Workshop Manual

Arteon 2018 ➤
Tiguan 2016 ➤
Tiguan RUS 2017 ➤

4-cyl. direct injection engine (2.0 l, 4 V, EA 888 gen III BZ, turbocharger, chain drive)

Engine ID	CZP A	CZP B							

Edition 05.2017

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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 Safety information 1
1.1 Safety regulations for working on fuel supply 1
1.2 Safety measures when working on vehicles with a start/stop system 1
1.3 Safety precautions when using testers and measuring instruments during a road test 2
1.4 Safety precautions when working on ignition system 2
1.5 Safety precautions when working on the cooling system 2
2 Identification 3
2.1 Engine number/engine data 3
3 Repair notes 4
3.1 Rules for cleanliness 4
3.2 Foreign objects in engine 4
3.3 Contact corrosion 4
3.4 Routing and attachment of lines 4
3.5 Fitting radiator and condensers 5
3.6 Checking vacuum system 5
10 - Removing and installing engine 6
1 Removing and installing engine 6
1.1 Removing engine 6
1.2 Separating engine and gearbox 18
1.3 Securing engine on engine and gearbox support 23
1.4 Installing engine 24
2 Assembly mountings 28
2.1 Assembly overview - assembly mountings 28
2.2 Removing and installing motor mounting 29
2.3 Removing and installing gearbox mounting 30
2.4 Removing and installing pendulum support 31
2.5 Supporting engine in installation position 32
2.6 Checking adjustment of assembly mountings (engine and gearbox mountings) 39
2.7 Adjusting assembly mountings 39
3 Motor cover 41
3.1 Removing and installing engine cover 41
13 - Crankshaft group 42
1 Cylinder block (pulley end) 42
1.1 Assembly overview - cylinder block (pulley end) 42
1.2 Removing and installing poly-V belt 44
1.3 Removing and installing tensioner for poly V-belt 45
1.4 Removing and installing vibration damper 45
1.5 Renewing seal for vibration damper 51
1.6 Removing and installing bracket for ancillaries 53
1.7 Removing and installing engine support 55
2 Cylinder block, gearbox end 57
2.1 Assembly overview - cylinder block, gearbox end 57
2.2 Removing and installing flywheel 58
2.3 Removing and installing sealing flange on gearbox side 59
3 Crankshaft 63
3.1 Assembly overview - crankshaft 63
3.2 Crankshaft dimensions 65
3.3 Allocation of main bearing shells 65
3.4 Renewing needle bearing in crankshaft 66

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3.5 Measuring axial clearance of crankshaft . . . 68
3.6 Measuring radial clearance of crankshaft . . . 69
3.7 Removing and installing sender wheel . . . 70
4 Balancer shaft . . . 71
4.1 Assembly overview - balance shaft . . . 71
4.2 Removing and installing balance shaft . . . 72
4.3 Renewing oil seal for balance shaft (inlet side) . . . 76
5 Pistons and conrods . . . 79
5.1 Assembly overview - pistons and conrods . . . 79
5.2 Removing and installing pistons . . . 82
5.3 Checking pistons and cylinder bores . . . 83
5.4 Separating new conrod . . . 85
5.5 Checking radial clearance of conrods . . . 85
5.6 Removing and installing oil spray jets . . . 86

15 - Cylinder head, valve gear . . . 87
1 Cylinder head . . . 87
1.1 Assembly overview - cylinder head . . . 87
1.2 Removing and installing cylinder head . . . 89
1.3 Assembly overview - vacuum pump . . . 95
1.4 Removing and installing vacuum pump . . . 96
1.5 Checking compression . . . 97
2 Cover for timing chain . . . 100
2.1 Assembly overview - cover for timing chain . . . 100
2.2 Removing and installing upper timing chain cover . . . 101
2.3 Removing and installing timing chain cover (bottom) . . . 103
3 Chain drive . . . 106
3.1 Assembly overview - camshaft timing chains . . . 106
3.2 Assembly overview - drive chain for balance shaft . . . 108
3.3 Removing and installing camshaft timing chain . . . 110
3.4 Removing and installing drive chain for balance shaft . . . 120
3.5 Checking valve timing . . . 123
3.6 Checking timing chain . . . 125
4 Valve gear . . . 127
4.1 Assembly overview - valve gear . . . 127
4.2 Removing and installing camshaft . . . 130
4.3 Installing ball for sliding piece . . . 138
4.4 Removing and installing actuators for camshaft adjustment . . . 139
4.5 Removing and installing camshaft control valve 1 N205 . . . 139
4.6 Removing and installing exhaust camshaft control valve 1 N318 . . . 140
4.7 Removing and installing valve stem seals . . . 140
5 Inlet and exhaust valves . . . 149
5.1 Checking valve guides . . . 149
5.2 Checking valves . . . 150
5.3 Valve dimensions . . . 150

17 - Lubrication . . . 151
1 Sump, oil pump . . . 151
1.1 Assembly overview - sump/oil pump . . . 151
1.2 Engine oil: . . . 153
1.3 Removing and installing lower part of sump . . . 154
1.4 Removing and installing upper part of sump . . . 159
1.5 Removing and installing oil pump . . . 162
1.6 Removing and installing oil level and oil temperature sender G266 . . . 164
2 Engine oil cooler . . . 166

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2.1 Assembly overview - engine oil cooler . . . 166
2.2 Removing and installing engine oil cooler . . . 166
2.3 Removing and installing mechanical switching valve . . . 168
3 Crankcase ventilation . . . 169
3.1 Assembly overview - crankcase breather system . . . 169
3.2 Removing and installing oil separator . . . 170
4 Oil filter, oil pressure switch . . . 172
4.1 Assembly overview - oil filter . . . 172
4.2 Exploded view - oil pressure switches/oil pressure control . . . 173
4.3 Removing and installing piston cooling jet control valve N522 . . . 174
4.4 Removing and installing oil pressure switch F1 . . . 174
4.5 Removing and installing oil pressure switch for reduced oil pressure F378 . . . 175
4.6 Removing and installing stage 3 oil pressure switch F447 . . . 176
4.7 Checking oil pressure . . . 178
4.8 Removing and installing oil pressure regulating valve N428 . . . 181

19 - Cooling . . . 183
1 Cooling system/coolant . . . 183
1.1 Connection diagram - coolant hoses . . . 183
1.2 Checking cooling system for leaks . . . 186
1.3 Draining and adding coolant . . . 188
2 Coolant pump, regulation of cooling system . . . 195
2.1 Assembly overview - coolant pump, thermostat . . . 195
2.2 Assembly overview - electric coolant pump . . . 197
2.3 Assembly overview - coolant temperature sender . . . 200
2.4 Removing and installing auxiliary pump for heating V488 . . . 200
2.5 Removing and installing coolant pump . . . 203
2.6 Removing and installing toothed belt for coolant pump . . . 205
2.7 Removing and installing coolant shut-off valve N82 . . . 207
2.8 Removing and installing coolant valve for gearbox N488 , vehicles with dual clutch gearbox . . . 209
2.9 Removing and installing actuator for engine temperature regulation N493 . . . 211
2.10 Removing and installing coolant temperature sender G62 . . . 212
2.11 Removing and installing radiator outlet coolant temperature sender G83 . . . 214
3 Coolant pipes . . . 215
3.1 Assembly overview - coolant pipes . . . 215
3.2 Removing and installing front coolant pipe . . . 215
3.3 Removing and installing upper coolant pipes . . . 217
4 Radiator, radiator fan . . . 219
4.1 Assembly overview - radiator . . . 219
4.2 Assembly overview - radiator cowl and radiator fan . . . 220
4.3 Removing and installing radiator . . . 220
4.4 Removing and installing radiator cowl . . . 222
4.5 Removing and installing radiator fan . . . 223

21 - Turbocharging/supercharging . . . 225
1 Exhaust turbocharger . . . 225
1.1 Assembly overview - turbocharger . . . 225
1.2 Removing and installing turbocharger . . . 227
2 Charge air system . . . 233
2.1 Assembly overview - charge air system . . . 233
2.2 Assembly overview - charge-air hose connections . . . 234
2.3 Removing and installing charge air cooler . . . 234
2.4 Removing and installing charge pressure sender G31 . . . 237
2.5 Checking charge air system for leaks . . . 238

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24 - Mixture preparation - injection 241

1 Injection system 241
1.1 Overview of fitting locations - injection system 241

2 Injectors 251
2.1 Assembly overview - fuel rail with injectors 251
2.2 Removing and installing fuel rail 253
2.3 Removing and installing injectors 253
2.4 Renewing seals on injectors 259
2.5 Cleaning injectors 260

3 Air filter 262
3.1 Assembly overview - air filter housing 262
3.2 Removing and installing air filter housing 263

4 Intake manifold 265
4.1 Assembly overview - intake manifold 265
4.2 Removing and installing intake manifold 266
4.3 Removing and installing throttle valve module GX3 271
4.4 Cleaning throttle valve module 273

5 Senders and sensors 275
5.1 Removing and installing fuel pressure sender G247 275
5.2 Checking fuel pressure sender G247 277
5.3 Removing and installing fuel pressure sender for low-pressure G410 279
5.4 Removing and installing intake manifold sender GX9 280
5.5 Removing and installing air mass meter G70 281

6 Engine (motor) control unit 283
6.1 Removing and installing engine (motor) control unit J623 283
6.2 Removing and installing engine (motor) control unit J623 with protective housing 284

7 High-pressure pump 287
7.1 Assembly overview - high-pressure pump 287
7.2 Removing and installing high-pressure pump 288

8 Lambda probe 292
8.1 Assembly overview - Lambda probe 292
8.2 Removing and installing Lambda probe 1 before catalytic converter GX10 293
8.3 Removing and installing Lambda probe 1 after catalytic converter GX7 294

26 - Exhaust system 296

1 Exhaust pipes, silencers 296
1.1 Assembly overview - silencers 296
1.2 Removing and installing silencer 299
1.3 Separating exhaust pipes/silencers, Arteon 300
1.4 Aligning exhaust system free of stress 303
1.5 Check exhaust system for leaks 303

2 Exhaust gas cleaning 304
2.1 Assembly overview - emission control 304
2.2 Removing and installing bracket for catalytic converter, Tiguan 307
2.3 Removing and installing catalytic converter 309

28 - Ignition system 316

1 Ignition system 316
1.1 Assembly overview - ignition system 316
1.2 Removing and installing ignition coils with output stage 317
1.3 Removing and installing knock sensor I G61 319
1.4 Removing and installing Hall sender 320
1.5 Removing and installing engine speed sender G28 321

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00 – Technical data

1 Safety information

(VRL010392; Edition 05.2017)

⇒ "1.1 Safety regulations for working on fuel supply", page 1

⇒ "1.2 Safety measures when working on vehicles with a start/stop system", page 1

⇒ "1.3 Safety precautions when using testers and measuring instruments during a road test", page 2

⇒ "1.4 Safety precautions when working on ignition system", page 2

⇒ "1.5 Safety precautions when working on the cooling system", page 2

1.1 Safety regulations for working on fuel supply

Risk of injury from highly-pressurised fuel.

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

Before opening the fuel system:

– Wear protective goggles.

– Wear protective gloves.

– To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

Danger of fire from escaping fuel

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

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

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

Risk of injury due to unexpected motor start

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

– Deactivate Start/Stop system by switching off the ignition.

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

Risk of injury through insecure testing and measuring instruments

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

– Secure testing and measuring instruments on the rear seat.

or

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

1.4 Safety precautions when working on ignition system

Risk of injury due to electric shock

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

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

Risk of damage to components

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

– Switch off the ignition before connecting or disconnecting electric cables.

– Switch off the ignition before washing the engine.

1.5 Safety precautions when working on the cooling system

Scalding from hot coolant

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

– Wear protective gloves.

– Wear protective goggles.

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

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2 Identification

⇒ “2.1 Engine number/engine data”, page 3

2.1 Engine number/engine data

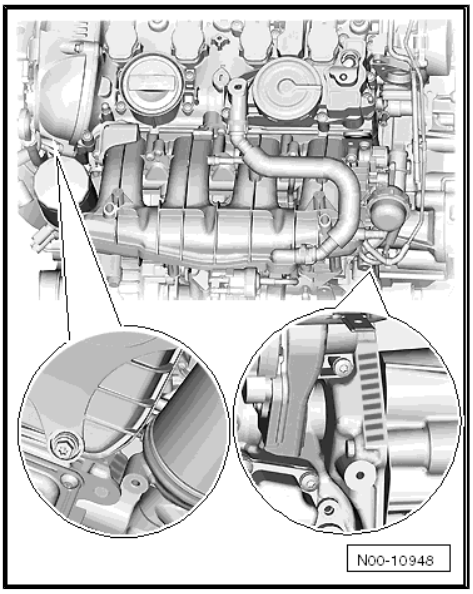
Engine number

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

The engine code is also stamped on the cylinder block behind the oil filter.

In addition, there is a sticker on the right of the timing chain cover with “engine code” and “serial number”.

The first 3 digits denote the mechanical design of the engine and are stamped on the engine. The fourth digit shows the engine output and torque and varies according to engine control unit. The four-digit engine code can be found on the identification plate and on the vehicle data sticker. It can also be read from the engine control unit.



Note

Fitting locations of vehicle data sticker ⇒ Maintenance ; Booklet ; Vehicle data sticker .

Engine data

Codes		CZPA	CZPB
Manufactured from	Tiguan	11.2015 ►	---
	Arteon	---	05.2017 ►
Exhaust emission standard		EU 6	EU 6
Displacement	l	2.0	2.0
Power	kW at rpm	132 at 3900 … 6000	140 at 4200 … 6000
Torque	Nm at rpm	320 at 1500 … 3940	320 at 1450 … 4200
Bore	Diameter, mm	82.5	82.5
Stroke	mm	92.8	92.8
Compression ratio		11.65:1	11.65:1
RON		95	95
Injection system		Direct injection and intake manifold injection	Direct injection and intake manifold injection
Firing order		1-3-4-2	1-3-4-2
Charging		Exhaust turbocharger	Exhaust turbocharger
Camshaft timing adjustment		yes	yes
Variable valve timing		Inlet side	Inlet side
Secondary air injection		No	No
Valves per cylinder		4	4
Oil pressure control		yes	yes

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3 Repair notes

⇒ “3.1 Rules for cleanliness”, page 4

⇒ “3.2 Foreign objects in engine”, page 4

⇒ “3.3 Contact corrosion”, page 4

⇒ “3.4 Routing and attachment of lines”, page 4

⇒ “3.5 Fitting radiator and condensers”, page 5

⇒ “3.6 Checking vacuum system”, page 5

3.1 Rules for cleanliness

Even small amounts of contamination/soiling can lead to defects. You must therefore comply with the following rules for cleanliness when working on the fuel supply system, injection system and turbocharger:

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

3.2 Foreign objects in engine

- To prevent the ingress of foreign bodies during work on the engine, seal open channels of the intake and exhaust sections with suitable bungs, for example from the engine bung set - VAS 6122- .

3.3 Contact corrosion

Contact corrosion can occur if non-approved fasteners are used on the vehicle (bolts, nuts, washers etc.).

For this reason, only connecting elements with a special surface coating have been fitted.

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

If there is any doubt about the suitability of parts, a general rule is to use new parts ⇒ Electronic parts catalogue (ETKA) .

3.4 Routing and attachment of lines

- Mark fuel lines, vacuum lines, pipes/hoses for activated charcoal filter system 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.

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- To avoid damaging pipes and wires, ensure adequate clearance from all moving or hot components in the engine compartment on account of the confined space.

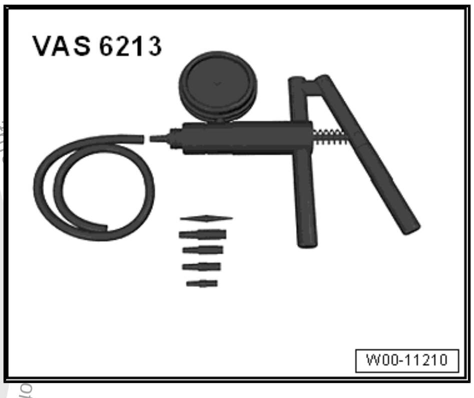
3.5 Fitting radiator and condensers

Even if installed correctly, the radiator, the condenser and the charge air cooler may have small dents in their fins. This does not mean that these components have been damaged. It is not permissible to renew radiators, condensers or charge air coolers only because of such minor dents.

3.6 Checking vacuum system

Special tools and workshop equipment required

- Hand operated vacuum pump - VAS 6213-



Procedure

– Check all vacuum lines throughout entire vacuum system for:

- Cracks
- Marten bites
- Crushing
- Porous areas and other leaks

– Check vacuum line to solenoid valve and from solenoid valve to relevant component.

– If a fault has been entered in the event memory, make sure to check not only all vacuum lines leading to the specified component, but also those leading to other components.

– If pressure cannot be built-up using hand vacuum pump - VAS 6213- or pressure immediately drops again, check hand vacuum pump and connecting hoses for leaks.

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10 – Removing and installing engine

1 Removing and installing engine

⇒ “1.1 Removing engine”, page 6

⇒ “1.2 Separating engine and gearbox”, page 18

⇒ “1.3 Securing engine on engine and gearbox support”, page 23

⇒ “1.4 Installing engine”, page 24

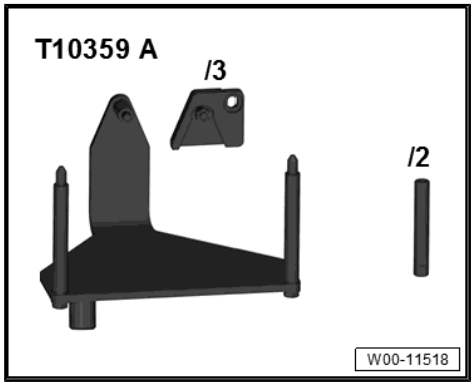
1.1 Removing engine

Special tools and workshop equipment required

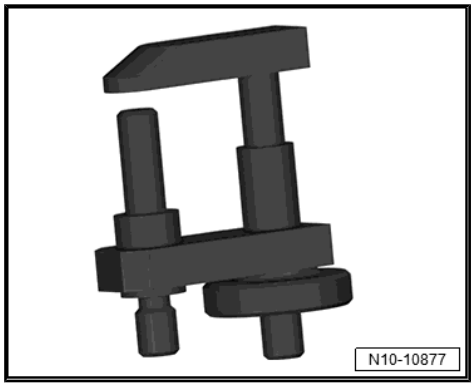
- Engine and gearbox jack - VAS 6931-



- Engine support - T10359 A-

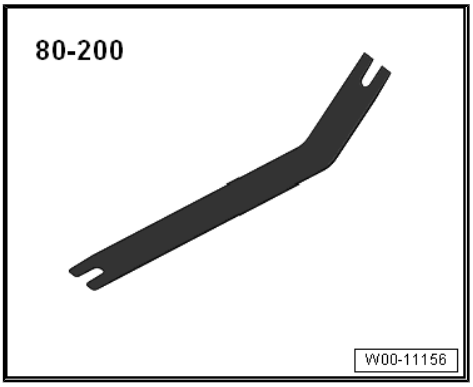


- Pin - T10359/2-
- Adapter - T10359/3-
- Securing element from gearbox support - 3282-



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- Release lever - 80 - 200-

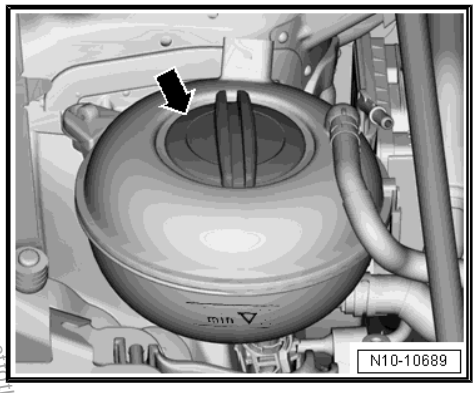


- Safety glasses
- Safety gloves
- Stepladder

Note

The engine is removed downwards with gearbox. To do this, it is necessary to remove the subframe with steering rack.

Procedure



CAUTION

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

Skin and other parts of the body may be scalded.

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

– Open filler cap -arrow- for coolant expansion tank.

– Remove front parts of left and right front wheel housing liners or front wheel housing liner section ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Assembly overview – front wheel housing liner .

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

– Detach left drive shaft from flange shaft, and tie in elevated position ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

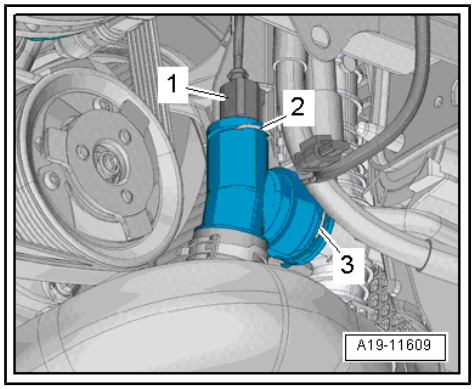
– Remove right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

Note

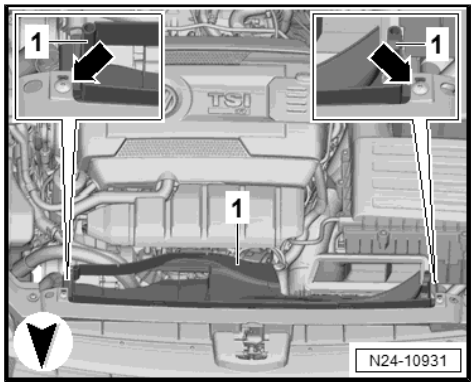
Take care not to damage the surface protection of the drive shaft.

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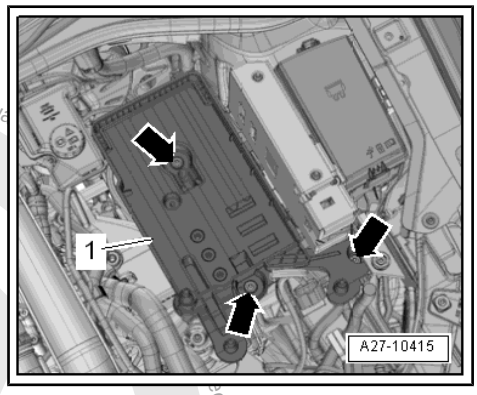
– Separate connector -1-.
– Place drip tray for workshop hoist - VAS 6208- underneath.
– Lift retaining clip -3-, disconnect coolant hose (bottom right) from radiator and drain off coolant.
– Remove engine cover panel ⇒ page 41 .
– Remove air filter housing ⇒ page 263 .



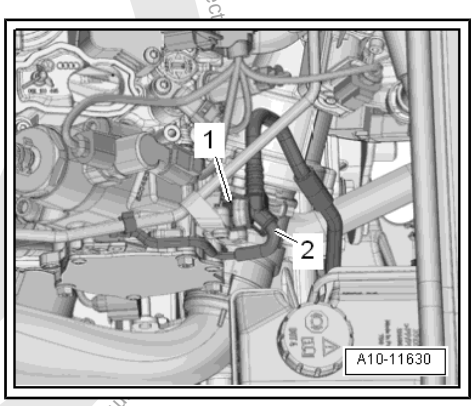
– Unscrew bolt -arrow- on left and right.
– Unclip lower part of air duct -1- and remove it.
– Remove radiator cowl ⇒ page 222 .



– Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and reconnecting battery .
– Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .



– If fitted, disconnect vacuum hose -2-.
– Press release tabs on vacuum hose -1-, and remove hose from vacuum pump.

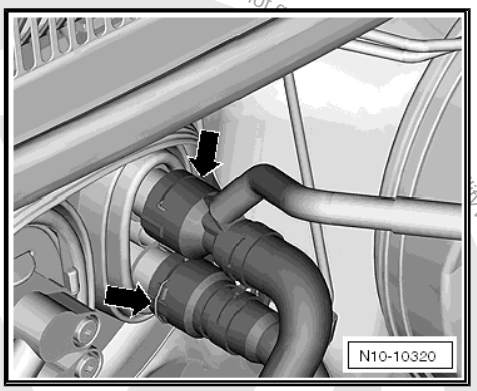


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Vehicles without seat heating:

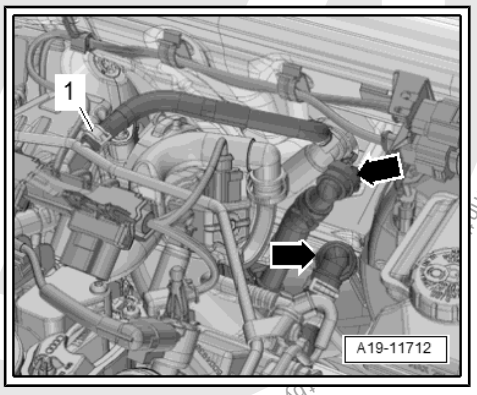
– Lift retaining clips -arrows- and disconnect coolant hoses from heat exchanger for heater.

– Hold coolant hoses downwards to allow coolant to drain.



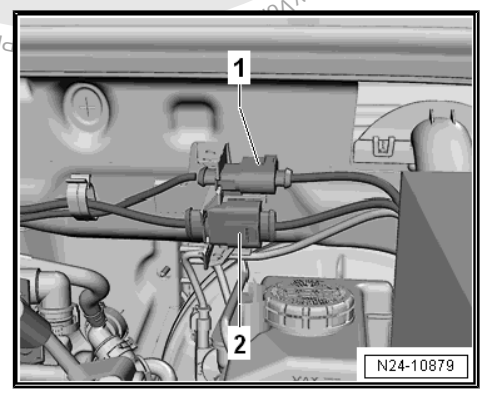
Vehicles with auxiliary heater

– Release hose clip -1-, lift retaining clips -arrows-, and disconnect coolant hoses.

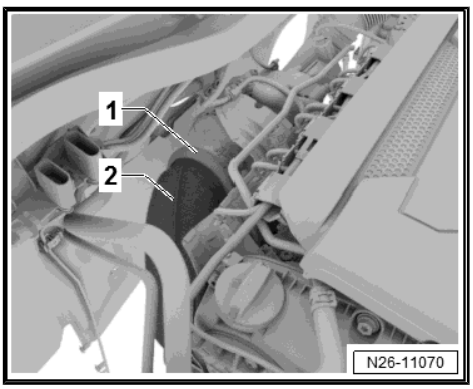


Continued for all vehicles:

– Detach electrical connectors -1, 2- from bracket, unplug connectors and move electrical wiring clear.



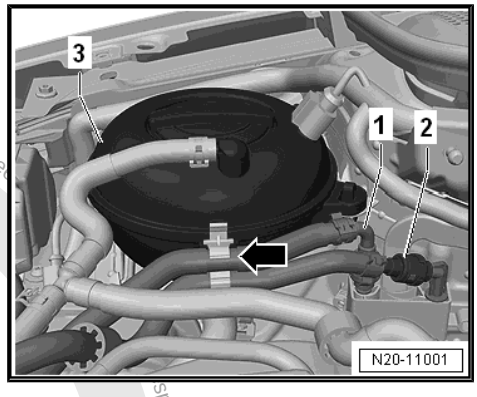
– Loosen clamp -1- for catalytic converter -2-, and push clamp onto turbocharger.



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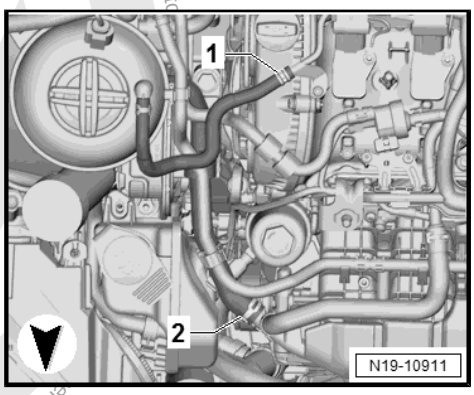
CAUTION

The fuel system is pressurised.
Danger of injury through fuel spray.
- **Wear protective goggles.**
- **Wear protective gloves.**
- **To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.**

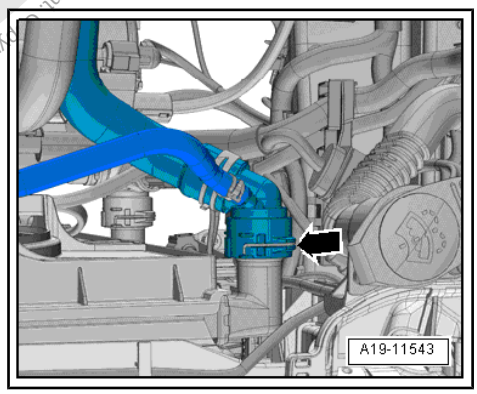


– Disconnect hose couplings -1- and -2- ⇒ Rep. gr. 20 ; Plug-in connectors; Disconnecting plug-in connectors . Detach hoses from coolant expansion tank -3-.

– Release hose clips -1, 2-, and remove coolant hoses.

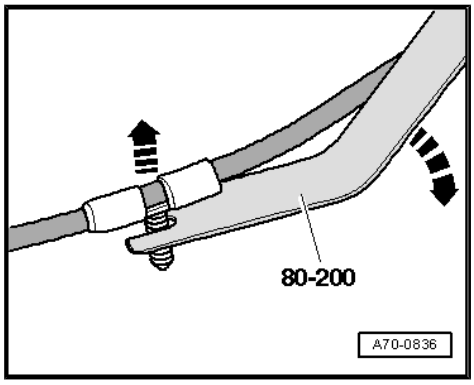


– Lift retaining clip -arrow- and disconnect coolant hose (top left) from radiator.



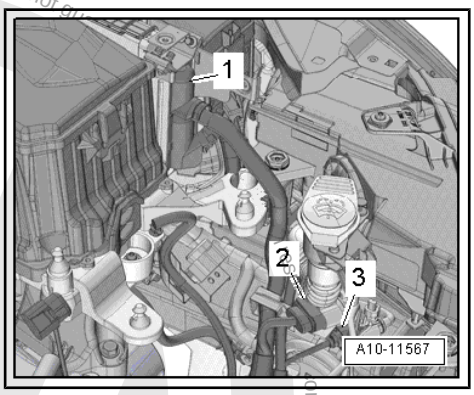
Note

For the work steps below, use removal lever - 80 - 200- to unclip the binding clips.

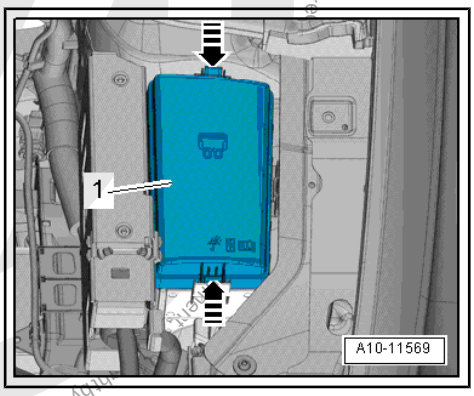


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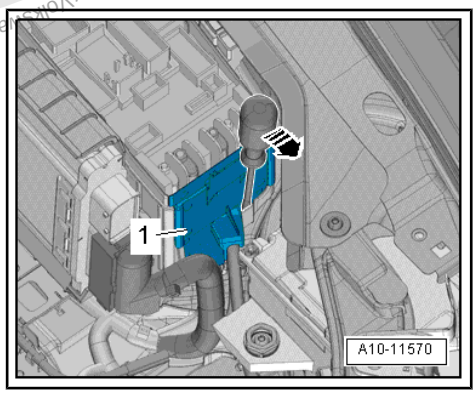
– Disconnect connector -1- on engine control unit - J623- ⇒ page 283 .
– Remove connectors -2 and 3- from retainer and disconnect them.
– Move electrical lines free.



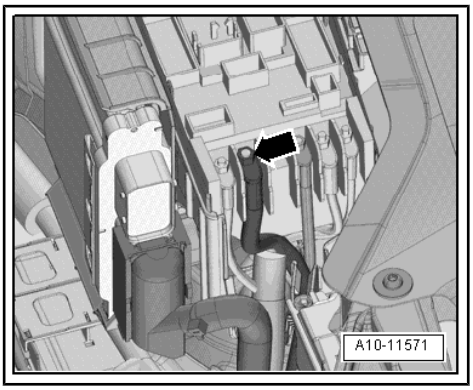
– Release catches -arrows- and detach cover -1- for electronics box in engine compartment.



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



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



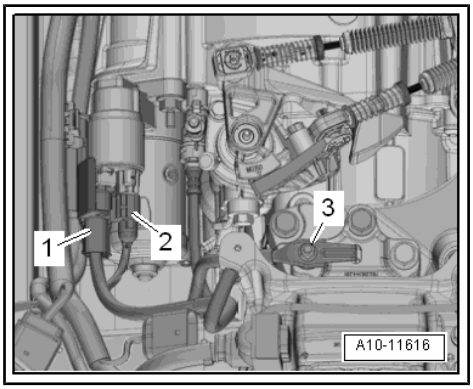
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Vehicles with manual gearbox:

– Disconnect connector -2-.

– Push back cover for battery positive terminal -1-, and unbolt battery positive cable from starter solenoid switch.

– Unscrew nut -3- and remove earth wire.



Note

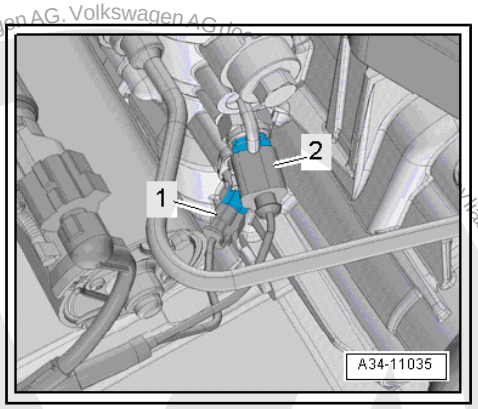
Depending on vehicle version, the earth wire is secured to the starter bolt.

– Disconnect electrical connections on gearbox (front left).

1 - For gearbox neutral position sender - G701-

2 - For reversing light switch - F4-

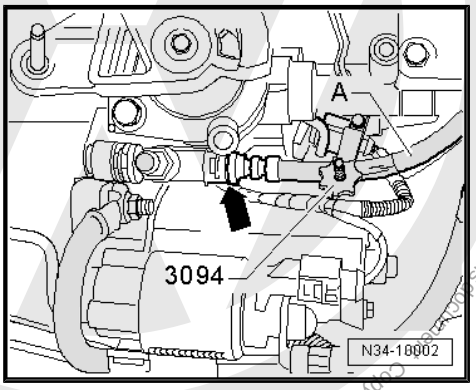
– Disconnect gear selector cable and gate selector cable from gearbox. Then, unbolt cable support bracket, and lay it to one side together with cables ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .



– Clamp off pipe/hose line -A- leading to slave cylinder using hose clamp - 3094- .

– Pull out clip -arrow- for pipe/hose line to stop.

– Pull pipe/hose line out of slave cylinder breather.

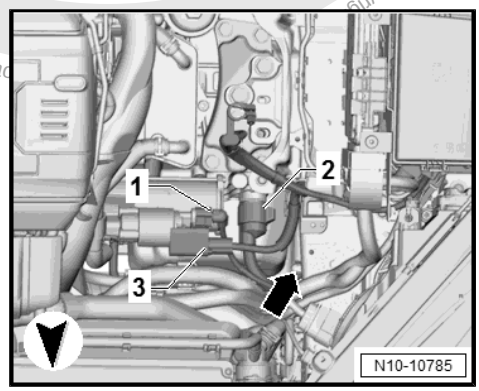


Vehicles with dual clutch gearbox:

– Separate connector -1-.

– Push back cover for battery positive terminal -3-, and unbolt battery positive cable from starter solenoid switch.

– Loosen nut -arrow-, and remove earth wire.



Note

Depending on vehicle version, the earth wire is secured to the starter bolt.

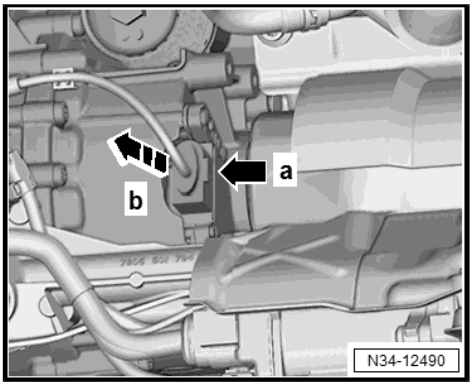
– Touch earth connection (without gloves) in order to discharge yourself.

– Do not touch contacts in the gearbox connector with hands.

– Disconnect connector -2- for mechatronic unit for dual clutch gearbox - J743- . To do this, turn rotary fastener in anti-clockwise direction.

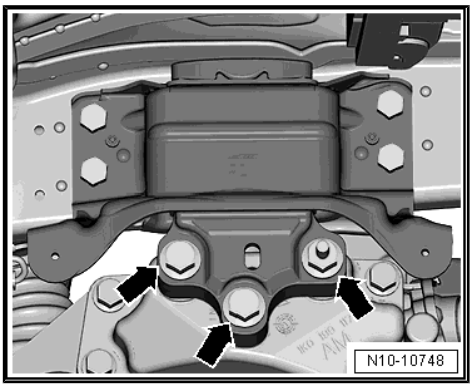
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– If fitted, release electrical connector for auxiliary hydraulic pump 1 for gearbox oil - V475- -a-, and pull off connector -b-.
– Disconnect selector lever cable from gearbox, and pull it out of cable support bracket ⇒ Rep. gr. 34 ; Selector mechanism; Removing and installing selector mechanism .

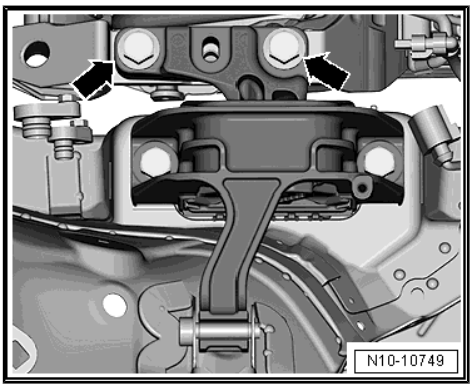


Continued for all:

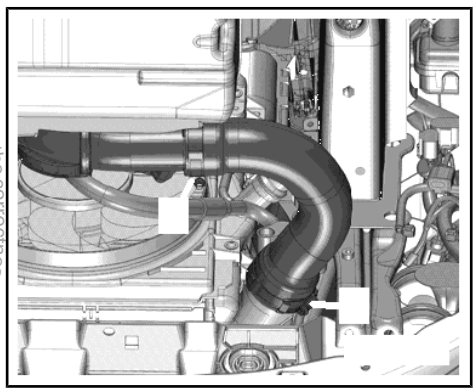
– Loosen bolts -arrows- for gearbox mounting approx. 2 turns.



– Loosen bolts -arrows- for engine mounting approx. 2 turns.

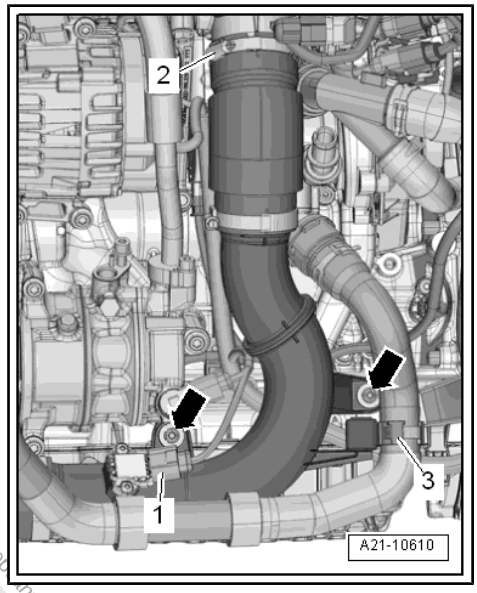


– Release hose clip -1- and -2-, and remove right charge air hose.
– Seal open lines and connections with clean plugs from engine bung set - VAS 6122- .

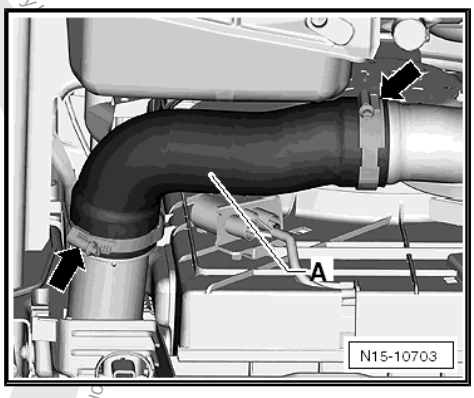


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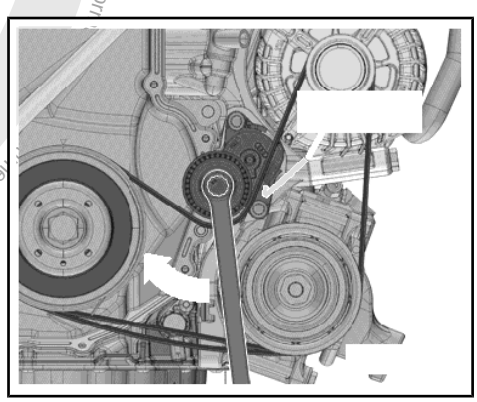
– Lay coolant hose -3- to one side.
– Unscrew bolts -arrows-.
– Release hose clip -2-.
– Disconnect electrical connector -1- from charge pressure sender - G31- .
– Remove air pipe.



– Open hose clip -arrow- on charge air cooler and pull off left charge air hose -A- from charge air cooler.



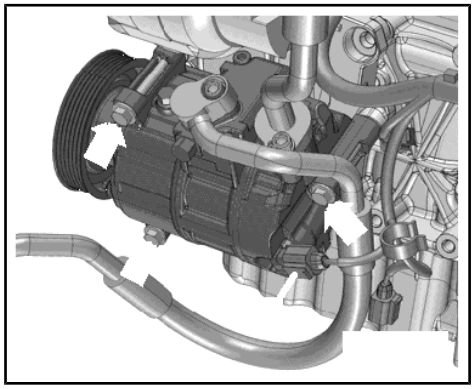
– Before removing the poly V-belt, use a piece of chalk or a felt pen to mark the running direction.
– To relieve tension on poly V-belt, swivel tensioning device in clockwise direction -arrow-.
– Remove poly V-belt from poly V-belt pulley of air conditioner compressor and release tensioning device. Remove locking pin - T10060 A- if necessary.



CAUTION

Risk of freezing injury caused by refrigerant.

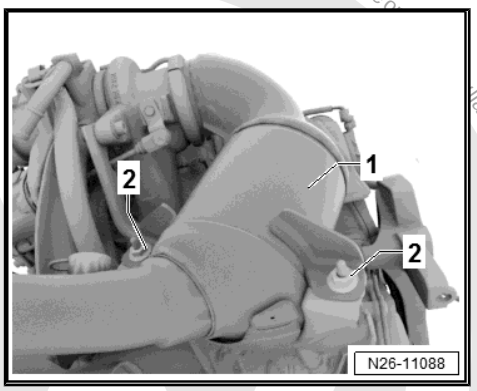
– Do not open refrigerant circuit of air conditioning system.



– Disconnect connector -1- on air conditioning compressor regulating valve - N280- .
– Unscrew bolts -arrows-.
– Detach air conditioner compressor with refrigerant hoses connected from bracket, and tie it up on the right side. Do NOT stretch, kink or bend refrigerant lines and hoses while doing so.

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– Unscrew nuts -2-.

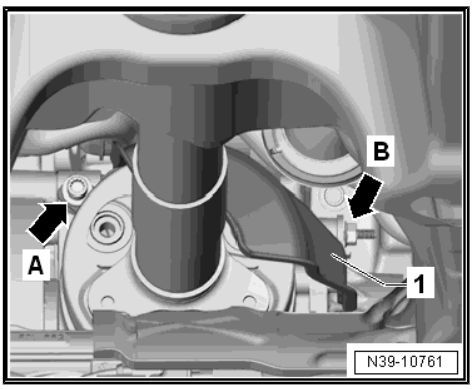


– Loosen clamp -arrow-, and push it to rear.
– Detach catalytic converter with front exhaust pipe.

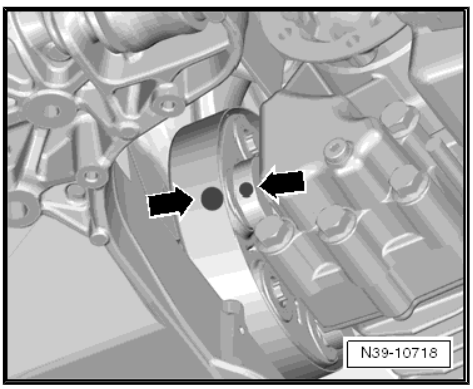
Vehicles with all-wheel drive:



– Unscrew bolts -A- and -B- from bevel box and remove heat shield -1-.



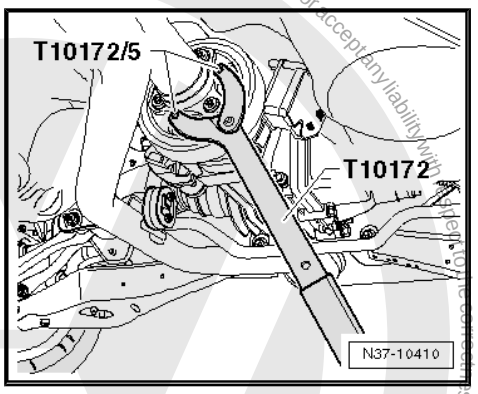
– Mark position of propshaft relative to bevel box flange.



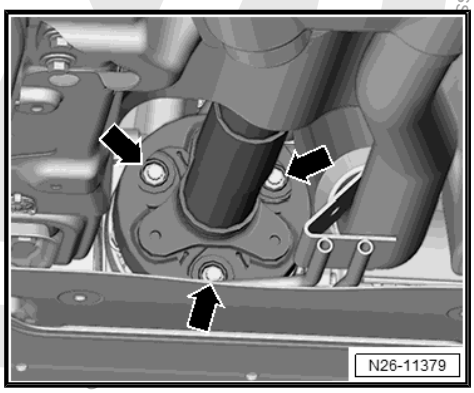
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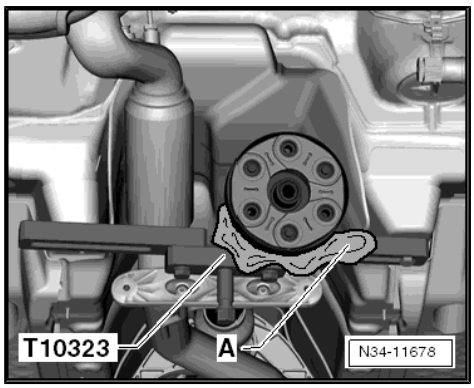
– Counterhold at rear final drive when loosening or tightening propshaft.



– Unbolt propshaft at front from bevel box -arrows-.

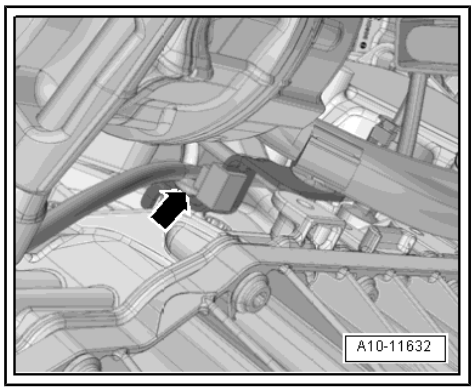


– Secure support - T10323- with a bolt on inside rear threaded hole for subframe.
– A securing bolt from the subframe is suitable for this.
– Put a cloth -A- on support .
– Pull propshaft off bevel box, and lay it to one side.

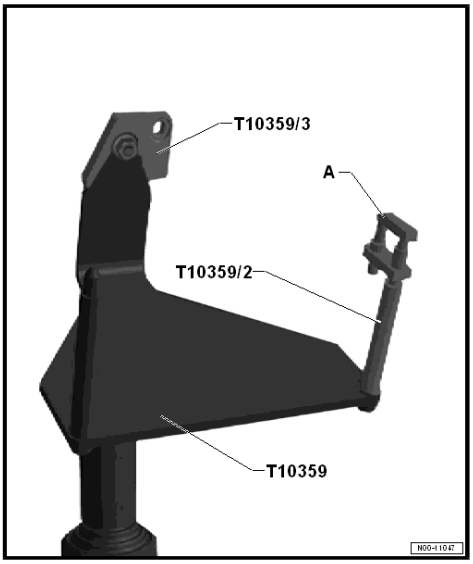


Continued for all vehicles:

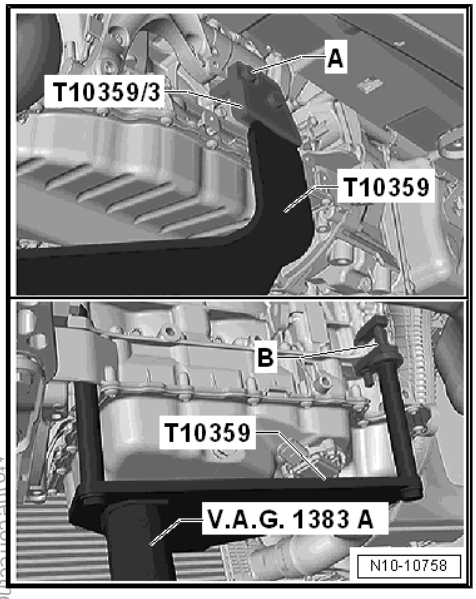
– Remove bolt -arrow- and push bracket for electrical wiring harness to one side.



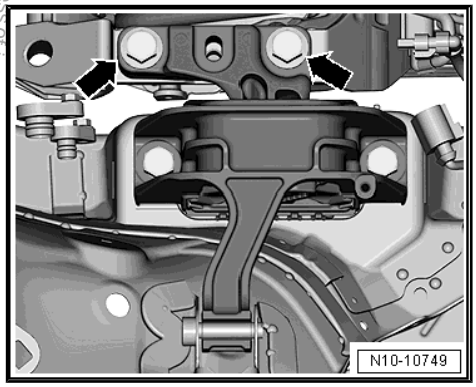
– Secure adapter -T10359/3- to engine support - T10359- , as shown in illustration.
– Use locking element -A- from gearbox support - 3282- to secure pin -T10359/2- to engine support.
– Insert engine support - T10359- in engine and gearbox jack - VAS 6931- .



– Fit engine support - T10359- to cylinder block. Screw bolt -A- with spacer sleeve into cylinder block. Specified torque: 20 Nm
– Secure engine with locking element -B-, and slightly lift engine with gearbox.

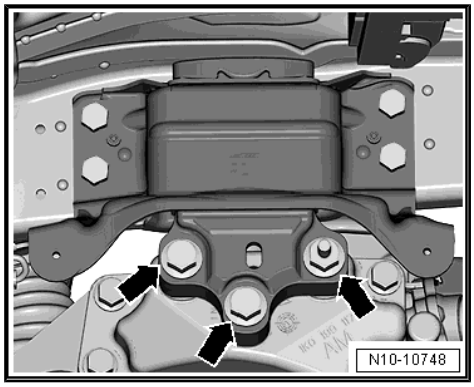


– Remove bolts -arrows- for engine mounting.

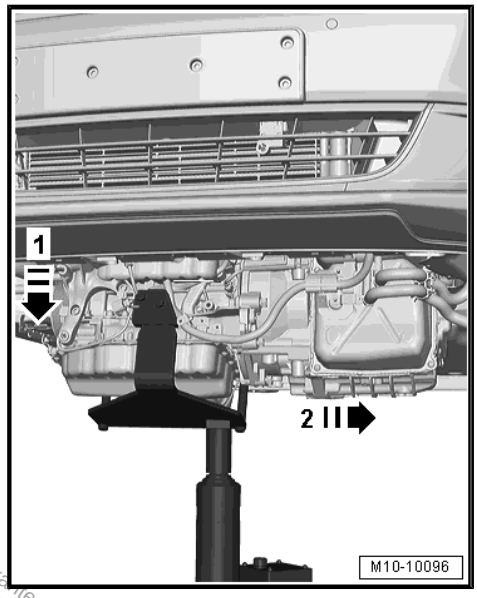


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– Remove bolts -arrows- securing gearbox mounting.



– Carefully lower engine/gearbox assembly. Check that all vacuum lines and electrical wiring between engine, gearbox and body have been detached while doing so.



1.2 Separating engine and gearbox

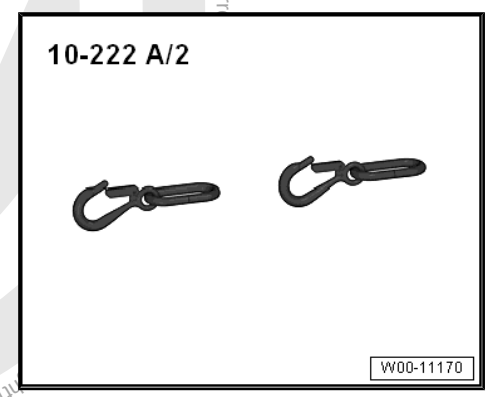
⇒ “1.2.1 Separating engine and gearbox, vehicles with manual gearbox”, page 18

⇒ “1.2.2 Separating engine and gearbox, vehicles with dual clutch gearbox”, page 21

1.2.1 Separating engine and gearbox, vehicles with manual gearbox

Special tools and workshop equipment required

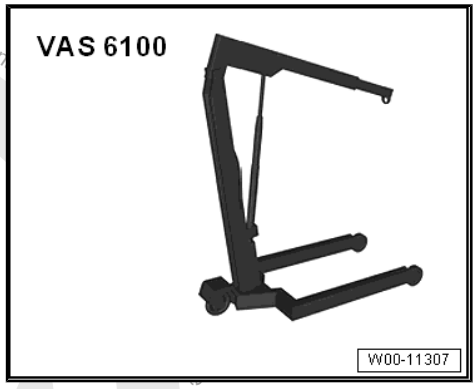
♦ Hook - 10 - 222 A /2-



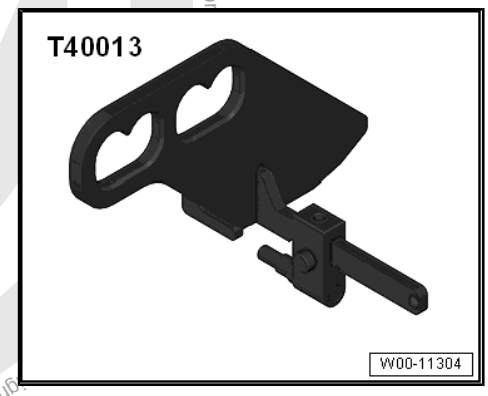
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♦ Workshop hoist - VAS 6100-



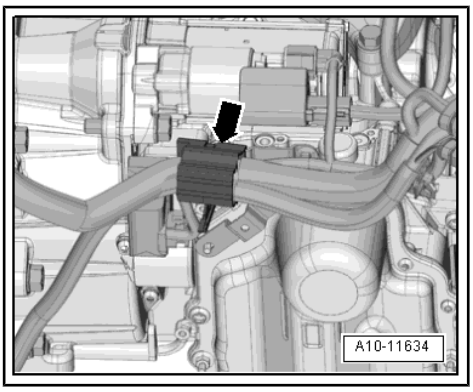
♦ Lifting tackle - T40013-



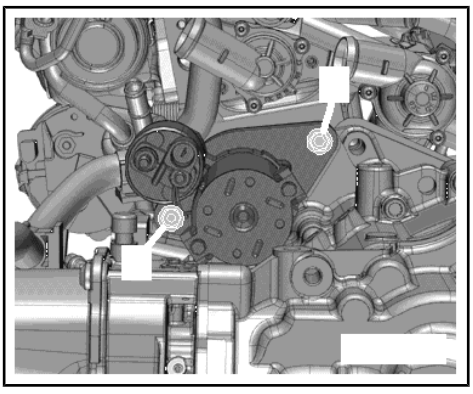
Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10359- .

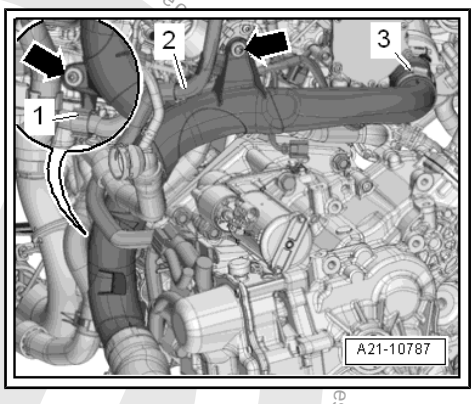
– Release electrical wires from retainer -arrow- and lay them to one side.



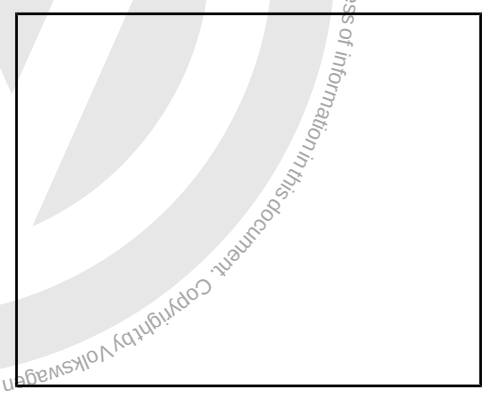
– Unscrew bolts -1 and 2-, and remove starter from gearbox.



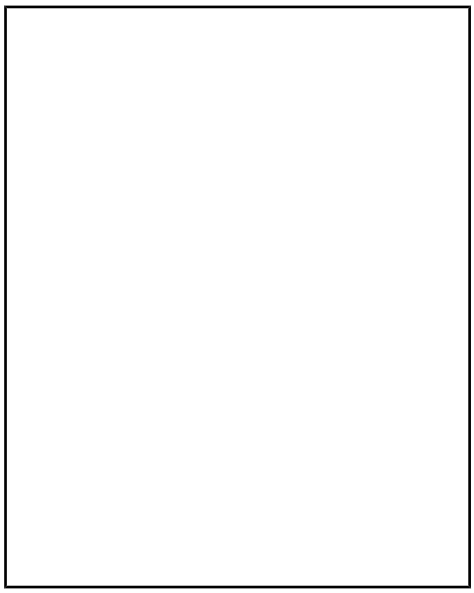
– Move electrical wiring harnesses -1, 2- clear at air pipe.
– Loosen screw-type clip -3-.
– Remove bolts -arrows- and detach air pipe.



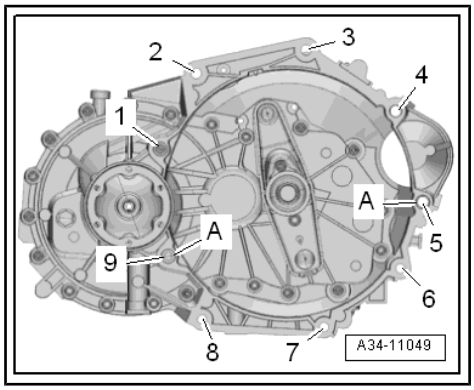
Unscrew bolts -arrows- and detach gearbox support.



– Attach lifting tackle - T40013- to gearbox and close lock.
– Attach workshop hoist - VAS 6100- with hooks - 10 - 222 A / 2- to lifting tackle.



– Remove bolts -1, 2, 3, 6, 7, 8, 9- securing gearbox to engine.



Note

Ignore -items 4, 5- and -A-.

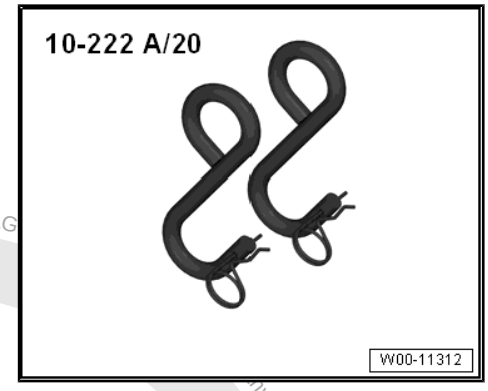
– Pull gearbox off engine.

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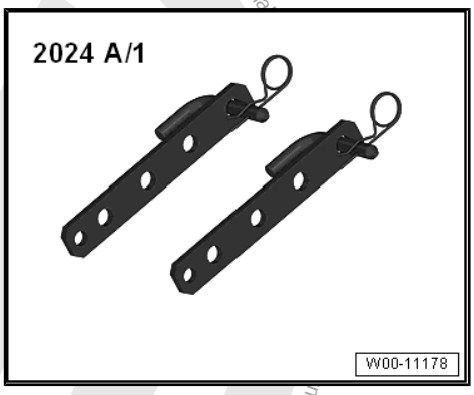
1.2.2 Separating engine and gearbox, vehicles with dual clutch gearbox

Special tools and workshop equipment required

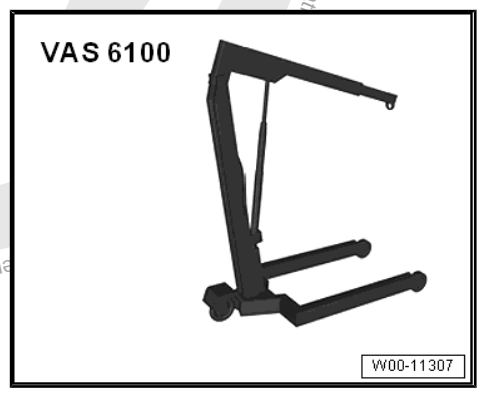
- Adapter - 10 - 222 A /20-



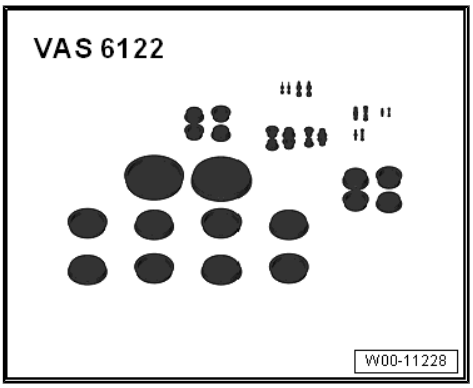
- Hook of -2024 A /1- lifting tackle - 2024 A-



- Workshop hoist - VAS 6100-



- Set of plugs for engine - VAS 6122-



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NOTICE

If engine and gearbox are separated, needle bearing in crankshaft must be renewed ⇒ page 66 .

Procedure

- Engine/gearbox assembly removed and attached to engine bracket - T10497- .

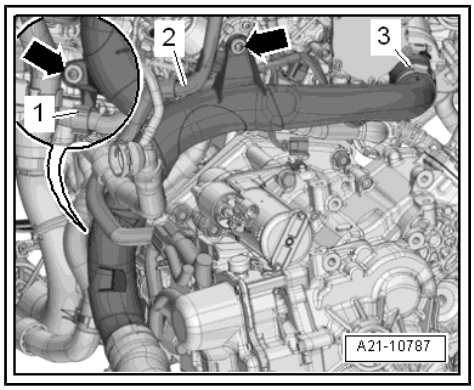
– Move electrical wiring harnesses -1, 2- clear at air pipe.

– Loosen screw-type clip -3-.

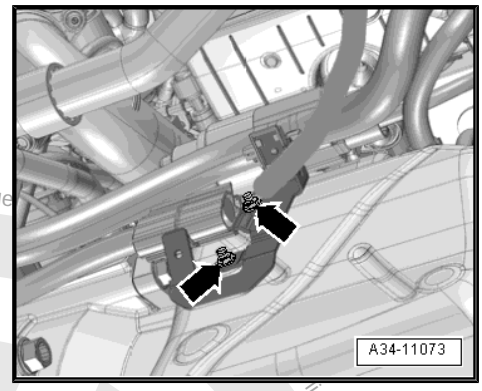
– Remove bolts -arrows- and detach air pipe.

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

– Unscrew coolant pipe from gearbox.



– Unscrew nuts -arrows-, and remove bracket at front of sump.

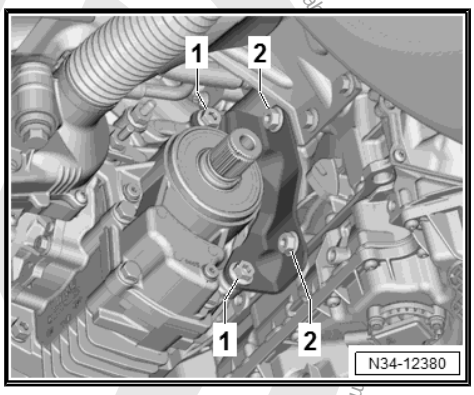


Note

The studs are welded to the front of the sump.

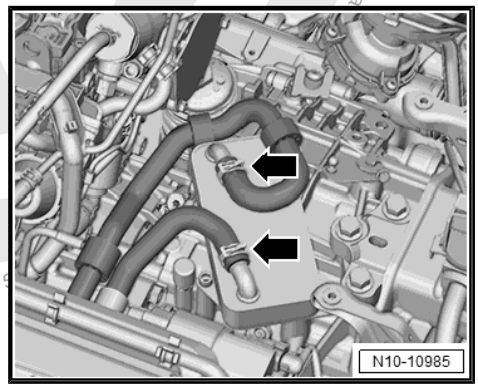
Vehicles with all-wheel drive:

– Unscrew bolts -1, 2-, and remove bracket for bevel box.



Continued for all vehicles:

– Open hose clips -arrows-, and disconnect coolant hoses from gear oil cooler.

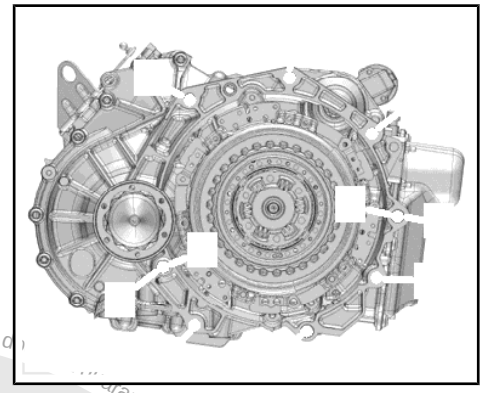


Note

Use a cloth to catch the escaping coolant.

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



Note

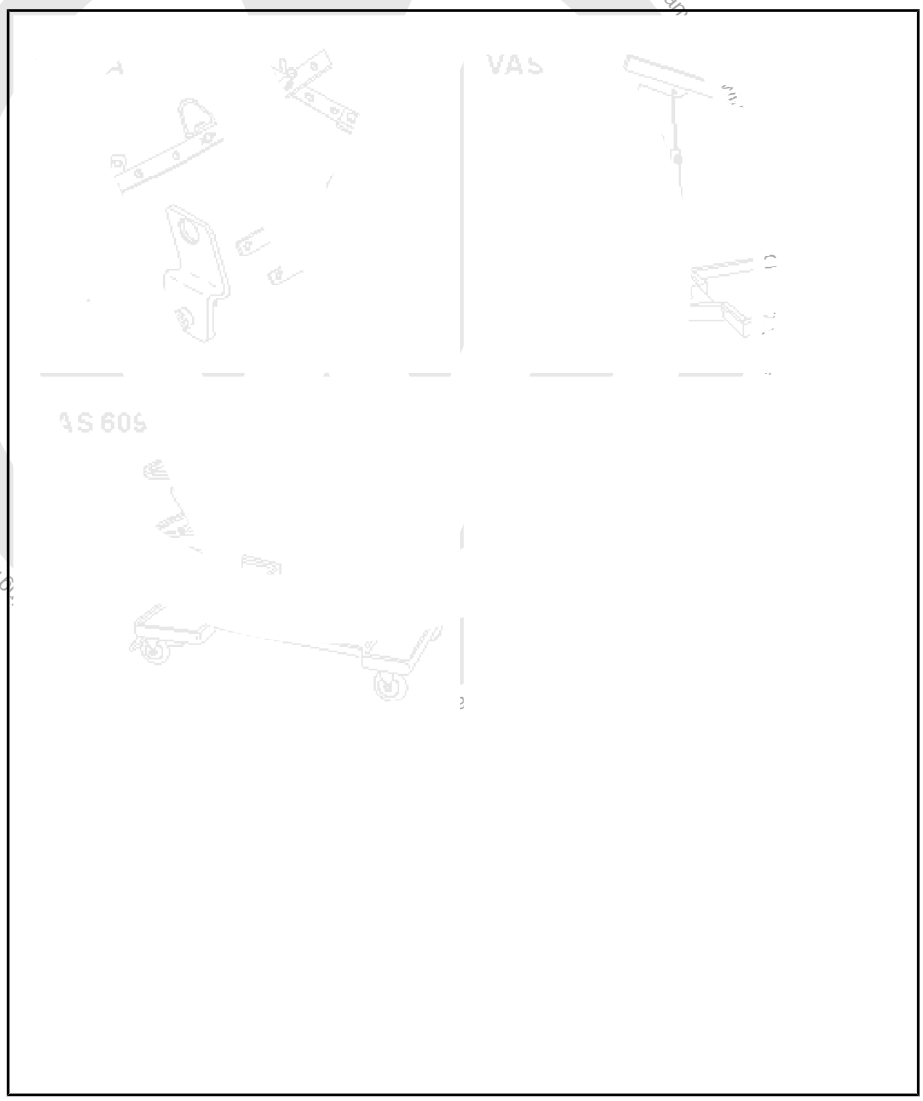
Disregard -Item A-.

– Pull gearbox off engine.

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1.3 Securing engine on engine and gearbox support

Special tools and workshop equipment required

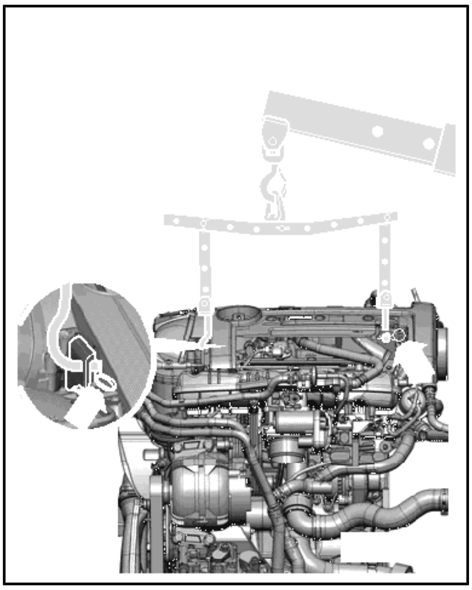


- ♦ Lifting tackle - 2024 A-
- ♦ Workshop hoist - VAS 6100-
- ♦ Engine and gearbox support - VAS 6095-

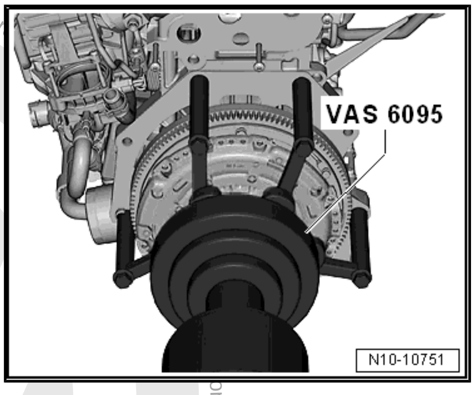
Procedure

- Gearbox detached from engine ⇒ page 18 .

– Attach lifting tackle - 2024 A- to engine on workshop hoist - VAS 6100- .
– In order to match the lifting tackle to the centre of gravity of the engine, the holes in the hook rail must be allocated as shown in the illustration.
– The support hooks and pins on the lifting tackle must be secured with locking pins -arrows-.
– Using workshop hoist - VAS 6100- , lift engine off engine and gearbox jack - VAS 6931- .



– Remove dowel sleeves for gearbox, and, on gearbox side, bolt engine to engine and gearbox support - VAS 6095- .



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1.4 Installing engine

Specified torques

Note

- *The specified torques are only valid for nuts and bolts which have been slightly greased, oiled, phosphate-treated or black-oxided.*
- *Additional lubricant such as engine oil or gear oil may be used, but do not use lubricant containing graphite.*
- *Do not use degreased parts.*
- *Renew bolts that are tightened with turning further angle.*
- *Renew self-locking nuts and bolts, and seals, O-rings and gaskets.*
- *Hose unions and air intake pipes and hoses must be free of oil and grease before installation.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *Attach cable ties in all the same places when installing.*
- *Tolerance for specified torques ± 15%.*

Component		Nm
Bolts and nuts	M6	10

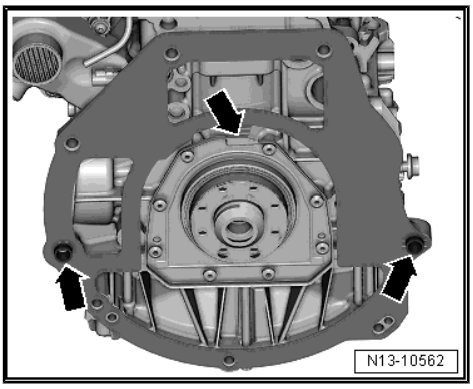
Component		Nm
	M7	15
	M8	20
	M10	40
	M12	65

- Assembly mountings
  ⇒ “2.1 Assembly overview - assembly mountings”, page 28 .
- Securing gearbox to engine ⇒ Rep. gr. 34 ; Removing and installing gearbox; Specified torques for gearbox .

Procedure

– Check for damage to dowel sleeves in cylinder block for centring engine and gearbox and renew them as needed.

– Hook intermediate plate onto sealing flange and slide onto dowel sleeves -arrows-.



Vehicles with manual gearbox:

– If clutch release bearing is worn, renew it ⇒ Rep. gr. 30 ; Clutch mechanism; Repairing clutch release mechanism .

– Lightly grease input shaft splines using grease as per ⇒ Electronic parts catalogue (ETKA) .

– Check centring of clutch plate.

– Bolt gearbox to engine.

Vehicles with dual clutch gearbox:

– If engine and gearbox were separated, renew needle bearing in crankshaft ⇒ page 66 .

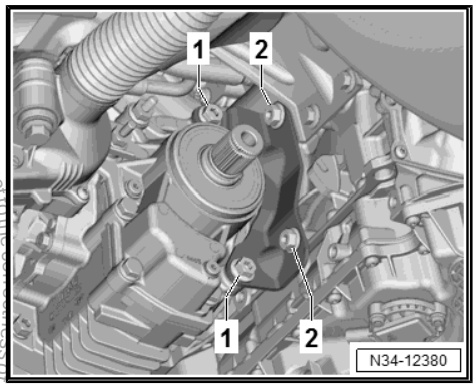
Continued for all vehicles:

– Bolt gearbox to engine.

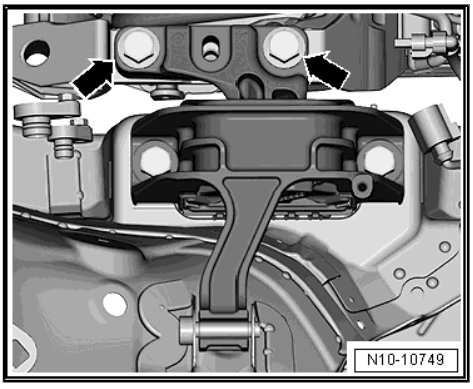
– Install bracket for bevel box.

– Install starter ⇒ Electrical system; Rep. gr. 27 ; Starter; Removing and installing starter .

– Guide engine/gearbox assembly into body.

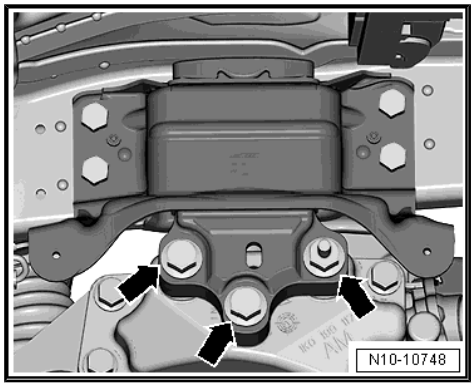


– First screw bolts -arrows- for engine mountings into stop by hand.



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



Note

The bolts are tightened to final torque only after adjusting the assembly mountings ⇒ page 28 .

– Remove engine bracket - T10359- from engine.

– Install drive shafts ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Assembly overview - drive shaft .

Vehicles with manual gearbox:

– Install clutch slave cylinder ⇒ Rep. gr. 30 ; Clutch mechanism; Removing and installing clutch slave cylinder .

– Install cables with cable support bracket ⇒ Rep. gr. 34 ; Selector mechanism; Assembly overview - selector cables .

Vehicles with dual clutch gearbox:

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

Continued for all vehicles:

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

– Install poly V-belt ⇒ page 44 .

– Adjust assembly mountings ⇒ page 39 .

– Install battery tray ⇒ Electrical system; Rep. gr. 27 ; Battery; Exploded view - battery .

– Electrical connections and routing ⇒ Electrical system; Rep. gr. 97 ; Relay carriers, fuse carriers, electronics boxes; Overview of fitting locations - relay carriers, fuse carriers, electronics boxes and ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

– Install air filter housing ⇒ page 263 .

– Fit engine cover panel ⇒ page 41 .

– Check oil level.

– Connect coolant hoses with plug-in connector to heat exchanger for heater ⇒ page 220 .

– Add coolant ⇒ page 190 .

Note

Never reuse old coolant.

– Install subframe ⇒ Running gear, axles, steering; Rep. gr. 40 ; Subframe; Removing and installing subframe without steering rack .

– Install front wheel housing liners ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Assembly overview - front wheel housing liner .

If a new base engine or short engine was installed, additional adaptations must be carried out in the engine control unit. Proceed as follows to do this:

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– Connect ⇒ Vehicle diagnostic tester, and select following functions.

- `Engine control unit functions`
- `0001 - Activate engine run-in`

and

- `Engine control unit functions`
- `0001 - Basic setting`
- `0001 - Adaption of chain drive after repairs`

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2 Assembly mountings

⇒ “2.1 Assembly overview - assembly mountings”, page 28

⇒ “2.2 Removing and installing motor mounting”, page 29

⇒ “2.3 Removing and installing gearbox mounting”, page 30

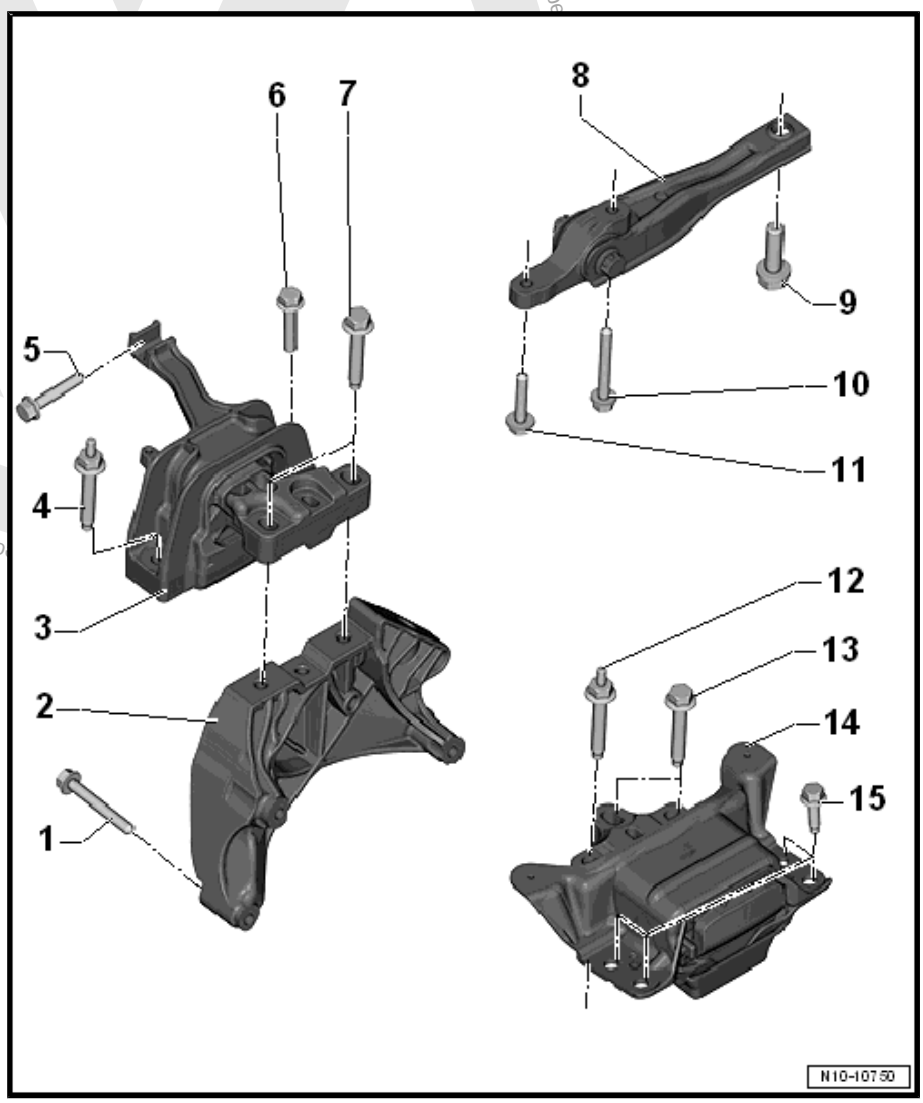
⇒ “2.4 Removing and installing pendulum support”, page 31

⇒ “2.5 Supporting engine in installation position”, page 32

⇒ “2.6 Checking adjustment of assembly mountings (engine and gearbox mountings)”, page 39

⇒ “2.7 Adjusting assembly mountings”, page 39

2.1 Assembly overview - assembly mountings



1 - Bolt
- ❑ Renew
- ❑ Specified torque and tightening sequence ⇒ page 56

2 - Engine support
- ❑ Removing and installing ⇒ page 55

3 - Engine mounting
- ❑ With support arm.
- ❑ Removing and installing ⇒ page 29

4 - Bolt
- ❑ Renew
- ❑ 40 Nm +90°

5 - Bolt
- ❑ Renew
- ❑ 20 Nm +90°

6 - Bolt
- ❑ Renew
- ❑ 40 Nm +90°

7 - Bolt
- ❑ Renew
- ❑ 60 Nm +90°

8 - Pendulum support
- ❑ Removing and installing ⇒ page 31

9 - Bolt
- ❑ Renew
- ❑ Specified torque and tightening sequence ⇒ page 31

10 - Bolt
- ❑ Renew
- ❑ Specified torque and tightening sequence ⇒ page 31

11 - Bolt
- ❑ Renew

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❑ Specified torque and tightening sequence ⇒ page 31

12 - Bolt

❑ Renew
❑ 60 Nm +90°

13 - Bolt

❑ Renew
❑ 60 Nm +90°

14 - Gearbox mounting

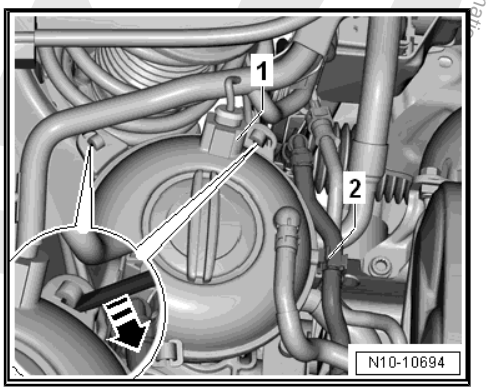
❑ With support arm.
❑ Removing and installing ⇒ page 30

15 - Bolt

❑ Renew
❑ 50 Nm +90°

2.2 Removing and installing motor mounting

– Separate connector -1-.
– Free hoses -2- from fittings and lay them to one side.
– Using a screwdriver, release fasteners -arrow- and move coolant expansion tank to one side.
– Support engine in its installation position ⇒ page 32 .
– Take up weight of engine/gearbox assembly slightly with spindle; do not lift.



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

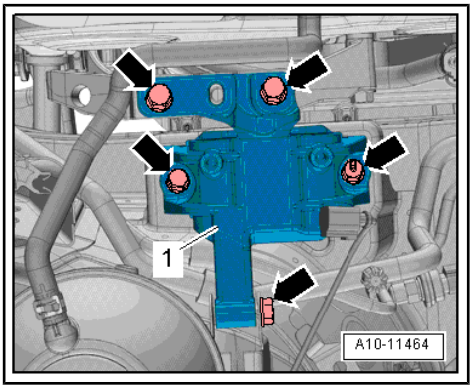
Installing

Install in reverse order of removal, observing the following:

– Checking adjustment of assembly mountings ⇒ page 39 .

Specified torques

♦ ⇒ “2.1 Assembly overview - assembly mountings”, page 28

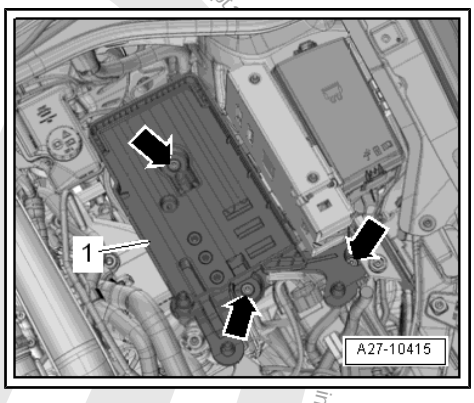


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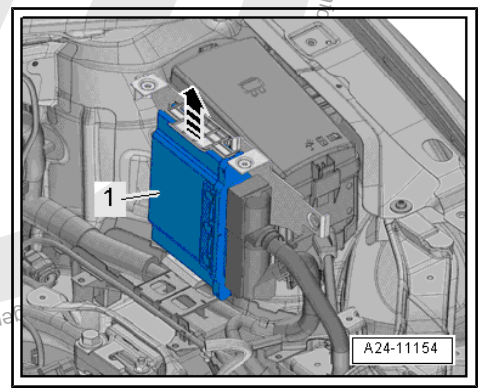
2.3 Removing and installing gearbox mounting

Removing

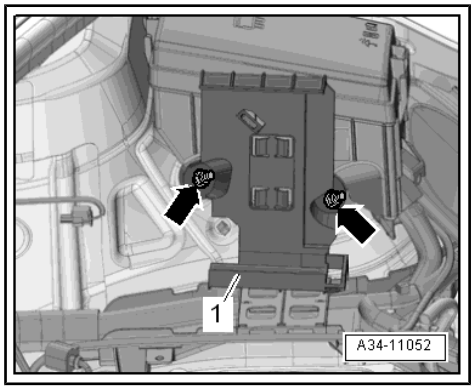
– Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .



– Remove engine control unit - J623- from bracket ⇒ page 283 .



– Unscrew nuts -arrows- and remove bracket -1-.

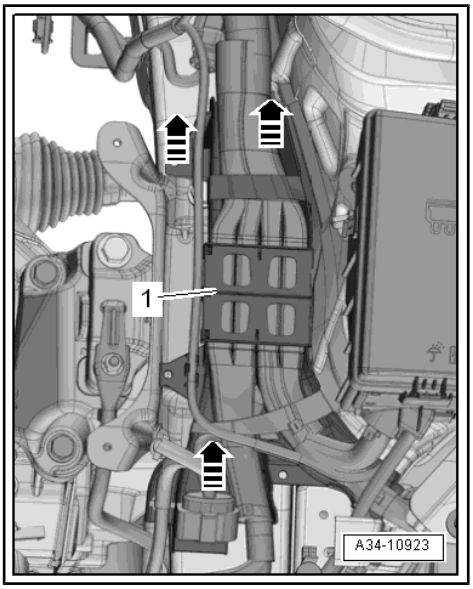


Note

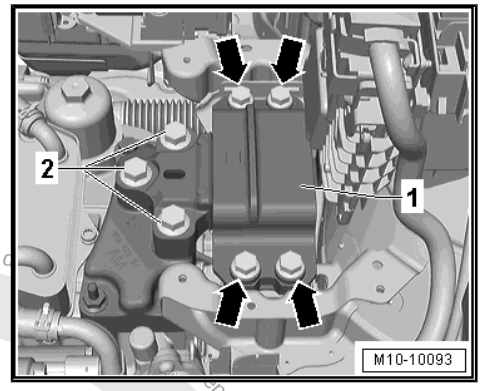
Different types of brackets are fitted depending on version.

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– Unclip wire guide -1- upwards -arrows-, and push it slightly to one side.
– Support engine in its installation position ⇒ page 32 .



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



Installing

Install in reverse order of removal, observing the following:

Note

- *Renew bolts that are tightened with turning further angle.*
- *Gearbox support and support arm of gearbox mounting must be perfectly parallel to each other before screwing in bolts. If necessary, lift gearbox at rear using trolley jack.*

– Tighten gearbox mounting on longitudinal member.
– Lift gearbox with spindle of support bracket until gearbox support makes contact with support arm of gearbox mounting.
– Start bolts by hand. Ensure to not screw in the bolts at an angle while doing so.
– Checking adjustment of assembly mountings ⇒ page 39 .
– When the bolts are tightened to specified torque, remove support bracket - 10 -222 A- from engine.

Specified torques

- ⇒ “2.1 Assembly overview - assembly mountings”, page 28
- Battery; Assembly overview - battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Assembly overview - battery

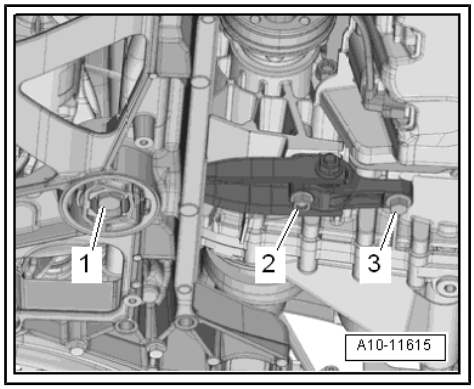
2.4 Removing and installing pendulum support

Removing

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

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– Unscrew bolts -1, 2 and 3-, and remove pendulum support.



Installing

Install in reverse order of removal, observing the following:

Specified torques

Stage	Bolts	Specified torque/turning further angle
1.	-2, 3-	50 Nm
2.	-1-	130 Nm
3.	-1 … 3-	Turn 90° further

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

2.5 Supporting engine in installation position

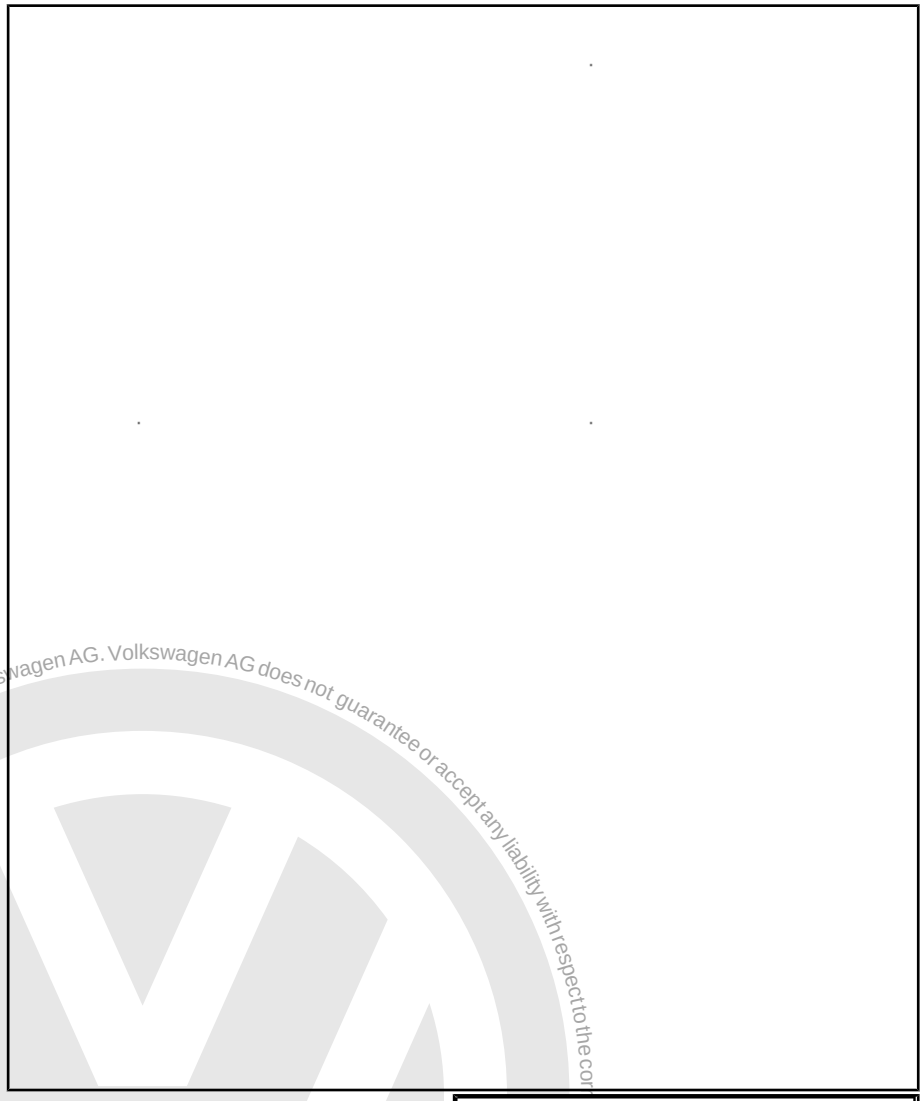
⇒ “2.5.1 Supporting engine in installation position, Tiguan”, page 32

⇒ “2.5.2 Supporting engine in installation position, Arteon”, page 35

2.5.1 Supporting engine in installation position, Tiguan

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Special tools and workshop equipment required





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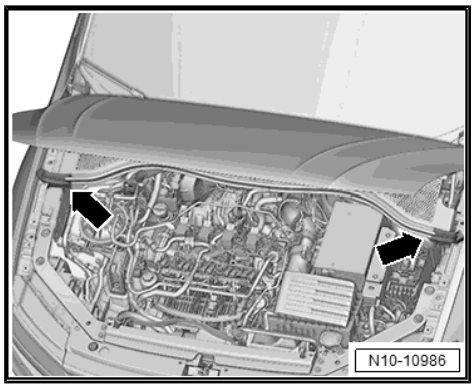
- Support - 10 - 222 A-
- Hook - 10-222A/10-
- Adapter - 10-222A/28-
- Adapter - 10-222A/28-2-
- 2 × adapter - 10 - 222 A /29-
- 2 × -T40091/1- and -T40091/3- from engine support basic set - T40091-

- ♦ 2 × swivel joints - T40093/3- from engine support supplementary set - T40093-
- ♦ Shackle - 10 - 222 A /12-

Supporting engine

– Remove engine cover panel ⇒ page 41 .

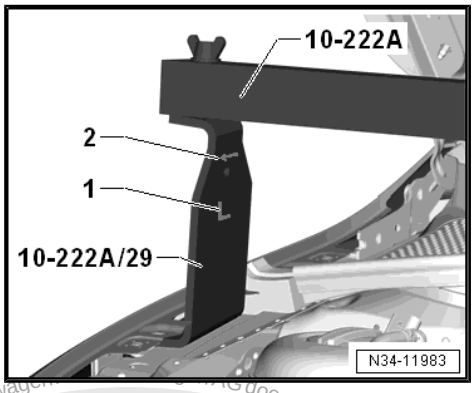
– Remove foam elements -arrows- on left and right for plenum chamber seal.



– On both sides of vehicle, insert adapters - 10 - 222 A /29- between wing and sheet metal for mounting wing underneath it.

Installation position:

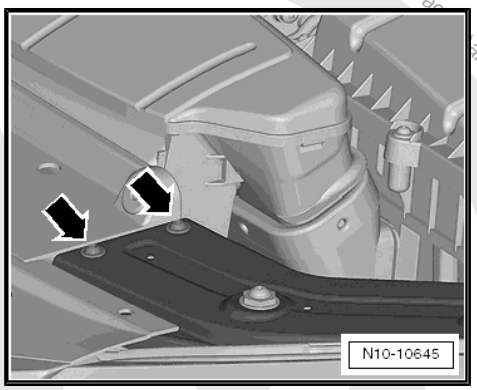
- ♦ Support bracket - 10-222 A- is set-up behind gas strut for bonnet.
- ♦ Adapter “L” = -1- is inserted on “right” of vehicle.
- ♦ Adapter “R” (not seen here) is inserted on “left” of vehicle.
- ♦ Arrow -2- always points in direction of travel.



– Push 2 × swivel joints - T40091/3- onto support bracket - 10-222 A- .

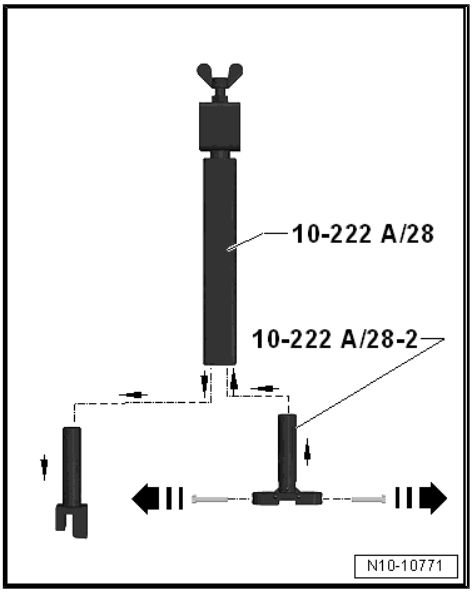
– Secure support bracket - 10-222 A- to adapters - 10 - 222 A/29- .

– Unscrew bolts -arrows- for lock carrier bracket on left and right.

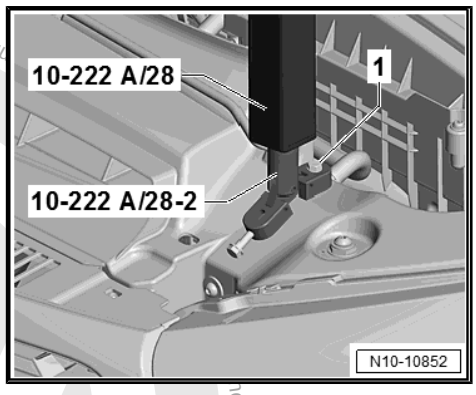


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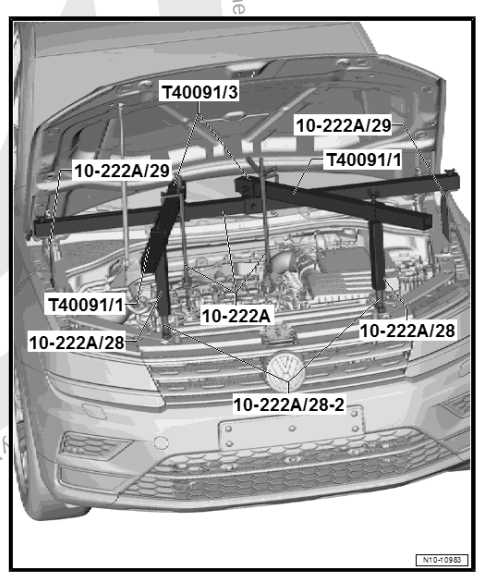
– Unscrew lower supports from adapters - 10 - 222 A /28- and replace them with adapters -10-222 A /28-2- .
– Unscrew bolts -arrows- for securing support bracket to lock carrier from adapter - 10-222 A /28-2- .



