermostat", page 250](#)
- ⇒ [o2.2 verview - electric coolant pump", page 252](#)
- ⇒ [o2.3 verview - coolant temperature sender", page 252](#)
- ⇒ [a2.4 nd installing electric coolant pump", page 253](#)
- ⇒ [a2.5 nd installing coolant pump", page 255](#)
- ⇒ [a2.6 nd installing toothed belt pulley for coolant pump", page 261](#)
- ⇒ [a2.7 nd installing coolant temperature senderG62", page 263](#)
- ⇒ [a2.8 nd installing radiator outlet coolant temperature senderG83", page 265](#)
- ⇒ [a2.9 nd installing engine outlet coolant temperature senderG82", page 266](#)
- ⇒ [a2.10 nd installing engine temperature regulation moduleGX33", page 269](#)
- ⇒ [c2.11 oolant pump", page 271](#)

2.1 Assembly overview - coolant pump, thermostat



1 - Toothed belt

- ☐ For coolant pump
- ☐ Renew toothed belt after coolant pump has been removed

2 - Crankshaft

- ☐ For coolant pump
- ☐ Removing and installing ⇒ [a2.6 and installing toothed belt pulley for coolant pump](#), page 261

3 - Bolt

- ☐ M8 × 35
- ☐ Renew
- ☐ 20 Nm +90°

4 - Toothed belt guard

- ☐ For toothed belt for coolant pump

5 - Bolt

- ☐ M6 x 35
- ☐ 8 Nm

6 - Coolant pump

- ☐ Renew toothed belt as well when renewing coolant pump
- ☐ Removing and installing ⇒ [page 255](#)

7 - Bolt

- ☐ Specified torque and tightening sequence ⇒ [page 260](#)
- ☐ M6 x 60
- ☐ 12 Nm

8 - Bolt

- ☐ Must not be loosened

9 - Bracket for engine temperature regulation module -GX33-

10 - Engine temperature regulation module -GX33-

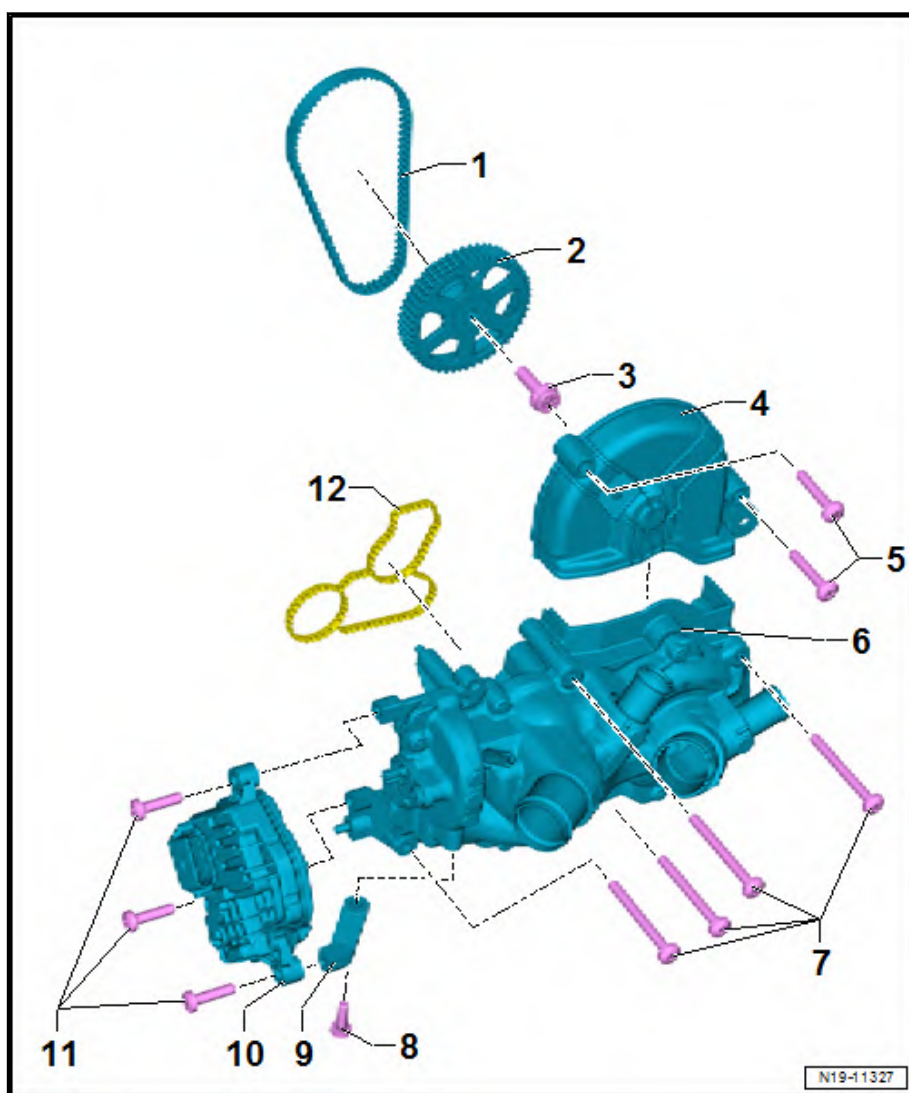
- ☐ Consisting of:
 - ◆ Position sender for engine temperature regulation -G1004-
 - ◆ Actuator for engine temperature regulation -N493-
- ☐ Removing and installing ⇒ [page 269](#)

11 - Bolt

- ☐ 8 Nm
- ☐ When using insert tool -T10572- and torque wrench -V.A.G 1783-, observe corrected specified torque of 4.2 Nm.

12 - Seal

- ☐ Renew



N19-11327



2.2 Assembly overview - electric coolant pump

1 - Charge air cooling pump -V188-

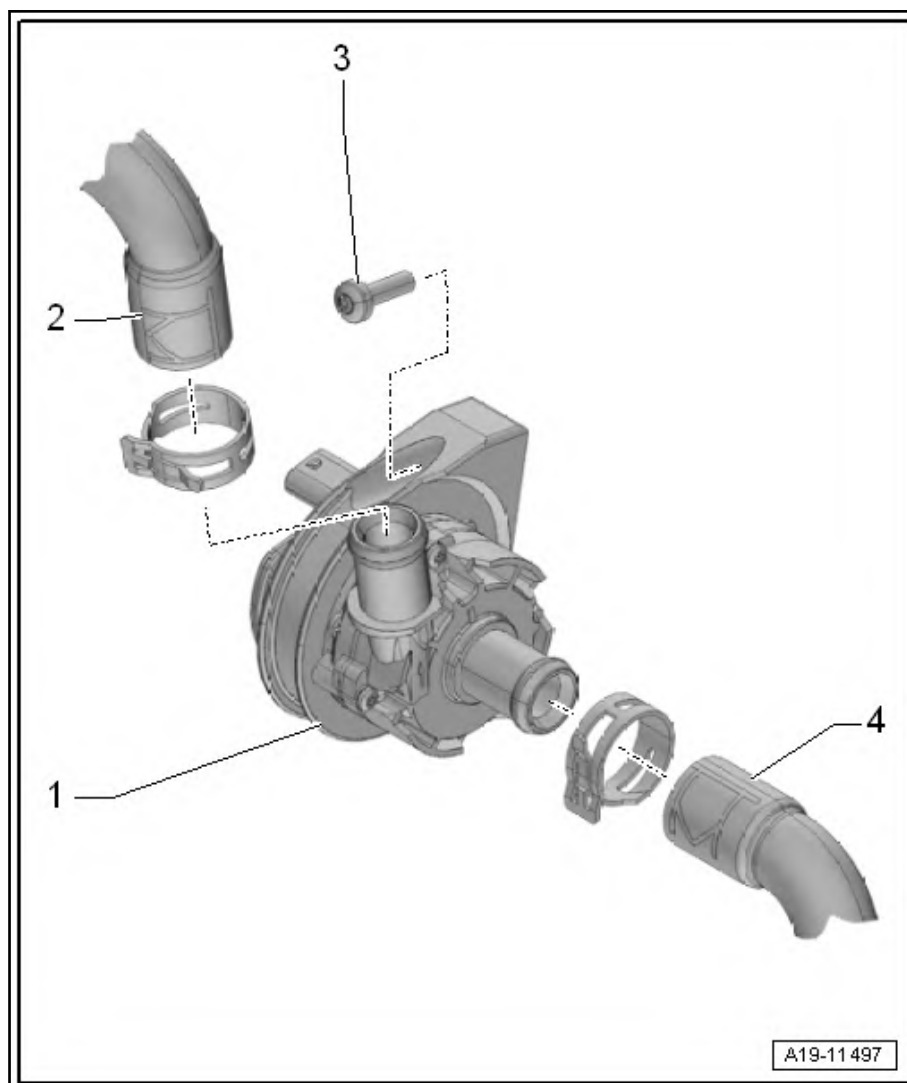
- ☐ with holder
- ☐ Removing and installing ⇒ [a2.4 nd installing electric coolant pump](#), page 253

2 - Coolant hose

3 - Bolt

- ☐ 8 Nm

4 - Coolant hose



2.3 Assembly overview - coolant temperature sender

⇒ [o2.3.1 verview - coolant temperature sender](#), page 252

2.3.1 Assembly overview - coolant temperature sender



1 - Retaining clip

- ☐ Check for firm seating

2 - O-ring

- ☐ Renew, see ➔ Electronic parts catalogue (ET-KA)

3 - Radiator outlet coolant temperature sender -G83-

- ☐ Removing and installing ➔ [a2.8 nd installing radiator outlet coolant temperature senderG83](#), page 265

4 - Support ring

5 - O-ring

- ☐ Renew, see ➔ Electronic parts catalogue (ET-KA)

6 - O-ring

- ☐ Renew, see ➔ Electronic parts catalogue (ET-KA)

7 - Support ring

8 - Bolt

- ☐ 8 Nm

9 - Radiator outlet coolant - G62-

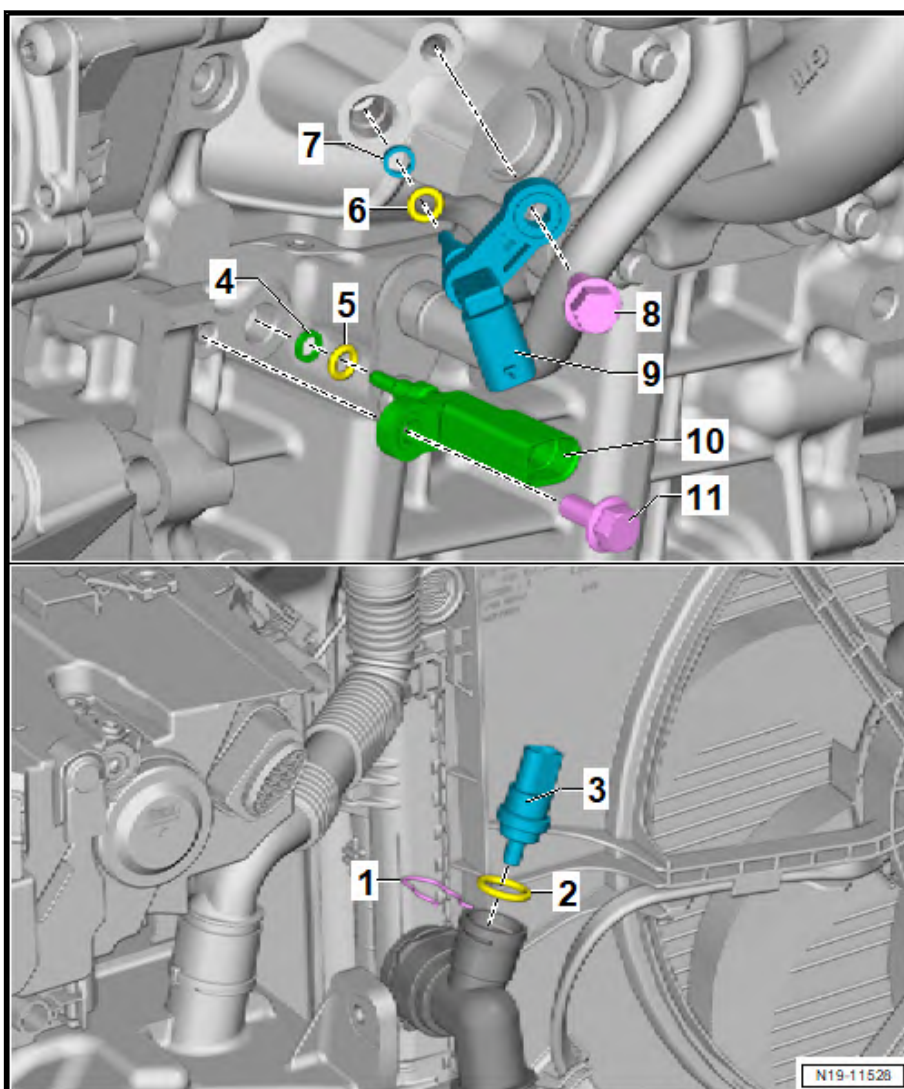
- ☐ Removing and installing ➔ [a2.7 nd installing coolant temperature senderG62](#), page 263

10 - Coolant temperature sender at engine output -G82-

- ☐ Removing and installing ➔ [a2.9 nd installing engine outlet coolant temperature senderG82](#), page 266

11 - Bolt

- ☐ 8 Nm



2.4 Removing and installing electric coolant pump

Special tools and workshop equipment required



- ◆ Hose clamps to 25 mm -3094-



- ◆ Drip tray for workshop hoist -VAS 6208-



- ◆ Spring-type clip pliers -VAS 6362-



Removing

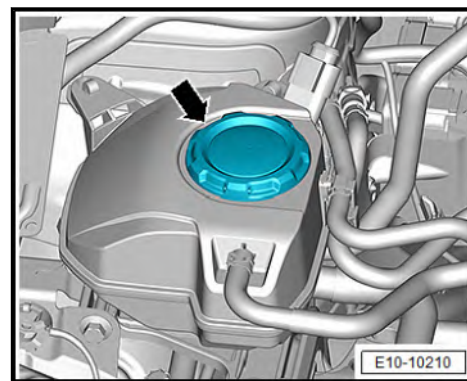
CAUTION

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

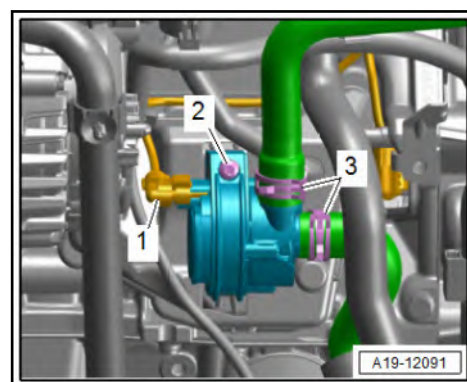
Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with cloths and opening it carefully.

- Open cap -arrow-.



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



- Place drip tray for workshop hoist -VAS 6208- underneath.
- Disconnect electrical connector -1-.
- Clamp off coolant hoses on charge air cooling pump -V188- using hose clamps up to 25 mm -3094-.
- Release hose clips -3- and pull off coolant hoses.
- Unscrew bolt -2- and remove charge air cooling pump - V188-.

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ Electronic parts catalogue.*
- ◆ *Do not reuse old coolant.*
- Check coolant level ⇒ [a1.3 nd adding coolant](#)”, page 240 .

Torque settings

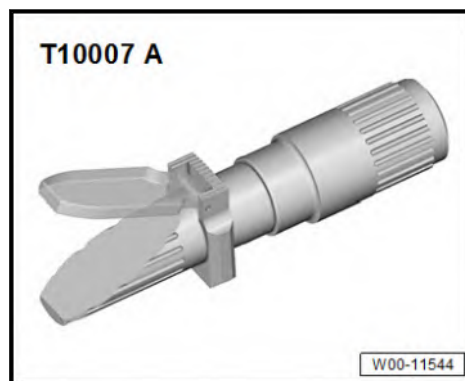
- ◆ ⇒ [o2.2 verview - electric coolant pump](#)”, page 252

2.5 Removing and installing coolant pump

Special tools and workshop equipment required



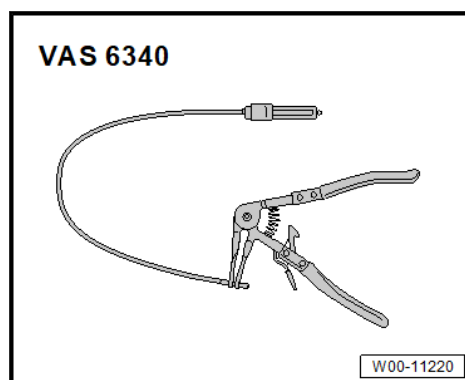
◆ Refractometer -T10007 A-



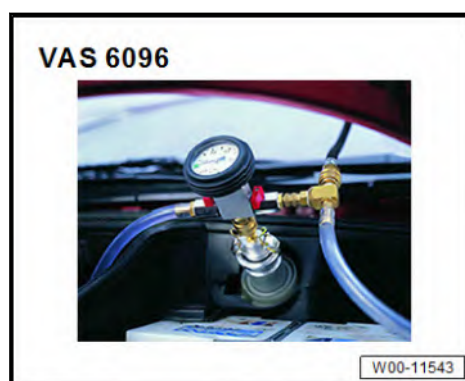
◆ Drip tray for workshop hoist -VAS 6208-



◆ Hose clamp pliers -VAS 6340-



◆ Cooling system charge unit -VAS 6096-

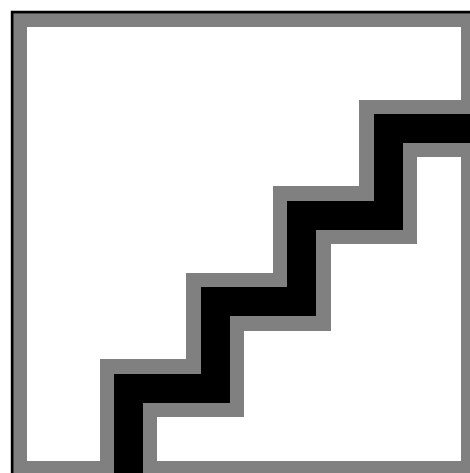




- ◆ Adapter for cooling system tester -V.A.G 1274/8-



- ◆ Torque wrench -VAS 6583A-



Removing

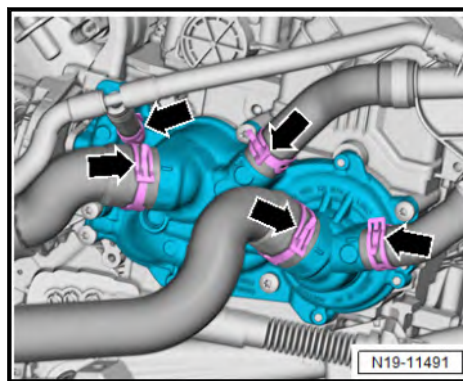
- Deactivate vehicle's drive system and switch off all electrical consumers.



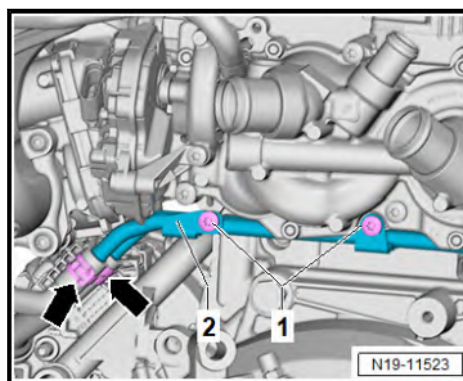
NOTICE

**Operational readiness must not be restored during the repair.
Risk of damage to engine temperature regulation module -
GX33-.**

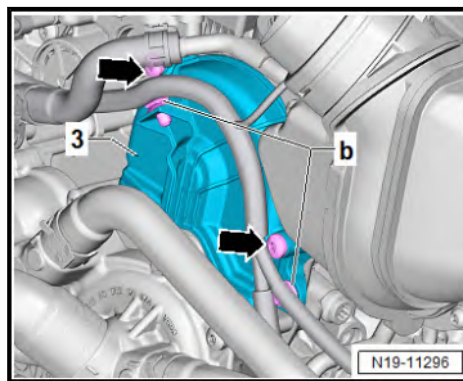
- It is not necessary to disconnect the battery for this step.
- Remove air filter housing ➔ [page 359](#) .
- Cover the openings in the gearbox with a cloth to prevent any fluid entering the clutch housing.
- Drain coolant ➔ [page 240](#) .
- Release hose clips for coolant hoses -arrows-, and pull coolant hoses off coolant pump.



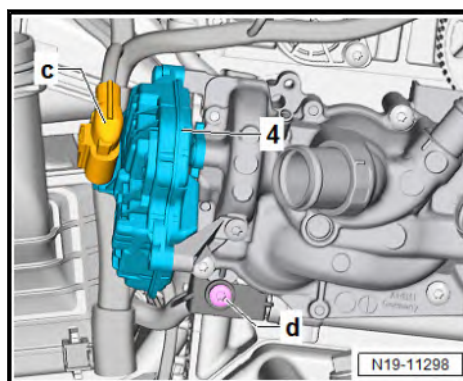
- Unscrew bolts -1-.



- Unclip clips for wiring harness -b- from toothed belt guard for coolant pump -3-.

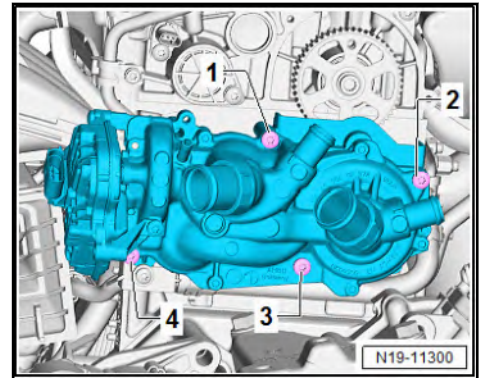


- Unscrew bolts -arrows-, and remove toothed belt guard -3-.
- Disconnect electrical connector -c- on engine temperature regulation module -GX33- -4-.





- Loosen and unscrew bolts in the sequence -4- to -1-.



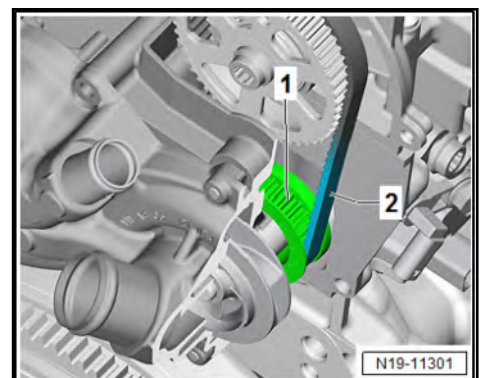
- Detach coolant pump with toothed belt.

Installing

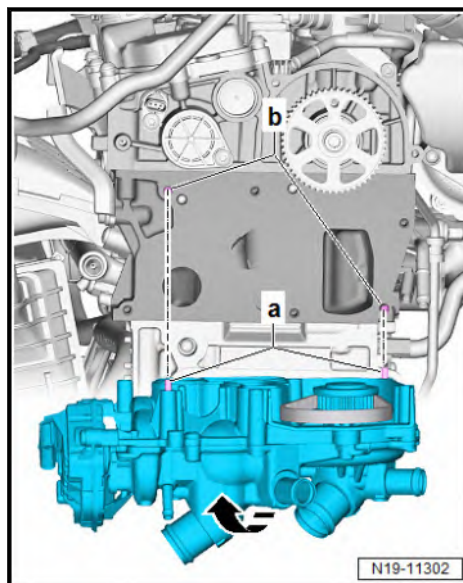


Note

- ◆ *The contact surfaces on the cylinder head must be clean.*
- ◆ *Secure hose connections with hose clips in such a way that factory standard is restored ⇒ Electronic parts catalogue*
- ◆ *Always adhere to the sequence of work steps given below when installing the coolant pump.*
- ◆ *This ensures that the toothed belt is correctly tensioned.*
- Always renew housing gasket after removal.
- Ensure proper seating of seal.
- Always renew toothed belt of coolant pump after removal.
- Lubricate seal for coolant pump lightly with coolant.
- Fit toothed belt -2- centrally between belt guide of coolant pump toothed belt pulley -1-.



- Bring coolant pump into installation position.
- The pins on coolant pump -arrows a- must engage in holes on cylinder head -arrows b-.

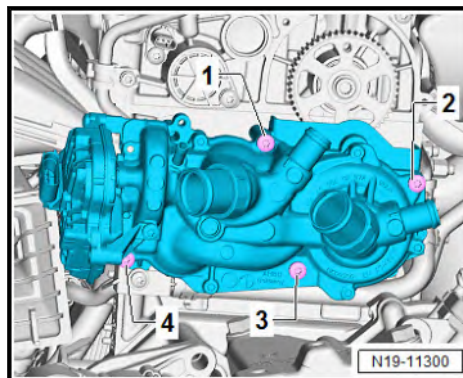


Note

The toothed belt is tensioned automatically by the centring pins of the coolant pump.

- Mount coolant pump on cylinder head with securing bolts.
- Fit toothed belt on toothed belt pulley on camshaft.

Tightening sequence



- Tighten bolts in the sequence -1- to -4- to 12 Nm.

If the engine temperature regulation module -GX33- has been removed:

- If necessary, turn shaft of coolant pump to installation position. ⇒ [page 274](#)

Continue installation in reverse order of removal. Observe the following when doing this:

Coolant hose schematic diagram ⇒ [page 236](#) .

- Add coolant ⇒ [page 244](#) .

Torque settings

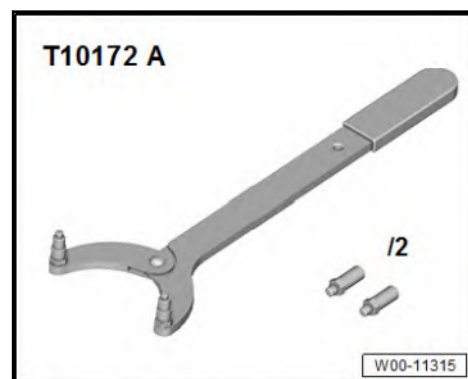
- ♦ ⇒ [o2.1 verview - coolant pump, thermostat", page 250](#)
- ♦ ⇒ [o3.1 verview - coolant pipes", page 277](#)



2.6 Removing and installing toothed belt pulley for coolant pump

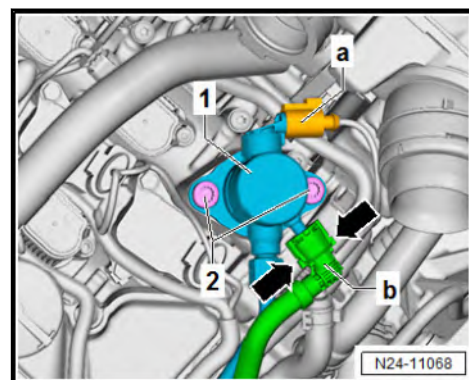
Special tools and workshop equipment required

- ◆ Counterhold -T10172 A- with adapter -T10172/2-

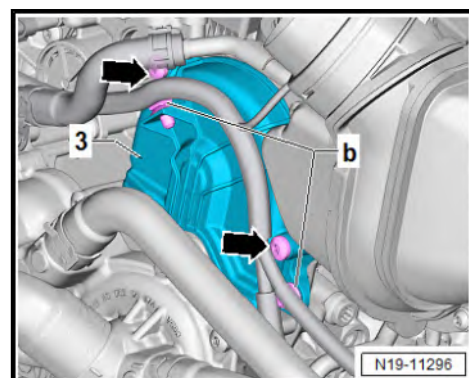


Removing

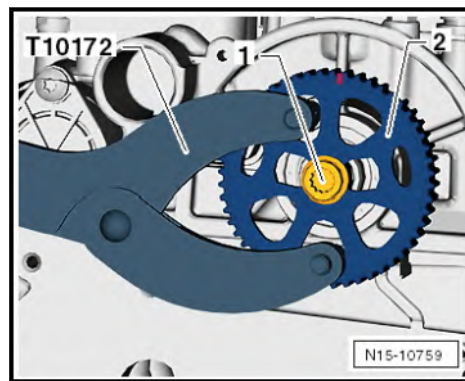
- Remove air filter housing ➔ [page 359](#) .



- Place a cloth underneath to catch escaping fuel.
- Release hose coupling -b- by pressing button -arrows-. Pull off fuel supply hose.
- Unclip clips for wiring harness -b- from toothed belt guard for coolant pump -3-.



- Unscrew bolts -arrows-, and remove toothed belt guard -3-.
- Unscrew bolt -1- using counterhold -T10172A- with adapter -T10172/2-.

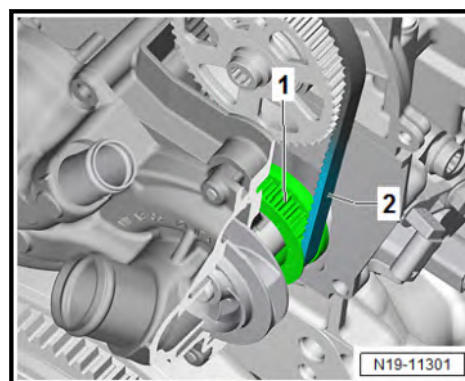


- Remove toothed belt pulley -2-. Secure toothed belt when doing this to prevent it from falling.

Installing

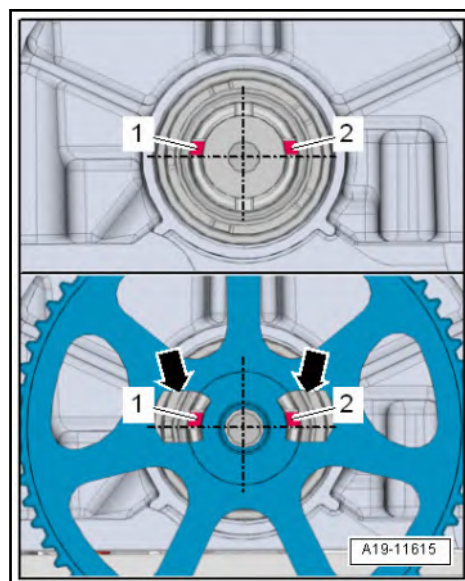
Install in reverse order of removal, observing the following:

- Fit toothed belt -2- centrally between belt guide of coolant pump toothed belt pulley -1-.



- Fit toothed belt pulley:

Position of camshaft recesses:



- The grooves -1- and -2- in the camshaft are arranged asymmetrically.
- Cut-outs -arrows- in toothed belt pulley are also arranged asymmetrically.



- Fit toothed belt pulley onto camshaft so that the asymmetrical notches of the camshaft are fully centred within the cut-outs of the toothed belt pulley.
- Carefully push toothed belt onto toothed belt pulley.

Specified torque

- ♦ ⇒ [o2.1 verview - coolant pump, thermostat", page 250](#)

2.7 Removing and installing coolant temperature sender -G62-

Special tools and workshop equipment required

- ♦ Drip tray for workshop hoist -VAS 6208-



Removing

- Engine cold.

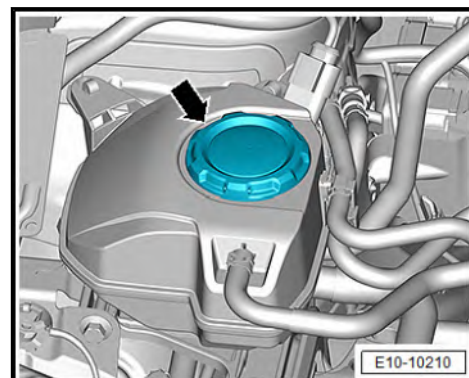
CAUTION

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

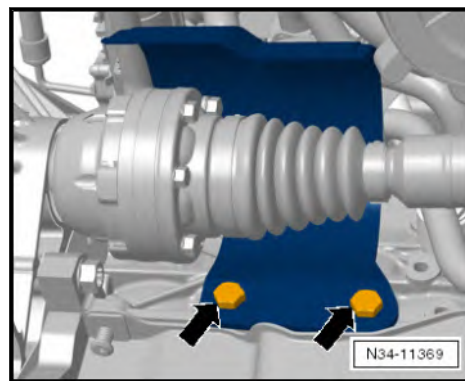
Skin and other parts of the body may be scalded.

- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with a cloth and opening it carefully.

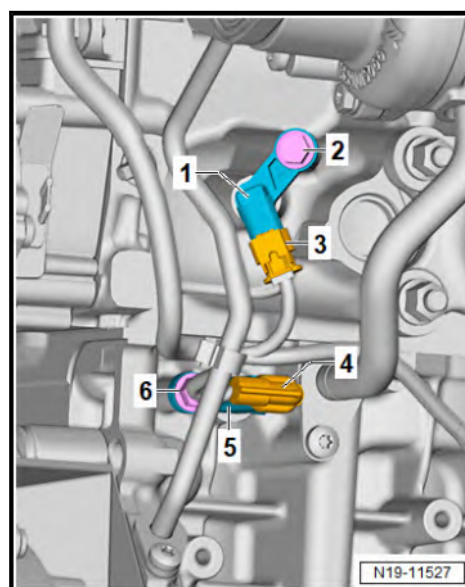
- Open cap -arrow-.



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



- Unscrew bolts -arrows- and remove heat shield for right drive shaft.
- Disconnect electrical connector -3-.



- Place a cloth underneath to catch any escaping coolant.
- Place drip tray for workshop hoist -VAS 6208- underneath.
- Unscrew bolt -2- and pull out coolant temperature sender -G62- -1-.



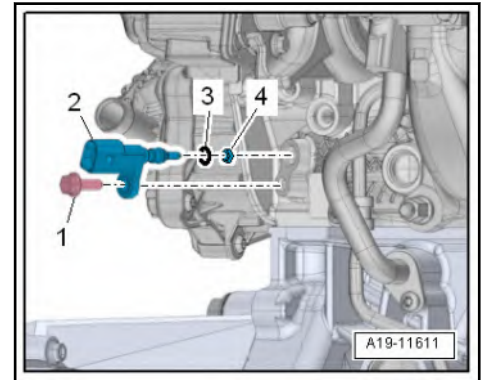
Note

Items 4, 5, 6 can be disregarded here.

Installing

Install in reverse order of removal, observing the following:

- If O-ring -3- with support ring -4- remains lodged in cylinder head, pull out O-ring and support ring using removal tool -T10498-.



- Insert new coolant temperature sender -G82- immediately into cylinder head in order to avoid loss of coolant.

i Note

Renew O-ring.

- Check coolant level ⇒ [a1.3 nd adding coolant](#)", page 240 .

Torque settings

- ◆ ⇒ [o2.3 verview - coolant temperature sender](#)", page 252
- ◆ Drive shaft heat shield ⇒ Running gear, axles, steering; Rep. gr. 40; Drive shaft; Assembly overview - drive shaft

2.8 Removing and installing radiator outlet coolant temperature sender -G83-

Removing

- Engine cold.

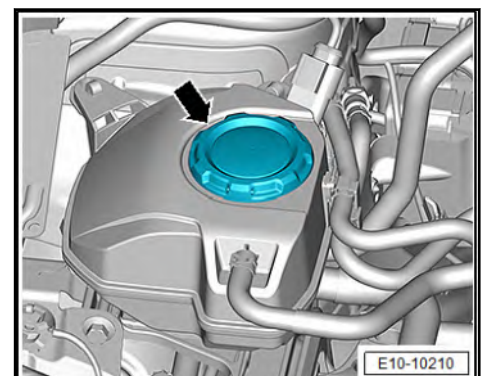
⚠ CAUTION

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

Skin and other parts of the body may be scalded.

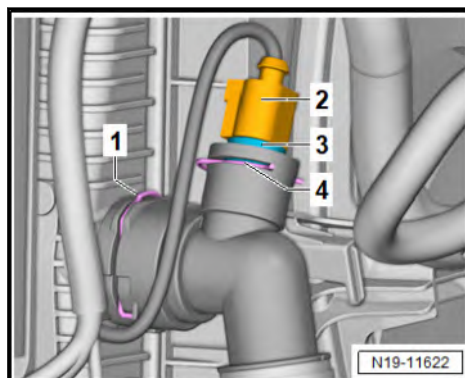
- Wear protective gloves.
- Wear protective goggles.
- Reduce excess pressure by covering cap of coolant expansion tank with a cloth and opening it carefully.

- Carefully open cap -arrow-.





- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Disconnect electrical connector -2-.



Note

Place a cloth underneath to catch escaping coolant.

- Pull off retaining clip -4- and pull out radiator outlet coolant temperature sender -G83- -3- from connection.

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Renew O-ring.*
- ◆ *Insert new radiator outlet coolant temperature sender -G83- immediately into connection in order to avoid loss of coolant.*
- Install front noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Check coolant level ⇒ [a1.3 nd adding coolant", page 240](#) .

2.9 Removing and installing engine outlet coolant temperature sender -G82-

Special tools and workshop equipment required

- ◆ Removal tool -T10498-





- ◆ Drip tray for workshop hoist -VAS 6208-



Removing

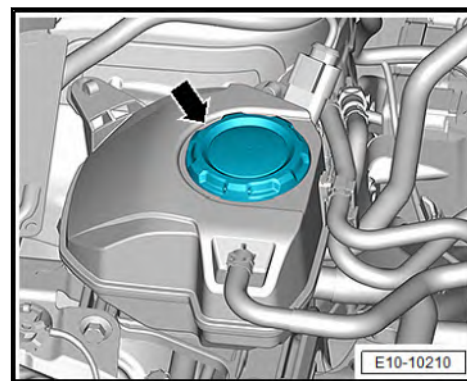
- Engine cold.

CAUTION

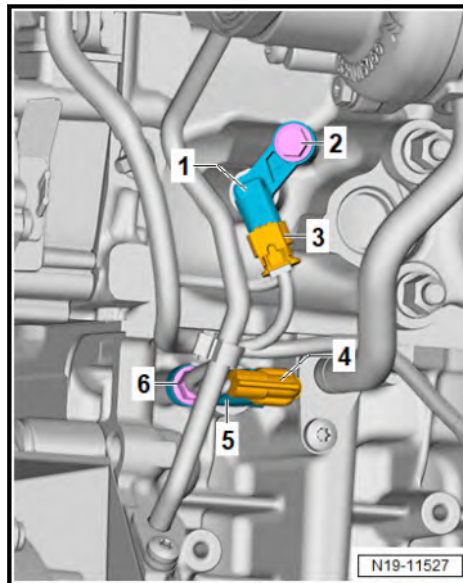
On a warm engine, the cooling system is under high pressure.
Danger of scalding by steam and hot coolant.

Skin and other parts of the body may be scalded.

- Wear protective gloves.
 - Wear protective goggles.
 - Reduce excess pressure by covering cap of coolant expansion tank with a cloth and opening it carefully.
-
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
 - Briefly open cap of coolant expansion tank -arrow- to release residual pressure in cooling system, then tighten again until cap engages.



- Place a cloth underneath to catch escaping coolant.
- Place drip tray for workshop hoist -VAS 6208- underneath.
- Disconnect electrical connector -4-. To do this, first remove heat insulation sleeve.



- Unscrew bolt -6- for engine outlet coolant temperature sender -G82- -5-.
- Pull off engine outlet coolant temperature sender -G82- -5-.



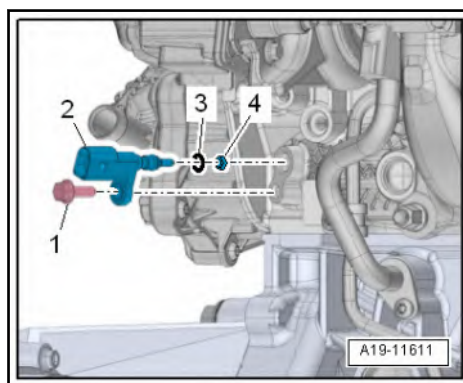
Note

Items 1, 2, 3 can be disregarded here.

Installing

Install in reverse order of removal, observing the following:

- If O-ring -3- with support ring -4- remains lodged in cylinder head, pull out O-ring and support ring using removal tool -T10498-.



- To avoid loss of coolant, immediately insert new engine outlet coolant temperature sender -G82- into cylinder head.
- Renew O-ring.
- Check coolant level ➔ [page 240](#) .

Torque settings

- ♦ ➔ [o2.3 verview - coolant temperature sender", page 252](#)



2.10 Removing and installing engine temperature regulation module -GX33-

Special tools and workshop equipment required

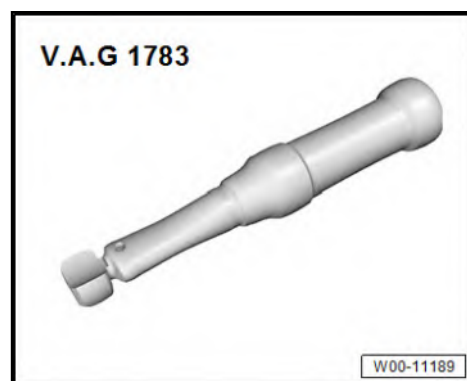
◆ Insert tool -T10572-



◆ Torx bit T30 -T10573-



◆ Torque wrench -V.A.G 1783-



Procedure

Removing

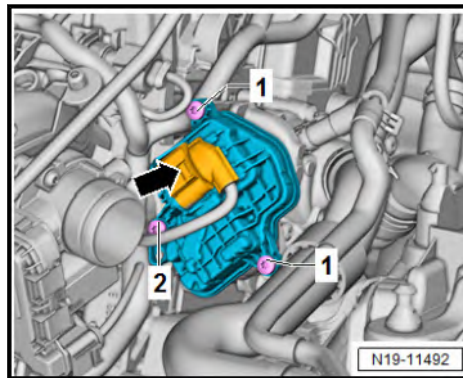
- Deactivate vehicle's drive system and switch off all electrical consumers.



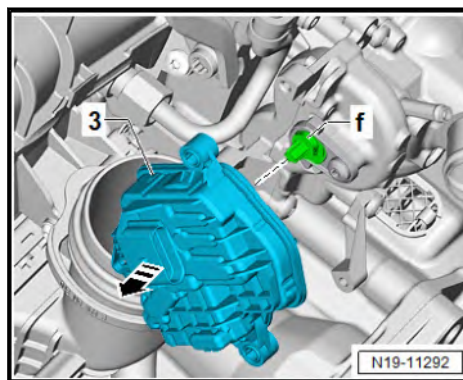
NOTICE

Operational readiness must not be restored during the repair.
Risk of damage to engine temperature regulation module.

- It is not necessary to disconnect the battery for this step.
- Remove intake manifold ➔ [page 367](#) .
- Disconnect electrical connector -arrow- on engine temperature regulation module -GX33-.



- Unscrew bolts -1- and -2- for engine temperature regulation module -GX33-.
- Pull engine temperature regulation module -GX33- -3- in -direction of arrow- off coolant pump shaft -f-.

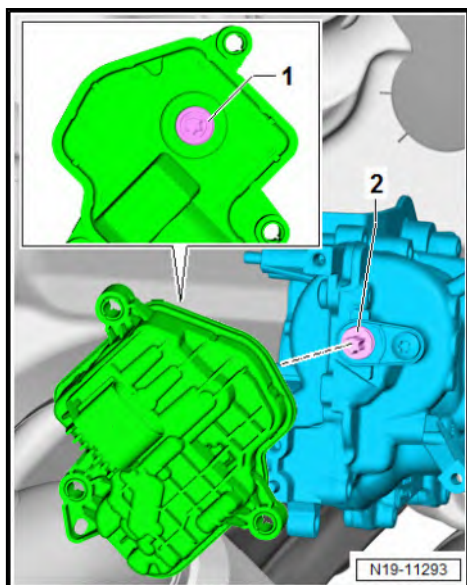


- Remove engine temperature regulation module -GX33-.

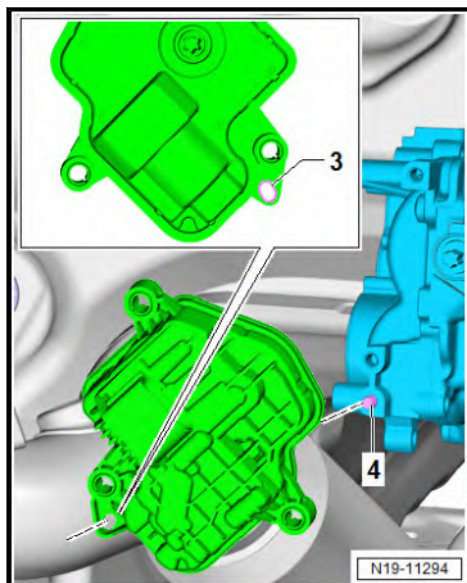
Installing

Install in reverse order of removal, observing the following:

- Check coolant pump ➤ [page 275](#) .
- The contour on engine temperature regulation module -GX33- -1- fits onto contour of coolant pump shaft -2- in only one position.



- The actuator -3- is guided on the coolant pump -4- by a notched pin.



- Adhere to the sequence:
 - Turn shaft of coolant pump to installation position ➤ [page 274](#).
 - First, fit contour of actuator -1- onto coolant pump shaft -2-.
 - Then fit recess on actuator -3- onto notched pin of coolant pump -4-.
 - Start bolts for engine temperature regulation module -GX33-, and screw them in.



NOTICE

When using insert tool -T10572- and torque wrench -V.A.G 1783-, observe corrected specified torque of 4.2 Nm.

- Use torque wrench -V.A.G 1783-, insert tool -T10572- and Torx bit T30 -T10573- to tighten securing bolts ➤ [o2.1 ver-view - coolant pump, thermostat](#), [page 250](#).

Specified torques

- ◆ ➤ [o2.1 ver-view - coolant pump, thermostat](#), [page 250](#)
- ◆ ➤ [o4.1 ver-view - intake manifold](#), [page 365](#)

2.11 Checking coolant pump

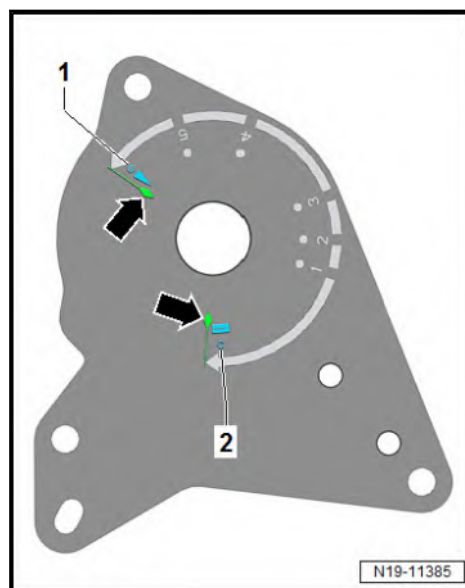
Special tools and workshop equipment required

- ◆ Tester for checking elongation of chain links -T10577-





Scale on indicating dial -T10577/2-:



1 - »Open« position of coolant pump -o-

2 - »Closed« position of coolant pump -c-

Pfeile - Limit stops



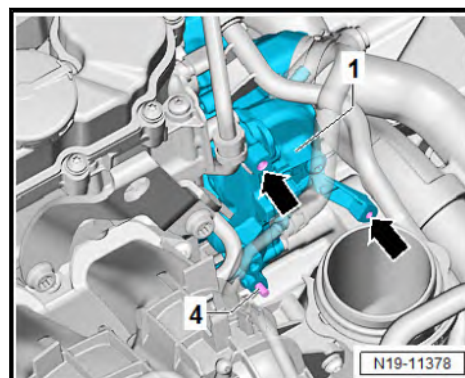
Note

- ◆ This work step is also used for bringing the coolant pump shaft and engine temperature regulation module -GX33- into the correct installation position.
- ◆ In case of malfunctions this work step can be used to check the coolant pump mechanically.
- ◆ During the test it is checked, whether the rotary valve or shaft are free to move.
- ◆ If the test shows that the shaft is too hard to move, the coolant pump must be renewed.

