



Workshop Manual

Audi A4 2015 ➤ , Audi A4 China 2016 ➤ ,
Audi A5 2016 ➤ , Audi A6 2019 ➤ ,
Audi A6 China 2019 ➤ ,
Audi Q5 China 2019 ➤

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Servicing 4-cylinder engine, 2.0 ltr. 4-valve TFSI (EA 888, Gen. III B cycle)

Engine ID	CVK B	DBP A	CWN A	CVLA	DEM A	DHD A	DKU A	DKU B	DKY A
	DLVA	DLVB	CVK C	DEM B					

Edition 12.2019



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 Identification	1
1.1 Engine number/engine data	1
2 Safety precautions	2
2.1 Safety precautions when working on the fuel supply system	2
2.2 Safety precautions when working on vehicles with start/stop system	2
2.3 Safety precautions when using testers and measuring instruments during a road test	3
2.4 Safety precautions when working on the cooling system	3
2.5 Safety precautions when working on the exhaust system	3
2.6 Safety precautions when working on the ignition system	4
3 Repair instructions	5
3.1 Rules for cleanliness	5
3.2 Foreign particles in engine	5
3.3 Contact corrosion	5
3.4 Routing and attachment of pipes, hoses and wiring	6
3.5 Installing radiators and condensers	6
3.6 Checking vacuum system	6
3.7 Nuts bolts	7
3.8 Identification plates	7
3.9 Use of impact wrenches	7
10 - Removing and installing engine	9
1 Removing and installing engine	9
1.1 Removing engine	9
1.2 Securing engine to engine and gearbox support	9
1.3 Installing engine	10
2 Assembly mountings	11
3 Engine cover panel	12
3.1 Removing and installing engine cover panel	12
13 - Crankshaft group	13
1 Cylinder block (pulley end)	13
1.1 Exploded view - cylinder block (pulley end)	13
1.2 Removing and installing poly V-belt	18
1.3 Removing and installing poly V-belt tensioner	20
1.4 Removing and installing vibration damper	21
1.5 Removing and installing bracket for ancillaries	35
1.6 Removing and installing engine support	38
2 Cylinder block (gearbox end)	39
2.1 Exploded view - cylinder block (gearbox end)	39
2.2 Removing and installing drive plate	40
2.3 Removing and installing sealing flange (gearbox end)	41
2.4 Renewing needle bearing in drive plate	44
3 Crankshaft	47
3.1 Exploded view - crankshaft	47
3.2 Crankshaft dimensions	49
3.3 Allocation of main bearing shells	49
3.4 Measuring axial clearance of crankshaft	50
3.5 Measuring radial clearance of crankshaft	51
3.6 Removing and installing sender wheel	52
4 Balance shaft	53
4.1 Exploded view - balance shaft	53



4.2	Removing and installing balance shaft	55
4.3	Renewing oil seal for balance shaft (inlet side)	59
5	Pistons and conrods	61
5.1	Exploded view - pistons and conrods	61
5.2	Removing and installing pistons	64
5.3	Removing and installing oil spray jets	65
5.4	Checking pistons and cylinder bores	67
5.5	Separating parts of new conrod	69
5.6	Checking radial clearance of conrod bearings	69
15	Cylinder head, valve gear	70
1	Timing chain cover	70
1.1	Exploded view - timing chain cover	70
1.2	Removing and installing timing chain cover	72
1.3	Renewing oil seal for vibration damper	75
2	Chain drive	78
2.1	Exploded view - camshaft timing chains	78
2.2	Exploded view - drive chain for balance shaft	80
2.3	Removing and installing bearing saddle	81
2.4	Removing and installing camshaft timing chain	85
2.5	Checking chain elongation	96
2.6	Removing and installing drive chain for balance shaft	97
3	Cylinder head	101
3.1	Exploded view - cylinder head	101
3.2	Removing and installing cylinder head	104
3.3	Checking compression	112
4	Valve gear	115
4.1	Exploded view - valve gear	115
4.2	Removing and installing camshaft	118
4.3	Installing ball for slider	125
4.4	Removing and installing actuators for camshaft adjustment	126
4.5	Removing and installing camshaft control valve 1 N205	127
4.6	Removing and installing valve stem oil seals	128
5	Inlet and exhaust valves	137
5.1	Checking valve guides	137
5.2	Checking valves	138
5.3	Valve dimensions	138
17	Lubrication	139
1	Sump/oil pump	139
1.1	Exploded view - sump/oil pump	139
1.2	Engine oil	142
1.3	Removing and installing sump (bottom section)	142
1.4	Removing and installing oil pump	143
1.5	Removing and installing sump (top section)	145
1.6	Removing and installing oil level and oil temperature sender G266	148
2	Engine oil cooler	149
2.1	Exploded view - engine oil cooler	149
2.2	Removing and installing engine oil cooler	150
2.3	Removing and installing mechanical switching valve	150
3	Crankcase breather	151
3.1	Exploded view - crankcase breather system	151
3.2	Removing and installing oil separator	152
4	Oil filter/oil pressure switches	154



4.1	Exploded view - oil filter	154
4.2	Exploded view - oil pressure switches/oil pressure control	155
4.3	Removing and installing oil pressure switch F22	157
4.4	Removing and installing oil pressure switch for reduced oil pressure F378	158
4.5	Removing and installing stage 3 oil pressure switch F447	158
4.6	Removing and installing valve for oil pressure control N428	161
4.7	Removing and installing piston cooling jet control valve N522	163
4.8	Checking oil pressure	164
19	Cooling	168
1	Cooling system/coolant	168
1.1	Connection diagram - coolant hoses	168
1.2	Checking cooling system for leaks	168
1.3	Draining and filling cooling system	171
2	Coolant pump/thermostat assembly	173
2.1	Exploded view - coolant pump/thermostat	173
2.2	Exploded view - electric coolant pump	174
2.3	Exploded view - coolant temperature senders	175
2.4	Removing and installing electric coolant pump	175
2.5	Removing and installing coolant pump	175
2.6	Removing and installing toothed belt for coolant pump	177
2.7	Removing and installing actuator for engine temperature regulation N493	178
2.8	Removing and installing coolant temperature sender G62	180
2.9	Removing and installing radiator outlet coolant temperature sender G83	181
3	Coolant pipes	182
4	Radiator/radiator fans	183
21	Turbocharging/supercharging	184
1	Turbocharger	184
1.1	Exploded view - turbocharger	184
1.2	Removing and installing turbocharger	188
1.3	Removing and installing charge pressure positioner V465	196
2	Charge air system	198
2.1	Exploded view - charge air system	198
2.2	Exploded view - hose connections for charge air system	198
2.3	Removing and installing charge air cooler	199
2.4	Removing and installing charge pressure sender G31	199
2.5	Checking charge air system for leaks	199
24	Mixture preparation - injection	201
1	Injection system	201
2	Air cleaner	202
3	Intake manifold	203
3.1	Exploded view - intake manifold	203
3.2	Removing and installing intake manifold	204
3.3	Removing and installing throttle valve module GX3	216
3.4	Cleaning throttle valve module GX3	217
3.5	Checking intake manifold change-over function	218
4	Injectors	220
4.1	Exploded view - fuel rail with injectors	220
4.2	Removing and installing fuel rail	222
4.3	Removing and installing injectors	223
4.4	Cleaning injectors	230
5	Gas injection valves	232



6	Gas pressure regulator	233
7	Senders and sensors	234
7.1	Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71	234
7.2	Removing and installing air mass meter G70	234
7.3	Removing and installing fuel pressure sender G247	234
7.4	Checking fuel pressure sender G247	237
7.5	Removing and installing fuel pressure sender for low pressure G410	242
7.6	Removing and installing pressure differential sender for particulate filter G1037	242
8	High-pressure pump	245
8.1	Exploded view - high-pressure pump	245
8.2	Removing and installing high-pressure pump	248
9	Lambda probe	252
9.1	Exploded view - Lambda probe	252
9.2	Removing and installing Lambda probe	254
10	Engine control unit	256
26	- Exhaust system	257
1	Exhaust pipes/silencers	257
1.1	Exploded view - silencers	257
1.2	Separating exhaust pipes/silencers	257
1.3	Removing and installing front silencers	257
1.4	Stress-free alignment of exhaust system	257
1.5	Checking exhaust system for leaks	257
2	Emission control system	258
2.1	Exploded view - emission control system	258
2.2	Removing and installing catalytic converter	260
2.3	Removing and installing particulate filter	263
3	Exhaust gas temperature control	267
3.1	Exploded view - exhaust gas temperature control	267
3.2	Removing and installing parts of exhaust gas temperature control	267
28	- Ignition system	270
1	Ignition system	270
1.1	Exploded view - ignition system	270
1.2	Removing and installing ignition coils	271
1.3	Removing and installing knock sensor 1 G61	273
1.4	Removing and installing Hall senders	274
1.5	Removing and installing engine speed sender G28	275



00 – Technical data

1 Identification

(ARL006767; Edition 12.2019)

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

1.1 Engine number/engine data

Engine number

- ◆ The engine number (“engine code” and “serial number”) can be found at the front of the joint between engine and gearbox.
- ◆ There is also a sticker on the timing chain cover (top) showing the engine code and the serial number.
- ◆ In addition, the engine code is listed on the vehicle data stickers.

Engine data

- ◆ ⇒ Rep. gr. 00 ; Overview of engines; Overview of engines with adjustment values .



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2 Safety precautions

⇒ [“2.1 Safety precautions when working on the fuel supply system”, page 2](#)

⇒ [“2.2 Safety precautions when working on vehicles with start/stop system”, page 2](#)

⇒ [“2.3 Safety precautions when using testers and measuring instruments during a road test”, page 3](#)

⇒ [“2.4 Safety precautions when working on the cooling system”, page 3](#)

⇒ [“2.5 Safety precautions when working on the exhaust system”, page 3](#)

⇒ [“2.6 Safety precautions when working on the ignition system”, page 4](#)

2.1 Safety precautions when working on the fuel supply system

Risk of injury - fuel system operates under high pressure

The fuel system is pressurised. There is a risk of injury as fuel may spray out.

Before opening the fuel system:

- Put on safety goggles.
- Put on protective gloves.
- Release pressure (wrap a clean cloth around connection and open connection carefully).



Risk of fire due to escaping fuel

If the battery is connected, the door contact switch activates the fuel pump when the driver's door is opened. Escaping fuel may ignite, causing a fire.

- Before opening the fuel system, disconnect power supply to fuel pump.

2.2 Safety precautions when working on vehicles with start/stop system

Risk of injury - engine may start unexpectedly

The engine can start unexpectedly if the vehicle's start/stop system is activated. A message in the instrument cluster indicates whether the start/stop system is activated.

- To deactivate the start/stop system, switch off the ignition.



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

Risk of injury if test equipment is not secured

If an accident occurs and the front passenger's airbag is triggered, test equipment which is not secured adequately may be catapulted through the vehicle with potentially serious consequences.

- Secure test equipment on the rear seat with a strap.

Or:

- Have a second mechanic operate test equipment on the rear seat.

2.4 Safety precautions when working on the cooling system

Risk of scalding as hot coolant can escape

The cooling system is under pressure when the power unit is hot.
Risk of scalding due to hot steam and hot coolant.

- Put on protective gloves.
- Put on safety goggles.
- Cover filler cap on expansion tank with a cloth and open carefully to release pressure.

Risk of injury from radiator fan(s)

The radiator fans can start up automatically and trap or draw in parts of the body.

- When working in the vicinity of the radiator, keep a safe distance from the radiator fan.
- Do not reach into the radiator fan when unplugging the connector.
- Unplug electrical connectors.

2.5 Safety precautions when working on the exhaust system

Risk of injury caused by components of the exhaust system

Danger of injury to hands and other parts of the body due to hot or sharp parts of the exhaust system.

- Allow exhaust system to cool down.
- Put on protective gloves.



Risk to health due to chemical substances in components of exhaust system

Risk to health if components of system for after-treatment of exhaust gases are dismantled.

- Do NOT cut, saw or open components of system for after-treatment of exhaust gases.

Risk of injury when disconnecting the exhaust system

There is a risk of eye irritation caused by soot particles in the air.

- Put on safety goggles.

Risk of injury due to hot condensation and particles in exhaust system

There may be hot condensation and/or particles in the exhaust system. Risk of eye and skin injuries, damage to the respiratory tract and poisoning.

- Wear protective gloves and safety goggles while performing cutting work on the exhaust system.
- When performing cutting work, use an extraction system or ensure sufficient ventilation.

2.6 Safety precautions when working on the ignition system

Risk of injury due to electric shock

When the engine is running, there are high voltage levels in the ignition system. There is a risk of electric shock when touching the ignition system!

- Never touch or disconnect ignition wiring when the engine is running or being turned at cranking speed.



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3 Repair instructions

⇒ ["3.1 Rules for cleanliness", page 5](#)

⇒ ["3.2 Foreign particles in engine", page 5](#)

⇒ ["3.3 Contact corrosion", page 5](#)

⇒ ["3.4 Routing and attachment of pipes, hoses and wiring", page 6](#)

⇒ ["3.5 Installing radiators and condensers", page 6](#)

⇒ ["3.6 Checking vacuum system", page 6](#)

⇒ ["3.7 Nuts, bolts", page 7](#)

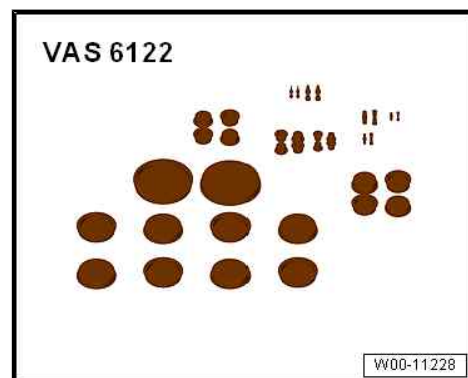
⇒ ["3.8 Identification plates", page 7](#)

⇒ ["3.9 Use of impact wrenches", page 7](#)

3.1 Rules for cleanliness

Even small quantities of dirt can lead to defects. For this reason, please observe the following rules when working on the fuel supply system, turbocharger and injection system:

- ◆ Carefully clean connection points and the surrounding area with engine cleaner or brake cleaner and dry thoroughly before opening.
- ◆ Seal off open pipes and connections immediately with clean plugs, e.g. from engine bung set - VAS 6122- .
- ◆ Place removed parts on a clean surface and cover them. Use only lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components; replacement parts should only be unpacked immediately prior to installation. Do not use parts that have been previously unpacked and stored away loose (e.g. in toolboxes, etc.).
- ◆ When the system is open, do not work with compressed air and do not move the vehicle.
- ◆ Make sure that no fuel runs onto the fuel hoses. Should this occur, the fuel hoses must be cleaned again immediately.
- ◆ Protect unplugged electrical connectors against dirt and moisture and make sure connections are dry when attaching.



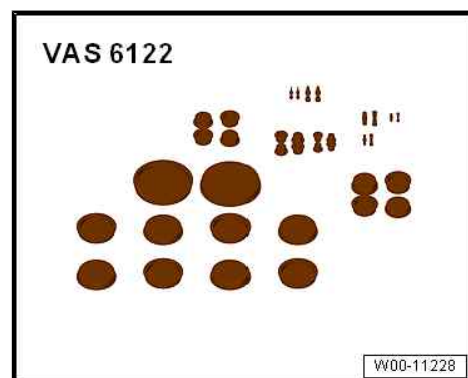
3.2 Foreign particles in engine

- ◆ When performing assembly work on the engine, all open passages in the intake and exhaust systems must be sealed with suitable plugs (e.g. from engine bung set - VAS 6122-) to prevent foreign particles from entering the engine.



Note

*If the turbocharger has suffered mechanical damage
⇒ [page 188](#)*



3.3 Contact corrosion

Contact corrosion can occur if unsuitable fasteners are used (e.g. bolts, nuts, washers, etc.).



For this reason, only fasteners with a special surface coating are fitted.

Additionally, all rubber and plastic parts and all adhesives are made of non-conductive materials.

Always install new parts if you are not sure whether used parts can be re-fitted ⇒ Electronic parts catalogue .

Please note:

- ◆ We recommend using only genuine replacement parts; these have been tested and are compatible with aluminium.
- ◆ We recommend using Audi Genuine Accessories.
- ◆ Damage caused by contact corrosion is not covered by warranty.

3.4 Routing and attachment of pipes, hoses and wiring

- ◆ Mark fuel lines, hydraulic lines, vacuum lines, lines for activated charcoal filter and electrical wiring etc. before removal so they can be re-installed in the original positions and correctly connected. Make sketches or take photographs if necessary.
- ◆ Because of the limited space in the engine compartment, it is important to ensure that there is adequate clearance to any moving or hot components to avoid damage to lines and wiring.
- ◆ After attaching, check the routing of the fuel lines and refrigerant lines. They must be inserted in the retainers provided and should not make contact with other components.

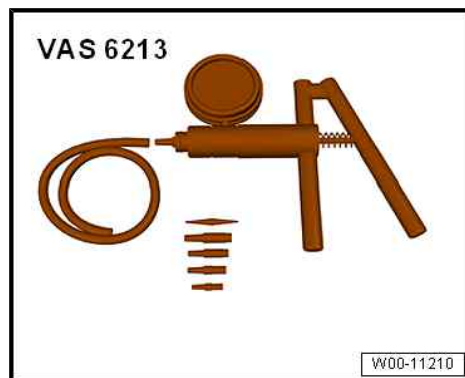
3.5 Installing radiators and condensers

Even when the radiator, condenser and charge air cooler are correctly installed, slight impressions may be visible on the fins of these components. This does not mean that the components are damaged. If the fins are only very slightly distorted, this does not justify renewal of the radiator, condenser or charge air cooler.

3.6 Checking vacuum system

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



Procedure

- Check all vacuum lines in the complete vacuum system for:
 - ◆ Cracks
 - ◆ Traces of animal bites
 - ◆ Kinked or crushed lines



- ◆ Porous or leaking lines
- Check vacuum line to solenoid valve and from solenoid valve to corresponding component.
- If a fault is stored in the event memory, check the vacuum lines leading to the corresponding component and also check the remaining vacuum lines in the system.
- If it is not possible to build up pressure with the hand vacuum pump - VAS 6213- or if the pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

3.7 Nuts, bolts

- ◆ Loosen bolts in reverse sequence to specified tightening sequence.
- ◆ Bolts and nuts used to secure covers and housings must be tightened in steps according to the specified tightening sequence and method.
- ◆ Bolts and nuts which secure covers and housings should be loosened and tightened in diagonal sequence and in stages if no tightening sequence is specified.
- ◆ Always renew self-locking bolts and nuts.
- ◆ Unless otherwise specified, use a wire brush to clean the threads of bolts which are secured with locking fluid. Then install bolts with locking fluid; for locking fluid refer to ⇒ Electronic parts catalogue .
- ◆ Threaded holes which take self-locking bolts or bolts coated with locking fluid must be cleaned using a thread tap or similar. Otherwise there is a danger of the bolts shearing off the next time they are removed.
- ◆ The tightening torques stated apply to non-oiled nuts and bolts.

3.8 Identification plates

When renewing vehicle components, the identification plates on the old parts that have a replacement part number (see ⇒ Electronic parts catalogue) must be attached to the new parts due to approval regulations.

3.9 Use of impact wrenches

In general, it is permitted to use an impact wrench to unscrew bolts and nuts. An exception to this is when work is performed inside an open high-voltage battery. For this work, it is not permitted to use an impact wrench.

An impact wrench may be used to screw in bolts and nuts when performing repair work if the following requirements are observed. In general, electric and compressed-air impact wrenches should be used.

Requirements:

- Only screw in bolts with locking fluid or self-locking nuts at low speed.
- Use a suitable impact wrench with variable speed and adjustable torque range.



- Use suitable bits when working in the vicinity of sensitive surfaces, e.g. plastic-coated bits for aluminium rims.
- When working in the vicinity of natural gas systems, observe the information in the Workshop Manual "Natural gas engines - General information".

Use:

- Fit bolts/nuts by hand.
- Only use an impact wrench to screw in bolts/nuts until the head of the bolt/nut makes contact and then continue tightening with a torque wrench.
- Clean threaded pins before unscrewing the bolt/nut.



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10 – Removing and installing engine

1 Removing and installing engine

⇒ [“1.1 Removing engine”, page 9](#)

⇒ [“1.2 Securing engine to engine and gearbox support”, page 9](#)

⇒ [“1.3 Installing engine”, page 10](#)

1.1 Removing engine

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Removing and installing engine; Removing engine

1.2 Securing engine to engine and gearbox support

Special tools and workshop equipment required

- ◆ Engine and gearbox support - VAS 6095A-



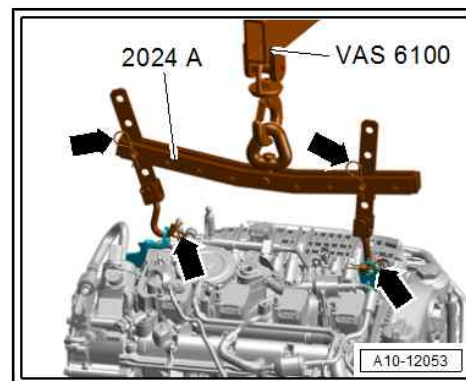
Procedure

- Engine attached to workshop hoist - VAS 6100- using lifting tackle - 2024A-



Note

To adjust to the centre of gravity of the assembly, the perforated rails of the support hooks must be positioned as shown.



WARNING

Accident risk from loose components of lifting tackle.

- ◆ **The support hooks and retaining pins on the lifting tackle must be secured with locking pins.**

- Secure support hooks and retaining pins with locking pins -arrows-.
- Remove drive plate ⇒ [page 40](#) .



- Secure engine to engine and gearbox support - VAS 6095A-
using universal mounting - VAS 6095/1- .

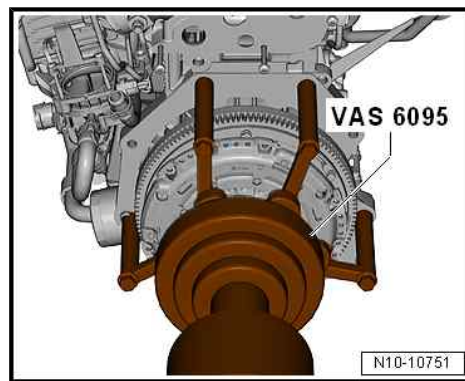
Tightening torque

Component		Nm
Bolts/nuts	M6	10
	M8	20
	M10	45
	M12	65

Assembling

Assembly is performed in reverse sequence; note the following:

- Install drive plate ⇒ [page 40](#) .



1.3 Installing engine

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Removing and installing engine; Installing engine .



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2 Assembly mountings

All procedures and components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Assembly mountings .



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3 Engine cover panel

⇒ **"3.1 Removing and installing engine cover panel", page 12**

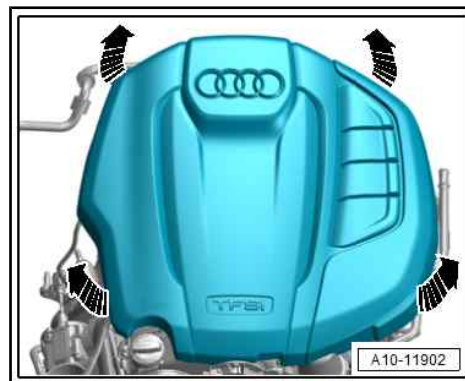
3.1 Removing and installing engine cover panel

Removing

- Carefully pull engine cover panel off ball studs one after another -arrows-. Do not jerk engine cover panel away, and do not try to pull on one side only.

Installing

- To avoid damage, do not strike the engine cover panel with your fist or with any kind of tool.
- Position engine cover panel, paying attention to oil filler neck and dipstick.
- Press engine cover panel onto ball studs first on left side, then on right side.



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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ [“1.1 Exploded view - cylinder block \(pulley end\)”, page 13](#)

⇒ [“1.2 Removing and installing poly V-belt”, page 18](#)

⇒ [“1.3 Removing and installing poly V-belt tensioner”, page 20](#)

⇒ [“1.4 Removing and installing vibration damper”, page 21](#)

⇒ [“1.5 Removing and installing bracket for ancillaries”,
page 35](#)

⇒ [“1.6 Removing and installing engine support”, page 38](#)

1.1 Exploded view - cylinder block (pulley end)

⇒ [“1.1.1 Exploded view - cylinder block \(pulley end\), vehicles with alternator”, page 13](#)

⇒ [“1.1.2 Exploded view - cylinder block \(pulley end\), vehicles with starter-alternator”, page 16](#)

1.1.1 Exploded view - cylinder block (pulley end), vehicles with alternator



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1 - Poly V-belt

- ☐ Check for wear
- ☐ Do not kink
- ☐ Routing of poly V-belt
⇒ [page 15](#)
- ☐ Before removing, mark direction of rotation with chalk or felt-tip pen
- ☐ Removing and installing
⇒ [page 18](#)
- ☐ When installing, make sure it is properly seated on pulleys.

2 - Tensioner for poly V-belt

- ☐ Pivot with wrench to slacken poly V-belt
- ☐ Lock in position with locking pin - T10060A- .
- ☐ Removing and installing
⇒ [page 20](#)

3 - Bolt

- ☐ Renew after removing
- ☐ 8 Nm +45°

4 - Bolt

- ☐ Renew after removing
- ☐ Use counterhold tool - T10355- when loosening and tightening
- ☐ Lubricate O-ring with engine oil
- ☐ Different versions
- ☐ Property class 8.8: 150 Nm + 90°
- ☐ Property class 10.9: 100 Nm + 180°
- ☐ The property class of the bolt is visible on the bolt head

5 - O-ring

- ☐ Not available as replacement part; supplied together with bolt

6 - Vibration damper

- ☐ With poly V-belt pulley
- ☐ Removing and installing
⇒ ["1.4.1 Removing and installing vibration damper - vehicles with alternator", page 21](#)

7 - Bracket for ancillaries

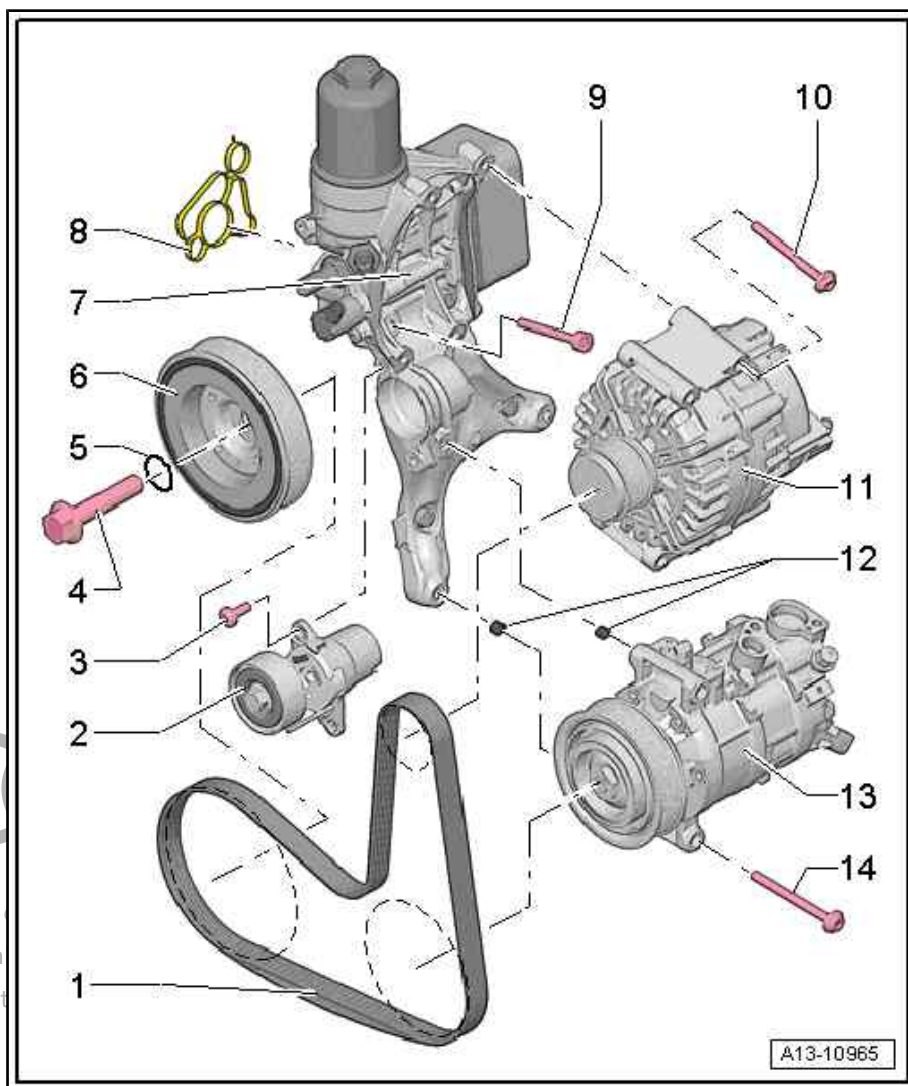
- ☐ With oil filter housing and engine oil cooler
- ☐ Removing and installing bracket for ancillaries
⇒ ["1.5.1 Removing and installing bracket for ancillaries - vehicles with alternator", page 35](#)
- ☐ Removing and installing engine oil cooler ⇒ [page 150](#)

8 - Gasket

- ☐ Renew after removing

9 - Bolt

- ☐ Renew after removing
- ☐ Tightening torques and sequence ⇒ [page 15](#)





10 - Bolt

- ☐ Tightening torques ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

11 - Alternator

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

12 - Dowel sleeves

- ☐ For air conditioner compressor

13 - Air conditioner compressor

- ☐ Do not unscrew or disconnect refrigerant hoses or pipes
- ☐ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket

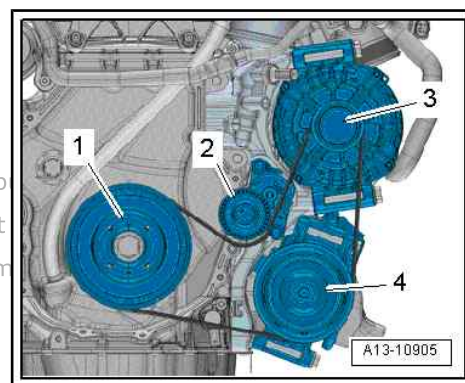
14 - Bolt

- ☐ Tightening torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

Routing of poly V-belt

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

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Bracket for ancillaries - tightening torques and tightening sequence

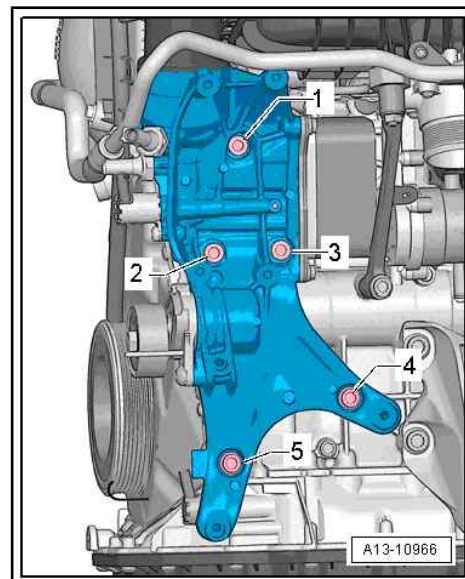


Note

After removing, renew bolts tightened with specified tightening angle.

- Fit bracket for ancillaries (first tighten bolt -4-).
- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 ... 5-	Screw in by hand until contact is made
2.	-1 ... 5-	20 Nm
3.	-1 ... 5-	Turn 90° further





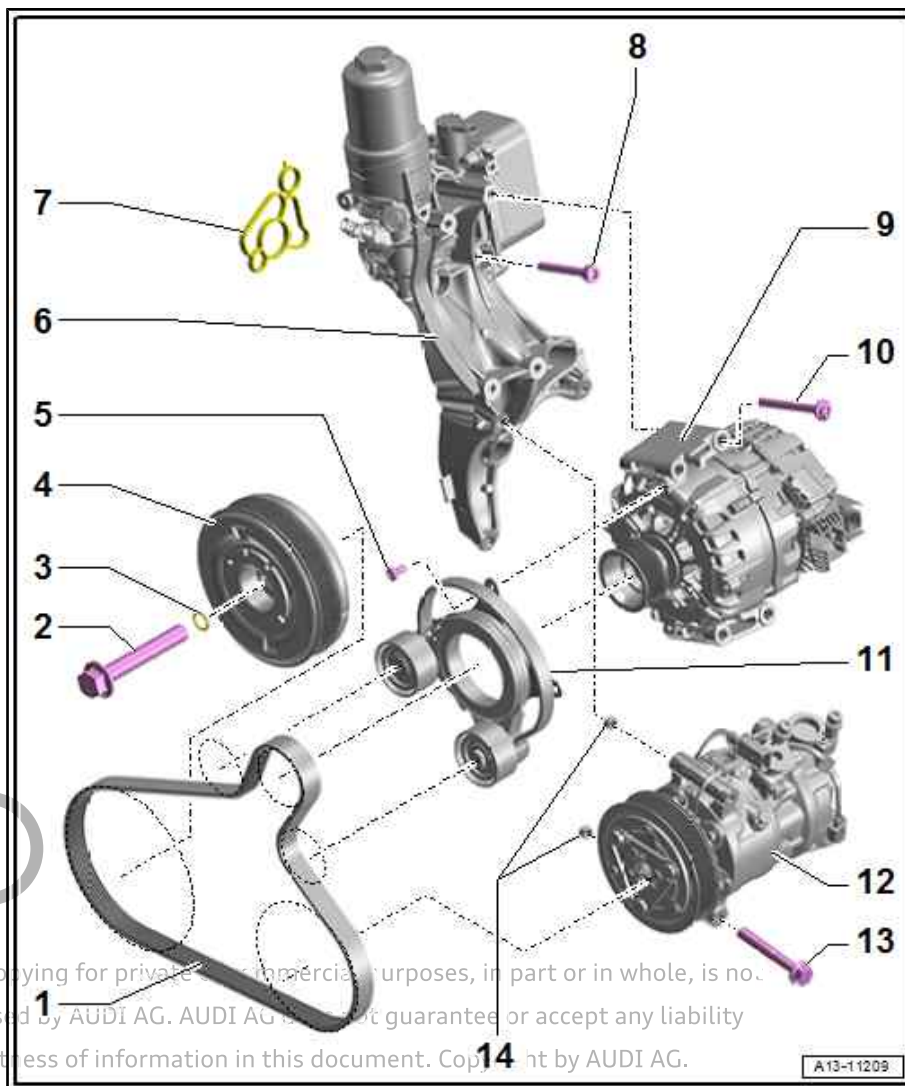
1.1.2 Exploded view - cylinder block (pulley end), vehicles with starter-alternator

1 - Poly V-belt

- ☐ Check for wear
- ☐ Do not kink
- ☐ Routing of poly V-belt
⇒ [page 17](#)
- ☐ Before removing, mark direction of rotation with chalk or felt-tip pen
- ☐ Removing and installing
⇒ [page 18](#)
- ☐ When installing, make sure it is properly seated on pulleys

2 - Bolt

- ☐ Renew after removing
- ☐ Lubricate O-ring with engine oil
- ☐ Different versions (depending on type of gearbox and property class of bolt)
- ☐ Vehicles with manual gearbox and property class 10.9: 240 Nm + 180°
- ☐ Vehicles with automatic gearbox and property class 8.8: 150 Nm + 90°
- ☐ Vehicles with automatic gearbox and property class 10.9: 100 Nm + 180°
- ☐ The property class of the bolt is visible on the bolt head



3 - O-ring

- ☐ Not available as replacement part; supplied together with bolt

4 - Vibration damper

- ☐ With poly V-belt pulley
- ☐ Removing and installing
⇒ [“1.4.2 Removing and installing vibration damper - vehicles with starter-alternator”, page 27](#)

5 - Bolt

- ☐ Renew after removing
- ☐ 8 Nm + 90°

6 - Bracket for ancillaries

- ☐ With oil filter housing and engine oil cooler
- ☐ Removing and installing bracket for ancillaries
⇒ [“1.5.2 Removing and installing bracket for ancillaries - vehicles with starter-alternator”, page 36](#)
- ☐ Removing and installing engine oil cooler ⇒ [page 150](#)

7 - Gasket

- ☐ Renew after removing



8 - Bolt

- ☐ Renew after removing
- ☐ Tightening torques and sequence ⇒ [page 17](#)

9 - Starter-alternator - C29-

- ☐ Exploded view ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

10 - Bolt

- ☐ Tightening torque ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

11 - Tensioner

- ☐ For poly V-belt
- ☐ Removing and installing
⇒ ["1.3.2 Removing and installing poly V-belt tensioner - vehicles with starter-alternator", page 20](#)

12 - Air conditioner compressor

- ☐ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket

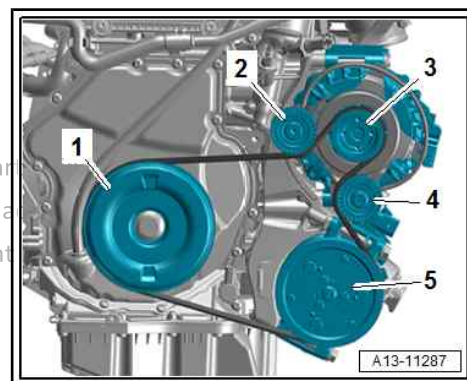
13 - Bolt

- ☐ Tightening torque ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

14 - Dowel sleeves

Routing of poly V-belt for starter-alternator - C29-

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



Bracket for ancillaries, vehicles with starter-alternator - tightening torques and tightening sequence

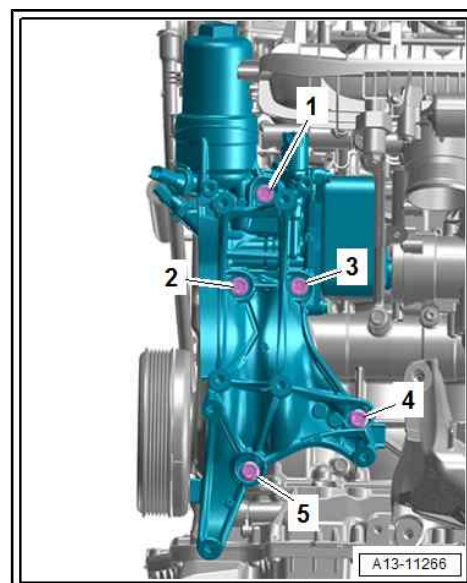


Note

After removing, renew bolts tightened with specified tightening angle.

- Fit bracket for ancillaries (first tighten bolt -4-).
- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 ... 5-	Screw in by hand until contact is made
2.	-1 ... 5-	20 Nm
3.	-1 ... 5-	Turn 90° further





1.2 Removing and installing poly V-belt

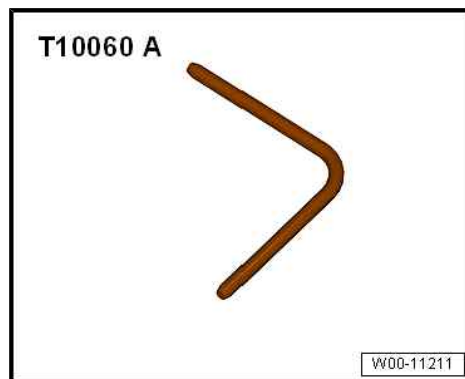
⇒ ["1.2.1 Removing and installing poly V-belt - vehicles with alternator", page 18](#)

⇒ ["1.2.2 Removing and installing poly V-belt - vehicles with starter-alternator", page 19](#)

1.2.1 Removing and installing poly V-belt - vehicles with alternator

Special tools and workshop equipment required

- ◆ Locking pin - T10060A-



Removing



WARNING

Risk of injury as the radiator fans may start up automatically.

- ◆ *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*

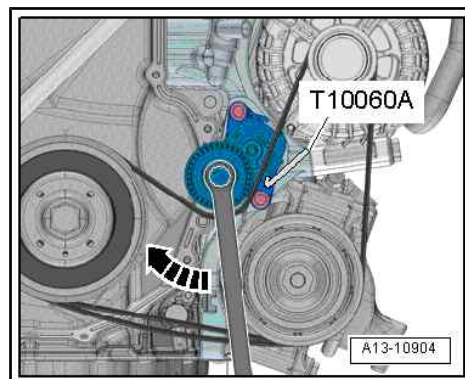


Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- ◆ *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*

- To slacken poly V-belt turn tensioner in direction of -arrow-.
- Lock tensioner with locking pin - T10060A- .
- Take off poly V-belt.

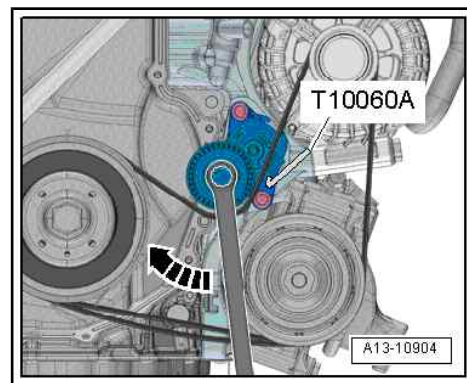




Installing

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

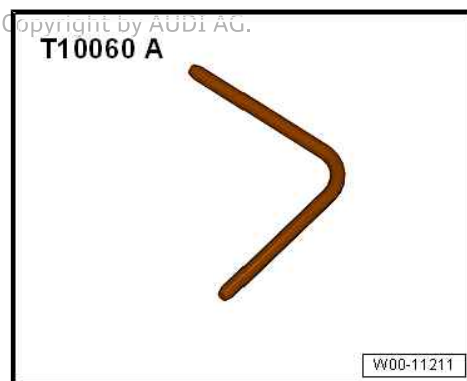
- Fit poly V-belt ⇒ [page 15](#) .
- Turn tensioner slightly in direction of -arrow- and remove locking pin - T10060A- .
- Release tensioner.
- Check that poly V-belt is properly seated.
- Start engine and check that poly V-belt runs properly.



1.2.2 Removing and installing poly V-belt - vehicles with starter-alternator

Special tools and workshop equipment required

- ◆ Locking pin - T10060A -



Removing



WARNING

Risk of injury as the radiator fans may start up automatically.

- ◆ *Even when the ignition is switched off, the radiator fans can start up without warning due to accumulated heat in the engine compartment, etc.*



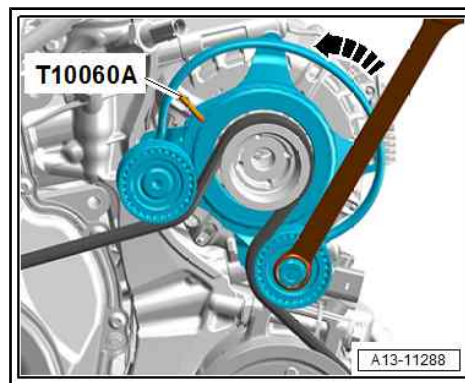
Caution

Running a used poly V-belt in the opposite direction could cause irreparable damage.

- ◆ *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*



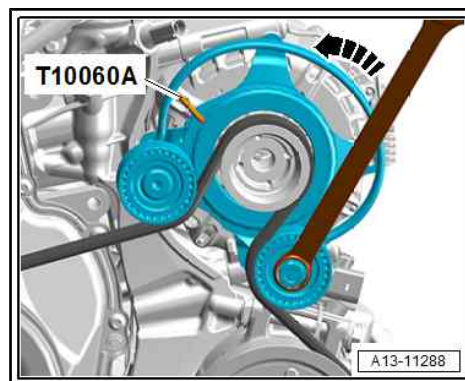
- To slacken poly V-belt turn tensioner in direction of -arrow-.
- Lock tensioner with locking pin - T10060A- .
- Take off poly V-belt.



Installing

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

- Fit poly V-belt ⇒ [page 17](#) .
- Turn tensioner slightly in direction of -arrow- and remove locking pin - T10060A- .
- 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 poly V-belt tensioner

⇒ [“1.3.1 Removing and installing poly V-belt tensioner - vehicles with alternator”, page 20](#)

⇒ [“1.3.2 Removing and installing poly V-belt tensioner - vehicles with starter-alternator”, page 20](#)

1.3.1 Removing and installing poly V-belt tensioner - vehicles with alternator

Removing

- Detach poly V-belt from tensioner
⇒ [“1.2 Removing and installing poly V-belt”, page 18](#) .
- Remove bolts -arrows- and take off tensioner -1- for poly V-belt from bracket for ancillaries.

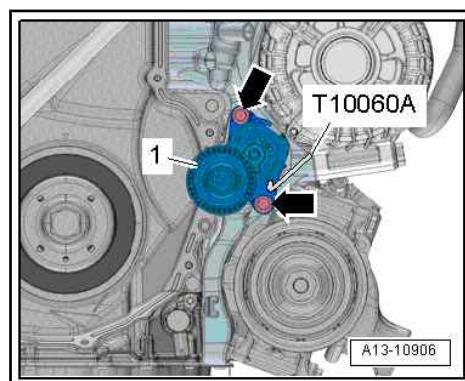
Installing

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

- Install poly V-belt ⇒ [page 18](#) .

Tightening torques

- ◆ ⇒ [“1.1.1 Exploded view - cylinder block \(pulley end\), vehicles with alternator”, page 13](#)



1.3.2 Removing and installing poly V-belt tensioner - vehicles with starter-alternator

Removing

- Detach poly V-belt from tensioner
⇒ [“1.2 Removing and installing poly V-belt”, page 18](#) .



- Remove bolts -arrows-.
- Remove tensioner -1-.

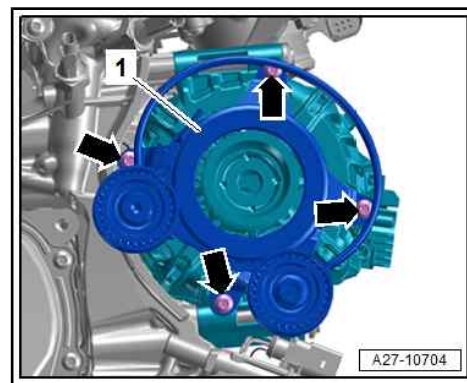
Installing

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

- Install poly V-belt ⇒ [page 18](#) .

Tightening torques

- ◆ ⇒ [“1.1.2 Exploded view - cylinder block \(pulley end\), vehicles with starter-alternator”, page 16](#)



1.4 Removing and installing vibration damper

⇒ [“1.4.1 Removing and installing vibration damper - vehicles with alternator”, page 21](#)

⇒ [“1.4.2 Removing and installing vibration damper - vehicles with starter-alternator”, page 27](#)

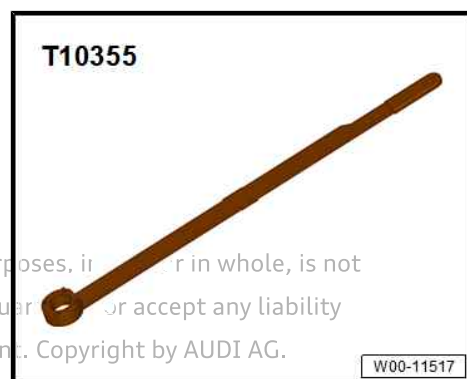
1.4.1 Removing and installing vibration damper - vehicles with alternator

Special tools and workshop equipment required

- ◆ Counterhold tool - T10355-



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- ◆ Ratchet wrench (21 mm) - T40263-

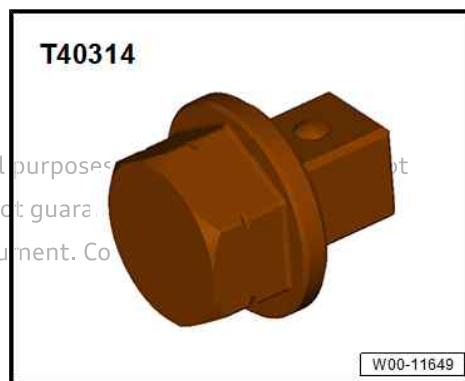




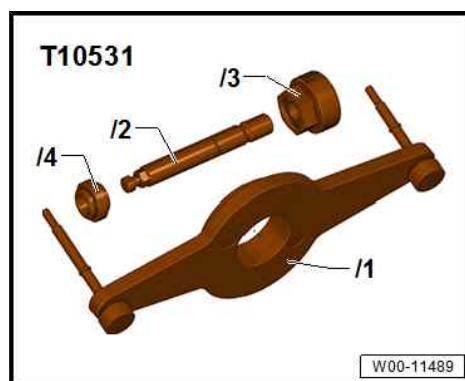
◆ Adapter - T40314-



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◆ Assembly tool - T10531-



Components of assembly tool - T10531- :

- ◆ Support - T10531/1-
- ◆ Clamping pin - T10531/2-
- ◆ Turning-over tool - T10531/3-
- ◆ Flange nut - T10531/4-



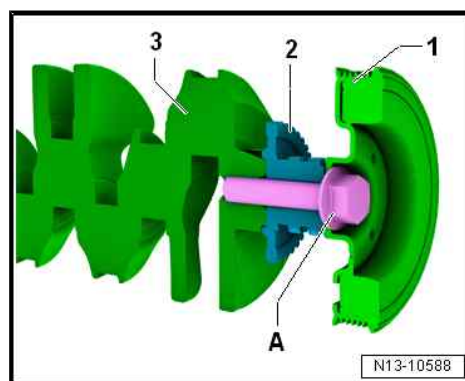
Note

The securing bolt for the vibration damper -A- secures the vibration damper -1-, timing chain sprocket -2- and crankshaft -3- to each other. Before removing the securing bolt, the timing chain sprocket must be secured to the crankshaft as described below.

Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper .

- Remove pulley without locking tensioner in place
⇒ [“1.2.1 Removing and installing poly V-belt - vehicles with alternator”, page 18](#) .



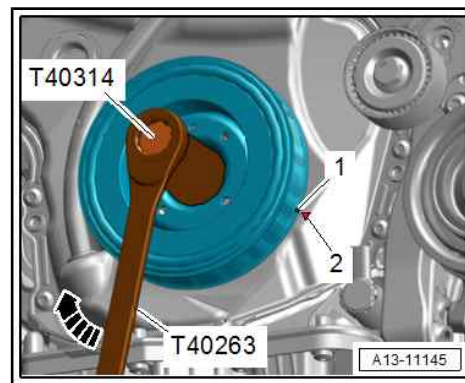


Caution

Irreparable damage can be caused if the camshaft timing chain slips.

- ◆ **Turn crankshaft only in direction of engine rotation -arrow-.**

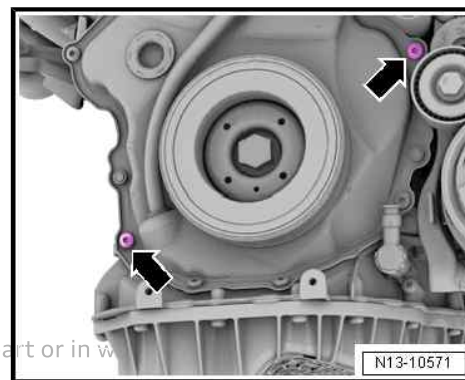
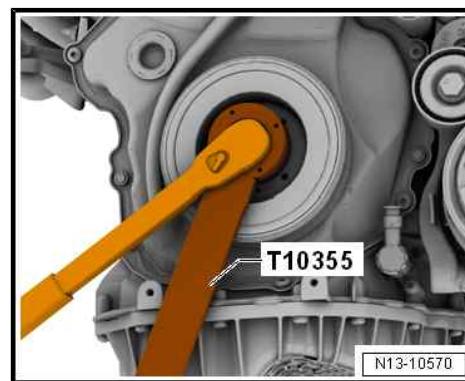
- Use ratchet wrench (21 mm) - T40263- , adapter - T40314- and socket (24 mm) to turn crankshaft until vibration damper is at "TDC" position.
- Notch -1- on vibration damper must align with arrow marking -2- on cover for timing chains (bottom).
- Marking on timing chain cover (bottom) must be in 4 o'clock position.



Caution

Do not loosen bolt for vibration damper by more than a half turn at this stage.

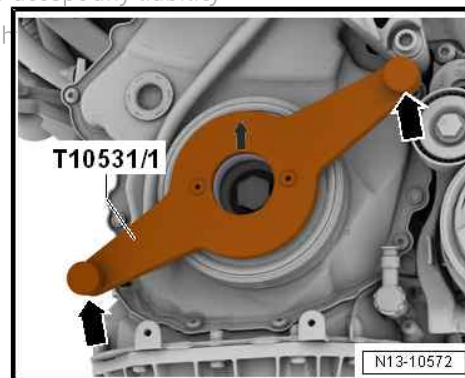
- Loosen bolt for vibration damper by approx. a half turn using counterhold tool - T10355- .
- If vibration damper has been twisted out of position, correct "TDC" position.
- Remove bolts -arrows- for timing chain cover (bottom).



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- Apply support - T10531/1- (as illustrated) to vibration damper and screw in knurled screws -arrows- hand-tight.

- Arrow marking on support - T10531/1- must point upwards.
- Remove bolt for vibration damper completely.





- Check whether turning-over tool - T10531/3- -item A- slides easily over clamps -B-. Turn tensioning bolt -arrow- if necessary.



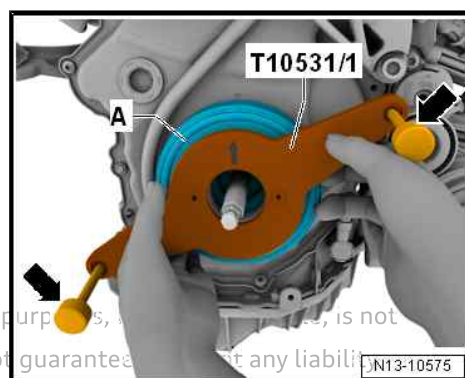
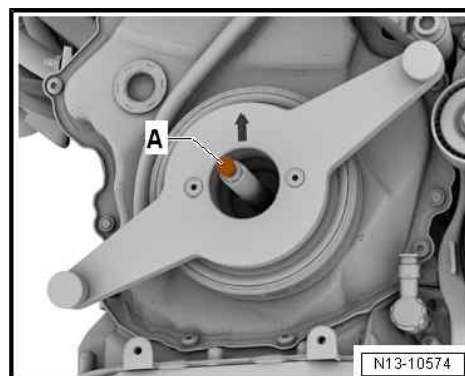
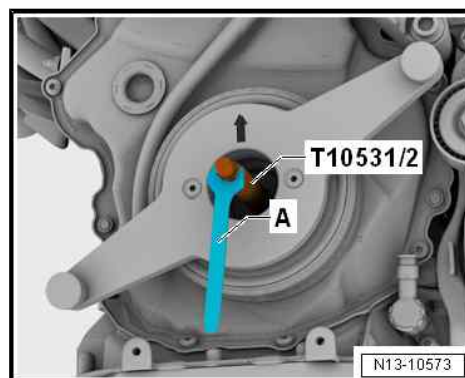
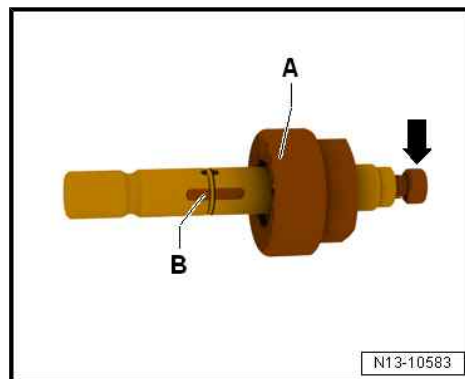
Note

Do not turn the tensioning bolt from this stage onwards; otherwise the clamping pin - T10531/2- will get stuck when it is screwed into the crankshaft.

- Screw clamping pin - T10531/2- into crankshaft and hand-tighten with open-end spanner (12 mm) -item A-.
- Hand-tighten tensioning bolt -A- to secure chain sprocket to crankshaft.
- Remove knurled screws -arrows-. Detach support - T10531/1- and vibration damper -A-.



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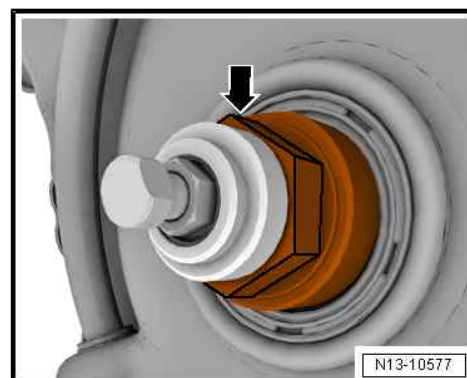
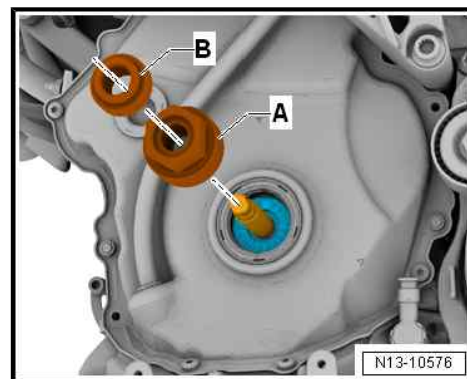




If crankshaft needs to be rotated without vibration damper:

- Fit turning-over tool - T10531/3- -item A- onto clamping pin - T10531/2- (pay attention to tooth-shaped profile on chain sprocket).
- In TDC position, flat surface of tool faces upwards.
- Tighten turning-over tool with flange nut - T10531/4- -item B-.

- Crankshaft can now be rotated at hexagon flats -arrow-.



Installing

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

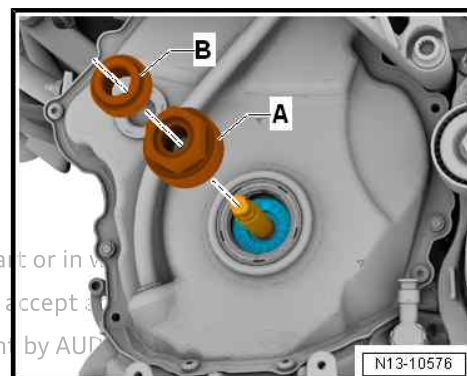


Note

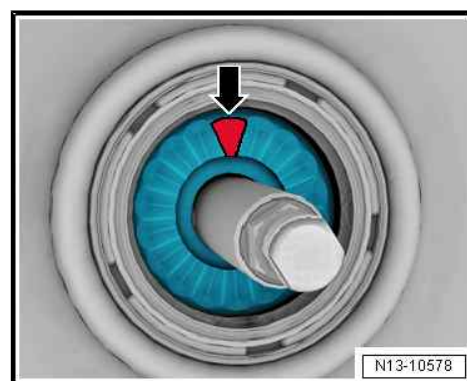
Renew bolt with O-ring after removal.

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- If necessary, detach flange nut - T10531/4- -item B- and turning-over tool - T10531/3- -item A- from clamping pin - T10531/2-.

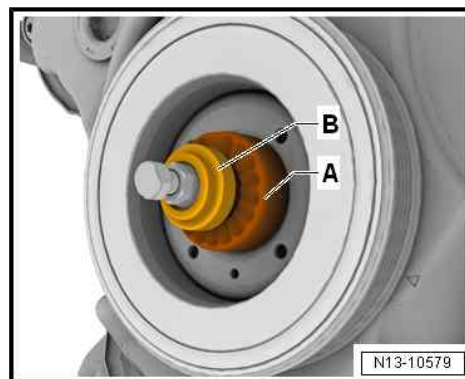


- Fit vibration damper in TDC position (pay attention to tooth-shaped profile -arrow- on chain sprocket).

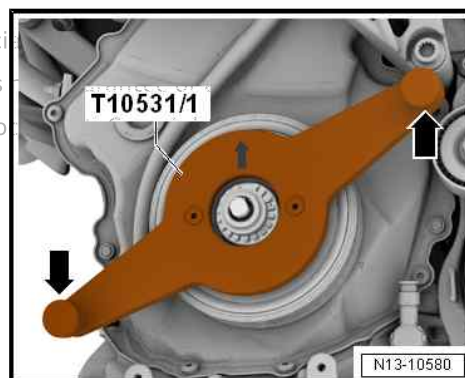




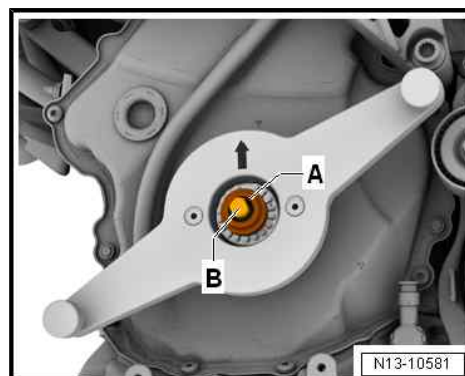
- Fit turning-over tool - T10531/3- -item A- onto clamping pin - T10531/2- .
- The hexagon flats should face the vibration damper.
- Screw flange nut - T10531/4- -item B- on while moving vibration damper back and forth slightly to check whether vibration damper is seated correctly in tooth-shaped profile.
- Tighten flange nut until vibration damper can no longer be rotated.



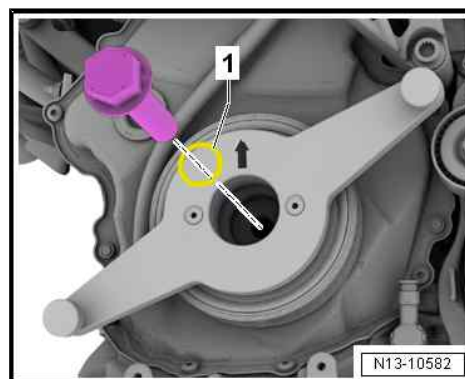
- Apply support - T10531/1- (as illustrated) to vibration damper and secure hand-tight with knurled screws -arrows-.
- Arrow marking on support - T10531/1- must point upwards.



- Unscrew flange nut - T10531/4- -item A- and loosen tensioning bolt -B-.
- Unscrew clamping pin - T10531/2- and remove with turning-over tool - T10531/3- .

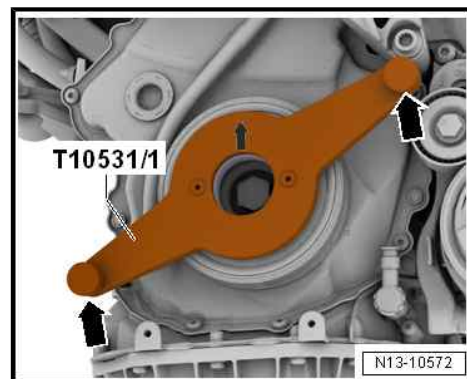


- Screw in new bolt for vibration damper with lubricated O-ring -1- hand-tight.





- Remove knurled screws -arrows- and detach support - T10531/1- .



- Tighten bolt for vibration damper using counterhold tool - T10355- .

Remaining installation steps are carried out in reverse sequence; note the following:



Note

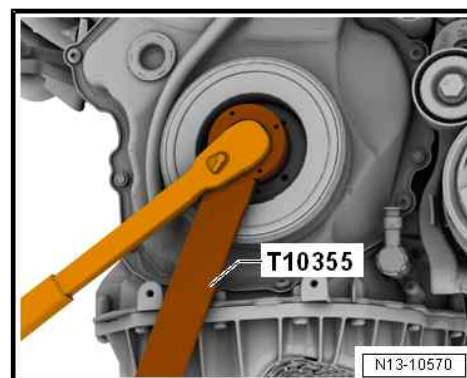
Renew bolts for timing chain cover after removal.

- Install poly V-belt
 ⇒ [“1.2.1 Removing and installing poly V-belt - vehicles with alternator”, page 18](#) .

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper

Tightening torques

- ◆ ⇒ [“1.1.1 Exploded view - cylinder block \(pulley end\), vehicles with alternator”, page 13](#)
- ◆ ⇒ [“1.1 Exploded view - timing chain cover”, page 70](#)



1.4.2 Removing and installing vibration damper - vehicles with starter-alternator

Special tools and workshop equipment required

- ◆ Ratchet wrench (21 mm) - T40263-

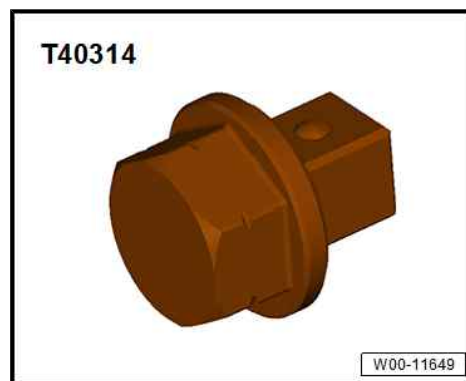


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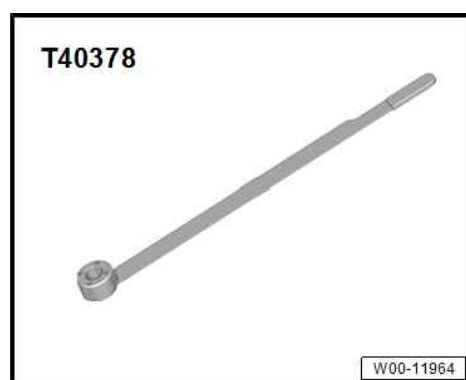




◆ Adapter - T40314-



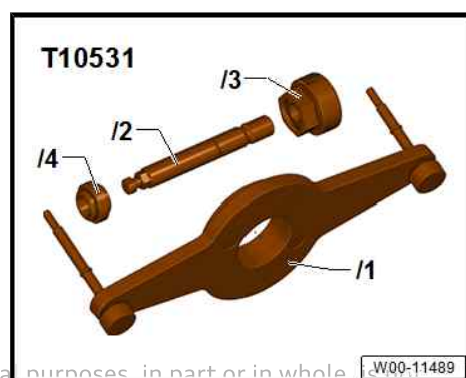
◆ Counterhold tool - T40378-



◆ Counterhold tool - T40379-



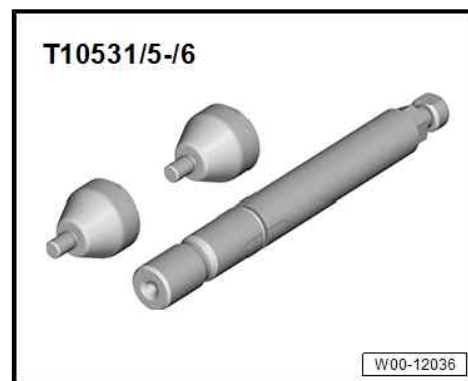
◆ Assembly tool - T10531-



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◆ Adapters - T10531/5-



◆ Clamping pin - T10531/6-



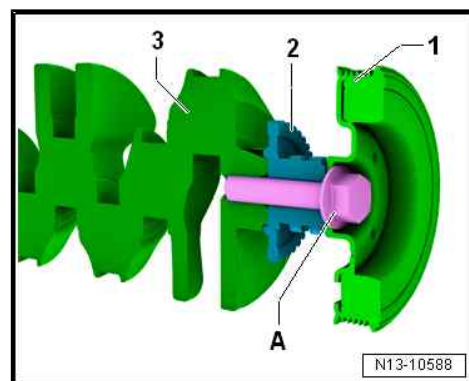
Note

The securing bolt for the vibration damper -A- secures the vibration damper -1-, timing chain sprocket -2- and crankshaft -3- to each other. Before removing the securing bolt, the timing chain sprocket must be secured to the crankshaft as described below.

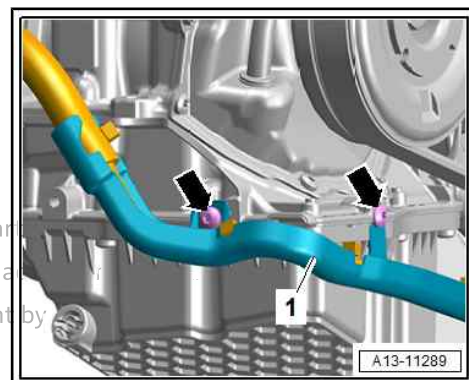
Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13; Cylinder block (pulley end); Removing and installing vibration damper .

- Remove poly V-belt
 ⇒ ["1.2.2 Removing and installing poly V-belt - vehicles with starter-alternator", page 19](#) .
- Remove bolts -arrows- and press wiring duct downwards.



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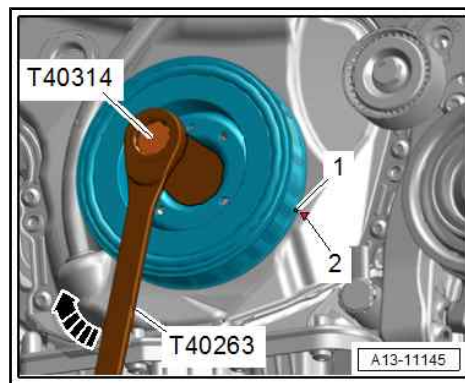


Caution

Irreparable damage can be caused if the camshaft timing chain slips.

- ◆ **Turn crankshaft only in direction of engine rotation -arrow-.**

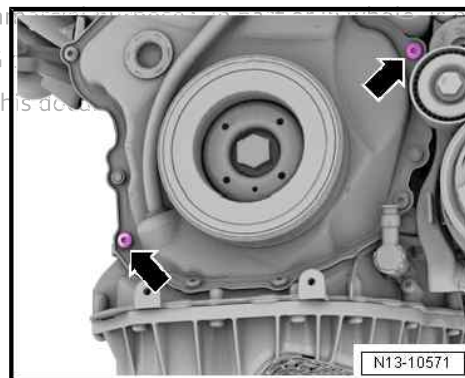
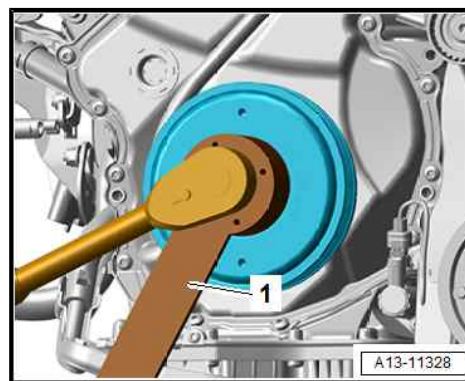
- Use ratchet wrench (21 mm) - T40263- , adapter - T40314- and socket (24 mm) to turn crankshaft until vibration damper is at "TDC" position.
- Notch -1- on vibration damper must align with arrow marking -2- on cover for timing chains (bottom).
- Marking on timing chain cover (bottom) must be in 4 o'clock position.



Caution

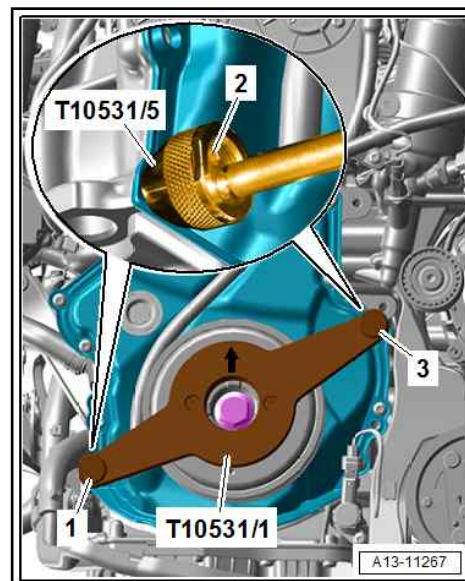
Do not loosen bolt for vibration damper by more than a half turn at this stage.

- Loosen bolt for vibration damper approx. $\frac{1}{2}$ a turn; depending on version, use counterhold tool - T40378- or counterhold tool - T40379- -1- to do so.
- If vibration damper has been twisted out of position, correct "TDC" position.
- Remove bolts -arrows- for timing chain cover (bottom).





- Screw adapter -T10531/5- into cylinder block hand-tight.
- Apply support - T10531/1- (as illustrated) to vibration damper and screw knurled screws -1, 3- hand-tight into adapters.
- If necessary, align and counterhold adapters on hexagon flats -2- using a hexagon socket (4 mm).
- Arrow marking on support - T10531/1- must point upwards.
- Remove bolt for vibration damper completely.

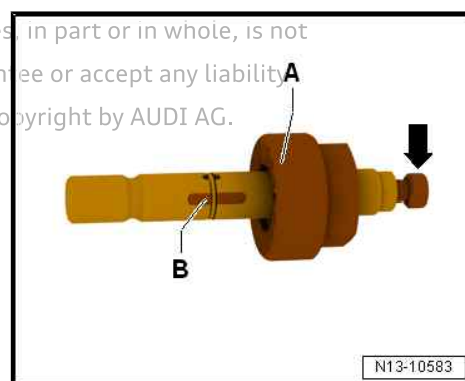


- Check whether turning-over tool -T10531/3- item A- slides easily over clamps -B-. Unscrew tensioning bolt -arrow- slightly if necessary.

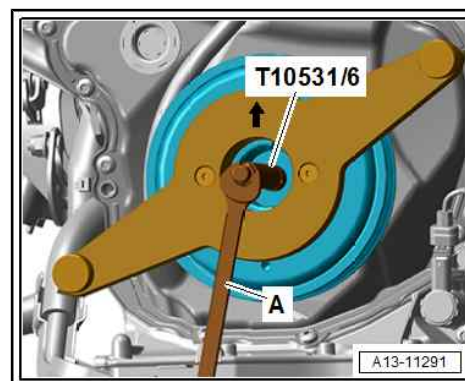


Note

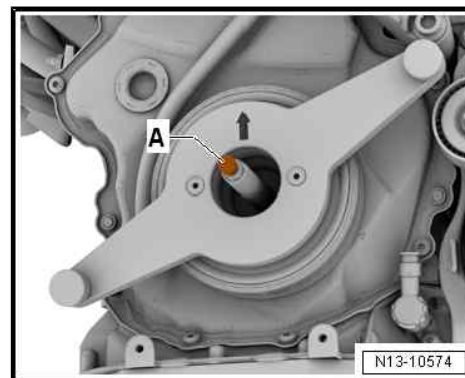
Do not turn the tensioning bolt from this stage onwards; otherwise the clamping pin - T10531/6- will get stuck when it is screwed into the crankshaft.



- Screw clamping pin - T10531/6- into crankshaft and hand-tighten with open-end spanner (12 mm) -item A-.

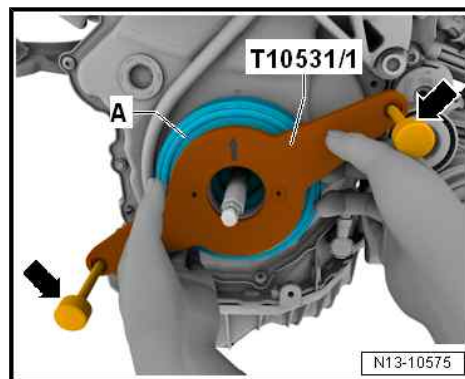


- Hand-tighten tensioning bolt -A- to secure chain sprocket to crankshaft.



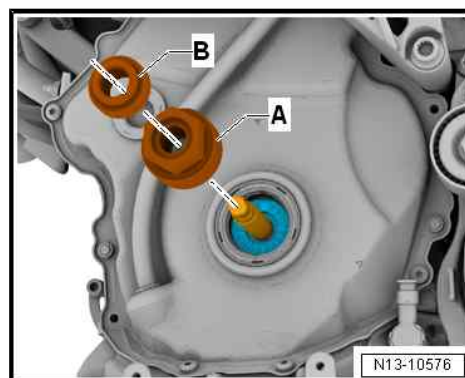


- Remove knurled screws -arrows-. Detach support - T10531/1- and vibration damper -A-.



If crankshaft needs to be rotated without vibration damper:

- Fit turning-over tool - T10531/3- -item A- onto clamping pin - T10531/6- (pay attention to tooth-shaped profile on chain sprocket).
- In TDC position, flat surface of tool faces upwards.
- Tighten turning-over tool with flange nut - T10531/4- -item B-.



- Crankshaft can now be rotated at hexagon flats -arrow-.



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Installing

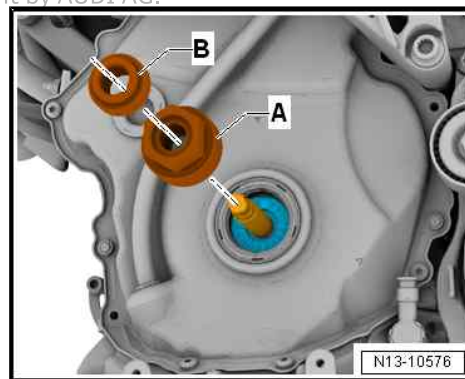
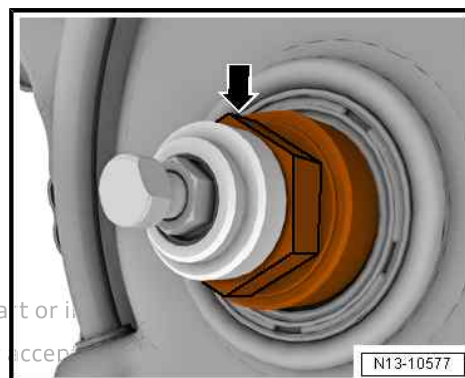
Installation is carried out in reverse order; note the following:



Note

Renew bolt with O-ring after removal.

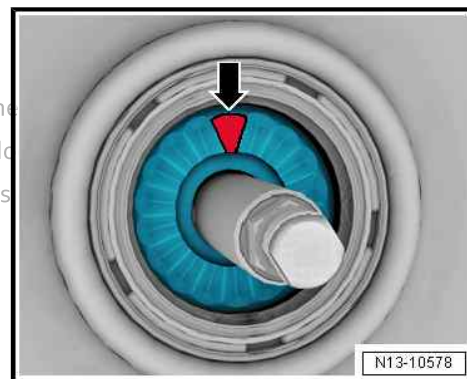
- If necessary, detach flange nut - T10531/4- -item B- and turning-over tool - T10531/3- -item A- from clamping pin - T10531/6- .



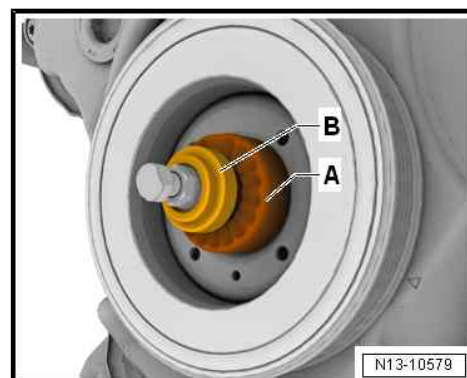


- Fit vibration damper in TDC position (pay attention to tooth-shaped profile -arrow- on chain sprocket).

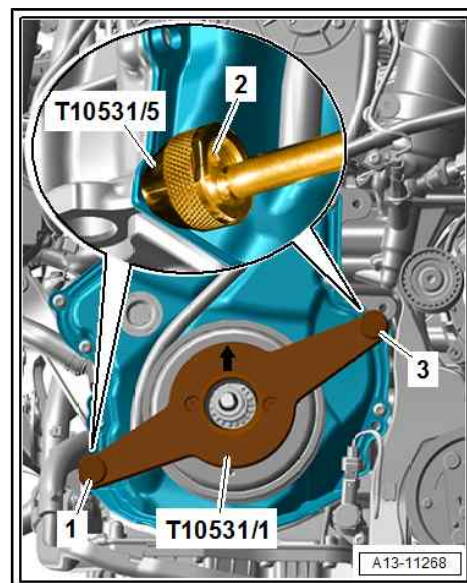
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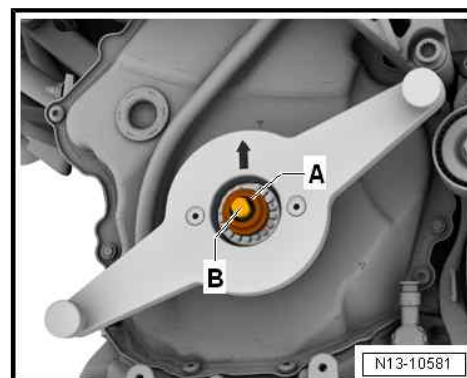
- Fit turning-over tool - T10531/3- -item A- onto clamping pin - T10531/6- .
- The hexagon flats should face the vibration damper.
- Screw flange nut - T10531/4- -item B- on while moving vibration damper back and forth slightly to check whether vibration damper is seated correctly in tooth-shaped profile.
- Tighten flange nut until vibration damper can no longer be rotated.



- Apply support - T10531/1- (as illustrated) to vibration damper and screw knurled screws -1, 3- hand-tight into adapters.
- If necessary, align and counterhold adapters on hexagon flats -2- using a hexagon socket (4 mm).
- Arrow marking on support - T10531/1- must point upwards.



- Unscrew flange nut - T10531/4- -item A- and tensioning bolt -B-.
- Unscrew clamping pin - T10531/6- and remove with turning-over tool - T10531/3- .



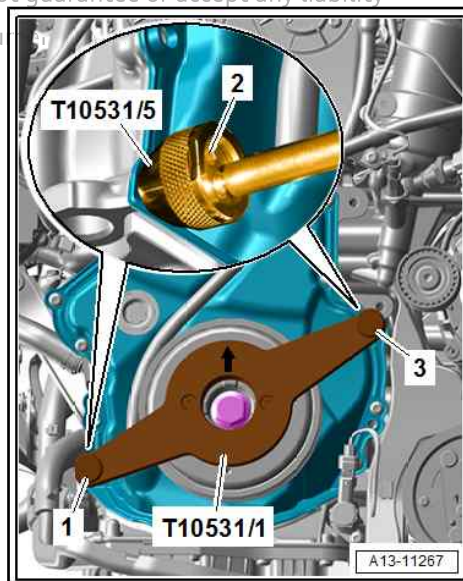
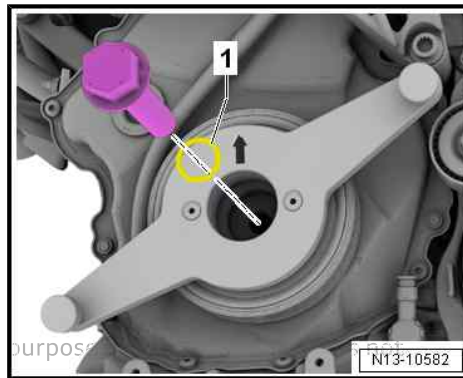


- Screw in new bolt for vibration damper with lubricated O-ring
-1- hand-tight.



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- Remove knurled screws -1, 3- and detach support - T10531/1- .
- Unscrew adapter - T10531/5- .



- Tighten bolt for vibration damper; depending on version, use counterhold tool - T40378- or counterhold tool - T40379- -1- to do so.

Remaining installation steps are carried out in reverse sequence; note the following:



Note

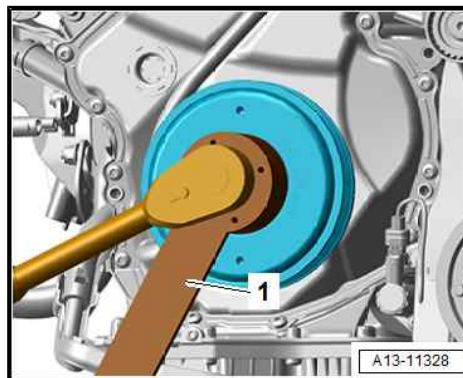
Renew bolts for timing chain cover after removal.

- Install poly V-belt
⇒ [“1.2.2 Removing and installing poly V-belt - vehicles with starter-alternator”, page 19](#) .