– Bolt adapter - 10-222 A /28-2- to lock carrier using securing bolt -1-. Specified torque: 8 Nm



– Set-up square tubes - T40091/1- with one spindle each as shown.
– Engage spindles in support eyes of engine. Use shackle - 10 - 222 A /12- if necessary.
– Take up weight of engine/gearbox assembly using spindles .

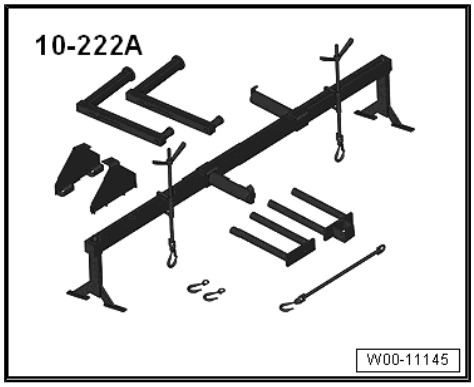


2.5.2 Supporting engine in installation position, Arteon

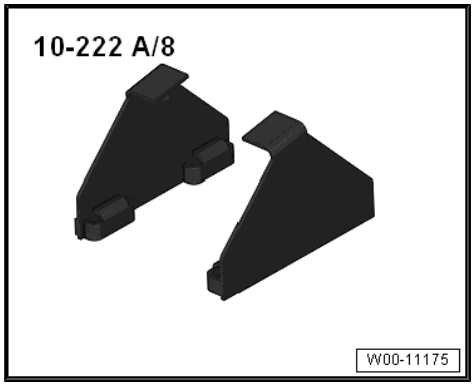
Special tools and workshop equipment required

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♦ Support - 10 - 222 A-



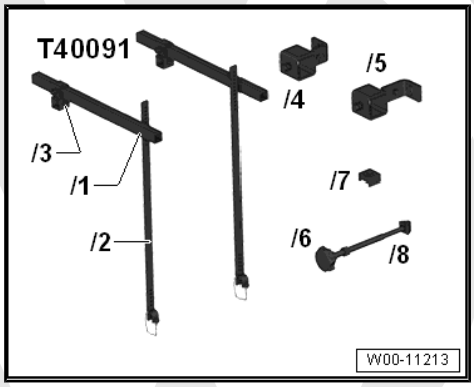
♦ Adapter - 10 - 222 A /8-



♦ Shackle - 10 - 222 A /12- qty. 2



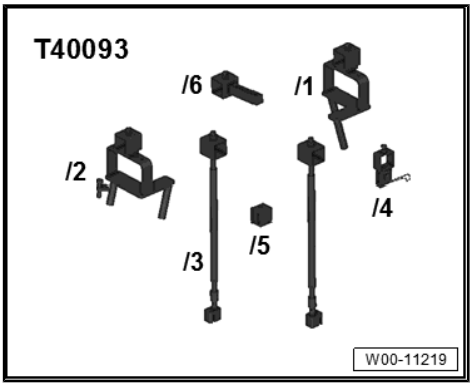
♦ Square tube - T40091/1-



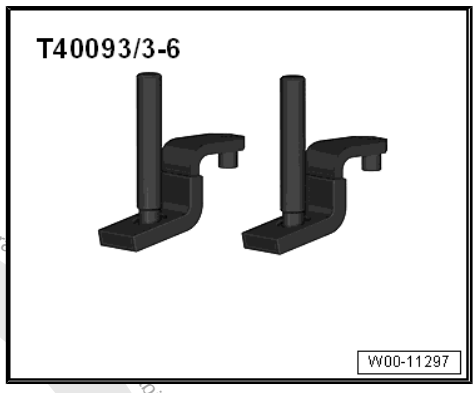
♦ Connector - T40091/3-

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♦ Spindle - T40093/3- qty. 2



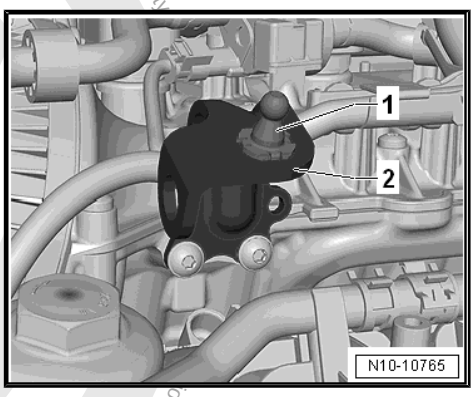
♦ Adapter - T40093/3-6A-



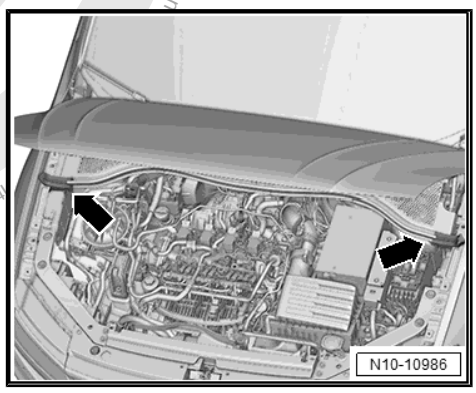
Supporting engine

– Remove engine cover panel ⇒ page 41 .

– Unclip right mounting -1- for engine cover panel from retainer -2-.



– Remove foam elements -arrows- on left and right for plenum chamber seal.



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Assemble engine support bracket - 10-222 A- as shown:

A - Adapter - 10 - 222 A /8-

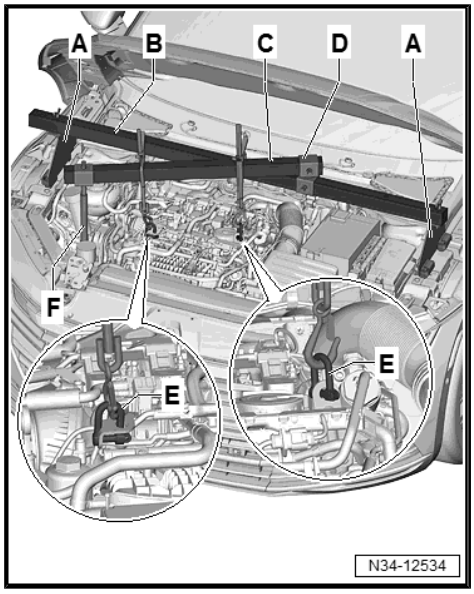
B - Support bracket - 10-222 A-

C - Square tube - T40091/1-

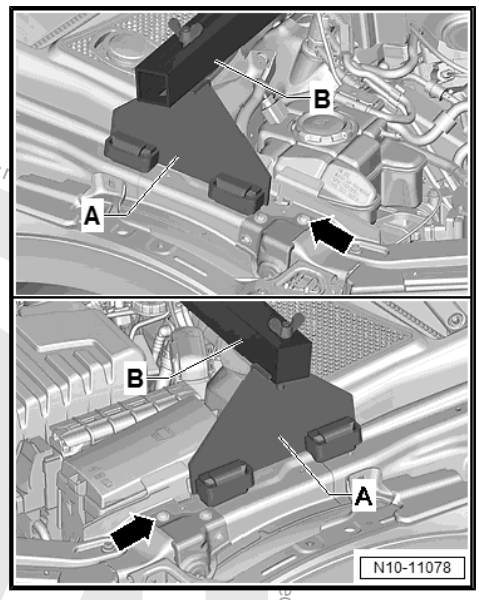
D - Connector - T40091/3-

E - Shackle - 10 - 222 A /12-

F - Spindle - T40093/3- with adapter - T40093/3-6A-



– Place adapters - 10 - 222 A /8- -A- on longitudinal member behind bolt -arrow- on both sides of vehicle, as shown in illustration.

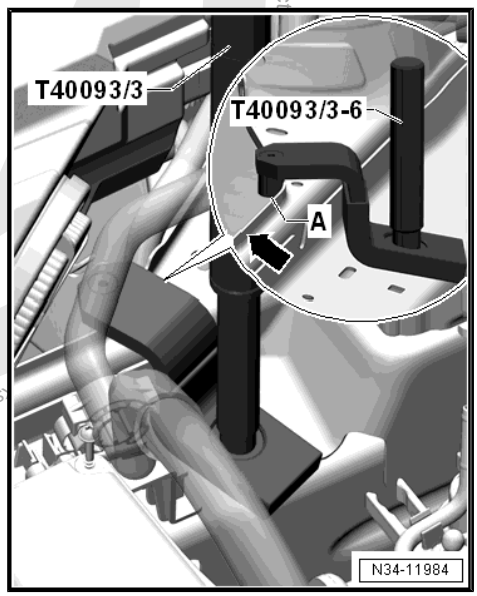


– Place adapter - T40093/3-6- on right longitudinal member.

• The adapter - T40093/3-6- is locked with the pin -A- behind the flange of the longitudinal member -arrow-.

– If necessary, carefully unclip any pipes for air conditioning system in front area. Do not disconnect pipe/hose system ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; System overview - refrigerant circuit .

– Take up weight of engine/gearbox assembly using spindles .



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

Procedure

The following specifications must be obtained:



- There must be a distance of -a- = 10 mm between engine support -2- and engine mounting -1-.
- Side surface of engine support casting should be located parallel to support arm of engine mounting.
- Distance -b- = distance -b-.

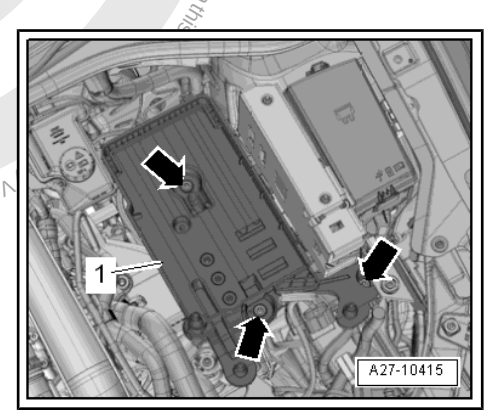
Note

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

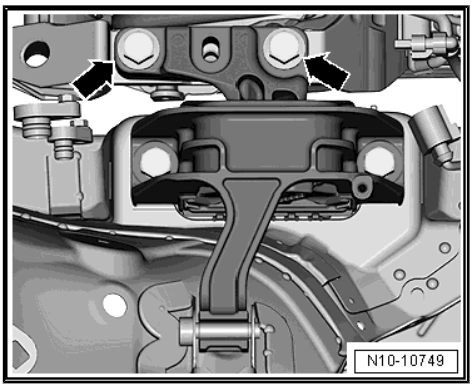
– If the dimension is too small or too high, adjust assembly mountings ⇒ page 39 .

2.7 Adjusting assembly mountings

Procedure



– Remove battery tray -1- ⇒ Electrical system; Rep. gr. 27 ; Battery; Removing and installing battery tray .
– Support engine in its installation position ⇒ page 32 .



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

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– Using assembly lever, adjust engine/gearbox assembly until specifications listed below are attained:

- There must be a distance of -a- = 10 mm between engine support -2- and engine mounting -1-.
- Side surface of the engine support casting should be located parallel to support arm of engine mounting.
- Distance -b- = distance -b-.



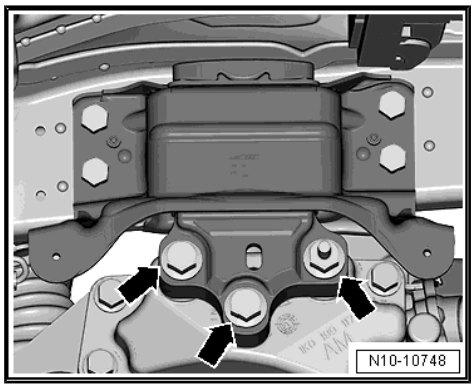
Note

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

– Tighten bolts for engine mounting.

– Unscrew gearbox mounting bolts -arrows- one after the other and renew them (if not already renewed when installing engine).

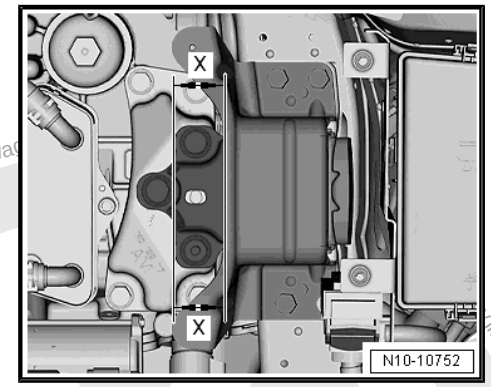
– First screw bolts in loosely.



– On gearbox side, ensure that support arm and gearbox mounting are parallel.

- Distance -x- = distance -x-.

– Tighten bolts for gearbox mounting.



Specified torques

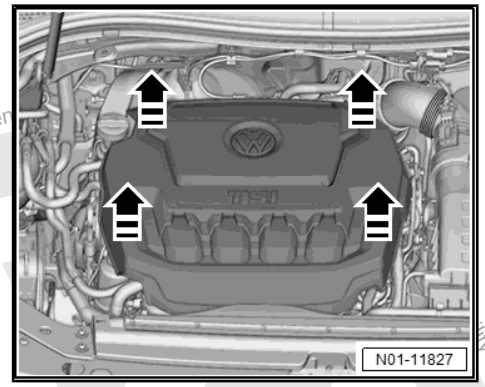
- ⇒ “2.1 Assembly overview - assembly mountings”, page 28
- ⇒ Electrical system; Rep. gr. 27 ; Battery; Assembly overview - battery

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3 Motor cover

⇒ “3.1 Removing and installing engine cover”, page 41

3.1 Removing and installing engine cover



Removing

– Carefully pull engine cover panel off retaining pins one after the other -arrows-. Do not pull off motor cover panel abruptly or only on one side.

Installing

– To prevent damage, do not strike engine cover panel with the fist or a tool.

– Position engine cover panel, paying attention to oil filler neck and dipstick.

– Press engine cover panel into rubber grommets first on left side and then on right side.

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13 – Crankshaft group

1 Cylinder block (pulley end)

⇒ “1.1 Assembly overview - cylinder block (pulley end)”, page 42

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

⇒ “1.3 Removing and installing tensioner for poly V-belt”, page 45

⇒ “1.4 Removing and installing vibration damper”, page 45

⇒ “1.5 Renewing seal for vibration damper”, page 51

⇒ “1.6 Removing and installing bracket for ancillaries”, page 53

⇒ “1.7 Removing and installing engine support”, page 55

1.1 Assembly overview - cylinder block (pulley end)

1 - Poly V-belt

- ❑ Check for wear
- ❑ Do not kink
- ❑ Poly V-belt routing ⇒ page 44
- ❑ Removing and installing ⇒ page 44
- ❑ When installing, make sure it is properly seated on pulleys.

2 - Tensioning device for poly V-belt

- ❑ Swing with open-end spanner to slacken poly V-belt.
- ❑ Lock with locking pin - T10060 A- .
- ❑ Removing and installing ⇒ page 45

3 - Bolt

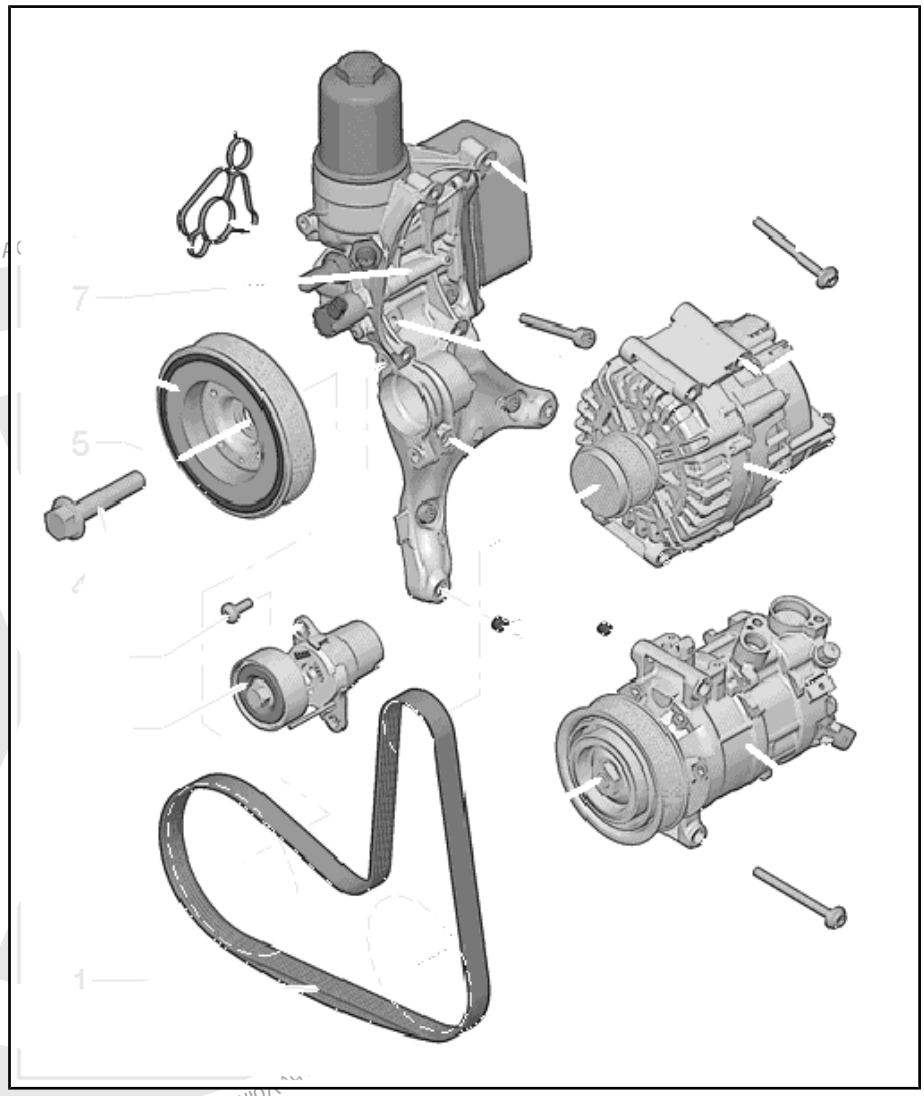
- ❑ Renew
- ❑ 8 Nm +45°

4 - Bolt

- ❑ Renew
- ❑ Moisten O-ring with oil.
- ❑ 150 Nm +90° further
- ❑ Use counter-hold tool - T10355- to loosen and tighten
- ❑ Removing and installing ⇒ page 45

5 - O-ring

- ❑ Not a replacement part. Included in items supplied with bolt.



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6 - Vibration damper

- ❑ With poly V-belt pulley
- ❑ Removing and installing ⇒ page 45
- ❑ Renew seal for vibration damper ⇒ page 51

7 - Ancillary bracket

- ❑ With oil filter and engine oil cooler
- ❑ Removing and installing ancillary bracket ⇒ page 53 .
- ❑ Removing and installing engine oil cooler ⇒ page 166

8 - Seal

- ❑ Renew

9 - Bolt

- ❑ Renew
- ❑ Specified torque and tightening sequence ⇒ page 43

10 - Bolt

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

11 - Alternator

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

12 - Dowel sleeves

- ❑ For air conditioner compressor.

13 - Air conditioner compressor

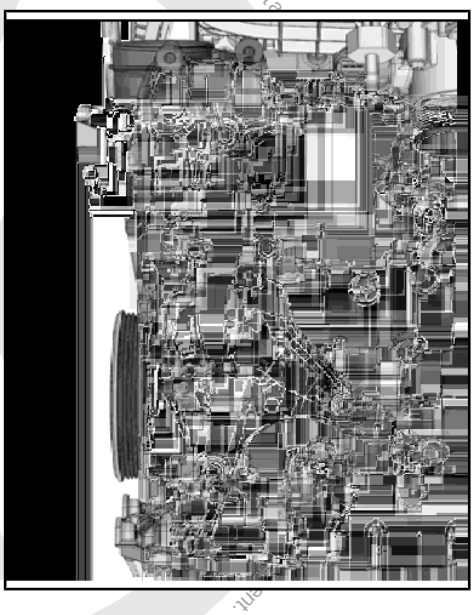
- ❑ Do not unscrew or disconnect refrigerant lines
- ❑ Assembly overview ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Assembly overview - drive unit of air conditioner compressor .

14 - Bolt

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

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Ancillary bracket - specified torques and tightening sequence



– Fit bracket for ancillaries (first tighten bolt -4- by hand).

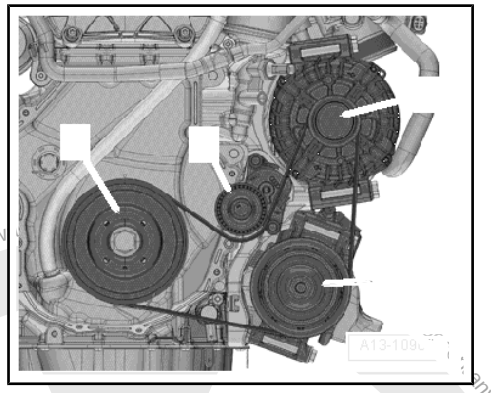
Note

Renew bolts that are tightened with turning further angle.

– Tighten bolts in sequence -1 … 5- in 3 stages as follows:

1. Tighten bolts by hand.
2. Tighten bolts to 20 Nm.
3. Turn bolts 90° further.

Poly V-belt routing

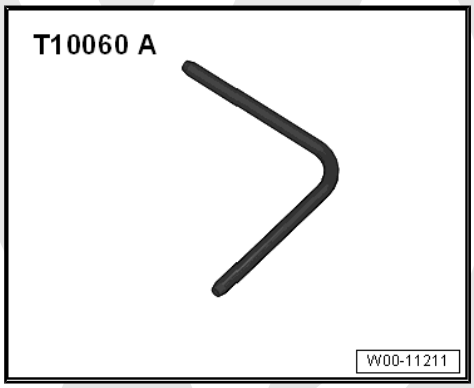


1 - Vibration damper
2 - Tensioning device for poly V-belt
3 - Alternator
4 - Air conditioner compressor

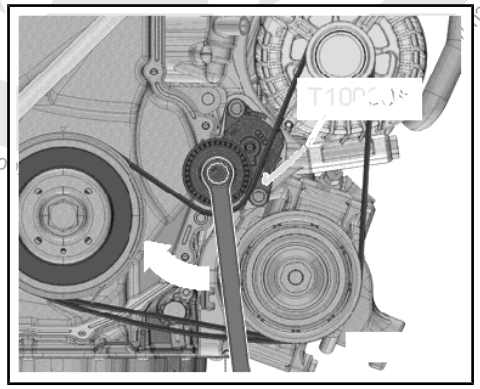
1.2 Removing and installing poly-V belt

Special tools and workshop equipment required

♦ Locking pin - T10060 A-

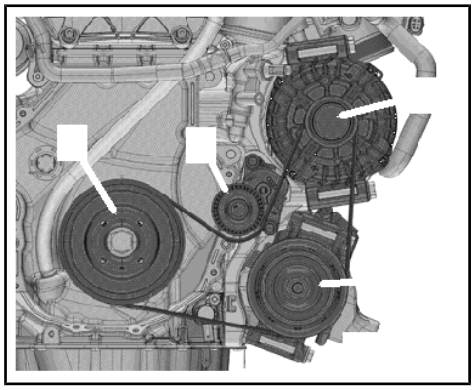


Removing



– If poly V-belt is to be reinstalled, mark direction of rotation on belt using chalk or felt tip pen before removing.
– To slacken poly V-belt turn tensioning device in direction of -arrow-. To do so, fit tool from “above”.
– Lock tensioning device in place with locking pin - T10060 A- .
– Remove poly V-belt.

Installing

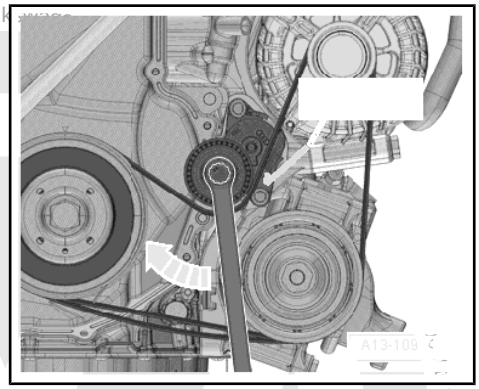


– When installing used poly V-belts, observe the direction of rotation marked on removal.
– Fit poly V-belt as shown in figure.

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

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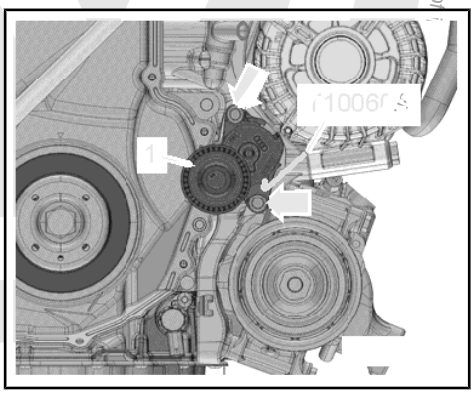
– Turn tensioning device in -direction of arrow-, and pull out locking pin - T10060 A- .
– Release tensioner.
– Check that poly V-belt is properly seated.
– Start engine and check that poly V-belt runs properly.



1.3 Removing and installing tensioner for poly V-belt

Removing

– Remove poly V-belt from tensioner
⇒ “1.2 Removing and installing poly-V belt”, page 44 .
– Unscrew bolts -arrows- and pull tensioning device -1- for poly V-belt off ancillary bracket.



Installing

Install in reverse order of removal, observing the following:

– Install poly V-belt ⇒ page 44 .

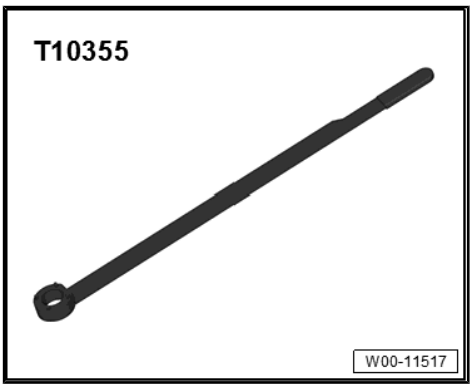
Specified torques

♦ ⇒ “1.1 Assembly overview - cylinder block (pulley end)”, page 42

1.4 Removing and installing vibration damper

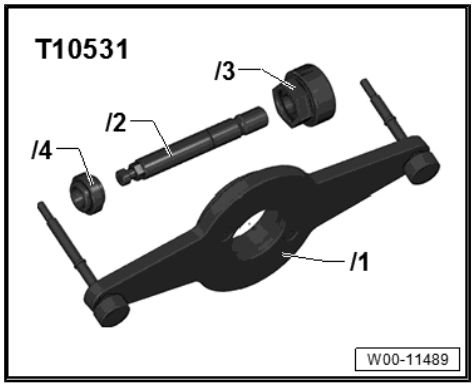
Special tools and workshop equipment required

♦ Counter-hold tool - T10355-



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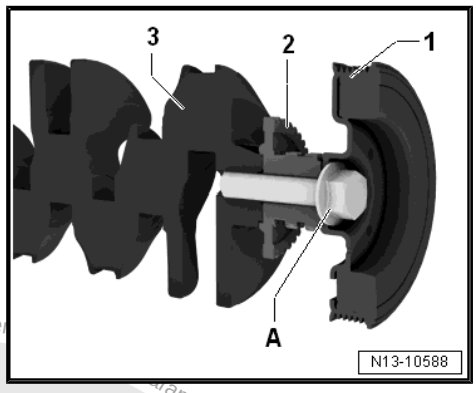
- Assembly tool - T10531-



Components of assembly tool - T10531- :

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

The vibration damper securing bolt -A- is used to secure the vibration damper -1- and the timing chain sprocket -2- on crankshaft -3-. Before removing the vibration damper, lock the timing chain sprocket in position relative to crankshaft as described below.



Removing vibration damper

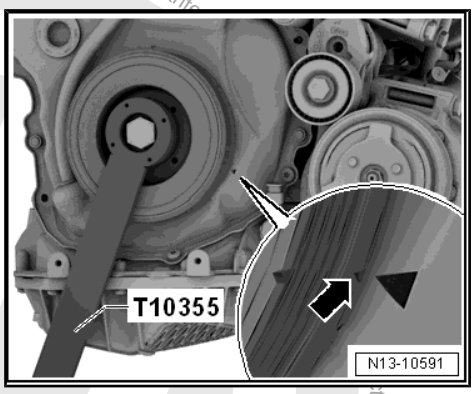
– Remove right wheel housing liner or front wheel housing liner section ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Assembly overview – front wheel housing liner .

– Remove poly V-belt ⇒ page 44 .

– Pull locking pin - T10060 A- out of tensioning device for poly V-belt.

– Turn vibration damper to TDC position -arrow- using counterhold tool - T10355- .

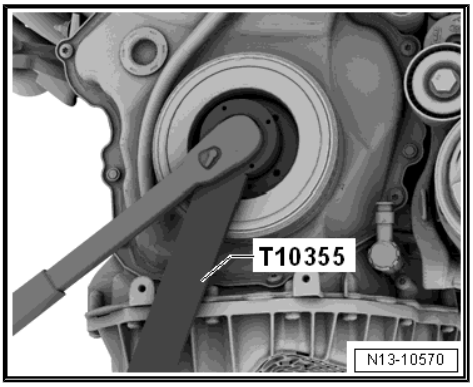
- Notch on vibration damper must align with arrow marking on cover for timing chains (bottom).
- The marking on the cover is located at »4 o'clock position«.



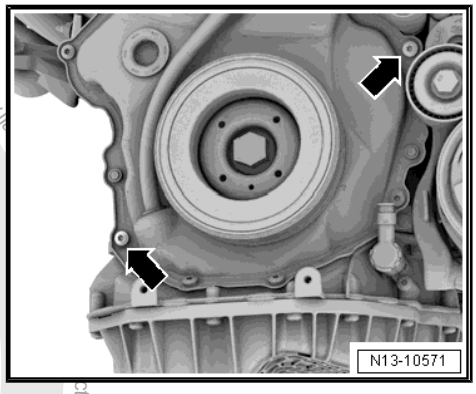
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– Loosen vibration damper bolt by $^1/_2$ turn. To do this, use counter hold tool - T10355- .

– If vibration damper was turned while loosening bolt, reset TDC position.

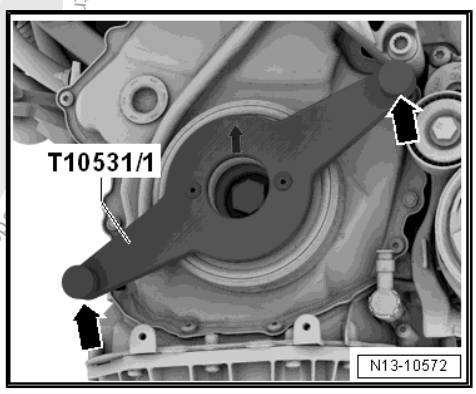


– Unscrew securing bolts -arrows- for timing chain cover. Bolts must be renewed.

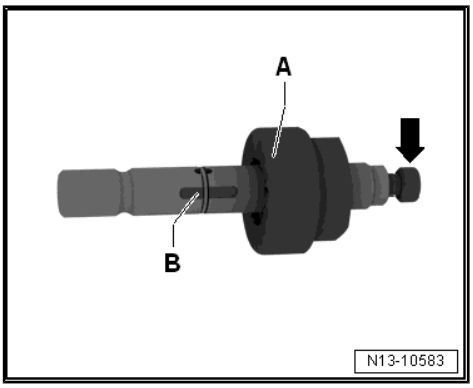


– Fit support - T10531/1- to vibration damper, as shown in illustration, and tighten knurled screws -arrows- by hand.

– Unscrew vibration damper bolt completely.



– Check if turning over tool -A- slides easily over clamping pieces -B-. If necessary, turn tensioning bolt -arrow-.

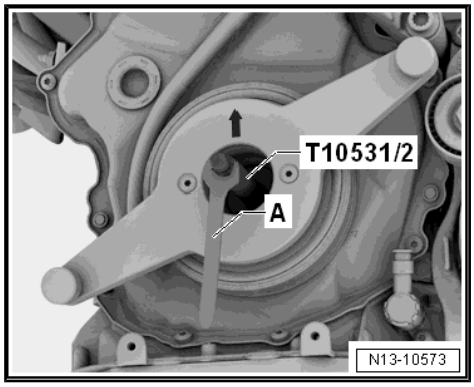


Note

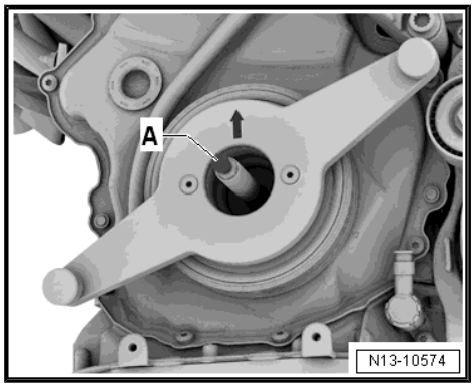
Do not turn the tensioning bolt any more, otherwise the clamping pin - T10531/2- will be jammed when it is screwed into the crankshaft.

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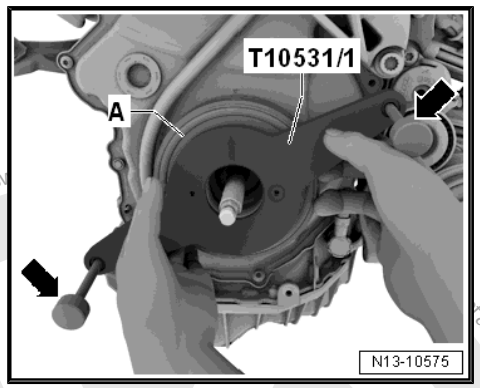
– Screw clamping pin - T10531/2- into crankshaft, and tighten it hand-tight with a 12 mm open-end spanner -A-.



– Tighten tensioning bolt -A- by hand in order to lock the chain sprocket in position relative to crankshaft.



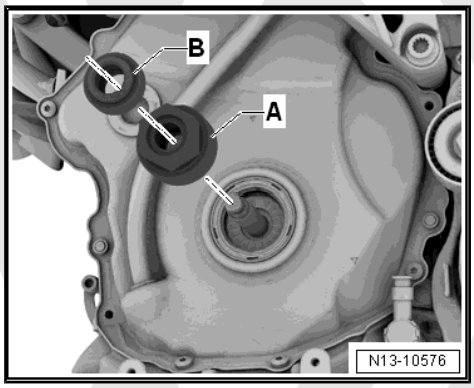
– Unscrew knurled screws -arrows-. Remove support - T10531/1- and vibration damper -A-.



Turning crankshaft without vibration damper

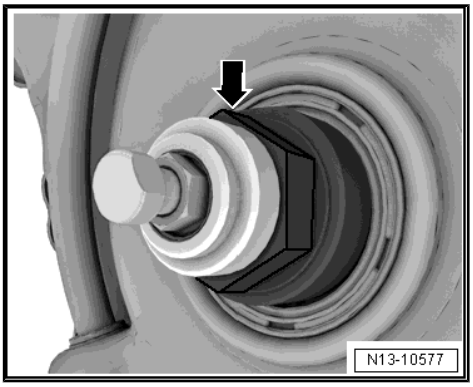
– Fit turning over tool -A- on clamping pin. Pay attention to toothed contours of chain sprocket while doing so. In TDC position the flat section of the tool faces upwards.

– Tighten turning over tool with flange nut -B-.



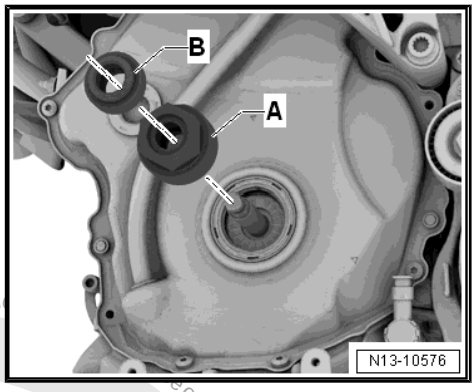
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– Now, the crankshaft can be turned on hexagon -arrow-.

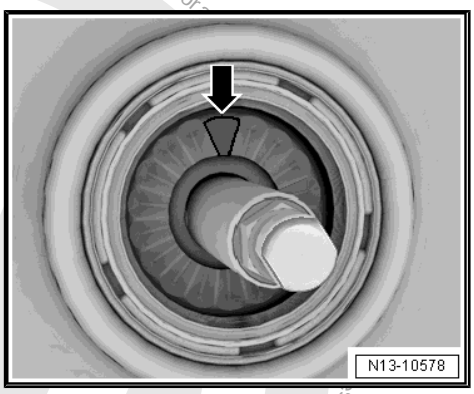


Installing vibration damper

– If necessary, remove flange nut -B- and turning over tool -A- from clamping pin.

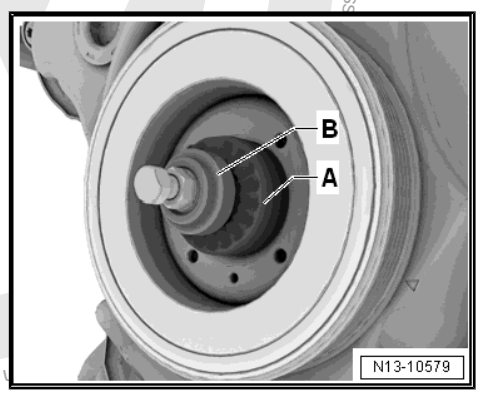


– Fit vibration damper in TDC position. Pay attention to teeth of chain sprocket -arrow- while doing so.



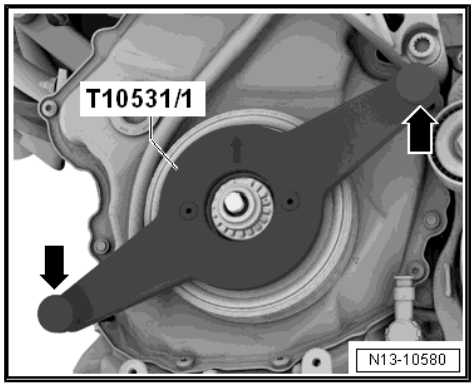
– Fit turning over tool -A- on clamping pin. The hexagon faces towards vibration damper while doing so.

– Screw on flange nut -B-. Move vibration damper slightly back and forth while doing so, in order to ensure that vibration damper is properly seated on teeth. Tighten flange nut, until vibration damper cannot be turned any more.

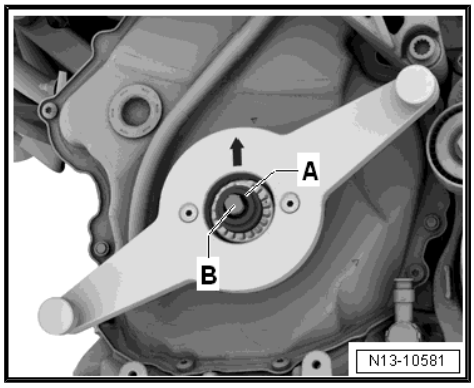


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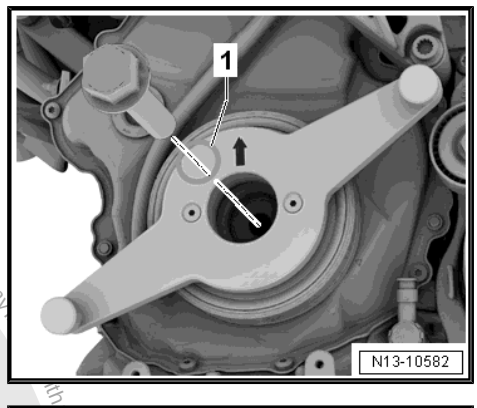
– Fit support - T10531/1- to vibration damper, as shown in illustration, and tighten knurled screws -arrows- by hand.



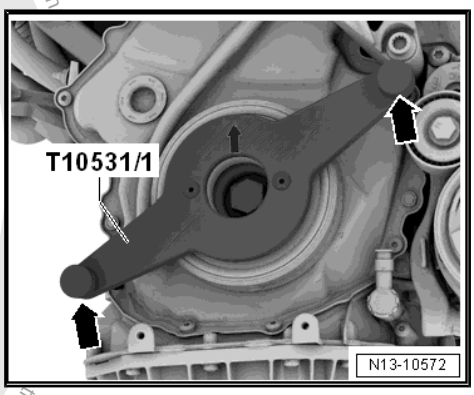
– Unscrew flange nut -A-, and loosen clamping pin -B-.
– Unscrew clamping pin , and remove it together with turning over tool .



– Screw in new vibration damper bolt with lubricated O-ring -1- by hand.

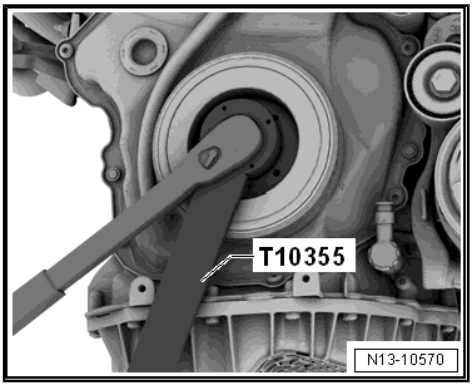


– Unscrew knurled screws -arrows-, and remove support - T10531/1- .

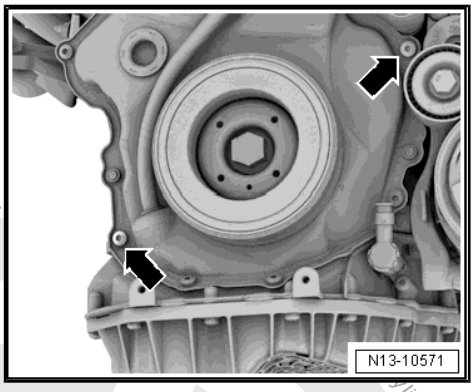


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– Tighten vibration damper bolt using counter hold tool - T10355- .



– Screw in new securing bolts -arrows-.



Further assembly is basically the reverse of the removal procedure.

Specified torques

- ⇒ “1.1 Assembly overview - cylinder block (pulley end)”, page 42

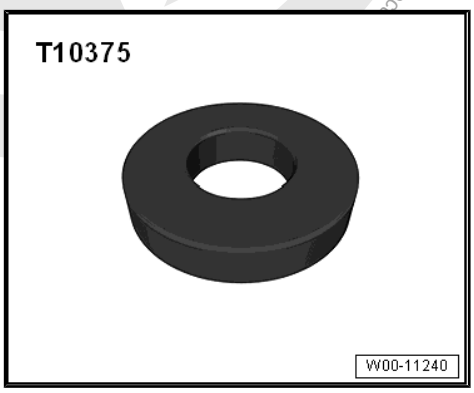
1.5 Renewing seal for vibration damper

Special tools and workshop equipment required

- Press tool - T10354-



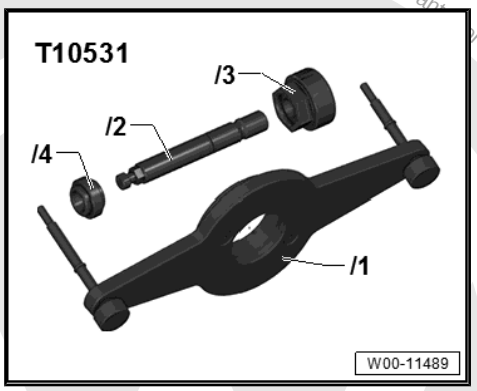
- Thrust washer - T10375-



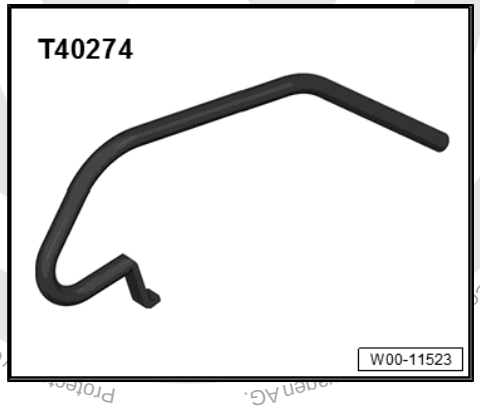
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♦ Flange nut - 10531/4- from assembly tool - T10531-



♦ Extractor hook - T40274-

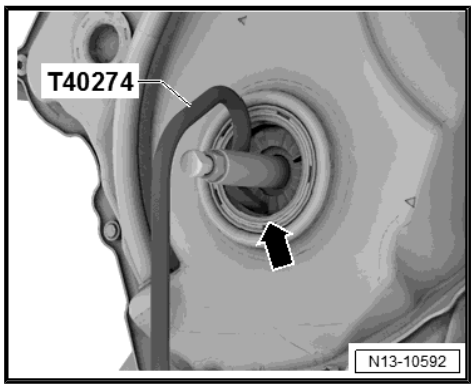


Removing

– Remove vibration damper ⇒ page 45 .

• Clamping pin - T10531/2- is inserted.

– Using extractor hook - T40274- , pull out seal -arrow-.

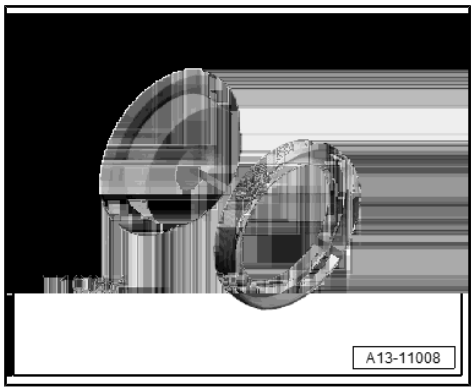


Installing

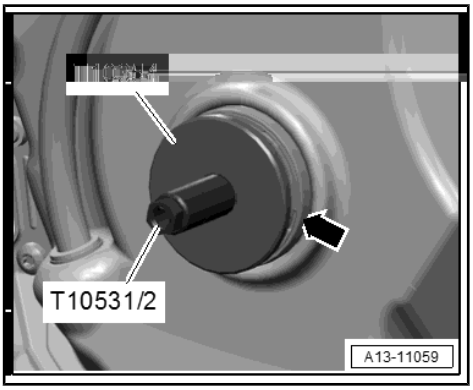
– Clean contact surface and sealing surface.

– Slide seal -arrow- onto thrust piece - T10354- .

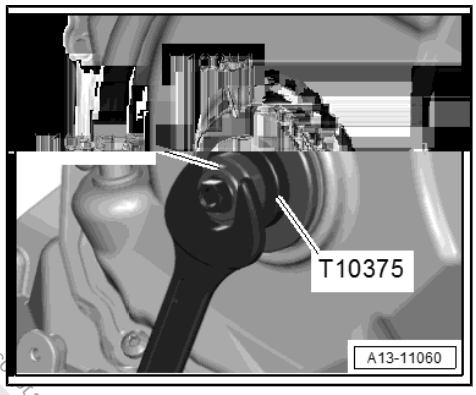
• Closed side of oil seal faces towards thrust piece - T10354- .



– Slide seal -arrow- with thrust piece - T10354- onto clamping pin - T10531/2- , and fit it to lower timing chain cover.



– In addition, fit thrust pad - T10375- , and screw on flange nut - 10531/4- .
– Using open-end spanner, AF 21, tighten flange nut until seal has been pressed in as far as stop.



Note

- *Renew bolt for vibration damper.*
- *Renew O-ring.*

Further assembly is basically the reverse of the removal procedure. During this procedure, observe the following:

– Install vibration damper ⇒ page 45 .

1.6 Removing and installing bracket for ancillaries

Special tools and workshop equipment required

- Drip tray for workshop hoist - VAS 6208-



Removing

– Drain coolant ⇒ page 188 .
– Remove alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Removing and installing alternator .

CAUTION

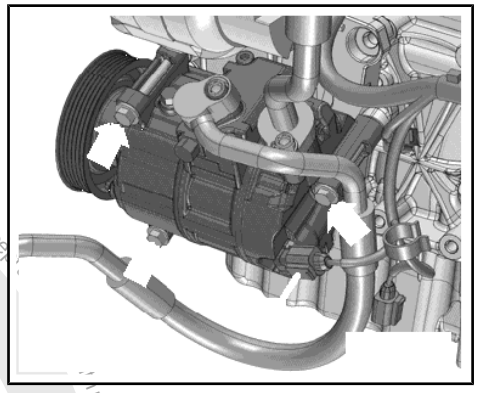
Risk of freezing injury caused by refrigerant.
– Do not open refrigerant circuit of air conditioning system.

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– Disconnect connector -1- on air conditioning compressor regulating valve - N280- .

– Unscrew bolts -arrows-.

– Detach air conditioner compressor with refrigerant hoses connected from bracket, and tie it up on the right side. Do NOT stretch, kink or bend refrigerant lines and hoses.



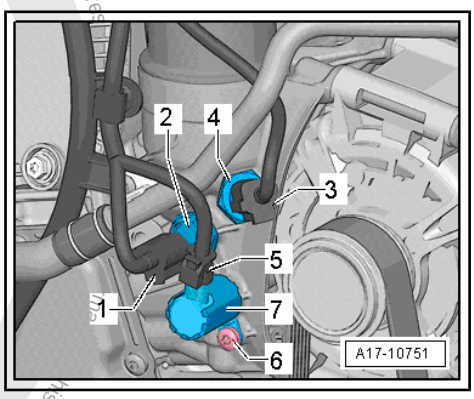
– Disconnect connectors:

1 - For oil pressure switch - F1- -item 2-.

3 - For oil pressure switch for reduced oil pressure - F378- -item 4-.

5 - For piston cooling jet control valve - N522- -item 7-

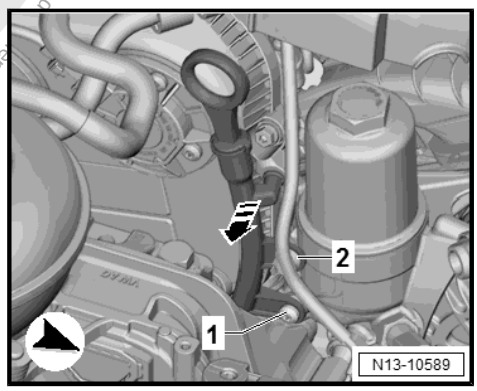
– Remove oil filter element ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .



– Unclip cable -2-.

– Remove bolt -1- for guide tube.

– Pull guide tube off cover in -direction of arrow-.

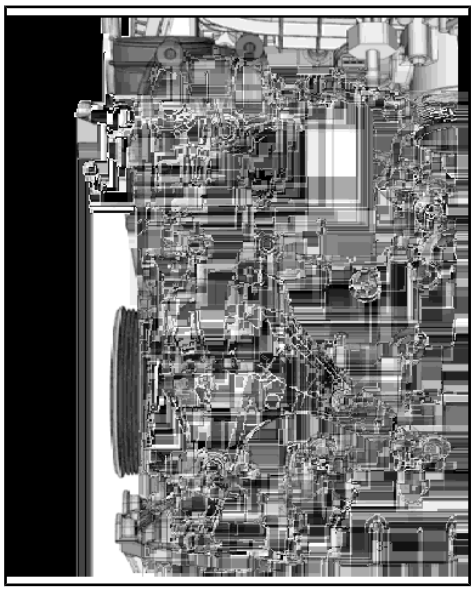


– Move wiring harness clear.

– Place drip tray - VAS 6208- beneath engine.

– Unscrew bolts -1 to 5- and pull ancillary bracket with engine oil cooler off coolant pump housing.

– “Guide out” ancillary bracket between intake manifold and engine support.



Installing

Install in reverse order of removal, observing the following:

Note

- *Replace bolts that are tightened with specified tightening angle.*
- *Renew O-rings and seals.*

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– Moisten new O-rings -4- with coolant.

– Insert connecting piece -2- in engine oil cooler -1-.

– Push ancillary bracket with engine oil cooler -1- onto connecting piece, start bolts, and tighten them ⇒ page 43 .

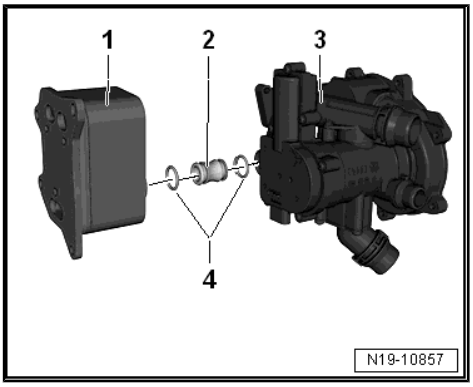
– Install air conditioner compressor ⇒ Heating, air conditioning; Rep. gr. 87 ; Air conditioner compressor; Assembly overview - drive unit of air conditioner compressor .

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

– Install poly V-belt ⇒ page 44 .

– Add coolant ⇒ page 190 .

– Install oil filter and check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .



Specified torques

- ⇒ “1.1 Assembly overview - cylinder block (pulley end)”, page 42
- ⇒ “2.1 Assembly overview - cover for timing chain”, page 100
- Alternator; Assembly overview - alternator ⇒ Electrical system; Rep. gr. 27 ; Alternator; Assembly overview - alternator .

1.7 Removing and installing engine support

Special tools and workshop equipment required

- Bits - T10099-



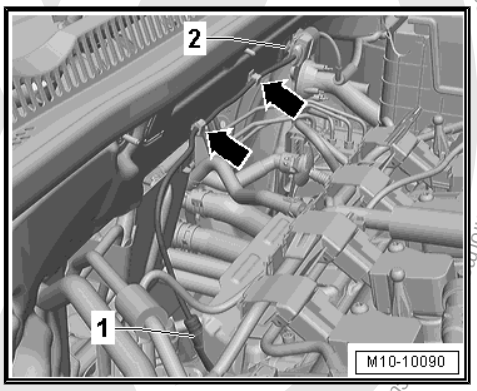
Removing

– Unclip lambda probe wire from retainers -arrows-.

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

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

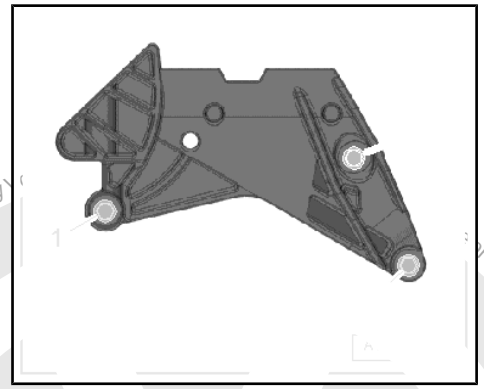
– Removing engine mounting ⇒ page 29 .



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– Lower engine slightly. Use bit - T10099- to unscrew bolts -1- and -2- from below.

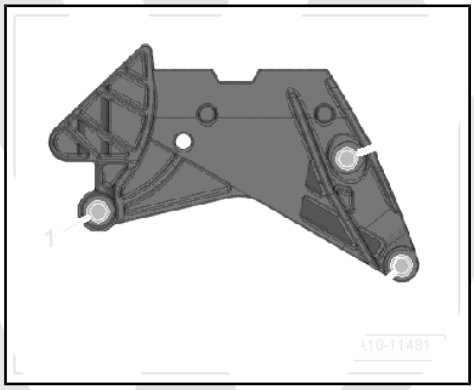
– Lift engine again, and unscrew bolt -3- from above.



Installing

Install in reverse order of removal, observing the following:

Engine support - specified torque and installation sequence



Note

Renew bolts.

– Tighten bolts in stages in the sequence shown.

Stage	Bolts	Specified torque/turning further angle
1.	-1 … 3-	7 Nm
2.	-1 … 3-	40 Nm
3.	-1 … 3-	Turn 90° further

– Install engine mounting ⇒ page 29 .

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2 Cylinder block, gearbox end

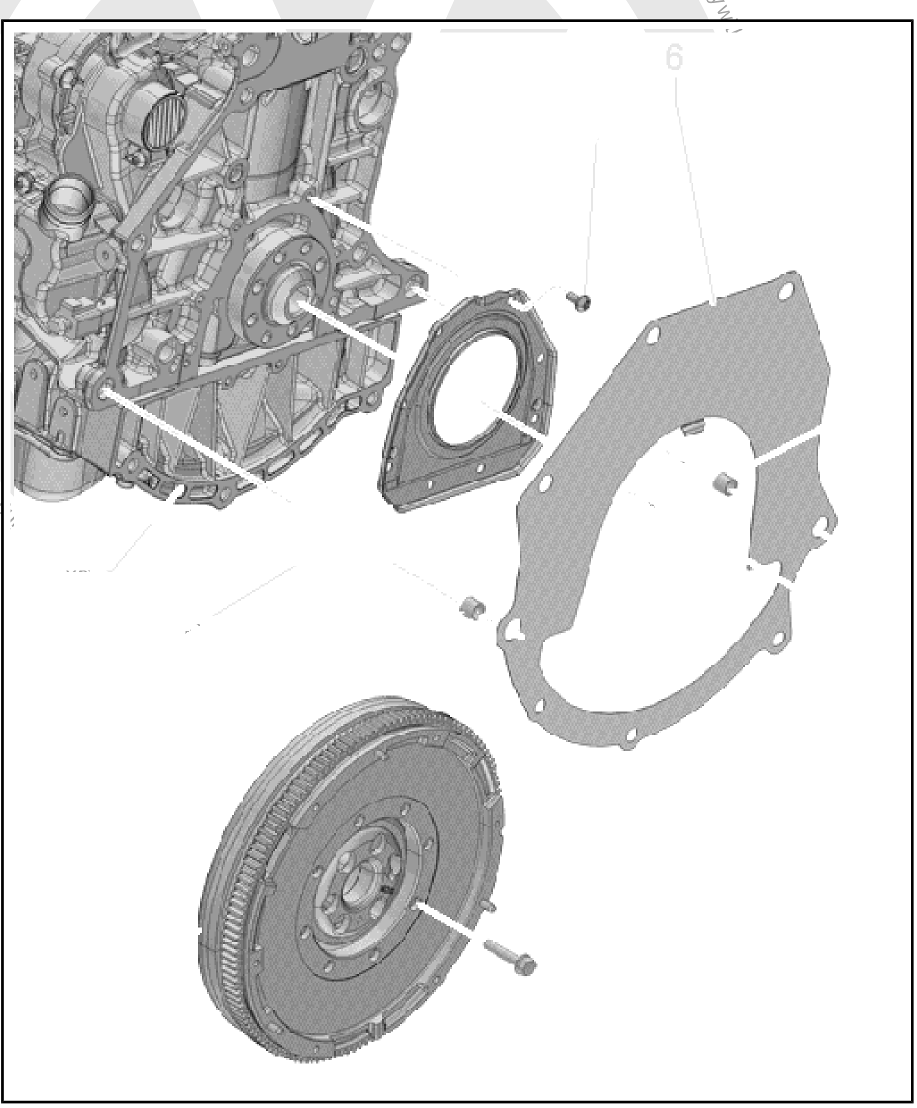
⇒ “2.1 Assembly overview - cylinder block, gearbox end”, page 57

⇒ “2.2 Removing and installing flywheel”, page 58

⇒ “2.3 Removing and installing sealing flange on gearbox side”, page 59

2.1 Assembly overview - cylinder block, gearbox end

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1 - Flywheel

- ❑ Removing and installing ⇒ page 58
- ❑ Can only be installed in one position, holes are offset.

2 - Dowel sleeve

3 - Sealing flange, gearbox side

- ❑ With seal
- ❑ Renew
- ❑ Removing and installing ⇒ page 59
- ❑ Before installing, remove oil residue from crankshaft journal using a clean cloth.
- ❑ Do not remove guide sleeve until sealing flange has been slid onto crankshaft journal.

4 - Cylinder block

5 - Bolt

- ❑ Specified torque and tightening sequence ⇒ page 59

6 - Intermediate plate

- ❑ Illustration does not show version installed in vehicle.
- ❑ Must seat on dowel sleeves.
- ❑ Do not damage or bend when assembling.
- ❑ Is fitted onto sealing flange ⇒ page 58

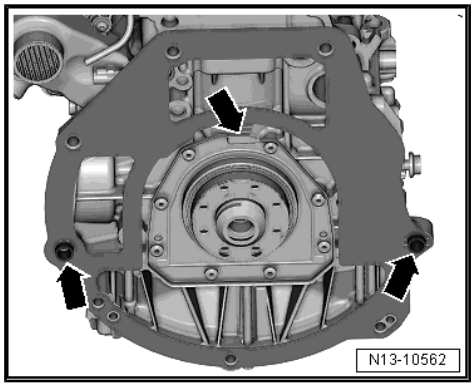
7 - Dowel sleeve

8 - Bolt

- ❑ For dual-mass flywheel
- ❑ Renew
- ❑ 60 Nm +90°

Installing intermediate plate

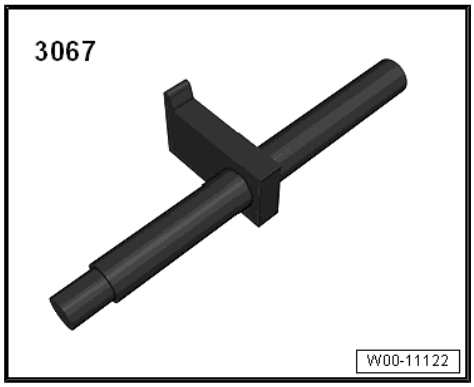
– Hook intermediate plate onto sealing flange and slide onto dowel sleeves -arrows-.



2.2 Removing and installing flywheel

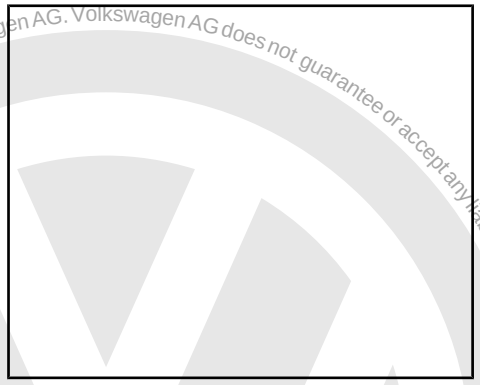
Special tools and workshop equipment required

♦ Counter-hold tool - 3067-



Removing

• Gearbox is removed.



Note

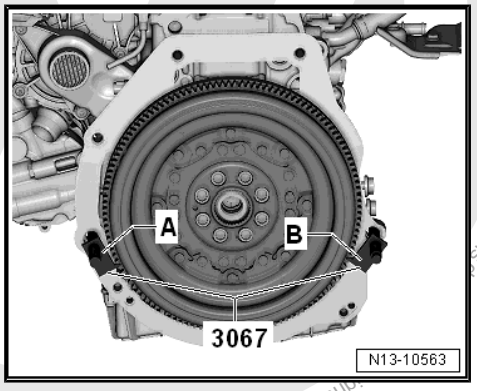
♦ *Screw out bolts -B- not with an air wrench or power impact wrench but by hand.*

♦ *When removing the bolts, make sure that the bolt heads do not come into contact with the flywheel.*

♦ *Rotate dual-mass flywheel -A- so that bolts -B- align centrally with the holes -arrows-.*

– Insert counterhold tool - 3067- in hole -B- in cylinder block.

– Loosen and remove flywheel bolts.



Installing

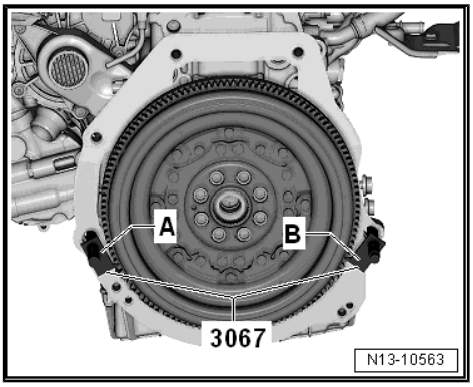
Install in reverse order of removal, observing the following:

Note

Renew bolts that are tightened with turning further angle.

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– Insert counterhold tool - 3067- in hole -A- of cylinder block.



Specified torques

♦ ⇒ “2.1 Assembly overview - cylinder block, gearbox end”, page 57

2.3 Removing and installing sealing flange on gearbox side

Special tools and workshop equipment required

♦ Guide piece - T10122/6A- from fitting tool - T10122B-



♦ Assembly aid - T10122/1- from fitting tool - T10122B-

♦ Hand drill with plastic brush attachment

♦ Safety glasses

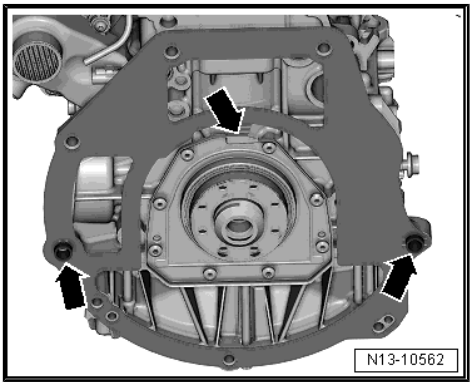
♦ Sealant ⇒ Electronic parts catalogue (ETKA)

Removing

• Gearbox is removed.

– Remove flywheel ⇒ page 58 .

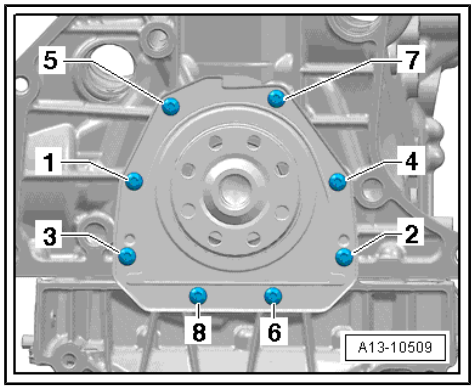
– Detach intermediate plate from sealing flange and dowel pins -arrows-.



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– Unscrew bolts -1 to 8-.

– Prise off sealing flange.



Installing

Note

- *Observe use-by date of silicone sealant.*
- *The sealing flange must be installed within 5 minutes of applying the silicone sealant.*
- *In order to prevent the lubrication system from being soiled with sealant residue cover the open section of the sump with a clean cloth.*

CAUTION

Risk of eye injury caused by sealant residue.

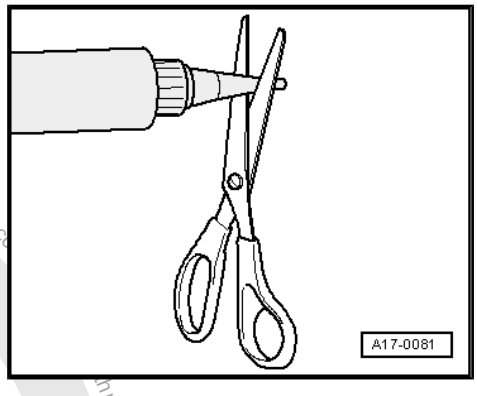
– Wear protective goggles.

– Remove sealant remaining on cylinder block with flat scraper or rotating plastic brush.

– Clean sealing surfaces. They must be oil and grease free.

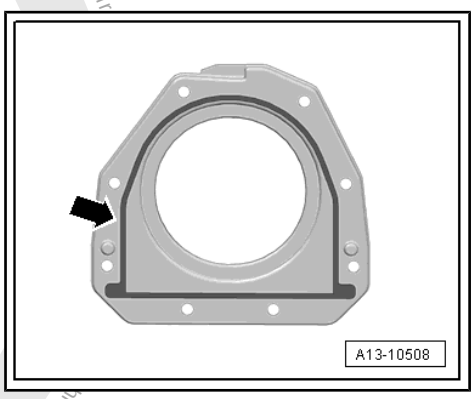
– Clean crankshaft journal. Lightly coat crankshaft journal only if surface rust is evident.

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



– Apply silicone sealant as shown to clean sealing surface of sealing flange.

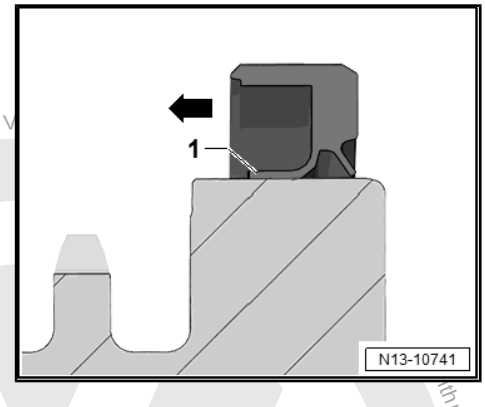
- Thickness of sealant bead: 2 to 3 mm.



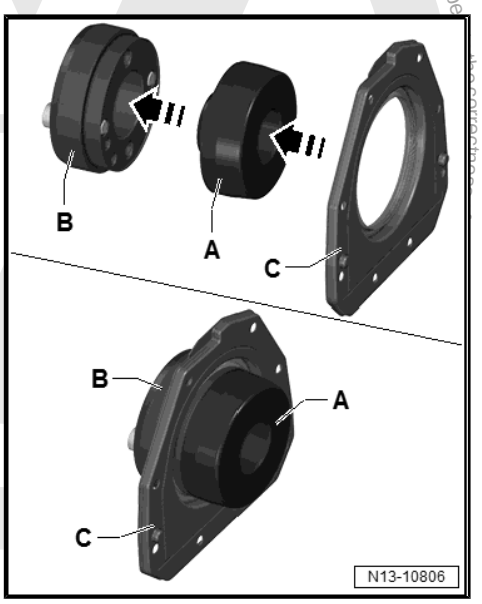
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Note

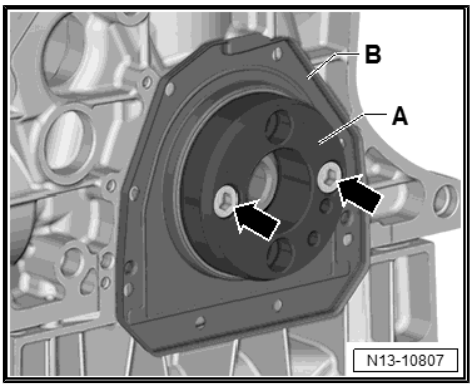
- *The sealing flange must be installed within 5 minutes after applying the silicone sealant.*
- *The bead of sealant must not be thicker than specified, otherwise excess sealant can enter the sump and obstruct the strainer in the oil intake pipe.*
- *Check the sealing lip of the sealing flange. It should not be bent or damaged.*
- *When installed correctly, the sealing lip -1- points in the direction of engine.*



– Check guide piece - T10122/6A- -(B)-. It must not be dirty or have any sharp edges.
– Place assembly aid - T10122/1- -(A)- on guide piece - T10122/6A- -(B)-.
– With the outside leading, push sealing flange -C- onto guide piece -B-.
– Remove assembly aid -A-.

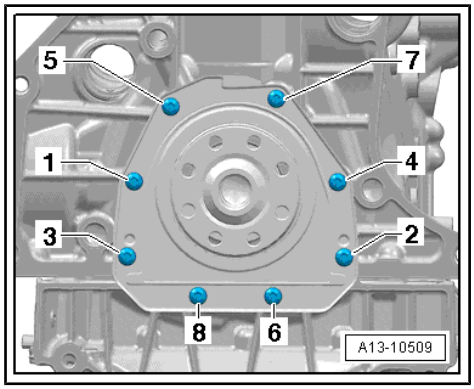


– Place guide piece -A- with sealing flange -B- on crankshaft journal.
– It is not necessary to tighten bolts -arrows-.
– Fit sealing flange -B- over assembly sleeve -A- onto crankshaft journal.
– Remove guide piece -A-.



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– Tighten new bolts evenly in the sequence shown.



Stage	Bolts	Specified torque/turning further angle
1.	-1 … 8-	Screw in by hand as far as stop
2.	-1 … 8-	9 Nm

Note

After installing the sealing flange, wait about 30 minutes for the sealant to dry. Only then fill with engine oil.

Further assembly is basically the reverse of the removal procedure.

Specified torques

- ⇒ “2.1 Assembly overview - cylinder block, gearbox end”, page 57

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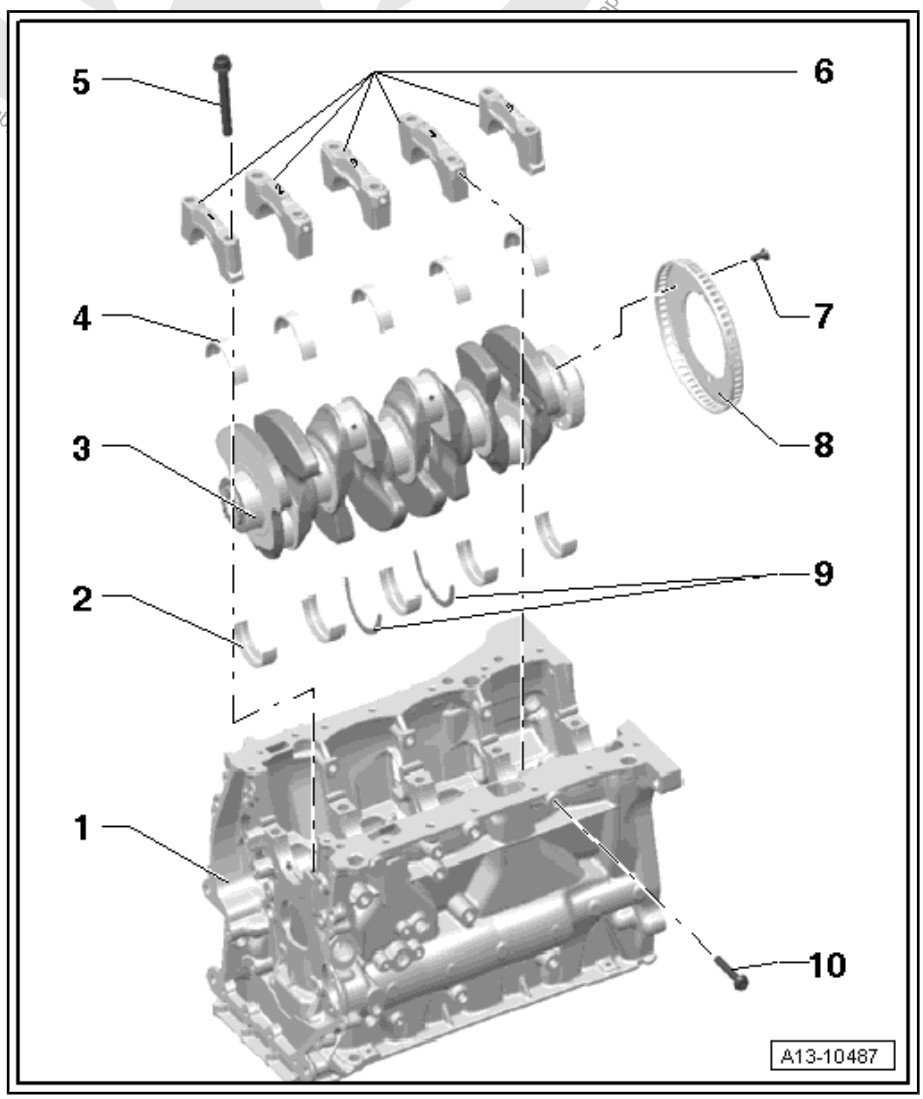
3 Crankshaft

⇒ “3.1 Assembly overview - crankshaft”, page 63
⇒ “3.2 Crankshaft dimensions”, page 65
⇒ “3.3 Allocation of main bearing shells”, page 65
⇒ “3.4 Renewing needle bearing in crankshaft”, page 66
⇒ “3.5 Measuring axial clearance of crankshaft”, page 68
⇒ “3.6 Measuring radial clearance of crankshaft”, page 69
⇒ “3.7 Removing and installing sender wheel”, page 70

3.1 Assembly overview - crankshaft

Note

Secure engine to repair stand using engine and gearbox support - VAS 6095- when dismantling/assembling engine ⇒ page 23 .



1 - Cylinder block

2 - Bearing shell for cylinder block

- ❑ With oil groove.
- ❑ Moisten with oil.
- ❑ Do not interchange used bearing shells (mark).
- ❑ Marking of crankshaft bearing shells (classification) ⇒ page 65

3 - Crankshaft

- ❑ After removing, place it down so that the sender wheel ⇒ Item 8 (page 64) is not damaged and the crankshaft does not rest on the sender wheel
- ❑ If the crankshaft is renewed, the bearing shells must be reallocated to bearing cap ⇒ page 65
- ❑ Axial clearance ⇒ page 68
- ❑ Radial clearance ⇒ page 69
- ❑ Do not rotate crankshaft when checking radial clearance
- ❑ Crankshaft dimensions ⇒ page 65 .

4 - Bearing shell for bearing cap

- ❑ Without oil groove.
- ❑ Moisten with oil.

- ❑ Do not interchange used bearing shells (mark).
- ❑ Marking of crankshaft bearing shells (classification) ⇒ page 65

5 - Bolt

- ❑ Renew
- ❑ Tightening sequence ⇒ page 64

6 - Bearing cap

- ❑ Bearing cap 1: belt pulley end.
- ❑ Bearing shell retaining lugs in cylinder block and bearing caps must align.

7 - Bolt

- ❑ 10 Nm +90° further
- ❑ Renew
- ❑ Sender wheel must be renewed if bolts are loosened ⇒ page 70

8 - Sender wheel

- ❑ For engine speed sender - G28-
- ❑ Can only be installed in one position, holes are offset.
- ❑ Always renew sender wheel if securing bolts have been unscrewed
- ❑ Removing and installing ⇒ page 70

9 - Thrust washers

- ❑ For bearing 3
- ❑ Moisten with oil.

10 - Bolt

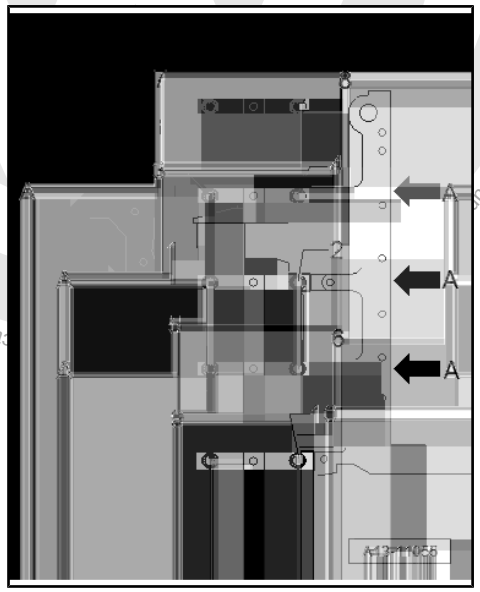
- ❑ Renew
- ❑ Tightening sequence ⇒ page 64

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Crankshaft - specified torques and tightening sequence

– Tighten bolts in stages in the sequence shown.

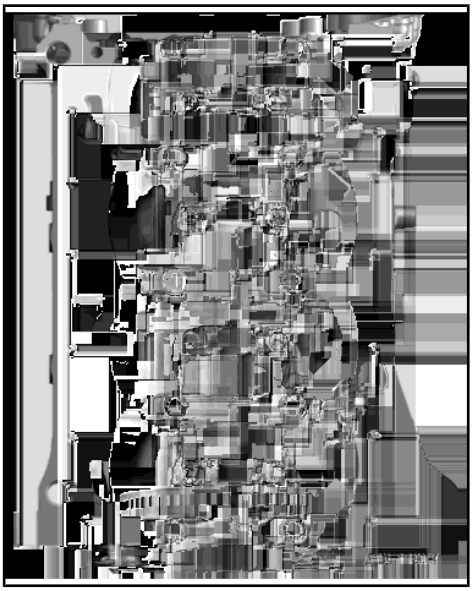
Stage	Bolts	Specified torques/angle specifications
1.	-1 … 10- and -arrows A-	Screw in by hand as far as stop
2.	-1 … 10-	65 Nm
3.	-1 … 10-	Turn 90° further
4.	-Arrows A-	15 Nm
5.	-Arrows A-	Turn 90° further



Marking of crankshaft bearing caps

– Mark installation position of bearing caps -1 … 5- for reinstallation.

• Tabs -arrows- on bearing caps must face towards crankshaft bearing “3” on inlet side.



3.2 Crankshaft dimensions

(Dimensions in mm)

Honing dimension 1)	Main journal Ø	Conrod journal Ø
Basic dimension	48.00	47.80

1) No provision has yet been made to recondition worn crankshafts.

3.3 Allocation of main bearing shells

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

Which bearing shell is to be inserted at each place in the cylinder block (upper bearing shell) is marked by letters on the lower sealing surface or on the front side of cylinder block.

Which bearing shell is to be inserted at each place in bearing cap (lower bearing shell) is marked by letters on the crankshaft.

The first letter is allocated to bearing cap one, the second to bearing cap two, etc.

Marking on bearing shell for cylinder block:

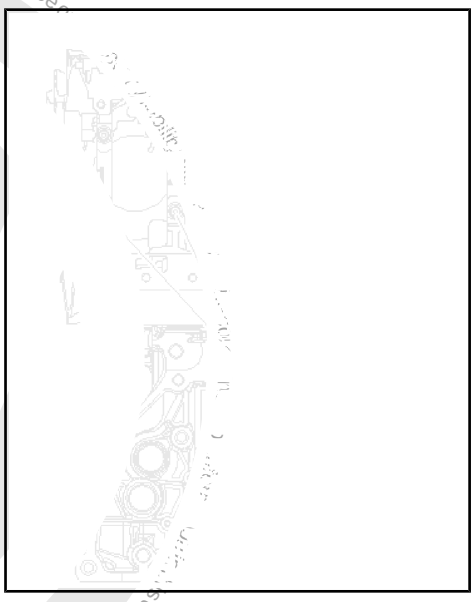
Note

The marking on the cylinder block can be found engraved either in the sump sealing surface or in the front end (gearbox side) of the cylinder block.

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Identification on cylinder block is allocated to upper bearing shell (bearing shell for cylinder block).

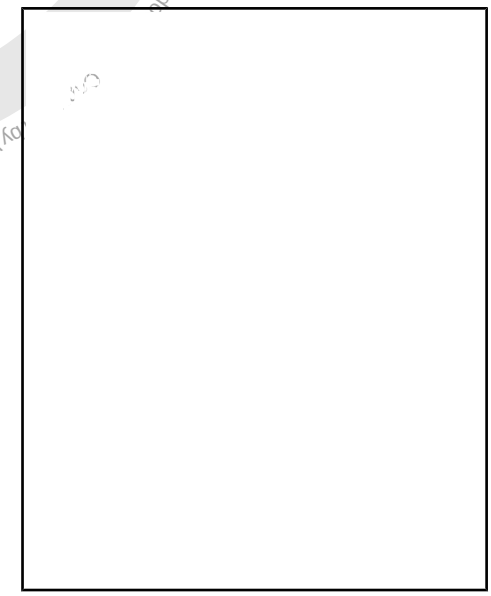
– Note letters and identify colour code to be installed based on table.



Marking on bearing shell for bearing cap:

Identification on crankshaft is allocated to lower bearing shell (bearing shell for bearing cap).

– Note letters and identify colour code to be installed based on table.



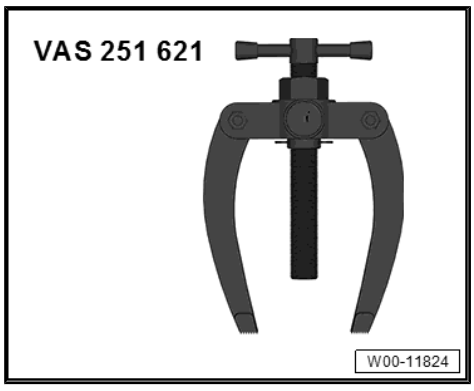
S	=	black
R	=	red
G	=	yellow
B	=	blue
W	=	white

3.4 Renewing needle bearing in crankshaft

Only vehicles with a dual clutch gearbox

Special tools and workshop equipment required

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



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- Internal puller - VAS 251 635-



- Drift - VW 207 C-



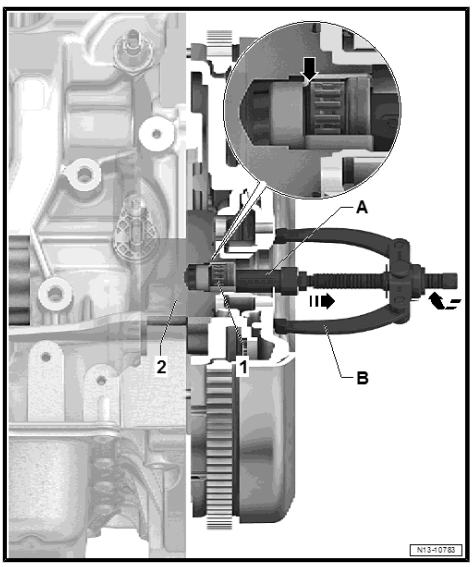
Condition:

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

Pulling out needle roller bearing

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

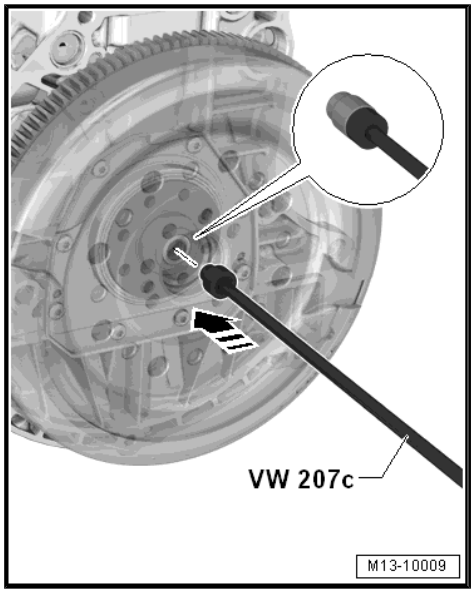
– The internal puller must be positioned behind the needle-and-cage assembly -arrow-.



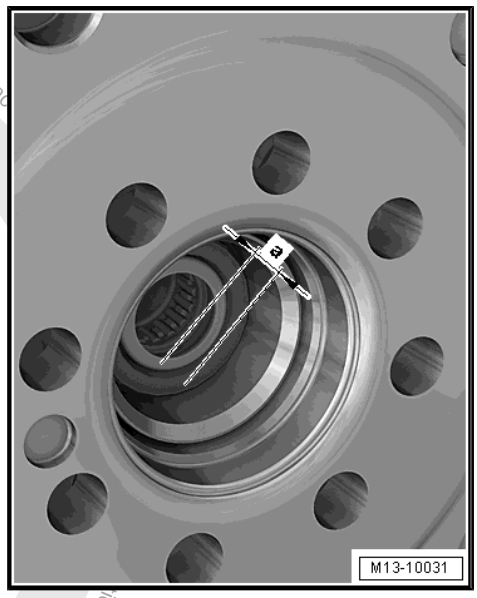
Installing

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

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



Installation depth: dimension -a- = 2.0 mm



Note

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

3.5 Measuring axial clearance of crankshaft

Special tools and workshop equipment required

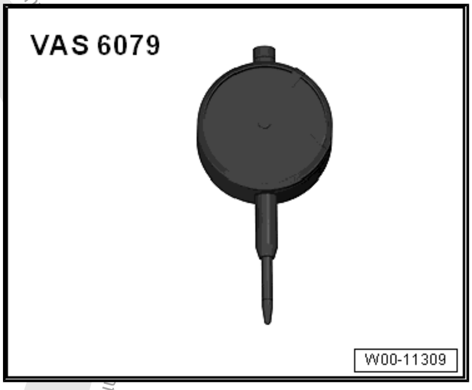
♦ Universal dial gauge holder - VW 387-

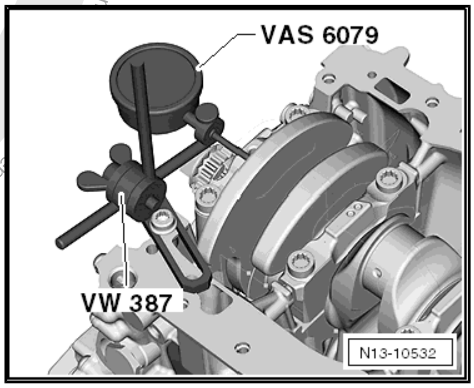


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♦ Dial gauge - VAS 6079-





Procedure

– Screw dial gauge - VAS 6079- with universal dial gauge holder - VW 387- onto cylinder block and set against crank web with projection of approx. 2 mm.
– Press crankshaft against dial gauge by hand and set gauge to “0”.
– Push crankshaft away from dial gauge and read off value.

Axial clearance:

• New: 0.07 to 0.23 mm
• Wear limit: 0.30 mm

3.6 Measuring radial clearance of crankshaft

Special tools and workshop equipment required

♦ Plastigage

Procedure

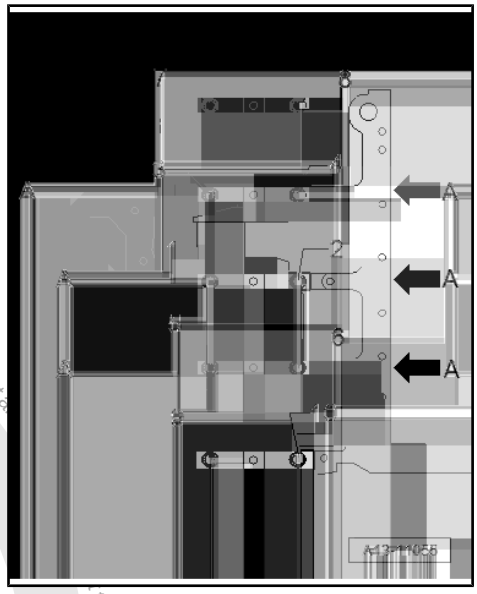
Note

♦ *Do not interchange used bearings.*
♦ *Bearing shells worn down to nickel layer must be renewed.*

– Remove crankshaft bearing cap, and clean bearing cap and bearing journal.
– Place a length of Plastigage corresponding to the width of the bearing on the bearing journal or in the bearing shells.

• Plastigage must rest in middle of bearing shell.

– Fit crankshaft bearing cap, and tighten using old bolts -1 … 10- ⇒ page 64 . Make sure not to rotate crankshaft while tightening.



Note

Disregard bolts -arrows A-.

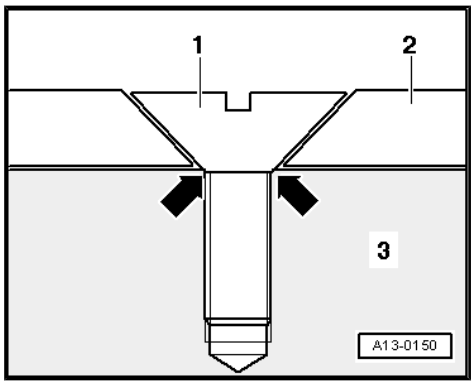
– Remove crankshaft bearing cap again.
– Compare width of Plastigage with the measurement scale.

Radial clearance:

- New: 0.017 to 0.037 mm
- Wear limit: 0.15 mm

3.7 Removing and installing sender wheel

– Remove engine.
– Remove sealing flange on gearbox side ⇒ page 59 .
– Remove upper part of sump ⇒ page 159 .
– Remove balancer shaft timing chain ⇒ page 120 .
– Unscrew conrod bearing cap.
– Remove crankshaft bearing cap.
– Remove crankshaft and unscrew sender wheel.
– Always renew sender wheel -2- each time bolts -1- are loosened.



Note

- *The second time the bolts are tightened, the contact points in the sender wheel for the countersunk heads are deformed so much that the bolt heads seat on the crankshaft -3-, -arrows- and the sender wheel is loose under the bolts.*
- *The sender wheel can only be installed in one position; the holes are offset.*

Specified torques

- ⇒ “3.1 Assembly overview - crankshaft”, page 63

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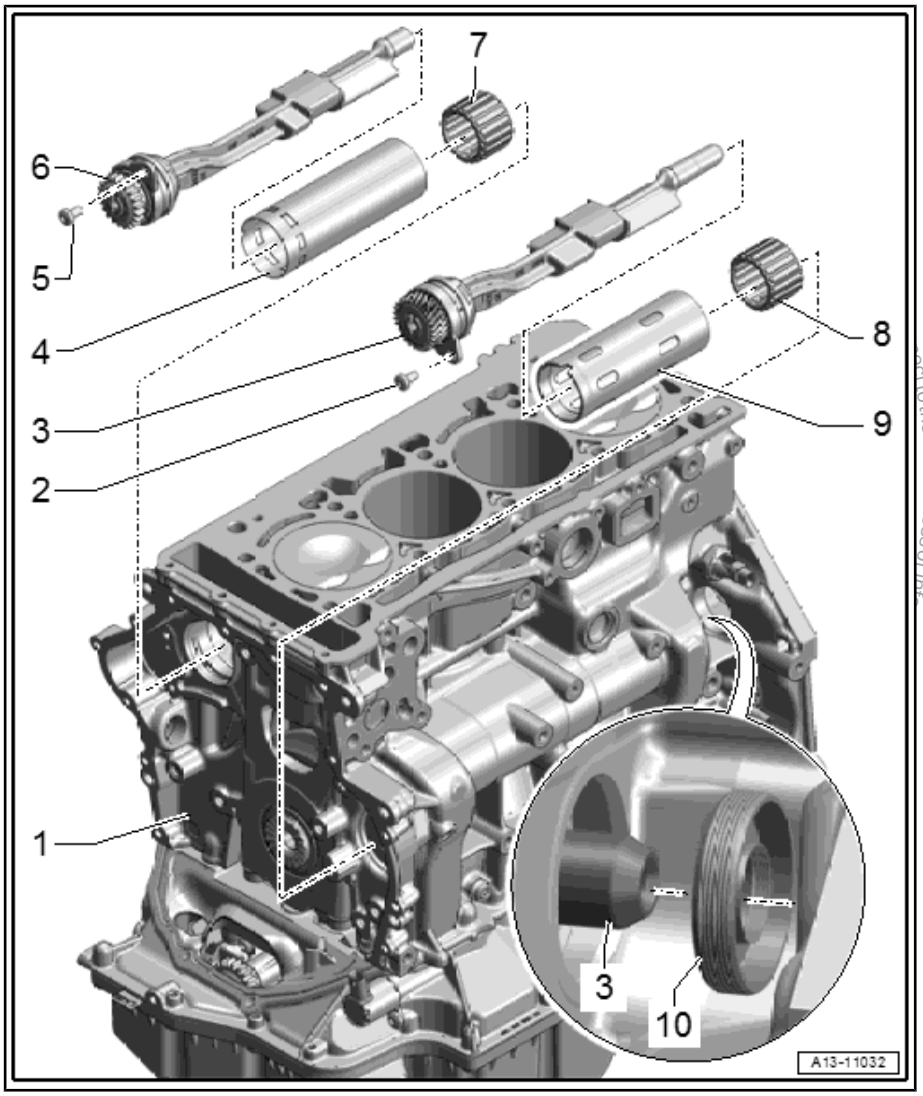
4 Balancer shaft

⇒ "4.1 Assembly overview - balance shaft", page 71

⇒ "4.2 Removing and installing balance shaft", page 72

⇒ "4.3 Renewing oil seal for balance shaft (inlet side)", page 76

4.1 Assembly overview - balance shaft



1 - Cylinder block

2 - Bolt

- ❑ 9 Nm

3 - Balance shaft, inlet side

- ❑ Lubricate bearing with engine oil
- ❑ Always renew in pairs ⇒ page 72

4 - Tube

- ❑ For balance shaft, exhaust side
- ❑ Fitting position ⇒ page 72

5 - Bolt

- ❑ 9 Nm

6 - Balance shaft, exhaust side

- ❑ Lubricate bearing with engine oil
- ❑ Always renew in pairs ⇒ page 75

7 - Needle bearing

- ❑ Renew after removal
- ❑ Observe colour of gear ring for needle bearing; always install needle bearing of corresponding colour
- ❑ Lubricate bearing with engine oil

8 - Needle bearing

- ❑ Renew after removal
- ❑ Observe colour of gear ring for needle bearing; always install needle bearing of corresponding colour
- ❑ Lubricate bearing with engine oil

9 - Tube

- ❑ For balance shaft, inlet side
- ❑ Fitting position ⇒ page 72

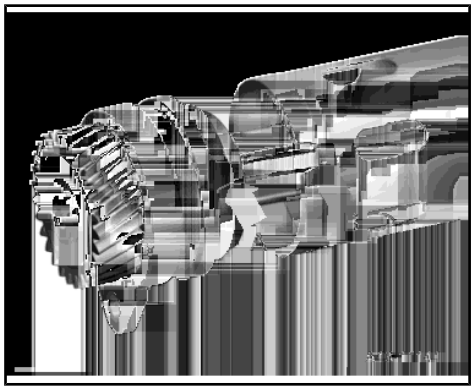
10 - Seal

- ❑ For balance shaft, inlet side
- ❑ Renewing ⇒ page 76

ect to the correctness of inf

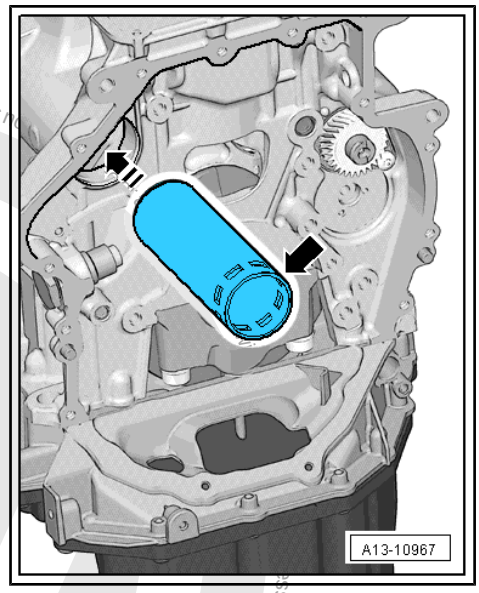
Tube for balance shaft, inlet side - installation position

- Tab -arrow A- on balance shaft must engage in recess -arrow B- on tube.



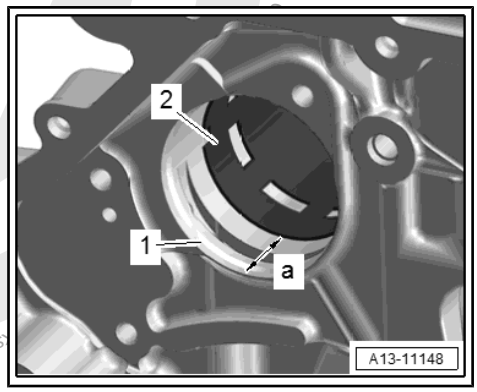
Tube for balance shaft, exhaust side - installation position

- The apertures -right arrow- must face towards chain side.



