Workshop Manual

Audi A4 2015 ➤ , Audi A5 2016 ➤ , Audi A6 2019 ➤ , Audi A6 China 2019 ➤ , Audi A7 Sportback 2018 ➤ , Audi A8 2018 ➤ , Audi Q5 2017 ➤ , Audi Q5 China 2019 ➤ , Audi Q7 2016 ➤ , Audi Q8 2018 ➤

Servicing 6-cylinder engine, 2.9 ltr., 3.0 ltr. 4-valve TFSI EA 839									
Engine ID	CWGD	DECA	CZSE	DLZA	DKMB	CZSA	DCBD	DCBE	

Edition 02.2019

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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

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

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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 high-voltage system 2
2.2 Safety precautions when working in the vicinity of high-voltage components 3
2.3 Safety precautions when working on the fuel supply system 3
2.4 Safety precautions when working on vehicles with start/stop system 4
2.5 Safety precautions when using testers and measuring instruments during a road test 4
2.6 Safety precautions when working on the subframe 4
2.7 Safety precautions when working on the ignition system 4
2.8 Safety precautions when working on the cooling system 5
2.9 Safety precautions when working on the exhaust system 5
3 Repair instructions 6
3.1 Rules for cleanliness 6
3.2 Foreign particles in engine 6
3.3 Contact corrosion 6
3.4 Routing and attachment of pipes, hoses and wiring 7
3.5 Installing radiators and condensers 7
3.6 Checking fuel system for leaks 7

10 - Removing and installing engine 8
1 Removing and installing engine 8
2 Assembly mountings 9
3 Engine cover panel 10
3.1 Removing and installing engine cover panel 10

13 - Crankshaft group 12
1 Cylinder block (pulley end) 12
1.1 Exploded view - cylinder block (pulley end) 12
1.2 Exploded view - sealing flange (pulley end) 23
1.3 Removing and installing poly V-belts 24
1.4 Removing and installing tensioner for poly V-belt 30
1.5 Removing and installing vibration damper 33
1.6 Removing and installing bracket for ancillaries 38
1.7 Removing and installing engine support 41
1.8 Renewing crankshaft oil seal (pulley end) 42
1.9 Removing and installing sealing flange (pulley end) 43
2 Cylinder block (gearbox end) 47
2.1 Exploded view - cylinder block (gearbox end) 47
2.2 Removing and installing drive plate 47
2.3 Renewing crankshaft oil seal (gearbox end) 48
3 Crankshaft 51
3.1 Exploded view - crankshaft 51
3.2 Crankshaft dimensions 54
3.3 Allocation of main bearing shells 54
3.4 Measuring axial clearance of crankshaft 54
3.5 Measuring radial clearance of crankshaft 55
3.6 Removing and installing sender wheel 56
3.7 Checking sender wheel 56
3.8 Removing and installing crankshaft 57
4 Balance shaft 62

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4.1 Exploded view - balance shaft . . . 62
4.2 Removing and installing balance shaft . . . 62
4.3 Renewing roller bearing . . . 66
5 Pistons and conrods . . . 69
5.1 Exploded view - pistons and conrods . . . 69
5.2 Removing and installing pistons . . . 72
5.3 Removing and installing oil spray jets . . . 76
5.4 Checking pistons and cylinder bores . . . 77
5.5 Checking radial clearance of conrod bearings . . . 78

15 - Cylinder head, valve gear . . . 79
1 Timing chain cover . . . 79
1.1 Exploded view - timing chain cover . . . 79
1.2 Removing and installing timing chain cover . . . 81
2 Chain drive . . . 89
2.1 Exploded view - camshaft timing chains . . . 89
2.2 Exploded view - drive chain for oil pump . . . 92
2.3 Removing camshaft timing chain from camshafts . . . 93
2.4 Removing and installing camshaft timing chain . . . 113
2.5 Removing and installing chain tensioner . . . 114
3 Cylinder head . . . 118
3.1 Exploded view - cylinder head . . . 118
3.2 Exploded view - camshaft housing . . . 121
3.3 Removing and installing cylinder head . . . 124
3.4 Removing and installing camshaft housing . . . 141
3.5 Checking compression . . . 149
4 Valve gear . . . 151
4.1 Exploded view - valve gear . . . 151
4.2 Measuring axial clearance of camshaft . . . 153
4.3 Measuring radial clearance of camshaft . . . 154
4.4 Removing and installing camshaft . . . 154
4.5 Removing and installing cam actuators . . . 156
4.6 Removing and installing camshaft control valve 1 N205 . . . 157
4.7 Removing and installing valve stem oil seals . . . 158
5 Inlet and exhaust valves . . . 169
5.1 Checking valve guides . . . 169
5.2 Checking valves . . . 169
5.3 Valve dimensions . . . 170

17 - Lubrication . . . 171
1 Sump/oil pump . . . 171
1.1 Exploded view - sump/oil pump . . . 171
1.2 Engine oil . . . 175
1.3 Removing and installing sump (bottom section) . . . 175
1.4 Removing and installing sump (top section) . . . 177
1.5 Removing and installing oil baffle plate . . . 185
1.6 Removing and installing oil pump . . . 187
1.7 Removing and installing oil level and oil temperature sender G266 . . . 189
2 Engine oil cooler . . . 190
2.1 Exploded view - engine oil cooler . . . 190
2.2 Removing and installing engine oil cooler . . . 190
2.3 Removing and installing spray nozzle valve . . . 192
3 Crankcase breather . . . 194
3.1 Exploded view - crankcase breather system . . . 194
3.2 Removing and installing crankcase breather module . . . 195

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4 Oil filter/oil pressure switches ... 196
4.1 Exploded view - oil filter ... 196
4.2 Exploded view - oil pressure switches/oil pressure control ... 198
4.3 Removing and installing oil filter housing ... 199
4.4 Removing and installing oil pressure switch F22 ... 201
4.5 Removing and installing oil temperature sender G8 ... 203
4.6 Removing and installing oil pressure sender G10 ... 205
4.7 Checking oil pressure ... 206
4.8 Removing and installing valve for oil pressure control N428 ... 207

19 - Cooling ... 209

1 Cooling system/coolant ... 209
1.1 Connection diagram - coolant hoses ... 209
1.2 Checking cooling system for leaks ... 209
1.3 Draining and filling cooling system ... 213

2 Coolant pump/thermostat assembly ... 214
2.1 Exploded view - coolant pump/thermostat ... 214
2.2 Exploded view - electric coolant pump ... 216
2.3 Exploded view - coolant temperature senders ... 216
2.4 Removing and installing electric coolant pump ... 217
2.5 Removing and installing coolant pump ... 217
2.6 Removing and installing map-controlled engine cooling system thermostat F265 ... 217
2.7 Removing and installing coolant temperature sender G62 ... 220
2.8 Removing and installing engine outlet coolant temperature sender G82 ... 222
2.9 Removing and installing radiator outlet coolant temperature sender G83 ... 224
2.10 Removing and installing temperature sender for engine temperature regulation G694 ... 225
2.11 Removing and installing coolant valves ... 227

3 Coolant pipes ... 229

4 Radiators/radiator fans ... 230

21 - Turbocharging/supercharging ... 231

1 Turbochargers ... 231
1.1 Exploded view - turbocharger ... 231
1.2 Removing and installing turbocharger ... 238
1.3 Renewing vacuum unit for turbocharger ... 246
1.4 Removing and installing temperature sender for engine cover panel G765 ... 258

2 Charge air system ... 259
2.1 Exploded view - charge air system ... 259
2.2 Exploded view - hose connections for charge air system ... 269
2.3 Removing and installing air pipe ... 270
2.4 Removing and installing intake manifold ... 271
2.5 Removing and installing charge air cooler ... 276
2.6 Removing and installing charge pressure sender G31 ... 276
2.7 Removing and installing charge air temperature sender ... 276
2.8 Removing and installing overrun air recirculation valve ... 277
2.9 Checking charge air system for leaks ... 279

24 - Mixture preparation - injection ... 281

1 Injection system ... 281

2 Vacuum system ... 282
2.1 Connection diagram - vacuum system ... 282
2.2 Checking vacuum system ... 284

3 Air cleaner ... 286

4 Intake manifold ... 287

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4.1 Exploded view - intake manifold . . . 287
4.2 Removing and installing intake manifold . . . 288
4.3 Removing and installing throttle valve module J338 . . . 290
4.4 Cleaning throttle valve module . . . 290
5 Injectors . . . 292
5.1 Exploded view - fuel rail with injectors . . . 292
5.2 Removing and installing fuel rail . . . 293
5.3 Removing and installing injectors . . . 295
5.4 Cleaning injectors . . . 301
6 Senders and sensors . . . 302
6.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound . . . 302
6.2 Exploded view - pressure differential sender . . . 302
6.3 Removing and installing actuator for structure-borne sound R214 . . . 304
6.4 Removing and installing control unit for structure-borne sound J869 . . . 304
6.5 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71 . . . 304
6.6 Removing and installing fuel pressure sender G247 . . . 304
6.7 Removing and installing fuel pressure sender for low pressure G410 . . . 305
6.8 Removing and installing pressure differential sender . . . 306
7 High-pressure pump . . . 310
7.1 Exploded view - high-pressure pump . . . 310
7.2 Removing and installing high-pressure pump . . . 313
7.3 Removing and installing high-pressure pipe . . . 315
8 Lambda probe . . . 320
8.1 Exploded view - Lambda probe . . . 320
8.2 Removing and installing Lambda probe . . . 323
9 Engine control unit . . . 330

26 - Exhaust system . . . 331
1 Exhaust pipes/silencers . . . 331
1.1 Exploded view - silencers . . . 331
1.2 Separating exhaust pipes/silencers . . . 331
1.3 Removing and installing front silencers . . . 331
1.4 Stress-free alignment of exhaust system . . . 331
1.5 Checking exhaust system for leaks . . . 331
2 Emission control system . . . 332
3 Exhaust gas temperature control . . . 333
3.1 Exploded view - exhaust gas temperature control . . . 333
3.2 Removing and installing parts of exhaust gas temperature control . . . 334

28 - Ignition system . . . 340
1 Ignition system . . . 340
1.1 Exploded view - ignition system . . . 340
1.2 Removing and installing ignition coils with output stages . . . 341
1.3 Removing and installing knock sensor 1 G61 . . . 344
1.4 Removing and installing Hall senders . . . 344
1.5 Removing and installing engine speed sender G28 . . . 345

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00 – Technical data

1 Identification

(ARL006256; Edition 02.2019)

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

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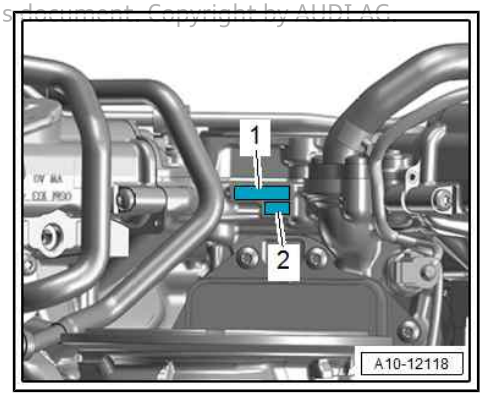
1.1 Engine number/engine data

Engine number

- Pull off engine cover panel and heat shield to make engine number visible.
- The engine number is located at the top rear of the cylinder block.



1 - Serial number

2 - Engine code

- 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

For allocation of engine code, refer to ⇒ Technical data for engines; Rep. gr. 00 ; Overview of engines .

2 Safety precautions

⇒ “2.1 Safety precautions when working on the high-voltage system”, page 2

⇒ “2.2 Safety precautions when working in the vicinity of high-voltage components”, page 3

⇒ “2.3 Safety precautions when working on the fuel supply system”, page 3

⇒ “2.4 Safety precautions when working on vehicles with start/stop system”, page 4

⇒ “2.5 Safety precautions when using testers and measuring instruments during a road test”, page 4

⇒ “2.6 Safety precautions when working on the subframe”, page 4

⇒ “2.7 Safety precautions when working on the ignition system”, page 4

⇒ “2.8 Safety precautions when working on the cooling system”, page 5

⇒ “2.9 Safety precautions when working on the exhaust system”, page 5

2.1 Safety precautions when working on the high-voltage system

High voltage can cause fatal injury.

The voltage levels in the high-voltage system constitute a safety hazard. Danger of severe or fatal injuries from electric shock.

- Persons with life-sustaining or other electronic medical devices in or on their body must not perform any work on the high-voltage system. Such medical devices include internal analgesic pumps, implanted defibrillators, pacemakers, insulin pumps and hearing aids.
- The high-voltage system must be de-energised by a suitably qualified person.

Risk of injury - engine may start unexpectedly

It is difficult to determine whether the drive system of an electric vehicle or hybrid vehicle is active. Moving parts can trap or draw in parts of the body.

- Switch off ignition.
- Deposit the ignition key outside of the vehicle.

Risk of damage to high-voltage wiring

Incorrect handling may result in damage to the insulation of high-voltage wires or high-voltage connectors.

- Never use high-voltage wiring or high-voltage connectors as a support.
- Never support tools or equipment on high-voltage wires and high-voltage connectors.
- High-voltage cables must not be excessively bent or kinked.

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– Pay attention to coding when connecting high-voltage connections.

Risk of injury if auxiliary air conditioner is activated

On electric and hybrid vehicles, the auxiliary air conditioner can switch itself on if it has been activated. The radiator fans can start up automatically and trap or draw in parts of the body.

– Deactivate auxiliary air conditioner.

2.2 Safety precautions when working in the vicinity of high-voltage components

High voltage can cause fatal injury.

The voltage levels in the high-voltage system constitute a safety hazard. Danger of severe or fatal injuries from electric shock if high-voltage components or high-voltage wiring are damaged.

– Carry out a visual check of high-voltage components and high-voltage wiring.
– Never use cutting/forming tools or other sharp-edged implements.
– Never perform work using welding, brazing, thermal bonding or hot air.

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2.3 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.

2.4 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.

2.5 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.

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2.6 Safety precautions when working on the subframe

Risk of damage to components

Lowering the vehicle onto its wheels can damage components if the assembly mountings, steering rack or subframe cross brace are not properly fitted.

– Never lower vehicle onto its wheels with suspension components unfastened or detached.

– Never support weight of vehicle on subframe or subframe cross brace with suspension components unfastened or detached.

2.7 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.

Risk of damage to components

Washing the engine or connecting/disconnecting electrical wiring may result in components being damaged if the engine is running.

– Switch off ignition before connecting/disconnecting electrical wiring.
– Switch off ignition before cleaning engine.

2.8 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.

2.9 Safety precautions when working on the exhaust system

Risk of damage to flexible joint

The flexible joint can be damaged or develop leaks if it is handled incorrectly.

– Do not bend flexible joint more than 10°.
– Install flexible joint so that it is not under tension.

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.

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3 Repair instructions

⇒ “3.1 Rules for cleanliness”, page 6

⇒ “3.2 Foreign particles in engine”, page 6

⇒ “3.3 Contact corrosion”, page 6

⇒ “3.4 Routing and attachment of pipes, hoses and wiring”, page 7

⇒ “3.5 Installing radiators and condensers”, page 7

⇒ “3.6 Checking fuel system for leaks”, 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.
- Before removing injectors, clean surrounding area and blow out with compressed air if necessary. Wear safety goggles to do this.
- 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.
- In the event of mechanical damage to one of the cylinder banks, the intake and exhaust systems and combustion chambers of the opposite cylinder bank must always be examined for foreign particles to prevent further damage occurring later.
- If the turbocharger has suffered mechanical damage ⇒ page 242

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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.
- To avoid damaging pipes, hoses and wiring, ensure sufficient clearance from all moving or hot components in engine compartment (limited space in engine compartment).
- 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 fuel system for leaks

– Allow engine to run for several minutes at moderate rpm.
– Switch off ignition.
– Check complete fuel system for leaks.
– If leaks are found although the connections have been tightened to the correct torque, the relevant component must be renewed.
– Road-test vehicle and accelerate with full throttle at least once.
– Then check high-pressure system again for leaks.

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10 – Removing and installing engine

1 Removing and installing engine

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Removing and installing engine .

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2 Assembly mountings

All procedures and components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Assembly mountings .

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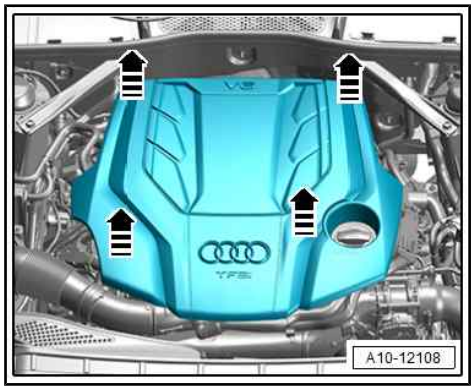
3 Engine cover panel

⇒ “3.1 Removing and installing engine cover panel”, page 10

3.1 Removing and installing engine cover panel

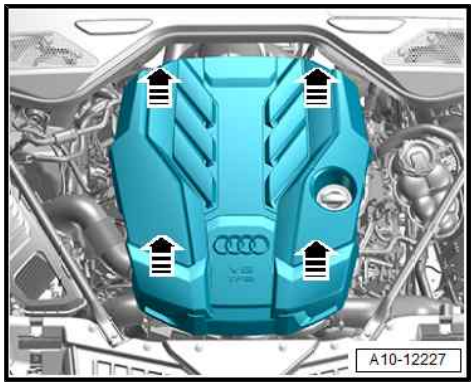
Removing engine cover panel (version 1)

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



Removing engine cover panel (version 2)

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



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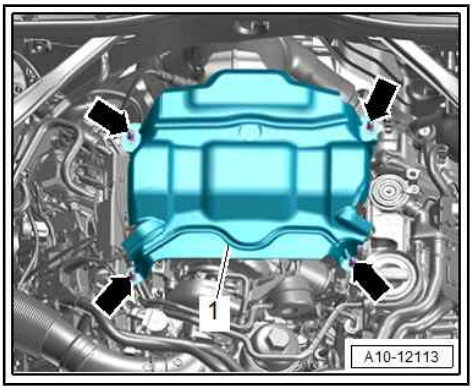
Removing heat shield

– Remove ball studs and bolts -arrows- and detach heat shield -1-.



Installing

WARNING

Danger of fire and damage if the heat shield/engine cover panel is not fitted.

- ***The heat shield and the engine cover panel must always be fitted before the bonnet is closed.***
- ***If the heat shield and engine cover panel are not fitted, it is not permissible to start the vehicle with the bonnet closed or drive the vehicle.***

– 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 into rubber grommets first on left side, then on right side.

Tightening torques

- ⇒ “3.1 Exploded view - cylinder head”, page 118

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13 – Crankshaft group

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1 Cylinder block (pulley end)

⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 12

⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 23

⇒ “1.3 Removing and installing poly V-belts”, page 24

⇒ “1.4 Removing and installing tensioner for poly V-belt”, page 30

⇒ “1.5 Removing and installing vibration damper”, page 33

⇒ “1.6 Removing and installing bracket for ancillaries”, page 38

⇒ “1.7 Removing and installing engine support”, page 41

⇒ “1.8 Renewing crankshaft oil seal (pulley end)”, page 42

⇒ “1.9 Removing and installing sealing flange (pulley end)”, page 43

1.1 Exploded view - cylinder block (pulley end)

⇒ “1.1.1 Exploded view - cylinder block (pulley end), alternator belt drive, vehicles with 2.9 ltr./3.0 ltr. engine”, page 12

⇒ “1.1.2 Exploded view - cylinder block (pulley end), starter-alternator belt drive, vehicles with 3.0 ltr. engine”, page 15

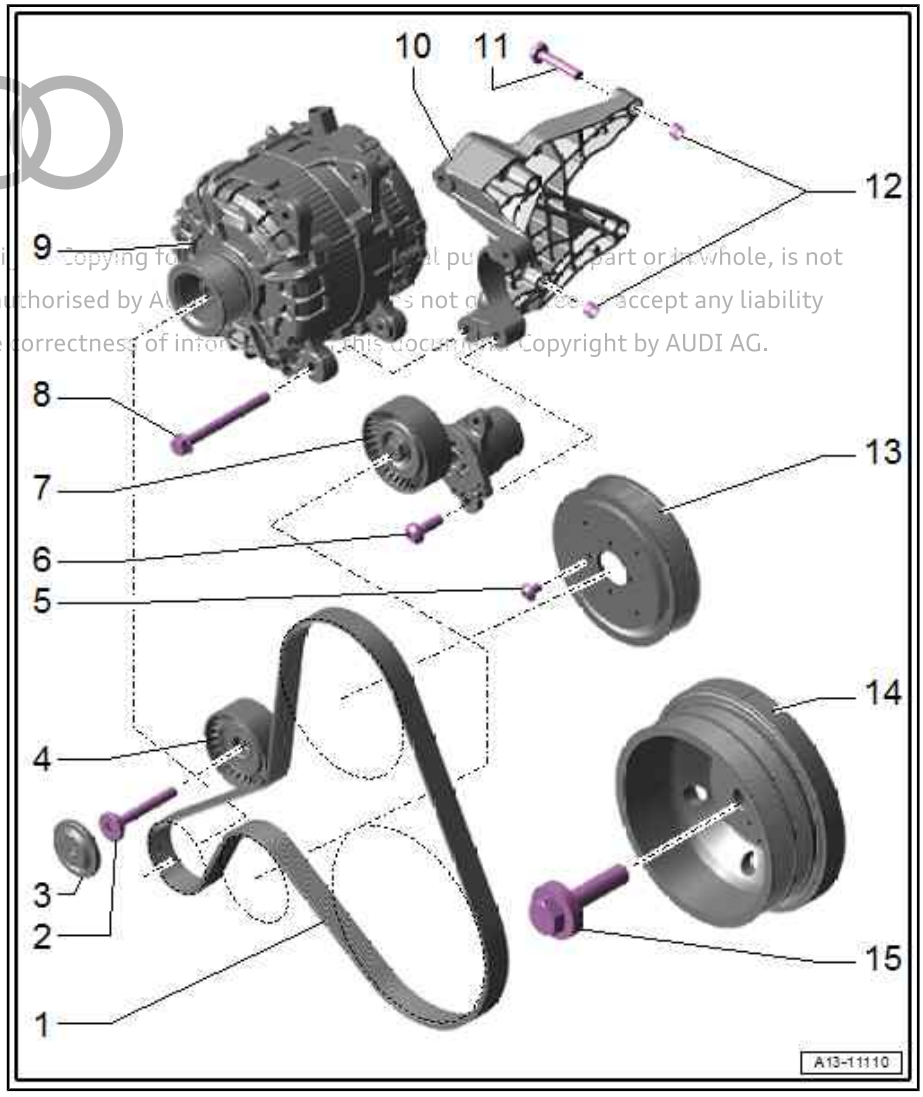
⇒ “1.1.3 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 2.9 ltr. engine without electric compressor”, page 17

⇒ “1.1.4 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 2.9 ltr. engine with electric compressor”, page 18

⇒ “1.1.5 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 3.0 ltr. engine”, page 19

⇒ “1.1.6 Exploded view - cylinder block (pulley end), vehicles with high-voltage system”, page 21

1.1.1 Exploded view - cylinder block (pulley end), alternator belt drive, vehicles with 2.9 ltr./3.0 ltr. engine



1 - Poly V-belt

- ❑ Check for wear
- ❑ Do not kink
- ❑ Belt routing ⇒ Fig. ""Belt routing for alternator"", page 14
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ "1.3 Removing and installing poly V-belts", page 24
- ❑ When installing, make sure it is properly seated on pulleys.

2 - Bolt

- ❑ 25 Nm

3 - Cover

- ❑ For idler roller

4 - Idler roller

- ❑ For poly V-belt

5 - Bolt

- ❑ Tightening torque ⇒ Item 4 (page 215)

6 - Bolt

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

7 - Tensioner

- ❑ For poly V-belt
- ❑ Removing and installing ⇒ "1.4.1 Removing and installing poly V-belt tensioner for alternator - vehicles with 2.9 ltr./3.0 ltr. engine", page 30

8 - Bolt

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

9 - Alternator

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

10 - Bracket

- ❑ For alternator
- ❑ Removing and installing ⇒ "1.6.1 Removing and installing bracket for alternator", page 38

11 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ""Bracket for alternator - tightening torques and sequence"" , page 14

12 - Dowel sleeves

13 - Pulley

- ❑ For coolant pump

14 - Vibration damper

- ❑ Removing and installing ⇒ "1.5 Removing and installing vibration damper", page 33

15 - Bolt

- ❑ Renew after removing

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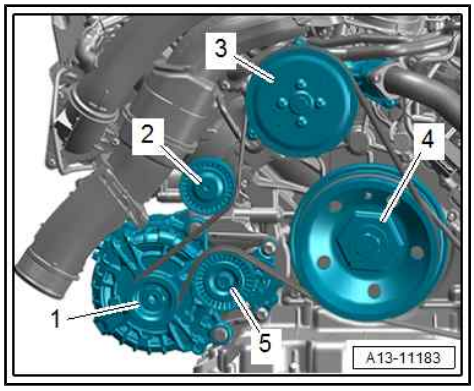
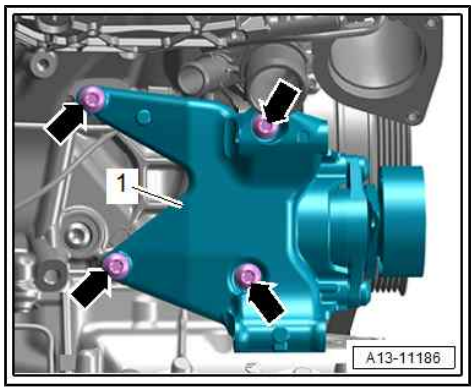
❑ 150 Nm +90°

Belt routing for alternator



1 - Alternator
2 - Idler roller
3 - Coolant pump
4 - Vibration damper
5 - Tensioner for poly V-belt

Bracket for alternator - tightening torques and sequence



- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torques/angle specification
1.	-arrows-	8 Nm in diagonal sequence
2.	-arrows-	Turn 90° further in diagonal sequence

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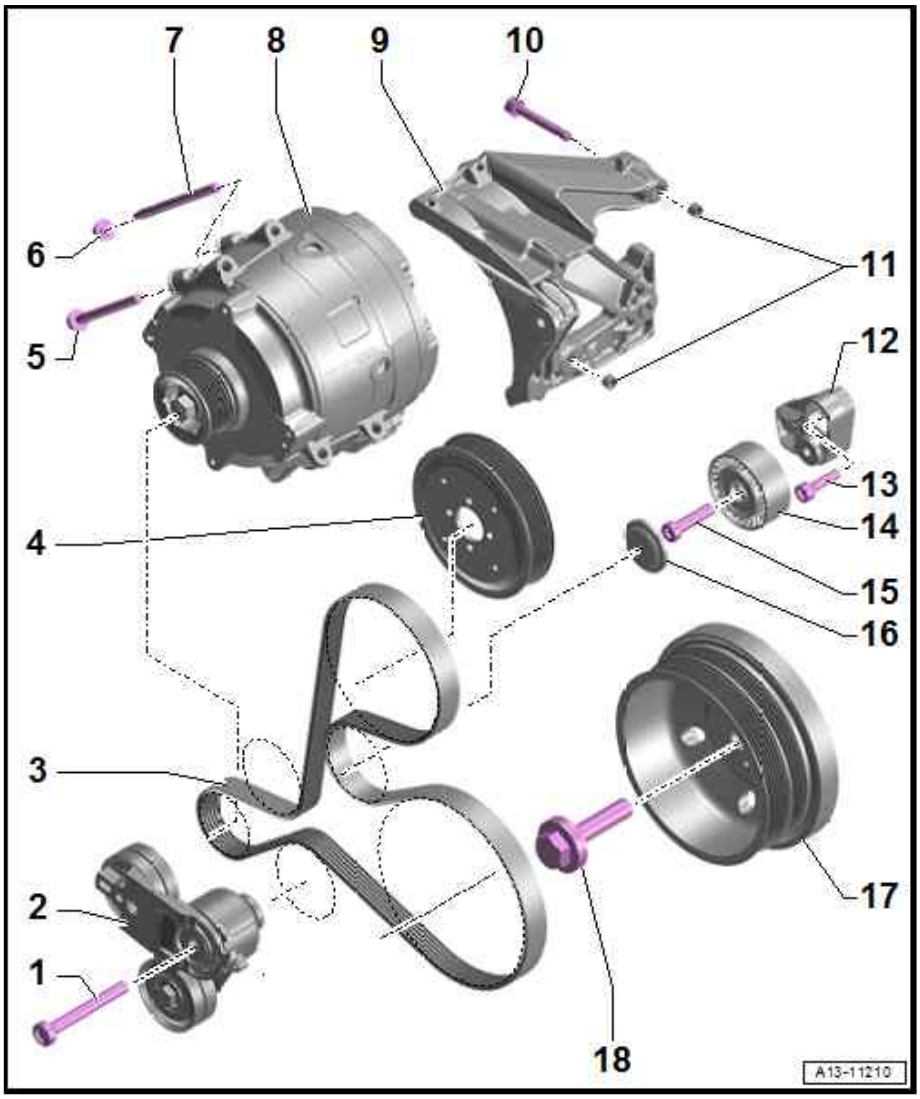
1.1.2 Exploded view - cylinder block (pulley end), starter-alternator belt drive, vehicles with 3.0 ltr. engine



1 - Bolt
- ❑ 40 Nm

2 - Tensioner
- ❑ For poly V-belt
- ❑ Removing and installing ⇒ “1.4.2 Removing and installing poly V-belt tensioner for starter-alternator - vehicles with 2.9 ltr./3.0 ltr. engine”, page 31

3 - Poly V-belt
- ❑ Check for wear
- ❑ Do not kink
- ❑ Belt routing ⇒ Fig. ““Belt routing for starter-alternator”“ , page 16
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ “1.3.3 Removing and installing poly V-belt for starter-alternator - vehicles with 2.9 ltr. engine”, page 26
- ❑ When installing, make sure it is properly seated on pulleys.

4 - Pulley
- ❑ For coolant pump

5 - Bolt
- ❑ Tightening torques ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

6 - Nut
- ❑ Tightening torques ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

7 - Threaded pin
- ❑ Tightening torques ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

8 - Starter-alternator - C29-
- ❑ Removing and installing ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator

9 - Bracket
- ❑ For starter-alternator
- ❑ Removing and installing ⇒ “1.6.2 Removing and installing bracket for starter-alternator”, page 39

10 - Bolt
- ❑ Tightening torque and sequence ⇒ Fig. ““Bracket -1- for starter-alternator - tightening torque and tightening sequence”“ , page 16

11 - Dowel sleeves

12 - Bracket
- ❑ For idler roller

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13 - Bolt

- ❑ 25 Nm

14 - Idler roller

- ❑ For poly V-belt

15 - Bolt

- ❑ Renew after removing
- ❑ 40 Nm

16 - Cover

- ❑ For idler roller

17 - Vibration damper

- ❑ Removing and installing ⇒ “1.5 Removing and installing vibration damper”, page 33

18 - Bolt

- ❑ Renew after removing
- ❑ 150 Nm +90°

Belt routing for starter-alternator

1 - Starter-alternator

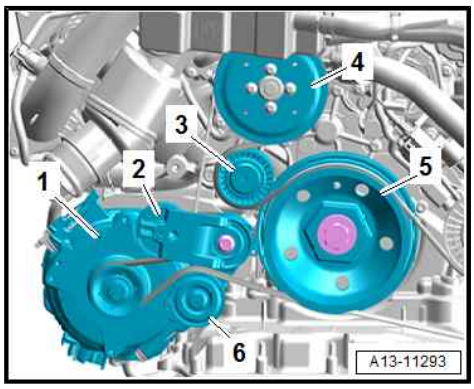
2 - Tensioning roller (top)

3 - Idler roller

4 - Coolant pump

5 - Vibration damper

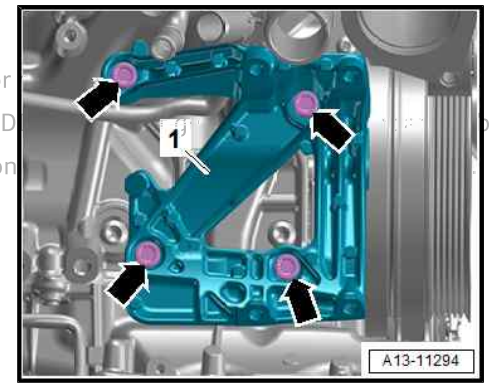
6 - Tensioning roller (bottom)



Bracket -1- for starter-alternator - tightening torque and tightening sequence

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torques
1.	-arrows-	8 Nm in diagonal sequence
2.	-arrows-	22 Nm in diagonal sequence



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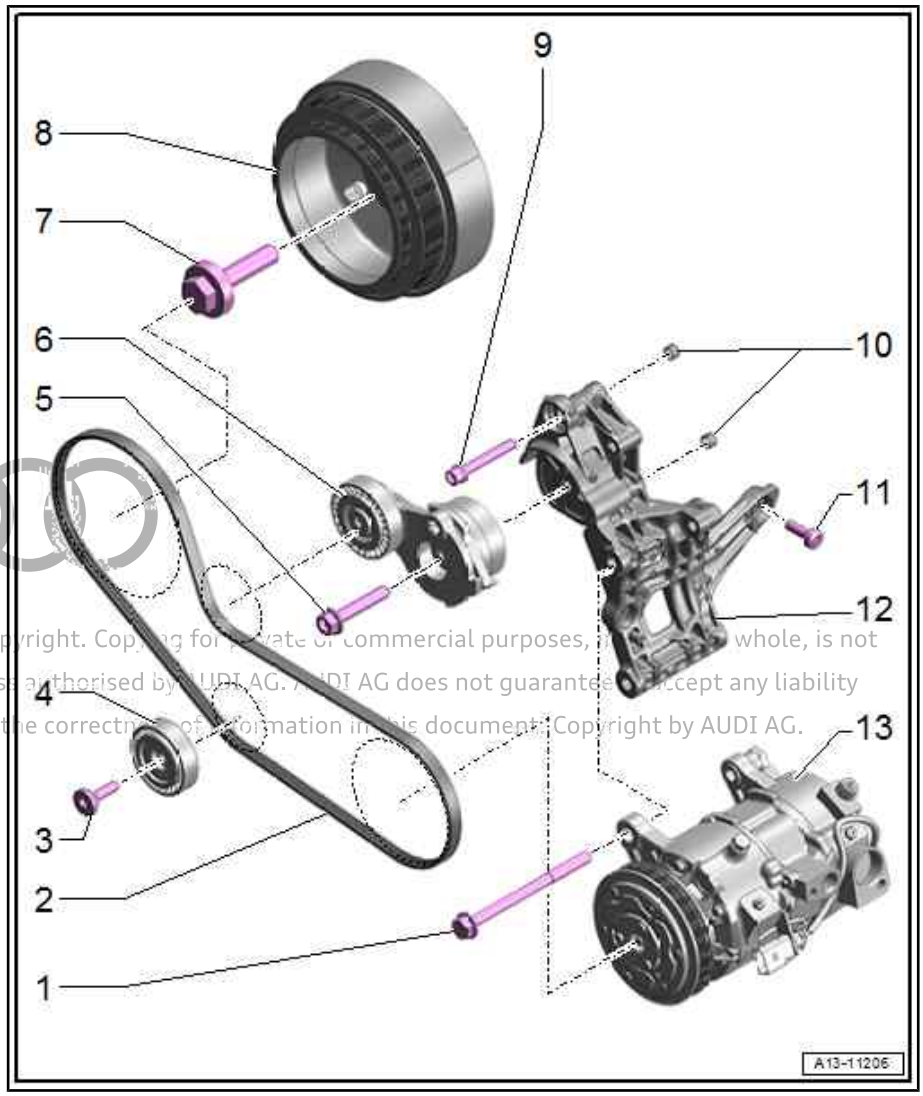
1.1.3 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 2.9 ltr. engine without electric compressor



1 - Bolt

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

2 - Poly V-belt

- ❑ Check for wear
- ❑ Do not kink
- ❑ Belt routing ⇒ Fig. ""Belt routing for air conditioner compressor, vehicles with 2.9 ltr. engine"" , page 18
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ "1.3.5 Removing and installing poly V-belt for air conditioner compressor - vehicles with 2.9 ltr. engine", page 28
- ❑ When installing, make sure it is properly seated on pulleys.

3 - Bolt

- ❑ 25 Nm

4 - Idler roller

- ❑ For poly V-belt

5 - Bolt

- ❑ 40 Nm

6 - Tensioner

- ❑ For poly V-belt
- ❑ Removing and installing ⇒ "1.4.3 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 2.9 ltr. engine", page 31

7 - Bolt

- ❑ Tightening torque ⇒ Item 15 (page 13)

8 - Vibration damper

- ❑ Removing and installing ⇒ "1.5 Removing and installing vibration damper", page 33

9 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ""Bracket for air conditioner compressor - tightening torques and sequence, vehicles with 2.9 ltr. engine"" , page 18

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10 - Dowel sleeves

11 - Bolt

- ❑ Tightening torques and sequence
  ⇒ Fig. ""Bracket for air conditioner compressor - tightening torques and sequence, vehicles with 2.9 ltr. engine"" , page 18

12 - Bracket

- ❑ For air conditioner compressor
- ❑ Removing and installing
  ⇒ "1.6.3 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine without electric compressor", page 39

13 - Air conditioner compressor

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

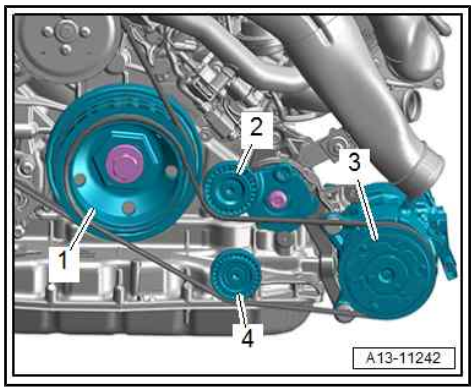
Belt routing for air conditioner compressor, vehicles with 2.9 ltr. engine

1 - Vibration damper

2 - Tensioner for poly V-belt

3 - Air conditioner compressor

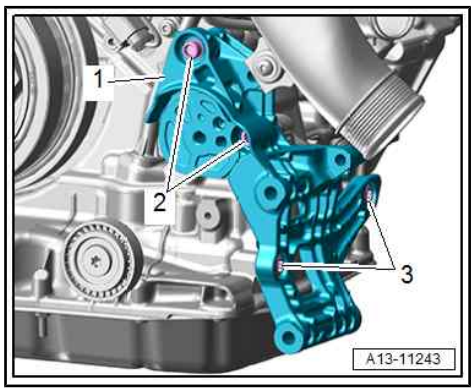
4 - Idler roller



Bracket for air conditioner compressor - tightening torques and sequence, vehicles with 2.9 ltr. engine

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torques/angle specification
1.	-2, 3-	Screw in by hand until contact is made
2.	-2, 3-	22 Nm



1.1.4 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 2.9 ltr. engine with electric compressor

All components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Exploded view - cylinder block (pulley end) .

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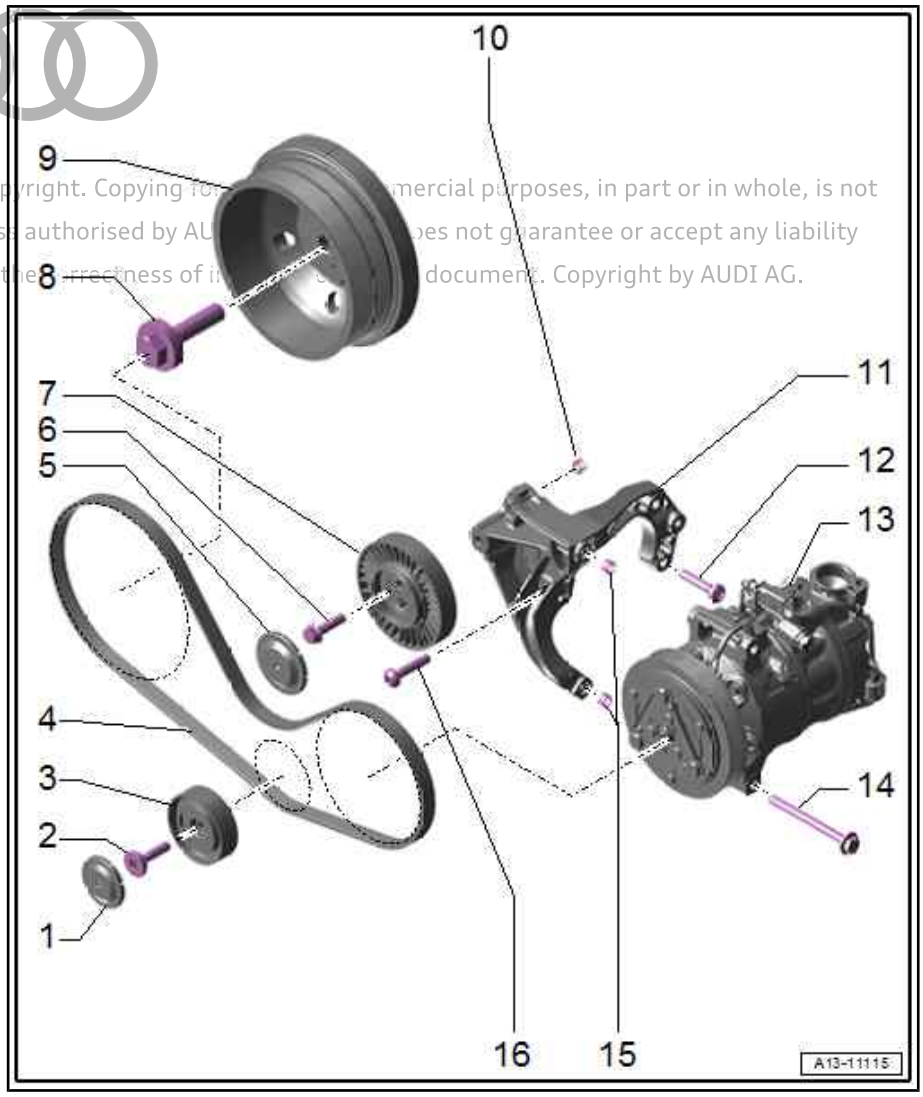
1.1.5 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 3.0 ltr. engine



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1 - Cover
- ❑ For idler roller

2 - Bolt
- ❑ 25 Nm

3 - Idler roller
- ❑ For poly V-belt

4 - Poly V-belt
- ❑ Check for wear
- ❑ Do not kink
- ❑ Belt routing ⇒ Fig. ""Belt routing for air conditioner compressor, vehicles with 3.0 ltr. engine"" , page 20
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ “1.3.6 Removing and installing poly V-belt for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 28
- ❑ When installing, make sure it is properly seated on pulleys.

5 - Cover
- ❑ For tensioner

6 - Bolt
- ❑ 25 Nm

7 - Tensioner
- ❑ For poly V-belt
- ❑ Removing and installing ⇒ “1.4.4 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 32

8 - Bolt
- ❑ Tightening torque ⇒ Item 15 (page 13)

9 - Vibration damper
- ❑ Removing and installing ⇒ “1.5 Removing and installing vibration damper”, page 33

10 - Dowel sleeve
- ❑ 2x

11 - Bracket
- ❑ For air conditioner compressor
- ❑ Removing and installing ⇒ “1.6.5 Removing and installing bracket for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 40

12 - Bolt
- ❑ Renew after removing

❑ Tightening torques and sequence
⇒ Fig. ""Bracket for air conditioner compressor - tightening torques and sequence, vehicles with 3.0 ltr. engine"" , page 20

13 - Air conditioner compressor

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

14 - Bolt

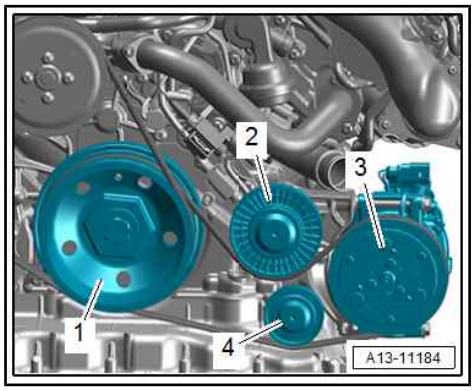
❑ Tightening torques ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

15 - Dowel sleeves

16 - Bolt

❑ Tightening torques and sequence
⇒ Fig. ""Bracket for air conditioner compressor - tightening torques and sequence, vehicles with 3.0 ltr. engine"" , page 20

Belt routing for air conditioner compressor, vehicles with 3.0 ltr. engine



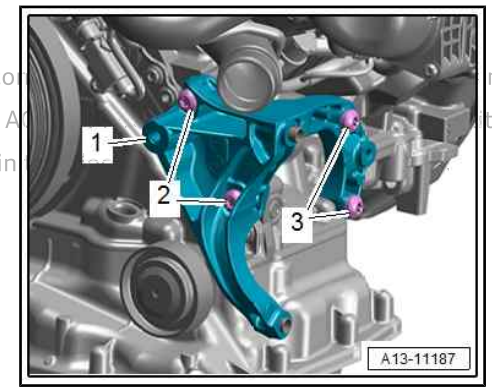
1 - Vibration damper

2 - Tensioner for poly V-belt

3 - Air conditioner compressor

4 - Idler roller

Bracket for air conditioner compressor - tightening torques and sequence, vehicles with 3.0 ltr. engine



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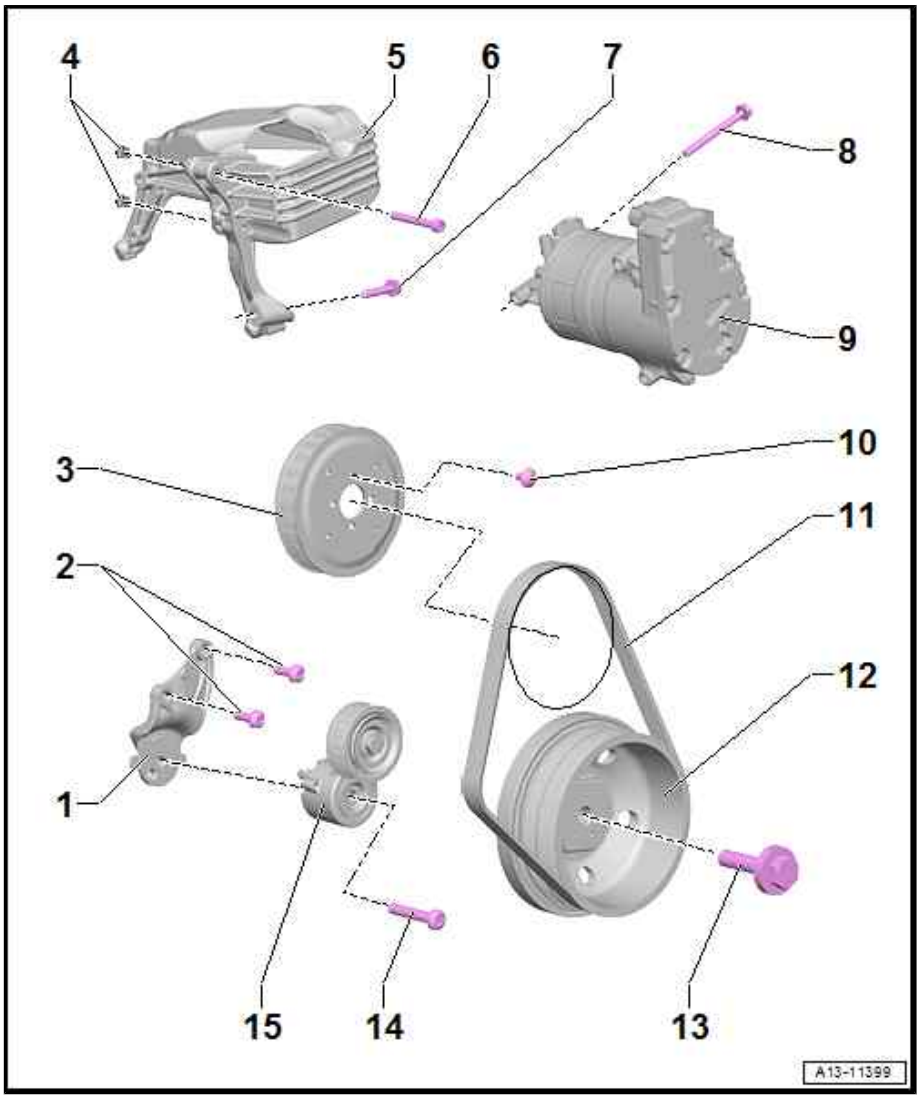
- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torques/angle specification
1.	-2, 3-	Screw in by hand until contact is made
2.	-2, 3-	8 Nm
3.	-2-	Turn 90° further
4.	-3-	Turn 90° further

1.1.6 Exploded view - cylinder block (pulley end), vehicles with high-voltage system



1 - Bracket
- ❑ For idler roller

2 - Bolt
- ❑ Renew after removing
- ❑ 8 Nm +90°

3 - Pulley
- ❑ For coolant pump

4 - Dowel sleeve

5 - Bracket
- ❑ For air conditioner compressor
- ❑ Removing and installing ⇒ “1.6.6 Removing and installing bracket for air conditioner compressor - vehicles with high-voltage system”, page 41

6 - Bolt
- ❑ 22 Nm

7 - Bolt
- ❑ 22 Nm

8 - Bolt
- ❑ Tightening torques: Exploded view - drive unit for electrically driven air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

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

10 - Bolt
- ❑ Tightening torque ⇒ Item 4 (page 215)

11 - Poly V-belt
- ❑ Check for wear
- ❑ Do not kink
- ❑ Belt routing ⇒ Fig. ““Belt routing for coolant pump - vehicles with high-voltage system”“ , page 22
- ❑ Before removing, mark direction of rotation with chalk or felt-tip pen
- ❑ Removing and installing ⇒ “1.3.7 Removing and installing poly V-belt for coolant pump - vehicles with high-voltage system”, page 29
- ❑ When installing, make sure it is properly seated on pulleys.

12 - Vibration damper
- ❑ Removing and installing ⇒ “1.5.3 Removing and installing vibration damper - vehicles with high-voltage system”, page 36

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13 - Bolt

- ❑ Tightening torque ⇒ Item 15 (page 13)

14 - Bolt

- ❑ 40 Nm

15 - Tensioner

- ❑ For poly V-belt
- ❑ Removing and installing
  ⇒ “1.4.5 Removing and installing tensioner for poly V-belt for coolant pump - vehicles with high-voltage system”, page 32

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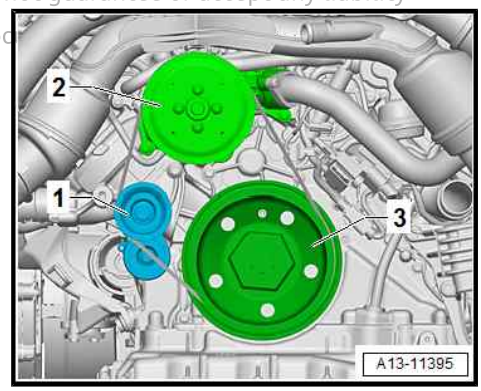
Belt routing for coolant pump - vehicles with high-voltage system

1 - Tensioner for poly V-belt

2 - Coolant pump

3 - Vibration damper



1.2 Exploded view - sealing flange (pulley end)

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1 - Oil seal

- ❑ For crankshaft (pulley end)
- ❑ Renewing ⇒ “1.8 Renewing crankshaft oil seal (pulley end)”, page 42

2 - Sealing flange (pulley end)

- ❑ Removing and installing ⇒ “1.9 Removing and installing sealing flange (pulley end)”, page 43

3 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ““Sealing flange (pulley end) - tightening torques and sequence”“ , page 23

4 - Dowel sleeve

5 - Bolt

- ❑ 9 Nm

6 - Dipstick guide tube

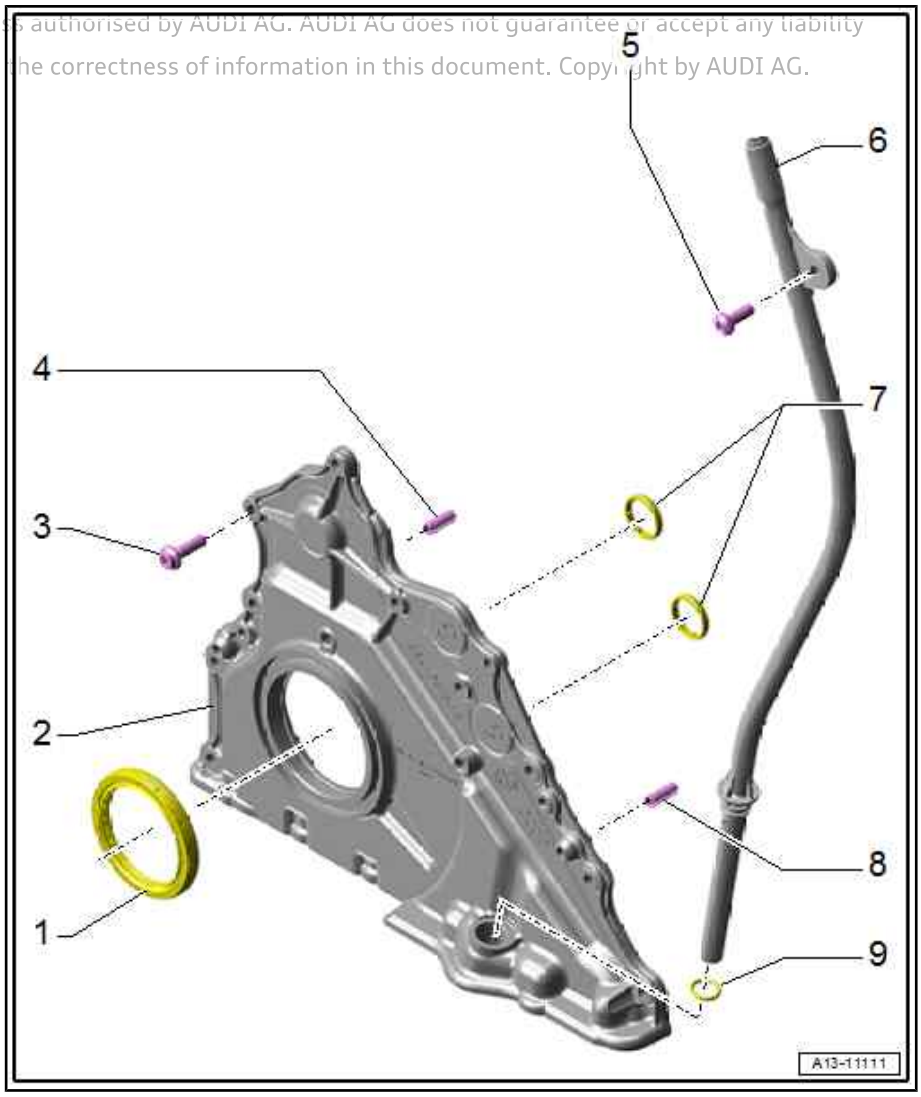
7 - Seals

- ❑ Renew after removing

8 - Dowel sleeve

9 - O-ring

- ❑ Renew after removing

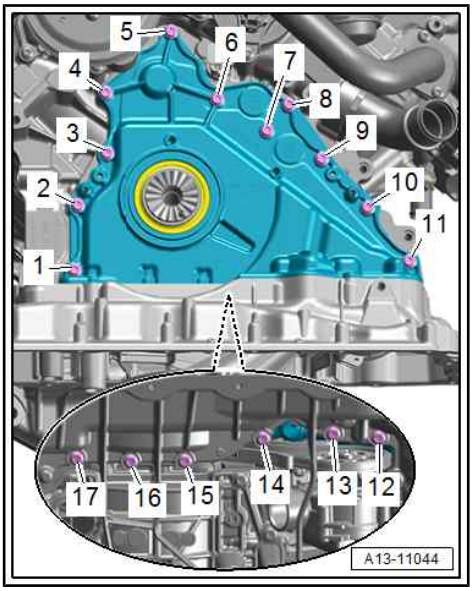


Sealing flange (pulley end) - tightening torques and sequence

- 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 … 17-	3 Nm
2.	-1 … 17-	Turn 90° further



1.3 Removing and installing poly V-belts

⇒ “1.3.1 Removing and installing poly V-belt for alternator - vehicles with 2.9 ltr. engine”, page 24

⇒ “1.3.2 Removing and installing poly V-belt for alternator - vehicles with 3.0 ltr. engine”, page 25

⇒ “1.3.3 Removing and installing poly V-belt for starter-alternator - vehicles with 2.9 ltr. engine”, page 26

⇒ “1.3.4 Removing and installing poly V-belt for starter-alternator - vehicles with 3.0 ltr. engine”, page 27

⇒ “1.3.5 Removing and installing poly V-belt for air conditioner compressor - vehicles with 2.9 ltr. engine”, page 28

⇒ “1.3.6 Removing and installing poly V-belt for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 28

⇒ “1.3.7 Removing and installing poly V-belt for coolant pump - vehicles with high-voltage system”, page 29

1.3.1 Removing and installing poly V-belt for alternator - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

- Locking pin - T10060A-

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Removing

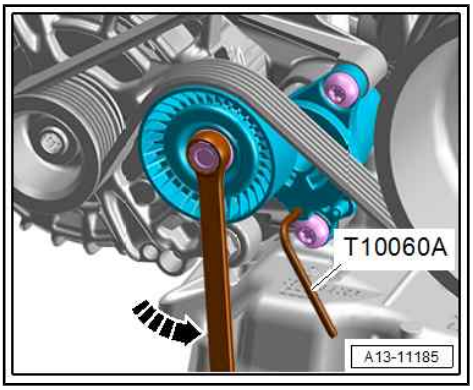
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

– Detach poly V-belt from air conditioner compressor ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

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 anti-clockwise direction -arrow- using ring spanner.

– Lock tensioner with locking pin - T10060A- and take off poly V-belt.

Installing

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

– Fit poly V-belt ⇒ Fig. ""Belt routing for alternator"" , page 14 .

– Turn tensioner of poly V-belt for alternator slightly anti-clockwise -arrow- using a ring spanner and pull out locking pin - T10060A- .

– Release tensioner to slacken poly V-belt.

– Check that poly V-belt is properly seated.

– Install poly V-belt for air conditioner compressor ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

– Start engine and check that poly V-belt(s) run properly.

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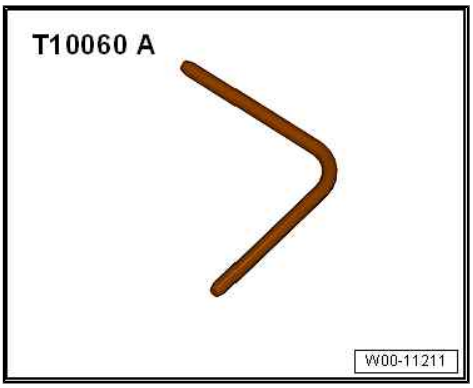
1.3.2 Removing and installing poly V-belt for alternator - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

- Locking pin - T10060A-



Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

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.*

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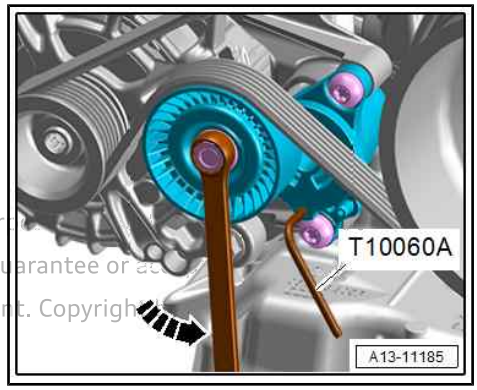

– To slacken poly V-belt turn tensioner in anti-clockwise direction -arrow- using ring spanner.

– Lock tensioner with locking pin - T10060A- and take off poly V-belt.

Installing

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

– Fit poly V-belt ⇒ Fig. ""Belt routing for alternator"" , page 14 .

– Turn tensioner of poly V-belt for alternator slightly anti-clockwise -arrow- using a ring spanner and pull out locking pin - T10060A- .

– Release tensioner to slacken poly V-belt.

– Check that poly V-belt is properly seated.

– Start engine and check that poly V-belt(s) run properly.

1.3.3 Removing and installing poly V-belt for starter-alternator - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

- Locking tool - T40098-

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

– Detach poly V-belt from air conditioner compressor ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

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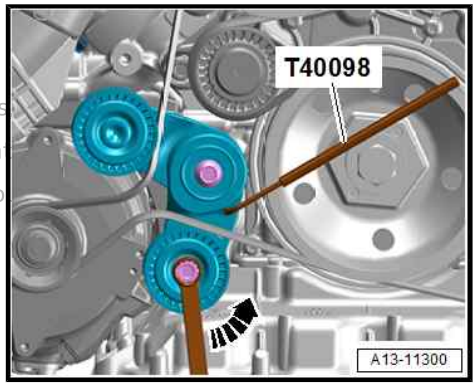
Caution

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.***



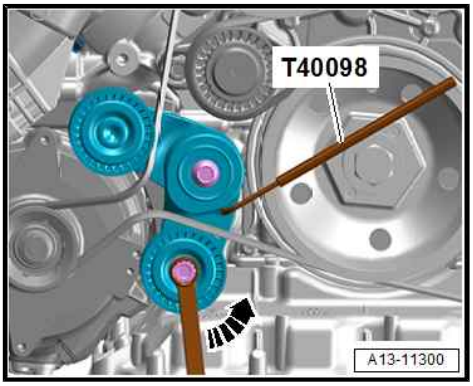
– To slacken poly V-belt turn tensioner in anti-clockwise direction -arrow- using ring spanner.

– Lock tensioner with locking tool - T40098- and take off poly V-belt.

Installing

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

– Fit poly V-belt
⇒ Fig. ""Belt routing for starter-alternator"" , page 16 .



– Turn tensioner of poly V-belt for alternator slightly anti-clockwise -arrow- using a ring spanner and pull out locking tool - T40098- .

– Release tensioner to slacken poly V-belt.

– Check that poly V-belt is properly seated.

– Install poly V-belt for air conditioner compressor ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

– Start engine and check that poly V-belt(s) run properly.

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

1.3.4 Removing and installing poly V-belt for starter-alternator - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

- Locking tool - T40098-

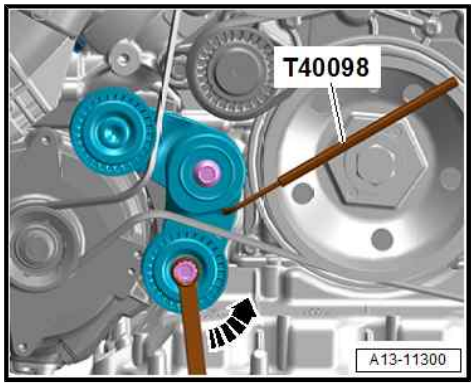
Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

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.*



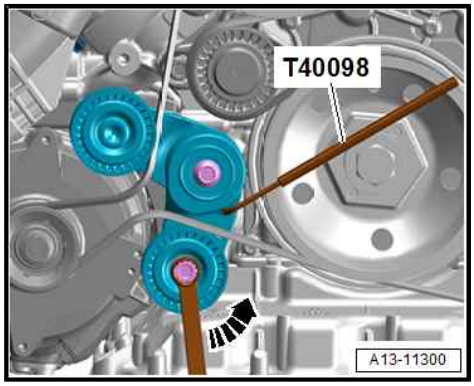
– To slacken poly V-belt turn tensioner in anti-clockwise direction -arrow- using ring spanner.

– Lock tensioner with locking tool - T40098- and take off poly V-belt.

Installing

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

– Fit poly V-belt
⇒ Fig. ""Belt routing for starter-alternator"" , page 16 .



– Turn tensioner of poly V-belt for alternator slightly anti-clockwise -arrow- using a ring spanner and pull out locking tool - T40098- .

– Release tensioner to slacken poly V-belt.

– Check that poly V-belt is properly seated.

– Start engine and check that poly V-belt(s) run properly.

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

1.3.5 Removing and installing poly V-belt for air conditioner compressor - vehicles with 2.9 ltr. engine

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

1.3.6 Removing and installing poly V-belt for air conditioner compressor - vehicles with 3.0 ltr. engine

Removing

– Remove poly V-belt for alternator
⇒ "1.3.2 Removing and installing poly V-belt for alternator - vehicles with 3.0 ltr. engine", page 25 /
⇒ "1.3.3 Removing and installing poly V-belt for starter-alternator - vehicles with 2.9 ltr. engine", page 26 .

– Remove cover.

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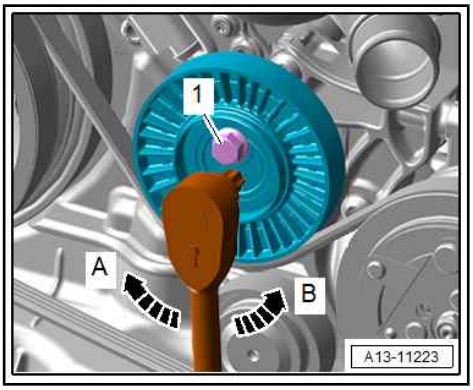
– Loosen bolt -1- by $^1/_2$ a turn.



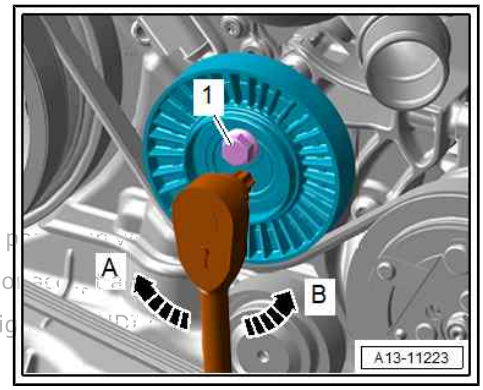
> **Caution**
>
> *Running a used poly V-belt in the opposite direction could cause irreparable damage.*
>
> ♦ *Before removing the poly V-belt, mark the direction of rotation with chalk or a felt-tip pen for re-installation.*

– To slacken poly V-belt, turn tensioner clockwise -arrow A- using special wrench Torx T55. Then remove poly V-belt.

Installing

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

– Fit poly V-belt
⇒ Fig. ""Belt routing for air conditioner compressor, vehicles with 3.0 ltr. engine"" , page 20 .



– To tension poly V-belt for air conditioner compressor, turn tensioner anti-clockwise using special wrench Torx T55 -arrow B- as far as stop (tensioner should remain under tension).

– Tighten bolt -1-.

– Check that poly V-belt is properly seated.

– Install poly V-belt for alternator
⇒ "1.3.2 Removing and installing poly V-belt for alternator - vehicles with 3.0 ltr. engine", page 25 /
⇒ "1.3.3 Removing and installing poly V-belt for starter-alternator - vehicles with 2.9 ltr. engine", page 26 .

– Start engine and check that poly V-belt(s) run properly.

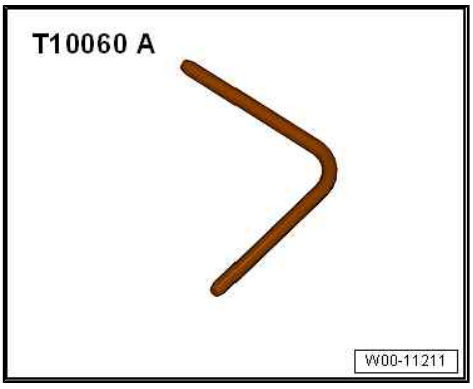
Tightening torques

♦ ⇒ "1.1.5 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 3.0 ltr. engine", page 19

1.3.7 Removing and installing poly V-belt for coolant pump - vehicles with high-voltage system

Special tools and workshop equipment required

♦ Locking pin - T10060A-



Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep.

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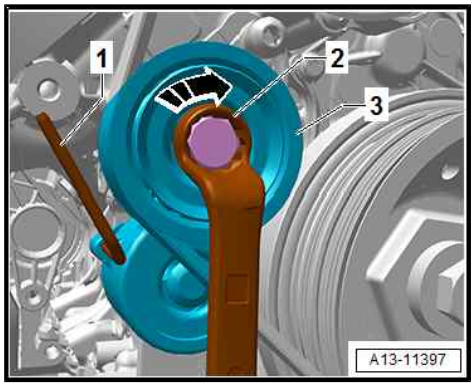
gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

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.*

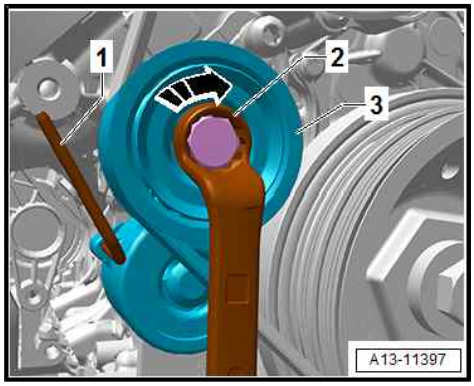


– To slacken poly V-belt, turn tensioner -3- in clockwise direction -arrow- using ring spanner -2-.

– Lock tensioner with locking pin - T10060A- -item 1- and take off poly V-belt.

Installing

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



– Fit poly V-belt
⇒ Fig. ""Belt routing for coolant pump - vehicles with high-voltage system"" , page 22 .

– Turn tensioner -3- of poly V-belt for alternator slightly clockwise -arrow- using a ring spanner -2- and pull out locking pin - T10060A- -item 1-.

– To tension poly V-belt, release tensioner by turning in anti-clockwise direction.

– Check that poly V-belt is properly seated.

– Start engine and check that poly V-belt(s) run properly.

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

1.4 Removing and installing tensioner for poly V-belt

⇒ "1.4.1 Removing and installing poly V-belt tensioner for alternator - vehicles with 2.9 ltr./3.0 ltr. engine", page 30

⇒ "1.4.2 Removing and installing poly V-belt tensioner for starter-alternator - vehicles with 2.9 ltr./3.0 ltr. engine", page 31

⇒ "1.4.3 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 2.9 ltr. engine", page 31

⇒ "1.4.4 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 3.0 ltr. engine", page 32

⇒ "1.4.5 Removing and installing tensioner for poly V-belt for coolant pump - vehicles with high-voltage system", page 32

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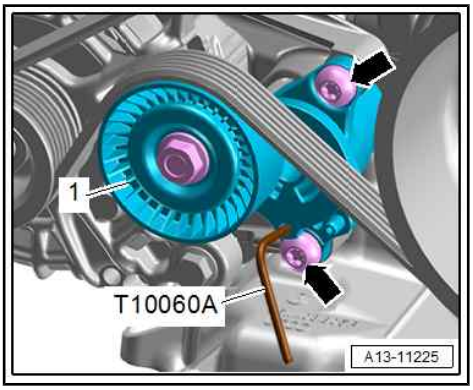
1.4.1 Removing and installing poly V-belt tensioner for alternator - vehicles with 2.9 ltr./3.0 ltr. engine

Removing

– Slacken poly V-belt
⇒ "1.3 Removing and installing poly V-belts", page 24 .

– Remove bolts -arrows- and detach tensioner -1-.



Installing

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

– Install poly V-belt
⇒ “1.3 Removing and installing poly V-belts”, page 24 .

Tightening torques

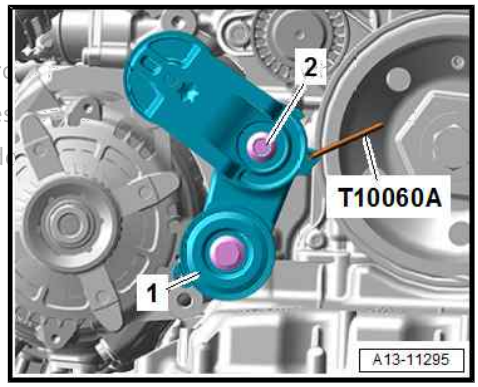
♦ ⇒ “1.1.1 Exploded view - cylinder block (pulley end), alternator belt drive, vehicles with 2.9 ltr./3.0 ltr. engine”, page 12

1.4.2 Removing and installing poly V-belt tensioner for starter-alternator - vehicles with 2.9 ltr./3.0 ltr. engine

Removing

– Slacken poly V-belt
⇒ “1.3.3 Removing and installing poly V-belt for starter-alternator - vehicles with 2.9 ltr. engine”, page 26 .

– Remove bolt -2- and detach tensioner -1-.



Installing

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with respect to the correctness of information in this d

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

– Install poly V-belt
⇒ “1.3.3 Removing and installing poly V-belt for starter-alternator - vehicles with 2.9 ltr. engine”, page 26 .

Tightening torques

♦ ⇒ “1.1.2 Exploded view - cylinder block (pulley end), starter-alternator belt drive, vehicles with 3.0 ltr. engine”, page 15

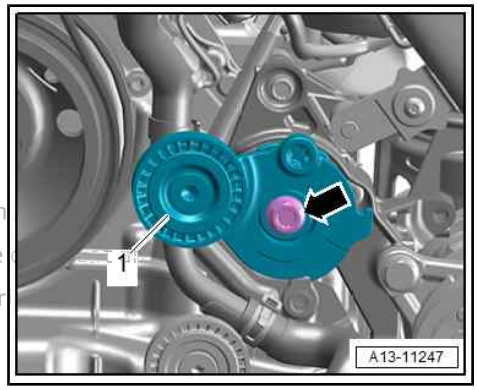
1.4.3 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 2.9 ltr. engine

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belt tensioner .

– Slacken poly V-belt ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

– Unscrew bolt -arrow-, push coolant hose slightly to one side and detach tensioner -1- (illustration shows engine without electric compressor).



Installing

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

– Install poly V-belt ⇒ 6-cylinder direct injection engine (2.9 ltr. 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing poly V-belts .

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Tightening torques

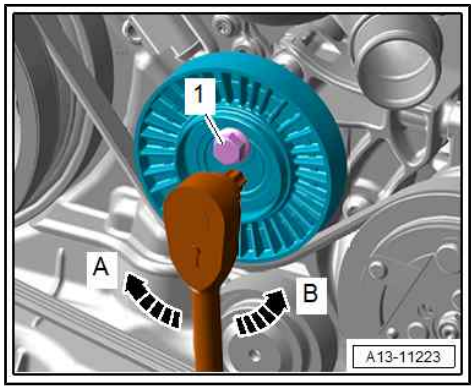
◆ ⇒ “1.1.3 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 2.9 ltr. engine without electric compressor”, page 17

1.4.4 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 3.0 ltr. engine

Removing

– Slacken poly V-belt ⇒ “1.3.6 Removing and installing poly V-belt for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 28 .

– Remove bolt -1- and detach tensioner.



Installing

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

– Install poly V-belt ⇒ “1.3.6 Removing and installing poly V-belt for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 28 .

Tightening torques

◆ ⇒ “1.1.5 Exploded view - cylinder block (pulley end), air conditioner compressor belt drive, vehicles with 3.0 ltr. engine”, page 19

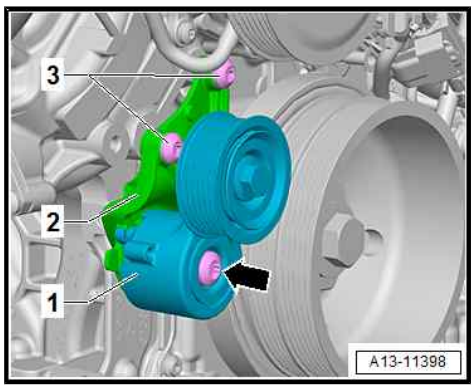
1.4.5 Removing and installing tensioner for poly V-belt for coolant pump - vehicles with high-voltage system

Removing

– Slacken poly V-belt ⇒ “1.3.7 Removing and installing poly V-belt for coolant pump - vehicles with high-voltage system”, page 29 .

– Remove bolt -1- and detach tensioner -1-.

– If bracket -2- is to be removed, unscrew bolts -3- and detach bracket -2-.



Installing

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

– Install poly V-belt ⇒ “1.3.7 Removing and installing poly V-belt for coolant pump - vehicles with high-voltage system”, page 29 .

Tightening torques

◆ ⇒ “1.1.6 Exploded view - cylinder block (pulley end), vehicles with high-voltage system”, page 21

1.5 Removing and installing vibration damper

⇒ “1.5.1 Removing and installing vibration damper - vehicles with 2.9 ltr. engine”, page 33

⇒ “1.5.2 Removing and installing vibration damper - vehicles with 3.0 ltr. engine”, page 35

⇒ “1.5.3 Removing and installing vibration damper - vehicles with high-voltage system”, page 36

1.5.1 Removing and installing vibration damper - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

- Hose clip pliers - VAS 6362-

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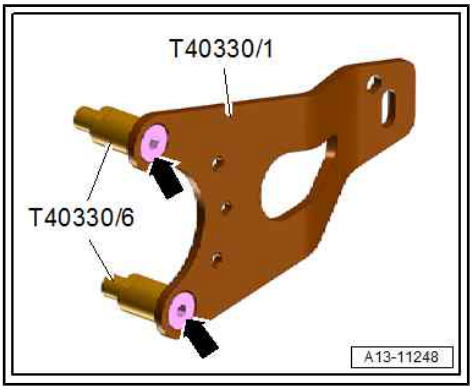
- Counterhold tool - T40330-

Preparing tool

– Secure adapter -T40330/6- to counterhold tool -T40330/1- using bolts -arrows-.



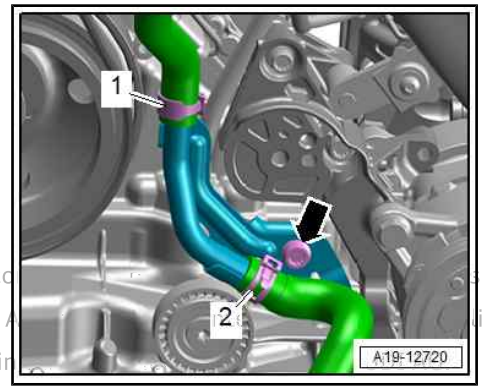
Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper .

– Remove poly V-belt for alternator ⇒ “1.3.1 Removing and installing poly V-belt for alternator - vehicles with 2.9 ltr. engine”, page 24 .

– Remove poly V-belt tensioner for air conditioner compressor ⇒ “1.4.3 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 2.9 ltr. engine”, page 31 .

– Remove bolt -arrow-.
– Release hose clip -1-, disconnect coolant hose and push front coolant pipe (bottom left) slightly to one side.



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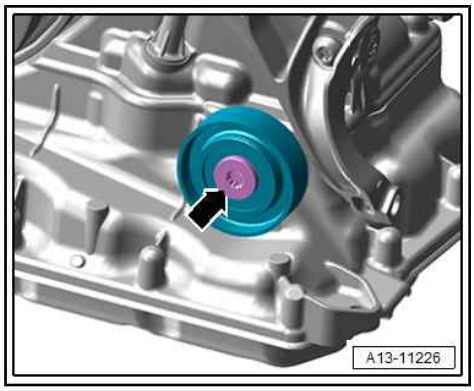
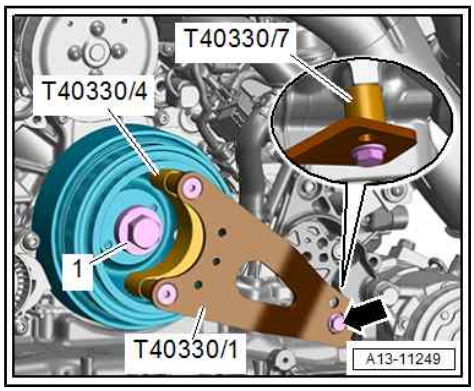
– Remove cover.
– Unscrew bolt -arrow- and remove idler roller.

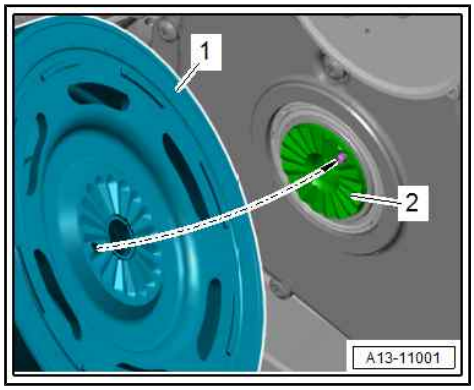


– Position adapter -T40330/4- with counterhold tool -T40330/1- against vibration damper and secure with bolt -arrow- (tighten to 23 Nm and fit spacer sleeves -T40330/7- in between).
– Remove bolt -1-.
– Unscrew bolt -arrow- and remove counterhold tool and vibration damper.

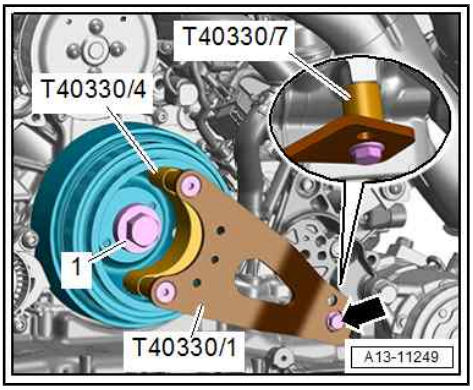


Installing

• After removing, renew bolts tightened with specified tightening angle.
– Position vibration damper -1- on crankshaft -2- and secure with a new bolt (pay attention to dowel sleeve -arrow-).



– Position adapter -T40330/4- with counterhold tool -T40330/1- against vibration damper and secure with bolt -arrow- (tighten to 23 Nm and fit spacer sleeves -T40330/7- in between).
– Tighten bolt -1- for vibration damper.
– Remove bolt -arrow- and detach counterhold tool.
– Install poly V-belt tensioner for air conditioner compressor ⇒ “1.4.3 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 2.9 ltr. engine”, page 31 .
– Install poly V-belt for alternator ⇒ “1.3.1 Removing and installing poly V-belt for alternator - vehicles with 2.9 ltr. engine”, page 24 .



Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper .

Tightening torques

◆ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 12
◆ ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes

1.5.2 Removing and installing vibration damper - vehicles with 3.0 ltr. engine

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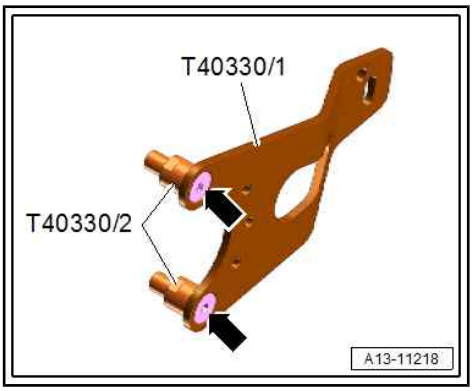
Special tools and workshop equipment required

◆ Counterhold tool - T40330-

Preparing tool

– Secure adapter -T40330/2- to counterhold tool -T40330/1- using bolts -arrows-.

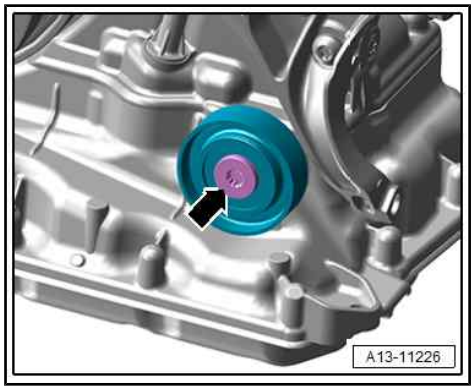


Removing

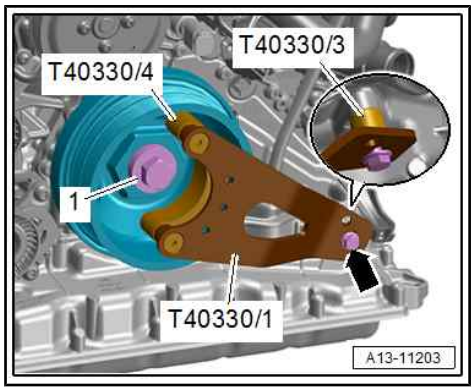
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper .

– Remove poly V-belt for air conditioner compressor ⇒ “1.3.6 Removing and installing poly V-belt for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 28 .
– Remove poly V-belt tensioner for air conditioner compressor ⇒ “1.4.4 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 32 .

– Remove cover.
– Unscrew bolt -arrow- and remove idler roller.



– Position adapter -T40330/4- with counterhold tool -T40330/1- against vibration damper and secure with bolt -arrow- (tighten to 23 Nm and fit spacer sleeves -T40330/3- in between).
– Remove bolt -1-.
– Unscrew bolt -arrow- and remove counterhold tool and vibration damper.



Installing

- After removing, renew bolts tightened with specified tightening angle.

– Position vibration damper -1- on crankshaft -2- and secure with a new bolt (pay attention to dowel sleeve -arrow-).

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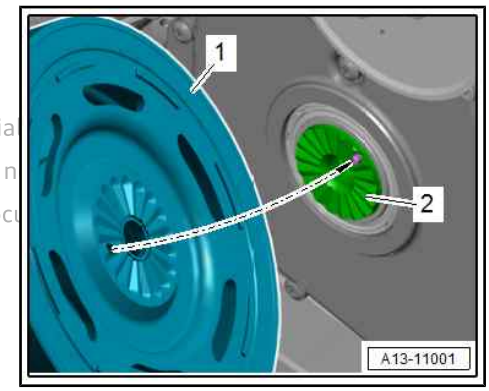
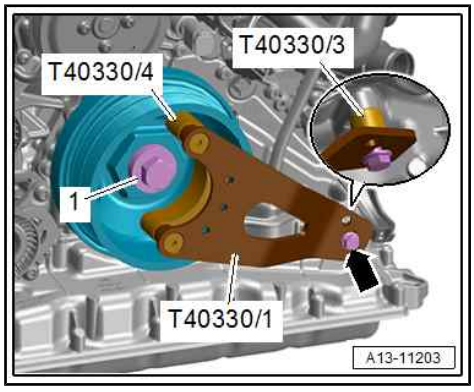


– Position adapter -T40330/4- with counterhold tool -T40330/1- against vibration damper and secure with bolt -arrow- (tighten to 23 Nm and fit spacer sleeves -T40330/3- in between).
– Tighten bolt -1- for vibration damper.
– Remove bolt -arrow- and detach counterhold tool.
– Install poly V-belt tensioner for air conditioner compressor ⇒ “1.4.4 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 32 .



Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper .

Tightening torques

♦ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 12

1.5.3 Removing and installing vibration damper - vehicles with high-voltage system

Special tools and workshop equipment required

♦ Counterhold tool - T40330-

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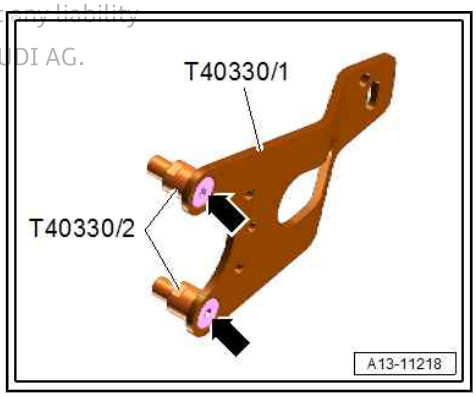
Preparing tool

– Secure adapter -T40330/2- to counterhold tool -T40330/1- using bolts -arrows-.



Removing

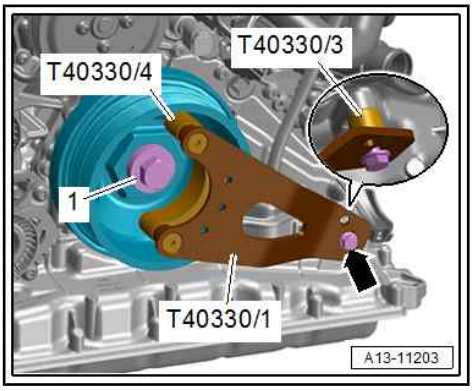
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper .

– Remove poly V-belt for coolant pump
⇒ “1.3.7 Removing and installing poly V-belt for coolant pump - vehicles with high-voltage system”, page 29 .

– Position adapter -T40330/4- with counterhold tool -T40330/1- against vibration damper and secure with bolt -arrow- (tighten to 23 Nm and fit spacer sleeves -T40330/3- in between).

– Remove bolt -1-.

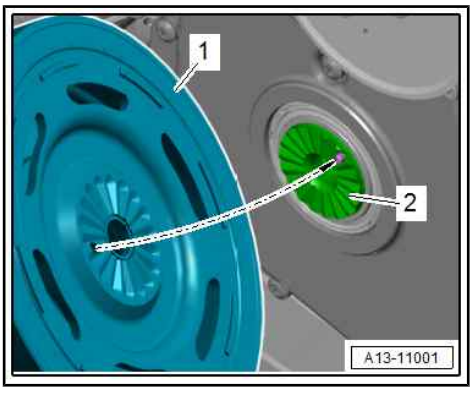
– Unscrew bolt -arrow- and remove counterhold tool and vibration damper.



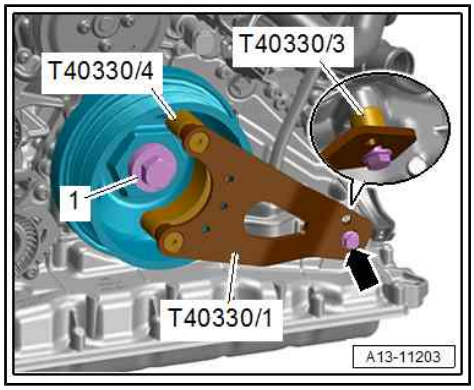
Installing

• After removing, renew bolts tightened with specified tightening angle.

– Position vibration damper -1- on crankshaft -2- and secure with a new bolt (pay attention to dowel sleeve -arrow-).



– Position adapter -T40330/4- with counterhold tool -T40330/1- against vibration damper and secure with bolt -arrow- (tighten to 23 Nm and fit spacer sleeves -T40330/3- in between).
– Tighten bolt -1- for vibration damper.
– Remove bolt -arrow- and detach counterhold tool.
– Fit poly V-belt for coolant pump
⇒ “1.3.7 Removing and installing poly V-belt for coolant pump - vehicles with high-voltage system”, page 29 .



Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing vibration damper .

Tightening torques

◆ ⇒ “1.1 Exploded view - cylinder block (pulley end)”, page 12

1.6 Removing and installing bracket for ancillaries

⇒ “1.6.1 Removing and installing bracket for alternator”, page 38

⇒ “1.6.2 Removing and installing bracket for starter-alternator”, page 39

⇒ “1.6.3 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine without electric compressor”, page 39

⇒ “1.6.4 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine with electric compressor”, page 40

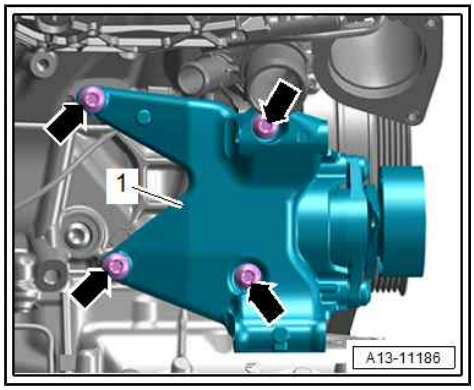
⇒ “1.6.5 Removing and installing bracket for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 40

⇒ “1.6.6 Removing and installing bracket for air conditioner compressor - vehicles with high-voltage system”, page 41

1.6.1 Removing and installing bracket for alternator

Removing

– Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .
– Unscrew bolts -arrows- and detach bracket -1-.



Installing

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

• After removing, renew bolts tightened with specified tightening angle.

Tightening torques

◆ ⇒ Fig. ““Bracket for alternator - tightening torques and sequence”“ , page 14
◆ ⇒ Electrical system; Rep. gr. 27 ; Alternator; Exploded view - alternator

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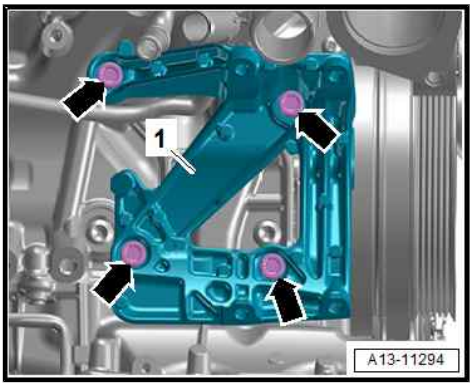
1.6.2 Removing and installing bracket for starter-alternator

Removing

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

– Unscrew bolts -arrows- and detach bracket -1-.



Installing

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

- After removing, renew bolts tightened with specified tightening angle.

Tightening torques

♦ ⇒ Fig. ""Bracket -1- for starter-alternator - tightening torque and tightening sequence"" , page 16

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

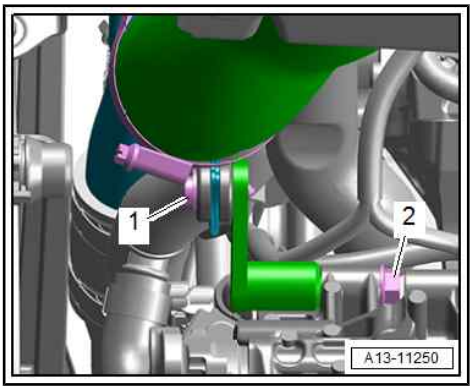
1.6.3 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine without electric compressor

Removing

– Remove air conditioner compressor from bracket and tie up to left side ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .

– Remove poly V-belt tensioner for air conditioner compressor ⇒ "1.4.3 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 2.9 ltr. engine", page 31 .

– Remove bolt -1- and loosen nut -2-.



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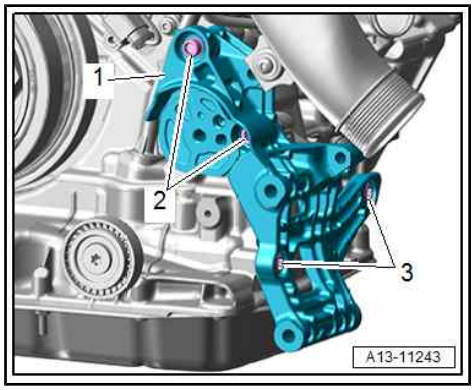
– Unscrew bolts -2, 3- and remove bracket -1- for air conditioner compressor.



Installing

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

– Install poly V-belt tensioner for air conditioner compressor ⇒ “1.4.3 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 2.9 ltr. engine”, page 31 .

Tightening torques

- ⇒ Fig. ““Bracket for air conditioner compressor - tightening torques and sequence, vehicles with 2.9 ltr. engine”“ , page 18
- ⇒ “2.1 Exploded view - charge air system”, page 259
- ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

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1.6.4 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine with electric compressor

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing bracket for ancillaries .

1.6.5 Removing and installing bracket for air conditioner compressor - vehicles with 3.0 ltr. engine

Removing

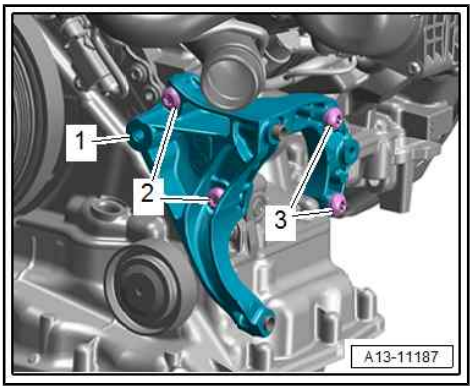
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing bracket for ancillaries .

– Remove poly V-belt tensioner for air conditioner compressor ⇒ “1.4.4 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 32 .

– All models except A8: Remove air conditioner compressor from bracket and tie up to left side ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Detaching and attaching air conditioner compressor at bracket .

– A8: Remove air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Removing and installing air conditioner compressor .

– Unscrew bolts -2, 3- and remove bracket -1- for air conditioner compressor.



Installing

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

- After removing, renew bolts tightened with specified tightening angle.

– Install poly V-belt tensioner for air conditioner compressor ⇒ “1.4.4 Removing and installing poly V-belt tensioner for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 32 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing bracket for ancillaries

Tightening torques

◆ ⇒ Fig. ““Bracket for air conditioner compressor - tightening torques and sequence, vehicles with 3.0 ltr. engine”“ , page 20

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

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

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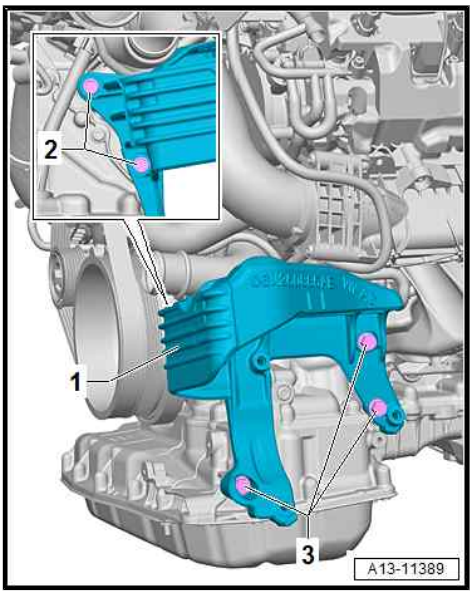
1.6.6 Removing and installing bracket for air conditioner compressor - vehicles with high-voltage system

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing bracket for ancillaries .

– Unscrew bolts -2, 3- and remove bracket -1- for air conditioner compressor.



Installing

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

- After removing, renew bolts tightened with specified tightening angle.

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing bracket for ancillaries

Tightening torques

◆ ⇒ “1.1.6 Exploded view - cylinder block (pulley end), vehicles with high-voltage system”, page 21

◆ Exploded view - drive unit for electrically driven air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Exploded view - air conditioner compressor drive unit

1.7 Removing and installing engine support

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing engine support .

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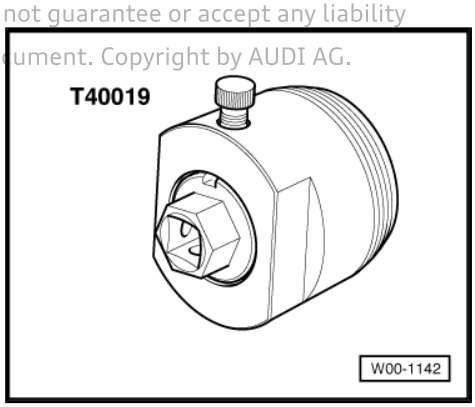
1.8 Renewing crankshaft oil seal (pulley end)

Special tools and workshop equipment required

- Oil seal extractor - T40019-



- Assembly tool - T40320-

Procedure

– Remove vibration damper
⇒ “1.5 Removing and installing vibration damper”, page 33 .

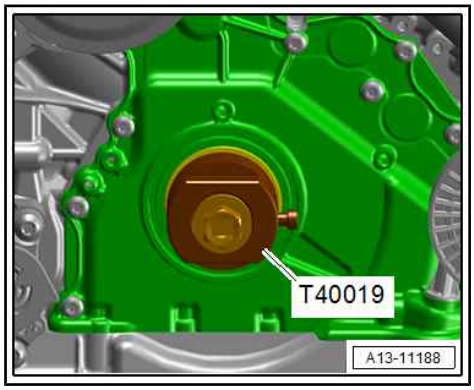
– Adjust inner part of oil seal extractor -T40019- so it is flush with the outer part and lock in position with knurled screw.

– Lubricate threaded head of oil seal extractor, place it in position and screw it into oil seal as far as possible (applying firm pressure).

– Loosen knurled screw and turn inner part against crankshaft until the oil seal is pulled out.

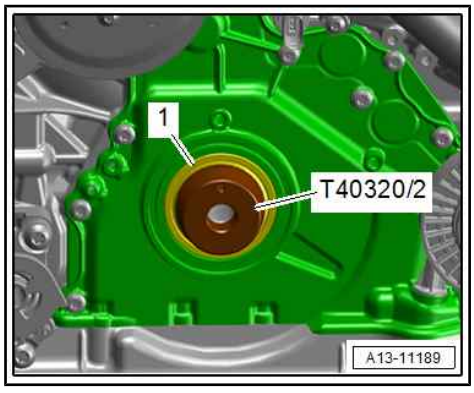
– Clamp flats of oil seal extractor in vice and use pliers to remove seal.

– Clean contact surface and sealing surface.



– Fit guide sleeve -T40320/2- on crankshaft and slide oil seal -1- into sealing flange (pulley end).

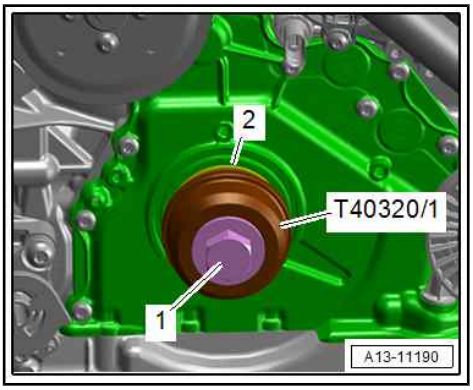
- Open side of oil seal faces engine.
- Leave guide sleeve -T40320/2- in position on crankshaft for pressing in oil seal.



– Fit press tool -T40320/1- on crankshaft using bolt -1- for vibration damper.
– Press oil seal -2- in as far as stop.

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

– Install vibration damper
⇒ “1.5 Removing and installing vibration damper”, page 33 .



1.9 Removing and installing sealing flange (pulley end)

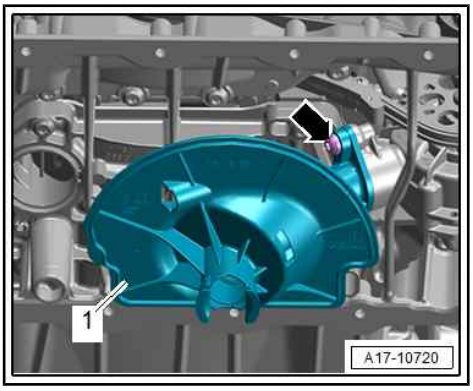
Special tools and workshop equipment required

- Electric drill with plastic brush
- Safety goggles
- Sealant ⇒ Electronic parts catalogue
- Bolt, M6x30 (2x)

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing sealing flange (pulley end) .

– Remove vibration damper
⇒ “1.5 Removing and installing vibration damper”, page 33 .
– Remove bracket for air conditioner compressor
⇒ “1.6 Removing and installing bracket for ancillaries”, page 38 .
– Remove oil pressure sender - G10-
⇒ “4.6 Removing and installing oil pressure sender G10 ”, page 205 .
– Remove sump (bottom section)
⇒ “1.3 Removing and installing sump (bottom section)”, page 175 .
– Unscrew bolt -arrow- and detach intake connecting pipe -1-.



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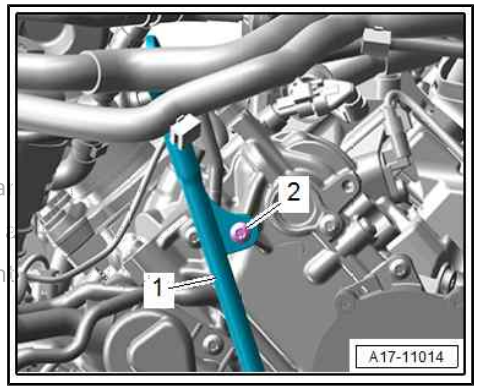
– Remove bolt -2-, pull guide tube -1- for oil dipstick off sealing flange (front) and detach guide tube.



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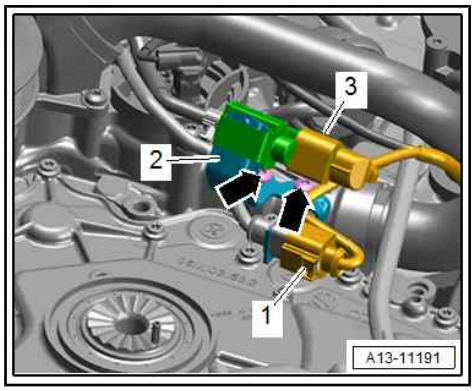
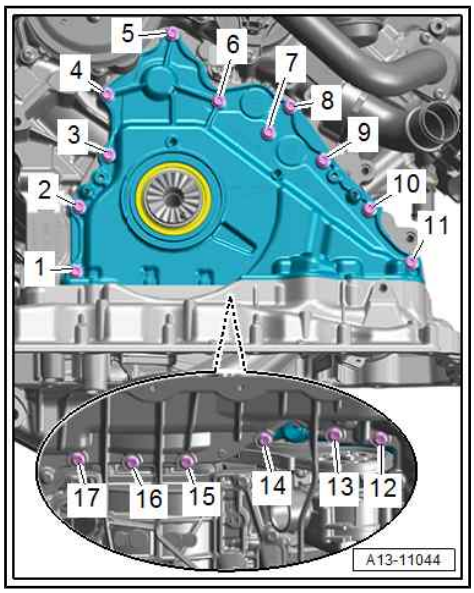
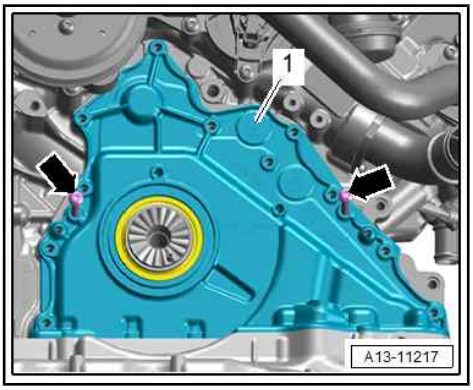
– Unplug electrical connector -3- and detach change-over valve from bracket -2-.
– Unplug electrical connector -1-.
– Remove bolts -arrows- and tie up bracket to one side.



– Slacken and remove bolts in the sequence: -17 ... 1-.



– To loosen sealing flange (front) -1-, screw in two M6x30 bolts -arrows- as far as stop.
– Screw bolts in $^1/_2$ turn each (one after the other) until sealing flange (front) is released.
– Remove bolts, detach sealing flange and press out oil seal for crankshaft.

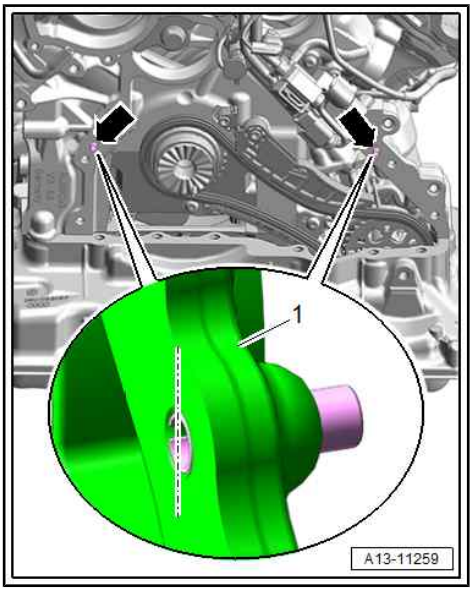


Installing

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

- After removing, renew bolts tightened with specified tightening angle.
- Renew intake connecting pipe with bolt, gaskets, seals, oil seal for crankshaft and O-rings after removal.

– Pull dowel sleeves -arrows- off cylinder block.
– Drive dowel sleeves into corresponding holes on sealing flange (pulley end) -1- (as shown) so that they are flush with sealing surface.



Caution

Protect lubrication system against contamination.

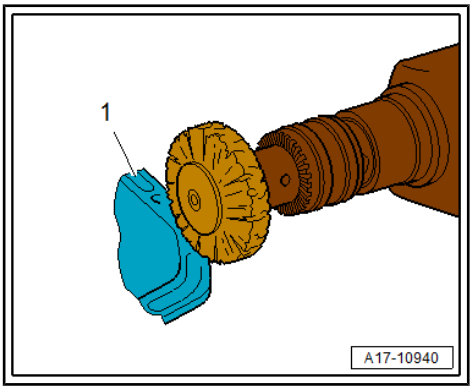
- *Cover exposed parts of the engine.*

WARNING

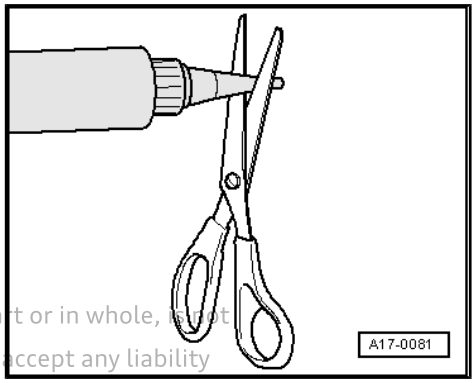
Risk of eye injury.

- *Put on safety goggles.*

– Remove sealant residue from cylinder block and sump (top section) -1- using rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.



- Note expiry date of sealant.
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 1.5 mm).



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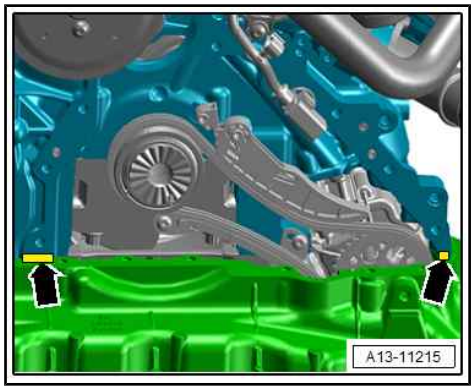
– Apply a thin bead of sealant at the edge of the joint between the cylinder block and the sump (top section) -arrows-.

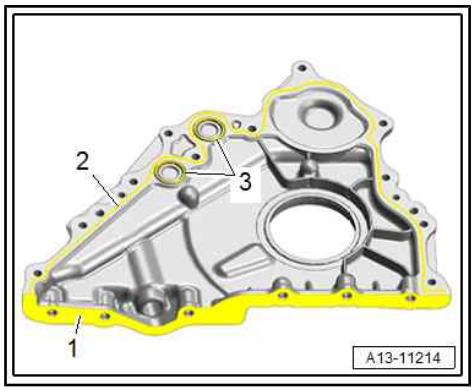


– Fit seals -3-.

Caution

Make sure lubrication system is not clogged by excess sealant.

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



- The bead of sealant -2- must project 3.0 mm above the sealing surface.
- Install sealing flange within 5 minutes of applying the sealant.