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper

Tightening torques

- ♦ ⇒ [“1.1.2 Exploded view - cylinder block \(pulley end\), vehicles with starter-alternator”, page 16](#)
- ♦ ⇒ [“1.1 Exploded view - timing chain cover”, page 70](#)





1.5 Removing and installing bracket for ancillaries

⇒ [“1.5.1 Removing and installing bracket for ancillaries - vehicles with alternator”, page 35](#)

⇒ [“1.5.2 Removing and installing bracket for ancillaries - vehicles with starter-alternator”, page 36](#)

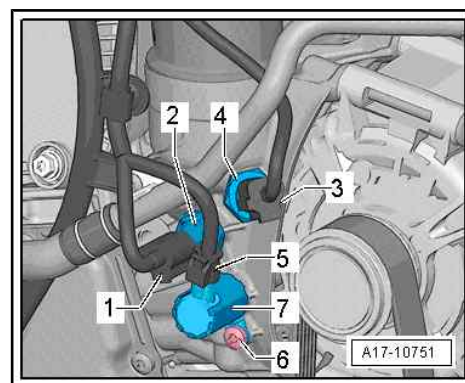
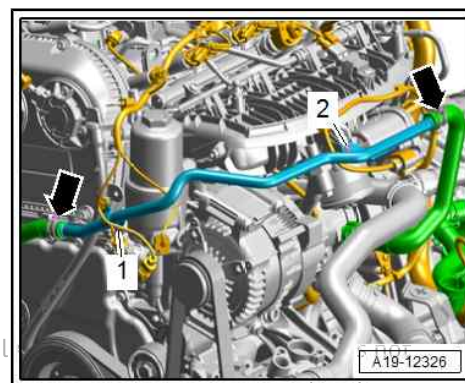
1.5.1 Removing and installing bracket for ancillaries - vehicles with alternator

Removing

- Remove engine cover panel ⇒ [page 12](#) .
- Move electrical wiring clear.
- Remove bolts -1 and 2- and press coolant pipe (left-side) to the side.
- Drain coolant ⇒ [page 171](#) .
- Detach poly V-belt from tensioner
 ⇒ [“1.2.1 Removing and installing poly V-belt - vehicles with alternator”, page 18](#) .
- Remove air conditioner compressor from bracket with refrigerant lines still attached and tie up to longitudinal member ⇒ Heating, air conditioning; Rep. gr. 87 : Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .
- Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Remove oil filter element ⇒ [page 142](#) .

Unplug electrical connectors:

- 1 - For oil pressure switch - F22- -item 2-
- 3 - For oil pressure switch for reduced oil pressure - F378- -item 4-
- 5 - For piston cooling jet control valve - N522- -item 7-





Note

Place a cloth underneath bracket for ancillaries to catch any escaping oil.

- Unscrew bolts -1 ... 5- and detach bracket for ancillaries from coolant pump housing.

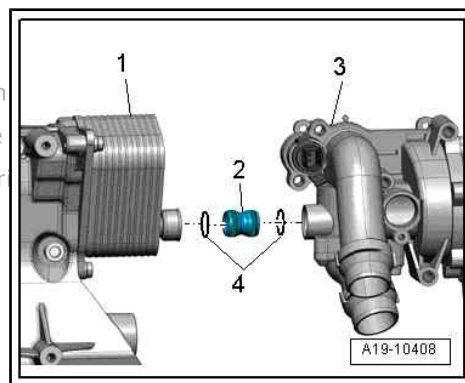
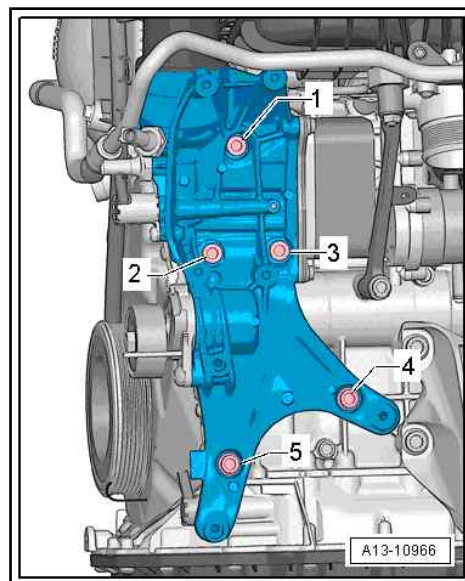
Installing

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



Note

- ◆ After removing, renew bolts tightened with specified tightening angle.
- ◆ Renew seals and O-rings after removal.
- Moisten new O-rings -4- with coolant.
- Insert connection -2- into coolant pump housing -3-.
- Push bracket for ancillaries -1- onto connection, fit bolts and tighten; tightening sequence ⇒ [page 15](#).
- Install alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .
- Install poly V-belt
⇒ [“1.2.1 Removing and installing poly V-belt - vehicles with alternator”, page 18](#) .
- Install oil filter element and check oil level ⇒ [page 142](#) .



Note

Do not reuse coolant.

- Fill up coolant ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .
- Install engine cover panel ⇒ [page 12](#) .

Tightening torques

- ◆ ⇒ [Fig. “Bracket for ancillaries - tightening torques and tightening sequence”](#) , [page 15](#)
- ◆ ⇒ [“1.1 Exploded view - cylinder block \(pulley end\)”](#) , [page 13](#)
- ◆ ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes

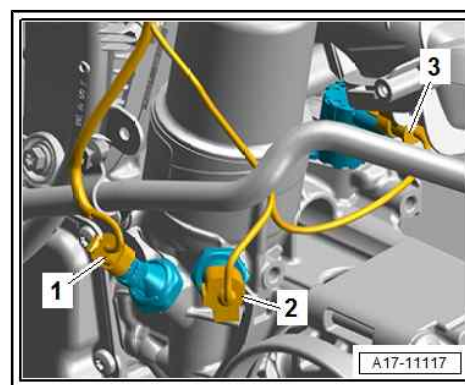
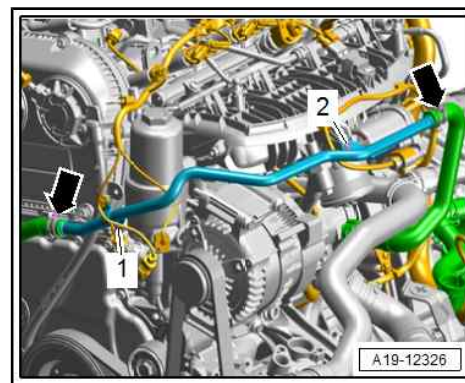
1.5.2 Removing and installing bracket for ancillaries - vehicles with starter-alternator

Removing

- Remove engine cover panel ⇒ [page 12](#) .



- Move electrical wiring clear.
- Unscrew bolts -1, 2- and swivel coolant pipe (left-side) upwards.
- Drain coolant ⇒ [page 171](#) .
- Remove poly V-belt
 ⇒ [“1.2.2 Removing and installing poly V-belt - vehicles with starter-alternator”, page 19](#) .
- Remove air conditioner compressor from bracket with refrigerant lines still attached and tie up to longitudinal member ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .
- Remove starter-alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Remove oil filter element ⇒ [page 142](#) .
- Unplug electrical connectors:
 - 1 - For oil pressure switch - F22-
 - 2 - For oil pressure switch for reduced oil pressure - F378-
 - 3 - For piston cooling jet control valve - N522-



Note

Place a cloth underneath bracket for ancillaries to catch any escaping oil.

- Unscrew bolts -1 ... 5- and detach bracket for ancillaries from coolant pump housing.

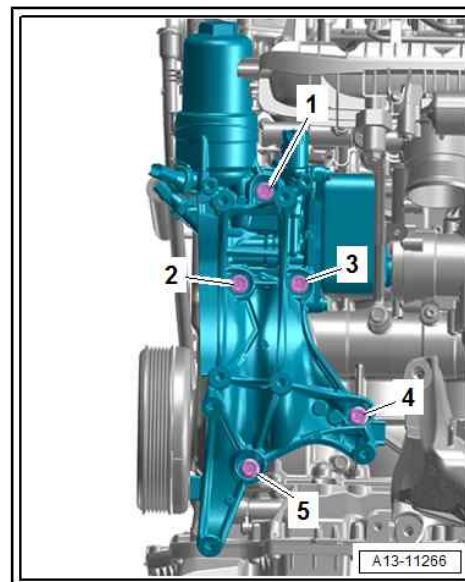
Installing

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



Note

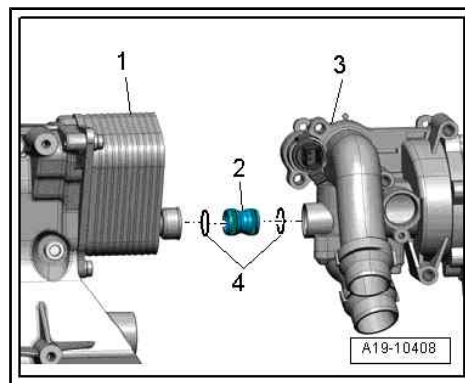
- ◆ *After removing, renew bolts tightened with specified tightening angle.*
- ◆ *Renew seals and O-rings after removal.*



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- Moisten new O-rings -4- with coolant.
- Insert connection -2- into coolant pump housing -3-.
- Push bracket for ancillaries -1- onto connection, fit bolts and tighten; tightening sequence ⇒ [page 15](#) .
- Install starter-alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
- Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .
- Install poly V-belt
⇒ [“1.2.2 Removing and installing poly V-belt - vehicles with starter-alternator”, page 19](#) .
- Install oil filter element and check oil level ⇒ [page 142](#) .



Note

Do not reuse coolant.

- Fill up coolant ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .
- Install engine cover panel ⇒ [page 12](#) .

Tightening torques

- ♦ ⇒ [Fig. “Bracket for ancillaries - tightening torques and tightening sequence”](#), [page 15](#)
- ♦ ⇒ [“1.1 Exploded view - cylinder block \(pulley end\)”, page 13](#)
- ♦ ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes

1.6 Removing and installing engine support

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing engine support .



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2 Cylinder block (gearbox end)

⇒ [“2.1 Exploded view - cylinder block \(gearbox end\)”, page 39](#)

⇒ [“2.2 Removing and installing drive plate”, page 40](#)

⇒ [“2.3 Removing and installing sealing flange \(gearbox end\)”, page 41](#)

⇒ [“2.4 Renewing needle bearing in drive plate”, page 44](#)

2.1 Exploded view - cylinder block (gearbox end)

1 - Cylinder block

2 - Dowel sleeves

3 - Sealing flange (gearbox end)

- ☐ With oil seal
- ☐ Renew after removing
- ☐ Removing and installing ⇒ [page 41](#)
- ☐ Before installing, remove oil residue from crankshaft journal with a clean cloth
- ☐ Guide sleeve is not to be removed until sealing flange has been slipped onto crankshaft journal

4 - Bolt

- ☐ Tightening torques and sequence ⇒ [page 40](#)

5 - Drive plate

- ☐ Removing and installing ⇒ [page 40](#)
- ☐ A needle bearing must be fitted in the drive plate on vehicles with manual gearbox; install needle bearing if not yet fitted ⇒ [page 44](#)
- ☐ There should be no needle bearing fitted in the drive plate on vehicles with a dual clutch gearbox; remove needle bearing if necessary ⇒ [page 44](#)

6 - Bolt

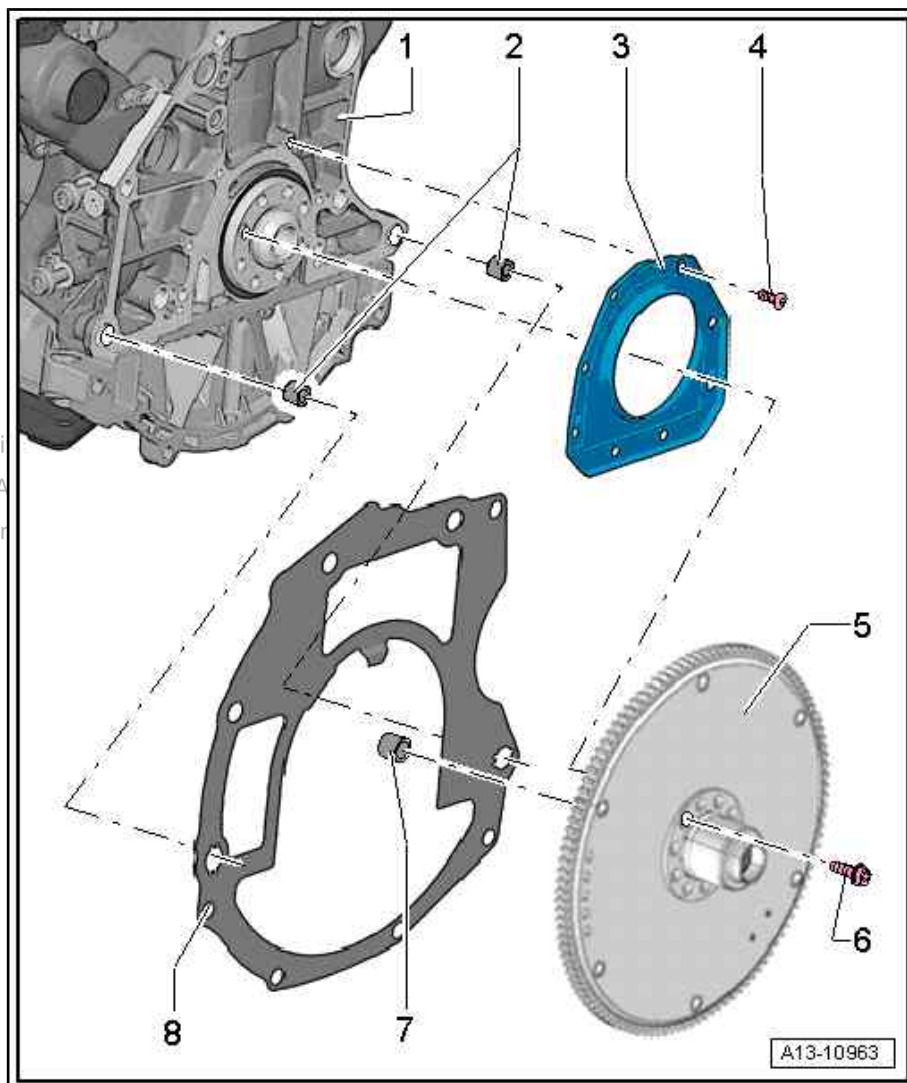
- ☐ Renew after removing
- ☐ 60 Nm +90°

7 - Needle bearing

- ☐ Renewing ⇒ [page 44](#)

8 - Intermediate plate

- ☐ Do not damage/bend when assembling
- ☐ Installing ⇒ [page 40](#)





Sealing flange (gearbox end) - tightening torques and sequence

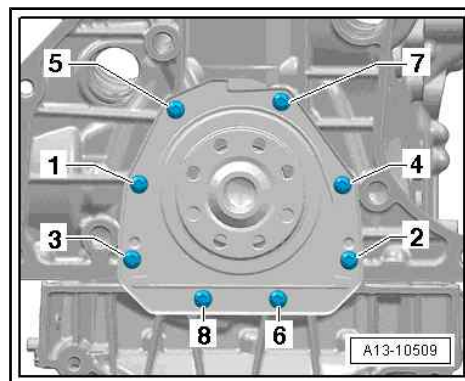


Note

After removing, renew bolts tightened with specified tightening angle.

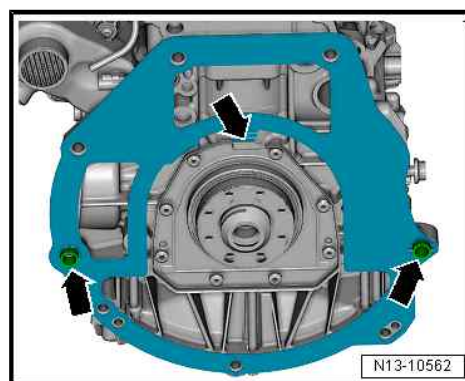
- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 ... 8-	Screw in by hand until contact is made
2.	-1 ... 8-	Steel bolts: 9 Nm Aluminium bolts: 4 Nm
3.	-1 ... 8-	Aluminium bolts: Turn 45° further



Installing intermediate plate

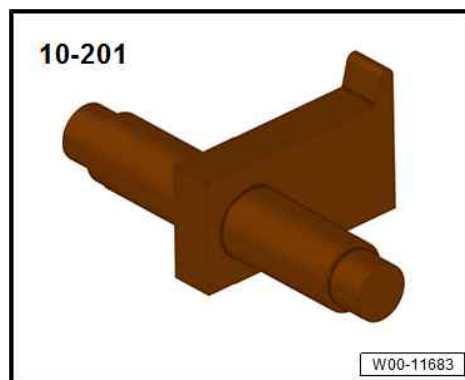
- Engage intermediate plate on sealing flange -top arrow- and push onto dowel sleeves -bottom arrows-.



2.2 Removing and installing drive plate

Special tools and workshop equipment required

- ♦ Counterhold tool - 10-201-



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Removing

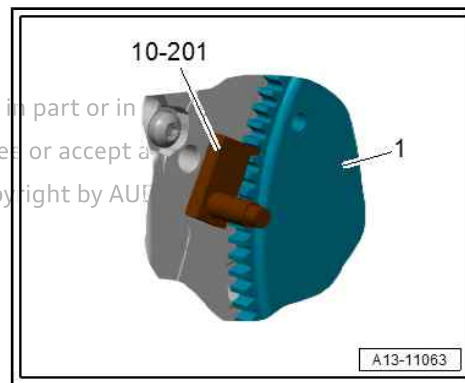
- Gearbox removed ⇒ Gearbox; Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox
- Insert counterhold tool - 10-201- to slacken bolts.



Caution

Take care not to damage outer surface of bearing flange on drive plate.

- ◆ **Use a multi-point socket bit with a length of at least 40 mm to slacken and tighten the drive plate bolts.**



- Remove bolts and take off drive plate -1-.

Installing

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



Note

- ◆ *After removing, renew bolts tightened with specified tightening angle.*
- ◆ *For equipment version with manual gearbox, a needle bearing is fitted in the drive plate. Before installing, check that the needle bearing is fitted. Removing and installing needle bearing in drive plate (pressing in and out) ⇒ [page 44](#) .*
- Fit counterhold tool - 10-201- the other way round to tighten bolts.

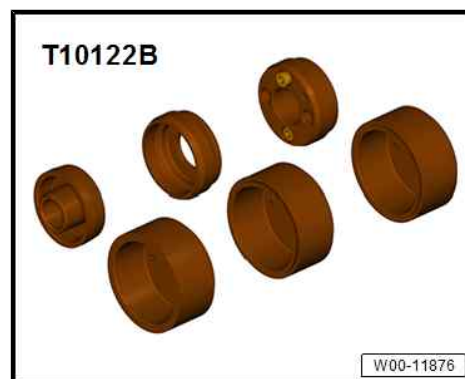
Tightening torques

- ◆ ⇒ [“2.1 Exploded view - cylinder block \(gearbox end\)”, page 39](#)

2.3 Removing and installing sealing flange (gearbox end)

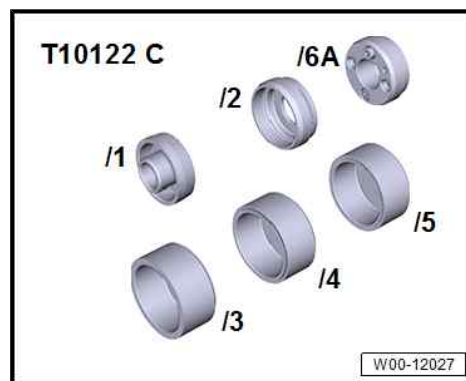
Special tools and workshop equipment required

- ◆ Guide piece - T10122/6- or -T10122/6A- from fitting tool - T10122B- or -T10122C-





- ◆ Assembly aid - T10122/1- from fitting tool - T10122B- or - T10122C-



- ◆ Electric drill with plastic brush attachment
- ◆ Safety goggles
- ◆ Sealant ➔ Electronic parts catalogue

Removing

- Gearbox removed ➔ Gearbox; Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox .
- Remove drive plate ➔ [page 40](#) .
- Remove bolts -1 ... 8-.
- Remove sealing flange.
- Cover exposed parts of the engine.

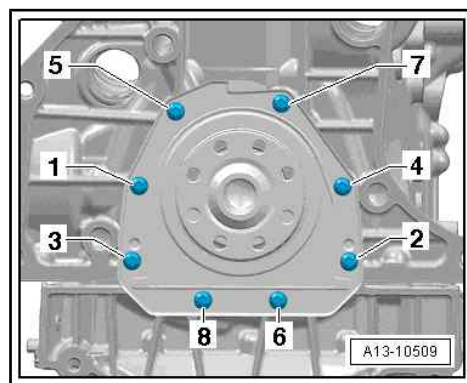
Installing



Caution

Make sure sealant residue does not enter lubrication system.

- ◆ *Place a clean cloth over the exposed section of the sump.*

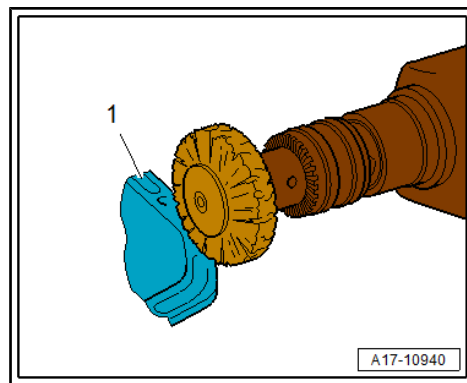


WARNING

Risk of eye injury.

- ◆ *Put on safety goggles.*

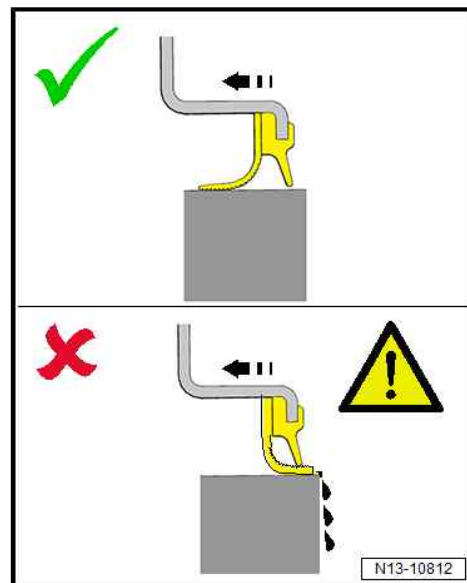
- Remove sealant remaining on cylinder block -1- with flat scraper or rotating plastic brush.
- Clean sealing surfaces; they must be free of oil and grease.



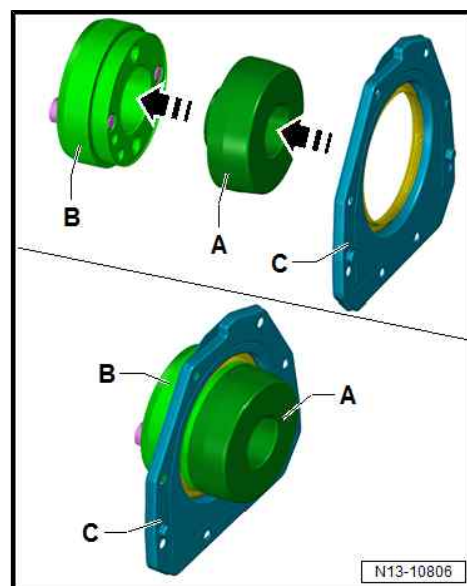
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- Check that sealing lip of sealing flange is not bent or damaged.
- Sealing lip must face engine after installation. If the sealing lip faces outwards after installation this will result in oil leakage.



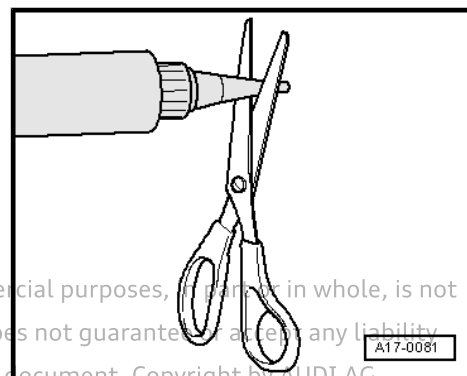
- Check guide piece - T10122/6- -item B-; it must not have sharp edges or be dirty.
- Fit assembly aid - T10122/1- -item A- onto guide piece -item B-.
- Push sealing flange -C- onto guide piece -B-, starting with outer edge.
- Detach assembly aid -A-.



Note

Note expiry date of sealant.

- Cut off nozzle of tube at front marking (nozzle Ø approx. 2 mm).



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Note

Guide piece - T10122/6- is not shown in illustration.



Caution

Make sure lubrication system is not clogged by excess sealant.

- ◆ **The sealant bead must not be thicker than specified.**

- Thickness of sealant bead: 2 ... 3 mm
- The sealing flange must be installed within 5 minutes after applying sealant.
- Fit guide piece -A- with sealing flange -B- on crankshaft journal.

Note:

It is not necessary to tighten bolts -arrows-.

- Push sealing flange -B- over guide piece -A- onto crankshaft journal.
- Detach guide piece -A-.
- Secure sealing flange with bolts.



Note

After installing the sealing flange, wait about 30 minutes for the sealant to dry. Then (and only then) fill the engine with engine oil.

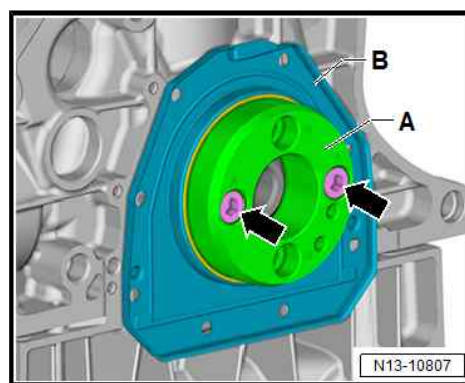
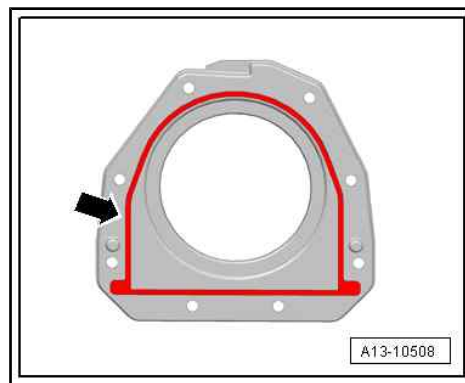
Remaining installation steps are carried out in reverse sequence; note the following:

- Install drive plate ➔ [page 40](#) .
- Check oil level ➔ [page 142](#) .

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Tightening torques

- ◆ ➔ ["2.1 Exploded view - cylinder block \(gearbox end\)"](#), [page 39](#)



2.4 Renewing needle bearing in drive plate



Note

A needle bearing is fitted in the drive plate only on vehicles with manual gearbox.

Special tools and workshop equipment required

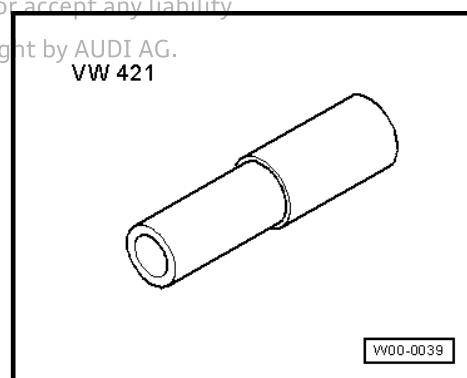


◆ Tube - VW 418 A-

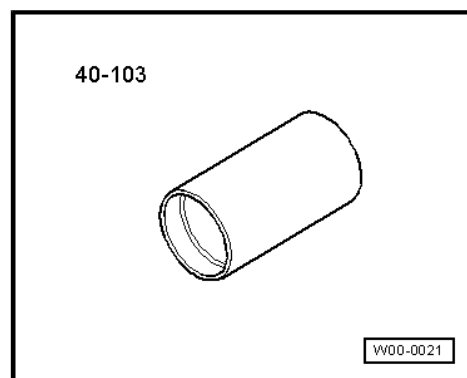


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◆ Tube - VW 421-

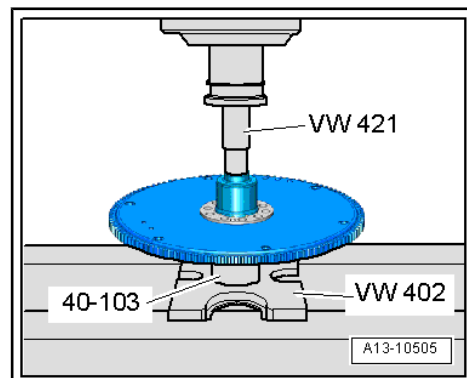


◆ Support - 40-103-



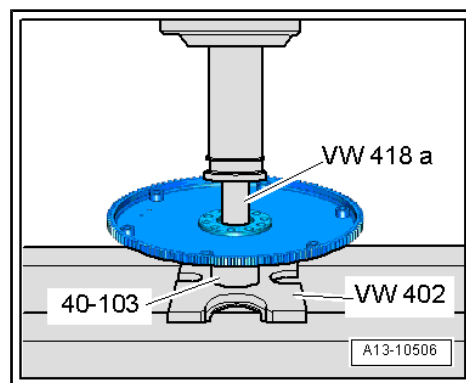
Procedure

- Gearbox removed ⇒ Gearbox; Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox .
- Remove drive plate ⇒ [page 40](#) .
- Place support - 40-103- under drive plate when pressing out and pressing in needle bearing.
- Use tube - VW 421- and workshop press and press out needle bearing.
- Smaller diameter of tube -VW 421- faces drive plate.





- Carefully press in needle bearing as far as stop, using tube - VW 418 A- and workshop press.
- Installation position: closed side of needle bearing faces engine.
- Install drive plate ➔ [page 40](#) .



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3 Crankshaft

⇒ [“3.1 Exploded view - crankshaft”, page 47](#)

⇒ [“3.2 Crankshaft dimensions”, page 49](#)

⇒ [“3.3 Allocation of main bearing shells”, page 49](#)

⇒ [“3.4 Measuring axial clearance of crankshaft”, page 50](#)

⇒ [“3.5 Measuring radial clearance of crankshaft”, page 51](#)

⇒ [“3.6 Removing and installing sender wheel”, page 52](#)

3.1 Exploded view - crankshaft



Note

Secure engine to engine and gearbox support when performing assembly work ⇒ [page 9](#).

1 - Cylinder block

2 - Bearing shell for cylinder block

- ☐ With oil groove
- ☐ Renew used bearing shells
- ☐ Classification of crankshaft bearing shells ⇒ [page 49](#)
- ☐ Lubricate with engine oil

3 - Crankshaft

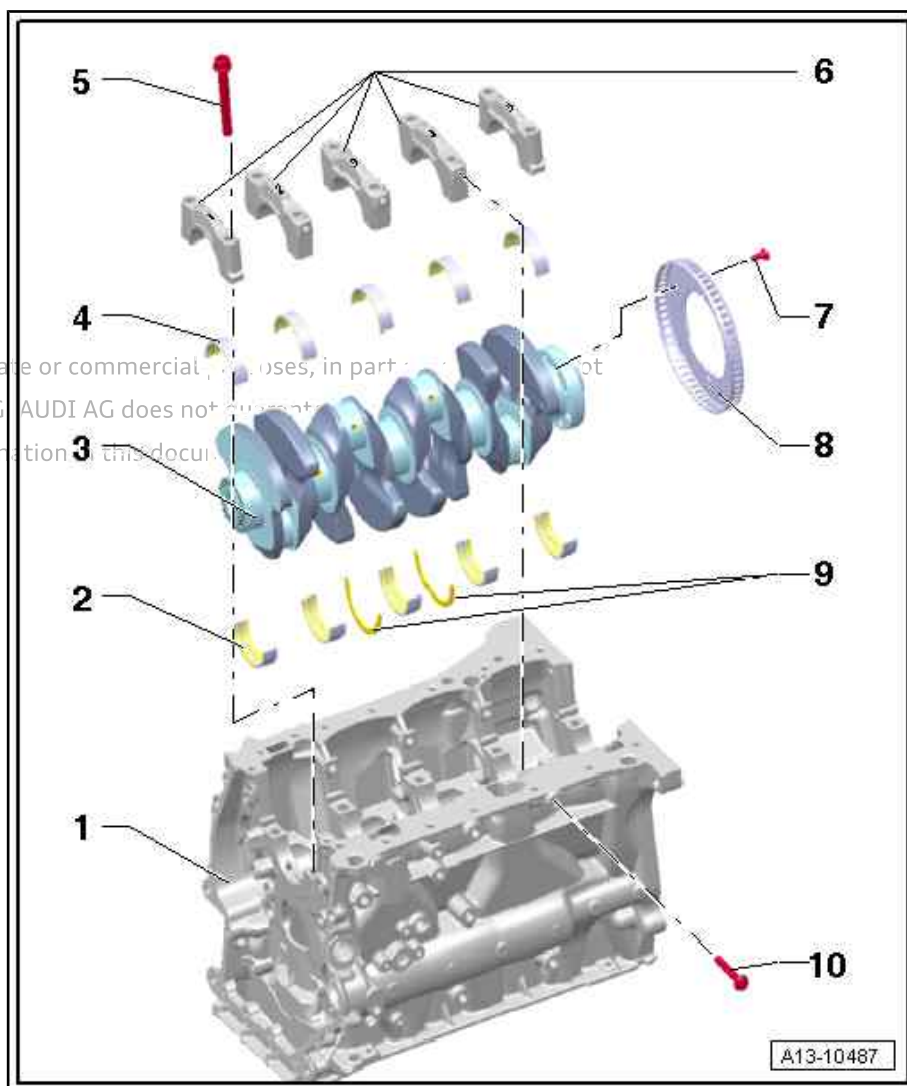
- ☐ After removing, place it down so that the sender wheel does not become damaged ⇒ [Item 8 \(page 48\)](#)
- ☐ If crankshaft is renewed, new bearing shells must be assigned to bearing caps ⇒ [page 49](#)
- ☐ Measuring axial clearance ⇒ [page 50](#)
- ☐ Measuring radial clearance ⇒ [page 51](#)
- ☐ Crankshaft dimensions ⇒ [page 49](#)

4 - Bearing shell for bearing cap

- ☐ Without oil groove
- ☐ Renew used bearing shells
- ☐ Classification of crankshaft bearing shells ⇒ [page 49](#)
- ☐ Lubricate with engine oil

5 - Bolt

- ☐ Renew after removing





- ☐ Use old bolts when measuring radial clearance
- ☐ Tightening torque and sequence ⇒ [page 48](#)

6 - Bearing caps

- ☐ Bearing cap 1: Pulley end
- ☐ Bearing caps 2, 3 and 4 are secured additionally with bolts at side
- ☐ Mark installation position for re-installation ⇒ [page 49](#)

7 - Bolt

- ☐ Renew after removing
- ☐ Sender wheel ⇒ [Item 8 \(page 48\)](#) must be renewed if bolts are loosened ⇒ [page 52](#)
- ☐ 10 Nm +90°

8 - Sender wheel

- ☐ For engine speed sender - G28-
- ☐ Can only be installed in one position
- ☐ Sender wheel must be renewed if bolts ⇒ [Item 7 \(page 48\)](#) are loosened
- ☐ Removing and installing ⇒ [page 52](#)
- ☐ After renewal, perform adaptations listed in Guided Function "01 - Functions, engine mechanics" ⇒ Vehicle diagnostic tester

9 - Thrust washers

- ☐ For bearing No. 3
- ☐ Lubricate with engine oil

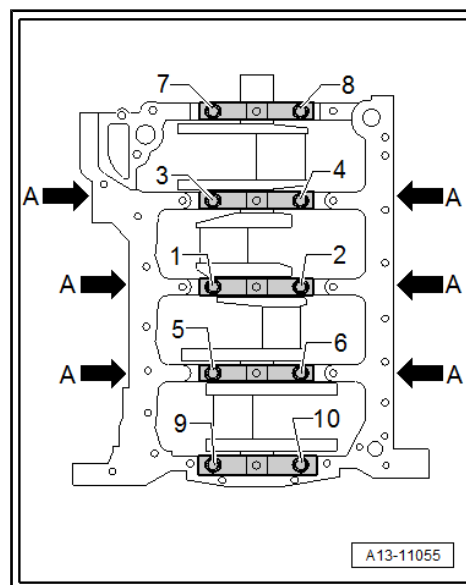
10 - Bolt

- ☐ Renew after removing
- ☐ Tightening torques and sequence ⇒ [page 48](#)

Crankshaft - tightening torques and sequence

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 ... 10- and -arrows A-	Screw in by hand until contact is made
2.	-1 ... 10-	65 Nm
3.	-1 ... 10-	Turn 90° further
4.	-Arrows A-	15 Nm
5.	-Arrows A-	Turn 90° further



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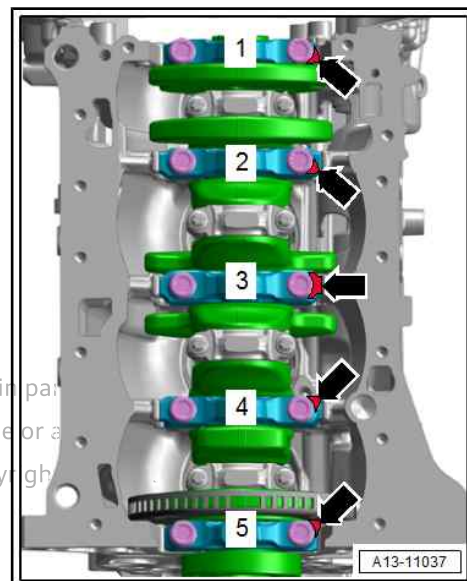


Markings on crankshaft bearing caps

- Mark position of bearing caps -1 ... 5- for re-installation.
- Lugs -arrows- on bearing caps face crankshaft bearing 3 on inlet side.



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3.2 Crankshaft dimensions

Honing dimension 1)	Crankshaft main bearing journal Ø mm		Conrod journal Ø mm	
Basic dimension	48.00	-0.032 -0.052	47.80	-0.022 -0.042

1) There is currently no provision for machining used crankshafts.

3.3 Allocation of main bearing shells

Bearing shells of the correct thickness are allocated to the cylinder block and crankshaft at the factory. Coloured dots are used to identify the thickness of the bearing shells.

Letter codes on lower sealing surface or end of cylinder block indicate which bearing shell is to be fitted in cylinder block (top bearing shell) at each location.

Letter codes on crankshaft indicate which bearing shell is to be fitted in bearing cap (bottom bearing shell).

The first letter stands for bearing cap 1, the second letter for bearing cap 2, etc.



Marking on bearing shell for cylinder block:

Marking on cylinder block refers to top bearing shell (bearing shell for cylinder block).

- Note down letter and select colour coding to be fitted from the table.

S	=	Black
R	=	Red
G	=	Yellow
V	=	Violet
W	=	White

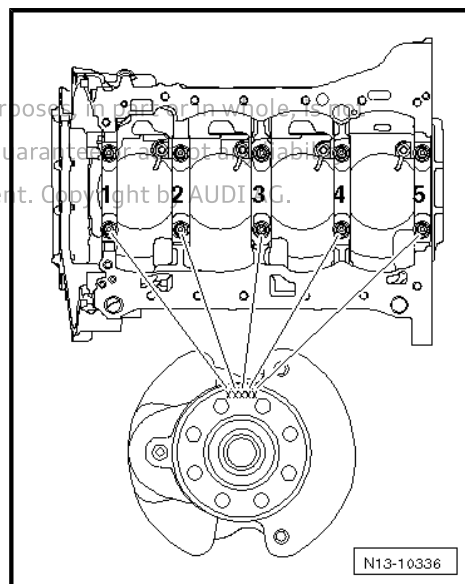
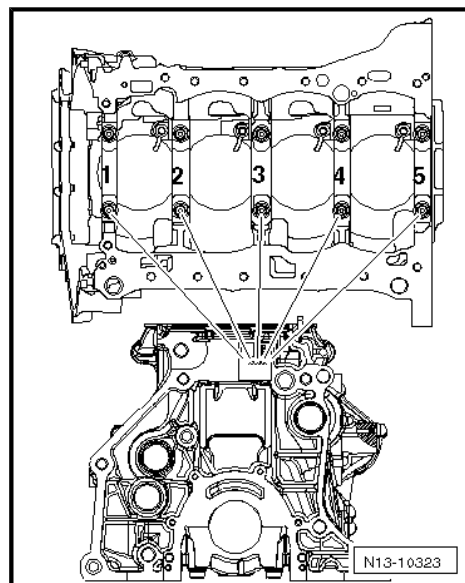


Marking on bearing shell for bearing cap:

Marking on crankshaft refers to bottom bearing shell (bearing shell for bearing cap).

- Note down letter and select colour coding to be fitted from the table.

R	=	Red
G	=	Yellow
B	=	Blue
W	=	White
V	=	Violet
S	=	Black



3.4 Measuring axial clearance of crankshaft

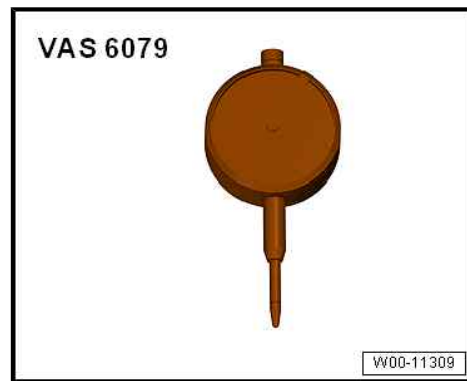
Special tools and workshop equipment required

- ♦ Universal dial gauge bracket - VW 387-





◆ Dial gauge - VAS 6079-

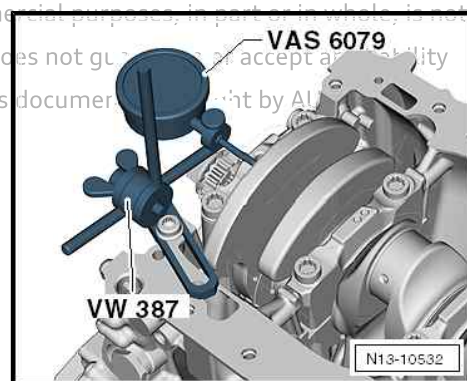


Procedure

- Bolt dial gauge - VAS 6079- with universal dial gauge bracket - VW387- onto cylinder block and set it against crank web.
- Press crankshaft against dial gauge by hand and set gauge to "0".
- Push crankshaft away from dial gauge and read off value.

Axial clearance:

- New: 0.070 ... 0.231 mm.
- Wear limit: 0.30 mm.



3.5 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

- ◆ Plastigauge

Procedure



Note

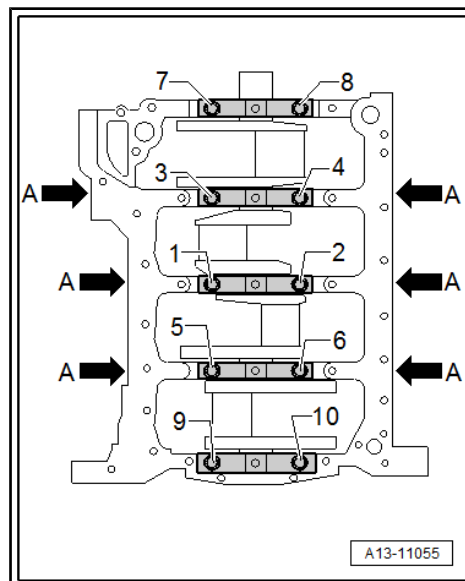
- ◆ *Use old bolts when measuring radial clearance.*
- ◆ *Renew used bearing shells.*
- Remove crankshaft bearing caps and clean bearing caps and journals.
- Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or bearing shell.
- The Plastigauge must be positioned in the centre of the bearing shell



- Fit crankshaft bearing caps and secure with old bolts
-1 ... 10- ⇒ [page 48](#) without rotating crankshaft.
- Remove crankshaft bearing caps again.
- Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.017 ... 0.037 mm.
- Wear limit: 0.15 mm.
- When carrying out final assembly, renew bolts.



3.6 Removing and installing sender wheel

Removing

- Engine removed and secured to engine and gearbox support
⇒ [page 9](#)
- Remove sealing flange (gearbox end) ⇒ [page 41](#) .
- Remove sump (top section) ⇒ [page 145](#) .
- Remove balance shaft timing chain ⇒ [page 85](#) .
- Unbolt conrod bearing caps.
- Remove crankshaft bearing caps.
- Remove crankshaft and unbolt sender wheel.

Installing

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

- Sender wheel -2- must always be renewed after slackening off bolts -1-.

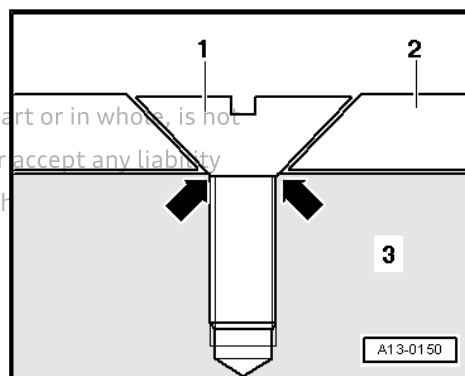


Note

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- ◆ *If the countersunk bolts are tightened a second time, the seats for the bolt heads in the sender wheel will be deformed to such an extent that the bolt heads make contact with the crankshaft -3- -arrows- and the sender wheel beneath the bolts will be loose.*

- ◆ *Sender wheel can only be installed in one position. Holes are off-set.*



- If sender wheel was renewed, perform adaptations listed in Guided Function "01 - Functions, engine mechanics" ⇒ Vehicle diagnostic tester.

Tightening torques

- ◆ ⇒ ["3.1 Exploded view - crankshaft", page 47](#)



4 Balance shaft

- ⇒ **“4.1 Exploded view - balance shaft”, page 53**
 ⇒ **“4.2 Removing and installing balance shaft”, page 55**
 ⇒ **“4.3 Renewing oil seal for balance shaft (inlet side)”, page 59**

4.1 Exploded view - balance shaft

1 - Cylinder block

2 - Bolt

- ☐ 9 Nm

3 - Balance shaft (inlet side)

- ☐ Lubricate bearing with engine oil
- ☐ Always renew both sides together
⇒ [page 55](#)

4 - Pipe

- ☐ For balance shaft (exhaust side)
- ☐ Installation position
⇒ [page 54](#)

5 - Bolt

- ☐ 9 Nm

6 - Balance shaft (exhaust side)

- ☐ Lubricate bearing with engine oil
- ☐ Always renew both sides together
⇒ [page 58](#)

7 - Needle bearing

- ☐ Renew after removing
- ☐ Needle bearing is colour-coded; a needle bearing with the same colour must be installed
- ☐ Lubricate bearing with engine oil

8 - Needle bearing

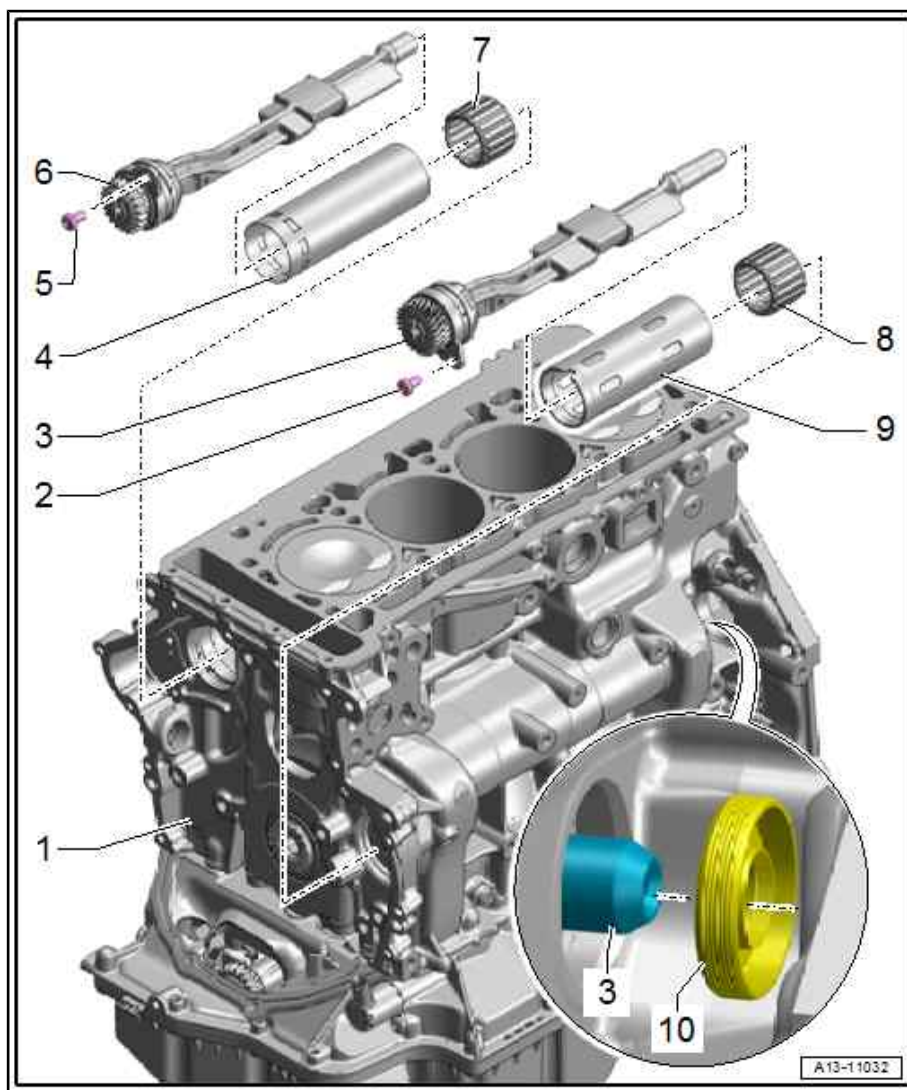
- ☐ Renew after removing
- ☐ Needle bearing is colour-coded; a needle bearing with the same colour must be installed
- ☐ Lubricate bearing with engine oil

9 - Pipe

- ☐ For balance shaft (inlet side)
- ☐ Installation position ⇒ [page 54](#)

10 - Oil seal

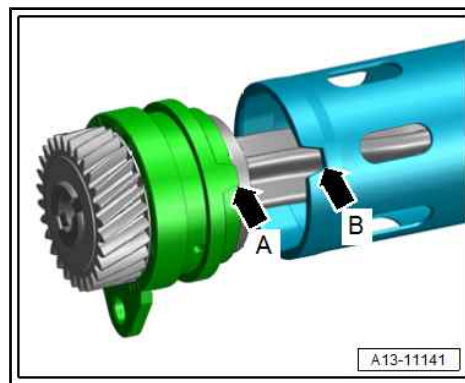
- ☐ For balance shaft (inlet side)
- ☐ Renewing ⇒ [page 59](#)





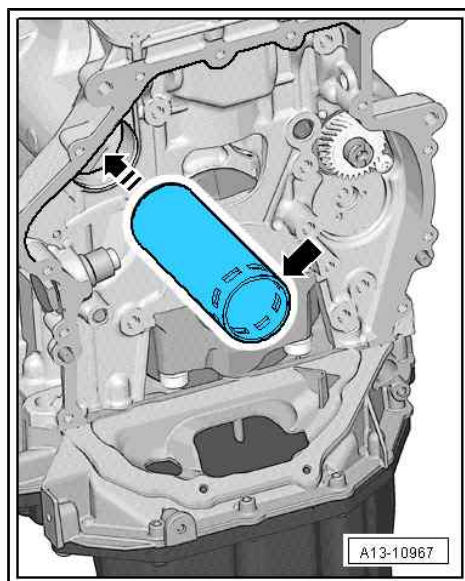
Tube for balance shaft (inlet side) - installation position

- Lug -arrow A- on balance shaft must engage in notch -arrow B- on tube.

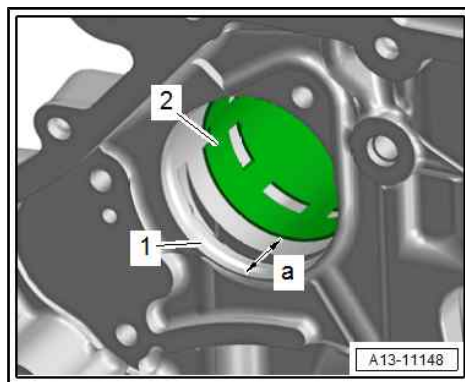


Tube for balance shaft (exhaust side) - installation position

- Openings -right arrow- must face chain side.



- Insert tube -2- for balance shaft into cylinder block -1-.
- Installation position is correct when dimension -a- = 21 mm.



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4.2 Removing and installing balance shaft

⇒ [“4.2.1 Removing and installing balance shaft \(inlet side\)”, page 55](#)

⇒ [“4.2.2 Removing and installing balance shaft \(exhaust side\)”, page 58](#)

4.2.1 Removing and installing balance shaft (inlet side)



Note

- ◆ *The needle bearing must be renewed when removing and installing the balance shaft.*
- ◆ *The needle bearing is colour-coded; a needle bearing with the same colour must be installed.*

Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Balance shaft; Removing and installing balance shaft .

- Remove radiator ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiator/radiator fans; Removing and installing radiator .
- Remove toothed belt for coolant pump ⇒ [page 177](#) .
- Remove drive chain for balance shaft ⇒ [page 97](#) .

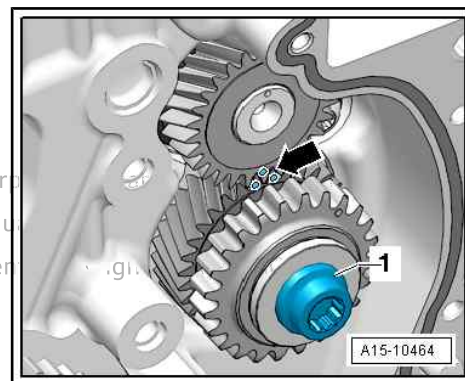
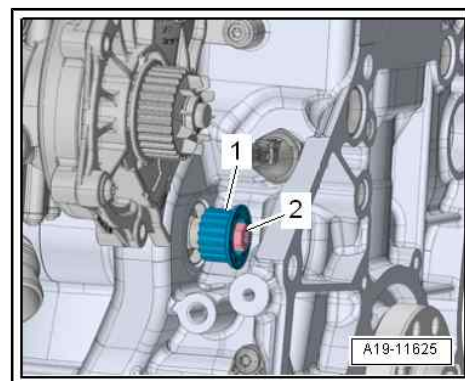


Caution

Risk of damage to thread.

- ◆ *The drive sprocket bolt has a left-hand thread.*

- Remove bolt -2-.
- Detach drive sprocket -1- for toothed belt for coolant pump.
- Unscrew bolt -1- and remove idler gear.



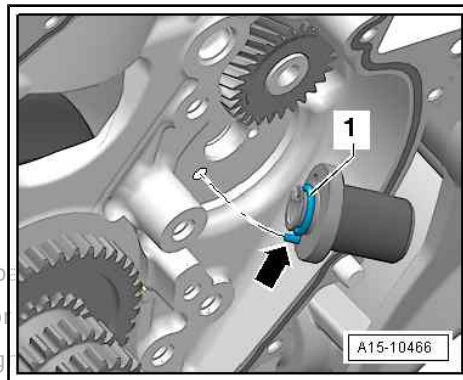
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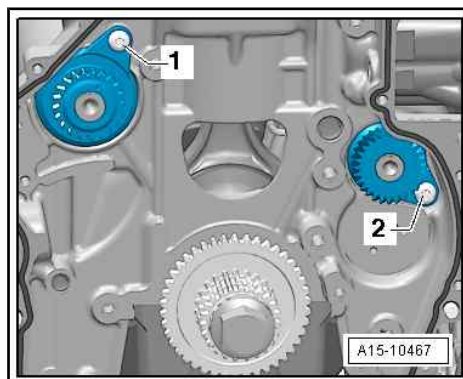
- Detach bearing mounting -1-.



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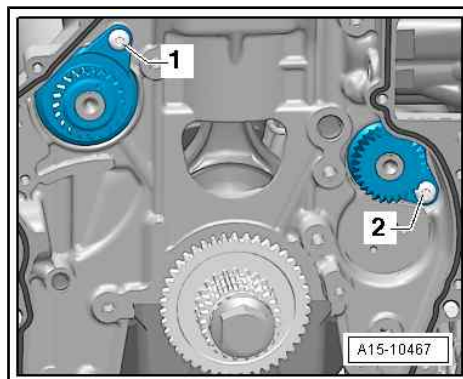
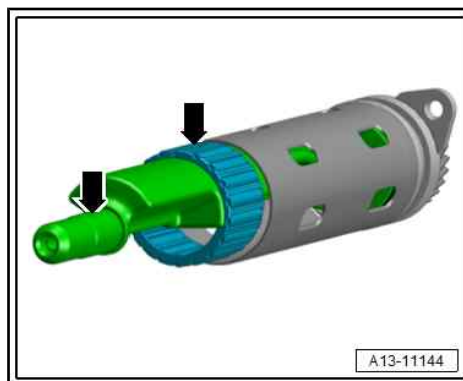


- Remove bolt -2- and pull out balance shaft (inlet side).



Installing

- Fit tube (pay attention to installation position ➤ [page 54](#)).
 - Clip on new needle bearing.
 - Lubricate bearing and running surface -arrows- of balance shaft (inlet side) with engine oil.
 - Rotate balance shaft into installation position.
 - The semi-circular bearing contact surface must face upwards for installation.
- Insert balance shaft (inlet side) and tighten bolt -2-.





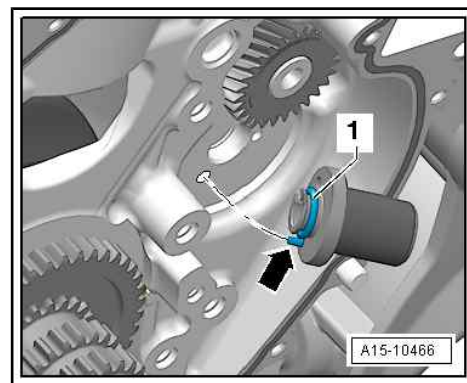
- Lubricate new O-ring -1- with engine oil.
- Lubricate bearing mounting with engine oil and insert it.
- Dowel pin -arrow- for bearing mounting must engage in bore in cylinder block.



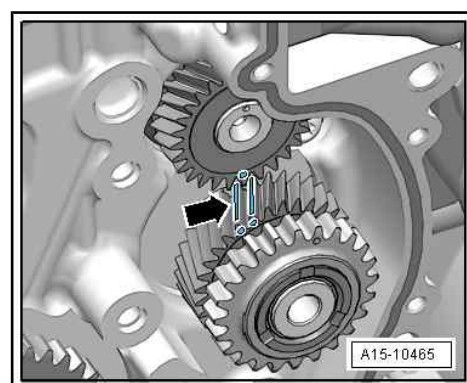
Caution

Risk of damage to engine.

- ◆ **Always renew idler gear; otherwise there will be no backlash.**
- ◆ **The new idler gear has a special lubricant coating which wears off after a short running period and thus automatically creates the specified backlash.**



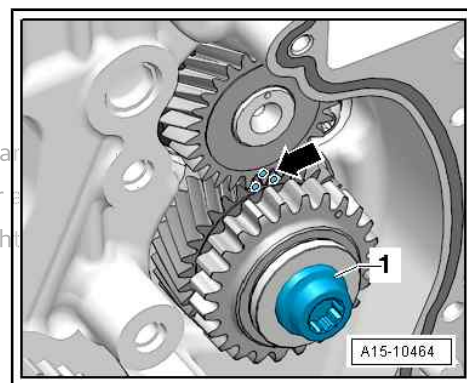
- Mark faces of gear teeth of idler gear with paint marker -arrow-.
- Insert idler gear; marking on balance shaft must be positioned between markings on faces of gear teeth.



- With gear in this position, tighten bolt -1- for idler gear: tightening sequence ➔ [page 81](#) .
- Check markings on idler gear/balance shaft -arrow-.

Remaining installation steps are carried out in reverse sequence; note the following:

- Install drive chain for balance shaft ➔ [page 97](#) .
- Renew oil seal for balance shaft (inlet side) ➔ [page 59](#) .
- Install toothed belt for coolant pump ➔ [page 177](#) .
- Install radiator ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiator/radiator fans; Removing and installing radiator .



Additional work depending on model ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Balance shaft; Removing and installing balance shaft

Tightening torques

- ◆ ➔ ["4.1 Exploded view - balance shaft", page 53](#)



4.2.2 Removing and installing balance shaft (exhaust side)



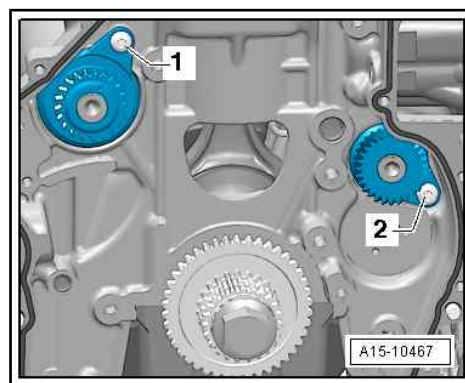
Note

- ◆ The needle bearing must be renewed when removing and installing the balance shaft.
- ◆ The needle bearing is colour-coded; a needle bearing with the same colour must be installed.

Removing

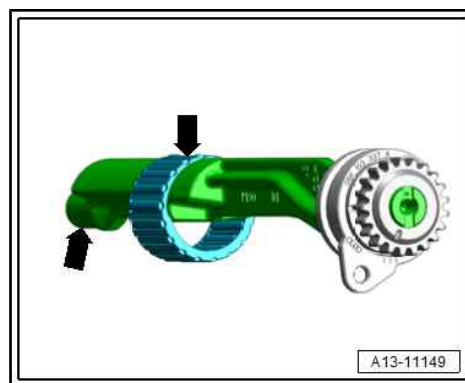
Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Balance shaft; Removing and installing balance shaft

- Remove radiator ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiator/radiator fans; Removing and installing radiator .
- Remove drive chain for balance shaft ⇒ [page 97](#) .
- Remove bolt -1- and pull out balance shaft (exhaust side).



Installing

- Check installation position of tube for balance shaft ⇒ [page 54](#) .
- Lubricate bearing and bearing race -arrows- of balance shaft (exhaust side) with engine oil.
- Rotate balance shaft into installation position.
- The semi-circular bearing contact surface must face upwards for installation.





- Insert balance shaft (exhaust side) and tighten bolt -1-.

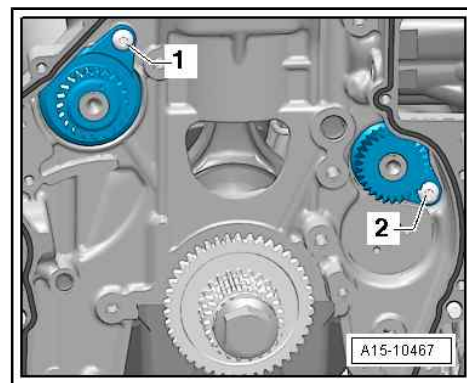
Remaining installation steps are carried out in reverse sequence; note the following:

- Install drive chain for balance shaft ➔ [page 97](#) .
- Install radiator ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiator/radiator fans; Removing and installing radiator .

Additional work depending on model ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Balance shaft; Removing and installing balance shaft

Tightening torques

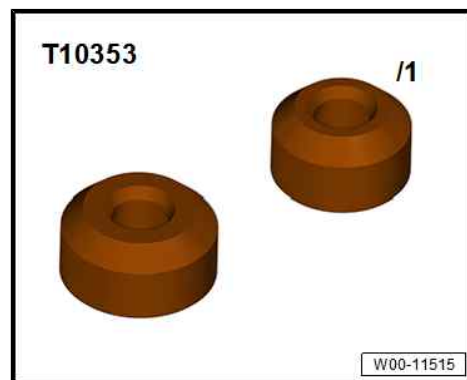
- ◆ ➔ ["4.1 Exploded view - balance shaft", page 53](#)



4.3 Renewing oil seal for balance shaft (inlet side)

Special tools and workshop equipment required

- ◆ Thrust piece - T10353/1-



Procedure

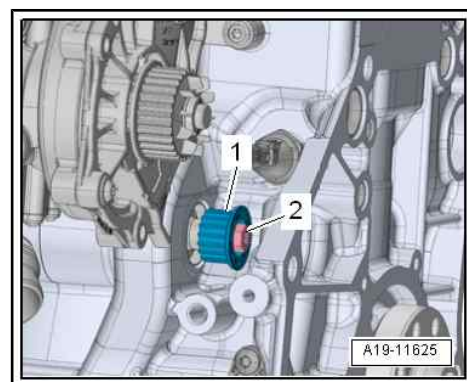
- Remove toothed belt for coolant pump ➔ [page 177](#) .



Caution

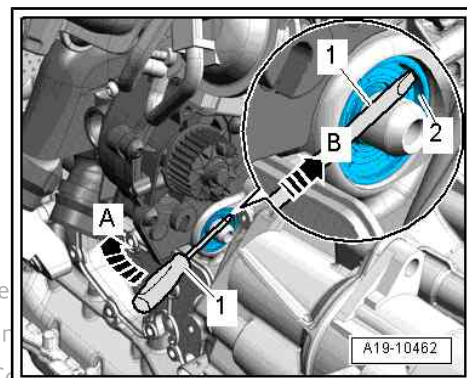
Risk of damage to thread.

- ◆ *The drive sprocket bolt has a left-hand thread.*



- Unscrew bolt -2- and detach drive sprocket -1- for toothed belt for coolant pump.

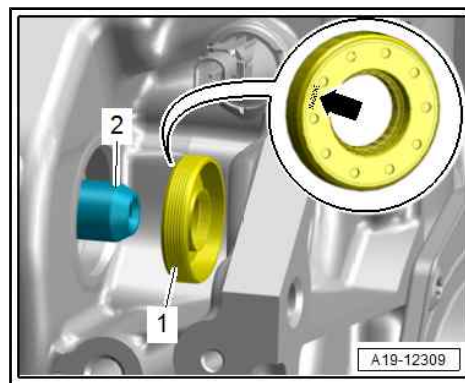
- Press screwdriver -1- firmly onto section -2- of oil seal -arrow B-.
- Lever out oil seal -arrow A-.
- Clean contact surface and sealing surface.



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- Lubricate sealing surface of balance shaft -2- with gear oil.
- Fit oil seal -1- onto balance shaft.
- Marking "Inside" -arrow- must face towards engine.

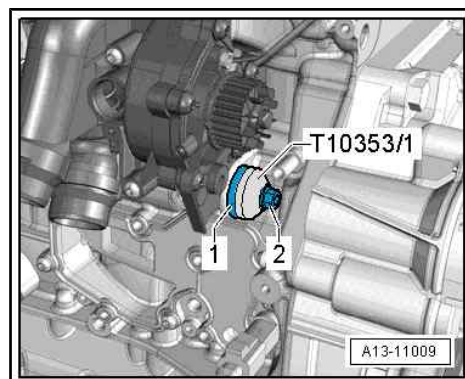


Caution

Risk of damage to thread.

- ◆ *The drive sprocket bolt has a left-hand thread.*

- Apply thrust piece - T10353/1- to oil seal -1- and carefully press into cylinder block as far as stop using bolt -2- (take care not to tilt oil seal).
- Install toothed belt for coolant pump ➔ [page 177](#) .



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5 Pistons and conrods

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⇒ ["5.1 Exploded view - pistons and conrods", page 61](#)

⇒ ["5.2 Removing and installing pistons", page 64](#)

⇒ ["5.3 Removing and installing oil spray jets", page 65](#)

⇒ ["5.4 Checking pistons and cylinder bores", page 67](#)

⇒ ["5.5 Separating parts of new conrod", page 69](#)

⇒ ["5.6 Checking radial clearance of conrod bearings", page 69](#)

5.1 Exploded view - pistons and conrods

1 - Bolts

- ☐ Renew after removing
- ☐ Lubricate thread and contact surface with engine oil
- ☐ Use old bolts when measuring radial clearance
- ☐ 45 Nm +90°

2 - Conrod bearing cap

- ☐ Note installation position
- ☐ Due to the cracking method used to separate the bearing cap from the conrod in manufacture, the caps only fit in one position and only on the appropriate conrod
- ☐ Mark cylinder and conrod allocation in colour -A-
- ☐ Installation position: Marking -B- faces towards pulley end
- ☐ Separating parts of new conrod ⇒ [page 69](#)

3 - Bearing shells

- ☐ Installation position ⇒ [page 62](#)
- ☐ Renew used bearing shells
- ☐ Lubricate with engine oil before installing
- ☐ Axial clearance

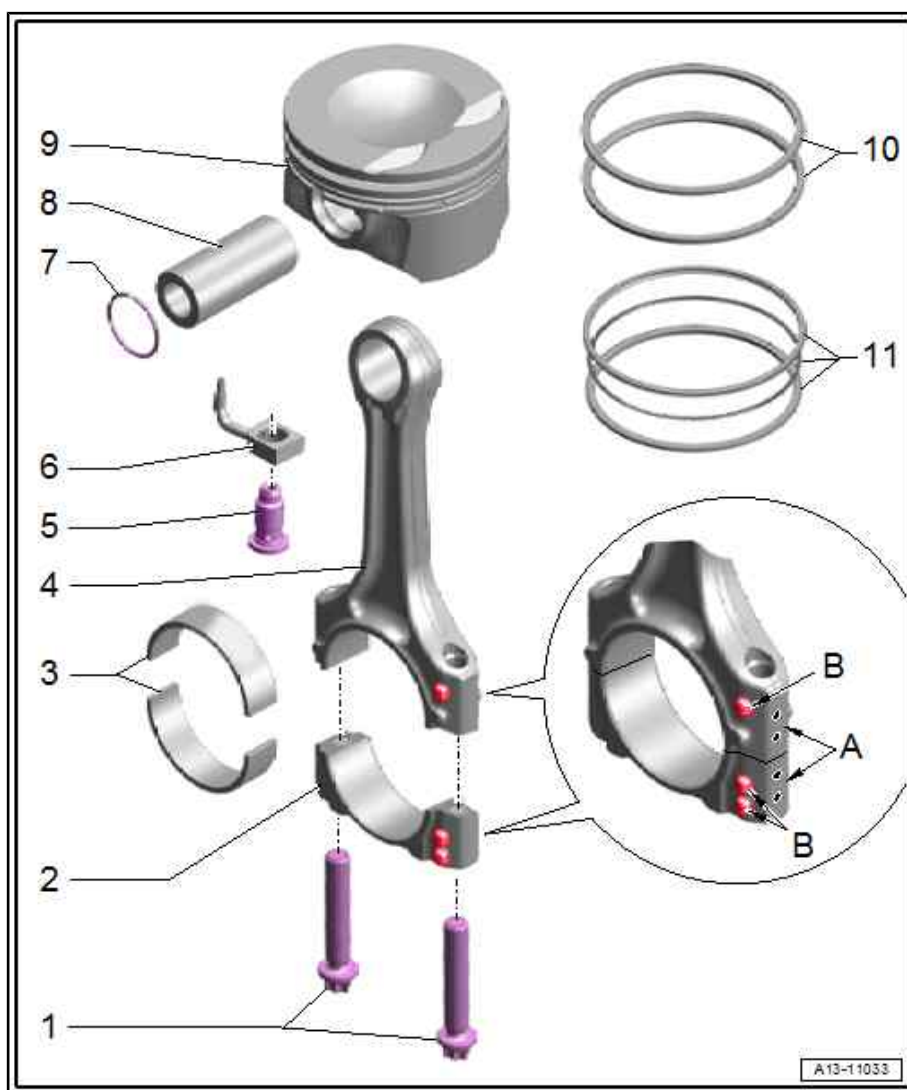
◆ New: 0.10 ... 0.35 mm

◆ Wear limit: 0.40 mm

- ☐ Measuring radial clearance ⇒ [page 69](#)

4 - Conrod

- ☐ Only renew as a complete set
- ☐ Mark cylinder and conrod bearing cap allocation





- ☐ Installation position: Marking -B- faces towards pulley end
- ☐ Separating parts of new conrod ⇒ [page 69](#)
- ☐ Measuring radial clearance ⇒ [page 69](#)

5 - Pressure relief valve

- ☐ 27 Nm

6 - Oil spray jet

- ☐ For piston cooling
- ☐ Installation position ⇒ [page 64](#)
- ☐ Removing and installing ⇒ [page 65](#)

7 - Circlip

- ☐ Renew after removing

8 - Piston pin

- ☐ Lubricate with engine oil before installing

9 - Piston

- ☐ Removing and installing ⇒ [page 64](#)
- ☐ Installation position: arrow on piston crown points to pulley end
- ☐ Mark allocation to cylinder
- ☐ Checking pistons and cylinder bores ⇒ [page 67](#)

10 - Compression rings

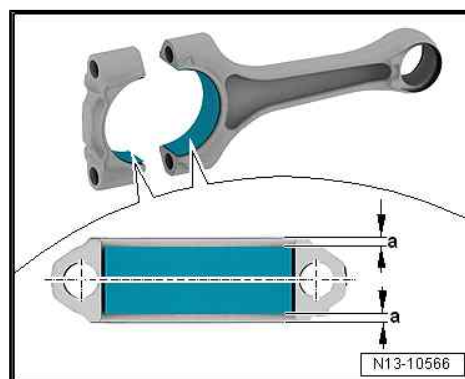
- ☐ Install using piston ring pliers VAS 211 003 ⇒ [page 63](#)
- ☐ Allocation and installation position ⇒ [page 63](#)
- ☐ Checking ring gap ⇒ [page 68](#)
- ☐ Ring-to-groove clearance cannot be checked
- ☐ Offset gaps by 120°

11 - Oil scraper ring

- ☐ Remove and install 3-part oil scraper ring carefully by hand
- ☐ When installing, offset top gap of 3-part oil scraper ring by 120° to next compression ring
- ☐ Gap cannot be measured
- ☐ Ring-to-groove clearance cannot be checked
- ☐ Installation position ⇒ [page 63](#)
- ☐ Allocation ⇒ [page 63](#)

Bearing shell - installation position

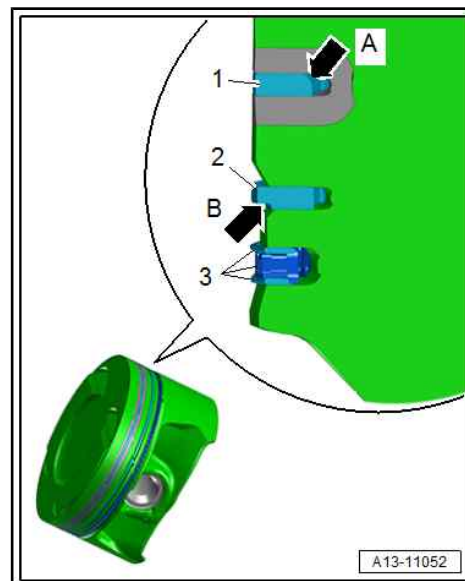
- Position bearing shells in centre of conrod and conrod bearing cap when fitting.
- Dimension -a- = dimension -a-





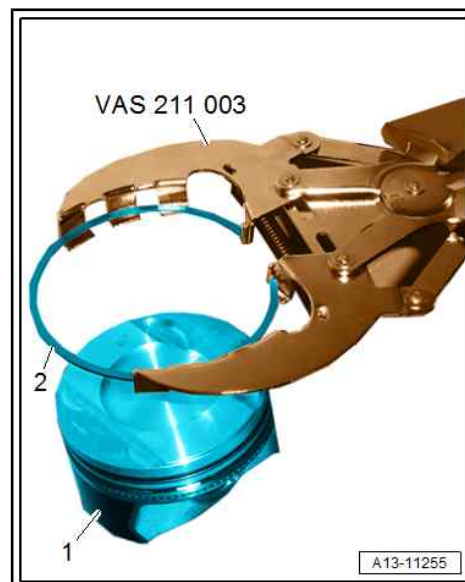
Allocation of piston rings

- 1 - Compression ring with chamfer -A- (inside, top): into upper groove. »TOP« marking or lettering faces upwards.
- 2 - Compression ring with shoulder -B- (outer side, bottom): into centre groove.
- 3 - Oil scraper ring (two or three parts, depending on version)



Installing compression rings

- »TOP« marking or lettering faces upwards.
- Open up compression ring -2- using piston ring pliers -VAS 211 003- just far enough to be able to slide it over piston -1-.

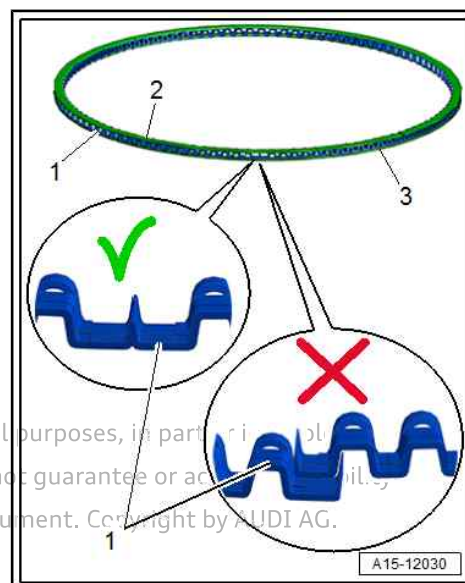


Installing oil scraper ring - version with three parts

- Note installation position of spring:
- Ends of fins -2, 3- and spring -1- must be offset from one another by at least 90°.
- Install by hand.

Installation sequence:

- 1. Insert spring -1- in groove.
- 2. Insert bottom fin -3- in groove.
- 3. Insert top fin -2- in groove.

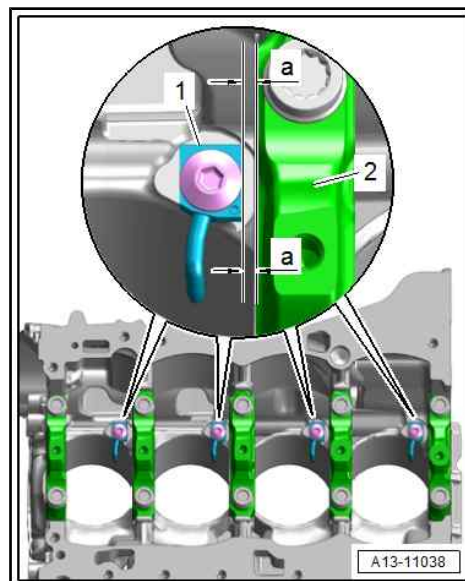


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Oil spray jets - installation position

- Side surface of oil spray jet -1- must be parallel with adjacent crankshaft bearing -2-.
- Dimension -a- = dimension -a-



5.2 Removing and installing pistons

Special tools and workshop equipment required

- ◆ Pin - VW 222A-

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- ◆ Funnel - T40347-



Removing

- Engine secured to engine and gearbox support ➔ [page 9](#) .
- Remove cylinder head ➔ [page 104](#) .
- Remove sump (top section) ➔ [page 145](#) .
- Mark installation position and matching of:
- ◆ Pistons to cylinders
- ◆ Conrods to cylinders ➔ [Item 4 \(page 61\)](#)



- Remove conrod bearing cap and pull out piston and conrod upwards.



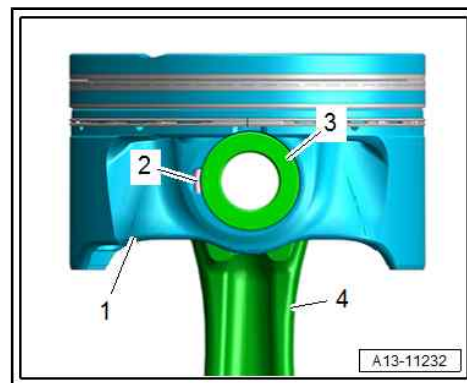
Note

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

- Take circlip -2- out of piston pin boss.
- Use drift - VW 222A- to drive out piston pin -3-.
- Detach piston -1- from conrod -4-.

Installing

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



Note

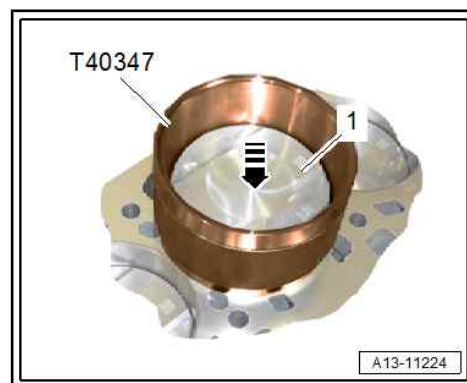
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- ◆ *After removing, renew bolts tightened with specified tightening angle.*
- ◆ *Arrow on piston crown points to pulley end.*
- ◆ *Offset top gap of 3-part oil scraper ring by 120° to next compression ring.*

- Install compression rings ➔ [page 63](#) .
- Install oil scraper ring ➔ [page 63](#) .
- Lubricate running surfaces of bearing shells and cylinder walls with engine oil.
- Carefully push piston -1- into cylinder by hand -arrow- using funnel - T40347- .
- Install conrod bearing cap; note installation position ➔ [Item 2 \(page 61\)](#) .
- Install cylinder head ➔ [page 104](#) .
- Install sump (upper section) ➔ [page 145](#) .

Tightening torques

- ◆ ➔ [“5.1 Exploded view - pistons and conrods”, page 61](#)



5.3 Removing and installing oil spray jets

Special tools and workshop equipment required

- ◆ Socket T40 - T10545-





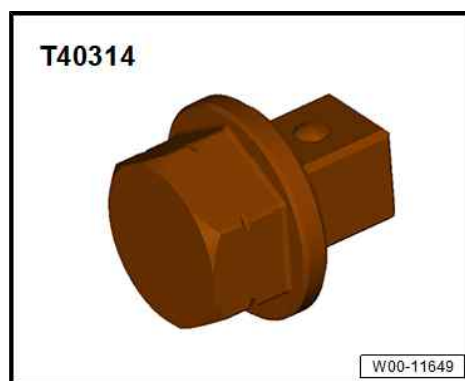
- ◆ Ratchet wrench (21 mm) - T40263-



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- ◆ Adapter - T40314-



Removing cylinders "1" to "3":

- Gearbox removed ⇒ Gearbox; Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox .
- Remove sump (top section) ⇒ [page 145](#) .



Caution

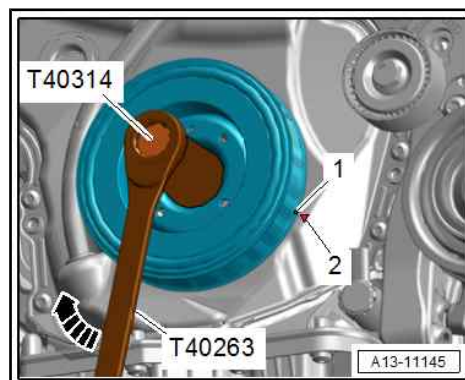
Irreparable damage can be caused if the camshaft timing chain slips.

- ◆ *Only turn crankshaft in direction of engine rotation.*

- Using ratchet wrench (21 mm) - T40263- , adapter - T40314- and socket (24 mm), turn crankshaft -arrow- until corresponding bolt is accessible.

Removing cylinder 4:

- Engine removed and secured to engine and gearbox support ⇒ [page 9](#)
- Remove sump (top section) ⇒ [page 145](#) .
- Remove balance shaft timing chain ⇒ [page 85](#) .
- Unbolt conrod bearing caps.
- Remove crankshaft bearing caps.
- Remove crankshaft.





Continued for all cylinders:

- Unscrew pressure relief valve -1- using socket - T10545- .
- Remove oil spray jet -2-.

Installing

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

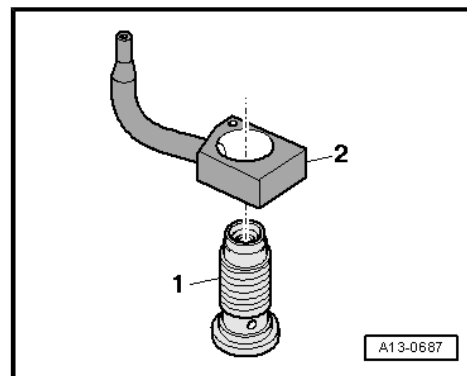
- Installation position ⇒ [page 64](#)



Caution

Risk of damage to oil spray jets.

- ◆ **Do not bend oil spray jets.**
- ◆ **Check that oil spray jets have adequate clearance after re-installing pistons.**
- ◆ **Always renew bent oil spray jets.**



- Install balance shaft timing chain ⇒ [page 85](#) .
- Install sump (upper section) ⇒ [page 145](#) .