– Insert tube -2- for balance shaft into cylinder block -1-.

- In correct installation position, dimension -a- = 21 mm.



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4.2 Removing and installing balance shaft

⇒ “4.2.1 Removing and installing inlet side balance shaft”, page 72

⇒ “4.2.2 Removing and installing exhaust side balance shaft”, page 75

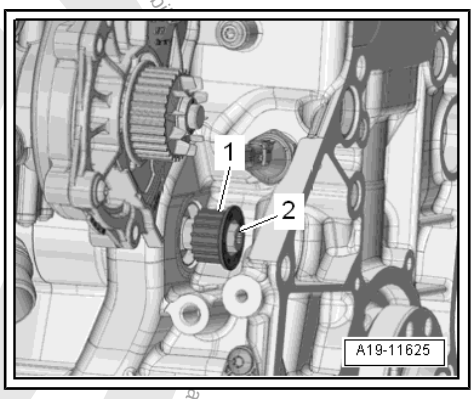
4.2.1 Removing and installing inlet side balance shaft

Needle bearing for balance shaft must be renewed each time it is removed. Install new needle bearing with same colour code.

Removing

– Remove toothed belt for coolant pump ⇒ page 205 .

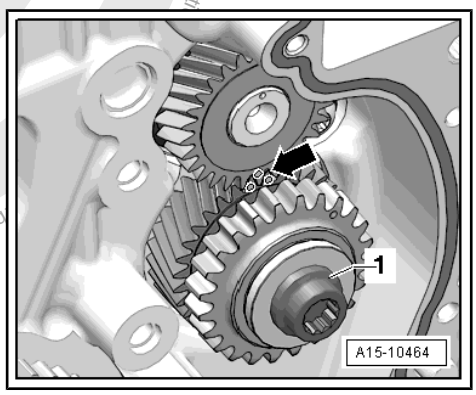
– Remove timing chain cover (top) ⇒ page 101 .
– Remove lower timing chain cover ⇒ page 103 .
– Remove camshaft timing chain and drive chain for balance shafts ⇒ page 110 .
– Unscrew bolt -2-.



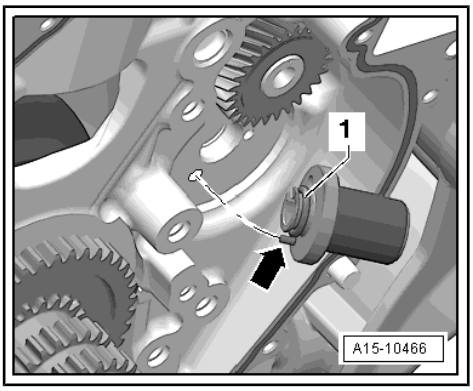
Note

The drive sprocket bolt has a left-hand thread.

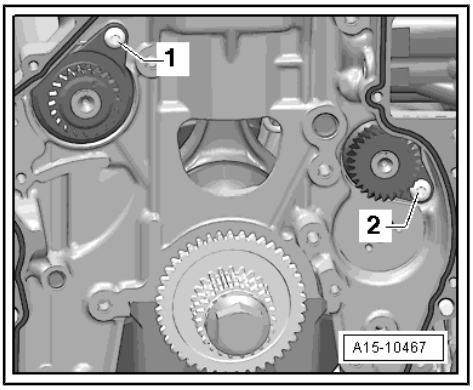
– Detach drive sprocket -1- for toothed belt for coolant pump.
– Remove intermediate shaft sprocket -1-.



– Remove bearing mounting -1-.



– Unscrew bolt -2- for balance shaft on inlet side and pull out balance shaft.



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Installing

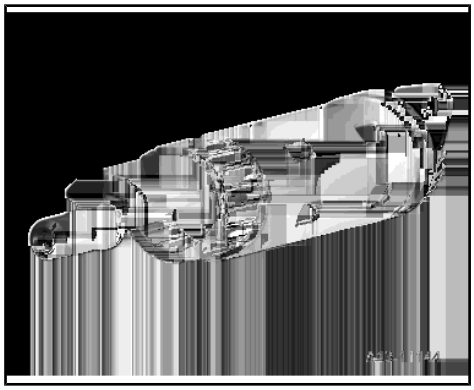
– Push on tube, observe correct installation position when doing so ⇒ page 72 .

– Clip on new needle bearing.

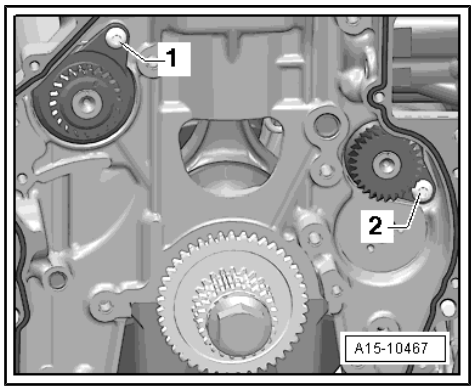
– Apply engine oil on bearing and contact surface of bearing -arrows- on balance shaft, inlet side.

– Turn balance shaft to installation position.

• When installing, make sure that half-round contact surface of bearing points upwards.

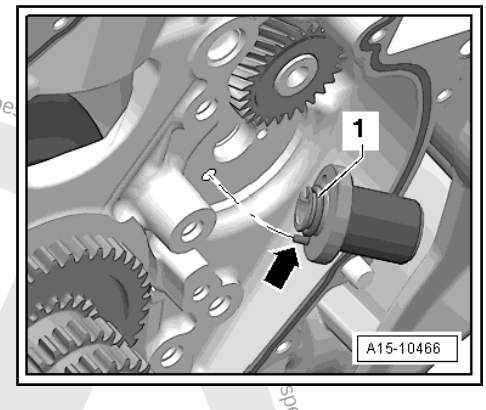


– Install balance shaft for inlet side and tighten bolt -2-.



– Renew O-ring -1- and lubricate with engine oil.

– Lubricate bearing mounting with engine oil and install; dowel pin -arrow- for bearing mounting must engage in bore in cylinder block.



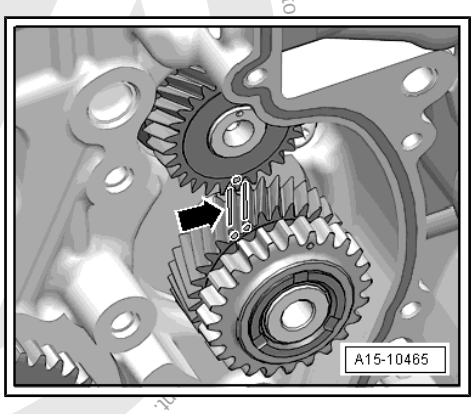
Note

♦ *The idler gear must always be renewed. Otherwise no tooth backlash is set, engine damage.*

♦ *The new idler gear is coated with a solid film lubricant that wears off after a short period and thus automatically sets the tooth backlash.*

– Mark faces of gear teeth of idler gear with paint -arrow-.

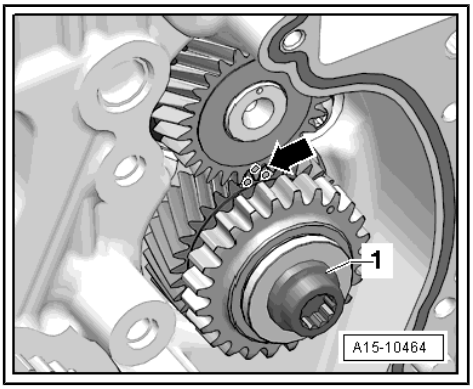
– Insert idler gear; marking on balance shaft must be positioned between markings on faces of gear teeth.



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– Tighten bolt -1- for idler gear; tightening sequence ⇒ page 110 .

– Check markings on idler gear/balance shaft -arrow-.



Further assembly is basically the reverse of the removal procedure. During this procedure, observe the following:

– Install drive chain for balance shafts and camshaft timing chain ⇒ page 110 .

– Install timing chain cover (bottom) ⇒ page 103 .

– Install timing chain cover (top) ⇒ page 101 .

– Renew oil seal for balance shaft on inlet side ⇒ page 76 .

– Fit toothed belt for coolant pump ⇒ page 205 .

Specified torques

◆ ⇒ “4.1 Assembly overview - balance shaft”, page 71

4.2.2 Removing and installing exhaust side balance shaft

Needle bearing for balance shaft must be renewed each time it is removed. Install new needle bearing with same colour code.

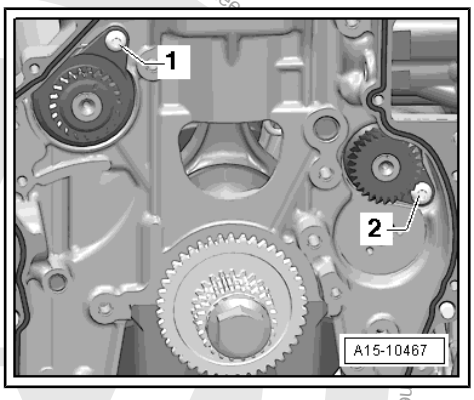
Removing

– Remove timing chain cover (top) ⇒ page 101 .

– Remove lower timing chain cover ⇒ page 103 .

– Remove camshaft timing chain and drive chain for balance shafts ⇒ page 110 .

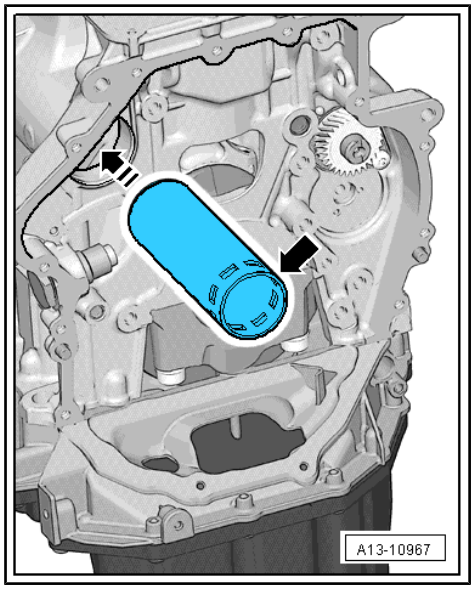
– Unscrew bolt -1- for balance shaft on exhaust side and pull out balance shaft.



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Installing

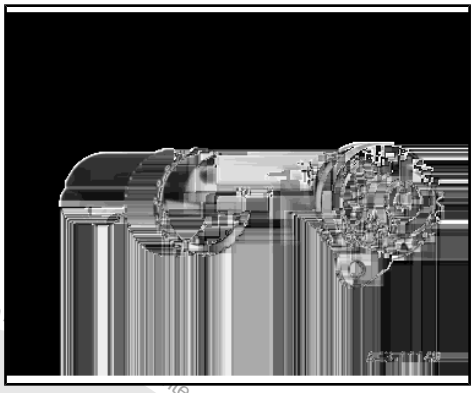
– Check installation position of tube for balance shaft. The apertures -arrow- must face towards chain side.



– Apply engine oil on bearing and contact surface of bearing -arrows- on balance shaft, exhaust side.

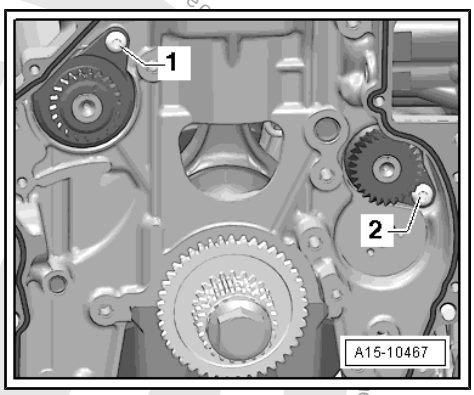
– Turn balance shaft to installation position.

• When installing, make sure that half-round contact surface of bearing points upwards.



– Install balance shaft for exhaust side.

– Before tightening bolt -1-, check that balance shaft rests flat against crankcase.



Note

If the balancer shaft does not rest flat, the pipe for balancer shaft must be inserted again.

Further assembly is basically the reverse of the removal procedure. During this procedure, observe the following:

– Install drive chain for balance shafts and camshaft timing chain ⇒ page 110 .

– Install timing chain cover (bottom) ⇒ page 103 .

– Install timing chain cover (top) ⇒ page 101 .

Specified torques

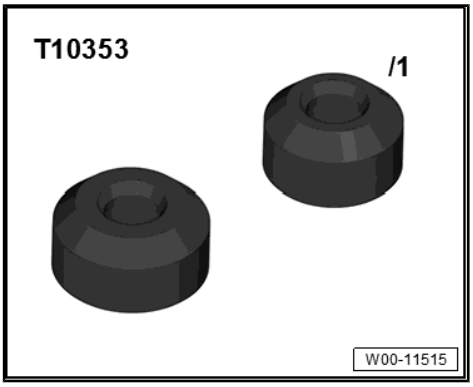
◆ ⇒ “4.1 Assembly overview - balance shaft”, page 71

4.3 Renewing oil seal for balance shaft (inlet side)

Special tools and workshop equipment required

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♦ Press tool - T10353/1-

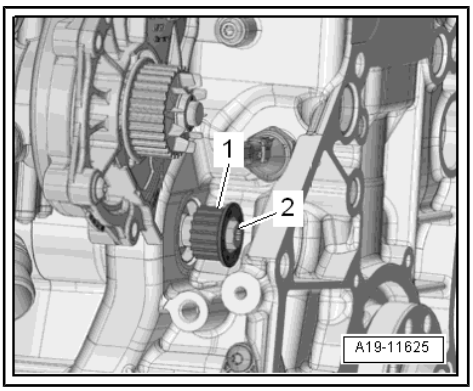


Procedure

– Remove toothed belt for coolant pump ⇒ page 205 .

– Unscrew bolt -2-.

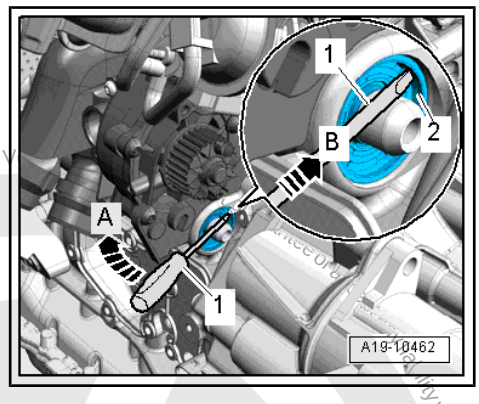
– Detach drive sprocket -1- for toothed belt for coolant pump.



– Press screwdriver -1- firmly onto section -2- of oil seal -arrow B-.

– Lever out oil seal -arrow A-.

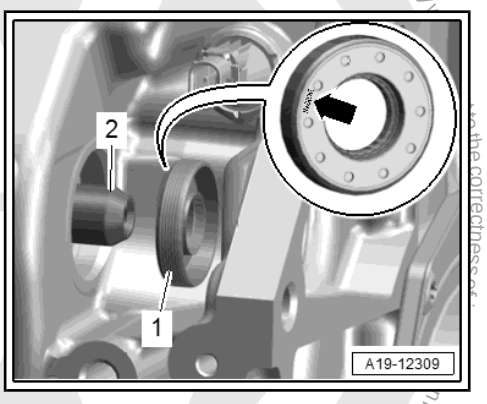
– Clean contact surface and sealing surface.



– Lubricate sealing surface of balance shaft -2- with engine oil.

– Fit oil seal -1- onto balance shaft.

• Lettering “Inside” -arrow- must point towards engine.

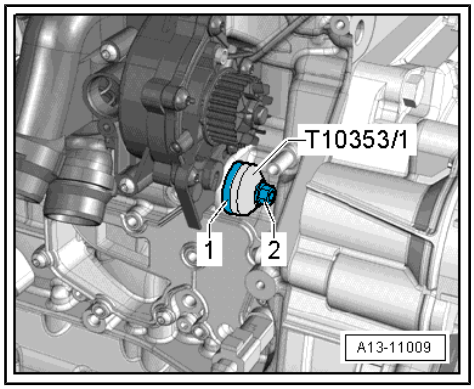


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Note

The drive sprocket bolt has a left-hand thread.

– Apply thrust piece - T10353/1- to oil seal -1- and press into cylinder block as far as stop using bolt -2- (take care not to tilt oil seal).
– Fit toothed belt for coolant pump ⇒ page 205 .
– Add coolant ⇒ page 190 .

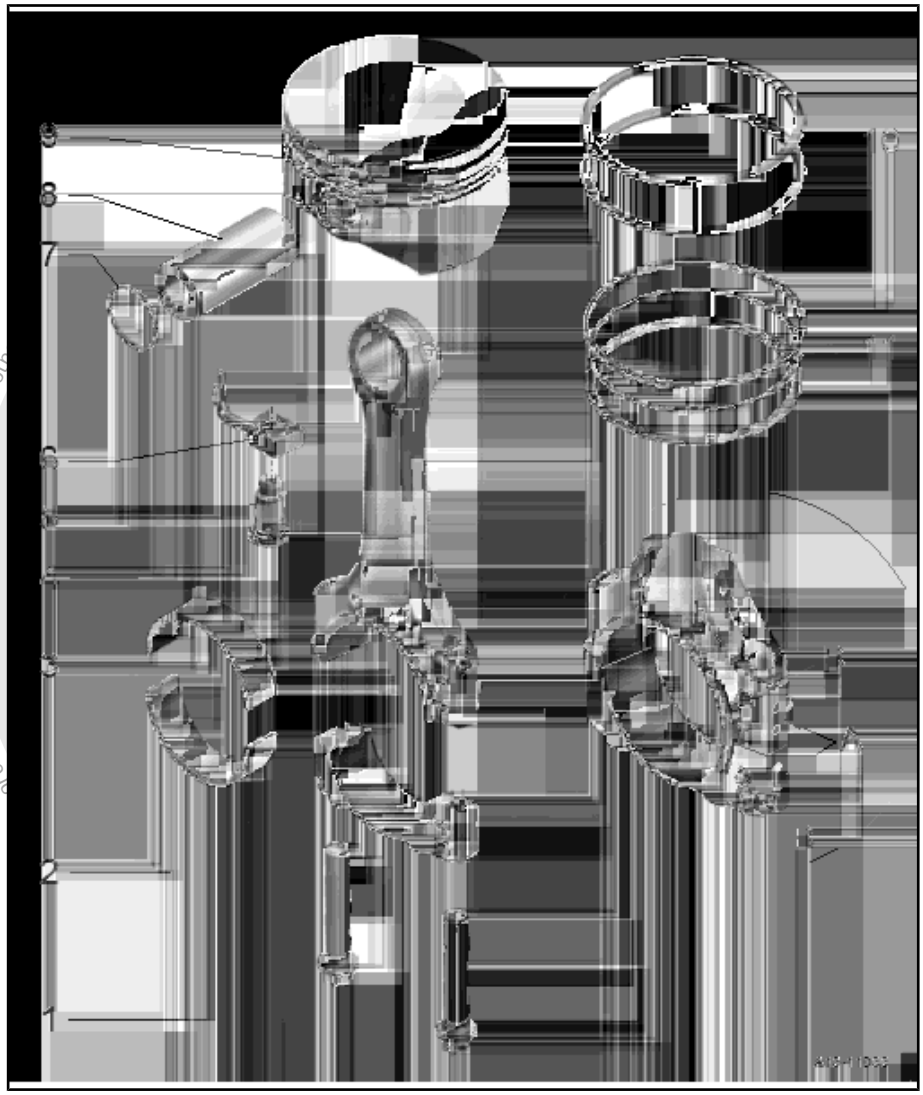


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5 Pistons and conrods

⇒ “5.1 Assembly overview - pistons and conrods”, page 79
⇒ “5.2 Removing and installing pistons”, page 82
⇒ “5.3 Checking pistons and cylinder bores”, page 83
⇒ “5.4 Separating new conrod”, page 85
⇒ “5.5 Checking radial clearance of conrods”, page 85
⇒ “5.6 Removing and installing oil spray jets”, page 86

5.1 Assembly overview - pistons and conrods



1 - Bolts

- ❑ Renew after removal
- ❑ Apply engine oil to thread and contact surface
- ❑ Use old bolts to measure radial clearance.
- ❑ 45 Nm +90°

2 - Conrod bearing cap

- ❑ Observe installation position
- ❑ Conrod bearing cap only fits in one position and only on the appropriate conrod due to the breaking procedure (cracking) separating the cap from the conrod
- ❑ Mark allocation to cylinder and conrod in colour -A-
- ❑ Installation position: Marking -B- faces towards pulley end.
- ❑ Separating new conrod ⇒ page 85 .

3 - Bearing bushes

- ❑ Fitting position ⇒ page 80
- ❑ Renew worn bearing shells
- ❑ Apply engine oil before installing
- ❑ Axial clearance

♦ New: 0.10 … 0.35 mm

♦ Wear limit: 0.40 mm

- ❑ Measuring radial clearance ⇒ page 85

4 - Connecting rod

- ❑ Renew as set only.
- ❑ Mark allocation to cylinder and to conrod bearing cap
- ❑ Installation position: Marking -B- faces towards pulley end.
- ❑ Separating new conrod ⇒ page 85 .

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- ❑ Measuring radial clearance ⇒ page 85

5 - Pressure relief valve

- ❑ 27 Nm

6 - Oil spray jet

- ❑ For piston cooling
- ❑ Removing and installing ⇒ page 86

7 - Retaining ring

- ❑ Renew after removal

8 - Piston pin

- ❑ Apply engine oil before installing

9 - Piston

- ❑ Installing with piston installation sleeve -T40347- ⇒ page 82
- ❑ Installation position: arrow on piston crown faces towards pulley end
- ❑ Mark allocation to cylinder
- ❑ Checking piston and cylinder bore ⇒ page 83

10 - Compression rings

- ❑ Install with piston ring pliers -VAS 211 003- ⇒ page 81
- ❑ Offset gaps by 120°
- ❑ Installation position: “TOP” or “R” marking must face upwards towards piston crown.
- ❑ ⇒ Fig. ““Checking piston ring gap”“ , page 84
- ❑ Ring-to-groove clearance cannot be checked.

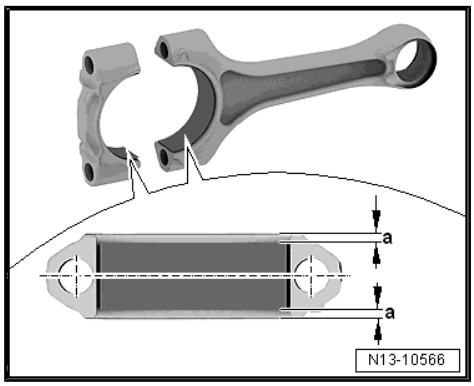
11 - Oil scraper ring

- ❑ Three parts
- ❑ Remove and install by hand
- ❑ Install in such a way that upper gap of three-part oil scraper ring is offset by 120° relative to adjacent compression ring
- ❑ Ring gap cannot be measured
- ❑ Ring-to-groove clearance cannot be checked.
- ❑ ⇒ Fig. ““Installing oil scraper ring, three-part”“ , page 81
- ❑ ⇒ Fig. ““Allocation of piston rings”“ , page 81

Bearing shells - installation position

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

Distance -a- must be identical on both sides.



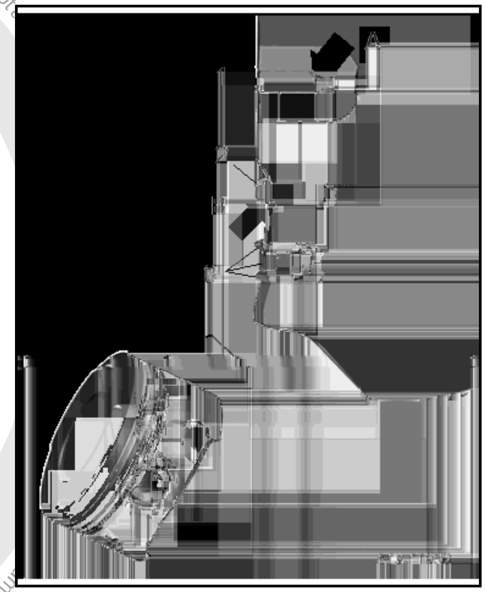
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Allocation of piston rings

1 - Compression ring with chamfer -arrow A- on upper inner side. »TOP« marking and lettering point inwards

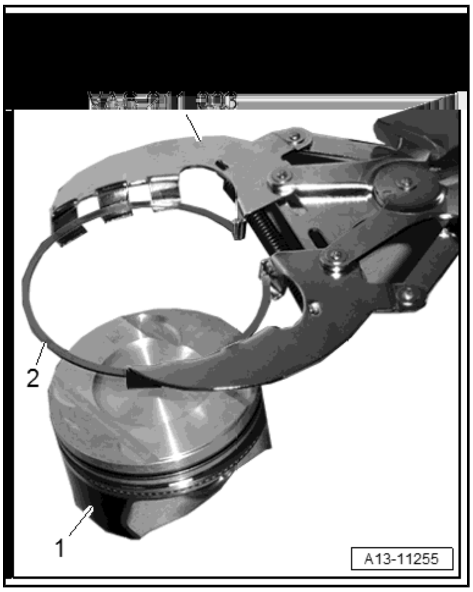
2 - Compression ring shoulder -arrow B- on lower outer side. »TOP« marking and lettering point inwards

3 - Oil scraper ring, three-part



Installing compression rings

- »TOP« marking and lettering point upwards.
- Compression ring -2- should not be opened using piston ring pliers -VAS 211 003- any further than necessary to just push it over piston -1-.



Installing oil scraper ring, three-part

– Note installation position of spring:

- Butts of plates -2, 3- and spring -1- must have an offset of at least 90° to each other.

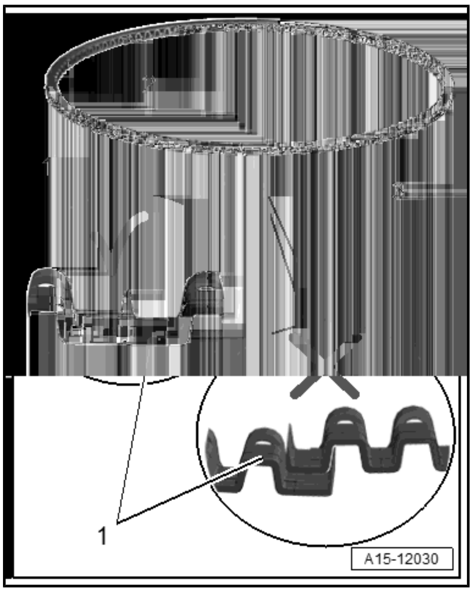
– Install by hand.

Installation sequence:

– 1. Insert spring -1- into groove.

– 2. Insert plate -3- in bottom of groove.

– 3. Insert plate -2- in top of groove.



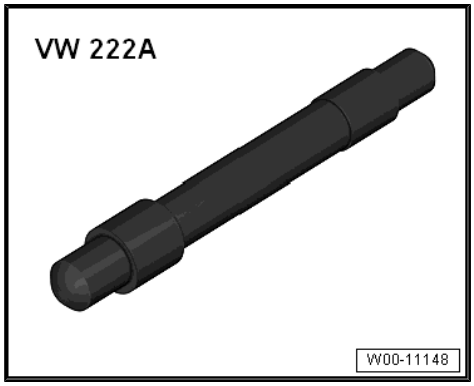
5.2 Removing and installing pistons

Note

If pistons are installed without the piston installation sleeve - T40347- , the oil scraper ring will be damaged.

Special tools and workshop equipment required

- Drift - VW 222 A-



- Piston installation sleeve -T40347- (not shown)

Removing

– Remove engine, and secure it to engine and gearbox support - VAS 6095- ⇒ page 23 .

– Remove cylinder head ⇒ page 89 .

– Remove upper part of sump ⇒ page 159 .

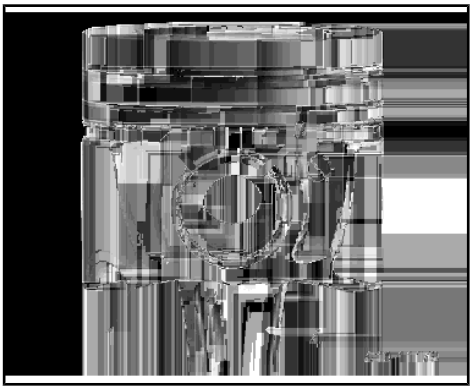
– Mark piston installation position and corresponding cylinder number.

– Mark conrod installation position and corresponding cylinder number ⇒ Item 4 (page 79) .

– Remove conrod bearing cap and withdraw piston and conrod upwards.

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– Remove retaining ring from piston pin eye.
– Remove retaining ring -2- from piston pin eye.
– Drive out piston pin -3- using drift - VW 222A- .



Note

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

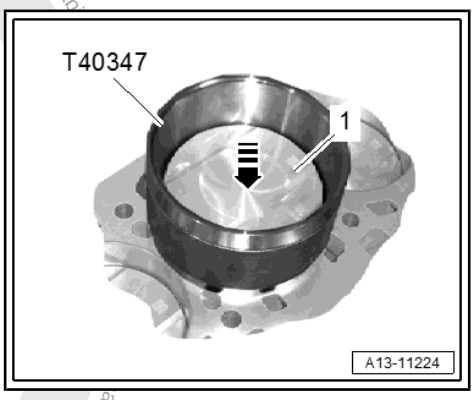
– Remove piston -1- from conrod -4-.

Installing

Installation is carried out in the reverse order. When installing, note the following:

- Renew bolts that are tightened with turning further angle after each removal.
- Arrow on piston crown points to belt pulley end.
- Install in such a way that upper gap of three-part oil scraper ring is offset by 120° relative to adjacent compression ring

– Install compression rings ⇒ page 81 .
– Install oil scraper ring ⇒ page 81 .



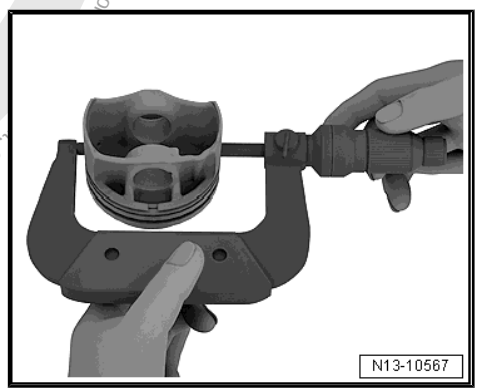
– Oil contact surfaces of bearing shells and cylinder wall with engine oil.
– Carefully push piston -1- into cylinder -arrow- by hand using piston installation sleeve -T40347- .
– Install conrod bearing cap, noting installation position ⇒ Item 2 (page 79) .
– Install cylinder head ⇒ page 89 .
– Install upper part of sump ⇒ page 159 .

Specified torques

♦ ⇒ “5.1 Assembly overview - pistons and conrods”, page 79

5.3 Checking pistons and cylinder bores

Checking piston



Special tools and workshop equipment required

♦ Micrometre 75 - 100 mm - VAS 6071-

– Using a micrometer, measure approx. 15 mm from the lower edge, perpendicular to the piston pin axis.

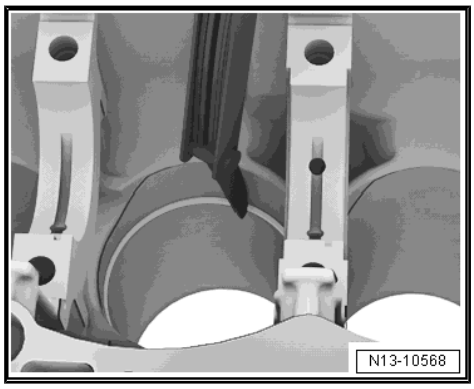
♦ Difference between actual and nominal diameter max. 0.04 mm.

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		Piston ∅
Basic dimension	mm	82.42[1)]

- [1)] Dimensions without graphite coating (thickness 0.02 mm). The graphite coating will wear down.

Checking piston ring gap



Special tools and workshop equipment required

- ♦ Feeler gauge

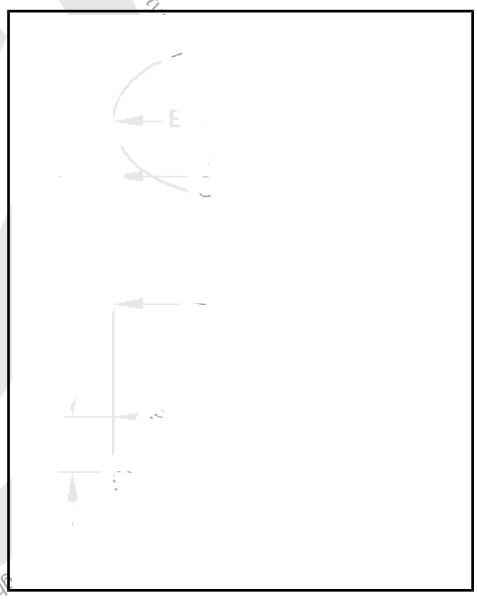
– Push piston ring at right angles to cylinder wall from above down to approx. 15 mm from bottom end of cylinder. Push in using a piston without rings.

Piston ring dimensions in mm	New	Wear limit
1st compression ring	0.30 to 0.40	0.60
2nd compression ring	0.40 … 0.50	0.70
Oil scraper ring	Cannot be measured	Cannot be measured

Checking cylinder bores

Note

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



Special tools and workshop equipment required

- ♦ Cylinder gauge - VAS 6078-

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NOTICE

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

– **Do not machine cylinder bore (reboring, honing, grinding) with workshop equipment.**

– Using a cylinder gauge - VAS 6078- , take measurements at 3 positions diagonally in the lateral direction -A- and in the longitudinal direction -B-.

♦ Difference between actual and nominal diameter max. 0.08 mm.

		Cylinder bore ∅
Basic dimension	mm	82.51

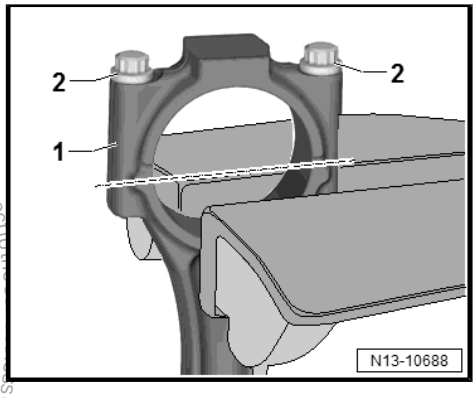
5.4 Separating new conrod

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

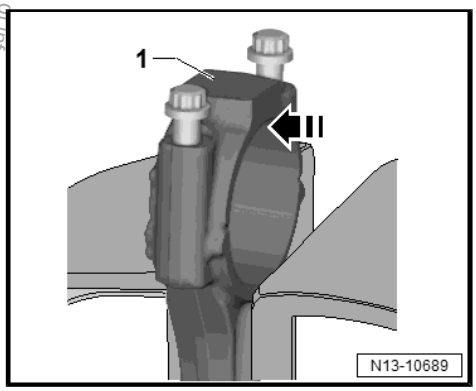
– Mark allocation of conrod to cylinder.

– Clamp conrod -1- in a vice below the dashed line using aluminium vice clamps.

– Unscrew both bolts -2- about 5 turns.



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



5.5 Checking radial clearance of conrods

Special tools and workshop equipment required

♦ Plastigage

Procedure

– Remove conrod bearing cap.

– Clean bearing cap and bearing journal.

– Place a Plastigage corresponding to the width of the bearing on the journal or into the bearing shells.

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– Fit conrod bearing cap and tighten it using old bolts ⇒ Item 1 (page 79) . When tightening, make sure not to rotate crankshaft.
– Remove conrod bearing cap again.
– Compare width of Plastigage with the measurement scale.

Radial clearance:

- New: 0.02 to 0.06 mm
- Wear limit: 0.09 mm.

– Renew conrod bolts.

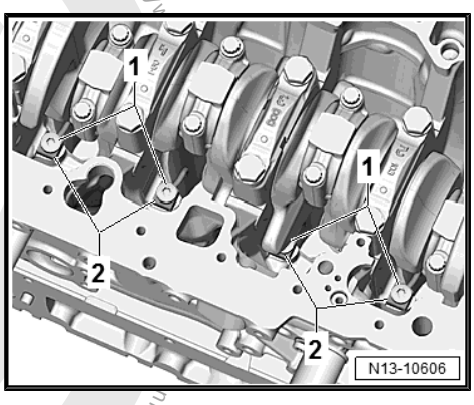
5.6 Removing and installing oil spray jets

Special tools and workshop equipment required

♦ Bit - T10545-

Removing

– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
– Remove upper part of sump ⇒ page 159 .
– Turn crankshaft via vibration damper securing bolt in direction of engine rotation until the respective bolt is accessible.
– Unscrew pressure relief valve -1- using Torx bit T40 - T10545-
– Remove oil spray jets -2-.

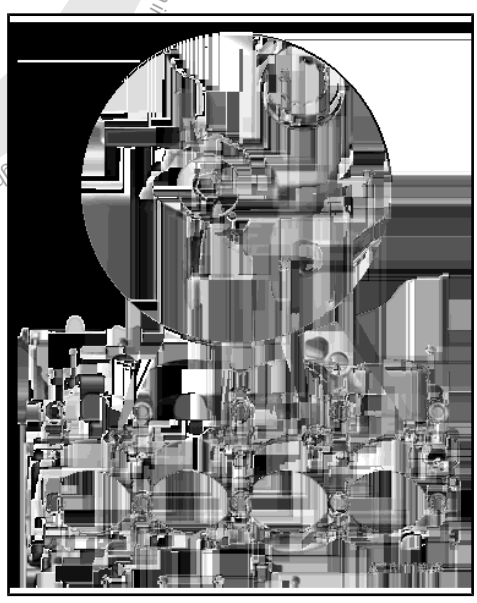


Installing

NOTICE

Risk of damage to oil spray jets caused by deformation.

– Do not bend oil spray jets.



Install in reverse order of removal, observing the following:

- Side surface of oil spray jet -1- must be aligned parallel to adjacent crankshaft bearing -2-.
- Distance -a- = distance -a-.

– Install upper part of sump ⇒ page 159 .
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview – noise insulation .

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15 – Cylinder head, valve gear

1 Cylinder head

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

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

⇒ “1.3 Assembly overview - vacuum pump”, page 95

⇒ “1.4 Removing and installing vacuum pump”, page 96

⇒ “1.5 Checking compression”, page 97

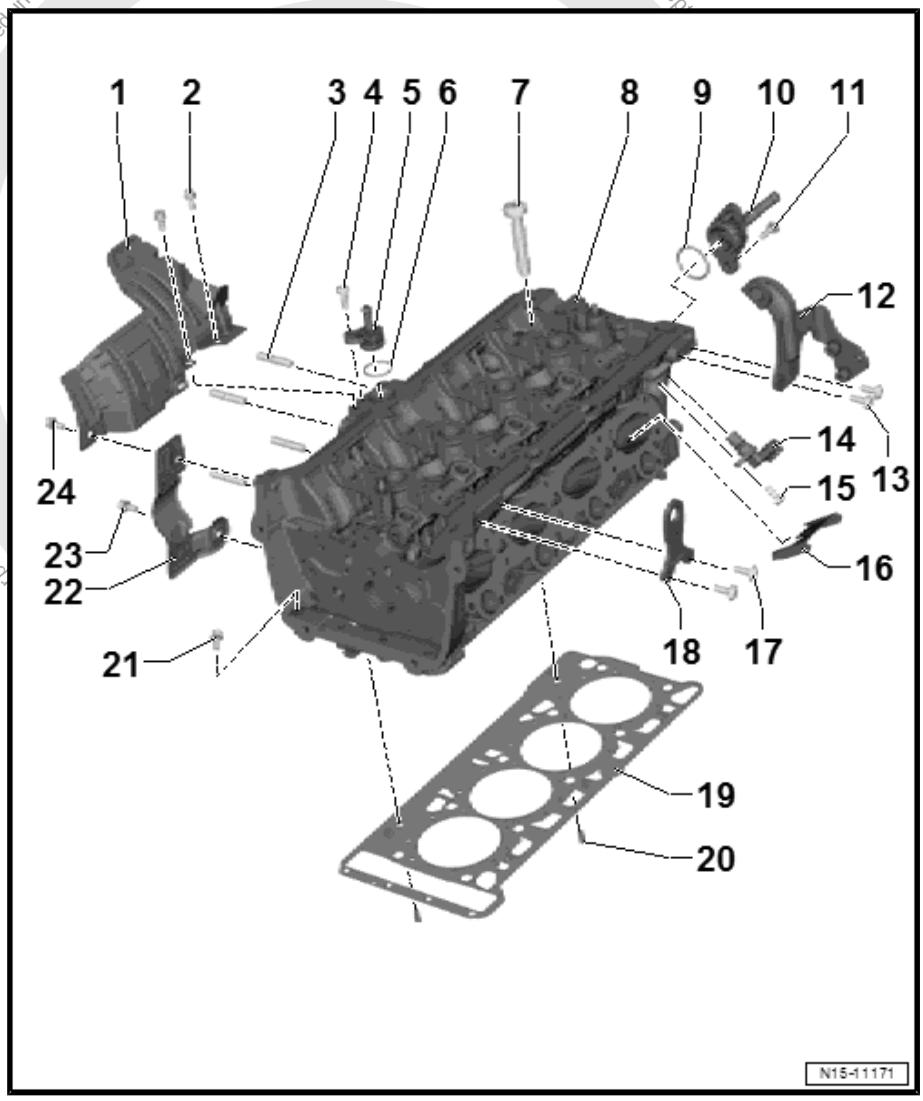
1.1 Assembly overview - cylinder head

Note

- *Renew cylinder head bolts.*
- *Always renew self-locking nuts, bolts which have been tightened with turning further angle, as well as oil seals and gaskets.*
- *The plastic protectors fitted to protect the open valves must only be removed immediately before fitting the cylinder head.*
- *After fitting a new cylinder head or cylinder head gasket, the engine oil and coolant must be changed.*

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1 - Heat shield

2 - Bolt
- ❑ 9 Nm

3 - Studs
- ❑ For turbocharger
- ❑ Coat with high-temperature paste
- ❑ 15 Nm

4 - Bolt
- ❑ 9 Nm

5 - Union
- ❑ For coolant hose

6 - O-ring
- ❑ Renew after removal
- ❑ Moisten with coolant

7 - Cylinder head bolt
- ❑ Renew
- ❑ Note procedure when loosening ⇒ page 89 .
- ❑ Note procedure when tightening ⇒ page 89 .

8 - Cylinder head
- ❑ Removing and installing ⇒ page 89
- ❑ Check for distortion ⇒ page 89 .

9 - O-ring
- ❑ Renew after removal
- ❑ Moisten with coolant

10 - Union
- ❑ For coolant hose

11 - Bolt
- ❑ 9 Nm

12 - Engine lifting eye

13 - Bolts
- ❑ 10 Nm +90°

14 - Hall sender - G40-
- ❑ Removing and installing ⇒ page 320

15 - Bolt
- ❑ 9 Nm

16 - Partition

17 - Bolts
- ❑ 10 Nm +90°

18 - Engine lifting eye

19 - Cylinder head gasket
- ❑ Renew
- ❑ Observe installation position: Part number to cylinder head

20 - Dowel pin

21 - Bolt

- ❑ Renew
- ❑ Note procedure when loosening ⇒ page 89 .
- ❑ Note procedure when tightening ⇒ page 89 .
- ❑ 8 Nm +90° further

22 - Heat shield

23 - Bolt

- ❑ 9 Nm

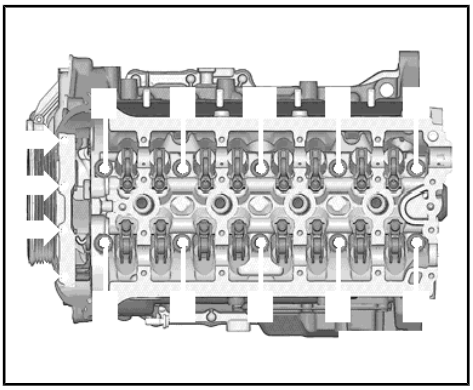
24 - Bolt

- ❑ 9 Nm

Loosening cylinder head bolts

– Unscrew bolts -arrows-.

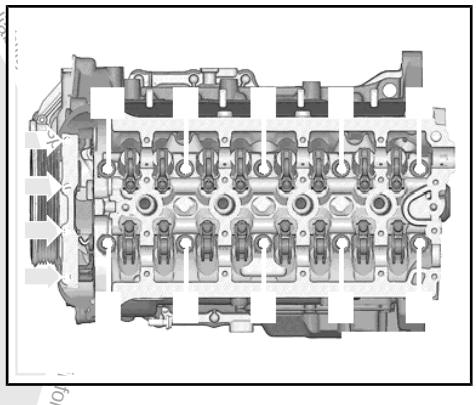
– Slacken cylinder head bolts in the sequence -1 to 10-.



Tightening sequence for cylinder head

– Tighten cylinder head bolts in the sequence -1 … 10- as follows:

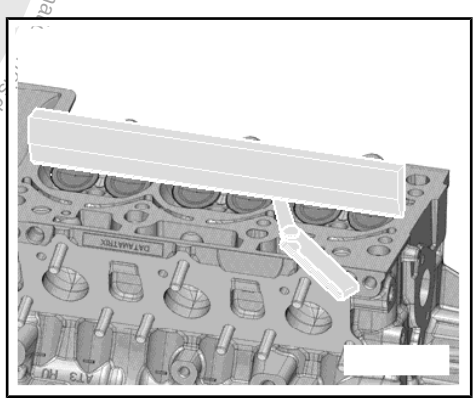
Stage	Bolts	Specified torques/angle specifications
1.	-1 … 10-	Screw in by hand as far as stop
2.	-1 … 10-	40 Nm
3.	-1 … 10-	Turn 90° further
4.	-1 … 10-	Turn 90° further
5.	-Arrows-	8 Nm
6.	-Arrows-	Turn 90° further



Checking cylinder head for distortion

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

♦ Max. permissible distortion: 0.05 mm

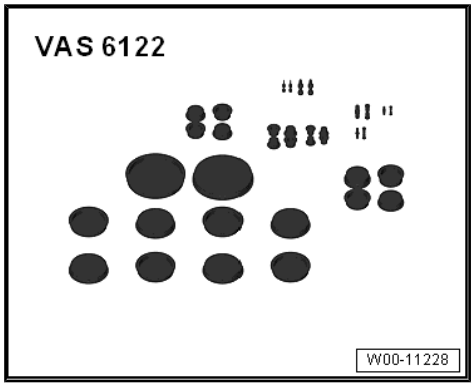


1.2 Removing and installing cylinder head

Special tools and workshop equipment required

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- Set of plugs for engine - VAS 6122-

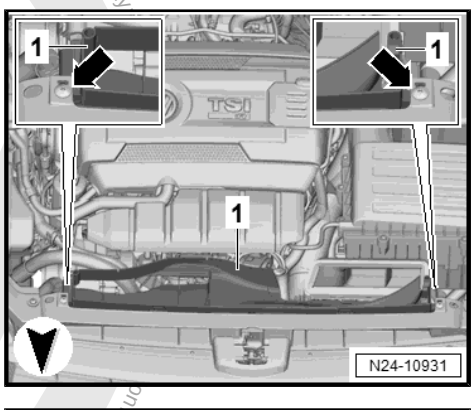


Removing

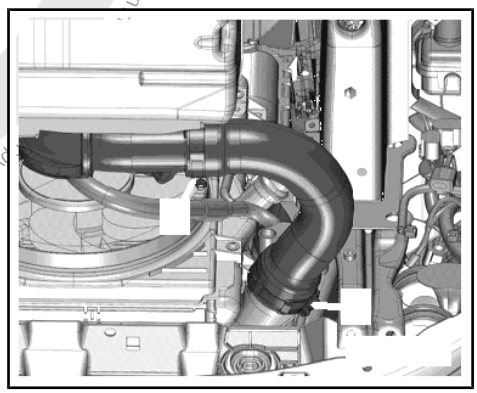
Note

- *Fit the cable ties in the original position when installing.*
- *Seal open channels of intake and exhaust system with suitable plugs from engine bung set - VAS 6122- .*
- *Cover the openings in the gearbox with a cloth to prevent any coolant from getting into the clutch housing.*

– Unscrew bolt -arrow- on left and right.
– Unclip lower part of air duct -1- and remove it.
– Remove camshafts ⇒ page 130 .
– Remove front exhaust pipe with catalytic converter ⇒ page 309 .
– Remove Lambda probe 1 before catalytic converter - GX10- ⇒ page 293 .

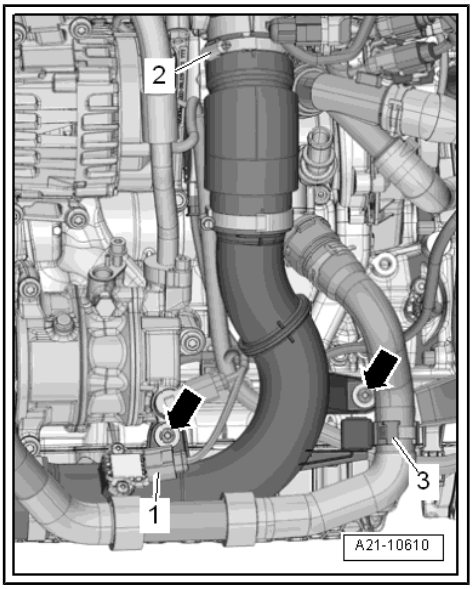


– Release hose clip -2-, and detach charge air hose from charge air cooler.
– Seal open lines and connections with clean plugs from engine bung set - VAS 6122- .



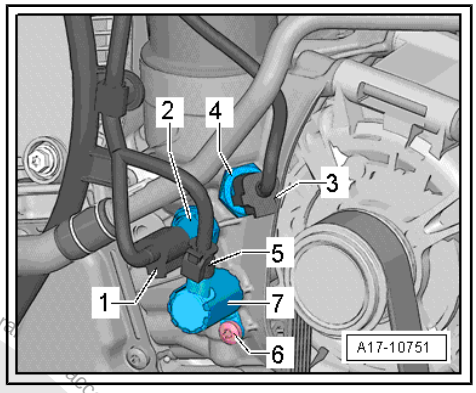
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– Release hose clip -2-.
– Lay coolant hose -3- to one side.
– Unscrew bolts -arrows-.
– Unplug electrical connector -1- at charge pressure sender - G31- and detach air pipe (right-side).

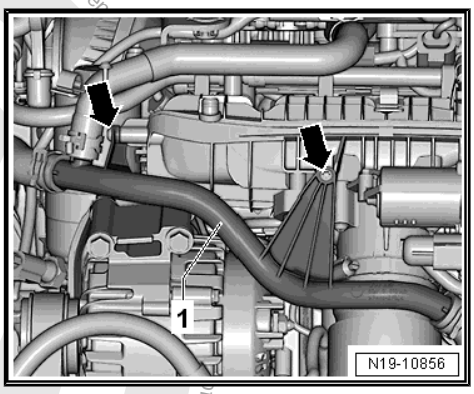


– Disconnect connectors:

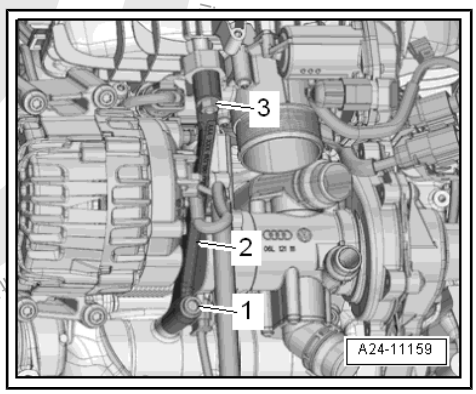
1 - For oil pressure switch - F1-
2 - For oil pressure switch for reduced oil pressure - F378-
5 - For piston cooling jet control valve - N522-



– Unscrew bolts -arrows-.



– Unscrew bolt -1- and nut -3- and remove bracket -2- for intake manifold.



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– Disconnect connectors:

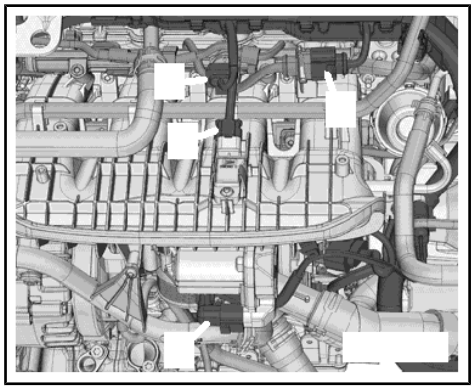
1 - For throttle valve module - GX3-

2 - For intake manifold sender - GX9- .

3 - For fuel pressure sender - G247- .

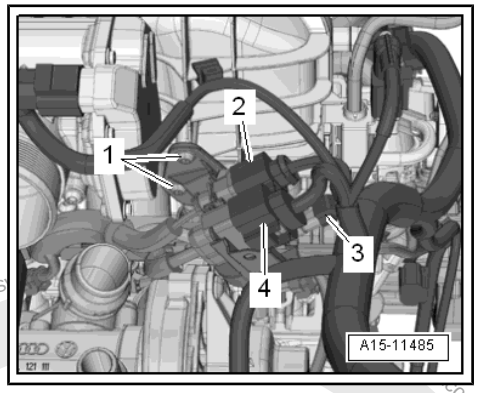
– Remove connector -4- from retainer.

– Move electrical wiring harness clear and press to one side.



– Remove connector -3- for knock sensor 1 - G61- from retainer and disconnect it.

– Disconnect connectors -2 and 4-.



– Disconnect connectors and lay wiring harnesses to one side:

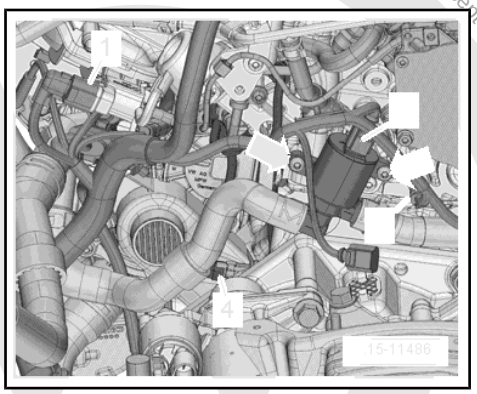
1 - For intake manifold flap valve - N316- .

2 - For coolant shut-off valve - N82- .

3 - For coolant temperature sender - G62-

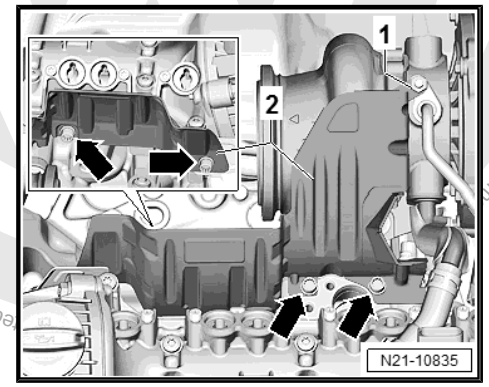
4 - For stage 3 oil pressure switch - F447-

– Unscrew bolts -arrows-.



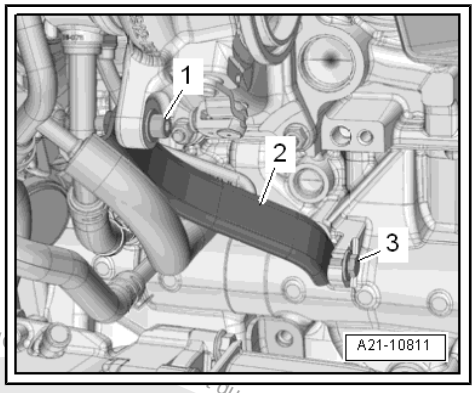
– Unscrew bolts -arrows- and nut -1-.

– Remove heat shield -2-.

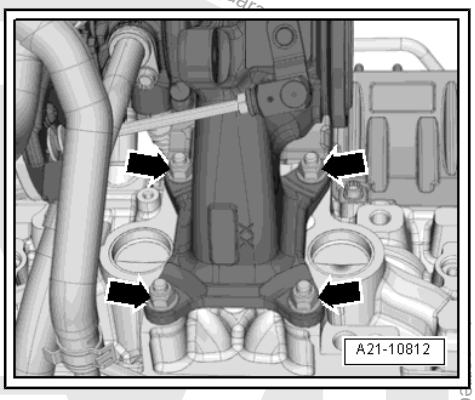


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– Remove bolt -1- and loosen bolt -3-.
– Remove bracket -2- for turbocharger.



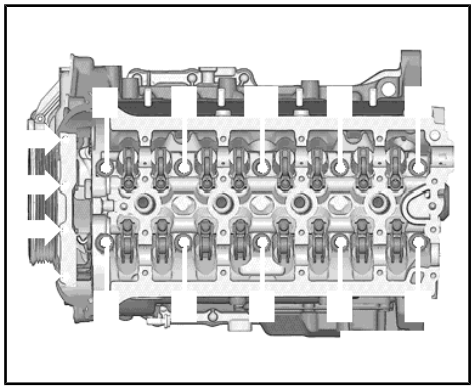
– Unscrew nuts -arrows-.
– Detach turbocharger from cylinder head and tie up to rear.



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– Unscrew bolts -arrows-.

– Unscrew cylinder head bolts in sequence -1 to 10-.



Note

Make sure all hoses/pipes and wiring are removed.

– Take off cylinder head and set it down on a soft surface (foam plastic).

Installing

Note

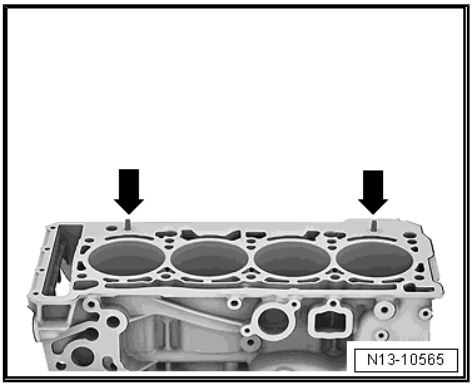
- *Renew bolts that are tightened with turning further angle.*
- *Renew gaskets, oil seals and self-locking nuts.*
- *Hose connections and air duct pipes must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .*
- *Spray the worm screws of the used hose clips with penetrating spray before installing.*

– Do not remove new cylinder head gasket from packaging until it is ready to be fitted. The silicone coating and the indented area of the cylinder head gasket must not be damaged.

– Carefully remove sealant residue from cylinder head and cylinder block. Ensure that no long scores or scratches are made on the surfaces, while doing so. Carefully remove remains of emery and abrasives.

– Clean blind holes for cylinder head bolts. Blow out with compressed air if necessary.

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– Position cylinder head gasket.

♦ Note centring pins in cylinder block -arrows-.

♦ Check installation position of cylinder head gasket. Characteristic: the part number should be legible from the inlet side.

– If crankshaft has been turned in the meantime, position cylinder number 1 piston to TDC and then turn crankshaft back slightly. When doing so, ensure that timing chain is not damaged.

– Fit cylinder head.

– Insert and tighten cylinder head bolts. Tightening sequence ⇒ Fig. ""Tightening sequence for cylinder head"" , page 89

– Install camshafts, but do not fit camshaft timing chain yet ⇒ page 135 .

– Support engine in its installation position again ⇒ page 32 .

– Removing engine mounting and engine support.

– Now, install camshaft timing chain ⇒ page 115 .

The remaining assembly steps are basically a reverse of the dismantling procedure, when doing this note as follows:

– Change engine oil ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

– Fill with new coolant ⇒ page 188 .

Specified torques

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

♦ ⇒ “4.1 Assembly overview - intake manifold”, page 265

♦ ⇒ “3.1 Assembly overview - coolant pipes”, page 215

♦ ⇒ “1.1 Assembly overview - turbocharger”, page 225

♦ ⇒ “1.1 Assembly overview - silencers”, page 296

1.3 Assembly overview - vacuum pump

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1 - Seal

- ❑ Renew after removal

2 - Vacuum pump

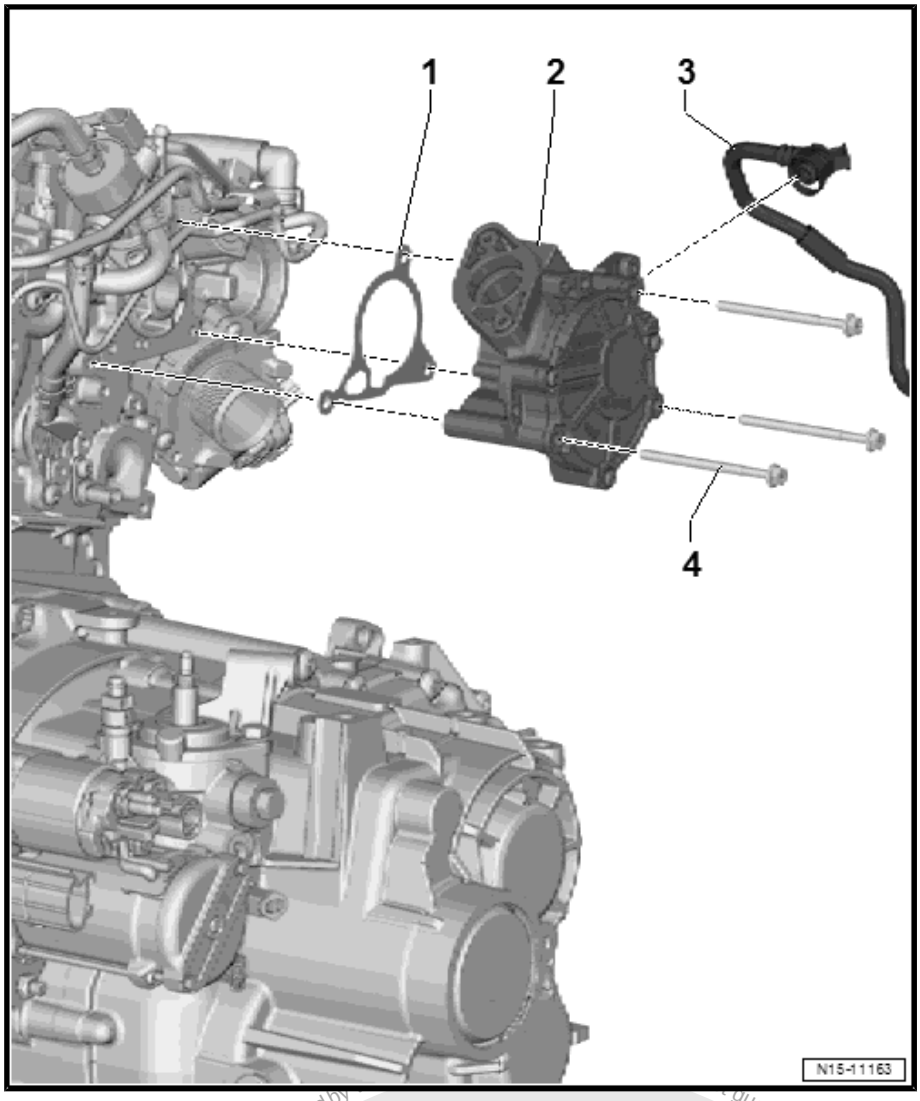
- ❑ No provision is made for the vacuum pump to be dismantled

3 - Vacuum hose

- ❑ To brake servo

4 - Bolts

- ❑ 8 Nm +180°



1.4 Removing and installing vacuum pump

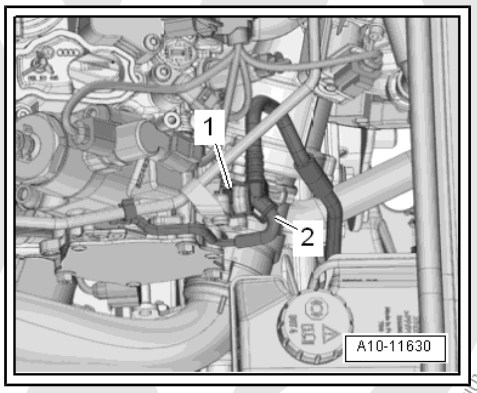
Removing:

– Remove engine cover panel ⇒ page 41 .

– Remove air filter housing ⇒ page 263 .

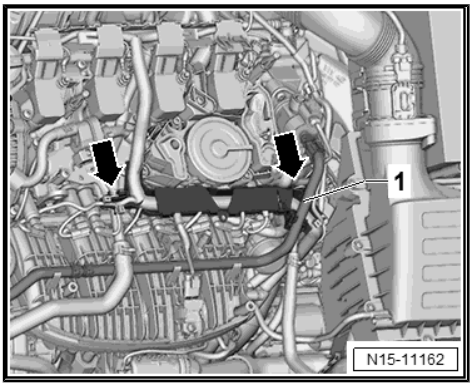
– Separate vacuum hose -2-.

– Press release tabs on vacuum hose -1-, and remove hose from vacuum pump.



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– Unclip fuel hose -1-, release wiring duct -arrows-, and pull it upwards off bracket.

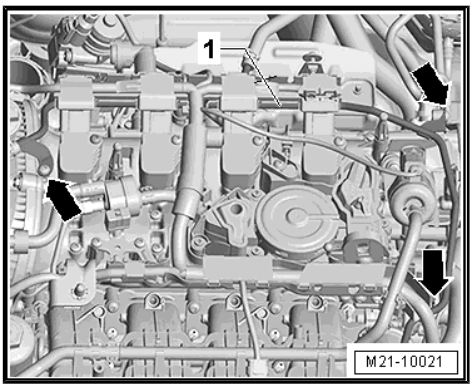


– Unscrew bolts -arrows- for coolant pipe -1-.

NOTICE

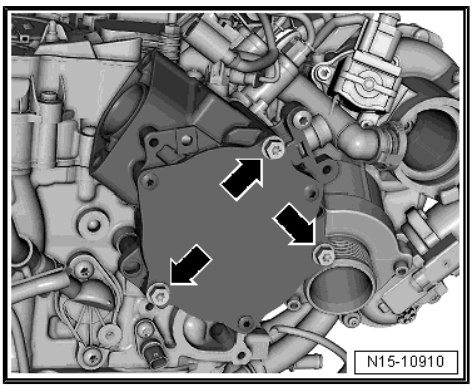
Risk of damage to coolant pipes caused by deformation.

– Never attempt to reshape the coolant pipe.



– Remove high-pressure pump with »roller tappet« ⇒ page 288 .

– Unscrew bolts -arrows-, and remove vacuum pump.



Installing:

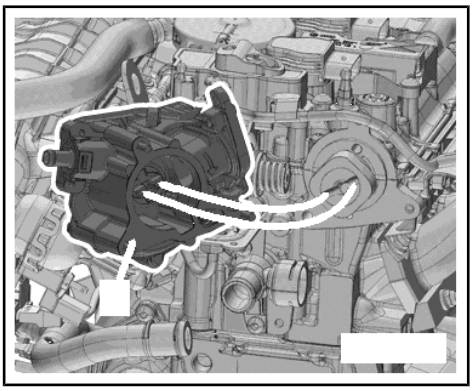
- Specified torques ⇒ page 95

– Clean sealing surfaces.

– Position drive lug of vacuum pump carrier -1- so that it engages in slot of camshaft when vacuum pump is fitted.

– Position new gasket on vacuum pump, insert 2 bolts, and fit vacuum pump with gasket on cylinder head.

– When doing so, ensure that vacuum pump is flush with flange.



Further assembly is basically the reverse of the removal procedure.

1.5 Checking compression

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Special tools and workshop equipment required



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- Spark plug socket - 3122 B-
- Compression tester - V.A.G 1763-
- Adapter - V.A.G 1381/1-
- Adapter - V.A.G 1381/5A-

Test sequence

Note

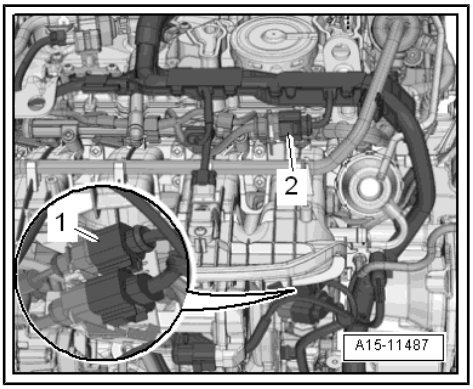
- *Engine oil temperature min. 30°C*
- *Battery voltage at least 12.7 V*

– Removing ignition coils with output stages ⇒ page 317 .

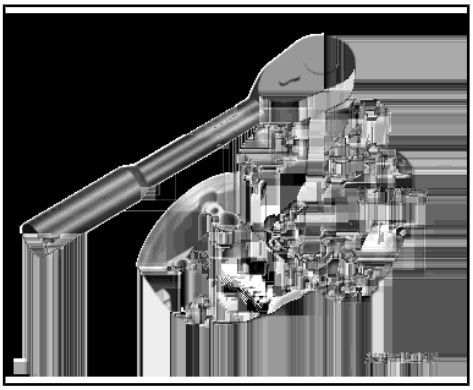
– Disconnect connectors:

1 - For injectors -N30- to -N33-

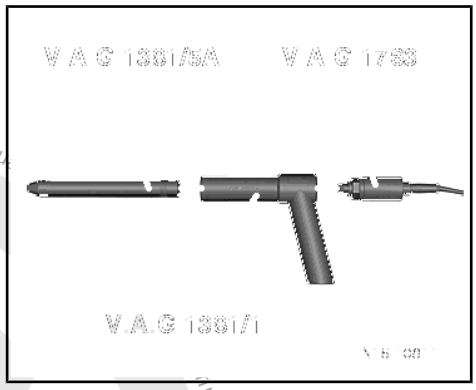
2 - For injectors 2 -N532- to -N535-



– Unscrew spark plugs using spark plug socket - 3122 B- .



– Check compression using compression tester - V.A.G 1763- , adapter - V.A.G 1381/1- and adapter - V.A.G 1381/5A- .



Note

Using compression tester: ⇒ Operating instructions .

– Start engine until tester shows no further pressure increase.

Compression pressures	bar
New	16.0 … 19.0
Wear limit	12.0
Maximum difference between cylinders	3.0

– Install spark plugs ⇒ Maintenance ; Booklet ; Spark plugs: Renewing

– Install ignition coils ⇒ page 317 .

Note

Faults will have been stored in the memory because connectors have been disconnected. Read and clear the event memory after the measurement.

– Connect ⇒ Vehicle diagnostic tester, and select following functions.

- `Engine control unit functions`
- `0001 - Generate readiness code`

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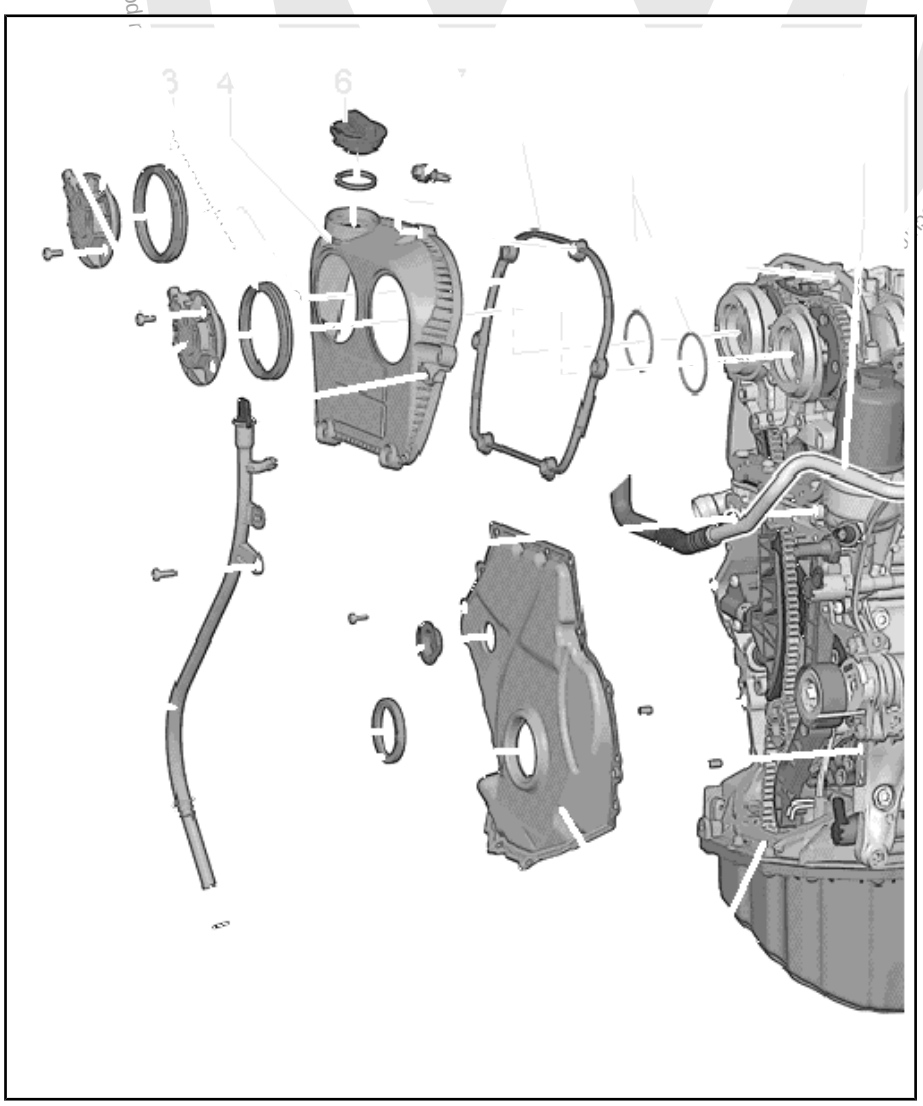
2 Cover for timing chain

⇒ “2.1 Assembly overview - cover for timing chain”, page 100

⇒ “2.2 Removing and installing upper timing chain cover”, page 101

⇒ “2.3 Removing and installing timing chain cover (bottom)”, page 103

2.1 Assembly overview - cover for timing chain



1 - Bolt
- ❑ 9 Nm

2 - Exhaust camshaft control valve 1 - N318-

3 - Oil seals
- ❑ To remove, cover must be removed.

4 - Timing chain cover (top)
- ❑ Removing and installing ⇒ page 101

5 - Seal
- ❑ Renew if damaged

6 - Sealing cover
- ❑ Extension may be fitted between cap and cover

7 - Bolt
- ❑ Tightening sequence ⇒ page 102
- ❑ 9 Nm

8 - Seal
- ❑ Renew if damaged

9 - O-ring
- ❑ Renew
- ❑ Moisten with engine oil.

10 - Not installed

11 - Engine

12 - Dowel pins
- ❑ For centring cover

13 - Lower timing chain cover
- ❑ With shaft seal
- ❑ Renewing ⇒ page 103

14 - Oil seal
- ❑ For vibration damper.
- ❑ Renewing ⇒ page 51

15 - Plug
- ❑ Renew

16 - Bolt
- ❑ Renew

❑ Tightening sequence ⇒ page 105

17 - O-ring

❑ Renew

❑ Lubricate before assembling.

18 - Dipstick guide tube

19 - Bolt

❑ 9 Nm

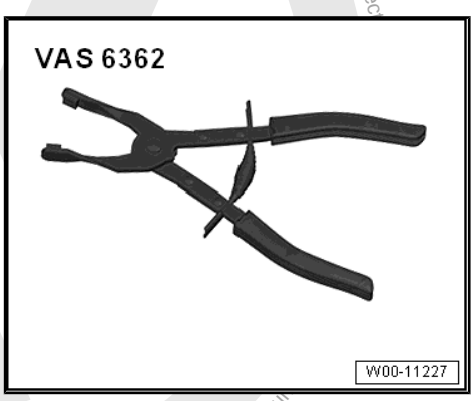
20 - Inlet camshaft control valve 1 - N205-

❑ Removing and installing ⇒ page 139

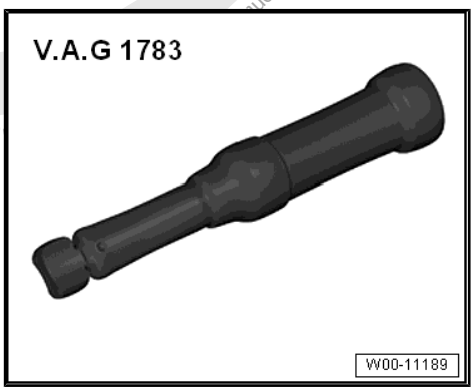
2.2 Removing and installing upper timing chain cover

Special tools and workshop equipment required

♦ Spring-type clip pliers - VAS 6362-



♦ Torque wrench - V.A.G 1783-



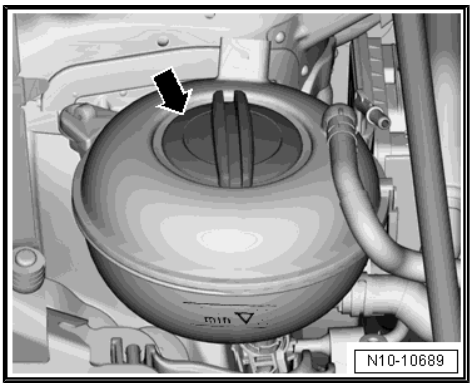
♦ Open-end spanner insert (10 mm) - V.A.G 1783/1-

Removing

• Engine cold.

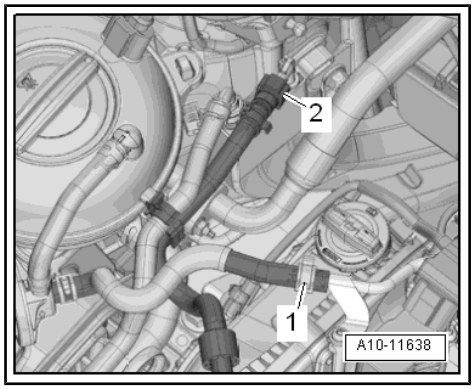
– Briefly open filler cap -arrow- for coolant expansion tank in order to reduce residual pressure in cooling system.

– Remove engine cover panel ⇒ page 41 .

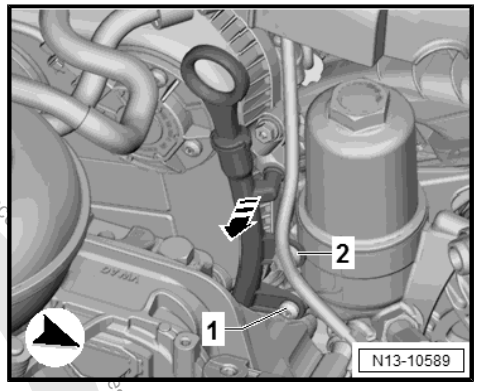


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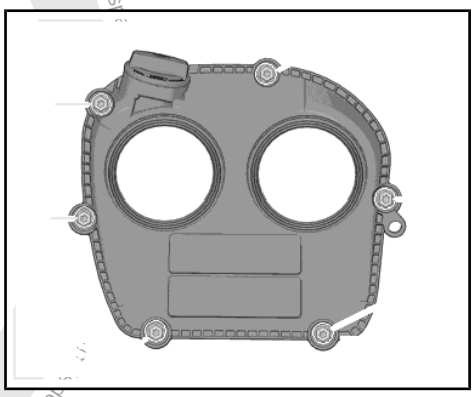
– Release hose clip -1-, disconnect coolant hose and push towards right.
– Disconnect hose -2- for activated charcoal filter (press release tab on hose) and move hose clear.
– Remove inlet camshaft control valve 1 - N205- / exhaust camshaft control valve 1 - N318- ⇒ page 139 .



– Unscrew bolt -1-, and unclip wiring harness -2-.
– Pull guide tube for oil dipstick off upper timing chain cover -arrow-.
– Slightly pull dipstick guide tube out of lower cover.
– Unclip wiring harness for camshaft control valves, and lay it to one side.

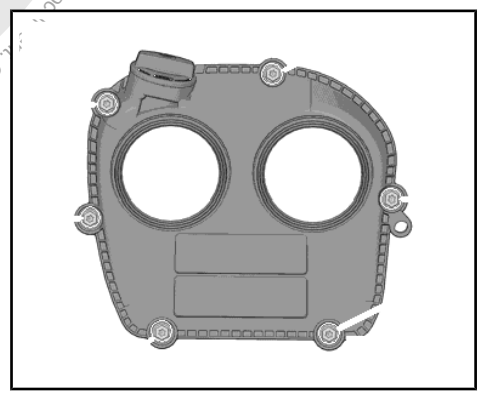


– Unscrew bolts -1 to 6- and detach top cover for timing chain.
– Remove bolts -3, 5- if necessary.



Installing

– Renew seals, and apply engine oil to new ones.
– Fit cover on cylinder head, and screw in bolts by hand. When doing so, ensure that cylinder head gasket is seated properly on cylinder head.
– Tighten bolts -1 to 6- in the sequence shown. Use torque wrench - V.A.G 1783- and open-end spanner insert AF 10 - V.A.G 1783/1- for bolts -3- and -5-.
– Install camshaft control valve 1 - N205- and exhaust camshaft control valve 1 - N318- ⇒ page 139 .
– Check if dipstick guide tube is correctly inserted into lower cover.
– Fit engine cover panel ⇒ page 41 .



Specified torques

◆ ⇒ “2.1 Assembly overview - cover for timing chain”, page 100

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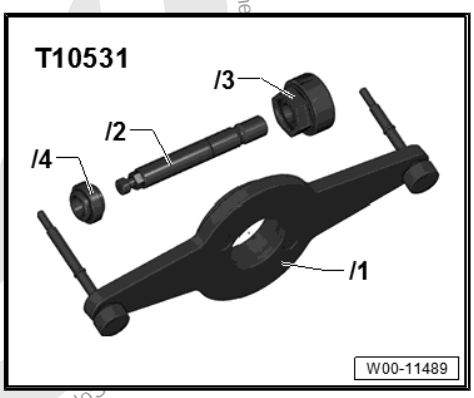
2.3 Removing and installing timing chain cover (bottom)

Note

Due to the adhesive strength of the sealant, the cover is bent when being removed. For this reason, the cover always needs be renewed.

Special tools and workshop equipment required

- Assembly tool - T10531-



- Silicone sealant ⇒ Electronic parts catalogue (ETKA)
- Applicator gun - VAS 6966-

Removing

– Remove wheel housing liner or front wheel housing liner section ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Assembly overview – front wheel housing liner .

– Remove engine support ⇒ page 55 .

– Remove vibration damper ⇒ page 45 .

– Drain engine oil ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

– Remove valve for oil pressure control - N428- ⇒ page 181 .

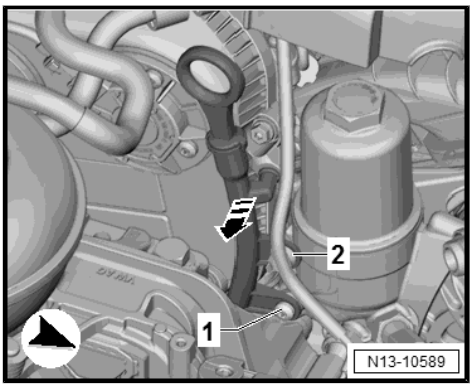
– Remove tensioner for poly V-belt ⇒ page 45 .

– Move retaining clip -2- for electrical wiring harness clear.

– Unscrew bolt -1-.

– Pull dipstick guide tube off cover -arrow-.

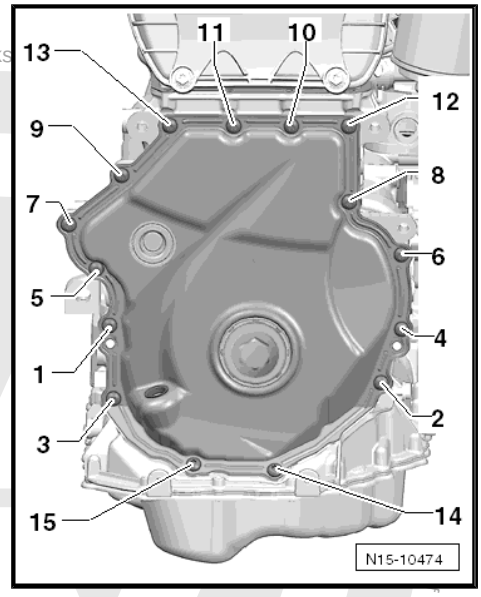
– Pull dipstick guide tube out of the timing chain cover.



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– Unscrew bolts -1 … 15-.

– Lever lower timing chain cover off.



Installing

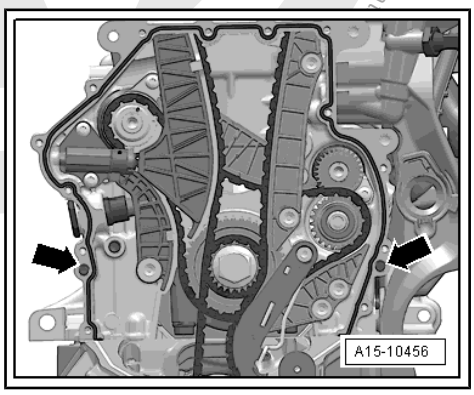
Note

- *Note expiry date of silicone sealant.*
- *Engine oil: capacities and specifications*
- *The cover must be installed within 5 minutes after applying the silicone sealant.*
- *Renew bolts that are tightened with turning further angle.*
- *Renew seal and O-ring.*
- *Danger of soiling lubrication system. Cover open parts of engine.*

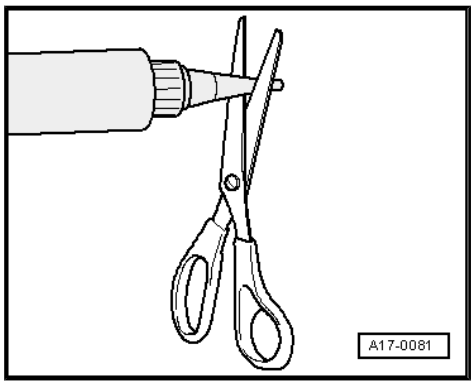
– Remove sealant residues from cylinder block with a flat scraper.

– Remove any oil and grease from sealing surfaces.

– Check that both dowel pins for centring the cover -arrows- are fitted.



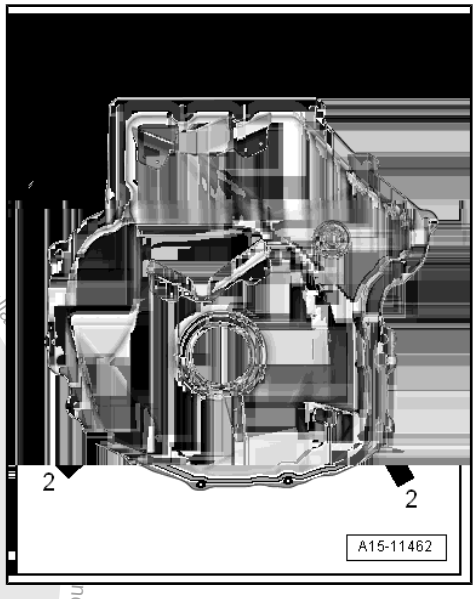
– Cut off nozzle on tube at front marking (∅ of nozzle approx. 3 mm).



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– Apply silicone sealant onto clean sealing surface -arrow 1- and edges -arrows 2- of new cover, as shown in illustration.

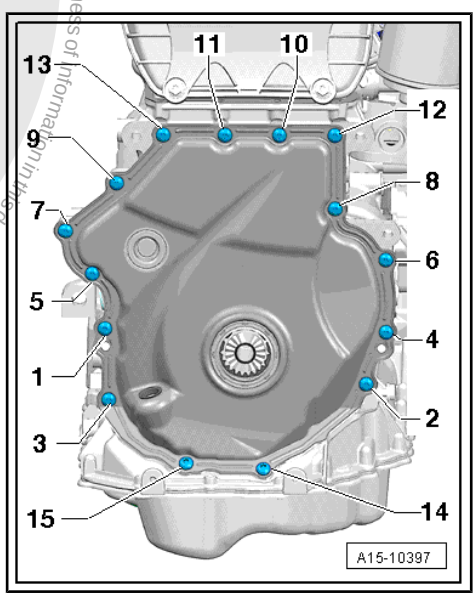
♦ Thickness of sealant bead: 2 to 3 mm.



– Immediately fit cover, and tighten bolts in sequence shown.

Note

Do not tighten bolts -3- and -6- with turning further angle until after the vibration damper has been installed. The bolts must be unscrewed again for installing the vibration damper.



Stage	Bolts	Specified torque/turning further angle
1.	-1 … 15-	Screw in by hand as far as stop
2.	-1 … 15-	8 Nm
3.	-1 … 15-	45° (turn bolts 3 and 6 45° further after vibration damper has been installed)

– Install vibration damper ⇒ page 45 .

– Install valve for oil pressure control - N428- ⇒ page 181 .

– Install tensioner for poly V-belt ⇒ page 53 .

– Install poly V-belt ⇒ page 44 .

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

– Replenish engine oil, and check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

Specified torques

♦ ⇒ “2.1 Assembly overview - cover for timing chain”, page 100

♦ ⇒ “2.1 Assembly overview - assembly mountings”, page 28

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3 Chain drive

⇒ “3.1 Assembly overview - camshaft timing chains”, page 106

⇒ “3.2 Assembly overview - drive chain for balance shaft”, page 108

⇒ “3.3 Removing and installing camshaft timing chain”, page 110

⇒ “3.4 Removing and installing drive chain for balance shaft”, page 120

⇒ “3.5 Checking valve timing”, page 123

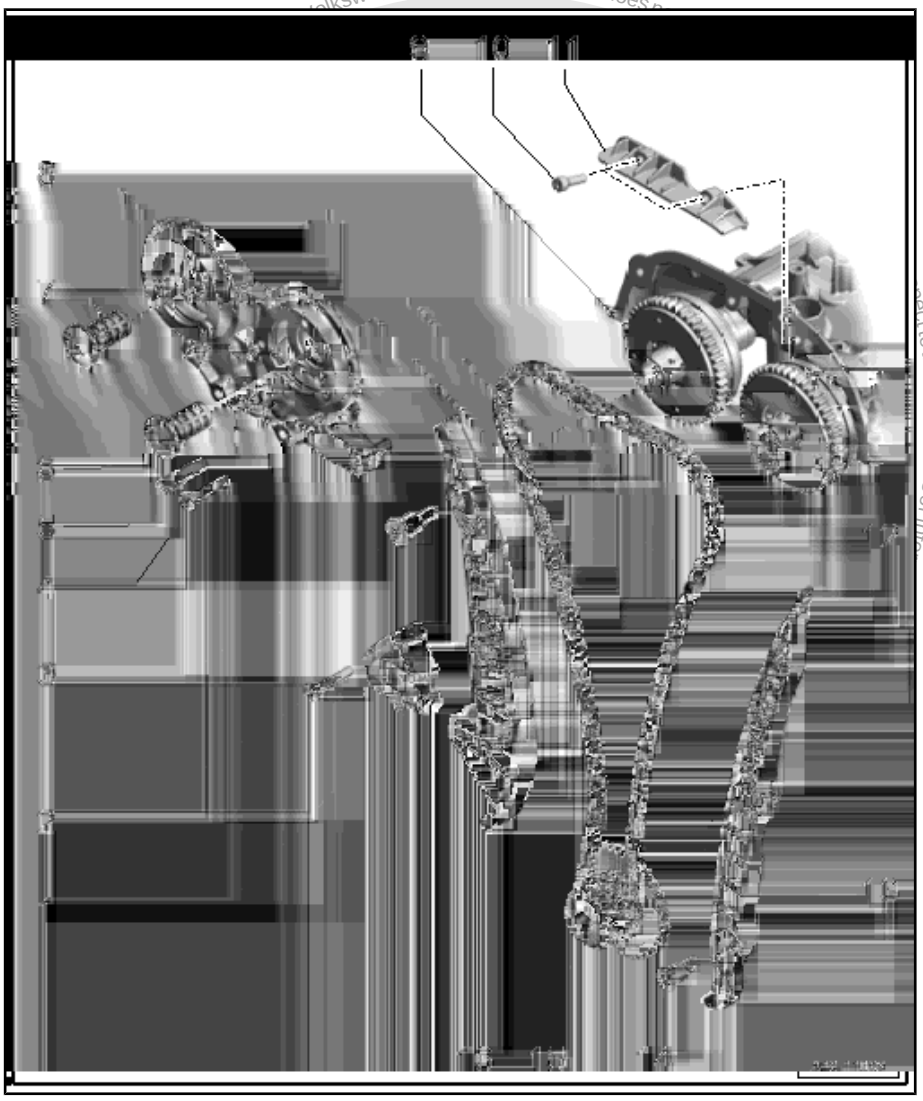
⇒ “3.6 Checking timing chain”, page 125

3.1 Assembly overview - camshaft timing chains

Note

- *After working on the chain drive, adapt learnt values in engine control unit. To do this, switch on ignition, and select the following menu options on vehicle diagnostic tester :*
- `Engine control unit functions`
- `0001 - Adaption of chain drive after repairs`

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1 - Chain tensioner

- ❑ Is spring-loaded
- ❑ Secure with locking tool - T40267- before removing.

2 - Bolt

- ❑ Renew after removal
- ❑ 4 Nm +90°

3 - Guide pin

- ❑ 20 Nm

4 - Bolt

- ❑ Renew after removal
- ❑ Specified torque and tightening sequence ⇒ page 108

5 - Clamping sleeve

- ❑ Is pulled into cylinder head together with securing bolt

6 - Timing valves

- ❑ Left-hand thread
- ❑ Depending on version, remove using removal tool - T10352/2- or - T10352/3- .
- ❑ Checking ⇒ page 108
- ❑ 35 Nm

7 - Timing valves

- ❑ Left-hand thread
- ❑ Depending on version, remove using removal tool - T10352/2- or - T10352/3- .
- ❑ Checking ⇒ page 108
- ❑ 35 Nm

8 - Bearing saddle

- ❑ Specified torque and tightening sequence ⇒ page 108

9 - Cylinder head cover

10 - Bolt

- ❑ 9 Nm

11 - Slide rail

- ❑ For camshaft timing chain

12 - Camshaft timing chain

- ❑ Removing and installing ⇒ page 110

13 - Guide rail for camshaft timing chain

14 - Guide pin

- ❑ 20 Nm

15 - Crankshaft chain sprocket

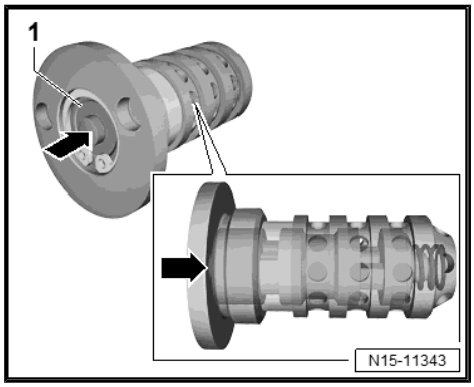
- ❑ Fitting position ⇒ page 108

16 - Tensioning rail

❑ For camshaft timing chain

Checking control valve

– It must be possible to press in piston -1- approx. 3 mm against spring force. It must move freely, without sticking.

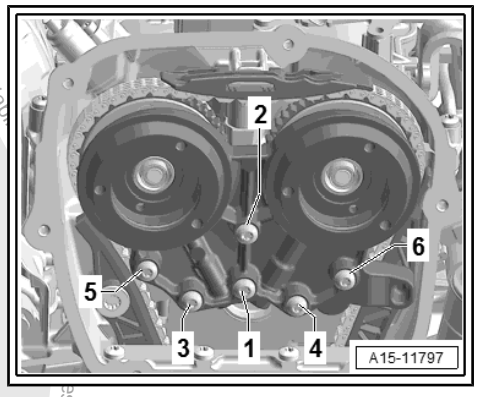


Bearing saddle - specified torque and tightening sequence

If a clamping sleeve is installed, it is pulled into the cylinder head together with bolt -1-.

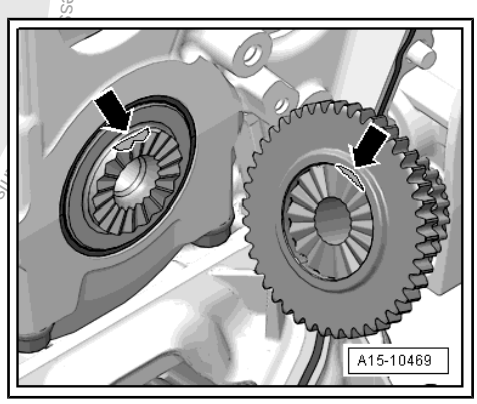
– Tighten bolts in stages in the sequence shown.

Stage	Bolt	Specified torque/turning further angle
1.	-1-	3 Nm (insert clamping sleeve)
2.	-1 … 6-	9 Nm



Triple chain sprocket - installation position

- The two sections -arrows- must be aligned.