– Apply a thin coat of sealant to bottom sealing surface -1- on sealing flange.

– Carefully position sealing flange (pulley end) by guiding it towards sealing surface on cylinder block and sump (top section) at an angle from above, but do not press it on yet.

- Sealant must not be allowed to get into threaded holes.

– Screw in all bolts by hand and drive dowel sleeves into cylinder block.

– Tighten sealing flange bolts (pulley end).

– Install crankshaft oil seal (pulley end)
⇒ “1.8 Renewing crankshaft oil seal (pulley end)”, page 42 .

– Install sump (bottom section)
⇒ “1.3 Removing and installing sump (bottom section)”, page 175 .

– Install oil pressure sender - G10-
⇒ “4.6 Removing and installing oil pressure sender G10 ”, page 205 .

– Install bracket for air conditioner compressor
⇒ “1.6 Removing and installing bracket for ancillaries”, page 38 .

– Install vibration damper
⇒ “1.5 Removing and installing vibration damper”, page 33 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 13 ; Cylinder block (pulley end); Removing and installing sealing flange (pulley end)

Tightening torques

- ⇒ Fig. ““Sealing flange (pulley end) - tightening torques and sequence”“ , page 23
- ⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 23
- ⇒ “1.1 Exploded view - sump/oil pump”, page 171

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2 Cylinder block (gearbox end)

⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 47

⇒ “2.2 Removing and installing drive plate”, page 47

⇒ “3.6 Removing and installing sender wheel”, page 56

⇒ “3.7 Checking sender wheel”, page 56

⇒ “2.3 Renewing crankshaft oil seal (gearbox end)”, page 48

2.1 Exploded view - cylinder block (gearbox end)

- When carrying out repairs, secure engine to engine and gearbox support ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Removing and installing engine; Securing engine to engine and gearbox support .

1 - Bolt

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

2 - Drive plate

- ❑ With bearing flange
- ❑ Check running surface on bearing flange and holes for torque converter for cracks and scoring
- ❑ Removing and installing ⇒ “2.2 Removing and installing drive plate”, page 47

3 - Sender wheel

- ❑ For engine speed sender - G28-
- ❑ Removing and installing ⇒ “3.6 Removing and installing sender wheel”, page 56
- ❑ Checking ⇒ “3.7 Checking sender wheel”, page 56

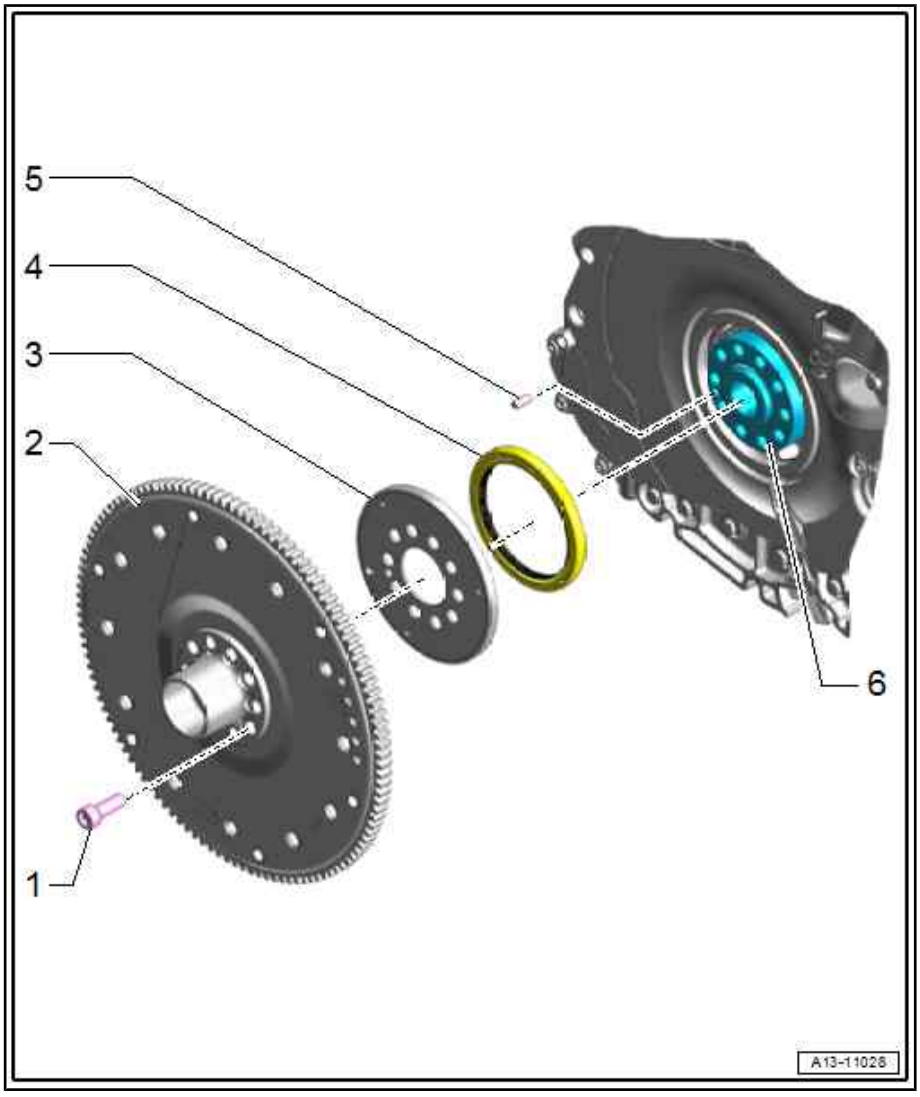
4 - Oil seal

- ❑ For crankshaft (gearbox end)
- ❑ Renewing ⇒ “2.3 Renewing crankshaft oil seal (gearbox end)”, page 48

5 - Dowel pin

6 - Crankshaft

- ❑ Exploded view ⇒ “3.1 Exploded view - crankshaft”, page 51



2.2 Removing and installing drive plate

Special tools and workshop equipment required

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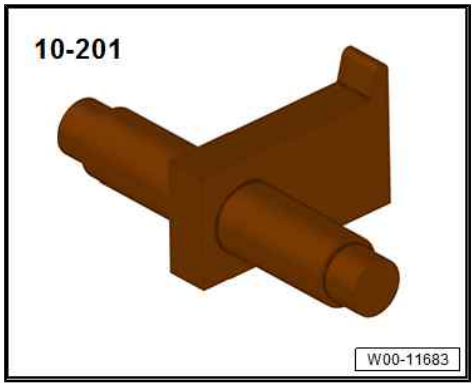
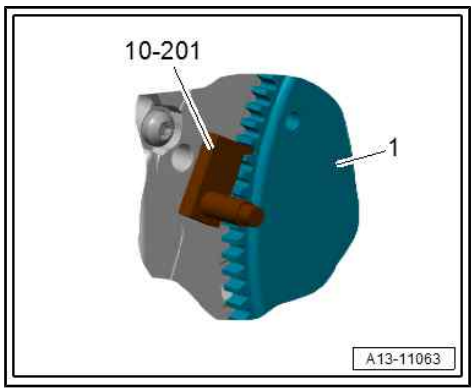
♦ Counterhold tool - 10-201-



Removing

- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; 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- and sender wheel.

Installing

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

- If the drive plate has been removed or renewed, check that the sender wheel is operating correctly before installation ⇒ “3.7 Checking sender wheel”, page 56 .
- After removing, renew bolts tightened with specified tightening angle.

– Pay attention to dowel pin when installing drive plate.

– Fit counterhold tool - 10-201- the other way round to tighten bolts.

Tightening torques

♦ ⇒ “2.1 Exploded view - cylinder block (gearbox end)”, page 47

2.3 Renewing crankshaft oil seal (gearbox end)

Special tools and workshop equipment required

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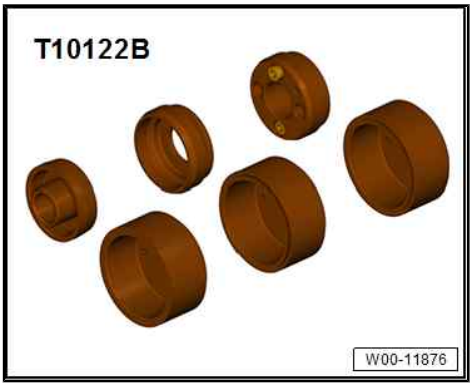
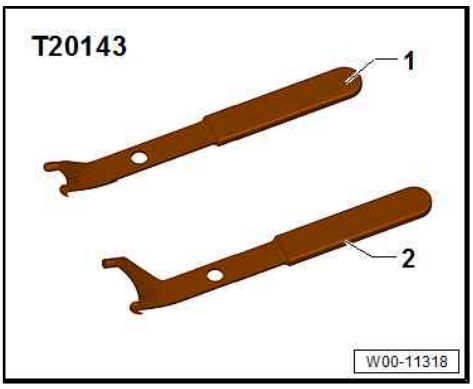
♦ Fitting tool - T10122B-



♦ Extractor tool - T20143/2-



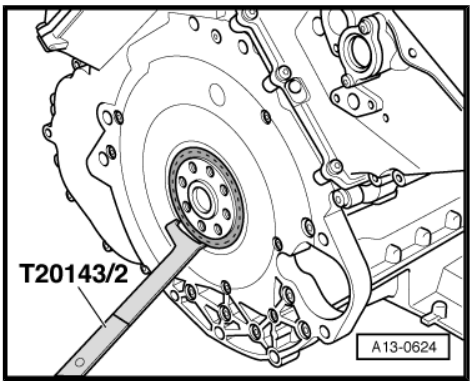
Procedure

- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

– Remove drive plate
⇒ “2.2 Removing and installing drive plate”, page 47 .

– Remove sender wheel
⇒ “3.6 Removing and installing sender wheel”, page 56 .

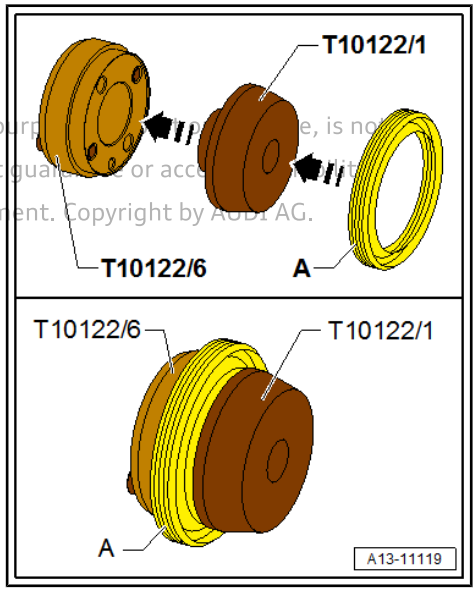
– Pry out oil seal using extractor tool -T20143/2- .



– Clean contact surface and sealing surface.

– Fit assembly aid -T10122/1- onto guide piece - T10122/6- and slide oil seal -A- onto guide piece (closed side first).

– Detach assembly aid -T10122/1- .



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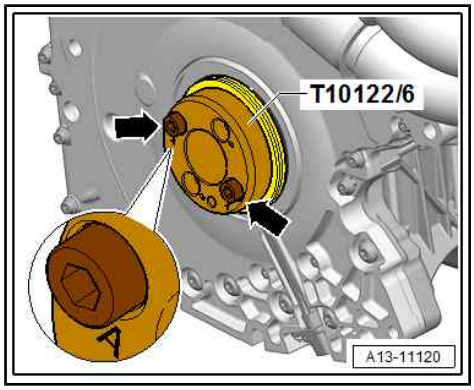
– Fit guide piece - T10122/6- onto crankshaft.
– Use bolts -arrows- to secure guide piece to crankshaft through securing points -A-.

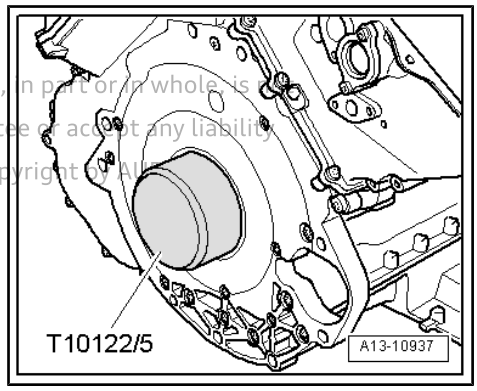


Caution

Risk of leaks if installed incorrectly.

- *Slide oil seal onto crankshaft by hand to prevent sealing lip on oil seal from folding over.*

– Slide oil seal over guide piece - T10122/6- onto crankshaft by hand.
– Press in oil seal evenly all round using thrust piece - T10122/5- .



– Remove guide piece - T10122/6- .
– Check that oil seal and its sealing lip are correctly seated. If sealing lip is partially folded over, repeat procedure with a new oil seal.
– Install sender wheel
⇒ “3.6 Removing and installing sender wheel”, page 56 .
– Install drive plate
⇒ “2.2 Removing and installing drive plate”, page 47 .

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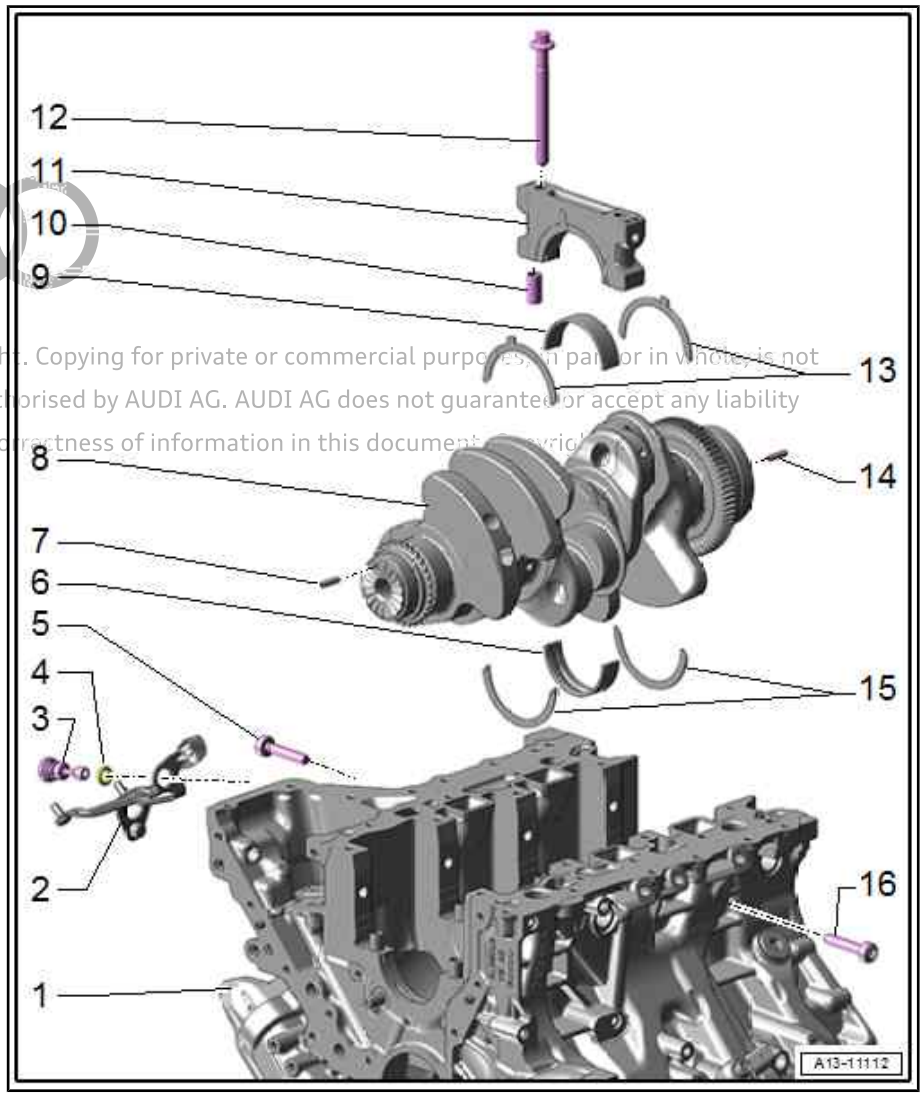
3 Crankshaft

⇒ “3.1 Exploded view - crankshaft”, page 51
⇒ “3.2 Crankshaft dimensions”, page 54
⇒ “3.3 Allocation of main bearing shells”, page 54
⇒ “3.4 Measuring axial clearance of crankshaft”, page 54
⇒ “3.5 Measuring radial clearance of crankshaft”, page 55
⇒ “3.6 Removing and installing sender wheel”, page 56
⇒ “3.7 Checking sender wheel”, page 56
⇒ “3.8 Removing and installing crankshaft”, page 57

3.1 Exploded view - crankshaft

- When carrying out repairs, secure engine to engine and gearbox support ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Removing and installing engine; Securing engine to engine and gearbox support .



1 - Cylinder block

2 - Bracket

- ❑ For vacuum reservoir

3 - Plug

- ❑ For “TDC” bore
- ❑ Different versions; allocation and tightening torques ⇒ page 53

4 - O-ring

- ❑ For plug version A ⇒ page 53
- ❑ Renew after removing

5 - Bolt

- ❑ Renew after removing
- ❑ Tightening torques and sequence ⇒ Fig. ““Bearing caps - tightening torques and sequence”” , page 53

6 - Bearing shell

- ❑ For cylinder block (with oil groove)
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for the bearing caps with the correct coloured markings ⇒ “3.3 Allocation of main bearing shells”, page 54
- ❑ Lubricate with engine oil

7 - Dowel sleeve

8 - Crankshaft

- ❑ Measuring axial clearance ⇒ “3.4 Measuring axial clearance of crankshaft”, page 54

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- ❑ Measuring radial clearance ⇒ “3.5 Measuring radial clearance of crankshaft”, page 55
- ❑ Crankshaft dimensions ⇒ “3.2 Crankshaft dimensions”, page 54
- ❑ Removing and installing ⇒ “3.8 Removing and installing crankshaft”, page 57
- ❑ Renew dowel sleeve ⇒ Item 7 (page 51) and dowel pin ⇒ Item 14 (page 52) when installing a new crankshaft
- ❑ Note installation position in relation to balance shaft

9 - Bearing shell

- ❑ For bearing cap (without oil groove)
- ❑ Renew used bearing shells
- ❑ Install new bearing shells for the bearing caps with the correct coloured markings ⇒ “3.3 Allocation of main bearing shells”, page 54
- ❑ Lubricate with engine oil

10 - Dowel sleeve

- ❑ 2x per bearing cap

11 - Bearing caps

- ❑ Allocation ⇒ Fig. ““Allocation of bearing cap”“ , page 53
- ❑ Bearing shell retaining lugs (cylinder block/bearing cap) must be on the same side

12 - Bolt

- ❑ Renew after removing
- ❑ Use old bolts when measuring radial clearance
- ❑ Tightening torques and sequence ⇒ Fig. ““Bearing caps - tightening torques and sequence”“ , page 53

13 - Thrust washers

- ❑ Only fitted on 3rd crankshaft bearing
- ❑ Installation position: oil grooves face outwards
- ❑ Make sure it engages in retaining frame

14 - Dowel pin

15 - Thrust washers

- ❑ Only fitted on 3rd crankshaft bearing
- ❑ Installation position: oil grooves face outwards

16 - Bolt

- ❑ Renew after removing
- ❑ Tightening torques and sequence ⇒ Fig. ““Bearing caps - tightening torques and sequence”“ , page 53

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Plug for “TDC” drilling - allocation and tightening torques

– Clean threaded hole in cylinder block.

Plug version A:

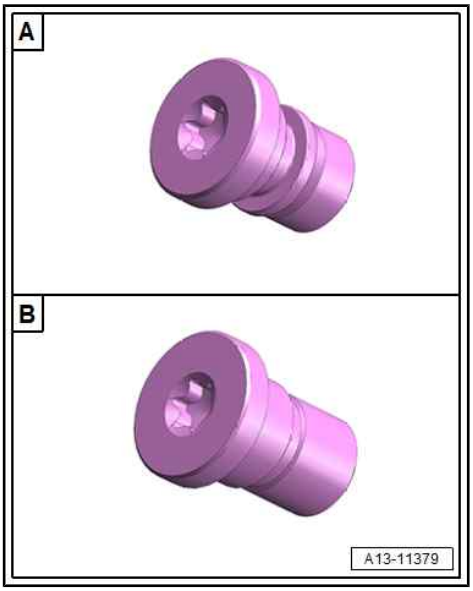
– Renew O-ring after removal.

– Clean plug, fit with new O-ring and tighten to 25 Nm.

Plug version B:

– Renew plug after removal.

– Tighten plug to 40 Nm.



Allocation of bearing cap

– Allocate bearing caps -1 ... 4- as shown.

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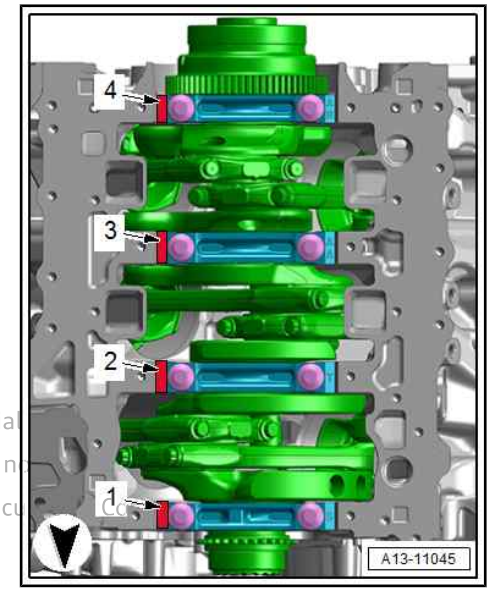
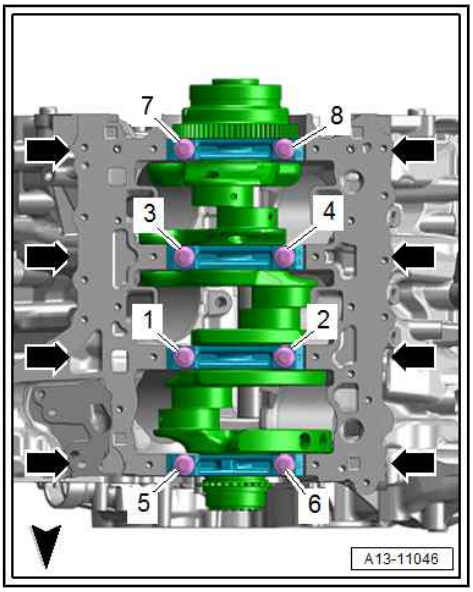


Bearing caps - tightening torques and sequence

- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

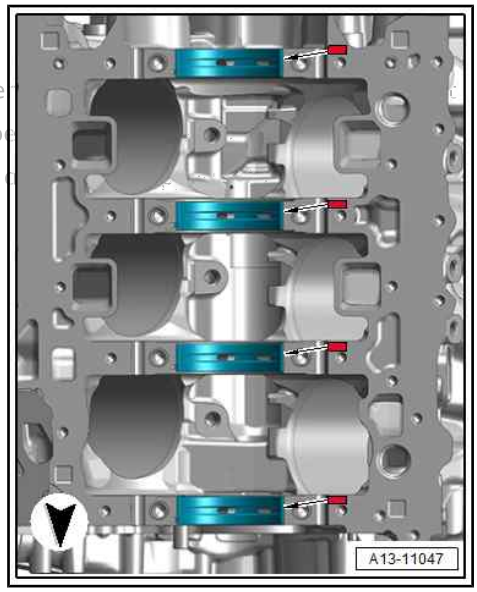
Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	Screw in by hand until contact is made
2.	-1 … 8-	30 Nm
3.	-1 … 8-	50 Nm
4.	-1 … 8-	Turn 90° further
5.	-arrows-	20 Nm
6.	-arrows-	Turn 90° further



3.2 Crankshaft dimensions

	Crankshaft main bearing journal ∅	Crankshaft main bearing journal ∅	Crankshaft conrod journal ∅
	2.9 ltr. engine mm	**3.0 ltr. engine mm**	**All engines mm**
Basic dimension	67.000 – 0.022 – 0.042	65.000 – 0.022 – 0.042	56.000 – 0.022 – 0.042

3.3 Allocation of main bearing shells



Allocation of crankshaft bearing shells for cylinder block

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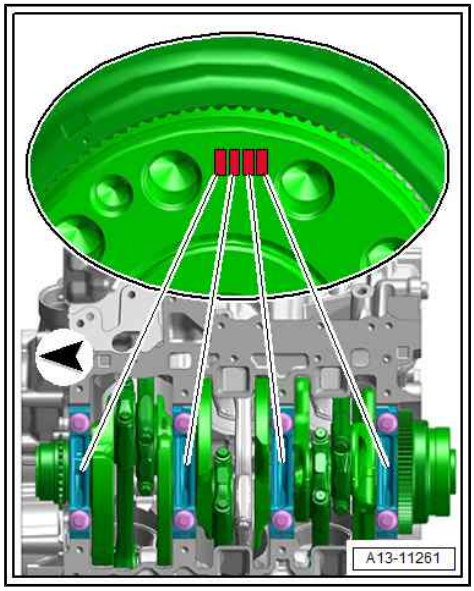
- Bearing shells of the correct thickness are matched to the bearings in the cylinder block at the factory. Coloured dots on the side of the bearing shells are used to identify the bearing shell thickness.
- The allocation of the bearing shells to the cylinder block is indicated by letters on the right of the cylinder block, as shown.

Letter on cylinder block	Colour coding of bearing
R =	Red
S =	Black
G =	Yellow
U =	Green
B =	Blue



Allocation of crankshaft bearing shells for bearing caps

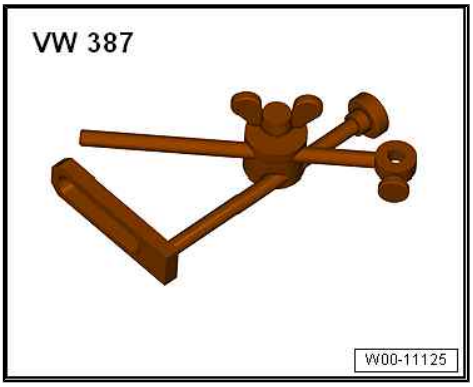
- Bearing shells of the correct thickness are assigned to the bearing caps at the factory. Coloured dots on the side of the bearing shells are used to identify the bearing shell thickness.
- The allocation of the bearing shells to the bearing caps is indicated by letters on the rear crankshaft flange, as shown in the illustration.
- The row of letters begins with crankshaft bearing “1” (pulley end) and ends with crankshaft bearing “4” (gearbox end).

Letter on crankshaft flange	Colour coding of bearing
R =	Red
S =	Black
G =	Yellow
U =	Green
B =	Blue

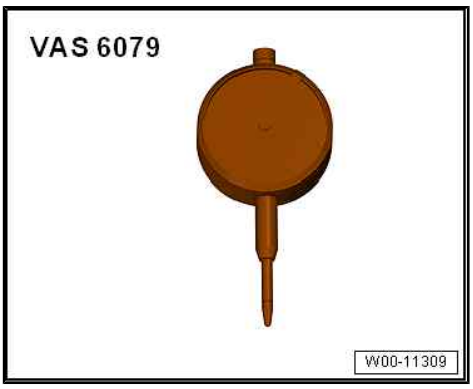
3.4 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



♦ Dial gauge - VAS 6079-



Procedure

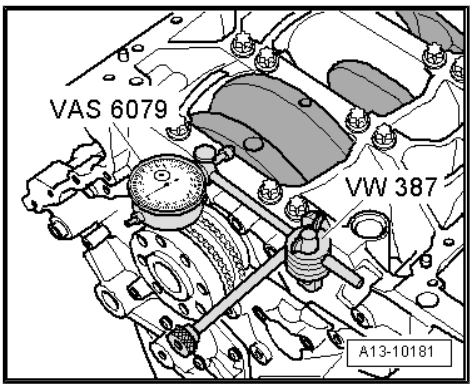
– Bolt dial gauge - VAS 6079- with dial gauge bracket - VW 387- to cylinder block.

– Apply dial gauge to 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: 0.013 ... 0.251 mm



3.5 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

• Use old bolts when measuring radial clearance.

– Remove bearing cap and clean bearing journal.

– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or in the bearing shell.

• The Plastigauge must be positioned in the centre of the bearing shell.

– Fit bearing caps and tighten through specified angle ⇒ Fig. ““Bearing caps - tightening torques and sequence”“ , page 53 without rotating crankshaft.

– Remove bearing cap again.

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– Compare width of Plastigauge with measurement scale.

Radial clearance:

- New: 0.021 ... 0.036 mm.
- Wear limit: 0.08 mm.

– When carrying out final assembly, renew bolts.

3.6 Removing and installing sender wheel

Removing

- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

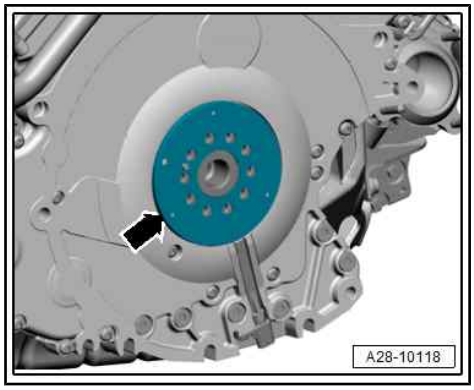
– Remove drive plate
⇒ “2.2 Removing and installing drive plate”, page 47 .

Caution

Risk of magnetic fields causing irreparable damage to sender wheel.

- *The sender wheel must be kept away from magnets (e.g. base of torch, loudspeaker).*
- *If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation*
⇒ “3.7 Checking sender wheel”, page 56 .

– Detach sender wheel -arrow-.



Installing

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

– Install drive plate
⇒ “2.2 Removing and installing drive plate”, page 47 .

– If sender wheel has been renewed, perform corresponding adaptions listed in Guided Function “01 - Functions, engine mechanics” / “0001 - Work steps after component replacement” ⇒ Vehicle diagnostic tester.

3.7 Checking sender wheel

Caution

Risk of magnetic fields causing irreparable damage to sender wheel.

- *The sender wheel must be kept away from magnets (e.g. base of torch, loudspeaker).*
- *If the drive plate/flywheel or the sender wheel itself has been removed or renewed, check that the sender wheel is operating correctly before installation.*

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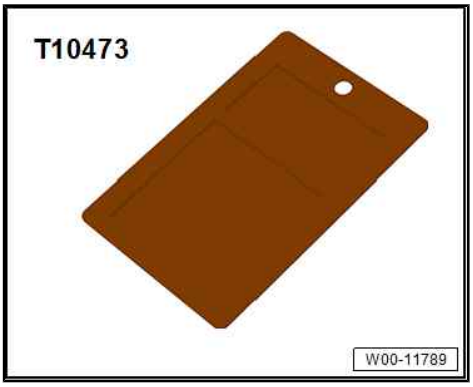
Special tools and workshop equipment required

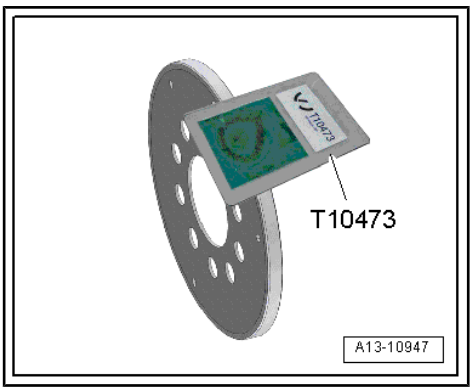
♦ Sensor gauge - T10473-



Procedure

- Sender wheel removed
  ⇒ “3.6 Removing and installing sender wheel”, page 56 .

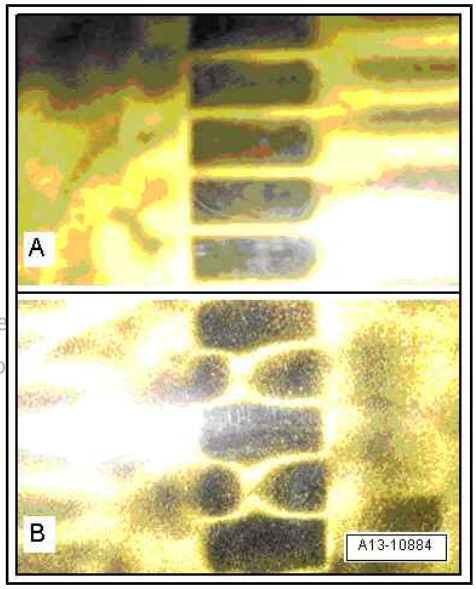
– Check entire circumference of sender wheel using sensor gauge - T10473- , as shown in illustration.



Inspection image of sender wheel

A - Sender wheel OK

B - Sender wheel defective



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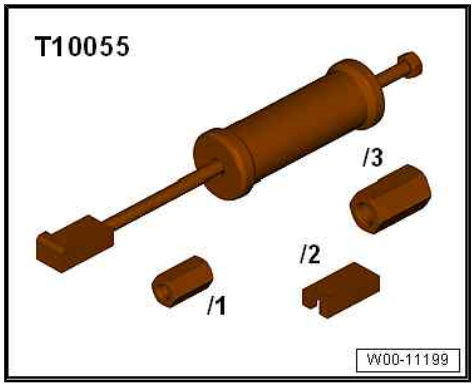
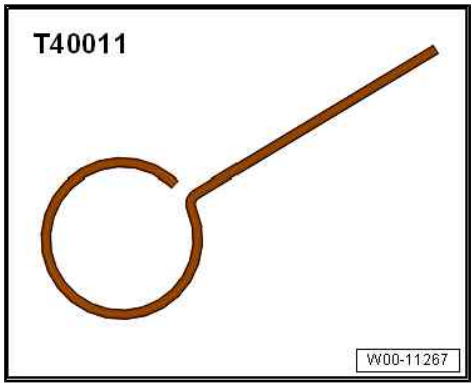
3.8 Removing and installing crankshaft

Special tools and workshop equipment required

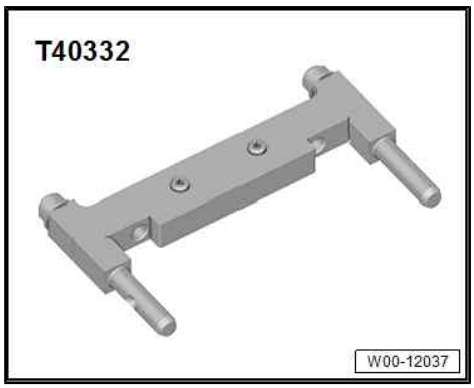
- Puller - T10055-



- Screwdriver Torx T25 - T10248- (not illustrated)
- Locking pin - T40011-



- Puller -T40332-



- Adjustment pin -T40362- (not illustrated)

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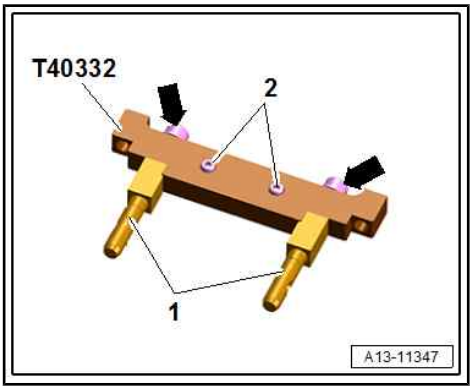
Preparing extractor -T40332-

– Secure tensioning bolts -1- to crosspiece of puller -T40332- using bolts -arrows-, as shown.

– Unscrew threaded pins -2- for assembling tool later.



Removing

- Engine secured to engine and gearbox support ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Removing and installing engine; Securing engine to engine and gearbox support .

– Remove piston
⇒ “5.2 Removing and installing pistons”, page 72 .

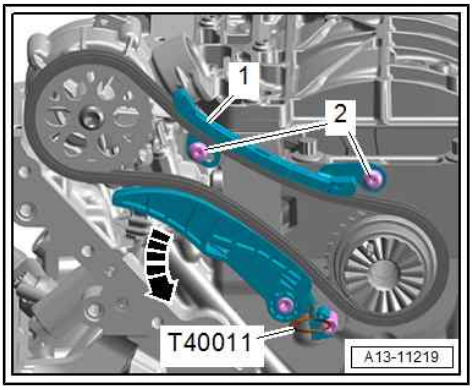
– Remove sealing flange (pulley end)
⇒ “1.9 Removing and installing sealing flange (pulley end)”, page 43 .

– If not yet removed, remove timing chain cover (bottom)
⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 84 .

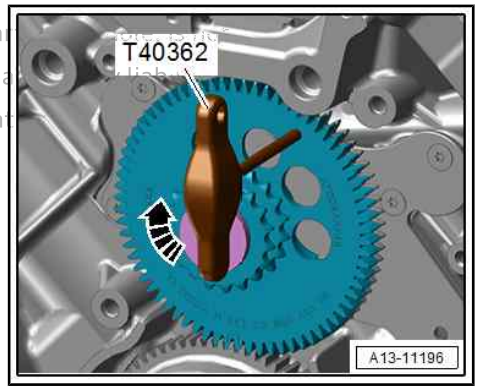
– Press tensioning rail in direction of -arrow- and lock in place using locking pin - T40011- .

– Unscrew bolts -2- and detach guide rail -1-.

– Remove oil pump together with chain sprocket
⇒ “1.6 Removing and installing oil pump”, page 187 .



– Lock backlash compensation assembly at gear by inserting adjustment pin -T40362- into sprocket as far as stop and turning it 180° clockwise -arrow-.



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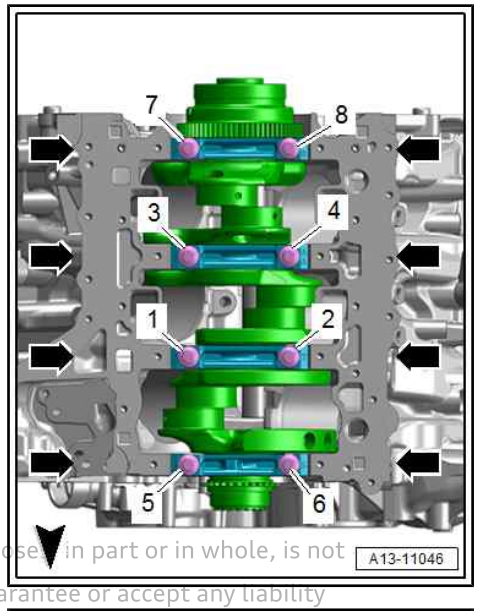
– Remove bolts -arrows- and -1 … 8-.



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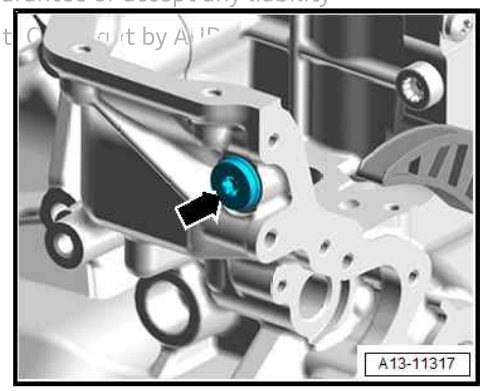
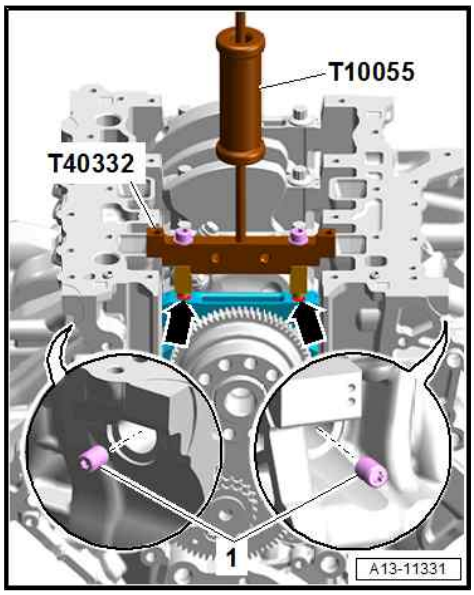
– Remove plug (front left) -arrow-.



– Apply and secure extractor -T40332- (prepared previously) at grooves -arrows- on corresponding bearing cap; to do so, screw in threaded pins -1- on left and right as far as stop using screwdriver Torx T25 - T10248- .
– Secure puller - T10055- to extractor -T40332- and pull off bearing cap.
– Pull off remaining bearing caps and remove crankshaft.



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Installing

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

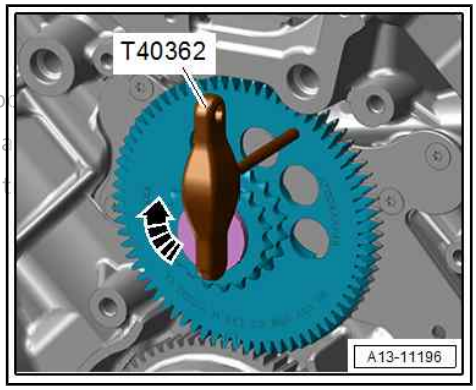
- After removing, renew bolts tightened with specified tightening angle.
- Backlash compensation assembly locked at balance shaft gear with adjustment pin -T40362-

– Ensure correct version:

♦ Bearing caps ⇒ Fig. ""Allocation of bearing cap"" , page 53

♦ Bearing shells
⇒ "3.3 Allocation of main bearing shells", page 54

– Oil running surface of bearing shells with engine oil.

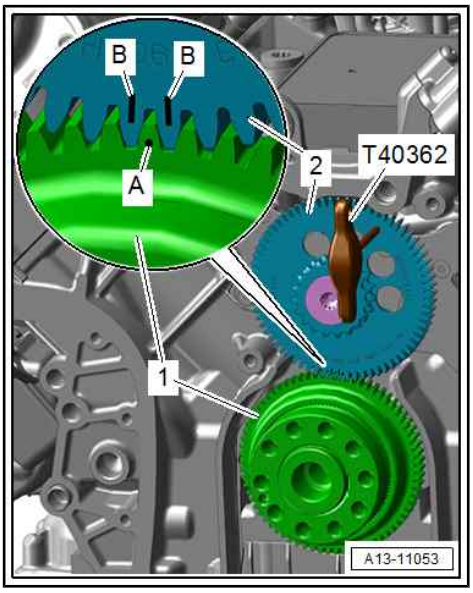


– Move crankshaft into installation position and press it on; pay attention to markings:

- Marking -A- for crankshaft -1- must be between the two markings -B- on balance shaft gear -2-.

Tightening torques

♦ ⇒ Fig. ""Bearing caps - tightening torques and sequence"" , page 53

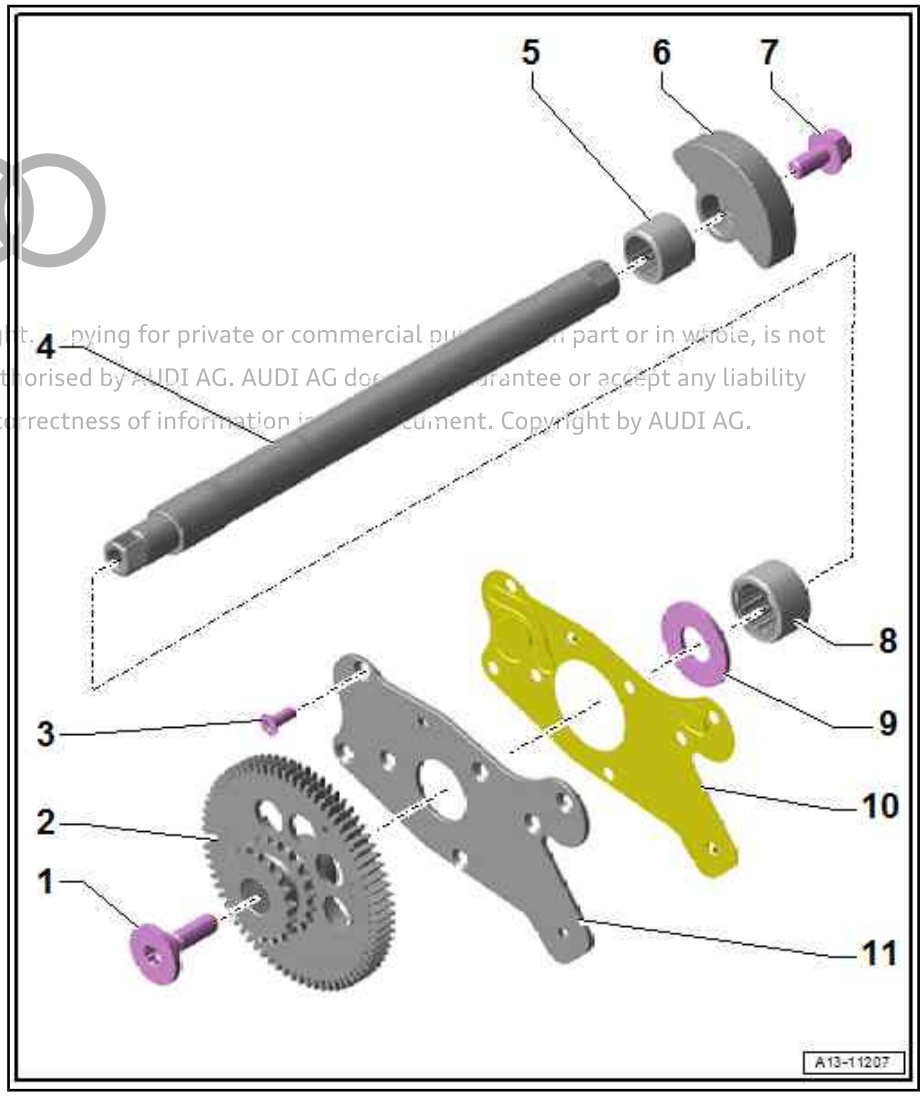


4 Balance shaft

⇒ “4.1 Exploded view - balance shaft”, page 62

⇒ “4.2 Removing and installing balance shaft”, page 62

4.1 Exploded view - balance shaft



1 - Bolt

- ❑ Renew after removing
- ❑ 40 Nm +45°

2 - Gear

- ❑ With sprockets for camshaft timing chains

3 - Bolt

- ❑ 9 Nm

4 - Balance shaft

- ❑ Removing and installing ⇒ “4.2 Removing and installing balance shaft”, page 62

5 - Roller bearing

- ❑ Renewing ⇒ “4.3 Renewing roller bearing”, page 66

6 - Balance weight

- ❑ Can only be fitted on balance shaft in one position.

7 - Bolt

- ❑ Renew after removing
- ❑ 40 Nm +90°

8 - Roller bearing

- ❑ Renewing ⇒ “4.3 Renewing roller bearing”, page 66

9 - Thrust washer

10 - Gasket

- ❑ Renew after removing

11 - Bearing plate

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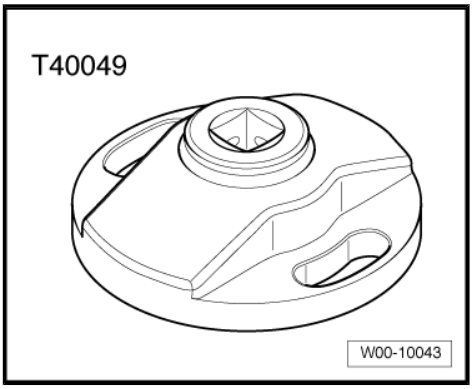
4.2 Removing and installing balance shaft

Special tools and workshop equipment required

♦ Key - T40049-



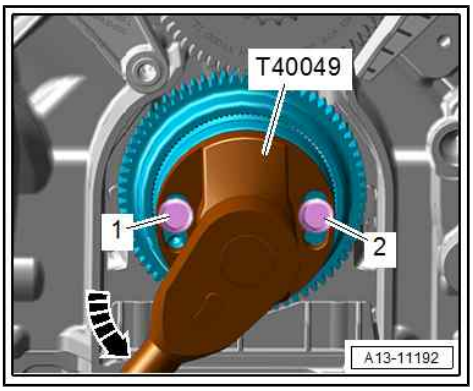
♦ Camshaft clamp - T40264- (not illustrated)

Removing

- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

– Remove timing chains
⇒ “2.4 Removing and installing camshaft timing chain”, page 113 .

– Secure key - T40049- to crankshaft using bolts -1, 2-.



– Remove sealing flange (pulley end)
⇒ “1.9 Removing and installing sealing flange (pulley end)”, page 43 .

Caution

Risk of damage to valves and piston crowns.

♦ *Do NOT turn crankshaft.*

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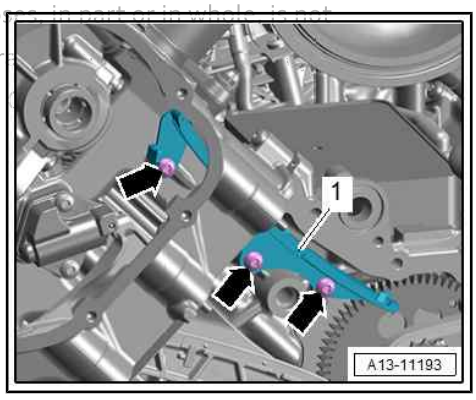
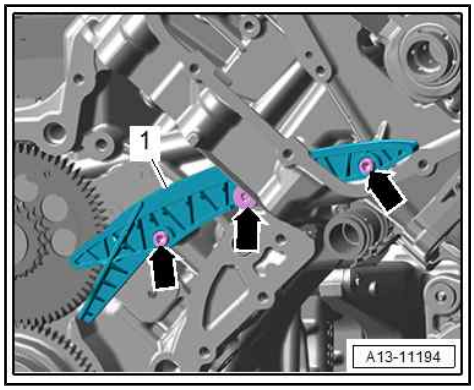
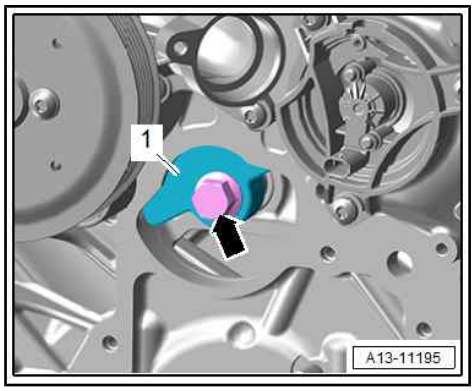
– Unscrew bolts -arrows- and remove guide rail -1-.



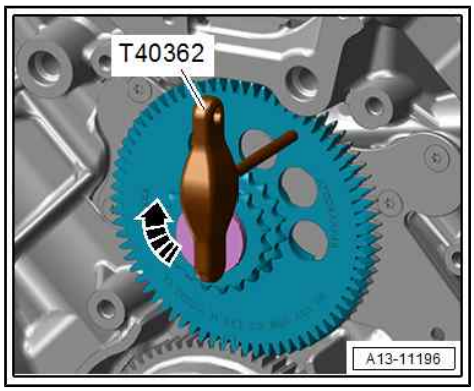
– Unscrew guide pins -arrows- and remove guide rail -1-.



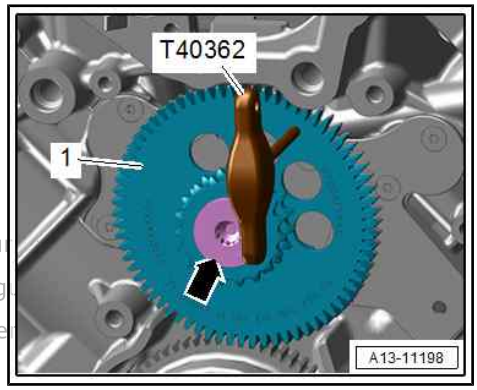
– Remove bolt -arrow- on pulley end, using key - T40049- to counterhold crankshaft (balance weight -1- is removed later).



– Lock backlash compensation assembly at gear by inserting adjustment pin -T40362- into sprocket as far as stop and turning it 180° clockwise -arrow-.



– Remove bolt -arrow- (counterhold crankshaft with key - T40049-).
– Remove gear -1-.



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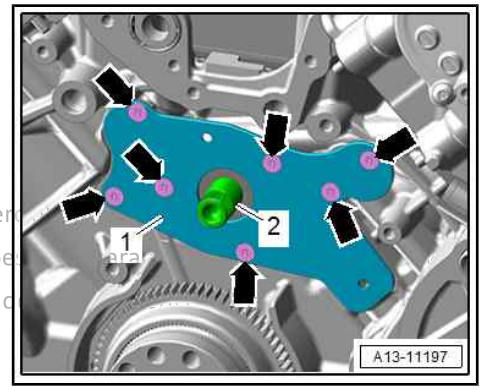
– Remove bolts -arrows- and detach bearing plate -1- for balance shaft.

– Remove balance shaft -2- from cylinder block towards gearbox end and, at the same time, detach balance weight on pulley end.



Installing

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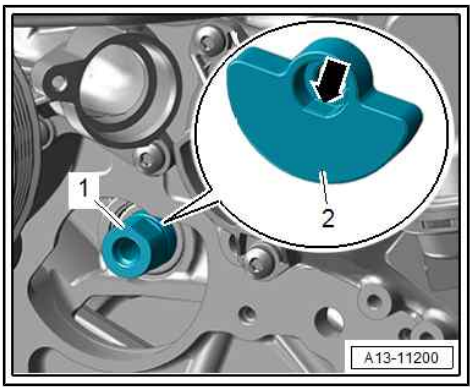
Installation is carried out in reverse order; note the following:

- After removing, renew bolts tightened with specified tightening angle.
- Renew gasket after removing.
- Backlash compensation assembly locked at gear with adjustment pin -T40362- .
- A new gear is supplied with an assembly aid which is inserted in place of the adjustment pin -T40362- .

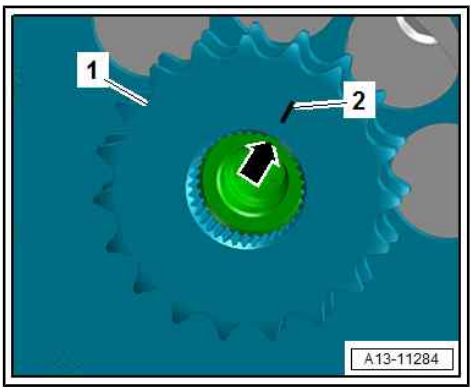
– Move balance shaft -1- into installation position.

– Fit balance weight -2- onto balance shaft at pulley end.

- Machined surface -arrow- of balance weight must be positioned over machined surface of balance shaft.



– Move gear -1- into installation position; marking -2- must align with dual toothing of balance shaft -arrow-.

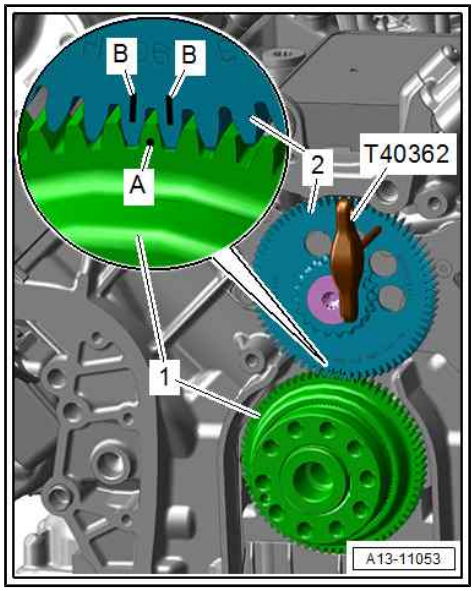


– Fully slide gear onto balance shaft, noting marking:

• Marking -A- for crankshaft -1- must be between the two markings -B- on balance shaft gear -2-.

– Counterhold crankshaft with key - T40049- and tighten bolt for gear and balance weight.

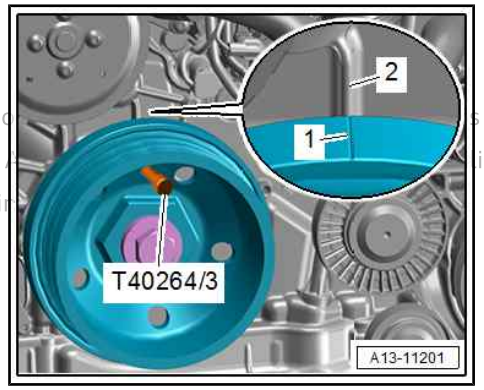
– Install sealing flange (pulley end)
⇒ “1.9 Removing and installing sealing flange (pulley end)”, page 43 .



– Adjust crankshaft so that notch -1- on vibration damper aligns with cast projection -2- on sealing flange (pulley end).

– Screw camshaft clamp - T40264/3- through bore in vibration damper into sealing flange (pulley end) by hand until it makes contact. If necessary, turn crankshaft back and forth slightly.

– Install camshaft timing chains
⇒ “2.4 Removing and installing camshaft timing chain”, page 113 .



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Tightening torques

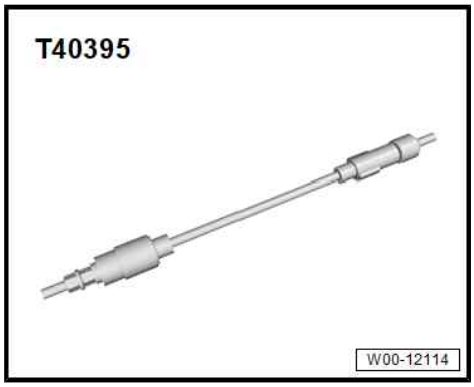
♦ ⇒ “2.1 Exploded view - camshaft timing chains”, page 89

♦ ⇒ “4.1 Exploded view - balance shaft”, page 62

4.3 Renewing roller bearing

Special tools and workshop equipment required

♦ Special tool -T40395-



Pulling out

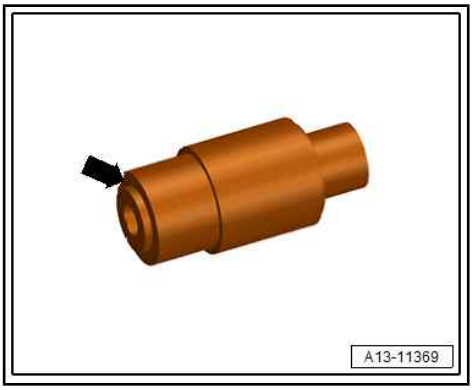
• Engine secured to engine and gearbox support ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Removing and installing engine; Securing engine to engine and gearbox support .

– Remove crankshaft
⇒ “3.1 Exploded view - crankshaft”, page 51 .

– Remove balance shaft
⇒ “4.2 Removing and installing balance shaft”, page 62 .

– Position special tool correctly on roller bearing:

• The chamfer -arrow- faces towards the roller bearing.



– Align adapter -T40395/3- .

• The side without the chamfer -arrows- faces downwards.

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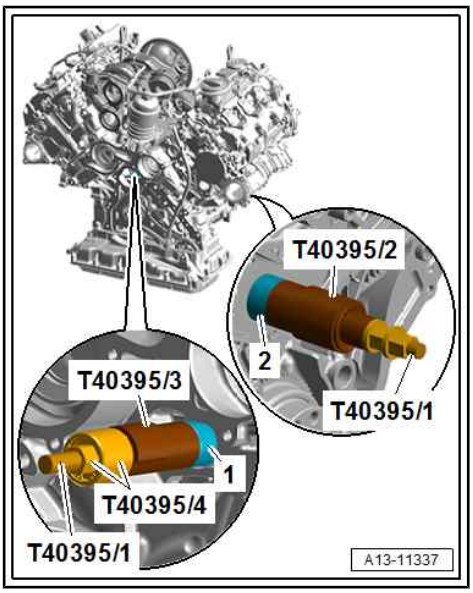
– Pull roller bearings (front -1- and rear -2-) out inwards using spindle -T40395/1- and adapters -T40395/2- / -T40395/3- ; to do so, turn nut -T40395/4- .

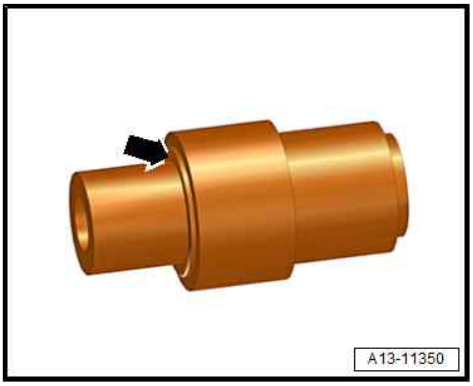
– Detach special tool and remove roller bearing.



Installing

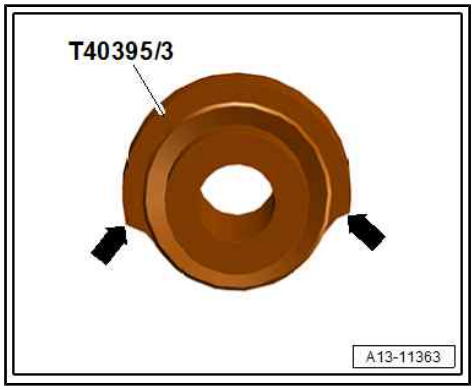
– Position adapter correctly on roller bearing:

• Chamfer -arrow- must face roller bearing; chamfer determines installation depth.



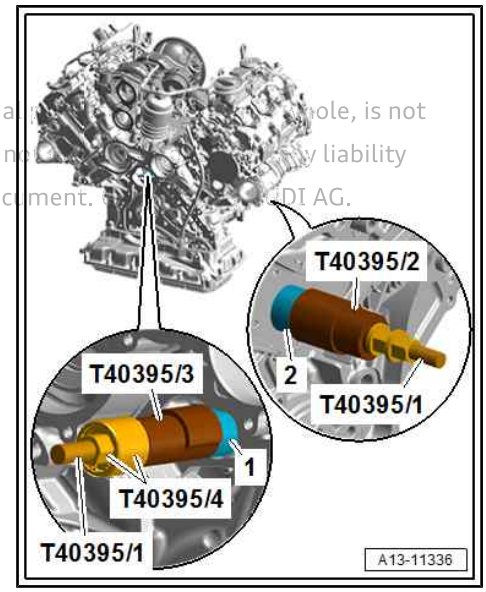
– Align adapter -T40395/3- .

• The side without the chamfer -arrows- faces downwards.



– Pull roller bearings (front -1- and rear -2-) in as far as stop using spindle -T40395/1- and adapters -T40395/2- / -T40395/3- ; to do so, turn nut -T40395/4- .

• The sides of the roller bearings with identification lettering face outwards.



– Install balance shaft
⇒ “4.2 Removing and installing balance shaft”, page 62 .

– Install crankshaft
⇒ “3.1 Exploded view - crankshaft”, page 51 .

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5 Pistons and conrods

⇒ “5.1 Exploded view - pistons and conrods”, page 69
⇒ “5.2 Removing and installing pistons”, page 72
⇒ “5.3 Removing and installing oil spray jets”, page 76
⇒ “5.4 Checking pistons and cylinder bores”, page 77
⇒ “5.5 Checking radial clearance of conrod bearings”, page 78

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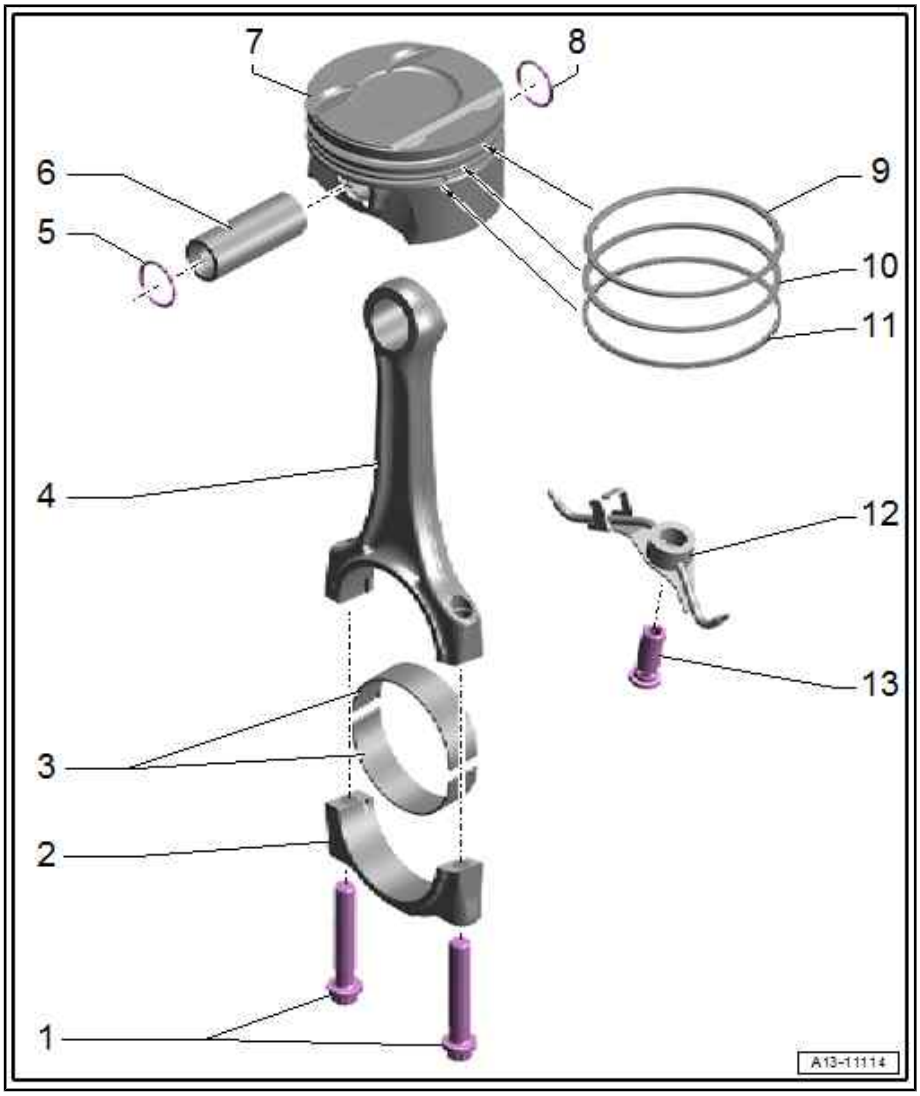
5.1 Exploded view - pistons and conrods



1 - Bolts

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

2 - Conrod bearing cap

- ❑ Mark cylinder and conrod allocation in colour ⇒ Fig. ““Marking conrods”“ , page 72
- ❑ Installation position of conrod pairs ⇒ Fig. ““Installation position of conrods”“ , page 72

3 - Bearing shells

- ❑ Ensure that retaining lugs are securely seated.
- ❑ Renew used bearing shells

4 - Conrod

- ❑ Only renew as a complete set
- ❑ Mark cylinder and conrod bearing cap allocation in colour ⇒ Fig. ““Marking conrods”“ , page 72
- ❑ Installation position of conrod pairs ⇒ Fig. ““Installation position of conrods”“ , page 72
- ❑ Axial clearance for each conrod pair (when new): 0.30 … 0.54 mm
- ❑ Measuring radial clearance ⇒ “5.5 Checking radial clearance of conrod bearings”, page 78

5 - Circlip

- ❑ Renew after removing

6 - Piston pin

- ❑ Removing and installing ⇒ “5.2 Removing and installing pistons”, page 72

7 - Piston

- ❑ Mark installation position and cylinder number ⇒ Fig. ""Installation position of pistons"" , page 72
- ❑ Renew piston if cracking is visible on piston crown or piston skirt
- ❑ Install with piston installation sleeve -T40369-
- ❑ Removing and installing ⇒ "5.2 Removing and installing pistons", page 72
- ❑ Checking pistons and cylinder bores ⇒ "5.4 Checking pistons and cylinder bores", page 77

8 - Circlip

- ❑ Renew after removing

9 - Compression ring

- ❑ Install using piston ring pliers -VAS 211 003- ⇒ Fig. ""Installing compression rings"" , page 71
- ❑ Measuring ring gap ⇒ Fig. ""Measuring piston ring gap"" , page 77
- ❑ Measuring ring-to-groove clearance ⇒ Fig. ""Measuring ring-to-groove clearance"" , page 78
- ❑ Allocation and installation position ⇒ Fig. ""Allocation of piston rings"" , page 71
- ❑ Offset gaps by 120° to ⇒ Item 10 (page 70)

10 - Compression ring

- ❑ Install using piston ring pliers -VAS 211 003- ⇒ Fig. ""Installing compression rings"" , page 71
- ❑ Measuring ring gap ⇒ Fig. ""Measuring piston ring gap"" , page 77
- ❑ Measuring ring-to-groove clearance ⇒ Fig. ""Measuring ring-to-groove clearance"" , page 78
- ❑ Allocation and installation position ⇒ Fig. ""Allocation of piston rings"" , page 71
- ❑ Offset gaps by 120°

11 - Oil scraper ring

- ❑ Remove and install 3-part oil scraper ring carefully by hand
- ❑ Installation position ⇒ Fig. ""Installing oil scraper ring"" , page 71
- ❑ Gap cannot be measured
- ❑ Ring-to-groove clearance cannot be checked
- ❑ Allocation ⇒ Fig. ""Allocation of piston rings"" , page 71

12 - Oil spray jet

- ❑ With spray nozzle valve
- ❑ Do not bend
- ❑ Removing and installing ⇒ "5.3 Removing and installing oil spray jets", page 76

13 - Banjo bolt

- ❑ Renew after removing
- ❑ 10 Nm +45°

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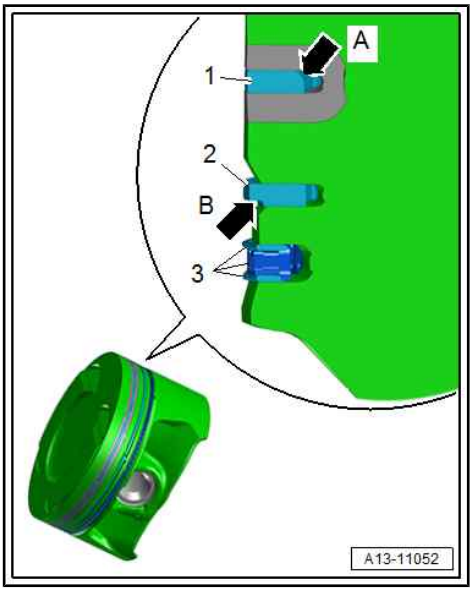
Allocation of piston rings

1 - Compression ring with chamfer -arrow A- (inner side, top)

2 - Compression ring with shoulder -arrow B- (outer side, bottom)

3 - Three-part oil scraper ring



Installing compression rings

- Open up compression ring -2- using piston ring pliers -VAS 211 003- just far enough to be able to slide it over piston -1-.

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Installing oil scraper ring

– Note installation position of spring:

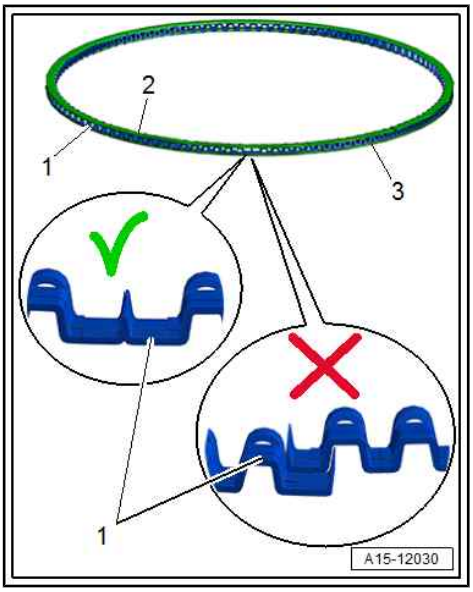
- Ends of fins -2, 3- and spring -1- must be offset from one another by at least 90°.

– 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.

- Offset top gap of 3-part oil scraper ring by 120° to next compression ring.

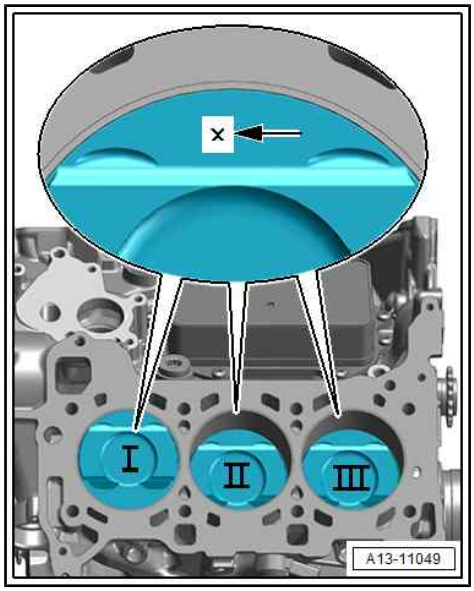


Installation position of pistons

Caution

Do not damage the coating of the piston crown.

- *If you intend to re-install used pistons, mark the cylinder number on the piston crown using paint. Do not mark piston crown by means of centre punch, notch or the like.*



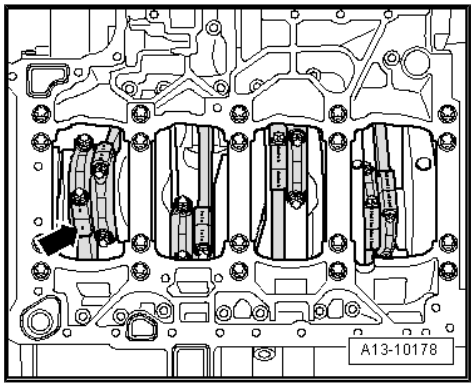
Installation position:

Pfeil - points to pulley end

x - Cylinder bank identification: L = left, R = right

Marking conrods

– Use a coloured pen to mark matching conrods and conrod bearing caps with cylinder numbers -arrow- for re-installation.



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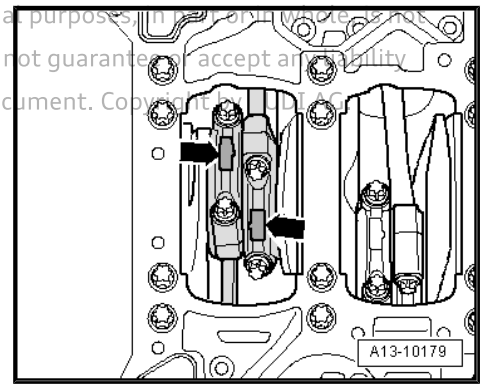
Installation position of conrods

- The cast lugs on the ground surfaces -arrows- of the conrod pairs must face each other.

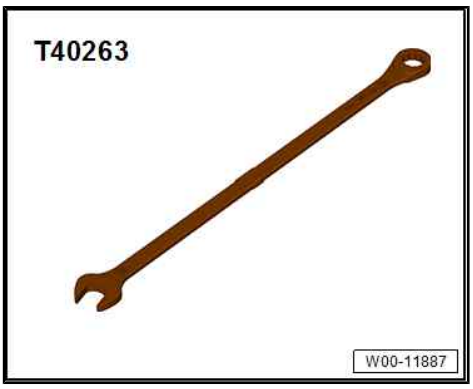


5.2 Removing and installing pistons

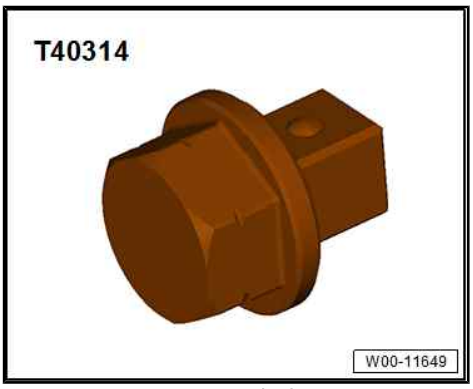
Special tools and workshop equipment required

- Pin - VW 222A-

- Wrench, 21 mm - T40263-



- Adapter - T40314-



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- Piston installation sleeve -T40369- (not illustrated)
- Piston ring pliers -VAS 211 003- (not illustrated)

Removing

- Engine secured to engine and gearbox support ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Removing and installing engine; Securing engine to engine and gearbox support .

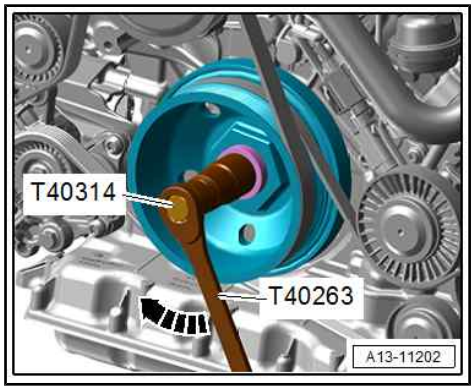
– Remove corresponding cylinder head
⇒ “3.3 Removing and installing cylinder head”, page 124 .

– Remove oil baffle plate
⇒ “1.5 Removing and installing oil baffle plate”, page 185 .

– Mark installation position and matching of:

- Conrod bearing caps to cylinders and to conrods
⇒ Fig. ““Marking conrods”“ , page 72
- Pistons to cylinders
⇒ Fig. ““Installation position of pistons”“ , page 72
- Conrods to cylinders ⇒ Item 4 (page 69)

– If necessary, unscrew camshaft clamp -T40264/3- and turn crankshaft as appropriate.



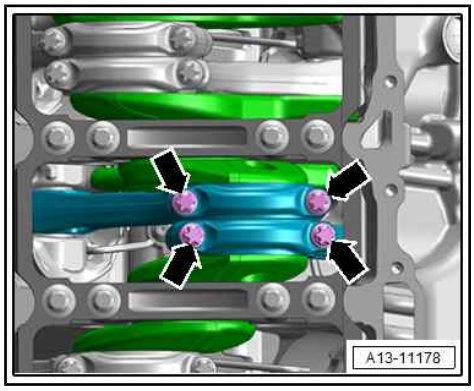
Caution

Irreparable engine damage can be caused if the camshaft timing chains slip.

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

– Turn crankshaft using wrench, 21 mm - T40263- and adapter - T40314- -arrow-, paying attention to camshaft timing chain or guiding camshaft timing chain.

– Unscrew relevant bolts -arrows- and detach conrod bearing cap.



Caution

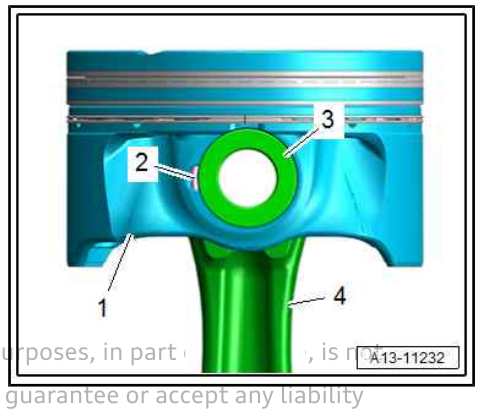
Risk of damage to oil spray jets due to deformation.

- *Never bend oil spray jets.*

– Detach piston, paying attention to oil spray jets.

– Take circlip -2- out of piston pin boss.

– Use drift - VW 222A- to drive out piston pin -3-.



Note:

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

– Detach piston -1- from conrod -4-.

Installing

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

- After removing, renew bolts tightened with specified tightening angle.

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Installation positions:

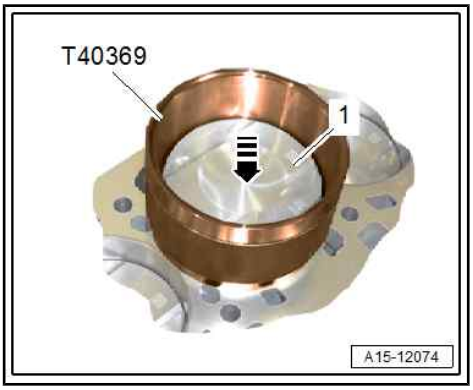
- Piston rings ⇒ Fig. ""Allocation of piston rings"" , page 71
- Pistons ⇒ Fig. ""Installation position of pistons"" , page 72
- Conrods ⇒ Fig. ""Installation position of conrods"" , page 72

– Install compression rings ⇒ Fig. ""Installing compression rings"" , page 71 .

– Install oil scraper ring ⇒ Fig. ""Installing oil scraper ring"" , page 71 .

– Oil running surfaces of bearing shells and cylinder wall.

– Carefully push piston -1- into cylinder by hand -arrow- using piston installation sleeve -T40369- .



Caution

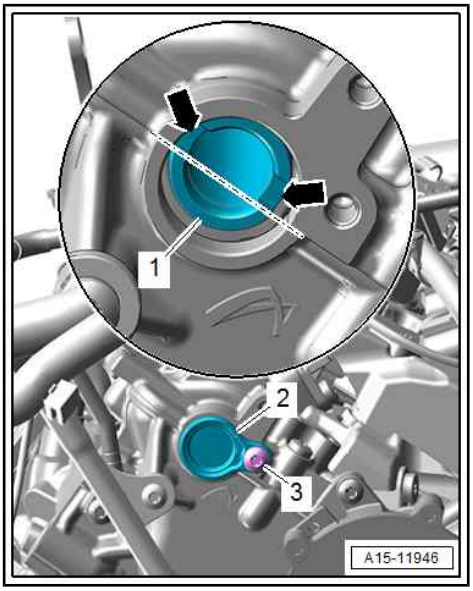
Risk of damage to oil spray jets due to deformation.

- ***Never bend oil spray jets.***

– Check that oil spray jets have adequate clearance after installing pistons.

– Install conrod bearing caps according to markings.

- If pistons are only removed on one cylinder bank, “TDC” position of crankshafts must be checked with camshaft housing fitted.



Caution

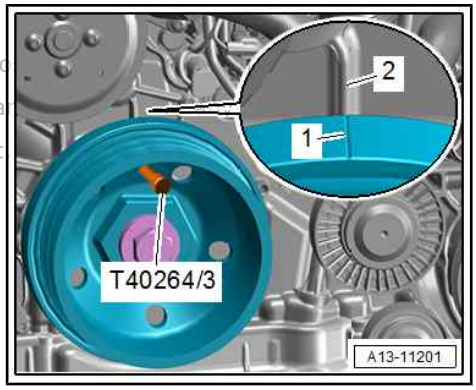
Risk of damage to engine.

- ***Camshafts must be at “TDC” position, as described below.***

– Unscrew bolt -3- and detach cover -2-.

- Exhaust camshaft -1- has an asymmetrically positioned pair of grooves -arrows-. In TDC position, the asymmetrically positioned pair of grooves must be above the imaginary horizontal centre line, as shown. (Shown on exhaust camshaft, cylinder bank 2)

- Notch -1- on vibration damper must align with cast projection -2- on sealing flange (pulley end).



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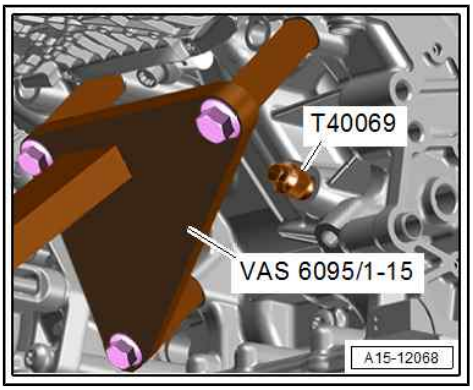
– Screw locking pin - T40069- into hole and tighten to 20 Nm. If necessary, turn crankshaft back and forth slightly. The locking pin will engage in the crank web hole.



– Install oil baffle plate
⇒ “1.5 Removing and installing oil baffle plate”, page 185 .

– Install cylinder head
⇒ “3.3.6 Installing cylinder head - vehicles with 3.0 ltr. engine”, page 137 .

Tightening torques

- ⇒ “5.1 Exploded view - pistons and conrods”, page 69

5.3 Removing and installing oil spray jets

Removing

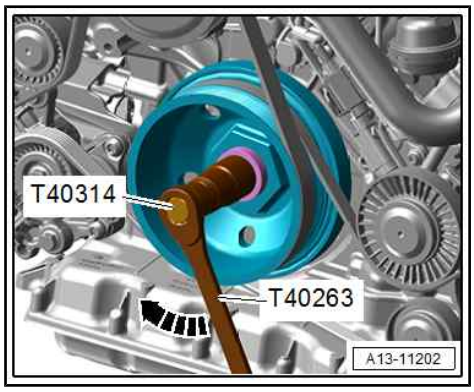
– Remove oil baffle plate
⇒ “1.5 Removing and installing oil baffle plate”, page 185 .

Caution

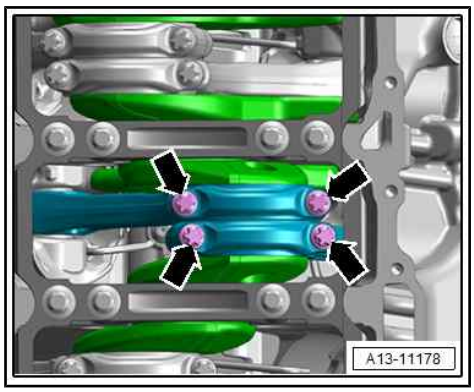
Irreparable damage can be caused if the camshaft timing chain slips.

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

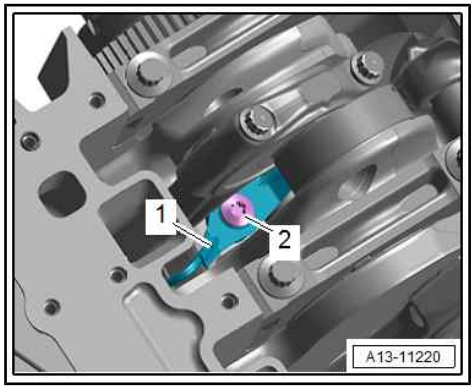
– Use wrench, 21 mm - T40263- and adapter - T40314- to turn crankshaft -arrow- until corresponding oil spray jet is accessible.



– Mark installation position and matching of conrod bearing caps to cylinder and to conrods for re-installation ⇒ page 72 .
– Unscrew relevant bolts -arrows- and detach conrod bearing cap.



– Unscrew banjo bolt -2- and remove oil spray jet -1-.
– Repeat procedure for each oil spray jet if necessary.



Installing

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

- Renew banjo bolts after removal.
- After removing, renew bolts tightened with specified tightening angle.
- Do not bend oil spray jets.
- Check clearance of oil spray jets.

– Install oil baffle plate
⇒ “1.5 Removing and installing oil baffle plate”, page 185 .

Tightening torques

- ⇒ “5.1 Exploded view - pistons and conrods”, page 69

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5.4 Checking pistons and cylinder bores

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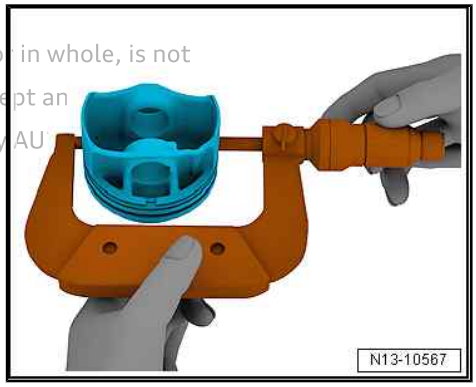
Checking piston

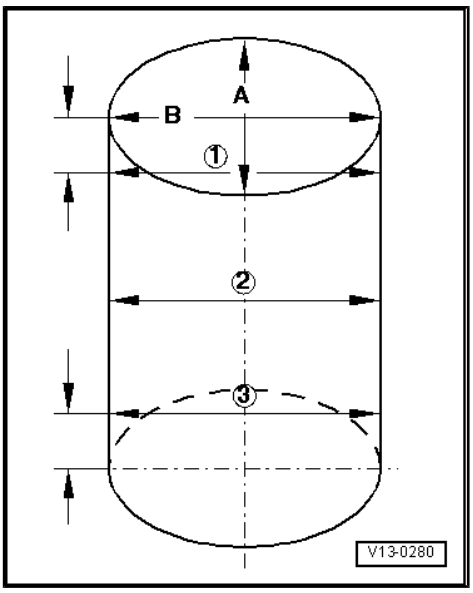


– Using a micrometer (75 ... 100 mm), measure approx. 10 mm from the lower edge, perpendicular to the piston pin axis.

- Maximum deviation from nominal dimension: 0.017 mm.

Piston ∅ mm		
	2.9 ltr.	**3.0l**
Nominal dimension	84.47[1)]	84.45[1)]
• [1)] Dimensions including coating (thickness 0.018 mm). The coating will wear down in service.		

Measuring cylinder bore

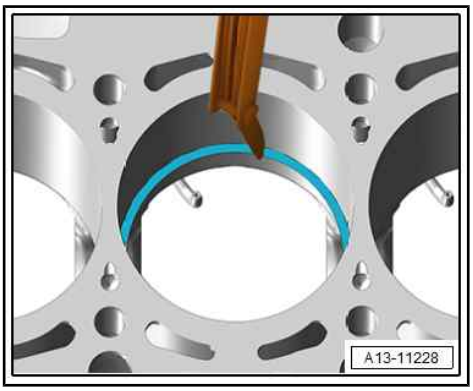


– Use a cylinder gauge - VAS 6078- to take measurements at 3 points in transverse direction -A- and in longitudinal direction -B-.

- Maximum deviation from nominal dimension: 0.08 mm.

Cylinder bore ∅ mm	
Nominal dimension	84.510 + 0.005 [1)]
• [1)] Measure at 50 mm into cylinder bore.	

Measuring piston ring gap



– Insert ring at right angle to cylinder wall from above and push down into lower cylinder opening approx. 15 mm from bottom of cylinder.

– To do so, use a piston without rings.

2.9 ltr. engine

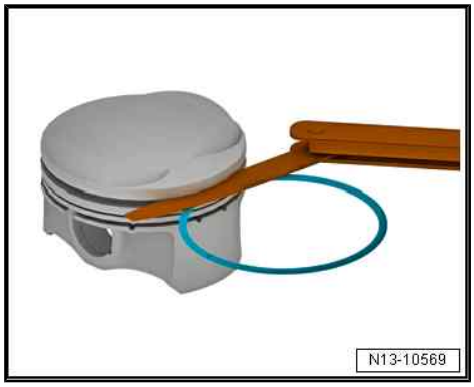
Piston ring	**new mm**	**Wear limit mm**
1st compression ring	0.20 … 0.35	0.45
2nd compression ring	0.50 … 0.70	0.80
Oil scraper ring (3 parts)	Cannot be measured	

3.0 ltr. engine

Piston ring	**new mm**	**Wear limit mm**
1st compression ring	0.15 … 0.25	0.35
2nd compression ring	0.30 … 0.45	0.55
Oil scraper ring (3 parts)	Cannot be measured	

Measuring ring-to-groove clearance

– Clean groove in piston before checking clearance.



2.9 ltr. engine

Piston ring	new mm	Wear limit mm
1st compression ring	0.03 … 0.07	0.15
2nd compression ring	0.015 … 0.060	0.15
Oil scraper ring (3 parts)	Cannot be measured	

3.0 ltr. engine

Piston ring	new mm	Wear limit mm
1st compression ring	0.03 … 0.08	0.15
2nd compression ring	0.02 … 0.07	0.15
Oil scraper ring (3 parts)	Cannot be measured	

5.5 Checking radial clearance of conrod bearings

Special tools and workshop equipment required

♦ Plastigauge

Procedure

• Use old bolts when measuring radial clearance.

– 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 caps and tighten through specified angle ⇒ Item 1 (page 69) without rotating crankshaft.

– Remove conrod bearing cap again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

• New: 0.027 ... 0.072 mm.

• Wear limit: 0.120 mm.

– When carrying out final assembly, renew bolts.

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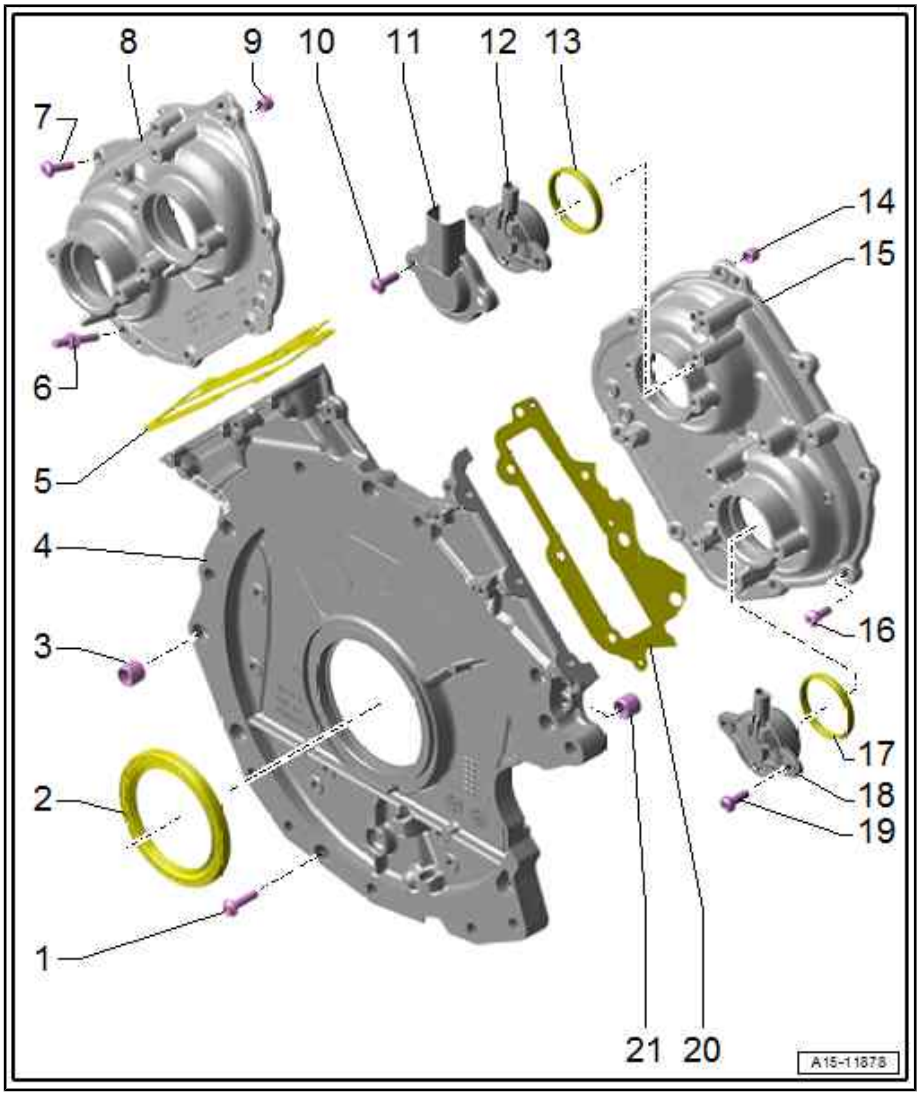
15 – Cylinder head, valve gear

1 Timing chain cover

⇒ “1.1 Exploded view - timing chain cover”, page 79

⇒ “1.2 Removing and installing timing chain cover”, page 81

1.1 Exploded view - timing chain cover



1 - Bolt

- ❑ Renew after removing
- ❑ Tightening torques and sequence ⇒ Fig. ““Timing chain cover (bottom) - tightening torques and tightening sequence”“ , page 81

2 - Oil seal

- ❑ For crankshaft (gearbox end)
- ❑ Renewing ⇒ “2.3 Renewing crankshaft oil seal (gearbox end)”, page 48

3 - Dowel sleeve

- ❑ 2x

4 - Timing chain cover (bottom)

- ❑ Removing and installing ⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 84

5 - Cylinder head gasket, bank 2 (left-side)

6 - Centre hex stud

- ❑ Tightening torques and sequence ⇒ Fig. ““Timing chain cover for cylinder bank 2 (left-side) - tightening torques and sequence”“ , page 80

7 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ““Timing chain cover for cylinder bank 2 (left-side) - tightening torques and sequence”“ , page 80

8 - Timing chain cover (top) for cylinder bank 2 (left-side)

- ❑ Removing and installing ⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81

9 - Dowel sleeve

- ❑ 2x

10 - Bolt

- ❑ 9 Nm

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11 - Heat shield

12 - Exhaust camshaft control valve 1 - N318-

- ❑ Cylinder bank 2 (left-side): exhaust camshaft control valve 2 - N319-
- ❑ Removing and installing ⇒ “4.6 Removing and installing camshaft control valve 1 N205 ”, page 157

13 - Seal

- ❑ Renew after removing

14 - Dowel sleeve

- ❑ 2x

15 - Timing chain cover (top) for cylinder bank 1 (right-side)

- ❑ Removing and installing ⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81

16 - Bolt

- ❑ Tightening torques and sequence
  ⇒ Fig. ““Timing chain cover for cylinder bank 1 (right-side) - tightening torques and sequence”“ , page 80

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17 - Seal

- ❑ Renew after removing

18 - Camshaft control valve 1 - N205-

- ❑ Cylinder bank 2 (left-side): camshaft control valve 2 - N208-
- ❑ Removing and installing ⇒ “4.6 Removing and installing camshaft control valve 1 N205 ”, page 157

19 - Bolt

- ❑ 9 Nm

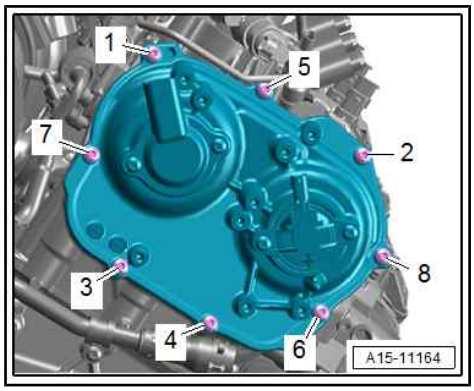
20 - Cylinder head gasket, bank 1 (right-side)

21 - Dowel sleeve

- ❑ 2x

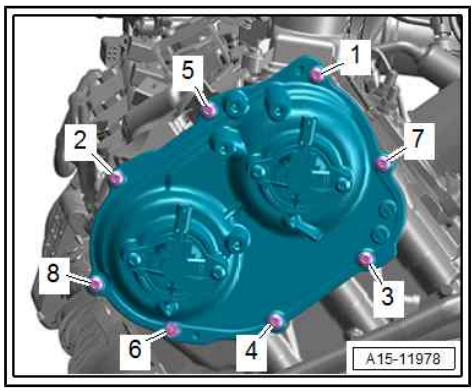
Timing chain cover for cylinder bank 1 (right-side) - tightening torques and sequence

– Tighten bolts -1 ... 8- to 9 Nm in the sequence shown.



Timing chain cover for cylinder bank 2 (left-side) - tightening torques and sequence

– Tighten bolts -1 ... 8- to 9 Nm in the sequence shown.

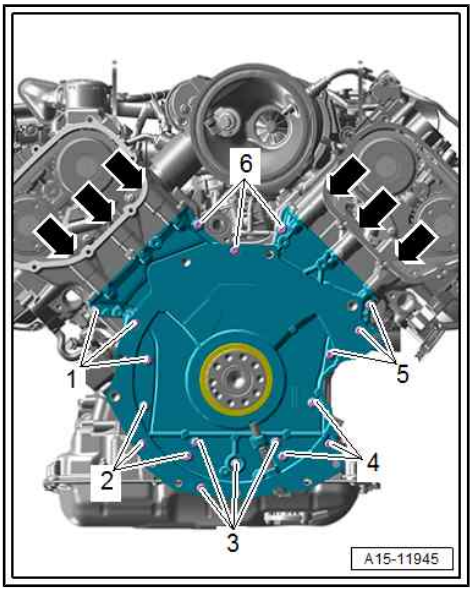


Timing chain cover (bottom) - tightening torques and tightening sequence

- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-arrows-	3 Nm
2.	-1 … 6-	3 Nm
3.	-arrows-	8 Nm
4.	-1 … 6-	Turn 90° further
5.	-arrows-	Turn 90° further



1.2 Removing and installing timing chain cover

⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81

⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 84

1.2.1 Removing and installing timing chain covers (top)

Special tools and workshop equipment required

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

Removing

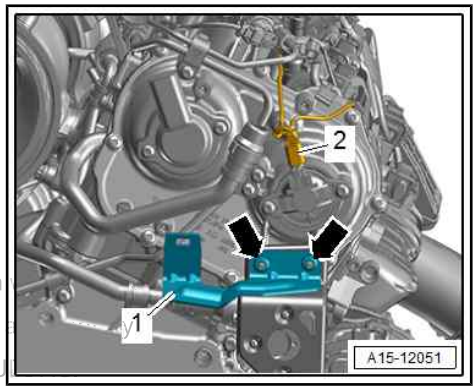
- Reinstall heat insulation sleeves in the same locations when installing.

– Remove high-pressure pipe (rear)
⇒ “7.3 Removing and installing high-pressure pipe”, page 315 .

Cylinder bank 1 (right-side):

– If fitted, remove coolant circulation pump - V50- ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing electric coolant pump .

– Unplug electrical connector -2- for camshaft control valve 1 - N205- and move electrical wiring clear.



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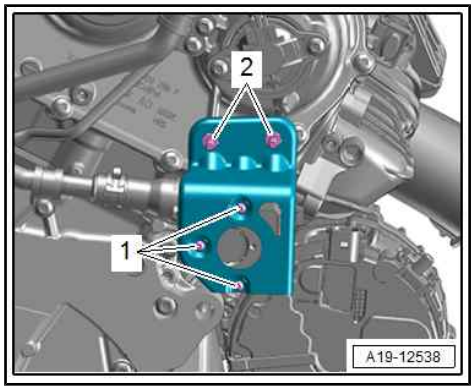
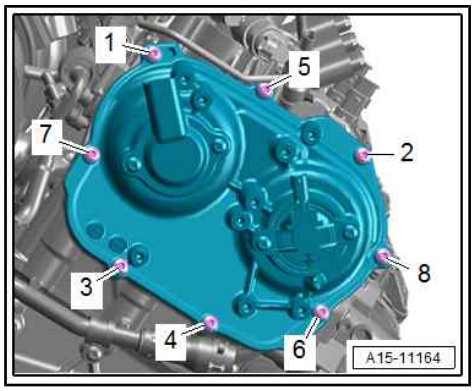
– Remove centre hex studs -2- and bolts -1-, then detach bracket for continued coolant circulation pump - V51- .

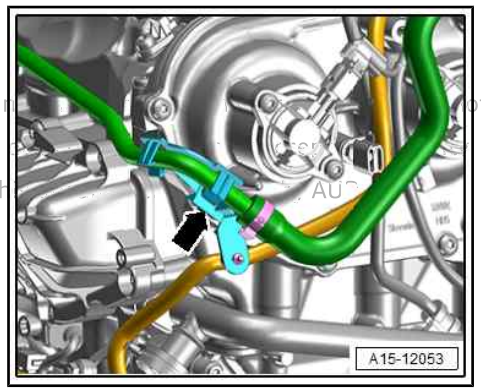


– Slacken and remove bolts in the sequence: -8 ... 1-.



Cylinder bank 2 (left-side):

– If fitted, unclip bracket -arrow- from timing chain cover and press it to side with vacuum hose still attached.



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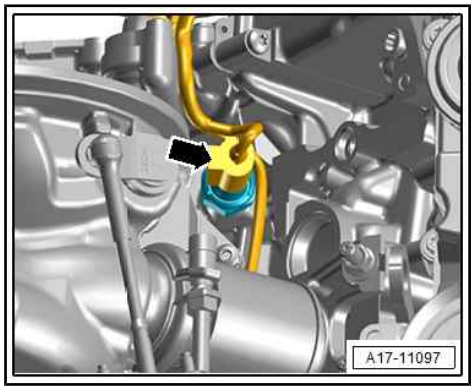
– Open heat insulation sleeve and unplug electrical connector -arrow- on oil pressure switch - F22- . (Shown on vehicle with 3.0 ltr. engine.)



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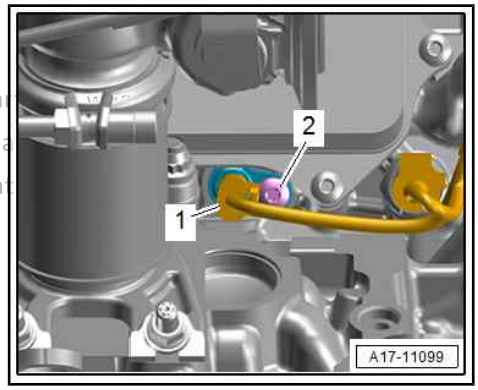
– Unplug electrical connector -1- at oil temperature sender - G8- . (Shown on vehicle with 3.0 ltr. engine.)

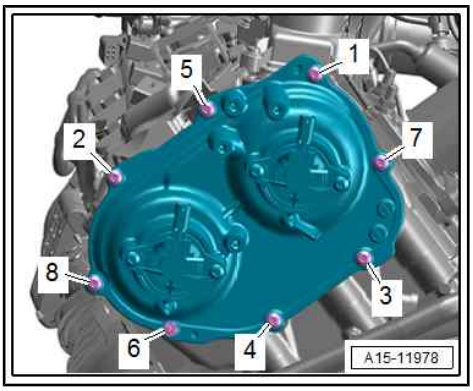
– Move wiring harness clear at timing chain cover.



– Slacken and remove bolts in the sequence: -8 ... 1-.

Both sides (continued):

– Carefully release and detach timing chain cover from bonded joints.



Caution

Risk of irreparable damage to engine.

- *Block off the opening in the valve timing housing with a clean cloth to prevent small items from dropping into the engine when the timing chain cover (top) is removed.*

Installing

- After removing, renew bolts tightened with specified tightening angle.
- Renew O-rings after removing.
- Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .

– Remove old sealant from sealing surfaces.

Caution

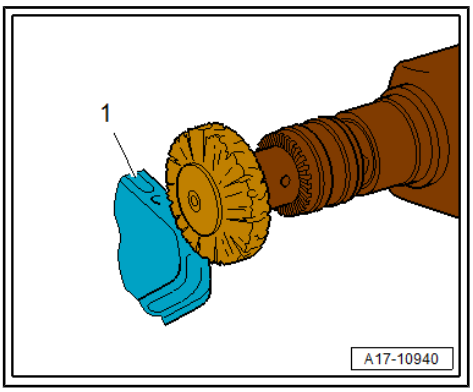
Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*

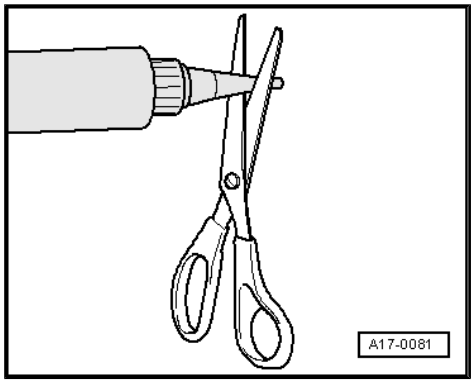


– Remove remaining sealant on timing chain cover -1- and cylinder head using rotating plastic brush or similar.

– Clean surfaces; they must be free of oil and grease.

- Note expiry date of sealant.

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



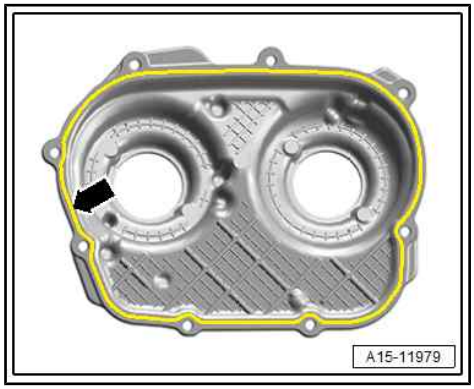
Caution

Make sure lubrication system is not clogged by excess sealant.

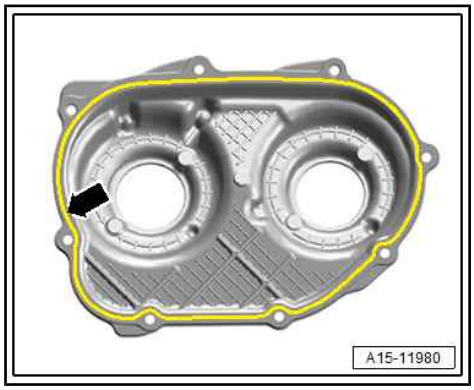
- *The sealant bead must not be thicker than specified.*

- Width of sealant bead: 3.0 mm.

– Apply sealant bead -arrow- onto clean sealing surface of timing chain cover for cylinder bank 1 (right-side).



– Apply sealant bead -arrow- onto clean sealing surface of timing chain cover for cylinder bank 2 (left-side).



- Install timing chain cover within 5 minutes of applying sealant.

– Slide timing chain cover carefully onto dowel sleeves on cylinder head but do not press sealant bead on yet.

- Sealant must not be allowed to get into threaded holes.

– First, screw all bolts for timing chain cover in by hand and then tighten.

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

– Install high-pressure pipe (rear)
⇒ “7.3 Removing and installing high-pressure pipe”, page 315 .

Tightening torques

- ⇒ Fig. ““Timing chain cover for cylinder bank 1 (right-side) - tightening torques and sequence”“ , page 80
- ⇒ Fig. ““Timing chain cover for cylinder bank 2 (left-side) - tightening torques and sequence”“ , page 80
- ⇒ “2.2 Exploded view - electric coolant pump”, page 216

1.2.2 Removing and installing timing chain cover (bottom)

Special tools and workshop equipment required

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- Socket Torx T30 - T10405-

- Bolt, M6x20 (3x)
- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue

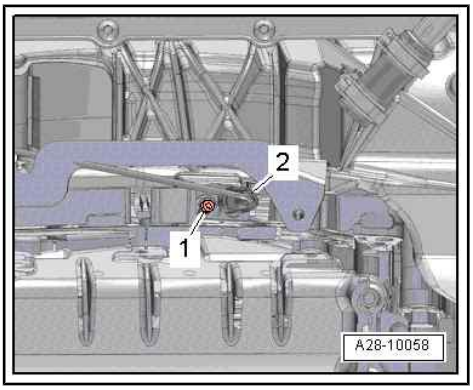
Removing

- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

– Remove drive plate
⇒ “2.2 Removing and installing drive plate”, page 47 .

– Remove timing chain covers (top)
⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81 .

– Unplug electrical connector -2- for engine speed sender - G28- .