Tightening torques

◆ ⇒ ["5.1 Exploded view - pistons and conrods", page 61](#)

◆ ⇒ ["3.1 Exploded view - crankshaft", page 47](#)

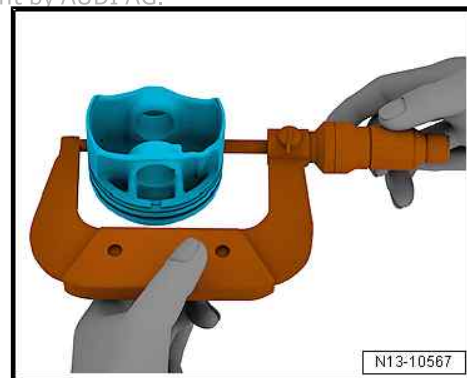
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5.4 Checking pistons and cylinder bores

Checking piston

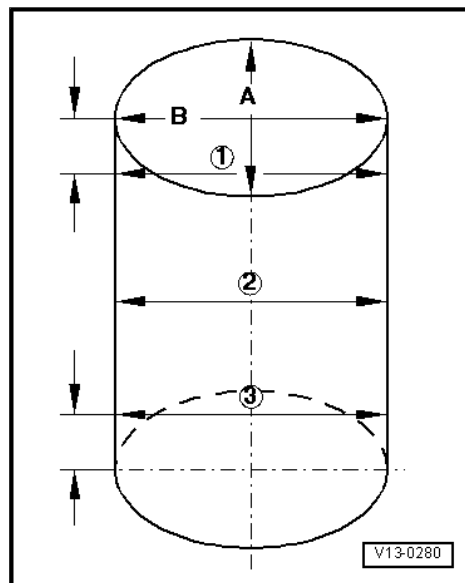
- Using a micrometer (75 ... 100 mm), measure approx. 15 mm from the lower edge, perpendicular to the piston pin axis.
- ◆ Maximum deviation from nominal dimension: 0.04 mm.

Piston Ø mm	
Nominal dimension	82.420 ¹⁾
• ¹⁾ Dimensions not including coating (thickness 0.02 mm). The coating will wear down in service.	





Checking cylinder bore



Special tools and workshop equipment required

- ♦ Cylinder gauge - VAS 6078-



Note

Do not measure the cylinder bores when the cylinder block is mounted to the engine and gearbox support, as this may result in incorrect measurements.



Caution

Machining (reboring, honing, grinding) cylinder bore with workshop equipment is not permitted. The surface of the cylinder bore is damaged by machining.

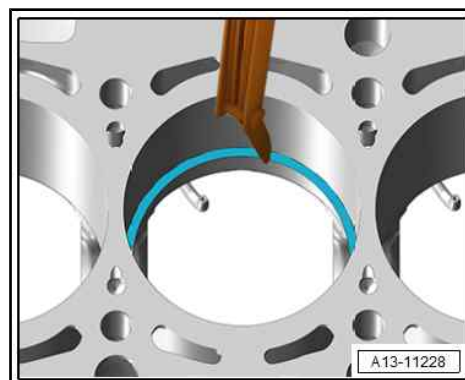
- Use cylinder gauge - VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction -B-.
- ♦ Maximum deviation from nominal dimension: 0.08 mm.

Cylinder bore Ø mm	
Nominal dimension	82.51 ¹⁾
• ¹⁾ Measure at 50 mm into cylinder bore.	

Checking piston ring gap

- Insert piston ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder. Use a piston without rings to push ring into bore.

Piston ring	new mm	Wear limit mm
1st compression ring	0.30 ... 0.40	0.60
2nd compression ring	0.40 ... 0.50	0.70
Oil scraper rings	Cannot be measured	





5.5 Separating parts of new conrod

It is possible that the two parts of a new conrod are not completely separated as intended. If it is not possible to take off the conrod bearing cap by hand, proceed as follows:

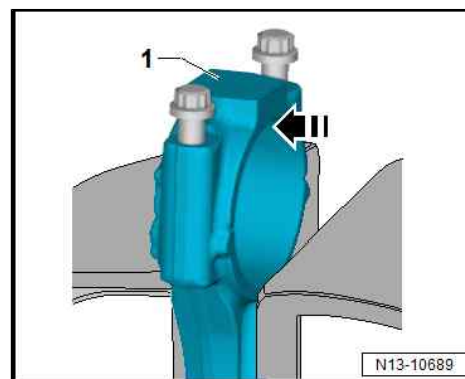
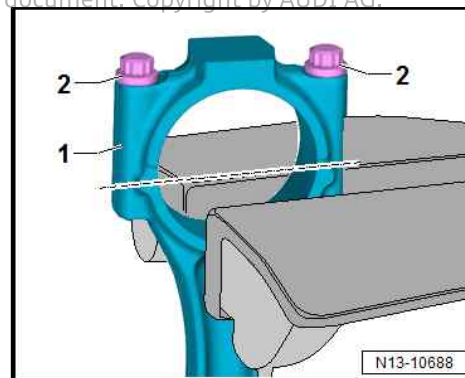
- Mark cylinder number of conrod ➔ [Item 4 \(page 61\)](#).
- Clamp conrod -1- in a vice below the dotted line using aluminium jaw covers.



Note

To avoid any risk of damage, the conrod should only be clamped lightly.

- Loosen the two bolts -2- approx. 5 turns.
- Using a plastic hammer, carefully knock conrod bearing cap -1- loose in direction of -arrow-.



5.6 Checking radial clearance of conrod bearings

Special tools and workshop equipment required

- ◆ Plastigauge

Procedure

- Remove conrod bearing cap.
- Clean bearing cap and bearing journal.
- Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.
- Fit conrod bearing cap and secure with old bolts ➔ [Item 1 \(page 61\)](#) without rotating crankshaft.
- Remove conrod bearing cap again.
- Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.02 ... 0.06 mm.
- Wear limit: 0.09 mm.
- When carrying out final assembly, renew bolts.



15 – Cylinder head, valve gear

1 Timing chain cover

⇒ [“1.1 Exploded view - timing chain cover”, page 70](#)

⇒ [“1.2 Removing and installing timing chain cover”, page 72](#)

⇒ [“1.3 Renewing oil seal for vibration damper”, page 75](#)

1.1 Exploded view - timing chain cover

1 - O-ring

- ☐ Renew after removing
- ☐ Lubricate with engine oil

2 - Dipstick guide tube

3 - Bolt

- ☐ 9 Nm

4 - Coolant pipe (left-side)

- ☐ Removing and installing
⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19
- ☐ Coolant pipes; Removing and installing coolant pipes

5 - Bolt

- ☐ Tightening torques and sequence ⇒ [page 71](#)

6 - Bolt

- ☐ 9 Nm

7 - Camshaft control valve 1 - N205-

- ☐ Removing and installing
⇒ [page 127](#)

8 - Bolt

- ☐ 9 Nm

9 - Exhaust camshaft control valve 1 - N318-

- ☐ Removing and installing
⇒ [page 127](#)

10 - Seals

- ☐ Renew after removing
- ☐ Installation position: side with small inner diameter faces outwards
- ☐ To renew, remove timing chain cover (top) ⇒ [Item 13 \(page 70\)](#)
- ☐ Lubricate with engine oil

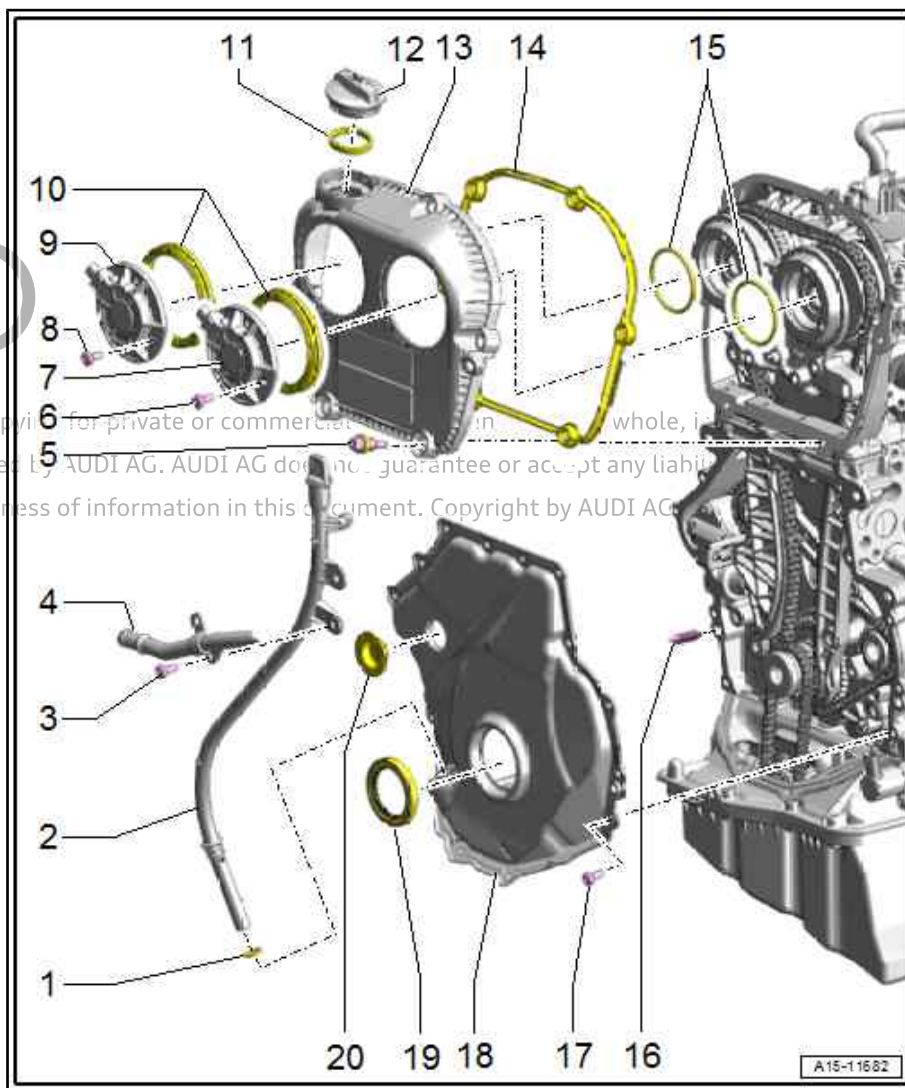
11 - Seal

- ☐ Renew if damaged or leaking

12 - Filler cap

13 - Timing chain cover (top)

- ☐ Removing and installing ⇒ [page 72](#)





14 - Gasket

- ☐ Renew if damaged

15 - O-rings

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

16 - Dowel pin

- ☐ 2x
- ☐ For timing chain cover (bottom)

17 - Bolt

- ☐ Renew after removing
- ☐ Tightening torques and sequence ⇒ [page 71](#)

18 - Timing chain cover (bottom)

- ☐ With oil seal
- ☐ Renew after removing
- ☐ Removing and installing ⇒ [page 73](#)

19 - Oil seal

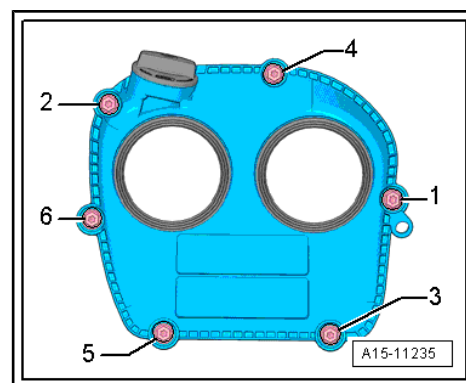
- ☐ For vibration damper
- ☐ Renewing ⇒ [page 75](#)

20 - Sealing plug

- ☐ Renew after removing

Timing chain cover (top) - tightening torques and tightening sequence

- Tighten bolts -1 ... 6- to 9 Nm in the sequence shown.



Timing chain cover (bottom) - tightening torques and tightening sequence

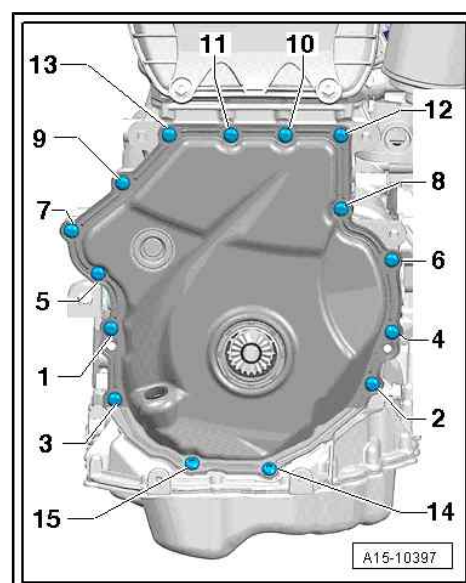


Note

After removing, renew bolts tightened with specified tightening angle.

- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 ... 15-	Screw in by hand until contact is made
2.	-1 ... 15-	8 Nm
3.	-1, 2, 4, 5- and -7 ... 15-	Turn 45° further
4.	-3, 6-	Turn 45° further after installing vibration damper





1.2 Removing and installing timing chain cover

⇒ [“1.2.1 Removing and installing timing chain cover \(top\)”, page 72](#)

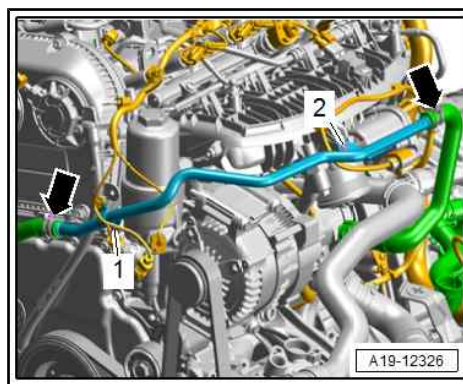
⇒ [“1.2.2 Renewing timing chain cover \(bottom\)”, page 73](#)

1.2.1 Removing and installing timing chain cover (top)

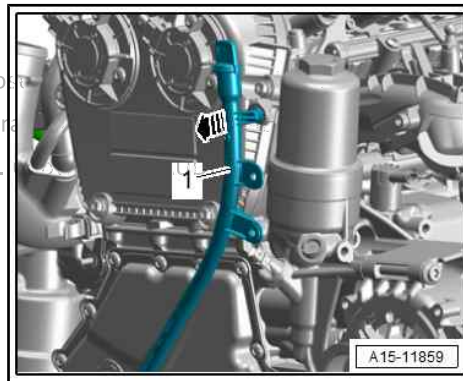
Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Timing chain cover; Removing and installing timing chain cover .

- Remove camshaft control valves ⇒ [page 127](#) .
- Move electrical wiring clear.
- Remove bolts -1 and 2- and press coolant pipe (left-side) to the side.



- If necessary, unclip guide tube -1- for oil dipstick from timing chain cover (top) -arrow- and pull it out of timing chain cover (bottom).



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- Unscrew bolts -1 ... 6- and remove timing chain cover (top).

Installing

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



Note

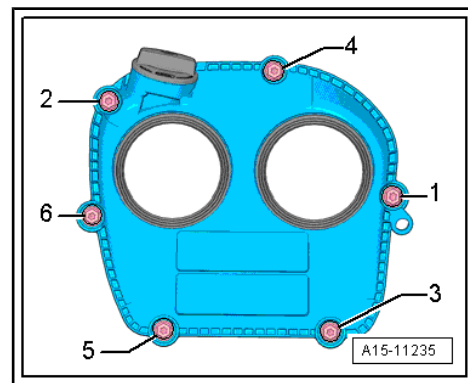
Renew seals and O-rings after removing.

- Lubricate seals and O-rings with engine oil.
- Installation position of seals: side with small inner diameter faces outwards
- Install camshaft control valves ➤ [page 127](#) .

Additional work depending on model ➤ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Timing chain cover;
Removing and installing timing chain cover

Tightening torques

- ◆ ➤ Fig. “Timing chain cover (top) - tightening torques and tightening sequence”, [page 71](#)
- ◆ ➤ “1.1 Exploded view - timing chain cover”, [page 70](#)
- ◆ ➤ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes



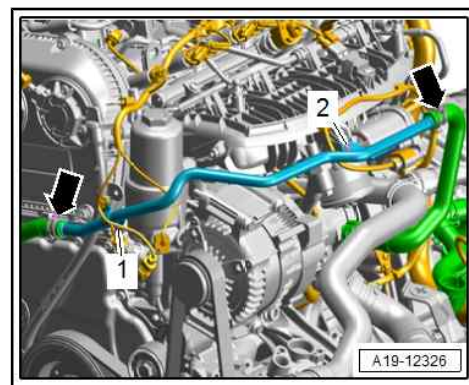
1.2.2 Renewing timing chain cover (bottom)

Special tools and workshop equipment required

- ◆ Sealant ➤ Electronic parts catalogue

Removing

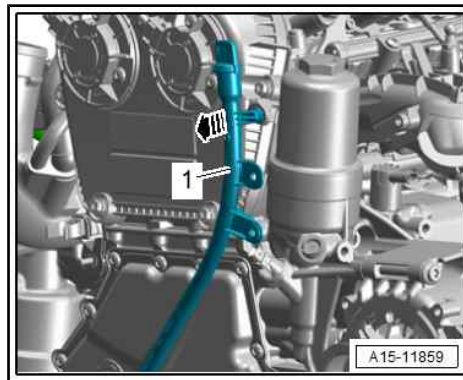
- Engine oil drained ➤ [page 142](#) .
- Remove engine cover panel ➤ [page 12](#) .
- Move electrical wiring clear.
- Remove bolts -1 and 2- and press coolant pipe (left-side) to the side.



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- If necessary, unclip guide tube -1- for oil dipstick from timing chain cover (top) -arrow-.
- Pull guide tube for oil dipstick out of timing chain cover (bottom).
- Remove tensioner for poly V-belt ➔ [page 20](#) .
- Remove vibration damper ➔ [page 21](#) .



- Remove bolts -1 ... 15-.
- Prise off timing chain cover (bottom).

Installing



Note

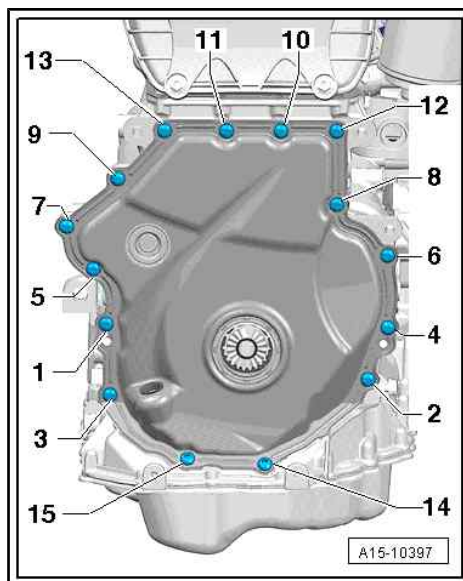
- ◆ After removing, renew bolts tightened with specified tightening angle.
- ◆ Renew timing chain cover (bottom) and seal after removal.



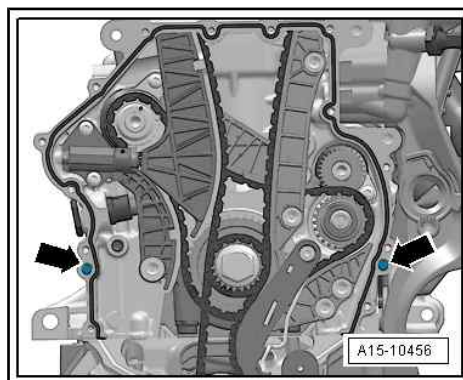
Caution

Protect lubrication system against contamination.

- ◆ Cover exposed parts of the engine.



- Remove sealant remaining on cylinder block with flat scraper.
- Clean sealing surfaces; they must be free of oil and grease.
- Check that both dowel pins -arrows- for centring cover are fitted.



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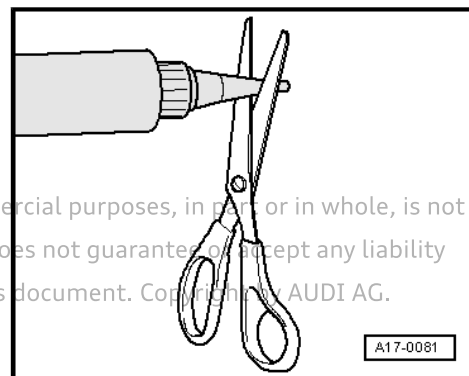
Note

Note expiry date of sealant.

- Cut off nozzle of tube at front marking (nozzle Ø approx. 3 mm).



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Caution

Make sure lubrication system is not clogged by excess sealant.

- ◆ ***The sealant bead must not be thicker than specified.***

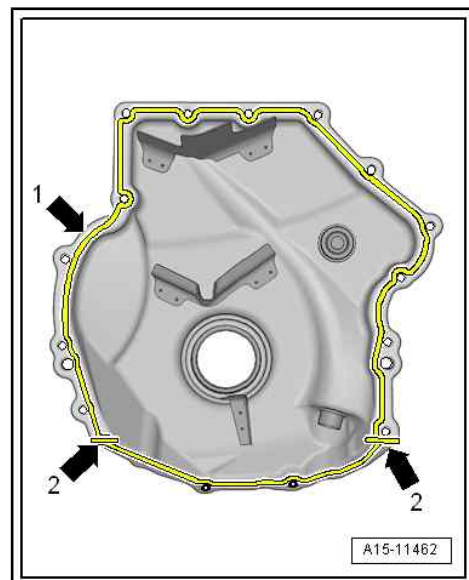
- Apply sealant onto clean sealing surface -arrow 1- and onto edges -arrows 2- of new cover.
- Thickness of sealant bead: 2 ... 3 mm



Note

The cover must be installed within 5 minutes after applying sealant.

- Immediately fit cover and tighten bolts.



Note

After fitting cover, the sealant must dry for approx. 30 minutes. Then (and only then) fill the engine with engine oil.

- Install vibration damper ⇒ [page 21](#) .
- Install poly V-belt tensioner ⇒ [page 20](#) .
- Top up engine oil and check oil level ⇒ [page 142](#) .
- Install engine cover panel ⇒ [page 12](#) .

Tightening torques

- ◆ ⇒ [Fig. “Timing chain cover \(bottom\) - tightening torques and tightening sequence”](#), [page 71](#)
- ◆ ⇒ [“1.1 Exploded view - timing chain cover”](#), [page 70](#)
- ◆ ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes

1.3 Renewing oil seal for vibration damper

Special tools and workshop equipment required



◆ Thrust piece - T10354-



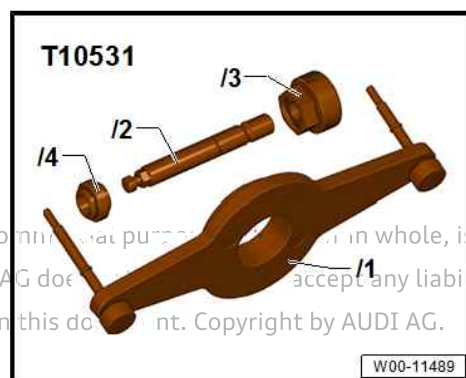
◆ Thrust washer - T10375-



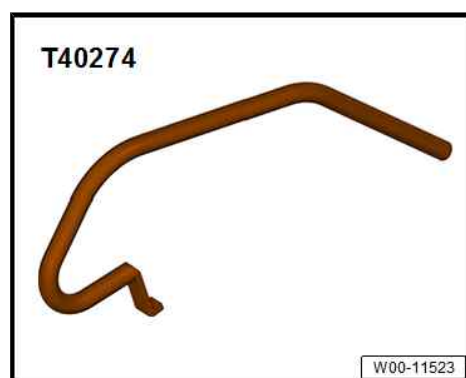
◆ Flange nut - 10531/4- from assembly tool - T10531-



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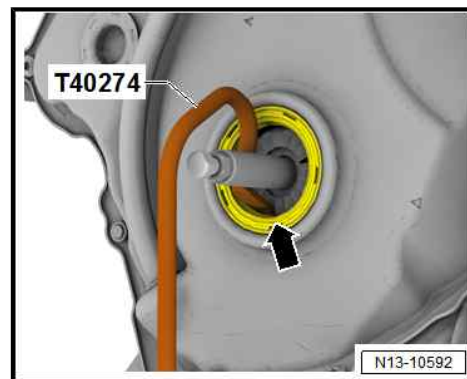
◆ Extractor hook - T40274-



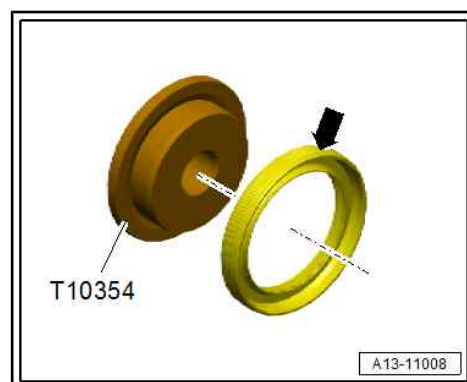


Removing

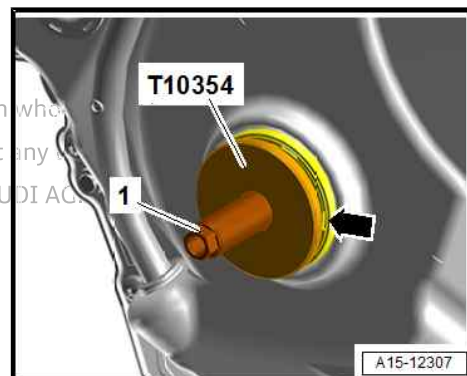
- Remove vibration damper ➤ [page 21](#) .
- Pry out oil seal -arrow- using extractor hook - T40274- .
- Clean contact surface and sealing surface.



- Fit oil seal -arrow- onto thrust piece - T10354- .
- Closed side of oil seal faces thrust piece - T10354- .



- Vehicles with alternator: Slide oil seal -arrow- with thrust piece - T10354- onto clamping pin - T10531/2- -item 1- and position it on timing chain cover (bottom).



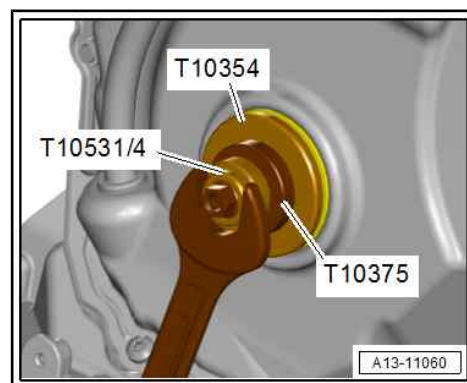
- Vehicles with starter-alternator: Slide oil seal -arrow- with thrust piece - T10354- onto clamping pin - T10531/6- -item 1- and position it on timing chain cover (bottom).

- Also fit thrust pad - T10375- and tighten flange nut - 10531/4- .
- Drive oil seal in as far as stop using thrust piece - T10354- .

Installing

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

- Install vibration damper ➤ [page 21](#) .





2 Chain drive

⇒ [“2.1 Exploded view - camshaft timing chains”, page 78](#)

⇒ [“2.2 Exploded view - drive chain for balance shaft”, page 80](#)

⇒ [“2.3 Removing and installing bearing saddle”, page 81](#)

⇒ [“2.4 Removing and installing camshaft timing chain”, page 85](#)

⇒ [“2.5 Checking chain elongation”, page 96](#)

⇒ [“2.6 Removing and installing drive chain for balance shaft”, page 97](#)

2.1 Exploded view - camshaft timing chains



Note

If work has been carried out on the chain drive, perform the adaptations listed in Guided Function “01 - Functions, engine mechanics” ⇒ Vehicle diagnostic tester.

1 - Chain tensioner

- ☐ Exerts spring pressure
- ☐ Before removing, lock in place using locking tool - T40267-

2 - Bolt

- ☐ Renew after removing
- ☐ For aluminium bolts: 4 Nm + 90°
- ☐ For steel bolts: 9 Nm

3 - Guide pin

- ☐ 20 Nm

4 - Bolt

- ☐ Renew after removing
- ☐ Tightening sequence ⇒ [page 79](#)

5 - Clamping sleeve

- ☐ Not fitted on all bearing saddle versions

6 - Timing valve

- ☐ Left-hand thread
- ☐ 35 Nm

7 - Timing valve

- ☐ Left-hand thread
- ☐ 35 Nm

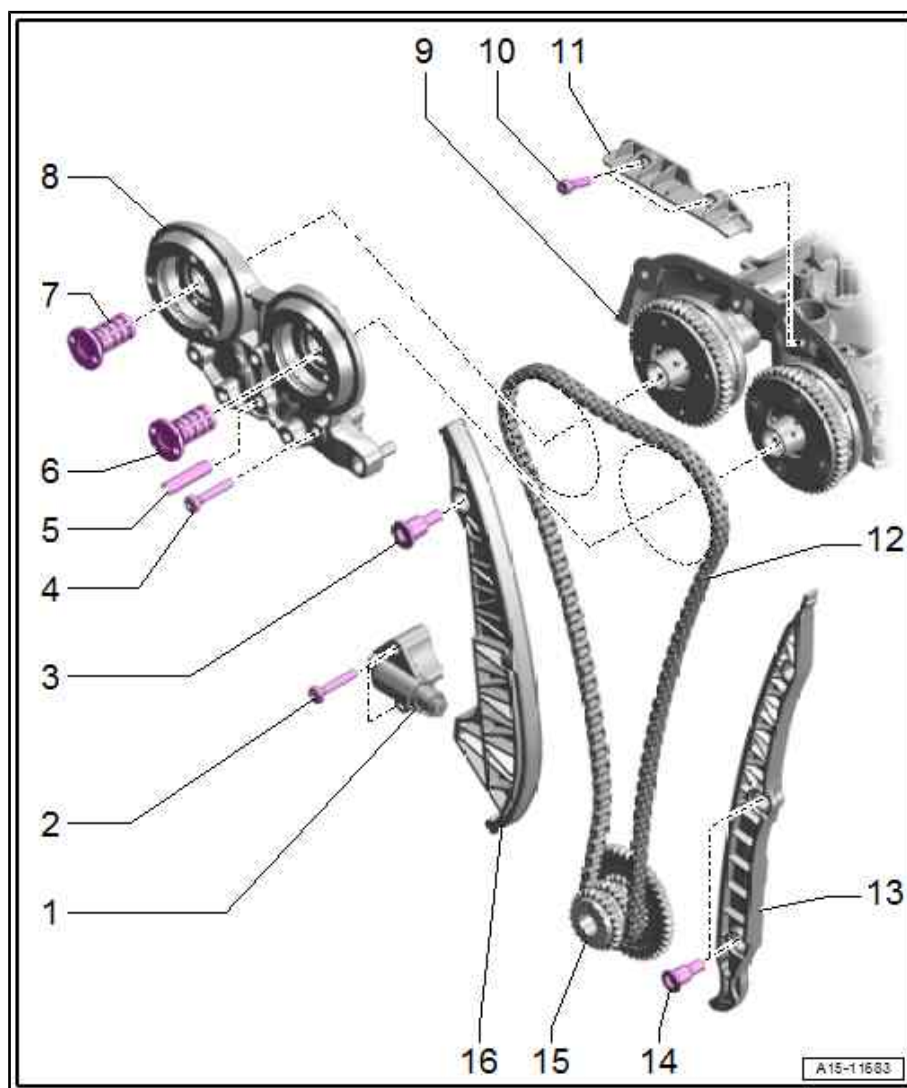
8 - Bearing saddle

- ☐ Removing and installing ⇒ [page 81](#)

9 - Cylinder head cover

10 - Bolt

- ☐ 9 Nm



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11 - Guide rail

- ☐ For camshaft timing chain

12 - Camshaft timing chain

- ☐ Mark direction of rotation for re-installation with a paint marker
- ☐ Removing and installing ⇒ [page 85](#)
- ☐ After carrying out work on chain drive, perform adaptations listed in Guided Function "01 - Functions, engine mechanics" ⇒ Vehicle diagnostic tester

13 - Guide rail

- ☐ For camshaft timing chain

14 - Guide pin

- ☐ 20 Nm

15 - Three-part chain sprocket assembly

- ☐ Installation position ⇒ [page 79](#)

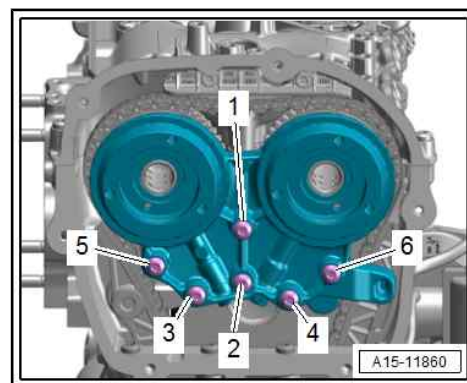
16 - Tensioning rail

- ☐ For camshaft timing chain

Bearing saddle - tightening torques and sequence

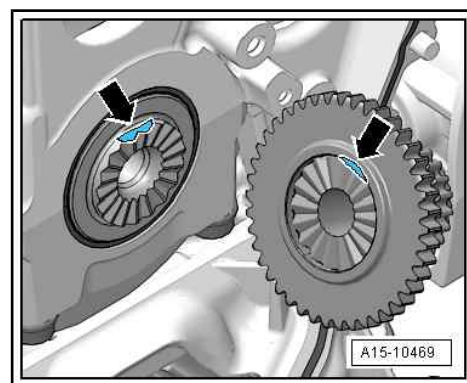
– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1 ... 6-	Screw in by hand until contact is made
2.	-1 ... 6-	9 Nm



Three-part chain sprocket assembly - installation position

- The two sections -arrows- must be aligned.



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2.2 Exploded view - drive chain for balance shaft

1 - Three-part chain sprocket assembly

- ❑ Installation position
⇒ [page 79](#)

2 - Guide pin

- ❑ 20 Nm

3 - Tensioning rail

- ❑ For drive chain for balance shaft

4 - Drive chain for balance shafts

- ❑ Removing and installing
⇒ [page 97](#)

5 - Guide pin

- ❑ 20 Nm

6 - Balance shaft (exhaust side)

- ❑ Exploded view
⇒ [page 53](#)

7 - Chain tensioner

- ❑ Use sealant when installing ⇒ Electronic parts catalogue
- ❑ 85 Nm

8 - Seal

- ❑ Renew after removing

9 - Cylinder block

10 - Balance shaft (inlet side)

- ❑ Exploded view
⇒ [page 53](#)

11 - O-ring

- ❑ Lubricate with engine oil

12 - Bearing mounting

- ❑ Lubricate with engine oil
- ❑ Installation position ⇒ [page 81](#)

13 - Idler gear

- ❑ If bolt ⇒ [Item 15 \(page 80\)](#) has been loosened, idler gear must be renewed

14 - Thrust washer

15 - Bolt

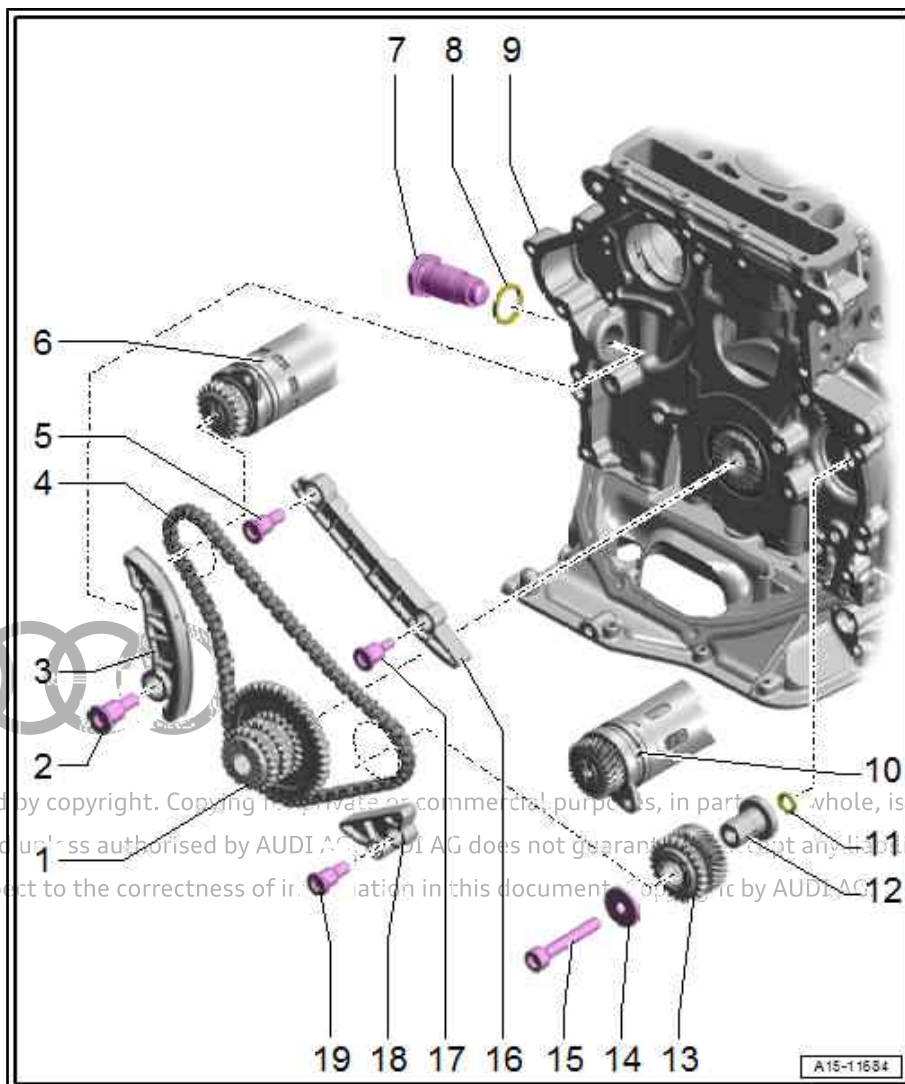
- ❑ Renew after removing
- ❑ If bolt has been loosened, idler gear ⇒ [Item 13 \(page 80\)](#) must be renewed
- ❑ Tightening torques and sequence ⇒ [page 81](#)

16 - Guide rail

- ❑ For drive chain for balance shaft

17 - Guide pin

- ❑ 20 Nm





18 - Guide rail

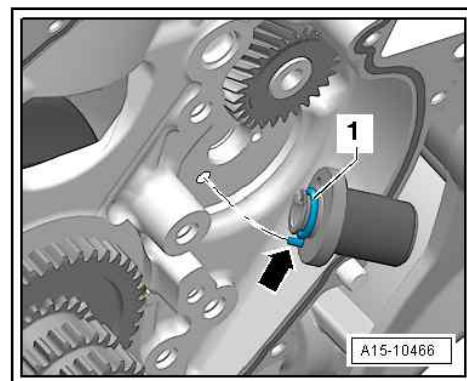
- ☐ For balance shaft timing chain

19 - Guide pin

- ☐ 12 Nm

Bearing mounting - installation position

- Lubricate new O-ring -1- with engine oil prior to installation.
- Dowel pin -arrow- for bearing mounting must engage in bore in cylinder block.
- Lubricate bearing mounting with engine oil.



Idler gear - tightening torques and sequence

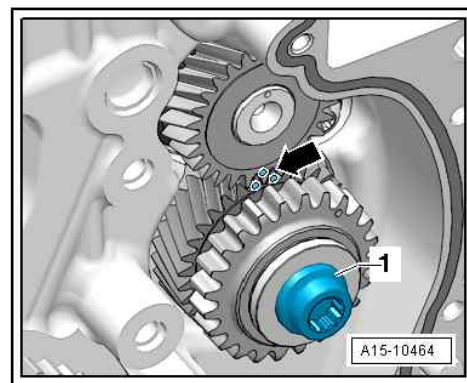


Note

After removing, renew bolts tightened with specified tightening angle.

- Tighten bolt in stages:

Stage	Tightening torques/angle specification
1.	10 Nm
2.	- Turn idler gear • Idler gear must be without play; otherwise loosen bolt and tighten again
3.	25 Nm
4.	Turn 90° further



2.3 Removing and installing bearing saddle

Special tools and workshop equipment required

- ◆ Assembly tool - T10352B-

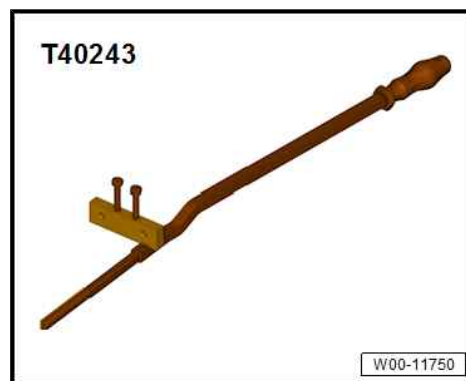


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◆ Assembly lever - T40243-



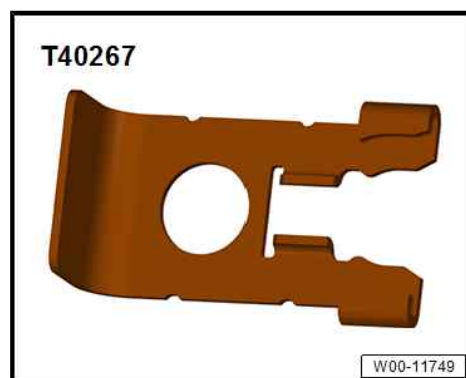
◆ Ratchet wrench (21 mm) - T40263-



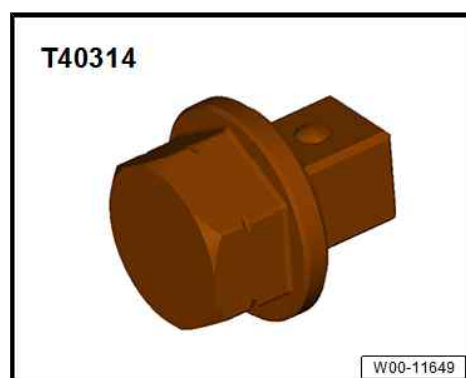
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◆ Locking tool - T40267-



◆ Adapter - T40314-



Removing

- Remove timing chain cover (top) ⇒ [page 72](#) .



Caution

Risk of damage to thread.

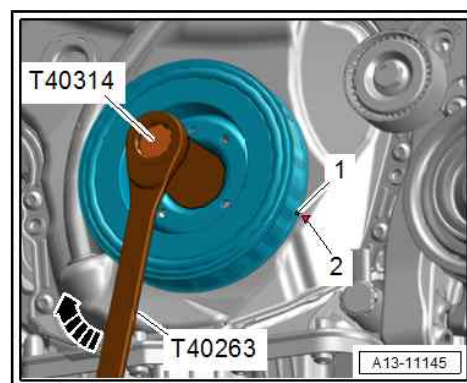
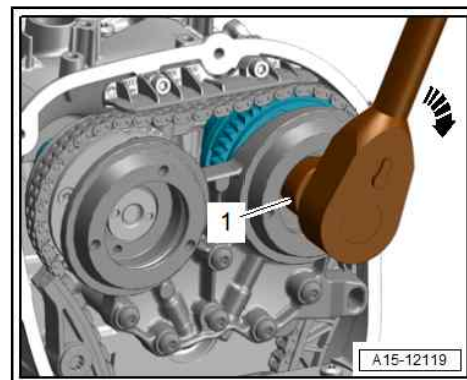
◆ *The timing valves have a left-hand thread.*

- Turn assembly tool -1- in direction of -arrow- to remove timing valve (left and right).

Depending on version of timing valve, use one of the following tools:

- ◆ Assembly tool - T10352-
- ◆ Assembly tool - T10352/1-
- ◆ Assembly tool - T10352/2-
- ◆ Assembly tool - T10352/3-
- ◆ Assembly tool - T10352/4-

- When doing so, counterhold vibration damper with ratchet wrench (21 mm) - T40263- , adapter - T40314- and socket (24 mm).



- Remove bolts -1 ... 6-.

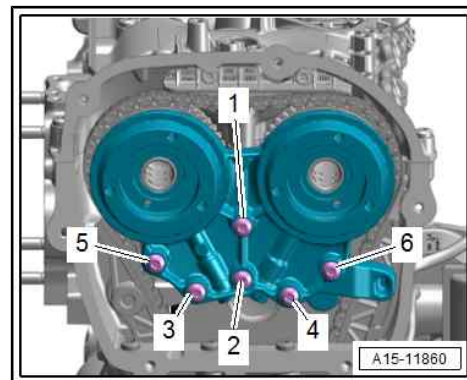


WARNING

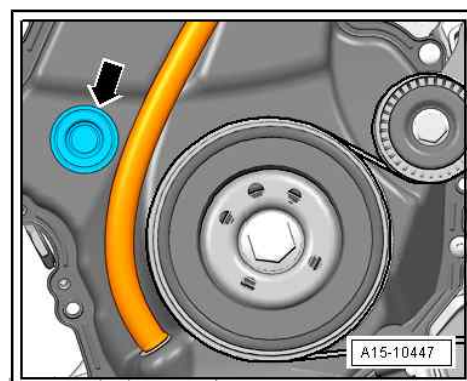
Risk of damage to bearing saddle.

◆ *Detach bearing saddle carefully without tilting it.*

- Detach bearing saddle.



- Remove sealing plug -arrow-.

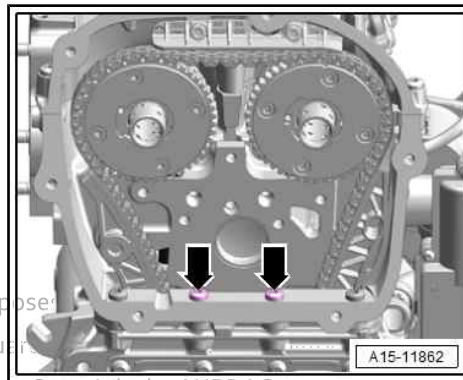




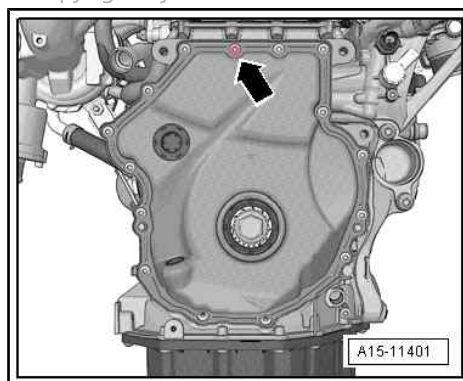
- Remove bolts -arrows-.



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- Remove bolt -arrow-.



- Bolt assembly lever - T40243- onto cylinder head -bottom arrows-.



Note

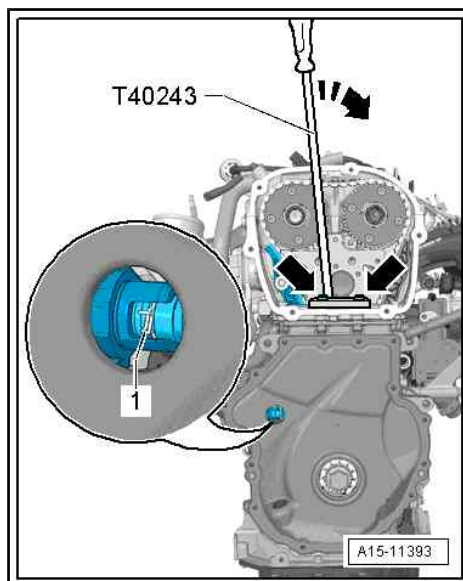
A second mechanic is required for the following steps.

- Compress and hold circlip -1- for chain tensioner.
- Push assembly lever - T40243- slowly in direction of -arrow- and hold in place.
- This will press the chain tensioner back.

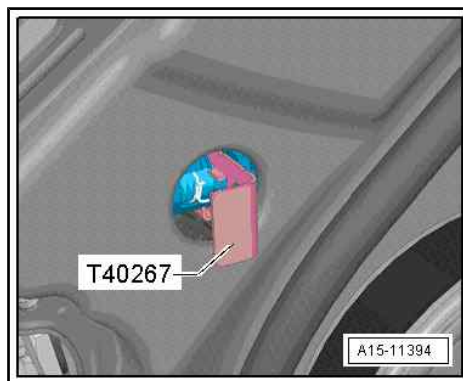


Note

The chain tensioner is oil-damped and can therefore only be pressed back slowly by applying constant pressure.



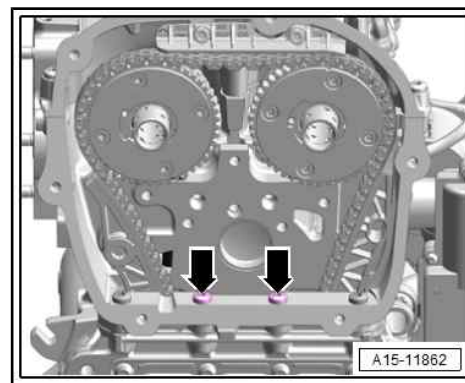
- Lock chain tensioner with locking tool - T40267- .
- Remove assembly lever - T40243- .



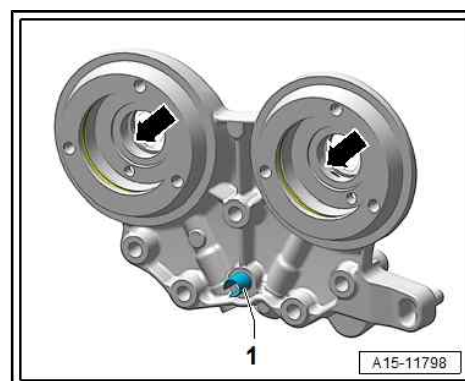


Installing

- Fit and tighten bolts -arrows-. Tightening torque
 ⇒ [Item 4 \(page 101\)](#)



- Lubricate holes -arrows- with engine oil.
- Check whether spring pin -1- is fitted.

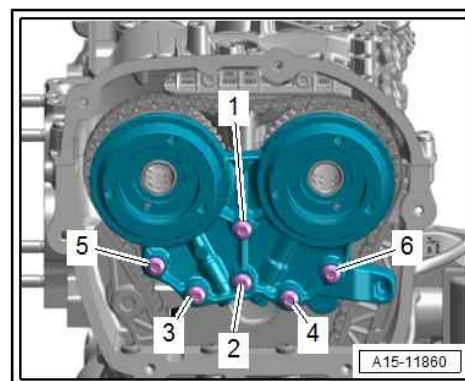


WARNING

Risk of damage to bearing saddle.

- ◆ *Carefully attach bearing saddle without tilting it.*

- Fit bearing saddle and screw in bolts -1 ... 6- by hand until they make contact.
- Remove locking tool - T40267- .
- Tighten bolts for bearing saddle ⇒ [page 79](#) .



Remaining installation steps are carried out in reverse sequence; note the following:

- Install timing chain cover (top) ⇒ [page 72](#) .
- ◆ ⇒ [Fig. ““Bearing saddle - tightening torques and sequence””, page 79](#)
- ◆ ⇒ [“2.1 Exploded view - camshaft timing chains”, page 78](#)
- ◆ ⇒ [“3.1 Exploded view - cylinder head”, page 101](#)

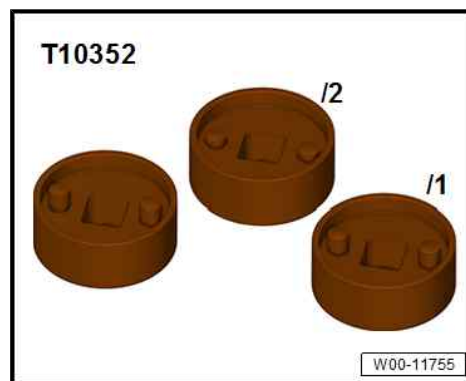
2.4 Removing and installing camshaft timing chain

Special tools and workshop equipment required

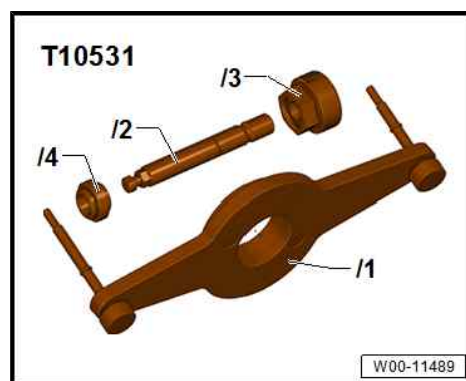
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◆ Assembly tool - T10352B-



◆ Assembly tool - T10531-



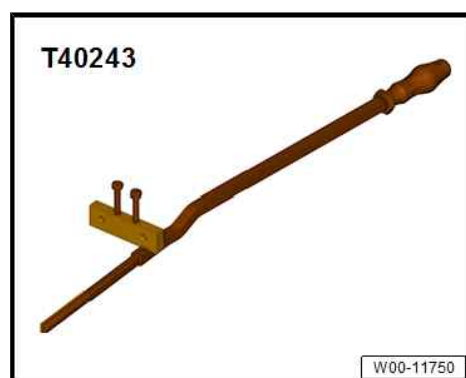
◆ Locking pin - T40011-



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◆ Assembly lever - T40243-





- ◆ Ratchet wrench (21 mm) - T40263-



- ◆ Assembly tool - T40266-



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- ◆ Assembly tool - T10567-



- ◆ Locking tool - T40267-

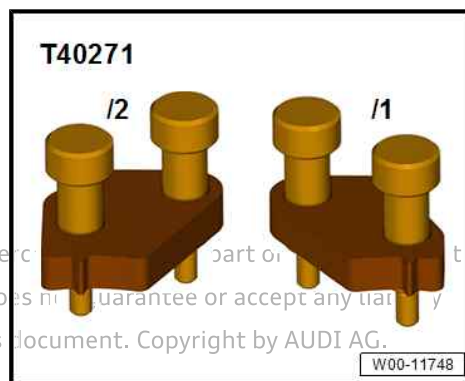




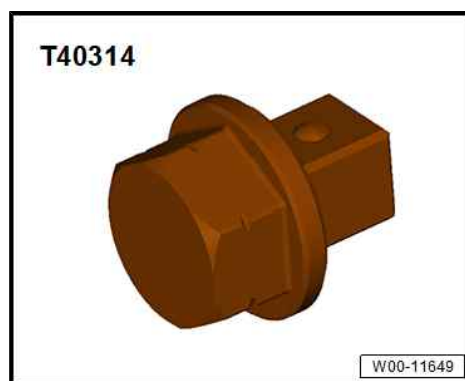
◆ Camshaft clamp - T40271-



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◆ Adapter - T40314-



Removing

- Remove timing chain cover (top) ➤ [page 72](#) .



Caution

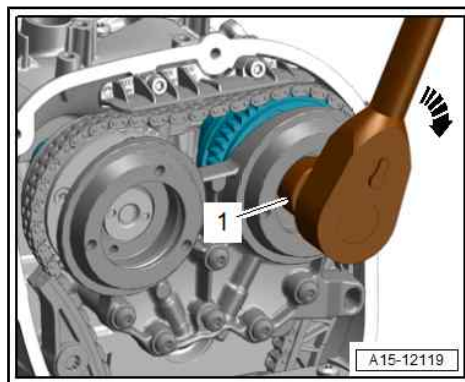
Risk of damage to thread.

- ◆ ***The timing valves have a left-hand thread.***

- Turn assembly tool -1- in direction of -arrow- to remove timing valve (left and right).

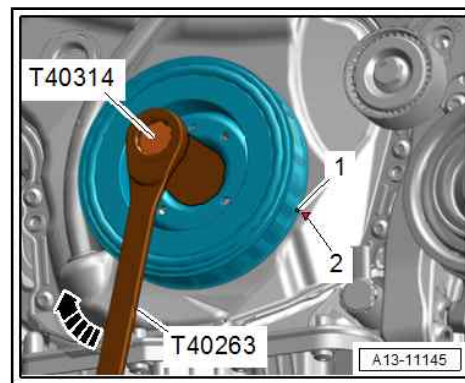
Depending on version of timing valve, use one of the following tools:

- ◆ Assembly tool - T10352-
- ◆ Assembly tool - T10352/1-
- ◆ Assembly tool - T10352/2-
- ◆ Assembly tool - T10352/3-
- ◆ Assembly tool - T10352/4-





- When doing so, counterhold vibration damper with ratchet wrench (21 mm) - T40263- , adapter - T40314- and socket (24 mm).



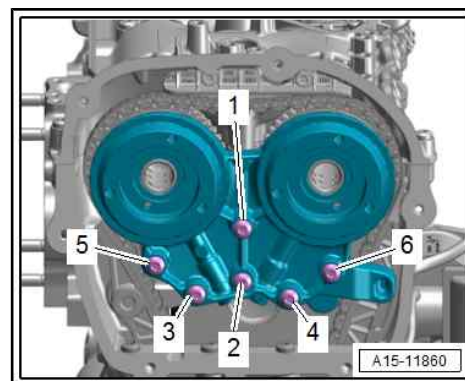
- Remove bolts -1 ... 6-.



WARNING

Risk of damage to bearing saddle.

- ◆ *Detach bearing saddle carefully without tilting it.*



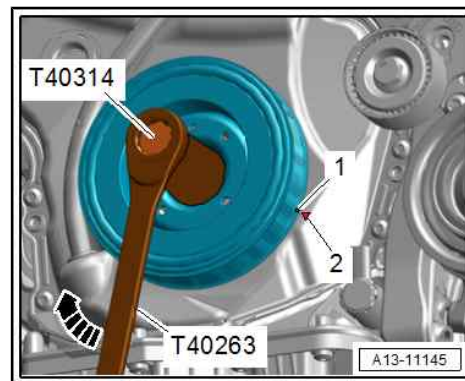
- Detach bearing saddle.



Caution

Irreparable damage can be caused if the camshaft timing chain slips.

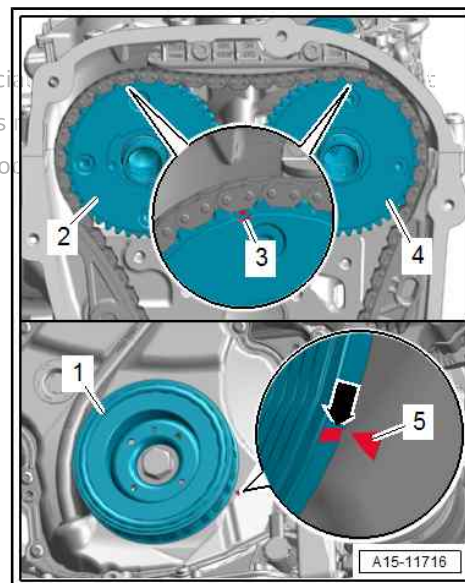
- ◆ *Turn crankshaft only in direction of engine rotation -arrow-.*



- Use ratchet wrench (21 mm) - T40263- , adapter - T40314- and socket (24 mm) to turn crankshaft until vibration damper is at "TDC" position.

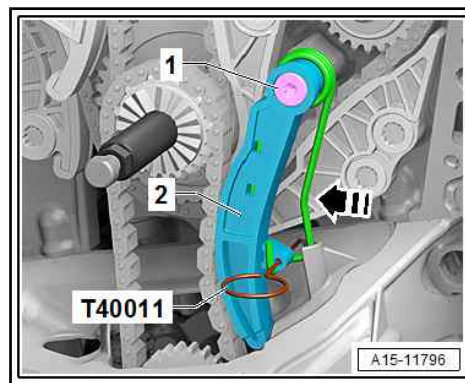
- The marking -3- on each of the camshaft chain sprockets -2- and -4- must face upwards.
- The notch -arrow- on the vibration damper -1- and the arrow marking -5- on the timing chain cover (bottom) must be aligned.

- Remove timing chain cover (bottom) ➔ [page 73](#) .
- Check "TDC" position again.

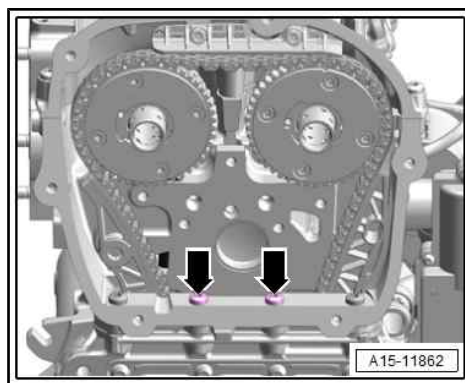




- Press support wire of tensioning spring in direction of -arrow- and lock in place using locking pin - T40011- .
- Remove guide pin -1- and take off chain tensioner -2-.
- Detach chain for oil pump from three-part chain sprocket assembly, pull it off towards front and put it down on chain sprocket for oil pump.



- Remove bolts -arrows-.

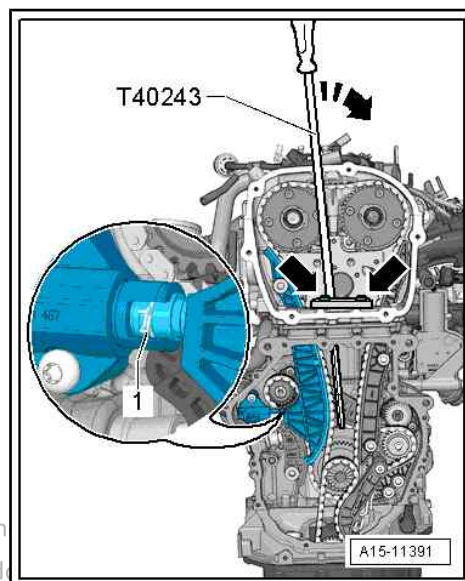


- Bolt assembly lever - T40243- onto cylinder head -bottom arrows-.
- Compress and hold circlip -1- for chain tensioner.
- Push assembly lever - T40243- slowly in direction of -arrow- and hold in place.
- This will press the chain tensioner back.

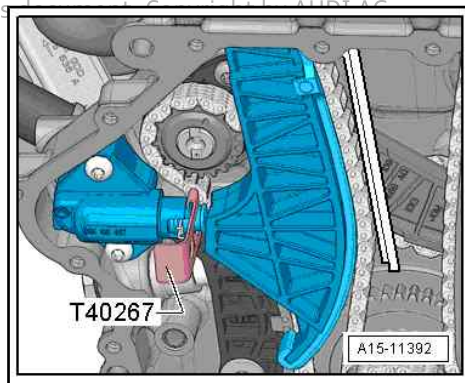


Note

The chain tensioner is oil-damped and can therefore only be pressed back slowly by applying constant pressure.



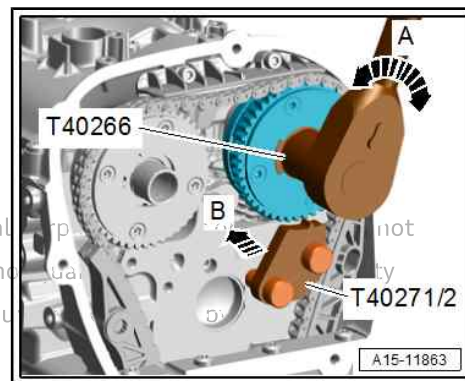
- Lock chain tensioner with locking tool - T40267- .
- Remove assembly lever - T40243- .





- Bolt camshaft clamp - T40271/2- onto cylinder head.
- Slide camshaft clamp into teeth of chain sprocket in direction of -arrow B-.
- If necessary, turn inlet camshaft back and forth slightly -arrows A- using assembly tool - T40266- or assembly tool - T10567- .

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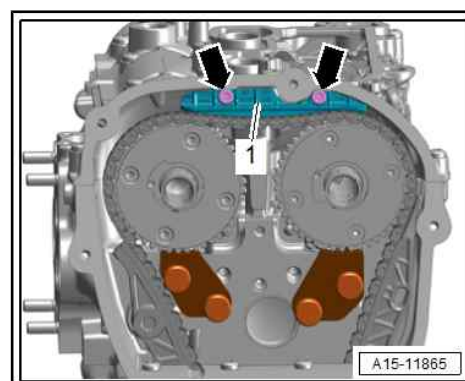
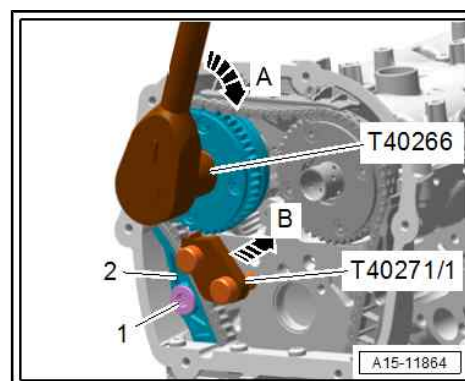
- Bolt camshaft clamp - T40271/1- onto cylinder head.



Note

A second mechanic is required for the following step.

- Hold exhaust camshaft in position using assembly tool - T40266- or assembly tool - T10567- . Remove guide pin -1- and remove tensioning rail -2- downwards.
- Continue turning exhaust camshaft clockwise -arrow A- until camshaft clamp - T40271/1- can be pressed into teeth -arrow B- on chain sprocket.
- Unscrew bolts -arrows- and remove guide rail -1-.



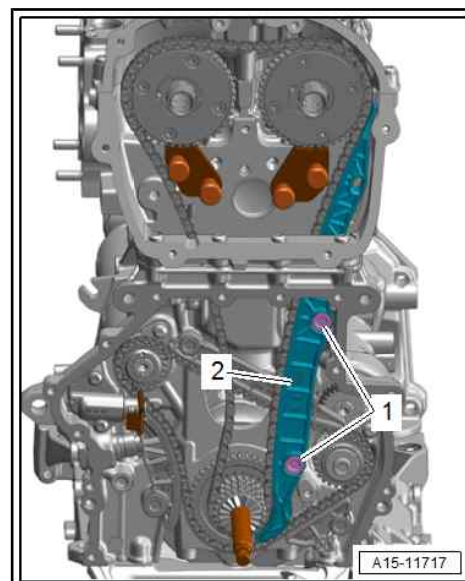
- Remove guide pin -1- and take off guide rail -2-.
- Detach camshaft timing chain from sprockets and remove it downwards.



Caution

Risk of damage to valves and piston crowns.

- ◆ ***Do not turn the crankshaft after the camshaft timing chain has been removed.***

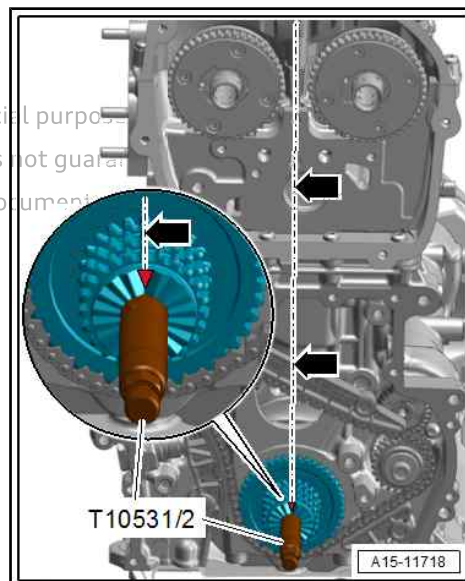




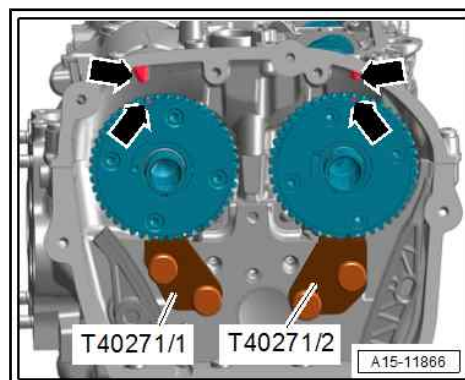
Installing

Requirements:

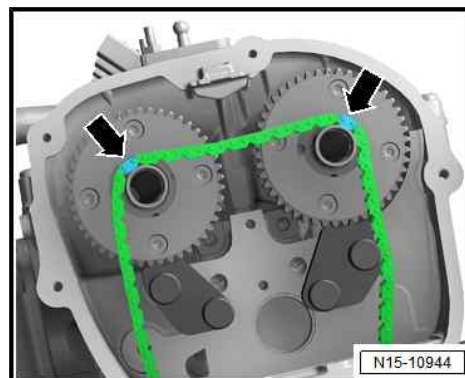
- Crankshaft in "TDC" position; V-shaped notch in three-part chain sprocket assembly aligned with an imaginary vertical line -arrows- centred between camshaft chain sprockets.
- Three-part chain sprocket assembly locked in position with clamping pin - T10531/2- .



- Camshaft chain sprockets locked in "TDC" position with camshaft clamp - T40271/1- and -T40271/2- .
- The marks -arrows- must align.

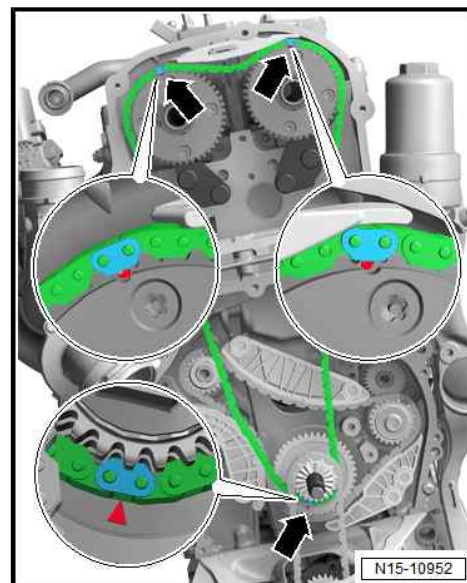


- Fit camshaft timing chain so that coloured markings -arrows- are positioned on camshaft journals, as shown.

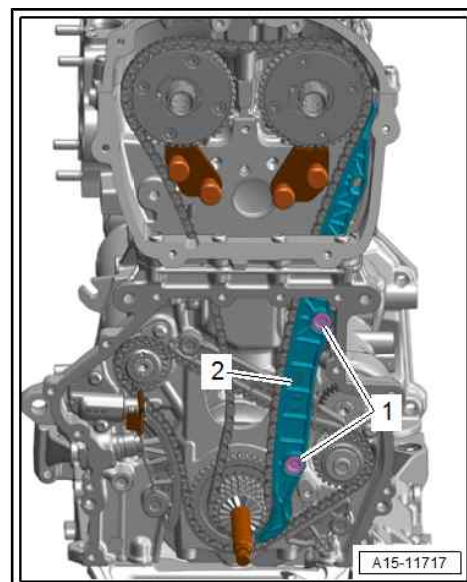




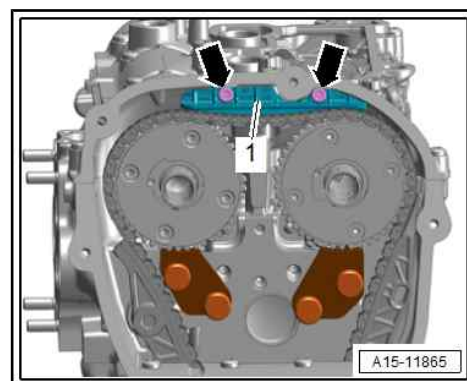
- Fit camshaft timing chain onto inlet camshaft, exhaust camshaft and three-part chain sprocket assembly.
- Links with coloured markings must be positioned opposite markings -arrows- on chain sprockets.



- Install guide rail -2- and tighten guide pin -1-.



- Install guide rail -1- and tighten bolts -arrows-.



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Note

A second mechanic is required for the following step.

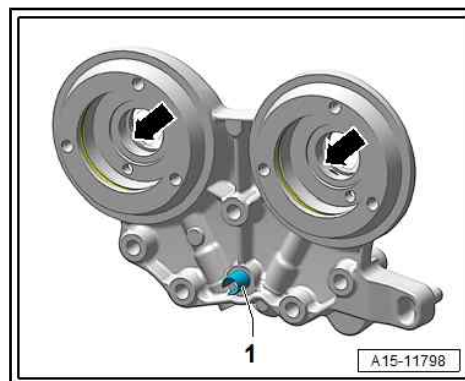
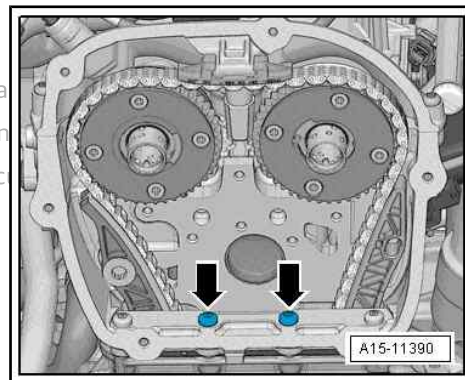
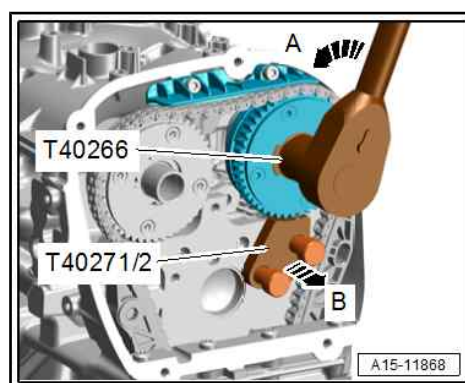
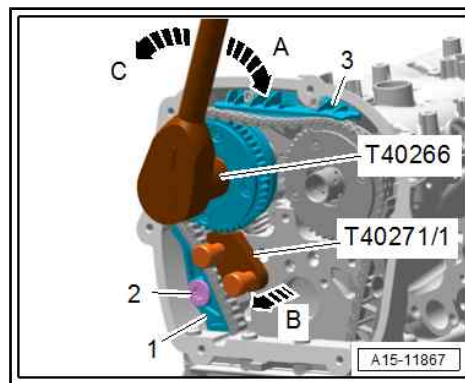
- Release tension on exhaust camshaft slightly by turning it in direction of -arrow A- with assembly tool - T40266- or assembly tool - T10567- , and pull camshaft clamp - T40271/1- out of teeth on chain sprocket -arrow B-.
- Allow exhaust camshaft to turn in direction of -arrow C- until timing chain is in contact with guide rail -3-.
- Hold camshaft in this position, fit tensioning rail -1- and tighten guide pin -2-.
- Remove camshaft clamp - T40271/1- .
- Release tension on inlet camshaft slightly by turning it in direction of -arrow A- with assembly tool - T40266- or assembly tool - T10567- , pull camshaft clamp - T40271/2- out of teeth on chain sprocket -arrow B- and bring camshaft into rest position.
- Remove camshaft clamp - T40271/2- .



- Fit and tighten bolts -arrows-. Tightening torque
⇒ [Item 4 \(page 101\)](#)

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- Lubricate holes -arrows- with engine oil.
- Check whether spring pin -1- is fitted.



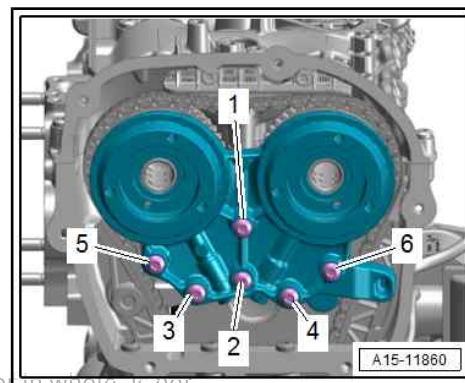


WARNING

Risk of damage to bearing saddle.

♦ *Carefully attach bearing saddle without tilting it.*

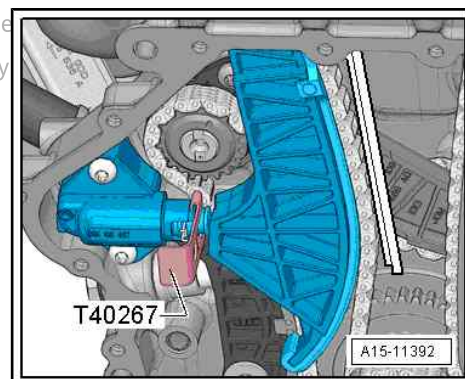
- Fit bearing saddle and screw in bolts -1 ... 6- by hand until they make contact.



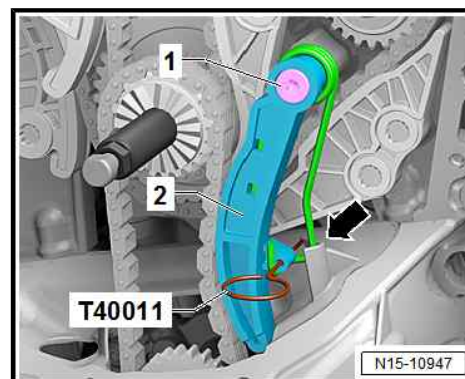
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Remove locking tool - T40267- .AUDI AG does not guarantee or accept responsibility for the use of this document. Copyright by Audi AG

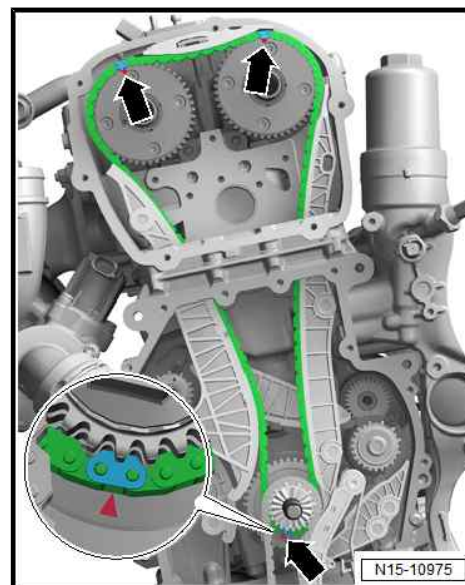
Tighten bolts for bearing saddle => [page 79](#) .



- Fit drive chain for oil pump.
- Fit chain tensioner -2- and tighten guide pin -1-.
- Remove locking pin - T40011- ; support wire must come into contact with opening -arrow- on sump (top section).



- Checking adjustment:
- Links with coloured markings must be positioned opposite markings -arrows- on chain sprockets.
- Install timing valves => [Item 6 \(page 78\)](#) .





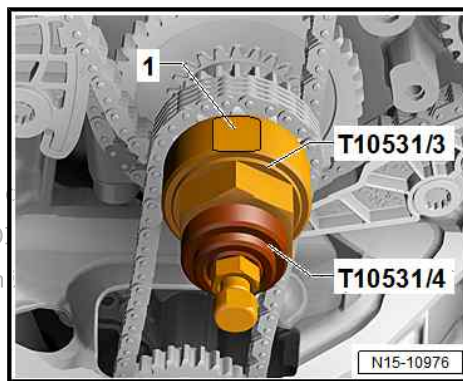
Caution

Irreparable damage can be caused if the camshaft timing chain slips.

- ◆ **Turn crankshaft only in direction of engine rotation (in clockwise direction).**

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

- ◆ **Turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.**



- Fit flange nut - T10531/4- and turning-over tool - T10531/3- .
- Turn engine two rotations in direction of engine rotation.



Note

Due to the ratio, the timing chain links with coloured markings are no longer aligned after the engine has been turned.

- Unscrew flange nut and remove turning-over tool.

Remaining installation steps are carried out in reverse sequence; note the following:

- Remove timing chain cover (bottom) ⇒ [page 73](#) .
- Install timing chain cover (top) ⇒ [page 72](#) .

Learnt values for chain elongation must be re-adapted after carrying out work on chain drive.

- Perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis].

Tightening torques

- ◆ ⇒ [“2.1 Exploded view - camshaft timing chains”, page 78](#)
- ◆ ⇒ [“2.2 Exploded view - drive chain for balance shaft”, page 80](#)
- ◆ ⇒ [“3.1 Exploded view - cylinder head”, page 101](#)

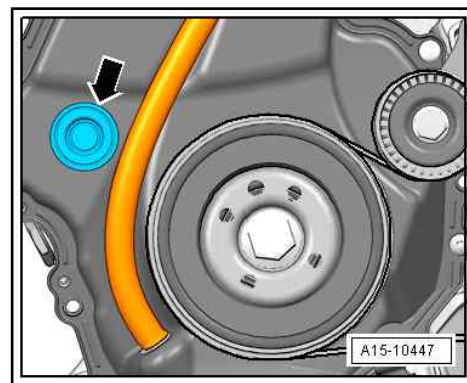
2.5 Checking chain elongation

Procedure

- Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



- Remove sealing plug -arrow-.



- Turn vibration damper in direction of engine rotation until piston of chain tensioner has extended as far as it will go in direction of -arrow-.
- Count visible teeth of piston.

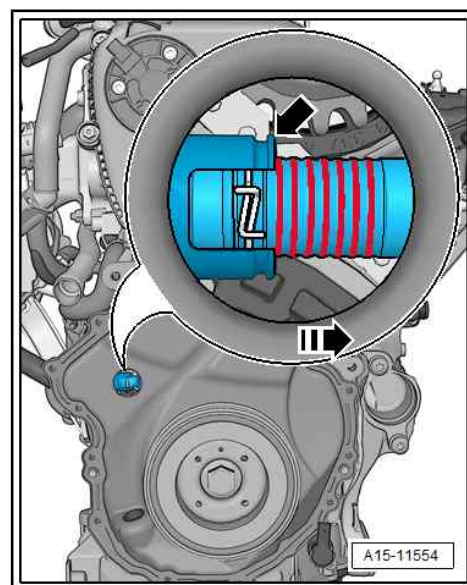
Note:

Visible teeth are all teeth to the right of the chain tensioner housing -arrow-.

- The timing chain must not be renewed if six or fewer teeth are visible.
- If six or fewer teeth are visible and there is an entry in the event memory: Adapt chain elongation (⇒ Vehicle diagnostic tester, 01 - Chain elongation adaption diagnosis) and delete event memory.
- If seven or more teeth are visible: Renew camshaft timing chain.

Tightening torques

- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



2.6 Removing and installing drive chain for balance shaft

Special tools and workshop equipment required

- ◆ Sealant for chain tensioner ⇒ Electronic parts catalogue

Removing

- Remove camshaft timing chain ⇒ [page 85](#) .

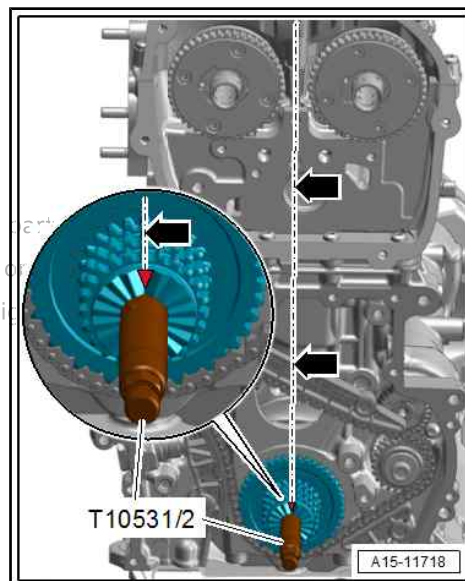
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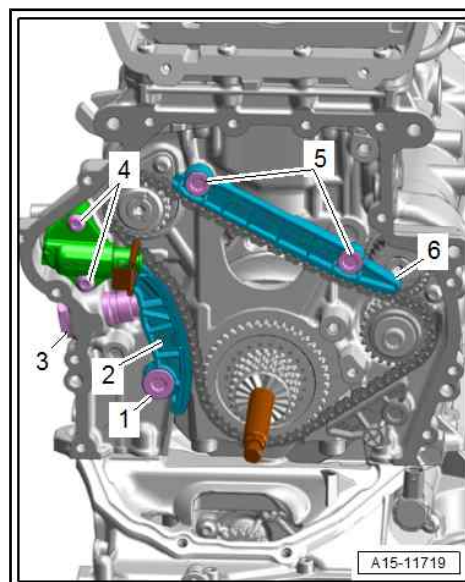
Requirements:

- Crankshaft in "TDC" position; V-shaped notch in three-part chain sprocket assembly aligned with an imaginary vertical line -arrows- centred between camshaft chain sprockets.
- Three-part chain sprocket assembly locked in position with clamping pin - T10531/2- .

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- Remove bolts -4- and take off tensioner for camshaft timing chain.
- Remove chain tensioner -3- for drive chain for balance shafts.
- Unscrew guide pin -1, 5- and take off tensioning rail -2- and guide rail -6-.
- Detach drive chain for balance shaft.