Procedure

- Remove engine temperature regulation module -GX33- ➤ [a2.10 nd installing engine temperature regulation moduleGX33", page 269](#) .

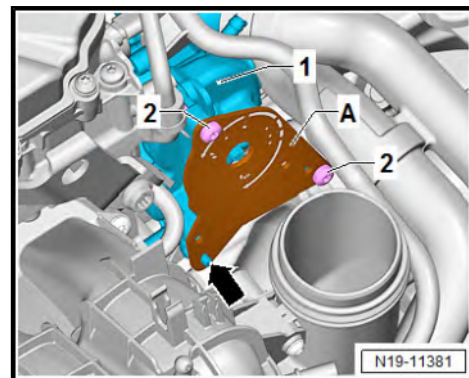
Fitting tool to coolant pump:



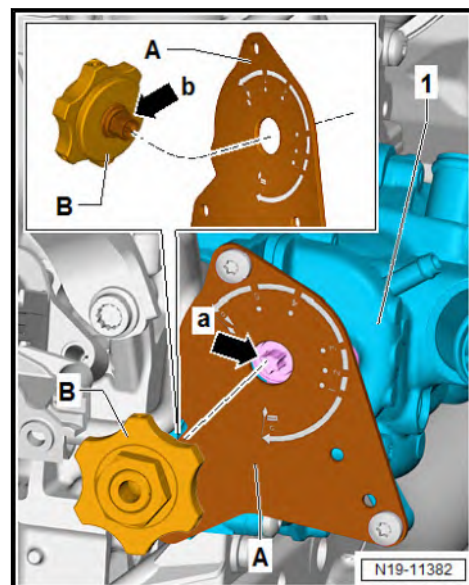
- Fit indicator dial -T10577/2- onto guide -4-.



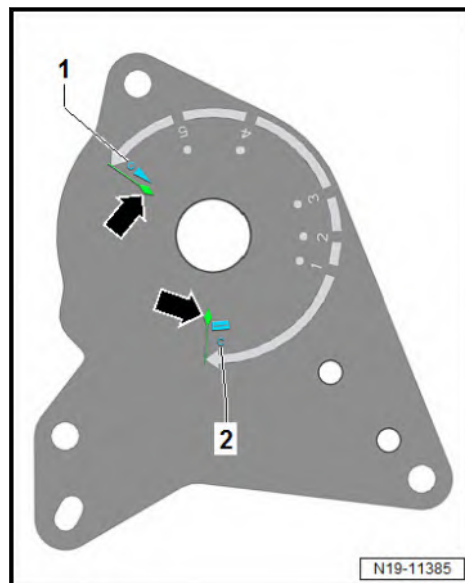
- Bolt on indicator dial -T10577/2- at the two holes -arrows- in coolant pump -1-.
- Tighten the two bolts -2- for indicator dial -T10577/2- -A- supplied with test tool -T10577- to 5 Nm on coolant pump -1-.



- Fit test tool -T10577/1- -B- to coolant pump -1- as shown in illustration.

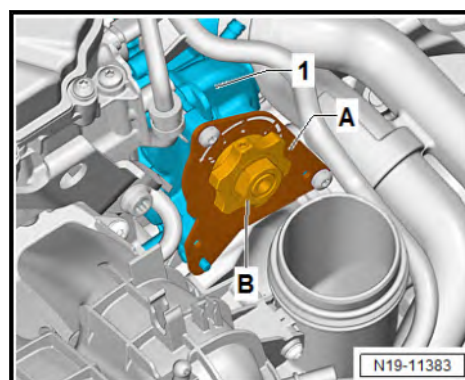


- The mounting -arrow b- on test tool -T10577/1- -B- fits onto shaft -arrow a- of coolant pump -1- in only one position.
- When fitting, arrow of marking »O« -1- must point to area of marking on test tool -T10577/1-.

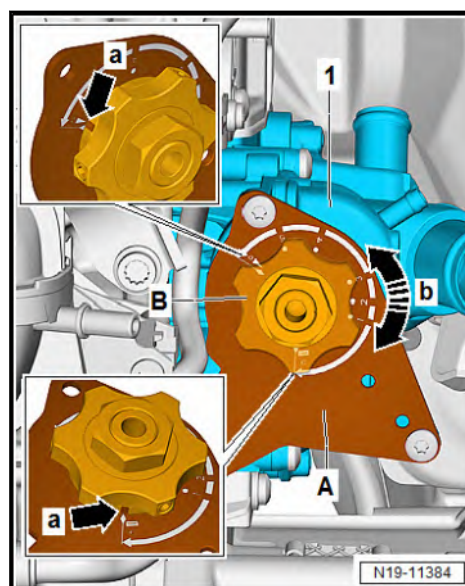


- If the arrow and marking are not properly aligned, bring coolant pump into installation position ➤ [page 274](#) .

Bringing coolant pump into installation position:



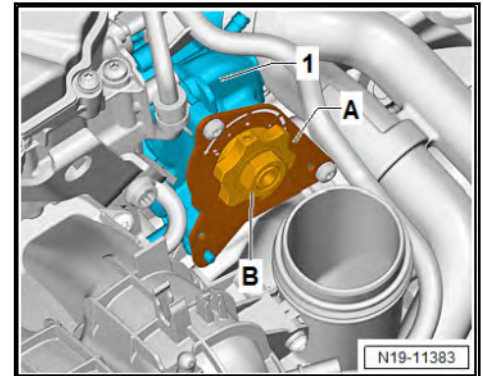
- Test tool -T10577- is fitted to coolant pump -1- ➤ [page 272](#) .
- Use test tool -T10577/1- -A- to turn coolant pump shaft -1- to installation position.



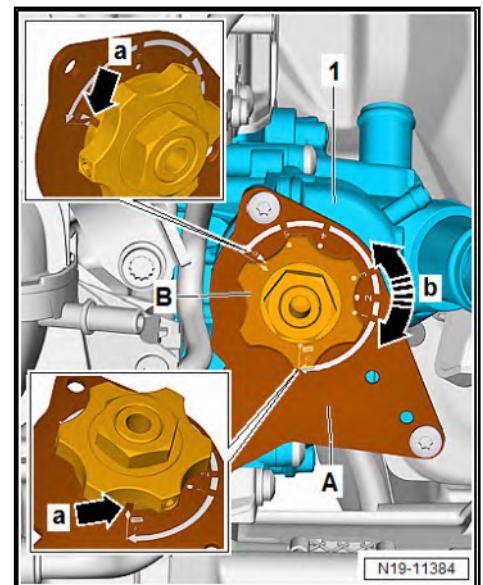


- The arrow of marking »O« on indicator dial -T10577/2- -A- must point into the area of marking -arrow a- on test tool -T10577/1- -B-.
- Remove test tool -T10577-, and install engine temperature regulation module -GX33-.

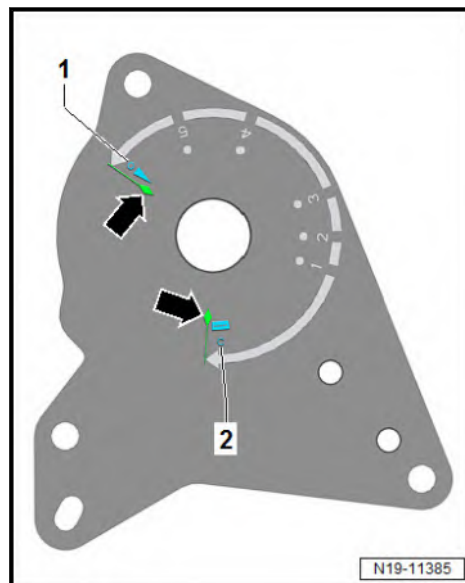
Checking coolant pump:



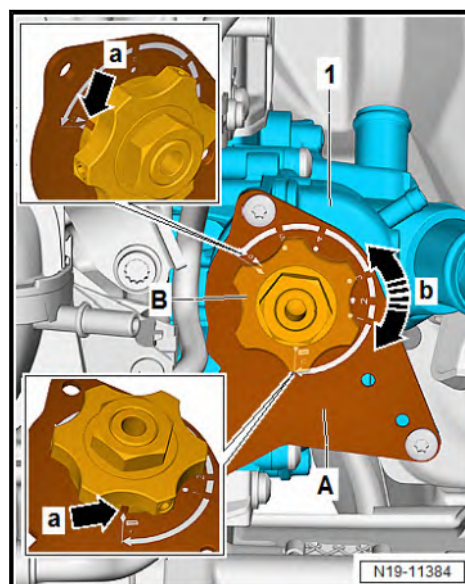
- Test tool -T10577/1- -B- is fitted to coolant pump -1- ➤ [page 272](#) .
- Bring coolant pump into installation position ➤ [page 274](#) .
- The arrow of marking »O« on indicator dial -T10577/2- -A- must point into the area of marking -arrow a- on test tool -T10577/1- -B-.



- Turn test tool -T10577/1- between the two markings -arrows a- in -directions of arrow b-.
- The marking on test tool -T10577/1- -B- must move between markings »O« and »C«.
- The force required for this must not cause the overload protection of test tool -T10577/1- -B- to be triggered.
- If the overload protection is triggered, the coolant pump shaft is too hard to move. In this case, the test tool -T10577/1- can be turned without any resistance.
- The coolant pump must be renewed ➤ [page 255](#) .
- Move test tool -T10577/1- between the two limit stops -arrows-.



- Turn marking -arrow a- in -directions of arrow b- to the two limit stops.



- If the limit stops are reached and exceeded, the overload protection must be triggered. In this case, the test tool -T10577/1- can be turned without any resistance.
- If the overload protection is not triggered, the coolant pump must be renewed, because the limit stops cannot be reached.
- The coolant pump must be renewed ➤ [page 255](#) .



3 Coolant pipes

⇒ [o3.1 verview - coolant pipes", page 277](#)

⇒ [a3.2 nd installing coolant pipes", page 278](#)

3.1 Assembly overview - coolant pipes



Note

The arrows on the coolant pipes and on the ends of coolant hoses must be aligned with each other.

1 - Bolt

- ☐ 8 Nm

2 - Front coolant pipe

- ☐ Removing and installing ⇒ [a3.2 nd installing coolant pipes", page 278](#)

3 - Upper coolant pipe

- ☐ Removing and installing ⇒ [page 279](#)

4 - Bolt

- ☐ 3.7 Nm

5 - Spring-type clip

6 - Coolant hose

- ☐ Coolant pump return

7 - Coolant hose

- ☐ To turbocharger

8 - Coolant hose

- ☐ From turbocharger

9 - Spring-type clip

10 - Left coolant pipe

- ☐ Removing and installing ⇒ [a3.2 nd installing coolant pipes", page 278](#)

11 - Bolt

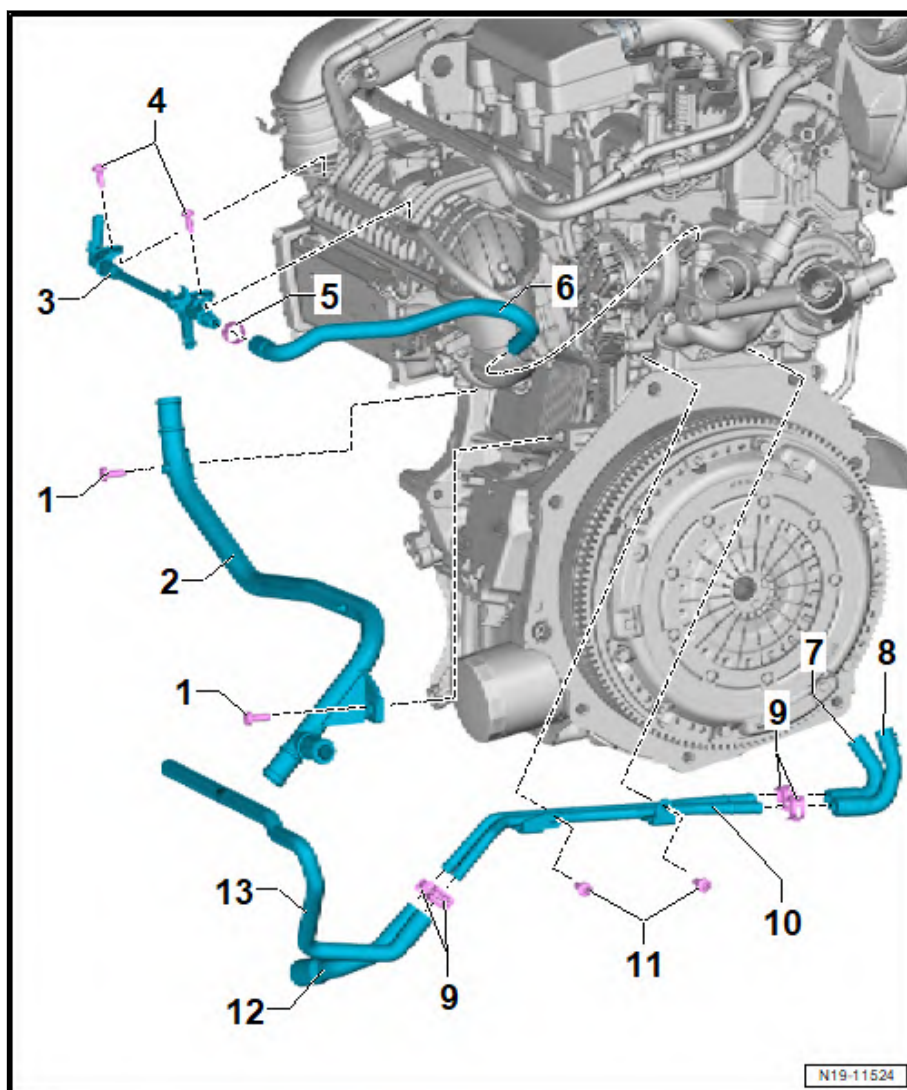
- ☐ 8 Nm

12 - Coolant hose

- ☐ From charge air cooling pump -V188-

13 - Coolant hose

- ☐ To charge air cooler





3.2 Removing and installing coolant pipes

⇒ [a3.2.1 nd installing coolant pipes, front", page 278](#)

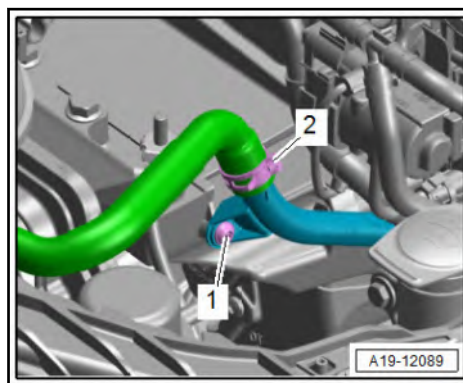
⇒ [a3.2.2 nd installing coolant pipes, left", page 279](#)

⇒ [a3.2.3 nd installing coolant pipe, upper", page 279](#)

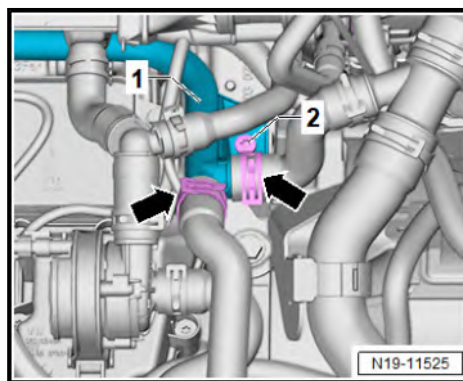
3.2.1 Removing and installing coolant pipes, front

Removing

- Remove charge air cooler ⇒ [page 330](#) .
- Loosen hose clip -2- and pull off coolant hose.



- Unscrew bolt -1-.
- Release hose clips -arrows- and pull off coolant hoses.



- Unscrew bolt -2- and remove coolant pipe -1-.

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Renew seals and O-rings.*
- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ Electronic parts catalogue.*

- Install charge air cooler ⇒ [page 330](#) .

Torque settings

- ◆ ⇒ [o3.1 verview - coolant pipes", page 277](#)

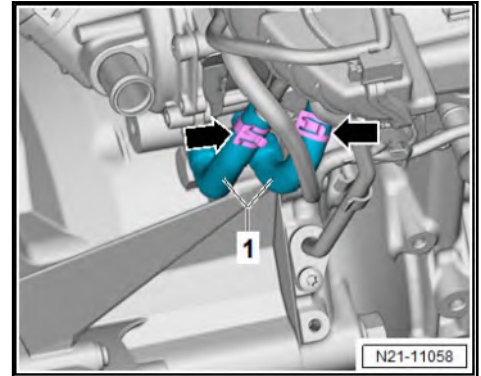


◆ ⇒ [o4.1 verview - intake manifold", page 365](#)

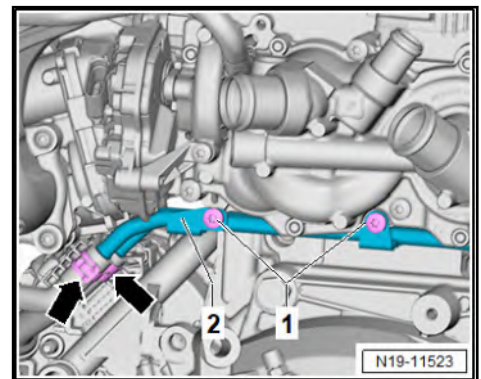
3.2.2 Removing and installing coolant pipes, left

Removing

- Drain coolant ⇒ [a1.3 nd adding coolant", page 240](#) .



- Loosen hose clips -arrows- and pull off coolant hoses -1-.
- Release hose clips -arrows- and pull off coolant hoses.



- Unscrew bolts -1- and remove coolant pipe.

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Renew seals and O-rings.*
- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ Electronic parts catalogue.*
- Add coolant ⇒ [a1.3 nd adding coolant", page 240](#) .

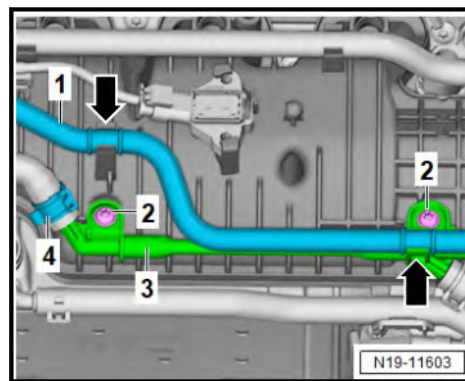
Torque settings

◆ ⇒ [o3.1 verview - coolant pipes", page 277](#)

3.2.3 Removing and installing coolant pipe, upper

Removing

- Unclip line -1- -arrows-.



- Detach hose clips -4- from coolant pipe -3- on both sides.
- Seal coolant hoses using suitable plugs.
- Unscrew bolts -2- and remove coolant pipe -3-.

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Renew seals and O-rings.*
- ◆ *Secure all hose connections with hose clips corresponding to the series equipment ⇒ [Electronic parts catalogue](#).*
- Check coolant level and top up as necessary. ⇒ [a1.3 nd adding coolant](#), page 240

Torque settings

- ◆ ⇒ [o3.1 verview - coolant pipes](#), page 277



4 Radiator, radiator fan

⇒ [o4.1 verview – radiator", page 281](#)

⇒ [o4.2 verview - radiator cowl and radiator fan", page 286](#)

⇒ [o4.3 verview - radiator blind", page 286](#)

⇒ [a4.4 nd installing radiator", page 289](#)

⇒ [a4.5 nd installing radiator cowl", page 306](#)

⇒ [a4.6 nd installing radiator fanV7", page 307](#)

⇒ [a4.7 nd installing radiator blind", page 308](#)

⇒ [a4.8 nd installing radiator blind control motorV544", page 310](#)

4.1 Assembly overview – radiator

⇒ [o4.1.1 verview – radiator, Golf 2020, Golf Estate 2021 ", page 281](#)

⇒ [o4.1.2 verview – radiator, Polo 2018, T-Cross", page 283](#)

⇒ [o4.1.3 verview - radiator/radiator fan, T-Roc, T-Roc Cabrio", page 285](#)

4.1.1 Assembly overview – radiator, Golf 2020, Golf Estate 2021



1 - Air duct

- ☐ Left
- ☐ Threaded connection
2 Nm

2 - Condenser

- ☐ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87; Refrigerant circuit; Removing and installing condenser

3 - Air duct

- ☐ Right
- ☐ Threaded connection
2 Nm

4 - Bolt

- ☐ For radiator mounting
- ☐ 5 Nm

5 - Radiator mounting

- ☐ If radiator mountings have been broken or pinched off, secure to lock carrier, see ⇒ Electronic parts catalogue (ETKA).
- ☐ Qty. 2
- ☐ Bolt torque 5 Nm

6 - Oil seals

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

7 - Coolant hose

8 - Bonded rubber bush

9 - Coolant hose

10 - Radiator for engine coolant

- ☐ With radiator for charge air cooling circuit
- ☐ Removing and installing ⇒ [page 289](#)

11 - Bonded rubber bush

12 - Oil seals

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

13 - Coolant hose

14 - Seal

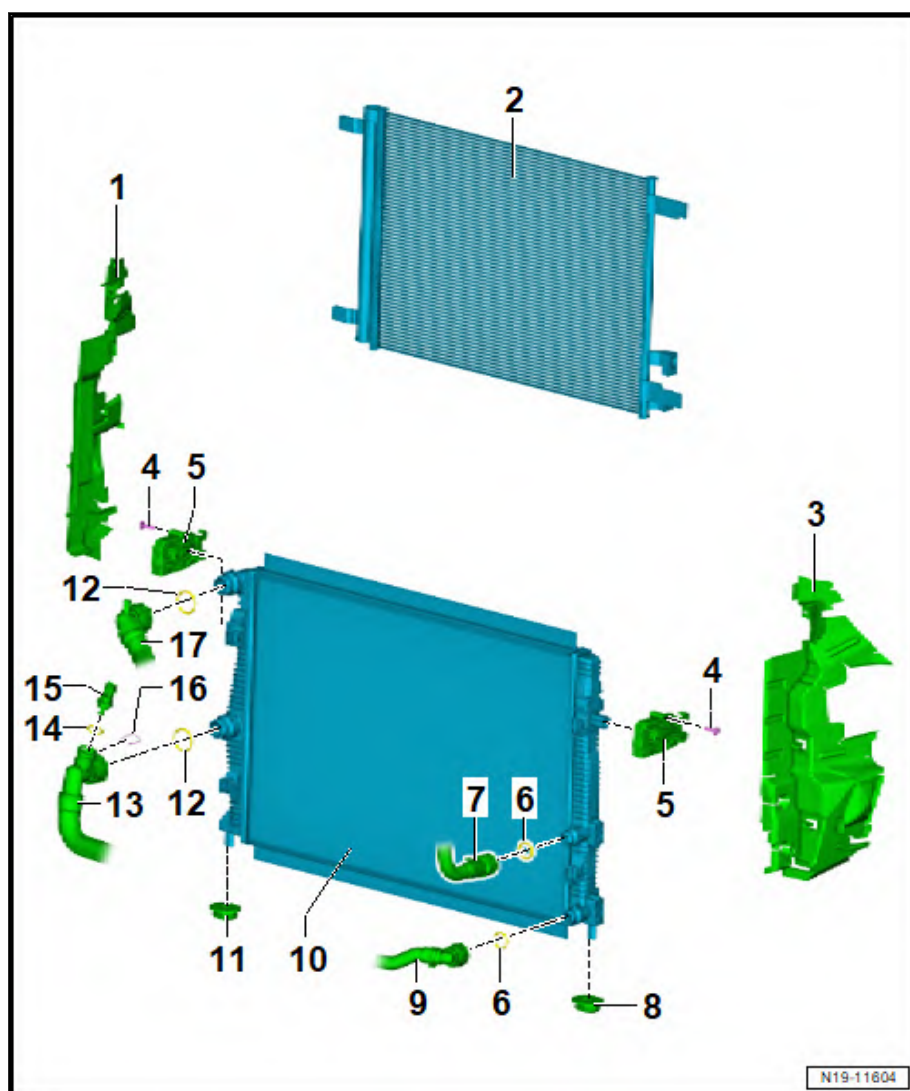
- ☐ Renew, see ⇒ Electronic parts catalogue (ETKA)

15 - Radiator outlet coolant temperature sender -G83-

- ☐ Removing and installing ⇒ [page 265](#)

16 - Retaining clip

17 - Coolant hose

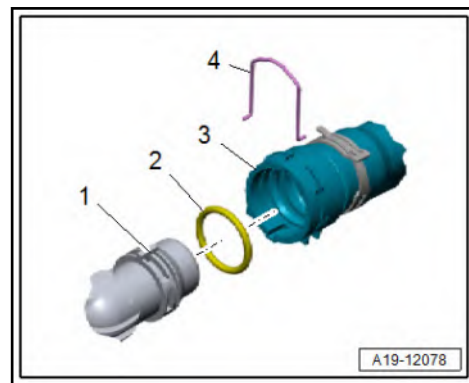




Note

The markings »arrows« on the coolant pipes and on the ends of the hoses must align.

Connecting coolant hose with plug-in connector



- Check retaining clip -4- for damage, renew if necessary.
- Check seal -2- for damage, renew if necessary.
- Moisten seal -2- with coolant and insert into coolant hose.
- Press plug-in connector -3- on connection -1- until it engages.
- Press again on plug-in connector -3-, and then pull to check that plug-in connector is correctly engaged.

4.1.2 Assembly overview – radiator, Polo 2018, T-Cross



1 - Air duct

- ☐ Left

2 - Condenser

- ☐ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87; Refrigerant circuit; Removing and installing condenser

3 - Air duct

- ☐ Right

4 - Radiator mounting

- ☐ Qty. 2

5 - Bonded rubber bush

- ☐ Qty. 2

6 - Oil seals

- ☐ Qty. 4
- ☐ Renew, see ⇒ Electronic parts catalogue (ET-KA)

7 - Coolant hose

8 - Coolant hose

9 - Radiator for engine coolant

- ☐ With water radiator for charge air cooling circuit
- ☐ Removing and installing ⇒ [page 293](#)

10 - Coolant hose

11 - Retaining clip

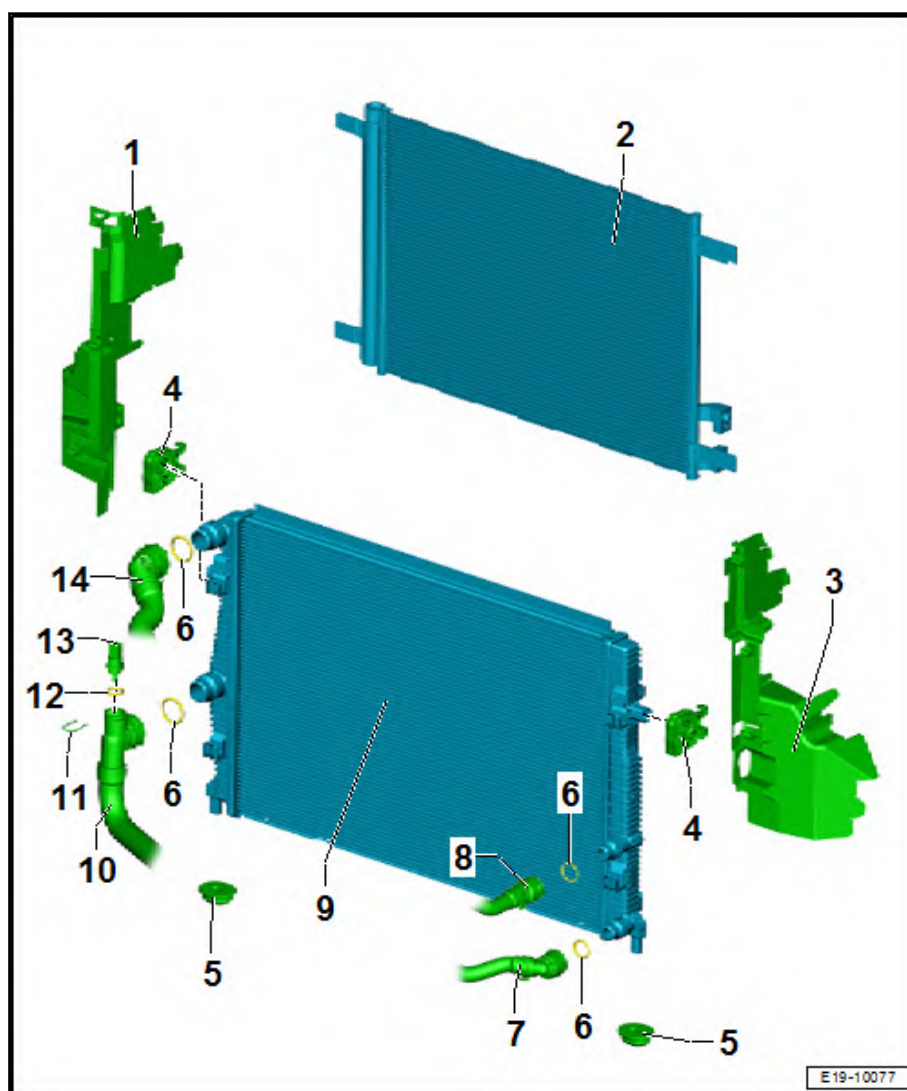
12 - Seal

- ☐ Renew

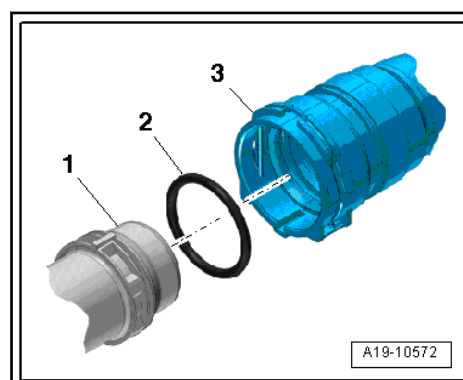
13 - Radiator outlet coolant temperature sender -G83-

- ☐ Removing and installing ⇒ [page 265](#)

14 - Coolant hose



Connecting coolant hose with plug-in connector





- Remove old O-ring -2- in coolant hose -3-.
- Moisten new O-ring with coolant and insert into coolant hose.
- Push coolant hose into connection -1- until it audibly engages.
- Press again on coolant hose and check plug-in connector is engaged correctly by pulling hose back.

4.1.3 Assembly overview - radiator/radiator fan, T-Roc, T-Roc Cabrio

1 - Condenser

- ☐ Removing and installing ➔ Heating, air conditioning; Rep. gr. 87; Refrigerant circuit; Removing and installing condenser

2 - Bolts

- ☐ Qty. 2
- ☐ 5 Nm

3 - Radiator mounting

- ☐ Qty. 2

4 - Air duct

- ☐ Left

5 - Radiator for engine coolant

- ☐ Removing and installing ➔ [page 289](#)

6 - Seal

7 - Water radiator for charge air cooling circuit

- ☐ Radiator and water radiator for charge air cooling circuit are removed together
- ☐ After renewing, renew entire coolant.
- ☐ Removing and installing ➔ [4.4.3 and installing radiator, T-Roc, T-Roc Cabrio](#), [page 298](#)

8 - Lower radiator mounting

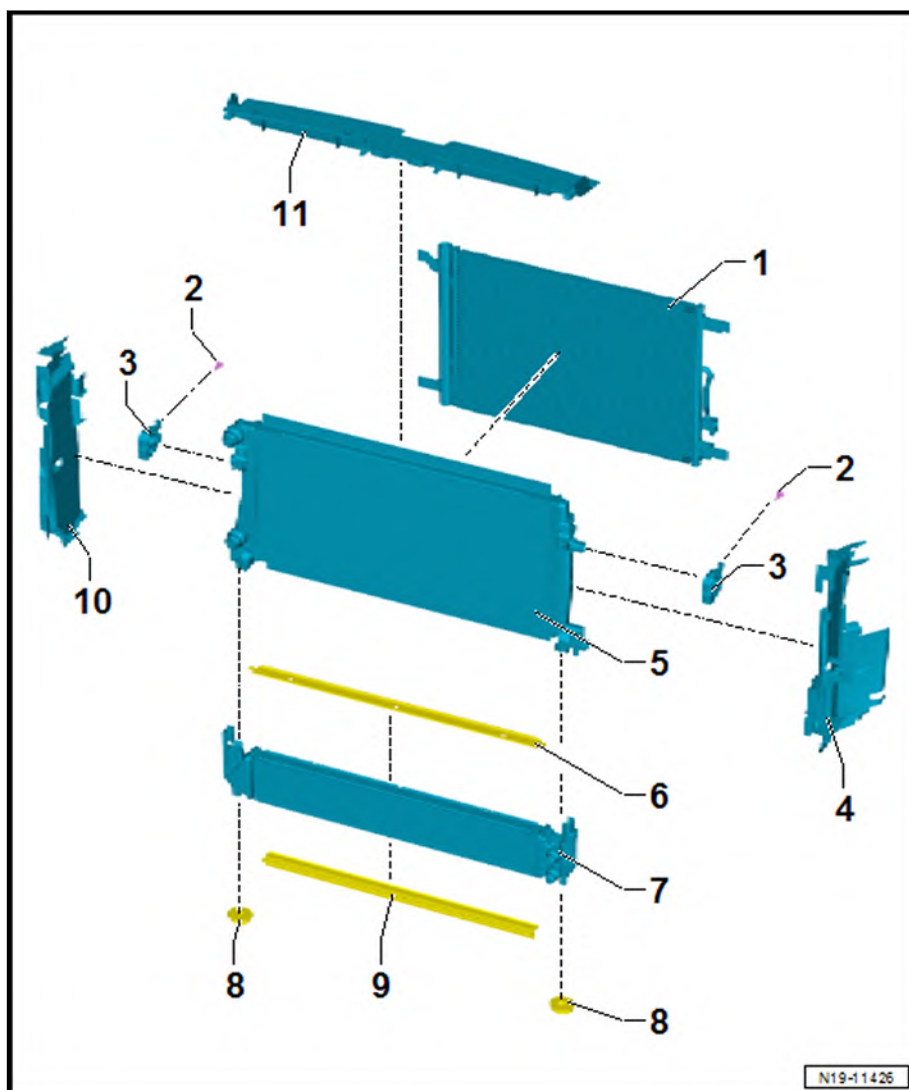
- ☐ Qty. 2
- ☐ Ensure it is properly seated

9 - Seal

10 - Air duct

- ☐ Right

11 - Air duct



N19-11426



4.2 Assembly overview - radiator cowl and radiator fan

⇒ [o4.2.1 verview - radiator cowl and radiator fan", page 286](#)

4.2.1 Assembly overview - radiator cowl and radiator fan

1 - Bolt

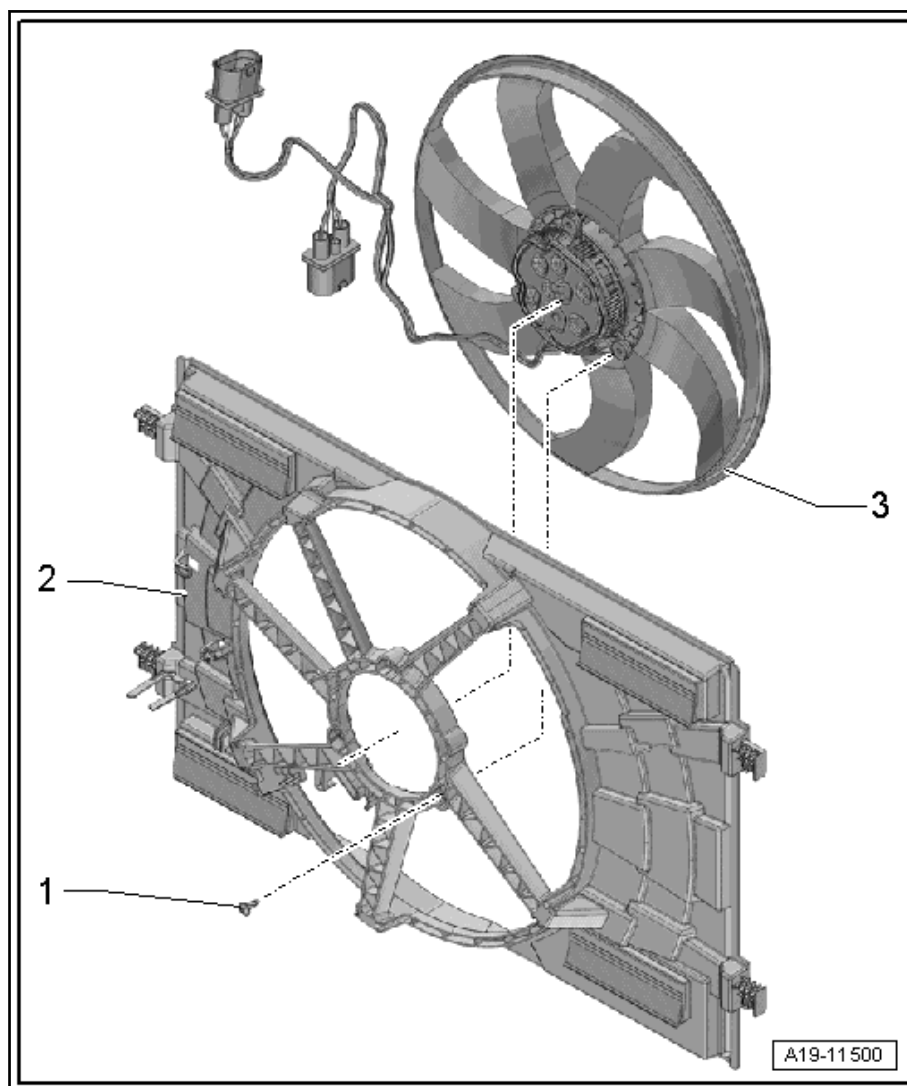
- 5 Nm

2 - Radiator cowl

- Removing and installing ⇒ [a4.5 nd installing radiator cowl", page 306](#)

3 - Radiator fan -V7-

- Removing and installing ⇒ [a4.6 nd installing radiator fanV7", page 307](#)



4.3 Assembly overview - radiator blind

⇒ [o4.3.1 verview - radiator blind", page 286](#)

⇒ [o4.3.2 verview - components of radiator blind", page 288](#)

4.3.1 Assembly overview - radiator blind



1 - Bumper carrier

- ☐ Assembly overview
⇒ General body repairs, exterior; Rep. gr. 50; Lock carrier; Assembly overview - lock carrier

2 - Rear seal

3 - Radiator blind control motor -V544-

- ☐ Removing and installing ⇒ [a4.8 nd installing radiator blind control motorV544", page 310](#)

4 - Locking lugs

- ☐ For seals

5 - Ambient temperature sensor -G17-

- ☐ Fitting location ⇒ [Item 12 \(page 287\)](#)
- ☐ Clipped into front seal
- ☐ ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

6 - Radiator blind

- ☐ Removing and installing ⇒ [a4.7 nd installing radiator blind", page 308](#)

7 - Electrical connector

- ☐ For radiator blind control motor -V544-
- ☐ Secured to lock carrier.
- ☐ ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

8 - Bracket

- ☐ For electrical connector on lock carrier ⇒ [Item 7 \(page 287\)](#)

9 - Bolt

- ☐ Qty. 2
- ☐ 8 Nm

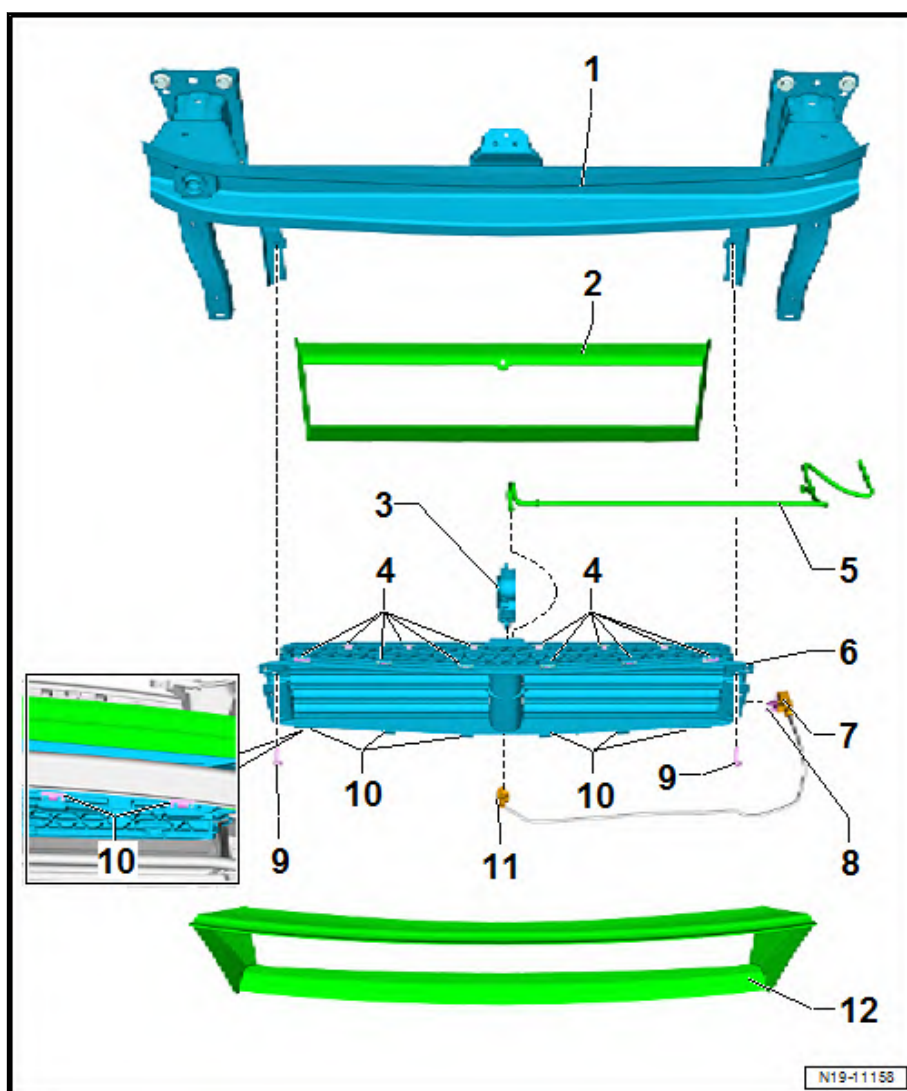
10 - Wiring harness

- ☐ For radiator blind control motor -V544-
- ☐ ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

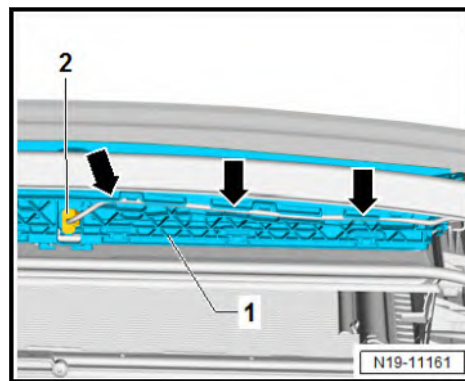
11 - Locking lugs

- ☐ For seals

12 - Front seal



Routing cables/lines on radiator blind



- Wiring harness -2- for radiator blind control motor -V544- is clipped into frame of radiator blind -1- -arrows-.

4.3.2 Assembly overview - components of radiator blind

1 - Connection

2 - Bolt

- 1.5 Nm

3 - Radiator blind control motor -V544-

- Removing and installing ⇒ [a4.8 nd installing radiator blind control motor V544](#), page 310

4 - Flaps

- Note arrangement ⇒ [page 288](#)

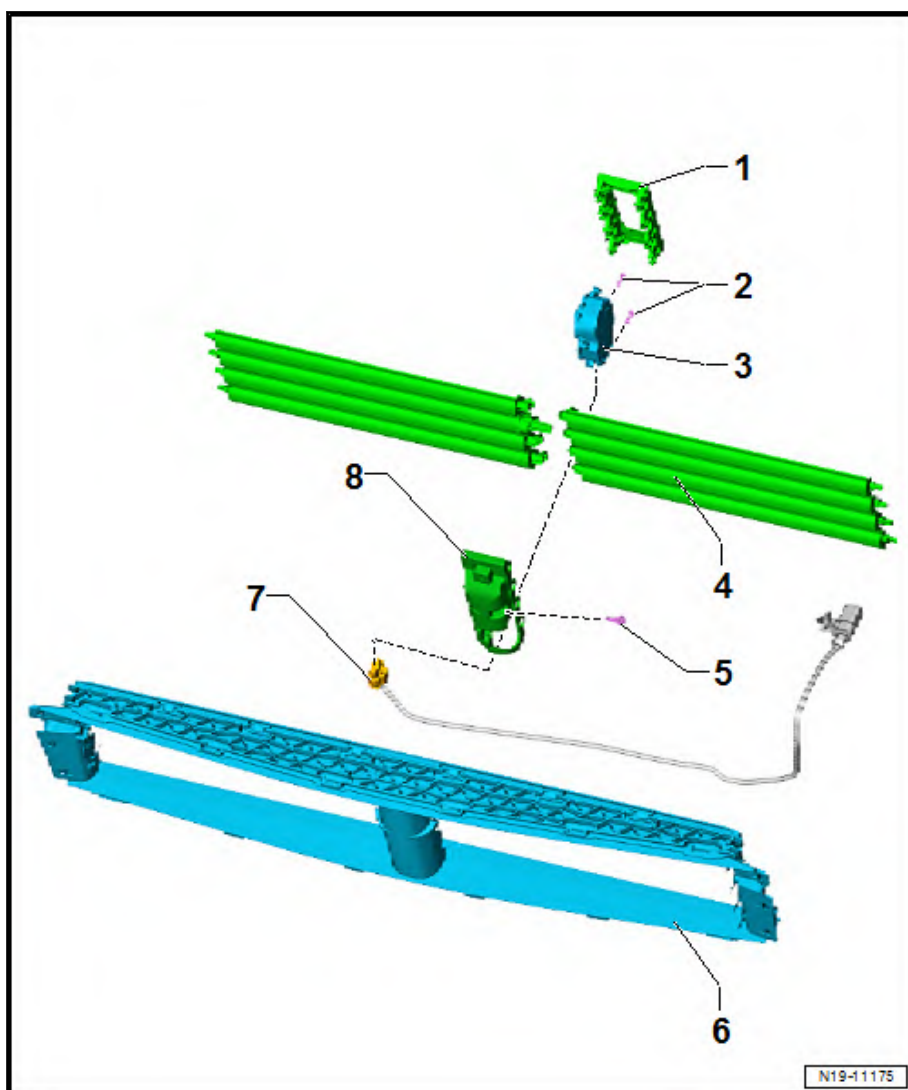
5 - Bolt

- 1.5 Nm

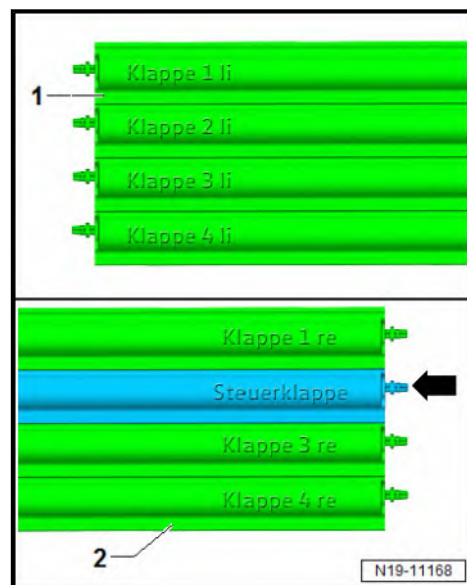
6 - Frame

7 - Wiring harness

8 - Engine mounting



Arrangement of louvres



1 - Left flaps

2 - Right flaps

Pfeil - Control flap

4.4 Removing and installing radiator

⇒ [a4.4.1 nd installing radiator, Golf 2020, Golf Estate 2021 ", page 289](#)

⇒ [a4.4.2 nd installing radiator, Polo 2018 ➤", page 293](#)

⇒ [a4.4.3 nd installing radiator, T-Roc, T-Roc Cabrio", page 298](#)

⇒ [a4.4.4 nd installing radiator, T-Cross", page 301](#)

4.4.1 Removing and installing radiator, Golf 2020, Golf Estate 2021

Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist -VAS 6208-



Removing



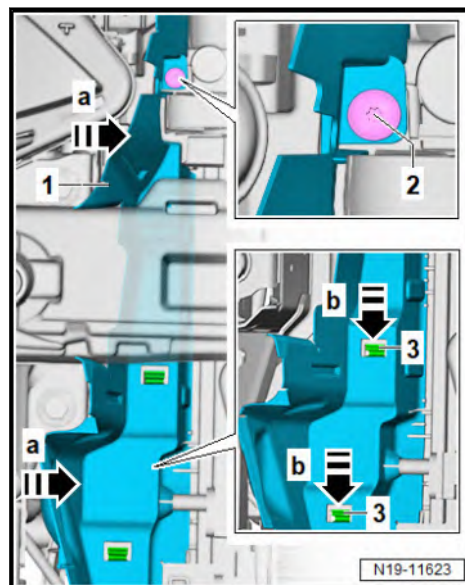
CAUTION

Danger of injury; the radiator fans can run at any time.