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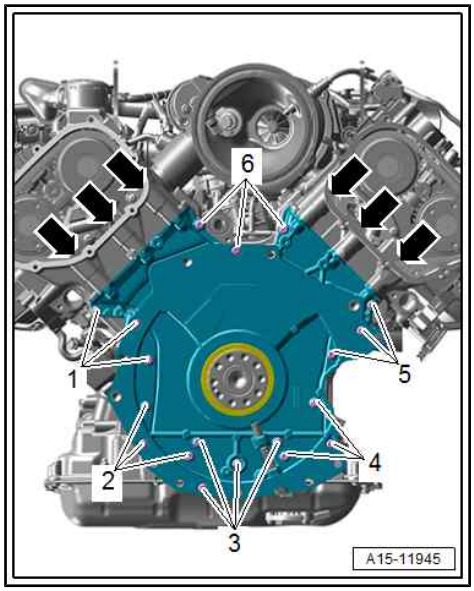
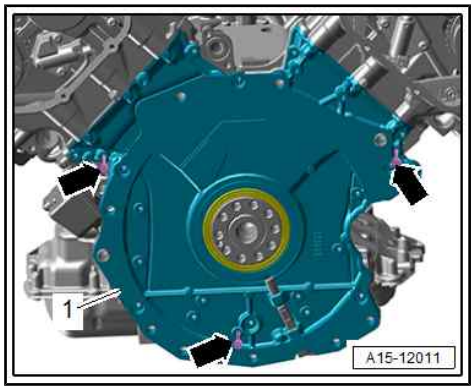
– Remove bolts -arrows- and -1 … 6-.



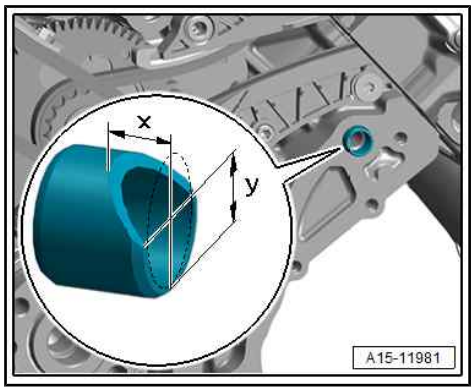
– To loosen cover (bottom) -1- for timing chains, tighten 3 bolts M6x20 -arrows- as far as stop.
– Tighten bolts one after the other by $^1/_2$ each until timing chain cover (bottom) is loosened.
– Remove bolts again, detach timing chain cover (bottom) and press out crankshaft oil seal (gearbox end).



Installing

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

- After removing, renew bolts tightened with specified tightening angle.
– Pull dowel sleeve at top right out of cylinder block.
– Bevel the dowel sleeve with a file, as shown.
- Dimension -x- = 6.5 mm
- Dimension -y- = 8 mm
– Fit dowel sleeve on cylinder block in such a way that the bevelled side points upwards. Bevelling the dowel sleeve makes it easier to fit the timing chain cover (bottom) with the cylinder head installed.



Caution

Protect lubrication system against contamination.

- ***Cover exposed parts of the engine.***

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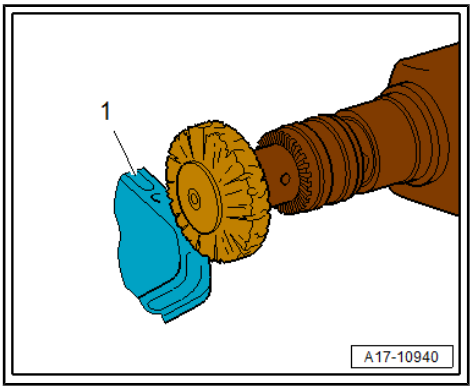
WARNING

Risk of eye injury.

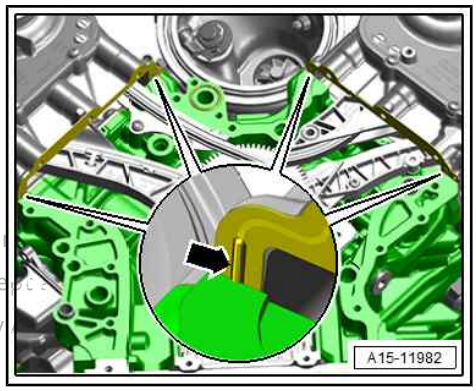
- *Put on safety goggles.*



– Remove remaining sealant on timing chain cover (bottom) -1-, cylinder block and cylinder head using rotating plastic brush or similar.

– Clean surfaces; they must be free of oil and grease.

– The old sealing compound must not be removed from the groove -arrow- in the cylinder head gaskets. With the cylinder head installed, the groove is only half visible.



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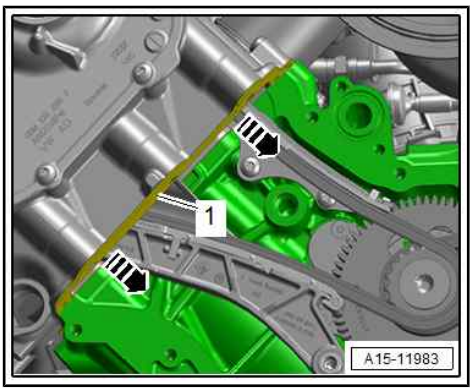
Caution

Avoid damage to cylinder head gasket.

- *Only bend the ends of the cylinder head gaskets slightly and do not kink.*



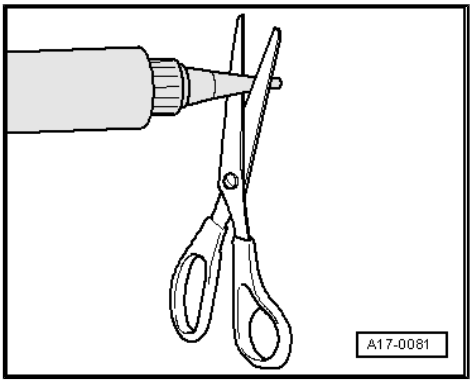
• The cylinder head gasket must be renewed if it is bent or kinked.

– Carefully bend the cylinder head gasket -1- down very slightly -arrows- on both sides, just far enough to be able to clean the upper sealing surface between the gasket and the cylinder head.

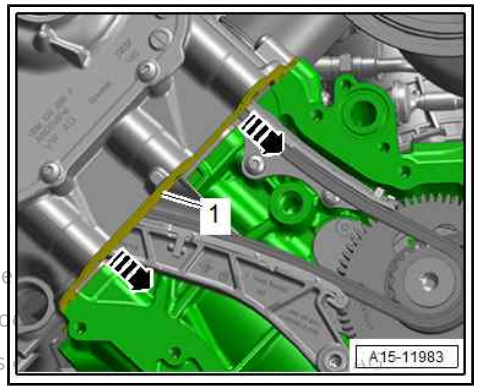
– Clean cylinder head gaskets (top and bottom); they must be free of oil and grease.

• Note expiry date of sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.5 mm).



– Apply a small amount of sealant to sealing surfaces of cylinder head gasket -1- (top and bottom) on both sides. To do so, bend cylinder head gasket down again very slightly -arrows-.
– Use a flat object (e.g. a feeler gauge) to apply sealant to the area between cylinder head and gasket.



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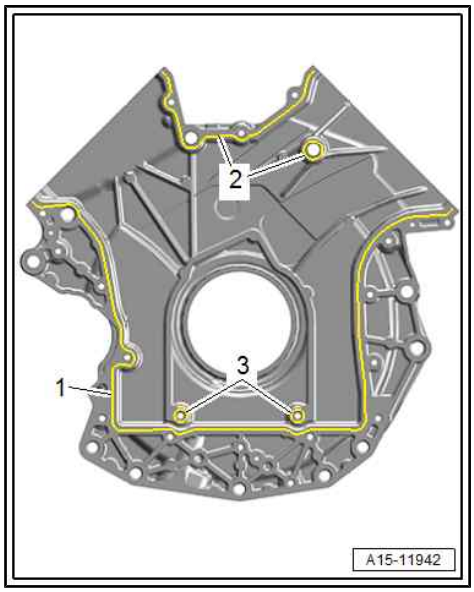
Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant beads -1, 2, 3- onto the clean sealing surfaces of the timing chain cover (bottom).
• Width of sealant beads: 3.0 mm.
• Install timing chain cover within 5 minutes of applying sealant.
• Take care not to damage the cylinder head gaskets when fitting the timing chain cover (bottom).
– Fit timing chain cover (bottom), guiding it towards sealing surface on cylinder block and cylinder head at an angle from below, but do not press sealant bead on yet.
• Sealant must not be allowed to get into threaded holes.
– First, screw all bolts in by hand and then tighten.

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

– Install crankshaft oil seal (gearbox end)
⇒ “2.3 Renewing crankshaft oil seal (gearbox end)”, page 48 .
– Install timing chain covers (top)
⇒ “1.2 Removing and installing timing chain cover”, page 81 .
– Install drive plate
⇒ “2.2 Removing and installing drive plate”, page 47 .

Tightening torques

◆ ⇒ Fig. ““Timing chain cover (bottom) - tightening torques and tightening sequence”“ , page 81

2 Chain drive

⇒ “2.1 Exploded view - camshaft timing chains”, page 89

⇒ “2.2 Exploded view - drive chain for oil pump”, page 92

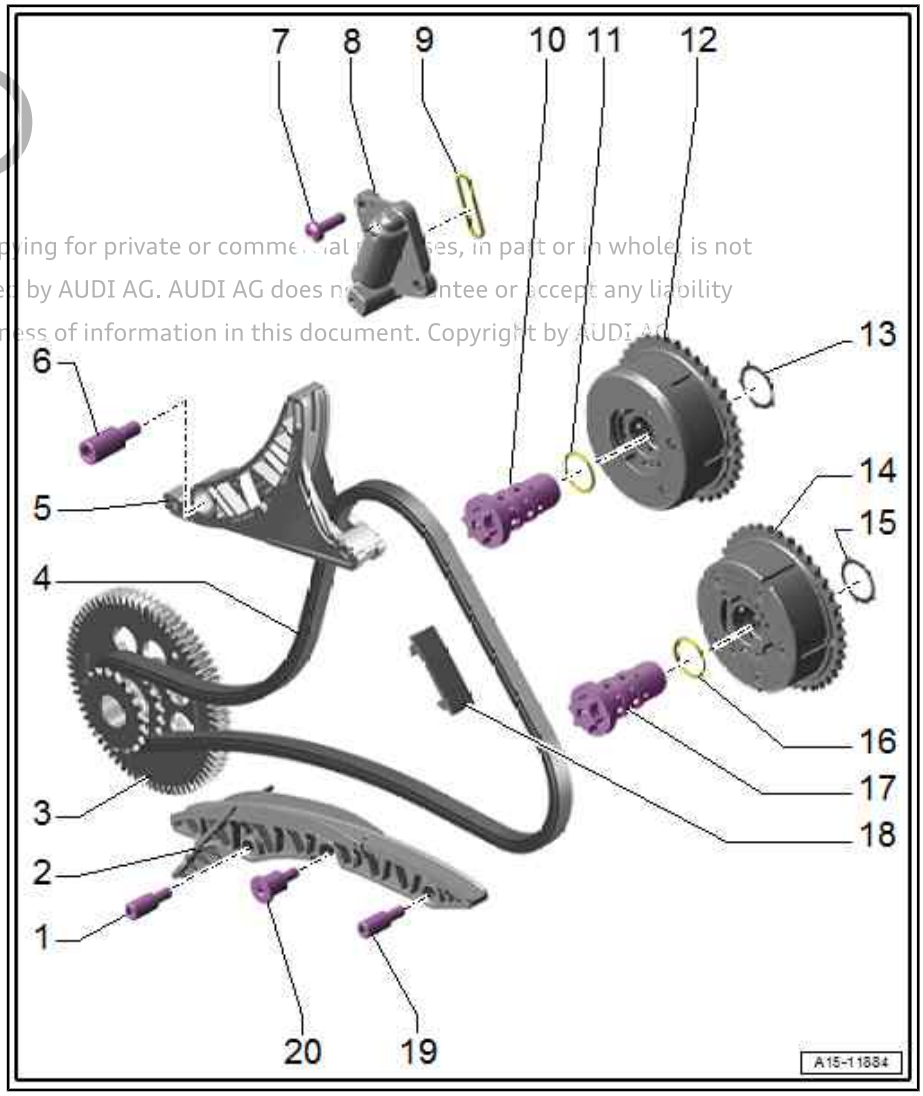
⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93

⇒ “2.4 Removing and installing camshaft timing chain”, page 113

⇒ “2.5 Removing and installing chain tensioner”, page 114

2.1 Exploded view - camshaft timing chains

Camshaft timing chain for cylinder bank 1 (right-side)



1 - Guide pin
- ❑ Renew after removing
- ❑ 5 Nm +45°

2 - Guide rail

3 - Gear
- ❑ With sprockets for camshaft timing chains

4 - Camshaft timing chain
- ❑ Removing from camshafts ⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93
- ❑ Do not separate from tensioning rail ⇒ Item 5 (page 89)
- ❑ Removing and installing ⇒ “2.4 Removing and installing camshaft timing chain”, page 113

5 - Tensioning rail
- ❑ Do not separate from camshaft timing chain ⇒ Item 4 (page 89)

6 - Pivot pin
- ❑ 23 Nm

7 - Bolt
- ❑ 9 Nm

8 - Chain tensioner
- ❑ Removing and installing ⇒ “2.5 Removing and installing chain tensioner”, page 114

9 - Seal
- ❑ Renew after removing

10 - Timing valve
- ❑ For camshaft adjuster
- ❑ Tightening torques and sequence ⇒ page 99

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11 - O-ring

- ❑ Renew after removing

12 - Camshaft adjuster

- ❑ For exhaust camshaft
- ❑ Allocation ⇒ Electronic parts catalogue
- ❑ After removing, renew friction washer (diamond-coated washer) ⇒ Item 13 (page 90)
- ❑ Removing and installing ⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93

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13 - Friction washer (diamond-coated washer)

- ❑ To ensure secure fit between camshaft adjuster and end of camshaft
- ❑ Renew after removing
- ❑ Bring new friction washer (diamond-coated washer) into installation position carefully without bending it

14 - Camshaft adjuster

- ❑ For inlet camshaft
- ❑ Allocation ⇒ Electronic parts catalogue
- ❑ After removing, renew friction washer (diamond-coated washer) ⇒ Item 15 (page 90)
- ❑ Removing and installing ⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93

15 - Friction washer (diamond-coated washer)

- ❑ To ensure secure fit between camshaft adjuster and end of camshaft
- ❑ Renew after removing
- ❑ Bring new friction washer (diamond-coated washer) into installation position carefully without bending it

16 - O-ring

- ❑ Renew after removing

17 - Timing valve

- ❑ For camshaft adjuster
- ❑ Tightening torques and sequence ⇒ page 99

18 - Slide

- ❑ Renew after removing

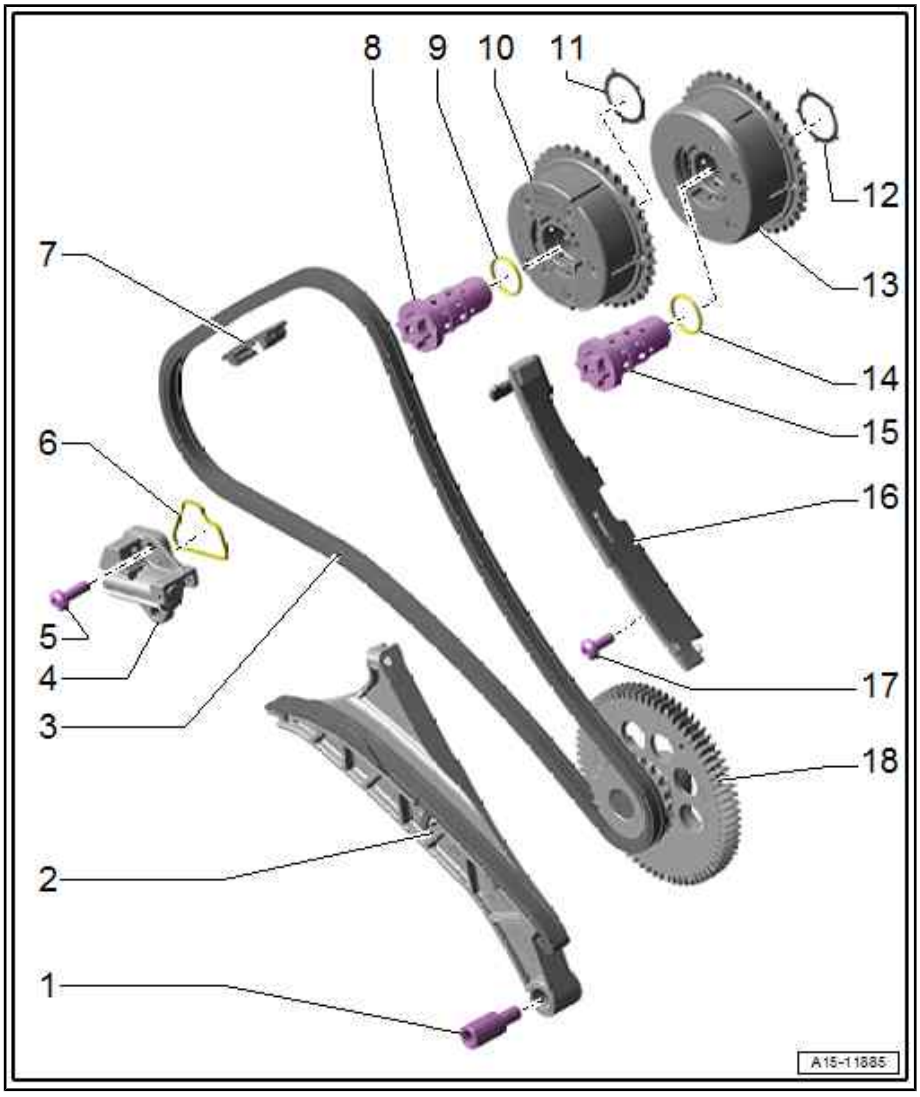
19 - Guide pin

- ❑ Renew after removing
- ❑ 5 Nm +45°

20 - Guide pin

- ❑ Renew after removing
- ❑ 5 Nm +45°

Camshaft timing chain for cylinder bank 2 (left-side)



1 - Pivot pin

- ❑ 23 Nm

2 - Tensioning rail

3 - Camshaft timing chain

- ❑ Mark direction of rotation for re-installation with a paint marker
- ❑ Removing from camshafts ⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93
- ❑ Removing and installing ⇒ “2.4 Removing and installing camshaft timing chain”, page 113

4 - Chain tensioner

- ❑ Removing and installing ⇒ “2.5 Removing and installing chain tensioner”, page 114

5 - Bolt

- ❑ 9 Nm

6 - Gasket

- ❑ Renew after removing

7 - Slide

- ❑ Renew after removing

8 - Timing valve

- ❑ For camshaft adjuster
- ❑ Tightening torques and sequence ⇒ page 99

9 - O-ring

- ❑ Renew after removing

10 - Camshaft adjuster

- ❑ For inlet camshaft
- ❑ Allocation ⇒ Electronic parts catalogue
- ❑ After removing, renew friction washer (diamond-coated washer) ⇒ Item 11 (page 91)
- ❑ Removing and installing ⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93

11 - Friction washer (diamond-coated washer)

- ❑ To ensure secure fit between camshaft adjuster and end of camshaft
- ❑ Renew after removing
- ❑ Bring new friction washer (diamond-coated washer) into installation position carefully without bending it

12 - Friction washer (diamond-coated washer)

- ❑ To ensure secure fit between camshaft adjuster and end of camshaft
- ❑ Renew after removing
- ❑ Bring new friction washer (diamond-coated washer) into installation position carefully without bending it

13 - Camshaft adjuster

- ❑ For exhaust camshaft
- ❑ Allocation ⇒ Electronic parts catalogue
- ❑ After removing, renew friction washer (diamond-coated washer) ⇒ Item 12 (page 91)
- ❑ Removing and installing ⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93

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14 - O-ring
- ❑ Renew after removing

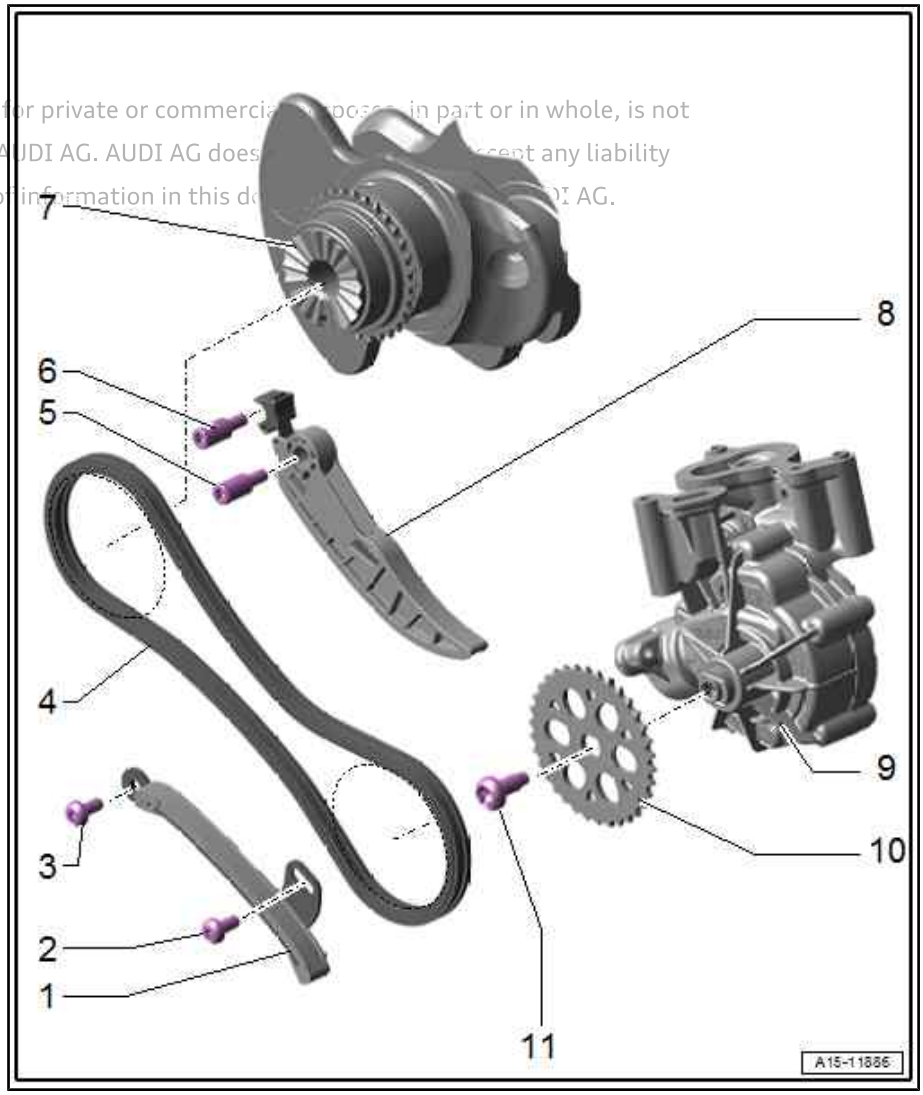
15 - Timing valve
- ❑ For camshaft adjuster
- ❑ Tightening torques and sequence ⇒ page 99

16 - Guide rail

17 - Bolt
- ❑ 9 Nm

18 - Gear
- ❑ With sprockets for camshaft timing chains

2.2 Exploded view - drive chain for oil pump



1 - Guide rail

2 - Bolt
- ❑ 9 Nm

3 - Bolt
- ❑ 9 Nm

4 - Drive chain
- ❑ For oil pump

5 - Guide pin
- ❑ Renew after removing
- ❑ 5 Nm +45°

6 - Guide pin
- ❑ Renew after removing
- ❑ 5 Nm +45°

7 - Crankshaft
- ❑ With drive chain sprocket for oil pump

8 - Tensioning rail

9 - Oil pump
- ❑ Removing and installing ⇒ “1.6 Removing and installing oil pump”, page 187

10 - Chain sprocket
- ❑ For oil pump

11 - Bolt
- ❑ Tightening torque ⇒ Item 6 (page 172)

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2.3 Removing camshaft timing chain from camshafts

⇒ "2.3.1 Removing camshaft timing chain from camshafts - cylinder bank 1 (right-side)", page 93

⇒ "2.3.2 Removing camshaft timing chain from camshafts - cylinder bank 2 (left-side)", page 102

2.3.1 Removing camshaft timing chain from camshafts - cylinder bank 1 (right-side)

In the following procedure the camshaft timing chain remains on the engine.

Special tools and workshop equipment required

- Torque wrench - V.A.G 1331-

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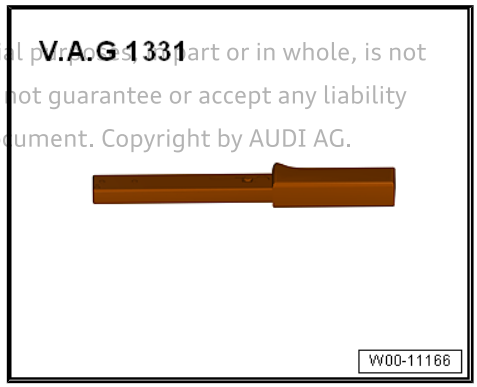
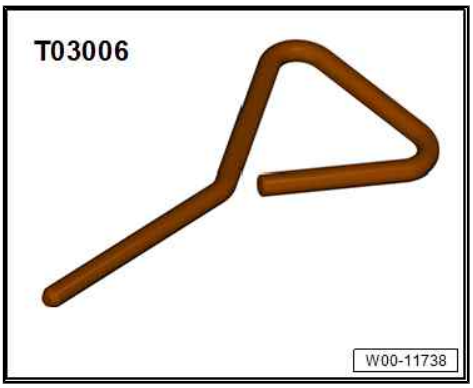
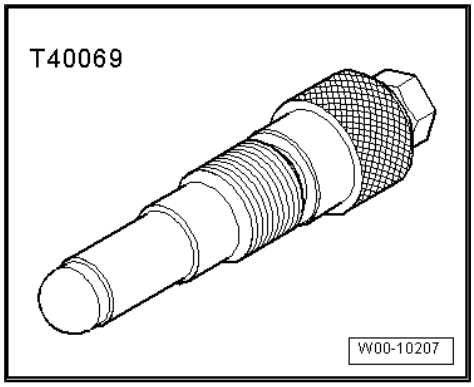


- Torque wrench - VAS 6583-

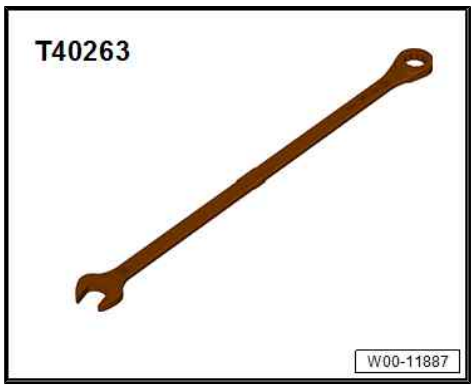
- Locking pin - T03006-



- Locking pin - T40069- (with engine removed)



- Wrench, 21 mm - T40263-



- Camshaft clamp - T40264/3-

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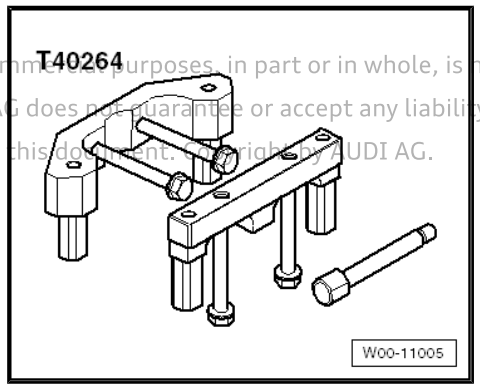
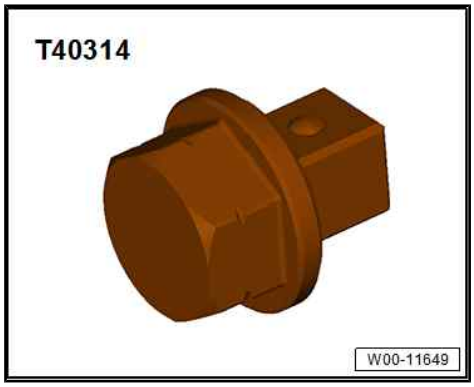
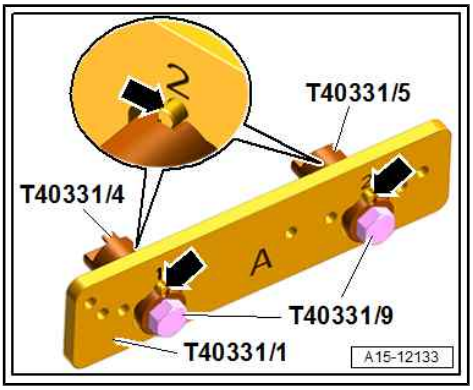


- Adapter - T40314-



- Camshaft clamp - T40331- (not illustrated)
- Socket E24 - T90000- (not illustrated)
- Counterhold tool - T90001- (not illustrated)
- Counterhold tool - T90002- (not illustrated)
- Socket -VAS 261 001- (not illustrated)

Preparing camshaft clamp - T40331-



- Lettering “A” on camshaft clamp - T40331/1- faces forwards.
- Camshaft clamps - T40331/4- and -T40331/5- and washers on bolts -T40331/9- must be positioned using dowel pins -arrows-.

– Tighten bolts hand tight.

Removing

For the preparatory work required before removing camshaft timing chain from camshafts (with engine installed), refer to ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Chain drive; Removing camshaft timing chain from camshafts .

Caution

Risk of damage to valves and piston crowns.

- ***The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed.***

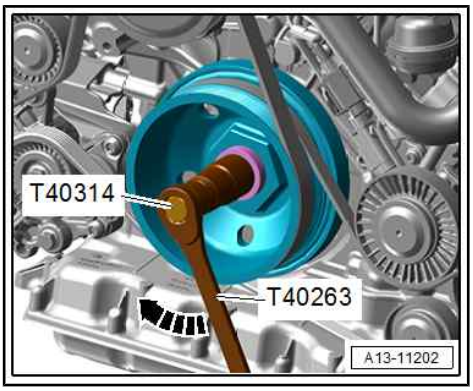
– Remove timing chain cover (top) for cylinder bank 1 (right-side)
⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81 .

– Remove air pipe (top) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe .

Caution

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

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



– Use wrench, 21 mm - T40263- and adapter - T40314- to turn crankshaft -arrow- until vibration damper is at “TDC” position. (Shown on vehicle with 3.0 ltr. engine.)

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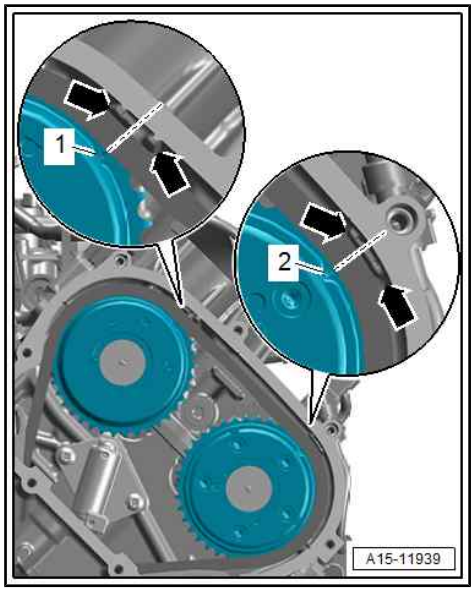
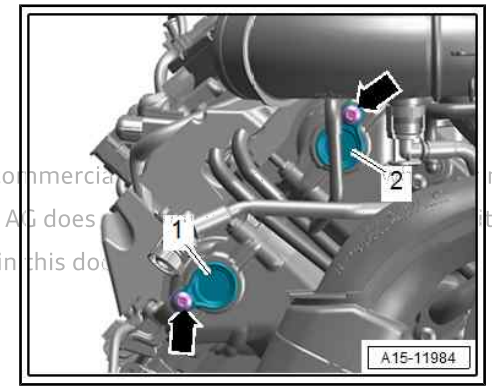
- The marking -1-/-2- on the camshaft adjusters must be opposite the corresponding projections -arrows- on the camshaft housing. Turn crankshaft one turn if necessary.



– Unscrew bolts -arrows- and remove sealing plugs -1, 2-.



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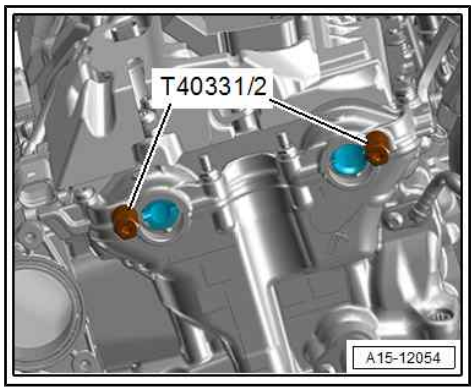
– Tighten adapter -T40331/2- on camshaft housing to 9 Nm.

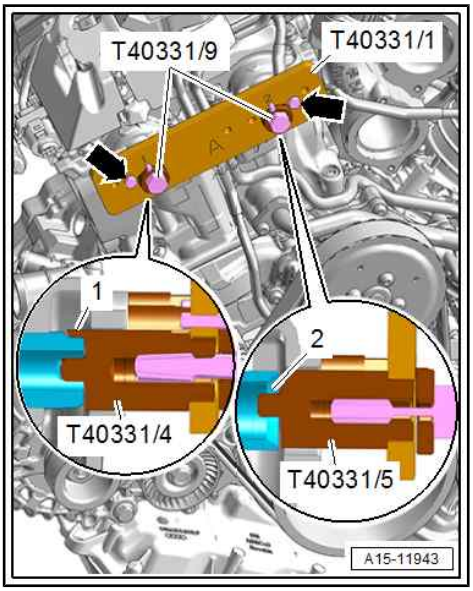


- It should be possible to insert the camshaft clamp -T40331/1- easily.
- Do not knock camshaft clamp into place with any kind of tool.

– Insert camshaft clamp -T40331/1- prepared previously into camshafts as far as stop. Turn crankshaft slightly if necessary.

- Camshaft clamp -T40331/4- engages in flat surface -1- on inlet camshaft, as shown.
- Camshaft clamp -T40331/5- engages in asymmetrically positioned groove (top) -2- on exhaust camshaft, as shown.

– Tighten bolts -arrows- to 9 Nm.



Note:

Counterhold tool - T90001- can only be fitted in one position; notch -1- and marking -2- on camshaft adjuster must align.

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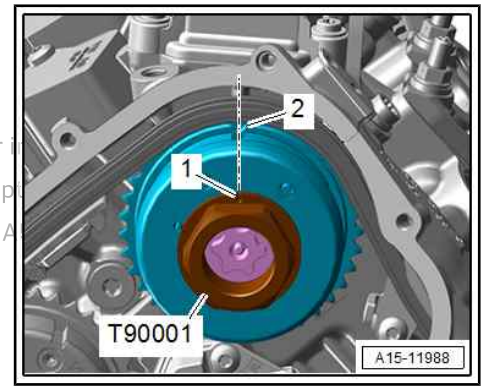
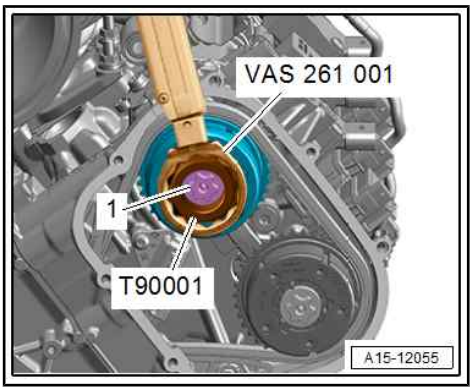


Caution

Risk of damage to camshafts.

- ***Do NOT use camshaft clamps -T40331- to counterhold when loosening timing valves for camshaft adjusters.***



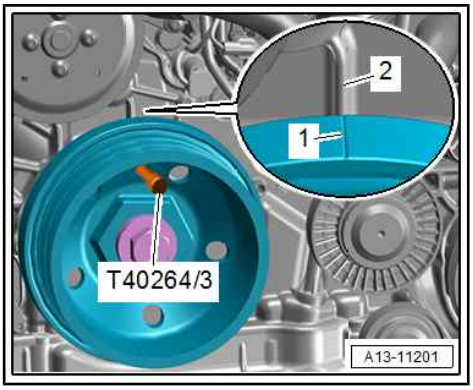
– Fit socket -VAS 261 001- with counterhold tool - T90001- to counterhold on corresponding camshaft adjuster and loosen timing valve -1- with socket E24 - T90000- .

– Mark position of camshaft adjusters in relation to camshafts with paint for re-installation.

- Notch -1- on vibration damper must align with cast projection -2- on sealing flange (pulley end).

Procedure if engine has NOT been removed during preparatory work:

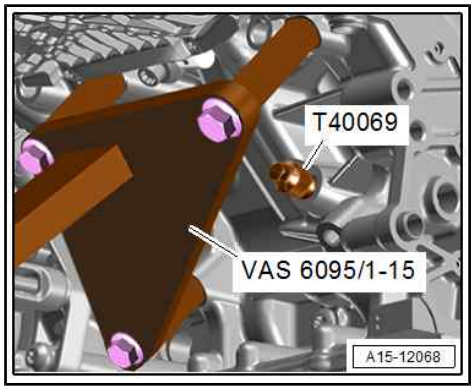
– Screw camshaft clamp - T40264/3- through bore in vibration damper into sealing flange (pulley end) by hand until it makes contact. If necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



Procedure if engine has been removed during preparatory work:

– If still fitted, unscrew plug.

– Screw locking pin - T40069- into hole and tighten to 20 Nm. If necessary, turn crankshaft back and forth slightly.

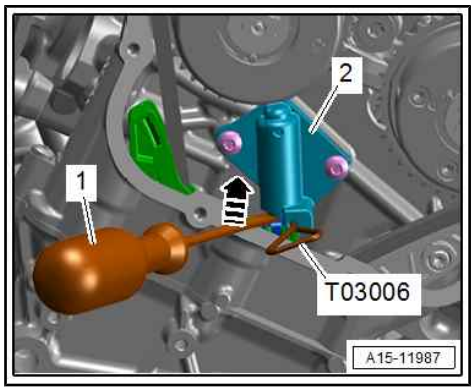


Continued:

– Press piston of chain tensioner -2- back as far as stop -arrow- using a screwdriver -1-. Then lock chain tensioner by inserting locking pin - T03006- .

Note:

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



– Unscrew timing valves -1, 2- and detach both camshaft adjusters.

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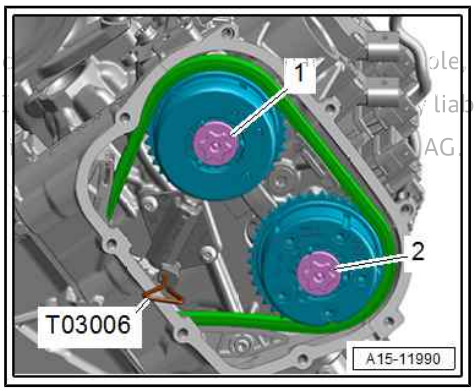
Installing

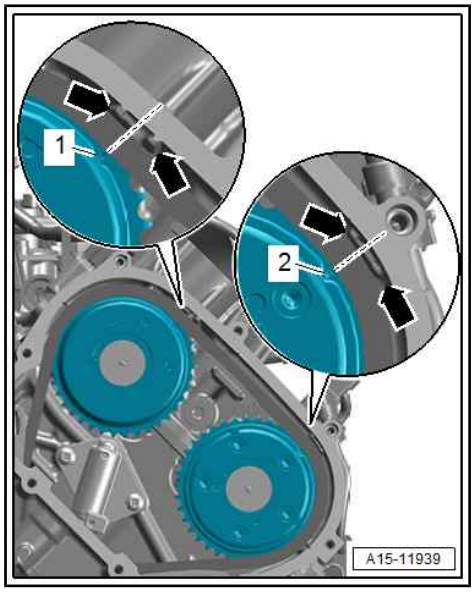
- Crankshaft locked in “TDC” position with camshaft clamp - T40264/3- / locking pin - T03006- .
- Camshaft clamp -T40331/1- screwed on to camshaft housing (9 Nm)
- Renew friction washers (diamond-coated washers) ⇒ Item 13 (page 90) and ⇒ Item 15 (page 90) after removal.



Caution

Risk of damage to engine if camshaft adjusters are loosened.

- ***When installing, it is very important to ensure that the required friction washer (diamond-coated washer) is fitted. This is necessary to ensure a secure fit between the camshaft adjuster and the stub on the camshaft.***
- ***Bring new friction washer (diamond-coated washer) into installation position carefully without bending it.***
- ***The camshaft adjusters MUST be installed as described in the following work steps:***



- The markings -1, 2- on the camshaft adjusters must be opposite the corresponding projections -arrows- on the camshaft housing.

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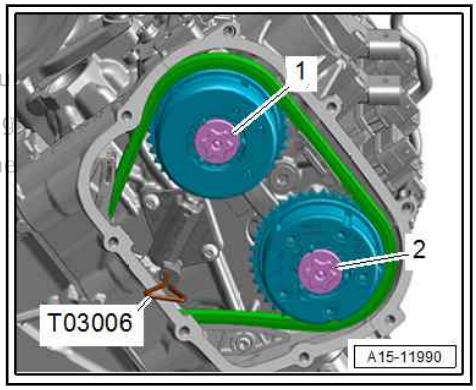
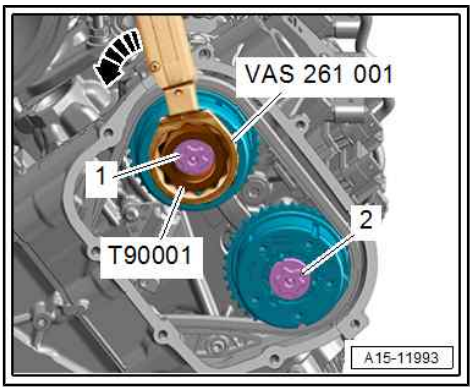
– With camshaft timing chain fitted, bring camshaft adjusters into installation position described previously (note marks applied when removing).
– Oil timing valves -1, 2- on thread and bolt head contact surface and screw in without tightening.
• It should still be possible to turn both camshaft adjusters on the camshaft.
– Remove locking pin - T03006- .



• A second mechanic is required for the following step.
– Have a second mechanic use torque wrench - VAS 6583- with socket -VAS 261 001- and counterhold tool - T90001- to apply 30 Nm of torque at exhaust camshaft adjuster in anti-clockwise direction -arrow- and maintain this torque.
– Tighten timing valves as follows using socket E24 - T90000- , while keeping camshaft adjuster under tension:

♦ Timing valve -2- on inlet camshaft: 30 Nm
♦ Timing valve -1- on exhaust camshaft: 30 Nm



Checking valve timing

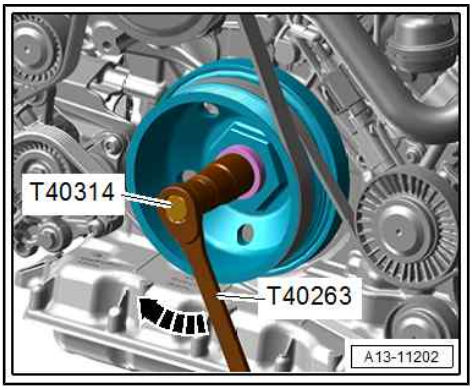
– Remove camshaft clamp -T40331/1- .
– Remove camshaft clamp - T40264/3- / locking pin - T40069- .

Caution

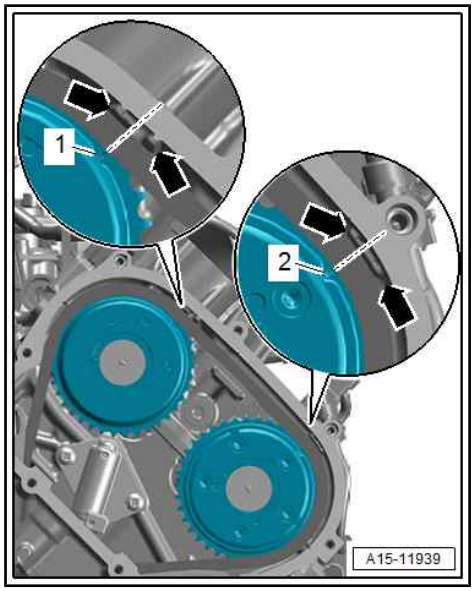
Risk of damage to valves and piston crowns.

♦ *The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed.*

– Use wrench, 21 mm - T40263- and adapter - T40314- to turn crankshaft two turns -arrow- until vibration damper is back at “TDC” position.



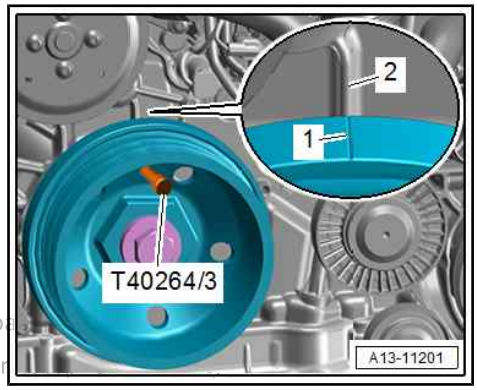
- The markings -1, 2- on the camshaft adjusters must be opposite the corresponding projections -arrows- on the camshaft housing.



- Notch -1- on vibration damper must align with cast projection -2- on sealing flange (pulley end).

Procedure if engine has NOT been removed during preparatory work:

– Screw camshaft clamp - T40264/3- through bore in vibration damper into sealing flange (pulley end) by hand until it makes contact. If necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



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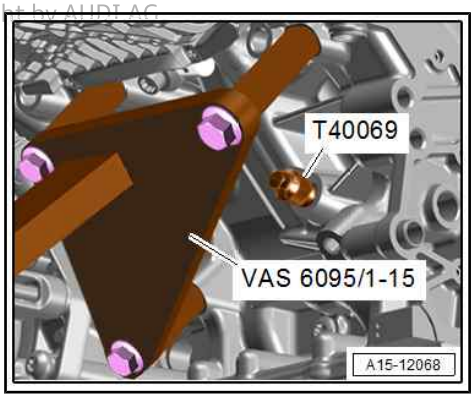
Procedure if engine has been removed during preparatory work:

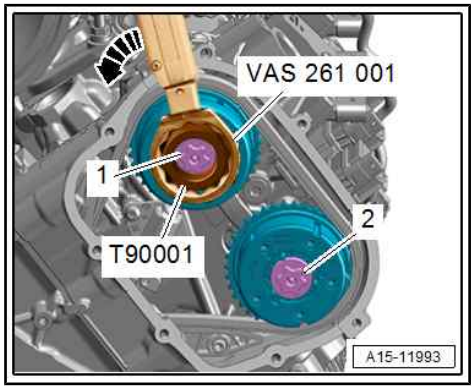
– Screw locking pin - T40069- into hole and tighten to 20 Nm. If necessary, turn crankshaft back and forth slightly.



Continued:

- A second mechanic is required for the following step.

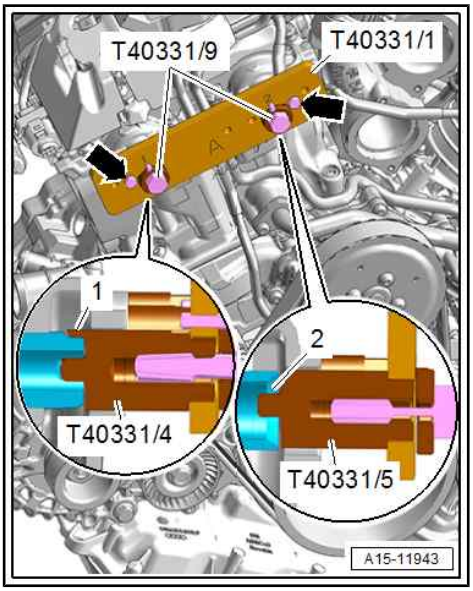
– Have a second mechanic use torque wrench - VAS 6583- with socket -VAS 261 001- and counterhold tool - T90001- to apply 30 Nm of torque at exhaust camshaft adjuster in anti-clockwise direction -arrow- and maintain this torque.



- It should be possible to insert the camshaft clamp -T40331/1- easily.
- Do not knock camshaft clamp into place with any kind of tool.

– Insert camshaft clamp -T40331/1- prepared previously into camshaft as far as stop.

- Camshaft clamp -T40331/4- engages in flat surface -1- on inlet camshaft, as shown.
- Camshaft clamp -T40331/5- engages in asymmetrically positioned groove (top) -2- on exhaust camshaft, as shown.

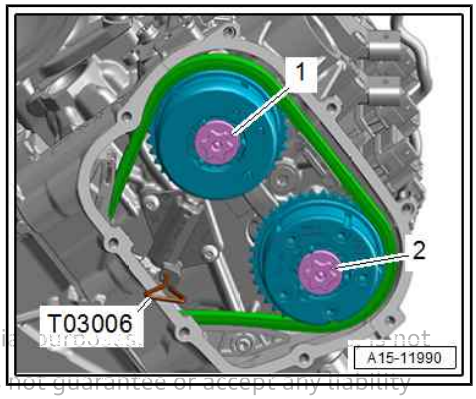


If it is NOT possible to insert the camshaft clamp -T40331/1- :

– Remove camshaft clamp - T40264/3- / locking pin - T40069- .

– Insert camshaft clamp -T40331/1- prepared previously into camshafts as far as stop, as described previously. To do so, turn crankshaft slightly.

– Loosen timing valves -1, 2- half a turn using socket E24 - T90000- .



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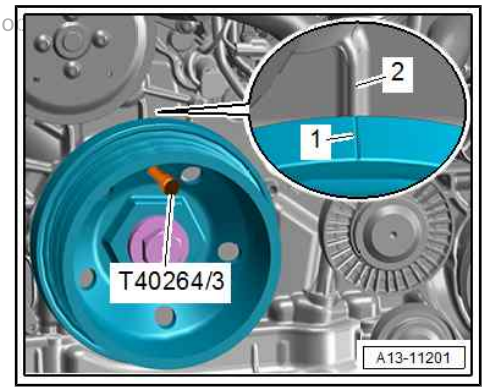
- Notch -1- on vibration damper must align with cast projection -2- on sealing flange (pulley end).

Procedure if engine has NOT been removed during preparatory work:

– Screw camshaft clamp - T40264/3- through bore in vibration damper into sealing flange (pulley end) by hand until it makes contact. If necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.

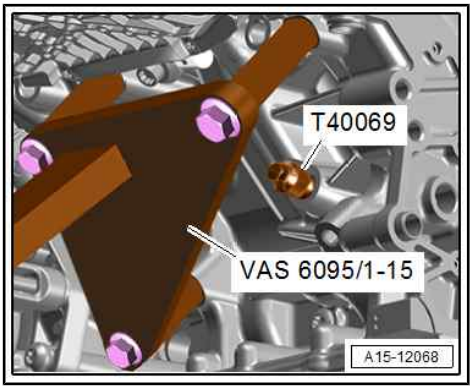


Procedure if engine has been removed during preparatory work:

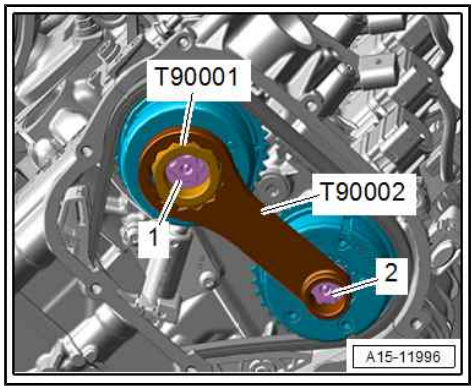
– Screw locking pin - T40069- into hole and tighten to 20 Nm. If necessary, turn crankshaft back and forth slightly.

Continued:

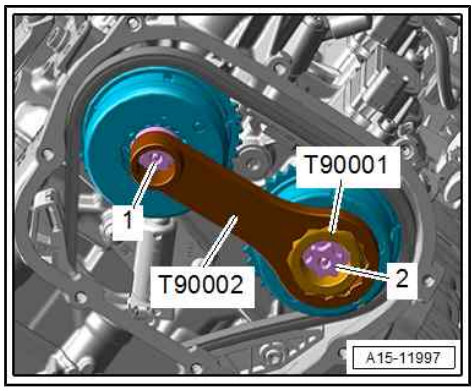
– Repeat adjustment ⇒ page 99 .



If it is possible to insert the camshaft clamp -T40331/1- :



- Remove camshaft clamp - T40264/3- / locking pin - T40069- .
- Remove camshaft clamp -T40331/1- .
- Apply counterhold tool - T90001- and counterhold tool - T90002- to exhaust camshaft adjuster.
- Support counterhold tool at timing valve -2- for inlet camshaft. If necessary, turn crankshaft clockwise slightly (only clockwise).
- Turn timing valve -1- 35° further using socket E24 - T90000- .



- Apply counterhold tool - T90001- and counterhold tool - T90002- to inlet camshaft adjuster.
- Support counterhold tool at timing valve -1- for exhaust camshaft. If necessary, turn crankshaft clockwise slightly (only clockwise).
- Turn timing valve -2- 35° further using socket E24 - T90000- .
- Remove counterhold tool - T90001- and counterhold tool - T90002- .
- Install air pipe (top) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe .
- Install timing chain cover (top) for cylinder bank 1 ⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81 .

Additional work ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Chain drive; Removing camshaft timing chain from camshafts

- If changes have been made to timing chain drive and/or components have been renewed, perform corresponding adaptions listed in Guided Function “0001 - Functions, engine mechanics” ⇒ Vehicle diagnostic tester.

Tightening torques

- ⇒ “2.1 Exploded view - camshaft timing chains”, page 89
- ⇒ “3.2 Exploded view - camshaft housing”, page 121

2.3.2 Removing camshaft timing chain from camshafts - cylinder bank 2 (left-side)

In the following procedure the camshaft timing chain remains on the engine.

Special tools and workshop equipment required

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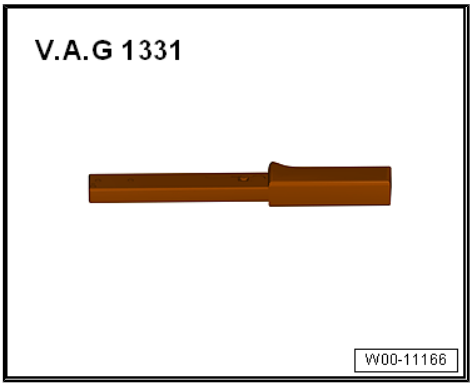
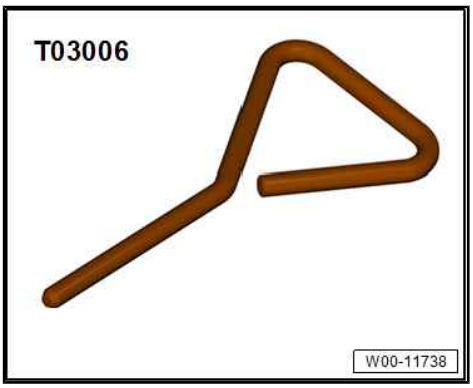
- Torque wrench - V.A.G 1331-

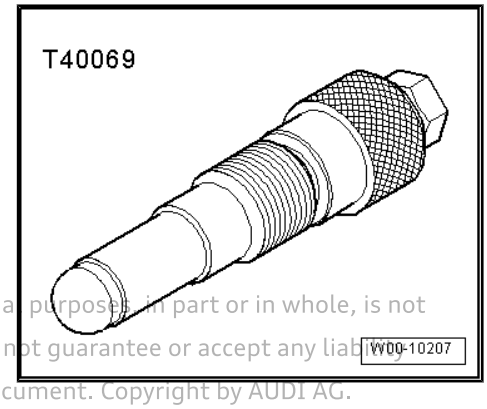


- Torque wrench - VAS 6583-

- Locking pin - T03006-



- Locking pin - T40069- (with engine removed)



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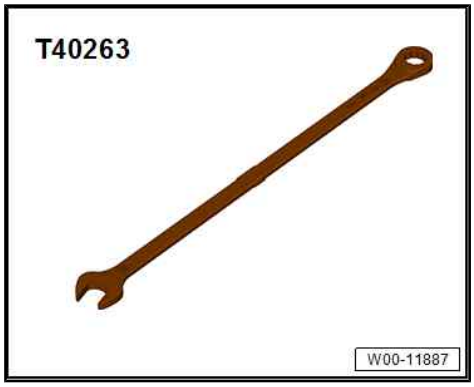
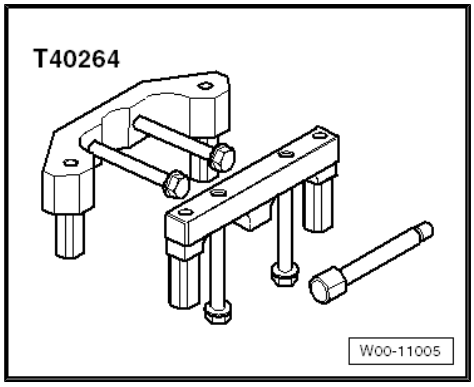
- Wrench, 21 mm - T40263-



- Camshaft clamp - T40264/3-



- Adapter - T40314-

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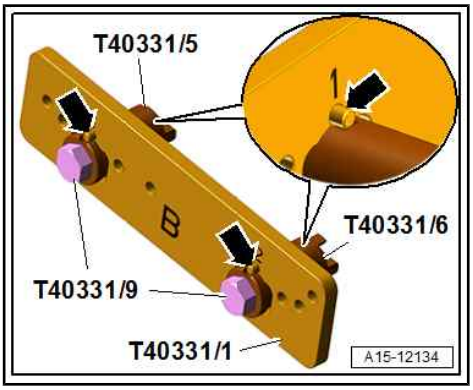
- Camshaft clamp - T40331- (not illustrated)
- Socket E24 - T90000- (not illustrated)
- Counterhold tool - T90001- (not illustrated)
- Counterhold tool - T90002- (not illustrated)
- Socket -VAS 261 001- (not illustrated)

Preparing camshaft clamp - T40331-



- Lettering “B” on camshaft clamp - T40331/1- faces forwards.
- Camshaft clamps - T40331/5- and -T40331/6- and washers on bolts -T40331/9- must be positioned using dowel pins -arrows-.

– Tighten bolts hand tight.

Removing

For the preparatory work required before removing camshaft timing chain from camshafts (with engine installed), refer to ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Chain drive; Removing camshaft timing chain from camshafts .

Caution

Risk of damage to valves and piston crowns.

- ***The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed.***

– Remove timing chain cover (top) for cylinder bank 2 (right-side)
⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81 .

– Remove air pipe (top) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe .

– Remove vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .

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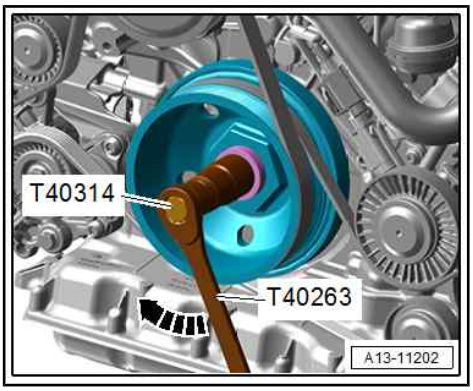
Caution

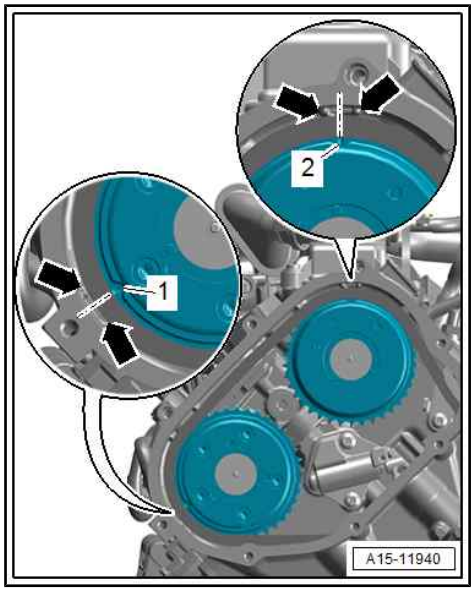
Irreparable damage can be caused if the camshaft timing chain slips.

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



– Use wrench, 21 mm - T40263- and adapter - T40314- to turn crankshaft -arrow- until vibration damper is at “TDC” position. (Shown on vehicle with 3.0 ltr. engine.)

- The marking -1, 2- on the camshaft adjusters must be opposite the corresponding projections -arrows- on the camshaft housing. Turn crankshaft one turn if necessary.



– Unscrew bolts -arrows- and remove sealing plugs -2-.
– Press guide tube for oil dipstick -1- slightly to one side.

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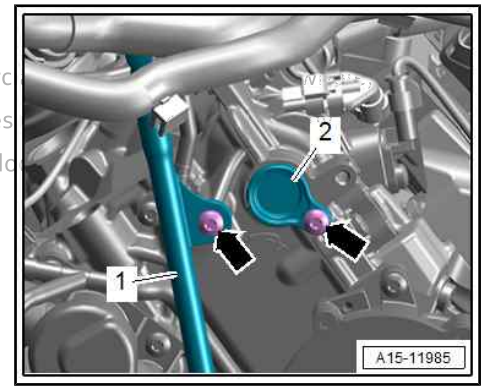
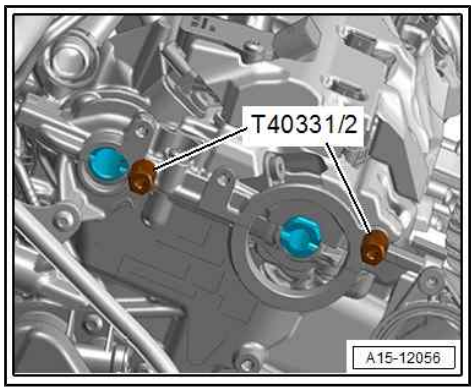


– Tighten adapter -T40331/2- on camshaft housing to 9 Nm.

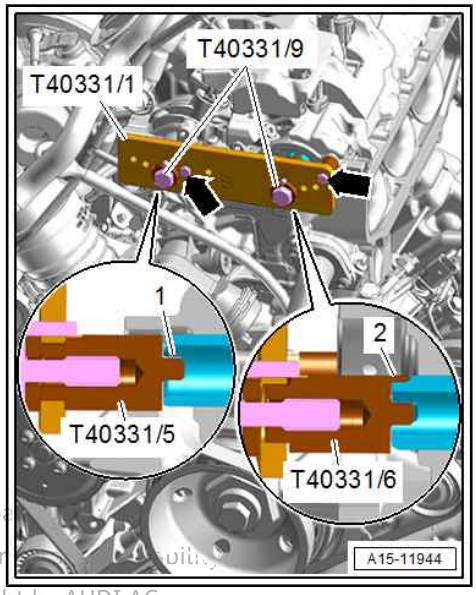


- It should be possible to insert the camshaft clamp -T40331/1- easily.
- Do not knock camshaft clamp into place with any kind of tool.

– Insert camshaft clamp -T40331/1- prepared previously into camshafts as far as stop. Turn crankshaft slightly if necessary.

- Camshaft clamp -T40331/5- engages in asymmetrically positioned groove (top) -1- on exhaust camshaft, as shown.
- Camshaft clamp -T40331/6- engages in flat surface -2- on inlet camshaft, as shown.

– Tighten bolts -arrows- to 9 Nm.



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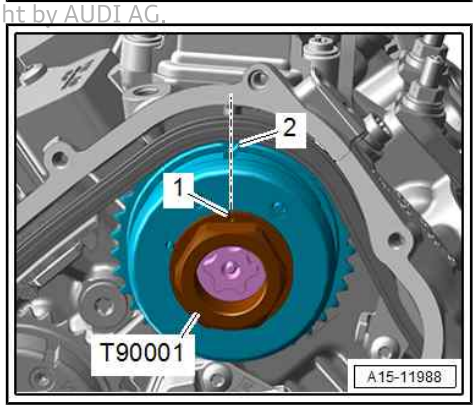
Note:

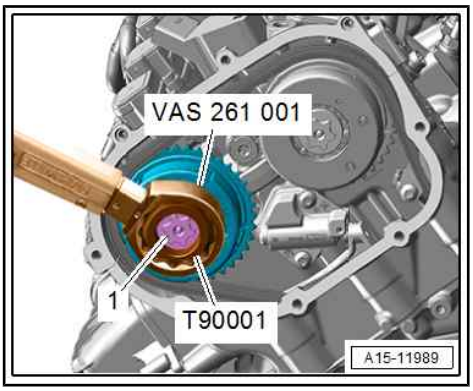
Counterhold tool - T90001- can only be fitted in one position; notch -1- and marking -2- on camshaft adjuster must align.



Caution

Risk of damage to camshafts.

- ***Do NOT use camshaft clamps -T40331- to counterhold when loosening timing valves for camshaft adjusters or camshaft chain sprocket.***



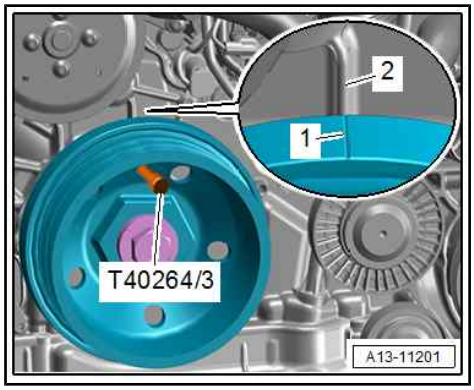
– Fit counterhold tool - T90001- with socket -VAS 261 001- to counterhold on corresponding camshaft adjuster and loosen timing valve -1- with socket E24 - T90000- .

– Mark position of camshaft adjusters in relation to camshafts with paint for re-installation.

- Notch -1- on vibration damper must align with cast projection -2- on sealing flange (pulley end).

Procedure if engine has NOT been removed during preparatory work:

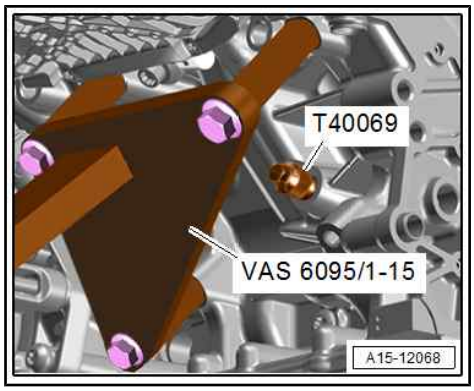
– Screw camshaft clamp - T40264/3- through bore in vibration damper into sealing flange (pulley end) by hand until it makes contact. If necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



Procedure if engine has been removed during preparatory work:

– If still fitted, unscrew plug.

– Screw locking pin - T40069- into hole and tighten to 20 Nm. If necessary, turn crankshaft back and forth slightly.

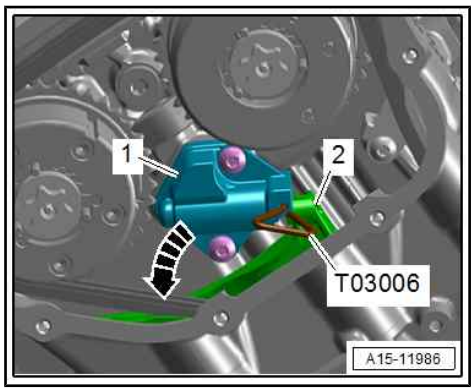


Continued:

– Press guide rail -2- back -arrow- and lock piston of chain tensioner -1- using locking pin - T03006- .

Note:

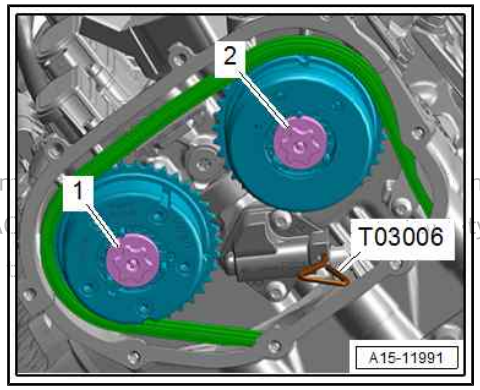
The piston is oil-damped and can therefore only be pressed back slowly by applying constant pressure.



– Unscrew timing valves -1, 2- and detach both camshaft adjusters.

Installing

- Crankshaft locked in “TDC” position with camshaft clamp - T40264/3- / locking pin - T40069- .
- Camshaft clamp -T40331/1- screwed on to camshaft housing (9 Nm)
- Renew friction washers (diamond-coated washers) ⇒ Item 11 (page 91) and ⇒ Item 12 (page 91) after removal.



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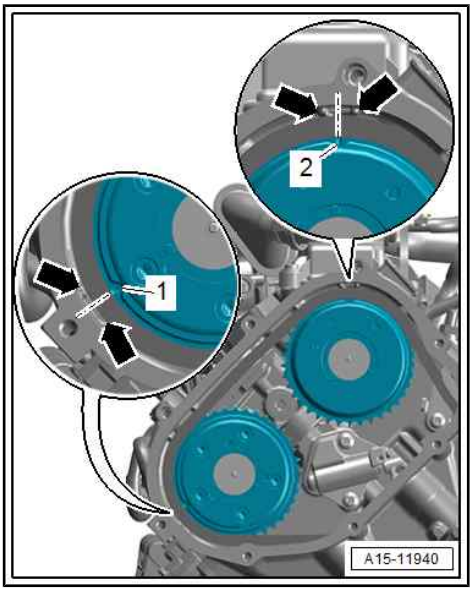
Caution

Risk of damage to engine if camshaft adjusters are loosened.

- *When installing, it is very important to ensure that the required friction washer (diamond-coated washer) is fitted. This is necessary to ensure a secure fit between the camshaft adjuster and the stub on the camshaft.*
- *Bring new friction washer (diamond-coated washer) into installation position carefully without bending it.*
- *The camshaft adjusters MUST be installed as described in the following work steps:*



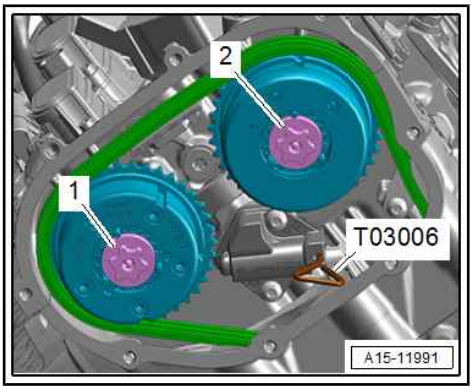
- The marking -1, 2- on the camshaft adjusters must be opposite the corresponding projections -arrows- on the camshaft housing.

– With camshaft timing chain fitted, bring camshaft adjusters into installation position described previously (note marks applied when removing).

– Oil timing valves -1, 2- on thread and bolt head contact surface and screw in without tightening.

- It should still be possible to turn both camshaft adjusters on the camshaft.

– Remove locking pin - T03006- .



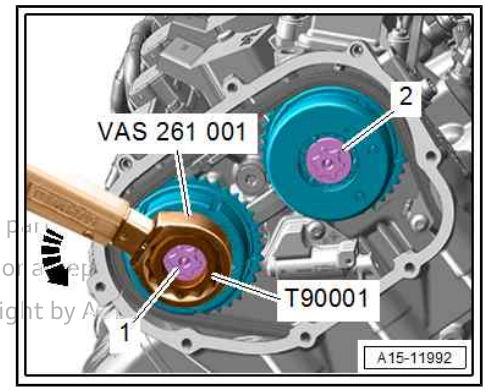
- A second mechanic is required for the following step.

– Have a second mechanic use torque wrench - VAS 6583- with socket -VAS 261 001- and counterhold tool - T90001- to apply 30 Nm of torque at inlet camshaft adjuster in anti-clockwise direction -arrow- and maintain this torque.

– Tighten timing valves as follows using socket E24 - T90000- , while keeping camshaft adjuster under tension:

♦ Timing valve -2- on exhaust camshaft: 30 Nm

♦ Timing valve -1- on inlet camshaft: 30 Nm



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Checking valve timing

– Remove camshaft clamp - T40331/1- .

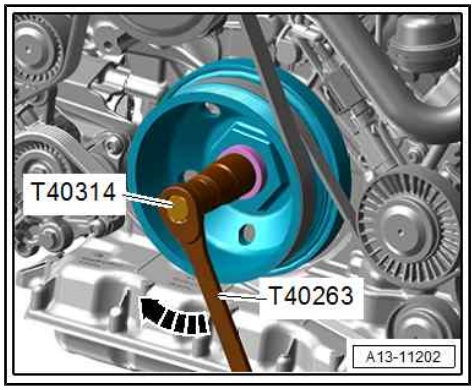
– Remove camshaft clamp - T40264/3- / locking pin - T40069- .

Caution

Risk of damage to valves and piston crowns.

- *The crankshaft and camshafts must only be turned with the chain drive mechanism fully installed.*

– Use wrench, 21 mm - T40263- and adapter - T40314- to turn crankshaft two turns -arrow- until vibration damper is back at “TDC” position.



• The marking -1, 2- on the camshaft adjusters must be opposite the corresponding projections -arrows- on the camshaft housing.

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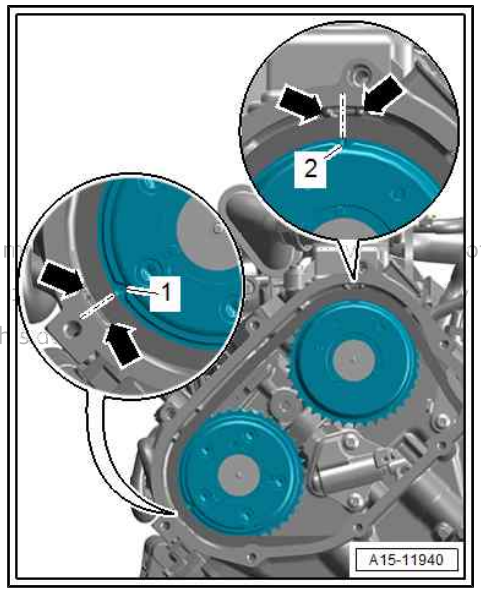
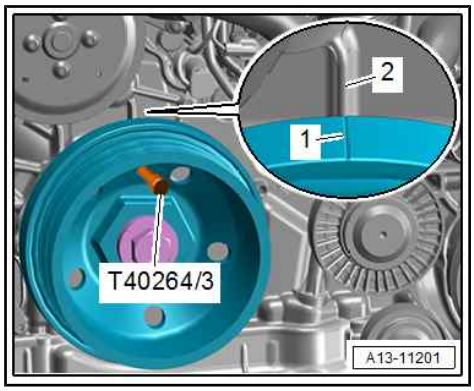


• Notch -1- on vibration damper must align with cast projection -2- on sealing flange (pulley end).

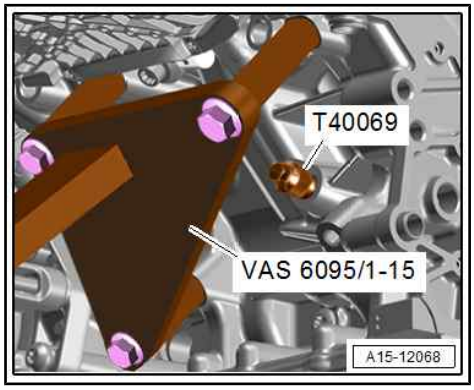
Procedure if engine has NOT been removed during preparatory work:

– Screw camshaft clamp - T40264/3- through bore in vibration damper into sealing flange (pulley end) by hand until it makes contact. If necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.



Procedure if engine has been removed during preparatory work:

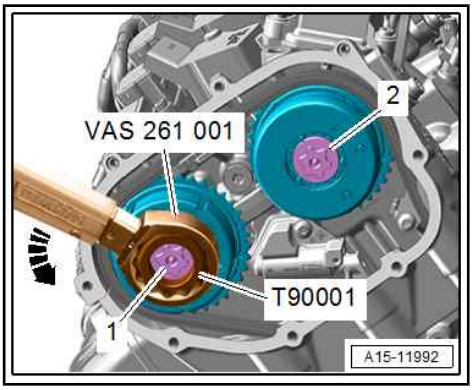
– Screw locking pin - T40069- into hole and tighten to 20 Nm. If necessary, turn crankshaft back and forth slightly.



Continued:

- A second mechanic is required for the following step.

– Have a second mechanic use torque wrench - VAS 6583- with socket -VAS 261 001- and counterhold tool - T90001- to apply 30 Nm of torque at inlet camshaft adjuster in anti-clockwise direction -arrow- and maintain this torque.



- It should be possible to insert the camshaft clamp -T40331/1- easily.
- Do not knock camshaft clamp into place with any kind of tool.

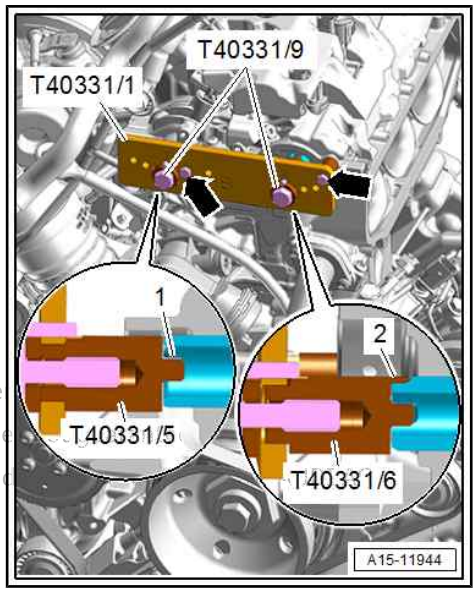
– Insert camshaft clamp -T40331/1- prepared previously into camshaft as far as stop.

- Camshaft clamp -T40331/5- engages in asymmetrically positioned groove (top) -1- on exhaust camshaft, as shown.
- Camshaft clamp -T40331/6- engages in flat surface -2- on inlet camshaft, as shown.

If it is NOT possible to insert the camshaft clamp -T40331/1- :

– Remove camshaft clamp - T40264/3- / locking pin - T40069- .

– Insert camshaft clamp -T40331/1- prepared previously into camshafts as far as stop, as described previously. To do so, turn crankshaft slightly.



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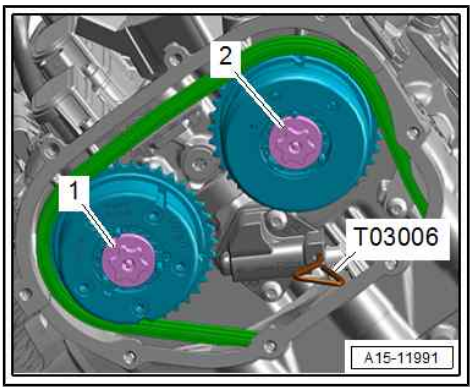
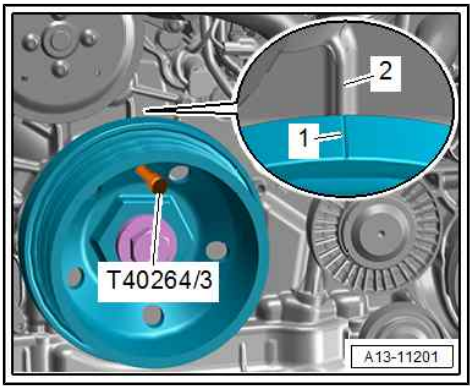
– Loosen timing valves -1, 2- half a turn using socket E24 - T90000- .



- Notch -1- on vibration damper must align with cast projection -2- on sealing flange (pulley end).

Procedure if engine has NOT been removed during preparatory work:

– Screw camshaft clamp - T40264/3- through bore in vibration damper into sealing flange (pulley end) by hand until it makes contact. If necessary, turn crankshaft backwards and forwards slightly to fully centralise locking pin.

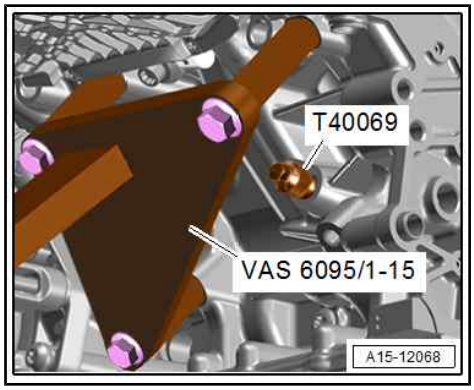


Procedure if engine has been removed during preparatory work:

– Screw locking pin - T40069- into hole and tighten to 20 Nm. If necessary, turn crankshaft back and forth slightly.

Continued:

– Repeat adjustment ⇒ page 109 .



If it is possible to insert the camshaft clamp -T40331/1- :

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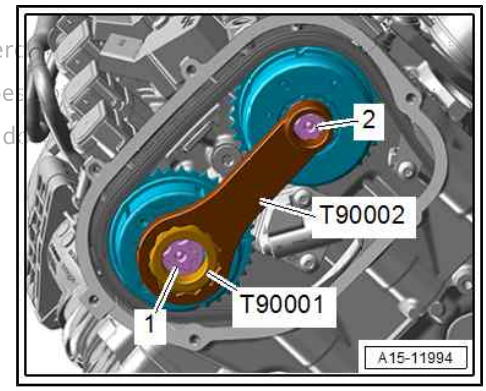
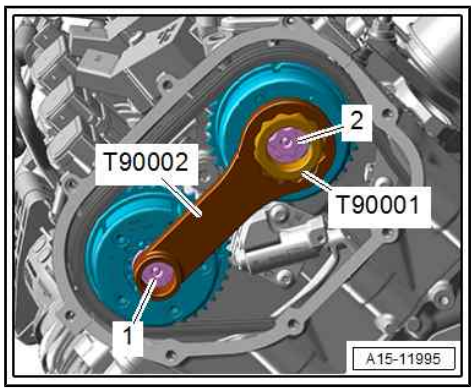
– Remove camshaft clamp - T40264/3- / locking pin - T40069- .
– Remove camshaft clamp -T40331/1- .
– Apply counterhold tool - T90001- and counterhold tool - T90002- to inlet camshaft adjuster.
– Support counterhold tool at timing valve -2- for exhaust camshaft. Turn crankshaft slightly if necessary.
– Turn timing valve -1- 35° further using socket E24 - T90000- .



– Apply counterhold tool - T90001- and counterhold tool - T90002- to exhaust camshaft adjuster.
– Support counterhold tool at timing valve -1- for inlet camshaft. Turn crankshaft slightly if necessary.
– Turn timing valve -2- 35° further using socket E24 - T90000- .
– Install vacuum pump ⇒ Brake system; Rep. gr. 47 ; Vacuum system; Removing and installing vacuum pump .
– Install air pipe (top) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe .
– Install timing chain cover (top) for cylinder bank 2 ⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81 .



Additional work ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Chain drive; Removing camshaft timing chain from camshafts

– If changes have been made to timing chain drive and/or components have been renewed, perform corresponding adaptions listed in Guided Function “0001 - Functions, engine mechanics” ⇒ Vehicle diagnostic tester.

Tightening torques

- ⇒ “2.1 Exploded view - camshaft timing chains”, page 89
- ⇒ “3.2 Exploded view - camshaft housing”, page 121
- ⇒ “1.2 Exploded view - sealing flange (pulley end)”, page 23

2.4 Removing and installing camshaft timing chain

Removing

– Remove timing chain cover (bottom)
⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 84 .

Camshaft timing chain for cylinder bank 2 (left-side):

Caution

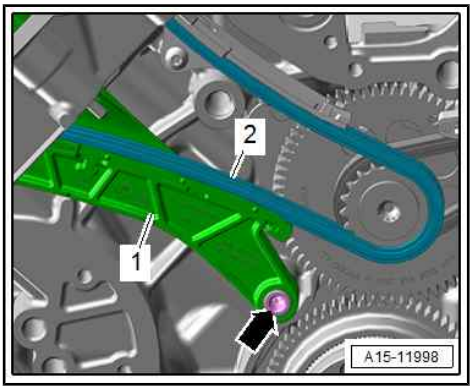
If a used timing chain rotates in the opposite direction when it is refitted, this can cause breakage.

- ***Paint an arrow on timing chain (left-side) to mark running direction and allocation for re-installation.***

– Remove camshaft timing chain from camshafts for cylinder bank 2 (left-side)
⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93 .

– Unscrew guide pins -arrow- and detach guide rail -1- downwards.

– Lift off timing chain -2-.



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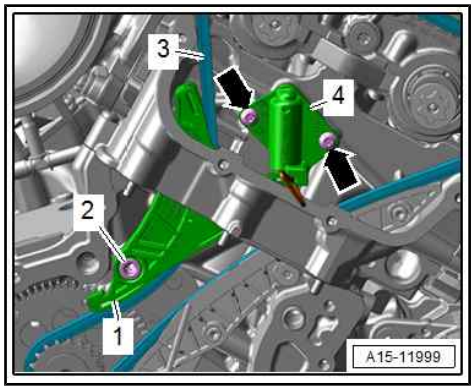
Camshaft timing chain for cylinder bank 1 (right-side):



- Camshaft timing chain for cylinder bank 2 (left-side) removed.

– Remove camshaft timing chain from camshafts for cylinder bank 1 (right-side)
⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93 .

– Unscrew bolts -arrows- and detach chain tensioner -4-.

– Unscrew mounting pin -2- and remove camshaft timing chain -3- with tensioning rail -1-.

- Camshaft timing chain must not be separated from tensioning rail.

Installing

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

- Renew gasket after removing.

– Fit timing chains on camshafts
⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93 .

– Install timing chain cover (bottom)
⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 84 .

– If changes have been made to timing chain drive and/or components have been renewed, perform corresponding adaptions listed in Guided Function “0001 - Functions, engine mechanics” ⇒ Vehicle diagnostic tester.

Tightening torques

♦ ⇒ “2.1 Exploded view - camshaft timing chains”, page 89

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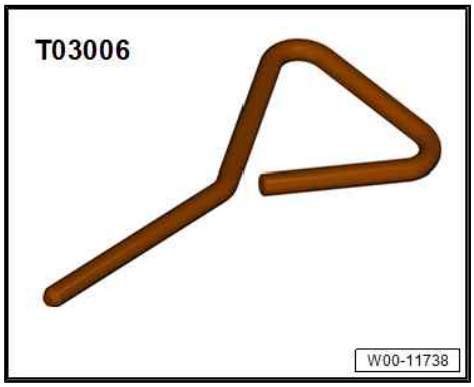
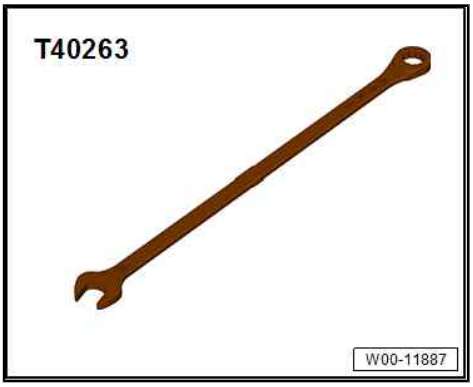
2.5 Removing and installing chain tensioner

Special tools and workshop equipment required

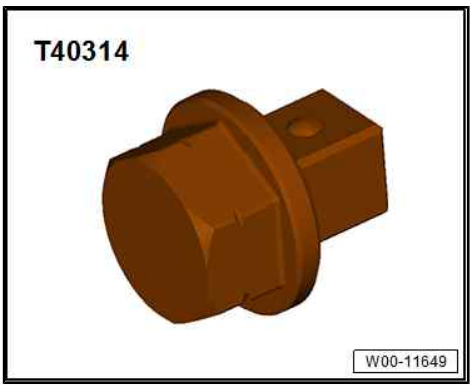
♦ Locking pin - T03006-



- Wrench, 21 mm - T40263-



- Adapter - T40314-



Removing

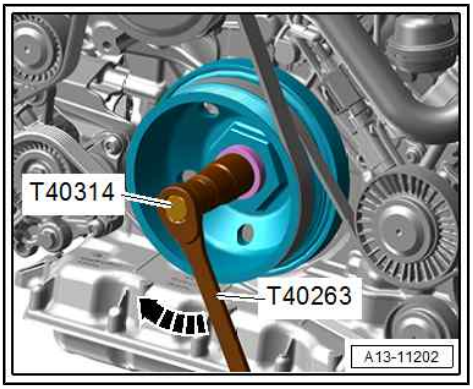
– Remove relevant timing chain cover (top)
⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81 .

Caution

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

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

– Use wrench, 21 mm - T40263- and adapter - T40314- to turn crankshaft -arrow- until vibration damper is at “BDC” position. (Shown on vehicle with 3.0 ltr. engine.)



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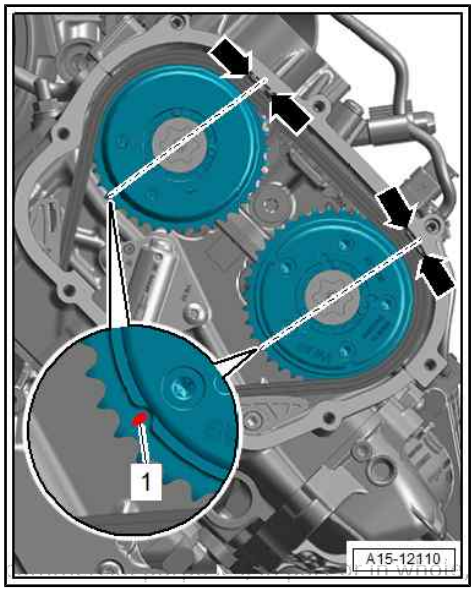
Chain tensioner for cylinder bank 1 (right-side):

- The markings -1- on the camshaft adjusters must be opposite the corresponding projections -arrows- on the camshaft housing. Turn crankshaft one turn if necessary.



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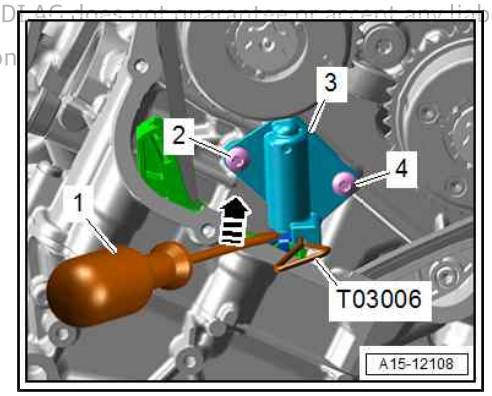
– Press piston of chain tensioner -3- back as far as stop -arrow- using a screwdriver -1-. Then lock chain tensioner by inserting locking pin - T03006- .

Note:

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

– Remove bolts -2 and 4- and take off chain tensioner.



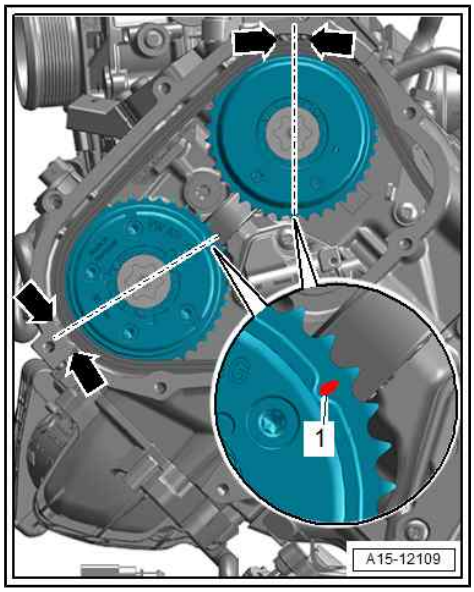
Caution

Risk of damage to valves and piston crowns.

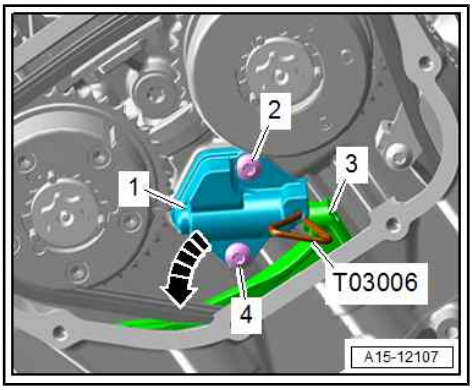
- *Do NOT turn crankshaft.*

Chain tensioner for cylinder bank 2 (left-side):

- The markings -1- on the camshaft adjusters must be opposite the corresponding projections -arrows- on the camshaft housing. Turn crankshaft one turn if necessary.



– Press guide rail -3- back -arrow- and lock piston of chain tensioner -1- using locking pin - T03006- .



Note:

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

– Remove bolts -2 and 4- and take off chain tensioner.

Caution

Risk of damage to valves and piston crowns.

- ***Do NOT turn crankshaft.***

Installing

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

- Renew gasket after removing.

– Install timing chain cover (top) ⇒ “1.2.1 Removing and installing timing chain covers (top)”, page 81 .

– If changes have been made to timing chain drive and/or components have been renewed, perform corresponding adaptions listed in Guided Function “0001 - Functions, engine mechanics” ⇒ Vehicle diagnostic tester.

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Tightening torques

- ⇒ “2.1 Exploded view - camshaft timing chains”, page 89

3 Cylinder head

⇒ “3.1 Exploded view - cylinder head”, page 118

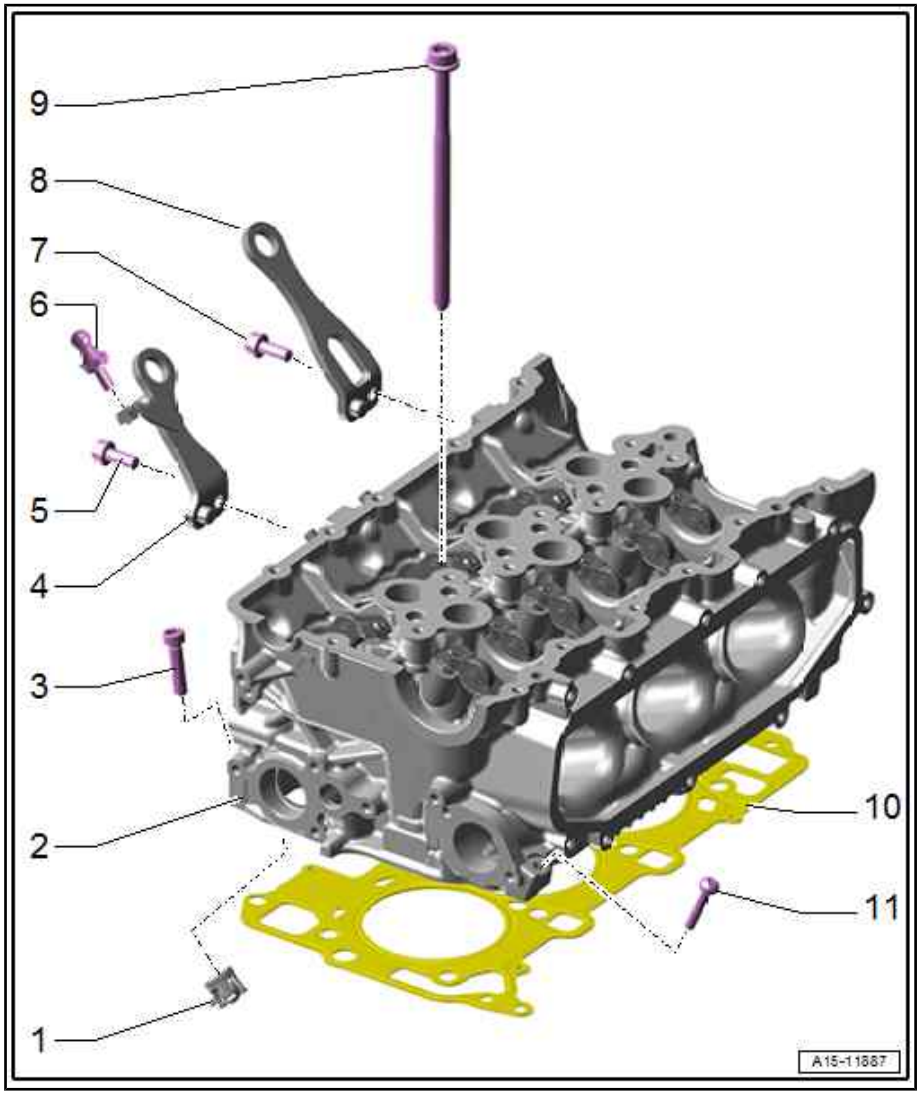
⇒ “3.2 Exploded view - camshaft housing”, page 121

⇒ “3.3 Removing and installing cylinder head”, page 124

⇒ “3.4 Removing and installing camshaft housing”, page 141

⇒ “3.5 Checking compression”, page 149

3.1 Exploded view - cylinder head



1 - Non-return valve

- ❑ For coolant

2 - Cylinder head

- ❑ Shown for cylinder bank 2 (left-side)
- ❑ Removing and installing ⇒ “3.3 Removing and installing cylinder head”, page 124
- ❑ Checking for distortion ⇒ Fig. ““Checking cylinder head for distortion”“ , page 121
- ❑ Machining limit ⇒ Fig. ““Cylinder head machining limit”“ , page 121
- ❑ If renewed, change coolant and engine oil

3 - Bolt

- ❑ Renew after removing
- ❑ Loosening sequence:

◆ Cylinder bank 1 (right-side) ⇒ page 126

◆ Cylinder bank 2 (left-side) ⇒ page 136

- ❑ Tightening torques and sequence:

◆ Cylinder bank 1 (right-side) ⇒ Fig. ““Cylinder head, bank 1 (right-side) - tightening torques and sequence”“ , page 119

◆ Cylinder bank 2 (left-side) ⇒ Fig. ““Cylinder head, bank 2 (left-side) - tightening torques and sequence”“ , page 120

4 - Engine lifting eye

5 - Bolt

- ❑ 22 Nm

6 - Ball stud

- ❑ For engine cover panel
- ❑ 5 Nm +45°

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7 - Bolt

- ❑ 22 Nm

8 - Engine lifting eye

9 - Bolt

- ❑ Renew after removing
- ❑ Loosening sequence:

◆ Cylinder bank 1 (right-side) ⇒ page 126

◆ Cylinder bank 2 (left-side) ⇒ page 136

- ❑ Tightening torques and sequence:

◆ Cylinder bank 1 (right-side)
⇒ Fig. ""Cylinder head, bank 1 (right-side) - tightening torques and sequence"" , page 119

◆ Cylinder bank 2 (left-side)
⇒ Fig. ""Cylinder head, bank 2 (left-side) - tightening torques and sequence"" , page 120

10 - Cylinder head gasket

- ❑ Renewing ⇒ "3.3 Removing and installing cylinder head", page 124
- ❑ Installation position: part number must face cylinder head
- ❑ If renewed, change coolant and engine oil

11 - Bolt

- ❑ Renew after removing
- ❑ Loosening sequence:

◆ Cylinder bank 1 (right-side) ⇒ page 126

◆ Cylinder bank 2 (left-side) ⇒ page 136

- ❑ Tightening torques and sequence:

◆ Cylinder bank 1 (right-side)
⇒ Fig. ""Cylinder head, bank 1 (right-side) - tightening torques and sequence"" , page 119

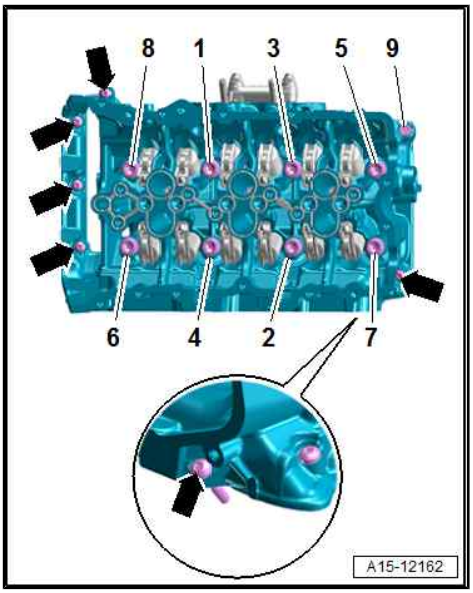
◆ Cylinder bank 2 (left-side)
⇒ Fig. ""Cylinder head, bank 2 (left-side) - tightening torques and sequence"" , page 120

Cylinder head, bank 1 (right-side) - tightening torques and sequence

- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	Screw in by hand until contact is made
2.	-1 … 8-	30 Nm
3.	-1 … 8-	50 Nm
4.	-1 … 8-	Turn 90° further
5.	-1 … 8-	Turn 90° further
6.	-9-	10 Nm
7.	-arrows-	8 Nm
8.	-9-	Turn 90° further
9.	-arrows-	Turn 90° further



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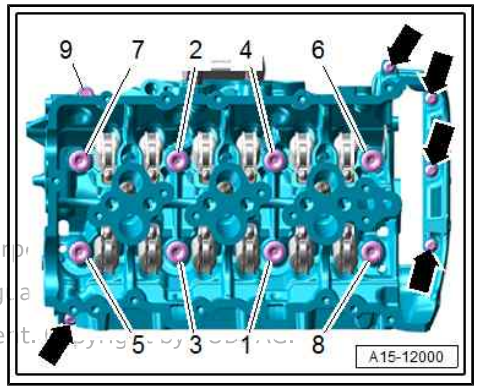
Cylinder head, bank 2 (left-side) - tightening torques and sequence



- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 8-	Screw in by hand until contact is made
2.	-1 … 8-	30 Nm
3.	-1 … 8-	50 Nm
4.	-1 … 8-	Turn 90° further
5.	-1 … 8-	Turn 90° further
6.	-9-	10 Nm
7.	-arrows-	8 Nm
8.	-9-	Turn 90° further
9.	-arrows-	Turn 90° further

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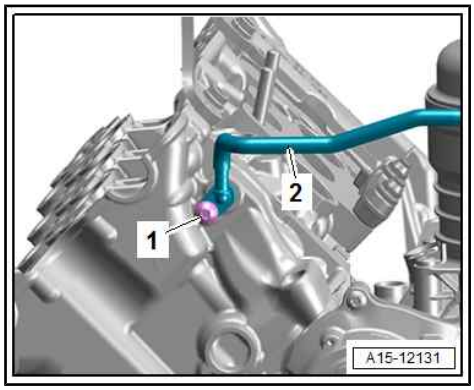
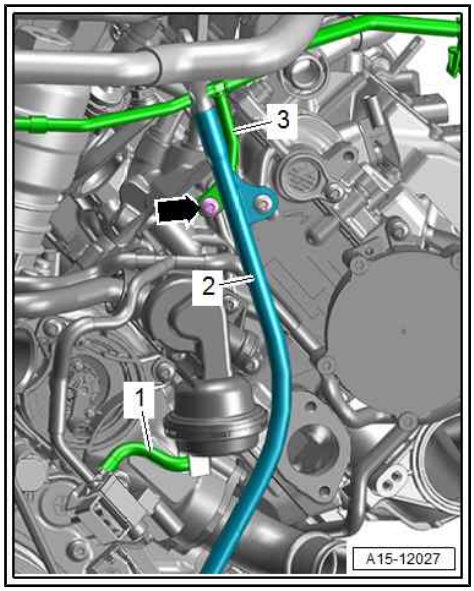
Installing coolant bleeder line, cylinder bank 1 (right-side)



- Renew O-ring after removal.

– Tighten bolt -1- to 9 Nm.

Installing coolant bleeder line, cylinder bank 2 (left-side)



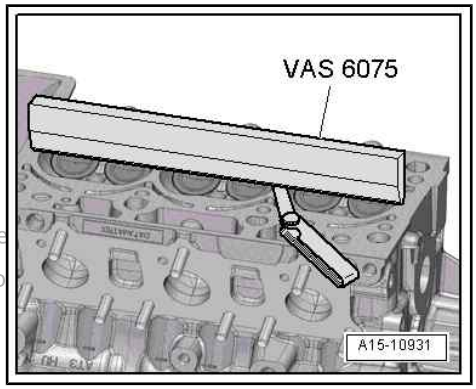
- Renew O-ring after removal.

– Tighten bolt -arrow- for coolant bleeder line -3- to 9 Nm.

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: 0.1 mm.



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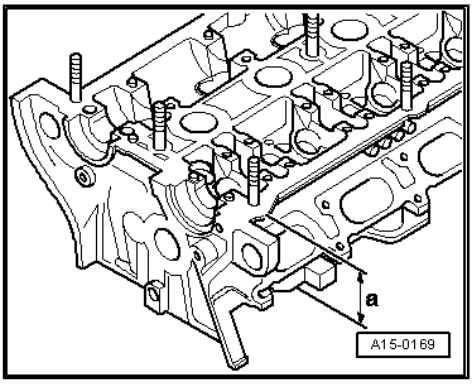
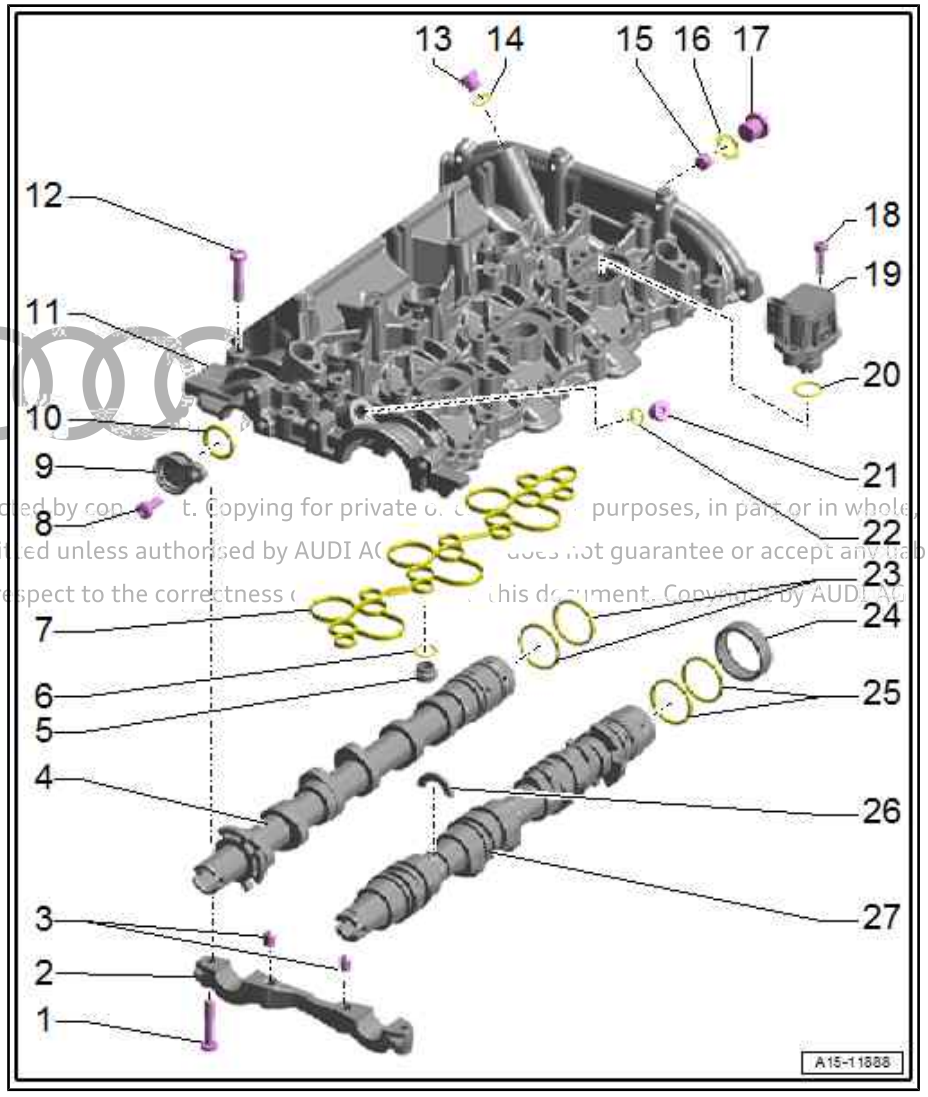
Cylinder head machining limit

Machining of the cylinder head (surface grinding) is only permissible down to the minimum dimension -a-.