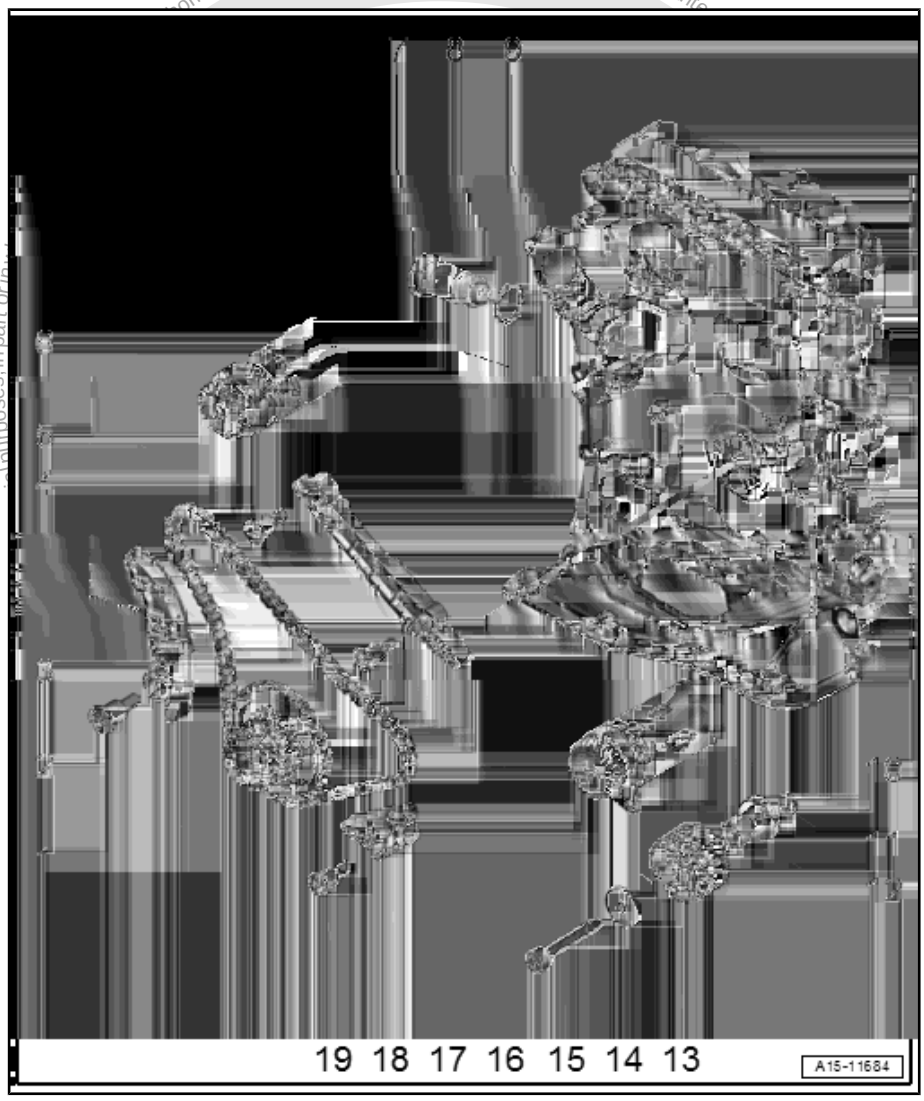


3.2 Assembly overview - drive chain for balance shaft

Note

- *After working on the chain drive, adapt learnt values in engine control unit. To do this, switch on ignition, and select the following menu options on vehicle diagnostic tester :*
- `Engine control unit functions`
- `0001 - Adaption of chain drive after repairs`

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1 - Crankshaft chain sprocket
- ❑ Fitting position ⇒ page 108

2 - Guide pin
- ❑ 20 Nm

3 - Tensioning rail
- ❑ For drive chain for balance shaft

4 - Drive chain for balance shafts
- ❑ Removing and installing ⇒ page 120

5 - Guide pin
- ❑ 20 Nm

6 - Balance shaft, exhaust side
- ❑ Assembly overview ⇒ page 71

7 - Chain tensioner
- ❑ 85 Nm

8 - Seal
- ❑ Renew after removal
- ❑ Apply sealant - D 154 103 A1-

9 - Cylinder block

10 - Balance shaft, inlet side
- ❑ Assembly overview ⇒ page 71

11 - O-ring
- ❑ Lubricate with engine oil

12 - Pivot pin
- ❑ Lubricate with engine oil
- ❑ Fitting position ⇒ page 110

13 - Intermediate gear
- ❑ If bolt ⇒ Item 15 (page 109) has been loosened, intermediate gear must be renewed

14 - Thrust washer

15 - Bolt
- ❑ Renew after removal
- ❑ If bolt has been loosened, intermediate gear ⇒ Item 13 (page 109) must be renewed
- ❑ Specified torques and tightening sequence ⇒ page 110

16 - Slide rail
- ❑ For drive chain for balance shaft

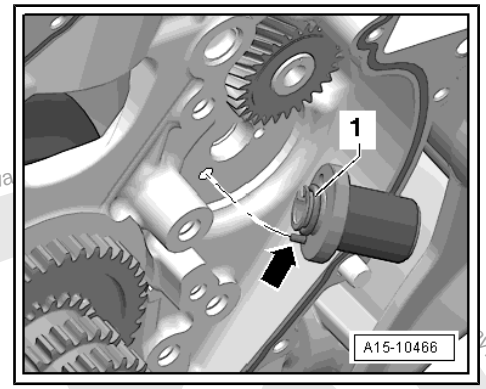
17 - Guide pin
- ❑ 20 Nm

18 - Slide rail
- ❑ For balancer shaft timing chain

19 - Guide pin
- ❑ 12 Nm

Bearing mounting - installation position

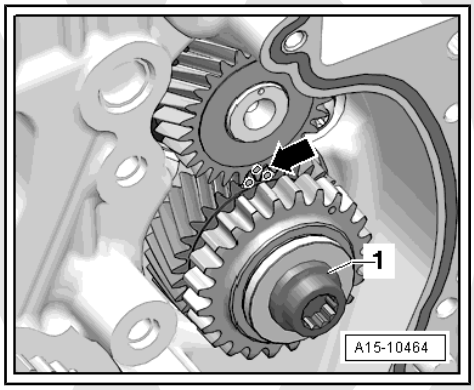
- Renew O-ring -1- and lubricate with oil.
- Dowel pin -arrow- for bearing mounting must engage in bore in cylinder block.
- Lubricate bearing mounting.



Tightening sequence - idler gear

Note

- *The idler gear must always be renewed. Otherwise no tooth backlash is set, which may result in damage to the engine.*
- *The new idler gear is coated with a solid film lubricant that wears off after a short period as a result of which the tooth backlash is automatically set.*



– With new bolt tighten as follows.

Stage	Specified torques/angle specifications
1.	10 Nm
2.	– Turn intermediate gear • There must be no play in intermediate gear; otherwise loosen bolt and tighten again
3.	25 Nm
4.	Turn 90° further

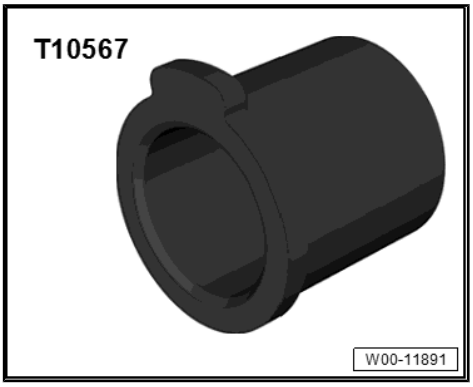
3.3 Removing and installing camshaft timing chain

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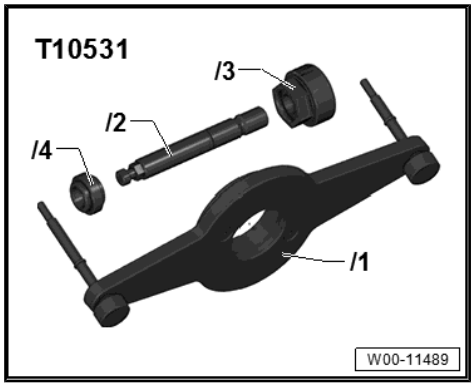
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Special tools and workshop equipment required

- Depending on version assembly tool - T10352/2- or - T10352/3-
- Counter-hold tool - T10355-
- Pin - T40011-
- Assembly lever - T40243-
- Locking tool - T40267-
- Camshaft clamp - T40271-
- Assembly tool - T10567-



- Assembly tool - T10531-



Components of assembly tool - T10531- :

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

Removing

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

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

– Support engine in its installation position ⇒ page 32 .

– Removing engine mounting ⇒ page 29 .

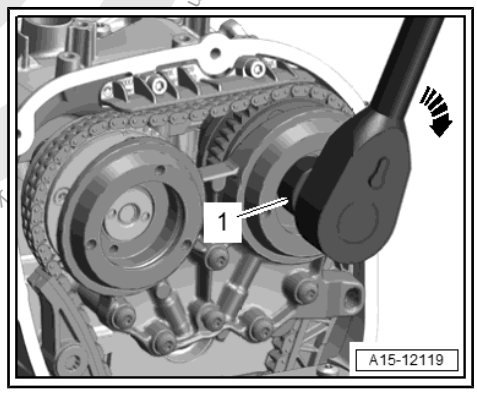
– Remove engine support ⇒ page 55 .

– Remove timing chain cover (top) ⇒ page 101 .

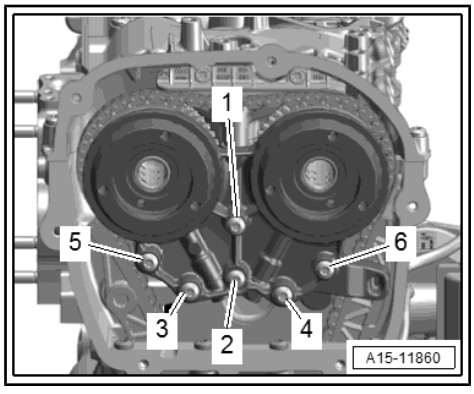
Note

- *The timing valves have left-hand threads.*
- *Depending on the version, different timing valves may be installed. Use the appropriate assembly tool -1-.*

– Turn assembly tool - T10352/2- or -T10352/3- in -direction of arrow- to remove left and right timing valves.



– Unscrew bolts -1 … 6-, and carefully remove bearing saddle keeping it straight in the process.



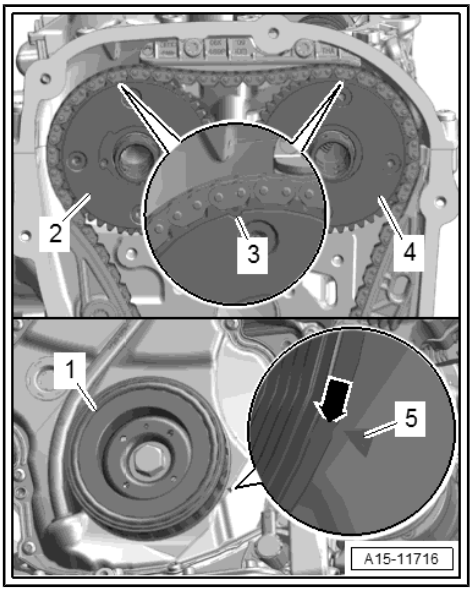
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– Turn vibration damper to “TDC position” using counter-hold - T10355- .

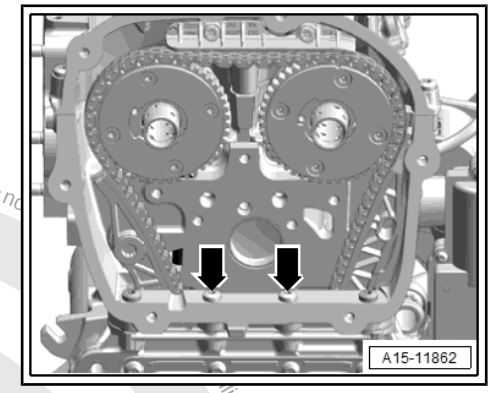
• Marks -3- on camshaft sprockets (notches with a dot behind) must point upwards.

• Notch -arrow- on vibration damper -1- must align with arrow mark -5- on lower timing chain cover.

– Remove lower timing chain cover ⇒ page 103 .



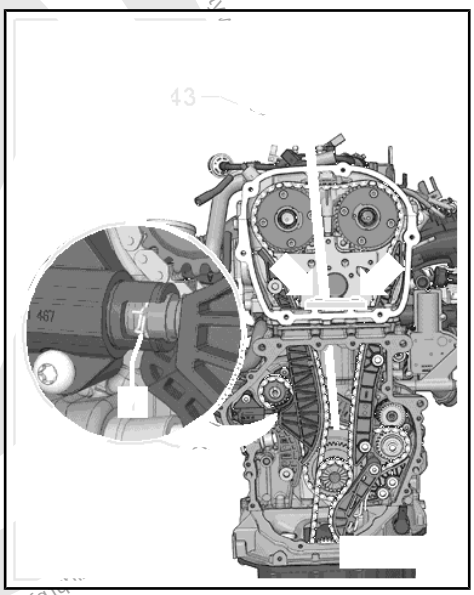
– Unscrew bolts -arrows-.



– Screw in lever - T40243- -arrows-.

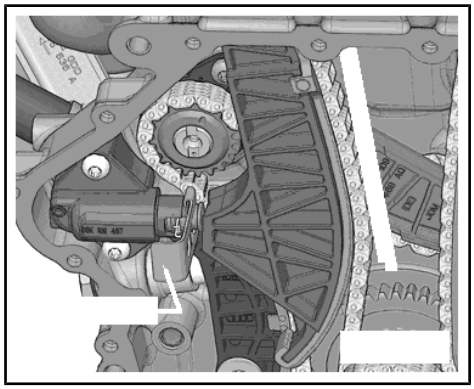
– Press together retaining ring -1- of chain tensioner and hold it in that position.

– Slowly push lever - T40243- in -direction of arrow-, and hold it in that position.

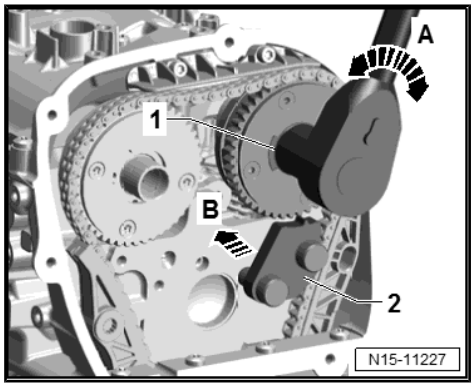


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– Secure chain tensioner with locking pin - T40267- .
– Remove lever - T40243- .



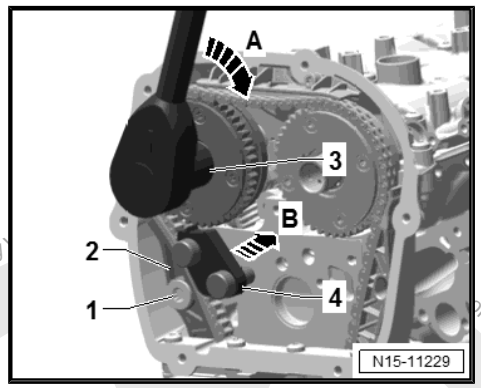
– Bolt camshaft clamp - T40271/2- -2- to cylinder head.
– Insert camshaft clamp between teeth of chain sprocket -arrow B-.
– If necessary, use adapter - T10567- -1- to slightly turn inlet camshaft back and forth -arrows A-.



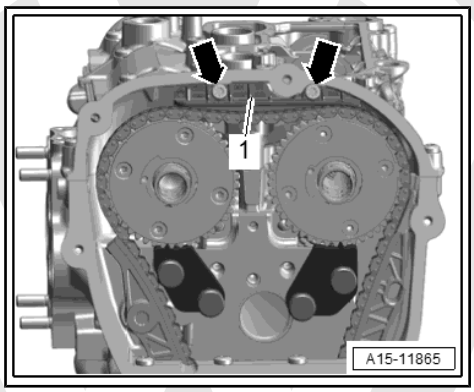
– Bolt camshaft clamp - T40271/1- -4- to cylinder head.

A second mechanic is required for the following work step.

– Using assembly tool - T10567- -3-, locate exhaust camshaft in direction of arrow -A-. Remove bolt -1- and guide tensioning rail -2- downwards.
– Turn camshaft clockwise -A- until camshaft clamp - T40271/1- -4- can be inserted in teeth of chain sprocket -B-.

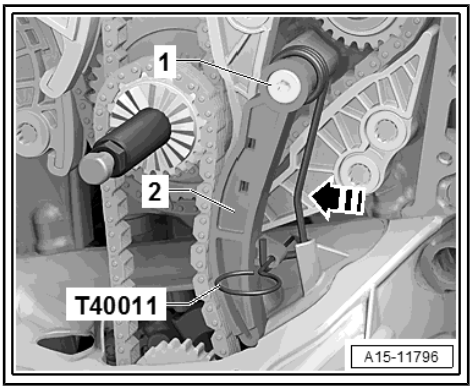


– Unscrew bolts -arrows-, and remove guide rail -1-.

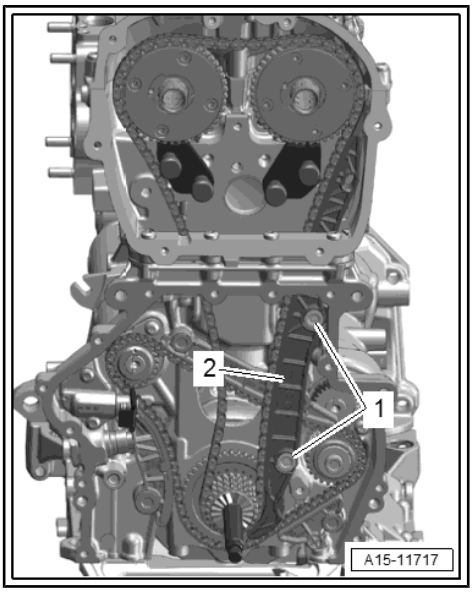


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– Press tensioning bar of oil pump chain tensioner in direction of -arrow- and lock it with locking pin - T40011- .
– Unscrew bolt -1-, and remove chain tensioner -2-.
– Remove chain for oil pump from crankshaft sprocket, pull it off towards front, and lay it down on oil pump chain sprocket.



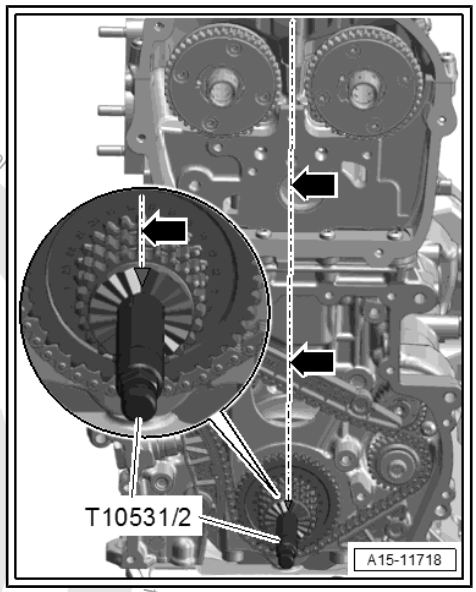
– Unscrew guide pins -1-, and remove guide rail -2-.
– Remove camshaft timing chain from camshaft sprockets, and remove it downwards.



Installing camshaft timing chain

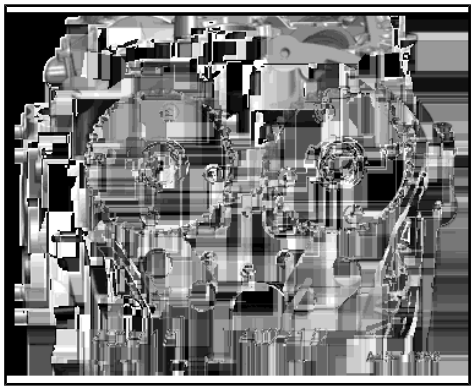
Prerequisites:

- Crankshaft is positioned to “TDC”; V recess on crankshaft sprocket points along imaginary vertical line -arrows- towards centre point between camshaft sprockets.
- Crankshaft sprocket is locked in position with clamping pin - T10531/2- .

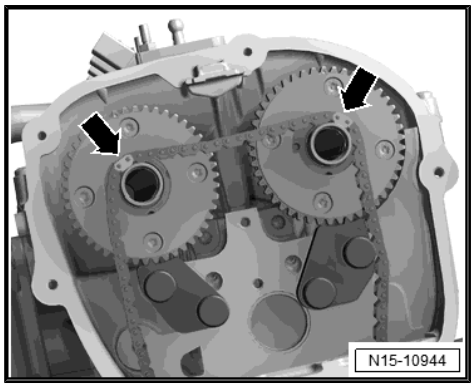


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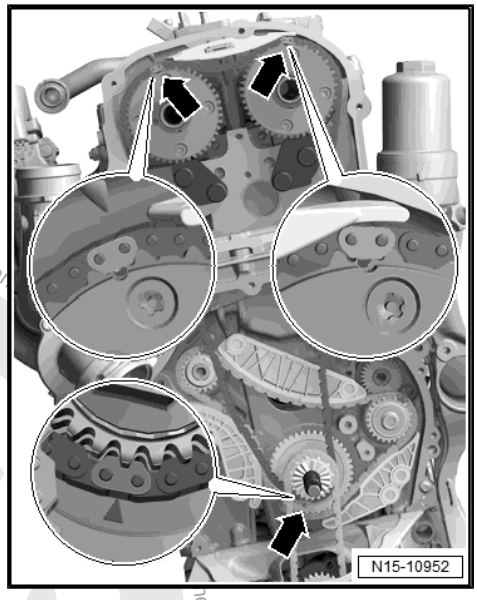
- Camshaft sprockets are locked in position at “TDC” with camshaft clamps - T40271/1- and -T40271/2- .
- The markings -arrows- must align.
- Marking on exhaust camshaft is slightly offset towards right.
- Use a waterproof pen for additional identification of markings (notches with a dot behind). The dots on the teeth will be partially hidden by the timing chain.



– Fit camshaft timing chain onto camshaft journals with coloured markings -arrows- properly aligned.

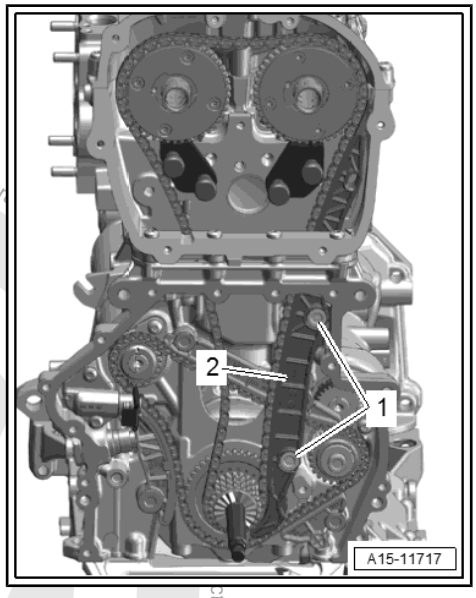


– Fit camshaft timing chain on inlet camshaft, exhaust camshaft and crankshaft sprocket.
- Coloured chain links must align with markings on chain sprockets -arrows-.

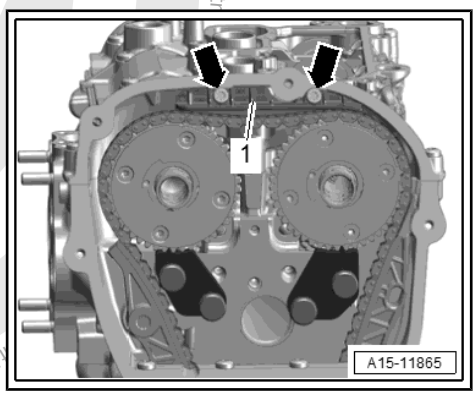


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– Insert guide rail -2-, and tighten guide pins -1-.

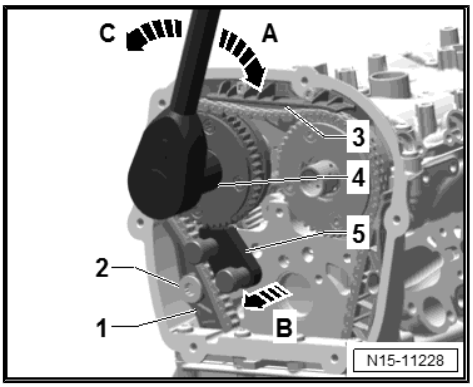


– Insert guide rail -1-, and tighten bolts -arrows-.



A second mechanic is required for the following work step.

– Reduce preload of exhaust camshaft in direction of -arrow A- using assembly tool - 10567- -4- and pull camshaft clamp - T40271/1- -5- out of teeth of chain sprocket -arrow B-.
– Have exhaust camshaft turned in direction of arrow -C- until timing chain is in contact with guide rail -3-.
– Hold camshaft in this position, install tensioning rail -1- and tighten guide pin -2-.



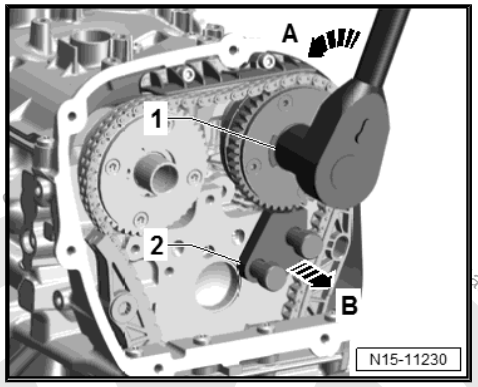
Note

Failure to counterhold the camshaft while the tensioning rail is being installed may cause the timing chain to jump!

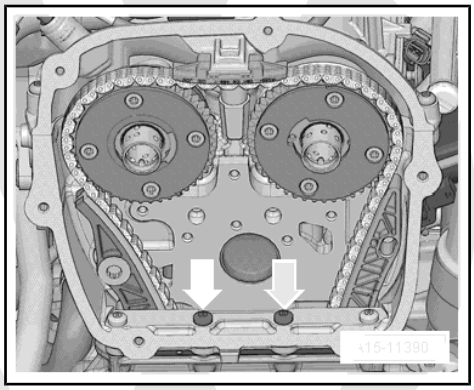
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– Use assembly tool - T10567- -1- to release preload on inlet camshaft in direction of -arrow A-, pull camshaft clamp - T40271/2- -2- out of sprocket teeth -B- and bring camshaft to rest position.

– Remove camshaft clamp - T40271/1- and -T40271/2- .

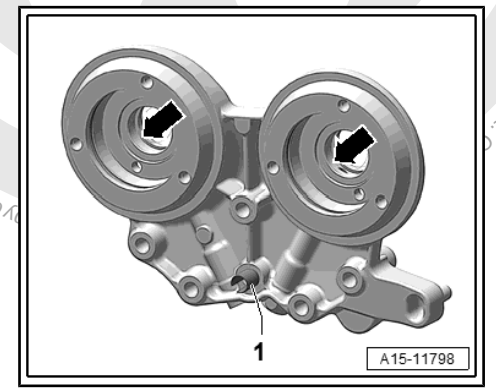


– Screw in and tighten bolts -arrows-. Specified torque ⇒ Item 21 (page 89) .



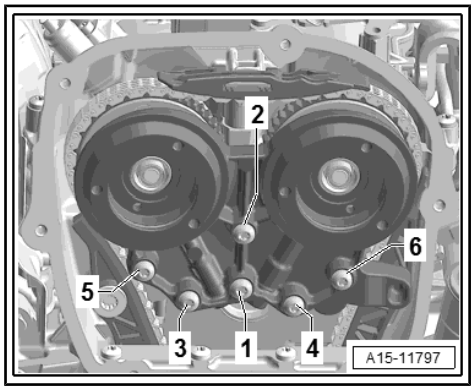
– Make sure to drive back clamping sleeve -1- before bearing saddle is used again. The clamping sleeve must be flush with the cylinder head side of the bearing saddle.

– Moisten holes -arrows- with engine oil.



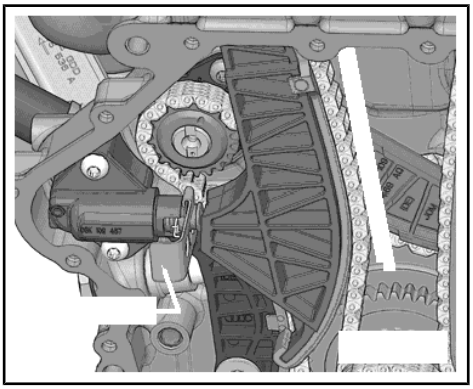
– Fit bearing saddle taking care not to cant it. Screw in bolts -1 to 6- by hand.

– The clamping sleeve is pulled into the cylinder head by the bolt -1-.

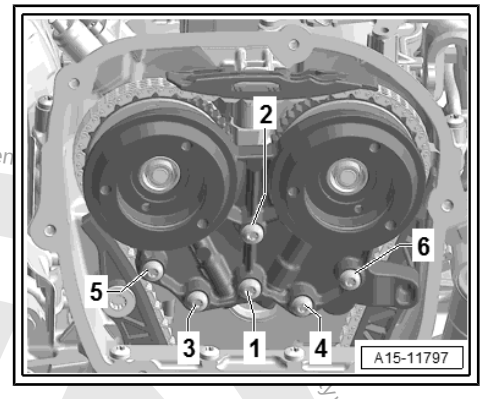


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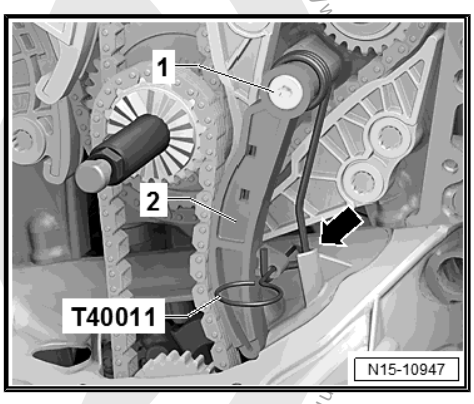
– Remove locking tool - T40267- .



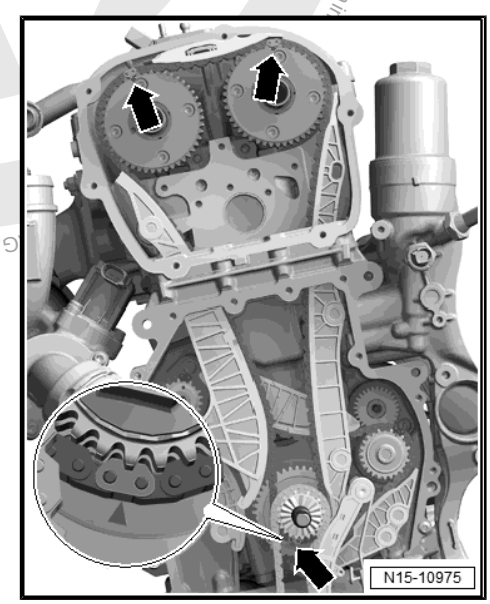
– Tighten bolts for bearing saddle. Specified torques and installation sequence ⇒ page 108 .



– Fit drive chain for oil pump.
– Insert chain tensioner -2-, and tighten guide pins -1-.
– Remove locking pin - T40011- making sure that retaining clip is seated in recess in top section of sump -arrow-.

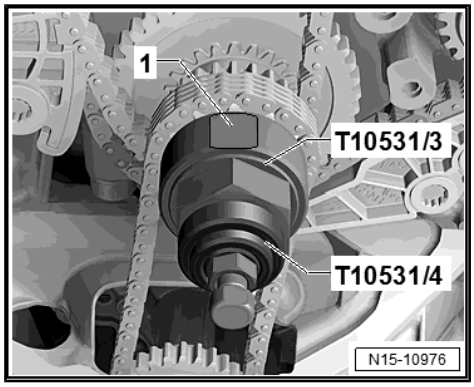


– Check setting:
• Coloured chain links must align with markings on chain sprockets -arrows-.
– Install timing valves ⇒ Item 6 (page 107) .



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



Note

Due to the ratio, the coloured chain links do not align with the markings any more after the engine has been turned.

– Remove turning over tool, and install lower timing chain cover ⇒ page 104 .
– Install vibration damper ⇒ page 45 .
– Install timing chain cover (top) ⇒ page 101 .
– Install tensioner for poly V-belt ⇒ page 45 .
– Install poly V-belt ⇒ page 44 .

Further installation is carried out in reverse order of removal, observing the following:

– After working on the chain drive, adapt learnt values in engine control unit. To do this, switch on ignition, and select the following menu options on vehicle diagnostic tester :

`Engine control unit functions`

`0001 - Adaption of chain drive after repairs`

Specified torques

- ⇒ “3.1 Assembly overview - camshaft timing chains”, page 106
- ⇒ “3.2 Assembly overview - drive chain for balance shaft”, page 108
- Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

3.4 Removing and installing drive chain for balance shaft

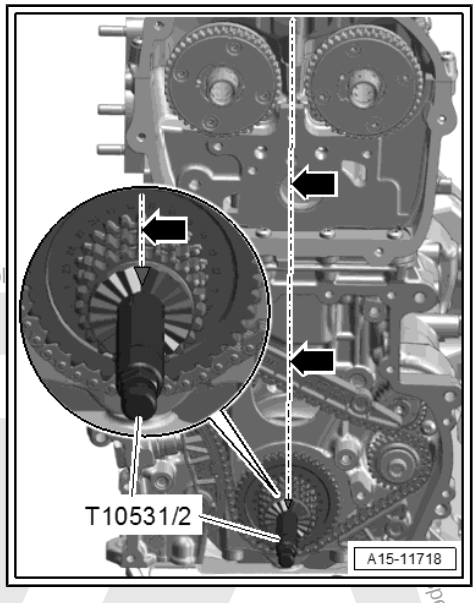
Removing

– Remove camshaft timing chain ⇒ page 110
– Remove right drive shaft ⇒ Running gear, axles, steering; Rep. gr. 40 ; Drive shaft; Removing and installing drive shaft .

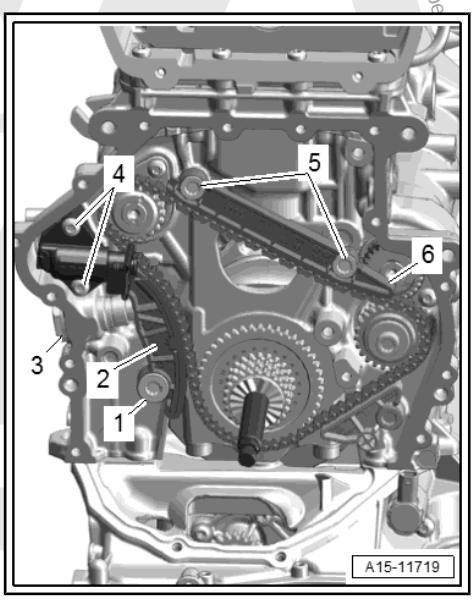
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Prerequisites:

- Crankshaft is positioned to “TDC”; V recess on crankshaft sprocket points along imaginary vertical line -arrows- towards centre point between camshaft sprockets.
- Crankshaft sprocket is locked in position with clamping pin - T10531/2- .



– Unscrew bolts -4-, and remove tensioner for camshaft timing chain.
– Unbolt chain tensioner -3- for drive chain of balance shafts.
– Unscrew guide pins -1 and 5-, and remove tensioning rail -2- and guide rail -6-.
– Remove drive chain for balance shaft.



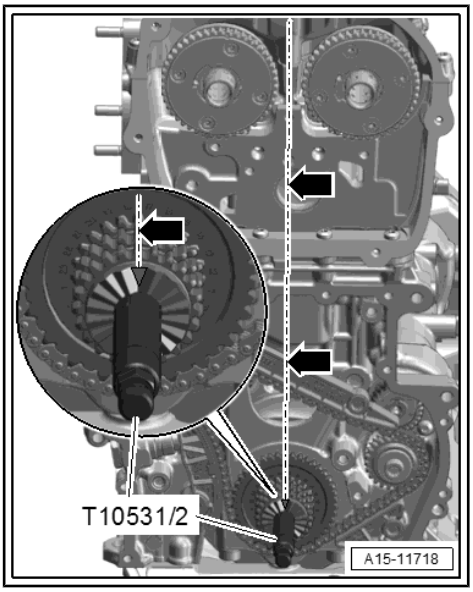
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Installing

Install in reverse order of removal, observing the following:

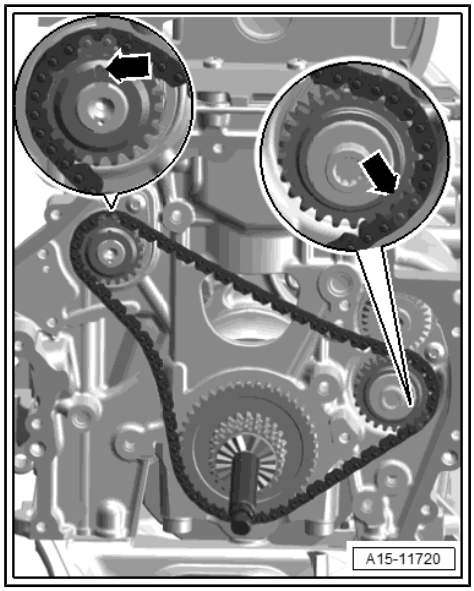
Prerequisites:

- Crankshaft is positioned to “TDC”; V recess on crankshaft sprocket points along imaginary vertical line -arrows- towards centre point between camshaft sprockets.
- Crankshaft sprocket is locked in position with clamping pin - T10531/2- .

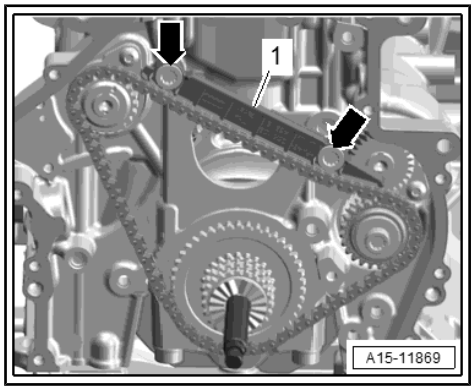


– First, fit drive chain for balance shafts onto balance shafts as shown in illustration.

• Coloured chain links must align with markings -arrows- on chain sprockets.

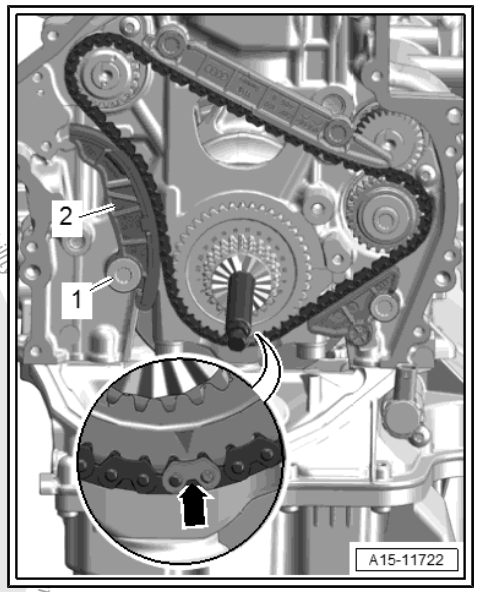


– Insert guide rail -1-, and tighten guide pins -arrows-.



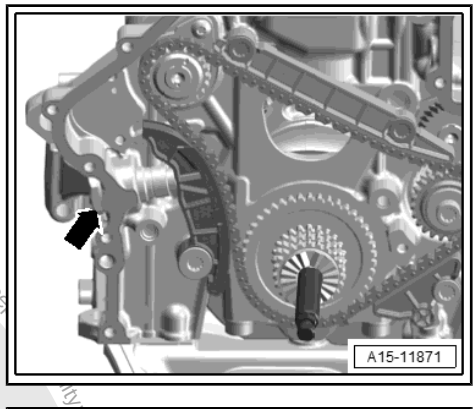
– Align coloured chain link -arrow- of drive chain for balance shafts with marking on crankshaft sprocket as shown in illustration.

– Insert tensioning rail -2-, and tighten guide pins -1-.



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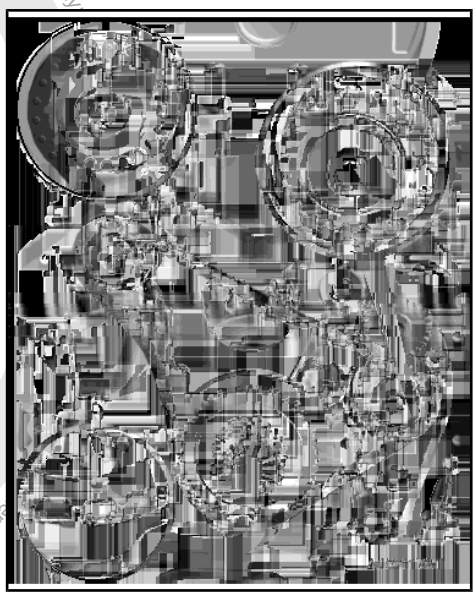
– Bolt on chain tensioner -arrow-.



– Check adjustment again:

• Coloured chain links must align with markings -arrows- on chain sprockets.

– Install camshaft timing chain ⇒ page 110 .



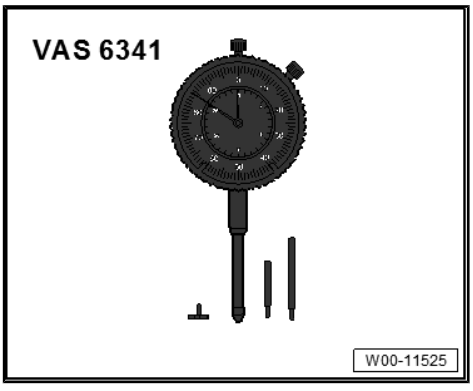
Specified torques

◆ ⇒ “3.2 Assembly overview - drive chain for balance shaft”, page 108

3.5 Checking valve timing

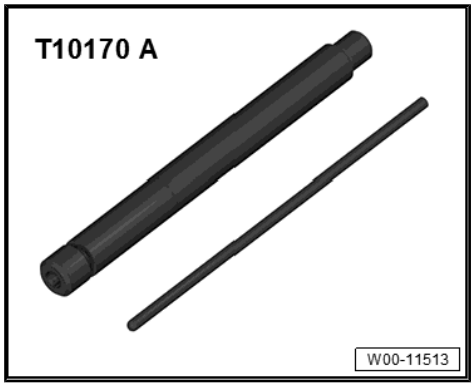
Special tools and workshop equipment required

◆ Dial gauge set, 4-part - VAS 6341-



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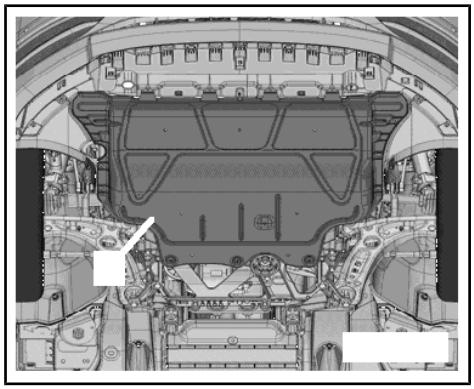
♦ Dial gauge adapter - T10170 A-



– Remove timing chain cover (top) ⇒ page 101 .

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

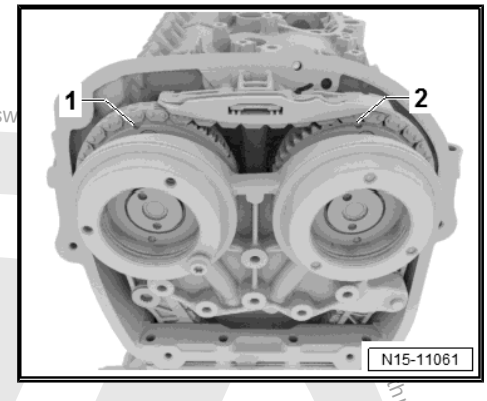
– Remove right wheel and right wheel housing liner or front wheel housing liner section ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Assembly overview – front wheel housing liner .



– Using 24 mm socket, turn crankshaft via vibration damper in direction of engine rotation until markings -1- and -2- are almost at top.

– Remove ignition coil with output stage for cylinder 1 ⇒ page 317 .

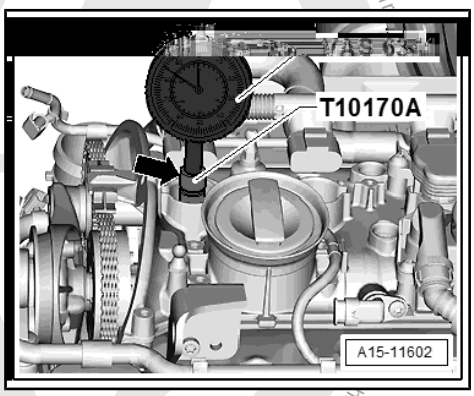
– Remove spark plug for cylinder 1 using spark plug socket and extension - 3122 B- .



– Screw dial gauge adapter - T10170/A- into spark plug hole to stop.

– Insert dial gauge - VAS 6341- with extension - T10170A/1- as far as it will go and secure in place with self-locking nut -arrow-.

– Slowly turn crankshaft in engine DOR to maximum needle deflection. Once maximum needle deflection is reached (reverse point of needle), piston is at »TDC«.

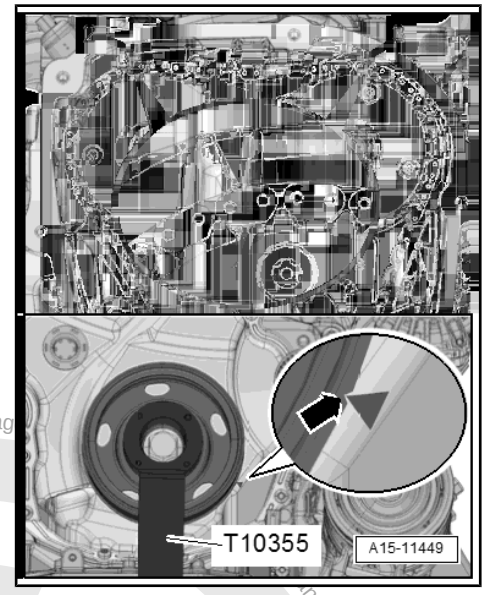


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Note

- *Use a ratchet spanner with a 24 mm socket to turn the vibration damper.*
- *If the crankshaft has been turned beyond "TDC" turn engine another two revolutions in direction of engine rotation. Do not turn engine in opposite direction to normal rotation.*
- *Marking -1- on the exhaust camshaft is slightly offset towards the right.*

- Notch on vibration damper must align with arrow marking on timing chain cover (bottom) -arrow-.
- Markings -1- on camshaft sprockets (notches with a dot behind) must align with markings -2- and -3- on cylinder head.

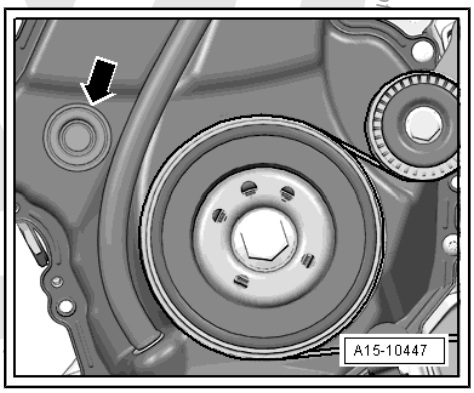


3.6 Checking timing chain

Note

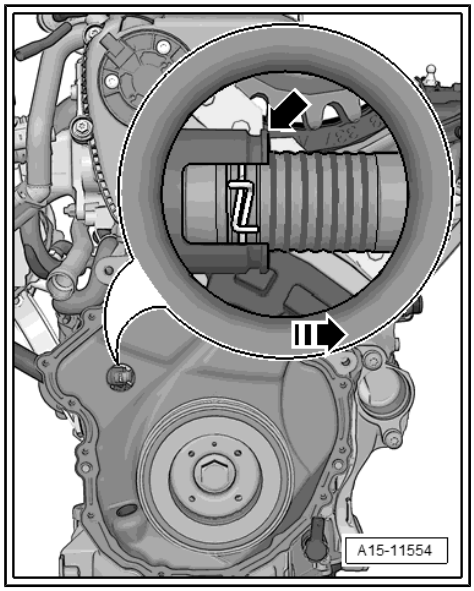
If complaints (e.g. noise) indicate a stretched camshaft timing chain, check timing chain as described below.

– Remove wheel housing liner or front wheel housing liner section ⇒ General body repairs, exterior; Rep. gr. 66 ; Wheel housing liner; Assembly overview – front wheel housing liner .
– Remove sealing plug -arrow-. The sealing cap must be renewed.



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– Turn vibration damper in direction of engine rotation until piston of chain tensioner is fully extended in -direction of arrow-.
– Count piston notches that are visible.



Note

Visible notches are those located to the right from the chain tensioner housing -arrow-.

- If 6 or less notches are visible, the camshaft timing chain must not be renewed.
- If 7 or more notches are visible, renew camshaft timing chain ⇒ page 110 .

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4 Valve gear

⇒ “4.1 Assembly overview - valve gear”, page 127

⇒ “4.2 Removing and installing camshaft”, page 130

⇒ “4.3 Installing ball for sliding piece”, page 138

⇒ “4.4 Removing and installing actuators for camshaft adjustment”, page 139

⇒ “4.5 Removing and installing camshaft control valve 1 N205 ”, page 139

⇒ “4.6 Removing and installing exhaust camshaft control valve 1 N318 ”, page 140

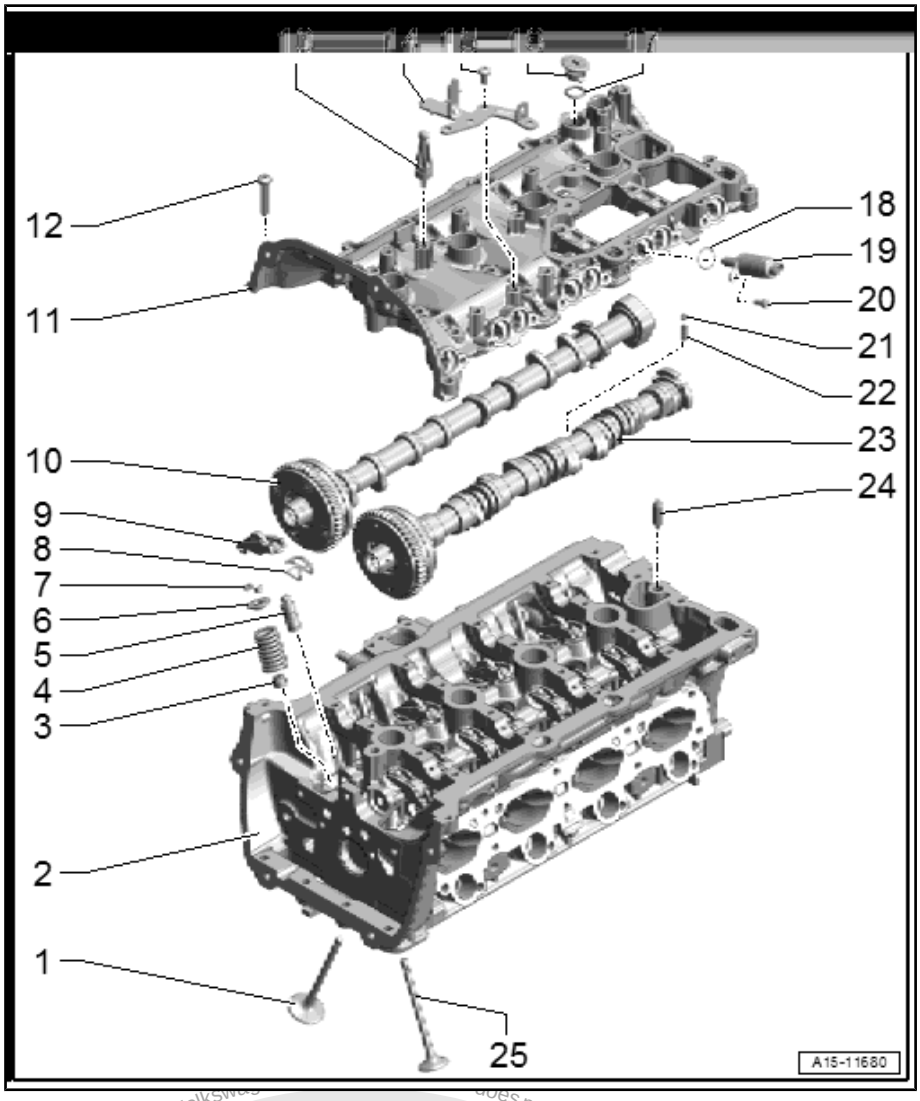
⇒ “4.7 Removing and installing valve stem seals”, page 140

4.1 Assembly overview - valve gear

Note

- *Cylinder head and cylinder head cover must be renewed together.*
- *After installing camshafts wait for approx. 30 minutes before starting engine. The hydraulic compensation elements must settle (otherwise valves will strike pistons).*
- *After working on the valve gear, turn the engine carefully at least 2 rotations to ensure that none of the valves make contact when the starter is operated.*
- *Always renew gaskets and seals.*
- *After working on the chain drive, adapt learnt values in engine control unit. To do this, switch on ignition, and select the following menu options on vehicle diagnostic tester :*
- `Engine control unit functions`
- `0001 - Adaption of chain drive after repairs`

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1 - Outlet valve

- ❑ Do not rework. Only lapping in is permitted.
- ❑ Valve dimensions ⇒ page 150
- ❑ Checking valve guides ⇒ page 149

2 - Cylinder head

- ❑ Cylinder head and cylinder head cover should always be renewed together

3 - Valve stem seal

- ❑ Renewing ⇒ page 140

4 - Valve springs

5 - Hydraulic compensation element

- ❑ Do not interchange
- ❑ Apply engine oil to contact surface

6 - Valve spring plate

7 - Valve cotters

8 - Retaining clip

- ❑ For hydraulic compensation element.

9 - Roller rocker fingers

- ❑ Removing and installing ⇒ “4.2 Removing and installing camshaft”, page 130
- ❑ Mark installation position for re-installation.
- ❑ Check roller bearing for ease of movement.
- ❑ Apply engine oil to contact surface
- ❑ Inlet side: big, narrow roller
- ❑ Exhaust side: small, wide roller

10 - Exhaust camshaft

- ❑ Removing and installing ⇒ page 130
- ❑ Check radial clearance with Plastigage (roller rocker fingers removed).
- ❑ Axial clearance: 0.095 … 0.202 mm
- ❑ Radial clearance: 0.024 to 0.066 mm.
- ❑ Maximum run-out: 0.04 mm

11 - Cylinder head cover

- ❑ With integrated camshaft bearings.
- ❑ Removing and installing ⇒ “4.2 Removing and installing camshaft”, page 130
- ❑ Sealing surface should only be cleaned; reworking not permitted
- ❑ Remove sealant residue.
- ❑ Cylinder head and cylinder head cover should always be renewed together

12 - Bolt

- ❑ Renew after removal
- ❑ Loosening ⇒ page 130

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- ❑ Specified torques and tightening sequence ⇒ page 130

13 - Ball stud

- ❑ For engine cover panel
- ❑ 9 Nm

14 - Bracket

- ❑ For wiring harness

15 - Bolt

- ❑ 9 Nm

16 - Plug

17 - O-ring

- ❑ Renew after removal

18 - O-ring

- ❑ Not a replacement part; provided together with actuator for camshaft adjustment

19 - Actuator for camshaft adjustment

- ❑ Allocation ⇒ page 129
- ❑ Removing and installing ⇒ page 139

20 - Bolt

- ❑ 4.5 Nm

21 - Spring

- ❑ No replacement part.

22 - Ball

- ❑ For sliding piece
- ❑ Installing ⇒ page 138

23 - Inlet camshaft

- ❑ Removing and installing ⇒ page 130
- ❑ Check radial clearance with Plastigage (roller rocker fingers removed).
- ❑ Axial clearance: 0.095 … 0.202 mm
- ❑ Radial clearance: 0.024 to 0.066 mm.
- ❑ Runout: max. 0.04 mm

24 - Dowel pin

- ❑ Qty. 2

25 - Inlet valve

- ❑ Do not rework. Only lapping in is permitted.
- ❑ Valve dimensions ⇒ page 150
- ❑ Checking valve guides ⇒ page 149

Actuators for camshaft adjustment

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1 - Inlet cam actuator A for cylinder 1 - N576-

2 - Inlet cam actuator B for cylinder 1 - N577-

3 - Inlet cam actuator B for cylinder 2 - N585-

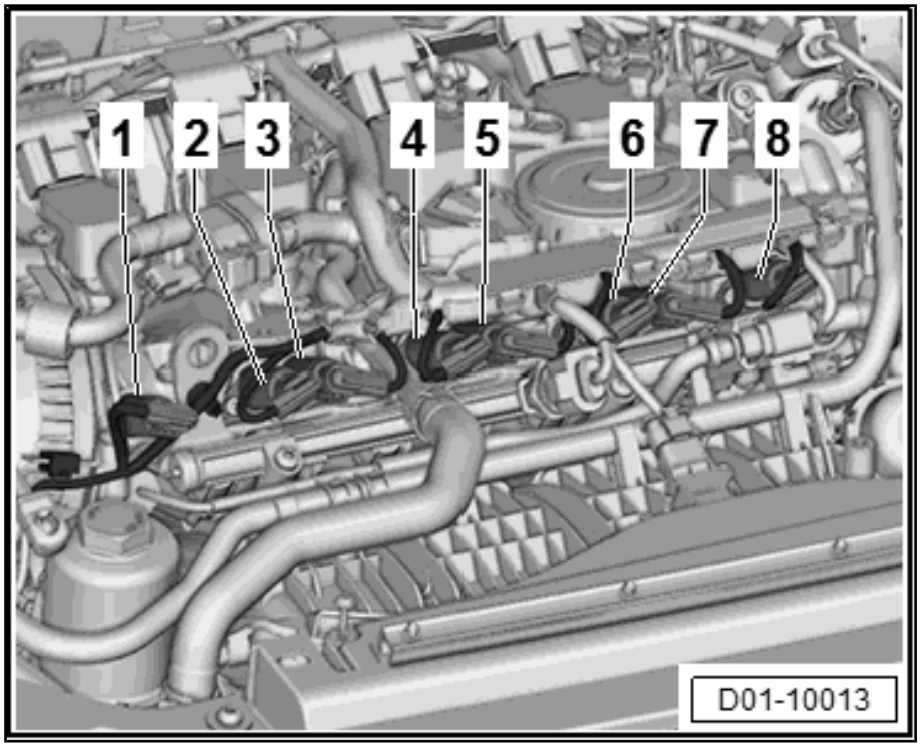
4 - Inlet cam actuator A for cylinder 2 - N584-

5 - Inlet cam actuator A for cylinder 3 - N592-

6 - Inlet cam actuator B for cylinder 3 - N593-

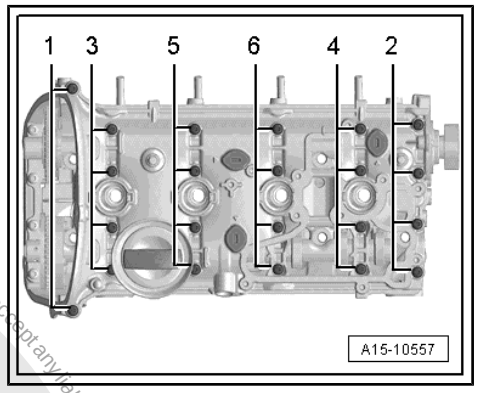
7 - Inlet cam actuator B for cylinder 4 - N601-

8 - Inlet cam actuator A for cylinder 4 - N600-



Cylinder head cover - release

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

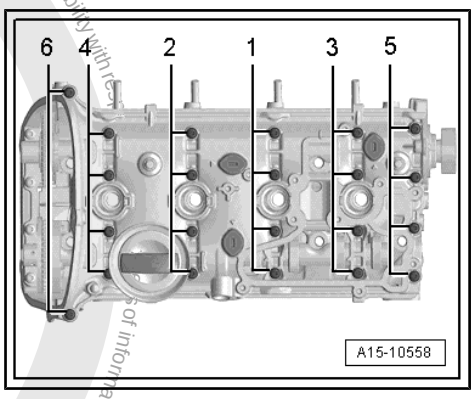


Tightening sequence for cylinder head cover

Note

- *Renew bolts that are tightened with turning further angle.*
- *Take care to keep cylinder head cover level.*

– Tighten bolts in stages in the sequence shown.



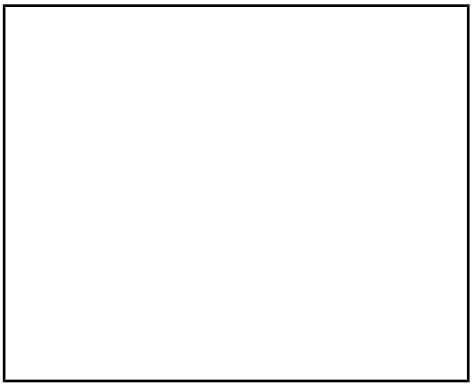
Stage	Bolts	Specified torques/angle specifications
1.	-1 … 6-	Screw in by hand in several stages as far as stop
2.	-1 … 6-	8 Nm
3.	-1 … 6-	Turn 90° further

4.2 Removing and installing camshaft

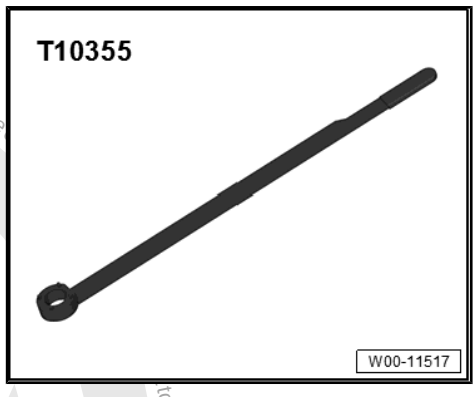
Special tools and workshop equipment required

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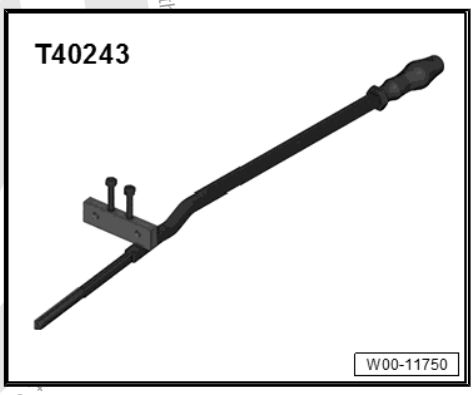
- Depending on version assembly tool - T10352/2- or - T10352/3-



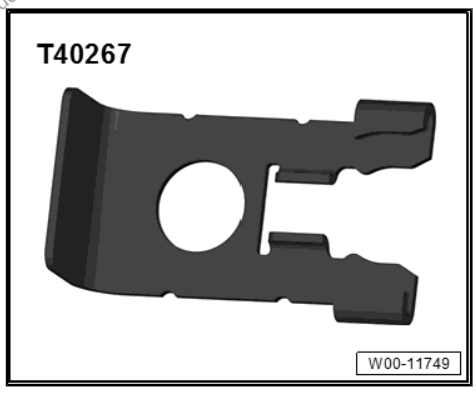
- Counter-hold tool - T10355-



- Assembly lever - T40243-

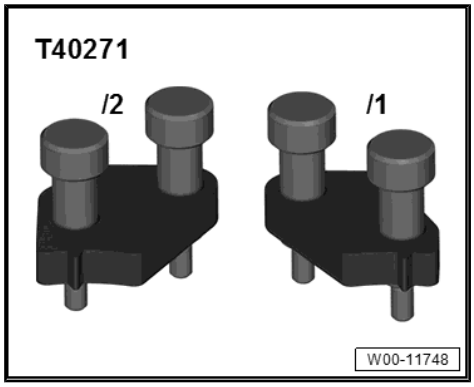


- Locking tool - T40267-



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- Camshaft clamp - T40271-



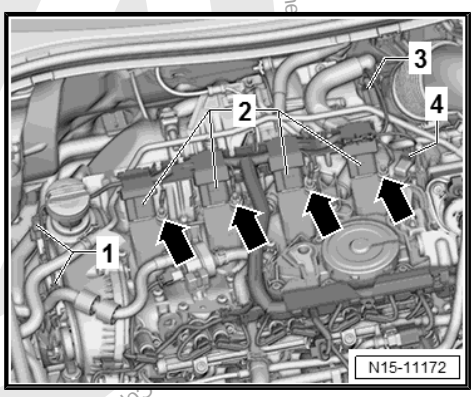
- Assembly tool - T10567-
- Sealant - D 154 103 A1-

Removing

Note

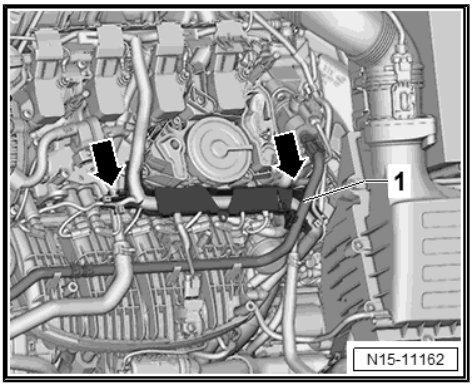
- *Sealing surfaces at bottom of cylinder head cover and top of cylinder head must not be machined.*
- *The camshaft bearings are integrated into the cylinder head and cylinder head cover. The camshaft timing chain must be removed before you remove the cylinder head cover.*
- *Fit the cable ties in the original position when installing.*
- *Before removing camshafts, temporarily reinstall engine support and engine mounting since the support bracket hinders the removal of the camshafts.*

– Remove camshaft timing chain ⇒ page 110 .
– Temporarily reinstall engine support and engine mounting. Tighten bolts hand-tight only.
– Remove support bracket.
– Remove air filter housing ⇒ page 263 .
– Drain coolant ⇒ page 188 .
– Unscrew nuts -arrows-.
– Pull off connectors -1-, -2-, -3- and -4-. Open retainer for wiring harness.

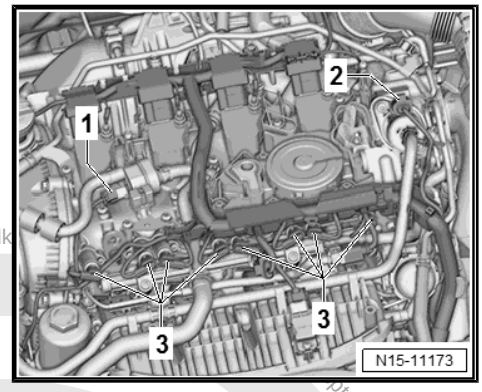


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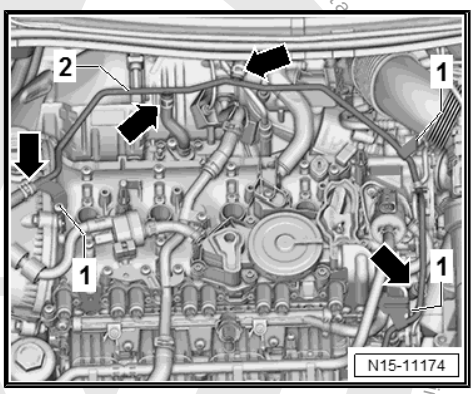
– Unclip fuel hose -1-, release wiring duct -arrows-, and pull it upwards off bracket.



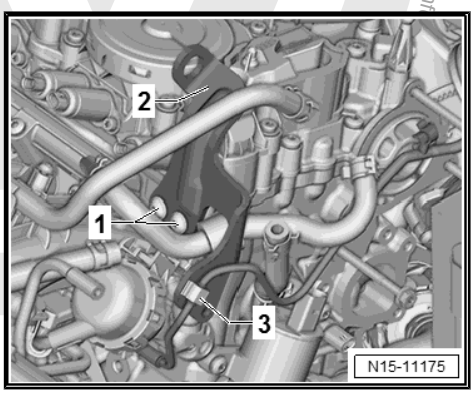
– Pull off connectors -1-, -2- and -3-.
– Move wiring harness towards the front.
– Remove ignition coils ⇒ page 317 .



– Unscrew bolts -1-.
– Remove coolant hoses -arrows-, and swing coolant pipe -2- to one side.
– Remove high-pressure pump ⇒ page 288 .
– Remove vacuum pump ⇒ page 96 .

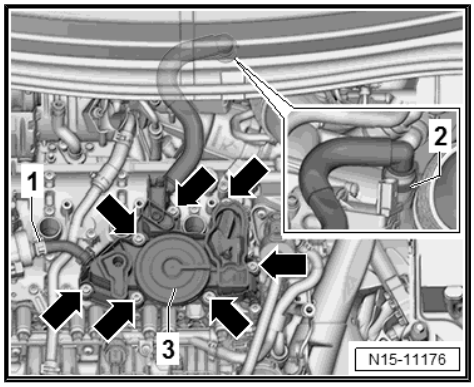


– Unclip hose -3-.
– Unscrew bolts -1-, and remove engine lifting eye -2-.

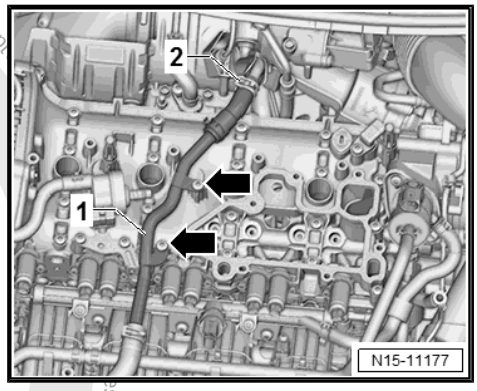


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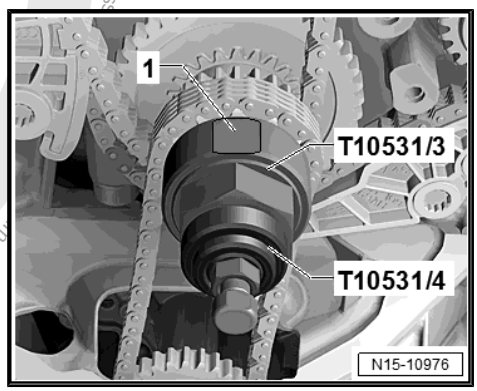
– Open hose clip -1-, and detach hose from activated charcoal filter solenoid valve 1 - N80- .
– Release and pull off crankcase breather line -2-.
– Unscrew bolts -arrows-, and remove oil separator -3-.
– Pull activated charcoal filter solenoid valve 1 - N80- off retainer.



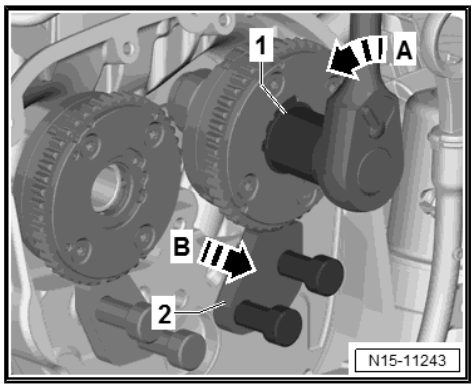
– Unscrew bolts -arrows-.
– Open hose clip -2-, and pull off coolant hose.
– Swivel coolant pipe -1- to side.



– Fit turning over tool - T10531/3- . At “TDC position” the flat section -1- faces upwards. Screw on flange nut - T10531/4- . Turn crankshaft with a 32 mm open-end spanner anti-clockwise to move it out of “TDC position”.

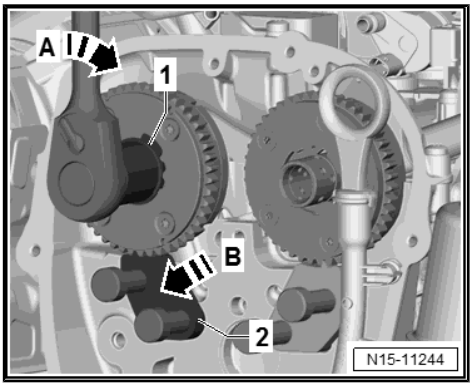


– Turn inlet camshaft in direction of arrow -A- using assembly tool - T10567- -1-, push camshaft clamp - T40271/2- -2- out of teeth of chain sprocket -B- and bring camshaft into rest position.

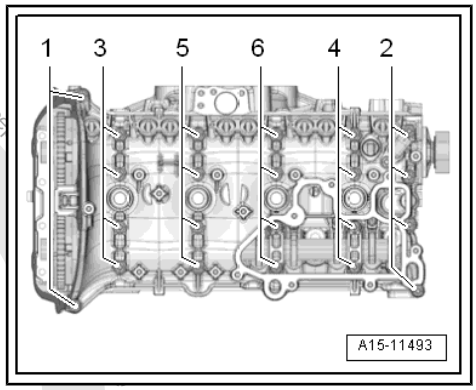


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– Turn exhaust camshaft in direction of arrow -A- using assembly tool - T10567- -1-, push camshaft clamp - T40271/1- -2- out of teeth of chain sprocket -B- and bring camshaft into rest position.



– Unscrew and remove cylinder head cover bolts in the sequence -1 to 6-.



– Remove cylinder head cover.

– Remove camshafts, and cover open parts of engine.

Installing camshafts

Note

- *Sealing surfaces must be free of oil and grease.*
- *Ensure that all roller rocker fingers are properly seated on valve stem ends. Allocation ⇒ Item 9 (page 128) .*

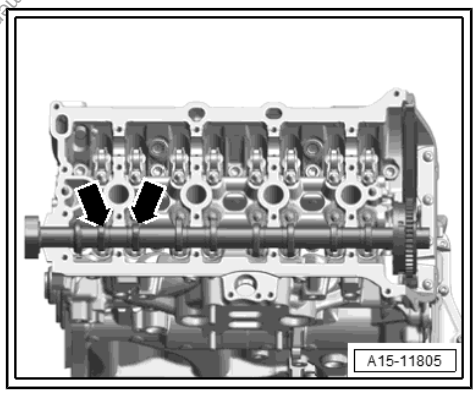
– If crankshaft has been turned in the meantime, position cylinder number 1 piston to TDC and then turn crankshaft back slightly.

– Remove sealant residue from groove in cylinder head cover and from sealing surfaces.

– Clean sealing surfaces. They must be oil and grease free.

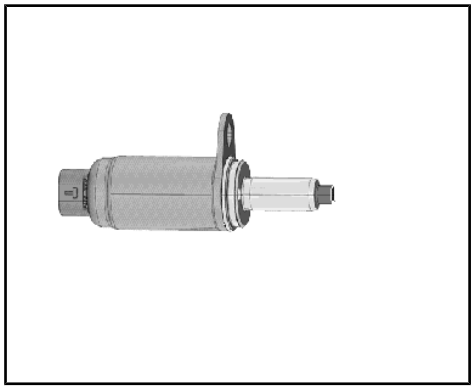
– Oil running surfaces of both camshafts.

– Insert exhaust camshaft into cylinder head. Turn cams for cylinder 4 -arrows- upwards.



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– Make sure that plungers of the actuators for camshaft adjustment are retracted.



⚠ CAUTION

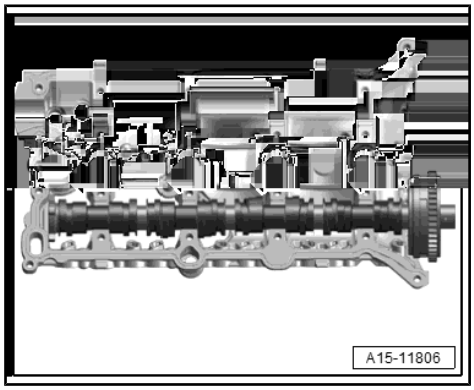
The ball for the sliding piece may pop out! Risk of eye injury!

– Wear protective goggles.

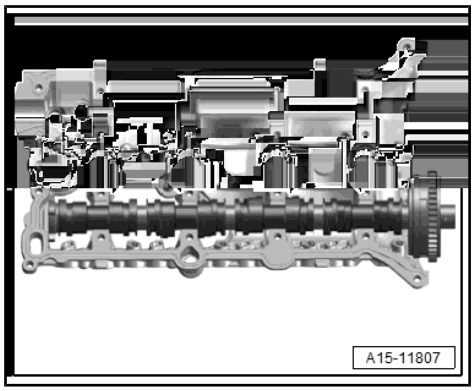
– Move sliding pieces of inlet camshaft back and forth only within regular sliding range.

– Insert inlet camshaft into cylinder head cover.

• Make sure that sliding pieces have been pushed away from chain sprocket -arrows-.

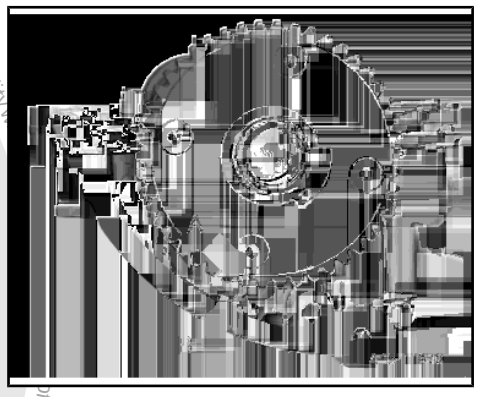


– After inlet camshaft has been inserted, push front and rear sliding piece pairs towards each other -arrows-.



– Align inlet camshaft in “TDC” position.

• Marking -arrow A- must align with protrusion -arrow B- on cylinder head cover.

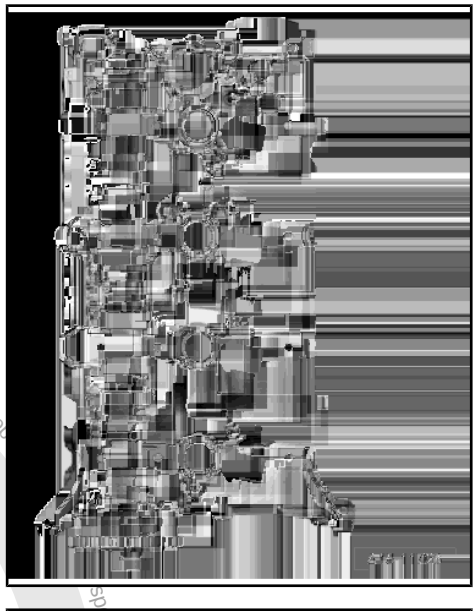


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– Apply sealant to clean sealing surface of cylinder head cover as shown in illustration -arrows-.

♦ Thickness of sealant bead: 2 to 3 mm.

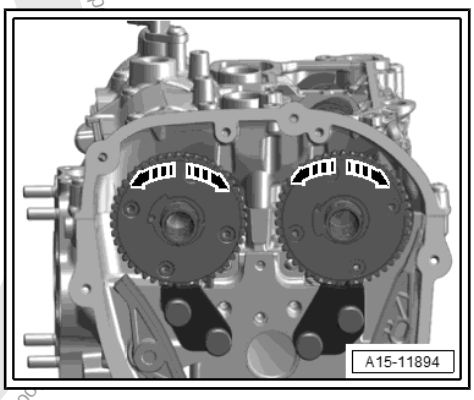
– Hold camshaft in place, and fit cylinder head cover with camshaft fitted on cylinder head.



– Slightly press on cylinder head cover with one hand, and turn camshafts slightly while doing so, until cylinder head cover is properly seated on cylinder head and is »free of stress«.

– Renew bolts for cylinder head cover.

– Tighten bolts in several stages, tightening sequence ⇒ page 130 .

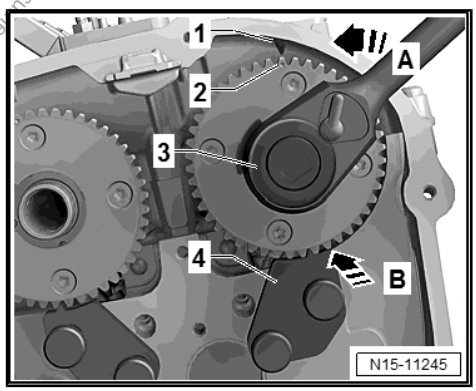


Note

Take care to keep cylinder head cover level.

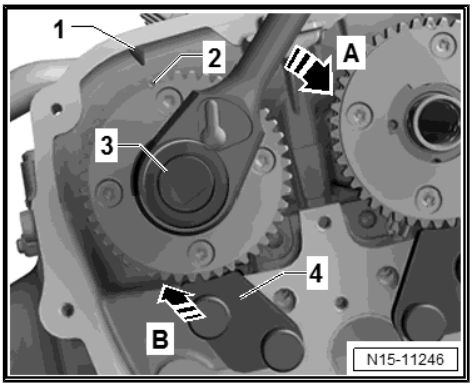
– Turn inlet camshaft in direction of -arrow A- using assembly tool - T10567- -3- until the markings -1- and -2- align.

– Insert camshaft clamp - T40271/2- -4- between teeth of chain sprocket -B-.



– Turn exhaust camshaft in direction of -arrow A- using assembly tool - T10567- -3- until the markings -1- and -2- align.

– Insert camshaft clamp - T40271/1- -4- between teeth of chain sprocket -B-.

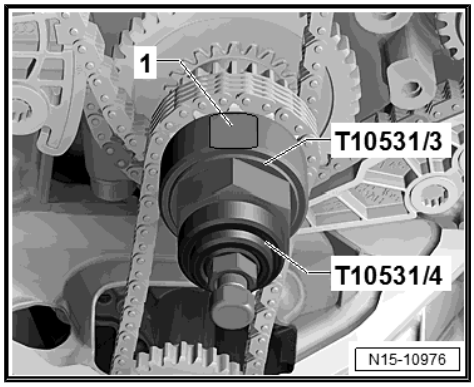


Note

Marking -2- is slightly offset towards right.

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– Turn crankshaft on hexagon to “TDC position”. At “TDC position” the flat section -1- faces upwards.
– Assemble cylinder head in reverse order.
– Fit support bracket back on.
– Removing engine mounting and engine support.
– Install camshaft timing chain ⇒ page 110 .



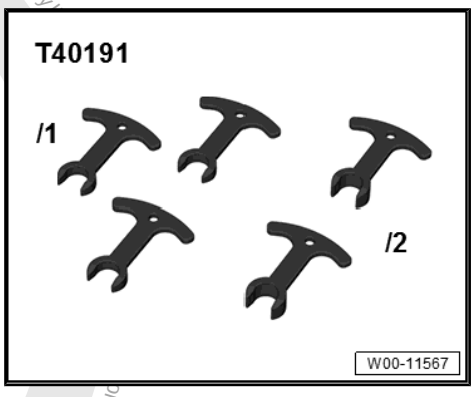
Specified torques

- ⇒ “4.1 Assembly overview - valve gear”, page 127
- ⇒ “3.1 Assembly overview - crankcase breather system”, page 169

4.3 Installing ball for sliding piece

Special tools and workshop equipment required

- Spacers - T40191-

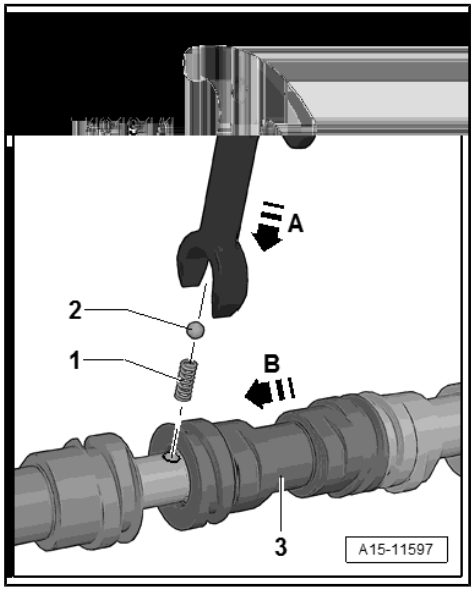


Installing

CAUTION

The ball for the sliding piece may pop out! Risk of eye injury!
– Wear protective goggles.

– Insert spring -1- into camshaft.
– Place ball -2- onto spring in camshaft.
– Using spacer - T40191/1- , press ball and spring downwards in -direction of arrow A-, and hold them in this position.
– Slide sliding piece -3- in -direction of arrow B-.

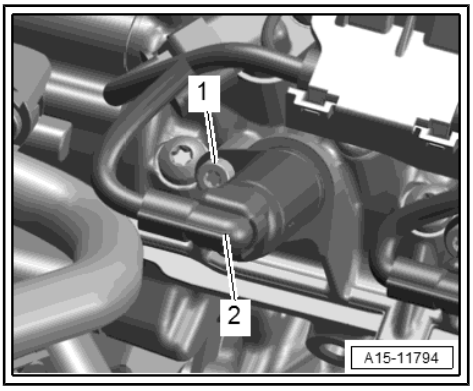


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4.4 Removing and installing actuators for camshaft adjustment

Allocation ⇒ page 129 .

Removing



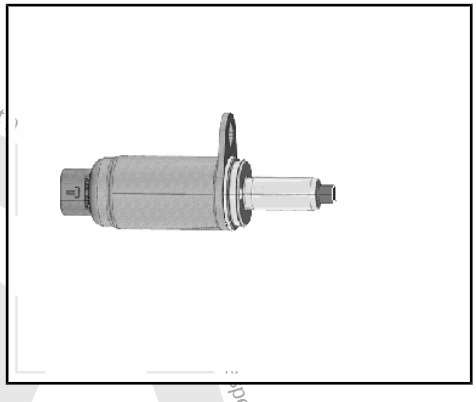
– Remove engine cover panel ⇒ page 41 .
– Disconnect relevant electrical connector -2-.
– Unscrew bolt -1-, and pull off actuator for camshaft adjustment.

Installing

Install in reverse order of removal, observing the following:

Note

Check O-rings for damage.



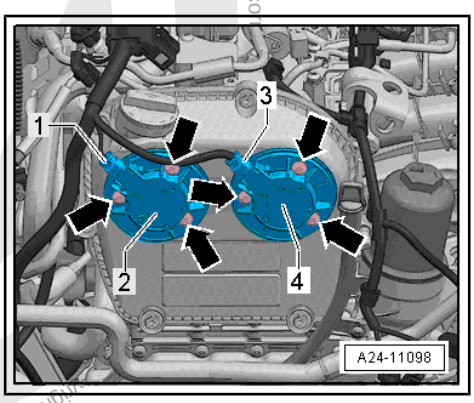
– Press down pin of actuator for camshaft adjustment -arrow- by hand.
• Actuator pin must not be in extended position.
– Fit engine cover panel ⇒ page 41 .

Specified torques

◆ ⇒ “4.1 Assembly overview - valve gear”, page 127

4.5 Removing and installing camshaft control valve 1 - N205-

Removing



– Pull off connector -3- from camshaft control valve 1 - N205- .
– Place a clean cloth under camshaft control valves.
– Unscrew bolts -arrows- for camshaft control valve 1 - N205- and remove valve -4-.

Installing

Install in reverse order of removal, observing the following:

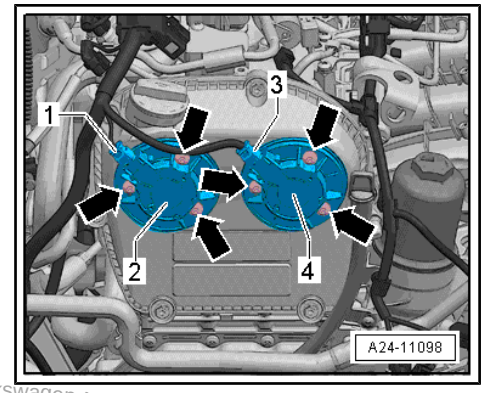
– Lubricate sealing surfaces of oil seals for inlet camshaft control valve 1 - N205- with engine oil.

Specified torques

◆ ⇒ “2.1 Assembly overview - cover for timing chain”, page 100

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



Removing

– Detach connector -1- from exhaust camshaft control valve 1 - N318- .

– Place a clean cloth under camshaft control valves.

– Unscrew bolts -arrows- for exhaust camshaft control valve 1 - N318- and remove valve -2-.

Installing

Install in reverse order of removal, observing the following:

– Lubricate sealing surfaces of oil seals for exhaust camshaft control valve 1 - N318- with engine oil.

Specified torques

◆ ⇒ “2.1 Assembly overview - cover for timing chain”, page 100

4.7 Removing and installing valve stem seals

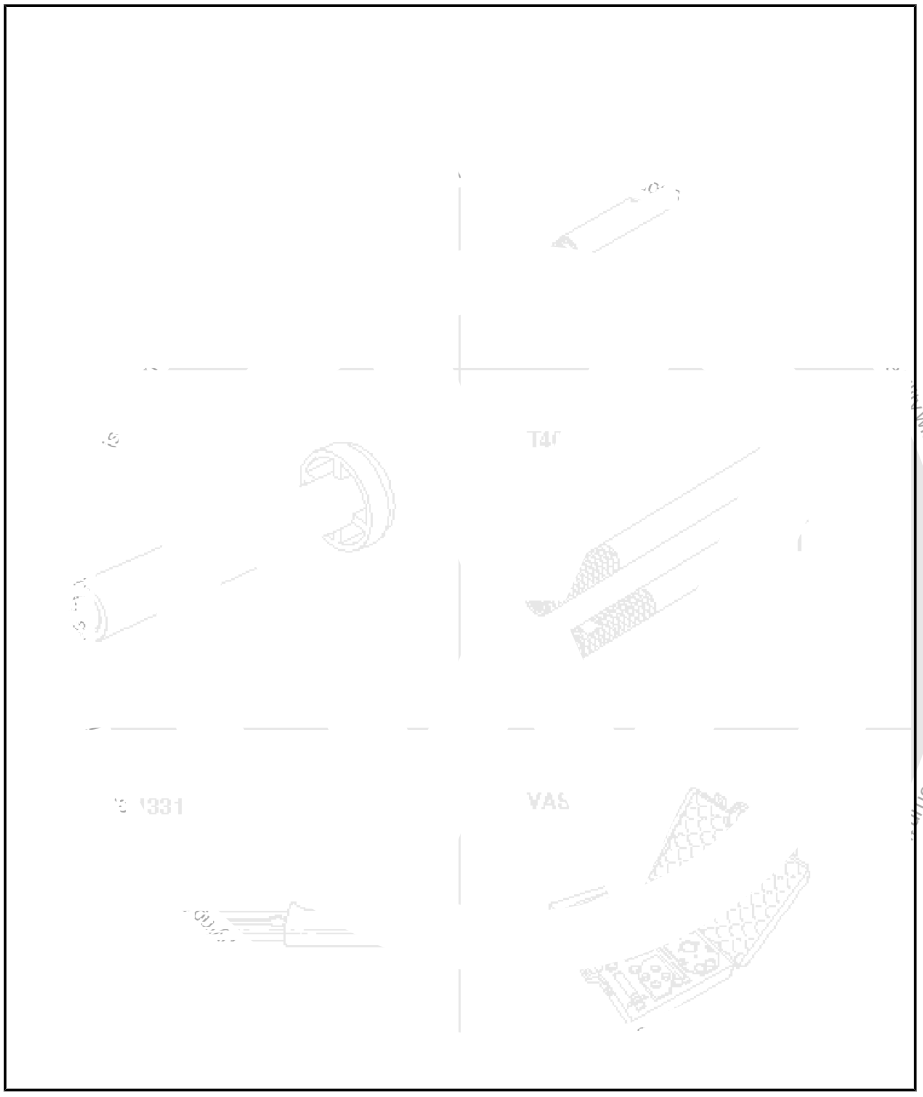
⇒ “4.7.1 Removing and installing valve stem seals (cylinder head installed)”, page 140

⇒ “4.7.2 Removing and installing valve stem seals (cylinder head removed)”, page 145

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

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Special tools and workshop equipment required



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- Spark plug socket - 3122 B-
- Valve stem seal puller - 3364-
- Valve stem seal fitting tool, inlet side - 3365-
- Valve stem seal fitting tool, exhaust side - T40376/1-
- Adapter - T40012-
- Torque wrench - V.A.G 1331-
- Dismantling and assembling device for valve cotters - VAS 5161-
- Guide plate - VAS 5161/19C-

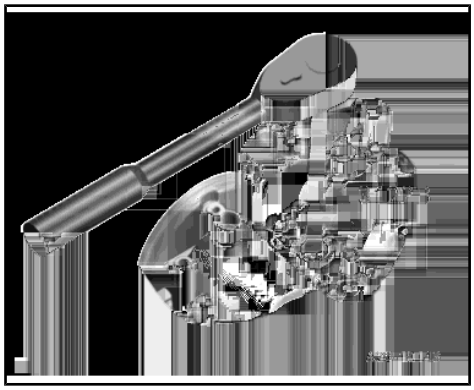
Removing valve stem oil seals

– Remove camshafts ⇒ page 130 .

– Mark allocation of roller rocker fingers and hydraulic compensation elements for reinstallation.

– Remove roller rocker fingers together with hydraulic compensation elements and place down on a clean surface.

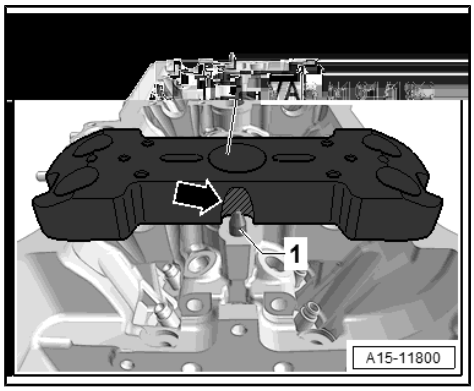
– Unscrew spark plugs using spark plug socket and extension - 3122 B- .



Reworking guide plate

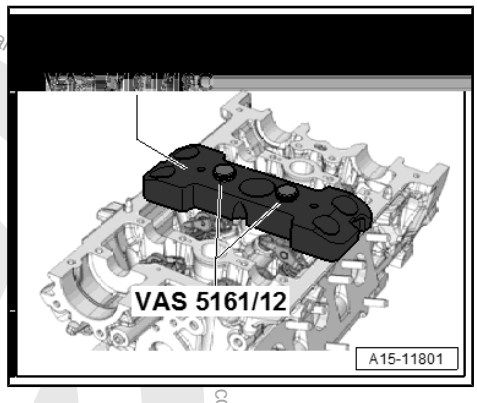
Check if recess -arrow- is present.

– If necessary, rework guide plate - VAS 5161/19C- -arrow-, until it rests against cylinder head and guide plate -1- is free.



– Screw guide plate - VAS 5161/19C- to cylinder head, as shown in illustration, using knurled screws - VAS 5161/12- .

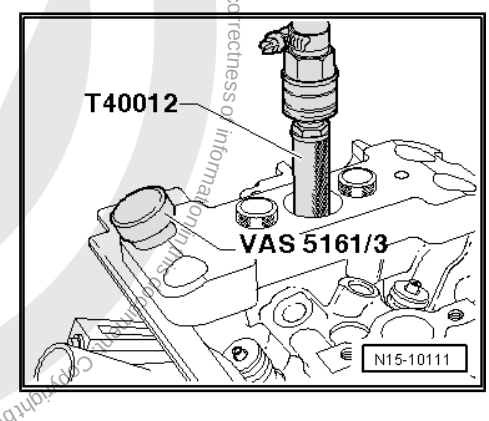
– Set piston of respective cylinder to “bottom dead centre”.



– Screw adapter - T40012- into spark plug thread.

– Connect compressed air with pressure rating of at least 6 bar.

– Strike tight valve cotters with drift - VAS 5161/3- and a plastic hammer.



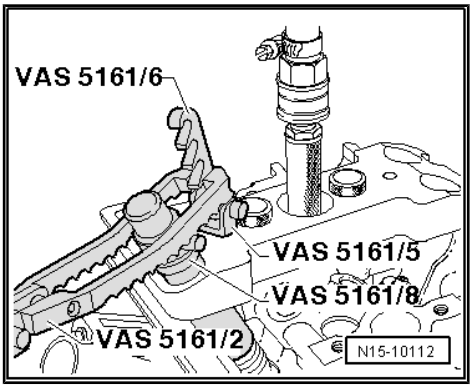
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For inlet side

– Screw retainer - VAS 5161/6- with guide fork - VAS 5161/5- into centre thread of guide plate - VAS 5161/19C- .

– Insert assembly cartridge - VAS 5161/8- into guide plate - VAS 5161/19C- .

– Attach pressure fork - VAS 5161/2- to retainer - VAS 5161/6- .



For exhaust side

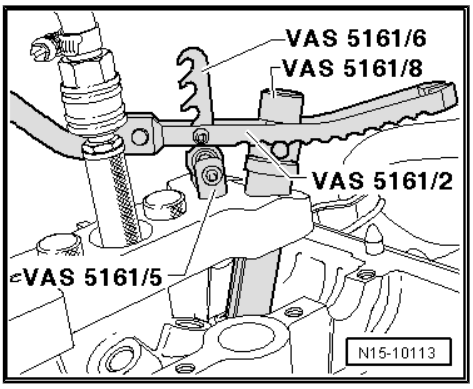
– Screw retainer - VAS 5161/6- with guide fork - VAS 5161/5- into outer thread of guide plate - VAS 5161/19C- .

– Press installation cartridge - VAS 5161/8- down and turn knurled screw of installation cartridge - VAS 5161/8- to right until tips engage in valve cotters.

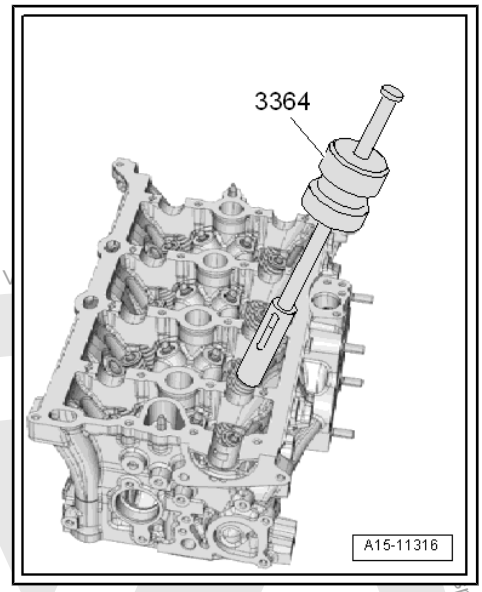
– Move knurled screw back and forth slightly to press apart valve cotters and capture them in the assembly cartridge.

– Release pressure fork - VAS 5161/2- .

– Remove installation cartridge - VAS 5161/8- .



– Pull off valve stem seals using valve stem seal puller - 3364- .



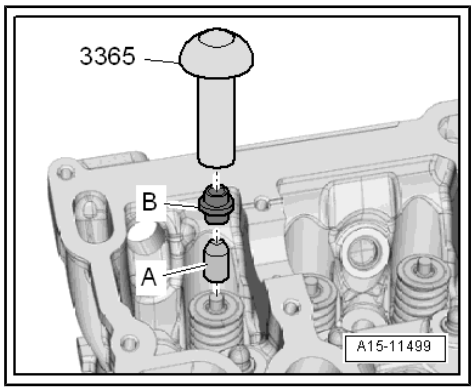
– If valve stem seal puller - 3364- cannot be used on account of restricted space, drive out roll pin -arrow- with a drift and remove impact extractor attachment.



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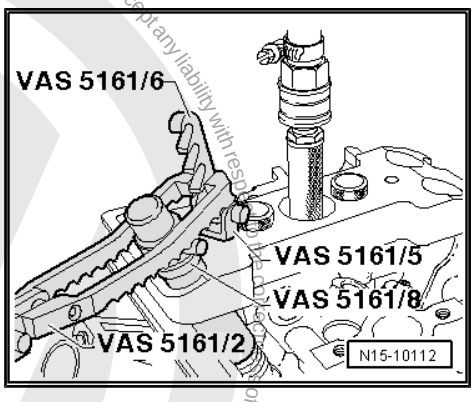
– Place lower part of valve stem seal puller - 3364- onto valve stem seal.
– Insert punch -1- into bore in lower part of puller.
– Place installation lever on puller and pull out valve stem seal -arrow-.