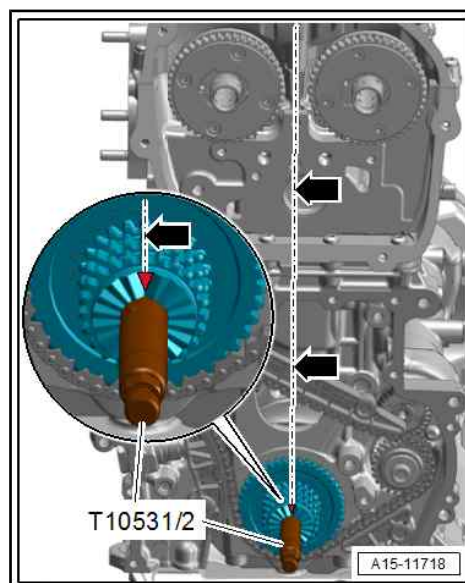


Installing

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

Requirements:

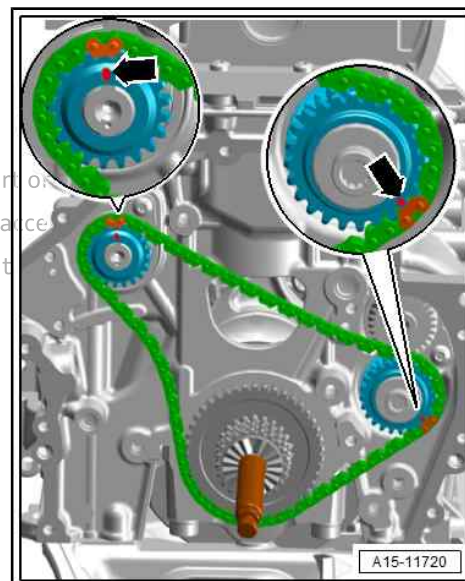
- Crankshaft in "TDC" position; V-shaped notch in three-part chain sprocket assembly aligned with an imaginary vertical line -arrows- centred between camshaft chain sprockets.
- Three-part chain sprocket assembly locked in position with clamping pin - T10531/2- .



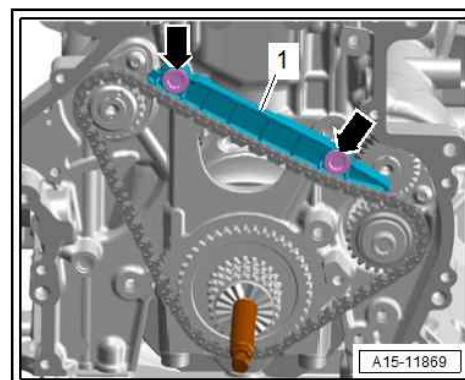


- Start by placing drive chain for balance shafts onto balance shafts as shown.
- Links with coloured markings must be positioned opposite markings -arrows- on chain sprockets.

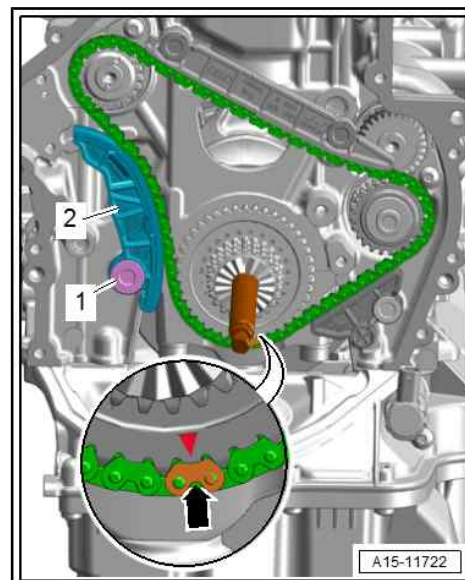
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- Install guide rail -1- and tighten guide pins -arrows-.

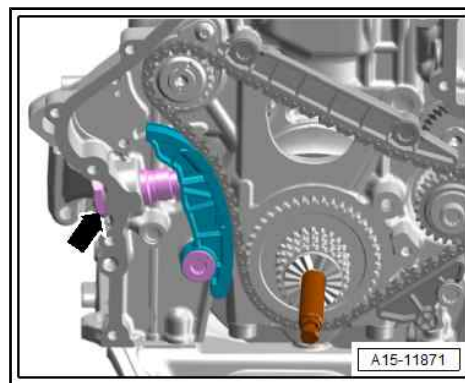


- Position coloured link -arrow- of drive chain for balance shafts as shown at marking on three-part chain sprocket assembly.
- Install tensioning rail -2- and tighten guide pin -1-.





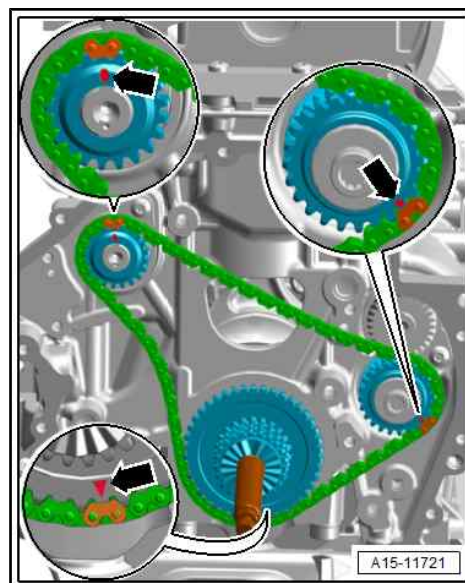
- Position chain tensioner -arrow- with sealant (⇒ Electronic parts catalogue) and secure.



- Check adjustment again:
- Links with coloured markings must be positioned opposite markings -arrows- on chain sprockets.
- Install camshaft timing chain ⇒ [page 85](#) .

Tightening torques

- ♦ ⇒ [“2.2 Exploded view - drive chain for balance shaft”, page 80](#)



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3 Cylinder head

⇒ "3.1 Exploded view - cylinder head", page 101

⇒ "3.2 Removing and installing cylinder head", page 104

⇒ "3.3 Checking compression", page 112

3.1 Exploded view - cylinder head

1 - Cylinder head gasket

- ☐ Renew after removing
- ☐ Installation position: part number must face cylinder head
- ☐ If renewed, change coolant and engine oil
- ☐ After renewal, perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis]

2 - Dowel pin

- ☐ 2x

3 - Cylinder head

- ☐ Removing and installing ⇒ page 104
- ☐ Checking for distortion ⇒ page 104
- ☐ If renewed, change coolant and engine oil
- ☐ After renewal or removal and reinstallation, perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis]

4 - Bolt

- ☐ Renew after removing
- ☐ Slackening ⇒ page 102
- ☐ Tightening torque and sequence ⇒ page 103

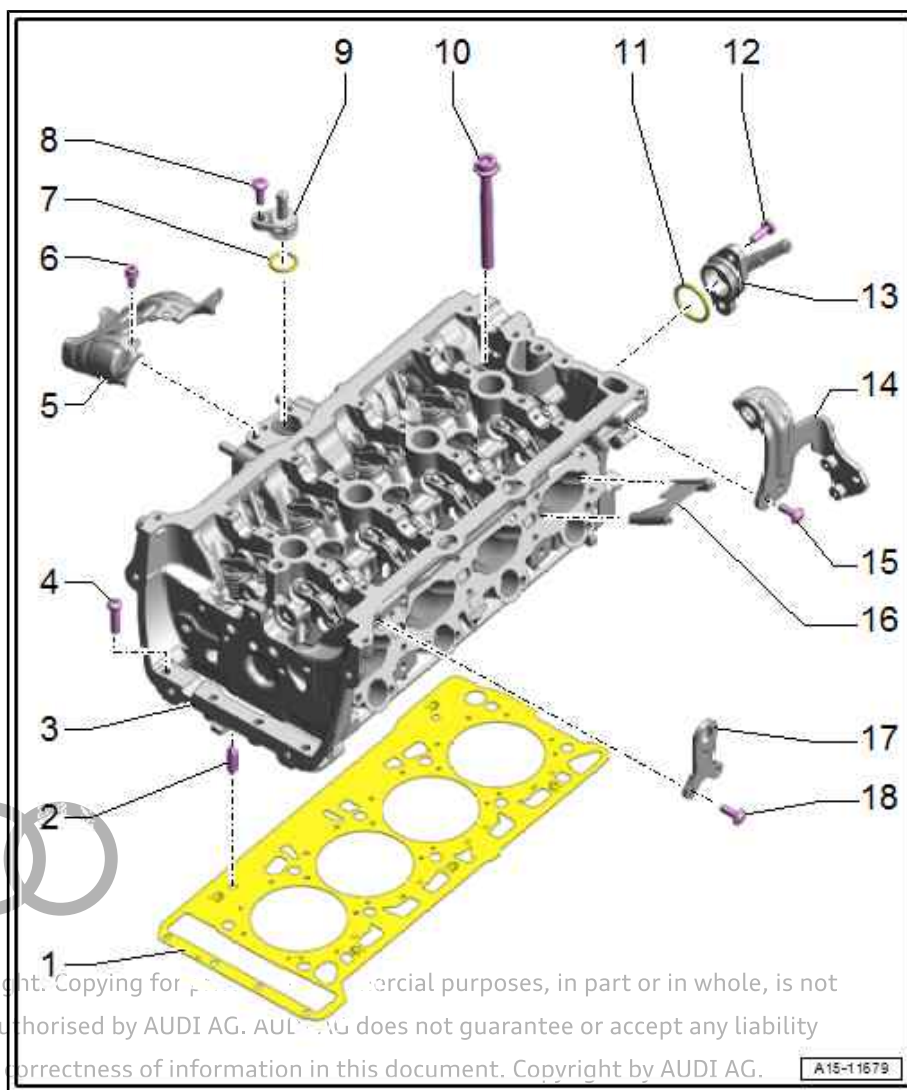
5 - Heat shield

6 - Bolt

- ◆ Tighten initially to 5 Nm
- ◆ Subsequently tighten to 9 Nm

7 - O-ring

- ☐ Renew after removing
- ☐ Lubricate with coolant



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A15-11679



8 - Bolt

- ☐ 9 Nm

9 - Connection

- ☐ For coolant hose

10 - Bolt

- ☐ Renew after removing
- ☐ Slackening ⇒ [page 102](#)
- ☐ Tightening torques and sequence ⇒ [page 103](#)

11 - O-ring

- ☐ Renew after removing
- ☐ Lubricate with coolant

12 - Bolt

- ☐ 9 Nm

13 - Connection

- ☐ For coolant hose

14 - Engine lifting eye

15 - Bolt

- ☐ Renew after removing
- ☐ 10 Nm +90°

16 - Separating plate

17 - Engine lifting eye

18 - Bolt

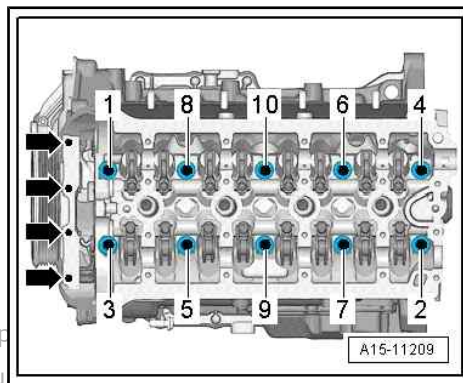
- ☐ Renew after removing
- ☐ 10 Nm +90°

Slackening cylinder head bolts

- Remove bolts -arrows-.
- Loosen and remove cylinder head bolts in sequence -1 ... 10-.



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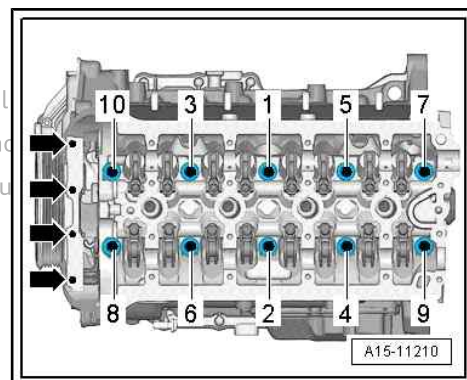
Tightening torques and sequence for cylinder head

- After removing, renew bolts tightened with specified tightening angle.
- Bolts - difference:
- Bolt without collar
- Bolt with collar -arrow-



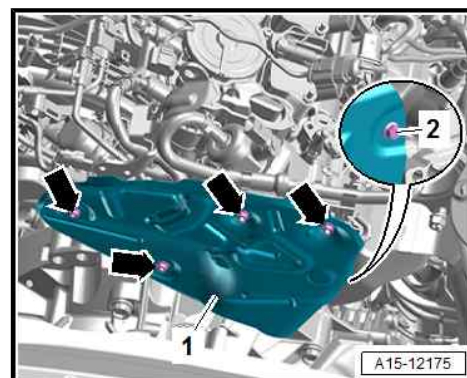
- Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 per 10-	Screw in by hand until contact is made
2.	-1 with 10-	Without collar: 40 Nm; with collar: 50 Nm (difference ⇒ page 103)
3.	-1 ... 10-	Turn 90° further
4.	-1 ... 10-	Turn 90° further
5.	-Arrows-	8 Nm
6.	-Arrows-	Turn 90° further



Heat shield for vehicles with particulate filter - tightening torques

- Tighten nuts -arrows- and bolt -2- to 9 Nm.

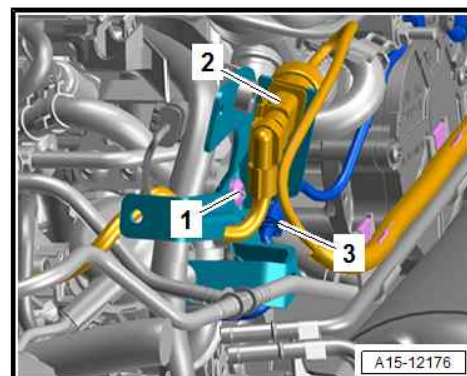


Bracket for heat shield for vehicles with particulate filter - tightening torques

- Tighten bolt -1- to 9 Nm.

Note:

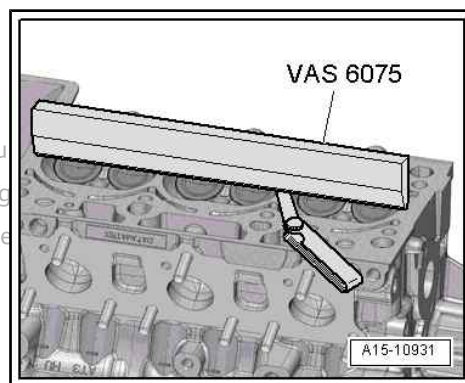
There are variations depending on model and version.





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.



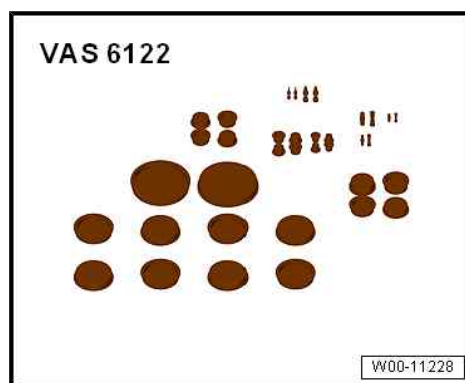
3.2 Removing and installing cylinder head

Special tools and workshop equipment required

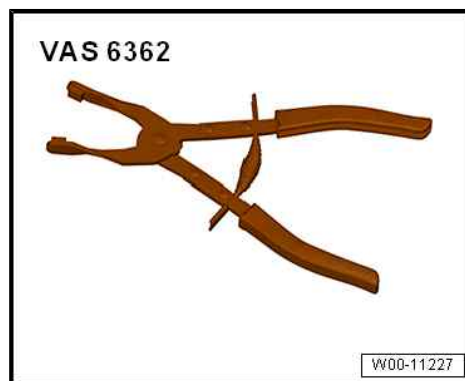
- ♦ Spark plug spanner - 3122B-



- ♦ Engine bung set - VAS 6122-



- ♦ Hose clip pliers - VAS 6362-





- ◆ Special wrench (Polydrive) - T10070-

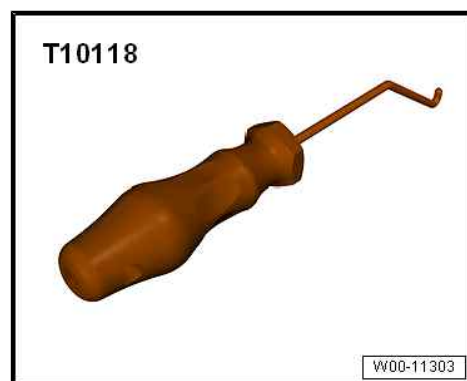


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- ◆ Assembly tool - T10118-



- ◆ Blade scraper; blade width at least 40 mm (commercially available)

Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing cylinder head .



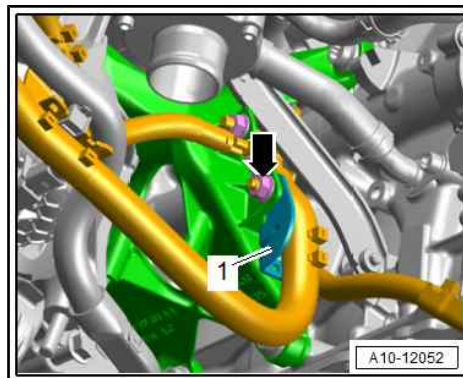
Note

Re-install all cable ties in original positions.

- Disconnect earth wire from battery terminal ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Remove camshafts ⇒ [page 118](#) .
- Remove throttle valve module - GX3- ⇒ [page 216](#) .



- Drain coolant ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling up coolant .
- Remove nut -arrow- and press bracket -1- with electrical wiring harness to one side.



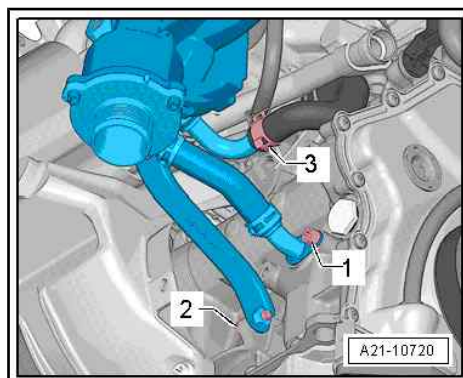
- Remove bolt -2-.



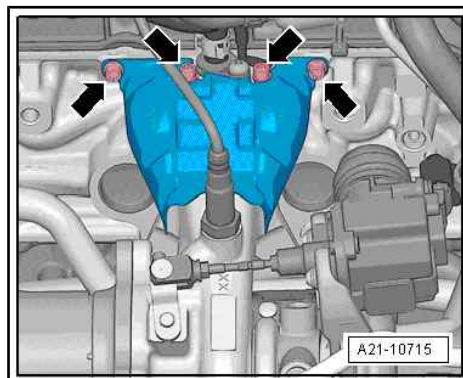
Note

Place a cloth underneath to catch escaping engine oil.

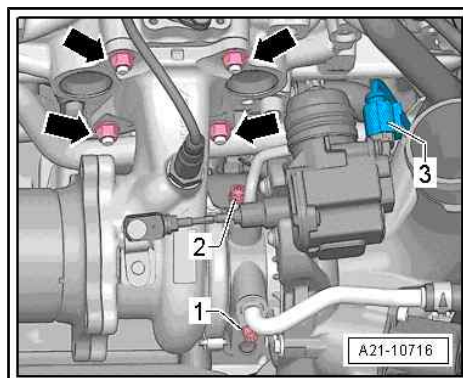
- Unscrew bolt -1- and detach oil return connection.



- Remove heat shield -arrows-.



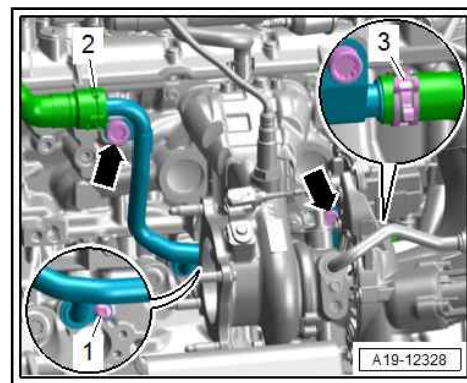
- Remove bolt -2- and detach oil supply line.
- Remove nuts -arrows- and pull turbocharger off studs.



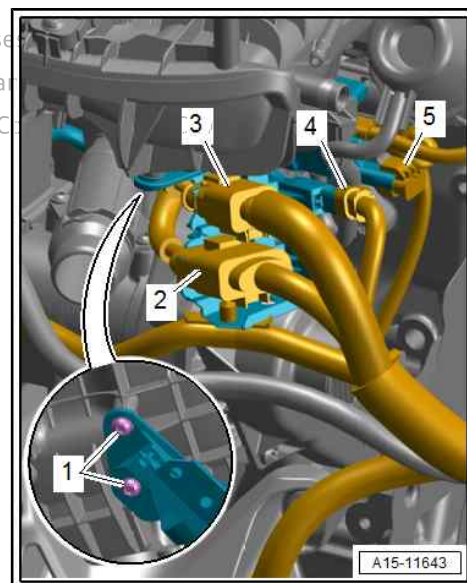
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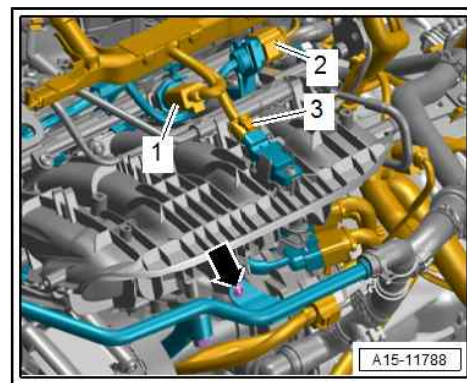
- Remove bolts -arrows- at coolant pipe (right-side).



- Detach electrical connectors -2, 3- from bracket and unplug.
- Unplug electrical connectors -4, 5-
- Remove bolts -1- securing bracket



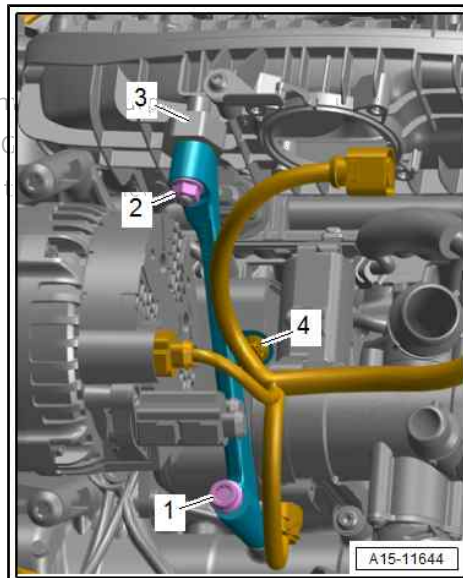
- Unplug electrical connectors -1, 2, 3-.



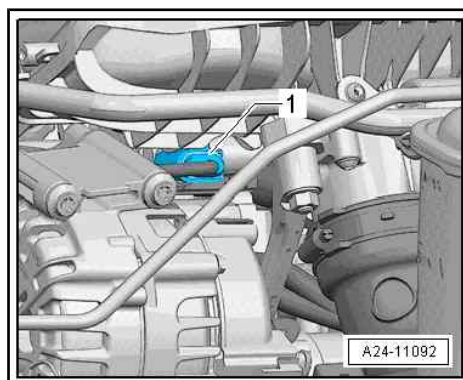


- Unscrew nut -2- and bolt -1- and remove support for intake manifold.

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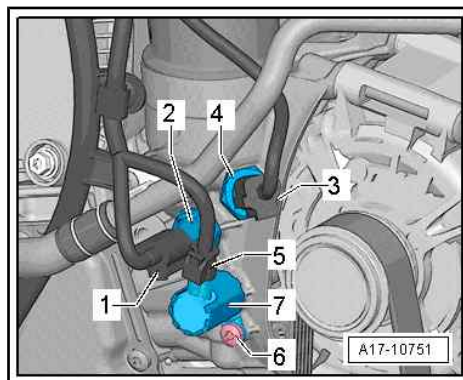


- If necessary, release and unplug electrical connector for fuel pressure sender - G247- with assembly tool - T10118- .



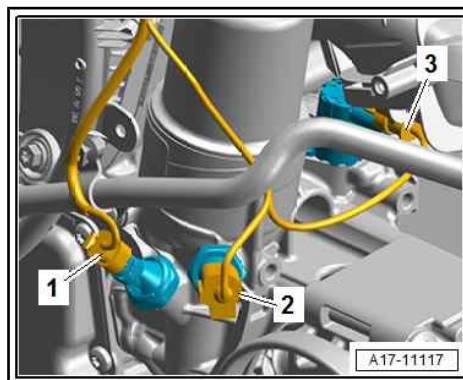
Vehicles with alternator:

- Unplug electrical connectors and move electrical wiring clear:
 - 1 - For oil pressure switch - F22- -item 2-
 - 3 - For oil pressure switch for reduced oil pressure - F378- -item 4-
 - 5 - For piston cooling jet control valve - N522- -item 7-



Vehicles with starter-alternator:

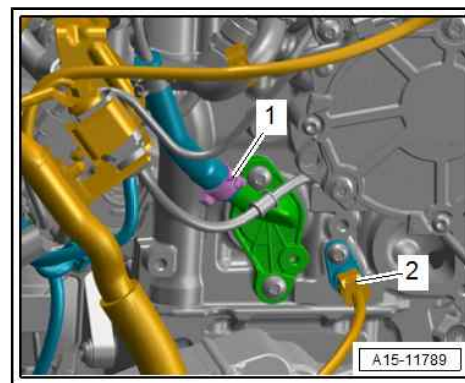
- Unplug electrical connectors:
 - 1 - For oil pressure switch - F22-
 - 2 - For oil pressure switch for reduced oil pressure - F378-
 - 3 - For piston cooling jet control valve - N522-



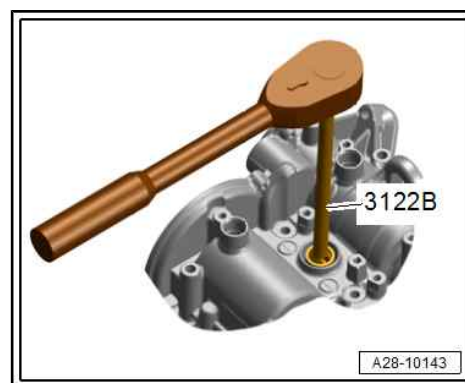


All vehicles (continued):

- Release hose clip -1- and detach coolant hose (rear).
- Unplug electrical connector -2- for coolant temperature sender - G62- .



- Remove spark plugs with spark plug spanner - 3122B- .



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- Remove bolts -arrows-.
- Use special wrench (Polydrive) - T10070- or bit XZN 12 - T40270- to remove cylinder head bolts in the sequence -1 ... 10-.



Note

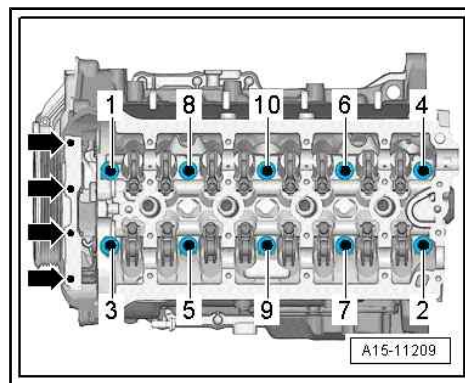
Make sure all hoses/pipes and wiring on component are disconnected.

- Take off cylinder head.
- Place cylinder head onto soft surface (foam plastic).



Note

Seal off all open passages in the intake and exhaust system with clean cloths or plugs (thoroughly cleaned) from engine bung set - VAS 6122-.



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Installing



Caution

Risk of damage to sealing surfaces.

- ◆ ***Carefully remove sealant residue from cylinder head and cylinder block.***
- ◆ ***Ensure that no long scores or scratches are made on the surfaces.***

Risk of damage to cylinder block.

- ◆ ***No oil or coolant must be allowed to remain in the blind holes for the cylinder head bolts in the cylinder block.***

Ensure that cylinder head gasket seals properly:

- ◆ ***Do not remove new cylinder head gasket from packaging until it is ready to be fitted.***
- ◆ ***Handle the cylinder head gasket very carefully to prevent damage to the silicone coating or the indented area of the gasket.***

Risk of damage to open valves.

- ◆ ***When installing an exchange cylinder head, the plastic protectors fitted to protect the open valves should not be removed until the cylinder head is ready to be fitted.***



Note

- ◆ *After removing, renew bolts tightened with specified tightening angle.*
- ◆ *Renew self-locking nuts, as well as seals, gaskets and O-rings after removing.*
- ◆ *When installing an exchange cylinder head, the contact surfaces between the hydraulic compensation elements, roller rocker fingers and cams must be oiled.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- ◆ *After fitting a new cylinder head or cylinder head gasket, change engine oil and coolant in entire cooling system.*



Caution

Risk of engine damage due to contamination of lubrication system with residue from abrasive materials.

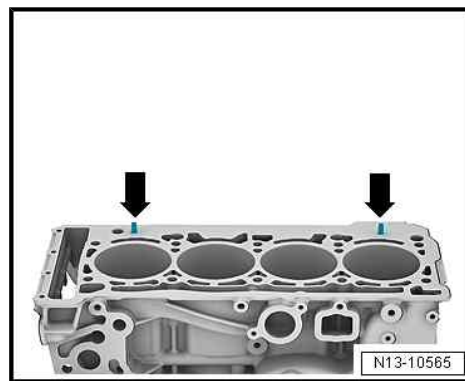
- ◆ *Do not use abrasive materials such as sandpaper, sanding discs, sanding pads, abrasive web, wire wool or similar on sealing surfaces of cylinder block and cylinder head.*
- ◆ *When removing sealant residue, make sure none of the residue enters the open channels of the engine.*
- ◆ *Ensure that nearby workspaces are kept clean and that no impermissible abrasive materials are being used there.*

- Remove sealant residue on cylinder block and cylinder head using only a commercially available blade scraper (blade width at least 40 mm).
- Sealing surface must not be raised.
- Dark discolouration does not have to be removed.





- Place cylinder head gasket in position.
- ◆ Note position of centring pins in cylinder block -arrows-.
- ◆ Note installation position of cylinder head gasket. Part No. should be legible from inlet side.
- If crankshaft has been rotated: Set piston of cylinder 1 to top dead centre and then turn crankshaft 90° anti-clockwise back to “TDC” position.
- Fit cylinder head.
- Insert and hand-tighten cylinder head bolts.
- Tightening sequence for cylinder head ⇒ [page 103](#)



Note

Cylinder head bolts do not have to be torqued down again later after repair work.

- Install camshafts ⇒ [page 118](#) .
- Install throttle valve module - GX3- ⇒ [page 216](#) .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- Install spark plugs ⇒ [page 270](#) .
- Change engine oil ⇒ [page 142](#) .
- Change coolant ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing cylinder head

Learnt values for chain elongation must be re-adapted after re-newing or removing and re-installing cylinder head.

- Perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis].

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - cylinder head”, page 101](#)
- ◆ ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes
- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 203](#)
- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 184](#)
- ◆ ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Exploded view - silencers

3.3 Checking compression

Special tools and workshop equipment required



◆ Spark plug spanner - 3122B-



◆ Compression tester - V.A.G 1763-



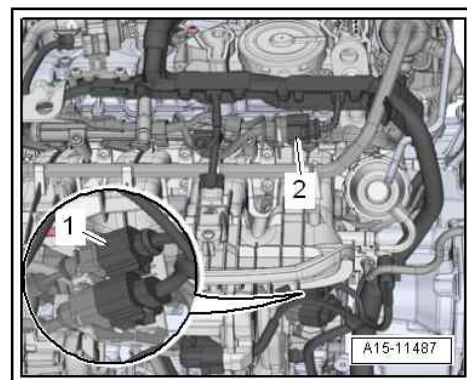
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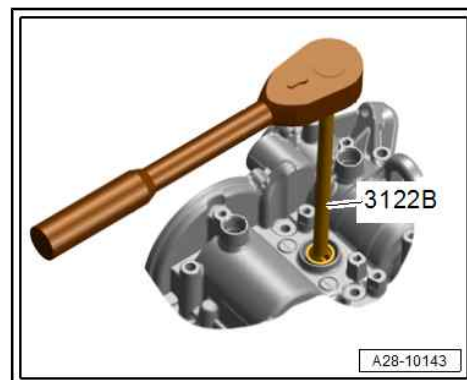
◆ Adapter - V.A.G 1763/13- (not illustrated)

Test sequence

- Engine oil temperature at least 30 °C
- Battery voltage at least 12.7 V
- Remove engine cover panel ⇒ [page 12](#) .
- Unplug electrical connector -1- for FSI injectors.
- Unplug electrical connector -2- for MPI injectors/gas injection valves.
- Remove ignition coils ⇒ [page 271](#) .



- Remove spark plugs with spark plug spanner - 3122B- .



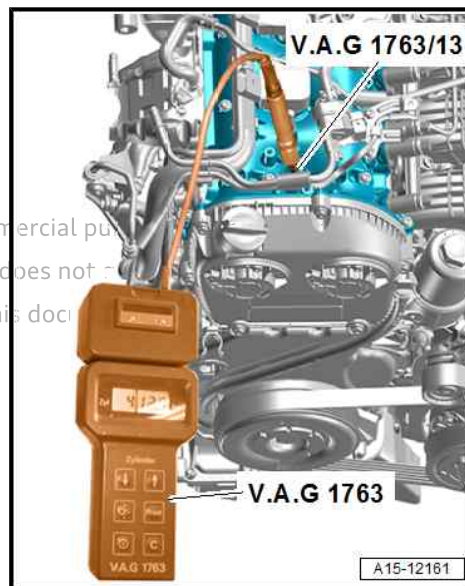


- Screw adapter - V.A.G 1763/13- into corresponding spark plug hole, as shown, and connect compression tester - V.A.G 1763- .
- Check compression pressure with compression tester - V.A.G 1763- (see ⇒ operating instructions for details of how to use tester).
- Press down accelerator pedal completely and simultaneously operate starter until pressure no longer increases on tester display.
- Repeat procedure on each cylinder.

Compression pressure	bar
When new	16.0 ... 19.0
Wear limit	12.0
Maximum difference between cylinders	3.0

Assembling

- Install spark plugs ⇒ [page 270](#) .
- Install ignition coils ⇒ [page 271](#) .
- Install engine cover panel ⇒ [page 12](#) .
- Erase any entries in engine control unit event memory resulting from testing ⇒ Vehicle diagnostic tester.





4 Valve gear

⇒ [“4.1 Exploded view - valve gear”, page 115](#)

⇒ [“4.2 Removing and installing camshaft”, page 118](#)

⇒ [“4.3 Installing ball for slider”, page 125](#)

⇒ [“4.4 Removing and installing actuators for camshaft adjustment”, page 126](#)

⇒ [“4.5 Removing and installing camshaft control valve 1 N205”, page 127](#)

⇒ [“4.6 Removing and installing valve stem oil seals”, page 128](#)

4.1 Exploded view - valve gear

1 - Exhaust valve

- ☐ Do not machine, only grinding-in is permitted
- ☐ Valve dimensions
⇒ [page 138](#)
- ☐ Checking valve guides
⇒ [page 137](#)

2 - Cylinder head

- ☐ Cylinder head and cylinder head cover must be renewed together

3 - Valve spring plate (bottom)

- ☐ Only for vehicles with natural gas system

4 - Valve stem oil seal

- ☐ Different versions
⇒ [page 118](#)
- ☐ Renewing ⇒ [page 128](#)

5 - Valve spring

6 - Hydraulic compensation element

- ☐ Do not interchange
- ☐ Lubricate contact surface with engine oil

7 - Upper valve spring plate

8 - Valve cotters

9 - Securing clip

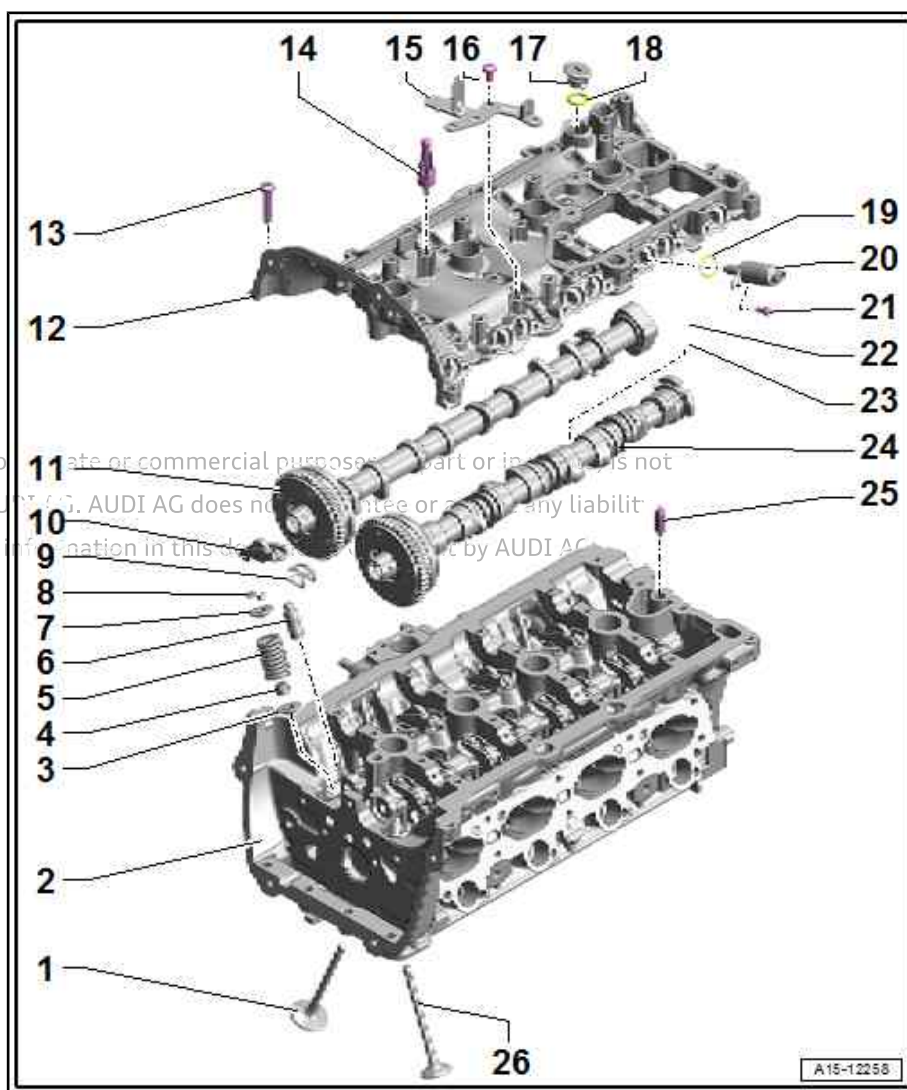
- ☐ For hydraulic compensation element

10 - Roller rocker finger

- ☐ Removing and installing
⇒ [“4.2 Removing and installing camshaft”, page 118](#)
- ☐ Mark installation position for re-installation
- ☐ Check roller bearings for ease of movement
- ☐ Lubricate contact surfaces with engine oil

11 - Exhaust camshaft

- ☐ Removing and installing ⇒ [page 118](#)





- ☐ Check radial clearance with Plastigauge (roller rocker fingers removed)
- ☐ Axial clearance when new: $0.1^{+0.102}_{-0.05}$ mm
- ☐ Radial clearance: 0.024 ... 0.066 mm
- ☐ Runout: max. 0.04 mm
- ☐ After renewal or removal and reinstallation, perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis]

12 - Cylinder head cover

- ☐ With integrated camshaft bearings
- ☐ Removing and installing ⇒ ["4.2 Removing and installing camshaft", page 118](#)
- ☐ Clean but do not machine sealing surface
- ☐ Remove old sealant residues
- ☐ Cylinder head and cylinder head cover must be renewed together
- ☐ After renewal or removal and reinstallation, perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis]

13 - Bolt

- ☐ Renew after removing
- ☐ Slackening ⇒ [page 117](#)
- ☐ Tightening torques and sequence ⇒ [page 117](#)

14 - Ball stud

- ☐ For engine cover panel
- ☐ 9 Nm

15 - Bracket

- ☐ For electrical wiring harness

16 - Bolt

- ☐ 9 Nm

17 - Sealing plug

18 - O-ring

- ☐ Renew after removing

19 - O-ring

- ☐ Not available as a replacement part, supplied together with actuator for camshaft adjustment
- ☐ Lubricate lightly with engine oil

20 - Actuator for camshaft adjustment

- ◆ Actuator 1 for camshaft adjustment - F366-
- ◆ Actuator 2 for camshaft adjustment - F367-
- ◆ Actuator 3 for camshaft adjustment - F368-
- ◆ Actuator 4 for camshaft adjustment - F369-
- ◆ Actuator 5 for camshaft adjustment - F370-
- ◆ Actuator 6 for camshaft adjustment - F371-
- ◆ Actuator 7 for camshaft adjustment - F372-
- ◆ Actuator 8 for camshaft adjustment - F373-
 - ☐ Removing and installing ⇒ [page 126](#)

21 - Bolt

- ☐ 4.5 Nm

22 - Spring

23 - Ball

- ☐ For slider



- ☐ Installing ➤ [page 125](#)

24 - Inlet camshaft

- ☐ Removing and installing ➤ [page 118](#)
- ☐ Check radial clearance with Plastigauge (roller rocker fingers removed)
- ☐ Axial clearance when new: $0.1^{+0.102}_{-0.05}$ mm
- ☐ Radial clearance: 0.024 ... 0.066 mm
- ☐ Runout: max. 0.04 mm
- ☐ After renewal or removal and reinstallation, perform adaption ➤ Vehicle diagnostic tester 01 - Engine electronics, functions, 01 - Chain elongation adaption diagnosis

25 - Dowel pin

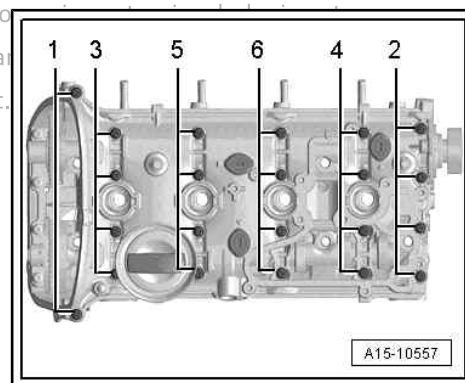
- ☐ 2x

26 - Inlet valve

- ☐ Do not machine, only grinding-in is permitted
- ☐ Valve dimensions ➤ [page 138](#)
- ☐ Checking valve guides ➤ [page 137](#)

Loosening cylinder head cover

- Loosen cylinder head cover bolts in the sequence -1 ... 6-.



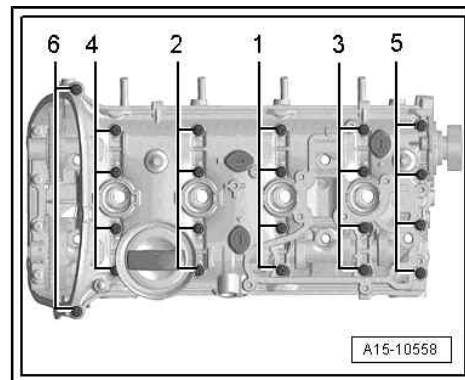
Tightening torques and sequence for cylinder head cover



Note

- ◆ After removing, renew bolts tightened with specified tightening angle.
- ◆ Take care to keep cylinder head cover straight.
- Tighten bolts in stages in the sequence shown:

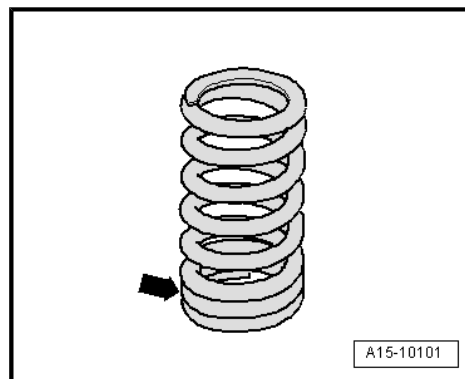
Stage	Bolts	Tightening torques/angle specification
1.	-1 ... 6-	Screw in by hand in several stages until contact is made
2.	-1 ... 6-	8 Nm
3.	-1 ... 6-	Turn 90° further





Position of valve spring

- The closely spaced spring coils -arrow- face the cylinder head.



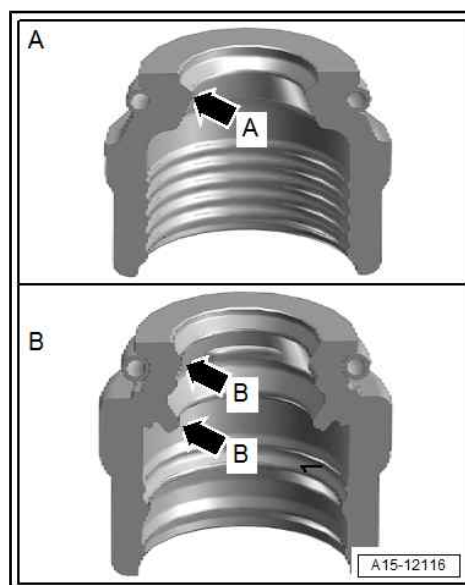
Different versions of valve stem oil seal

A - Valve stem oil seal with one sealing lip -A-

- ◆ For inlet and exhaust sides

B - Valve stem oil seal with two sealing lips -B-

- ◆ Only for exhaust side on some engines; for allocation refer to
⇒ Electronic parts catalogue



4.2 Removing and installing camshaft

Removing



Note



- ◆ Do not machine the sealing surfaces between the cylinder head cover and the cylinder head.

- ◆ Re-install all cable ties in original positions.

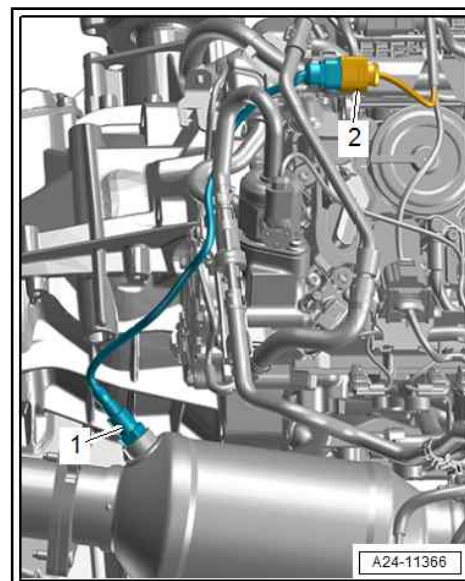
- Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Remove timing chain cover (top) ⇒ [page 72](#) .
- Remove air cleaner housing ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .



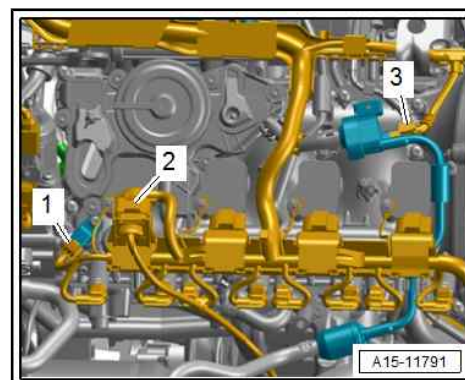
- If fitted, unplug electrical connector -2- for Lambda probe 1 after catalytic converter - GX7- -item 1- and move wiring clear.

Note:

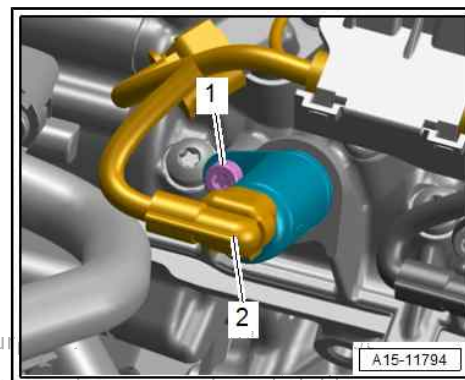
Installation position varies depending on model and version.



- Unplug electrical connectors and move wiring clear:
 - 1 - For Hall sender 3 - G300-
 - 2 - For Lambda probe 1 before catalytic converter - GX10- (take out of bracket)
 - 3 - For activated charcoal filter solenoid valve 1 - N80-
- Remove ignition coils ➔ [page 271](#) .

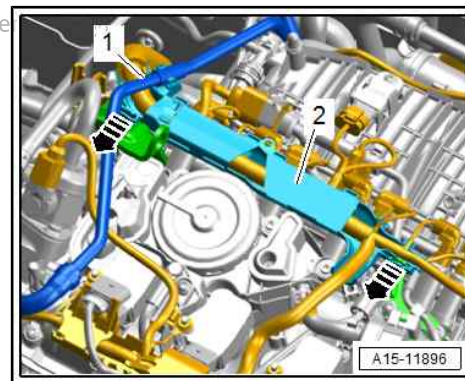


- Unplug electrical connector -2- at actuators for camshaft adjustment.



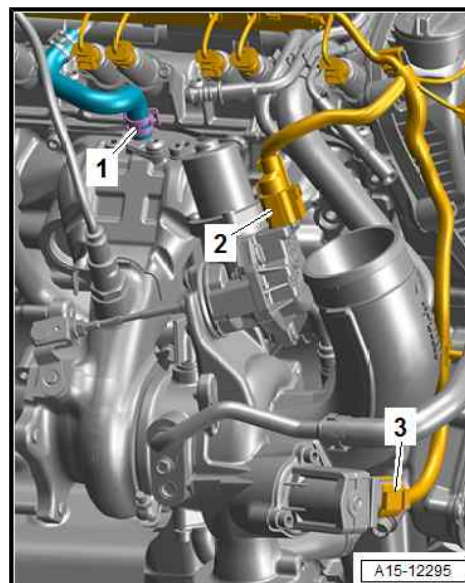
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- Move vacuum hose -1- and electrical wiring clear.
- Release retainers -arrows-, detach wiring duct -2- with electrical wiring harness and move to one side.





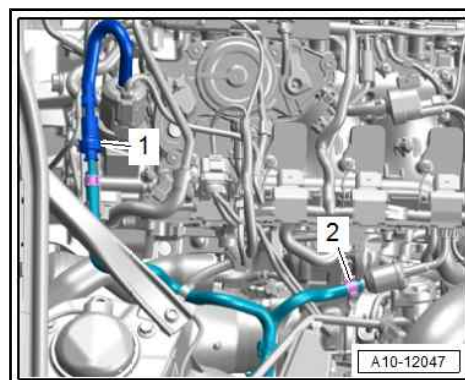
- Unplug electrical connectors:
- 2 - For charge pressure positioner - V465-
- 3 - For turbocharger air recirculation valve - N249-
- If necessary, release hose clip -1-, disconnect coolant hose and move hose clear.



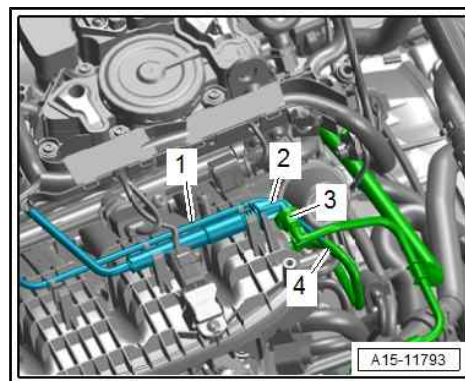
- Release hose clip -2- and disconnect hose for activated charcoal filter system.

Note:

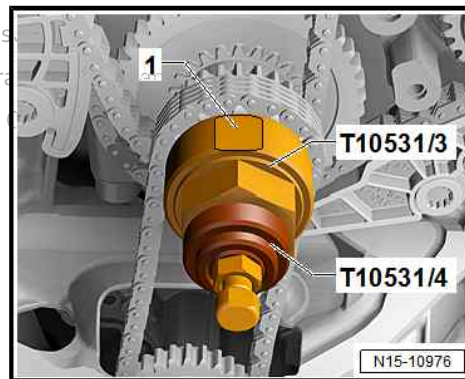
Installation position varies depending on model and version.



- Lift retaining clip -3-, detach coolant hose -2-, move it clear at cylinder head and push it to side.
- Detach vacuum hose -4-, disconnect vacuum line -1- for intake manifold flap valve - N316- and move clear at cylinder head.
- Remove oil separator ⇒ [page 152](#) .
- Remove high-pressure pump ⇒ [page 248](#) .
- Remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .
- Remove camshaft timing chain ⇒ [page 85](#) .

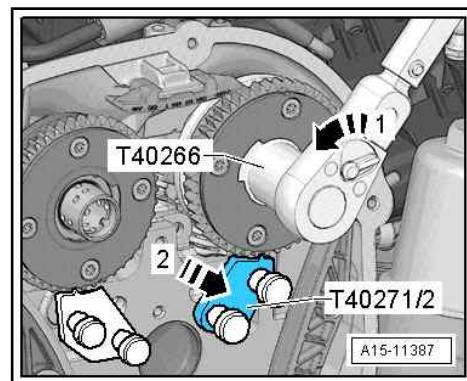


- Attach turning-over tool - T10531/3- . In "TDC" position, flat surface -1- faces upwards. Screw on flange nut - T10531/4- . Turn crankshaft 90° anti-clockwise out of "TDC" position using open-end spanner, 32 mm.

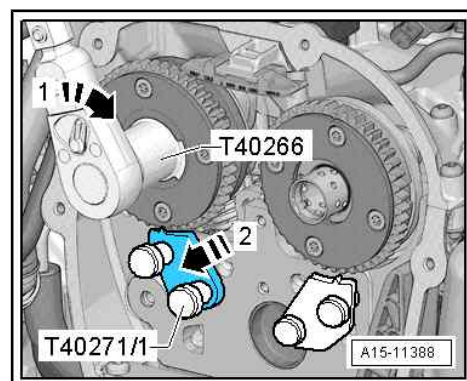




- Release tension on inlet camshaft slightly by turning it in direction of -arrow 1- with assembly tool - T40266- , pull camshaft clamp - T40271/2- out of teeth on chain sprocket -arrow 2- and bring camshaft into rest position.



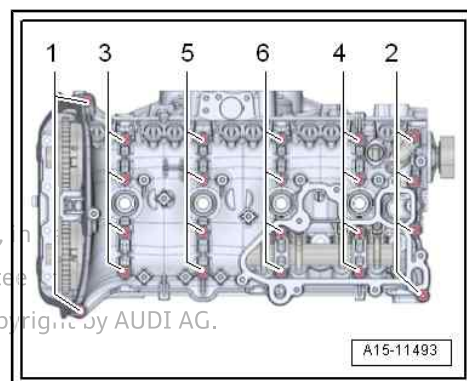
- Release tension on exhaust camshaft slightly by turning it in direction of -arrow 1- with assembly tool - T40266- , pull camshaft clamp - T40271/1- out of teeth on chain sprocket -arrow 2- and bring camshaft into rest position.



- Remove cylinder head cover bolts in the sequence -1 ... 6-.



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- Carefully release cylinder head cover -2- from bonded joint using a screwdriver -1- and detach it together with camshafts.



Note

Ensure that the camshafts do not fall out of the cylinder head cover.

- Detach camshafts and cover exposed parts of engine.
- If necessary for additional work, mark roller rocker fingers and hydraulic compensation elements for re-installation, remove them and place them on a clean surface.

Installing



Note

- ◆ *Crankshaft must not be at "TDC" position.*
- ◆ *After removing, renew bolts tightened with specified tightening angle.*
- Ensure that all roller rocker fingers make contact with the ends of the valve stems correctly and are clipped onto their respective hydraulic compensation elements.

If crankshaft has been rotated:

- Turn crankshaft to "TDC" position; V-shaped notch in three-part chain sprocket assembly should be aligned with an imaginary vertical line -arrows- centred between camshaft chain sprockets.
- Then turn crankshaft 90° anti-clockwise again out of "TDC" position.



Caution

Protect lubrication system and bearings against contamination.

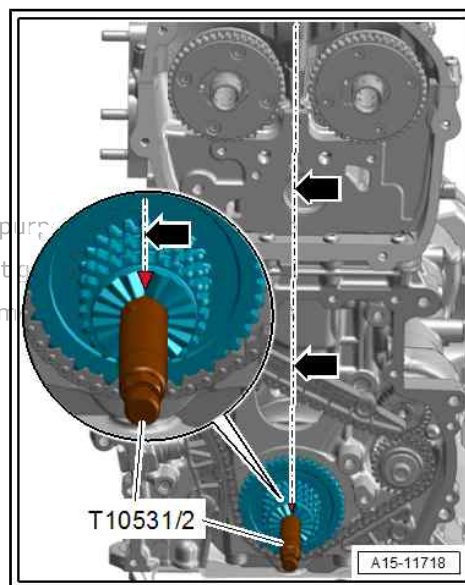
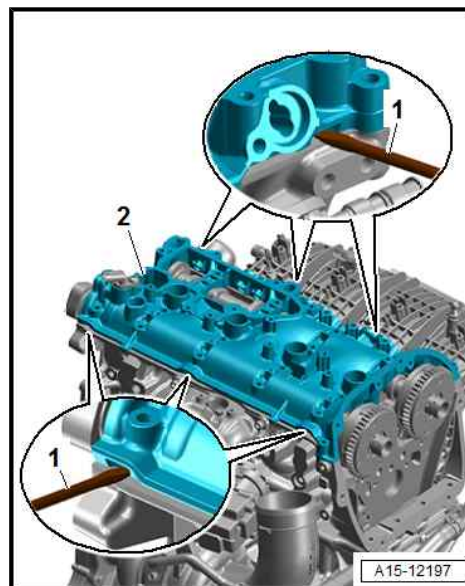
- ◆ *Cover exposed parts of the engine.*



WARNING

Risk of eye injury.

- ◆ *Put on safety goggles.*



- Remove sealant remaining on cylinder head with flat scraper.
- Remove sealant residue from groove in cylinder head cover and from sealing surfaces.
- Clean sealing surfaces; they must be free of oil and grease.

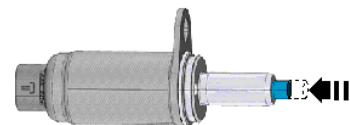


Caution

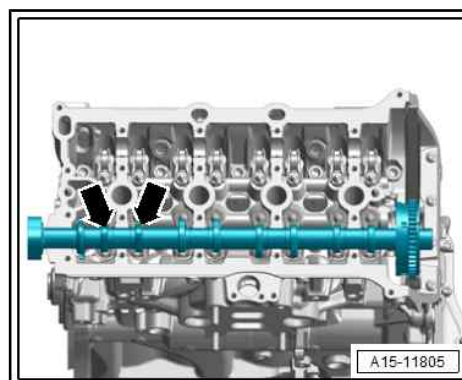
Risk of damage to engine.

- ◆ *Pins of actuators for camshaft adjustment must be brought into installation position.*

- Press down pins of actuators for camshaft adjustment -arrow- by hand.
- Pins of actuators must not be in extended position.
- Oil running surfaces of both camshafts with engine oil.
- Insert exhaust camshaft into cylinder head and rotate cams -arrows- of cylinder 4 so that they are at top.



A15-11338



A15-11805

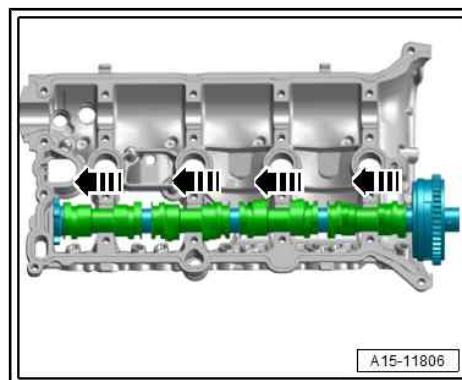


Caution

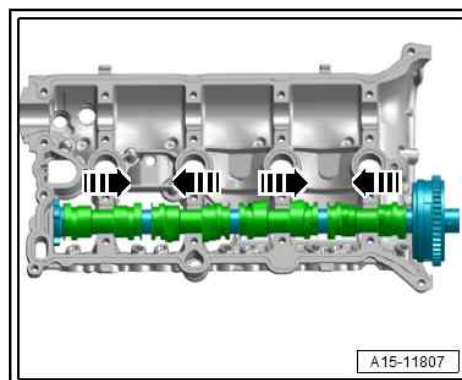
Risk of detaching spring-loaded ball for slider on camshaft.

- ◆ *Do not push sliders on inlet camshaft beyond their normal range of movement in either direction.*

- Insert inlet camshaft in cylinder head cover.
- The sliders must be pushed away from the chain sprocket -arrows-.
- With inlet camshaft fitted, push front and rear pairs of sliders towards one another -arrows-.



A15-11806

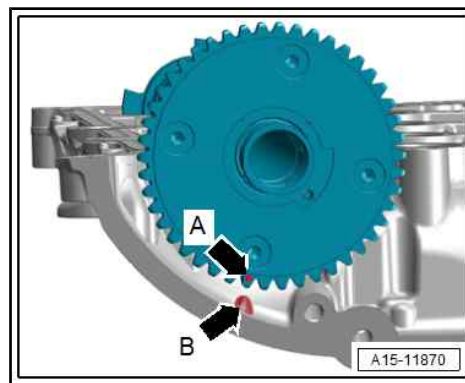


A15-11807

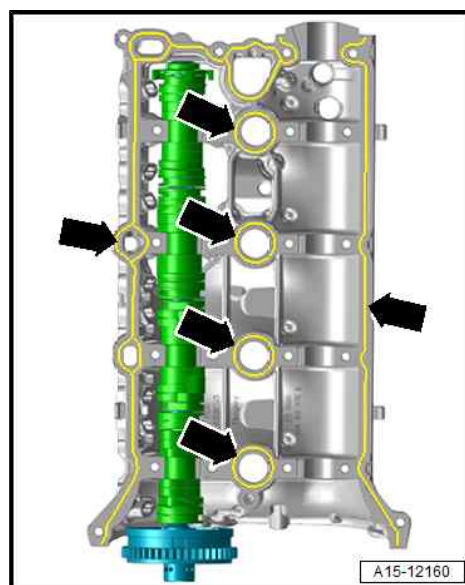




- Turn inlet camshaft to “TDC” position.
- The marking -arrow A- must be aligned with cast projection -arrow B- on cylinder head cover.



- Apply sealant as shown -arrows- onto clean sealing surface of cylinder head cover.
- ♦ Thickness of sealant bead: 1.5 ... 2.5 mm
- Hold camshaft in position and place cylinder head cover on cylinder head with camshaft fitted.

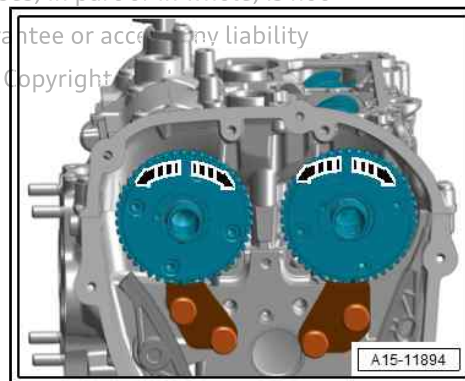


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- Press lightly on cylinder head cover with your hand and rotate camshafts back and forth slightly -arrows- until cylinder head cover comes into contact with cylinder head such that it is free of tension.
 - Tighten bolts in several stages ➔ [page 117](#) .

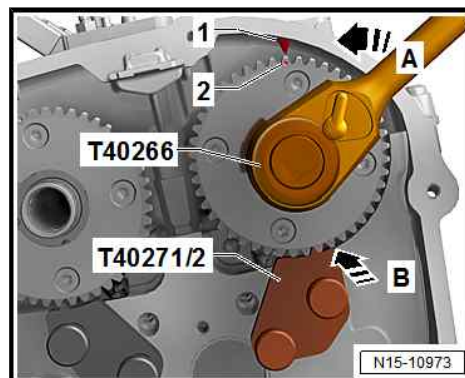


Note

Take care to keep cylinder head cover straight.



- Turn inlet camshaft in direction of -arrow A- using assembly tool - T40266- until markings -1- and -2- are aligned. Slide camshaft clamp - T40271/2- into teeth of chain sprocket -arrow B-.



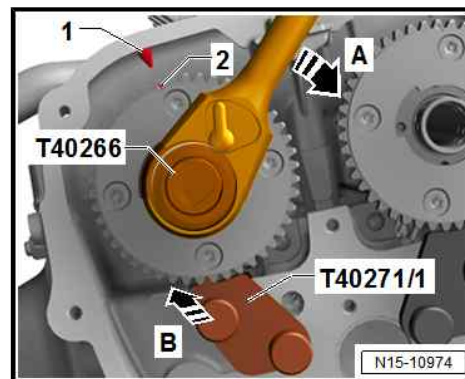


- Turn exhaust camshaft in direction of -arrow A- using assembly tool - T40266- until markings -1- and -2- are aligned. Slide camshaft clamp - T40271/1- into teeth of chain sprocket -arrow B-.



Note

Marking -2- is offset slightly to the right.



- Turn crankshaft at hexagon flats into “TDC” position.
- The flat surface -1- must be at the top.
- Remove flange nut - T10531/4- and turning-over tool - T10531/3- .

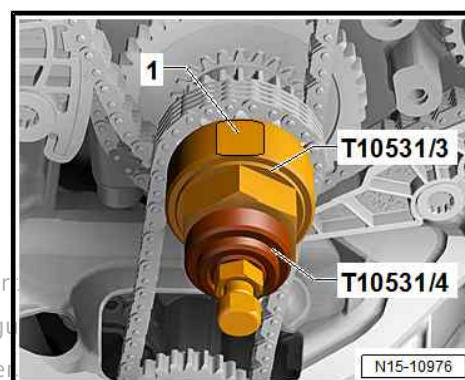
Remaining installation steps are carried out in reverse sequence; note the following:



Note

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Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .



- Install camshaft timing chain ⇒ [page 85](#) .
- Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .
- Install high-pressure pump ⇒ [page 248](#) .
- Install oil separator ⇒ [page 152](#)
- Install ignition coils ⇒ [page 271](#) .
- Install air cleaner housing ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .
- Install timing chain cover (top) ⇒ [page 72](#) .
- Connect coolant hoses with plug-in connectors ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiator/radiator fans; Exploded view - radiator/radiator fans .
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

Learnt values for chain elongation must be re-adapted after re-newing or removing and re-installing camshafts.

- Perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis].

Tightening torques

- ♦ ⇒ [“4.1 Exploded view - valve gear”, page 115](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.3 Installing ball for slider

Special tools and workshop equipment required



◆ Spacers - T40191-

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Installing

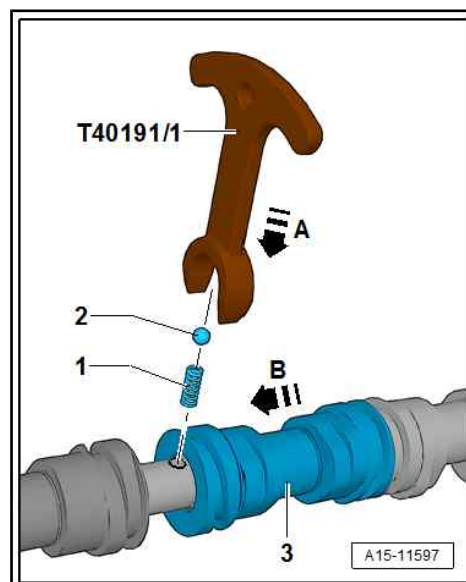


WARNING

Ball may spring out - risk of eye injury.

◆ *Put on safety goggles.*

- Insert spring -1- in camshaft.
- Place ball -2- on spring in camshaft.
- Push ball and spring downwards in direction of -arrow A- with spacer - T40191/1- and hold in place.
- Push slider -3- in direction of -arrow B-.



4.4 Removing and installing actuators for camshaft adjustment

Removing

- Remove engine cover panel ➤ [page 12](#) .
- Unplug relevant electrical connector -2-.
- Unscrew bolt -1- and detach actuator for camshaft adjustment.

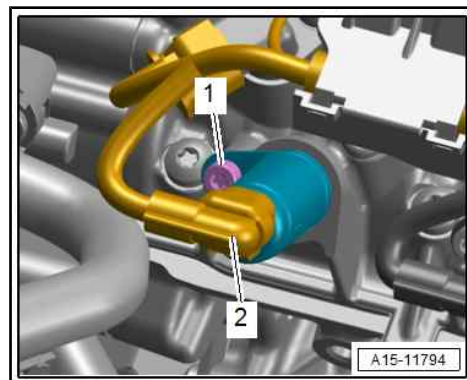
Installing

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



Note

Check O-rings for damage.





Caution

Risk of damage to engine.

- ◆ **Pin of actuator for camshaft adjustment must be brought into installation position.**

- Press down pin of actuator for camshaft adjustment -arrow- by hand.
- Pin of actuator must not be in extended position.
- Lubricate O-rings with engine oil.
- Install engine cover panel ➔ [page 12](#) .

Tightening torques

- ◆ ➔ ["4.1 Exploded view - valve gear", page 115](#)

4.5 Removing and installing camshaft control valve 1 - N205-

The description applies to camshaft control valve 1 - N205- and exhaust camshaft control valve 1 - N318- .

Removing

Preparatory work may be necessary depending on model ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Valve gear; Removing and installing camshaft control valve 1 - N205- .

- Unplug electrical connectors:
- 1 - For exhaust camshaft control valve 1 - N318-
- 3 - For camshaft control valve 1 - N205-
- Remove bolts -arrows- and detach camshaft control valves:
- 2 - Exhaust camshaft control valve 1 - N318-
- 4 - Camshaft control valve 1 - N205-

Installing

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



Note

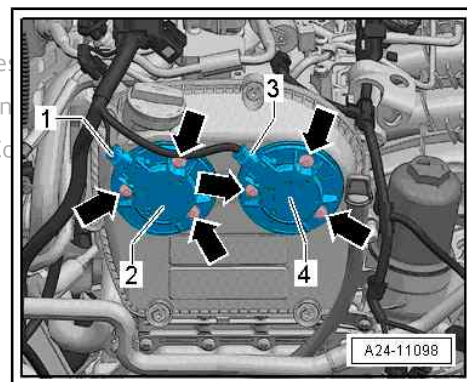
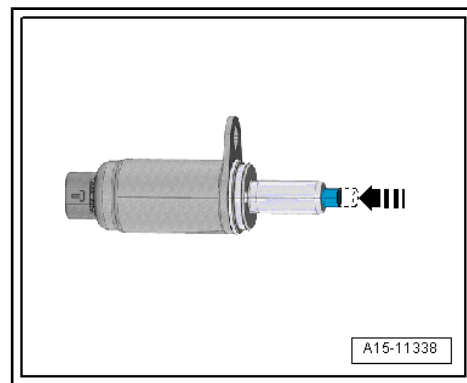
Renew seals and O-rings after removing.

- Use engine oil to lubricate O-rings on sealing surface for camshaft control valve.

Additional work depending on model ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Valve gear; Removing and installing camshaft control valve 1 - N205- .

Tightening torques

- ◆ ➔ ["1.1 Exploded view - timing chain cover", page 70](#)





4.6 Removing and installing valve stem oil seals

⇒ ["4.6.1 Removing and installing valve stem oil seals \(cylinder head installed\)", page 128](#)

⇒ ["4.6.2 Removing and installing valve stem oil seals \(cylinder head removed\)", page 132](#)

4.6.1 Removing and installing valve stem oil seals (cylinder head installed)

Special tools and workshop equipment required

- ◆ Spark plug spanner - 3122B-



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- ◆ Valve stem seal puller - 3364-



- ◆ Valve stem oil seal fitting tool - 3365- for valve stem oil seal with one sealing lip ⇒ [page 118](#)





- ◆ Valve stem oil seal fitting tool - T40376/1- for valve stem oil seal with two sealing lips ➤ [page 118](#)



- ◆ Removal and installation device for valve cotters - VAS 5161 A- with guide plate -VAS 5161/19C-



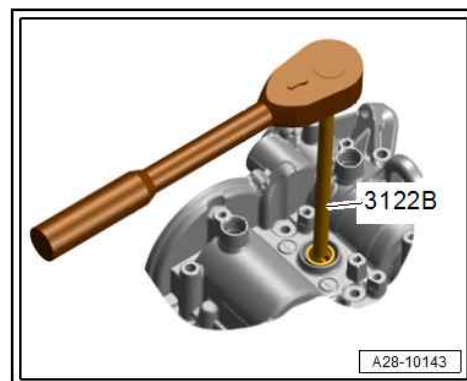
- ◆ Adapters - T40012-



- ◆ Assembly sleeve ➤ Electronic parts catalogue

Removing

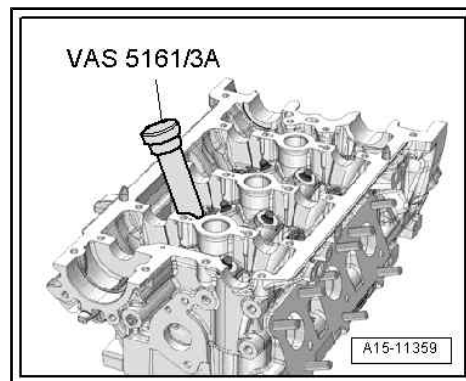
- Remove camshafts ➤ [page 118](#) .
- Remove spark plugs with spark plug spanner - 3122B- .
- Set piston of appropriate cylinder to “bottom dead centre”.



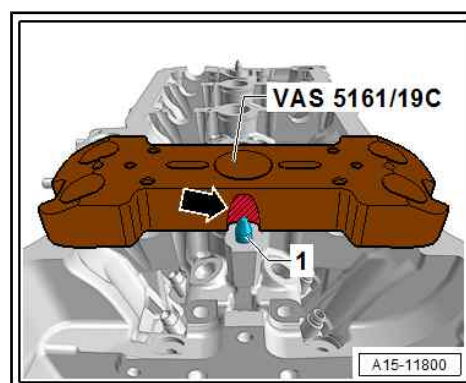
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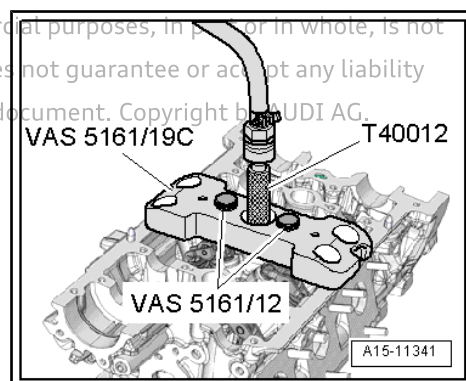
- Apply drift -VAS 5161/3A- to valve spring plate and use plastic-headed hammer to release sticking valve cotteners.



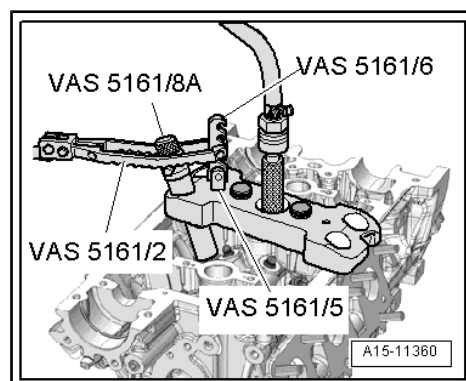
- Check whether there is a recess -arrow-.
- If necessary, machine guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- -arrow- so that guide plate rests on cylinder head and guide pin -1- does not make contact.



- Secure guide plate with knurled screws -VAS 5161/12- or commercial purposes, in part or in whole, is not permitted without the prior written consent of AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
- Screw adapter T40012 into spark plug thread.
- Connect adapter to compressed air line using a commercially available connection piece and apply constant air pressure.
- Minimum pressure: 6 bar



- Screw snap-in device -VAS 5161/6- with engaging fork -VAS 5161/5- into guide plate.
- Insert assembly cartridge -VAS 5161/8A- in guide plate.
- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotteners.
- Move knurled screw back and forth slightly; the valve cotteners are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork.
- Take out assembly cartridge.
- Detach guide plate and turn to one side.
- The compressed air hose remains connected.
- Detach valve spring with valve spring plate.

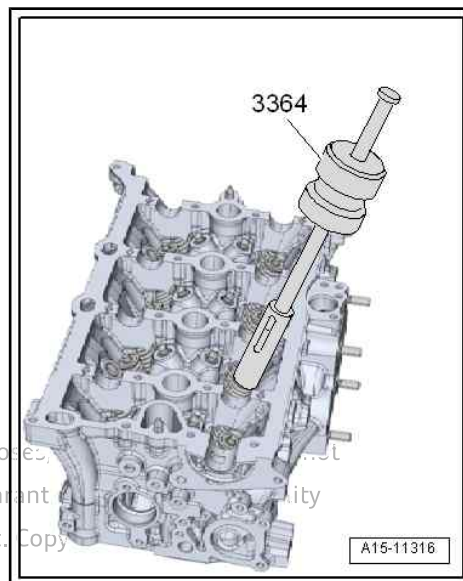




- Pull off valve stem oil seal with valve stem seal puller - 3364- .

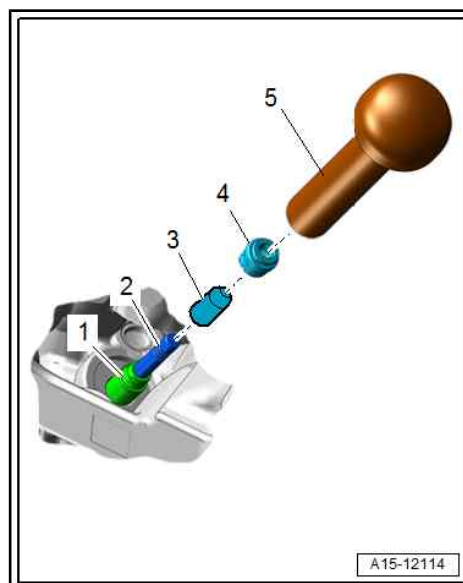


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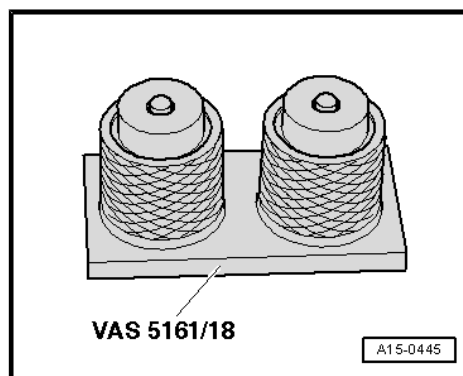
Installing

- To avoid damaging the new valve stem oil seal -4- during installation, fit the assembly sleeve -3- onto the valve stem -2-.
- Lightly oil sealing lip of valve stem oil seal.
- Use either pusher - 3365- or pusher - T40376/1- , depending on version/manufacturer of valve stem oil seal.
- Insert valve stem oil seal into valve stem oil seal fitting tool -5- and use assembly sleeve to press it carefully onto valve guide -1- as far as stop.
- Remove assembly sleeve .



If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

- Larger diameter of valve cotters faces upwards.
- Press assembly cartridge onto insertion device from above and take up valve cotters.
- Insert valve spring and valve spring plate ➔ [page 118](#) .



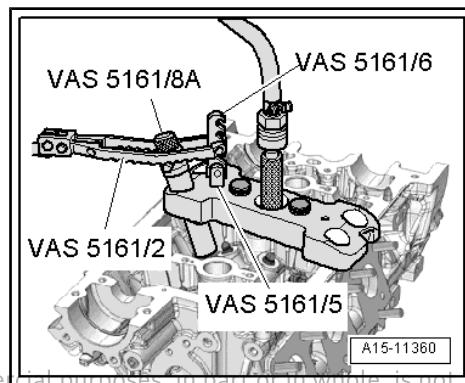


- Secure guide plate -VAS 5161/19C- back onto cylinder head.
- Insert assembly cartridge in guide plate.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotter.
- Release pressure fork with knurled screw still in pulled position.
- Repeat procedure for each valve.

Assembling

Assembly is performed in reverse sequence; note the following:

- Install camshafts ➔ [page 118](#)
- Install spark plugs ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 28 ; Ignition system; Exploded view - ignition system .



Caution

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

- ◆ ***The hydraulic tappets have to settle; wait for approx. 30 minutes after installing camshafts before starting engine.***

4.6.2 Removing and installing valve stem oil seals (cylinder head removed)

Special tools and workshop equipment required

- ◆ Valve stem seal puller - 3364-



- ◆ Valve stem oil seal fitting tool - 3365- for valve stem oil seal with one sealing lip ➔ [page 118](#)





- ◆ Valve stem oil seal fitting tool - T40376/1- for valve stem oil seal with two sealing lips ⇒ [page 118](#)



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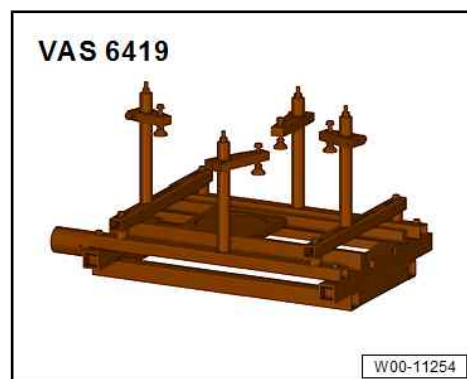
- ◆ Removal and installation device for valve cotters - VAS 5161 A- with guide plate -VAS 5161/19C-



- ◆ Engine and gearbox support - VAS 6095A-



- ◆ Cylinder head tensioning device - VAS 6419-



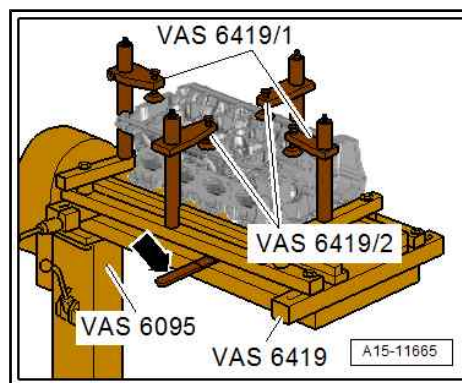
- ◆ Assembly sleeve ⇒ Electronic parts catalogue

Removing

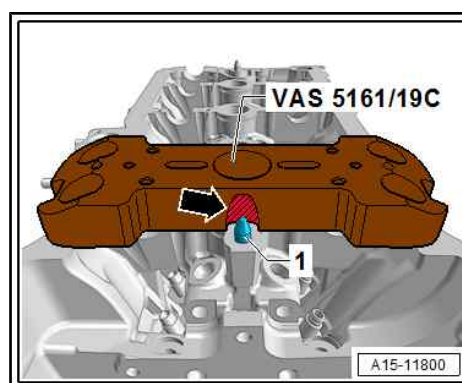
- Remove intake manifold ⇒ [page 204](#) .



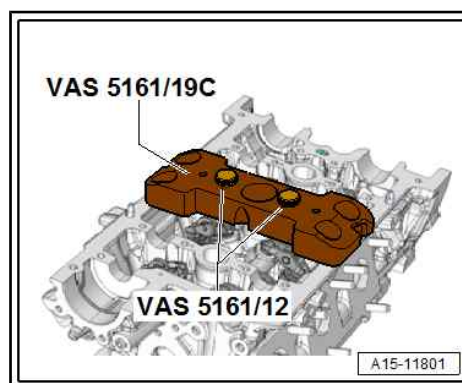
- Insert cylinder head tensoning device - VAS 6419- into engine and gearbox support - VAS 6095A- .
- Secure cylinder head in cylinder head tensoning device, as shown in illustration.
- Connect cylinder head tensoning device to compressed air supply.
- Using lever -arrow-, slide air pad under combustion chamber where valve stem oil seal is to be removed.
- Apply just enough compressed air to bring air pad into contact with valve heads.



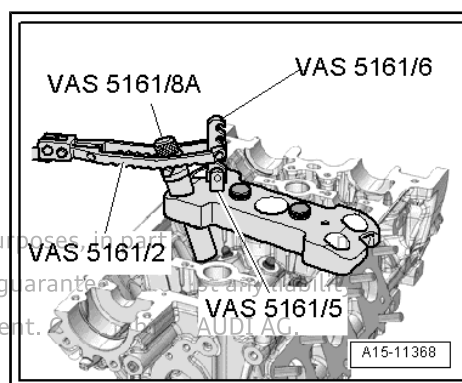
- Check whether there is a recess -arrow-.
- If necessary, machine guide plate for 2.0 ltr. and 3.0 ltr. FSI engine - VAS 5161/19C- -arrow- so that guide plate rests on cylinder head and guide pin -1- does not make contact.



- Secure guide plate with knurled screws -VAS 5161/12- .
- Insert drift -VAS 5161/3- into guide plate and use plastic-headed hammer to release sticking valve cotters.



- Screw snap-in device -VAS 5161/6- with engaging fork - VAS 5161/5- into guide plate.
- Insert assembly cartridge -VAS 5161/8A- in guide plate.
- Attach pressure fork -VAS 5161/2- to snap-in device and push assembly cartridge down.
- At the same time, turn knurled screw of assembly cartridge clockwise until tips engage in valve cotters.
- Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.
- Release pressure fork.
- Take out assembly cartridge.
- Detach guide plate and turn to one side.
- Detach valve spring with valve spring plate.