• Minimum dimension -a- = 138.0 ± 0.1 mm



3.2 Exploded view - camshaft housing



1 - Bolt
- ❑ Renew after removing
- ❑ 9 Nm

2 - Bearing caps
- ❑ Removing and installing ⇒ “4.4 Removing and installing camshaft”, page 154
- ❑ Note installation position

3 - Dowel sleeves

4 - Exhaust camshaft
- ❑ Removing and installing ⇒ “4.4 Removing and installing camshaft”, page 154
- ❑ Measuring axial clearance ⇒ “4.2 Measuring axial clearance of camshaft”, page 153
- ❑ Measuring radial clearance ⇒ “4.3 Measuring radial clearance of camshaft”, page 154
- ❑ Runout: max. 0.04 mm

5 - Retention valve
- ❑ For oil separator

6 - O-ring
- ❑ Renew after removing

7 - Gasket
- ❑ Renew after removing

8 - Bolt
- ❑ 9 Nm

9 - Sealing plug

10 - O-ring
- ❑ Renew after removing

11 - Camshaft housing
- ❑ Shown for cylinder bank 2 (left-side)
- ❑ Removing and installing ⇒ “3.4 Removing and installing camshaft housing”, page 141

12 - Bolt
- ❑ Renew after removing
- ❑ Tightening torques and sequence:

◆ Cylinder bank 1 (right-side)
⇒ Fig. ““Camshaft housing, cylinder bank 1 (right-side) - tightening torques and sequence”“ , page 124

◆ Cylinder bank 2 (left-side)
⇒ Fig. ““Camshaft housing, cylinder bank 2 (left-side) - tightening torques and sequence”“ , page 124

13 - Plug
- ❑ Renew after removing
- ❑ 5 Nm +90°

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14 - Seal

- ❑ Renew after removing

15 - Restrictor

- ❑ Cylinder bank I: 20 Nm
- ❑ Cylinder bank II: 15 Nm

16 - O-ring

- ❑ Renew after removing

17 - Plug

- ❑ 25 Nm

18 - Bolt

- ❑ Renew after removing
- ❑ 3 Nm +90°

19 - Cam actuator

- ❑ Removing and installing ⇒ “4.5 Removing and installing cam actuators”, page 156

20 - O-ring

- ❑ Supplied with ⇒ Item 19 (page 123) ; not available separately
- ❑ Lubricate lightly with engine oil
- ❑ Check for damage

21 - Plug

- ❑ Renew after removing
- ❑ 5 Nm +90°

22 - Seal

- ❑ Renew after removing

23 - Rectangular section seals

24 - Sleeve bearing

- ❑ For inlet camshaft
- ❑ Removing and installing ⇒ “4.4 Removing and installing camshaft”, page 154

25 - Rectangular section seals

26 - Axial bearing

27 - Inlet camshaft

- ❑ Removing and installing ⇒ “4.4 Removing and installing camshaft”, page 154
- ❑ Measuring axial clearance ⇒ “4.2 Measuring axial clearance of camshaft”, page 153
- ❑ Measuring radial clearance ⇒ “4.3 Measuring radial clearance of camshaft”, page 154
- ❑ Runout: max. 0.04 mm

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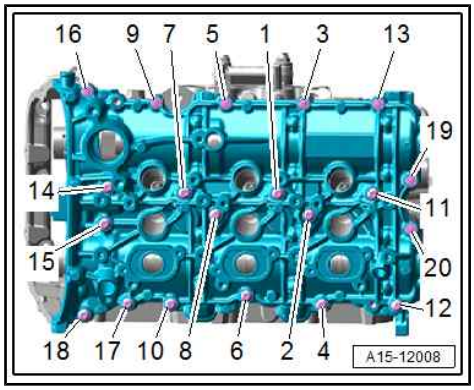
Camshaft housing, cylinder bank 1 (right-side) - tightening torques and sequence

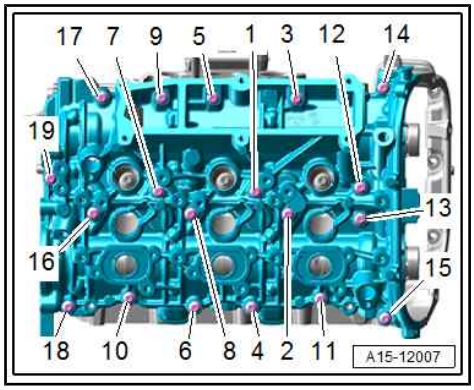


- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 20-	Screw in by hand until contact is made • The camshaft housing should make contact with the cylinder head over the full surface.
2.	-1 … 20-	8 Nm
3.	-1 … 20-	Turn 90° further

Camshaft housing, cylinder bank 2 (left-side) - tightening torques and sequence



- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 19-	Screw in by hand until contact is made • The camshaft housing should make contact with the cylinder head over the full surface.
2.	-1 … 19-	8 Nm
3.	-1 … 19-	Turn 90° further

3.3 Removing and installing cylinder head

⇒ “3.3.1 Removing cylinder head, bank 1 (right-side) - vehicles with 2.9 ltr. engine”, page 124

⇒ “3.3.2 Removing cylinder head, bank 2 (left-side) - vehicles with 2.9 ltr. engine”, page 126

⇒ “3.3.3 Installing cylinder head - vehicles with 2.9 ltr. engine”, page 129

⇒ “3.3.4 Removing cylinder head, bank 1 (right-side) - vehicles with 3.0 ltr. engine”, page 132

⇒ “3.3.5 Removing cylinder head, bank 2 (left-side) - vehicles with 3.0 ltr. engine”, page 134

⇒ “3.3.6 Installing cylinder head - vehicles with 3.0 ltr. engine”, page 137

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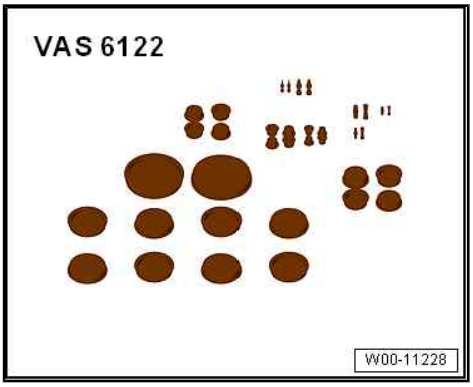
3.3.1 Removing cylinder head, bank 1 (right-side) - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



♦ Socket Torx T30 - T10405-

Procedure

– Remove camshaft housing for cylinder bank 1 (right-side) ⇒ “3.4.1 Removing and installing camshaft housing - cylinder bank 1 (right-side)”, page 141 .

– Remove turbocharger (right-side) ⇒ “1.2.1 Removing turbocharger, cylinder bank 1 (right-side) - vehicles with 2.9 ltr. engine”, page 238 .

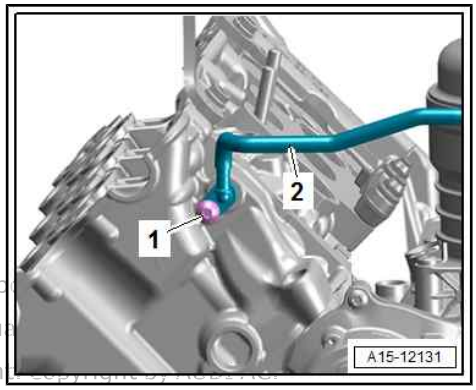
– Remove coolant pipe (front) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Remove intake manifold (right-side) ⇒ “4.2 Removing and installing intake manifold”, page 288 .

– Bring engine support and engine mounting into installation position and screw in bolts until they make contact.

– Remove support bracket ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Assembly mountings; Supporting engine in installation position .

– Remove bolt -1- and detach breather line -2- from cylinder head.



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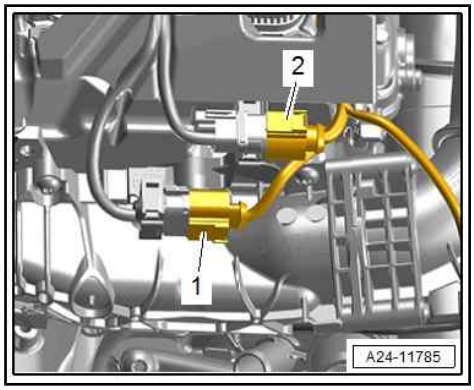
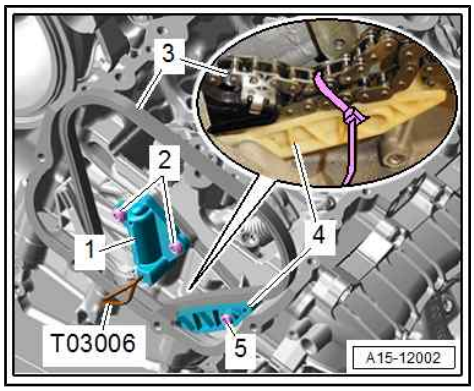
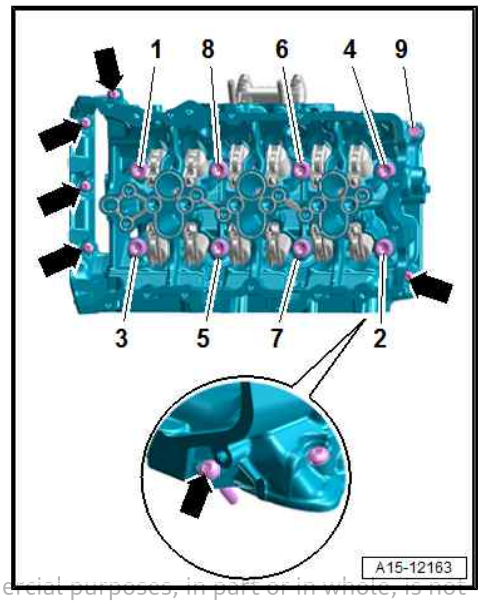
– Unplug electrical connector -1- for Lambda probe after catalytic converter - G130- and move wiring clear.
– Detach Lambda probe.



– Remove bolts -2- and detach chain tensioner -1-.
– Remove guide pin -5-.
– If cylinder head is being removed with engine installed: Press guide rail -4- upwards and secure it to camshaft timing chain -3- using cable tie, as shown.



– Remove bolts -arrows- and -9-.
– Slacken cylinder head bolts in the sequence -1 ... 8-.
– Remove bolts and carefully take off cylinder head.
– Place cylinder head onto soft surface (foam plastic).
– 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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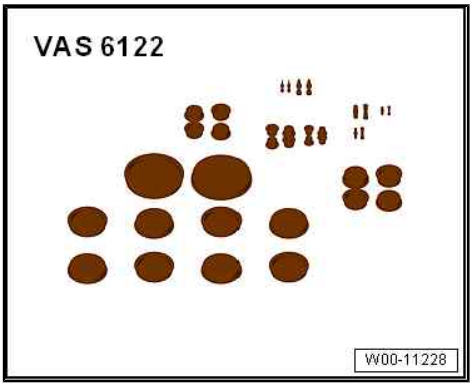
3.3.2 Removing cylinder head, bank 2 (left-side) - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



♦ Socket Torx T30 - T10405-

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Procedure

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing cylinder head .

– Remove camshaft housing (left-side)
⇒ “3.4.2 Removing and installing camshaft housing - cylinder bank 2 (left-side)”, page 145 .

– Remove turbocharger (left-side)
⇒ “1.2.2 Removing turbocharger, cylinder bank 2 (left-side) - vehicles with 2.9 ltr. engine”, page 240 .

Audi A6/A7 without electric compressor:

– Bring engine mounting into installation position and screw in bolts until they make contact.

Audi A6/A7 with electric compressor:

– Bring engine support and engine mounting into installation position and screw in bolts until they make contact.

– Bring subframe into installation position and tighten bolts to 115 Nm.

All vehicles (continued):

– Lower engine onto engine mounting.

– Remove support bracket ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Assembly mountings; Supporting engine in installation position .

– Remove coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

♦ Coolant pipe (front)

♦ Coolant pipe (front left)

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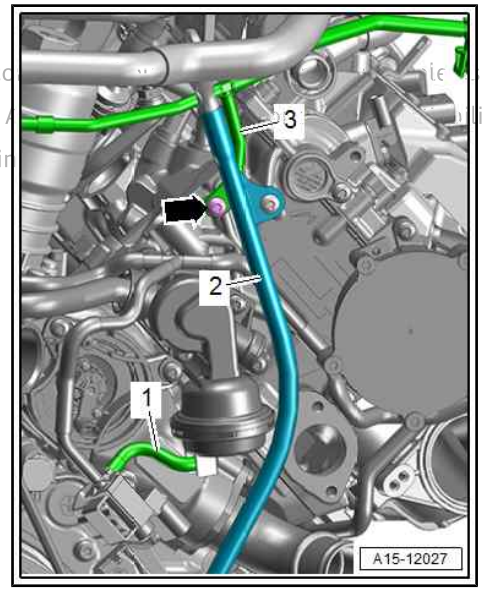
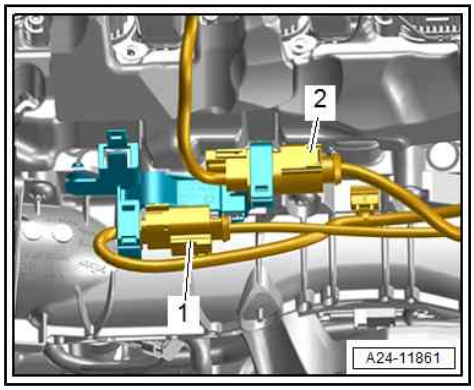
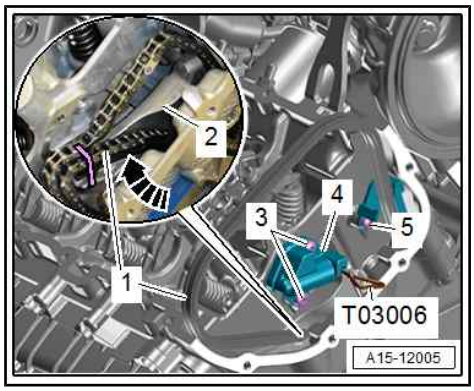
– Pull guide tube -2- for oil dipstick off sealing flange (pulley end) and detach guide tube.
– Remove bolt -arrow- and detach breather line -3- from cylinder head.
– Disconnect vacuum hose -1-, taking care not to damage it.



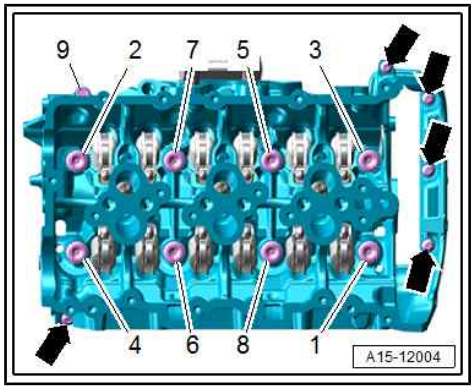
– Take electrical connector -1- for Lambda probe 2 after catalytic converter - G131- out of bracket, unplug and move wiring clear.
– Detach catalytic converter (left-side).



– Remove bolts -3- and detach chain tensioner -4-.
– Remove bolt -5- for guide rail.
– If cylinder head is being removed with engine installed: Press tensioning rail -2- upwards -arrow- and secure it to camshaft timing chain -1- using cable tie, as shown.



– Remove bolts -arrows- and -9-.
– Slacken cylinder head bolts in the sequence -1 ... 8-.
– Remove bolts and carefully take off cylinder head.
– Place cylinder head onto soft surface (foam plastic).
– Seal off all open passages in the intake and exhaust system with clean cloths or plugs (thoroughly cleaned) from engine bung set - VAS 6122- .



3.3.3 Installing cylinder head - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

- Blade scraper; blade width at least 40 mm (commercially available)
- Sealant ⇒ Electronic parts catalogue

Procedure

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Note

- *Risk of damage to sealing surfaces if handled incorrectly.*
- *Carefully remove sealant residue from cylinder head and cylinder block.*
- *Do NOT use abrasive materials (sandpaper, sanding discs, sanding pads, abrasive web, wire wool, etc.).*
- *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 the abrasive materials listed above are not being used there.*
- *Use of impermissible abrasive materials can lead to subsequent damage to the turbocharger, conrod bearings, etc.*

Caution

Risk of eye injury due to sealant residue.

- *Put on safety goggles.*

– Sealant residue may only be removed from the cylinder head and cylinder block using a commercially available blade scraper (blade width at least 40 mm).

– Remove loose residue with a lint-free cloth.

– Clean blind holes for cylinder head bolts in cylinder block so that they are free of oil and coolant residue.

• Carefully remove sealant residue from cylinder head and cylinder block.

• Ensure that no long scores or scratches are made on the surfaces.

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

• 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.

• 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.

• After removing, renew bolts tightened with specified tightening angle.

- Renew self-locking nuts, as well as seals, gaskets and O-rings after removing.
- The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.
- When installing an exchange cylinder head, the contact surfaces between roller rocker finger and cam must be oiled before installing the cylinder head cover.
- Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .
- Before fitting, check vacuum hoses for damage and renew if necessary.
- After fitting a new cylinder head or cylinder head gasket, change engine oil and coolant in entire cooling system.

– Check if non-return valve for coolant -arrow- is fitted in cylinder head (shown on cylinder bank 2).

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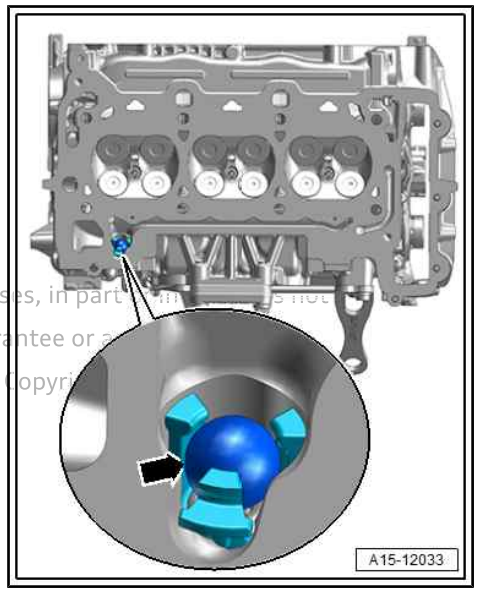
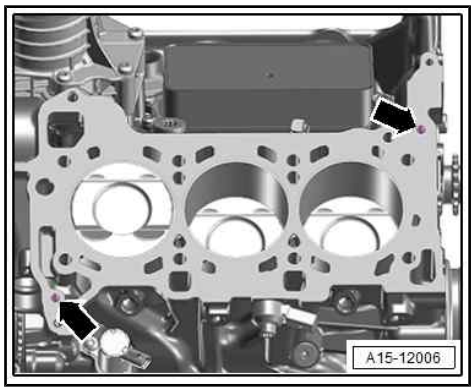


– Check that dowel sleeves -arrows- are fitted in cylinder block (shown on cylinder block, bank 2).
– Clean surfaces; they must be free of oil and grease.



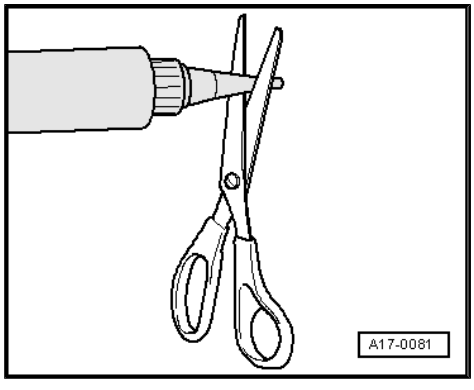
- Note expiry date of sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.0 mm).

Caution

Make sure lubrication system is not clogged by excess sealant.

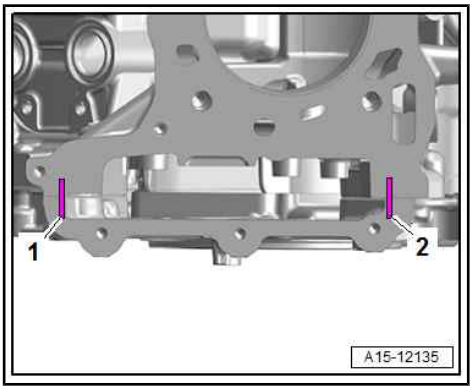
- ***The sealant beads must not be thicker than specified.***



Cylinder bank 1 (right-side):

– Apply beads of sealant -1, 2- onto clean sealing surfaces of cylinder block and timing chain cover (bottom) as shown.

• Width of sealant bead: 2 mm.



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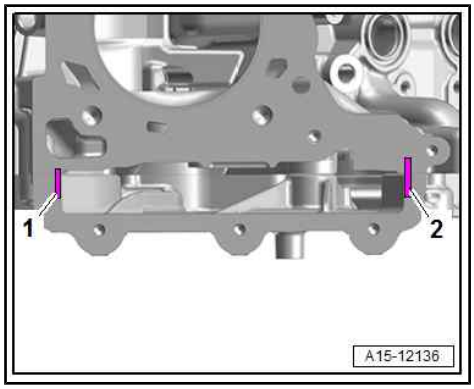
Cylinder bank 2 (left-side):



– Apply beads of sealant -1, 2- onto clean sealing surfaces of cylinder block and timing chain cover (bottom) as shown.

• Width of sealant bead: 2 mm.

– Fit cylinder head gasket onto dowel sleeves in cylinder block.

• Installation position of cylinder head gasket: the word “oben” (top) or the part number should face towards the cylinder head.

– Fit cylinder head.

– Screw in cylinder head bolts by hand until they make contact.

– Tighten cylinder head bolts.

Note:

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

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

– Install coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Install turbocharger ⇒ “1.2 Removing and installing turbocharger”, page 238 .

– Install camshaft housing ⇒ “3.4 Removing and installing camshaft housing”, page 141 .

– Change engine oil ⇒ “1.2 Engine oil”, page 175 .

– Fill cooling system with fresh coolant ⇒ “1.3 Draining and filling cooling system”, page 213 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing cylinder head

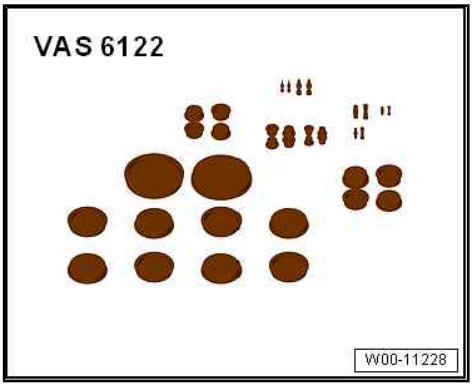
Tightening torques

- ⇒ “3.1 Exploded view - cylinder head”, page 118
- ⇒ Fig. ““Cylinder head, bank 1 (right-side) - tightening torques and sequence”“ , page 119
- ⇒ Fig. ““Cylinder head, bank 2 (left-side) - tightening torques and sequence”“ , page 120
- ⇒ Fig. ““Installing coolant bleeder line, cylinder bank 1 (right-side)”“ , page 120
- ⇒ Fig. ““Installing coolant bleeder line, cylinder bank 2 (left-side)”“ , page 120
- ⇒ “2.1 Exploded view - camshaft timing chains”, page 89
- ⇒ “1.1 Exploded view - turbocharger”, page 231

3.3.4 Removing cylinder head, bank 1 (right-side) - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

♦ Engine bung set - VAS 6122-



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Procedure

– Remove turbocharger
⇒ “1.2.4 Removing and installing turbocharger - vehicles with 3.0 ltr. engine”, page 242 .

– Remove camshaft housing for cylinder bank 1 (right-side)
⇒ “3.4.1 Removing and installing camshaft housing - cylinder bank 1 (right-side)”, page 141 .

– Remove coolant pipe (front) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

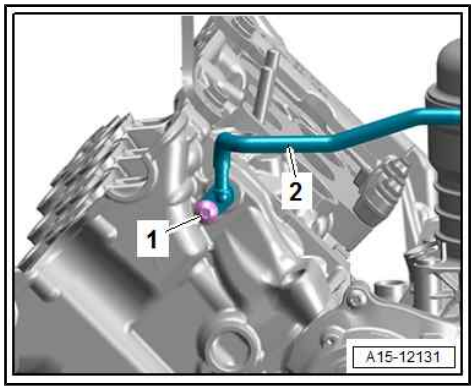
– Remove intake manifold (right-side)
⇒ “4.2 Removing and installing intake manifold”, page 288 .

– If fitted, remove coolant pipe (right-side) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

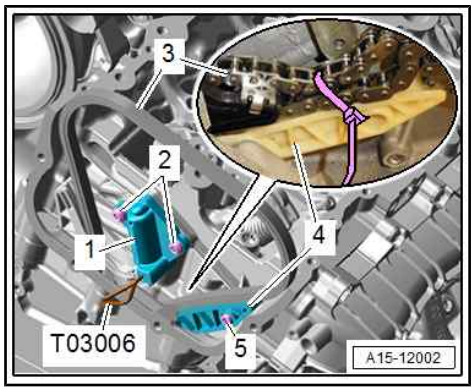
– Bring engine support and engine mounting into installation position and screw in bolts until they make contact.

– Remove support bracket ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Assembly mountings; Supporting engine in installation position .

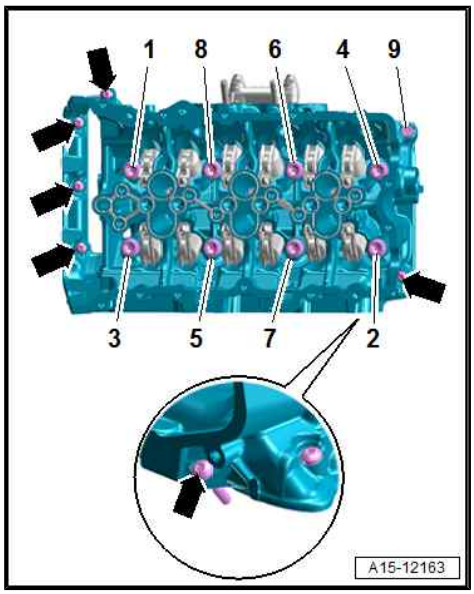
– Remove bolt -1- and detach breather line -2- from cylinder head.



– Remove bolts -2- and detach chain tensioner -1-.
– Remove guide pin -5-.
– If cylinder head is being removed with engine installed: Press guide rail -4- upwards and secure it to camshaft timing chain -3- using cable tie, as shown.



– Remove bolts -arrows- and -9-.
– Slacken cylinder head bolts in the sequence -1 ... 8-.
– Remove bolts and carefully take off cylinder head.
– Place cylinder head onto soft surface (foam plastic).
– Seal off all open passages in the intake and exhaust system with clean cloths or plugs (thoroughly cleaned) from engine bung set - VAS 6122- .



3.3.5 Removing cylinder head, bank 2 (left-side) - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

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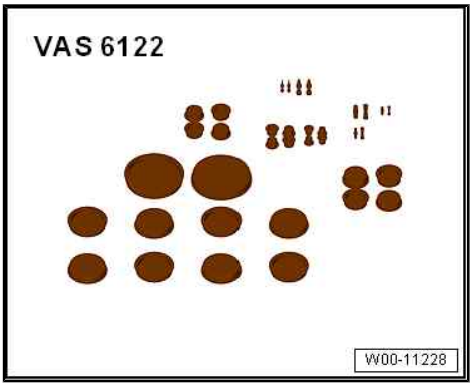
- Engine bung set - VAS 6122-



- Socket Torx T30 - T10405-

Procedure

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing cylinder head .

– Remove camshaft housing (left-side)
⇒ “3.4.2 Removing and installing camshaft housing - cylinder bank 2 (left-side)”, page 145 .

Audi A6/A7:

– Bring engine mounting into installation position and screw in bolts until they make contact.

– Lower engine onto engine mounting.

– Remove support bracket ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 10 ; Assembly mountings; Supporting engine in installation position .

All vehicles (continued):

– Remove coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

- Coolant pipe (front)
- Coolant pipe (front left)

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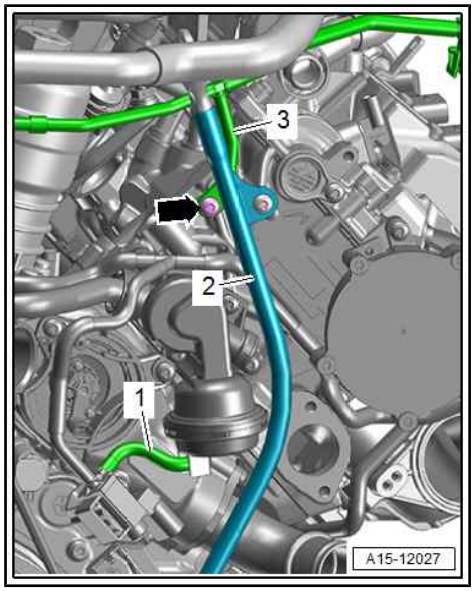
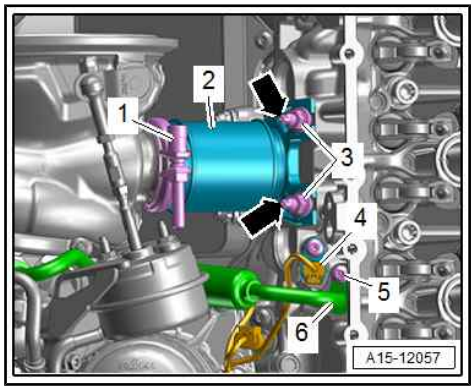
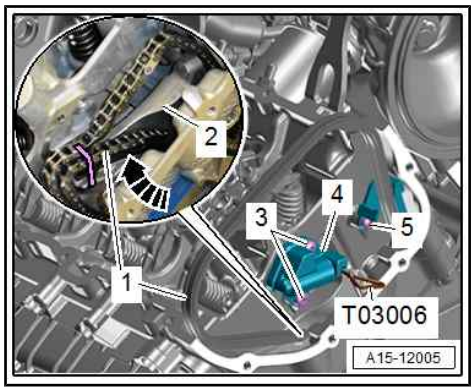
– Pull guide tube -2- for oil dipstick off sealing flange (pulley end) and detach guide tube.
– Remove bolt -arrow- and detach breather line -3- from cylinder head.
– Disconnect vacuum hose -1-, taking care not to damage it.



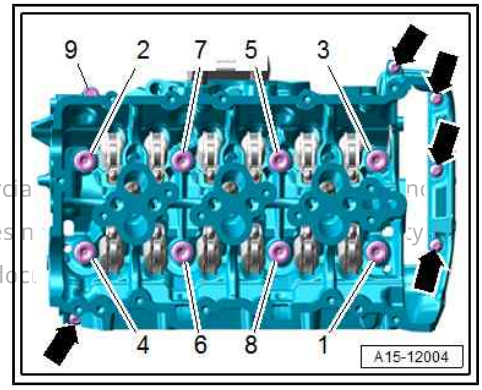
– Unplug electrical connector -4- for coolant temperature sender - G62- .
– Unscrew bolt -5- and move coolant line -6- clear to one side.
– Release screw-type clip -1- and remove nuts -3-.
– Unscrew threaded pins -arrows- and detach flexible joint -2-.



– Remove bolts -3- and detach chain tensioner -4-.
– Remove bolt -5- for guide rail.
– If cylinder head is being removed with engine installed: Press tensioning rail -2- upwards -arrow- and secure it to camshaft timing chain -1- using cable tie, as shown.



– Remove bolts -arrows- and -9-.
– Slacken cylinder head bolts in the sequence -1 ... 8-.
– Remove bolts and carefully take off cylinder head.
– Place cylinder head onto soft surface (foam plastic).
– 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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3.3.6 Installing cylinder head - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

- Sealant ⇒ Electronic parts catalogue
- Blade scraper; blade width at least 40 mm (commercially available)

Procedure

Note

- *Risk of damage to sealing surfaces if handled incorrectly.*
- *Carefully remove sealant residue from cylinder head and cylinder block.*
- *Do NOT use abrasive materials (sandpaper, sanding discs, sanding pads, abrasive web, wire wool, etc.).*
- *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 the abrasive materials listed above are not being used there.*
- *Use of impermissible abrasive materials can lead to subsequent damage to the turbocharger, conrod bearings, etc.*

Caution

Risk of eye injury due to sealant residue.

- ***Put on safety goggles.***

– Sealant residue may only be removed from the cylinder head and cylinder block using a commercially available blade scraper (blade width at least 40 mm).

– Remove loose residue with a lint-free cloth.

– Clean blind holes for cylinder head bolts in cylinder block so that they are free of oil and coolant residue.

• Carefully remove sealant residue from cylinder head and cylinder block.

• Ensure that no long scores or scratches are made on the surfaces.

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

• 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.

• 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.

• After removing, renew bolts tightened with specified tightening angle.

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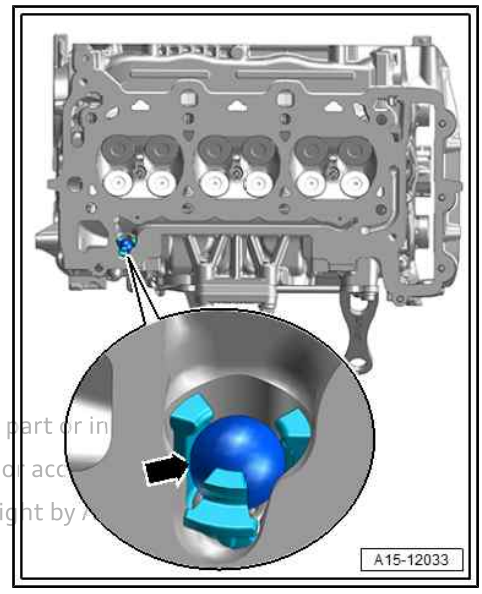
- Renew self-locking nuts, as well as seals, gaskets and O-rings after removing.
- The gaskets for the left and right cylinder heads have different shapes and cannot be interchanged.
- When installing an exchange cylinder head, the contact surfaces between roller rocker finger and cam must be oiled before installing the cylinder head cover.
- Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .
- 3.0 ltr. engine: Renew flexible joint after removing ⇒ Item 19 (page 237) .
- Before fitting, check vacuum hoses for damage and renew if necessary.
- After fitting a new cylinder head or cylinder head gasket, change engine oil and coolant in entire cooling system.

– Check if non-return valve for coolant -arrow- is fitted in cylinder head (shown on cylinder bank 2).



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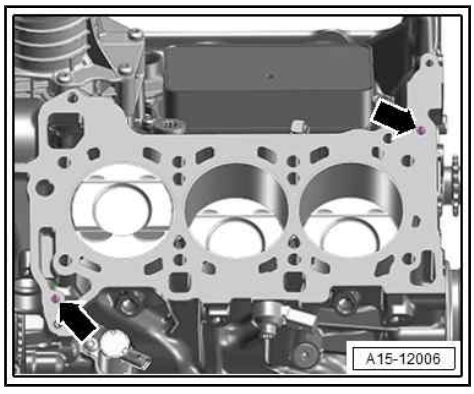
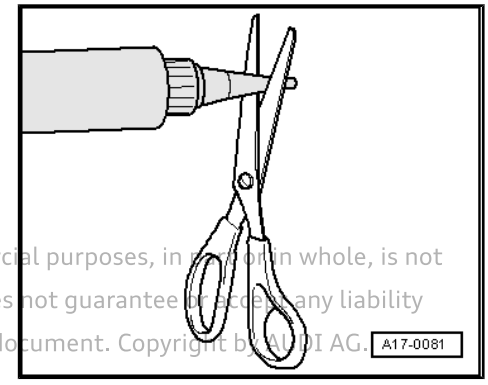
– Check that dowel sleeves -arrows- are fitted in cylinder block (shown on cylinder block, bank 2).
– Clean surfaces; they must be free of oil and grease.



- Note expiry date of sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.0 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

- ***The sealant beads must not be thicker than specified.***

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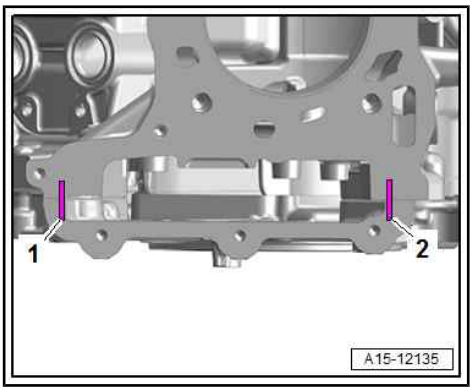
Cylinder bank 1 (right-side):

– Apply beads of sealant -1, 2- onto clean sealing surfaces of cylinder block and timing chain cover (bottom) as shown.

- Width of sealant bead: 2 mm.



Cylinder bank 2 (left-side):

– Apply beads of sealant -1, 2- onto clean sealing surfaces of cylinder block and timing chain cover (bottom) as shown.

- Width of sealant bead: 2 mm.

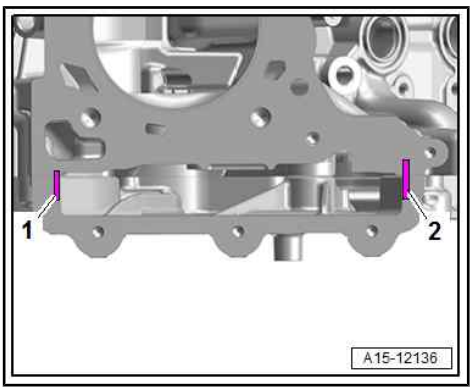
– Fit cylinder head gasket onto dowel sleeves in cylinder block.

- Installation position of cylinder head gasket: the word “oben” (top) or the part number should face towards the cylinder head.

– Fit cylinder head.

– Screw in cylinder head bolts by hand until they make contact.

– Tighten cylinder head bolts.



Note:

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

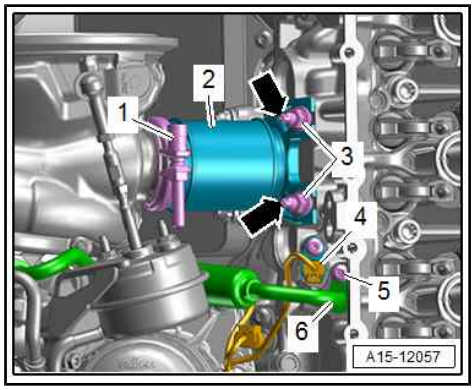
Remaining installation steps are carried out in reverse sequence; note the following:

– Install coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

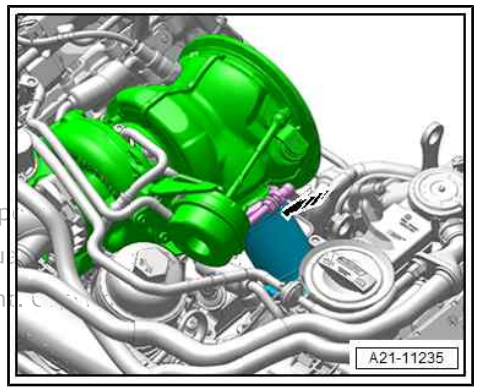
– Install camshaft housing
⇒ “3.4 Removing and installing camshaft housing”, page 141 .

– Cylinder head, bank 1 (right-side): Install turbocharger
⇒ “1.2.4 Removing and installing turbocharger - vehicles with 3.0 ltr. engine”, page 242 .

– Cylinder head, bank 2 (left-side): Fit flexible joint -2- with screw-type clip -1-. Fit and tighten studs -arrows-.
– Tighten nuts -3-.



– Press flexible joint in direction of -arrow- by hand while tightening screw-type clip.
• Pressure must be applied at right angle -arrow- to flexible joint.



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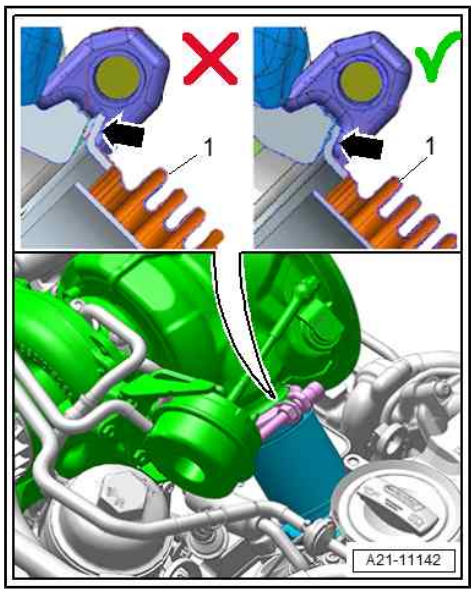
– When tightening, ensure that flange contour of flexible joint -1- is positioned flush with contour on turbine housing of turbocharger.



Note

It is possible to check the correct installation -arrow- of the flexible joint -1- by examining the screw-type clip from above.

– Change engine oil ⇒ “1.2 Engine oil”, page 175 .
– Fill cooling system with fresh coolant ⇒ “1.3 Draining and filling cooling system”, page 213 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing cylinder head

Tightening torques

- ⇒ “3.1 Exploded view - cylinder head”, page 118
- ⇒ Fig. ““Cylinder head, bank 1 (right-side) - tightening torques and sequence”“ , page 119
- ⇒ Fig. ““Cylinder head, bank 2 (left-side) - tightening torques and sequence”“ , page 120
- ⇒ Fig. ““Installing coolant bleeder line, cylinder bank 1 (right-side)”“ , page 120
- ⇒ Fig. ““Installing coolant bleeder line, cylinder bank 2 (left-side)”“ , page 120
- ⇒ “2.1 Exploded view - camshaft timing chains”, page 89
- ⇒ “1.1 Exploded view - turbocharger”, page 231

3.4 Removing and installing camshaft housing

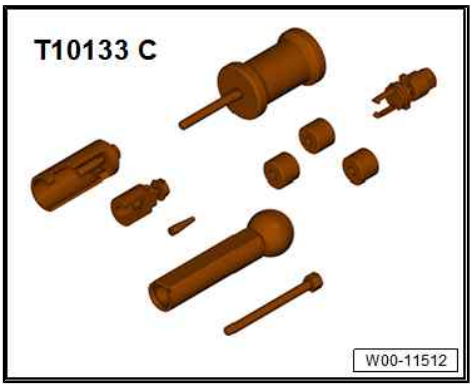
⇒ “3.4.1 Removing and installing camshaft housing - cylinder bank 1 (right-side)”, page 141

⇒ “3.4.2 Removing and installing camshaft housing - cylinder bank 2 (left-side)”, page 145

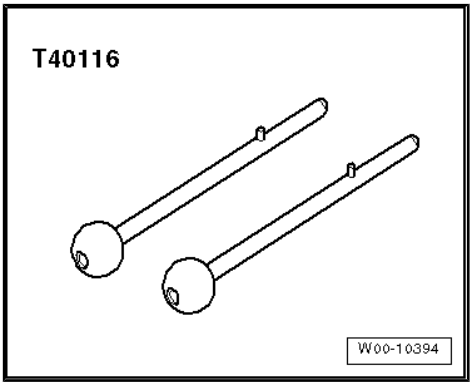
3.4.1 Removing and installing camshaft housing - cylinder bank 1 (right-side)

Special tools and workshop equipment required

- Impact extractor attachment -T10133/3- from tool set for FSI engines - T10133 C-



- Locating pins - T40116-



- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue
- Bolt, M8x25 (2x)

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Removing

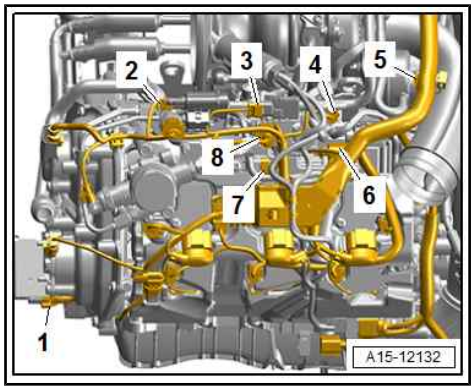
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing camshaft housing .

– Remove high-pressure pump ⇒ “7.2 Removing and installing high-pressure pump”, page 313 .

– Remove timing chain from camshafts ⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93 .

– Remove injectors ⇒ “5.3 Removing and installing injectors”, page 295 .

2.9 ltr. engine:



– Unplug electrical connectors:

1 - For continued coolant circulation pump - V51-

2 - For activated charcoal filter solenoid valve 1 - N80-

3 - For tank breather pressure sensor 1 - G950-

4 - For temperature sender for engine cover panel - G765-

5 - For overrun air recirculation valve for bank 1 - N625-

6 - For switch valve for mechanical coolant pump - N649-

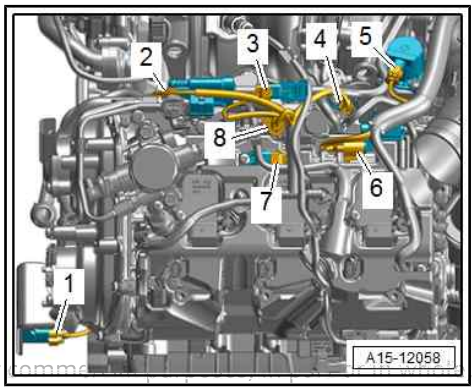
7 - For Hall sender 3 - G300-

8 - For charge pressure control solenoid valve - N75-

– Detach wiring harness and move clear to the side.

– Detach activated charcoal filter solenoid valve 1 - N80- from bracket and press to side.

3.0 ltr. engine:



– Unplug electrical connectors:

1 - For continued coolant circulation pump - V51-

2 - For activated charcoal filter solenoid valve 1 - N80-

3 - For tank breather pressure sensor 1 - G950-

4 - For temperature sender for engine cover panel - G765-

5 - For overrun air recirculation valve for bank 1 - N625-

6 - For switch valve for mechanical coolant pump - N649-

7 - For Hall sender 3 - G300-

8 - For charge pressure control solenoid valve - N75-

– Detach wiring harness and move clear to the side.

– Detach activated charcoal filter solenoid valve 1 - N80- from bracket and press to side.

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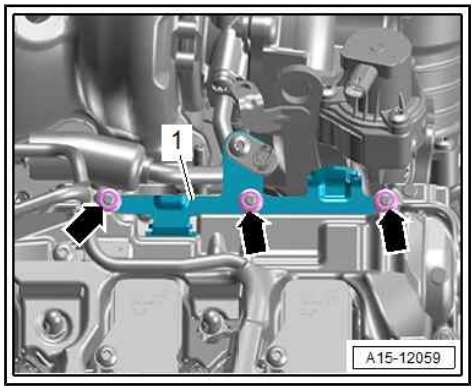
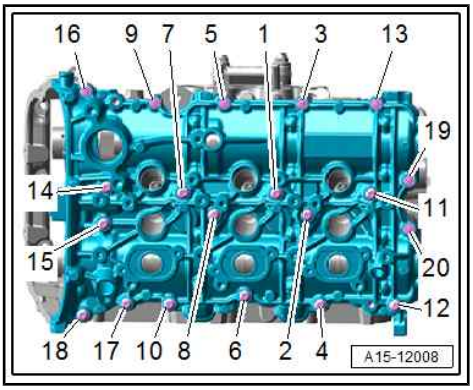
All vehicles (continued):

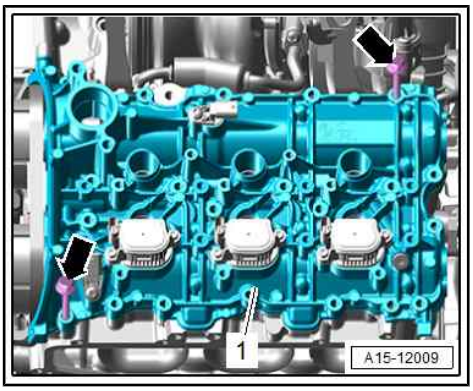


– Remove nuts -arrows- and detach bracket -1- for solenoid valves.

– Detach noise insulation (bottom section).
– Loosen and remove bolts for camshaft housing in the sequence -20 ... 1-.



– To loosen camshaft housing -1-, screw in two M8x25 bolts -arrows- as as far as stop.
– Screw bolts in $^1/_2$ turn each (one after the other) until camshaft housing is released.
– Remove bolts and detach camshaft housing.



Installing

- After removing, renew bolts tightened with specified tightening angle.
- Renew gasket after removing.
- Hydraulic compensation elements and roller rocker fingers installed.

If only one of the camshaft housings was removed, “TDC” position of crankshafts must be checked with camshaft housing fitted.

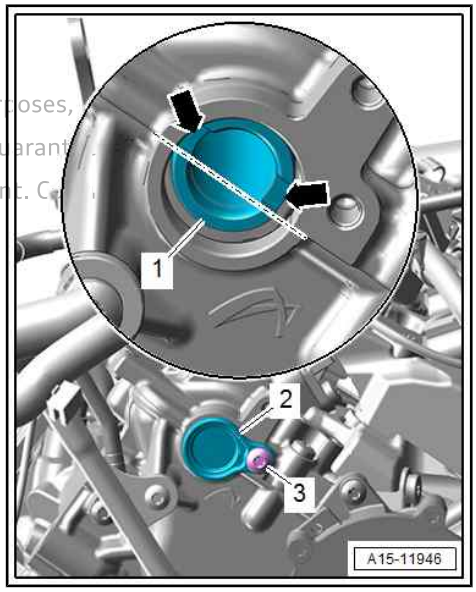
Caution

Risk of damage to engine.

- *Camshafts must be at “TDC” position, as described below.*

– Unscrew bolt -3- and remove sealing plug -2-.

- Exhaust camshaft -1- has an asymmetrically positioned pair of grooves -arrows-. In TDC position, the asymmetrically positioned pair of grooves must be above the imaginary horizontal centre line, as shown. Turn crankshaft one turn if necessary. (Shown on exhaust camshaft, cylinder bank 2)
- Crankshaft locked in “TDC” position with camshaft clamp - T40264/3- / locking pin - T40069- .
- Camshaft clamp -T40331/1- screwed into camshaft housing (right-side)



Caution

Protect lubrication system against contamination.

- *Cover exposed parts of the engine.*

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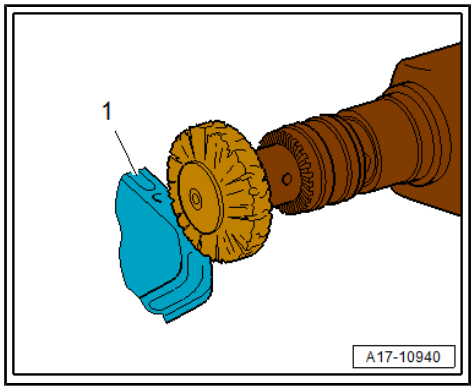
WARNING

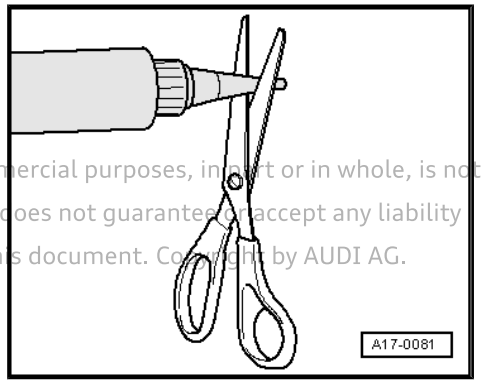
Risk of eye injury.

- *Put on safety goggles.*



– Remove remaining sealant from camshaft housing -1- and cylinder head using rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.
– Oil running surfaces of both camshafts.

• Note expiry date of sealant.
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.5 mm).



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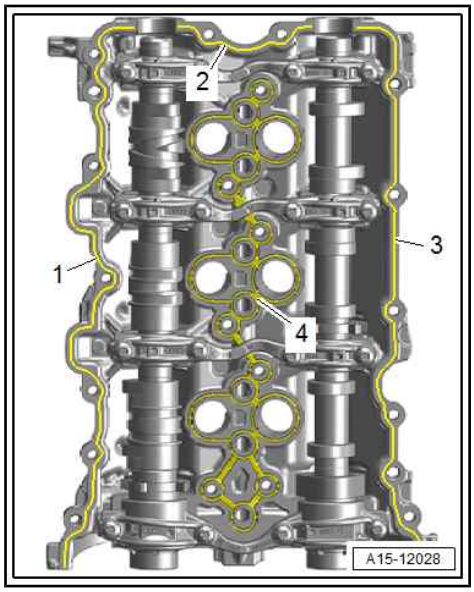
– Fit gasket -4-.

Caution

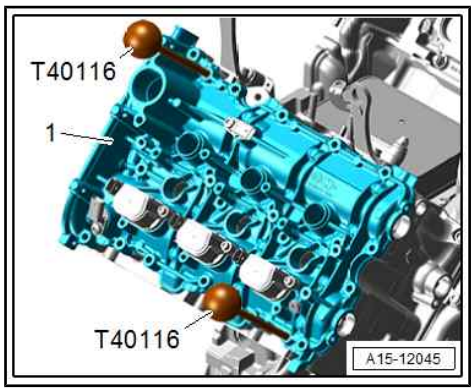
Make sure excess sealant does not contaminate camshaft bearings.

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

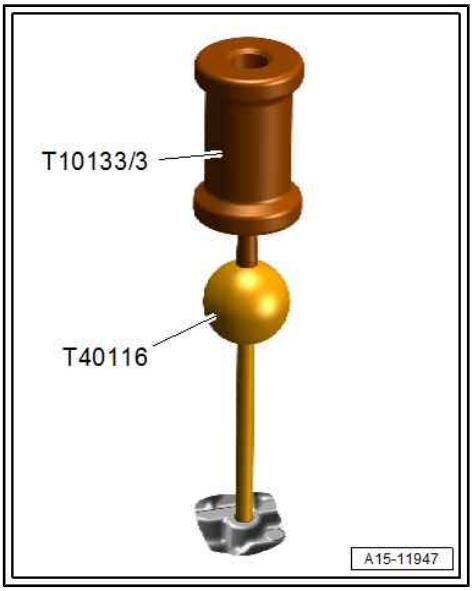


– Apply sealant beads -1, 2, 3- to the clean sealing surfaces of the camshaft housing.
• Width of sealant beads: 3.0 mm.
• Install camshaft housing within 5 minutes after applying the sealant.

– Place camshaft housing -1- on cylinder head but do not press sealant beads on yet.
• Sealant must not be allowed to get into threaded holes.
– Insert locating pins - T40116- in camshaft housing and cylinder head.
– Screw in all bolts for camshaft housing by hand initially and then tighten.



– Use impact extractor attachment -T10133/3- to pull out locating pins - T40116- .



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

– Insert noise insulation (bottom section).

– Install injectors
⇒ “5.3 Removing and installing injectors”, page 295 .

– Fit camshaft timing chain (adjust valve timing)
⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93 .

– Install high-pressure pump
⇒ “7.2 Removing and installing high-pressure pump”, page 313 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing camshaft housing

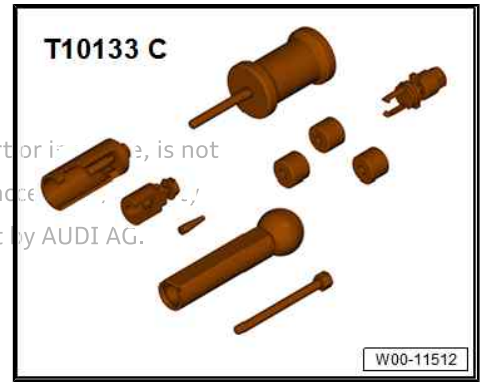
Tightening torques

♦ ⇒ Fig. ““Camshaft housing, cylinder bank 1 (right-side) - tightening torques and sequence”“ , page 124

3.4.2 Removing and installing camshaft housing - cylinder bank 2 (left-side)

Special tools and workshop equipment required

♦ Impact extractor attachment -T10133/3- from tool set for FSI engines - T10133 C-



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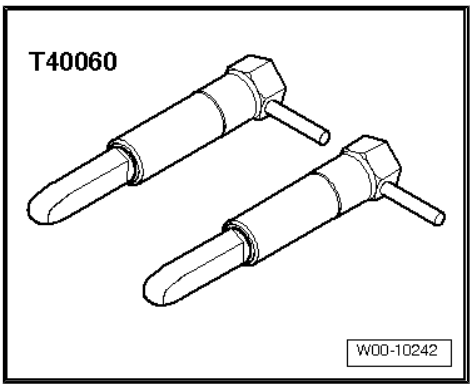
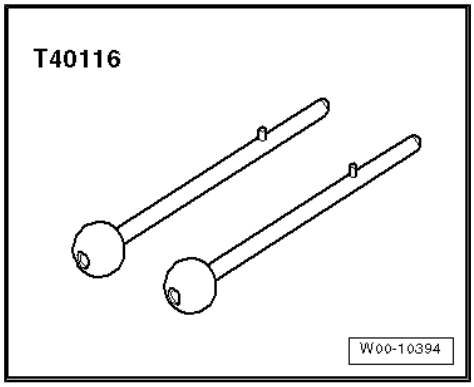
♦ Adjusting pin - T40060- (with engine installed)



- Locating pins - T40116-



- Electric drill with plastic brush attachment
- Safety goggles
- Sealant ⇒ Electronic parts catalogue
- Bolt, M8x25 (2x)

Removing

– Remove timing chain from camshafts ⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93 .

– Remove crankcase breather module ⇒ “3.2 Removing and installing crankcase breather module”, page 195 .

– Remove injectors ⇒ “5.3 Removing and installing injectors”, page 295 .

– Detach noise insulation (bottom section).

– Loosen and remove bolts for camshaft housing in the sequence -19 ... 1-.

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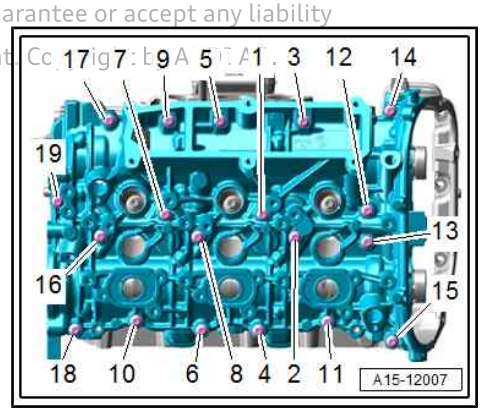

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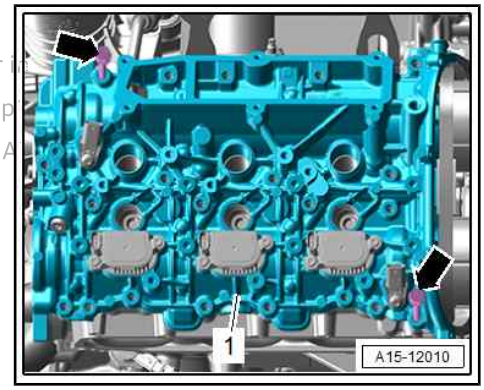
– To loosen camshaft housing -1-, screw in two M8x25 bolts -arrows- as far as stop.
– Screw bolts in 1/2 turn each (one after the other) until camshaft housing is released.
– Remove bolts and detach camshaft housing.



Installing

- After removing, renew bolts tightened with specified tightening angle.
- Renew gasket after removing.
- Hydraulic compensation elements and roller rocker fingers installed.

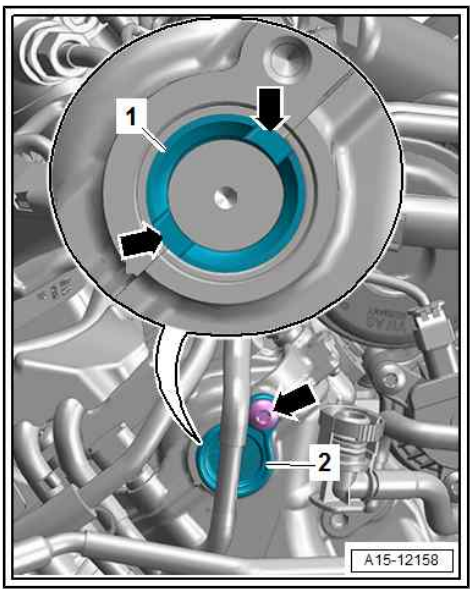
If only one of the camshaft housings was removed, “TDC” position of crankshafts must be checked with camshaft housing fitted.

Caution

Risk of damage to engine.

- *Camshafts must be at “TDC” position, as described below.*

– Unscrew bolt -3- and remove sealing plug -2-.
- Exhaust camshaft -1- has an asymmetrically positioned pair of grooves -arrows-. In TDC position, the asymmetrically positioned pair of grooves must be above the imaginary horizontal centre line, as shown. Turn crankshaft one turn if necessary.
- Crankshaft locked in “TDC” position with camshaft clamp - T40264/3- / locking pin - T40069- .
- Camshaft clamp -T40331/1- screwed into camshaft housing (left-side)



Caution

Protect lubrication system against contamination.

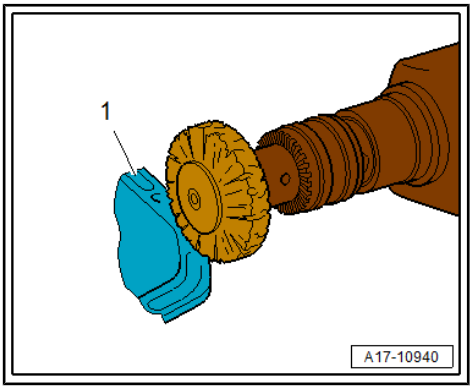
- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

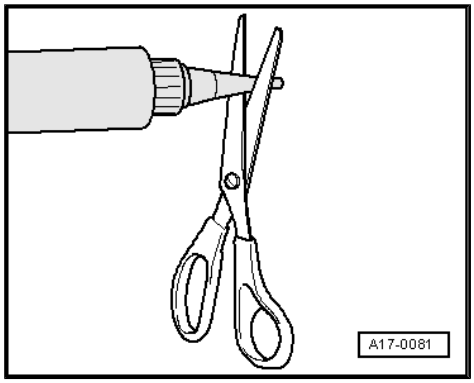
- *Put on safety goggles.*

– Remove remaining sealant from camshaft housing -1- and cylinder head using rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.
– Oil running surfaces of both camshafts.



- Note expiry date of sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.5 mm).



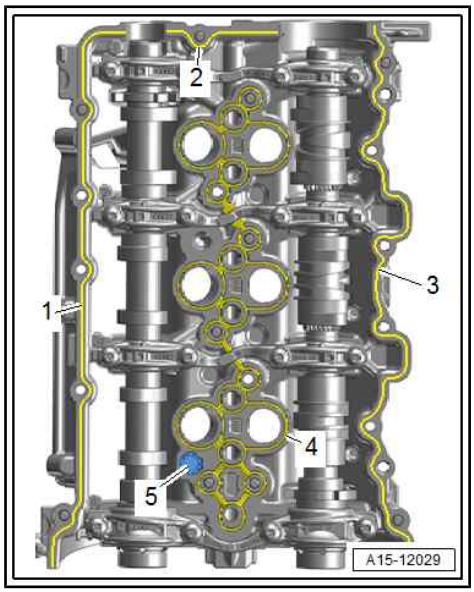
– Check whether retention valve -5- is fitted.

– Fit gasket -4-.

Caution

Make sure excess sealant does not contaminate camshaft bearings.

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



– Apply sealant beads -1, 2, 3- to the clean sealing surfaces of the camshaft housing.

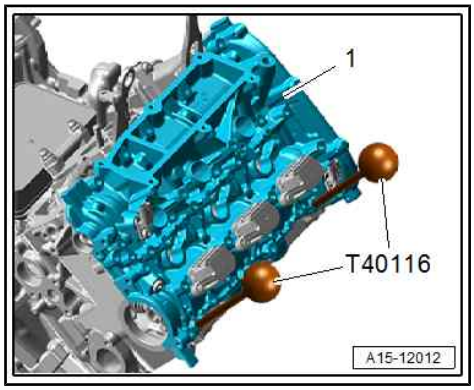
- Width of sealant beads: 3.0 mm.
- Install camshaft housing within 5 minutes after applying the sealant.

Procedure if engine has been removed during preparatory work:

– Place camshaft housing -1- on cylinder head but do not press sealant beads on yet.

- Sealant must not be allowed to get into threaded holes.

– Insert locating pins - T40116- in camshaft housing and cylinder head.



Procedure if engine has NOT been removed during preparatory work:

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing camshaft housing .

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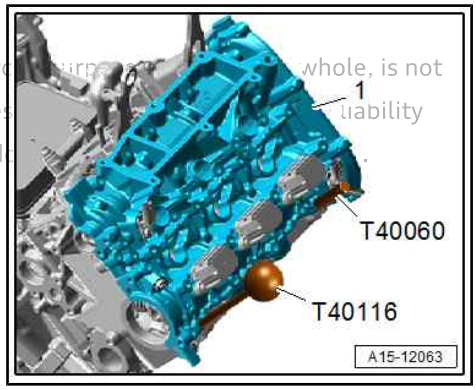
– Place camshaft housing -1- on cylinder head but do not press sealant beads on yet.

- Sealant must not be allowed to get into threaded holes.

– Insert locating pin - T40116- at front of camshaft housing and cylinder head.

– Insert adjusting pin - T40060- at rear of camshaft housing and cylinder head.



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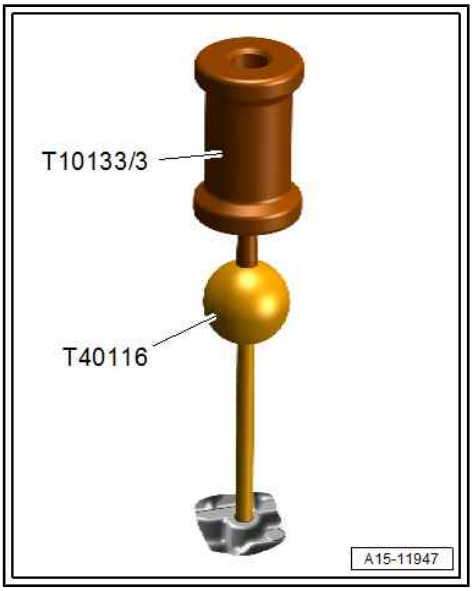

– Screw in all bolts for camshaft housing by hand initially and then tighten.
– Use impact extractor attachment -T10133/3- to pull out locating pin - T40116- .
– If necessary, pull adjusting pin - T40060- out with pliers.

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

– Insert noise insulation (bottom section).
– Install injectors
⇒ “5.3 Removing and installing injectors”, page 295 .
– Fit camshaft timing chain (adjust valve timing)
⇒ “2.3 Removing camshaft timing chain from camshafts”, page 93 .
– Install crankcase breather module
⇒ “3.2 Removing and installing crankcase breather module”, page 195 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Cylinder head; Removing and installing camshaft housing

Tightening torques

♦ ⇒ Fig. ““Camshaft housing, cylinder bank 2 (left-side) - tightening torques and sequence”“ , page 124

3.5 Checking compression

Special tools and workshop equipment required

♦ Compression tester - V.A.G 1763-

♦ Spark plug socket, 3/8" - VAS 6919-

Procedure

• Engine oil temperature at least 30 °C
• Battery voltage at least 12.5 V
– Remove fuse for fuel pump control unit - J538- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.
– Remove ignition coils
⇒ “1.2 Removing and installing ignition coils with output stages”, page 341 .
– Unscrew spark plugs using spark plug socket, 3/8" - VAS 6919- .

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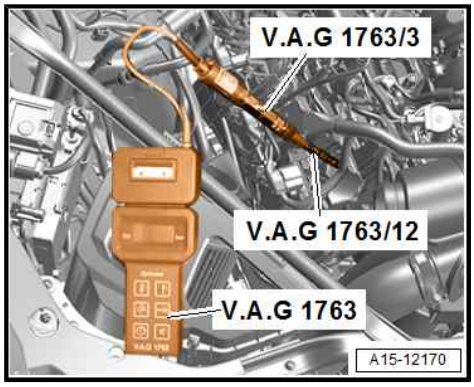
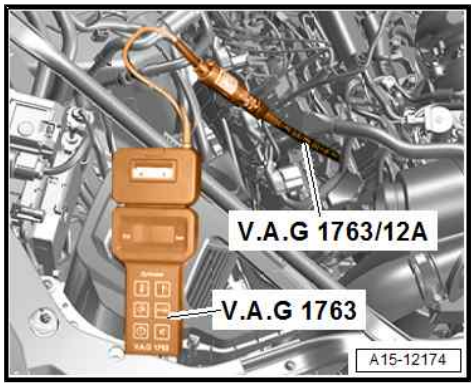
With adapter - V.A.G 1763/12- :

– Screw compression tester - V.A.G 1763- into corresponding spark plug hole, as shown.



With adapter - V.A.G 1763/12A- :

– Screw compression tester - V.A.G 1763- into corresponding spark plug hole, as shown.



Continued:

– Check compression pressure with compression tester - V.A.G 1763- (see ⇒ operating instructions for details of how to use tester).

• A second mechanic is required for the following step.

– Have a 2nd mechanic press down the accelerator pedal completely and at the same time operate the starter until the pressure on the tester display no longer increases.

– Repeat procedure on each cylinder.

Compression pressure	bar	
	2.9 ltr. engine	**3.0 ltr. engine**
When new	12.0 … 17.0	14.0 … 18.5
Wear limit	10.0	12.0
Maximum difference between cylinders	3.0	3.0

Assembly is performed in reverse sequence; note the following:

– Install spark plugs ⇒ “1.1 Exploded view - ignition system”, page 340 .

– Install ignition coils ⇒ “1.2 Removing and installing ignition coils with output stages”, page 341 .

– Insert fuse for fuel pump control unit - J538- ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester.

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4 Valve gear

⇒ “4.1 Exploded view - valve gear”, page 151

⇒ “4.2 Measuring axial clearance of camshaft”, page 153

⇒ “4.3 Measuring radial clearance of camshaft”, page 154

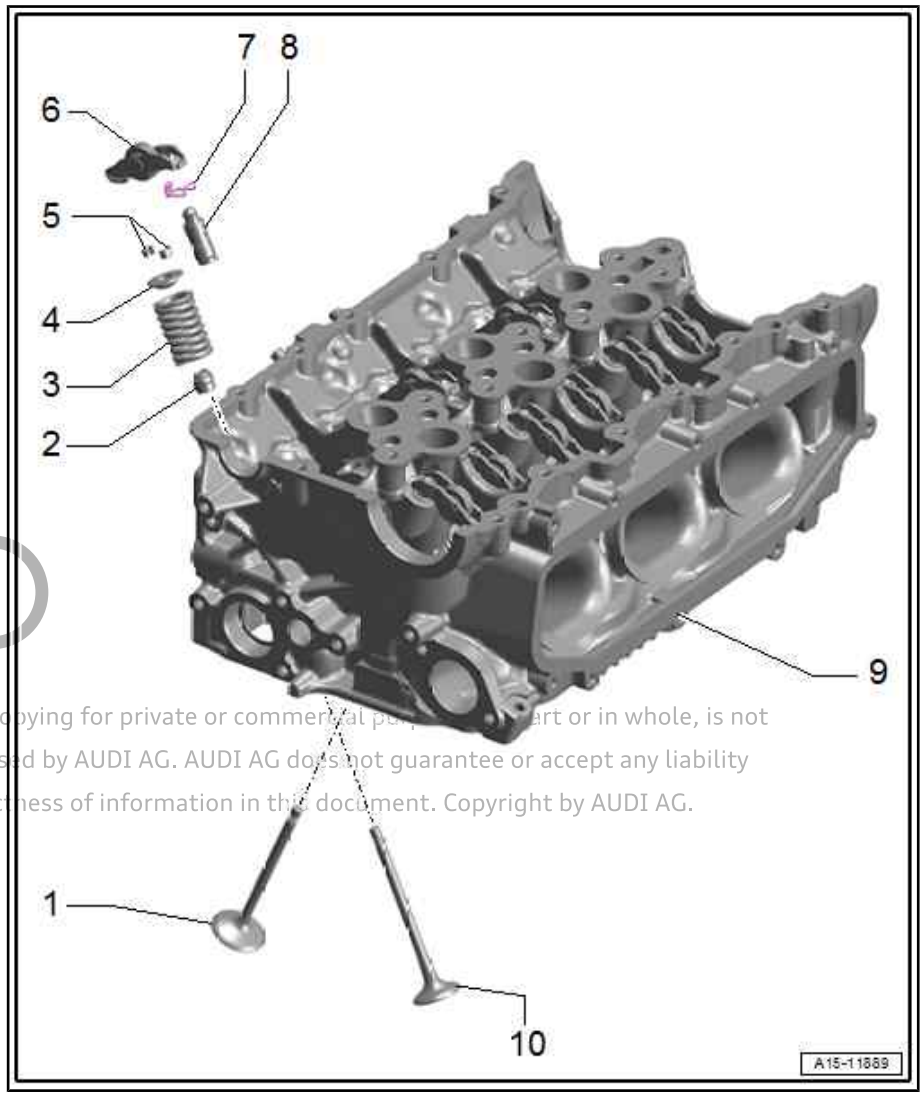
⇒ “4.4 Removing and installing camshaft”, page 154

⇒ “4.5 Removing and installing cam actuators”, page 156

⇒ “4.6 Removing and installing camshaft control valve 1 N205 ”, page 157

⇒ “4.7 Removing and installing valve stem oil seals”, page 158

4.1 Exploded view - valve gear



1 - Exhaust valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Mark installation position for re-installation
- ❑ Valve dimensions ⇒ “5.3 Valve dimensions”, page 170
- ❑ Checking valve guides ⇒ “5.1 Checking valve guides”, page 169

2 - Valve stem oil seal

- ❑ Different versions; allocation ⇒ page 153
- ❑ Renewing ⇒ “4.7 Removing and installing valve stem oil seals”, page 158

3 - Valve spring

- ❑ Installation position:

◆ Inlet valve ⇒ Fig. ““Installation position of valve spring for inlet valve”“, page 152

◆ Exhaust valve ⇒ Fig. ““Installation position of exhaust valve spring”“ , page 152

4 - Valve spring plate

5 - Valve cotters

6 - Roller rocker finger

- ❑ Mark installation position for re-installation with a coloured pen
- ❑ Check roller bearings for ease of movement
- ❑ Oil running surfaces before fitting
- ❑ Clip onto hydraulic compensation element ⇒ Item 8 (page 152) using securing clip ⇒ Item 7 (page 151)

7 - Securing clip

- ❑ Not supplied separately

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- ❑ Check for firm attachment

8 - Hydraulic compensation element

- ❑ Clipped onto roller rocker finger ⇒ Item 6 (page 151)
- ❑ Mark installation position for re-installation with a coloured pen
- ❑ Oil running surfaces before fitting

9 - Cylinder head

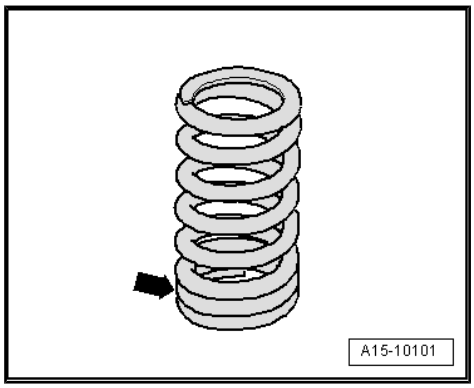
- ❑ Shown for cylinder bank 2 (left-side)
- ❑ Checking valve guides ⇒ “5.1 Checking valve guides”, page 169

10 - Inlet valve

- ❑ Do not machine, only grinding-in is permitted
- ❑ Mark installation position for re-installation
- ❑ Valve dimensions ⇒ “5.3 Valve dimensions”, page 170
- ❑ Checking valve guides ⇒ “5.1 Checking valve guides”, page 169

Installation position of valve spring for inlet valve

- Closely spaced spring coils -arrow- face towards cylinder head.



Installation position of exhaust valve spring

- Coloured markings -arrows- face upwards.

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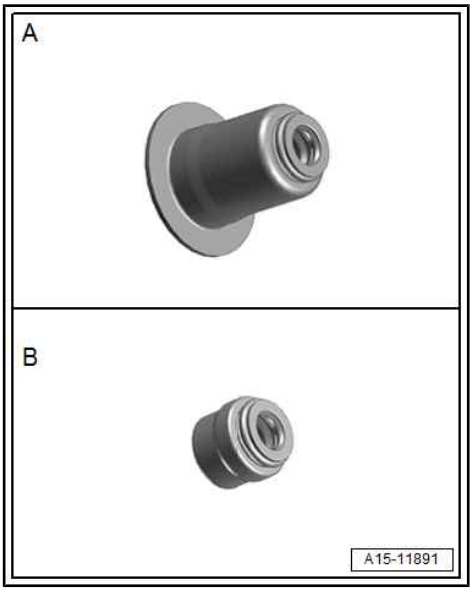
Allocation of valve stem oil seals

A - Exhaust side, painted red

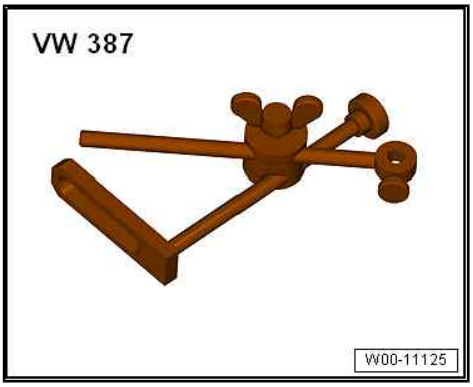
B - Inlet side, painted green



4.2 Measuring axial clearance of camshaft

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



- Dial gauge - VAS 6079-

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Procedure

- Camshaft housing removed
  ⇒ “3.4 Removing and installing camshaft housing”, page 141 .

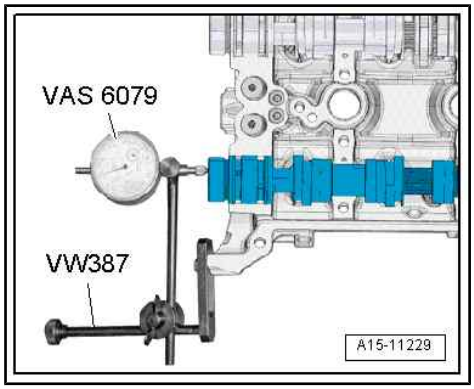
– Remove camshaft clamp -T40331/1- .

– Attach dial gauge - VAS 6079- with universal dial gauge bracket - VW 387- to camshaft housing.

– Press camshaft against dial gauge by hand.

– Set dial gauge to “0”.

– Press camshaft away from dial gauge and read off value:



Axial clearance

- Inlet camshaft: 0.014 ... 0.064 mm
- Exhaust camshaft: 0.048 ... 0.155 mm

4.3 Measuring radial clearance of camshaft

Special tools and workshop equipment required

♦ Plastigauge

Procedure

- Use old bolts when measuring radial clearance.

– Remove camshafts
  ⇒ “4.4 Removing and installing camshaft”, page 154 .

– Mark allocation of roller rocker fingers for re-installation.

– Carefully remove roller rocker fingers and place them on a clean surface.

– Clean bearings and bearing journals.

– Place a length of Plastigauge corresponding to the width of the bearing on the bearing journal or bearing shell to be measured.

- The Plastigauge must be positioned in the centre of the bearing.

– Re-insert camshafts, fit camshaft housing and tighten to specified torque without rotating camshafts
  ⇒ Fig. ““Camshaft housing, cylinder bank 1 (right-side) - tightening torques and sequence”“ , page 124 .

– Remove camshaft housing and camshafts again.

– Compare width of Plastigauge with measurement scale.

Radial clearance:

- 0.024…0.066 mm

– When carrying out final assembly, renew bolts.

4.4 Removing and installing camshaft

The procedure is described for the cylinder bank 1 (right-side).

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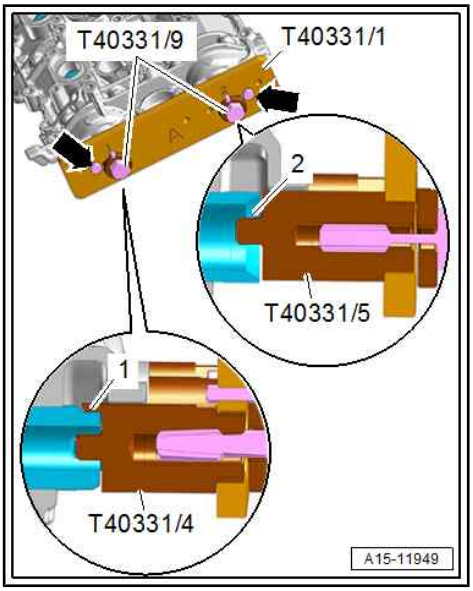
Removing

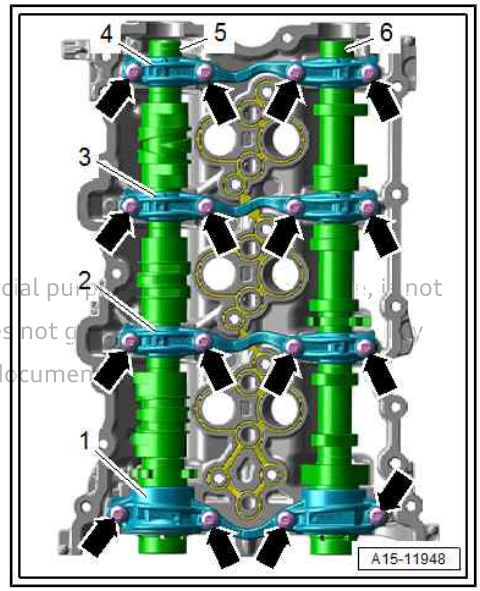
– Remove relevant camshaft housing
⇒ “3.4 Removing and installing camshaft housing”, page 141 .

– Remove camshaft clamp -T40331/1- -arrows-.



– Unscrew bolts -arrows- and detach bearing caps -1 … 4-.

– Detach camshafts -5, 6-.



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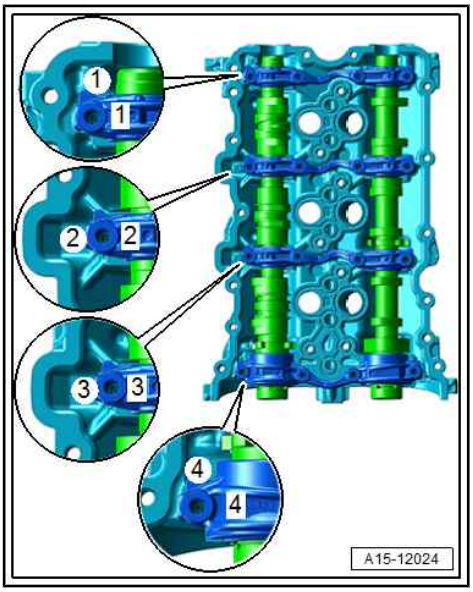
Installing

To prevent installation at the wrong locations, bearing caps are marked in relation to camshaft housing as shown.

Note

The camshaft must be renewed if the slider for cam travel adjustment has been pushed out of the camshaft splines.



– Bring axial bearing -2- and camshafts into installation position on camshaft housing.

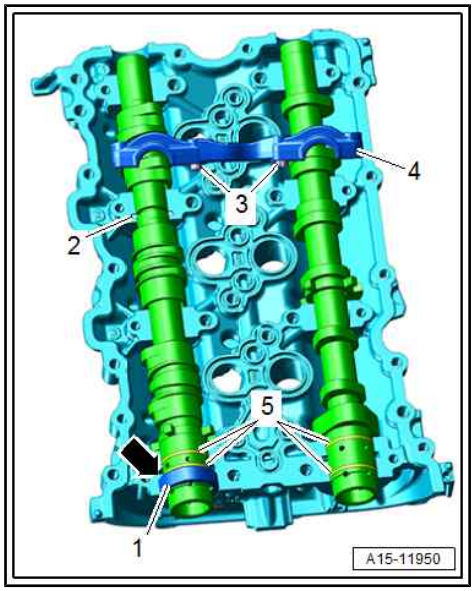
• The ends of the rectangular section seals -5- must point up or down, never to the side.

• Sleeve bearing -1- must be fitted on camshaft housing -arrow- as far as stop.

– Bring all bearing caps -4- into installation position and secure with bolts, noting allocation.

• Both dowel sleeves -3- must engage in holes in each bearing cap.

• Spring pins must engage in holes in camshaft housing.



– Align camshafts and insert camshaft clamp -T40331/1- as far as stop.

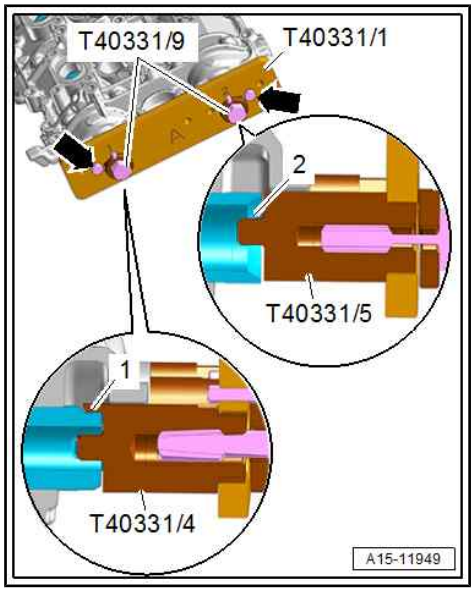
• Lettering on camshaft clamp faces forwards (“A” for cylinder bank 1).

– Tighten bolts -arrows- hand-tight.

• Camshaft clamp -T40331/4- engages in flat surface -1- on inlet camshaft.

• Camshaft clamp -T40331/5- engages in asymmetrically positioned groove (top) -2- on exhaust camshaft.

– Install camshaft housing
⇒ “3.4 Removing and installing camshaft housing”, page 141 .



4.5 Removing and installing cam actuators

Removing cylinder bank 1 (right-side)

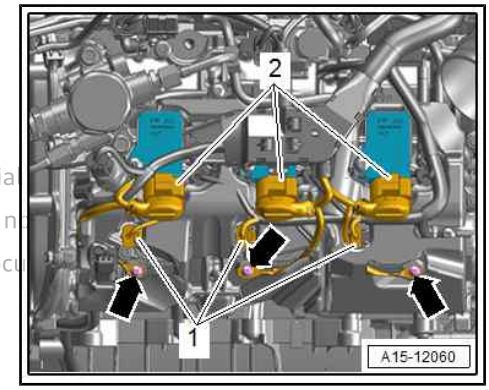
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Valve gear; Removing and installing cam actuators .

– Unplug electrical connectors:

1 - For inlet cam actuator -F448-, -F452-, -F456-

2 - For ignition coils -N70-, -N127-, -N291-

– Remove bolts -arrows- and move earth wiring clear.



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Removing cylinder bank 2 (left-side)

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Valve gear; Removing and installing cam actuators .

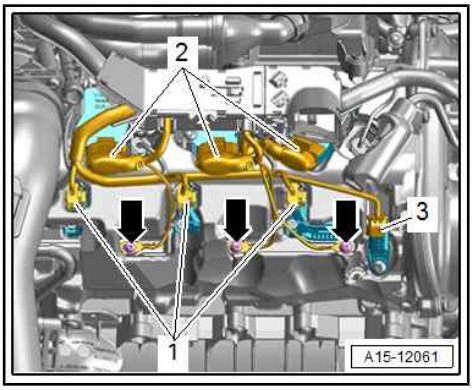
– Unplug electrical connectors:

1 - For inlet cam actuator -F460- , -F464- , -F468-

2 - For ignition coils -N292- , -N323- , -N324- (lift wiring duct slightly if necessary)

3 - For Hall sender 2 - G163-

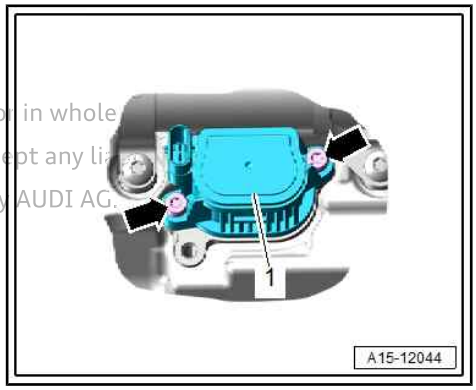
– Remove bolts -arrows- and move earth wiring clear.



Both sides (continued):

– Press top section of noise insulation upwards.

– Remove bolts -arrows- and detach cam actuator -1-.



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Installing

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

- Check O-rings for damage ⇒ page 265 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Valve gear; Removing and installing cam actuators .

Tightening torques

- ⇒ “4.1 Exploded view - valve gear”, page 151
- Earth wires ⇒ Current flow diagrams, Electrical fault finding and Fitting locations

4.6 Removing and installing camshaft control valve 1 - N205-

This procedure applies to camshaft control valves -N205- , -N208- , -N318- and -N319- .

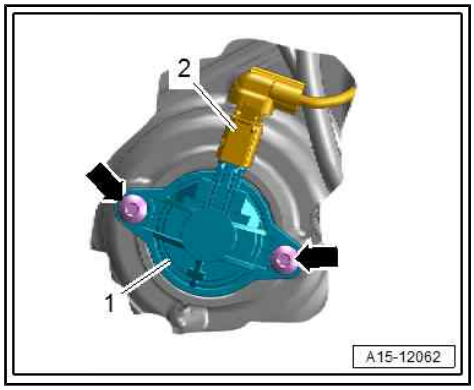
Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 15 ; Valve gear; Removing and installing camshaft control valve 1 - N205- .

– Remove engine cover panel ⇒ page 10 .

– Unplug electrical connector -2-.

– Unscrew bolts -arrows- and remove camshaft control valve -1-.



Installing

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

- Renew seals after removing.

– Install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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 79

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4.7 Removing and installing valve stem oil seals

⇒ “4.7.1 Removing and installing valve stem oil seals (cylinder head installed)”, page 158

⇒ “4.7.2 Removing and installing valve stem oil seals (cylinder head removed)”, page 163

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

Special tools and workshop equipment required

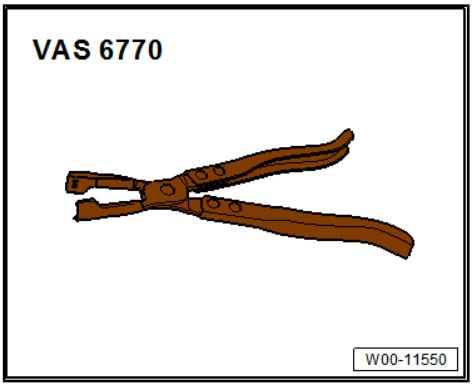
◆ Valve stem seal puller - 3364- for inlet side

◆ Valve stem oil seal fitting tool - 3365- for inlet side, or (depending on version/manufacturer of valve stem oil seal)

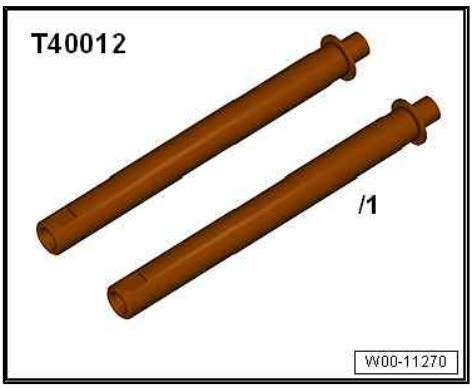
◆ Valve shaft seal fitting tool - T40376/1- (not illustrated)

- Removal and installation device for valve cotters - VAS 5161 A- with guide plate - VAS 5161A/38-

- Spark plug socket, 3/8" - VAS 6919- (not illustrated)
- Valve stem pliers - VAS 6770- for exhaust side



- Adapter - T40012-



- Wrench, 21 mm - T40263-

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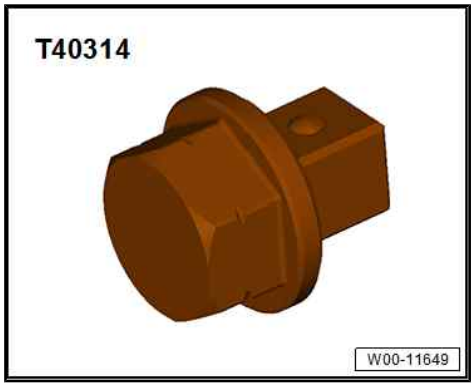
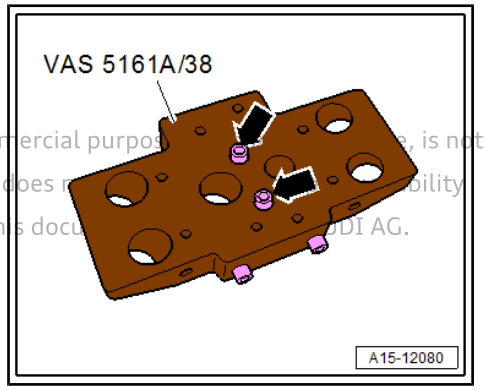
- Adapter - T40314-



- Valve shaft seal fitting tool -T40376/2- for exhaust side (not illustrated)
- Assembly sleeve ⇒ Electronic parts catalogue

Preparing tool

– Secure M8 hexagon socket head bolts with large bolt head diameter -arrows- (from tool kit) to underside of guide plate - VAS 5161A/38- , as shown.



• Guide plate is centred to cylinder head using hexagon socket head bolts.

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Procedure

– Remove relevant camshaft housing ⇒ “3.4 Removing and installing camshaft housing”, page 141 .

– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

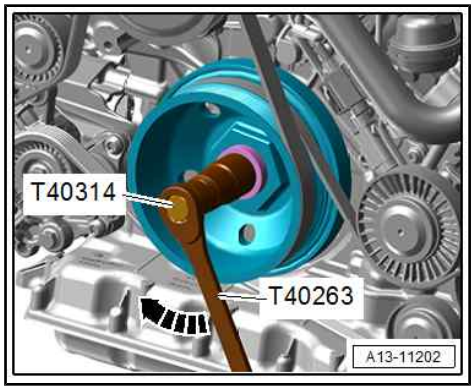
– Unscrew spark plugs using spark plug socket, 3/8" - VAS 6919- .

Caution

Avoid damage to timing chain.

- *Camshaft timing chains must be guided when crankshaft is turned.*

– Use wrench, 21 mm - T40263- and adapter - T40314- to turn crankshaft -arrow- until piston of corresponding cylinder is at “bottom dead centre” position.



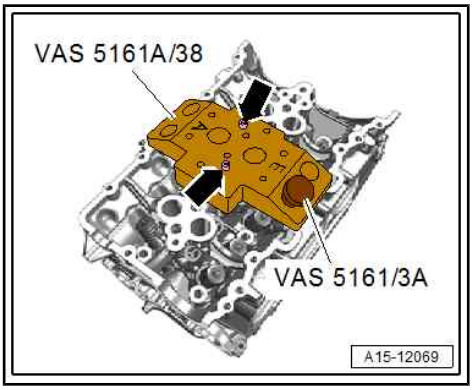
– Align guide plate - VAS 5161A/38- on cylinder head, noting markings:

A - Exhaust side

E - Inlet side

– Tighten bolts -arrows- for guide plate to 9 Nm.

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

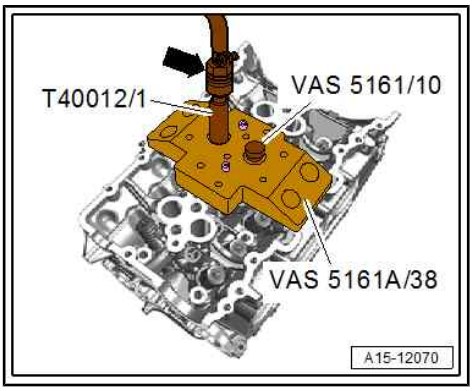


– Screw sealing pin -VAS 5161/10- hand-tight into guide plate -VAS 5161A/38- .

– Screw adapter - T40012/1- with seal hand-tight into the corresponding spark plug thread.

– Connect adapter to compressed air line using a commercially available connection piece -arrow- and apply constant air pressure.

• Minimum pressure: 6 bar



– Screw snap-in device -VAS 5161/6- with engaging fork into guide plate using M8 stud -VAS 5161/5- .

– Insert assembly cartridge -VAS 5161/8A- in guide plate.

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

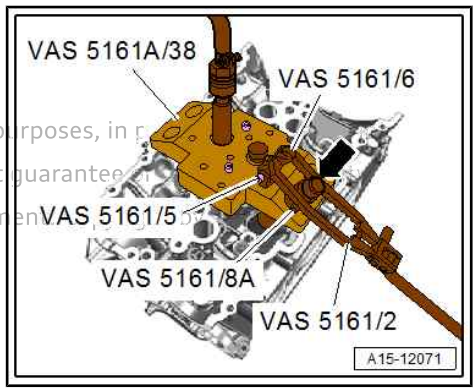
– At the same time, turn knurled screw -arrow- of assembly cartridge clockwise until tips engage in valve cotters.

– Move knurled screw back and forth slightly; the valve cotters are thus forced apart and taken up by the assembly cartridge.

• Knurled screw should slide into assembly cartridge as far as stop.

– Release pressure fork.

– Take out assembly cartridge.



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Caution

Risk of damage to valves if handled incorrectly.

- ***To prevent valve from falling into cylinder, do not unbolt guide plate and sealing pin.***
- ***The pressure in the cylinder must be held at at least 6 bar.***

– Mark installation position of springs for exhaust valve with paint for re-installation.

– Detach valve spring with valve spring plate.

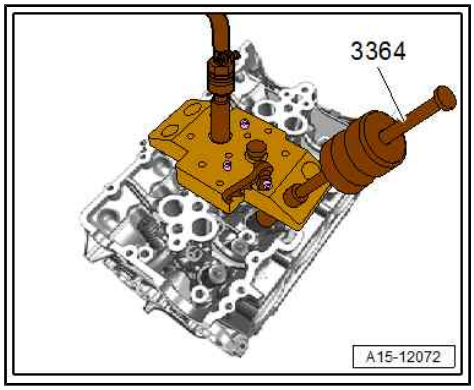
– Detach valve stem oil seal.

Inlet side:

– Use valve stem seal puller - 3364- to do so.

Exhaust side:

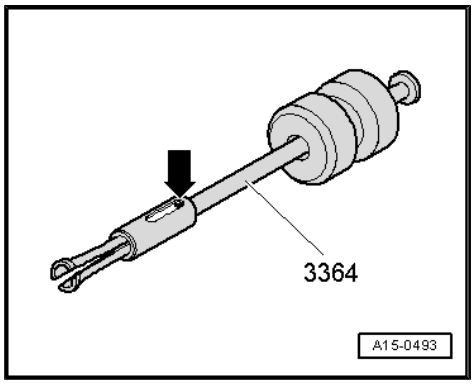
– Use valve stem pliers - VAS 6770- to do so. If difficult to remove, heat with hot air blower - V.A.G 1416- .



Continued:

If the valve stem seal puller - 3364- cannot be used on some of the valve stem oil seals due to the confined space, proceed as follows:

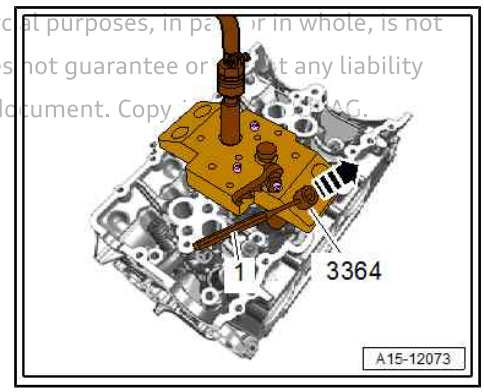
– Knock out pin -arrow- of puller using a drift and remove impact extractor attachment.



– Secure bottom section of puller -3364- with punch or roll-pin drift -1-.

– Apply puller at valve stem oil seal.

– Apply assembly lever to puller and pull out valve stem oil seal -arrow-.



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Inlet side:

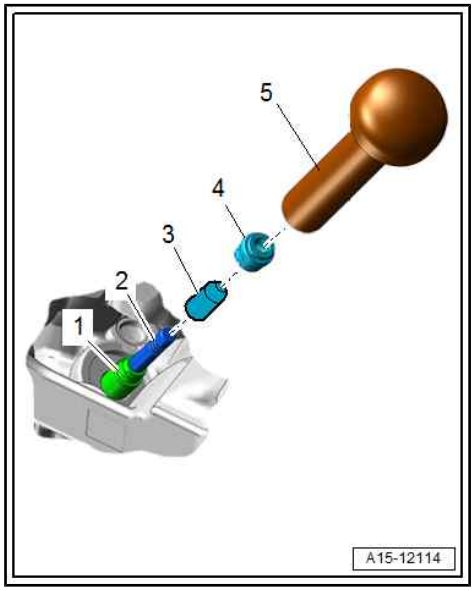
- To avoid damaging the new valve stem oil seal -4- during installation, fit the assembly sleeve -3- onto the valve stem -2-.

– 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 shaft seal fitting tool -5- and use assembly sleeve to press it carefully onto valve guide -1- as far as stop.

– Remove assembly sleeve .



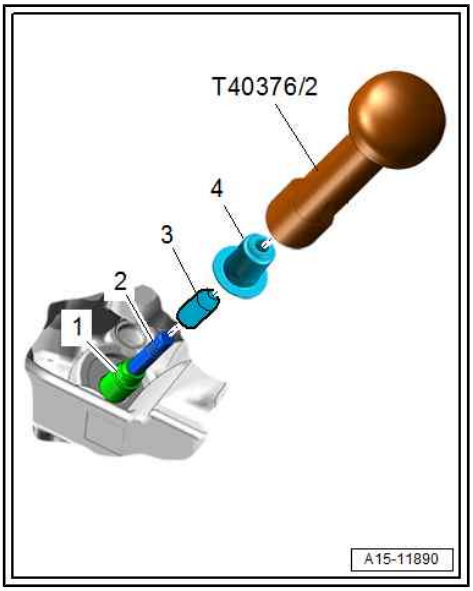
Exhaust side:

- 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.

– Insert valve stem oil seal into valve shaft seal fitting tool - T40376/2- and use assembly sleeve to carefully press it onto valve guide -1- as far as stop.

– Remove assembly sleeve .



Continued:

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

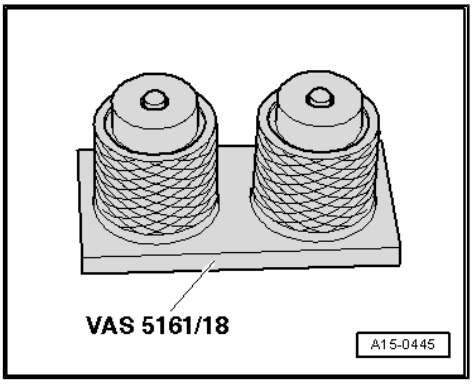
- Larger diameter of valve cotters faces upwards.

– Press assembly cartridge onto insertion device from above and pick up valve cotters.

– Insert valve spring and valve spring plate:

- Installation position of inlet valve
⇒ Fig. ““Installation position of valve spring for inlet valve”“ , page 152

- Installation position of exhaust valve
⇒ Fig. ““Installation position of exhaust valve spring”“ , page 152

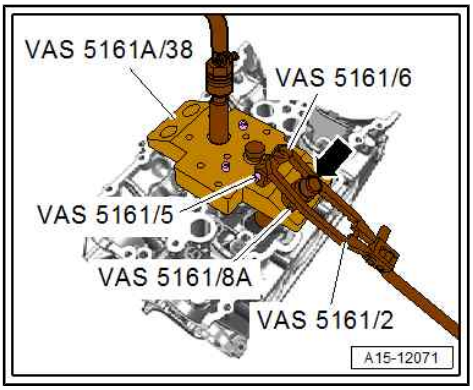


– Insert assembly cartridge -VAS 5161/8A- in guide plate - VAS 5161A/38- again.

– Press down pressure fork -VAS 5161/2- and pull knurled screw -arrow- 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.



Attaching

– 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.

– Install camshafts
⇒ “4.4 Removing and installing camshaft”, page 154 .

– Install spark plugs
⇒ “1.1 Exploded view - ignition system”, page 340 .

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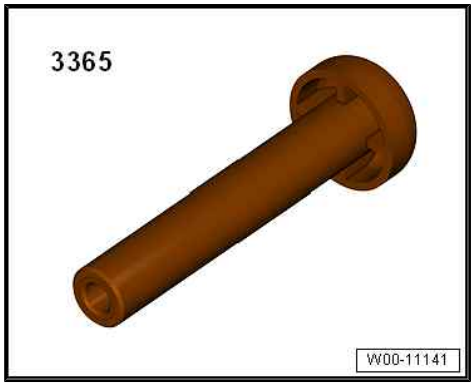
4.7.2 Removing and installing valve stem oil seals (cylinder head removed)

Special tools and workshop equipment required

- Valve stem seal puller - 3364- for inlet side

- Valve stem oil seal fitting tool - 3365- for inlet side, or (depending on version/manufacturer of valve stem oil seal)



- Valve shaft seal fitting tool - T40376/1- (not illustrated)
- Removal and installation device for valve cotters - VAS 5161 A- with guide plate - VAS 5161A/38-

- Engine and gearbox support - VAS 6095A-

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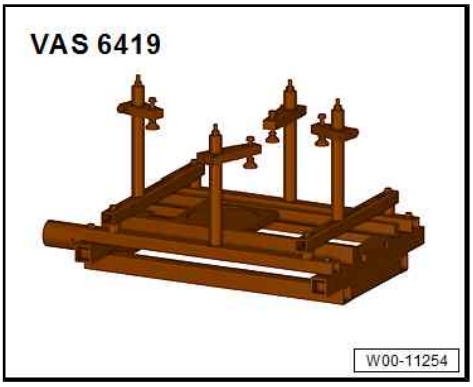
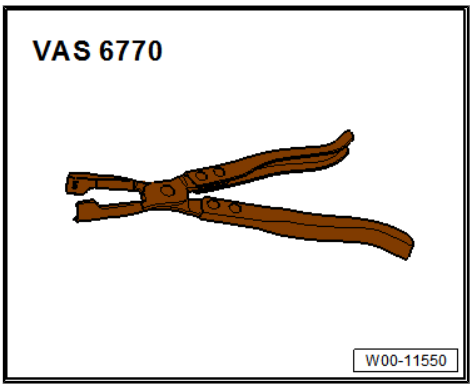
♦ Cylinder head tensioning device - VAS 6419-



♦ Valve stem pliers - VAS 6770- for exhaust side



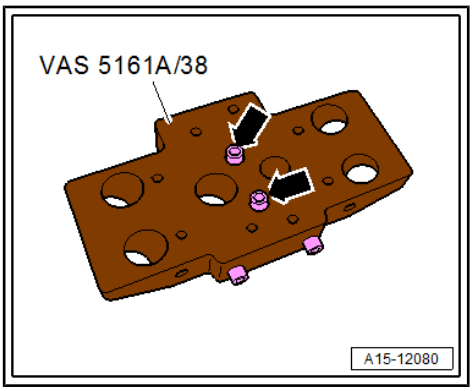
♦ Valve shaft seal fitting tool -T40376/2- for exhaust side (not illustrated)

♦ Assembly sleeve ⇒ Electronic parts catalogue

Preparing tool

– Secure M8 hexagon socket head bolts with large bolt head diameter -arrows- (from tool kit) to underside of guide plate - VAS 5161A/38- , as shown.

• Guide plate is centred to cylinder head using hexagon socket head bolts.



Procedure

– Mark original positions of roller rocker fingers and hydraulic compensation elements for re-installation.

– Remove roller rocker fingers together with hydraulic compensation elements and put down on a clean surface.

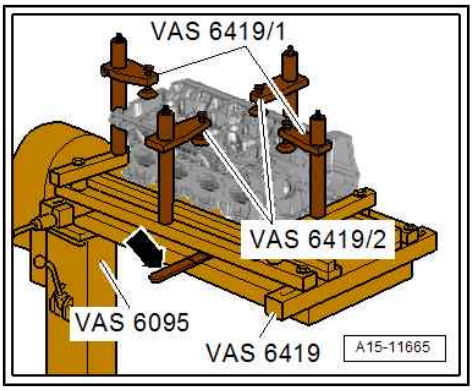
– Insert cylinder head tensioning device - VAS 6419- into engine and gearbox support - VAS 6095- .

– Secure cylinder head in cylinder head tensioning device.

– Connect cylinder head tensioning 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.



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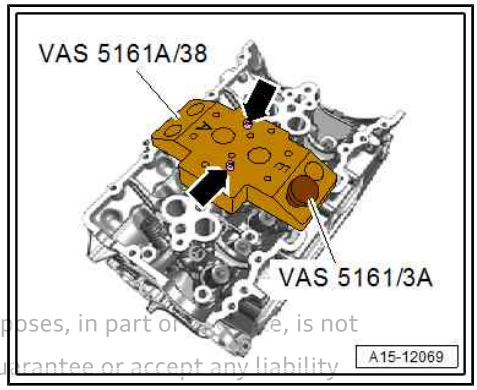
– Align guide plate - VAS 5161A/38- on cylinder head, noting markings:

A - Exhaust side

B - Inlet side

– Tighten bolts -arrows- for guide plate to 9 Nm.

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



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– Screw snap-in device -VAS 5161/6- with engaging fork into guide plate using M8 stud -VAS 5161/5- .

– 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 -arrow- 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.

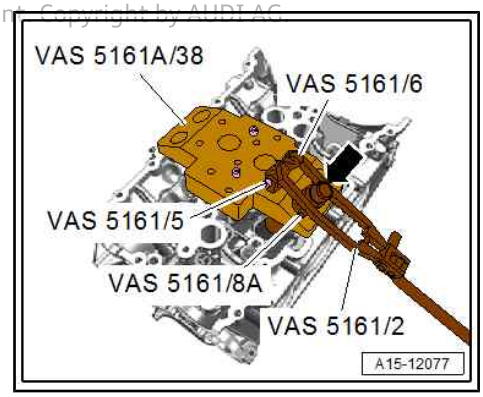
• Knurled screw should slide into assembly cartridge as far as stop.

– Release pressure fork.

– Take out assembly cartridge.

– Mark installation position of springs for exhaust valve with paint for re-installation.

– Detach valve spring with valve spring plate.



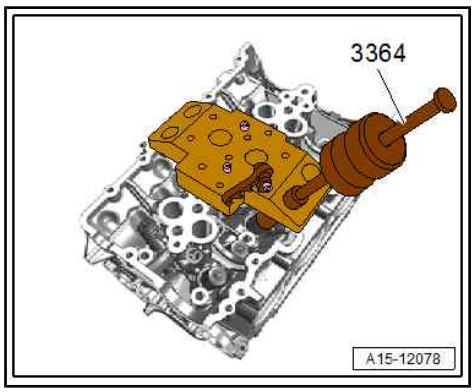
– Detach valve stem oil seal:

Inlet side:

– Use valve stem seal puller - 3364- to do so.

Exhaust side:

– Use valve stem pliers - VAS 6770- to do so. If difficult to remove, heat with hot air blower - V.A.G 1416- .



Inlet side:

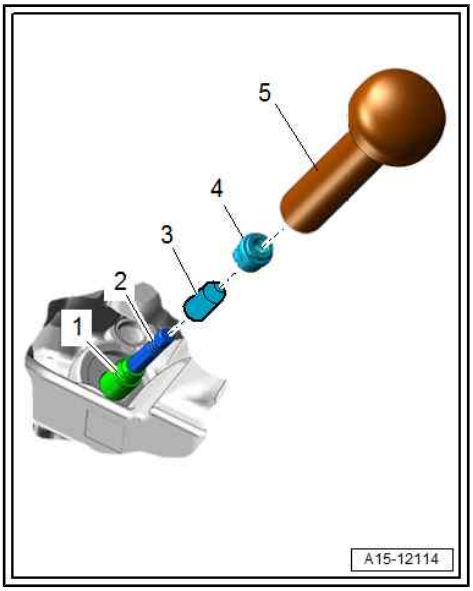
- To avoid damaging the new valve stem oil seal -4- during installation, fit the assembly sleeve -3- onto the valve stem -2-.