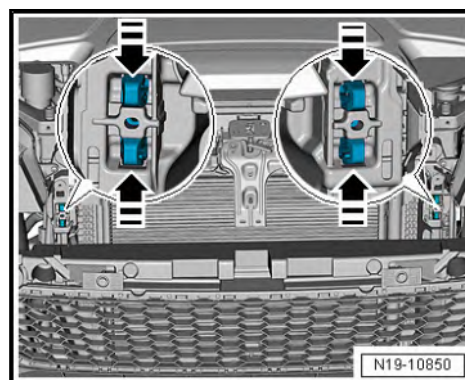
- Disconnect electrical connectors:



- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63; Front bumper; Removing and installing bumper cover.
- Drain coolant ⇒ [a1.3 nd adding coolant", page 240](#) .
- Remove radiator cowl ⇒ [a4.5.1 nd installing radiator cowl", page 306](#) .
- Unclip air ducts -1- on both sides of lock carrier.



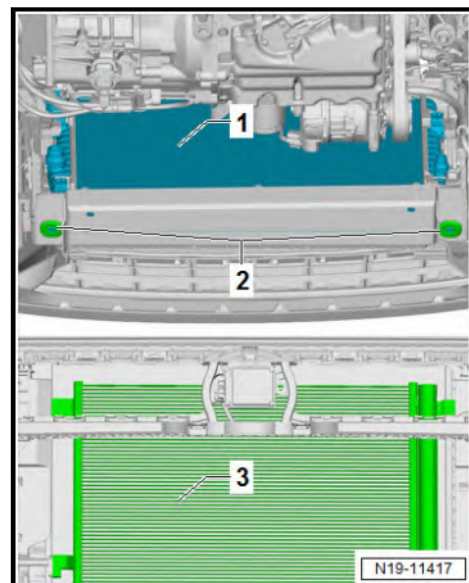
- Unscrew bolt -2- on both sides.
- Release all fasteners -3- in direction of arrow -b- and unscrew air ducts -1- in direction of arrow -a-.
- Release catches -arrows- of radiator mounting on left and right, or pinch them off using side cutters. Push radiator at top slightly towards engine.



Note

The radiator mounting will be reused when reinstalling the radiator. It will then be bolted to lock carrier. For bolts, refer to ⇒ Electronic parts catalogue (ETKA).

- Swivel radiator -1- backwards and pull out from radiator mountings -2-.



- Have a second mechanic pull out condenser -3- from radiator -1- and secure to body.
- Remove radiator -1-.

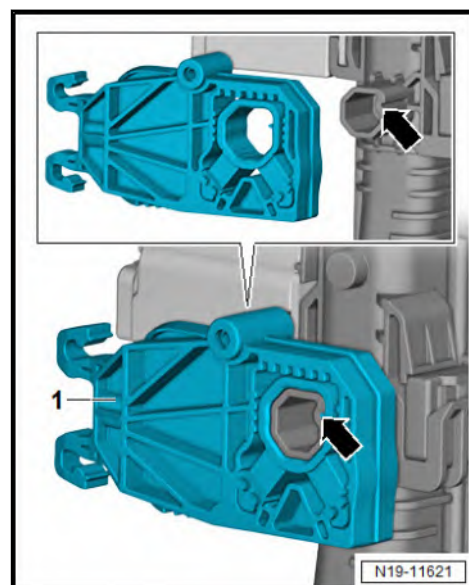
Installing

Install in reverse order of removal, observing the following:

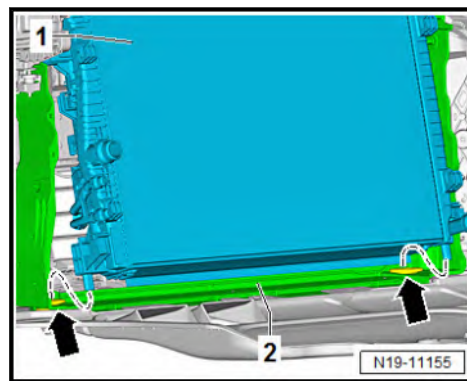


Note

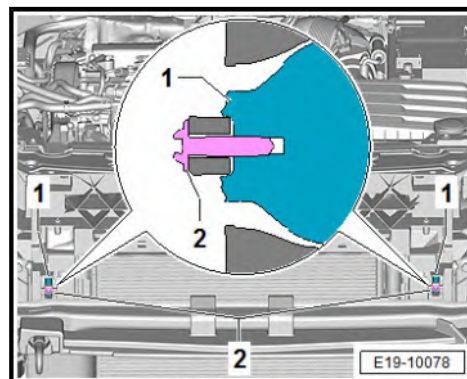
- ♦ *If there are minor dents in the fins, refer to [r3.7 radiators and condensers](#), page 9.*
- ♦ *Renew O-rings after removal.*
- Fit radiator mounting -1- onto radiator. When doing so, note the installation position -arrow-.



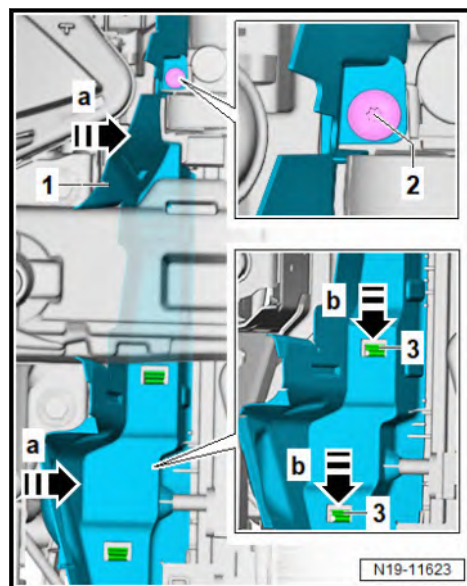
- Insert radiator into mountings -arrows- in lock carrier.



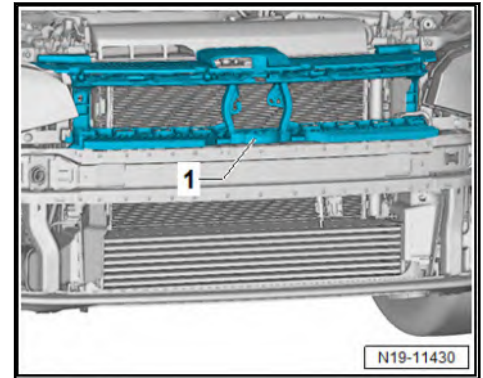
- Swing radiator into lock carrier. Ensure proper seating of radiator mountings in lock carrier.
- Screw in radiator mounting bolts ⇒ [Item 4 \(page 282\)](#) . .
- Attach condenser to radiator, and engage it.
- Use bolts to secure radiator mountings to lock carrier whose fasteners have been pinched off. Use new bolts -2- ⇒ Electronic parts catalogue (ETKA).



- Install air ducts -1- on both sides.



- Install assembly frame -1- ⇒ General body repairs, exterior;
Rep. gr. 50; Lock carrier, Assembly overview - lock carrier.



- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63; Front bumper; Removing and installing bumper cover.
- Install radiator cowl ⇒ [a4.5 nd installing radiator cowl](#), page 306 .
- Connect coolant hose with plug-in connector ⇒ [page 283](#) .
- If radiator has been renewed, renew entire coolant.
- Add coolant ⇒ [page 240](#) .

Torque settings

- ◆ ⇒ [o4.1.1 verview – radiator, Golf 2020, Golf Estate 2021](#) ", page 281
- ◆ ⇒ [o4.2.1 verview - radiator cowl and radiator fan](#)", page 286

4.4.2 Removing and installing radiator, Polo 2018 ➤

Special tools and workshop equipment required

- ◆ Drip tray for workshop hoist -VAS 6208-



Removing

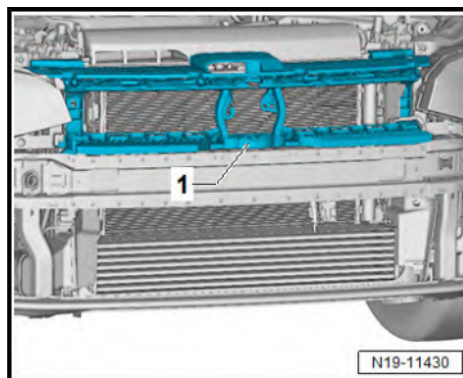
⚠ CAUTION

Danger of injury; the radiator fans can run at any time.

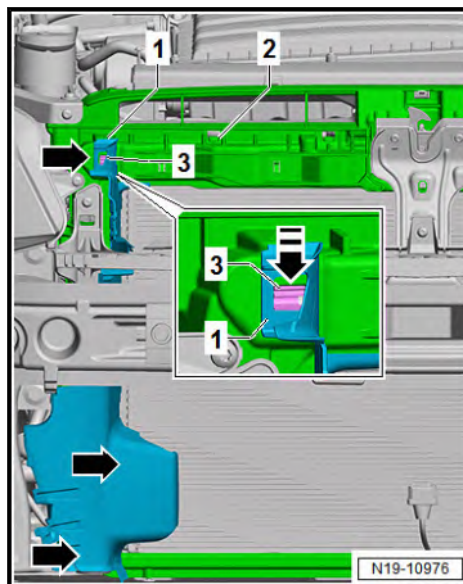
- Disconnect electrical connectors:
- Remove radiator cowl ⇒ [a4.5 nd installing radiator cowl](#)", page 306 .
- Remove bumper cover ⇒ General body repairs, exterior; Rep. gr. 63; Body - front; Removing and installing bumper cover.



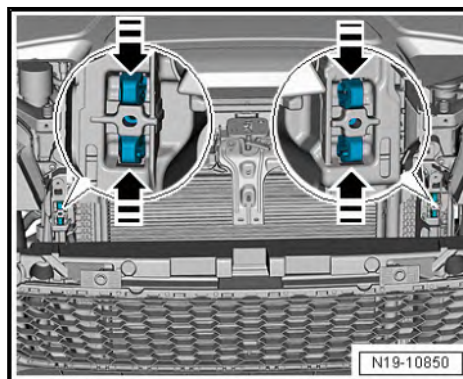
- Remove assembly frame -1- ⇒ General body repairs, exterior; Rep. gr. 50; Lock carrier, Assembly overview - lock carrier.



- To do this, unclip air ducts -1- on both sides from lock carrier -2-.



- Release all fasteners -arrows- and pull off air ducts.
- Release catches -arrows- of radiator mounting on left and right, or pinch them off using side cutters.

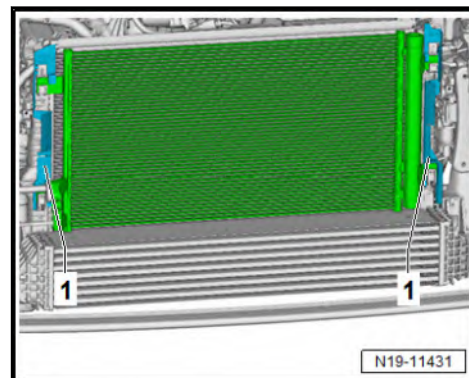




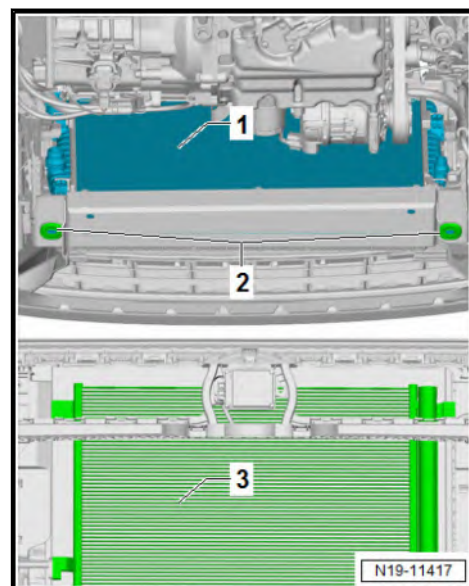
Note

The radiator mounting will be reused when reinstalling the radiator. It will then be bolted to lock carrier. For bolts, refer to ⇒ Electronic parts catalogue (ETKA).

- Push radiator upwards slightly towards engine and remove sealing strips -1- on both sides.



- Swivel radiator -1- backwards and pull out from radiator mountings -2-.



- Have a second mechanic pull out condenser -3- from radiator -1- and secure to body.
- Remove radiator -1-.

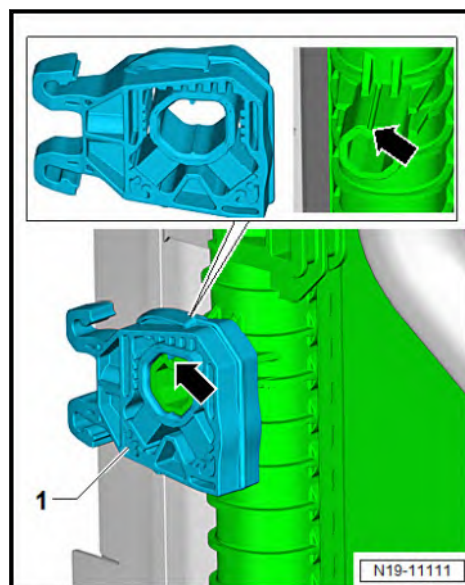
Installing

Install in reverse order of removal, observing the following:

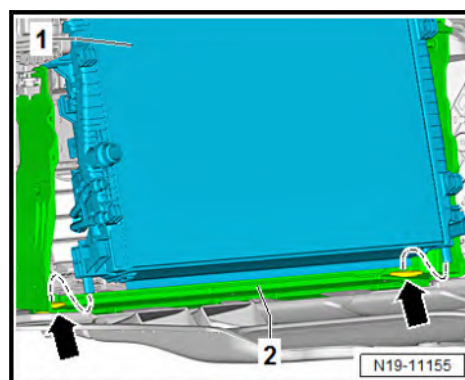


Note

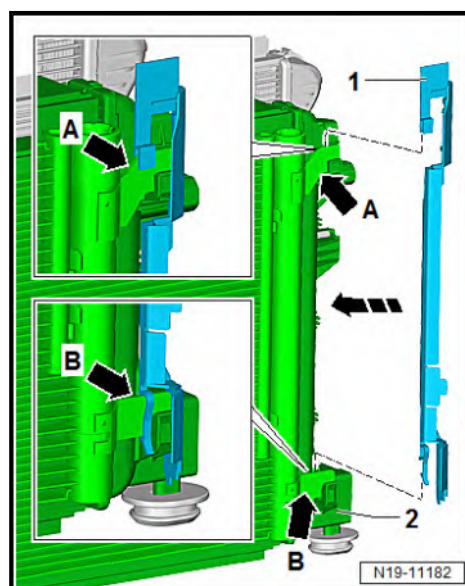
- ♦ *If there are minor dents in the fins, refer to ⇒ [page 9](#).*
- ♦ *Renew O-rings after removal.*
- Fit radiator mounting -1- onto radiator. When doing so, note the installation position -arrow-.



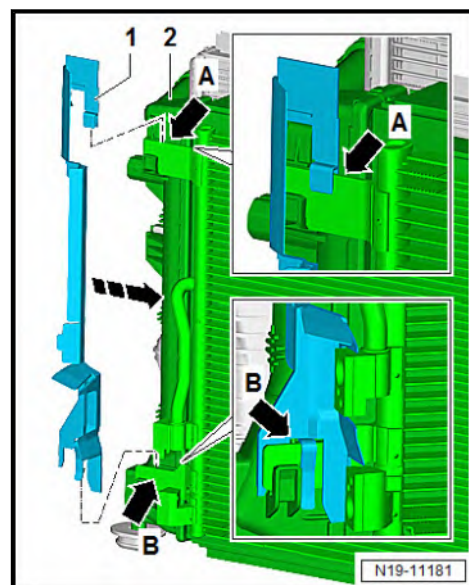
- Insert radiator into mountings -arrows- in lock carrier.



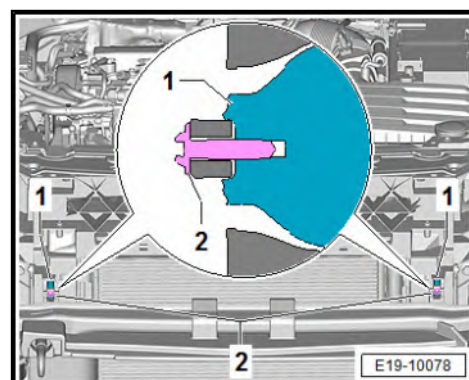
- Swing radiator into lock carrier. Ensure proper seating of radiator mountings in lock carrier.
- Attach condenser to radiator, and engage it.
- Secure sealing strip on right as shown.



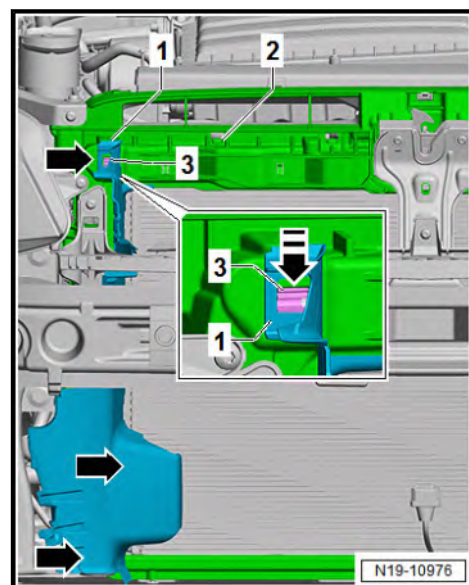
- Secure sealing strip on left as shown.



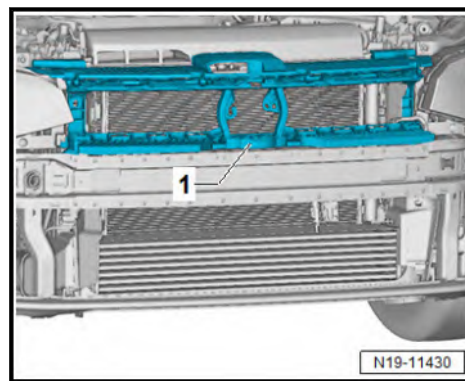
- If fastener was cut off, bolt radiator mountings to lock carrier.
Use new bolts -2- → Electronic parts catalogue (ETKA).



- Install air ducts -1- on both sides.



- Install assembly frame -1- → General body repairs, exterior;
Rep. gr. 50; Lock carrier, Assembly overview - lock carrier.



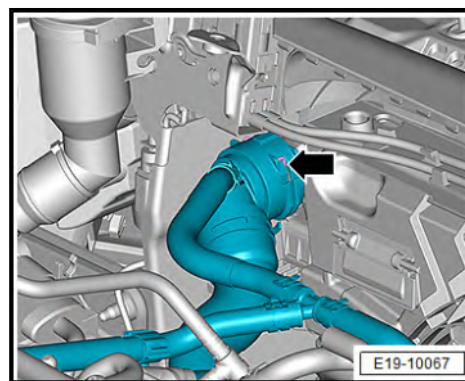
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63; Front bumper; Removing and installing bumper cover.
- Install radiator cowl ⇒ [a4.5 nd installing radiator cowl](#), page 306 .
- Connect coolant hose with plug-in connector ⇒ [page 284](#) .
- If radiator has been renewed, renew entire coolant.
- Add coolant ⇒ [page 240](#) .

Torque settings

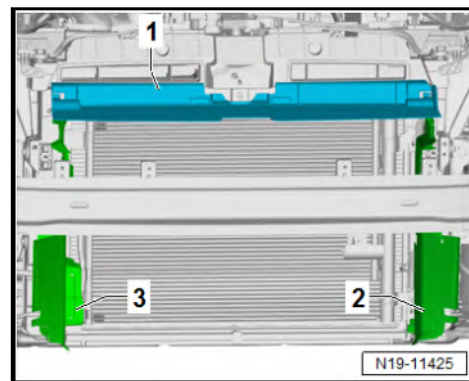
- ♦ ⇒ [o4.1 verview – radiator](#), page 281

4.4.3 Removing and installing radiator, T-Roc, T-Roc Cabrio

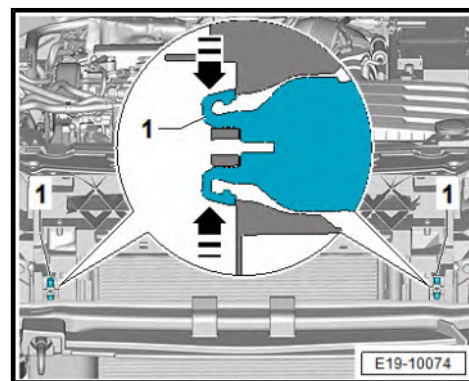
Removing



- Remove bumper cover ⇒ General body repairs, exterior; Rep. gr. 63; Body, front; Removing and installing bumper cover.
- Remove radiator cowl ⇒ [a4.5 nd installing radiator cowl](#), page 306 .
- Drain coolant ⇒ [a1.3.1 nd adding coolant](#), page 240 .
- Release clip -arrow-.
- Pull coolant hose on top left off radiator.
- Release and detach air ducts -1...3-.



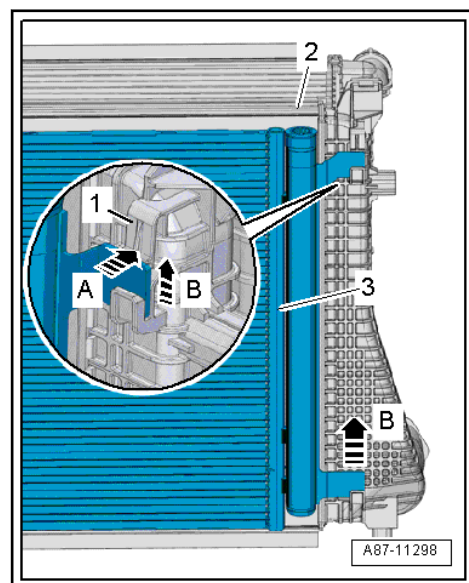
- Release locking lugs -arrows- of radiator mountings -1- on left and right, or pinch them off using side cutters.



Note

After the locking lugs have been pinched off, secure the radiator mountings with bolts as per ⇒ Electronic parts catalogue (ET-KA).

Vehicles with air conditioning system



- Push radiator -2- at top slightly in direction of engine.
- Release locking lugs -1- on left and right in direction of -arrow A-.

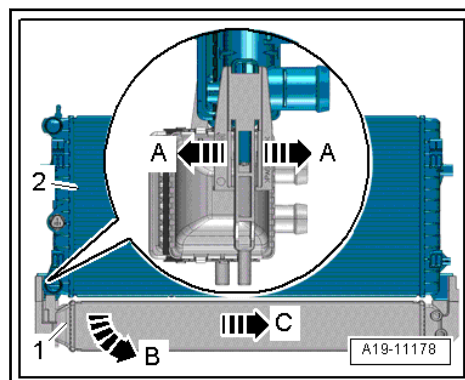


- Pull condenser -3- in direction of -arrow B-, and detach it from radiator.
- Tie up condenser -3- on lock carrier.

Continued for all vehicles

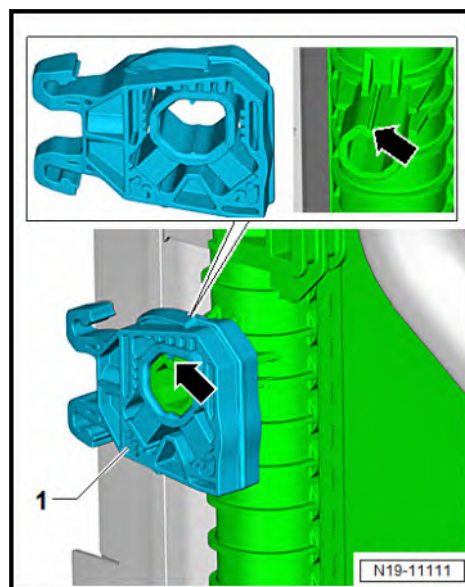
- Pull radiator at bottom out of mountings.
- Remove radiator and water radiator for charge air cooling circuit.

Separating radiator and water radiator for charge air cooling circuit



- Release locking lugs on water radiator for charge air cooling circuit -1- in direction of -arrow A-.
- Pull water radiator for charge air cooling circuit -1- off radiator -2- -arrow B-, and detach it -arrow C-.
- Remove both radiators.

Installing



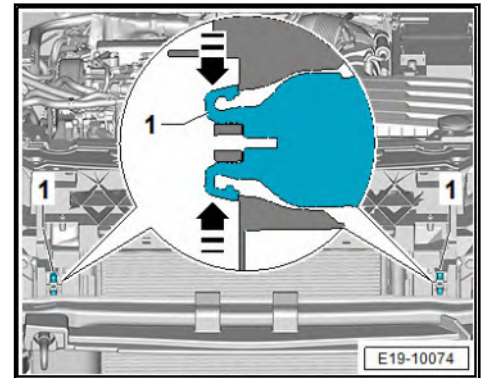
Install in reverse order of removal, observing the following:



Note

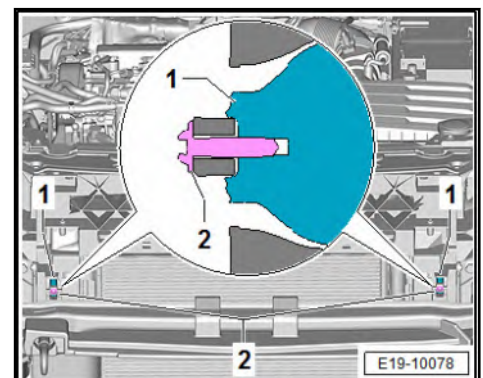
- ◆ If there are minor dents in the fins, refer to [⇒ r3.7 radiators and condensers](#), page 9.
- ◆ Renew O-rings after removal.
- Fit radiator mountings -1- on left and right onto radiator. When doing so, note the installation position -arrows-.

When radiator mountings are not secured with bolts



- Ensure proper seating of radiator mountings -1- in lock carrier.

When radiator mountings are secured with bolts



- If the locking lugs of radiator mountings -1- have been pinched off, use bolts -2- ⇒ Electronic parts catalogue (ET-KA).
- If radiator has been renewed, renew entire coolant.
- Add coolant [⇒ a1.3.1 nd adding coolant](#), page 240.

Specified torques

- ◆ [⇒ o4.1.3 verview - radiator/radiator fan, T-Roc, T-Roc Cabrio](#), page 285

4.4.4 Removing and installing radiator, T-Cross

Special tools and workshop equipment required



- ◆ Drip tray for workshop hoist -VAS 6208-

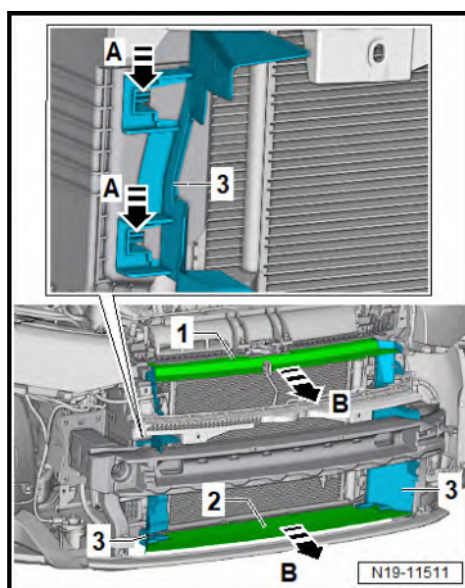


Removing

CAUTION

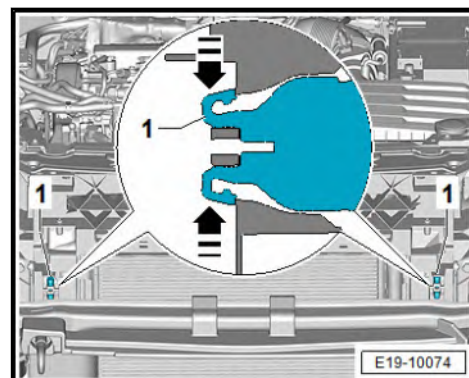
Danger of injury; the radiator fans can run at any time.

- Disconnect electrical connectors:
- Remove radiator cowl ⇒ [a4.5 nd installing radiator cowl", page 306](#) .
- Remove bumper cover ⇒ General body repairs, exterior; Rep. gr. 63; Body - front; Removing and installing bumper cover.
- Pull off air ducts -1 and 2- towards front in direction of -arrow B-.



- Release all fasteners -arrows A-, pull off air ducts -3-, and remove them from behind lock carrier.

Vehicles with original radiator mounting carrier



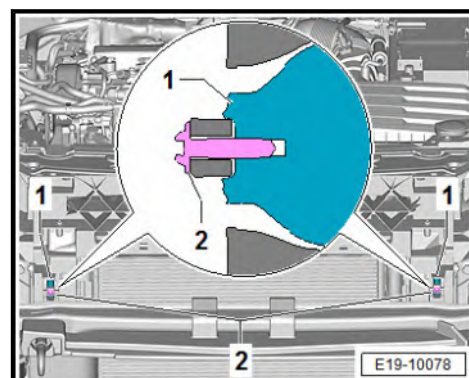
- Release fasteners -arrows- of radiator mounting -1-, or pinch them off using diagonal cutter.



Note

The radiator mounting carrier will be reused for reinstallation. It will then be bolted to the lock carrier. For bolts, refer to ⇒ Electronic parts catalogue (ETKA).

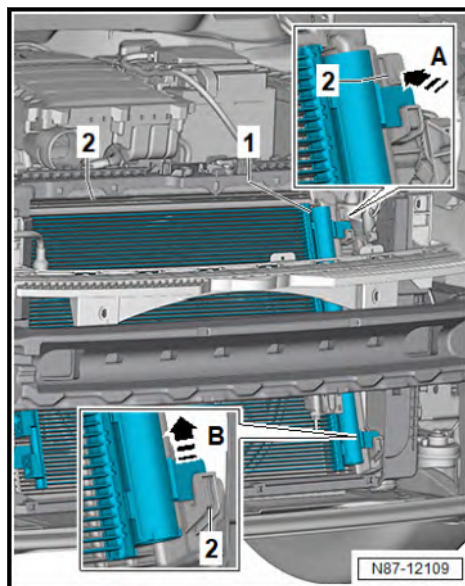
Vehicles with bolted radiator mounting carrier



- Unscrew bolts -2- of radiator mounting carrier -1-.

Continued for all vehicles

- Tilt radiator as far as possible towards engine.
- Press fasteners -arrow A- on both sides to release.



- Push condenser -1- upwards in direction of -arrow B-, and suspend it with lines connected.
- Remove radiator -2- upwards.

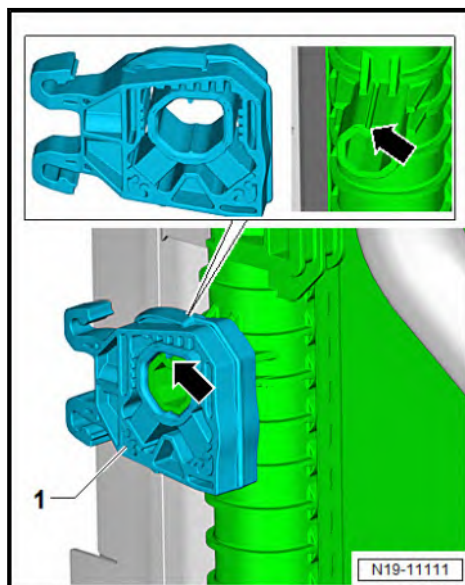
Installing

Install in reverse order of removal, observing the following:

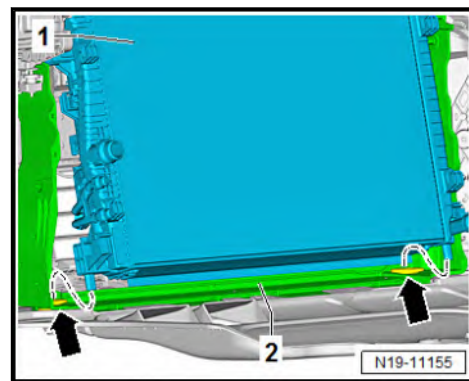


Note

- ♦ If there are minor dents in the fins, refer to [⇒ page 9](#).
- ♦ Renew O-rings after removal.
- Fit radiator mounting -1- onto charge air cooler. When doing so, note the installation position -arrow-.

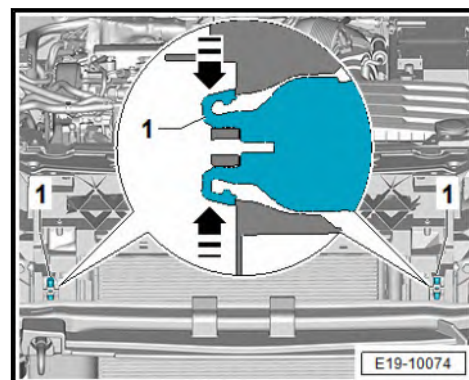


- Insert radiator into mountings -arrows- in lock carrier.



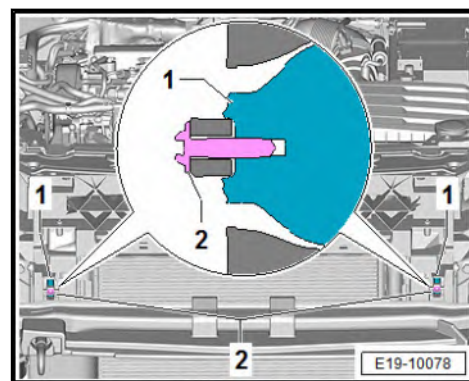
- Swing radiator into lock carrier. Ensure proper seating of radiator mountings in lock carrier.
- Attach condenser to radiator, and engage it.

When radiator mountings are not secured with bolts

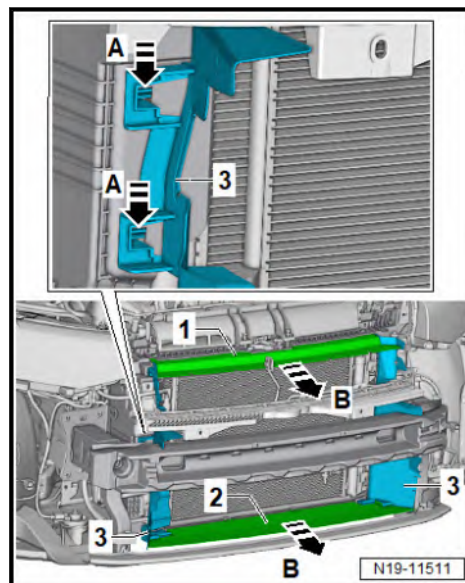


- Ensure proper seating of radiator mountings -1- in lock carrier.

When radiator mountings are secured with bolts



- If the locking lugs of radiator mountings -1- have been pinched off, use bolts -2- ➔ Electronic parts catalogue (ET-KA).
- Install air ducts -3-, and engage fasteners -arrow A-.



- Clip in air ducts -1 and 2- on both sides.
- Install radiator cowl ⇒ [a4.5 nd installing radiator cowl", page 306](#) .
- Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63; Front bumper; Removing and installing bumper cover.
- Connect coolant hose with plug-in connector ⇒ [page 284](#) .
- If radiator has been renewed, renew entire coolant.
- Add coolant ⇒ [page 240](#) .

Torque settings

- ♦ ⇒ [o4.1 verview – radiator", page 281](#)

4.5 Removing and installing radiator cowl

⇒ [a4.5.1 nd installing radiator cowl", page 306](#)

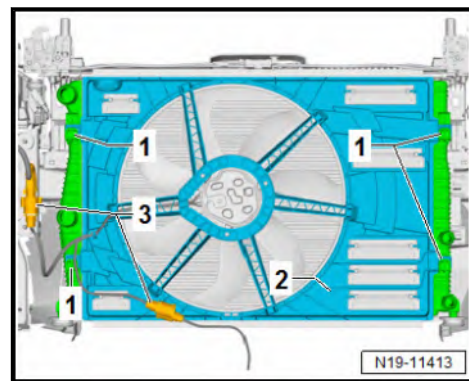
4.5.1 Removing and installing radiator cowl

Removing

CAUTION

Danger of injury; the radiator fans can run at any time.

- Disconnect electrical connectors:
- Remove air duct on lock carrier ⇒ [page 362](#) .
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.
- Separate connector -3- for radiator fan.



- Simultaneously press locking tabs on left and right of radiator cowl -1-.
- Lift radiator cowl -2- upwards out of mountings -1- from radiator.
- Carefully remove radiator cowl downwards.

Installing

Install in reverse order of removal, observing the following:

- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview – noise insulation.
- Add coolant ⇒ [a1.3 nd adding coolant", page 240](#) .

Torque settings

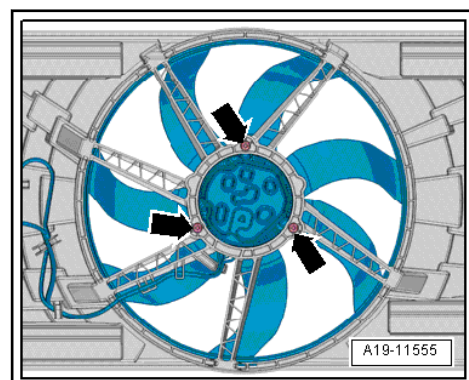
- ◆ ⇒ [o3.1 verview - air filter housing", page 357](#)

4.6 Removing and installing radiator fan - V7-

⇒ [a4.6.1 nd installing radiator fanV7", page 307](#)

4.6.1 Removing and installing radiator fan - V7-

Removing



Note

Attach cable ties in all the same places when installing.



- Remove radiator cowl ⇒ [page 306](#) .
- Move wiring harness clear.
- Unscrew bolts -arrows-.
- Remove radiator fan -V7-.

Installing

Install in reverse order of removal, observing the following:

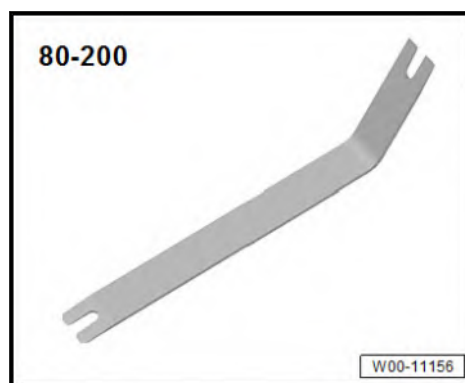
Torque settings

- ♦ ⇒ [o4.1 verview – radiator”, page 281](#)

4.7 Removing and installing radiator blind

Special tools and workshop equipment required

- ♦ Release lever -80 - 200-

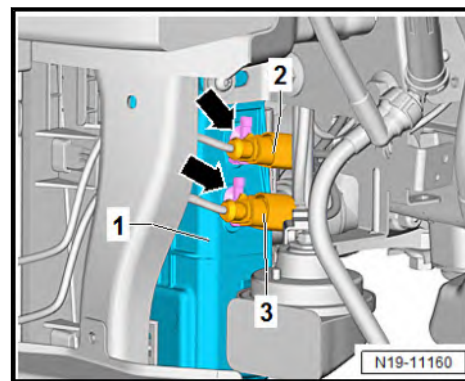


- ♦ Removal wedge -3409-

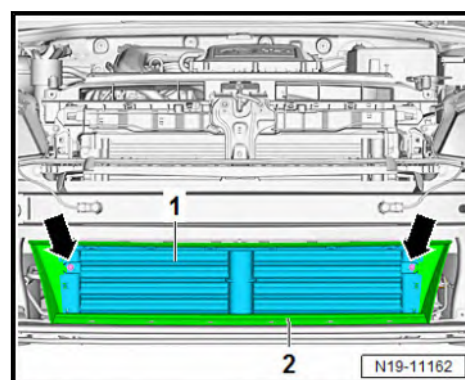


Removing:

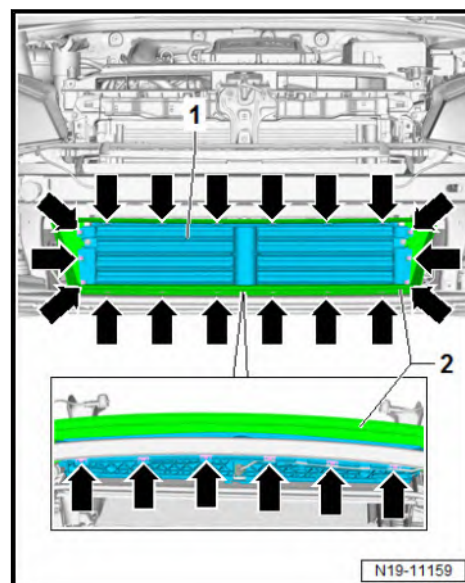
- Remove noise insulation ⇒ Rep. gr. 66; Noise insulation; Removing and installing noise insulation.
- Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63; Front bumper; Removing and installing bumper cover.
- Release and pull off connectors -2- and -3-.



- Unclip bracket -arrows- from front end -1-.
- Unscrew bolts -arrows-.



- Pull radiator blind -1- together with seal -2- towards front.
- Secure radiator blind -1- to prevent it from falling.
- Unclip seal -2- on retaining tabs -arrows-.



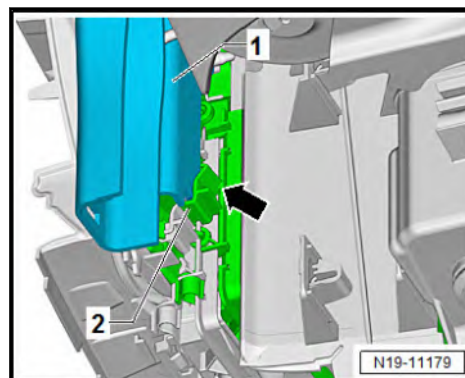
- Remove seal -2- from radiator blind -1-.
- Remove radiator blind -1- downwards.

Installing:

Install in reverse order of removal, observing the following:



- Make sure that the guides of radiator blind -2- are properly seated on bumper carrier -1- -arrow-.

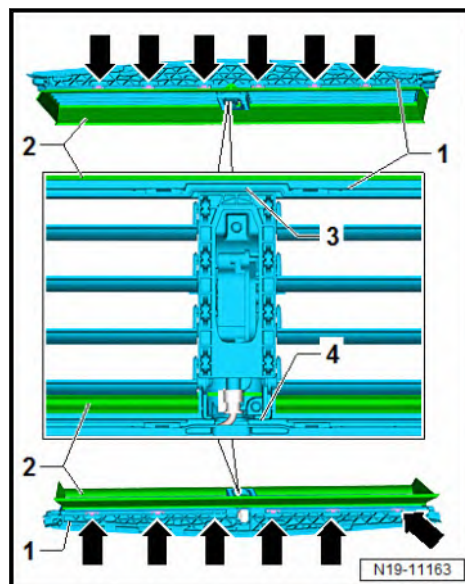


- After replacing radiator blind, a basic setting must be performed.
- Use ⇒ Vehicle diagnostic tester for this.
- Clear event memory ⇒ Vehicle diagnostic tester.
- Restore operational readiness then select and execute the following menu options on ⇒ Vehicle diagnostic tester:

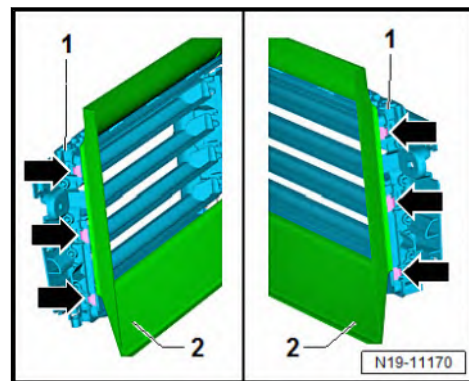
◆ 0001 - Adaption of radiator blind control motor - V544

4.8 Removing and installing radiator blind control motor -V544-

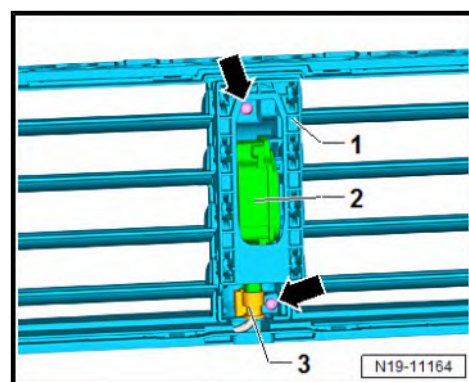
- Remove radiator blind ⇒ [a4.7 nd installing radiator blind](#)", [page 308](#) .
- Unclip seal -2- at top and bottom on retaining tabs -arrows-.