Installing valve stem seals

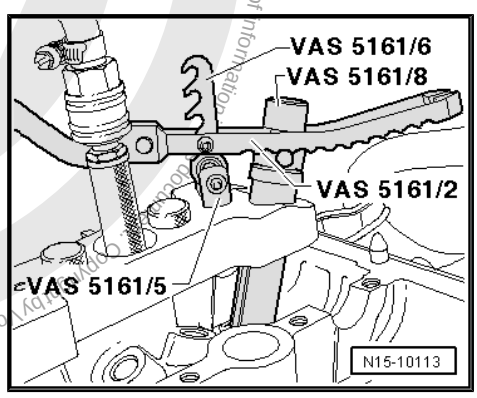


– Place plastic sleeve -A-, enclosed with new valve stem seals -B-, onto valve stem.
– Lightly oil sealing lip of valve stem seal.
– Push valve stem oil seal onto plastic sleeve.
– Carefully press valve stem oil seal on inlet side onto valve guide using valve stem seal fitting tool - 3365- .
– Carefully press valve stem oil seal on exhaust side onto valve guide using valve stem seal fitting tool - T40376/1- .
– Take out plastic sleeve.
– Insert valve spring and valve spring plate.
– Install removal and installation device for valve cotters - VAS 5161- as shown.

Inlet side



Exhaust side



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Note

- *If the valve cotters have been removed from the installation cartridge, they must first be inserted into the insertion device - VAS 5161/18- .*
- *Press assembly cartridge -VAS 5161/8- onto insertion device from above and pick up valve cotters.*

– Press installation cartridge - VAS 5161/8- down with pressure fork - VAS 5161/2- , and turn installation cartridge knurled screw back and forth whilst pulling upwards.

– Relieve pressure fork - VAS 5161/2- whilst pulling on knurled screw.

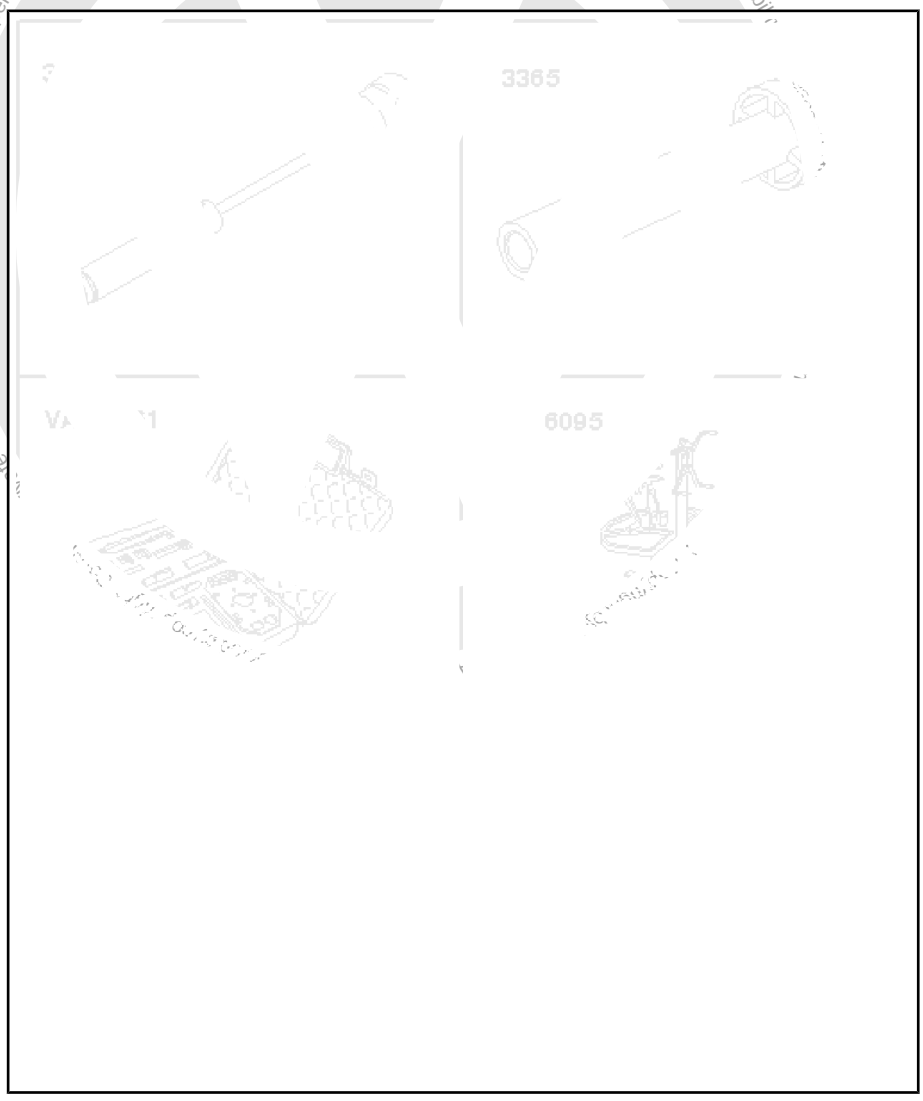
– Remove removal and installation device - VAS 5161- .

The remaining assembly steps are basically a reverse of the dismantling procedure, when doing this note as follows:

– Install camshafts ⇒ page 130 .

4.7.2 Removing and installing valve stem seals (cylinder head removed)

Special tools and workshop equipment required



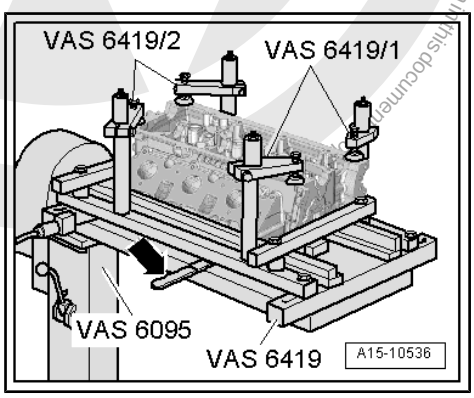
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- Valve stem seal puller - 3364-
- Valve stem seal fitting tool, inlet side - 3365-
- Valve stem seal fitting tool, exhaust side - T40376/1-
- Dismantling and assembling device for valve cotters - VAS 5161-
- Guide plate - VAS 5161/19C-
- Engine and gearbox support - VAS 6095-
- Cylinder head tensioning device - VAS 6419-

Removing valve stem oil seals

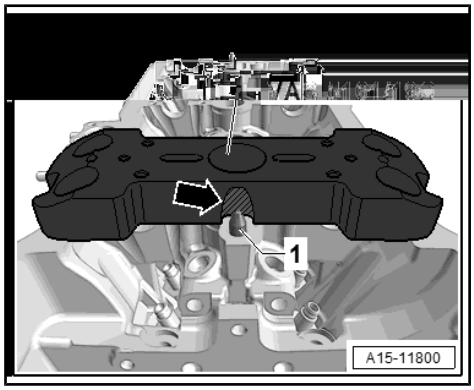
– Remove camshafts ⇒ page 130 .
– Mark allocation of roller rocker fingers and hydraulic compensation elements for reinstallation.
– Remove roller rocker fingers together with hydraulic compensation elements and place down on a clean surface.
– Insert cylinder head tensioning device -VAS 6419- into engine and gearbox support - VAS 6095- .
– Tension cylinder head on cylinder head tensioning device as shown in illustration.
– Connect cylinder head tensioning device to compressed air.
– Use lever -arrow- to slide air cushion under combustion chamber from which valve stem seal is to be removed.
– Allow compressed air to flow into air cushion until it lies against valve disc.



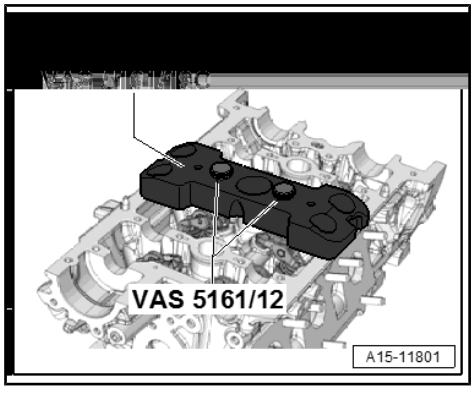
Reworking guide plate

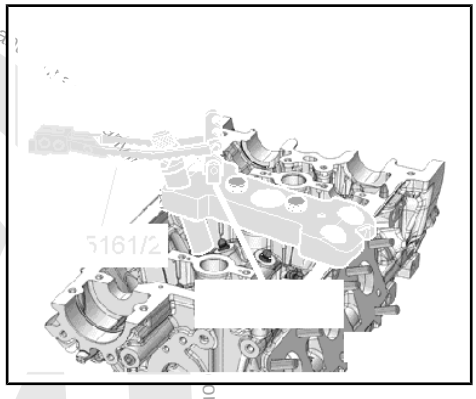
Check if recess -arrow- is present.

– If necessary, rework guide plate - VAS 5161/19C- -arrow-, until it rests against cylinder head and guide plate -1- is free.

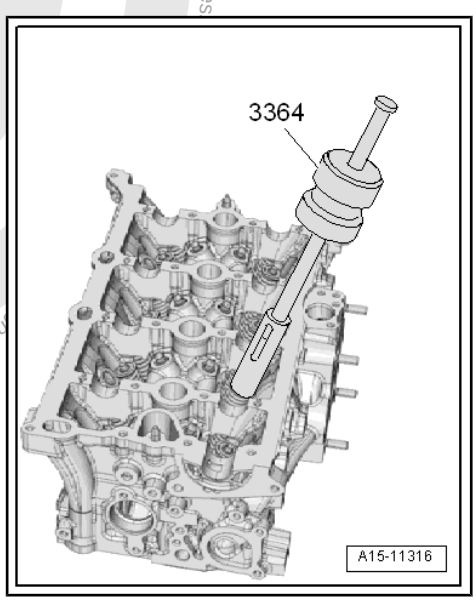


– Bolt guide plate - VAS 5161/19C- to cylinder head using knurled screws - VAS 5161/12- as shown.
– Insert drift -VAS 5161/3- into guide plate and use a plastic hammer to knock loose the firmly seated valve cotters.



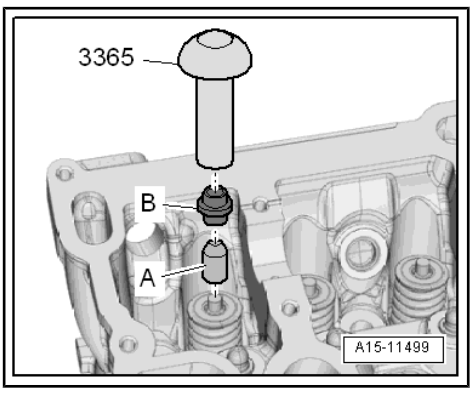


- Screw retainer - VAS 5161/6- with guide fork - VAS 5161/5- into thread of guide plate - VAS 5161/19C- .
- Insert assembly cartridge - VAS 5161/8A- into guide plate - VAS 5161/19C- .
- Attach pressure fork - VAS 5161/2- to retainer - VAS 5161/6- .
- Press installation cartridge - VAS 5161/8- down and turn knurled screw of installation cartridge - VAS 5161/8- to right until tips engage in valve cotters.
- Move knurled screw back and forth slightly to press apart valve cotters and capture them in the assembly cartridge.
- Release pressure fork - VAS 5161/2- .
- Remove installation cartridge - VAS 5161/8- .
- Pull off valve stem seals using valve stem seal puller - 3364- .



Installing valve stem seals

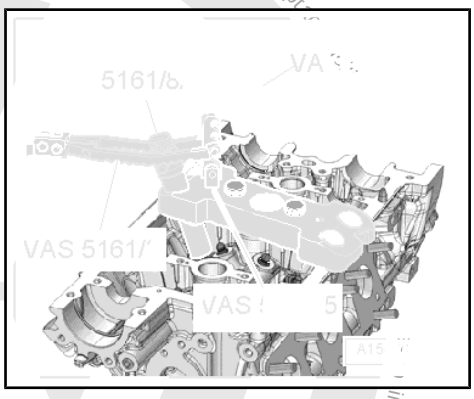
- Place plastic sleeve -A-, enclosed with new valve stem seals -B-, onto valve stem.
- Lightly oil sealing lip of valve stem seal.
- Push valve stem oil seal onto plastic sleeve.
- Carefully press valve stem oil seal on inlet side onto valve guide using valve stem seal fitting tool - 3365- .
- Carefully press valve stem oil seal on exhaust side onto valve guide using valve stem seal fitting tool - T40376/1- .
- Remove plastic sleeve.
- Insert valve spring and valve spring plate.
- Remove removal and installation device for valve cotters - VAS 5161- as shown.



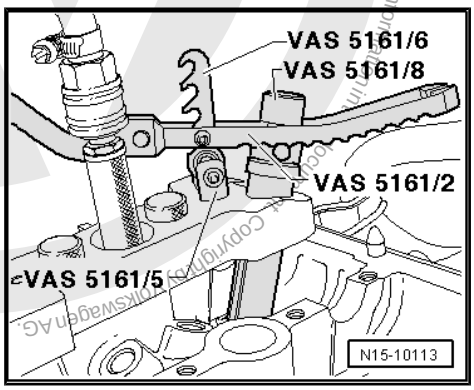
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Inlet side



Exhaust side



Note

- *If the valve cotters have been removed from the installation cartridge, they must first be inserted into the insertion device - VAS 5161/18- .*
- *Press assembly cartridge -VAS 5161/8- onto insertion device from above and pick up valve cotters.*

– Press installation cartridge - VAS 5161/8- down with pressure fork - VAS 5161/2- , and turn installation cartridge knurled screw back and forth whilst pulling upwards.

– Relieve pressure fork - VAS 5161/2- whilst pulling on knurled screw.

– Remove removal and installation device for valve cotters - VAS 5161- .

Further assembly is basically the reverse of the removal procedure. During this procedure, observe the following:

– Install camshafts ⇒ page 130 .

5 Inlet and exhaust valves

⇒ “5.1 Checking valve guides”, page 149

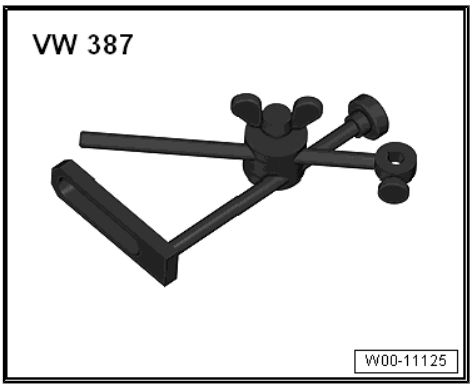
⇒ “5.2 Checking valves”, page 150

⇒ “5.3 Valve dimensions”, page 150

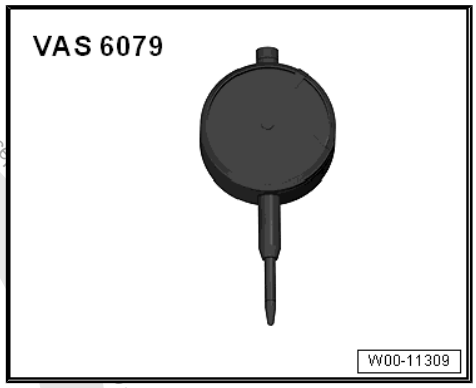
5.1 Checking valve guides

Special tools and workshop equipment required

- Universal dial gauge holder - VW 387-



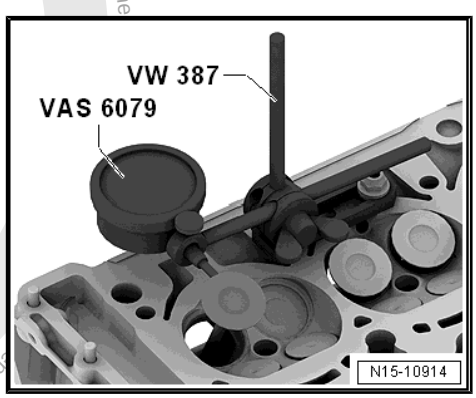
- Dial gauge - VAS 6079-



Test sequence

– Insert valve in guide. Valve stem end must be flush with guide. On account of differing stem diameters, only use inlet valve in inlet valve guide and exhaust valve in exhaust valve guide.

– Determine rock.



Wear limit

Inlet valve guide	Exhaust valve guide
0.80 mm	0.80 mm

Note

- *If the wear limit is exceeded, repeat the measurement with new valves. If the wear limit is exceeded again, renew the cylinder head.*
- *If the valve is to be renewed as part of a repair, use a new valve for the calculation.*

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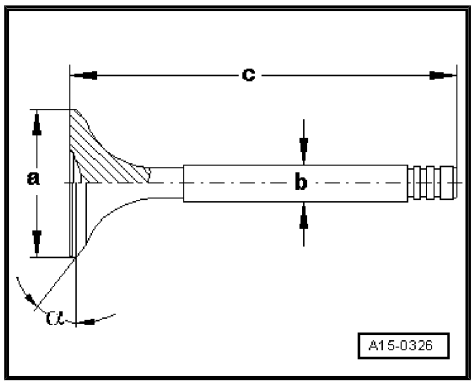
5.2 Checking valves

– Check for scoring on valve stems and valve seat surfaces.

– Exchange valve if significant scoring can be seen.

5.3 Valve dimensions

Valve dimensions



Note

Inlet and exhaust valves must not be reworked. Only lapping-in is permitted.

Dimension		Inlet valve	Outlet valve
∅ a	mm	32.10 ± 0.10	28.0 ± 0.1
∅ b	mm	5.98 ± 0.01	5.94 ± 0.01
c	mm	105.0 ± 0.2	102.9 ± 0.2
α	∠°	45	45

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17 – Lubrication

1 Sump, oil pump

⇒ “1.1 Assembly overview - sump/oil pump”, page 151

⇒ “1.2 Engine oil:”, page 153

⇒ “1.3 Removing and installing lower part of sump”, page 154

⇒ “1.4 Removing and installing upper part of sump”, page 159

⇒ “1.5 Removing and installing oil pump”, page 162

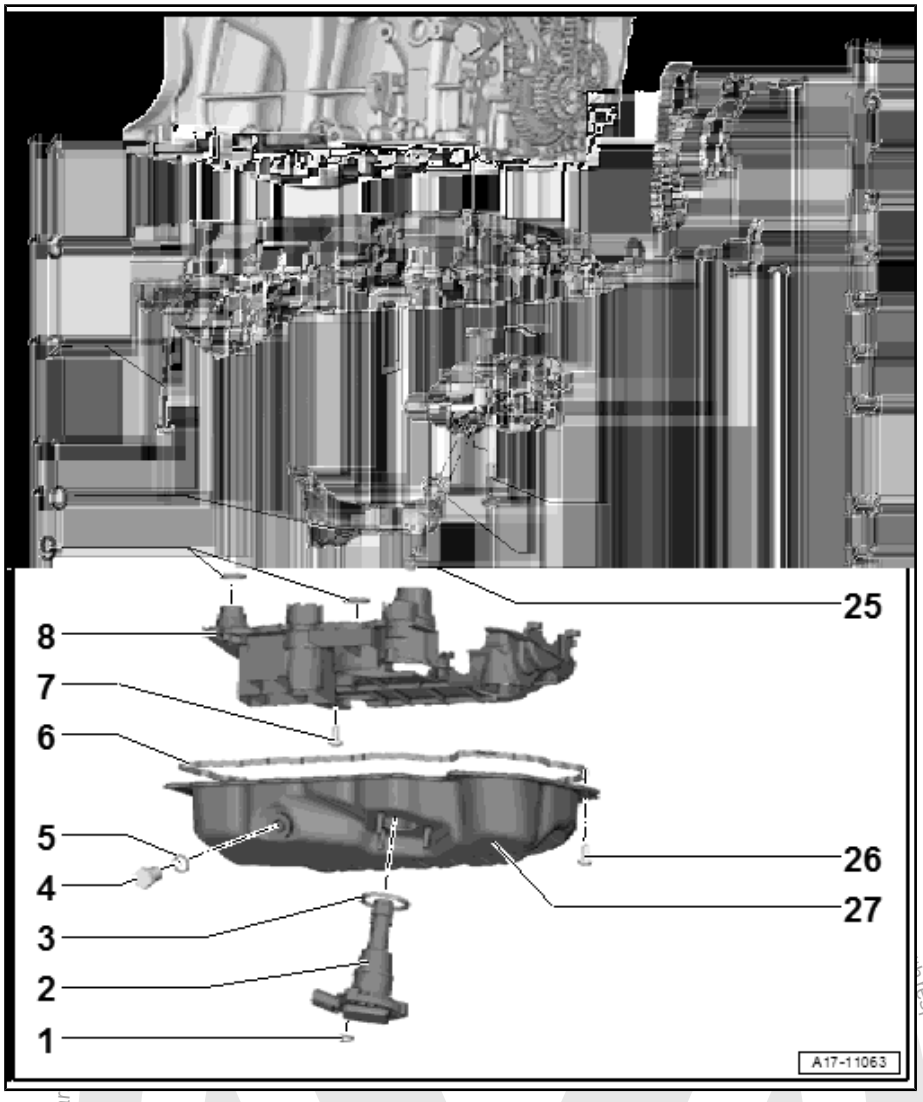
⇒ “1.6 Removing and installing oil level and oil temperature sender G266 ”, page 164

1.1 Assembly overview - sump/oil pump

Note

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

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1 - Nut

- ❑ 9 Nm

2 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 164

3 - O-ring

- ❑ Moisten with engine oil.
- ❑ Renew after removal

4 - Oil drain plug/sealing plug

- ❑ Sheet metal sump: 30 Nm
- ❑ Plastic sump: turn as far as stop using assembly tool - T10549-

5 - Seal / O-ring

- ❑ Renew seal after each removal
- ❑ Renew O-ring in case of leaks.

6 - Gasket/sealant

- ❑ ⇒ Electronic parts catalogue (ETKA)

7 - Bolt

- ❑ For baffle plate and oil suction pipe
- ❑ Renew after removal
- ❑ 4 Nm +45°

8 - Baffle plate

- ❑ If the top section of sump is renewed, the baffle plate must be renewed as well.

9 - O-ring

- ❑ Moisten with engine oil.
- ❑ Renew after removal

10 - Oil intake tube

- ❑ Clean strainer if soiled

11 - Centring sleeve

12 - Bolt

- ❑ Renew after removal
- ❑ Tightening sequence ⇒ page 153

13 - Upper part of sump

- ❑ Removing and installing ⇒ page 159
- ❑ Tightening sequence ⇒ page 153
- ❑ If the top section of sump is renewed, the baffle plate must be renewed as well.

14 - Cylinder block

15 - Drive chain for oil pump

- ❑ Mark direction of rotation before removing.

16 - Bolt

- ❑ 9 Nm

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17 - Chain tensioner

18 - O-ring

- ❑ Moisten with engine oil.
- ❑ Renew after removal

19 - Valve for oil pressure control - N428-

- ❑ Removing and installing ⇒ page 181

20 - Bolt

- ❑ Specified torque ⇒ Item 1 (page 173)

21 - Oil strainer

22 - Oil pump

- ❑ Removing and installing ⇒ page 162

23 - Bolt for oil pump

- ❑ Renew after removal
- ❑ 8 Nm +90°

24 - O-ring

- ❑ Moisten with engine oil.
- ❑ Renew after removal

25 - Bolt for oil suction pipe

- ❑ Renew after removal
- ❑ 4 Nm +45°

26 - Bolt for sump

- ❑ Renew after removal
- ❑ Tightening sequence ⇒ page 154

27 - Lower part of sump

- ❑ Sheet-metal or plastic
- ❑ Removing and installing ⇒ page 154

Tightening sequence for sump (top section)



Note

Renew bolts that are tightened with turning further angle.

– Tighten bolts -1 to 14- in the sequence shown.

Stage	Tightening sequence and specified torque
1. Bolts -1- to -14-	Tighten to 8 Nm
2. Bolts -1- and -2-	Turn 180° further
3. Bolts -3- to -9-	Turn 45° further
4. Bolt -10-	Turn 180° further
5. Bolts -11- to -14-	Turn 90° further

1.2 Engine oil:

Capacities and specifications ⇒ Maintenance ; Booklet ; Engine oil: Capacities and specifications .

Change engine oil ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

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Check engine oil level ⇒ Maintenance ; Booklet ; Engine oil level: Checking .

1.3 Removing and installing lower part of sump

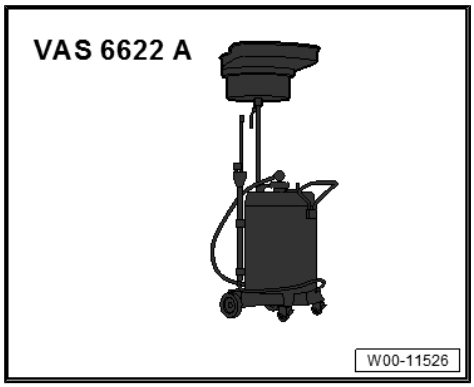
⇒ “1.3.1 Removing and installing bottom section of sump, plastic sump”, page 154

⇒ “1.3.2 Removing and installing bottom section of sump, sheet-metal sump”, page 156

1.3.1 Removing and installing bottom section of sump, plastic sump

Special tools and workshop equipment required

- Used oil collection and extraction unit - VAS 6622A-

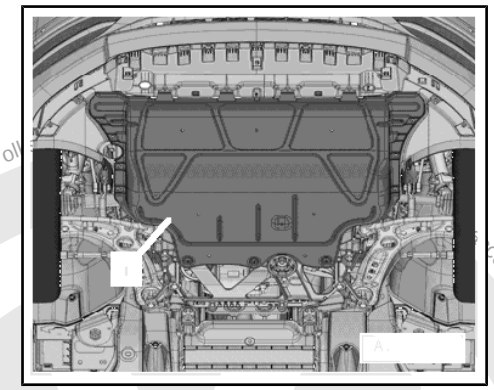


- Assembly tool - T10549-

Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

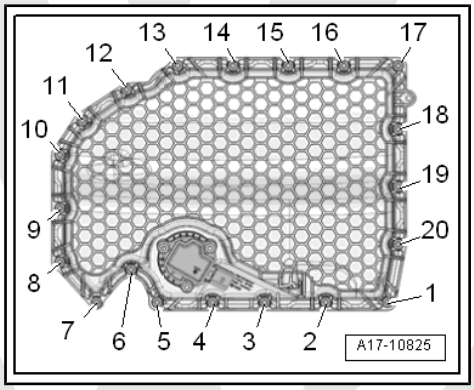
– Place used oil collection and extraction unit - VAS 6622A- under engine, and drain engine oil.



Note

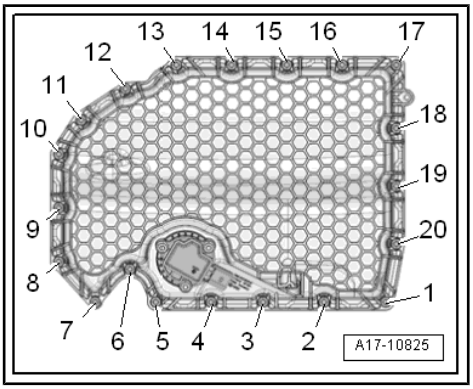
Please observe disposal instructions!

– Unscrew bolts -1 … 20-, and remove sump.



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Installing



– Install baffle plate, specified torque ⇒ Item 7 (page 152) .

– Tighten new bolts -1- to -20- in two stages in the sequence shown:

Stage	Tightening sequence and specified torque
1. Bolts -1- to -20-	Tighten to 8 Nm
2. Bolts -1- to -20-	Turn 90° further

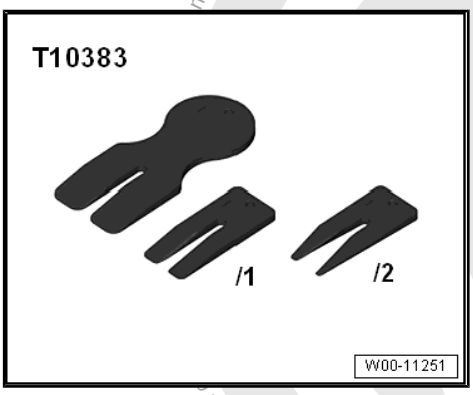
– Replenish engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

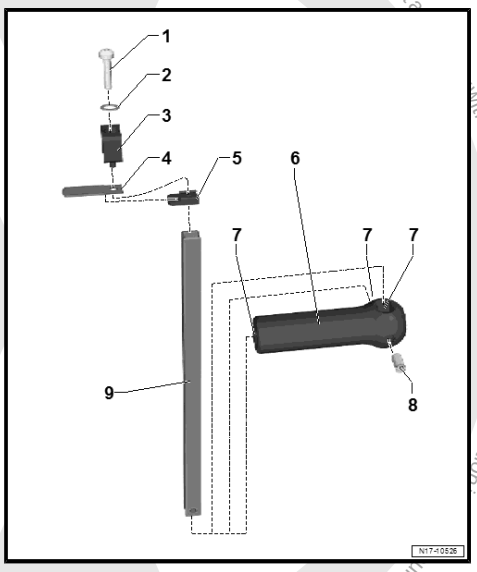
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1.3.2 Removing and installing bottom section of sump, sheet-metal sump

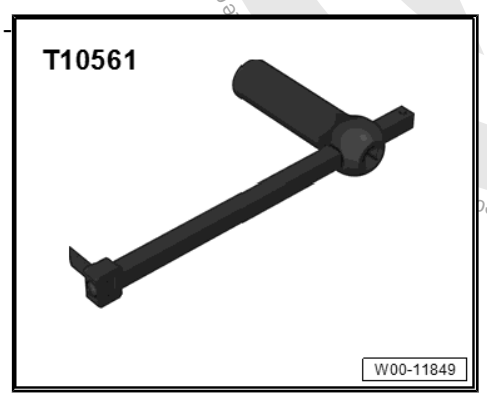
Special tools and workshop equipment required

- Wedge - T10383/2-

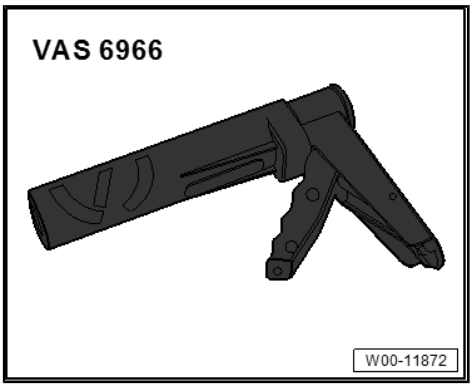




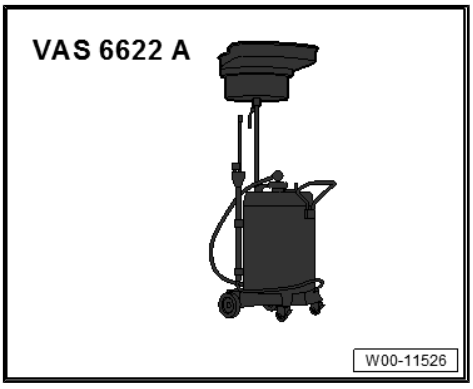
- Cutting tool - T10561-



- Applicator gun - VAS 6966-



- Used oil collection and extraction unit - VAS 6622A-



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- Commercially available scraper
- Hand drill with plastic brush attachment
- Safety glasses
- Silicone sealant ⇒ Electronic parts catalogue (ETKA)

Components of cutting tool - T10561-

1 - Bolt

2 - Washer

3 - Bracket

4 - Knife

5 - Guide

6 - Handle

7 - Inserts for support (rod) for conversion of handle

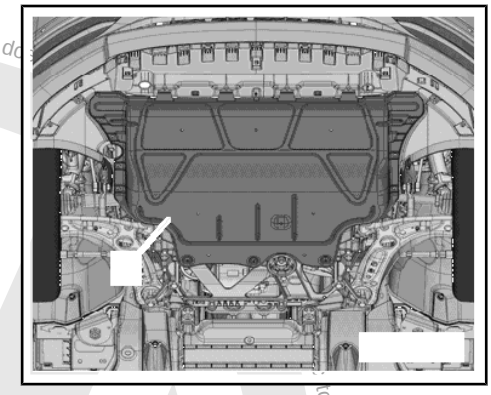
8 - Bolt

9 - Support bearing

Removing

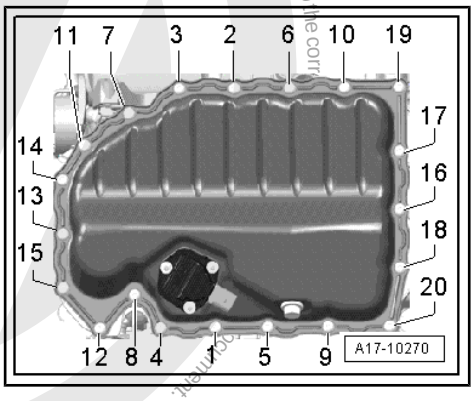
– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

– Place used oil collection and extraction unit - VAS 6622A- under engine, and drain engine oil.



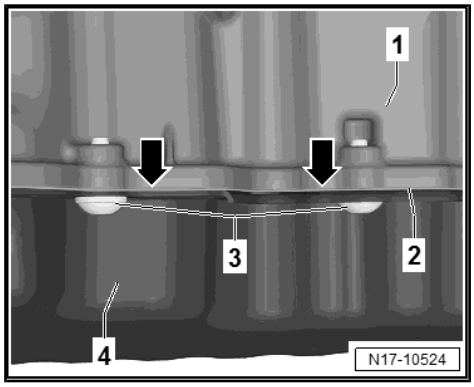
– Unscrew securing bolts for oil pan, but leave 2 of them.

– Loosen 2 bolts on oil sump, but do not unscrew completely.



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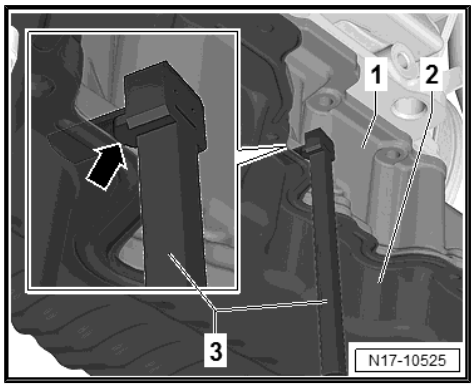
– Cut through seal between oil sump -4- and engine -1-.
– Use cutting tool - T10561- to do this.



Note

- *The sump is sealed with liquid sealant -2- ⇒ Electronic parts catalogue .*
- *When hardened, the sealant has a high adhesive strength.*

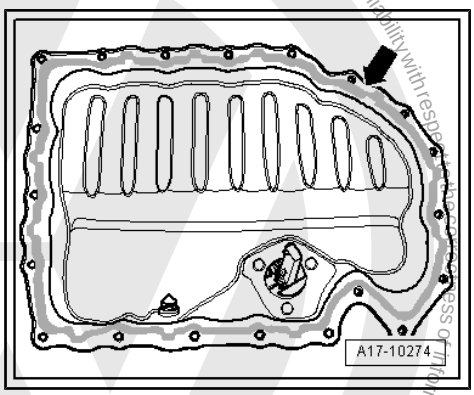
– Separation is made centrally between bolts -3-.
– Position cutting tool - T10561- on seal -arrows- without it canting.



– Drive in cutting tool - T10561- -3- using a hammer as far as it will go -arrow-.
– Do not cant cutting tool - T10561- when doing this.
– Do not cutting tool - T10561- sideways.
– Do not lever with cutting tool - T10561- .
– Repeat this procedure on several position until the oil pan has come off.
– Use wedge - T10383/2- to further loosen detached positions.
– Using a plastic hammer carefully drive in wedge.
– Drive in wedge - T10383/2- only to same depth as sealing surface.
– Carefully detach sump (bottom section) from adhesive bond.
– Fit wedge - T10383/2- at another position and detach the bonded joint in the same way.
– Carefully detach lower part of sump from adhesive bond using a commercially available scraper.

Installing

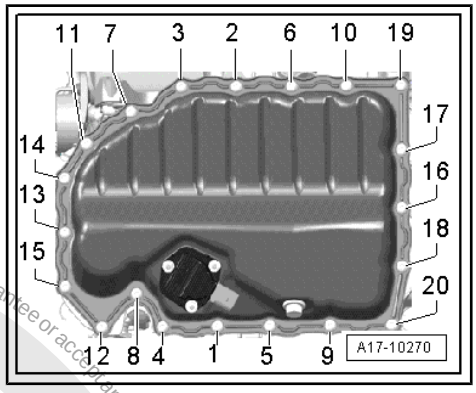
– Remove any sealant residue, and clean contact surfaces.
– Apply the bead of silicone sealant onto the sealing surface of the bottom section of sump, as shown in illustration.



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– Tighten new bolts -1- to -20- in two stages in the sequence shown:

Stage	Tightening sequence and specified torque
1. Bolts -1- to -20-	Tighten to 8 Nm
2. Bolts -1- to -20-	Turn 45° further

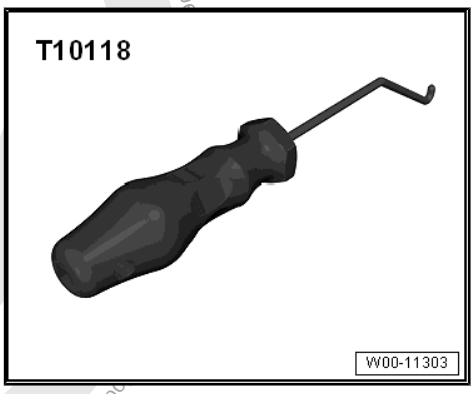


– Replenish engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

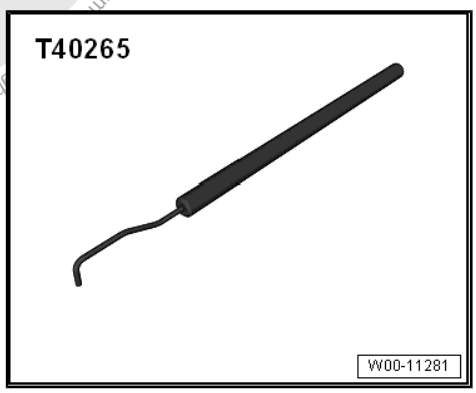
1.4 Removing and installing upper part of sump

Special tools and workshop equipment required

♦ Assembly tool - T10118-



♦ Locking tool - T40265-



♦ Hand drill with plastic brush attachment

♦ Safety glasses

♦ Silicone sealant ⇒ Electronic parts catalogue (ETKA)

♦ Applicator gun - VAS 6966-

Note

If the top section of sump is renewed, the baffle plate must be renewed as well.

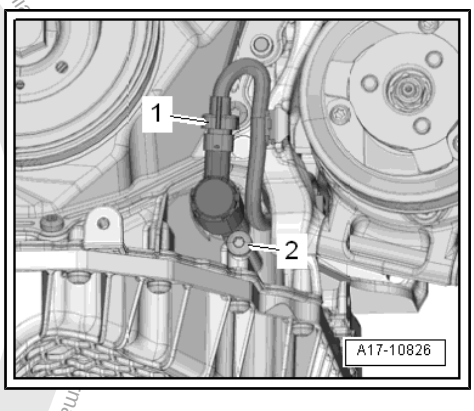
Removing

• Gearbox is removed.

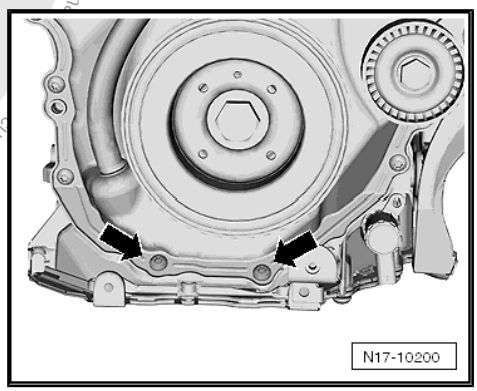
– Remove sump (bottom section) ⇒ page 154 .

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– Remove rear sealing flange ⇒ page 59 .
– Remove oil pump ⇒ page 162 .
– Separate connector -1-.



– Unscrew bolts -arrows-.



– Unscrew bolts -1 through 14-.
– Lever off upper part of sump on gearbox side first. When levering off, exercise caution to ensure the timing chain cover is not bent in the process.



Installing

Note

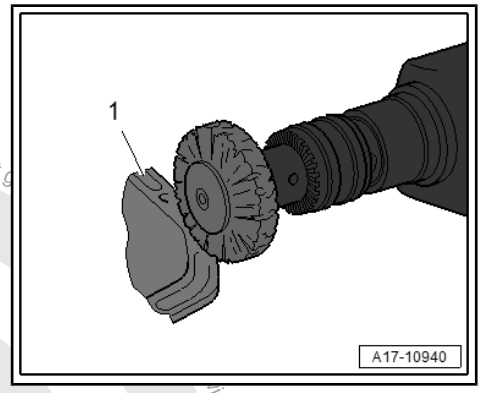
- *Observe use-by date of silicone sealant.*
- *The sump (top section) must be installed within 5 minutes after applying the silicone sealant.*
- *Replace bolts that are tightened with specified tightening angle.*
- *Renew gaskets, oil seals and self-locking nuts.*

– Remove sealant residues from cylinder block with a flat scraper.

CAUTION

Risk of eye injury caused by sealant residue.
– Wear protective goggles.

– Remove sealant residue from sump (top section) using a rotating plastic brush, for example.



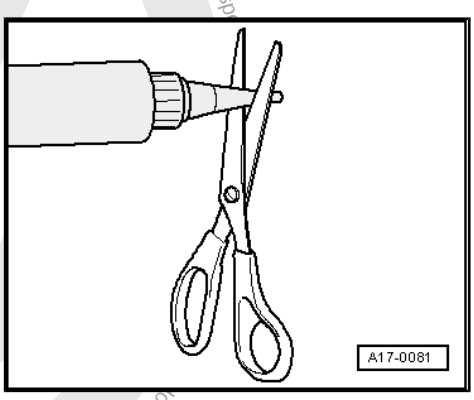
Note

Check timing chain cover for deformation. To do this, fit sump upper part first without sealant and check gap between cover and sump upper part. If deformation is evident and cover cannot be aligned, renew cover after top section of sump has been installed.

– Clean sealing surfaces. They must be oil and grease free.

– Check oil passages in top section of sump and in crankcase for soiling.

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

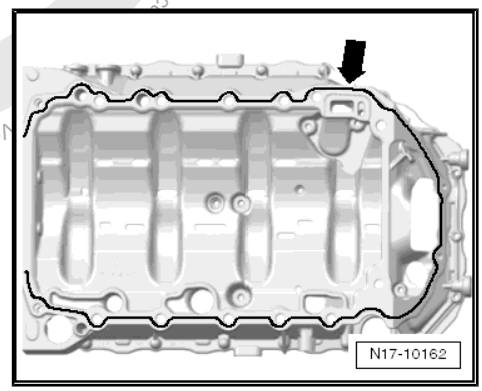


Note

Danger of blocking lubrication system with excess sealant. Do not apply sealant bead thicker than specified.

– Apply silicone sealant onto clean sealing surface of top section of sump as illustrated -arrow-.

• Thickness of sealant bead: 2 to 3 mm.



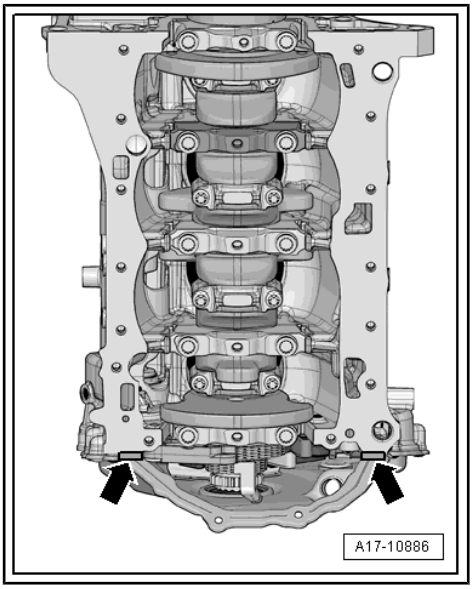
– Apply silicone sealant between cylinder block and lower timing chain cover, as shown in illustration -arrows-.

Note

♦ *After applying the silicone sealant, the top part of the sump must be fitted within 5 minutes.*

♦ *The bead of sealant must not be thicker than specified, otherwise excess sealant can enter the sump and obstruct the strainer in the oil intake pipe.*

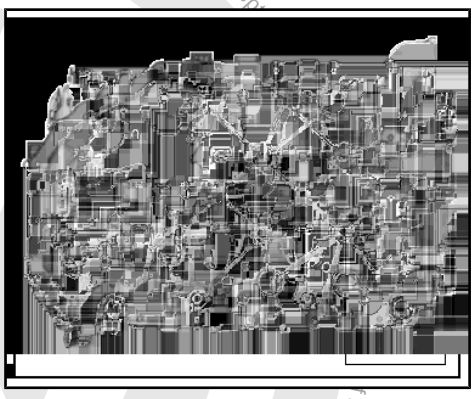
• Sump upper part and crankcase must be flush on gearbox side.



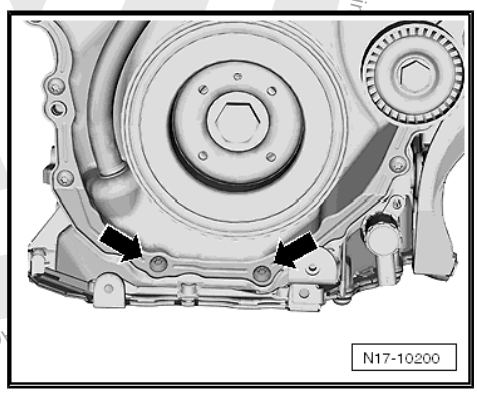
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– Fit upper part of sump immediately, and tighten bolts -1 to 14- in the sequence shown.

1. Tighten bolts -1 to 14- to 8 Nm.
2. Turn bolts -1 and 2- 180° further.
3. Turn bolts -3 to 9- 45° further.
4. Turn bolt -10- 180° further.
5. Turn bolts -11 to 14- 90° further.



– Screw in new bolts -arrows-. Tightening torque 8 Nm +45°.
– Install rear sealing flange ⇒ page 59 .
– Install oil pump ⇒ page 162 .
– Insert new baffle plate, and bolt it on.
– Install bottom section of sump ⇒ page 154 .



Further assembly is basically the reverse of the removal procedure.

– Replenish engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

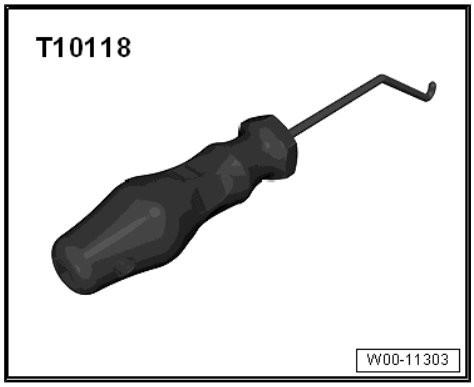
Specified torques

♦ ⇒ “1.1 Assembly overview - sump/oil pump”, page 151

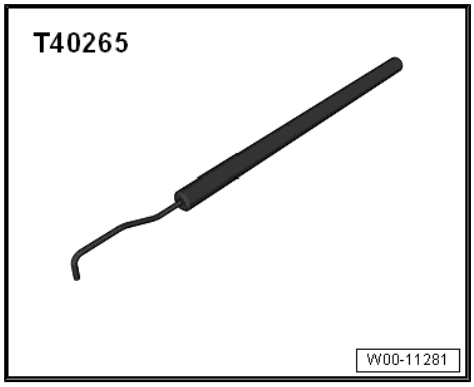
1.5 Removing and installing oil pump

Special tools and workshop equipment required

♦ Assembly tool - T10118-



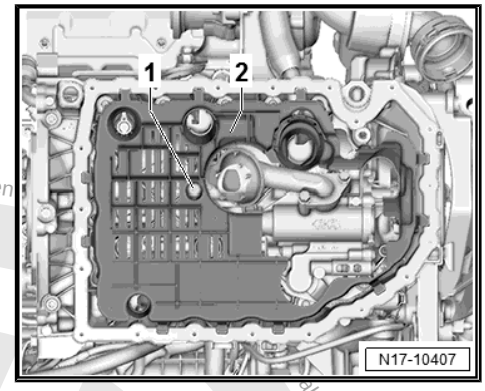
♦ Locking tool - T40265-



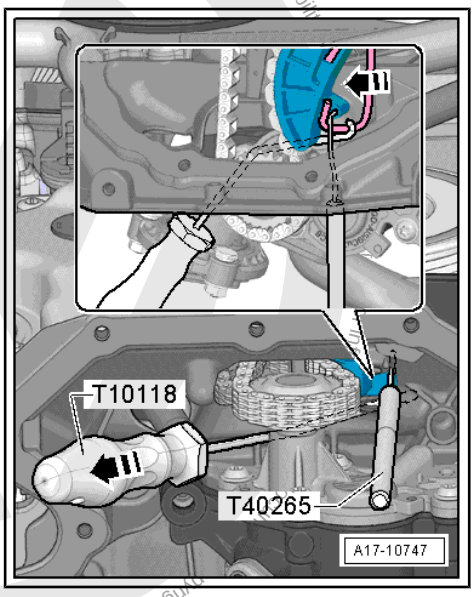
Removing

– Remove sump (bottom section) ⇒ page 154 .

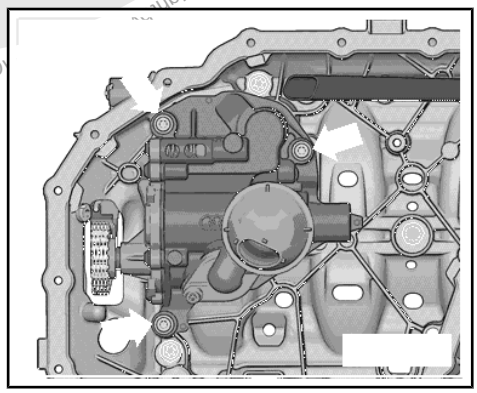
– Unscrew bolt -1-, and remove baffle plate -2-.



– Pull spring of chain tensioner in -direction of arrow- using assembly tool - T10118- and secure it with locking pin - T40265- .



– Unscrew bolts -arrows- and remove oil pump.



Installing

Install in reverse order of removal, observing the following:

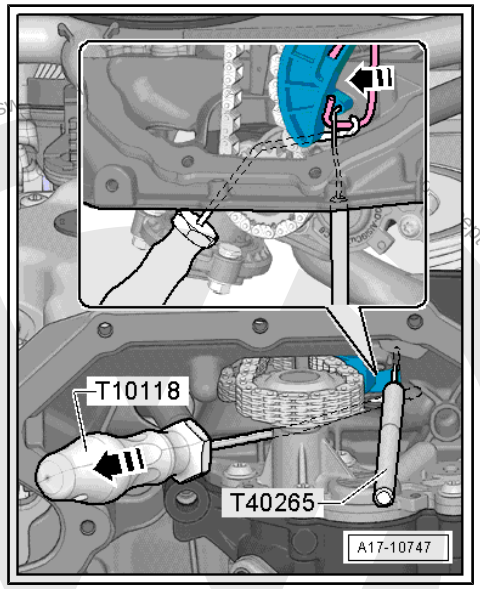
– Check that both centring sleeves for centring oil pump are present.

– Before installing oil pump, check strainer in oil suction pipe and oil galleries in upper part of sump for soiling.

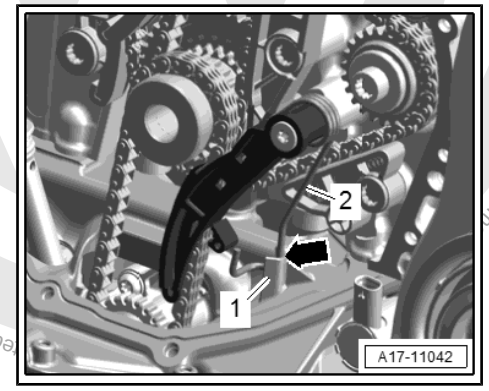
– Guide oil pump chain sprocket into drive chain and install oil pump.

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– Pull spring of chain tensioner in -direction of arrow- using assembly tool - T10118- and remove locking pin - T40265- .
– Slowly relieve tension from assembly tool - T10118- .



– Check position of retaining clip of chain tensioner.
• Retaining clip -2- must rest against protrusion -1- of top section of sump -arrow- as shown in illustration.



Note

To improve clarity, lower timing chain cover is not shown in illustration.

– Fit O-rings ⇒ Item 9 (page 152) onto baffle plate, and moisten them with engine oil.
– Insert new baffle plate, and bolt it on.
– Install bottom section of sump ⇒ page 154 .
– Replenish engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

Specified torques

◆ ⇒ “1.1 Assembly overview - sump/oil pump”, page 151

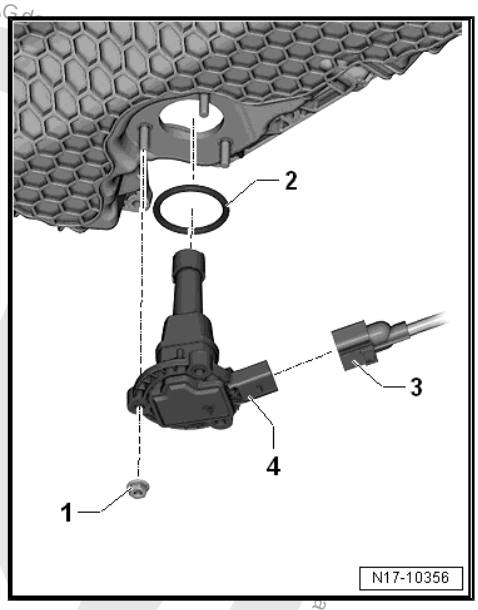
1.6 Removing and installing oil level and oil temperature sender - G266-

Removing

– Drain engine oil ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

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– Separate electrical connector -3-.
– Undo nuts -1- and remove oil level and oil temperature sender - G266- -item 4-.



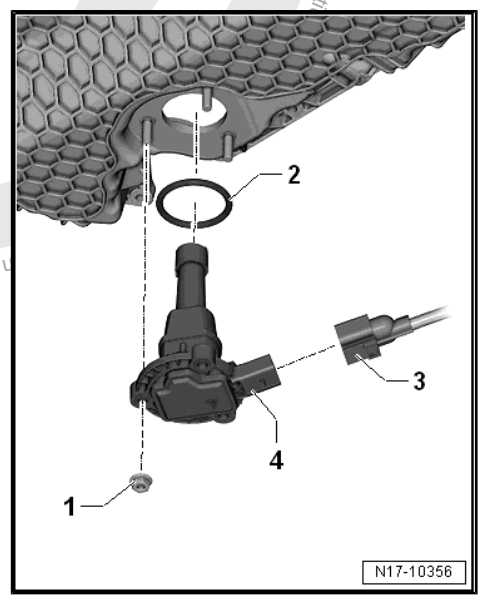
Installing

Install in reverse order of removal, observing the following:

– Renew oil seal -2-.
– Replenish engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

Specified torques

◆ ⇒ “1.1 Assembly overview - sump/oil pump”, page 151



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2 Engine oil cooler

⇒ “2.1 Assembly overview - engine oil cooler”, page 166

⇒ “2.2 Removing and installing engine oil cooler”, page 166

⇒ “2.3 Removing and installing mechanical switching valve”, page 168

2.1 Assembly overview - engine oil cooler

1 - Ancillary bracket
- ❑ Removing and installing ⇒ page 53

2 - Seal
- ❑ Renew

3 - O-ring
- ❑ Renew
- ❑ Moisten with engine oil.

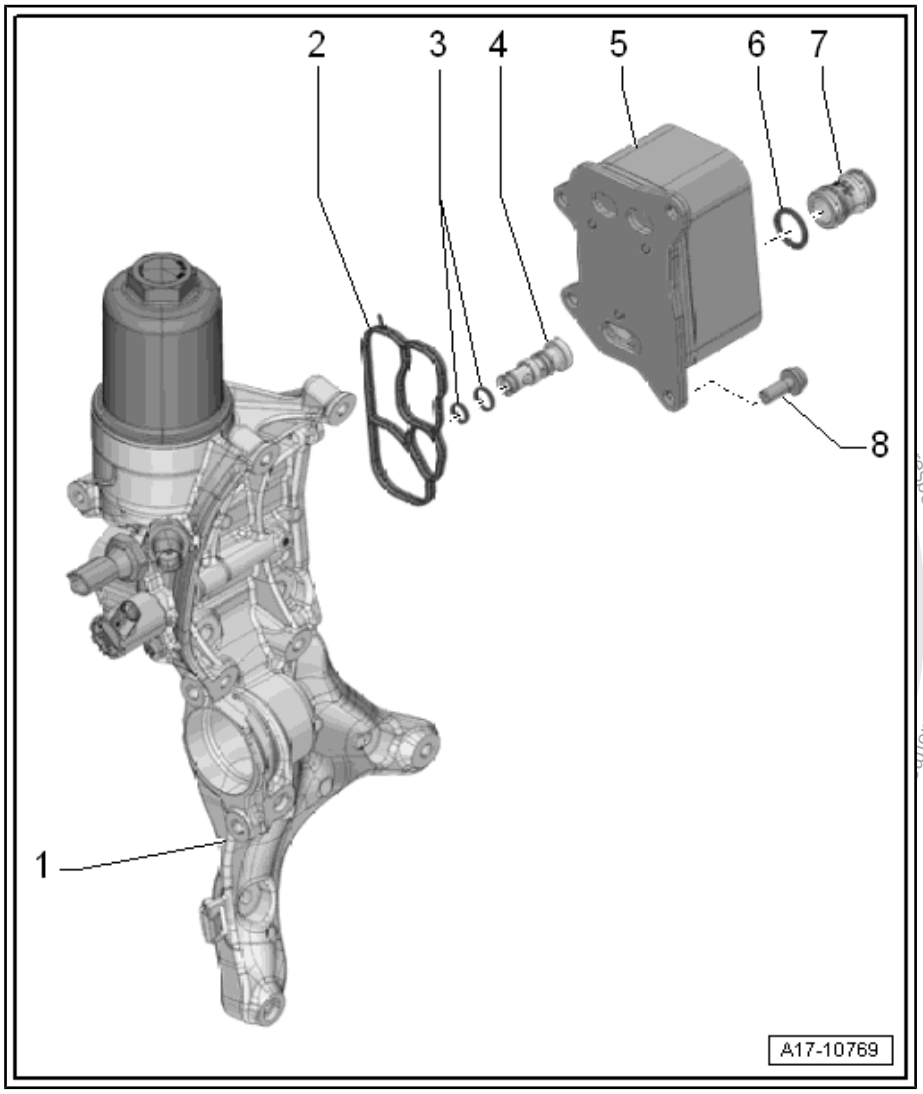
4 - Mechanical switching valve
- ❑ Renewing ⇒ page 168

5 - Engine oil cooler
- ❑ Observe notes ⇒ page 151
- ❑ Removing and installing ⇒ page 166

6 - Seal
- ❑ Renew
- ❑ Moisten with coolant

7 - Connection

8 - Bolt
- ❑ Renew
- ❑ 8 Nm +45°



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2.2 Removing and installing engine oil cooler

Special tools and workshop equipment required

♦ Drip tray for workshop hoist - VAS 6208-



Removing

CAUTION

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

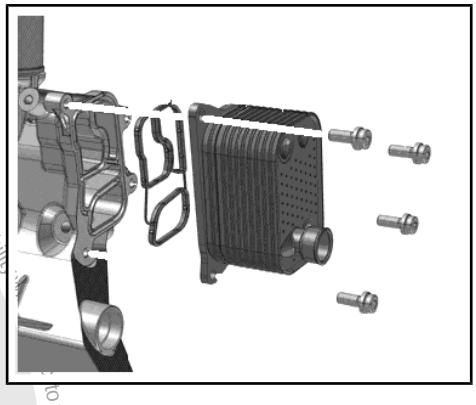
Skin and other parts of the body may be scalded.

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

– Drain coolant ⇒ page 188 .

– Remove bracket for ancillaries ⇒ page 53 .

– Unscrew bolts -4 and 5- and remove engine oil cooler -3- together with seal -2-.



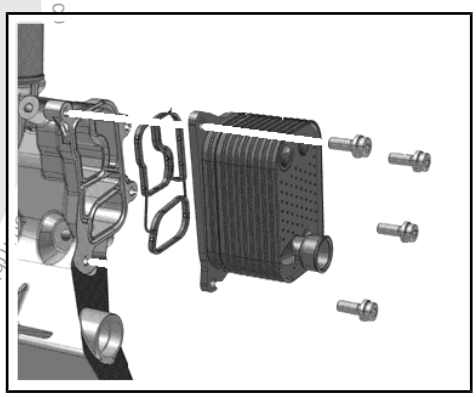
Installing

Install in reverse order of removal, observing the following:

Note

♦ *Renew gaskets and seals.*

♦ *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue (ETKA) .*



– Install engine oil cooler -3- with new seal -2-.

– Install bracket for ancillaries ⇒ page 53 .

– Add coolant ⇒ page 190 .

– Replenish engine oil and check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

Specified torques

♦ ⇒ "2.1 Assembly overview - engine oil cooler", page 166

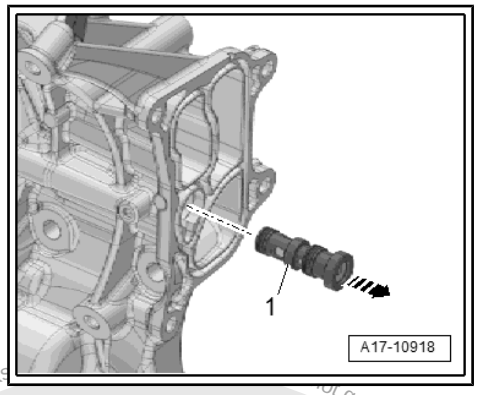
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2.3 Removing and installing mechanical switching valve

Removing

– Remove engine oil cooler ⇒ page 166 .

– Remove mechanical switching valve -1- from ancillary bracket -arrow-.



Installing

Install in reverse order of removal, observing the following:

Note

- *Renew gaskets and seals.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue (ETKA) .*

– Moisten O-rings of mechanical switching valve with engine oil, and install switching valve.

– Install engine oil cooler ⇒ page 166 .

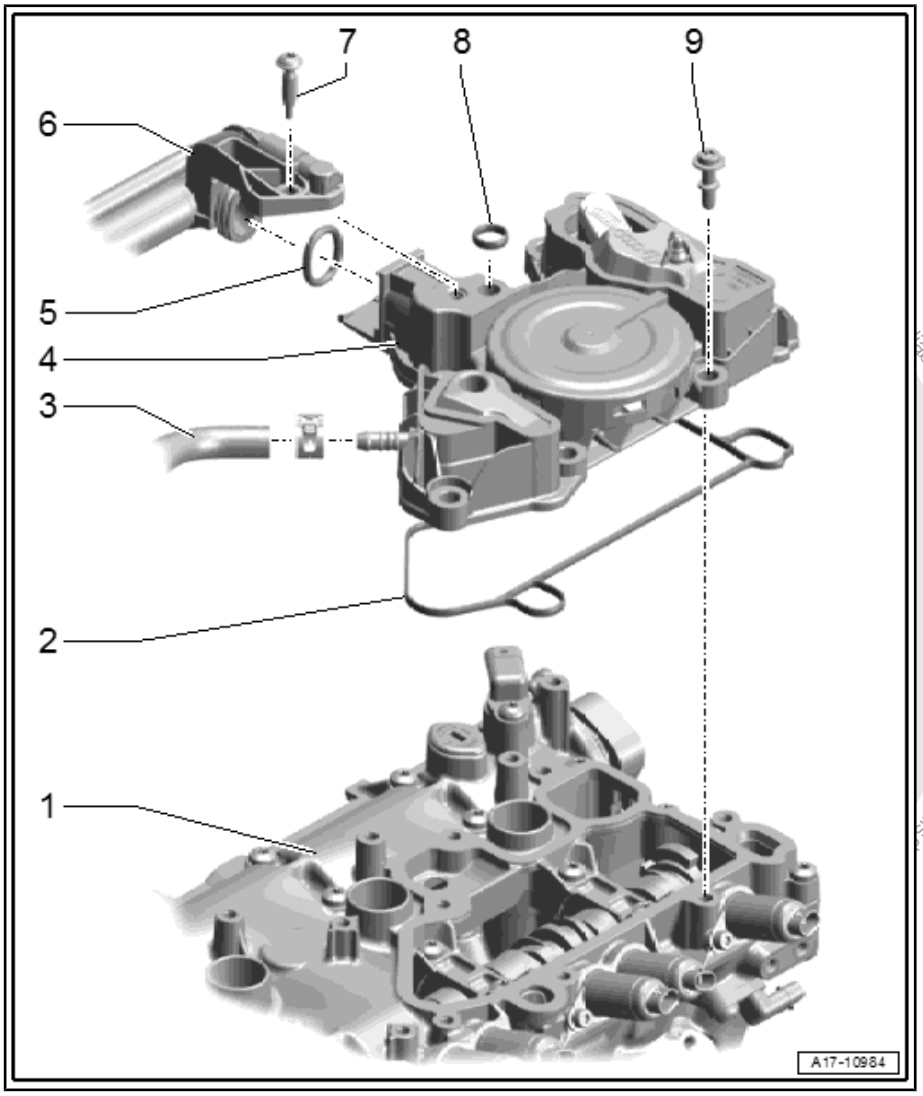
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3 Crankcase ventilation

⇒ "3.1 Assembly overview - crankcase breather system", page 169

⇒ "3.2 Removing and installing oil separator", page 170

3.1 Assembly overview - crankcase breather system



1 - Cylinder head cover

2 - Seal

- ❑ Renew if damaged

3 - Hose

- ❑ To activated charcoal filter solenoid valve 1 - N80-

4 - Oil separator

- ❑ Removing and installing ⇒ page 170

5 - Seal

- ❑ Renew if damaged

6 - Hose

- ❑ For crankcase ventilation.
- ❑ To turbocharger

7 - Bolt

- ❑ Thread-forming
- ❑ Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to torque.
- ❑ 4 Nm

8 - Seal

- ❑ Renew if damaged

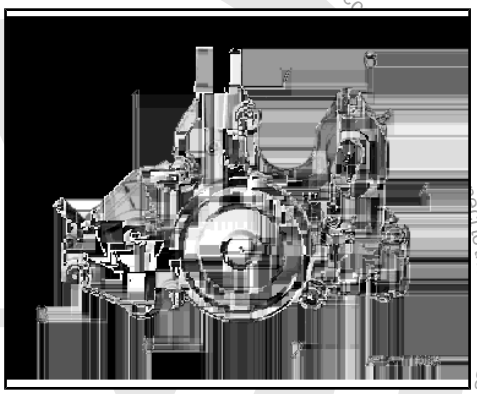
9 - Bolt

- ❑ Thread-forming
- ❑ Fit and screw in bolt by hand so that it screws into old thread Then tighten bolt to torque.
- ❑ Specified torques and tightening sequence ⇒ page 170

ability with respect to the correctness of information in this

Tightening sequence - oil separator

– Tighten bolts in the order -1 ... 7- to 9 Nm.

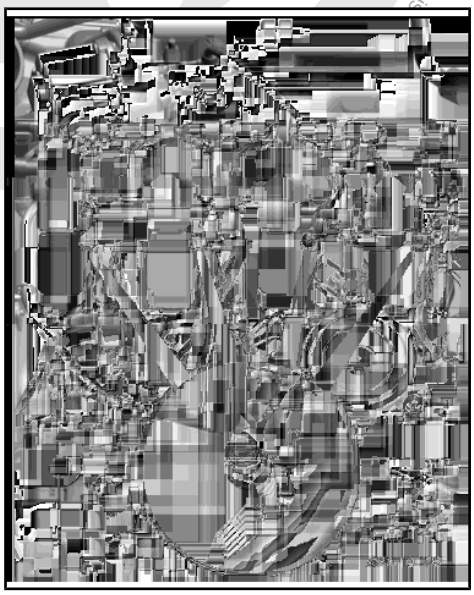


3.2 Removing and installing oil separator

Removing

– Remove engine cover panel.

– Unscrew nuts -2-, and lay earth wire -1- to one side.

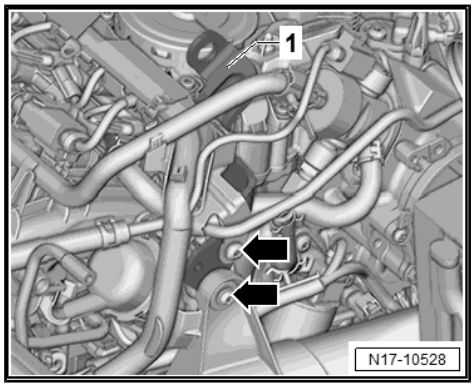


– Release ignition coil connectors and, at the same time, pull connectors off ignition coils.

– Unscrew ignition coil bolts “3 and 4”, and pull out ignition coils.

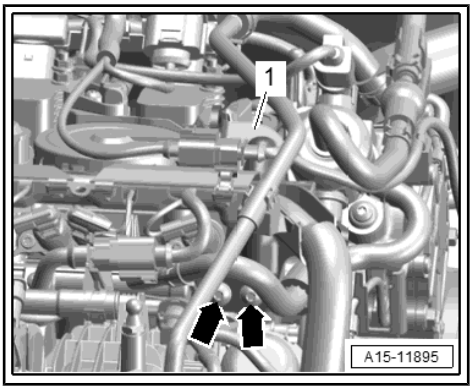
– Remove air filter housing ⇒ page 263 .

– Unscrew bolts -arrows- from engine lifting eye -1-.

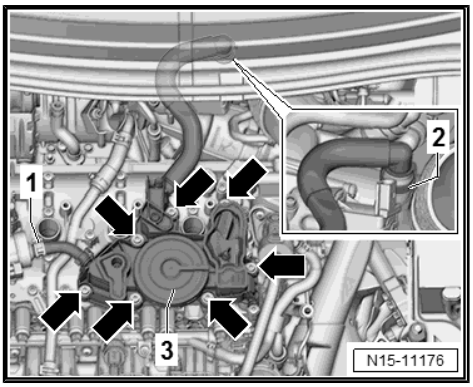


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– Unscrew bolts -arrows-, and push engine lifting eye -1- to one side.



– Open hose clip -1-, and detach hose from activated charcoal filter solenoid valve 1 - N80- .
– Release and pull off crankcase breather line -2-.
– Unscrew bolts -arrows-, and remove oil separator -3-.



Installing

Install in reverse order of removal, observing the following:

Note

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

Specified torques

◆ ⇒ “3.1 Assembly overview - crankcase breather system”, page 169

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4 Oil filter, oil pressure switch

⇒ “4.1 Assembly overview - oil filter”, page 172

⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 173

⇒ “4.3 Removing and installing piston cooling jet control valve N522 ”, page 174

⇒ “4.4 Removing and installing oil pressure switch F1 ”, page 174

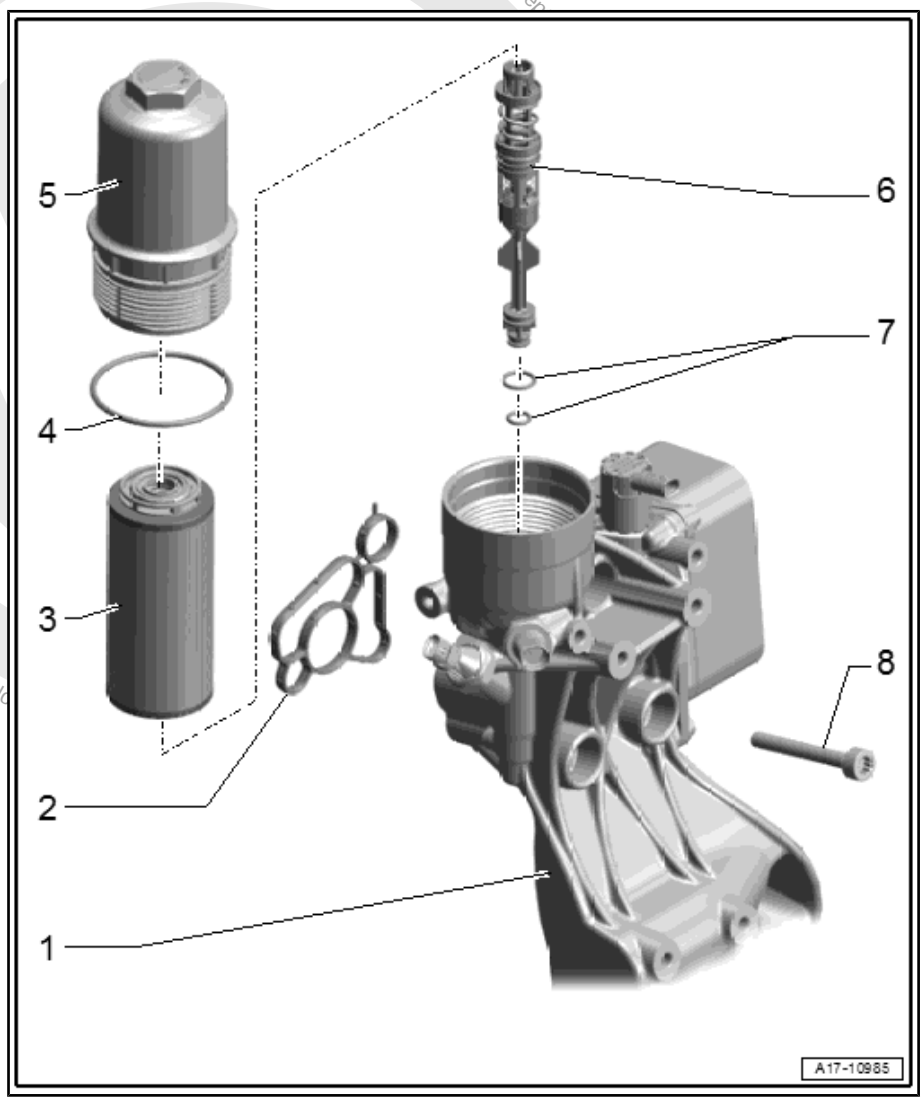
⇒ “4.5 Removing and installing oil pressure switch for reduced oil pressure F378 ”, page 175

⇒ “4.6 Removing and installing stage 3 oil pressure switch F447 ”, page 176

⇒ “4.7 Checking oil pressure”, page 178

⇒ “4.8 Removing and installing oil pressure regulating valve N428 ”, page 181

4.1 Assembly overview - oil filter



1 - Ancillary bracket

- ❑ Removing and installing ⇒ page 53

2 - Seal

- ❑ Renew

3 - Oil filter element

- ❑ Removing and installing ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

4 - O-ring

- ❑ Renew
- ❑ Moisten with engine oil.

5 - Oil filter housing

- ❑ 25 Nm

6 - Oil drain connection

7 - O-ring

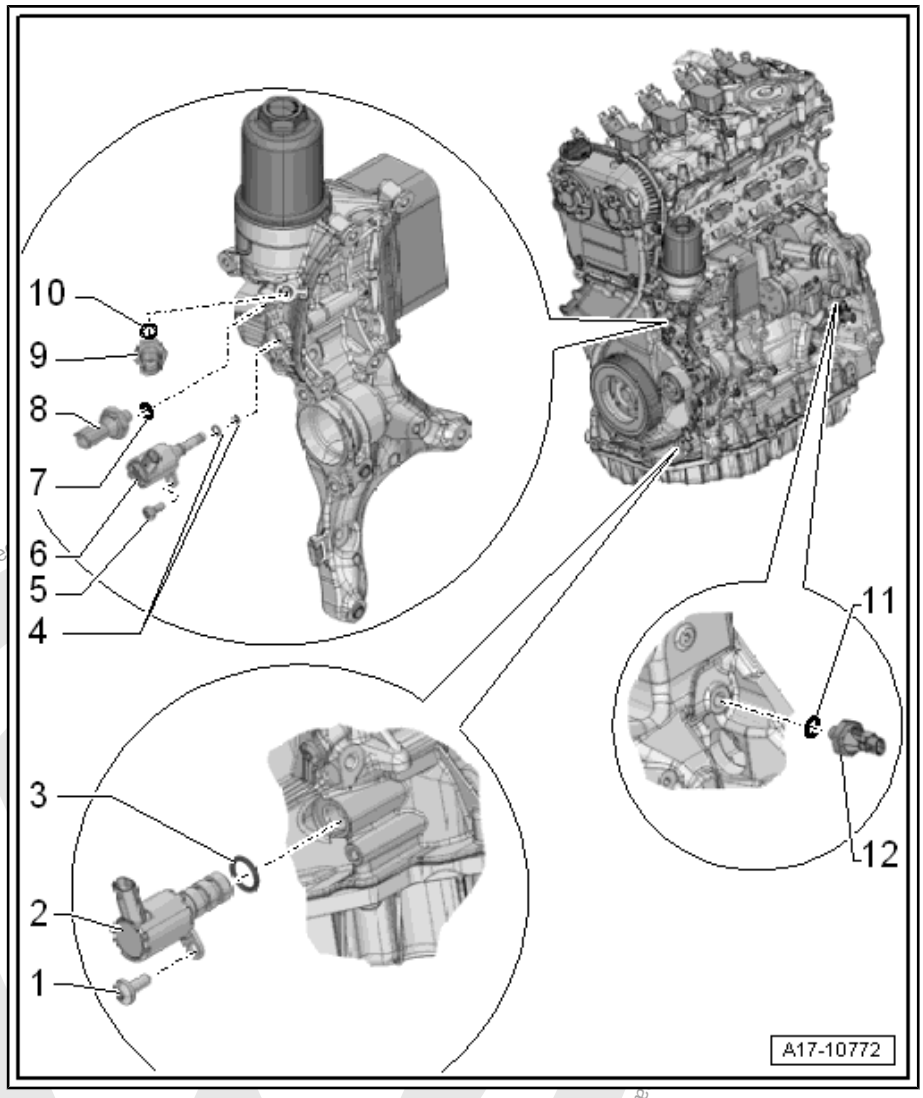
- ❑ Not available as replacement part, supplied together with ⇒ Item 6 (page 172)

8 - Bolt

- ❑ Specified torque and tightening sequence ⇒ page 43

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4.2 Exploded view - oil pressure switches/oil pressure control



1 - Bolt
- ❑ Renew
- ❑ 4 Nm +90°

2 - Valve for oil pressure control - N428-
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 181

3 - O-ring
- ❑ Renew
- ❑ Moisten with engine oil.

4 - O-ring
- ❑ Renew
- ❑ Moisten with engine oil.

5 - Bolt
- ❑ Renew
- ❑ 4 Nm +45°

6 - Piston cooling jet control valve - N522-
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 174 .

7 - Seal
- ❑ Renew oil pressure switch each time it has been loosened.

8 - Oil pressure switch - F1-
- ❑ Blue or grey insulation
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 174
- ❑ 20 Nm

9 - Oil pressure switch for reduced oil pressure - F378-
- ❑ Brown insulation
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 175
- ❑ 20 Nm

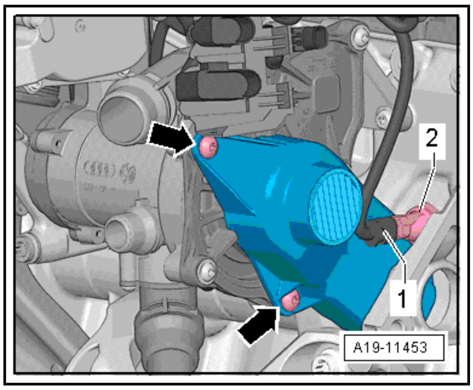
10 - Seal
- ❑ Renew oil pressure switch each time it has been loosened.

11 - Seal
- ❑ Renew oil pressure switch each time it has been loosened.

12 - Stage 3 oil pressure switch - F447-
- ❑ Checking ⇒ Vehicle diagnostic tester
- ❑ Removing and installing ⇒ page 176
- ❑ Fitting position ⇒ page 174
- ❑ 20 Nm

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installation position of stage 3 oil pressure switch - F447-



4.3 Removing and installing piston cooling jet control valve - N522-

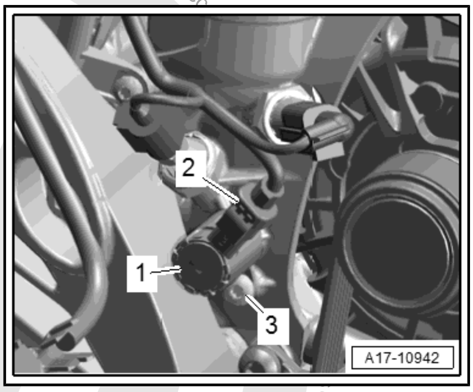
Removing

Note

Place a cloth underneath ancillary bracket to catch any escaping engine oil.

– Disconnect connector -2- on piston cooling jet control valve - N522- .

– Unscrew bolt -3-, and remove piston cooling jet control valve - N522- -1-.



Installing

Install in reverse order of removal, observing the following:

Note

- *Renew O-rings.*
- *Insert piston cooling jet control valves - N522- immediately in hole to avoid loss of oil.*

– Check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

Specified torques

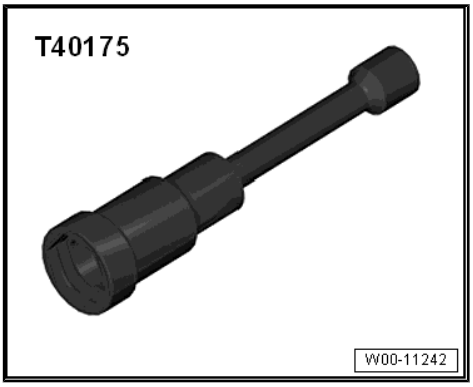
- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 173

4.4 Removing and installing oil pressure switch - F1-

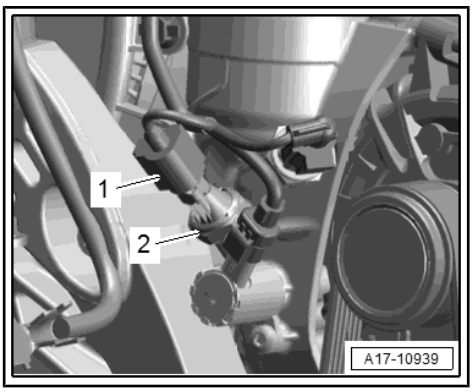
Special tools and workshop equipment required

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♦ Jointed wrench 24 mm - T40175-



Removing



Note

♦ *Place a cloth underneath ancillary bracket to catch any escaping engine oil.*

♦ *Renew the seal each time the oil pressure switch has been loosened.*

– Separate electrical connector -1- on oil pressure switch - F1- .

– Unscrew oil pressure switch -2-.

Installing

Installation is carried out in the reverse order. When installing, note the following:

Note

Screw oil pressure switch - F1- immediately into bore to avoid loss of oil.

– Check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

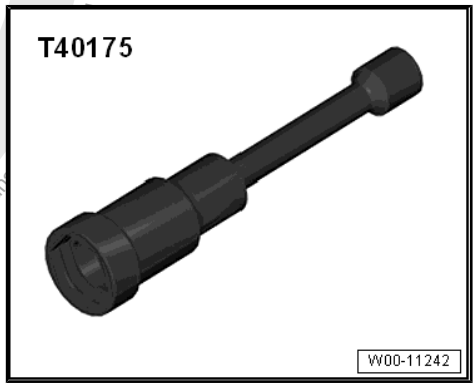
Specified torques

♦ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 173

4.5 Removing and installing oil pressure switch for reduced oil pressure - F378-

Special tools and workshop equipment required

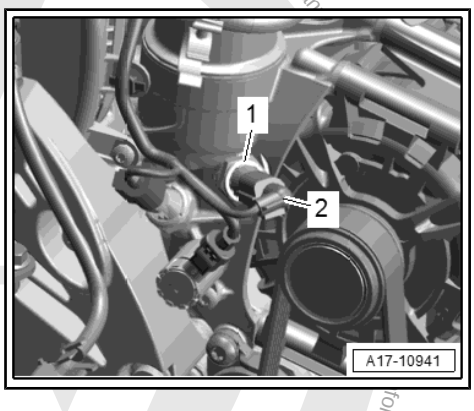
♦ Jointed wrench 24 mm - T40175-



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Removing



Note

- *Place a cloth underneath ancillary bracket to catch any escaping engine oil.*
- *Renew the seal each time the oil pressure switch has been loosened.*
- *Screw oil pressure switch for reduced oil pressure - F378- immediately into bore to avoid loss of oil.*

– Separate electrical connector -2- on oil pressure switch for reduced oil pressure - F378-.

– Unscrew oil pressure switch for reduced oil pressure -1-.

Installing

Installation is carried out in the reverse order. When installing, note the following:

– Check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil.

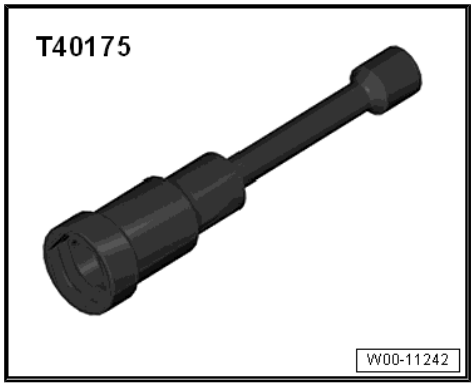
Specified torques

- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 173

4.6 Removing and installing stage 3 oil pressure switch - F447-

Special tools and workshop equipment required

- Jointed wrench 24 mm - T40175-



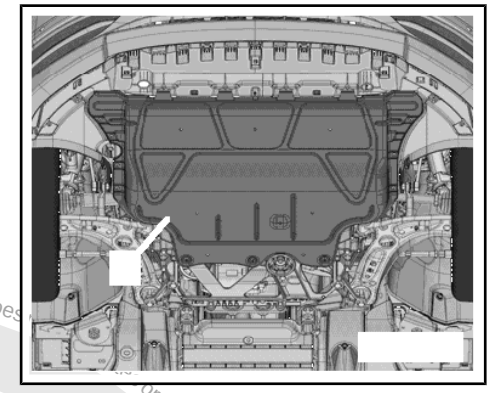
Note

Renew the seal each time the oil pressure switch has been loosened.

Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

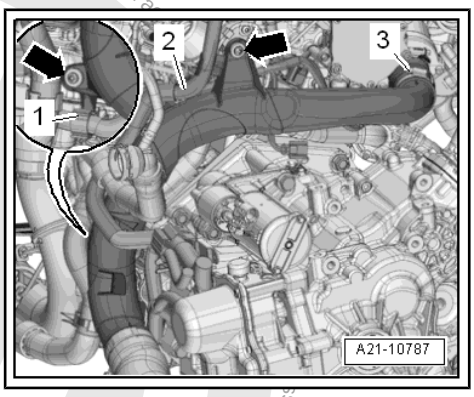
– Remove air filter housing ⇒ page 263 .



– Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.

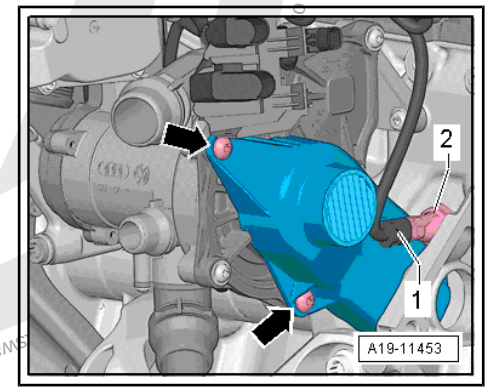
– Loosen screw-type clip -3-.

– Unscrew bolts -arrows-, loosen screw-type clip at bottom, and remove air pipe.



– Disconnect connector -1- from stage 3 oil pressure switch - F447- .

– Unscrew bolts -arrows- and remove toothed belt guard.



Note

Use cloth to catch escaping engine oil.

– Remove oil pressure switch, stage 3 - F447- -item 2- using articulated wrench, 24 mm - T40175-

Installing

Install in reverse order of removal, observing the following:

Note

Screw stage 3 oil pressure switch - F447- immediately into bore to avoid loss of oil.

– Check oil level ⇒ Maintenance ; Booklet ; Engine oil: Draining; Renewing oil filter and replenishing engine oil .

Specified torques

- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 173
- ⇒ “3.1 Assembly overview - air filter housing”, page 262
- Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

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4.7 Checking oil pressure

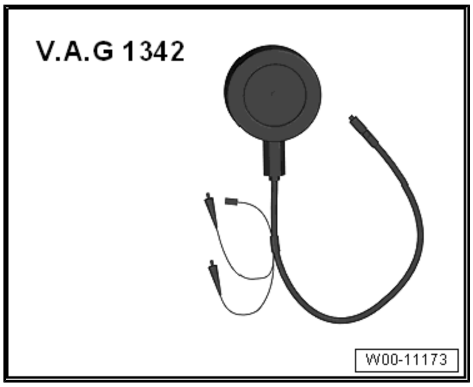
⇒ “4.7.1 Checking engine oil pressure”, page 178

⇒ “4.7.2 Checking oil pressure and oil spray jets”, page 179

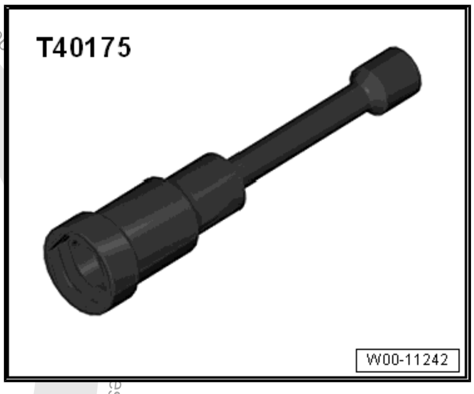
4.7.1 Checking engine oil pressure

Special tools and workshop equipment required

- ♦ Oil pressure tester - V.A.G 1342-



- ♦ Jointed wrench 24 mm - T40175-



Conditions for testing

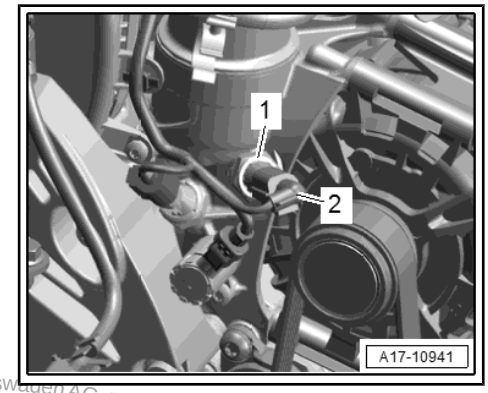
- Oil level OK.
- Engine oil temperature at least 80°C (radiator fan must have run once)

Note

- ♦ *The oil pump is regulated and has 2 pressure levels. The pressure levels are checked subsequently.*
- ♦ *During the run-in period (approx. 1000 km) or emergency running mode of the engine, the oil pump operates only at high pressure level.*
- ♦ *The oil pressure depends on the engine oil temperature. At an engine oil temperature of 80°C the mean value must be attained approximately.*

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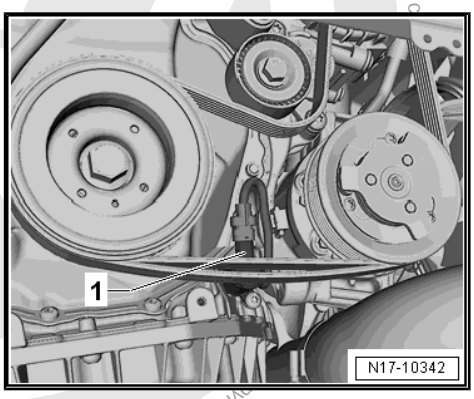
Test sequence



– Separate electrical connector -2- on oil pressure switch for reduced oil pressure - F378- .
– Place a cloth underneath ancillary bracket to catch any escaping engine oil.
– Unscrew oil pressure switch for reduced oil pressure -1-.
– Screw oil pressure tester - V.A.G 1342- into oil filter bracket in place of the oil pressure switch.
– Screw oil pressure switch for reduced oil pressure - F378- into oil pressure tester , and connect connector.
– Connect oil pressure tester to earth.
– Start engine, and check oil pressure at the specified engine speed levels (low pressure level).

• Oil pressure at idling speed: 0.85 to 1.6 bar
• Oil pressure at 2000 rpm: 1.2 to 1.6 bar
• Oil pressure at 3000 rpm: 1.2 to 1.6 bar

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

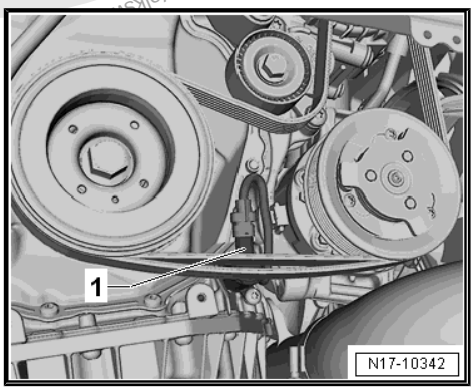


– Pull connector -1- off valve for oil pressure control - N428- . Unclip cable and route it towards bottom to prevent it from being trapped in the belt drive. With disconnected connector the oil pump operates at high pressure level.
– Start engine, and check oil pressure at the specified engine speed levels (high pressure level).

• Oil pressure at idling speed: 0.85 to 4.0 bar
• Oil pressure at 2000 rpm: 2.0 to 4.0 bar
• Oil pressure at 3000 rpm: 3.0 to 4.0 bar

Installing

– Install oil pressure switch.



– Connect connector -1- to valve for oil pressure control - N428- . Route cable carefully.
– Install noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview – noise insulation .
– Read engine control unit event memory, and clear all entries.

Specified torques

◆ ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 173

4.7.2 Checking oil pressure and oil spray jets

Special tools and workshop equipment required

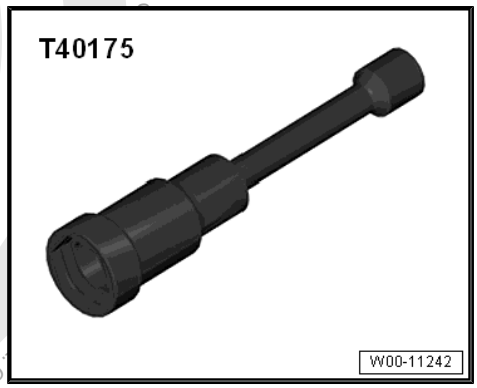
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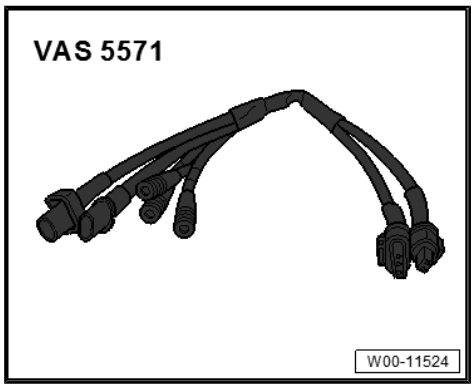
- Oil pressure tester - V.A.G 1342-



- Jointed wrench 24 mm - T40175-



- Test instrument/DSO adapter - VAS 5571-



Note

During this check procedure, the piston cooling jet control valve - N522- and the oil passage to the oil spray jets for cooling the pistons are checked.

Conditions for testing

- Oil level OK.
- Engine oil pressure OK.
- Oil pressure tester - V.A.G 1342- is connected as described in section ⇒ “4.7.1 Checking engine oil pressure”, page 178 .

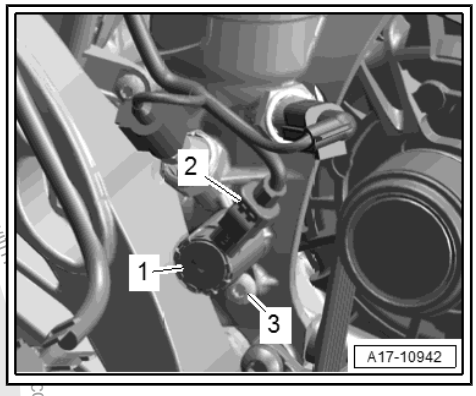
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Test sequence

– Pull connector -2- off piston cooling jet control valve - N522- . Connect connector and control valve to test instrument/DSO adapter - VAS 5571- .

– Start engine and allow to idle.

– Observe oil pressure tester , disconnect connector for control valve, and connect it again. A pressure variation must be indicated on the oil pressure tester .



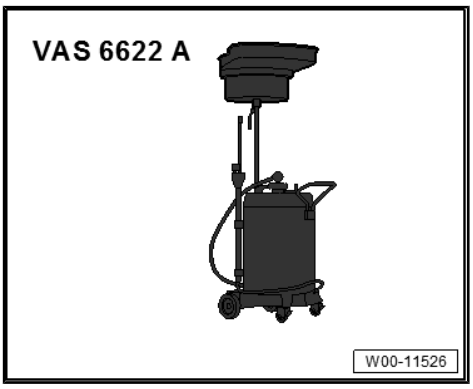
Note

If the engine runs at idling speed, the oil passage to the oil spray jets is closed. When the connector is pulled off, the oil passage to the oil spray jets is opened. If no pressure variation is indicated, the piston cooling jet control valve - N522- is defective, or the oil passage to the oil spray jets is blocked.

4.8 Removing and installing oil pressure regulating valve - N428-

Special tools and workshop equipment required

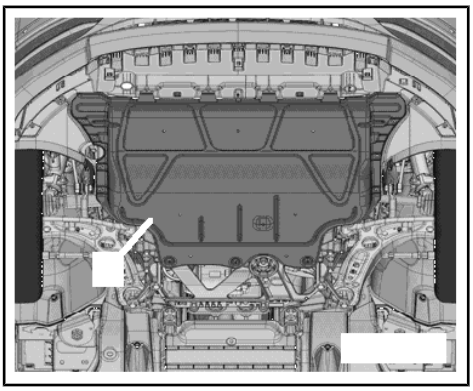
♦ Used oil collection and extraction unit - VAS 6622A-



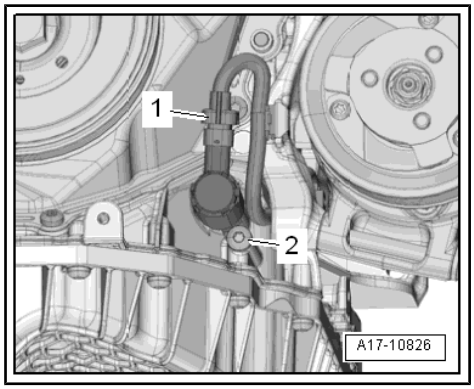
Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

– Remove poly V-belt ⇒ page 44 .