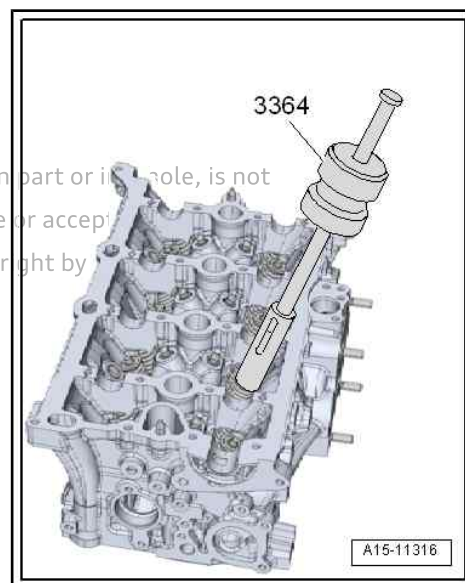




- Pull off valve stem oil seal with valve stem seal puller - 3364- .

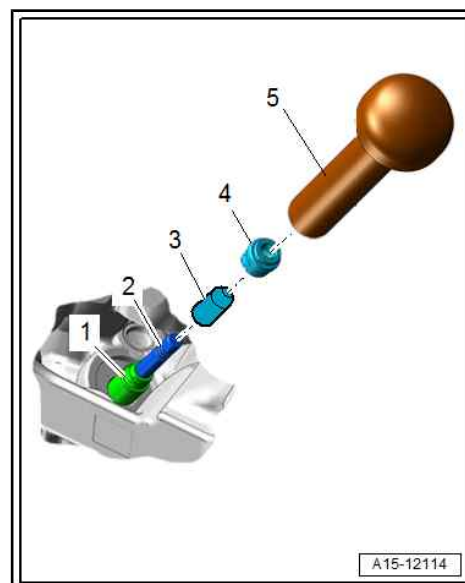


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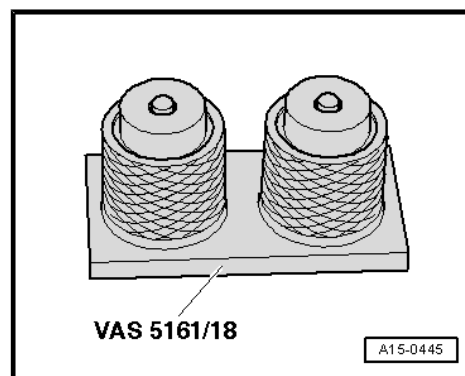
Installing

- To avoid damaging the new valve stem oil seal -4- during installation, fit the assembly sleeve -3- onto the valve stem -2-.
- Lightly oil sealing lip of valve stem oil seal.
- Use either pusher - 3365- or pusher - T40376/1- , depending on version/manufacturer of valve stem oil seal.
- Insert valve stem oil seal into valve stem oil seal fitting tool -5- and use assembly sleeve to press it carefully onto valve guide -1- as far as stop.
- Remove assembly sleeve .



If valve cotters have been removed from assembly cartridge, they must first be inserted in insertion device -VAS 5161/18- .

- Larger diameter of valve cotters faces upwards.
- Press assembly cartridge onto insertion device from above and take up valve cotters.
- Insert valve spring and valve spring plate ➔ [page 118](#) .

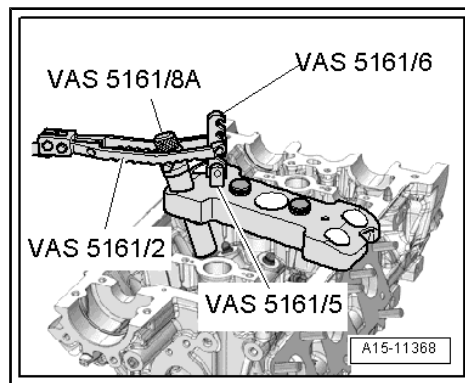




- Secure guide plate -VAS 5161/19C- back onto cylinder head.
- Insert assembly cartridge in guide plate.
- Press down pressure fork and pull knurled screw upwards while turning screw in both directions - this will insert the valve cotters.
- Release pressure fork with knurled screw still in pulled position.
- Repeat procedure for each valve.

Assembling

- Install intake manifold ⇒ [page 204](#) .



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5 Inlet and exhaust valves

⇒ ["5.1 Checking valve guides", page 137](#)

⇒ ["5.2 Checking valves", page 138](#)

⇒ ["5.3 Valve dimensions", page 138](#)

5.1 Checking valve guides

Special tools and workshop equipment required

- ◆ Universal dial gauge bracket - VW 387-



- ◆ Dial gauge - VAS 6079-



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Test sequence



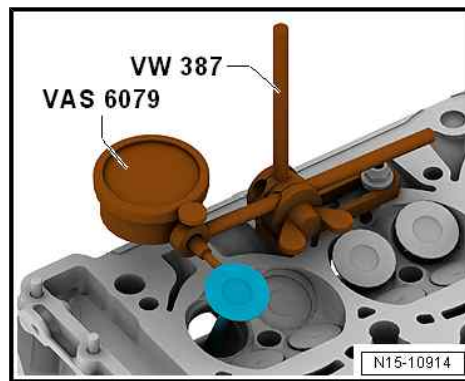
Note

- ♦ If the valve has to be renewed as part of a repair, use a new valve for the measurement.
- ♦ Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide, as the stem diameters are different.
- Insert valve into guide.
- End of valve stem must be flush with valve guide.
- Measure the amount of sideways play.
- Wear limit: 0.6 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 renewed.



5.2 Checking valves

- Visually inspect for scoring on valve stems and valve seat surfaces.
- Renew valve if scoring is clearly visible.

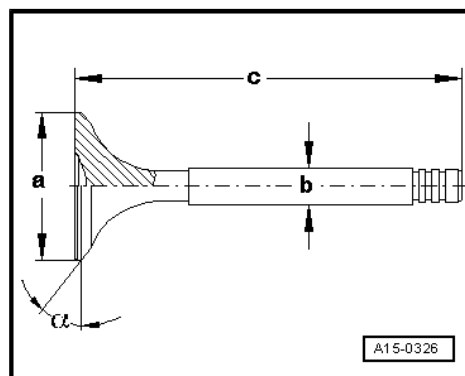
5.3 Valve dimensions



Note

Inlet and exhaust valves must not be machined. Only grinding-in is permitted.

Dimension		Inlet valve	Exhaust valve
Ø a	mm	33.85 ± 0.10	28.0 ± 0.1
Ø b	mm	5.92 ± 0.02	5.92 ± 0.02
c	mm	103.97	101.87
α	°	45	45





17 – Lubrication

1 Sump/oil pump

⇒ [“1.1 Exploded view - sump/oil pump”, page 139](#)

⇒ [“1.2 Engine oil”, page 142](#)

⇒ [“1.3 Removing and installing sump \(bottom section\)”, page 142](#)

⇒ [“1.4 Removing and installing oil pump”, page 143](#)

⇒ [“1.5 Removing and installing sump \(top section\)”, page 145](#)

⇒ [“1.6 Removing and installing oil level and oil temperature sender G266”, page 148](#)

1.1 Exploded view - sump/oil pump



Note

If large quantities of metal shavings or particles are found in the engine oil when repairing the engine, the oil passages must be cleaned carefully in order to prevent further damage occurring later. In addition, renew oil spray jets, engine oil cooler and oil filter.



1 - Nut

- ☐ 9 Nm

2 - Oil level and oil temperature sender - G266-

- ☐ Removing and installing
⇒ [page 148](#)

3 - Seal

- ☐ Renew after removing

4 - Bolt

- ☐ Renew after removing
- ☐ Tightening sequence
⇒ [page 141](#)

5 - Sump (bottom section)

- ☐ Removing and installing
⇒ [page 142](#)

6 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

7 - Sealing plug

- ☐ Turn as far as stop

8 - Gasket

- ☐ Renew after removing

9 - Bolt

- ☐ Renew after removing
- ☐ 4 Nm +45°

10 - Suction pipe

- ☐ Clean strainer if dirty

11 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

12 - Oil pump

- ☐ Removing and installing ⇒ [page 143](#)

13 - Centring sleeve

- ☐ 2x
- ☐ For oil pump

14 - O-ring

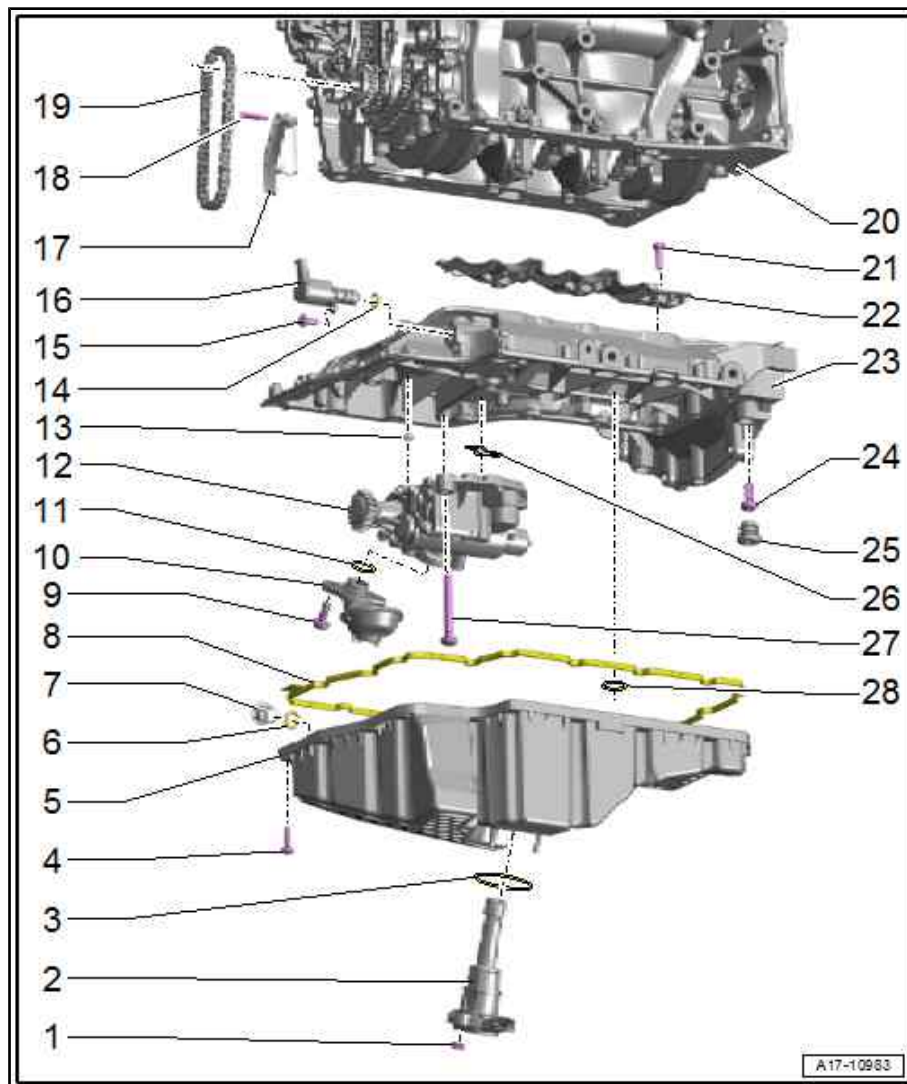
- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

15 - Bolt

- ☐ Renew after removing
- ☐ Tightening torque ⇒ [Item 1 \(page 155\)](#)

16 - Valve for oil pressure control - N428-

- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 161](#)





17 - Chain tensioner

18 - Guide pin

- ☐ 9 Nm

19 - Drive chain for oil pump

- ☐ Mark direction of rotation before removing

20 - Cylinder block

21 - Bolt

- ☐ Renew after removing
- ☐ 4 Nm +45°

22 - Baffle plate

23 - Sump (top section)

- ☐ Removing and installing ⇒ [page 145](#)

24 - Bolt

- ☐ Renew after removing
- ☐ Tightening sequence ⇒ [page 142](#)

25 - Plug

- ☐ 3x

26 - Oil strainer

27 - Bolt

- ☐ Renew after removing
- ☐ 8 Nm +90°

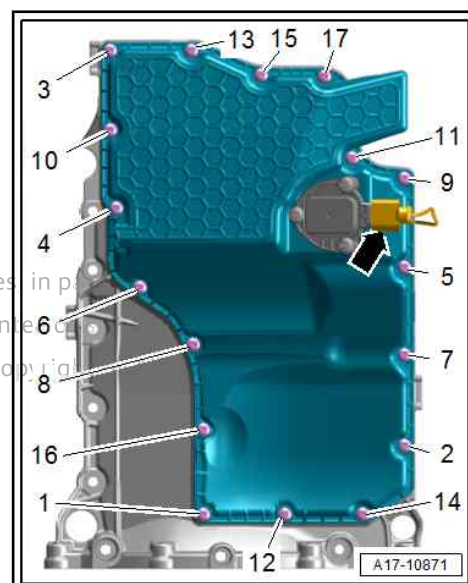
28 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

Sump (bottom section) - tightening torques and sequence

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 ... 17-	Screw in by hand until contact is made
2.	-1 ... 17-	8 Nm
3.	-1 ... 17-	Turn 90° further

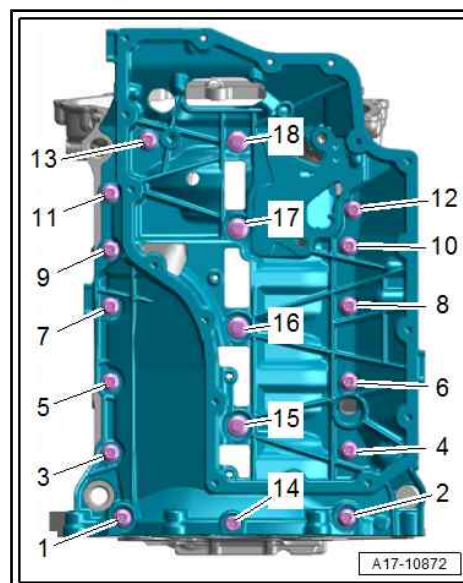




Sump (top section) - tightening torques and sequence

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 ... 18-	8 Nm
2.	-1 ... 13-	Turn 45° further
3.	-14 ... 18-	Turn 90° further



1.2 Engine oil

- ♦ Draining and filling up engine oil, checking oil level, removing and installing oil filter element ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Sump/oil pump; Engine oil

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- ♦ Oil capacities, oil specifications and viscosity grades ⇒ Main-tenance tables .

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1.3 Removing and installing sump (bottom section)

Removing

- Engine oil drained ⇒ [page 142](#) .

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Sump/oil pump; Removing and installing sump (bottom section) .



- Unplug electrical connector -arrow- for oil level and oil temperature sender - G266- .
- Unscrew bolts -1 ... 17- and detach sump (bottom section).
- If renewing sump (bottom section), remove oil level and oil temperature sender - G266- ⇒ [page 148](#) .

Installing

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



Note

Renew seal and O-ring after removal.

- Fill with engine oil and check oil level ⇒ [page 142](#) .

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Sump/oil pump; Removing and installing sump (bottom section)

Tightening torques

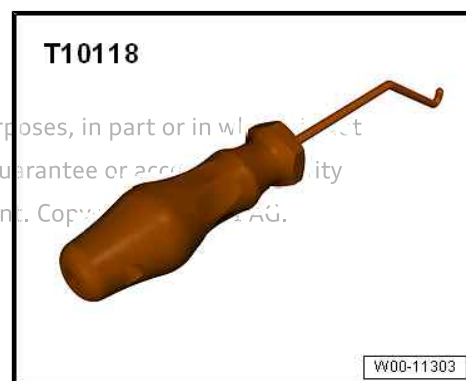
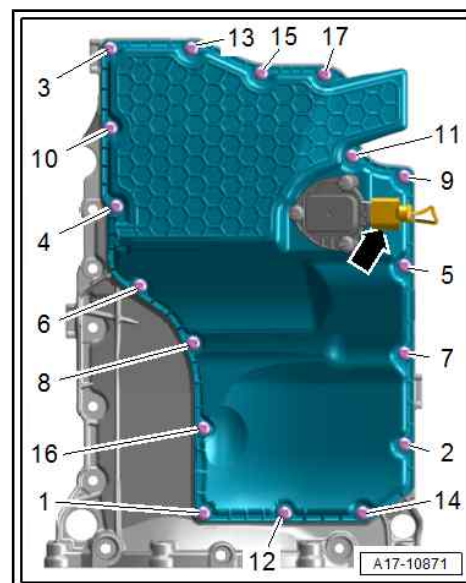
- ◆ ⇒ [Fig. ““Sump \(bottom section\) - tightening torques and sequence””, page 141](#)
- ◆ ⇒ [“1.1 Exploded view - sump/oil pump”, page 139](#)

1.4 Removing and installing oil pump

Special tools and workshop equipment required

- ◆ Assembly tool - T10118-

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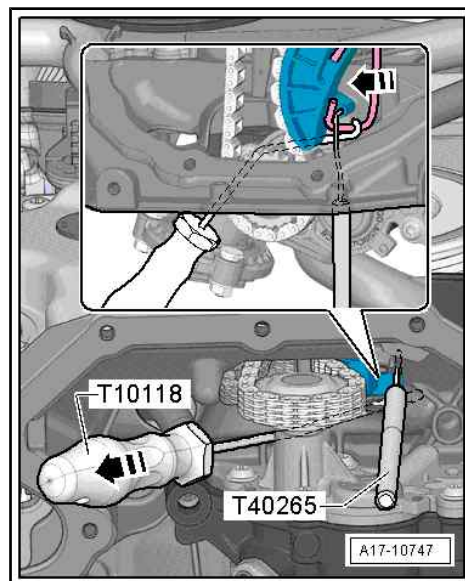
- ◆ Locking tool - T40265-





Removing

- Remove sump (bottom section) ➔ [page 142](#) .
- Using assembly tool - T10118- , pull support wire of spring for chain tensioner in direction of -arrow- and secure in place with locking tool - T40265- .

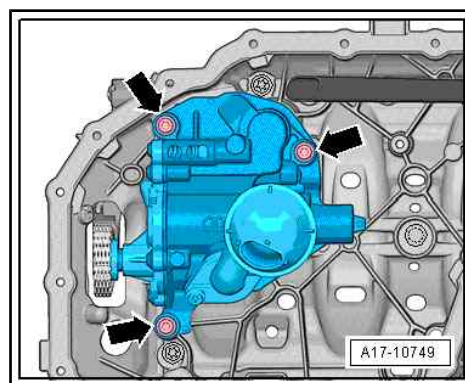


- Remove bolts -arrows- and detach oil pump.

Installing

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

- Check that both centring sleeves are fitted in oil pump.
- Before installing, check passages in sump (top section) and strainer ➔ [Item 26 \(page 141\)](#) in oil pump for dirt.
- Guide oil pump sprocket into drive chain and install oil pump.



Caution

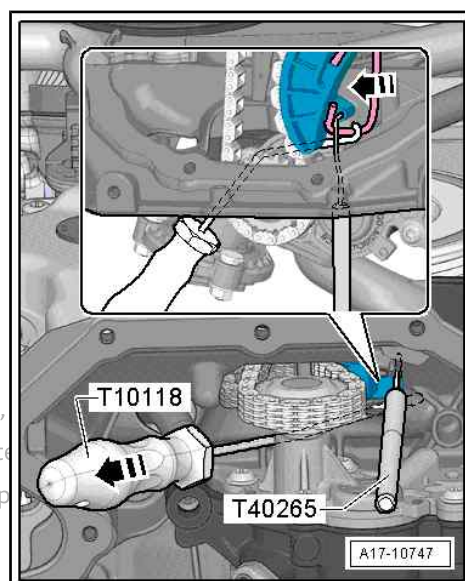
Risk of irreparable damage to engine.

- ◆ ***The following step must be performed to ensure that spring of chain tensioner returns to installation position:***

- Using assembly tool - T10118- , pull support wire of spring for chain tensioner in direction of -arrow- and remove locking tool - T40265- .



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- Check position of chain tensioner support wire.
- The support wire -2- must rest on cast projection -1- on sump (top section), as shown -arrow-.



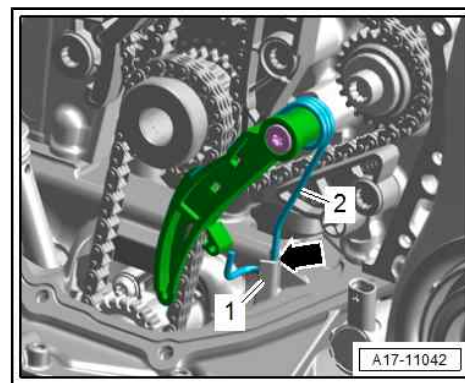
Note

Shown in illustration with timing chain cover (bottom) removed.

- Install sump (bottom section) ⇒ [page 142](#) .

Tightening torques

- ♦ ⇒ [“1.1 Exploded view - sump/oil pump”, page 139](#)



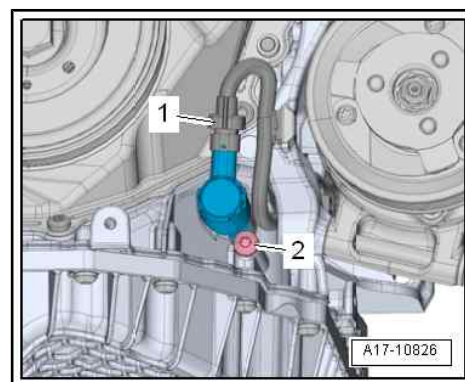
1.5 Removing and installing sump (top section)

Special tools and workshop equipment required

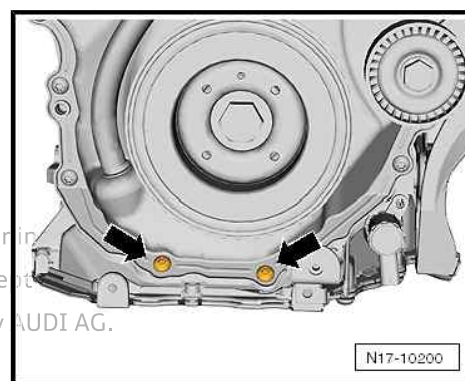
- ♦ Electric drill with plastic brush
- ♦ Safety goggles
- ♦ Sealant ⇒ Electronic parts catalogue

Removing

- Gearbox removed ⇒ Gearbox; Rep. gr. 34 ; Removing and installing gearbox; Removing gearbox .
- Remove sealing flange (gearbox end) ⇒ [page 41](#) .
- Remove sump (bottom section) ⇒ [page 142](#) .
- Remove oil pump ⇒ [page 143](#) .
- Unplug electrical connector -1- for valve for oil pressure control - N428- .



- Remove bolts -arrows-.



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- Use the 3 bolts to pull out plugs.
- Unscrew bolts -1 ... 18- and remove sump (top section).



Caution

Risk of damage to timing chain cover.

- ◆ **Lever off sump (top section) at gearbox end first. Be careful when levering off.**

Installing



Note

After removing, renew bolts that were tightened with specified tightening angle.

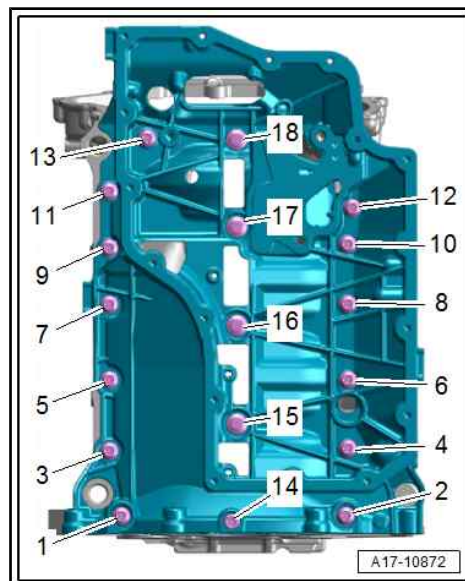
- Remove sealant remaining on cylinder block with flat scraper.



WARNING

Risk of eye injury.

- ◆ **Put on safety goggles.**



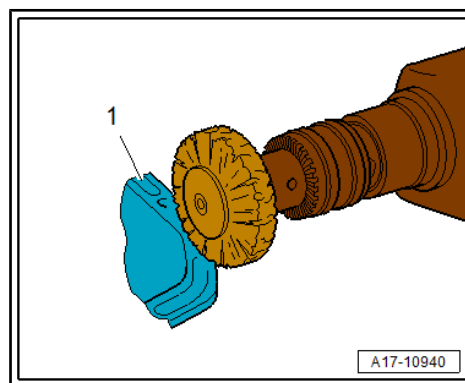
- Remove residual sealant on sump (top section) and timing chain cover (bottom) -1- using rotating plastic brush or similar.



Note

Check whether timing chain cover is deformed. For this purpose, first fit sump (top section) without sealant and determine gap between cover and sump (top section). If the cover is deformed and cannot be straightened, renew cover after installing sump (top section).

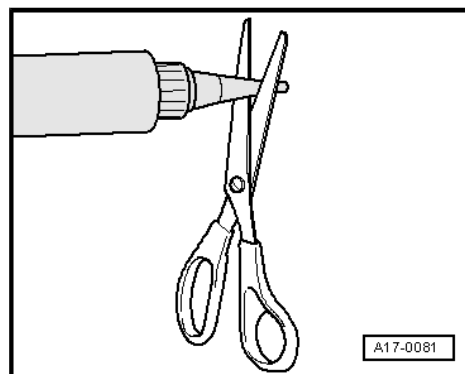
- Clean sealing surfaces; they must be free of oil and grease.
- Check oil passages in sump (top section) and in crankcase for dirt.



Note

Note expiry date of sealant.

- Cut off nozzle of tube at front marking (nozzle Ø approx. 2 mm).





- If previously removed, install baffle plate
⇒ [Item 22 \(page 141\)](#) .

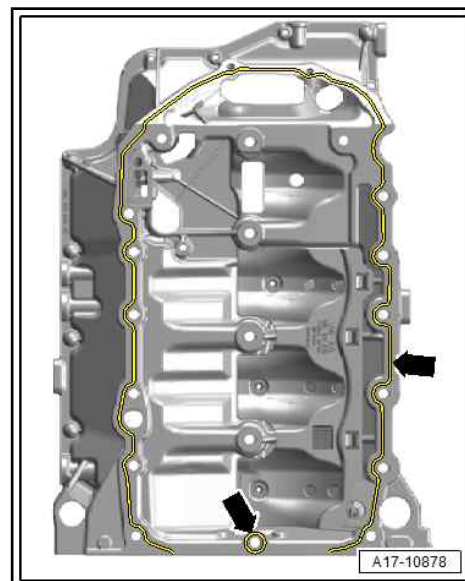


Caution

Make sure lubrication system is not clogged by excess sealant.

- ◆ ***The sealant bead must not be thicker than specified.***

- ◆ Thickness of sealant bead: 2 ... 3 mm
- Apply sealant as shown -arrows- onto clean sealing surface of sump (top section).



- Apply sealant between cylinder block and timing chain cover (bottom) -arrows-.



Note

The sump (top section) must be installed within 5 minutes after applying sealant.

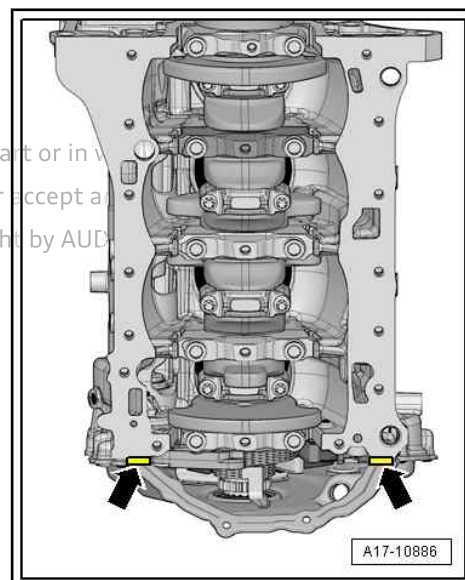
- Sump (top section) and cylinder block must be flush at gearbox end.
- Immediately fit sump (top section) and tighten bolts.

Remaining installation steps are carried out in reverse sequence; note the following:

- Install sealing flange (gearbox end) ⇒ [page 41](#) .
- Install oil pump ⇒ [page 143](#) .

Tightening torques

- ◆ ⇒ [Fig. "Sump \(top section\) - tightening torques and sequence"](#) , [page 142](#)
- ◆ ⇒ [Item 17 \(page 71\)](#)





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

Removing

- Engine oil drained ⇒ [page 142](#) .
- Unplug electrical connector -2-.
- Remove nuts -1- and detach oil level and oil temperature sender - G266- -item 3-.

Installing

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



Note

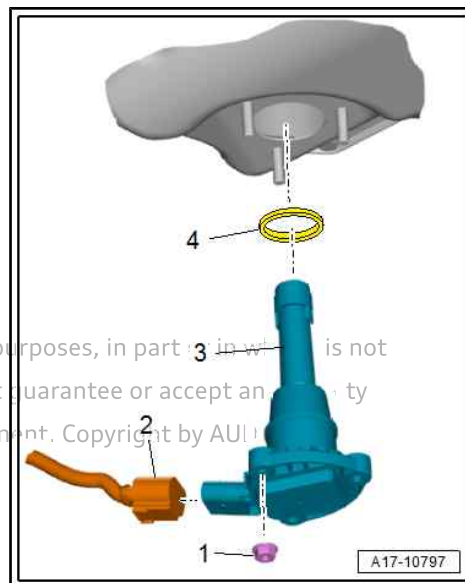
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Renew seal -4- after removing.

- Fill with engine oil and check oil level ⇒ [page 142](#) .

Tightening torques

- ♦ ⇒ [“1.1 Exploded view - sump/oil pump”, page 139](#)





2 Engine oil cooler

⇒ [“2.1 Exploded view - engine oil cooler”, page 149](#)

⇒ [“2.2 Removing and installing engine oil cooler”, page 150](#)

⇒ [“2.3 Removing and installing mechanical switching valve”, page 150](#)

2.1 Exploded view - engine oil cooler

1 - Bracket for ancillaries

- ☐ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ☐ Removing and installing
⇒ [page 35](#)

2 - Gasket

- ☐ Renew after removing

3 - O-rings

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

4 - Mechanical switching valve

- ☐ Removing and installing
⇒ [page 150](#)

5 - Engine oil cooler

- ☐ See note ⇒ [page 139](#)
- ☐ Removing and installing
⇒ [page 150](#)

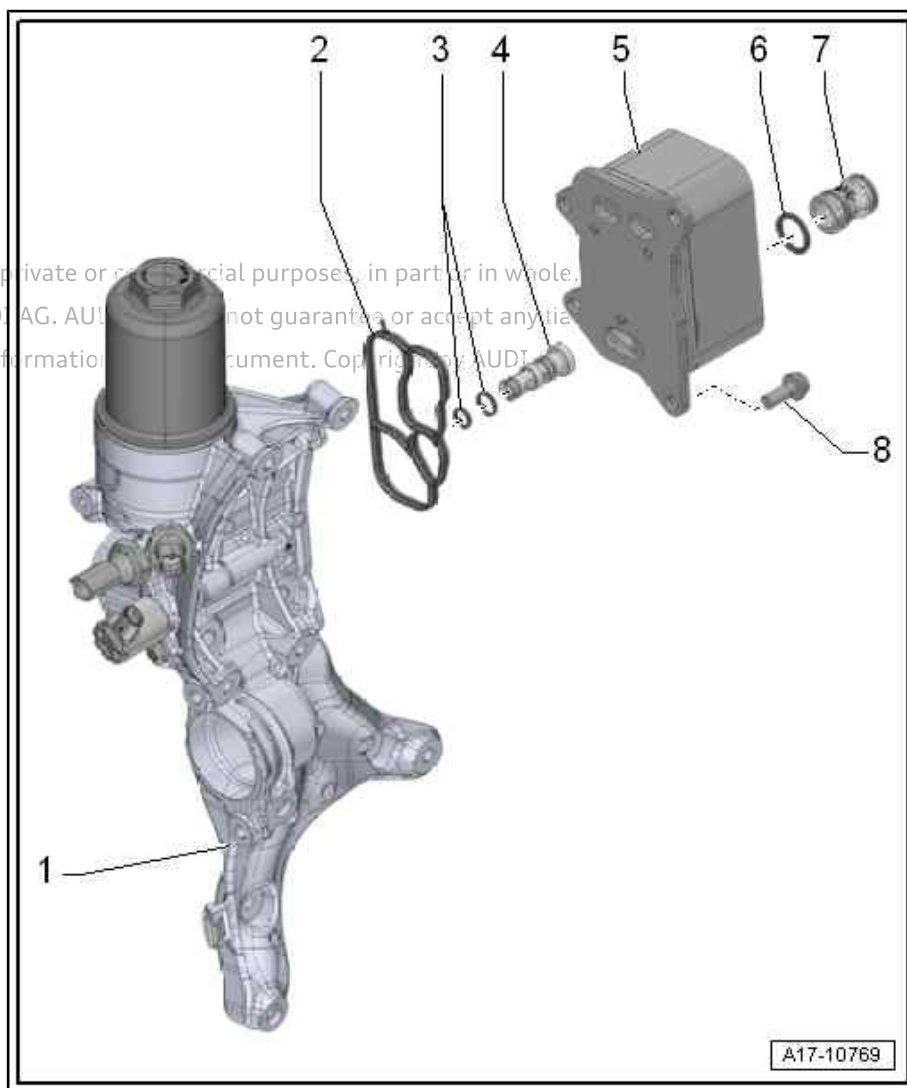
6 - Seal

- ☐ Renew after removing
- ☐ Lubricate with coolant

7 - Connection

8 - Bolt

- ☐ Renew after removing
- ☐ 8 Nm +45°





2.2 Removing and installing engine oil cooler

Removing

- Remove bracket for ancillaries ➤ [page 35](#) .
- Unscrew bolts -4, 5- and detach engine oil cooler -3- with gasket -2- from bracket for ancillaries -1-.

Installing

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



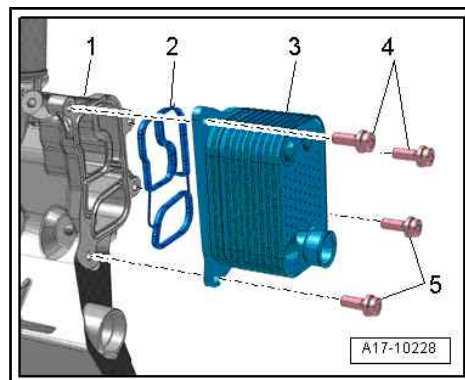
Note

Renew gasket after removing.

- Install bracket for ancillaries ➤ [page 35](#) .

Tightening torques

- ♦ ➤ [“2.1 Exploded view - engine oil cooler”, page 149](#)



2.3 Removing and installing mechanical switching valve

Removing

- Remove engine oil cooler ➤ [page 150](#) .
- Take mechanical switching valve -1- out of bracket for ancillaries -arrow-.

Installing

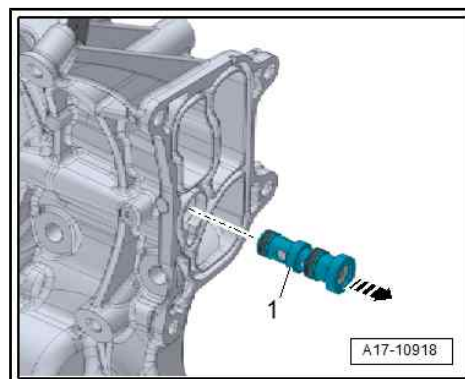
Installation is carried out in reverse order; note the following:



Note

Renew O-rings after removing.

- Lightly lubricate O-rings of mechanical switching valve with engine oil and install.
- Install engine oil cooler ➤ [page 150](#) .



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3 Crankcase breather

⇒ [“3.1 Exploded view - crankcase breather system”, page 151](#)

⇒ [“3.2 Removing and installing oil separator”, page 152](#)

3.1 Exploded view - crankcase breather system

1 - Cylinder head cover

2 - Gasket

- ☐ Renew after removing

3 - Hose

- ☐ To activated charcoal filter solenoid valve 1 - N80-

4 - Oil separator

- ☐ Removing and installing
 ⇒ [page 152](#)

5 - Seal

- ☐ Renew after removing

6 - Hose

- ☐ For crankcase breather
- ☐ To turbocharger

7 - Bolt

- ☐ Thread-forming
- ☐ Fit and screw in bolt by hand so that it is screwed into old thread. Then tighten bolt to torque
- ☐ 4 Nm

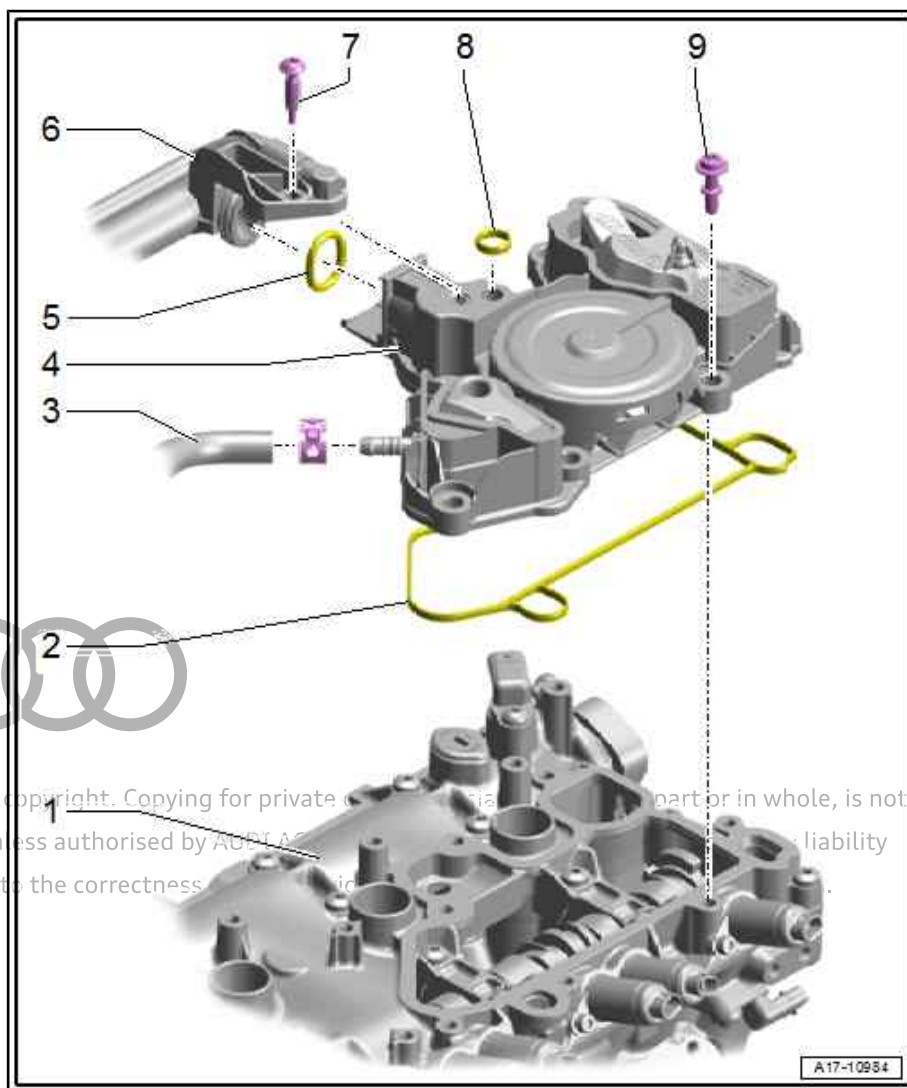
8 - Seal

- ☐ Renew after removing

9 - Bolt

- ☐ Thread-forming
- ☐ Fit and screw in bolt by hand so that it is screwed into old thread. Then tighten bolt to torque

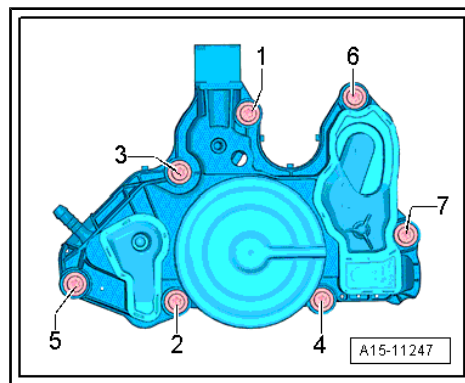
- ☐ Tightening torques and sequence ⇒ [page 152](#)





Oil separator - tightening torques and sequence

- Tighten bolts in the sequence -1 ... 7- to 9 Nm.



3.2 Removing and installing oil separator

Special tools and workshop equipment required

- ◆ Hose clip pliers - VAS 6362-

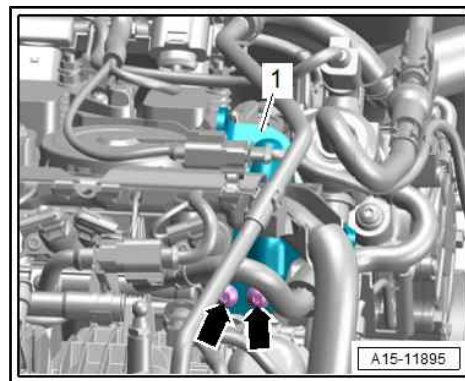


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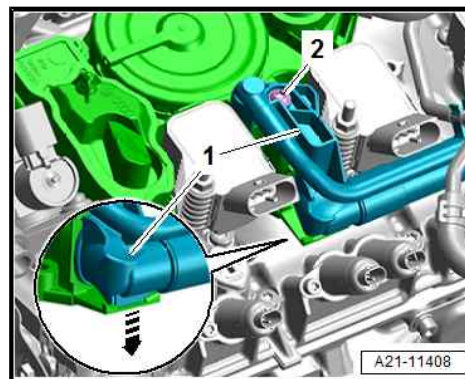


Removing

- Remove ignition coils for cylinders 3 and 4 ➔ [page 271](#) .
- Remove bolts -arrows- and press engine lifting eye -1- to one side.



- Remove bolt -2-.
- Release fastener -arrow-, disconnect crankcase breather hose -1- and move it clear.





- Release hose clip -1- and detach hose from activated charcoal filter solenoid valve 1 - N80- .
- Remove bolts -arrows- and detach oil separator.

Installing

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

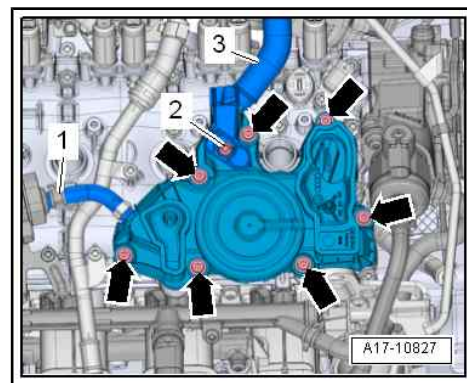


Note

- ◆ *Renew gasket and seals after removing.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ *Electronic parts catalogue* .*
- Install ignition coils ⇒ [page 271](#) .

Tightening torques

- ◆ ⇒ [Fig. “Oil separator - tightening torques and sequence”](#), [page 152](#)
- ◆ ⇒ [“3.1 Exploded view - cylinder head”](#), [page 101](#)



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4 Oil filter/oil pressure switches

⇒ ["4.1 Exploded view - oil filter", page 154](#)

⇒ ["4.2 Exploded view - oil pressure switches/oil pressure control", page 155](#)

⇒ ["4.3 Removing and installing oil pressure switch F22 ", page 157](#)

⇒ ["4.4 Removing and installing oil pressure switch for reduced oil pressure F378 ", page 158](#)

⇒ ["4.5 Removing and installing stage 3 oil pressure switch F447 ", page 158](#)

⇒ ["4.6 Removing and installing valve for oil pressure control N428 ", page 161](#)

⇒ ["4.7 Removing and installing piston cooling jet control valve N522 ", page 163](#)

⇒ ["4.8 Checking oil pressure", page 164](#)

4.1 Exploded view - oil filter

1 - Bracket for ancillaries

- ☐ Different versions available; for allocation refer to ⇒ Electronic parts catalogue
- ☐ Removing and installing ⇒ [page 35](#)

2 - Gasket

- ☐ Renew after removing

3 - Oil filter element

- ☐ Removing and installing ⇒ [page 142](#)
- ☐ See note ⇒ [page 139](#)

4 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

5 - Oil filter housing

- ☐ 25 Nm

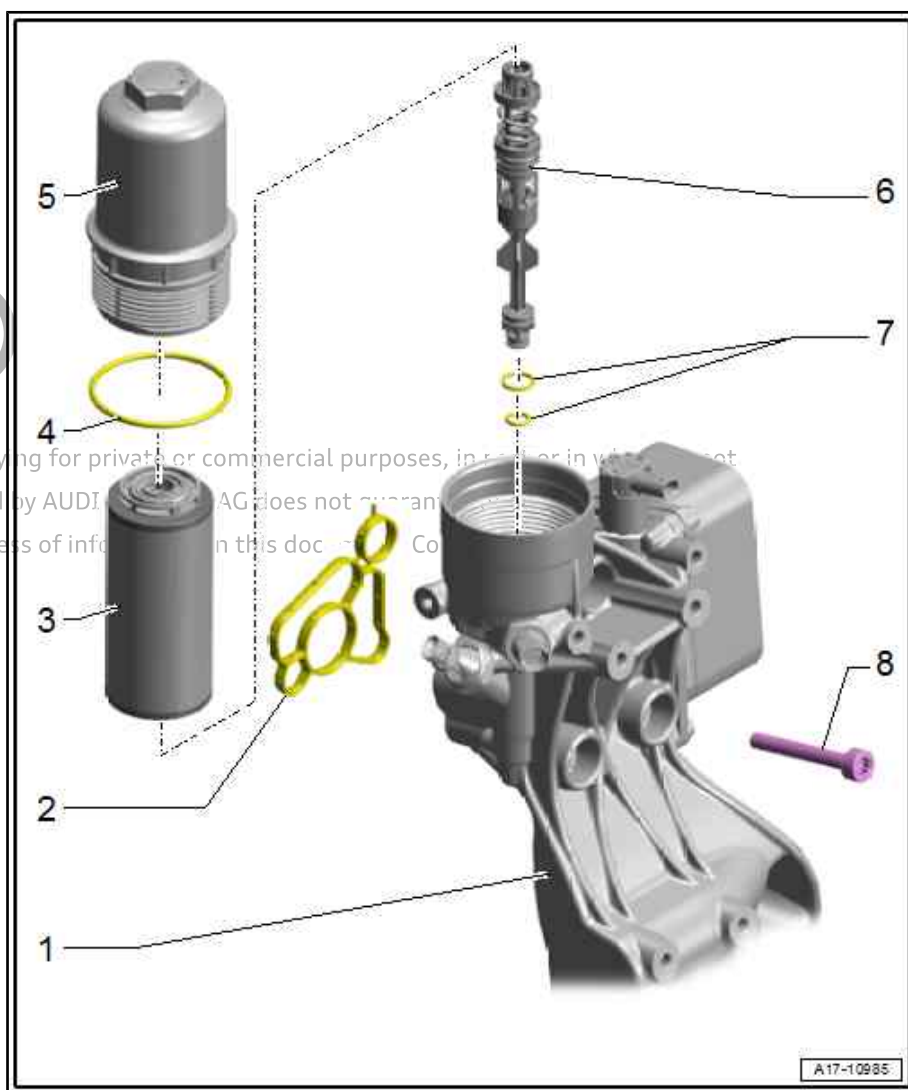
6 - Oil drain connection

7 - O-rings

- ☐ Not available as replacement part, supplied together with ⇒ [Item 6 \(page 154\)](#)

8 - Bolt

- ☐ Tightening torques and sequence ⇒ [page 15](#)





4.2 Exploded view - oil pressure switches/oil pressure control

⇒ ["4.2.1 Exploded view - oil pressure switches/oil pressure control, version 1", page 155](#)

⇒ ["4.2.2 Exploded view - oil pressure switches/oil pressure control, version 2", page 156](#)

4.2.1 Exploded view - oil pressure switches/oil pressure control, version 1

1 - Bolt

- ☐ Renew after removing
- ☐ 4 Nm +45°

2 - Valve for oil pressure control - N428-

- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing
⇒ [page 161](#)

3 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

4 - O-rings

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

5 - Bolt

- ☐ Renew aluminium bolt after removal
- ☐ Tightening torques:

◆ Steel bolt: 9 Nm

◆ Aluminium bolt: 4 Nm +45°

6 - Piston cooling jet control valve - N522-

- ☐ Removing and installing
⇒ [page 163](#)

7 - Seal

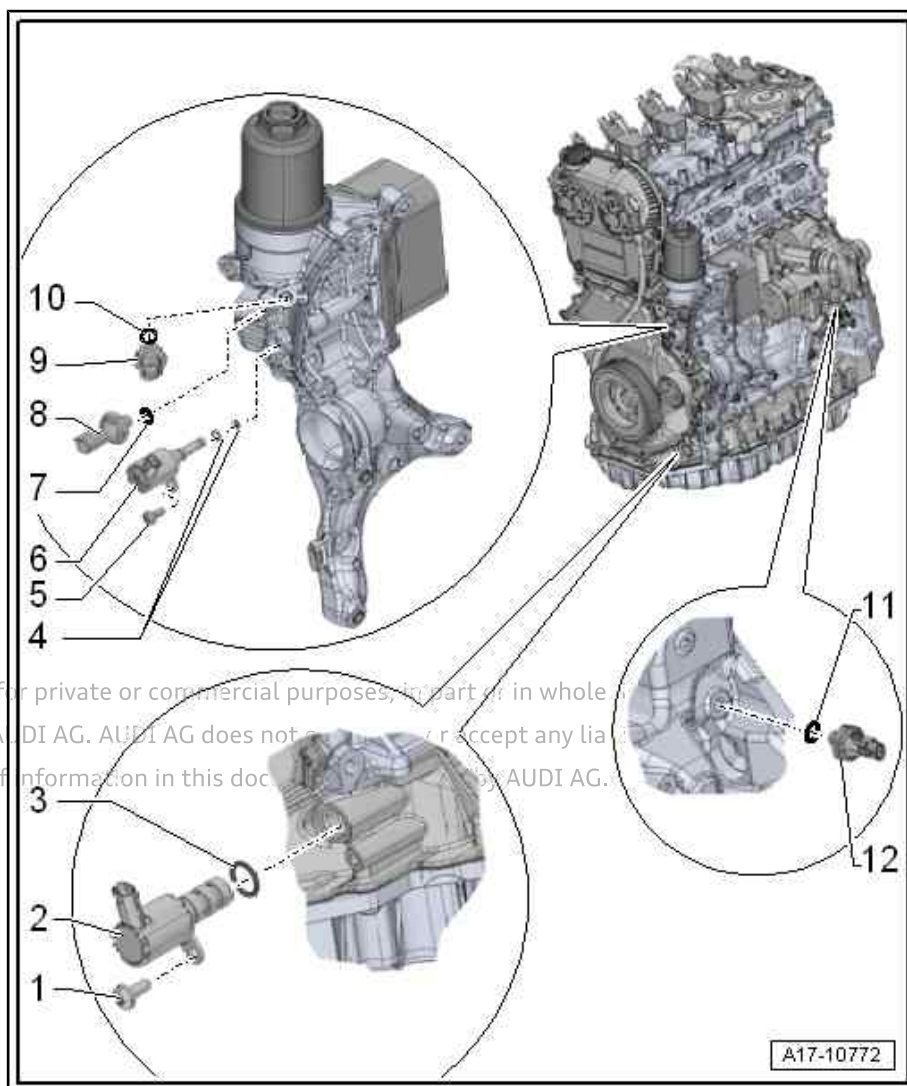
- ☐ Renew (cut seal open to do so)
- ☐ If seal is not available separately, refer to ⇒ Electronic parts catalogue ; renew oil pressure switch after removal

8 - Oil pressure switch - F22-

- ☐ Blue insulation
- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 157](#)
- ☐ 20 Nm

9 - Oil pressure switch for reduced oil pressure - F378-

- ☐ Brown insulation
- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 158](#)





- ☐ 20 Nm

10 - Seal

- ☐ Renew (cut seal open to do so)
- ☐ If seal is not available separately, refer to ⇒ Electronic parts catalogue ; renew oil pressure switch after removal

11 - Seal

- ☐ Renew (cut seal open to do so)
- ☐ If seal is not available separately, refer to ⇒ Electronic parts catalogue ; renew oil pressure switch after removal

12 - Stage 3 oil pressure switch - F447-

- ☐ Green insulation
- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing
⇒ ["4.5.1 Removing and installing stage 3 oil pressure switch F447 - version 1", page 158](#)
- ☐ 20 Nm

4.2.2 Exploded view - oil pressure switches/oil pressure control, version 2

1 - Bolt

- ☐ Renew after removing
- ☐ 4 Nm +45°

2 - Valve for oil pressure control - N428-

- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing
⇒ [page 161](#)

3 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

4 - Seal

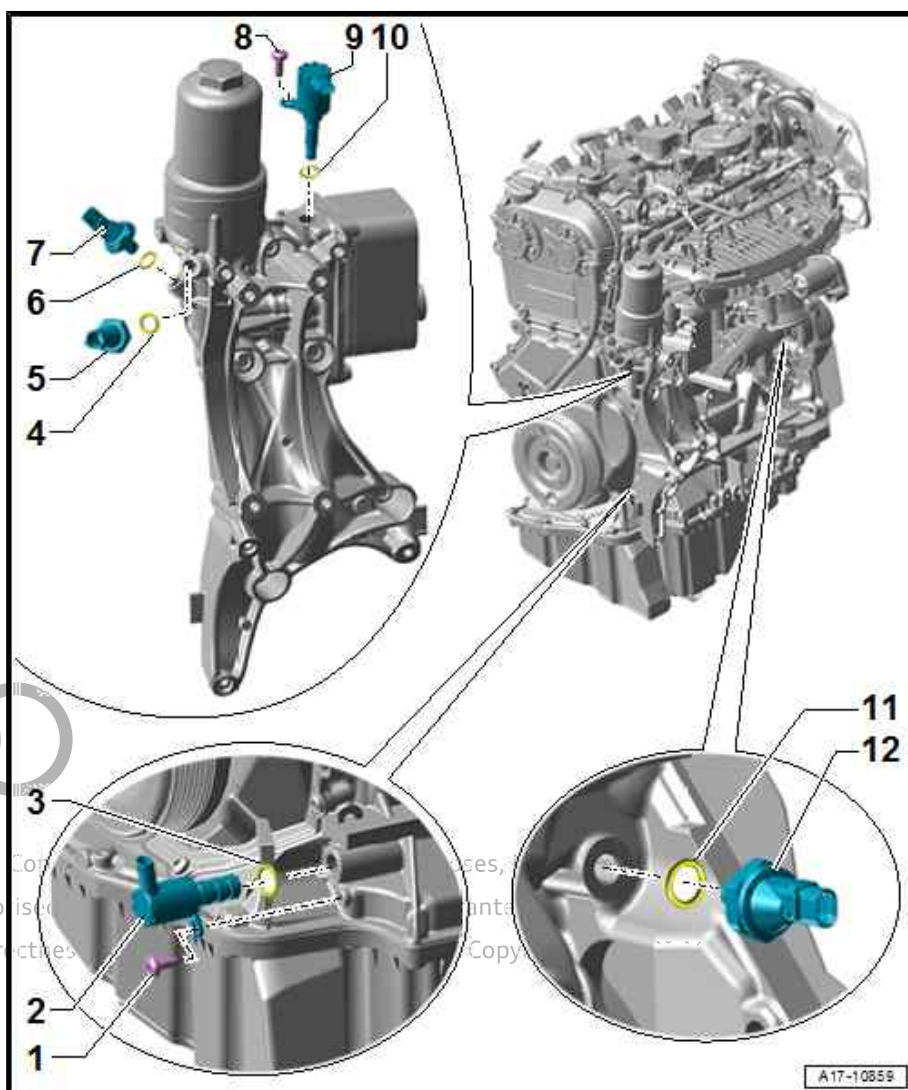
- ☐ Renew (cut seal open to do so)
- ☐ If seal is not available separately, refer to ⇒ Electronic parts catalogue ; renew oil pressure switch after removal

5 - Oil pressure switch for reduced oil pressure - F378-

- ☐ Brown insulation
- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing
⇒ [page 158](#)
- ☐ 20 Nm

6 - Seal

- ☐ Renew (cut seal open to do so)





- ☐ If seal is not available separately, refer to ⇒ Electronic parts catalogue ; renew oil pressure switch after removal

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7 - Oil pressure switch - F22-

- ☐ Blue insulation
- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing ⇒ [page 157](#)
- ☐ 20 Nm

8 - Bolt

- ☐ 9 Nm

9 - Piston cooling jet control valve - N522-

- ☐ Removing and installing ⇒ [page 163](#)

10 - Seal

- ☐ Renew after removing

11 - Seal

- ☐ Renew (cut seal open to do so)
- ☐ If seal is not available separately, refer to ⇒ Electronic parts catalogue ; renew oil pressure switch after removal

12 - Stage 3 oil pressure switch - F447-

- ☐ Green insulation
- ☐ Checking ⇒ Vehicle diagnostic tester
- ☐ Removing and installing
⇒ [“4.5.2 Removing and installing stage 3 oil pressure switch F447 - version 2”, page 159](#)
- ☐ 20 Nm

4.3 Removing and installing oil pressure switch - F22-

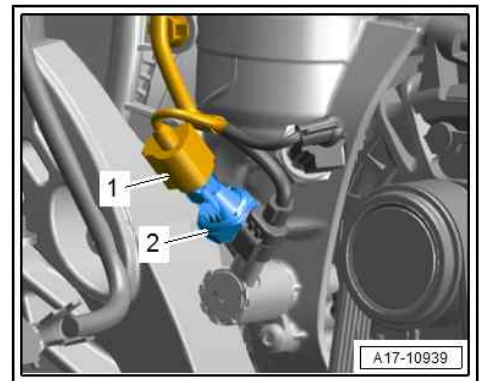
Procedure

- Unplug electrical connector -1-.



Note

- ◆ Place a cloth underneath bracket for ancillaries to catch any escaping oil.
- ◆ If re-using old oil pressure switch - F22- , check availability of seal in ⇒ Electronic parts catalogue (ETKA). If it is not available, renew oil pressure switch - F22- .
- ◆ Cut seal open to renew.
- ◆ Fit new oil pressure switch - F22- into hole immediately to avoid loss of oil.
- Remove oil pressure switch - F22- -item 2-. (Illustration shows vehicle with alternator.)



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

- Check oil level ⇒ [page 142](#) .

Tightening torques

- ◆ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 155](#)



4.4 Removing and installing oil pressure switch for reduced oil pressure - F378-

Procedure

- Unplug electrical connector -2-



Note

- ♦ Place a cloth underneath bracket for ancillaries to catch any escaping oil.
- ♦ If re-using old oil pressure switch for reduced oil pressure - F378-, check availability of seal in ⇒ *Electronic parts catalogue (ETKA)*. If it is not available, renew oil pressure switch for reduced oil pressure - F378-.
- ♦ Cut seal open to renew.
- ♦ Fit new oil pressure switch for reduced oil pressure - F378- immediately into hole to avoid loss of oil.

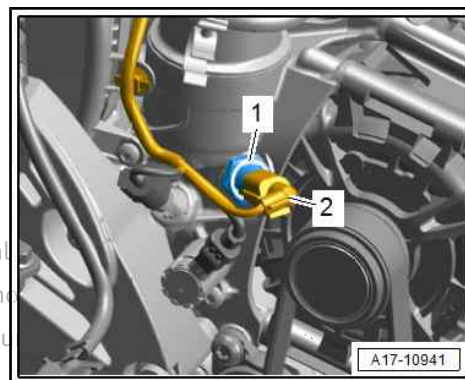
- Unscrew oil pressure switch for reduced oil pressure - F378- -item 1-. (Illustration shows vehicle with alternator.)

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

- Check oil level ⇒ [page 142](#) .

Tightening torques

- ♦ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 155](#)



4.5 Removing and installing stage 3 oil pressure switch - F447-

⇒ [“4.5.1 Removing and installing stage 3 oil pressure switch F447 - version 1”, page 158](#)

⇒ [“4.5.2 Removing and installing stage 3 oil pressure switch F447 - version 2”, page 159](#)

4.5.1 Removing and installing stage 3 oil pressure switch - F447- - version 1

Special tools and workshop equipment required

- ♦ Articulated wrench, 24 mm - T40175-



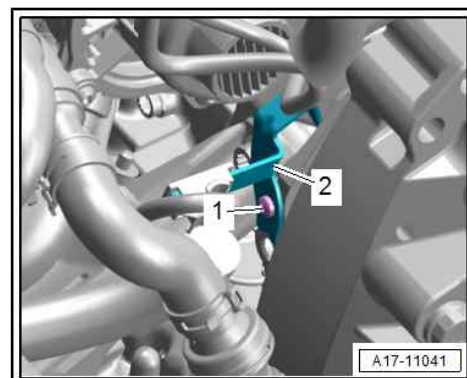
Procedure

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr.



17 ; Oil filter/oil pressure switches; Removing and installing stage 3 oil pressure switch - F447- .

- Remove engine cover panel ⇒ [page 12](#) .
- If necessary, move electrical wiring harness clear.
- Remove bolt -1- and push bracket -2- with engine wiring harness to one side. (Different versions.)

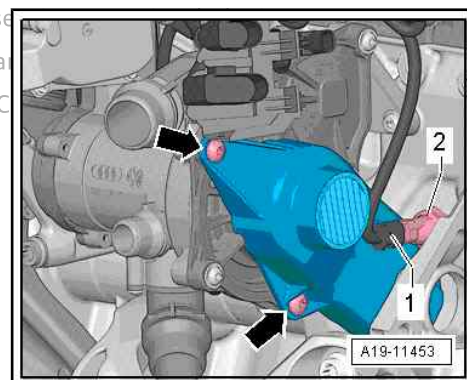


- Unplug electrical connector -1-.
- Remove bolts -arrows- and detach toothed belt cover.



Note

- ◆ Lay a cloth under the oil pressure switch to catch escaping engine oil.
 - ◆ If re-using old stage 3 oil pressure switch - F447- , check availability of seal in ⇒ *Electronic parts catalogue (ETKA)*. If it is not available, renew stage 3 oil pressure switch - F447- .
 - ◆ Cut seal open to renew.
 - ◆ Fit new stage 3 oil pressure switch - F447- immediately into hole to avoid loss of oil.
- Use articulated wrench, 24 mm - T40175- to unscrew stage 3 oil pressure switch - F447- -item 2-.



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

- Install engine cover panel ⇒ [page 12](#) .
- Check oil level ⇒ [page 142](#) .

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches ; Removing and installing stage 3 oil pressure switch - F447-

Tightening torques

- ◆ ⇒ [“4.2.1 Exploded view - oil pressure switches/oil pressure control, version 1”, page 155](#)
- ◆ ⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 173](#)

4.5.2 Removing and installing stage 3 oil pressure switch - F447- - version 2

Special tools and workshop equipment required



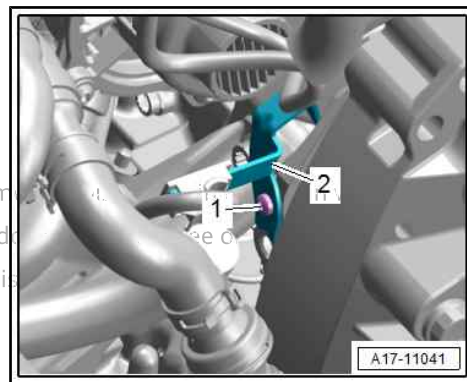
- ◆ Articulated wrench, 24 mm - T40175-



Procedure

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches; Removing and installing stage 3 oil pressure switch - F447- .

- Remove engine cover panel ⇒ [page 12](#) .
- If necessary, move electrical wiring harness clear.
- Remove bolt -1- and push bracket -2- with engine wiring harness to one side. (Different versions.)



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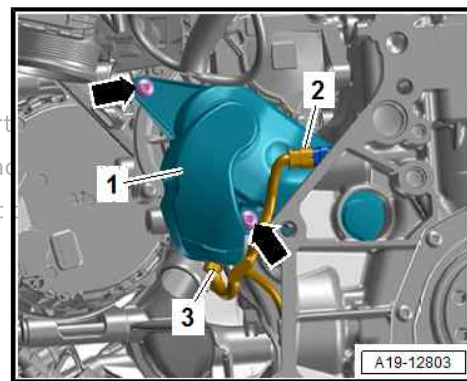
- Move electrical wiring harness -3- clear.
- Unplug electrical connector -2- for stage 3 oil pressure switch - F447- .
- Remove bolts -arrows- and detach toothed belt cover -1-.

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Note

- ◆ Lay a cloth under the oil pressure switch to catch escaping engine oil.
 - ◆ If re-using old stage 3 oil pressure switch - F447- , check availability of seal in ⇒ *Electronic parts catalogue (ETKA)*. If it is not available, renew stage 3 oil pressure switch - F447- .
 - ◆ Cut seal open to renew.
 - ◆ Fit new stage 3 oil pressure switch - F447- immediately into hole to avoid loss of oil.
- Use articulated wrench, 24 mm - T40175- to unscrew stage 3 oil pressure switch - F447- -item 2-.



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

- Install engine cover panel ⇒ [page 12](#) .
- Check oil level ⇒ [page 142](#) .

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches ; Removing and installing stage 3 oil pressure switch - F447-

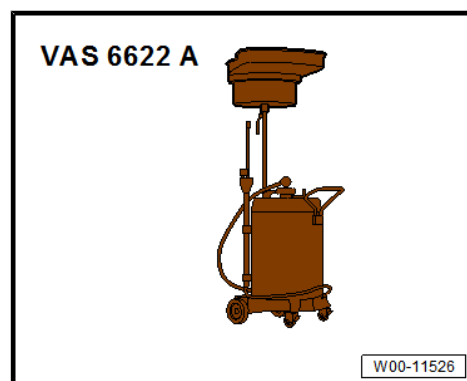
Tightening torques

- ◆ ⇒ ["4.2.2 Exploded view - oil pressure switches/oil pressure control, version 2", page 156](#)
- ◆ ⇒ ["2.1 Exploded view - coolant pump/thermostat", page 173](#)

4.6 Removing and installing valve for oil pressure control - N428-

Special tools and workshop equipment required

- ◆ Used oil collection and extraction unit - VAS 6622A-



Removing

- Remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .



- Unplug electrical connector -1-.
- Place used oil collection and extraction unit - VAS 6622A- underneath.
- Remove bolt -2- and detach valve for oil pressure control - N428- (pull poly V-belt slightly downwards).

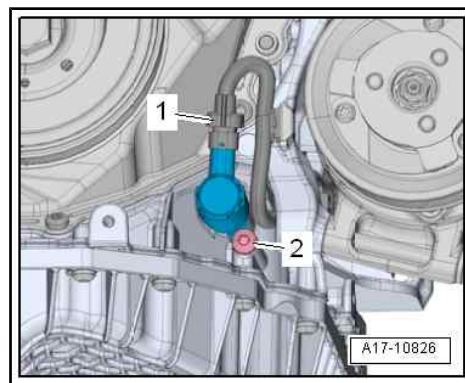
Installing

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

- Renew O-ring after removal.
- Check oil level ⇒ [page 142](#) .

Tightening torques

- ◆ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 155](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



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4.7 Removing and installing piston cooling jet control valve - N522-

⇒ [“4.7.1 Removing and installing piston cooling jet control valve N522 - version 1”, page 163](#)

⇒ [“4.7.2 Removing and installing piston cooling jet control valve N522 - version 2”, page 163](#)

4.7.1 Removing and installing piston cooling jet control valve - N522- - version 1

Removing

- Unplug electrical connector -2-.



Note

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Place a cloth underneath bracket for ancillaries to catch any escaping oil.

- Remove bolt -3- and detach piston cooling jet control valve - N522- -item 1-.



Note

Fit the new piston cooling jet control valve - N522- into the connection immediately to avoid loss of oil.

Installing

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



Note

Renew O-rings after removing.

- Check oil level ⇒ [page 142](#) .

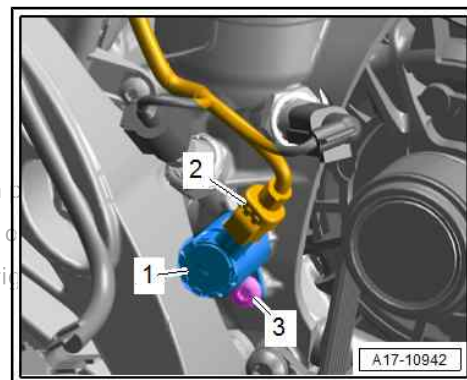
Tightening torques

- ◆ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 155](#)

4.7.2 Removing and installing piston cooling jet control valve - N522- - version 2

Removing

- Remove intake manifold ⇒ [page 204](#) .





- Unplug electrical connector -2-.



Note

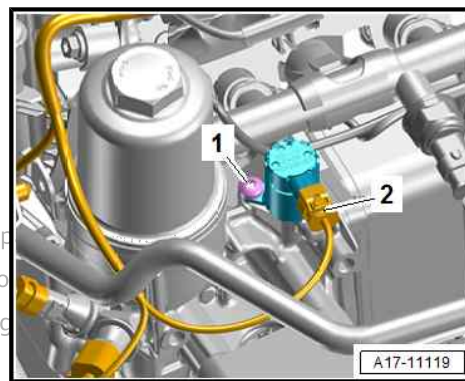
Place a cloth underneath bracket for ancillaries to catch any escaping oil.

- Remove bolt -1- and detach piston cooling jet control valve - N522-.
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Note

Fit the new piston cooling jet control valve - N522- into the connection immediately to avoid loss of oil.



Installing

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



Note

Renew O-rings after removing.

- Install intake manifold ⇒ [page 204](#) .
- Check oil level ⇒ [page 142](#) .

Tightening torques

- ♦ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 155](#)

4.8 Checking oil pressure

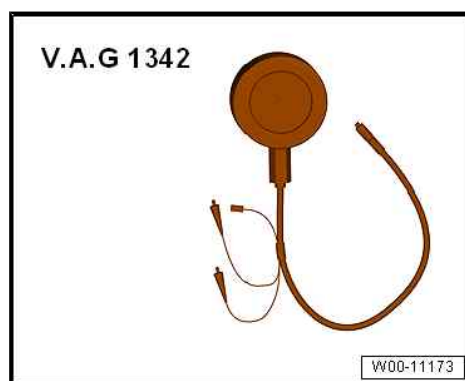
⇒ [“4.8.1 Checking engine oil pressure”, page 164](#)

⇒ [“4.8.2 Checking oil pressure for piston cavity oil jets”, page 166](#)

4.8.1 Checking engine oil pressure

Special tools and workshop equipment required

- ♦ Oil pressure tester - V.A.G 1342-





- ◆ Articulated wrench, 24 mm - T40175-



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Test requirements

- Oil level OK
- Engine oil temperature at least 80°C (radiator fan must have run once).



Note

- ◆ *The oil pump is regulated and has two pressure stages. The pressure stages are tested one after the other.*
- ◆ *During the running-in period or when the engine is in emergency running mode, the oil pump only operates in the higher pressure stage.*
- ◆ *The oil pressure is dependent on the engine oil temperature. The mean value should be reached at an engine oil temperature of around 80 °C.*



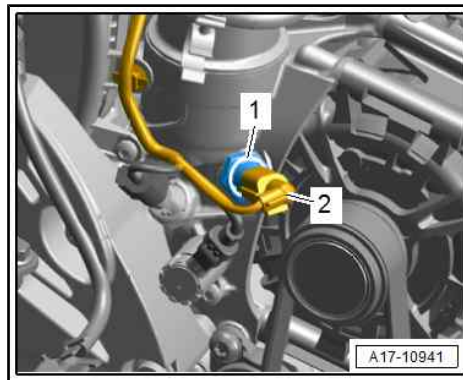
Test sequence



Note

Place a cloth underneath bracket for ancillaries to catch any escaping oil.

- Unplug electrical connector -2- (illustration shows engine with alternator).
- Unscrew oil pressure switch for reduced oil pressure - F378- -item 1-.
- Screw oil pressure tester - V.A.G 1342- into oil filter bracket in place of oil pressure switch.
- Screw oil pressure switch for reduced oil pressure - F378- into oil pressure tester - V.A.G 1342- and plug in electrical connector.
- Start engine.
 - Oil pressure at idling speed: 0.85 ... 1.6 bar
 - Oil pressure at 2000 rpm: 1.2 ... 1.6 bar
 - Oil pressure at 3700 rpm: 3.0 ... 4.0 bar (second pressure stage active, valve for oil pressure control - N428- OK)



Assembling

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- Install oil pressure switch
⇒ [“4.4 Removing and installing oil pressure switch for reduced oil pressure F378”, page 158](#) and route electrical wiring carefully.
- Erase any entries in engine control unit event memory resulting from testing ⇒ Vehicle diagnostic tester.

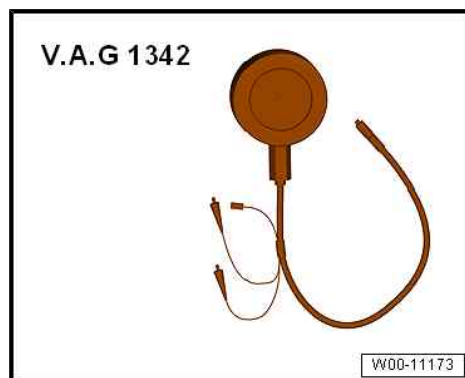
Tightening torques

- ♦ ⇒ [“4.2 Exploded view - oil pressure switches/oil pressure control”, page 155](#)
- ♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.8.2 Checking oil pressure for piston cavity oil jets

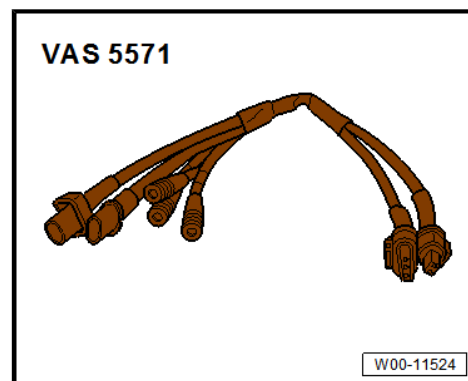
Special tools and workshop equipment required

- ♦ Oil pressure tester - V.A.G 1342-





◆ Test instrument adapter - VAS 5571-



Test requirements

- Oil level OK
- Engine oil temperature at least 80°C (radiator fan must have run once).

Test sequence

- Remove stage 3 oil pressure switch - F447- ⇒ [page 158](#) .
- Screw oil pressure switch into oil pressure tester - V.A.G 1342- .
- Screw in oil pressure tester - V.A.G 1342- in place of oil pressure switch.
- Connect test instrument adapter/DSO (2-pin) - VAS 5571- to oil pressure switch.
- Plug electrical connector for stage 3 oil pressure switch - F447- into test instrument adapter/DSO (2-pin) - VAS 5571- .
- The engine should only run as long as required for the test.
- Check oil pressure ⇒ Vehicle diagnostic tester, [Stage 3 oil pressure switch F447].

Assembling

- Install stage 3 oil pressure switch - F447-
⇒ [“4.5 Removing and installing stage 3 oil pressure switch F447”](#), [page 158](#) .



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19 – Cooling

1 Cooling system/coolant

⇒ [“1.1 Connection diagram - coolant hoses”, page 168](#)

⇒ [“1.2 Checking cooling system for leaks”, page 168](#)

⇒ [“1.3 Draining and filling cooling system”, page 171](#)

1.1 Connection diagram - coolant hoses

All components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19; Cooling system/coolant; Connection diagram - coolant hoses .

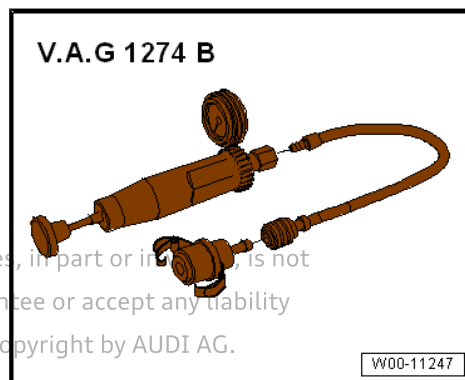
1.2 Checking cooling system for leaks

Special tools and workshop equipment required

- ♦ Cooling system tester - V.A.G 1274 B-



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- ♦ Adapter for cooling system tester - V.A.G 1274/8-

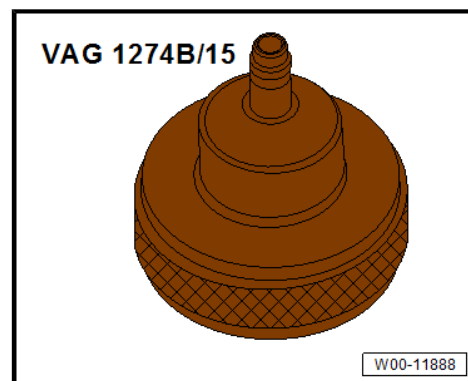


- ♦ Cooling system tester adapter - V.A.G 1274/9- for filler cap (version 2)





- ◆ Cooling system tester adapter - V.A.G 1274B/15- for filler cap (version 1)



Procedure

- Engine must be warm.
- Ignition switched off.



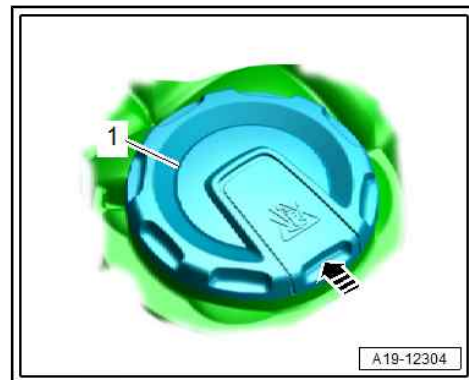
WARNING

The cooling system is under pressure when the power unit is hot. Risk of scalding due to hot steam and hot coolant.

Danger of scalding skin and other parts of the body.

- *Put on protective gloves.*
- *Put on safety goggles.*
- *Cover filler cap on expansion tank with a cloth and open carefully to release pressure.*

- Release fastener -arrow- and open filler cap -1- on coolant expansion tank.



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- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.
- Using hand pump on cooling system tester, build up a pressure of approx. 1.0 bar.
- The pressure should not drop more than 0.2 bar within 10 minutes.
- If the pressure drops more than 0.2 bar, locate leak and eliminate fault.



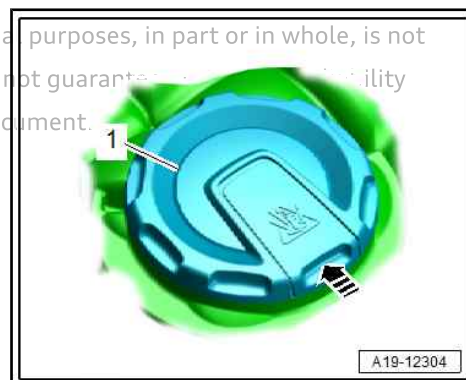
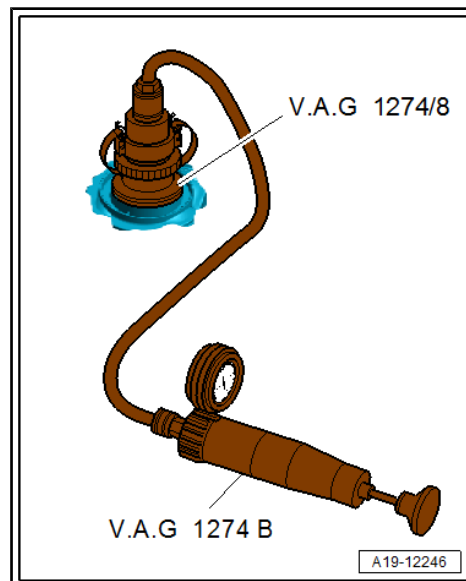
Note

The drop in pressure of 0.2 bar within 10 minutes is caused by the decrease in coolant temperature. The colder the engine is, the less the pressure will fall. If necessary, check again when the engine is cold.

Checking pressure relief valve in filler cap

Filler cap (version 1):

- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274 B/15- onto filler cap.



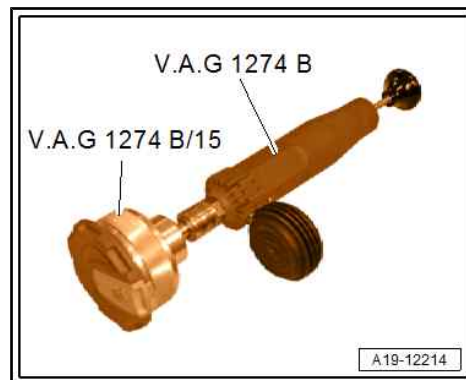
- Using hand pump on cooling system tester, build up a pressure of approx. 2 bar.

Blue filler cap

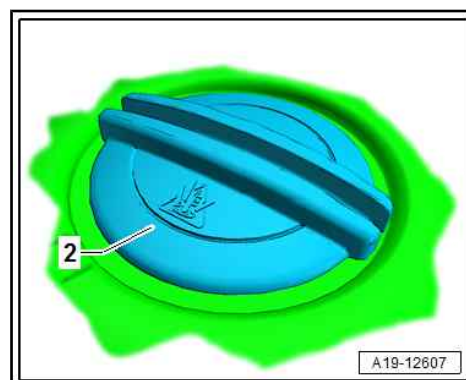
- The pressure must be reduced to 1.6 ... 1.4 bar and kept at this level.
- Renew filler cap if pressure relief valve does not react as described.

Black filler cap

- The pressure must be reduced to 1.8 ... 1.6 bar and kept at this level.
- Renew filler cap if pressure relief valve does not react as described.



Filler cap (version 2):





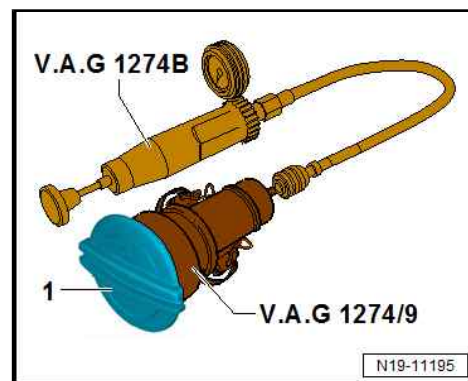
- Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap -1-.

Blue filler cap

- Build up pressure with hand pump on cooling system tester.
- The pressure relief valve should open at a pressure of 1.4 ... 1.6 bar.
- Renew filler cap if pressure relief valve does not react as described.

Black filler cap

- The pressure relief valve should open at a pressure of 1.6 ... 1.8 bar.
- Renew filler cap if pressure relief valve does not react as described.



1.3 Draining and filling cooling system

Coolant specifications



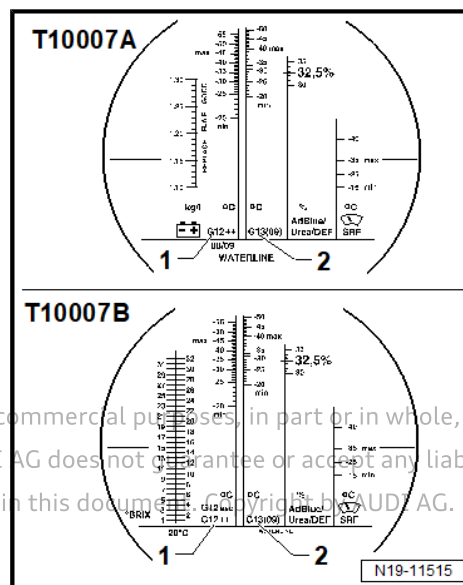
Caution

To ensure optimal corrosion protection, only distilled water may be mixed with coolant additives.