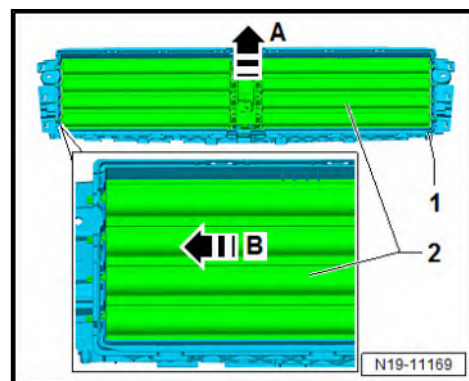
- Pull seal -2- off radiator blind -1-.
- Unclip seal -2- on left and right on retaining tabs -arrows-.



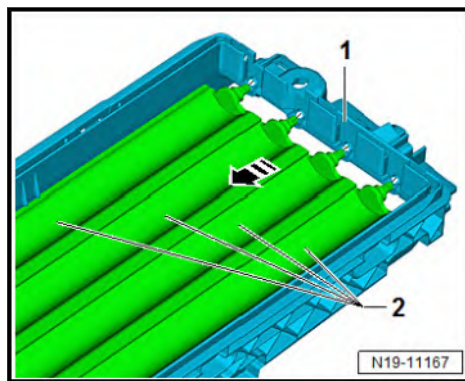
- Remove seal -2- from radiator blind -1-.
- Set flaps of radiator blind to open position as shown in illustration.



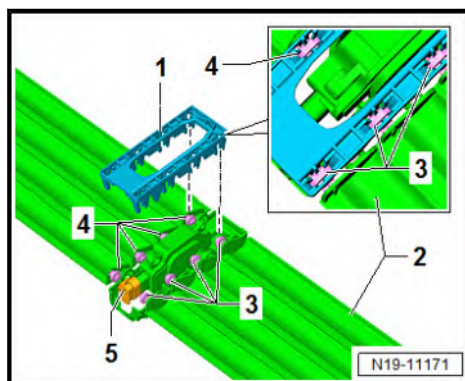
- To do this, move connecting piece -1-.
- Release and pull off connector -3-.
- Unscrew bolts -arrows-.
- Lift radiator blind control motor -V544- together with flaps upwards out of motor mounting ⇒ [Item 3 \(page 288\)](#) .



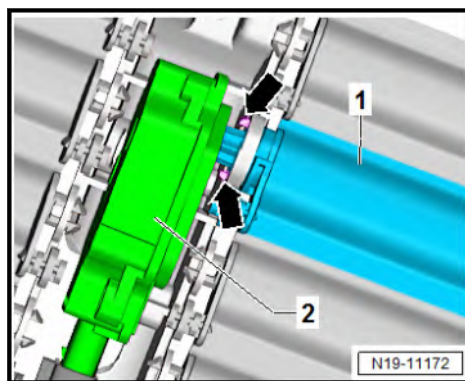
- Push radiator blind control motor -V544- with flaps -2- as far to the left as possible -arrow B-.
- Lever flaps -2- on right side out of frame -1-.



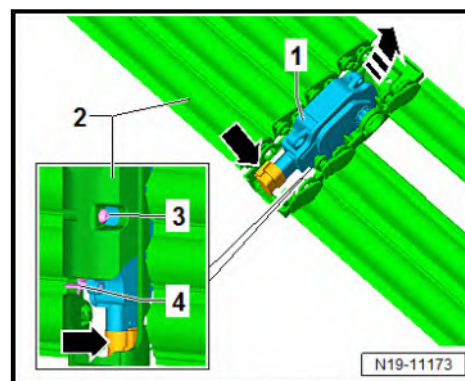
- Mark installation position of connecting piece -1-.



- Use connector contact -5- as a reference.
- Lever connecting piece -1- off guide rollers -3- and -4- of flaps -2-.
- Pull control flap -1- off radiator blind control motor -V544- -2-.



- To do this, release retaining clips -arrows-.
- Unscrew bolt -3-.

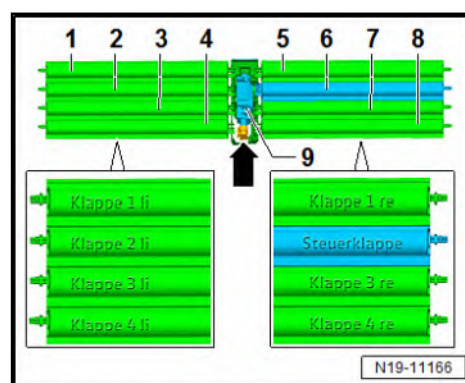


- Carefully swing radiator blind control motor -V544- upwards in -direction of arrow-.
- Pull radiator blind control motor -V544- off pin -4-.
- Release and remove flaps on engine mounting ➔ [Item 8 \(page 288\)](#) .

Installing

Install in reverse order of removal, observing the following:

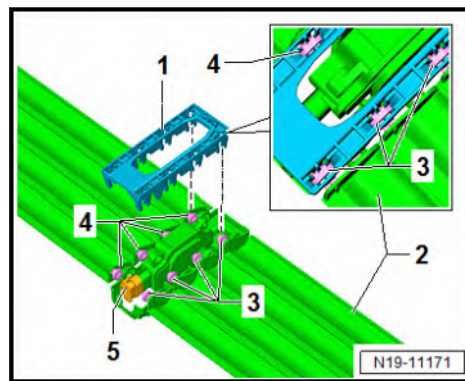
- Insert flaps -1- to -8- as shown in illustration, and engage them.



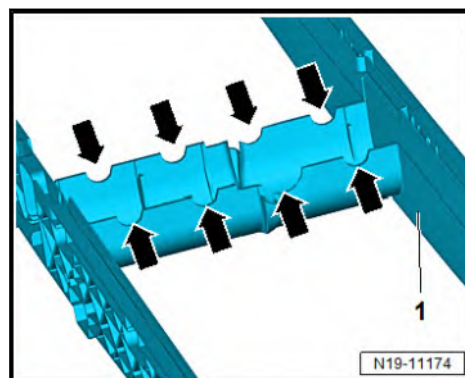
- Insert control flap -6-, and engage it.
- Note position of connector contact -arrow- when installing. The connector contact must face downwards.
- Note arrangement of flaps. The flaps are located on top of one another.
- The upper flaps rest on the flaps located below them.

Num-ber	Left flaps	Num-ber	Right flaps
1	Flap 1, left	5	Flap 1, right
2	Flap 2, left	6	Control flap
3	Flap 3, left	7	Flap 3, right
4	Flap 4, left	8	Flap 4, right

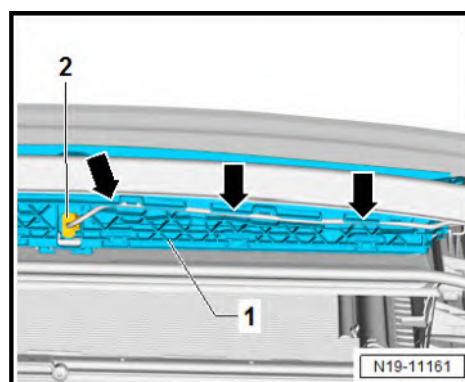
- Fit connecting piece -1- in correct installation position.



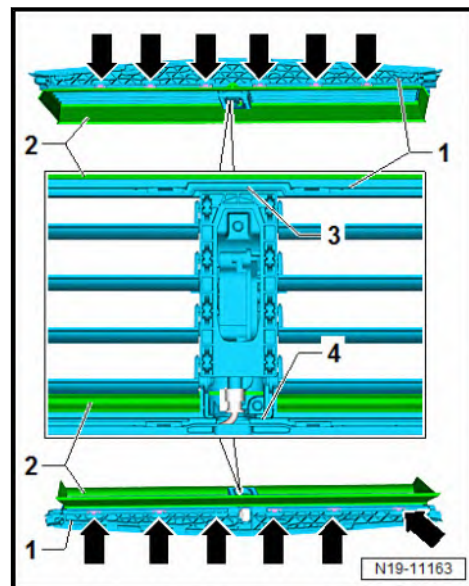
- Use the marking made beforehand or the connector contact -arrow- as a reference.
- Make sure that the connecting piece is properly seated on guide rollers.
- Insert flaps with radiator blind control motor -V544- into frame.
- Bolt on radiator blind control motor -V544-, and connect connector.
- Insert radiator blind control motor -V544- with flaps into frame -1-.



- Make sure that the flaps of radiator blind control motor -V544- are properly seated in mountings -arrows-.
- Connect connector -2-.



- Clip in wiring harness -arrows-.
- Fit seal -2- to frame of radiator blind -1-.



- When doing this, make sure it is properly positioned at recesses -3- and -4-.
 - Clip in seal -2-.
 - After replacing radiator blind control motor -V544-, a basic setting must be performed.
 - Use ⇒ Vehicle diagnostic tester for this.
 - Clear event memory ⇒ Vehicle diagnostic tester.
 - Restore operational readiness then select and execute the following menu options on ⇒ Vehicle diagnostic tester:
- ◆ 0001 - Adaption of radiator blind control motor - V544



21 – Turbocharging/supercharging

1 Turbocharger

⇒ [o1.1 verview - turbocharger", page 316](#)

⇒ [a1.2 nd installing turbocharger", page 319](#)

⇒ [a1.3 nd installing charge pressure control moduleGX34", page 325](#)

⇒ [a1.4 nd installing connection for turbocharger", page 326](#)

1.1 Assembly overview - turbocharger

Part 1



1 - Bolt

- ☐ 8 Nm

2 - Union

- ☐ Removing and installing ➤ [page 326](#)

3 - Connection

4 - Bolt

- ☐ 25 Nm

5 - Bolt

- ☐ 8 Nm

6 - Heat shield

- ☐ Removing and installing ➤ [page 321](#)

7 - O-ring

- ☐ Renew

8 - Turbocharger

- ☐ Removing and installing ➤ [a1.2 nd installing turbocharger", page 319](#)

9 - Seal

- ☐ Removing and installing ➤ [page 324](#)
- ☐ Renew

10 - Screw-type clamp

- ☐ Renew
- ☐ Specified torque and tightening sequence ➤ [Fig. "Installing catalytic converter - specified torque and tightening sequence:", page 406](#)

11 - O-ring

- ☐ Renew

12 - Stud

- ☐ Bolted into cylinder head
- ☐ 16 Nm

13 - Seal

- ☐ Renew

14 - Nut

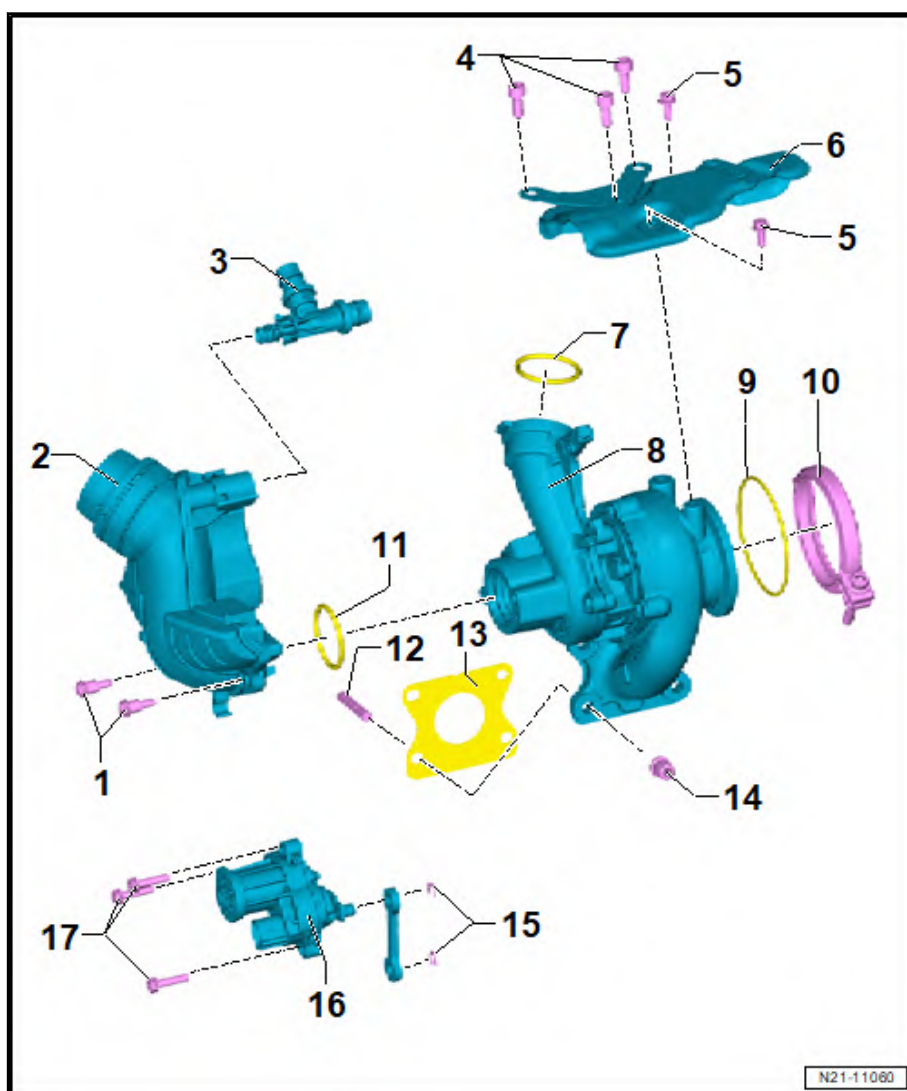
- ☐ Renew

Torque in clockwise direction:

- ☐ Stage 1: 7 Nm
- ☐ Stage 2: 10 Nm
- ☐ Stage 3: 14 Nm

15 - Retaining clip

- ☐ For actuating lever
- ☐ Renew





16 - Charge pressure control module -GX34-

- ☐ Consisting of:
- ◆ Charge pressure positioner -V465-
- ◆ Position sender for charge pressure positioner -G581-
- ☐ Removing and installing ⇒ [a1.3 nd installing charge pressure control moduleGX34", page 325](#)

17 - Bolt

- ☐ Renew
- ☐ 8 Nm +90°
- ☐ When using insert tool -T10572- and torque wrench -V.A.G 1783-, observe corrected specified torque of 4.2 Nm +90°

Part 2



1 - Oil supply line

2 - Bolt

- ☐ 8 Nm

3 - O-ring

- ☐ Qty. 2
- ☐ Renew, see ➤ Electronic parts catalogue (ET-KA)

4 - Hose

- ☐ For crankcase ventilation.

5 - O-ring

- ☐ Renew, see ➤ Electronic parts catalogue (ET-KA)

6 - Turbocharger

- ☐ Removing and installing ➤ [a1.2 nd installing turbocharger](#), page 319

7 - O-ring

- ☐ Qty. 2
- ☐ Renew, see ➤ Electronic parts catalogue (ET-KA)

8 - Oil return line

9 - Bolt

- ☐ 8 Nm

10 - Coolant lines

- ☐ Supply and return

11 - Bolt

- ☐ 8 Nm

12 - Seal

- ☐ Renew

13 - Bolt

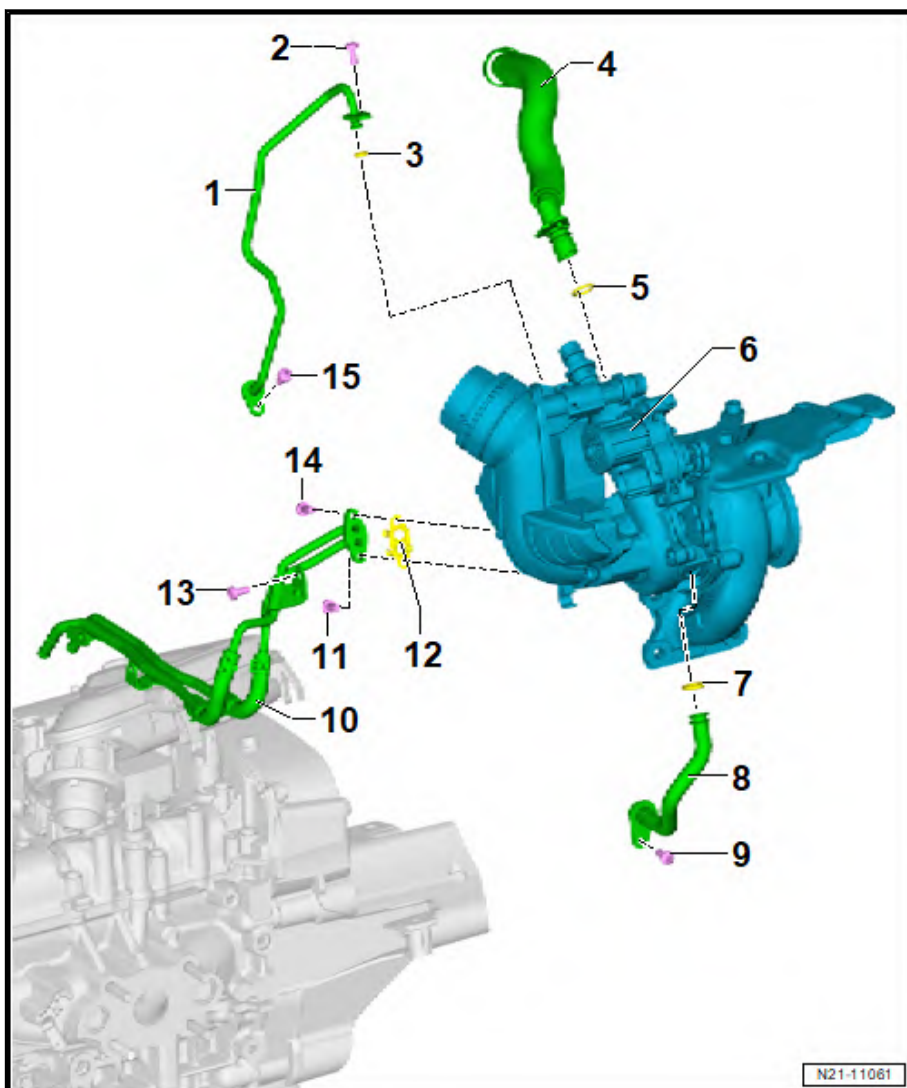
- ☐ 8 Nm

14 - Bolt

- ☐ 8 Nm

15 - Bolt

- ☐ 8 Nm



1.2 Removing and installing turbocharger

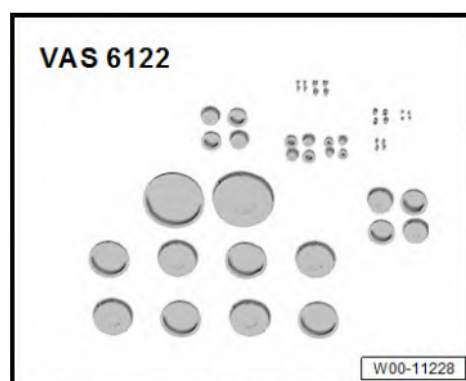
Special tools and workshop equipment required



- ◆ Drip tray for workshop hoist -VAS 6208-



- ◆ Engine bung set -VAS 6122-



- ◆ Socket Torx T 30 -T10405-



- ◆ Removal tool -T10498-



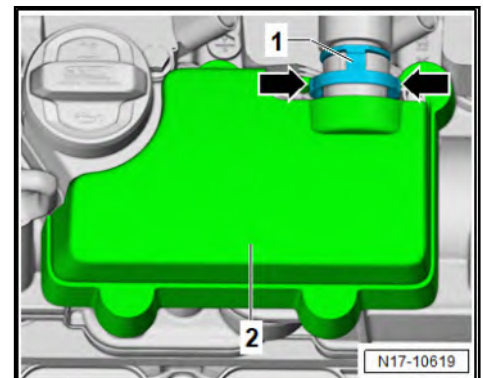


Removing

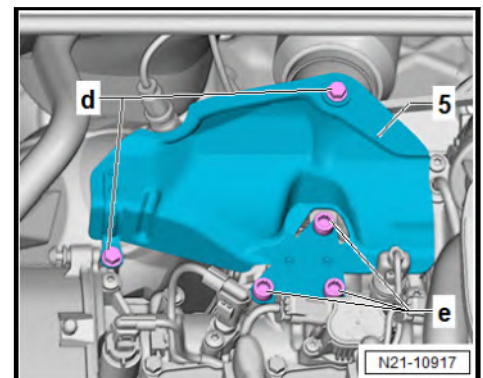


Note

- ◆ *Fit all heat shield sleeves in the same place when installing.*
- ◆ *If a mechanical fault is discovered on the turbocharger (e.g. a destroyed compressor impeller), it is not sufficient to just renew the turbocharger. To avoid any subsequent damage, the following work must be carried out:*
- ◆ *Check air filter housing, air filter element and air inlet hoses for contamination.*
- ◆ *Check the whole charge air path and charge air cooler for foreign objects.*
- ◆ *If foreign objects are discovered in the charge air system, clean the charge air path and, if necessary, renew the charge air cooler.*
- ◆ *Seal any open connections in the air and exhaust gas system using the engine bung set -VAS 6122-.*
- Remove air intake pipe between charge air cooler and turbocharger ➔ [page 336](#) .
- Remove connection for turbocharger ➔ [page 326](#) .
- Remove charge pressure control module -GX34- ➔ [a1.3 nd installing charge pressure control module GX34", page 325](#) .
- Press release buttons -arrows- on crankcase breather hose -1- and pull off hose from upper oil separator -2-.



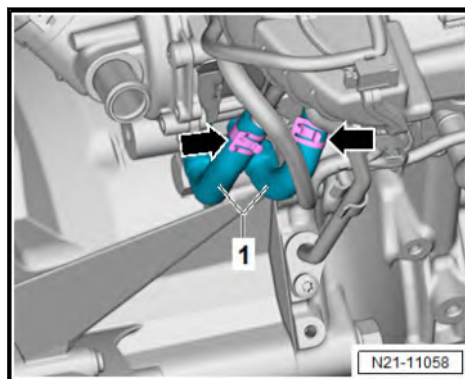
- Remove upper heat shield above turbocharger and catalytic converter.



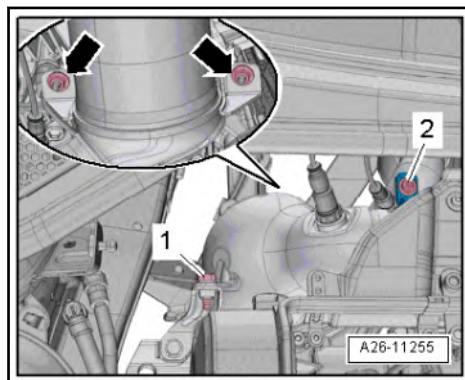
- To do this, unscrew bolts -d- and -e-, and remove heat shield -5-.



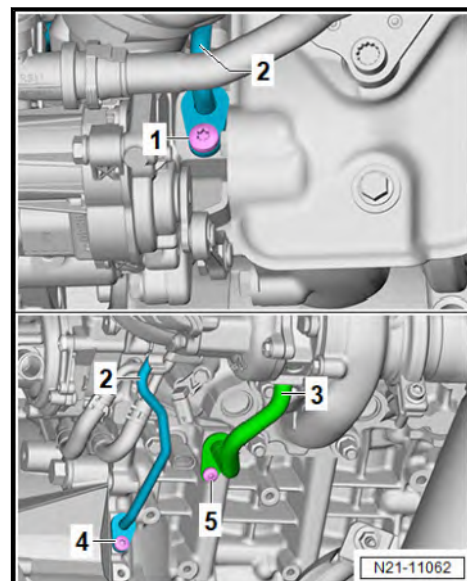
- Place drip tray for workshop hoists -VAS 6208- underneath to catch any fluids.
- Remove drive shaft heat shield ⇒ Running gear, axles, steering; Rep. gr. 40; Drive shaft; Removing and installing drive shaft heat shield.
- Loosen hose clips -arrows- and pull off coolant hoses -1-.



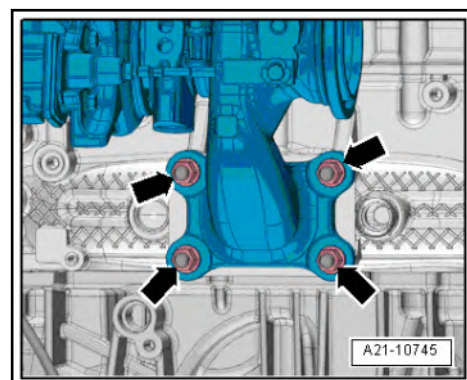
- Clamp off coolant hoses leading to coolant pipes using hose clamps, up to 25 mm -3094-.
- Loosen hose clips -arrows-, and pull off coolant hoses.
- Mark installation position of screw-type clip -2- between turbocharger and catalytic converter ⇒ [Fig. "Clamp position", page 407](#).



- Loosen screw-type clip -2-, and remove it.
- Unscrew bolt -1-.
- Loosen nuts -arrows-.
- Loosen any remaining threaded connections of catalytic converter on bracket and on engine ⇒ [o2.1 overview - emission control", page 404](#).
- Push catalytic converter towards right side.
- Place a cloth under oil lines to catch any oil which may drain out.
- Remove oil supply line -2-, unscrewing bolts -1- and -4- to do so.



- Unscrew bolt -5- and remove oil return line -3-.
- Unscrew nuts -arrows-.

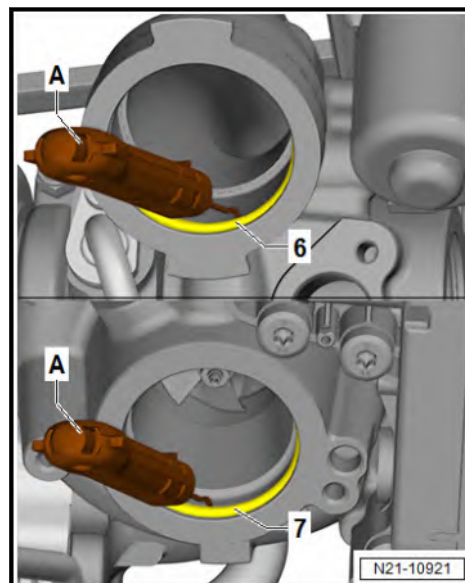


- Pull turbocharger and oil return line evenly towards rear.
- Remove turbocharger together with coolant pipes and oil return line from engine.
- Take out turbocharger together with coolant pipes and oil return line upwards.

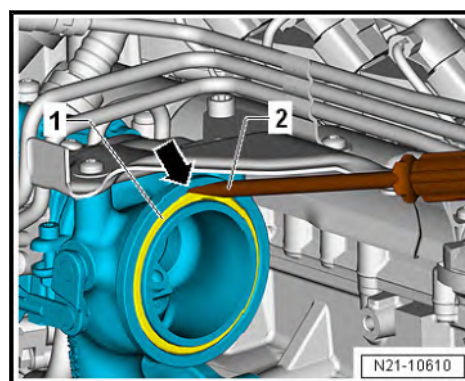
Installing

Install in reverse order of removal, observing the following:

- Use removal tool -T10498- -A- to pull out seal -6-.



- Use removal tool -T10498- -A- to pull out seal -7-.
- Renew seals, O-rings and securing nuts.
- Before installing, lightly moisten O-rings with clean engine oil.
- Mount turbocharger and screw on nuts.
- Fit oil return line to engine and turbocharger. Align oil return line, and tighten bolts by hand.
- Fill turbocharger with engine oil at connection for oil supply line.
- Fit oil supply line to engine and turbocharger. Align oil supply line, and tighten bolts by hand.
- Tighten nuts and bolts.
- Lever out seal between turbocharger and catalytic converter, and renew it.



- To do this, insert a screwdriver -2- in recess -arrow- on turbocharger.
- Renew screw-type clip between turbocharger and catalytic converter ⇒ [Item 9 \(page 406\)](#) .
- Install screw-type clip between turbocharger and catalytic converter in the installation position which has been marked prior to removal ⇒ [Fig. "Clamp position", page 407](#) .
- Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue.



- Fit catalytic converter, and tighten it ⇒ [Fig. ““Installing catalytic converter - specified torque and tightening sequence:””, page 406](#) .
- Observe electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Add coolant ⇒ [a1.3 nd adding coolant”, page 240](#) .
- After installing turbocharger, run engine for about 1 minute at idling speed to ensure that oil is supplied to turbocharger.

If a new turbocharger with charge pressure positioner has been installed:

- Adapt engine control unit -J623- to charge pressure positioner -V465- ⇒ Vehicle diagnostic tester.

◆ `0001 - Basic setting`

◆ `0001 - Adaption charge pressure positioner V465`

Torque settings

- ◆ ⇒ [o1.1 verview - turbocharger”, page 316](#)
- ◆ ⇒ [Fig. ““Installing catalytic converter - specified torque and tightening sequence:””, page 406](#)
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 40; Drive shaft; Assembly overview - drive shaft

1.3 Removing and installing charge pressure control module -GX34-

Special tools and workshop equipment required

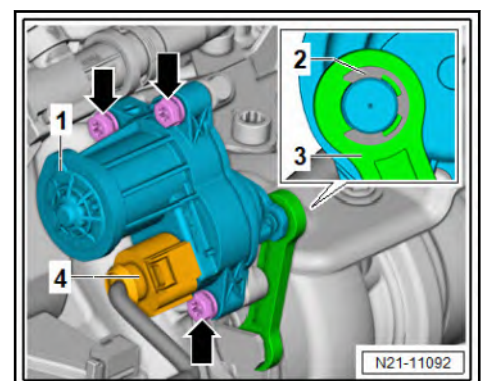
- ◆ Socket set -VAS 6928-

The charge pressure control module -GX34- comprises the following components:

- ◆ Charge pressure positioner -V465-
- ◆ Position sender for charge pressure positioner -G581-

Removing

- Remove connection for turbocharger ⇒ [page 326](#) .
- Release and pull off electrical connector -4-.



- Pull off securing clip -2-, and remove control rod -3- from control lever.
- Unscrew bolts -arrows- and remove charge pressure control module -GX34- -1-.



Installing

Install in reverse order of removal, observing the following:

Always renew securing bolts and the securing clip.

- Adapt engine control unit -J623- to charge pressure positioner -V465- ⇒ Vehicle diagnostic tester.

◆ 0001 - Basic setting

◆ 0001 - Adaption charge pressure positioner V465

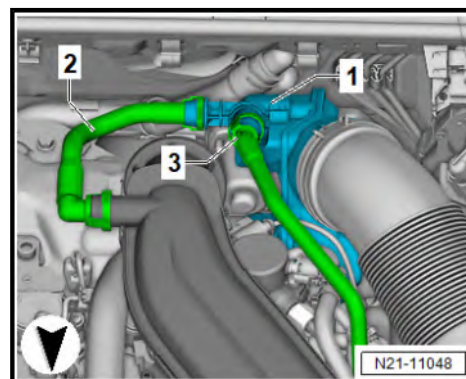
Torque settings

- ◆ ⇒ [o1.1 verview - turbocharger", page 316](#)
- ◆ ⇒ Running gear, axles, steering; Rep. gr. 40; Drive shaft; Assembly overview - drive shaft

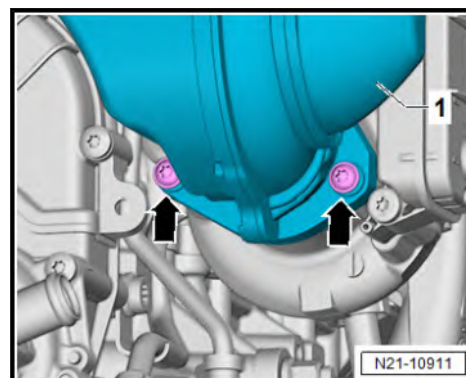
1.4 Removing and installing connection for turbocharger

Removing

- Remove air filter housing. ⇒ [a3.2 nd installing air filter housing", page 359](#)
- Release and pull off breather lines -2- and -3- at connection -1-.



- To do this, press together webs of locking mechanism on both sides of breather lines.
- Unscrew (encapsulated) bolts -arrows- and remove connection -1-.



Installing

Install in reverse order of removal, observing the following:

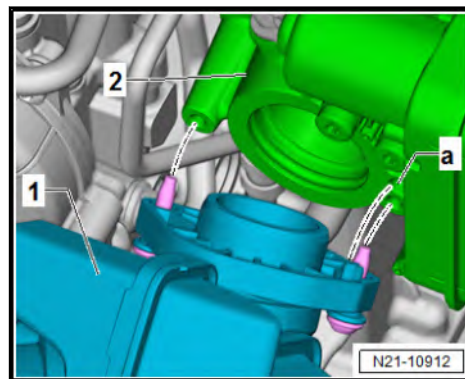


Note

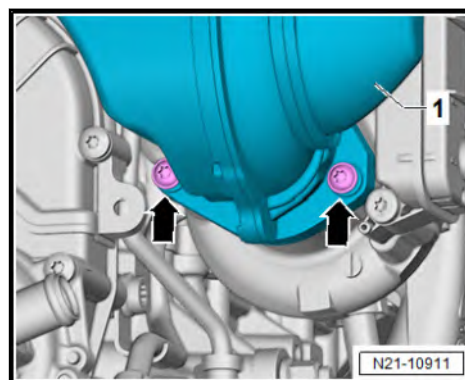
Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue.

- Renew O-ring.
- Before installing, lightly moisten O-rings with clean engine oil.

Installation position



- Fit connection -1- to turbocharger -2-.
- Pin on connection must engage in hole -a- on turbocharger.
- Tighten securing bolts -arrows- for connection -1-.



Specified torques

- ♦ ⇒ [o1.1 verview - turbocharger", page 316](#)



2 Charge air system

⇒ [o2.1 verview - charge air system", page 328](#)

⇒ [a2.2 nd installing charge air cooler", page 330](#)

⇒ [a2.3 nd installing charge pressure senderGX26", page 331](#)

⇒ [c2.4 harge air system for leaks", page 332](#)

⇒ [a2.5 nd installing air pipe", page 336](#)

2.1 Assembly overview - charge air system



Note

Before performing any checks or any repair work, make sure that all air pipes, air hoses and vacuum lines are firmly seated and leak-tight.



1 - Breather line

- ☐ for vehicles with pressure sensor for activated charcoal filter air flushing -GX44-
- ☐ Connection diagram
⇒ Rep. gr. 20; Activated charcoal filter system, without fuel tank leak detection; Connection diagram – activated charcoal filter system

2 - Seal

- ☐ Check for damage, renew if necessary. See
⇒ Electronic parts catalogue (ETKA)

3 - Bolt

- ☐ Torque ⇒ [page 365](#)

4 - Intake manifold sender - GX9-

- ☐ Consisting of:
- ◆ Intake manifold pressure sender -G71-
- ◆ Intake manifold temperature sender -G72-
- ☐ Removing and installing ⇒ [a5.3 nd installing intake manifold senderGX9", page 375](#)
- ☐ Assembly overview ⇒ [o4.1 verview - intake manifold", page 365](#)

5 - O-ring

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

6 - Intake manifold

- ☐ Assembly overview ⇒ [o4.1 verview - intake manifold", page 365](#)
- ☐ Removing and installing ⇒ [a4.2 nd installing intake manifold", page 367](#)

7 - Seal

- ☐ Moisten with engine oil before installing
- ☐ Renew

8 - Securing bolt

- ☐ Torque ⇒ [page 367](#)

9 - Throttle valve module -GX3-

- ☐ Consisting of:

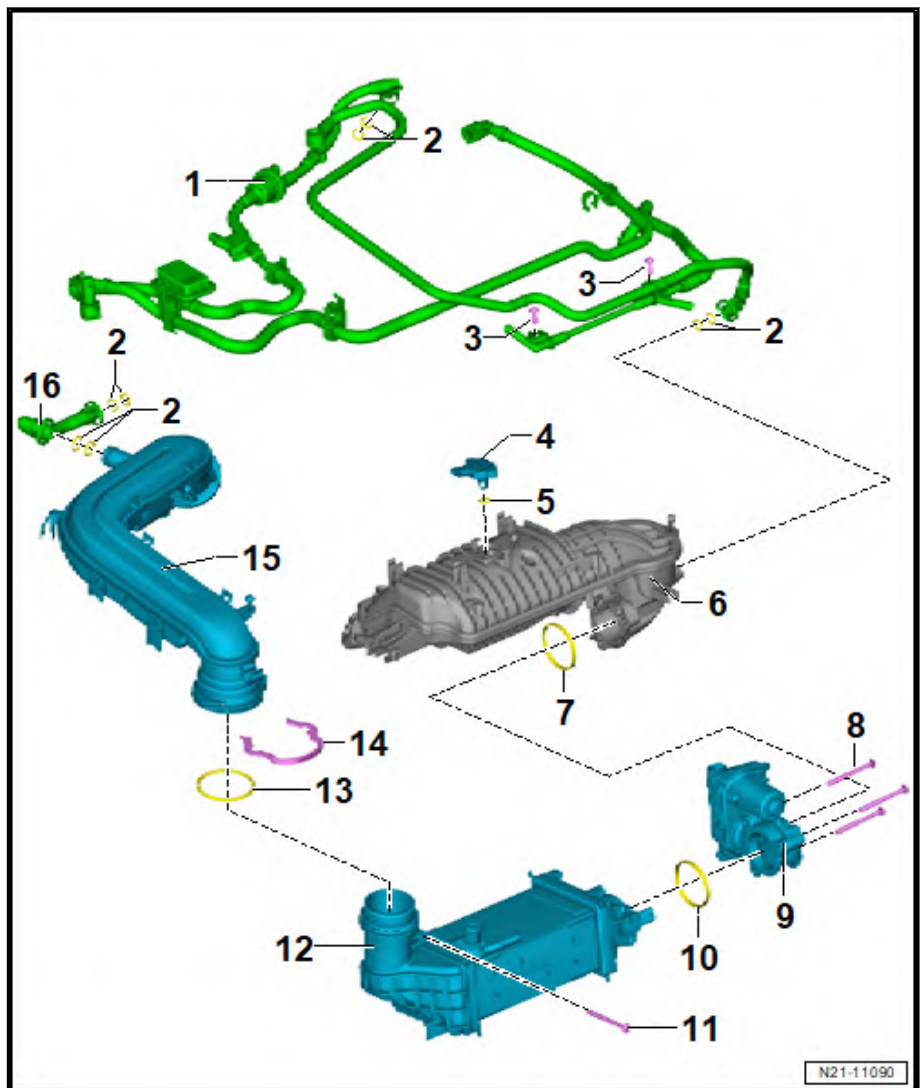
Throttle valve module -J338-

Throttle valve drive for electronic power control -G186-

Throttle valve drive angle sender 1 for electronic power control -G187-

Throttle valve drive angle sender 2 for electronic power control -G188-

- ☐ Removing and installing ⇒ [a4.3 nd installing throttle valve moduleGX3", page 369](#)
- ☐ Cleaning ⇒ [t4.4 hrottle valve moduleGX3", page 370](#)



N21-11090



10 - Seal

- ☐ Moisten with engine oil before installing
- ☐ Renew

11 - Bolt

- ☐ Torque ⇒ [o4.1 verview - intake manifold", page 365](#)

12 - Charge air cooler

- ☐ Installation position of charge pressure sender -GX26- ⇒ [Fig. "“Assembly overview - charge pressure sender -GX26-”", page 330](#)
- ☐ Removing and installing ⇒ [a2.2 nd installing charge air cooler", page 330](#)

13 - Seal

- ☐ Moisten with engine oil before installing
- ☐ Renew

14 - Retaining clip

- ☐ Renew

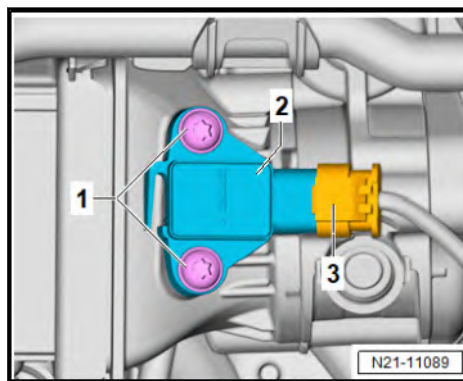
15 - Air intake pipe between charge air cooler and turbocharger

- ☐ Removing and installing ⇒ [a2.5 nd installing air pipe", page 336](#)

16 - Breather line

- ☐ for vehicles with pressure sensor for activated charcoal filter air flushing -GX44-
- ☐ between air intake pipe and connection on turbocharger
- ☐ Connection diagram ⇒ Rep. gr. 20; Activated charcoal filter system, without fuel tank leak detection;
Connection diagram – activated charcoal filter system

Assembly overview - charge pressure sender -GX26-



1 - Bolt, 3 Nm

2 - Removing and installing charge pressure sender -GX26- ⇒ [a2.3 nd installing charge pressure senderGX26", page 331](#)

3 - Electrical connector for charge pressure sender -GX26-

2.2 Removing and installing charge air cooler

⇒ [a2.2.1 nd installing charge air cooler", page 330](#)

2.2.1 Removing and installing charge air cooler

Special tools and workshop equipment required

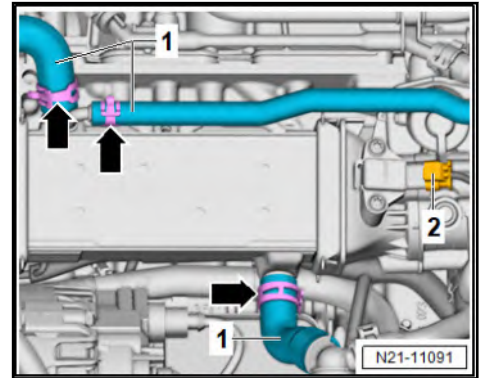


- ◆ Drip tray for workshop hoist -VAS 6208-



Removing

- Drain coolant ➔ [a1.3 nd adding coolant](#), page 240 .
- Remove intake manifold ➔ [a4.2 nd installing intake manifold](#), page 367 .
- Disconnect electrical connector -2-.



- Detach clips -arrows- and pull off coolant hoses -1- from charge air cooler.
- Remove charge air cooler upwards.

Installing

Install in reverse order of removal, observing the following:

- Renew seals.
- Install intake manifold ➔ [a4.2 nd installing intake manifold](#), page 367 .
- Add coolant ➔ [a1.3 nd adding coolant](#), page 240 .

Torque settings

- ◆ ➔ [o4.1 verview - intake manifold](#), page 365
- ◆ ➔ [o2.1 verview - charge air system](#), page 328

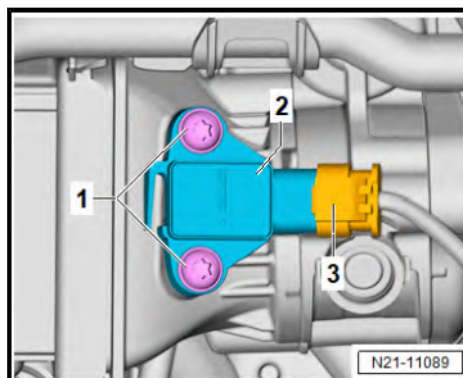
2.3 Removing and installing charge pressure sender -GX26-

Charge pressure sender -GX26- consists of:

- ◆ Charge pressure sender -G31-
- ◆ Intake air temperature sender -G42-



Removing



- Disconnect electrical connector -3-.
- Unscrew bolts -1- and remove charge pressure sender - GX26- -2-.

Installing

Install in reverse order of removal, observing the following:



Note

Renew O-ring if damaged, see → Electronic parts catalogue (ETKA).

Specified torques

- ♦ ⇒ Fig. [“Assembly overview - charge pressure sender - GX26-”, page 330](#)

2.4 Checking charge air system for leaks

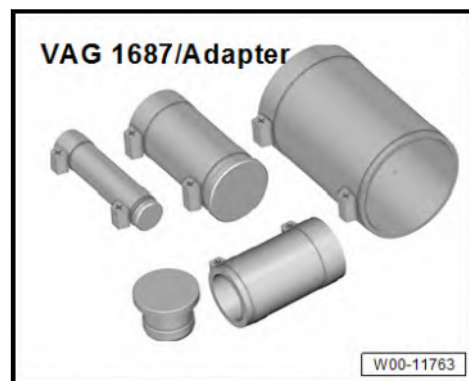
Special tools and workshop equipment required

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

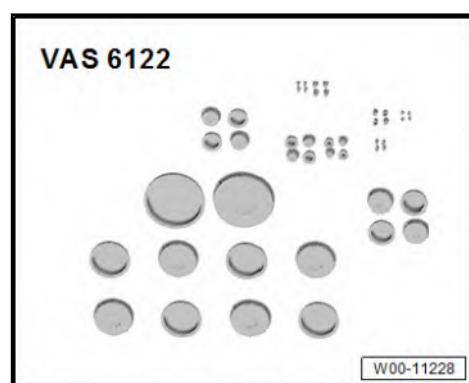




- ◆ Adapter -V.A.G 1687/10-

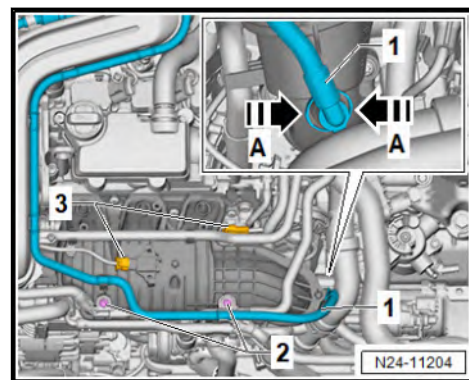


- ◆ Adapter -V.A.G 1687/20-
- ◆ Adapter -V.A.G 1687/13-2-
- ◆ Engine bung set -VAS 6122-

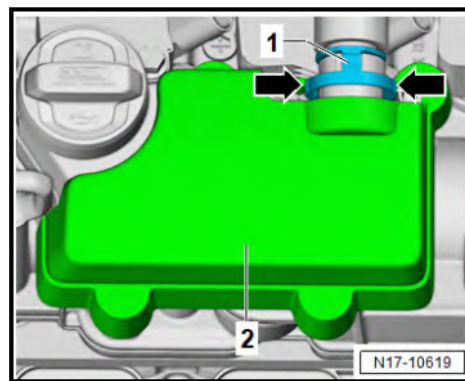


Procedure

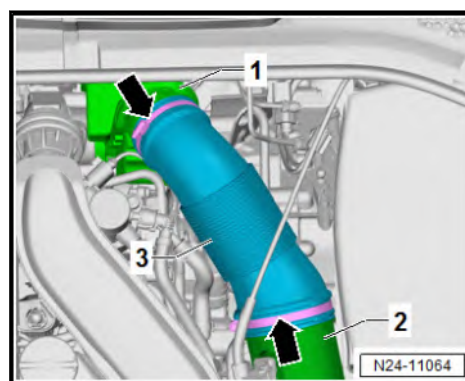
- Release catch -1- and pull off vacuum line.