– Place used oil collection and extraction unit - VAS 6622- under engine.
– Separate connector -1-.
– Unscrew bolt -2- and pull off oil pressure control valve - N428- -3-.



Installing

Install in reverse order of removal, observing the following:

Note

Renew O-ring.

Specified torques

- ⇒ “4.2 Exploded view - oil pressure switches/oil pressure control”, page 173
- Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

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19 – Cooling

1 Cooling system/coolant

⇒ “1.1 Connection diagram - coolant hoses”, page 183

⇒ “1.2 Checking cooling system for leaks”, page 186

⇒ “1.3 Draining and adding coolant”, page 188

1.1 Connection diagram - coolant hoses

⇒ “1.1.1 Vehicles with manual gearbox”, page 183

⇒ “1.1.2 Vehicles with dual clutch gearbox”, page 184

1.1.1 Vehicles with manual gearbox

Note

- *Blue = large coolant circuit.*
- *Red = small coolant circuit.*
- *Brown = heater circuit.*
- *Yellow = gear oil cooling circuit.*
- *The arrows point in the direction of coolant flow.*

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1 - Radiator for engine coolant

2 - Radiator outlet coolant temperature sender - G83-

3 - Actuator for engine temperature regulation - N493-

4 - Cylinder head/cylinder block

5 - Throttle

6 - Auxiliary heater
- ❑ Equipment version

7 - Coolant expansion tank

8 - Cap for coolant expansion tank
- ❑ Check pressure relief valve ⇒ page 188

9 - Non-return valve

10 - Exhaust manifold
- ❑ Integrated in cylinder head

11 - Exhaust turbocharger

12 - Heat exchanger for heater

13 - Throttle

14 - Non-return valve

15 - Auxiliary pump for heating - V488-

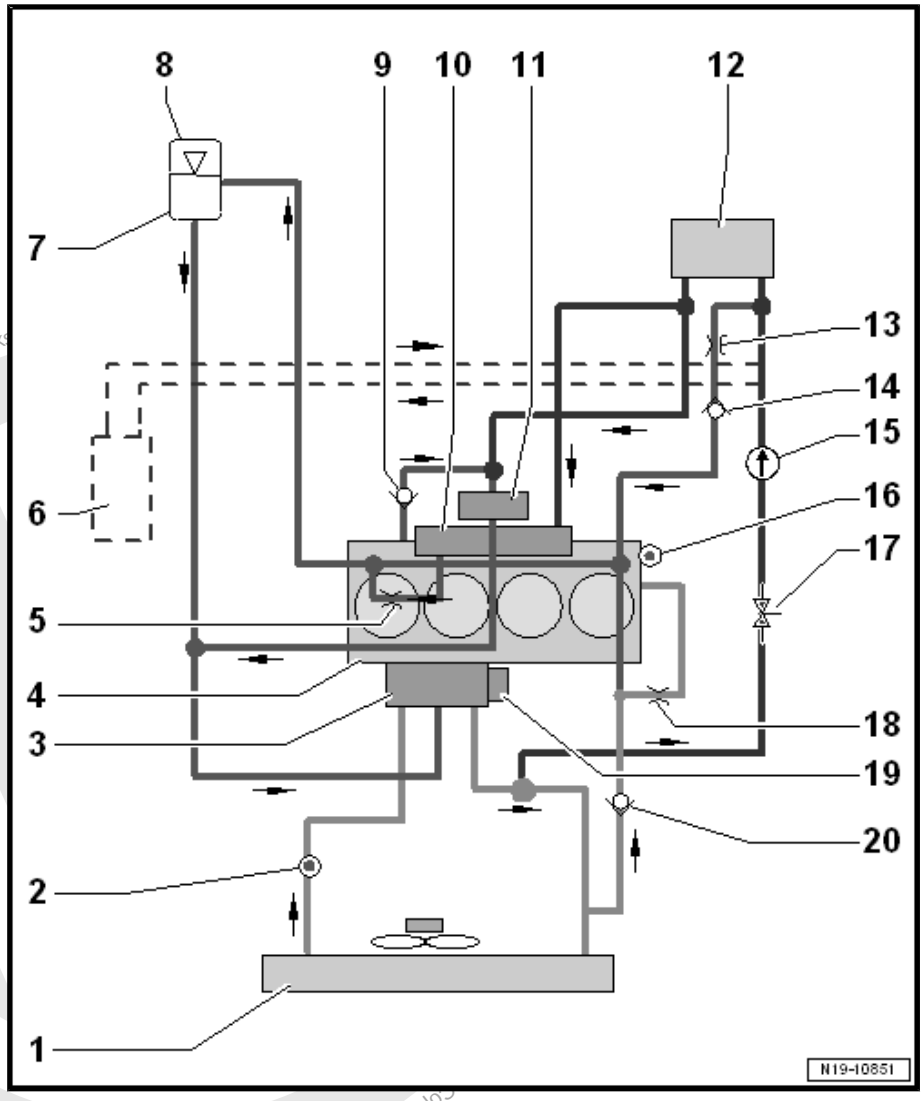
16 - Radiator outlet coolant - G62-

17 - Coolant shut-off valve - N82-

18 - Throttle

19 - Coolant pump

20 - Non-return valve

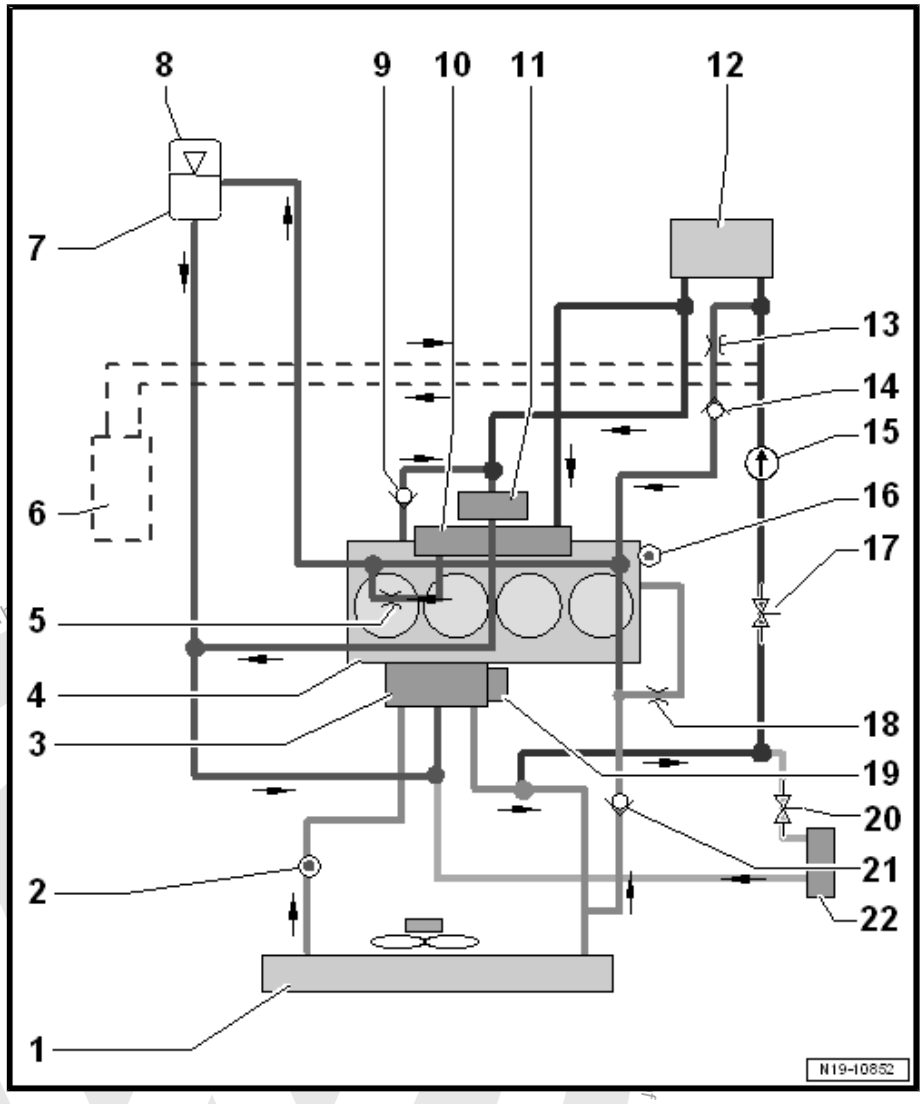


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1.1.2 Vehicles with dual clutch gearbox

Note

- *Blue = large coolant circuit.*
- *Red = small coolant circuit.*
- *Brown = heater circuit.*
- *Yellow = gear oil cooling circuit.*
- *The arrows point in the direction of coolant flow.*



1 - Radiator for engine coolant

2 - Radiator outlet coolant temperature sender - G83-

3 - Actuator for engine temperature regulation - N493-

4 - Cylinder head/cylinder block

5 - Throttle

6 - Auxiliary heater

- ❑ Equipment version

7 - Coolant expansion tank

8 - Cap for coolant expansion tank

- ❑ Check pressure relief valve ⇒ page 188

9 - Non-return valve

10 - Exhaust manifold

- ❑ Integrated in cylinder head

11 - Exhaust turbocharger

12 - Heat exchanger for heater

13 - Throttle

14 - Non-return valve

15 - Auxiliary pump for heating - V488-

16 - Radiator outlet coolant - G62-

17 - Coolant shut-off valve - N82-

18 - Throttle

19 - Coolant pump

20 - Coolant valve for gearbox - N488-

21 - Non-return valve

22 - Gear oil cooler

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1.2 Checking cooling system for leaks

Special tools and workshop equipment required



- Adapter for cooling system tester - V.A.G 1274/8-
- Adapter for cooling system tester - V.A.G 1274/9-
- Cooling system tester - V.A.G 1274 B-

Note

To perform the leakage test correctly, first run a self-test on the cooling system tester - V.A.G 1274 B- .

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Self-test of cooling system tester - V.A.G 1274 B-

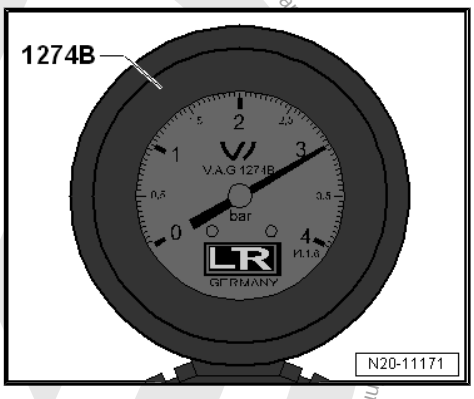
– Operate cooling system tester - V.A.G 1274 B- several times.

– Build up a pressure of 3.0 bar on cooling system tester .

– Observe pressure on pressure gauge of cooling system tester for 30 seconds.

If no pressure builds up or if the pressure drops again:

The cooling system tester - V.A.G 1274 B- is leaking and should not be used.



Checking cooling system for leaks

• Engine at operating temperature.

CAUTION

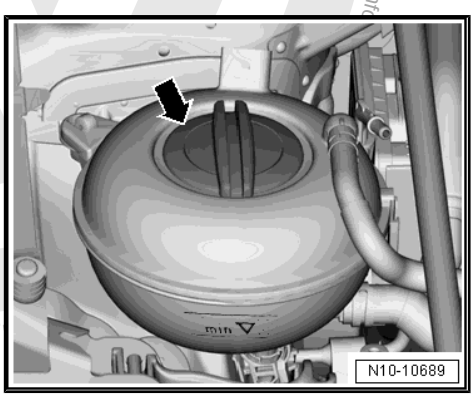
On a warm engine, the cooling system is under high pressure. Danger of scalding due to steam and hot coolant.

Skin and other parts of the body may be scalded.

– Wear protective gloves.

– Wear protective goggles.

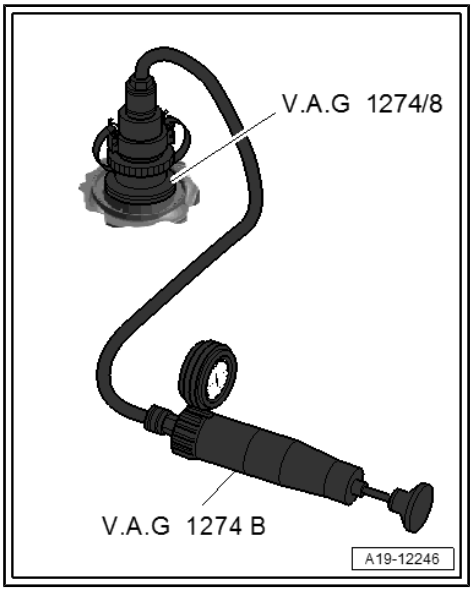
– Reduce excess pressure by covering the cap of the coolant expansion tank with cloths and opening it carefully.



– Open filler cap -arrow- for coolant expansion tank.

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– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/8- to coolant expansion tank.
– Build up pressure of approx. 1.5 bar using hand pump of cooling system tester.
• The pressure must not drop by more than 0.2 bar within 10 minutes.
– If the pressure drops by more than 0.2 bar, locate and rectify leaks.

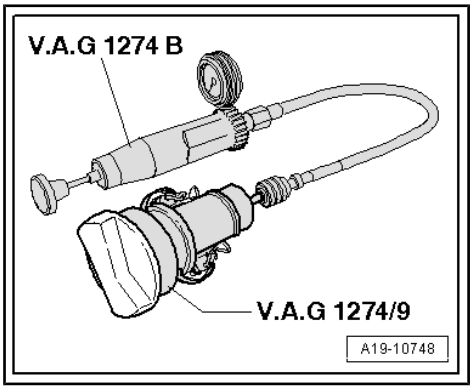


Note

The pressure drop of 0.2 bar within 10 minutes depends on the how far the coolant can cool down. The colder the engine, the lower the pressure drop. If necessary, repeat the check while the engine is cold.

Check pressure relief valve in cap.

– Fit cooling system tester - V.A.G 1274 B- with adapter - V.A.G 1274/9- onto coolant filler cap.
– Build up pressure using hand pump of cooling system tester.
• The pressure relief valve must open at a pressure of 1.6 to 1.8 bar.
– Renew filler cap, if pressure relief valve does not open as described.



1.3 Draining and adding coolant

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Special tools and workshop equipment required



- Adapter for cooling system tester - V.A.G 1274/8-
- Hose clamp pliers - VAS 6340-
- Coolant system charge unit - VAS 6096-
- Drip tray for workshop hoist - VAS 6208-
- Refractometer - T10007 A-
- Vehicle diagnostic tester

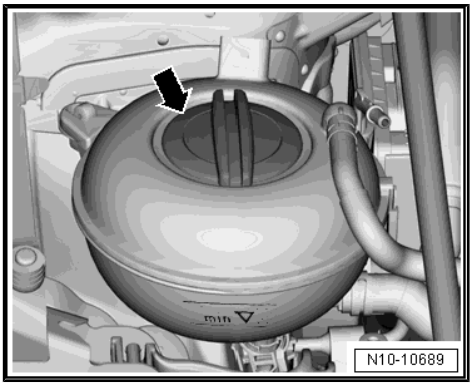
Draining

CAUTION

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

Skin and other parts of the body may be scalded.

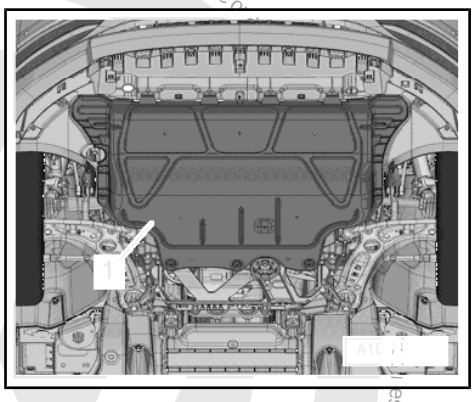
- **Wear protective gloves.**
- **Wear protective goggles.**
- **Reduce excess pressure by covering the cap of the coolant expansion tank with cloths and opening it carefully.**



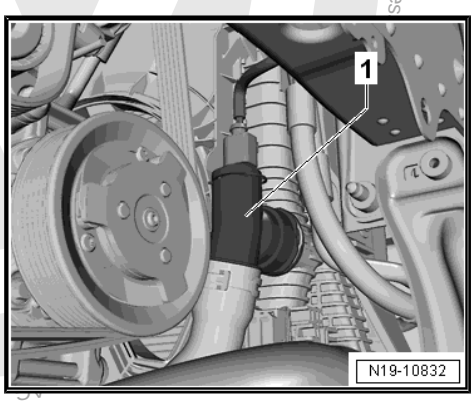
– Open filler cap -arrow- for coolant expansion tank.

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

– Place drip tray for workshop hoist - VAS 6208- underneath.



– Disconnect coolant hose -1- from lower right of radiator, and drain coolant.



Preparing cooling system for filling:

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Note

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

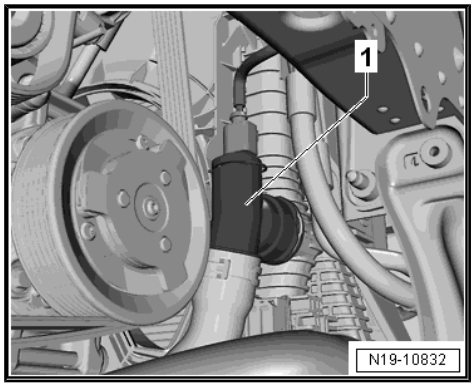
Coolant mixture ratio

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

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Procedure

– Connect coolant hose with plug-in connector -1- to radiator at bottom right ⇒ page 220 .



– Fill coolant expansion tank of -VAS 6096- with 10 litres of pre-mixed coolant in correct mixture ratio; mixture ratio ⇒ page 191 .
– Screw adapter for cooling system tester - V.A.G 1274/8- onto coolant expansion tank.
– Attach cooling system charge unit - VAS 6096- to adapter - V.A.G 1274/8- .
– Feed vent hose -1- into a small container -2-.

Note

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

– Close valves -A- and -B- (turn lever transverse to direction of flow to do this).
– Fit hose -3- to compressed air supply with a pressure of 6 … 10 bar.
– Connect ⇒ Vehicle diagnostic tester, and select following functions.

◆ `Engine control unit functions`
◆ `0001 - Fill/bleed cooling system`

Filling with coolant:

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– Open valve -B-; turn lever in direction of flow to do this.

• In cooling system, vacuum is generated by suction jet pump; needle of gauge must move into green area.

– Also briefly open valve -A- (turn lever in direction of flow to do this) so that hose on -VAS 6096- coolant reservoir fills with coolant.

– Close valve -A- again.

– Leave valve -B- open for a further 2 minutes.

• Vacuum continues to be generated in the cooling system by the suction jet pump; the needle of gauge must remain in green range.

– Close valve -B-.

– Pull off compressed air hose.

• The needle on the gauge should stop in the green zone. The vacuum level in the cooling system is then sufficient for subsequent filling.

Note

♦ *If the needle does not reach the green zone, repeat the process.*

♦ *If vacuum drops, cooling system must be checked for leaks.*

♦ *The subsequent filling must be performed »slowly«.*

– Open valve -A- slowly.

• Vacuum in cooling system causes coolant to be extracted from -VAS 6096- coolant reservoir and coolant system to be filled.

• The coolant level must be above the max. marking after filling.

– Remove cooling system charge unit - VAS 6096- from coolant expansion tank.

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

– On vehicles with auxiliary heater, switch on auxiliary heater for about 30 seconds.

– Set temperature regulator to “HI”.

– Switch off air conditioner compressor. To do this, press AC button.

• LED in button should not light up.

– Start engine and run it for max. 2 min. at a speed of approx. 1,500 rpm.

– Fill coolant up to the overflow hole of the coolant expansion tank while the engine is running.

– Tighten cap of coolant expansion tank until it engages.

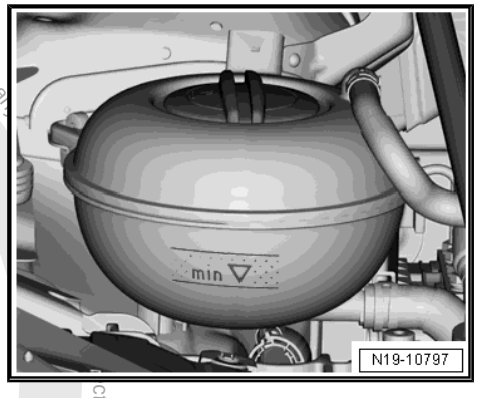
– Then run engine at idling speed until radiator fan cuts in.

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– Check coolant level.

- When the engine is cold, the coolant level must be between “min.” and max. marking.
- The coolant level must be at the max. marking when the engine is warm.

– Fill more coolant if necessary.



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2 Coolant pump, regulation of cooling system

⇒ “2.1 Assembly overview - coolant pump, thermostat”, page 195

⇒ “2.2 Assembly overview - electric coolant pump”, page 197

⇒ “2.3 Assembly overview - coolant temperature sender”, page 200

⇒ “2.4 Removing and installing auxiliary pump for heating V488 ”, page 200

⇒ “2.5 Removing and installing coolant pump”, page 203

⇒ “2.6 Removing and installing toothed belt for coolant pump”, page 205

⇒ “2.7 Removing and installing coolant shut-off valve N82 ”, page 207

⇒ “2.8 Removing and installing coolant valve for gearbox N488 , vehicles with dual clutch gearbox”, page 209

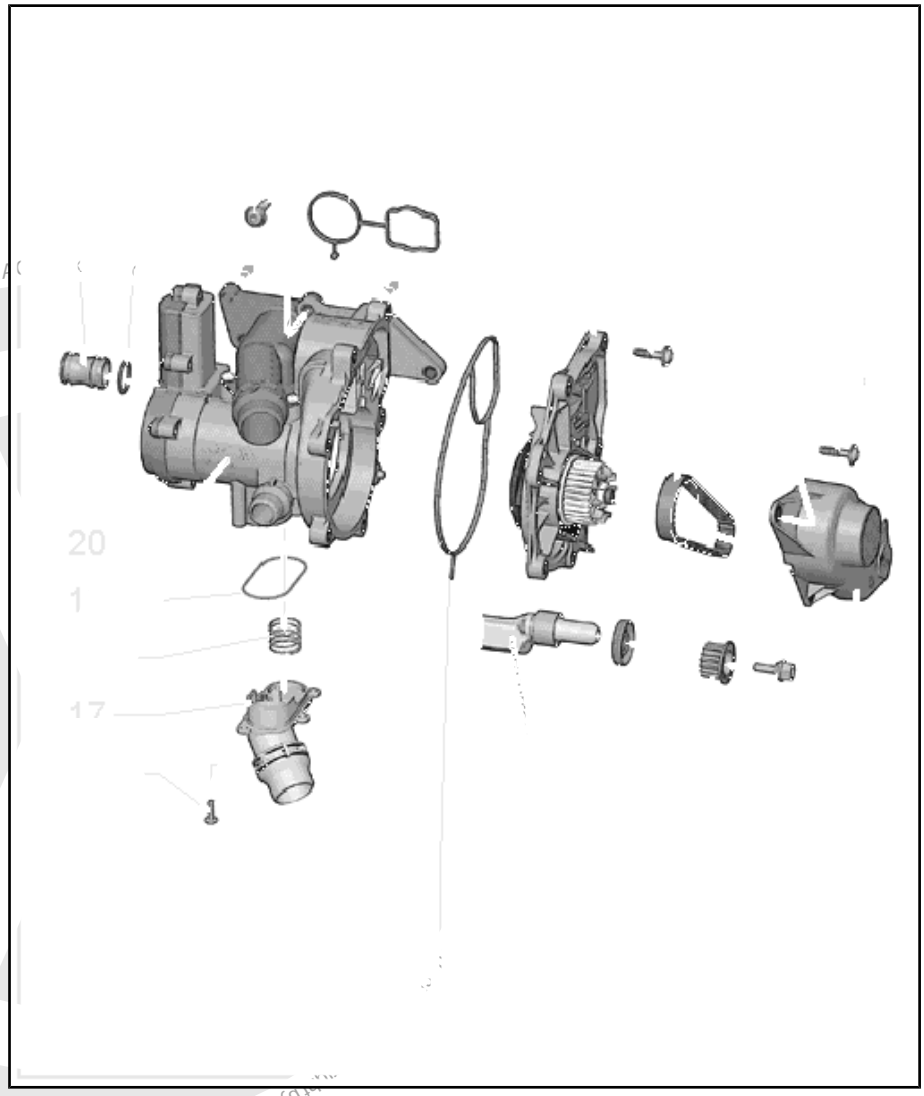
⇒ “2.9 Removing and installing actuator for engine temperature regulation N493 ”, page 211

⇒ “2.10 Removing and installing coolant temperature sender G62 ”, page 212

⇒ “2.11 Removing and installing radiator outlet coolant temperature sender G83 ”, page 214

2.1 Assembly overview - coolant pump, thermostat

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1 - Connection

2 - O-ring

- ❑ Renew
- ❑ Moisten with coolant

3 - Centring pin

4 - Bolt

- ❑ Specified torque and tightening sequence ⇒ page 197

5 - Seal

- ❑ Renew

6 - Coolant pump

- ❑ Removing and installing ⇒ page 203
- ❑ New coolant pump: remove protective cap

7 - Bolt

- ❑ Tightening sequence ⇒ page 197

8 - Toothed belt

- ❑ For coolant pump
- ❑ Removing and installing ⇒ page 205

9 - Bolt

- ❑ 9 Nm

10 - Toothed belt guard

11 - Bolt

- ❑ Left-hand thread
- ❑ Renew
- ❑ 10 Nm +90° further

12 - Toothed belt drive sprocket

- ❑ Observe installation position

13 - Oil seal for balance shaft, inlet side

- ❑ Renewing ⇒ page 76

14 - Balancer shaft

15 - Seal

- ❑ Renew

16 - Bolt

- ❑ 9 Nm

17 - Union

18 - Spring

19 - Seal

- ❑ Renew

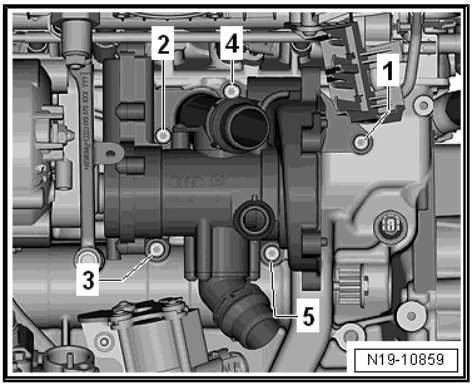
20 - Actuator for engine temperature regulation - N493-

- ❑ Removing and installing ⇒ page 211

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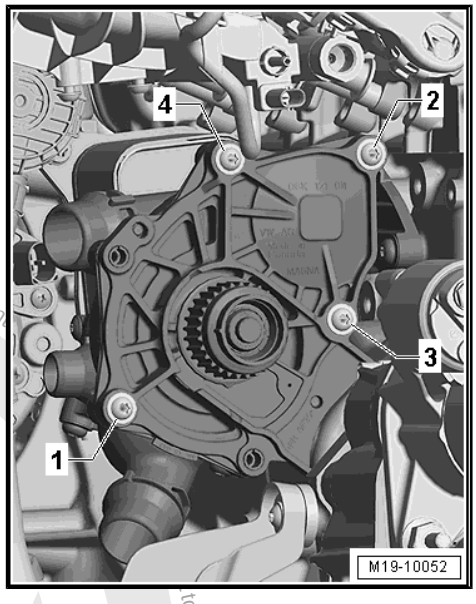
Actuator for engine temperature regulation - N493- - tightening torque and sequence

– Tighten bolts in the order -1 ... 5- to 9 Nm.



Coolant pump - specified torque and tightening sequence

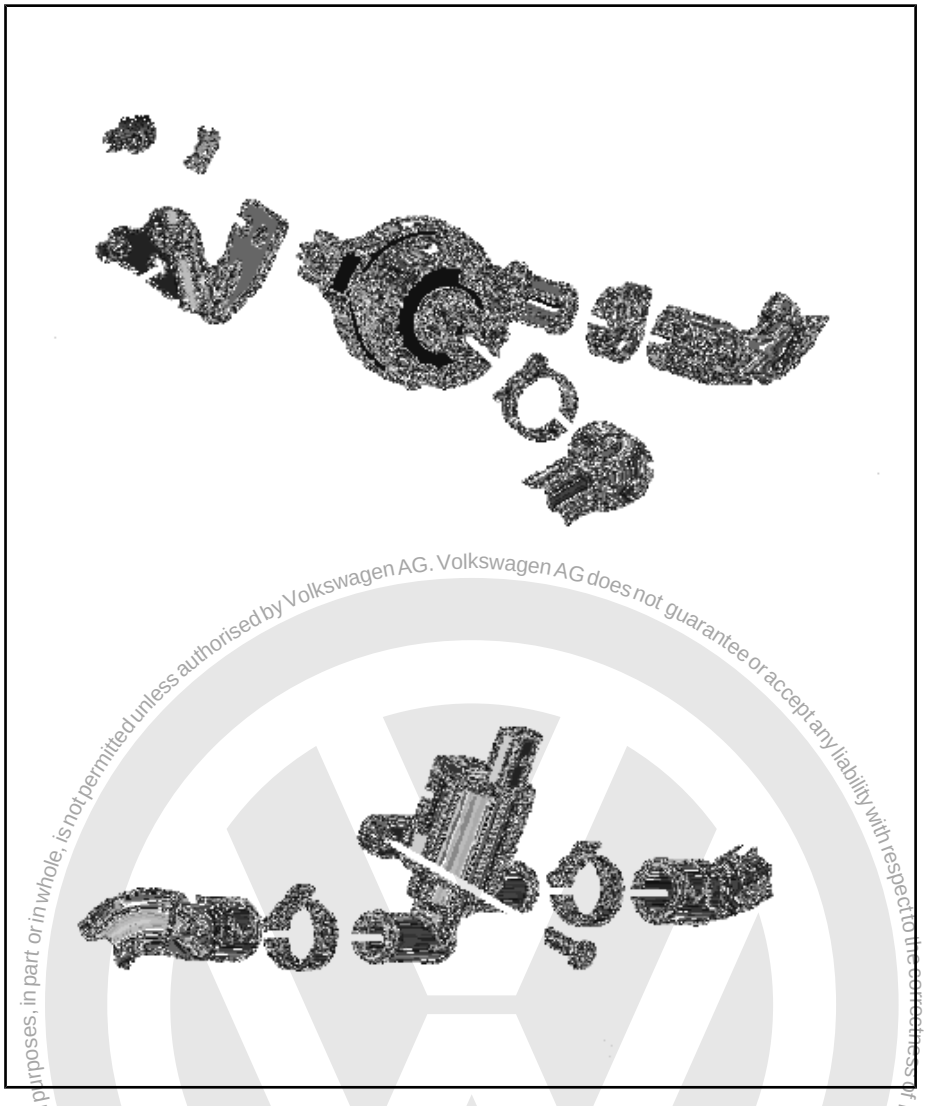
– Tighten bolts for coolant pump in the sequence -1 … 4- to 9 Nm.



2.2 Assembly overview - electric coolant pump

Auxiliary pump for heating - V488- , coolant shut-off valve - N82-

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1 - Coolant hose

2 - Coolant shut-off valve - N82-

- ❑ Removing and installing ⇒ page 207

3 - Auxiliary pump for heating - V488-

- ❑ with holder
- ❑ May vary depending on version
- ❑ Removing and installing ⇒ page 200

4 - Bracket

- ❑ For auxiliary pump for heating - V488-

5 - Bolt

- ❑ 20 Nm

6 - Clip

7 - Coolant hoses

8 - Coolant hose

9 - Bolt

- ❑ 9 Nm

Coolant valve for gearbox - N488- , vehicles with dual clutch gearbox

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1 - Coolant hose

2 - Hose clamp

3 - Bolts

- ❑ 25 Nm

4 - Bracket

- ❑ For coolant valve for gearbox - N488-

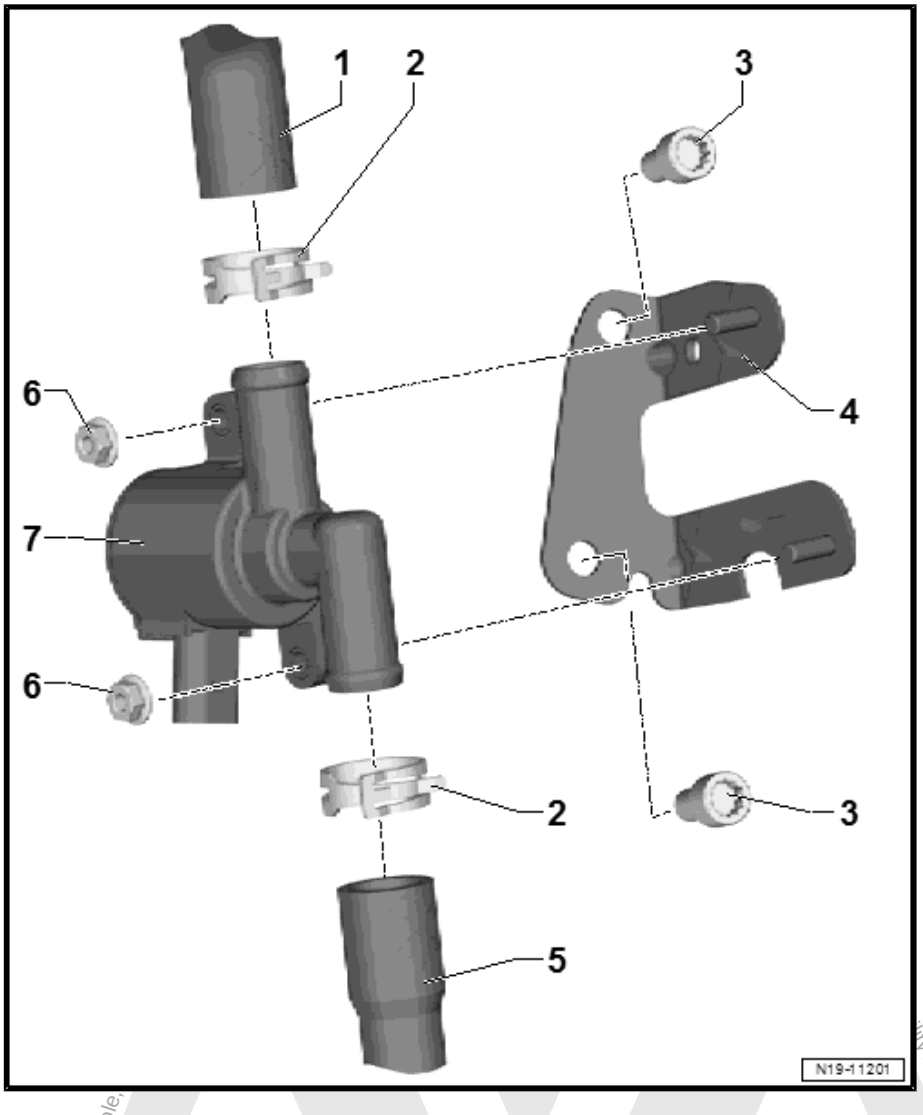
5 - Coolant hose

6 - Nuts

- ❑ 9 Nm

7 - Coolant valve for gearbox - N488-

- ❑ Removing and installing ⇒ page 209



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2.3 Assembly overview - coolant temperature sender

1 - Retaining clip
- ❑ Check for firm seating

2 - O-ring
- ❑ Renew

3 - Radiator outlet coolant temperature sender - G83-
- ❑ Removing and installing ⇒ page 214

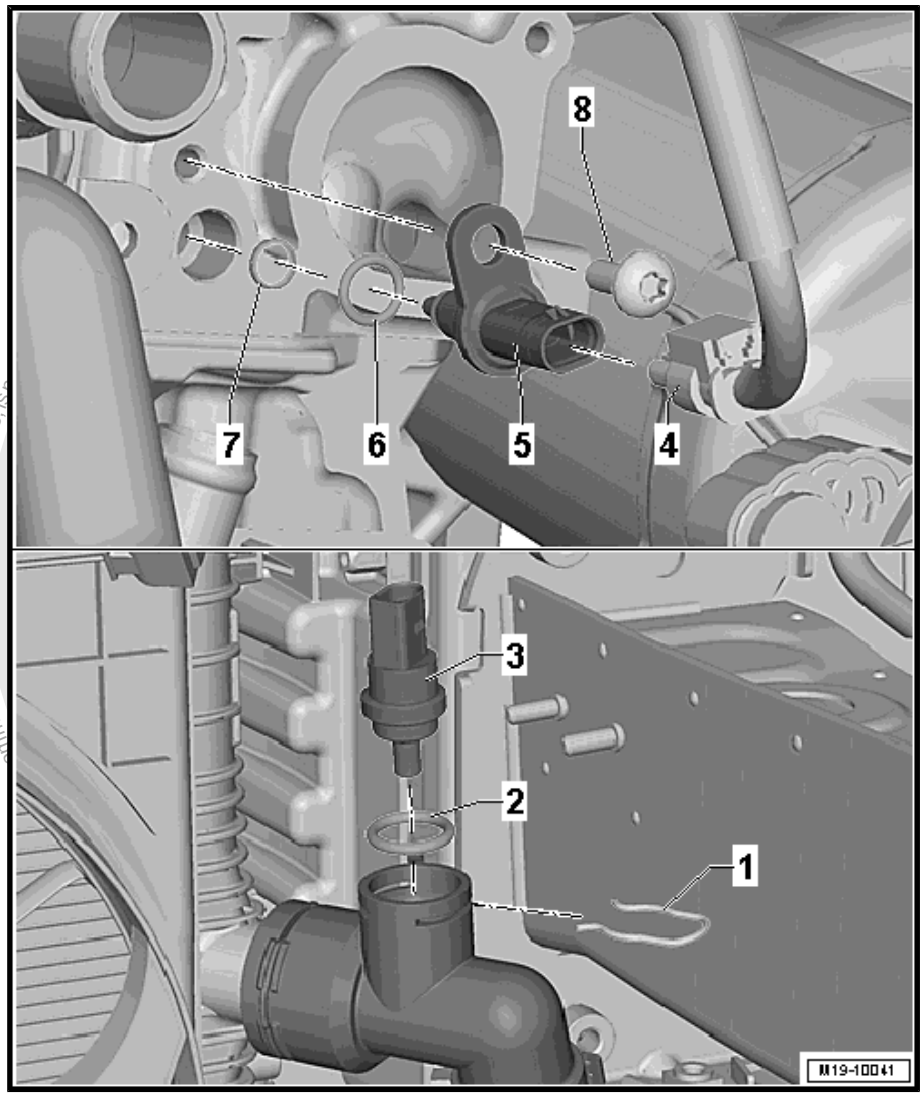
4 - Electrical connector

5 - Radiator outlet coolant - G62-
- ❑ On cylinder head (gearbox end).
- ❑ Removing and installing ⇒ page 212

6 - O-ring
- ❑ Renew
- ❑ Moisten with coolant

7 - O-ring
- ❑ Renew
- ❑ Moisten with coolant

8 - Bolt
- ❑ Renew
- ❑ 4 Nm +45°

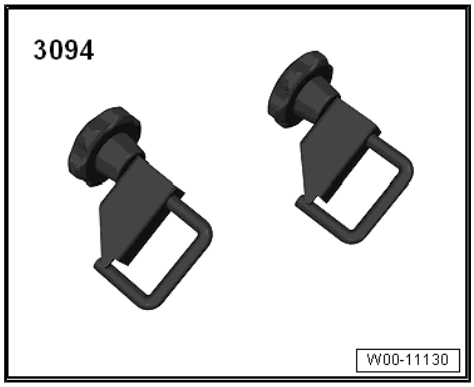


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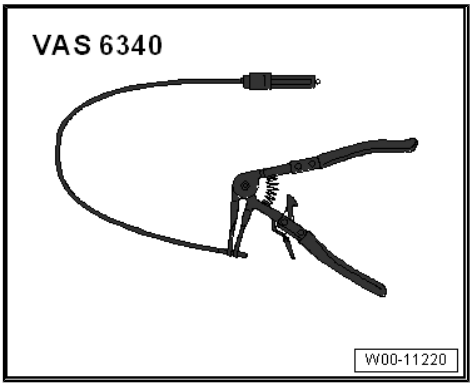
2.4 Removing and installing auxiliary pump for heating - V488-

Special tools and workshop equipment required

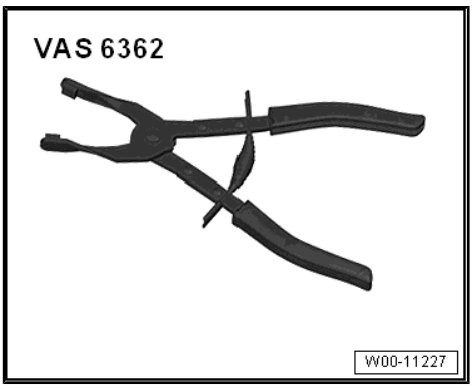
♦ Hose clamps to 25 mm - 3094-



- Hose clamp pliers - VAS 6340-



- Spring-type clip pliers - VAS 6362-



Removing

Note

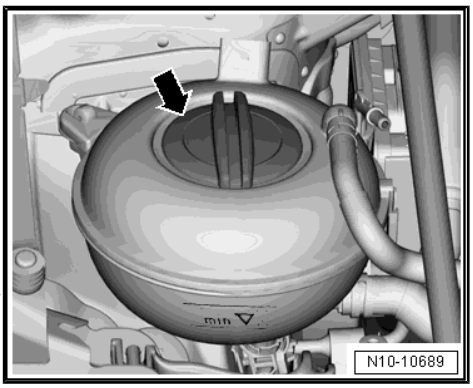
Fit all heat insulation sleeves in the original position when installing.

CAUTION

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

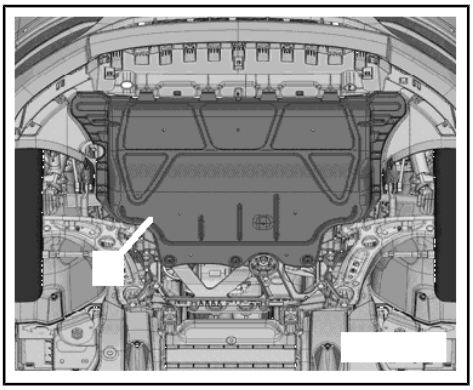
Skin and other parts of the body may be scalded.

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



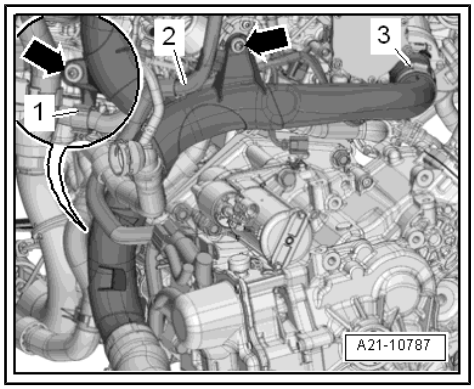
– Open filler cap -arrow- for coolant expansion tank.

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

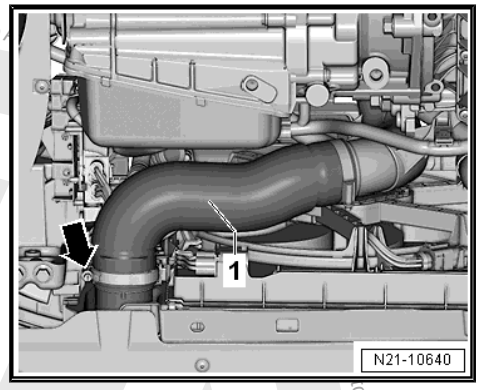


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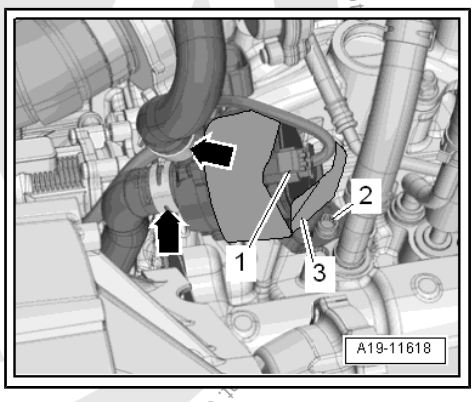
– Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.
– Loosen screw-type clip -3-.
– Unscrew bolts -arrows-.



– Loosen hose clip -arrow-, and remove charge air hose -1- downwards, together with air pipe.



– Open heat insulation sleeve -3-.
– Separate connector -1-.
– Clamp off coolant hoses on auxiliary pump for heating - V488- using hose clamps -3094- .



Note

Use a cloth to catch the escaping coolant.

– Release hose clips -arrows- and detach coolant hoses.
– Unscrew bolt -2-, and remove auxiliary pump for heating - V488- .

Installing

Install in reverse order of removal, observing the following:

Note

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

– Check coolant level ⇒ page 194 .

Specified torques

- ⇒ “2.2 Assembly overview - electric coolant pump”, page 197
- ⇒ “3.1 Assembly overview - air filter housing”, page 262
- Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

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2.5 Removing and installing coolant pump

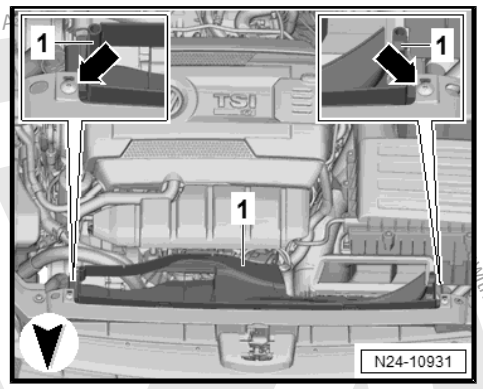
Removing

– Drain coolant ⇒ page 188 .

– Remove air filter housing ⇒ page 263 .

– Unscrew bolt -arrow- on left and right.

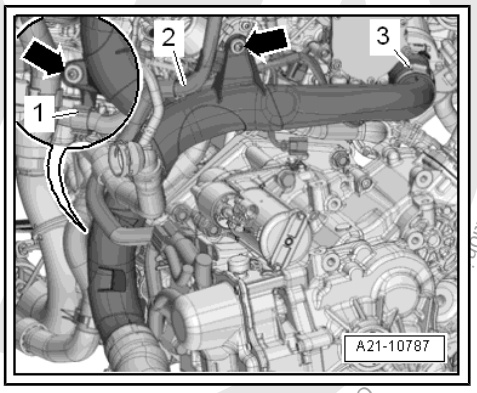
– Unclip lower part of air duct -1- and remove it.



– Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.

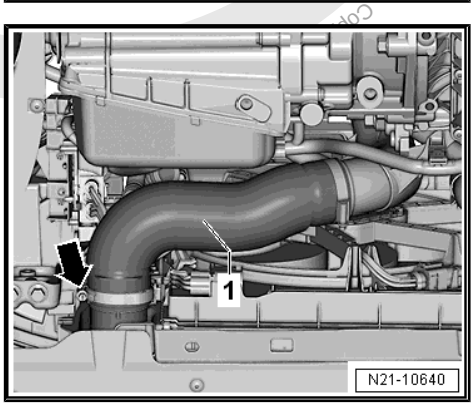
– Loosen screw-type clip -3-.

– Unscrew bolts -arrows-.

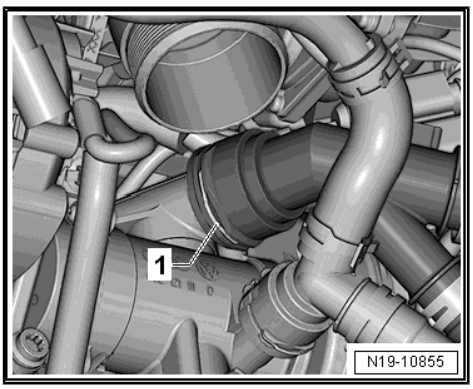


– Loosen hose clip -arrow-, and remove charge air hose -1- downwards, together with air pipe.

– Remove throttle valve module ⇒ page 271 .

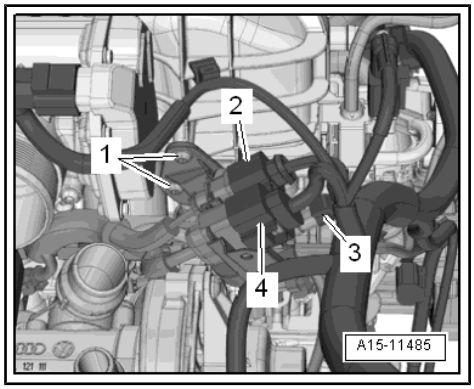


– Lift retaining clip -1-, detach upper coolant connection and push it to one side.

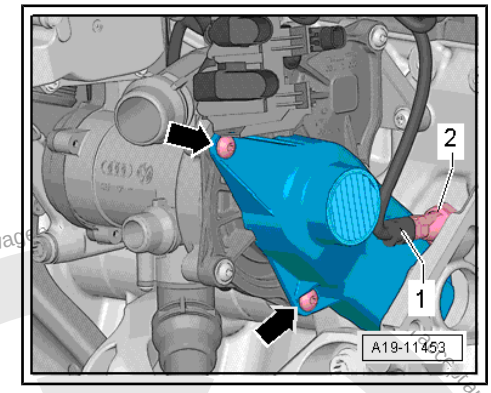


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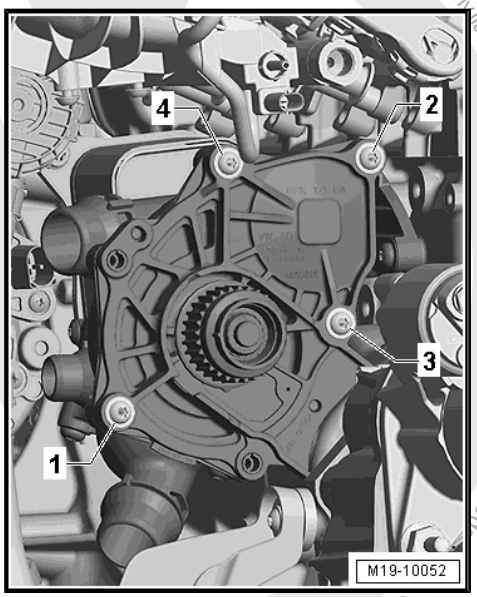
– Disconnect connectors -2, 3 and 4-. Unscrew securing bolts -1-, and lay bracket to one side.



– Separate electrical connector -1- on oil pressure switch -2-.
– Unscrew bolts -arrows- and remove toothed belt guard.



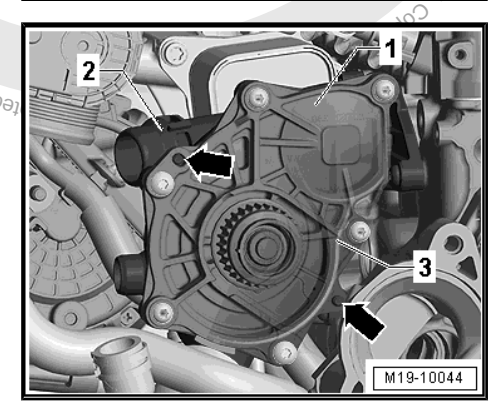
– Unscrew bolts -1 … 4-, and remove toothed belt from coolant pump.
– Unscrew bolts -1 … 4- completely, and detach coolant pump from actuator for engine temperature regulation - N493- .



Installing

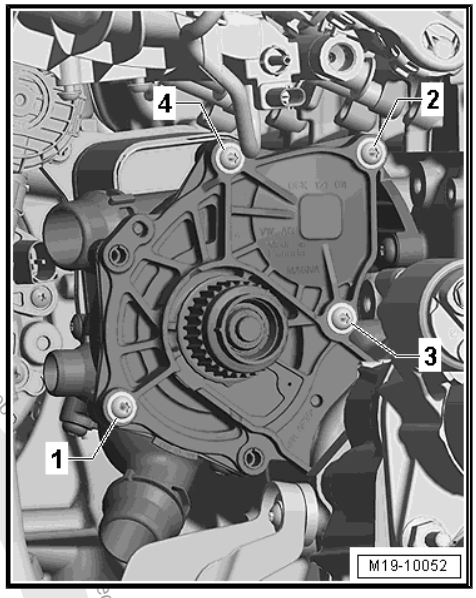
Install in reverse order of removal, observing the following:

– Fit coolant pump, and install toothed belt.
– Ensure correct seating of centring rings -arrows- and seal -3-.



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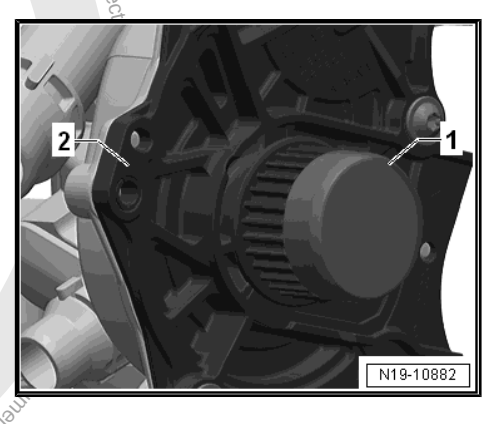
– Tighten bolts -1 … 4- when the toothed belt is fitted. Specified torque and tightening sequence ⇒ page 197 .



– If a new coolant pump has been installed, pull off protective cap -1-.
– Add coolant ⇒ page 190 .

Specified torques

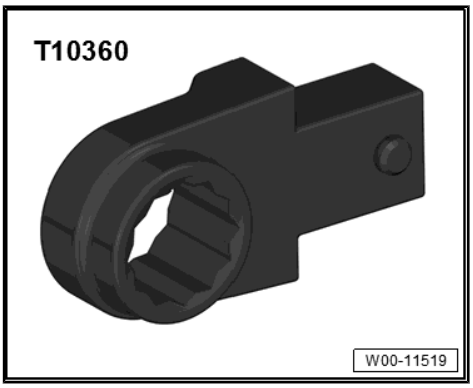
- ⇒ "2.1 Assembly overview - coolant pump, thermostat", page 195
- ⇒ 3.1 Assembly overview - air filter housing", page 262



2.6 Removing and installing toothed belt for coolant pump

Special tools and workshop equipment required

- Insert tool - T10360-

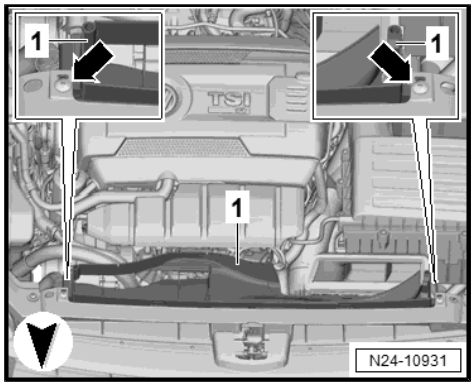


Removing

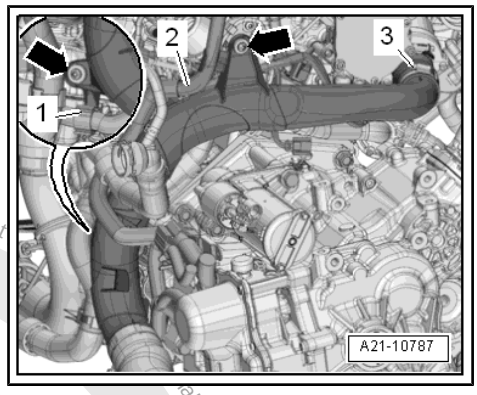
– Drain coolant ⇒ page 188 .
– Remove air filter housing ⇒ page 263 .

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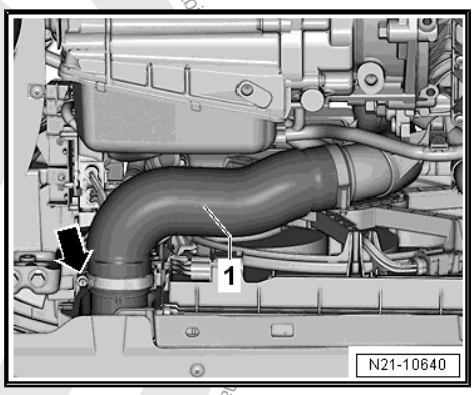
– Unscrew bolt -arrow- on left and right.
– Unclip lower part of air duct -1- and remove it.



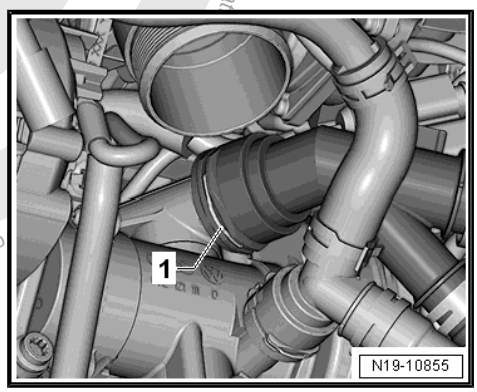
– Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.
– Loosen screw-type clip -3-.
– Unscrew bolts -arrows-.



– Loosen hose clip -arrow-, and remove charge air hose -1- downwards, together with air pipe.



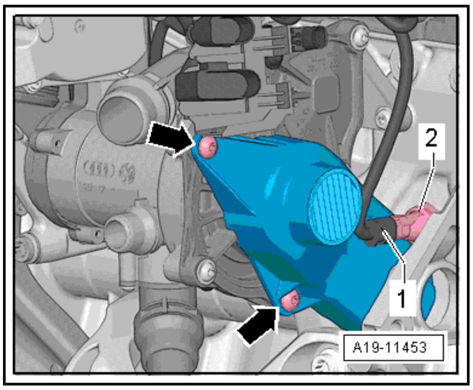
– Lift retaining clip -1-, detach upper coolant connection and push it to one side.

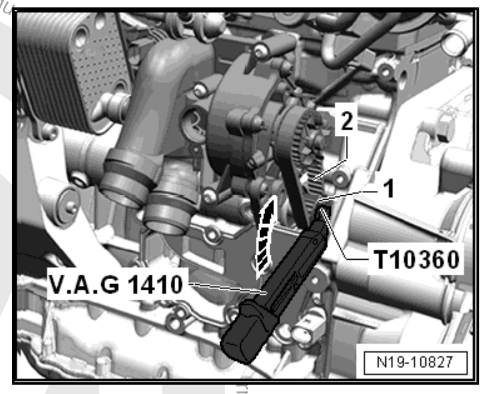


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– Separate electrical connector -1- on oil pressure switch -2-.

– Unscrew bolts -arrows- and remove toothed belt guard.





Note

The drive sprocket bolt has a left-hand thread.

– Loosen bolt on drive sprocket -1- for coolant pump using torque wrench - V.A.G 1410- and insert tool - T10360- , and unscrew it by 3 turns. To do this, counter hold at vibration damper.

Note

If tool cannot be used on account of starter securing bolt (on vehicles with manual gearbox), unscrew respective securing bolt by approx. 15 mm.

– Remove toothed belt -2-.

Installing

Installation is carried out in the reverse order. When installing, note the following:

– Renew bolt for drive sprocket.

– Installation position of drive gear: Collar on drive gear faces gearbox.

– Fit toothed belt and tighten securing bolt.

– Add coolant ⇒ page 190 .

Specified torques

- ⇒ “2.1 Assembly overview - coolant pump, thermostat”, page 195
- ⇒ “3.1 Assembly overview - air filter housing”, page 262

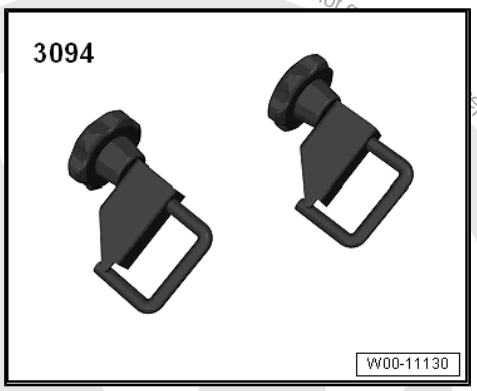
2.7 Removing and installing coolant shut-off valve - N82-

Special tools and workshop equipment required

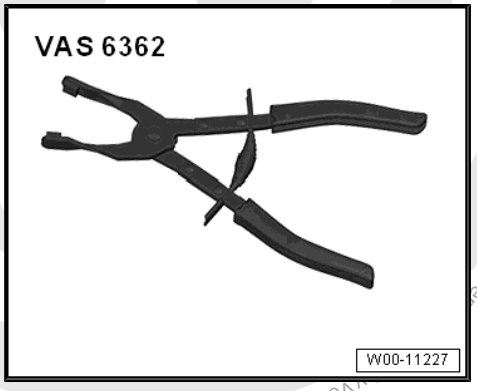
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♦ Hose clamps to 25 mm - 3094-



♦ Spring-type clip pliers - VAS 6362-

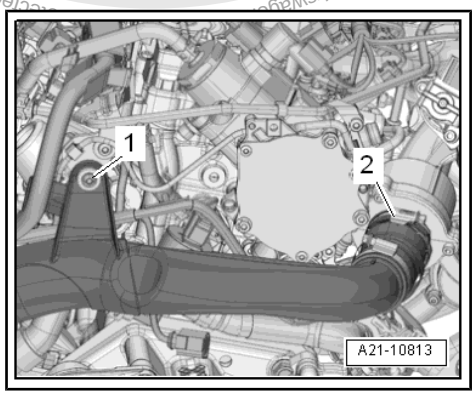


Removing

– Remove air filter housing ⇒ page 263 .

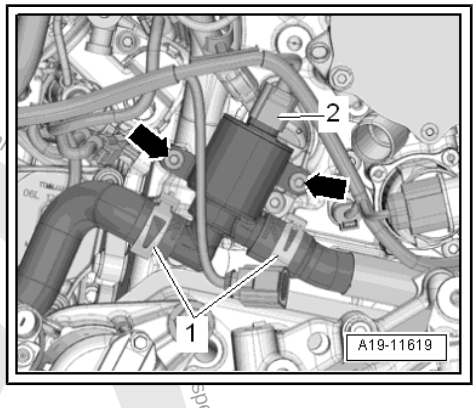
– Release hose clip -2-.

– Remove bolt -1- and press air pipe (left-side) towards left slightly.



– Disconnect connector -2-.

– Use hose clamps -3094- to clamp off coolant hoses on coolant shut-off valve - N82- .



Note

Cover the openings in the gearbox with a cloth to prevent any coolant from getting into the clutch housing.

– Release hose clip -1- and remove coolant hose.

– Unscrew bolt -arrows- and detach coolant shut-off valve - N82- .

Installing

Install in reverse order of removal, observing the following:

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue (ET-KA) .

– Check coolant level ⇒ page 194 .

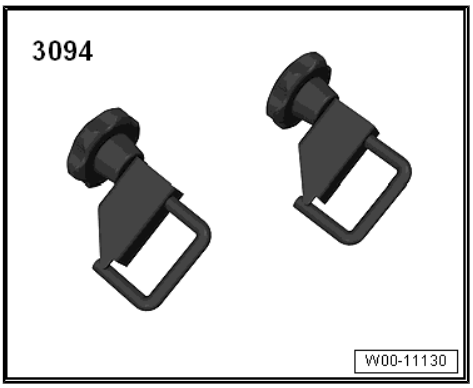
Specified torques

- ⇒ “2.2 Assembly overview - electric coolant pump”, page 197
- ⇒ “3.1 Assembly overview - air filter housing”, page 262

2.8 Removing and installing coolant valve for gearbox - N488- , vehicles with dual clutch gearbox

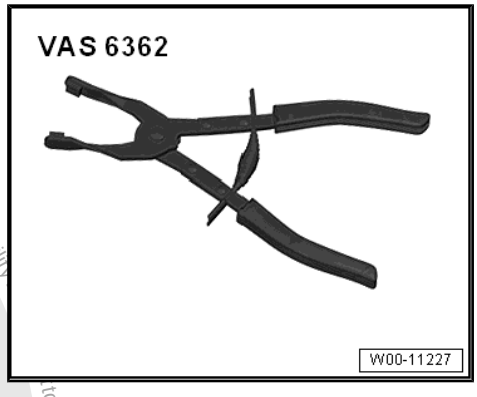
Special tools and workshop equipment required

- Hose clamps to 25 mm - 3094-



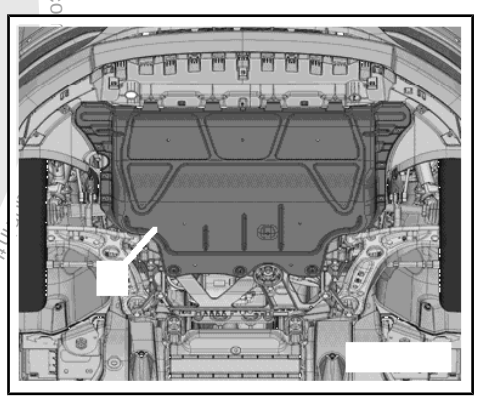
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♦ Spring-type clip pliers - VAS 6362-

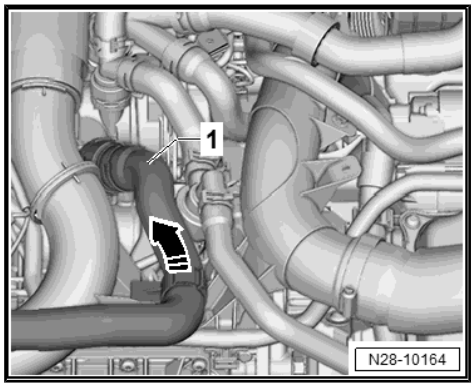


Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

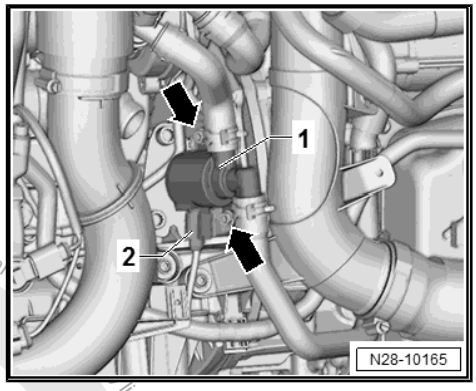


– Disconnect coolant hose -1- from charge air pipe, and push it upwards.



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– Separate electrical connector -2-.
– Clamp off coolant hoses on coolant valve for gearbox - N488- with hose clamps -3094- .
– Open hose clips, and pull off coolant hoses.
– Unscrew nuts -arrows-, and remove coolant valve .



Installing

Install in reverse order of removal, observing the following:

Note

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

– Check coolant level ⇒ page 194 .

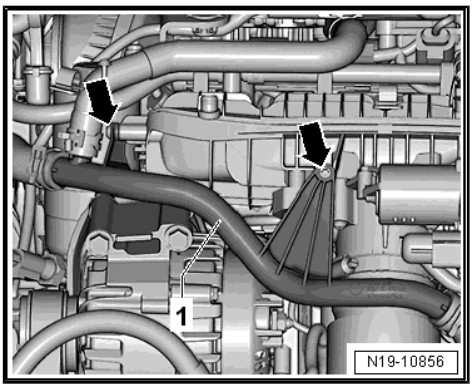
Specified torques

- ⇒ “2.2 Assembly overview - electric coolant pump”, page 197
- ⇒ “3.1 Assembly overview - air filter housing”, page 262
- Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

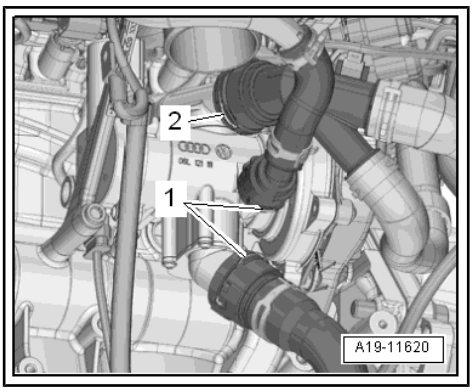
2.9 Removing and installing actuator for engine temperature regulation - N493-

Removing

– Remove coolant pump ⇒ page 203 .
– Remove throttle valve module - GX3- ⇒ page 271 .
– Unscrew coolant pipe from intake manifold -arrows-.

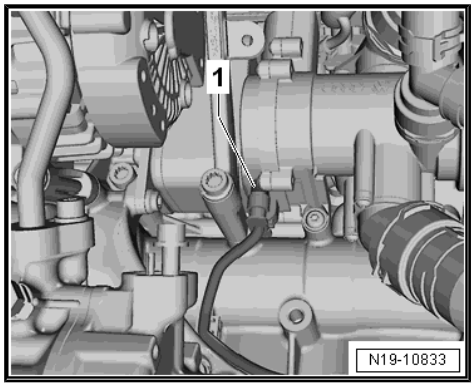


– Lift retaining clips -1- and disconnect coolant hoses.



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– Pull connector -1- off actuator for engine temperature regulation - N493- .

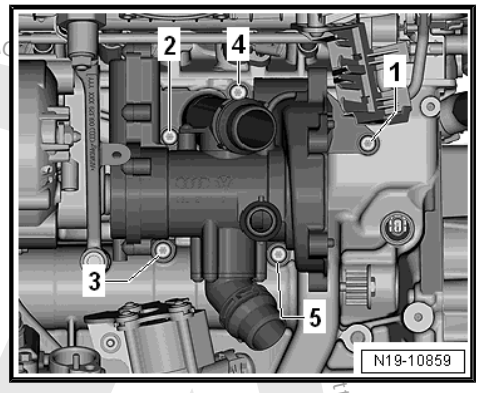


– Unscrew bolts -1 to 5-.
– Detach actuator for engine temperature regulation - N493- from centring pins, and pull it off engine oil cooler.

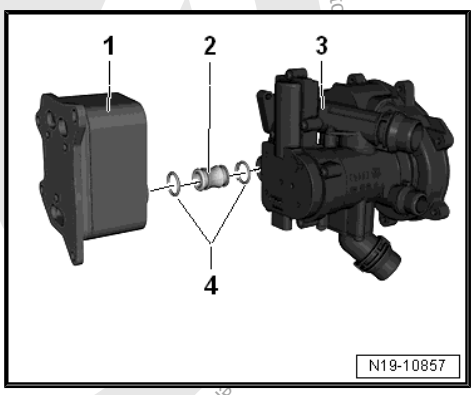
Installing

Note

Renew gaskets, seals and O-rings.



– Moisten new O-rings -4- and gasket of actuator with coolant.
– Check whether the two centring pins are fitted in the cylinder block; install if necessary.
– Fit connecting piece -2- into engine oil cooler -1-.
– Push actuator for engine temperature regulation - N493- -3- onto connecting piece and centring pins in cylinder block.



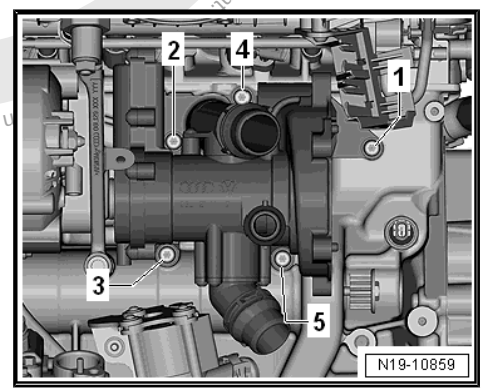
– Tighten bolts for actuator for engine temperature regulation - N493- ⇒ page 197 .
– Install coolant pump ⇒ page 203 .

Further installation is carried out in the reverse order of removal; note the following:

– Check cooling system for leaks after all coolant hoses have been connected ⇒ page 186 .
– Add coolant ⇒ page 190 .

Specified torques

- ⇒ “2.1 Assembly overview - coolant pump, thermostat”, page 195
- ⇒ “4.1 Assembly overview - intake manifold”, page 265



2.10 Removing and installing coolant temperature sender - G62-

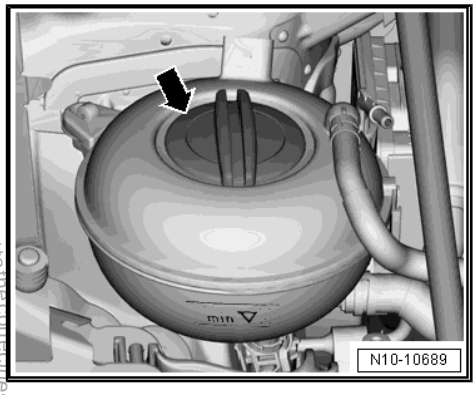
Removing

- Engine cold.

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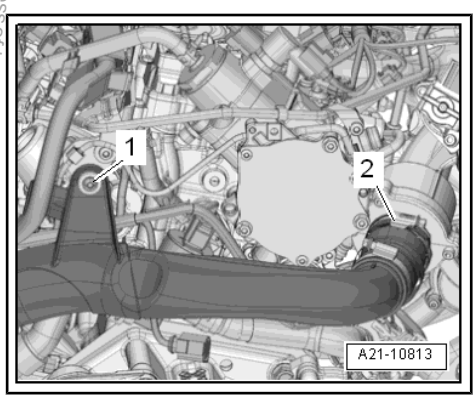
– Briefly open cap -arrow- of coolant expansion tank to reduce residual pressure in cooling system, and then tighten cap again until it engages.



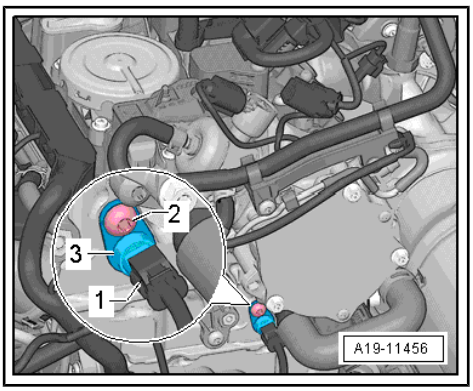
– Remove air filter housing ⇒ page 263 .

– Release hose clip -2-.

– Remove bolt -1- and press air pipe (left-side) towards left slightly.



– Separate connector -1-.



Note

- *Cover the openings in the gearbox with a cloth to prevent any coolant from getting into the clutch housing.*
- *Insert new coolant temperature sender - G62- immediately into connection to avoid loss of coolant.*

– Remove bolt -2- and detach coolant temperature sender - G62- -item 3-.

Installing

Install in reverse order of removal, observing the following:

Note

Renew O-rings.

– Check coolant level ⇒ page 190 .

Specified torques

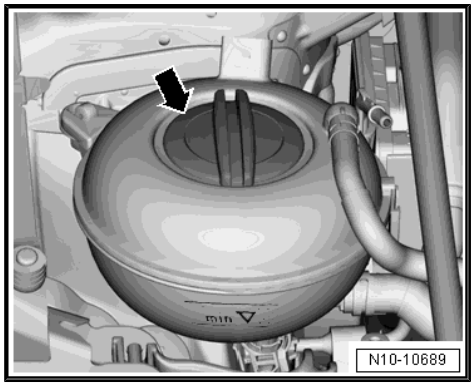
- ⇒ “2.3 Assembly overview - coolant temperature sender”, page 200
- ⇒ “3.1 Assembly overview - air filter housing”, page 262

2.11 Removing and installing radiator outlet coolant temperature sender - G83-

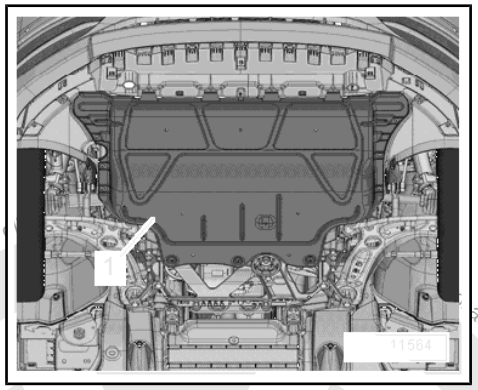
Removing

- Engine cold.

– Briefly open cap -arrow- of coolant expansion tank to reduce residual pressure in cooling system, and then tighten cap again until it engages.

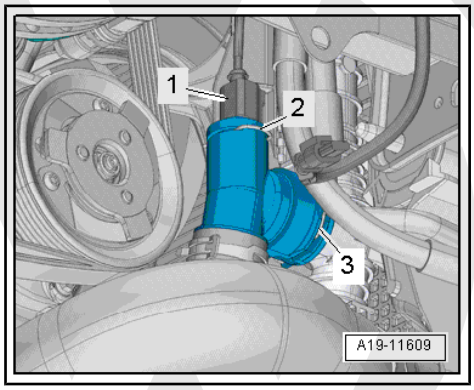


– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



– Separate connector -1-.

– Pull out retaining clip -2-, and pull off radiator outlet coolant temperature sender - G83- .



Note

- *Use a cloth to catch the escaping coolant.*
- *Insert new coolant temperature sender at radiator outlet - G83- into connection immediately to avoid loss of coolant.*

Installing

Install in reverse order of removal, observing the following:

Note

Renew O-ring.

– Check coolant level ⇒ page 190 .

Specified torques

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

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3 Coolant pipes

⇒ “3.1 Assembly overview - coolant pipes”, page 215
⇒ “3.2 Removing and installing front coolant pipe”, page 215
⇒ “3.3 Removing and installing upper coolant pipes”, page 217

3.1 Assembly overview - coolant pipes

1 - Coolant pipe
- ❑ On top of engine
- ❑ Removing and installing ⇒ page 217

2 - Bolts
- ❑ 9 Nm

3 - Bolts
- ❑ 9 Nm

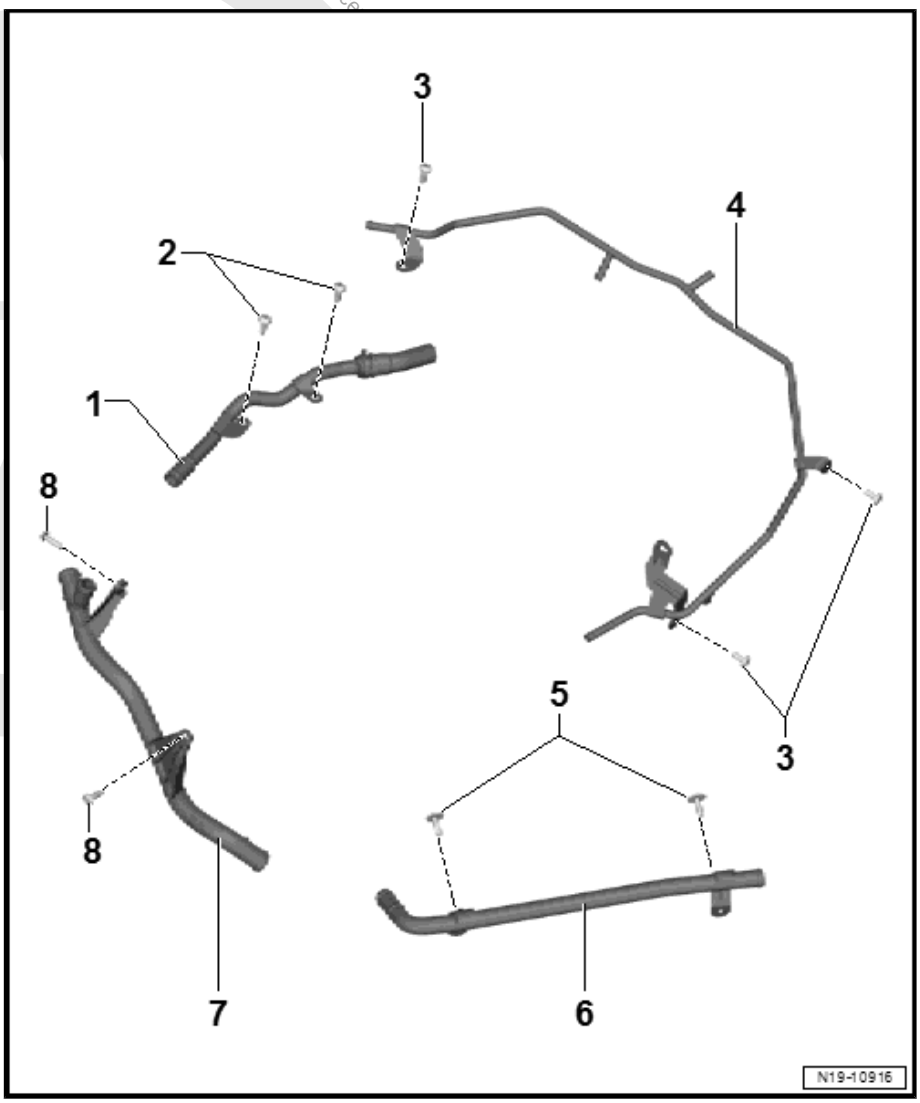
4 - Coolant line

5 - Bolts
- ❑ 9 Nm

6 - Coolant pipe
- ❑ to radiator cowl
- ❑ Only for vehicles with auxiliary radiator

7 - Coolant pipe
- ❑ On front of engine
- ❑ Removing and installing ⇒ page 215

8 - Bolts
- ❑ 6 Nm

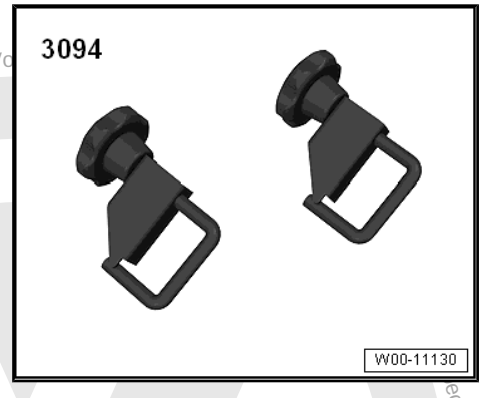


3.2 Removing and installing front coolant pipe

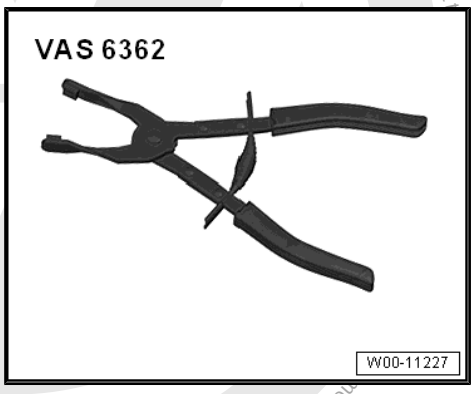
Special tools and workshop equipment required

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- Hose clamps to 25 mm - 3094-

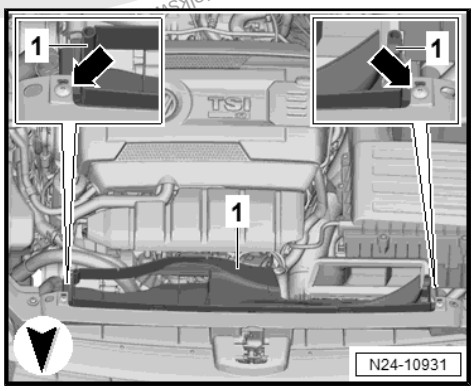


- Spring-type clip pliers - VAS 6362-



Removing

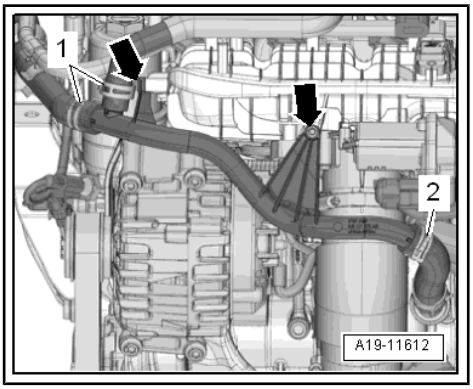
– Remove air filter housing ⇒ page 263 .
– Unscrew bolt -arrow- on left and right.
– Unclip lower part of air duct -1- and remove it.



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Note

Use a cloth to catch the escaping coolant.



- Clamp off coolant hoses -1 and 2- with hose clamps, up to 25 mm in diameter - 3094- .
- Release hose clips and detach coolant hoses.
- Unscrew bolts -arrows- and remove front coolant pipe.

Installing

Install in reverse order of removal, observing the following:

Note

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

- Check coolant level ⇒ page 194 .

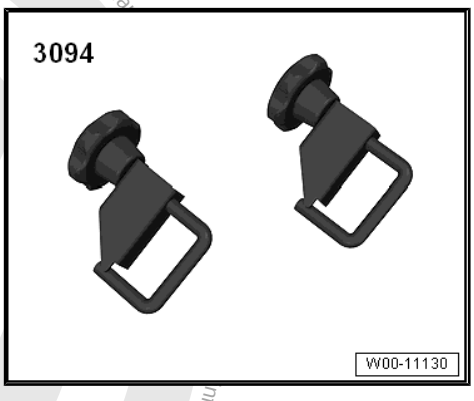
Specified torques

♦ ⇒ “3.1 Assembly overview - coolant pipes”, page 215

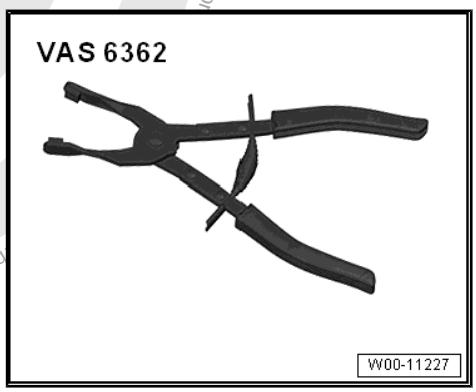
3.3 Removing and installing upper coolant pipes

Special tools and workshop equipment required

♦ Hose clamps to 25 mm - 3094-



♦ Spring-type clip pliers - VAS 6362-

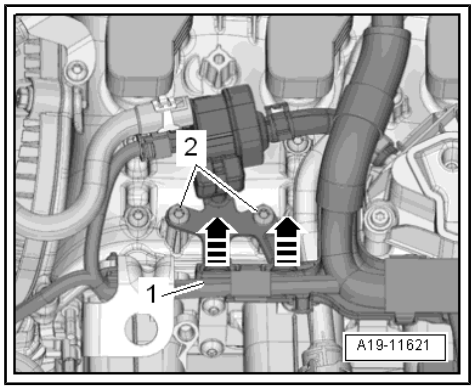


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Removing

– Remove Ignition coil with output stage for cylinder “3” ⇒ page 317 .

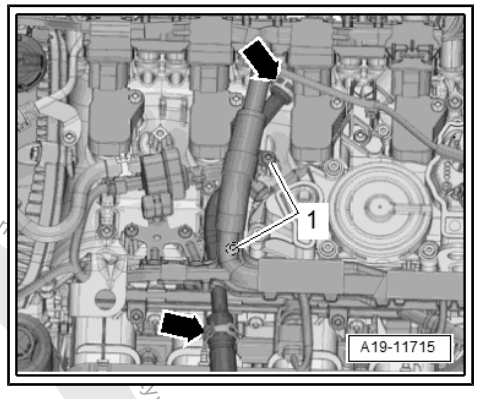
– Release fasteners -arrows- and detach wiring duct -1- from bracket.



– Clamp off coolant hoses before and after coolant pipe using hose clamps up to 25 mm - 3094- .

– Release hose clips -arrows- and detach coolant hoses.

– Unscrew bolt -1- and remove coolant pipe (top).



Installing

Install in reverse order of removal, observing the following:

Note

Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue (ET-KA) .

– Check coolant level ⇒ page 194 .

Specified torques

◆ ⇒ “3.1 Assembly overview - coolant pipes”, page 215

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4 Radiator, radiator fan

⇒ “4.1 Assembly overview - radiator”, page 219

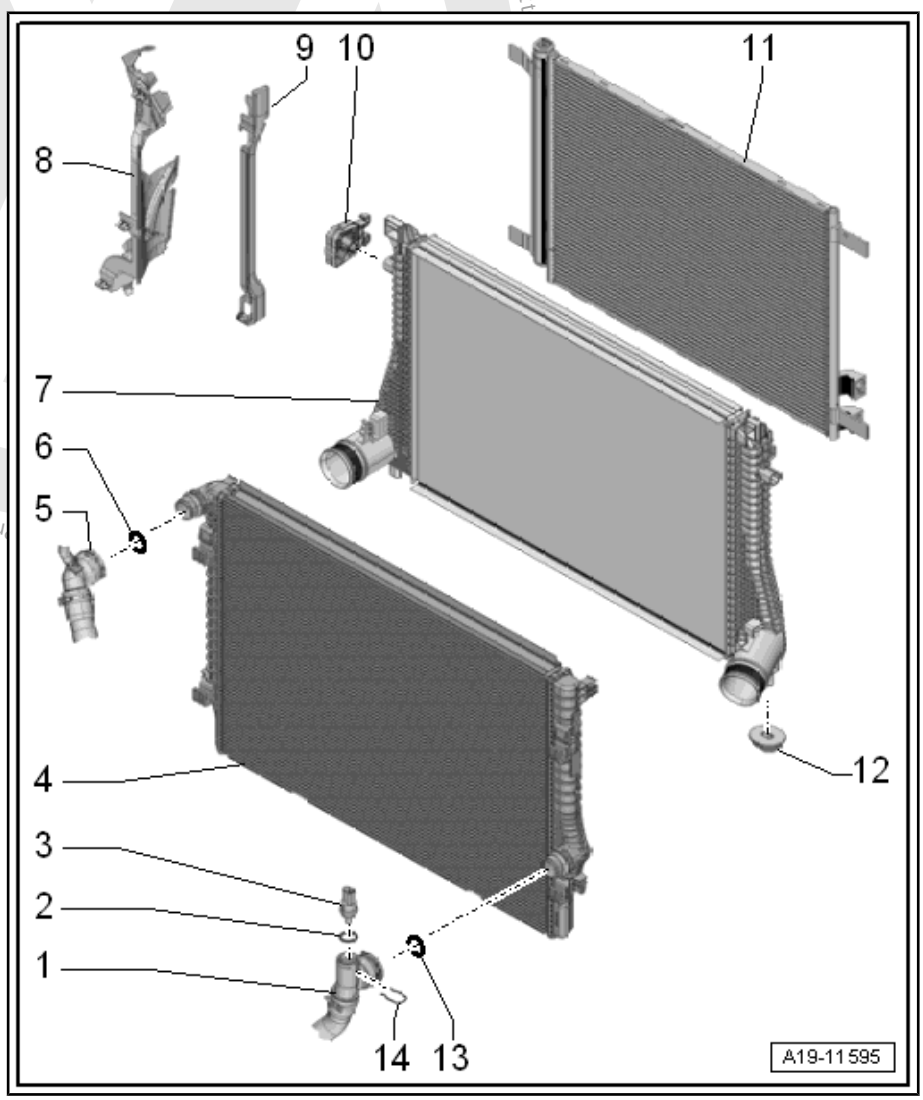
⇒ “4.2 Assembly overview - radiator cowl and radiator fan”, page 220

⇒ “4.3 Removing and installing radiator”, page 220

⇒ “4.4 Removing and installing radiator cowl”, page 222

⇒ “4.5 Removing and installing radiator fan”, page 223

4.1 Assembly overview - radiator



1 - Coolant hose
- ❑ Pull out retaining clip to remove
- ❑ Connect ⇒ page 220

2 - O-ring
- ❑ Renew
- ❑ Moisten with coolant

3 - Radiator outlet coolant temperature sender - G83-
- ❑ Removing and installing ⇒ page 214

4 - Radiator for engine coolant
- ❑ Removing and installing ⇒ page 220

5 - Coolant hose
- ❑ Pull out retaining clip to remove
- ❑ Connect ⇒ page 220

6 - O-ring
- ❑ Renew if damaged
- ❑ Moisten with coolant

7 - Intercooler
- ❑ Removing and installing ⇒ page 234

8 - Air guide

9 - Air guide

10 - Radiator mounting

11 - Condenser
- ❑ Removing and installing ⇒ Heating, air conditioning; Rep. gr. 87 ; Refrigerant circuit; Removing and installing condenser

12 - Rubber mounting
- ❑ For charge air cooler.

13 - O-ring
- ❑ Renew if damaged
- ❑ Moisten with coolant

14 - Retaining clip
- ❑ For radiator outlet coolant temperature sender - G83- .

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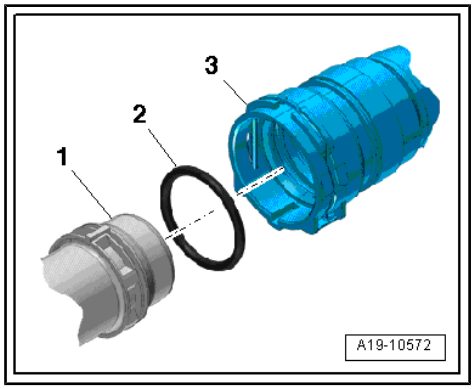
Connecting coolant hose with plug-in connector

– Remove O-ring -2- in coolant hose -3- if damaged.

– Moisten O-ring with coolant, and insert it into coolant hose.

– Push coolant hose onto coolant pipe -1- until it audibly engages.

– Press again on coolant hose and check plug-in connector is engaged correctly by pulling hose back.



4.2 Assembly overview - radiator cowl and radiator fan

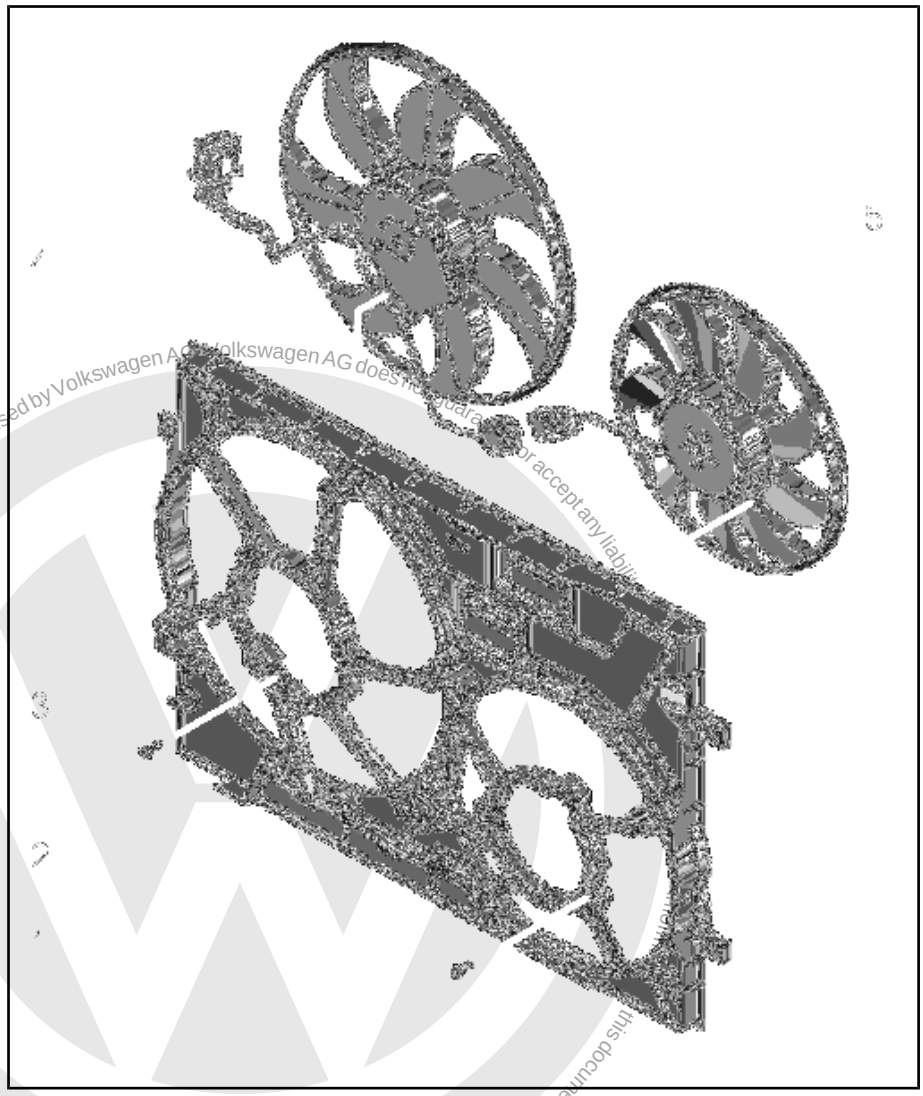
1 - Bolt
- ❑ 5 Nm

2 - Radiator cowl
- ❑ Removing and installing ⇒ page 222

3 - Bolt
- ❑ 5 Nm

4 - Radiator fan - V7-
- ❑ Removing and installing ⇒ page 223

5 - Radiator fan 2 - V177-
- ❑ Removing and installing ⇒ page 223



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4.3 Removing and installing radiator

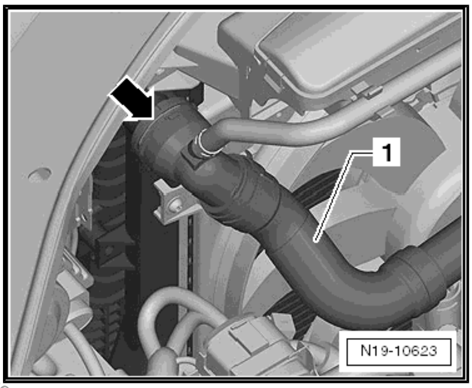
Removing

– Drain coolant ⇒ page 188 .

– Remove radiator cowl ⇒ page 222 .

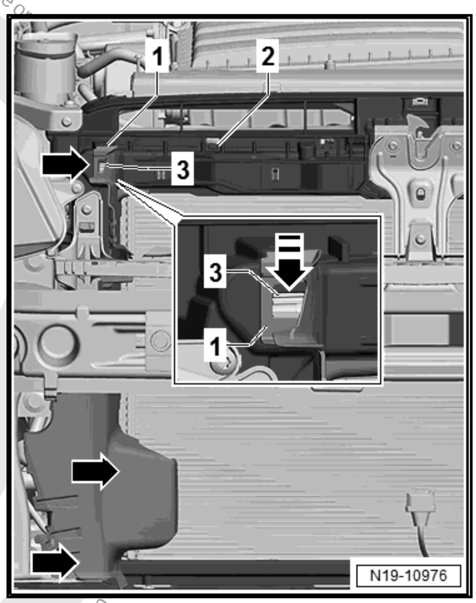
– Remove coolant hose at top left from radiator -arrow-.

– Remove front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper; Removing and installing bumper cover .