– 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 shaft seal fitting tool -5- and use assembly sleeve to press it carefully onto valve guide -1- as far as stop.

– Remove assembly sleeve .



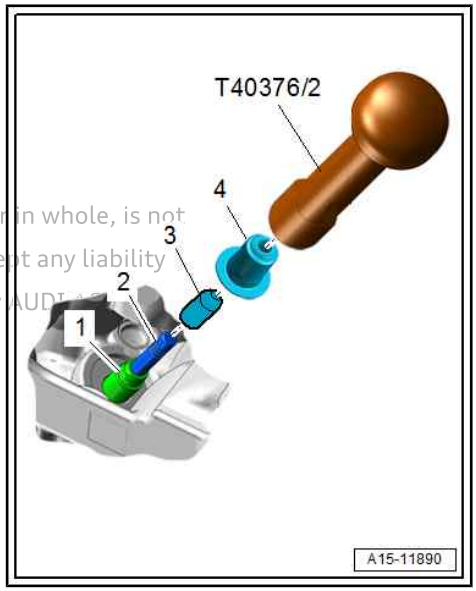
Exhaust side:

- To avoid damaging new valve stem oil seal -4- during installation, fit assembly sleeve -item 3- onto valve stem -2-.

– Lightly oil sealing lip of valve stem oil seal.

– Insert valve stem oil seal into valve shaft seal fitting tool -T40376/2- and use assembly sleeve to carefully press it onto valve guide -1- as far as stop.

– Remove assembly sleeve .



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Continued:

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

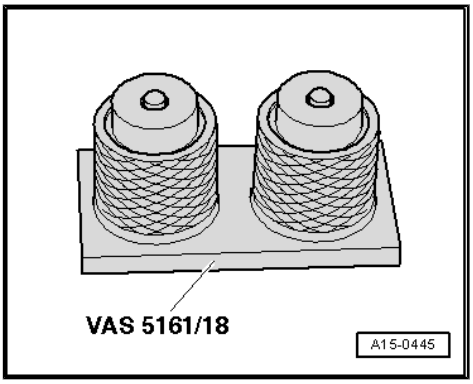
- Larger diameter of valve cotters faces upwards.

– Press assembly cartridge onto insertion device from above and pick up valve cotters.

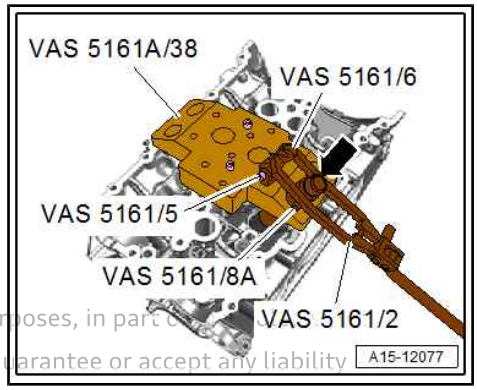
– Insert valve spring and valve spring plate:

- Installation position of inlet valve
⇒ Fig. ""Installation position of valve spring for inlet valve"" , page 152

- Installation position of exhaust valve
⇒ Fig. ""Installation position of exhaust valve spring"" , page 152



– Insert assembly cartridge -VAS 5161/8A- in guide plate - VAS 5161A/38- again.
– Press down pressure fork -VAS 5161/2- and pull knurled screw -arrow- 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.



Attaching

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Assembly is performed in reverse sequence; note the following:

– 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.
– Install camshaft housing
⇒ “3.4 Removing and installing camshaft housing”, page 141 .

5 Inlet and exhaust valves

⇒ “5.1 Checking valve guides”, page 169

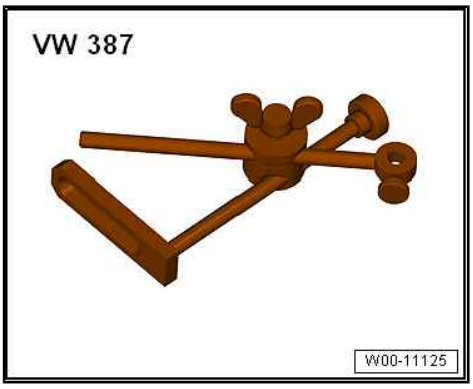
⇒ “5.2 Checking valves”, page 169

⇒ “5.3 Valve dimensions”, page 170

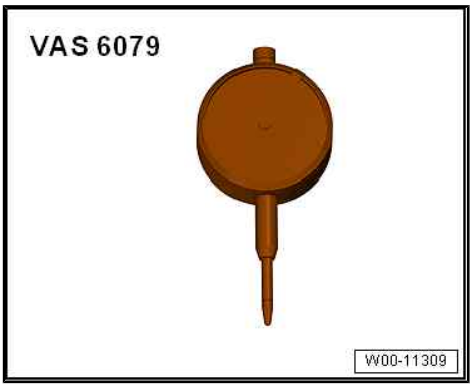
5.1 Checking valve guides

Special tools and workshop equipment required

- Universal dial gauge bracket - VW 387-



- Dial gauge - VAS 6079-



Procedure

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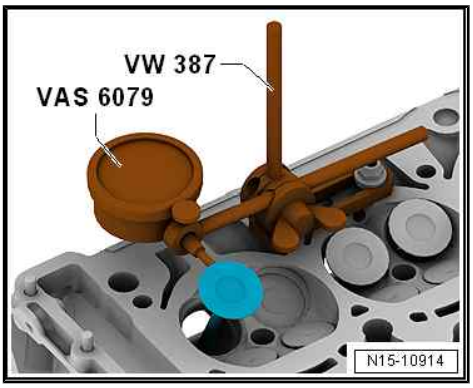
- If the valve has to be renewed as part of a repair, use a new valve for the measurement.
- Only insert inlet valve into inlet valve guide and exhaust valve into exhaust valve guide.

– Secure dial gauge - VAS 6079- to cylinder head with universal dial gauge bracket - VW 387- as shown in illustration.



– Insert valve into guide.

- End of valve stem must be flush with valve guide.

– Measure the amount of sideways play.

- Wear limit: 0.8 mm.

– If the wear limit is exceeded, repeat the measurement with new valves.

– Renew cylinder head if wear limit is still exceeded. Valve guides cannot be renewed.

5.2 Checking valves

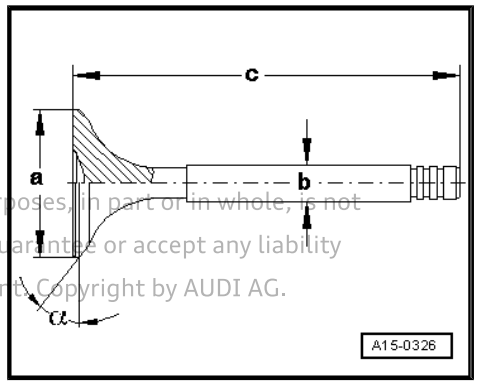
– Visually inspect for scoring on valve stems and valve seat surfaces.

– Renew valve if scoring is clearly visible.

5.3 Valve dimensions

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

Dimension		Inlet valve		Exhaust valve	
		2.9 ltr.	**3.0l**	**2.9 ltr.**	**3.0l**
∅ a	mm	32.0 ± 0.1		28.0 ± 0.1	
∅ b	mm	5.92 ± 0.02		5.92 ± 0.02	
c	mm	102.43		103.184	
α	∠	44° 50’ ± 10’	45	44° 50’ ± 10’	45



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17 – Lubrication

1 Sump/oil pump

⇒ “1.1 Exploded view - sump/oil pump”, page 171

⇒ “1.2 Engine oil”, page 175

⇒ “1.3 Removing and installing sump (bottom section)”, page 175

⇒ “1.4 Removing and installing sump (top section)”, page 177

⇒ “1.5 Removing and installing oil baffle plate”, page 185

⇒ “1.6 Removing and installing oil pump”, page 187

⇒ “1.7 Removing and installing oil level and oil temperature sender G266 ”, page 189

1.1 Exploded view - sump/oil pump

- If large quantities of metal shavings or particles are found in the engine oil when repairing the engine, the oil passages must be cleaned thoroughly to ensure that this does not result in damage. In addition, renew oil spray jets, engine oil cooler and oil filter element.
- Oil spray jet for piston cooling ⇒ “5.1 Exploded view - pistons and conrods”, page 69 .

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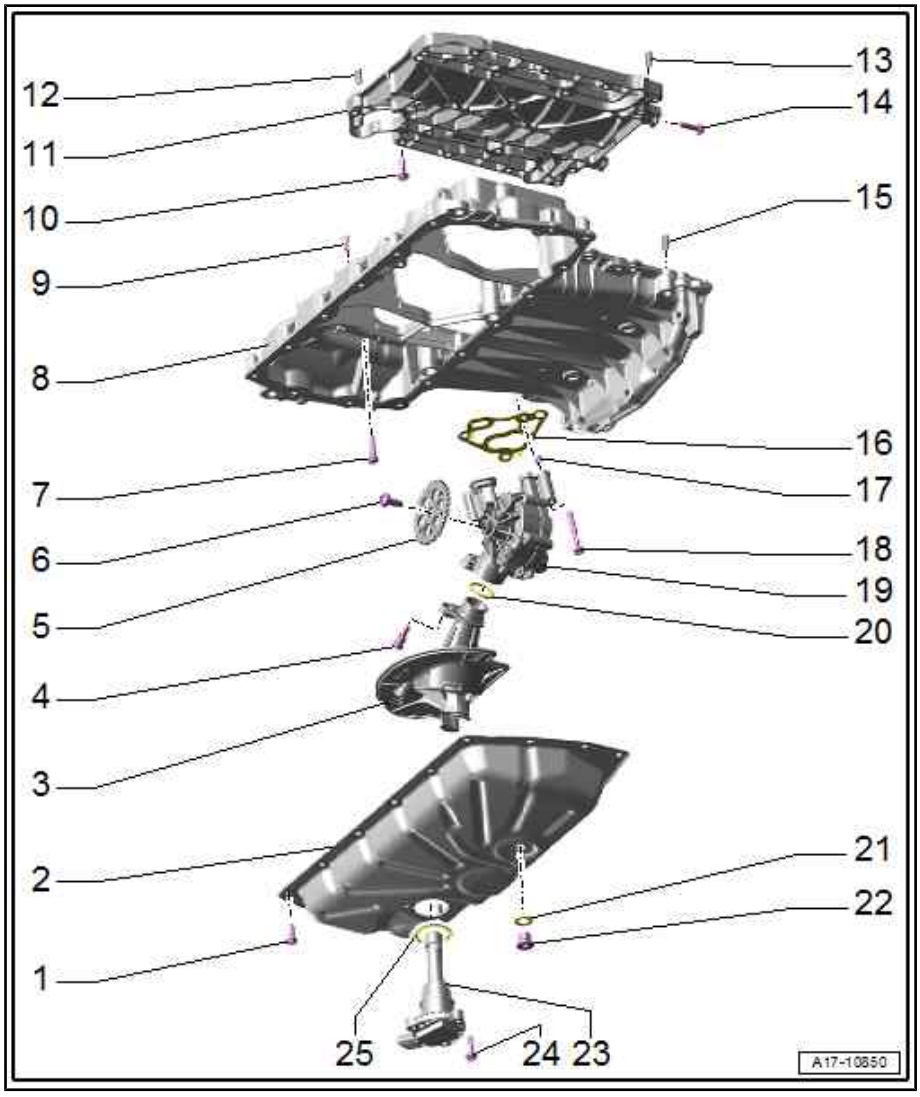

1 - Bolt

- ❑ Renew after removing
- ❑ Tightening torques and sequence
  ⇒ Fig. ""Sump (bottom section) - tightening torques and sequence"" , page 173

2 - Sump (bottom section)

- ❑ Removing and installing
  ⇒ "1.3 Removing and installing sump (bottom section)", page 175

3 - Intake connecting pipe

- ❑ For oil pump
- ❑ Renew after removing
- ❑ Supplied with
  ⇒ Item 4 (page 172)

4 - Bolt

- ❑ Supplied with
  ⇒ Item 3 (page 172) ; not available separately
- ❑ Renew after removing
- ❑ 8 Nm +90°

5 - Chain sprocket

- ❑ For oil pump

6 - Bolt

- ❑ Renew after removing
- ❑ 20 Nm +90°

7 - Bolt

- ❑ Renew after removing
- ❑ Tightening torques and sequence
  ⇒ Fig. ""Sump (top section) - tightening torques and sequence with bottom cover for camshaft timing chains fitted"" , page 174 or
  ⇒ Fig. ""Sump (top section) - tightening torques and sequence with camshaft timing chain cover (bottom) removed"" , page 174

8 - Sump (top section)

- ❑ Removing and installing ⇒ "1.4 Removing and installing sump (top section)", page 177

9 - Dowel sleeve

10 - Bolt

- ❑ Renew after removing
- ❑ Tightening torques and sequence
  ⇒ Fig. ""Oil baffle plate - tightening torques and sequence"" , page 174

11 - Oil baffle plate

- ❑ Removing and installing ⇒ "1.5 Removing and installing oil baffle plate", page 185

12 - Dowel sleeve

13 - Dowel sleeve

14 - Bolt

- ❑ Renew after removing

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- ❑ Tightening torques and sequence
  ⇒ Fig. ""Timing chain cover (bottom) - tightening torques and tightening sequence"" , page 81 and
  ⇒ Fig. ""Oil baffle plate - tightening torques and sequence"" , page 174

15 - Dowel sleeve

16 - Gasket

- ❑ Renew after removing

17 - Dowel sleeve

18 - Bolt

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

19 - Oil pump

- ❑ Do not dismantle
- ❑ Removing and installing ⇒ "1.6 Removing and installing oil pump", page 187

20 - O-ring

- ❑ Renew after removing

21 - Seal

- ❑ Renew after removing

22 - Oil drain plug

- ❑ Lubricate thread
- ❑ 30 Nm

23 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing
  ⇒ "1.7 Removing and installing oil level and oil temperature sender G266 ", page 189

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24 - Bolt

- ❑ Renew after removing
- ❑ 3 Nm +90°

25 - Seal

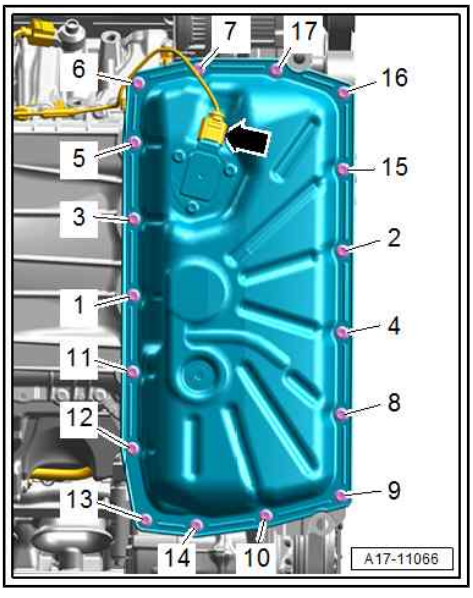
- ❑ Renew after removing

Sump (bottom section) - tightening torques and sequence

- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

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

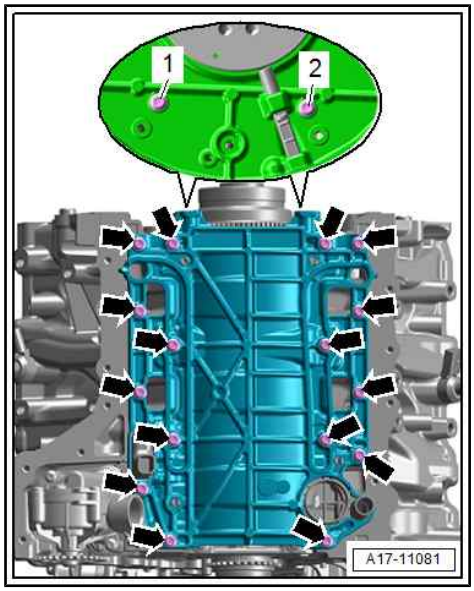


Oil baffle plate - tightening torques and sequence

- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages as follows:

Stage	Bolts	Tightening torque/angle specification
1.	-arrows-	Screw in by hand until contact is made
2.	-1, 2-	3 Nm
3.	-arrows-	3 Nm in diagonal sequence
4.	-1, 2-	Turn 90° further
5.	-arrows-	Turn 90° further in diagonal sequence

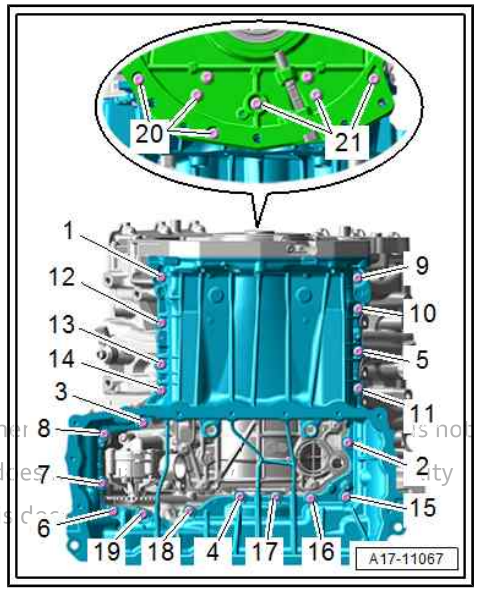


Sump (top section) - tightening torques and sequence with bottom cover for camshaft timing chains fitted

- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 21-	Screw in by hand until contact is made
2.	-20, 21-	3 Nm
3.	-1 … 19-	3 Nm
4.	-20, 21-	Turn 90° further
5.	-1 … 19-	Turn 90° further



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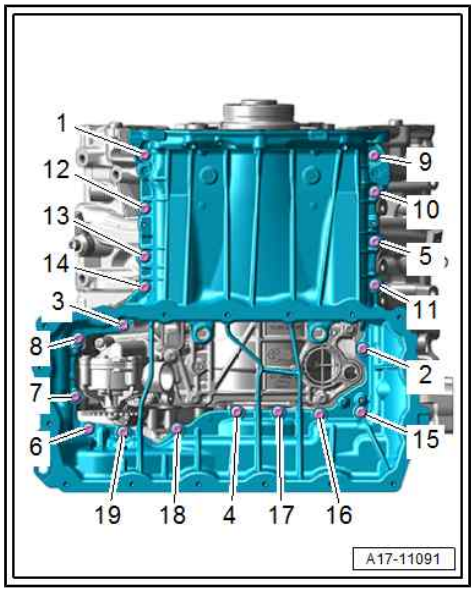
Sump (top section) - tightening torques and sequence with camshaft timing chain cover (bottom) removed

- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1 … 19-	Screw in by hand until contact is made
2.	-1 … 19-	3 Nm
3.	-1 … 19-	Turn 90° further



1.2 Engine oil

- Draining and filling up engine oil, checking oil level, removing and installing oil filter element ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Sump/oil pump; Engine oil
- Oil capacities, oil specifications and viscosity grades ⇒ Maintenance tables .

1.3 Removing and installing sump (bottom section)

Special tools and workshop equipment required

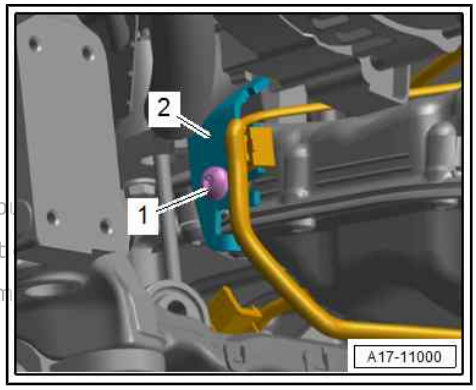
- Socket Torx T30 - T10405-

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

Removing

- Engine oil drained ⇒ “1.2 Engine oil”, page 175 .

– If fitted, remove bolt -1- and press bracket -2- with electrical wiring harness to one side.



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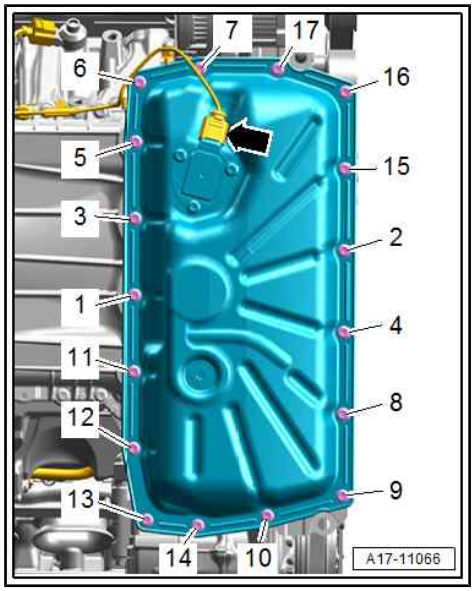
– Unplug electrical connector -arrow- at oil level and oil temperature sender - G266- .
– Move electrical wiring clear.



Caution

Take care to keep components clean.

- *There will still be some oil in the sump (bottom section).*

– Slacken and remove bolts in the sequence: -17 ... 1-.
– Carefully release sump (bottom section) from bonded joint and detach.

Installing

- After removing, renew bolts tightened with specified tightening angle.

Caution

Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*

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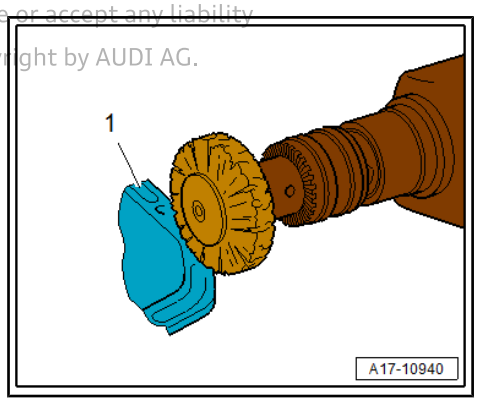
WARNING

Risk of eye injury.

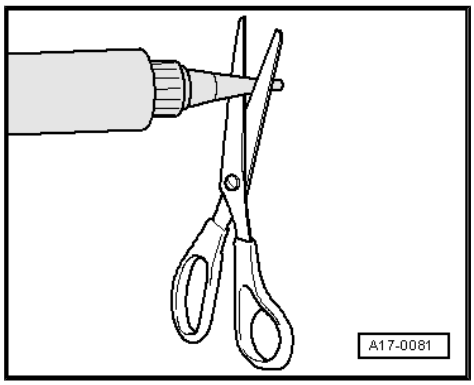
- *Put on safety goggles.*



– Remove remaining sealant on bottom section -1- and top section of sump with a rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.

- Note expiry date of sealant.

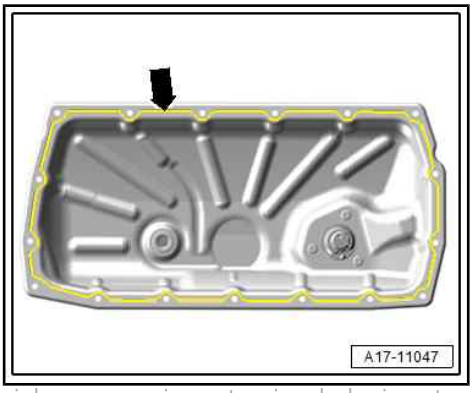
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.5 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply sealant bead -arrow- onto clean sealing surface of sump (bottom section) as shown in illustration.

• Width of sealant bead: 3.0 mm.

• Install sump (bottom section) within 5 minutes of applying sealant.

– Carefully fit bottom section of sump onto top section but do not press sealant bead on yet.

• Sealant must not be allowed to get into threaded holes.

– First, screw all bolts in by hand and then tighten.

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

– Fill with engine oil and check oil level ⇒ “1.2 Engine oil”, page 175 .

Tightening torques

- ⇒ Fig. ““Sump (bottom section) - tightening torques and sequence”“ , page 173

1.4 Removing and installing sump (top section)

⇒ “1.4.1 Removing and installing sump (top section) with timing chain cover (bottom) installed”, page 177

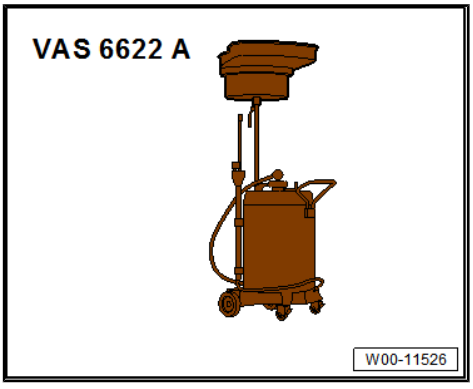
⇒ “1.4.2 Removing and installing sump (top section) with timing chain cover (bottom) removed”, page 181

1.4.1 Removing and installing sump (top section) with timing chain cover (bottom) installed

Complete procedure if timing chain cover (bottom) has NOT been removed during preparatory work

Special tools and workshop equipment required

- Used oil collection and extraction unit - VAS 6622A-



- Electric drill with plastic brush attachment
- Sealant ⇒ Electronic parts catalogue

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- Safety goggles
- Bolt, M6x30 (4x)

Removing

- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .
- Engine oil drained ⇒ “1.2 Engine oil”, page 175 .

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Sump/oil pump; Removing and installing sump (top section) .

– Remove drive plate
⇒ “2.2 Removing and installing drive plate”, page 47 .

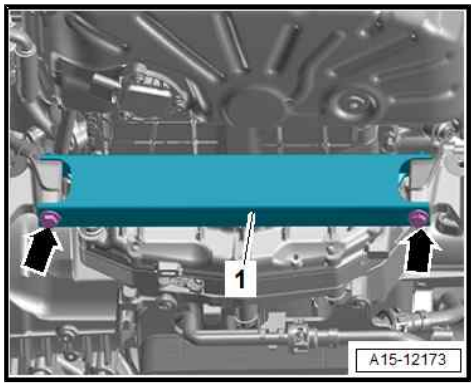
– If not yet removed, remove steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering rack; Removing and installing steering rack .

– Remove sump (bottom section)
⇒ “1.3 Removing and installing sump (bottom section)”, page 175 .

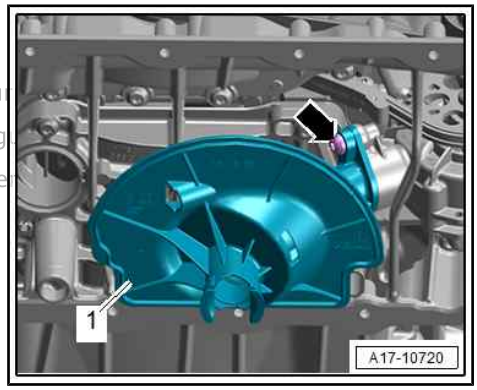
– 2.9 ltr. engine: Remove bracket for air conditioner compressor
⇒ “1.6.3 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine without electric compressor”, page 39 .

– 3.0 ltr. engine: Detach poly V-belt for air conditioner compressor from pulley
⇒ “1.3.6 Removing and installing poly V-belt for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 28 .

– Vehicles with brace for subframe: Remove bolts -arrows- and detach brace -1-.



– Unscrew bolt -arrow- and detach intake connecting pipe -1-.



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– Move electrical wiring harness clear.
– Slacken and remove bolts in the sequence: -21 ... 1-.

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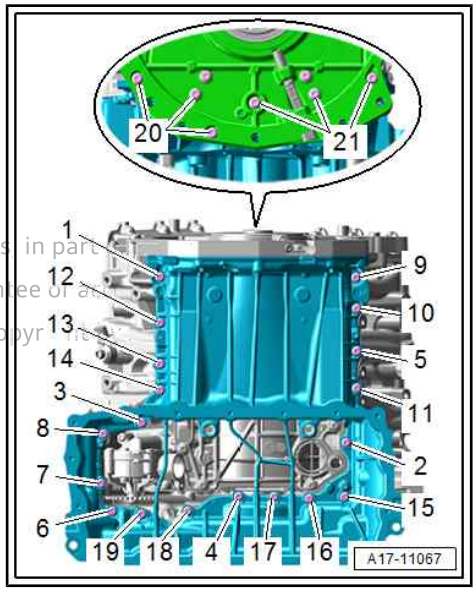
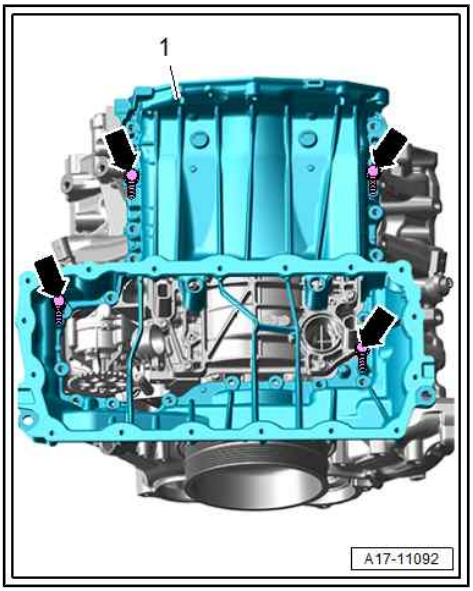


– To loosen sump (top section) -1-, screw in four M6x40 bolts -arrows- as far as stop.
– Screw bolts 1/2 turn each in diagonal sequence until sump (top section) is released.
– Remove bolts and detach sump (top section).



Installing

- Renew intake connecting pipe with bolt and O-ring after removal.

Caution

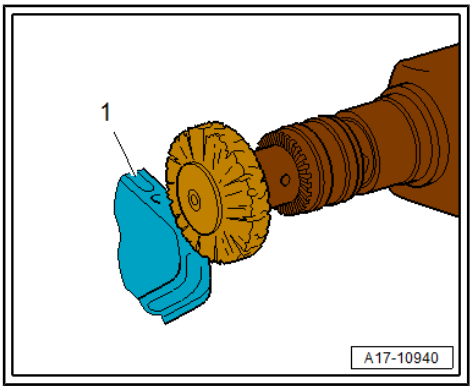
Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

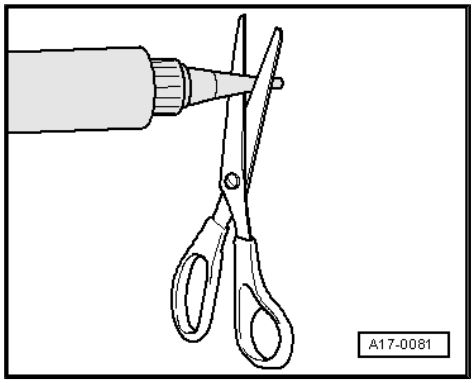
- *Put on safety goggles.*



– Remove sealant residue from sump (top section) and cylinder block -1- using rotating plastic brush or similar.
– Clean surfaces; they must be free of oil and grease.

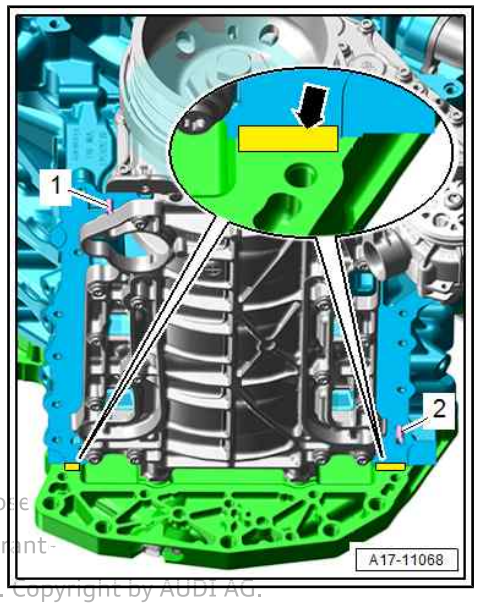
- Note expiry date of sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.5 mm).



– Detach dowel sleeves -1, 2-.

– Apply sealant at joints between cylinder block and timing chain cover (bottom) -arrow-.



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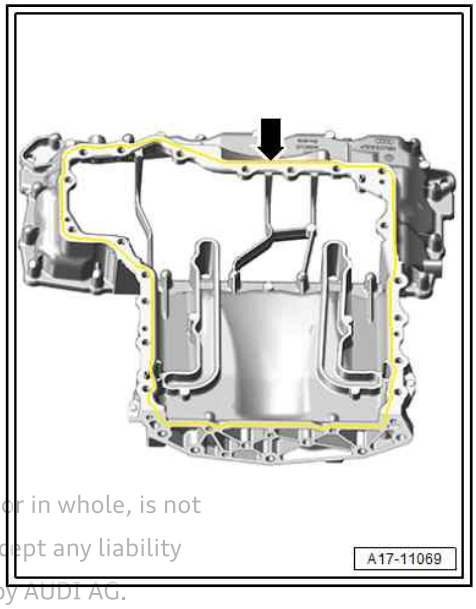
Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply bead of sealant -arrow- onto clean sealing surface of sump (top section).

- Width of sealant bead: 3.0 mm.
- Install sump (top section) within 5 minutes of applying sealant.
- A second mechanic is required for the following step.

– Carefully fit sump (top section) with the help of a second mechanic. To do so, guide it towards sealing surface on cylinder block and timing chain cover (bottom) at an angle from below, but do not press sealant bead on yet.

- Sealant must not be allowed to get into threaded holes.

– First, screw all bolts in by hand and then tighten.

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

– 2.9 ltr. engine: Install bracket for air conditioner compressor ⇒ “1.6.3 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine without electric compressor”, page 39 .

– 3.0 ltr. engine: Install poly V-belt for air conditioner compressor ⇒ “1.3.6 Removing and installing poly V-belt for air conditioner compressor - vehicles with 3.0 ltr. engine”, page 28 .

– Install sump (bottom section) ⇒ “1.3 Removing and installing sump (bottom section)”, page 175 .

– Install steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering rack; Removing and installing steering rack .

– Install drive plate ⇒ “2.2 Removing and installing drive plate”, page 47 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Sump/oil pump; Removing and installing sump (top section) .

Tightening torques

- ⇒ Fig. ““Sump (top section) - tightening torques and sequence with bottom cover for camshaft timing chains fitted”“ , page 174
- ⇒ “1.1 Exploded view - sump/oil pump”, page 171
- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe

1.4.2 Removing and installing sump (top section) with timing chain cover (bottom) removed

Simplified procedure if timing chain cover (bottom) has been removed during preparatory work

Special tools and workshop equipment required

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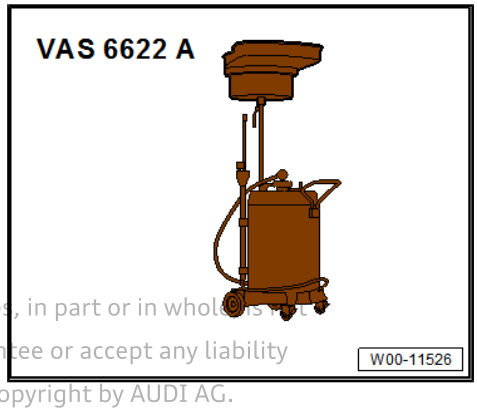
- Used oil collection and extraction unit - VAS 6622A-



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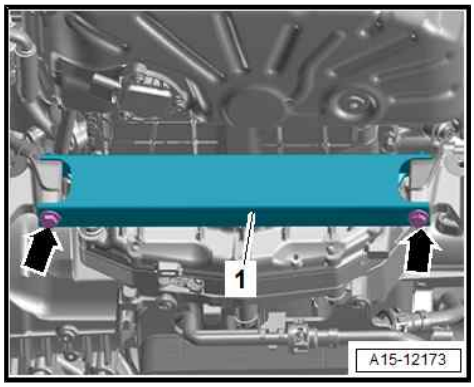
- Electric drill with plastic brush attachment
- Sealant ⇒ Electronic parts catalogue
- Safety goggles
- Bolt, M6x30 (4x)

Removing

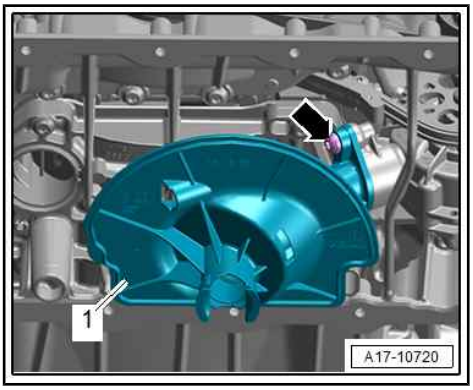
- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .
- Engine oil drained ⇒ “1.2 Engine oil”, page 175 .

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Sump/oil pump; Removing and installing sump (top section) .

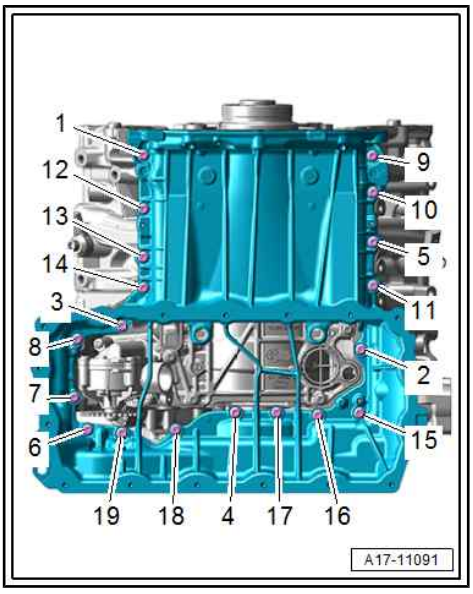
– Remove timing chain cover (bottom) ⇒ page 84 .
– If not yet removed, remove steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering rack; Removing and installing steering rack .
– Remove sump (bottom section) ⇒ “1.3 Removing and installing sump (bottom section)”, page 175 .
– 2.9 ltr. engine: Remove bracket for air conditioner compressor ⇒ “1.6.3 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine without electric compressor”, page 39 .
– Vehicles with brace for subframe: Remove bolts -arrows- and detach brace -1-.



– Move electrical wiring harness clear.
– Unscrew bolt -arrow- and detach intake connecting pipe -1-.



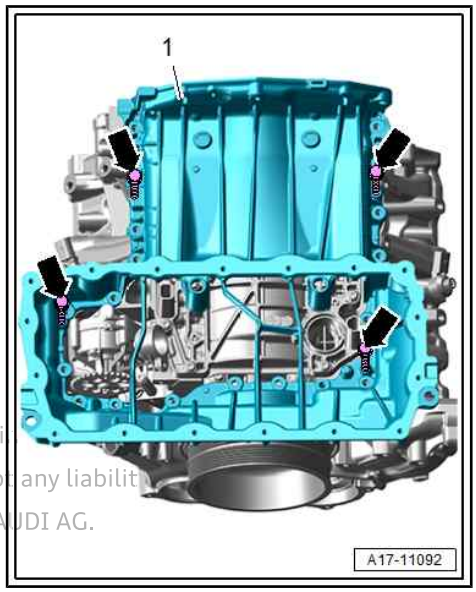
– Slacken and remove bolts in the sequence: -19 ... 1-.



– To loosen sump (top section) -1-, screw in four M6x40 bolts -arrows- as far as stop.
– Screw bolts $^{1}/_{2}$ turn each in diagonal sequence until sump (top section) is released.
– Remove bolts and detach sump (top section).

Installing

- Renew bolts after removing.
- Renew intake connecting pipe with bolt and O-ring after removal.



Caution

Protect lubrication system and bearings against contamination.

- ***Cover exposed parts of the engine.***

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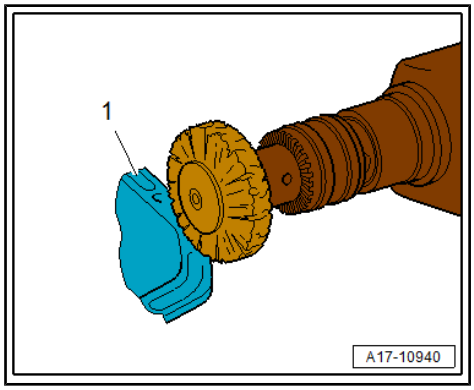
WARNING

Risk of eye injury.

- *Put on safety goggles.*

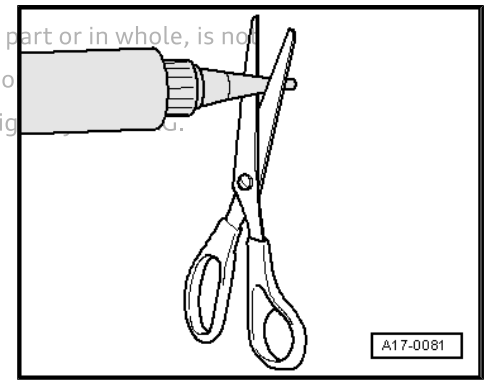
– Remove sealant residue from sump (top section) and cylinder block -1- using rotating plastic brush or similar.

– Clean surfaces; they must be free of oil and grease.



• Note expiry date of sealant.

– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.5 mm).



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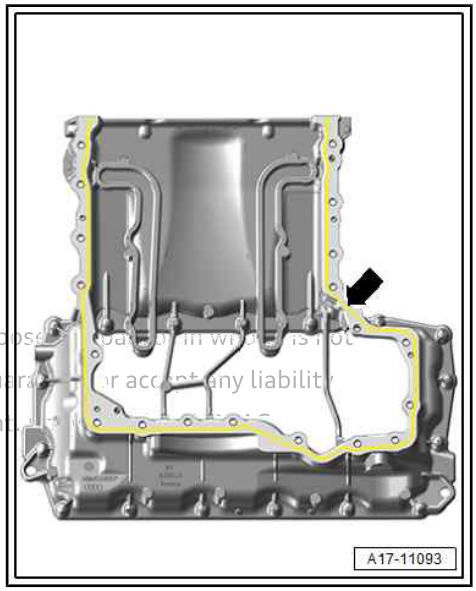
Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Apply bead of sealant -arrow- onto clean sealing surface of sump (top section).

- Width of sealant bead: 3.0 mm.
- Install sump (top section) within 5 minutes of applying sealant.
- A second mechanic is required for the following step.

– Carefully fit sump (top section) with the help of a second mechanic but do not press sealant bead on yet.

- Sealant must not be allowed to get into threaded holes.

– First, screw all bolts in by hand and then tighten.

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

– Install timing chain cover (bottom) ⇒ “1.2.2 Removing and installing timing chain cover (bottom)”, page 84 .

– 2.9 ltr. engine: Install bracket for air conditioner compressor ⇒ “1.6.3 Removing and installing bracket for air conditioner compressor - vehicles with 2.9 ltr. engine without electric compressor”, page 39 .

– Install sump (bottom section) ⇒ “1.3 Removing and installing sump (bottom section)”, page 175 .

– Install steering rack ⇒ Running gear, axles, steering; Rep. gr. 48 ; Steering rack; Removing and installing steering rack .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Sump/oil pump; Removing and installing sump (top section) .

Tightening torques

- ⇒ Fig. ““Sump (top section) - tightening torques and sequence with camshaft timing chain cover (bottom) removed”“ , page 174
- ⇒ “1.1 Exploded view - sump/oil pump”, page 171
- ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Exploded view - subframe

1.5 Removing and installing oil baffle plate

Special tools and workshop equipment required

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

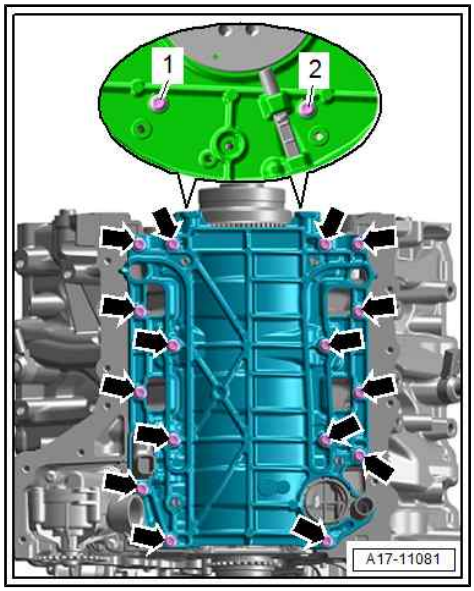
Removing

- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

– With timing chain cover (bottom) fitted, remove sump (top section)

⇒ “1.4.1 Removing and installing sump (top section) with timing chain cover (bottom) installed”, page 177 .

– Remove bolts -arrows- and -1, 2-.



– Lever oil baffle plate downwards out of bonded joint on timing chain cover (bottom) and detach oil baffle plate.

Installing

Caution

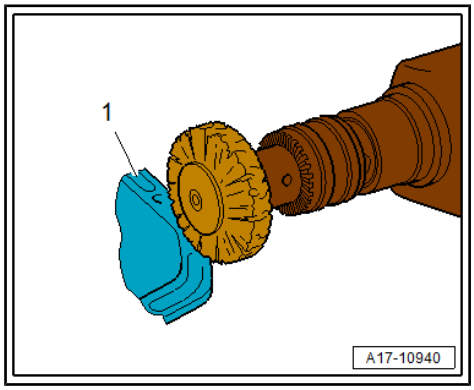
Protect lubrication system and bearings against contamination.

- *Cover exposed parts of the engine.*

WARNING

Risk of eye injury.

- *Put on safety goggles.*



– Remove sealant residue from oil baffle plate and cylinder block -1- using rotating plastic brush or similar.

– Clean surfaces; they must be free of oil and grease.

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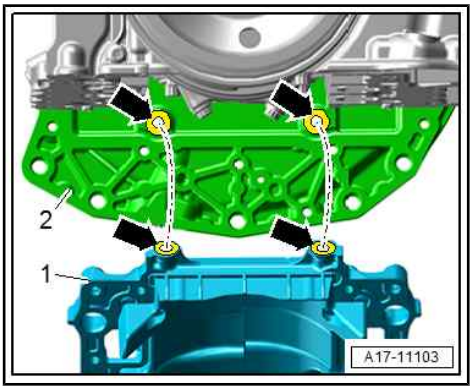
- Note expiry date of sealant.

Caution

Make sure lubrication system is not clogged by excess sealant.

- *The sealant must not be applied thicker than specified.*



– Thinly coat sealing surfaces -arrows- on oil baffle plate and timing chain cover (bottom) -2- with sealant.

- Install oil baffle plate within 5 minutes of applying sealant.

– Carefully fit oil baffle plate. To do so, guide it towards sealing surface on cylinder block and timing chain cover (bottom) at an angle and from below.

- Sealant must not be allowed to get into threaded holes.

– First, screw all bolts in by hand and then tighten.

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

– Install sump (upper section) ⇒ page 177 .

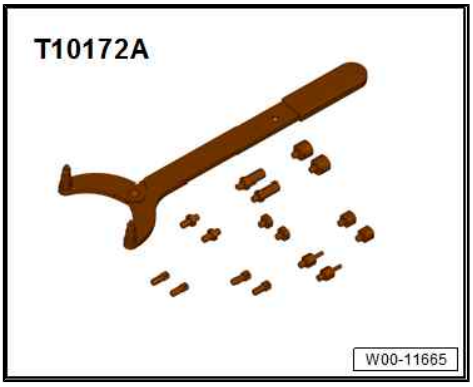
Tightening torques

- ⇒ Fig. ""Oil baffle plate - tightening torques and sequence"" , page 174

1.6 Removing and installing oil pump

Special tools and workshop equipment required

- Counterhold tool - T10172A-



Removing

- Gearbox removed ⇒ Gearbox; Rep. gr. 37 ; Removing and installing gearbox; Removing gearbox .

– Remove sump (top section) ⇒ page 177 .

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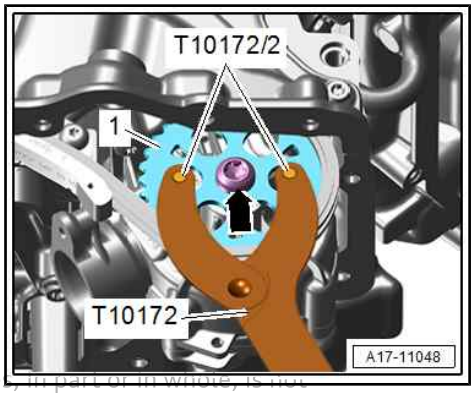
– Fit counterhold tool - T10172- with adapter -T10172/2- and remove bolt -arrow-.
– Pull chain sprocket -1- off oil pump and leave it in position.



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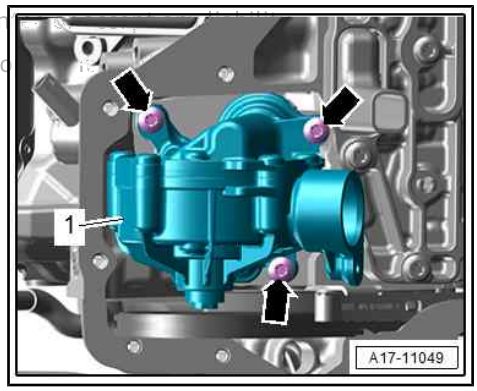
– Remove bolts -arrows- and detach oil pump -1-.

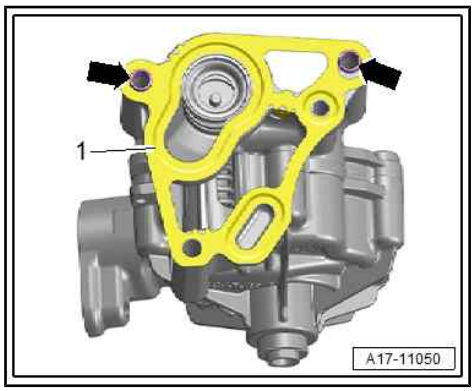


Installing

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

- Renew gasket after removing.
- After removing, renew bolts tightened with specified tightening angle.

– Check that centring sleeves -arrows- are fitted in oil pump.
– Fit gasket -1-.
– Install sump (upper section)
⇒ “1.4.1 Removing and installing sump (top section) with timing chain cover (bottom) installed”, page 177 .



Tightening torques

◆ ⇒ “1.1 Exploded view - sump/oil pump”, page 171

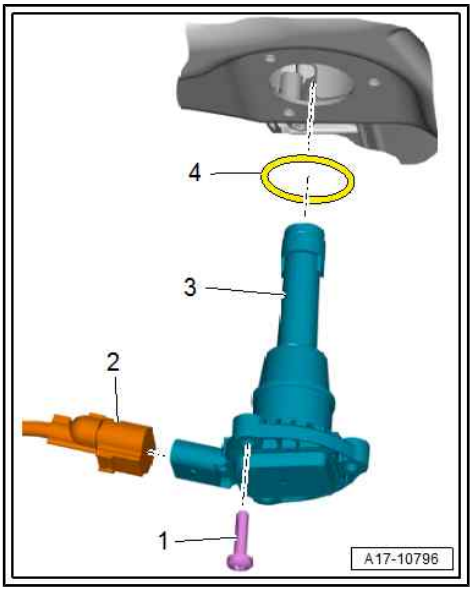
1.7 Removing and installing oil level and oil temperature sender - G266-

Removing

- Engine oil drained ⇒ page 175 .

– Unplug electrical connector -2-.

– Remove bolts -1- and detach oil level and oil temperature sender - G266- -item 3-.



Installing

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

- Renew seal -4- after removing.

– Fill with engine oil and check oil level ⇒ “1.2 Engine oil”, page 175 .

Tightening torques

◆ ⇒ “1.1 Exploded view - sump/oil pump”, page 171

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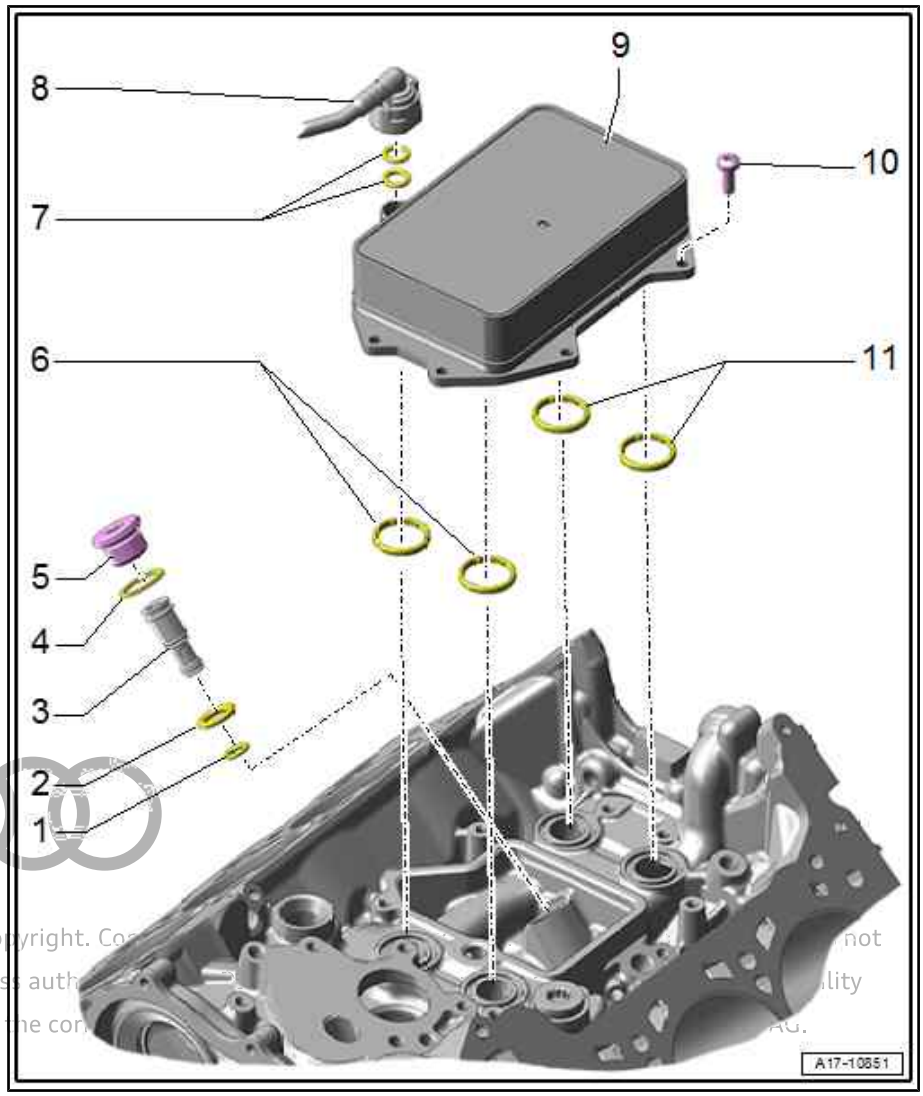
2 Engine oil cooler

⇒ “2.1 Exploded view - engine oil cooler”, page 190

⇒ “2.2 Removing and installing engine oil cooler”, page 190

⇒ “2.3 Removing and installing spray nozzle valve”, page 192

2.1 Exploded view - engine oil cooler



1 - O-ring
- ❑ Renew after removing

2 - O-ring
- ❑ Renew after removing

3 - Spray nozzle valve
- ❑ Removing and installing ⇒ “2.3 Removing and installing spray nozzle valve”, page 192

4 - Seal
- ❑ Renew after removing

5 - Plug
- ❑ Renew after removing
- ❑ 10 Nm +45°

6 - Seals
- ❑ Renew after removing

7 - O-rings
- ❑ Renew after removing

8 - Hose
- ❑ For crankcase breather
- ❑ Cannot be removed without being damaged irreparably

9 - Engine oil cooler
- ❑ Removing and installing ⇒ “2.2 Removing and installing engine oil cooler”, page 190
- ❑ If renewed, refill system with fresh coolant

10 - Bolt
- ❑ 9 Nm

11 - Seals
- ❑ Renew after removing

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2.2 Removing and installing engine oil cooler

Special tools and workshop equipment required

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

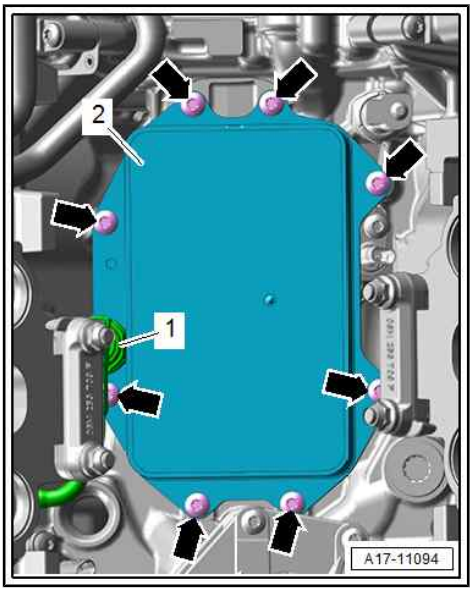
♦ Safety goggles

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Engine oil cooler; Removing and installing engine oil cooler .

– Remove bolts -arrows-.

– Release engine oil cooler -2- from bonded joint and detach with crankcase breather hose -1-.



Installing

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

• Renew seals after removing.

Caution

Protect lubrication system and bearings against contamination.

♦ *Cover exposed parts of engine and engine oil cooler.*

WARNING

Risk of eye injury.

♦ *Put on safety goggles.*

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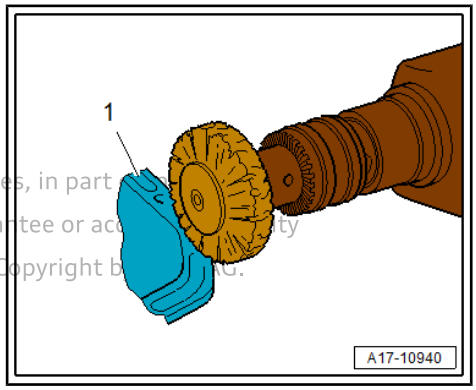
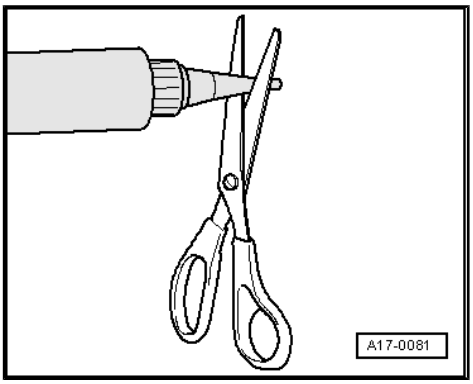


– Remove sealant residue on engine oil cooler -1- and cylinder block using rotating plastic brush or similar.

– Clean surfaces; they must be free of oil and grease.

• Note expiry date of sealant.

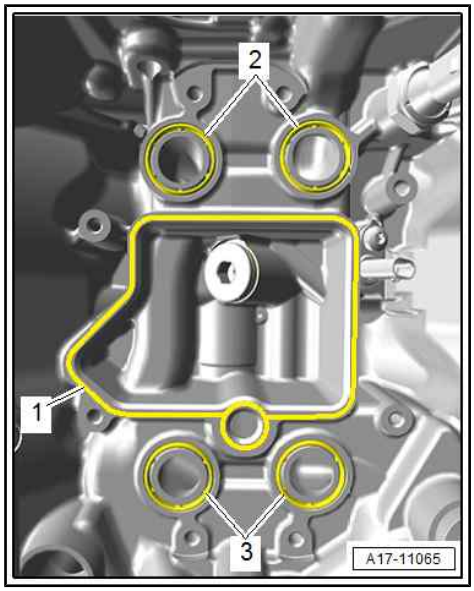
– Cut off nozzle of tube at front marking (nozzle ∅ approx. 2.5 mm).



Caution

Make sure lubrication system is not clogged by excess sealant.

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



– Fit seals -2, 3-.

– Apply bead of sealant -1- onto clean sealing surface of cylinder block.

- Width of sealant bead: 3.0 mm.
- Install engine oil cooler within 5 minutes of applying the sealant.
- Do not reuse coolant.

– Fit engine oil cooler and tighten bolts.

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

– Check oil level ⇒ “1.2 Engine oil”, page 175 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Engine oil cooler; Removing and installing engine oil cooler

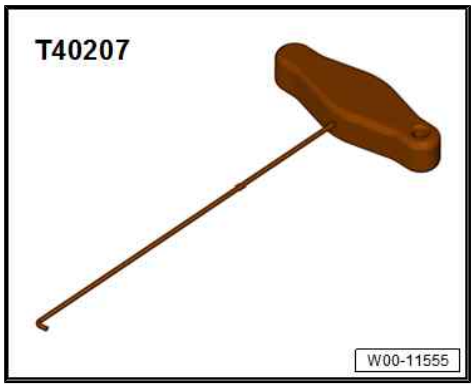
Tightening torques

- ⇒ “2.1 Exploded view - engine oil cooler”, page 190

2.3 Removing and installing spray nozzle valve

Special tools and workshop equipment required

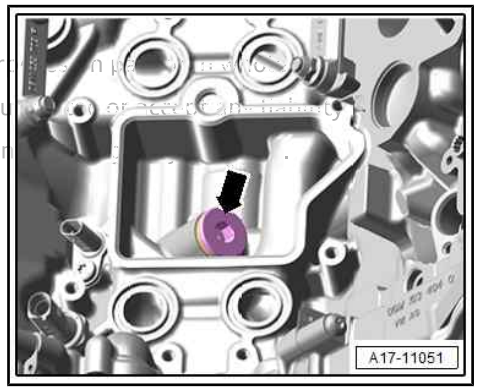
- Hook - T40207-



Removing

– Remove engine oil cooler ⇒ “2.2 Removing and installing engine oil cooler”, page 190 .

– Remove screw plug -arrow-.



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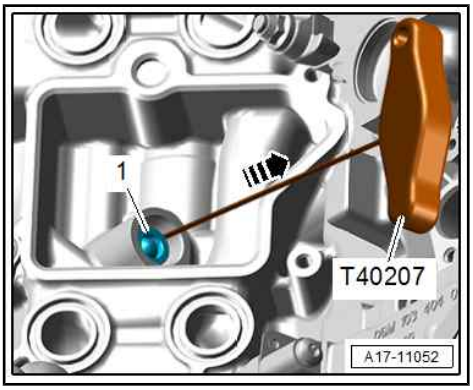
– Pull out spray nozzle valve -1- using hook - T40207- .



Installing

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

- Renew O-rings and oil seal after removing.

– Install engine oil cooler
⇒ “2.2 Removing and installing engine oil cooler”, page 190 .

Tightening torques

◆ ⇒ “2.1 Exploded view - engine oil cooler”, page 190

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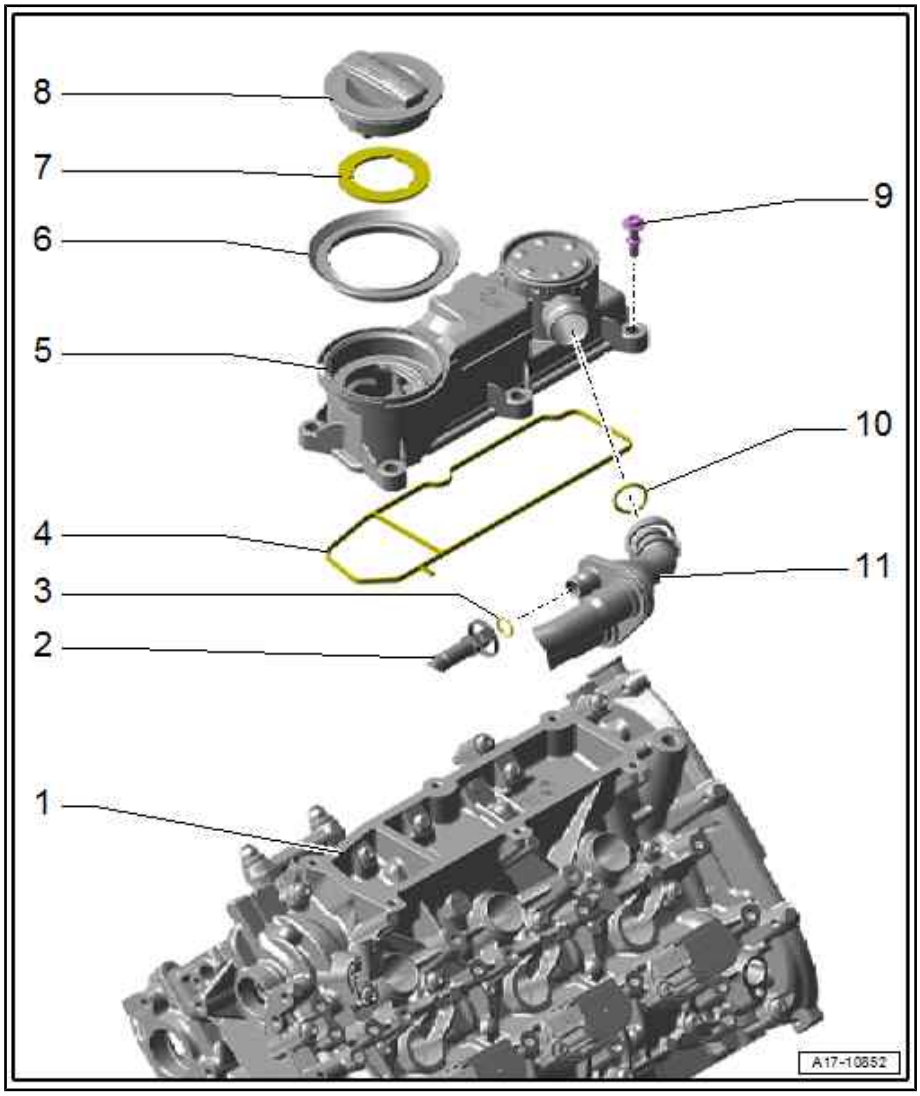
3 Crankcase breather

⇒ “3.1 Exploded view - crankcase breather system”, page 194

⇒ “3.2 Removing and installing crankcase breather module”, page 195

3.1 Exploded view - crankcase breather system



1 - Camshaft housing

2 - Hose/sealing plug

- ❑ Depending on version

3 - O-ring

- ❑ For specific equipment version
- ❑ Renew after removing

4 - Gasket

- ❑ Renew after removing

5 - Crankcase breather module

- ❑ Removing and installing ⇒ “3.2 Removing and installing crankcase breather module”, page 195

6 - Grommet

7 - Seal

- ❑ Renew if damaged

8 - Filler cap

9 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ““Crankcase breather module - tightening torques and sequence”“ , page 195

10 - O-ring

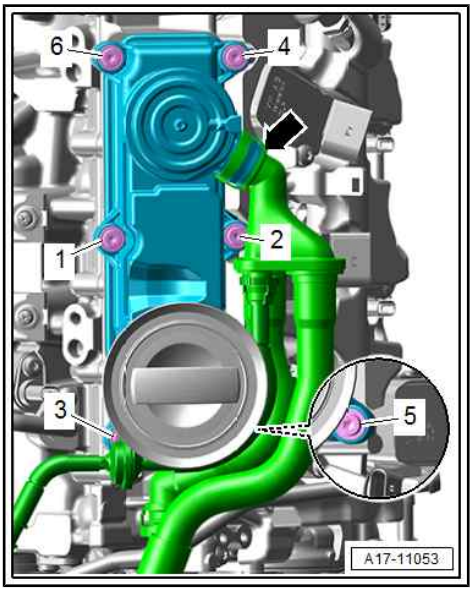
- ❑ Renew after removing

11 - Hose

- ❑ For crankcase breather
- ❑ Crankcase breather hose cannot be detached from air pipe without being irreparably damaged ⇒ “2.1 Exploded view - charge air system”, page 259 .

Crankcase breather module - tightening torques and sequence

– Tighten bolts to 9 Nm in the sequence shown.



3.2 Removing and installing crankcase breather module

Removing

- Reinstall heat insulation sleeves in the same locations when installing.

– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– If fitted, open heat shield sleeve.

– Press release tabs on both sides and disconnect crankcase breather connection -arrow-.

– Unscrew bolts -1 … 6- and remove crankcase breather module.

Installing

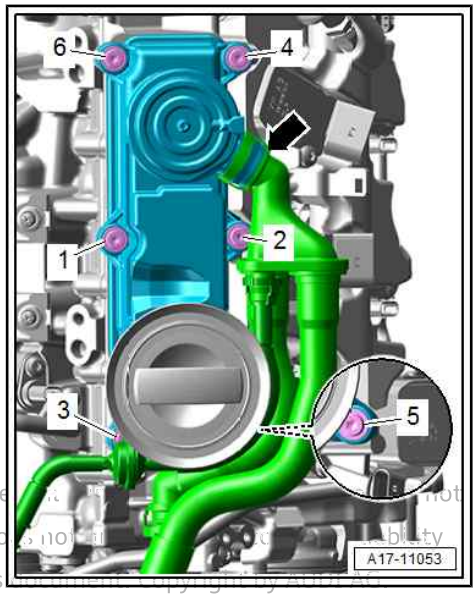
Installation is carried out in reverse order; note the following:

- Renew seal/gasket and O-ring after removal.

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

Tightening torques

◆ ⇒ Fig. ““Crankcase breather module - tightening torques and sequence”“ , page 195



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4 Oil filter/oil pressure switches

⇒ “4.1 Exploded view - oil filter”, page 196

⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198

⇒ “4.3 Removing and installing oil filter housing”, page 199

⇒ “4.4 Removing and installing oil pressure switch F22 ”, page 201

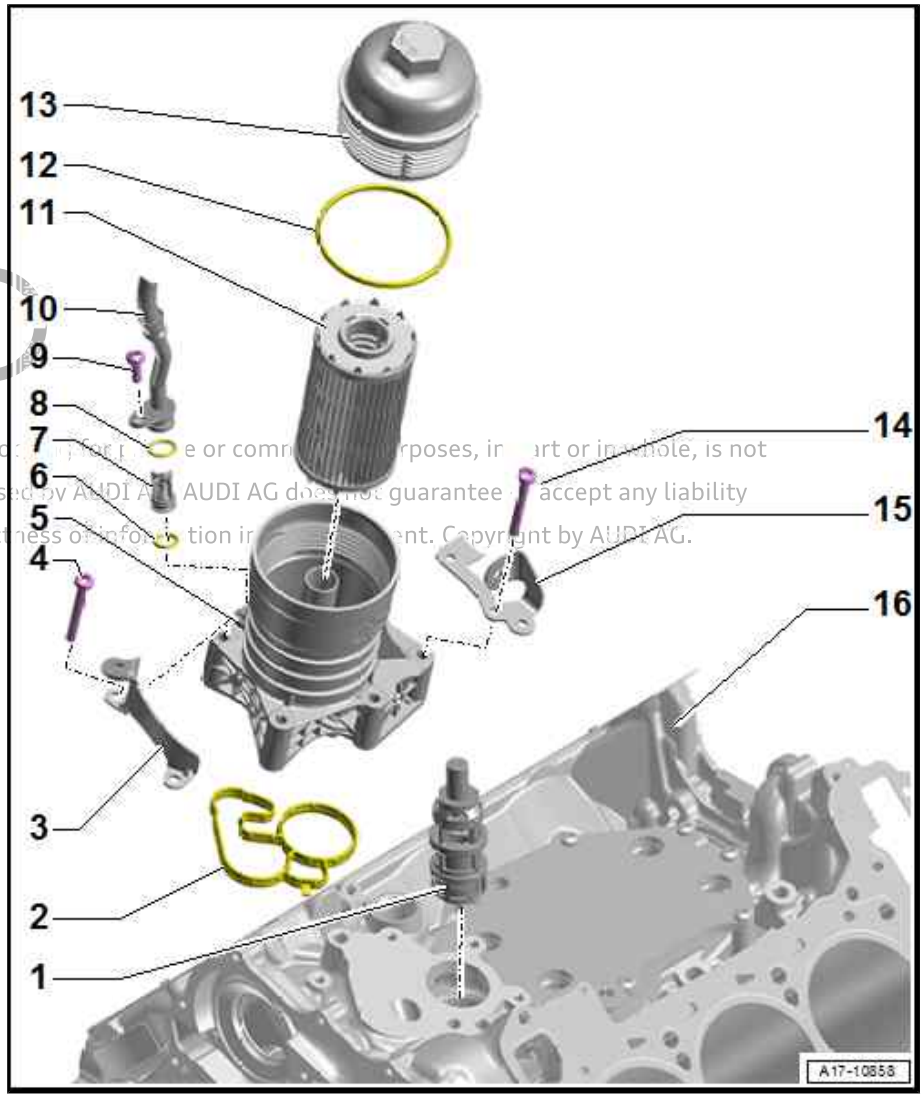
⇒ “4.5 Removing and installing oil temperature sender G8 ”, page 203

⇒ “4.6 Removing and installing oil pressure sender G10 ”, page 205

⇒ “4.7 Checking oil pressure”, page 206

⇒ “4.8 Removing and installing valve for oil pressure control N428 ”, page 207

4.1 Exploded view - oil filter



1 - Temperature regulator for engine oil

- ❑ Removing and installing ⇒ “4.3 Removing and installing oil filter housing”, page 199

2 - Gasket

- ❑ Renew after removing

3 - Bracket

- ❑ For air pipe (top)
- ❑ Not fitted on all models

4 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ““Oil filter housing - tightening torques and sequence”“ , page 197

5 - Oil filter housing

- ❑ Removing and installing ⇒ “4.3 Removing and installing oil filter housing”, page 199

6 - O-ring

- ❑ Renew after removing

7 - Non-return valve

8 - O-ring

- ❑ Renew after removing

9 - Bolt

- ❑ 9 Nm

10 - Oil supply line

11 - Oil filter element

- ❑ Removing and installing ⇒ “1.2 Engine oil”, page 175

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12 - O-ring

- ❑ Part of oil filter element

13 - Sealing cap

- ❑ 25 Nm

14 - Bolt

- ❑ Tightening torques and sequence
  ⇒ Fig. ""Oil filter housing - tightening torques and sequence"" , page 197

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15 - Bracket

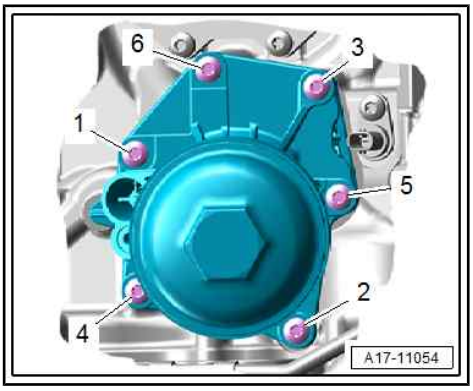
16 - Cylinder block

Oil filter housing - tightening torques and sequence

- After removing, renew bolts tightened with specified tightening angle.

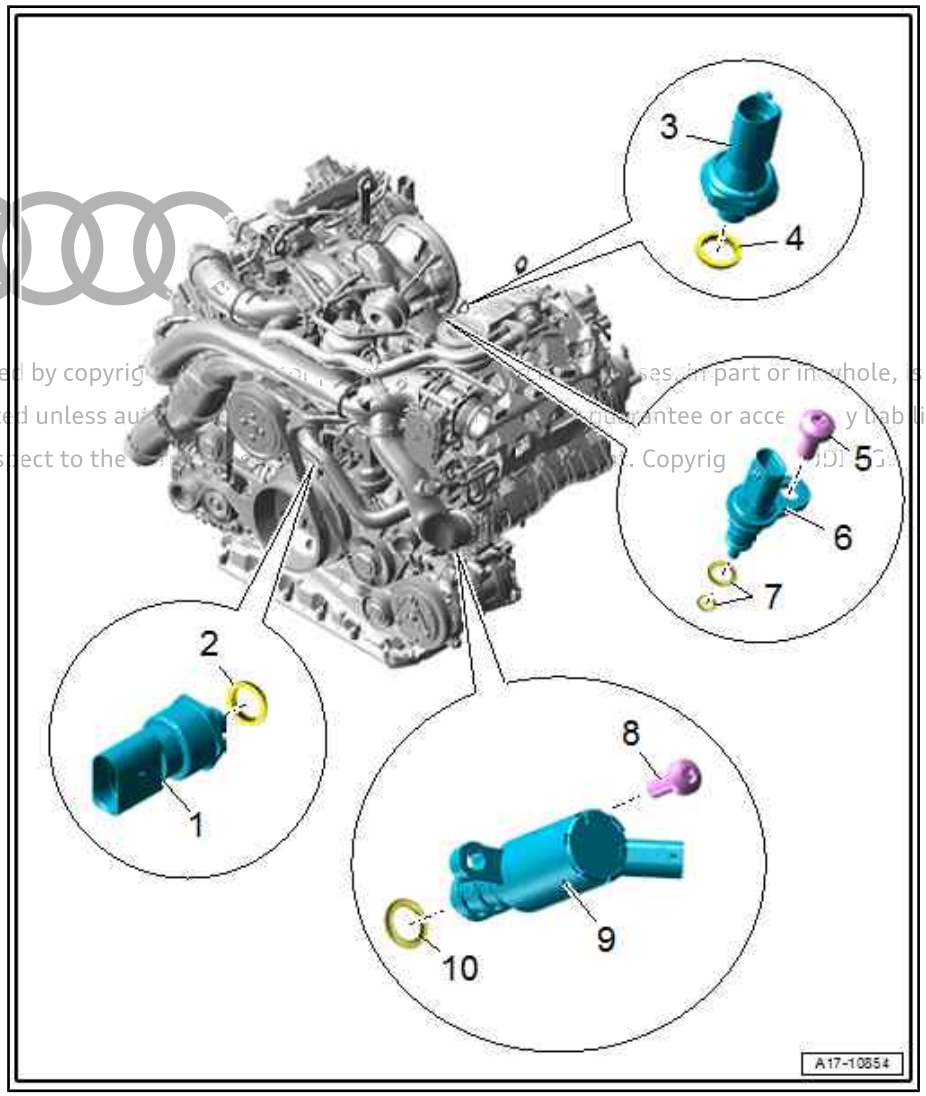
– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque/angle specification
1.	-1 … 6-	Screw in by hand until contact is made
2.	-1 … 6-	5 Nm
3.	-1 … 6-	8 Nm
4.	-1 … 6-	Turn 90° further



4.2 Exploded view - oil pressure switches/oil pressure control

Shown on vehicle with 3.0 ltr. engine.



1 - Oil pressure sender - G10-

- ❑ Removing and installing ⇒ “4.6 Removing and installing oil pressure sender G10 ”, page 205
- ❑ 20 Nm

2 - Seal

- ❑ Renew after removing

3 - Oil pressure switch - F22-

- ❑ Opening/closing pressure 0.3 … 0.6 bar (monitoring of switchable piston oil spray jets)
- ❑ Green insulation
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ “4.4 Removing and installing oil pressure switch F22 ”, page 201
- ❑ 20 Nm

4 - Seal

- ❑ Renew after removing

5 - Bolt

- ❑ 9 Nm

6 - Oil temperature sender - G8-

- ❑ Removing and installing ⇒ “4.5 Removing and installing oil temperature sender G8 ”, page 203

7 - O-rings

- ❑ Renew after removing

8 - Bolt

- ❑ 9 Nm

9 - Valve for oil pressure control - N428-

- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ “4.8 Removing and installing valve for oil pressure control N428 ”, page 207

10 - O-ring

- ❑ Renew after removing

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4.3 Removing and installing oil filter housing

⇒ “4.3.1 Removing and installing oil filter housing - vehicles with 2.9 ltr. engine”, page 199

⇒ “4.3.2 Removing and installing oil filter housing - vehicles with 3.0 ltr. engine”, page 200

4.3.1 Removing and installing oil filter housing - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

- Socket Torx T30 - T10405-

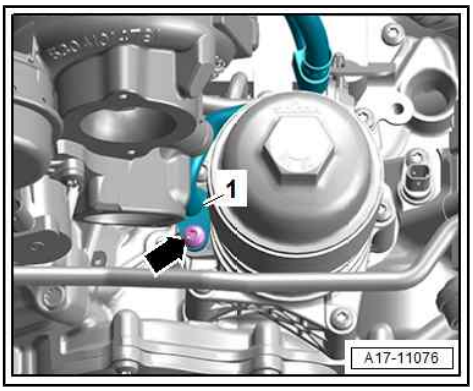
Removing

– Remove turbocharger (left-side)
⇒ “1.2.2 Removing turbocharger, cylinder bank 2 (left-side) - vehicles with 2.9 ltr. engine”, page 240 .

– Remove oil filter element ⇒ “1.2 Engine oil”, page 175 .

– Place a cloth underneath to catch escaping engine oil.

– Remove bolt -arrow- and disconnect oil supply line -1-.



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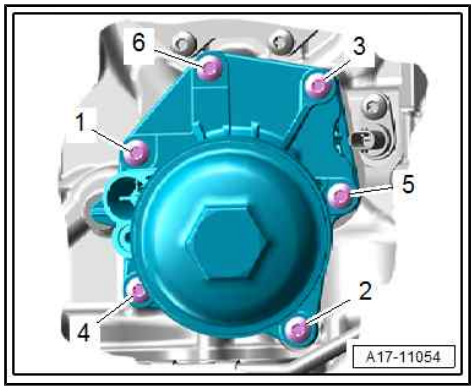
– Unscrew bolts -1 … 6- using socket Torx T30 - T10405- , detach oil filter housing.

– Detach temperature regulator for engine oil.



Installing

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

- Renew O-ring and gasket after removal.
- After removing, renew bolts tightened with specified tightening angle.

– Install oil filter element ⇒ “1.2 Engine oil”, page 175 .

– Install turbocharger (left-side) ⇒ “1.2.2 Removing turbocharger, cylinder bank 2 (left-side) - vehicles with 2.9 ltr. engine”, page 240 .

Tightening torques

◆ ⇒ “4.1 Exploded view - oil filter”, page 196

4.3.2 Removing and installing oil filter housing - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

◆ Socket Torx T30 - T10405-

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches; Removing and installing oil filter housing .

– Remove oil filter element ⇒ “1.2 Engine oil”, page 175 .

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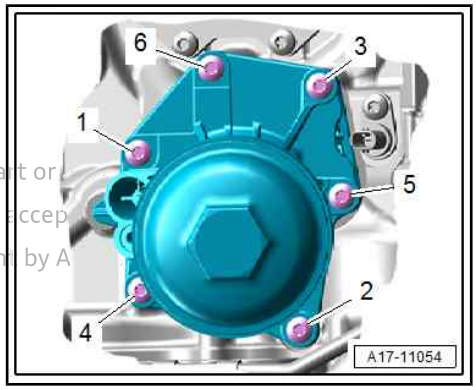
– Unscrew bolts -1 … 6- using socket Torx T30 - T10405- , detach oil filter housing.

– Detach temperature regulator for engine oil.



Installing

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

- Renew O-ring and gasket after removal.
- After removing, renew bolts tightened with specified tightening angle.

– Install oil filter element ⇒ “1.2 Engine oil”, page 175 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches; Removing and installing oil filter housing

Tightening torques

◆ ⇒ “4.1 Exploded view - oil filter”, page 196

4.4 Removing and installing oil pressure switch - F22-

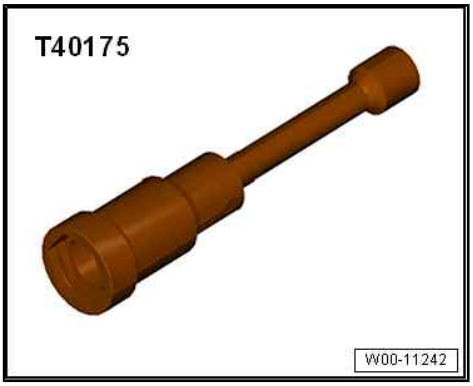
⇒ “4.4.1 Removing and installing oil pressure switch F22 - vehicles with 2.9 ltr. engine”, page 201

⇒ “4.4.2 Removing and installing oil pressure switch F22 - vehicles with 3.0 ltr. engine”, page 202

4.4.1 Removing and installing oil pressure switch - F22- - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

◆ Articulated wrench, 24 mm - T40175-



Procedure

- Reinstall heat insulation sleeves in the same locations when installing.

– Remove catalytic converter (left-side) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Emission control system; Removing and installing catalytic converter , move it to one side and secure it with Lambda probe connected (to do so, move electrical wiring clear).

– Open heat insulation sleeve.

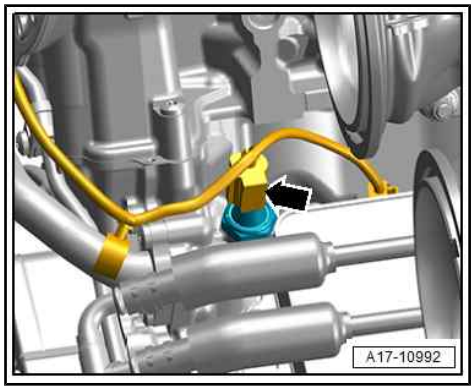
– Unplug electrical connector -arrow-.

– Use articulated wrench, 24 mm - T40175- to unscrew oil pressure switch - F22- .

• Renew seal after removing.

– Install catalytic converter (left-side) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Emission control system; Removing and installing catalytic converter .

– Check oil level ⇒ “1.2 Engine oil”, page 175 .



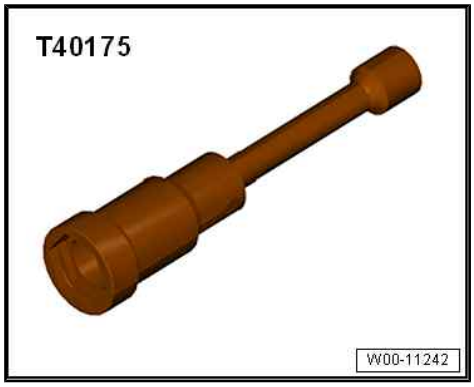
Tightening torques

♦ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198

4.4.2 Removing and installing oil pressure switch - F22- - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

♦ Articulated wrench, 24 mm - T40175-



Procedure

• Reinstall heat insulation sleeves in the same locations when installing.

Audi Q8

– Remove air cleaner housing ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI EA 839); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .

All models except Audi Q8

– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

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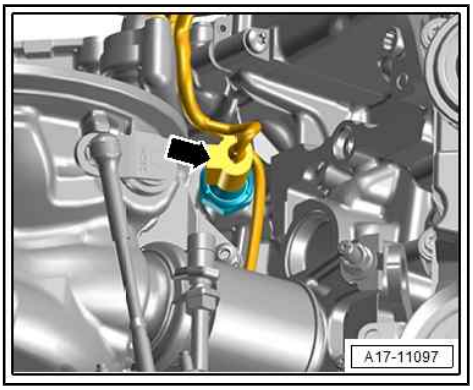
All vehicles (continued):



– Open heat insulation sleeve.
– Unplug electrical connector -arrow-.
– Use articulated wrench, 24 mm - T40175- to unscrew oil pressure switch - F22- .
• Renew seal after removing.
– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .
– Check oil level ⇒ “1.2 Engine oil”, page 175 .

Tightening torques

◆ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198
◆ ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI EA 839); Rep. gr. 24 ; Air cleaner; Exploded view - air cleaner housing

4.5 Removing and installing oil temperature sender - G8-

⇒ “4.5.1 Removing and installing oil temperature sender G8 - vehicles with 2.9 ltr. engine”, page 203

⇒ “4.5.2 Removing and installing oil temperature sender G8 - vehicles with 3.0 ltr. engine”, page 204

4.5.1 Removing and installing oil temperature sender - G8- - vehicles with 2.9 ltr. engine

Removing

– Remove catalytic converter (left-side) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Emission control system; Removing and installing catalytic converter , move it to one side and secure it with Lambda probe connected (to do so, move electrical wiring clear).

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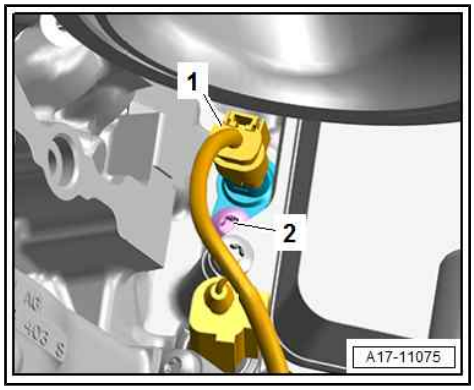
– Unplug electrical connector -1-.

– Place a cloth underneath to catch escaping engine oil.

– Unscrew bolt -2- and pull off oil temperature sender - G8- .



Note:

If O-rings remain lodged in cylinder block, lift them out with a piece of wire.

- Renew O-rings after removing.

– Fit new oil temperature sender immediately so that as little oil as possible is lost.

– Install catalytic converter (left-side) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Emission control system; Removing and installing catalytic converter .

– Check oil level ⇒ “1.2 Engine oil”, page 175 .

Tightening torques

◆ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198

4.5.2 Removing and installing oil temperature sender - G8- - vehicles with 3.0 ltr. engine

Removing

Audi Q8

– Remove air cleaner housing ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI EA 839); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .

All models except Audi Q8

– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

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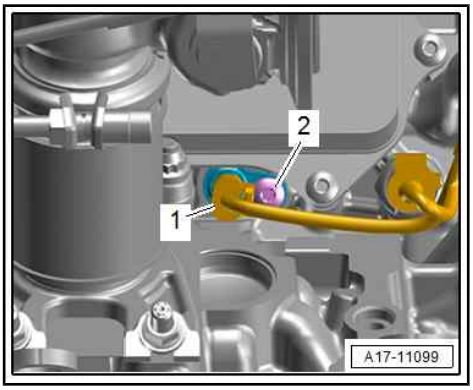
All vehicles (continued):

– Unplug electrical connector -1-.

– Place a cloth underneath to catch escaping engine oil.

– Unscrew bolt -2- and pull off oil temperature sender - G8- .



Note:

If O-rings remain lodged in cylinder block, lift them out with a piece of wire.

- Renew O-rings after removing.

– Fit new oil temperature sender immediately so that as little oil as possible is lost.

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Check oil level ⇒ “1.2 Engine oil”, page 175 .

Tightening torques

◆ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198

◆ ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI EA 839); Rep. gr. 24 ; Air cleaner; Exploded view - air cleaner housing

4.6 Removing and installing oil pressure sender - G10-

⇒ “4.6.1 Removing and installing oil pressure sender G10 - vehicles with 2.9 ltr. engine”, page 205

⇒ “4.6.2 Removing and installing oil pressure sender G10 - vehicles with 3.0 ltr. engine”, page 206

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4.6.1 Removing and installing oil pressure sender - G10- - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

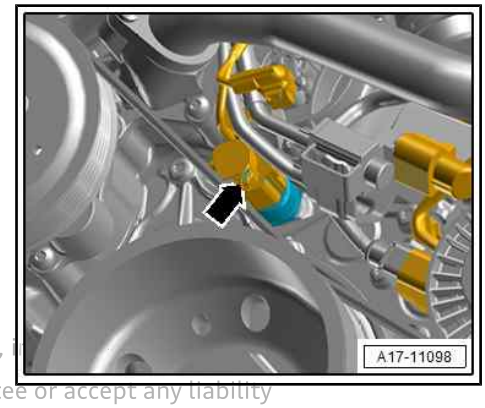
◆ Socket, 24 mm - T40363- (not illustrated)

Procedure

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches ; Removing and installing oil pressure sender - G10- .

– If not removing oil pressure sender - G10- to measure oil pressure, remove coolant pipe (front left) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– If removing oil pressure sender - G10- to measure oil pressure, remove radiator with radiator cowl ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiators/radiator fans; Removing and installing radiator .



– Unplug electrical connector -arrow-.
– Place a cloth underneath to catch escaping engine oil.
– Unscrew oil pressure sender - G10- using socket, 24 mm - T40363- .
• Renew seal after removing.
– Fit new oil pressure sender immediately so that as little oil as possible is lost.
– Check oil level ⇒ “1.2 Engine oil”, page 175 .
– If removed previously, install radiator ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiators/radiator fans; Removing and installing radiator .
– If removed previously, install coolant pipe (front left) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches ; Removing and installing oil pressure sender - G10-

Tightening torques

♦ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198

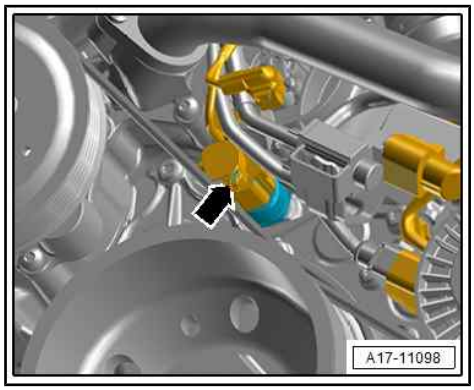
4.6.2 Removing and installing oil pressure sender - G10- - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

♦ Socket, 24 mm - T40363- (not illustrated)

Procedure

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches ; Removing and installing oil pressure sender - G10- .



– Unplug electrical connector -arrow-.
– Place a cloth underneath to catch escaping engine oil.
– Unscrew oil pressure sender - G10- using socket, 24 mm - T40363- .
• Renew seal after removing.
– Fit new oil pressure switch immediately so that as little oil as possible is lost.
– Check oil level ⇒ “1.2 Engine oil”, page 175 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches ; Removing and installing oil pressure sender - G10-

Tightening torques

♦ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198

4.7 Checking oil pressure

Special tools and workshop equipment required

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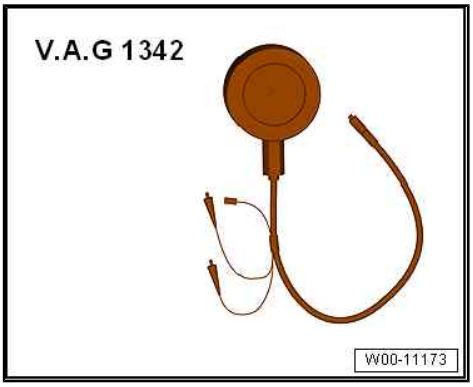
♦ Oil pressure tester - V.A.G 1342-



Procedure

- Oil level OK
- Engine oil temperature approx. 80 °C

– Remove oil pressure sender - G10-
⇒ “4.6 Removing and installing oil pressure sender G10 ”, page 205 .

– Connect oil pressure tester - V.A.G 1342- to opening for oil pressure sender and tie up test hose so it is clear of vibration damper.

– Screw oil pressure sender - G10- into oil pressure tester.

– Start engine and leave it running only as long as required for the test.

– Start engine.

- Minimum oil pressure at idling speed: 0.9 bar.
- Minimum oil pressure at 2000 rpm: 1.3 bar.

Attaching

– Install oil pressure sender - G10-
⇒ “4.6 Removing and installing oil pressure sender G10 ”, page 205 .

– Erase any entries in event memory resulting from testing ⇒ Vehicle diagnostic tester.

4.8 Removing and installing valve for oil pressure control - N428-

⇒ “4.8.1 Removing and installing valve for oil pressure control N428 - vehicles with 2.9 ltr. engine”, page 207
⇒ “4.8.2 Removing and installing valve for oil pressure control N428 - vehicles with 3.0 ltr. engine”, page 208

4.8.1 Removing and installing valve for oil pressure control - N428- - vehicles with 2.9 ltr. engine

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches; Removing and installing valve for oil pressure control - N428- .

– If not removed already, remove noise insulation (front) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Removing and installing noise insulation .

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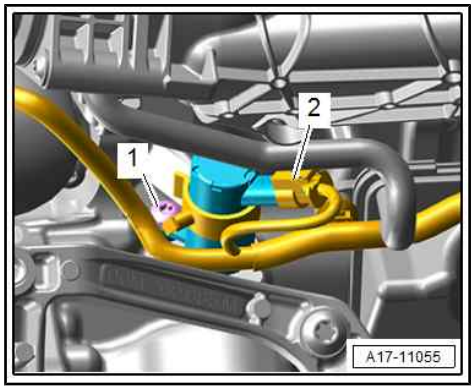
– If not yet removed, remove front left wheel spoiler ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Removing and installing wheel housing liner (front) .
– Unplug electrical connector -2- and move electrical wiring harness clear.
– Remove bolt -1-.
– Detach valve for oil pressure control - N428- from cylinder block.



Installing

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

- Renew O-ring after removal.

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches; Removing and installing valve for oil pressure control - N428-

Tightening torques

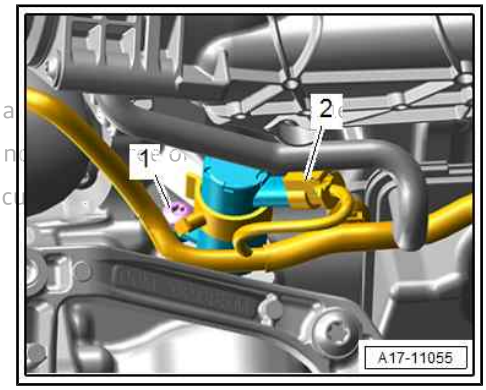
- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liners; Exploded view - wheel housing liner (front)
- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation

4.8.2 Removing and installing valve for oil pressure control - N428- - vehicles with 3.0 ltr. engine

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches; Removing and installing valve for oil pressure control - N428- .

– Unplug electrical connector -2- and move electrical wiring harness clear.
– Remove bolt -1-.
– Detach valve for oil pressure control - N428- from cylinder block.



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Installing

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

- Renew O-ring after removal.

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 17 ; Oil filter/oil pressure switches; Removing and installing valve for oil pressure control - N428-

Tightening torques

- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 198

19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 209

⇒ “1.2 Checking cooling system for leaks”, page 209

⇒ “1.3 Draining and filling cooling system”, page 213

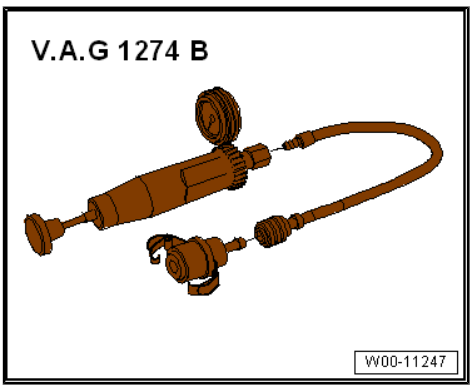
1.1 Connection diagram - coolant hoses

All components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/ coolant; Connection diagram - coolant hoses .

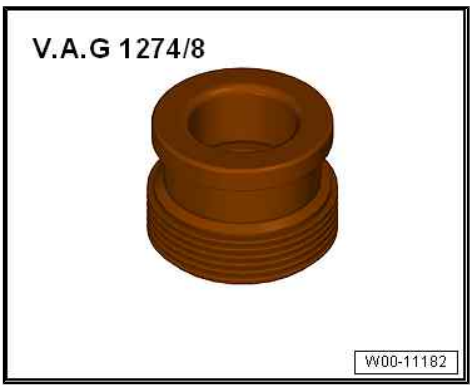
1.2 Checking cooling system for leaks

Special tools and workshop equipment required

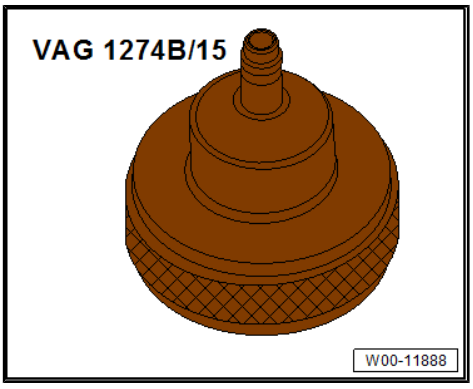
- Cooling system tester - V.A.G 1274 B-



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



- Cooling system tester adapter - V.A.G 1274B/15- for filler cap, version 1



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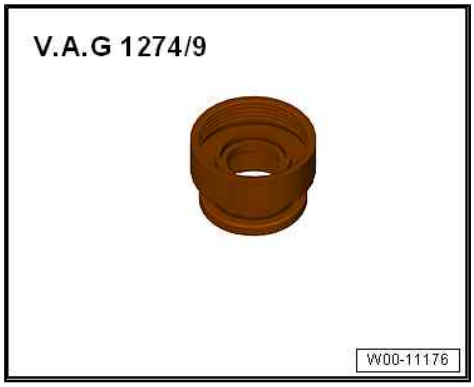
♦ Cooling system tester adapter - V.A.G 1274/9- for filler cap, version 2



Procedure

- Engine must be warm.
- Ignition switched off.

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Checking cooling system for leaks .

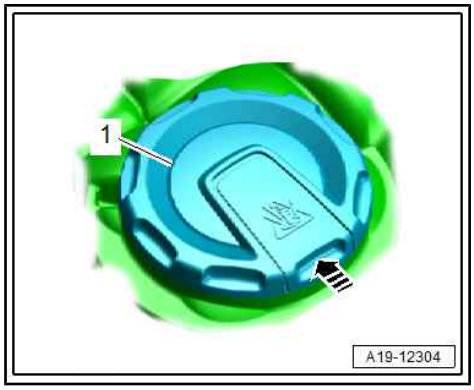
WARNING

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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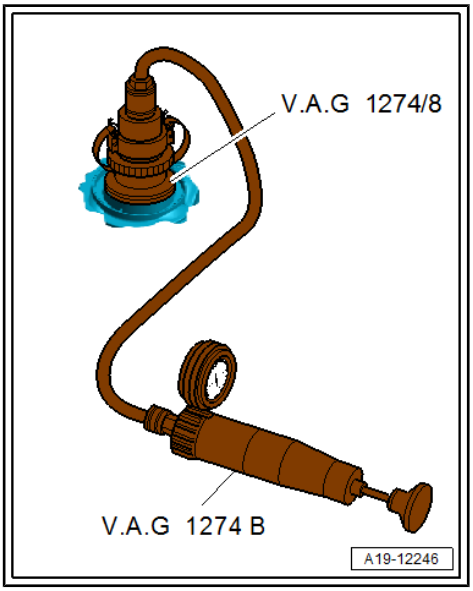
– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- onto coolant expansion tank.

– 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.

WARNING

Risk of scalding due to hot steam and hot coolant.

Danger of scalding skin and other parts of the body.

- *To release pressure, press pressure relief valve on cooling system tester until reading on pressure gauge is 0.*

Checking pressure relief valve in filler cap, version 1

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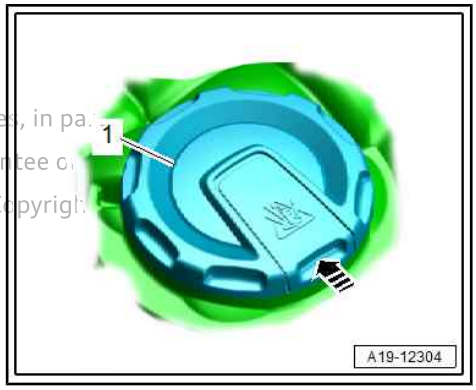
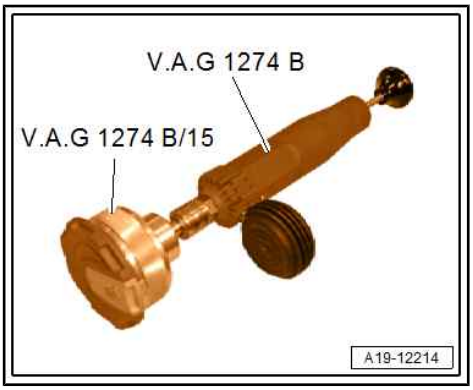


– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274 B/15- onto filler cap.

– 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.

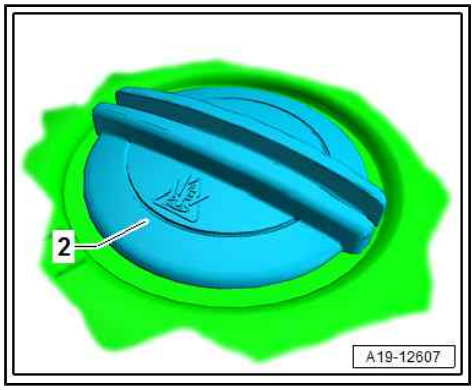
– Renew filler cap if pressure relief valve does not react as described.

Black filler cap:

• The pressure must be reduced to 1.8 ... 1.6 bar and kept at this level.

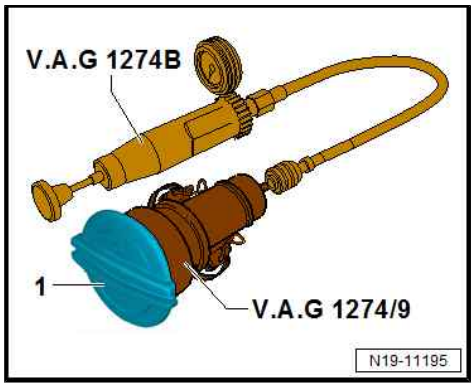
– Renew filler cap if pressure relief valve does not react as described.

Checking pressure relief valve in filler cap, version 2



– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto filler cap.

– Build up pressure with hand pump on cooling system tester.



Blue filler cap:

- 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.

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Checking cooling system for leaks

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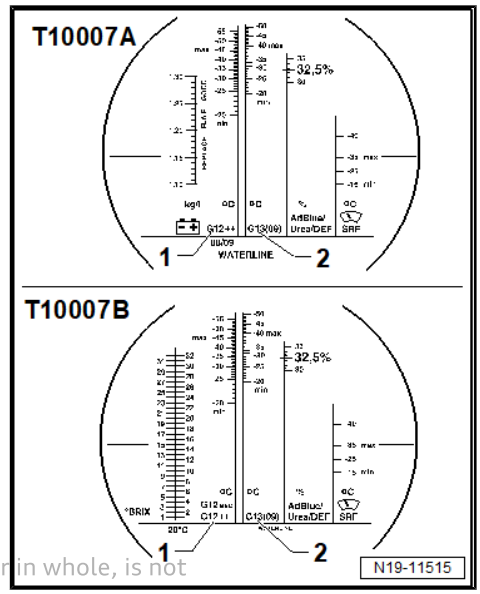
1.3 Draining and filling cooling system

Coolant specifications



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.*

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Draining and filling cooling system

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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 214

⇒ “2.2 Exploded view - electric coolant pump”, page 216

⇒ “2.3 Exploded view - coolant temperature senders”, page 216

⇒ “2.4 Removing and installing electric coolant pump”, page 217

⇒ “2.5 Removing and installing coolant pump”, page 217

⇒ “2.6 Removing and installing map-controlled engine cooling system thermostat F265 ”, page 217

⇒ “2.7 Removing and installing coolant temperature sender G62 ”, page 220

⇒ “2.8 Removing and installing engine outlet coolant temperature sender G82 ”, page 222

⇒ “2.9 Removing and installing radiator outlet coolant temperature sender G83 ”, page 224

⇒ “2.10 Removing and installing temperature sender for engine temperature regulation G694 ”, page 225

⇒ “2.11 Removing and installing coolant valves”, page 227

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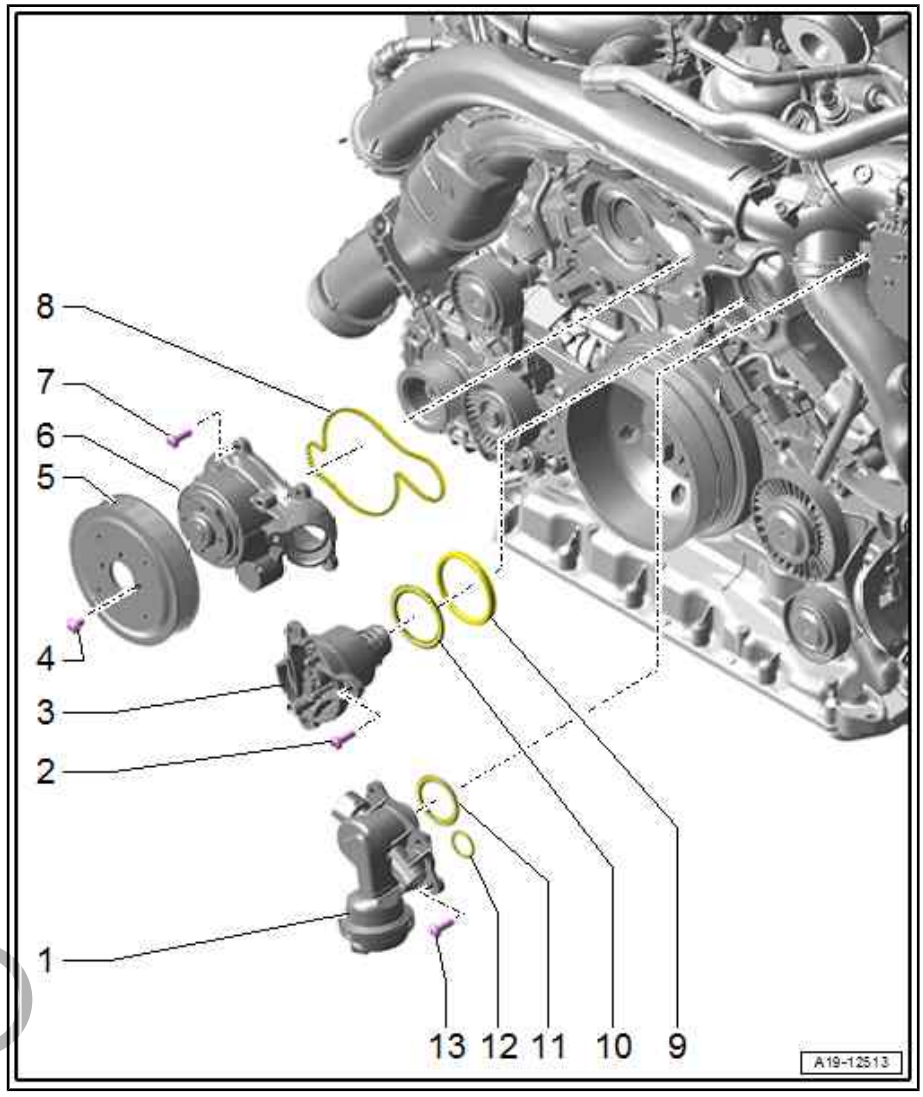
2.1 Exploded view - coolant pump/thermostat

Shown on vehicle with 3.0 ltr. engine.