- To do this, press catches in direction of -arrow-.
- Seal open connection on intake manifold using a suitable plug from engine bung set -VAS 6122-.
- Pull off bleeder line -1-. Press release tabs -arrows- to do this.

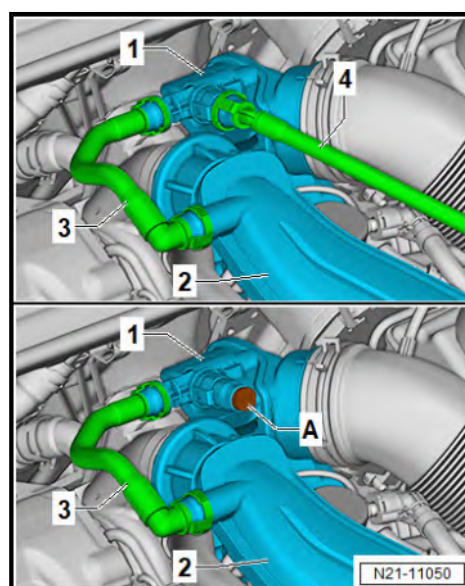


- Seal open connection on breather line using a suitable plug from engine bung set -VAS 6122-.
- Loosen hose clips -arrows- on connection -1- and on air filter housing -2-.



- Pull out air intake hose -3-.

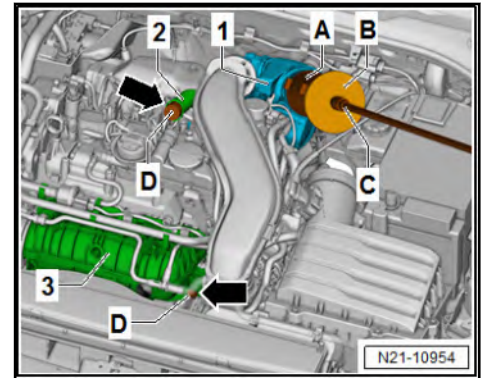
Vehicles with pressure sensor for activated charcoal filter air flushing -GX44-:



- Release and pull off breather line -4-.
- Seal open connection of intake connecting pipe on turbocharger -1- with a suitable plug from engine bung set -VAS 6122- -A-.

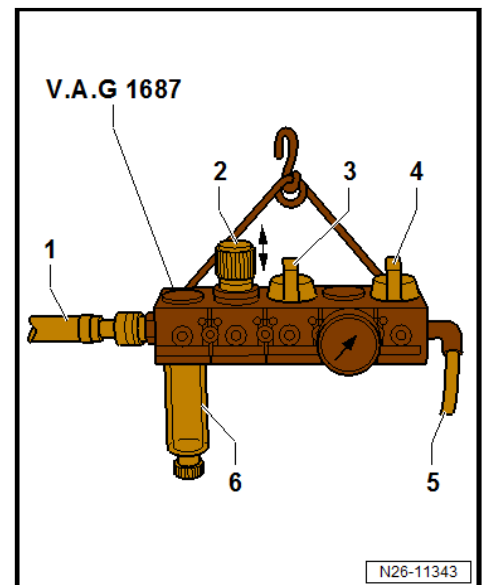


Continued for all vehicles:



- Connect adapter -V.A.G 1687/20- -A- with -V.A.G 1687/11- -B- to turbocharger -1-.
- Make sure that open connections -arrows- are sealed with suitable plugs from engine bung set -VAS 6122- -D-.
- 2 - Breather line on crankcase breather
- 3 - Intake manifold
- Connect hose -C- of charge air system tester -V.A.G 1687- to adapter.

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



- Pull pressure control valve -2- upwards, unscrew it completely, and close valves -3- and -4-.
- Connect charge air system tester -V.A.G 1687- to compressed air -1- via commercial adapter.
- If there is water in the inspection glass -6-, drain it via the drain plug.
- Open valve -3-.
- Adjust pressure to 0.5 bar with pressure control valve -2-.
- Open valve -4- and wait until test circuit is full. If necessary, adjust pressure to 0.5 bar.
- Check charge air system for leaks:
 - ◆ by listening



- ◆ by feeling
- ◆ Using commercially available leak detector spray
- ◆ Using ultrasonic tester -V.A.G 1842S-



Note

- ◆ *A small amount of air escapes through the valves and enters the engine and the exhaust system. Therefore a holding pressure test is not possible.*
- ◆ *For information on how to use the ultrasonic tester -V.A.G 1842S-, see the ⇒ operating instructions.*
- ◆ *Before removing the adapter, release pressure in the test circuit by pulling off hose coupling.*

Install in reverse order of removal, observing the following:

- Renew O-rings.

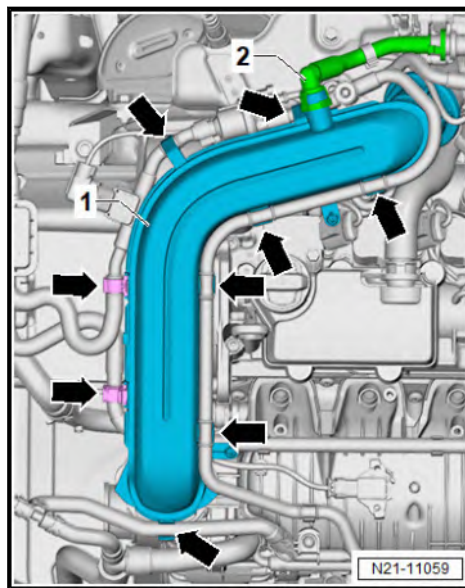
Torque settings

- ◆ ⇒ [o3.1 verview - air filter housing", page 357](#)

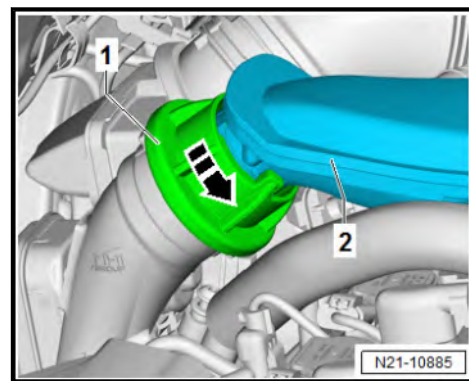
2.5 Removing and installing air pipe

Removing

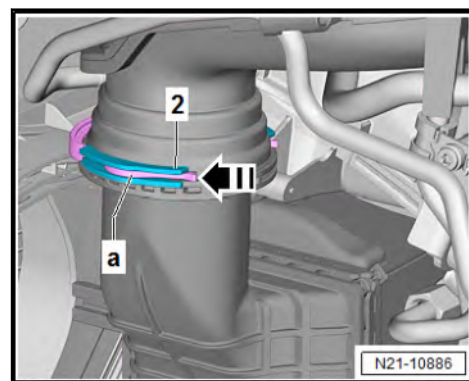
- Release and pull off breather line -2- at air intake pipe -1-. To do this, press together webs of locking mechanism on both sides.



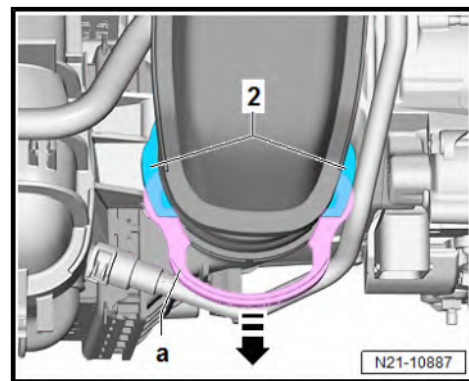
- Release all lines and clips -arrows- from air intake pipe -1- and free off.
- Turn locking ring -1- for air intake pipe -2- in -direction of arrow-.



- Release retaining bracket -a- at ends -2- on both sides -direction of arrow-.



- Pull retaining bracket -a- in direction of -arrow-.

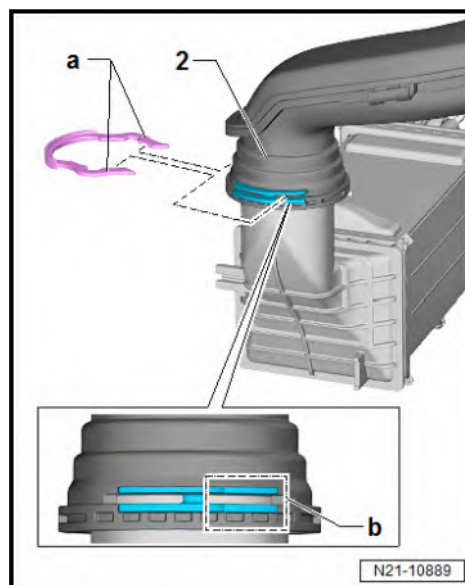


- Detach retaining bracket -a- at catch -2-.
- Pull air intake pipe off charge air cooler.
- Pull air intake pipe off turbocharger by slightly turning it back and forth.

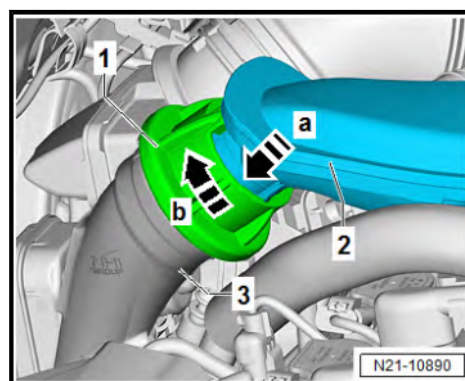
Installing

Install in reverse order of removal, observing the following:

- Renew all O-rings after removal.
- Lightly moisten O-rings with engine oil before fitting.
- Check correct position of O-rings prior to final assembly.
- Always renew retaining bracket -a- after removal.



- Push air intake pipe to stop onto turbocharger.
- Push air intake pipe to stop onto charge air cooler.
- Slide retaining bracket -a- into grooves of air intake pipe.
- The chamfers on retaining bracket -a- must engage in rear grooves -b- of air intake pipe -2-.
- Push air intake pipe -2- in -direction of arrow a- onto turbocharger -3-.



- Turn locking ring -1- to stop in -direction of arrow b-.



24 – Mixture preparation - injection

1 Injection system

⇒ [o1.1 f fitting locations - injection system", page 339](#)

1.1 Overview of fitting locations - injection system

⇒ [o1.1.1 f fitting locations - engine compartment", page 339](#)

⇒ [o1.1.2 f fitting locations - engine from above, with particulate filter", page 342](#)

⇒ [o1.1.3 f fitting locations – engine, rear", page 344](#)

⇒ [o1.1.4 f fitting locations – engine, front", page 344](#)

1.1.1 Overview of fitting locations - engine compartment



1 - Lambda probe 1 before catalytic converter -GX10-

Consisting of:

- ◆ Lambda probe -G39-
- ◆ Lambda probe heater - Z19-
 - ❑ Assembly overview ➤ [o8.1 verview - Lambda probe", page 388](#)

2 - Lambda probe 1 after catalytic converter -GX7-

Consisting of:

- ◆ Lambda probe after catalytic converter -G130-
- ◆ Lambda probe 1 heater after catalytic converter - Z29-
 - ❑ Assembly overview ➤ [o8.1 verview - Lambda probe", page 388](#)

3 - Brake servo

- ❑ Assembly overview ➤ Brake system; Rep. gr. 47; Brake servo/brake master cylinder, Assembly overview - brake servo/brake master cylinder

4 - Accelerator position sender -G79-/accelerator position sender 2 -G185-

- ❑ Fitting location ➤ [page 341](#)

5 - Clutch position sender - G476-

6 - Engine control unit -J623-

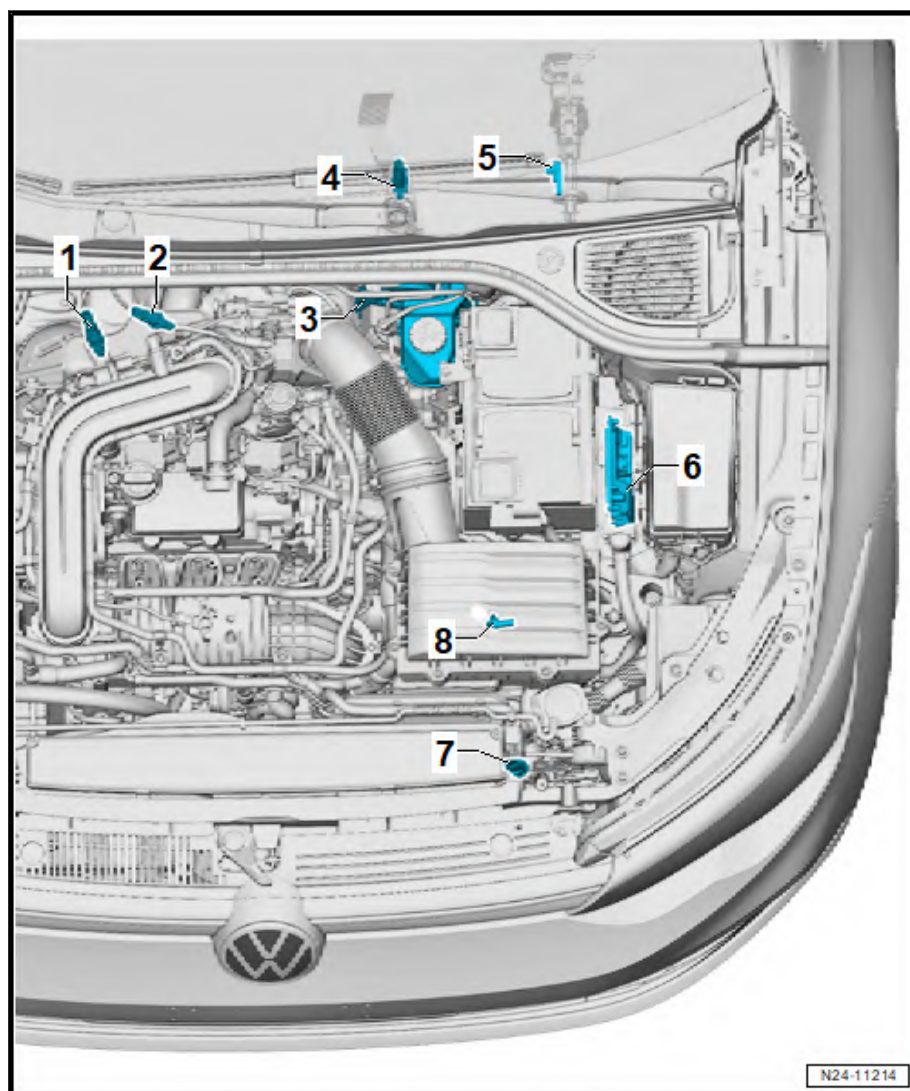
- ❑ Removing and installing ➤ [a6.2 nd installing engine control unitJ623", page 377](#)

7 - Radiator outlet coolant temperature sender -G83-

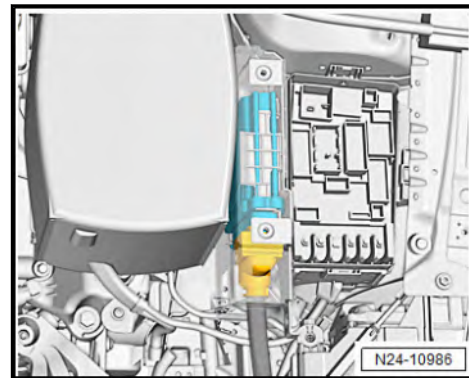
- ❑ Assembly overview ➤ [o2.3 verview - coolant temperature sender", page 252](#)

8 - Gearbox neutral position sender -G701-/reversing light switch -F4-

- ❑ Fitting location ➤ [page 341](#)

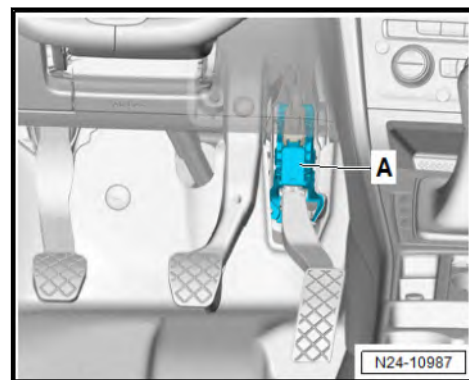


Fitting location of engine control unit -J623-



- ◆ Between battery and fuse carrier on left in engine compartment

Fitting location -A- of accelerator position sender -G79- and accelerator position sender 2 -G185-



- ◆ In accelerator pedal module.

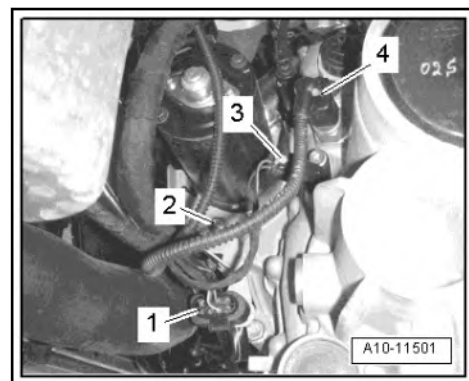


Note

The accelerator position sender -G79- and accelerator position sender 2 -G185- are integrated in the accelerator pedal module and cannot be renewed individually.

- Removing and installing accelerator position sender 2 -G79- and accelerator position sender -G185- -A- ⇒ Rep. gr. 20; Accelerator mechanism; Removing and installing accelerator pedal module with accelerator position sender -G79-/-G185-.

Fitting location of gearbox neutral position sender -G701-



- ◆ On gearbox (front left)



3 - Electrical connector for gearbox neutral position sender
-G701-

4 - Electrical connector for reversing light switch -F4-

1.1.2 Overview of fitting locations - engine from above, with particulate filter



1 - Pressure sensor for activated charcoal filter air flushing -GX44-

- Consisting of

- ◆ Pressure sensor for activated charcoal filter system -G804-
- ◆ Temperature sensor for activated charcoal filter air flushing -G1084-

2 - Exhaust camshaft control valve 1 -N318-

- Assembly overview ⇒ [o3.1 verview - valve gear", page 166](#)

3 - Activated charcoal filter solenoid valve 1 -N80-

4 - Ignition coil 1 with output stage -N70-

- Assembly overview ⇒ [o1.1 verview - ignition system", page 411](#)

5 - Exhaust gas pressure sensor 1 -G450-

- Assembly overview ⇒ [o1.2 verview - camshaft housing", page 117](#)

6 - Exhaust camshaft position sender -G1003-

- Assembly overview ⇒ [o1.1 verview - ignition system", page 411](#)

7 - Ignition coil 2 with output stage -N127-

- Assembly overview ⇒ [o1.1 verview - ignition system", page 411](#)

8 - Fuel metering valve -N290-

- Assembly overview ⇒ [o7.1 verview - high-pressure pump", page 383](#)

9 - Ignition coil 3 with output stage -N291-

- Assembly overview ⇒ [o1.1 verview - ignition system", page 411](#)

10 - Inlet camshaft position sender -G1002-

- Assembly overview ⇒ [o1.1 verview - ignition system", page 411](#)

11 - Throttle valve module -GX3-

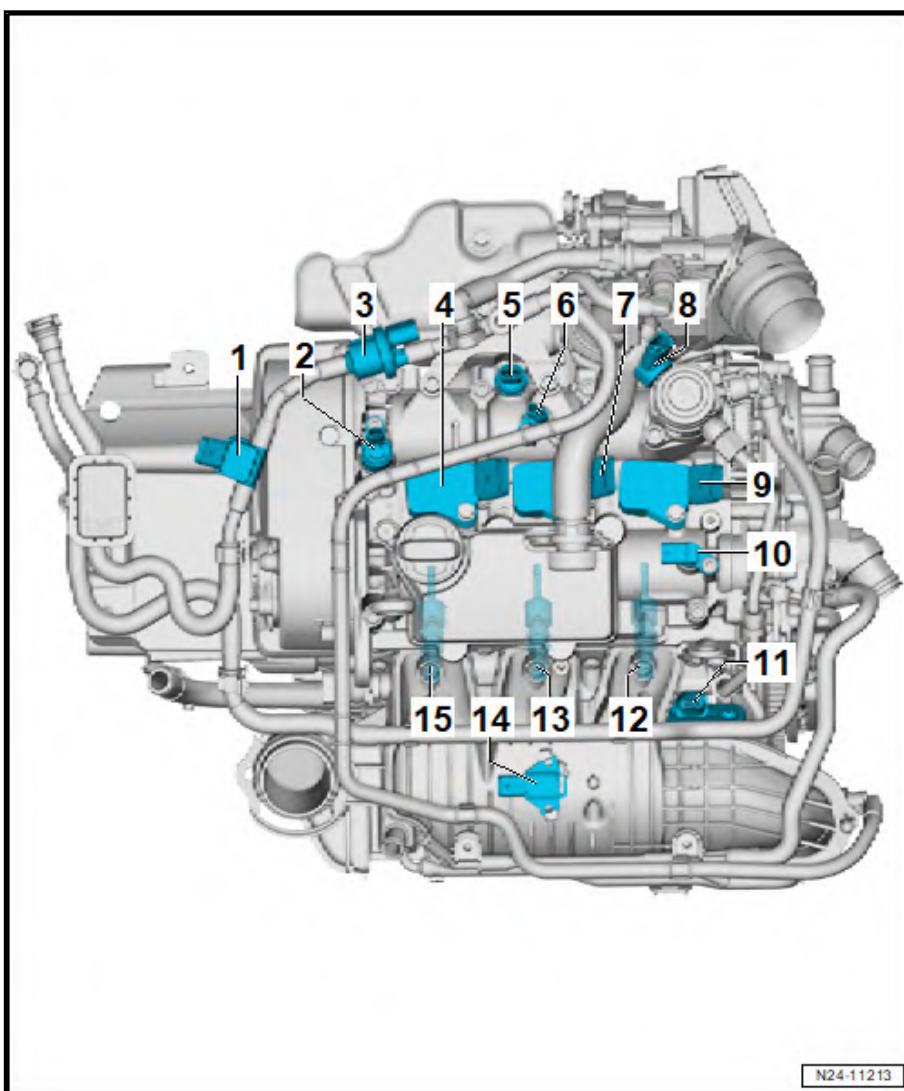
- Consisting of

- ◆ Throttle valve module -J338-
- ◆ Throttle valve drive for electronic power control -G186-
- ◆ Throttle valve drive angle sender 1 for electronic power control -G187-
- ◆ Throttle valve drive angle sender 2 for electronic power control -G188-
- Assembly overview ⇒ [o4.1 verview - intake manifold", page 365](#)

12 - Injector, cylinder 3 -N32-

- Assembly overview ⇒ [o2.1 verview - fuel rail with injectors", page 346](#)

13 - Injector, cylinder 2 -N31-





- ☐ Assembly overview ➔ [o2.1 verview - fuel rail with injectors", page 346](#)

14 - Intake manifold sender -GX9-

- ☐ Consisting of
- ◆ Intake manifold pressure sender -G71-
- ◆ Intake manifold temperature sender -G72-
 - ☐ Assembly overview ➔ [page 328](#)

15 - Injector, cylinder 1 -N30-

- ☐ Assembly overview ➔ [o2.1 verview - fuel rail with injectors", page 346](#)

1.1.3 Overview of fitting locations – engine, rear

1 - Charge pressure control module -GX34-

- ☐ Consisting of:
- ◆ Charge pressure positioner -V465-
- ◆ Position sender for charge pressure positioner -G581-
 - ☐ Assembly overview ➔ [o1.1 verview - turbo-charger", page 316](#)

2 - Piston cooling jet control valve -N522-

- ☐ Assembly overview ➔ [o4.1 verview - oil filter/oil pressure switch", page 230](#)

3 - Valve for oil pressure control -N428-

- ☐ Assembly overview ➔ [o1.1 verview - sump/oil pump", page 212](#)

4 - Oil level and oil temperature sender -G266-

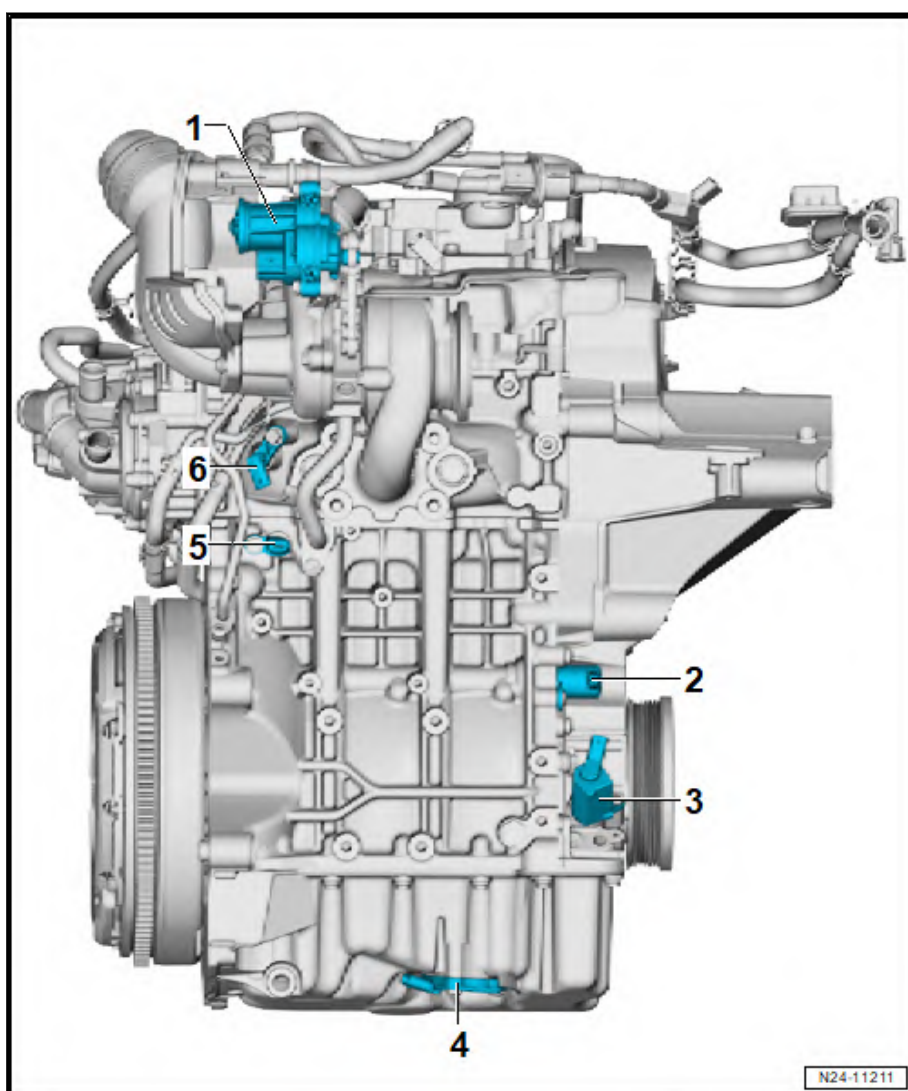
- ☐ Assembly overview ➔ [o1.1 verview - sump/oil pump", page 212](#)

5 - Coolant temperature sender at engine output -G82-

- ☐ Assembly overview ➔ [o2.3 verview - coolant temperature sender", page 252](#)

6 - Radiator outlet coolant -G62-

- ☐ Assembly overview ➔ [o2.3 verview - coolant temperature sender", page 252](#)



1.1.4 Overview of fitting locations – engine, front

1 - Knock sensor 1 -G61-

- ❑ Assembly overview ⇒ [o1.1 verview - ignition system", page 411](#)
- ❑ Removing and installing ⇒ [a1.3 nd installing knock sensor 1G61", page 416](#)

2 - Charge air pressure sender -GX26-

- ❑ Assembly overview ⇒ [Fig. ""Assembly overview - charge pressure sender -GX26-""", page 330](#)

3 - Throttle valve module - GX3-

- ❑ Consisting of
- ◆ Throttle valve module - J338-
- ◆ Throttle valve drive for electronic power control - G186-
- ◆ Throttle valve drive angle sender 1 for electronic power control -G187-
- ◆ Throttle valve drive angle sender 2 for electronic power control -G188-
- ❑ Assembly overview ⇒ [o4.1 verview - intake manifold", page 365](#)

4 - Engine speed sender - G28-

- ❑ Assembly overview ⇒ [o1.1 verview - ignition system", page 411](#)

5 - Charge air cooling pump -V188-

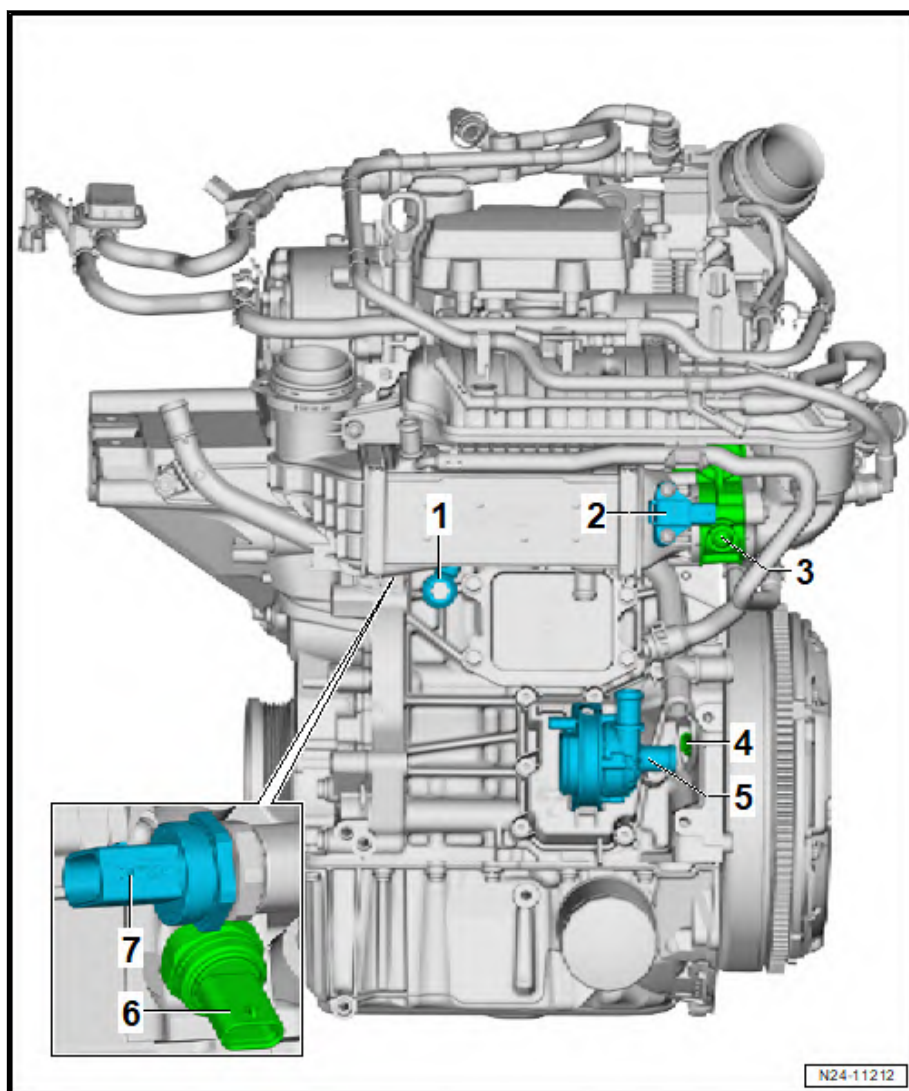
- ❑ Assembly overview ⇒ [o2.2 verview - electric coolant pump", page 252](#)

6 - Oil pressure sender -G10-

- ❑ Assembly overview ⇒ [o4.1 verview - oil filter/oil pressure switch", page 230](#)

7 - Fuel pressure sender -G247-

- ❑ Assembly overview ⇒ [o2.1 verview - fuel rail with injectors", page 346](#)





2 Injectors

⇒ [o2.1 verview - fuel rail with injectors", page 346](#)

⇒ [a2.2 nd installing fuel rail", page 348](#)

⇒ [a2.3 nd installing injectors", page 349](#)

2.1 Assembly overview - fuel rail with injectors



1 - Bolt

- ☐ 8 Nm

2 - Bracket

3 - High-pressure pipe

- ☐ Does not need to be replaced
- ☐ Before installing used high-pressure pipes, check thoroughly for leaks
- ☐ Do not alter shape.
- ☐ Lubricate thread of union nuts with clean engine oil
- ☐ Removing and installing ⇒ [a7.3 nd installing high-pressure pipe](#), page 386
- ☐ 16 Nm +45°

4 - Bolt

- ☐ Renew
- ☐ 8 Nm +90°

5 - Fuel distributor

- ☐ Removing and installing ⇒ [a2.2 nd installing fuel rail](#), page 348

6 - Fuel pressure sender - G247-

- ☐ Moisten taper and thread with clean engine oil
- ☐ Checking ⇒ [f5.2 uel pressure senderG247](#), page 373
- ☐ Removing and installing ⇒ [a5.1 nd installing fuel pressure senderG247](#), page 372
- ☐ 22 Nm

7 - Injector

- ☐ Removing and installing ⇒ [a2.3 nd installing injectors](#), page 349

8 - O-ring

- ☐ Lubricate with clean engine oil
- ☐ Renew

9 - Support ring

- ☐ Renew

10 - Depressor

- ☐ Fuel rail exerts force which secures injector in cylinder head by means of depressor
- ☐ Renew

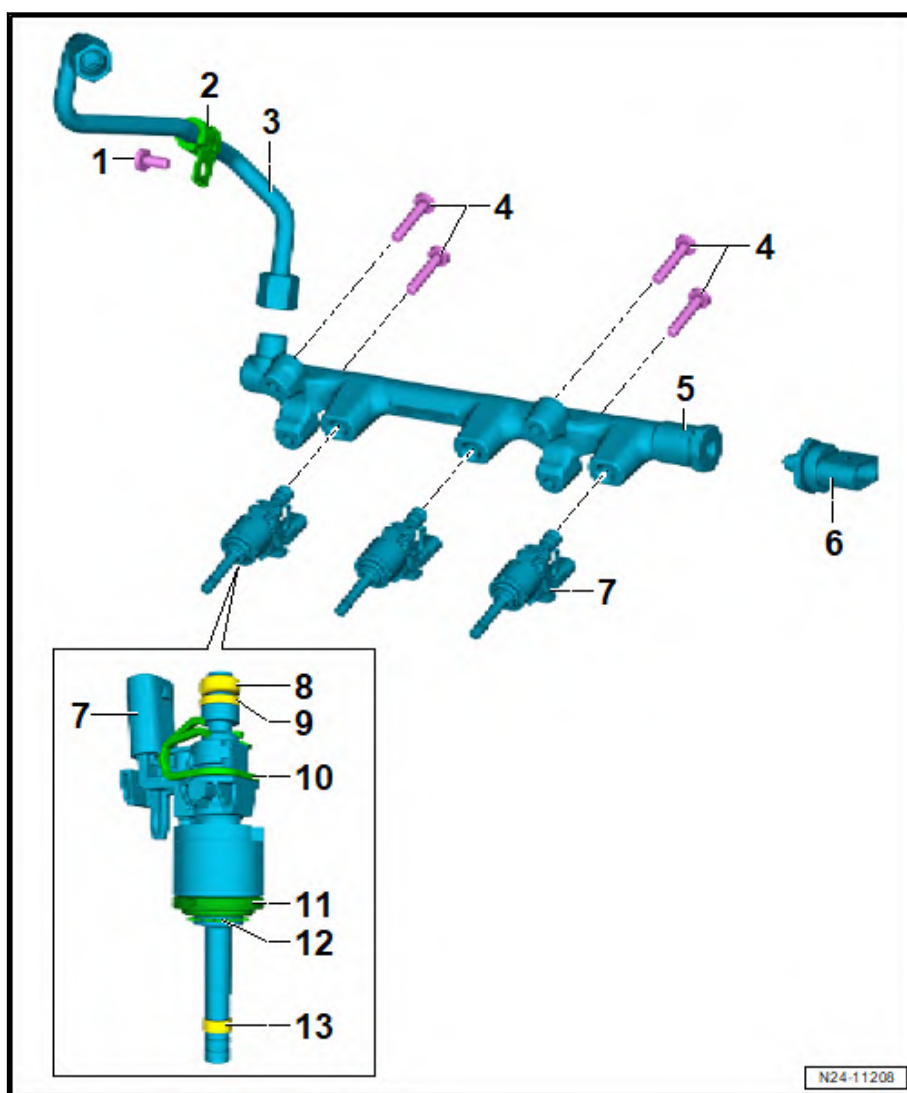
11 - Decoupling element

- ☐ Renew if damaged

12 - Retaining ring

13 - Combustion chamber seal

- ☐ Do not treat with grease or other lubricant.





❑ Renewing ➔ [a2.3 nd installing injectors", page 349](#)

2.2 Removing and installing fuel rail

Removing



Note

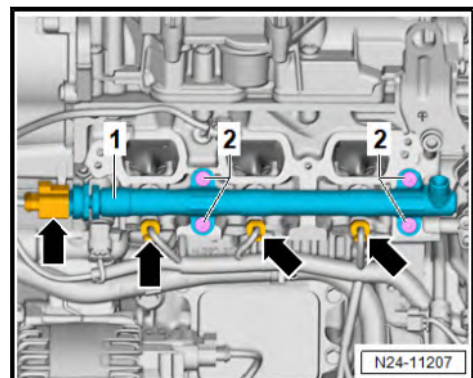
- ◆ *When pulling off the fuel rail, injectors may be released from the cylinder head or the fuel rail.*
- ◆ *Injectors must only be removed when the engine is cold.*
- ◆ *Due to the fuel pressure, all seals on the injector must be renewed after the removal.*



CAUTION

The fuel system is pressurised.
Danger of injury through fuel spray.
– Release high pressure.

- Remove intake manifold ➔ [a4.2 nd installing intake manifold", page 367](#) .
- Place a cloth underneath to catch escaping fuel.
- Remove high-pressure pipe ➔ [a7.3 nd installing high-pressure pipe", page 386](#) .
- Seal line so that fuel system is not contaminated by dirt.
- Disconnect electrical connector -arrows-.



- Unscrew bolts -2- and carefully pull off fuel rail -1- from injectors.



Note

The injectors may be pulled out along with the fuel rail when the fuel rail is pulled off.

Installing

Install in reverse order of removal, observing the following:

- Visually inspect fuel rail and remove any foreign bodies or old O-rings as necessary.



- Make sure that sealing surfaces in fuel rail are not scored or scratched. Otherwise the component must be renewed.
- Renew seals for injectors ➔ [a2.3 nd installing injectors", page 349](#) .
- Apply mountings on fuel rail onto injectors.
- Press fuel rail to stop onto springs of injectors (first on right side, then on left side).



Note

The fuel rail must not be pulled towards the cylinder head by means of the bolts.

- Push down fuel rail firmly in area of securing bolts until it rests against cylinder head. Screw in bolts by 2 turns.
- While pushing down tighten bolts to stop by hand.
- Tighten bolts evenly and diagonally to specified torque.
- Install high-pressure pipe ➔ [a7.3 nd installing high-pressure pipe", page 386](#) .
- Install intake manifold ➔ [a4.2 nd installing intake manifold", page 367](#) .

Torque settings

- ◆ ➔ [o2.1 verview - fuel rail with injectors", page 346](#)

2.3 Removing and installing injectors

Special tools and workshop equipment required

- ◆ Removal tool -T10498-
- ◆ Tool set for FSI engines -T10133 C- with -T10133/16A- and -T10133/19-

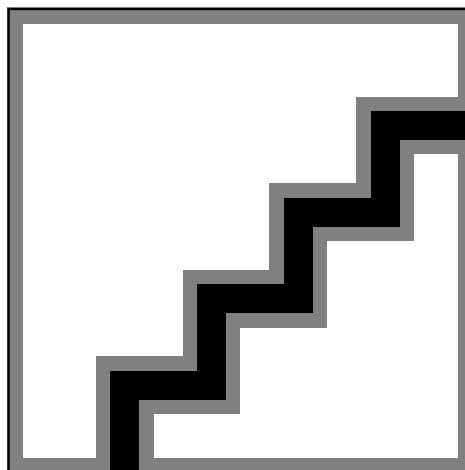




- ◆ Set of tools for high-pressure injector -T10581-



- ◆ Set of tools for high-pressure injector -T10629-



Procedure

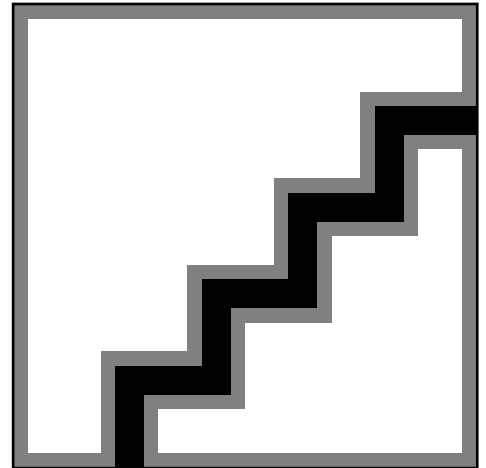


Note

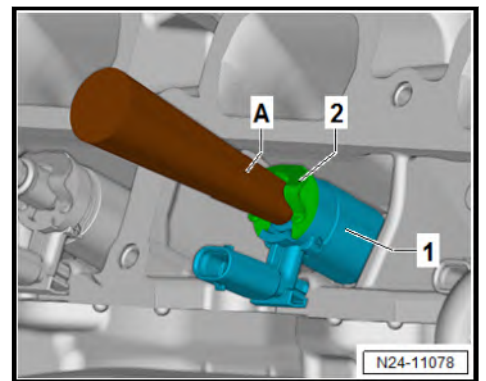
- ◆ *Injectors must only be removed when the engine is cold.*
- ◆ *When pulling off the fuel rail, injectors may be released from the cylinder head or the fuel rail.*
- ◆ *Due to the fuel pressure, all seals on the injector must be renewed after the removal.*
- ◆ *In this case, the injectors must be pulled out of the fuel rail.*
- Removing fuel rail ➔ [a2.2 nd installing fuel rail", page 348](#) .



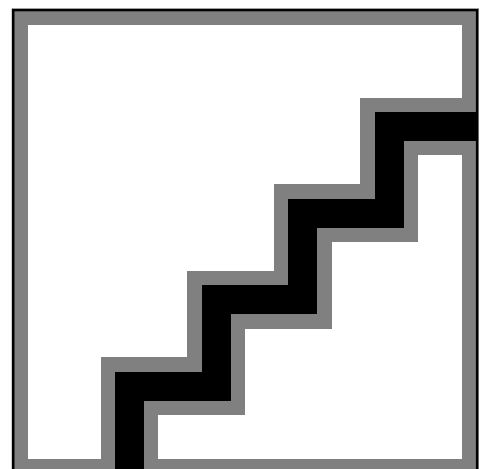
Removing injectors on cylinder head:



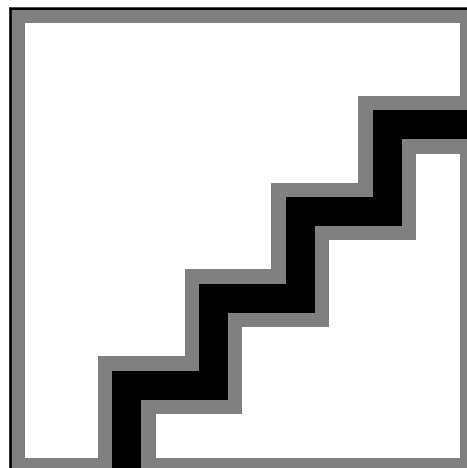
- Separate connector -5- on injector -1-.
- Carefully remove O-ring -2- and support ring -3-.
- Carefully lever off hold-down device -4- in direction of -arrow- using a screwdriver.
- Slide thrust piece -T10581/3- -A- over injector -1-.



- Carefully loosen injector with light blows onto thrust piece.
- Mount base plate -T10629/2- -A- with knurled screw - T10629/3- -B- as shown in illustration.



- Use holes for fuel rail to bolt base plate to cylinder head.
- Position puller -T10629/1- -C- at groove in injector -1-.



- Support of puller -T10629/1- is inserted beneath sealing taper of support ring.
- Unscrew bolt -E- from removal tool -T10133/16A- -D- a few turns.
- Slide removal tool -T10133/16A- -D- over puller -T10629/1- -B-.
- Screw bolt -D- of removal tool -T10133/16A- into puller -T10581/4- -C-.
- Align removal tool -T10133/16A-, and fit it onto base plate -T10629/2- -A-.
- Turn removal tool -T10133/16A- -D- in such a way that the contact surface with base plate -T10629/2- -A- is as large as possible.
- Tighten bolt -E- lightly by hand. Removal tool -T10133/16A- must be supported on base plate -T10629/2-.
- Use a torque wrench to pull out the injector.
- Set the torque wrench to 5 Nm.
- Pull out injector by screwing in bolt -E-.
- If the torque limit of »5 Nm« has been reached and the injector still can't be pulled out, remove the puller. Use the impact sleeve again to loosen the injector.
- Repeat the procedure on each injector.

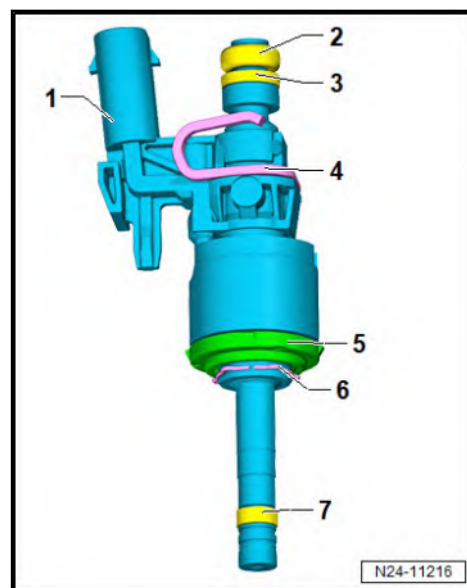


Note

If the torque limit is exceeded, the injector may become damaged.



Dismantling injectors:



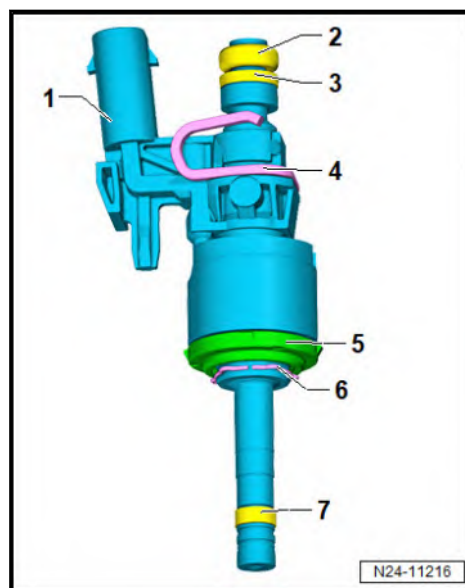
- 1 - Injector
- 2 - Seal
- 3 - Spacer ring
- 4 - Depressor
- 5 - Decoupling element
- 6 - Retaining ring
- 7 - Combustion chamber seal

Renew spacer ring and seal:

- Renew seal -2- and spacer ring -3- after removal.
- Carefully remove seal -2- and spacer ring -3- using removal tool -T10498-.
- Clean injector shaft using a clean cloth to remove any deposits from combustion.
- Install seal and spacer ring in the specified sequence.
- Before installing injector moisten new seal -2- with clean engine oil.