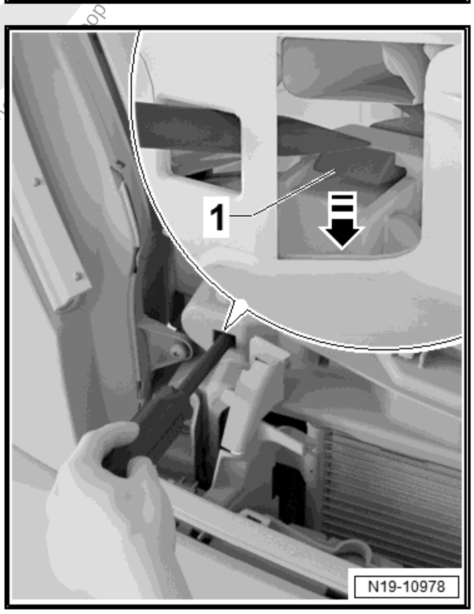
– Unclip air ducts -1- on both sides from lock carrier -2- -arrow-.

– To do this, release catches -3- in -direction of arrow-, and pull off air ducts. Disregard arrows below.



– Working through opening in lock carrier, press locking tabs for radiator on left and right -1-. Press radiator off charge air cooler.

– Swing radiator towards engine, and lift it out of charge air cooler mountings. Remove radiator downwards.



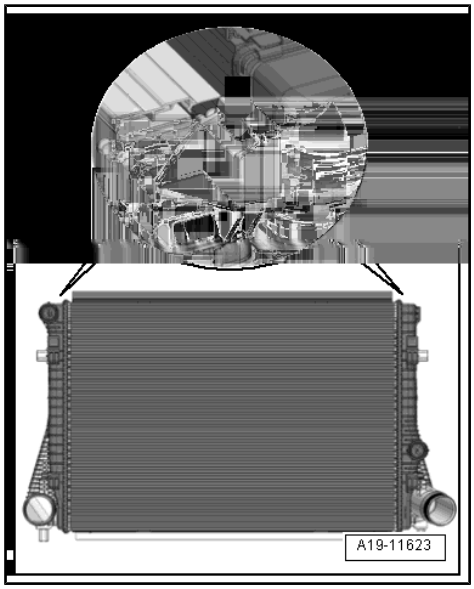
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Installing

– If there are minor dents in the fins, refer to ⇒ page 5 .
– Renew O-rings.
– Insert radiator at an angle into lower charge air cooler mounting, and engage radiator in charge air cooler -arrow-. Ensure proper engagement by pulling.
– Install radiator cowl ⇒ page 222 .
– Connect coolant hose with plug-in connector ⇒ page 220 .
– Fill with new coolant ⇒ page 194 .

Specified torques

◆ ⇒ “4.1 Assembly overview - radiator”, page 219



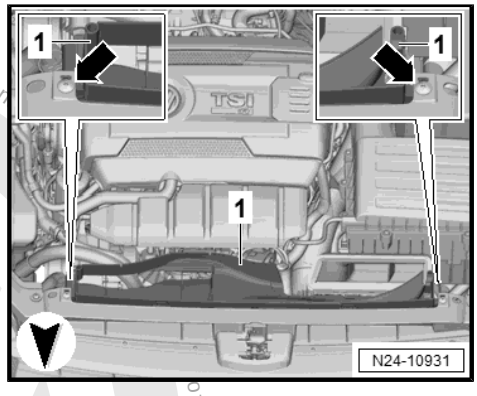
4.4 Removing and installing radiator cowl

Special tools and workshop equipment required

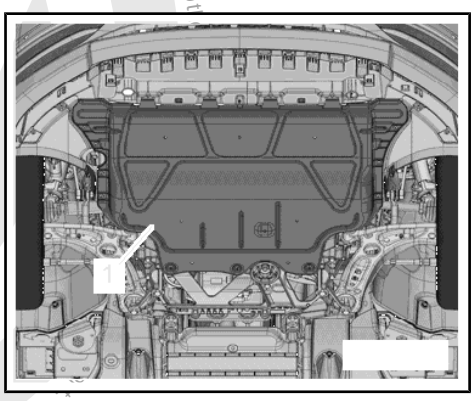
◆ Protective mat - VAS 531 003-

Removing

– Remove air filter housing ⇒ page 263 .
– Unscrew bolt -arrow- on left and right.
– Unclip lower part of air duct -1- and remove it.



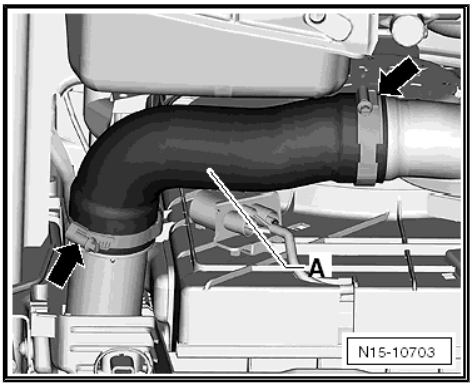
– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



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– Loosen hose clips -arrows-, and remove charge air hose -A-.

– Detach coolant hose at bottom right from clip.



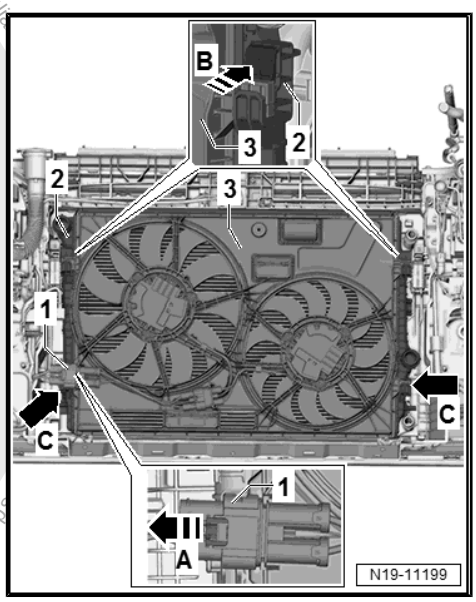
CAUTION

Danger of injury; the radiator fans can run at any time.

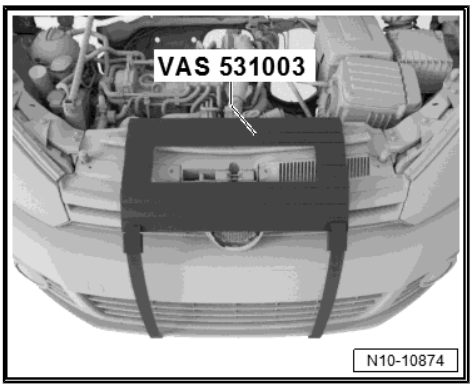
– Disconnect electrical connectors.

– Disconnect connector -1- for radiator fan. To do this, push locking tab -A- in direction of arrow, and press release mechanism.

– Simultaneously press locking tabs on left and right of radiator cowl -arrow B-, pull radiator cowl upwards off radiator -arrow C-, and remove it downwards.



– Cover radiator using protective mat - VAS 531 003- .



Installing

Install in reverse order of removal.

Specified torques

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

4.5 Removing and installing radiator fan

Removing

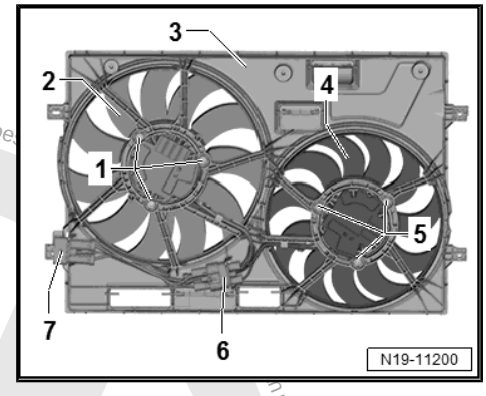
Note

Attach cable ties in all the same places when installing.

– Remove radiator cowl ⇒ page 222 .

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– Separate connector -6-.
– Unclip electrical connector -7-.
– Unscrew and remove bolts -1- for radiator fan -2-.
– Unscrew and remove bolts -5- for radiator fan -4-.



Installing

Install in reverse order of removal, observing the following:

– Install radiator cowl ⇒ page 222 .

Specified torques

◆ ⇒ “4.2 Assembly overview - radiator cowl and radiator fan”, page 220

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21 – Turbocharging/supercharging

1 Exhaust turbocharger

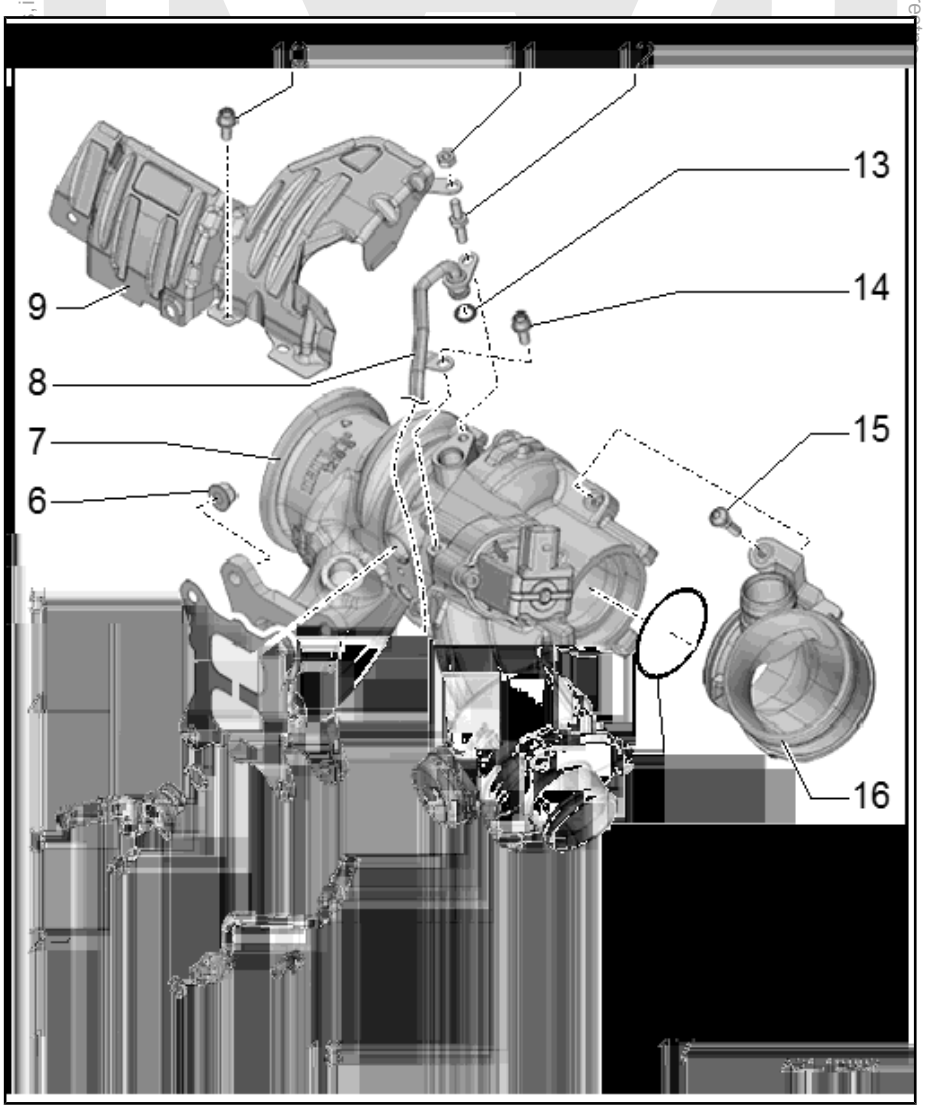
⇒ "1.1 Assembly overview - turbocharger", page 225

⇒ "1.2 Removing and installing turbocharger", page 227

1.1 Assembly overview - turbocharger

Part I

Part II ⇒ page 226



1 - O-ring
- ❑ Renew
- ❑ Moisten with engine oil.

2 - Bolt
- ❑ 9 Nm

3 - Coolant supply line

4 - O-ring
- ❑ Renew
- ❑ Moisten with coolant

5 - Seal
- ❑ Renew

6 - Nut
- ❑ Renew
- ❑ 25 Nm

7 - Exhaust turbocharger
- ❑ Removing and installing ⇒ page 227

8 - Oil supply line

9 - Heat shield

10 - Bolt
- ❑ 9 Nm

11 - Nut
- ❑ 9 Nm

12 - Bolt
- ❑ 9 Nm

13 - O-ring
- ❑ Renew
- ❑ Moisten with engine oil.

14 - Bolt
- ❑ 9 Nm

15 - Bolt
- ❑ 9 Nm

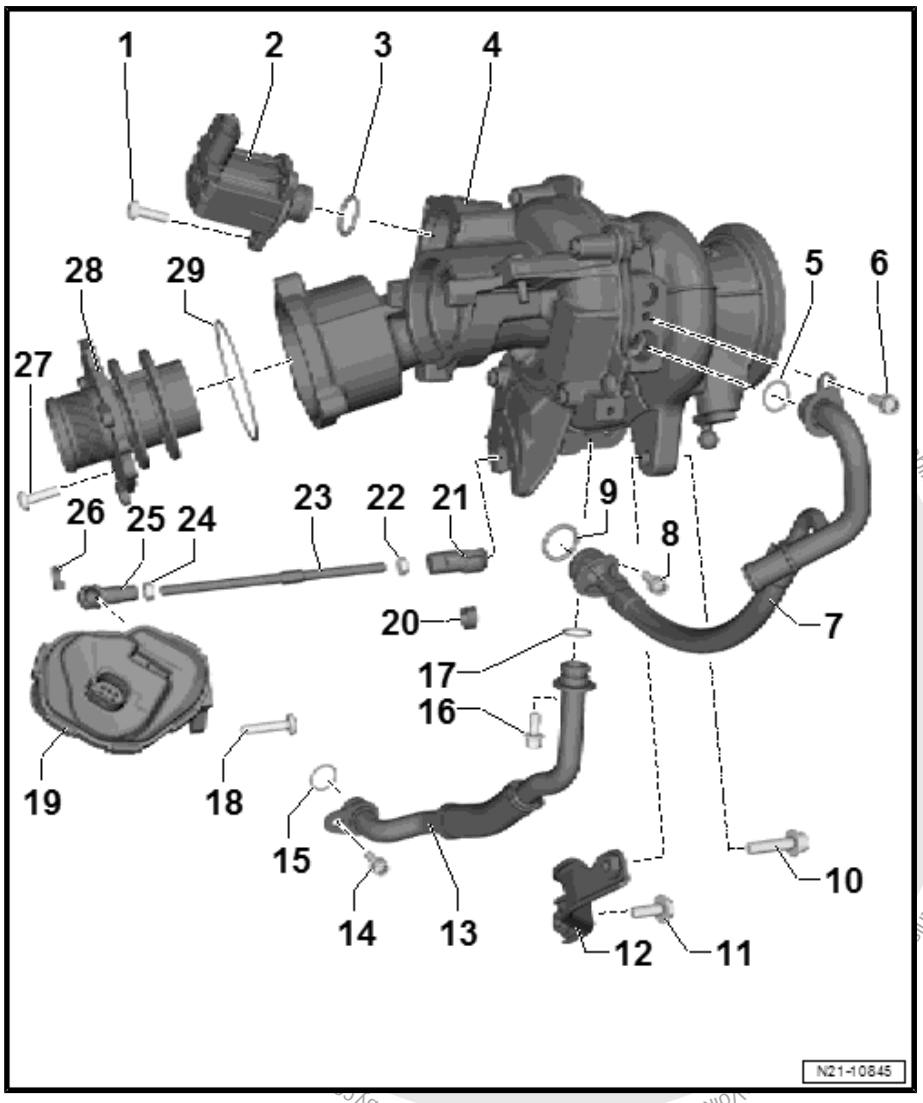
16 - Connection

17 - O-ring
- ❑ Renew

18 - Bolt

- ❑ 9 Nm

Part II



1 - Bolt

- ❑ 9 Nm

2 - Turbocharger air recirculation valve - N249-

- ❑ Note installation position ⇒ page 227

3 - O-ring

- ❑ Renew

4 - Exhaust turbocharger

- ❑ Removing and installing ⇒ page 227

5 - O-ring

- ❑ Renew
- ❑ Moisten with coolant

6 - Bolt

- ❑ 9 Nm

7 - Coolant return line

8 - Bolt

- ❑ 9 Nm

9 - O-ring

- ❑ Renew
- ❑ Moisten with coolant

10 - Bolt

- ❑ Coat thread with high-temperature paste ⇒ Electronic parts catalogue (ETKA) .
- ❑ 30 Nm

11 - Bolt

- ❑ 30 Nm

12 - Bracket

- ❑ For turbocharger

13 - Oil return line

14 - Bolt

- ❑ 9 Nm

15 - O-ring

- ❑ Renew
- ❑ Moisten with engine oil.

16 - Bolt

- ❑ 9 Nm

17 - O-ring

- ❑ Renew

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- ❑ Moisten with engine oil.

18 - Bolt

- ❑ 10 Nm

19 - Charge air pressure controller - V465-

20 - Clip

21 - Ball socket

22 - Nut

- ❑ 10 Nm

23 - Threaded rod

24 - Nut

- ❑ 10 Nm

25 - Ball socket

26 - Clip

27 - Bolt

- ❑ 9 Nm

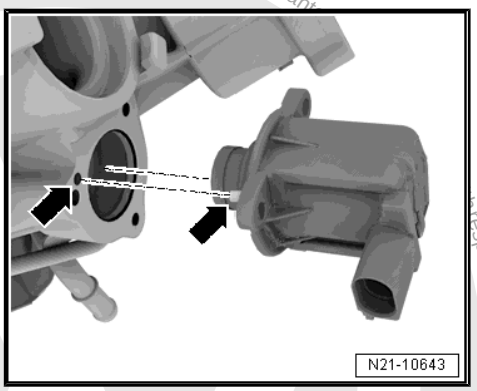
28 - Connection

29 - O-ring

- ❑ Renew
- ❑ Moisten with coolant

Installation location of turbocharger air recirculation valve - N249-

– Note installation position -arrows-.



1.2 Removing and installing turbocharger

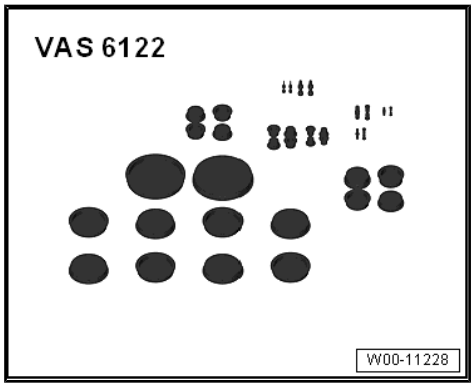
Note

- *The turbocharger is removed upwards.*
- *If a mechanical fault is discovered on the turbocharger (e.g. a destroyed compressor impeller), it is not sufficient to just renew the turbocharger. To avoid any subsequent damage, the following work must be carried out:*
- *Check air filter housing, air filter element and air inlet hoses for contamination.*
- *Check the whole charge air path and charge air cooler for foreign objects.*
- *If foreign objects are discovered in the charge air system, clean the charge air path and, if necessary, renew the charge air cooler.*

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Special tools and workshop equipment required

- Set of plugs for engine - VAS 6122-



- Spring-type clip pliers - VAS 6362-

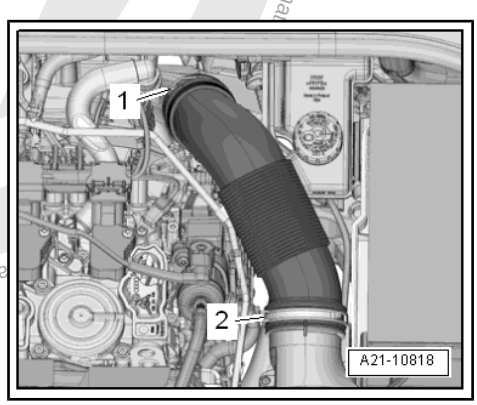


Removing

– Remove front exhaust pipe with catalytic converter ⇒ page 309 .

– Remove air filter housing ⇒ page 263 .

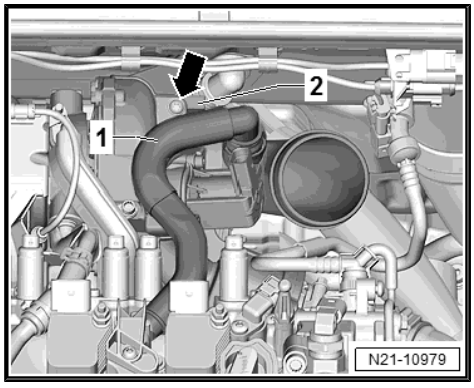
– Release hose clip -1- and remove air pipe from turbocharger.



– Press release tabs on hose -1- for crankcase breather and detach hose.

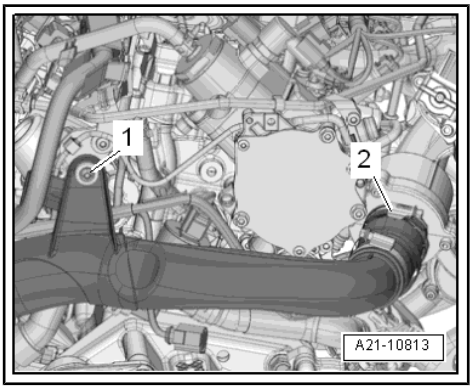
– Unscrew bolt -arrow-, twist support -2- backwards and remove.

– Drain coolant ⇒ page 188 .

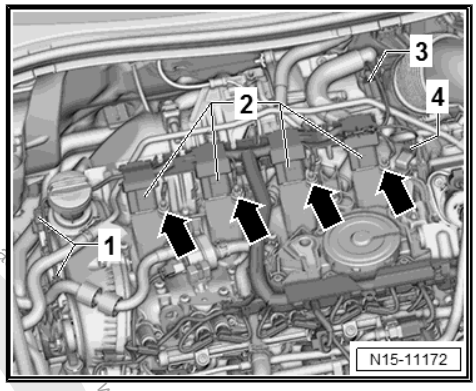


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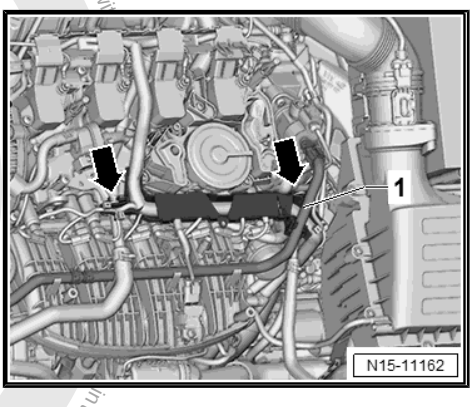
– Unscrew bolt -1-, and open hose clip -2-.
– Pull charge air pipe off turbocharger.



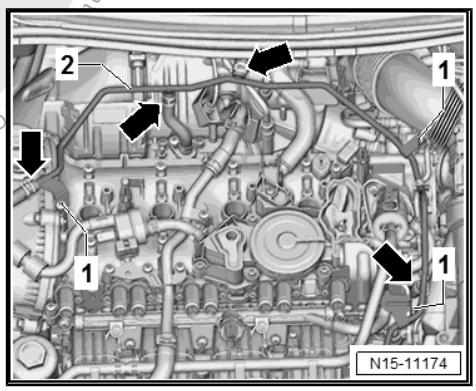
– Unscrew nuts -arrows-.
– Pull off connectors -1-, -2-, -3- and -4-. Open retainer for wiring harness.



– Unclip fuel hose -1-, release wiring duct -arrows-, and pull it upwards off bracket.
– Remove ignition coils ⇒ page 317 .

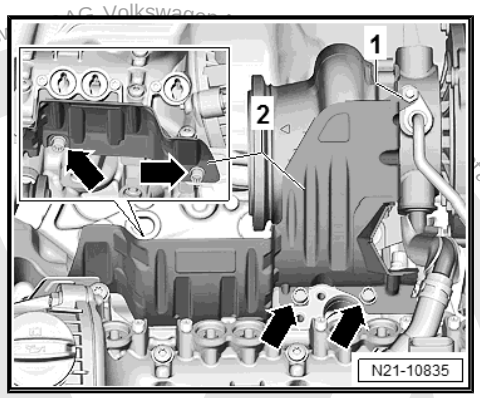


– Unscrew bolts -1-.
– Remove coolant hoses -arrows-, and swing coolant pipe -2- to one side.

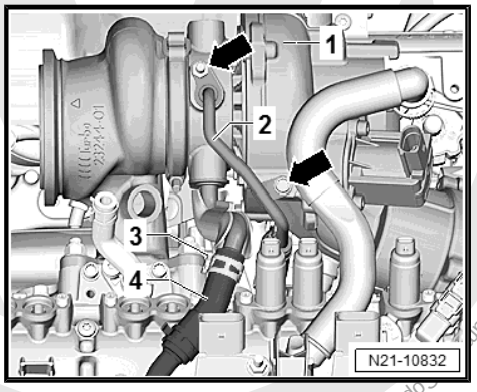


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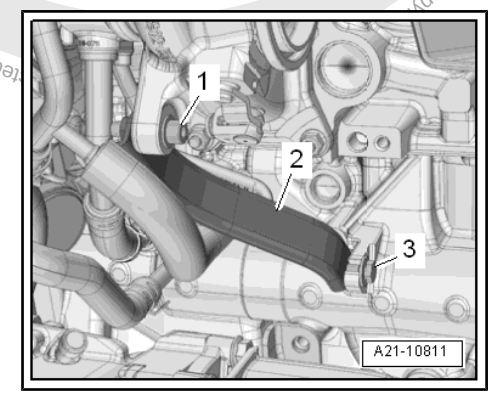
– Unscrew bolts -arrows- and nut -1-.
– Remove heat shield -2-.
– Remove Lambda probe 1 before catalytic converter - GX10- ⇒ page 293 .



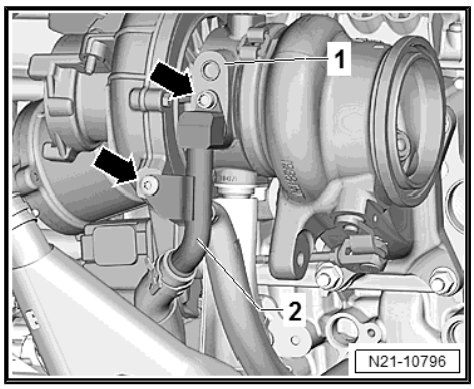
– Unscrew bolts -arrows-, and pull oil supply pipe -2- off turbocharger -1-.
– Open hose clip -3-, and pull hose -4- off turbocharger.



– Remove bracket -2- for turbocharger from below. To do this, unscrew bolt -1- and loosen bolt -3-.

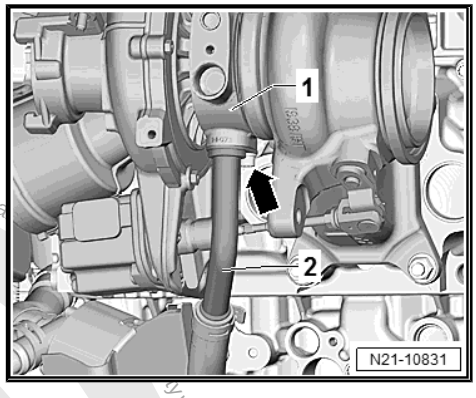


– Unscrew bolts -arrows-, and pull coolant pipe -2- off turbocharger -1-.

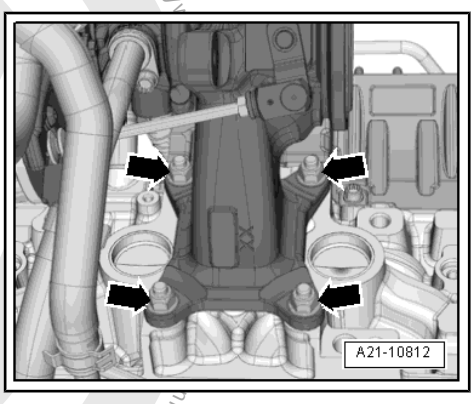


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– Unscrew bolts -arrows-, and pull oil return pipe -2- off turbocharger -1-.

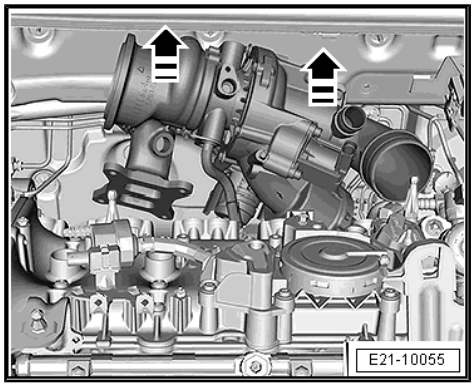


– Unscrew nuts -arrows-.



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– Remove turbocharger from cylinder head, and remove it upwards.



Installing

Install in reverse order of removal, observing the following:

Note

- *Renew seals, gaskets, O-rings and self-locking nuts.*
- *Lubricate turbocharger studs with high-temperature paste. For high-temperature, paste refer to ⇒ Electronic parts catalogue (ETKA) .*
- *Fill turbocharger with engine oil at connection for oil supply line.*
- *Hose connections and hoses for charge air system must be free of oil and grease before assembly.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue (ETKA) .*

– Install front exhaust pipe with catalytic converter ⇒ page 309 .
– Align exhaust system free of stress ⇒ page 303 .
– Add coolant ⇒ page 190 .
– Check oil level.

Note

- *After installing turbocharger, run engine for about 1 minute at idling speed. Do not rev up immediately to ensure that the turbocharger is fully primed with oil.*
- *After new components have been installed (engine/short engine, cylinder head or turbocharger) the oil pressure control must be set to max. pressure for approx. 1000 km if the function is available in the engine control unit. This will compensate for the increased friction during run-in of new components, and a better transport of wear-related particles is guaranteed. To do this, connect vehicle diagnostic tester, switch on ignition, and select the following menu options:*
- `Engine control unit functions`
- `0001 - Activate engine run-in`

Specified torques

- ⇒ “1.1 Assembly overview - turbocharger”, page 225
- ⇒ “3.1 Assembly overview - air filter housing”, page 262
- ⇒ “8.1 Assembly overview - Lambda probe”, page 292

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2 Charge air system

⇒ "2.1 Assembly overview - charge air system", page 233

⇒ "2.2 Assembly overview - charge-air hose connections", page 234

⇒ "2.3 Removing and installing charge air cooler", page 234

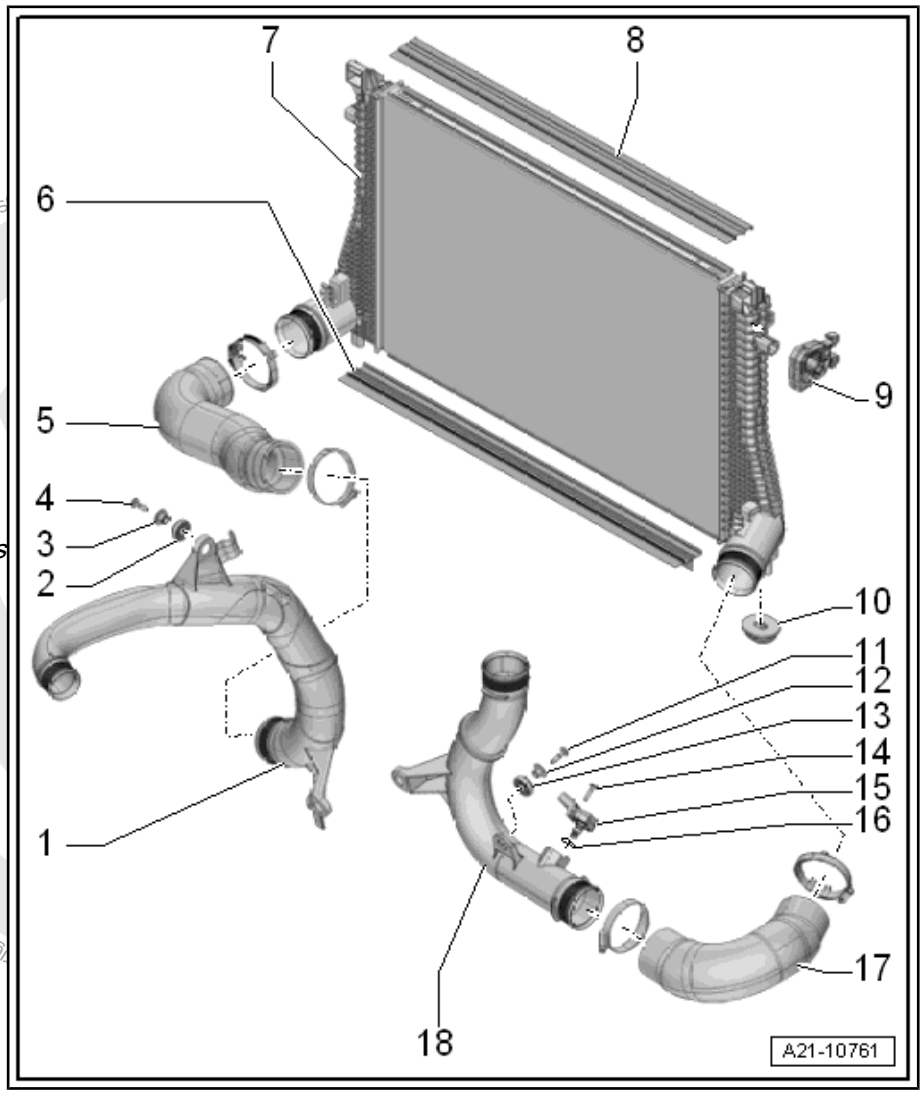
⇒ "2.4 Removing and installing charge pressure sender G31 ", page 237

⇒ "2.5 Checking charge air system for leaks", page 238

2.1 Assembly overview - charge air system

Note

- *Installing screw-type clips for charge air hose connections ⇒ page 234 .*
- *Check all air hoses and pipes for firm seating and leaks before carrying out tests or repairs.*



1 - Air intake pipe

2 - Grommet

3 - Spacer sleeve

4 - Bolt

❑ 7 Nm

5 - Charge air hose

❑ Installing ⇒ page 234

6 - Air guide

7 - Intercooler

❑ Removing and installing ⇒ page 234

Note

If there are minor dents refer to ⇒ page 5 .

8 - Air guide

9 - Rubber mounting

❑ For charge air cooler.

10 - Rubber mounting

❑ For charge air cooler.

11 - Bolt

❑ 7 Nm

12 - Spacer sleeve

13 - Grommet

14 - Bolt

❑ 5 Nm

15 - Charge air pressure sender - G31-

❑ Removing and installing ⇒ page 237

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16 - O-ring

- ❑ Renew

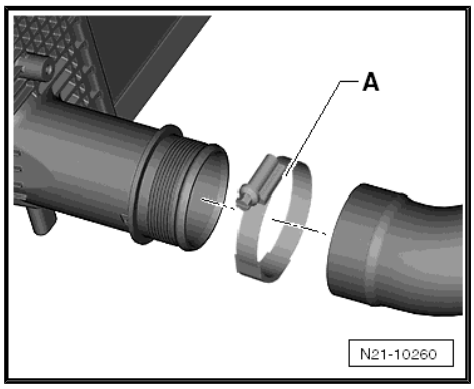
17 - Charge air hose

- ❑ Installing ⇒ page 234

18 - Air intake pipe

2.2 Assembly overview - charge-air hose connections

Fitting hose connections with fluted union



Note

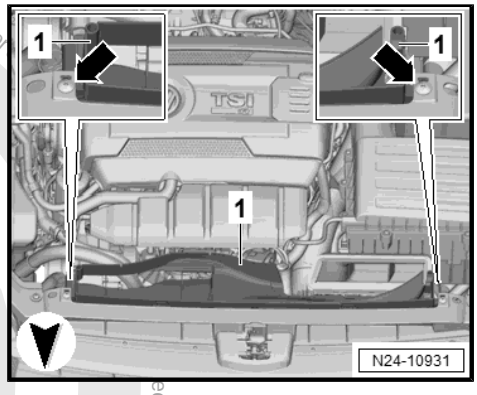
The screw-type clips -A- on the charge air pipes must be tightened to 5.5 Nm. If the torque is too low or too high, the charge air hose may slip off the charge air pipe during vehicle operation.

- Check all air hoses and pipes for firm seating and leaks before carrying out tests or repairs.
- Clean hose unions and air intake pipes and hoses. They must be free of oil and grease before installation.
- Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue .
- Spray the worm screws of the used hose clips with penetrating spray before installing.

2.3 Removing and installing charge air cooler

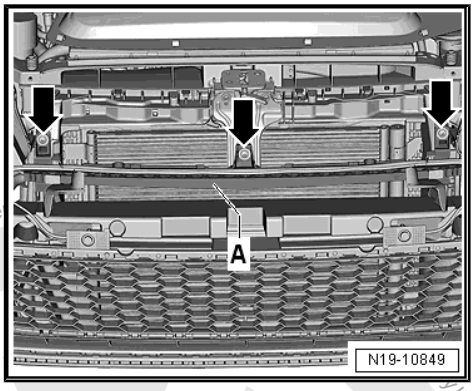
Removing

- Remove air filter housing ⇒ page 263 .
- Unscrew bolt -arrow- on left and right.
- Unclip lower part of air duct -1- and remove it.
- Remove radiator cowl ⇒ page 222 .
- Removing radiator ⇒ page 220 .



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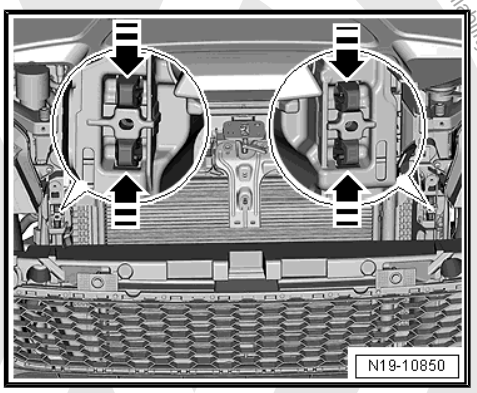
– If fitted, remove centre guide profile -A- from lock carrier -arrows-.



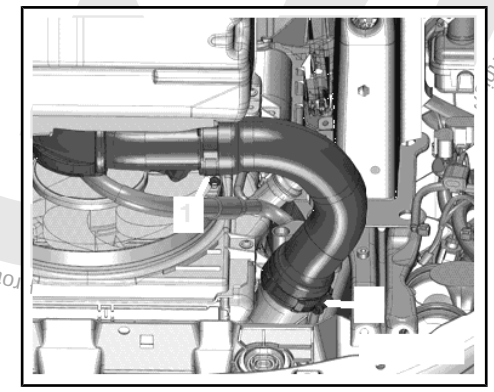
– Using diagonal pliers, pinch off fasteners -arrows- for radiator mounting on left and right. Push radiator at top slightly towards engine.

Note

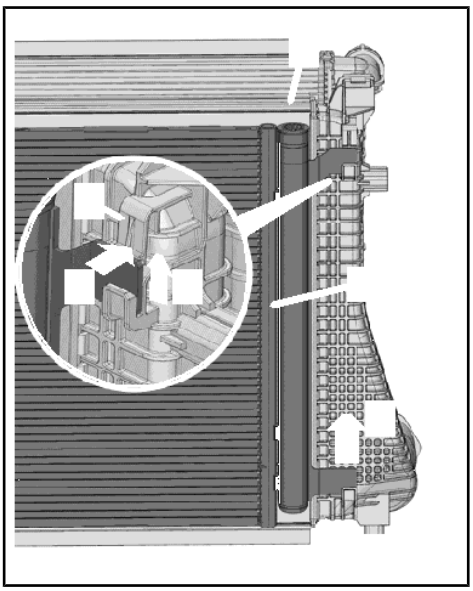
The radiator mounting will be reused when reinstalling the radiator. It will then be bolted to lock carrier. For bolts, refer to ⇒ Electronic parts catalogue (ETKA) .



– Release hose clips -1, 2-, and remove charge air hose.
– Seal open lines and connections with clean plugs from engine bung set - VAS 6122- .



– Have a second mechanic release retaining clips -1- on left and right in direction of arrow -A-. Remove condenser -3- upwards from mountings -arrows B-.
– Secure condenser to lock carrier.
– Take out charge air cooler from underneath.



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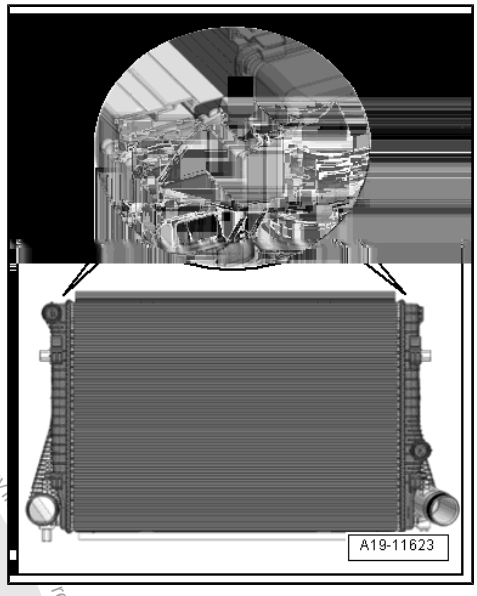
Installing

Install in reverse order of removal, observing the following:

– If there are minor dents in the fins, refer to ⇒ page 5 .

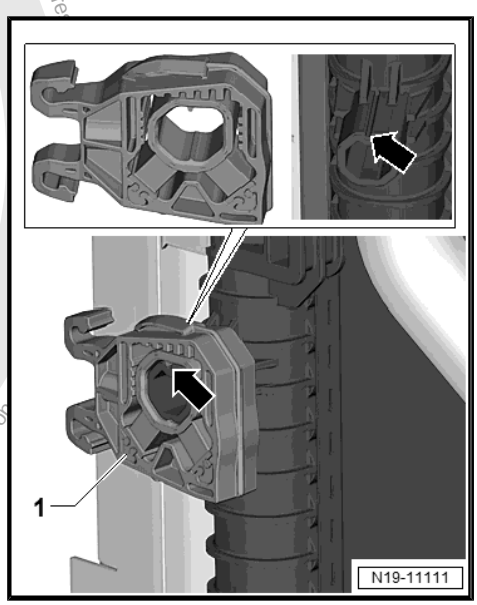
– Renew O-rings.

– Insert radiator at an angle into lower charge air cooler mounting, and engage radiator in charge air cooler -arrow-. Ensure proper engagement by pulling.



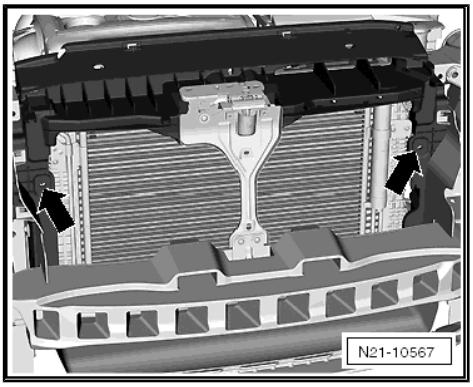
– Fit radiator mounting -1- onto charge air cooler. When doing so, note the installation position -arrow-.

– Swing charge air cooler together with radiator into lock carrier. Ensure proper seating of radiator mountings in lock carrier.



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– Use bolts -arrows- to secure radiator mountings, whose fasteners have been pinched off, to lock carrier. For bolts, refer to ⇒ Electronic parts catalogue (ETKA) .



– Install front bumper cover ⇒ General body repairs, exterior; Rep. gr. 63 ; Front bumper; Removing and installing bumper cover .
– Install radiator cowl ⇒ page 222 .
– Connect coolant hose with plug-in connector ⇒ page 220 .
– Add coolant ⇒ page 194 .

Note

- *Hose connections as well as hoses for charge air system must be free of oil and grease when installing.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue (ETKA) .*
- *In order to be in a position to securely attach the charge air hoses on their connections, the worm screws of the used hose clips have to the sprayed with penetrating spray before installing.*

Specified torques

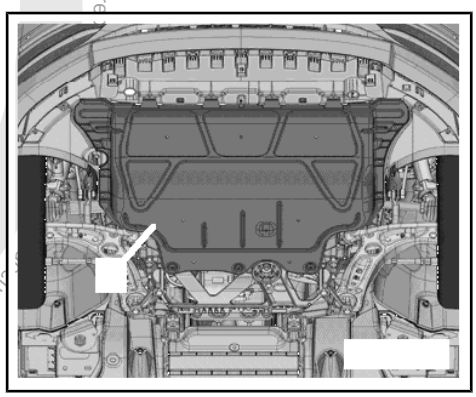
- ⇒ “4.1 Assembly overview - radiator”, page 219
- ⇒ “2.1 Assembly overview - charge air system”, page 233

Component	Specified torque
Radiator mounting to lock carrier	5 Nm

2.4 Removing and installing charge pressure sender - G31-

Removing

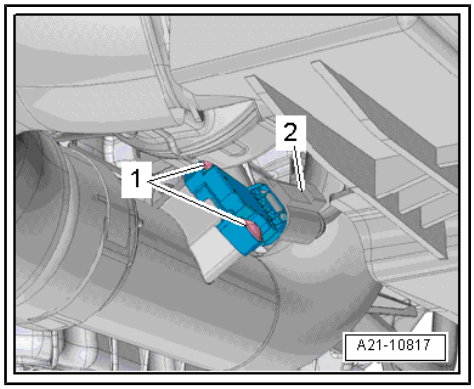
– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



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– Disconnect connector -2-.

– Unscrew bolts -1-, and pull charge pressure sender - G31- out of air pipe.



Installing

Install in reverse order of removal, observing the following:

Specified torques

- ⇒ “2.1 Assembly overview - charge air system”, page 233
- Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

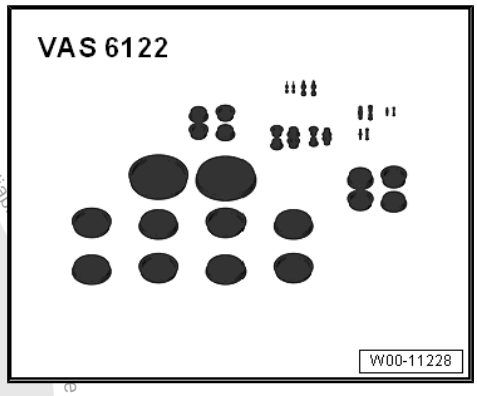
2.5 Checking charge air system for leaks

Special tools and workshop equipment required

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

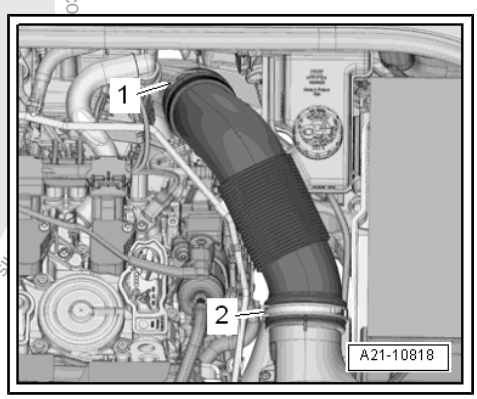


- Set of plugs for engine - VAS 6122-



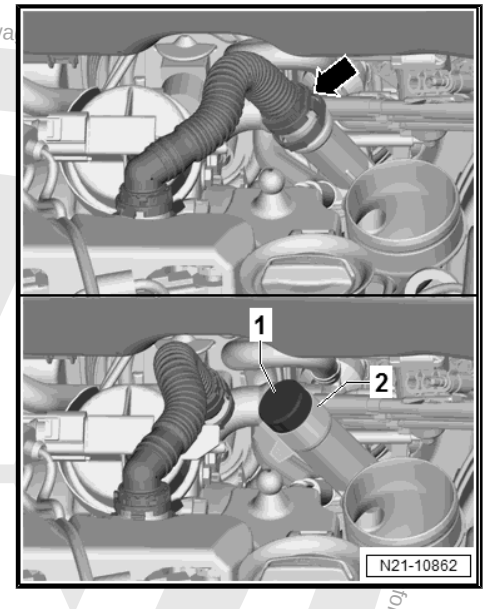
Procedure

1 – Release hose clamps -1, 2- and remove air pipe.

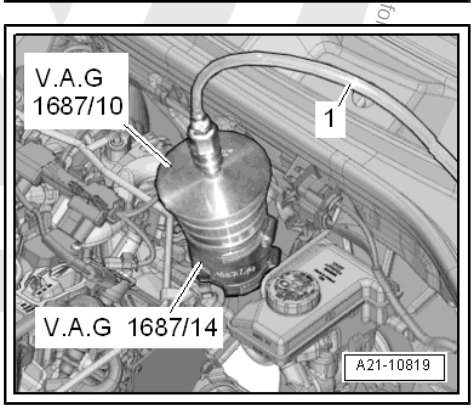


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– Pull off breather pipe for crankcase breather system -arrow-.
– Seal connection with a bung -1- from engine bung set and secure with a hose clip -2-.

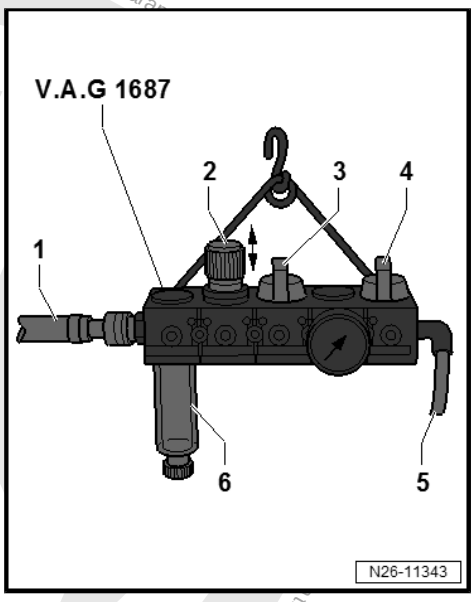


– Connect adapter - V.A.G 1687/10- with adapter -V.A.G 1687/14- to turbocharger.
– Connect charge air system tester - V.A.G 1687- to adapter.



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



– Pull pressure control valve -2- upwards, unscrew it completely, and close valves -3- and -4-.

– Connect charge air system tester - V.A.G 1687- to compressed air -1- via commercial adapter.

Note

If there is water in the inspection glass -6-, drain it via the drain plug.

– Open valve -3-.

– Adjust pressure to 0.5 bar with pressure control valve -2-.

– Open valve -4- and wait until test circuit is full. If necessary, re-adjust pressure to 0.5 bar.

– Check charge air system for leaks by listening, touching, with commercially available leak detector spray or using ultrasonic tester - V.A.G 1842- .

Note

- *A small amount of air escapes through the valves and enters the engine. Therefore a holding pressure test is not possible.*
- *Ultrasonic tester - V.A.G 1842- ⇒ operating instructions*
- *Before removing the adapters, depressurise the test circuit by detaching the hose coupling.*

Installing

Assemble in reverse order of dismantling.

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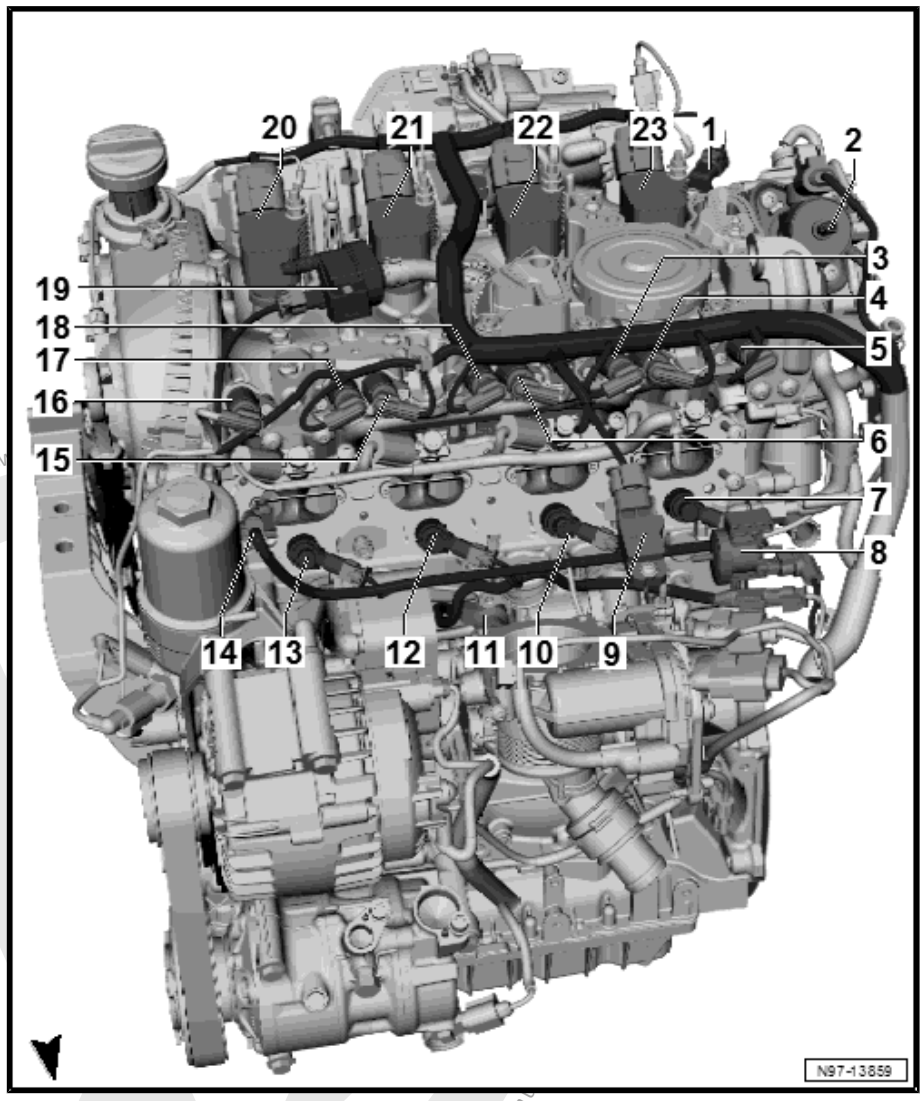
24 – Mixture preparation - injection

1 Injection system

⇒ "1.1 Overview of fitting locations - injection system", page 241

1.1 Overview of fitting locations - injection system

Overview of fitting locations - engine, top



1 - Hall sender 3 - G300-

- ❑ Assembly overview ⇒ page 316

2 - Fuel pressure regulating valve - N276-

3 - Inlet cam actuator B for cylinder 3 - N593-

- ❑ Assembly overview ⇒ page 127

4 - Inlet cam actuator B for cylinder 4 - N601-

- ❑ Assembly overview ⇒ page 127

5 - Inlet cam actuator A for cylinder 4 - N600-

- ❑ Assembly overview ⇒ page 127

6 - Inlet cam actuator A for cylinder 3 - N592-

- ❑ Assembly overview ⇒ page 127

7 - Injector, cylinder 4 - N33-

- ❑ Assembly overview ⇒ page 251

8 - Intake manifold flap air flow control valve - N316-

- ❑ Assembly overview ⇒ page 265

9 - Intake manifold sender - GX9-

- ❑ Consists of intake air temperature sender - G42- / intake manifold pressure sender - G71-

10 - Injector, cylinder 3 - N32-

- ❑ Assembly overview ⇒ page 251

11 - Knock sensor 1 - G61-

- ❑ Assembly overview ⇒ page 316

12 - Injector, cylinder 2 - N31-

- ❑ Assembly overview ⇒ page 251

13 - Injector, cylinder 1 - N30-

- ❑ Assembly overview ⇒ page 251

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14 - Intake manifold flap potentiometer - G336-

- ❑ Bend aside retaining tabs to allow for pulling potentiometer out of intake manifold

15 - Inlet cam actuator B for cylinder 2 - N585-

- ❑ Assembly overview ⇒ page 127

16 - Inlet cam actuator A for cylinder 1 - N576-

- ❑ Assembly overview ⇒ page 127

17 - Inlet cam actuator B for cylinder 1 - N577-

- ❑ Assembly overview ⇒ page 127

18 - Inlet cam actuator A for cylinder 2 - N584-

- ❑ Assembly overview ⇒ page 127

19 - Activated charcoal filter solenoid valve 1 - N80-

20 - Ignition coil 1 with output stage - N70-

- ❑ Assembly overview ⇒ page 316

21 - Ignition coil 2 with output stage - N127-

- ❑ Assembly overview ⇒ page 316

22 - Ignition coil 3 with output stage - N291-

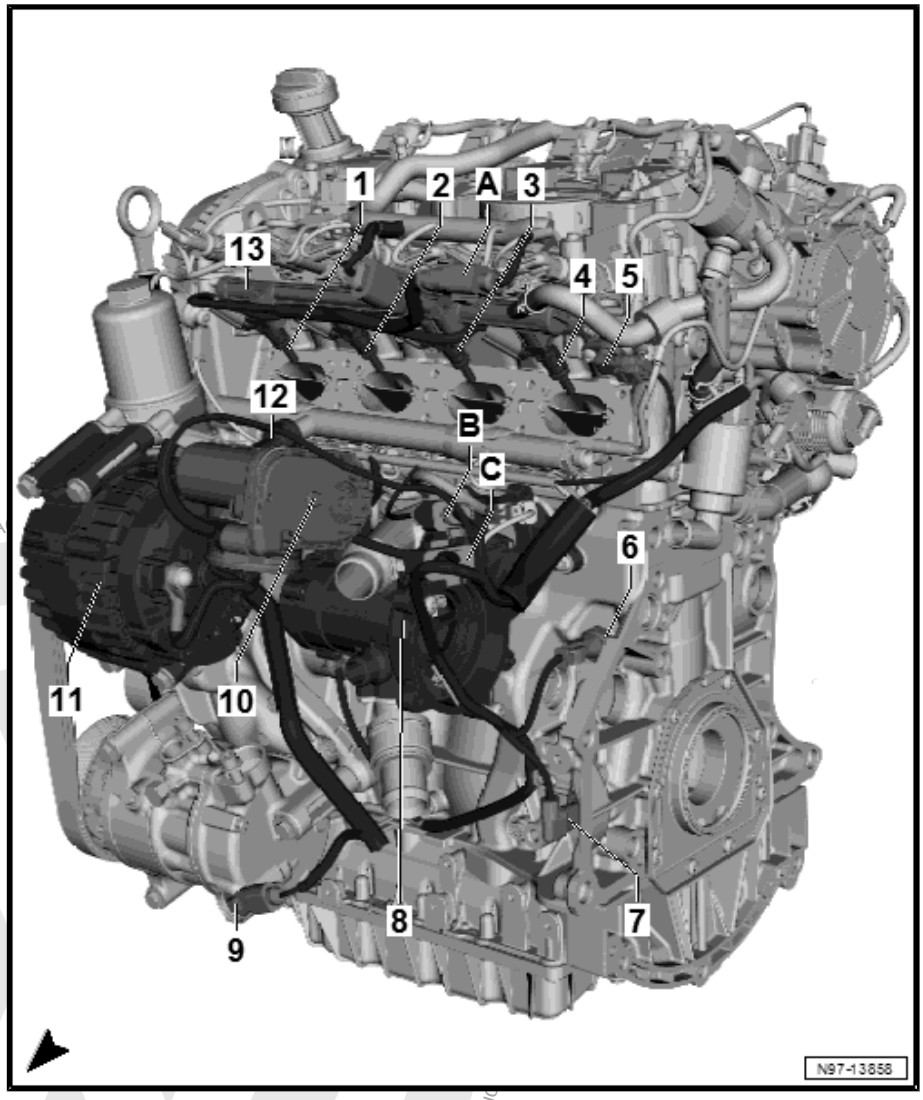
- ❑ Assembly overview ⇒ page 316

23 - Ignition coil 4 with output stage - N292-

- ❑ Assembly overview ⇒ page 316

Overview of fitting locations – engine, front

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1 - Injector 2 for cylinder 1 - N532-

- ❑ Assembly overview ⇒ page 252

2 - Injector 2 for cylinder 2 - N533-

- ❑ Assembly overview ⇒ page 252

3 - Injector 2 for cylinder 3 - N534-

- ❑ Assembly overview ⇒ page 252

4 - Injector 2 for cylinder 4 - N535-

- ❑ Assembly overview ⇒ page 252

5 - Hall sender - G40-

- ❑ Assembly overview ⇒ page 316

6 - Stage 3 oil pressure switch - F447-

- ❑ Assembly overview ⇒ page 173

7 - Engine speed sender - G28-

- ❑ Assembly overview ⇒ page 316

8 - Actuator for engine temperature regulation - N493-

- ❑ Assembly overview ⇒ page 195

9 - Air conditioner compressor regulating valve - N280-

10 - Throttle valve module - GX3-

- ❑ and

- ♦ Throttle valve drive (electric throttle) - G186-
- ♦ Angle sender for throttle valve drive - G187-
- ♦ Angle sender 2 for throttle valve drive - G188-

- ❑ Assembly overview ⇒ page 265

11 - Alternator with voltage regulator - CX1-

12 - Fuel pressure sender - G247-

13 - Fuel pressure sender for low-pressure - G410-

Overview of fitting locations - engine, right side

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1 - Exhaust camshaft control valve 1 - N318-

- ❑ Assembly overview ⇒ page 100

2 - Inlet camshaft control valve 1 - N205-

- ❑ Assembly overview ⇒ page 100

3 - Oil pressure switch - F1-

- ❑ Assembly overview ⇒ page 173

4 - Oil pressure switch for reduced oil pressure - F378-

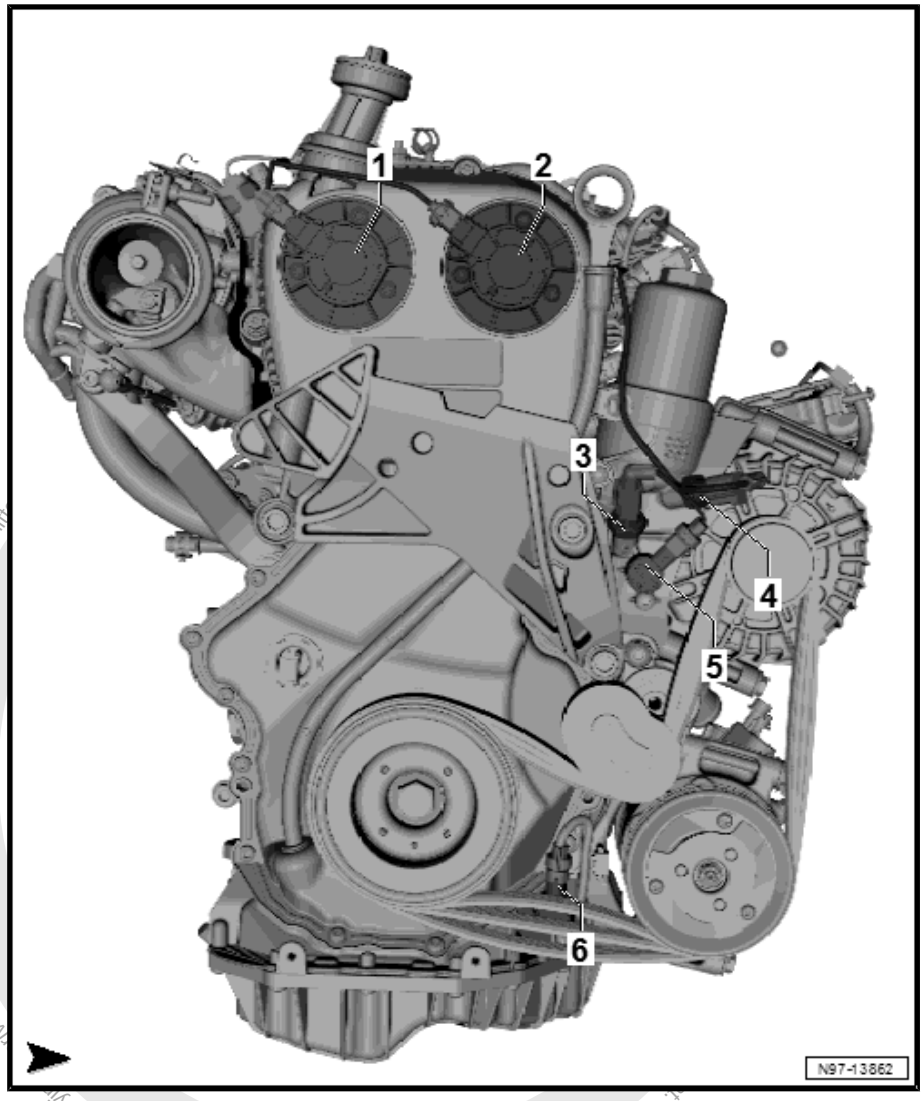
- ❑ Assembly overview ⇒ page 173

5 - Piston cooling jet control valve - N522-

- ❑ Assembly overview ⇒ page 173

6 - Valve for oil pressure control - N428-

- ❑ Assembly overview ⇒ page 173



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Overview of fitting locations - engine (left)

1 - Turbocharger air recirculation valve - N249-

- ❑ Assembly overview ⇒ page 225

2 - Charge pressure positioner - V465- with position sender for charge pressure positioner - G581-

- ❑ Assembly overview ⇒ page 225

3 - Auxiliary pump for heating - V488-

- ❑ Assembly overview ⇒ page 197

4 - Oil level and oil temperature sender - G266-

- ❑ Removing and installing ⇒ page 164

5 - Secondary air inlet valve - N112-

- ❑ Only engines with secondary air system

6 - Radiator outlet coolant - G62-

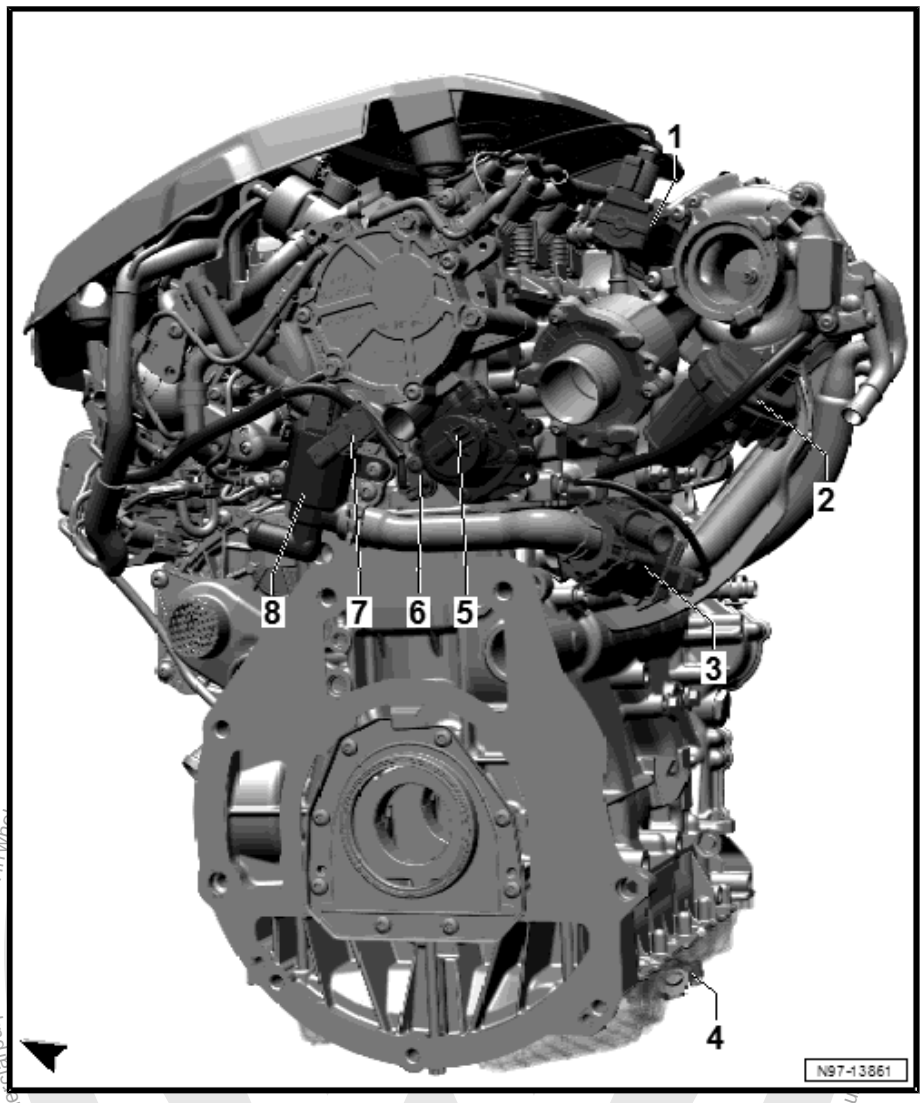
- ❑ Assembly overview ⇒ page 195

7 - Sender 1 for secondary air pressure - G609-

- ❑ Only engines with secondary air system

8 - Coolant shut-off valve - N82-

- ❑ Removing and installing ⇒ page 207



Overview of fitting locations – engine, rear

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Volkswagen Group Russia does not

1 - Turbocharger air recirculation valve - N249-

- ❑ Assembly overview ⇒ page 225

2 - Auxiliary pump for heating - V488-

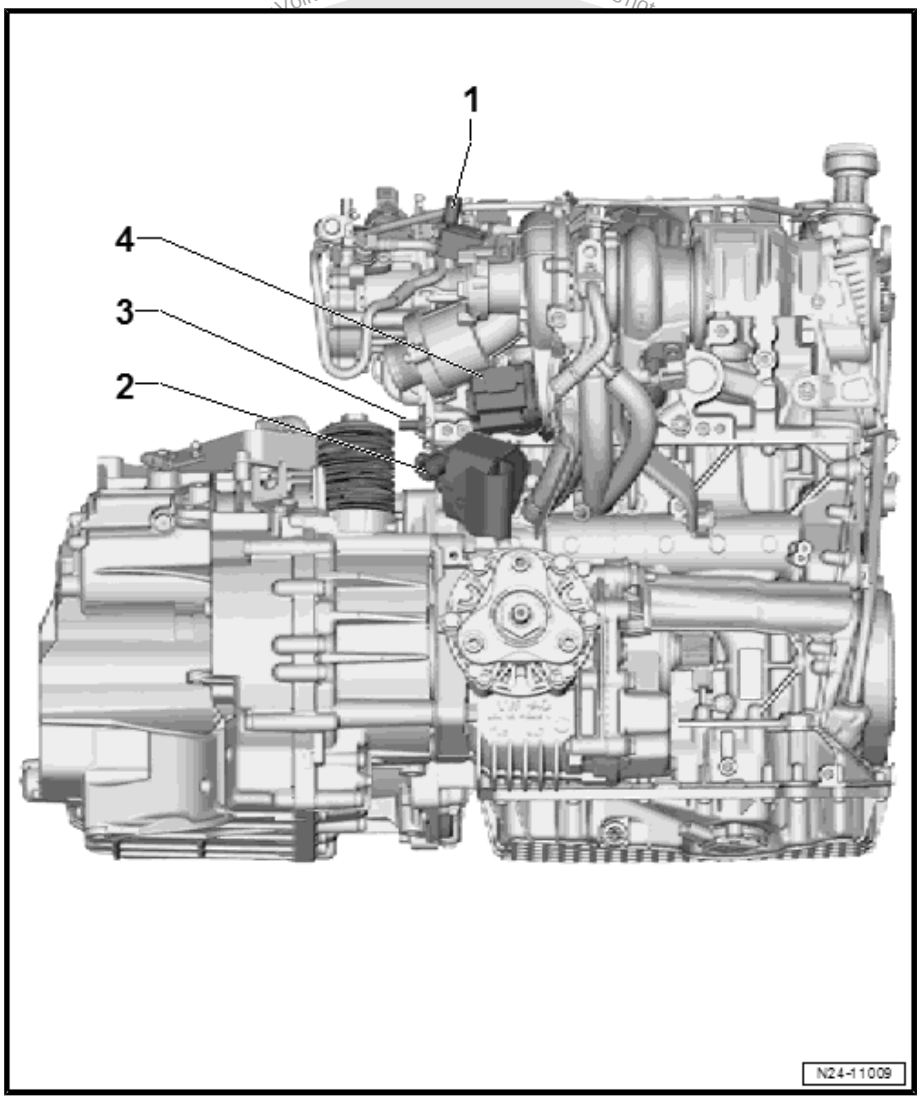
- ❑ Assembly overview ⇒ page 197

3 - Radiator outlet coolant - G62-

- ❑ Assembly overview ⇒ page 195

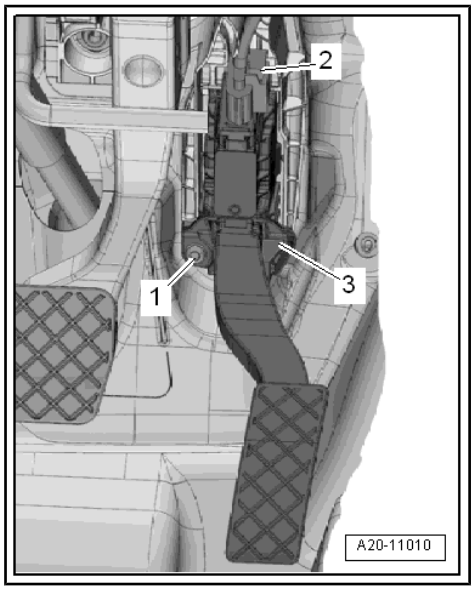
4 - Charge pressure positioner - V465- with position sender for charge pressure positioner - G581-

- ❑ Assembly overview ⇒ page 225

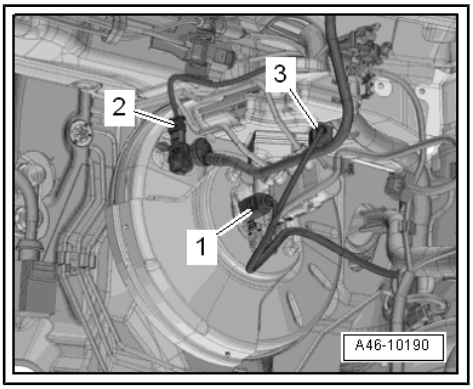


Accelerator pedal module - GX2-

2 - Connector for accelerator pedal module



Fitting location brake light switch - F- / brake pedal switch - F63- and vacuum sender - G608-

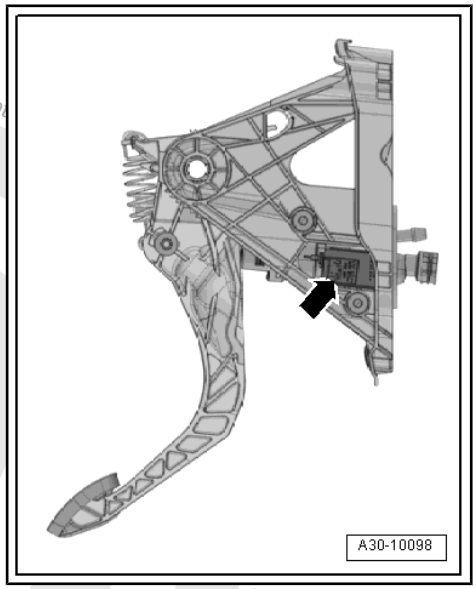


1 - Brake light switch - F- / brake pedal switch - F63-

2 - Vacuum sender - G608-

♦ On brake servo in engine compartment

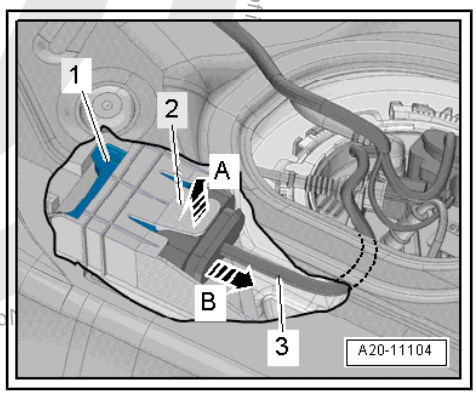
Clutch position sender - G476- -2-



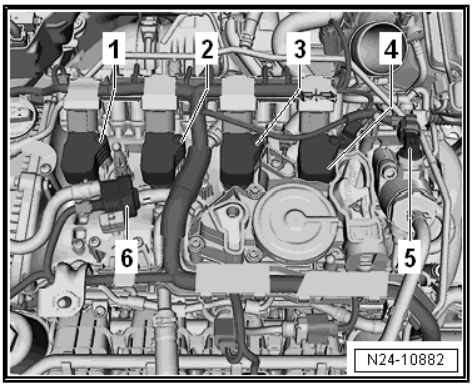
• On mounting bracket for clutch pedal -arrow-

Removing and installing ⇒ Rep. gr. 30 ; Clutch mechanism

Fuel pump control unit - J538- -1-



Ignition coils with output stages



1 - Ignition coil 1 with output stage - N70-

2 - Ignition coil 2 with output stage - N127-

3 - Ignition coil 3 with output stage - N291-

4 - Ignition coil 4 with output stage - N292-

5 - Fuel pressure regulating valve - N276-

6 - Activated charcoal filter solenoid valve 1 - N80-

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Injectors (combustion chamber)

1 - No. 1 cyl. injector - N30-

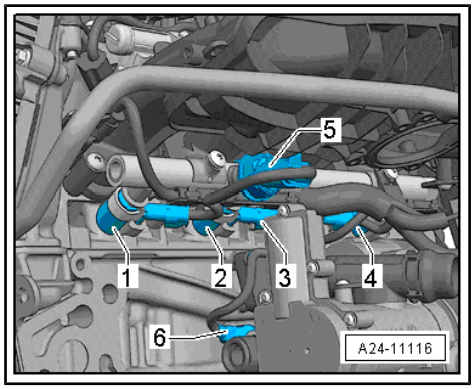
2 - No. 2 cyl. injector - N31-

3 - No. 3 cyl. injector - N32-

4 - No. 4 cyl. injector - N33-

5 - Fuel pressure sender - G247-

6 - Knock sensor 1 - G61-



Intake manifold injectors

1 - Injector 2 for cylinder 1 - N532-

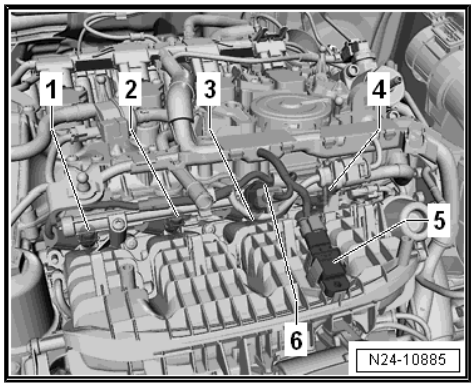
2 - Injector 2 for cylinder 2 - N533-

3 - Injector 2 for cylinder 3 - N534-

4 - Injector 2 for cylinder 4 - N535-

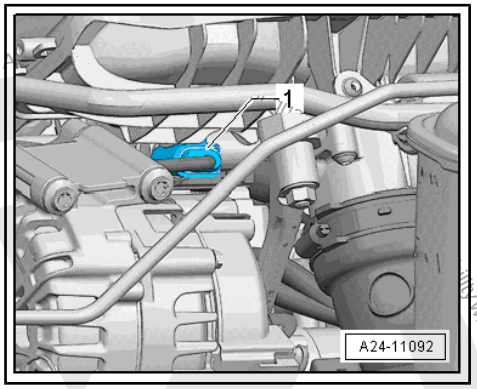
5 - Intake manifold sender - GX9-

6 - Fuel pressure sender for low-pressure - G410-



Fuel pressure sender in high-pressure system

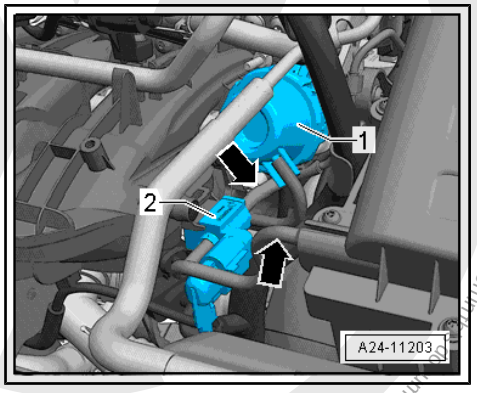
1 - Fuel pressure sender - G247-



Variable intake manifold

1 - Vacuum unit for intake manifold flaps

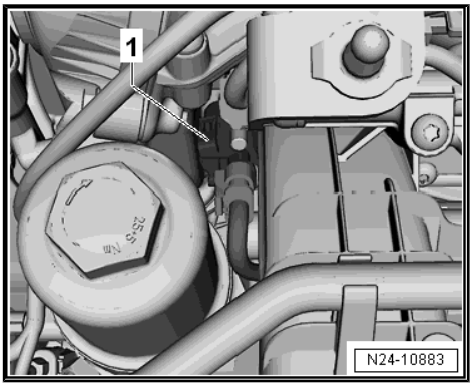
2 - Intake manifold flap air flow control valve - N316-



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Intake manifold flap potentiometer - G336-

Bend aside retaining tabs to allow for pulling potentiometer out of intake manifold.



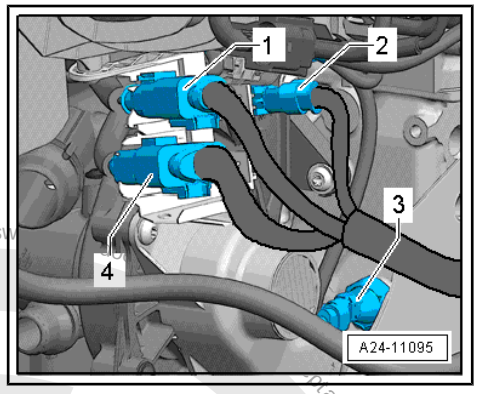
Connectors

1 - For injectors (combustion chamber).

2 - For knock sensor 1 - G61- .

3 - Stage 3 oil pressure switch - F447-

4 - For intake manifold flap valve - N316- , fuel pressure sender - G247- , intake manifold flap potentiometer - G336- , coolant temperature sender - G62- and Hall sender - G40- .



High-pressure pump and Hall sender

1 - Hall sender 3 - G300-

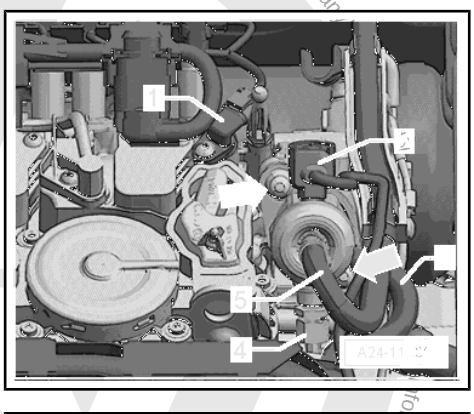
2 - Fuel pressure regulating valve - N276-

3 - Fuel line leading to fuel rail for injectors (intake manifold)

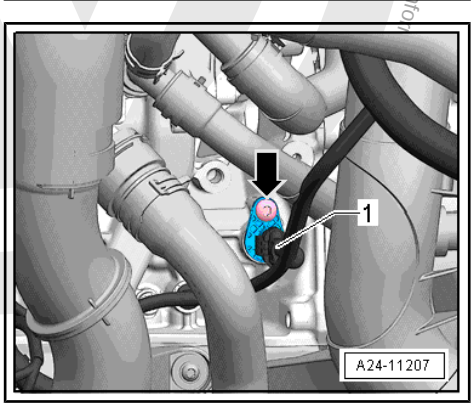
4 - High-pressure line leading to fuel rail for injectors (combustion chamber)

5 - Fuel pressurisation line from fuel tank

Pfeile - Securing bolts



Engine speed sender - G28- -1-

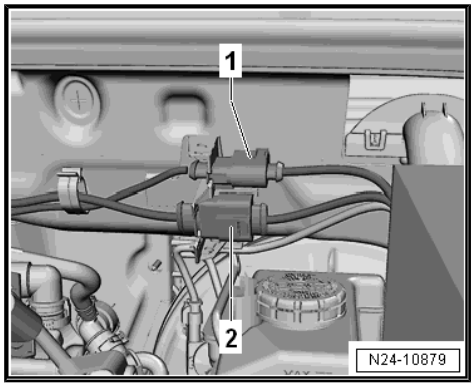


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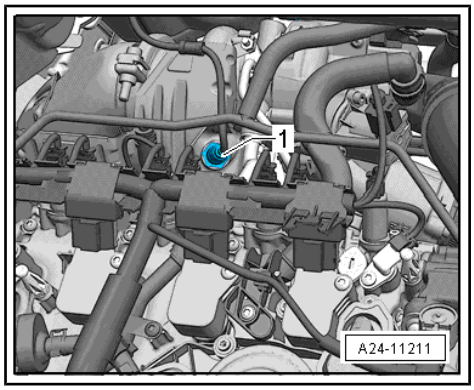
Lambda probes

1 - Connector for Lambda probe 1 after catalytic converter - GX7-

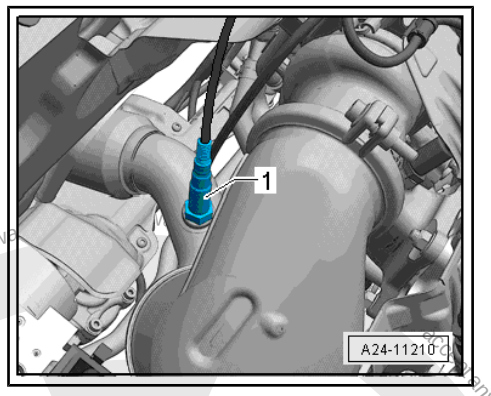
2 - Connector for Lambda probe 1 before catalytic converter - GX10-



Lambda probe 1 before catalytic converter - GX10- -1-



Lambda probe 1 after catalytic converter - GX7- -1-



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2 Injectors

⇒ “2.1 Assembly overview - fuel rail with injectors”, page 251

⇒ “2.2 Removing and installing fuel rail”, page 253

⇒ “2.3 Removing and installing injectors”, page 253

⇒ “2.4 Renewing seals on injectors”, page 259

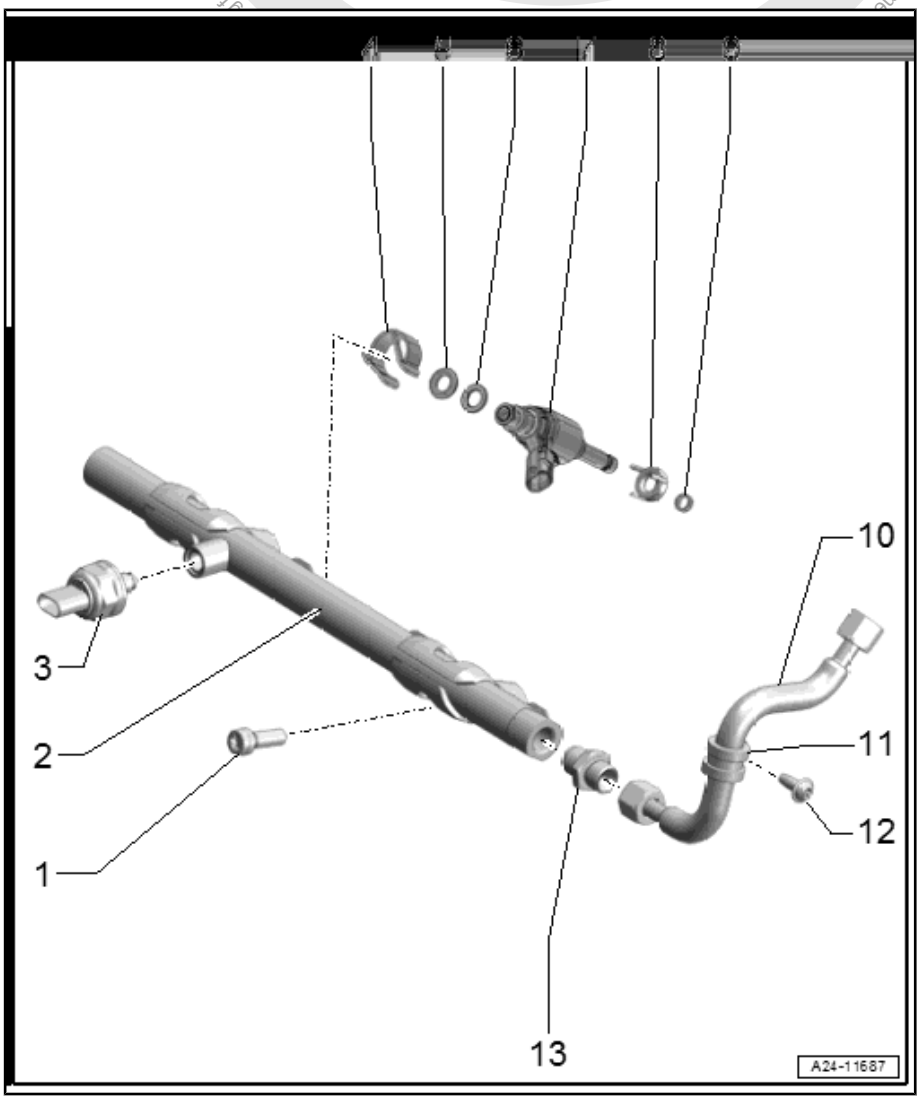
⇒ “2.5 Cleaning injectors”, page 260

2.1 Assembly overview - fuel rail with injectors

⇒ “2.1.1 Assembly overview - fuel rail with injectors, direct injection”, page 251

⇒ “2.1.2 Assembly overview - fuel rail with injectors, indirect injection”, page 252

2.1.1 Assembly overview - fuel rail with injectors, direct injection



1 - Bolt
- ❑ M6: 9 Nm
- ❑ Renew M8 bolt after removal
- ❑ M8: 20 Nm + 90°

2 - Fuel rail for FSI injectors
- ❑ Removing and installing ⇒ page 253

3 - Fuel pressure sender - G247-
- ❑ Lubricate taper lightly with clean engine oil; do not lubricate thread
- ❑ Removing and installing ⇒ page 275
- ❑ 27 Nm

4 - Support ring
- ❑ Renew after removal

5 - O-ring
- ❑ Renew after removal

6 - Spacer ring
- ❑ Renew after removal

7 - Injection valve
- ❑ Ensure correct installation position
- ❑ Removing and installing ⇒ page 253
- ❑ Cleaning ⇒ page 260

8 - Sealing disc

9 - Combustion chamber seal
- ❑ Renew after removing injector ⇒ page 253

10 - High-pressure pipe
- ❑ From high-pressure pump.

- ❑ Moisten ball of fuel supply line with engine oil.
- ❑ Install free of tension.
- ❑ Union nut, 27 Nm

11 - Clamp

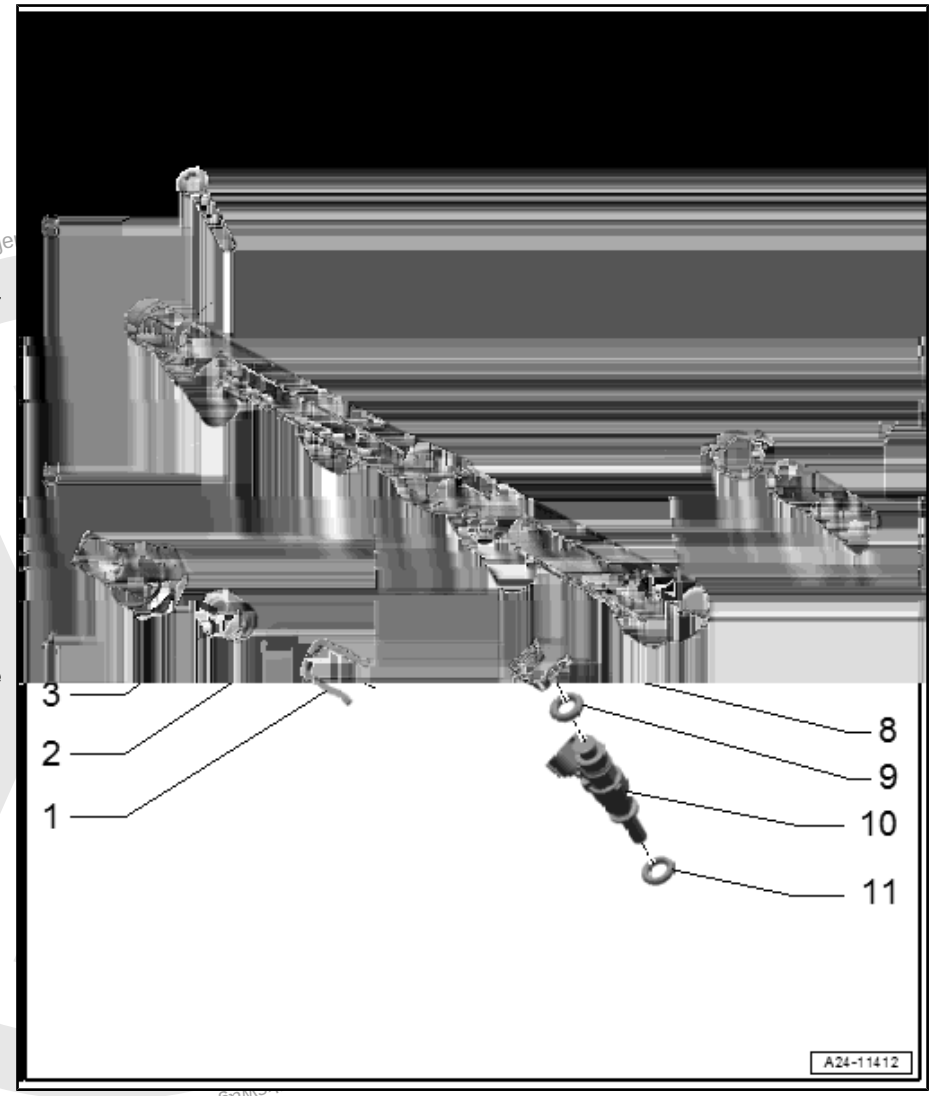
12 - Bolt

- ❑ 9 Nm

13 - Union

- ❑ Renew after removal
- ❑ Lubricate thread with clean engine oil
- ❑ 40 Nm

2.1.2 Assembly overview - fuel rail with injectors, indirect injection



1 - Retaining clip

- ❑ For fuel pressure sender for low pressure - G410-

2 - O-ring

- ❑ Renew after removal

3 - Adapter

- ❑ Must be screwed onto fuel pressure sender for low pressure - G410- -item 4-
- ❑ 15 Nm

4 - Fuel pressure sender for low-pressure - G410-

- ❑ Must be screwed onto adapter -item 3-
- ❑ Removing and installing ⇒ page 279
- ❑ 15 Nm

5 - Fuel rail for injectors (intake manifold)

6 - Bolt

- ❑ 9 Nm

7 - Fuel supply line

- ❑ To fuel rail for injectors (intake manifold)
- ❑ Install free of tension.

8 - Retaining clip

9 - O-ring

- ❑ Renew after removal

10 - Injection valve

- ❑ Ensure correct installation position
- ❑ Removing and installing ⇒ page 257

11 - O-ring

- ❑ Renew after removal

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2.2 Removing and installing fuel rail

Note

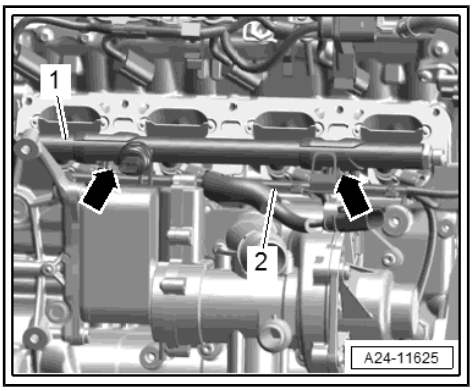
In this section, the work procedure for direct injection engines is described.

Removing

Note

Fit all cable ties in the original position when installing.

– Remove intake manifold ⇒ page 266 .
– Disconnect all electrical connectors from injectors.
– Unscrew bolts -arrows-.
– Pull fuel rail -1- together with wiring duct -2- off injectors.
– Lay wiring duct to one side.



Installing

Install in reverse order of removal, observing the following:

Note

- *Renew support rings for injectors after removal.*
- *If the injectors remain in the cylinder head when the fuel rail is pulled off, install only the O-rings and spacer rings from the repair kit.*
- *If the injectors are pulled out together with the fuel rail, the entire repair kit needs to be installed together with the combustion chamber ring seal ⇒ page 253 .*

– Install intake manifold ⇒ page 266 .

Specified torques

- ⇒ “2.1.1 Assembly overview - fuel rail with injectors, direct injection”, page 251

2.3 Removing and installing injectors

⇒ “2.3.1 Removing and installing injectors, direct injection”, page 253

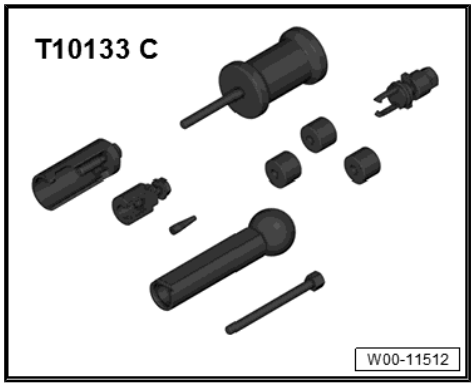
⇒ “2.3.2 Removing and installing injectors, indirect injection”, page 257

2.3.1 Removing and installing injectors, direct injection

Special tools and workshop equipment required

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♦ Tool set for FSI engines - T10133 C-



Removing

Note

Injectors must only be removed when the engine is cold.

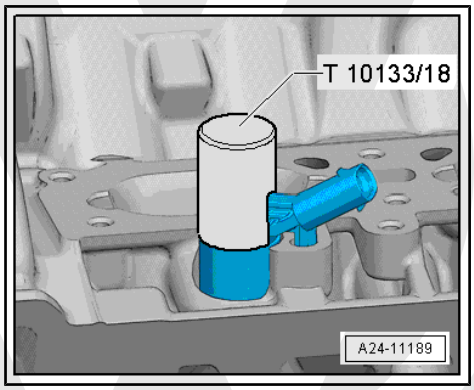
– Removing fuel rail ⇒ page 253 .

Note

If the injectors remain in the fuel rail, carefully pull the injectors out of the fuel rail.

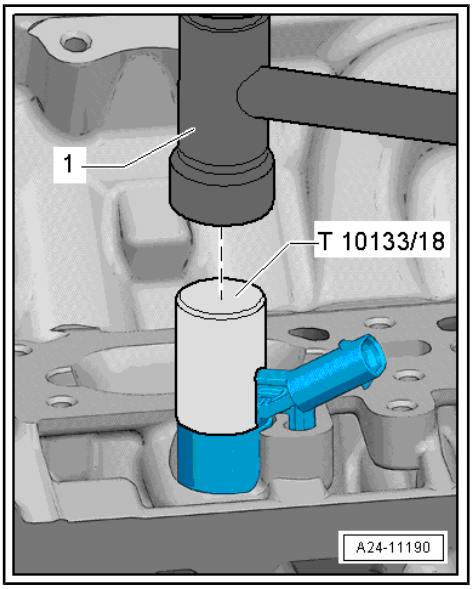
Remove injectors if they remain in cylinder head.