1 - Coolant shut-off valve

- ❑ Removing and installing ⇒ “2.11 Removing and installing coolant valves”, page 227

2 - Bolt

- ❑ 9 Nm

3 - Map-controlled engine cooling system thermostat - F265-

- ❑ Removing and installing ⇒ “2.6 Removing and installing map-controlled engine cooling system thermostat F265 ”, page 217

4 - Bolt

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

5 - Pulley

- ❑ For coolant pump

6 - Coolant pump

- ❑ Removing and installing ⇒ “2.5 Removing and installing coolant pump”, page 217

7 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ““Coolant pump - tightening torques and sequence”“ , page 216

8 - Gasket

- ❑ Renew after removing

9 - Seal

- ❑ Renew after removing map-controlled engine cooling system thermostat -F265-

10 - O-ring

- ❑ Renew after removing

11 - O-ring

- ❑ Renew after removing

12 - Seal

- ❑ Renew after removing

13 - Bolt

- ❑ 9 Nm

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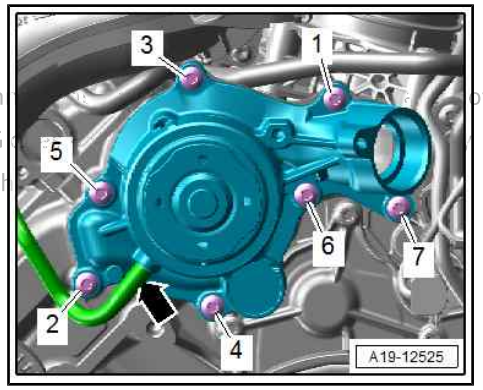
Coolant pump - tightening torques and sequence

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torque
1.	-1, 2-	9 Nm
2.	-1 … 7-	9 Nm



2.2 Exploded view - electric coolant pump

All components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/ thermostat assembly; Exploded view - electric coolant pump .

2.3 Exploded view - coolant temperature senders

Shown on vehicle with 3.0 ltr. engine.

1 - O-rings

- ❑ Renew

2 - Engine outlet coolant temperature sender - G82-

- ❑ Removing and installing ⇒ “2.8 Removing and installing engine outlet coolant temperature sender G82 ”, page 222

3 - Bolt

- ❑ 9 Nm

4 - O-rings

- ❑ Renew

5 - Temperature sender for engine temperature regulation - G694-

- ❑ Black insulation
- ❑ Removing and installing ⇒ “2.10 Removing and installing temperature sender for engine temperature regulation G694 ”, page 225

6 - Bolt

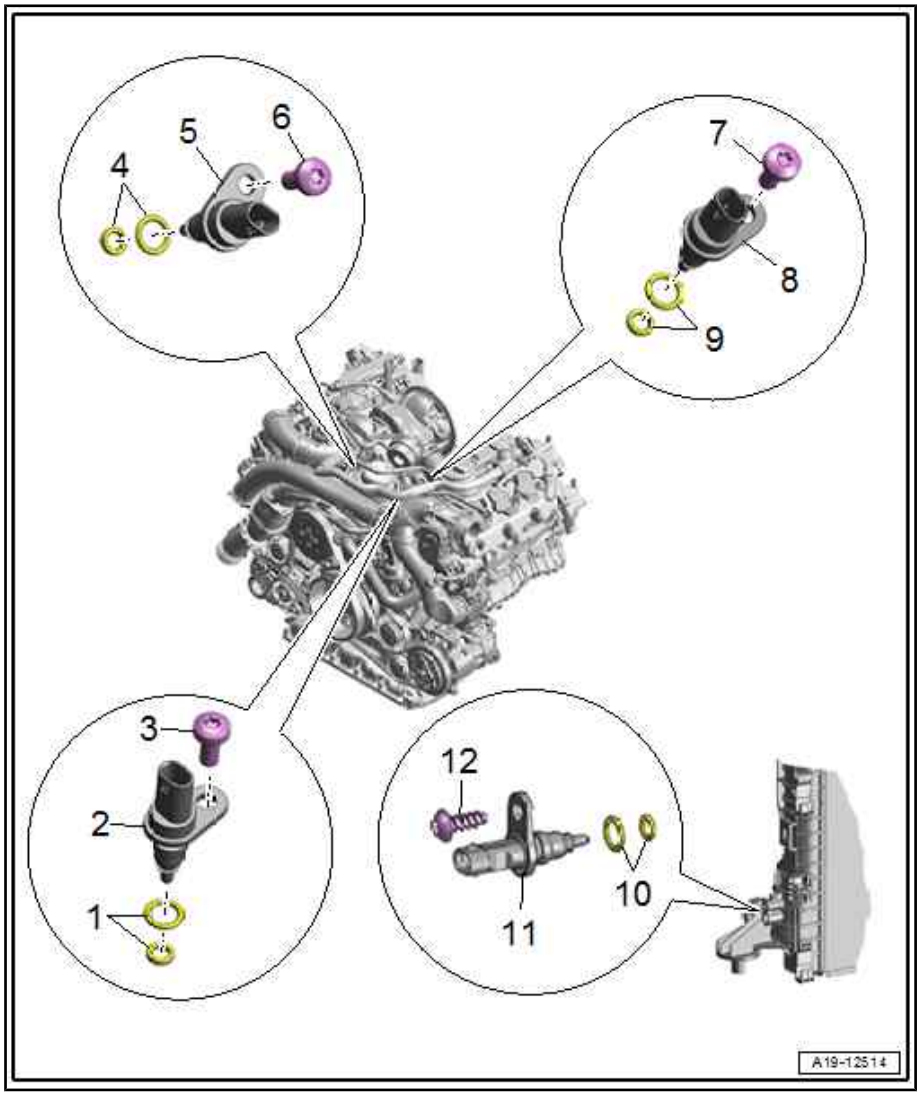
- ❑ 9 Nm

7 - Bolt

- ❑ 9 Nm

8 - Coolant temperature sender - G62-

- ❑ Removing and installing ⇒ “2.7 Removing and installing coolant temperature sender G62 ”, page 220



9 - O-rings

- ❑ Renew

10 - O-rings

- ❑ Renew

11 - Radiator outlet coolant temperature sender - G83-

- ❑ Different installation position depending on model
- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing radiator outlet coolant temperature sender - G83-

12 - Bolt

- ❑ Thread-forming
- ❑ Fit and screw in bolt by hand so that it is screwed into old thread. Then tighten bolt to torque
- ❑ 4.5 Nm

2.4 Removing and installing electric coolant pump

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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

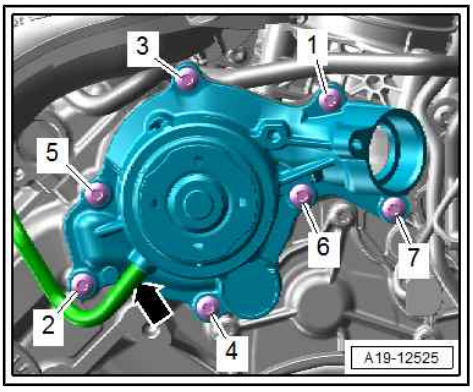
– Remove coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

♦ Coolant pipe (front)

♦ Coolant pipe (front left)

– Disconnect vacuum hose -arrow-, taking care not to damage it.

– Remove bolts -1 ... 7- and detach coolant pump.



Installing

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

- Renew gasket after removing.
- After removing, renew bolts tightened with specified tightening angle.
- Before fitting, check vacuum hoses for damage and renew if necessary.

– Install coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

Tightening torques

♦ ⇒ Fig. ""Coolant pump - tightening torques and sequence"", page 216

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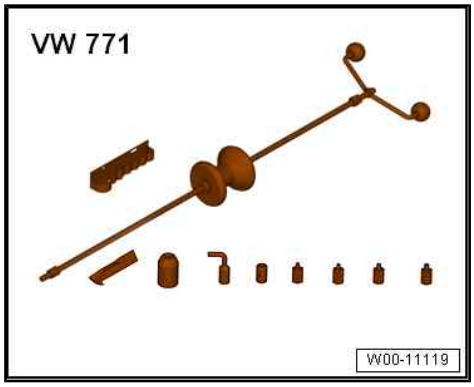
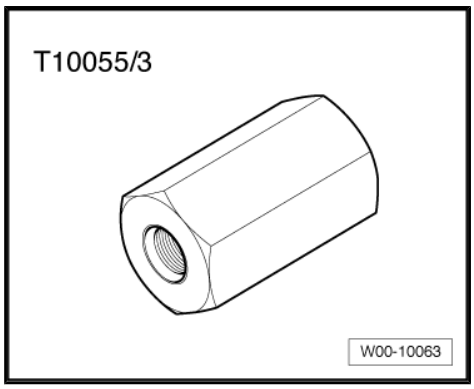
2.6 Removing and installing map-controlled engine cooling system thermostat - F265-

Special tools and workshop equipment required

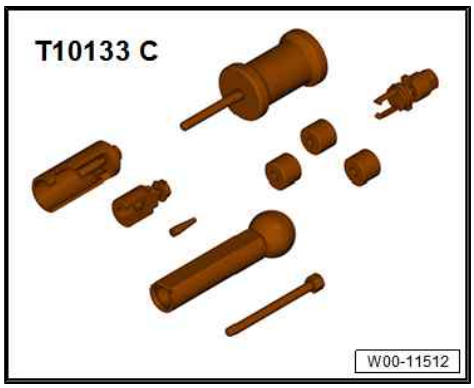
- -VW 771/37- from multi-purpose tool - VW 771- with:



- Adapter -T10055/3-



- Striker -T10133/3- from tool set for FSI engines - T10133C-



- Press tool -T40357- (not illustrated)
- Threaded pin M10x20

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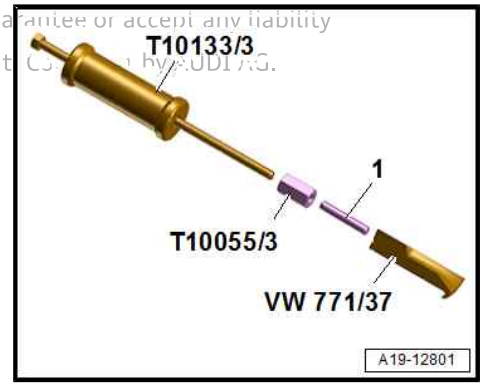
Preparing tool

– Attach striker -T10133/3- to -VW 771/37-. Use adapter -T10055/3- and threaded pin -1- to do so.



Removing

– Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing map-controlled engine cooling system thermostat - F265- .

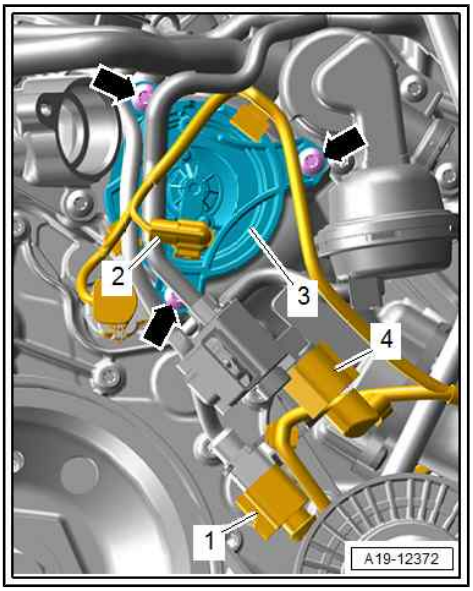
– Remove coolant pipe (front left) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Detach electrical connector -1- from bracket.

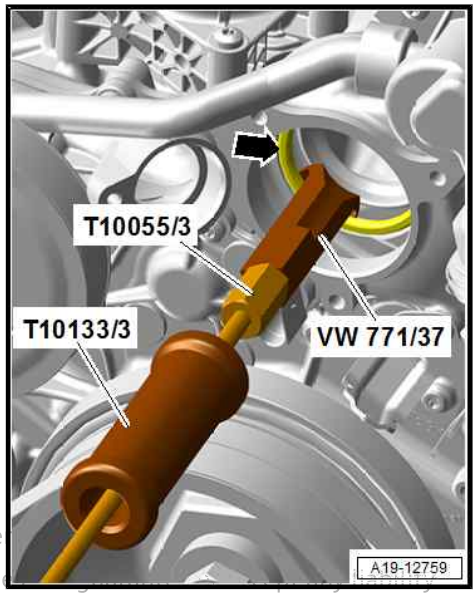
– Detach coolant valve for cylinder block - N545- -item 4- from bracket and press it to side.

– Unplug electrical connector -2- and move electrical wiring clear at map-controlled engine cooling system thermostat - F265- .

– Remove bolts -arrows- and detach -F265- .



– Pull seal -arrow- off using tool prepared previously.



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Installing

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

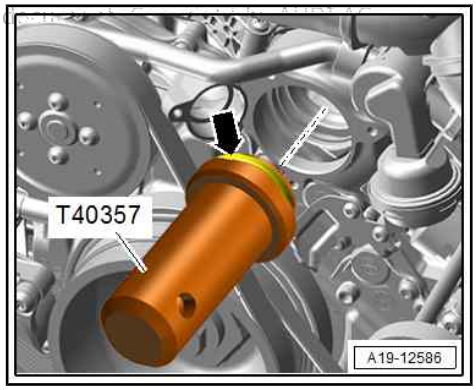
• Renew seal and O-ring after removing.

– Slide seal -arrow- on using press tool -T40357- and drive it in as far as stop.

• Open side of oil seal faces engine.

– Install coolant pipe (front left) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing map-controlled engine cooling system thermostat - F265-



Tightening torques

◆ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 214

2.7 Removing and installing coolant temperature sender - G62-

⇒ “2.7.1 Removing and installing coolant temperature sender G62 - vehicles with 2.9 ltr. engine”, page 220

⇒ “2.7.2 Removing and installing coolant temperature sender G62 - vehicles with 3.0 ltr. engine”, page 221

2.7.1 Removing and installing coolant temperature sender - G62- - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

- Socket Torx T30 - T10405-

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Procedure

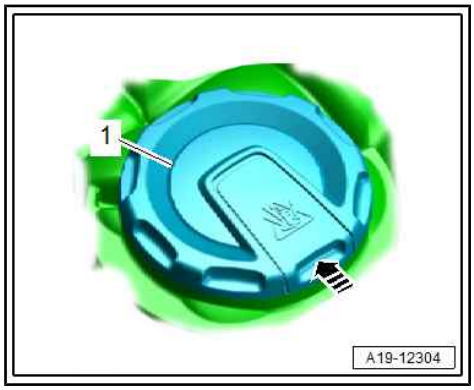
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing coolant temperature sender - G62- .

- Engine cold.

– To relieve residual pressure in cooling system, release fastener -arrow- and briefly open filler cap -1- on coolant expansion tank.

– Close filler cap again (make sure it engages).

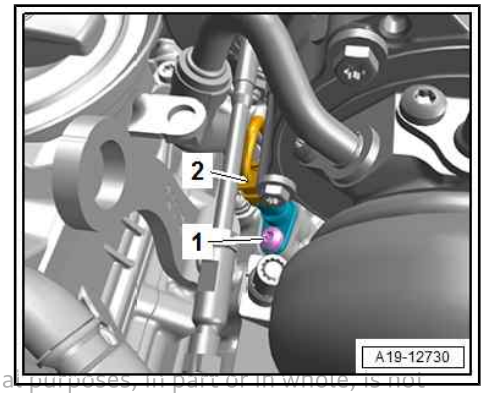
– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .



– Unplug electrical connector -2-.

– Place a cloth underneath to catch escaping coolant.

– Unscrew bolt -1- and pull off coolant temperature sender - G62- .



Note:

If an O-ring remains lodged in cylinder block, lift out O-ring with a piece of wire.

• Renew O-rings after removing.

– Fit new coolant temperature sender immediately so that as little coolant as possible is lost.

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– Install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Fill up coolant ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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 216

2.7.2 Removing and installing coolant temperature sender - G62- - vehicles with 3.0 ltr. engine

Procedure

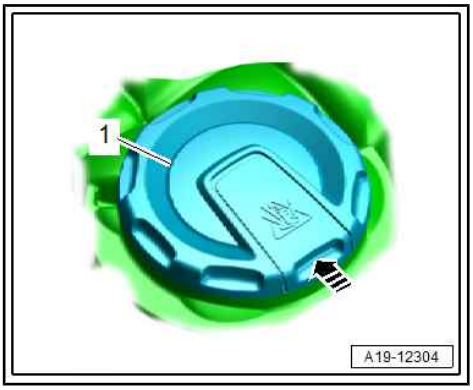
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing coolant temperature sender - G62- .

• Engine cold.

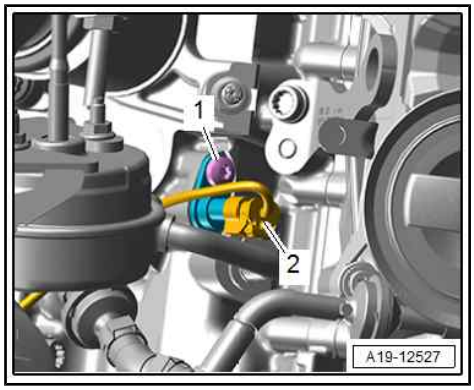
– To relieve residual pressure in cooling system, release fastener -arrow- and briefly open filler cap -1- on coolant expansion tank.

– Close filler cap again (make sure it engages).

– Depending on model, remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .



– Unplug electrical connector -2-.
– Place a cloth underneath to catch escaping coolant.
– Unscrew bolt -1- and pull off coolant temperature sender - G62- .



Note:

If an O-ring remains lodged in cylinder block, lift out O-ring with a piece of wire.

- Renew O-rings after removing.

– Fit new coolant temperature sender immediately so that as little coolant as possible is lost.
– Depending on model, install engine cover panel ⇒ "3.1 Removing and installing engine cover panel", page 10 .
– Fill up coolant ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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 216

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2.8 Removing and installing engine outlet coolant temperature sender - G82-

⇒ "2.8.1 Removing and installing engine outlet coolant temperature sender G82 - vehicles with 2.9 ltr. engine", page 222

⇒ "2.8.2 Removing and installing engine outlet coolant temperature sender G82 - vehicles with 3.0 ltr. engine", page 223

2.8.1 Removing and installing engine outlet coolant temperature sender - G82- - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

◆ Socket Torx T30 - T10405-

◆ Flat-nose pliers, straight and long version (commercially available)
◆ Flat-nose pliers, angled (45°) and long version (commercially available)

Procedure

– Drain coolant ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .

– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Remove bolts -1, 2-, detach coolant pipes from turbochargers and press to one side.

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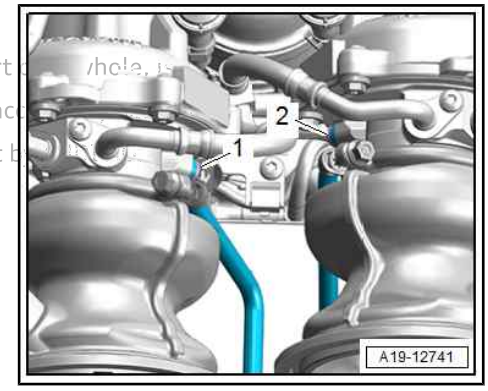
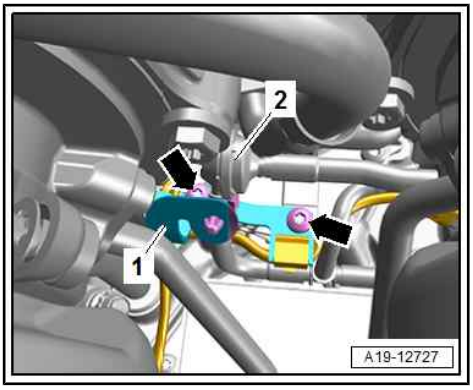


– Remove bolts -arrows-.

– Move crankcase breather hose -2- clear and press bracket -1- to one side.



– Remove bolt -1-.

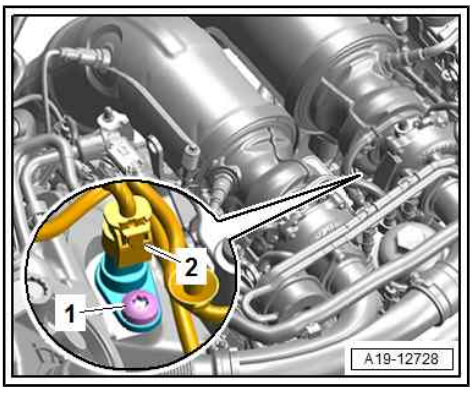
– Detach engine outlet coolant temperature sender - G82- and unplug electrical connector -2- using flat-nose pliers.

• Renew O-rings after removing.

– Fit coolant temperature sender using flat-nose pliers.

– Install large coolant pipe (rear right) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .



Tightening torques

◆ ⇒ “2.3 Exploded view - coolant temperature senders”, page 216

◆ ⇒ “4.1 Exploded view - oil filter”, page 196

2.8.2 Removing and installing engine outlet coolant temperature sender - G82- - vehicles with 3.0 ltr. engine

Procedure

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep.

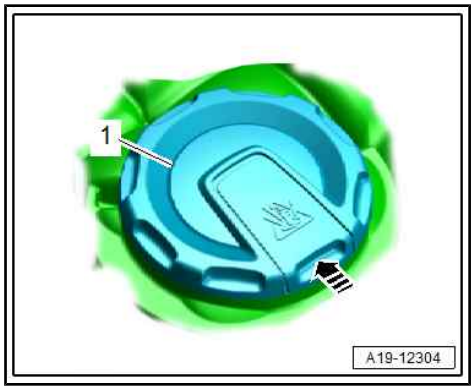
gr. 19 ; Coolant pump/thermostat assembly ; Removing and installing engine outlet coolant temperature sender - G82- .

- Engine cold.

– To relieve residual pressure in cooling system, release fastener -arrow- and briefly open filler cap -1- on coolant expansion tank.

– Close filler cap again (make sure it engages).

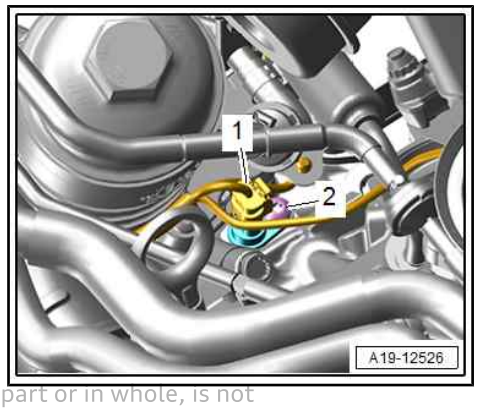
– Depending on model, remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .



– Unplug electrical connector -1-.

– Place a cloth underneath to catch escaping coolant.

– Unscrew bolt -2- and pull off engine outlet coolant temperature sender - G82- .



Note:

If an O-ring remains lodged in cylinder block, lift out O-ring with a piece of wire.

- Renew O-rings after removing.

– Fit new coolant temperature sender immediately so that as little coolant as possible is lost.

– Depending on model, install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

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– Fill up coolant ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing engine outlet coolant temperature sender - G82-

Tightening torques

◆ ⇒ “2.3 Exploded view - coolant temperature senders”, page 216

2.9 Removing and installing radiator outlet coolant temperature sender - G83-

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing radiator outlet coolant temperature sender - G83- .

2.10 Removing and installing temperature sender for engine temperature regulation - G694-

⇒ “2.10.1 Removing and installing temperature sender for engine temperature regulation G694 - vehicles with 2.9 ltr. engine”, page 225

⇒ “2.10.2 Removing and installing temperature sender for engine temperature regulation G694 - vehicles with 3.0 ltr. engine”, page 226

2.10.1 Removing and installing temperature sender for engine temperature regulation - G694- - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

- Socket Torx T30 - T10405-

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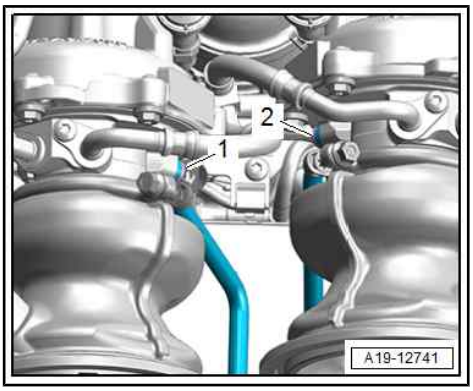
- Flat-nose pliers, straight and long version (commercially available)
- Flat-nose pliers, angled (45°) and long version (commercially available)

Procedure

– Drain coolant ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .

– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Remove bolts -1, 2-, detach coolant pipes from turbochargers and press to one side.



– Remove bolt -2-.

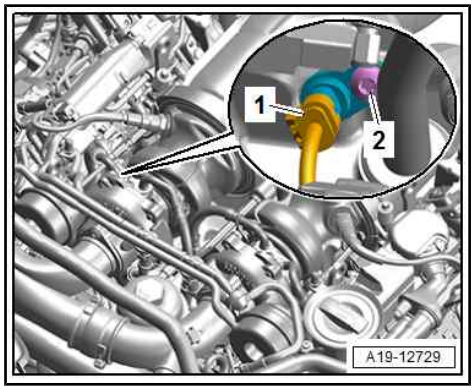
– Detach temperature sender for engine temperature regulation - G694- and unplug electrical connector -1- using flat-nose pliers.

• Renew O-ring after removal.

– Fit coolant temperature sender using flat-nose pliers.

– Install large coolant pipe (rear right) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .



Tightening torques

♦ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 214

2.10.2 Removing and installing temperature sender for engine temperature regulation - G694- - vehicles with 3.0 ltr. engine

Procedure

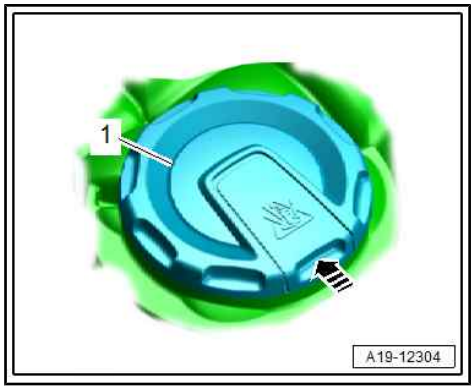
Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing temperature sender for engine temperature regulation - G694- .

• Engine cold.

– To relieve residual pressure in cooling system, release fastener -arrow- and briefly open filler cap -1- on coolant expansion tank.

– Close filler cap again (make sure it engages).

– Remove oil filter housing ⇒ page 199 .



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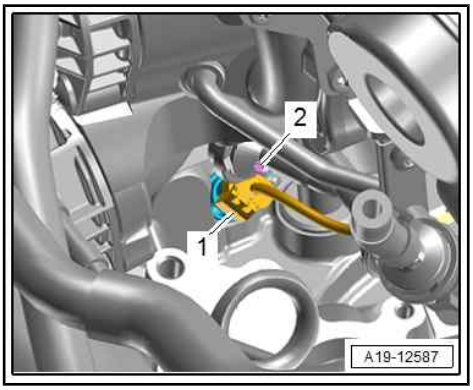
– Unplug electrical connector -1-.
– Place a cloth underneath to catch escaping coolant.
– Unscrew bolt -2- and detach temperature sender for engine temperature regulation - G694- .
• Renew O-ring after removal.
– Fit new coolant temperature sender immediately so that as little coolant as possible is lost.
– Install oil filter housing
⇒ “4.3 Removing and installing oil filter housing”, page 199 .
– Fill up coolant ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .



Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing temperature sender for engine temperature regulation - G694-

Tightening torques

♦ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 214

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2.11 Removing and installing coolant valves

⇒ “2.11.1 Removing and installing coolant shut-off valve - vehicles with 2.9 ltr. engine”, page 227

⇒ “2.11.2 Removing and installing coolant shut-off valve - vehicles with 3.0 ltr. engine”, page 228

2.11.1 Removing and installing coolant shut-off valve - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

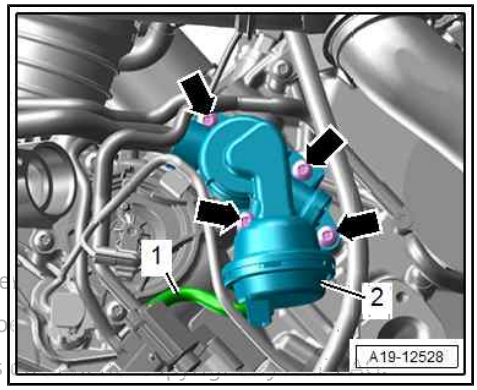
♦ Socket Torx T30 - T10405-

Removing

– Remove air pipe (bottom) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe .
– If necessary, remove coolant pipe (front) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Unscrew bolts -arrows- and detach coolant shut-off valve -2-.

– Being careful not to damage it, detach vacuum hose -1-.



Installing

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

- Renew O-ring and seal after removal.
- Before fitting, check vacuum hoses for damage and renew if necessary.

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– Install coolant pipe (front) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Install air pipe (bottom) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe .

Tightening torques

◆ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 214

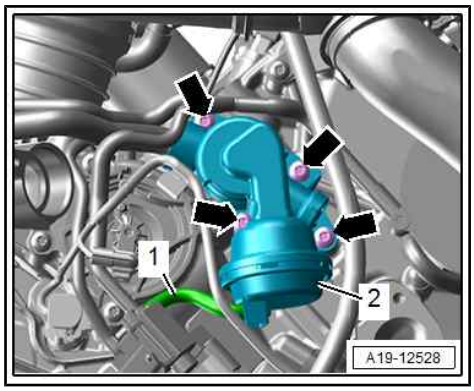
2.11.2 Removing and installing coolant shut-off valve - vehicles with 3.0 ltr. engine

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing coolant valves .

– Remove coolant pipe (front) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– Unscrew bolts -arrows- and detach coolant shut-off valve -2-.



– Being careful not to damage it, detach vacuum hose -1-.

Installing

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

- Renew O-ring and seal after removal.
- Before fitting, check vacuum hoses for damage and renew if necessary.

– Install coolant pipe (front) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pump/thermostat assembly; Removing and installing coolant valves

Tightening torques

◆ ⇒ “2.1 Exploded view - coolant pump/thermostat”, page 214

3 Coolant pipes

All procedures and components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes .

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4 Radiators/radiator fans

All procedures and components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Radiators/radiator fans .

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21 – Turbocharging/supercharging

1 Turbochargers

⇒ “1.1 Exploded view - turbocharger”, page 231

⇒ “1.2 Removing and installing turbocharger”, page 238

⇒ “1.3 Renewing vacuum unit for turbocharger”, page 246

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1.1 Exploded view - turbocharger

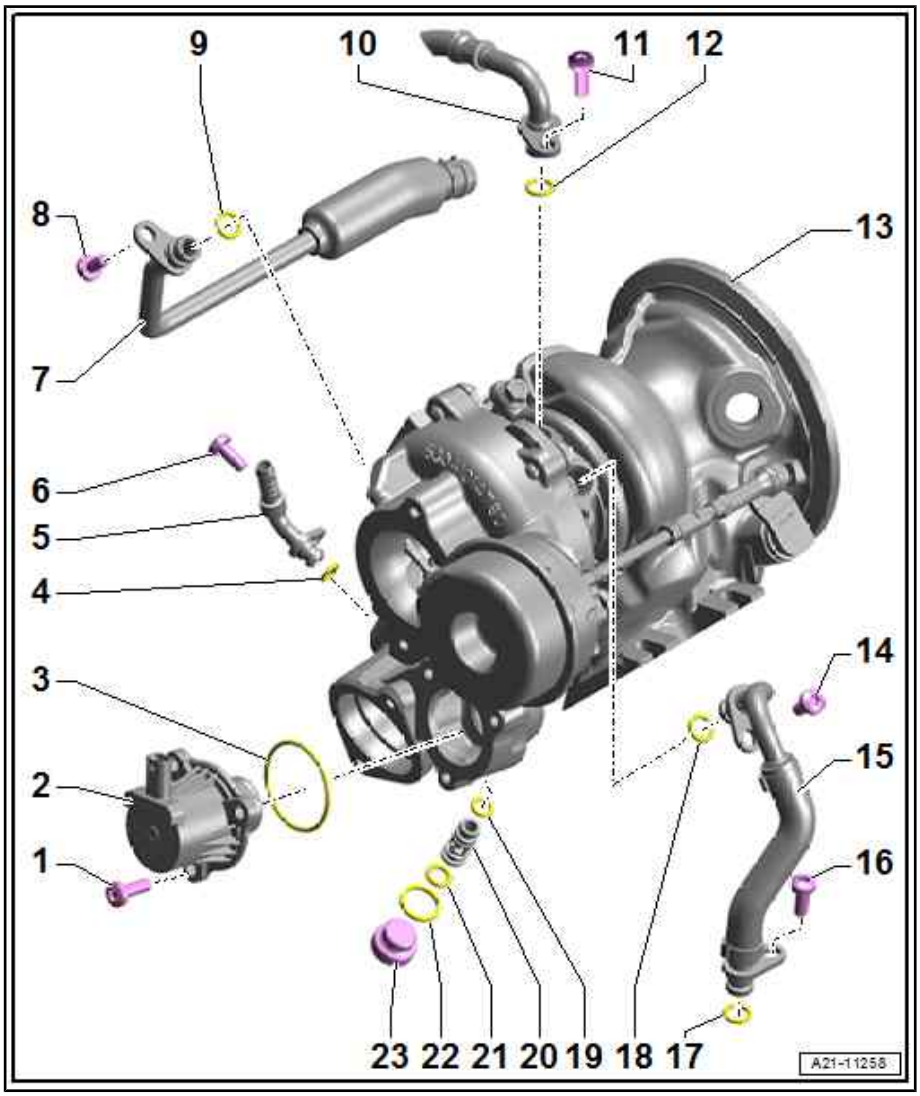
⇒ “1.1.1 Exploded view - turbocharger, vehicles with 2.9 ltr. engine”, page 231

⇒ “1.1.2 Exploded view - turbocharger, vehicles with 3.0 ltr. engine”, page 234

1.1.1 Exploded view - turbocharger, vehicles with 2.9 ltr. engine

Part I

Part II ⇒ page 232



1 - Bolt

- ❑ 9 Nm

2 - Overrun air recirculation valve

- ♦ Overrun air recirculation valve for bank 1 - N625-
- ♦ Overrun air recirculation valve for bank 2 - N626-
  - ❑ Removing and installing ⇒ “2.8.1 Removing and installing overrun air recirculation valve - vehicles with 2.9 ltr. engine”, page 277

3 - O-ring

- ❑ Renew after removing

4 - O-ring

- ❑ Renew after removing

5 - Connection

- ❑ For activated charcoal filter system

6 - Bolt

- ❑ 9 Nm

7 - Coolant pipe (rear right)

- ❑ Exploded view ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes

8 - Bolt

- ❑ Tightening torque ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes

9 - O-ring

- ❑ Fitting instructions ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes

10 - Oil supply line

11 - Bolt

- ❑ 9 Nm

12 - O-ring

- ❑ Renew after removing

13 - Turbocharger

- ❑ Shown for cylinder bank 2 (left-side)
- ❑ Removing and installing ⇒ “1.2 Removing and installing turbocharger”, page 238

14 - Bolt

- ❑ 9 Nm

15 - Coolant return line

16 - Bolt

- ❑ 9 Nm

17 - O-ring

- ❑ Renew after removing

18 - O-ring

- ❑ Renew after removing

19 - O-ring

- ❑ Green
- ❑ Renew after removing

20 - Venturi nozzle

- ❑ Press in until it engages

21 - O-ring

- ❑ Red
- ❑ Renew after removing

22 - Seal

- ❑ Renew after removing

23 - Plug

- ❑ 25 Nm

Part II

Part I ⇒ page 231

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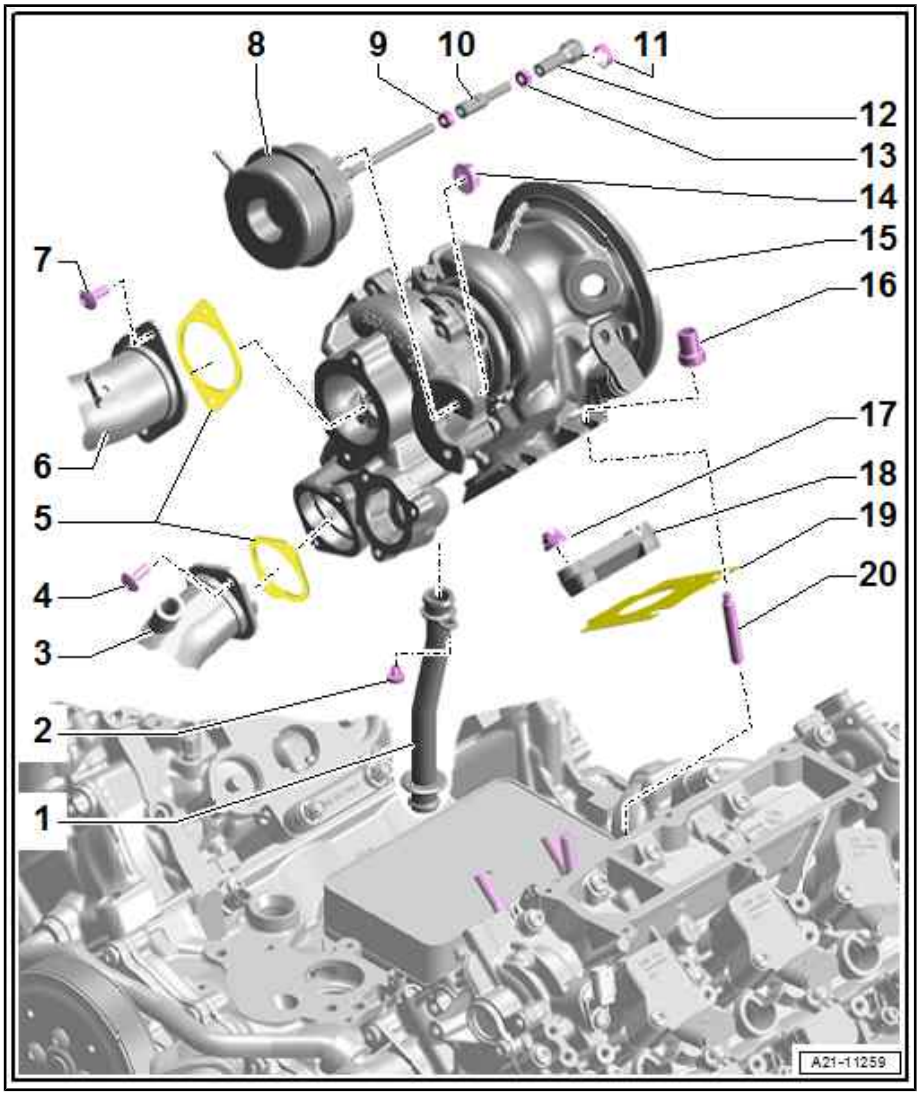

1 - Oil return line
- ❑ Renew after removing

2 - Clip

3 - Bottom air pipe
- ❑ Exploded view ⇒ “2.1.1 Exploded view - charge air system (engine end), vehicles with 2.9 ltr. engine”, page 259

4 - Bolt
- ❑ Tightening torque ⇒ Item 31 (page 261)

5 - Gaskets
- ❑ Renew after removing

6 - Air pipe

7 - Bolt
- ❑ 9 Nm

8 - Vacuum unit
- ❑ For turbocharger
- ❑ Different versions. Repair kit ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ “1.3 Renewing vacuum unit for turbocharger”, page 246

9 - Nut
- ❑ 8 Nm

10 - Threaded piece

11 - Retaining clip
- ❑ Renew after removing

12 - Ball socket

13 - Nut
- ❑ 8 Nm

14 - Nut
- ❑ 9 Nm

15 - Turbocharger
- ❑ Shown for cylinder bank 2 (left-side)
- ❑ Removing and installing ⇒ “1.2 Removing and installing turbocharger”, page 238

16 - Nut
- ❑ Renew after removing
- ❑ Tightening torques:

- ♦ 1st stage: 15 Nm
- ♦ 2nd stage: 30 Nm
- ♦ 3rd stage: After finishing work, tighten nuts to 30 Nm

17 - Nut
- ❑ 30 Nm

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18 - Tensioner

19 - Gasket

- ❑ Renew after removing

20 - Stud

- ❑ Renew
- ❑ 15 Nm

1.1.2 Exploded view - turbocharger, vehicles with 3.0 ltr. engine

Part I

Part II ⇒ page 235

Part III ⇒ page 237

1 - Connecting pipe

- ❑ For activated charcoal filter system

2 - O-ring

- ❑ Renew after removing

3 - Turbocharger

- ❑ Removing and installing ⇒ “1.2 Removing and installing turbocharger”, page 238

4 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

5 - Coolant supply line

6 - Bolt

- ❑ 9 Nm

7 - O-ring

- ❑ Renew after removing

8 - Overrun air recirculation valve for bank 1 - N625-

- ❑ Removing and installing ⇒ “2.8.2 Removing and installing overrun air recirculation valve - vehicles with 3.0 ltr. engine”, page 278

9 - Bolt

- ❑ 9 Nm

10 - Bolt

- ❑ Tightening torque ⇒ Item 9 (page 196)

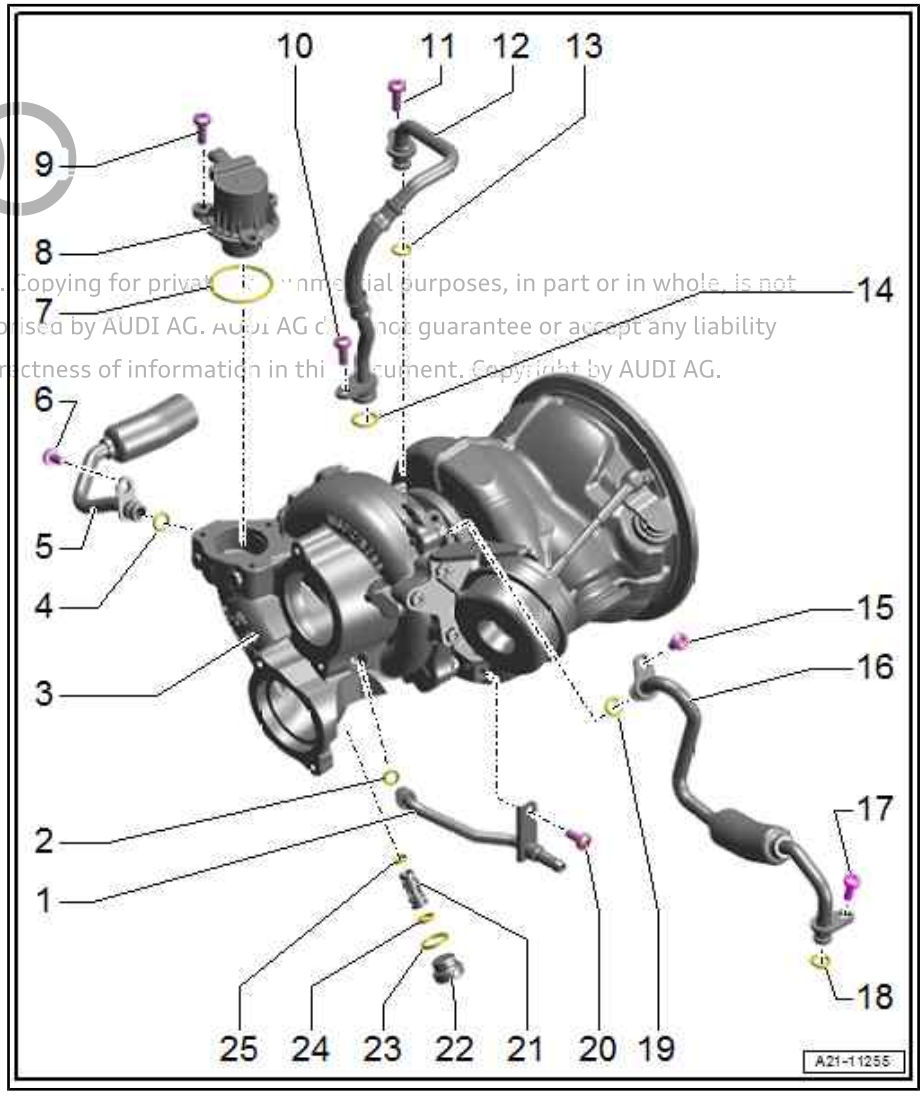
11 - Bolt

- ❑ 9 Nm

12 - Oil supply line

13 - O-ring

- ❑ Renew after removing



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- ❑ Lubricate lightly with engine oil

14 - O-ring

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

15 - Bolt

- ❑ 9 Nm

16 - Coolant return line

17 - Bolt

- ❑ 9 Nm

18 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

19 - O-ring

- ❑ Renew after removing
- ❑ Lubricate with coolant

20 - Bolt

- ❑ 9 Nm

21 - Venturi nozzle

- ❑ Press in until it engages

22 - Plug

- ❑ 25 Nm

23 - Seal

- ❑ Renew after removing

24 - O-ring

- ❑ Red
- ❑ Renew after removing

25 - O-ring

- ❑ Green
- ❑ Renew after removing

Part II

Part I ⇒ page 234

Part III ⇒ page 237

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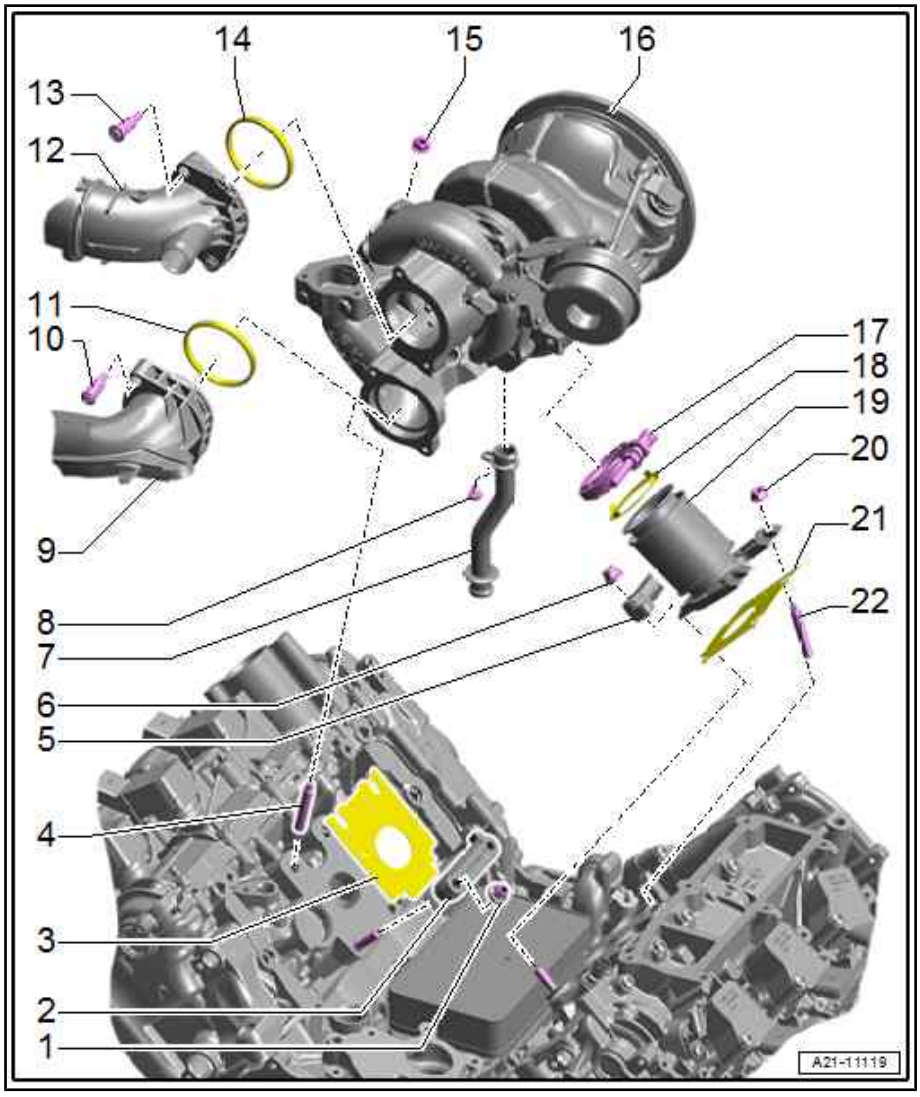

1 - Nut

- ❑ If loosened, renew stud ⇒ Item 4 (page 236)
- ❑ 30 Nm

2 - Tensioner

3 - Gasket

- ❑ Renew after removing

4 - Stud

- ❑ Renew if nut ⇒ Item 15 (page 236) has been loosened
- ❑ 15 Nm

5 - Tensioner

6 - Nut

- ❑ If loosened, renew stud ⇒ Item 4 (page 236)
- ❑ 30 Nm

7 - Oil return line

- ❑ Renew after removing

8 - Clip

9 - Air pipe

10 - Bolt

- ❑ Tightening torque ⇒ Item 9 (page 264)

11 - Seal

- ❑ Renew after removing

12 - Air pipe

13 - Bolt

- ❑ Tightening torque ⇒ Item 12 (page 264)

14 - Seal

- ❑ Renew after removing

15 - Nut

- ❑ Renew after removing
- ❑ Tightening torques:

◆ 1st stage: 15 Nm

◆ 2nd stage: 30 Nm

◆ 3rd stage: After finishing work, tighten nuts to 30 Nm

16 - Turbocharger

- ❑ Removing and installing ⇒ “1.2.4 Removing and installing turbocharger - vehicles with 3.0 ltr. engine”, page 242

17 - Screw-type clip

- ❑ Renew after removing
- ❑ 20 Nm

18 - Gasket

- ❑ Renew after removing

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19 - Flexible joint (decoupling element)

- ❑ If a new turbocharger is fitted, also renew flexible joint

20 - Nut

- ❑ Renew after removing
- ❑ Tightening torques:

- ♦ 1st stage: 15 Nm
- ♦ 2nd stage: 30 Nm
- ♦ 3rd stage: After finishing work, tighten nuts to 30 Nm

21 - Gasket

- ❑ Renew after removing

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22 - Stud

- ❑ Renew if nut ⇒ Item 20 (page 237) has been loosened
- ❑ 15 Nm

Part III

Part I ⇒ page 234

Part II ⇒ page 235

1 - Bolt

- ❑ 9 Nm

2 - Bracket

- ❑ For vacuum unit

3 - Turbocharger

- ❑ Removing and installing ⇒ “1.2.4 Removing and installing turbocharger - vehicles with 3.0 ltr. engine”, page 242

4 - Nut

- ❑ 9 Nm

5 - Retaining clip

- ❑ Renew after removing

6 - Ball socket

7 - Nut

- ❑ 8 Nm

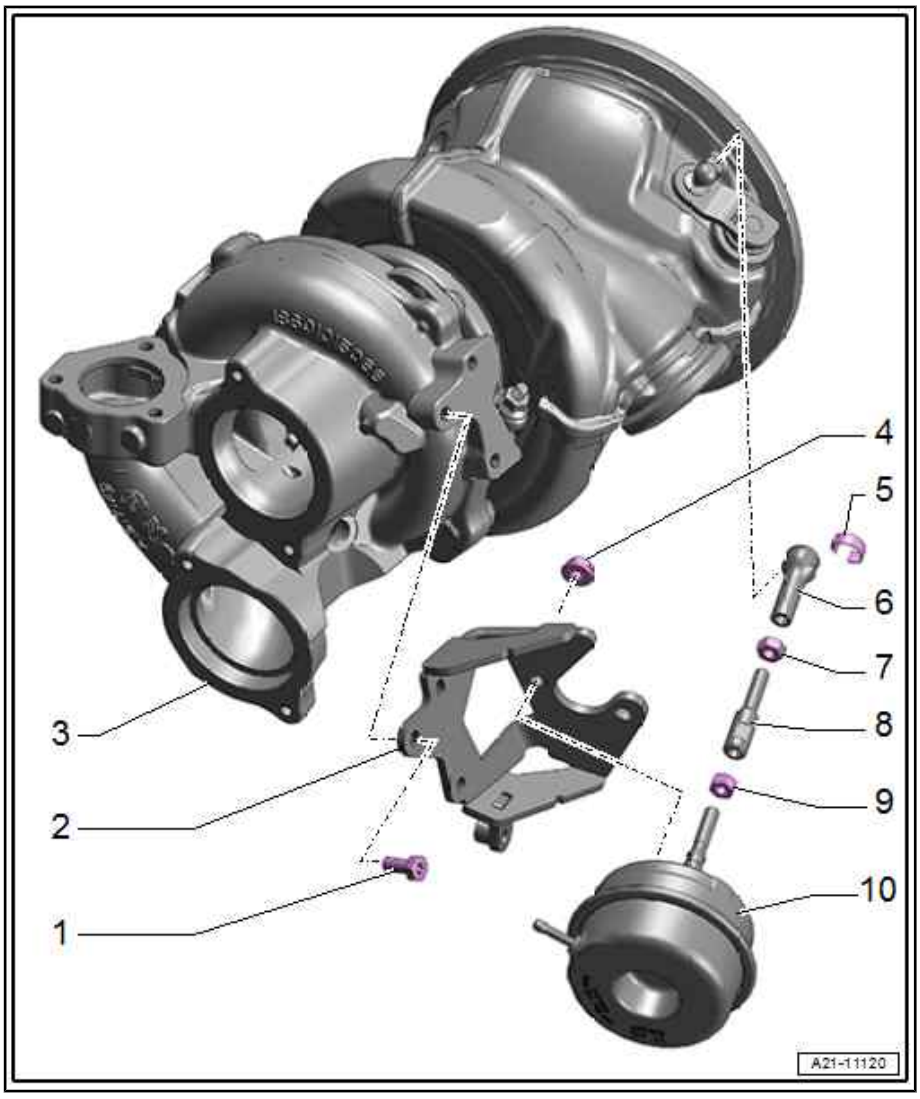
8 - Threaded piece

9 - Nut

- ❑ 8 Nm

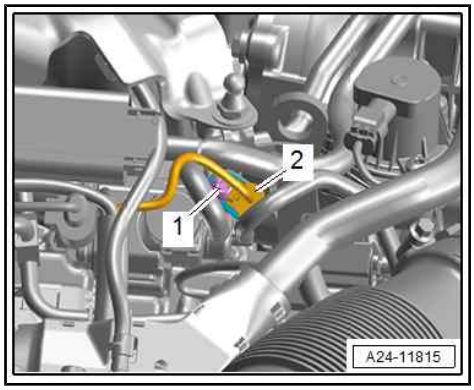
10 - Vacuum unit

- ❑ For turbocharger
- ❑ Repair kit ⇒ Electronic parts catalogue
- ❑ Removing and installing ⇒ “1.3 Renewing vacuum unit for turbocharger”, page 246



Temperature sender for engine cover panel - G765- - tightening torque

– Tighten bolt -1- to 9 Nm.



1.2 Removing and installing turbocharger

⇒ “1.2.1 Removing turbocharger, cylinder bank 1 (right-side) - vehicles with 2.9 ltr. engine”, page 238

⇒ “1.2.2 Removing turbocharger, cylinder bank 2 (left-side) - vehicles with 2.9 ltr. engine”, page 240

⇒ “1.2.3 Installing turbocharger - vehicles with 2.9 ltr. engine”, page 241

⇒ “1.2.4 Removing and installing turbocharger - vehicles with 3.0 ltr. engine”, page 242

1.2.1 Removing turbocharger, cylinder bank 1 (right-side) - vehicles with 2.9 ltr. engine

If the turbocharger has suffered mechanical damage
⇒ page 242

Special tools and workshop equipment required

♦ Socket Torx T30 - T10405-

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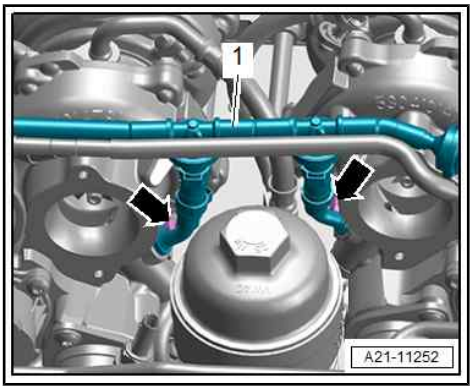
Removing

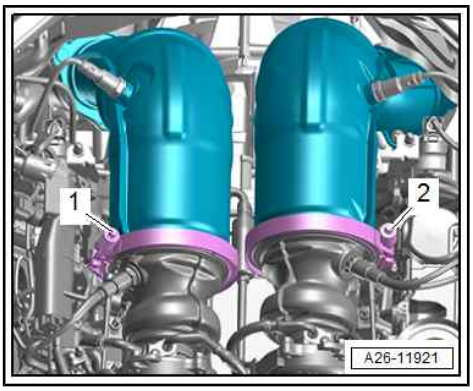
– Observe rules for cleanliness
⇒ “3.1 Rules for cleanliness”, page 6 .

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Turbochargers; Removing and installing turbochargers .

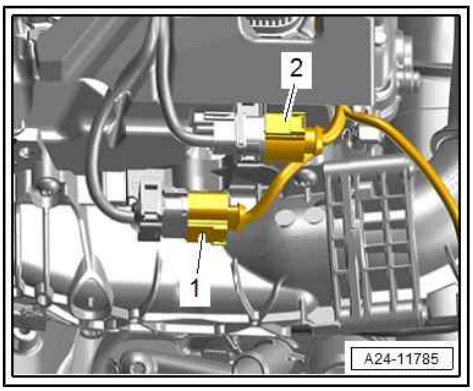
– Unscrew bolts -arrows-, disconnect hose -1- for activated charcoal filter system from turbochargers and move it to one side.



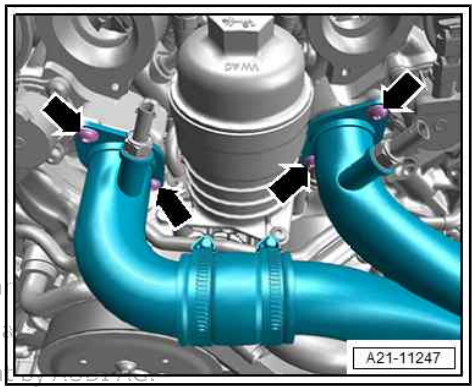
– Loosen screw-type clip -1- and press catalytic converter slightly towards rear.



– Unplug electrical connector -2- for Lambda probe - G39- and move wiring clear.



– Unscrew bolts -left arrows- and detach air pipe slightly.



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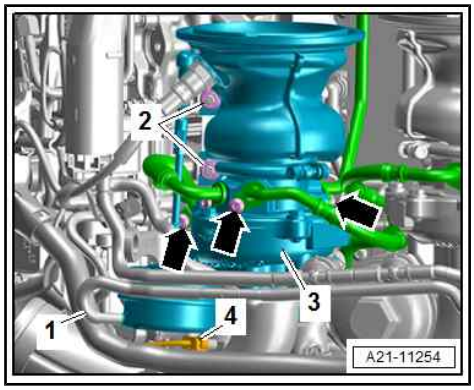
– Unscrew bolts -arrows- and disconnect oil line and coolant line.
– Unplug electrical connector -4- for overrun air recirculation valve for bank 1 - N625- .
– Being careful not to damage it, detach vacuum hose -1-.
– Remove nuts -2- and detach turbocharger -3-.



Installing
⇒ “1.2.3 Installing turbocharger - vehicles with 2.9 ltr. engine”, page 241

1.2.2 Removing turbocharger, cylinder bank 2 (left-side) - vehicles with 2.9 ltr. engine

If the turbocharger has suffered mechanical damage
⇒ page 242

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Special tools and workshop equipment required

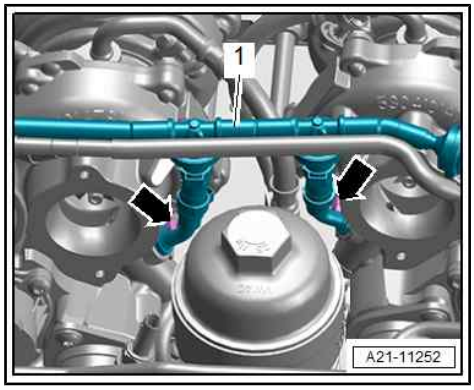
♦ Socket Torx T30 - T10405-

Removing

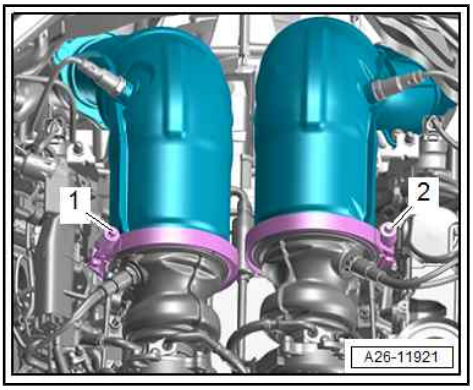
– Observe rules for cleanliness
⇒ “3.1 Rules for cleanliness”, page 6 .

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Turbochargers; Removing and installing turbochargers .

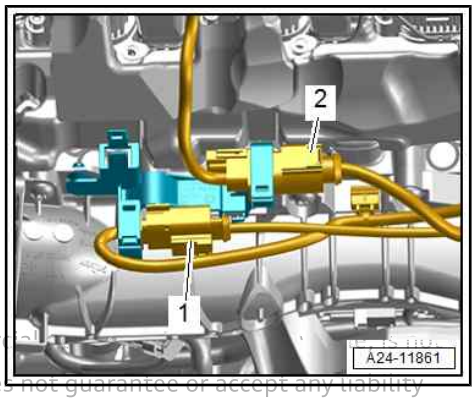
– Unscrew bolts -arrows-, disconnect hose -1- for activated charcoal filter system from turbochargers and move it to one side.



– Loosen screw-type clip -2- and press catalytic converter slightly towards rear.



– Unplug electrical connector -2- for Lambda probe 2 - G108- and move wiring clear.



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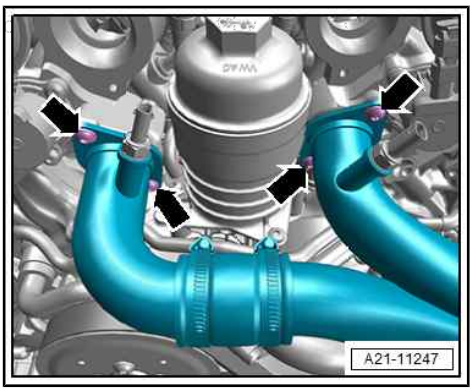
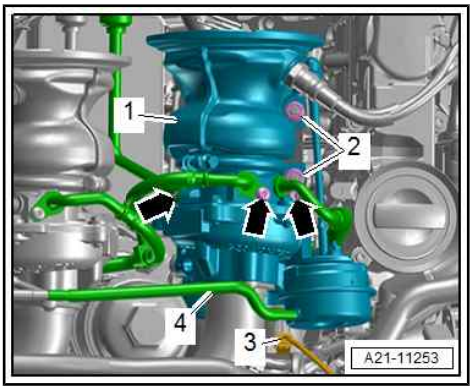
– Unscrew bolts -arrows- and detach air pipe slightly.



– Unscrew bolts -arrows- and disconnect oil line and coolant line.
– Unplug electrical connector -3- for overrun air recirculation valve for bank 2 - N626- .
– Being careful not to damage it, detach vacuum hose -4-.
– Remove nuts -2- and detach turbocharger -1-.

Installing

⇒ “1.2.3 Installing turbocharger - vehicles with 2.9 ltr. engine”, page 241



1.2.3 Installing turbocharger - vehicles with 2.9 ltr. engine

Installing

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

- Renew screw-type clip and oil return line after removing.

- Renew gaskets, seals, O-rings and self-locking nuts after removal.
- Renew studs.
- 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 .
- Before fitting, check vacuum hoses for damage and renew if necessary.
- Do not reuse coolant.

– Install catalytic converter ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Emission control system; Removing and installing catalytic converter .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Turbochargers; Removing and installing turbochargers

– Tighten nuts ⇒ Item 16 (page 233) and ⇒ Item 17 (page 233) . This step is necessary to compensate for the settling of the turbocharger connection.

– Check oil level ⇒ “1.2 Engine oil”, page 175 .

- After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.

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Tightening torques

◆ ⇒ “1.1.1 Exploded view - turbocharger, vehicles with 2.9 ltr. engine”, page 231

1.2.4 Removing and installing turbocharger - vehicles with 3.0 ltr. engine

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:

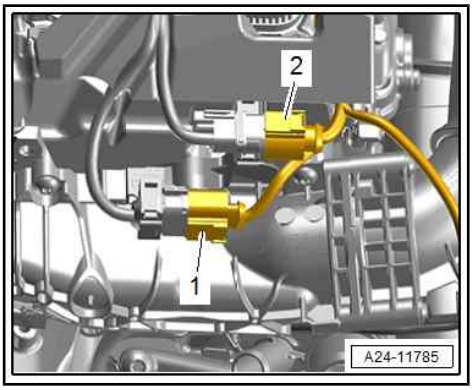
- Check air cleaner housing, air filter element and air hoses for dirt and foreign particles.
- Check the entire charge air system (including the charge air cooler) for foreign matter.
- If foreign matter is found in the charge air system, clean all relevant ducts and hoses and renew charge air cooler if necessary.

Removing

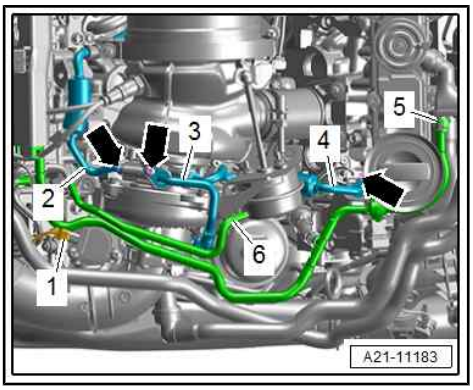
– Observe rules for cleanliness ⇒ “3.1 Rules for cleanliness”, page 6 .

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Turbochargers; Removing and installing turbochargers .

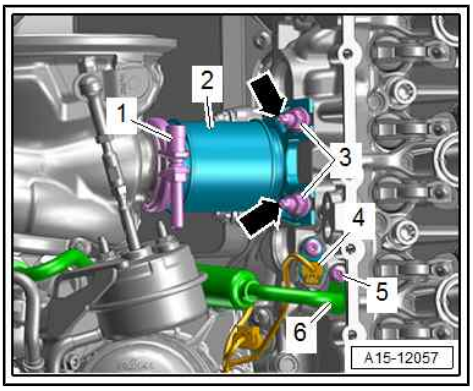
– Unplug electrical connector -2- for Lambda probe - G39- , remove from bracket and move electrical wire clear.



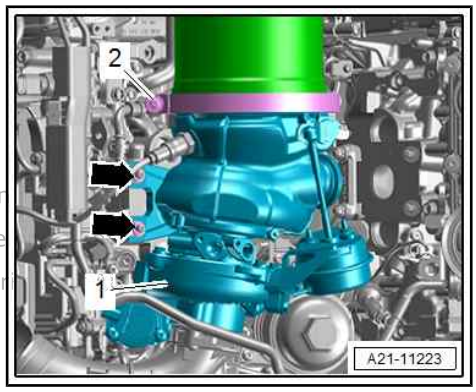
– Unscrew bolts -arrows- and detach coolant lines -2, 4- and oil supply line -3-.
– Being careful not to damage it, detach vacuum hose -6-.
– Unplug electrical connector -1- for overrun air recirculation valve for bank 1 - N625- .
– If fitted, disconnect hose -5- for activated charcoal filter system by pressing release tabs on both sides.



– Remove nuts -3-.
– Remove studs -arrows-.



– Loosen screw-type clip -2- and press catalytic converter slightly towards rear.
– Unscrew nuts -arrows- and studs and lift out turbocharger -1-.



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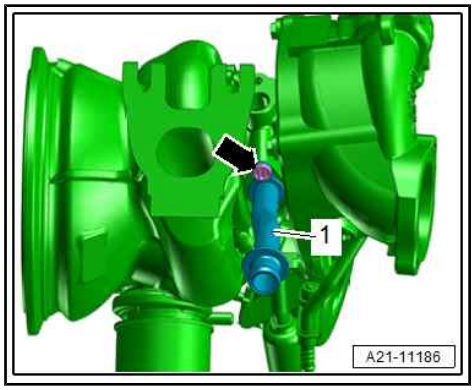
– Detach retaining clip -arrow- and remove oil return line -1-.



Installing

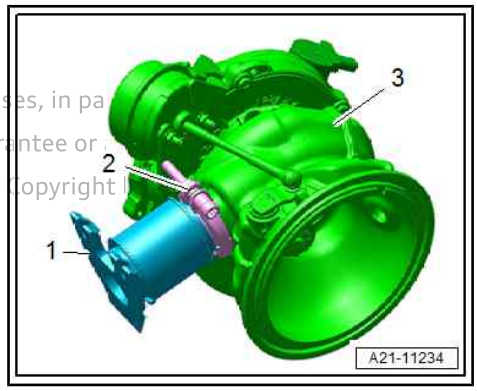
Installation is carried out in reverse order; note the following:

- Renew screw-type clip and oil return line after removing.
- If fitting a new turbocharger, renew flexible joint and screw-type clip.
- Renew gaskets, seals, O-rings and self-locking nuts after removal.
- Renew studs.
- 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 .
- Before fitting, check vacuum hoses for damage and renew if necessary.
- Do not reuse coolant.

If turbocharger was renewed:

– Fit new flexible joint -1- on turbocharger -3- using a new screw-type clip -2-, as shown in illustration.

– Tighten screw-type clip -2- far enough for flexible joint to still be able to move at turbocharger flange.



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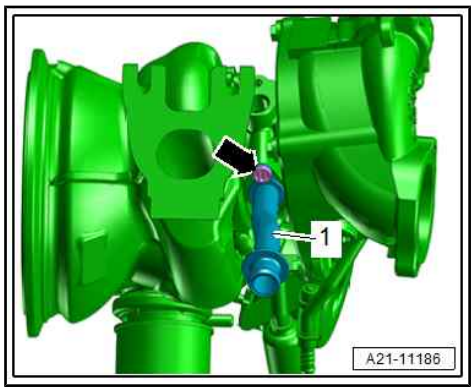
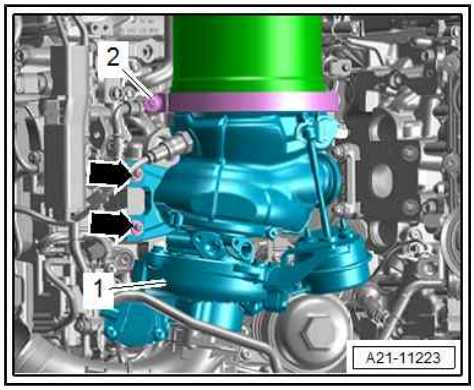
All vehicles (continued):

– Move oil return line -1- into installation position and secure it with retaining clip -arrow-.

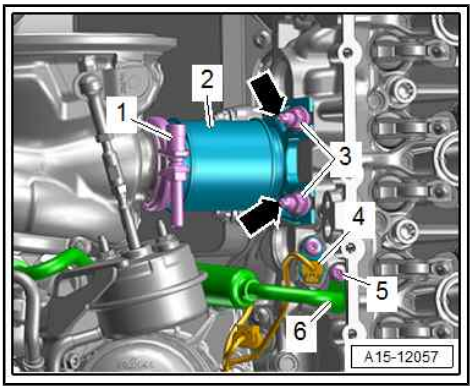
– Move turbocharger into installation position while guiding oil return line to cylinder block.



– Tighten studs and nuts -arrows-.



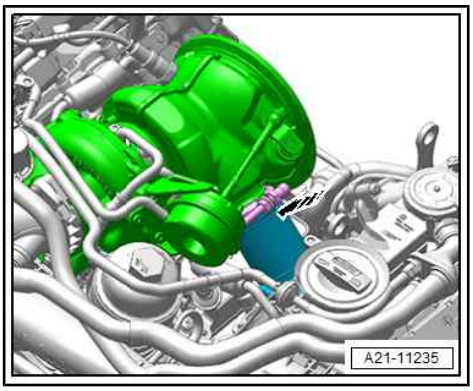
– Fit and tighten studs -arrows-.
– Tighten nuts -3-.



If turbocharger was renewed:

– Press flexible joint in direction of -arrow- by hand while tightening screw-type clip.

• Pressure must be applied at right angle -arrow- to flexible joint.



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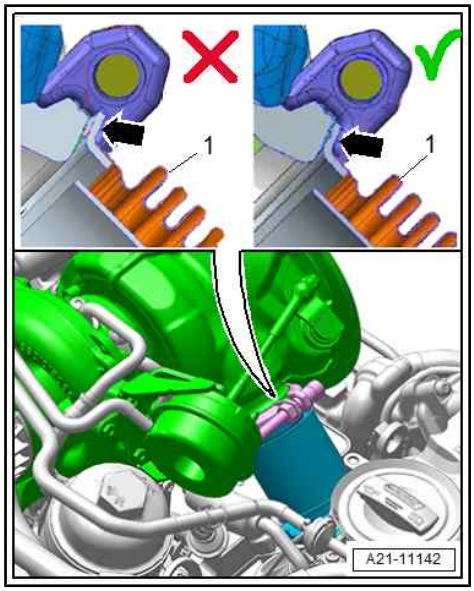
– When tightening, ensure that flange contour of flexible joint -1- is positioned flush with contour on turbine housing of turbocharger.



Note

It is possible to check the correct installation -arrow- of the flexible joint -1- by examining the screw-type clip from above.

The remaining installation steps are carried out in the reverse sequence.

– Install air pipe (top) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Turbochargers; Removing and installing turbochargers

– Fill up coolant ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Cooling system/coolant; Draining and filling cooling system .

– Tighten nuts ⇒ Item 15 (page 236) and ⇒ Item 20 (page 237) . This step is necessary to compensate for the settling of the turbocharger connection.

– Check oil level ⇒ “1.2 Engine oil”, page 175 .

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

• After installing turbocharger, allow engine to idle for approx. 1 minute and do not rev up immediately to ensure turbocharger is supplied with oil.

Tightening torques

◆ ⇒ “1.1.2 Exploded view - turbocharger, vehicles with 3.0 ltr. engine”, page 234

◆ ⇒ “2.2 Exploded view - hose connections for charge air system”, page 269

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1.3 Renewing vacuum unit for turbocharger

⇒ “1.3.1 Renewing vacuum unit for turbocharger, cylinder bank 1 (right-side) - vehicles with 2.9 ltr. engine”, page 246

⇒ “1.3.2 Renewing vacuum unit for turbocharger, cylinder bank 2 (left-side) - vehicles with 2.9 ltr. engine”, page 250

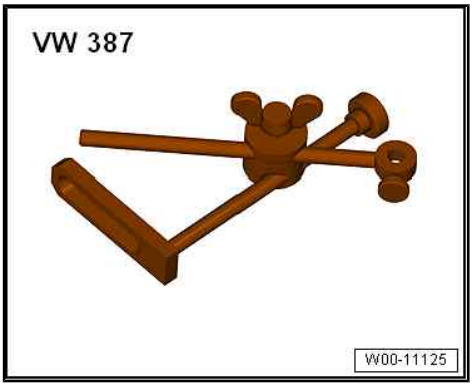
⇒ “1.3.3 Renewing vacuum unit for turbocharger - vehicles with 3.0 ltr. engine”, page 254

1.3.1 Renewing vacuum unit for turbocharger, cylinder bank 1 (right-side) - vehicles with 2.9 ltr. engine

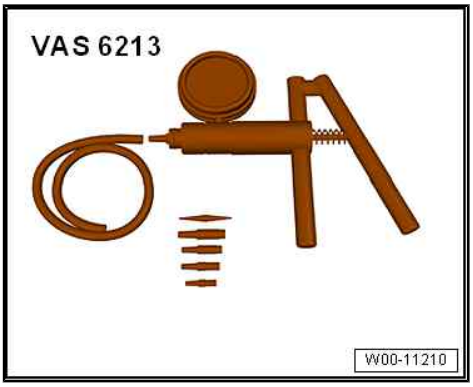
A repair kit is available to renew the vacuum unit ⇒ Electronic parts catalogue (ETKA) .

Special tools and workshop equipment required

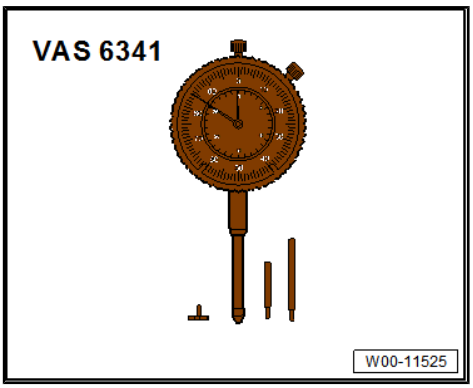
- Universal dial gauge bracket - VW 387-



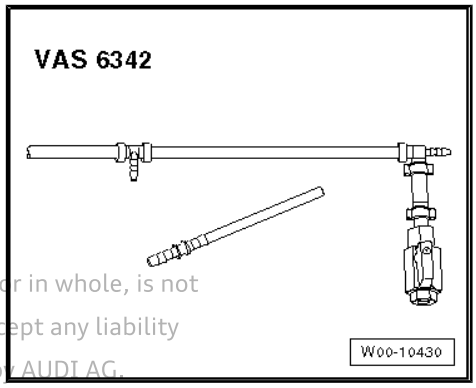
- Pressure sensor - V.A.G 1397B- (not illustrated)
- Hand vacuum pump - VAS 6213-



- Dial gauge set, 4-part - VAS 6341-



- Pressure control valve - VAS 6342-



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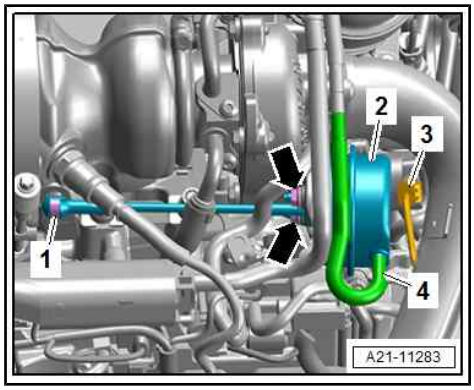
- Small mole grips, long version (commercially available)

Removing



– Remove engine cover panel and heat shield
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Detach vacuum hose -4- from vacuum unit, making sure not to damage it.

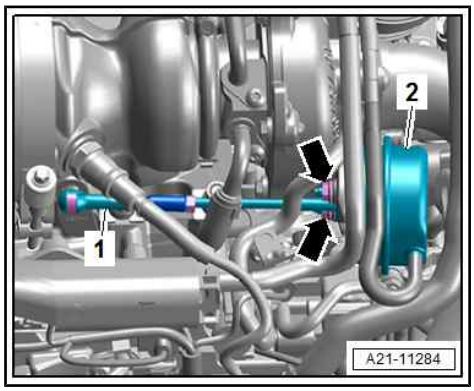
– Unplug electrical connector -3- for turbocharger air recirculation valve - N249- , move electrical wiring harness clear and press it to one side.

– Remove retaining clip -1- and detach control rod from actuating lever of turbocharger.

– Remove nuts -arrows- and detach vacuum unit -2-.

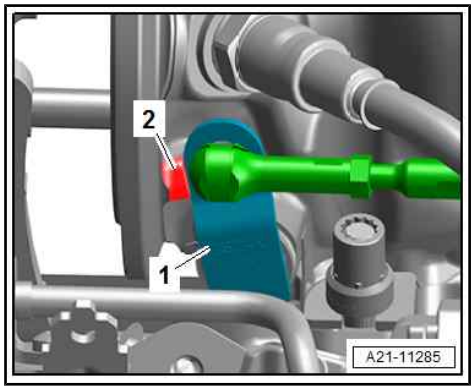
– If vacuum unit cannot be removed as described, remove overrun air recirculation valve for bank 1 - N625-
⇒ “2.8.1 Removing and installing overrun air recirculation valve - vehicles with 2.9 ltr. engine”, page 277 .

Installing

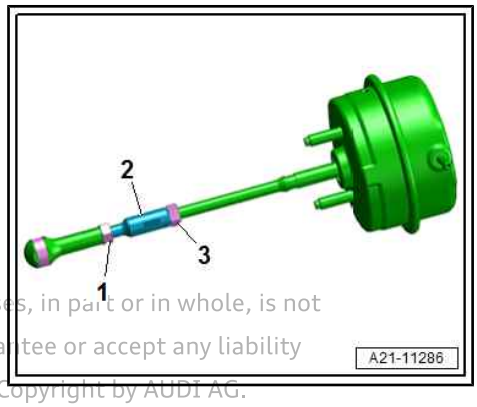


– Install vacuum unit -2- with adjustable control rod on turbocharger.

– To do so, tighten nuts -arrows- and press ball socket -1- onto ball stud of operating lever.



– Adjust control rod on threaded collar so that operating lever -1- makes contact at stop -2-.



– From this position, turn threaded collar -2- 1.5 turns anti-clockwise.

• This will increase the length of the control rod.

– Tighten lock nuts -1, 3-.

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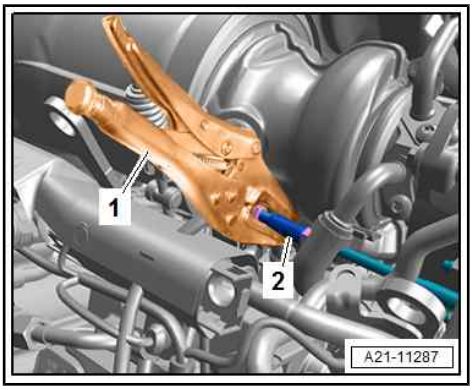
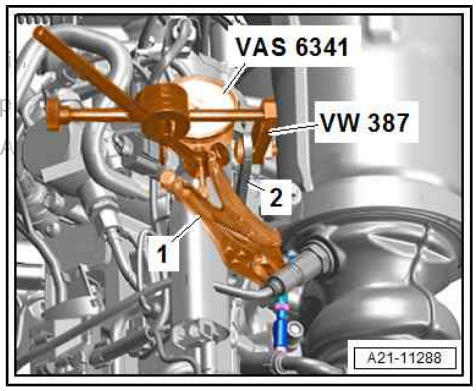
– Clamp small vice-grip pliers -1- on ball socket shaft -2-. The vice-grip pliers serve as a stop for the dial gauge.



– Secure universal dial gauge bracket - VW 387- to engine lifting eye -2-.

– Align dial gauge, 0-30 mm - VAS 6341/1- in universal dial gauge bracket - VW 387- so that measurement button is as parallel as possible with control rod of vacuum unit. To do so, have measurement button make contact with vice-grip pliers -1-.

– With 20 mm preload, set dial gauge to “0”.



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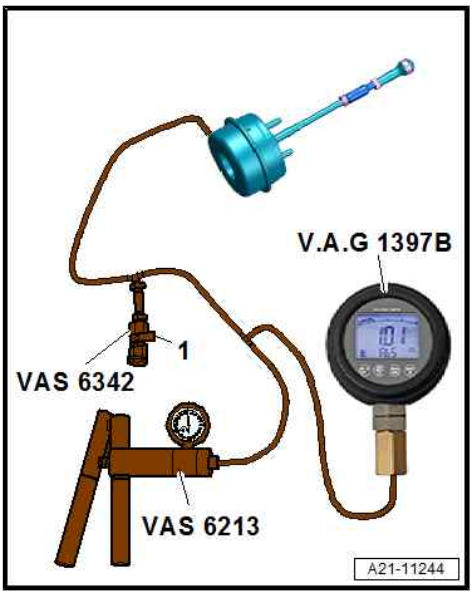
– Set up measuring equipment and testers as shown and connect to pressure sensor - V.A.G 1397B- and to vacuum unit for turbocharger.

– Close lever -1- on pressure control valve - VAS 6342- .



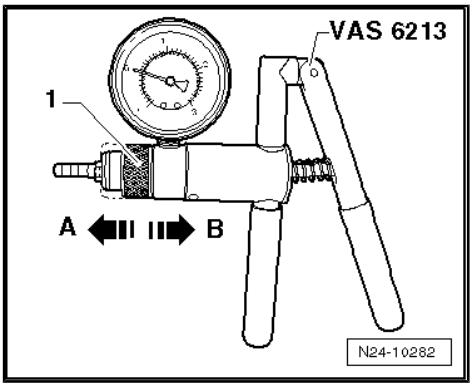
– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -A- to select “vacuum”.

– Switch on pressure sensor - V.A.G 1397B- .

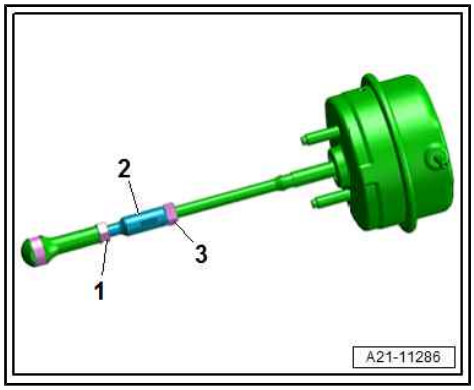
– Generate a vacuum of -300 mbar using hand vacuum pump - VAS 6213- .

– Open testing valve and slowly reduce vacuum pressure:

- The operating rod should start to move at a pressure of -200 mbar at the latest.
- At 230 … 170 mbar, travel of 7 … 9 mm should be shown on dial gauge.
- At 170 … 100 mbar, travel of 2 … 4 mm should be shown on dial gauge.

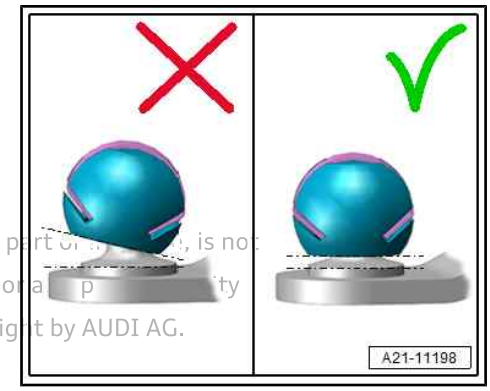


– If necessary, loosen lock nuts -1, 3- and adjust threaded collar -2-.
– Repeat test.
– Tighten lock nuts.



- The ball socket must be parallel to the operating lever.
- Before fitting, check vacuum hoses for damage and renew if necessary.

– Remove measuring equipment and connect vacuum hose to vacuum unit.
– Install heat shield and engine cover panel ⇒ "3.1 Removing and installing engine cover panel", page 10 .



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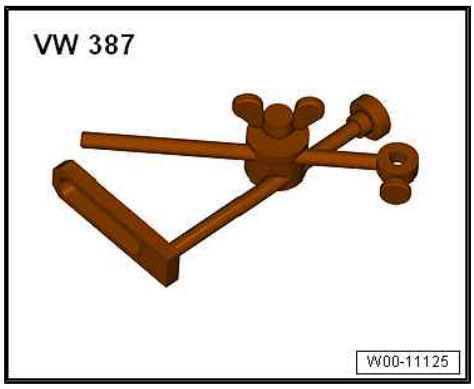
1.3.2 Renewing vacuum unit for turbocharger, cylinder bank 2 (left-side) - vehicles with 2.9 ltr. engine

A repair kit is available to renew the vacuum unit ⇒ Electronic parts catalogue (ETKA) .

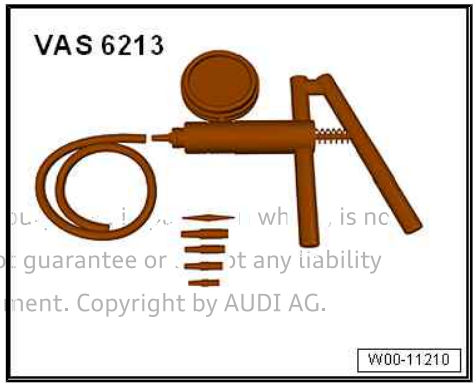
Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-



♦ Pressure sensor - V.A.G 1397B- (not illustrated)

- Hand vacuum pump - VAS 6213-



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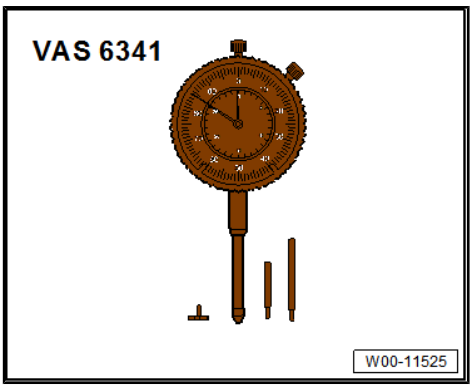
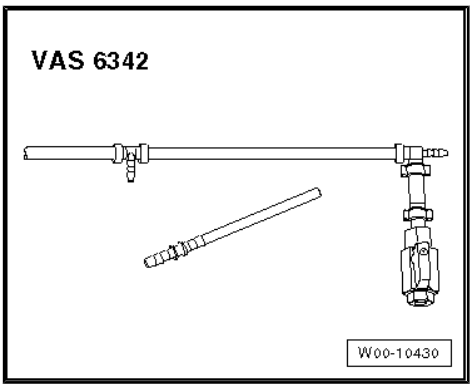
- Dial gauge set, 4-part - VAS 6341-



- Pressure control valve - VAS 6342-

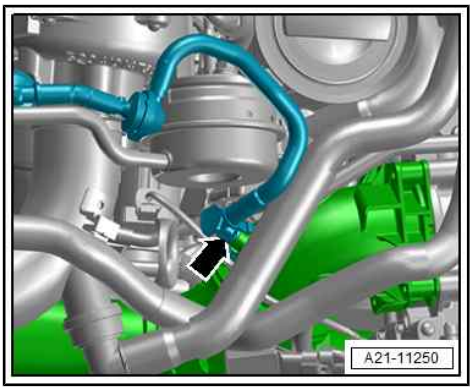


- Small mole grips, long version (commercially available)

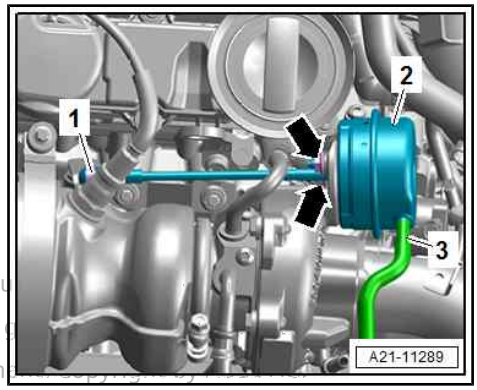
Removing

– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Press release tabs on both sides and detach hose -arrow- for activated charcoal filter system.



– Detach vacuum hose -3- from vacuum unit, making sure not to damage it.
– Remove retaining clip -1- and detach control rod from actuating lever of turbocharger.
– Remove nuts -arrows- and detach vacuum unit -2-.



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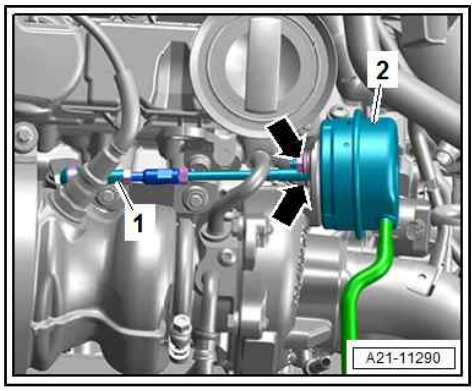
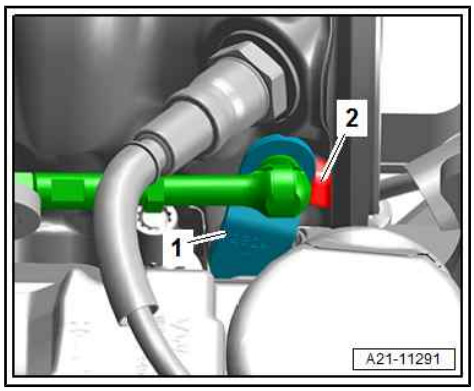
Installing

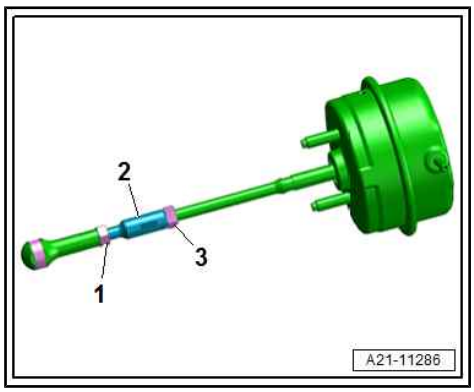
– Install vacuum unit -2- with adjustable control rod on turbocharger.
– To do so, tighten nuts -arrows- and press ball socket -1- onto ball stud of operating lever.



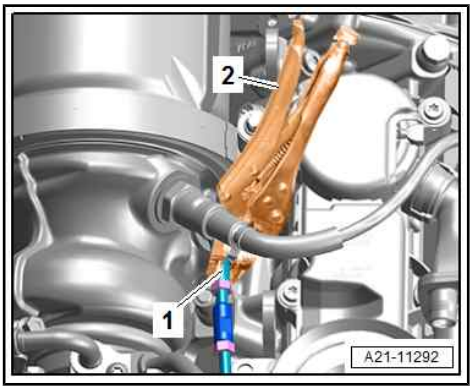
– Adjust control rod on threaded collar so that operating lever -1- makes contact at stop -2-.



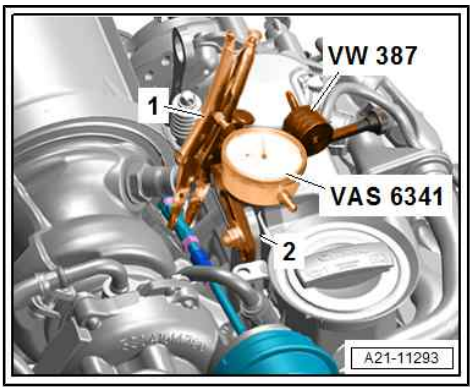
– From this position, turn threaded collar -2- 1.5 turns anti-clockwise.
• This will increase the length of the control rod.
– Tighten lock nuts -1, 3-.



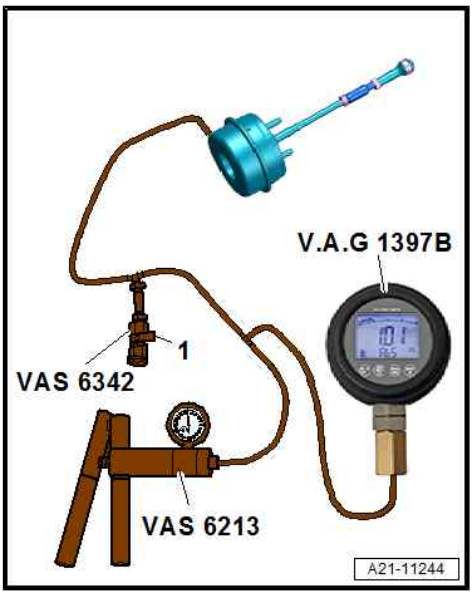
– Clamp small vice-grip pliers -1- on ball socket shaft -2-. The vice-grip pliers serve as a stop for the dial gauge.



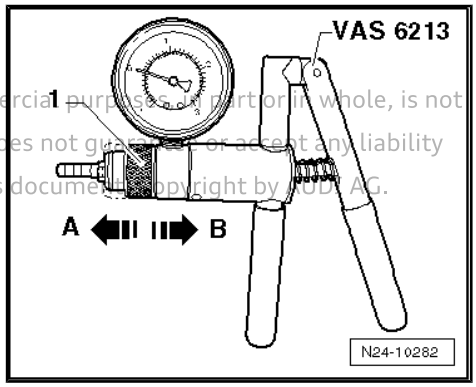
– Secure universal dial gauge bracket - VW 387- to engine lifting eye -2-.
– Align dial gauge, 0-30 mm - VAS 6341/1- in universal dial gauge bracket - VW 387- so that measurement button is as parallel as possible with control rod of vacuum unit. To do so, have measurement button make contact with vice-grip pliers -1-.
– With 5 mm preload, set dial gauge to “0”.



– Set up measuring equipment and testers as shown and connect to pressure sensor - V.A.G 1397B- and to vacuum unit for turbocharger.
– Close lever -1- on pressure control valve - VAS 6342- .



– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -A- to select “vacuum”.
– Switch on pressure sensor - V.A.G 1397B-.
– Generate a vacuum of -300 mbar using hand vacuum pump - VAS 6213- .
– Open testing valve and slowly reduce vacuum pressure:



- The operating rod should start to move at a pressure of -200 mbar at the latest.
- At 270 … 170 mbar, travel of 7 … 9 mm should be shown on dial gauge.
- At 170 … 100 mbar, travel of 2 … 4 mm should be shown on dial gauge.

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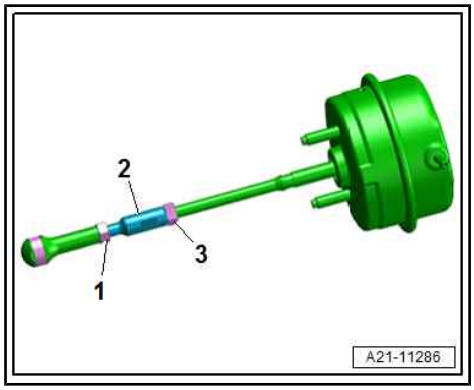
– If necessary, loosen lock nuts -1, 3- and adjust threaded collar -2-.
– Repeat test.
– Tighten lock nuts.

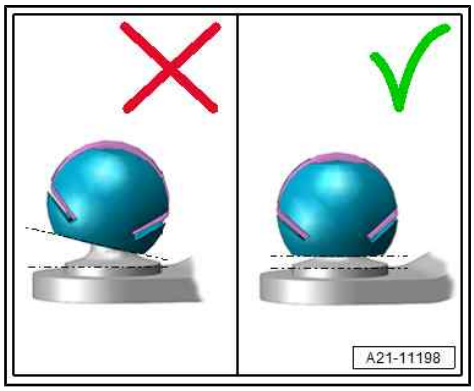


- The ball socket must be parallel to the operating lever.
- Before fitting, check vacuum hoses for damage and renew if necessary.

– Remove measuring equipment and connect vacuum hose to vacuum unit.

- Check O-rings for damage ⇒ page 265 .

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .



1.3.3 Renewing vacuum unit for turbocharger - vehicles with 3.0 ltr. engine

A repair kit is available to renew the vacuum unit ⇒ Electronic parts catalogue (ETKA) .

Special tools and workshop equipment required

♦ Universal dial gauge bracket - VW 387-

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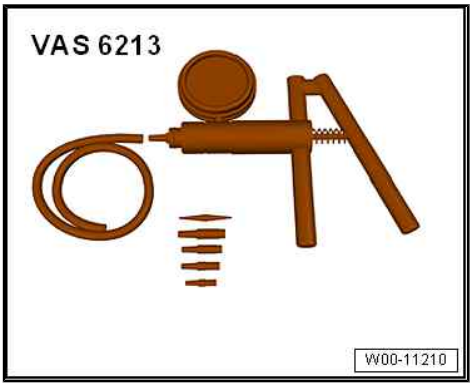
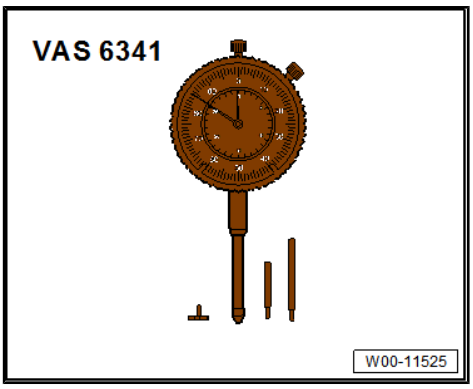
♦ Pressure sensor - V.A.G 1397B- (not illustrated)

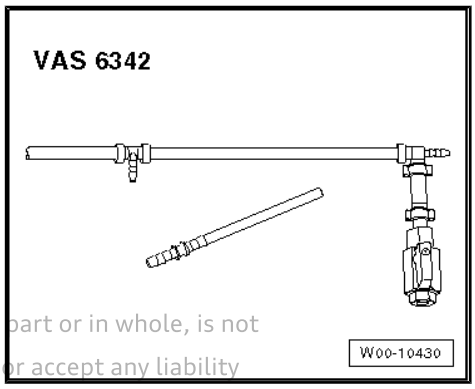
♦ Hand vacuum pump - VAS 6213-



♦ Dial gauge set, 4-part - VAS 6341-



♦ Pressure control valve - VAS 6342-



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♦ Small vice-grip pliers (commercially available)

Removing

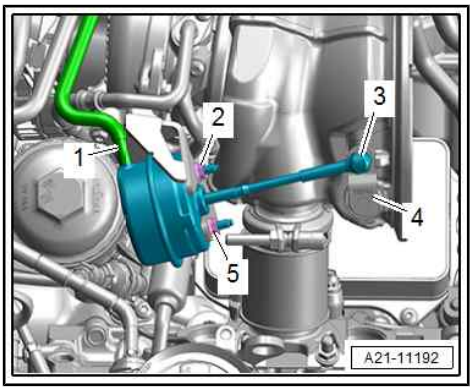
– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Remove oil filter element ⇒ “1.2 Engine oil”, page 175 .

– Detach vacuum hose -1- from vacuum unit, making sure not to damage it.

– Remove retaining clip -3- and detach control rod from actuating lever -4- of turbocharger.

– Remove nuts -2, 5- and detach vacuum unit.

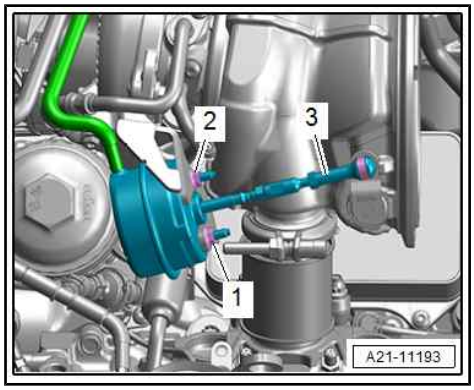


Installing

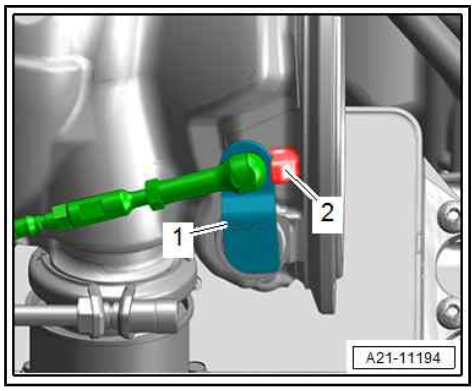
– Install vacuum unit with adjustable control rod on turbocharger.

– To do so, tighten nuts -1, 2- and press ball socket -3- onto ball stud of operating lever.

– Install oil filter element ⇒ “1.2 Engine oil”, page 175 .



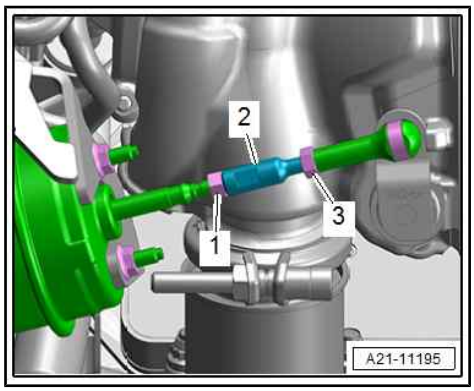
– Adjust control rod on threaded collar so that operating lever -1- makes contact at stop -2-.



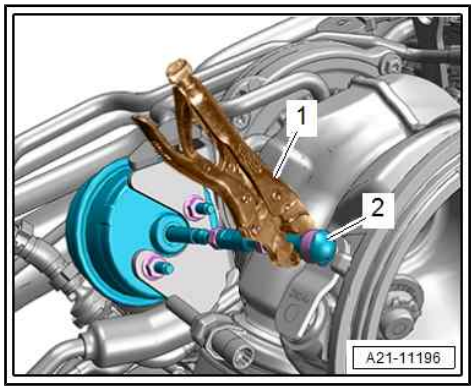
– From this position, turn threaded collar -2- 1.5 turns anti-clockwise.

• This will increase the length of the control rod.

– Tighten lock nuts -1, 3-.



– Clamp small vice-grip pliers -1- on ball socket shaft -2-. The vice-grip pliers serve as a stop for the dial gauge.



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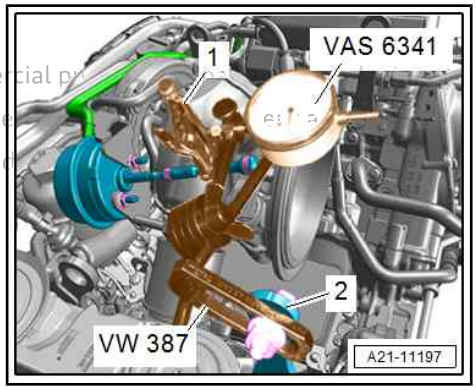
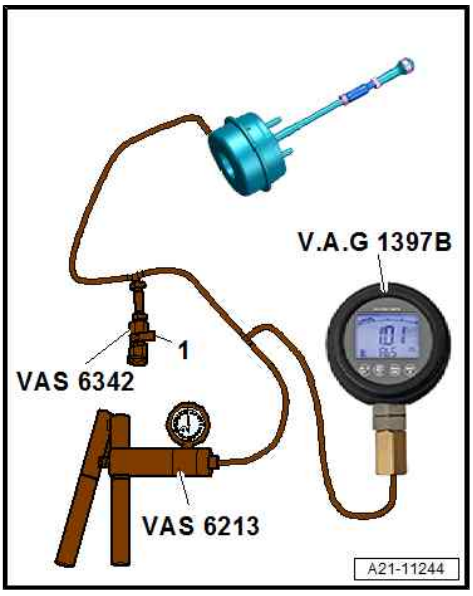
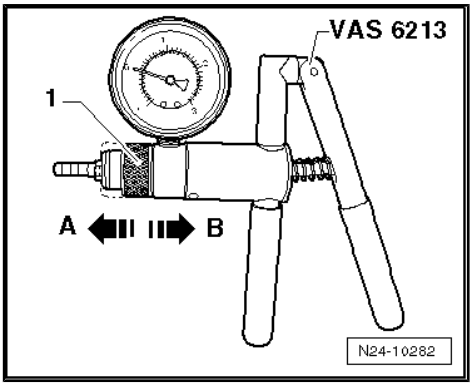
– Secure universal dial gauge bracket - VW 387- to engine lifting eye -2-.
– Align dial gauge, 0-30 mm - VAS 6341/1- in universal dial gauge bracket - VW 387- so that measurement button is as parallel as possible with control rod of vacuum unit. To do so, have measurement button make contact with vice-grip pliers -1-.
– With 20 mm preload, set dial gauge to “0”.



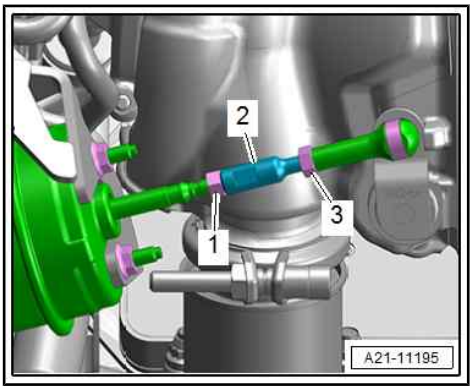
– Set up measuring equipment and testers as shown and connect to pressure sensor - V.A.G 1397B- and to vacuum unit for turbocharger.
– Close lever -1- on pressure control valve - VAS 6342- .



– Move adjuster ring -1- on hand vacuum pump - VAS 6213- to position -A- to select “vacuum”.
– Switch on pressure sensor - V.A.G 1397B- .
– Generate a vacuum of -300 mbar using hand vacuum pump - VAS 6213- .
– Open testing valve and slowly reduce vacuum pressure:
• The operating rod should start to move at a pressure of -200 mbar at the latest.
• At 165 … 175 mbar, travel of 7 … 9 mm should be shown on dial gauge.
• At 95 … 105 mbar, travel of 2 … 4 mm should be shown on dial gauge.



– If necessary, loosen lock nuts -1, 3- and adjust threaded collar -2-.
– Repeat test.
– Tighten lock nuts.

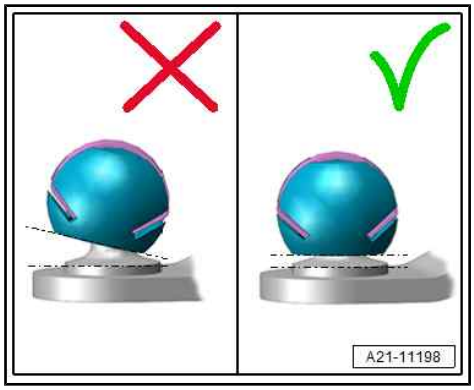


- The ball socket must be parallel to the operating lever.
- Before fitting, check vacuum hoses for damage and renew if necessary.

– Remove measuring equipment and connect vacuum hose to vacuum unit.

– Install oil filter element ⇒ “1.2 Engine oil”, page 175 .

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .



1.4 Removing and installing temperature sender for engine cover panel - G765-

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI EA 839); Rep. gr. 21 ; Turbochargers; Exploded view - turbochargers , Removing and installing temperature sender for engine cover panel - G765- .

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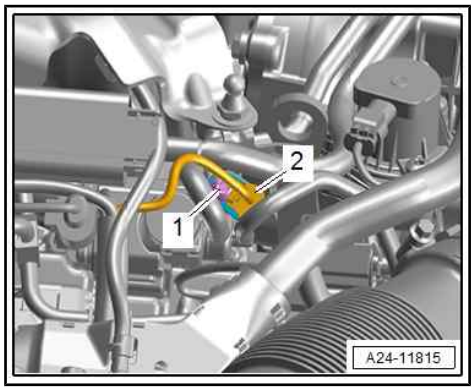
Removing

– Depending on model, remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Unplug electrical connector -2-.

– Unscrew bolt -1- and detach temperature sender for engine cover panel - G765- .



Installing

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

Additional work depending on model ⇒ 6-cylinder direct injection engine (3.0 ltr. 4-valve TFSI EA 839); Rep. gr. 21 ; Turbochargers; Exploded view - turbochargers , Temperature sender for engine cover panel - G765- .