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**Note**

- ◆ *The effectiveness of the coolant is greatly influenced by the quality of the water with which it is mixed. Because water may contain different substances depending on the country or even the region, the water quality to be used for cooling systems has been specified. Distilled water meets all the requirements and is therefore recommended for use when topping up or filling up with coolant.*
- ◆ *Use only coolant additives listed in the ⇒ Electronic parts catalogue (ETKA) . If you use other coolant additives, this can significantly impair in particular the corrosion protection effect. The resulting damage could lead to loss of coolant and consequently to serious damage to the power unit.*
- ◆ *Coolant with the recommended mixture ratio prevents frost and corrosion damage and stops scaling. At the same time it raises the boiling point of the fluid in the system. For this reason the cooling system must be filled all year round with the correct coolant additive.*
- ◆ *Because of its high boiling point, the coolant improves power unit reliability under heavy loads, particularly in countries with tropical climates.*
- ◆ *Refractometer - T10007A- or refractometer - T10007B- MUST be used to determine the current level of frost protection.*
- ◆ *Scale -1- on the refractometer applies to coolant additives G12 ++ and G12evo.*
- ◆ *Scale -2- on the refractometer applies to coolant additive G13.*
- ◆ *If more than one type of coolant additive has been used: Always use the scale for G13 to determine the anti-freeze protection.*
- ◆ *The mixture must guarantee frost protection down to at least -25 °C (in countries with arctic climate: down to -36 °C). The amount of antifreeze should only be increased if greater frost protection is required in very cold climates. This must only be down to -48 °C, however, as otherwise the cooling efficiency of the coolant is impaired.*
- ◆ *The coolant concentration must not be reduced by adding water even in warmer seasons and in warmer countries. Frost protection must be provided to at least -25 °C.*
- ◆ *The temperature indicated on the refractometer corresponds to the temperature at which the first ice crystals can form in the coolant.*
- ◆ *Do not reuse coolant.*
- ◆ *Only use water/coolant additive as a lubricant for coolant hoses.*

**Draining and filling cooling system**

- All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .



2 Coolant pump/thermostat assembly

⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 173](#)

⇒ [“2.2 Exploded view - electric coolant pump”, page 174](#)

⇒ [“2.3 Exploded view - coolant temperature senders”, page 175](#)

⇒ [“2.4 Removing and installing electric coolant pump”, page 175](#)

⇒ [“2.5 Removing and installing coolant pump”, page 175](#)

⇒ [“2.6 Removing and installing toothed belt for coolant pump”, page 177](#)

⇒ [“2.7 Removing and installing actuator for engine temperature regulation N493”, page 178](#)

⇒ [“2.8 Removing and installing coolant temperature sender G62”, page 180](#)

⇒ [“2.9 Removing and installing radiator outlet coolant temperature sender G83”, page 181](#)

2.1 Exploded view - coolant pump/thermostat

1 - Connection

2 - O-ring

- ☐ Renew after removing
- ☐ Coat with coolant; coolant ⇒ Electronic parts catalogue

3 - Centring pin

4 - Bolt

- ☐ Tightening torques and sequence ⇒ [page 174](#)

5 - Gasket

- ☐ Renew after removing

6 - Coolant pump

- ☐ Removing and installing ⇒ [page 175](#)
- ☐ New coolant pump: remove protective cap

7 - Bolt

- ☐ Tightening sequence ⇒ [page 174](#)

8 - Toothed belt

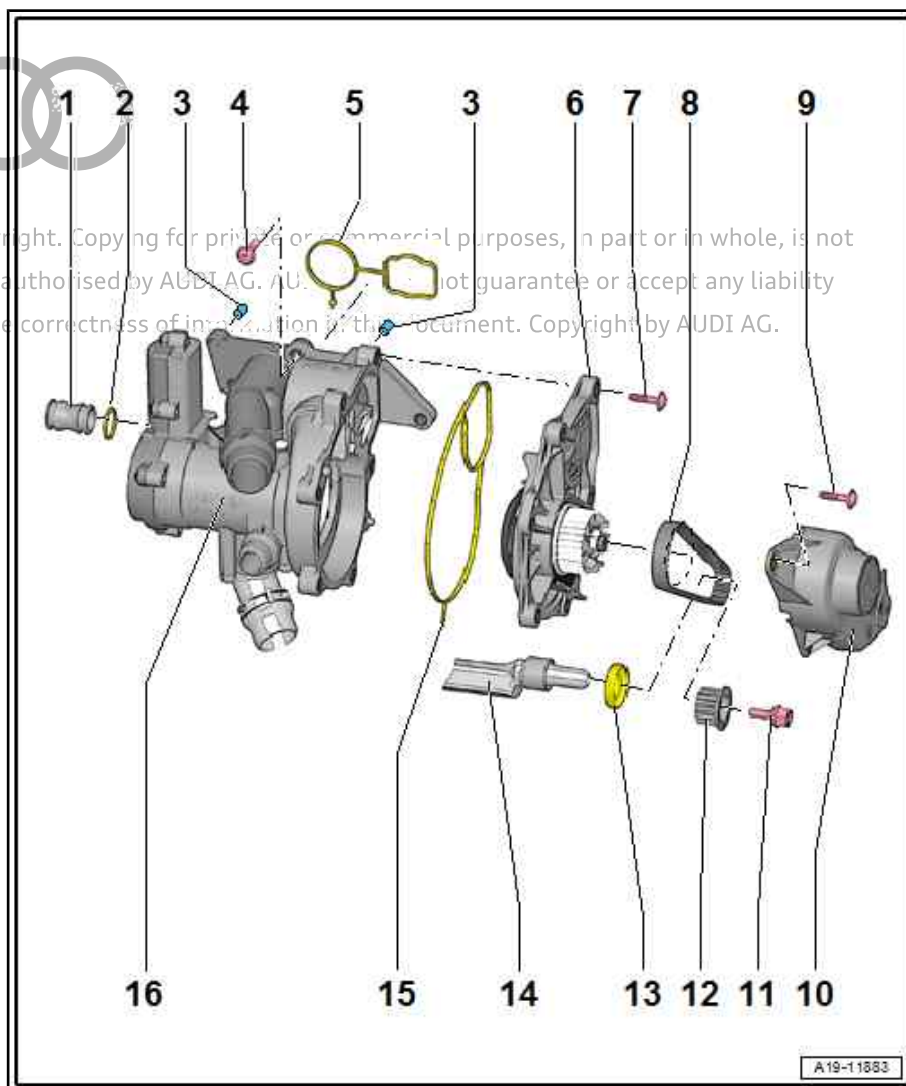
- ☐ For coolant pump
- ☐ Removing and installing ⇒ [page 177](#)

9 - Bolt

- ☐ 9 Nm

10 - Toothed belt cover

- ☐ Different versions available; for allocation refer to ⇒ Electronic parts catalogue





11 - Bolt

- ☐ Left-hand thread
- ☐ Renew after removing
- ☐ 10 Nm +90°

12 - Toothed belt drive sprocket

- ☐ Note installation position

13 - Oil seal

- ☐ For balance shaft (inlet side)
- ☐ Renewing ⇒ [page 59](#)

14 - Balance shaft (inlet side)

15 - Gasket

- ☐ Renew after removing

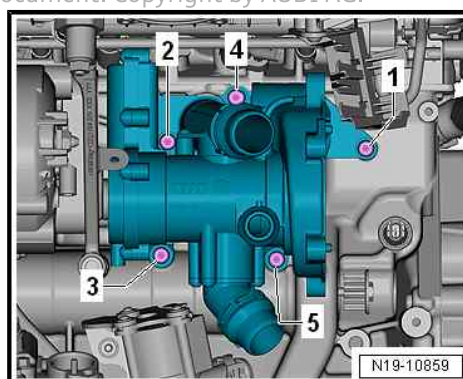
16 - Actuator for engine temperature regulation - N493-

- ☐ Removing and installing ⇒ [page 178](#)
- ☐ After renewal, perform adaptations listed in Guided Function "01 - Functions, engine mechanics" ⇒ Vehicle diagnostic tester

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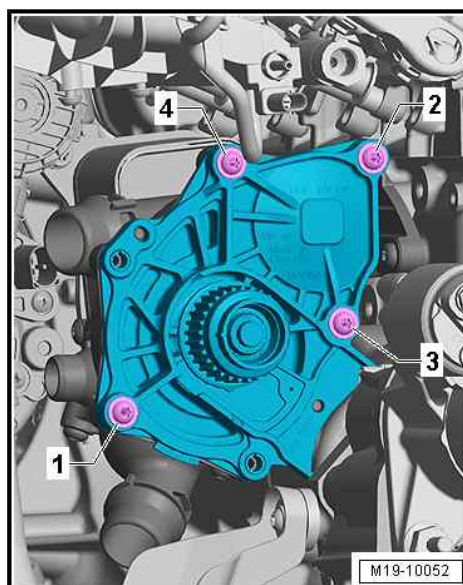
Actuator for engine temperature regulation - N493- - tightening torques and sequence

- Tighten bolts in the sequence -1 ... 5- to 9 Nm.



Coolant pump - tightening torques and sequence

- Tighten bolts for coolant pump in the sequence -1 ... 4- to 9 Nm.



2.2 Exploded view - electric coolant pump

All components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19; Coolant pump/thermostat assembly; Exploded view - electric coolant pump .



2.3 Exploded view - coolant temperature senders

1 - Retaining clip

- ☐ Check for firm attachment

2 - Radiator outlet coolant temperature sender - G83-

- ☐ Push-fitted version
- ☐ Removing and installing
 ⇒ 4-cylinder direct injection engine, (1.8, 2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly;
 Removing and installing radiator outlet coolant temperature sender - G83-

3 - O-ring

- ☐ Renew after removing
- ☐ Lubricate with coolant

4 - O-rings

- ☐ Renew after removing
- ☐ Lubricate with coolant

5 - Coolant temperature sender - G62-

- ☐ On cylinder head (gear-box end)
- ☐ Removing and installing
 ⇒ [page 180](#)

6 - Bolt

- ☐ Renew after removing
- ☐ 4 Nm +45°

7 - Bolt

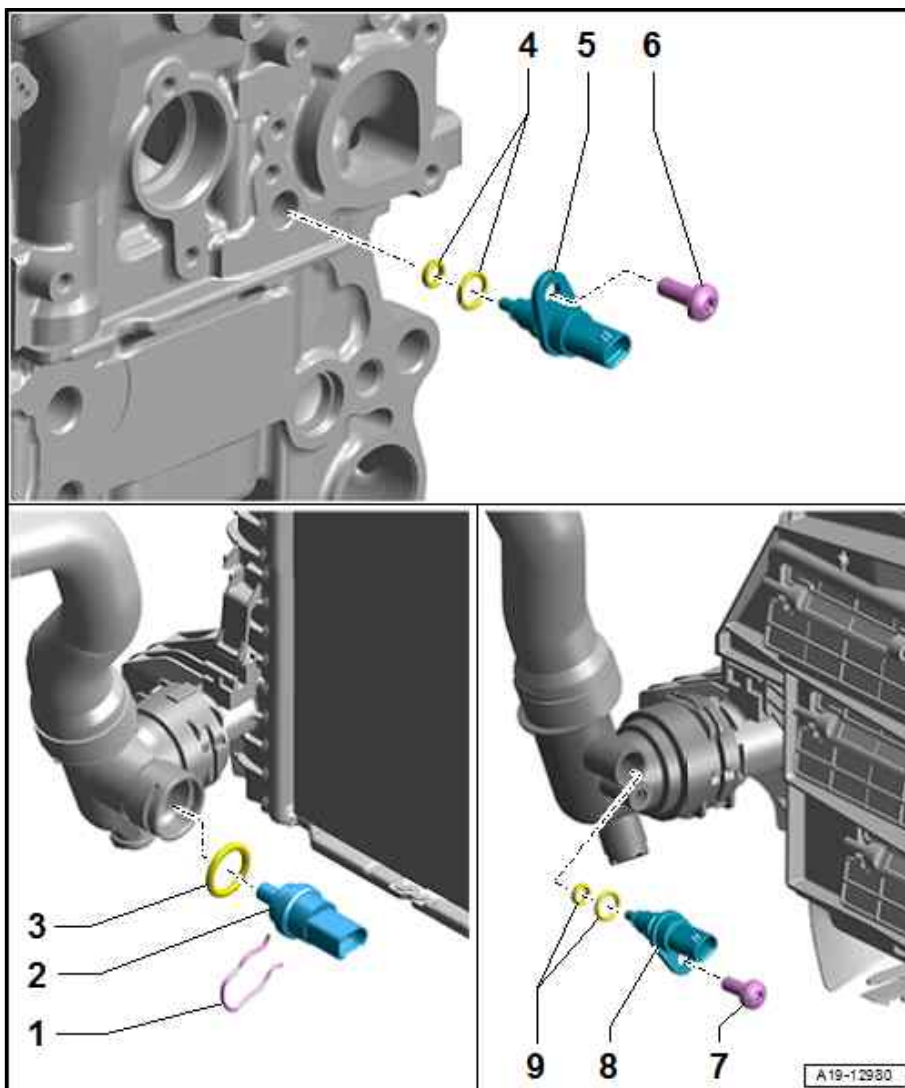
- ☐ 4.5 Nm

8 - Radiator outlet coolant temperature sender - G83-

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

9 - O-rings

- ☐ Renew after removing
- ☐ Lubricate with coolant



2.4 Removing and installing electric coolant pump

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing electric coolant pump .

2.5 Removing and installing coolant pump

Removing

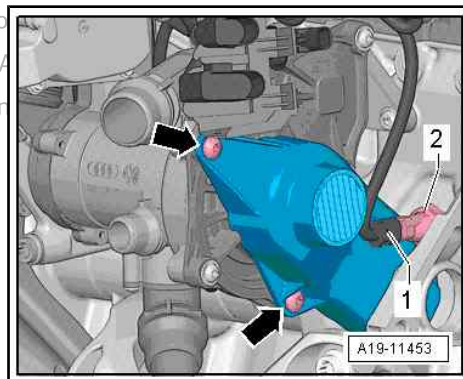
Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr.



19 ; Coolant pump/thermostat assembly; Removing and installing coolant pump .

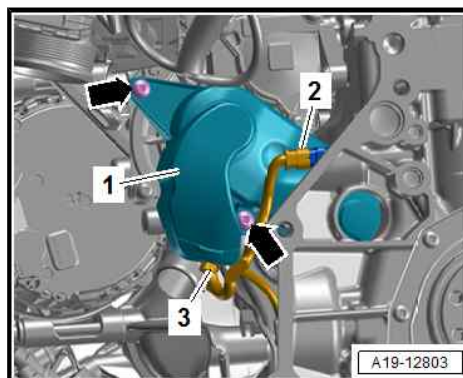
Toothed belt cover (version 1)

- Unplug electrical connector -1- for stage 3 oil pressure switch - F447- -item 2-.
- Remove bolts -arrows- and detach toothed belt cover.



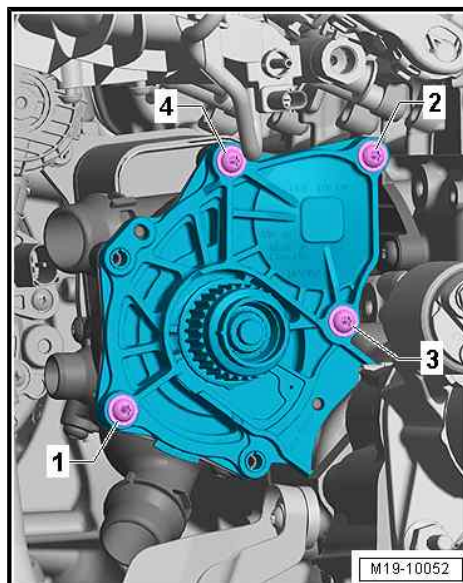
Toothed belt cover (version 2)

- Unplug electrical connector -item 2- for stage 3 oil pressure switch - F447- .
- Move electrical wiring harness -3- clear.
- Remove bolts -arrows- and detach toothed belt cover -1-.



Continued:

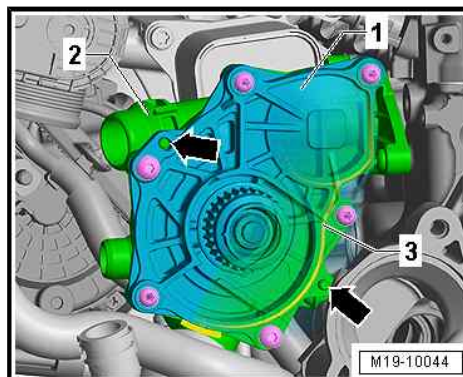
- Remove bolts -1 ... 4- and detach coolant pump from actuator for engine temperature regulation - N493- .
- Detach toothed belt from coolant pump.



Installing

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

- Fit coolant pump -1- and toothed belt.
- Check that centring elements -arrows- and gasket -3- are seated correctly.
- Tighten coolant pump bolts ⇒ [page 174](#) .



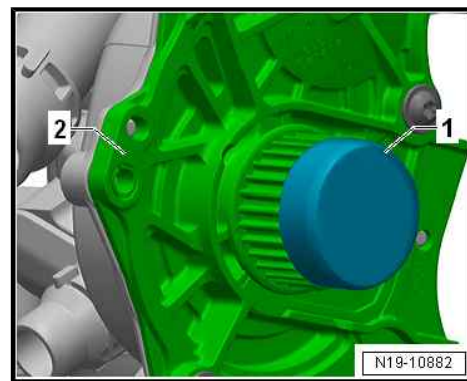


- After fitting new coolant pump -2-, remove protective cap -1- from drive sprocket.

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing coolant pump

Tightening torques

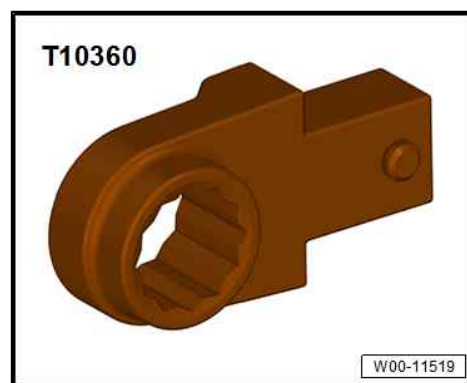
- ◆ ⇒ [“2.1 Exploded view - coolant pump/thermostat”, page 173](#)



2.6 Removing and installing toothed belt for coolant pump

Special tools and workshop equipment required

- ◆ Tool insert - T10360-

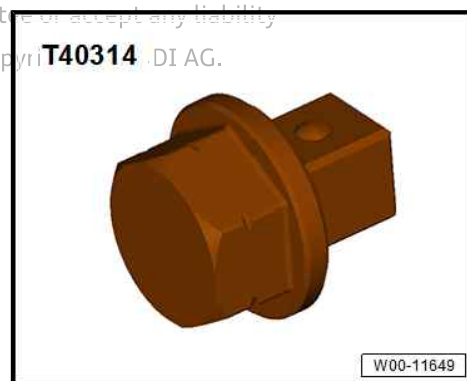


- ◆ Ratchet wrench (21 mm) - T40263-



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- ◆ Adapter - T40314-



Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr.



19 ; Coolant pump/thermostat assembly; Removing and installing toothed belt for coolant pump .

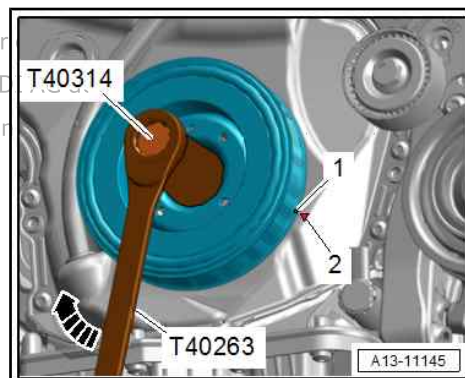
- Remove stage 3 oil pressure switch - F447- ➔ [page 158](#) .

Vehicles with alternator:

- Counterhold crankshaft at vibration damper with ratchet wrench (21 mm) - T40263- , adapter - T40314- and socket (24 mm).

Vehicles with starter-alternator:

- Depending on version, counterhold crankshaft at vibration damper using counterhold tool - T40378- or counterhold tool - T40379- .



All versions (continued):

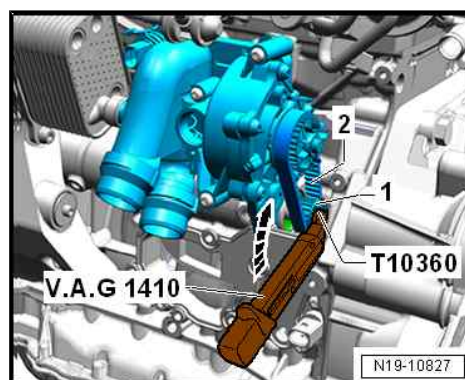


Caution

Risk of damage to thread.

- ◆ *The drive sprocket bolt has a left-hand thread.*

- Use torque wrench - V.A.G 1410- and insert tool - T10360- to loosen bolt on coolant pump drive sprocket -1- and unscrew three turns -arrow-.
- Remove toothed belt -2-.



Installing

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



Note

- ◆ *After removing, renew bolts tightened with specified tightening angle.*
- ◆ *Note installation position of toothed belt sprocket ➔ [Item 12 \(page 174\)](#) .*
- Install stage 3 oil pressure switch - F447- ➔ [page 158](#) .

Additional work depending on model ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing toothed belt for coolant pump

Tightening torques

- ◆ ➔ [“2.1 Exploded view - coolant pump/thermostat”, page 173](#)
- ◆ ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

2.7 Removing and installing actuator for engine temperature regulation - N493-

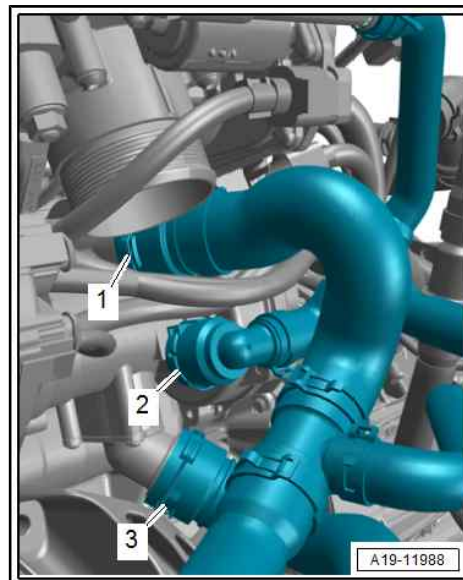
Removing

- Preparatory work may be necessary depending on model ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep.

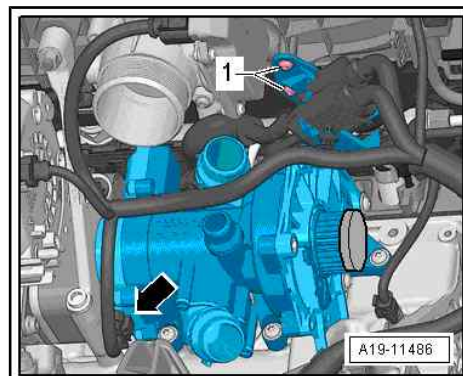


gr. 19 ; Coolant pump/thermostat assembly; Removing and installing actuator for engine temperature regulation - N493- .

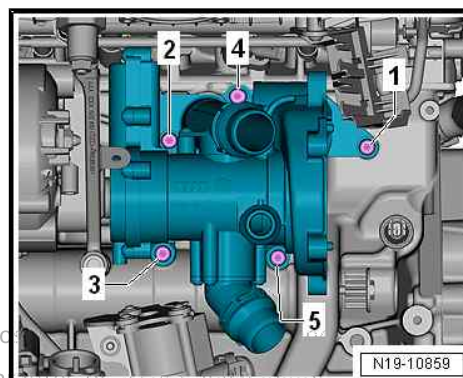
- Remove throttle valve module - GX3- ⇒ [page 216](#) .
- Remove coolant pump ⇒ [page 175](#) .
- Lift retaining clips -1, 3- and disconnect coolant hoses.



- Unplug electrical connector -arrow- for actuator for engine temperature regulation - N493- .



- Remove bolts -1 ... 5-.
- Detach actuator for engine temperature regulation - N493- from centring pins and pull actuator off engine oil cooler.



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Installing

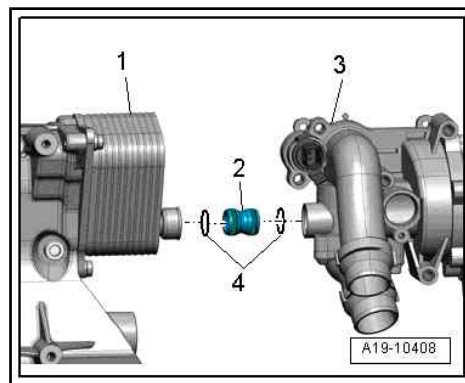
Installation is carried out in reverse order; note the following:



Note

Renew gaskets and O-rings after removal.

- Lubricate new O-rings -4- lightly with coolant ⇒ Electronic parts catalogue .
- Check whether the two centring pins are fitted in the cylinder block; install if necessary.
- Fit connecting piece -2- into engine oil cooler -1-.
- Push actuator for engine temperature regulation - N493- item 3- onto connecting piece and centring pins in cylinder block.
- Tighten bolts for actuator for engine temperature regulation - N493- ⇒ [page 174](#) .
- Install coolant pump ⇒ [page 175](#) .
- Install throttle valve module - GX3- ⇒ [page 216](#) .
- Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing actuator for engine temperature regulation - N493-
- After renewing, perform "Adaption" for actuator for engine temperature regulation - N493- in Guided Functions mode of ⇒ Vehicle diagnostic tester.



Tightening torques

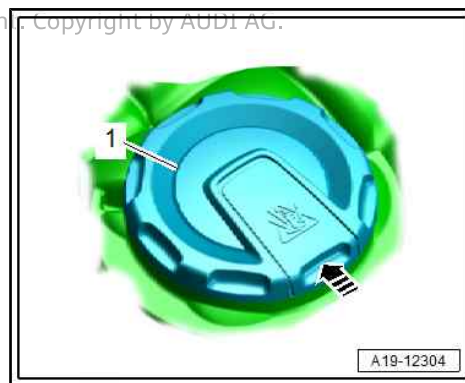
- ♦ ⇒ ["2.1 Exploded view - coolant pump/thermostat", page 173](#)

2.8 Removing and installing coolant temperature sender - G62-

Procedure

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing coolant temperature sender - G62-

- Engine cold
- To relieve residual pressure in cooling system, release fastener -arrow- and briefly open filler cap -1- on coolant expansion tank.
- If not already removed during preparatory work, remove engine cover panel ⇒ [page 12](#) .



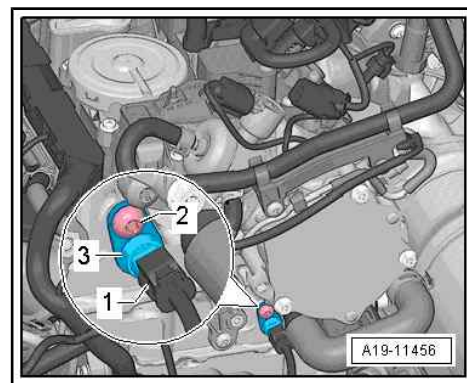


- Unplug electrical connector -1-.



Note

- ◆ *Place a cloth underneath to catch escaping coolant.*
 - ◆ *Insert new coolant temperature sender - G62- immediately into connection to avoid loss of coolant.*
 - ◆ *Renew O-rings after removing.*
- Remove bolt -2- and detach coolant temperature sender - G62- -item 3-.



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

- Check coolant level ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling up coolant .
- Install engine cover panel ⇒ [page 12](#) .

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing coolant temperature sender - G62-

Tightening torques

- ◆ ⇒ [“2.3 Exploded view - coolant temperature senders”, page 175](#)

2.9 Removing and installing radiator outlet coolant temperature sender - G83-

- All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing radiator outlet coolant temperature sender - G83- .
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3 Coolant pipes

All procedures and components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19; Coolant pipes .

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4 Radiator/radiator fans

All procedures and components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiator/radiator fans .



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21 – Turbocharging/supercharging

1 Turbocharger

⇒ [“1.1 Exploded view - turbocharger”, page 184](#)

⇒ [“1.2 Removing and installing turbocharger”, page 188](#)

⇒ [“1.3 Removing and installing charge pressure positioner V465”, page 196](#)

1.1 Exploded view - turbocharger

- ◆ Exploded view - turbocharger, part I ⇒ [page 184](#)
- ◆ Exploded view - turbocharger, part II ⇒ [page 185](#)
- ◆ Exploded view - charge pressure positioner ⇒ [page 187](#)

Exploded view - turbocharger, part I

1 - Bolt

- ☐ 25 Nm

2 - Oil return line

3 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

4 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

5 - Turbocharger

- ☐ Removing and installing ⇒ [page 188](#)

6 - Nut

- ☐ Renew after removing
- ☐ Coat studs with high-temperature paste ⇒ Electronic parts catalogue
- ☐ 25 Nm

7 - Gasket

- ☐ Renew after removing

8 - Bracket

9 - Coolant return line

10 - Bolt

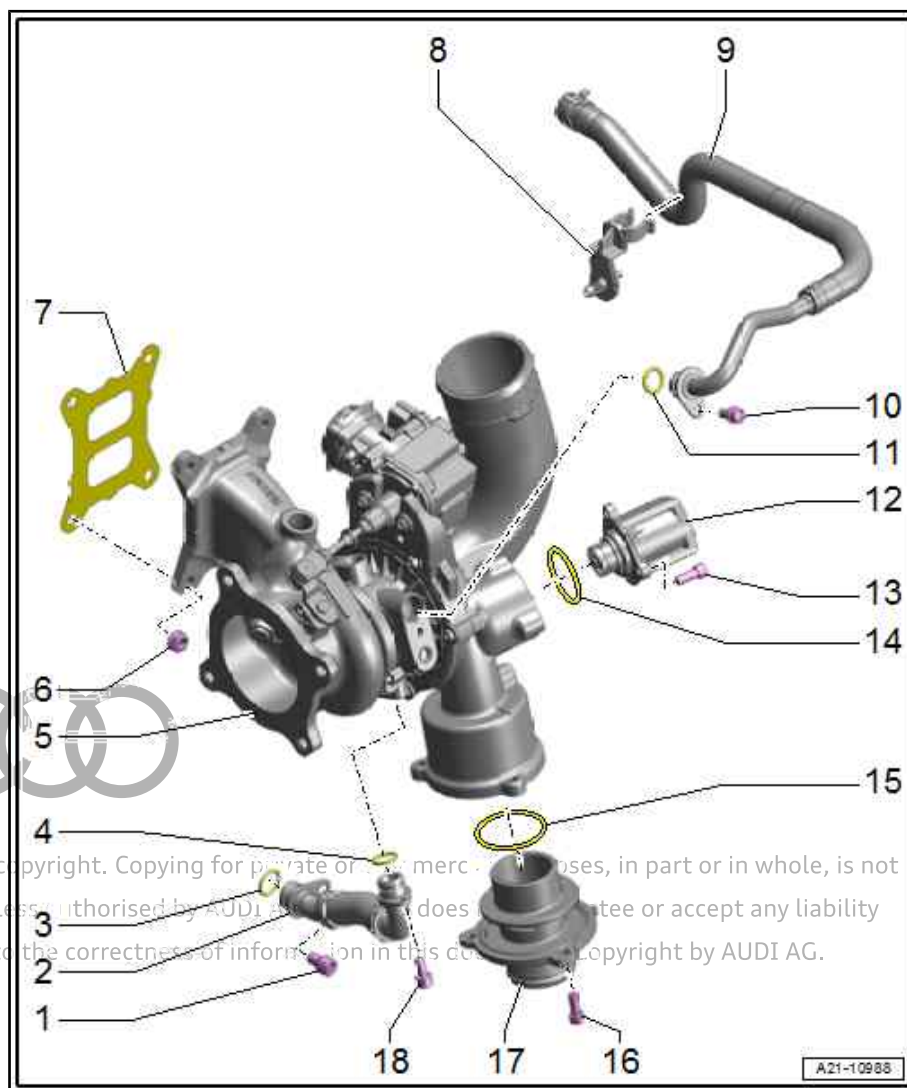
- ☐ 9 Nm

11 - O-ring

- ☐ Renew after removing
- ☐ Lubricate with coolant

12 - Turbocharger air recirculation valve - N249-

- ☐ Installation position ⇒ [page 185](#)





13 - Bolt

- ☐ 9 Nm

14 - O-ring

- ☐ Renew after removing

15 - O-ring

- ☐ Renew after removing

16 - Bolt

- ☐ 9 Nm

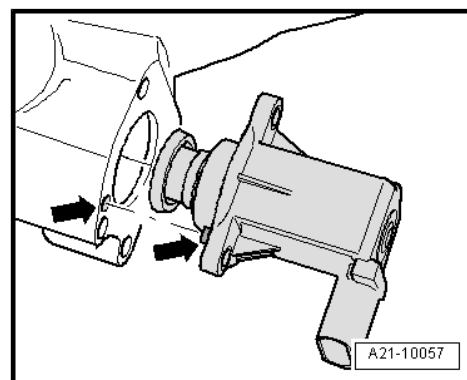
17 - Connection

18 - Bolt

- ☐ 9 Nm

Fitting location of turbocharger air recirculation valve - N249-

- Note installation position -arrows-.



Exploded view - turbocharger, part II



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1 - Support

2 - Turbocharger

- ❑ Removing and installing
⇒ [page 188](#)

3 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

4 - Line

- ❑ For crankcase breather
- ❑ Do not disconnect version with threaded connection
⇒ [Item 5 \(page 186\)](#) from turbocharger

5 - Bolt/threaded connection

- ❑ Depending on version, bolt or threaded connection with connected hose is fitted
- ❑ Do not disconnect threaded connection from turbocharger
- ❑ Bolt, 9 Nm

6 - Lambda probe 1 before catalytic converter - GX10-

- ❑ Exploded view
⇒ [page 252](#)

7 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

8 - Oil supply line

9 - Bolt

- ❑ 9 Nm

10 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil

11 - Bolt

- ❑ 9 Nm

12 - Bolt

- ❑ Coat with high-temperature paste ⇒ [Electronic parts catalogue](#)
- ❑ 30 Nm

13 - Heat shield

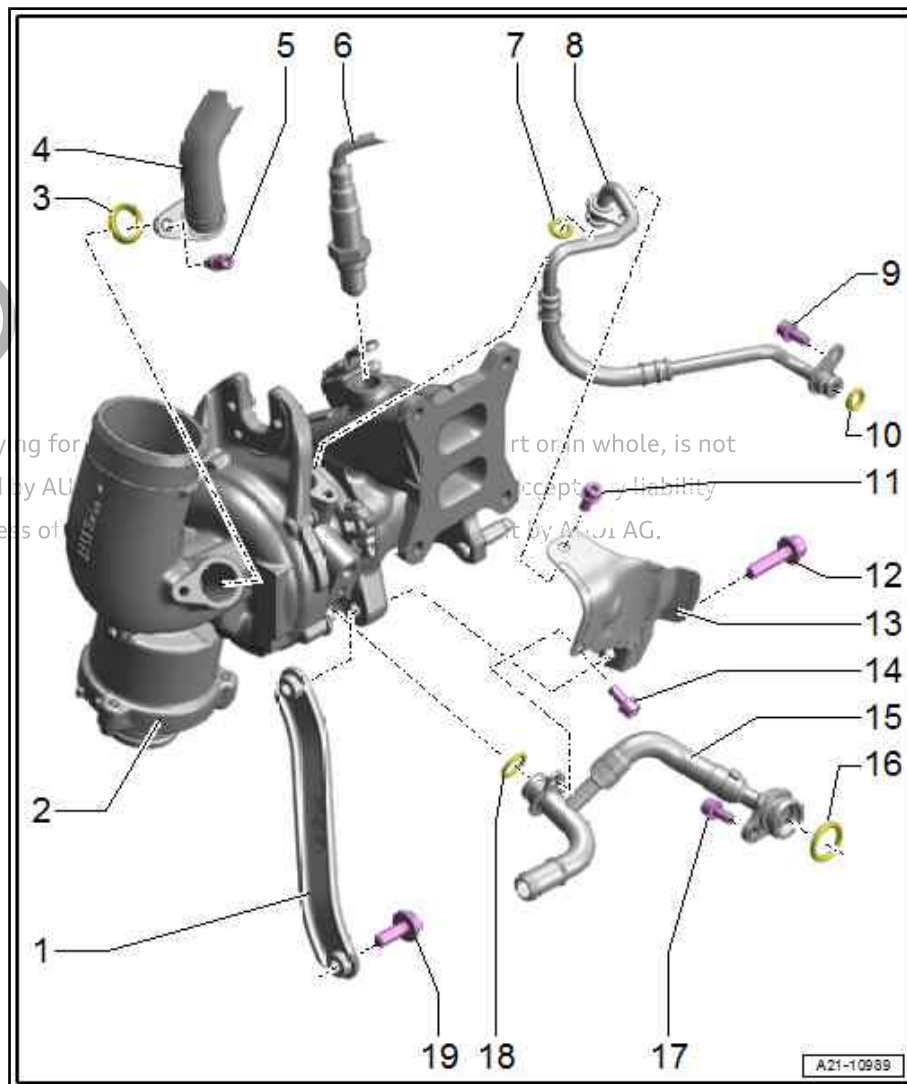
14 - Bolt

- ❑ 9 Nm

15 - Coolant supply line

16 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with engine oil





17 - Bolt

- ☐ 9 Nm

18 - O-ring

- ☐ Renew after removing
- ☐ Lubricate with coolant

19 - Bolt

- ☐ Renew after removing
- ☐ 20 Nm +90°

Exploded view - charge pressure positioner

1 - Lock nut

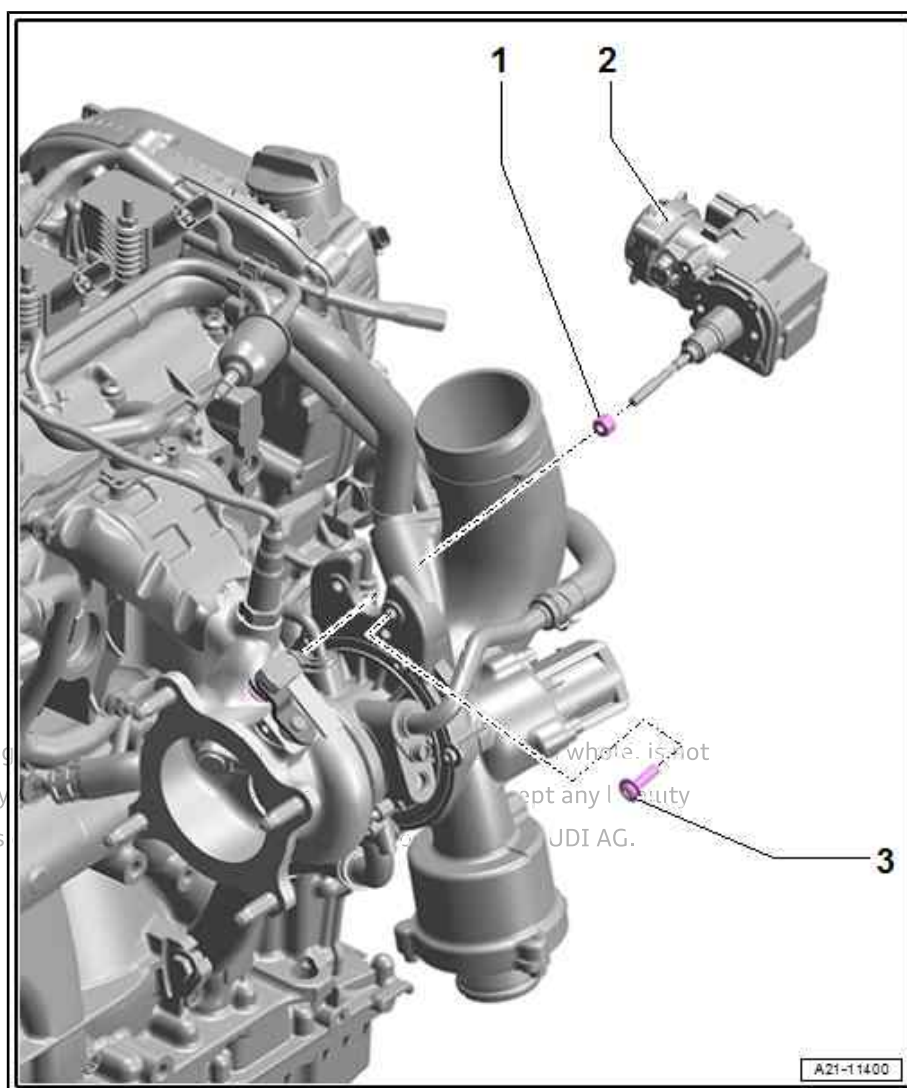
- ☐ 10 Nm

2 - Charge pressure positioner - V465-

- ☐ Before removing charge pressure positioner - V465- , check it is available in ⇒ Electronic parts catalogue (ETKA)
- ☐ Removing and installing ⇒ [page 196](#)

3 - Bolt

- ☐ 9 Nm





1.2 Removing and installing turbocharger



Caution

If the turbocharger has suffered mechanical damage (e.g. damaged compressor wheel), it is not sufficient merely to fit a new turbocharger. The following work must be performed in order to avoid further damage:

- ◆ *Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.*
- ◆ *Check the entire charge air system (including the charge air cooler) for foreign matter.*
- ◆ *If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.*

⇒ [“1.2.1 Removing turbocharger - vehicles without particulate filter”, page 188](#)

⇒ [“1.2.2 Removing turbocharger - vehicles with particulate filter”, page 192](#)

⇒ [“1.2.3 Installing turbocharger”, page 195](#)

1.2.1 Removing turbocharger - vehicles without particulate filter

Removing



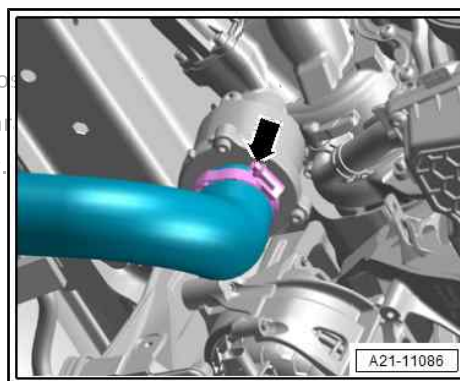
Note

Observe rules for cleanliness ⇒ [page 5](#).

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Turbocharger; Removing and installing turbocharger .

- Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Drain coolant ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling up coolant .
- Open hose clip -arrow-, detach air hose and swivel to side.

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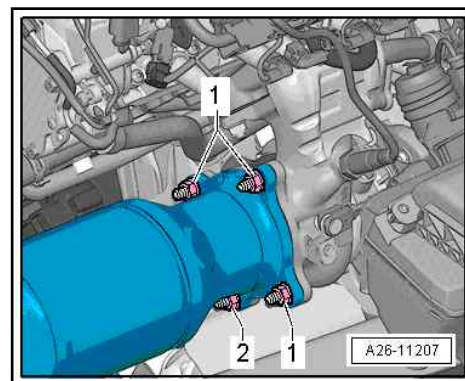


- Remove nut -2- from underneath.

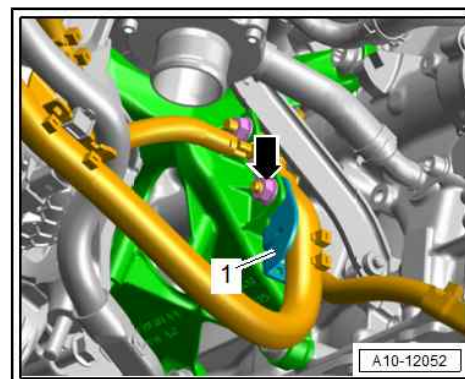


Note

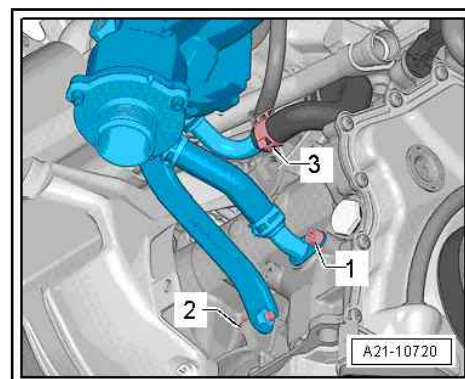
The nuts -1- are removed at a later stage.



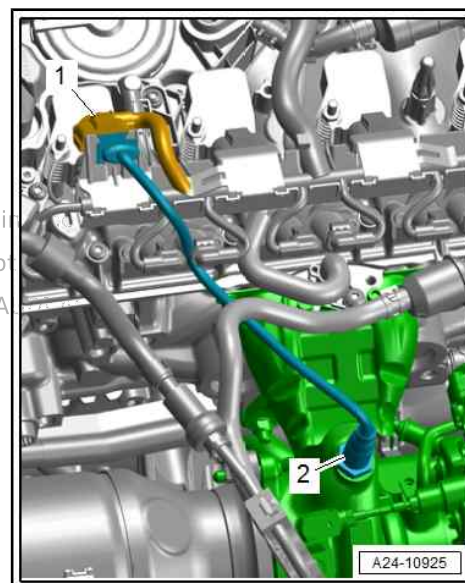
- Remove nut -arrow- and press bracket -1- with electrical wiring harness to one side.



- Unscrew bolt -1- and detach oil return line.
- Remove bolt -2-.



- Remove electrical connector -1- for Lambda probe 1 before catalytic converter - GX10- -item 2- from bracket and unplug connector.

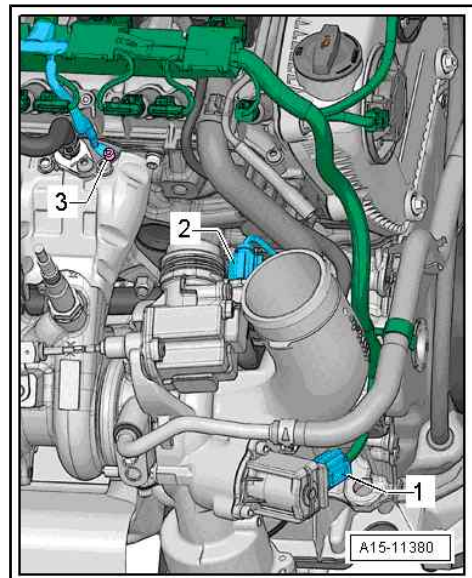
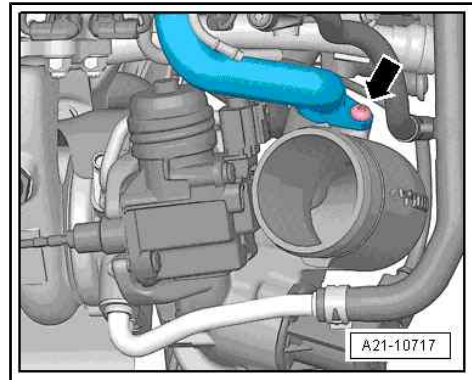


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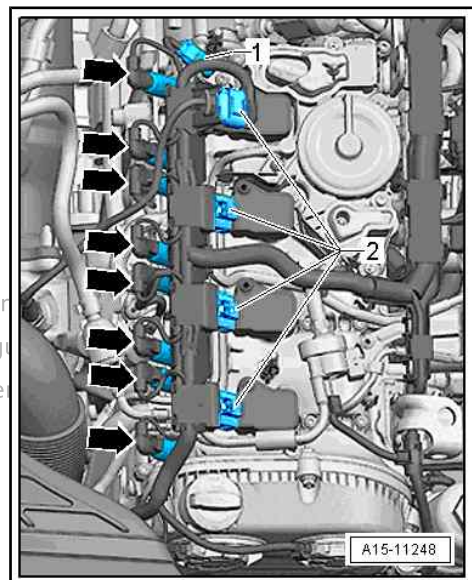
Version with bolted connection:

- Remove bolt -arrow- and detach crankcase breather pipe from turbocharger.
- Unplug electrical connector -2- for charge pressure positioner - V465- .
- Unplug electrical connector -1- for turbocharger air recirculation valve - N249- .



Version with threaded connection:

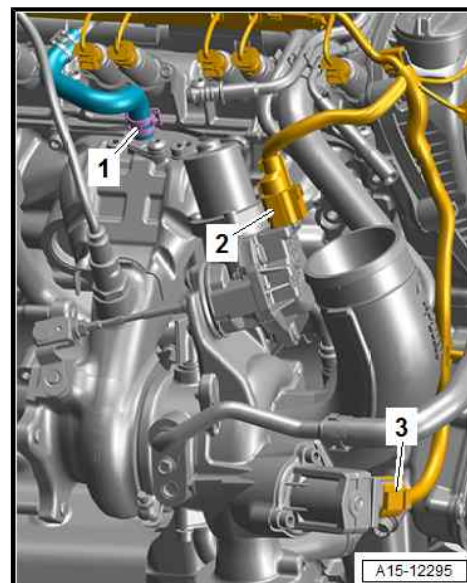
- Unplug electrical connectors:
 - 1 - For Hall sender - G40-
 - 2 - For ignition coils
 - Pfeile - For cam actuators



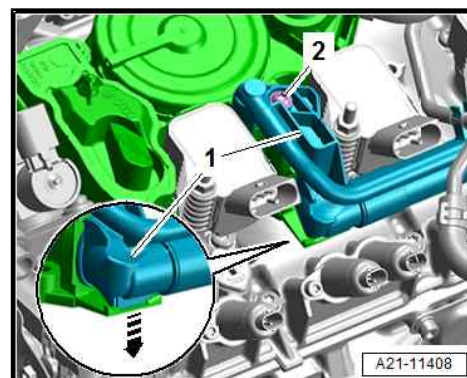
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- Unplug electrical connectors and move electrical wiring clear:
- 2 - For charge pressure positioner - V465-
- 3 - For turbocharger air recirculation valve - N249-
- Release hose clip -1- and disconnect coolant hose.

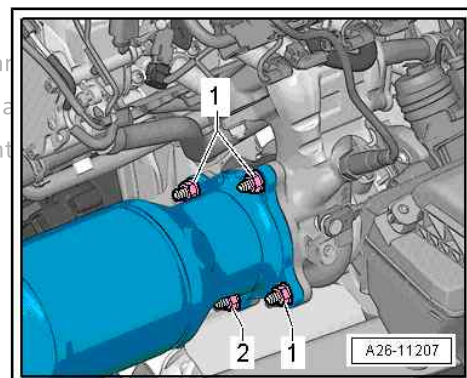


- Remove bolt -2-.
- Release fasteners -arrow-, disconnect crankcase breather hose -1- and move it clear.

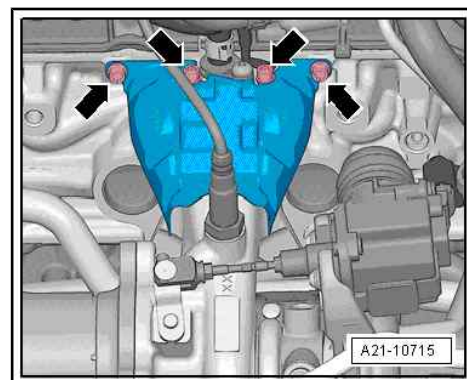


All versions (continued):

- Remove nuts -1- from above and push catalytic converter to-wards rear.

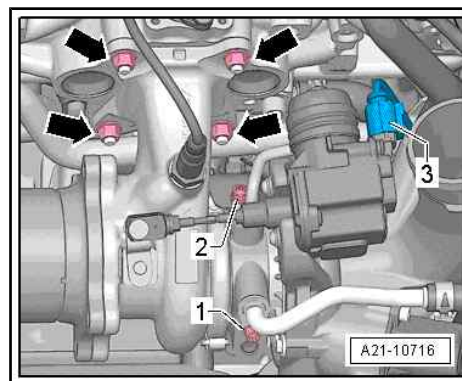


- Remove bolts -arrows- and detach heat shield.





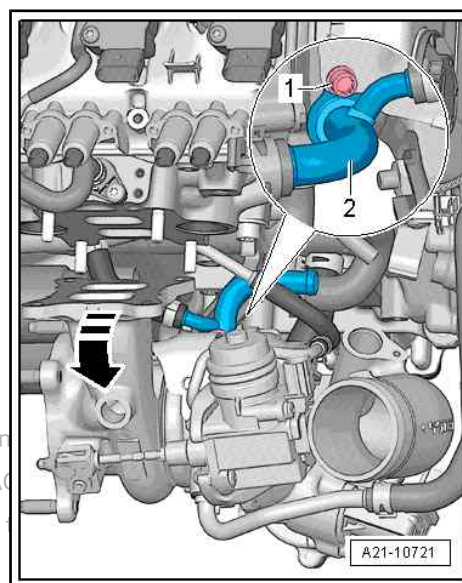
- Unscrew bolt -1- and remove coolant return line.
- Remove bolt -2- and detach oil supply line.
- Remove nuts -arrows-.



- Pull turbocharger off studs in direction of -arrow-.
- Have a 2nd mechanic hold turbocharger in place.
- Unscrew bolt -1-, push heat shield slightly to one side and disconnect coolant supply line -2-.
- Lift out turbocharger.



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1.2.2 Removing turbocharger - vehicles with particulate filter

Removing



Note

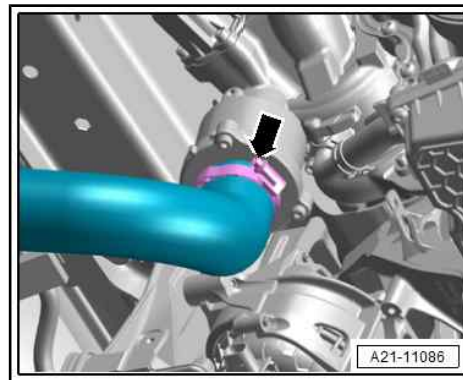
Observe rules for cleanliness ⇒ [page 5](#).

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Turbocharger; Removing and installing turbocharger .

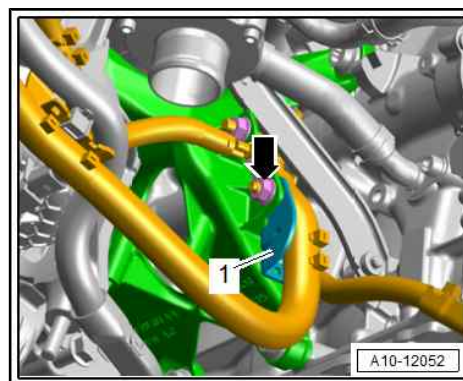
- Remove noise insulation panels ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .
- Drain coolant ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling up coolant .



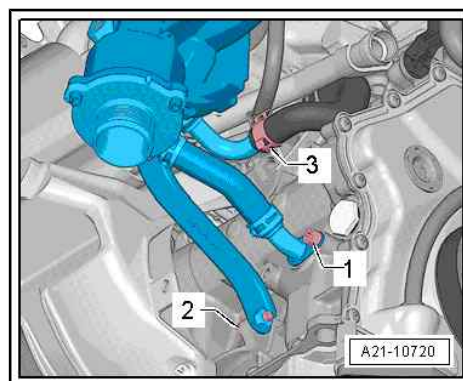
- Open hose clip -arrow-, detach air hose and swivel to side.



- Remove nut -arrow- and press bracket -1- with electrical wiring harness to one side.



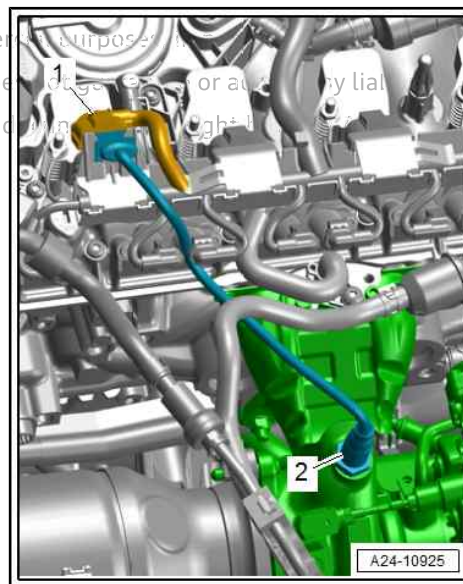
- Unscrew bolt -1- and detach oil return line.
- Remove bolt -2-.



- Remove electrical connector -1- for Lambda probe 1 before catalytic converter - GX10- item 2- from bracket and unplug connector.

Note:

Installation position varies depending on model and version.



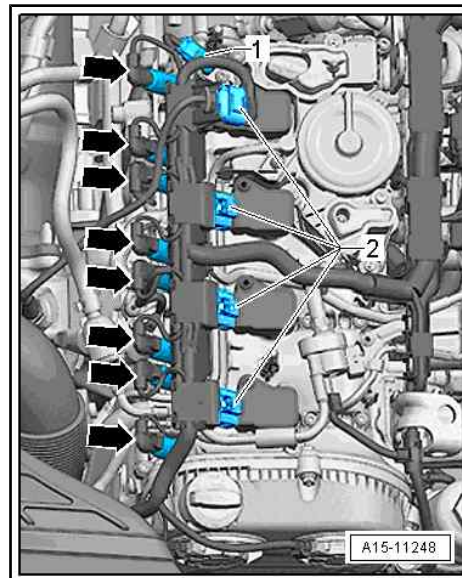


– Unplug electrical connectors:

1 - For Hall sender - G40-

2 - For ignition coils

Pfeile - For cam actuators

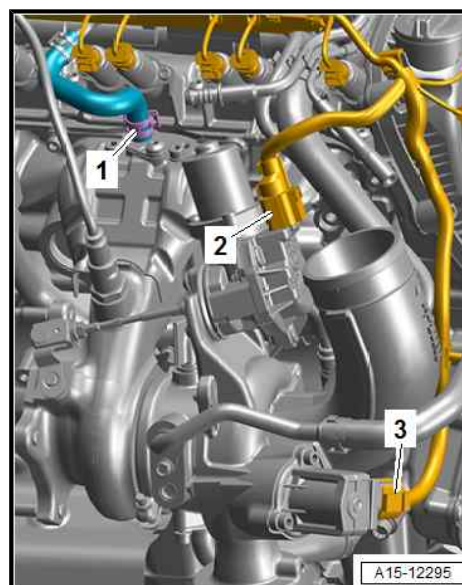


– Unplug electrical connectors and move electrical wiring clear:

2 - For charge pressure positioner - V465-

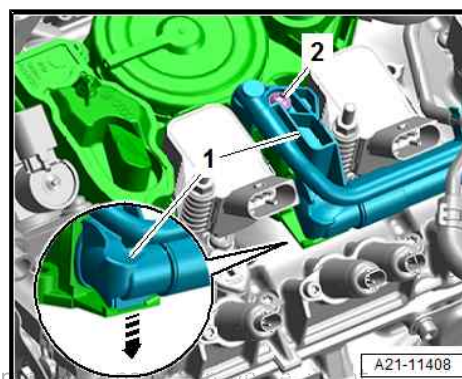
3 - For turbocharger air recirculation valve - N249-

– Release hose clip -1- and disconnect coolant hose.



– Remove bolt -2-.

– Release fasteners -arrow-, disconnect crankcase breather hose -1- and move it clear.



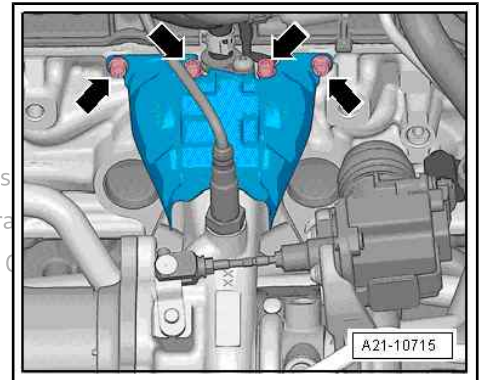
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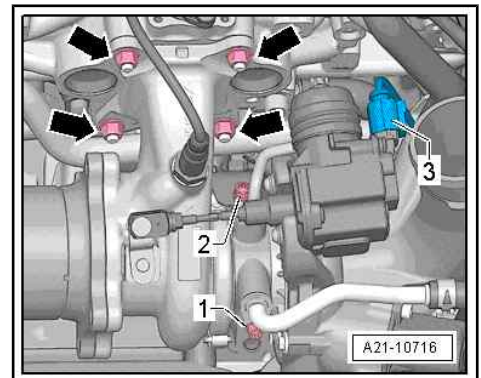
- Remove bolts -arrows- and detach heat shield.



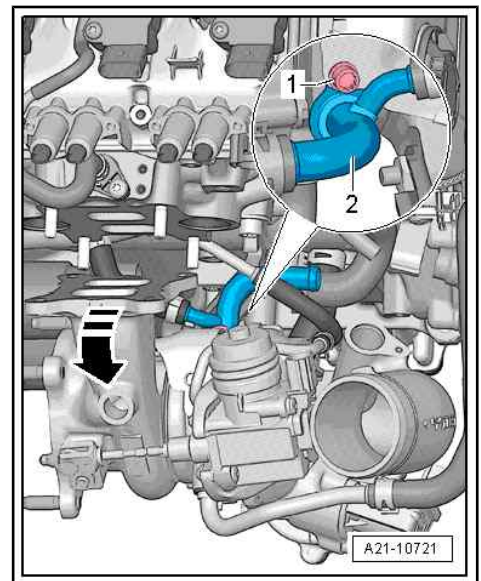
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- Unscrew bolt -1- and remove coolant return line.
- Remove bolt -2- and detach oil supply line.
- Remove nuts -arrows-.



- Pull turbocharger off studs in direction of -arrow-.
- Have a 2nd mechanic hold turbocharger in place.
- Unscrew bolt -1-, push heat shield slightly to one side and disconnect coolant supply line -2-.
- Lift out turbocharger.



1.2.3 Installing turbocharger

Installing

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



Note

- ◆ *After removing, renew bolts tightened with specified tightening angle.*
 - ◆ *Renew gaskets, seals, O-rings and self-locking nuts after removal.*
 - ◆ *Lubricate studs for turbocharger with high-temperature paste
⇒ Electronic parts catalogue .*
 - ◆ *Fill turbocharger with engine oil at connection for oil supply line.*
 - ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- Install catalytic converter ⇒ [page 260](#) .
 - Check oil level ⇒ [page 142](#) .
 - Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.



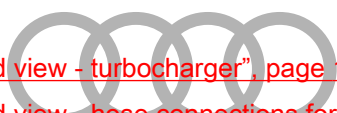
Note

- ◆ *After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.*
 - ◆ *Do not reuse coolant.*
- Fill up coolant ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Turbocharger; Removing and installing turbocharger

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - turbocharger”, page 184](#)
- ◆ ⇒ [“2.2 Exploded view - hose connections for charge air system”, page 198](#)
- ◆ ⇒ [“3.1 Exploded view - cylinder head”, page 101](#)
- ◆ ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation



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1.3 Removing and installing charge pressure positioner - V465-

Note

Before removing charge pressure positioner - V465- , check it is available in ⇒ Electronic parts catalogue (ETKA) .

Removing



Note

Observe rules for cleanliness ⇒ [page 5](#) .



- Remove air cleaner housing ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .
- Unplug electrical connector -4-.
- Loosen lock nut -2- by a quarter turn (counterhold at hexagon flats -arrow- on control rod).
- Unscrew control rod from actuating lever -1-, taking care not to turn lock nut.
- Remove bolts -3- and detach charge pressure positioner - V465- .

Installing

- If renewing charge pressure positioner, ensure installation position of lock nut is the same on new charge pressure positioner.

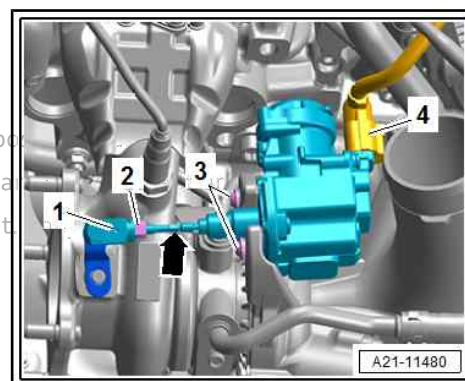
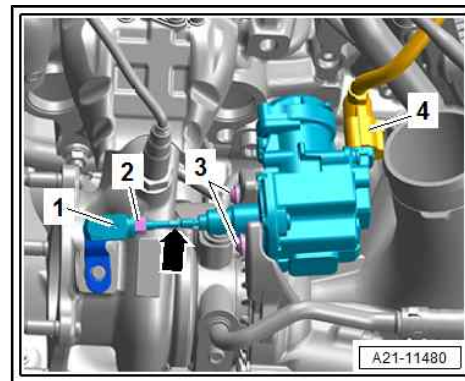
- Place charge pressure positioner - V465- in installation position and tighten bolts -3-.
- Screw control rod into actuating lever -1- until it makes contact with lock nut -2-.
- Plug in electrical connector -4-.
- Learn values must be adapted after renewing charge pressure positioner - V465- .

- Connect ⇒ Vehicle diagnostic tester.
- Select **Diagnosis** mode and then **Start diagnosis**.
- Choose **Select own test** tab and select following options one after the other:

- ◆ **Drive train**
- ◆ **Select engine code and engine**
- ◆ **01 - Self-diagnosis compatible systems**
- ◆ **01 - Engine electronics**
- ◆ **01 - Engine electronics, functions**
- ◆ **01 - Set charge pressure adjuster -V465**

Tightening torques

- ◆ ⇒ [page 187](#)





2 Charge air system

⇒ [“2.1 Exploded view - charge air system”, page 198](#)

⇒ [“2.2 Exploded view - hose connections for charge air system”, page 198](#)

⇒ [“2.3 Removing and installing charge air cooler”, page 199](#)

⇒ [“2.4 Removing and installing charge pressure sender G31 ”, page 199](#)

⇒ [“2.5 Checking charge air system for leaks”, page 199](#)

2.1 Exploded view - charge air system

All components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Exploded view - charge air system .

2.2 Exploded view - hose connections for charge air system



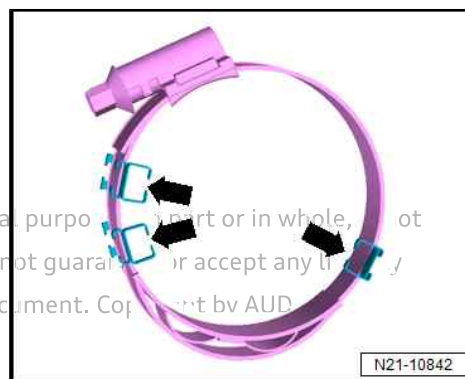
Note

- ◆ *Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ *Electronic parts catalogue* .*
- ◆ *If using used hose clips to secure the air hoses at their connections, spray rust remover onto the worm threads before installing.*

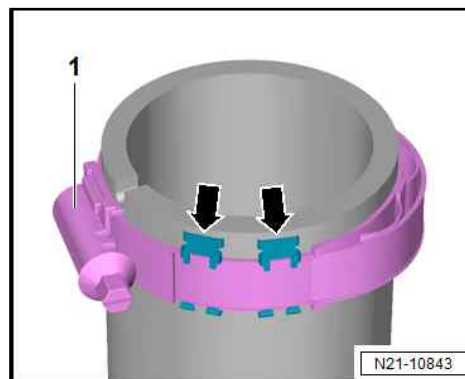
Hose clips on pressure side are fitted with retaining hooks -arrows-.

- To disconnect air hose, hose clip must be loosened far enough.
- Hose clips which have been loosened can be re-used.

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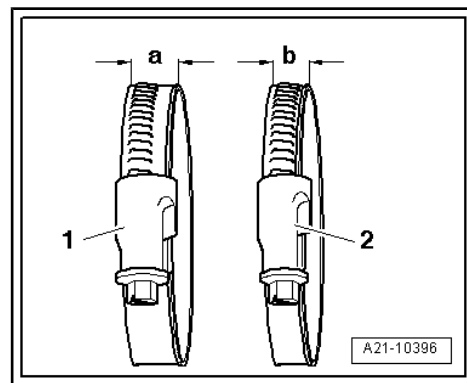
- Hose clip -1- with retaining hooks -arrows- must not be pulled off air hose.
- If a hose clip with retaining hooks is pulled off air hose, air hose must be renewed.
- New air hoses are supplied with hose clip fitted.





Tightening torque for

- 1 - Hose clip with width -a- = 12 mm: 5.5 Nm
- 2 - Hose clip with width -b- = 9 mm: 3.4 Nm



2.3 Removing and installing charge air cooler

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing charge air cooler .

2.4 Removing and installing charge pressure sender - G31-

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing charge pressure sender - G31- .

2.5 Checking charge air system for leaks

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Checking charge air system for leaks .

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

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- Unscrew pressure control valve -2- completely and close valves -3- and -4-.
- Make sure knob is pulled out before turning pressure control valve -2-.
- Using a commercially available connection piece, connect charge air system tester - V.A.G 1687- to compressed air -1-.
- If there is water in sight glass, remove drain plug -6- and drain water.
- Open valve -3-.



Caution

Risk of damage if pressure is set too high.

- ◆ *The pressure must not exceed 0.2 bar.*

- Adjust pressure to 0.2 bar via pressure control valve -2-.
- Open valve -4- and wait until test system is pressurised. If necessary, adjust pressure to 0.2 bar again.
- Check charge air system for audible leaks or leaks that can be felt with the hand; apply commercially available leak detecting spray or use ultrasonic tester - V.A.G 1842- .



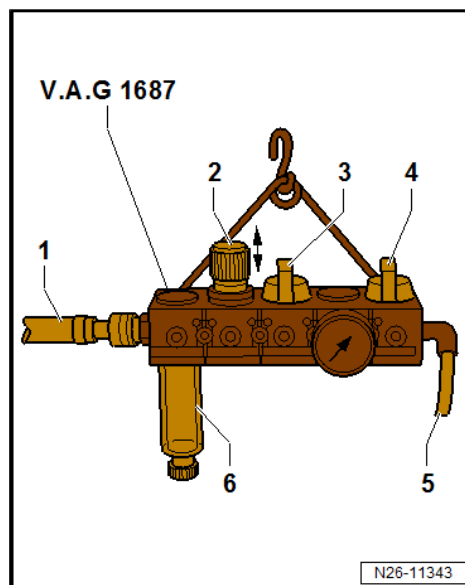
Note

- ◆ *A small amount of air escapes through the valves and enters the engine. Therefore it is not possible to perform a pressure retention test.*
- ◆ *Operation of ultrasonic tester - V.A.G 1842- ⇒ Operating instructions .*
- ◆ *Release pressure in test circuit by detaching coupling from adapter before removing adapter.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

Assembling

Assemble in reverse order.

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Checking charge air system for leaks



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24 – Mixture preparation - injection

1 Injection system

All components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Injection system .

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2 Air cleaner

All procedures and components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner .



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3 Intake manifold

⇒ ["3.1 Exploded view - intake manifold", page 203](#)

⇒ ["3.2 Removing and installing intake manifold", page 204](#)

⇒ ["3.3 Removing and installing throttle valve module GX3", page 216](#)

⇒ ["3.4 Cleaning throttle valve module GX3", page 217](#)

⇒ ["3.5 Checking intake manifold change-over function", page 218](#)

3.1 Exploded view - intake manifold

1 - Bolt

- ☐ 20 Nm

2 - Support for intake manifold

3 - Nut

- ☐ 10 Nm

4 - Bonded rubber bush

- ☐ 5 Nm

5 - Bolt

- ☐ 7 Nm

6 - Throttle valve module - GX3-

- ☐ with

◆ Throttle valve module - J338-

◆ Throttle valve drive for electric throttle - G186-

◆ Throttle valve drive angle sender 1 for electric throttle - G187-

◆ Throttle valve drive angle sender 2 for electric throttle - G188-

- ☐ Removing and installing
⇒ [page 216](#)

- ☐ After installing, perform
adaption ⇒ Vehicle diagnostic tester

- ☐ Cleaning ⇒ [page 217](#)

7 - Seal

- ☐ Renew after removing

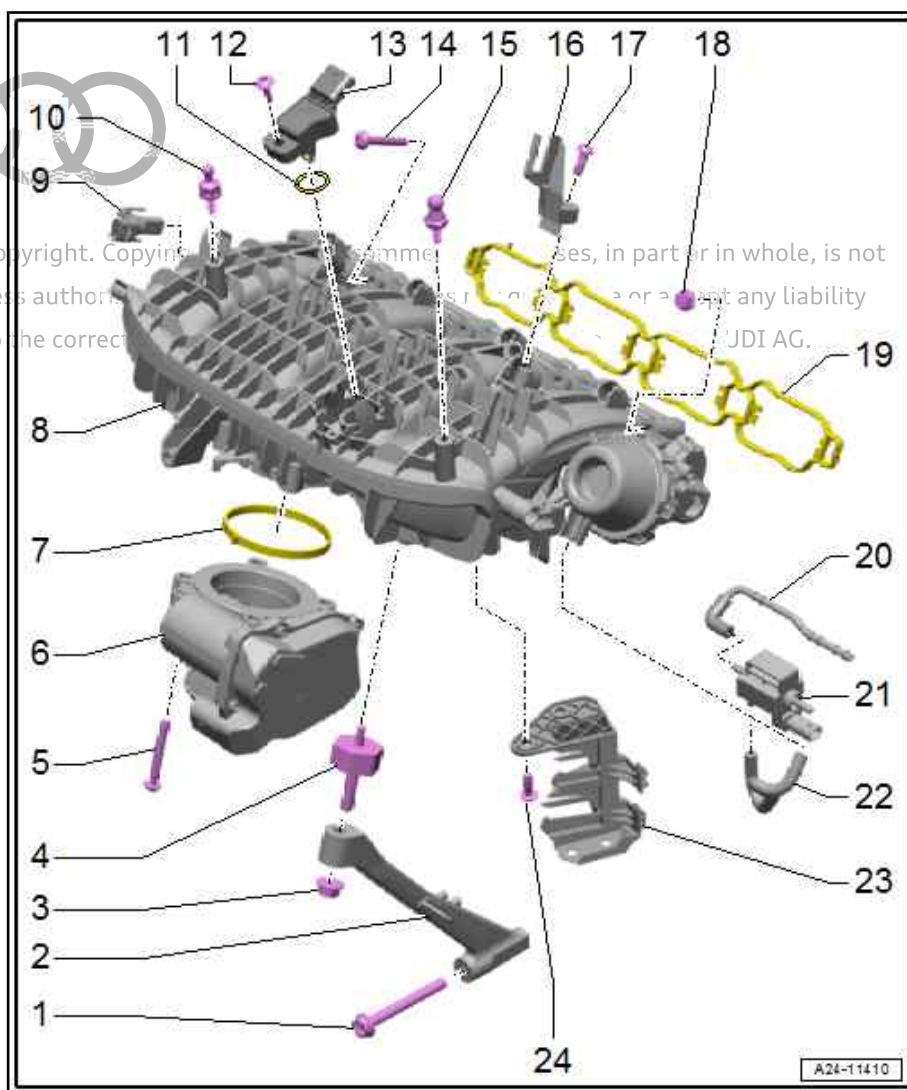
8 - Intake manifold

- ☐ Removing and installing ⇒ [page 204](#)

9 - Intake manifold flap potentiometer - G336-

10 - Ball stud

- ☐ For engine cover panel
- ☐ 5 Nm





11 - O-ring

- ☐ Renew after removing

12 - Bolt

- ☐ 1.5 Nm

13 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- ☐ Removing and installing ⇒ [page 234](#)

14 - Bolt

- ☐ Tighten in several stages and in diagonal sequence
- ☐ 9 Nm

15 - Ball stud

- ☐ For engine cover panel
- ☐ 5 Nm

16 - Bracket

- ☐ For electrical connector

17 - Bolt

- ☐ 5 Nm

18 - Bolt

- ☐ Tighten in several stages and in diagonal sequence
- ☐ 9 Nm

19 - Gasket

- ☐ Renew after removing

20 - Vacuum hose

- ☐ Leading from vacuum pump

21 - Intake manifold flap valve - N316-

22 - Vacuum hose

23 - Bracket

- ☐ For electrical connectors

24 - Bolt

- ☐ 5 Nm

3.2 Removing and installing intake manifold

⇒ [“3.2.1 Removing and installing intake manifold - vehicles without particulate filter”, page 204](#)

⇒ [“3.2.2 Removing and installing intake manifold - vehicles with particulate filter”, page 209](#)

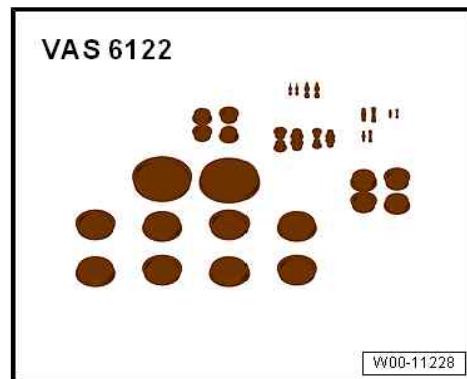
⇒ [“3.2.3 Installing intake manifold”, page 215](#)

3.2.1 Removing and installing intake manifold - vehicles without particulate filter

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- ◆ Engine bung set - VAS 6122-



- ◆ Hose clip pliers - VAS 6362-



- ◆ Socket, AF 17 mm - T10456-



- ◆ Safety goggles
- ◆ Protective gloves

Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing intake manifold .

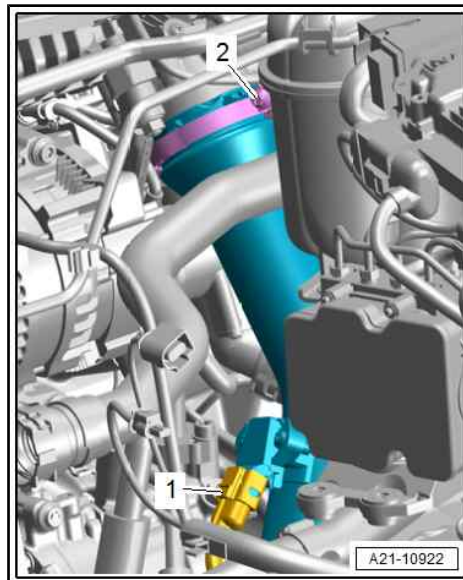
- If there is no B+ cover on the alternator, disconnect earth wire from battery terminal to avoid short circuits ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .



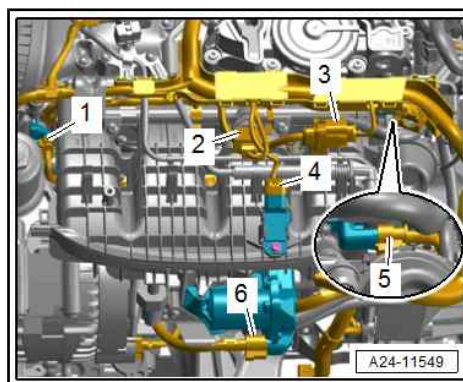
- Unplug electrical connector -1- for charge pressure sender - G31- .
- Loosen screw-type clip -2- and detach air pipe from throttle valve module - GX3- .

Note:

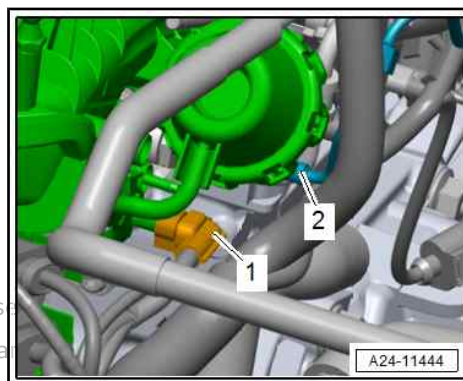
Installation position varies depending on model and version.



- Unplug electrical connectors and move wiring clear:
- 1 - For intake manifold flap potentiometer - G336-
- 2 - For fuel pressure sender for low pressure - G410- (vehicles with MPI engine) / gas rail temperature and pressure sensor - GX21- (vehicles with natural gas system)
- 3 - Central connector for injectors (MPI injection)/gas injection valves (vehicles with natural gas system)
- 4 - For intake air temperature sender - G42-
- 5 - For Hall sender - G40-
- 6 - For throttle valve module - GX3-



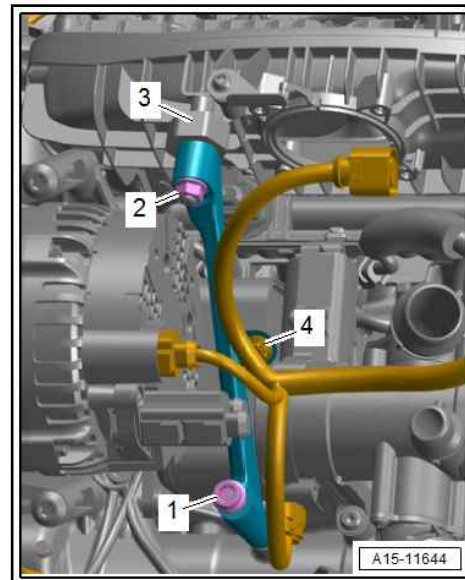
- Unplug electrical connector -1- for intake manifold flap valve - N316- .
- Disconnect vacuum hose -2-.



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- If necessary, move electrical wiring harness -4- clear.
- Unscrew nut -2- and bolt -1- and remove support for intake manifold.



- Move electrical wiring clear.
- Remove bolts -1 and 2- and press coolant pipe (left-side) to the side.

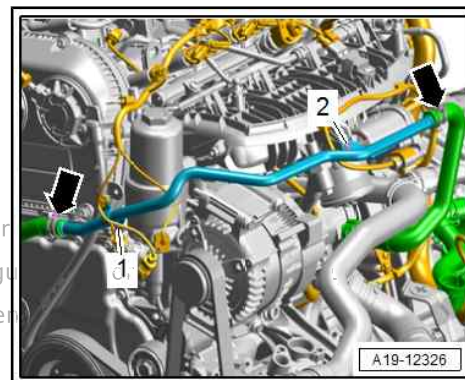


WARNING

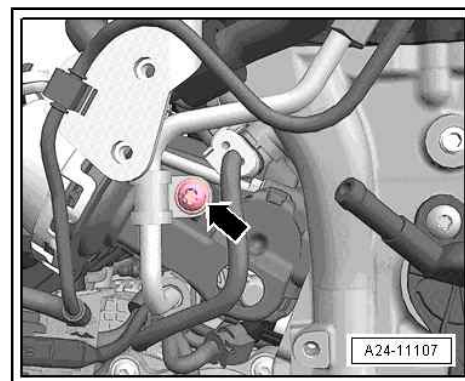
The fuel system is pressurised. Copying for private or commercial purposes without the written permission of AUDI AG. AUDI AG does not guarantee the correctness of information in this document.

Risk of injury as fuel may spray out.

- **Put on safety goggles.**
- **Put on protective gloves.**
- **Release pressure (wrap a clean cloth around connection and open connection carefully).**



- Remove bolt -arrow- for retaining clip.

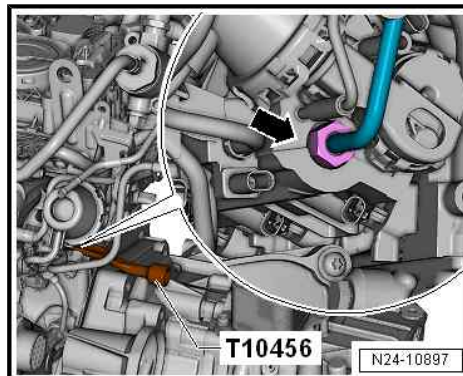




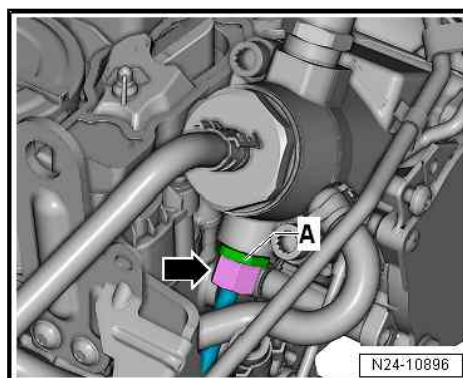
Note

Place a cloth underneath to catch escaping fuel.

- Unscrew union nut -arrow- using socket, AF 17 mm - T10456- .