Renewing depressor:



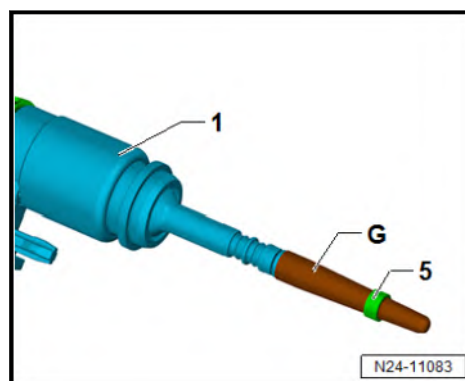
- Use a suitable screwdriver to carefully pull old depressor -4- off injector.
- Fit new depressor in groove and slide on.
- Opening of depressor must point towards electrical connection.

Renewing flexible joint:

- Using a suitable screwdriver, carefully lever off retaining ring -6- from injector and remove flexible joint -5-.
- Guide new flexible joint -5- on injector -1- and secure with new retaining ring -6-.

Renewing combustion chamber seal:

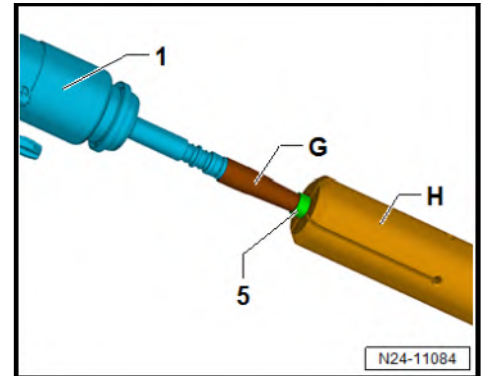
- Carefully remove combustion chamber seal using removal tool -T10498-.
- Take care not to damage the groove of injector. The injector must be renewed if the groove is damaged.
- When re-installing an injector, clean groove for combustion chamber seal using a clean cloth to remove any deposits from combustion.
- Slide assembly cone -T10581/5- -G- to stop onto injector -1-.



- Slide combustion chamber seal -5- to assembly cone -T10581/5-, as shown in illustration.



- Slide assembly sleeve -T10581/6- -H- onto assembly cone -T10581/5- -G- until it contacts combustion chamber seal -5-.

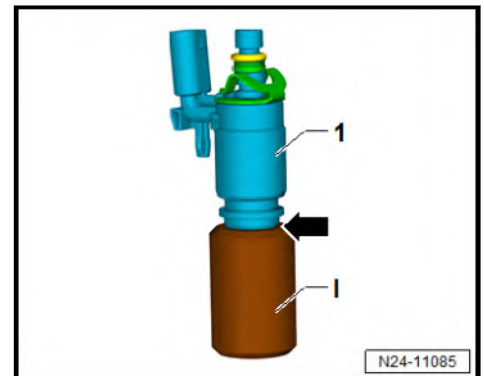


- Use assembly sleeve -T10581/6- to slide combustion chamber seal as far as possible onto assembly cone -T10581/5-.
- Use assembly sleeve -T10581/6- to slide on combustion chamber seal until it is seated in the first groove of the seal
⇒ [page 353](#) .
- Pull assembly sleeve -T10581/6- off injector -1-.

i Note

The combustion chamber ring seal is widened when it is pushed onto the injector. It must be compressed again after sliding on. This is done in two stages as described below.

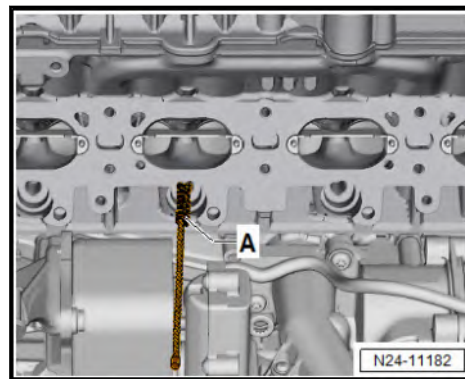
- Push calibration sleeve -T10581/7- -I- to stop onto injector -1-, and at the same time turn it slightly (approx. 180°) -arrow-.



- Pull calibration sleeve -T10581/7- off again, turning in opposite direction.
- Push calibration sleeve -T10581/7- to stop onto injector, and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10581/7- off again, turning in opposite direction.



Installing

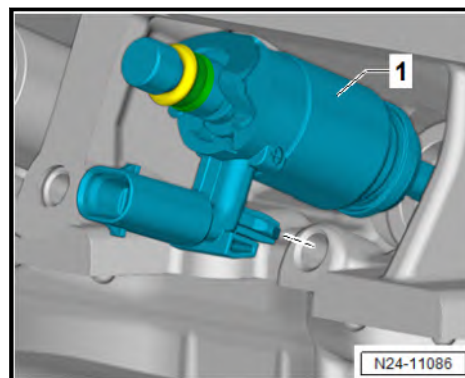


- Clean hole in cylinder head using nylon brush -T10133/4-A-.



Note

- ♦ *The combustion chamber seal must not be lubricated.*
 - ♦ *Renew combustion chamber seal, spacer ring and seal.*
 - ♦ *The injectors must insert easily. If necessary, wait until the combustion chamber ring seal has contracted sufficiently.*
- Push injectors -1- by hand to stop into the hole of cylinder head (must be free of oil and grease). Ensure injectors are positioned correctly in cylinder head.



- Electrical connector of injector must engage in respective recess in cylinder head.
- Moisten new seals with clean engine oil.
- Installing fuel rail ➔ [a2.2 nd installing fuel rail", page 348](#) .

If injectors have been renewed:

- Connect ➔ Vehicle diagnostic tester.
- Carry out function 0001 - Reset learnt injector values.



3 Air filter

⇒ [o3.1 verview - air filter housing", page 357](#)

⇒ [a3.2 nd installing air filter housing", page 359](#)

⇒ [a3.3 ir duct on lock carrier", page 362](#)

3.1 Assembly overview - air filter housing

⇒ [o3.1.1 verview - air filter housing", page 357](#)

3.1.1 Assembly overview - air filter housing



1 - Clip

2 - Air intake hose

3 - Clip

- 3.5 Nm

4 - Bolt

- For vehicles with air mass measurement module -GX35-
- Thread-cutting
- 1.5 ± 0.2 Nm

5 - Air mass measurement module -GX35-

- Does not apply for all vehicles
- Consisting of
Air mass meter -G70-
Temperature sender - G1005-

6 - Seal

- For vehicles with air mass measurement module -GX35-
- Check for damage, and renew if necessary
- Not available separately, see ➔ Electronic parts catalogue (ETKA)

7 - Air filter upper part

- For vehicles with air mass measurement module -GX35-

8 - Air filter upper part

- For vehicles without air mass measurement module -GX35-

9 - Bolt

- Thread-cutting
- Fitted firmly
- Qty. 7
- 2 Nm

10 - Air filter element

- Remove dirt, leaves and salt residues
- Use only genuine air filter elements ➔ Electronic Parts Catalogue
- For change intervals refer to ➔ Maintenance tables
- Removing and installing ➔ Maintenance; Booklet

11 - Louvre

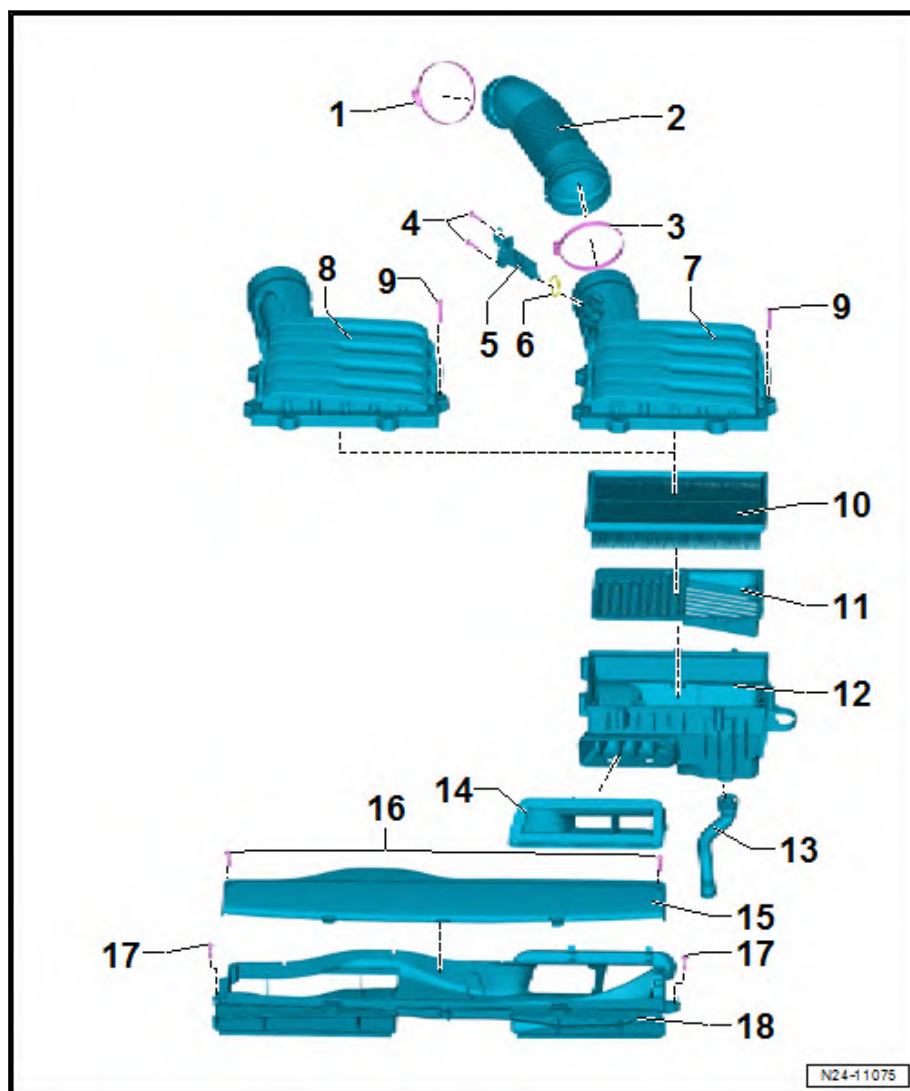
- Remove dirt, leaves and salt residues

12 - Air filter lower part

- Remove dirt, leaves and salt residues

13 - Water drain hose

- Remove dirt, leaves and salt residues





14 - Air duct

- ☐ Between air filter housing and air duct on lock carrier
- ☐ Two-piece

15 - Cover

- ☐ For air duct on lock carrier

16 - Bolt

- ☐ Qty. 2
- ☐ 2 Nm

17 - Bolt

- ☐ Thread-cutting
- ☐ Fitted firmly
- ☐ Qty. 2
- ☐ 2 Nm

18 - Air duct

- ☐ On lock carrier

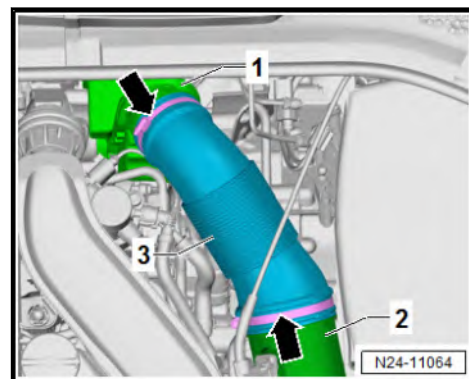
3.2 Removing and installing air filter housing

⇒ [a3.2.1 nd installing air filter housing", page 359](#)

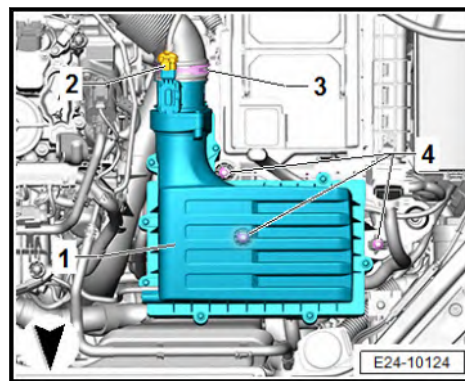
3.2.1 Removing and installing air filter housing

Removing

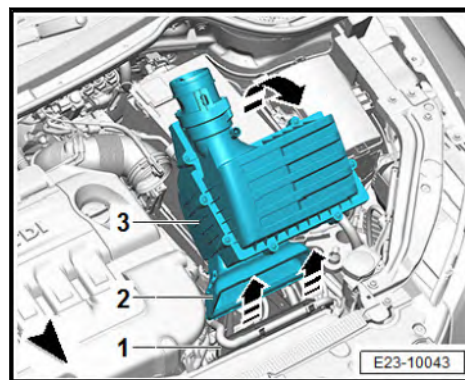
- Loosen screw-type clips -arrows- on connection -1- and on air filter housing -2-.



- Remove air hose -3-.
- If fitted, release and pull off electrical connector -2- for air mass measurement module -GX35-.



- Pull air filter housing -1- upwards off ball head pins -4-.
- Swing up air cleaner housing -3- backwards in direction of -arrow-. When doing this, pull off air duct -2- from air guide -1-.



Installing

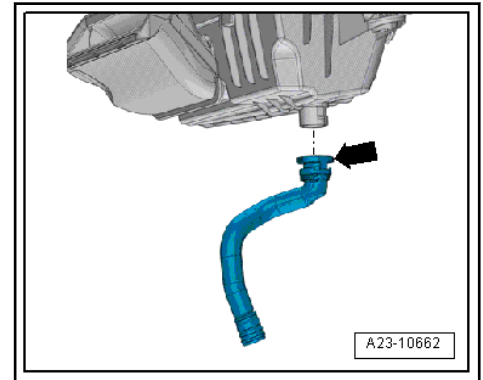
Install in reverse order of removal, observing the following:



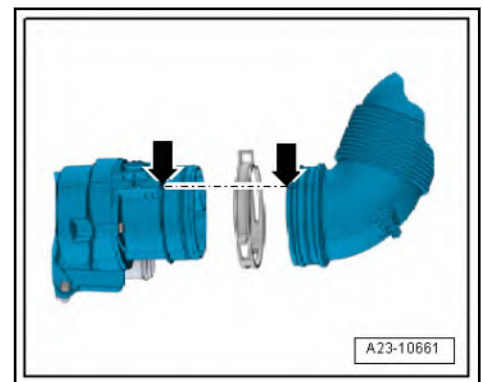
Note

- ◆ *If the air filter element is very dirty or wet, particles of dirt or water may reach the components and falsify the measured air mass value. Incorrect values can cause a loss of performance as a smaller injection quantity is calculated.*
- ◆ *Always use Genuine part for air filter element.*
- ◆ *A clean air filter housing is essential.*
- ◆ *Hose unions and air intake pipes and hoses must be free of oil and grease before installation.*
- ◆ *Use a silicone-free lubricant to install the air hoses.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue.*
- ◆ *Avoid malfunctions. When blowing out air filter housing with compressed air, cover critical components through which air flows.*
- ◆ *Use a clean cloth to do this.*
- ◆ *Observe disposal regulations.*

- Disconnect water drain hose -arrow-.



- Blow out water drain with compressed air.
- Check air intake hose (clean air side) for salt residue, dirt and leaves and clean if necessary.
- Check intake port for dirt as far as the air filter element and clean if necessary.
- Clean dirt and leaves out of connection on air cleaner (bottom section) and hose.
- Install air filter housing. Note water drain hose while doing this. Make sure to route the water drain hose downwards without kinks.
- Before installing the ball studs, coat with water (without additive).
- Fit air filter housing on battery tray and press on so that it engages audibly.
- Press air cleaner housing on again and then pull to check that housing is correctly engaged.
- Ensure that air cleaner housing is properly seated in air guide.
- When fitting air intake hose on air filter housing, pay attention to installation markings -arrows-.



Torque settings

- ◆ Securing bolt for air filter housing ⇒ [o3.1 verview - air filter housing", page 357](#)



3.3 Removing air duct on lock carrier

⇒ [a3.3.1 ir duct on lock carrier, Golf 2020, Golf Estate 2021", page 362](#)

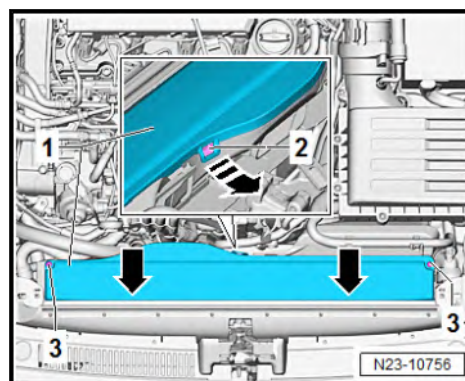
⇒ [a3.3.2 ir duct on lock carrier, Polo 2018", page 363](#)

⇒ [a3.3.3 ir duct on lock carrier, T-Roc, T-Roc Cabrio", page 363](#)

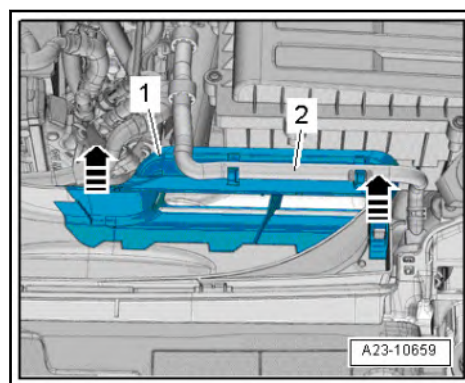
⇒ [a3.3.4 ir duct on lock carrier, T-Cross", page 364](#)

3.3.1 Removing air duct on lock carrier, Golf 2020, Golf Estate 2021

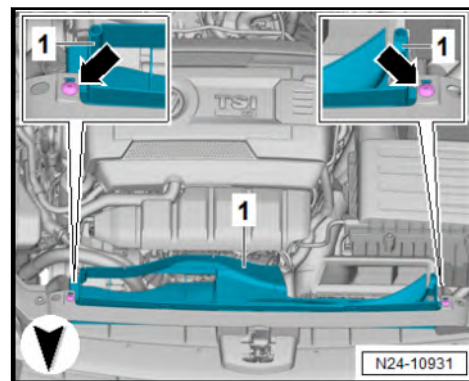
Removing



- Unscrew bolts -3-.
- Release fastener -2- in direction of -arrow- and remove cover.
- Push cover -1- towards front out of retainers -arrows-.
- Detach cover -1-.
- Lay coolant hose -2- to one side.



- Release fasteners -arrows-, and remove upper part of air duct -1-.
- Unscrew bolts -arrows-.



- Unclip lower part of air duct -1- and remove it.

Installing

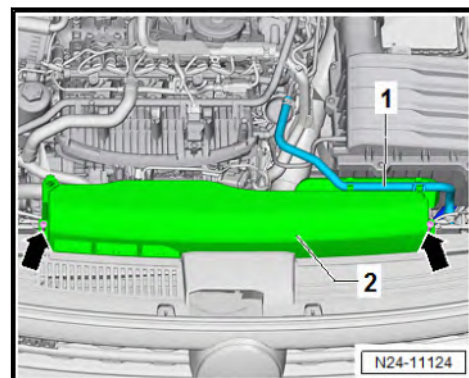
Install in reverse order of removal, observing the following:

Torque settings

- ◆ Securing bolt for air filter housing ⇒ [o3.1 verview - air filter housing", page 357](#)

3.3.2 Removing air duct on lock carrier, Polo 2018

- Unscrew bolt -arrow- on left and right.



Note

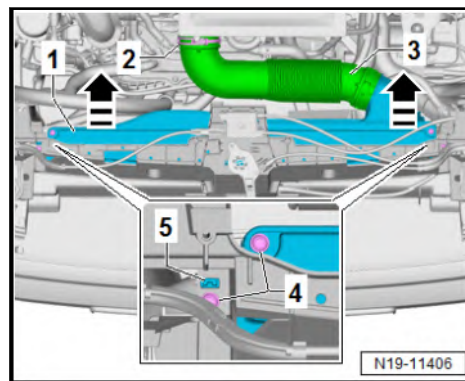
Disregard item 1.

- Unclip air duct -2-, and remove it.

3.3.3 Removing air duct on lock carrier, T-Roc, T-Roc Cabrio

Removing

- Remove radiator grille ⇒ General body repairs, exterior; Rep. gr. 66; Radiator grille/front trim; Removing and installing radiator grille.

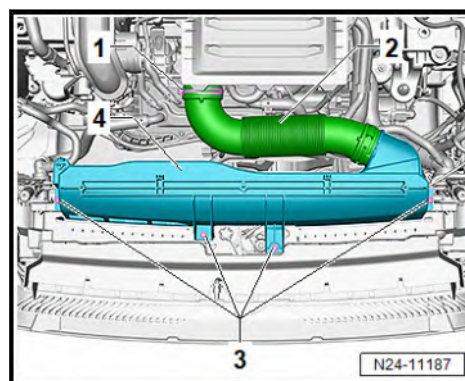


- Loosen clamp -2-, and pull off hose -3-.
- Unscrew bolts -4-.
- Release locking lugs -5-, and remove air duct -1- in direction of -arrow-.

3.3.4 Removing air duct on lock carrier, T-Cross

Removing

- Remove radiator grille ⇒ General body repairs, exterior; Rep. gr. 66; Radiator grille/front trim; Removing and installing radiator grille.



- Loosen clamp -1-, and pull hose -2- off air filter.
- Unscrew bolts -3-, and remove air duct -4-.



4 Intake manifold

⇒ [o4.1 verview - intake manifold", page 365](#)

⇒ [a4.2 nd installing intake manifold", page 367](#)

⇒ [a4.3 nd installing throttle valve moduleGX3", page 369](#)

⇒ [t4.4 hrottle valve moduleGX3", page 370](#)

4.1 Assembly overview - intake manifold



1 - Intake manifold

- ❑ Removing and installing ➤ [a4.2 nd installing intake manifold", page 367](#)

2 - O-ring

- ❑ Renew if damaged. For allocation, see ➤ Electronic parts catalogue (ETKA)

3 - Intake manifold sender - GX9-

- ❑ Removing and installing ➤ [a5.3 nd installing intake manifold senderGX9", page 375](#)

4 - Bolt

- ❑ Repair solution when retaining tabs have broken off
- ❑ Thread-cutting
- ❑ Fit and screw in bolt by hand to ensure it is screwed into old thread. Then tighten bolt to specified torque.
- ❑ 7 Nm

5 - Coolant pipe

- ❑ Secured to intake manifold.

6 - Seals

- ❑ Renew

7 - Bolt

- ❑ Specified torque and tightening sequence ➤ [page 367](#)

8 - Bolt

- ❑ Qty. 3
- ❑ Thread-cutting
- ❑ Fit and screw in bolt by hand to ensure it is screwed into old thread. Then tighten bolt to specified torque.
- ❑ 7 Nm

9 - Throttle valve module -GX3-

- ❑ Removing and installing ➤ [a4.3 nd installing throttle valve moduleGX3", page 369](#)
- ❑ Cleaning ➤ [t4.4 hrottle valve moduleGX3", page 370](#)

10 - O-ring

- ❑ Renew

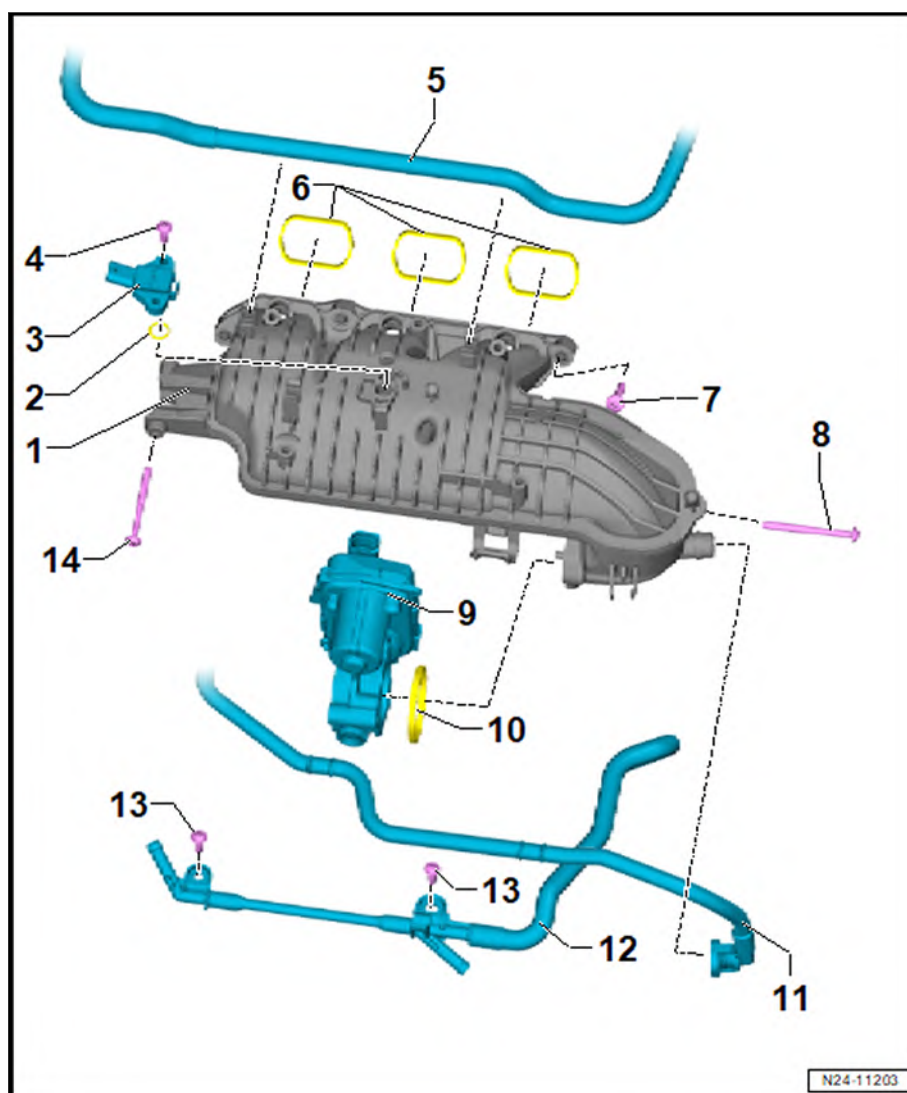
11 - Vacuum line

12 - Upper coolant pipe

- ❑ Removing and installing ➤ [page 279](#)

13 - Bolt

- ❑ For upper coolant pipe
- ❑ Torque ➤ [o3.1 erview - coolant pipes", page 277](#)

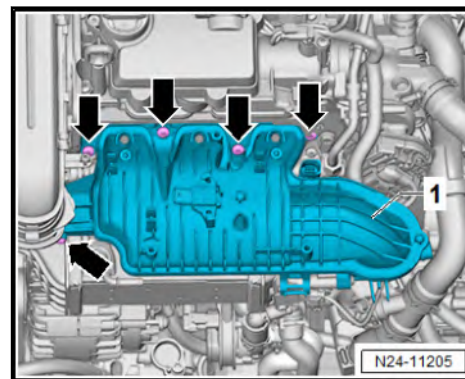




14 - Bolt

- ☐ Thread-cutting
- ☐ Fit and screw in bolt by hand to ensure it is screwed into old thread. Then tighten bolt to specified torque.
- ☐ Torque ➔ [page 367](#)

Intake manifold - specified torque and tightening sequence



– Tighten bolts in stages as follows:

Stage	Bolts	Specified torque
1st	-Arrows-	Starting in centre, screw in bolts alternately by hand until they make contact
2nd	-Upper arrows on cylinder head	Starting in centre, screw in bolts alternately to 10 Nm
3rd	-Left arrow to charge air cooler	7 Nm

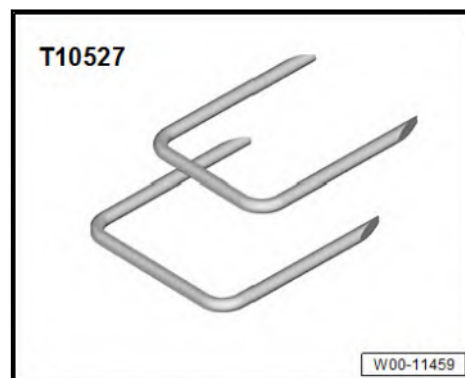
4.2 Removing and installing intake manifold

➔ [a4.2.1 nd installing intake manifold", page 367](#)

4.2.1 Removing and installing intake manifold

Special tools and workshop equipment required

- ◆ Release tool -T10527-





- ◆ Spring-type clip pliers -VAS 6362-



- ◆ Socket Torx T 30 -T10574-



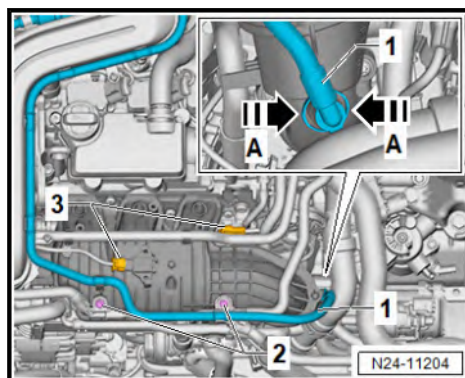
Removing



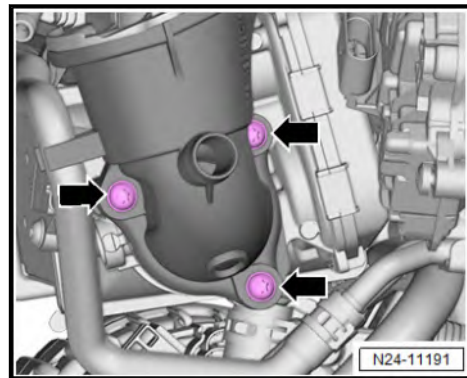
Note

The intake manifold is removed along with the throttle valve module -GX3-. The charge air cooler remains in the vehicle.

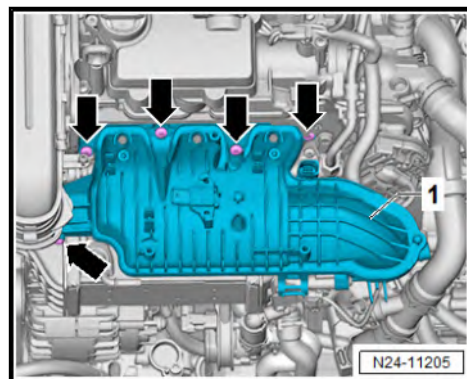
- Remove air filter housing ⇒ [a3.2 nd installing air filter housing](#), page 359 .
- Remove air pipe ⇒ [a2.5 nd installing air pipe](#), page 336 .
- Free off line -1- on intake manifold while pressing release buttons -arrows A- on both sides.



- Disconnect connectors -3- and unscrew bolts -2-.
- Unscrew bolts -arrows-.



- Unscrew bolts -arrows-.



- Remove intake manifold -1- with throttle valve module -GX3-.



Note

The charge air cooler remains in the vehicle.

Installing

Install in reverse order of removal, observing the following:



Note

Renew seals and O-rings.

Torque settings

- ◆ ⇒ [o3.1 overview - coolant pipes", page 277](#)
- ◆ ⇒ [o3.1 overview - air filter housing", page 357](#)
- ◆ ⇒ [o4.1 overview - intake manifold", page 365](#)

4.3 Removing and installing throttle valve module -GX3-

Throttle valve module -GX3- consists of

- ◆ Throttle valve module -J338-
- ◆ Throttle valve drive for electronic power control -G186-
- ◆ Throttle valve drive angle sender 1 for electronic power control -G187-



- ◆ Throttle valve drive angle sender 2 for electronic power control -G188-

Removing



Note

The throttle valve module -GX3- is removed along with intake manifold.

- Remove intake manifold ⇒ [page 367](#) .

The charge air cooler remains in the vehicle.

Installing

Install in reverse order of removal, observing the following:



Note

Renew O-rings after removal.

- After throttle valve control module -GX3- has been replaced, it must be re-adapted to engine control unit -J623-.
- Connect ⇒ Vehicle diagnostic tester.
- Restore operational readiness then select and execute the following menu option on ⇒ Vehicle diagnostic tester:

◆ 0001 - Basic setting

◆ 0001 - Adaption of throttle valve module - J338

Torque settings

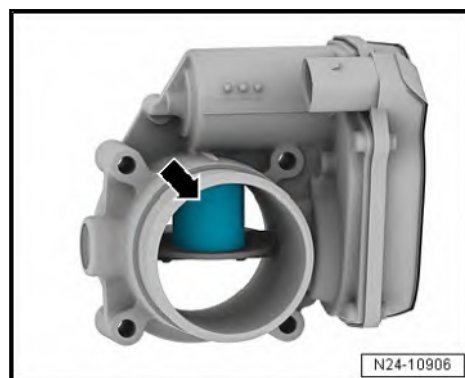
- ◆ ⇒ [o4.1 verview - intake manifold", page 365](#)

4.4 Cleaning throttle valve module -GX3-

Special tools and workshop equipment required

- ◆ Acetone (commercially available)
- ◆ Brush

Procedure





Note

- ◆ *If a new engine control unit -J623- is installed, the throttle valve module must be adapted.*
- ◆ *Contamination and coking in end stop can result in incorrect adaptation values.*
- ◆ *When cleaning the throttle valve housing, take care not to scratch it.*
- Remove throttle valve module -GX3- ➔ [a4.3 nd installing throttle valve moduleGX3", page 369](#) .
- Open throttle valve by hand and lock it in open position with a wedge (plastic or wood) -arrow-.

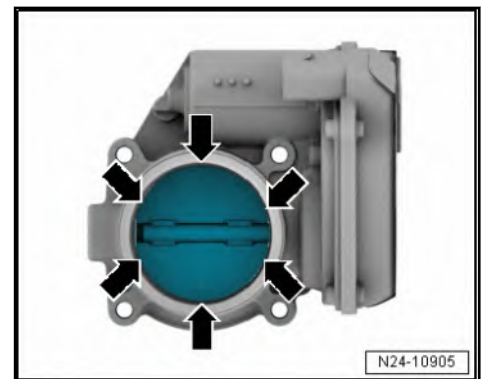


CAUTION

Risk of injury caused by acetone. Acetone is highly flammable and may cause eye and skin irritation.

- Wear protective goggles.
- Wear protective gloves.

- Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.



- Wipe the inside of the throttle valve housing with a lint-free cloth.
- Allow acetone to dry off completely.
- Install throttle valve module -GX3- ➔ [a4.3 nd installing throttle valve moduleGX3", page 369](#) .
- Connect a ➔ Vehicle diagnostic tester.
- Delete learnt values, and adapt engine control unit -J623- to throttle valve module -GX3-.
- Restore operational readiness then select and execute the following menu option on ➔ Vehicle diagnostic tester:
 - ◆ `0001 - Motor electronics functions`
 - ◆ `0001 - Basic setting`
 - ◆ `0001 - Adaption of throttle valve module - J338`



5 Senders and sensors

⇒ [a5.1 nd installing fuel pressure senderG247", page 372](#)

⇒ [f5.2 uel pressure senderG247", page 373](#)

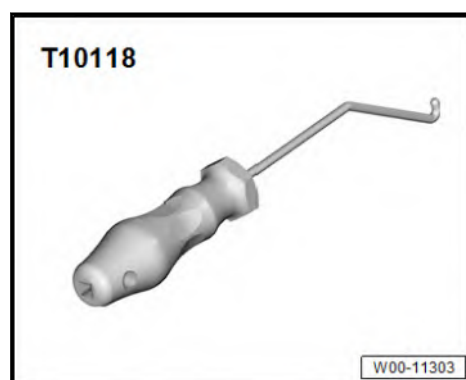
⇒ [a5.3 nd installing intake manifold senderGX9", page 375](#)

⇒ [a5.4 nd installing exhaust gas pressure sensor 1G450", page 375](#)

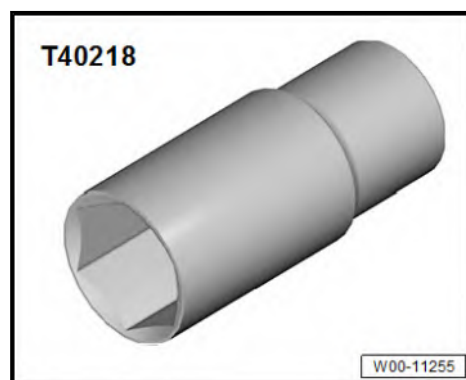
5.1 Removing and installing fuel pressure sender -G247-

Special tools and workshop equipment required

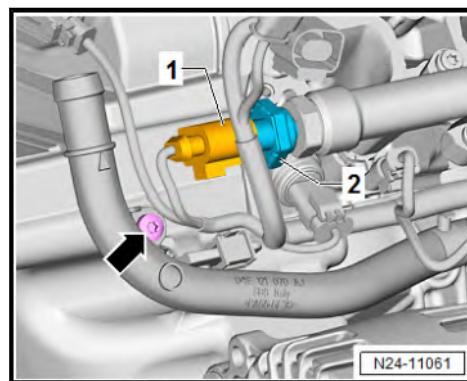
◆ Assembly tool -T10118-



◆ Socket 27 mm -T40218- or commercially available 27 mm hexagon socket insert



Removing



- Disconnect electrical connector -1- using assembly tool -T10118-.
- Unscrew bolt for coolant pipe -arrow-.
- Place a cloth underneath to catch escaping fuel.



- Unscrew fuel pressure sender -G247- -2- using socket 27 mm -T40218-.

Installing

Install in reverse order of removal, observing the following:

- Moisten thread of fuel pressure sender and moisten taper with engine oil before installing.

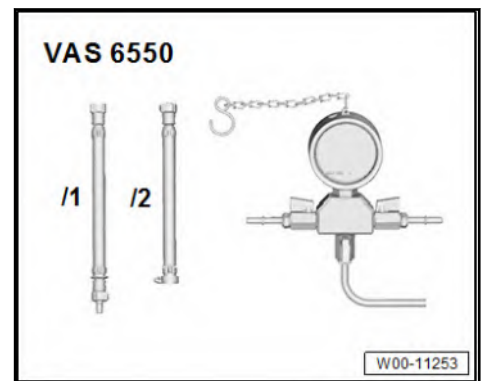
Specified torques

- ◆ ⇒ [o2.1 overview - fuel rail with injectors", page 346](#)
- ◆ ⇒ [o3.1 overview - coolant pipes", page 277](#)

5.2 Checking fuel pressure sender -G247-

Special tools and workshop equipment required

- ◆ Pressure gauge -VAS 6550-



- ◆ Vehicle diagnostic tester

Procedure

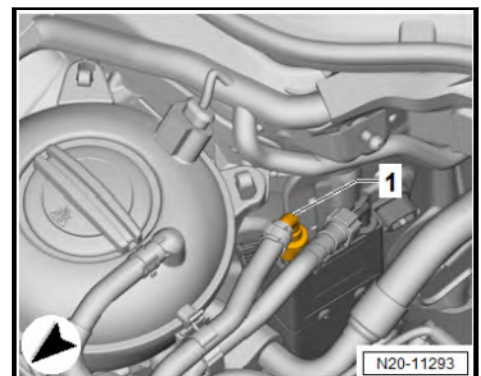
- 1/4 of fuel tank filled with fuel.

CAUTION

The fuel system is pressurised.
Danger of injury through fuel spray.

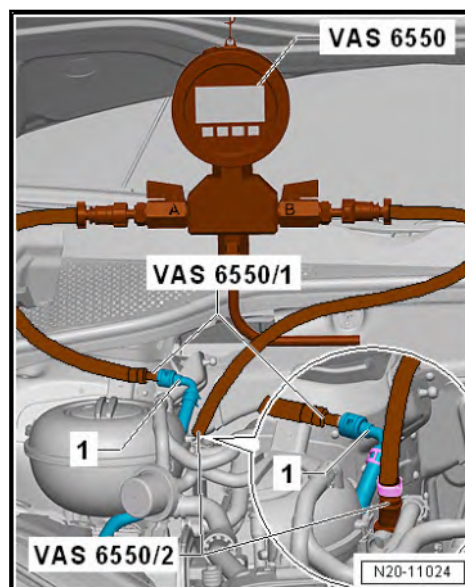
- Wear protective goggles.
- Wear protective gloves.
- To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

- Pull off supply line -1-. Disconnect plug-in connectors ⇒ Rep. gr. 20; Plug-in connectors; Disconnecting plug-in connectors.

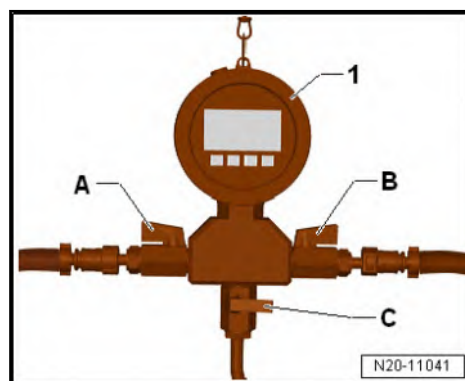




- Collect escaping fuel with a cleaning cloth.
- Connect hose -VAS 6550/1- to connection -A- of pressure tester -VAS 6550-.



- Connect hose -VAS 6550/1- to fuel supply line -1- leading to engine.
- Connect hose -VAS 6550/2- to connection -B- of pressure tester -VAS 6550-.
- Use hose -VAS 6550- to connect fuel line leading to fuel tank with pressure tester -VAS 6550/2-.
- Ensure plug-in connector are secured properly by pulling.
- Ensure that drain tap -C- on pressure tester -1- is closed.



- Shut-off valves -A- and -B- on pressure tester -1- are open.
- Use ⇒ Vehicle diagnostic tester to check fuel pressure sender -G247-. To do this, select following function:
 - ◆ `Diagnosis-capable systems`
 - ◆ `0001 - Engine electronics`
 - ◆ `0001 - Repair groups`
 - ◆ `24 - Mixture preparation/injection`
 - ◆ `G247 - Check fuel pressure sender`



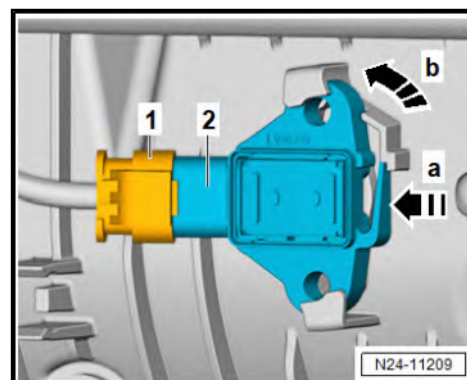
5.3 Removing and installing intake manifold sender -GX9-

Intake manifold sender -GX9- consists of:

- ◆ Intake air temperature sender 2 -G299-
- ◆ Intake manifold pressure sender -G71-

Removing

- Disconnect electrical connector -1-.



- Press release mechanism in direction of arrow -a-, turn intake manifold sender -GX9- -2- in direction of arrow -b- and pull out.

Installing

Install in reverse order of removal, observing the following:



Note

Check O-ring for damage and renew if necessary; see → Electronic parts catalogue (ETKA)

5.4 Removing and installing exhaust gas pressure sensor 1 -G450-

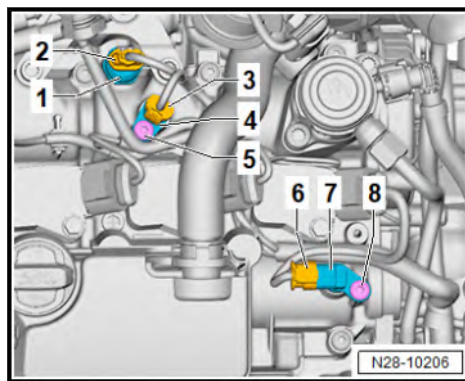
Special tools and workshop equipment required

- ◆ Socket 24 mm -T40284-



Removing

- Remove air pipe ⇒ [a2.5 nd installing air pipe", page 336](#) .
- Disconnect electrical connector -2-.



- Use socket, 24 mm -T40284- to unscrew exhaust gas pressure sensor 1 -G450- -1-.

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *Renew exhaust gas pressure sensor 1 -G450- after removal.*
 - ◆ *Before installing the exhaust gas pressure sensor 1 -G450-, check hole in camshaft housing for soiling.*
- Install air pipe ⇒ [a2.5 nd installing air pipe", page 336](#) .