– Depending on model, install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

Tightening torques

♦ ⇒ Fig. “” Temperature sender for engine cover panel -G765- - tightening torque”“ , page 238

2 Charge air system

⇒ “2.1 Exploded view - charge air system”, page 259

⇒ “2.2 Exploded view - hose connections for charge air system”, page 269

⇒ “2.3 Removing and installing air pipe”, page 270

⇒ “2.5 Removing and installing charge air cooler”, page 276

⇒ “2.6 Removing and installing charge pressure sender G31 ”, page 276

⇒ “2.7 Removing and installing charge air temperature sender”, page 276

⇒ “2.8 Removing and installing overrun air recirculation valve”, page 277

⇒ “2.9 Checking charge air system for leaks”, page 279

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2.1 Exploded view - charge air system

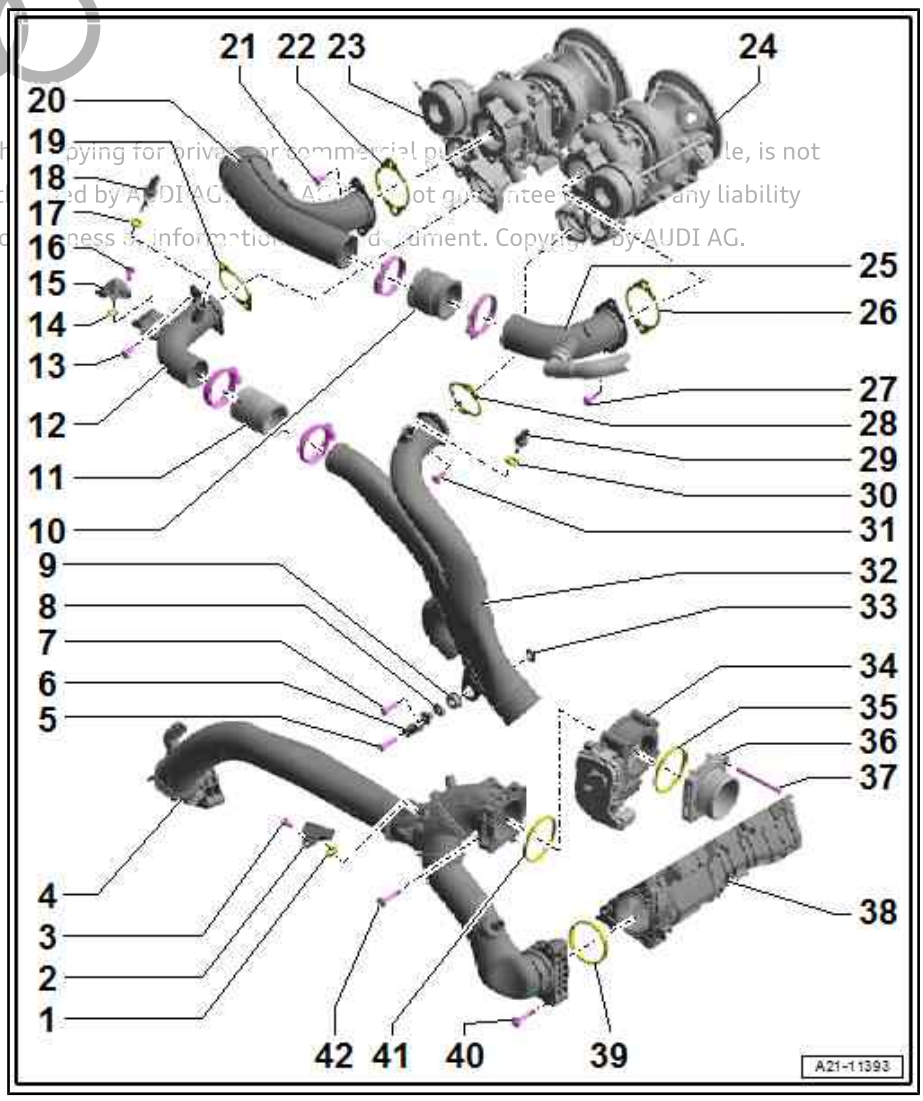
⇒ “2.1.1 Exploded view - charge air system (engine end), vehicles with 2.9 ltr. engine”, page 259

⇒ “2.1.2 Exploded view - charge air system (engine end), vehicles with 3.0 ltr. engine (version 1)”, page 263

⇒ “2.1.3 Exploded view - charge air system (engine end), vehicles with 3.0 ltr. engine (version 2)”, page 266

⇒ “2.1.4 Exploded view - charge air system (body end)”, page 269

2.1.1 Exploded view - charge air system (engine end), vehicles with 2.9 ltr. engine



1 - O-ring

- ❑ Renew after removing

2 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- ❑ Removing and installing ⇒ “6.5 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71 ”, page 304

3 - Bolt

- ❑ 5 Nm

4 - Air pipe (top)

- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe

5 - Bolt/nut

- ❑ Tightening torque:
- ♦ Bolt, 9 Nm
- ♦ Nut, 20 Nm

6 - Bracket

- ❑ For air pipe (bottom)
- ❑ Different versions

7 - Bolt

- ❑ 9 Nm

8 - Washer

9 - Grommet

10 - Air hose

11 - Air hose

12 - Bottom air pipe

- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe

13 - Bolt

- ❑ 9 Nm

14 - O-ring

- ❑ 2.9 ltr. engine with electric compressor only
- ❑ Renew after removing

15 - Charge pressure sender 2 - G447-

- ❑ 2.9 ltr. engine with electric compressor only
- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system ; Removing and installing charge pressure sender 2 - G447-

16 - Bolt

- ❑ 2.9 ltr. engine with electric compressor only
- ❑ 9 Nm

17 - Seal

- ❑ Renew after removing

18 - Temperature sender 1 for charge air cooler - G763-

- ❑ Removing and installing ⇒ “2.7 Removing and installing charge air temperature sender”, page 276
- ❑ 22 Nm

19 - Gasket

- ❑ Renew after removing

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20 - Intake manifold

- ❑ Removing and installing
  ⇒ “2.4.1 Removing and installing intake manifold - vehicles with 2.9 ltr. engine”, page 271

21 - Bolt

- ❑ 9 Nm

22 - Gasket

- ❑ Renew after removing

23 - Turbocharger

- ❑ Cylinder bank 1 (right-side)
- ❑ Exploded view ⇒ “1.1.1 Exploded view - turbocharger, vehicles with 2.9 ltr. engine”, page 231

24 - Turbocharger

- ❑ Cylinder bank 2 (left-side)
- ❑ Exploded view ⇒ “1.1.1 Exploded view - turbocharger, vehicles with 2.9 ltr. engine”, page 231

25 - Intake manifold with crankcase breather hose

- ❑ Depending on the version of the replacement intake manifold supplied, the retaining tab for the retaining clip on the electrical wiring harness may be located in a different position on the new intake manifold. In this case, the retaining clip on the electrical wiring harness must be repositioned
- ❑ Removing and installing ⇒ “2.4 Removing and installing intake manifold”, page 271
- ❑ Crankcase breather hose is connected to intake manifold and cannot be separated; observe notes:

◆ Crankcase breather hose on intake manifold - rest-of-world vehicles ⇒ page 262

◆ Crankcase breather hose on intake manifold - USA vehicles ⇒ page 263

26 - Gasket

- ❑ Renew after removing

27 - Bolt

- ❑ 9 Nm

28 - Gasket

- ❑ Renew after removing

29 - Temperature sender 2 for charge air cooler - G764-

- ❑ Removing and installing ⇒ “2.7 Removing and installing charge air temperature sender”, page 276
- ❑ 22 Nm

30 - Seal

- ❑ Renew after removing

31 - Bolt

- ❑ 9 Nm

32 - Bottom air pipe

- ❑ Different versions
- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe

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33 - Spacer sleeve

34 - Throttle valve module - J338-

- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing throttle valve module - J338-
- ❑ Cleaning ⇒ “4.4 Cleaning throttle valve module”, page 290

35 - Seal

- ❑ Renew after removing

36 - Connection

37 - 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 ⇒ Fig. ““ Throttle valve module -J338- - tightening torques and sequence”“ , page 266

38 - Intake manifold

- ❑ Exploded view ⇒ “4.1 Exploded view - intake manifold”, page 287

39 - Seal

- ❑ Renew after removing

40 - 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 ⇒ Fig. ““Top air pipe - tightening torques and sequence”“ , page 266

41 - Seal

- ❑ Renew after removing

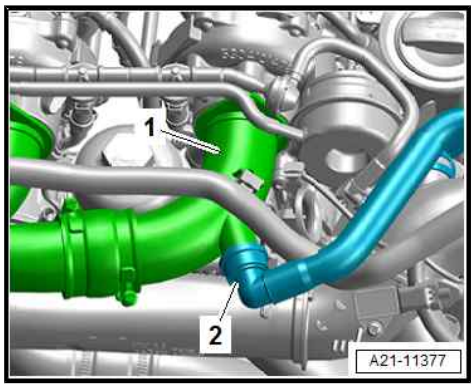
42 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ““Top air pipe - tightening torques and sequence”“ , page 266

Crankcase breather hose on intake manifold - rest-of-world vehicles

Crankcase breather hose -2- cannot be detached from intake manifold -1- without being irreparably damaged.

- Renew crankcase breather hose.
- When installing, ensure plug-in connector engages audibly and that it is not seated at an angle on connection for intake manifold -1-.



Crankcase breather hose on intake manifold - USA vehicles

Caution

Risk of violating emission legislation applying to USA vehicles.

- *Do not disconnect crankcase breather hose -2-.*

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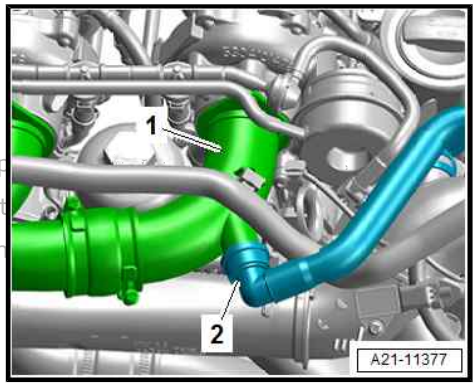
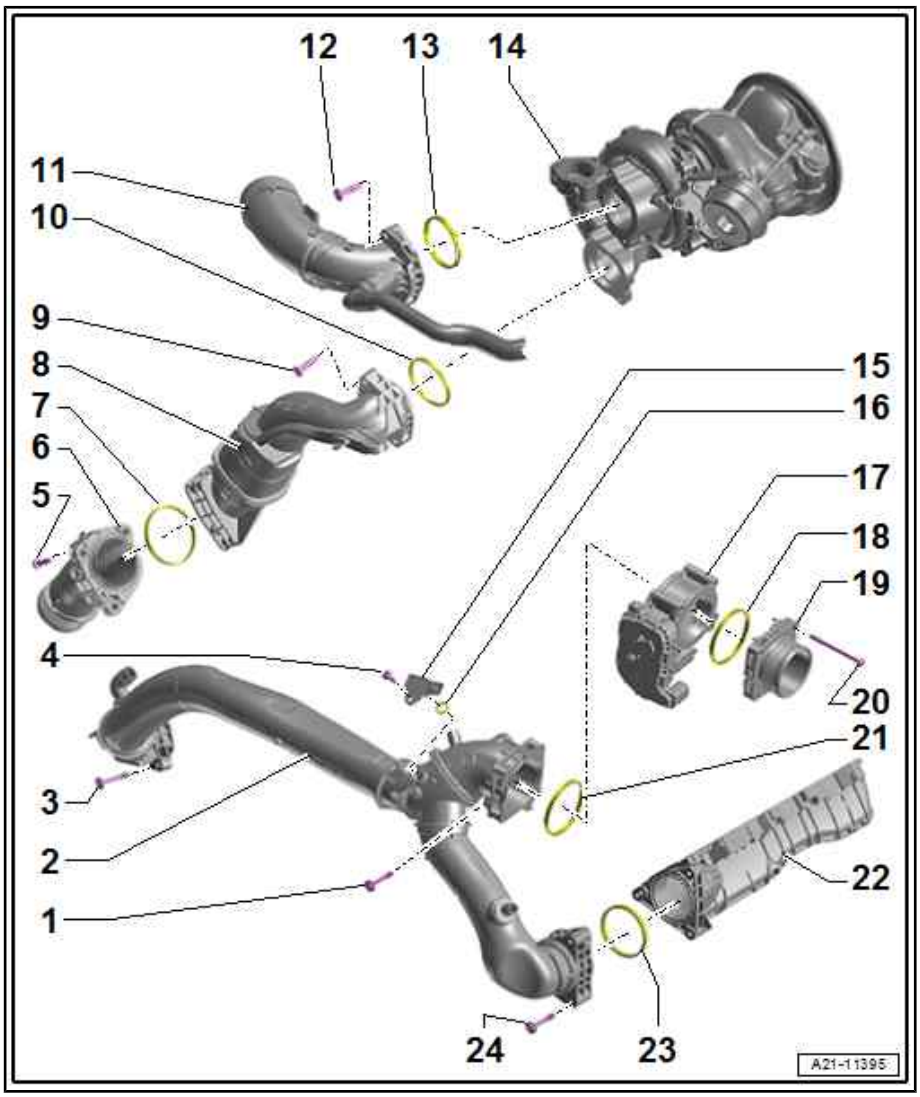


On USA vehicles, the crankcase breather hose -2- must not be separated from the intake manifold -1-.

- The crankcase breather hose -2- supplied via the ⇒ Electronic parts catalogue (ETKA) is only available together with the intake manifold -1-.

2.1.2 Exploded view - charge air system (engine end), vehicles with 3.0 ltr. engine (version 1)



1 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ""Top air pipe - tightening torques and sequence"" , page 266

2 - Air pipe (top)

- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe

3 - 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 ⇒ Fig. ""Top air pipe - tightening torques and sequence"" , page 266

4 - Bolt

- ❑ 5 Nm

5 - Bolt

- ❑ For model variant
- ❑ 8 Nm

6 - Connection

- ❑ Model variant

7 - Seal

- ❑ For model variant
- ❑ Renew after removing

8 - Air pipe

- ❑ Different versions available; for allocation refer to ⇒ Electronic parts catalogue

9 - Bolt

- ❑ 9 Nm

10 - Seal

- ❑ Renew after removing

11 - Intake manifold with crankcase breather hose

- ❑ Removing and installing ⇒ “2.4 Removing and installing intake manifold”, page 271
- ❑ Crankcase breather hose is connected to intake manifold and cannot be separated; observe notes:

- ♦ Crankcase breather hose on intake manifold - rest-of-world vehicles ⇒ page 265
- ♦ Crankcase breather hose on intake manifold - USA vehicles ⇒ page 265

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12 - Bolt

- ❑ 9 Nm

13 - Seal

- ❑ Renew after removing

14 - Turbocharger

- ❑ Exploded view ⇒ “1.1.2 Exploded view - turbocharger, vehicles with 3.0 ltr. engine”, page 234

15 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-

- ❑ Removing and installing ⇒ “6.5 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71”, page 304

16 - O-ring

- ❑ Renew after removing

17 - Throttle valve module - J338-

- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing throttle valve module - J338-
- ❑ Cleaning ⇒ “4.4 Cleaning throttle valve module”, page 290

18 - Seal

- ❑ Renew after removing

19 - Connection

20 - 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:

- ♦ 1st stage: 5 Nm
- ♦ 2nd stage: 6 Nm

21 - Seal

- ❑ Renew after removing

22 - Intake manifold

- ❑ Exploded view ⇒ “4.1 Exploded view - intake manifold”, page 287

23 - Seal

- ❑ Renew after removing

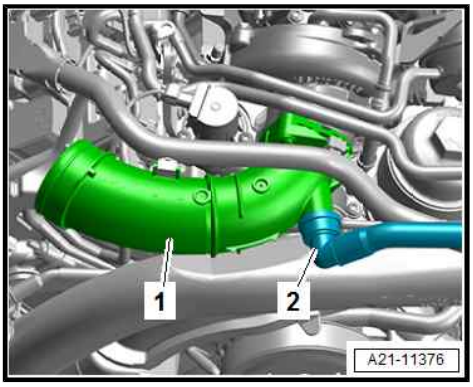
24 - Bolt

- ❑ 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 ⇒ Fig. ““Top air pipe - tightening torques and sequence”“ , page 266

Crankcase breather hose on intake manifold - rest-of-world vehicles

Crankcase breather hose -2- cannot be detached from intake manifold -1- without being irreparably damaged.

- Renew crankcase breather hose.
- When installing, ensure plug-in connector engages audibly and that it is not seated at an angle on connection for intake manifold -1-.



Crankcase breather hose on intake manifold - USA vehicles

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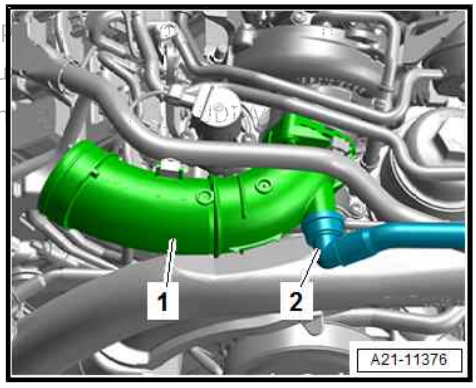
Caution

Risk of violating emission legislation applying to USA vehicles.

- ***Do not disconnect crankcase breather hose -2-.***



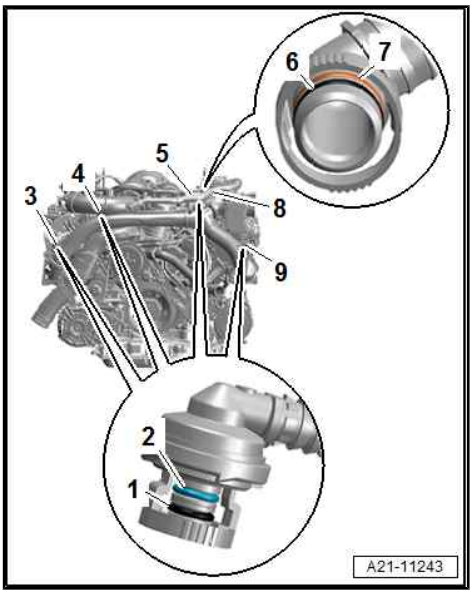
On USA vehicles, the crankcase breather hose -2- must not be separated from the intake manifold -1-.

- The crankcase breather hose -2- supplied via the ⇒ Electronic parts catalogue (ETKA) is only available together with the intake manifold -1-.

Checking O-rings for damage

– Check O-rings for damage and renew if necessary.

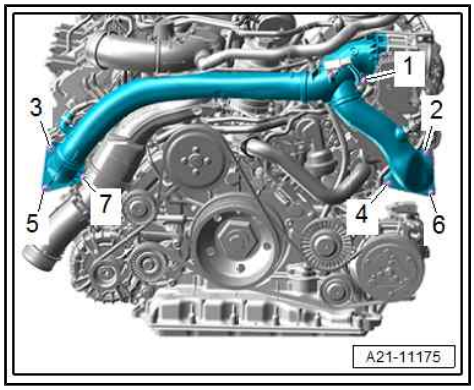
1 - O-ring (black)
2 - O-ring (blue)
3 - Crankcase breather hose
4 - Crankcase breather hose
5 - Hose for activated charcoal filter system
6 - O-ring (black)
7 - O-ring (orange)
8 - Crankcase breather hose
9 - Vacuum hose



Top air pipe - tightening torques and sequence

(Shown on vehicle with 3.0 ltr. engine.)

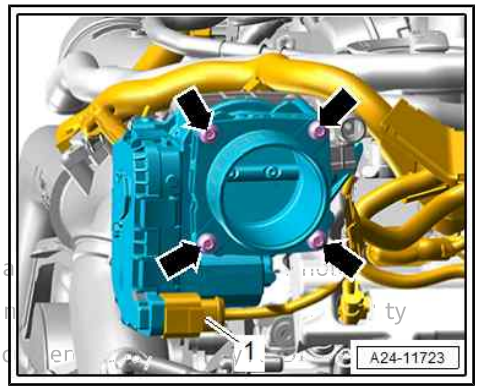
– Tighten bolts in stages in the sequence shown:



Stage	Bolts	Procedure/tightening torques
1.		Bring air pipe into installation position
2a.	-1 … 7-	• Air pipe to used intake manifolds: Fit and screw in by hand so that bolts make contact and are screwed into old thread
2b.	-1 … 3-	• Air pipe to new intake manifolds: Fit and screw in by hand until contact is made
3.	-2 … 7-	6 Nm
4.	-1-	9 Nm

Throttle valve module - J338- - tightening torques and sequence

– Tighten bolts in stages:



Stage	Bolts	Procedure/tightening torques
1.		Move throttle valve module - J338- with connection into installation position
2.	-arrows-	Fit and screw in by hand in diagonal sequence so that bolts make contact and are screwed into old thread
3.	-arrows-	5 Nm in diagonal sequence

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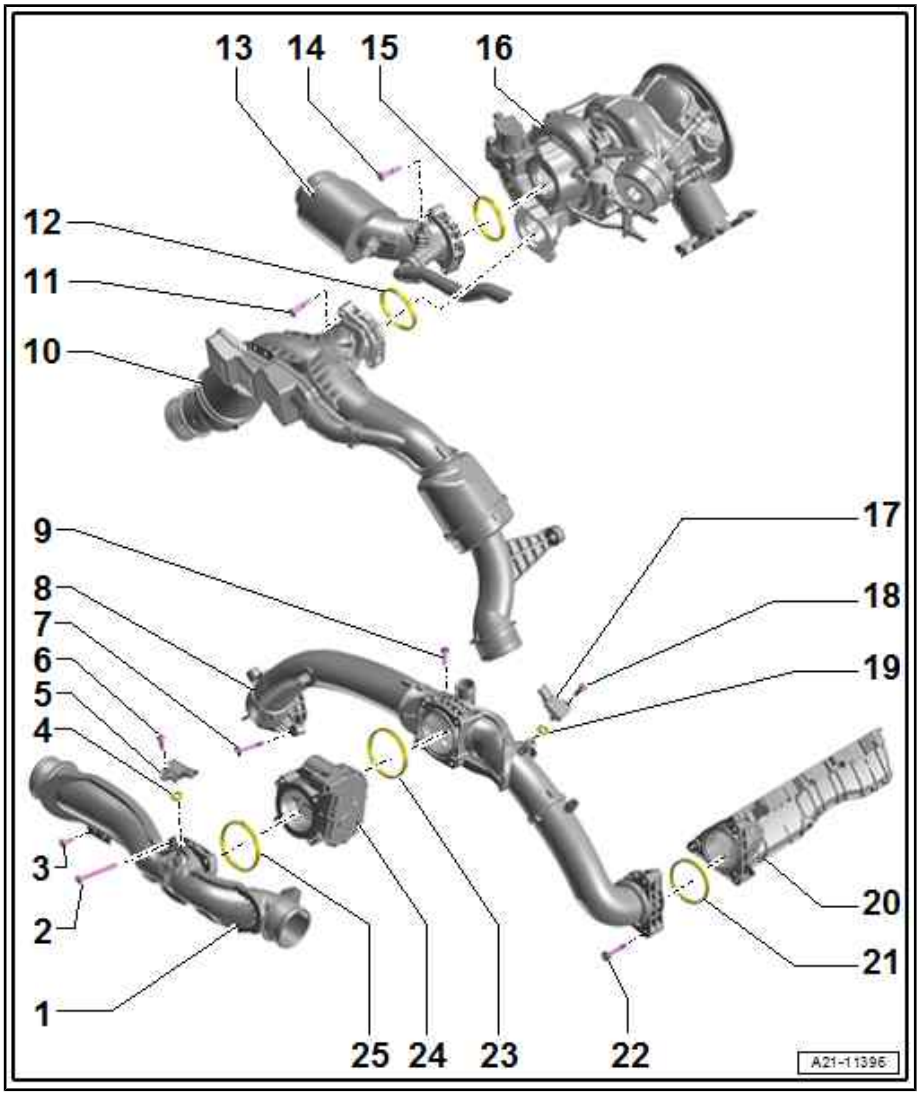
2.1.3 Exploded view - charge air system (engine end), vehicles with 3.0 ltr. engine (version 2)



1 - Air pipe

2 - 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 ⇒ Fig. ""Top air pipe - tightening torques and sequence"" , page 266

3 - 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 ⇒ Fig. ""Top air pipe - tightening torques and sequence"" , page 266

4 - O-ring

- ❑ Renew after removing

5 - Charge pressure sender - G31-

- ❑ Removing and installing ⇒ "2.6 Removing and installing charge pressure sender G31 ", page 276

6 - Bolt

- ❑ 5 Nm

7 - 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 ⇒ Fig. ""Top air pipe - tightening torques and sequence"" , page 266

8 - Air pipe (top)

- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe

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9 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ""Top air pipe - tightening torques and sequence"" , page 266

10 - Bottom air pipe

- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe

11 - Bolt

- ❑ 9 Nm

12 - Seal

- ❑ Renew after removing

13 - Intake manifold with crankcase breather hose

- ❑ Crankcase breather hose is connected to intake manifold and cannot be separated; observe notes:

- ♦ Crankcase breather hose on intake manifold - rest-of-world vehicles ⇒ page 268
- ♦ Crankcase breather hose on intake manifold - USA vehicles ⇒ page 269
  - ❑ Removing and installing
    ⇒ “2.4.3 Removing and installing intake manifold - Audi A8 with 3.0 ltr. engine”, page 275

14 - Bolt
- ❑ 9 Nm

15 - Seal
- ❑ Renew after removing

16 - Turbocharger
- ❑ Exploded view ⇒ “1.1.2 Exploded view - turbocharger, vehicles with 3.0 ltr. engine”, page 234

17 - Intake air temperature sender - G42- / intake manifold pressure sender - G71-
- ❑ Removing and installing
  ⇒ “6.5 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71 ”, page 304

18 - Bolt
- ❑ 5 Nm

19 - O-ring
- ❑ Renew after removing

20 - Intake manifold
- ❑ Exploded view ⇒ “4.1 Exploded view - intake manifold”, page 287

21 - Seal
- ❑ Renew after removing

22 - 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 ⇒ Fig. ““Top air pipe - tightening torques and sequence”“ , page 266

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23 - Seal
- ❑ Renew after removing

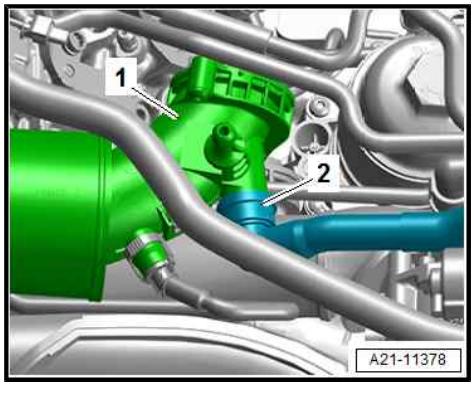
24 - Throttle valve module - J338-
- ❑ Removing and installing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing throttle valve module - J338-
- ❑ Cleaning ⇒ “4.4 Cleaning throttle valve module”, page 290

25 - Seal
- ❑ Renew after removing

Crankcase breather hose on intake manifold - rest-of-world vehicles

Crankcase breather hose -2- cannot be detached from intake manifold -1- without being irreparably damaged.

- Renew crankcase breather hose.
- When installing, ensure plug-in connector engages audibly and that it is not seated at an angle on connection for intake manifold -1-.

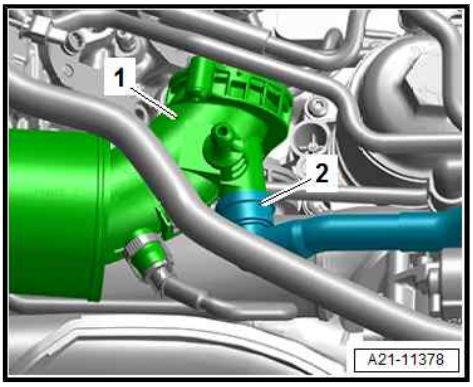


Crankcase breather hose on intake manifold - USA vehicles

Caution

Risk of violating emission legislation applying to USA vehicles.

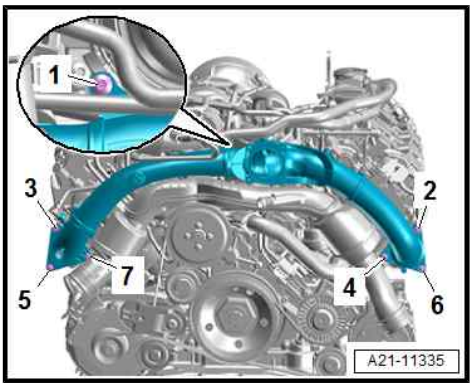
- *Do not disconnect crankcase breather hose -2-.*



On USA vehicles, the crankcase breather hose -2- must not be separated from the intake manifold -1-.

- The crankcase breather hose -2- supplied via the ⇒ Electronic parts catalogue (ETKA) is only available together with the intake manifold -1-.

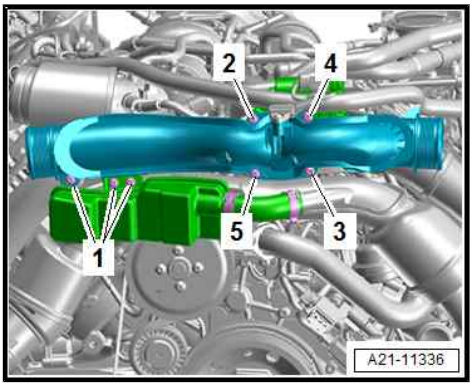
Top air pipe - tightening torques and sequence



– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Procedure/tightening torques
1.		Bring air pipe into installation position
2	-1-	Fit and screw in by hand until contact is made
3	-2 … 7-	Fit and screw in by hand so that bolts make contact and are screwed into old thread
4.	-1-	9 Nm
5.	-2 … 7-	5 Nm

Throttle valve module - J338- - tightening torques and sequence



– Tighten bolts in stages:

Stage	Bolts	Procedure/tightening torques
1.		Move throttle valve module - J338- with air pipe into installation position
2.	-1 … 5-	Fit and screw in by hand so that bolts make contact and are screwed into old thread
3.	-2 … 5-	5 Nm
4.	-1-	5 Nm

2.1.4 Exploded view - charge air system (body end)

All components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Exploded view - charge air system .

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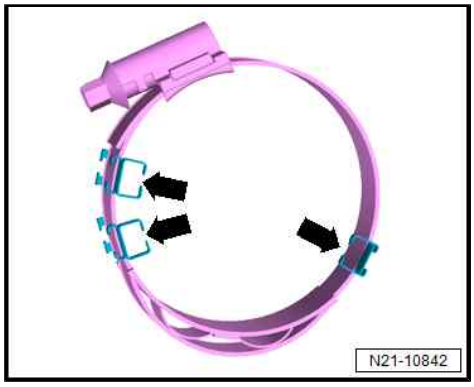
2.2 Exploded view - hose connections for charge air system

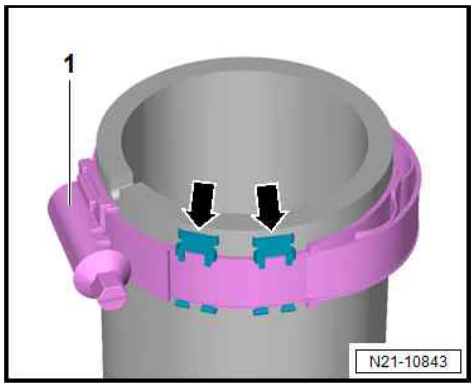
- Hose connections and air pipes/hoses must be free of oil and grease prior to fitting.
- Secure all hose connections with correct type of hose clips (as original equipment) ⇒ Electronic parts catalogue .
- If using used hose clips to secure the air hoses at their connections, spray rust remover onto 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.



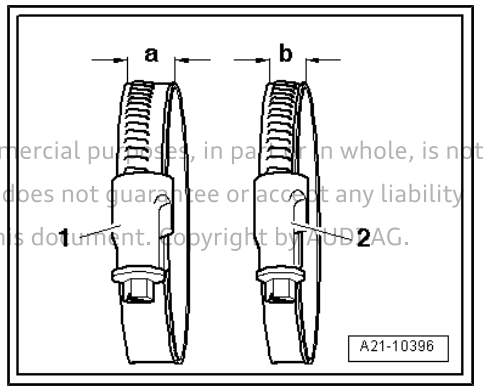
- Hose clip -1- with retaining hooks -arrows- must not be pulled off air hose.
- If a hose clip with retaining hooks is pulled off air hose, air hose must be renewed.
- New air hoses are supplied with hose clip fitted.



Tightening torques for:

1 - Hose clip with width -a- = 12 mm: 5 Nm

2 - Hose clip with width -b- = 9 mm: 3.4 Nm



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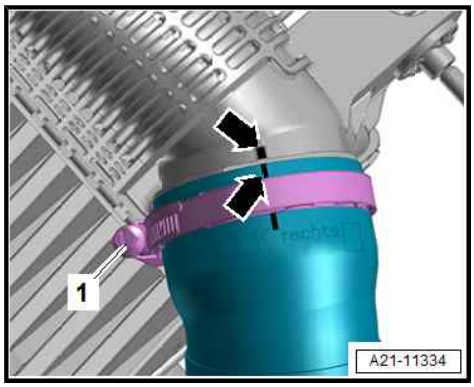
Air hoses to air pipes/charge air cooler - installation position and tightening torque

- Markings on air hose must be aligned opposite edge of housing and notch on air pipe/charge air cooler -arrows-.

– Tighten hose clips to 5 Nm.



2.3 Removing and installing air pipe

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing air pipe .

2.4 Removing and installing intake manifold

⇒ “2.4.1 Removing and installing intake manifold - vehicles with 2.9 ltr. engine”, page 271

⇒ “2.4.2 Removing and installing intake manifold - Audi A4/A5/ A6/A7/Q5 with 3.0 ltr. engine”, page 273

⇒ “2.4.3 Removing and installing intake manifold - Audi A8 with 3.0 ltr. engine”, page 275

2.4.1 Removing and installing intake manifold - vehicles with 2.9 ltr. engine

Note

Crankcase breather hose is connected to intake manifold and cannot be separated; observe notes ⇒ Item 25 (page 261) .

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Special tools and workshop equipment required

♦ Socket Torx T30 - T10405-

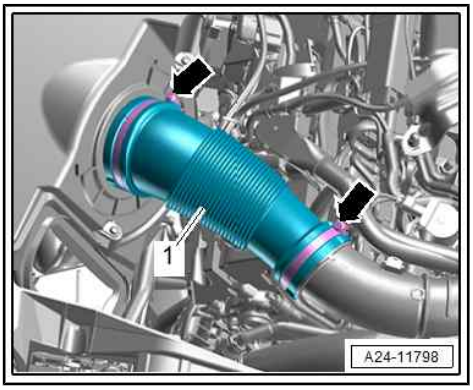
Removing

– Observe repair instructions ⇒ “3 Repair instructions”, page 6 .

– Remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

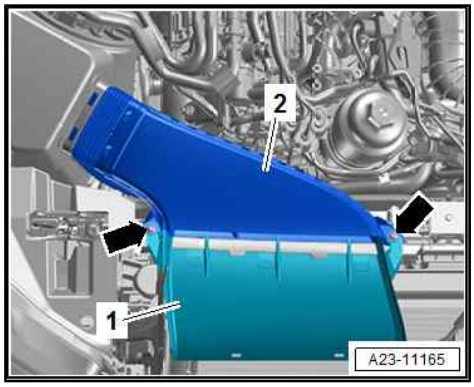
Audi A4/A5, Q5:

– Release hose clip -right arrow- and detach air hose -1-.

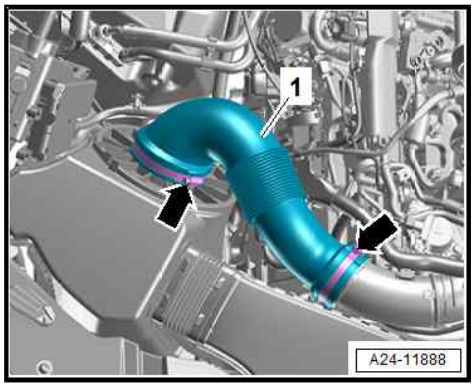


Audi A6/A7:

– Remove bolts -arrows-. Detach air duct -1-.



– Release hose clip -right arrow- and detach air hose -1-.



All vehicles:

– Unplug electrical connectors and move electrical wiring harness clear:

1 - For temperature sender 2 for charge air cooler - G764-

2 - For temperature sender 1 for charge air cooler - G763-

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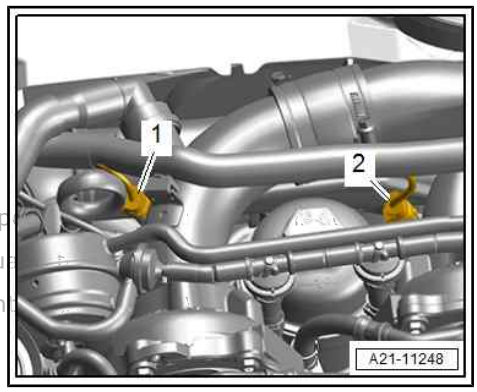
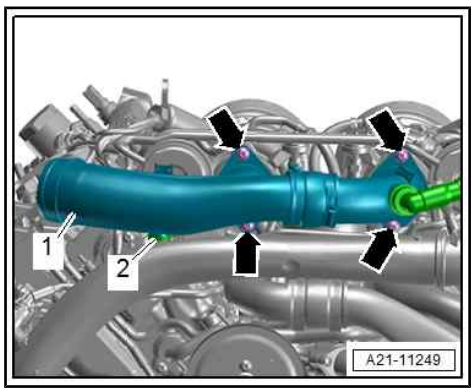


– Remove bolts -arrows-.

– Press release tabs on both sides and disconnect crankcase breather hose -2-.

– Move intake manifold -1- clear.



– Press release tabs on both sides and disconnect crankcase breather hose -arrows-.

– Detach intake manifold.

Installing

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

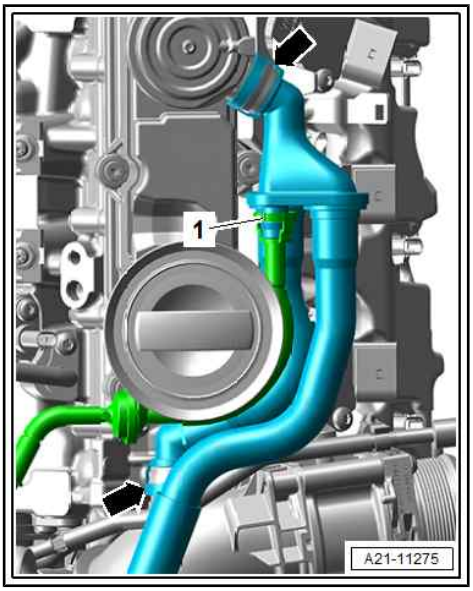
- Check O-rings for damage
  ⇒ Fig. ""Checking O-rings for damage"" , page 265 .

– Install engine cover panel
  ⇒ "3.1 Removing and installing engine cover panel", page 10 .

Tightening torques

◆ ⇒ "2.1.1 Exploded view - charge air system (engine end), vehicles with 2.9 ltr. engine", page 259

◆ ⇒ "2.2 Exploded view - hose connections for charge air system", page 269



2.4.2 Removing and installing intake manifold - Audi A4/A5/A6/A7/Q5 with 3.0 ltr. engine

Note

Crankcase breather hose is connected to intake manifold and cannot be separated; observe notes ⇒ Item 11 (page 264) .

Special tools and workshop equipment required

◆ Socket Torx T30 - T10405-

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Removing

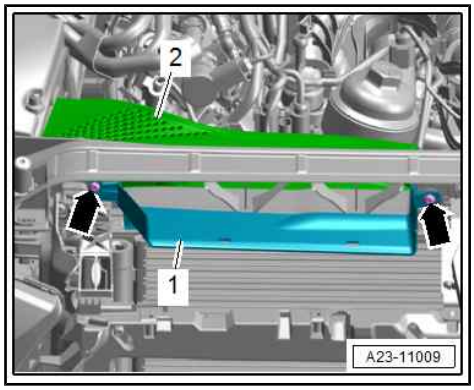
– Observe repair instructions ⇒ "3 Repair instructions", page 6 .

– Remove engine cover panel
  ⇒ "3.1 Removing and installing engine cover panel", page 10 .

– Remove lock carrier cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Bumper (front) .

Audi A4/A5:

– Remove bolts -arrows- and detach air duct -2-.



Audi A6/A7:

– Unscrew bolts -arrows- and remove air duct.

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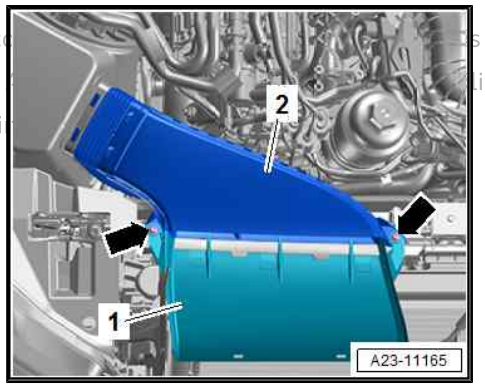
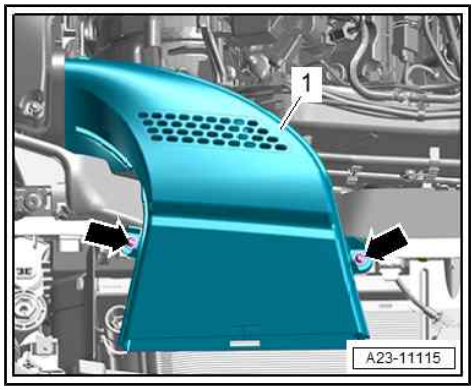


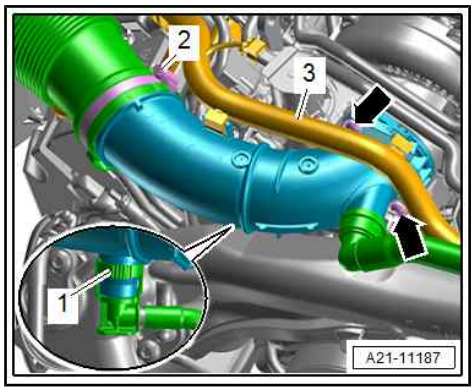
Audi Q5:

– Remove bolts -arrows- and detach air duct -1-.

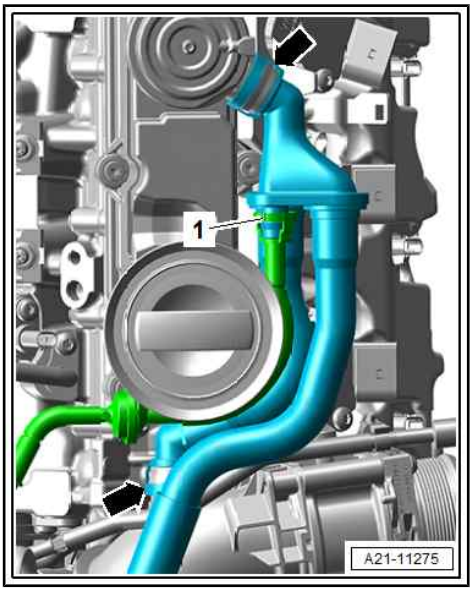


All vehicles:

– Release hose clip -2- and detach air pipe.
– Move electrical wiring harness -3- clear.
– Remove bolts -arrows-.
– Detach intake manifold and remove crankcase breather hose -1-. To do so, press release tabs on both sides.



– If fitted, disconnect hose -1- for activated charcoal filter system by pressing release tabs on both sides.
– Press release tabs on both sides and disconnect crankcase breather hose -arrow-.
– Detach intake manifold.



Installing

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

- Check O-rings for damage
⇒ Fig. ""Checking O-rings for damage"" , page 265 .

Tightening torques

- ⇒ "2.1.2 Exploded view - charge air system (engine end), vehicles with 3.0 ltr. engine (version 1)", page 263
- ⇒ "2.2 Exploded view - hose connections for charge air system", page 269

2.4.3 Removing and installing intake manifold - Audi A8 with 3.0 ltr. engine

Note

Crankcase breather hose is connected to intake manifold and cannot be separated; observe notes ⇒ Item 13 (page 267) .

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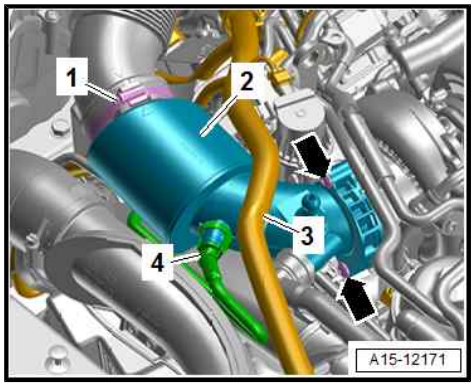
Special tools and workshop equipment required

- Socket Torx T30 - T10405-

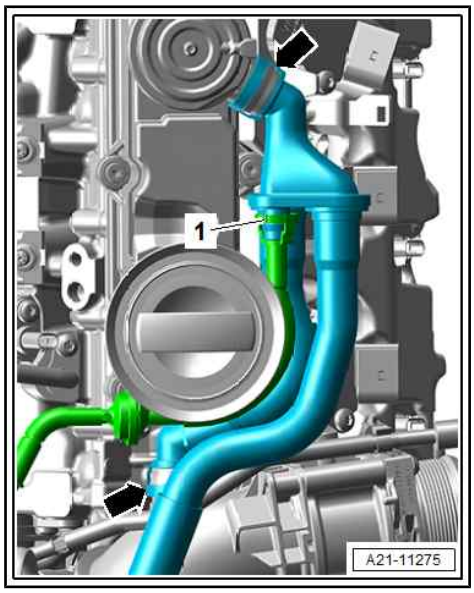
Removing

– Observe repair instructions ⇒ "3 Repair instructions", page 6 .
– Remove engine cover panel
⇒ "3.1 Removing and installing engine cover panel", page 10 .

– Release hose clip -1- and detach air pipe.
– Move electrical wiring harness -3- clear.
– Press release tabs on both sides and disconnect crankcase breather hose -4-.
– Remove bolts -arrows- and move intake manifold -2- clear.



– If fitted, disconnect hose -1- for activated charcoal filter system by pressing release tabs on both sides.
– Press release tabs on both sides and disconnect crankcase breather hose -arrow-.
– Detach intake manifold.



Installing

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

- Check O-rings for damage
  ⇒ Fig. ""Checking O-rings for damage"" , page 265 .

Tightening torques

- ⇒ "2.1.3 Exploded view - charge air system (engine end), vehicles with 3.0 ltr. engine (version 2)", page 266
- ⇒ "2.2 Exploded view - hose connections for charge air system", page 269

2.5 Removing and installing charge air cooler

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing charge air cooler .

2.6 Removing and installing charge pressure sender - G31-

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All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing charge pressure sender - G31- .

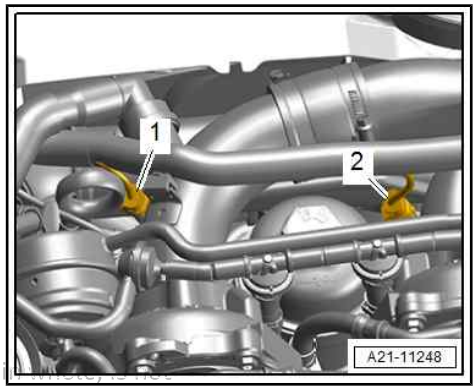
2.7 Removing and installing charge air temperature sender

Procedure applies for vehicles with 2.9 ltr. engine only.

Removing

– Remove engine cover panel
  ⇒ "3.1 Removing and installing engine cover panel", page 10 .

– Unplug corresponding electrical connector:



1 - For temperature sender 2 for charge air cooler - G764-

2 - For temperature sender 1 for charge air cooler - G763-

– Unscrew charge air temperature sender.

Installing

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

Installation is carried out in reverse sequence.

– Install engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

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Tightening torques

◆ ⇒ “2.1.1 Exploded view - charge air system (engine end), vehicles with 2.9 ltr. engine”, page 259

2.8 Removing and installing overrun air recirculation valve

⇒ “2.8.1 Removing and installing overrun air recirculation valve - vehicles with 2.9 ltr. engine”, page 277

⇒ “2.8.2 Removing and installing overrun air recirculation valve - vehicles with 3.0 ltr. engine”, page 278

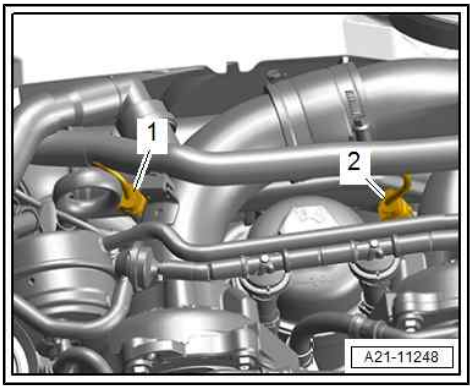
2.8.1 Removing and installing overrun air recirculation valve - vehicles with 2.9 ltr. engine

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing overrun air circulation valve .

– Remove oil filter element ⇒ page 175 and cover opening with a clean cloth.

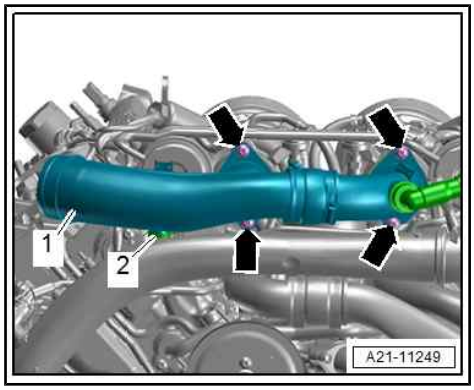
– Unplug electrical connectors and move electrical wiring harness clear:



1 - For temperature sender 2 for charge air cooler - G764-

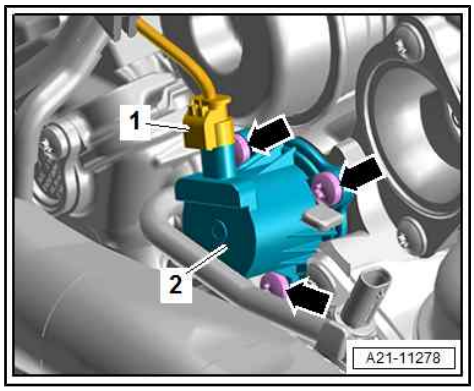
2 - For temperature sender 1 for charge air cooler - G763-

– Remove bolts -arrows-.
– Press release tabs on both sides and disconnect crankcase breather hose -2-.
– Move air pipe -1- to one side.



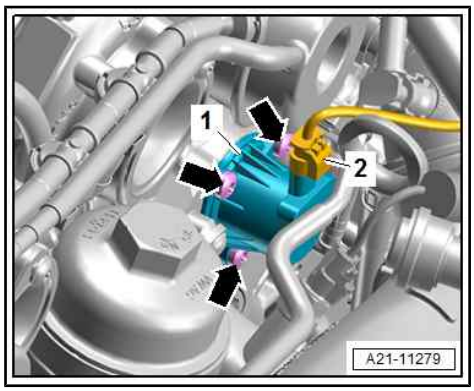
Cylinder bank 1 (right-side):

– Unplug electrical connector -1-.
– Remove bolts -arrows- and detach overrun air recirculation valve for bank 1 - N625- -item 2-.



Cylinder bank 2 (left-side):

– Unplug electrical connector -2-.
– Remove bolts -arrows- and detach overrun air recirculation valve for bank 2 - N626- -item 1-.



Installing

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

– Install oil filter element ⇒ page 175 .

• Check O-rings for damage ⇒ page 265 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Removing and installing overrun air circulation valve

Tightening torques

◆ ⇒ “1.1.1 Exploded view - turbocharger, vehicles with 2.9 ltr. engine”, page 231

2.8.2 Removing and installing overrun air recirculation valve - vehicles with 3.0 ltr. engine

Removing

– Remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

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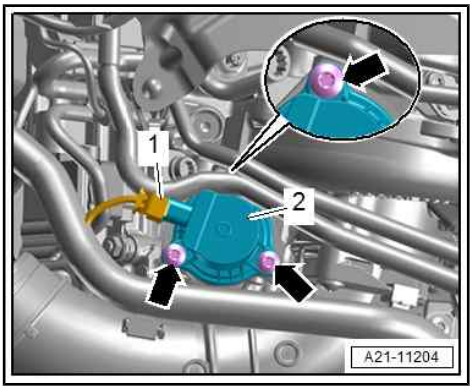
– Unplug electrical connector -1-.

– Remove bolts -arrows- and detach overrun air recirculation valve for bank 1 - N625- -item 2-.



Installing

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

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

Tightening torques

♦ ⇒ “1.1.2 Exploded view - turbocharger, vehicles with 3.0 ltr. engine”, page 234

2.9 Checking charge air system for leaks

Special tools and workshop equipment required

♦ Ultrasonic tester - V.A.G 1842- (not illustrated)

♦ Leak detection spray (commercially available)

Procedure

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Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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:

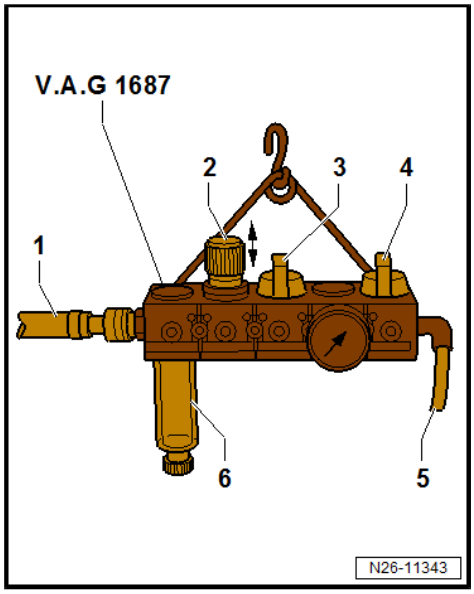
– Unscrew pressure control valve -2- completely and close valves -3, 4-.

• Make sure knob is pulled out before turning pressure control valve.

– 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- (refer to ⇒ operating manual).

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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.

– Release pressure in test circuit by detaching hose coupling from adapter before removing adapter.

Attaching

Assembly is performed in reverse sequence; note the following:

• Renew seal and O-rings after removal.

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

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 21 ; Charge air system; Checking charge air system for leaks

24 – Mixture preparation - injection

1 Injection system

All components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Injection system .

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2 Vacuum system

⇒ “2.1 Connection diagram - vacuum system”, page 282

⇒ “2.2 Checking vacuum system”, page 284

2.1 Connection diagram - vacuum system

⇒ “2.1.1 Connection diagram - vacuum system, vehicles with 2.9 ltr. engine without electric compressor”, page 282

⇒ “2.1.2 Connection diagram - vacuum system, vehicles with 2.9 ltr. engine with electric compressor”, page 283

⇒ “2.1.3 Connection diagram - vacuum system, vehicles with 3.0 ltr. engine”, page 283

2.1.1 Connection diagram - vacuum system, vehicles with 2.9 ltr. engine without electric compressor

Caution

Risk of engine malfunctions

- *When routing vacuum lines, make sure they are not kinked, twisted or crushed.*

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1 - Coolant valve for cylinder block - N545-

2 - Coolant pump

3 - Switch valve for mechanical coolant pump - N649-

4 - Vacuum unit

- ❑ For turbocharger, cylinder bank 1 (right-side)

5 - Vacuum unit

- ❑ For turbocharger, cylinder bank 2 (left-side)

6 - Charge pressure control solenoid valve - N75-

7 - Vacuum pump

8 - To brake servo

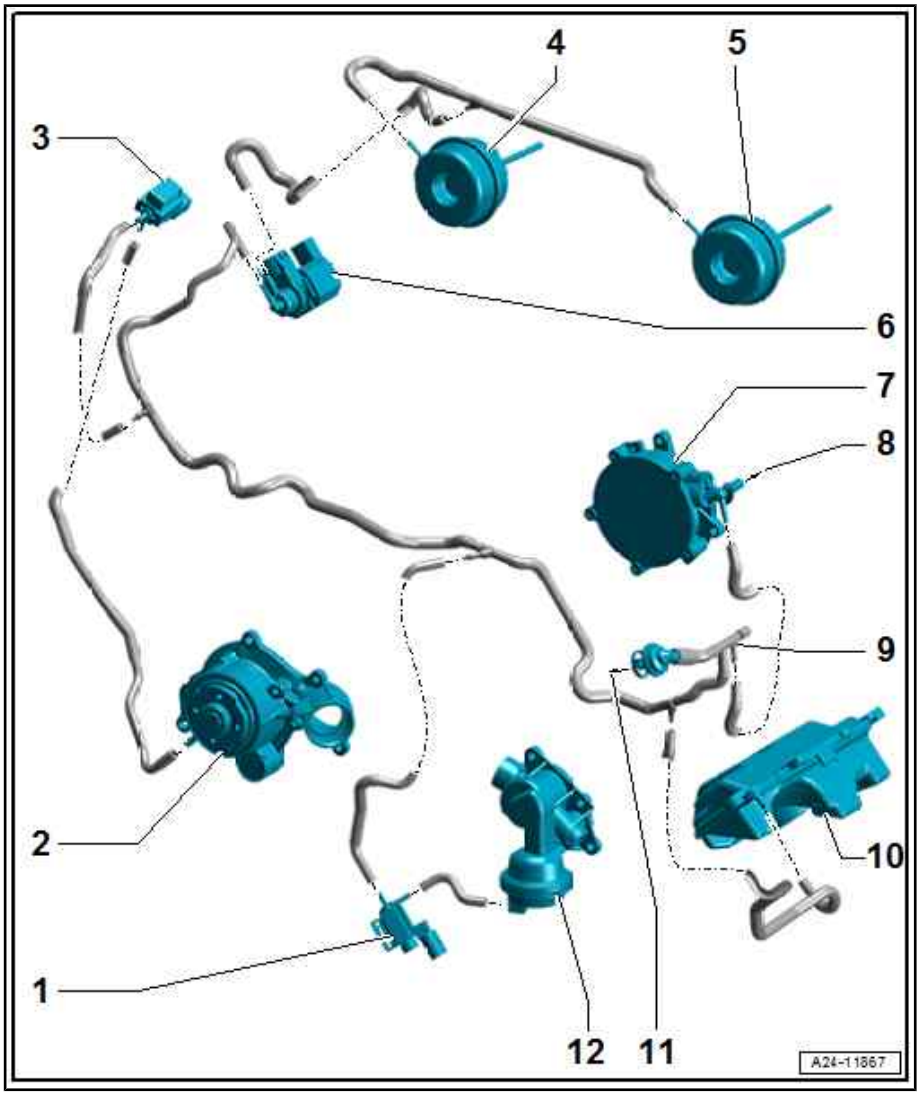
9 - Vacuum connecting piece

- ❑ With non-return valve

10 - Vacuum reservoir

11 - To air pipe

12 - Coolant shut-off valve



2.1.2 Connection diagram - vacuum system, vehicles with 2.9 ltr. engine with electric compressor

All components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Vacuum system; Connection diagram - vacuum system .

2.1.3 Connection diagram - vacuum system, vehicles with 3.0 ltr. engine

Caution

Risk of engine malfunctions

- ***When routing vacuum lines, make sure they are not kinked, twisted or crushed.***

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1 - Coolant valve for cylinder block - N545-

2 - Coolant pump

3 - Switch valve for mechanical coolant pump - N649-

4 - Charge pressure control solenoid valve - N75-

5 - Vacuum unit

- ❑ For turbocharger

6 - Vacuum reservoir

7 - To brake servo

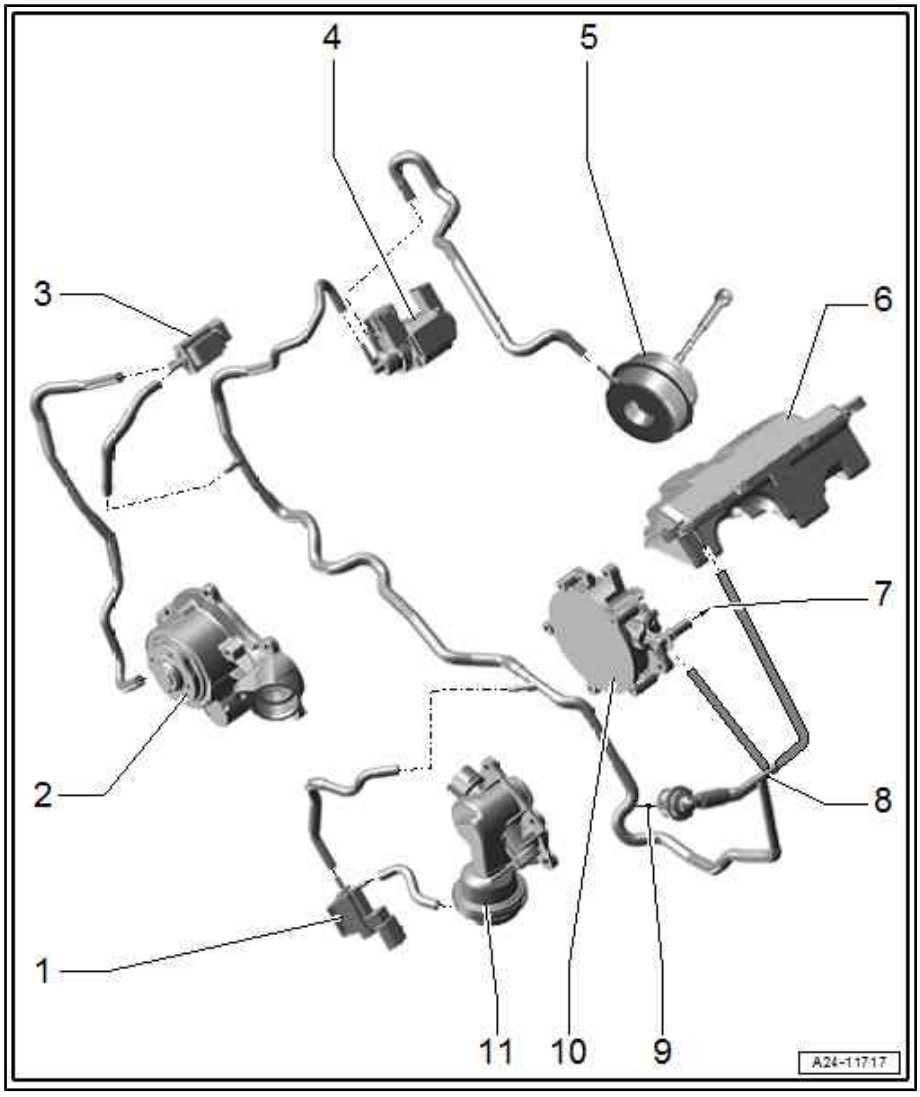
8 - Vacuum connecting piece

- ❑ With non-return valve

9 - To air pipe

10 - Vacuum pump

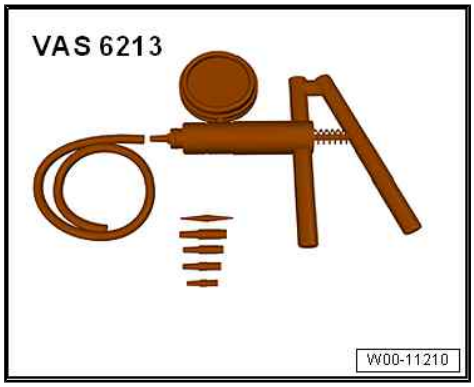
11 - Coolant shut-off valve



2.2 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

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- ♦ 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 a vacuum with the hand vacuum pump - VAS 6213- or if the vacuum pressure drops again immediately, check the hand vacuum pump and connecting hoses for leaks.

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3 Air cleaner

All procedures and components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner .

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4 Intake manifold

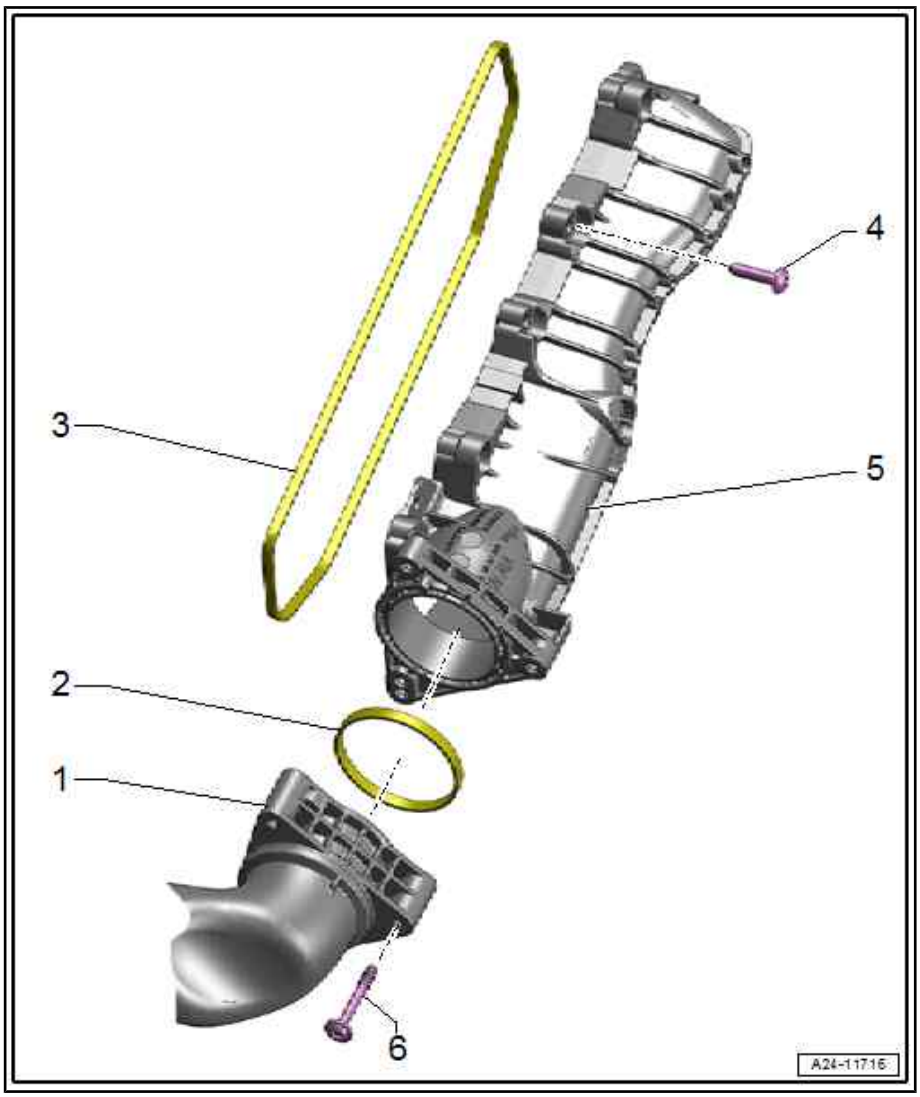
⇒ “4.1 Exploded view - intake manifold”, page 287

⇒ “4.2 Removing and installing intake manifold”, page 288

⇒ “4.3 Removing and installing throttle valve module J338 ”, page 290

⇒ “4.4 Cleaning throttle valve module”, page 290

4.1 Exploded view - intake manifold



1 - Air pipe (top)

- ❑ Exploded view ⇒ “2.1 Exploded view - charge air system”, page 259

2 - Seal

- ❑ Renew if damaged
- ❑ When renewing lever out with screwdriver
- ❑ Press in by hand

3 - Gasket

- ❑ Renew after removing

4 - Bolt

- ❑ Renew after removing
- ❑ Tightening torques and sequence:

◆ Cylinder bank 1 (right-side) ⇒ Fig. ““Intake manifold, cylinder bank 1 (right-side) - tightening torques and sequence”“ , page 288

◆ Cylinder bank 2 (left-side) ⇒ Fig. ““Intake manifold, cylinder bank 2 (left-side) - tightening torques and sequence”“ , page 288

5 - Intake manifold

- ❑ Shown for cylinder bank 2 (left-side)
- ❑ Removing and installing ⇒ “4.2 Removing and installing intake manifold”, page 288

6 - Bolt

- ❑ Tightening torques and sequence ⇒ Fig. ““Top air pipe - tightening torques and sequence”“ , page 266

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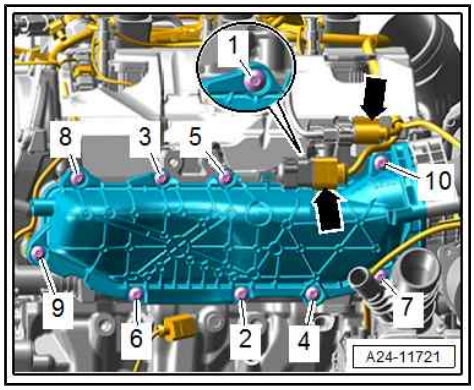
Intake manifold, cylinder bank 1 (right-side) - tightening torques and sequence

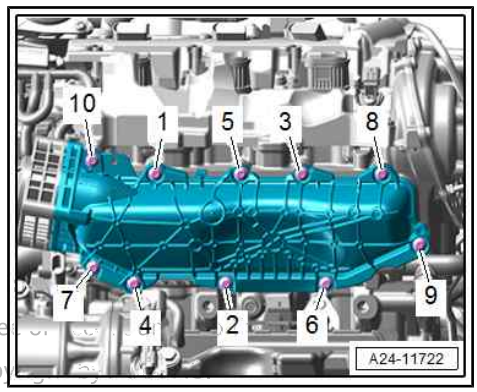


- After removing, renew bolts tightened with specified tightening angle.

– Tighten bolts in stages in the sequence shown:

Stage	Bolts	Tightening torques/angle specification
1.	-1 … 10-	2 Nm
2.	-1 … 10-	8 Nm
3.	-1 … 10-	Turn 45° further

Intake manifold, cylinder bank 2 (left-side) - tightening torques and sequence



- 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 … 10-	2 Nm
2.	-1 … 10-	8 Nm
3.	-1 … 10-	Turn 45° further

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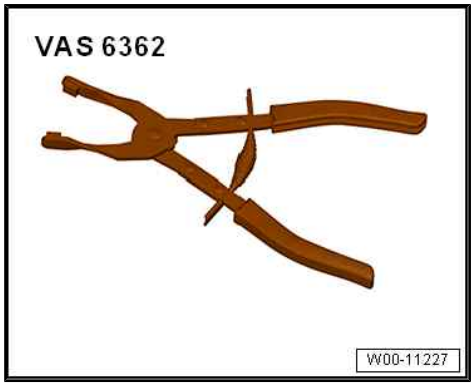
4.2 Removing and installing intake manifold

Special tools and workshop equipment required

◆ Hose clip pliers - VAS 6362-



Removing

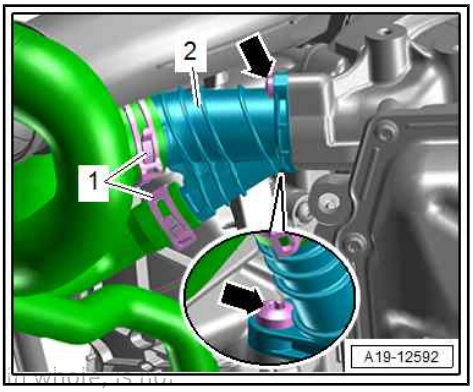
– Observe rules for cleanliness
⇒ “3.1 Rules for cleanliness”, page 6 .

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing intake manifold .

Intake manifold (cylinder bank 1, right-side):

– Release hose clips -1- and disconnect coolant hoses.

– Unscrew bolts -arrows- and remove connection -2-.



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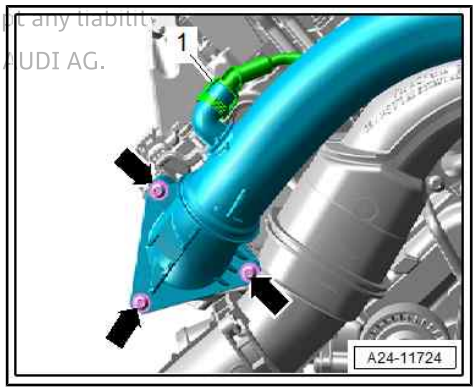
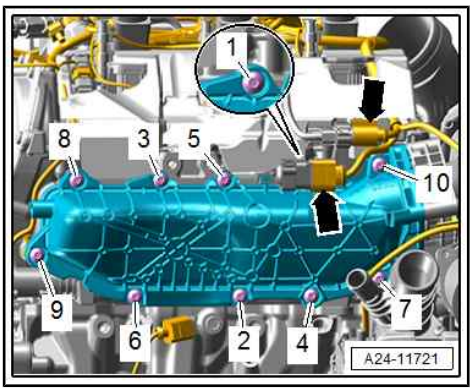
– Remove bolts -arrows- for air pipe.



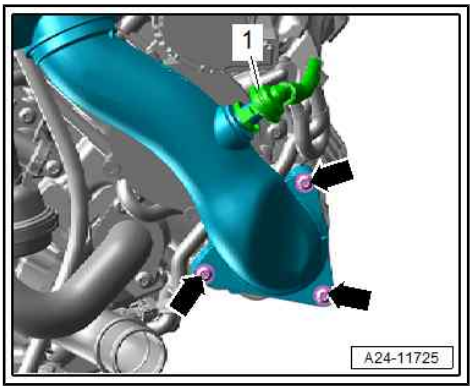
– Take electrical connectors -arrows- out of bracket and move clear to side.

– Loosen and remove bolts in the sequence: -10 ... 1- and detach intake manifold.

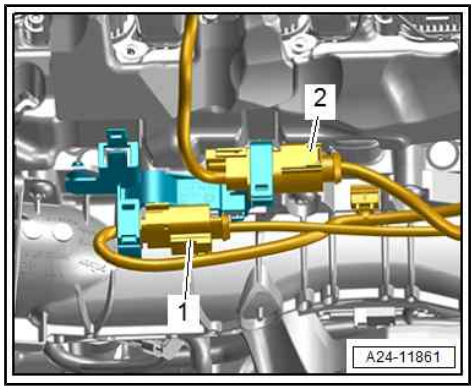


Intake manifold (cylinder bank 2, left-side):

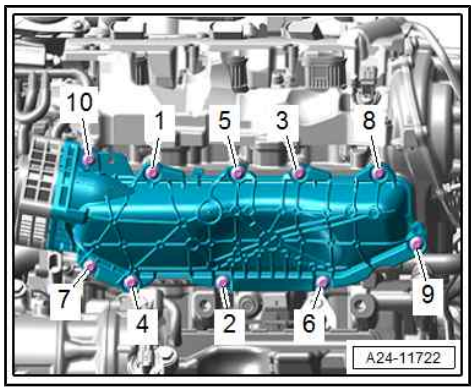
– Remove bolts -arrows- for air pipe.



– Vehicles with 2.9 ltr. engine: Detach electrical connectors -1, 2- from bracket and place to one side.



– Loosen and remove bolts in the sequence: -10 ... 1- and detach intake manifold.



Both sides (continued):

Caution

Risk of irreparable damage to engine.

- *Close off the intake ports with clean cloths to prevent small objects from dropping into the engine through the intake ports in the cylinder heads.*

Installing

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

- After removing, renew bolts tightened with specified tightening angle.
- Renew seals/gaskets after removing.

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing intake manifold

Tightening torques

- ⇒ Fig. ""Intake manifold, cylinder bank 1 (right-side) - tightening torques and sequence"" , page 288
- ⇒ Fig. ""Intake manifold, cylinder bank 2 (left-side) - tightening torques and sequence"" , page 288
- ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Exploded view - coolant pipes

4.3 Removing and installing throttle valve module - J338-

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing throttle valve module - J338- .

4.4 Cleaning throttle valve module

Carbon deposits and dirt in the limit stop can lead to incorrect adaption values.

Special tools and workshop equipment required

- Acetone (commercially available)
- Brush

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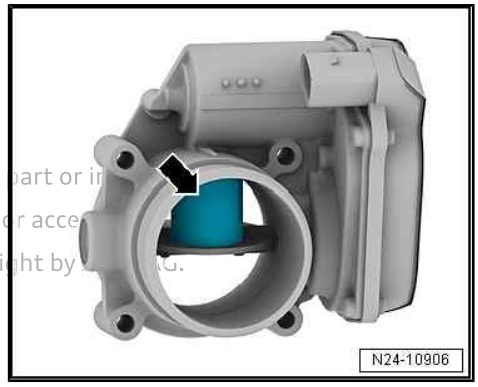
Procedure

– Remove throttle valve module - J338- ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing throttle valve module - J338- .

• Take care not to scratch the throttle valve housing when cleaning it.

– Open throttle valve by hand and lock it in open position with a wedge (plastic or wood) -arrow-.



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WARNING

Acetone is highly flammable.

- *Please observe all accident prevention regulations and safety precautions when handling flammable liquids.*
- *Do not use compressed air when cleaning the throttle valve.*
- *Wear safety goggles and protective clothing to avoid any contact with skin and risk of injury.*

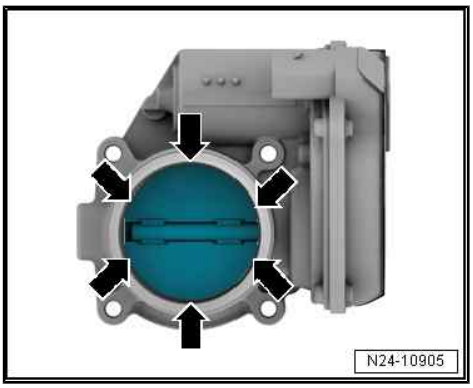
– Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.

– Wipe out throttle valve housing with a lint-free cloth.

– Allow acetone to flash off completely.

– Install throttle valve module - J338- ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Intake manifold; Removing and installing throttle valve module - J338- .

– Erase learnt values and perform adaption ⇒ Vehicle diagnostic tester.



5 Injectors

⇒ “5.1 Exploded view - fuel rail with injectors”, page 292
⇒ “5.2 Removing and installing fuel rail”, page 293
⇒ “5.3 Removing and installing injectors”, page 295
⇒ “5.4 Cleaning injectors”, page 301

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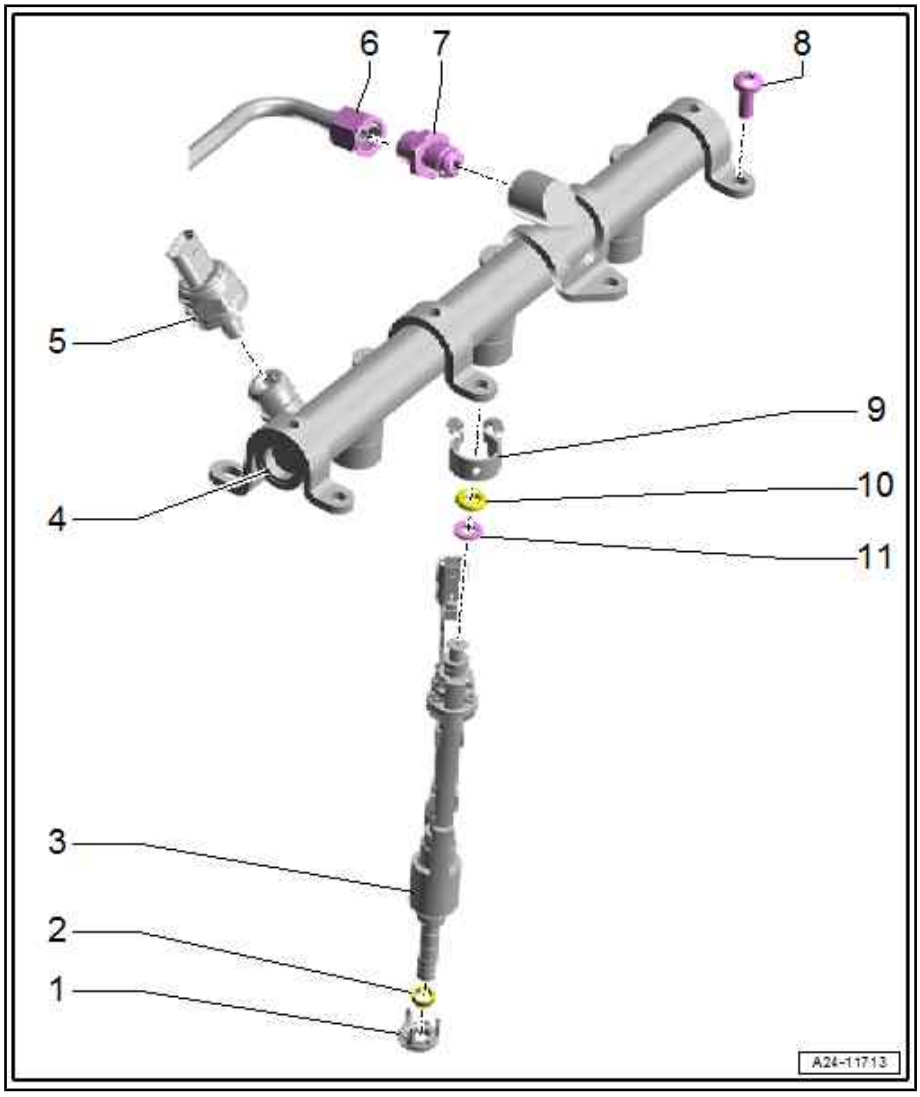
5.1 Exploded view - fuel rail with injectors



1 - Sealing washer

2 - Combustion chamber ring seal

- ❑ Renew after removing ⇒ “5.3 Removing and installing injectors”, page 295
- ❑ Do not apply grease or use any other lubricants

3 - Injector

- ❑ For 2.9 ltr. engines with noise insulation; installation position ⇒ Fig. ““Noise insulation for injector on 2.9 ltr. engine - installation position”“ , page 293
- ❑ Removing and installing ⇒ “5.3 Removing and installing injectors”, page 295
- ❑ Cleaning ⇒ “5.4 Cleaning injectors”, page 301

4 - Fuel rail

- ❑ Shown for cylinder bank 1 (right-side)
- ❑ Removing and installing ⇒ “5.2 Removing and installing fuel rail”, page 293

5 - Fuel pressure sender - G247-

- ❑ Removing and installing ⇒ “6.6 Removing and installing fuel pressure sender G247 ”, page 304
- ❑ Lubricate threads lightly with clean engine oil
- ❑ 25 Nm

6 - High-pressure pipe

- ❑ Removing and installing ⇒ “7.3 Removing and installing high-pressure pipe”, page 315
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ To loosen and tighten high-pressure pipe, counterhold at connecting piece
- ❑ Lubricate threads of union nuts with clean engine oil

♦ 1st stage: 27 Nm

♦ 2nd stage: 27 Nm

7 - Connection

- ❑ Counterhold at connecting piece when loosening high-pressure pipe
- ❑ Check secure fit before fitting high-pressure pipe
- ❑ Renew connecting piece if it is damaged or loose
- ❑ 40 Nm

8 - Bolt

- ❑ Tightening torques:

♦ 1st stage: 5 Nm

♦ 2nd stage: 9 Nm

♦ 3rd stage: 9 Nm

9 - Support ring

- ❑ Renew after removing
- ❑ Must be properly seated

10 - O-ring

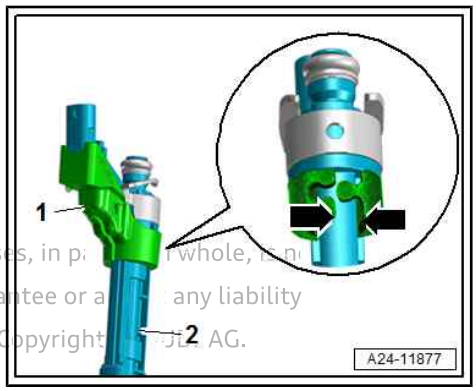
- ❑ Renew after removing
- ❑ Lubricate lightly with clean engine oil

11 - Spacer ring

- ❑ Renew after removing

Noise insulation for injector on 2.9 ltr. engine - installation position

– Attach and secure noise insulation -1- on injector -2-, as shown in illustration -arrows-.



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5.2 Removing and installing fuel rail

Observe rules for cleanliness
⇒ “3.1 Rules for cleanliness”, page 6 .

Removing fuel rail for cylinder bank 1 (right-side)

– Remove ignition coils
⇒ “1.2 Removing and installing ignition coils with output stages”, page 341 .

– Remove high-pressure pipe (right-side)
⇒ “7.3.1 Removing high-pressure pipe (right-side)”, page 315 .

– Unplug electrical connectors:

1 - For inlet cam actuator -F448- , -F452- , -F456-

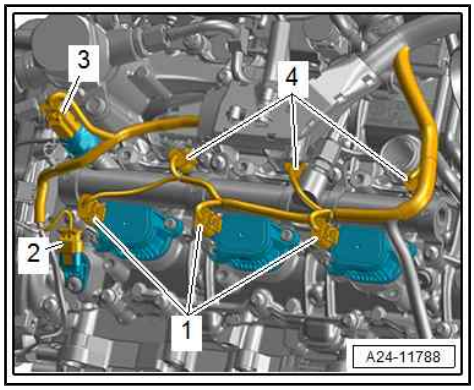
2 - For Hall sender - G40-

3 - For fuel pressure sender - G247-

4 - For injectors -N30- , -N31- , -N32-

– Detach electrical wiring harnesses and move clear to the side.

– Detach noise insulation (top section).

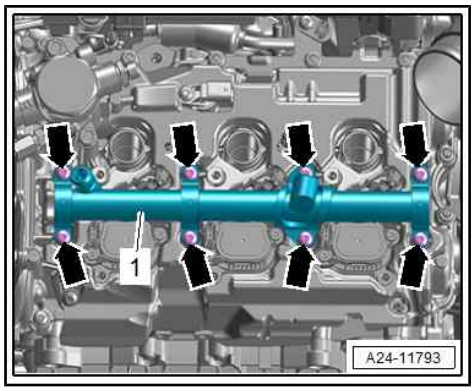


– Remove bolts -arrows-.

Caution

Risk of engine damage due to dirt.

- *Injectors must not be pulled out.*



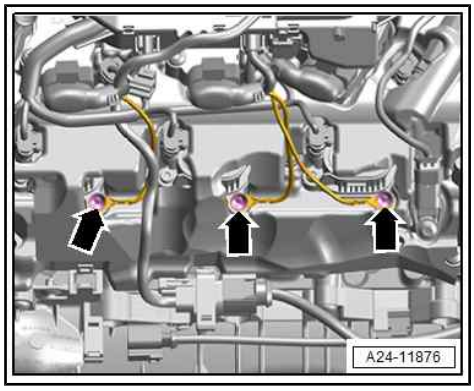
– Detach fuel rail -1- from injectors and remove.

Removing fuel rail for cylinder bank 2 (left-side)

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Injectors; Removing and installing fuel rail .

– Remove ignition coils
⇒ “1.2 Removing and installing ignition coils with output stages”, page 341 .

– Remove bolts -arrows- and move earth wiring clear.



– Unplug electrical connectors:

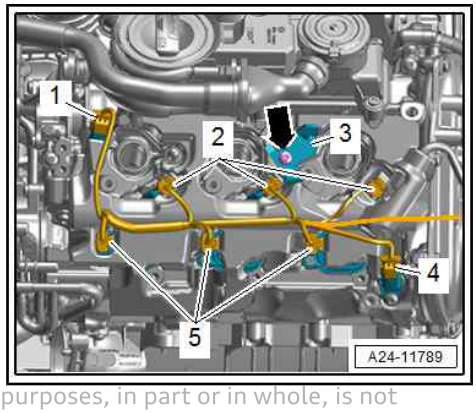
1 - For Hall sender 4 - G301-

2 - For injectors -N33- , -N83- , -N84-

4 - For Hall sender 2 - G163-

5 - For inlet cam actuator -F460- , -F464- , -F468-

– Remove bolt -arrow-, detach bracket -3- for wiring channel and noise insulation (top section).



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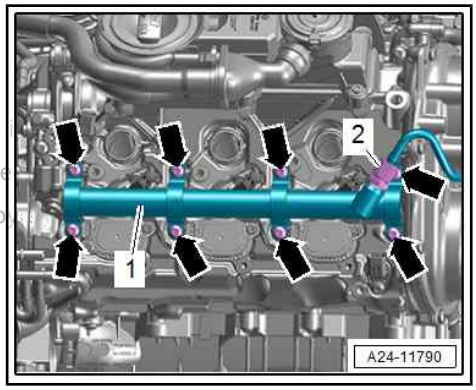
– Unscrew union nut -2- (counterhold at connecting piece).



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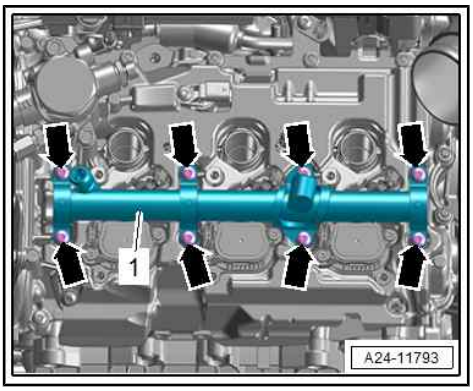
– Remove bolts -arrows-.

Caution

Risk of engine damage due to dirt.

- *Injectors must not be pulled out.*



– Detach fuel rail -1- from injectors and remove.

Installing

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

- Renew O-rings after removing.

– Fit noise insulation (top section).

– Install high-pressure pipe
⇒ “7.3 Removing and installing high-pressure pipe”, page 315 .

– Install ignition coils
⇒ “1.2 Removing and installing ignition coils with output stages”, page 341 .

– Install throttle valve module - J338-
⇒ “4.3 Removing and installing throttle valve module J338 ”, page 290 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Injectors; Removing and installing fuel rail

Tightening torques

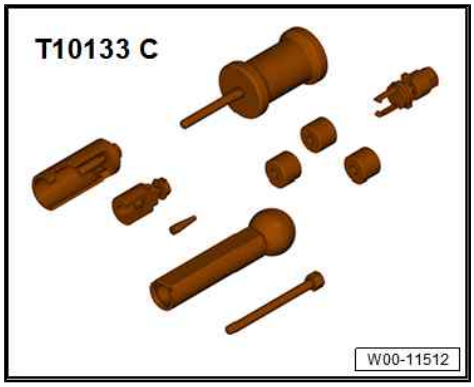
- ⇒ “5.1 Exploded view - fuel rail with injectors”, page 292

5.3 Removing and installing injectors

Special tools and workshop equipment required

- Spark plug socket, 3/8" - VAS 6919- (not illustrated)

- Tool set for FSI engines - T10133 C-



- Adapters - T40012-

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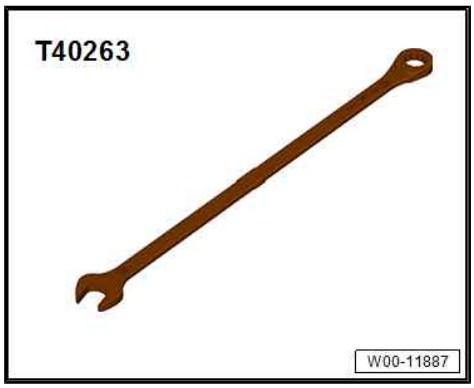
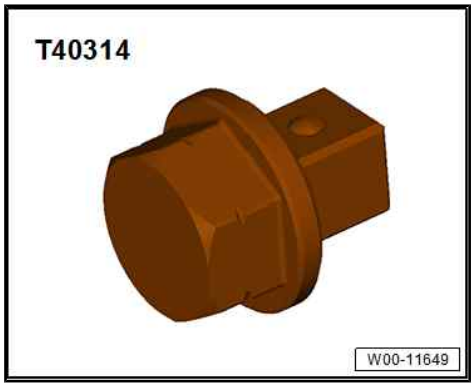
- Wrench, 21 mm - T40263-



- Adapter - T40314-

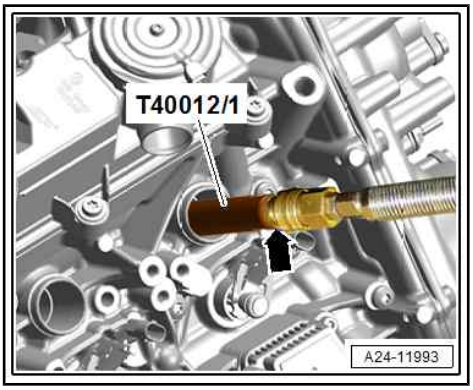


- Special tool -T90006- (not illustrated)

Removing

– Remove relevant fuel rail
⇒ “5.2 Removing and installing fuel rail”, page 293 .

– Unscrew relevant spark plug using spark plug socket, 3/8" - VAS 6919- .
– Screw adapter - T40012/1- with seal hand-tight into the corresponding spark plug thread.
– Connect adapter to compressed air line using a commercially available connection piece -arrow- and apply constant air pressure.
• Pressure: 1 bar

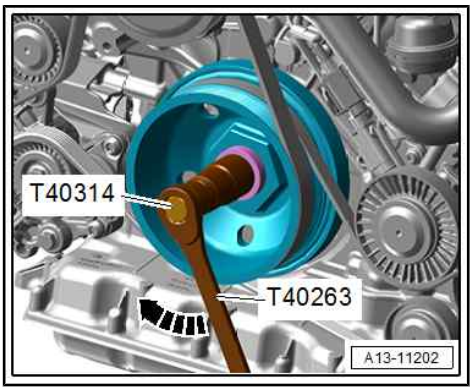


Caution

Irreparable engine damage can be caused if the camshaft timing chains slip.

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

– Use wrench, 21 mm - T40263- and adapter - T40314- to turn crankshaft -arrow- until valves in corresponding cylinder close.
• Air will not escape audibly.
• Pressure of 1 bar is maintained.

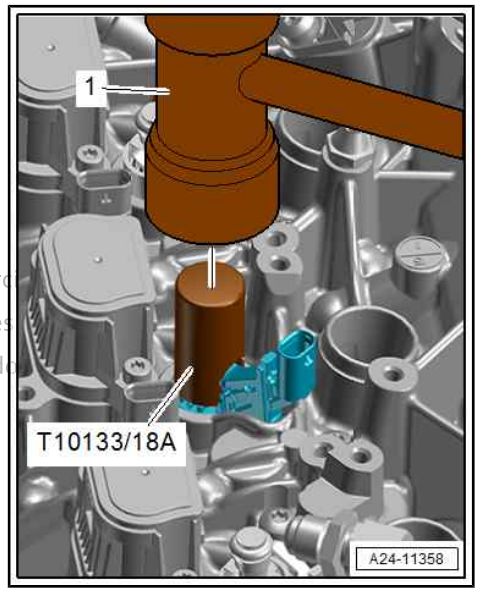


– Detach support ring.
– Slide sleeve -T10133/18A- over injector.
– Carefully knock against stop sleeve several times with a soft-faced hammer -1- to loosen injector.
– Pull off injector as described below.

WARNING

Risk of eye injury due to dirt particles. The pressure in the cylinder causes dirt to be blown out when the injector is pulled off.

- *Put on safety goggles.*



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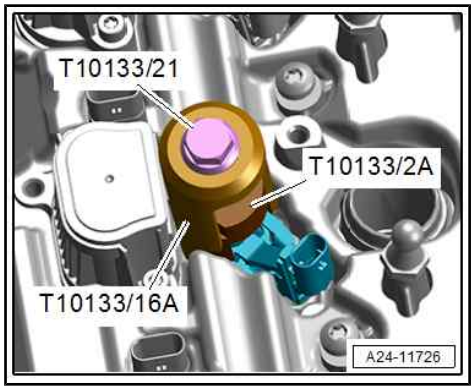
- Use a torque wrench to pull out injector.

– Set torque wrench to 5 Nm.

– Fit puller -T10133/2A- to groove on injector.



Note

If injectors manufactured by Delphi are installed, puller -T10133/10- must be used instead of puller -T10133/2A- .

– Attach puller -T10133/16A- .

– Pull out injector by turning bolt - T10133/21- with torque wrench.

- The torque must not exceed 5 Nm to avoid irreparable damage to the injector.

– If necessary, knock again several times, as described above.

– Unscrew adapter - T40012/1- and close spark plug hole.

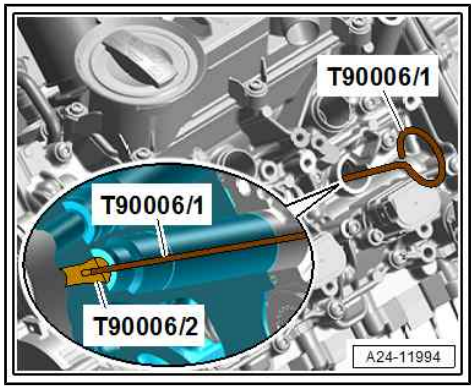
– Insert adapter -T90006/2- with handle -T90006/1- into hole for injector as far as stop and unscrew handle.

– Blow dirt out of injector shaft using compressed air.

– If necessary, use brush -T90006/3- to loosen dirt.

– Screw in handle and remove adapter -T90006/2- .

– Close injector shaft.

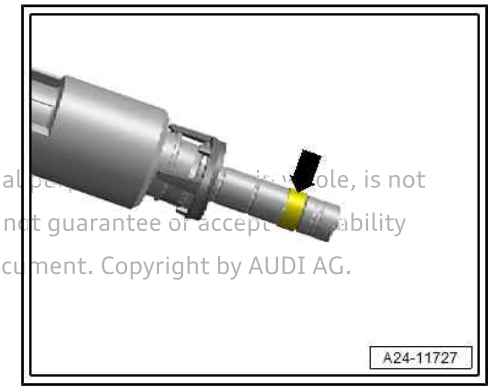


Continued:

– Remove old combustion chamber ring seal -arrow-. To do so, cut open combustion chamber ring seal using side-cutting pliers or prise open with small screwdriver and then pull off.

- Take care not to damage the groove on the injector.

– Repeat procedure for each injector.



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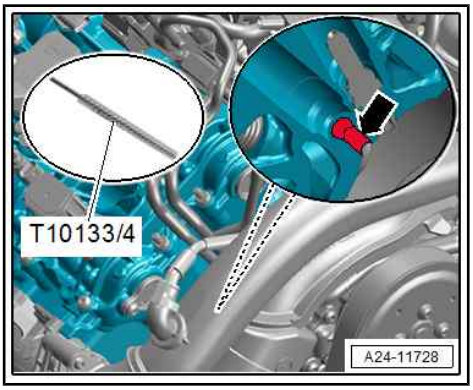
Installing

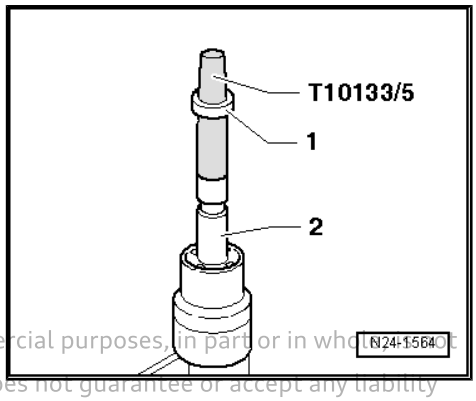
- Use complete repair set when installing.
- Renew support ring and sealing washer.
- Renew combustion chamber ring seal before re-installing injector.
- Lightly lubricate O-rings for injectors with clean engine oil.

– Clean bore -arrow- in cylinder head with nylon cylinder brush -T10133/4- .



– Before new combustion chamber ring seal is fitted, remove any combustion residue from ring groove and injector stem using a clean cloth.

– Fit assembly cone -T10133/5- with new combustion chamber ring seal -1- from repair kit onto injector -2-.



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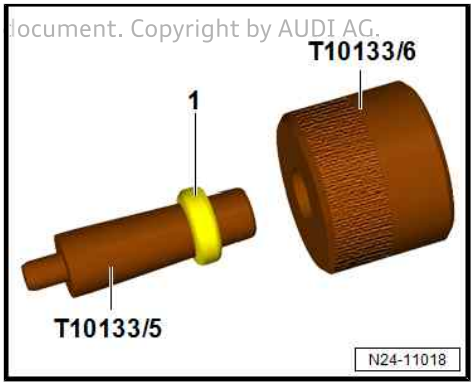
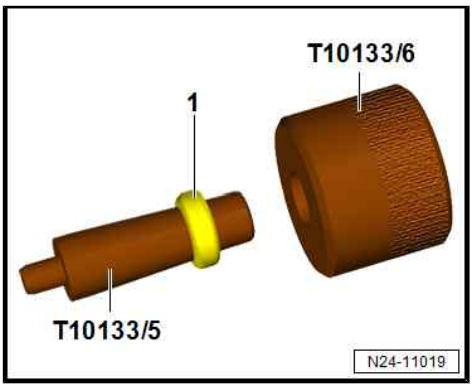
– Using assembly sleeve -T10133/6- , push combustion chamber ring seal -1- onto assembly cone -T10133/5- as far as it will go. (Knurled side of assembly sleeve faces towards combustion chamber ring seal.)



– 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.)

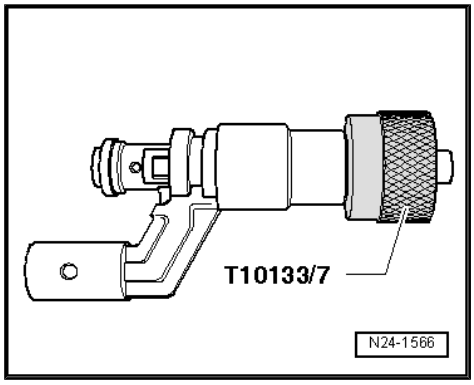


Note:

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.

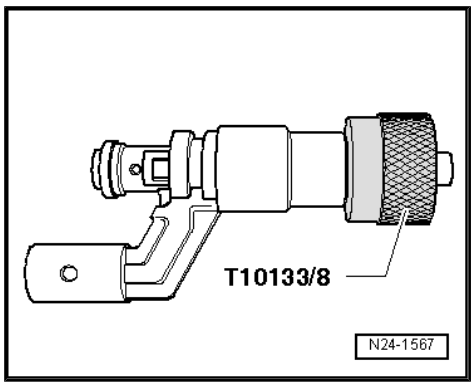
– Push calibration sleeve -T10133/7- onto injector as far as it will go and simultaneously turn it slightly (approx. 180°).

– 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.



– Fit parts from repair kit onto injector -1-:

2 - Support ring

3 - O-ring

4 - Spacer ring

5 - Sealing washer (if included in repair kit)

– To make it easier to install injector in fuel rail, lubricate new O-ring lightly with clean engine oil before installing it.

• The combustion chamber ring seal -6- must not be lubricated.

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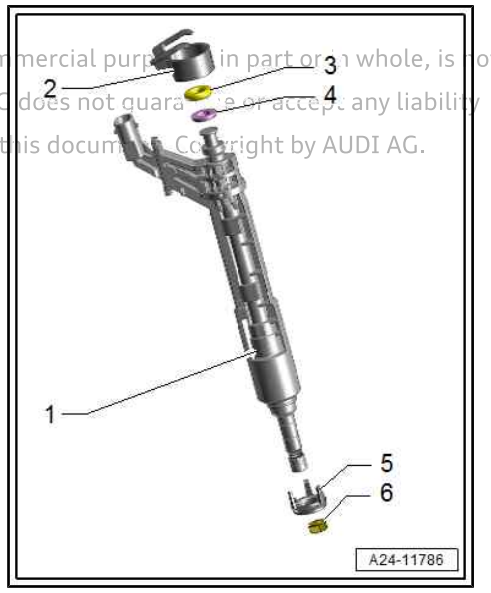
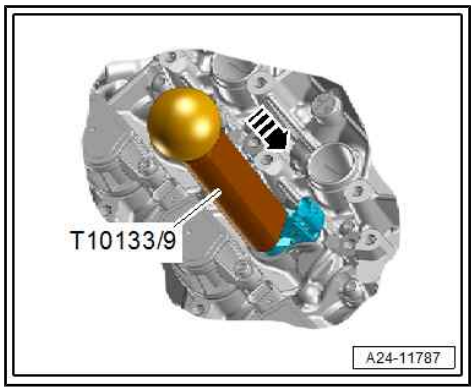


– Use assembly tool -T10133/9- to insert injector as far as it will go into hole in cylinder head; note correct installation position.

• Electrical connector of injector must engage in recess in cylinder head.

• It should be possible to insert the injector easily. If necessary wait until the combustion chamber ring seal has contracted sufficiently.



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

– Install fuel rail
⇒ “5.2 Removing and installing fuel rail”, page 293 .

5.4 Cleaning injectors

Special tools and workshop equipment required

- Ultrasonic cleaning unit - VAS 6418-
- Mounting plate for injection modules - VAS 6418/1-
- Cleaning fluid - VAS 6418/2-

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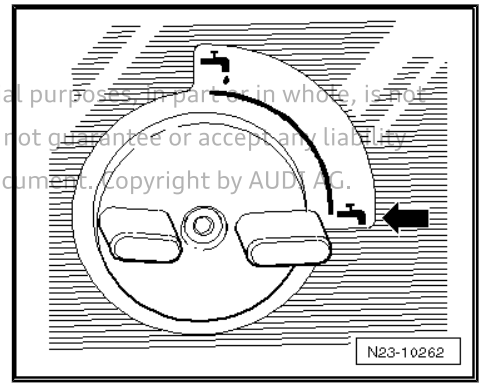
Cleaning

– Close drain tap -arrow- on ultrasonic cleaning unit - VAS 6418- (located on right side of housing).



– Fill up ultrasonic unit.

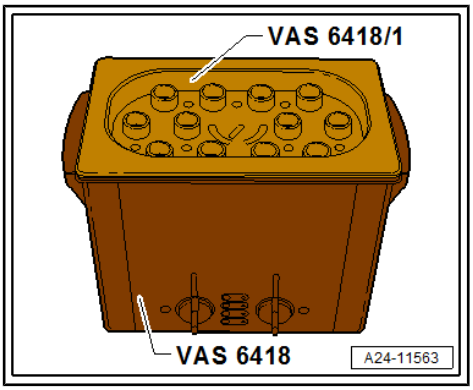
• Ratio of cleaning fluid: 2,100 ml of tap water which has been allowed to settle for a few minutes and 20 ml of cleaning fluid - VAS 6418/2-

• 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.

– Place mounting plate for injection modules - VAS 6418/1- on top of cleaning unit.

– Remove injectors ⇒ “5.3 Removing and installing injectors”, page 295 .

– Remove combustion chamber ring seal ⇒ page 299 .



• It is important to read the safety notes in the operating instructions before switching on the ultrasonic cleaning unit - VAS 6418- .

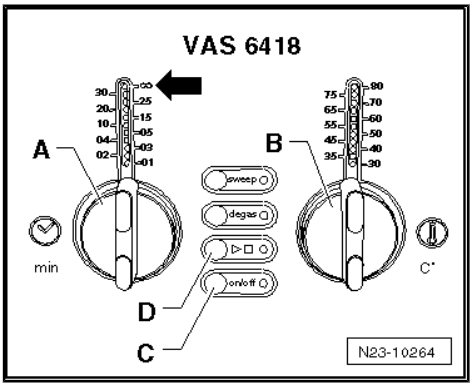
– Insert injectors all the way into guides of mounting plate for injection modules - VAS 6418/1- .

– 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.



• 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 ⇒ “5.3 Removing and installing injectors”, page 295 .

6 Senders and sensors

⇒ “6.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound”, page 302

⇒ “6.2 Exploded view - pressure differential sender”, page 302

⇒ “6.3 Removing and installing actuator for structure-borne sound R214 ”, page 304

⇒ “6.4 Removing and installing control unit for structure-borne sound J869 ”, page 304

⇒ “6.5 Removing and installing intake air temperature sender G42 / intake manifold pressure sender G71 ”, page 304

⇒ “6.6 Removing and installing fuel pressure sender G247 ”, page 304

⇒ “6.7 Removing and installing fuel pressure sender for low pressure G410 ”, page 305

⇒ “6.8 Removing and installing pressure differential sender”, page 306

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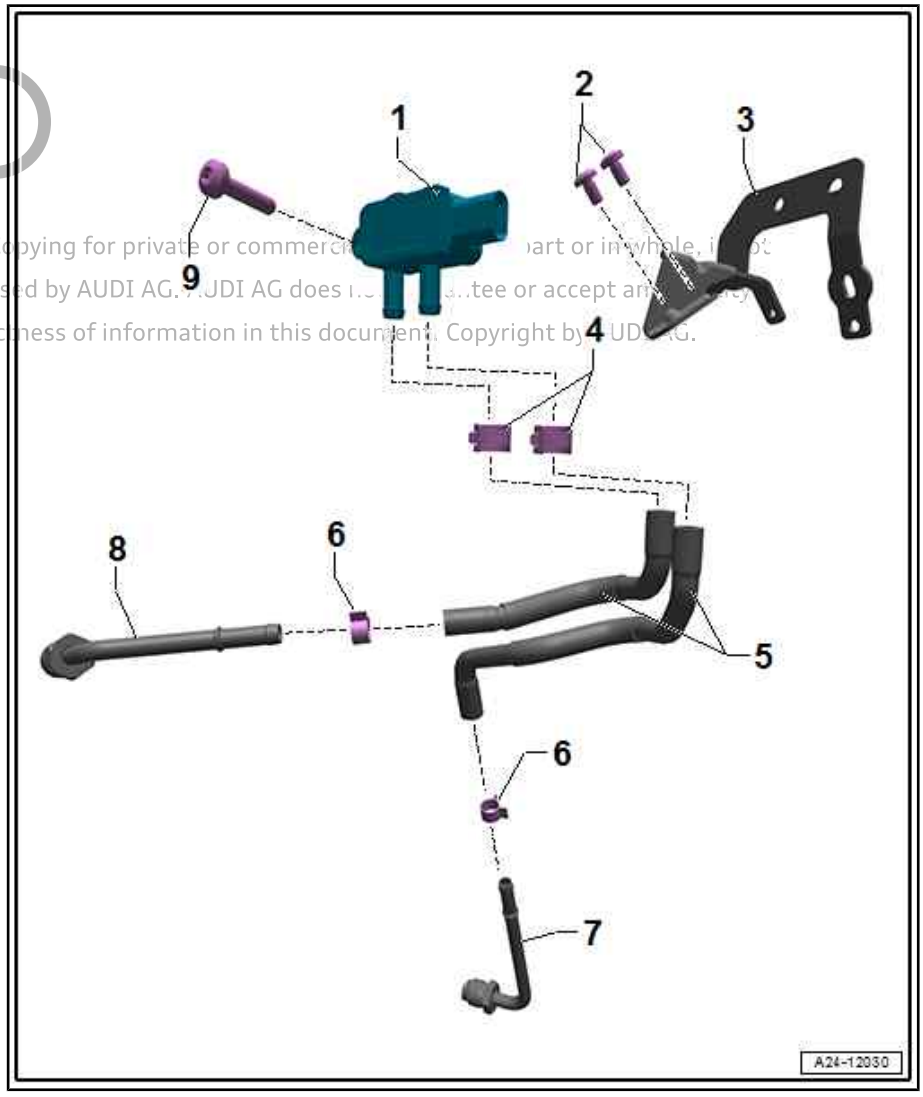
6.1 Exploded view - actuator for structure-borne sound and control unit for structure-borne sound

All components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Senders and sensors; Exploded view - actuator for structure-borne sound and control unit for structure-borne sound .