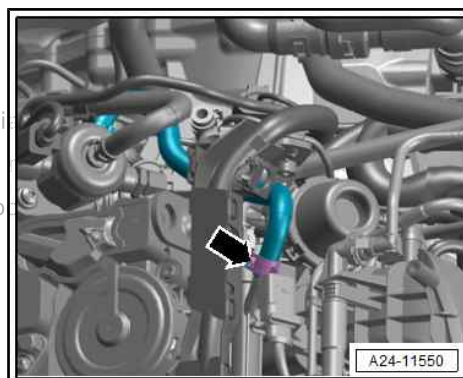


- Unscrew union nut -arrow- (counterhold at connecting piece -A-).
- Detach high-pressure pipe.
- Seal off open lines and connections with plugs (thoroughly cleaned) from engine bung set - VAS 6122- .

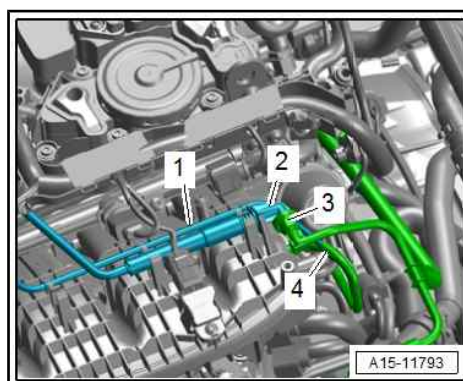


- Vehicles with MPI engine: Release hose clip -arrow- and disconnect fuel hose.

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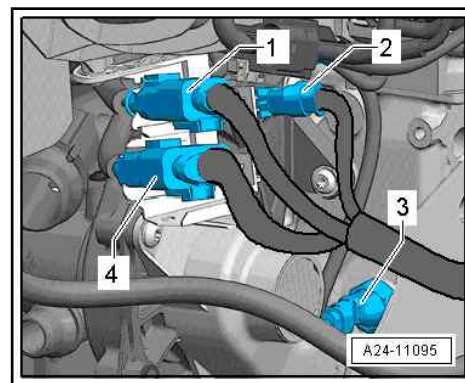


- Move coolant line -2- clear at intake manifold and push to one side.
- Disconnect vacuum hose -4-.
- Move vacuum line -1- for intake manifold flap valve - N316- clear at intake manifold.

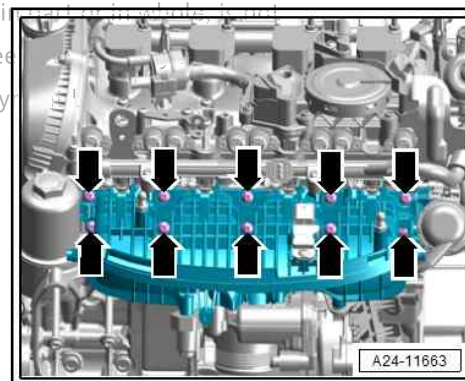




- Detach electrical connectors -1, 2, 4- from bracket.



- Remove bolts -arrows-.

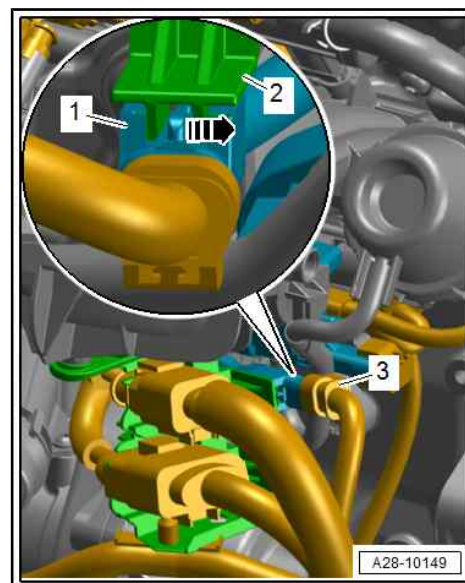


- Unplug electrical connector -3- and detach intake manifold.
- Release fastener -arrow-, detach it from bracket -2- and move electrical connector -1- for knock sensor 1 - G61- clear.



Note

Seal off all open passages in the intake system with clean cloths or plugs (thoroughly cleaned) from engine bung set - VAS 6122-.

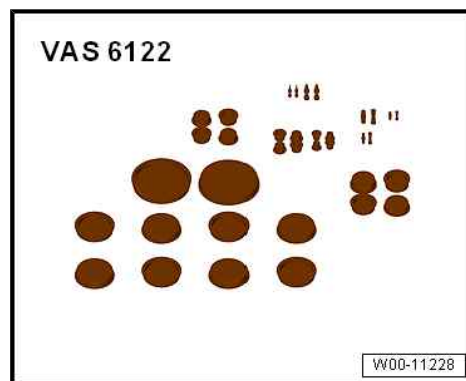


3.2.2 Removing and installing intake manifold - vehicles with particulate filter

Special tools and workshop equipment required



◆ Engine bung set - VAS 6122-



◆ Hose clip pliers - VAS 6362-



◆ Safety goggles

◆ Protective gloves

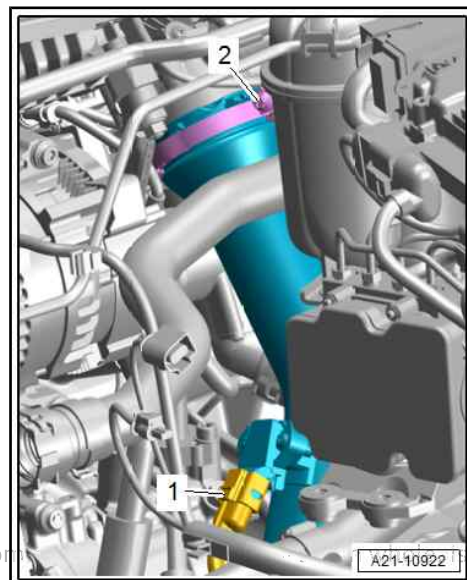
Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing intake manifold .

- Unplug electrical connector -1- for charge pressure sender - G31- .
- Loosen screw-type clip -2- and detach air pipe from throttle valve module - GX3- .

Note:

Installation position varies depending on model and version.

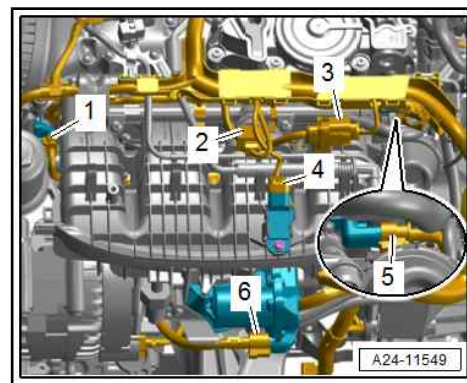


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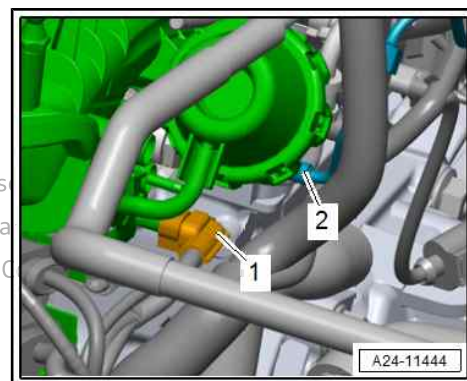
- Unplug electrical connectors and move wiring clear:

- 1 - For intake manifold flap potentiometer - G336-
- 4 - For intake air temperature sender - G42-
- 5 - For Hall sender - G40-
- 6 - For throttle valve module - GX3-

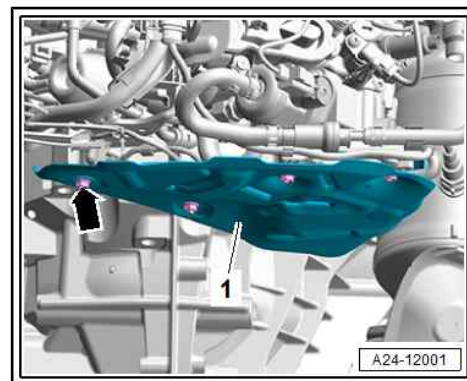


- Unplug electrical connector -1- for intake manifold flap valve - N316- .
- Disconnect vacuum hose -2-.

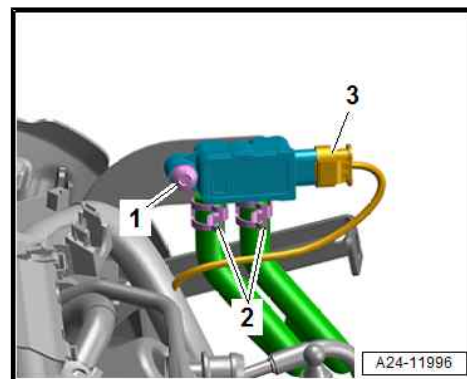
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- Remove nut -arrow- on heat shield (shown with particulate filter removed).

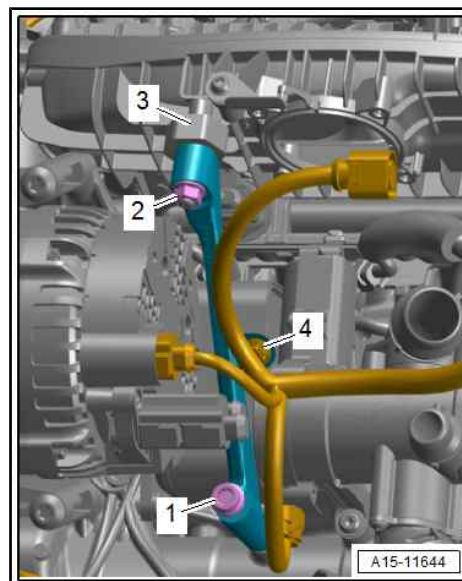


- Unplug electrical connector -3-.
- Remove bolt -1- and press pressure differential sender for particulate filter - G1037- to one side.

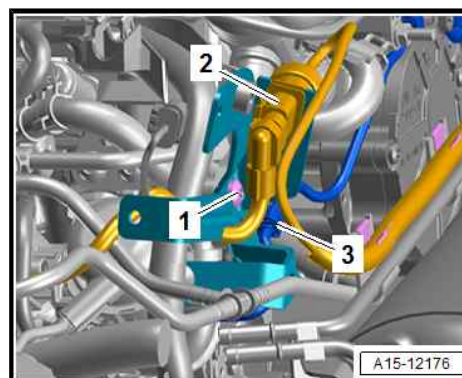




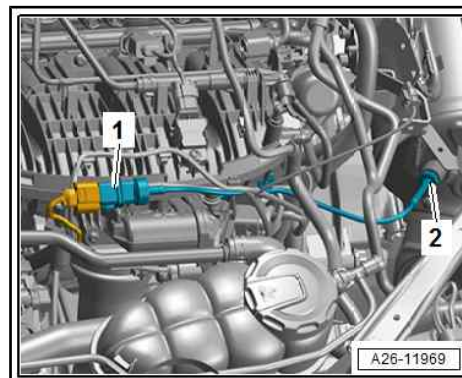
- Unscrew nut -2- and bolt -1- and remove support for intake manifold.



- Take electrical connector -2- for exhaust gas temperature sender 3 - G495- out of bracket and unplug.
- Release retaining clip -3- and move vacuum hose clear.
- Remove bolt -1- and detach bracket.



- Unplug electrical connector -1- for exhaust gas temperature sender 4 - G648- and move wiring clear.



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- Move electrical wiring clear.
- Remove bolts -1 and 2- and press coolant pipe (left-side) to the side.

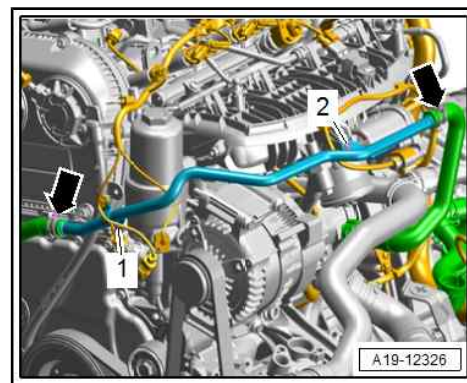


WARNING

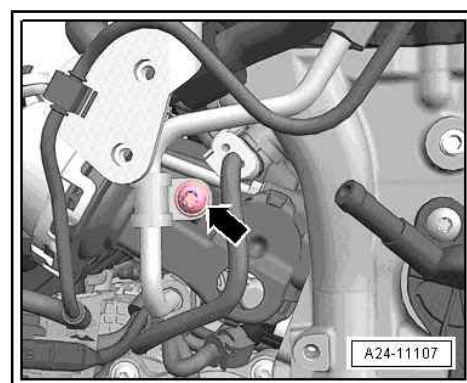
The fuel system is pressurised.

Risk of injury as fuel may spray out.

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*



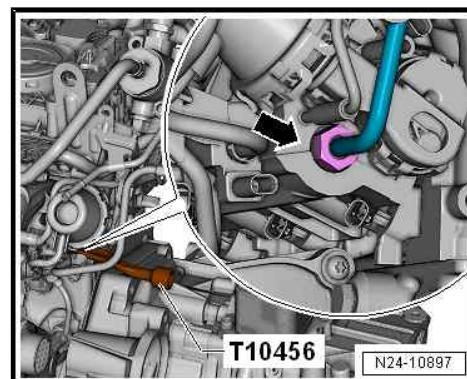
- Remove bolt -arrow- for retaining clip.



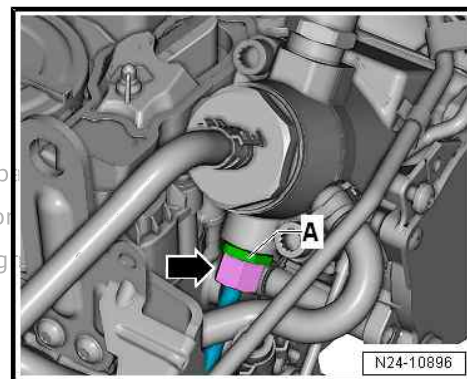
Note

Place a cloth underneath to catch escaping fuel.

- Unscrew union nut -arrow- using socket, AF 17 mm - T10456- .



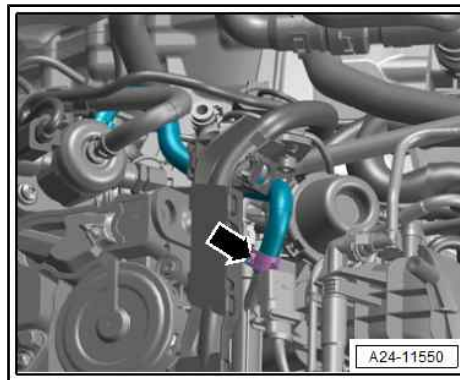
- Unscrew union nut -arrow- (counterhold at connecting piece -A-).
- Seal off open lines and connections with plugs (thoroughly cleaned) from engine bung set - VAS 6122- .



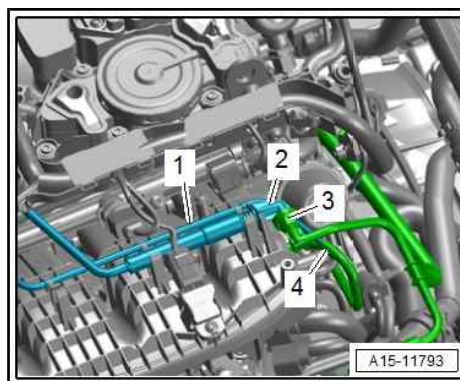
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- Vehicles with MPI engine: Release hose clip -arrow- and disconnect fuel hose.

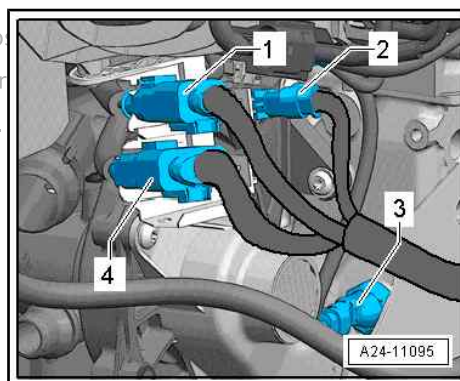


- Move coolant line -2- clear at intake manifold and push to one side.
- Disconnect vacuum hose -4-.
- Move vacuum line -1- for intake manifold flap valve - N316- clear at intake manifold.

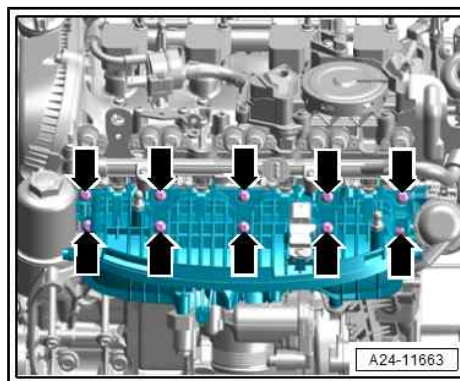


- Detach electrical connectors -1, 2, 4- from bracket.

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- Remove bolts -arrows-.



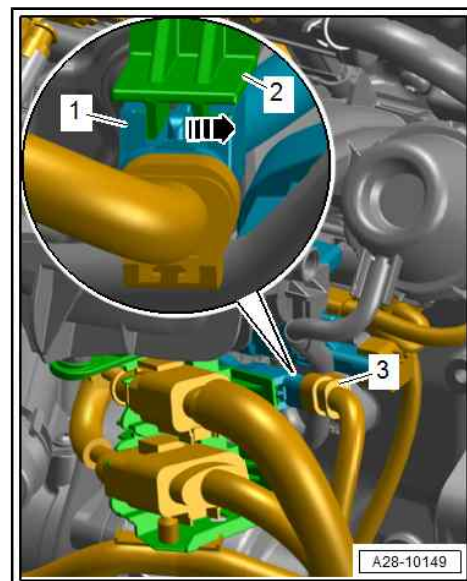


- Unplug electrical connector -3- and detach intake manifold.
- Release fastener -arrow-, detach it from bracket -2- and move electrical connector -1- for knock sensor 1 - G61- clear.



Note

Seal off all open passages in the intake system with clean cloths or plugs (thoroughly cleaned) from engine bung set - VAS 6122- .



3.2.3 Installing intake manifold

Installing

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



Note

- ◆ *Renew gaskets, connection for high-pressure pipe and spring-type clip for fuel hose after removing.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- Push intake manifold onto studs and onto cylinder head.
- Tighten union nut on high-pressure pipe hand-tight, align pipe so that it is free of stress and tighten nut to specified torque.
- Check fuel system for leaks.
- Electrical connections and routing ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- Install engine cover panel ⇒ [page 12](#) .
- Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .
- If intake manifold was renewed, perform adaptations listed in Guided Function “01 - Functions, engine mechanics” ⇒ Vehicle diagnostic tester.

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing intake manifold

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 203](#)
- ◆ ⇒ [“4.1.1 Exploded view - fuel rail with injectors, vehicles with FSI engine”, page 220](#)
- ◆ ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes



- ♦ ⇒ ["2.2 Exploded view - hose connections for charge air system", page 198](#)

3.3 Removing and installing throttle valve module - GX3-

Removing

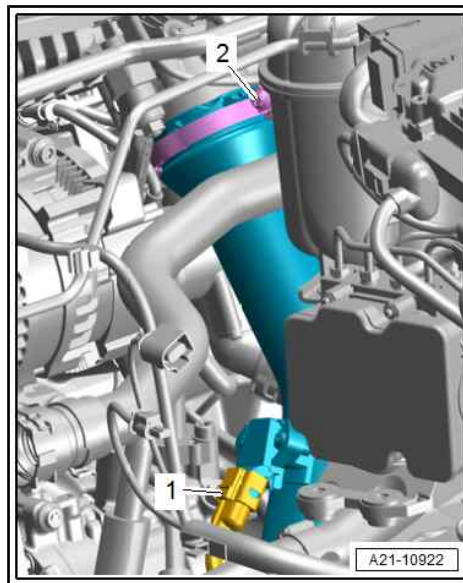
Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing throttle valve module - GX3- .

- Remove engine cover panel ⇒ [page 12](#) .
- Unplug electrical connector -1- for charge pressure sender - G31- .

Note:

Installation position varies depending on model and version.

- Loosen screw-type clip -2-, detach air pipe downwards from throttle valve module - GX3- and tie it to side. (Shown on a vehicle without natural gas system.)



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- Unplug electrical connector -1-.
- Remove bolts -arrows- and detach throttle valve module - GX3- .

Installing

- Remaining installation steps are carried out in reverse sequence; note the following:



Note

- ◆ *Renew seal after removing.*
- ◆ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*

- Clean sealing surface for seal.
- Install engine cover panel ⇒ [page 12](#) .

Learnt values must be re-adapted after removing or renewing throttle valve module.

- Connect ⇒ Vehicle diagnostic tester.
- Select **Diagnosis** mode and then **Start diagnosis**.
- Choose **Select own test** tab and select following options one after the other:
 - ◆ **Drive train**
 - ◆ **Select engine code and engine**
 - ◆ **@1 - Self-diagnosis compatible systems**
 - ◆ **@1 - Engine electronics**
 - ◆ **@1 - Engine electronics, functions**
 - ◆ **@1 - Adapt learnt values - after component re-placement**

Additional work depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing throttle valve module - GX3-

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 203](#)

3.4 Cleaning throttle valve module - GX3-



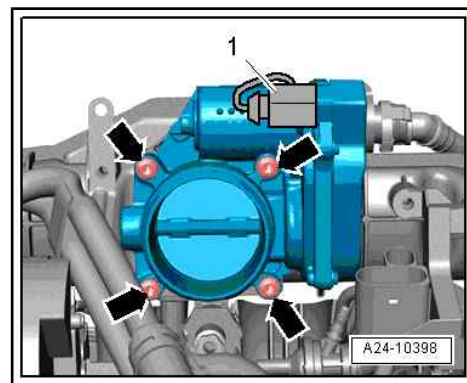
Note

- ◆ *Carbon deposits and dirt in the limit stop can lead to incorrect adaption values.*
- ◆ *Take care not to scratch the throttle valve housing when cleaning it.*

Special tools and workshop equipment required

- ◆ Acetone (commercially available)
- ◆ Brush
- ◆ Safety goggles
- ◆ Protective gloves

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Procedure



Note

Observe rules for cleanliness ➔ [page 5](#) .

- Remove throttle valve module - GX3- ➔ [page 216](#) .
- Open throttle valve by hand and lock it in open position with a wedge (plastic or wood) -arrow-.



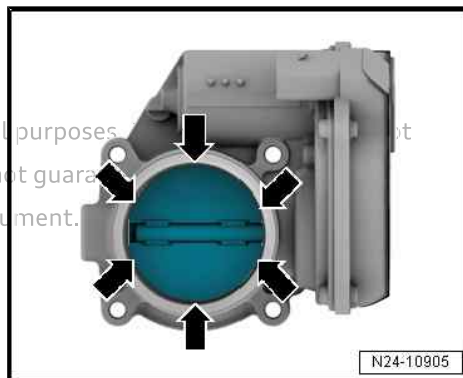
WARNING

Risk of injury Acetone is highly flammable and can cause irritation to the eyes and skin.

- ◆ Put on safety goggles.
- ◆ Put on 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 out throttle valve housing with a lint-free cloth.
- Allow acetone to flash off completely.



Note

After cleaning the throttle valve module - GX3- , perform the same measures as those required after renewing the throttle valve module.

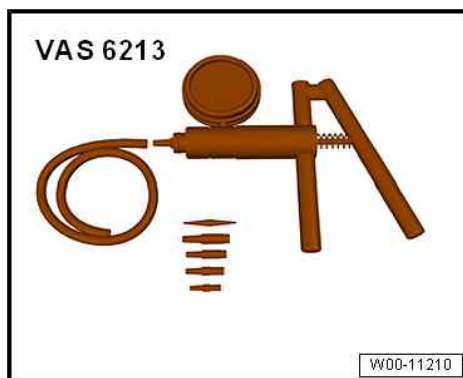
- Install throttle valve module - GX3- ➔ [page 216](#) .

3.5 Checking intake manifold change-over function

Only perform this test if there is a loss of engine torque (poor flexibility or lack of pulling power).

Special tools and workshop equipment required

- ◆ Hand vacuum pump - VAS 6213-



Test condition

- ◆ Intake manifold flap valve - N316- has been checked with a vehicle diagnostic tester.

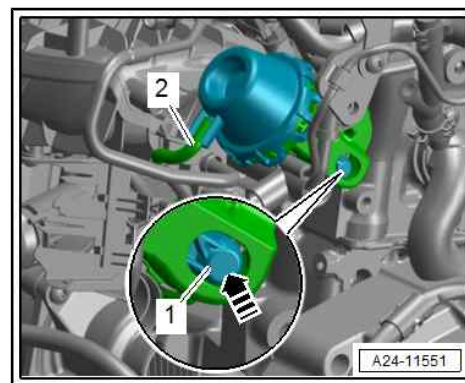


Perform the following steps if the intake manifold flap valve - N316- is OK.

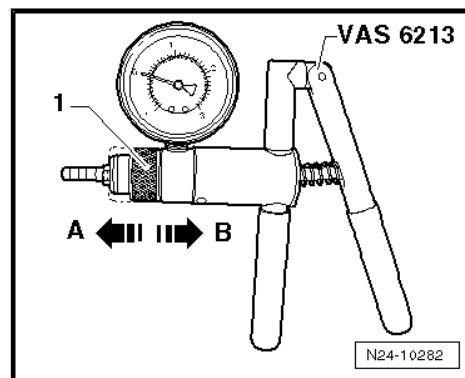
- Remove engine cover panel ➔ [page 12](#).
- Start engine and run at idling speed.
- Have a second mechanic rev up engine quickly (short burst of throttle) and observe vacuum unit for intake manifold change-over.
- The linkage -1- of the vacuum unit for intake manifold flap valve should pick up -arrow-.

If the change-over does not operate as described:

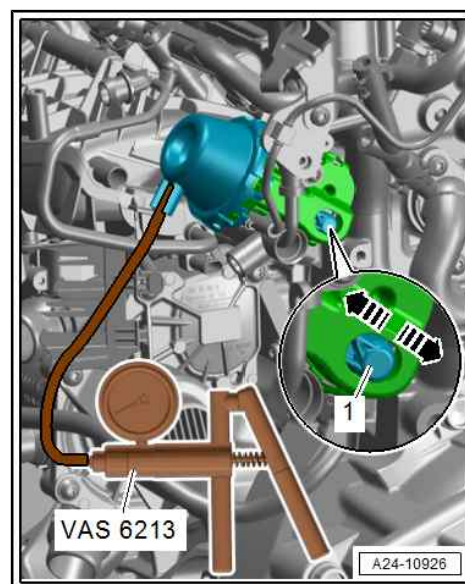
- Check vacuum system for leaks.
- Check proper connection of vacuum lines.
- Check vacuum hoses for porosity.



- Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -A- to select "vacuum".



- Connect hand vacuum pump - VAS 6213- to vacuum unit for intake manifold flap valve - N316- .
- Operate hand vacuum pump - VAS 6213- several times.
- The linkage -1- of the vacuum unit for intake manifold flap valve should pick up.
- Vent vacuum.
- The linkage should return to the initial position.
- The linkage should move in both directions -arrows-.
- Renew intake manifold if linkage does not move.





4 Injectors

⇒ [“4.1 Exploded view - fuel rail with injectors”, page 220](#)

⇒ [“4.2 Removing and installing fuel rail”, page 222](#)

⇒ [“4.3 Removing and installing injectors”, page 223](#)

⇒ [“4.4 Cleaning injectors”, page 230](#)

4.1 Exploded view - fuel rail with injectors

⇒ [“4.1.1 Exploded view - fuel rail with injectors, vehicles with FSI engine”, page 220](#)

⇒ [“4.1.2 Exploded view - fuel rail with injectors, vehicles with MPI engine”, page 222](#)

4.1.1 Exploded view - fuel rail with injectors, vehicles with FSI engine

1 - Injector sleeve

- ☐ Only for vehicles with natural gas system
- ☐ Renew after removing
- ☐ Removing and installing
⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Injectors; Removing and installing injectors

2 - Combustion chamber ring seal

- ☐ Renewing after injector has been removed
⇒ [page 223](#)

3 - Supporting element

- ☐ Vehicles with natural gas system only: If supporting element is renewed, injector sleeve
⇒ [Item 1 \(page 220\)](#)
must also be renewed

4 - Injector

- ☐ Ensure correct installation position.
- ☐ Vehicles with natural gas system only: If injector is renewed, injector sleeve
⇒ [Item 1 \(page 220\)](#)
must also be renewed
- ☐ Removing and installing
⇒ [page 223](#)
- ☐ Cleaning ⇒ [page 230](#)

5 - Spacer ring

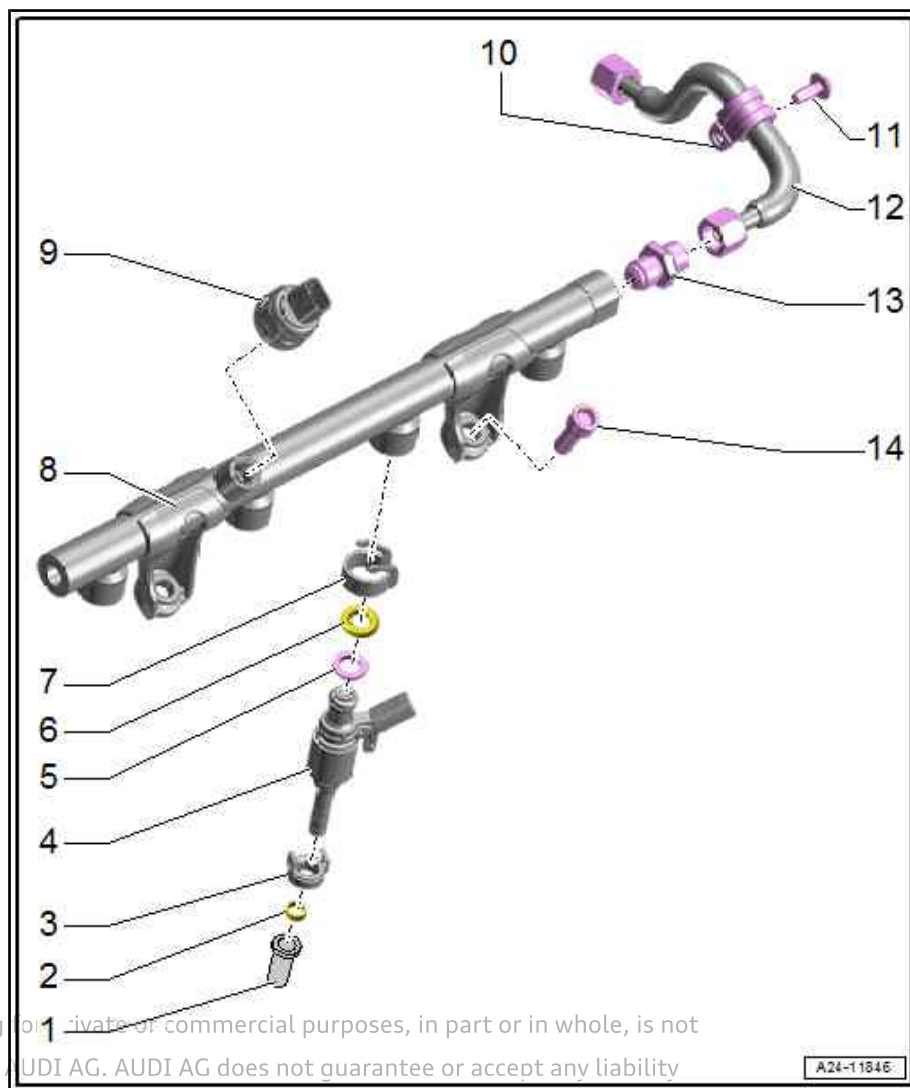
- ☐ Renew after removing

6 - O-ring

- ☐ Renew after removing

7 - Support ring

- ☐ Renew after removing



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8 - Fuel rail for FSI injectors

- ☐ Removing and installing ⇒ [page 222](#)

9 - Fuel pressure sender - G247-

- ☐ Lubricate taper lightly with clean engine oil; do not lubricate thread
- ☐ Removing and installing ⇒ [page 234](#)
- ☐ 27 Nm

10 - Retaining clamp

11 - Bolt

- ☐ 9 Nm

12 - High-pressure pipe

- ☐ From high-pressure pump
- ☐ Lightly lubricate ball of fuel supply line with engine oil
- ☐ Install so that parts are free of tension
- ☐ Union nut, 27 Nm

13 - Connection

- ☐ Renew after removing
- ☐ Lubricate threads lightly with clean engine oil
- ☐ 40 Nm

14 - Bolt

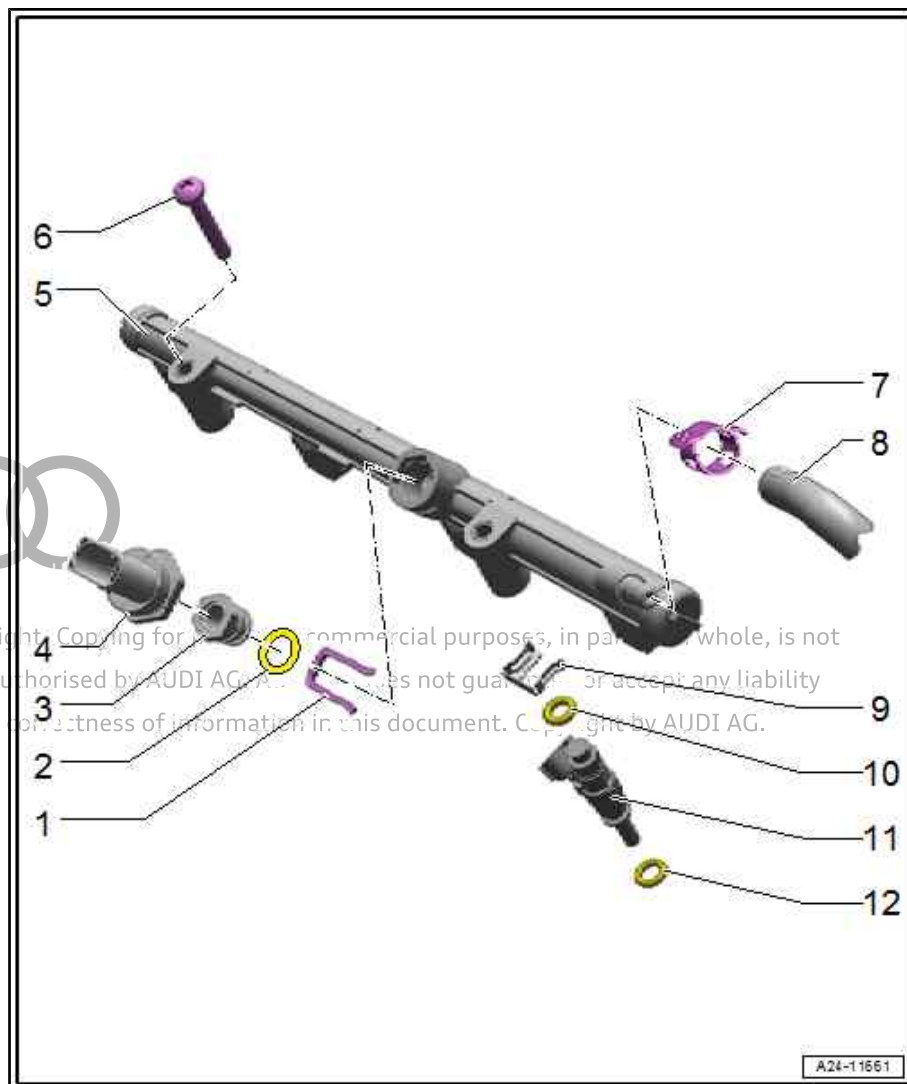
- ☐ M6: 9 Nm
- ☐ Renew M8 bolt after removing
- ☐ M8: 20 Nm +90°



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4.1.2 Exploded view - fuel rail with injectors, vehicles with MPI engine

- 1 - Retaining clip
 - ☐ For fuel pressure sender for low pressure - G410-
 - 2 - O-ring
 - ☐ Renew after removing
 - 3 - Adapter
 - ☐ Attach to fuel pressure sender for low pressure - G410-
⇒ [Item 4 \(page 222\)](#)
 - ☐ 27 Nm
 - 4 - Fuel pressure sender for low pressure - G410-
 - ☐ Attach to adapter
⇒ [Item 3 \(page 222\)](#)
 - ☐ Removing and installing
⇒ [page 242](#)
 - ☐ 27 Nm
 - 5 - Fuel rail for MPI injectors
 - 6 - Bolt
 - ☐ 9 Nm
 - 7 - Spring-type clip
 - ☐ Renew after removing
 - 8 - Fuel supply line
 - ☐ To fuel rail for MPI injectors
 - ☐ Install so that parts are free of tension
 - 9 - Retaining clip
 - 10 - O-ring
 - ☐ Renew after removing
 - 11 - Injector
 - ☐ Ensure correct installation position.
 - ☐ Removing and installing ⇒ [page 228](#)
 - 12 - O-ring
 - ☐ Renew after removing



4.2 Removing and installing fuel rail



Note

The following procedure applies to the fuel rail for FSI injectors.

Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Injectors; Removing and installing fuel rail .



- Remove intake manifold ➔ [page 204](#) .
- Unplug all electrical connectors at injectors and on fuel pressure sender - G247- .
- Remove bolts -arrows-.
- Detach fuel rail -1- with wiring duct -2- from injectors.
- Move wiring duct clear.

Installing

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



Note

- ◆ *Renew support rings for injectors after removing.*
- ◆ *If any injectors remain lodged in the cylinder head when the fuel rail is detached, it is only necessary to install the O-rings and spacers from the repair set.*

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- ◆ *If the injectors are pulled out along with the fuel rail, install all the components of the repair set with a combustion chamber ring seal ➔ [page 223](#) .*

- Install intake manifold ➔ [page 204](#) .

Additional work depending on model ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Injectors; Removing and installing fuel rail

Tightening torques

- ◆ ➔ [“4.1.1 Exploded view - fuel rail with injectors, vehicles with FSI engine”, page 220](#)

4.3 Removing and installing injectors

➔ [“4.3.1 Removing and installing injectors - vehicles with FSI engine”, page 223](#)

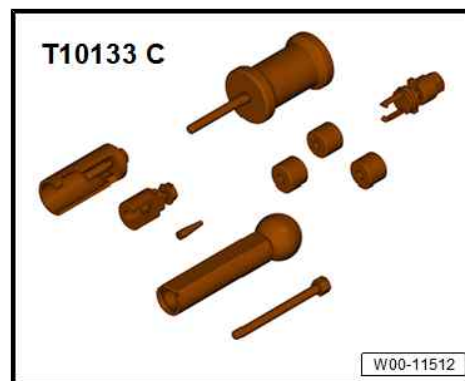
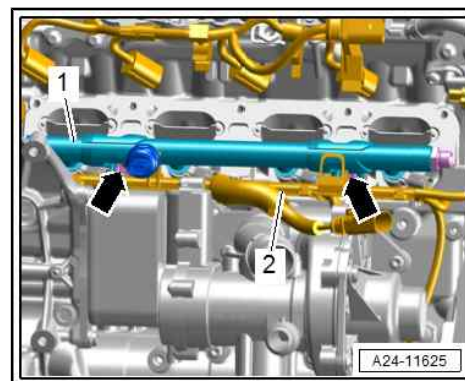
➔ [“4.3.2 Removing and installing injectors - vehicles with MPI engine”, page 228](#)

➔ [“4.3.3 Removing and installing injector sleeves - vehicles with natural gas system”, page 230](#)

4.3.1 Removing and installing injectors - vehicles with FSI engine

Special tools and workshop equipment required

- ◆ Tool set for FSI engines - T10133 C-





Removing



Note

- ◆ *Injectors must only be installed when engine is cold.*
- ◆ *Observe rules for cleanliness ➔ [page 5](#).*

Vehicles with natural gas system

- Mark allocation of injectors to corresponding cylinder.

All vehicles

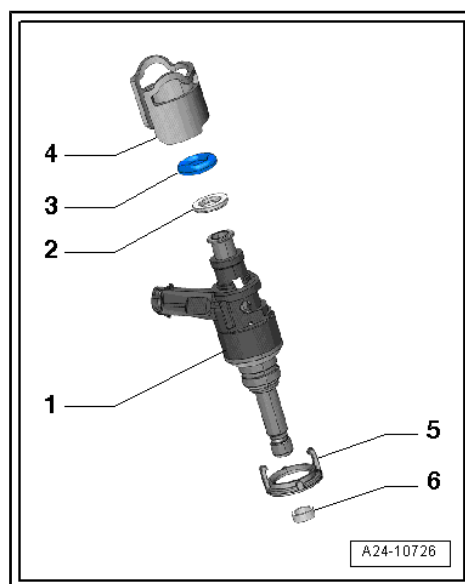
- Remove fuel rail ➔ [page 222](#).



Note

Carefully pull out any injectors that remain lodged in the fuel rail.

- Remove the injectors if they remain lodged in the cylinder head.
- Cover open inlet ports with a clean cloth.
- Detach support ring -4- from injector -1-.



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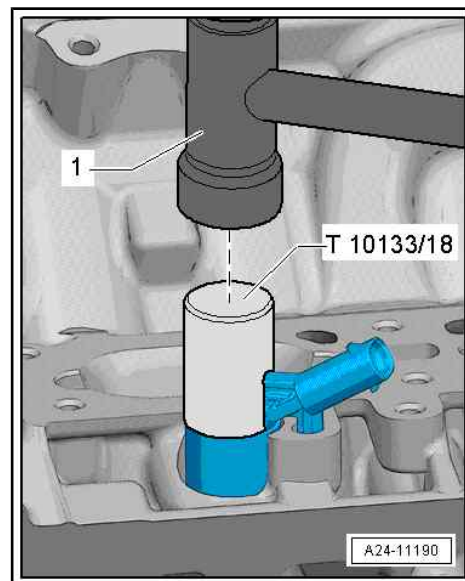


- Slide sleeve -T10133/18- over injector.
- Carefully knock against stop sleeve several times with a plastic hammer -1- to loosen injector.

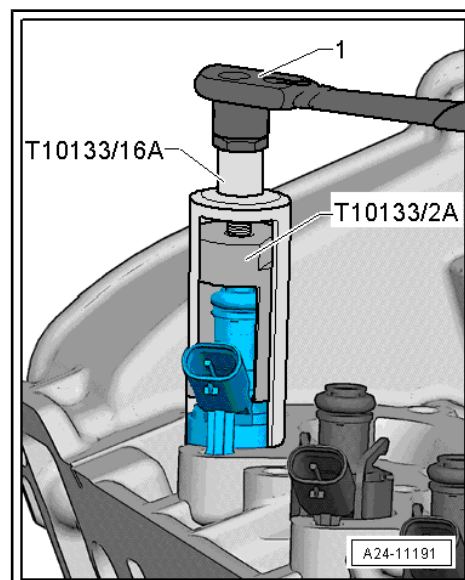


Note

- ◆ Use a torque wrench to pull out injector.
- ◆ Set torque wrench to 5 Nm.
- ◆ Observe correct torque to avoid irreparable damage to injector.



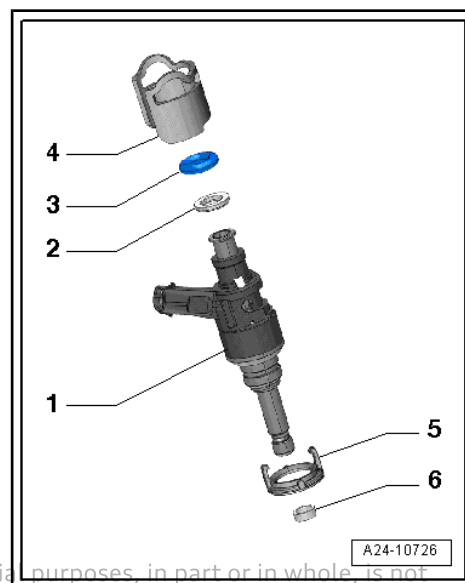
- Fit puller -T10133/2A- to groove on injector.
- Then fit guide puller T10133/16A .
- Pull out injector by turning bolt with torque wrench -1-.
- If injector does not come loose after limit torque of 5 Nm is reached, remove puller and repeat procedure using stop sleeve to loosen injector.
- Repeat procedure for each injector.



Dismantling injector

- Pull O-ring -3- and spacer ring -2- off injector -1-.
- Unclip supporting element -5-.
- Carefully remove old combustion chamber ring seal -6-. To do so, cut open combustion chamber ring seal using knife or prise open with small screwdriver and then pull off forwards.

4 - Support ring



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- Clean ring groove in area of seal -arrow-. Remove carbon deposits with a brass wire brush.



Note

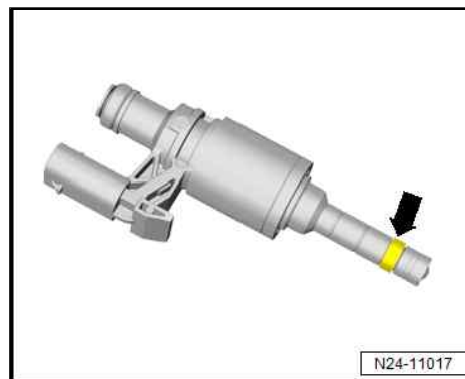
Take care not to damage groove on injector. Injector must be renewed if groove is damaged.

Installing

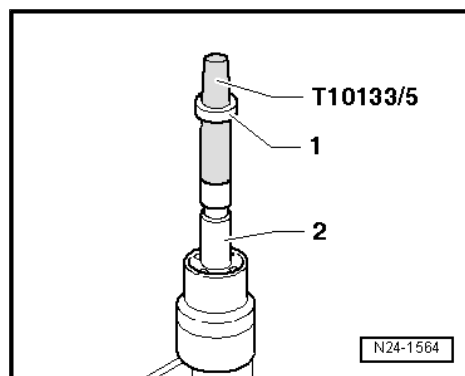
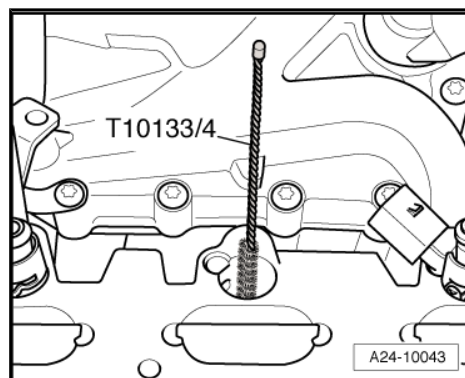


Note

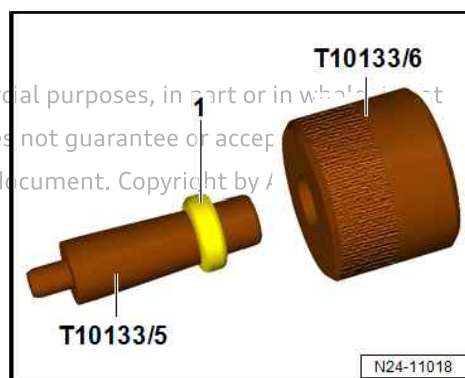
- ◆ Use complete repair set when installing.
 - ◆ Renew support ring after removing.
 - ◆ Renew combustion chamber ring seal before re-installing injector.
- Clean bore in cylinder head with nylon cylinder brush - T10133/4- .
 - When re-installing an injector, clean any combustion residue off groove for combustion chamber ring seal and injector stem with a clean cloth.



- Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- onto injector -2-.

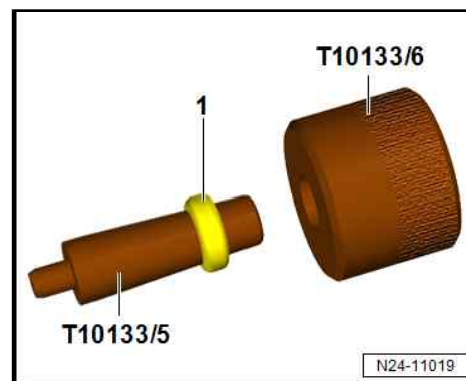


- Using assembly sleeve -T10133/6- , push combustion chamber ring seal -1- onto assembly cone -T10133/5- as far as it will go (knurled side of assembly sleeve faces towards combustion chamber ring seal).





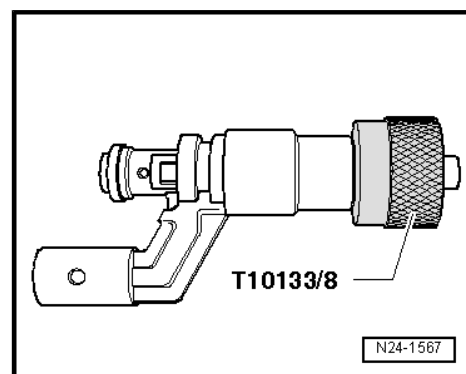
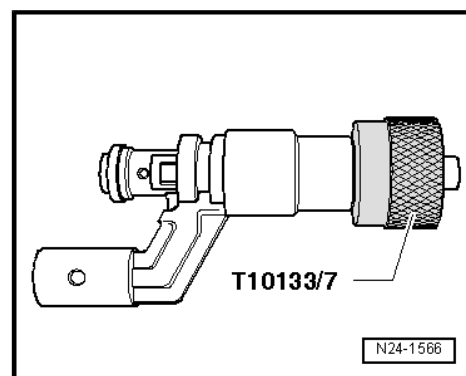
- Turn round assembly sleeve -T10133/6- and slide combustion chamber ring seal into groove (smooth side of assembly sleeve faces towards combustion chamber ring seal.)



Note

The combustion chamber ring seal is widened when it is pushed onto the injector. After pushing it on, it therefore has to be compressed again. This is done in two stages, as described below.

- Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/7- off again by turning it in the opposite direction.
- Push calibration sleeve -T10133/8- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).
- Pull calibration sleeve -T10133/8- off again by turning it in the opposite direction.



- Before installing new injector -1-, lubricate new O-ring -3- lightly with clean engine oil.



Note

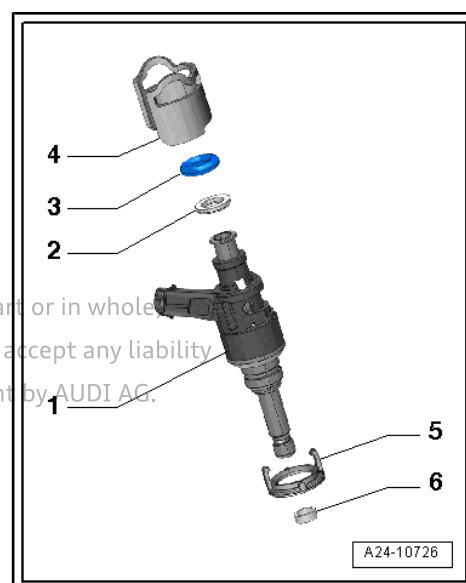
The combustion chamber ring seal -6- must not be lubricated.

Vehicles with natural gas system



Note

When re-installing injectors, make sure they are installed at correct cylinder according to markings.





All vehicles

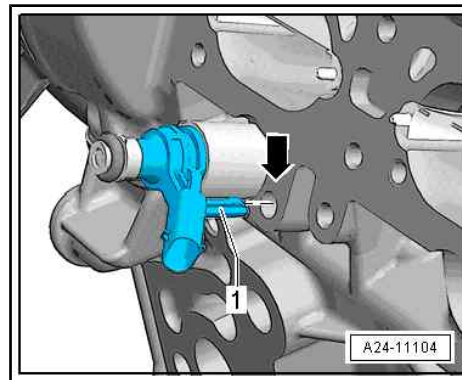
- Press injector by hand as far as it will go into aperture in cylinder head (aperture must be free of oil and grease). Ensure that the injector is properly seated -arrow- in the cylinder head.
- Lug -1- and hole -arrow- in cylinder head must face each other.



Note

It should be possible to insert the injector easily. If necessary wait until the combustion chamber ring seal has contracted sufficiently.

- Fit support ring onto injector.
- Install fuel rail ➔ [page 222](#) .



4.3.2 Removing and installing injectors - vehicles with MPI engine

Special tools and workshop equipment required

- ♦ Socket Torx T30 - T10405-



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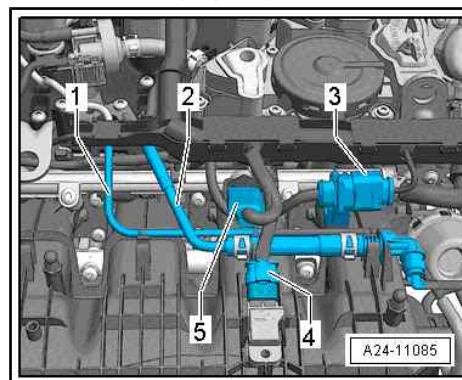
Removing



Note

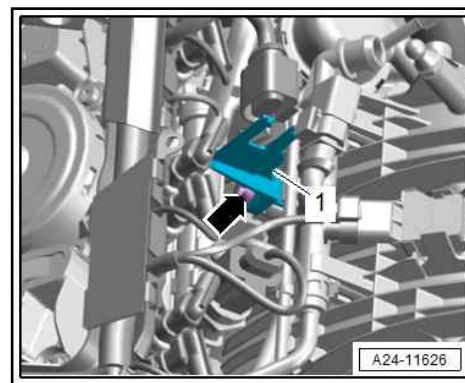
Observe rules for cleanliness ➔ [page 5](#) .

- Remove engine cover panel ➔ [page 12](#) .
- Detach electrical connector -3- from bracket and unplug.
- Move electrical wiring clear at intake manifold.
- Detach vacuum line -1- and coolant line -2- from intake manifold.
- Unplug electrical connectors -4, 5-.

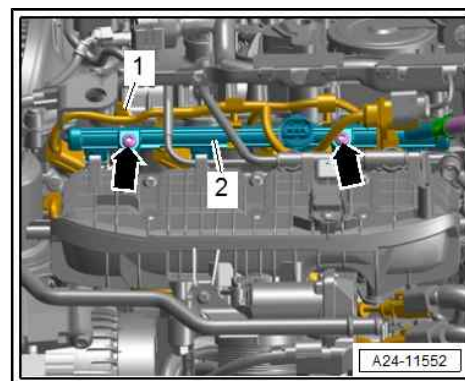




- Unscrew bolt -arrow- using socket Torx T30 - T10405- and detach bracket -1- for electrical connectors.

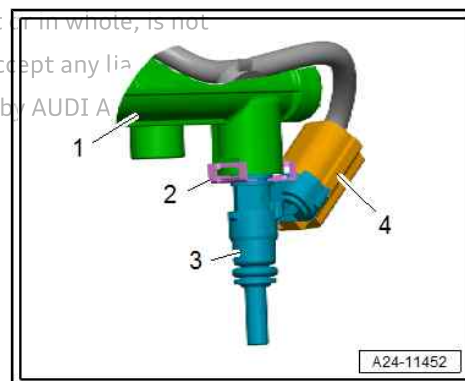


- Move electrical wiring harness -1- clear at engine lifting eye.
- Unscrew bolts -arrows- for MPI fuel rail.
- Carefully lift out fuel rail -2- with injectors.



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- Unplug electrical connector -4-.
- Release retaining clip -2- and detach injector -3- from fuel rail -1-.





Dismantling injector

- 1 - O-ring; renew after removal
- 2 - Injector
- 3 - Retaining clip
- 4 - O-ring; renew after removal

Installing

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



Note

Renew O-rings after removing.

- Lubricate O-rings with clean engine oil prior to installation.
- Press fuel rail with injectors by hand as far as it will go into aperture of intake manifold (injectors must be free of oil and grease).
- Install engine cover panel ⇒ [page 12](#) .

Tightening torques

- ♦ ⇒ [“4.1.2 Exploded view - fuel rail with injectors, vehicles with MPI engine”, page 222](#)
- ♦ ⇒ [Item 17 \(page 204\)](#)

4.3.3 Removing and installing injector sleeves - vehicles with natural gas system

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Injectors; Removing and installing injectors .

4.4 Cleaning injectors

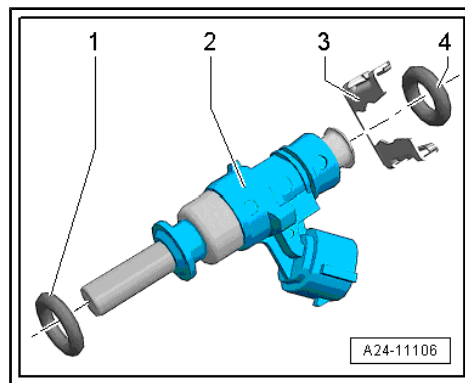


Note

- ♦ *The following procedure applies to FSI injectors.*
- ♦ *Observe rules for cleanliness ⇒ [page 5](#) .*

Special tools and workshop equipment required

- ♦ Ultrasonic cleaning unit - VAS 6418-
- ♦ Mounting plate for injectors - VAS 6418/1-
- ♦ Cleaning fluid - VAS 6418/2-



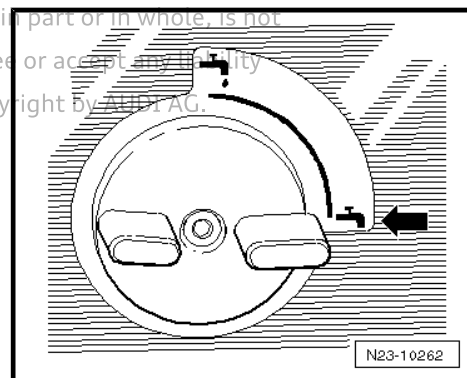


Cleaning

- Close drain tap - arrow - on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).
- Fill ultrasonic unit with 2,120 ml of water which has been allowed to settle for a few minutes and cleaning fluid - VAS 6418/2- .

Mixture ratio for cleaning fluid

- 2,100 ml of tap water which has been allowed to settle for a few minutes and 20 ml of cleaning fluid - VAS 6418/2-
- Remove injectors ➔ [page 223](#) .

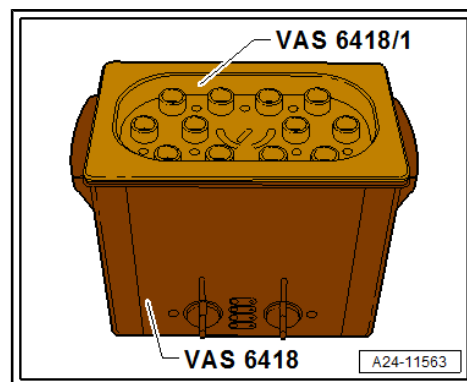


- Place mounting plate for injectors - VAS 6418/1- on top of cleaning unit.



Note

- ◆ *It is important to read the safety notes in the operating instructions before switching on the ultrasonic cleaning unit -VAS 6418- .*
- ◆ *The ideal fluid level is approx. 1 ... 4 mm above the base of the mounting plate. The ultrasonic cleaning unit - VAS 6418- can be damaged if the fluid level is too low.*

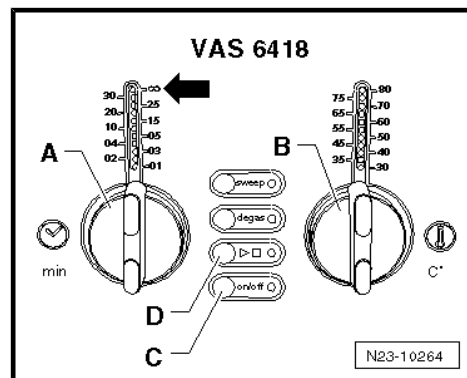


- Insert FSI injectors all the way into guides of mounting plate for injectors - VAS 6418/1- .
- Switch on cleaning unit by pressing **on/off** button -C-.
- Select a cleaning time of 30 minutes with rotary control -A-.
- Set rotary control -B- to a temperature of 50°C.
- Press **▶** button -D- to start cleaning procedure.



Note

- ◆ *The temperature-controlled cleaning process is now started. While the fluid is being heated, the ultrasound is activated at intervals in order to circulate the cleaning solution. The ultrasound is activated continuously when the preselected temperature is reached.*
- ◆ *The actual cleaning process commences when the temperature reaches at least 50 °C and must last for at least 30 minutes.*



- Install injectors with new combustion chamber seal ➔ [page 223](#) .



5 Gas injection valves

All procedures and components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Gas injection valves .



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6 Gas pressure regulator

All procedures and components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Gas pressure regulator .

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7 Senders and sensors

⇒ [“7.1 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71”, page 234](#)

⇒ [“7.2 Removing and installing air mass meter G70”, page 234](#)

⇒ [“7.3 Removing and installing fuel pressure sender G247”, page 234](#)

⇒ [“7.4 Checking fuel pressure sender G247”, page 237](#)

⇒ [“7.5 Removing and installing fuel pressure sender for low pressure G410”, page 242](#)

7.1 Removing and installing intake air temperature sender - G42- / intake manifold pressure sender - G71-

Removing

- Remove engine cover panel ⇒ [page 12](#) .
- Unplug electrical connector -2-.
- Remove bolt -1-.
- Release catches -arrows- and detach intake air temperature sender - G42- / intake manifold pressure sender - G71- from intake manifold.

Installing

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



Note

Renew O-ring after removal.

- Install engine cover panel ⇒ [page 12](#) .

Tightening torques

- ♦ ⇒ [“3.1 Exploded view - intake manifold”, page 203](#)

7.2 Removing and installing air mass meter - G70-

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Senders and sensors; Removing and installing air mass meter - G70- .

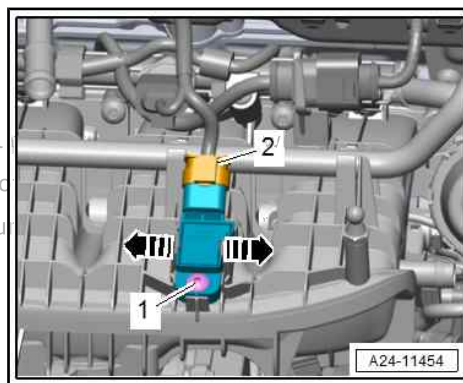
7.3 Removing and installing fuel pressure sender - G247-

⇒ [“7.3.1 Removing and installing fuel pressure sender G247 - vehicles with alternator”, page 234](#)

⇒ [“7.3.2 Removing and installing fuel pressure sender G247 - vehicles with starter-alternator”, page 236](#)

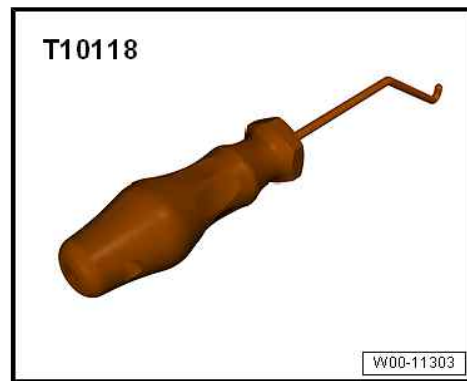
7.3.1 Removing and installing fuel pressure sender - G247- - vehicles with alternator

Special tools and workshop equipment required





- ◆ Assembly tool - T10118-



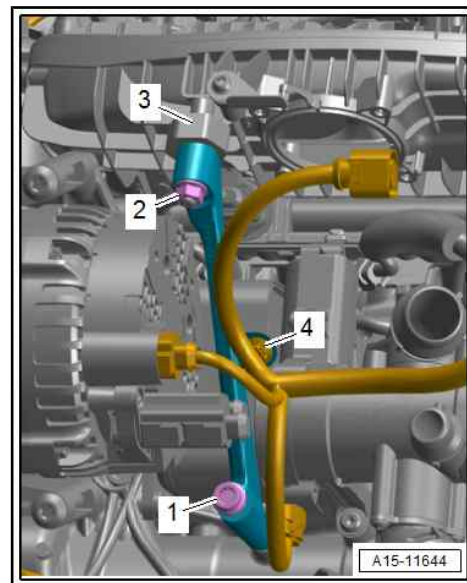
- ◆ Socket, 24 mm - T40363-
- ◆ Safety goggles
- ◆ Protective gloves

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Preparatory work may be necessary depending on model → 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Senders and sensors; Removing and installing fuel pressure sender - G247- .

- Remove engine cover panel ⇒ [page 12](#) .
- If necessary, move electrical wiring harness -4- clear.
- Unscrew nut -2- and bolt -1- and remove support for intake manifold.
- Remove bonded rubber bush -3-.





- Release electrical connector using assembly tool - T10118- and unplug it.

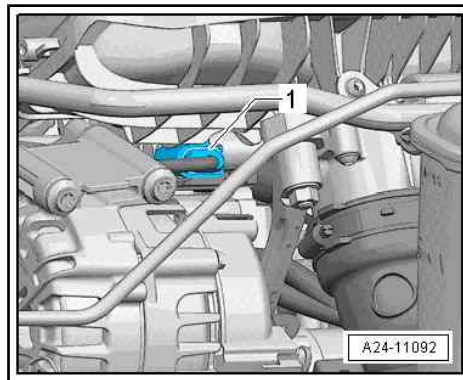


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*



Note

Catch escaping fuel with a cloth.

- Unscrew fuel pressure sender - G247- -item 1- using socket, 24 mm - T40363- .

Installing

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

- Install engine cover panel ⇒ [page 12](#) .

Tightening torques

- ◆ ⇒ [“4.1 Exploded view - fuel rail with injectors”, page 220](#)
- ◆ ⇒ [“3.1 Exploded view - intake manifold”, page 203](#)

7.3.2 Removing and installing fuel pressure sender - G247- - vehicles with starter-alternator

Special tools and workshop equipment required

- ◆ Socket, 24 mm - T40363-
- ◆ Safety goggles
- ◆ Protective gloves



Removing

- Release and unplug electrical connector -arrow-.

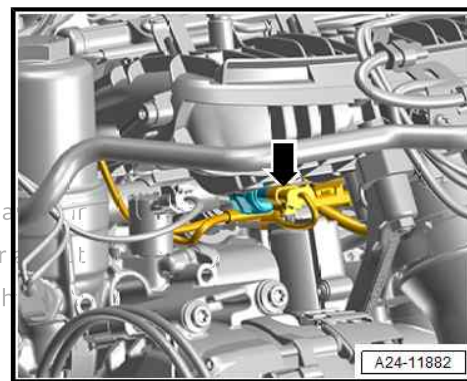


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- ***Put on safety goggles.***
- ***Put on protective gloves.***
- ***Release pressure (wrap a clean cloth around connection and open connection carefully).***



Note

Catch escaping fuel with a cloth.

- Unscrew fuel pressure sender - G247- using socket, 24 mm - T40363- .

Installing

Installation is carried out in reverse sequence.

Tightening torques

- ◆ ⇒ [“4.1 Exploded view - fuel rail with injectors”, page 220](#)

7.4 Checking fuel pressure sender - G247-

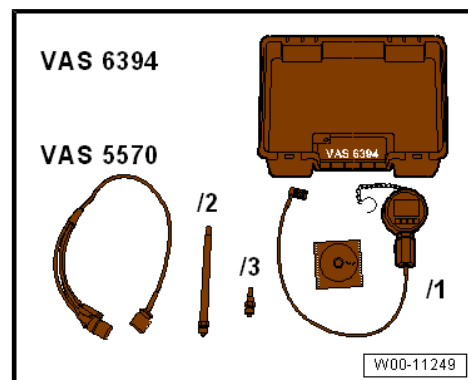
⇒ [“7.4.1 Checking fuel pressure sender G247 - vehicles with alternator”, page 237](#)

⇒ [“7.4.2 Checking fuel pressure sender G247 - vehicles with starter-alternator”, page 239](#)

7.4.1 Checking fuel pressure sender - G247- - vehicles with alternator

Special tools and workshop equipment required

- ◆ Vehicle diagnostic tester
- ◆ Test instrument adapter - VAS 5570-



- ◆ Pressure sensor tester - VAS 6394-
- ◆ Safety goggles
- ◆ Protective gloves



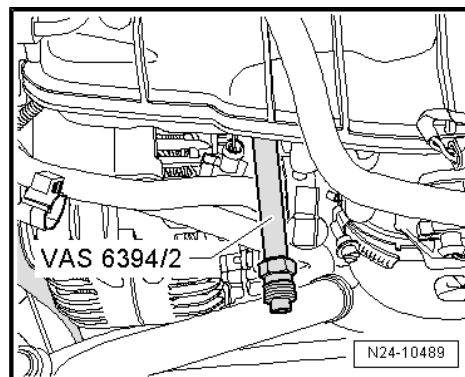
Procedure



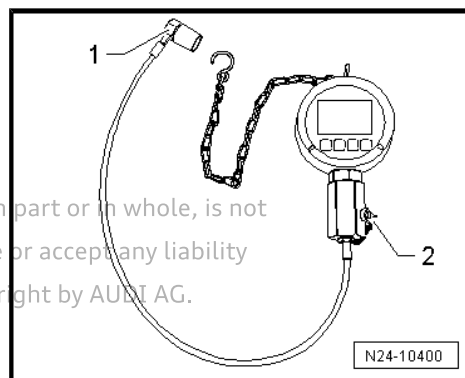
Note

Observe rules for cleanliness ⇒ [page 5](#) .

- Remove fuel pressure sender - G247- ⇒ [page 234](#) .
- Screw in adapter - VAS 6394/2- in place of fuel pressure sender - G247- and tighten adapter with same torque as specified for -G247- .



- Unscrew plug -2- on digital pressure gauge - VAS 6394/1- and screw in fuel pressure sender - G247- in its place (tighten to specified torque).



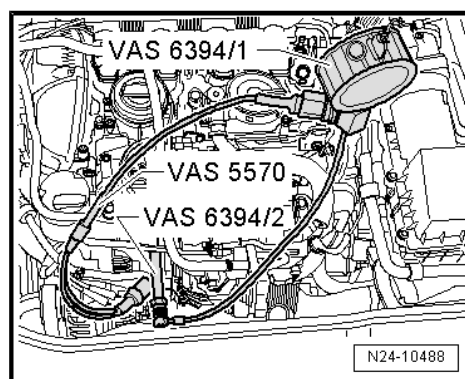
- Use test instrument adapter - VAS 5570- to make electrical connection between vehicle and fuel pressure sender - G247- .

Vehicles with natural gas system:

- Install battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
- Observe steps required after re-connecting battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

All vehicles (continued):

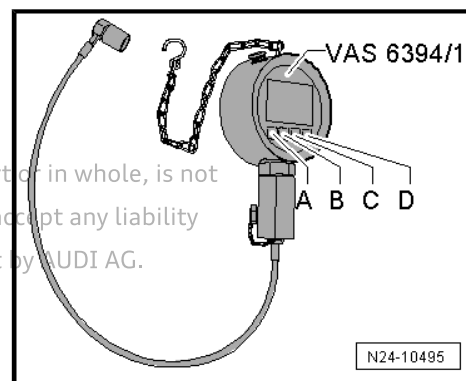
- Connect vehicle diagnostic tester .
- Switch on ignition.
- Select “Engine electronics” in vehicle self-diagnosis.
- Select “Measured values”.
- Select “Fuel pressure” from list.
- The display zone shows the actual pressure value being transmitted to the engine control unit by the fuel pressure sender - G247- .



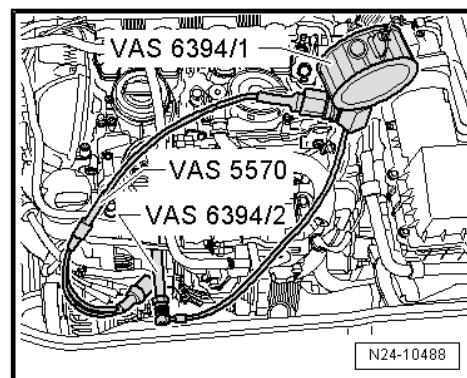


- Switch on pressure gauge - VAS 6394/1- by pressing button -A- once briefly.
- The digital pressure gauge - VAS 6394/1- should indicate 0 bar.
- If different value is shown, zero the tester by pressing button -C- briefly.

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- Connect pressure gauge - VAS 6394/1- to adapter - VAS 6394/2- .
- Start engine.
- Compare pressure indicated by pressure gauge - VAS 6394/1- with actual pressure value on vehicle diagnostic tester .
- The pressure readings must not deviate by more than 5 bar.
- If the deviation is more than 5 bar, fit a new fuel pressure sender - G247- to test it.



Note

Place a cloth underneath to catch escaping fuel.



WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- ◆ ***Put on safety goggles.***
- ◆ ***Put on protective gloves.***
- ◆ ***Release pressure (wrap clean cloth around connection and open connection carefully).***

- Screw a new fuel pressure sender - G247- into pressure gauge - VAS 6394/1- .
- Repeat the test with the new fuel pressure sender - G247- and compare the two pressure values.
- If measured values are still not the same, check electrical connection between fuel pressure sender - G247- and engine control unit ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- If measured values are now the same, install new fuel pressure sender - G247- ⇒ [page 234](#) .

Tightening torques

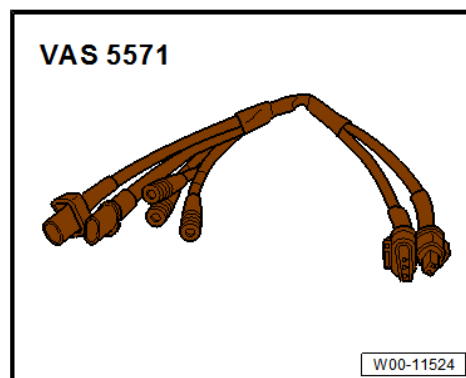
- ◆ ⇒ ["4.1.1 Exploded view - fuel rail with injectors, vehicles with FSI engine", page 220](#)

7.4.2 Checking fuel pressure sender - G247- - vehicles with starter-alternator

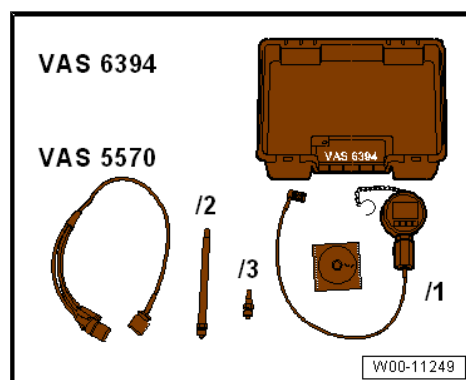
Special tools and workshop equipment required



- ◆ Vehicle diagnostic tester
- ◆ Test instrument adapter/DSO (+3-pin) - VAS 5571-



- ◆ Pressure sensor tester - VAS 6394-



- ◆ Safety goggles
- ◆ Protective gloves

Procedure

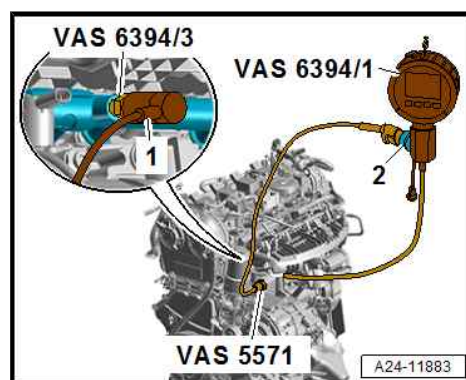


Note

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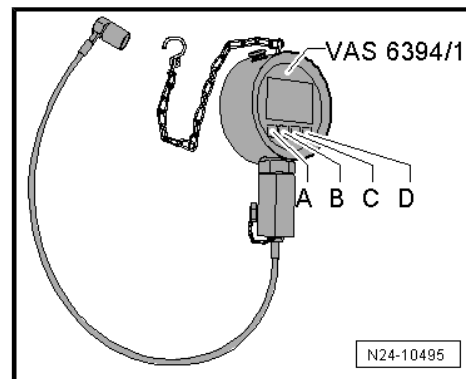
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- Remove fuel pressure sender - G247- ➤ [page 234](#) .
- Screw in adapter - VAS 6394/3- in place of fuel pressure sender -G247- and tighten to 27 Nm.
- Unscrew plug on digital pressure gauge and screw in fuel pressure sender - G247- -item 2- in its place (tighten to specified torque).
- Connect vehicle and fuel pressure sender - G247- electrically using test instrument adapter/DSO (+3-pin) - VAS 5571- .
- Connect vehicle diagnostic tester .
- Switch on ignition.
- Select "Engine electronics" in vehicle self-diagnosis.
- Select "Measured values".
- Select "Fuel pressure" from list.
- The display zone shows the actual pressure value being transmitted to the engine control unit by the fuel pressure sender - G247- .

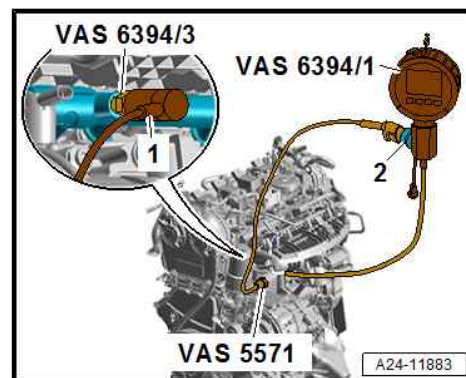




- Switch on pressure gauge - VAS 6394/1- by pressing button -A- once briefly.
- The digital pressure gauge - VAS 6394/1- should indicate 0 bar.
- If different value is shown, zero the tester by pressing button -C- briefly.



- Connect and tighten pressure line of digital pressure gauge - VAS 6394/1- item 1- at adapter - VAS 6394/3- .
- Start engine.
- Compare pressure indicated by pressure gauge - VAS 6394/1- with actual pressure value on vehicle diagnostic tester .
- The pressure readings must not deviate by more than 5 bar.
- If the deviation is more than 5 bar, fit a new fuel pressure sender - G247- to test it.



Note

Place a cloth underneath to catch escaping fuel.

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WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- ◆ ***Put on safety goggles.***
- ◆ ***Put on protective gloves.***
- ◆ ***Release pressure (wrap clean cloth around connection and open connection carefully).***

- Screw a new fuel pressure sender - G247- into pressure gauge - VAS 6394/1- .
- Repeat the test with the new fuel pressure sender - G247- and compare the two pressure values.
- If measured values are still not the same, check electrical connection between fuel pressure sender - G247- and engine control unit ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
- If measured values are now the same, install new fuel pressure sender - G247- ⇒ [page 234](#) .

Tightening torques

- ◆ ⇒ [“4.1.1 Exploded view - fuel rail with injectors, vehicles with FSI engine”, page 220](#)



7.5 Removing and installing fuel pressure sender for low pressure - G410-

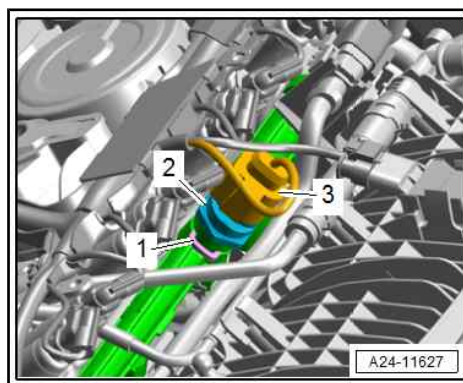
⇒ [“7.5.1 Removing and installing fuel pressure sender for low pressure G410 - vehicles without natural gas system”, page 242](#)

⇒ [“7.5.2 Removing and installing fuel pressure sender for low pressure G410 - vehicles with natural gas system”, page 242](#)

7.5.1 Removing and installing fuel pressure sender for low pressure - G410- - vehicles without natural gas system

Removing

- Remove engine cover panel ⇒ [page 12](#) .
- Unplug electrical connector -3-.
- Pull off retaining clip -1-.
- Pull fuel pressure sender for low pressure - G410- -item 2- out of fuel rail.



- If necessary, unscrew fuel pressure sender for low pressure -1- from adapter -2-.

Installing

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



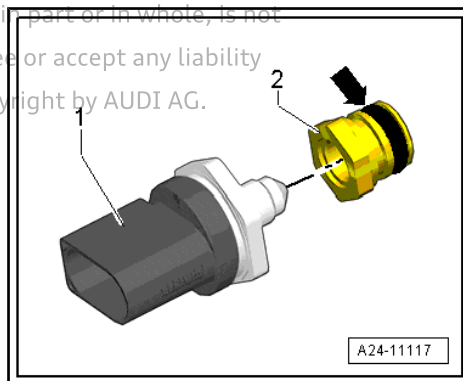
Note

Renew O-ring -arrow- after removal.

- Install engine cover panel ⇒ [page 12](#) .

Tightening torques

- ♦ ⇒ [“4.1.2 Exploded view - fuel rail with injectors, vehicles with MPI engine”, page 222](#)



7.5.2 Removing and installing fuel pressure sender for low pressure - G410- - vehicles with natural gas system

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Senders and sensors ; Removing and installing fuel pressure sender for low pressure - G410- .

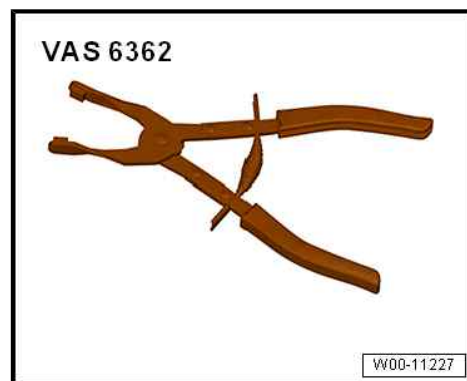
7.6 Removing and installing pressure differential sender for particulate filter - G1037-

Special tools and workshop equipment required

- ♦ Vehicle diagnostic tester



- ◆ Hose clip pliers - VAS 6362-

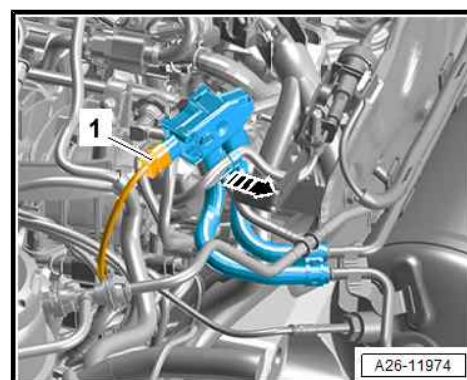


Removing

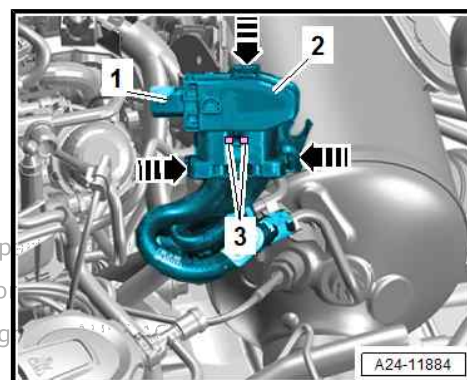
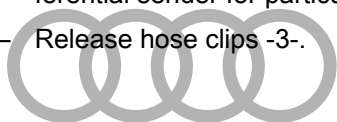
- Remove engine cover panel ➔ [page 12](#) .

Pressure differential sender for particulate filter - G1037- - version 1:

- Unplug electrical connector -1- for pressure differential sender for particulate filter - G1037- .
- Unclip bracket with pressure differential sender from intake manifold -arrow- and move clear.



- Release catches -arrows- and detach bracket for pressure differential sender for particulate filter - G1037- -item 2-.
- Release hose clips -3-.



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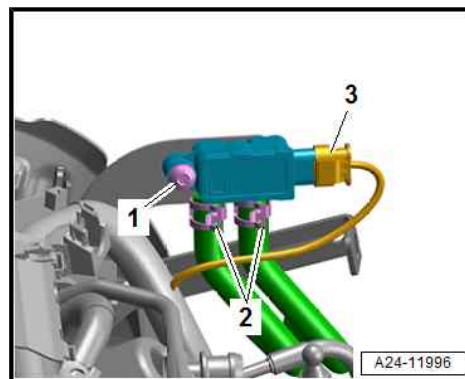


Pressure differential sender for particulate filter - G1037- - version 2:

- Unplug electrical connector -3-.
- Remove bolt -1- and release hose clips -2-.
- Detach pressure differential sender for particulate filter - G1037- .

All versions (continued):

- Spray hoses at pressure differential sender for particulate filter - G1037- with soap solution.
- To prevent hose connections from breaking off, carefully disconnect hoses and keep them straight when pulling them off.