Specified torques:

- ◆ ⇒ [o1.2 verview - camshaft housing", page 117](#)

6 Engine control unit

⇒ [a6.1 verview - engine control unit", page 377](#)

⇒ [a6.2 nd installing engine control unitJ623", page 377](#)

6.1 Assembly overview - engine control unit

1 - Bracket

2 - Nuts

□ Qty. 2

□ 8 Nm

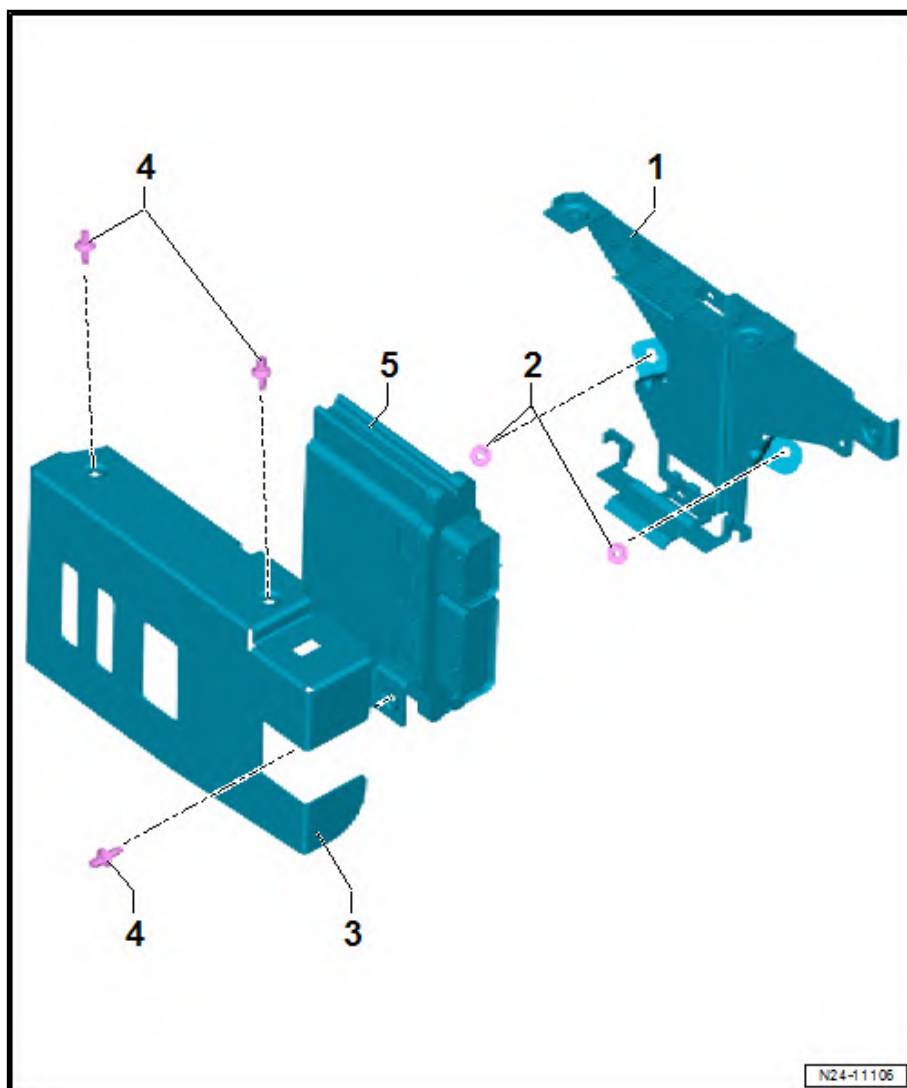
3 - Protective housing

4 - Shear bolts

□ Qty. 3

5 - Engine control unit -J623-

□ Removing and installing ⇒ [a6.2.2 nd installing engine \(motor\) control unitJ623 with protective housing", page 379](#)



6.2 Removing and installing engine control unit -J623-

⇒ [a6.2.1 nd installing engine control unitJ623 without protective housing", page 377](#)

⇒ [a6.2.2 nd installing engine \(motor\) control unitJ623 with protective housing", page 379](#)

6.2.1 Removing and installing engine control unit -J623- without protective housing

Special tools and workshop equipment required

◆ ⇒ Vehicle diagnostic tester



Removing

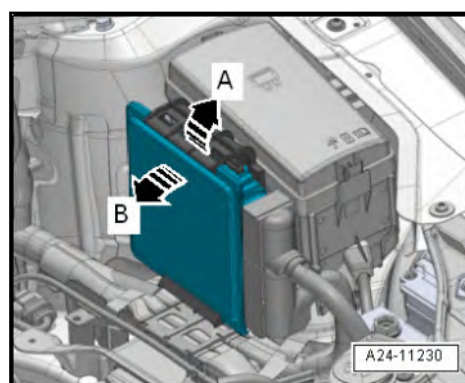
- When renewing engine control unit, connect ⇒ Vehicle diagnostic tester.
- Select 0001 - Renew engine control unit function.



Note

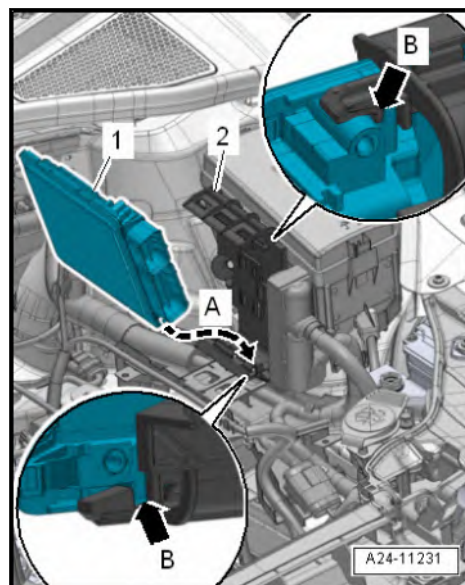
If the engine (motor) control unit comes into contact with the positive battery terminal, permanent damage to the engine (motor) control unit will be the consequence.

- Disconnect battery ⇒ Electrical system; Rep. gr. 27; Battery; Disconnecting and reconnecting battery.
- Release catch -arrow A-, and remove engine control unit -J623- -arrow B-.



- Release and pull off connectors for engine (motor) control unit -J623-.

Installing



Install in reverse order of removal, observing the following:

- Insert lower edge of engine control unit -J623- into bracket -arrow A-, and engage engine control unit in bracket at upper edge.
- When doing this, ensure that lugs of engine control unit engage in notches at top and bottom of bracket -arrows B-.



- Connect battery ⇒ Electrical system; Rep. gr. 27; Battery;
Disconnecting and connecting battery.

6.2.2 Removing and installing engine (motor) control unit -J623- with protective housing

Special tools and workshop equipment required

- ◆ Wiring harness repair set -VAS 1978 B-



- ◆ Hot air blower -VAS 1978/14A-



- ◆ Small grinder (commercially available)
- ◆ ⇒ Vehicle diagnostic tester

Removing

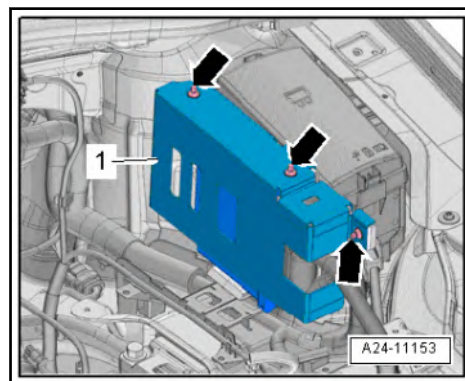
- If engine control unit is renewed, select 0001 - Renew engine control unit function in ⇒ Vehicle diagnostic tester.
- Store the vehicle key and other entry and start authorisation systems outside the vehicle to prevent the vehicle from being switched on unintentionally.



Note

- ◆ *If the engine (motor) control unit comes into contact with the positive battery terminal, permanent damage to the engine (motor) control unit will be the consequence.*
- ◆ *Therefore, make sure to disconnect the battery before removing the engine control unit.*
- Disconnect battery ⇒ Electrical system; Rep. gr. 27; Battery;
Disconnecting and connecting battery.

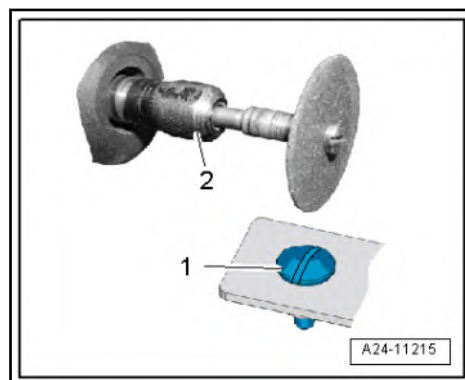
To remove protective housing -1-, unscrew shear bolts -arrows- as follows:



Note

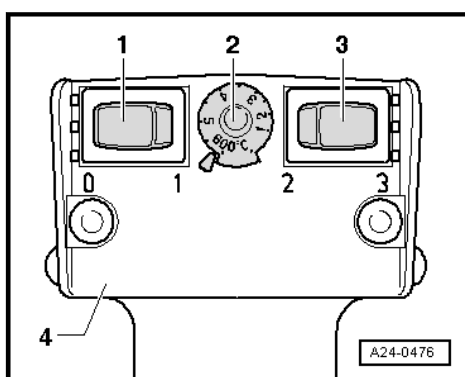
Cover the area around the engine control unit, and protect it from flying sparks.

- Make groove (for a screwdriver) in head of shear bolt -1- using a small grinder -2-.



Note

The threads of the shear bolts are secured with locking fluid. To unscrew these bolts, the threads must therefore be heated with the hot air blower.



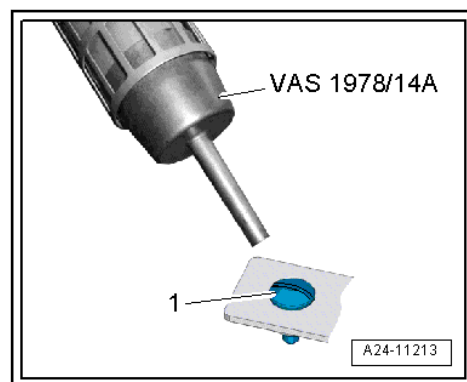
- Set the hot air blower as shown in illustration. Meaning potentiometer for temperature regulation -2- set to maximum heating power and 2-stage switch for air volume -3- set to position 3.



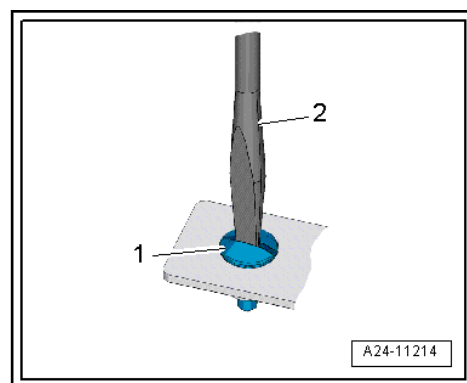
NOTICE

Risk of damage to adjacent components caused by hot air blower. Risk of overheating.

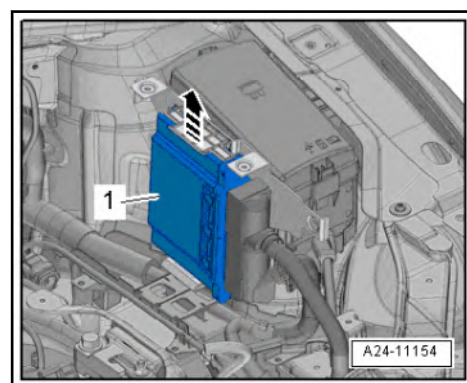
- If necessary, cover adjacent components.
- Heat head of shear bolt -1- for approx. 20 to 30 seconds.



- Unscrew shear bolt -1- with screwdriver -2-.



- Release fastener -arrow- and detach engine control unit -1-.



- Release and pull off connectors for engine (motor) control unit -J623-.

Installing

Install in reverse order of removal, observing the following:

- It is essential that the engine (motor) control unit -J623- be provided with the protective housing again.
- Clean the threaded holes for the shear-head bolts of locking compound residues. A thread chaser is suitable for cleaning.



- Use new shear-head bolts.

After installing a new engine control unit, the following operations must be performed:

- Connect ⇒ Vehicle diagnostic tester.
- Restore operational readiness then select and execute the following menu option on ⇒ Vehicle diagnostic tester:

◆ 0001 - Renew engine control unit



7 High-pressure pump

⇒ [o7.1 verview - high-pressure pump", page 383](#)

⇒ [a7.2 nd installing high-pressure pump", page 384](#)

⇒ [a7.3 nd installing high-pressure pipe", page 386](#)

7.1 Assembly overview - high-pressure pump

1 - High-pressure pump

- ☐ Do not dismantle.
- ☐ Removing and installing ⇒ [a7.2 nd installing high-pressure pump", page 384](#)

2 - Bolt

- ☐ Qty. 2
- ☐ M8 × 25
- ☐ Renew
- ☐ Note tightening sequence ⇒ [page 384](#) .

3 - O-ring

- ☐ When installing, moisten lightly with clean engine oil
- ☐ Renew

4 - Roller rocker fingers

- ☐ When installing lubricate lightly with clean engine oil

5 - Fuel line

- ☐ From fuel tank

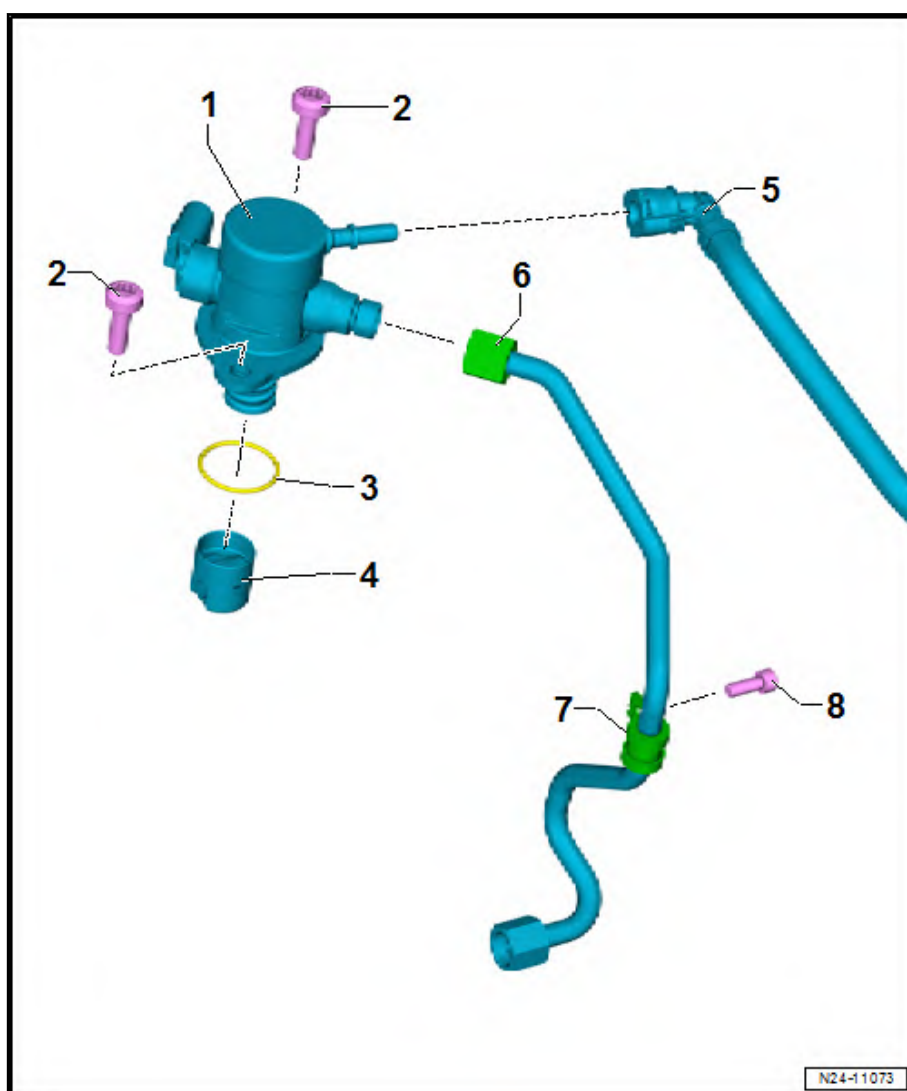
6 - High-pressure pipe

- ☐ Does not need to be replaced
- ☐ Unions must be free of damage
- ☐ Do not alter shape.
- ☐ Lubricate thread of union nuts with clean engine oil
- ☐ Removing and installing ⇒ [a7.3 nd installing high-pressure pipe", page 386](#)
- ☐ 16 Nm +45°

7 - Clip

8 - Bolt

- ☐ Can be reused
- ☐ M6 × 14
- ☐ 8 Nm





Note

To prevent flange of high-pressure pump from being deformed during installation, install high-pressure pump as follows:

Tightening procedure:

Stage	Bolts M8 × 25	Specified torque/turning further angle
1st	-2-	Screw onto stop by hand
2nd	-2-	Tighten one turn alternately until flange of high-pressure pump makes contact with camshaft housing
3rd	-2-	20 Nm
4th	-2-	Turn 90° further

7.2 Removing and installing high-pressure pump

Removing

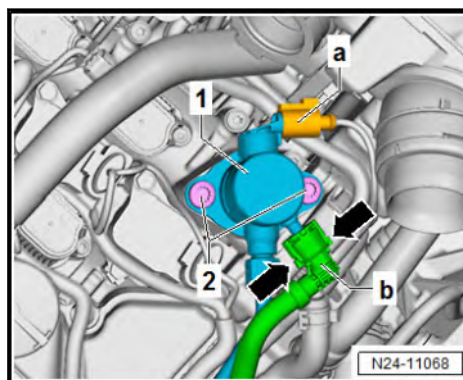
- Engine cold.



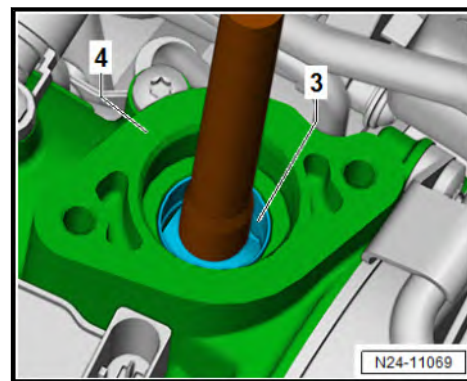
CAUTION

The fuel system is pressurised.
Danger of injury through fuel spray.
– Release high pressure.

- Place a cloth underneath to catch escaping fuel.
- Release and pull off electrical connector -a-.



- Release hose coupling -b- by pressing button -arrows-. Pull off fuel supply hose.
- Remove high-pressure pipe ⇒ [a7.3 nd installing high-pressure pipe", page 386](#) .
- Unscrew bolts -2-, and remove high-pressure pump -1-.
- Use a bar magnet to pull roller tappets -3- out of camshaft housing -4-.



Installing

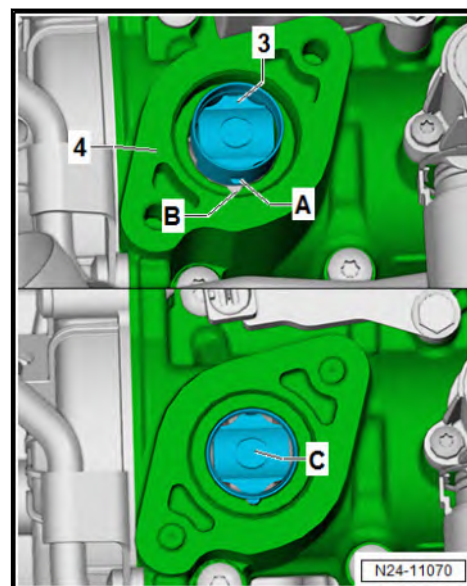


Note

Renew O-ring.

- Check roller tappet for damage and renew if necessary.
- Moisten roller tappet -3- with clean engine oil.
- Insert roller tappet -3- into camshaft housing. Observe installation position

Installation position of roller tappet



- The groove -A- of roller tappet -3- must engage in chamfer -B- in camshaft housing -4-.
- The contour -C- is visible, if the roller tappet is positioned correctly.
- The roller of the roller tappet must rest against the cam of the camshaft.
- Turn crankshaft in direction of engine rotation until roller tappet is at bottom dead centre.
- Moisten new O-ring with engine oil, and insert it into groove of high-pressure pump.
- Screw in new bolts by hand to stop at flange of high-pressure pump.



- To prevent flange of high-pressure pump from being deformed during installation, install high-pressure pump in accordance with assembly instructions: ➔ [page 384](#)

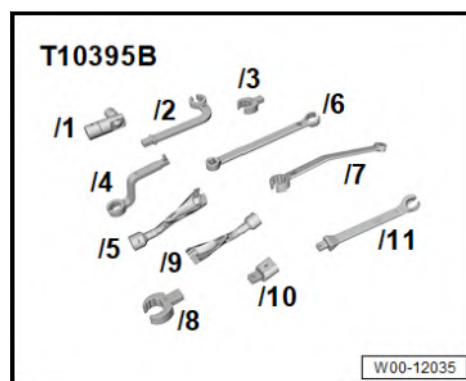
Torque settings

- ◆ ➔ [o2.1 verview - fuel rail with injectors", page 346](#)
- ◆ ➔ [o7.1 verview - high-pressure pump", page 383](#)
- ◆ ➔ [o3.1 verview - air filter housing", page 357](#)

7.3 Removing and installing high-pressure pipe

Special tools and workshop equipment required

- ◆ Insert -T10395/9- from tool set -T10395B-



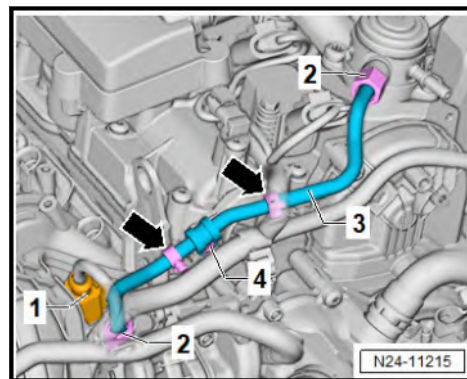
Removing

- Remove air filter housing. ➔ [a3.2 nd installing air filter housing", page 359](#)

CAUTION

The fuel system is pressurised.
Danger of injury through fuel spray.
– Release high pressure.

- Place a cloth underneath to catch escaping fuel.
- Disconnect electrical connector -1- for throttle valve module -GX3- and open clips for wiring harness -arrows- on high-pressure pipe -3-.



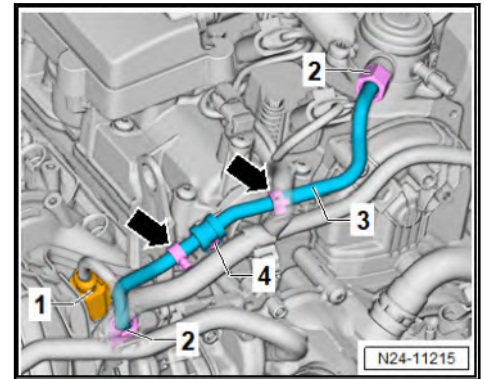
- Unscrew union nuts -2-.
- Unscrew securing bolt -4-. Remove high-pressure pipe -3- and guide out towards side.



Installing

Install in reverse order of removal, observing the following:

- The high-pressure pipe does not need to be renewed after disassembly.
- Unions must be free of damage
- Do not alter shape.
- Lubricate thread of union nuts with clean engine oil.
- Screw on union nuts -2- for high-pressure pipe -3- finger-tight, making sure that pipe is not under stress.



- Tighten securing bolt -4- hand-tight.
- Tighten union nuts -2- with insert -T10395/9- from tool set -T10395 B-.
- Tighten securing bolt on bracket -4- to specified torque.
- Fit electrical connector -1- for throttle valve module -GX3- and close clips for wiring harness -arrows- on high-pressure pipe -3-.
- Install air filter housing ⇒ [a3.2 nd installing air filter housing”, page 359](#) .

Torque settings

- ◆ ⇒ [o3.1 verview - air filter housing”, page 357](#)
- ◆ ⇒ [o2.1 verview - fuel rail with injectors”, page 346](#)
- ◆ ⇒ [o7.1 verview - high-pressure pump”, page 383](#)



8 Lambda probe

⇒ [o8.1 verview - Lambda probe", page 388](#)

⇒ [a8.2 nd installing Lambda probe", page 389](#)

8.1 Assembly overview - Lambda probe



Note

- ◆ *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ [Electronic parts catalogue](#).*
- ◆ *During installation, it is essential that wiring of lambda probe is reattached in same positions. The wire must be prevented from touching the exhaust pipe.*

1 - Lambda probe 1 before catalytic converter -GX10-

- ❑ Consisting of:
 - Lambda probe -G39-
 - Lambda probe heater - Z19-
- ❑ Removing and installing ⇒ [a8.2 nd installing Lambda probe", page 389](#)
- ❑ 55 Nm

2 - Lambda probe 1 after catalytic converter -GX7-

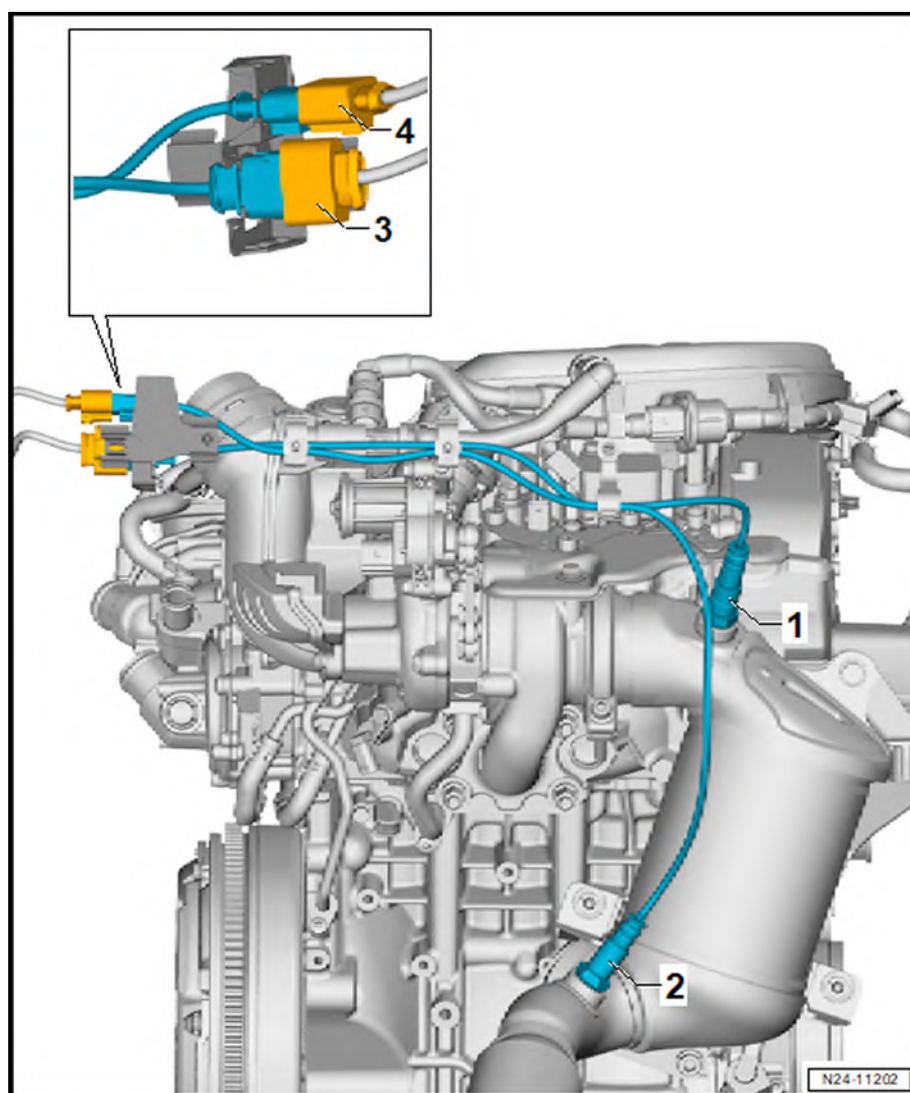
- ❑ Consisting of:
 - Lambda probe after catalytic converter -G130-
 - Lambda probe 1 heater after catalytic converter -Z29-
- ❑ Removing and installing ⇒ [a8.2 nd installing Lambda probe", page 389](#)
- ❑ 55 Nm

3 - Electrical connector

- ❑ For Lambda probe 1 before catalytic converter -GX10-.

4 - Electrical connector

- ❑ For Lambda probe 1 after catalytic converter -GX7-.



8.2 Removing and installing Lambda probe

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set -3337-



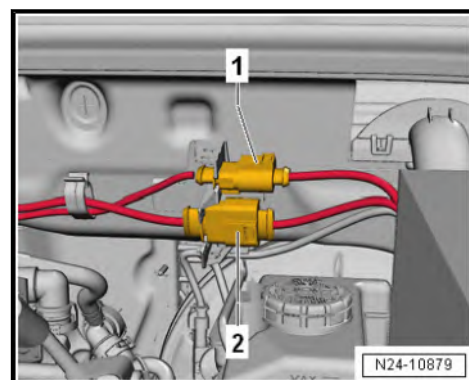
Lambda probe 1 before catalytic converter -GX10- consists of

- ◆ Lambda probe -G39-
- ◆ Lambda probe heater -Z19-

Lambda probe 1 after catalytic converter -GX7- consists of

- ◆ Lambda probe after catalytic converter -G130-
- ◆ Lambda probe 1 heater after catalytic converter -Z29-

Removing



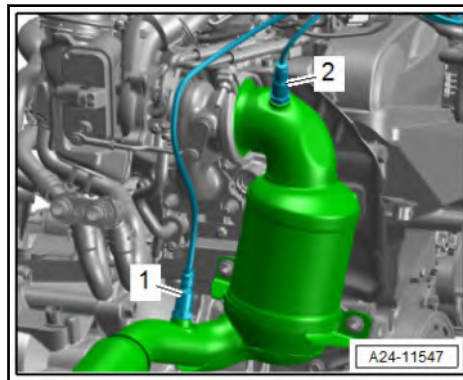
- Release, pull off and detach electrical connector -1 and 2- respectively.
- Lay wiring harness to one side.

Continued for all vehicles

Steckerfarbe braun - Lambda probe before catalytic converter -GX10-

Steckerfarbe schwarz - Lambda probe after catalytic converter -GX7-

- Unscrew corresponding Lambda probe using a tool from Lambda probe open ring spanner set -3337-.



- 1 - Lambda probe 1 after catalytic converter -GX7-
- 2 - Lambda probe 1 before catalytic converter -GX10-

Installing

Install in reverse order of removal, observing the following:



Note

- ◆ *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- ◆ *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue.*
- ◆ *During installation, it is essential that wiring of lambda probe is reattached in same positions. The wire must be prevented from touching the exhaust pipe.*
- If lambda probe has been renewed, erase learnt values and adapt lambda probe to engine control unit using ⇒ vehicle diagnostic tester.
- Reactivate vehicle's drive system, and select the following menu option on ⇒ Vehicle diagnostic tester:
 - ◆ 0001 - Lambda probe adaption

Torque settings

- ◆ [⇒ o8.1 verview - Lambda probe", page 388](#)



26 – Exhaust system

1 Exhaust pipes and silencers

⇒ [o1.1 verview – silencers”, page 391](#)

⇒ [e1.2 xhaust pipes from silencers”, page 395](#)

⇒ [a1.3 nd installing silencer”, page 396](#)

⇒ [e1.4 xhaust system free of stress”, page 401](#)

⇒ [e1.5 xhaust system for leaks”, page 401](#)

⇒ [p1.6 osition of clamp”, page 402](#)

1.1 Assembly overview – silencers

⇒ [o1.1.1 verview – silencers, Golf 2020 , Golf Estate 2021 , T-Roc, T-Roc Cabrio”, page 391](#)

⇒ [o1.1.2 verview – silencers, Polo 2018, T-Cross”, page 394](#)

1.1.1 Assembly overview – silencers, Golf 2020 , Golf Estate 2021 , T-Roc, T-Roc Cabrio



1 - Retainer

- ☐ Renew if damaged

2 - Bolt

- ☐ 20 Nm

3 - Mounting »A«

- ☐ Renew if damaged
- ☐ Only for rear silencer
- ☐ Aligning ➤ [page 393](#)

4 - Rear silencer

- ☐ One unit with front silencer as original equipment, but can be renewed separately for repair purposes.
- ☐ Removing and installing ➤ [a1.3 nd installing silencer", page 396](#)
- ☐ Separating exhaust pipes from silencers ➤ [e1.2 xhaust pipes from silencers", page 395](#)
- ☐ Aligning exhaust system free of tension ➤ [e1.4 xhaust system free of stress", page 401](#).

5 - Rear clamp

- ☐ Tighten threaded connections evenly.
- ☐ Align exhaust system free of tension before tightening ➤ [e1.4 xhaust system free of stress", page 401](#).
- ☐ Fitting position ➤ [page 402](#)
- ☐ Torque ➤ [page 403](#)

6 - Nut

- ☐ 30 Nm

7 - Retainer

- ☐ Renew if damaged

8 - Bolt

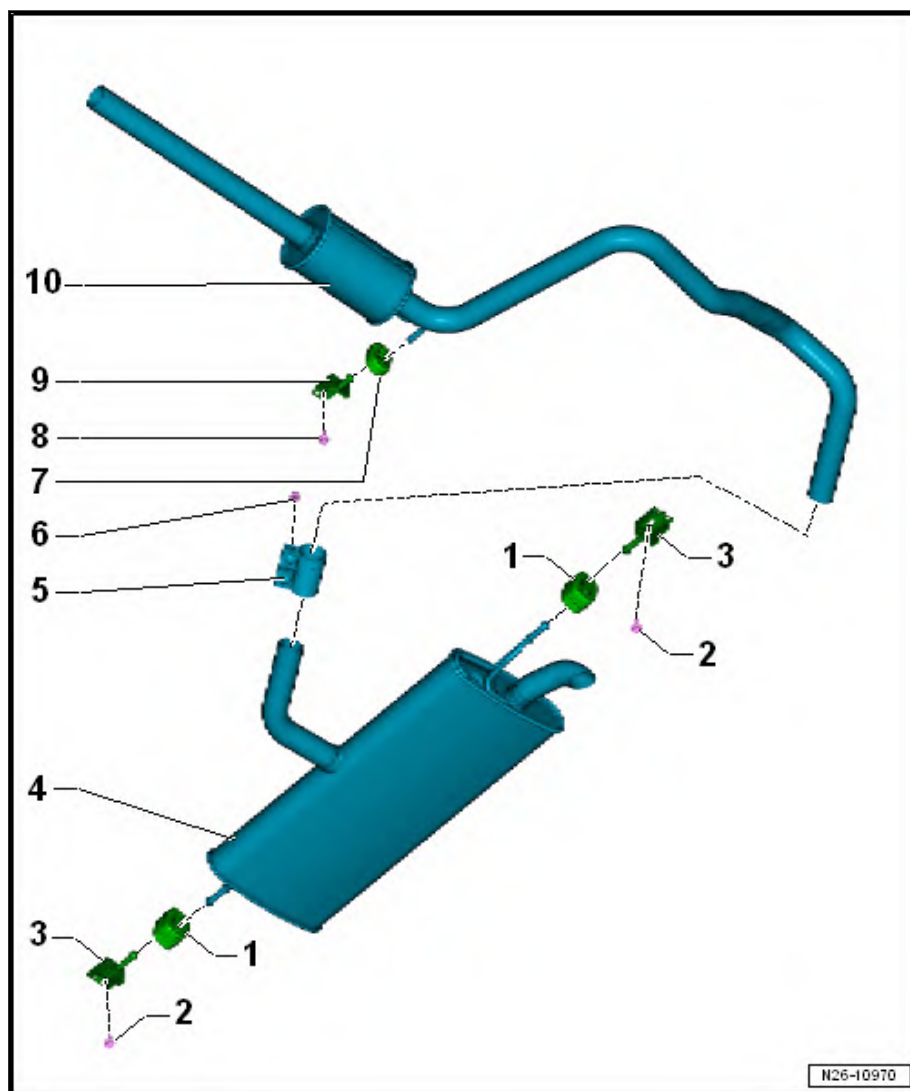
- ☐ 20 Nm +90°

9 - Mounting »B«

- ☐ Renew if damaged
- ☐ Only for front silencer
- ☐ Aligning ➤ [page 393](#)

10 - Front silencer

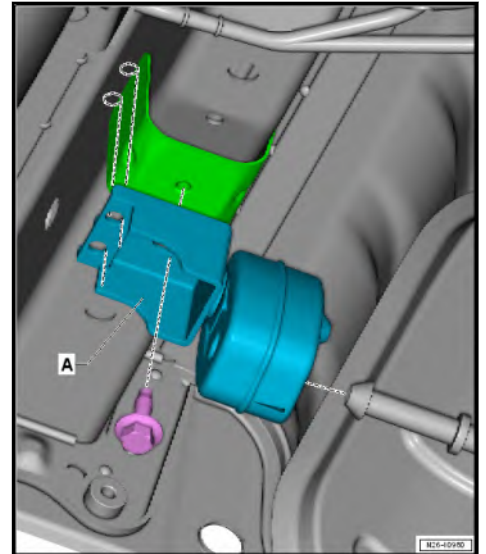
- ☐ Forms one unit with rear silencer as original equipment, but can be renewed separately for repair purposes
- ☐ Removing and installing ➤ [a1.3 nd installing silencer", page 396](#)
- ☐ Separating exhaust pipes from silencers ➤ [e1.2 xhaust pipes from silencers", page 395](#)





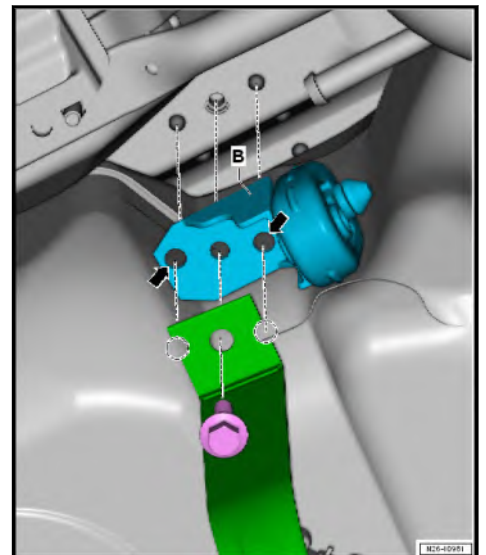
- ❑ Aligning exhaust system free of tension ➔ [e1.4 xhaust system free of stress", page 401](#) .

Aligning mounting »A«



- Pre-tighten bolt.
- Align mounting at elongated hole as necessary.
- Using blunt side of commercially available 8 mm drill bit, align holes of mounting -A- centrally and perpendicular to longitudinal member.
- Then tighten to specified torque.

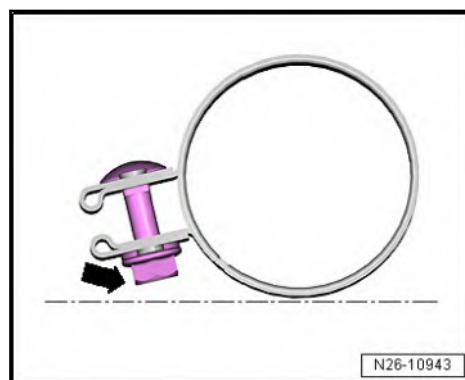
Aligning mounting »B«



- Pre-tighten bolt.
- Align mounting at elongated hole as necessary.
- Using blunt end of commercially available 8 mm drill bit, align holes -arrows- of mounting -B- centrally and parallel to longitudinal member.
- Then tighten to specified torque.



Installation position of rear clamp



- Fit clamp in position shown.
- Bolted connections facing to left.
- Bolt -arrow- must not protrude beyond lower edge of clamp.

1.1.2 Assembly overview – silencers, Polo 2018, T-Cross

1 - Clamping sleeve

- ☐ Fitting position ⇒ [page 402](#)
- ☐ Specified torque ⇒ [page 403](#)

2 - Front silencer

- ☐ Removing and installing ⇒ [page 397](#)

3 - Retaining ring

4 - Bracket

5 - Bolts

- ☐ Number depends on equipment
- ☐ 20 Nm

6 - Coupling point

- ☐ Disconnecting ⇒ [page 395](#)

7 - Rear silencer

- ☐ Removing and installing ⇒ [page 400](#)

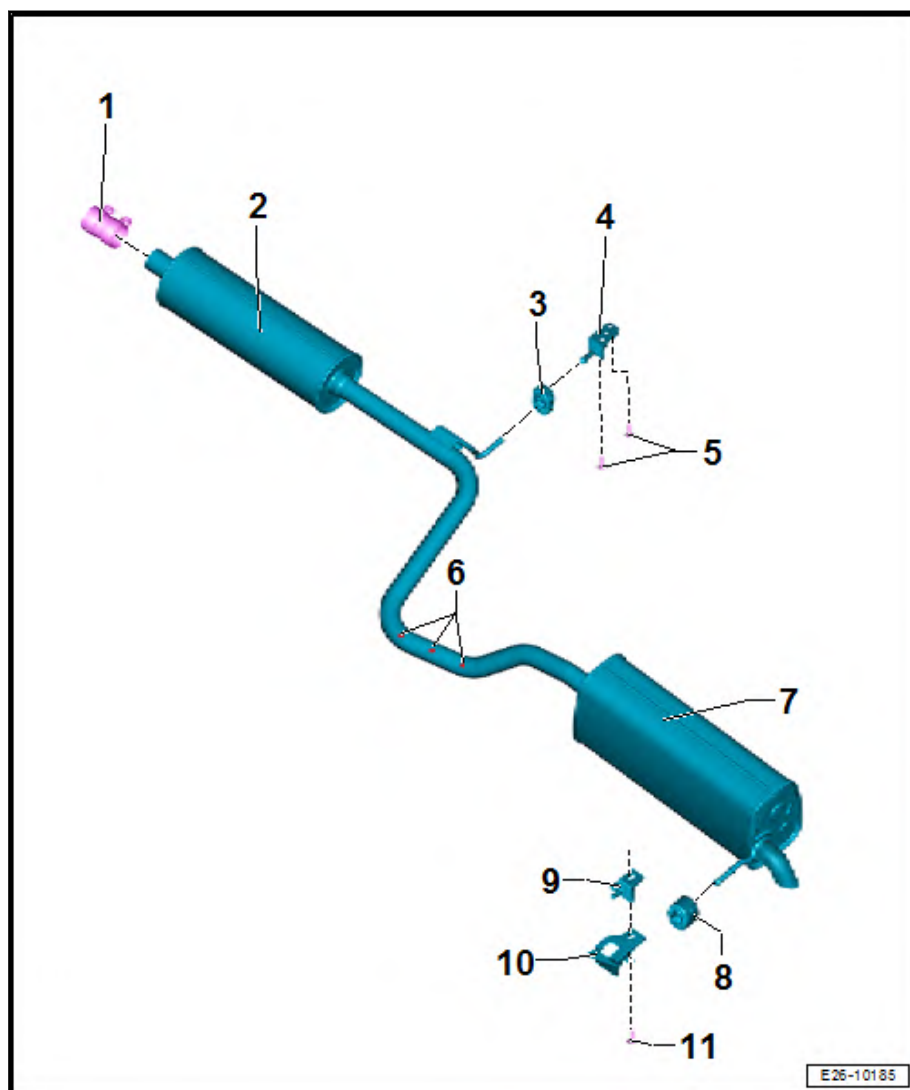
8 - Retaining ring

9 - Bracket

10 - Bracket

11 - Bolt

- ☐ 20 Nm





1.2 Separating exhaust pipes from silencers

⇒ [e1.2.1 xhaust pipes from silencers", page 395](#)

1.2.1 Separating exhaust pipes from silencers

Special tools and workshop equipment required

◆ Chain-type pipe cutter -VAS 6254-



◆ Pneumatic sabre saw -VAS 6598A-



Procedure



CAUTION

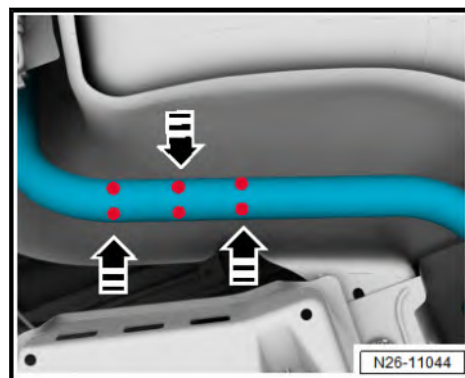
Risk of injury from swarf being flung into air.
Irritation and injury to skin and eyes possible.

- Wear protective goggles.
- Wear protective gloves.

- ◆ Separating points are provided in the exhaust system for the individual removal of exhaust system parts.
- ◆ The separating points are indicated with markings on the outside of the exhaust pipe.



Separating point on rear silencer



- Cut through exhaust pipe at centre separating point -upper arrow- at right angles, e.g. with pneumatic sabre saw -V.A.G 1523B- or chain pipe cutter -VAS 6254-.
- Position repair double clamp centrally between outer markings -lower arrow-.
- Take installation position of clamp into account ➔ [p1.6 position of clamp](#), page 402

1.3 Removing and installing silencer

➔ [a1.3.1 nd installing front silencer, Golf 2020, Golf Estate 2021, T-Roc, T-Roc Cabrio](#), page 396

➔ [a1.3.2 nd installing front silencer, Polo 2018, T-Cross](#), page 397

➔ [a1.3.3 nd installing rear silencer, Golf 2020, Golf Estate 2021, T-Roc, T-Roc Cabrio](#), page 398

➔ [a1.3.4 nd installing rear silencer, Polo 2018, T-Cross](#), page 400

1.3.1 Removing and installing front silencer, Golf 2020, Golf Estate 2021, T-Roc, T-Roc Cabrio

Removing

CAUTION

Risk of accident caused by high weight of silencers.

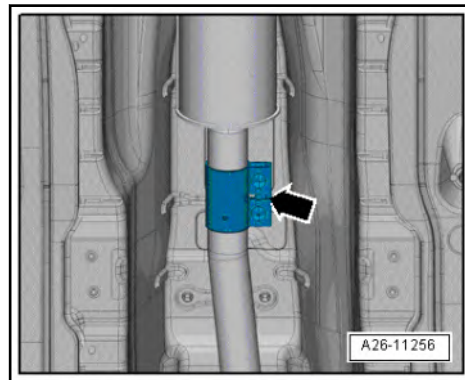
- Seek help from a second a mechanic for the following work.
- If fitted, remove rear left underbody cladding ➔ General body repairs, exterior; Rep. gr. 66; Underbody cladding.
- Remove rear tunnel cross-piece ➔ General body repairs, exterior; Rep. gr. 66; Underbody cladding.

Separating point without clamp

- Separate silencers ➔ [e1.2 xhaust pipes from silencers](#), page 395

Separating point with clamp

- Loosen clamp at rear, and push it to rear.
- Detach front silencer from rubber mounting.
- Loosen clamp -arrow- at front, and push it forwards.



- Remove front silencer.

Installing

Install in reverse order of removal, observing the following:

- Align exhaust system free of stress ⇒ [e1.4 xhaust system free of stress](#), page 401 .

Torque settings

- ⇒ [o1.1 verview – silencers](#), page 391
- ⇒ [o2.1 verview - emission control](#), page 404
- ⇒ General body repairs, exterior; Rep. gr. 66; Underbody cladding

1.3.2 Removing and installing front silencer, Polo 2018, T-Cross

Removing

- If fitted, remove middle underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66; Underbody cladding; Removing and installing underbody cladding.
- If fitted, remove rear left underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66; Underbody cladding; Removing and installing underbody cladding.
- Remove rear tunnel cross-piece ⇒ General body repairs, exterior; Rep. gr. 66; Underbody cladding; Removing and installing tunnel cross-piece.



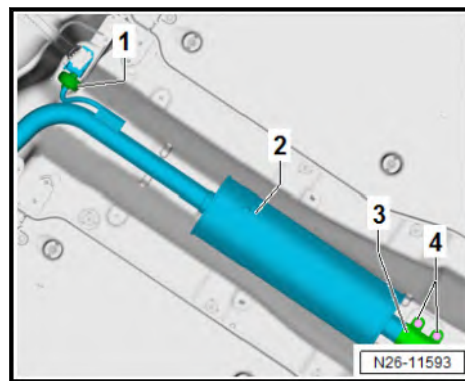
CAUTION

Danger of severe burns from hot exhaust system.

Risk of burns to hands and other parts of body.

- Allow exhaust system to cool.

- Loosen nuts -4-.



- Push clamp -3- forwards.
- Disconnect exhaust pipe/rear silencer. ⇒ [e1.2 exhaust pipes from silencers](#), page 395

CAUTION

Risk of accident caused by high weight of silencers.