6.2 Exploded view - pressure differential sender



1 - Pressure differential sender for particulate filter

- ❑ 2.9 ltr. engine:
- ♦ Cylinder bank 1 (right-side): pressure differential sender for particulate filter - G1037-
- ♦ Cylinder bank 2 (left-side): pressure differential sender 2 for particulate filter - G1038-
- ❑ 3.0 ltr. engine:
- ♦ Pressure differential sender for particulate filter - G1037-
  - ❑ Removing and installing ⇒ “6.8 Removing and installing pressure differential sender”, page 306

2 - Bolts

- ❑ 8 Nm

3 - Bracket

- ❑ Removing and installing ⇒ “6.8.4 Removing and installing bracket for pressure differential sender for particulate filter”, page 309

4 - Clamps

5 - Hoses

6 - Clamps

7 - Line

- ❑ Installation position ⇒ Fig. ““Fitting location of lines for pressure differential sender for particulate filter -G1037- - vehicles with 3.0 ltr. engine”“ , page 304
- ❑ Installation position on Audi Q7/Q8 ⇒ Fig. ““Fitting location of lines for pressure differential sender for particulate filter -G1037- - Q7/Q8 with 3.0 ltr. engine”“ , page 304
- ❑ Removing and installing ⇒ “6.8.2 Removing and installing lines for pressure differential sender for particulate filter”, page 306
- ❑ 45 Nm

8 - Line

- ❑ Installation position ⇒ Fig. ““Fitting location of lines for pressure differential sender for particulate filter -G1037- - vehicles with 3.0 ltr. engine”“ , page 304
- ❑ Installation position on Audi Q7/Q8 ⇒ Fig. ““Fitting location of lines for pressure differential sender for particulate filter -G1037- - Q7/Q8 with 3.0 ltr. engine”“ , page 304
- ❑ Removing and installing ⇒ “6.8.2 Removing and installing lines for pressure differential sender for particulate filter”, page 306
- ❑ 45 Nm

9 - Bolt

- ❑ 8 Nm

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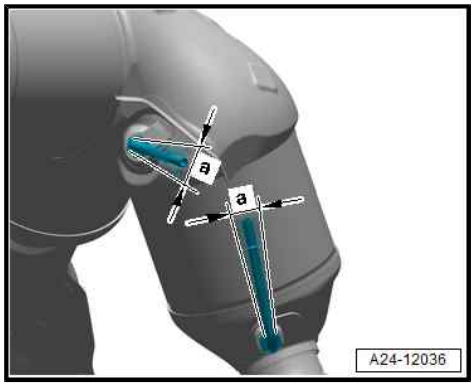
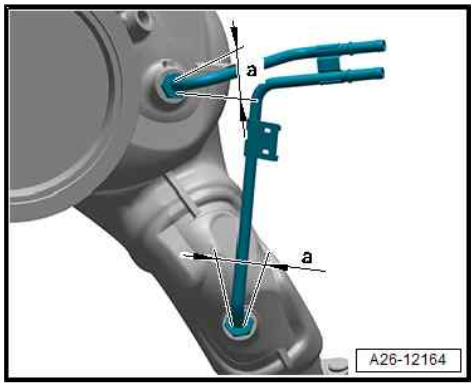
Fitting location of lines for pressure differential sender for particulate filter - G1037- - vehicles with 3.0 ltr. engine

- Pressure differential lines must be in area -a- shown in illustration.



Fitting location of lines for pressure differential sender for particulate filter - G1037- - Q7/Q8 with 3.0 ltr. engine

- Pressure differential lines must be in area -a- shown in illustration.



6.3 Removing and installing actuator for structure-borne sound - R214-

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Senders and sensors ; Removing and installing actuator for structure-borne sound - R214- .

6.4 Removing and installing control unit for structure-borne sound - J869-

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Senders and sensors ; Removing and installing control unit for structure-borne sound - J869- .

6.5 Removing and installing intake air temperature sender - G42- / intake manifold pressure sender - G71-

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Senders and sensors; Removing and installing intake air temperature sender - G42- / intake manifold pressure sender - G71- .

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6.6 Removing and installing fuel pressure sender - G247-

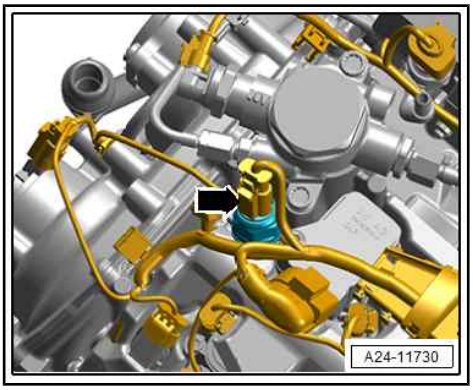
Special tools and workshop equipment required

♦ Socket, 24 mm -T40363- (not illustrated)

Removing

– Observe rules for cleanliness
⇒ “3.1 Rules for cleanliness”, page 6 .

– 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).*

– Wrap a clean cloth around connection and unscrew fuel pressure sender - G247- using socket, 24 mm -T40363- .

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Installing

Installation is carried out in reverse sequence.

Tightening torques

◆ ⇒ “5.1 Exploded view - fuel rail with injectors”, page 292

6.7 Removing and installing fuel pressure sender for low pressure - G410-

Special tools and workshop equipment required

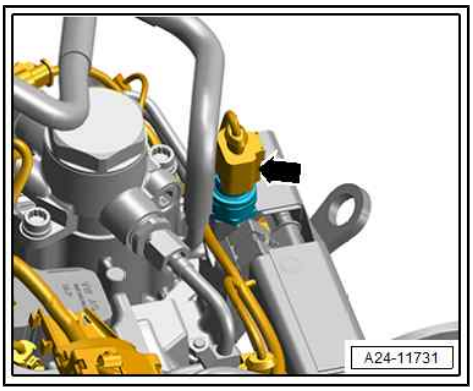
◆ Socket, 24 mm -T40363- (not illustrated)

Removing

– Observe rules for cleanliness
⇒ “3.1 Rules for cleanliness”, page 6 .

– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Unplug electrical connector -arrow-.



– Unscrew fuel pressure sender for low pressure - G410- using socket, 24 mm -T40363- (counterhold at connection).

Installing

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

– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

Tightening torques

◆ ⇒ “7.1 Exploded view - high-pressure pump”, page 310

6.8 Removing and installing pressure differential sender

⇒ “6.8.1 Removing and installing pressure differential sender for particulate filter”, page 306

⇒ “6.8.2 Removing and installing lines for pressure differential sender for particulate filter”, page 306

⇒ “6.8.3 Removing and installing lines for pressure differential sender for particulate filter - Q7/Q8”, page 308

⇒ “6.8.4 Removing and installing bracket for pressure differential sender for particulate filter”, page 309

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6.8.1 Removing and installing pressure differential sender for particulate filter

Removing

- Reinstall heat insulation sleeves in the same locations when installing.

– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– If fitted, open heat shield sleeve.

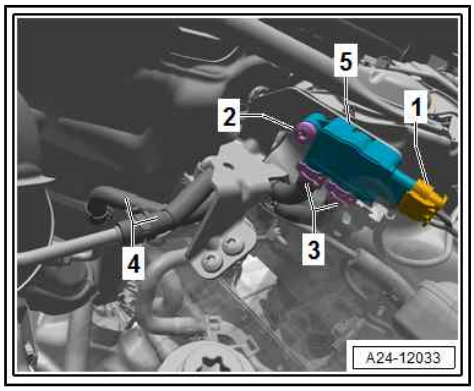
– Unplug electrical connector -1-.

– Remove bolt -2-.

– Loosen clamps -3-.

– Disconnect hoses -4-.

– Remove pressure differential sender for particulate filter -5-. (Shown on vehicle with 3.0 ltr. engine.)



Installing

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

– Blow through hoses (towards particulate filter) with compressed air.

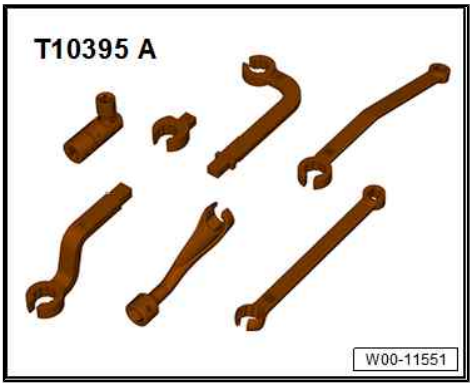
Tightening torques

◆ ⇒ “6.2 Exploded view - pressure differential sender”, page 302

6.8.2 Removing and installing lines for pressure differential sender for particulate filter

Special tools and workshop equipment required

- Tool set - T10395A-



Removing

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– Remove engine cover panel and heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

2.9 ltr. engine:

– Lines (right-side): Remove plenum chamber partition panel ⇒ General body repairs, exterior; Rep. gr. 50 ; Bulkhead; Removing and installing plenum chamber partition panel .

– Lines (left-side): Remove noise insulation (rear): ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

All versions (continued):

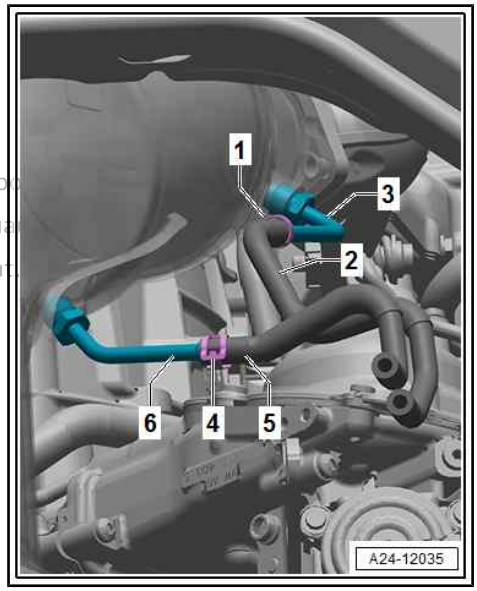
– If necessary, remove bracket for pressure differential sender for particulate filter - G1037- ⇒ “6.8.4 Removing and installing bracket for pressure differential sender for particulate filter”, page 309 .

Caution

The exhaust system can become extremely hot. This can cause injuries. Danger of burns to hands and other parts of the body.

- *Allow exhaust system to cool down.*

– Loosen clamps -1- and -4-.
– Disconnect hoses -2- and -5-.
– Detach lines -3- and -6- using suitable tool(s) from tool set - T10395A- . (Shown on vehicle with 3.0 ltr. engine.)



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Installing

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

– Vehicles with 3.0 ltr. engine: Observe installation position ⇒ Fig. ""Fitting location of lines for pressure differential sender for particulate filter -G1037- - vehicles with 3.0 ltr. engine"" , page 304 .
– Blow through hoses and lines with compressed air.
– Coat threads of lines with high-temperature paste ⇒ Electronic parts catalogue (ETKA) .

• High-temperature paste must not get into lines.

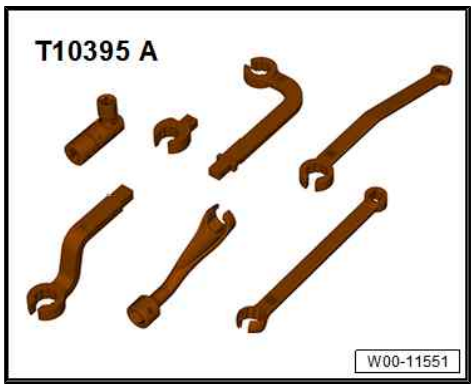
Tightening torques

♦ ⇒ “6.2 Exploded view - pressure differential sender”, page 302

6.8.3 Removing and installing lines for pressure differential sender for particulate filter - Q7/Q8

Special tools and workshop equipment required

♦ Tool set - T10395A-



Removing

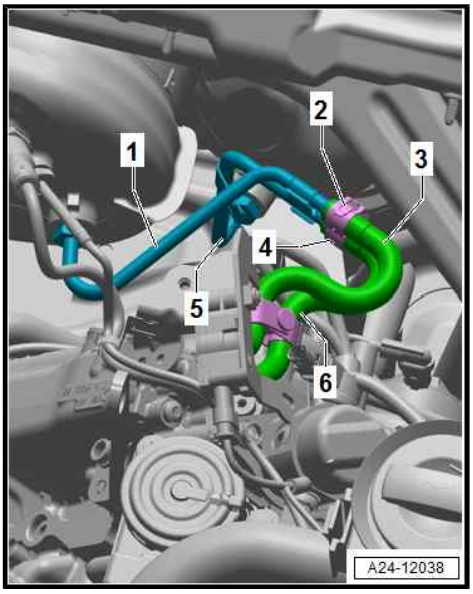
– Remove bracket for pressure differential sender for particulate filter - G1037- ⇒ “6.8.4 Removing and installing bracket for pressure differential sender for particulate filter”, page 309 .

Caution

The exhaust system can become extremely hot. This can cause injuries. Danger of burns to hands and other parts of the body.

♦ *Allow exhaust system to cool down.*

– Loosen clamps -2- and -4-.
– Disconnect hoses -3- and -6-.
– Detach lines -1- and -5- using suitable tool(s) from tool set -T10395A- .



Installing

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

– Vehicles with 3.0 ltr. engine: Observe installation position ⇒ Fig. ""Fitting location of lines for pressure differential sender for particulate filter -G1037- - Q7/Q8 with 3.0 ltr. engine"" , page 304 .
– Blow through hoses and lines with compressed air.
– Coat threads of lines with high-temperature paste ⇒ Electronic parts catalogue (ETKA) .

• High-temperature paste must not get into lines.

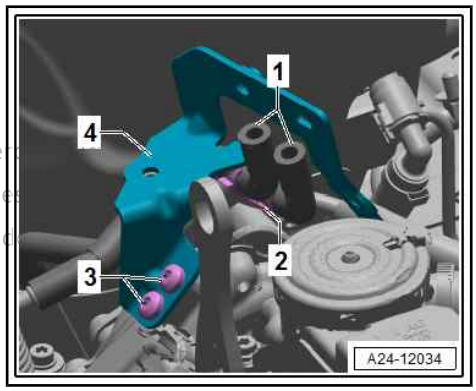
Tightening torques

◆ ⇒ "6.2 Exploded view - pressure differential sender", page 302

6.8.4 Removing and installing bracket for pressure differential sender for particulate filter

Removing

– Remove pressure differential sender for particulate filter -G1037- ⇒ "6.8.1 Removing and installing pressure differential sender for particulate filter", page 306 .
– Detach hoses -1- from retainer -2-. (Shown on vehicle with 3.0 ltr. engine.)
– Remove bolts -3-.
– Detach bracket -4-.



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Installing

Installation is carried out in reverse sequence.

Tightening torques

◆ ⇒ "6.2 Exploded view - pressure differential sender", page 302

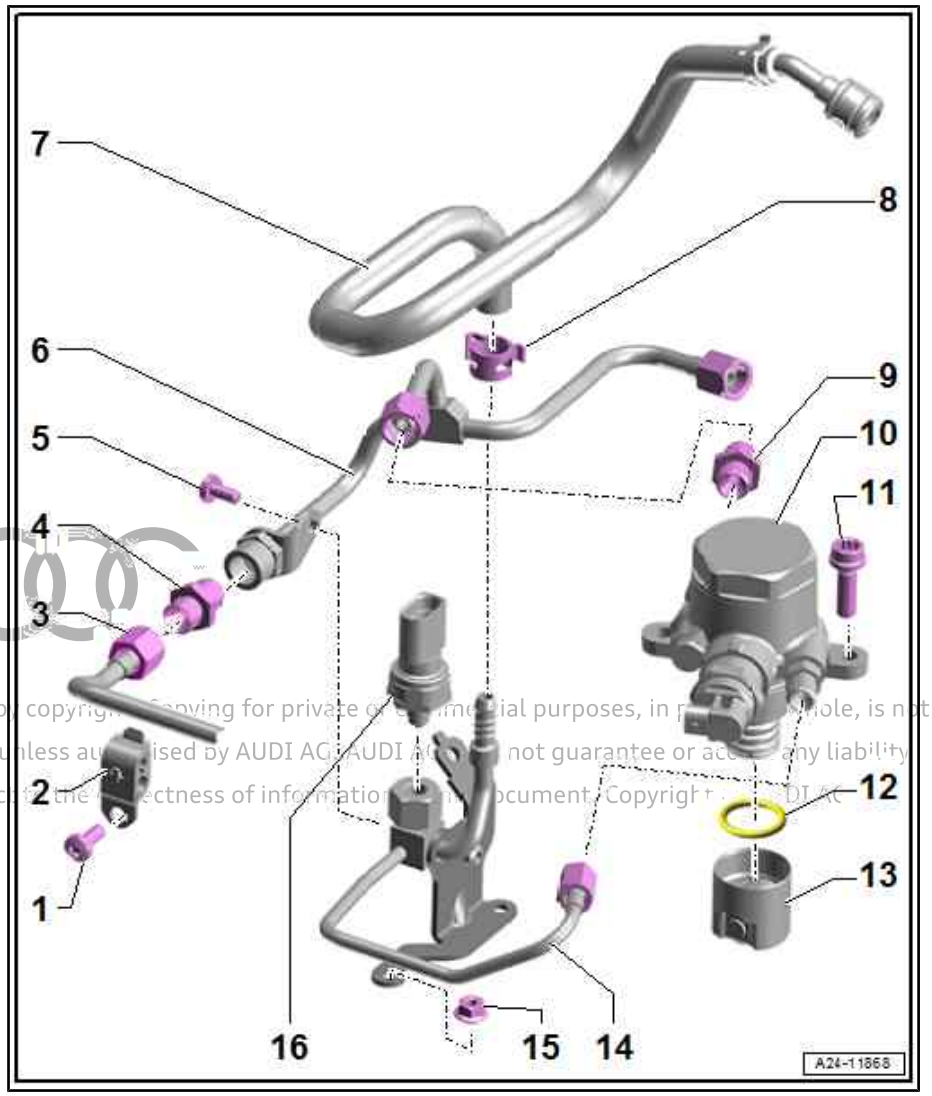
7 High-pressure pump

⇒ “7.1 Exploded view - high-pressure pump”, page 310

⇒ “7.2 Removing and installing high-pressure pump”, page 313

⇒ “7.3 Removing and installing high-pressure pipe”, page 315

7.1 Exploded view - high-pressure pump



1 - Bolt

- ❑ Renew after removing
- ❑ Tightening torque and sequence ⇒ Fig. ““High-pressure pipe (rear) - tightening torques and sequence”“ , page 312

2 - Retaining clamp

3 - High-pressure pipe (rear)

- ❑ Removing and installing ⇒ “7.3 Removing and installing high-pressure pipe”, page 315
- ❑ Counterhold at connecting piece when loosening high-pressure pipe
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ Tightening torques and sequence ⇒ Fig. ““High-pressure pipe (rear) - tightening torques and sequence”“ , page 312

4 - Connection

- ❑ Counterhold at connecting piece when loosening high-pressure pipe
- ❑ Check secure fit before fitting high-pressure pipe (40 Nm)
- ❑ Renew connecting piece if it is damaged or loose
- ❑ Tightening torque for new connecting piece: 65 Nm

5 - Bolt

- ❑ 9 Nm

6 - High-pressure pipe (right-side)

- ❑ Removing and installing ⇒ “7.3.1 Removing high-pressure pipe (right-side)”, page 315
- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ To loosen and tighten high-pressure pipe, counterhold at pipe connection
- ❑ Lubricate threads of union nuts with clean engine oil

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- ❑ Tightening torques and sequence
  ⇒ Fig. ""High-pressure pipe (right-side) - tightening torques and sequence"" , page 312

7 - Fuel hose (low-pressure section)

- ❑ Renew if disconnected from fuel pipe (low-pressure section) ⇒ Item 14 (page 311)

8 - Spring-type clip

- ❑ Renew after removing

9 - Connection

- ❑ Counterhold at connecting piece when loosening high-pressure pipe
- ❑ Check secure fit before fitting high-pressure pipe (40 Nm)
- ❑ Renew connecting piece if it is damaged or loose
- ❑ Tightening torque for new connecting piece: 65 Nm

10 - High-pressure pump

- ❑ With fuel metering valve - N290-
- ❑ Do not dismantle
- ❑ Removing and installing ⇒ "7.2 Removing and installing high-pressure pump", page 313

11 - Bolt

- ❑ Renew after removing
- ❑ Tightening torques and sequence
  ⇒ Fig. ""High-pressure pump - tightening torques and sequence"" , page 312

12 - O-ring

- ❑ Renew after removing
- ❑ Lubricate lightly with clean engine oil before installing

13 - Roller tappet

- ❑ Can only be installed in one position
- ❑ Lubricate lightly with clean engine oil before installing

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14 - Fuel pipe (low-pressure section)

- ❑ Do not alter shape
- ❑ Check for damage before re-installing
- ❑ To loosen and tighten high-pressure pipe, counterhold at pipe connection
- ❑ Lubricate threads of union nuts with clean engine oil
- ❑ Tightening torques and sequence
  ⇒ Fig. ""Fuel pipe (low-pressure section) - tightening torques and sequence"" , page 313

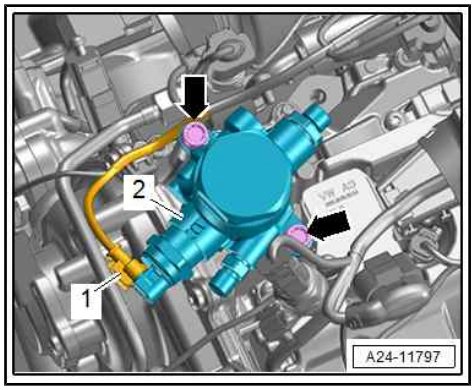
15 - Nut

- ❑ Tightening torque and sequence
  ⇒ Fig. ""Fuel pipe (low-pressure section) - tightening torques and sequence"" , page 313

16 - Fuel pressure sender for low pressure - G410-

- ❑ Removing and installing
  ⇒ "6.7 Removing and installing fuel pressure sender for low pressure G410 ", page 305
- ❑ 15 Nm

High-pressure pump - tightening torques and sequence

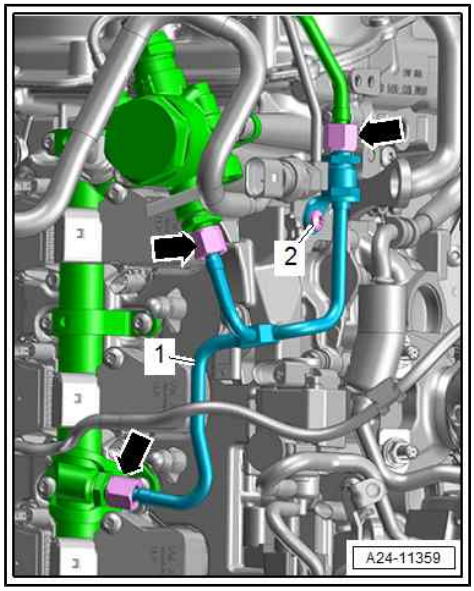


- After removing, renew bolts tightened with specified tightening angle.

– To prevent flange of high-pressure pump from being deformed during installation, fit bolts -arrows- in stages as follows:

Stage	Procedure/tightening torques/angle specification
1.	Screw in by hand until contact is made
2.	Tighten one turn alternately until flange of high-pressure pump makes contact with camshaft housing
3.	5 Nm
4.	20 Nm
5.	Turn 45° further

High-pressure pipe (right-side) - tightening torques and sequence



- Lubricate threads of union nuts with clean engine oil
- Counterhold at connecting piece when tightening union nuts -arrows-.

– Tighten bolts and union nuts in stages as follows:

Stage	Bolts/union nuts	Tightening torques
1.	-arrows-	5 Nm
2.	-2-	Screw in by hand until contact is made
3.	-arrows-	27 Nm
4.	-2-	9 Nm
5.	-arrows-	27 Nm

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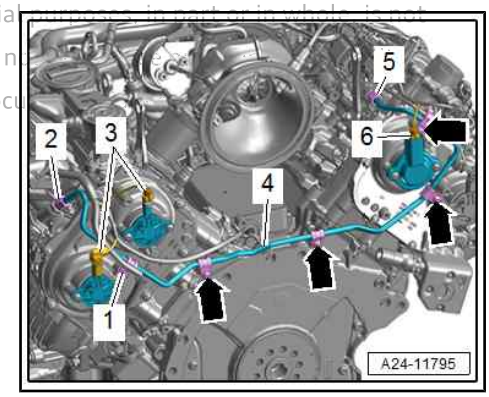
High-pressure pipe (rear) - tightening torques and sequence

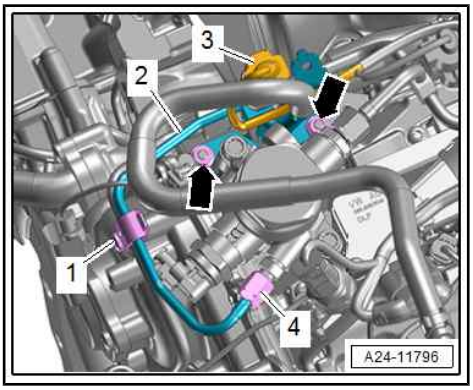


- After removing, renew bolts tightened with specified tightening angle.
- Lubricate threads of union nuts with clean engine oil
- Counterhold at connecting piece when tightening union nuts.

– Tighten bolts and union nuts in stages as follows:

Stage	Bolts/union nuts	Tightening torques/angle specification
1.	-2, 5-	5 Nm
2.	-1, arrows-	Screw in by hand until contact is made
3.	-2, 5-	25 Nm
4.	-1, arrows-	8 Nm
5.	-1, arrows-	Turn 45° further

Fuel pipe (low-pressure section) - tightening torques and sequence



(Shown on vehicle with 3.0 ltr. engine.)

- Lubricate threads of union nuts with clean engine oil

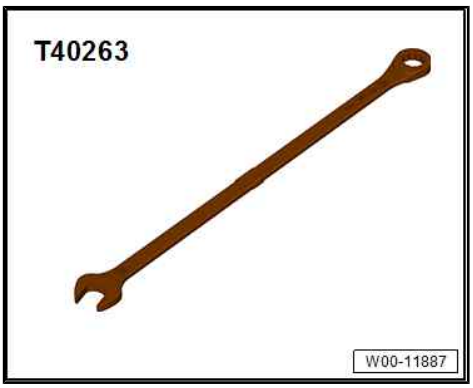
– Tighten nuts and union nuts in stages as follows:

Stage	Nuts/union nuts	Tightening torques/angle specification
1.	-4-	5 Nm
2.	-1, arrows-	Screw in by hand until contact is made
3.	-4-	22 Nm
4.	-1-	8 Nm
5.	-1-	Turn 45° further
6.	-arrows-	9 Nm

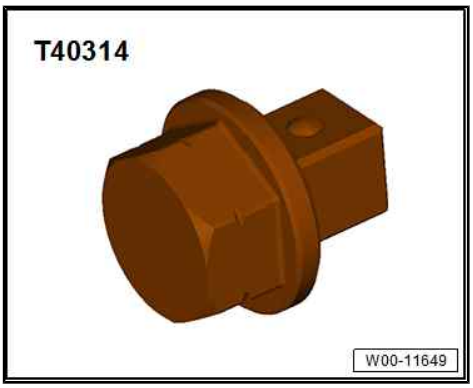
7.2 Removing and installing high-pressure pump

Special tools and workshop equipment required

♦ Wrench, 21 mm - T40263-



♦ Adapter - T40314-



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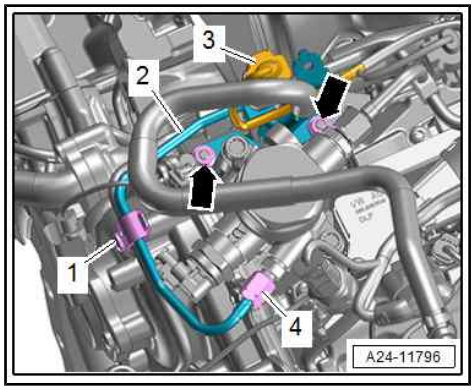
Removing

– Observe rules for cleanliness
⇒ “3.1 Rules for cleanliness”, page 6 .

– Remove high-pressure pipe (right-side)
⇒ “7.3.1 Removing high-pressure pipe (right-side)”, page 315 .

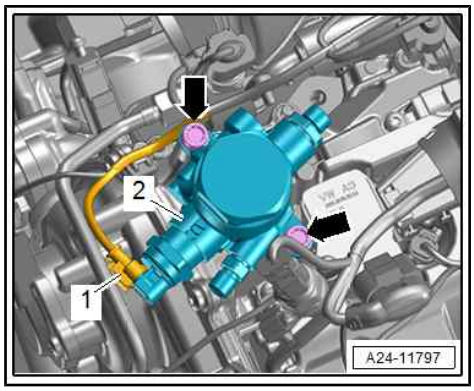
– Unplug electrical connector -3- for fuel pressure sender for low pressure - G410- .
– Remove bolt -1- and nuts -arrows-.
– Unscrew union nut -4- (counterhold at connecting piece). Place fuel line -2- to one side.



– Unplug electrical connector -1-.
– Remove bolts -arrows-.
– Carefully pull out high-pressure pump -2-. Roller tappet remains lodged inside camshaft housing.

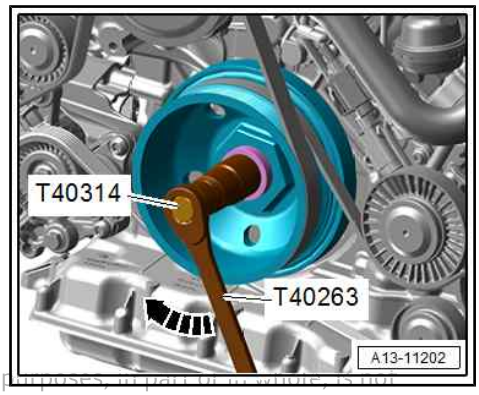
Installing

- Renew O-ring after removal.
- After removing, renew bolts tightened with specified tightening angle.
- The connections of the high-pressure pipe must not be damaged.



- A second mechanic is required for the following step.

– Have a second mechanic turn crankshaft with wrench, 21 mm - T40263- and adapter - T40314- in direction of normal engine rotation -arrow- until roller tappet reaches its lowest point. (Shown on vehicle with 3.0 ltr. engine.)



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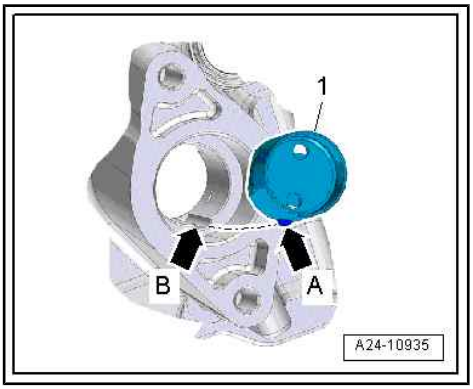
– Check roller tappet -1- for damage and renew if necessary.

– Lightly lubricate roller tappet with oil and insert it so that lug -arrow A- slides into guide notch -arrow B-.

– Tighten bolts alternately, taking care not to tilt high-pressure pump
⇒ Fig. ""High-pressure pump - tightening torques and sequence"" , page 312 .



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

– Install high-pressure pipe (right-side)
⇒ "7.3.1 Removing high-pressure pipe (right-side)", page 315 .

Tightening torques

- ⇒ "7.1 Exploded view - high-pressure pump", page 310
- ⇒ Fig. ""High-pressure pump - tightening torques and sequence"" , page 312
- ⇒ Fig. ""Fuel pipe (low-pressure section) - tightening torques and sequence"" , page 313

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7.3 Removing and installing high-pressure pipe

⇒ "7.3.1 Removing high-pressure pipe (right-side)", page 315

⇒ "7.3.2 Removing high-pressure pipe (rear) - vehicles with 2.9 ltr. engine", page 316

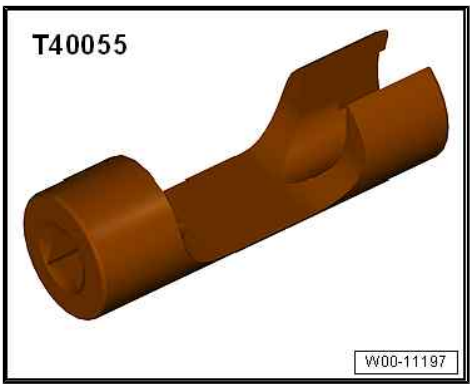
⇒ "7.3.3 Removing high-pressure pipe (rear) - vehicles with 3.0 ltr. engine", page 318

⇒ "7.3.4 Installing high-pressure pipe", page 319

7.3.1 Removing high-pressure pipe (right-side)

Special tools and workshop equipment required

- Socket - T40055-



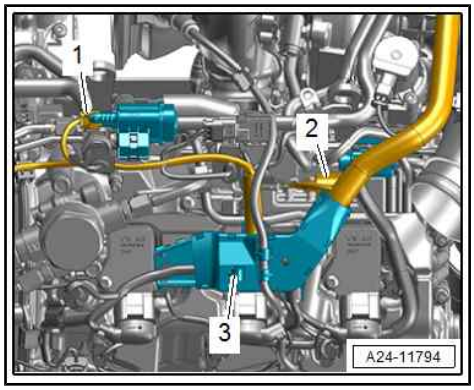
Procedure

- Reinstall heat insulation sleeves in the same locations when installing.

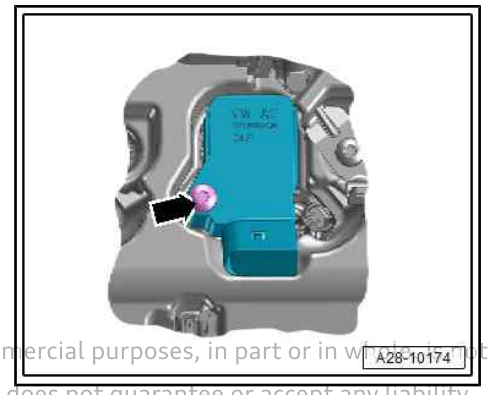
– Observe rules for cleanliness
⇒ "3.1 Rules for cleanliness", page 6 .

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; High-pressure pump; Removing and installing high-pressure pipe .

– Detach heat insulation sleeve, remove activated charcoal filter solenoid valve 1 - N80- -item 1- from bracket and press it upwards.
– Pull switch valve for mechanical coolant pump - N649- -item 2- off bracket and press it to the side.
– Detach wiring duct -3- from ball studs and press it upwards slightly.



– Remove bolt -arrow- and press ignition coil for cylinder 1 slightly to one side.



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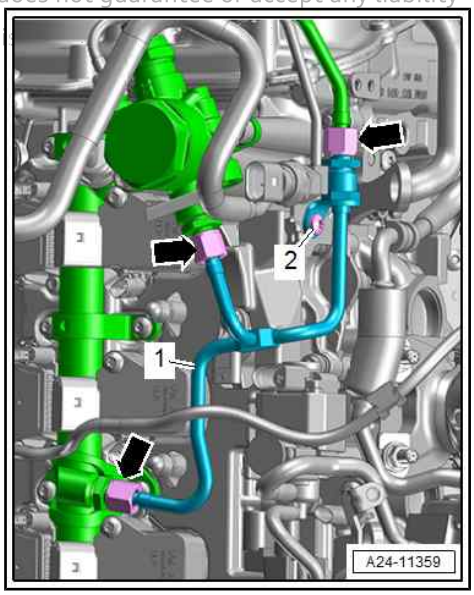
– Press noise insulation to one side and unscrew union nuts -arrows- (counterhold at corresponding connecting piece).
– Unscrew bolt -2- and detach high-pressure pipe (right-side) -1-.

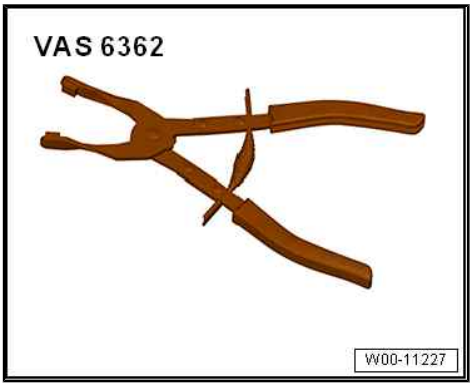


Installing ⇒ “7.3.4 Installing high-pressure pipe”, page 319

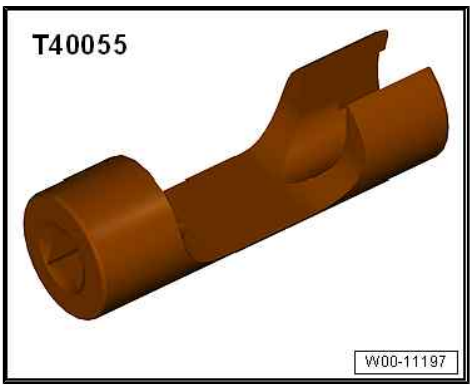
7.3.2 Removing high-pressure pipe (rear) - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

♦ Hose clip pliers - VAS 6362-



♦ Socket - T40055-



Procedure

– Observe rules for cleanliness
⇒ “3.1 Rules for cleanliness”, page 6 .

– Remove catalytic converter (both sides) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Emission control system; Removing and installing catalytic converter , move it to one side and secure it with Lambda probe connected (to do so, move electrical wiring clear).

– Remove coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

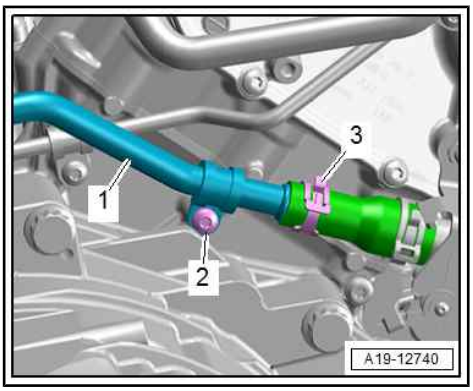
♦ Small coolant pipe (rear right)

♦ Coolant pipe (rear left)

– Remove bolt -2-.

– Release hose clip -3-.

– Detach large coolant pipe (rear right) and press to one side.



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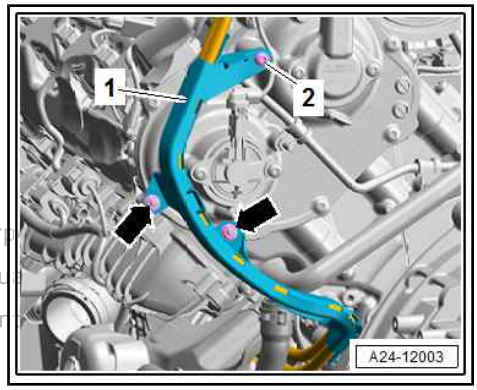
– If fitted, remove bolts -arrows- and nut -2-, and press bracket -1- to one side.



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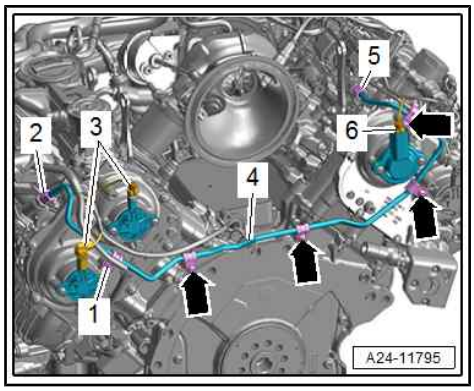
– Unplug electrical connectors -3, 6- and move electrical wires clear.
– Remove centre hex stud -1- and bolts -arrows-.
– Unscrew union nuts -2, 5- (counterhold at corresponding connecting piece). Detach high-pressure pipe (rear).

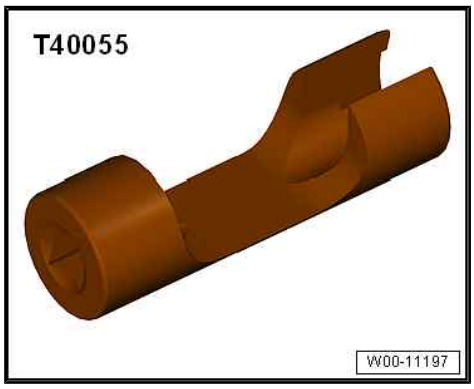


Installing ⇒ “7.3.4 Installing high-pressure pipe”, page 319

7.3.3 Removing high-pressure pipe (rear) - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

♦ Socket - T40055-



Procedure

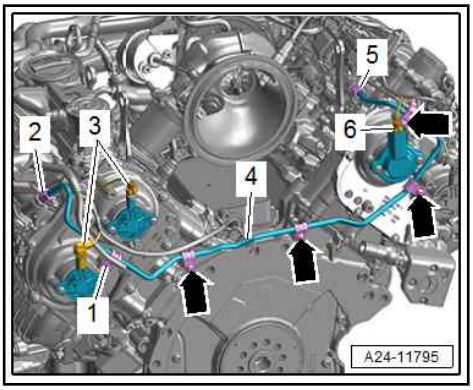
– Observe rules for cleanliness ⇒ “3.1 Rules for cleanliness”, page 6 .
– Remove coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

♦ Large coolant pipe (rear right)
♦ Small coolant pipe (rear right)
♦ Coolant pipe (rear left)

– Unplug electrical connectors -3, 6- and move electrical wires clear.

– Remove centre hex stud -1- and bolts -arrows-.

– Unscrew union nuts -2, 5- (counterhold at corresponding connecting piece). Detach high-pressure pipe (rear).



Installing ⇒ “7.3.4 Installing high-pressure pipe”, page 319

7.3.4 Installing high-pressure pipe

Procedure

- After removing, renew bolts tightened with specified tightening angle.
- The connections of the high-pressure pipe must not be damaged.
- Do not attempt to bend high-pressure pipe to a different shape.

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– Lubricate threads of union nuts with clean engine oil.

– First tighten union nut by hand until it makes contact, making sure that high-pressure pipe is not under tension.

– Pre-tighten union nut to 5 Nm.

– Tighten bolts for retaining clips.

– Tighten union nut to final tightening torque (counterhold at corresponding connecting piece).

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

– If removed previously, install heat shield and engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Install coolant pipes ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 19 ; Coolant pipes; Removing and installing coolant pipes .

– If removed previously, install catalytic converter (left-side) ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Emission control system; Removing and installing catalytic converter .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; High-pressure pump; Removing and installing high-pressure pipe

Tightening torques

- ⇒ “4.1 Exploded view - intake manifold”, page 287
- ⇒ Fig. ““High-pressure pipe (right-side) - tightening torques and sequence”“ , page 312
- ⇒ Fig. ““High-pressure pipe (rear) - tightening torques and sequence”“ , page 312

8 Lambda probe

⇒ “8.1 Exploded view - Lambda probe”, page 320

⇒ “8.2 Removing and installing Lambda probe”, page 323

8.1 Exploded view - Lambda probe

⇒ “8.1.1 Exploded view - Lambda probe, vehicles with 2.9 ltr. engine without particulate filter”, page 320

⇒ “8.1.2 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine without particulate filter”, page 321

⇒ “8.1.3 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine and particulate filter”, page 322

⇒ “8.1.4 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine and particulate filter, Q7/Q8”, page 323

8.1.1 Exploded view - Lambda probe, vehicles with 2.9 ltr. engine without particulate filter

1 - Lambda probe 2 after catalytic converter - G131-

- ❑ With Lambda probe 2 heater after catalytic converter - Z30-
- ❑ Removing and installing ⇒ “8.2.1 Removing and installing Lambda probe - vehicles with 2.9 ltr. engine”, page 323

2 - Lambda probe 2 - G108-

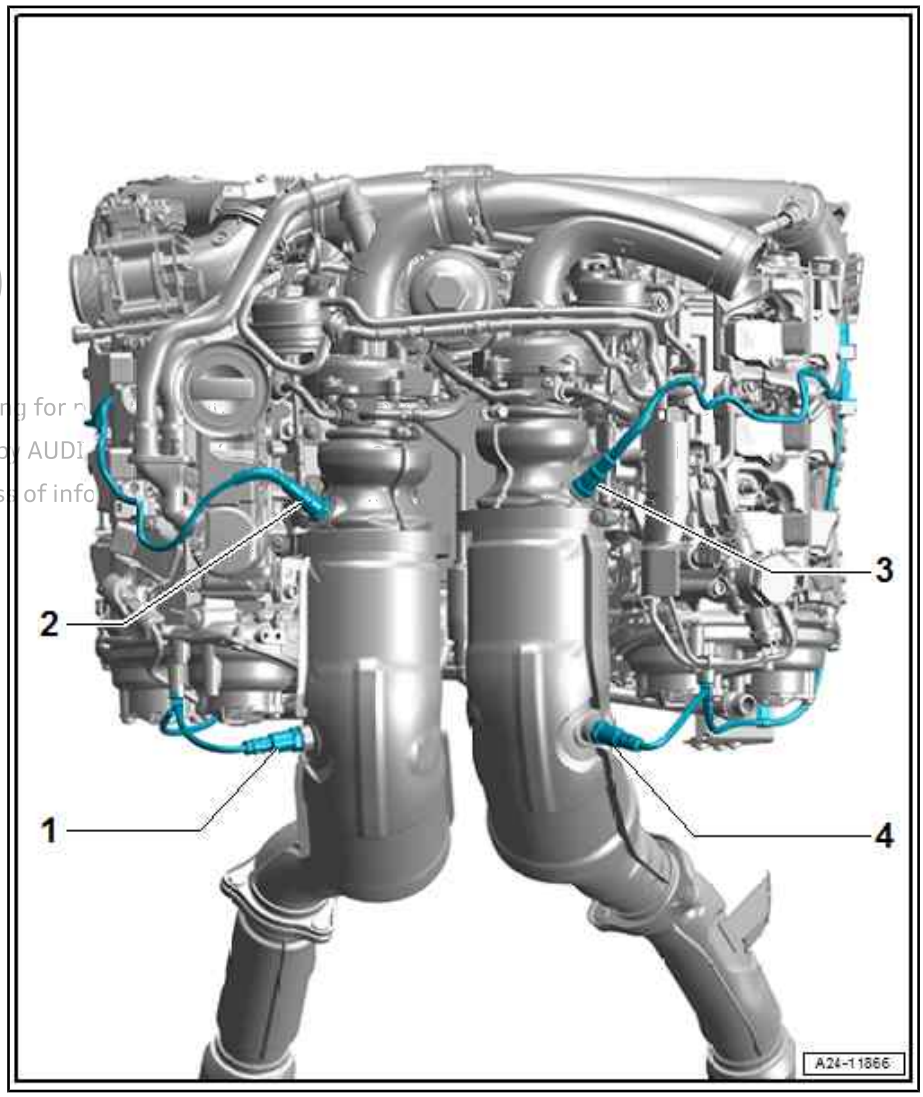
- ❑ With Lambda probe heater 2 - Z28-
- ❑ Removing and installing ⇒ “8.2.1 Removing and installing Lambda probe - vehicles with 2.9 ltr. engine”, page 323
- ❑ 55 Nm

3 - Lambda probe - G39-

- ❑ With Lambda probe heater - Z19-
- ❑ Removing and installing ⇒ “8.2.1 Removing and installing Lambda probe - vehicles with 2.9 ltr. engine”, page 323
- ❑ 55 Nm

4 - Lambda probe after catalytic converter - G130-

- ❑ With Lambda probe 1 heater after catalytic converter - Z29-
- ❑ Removing and installing ⇒ “8.2.1 Removing and installing Lambda probe - vehicles with 2.9 ltr. engine”, page 323
- ❑ 55 Nm



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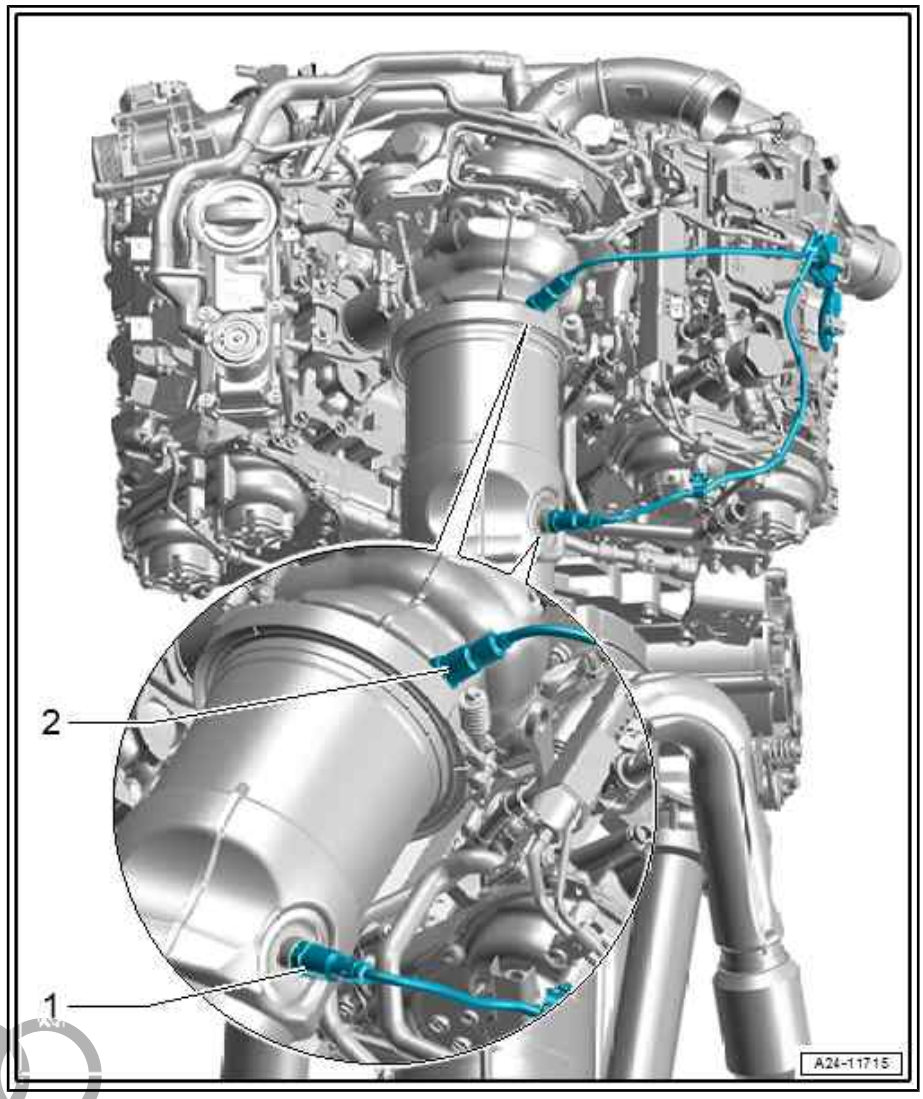
8.1.2 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine without particulate filter

1 - Lambda probe after catalytic converter - G130-

- ❑ With Lambda probe 1 heater after catalytic converter - Z29-
- ❑ Removing and installing ⇒ “8.2.2 Removing and installing Lambda probe - vehicles with 3.0 ltr. engine”, page 325
- ❑ 55 Nm

2 - Lambda probe - G39-

- ❑ With Lambda probe heater - Z19-
- ❑ Removing and installing ⇒ “8.2.2 Removing and installing Lambda probe - vehicles with 3.0 ltr. engine”, page 325
- ❑ 55 Nm



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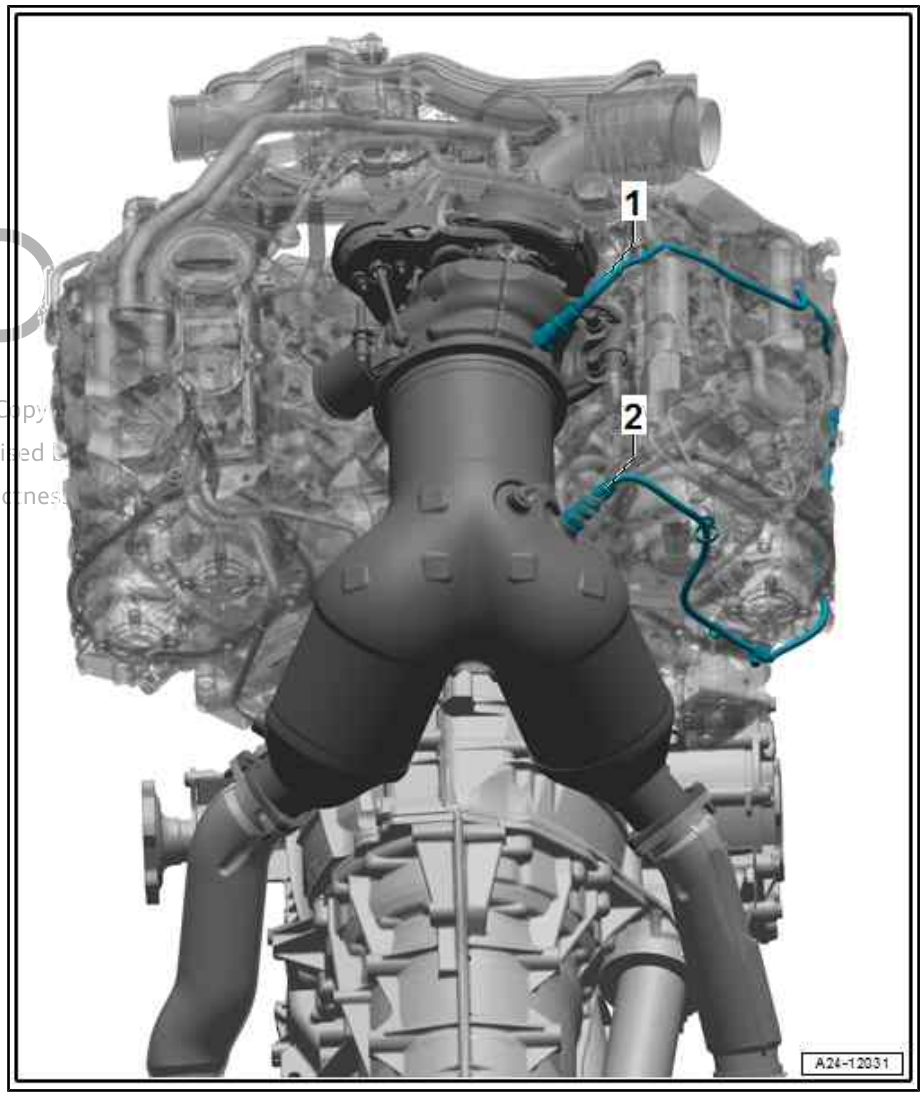
8.1.3 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine and particulate filter

1 - Lambda probe 1 before catalytic converter - GX10-

- ❑ Consists of:
- ♦ Lambda probe - G39-
- ♦ Lambda probe heater - Z19-
  - ❑ Removing and installing ⇒ “8.2.2 Removing and installing Lambda probe - vehicles with 3.0 ltr. engine”, page 325
  - ❑ 45 Nm

2 - Lambda probe 1 after catalytic converter - GX7-

- ❑ Consists of:
- ♦ Lambda probe after catalytic converter - G130-
- ♦ Lambda probe 1 heater after catalytic converter - Z29-
  - ❑ Removing and installing ⇒ “8.2.3 Removing and installing Lambda probe 1 after catalytic converter GX7 - vehicles with 3.0 ltr. engine and particulate filter”, page 326
  - ❑ 45 Nm



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8.1.4 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine and particulate filter, Q7/Q8

1 - Lambda probe 1 after catalytic converter - GX7-

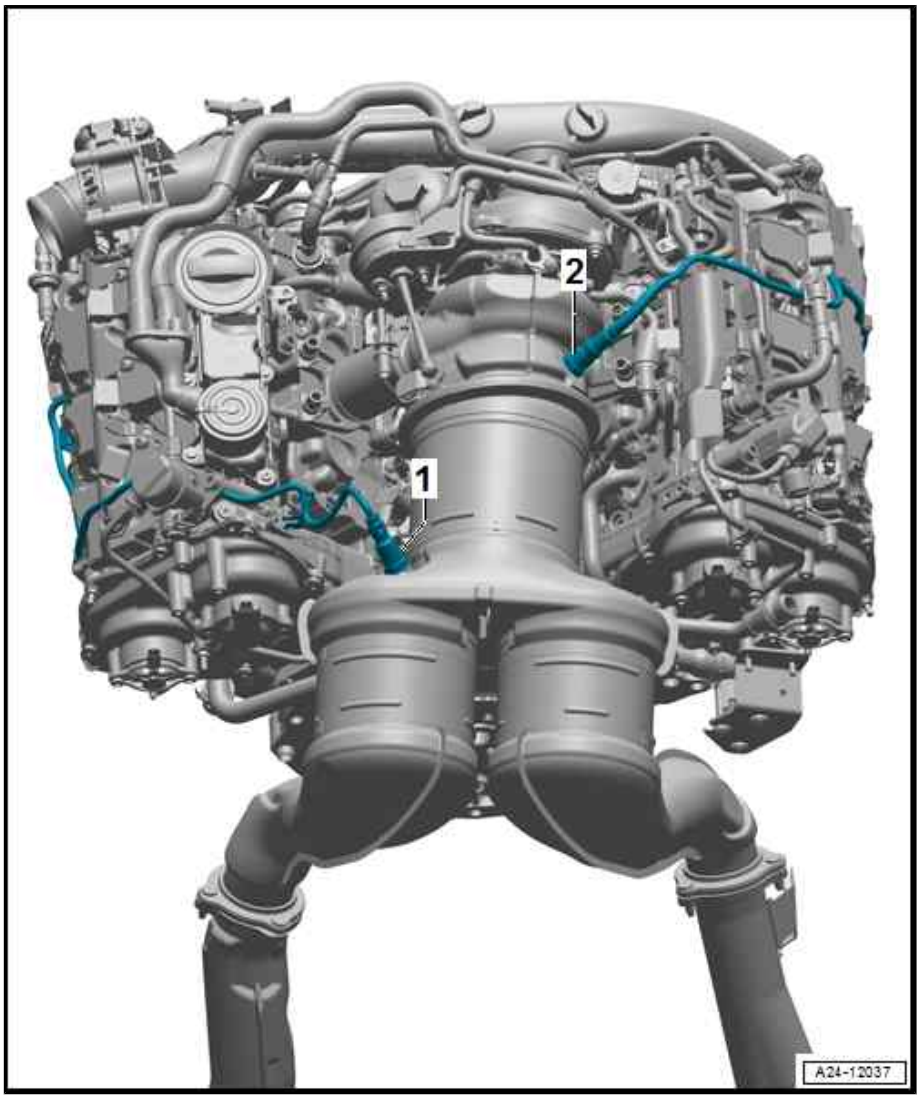
- ❑ Consists of:

- ♦ Lambda probe after catalytic converter - G130-
- ♦ Lambda probe 1 heater after catalytic converter - Z29-
  - ❑ Removing and installing ⇒ “8.2.3 Removing and installing Lambda probe 1 after catalytic converter GX7 - vehicles with 3.0 ltr. engine and particulate filter”, page 326
  - ❑ 45 Nm

2 - Lambda probe 1 before catalytic converter - GX10-

- ❑ Consists of:

- ♦ Lambda probe - G39-
- ♦ Lambda probe heater - Z19-
  - ❑ Removing and installing ⇒ “8.2.2 Removing and installing Lambda probe - vehicles with 3.0 ltr. engine”, page 325
  - ❑ 45 Nm



8.2 Removing and installing Lambda probe

⇒ “8.2.1 Removing and installing Lambda probe - vehicles with 2.9 ltr. engine”, page 323

⇒ “8.2.2 Removing and installing Lambda probe - vehicles with 3.0 ltr. engine”, page 325

⇒ “8.2.3 Removing and installing Lambda probe 1 after catalytic converter GX7 - vehicles with 3.0 ltr. engine and particulate filter”, page 326

⇒ “8.2.4 Removing and installing Lambda probe 1 after catalytic converter GX7 - vehicles with 3.0 ltr. engine and particulate filter, Q7/Q8”, page 328

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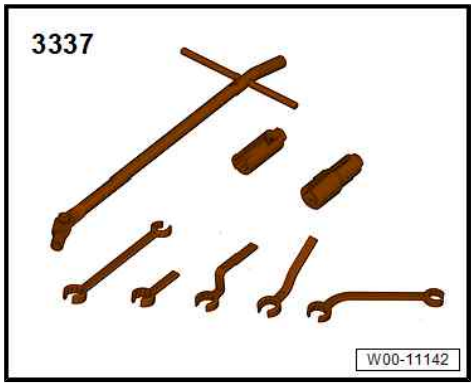
8.2.1 Removing and installing Lambda probe - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

♦ Lambda probe open ring spanner set - 3337-



Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Lambda probe; Removing and installing Lambda probe .

- Re-install all cable ties in original positions.

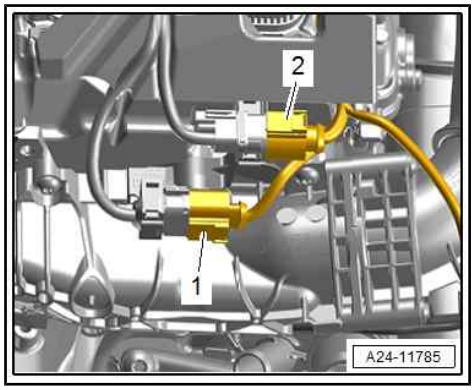
– Remove engine cover panel ⇒ page 10 ; also remove heat shield to remove Lambda probes -G39- / -G108- .

Lambda probe - G39- / Lambda probe after catalytic converter - G130- :

– Detach electrical connectors from bracket one after another, unplug and move electrical wires clear:

1 - For Lambda probe after catalytic converter - G130-

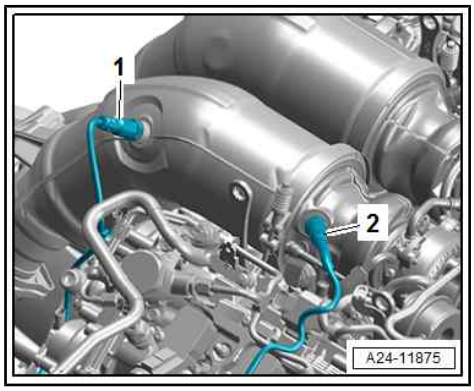
2 - For Lambda probe - G39-



– Remove Lambda probes using spanner -3337/7- (illustration shows vehicle without particulate filter):

1 - Lambda probe after catalytic converter - G130-

2 - Lambda probe - G39-

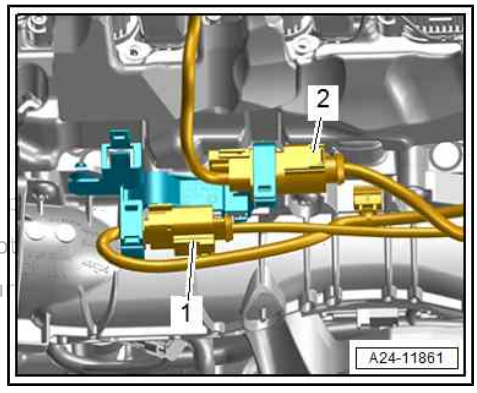


Lambda probe 2 - G108- / Lambda probe 2 after catalytic converter - G131- :

– Detach electrical connectors from bracket one after another, unplug and move electrical wires clear:

1 - For Lambda probe 2 after catalytic converter - G131-

2 - For Lambda probe 2 - G108-



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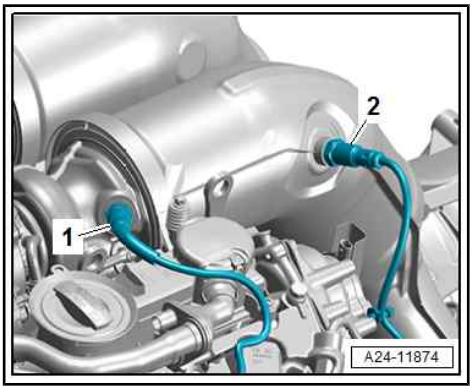
– Remove Lambda probes using spanner -3337/7- (illustration shows vehicle without particulate filter):



1 - Lambda probe 2 after catalytic converter - G131-

2 - Lambda probe 2 - G108-

Installing

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

- Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the 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
- When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Lambda probe; Removing and installing Lambda probe

Tightening torques

◆ ⇒ “8.1.1 Exploded view - Lambda probe, vehicles with 2.9 ltr. engine without particulate filter”, page 320

8.2.2 Removing and installing Lambda probe - vehicles with 3.0 ltr. engine

Special tools and workshop equipment required

◆ Lambda probe open ring spanner set - 3337-

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Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Lambda probe; Removing and installing Lambda probe .

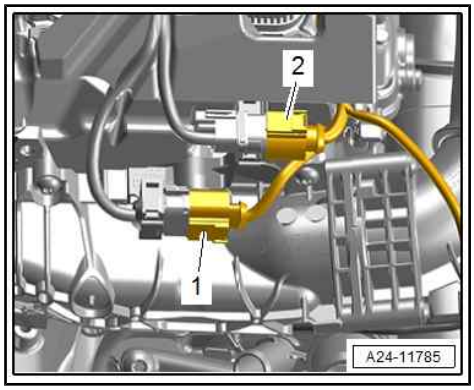
- Re-install all cable ties in original positions.

– Remove engine cover panel ⇒ page 10 ; also remove heat shield to remove Lambda probe - G39- .

– Detach electrical connectors from bracket one after another, unplug and move electrical wires clear:

1 - For Lambda probe after catalytic converter - G130-

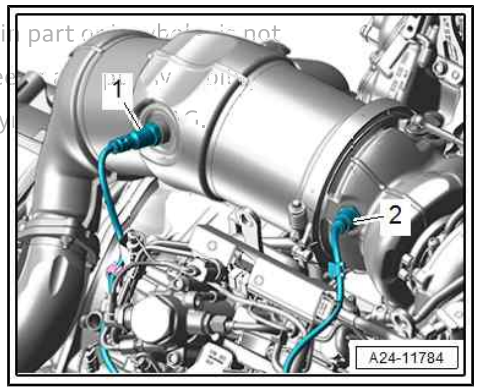
2 - For Lambda probe - G39-



– Unscrew Lambda probes using ring spanner -3337/7- :

1 - Lambda probe after catalytic converter - G130-

2 - Lambda probe - G39-



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Installing

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

- Threads of new Lambda probes are already coated with assembly paste; the paste must not get into the slots on the 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
- When installing, the Lambda probe wire must always be reattached at the same locations to prevent it from coming into contact with the exhaust pipe.

– Install heat shield and engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Lambda probe; Removing and installing Lambda probe

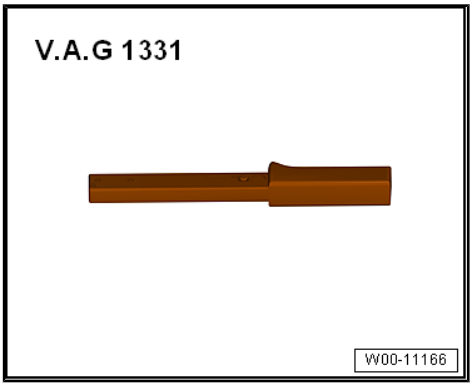
Tightening torques

◆ ⇒ “8.1.2 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine without particulate filter”, page 321

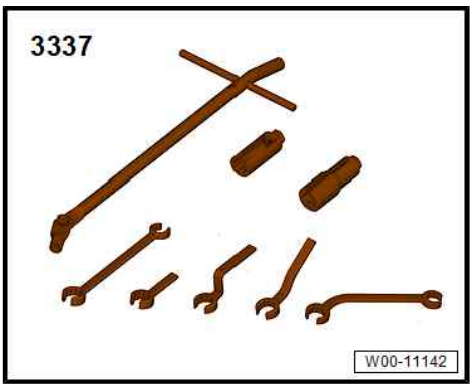
8.2.3 Removing and installing Lambda probe 1 after catalytic converter - GX7- - vehicles with 3.0 ltr. engine and particulate filter

Special tools and workshop equipment required

♦ Torque wrench - V.A.G 1331-



♦ Lambda probe open ring spanner set - 3337-



Removing

– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Remove heat shield
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Remove air cleaner housing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .

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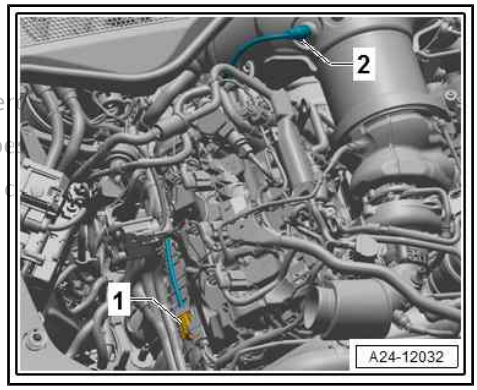
– Detach electrical connector -1- from retainer.
– Unplug electrical connector -1-.



Caution

The exhaust system can become extremely hot. This can cause injuries. Danger of burns to hands and other parts of the body.

- ***Allow exhaust system to cool down.***

– Move electrical wiring harness for Lambda probe 1 after catalytic converter - GX7- -2- clear.
– Detach Lambda probe 1 after catalytic converter - GX7- -2- using a suitable ring spanner from Lambda probe open ring spanner set - 3337- .

Installing

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

Note

New Lambda probe 1 after catalytic converter - GX7- must be coated with assembly paste. This paste must not get into the slots on Lambda probe 1 after catalytic converter - GX7- .

– Coat thread of Lambda probe 1 after catalytic converter - GX7- with high-temperature paste ⇒ Electronic parts catalogue (ETKA) .
- High-temperature paste must not get into the slots on Lambda probe 1 after catalytic converter - GX7- .

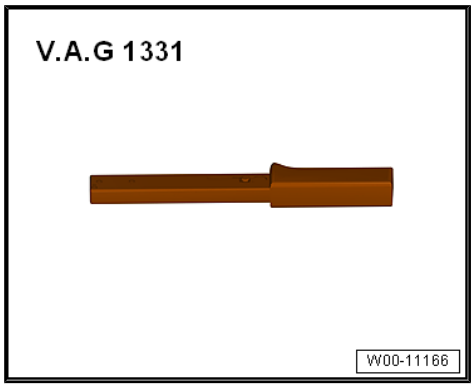
Tightening torques

- ⇒ “8.1.3 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine and particulate filter”, page 322

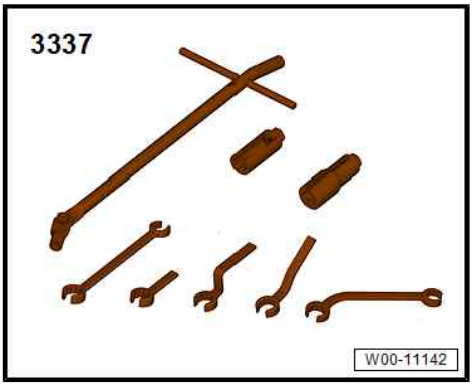
8.2.4 Removing and installing Lambda probe 1 after catalytic converter - GX7- - vehicles with 3.0 ltr. engine and particulate filter, Q7/Q8

Special tools and workshop equipment required

- Torque wrench - V.A.G 1331-



♦ Lambda probe open ring spanner set - 3337-



Removing

– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Remove heat shield
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

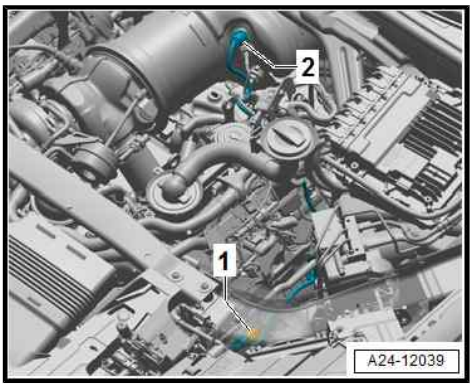
– Remove air cleaner housing ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 24 ; Air cleaner; Removing and installing air cleaner housing .

– Unplug electrical connector -1-.

Caution

The exhaust system can become extremely hot. This can cause injuries. Danger of burns to hands and other parts of the body.

♦ ***Allow exhaust system to cool down.***



– Move electrical wiring harness clear.

– Detach Lambda probe 1 after catalytic converter - GX7- -2- using a suitable ring spanner from Lambda probe open ring spanner set - 3337- .

Installing

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

Note

New Lambda probe 1 after catalytic converter - GX7- must be coated with assembly paste. This paste must not get into the slots on Lambda probe 1 after catalytic converter - GX7- .

– Coat thread of Lambda probe 1 after catalytic converter - GX7- with high-temperature paste ⇒ Electronic parts catalogue (ETKA) .

• High-temperature paste must not get into the slots on Lambda probe 1 after catalytic converter - GX7-.

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Tightening torques

♦ ⇒ “8.1.4 Exploded view - Lambda probe, vehicles with 3.0 ltr. engine and particulate filter, Q7/Q8”, page 323

9 Engine control unit

All procedures and components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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 331

⇒ “1.2 Separating exhaust pipes/silencers”, page 331

⇒ “1.3 Removing and installing front silencers”, page 331

⇒ “1.4 Stress-free alignment of exhaust system”, page 331

⇒ “1.5 Checking exhaust system for leaks”, page 331

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1.1 Exploded view - silencers

All components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Exploded view - silencers .

1.2 Separating exhaust pipes/silencers

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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 ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Exhaust pipes/silencers; Removing and installing front silencers .

1.4 Stress-free alignment of exhaust system

All procedures are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 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

All procedures and components are described in ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 26 ; Emission control system .

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3 Exhaust gas temperature control

⇒ “3.1 Exploded view - exhaust gas temperature control”, page 333

3.1 Exploded view - exhaust gas temperature control

⇒ “3.1.1 Exploded view - exhaust gas temperature control, vehicles with 2.9 ltr. engine”, page 333

⇒ “3.1.2 Exploded view - exhaust gas temperature control, vehicles with 3.0 ltr. engine”, page 334

3.1.1 Exploded view - exhaust gas temperature control, vehicles with 2.9 ltr. engine

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1 - Catalytic converter with particulate filter

- ❑ Cylinder bank 1 (right-side) shown

2 - Exhaust gas temperature sender 3

- ♦ Exhaust gas temperature sender 3 - G495- for cylinder bank 1 (right-side)
- ♦ Exhaust gas temperature sender 3 for bank 2 - G497- for cylinder bank 2 (left-side)
  - ❑ Removing and installing ⇒ “3.2.1 Removing and installing exhaust gas temperature sender 3 G495 / G497 - vehicles with 2.9 ltr. engine”, page 334

3 - Bracket

- ❑ For electrical connector

3.1.2 Exploded view - exhaust gas temperature control, vehicles with 3.0 ltr. engine

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1 - Catalytic converter with particulate filter

- ❑ Different versions available ⇒ Electronic parts catalogue

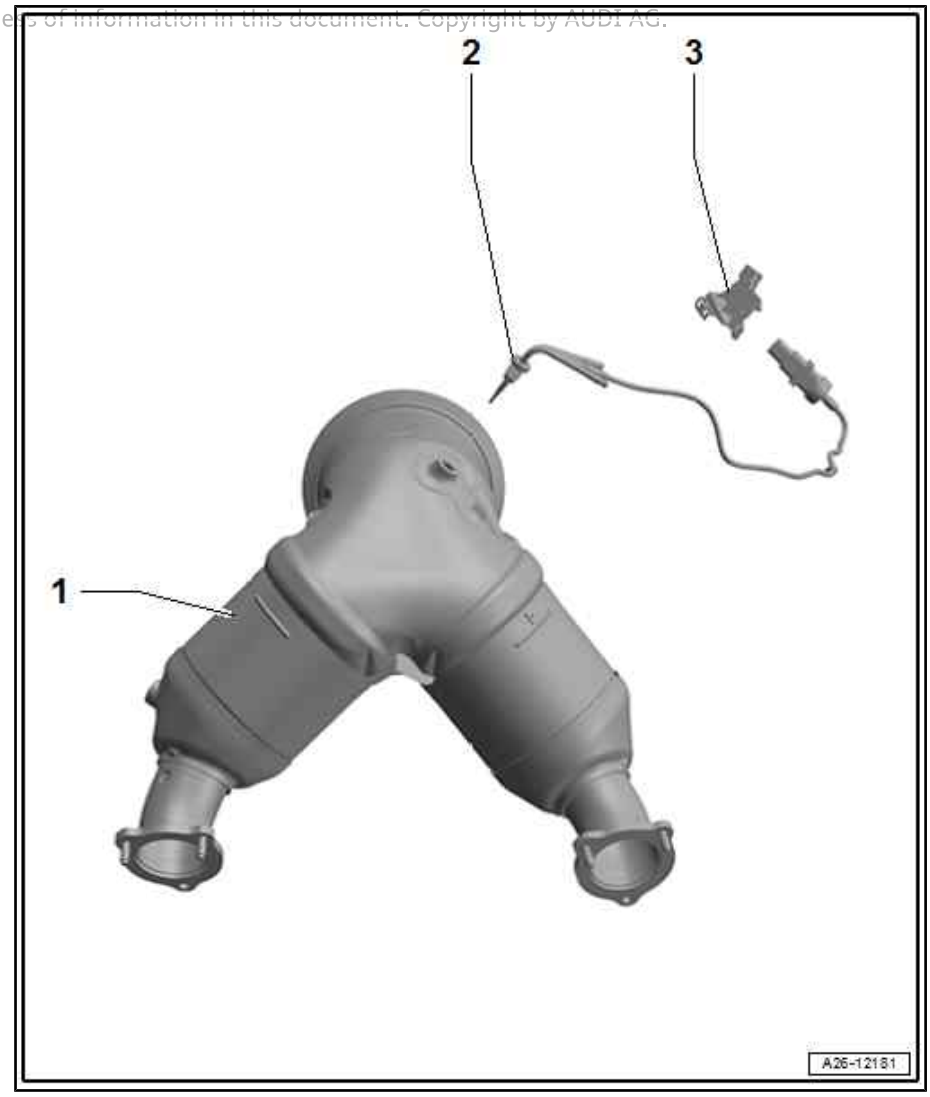
2 - Exhaust gas temperature sender 3 - G495-

- ❑ Different installation position depending on model
- ❑ Removing and installing:

- ♦ ⇒ “3.2.2 Removing and installing exhaust gas temperature sender 3 G495 - all vehicles with 3.0 ltr. engine and particulate filter except Q7/Q8”, page 336
- ♦ ⇒ “3.2.3 Removing and installing exhaust gas temperature sender 3 G495 - vehicles with 3.0 ltr. engine and particulate filter, Q7/Q8”, page 338

3 - Bracket

- ❑ For electrical connector



3.2 Removing and installing parts of exhaust gas temperature control

⇒ “3.2.1 Removing and installing exhaust gas temperature sender 3 G495 / G497 - vehicles with 2.9 ltr. engine”, page 334

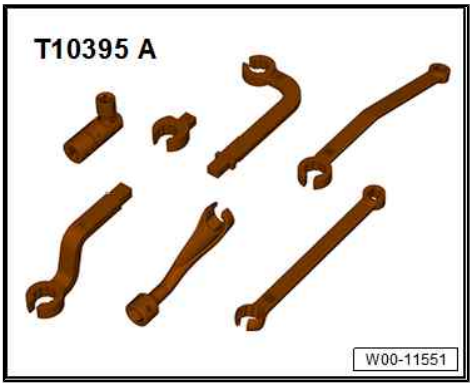
⇒ “3.2.2 Removing and installing exhaust gas temperature sender 3 G495 - all vehicles with 3.0 ltr. engine and particulate filter except Q7/Q8”, page 336

⇒ “3.2.3 Removing and installing exhaust gas temperature sender 3 G495 - vehicles with 3.0 ltr. engine and particulate filter, Q7/Q8”, page 338

3.2.1 Removing and installing exhaust gas temperature sender 3 -G495- / -G497- - vehicles with 2.9 ltr. engine

Special tools and workshop equipment required

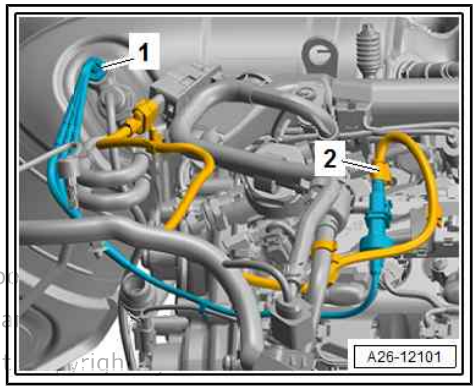
♦ Tool set - T10395A-



Removing

– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

Exhaust gas temperature sender 3 - G495- , cylinder bank 1 (right-side):



– Detach electrical connector -2- from bracket, unplug and move electrical wire clear.

Caution

The exhaust system can become extremely hot. This can cause injuries. Danger of burns to hands and other parts of the body.

♦ ***Allow exhaust system to cool down.***

– Detach exhaust gas temperature sender 3 - G495- -item 1- using suitable tool from tool set - T10395A- .

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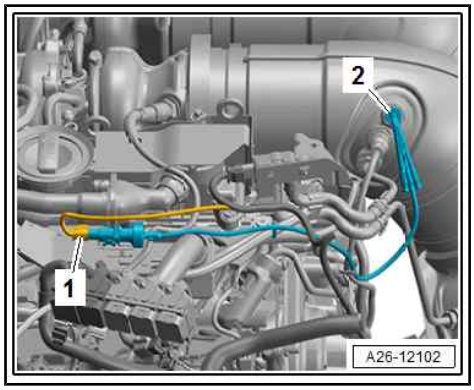
Exhaust gas temperature sender 3 for bank 2 - G497- , cylinder bank 2 (left-side):



– Detach electrical connector -1- from bracket, unplug and move electrical wire clear.

Caution

The exhaust system can become extremely hot. This can cause injuries. Danger of burns to hands and other parts of the body.

♦ *Allow exhaust system to cool down.*

– Detach exhaust gas temperature sender 3 - G495- -item 2- using suitable tool from tool set - T10395A- .

Installing

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

Note

Protect exhaust gas temperature senders against knocks and impact. If dropped, exhaust gas temperature senders must no longer be used.

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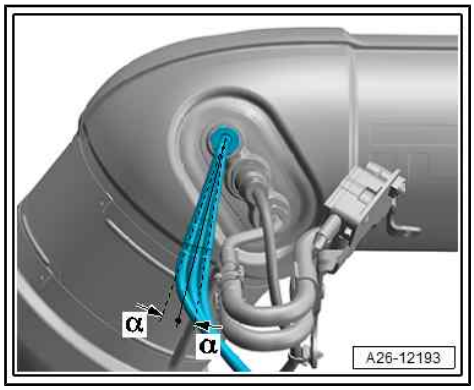
– Coat thread of exhaust gas temperature sender with high-temperature paste ⇒ Electronic parts catalogue

• High-temperature paste must not get into slots on exhaust gas temperature sender.

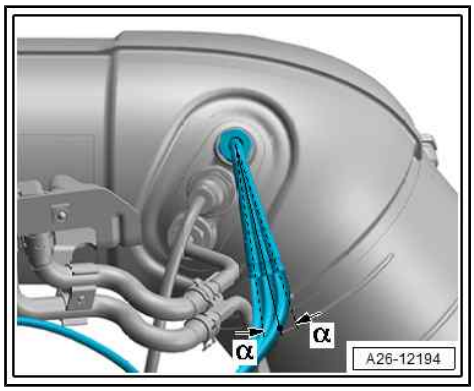
Installation position of exhaust gas temperature sender 3 - G495- , cylinder bank 1 (right-side):



– Align exhaust gas temperature sender 3 - G495- :

• Angle -α- = 5°

Installation position of exhaust gas temperature sender 3 for bank 2 - G497- , cylinder bank 2 (left-side):



– Align exhaust gas temperature sender 3 - G495- :

• Angle -α- = 5°

Tightening torques

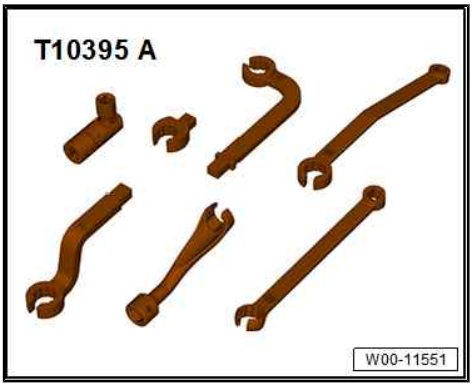
♦ ⇒ “3.1.1 Exploded view - exhaust gas temperature control, vehicles with 2.9 ltr. engine”, page 333

3.2.2 Removing and installing exhaust gas temperature sender 3 - G495- - all vehi-

cles with 3.0 ltr. engine and particulate filter except Q7/Q8

Special tools and workshop equipment required

- Tool set - T10395A-



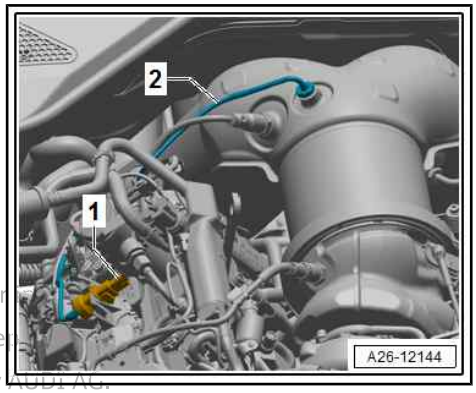
Removing

– Remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Remove heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Detach electrical connector -1- from retainer.

– Unplug electrical connector -1-.



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Caution

The exhaust system can become extremely hot. This can cause injuries. Danger of burns to hands and other parts of the body.

- *Allow exhaust system to cool down.*

– Move electrical wiring harness for exhaust gas temperature sender 3 - G495- -2- clear.

– Detach exhaust gas temperature sender 3 - G495- -2- using suitable tool from tool set - T10395A- .

Installing

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

– Observe correct installation position ⇒ page 338 .

Note

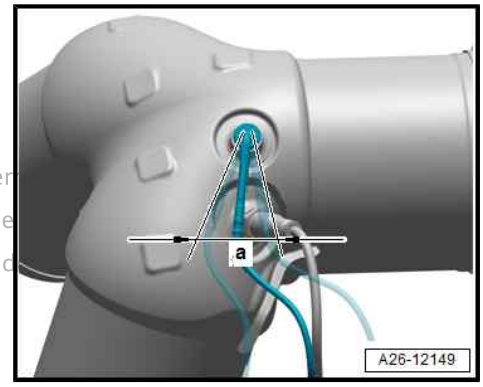
Protect exhaust gas temperature senders against knocks and impact. If dropped, exhaust gas temperature senders must no longer be used.

– Coat thread of exhaust gas temperature sender with high-temperature paste ⇒ Electronic parts catalogue .

- High-temperature paste must not get into slots on exhaust gas temperature sender.

Installation position of exhaust gas temperature sender 3 - G495-

- Exhaust gas temperature sender 3 - G495- must be within area -a- shown.



Tightening torques

◆ ⇒ “3.1.2 Exploded view - exhaust gas temperature control, vehicles with 3.0 ltr. engine”, page 334

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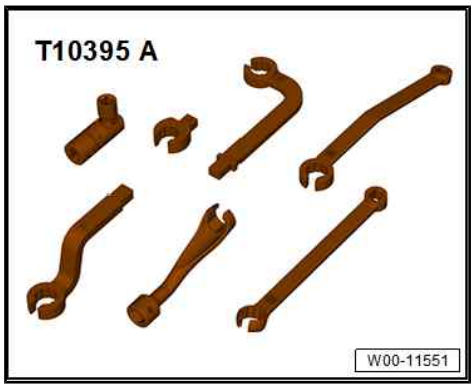
3.2.3 Removing and installing exhaust gas temperature sender 3 - G495- - vehicles with 3.0 ltr. engine and particulate filter, Q7/Q8

Special tools and workshop equipment required

◆ Tool set - T10395A-



Removing

– Remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

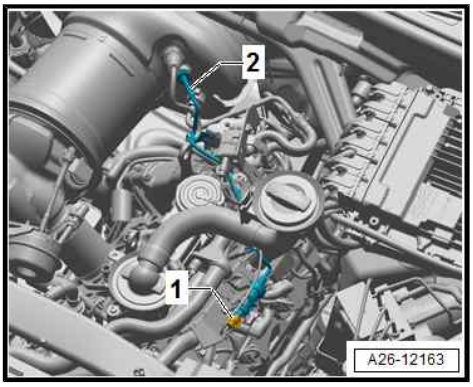
– Remove heat shield ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Unplug electrical connector -1-.

Caution

The exhaust system can become extremely hot. This can cause injuries. Danger of burns to hands and other parts of the body.

- ***Allow exhaust system to cool down.***



– Move electrical wiring harness clear.

– Detach exhaust gas temperature sender 3 - G495- -2- using suitable tool from tool set - T10395A- .

Installing

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

– Observe correct installation position
⇒ Fig. ""Installation position of exhaust gas temperature sender 3 -G495- "" , page 339 .

Note

Protect exhaust gas temperature senders against knocks and impact. If dropped, exhaust gas temperature senders must no longer be used.

– Coat thread of exhaust gas temperature sender with high-temperature paste ⇒ Electronic parts catalogue .

- High-temperature paste must not get into slots on exhaust gas temperature sender.

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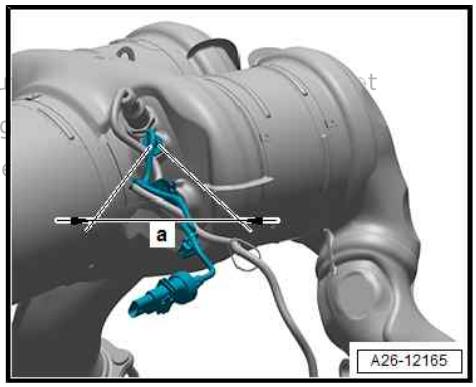
Installation position of exhaust gas temperature sender 3 - G495-

- Exhaust gas temperature sender 3 - G495- must be within area -a- shown.



Tightening torques

- ⇒ "3.1.2 Exploded view - exhaust gas temperature control, vehicles with 3.0 ltr. engine", page 334

28 – Ignition system

1 Ignition system

⇒ “1.1 Exploded view - ignition system”, page 340

⇒ “1.2 Removing and installing ignition coils with output stages”, page 341

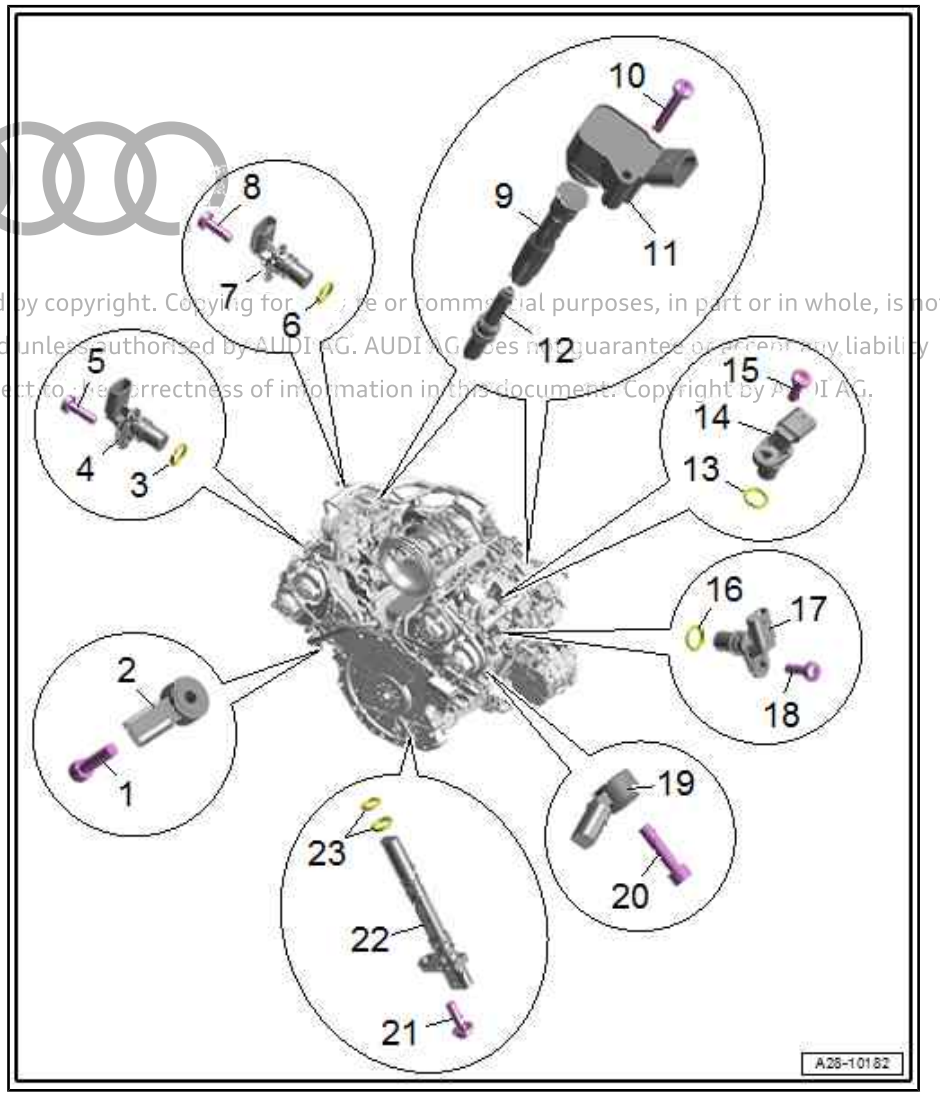
⇒ “1.3 Removing and installing knock sensor 1 G61 ”, page 344

⇒ “1.4 Removing and installing Hall senders”, page 344

⇒ “1.5 Removing and installing engine speed sender G28 ”, page 345

1.1 Exploded view - ignition system

Shown on vehicle with 3.0 ltr. engine.



1 - Bolt

- ❑ 25 Nm
- ❑ The tightening torque influences the function of the knock sensor

2 - Knock sensor 2 - G66-

- ❑ Removing and installing ⇒ “1.3 Removing and installing knock sensor 1 G61 ”, page 344

3 - O-ring

- ❑ Renew after removing

4 - Hall sender 2 - G163-

- ❑ Inlet side
- ❑ Removing and installing ⇒ “1.4 Removing and installing Hall senders”, page 344

5 - Bolt

- ❑ 9 Nm

6 - O-ring

- ❑ Renew after removing

7 - Hall sender 4 - G301-

- ❑ Exhaust side
- ❑ Removing and installing ⇒ “1.4 Removing and installing Hall senders”, page 344

8 - Bolt

- ❑ 9 Nm

9 - Spark plug connectors

- ❑ Installation position ⇒ “1.2 Removing and installing ignition coils with output stages”, page 341

10 - Bolt

- ❑ 9 Nm

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11 - 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-
- Ignition coil 5 with output stage - N323-
- Ignition coil 6 with output stage - N324-

❑ Removing and installing ⇒ "1.2 Removing and installing ignition coils with output stages", page 341

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12 - Spark plug

❑ Change interval ⇒ Maintenance tables
❑ 23 Nm

13 - O-ring

❑ Renew after removing

14 - Hall sender 3 - G300-

❑ Exhaust side
❑ Removing and installing ⇒ "1.4 Removing and installing Hall senders", page 344

15 - Bolt

❑ 9 Nm

16 - O-ring

❑ Renew after removing

17 - Hall sender - G40-

❑ Inlet side
❑ Removing and installing ⇒ "1.4 Removing and installing Hall senders", page 344

18 - Bolt

❑ 9 Nm

19 - Knock sensor 1 - G61-

❑ Removing and installing ⇒ "1.3 Removing and installing knock sensor 1 G61 ", page 344

20 - Bolt

❑ 25 Nm
❑ The tightening torque influences the function of the knock sensor

21 - Bolt

❑ 9 Nm

22 - Engine speed sender - G28-

❑ Removing and installing ⇒ "1.5 Removing and installing engine speed sender G28 ", page 345

23 - O-rings

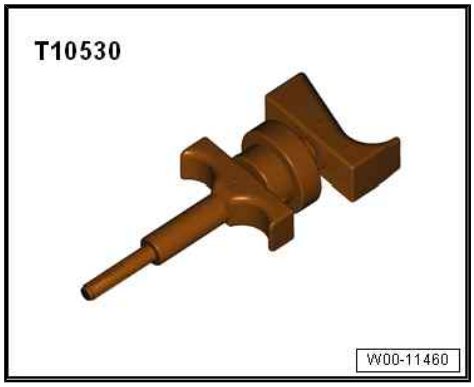
❑ Renew after removing

1.2 Removing and installing ignition coils with output stages

The ignition coils are easier to remove when the engine is warm.
The silicone paste used at the factory facilitates removal of the ignition coils and spark plug connectors when the engine is warm.

Special tools and workshop equipment required

♦ Puller - T10530-



♦ Silicone paste ⇒ Electronic parts catalogue (ETKA) .

Removing

Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 28 ; Ignition system; Removing and installing ignition coils with output stages .

– Remove bolt -arrow- for relevant ignition coil.

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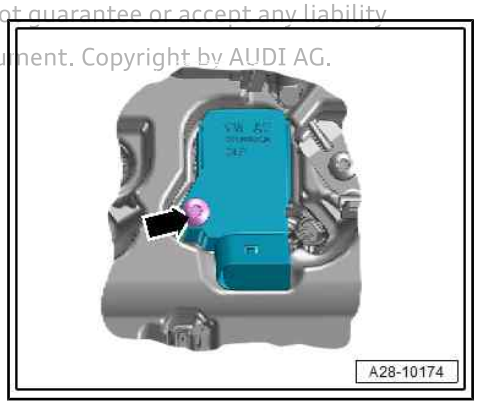
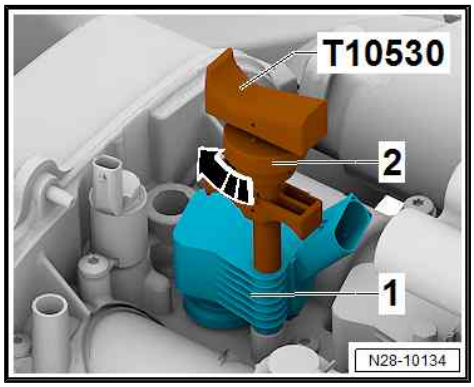
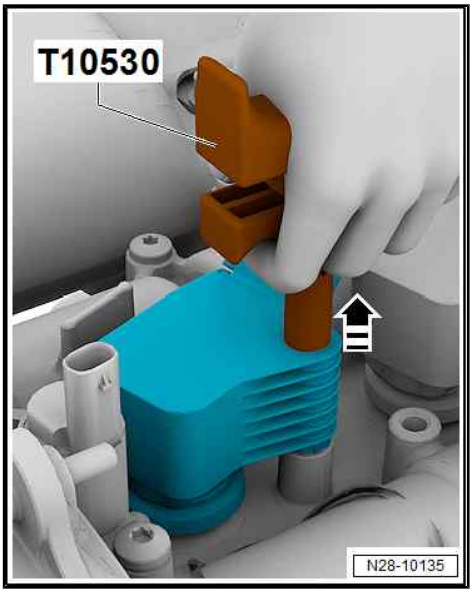


– Insert puller - T10530- into hole -1- in ignition coil.

– Turn knurled nut -2- clockwise -arrow- until puller is secured in place.



– Carefully pull ignition coil out vertically -arrow- with puller - T10530- .

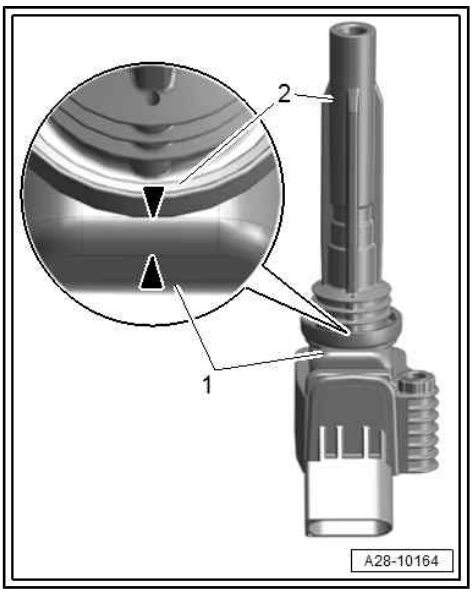


Installing

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

– Push spark plug connector -2- onto ignition coil -1- by hand as far as stop.

• The arrow markings on the spark plug connector and the ignition coil must be aligned, as shown.



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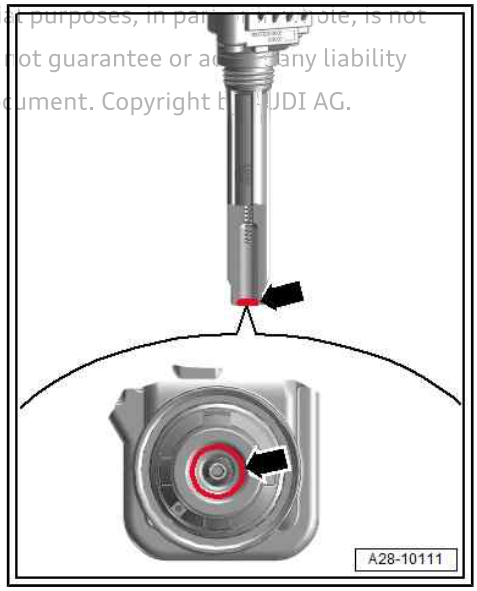
Caution

Ignition coils can be damaged irreparably if the wrong lubricant is used.

- ***Use only the approved silicone paste ⇒ Electronic parts catalogue .***

– Apply a thin bead of silicone paste all around end of sealing hose of ignition coil with output stage -arrow-.

– Press ignition coils onto spark plugs by hand evenly (do not use tools).



Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 28 ; Ignition system; Removing and installing ignition coils with output stages

Tightening torques

- ⇒ “1.1 Exploded view - ignition system”, page 340

1.3 Removing and installing knock sensor 1 - G61-

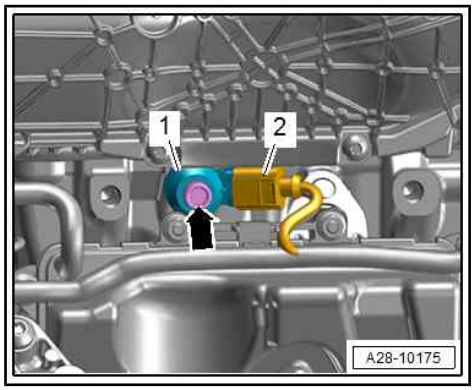
This procedure applies to knock sensor 1 - G61- and knock sensor 2 - G66- .

Removing

– Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 28 ; Ignition system; Removing and installing knock sensor 1 - G61- .

– Unscrew bolt -arrow- and remove knock sensor -1- (shown on knock sensor 2 - G66-).

– Unplug electrical connector -2-.



Installing

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

Note:

The tightening torque influences the function of the knock sensor.

Tightening torques

♦ ⇒ “1.1 Exploded view - ignition system”, page 340

1.4 Removing and installing Hall senders

Special tools and workshop equipment required

♦ Torx T30 bit - T10573- (not illustrated)

Removing Hall sender - G40- / Hall sender 2 - G163- (inlet camshaft)

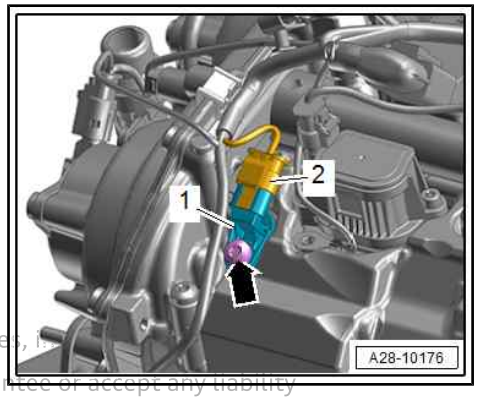
Hall sender - G40- : Preparatory work may be necessary depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 28 ; Ignition system; Removing and installing Hall senders .

– Hall sender 2 - G163- : Remove engine cover panel ⇒ “3.1 Removing and installing engine cover panel”, page 10 .

– Press top section of noise insulation upwards slightly.

– Unplug electrical connector -2-.

– Unscrew bolt -arrow- and remove Hall sender -1- (shown on - G40-).



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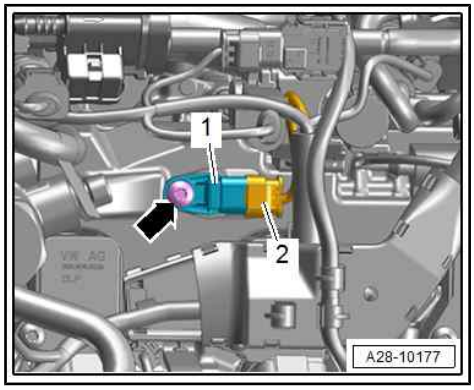
Removing Hall sender 3 - G300- (exhaust camshaft, cylinder bank 1)

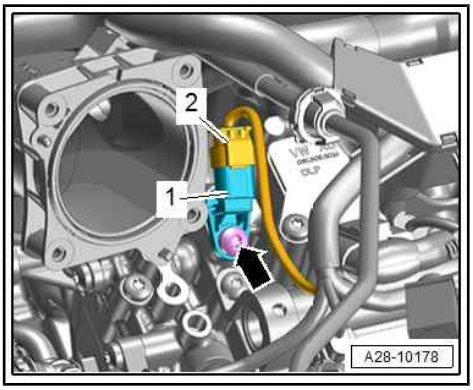
– Remove high-pressure pipe (right-side) ⇒ “7.3.1 Removing high-pressure pipe (right-side)”, page 315 .

– Unplug electrical connector -2-.

– Unscrew bolt -arrow- and remove Hall sender -1-.

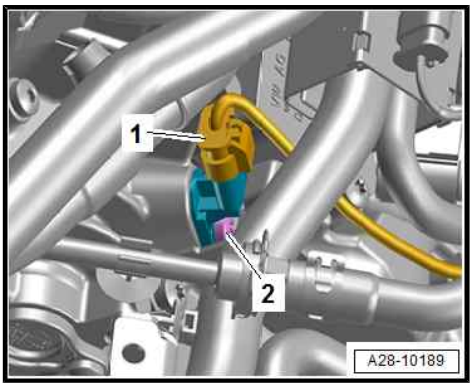


Removing Hall sender 4 - G301- (version 1)



– Remove throttle valve module - J338-
⇒ “4.3 Removing and installing throttle valve module J338 ”, page 290 .
– Press top section of noise insulation upwards slightly.
– Unplug electrical connector -2-.
– Unscrew bolt -arrow- and remove Hall sender -1-.

Removing Hall sender 4 - G301- (version 2)



– Remove engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .
– Unplug electrical connector -1-.
– Unscrew bolt -2- and detach Hall sender.

Installing

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

• Renew O-rings after removing.

– Install throttle valve module - J338-
⇒ “4.3 Removing and installing throttle valve module J338 ”, page 290 .
– Install high-pressure pipe
⇒ “7.3 Removing and installing high-pressure pipe”, page 315 .
– Install engine cover panel
⇒ “3.1 Removing and installing engine cover panel”, page 10 .

Additional work depending on model ⇒ 6-cylinder direct injection engine (2.9 ltr., 3.0 ltr. 4-valve TFSI); Rep. gr. 28 ; Ignition system; Removing and installing Hall senders

Tightening torques

◆ ⇒ “1.1 Exploded view - ignition system”, page 340

1.5 Removing and installing engine speed sender - G28-

– Remove noise insulation (rear) ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Exploded view - noise insulation .

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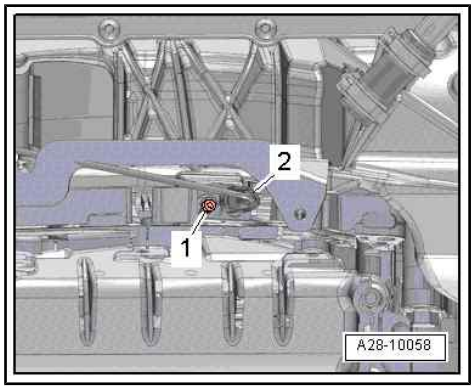
– Unplug electrical connector -2-.
– Unscrew bolt -1- and pull out engine speed sender - G28- .



Installing

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

- Renew O-rings after removing.

Tightening torques

◆ ⇒ “1.1 Exploded view - ignition system”, page 340

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

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