Installing

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



Note

- ♦ *Blow through hose (towards emission control module) with compressed air to remove dirt or ice (frozen condensation).*
 - ♦ *Make sure that hoses are securely fitted and seal properly.*
 - ♦ *If pressure pipes have been detached from emission control module, tighten them to specified torque.*
 - ♦ *Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .*
- Install engine cover panel ⇒ [page 12](#) .



8 High-pressure pump

⇒ "8.1 Exploded view - high-pressure pump", page 245

⇒ "8.2 Removing and installing high-pressure pump", page 248

8.1 Exploded view - high-pressure pump

⇒ "8.1.1 Exploded view - high-pressure pump (version 1), vehicles without natural gas system", page 245

⇒ "8.1.2 Exploded view - high-pressure pump (version 2), vehicles without natural gas system", page 247

⇒ "8.1.3 Exploded view - high-pressure pump, vehicles with natural gas system", page 248

8.1.1 Exploded view - high-pressure pump (version 1), vehicles without natural gas system

1 - Quick release coupling

- ☐ With cut-off valve
- ☐ Depending on version

2 - Electrical connector

3 - Fuel metering valve - N290- or fuel pressure regulating valve - N276-

- ☐ Fuel metering valve - N290- or fuel pressure regulating valve - N276- may be fitted, depending on version
- ☐ Integrated in high-pressure pump; cannot be renewed separately

4 - High-pressure pump

- ☐ Removing and installing ⇒ page 248
- ☐ Take care not to tilt when installing

5 - O-ring

- ☐ Renew if damaged
- ☐ Lubricate lightly with engine oil

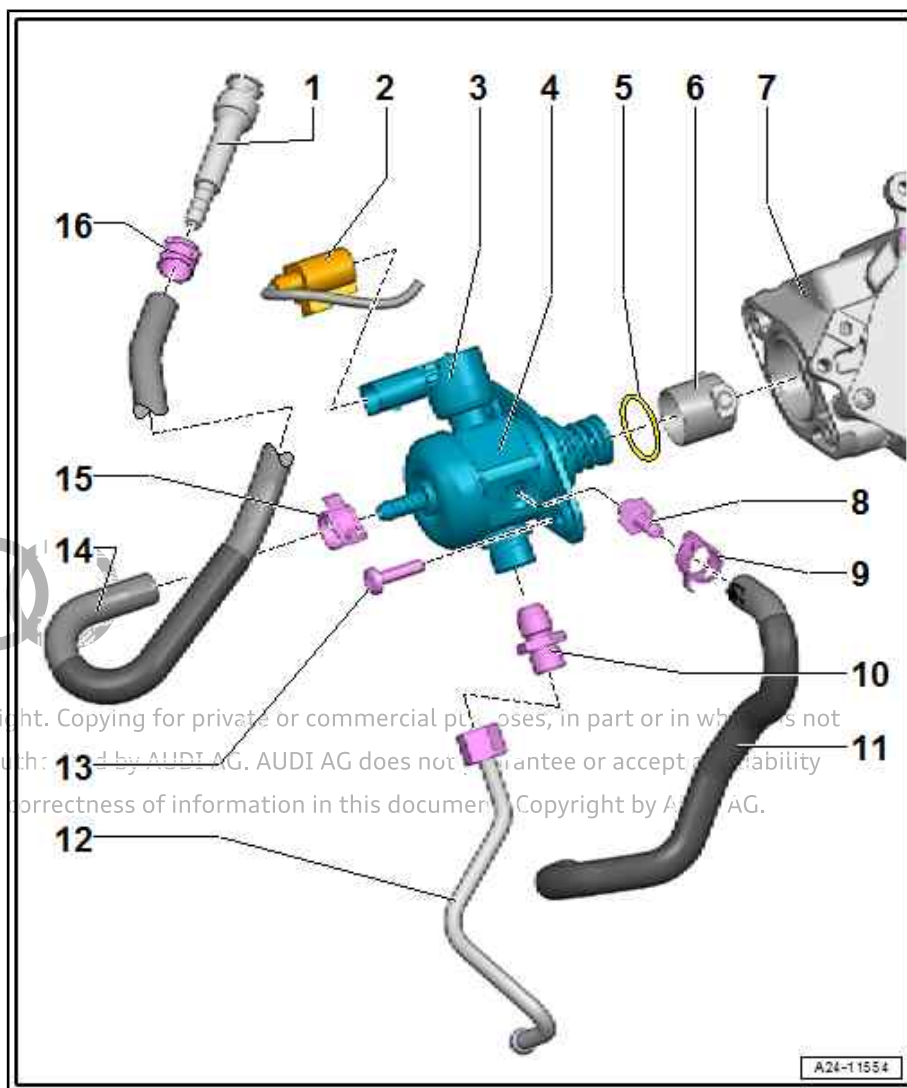
6 - Roller tappet

- ☐ May remain lodged in vacuum pump when high-pressure pump is removed

7 - Vacuum pump

8 - Connection/sealing plug

- ☐ Sealing plug for vehicles without MPI engine
- ☐ Connection for vehicles with MPI engine
- ☐ Connection must always be renewed once loosened
- ☐ M10: 15 Nm
- ☐ M12: 20 Nm



A24-11554



9 - Spring-type clip

- ☐ Renew after removing

10 - Connection

- ☐ For fuel supply line at high-pressure pump
- ☐ Counterhold when loosening union nut
- ☐ Must always be renewed once loosened
- ☐ 40 Nm

11 - Fuel supply hose

- ☐ To fuel rail (for vehicles with MPI engine)

12 - High-pressure pipe

- ☐ To fuel rail for FSI injectors
- ☐ Lightly lubricate ball of fuel supply line with engine oil
- ☐ Install so that parts are free of tension
- ☐ Union nut, 27 Nm

13 - Bolt

- ☐ M6; renew after removing
- ☐ Tightening torques and sequence ⇒ [page 246](#)

14 - Fuel supply hose

- ☐ From fuel tank

15 - Spring-type clip

- ☐ Renew after removing

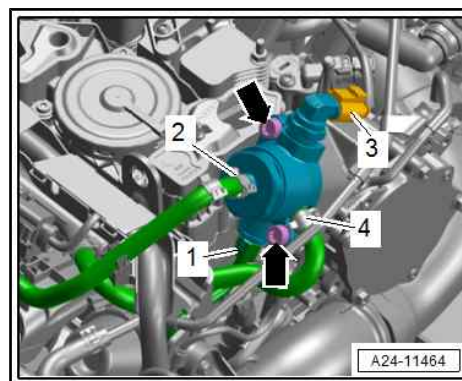
16 - Spring-type clip

- ☐ Renew after removing

High-pressure pump - tightening torques and sequence

- To prevent flange of high-pressure pump from being deformed during installation, tighten bolts in stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-Arrows-	Screw in by hand until contact is made
2.	-Arrows-	Tighten one turn alternately until flange of high-pressure pump makes contact with vacuum pump
3.	-Arrows-	M6 bolt: 8 Nm + 90°; renew bolts after removal M8 bolt: 20 Nm





8.1.2 Exploded view - high-pressure pump (version 2), vehicles without natural gas system

1 - High-pressure pipe

- ☐ To unscrew union nut, counterhold at hexagon flats of connecting piece using an open-end spanner
- ☐ Do not alter shape
- ☐ Install so that parts are free of tension
- ☐ Lubricate thread of union nut with clean engine oil
- ☐ Tighten union nut to 27 Nm
- ☐ Removing and installing ⇒ [page 248](#)

2 - Connection

- ☐ For high-pressure pipe
- ☐ To unscrew union nut on high-pressure pipe, counterhold at hexagon flats of connecting piece using an open-end spanner
- ☐ Must always be renewed once loosened
- ☐ 65 Nm

3 - High-pressure pump

- ☐ Depending on version of high-pressure pump:
- ◆ Fuel pressure regulating valve - N276- or
- ◆ Fuel metering valve - N290-
 - ☐ Integrated in high-pressure pump; cannot be renewed separately
 - ☐ Removing and installing ⇒ [page 248](#)
 - ☐ Take care not to tilt when installing

4 - Spring-type clip

- ☐ Renew after removing

5 - Fuel supply hose

- ☐ From fuel tank

6 - Bolt

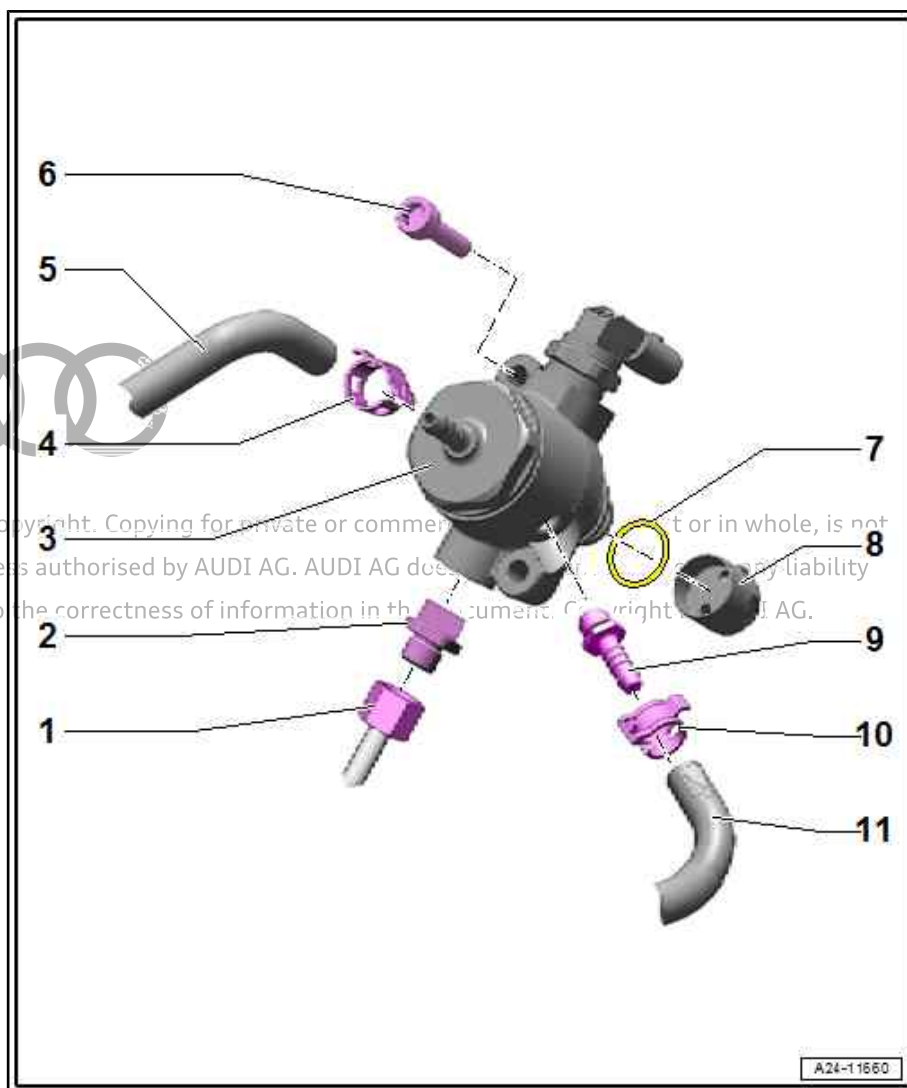
- ☐ M6; renew after removing
- ☐ Tightening torque and sequence ⇒ [page 248](#)

7 - O-ring

- ☐ Renew after removing
- ☐ Lubricate lightly with engine oil

8 - Roller tappet

- ☐ May remain lodged in vacuum pump when high-pressure pump is removed





9 - Connection

- ☐ Must always be renewed once loosened
- ☐ M10: 15 Nm
- ☐ M12: 20 Nm

10 - Spring-type clip

- ☐ Renew after removing

11 - Fuel supply hose

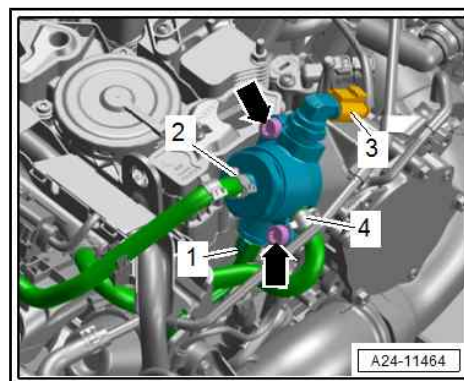
- ☐ To fuel rail for MPI injectors

High-pressure pump (version 2) - tightening torque and sequence

To prevent flange of high-pressure pump from being deformed during installation, fit high-pressure pump as follows:

- Tighten bolts in stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-Arrows-	Screw in by hand until contact is made
2.	-Arrows-	Tighten one turn alternately until flange of high-pressure pump makes contact with vacuum pump
3.	-Arrows-	M6 bolt: 8 Nm + 90°; renew bolts after removal M8 bolt: 20 Nm



8.1.3 Exploded view - high-pressure pump, vehicles with natural gas system

All components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; High-pressure pump; Exploded view - high-pressure pump .

8.2 Removing and installing high-pressure pump

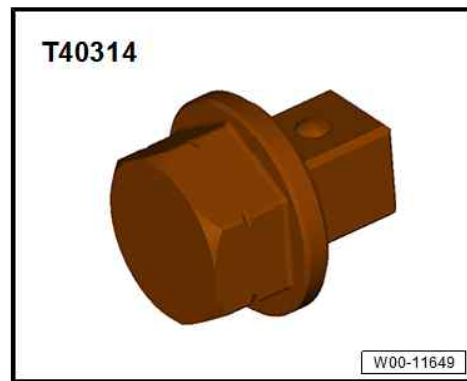
Special tools and workshop equipment required

- ◆ Ratchet wrench (21 mm) - T40263-





◆ Adapter - T40314-



- ◆ Safety goggles
- ◆ Protective gloves

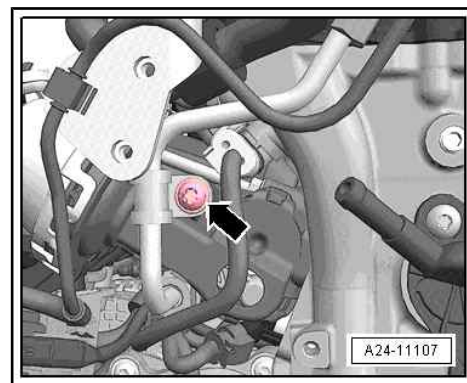
Removing

Preparatory work may be necessary depending on model ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; High-pressure pump; Removing and installing high-pressure pump .



Note

- ◆ *Remove the high-pressure pump only when the engine is cold.*
- ◆ *Observe rules for cleanliness ⇒ [page 5](#) .*
- Remove engine cover panel ⇒ [page 12](#) .
- Remove bolt -arrow- for retaining clip.



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- Unplug electrical connector -3-.

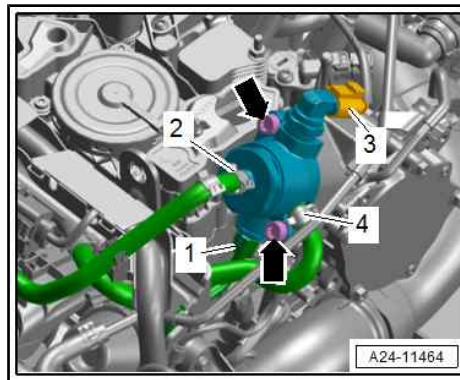


WARNING

The fuel system is pressurised.

Risk of injury as fuel may spray out.

- *Put on safety goggles.*
- *Put on protective gloves.*
- *Release pressure (wrap a clean cloth around connection and open connection carefully).*



Note

Place a cloth underneath to catch escaping fuel.

- Release hose clip -2- and detach fuel hose.
- Vehicles with MPI engine: Release hose clip -4- and detach fuel hose.
- Remove union nut -1-.
- Remove bolts -arrows-.
- Carefully pull out high-pressure pump. It is possible that the roller tappet may remain lodged in the vacuum pump.

Installing



Note

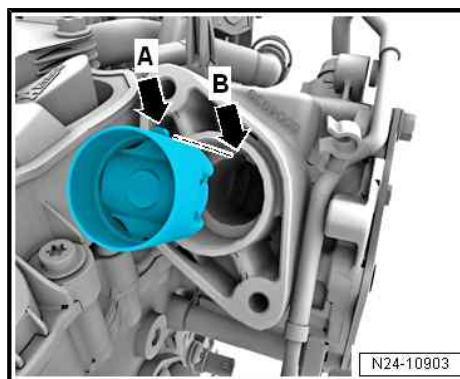
- ◆ *Renew O-ring and spring-type clips after removal.*
- ◆ *Renew connecting piece when reinstalling the same high-pressure pump.*
- ◆ *After removing, renew bolts tightened with specified tightening angle.*
- ◆ *Lubricate roller tappet and O-ring with clean engine oil for installation.*
- Check roller tappet for damage and renew if necessary.
- Fit roller tappet in vacuum pump (note position of locating element -arrows A, B-).



Caution

Irreparable engine damage can be caused if the camshaft timing chains slip.

- ◆ *Turn crankshaft only in direction of engine rotation (in clockwise direction).*





Vehicles with alternator:

- Have a second mechanic turn crankshaft with ratchet wrench (21 mm) - T40263- , adapter - T40314- and socket (24 mm) in direction of normal engine rotation -arrow- until roller tappet in vacuum pump reaches its lowest point.

Vehicles with starter-alternator:

- Have a second mechanic turn crankshaft in direction of normal engine rotation at nut for starter-alternator pulley until roller tappet in vacuum pump reaches its lowest point.

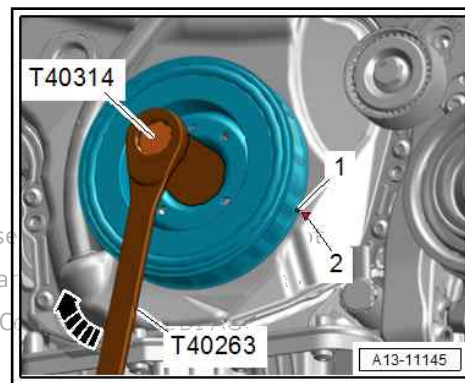
All vehicles (continued):

- Insert high-pressure pump with O-ring into vacuum pump and tighten bolts in stages.
- Secure fuel hoses with spring-type clips.
- Tighten union nut on high-pressure pipe hand-tight, align pipe so that it is free of stress and tighten nut to specified torque.
- Check fuel system for leaks.
- Install engine cover panel ➔ [page 12](#) .

Additional work depending on model ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; High-pressure pump; Removing and installing high-pressure pump

Tightening torques

- ◆ ➔ [Fig. ““High-pressure pump - tightening torques and sequence””, page 246](#)
- ◆ ➔ [“8.1 Exploded view - high-pressure pump”, page 245](#)
- ◆ ➔ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Exploded view - charge air system
- ◆ ➔ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation





9 Lambda probe

⇒ ["9.1 Exploded view - Lambda probe", page 252](#)

⇒ ["9.2 Removing and installing Lambda probe", page 254](#)

9.1 Exploded view - Lambda probe

⇒ ["9.1.1 Exploded view - Lambda probes, vehicles without particulate filter", page 252](#)

⇒ ["9.1.2 Exploded view - Lambda probes, vehicles with particulate filter", page 253](#)

9.1.1 Exploded view - Lambda probes, vehicles without particulate filter

1 - Lambda probe 1 after catalytic converter - GX7-

❑ Comprises:

- ◆ Lambda probe after catalytic converter - G130-
- ◆ Lambda probe 1 heater after catalytic converter - Z29-

❑ Installation position varies

❑ The threads on the new Lambda probes are coated with a special assembly paste.

❑ If re-installing old Lambda probe, coat thread with high-temperature paste: Refer to ⇒ Electronic parts catalogue for high-temperature paste

❑ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body

❑ Removing and installing

⇒ ["9.2 Removing and installing Lambda probe", page 254](#)

❑ 60 Nm

2 - Lambda probe 1 before catalytic converter - GX10-

❑ Comprises:

- ◆ Lambda probe - G39-

- ◆ Lambda probe heater - Z19-

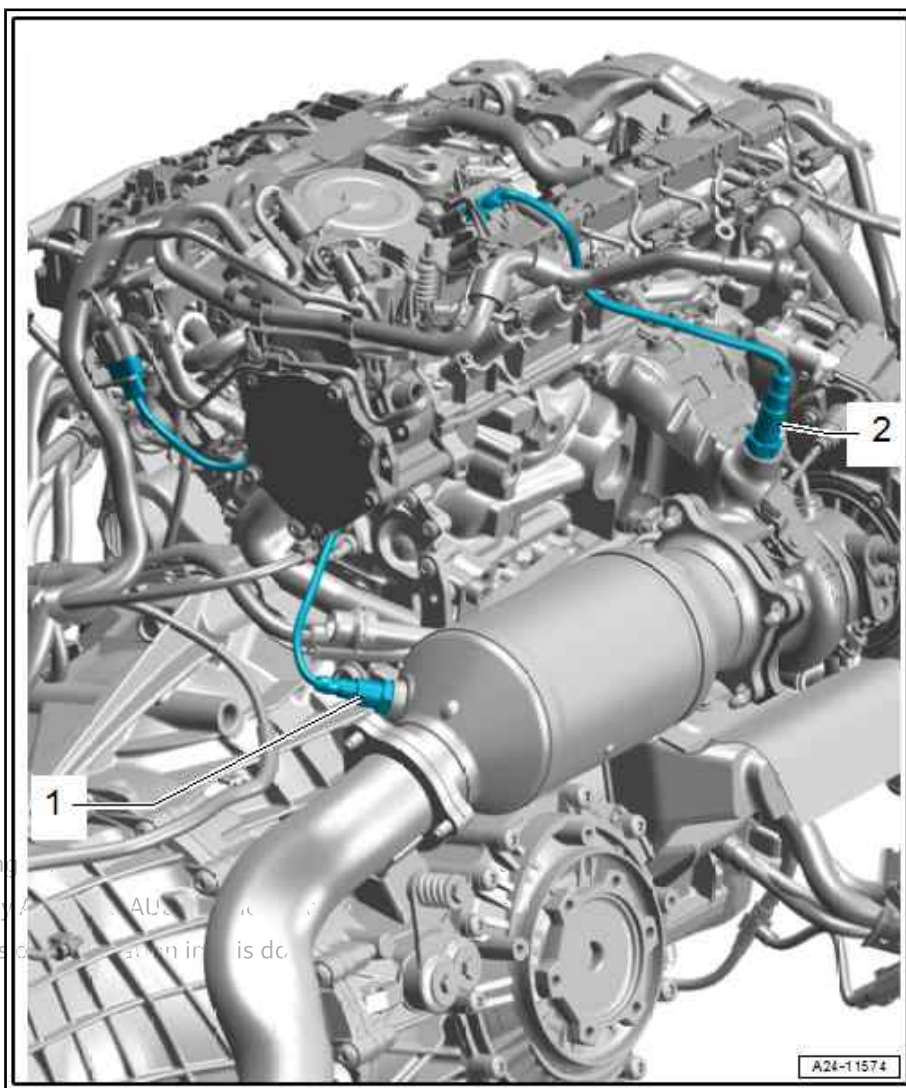
❑ The threads on the new Lambda probes are coated with a special assembly paste.

❑ If re-installing old Lambda probe, coat thread with high-temperature paste: Refer to ⇒ Electronic parts catalogue for high-temperature paste

❑ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body

❑ Removing and installing ⇒ ["9.2 Removing and installing Lambda probe", page 254](#)

❑ 60 Nm





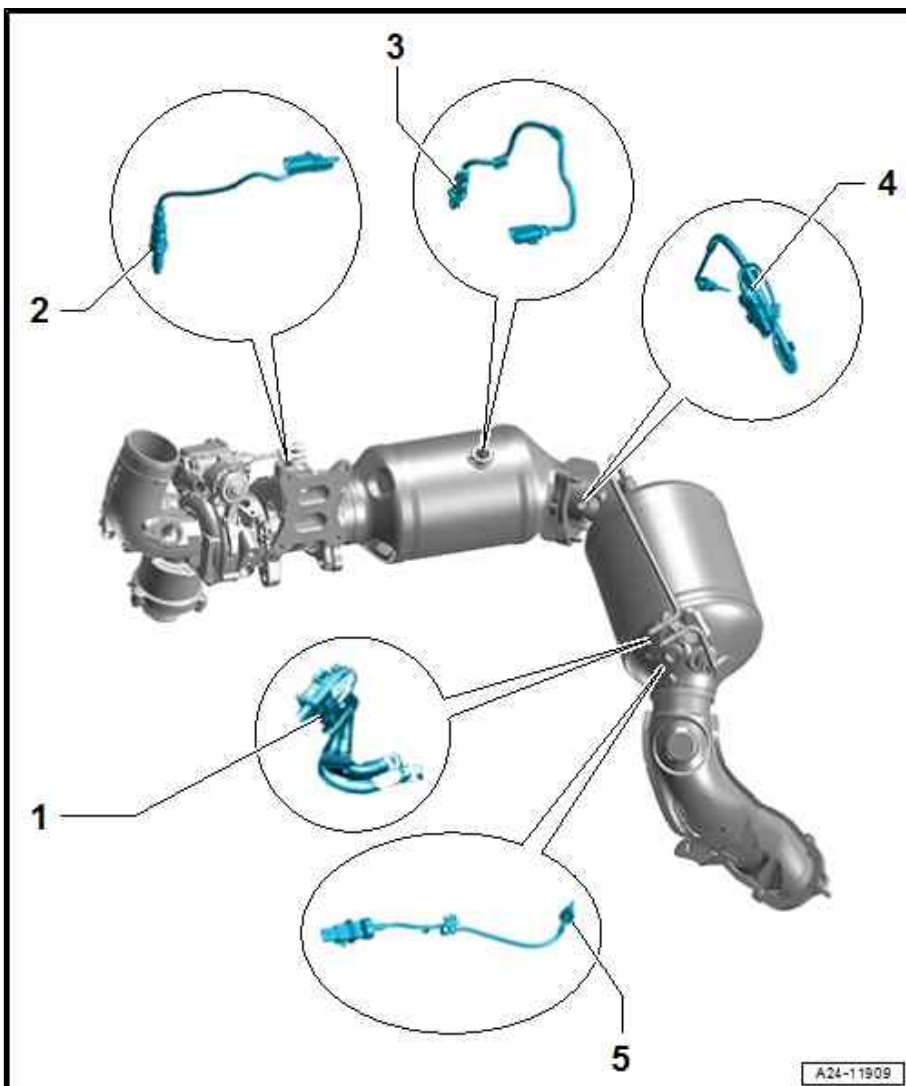
9.1.2 Exploded view - Lambda probes, vehicles with particulate filter

1 - Pressure differential sender for particulate filter - G1037-

- ☐ Removing and installing
 ⇒ [page 242](#)
- ☐ Tighten pressure line to 45 Nm
- ☐ Tightening torque for pressure differential sender for particulate filter - G1037-
 ⇒ [page 254](#)

2 - Lambda probe 1 before catalytic converter - GX10-

- ☐ Comprises:
 - ◆ Lambda probe - G39-
 - ◆ Lambda probe heater - Z19-
- ☐ The threads on the new Lambda probes are coated with a special assembly paste.
- ☐ If re-installing old Lambda probe, coat thread with high-temperature paste: Refer to ⇒ Electronic parts catalogue for high-temperature paste
- ☐ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body
- ☐ Removing and installing
 ⇒ ["9.2 Removing and installing Lambda probe", page 254](#)
- ☐ 60 Nm



3 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Comprises:
 - ◆ Lambda probe after catalytic converter - G130-
 - ◆ Lambda probe 1 heater after catalytic converter - Z29-
- ☐ Installation position varies
- ☐ The threads on the new Lambda probes are coated with a special assembly paste.
- ☐ If re-installing old Lambda probe, coat thread with high-temperature paste: Refer to ⇒ Electronic parts catalogue for high-temperature paste
- ☐ The assembly paste/high-temperature paste must not get into the slots on the Lambda probe body
- ☐ Removing and installing ⇒ ["9.2 Removing and installing Lambda probe", page 254](#)
- ☐ 60 Nm

4 - Exhaust gas temperature sender 3 - G495-

- ☐ ⇒ [Item 4 \(page 267\)](#)

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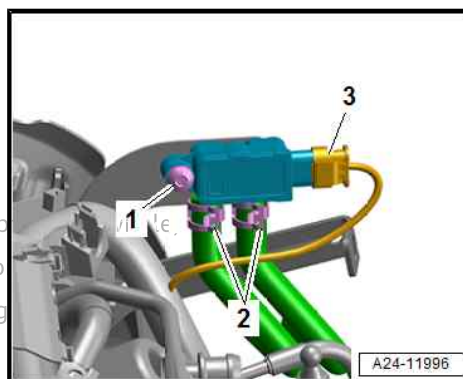


5 - Exhaust gas temperature sender 4 - G648-

- ⇒ [Item 5 \(page 267\)](#)

Pressure differential sender for particulate filter - G1037- (version 2) - tightening torque

- Tighten bolt -1- to 9 Nm.

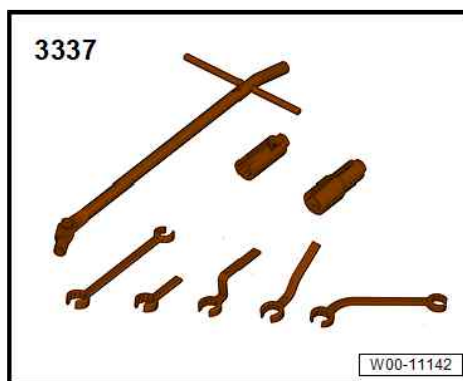


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9.2 Removing and installing Lambda probe

Special tools and workshop equipment required

- ◆ Lambda probe open ring spanner set - 3337-



Removing

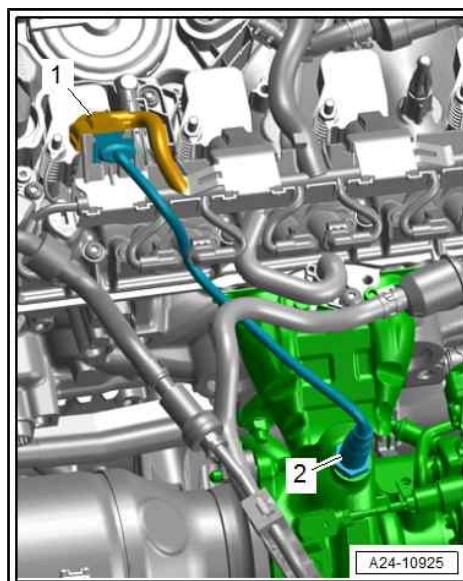
- Remove engine cover panel ⇒ [page 12](#) .

Lambda probe 1 before catalytic converter - GX10- :

- Unplug electrical connector -1-.
- Unscrew Lambda probe 1 before catalytic converter - GX10- -item 2- using a tool from Lambda probe open ring spanner set - 3337- .

Note:

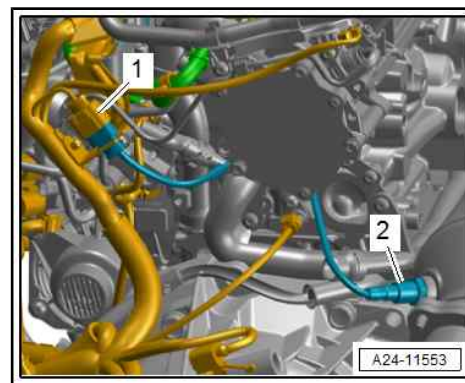
Installation position varies depending on model and version.





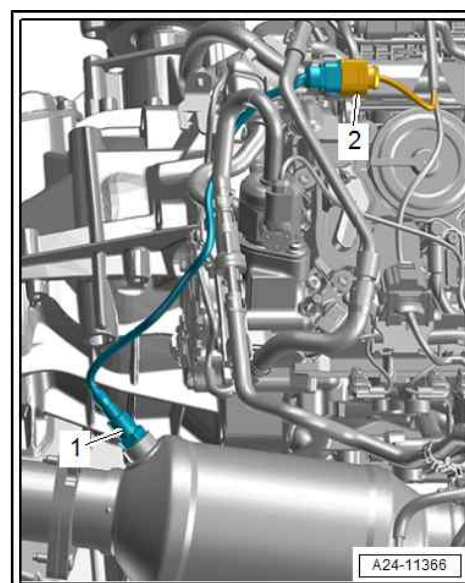
Lambda probe 1 after catalytic converter - GX7- (version 1):

- Unplug electrical connector -1-.
- Unscrew Lambda probe 1 after catalytic converter - GX7- -item 2- using a tool from Lambda probe open ring spanner set - 3337- .



Lambda probe 1 after catalytic converter - GX7- (version 2):

- Unplug electrical connector -2-.
- Unscrew Lambda probe 1 after catalytic converter - GX7- -item 1- using a tool from Lambda probe open ring spanner set - 3337- .



Lambda probe 1 after catalytic converter - GX7- (version 3):

- Unplug electrical connector -2-.
- Unscrew Lambda probe 1 after catalytic converter - GX7- -item 1- using a tool from Lambda probe open ring spanner set - 3337- .

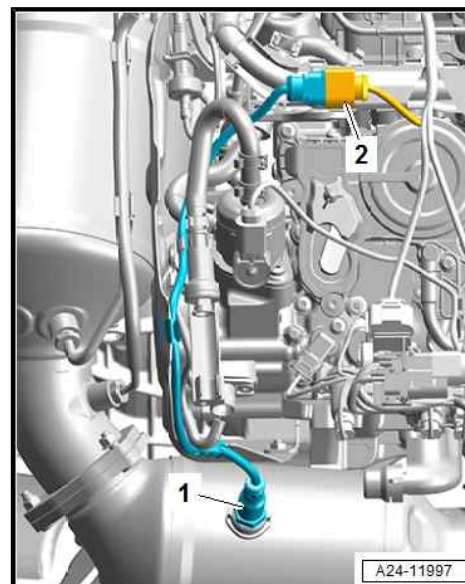
Installing

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



Note

- ◆ *New Lambda probes are coated with an assembly paste. The 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. The paste must not get into the slots on the Lambda probe body. High-temperature paste → Electronic parts catalogue*
- ◆ *The electrical wiring of the lambda probe must be secured at the original locations when installing. The wiring must NOT come into contact with the exhaust pipe.*



- Install engine cover panel ➤ [page 12](#).

Tightening torques

- ◆ ➤ ["9.1 Exploded view - Lambda probe", page 252](#)



10 Engine control unit

All procedures and components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Engine control unit .



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26 – Exhaust system

1 Exhaust pipes/silencers

⇒ [“1.1 Exploded view - silencers”, page 257](#)

⇒ [“1.2 Separating exhaust pipes/silencers”, page 257](#)

⇒ [“1.3 Removing and installing front silencers”, page 257](#)

⇒ [“1.4 Stress-free alignment of exhaust system”, page 257](#)

⇒ [“1.5 Checking exhaust system for leaks”, page 257](#)

1.1 Exploded view - silencers

All components are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Exploded view - silencers .

1.2 Separating exhaust pipes/silencers

All work is described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Separating exhaust pipes/silencers .

1.3 Removing and installing front silencers

All procedures are described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Removing and installing front silencer .

1.4 Stress-free alignment of exhaust system

All work is described in ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Stress-free alignment of exhaust system .

1.5 Checking exhaust system for leaks

- Start engine and run at idling speed.
- Plug tailpipes (e. g. with rags or stopper) and leave plugged until the check is complete.
- Listen for noise at connection points (cylinder head/turbocharger, turbocharger/front exhaust pipe etc.) to locate any leaks.
- Rectify any leaks that are found.



2 Emission control system

⇒ [“2.1 Exploded view - emission control system”, page 258](#)

⇒ [“2.2 Removing and installing catalytic converter”, page 260](#)

⇒ [“2.3 Removing and installing particulate filter”, page 263](#)

2.1 Exploded view - emission control system

⇒ [“2.1.1 Exploded view - emission control system, vehicles without particulate filter”, page 258](#)

⇒ [“2.1.2 Exploded view - emission control system, vehicles with particulate filter”, page 259](#)

2.1.1 Exploded view - emission control system, vehicles without particulate filter

1 - Gasket

- ☐ Renew after removing

2 - Turbocharger

- ☐ Exploded view
⇒ [page 184](#)

3 - Lambda probe 1 before catalytic converter - GX10-

- ☐ Exploded view
⇒ [page 252](#)

4 - Nut

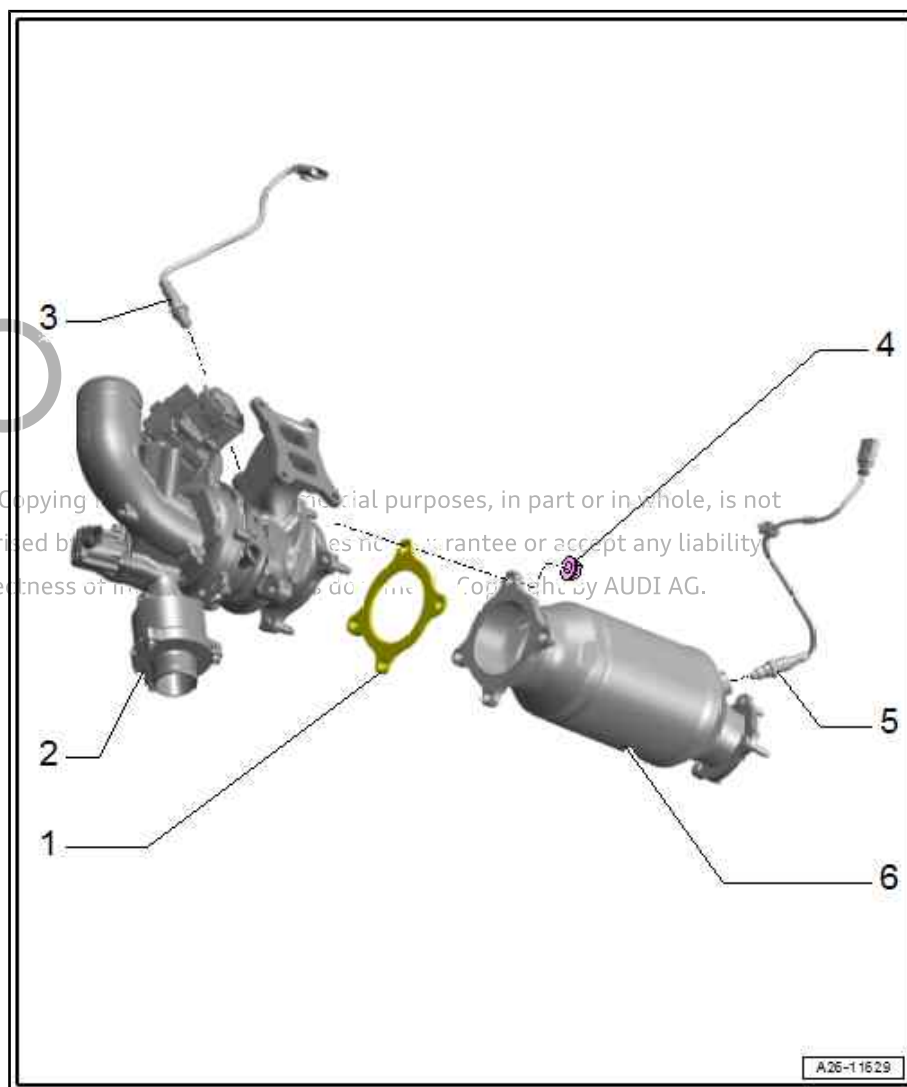
- ☐ Renew after removing
- ☐ Lubricate studs for turbocharger with high-temperature paste ⇒ Electronic parts catalogue
- ☐ 40 Nm

5 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Exploded view
⇒ [page 252](#)

6 - Catalytic converter

- ☐ Protect against knocks and impact
- ☐ Removing and installing
⇒ [page 260](#)
- ☐ Align exhaust system so it is free of stress
⇒ [page 257](#)





2.1.2 Exploded view - emission control system, vehicles with particulate filter

1 - Exhaust gas temperature sender 4 - G648-

- ☐ ⇒ [Item 5 \(page 267\)](#)

2 - Exhaust gas temperature sender 3 - G495-

- ☐ ⇒ [Item 4 \(page 267\)](#)

3 - Gasket

- ☐ Renew after removing

4 - Turbocharger

- ☐ Exploded view
⇒ [page 184](#)

5 - Lambda probe 1 before catalytic converter - GX10-

- ☐ Exploded view
⇒ [page 252](#)

6 - Gasket

- ☐ Renew after removing

7 - Catalytic converter

- ☐ Protect against knocks and impact
- ☐ Mounting components on gearbox
⇒ [page 260](#)
- ☐ Removing and installing
⇒ [page 260](#)
- ☐ Align exhaust system so it is free of stress
⇒ [page 257](#)

8 - Lambda probe 1 after catalytic converter - GX7-

- ☐ Exploded view
⇒ [page 252](#)

9 - Nut

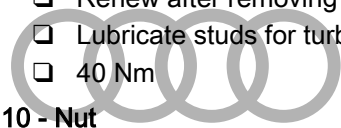
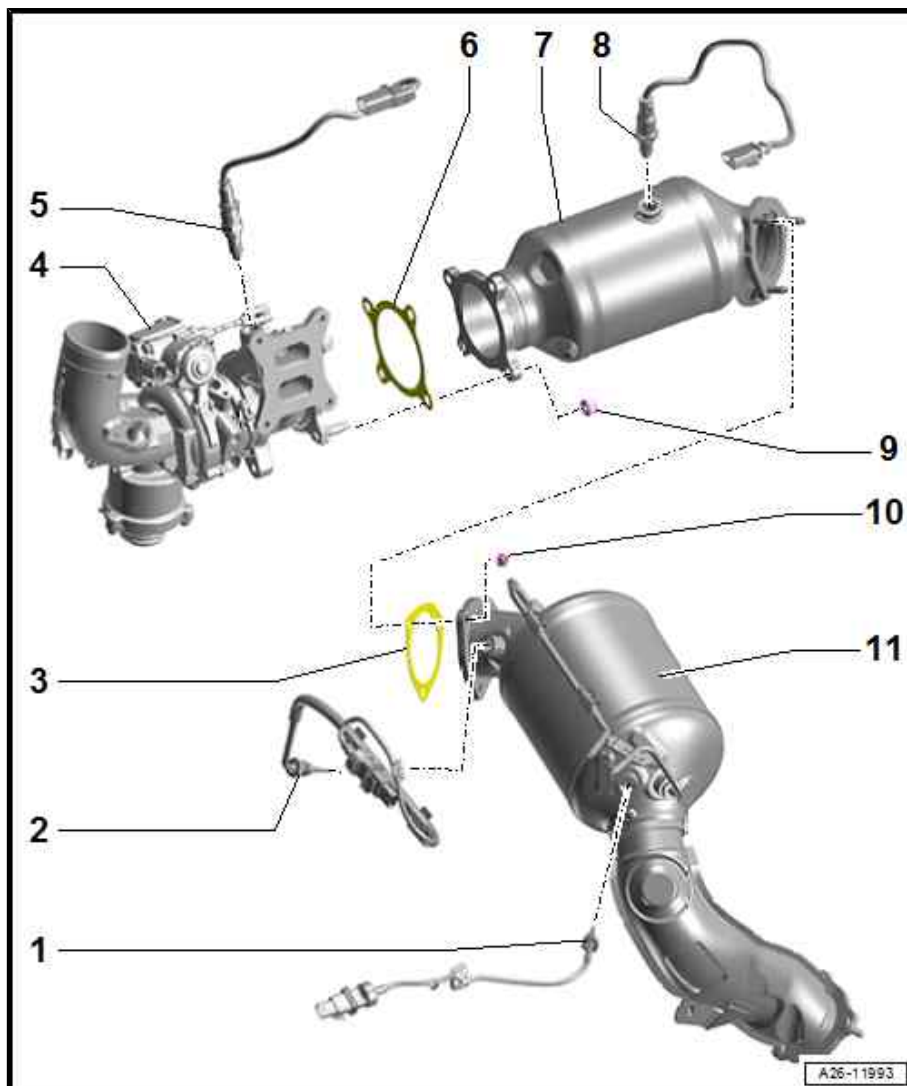
- ☐ Renew after removing
- ☐ Lubricate studs for turbocharger with high-temperature paste ⇒ [Electronic parts catalogue](#) .
- ☐ 40 Nm

10 - Nut

- ☐ Renew after removing
- ☐ Lubricate studs for turbocharger with high-temperature paste ⇒ [Electronic parts catalogue](#) .
- ☐ 23 Nm

11 - Particulate filter

- ☐ Mounting components on gearbox ⇒ [page 260](#)
- ☐ Removing and installing ⇒ [page 263](#)

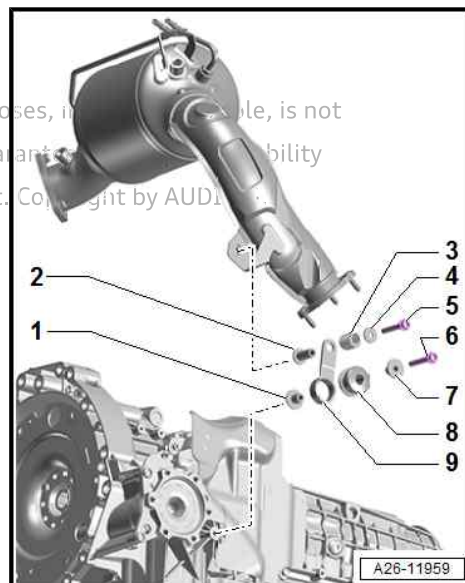


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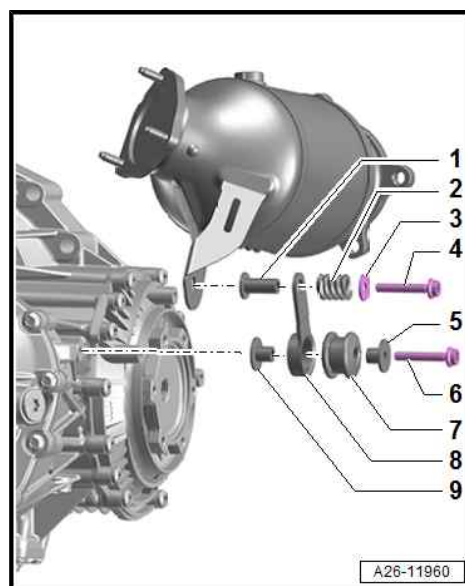
Mounting components for particulate filter on gearbox

- 1 - Spacer sleeve
- 2 - Spacer sleeve
- 3 - Compression spring
- 4 - Washer
- 5 - Bolt, 23 Nm
- 6 - Bolt, 23 Nm
- 7 - Spacer sleeve
- 8 - Buffer
- 9 - Bracket



Mounting components for catalytic converter on gearbox

- 1 - Spacer sleeve
- 2 - Compression spring
- 3 - Washer
- 4 - Bolt, 23 Nm
- 5 - Spacer sleeve
- 6 - Bolt, 23 Nm
- 7 - Buffer
- 8 - Bracket
- 9 - Spacer sleeve



2.2 Removing and installing catalytic converter

⇒ [“2.2.1 Removing and installing catalytic converter - vehicles without particulate filter”, page 260](#)

⇒ [“2.2.2 Removing and installing catalytic converter - vehicles with particulate filter”, page 262](#)

2.2.1 Removing and installing catalytic converter - vehicles without particulate filter

Removing



Note

Re-install all cable ties in original positions.

- Remove front silencer ⇒ [page 257](#) .



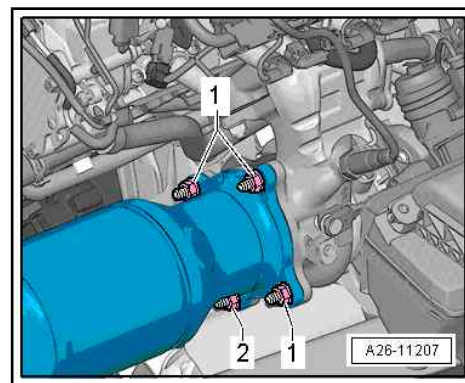
- Remove nut -2- from underneath.



Note

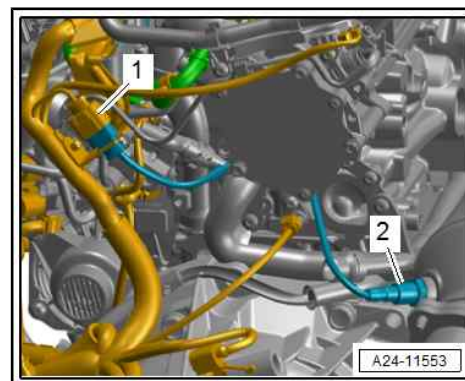
The nuts -1- are removed at a later stage.

- Remove air cleaner housing ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .
- Remove Lambda probe 1 before catalytic converter - GX10- ⇒ [“9.2 Removing and installing Lambda probe”, page 254](#) .



Lambda probe 1 after catalytic converter - GX7- (version 1):

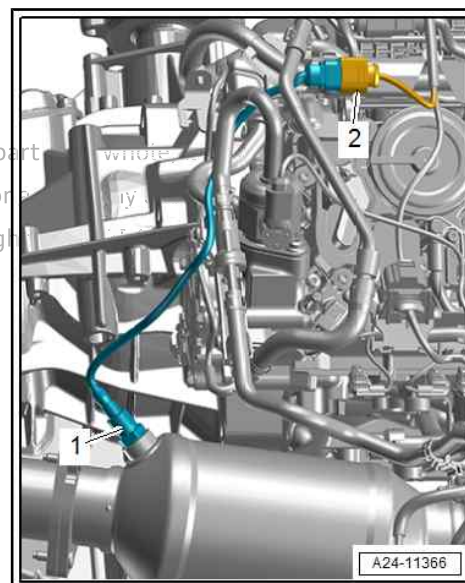
- Remove electrical connector -1- for Lambda probe 1 after catalytic converter - GX7- -item 2- from bracket and unplug connector.



Lambda probe 1 after catalytic converter - GX7- (version 2):

- Remove electrical connector -2- for Lambda probe 1 after catalytic converter - GX7- -item 1- from bracket and unplug connector.

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Continued:

- Remove nuts -1- from above and lift out catalytic converter.

Installing

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



Note

Renew gaskets, seals and self-locking nuts after removal.

- Install air cleaner housing ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .

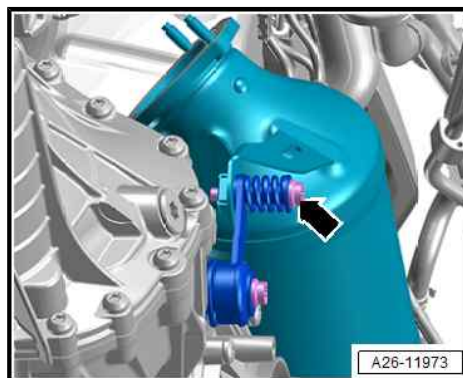
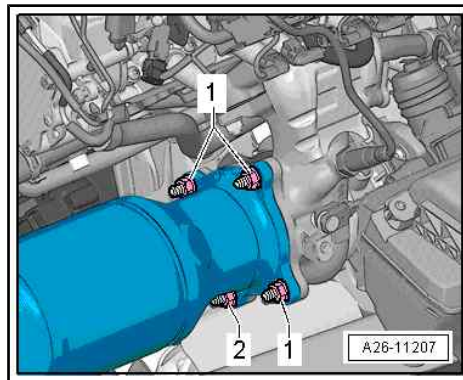
Tightening torques

- ♦ ⇒ [“9.1 Exploded view - Lambda probe”, page 252](#)
- ♦ ⇒ [“2.1.1 Exploded view - emission control system, vehicles without particulate filter”, page 258](#)

2.2.2 Removing and installing catalytic converter - vehicles with particulate filter

Removing

- Remove air cleaner housing ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .
- Remove particulate filter ⇒ [page 263](#) .
- Remove bolt -arrow- on bracket for catalytic converter.



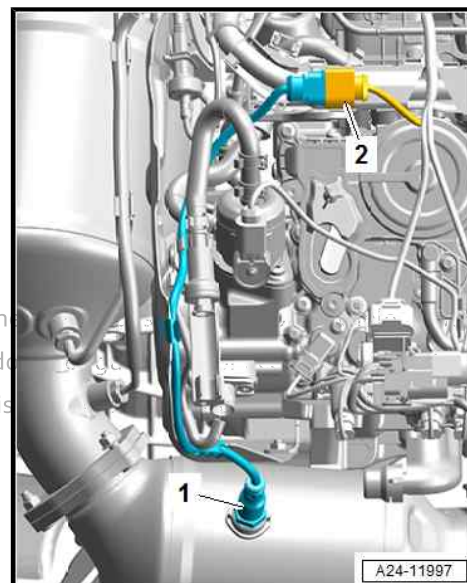
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- Remove electrical connector -2- for Lambda probe 1 after catalytic converter - GX7- -item 1- from bracket and unplug connector.



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- Unscrew nuts -1 and 2- and detach catalytic converter upwards towards rear.

Installing

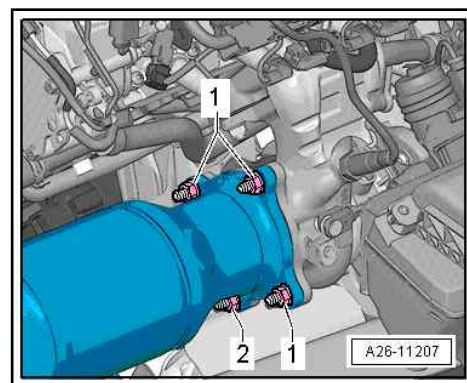
Installation is carried out in reverse order; note the following:



Note

Renew gaskets, seals and self-locking nuts after removal.

- Install air cleaner housing ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .
- Install particulate filter ⇒ [page 263](#) .



Tightening torques

- ♦ ⇒ [“2.1.2 Exploded view - emission control system, vehicles with particulate filter”, page 259](#)

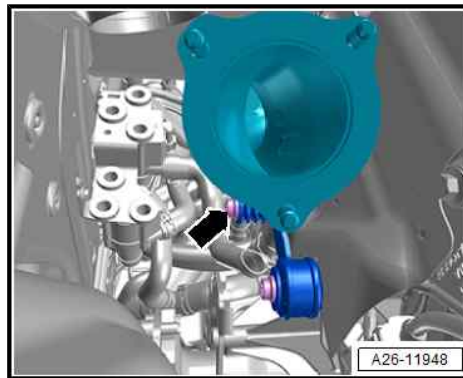
2.3 Removing and installing particulate filter

Removing

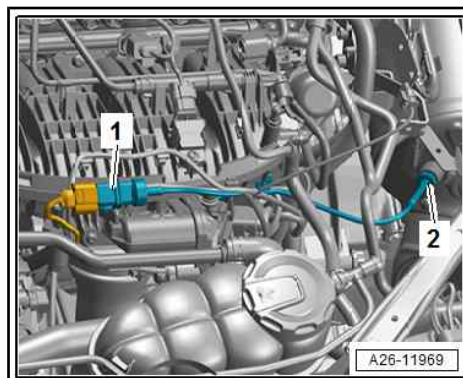
- Remove front silencer ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Removing and installing front silencer .
- Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .
- Detach intermediate steering shaft from steering rack and move clear by telescoping together ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .



- Remove bolt -arrow- on bracket for particulate filter.



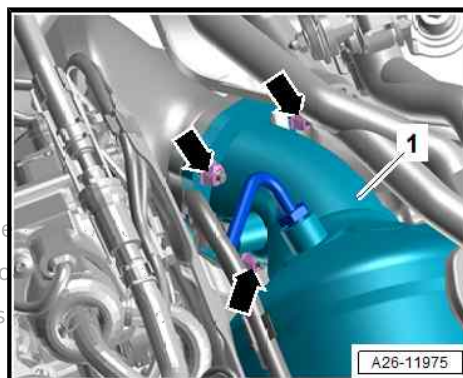
- Unplug electrical connector -1- for exhaust gas temperature sender 4 - G648- and move wiring clear.



- Remove nuts -arrows-.

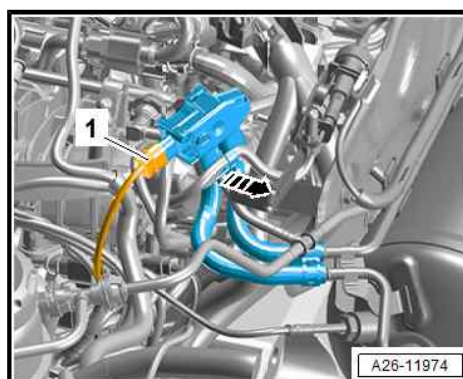


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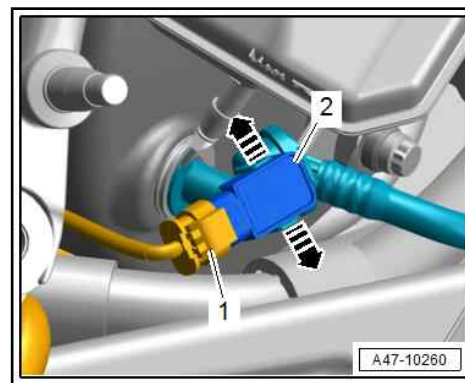
Pressure differential sender for particulate filter - G1037- - version 1:

- Unplug electrical connector -1- for pressure differential sender for particulate filter - G1037- .
- Unclip bracket with pressure differential sender from intake manifold -arrow- and move clear.





- Unplug electrical connector -1- for vacuum sender - G608-
 -item 2-.

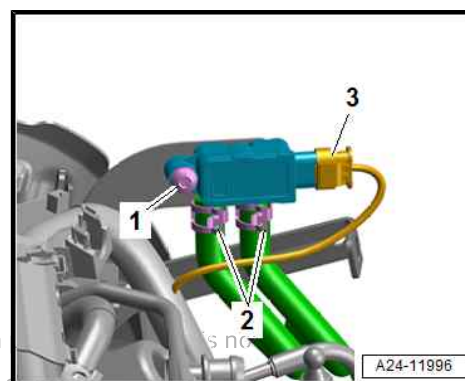


Pressure differential sender for particulate filter - G1037- - version 2:

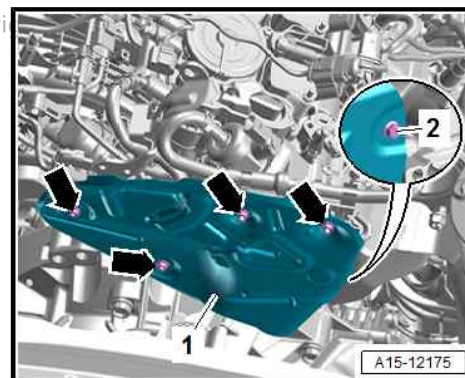
- Unplug electrical connector -3-.
- Remove bolt -1- and press pressure differential sender for
 particulate filter - G1037- to one side.



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- **Move electrical wiring clear at heat shield -1-.**
- Remove nuts -arrows- and bolt -2- and detach heat shield
 (shown with particulate filter removed).





- Release retaining clip -3- and move vacuum hose clear.
- Remove bolt -1- and detach bracket. (Different versions.)

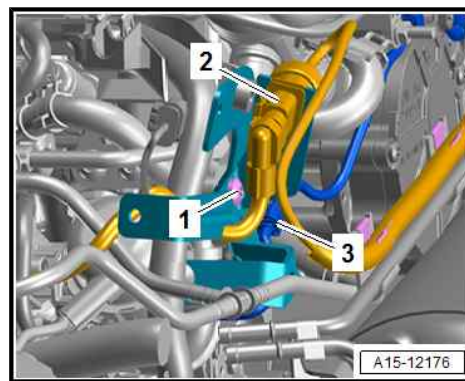
All versions (continued):

- Take electrical connector -2- for exhaust gas temperature sender 3 - G495- out of bracket and unplug.
- Detach particulate filter.

Installing

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

- Install intermediate steering shaft ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering column; Removing and installing intermediate steering shaft .
- Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .
- Install front silencer ⇒ 4-cylinder direct injection engine (2.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Removing and installing front silencer .



Note

If the particulate filter has been renewed, the ash deposit volume must be reset using ⇒ Vehicle diagnostic tester.

- ◆ [01 - Self-diagnosis compatible systems](#)
- ◆ [01 - Engine electronics, functions](#)
- ◆ [01 - Functions, engine mechanics](#)

Tightening torques

- ◆ ⇒ [“2.1.2 Exploded view - emission control system, vehicles with particulate filter”, page 259](#)



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3 Exhaust gas temperature control

⇒ [“3.1 Exploded view - exhaust gas temperature control”, page 267](#)

⇒ [“3.2 Removing and installing parts of exhaust gas temperature control”, page 267](#)

3.1 Exploded view - exhaust gas temperature control

1 - Pressure differential sender for particulate filter - G1037-

- ⇒ [Item 1 \(page 253\)](#)

2 - Lambda probe 1 before catalytic converter - GX10-

- ⇒ [Item 2 \(page 253\)](#)

3 - Lambda probe 1 after catalytic converter - GX7-

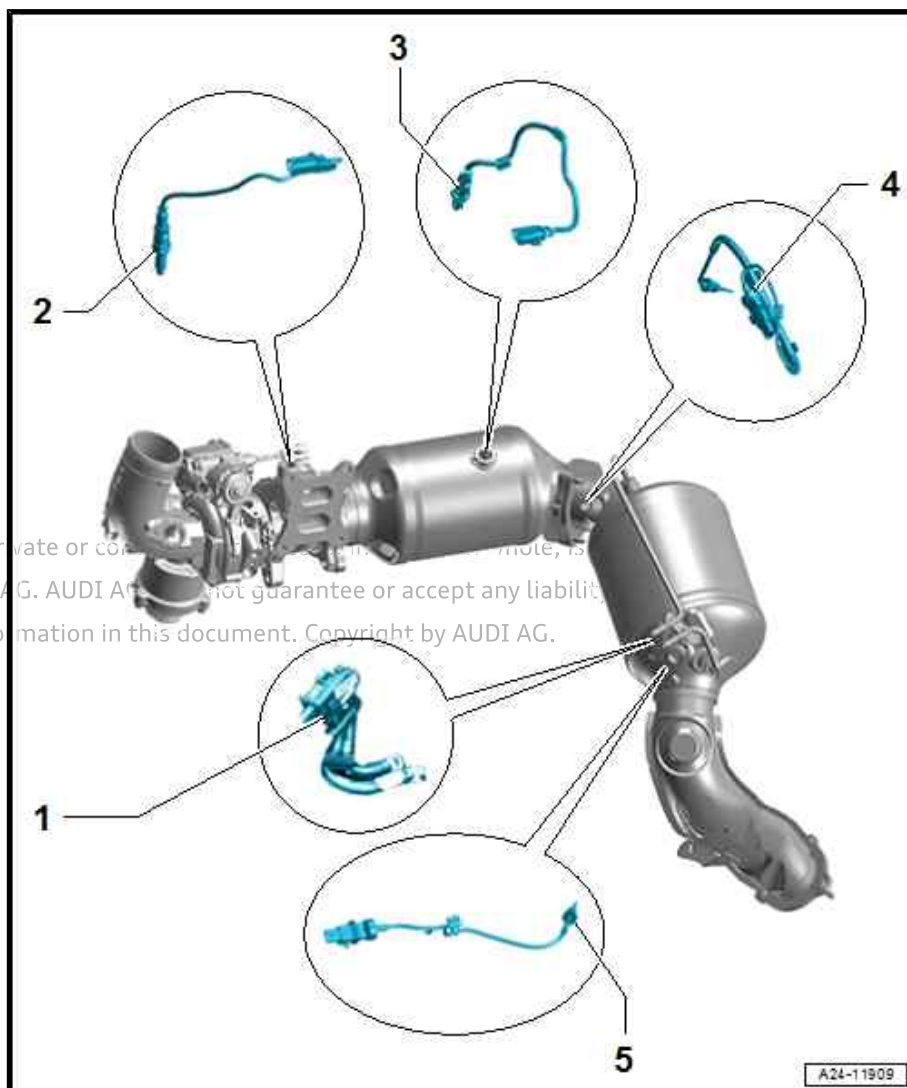
- ⇒ [Item 3 \(page 253\)](#)

4 - Exhaust gas temperature sender 3 - G495-

- Removing and installing
⇒ [page 267](#)
- 45 Nm

5 - Exhaust gas temperature sender 4 - G648-

- Removing and installing
⇒ [page 268](#)
- 45 Nm



3.2 Removing and installing parts of exhaust gas temperature control

⇒ [“3.2.1 Removing and installing exhaust gas temperature sender 3 G495”, page 267](#)

⇒ [“3.2.2 Removing and installing exhaust gas temperature sender 4 G648”, page 268](#)

3.2.1 Removing and installing exhaust gas temperature sender 3 - G495-

Special tools and workshop equipment required



- ◆ Tool set - T10395 A- with suitable tool insert



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- Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .
- Remove engine cover panel ⇒ [page 12](#) .
- Unplug electrical connector -2- and move electrical wire clear.
- Remove exhaust gas temperature sender 3 - G495- -item 1-.

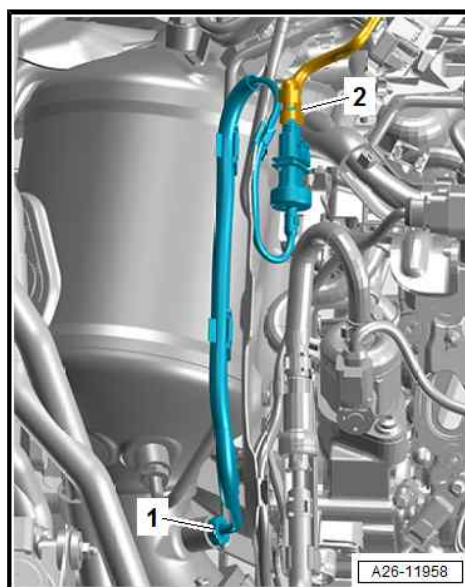
Installing

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

- Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.
- When installing, ensure sufficient clearance.
- Install engine cover panel ⇒ [page 12](#) .
- Install plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

Tightening torques

- ◆ ⇒ [“3.1 Exploded view - exhaust gas temperature control”, page 267](#)



3.2.2 Removing and installing exhaust gas temperature sender 4 - G648-

Special tools and workshop equipment required

- ◆ Tool set - T10395 A- with suitable tool insert



Removing

- Remove engine cover panel ⇒ [page 12](#) .



- Unplug electrical connector -1- and move electrical wire clear.
- Remove exhaust gas temperature sender 4 - G648- -item 2-.

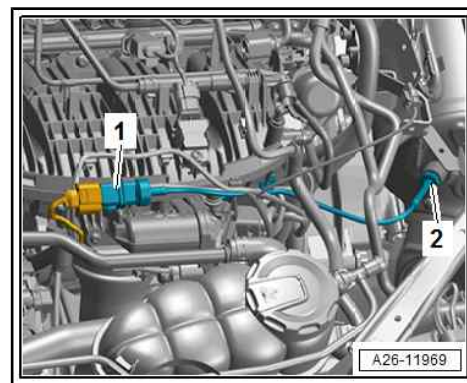
Installing

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

- Take care to protect exhaust gas temperature sender from knocks and impact; if dropped, the exhaust gas temperature sender can no longer be used.
- Install engine cover panel ➔ [page 12](#) .

Tightening torques

- ◆ ➔ ["3.1 Exploded view - exhaust gas temperature control", page 267](#)



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28 – Ignition system

1 Ignition system

⇒ "1.1 Exploded view - ignition system", page 270

⇒ "1.2 Removing and installing ignition coils", page 271

⇒ "1.3 Removing and installing knock sensor 1 G61 ",
page 273

⇒ "1.4 Removing and installing Hall senders", page 274

⇒ "1.5 Removing and installing engine speed sender G28 ", page
275

1.1 Exploded view - ignition system

1 - Bolt

- ☐ Renew after removing
- ☐ Tightening torque influences the function of the knock sensor
- ☐ 8 Nm +90°

2 - Knock sensor 1 - G61-

- ☐ Removing and installing
⇒ page 273

3 - Spark plug

- ☐ 30 Nm

4 - Spark plug connectors

5 - Ignition coil

- ◆ Ignition coil 1 with output stage - N70-
- ◆ Ignition coil 2 with output stage - N127-
- ◆ Ignition coil 3 with output stage - N291-
- ◆ Ignition coil 4 with output stage - N292-
- ☐ Removing and installing
⇒ page 271

6 - Bolt

- ☐ 10 Nm

7 - Nut

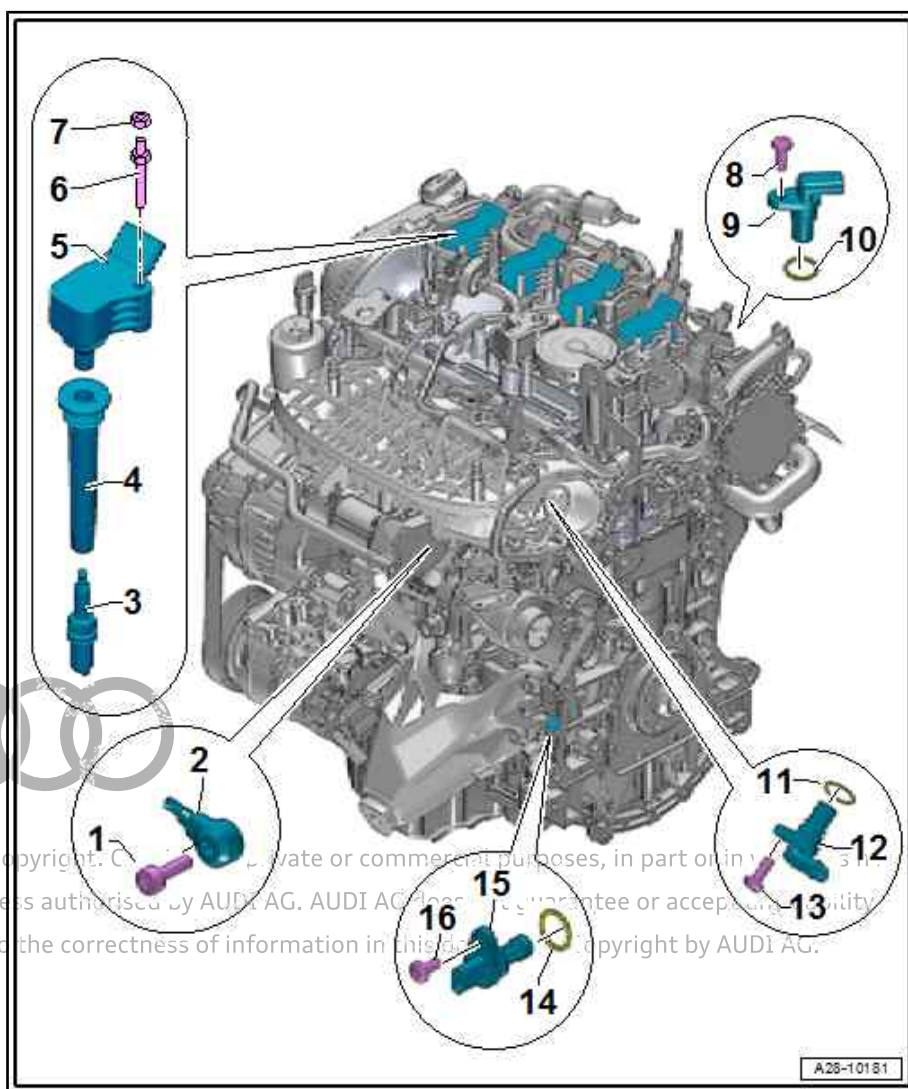
- ☐ 9 Nm

8 - Bolt

- ☐ 9 Nm

9 - Hall sender 3 - G300-

- ☐ Check seal for damage.
- ☐ Removing and installing ⇒ page 275
- ☐ After renewal or removal and reinstallation, perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis]





10 - O-ring

- ☐ Check for damage
- ☐ Not available separately; supplied with ⇒ [Item 9 \(page 270\)](#)

11 - O-ring

- ☐ Check for damage
- ☐ Not available separately; supplied with ⇒ [Item 12 \(page 271\)](#)

12 - Hall sender - G40-

- ☐ Removing and installing ⇒ [page 274](#)

☐ Check seal for damage

☐ After renewal or removal and reinstallation, perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis]

13 - Bolt

- ☐ 9 Nm

14 - O-ring

- ☐ Check for damage
- ☐ Not available separately; supplied with ⇒ [Item 15 \(page 271\)](#)

15 - Engine speed sender - G28-

- ☐ Removing and installing ⇒ [page 275](#)
- ☐ Check seal for damage.
- ☐ After renewal or removal and reinstallation, perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis]

16 - Bolt

- ☐ Renew after removing
- ☐ 4 Nm +45°

1.2 Removing and installing ignition coils

Special tools and workshop equipment required

- ◆ Puller - T10530-



- ◆ For silicone paste, refer to ⇒ Electronic parts catalogue .

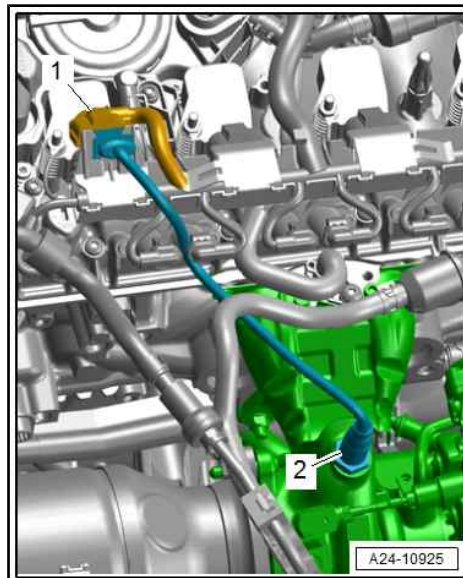


Removing

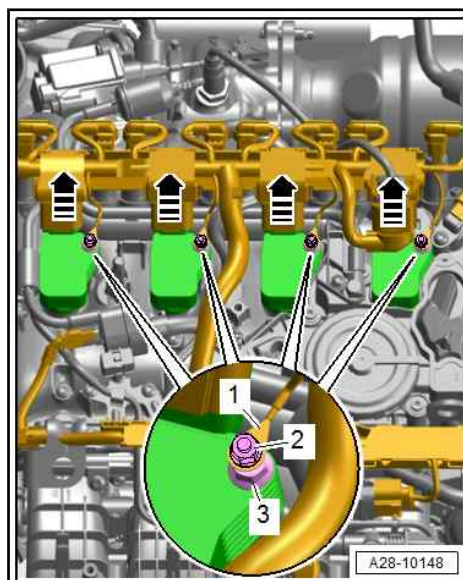
- Remove engine cover panel ➤ [page 12](#) .
- Unplug electrical connector -1- for Lambda probe 1 before catalytic converter - GX10- -item 2-.

Note:

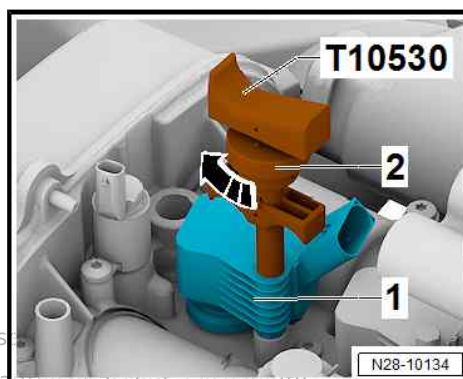
Installation position varies depending on model and version.



- If fitted, remove nut -2- and move earth wire -1- clear.
- Release electrical connectors and detach simultaneously from ignition coils in direction of -arrows-.
- Remove centre hex stud -3- for relevant ignition coil.



- Insert puller - T10530- into hole -1- in ignition coil.
- Turn knurled nut -2- clockwise -arrow- until puller is secured in place.



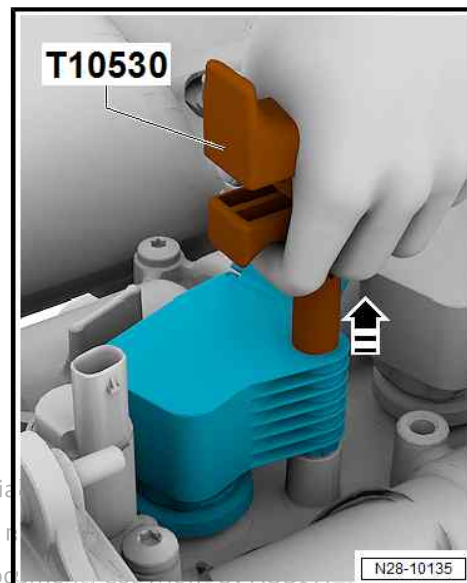
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- Carefully pull ignition coil out vertically -arrow- with puller - T10530- .



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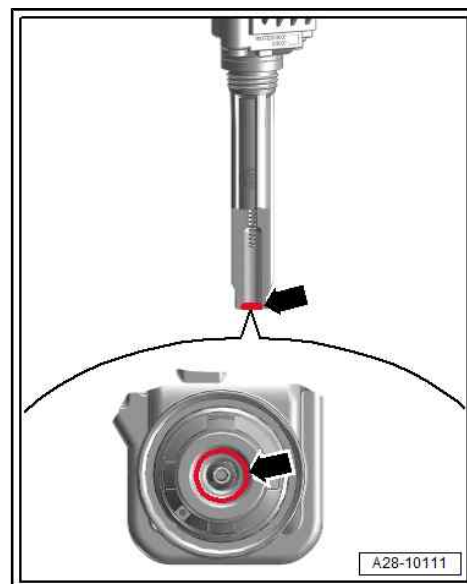


Installing

- Apply a thin bead of silicone paste all around end of sealing hose of ignition coil -arrow-.
- Press ignition coils onto spark plugs by hand evenly (do not use tools).
- Install engine cover panel ⇒ [page 12](#) .

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 270](#)



1.3 Removing and installing knock sensor 1 - G61-

Removing



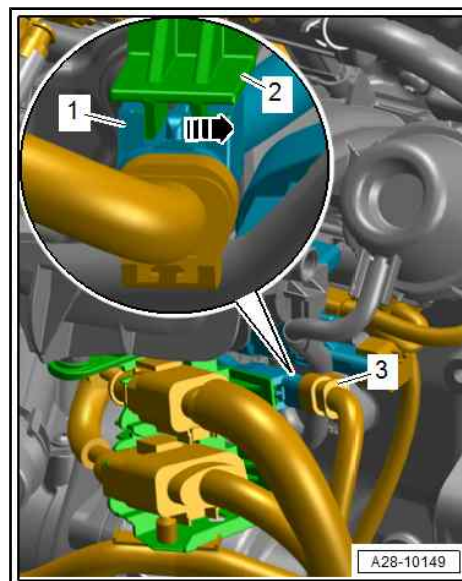
Note

Knock sensor 1 - G61- is located below the intake manifold and behind the actuator for engine temperature regulation - N493- .

- Remove actuator for engine temperature regulation - N493- ⇒ [page 178](#) .



- Unplug electrical connector -3-.
- Release fastener -arrow-, detach electrical wire -1- for knock sensor 1 - G61- from bracket -2- and move wire clear.



- Unscrew bolt -arrow- and remove knock sensor 1 - G61- .

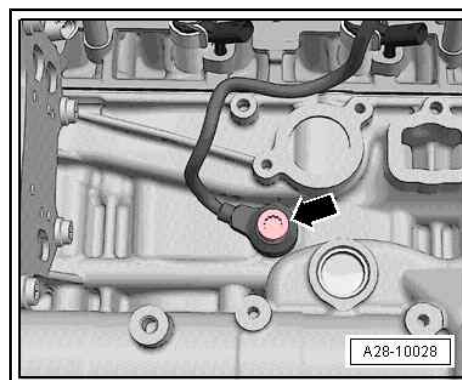
Installing

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

- Install actuator for engine temperature regulation - N493-
⇒ [page 178](#) .

Tightening torques

- ♦ ⇒ ["1.1 Exploded view - ignition system", page 270](#)



1.4 Removing and installing Hall senders

⇒ ["1.4.1 Removing and installing Hall sender G40 ", page 274](#)

⇒ ["1.4.2 Removing and installing Hall sender 3 G300 ",
page 275](#)

1.4.1 Removing and installing Hall sender - G40-

Removing

- Remove intake manifold ⇒ [page 204](#) .
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- Unscrew bolt -1- and remove Hall sender - G40- -item 2-.

Installing

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



Note

Renew O-ring after removal.

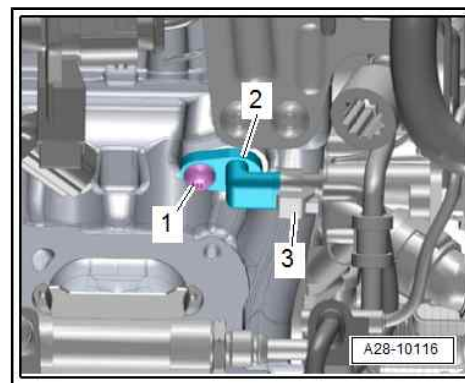
- Install intake manifold ⇒ [page 204](#) .

Learnt values for chain elongation must be re-adapted after re-newing or removing and re-installing Hall sender.

- Perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis].

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 270](#)



1.4.2 Removing and installing Hall sender 3 - G300-

Removing

- Remove engine cover panel ⇒ [page 12](#) .
- Unplug electrical connector -1-.
- Unscrew bolt -2- and remove Hall sender 3 - G300- .

Installing

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



Note

Renew O-ring after removal.

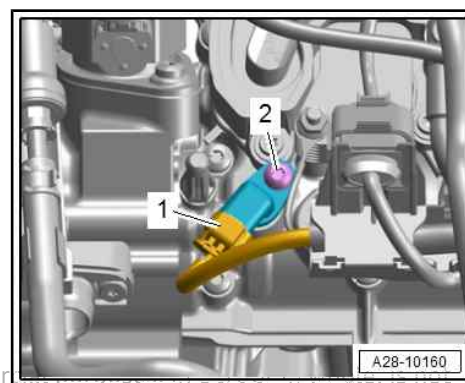
- Install engine cover panel ⇒ [page 12](#) .

Learnt values for chain elongation must be re-adapted after re-newing or removing and re-installing Hall sender.

- Perform adaption ⇒ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis].

Tightening torques

- ◆ ⇒ [“1.1 Exploded view - ignition system”, page 270](#)



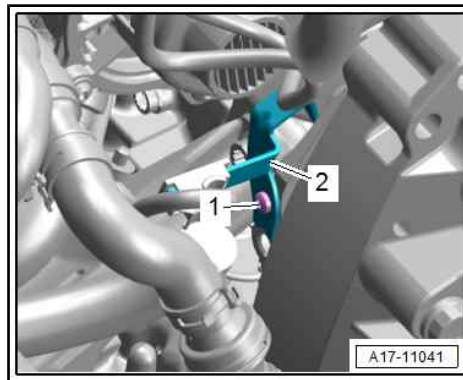
1.5 Removing and installing engine speed sender - G28-

Removing

- Remove engine cover panel ⇒ [page 12](#) .



- If necessary, move electrical wiring harness clear.
- Remove bolt -1- and push bracket -2- with engine wiring harness to one side. (Different versions.)



- Unplug electrical connector -2-.
- Unscrew bolt -1- and detach engine speed sender - G28- .

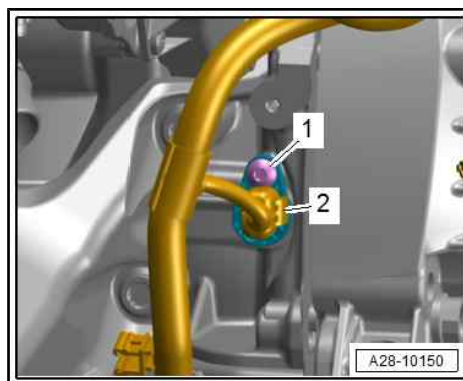
Installing

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

- Install engine cover panel ➔ [page 12](#) .

Learnt values for chain elongation must be re-adapted after renewing or removing and re-installing engine speed sender.

- Perform adaption ➔ Vehicle diagnostic tester [01 - Engine electronics, functions], [01 - Chain elongation adaption diagnosis].



Tightening torques

- ♦ ➔ [“1.1 Exploded view - ignition system”, page 270](#)



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