- Seek help from a second a mechanic for the following work.

- Disengage retaining ring -1-.
- Remove front silencer -2- with aid of second mechanic.

Installing

Install in reverse order of removal, observing the following:

- Note installation position of clamp. ⇒ [p1.6 osition of clamp](#), page 402
- Align exhaust system free of stress. ⇒ [e1.4 exhaust system free of stress](#), page 401

Specified torques

- ⇒ [o1.1.2 verview – silencers, Polo 2018, T-Cross](#), page 394

1.3.3 Removing and installing rear silencer, Golf 2020, Golf Estate 2021, T-Roc, T-Roc Cabrio

Removing

- If fitted, remove rear left underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66; Underbody cladding.

CAUTION

Risk of accident caused by high weight of silencers.

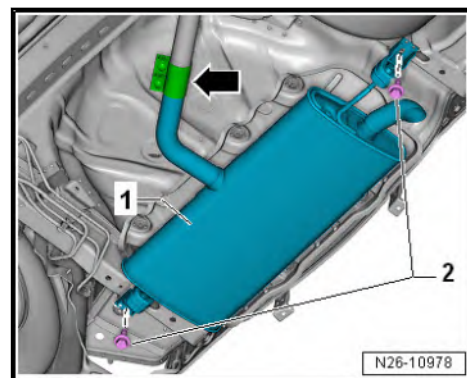
- Seek help from a second a mechanic for the following work.

Separating point without clamp

- Separate silencers ⇒ [e1.2 exhaust pipes from silencers](#), page 395



Separating point with clamp



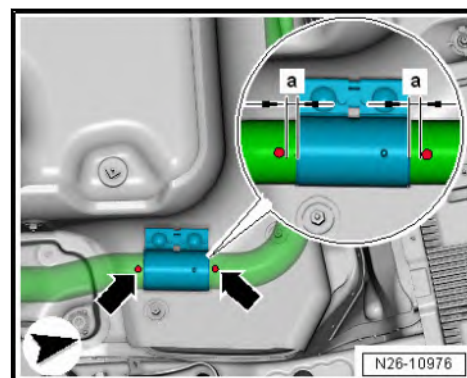
- Loosen clamp -arrow-, and push it forwards.
- Remove bolt -2- on both sides.
- Remove rear silencer -1-.



Note

- ◆ *The position of the coupling point may vary slightly, depending on the vehicle type.*
- ◆ *Pay attention to the marking of the coupling points ⇒ [page 396](#).*

Installing



Install in reverse order of removal, observing the following:



Note

Make sure to obtain the same distance -dimension a- to the marks -arrows-.

- Align exhaust system free of stress ⇒ [e1.4 xhaust system free of stress](#), [page 401](#).

Torque settings

- ⇒ [o1.1 verview – silencers](#), [page 391](#)
- ⇒ [o2.1 verview - emission control](#), [page 404](#)
- ⇒ General body repairs, exterior; Rep. gr. 66; Underbody cladding



1.3.4 Removing and installing rear silencer, Polo 2018, T-Cross

Removing

- If fitted, remove rear left underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66; Underbody cladding; Removing and installing underbody cladding.

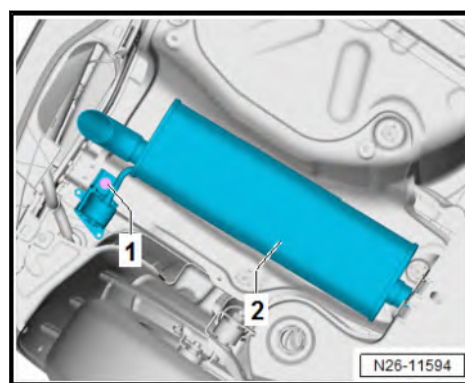
CAUTION

Danger of severe burns from hot exhaust system.

Risk of burns to hands and other parts of body.

- Allow exhaust system to cool.

- Disconnect exhaust pipe/rear silencer. ⇒ [e1.2 exhaust pipes from silencers](#), page 395



CAUTION

Risk of accident caused by high weight of silencers.

- Seek help from a second mechanic for the following work.

- Unscrew bolt -1-.
- Remove rear silencer -2- with aid of second mechanic.

Installing

Install in reverse order of removal, observing the following:

- Note installation position of clamp. ⇒ [p1.6 osition of clamp](#), page 402 .
- Align exhaust system free of stress. ⇒ [e1.4 exhaust system free of stress](#), page 401 .

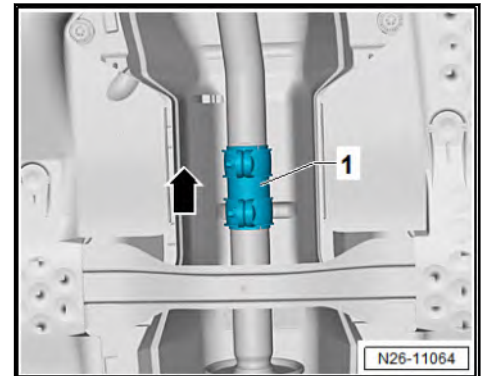
Specified torques

- ⇒ [o1.1.2 verview – silencers, Polo 2018, T-Cross](#), page 394

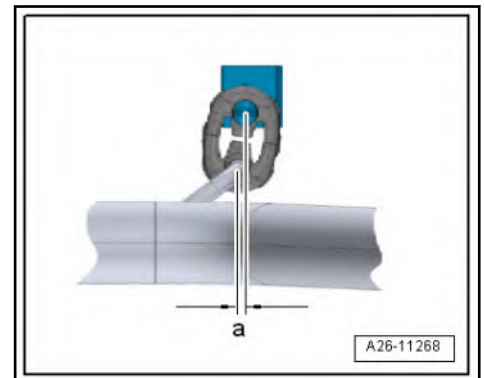


1.4 Aligning exhaust system free of stress

Procedure



- The exhaust system must be aligned when cold.
- Loosen bolt connections for front clamp -arrow-.
- Push exhaust system towards front of vehicle until preloading at mounting for exhaust pipe -a- = 5 mm.



- Install front clamp. ➔ [p1.6 osition of clamp", page 402](#)

Torque settings

- ◆ Clamp ➔ [page 403](#)

1.5 Checking exhaust system for leaks

Procedure

- Start engine and run it at idling speed.
- Seal end exhaust pipes with cloths or plugs, for example, for the duration of the leakage test.
- Check (by listening) points of connection between exhaust manifold and the cylinder head, between turbocharger and front exhaust pipe etc. to make sure there are no leaks.
- Repair any leaks found.



1.6 Installation position of clamp

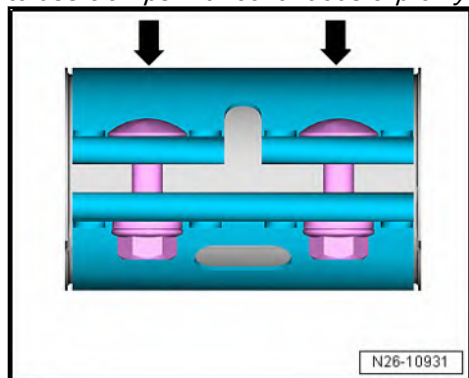
⇒ [p1.6.1 osition of clamp", page 402](#)

1.6.1 Installation position of clamp

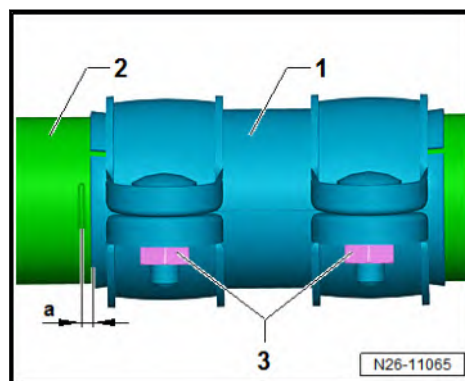


Note

Make sure to use clamps with continuous clip only.



Position of clamp



Make sure that installation dimension -a- is obtained.

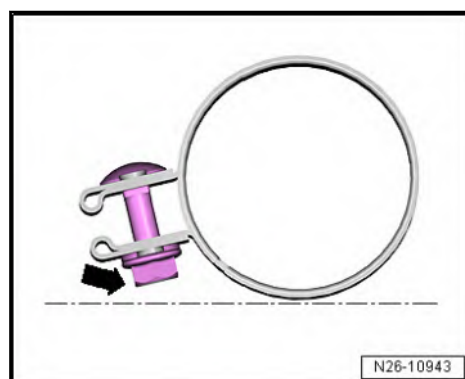
a - Distance to marking: approx. 5 mm

1 - Clamping sleeve

2 - Front exhaust pipe

3 - Securing nut

Installation position of clamp



– Fit clamp in position shown.



- Bolted connections facing to left.
- Bolt -arrow- must not protrude beyond lower edge of clamp.

Torque settings

Component	Specified torque
Clamping sleeve	30 Nm



2 Emission control

⇒ [o2.1 verview - emission control", page 404](#)

⇒ [a2.2 nd installing catalytic converter", page 407](#)

⇒ [a2.3 nd installing particulate filter", page 410](#)

2.1 Assembly overview - emission control

⇒ [o2.1.1 verview - emission control with particulate filter", page 404](#)

2.1.1 Assembly overview - emission control with particulate filter

Part 1, catalytic converter and attachments



1 - Bolt

- ☐ Specified torque and tightening sequence ⇒ [Fig. ""Installing catalytic converter - specified torque and tightening sequence:"", page 406](#)
- ☐ 20 Nm

2 - Bracket

3 - Bolt

- ☐ Specified torque and tightening sequence ⇒ [Fig. ""Installing catalytic converter - specified torque and tightening sequence:"", page 406](#)
- ☐ 20 Nm

4 - Lambda probe 1 before catalytic converter -GX10-

- ☐ Consisting of:
Lambda probe -G39-
Lambda probe heater -Z19-
- ☐ Assembly overview ⇒ [page 388](#)
- ☐ Removing and installing ⇒ [page 389](#)
- ☐ 55 Nm

5 - Lambda probe 1 after catalytic converter -GX7-

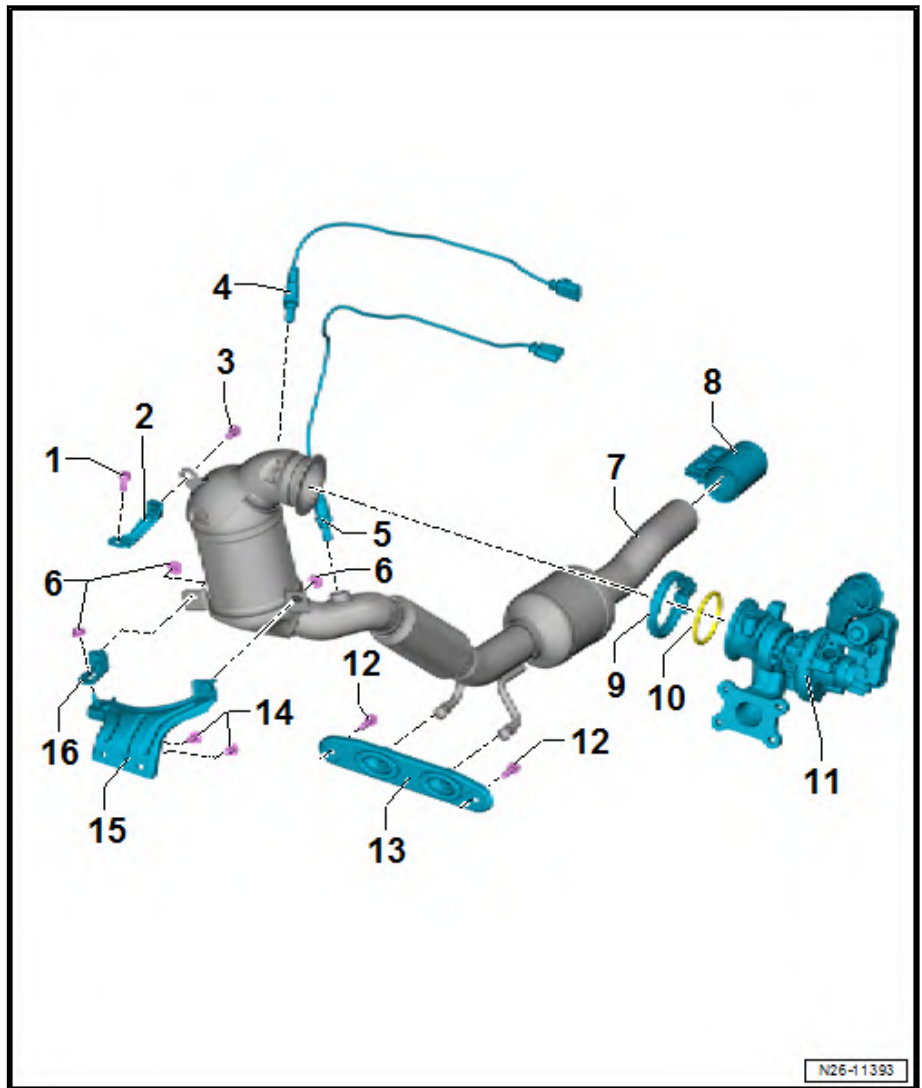
- ☐ Consisting of:
Lambda probe after catalytic converter -G130-
Lambda probe 1 heater after catalytic converter -Z29-
- ☐ Assembly overview ⇒ [page 388](#)
- ☐ Removing and installing ⇒ [page 389](#)
- ☐ 55 Nm

6 - Nut

- ☐ Specified torque and tightening sequence ⇒ [Fig. ""Installing catalytic converter - specified torque and tightening sequence:"", page 406](#)
- ☐ 20 Nm

7 - Front exhaust pipe

- ☐ With petrol particulate filter and catalytic converter
- ☐ Do not bend flexible joint more than 10°. Otherwise, it can be damaged.
- ☐ Install flexible joint so that it is not under tension
- ☐ Take care not to damage wire mesh on decoupling element.
- ☐ Protect catalytic converter from damage by knocks and impact
- ☐ Do not remove protective packaging from replacement part until you are ready to fit the flexible joint
- ☐ Removing and installing ⇒ [a2.2 nd installing catalytic converter", page 407](#)
- ☐ Aligning exhaust system free of tension ⇒ [page 401](#) .



N26-11393



8 - Clamping sleeve

- ☐ Tighten threaded connections evenly.
- ☐ Align exhaust system free of tension before tightening ⇒ [page 401](#)
- ☐ Fitting position ⇒ [page 391](#)
- ☐ Specified torque ⇒ [page 403](#)

9 - Screw-type clamp

- ☐ Renew
- ☐ Specified torque and tightening sequence ⇒ [Fig. ““Installing catalytic converter - specified torque and tightening sequence.””, page 406](#)

10 - Seal

- ☐ Removing and installing ⇒ [page 324](#)
- ☐ Renew

11 - Turbocharger

- ☐ Assembly overview ⇒ [o1.1 verview - turbocharger”, page 316](#)
- ☐ Removing and installing ⇒ [a1.2 nd installing turbocharger”, page 319](#)

12 - Bolt

- ☐ 20 Nm

13 - Bracket

- ☐ Renew if damaged

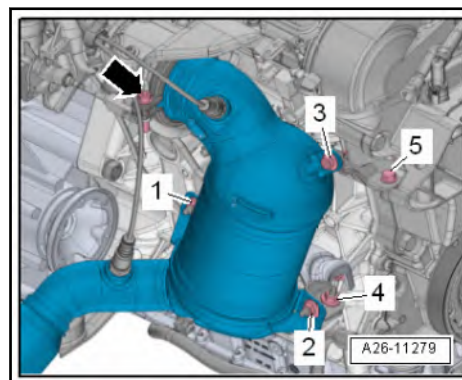
14 - Bolt

- ☐ 20 Nm

15 - Bracket

16 - Bracket

Installing catalytic converter - specified torque and tightening sequence:



1)	– Fit catalytic converter to turbocharger and fit screw-type clip -arrow- without tightening	
2)	– Loosely screw in bolts -3-, -5- and loosely screw on nuts -1-, -2- and -4- by hand.	• It should still be possible to move catalytic converter and bracket.
3)	– Tighten screw-type clip -arrow-	15 Nm
4)	– Tighten bolts and nuts in the sequence -1- to -5-.	20 Nm

Part 2, Brackets and heat shields

1 - Heat shield

- ☐ For engine
- ☐ Renew if damaged

2 - Bolts

- ☐ Qty. 4
- ☐ 20 Nm

3 - Bracket

4 - Bolts

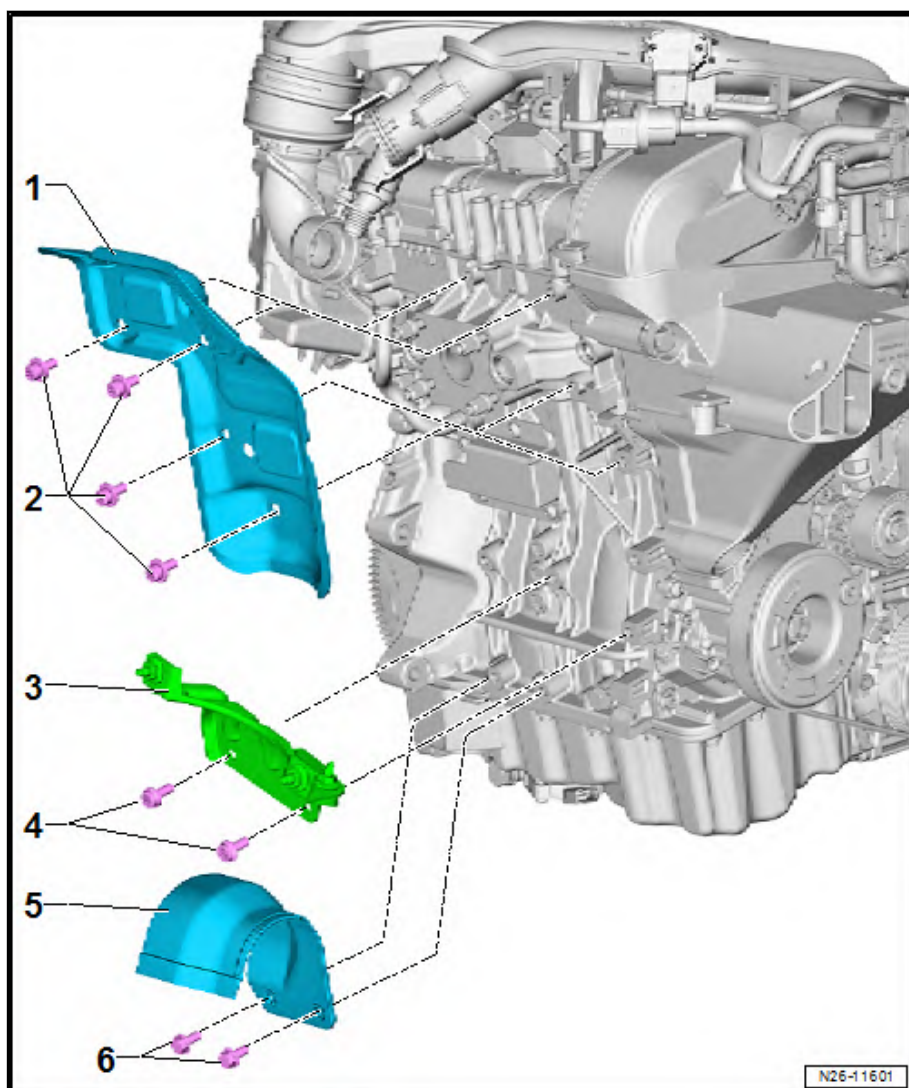
- ☐ Qty. 2
- ☐ 20 Nm

5 - Heat shield

- ☐ For drive shaft
- ☐ Renew if damaged

6 - Bolts

- ☐ Qty. 2
- ☐ 25 Nm



2.2 Removing and installing catalytic converter

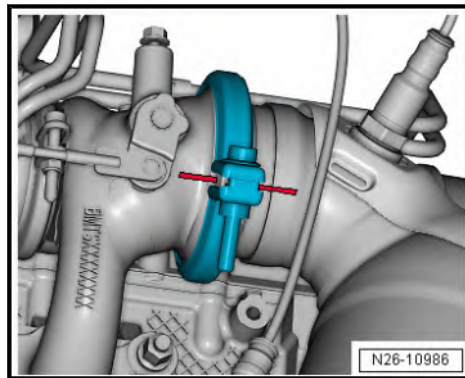
Removing



Note

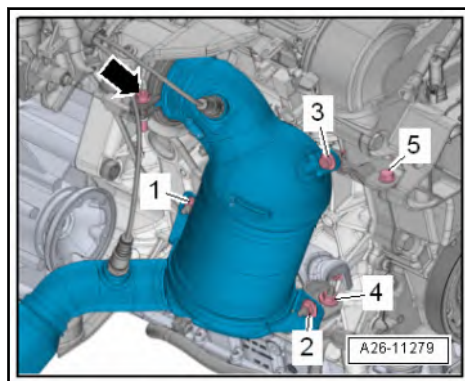
- ◆ *The catalytic converter is removed together with the front exhaust pipe.*
- ◆ *Attach cable ties in all the same places when installing.*
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Assembly overview - noise insulation.

Clamp position

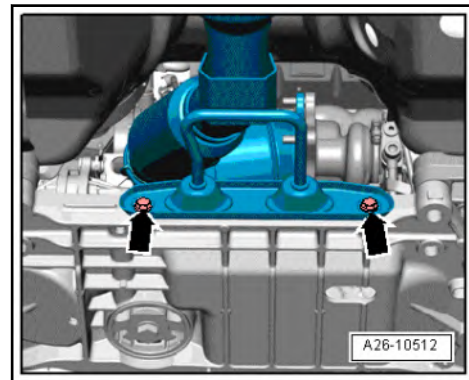


Note

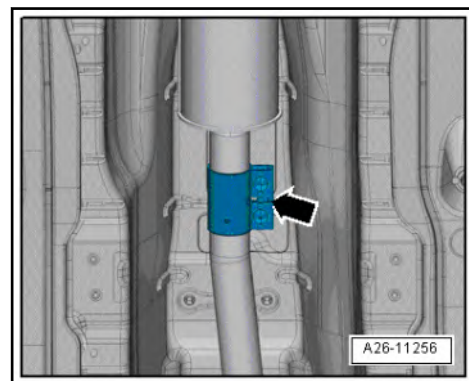
- ◆ *Installation position of clamp may vary depending on vehicle model.*
 - ◆ *Prior to loosening the connection between the catalytic converter and the turbocharger, mark the position of the clamp ➔ [page 407](#).*
 - ◆ *The mark is to be made on the component opposite to the component to be renewed.*
 - ◆ *Make sure that the clamp is fitted at the same position on reinstallation.*
- Mark installation position of clamp.
 - Remove Lambda probes ➔ [a8.2 nd installing Lambda probe](#), [page 389](#).
 - Loosen screw-type hose clip -arrow-.



- Unscrew nuts -1 and 2-.
- Unscrew bolts -3 and 5-.
- Unscrew bolts -arrows-.

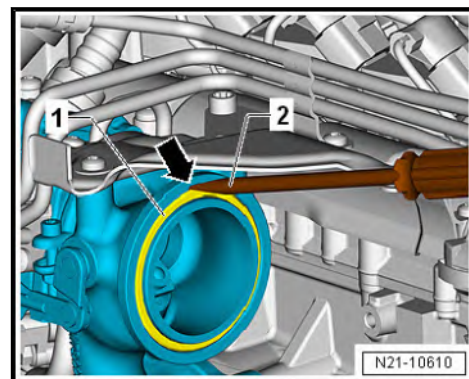


- If necessary, remove rear tunnel cross-piece ⇒ General body repairs, exterior; Rep. gr. 66; Underbody cladding.



- Loosen clamp -arrow-, and push it to rear.
- Detach catalytic converter with front exhaust pipe.

Installing



Install in reverse order of removal, observing the following:



Note

Renew seals/gaskets and self-locking nuts.

- Insert screwdriver -2- into groove -arrow- on turbocharger, and lever out seal -1-.
- Observe installation position of clamp ⇒ [page 407](#) .
- Align exhaust system free of stress. ⇒ [e1.4 xhaust system free of stress", page 401](#)



Vehicles with particulate filter:

- If the particulate filter was renewed, the ash load must be reset using ⇒ Vehicle diagnostic tester.

◆ Guided Engine Functions

◆ Adapt particulate filter learned values

Torque settings

- ◆ Specified torques and tightening sequence for catalytic converter: ⇒ [o2.1 verview - emission control", page 404](#)
- ◆ ⇒ [o8.1 verview - Lambda probe", page 388](#)
- ◆ ⇒ [p1.6 osition of clamp", page 402](#)

2.3 Removing and installing particulate filter



Note

- ◆ *The removal and installation procedure for the particulate filter is the same as that for the catalytic converter. Therefore, only removal and installation of the catalytic converter is described ⇒ [a2.2 nd installing catalytic converter", page 407](#).*
- ◆ *If the particulate filter was renewed, the ash load must be reset using ⇒ Vehicle diagnostic tester.*



28 – Ignition system

1 Ignition system

⇒ [01.1 verview - ignition system", page 411](#)

⇒ [a1.2 nd installing ignition coils with output stage", page 413](#)

⇒ [a1.3 nd installing knock sensor 1G61", page 416](#)

⇒ [a1.4 nd installing engine speed senderG28", page 417](#)

⇒ [a1.5 nd installing inlet camshaft position senderG1002", page 419](#)

⇒ [a1.6 nd installing exhaust camshaft position senderG1003", page 420](#)

1.1 Assembly overview - ignition system



1 - O-ring

- ❑ Check O-ring for damage.
- ❑ O-ring not available as a separate part; renew together with camshaft control valve 1 -N318- if damaged.

2 - Camshaft adjustment valve

- ❑ Exhaust side camshaft control valve 1 -N318-
- ❑ Removing and installing ⇒ [a3.5 nd installing exhaust camshaft control valve 1N318", page 192](#)

3 - Bolt

- ❑ Torque ⇒ [Item 5 \(page 118\)](#)

4 - Seal

- ❑ Only fitted in vehicles with particulate filter
- ❑ To be renewed only in conjunction with exhaust gas pressure sensor 1 -G450-

5 - Exhaust gas pressure sensor 1 -G450-

- ❑ Only fitted in vehicles with particulate filter
- ❑ Torque ⇒ [Item 6 \(page 118\)](#)

6 - Bolt

- ❑ 8 Nm

7 - Exhaust camshaft position sender -G1003-

- ❑ Camshaft position sender, exhaust side
- ❑ Removing and installing ⇒ [page 420](#)

8 - O-ring

- ❑ Renew if damaged, see ⇒ Electronic parts catalogue (ETKA)

9 - Bolt

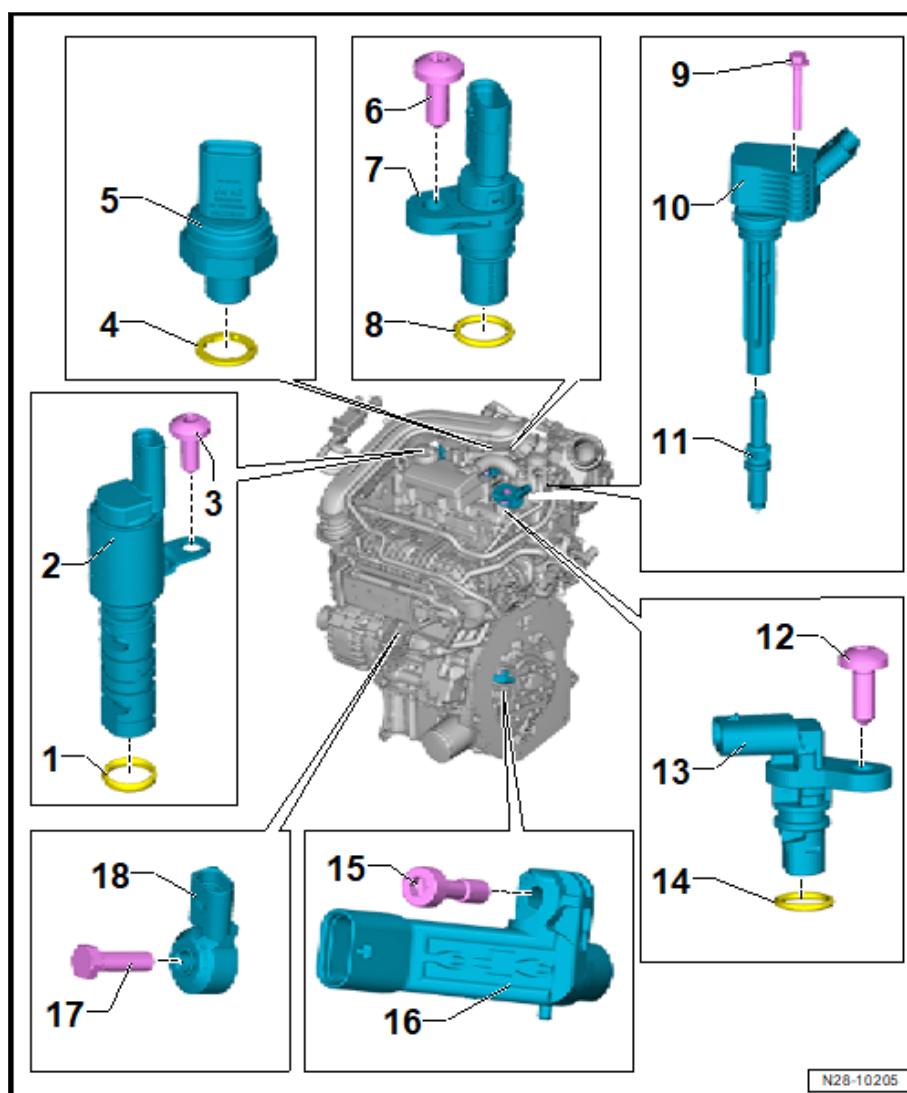
- ❑ 8 Nm

10 - Ignition coil with output stage

- ◆ For No. 1 cylinder: ignition coil 1 with output stage -N70-
- ◆ For No. 2 cylinder: ignition coil 2 with output stage -N127-
- ◆ For No. 3 cylinder: ignition coil 3 with output stage -N291-
- ❑ Removing and installing ⇒ [a1.2 nd installing ignition coils with output stage", page 413](#)

11 - Spark plug

- ❑ Remove and install with spark plug socket and extension -3122 B-
- ❑ Renew ⇒ Maintenance; Booklet 819.
- ❑ Change interval ⇒ Maintenance tables



Volkswagen Technical Site: <https://vwts.ru>



- ☐ 22 Nm

12 - Bolt

- ☐ 8 Nm

13 - Inlet camshaft position sender -G1002-

- ☐ Camshaft position sender, inlet side
- ☐ Removing and installing ⇒ [page 419](#)

14 - O-ring

- ☐ Renew if damaged, see ⇒ Electronic parts catalogue (ETKA)

15 - Engine speed sender -G28-

- ☐ Removing and installing ⇒ [a1.4 nd installing engine speed senderG28", page 417](#)

16 - Bolt

- ☐ 4.5 Nm

17 - Bolt

- ☐ The specified torque influences the function of the knock sensor.
- ☐ 20 Nm

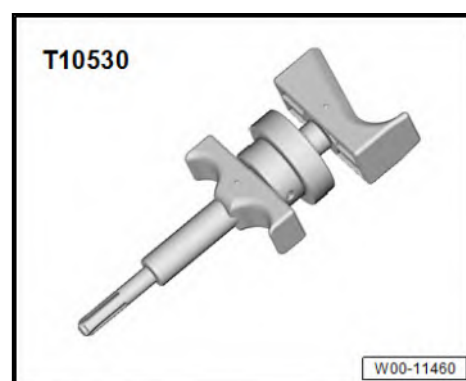
18 - Knock sensor 1 -G61-

- ☐ Removing and installing ⇒ [a1.3 nd installing knock sensor 1G61", page 416](#)

1.2 Removing and installing ignition coils with output stage

Special tools and workshop equipment required

- ◆ Puller -T10530-



Removing



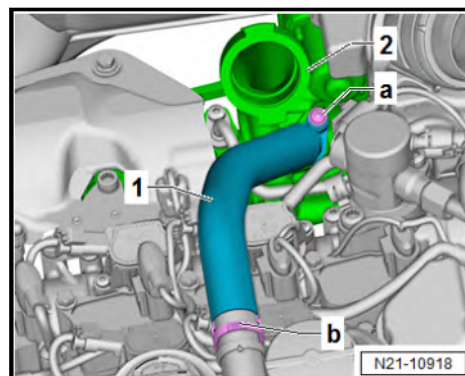
Note

- ◆ *The ignition coils are easier to remove when the engine is warm.*
- ◆ *The grease used during the first installation of the ignition coils makes it easier to remove the spark plug connectors when the engine is warm.*
- ◆ *When installing used ignition coils with output stage, the ignition coils must be lubricated with silicone paste ⇒ Electronic parts catalogue (ETKA).*
- ◆ *Ignition coils with output stage and spark plug connectors are available individually for repairs ⇒ Electronic parts catalogue (ETKA)*



- Remove air intake pipe. ➔ [a2.5 nd installing air pipe", page 336](#)

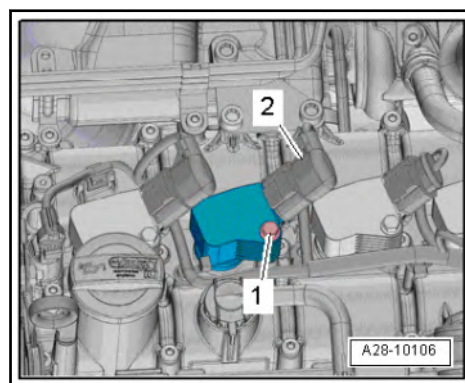
Ignition coil with output stage for cylinder 2



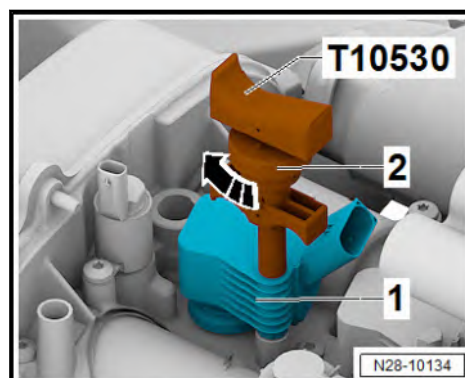
- Press release button -b- on crankcase breather hose -1-, and pull off hose.
- Carefully push crankcase breather hose -1- to one side.

Continuation for all cylinders

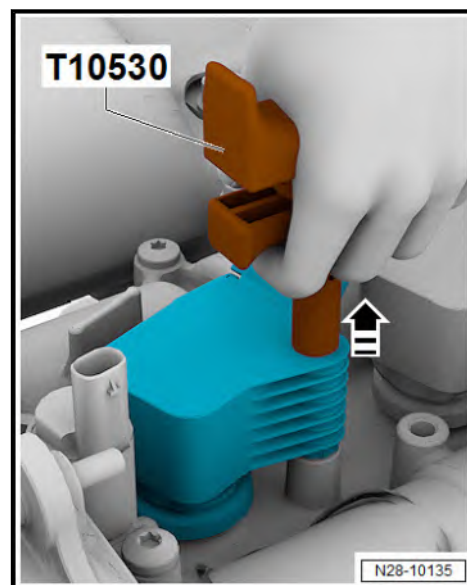
- Disconnect electrical connector -2-.



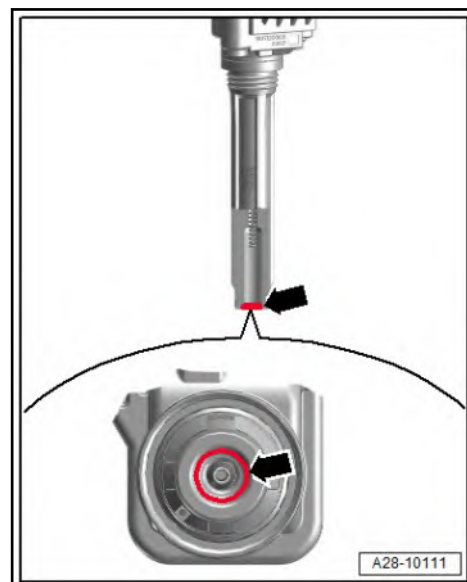
- Unscrew bolt -1-.
- Push puller -T10530- as far as stop into hole in ignition coil -1-.



- Tighten knurled nut -2- in -direction of arrow-.
- Pull ignition coil out of camshaft housing in direction of -arrow- using puller -T10530-.

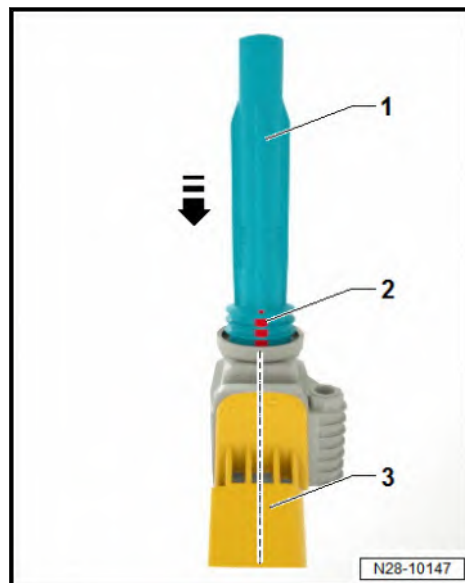


Installing



Install in reverse order of removal, observing the following:

- Apply a thin bead of silicone around sealing hose -arrows- of ignition coil ⇒ Electronic parts catalogue (ETKA).
- Fit spark plug connector -1- by hand onto ignition coil as far as stop



- The vent drilling -2- must be centred relative to connector housing -3- while doing so.
- Insert all ignition coils loosely into spark plug hole.
- Align ignition coils with connectors and simultaneously push all connectors onto ignition coils.
- Press ignition coils evenly onto spark plugs by hand (do not use tools).

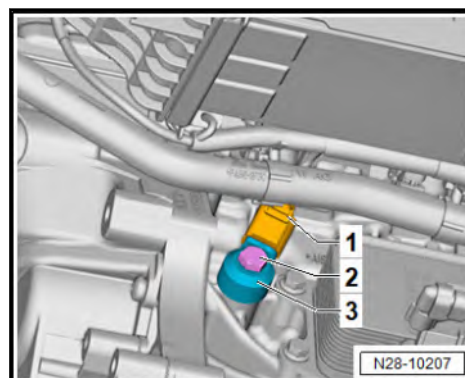
Torque settings

- ♦ ⇒ [o1.1 overview - ignition system", page 411](#)
- ♦ ⇒ [o3.1 overview - air filter housing", page 357](#)

1.3 Removing and installing knock sensor 1 -G61-

Removing

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



- Release and pull off electrical connector -1-.
- Unscrew bolt -2- and remove knock sensor 1 -G61- -3- from engine.

Installing

Install in reverse order of removal, observing the following:



The torque specification influences the function of knock sensor 1 -G61-.

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

Specified torque:

- ◆ ⇒ [o1.1 verview - ignition system", page 411](#)

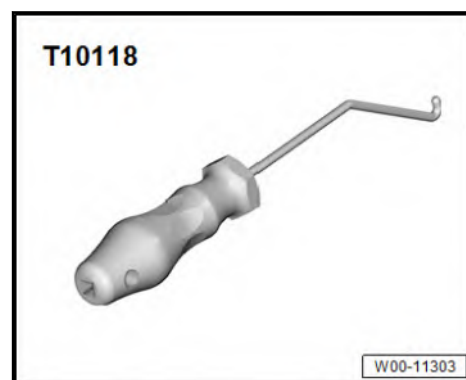
1.4 Removing and installing engine speed sender -G28-

⇒ [a1.4.1 nd installing engine speed senderG28", page 417](#)

1.4.1 Removing and installing engine speed sender -G28-

Special tools and workshop equipment required

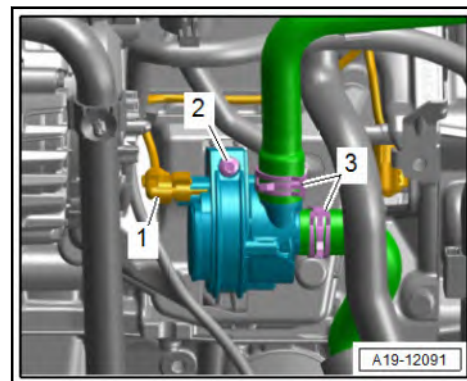
- ◆ Assembly tool -T10118-



- ◆ Socket, 4 mm -T10370-

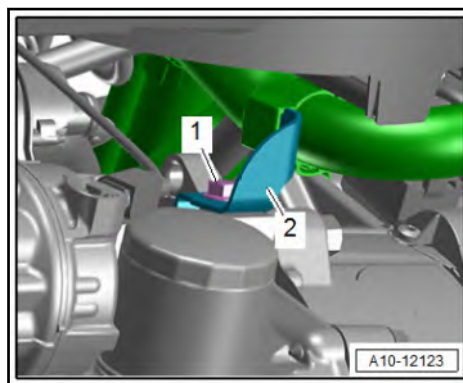


Removing

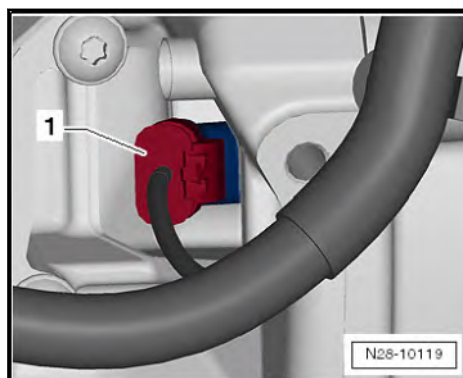




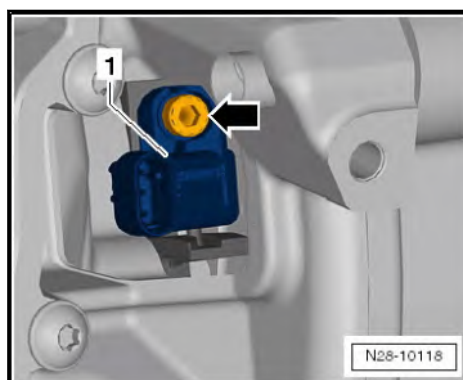
- Remove noise insulation ⇒ General body repairs, exterior;
Rep. gr. 66; Noise insulation; Removing and installing noise
insulation.
- Disconnect electrical connector -1-.
- Unscrew bolt -2- and press charge air cooling pump -V188-
to one side with hoses still connected.
- Unscrew bolt -1-.



- Push retainer -2- with coolant hose to one side.
- Release and disconnect electrical connector -1-. To do this,
use spring-type clip pliers -T10118-.

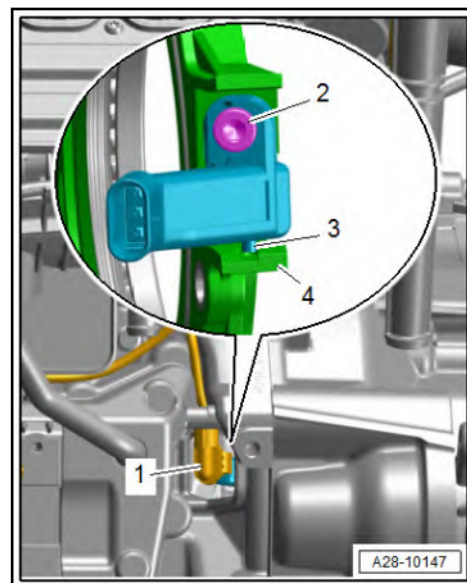


- Unscrew bolt -arrow- using socket insert, 4 mm -T10370-.
Remove engine speed sender -G28- -1-.





Installing



Install in reverse order of removal, observing the following:

- Bring engine speed sender -G28- in installation position making sure that guide -3- engages in sealing flange -4-.
- Tighten bolt -2-, and connect connector -1-.
- Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66; Noise insulation; Removing and installing noise insulation.

Torque settings

- ◆ ⇒ [o1.1 overview - ignition system", page 411](#)
- ◆ ⇒ [o2.2 overview - electric coolant pump", page 252](#)

1.5 Removing and installing inlet camshaft position sender -G1002-

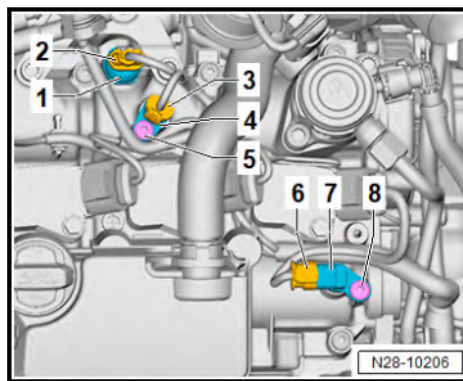
NOTICE

The factory-fitted senders of the ignition system are not suited for test and repair purposes. If senders of the ignition system are interchanged, engine faults and erroneous driving behaviour may result.

- Replace the factory-fitted senders only by the appropriate senders in accordance with ⇒ Electronic parts catalogue (ETKA).
- Do not use the factory-fitted senders for test and repair purposes.
- Do not interchange the senders among each other or among different vehicles.

Removing

- Release and pull off electrical connector -6- from inlet camshaft position sender -G1002- -7-.



- Unscrew bolt -8-.
- Pull inlet camshaft position sender -G1002- -7- out of camshaft housing.

Installing:

Install in reverse order of removal, observing the following:

- Check O-ring for damage, and renew it if necessary.

Specified torques:

♦ ➔ [o1.1 verview - ignition system", page 411](#)

1.6 Removing and installing exhaust camshaft position sender -G1003-

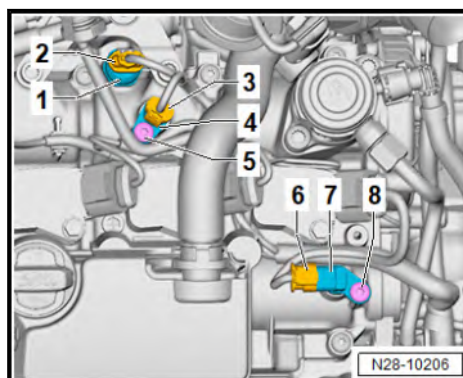
! NOTICE

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- Do not use the factory-fitted senders for test and repair purposes.
- Do not interchange the senders among each other or among different vehicles.

Removing

- Remove air pipe ➔ [page 336](#) .
- Release and pull off electrical connector -3- from exhaust camshaft position sender -G1003- -4-.





- Unscrew bolt -5-.
- Pull exhaust camshaft position sender -G1003- -4- out of camshaft housing.

Installing:

Install in reverse order of removal, observing the following:

- Check O-ring for damage, and renew it if necessary.
- Install air pipe ⇒ [page 336](#) .

Torque settings

- ◆ ⇒ [o1.1 verview - ignition system", page 411](#)