– Cover any open intake ports with a clean cloth.
– Disconnect connector from injector that is to be removed, and pull off support ring.
– Fit impact sleeve -T10133/18- over injector.



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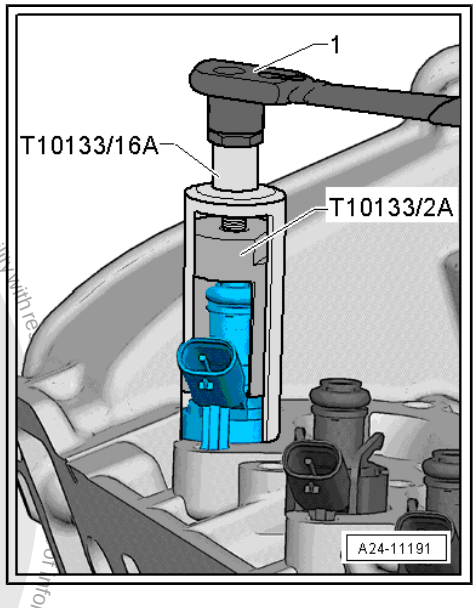
– Carefully release injector with light blows onto impact sleeve.



Note

- *Use a torque wrench to pull out the injector.*
- *Set the torque wrench to 5 Nm.*

– Insert puller -T10133/2A- into groove in injector.
– Fit puller T10133/16A .
– Pull out injector by turning bolt with torque wrench -1-.
– If torque limit of »5 Nm« has been reached and the injector still cannot be pulled out, remove puller and use impact sleeve again to release injector.

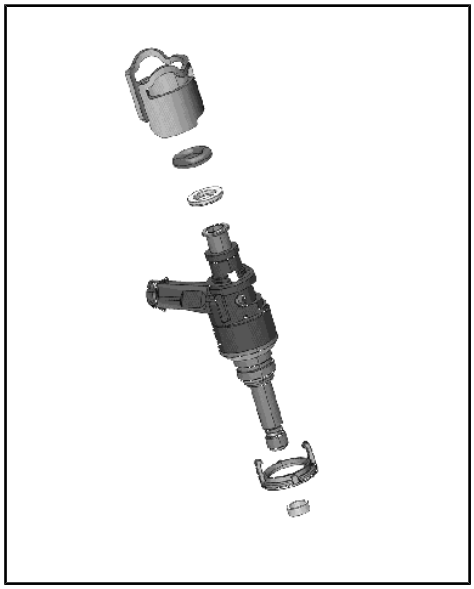


Note

- *If the torque limit is exceeded, the injector may become damaged.*
- *The combustion chamber ring seal must always be renewed prior to reinstallation of the injector* ⇒ page 256 .

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Dismantling injector



– Pull off O-ring -3- and spacer ring -2- from injector -1-.

– Unclip sealing washer -5-.

– Carefully remove old combustion chamber ring seal -6-. To do so, cut open combustion chamber ring using knife or prise open ring with small screwdriver and then pull off forwards.

4 - Renew support ring after each removal

Note

Take care not to damage injector groove. The injector must be renewed if the groove is damaged.

Installing

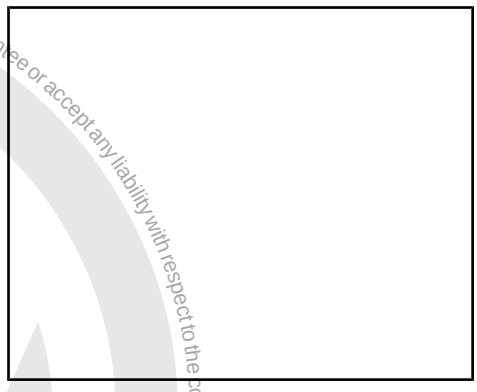
Note

- *Renew spacer ring if damaged.*
- *Lightly lubricate the O-rings for injectors with clean engine oil.*
- *The combustion chamber seal on the injector must not be oiled or greased.*
- *There must be no cleaning fluid or oil in the bores in the cylinder head when installing the injector.*
- *Clean used injectors as necessary* ⇒ page 260 .

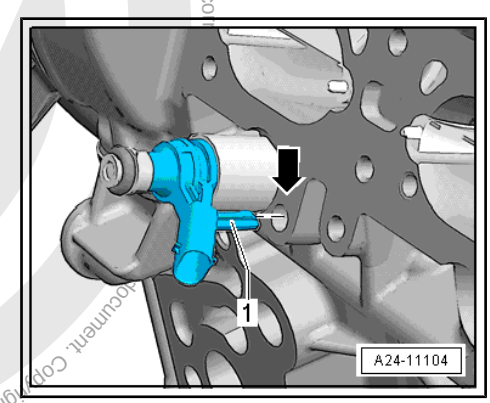
– Renewing seals on injector ⇒ page 259 .

– Before installing injectors, thoroughly clean injector bores in cylinder head with nylon brush - T10133/4- .

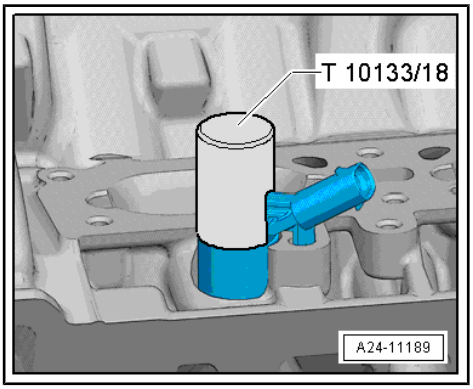
– Push injector by hand as far as it will go into the hole of the cylinder head (free of oil and grease). Ensure injectors are positioned correctly in cylinder head.

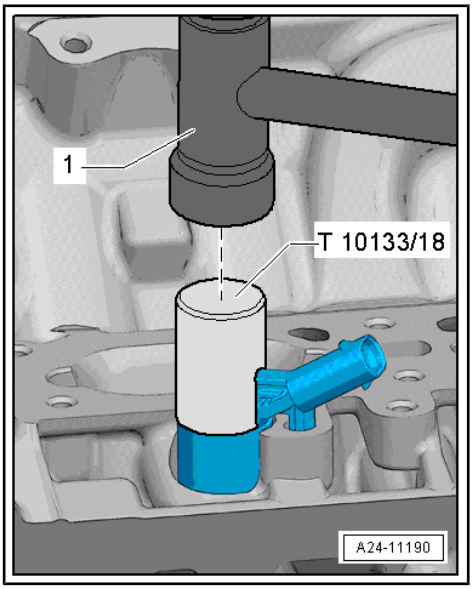


– Lug -1- and hole -arrow- in cylinder head must face each other.



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Note

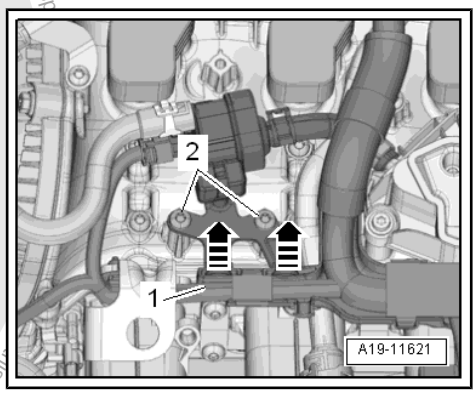
- *You must be able to insert the injector easily. If necessary, wait until the combustion chamber seal has contracted sufficiently.*
- *Ensure correct position of injectors in cylinder head.*
- *Proceed as follows if the injector cannot be inserted by hand:*
- *Fit impact sleeve -T10133/18- over injector.*
- *Carefully drive in injector with light blows onto impact sleeve.*

– Fit support ring onto injector.
– Lightly lubricate O-rings for injectors with clean engine oil.
– Fit fuel rail to injectors, and press it in evenly.
– Installing fuel rail ⇒ page 253 .
– Install intake manifold ⇒ page 266 .

2.3.2 Removing and installing injectors, indirect injection

Removing

– Remove engine cover panel ⇒ page 41 .
– Release fasteners -arrows- and detach wiring duct -1- from bracket.

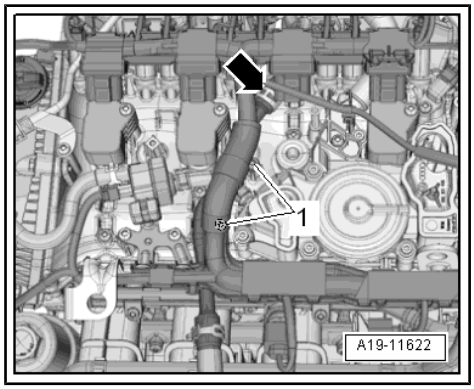


Note

Disregard -item 2-.

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– Unscrew bolt -1- for upper coolant pipe -arrow-.



– Disconnect connectors:

2 - For fuel pressure sender for low pressure - G410-

3 - For intake manifold sender - GX9- .

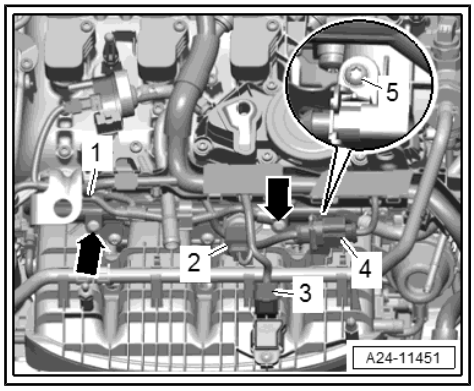
4 - For intake manifold injectors

– Move clear wiring harness -1- at engine lifting eye.

– Unscrew bolts -arrows- at fuel rail.

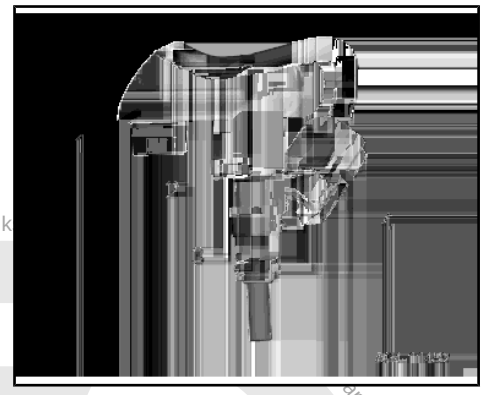
– Unscrew bolt -5- for retainer of connector.

– Carefully pull out fuel rail with injectors upwards.



– Separate electrical connector -4-.

– Pull off retaining clip -2-, and pull injector -3- off fuel rail -1-.



Installing

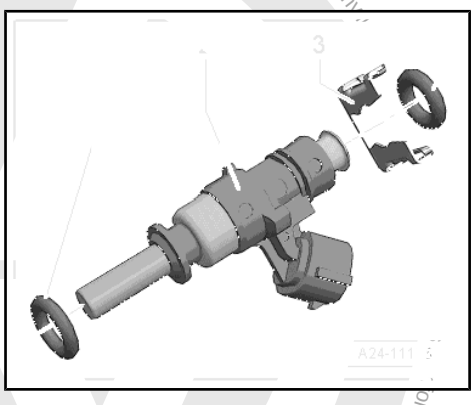
– Renew O-rings -1, 4- for injector -2-.

– Before installing O-rings, lightly moisten them with clean engine oil.

– Secure injector in fuel rail using retaining clip -3-.

– Connect connectors.

– Push fuel rail with injectors by hand as far as stop into hole in intake manifold (which must be free of oil and grease).



Further assembly is carried out in the reverse order.

Specified torques

- ⇒ “2.1.2 Assembly overview - fuel rail with injectors, indirect injection”, page 252
- ⇒ “3.1 Assembly overview - coolant pipes”, page 215

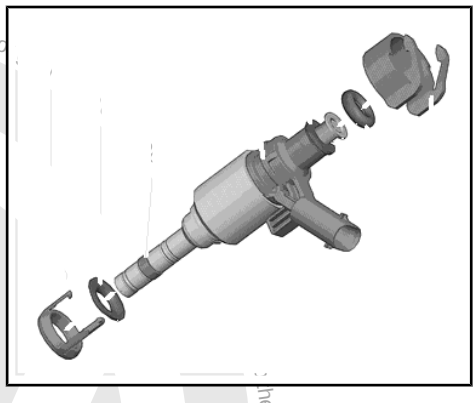
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2.4 Renewing seals on injectors

Note

- *In this section, the work procedure for the combustion chamber seals (Teflon ring seal) is described.*
- *The combustion chamber seal must always be renewed prior to reinstallation of the injector (combustion chamber).*

– Carefully remove old combustion chamber ring seal -3- using a suitable tool (e.g. cut open ring using razor blade, or prise open ring with small screwdriver and then pull it off towards front). It is essential to ensure that the groove and continuous ridge in groove surface are not damaged.

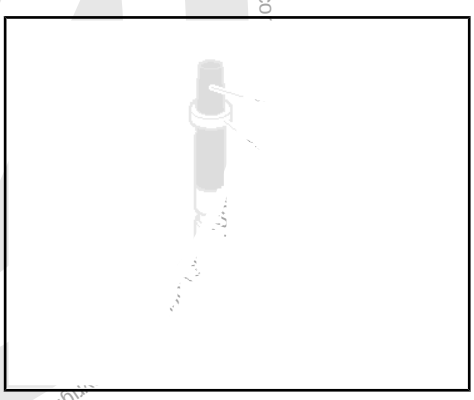


Note

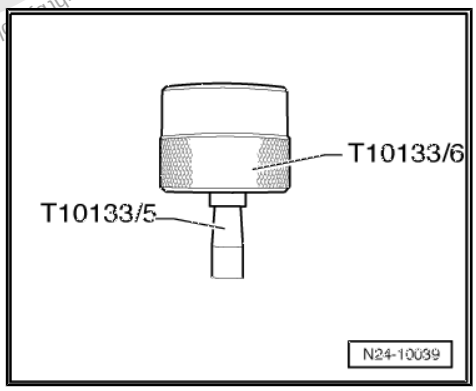
Injector must be renewed if groove is damaged.

– Before new combustion chamber ring seal is fitted, remove any combustion residues from groove for combustion chamber ring seal and from injector shaft using a clean cloth.

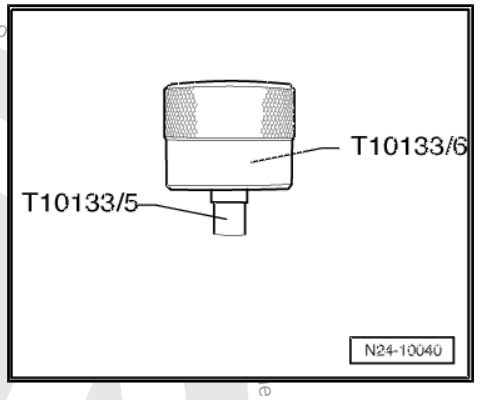
– Fit assembly cone - T10133/5- with new combustion chamber ring seal -1- onto injector -2-.



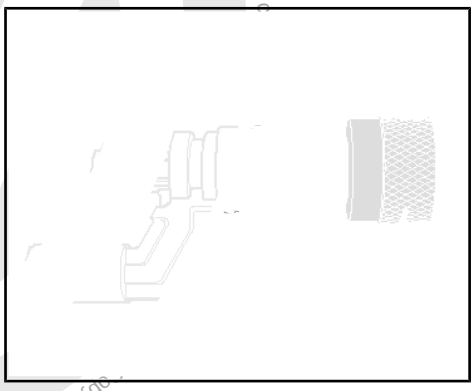
– Slide combustion chamber ring seal with assembly sleeve - T10133/6- onto assembly cone -T10133/5- as far as it will go.



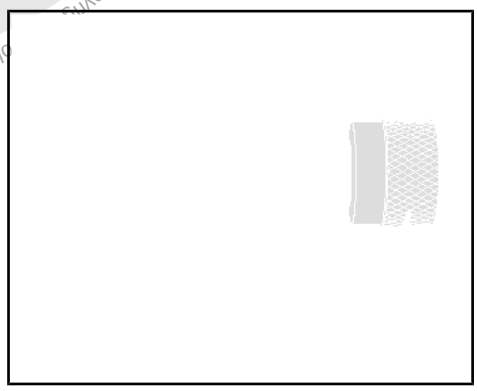
– Turn over assembly sleeve - T10133/6- , and push combustion chamber ring seal onto end of assembly cone - T10133/5- .
– Remove assembly cone - T10133/5- , and push combustion chamber ring seal into groove for combustion chamber ring seal using assembly sleeve - T10133/6- .



– Push calibration sleeve -T10133/7- onto injector to stop and simultaneously turn it slightly (approx. 180°).
– Pull calibration sleeve -T10133/7- off again, turning in opposite direction.



– Push calibration sleeve -T10133/8- onto injector to stop and simultaneously turn it slightly (approx. 180°).
– Pull calibration sleeve -T10133/8- off again, turning in opposite direction.
– Renew O-ring on injector. Before installing new O-ring, lightly moisten it with clean engine oil.



2.5 Cleaning injectors

Note

In this section, the work procedure for injectors (combustion chamber) is described.

Special tools and workshop equipment required

- Ultrasonic cleaning device - VAS 6418-
- Mounting plate for injection modules - VAS 6418/1-
- Cleaning fluid - VAS 6418/2-

Cleaning

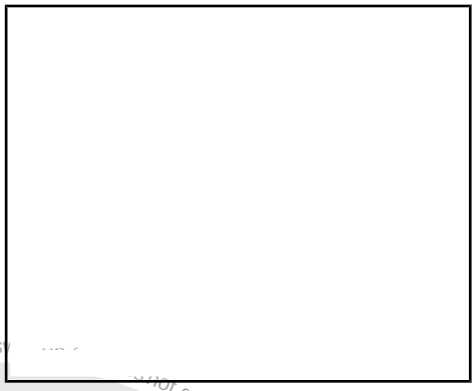
– Close drain tap -arrow- of ultrasonic cleaning unit - VAS 6418- at right-hand side of housing.

– Fill ultrasonic cleaning unit with 2120 ml of water which was allowed to stand for a while and with cleaning fluid - VAS 6418/2- .

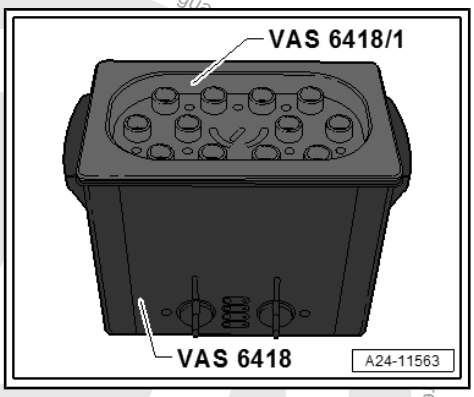
Mixing ratio for cleaning fluid

- 2100 ml of water which was allowed to stand for a while and 20 ml of cleaning fluid - VAS 6418/2- .

– Remove injectors ⇒ page 253 .



– Fit mounting plate for injection modules - VAS 6418/1- onto cleaning unit.



Note

- *Before starting ultrasonic cleaning unit - VAS 6418- , it is essential that the safety information described in the operating manual is observed.*
- *The ideal fluid level is reached when the cleaning agent is approx. 1 to 4 mm above the base of the support plate. The ultrasonic cleaner - VAS 6418- could become damaged if the fluid level is too low.*

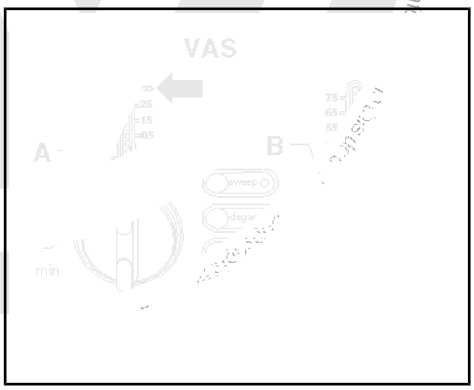
– Insert injectors into guides of mounting plate for injection modules - VAS 6418/1- as far as stop.

– Switch on cleaning unit by pressing on/off button -C-.

– Use rotary knob -A- to set cleaning time to 30 minutes.

– Set rotary knob -B- to a temperature of 50°C.

– Press button ▶ -D- to start the cleaning process.



Note

- *Temperature-controlled cleaning is now activated. During the warm-up period, ultrasonic waves are activated to mix the cleaning fluid. Once the preselected temperature is reached, the ultrasonic waves are switched to continuous operation.*
- *The cleaning time must be at least 30 minutes and cleaning only starts at a temperature of at least 50°C.*

– Each time after cleaning injectors (combustion chamber), renew combustion chamber seal (Teflon ring seal) ⇒ page 259 .

– Install injectors (combustion chamber) ⇒ page 253 .

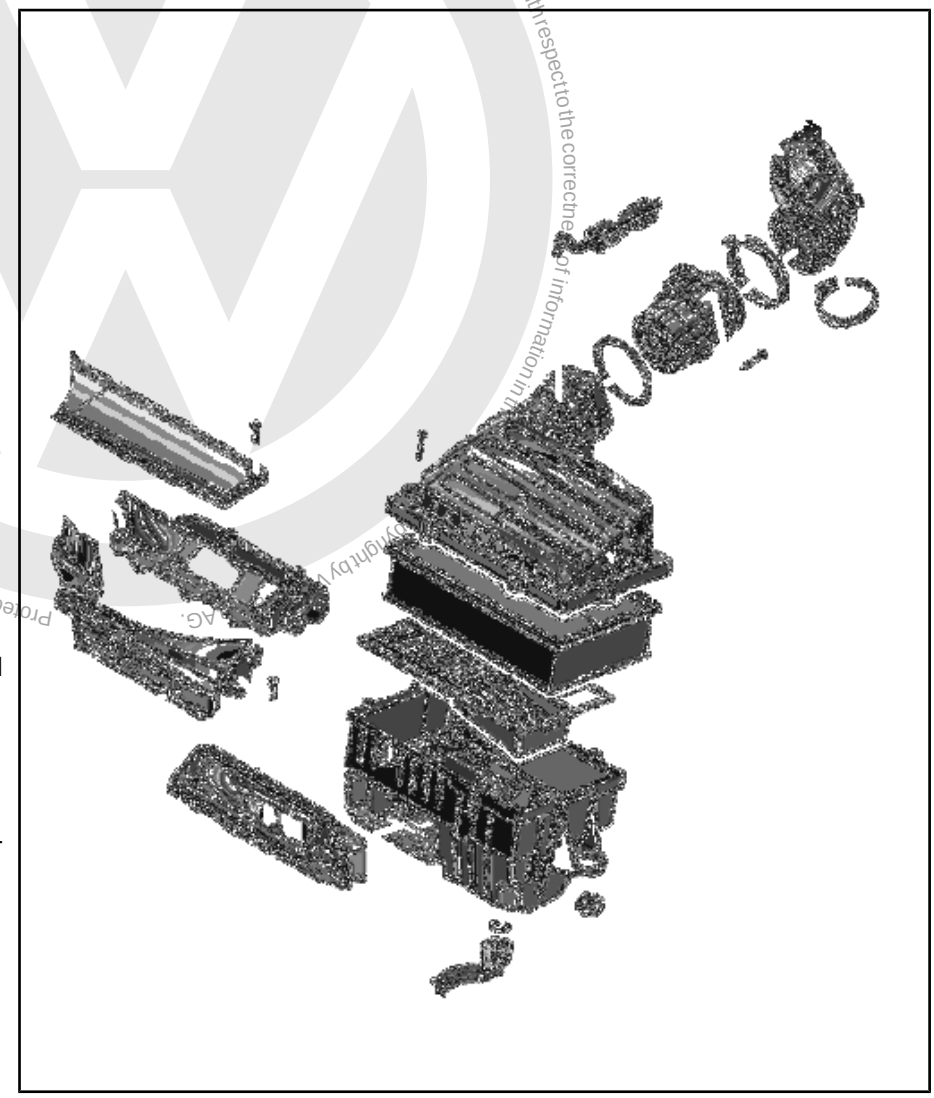
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3 Air filter

⇒ “3.1 Assembly overview - air filter housing”, page 262

⇒ “3.2 Removing and installing air filter housing”, page 263

3.1 Assembly overview - air filter housing



1 - Air guide
- ❑ On air cleaner (bottom section)

2 - Bolt
- ❑ 2 Nm

3 - Air duct (bottom section)
- ❑ On lock carrier.

4 - Air duct (top section)
- ❑ On lock carrier.

5 - Cover
- ❑ For air duct

6 - Bolt
- ❑ 2 Nm

7 - Bolt
- ❑ 1.5 Nm

8 - Air filter upper part
- ❑ Remove dirt, leaves and salt residues

9 - Breather hose
- ❑ From intake manifold flap valve - N316-
- ❑ Connecting point on upper part of air filter may vary

10 - Spring-type clip

11 - Air intake hose

12 - Screw-type clamp
- ❑ Installing ⇒ page 263

13 - Bolt
- ❑ 1.5 Nm

14 - Air mass meter - G70-
- ❑ Removing and installing ⇒ page 281

15 - O-ring
- ❑ Renew if damaged

16 - Air filter element
- ❑ Use only genuine air filter elements ⇒ Electronic parts catalogue
- ❑ For change intervals refer to ⇒ Maintenance tables
- ❑ Removing and installing ⇒ Maintenance ; Booklet

17 - Application
- ❑ For air filter lower part

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18 - Air filter lower part

- ❑ Remove dirt, leaves and salt residues

19 - Bump stop

20 - O-ring

- ❑ Renew if damaged

21 - Water drain hose

- ❑ Release by turning
- ❑ With valve
- ❑ Cleaning

Installing air ducts with screw-type clips

Note

- *Hose unions and air intake pipes and hoses must be free of oil and grease before installation.*
- *Secure all hose connections with hose clips corresponding to the series equipment ⇒ Electronic parts catalogue .*
- *Spray the worm screws of the used hose clips with penetrating spray before installing.*

Specified torque:

1 - Hose clip -a- = 13 mm wide: 5.5 Nm

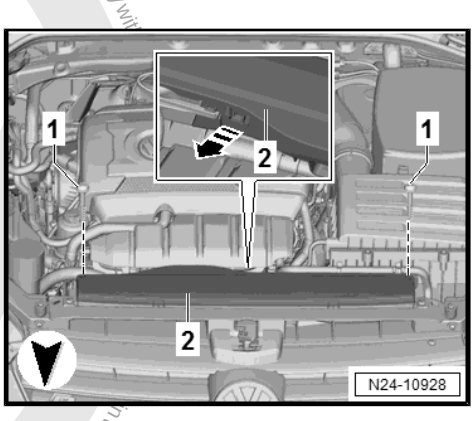
2 - Hose clip -b- = 9 mm wide: 3 Nm

3.2 Removing and installing air filter housing

Removing

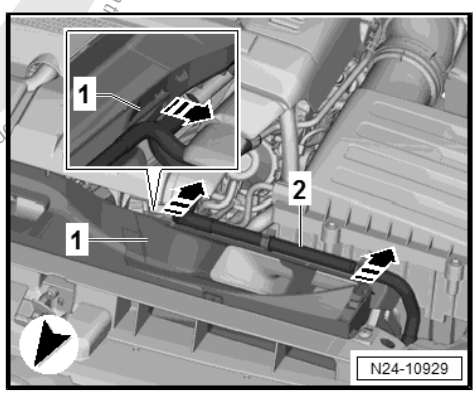
– Unscrew bolts -1-.

– Release catch -arrow- and remove cover -2-.



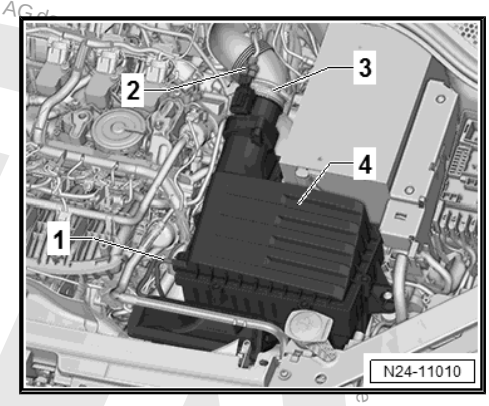
– Lay coolant hose -2- to one side.

– Release fasteners -arrows- and detach air duct (top section) -1-.



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– Detach vacuum hose -1-.
– Pull off connector -2- for air mass meter - G70- .
– Open hose clip -3-, and remove air hose.
– Pull air filter housing -4- upwards off rubber bushes, and remove.



Installing

Note

- *Use a silicone-free lubricant when installing the air hose.*
- *Secure all hose connections with the correct type of hose clips (same as original equipment) ⇒ Electronic parts catalogue (ETKA) .*

– Check air intake hose for salt residue, dirt and leaves (clean air side).
– Check intake port for dirt as far as the air filter element.
– Install air filter housing. Note water drain hose while doing this.

Note

Make sure to route the water drain hose downwards without kinks.

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4 Intake manifold

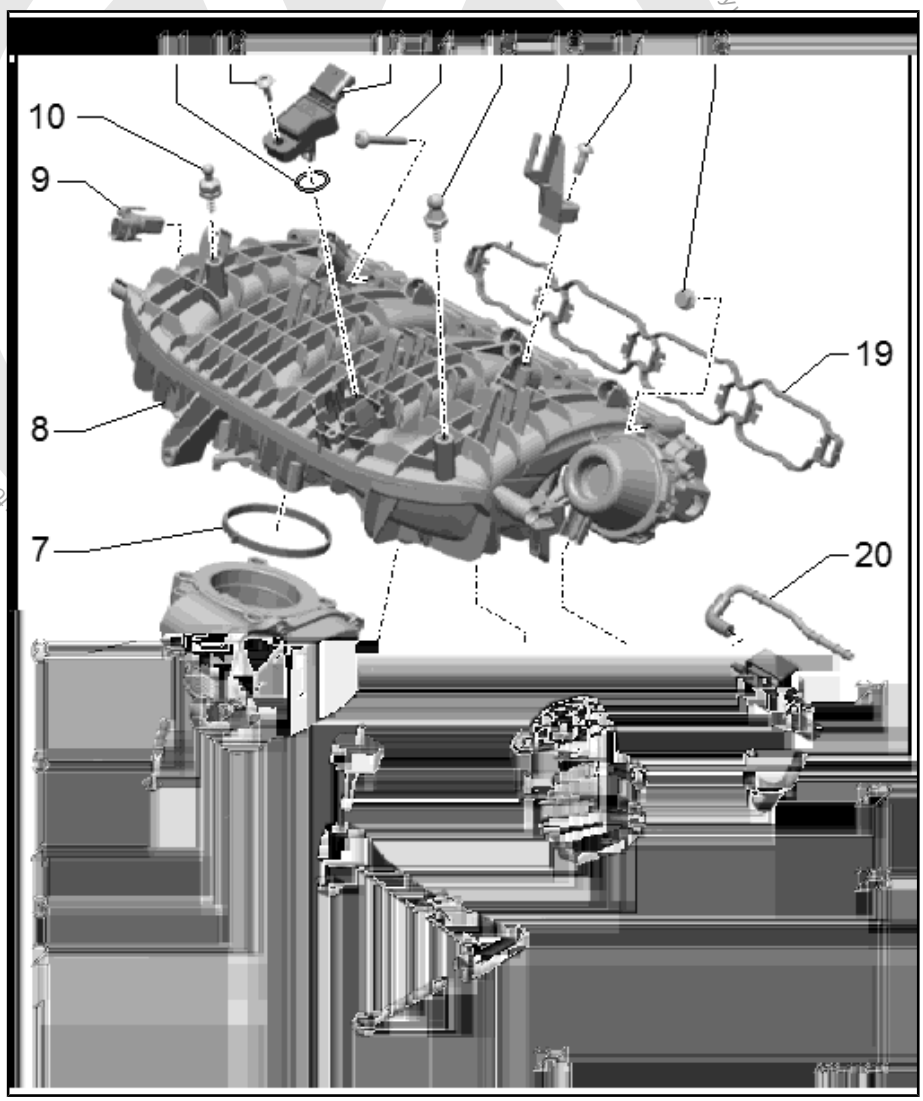
⇒ “4.1 Assembly overview - intake manifold”, page 265

⇒ “4.2 Removing and installing intake manifold”, page 266

⇒ “4.3 Removing and installing throttle valve module GX3 ”, page 271

⇒ “4.4 Cleaning throttle valve module ”, page 273

4.1 Assembly overview - intake manifold



1 - Bolt

- ❑ 20 Nm

2 - Support for intake manifold

3 - Nut

- ❑ 10 Nm

4 - Bonded rubber bush

- ❑ 5 Nm

5 - Bolt

- ❑ 7 Nm

6 - Throttle valve module - GX3-

- ❑ Including throttle valve drive (electric throttle operation) - G186- , angle sender 1 for throttle valve drive (electric throttle operation) - G187- and angle sender 2 for throttle valve drive (electric throttle operation) - G188- .
- ❑ Removing and installing ⇒ page 271

7 - Seal

- ❑ Renew after removal

8 - Intake manifold

- ❑ Removing and installing ⇒ page 266

9 - Intake manifold flap potentiometer - G336-

- ❑ Bend aside retaining tabs to allow for pulling potentiometer out of intake manifold

10 - Ball stud

- ❑ For engine cover panel
- ❑ 5 Nm

11 - O-ring

- ❑ Renew after removal

12 - Bolt

- ❑ 2.5 Nm

13 - Intake manifold sender - GX9-

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- Intake air temperature sender - G42-
- Intake manifold pressure sender - G71-
  - Removing and installing ⇒ page 280

14 - Bolt
- Tighten in several stages and in diagonal sequence
- 9 Nm

15 - Ball stud
- For engine cover panel
- 5 Nm

16 - Bracket
- For electrical connector.

17 - Bolt
- 5 Nm

18 - Nut
- 9 Nm
- Tighten in several stages and in diagonal sequence

19 - Seal
- Renew after removal

20 - Vacuum hose

21 - Intake manifold flap air flow control valve - N316-
- To remove, remove intake manifold.

22 - Vacuum hose

23 - Bracket
- For electrical connectors.

24 - Bolt
- 5 Nm

4.2 Removing and installing intake manifold

Special tools and workshop equipment required

- Torx bit - T10347-



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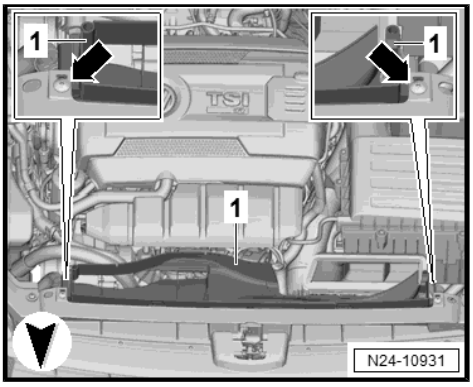
Removing

– Disconnect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and reconnecting battery .

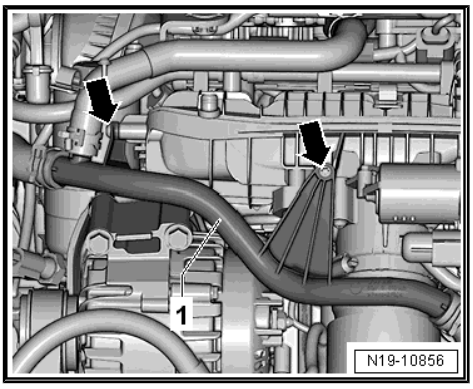
– Remove engine cover panel ⇒ page 41 .

– Remove air filter housing ⇒ page 263 .

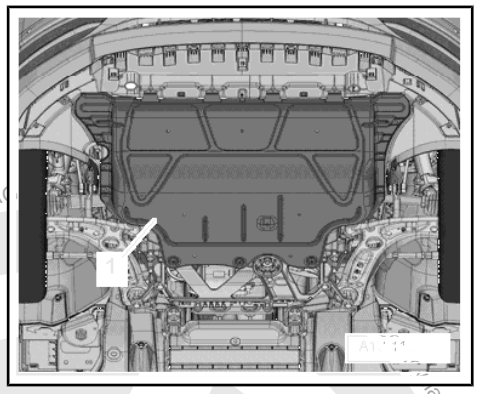
– Unscrew bolt -arrow- on left and right.
– Unclip lower part of air duct -1- and remove it.
– Unscrew bolts -arrows-.
– Detach air duct -1- in lock carrier, an pull it out in -direction of arrow-.



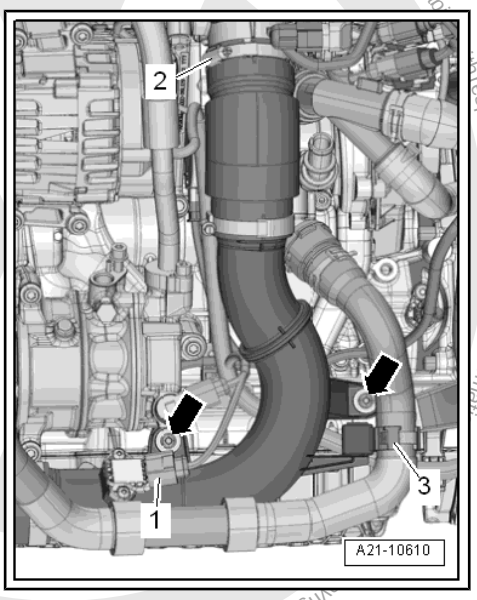
– Unscrew bolts -arrows- for coolant pipe.



– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

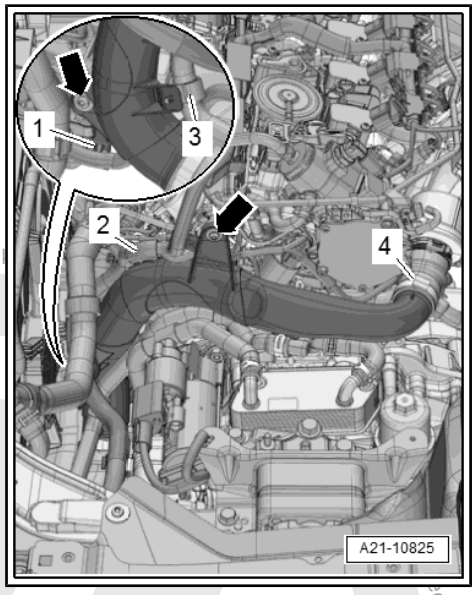


– Lay coolant hose -3- to one side.
– Pull connector -1- off charge pressure sender - G31- .
– Unscrew bolts -arrows-.
– Loosen hose clip -2- of charge air hose, and pull charge air hose downwards off throttle valve module - GX3- .

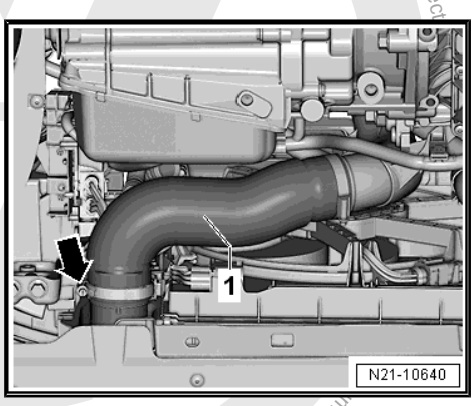


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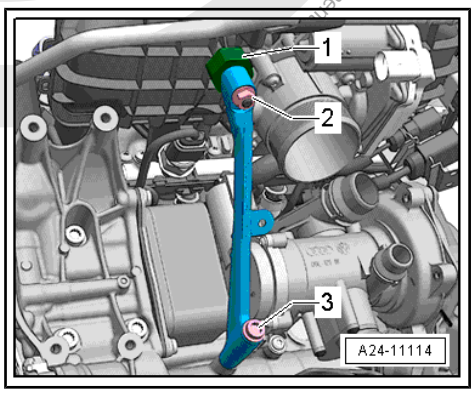
– Free coolant hose -3-.
– Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.
– Loosen screw-type clip -4-.
– Unscrew bolts -arrows-.



– Loosen hose clip -arrow-, and remove left charge air hose -1- downwards, together with air pipe.



– Remove intake manifold support. To do this, unscrew nut -2- and bolt -3-.
– Remove rubber bush -1- for intake manifold support.



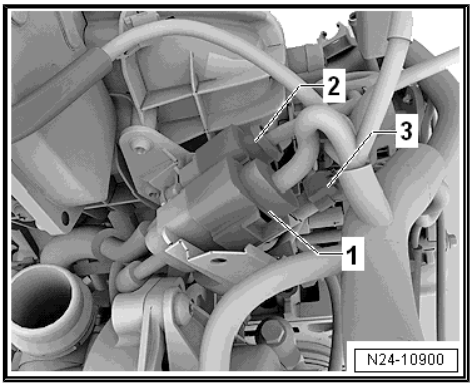
– Disconnect connectors, and lay wires to one side:

1 - For intake manifold flap potentiometer - G336- .
2 - For fuel pressure sender for low pressure - G410-
3 - Central connector for injectors (intake manifold)
4 - For intake manifold sender - GX9- .
5 - For Hall sender - G40- .
6 - For throttle valve module - J338-

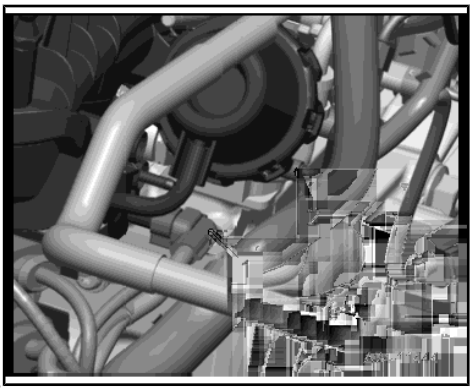


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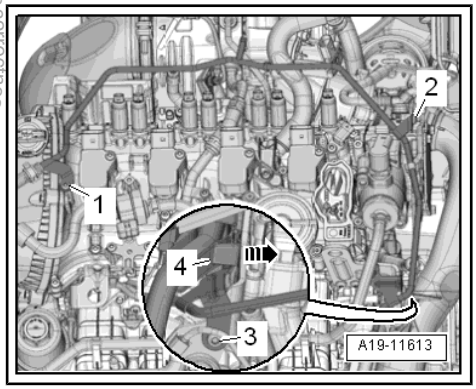
– Disconnect electrical connectors -1, 2, and 3- underneath intake manifold.



– Disconnect connector -1- at intake manifold flap valve - N316- .
– Separate vacuum hose -2-.



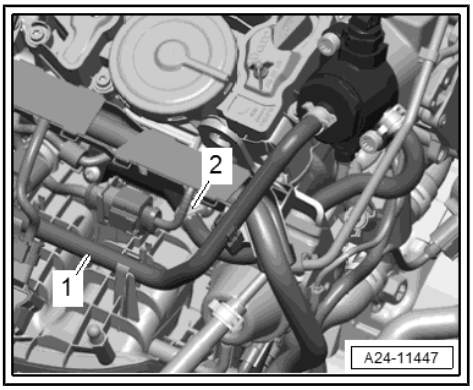
– Release fasteners -arrow-, and pull wiring duct slightly upwards.
– Unscrew bolts -2- and -3-, and carefully pull coolant line slightly upwards.



– Lay fuel hose -1- at intake manifold to one side.

CAUTION

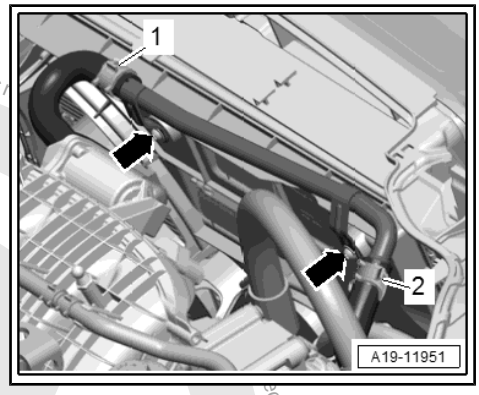
The fuel system is pressurised.
Danger of injury through fuel spray.
- **Wear protective goggles.**
- **Wear protective gloves.**
- **To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.**



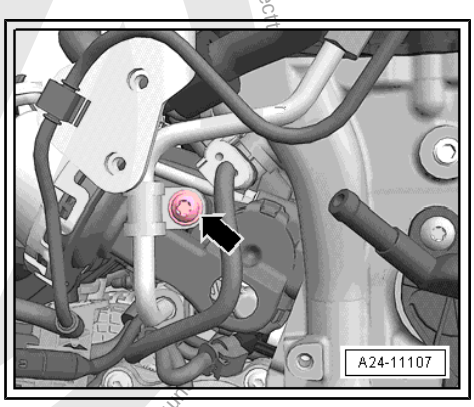
– Release hose clip -2-, and remove coolant hose.

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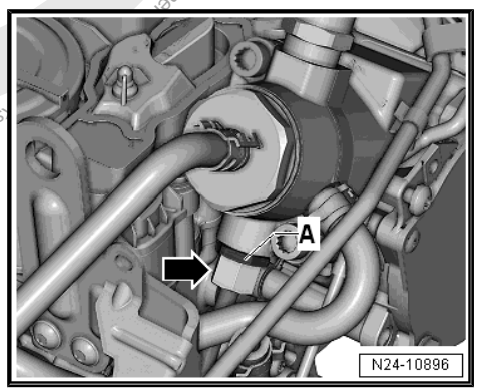
– Vehicles with auxiliary radiator: unscrew bolts -arrows-, and push coolant pipe slightly downwards.



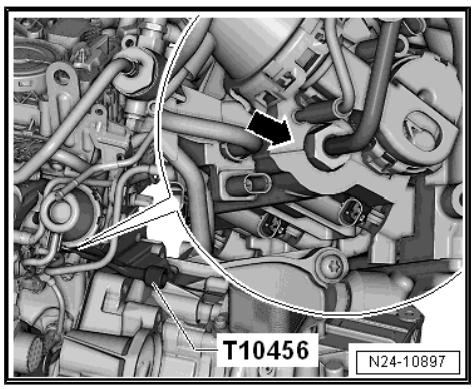
– Unbolt retaining clip -arrow- for high-pressure line.



– Counter hold union -A- and unscrew union nut -arrow-.



– Unscrew union nut on fuel rail using bit SW 17 - T10456- and remove high-pressure line.

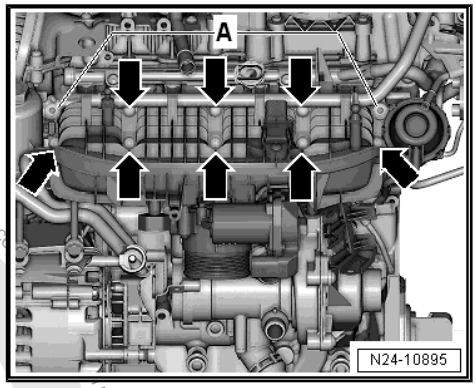


Note

- *Collect escaping fuel with a clean cloth.*
- *Seal open connections with clean caps. Make sure no dirt gets into the fuel system.*

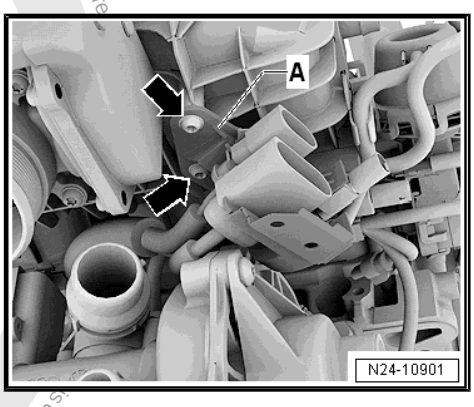
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– Unscrew nuts -A- from intake manifold, and unscrew bolts -arrows- using socket Torx T30 - T10347- .



– Slightly pull off intake manifold from cylinder head and unscrew bolts -arrows-for bracket -A-.

– Take intake manifold off cylinder head.



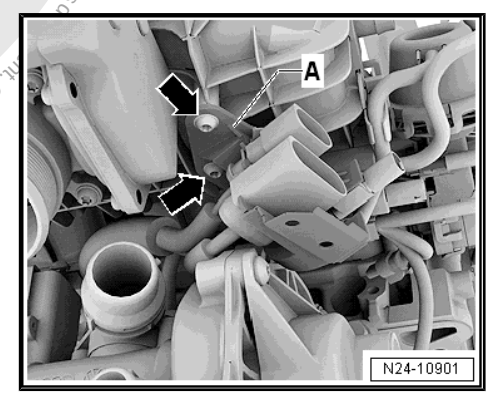
Note

Seal intake ports with a clean cloth.

Installing

– If the union on the high-pressure pump has been detached, renew union.

– Fit intake manifold on cylinder head and tighten bracket -A- for electrical connectors.



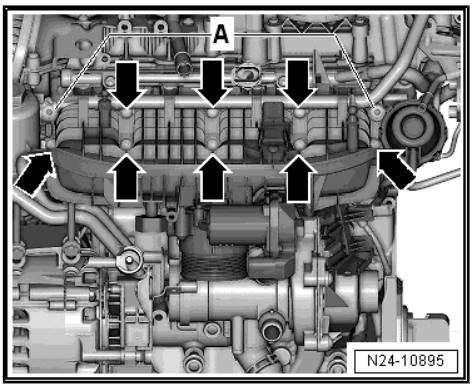
– Screw on nuts -A- hand-tight.

– Tighten bolts -arrows- diagonally and in several stages using socket Torx T30 - T10347- .

– Further assembly is carried out in the reverse order.

Specified torques

♦ ⇒ “4.1 Assembly overview - intake manifold”, page 265



4.3 Removing and installing throttle valve module - GX3-

Throttle valve module - GX3- consists of

♦ Throttle valve drive for electronic power control - G186-

♦ Throttle valve drive angle sender 1 for electronic power control - G187-

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- Throttle valve drive angle sender 2 for electronic power control - G188-

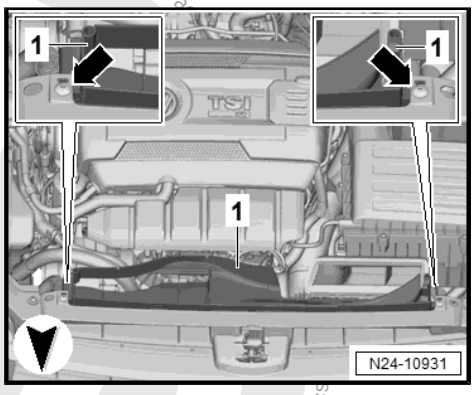
Removing

– Remove engine cover panel ⇒ page 41.

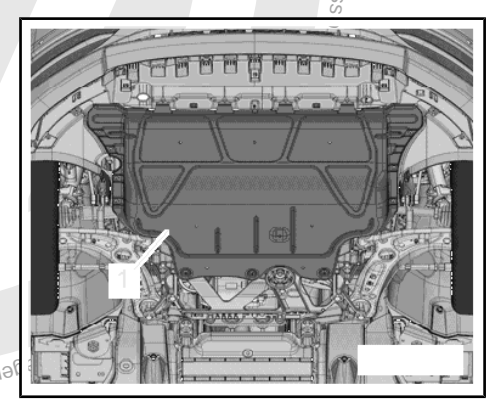
– Remove air filter housing ⇒ page 263 .

– Unscrew bolt -arrow- on left and right.

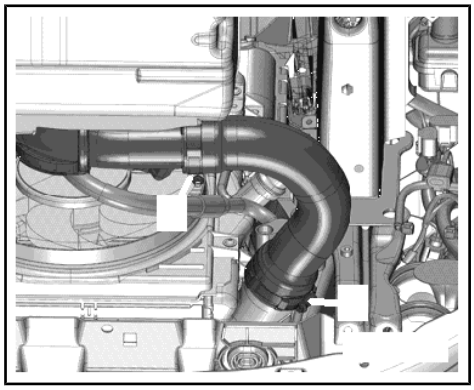
– Unclip lower part of air duct -1- and remove it.



– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



– Release hose clip -2-, and pull charge air hose off charge air cooler.

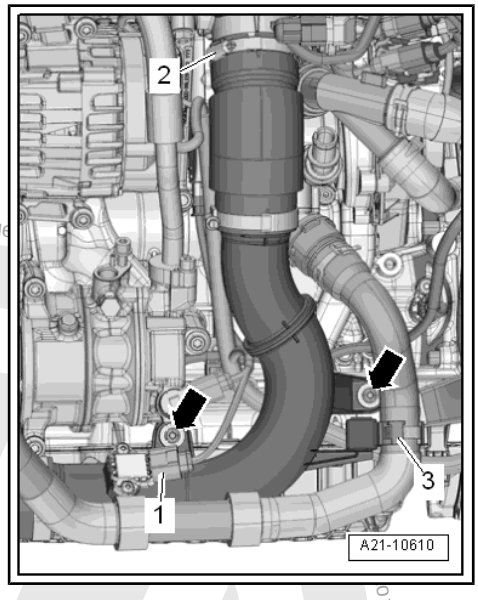


Note

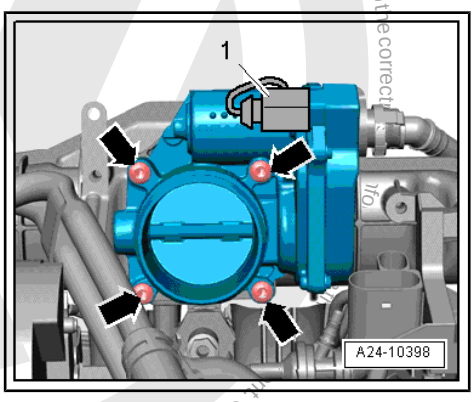
Disregard -item 1-.

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– Lay coolant hose -3- to one side.
– Pull connector -1- off charge pressure sender - G31- .
– Unscrew bolts -arrows-.
– Release hose clip -2- on charge air hose, and pull charge air hose off throttle valve module - GX3- .
– Remove air intake hose downwards.



– Detach electrical connector -1- from throttle valve module .
– Unscrew bolts -arrows- on throttle valve module from underneath and detach throttle valve module .



Installing

– Install in reverse order of removal.
– Clean sealing surface for O-ring.
– Fit gasket.
– Adapt throttle valve module . Proceed as follows to do this:
– Connect ⇒ Vehicle diagnostic tester, and select following functions.

♦ `Engine control unit functions`
♦ `0001 - Adaption throttle valve module`

Specified torques

♦ ⇒ “4.1 Assembly overview - intake manifold”, page 265

4.4 Cleaning throttle valve module

Note

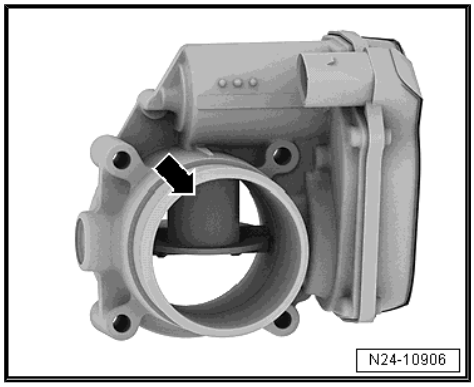
♦ *Contamination and coking in end stop can result in incorrect adaptation values.*
♦ *When cleaning the throttle valve housing it must not be scratched.*

Special tools and workshop equipment required

♦ Acetone (commercially available)
♦ Brush

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– Remove throttle valve module ⇒ page 271 .
– Open throttle valve by hand and lock it in open position with a wedge (plastic or wood) -arrow-.

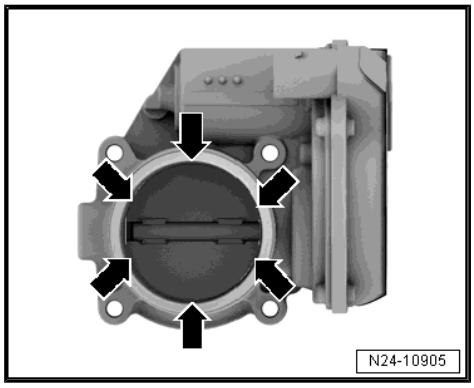


CAUTION

Risk of injury caused by acetone. Acetone is highly flammable and may cause eye and skin irritation.

– Wear protective goggles.
– Wear protective gloves.

– Clean throttle valve housing thoroughly, especially around the points -arrows- where the throttle valve closes, using commercially available acetone and a small brush.
– Wipe the inside of the throttle valve housing with a lint-free cloth.
– Allow acetone to dry off completely.
– Install throttle valve module ⇒ page 271 .
– Adapt throttle valve module . Proceed as follows to do this:
– Connect ⇒ Vehicle diagnostic tester, and select following functions.



◆ `Engine control unit functions`
◆ `0001 - Adaption throttle valve module`

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5 Senders and sensors

⇒ “5.1 Removing and installing fuel pressure sender G247 ”, page 275

⇒ “5.2 Checking fuel pressure sender G247 ”, page 277

⇒ “5.3 Removing and installing fuel pressure sender for low-pressure G410 ”, page 279

⇒ “5.4 Removing and installing intake manifold sender GX9 ”, page 280

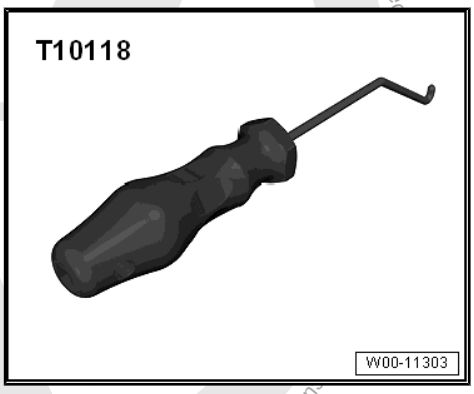
⇒ “5.5 Removing and installing air mass meter G70 ”, page 281

5.1 Removing and installing fuel pressure sender - G247-

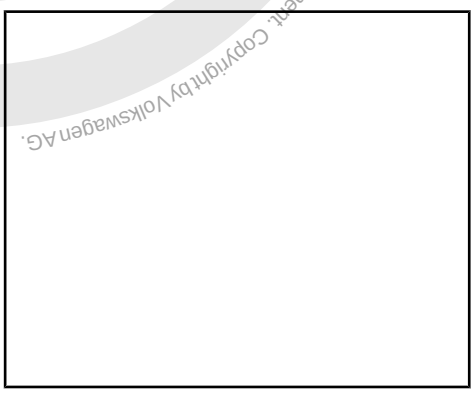
If fuel pressure sender - G247- fails, fuel pressure regulating valve - N276- is switched off, electric fuel pump is fully actuated, and engine is operated with available fuel pressure. This reduces the engine torque drastically.

Special tools and workshop equipment required

- Assembly tool - T10118-



- Socket AF 24 - T40284-

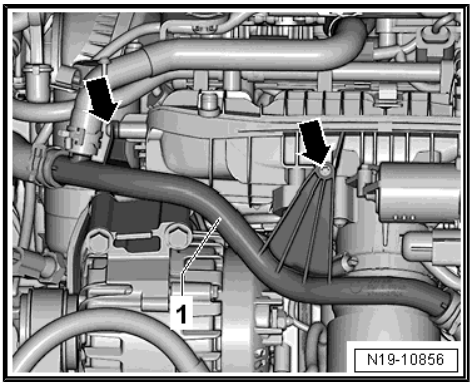


Removing

– Remove engine cover panel ⇒ page 41 .

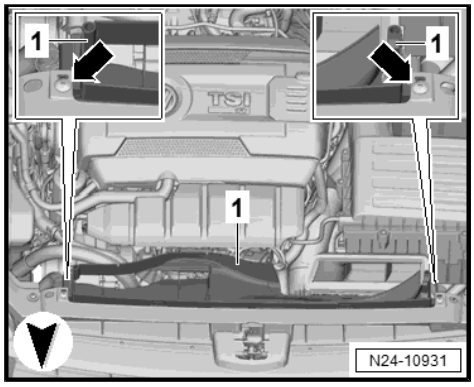
– Unscrew bolts -arrows-.

– Remove air filter housing ⇒ page 263 .

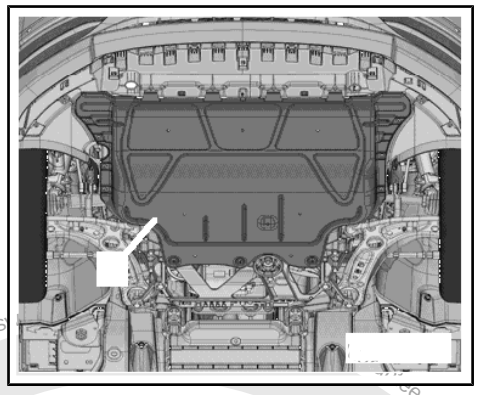


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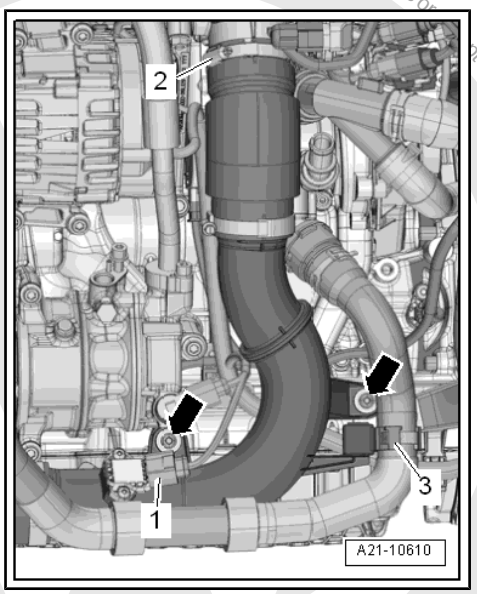
– Unscrew bolt -arrow- on left and right.
– Unclip lower part of air duct -1- and remove it.



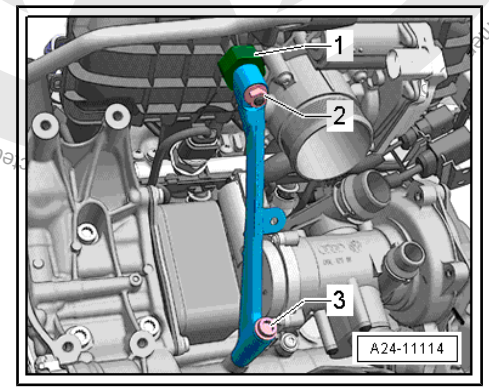
– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .



– Lay coolant hose -3- to one side.
– Pull connector -1- off charge pressure sender - G31- .
– Unscrew bolts -arrows-.
– Loosen hose clip -2- of charge air hose, and pull charge air hose downwards off throttle valve module - GX3- .

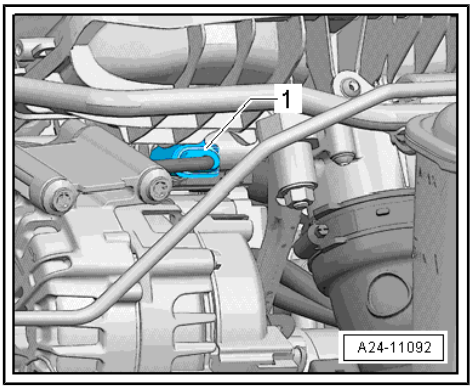


– Remove intake manifold support. To do this, unscrew securing nut -2- and bolt -3-.
– Remove rubber bush -1- for intake manifold support.

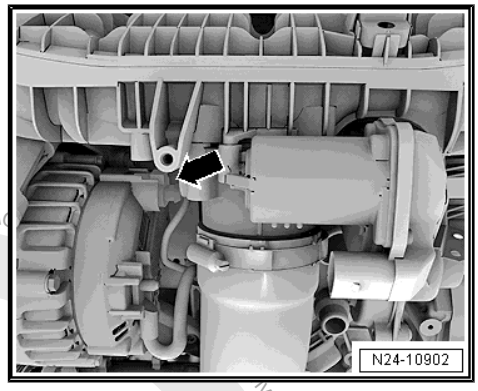


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– Release connector for fuel pressure sender - G247- -1- using assembly tool - T10118- .



– Pull off connector -arrow- from alternator, otherwise the bit can be caught on the connector!



– Loosen fuel pressure sender - G247- -1- using socket AF 24 - T40284- and unscrew.

Installing

– Lubricate sealing cone and thread of fuel pressure sender - G247- with clean engine oil.

– Further assembly is carried out in the reverse order.

Specified torques

♦ ⇒ “2.1.1 Assembly overview - fuel rail with injectors, direct injection”, page 251

5.2 Checking fuel pressure sender - G247-

Special tools and workshop equipment required

♦ Pressure sensor tester - VAS 6394-

♦ Adapter - VAS 6394/2-

♦ Test adapter - VAS 5570-

♦ Torque wrench - V.A.G 1331-

♦ Vehicle diagnostic tester

Procedure:

– Remove engine cover panel ⇒ page 41 .

⚠ CAUTION

The fuel system is pressurised.
Danger of injury through fuel spray.
– Wear protective goggles.
– Wear protective gloves.
– To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

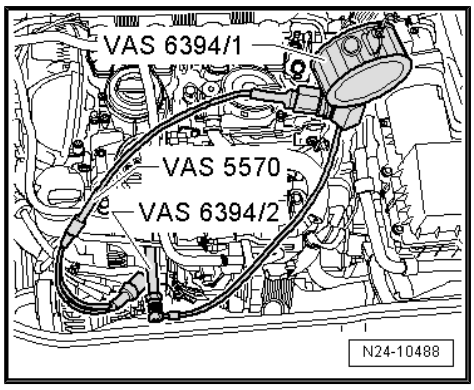
– Remove fuel pressure sender - G247- ⇒ page 275 .

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– Instead of fuel pressure sender - G247- , screw in adapter - VAS 6394/2- and tighten it to torque specified for fuel pressure sender - G247- .

– Open plug -2- of digital pressure gauge - VAS 6394/1- , screw previously removed fuel pressure sender - G247- into opening, and tighten it to specified torque.

– Use test adapter - VAS 5570- to establish electrical connection between vehicle and fuel pressure sender - G247- .



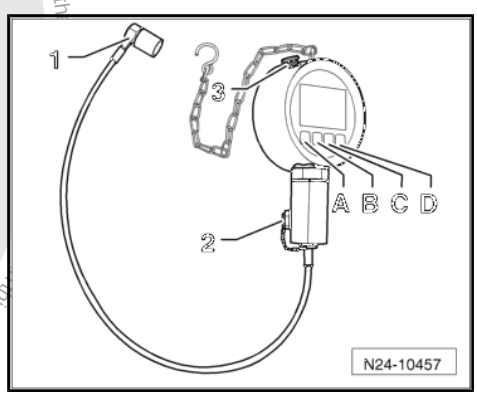
Note

For the steps below, the engine must be started. Therefore, install the intake hose and the air filter housing.

– Connect vehicle diagnostic tester.
– Switch on ignition.
– In self-diagnosis, select “Engine electronics”.
– Select “Measured values”.
– Select “Fuel pressure” from the list.

Display field shows the actual value reported to the engine control unit by the fuel pressure sender - G247- .

– Switch on digital pressure gauge - VAS 6394/1- by briefly pressing -A- button once.



Note

When button -A- is pressed for 2 seconds, the illumination will be switched on for 20 seconds.

Digital pressure gauge - VAS 6394/1- should display 0 bar; if this is not the case, press key -C- briefly once for zero point compensation.

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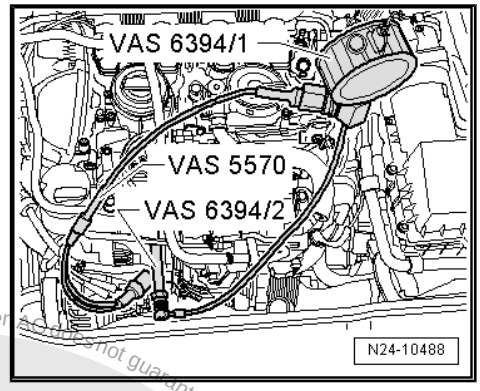
– Connect digital pressure gauge - VAS 6394/1- to adapter - VAS 6394/2- .

– Start engine.

– Compare pressure displayed on digital pressure gauge - VAS 6394/1- with actual value displayed on vehicle diagnostic tester.

• A maximum pressure deviation of 5 bar is permissible.

– If the deviation is greater than 5 bar, test a new fuel pressure sender - G247- .



CAUTION

The fuel system is pressurised.

Danger of injury through fuel spray.

– Wear protective goggles.

– Wear protective gloves.

– To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.

– Screw new fuel pressure sender - G247- into digital pressure gauge - VAS 6394/1- .

– Repeat test with new fuel pressure sender - G247- , and compare both measured values.

If measured values again fail to correspond:

– Check electrical wiring between fuel pressure sender - G247- and engine control unit ⇒ Current flow diagrams, Electrical fault finding and Fitting locations.

If measured values correspond this time:

– Install new fuel pressure sender - G247- ⇒ page 275 .

Specified torques

◆ ⇒ “2.1.1 Assembly overview - fuel rail with injectors, direct injection”, page 251

5.3 Removing and installing fuel pressure sender for low-pressure - G410-

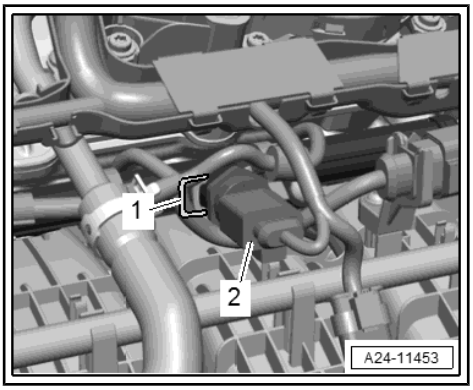
Removing

– Remove engine cover panel ⇒ page 41 .

– Disconnect connector -2-.

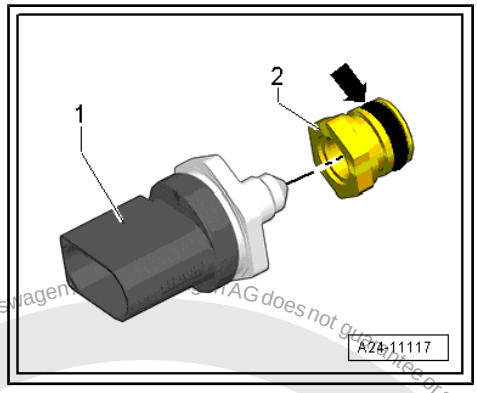
– Pull out securing clip -1-.

– Pull fuel pressure sender for low pressure - G410- out of fuel rail.



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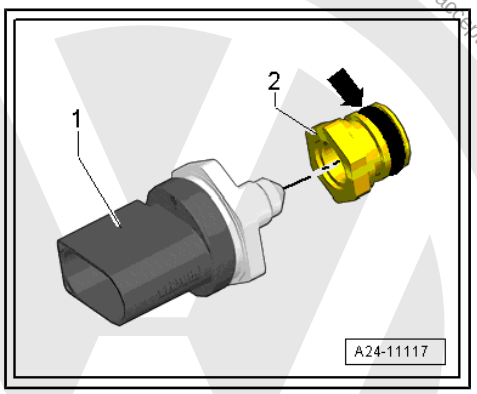
– Unscrew fuel pressure sender for low-pressure - G410- -1- from adapter -2-.



Installing

– Renew O-ring -arrow-.

– Screw fuel pressure sender for low-pressure - G410- -1- into adapter -2-.



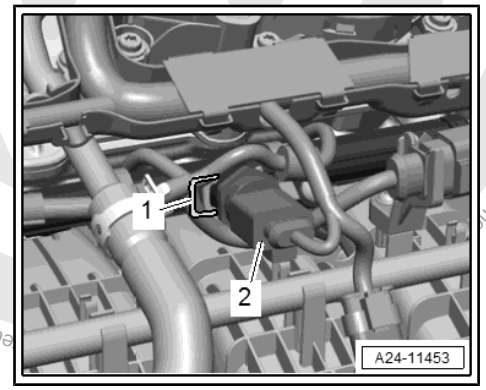
– Carefully push fuel pressure sender for low pressure - G410- into fuel rail as far as stop.

– Insert securing clip -1- into groove.

– Attach electrical connector -2-.

Specified torques

◆ ⇒ “2.1.2 Assembly overview - fuel rail with injectors, indirect injection”, page 252



5.4 Removing and installing intake manifold sender - GX9-

The intake manifold sender - GX9- consists of intake air temperature sender - G42- and intake manifold pressure sender - G71- .

Removing

– Remove engine cover panel ⇒ page 41 .

– Disconnect connector -2-.

– Unscrew bolt -1-.

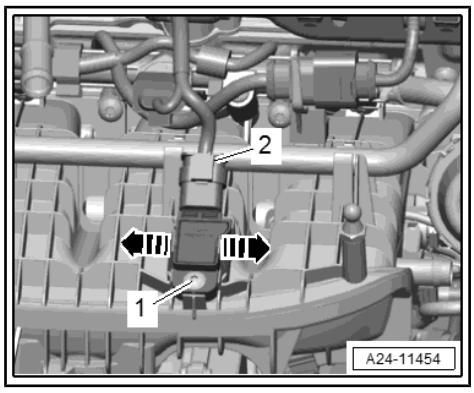
– Release fasteners -arrows-, and pull intake manifold sender - GX9- off intake manifold.

Installing

Install in reverse order of removal.

Specified torques

◆ ⇒ “4.1 Assembly overview - intake manifold”, page 265



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5.5 Removing and installing air mass meter - G70-

Special tools and workshop equipment required

- Spring-type clip pliers - VAS 6362-



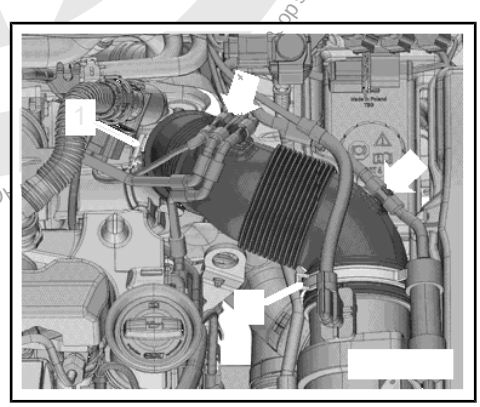
Removing

– Remove engine cover panel ⇒ page 41 .

– Move clear vacuum hoses -arrows-.

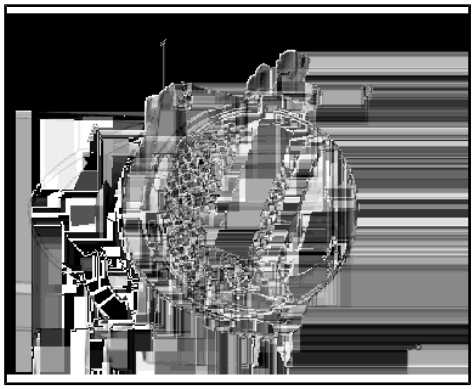
– Release and pull off connector.

– Release hose clamps -1, 2- and remove air pipe.



– Unscrew bolt -1-.

– Turn air mass meter - G70- -item 2- in direction of -arrow B- and detach.



Installing

To ensure the proper function of the air mass meter - G70- it is important to adhere to the following work sequences.

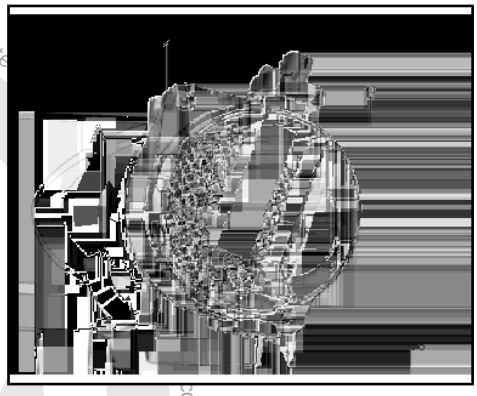
Note

- *If the air filter element is very dirty or wet, particles of dirt or water may reach the air mass meter and falsify the measured air mass value. This would lead to loss of power, since a smaller injection quantity is calculated.*
- *Always use Genuine part for air filter element.*
- *Always renew seal if damaged (infiltrating air).*
- *Use a silicone-free lubricant to install the air hose and seal.*
- *Hose unions and air intake pipes and hoses must be free of oil and grease before installation.*
- *Secure all hose connections with hose clips corresponding to the series equipment ⇒ Electronic parts catalogue .*

– Check for salt residue, dirt and leaves in air mass meter and air hose (clean air side).

– Check intake port for dirt as far as the air filter element. If contamination is found, remove salt residue, dirt or leaves from air filter housing.

– To install, insert air mass meter - G70- -item 2- and turn it in direction of -arrow A-.



– Fit engine cover panel ⇒ page 41 .

Specified torques

- ⇒ page 262

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6 Engine (motor) control unit

⇒ "6.1 Removing and installing engine (motor) control unit J623 ", page 283

⇒ "6.2 Removing and installing engine (motor) control unit J623 with protective housing", page 284

6.1 Removing and installing engine (motor) control unit - J623-

Special tools and workshop equipment required

- Vehicle diagnostic tester

Removing

– If the engine control unit is to be renewed, switch on ignition, and select the following menu options on vehicle diagnostic tester :

- `Engine control unit functions`
- `0001 - Renew engine (motor) control unit`

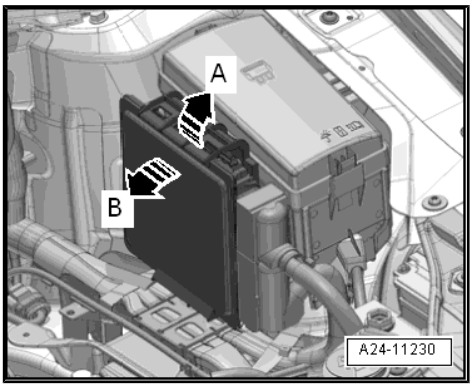
– Switch off ignition and remove ignition key.

Note

If the engine (motor) control unit comes into contact with the positive battery terminal, permanent damage to the engine (motor) control unit will be the consequence. For this reason, the battery always needs to be disconnected prior to removing the engine control unit from its bracket ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

– Release fastener -arrow A-, and remove engine control unit - J623- -arrow B-.

– Release and pull off connectors for engine (motor) control unit - J623- .



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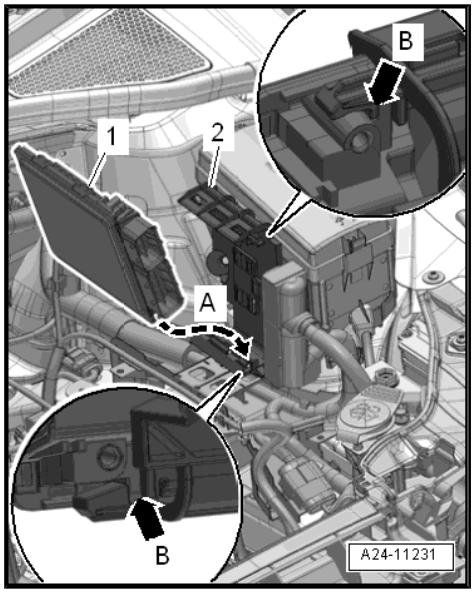
Installing

Install in reverse order of removal, observing the following:

– Insert lower edge of engine control unit - J623- into bracket -arrow A-, and engage engine control unit in bracket at upper edge.

• When doing this, ensure that lugs of engine control unit engage in notches at top and bottom of bracket -arrows B-.

– Connect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .



After a new engine (motor) control unit has been installed, the following work procedure must be carried out:

– Connect ⇒ Vehicle diagnostic tester, and select following functions.

♦ `Engine control unit functions`

♦ `0001 - Renew engine (motor) control unit`

6.2 Removing and installing engine (motor) control unit - J623- with protective housing

Special tools and workshop equipment required

♦ Hot air blower - VAS 1978/14A- with nozzle attachment from wiring harness repair set - VAS 1978 B-

♦ Small grinder with cutting disc, commercially available

♦ Vehicle diagnostic tester

Removing

– If the engine control unit is to be renewed, switch on ignition, and select the following menu options on vehicle diagnostic tester :

♦ `Engine control unit functions`

♦ `0001 - Renew engine (motor) control unit`

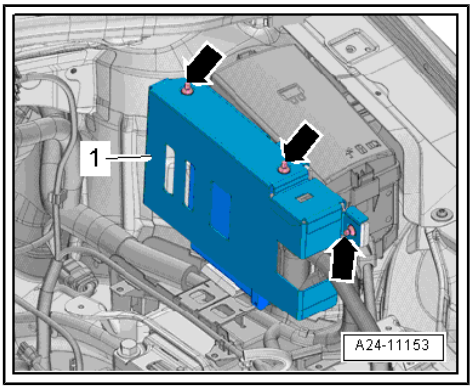
– Switch off ignition and remove key from ignition lock.

Note

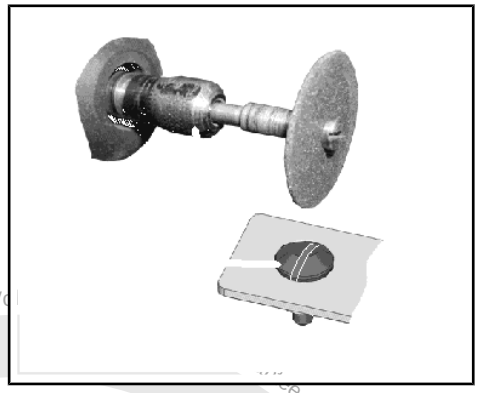
If the engine (motor) control unit comes into contact with the positive battery terminal, permanent damage to the engine (motor) control unit will be the consequence. For this reason, the battery always needs to be disconnected prior to removing the engine control unit from its bracket ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .

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To remove protective housing -1-, unscrew shear bolts -arrows- as follows:



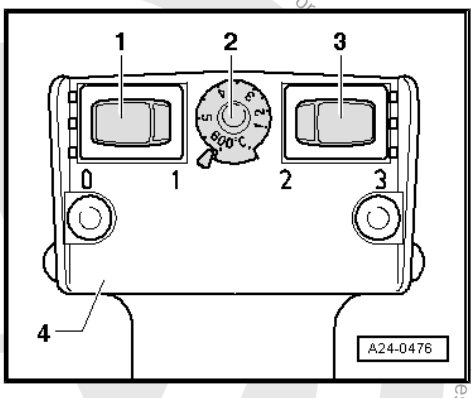
– Make groove (for a screwdriver) in head of shear bolt -1- using a small grinder -2-.



Note

The threads of the shear bolts are secured with locking fluid. To unscrew these bolts, the threads must therefore be heated with the hot air blower.

– Select settings on hot air blower as shown in illustration, i.e. set temperature potentiometer -2- to maximum heat output and two-stage air flow switch -3- to position 3.

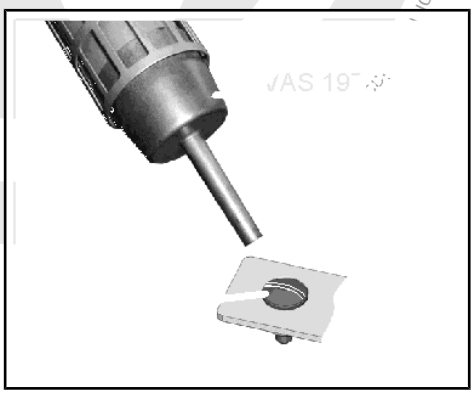


NOTICE

Risk of damage to adjacent components caused by hot air blower. Risk of overheating.

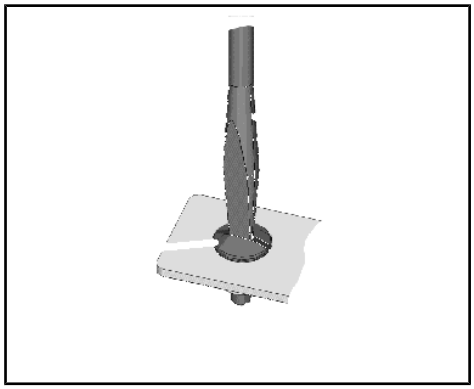
– If necessary, cover adjacent components.

– Heat head of shear bolt -1- for approx. 20 to 30 seconds.

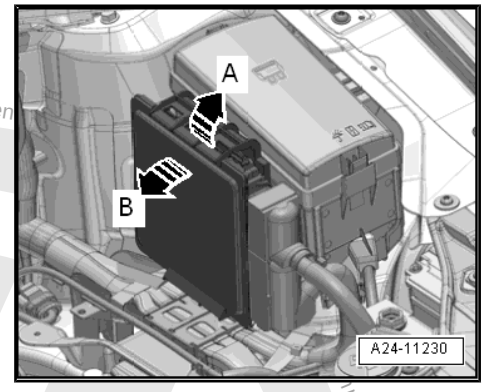


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– Unscrew shear bolt -1- with screwdriver -2-.
– Remove protective housing from engine (motor) control unit - J623- .



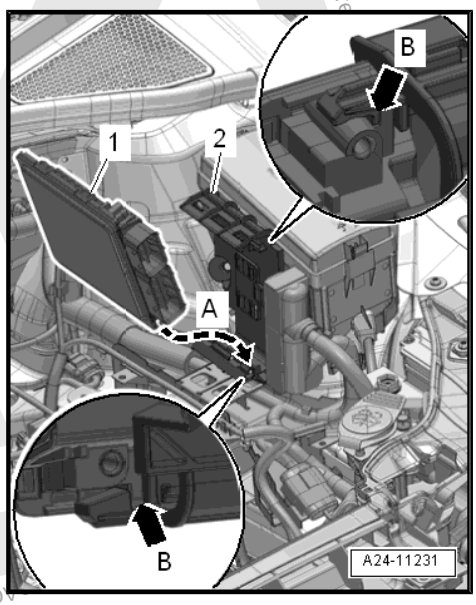
– Release fastener -arrow A-, and remove engine control unit - J623- -arrow B-.
– Release and pull off connectors for engine (motor) control unit - J623- .



Installing

Install in reverse order of removal, observing the following:

– Insert lower edge of engine control unit - J623- into bracket -arrow A-, and engage engine control unit in bracket at upper edge.
– It is essential that the engine (motor) control unit - J623- be provided with the protective housing again.
– Clean threaded holes for shear-head bolts from locking fluid residue. A thread chaser is suitable for cleaning.
– Tighten shear-head bolts until bolt head breaks off.
– Connect battery ⇒ Electrical system; Rep. gr. 27 ; Battery; Disconnecting and connecting battery .



After a new engine (motor) control unit has been installed, the following work procedure must be carried out:

– Switch on ignition and select the following menu options on vehicle diagnostic tester :

◆ `Engine control unit functions`
◆ `0001 - Renew engine (motor) control unit`

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7 High-pressure pump

⇒ “7.1 Assembly overview - high-pressure pump”, page 287

⇒ “7.2 Removing and installing high-pressure pump”, page 288

7.1 Assembly overview - high-pressure pump

CAUTION

The fuel system is pressurised.

Danger of injury through fuel spray.

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

1 - Quick-release coupling
- ❑ With shut-off valve
- ❑ Installed depending on version

2 - Electrical connector

3 - Fuel pressure regulating valve - N276-
- ❑ Integrated in high-pressure pump, cannot be renewed individually

4 - High-pressure pump
- ❑ Removing and installing ⇒ page 288
- ❑ Do not cant when installing.

5 - O-ring
- ❑ Renew if damaged

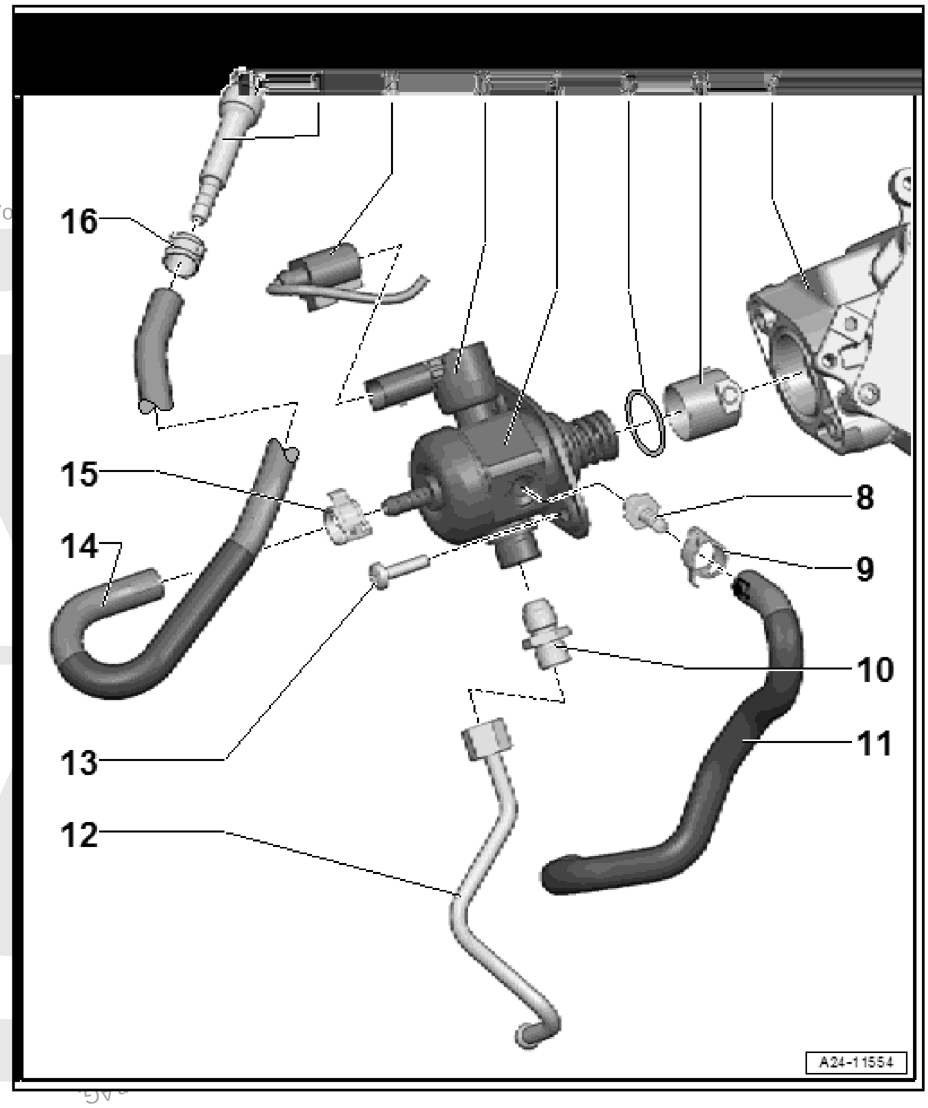
6 - Roller tappet
- ❑ Can remain inserted in vacuum pump after removal of high-pressure pump

7 - Vacuum pump

8 - Union
- ❑ Renew after removal
- ❑ 15 Nm

9 - Spring-type clip
- ❑ Renew after removal

10 - Union
- ❑ Counterhold connecting piece when loosening union nut
- ❑ Renew after removal
- ❑ 40 Nm



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11 - Fuel supply tank

- ❑ To fuel rail for MPI injectors

12 - High-pressure pipe

- ❑ To fuel rail for FSI injectors
- ❑ Moisten ball of fuel supply line with engine oil.
- ❑ Install free of tension.
- ❑ Union nut, 27 Nm

13 - Bolt

- ❑ Renew
- ❑ Tighten one turn alternately until flange of high-pressure pump makes contact with vacuum pump
- ❑ 8 Nm +90°

14 - Fuel supply tank

- ❑ From fuel tank

15 - Spring-type clip

- ❑ Renew after removal

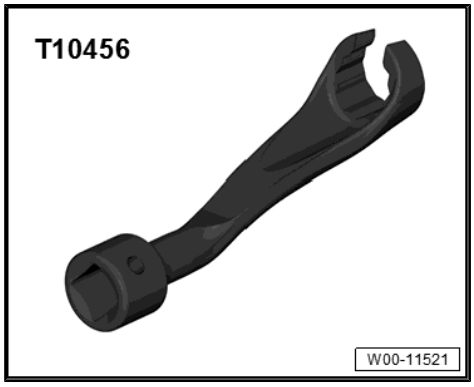
16 - Spring-type clip

- ❑ Renew after removal

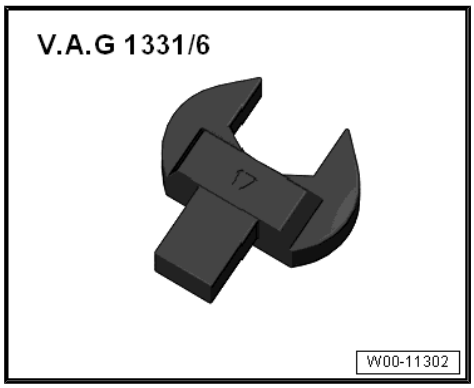
7.2 Removing and installing high-pressure pump

Special tools and workshop equipment required

- ♦ Socket, 17 mm - T10456-



- ♦ Tool insert, 17 mm - V.A.G 1331/6-



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Note

- *high-pressure pump may only be removed when the engine is cold.*
- *When installing the high-pressure pump, it is essential to ensure that no dirt enters the fuel system.*
- *Collect escaping fuel with a cleaning cloth.*
- *Check O-ring of high-pressure pump and renew it if damaged.*
- *If union for high-pressure line ⇒ Item 10 (page 287) is released, it must be renewed.*
- *Moisten high-pressure line with engine oil, and always make sure it is free of tension when installed.*

Removing

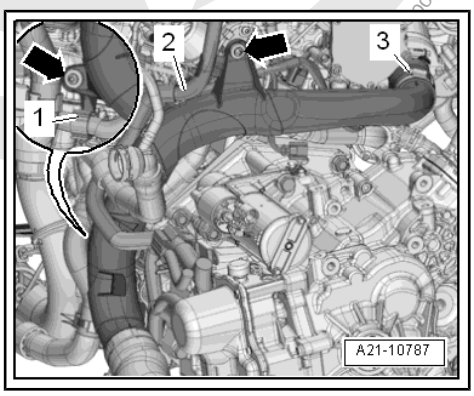
– Remove engine cover panel ⇒ page 41 .

– Remove air filter housing ⇒ page 263 .

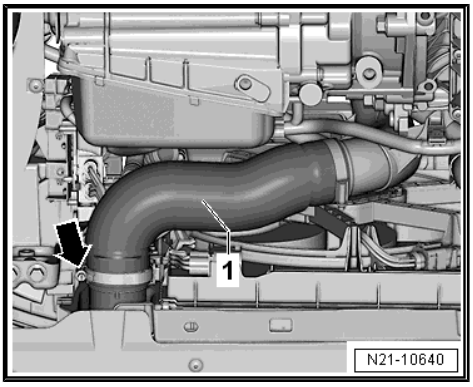
– Free electrical wiring harnesses -1- and -2- from fittings and lay them to one side.

– Loosen screw-type clip -3-.

– Unscrew bolts -arrows-.



– Loosen hose clip -arrow-, and remove left charge air hose -1- downwards, together with air pipe.



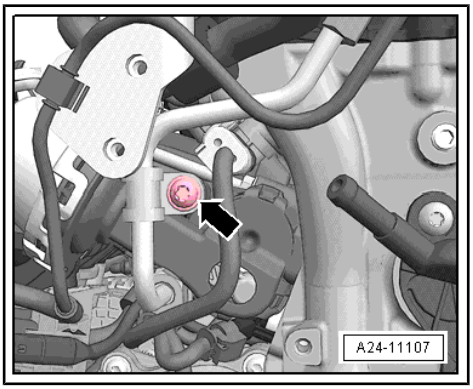
– Unbolt clamp -arrow-.

CAUTION

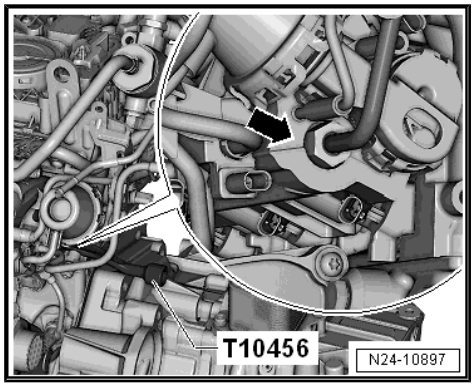
The fuel system is pressurised.

Danger of injury through fuel spray.

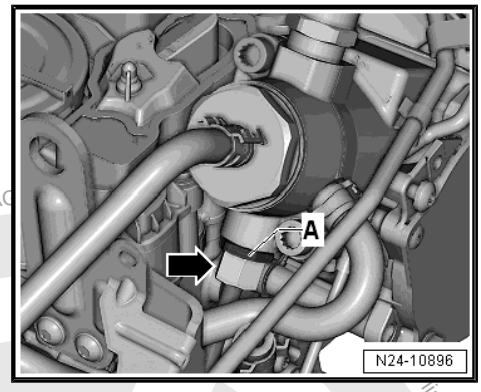
- **Wear protective goggles.**
- **Wear protective gloves.**
- **To release pressure, wrap a clean cloth around the connection and carefully loosen the connection.**



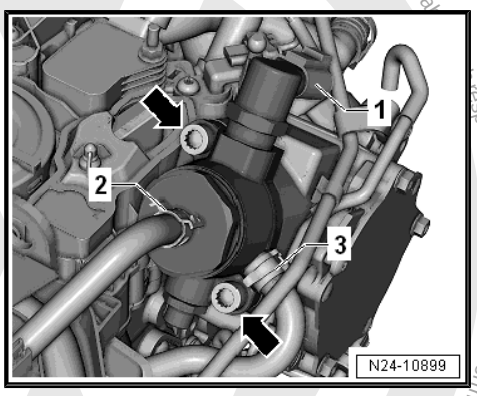
– Loosen union nut on fuel rail -arrow- using socket AF 17 mm - T10456- .



– Counterhold on hexagon -A-, and loosen union nut -arrow-. Remove high-pressure line.

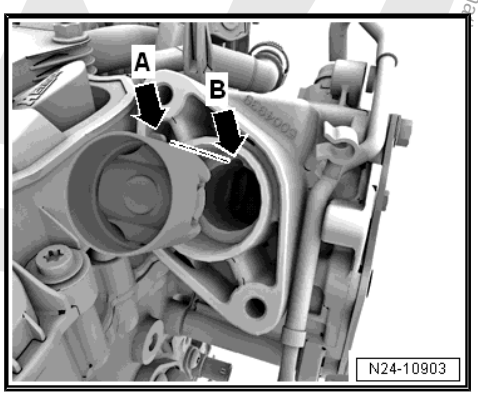


– Pull electrical connector -1- from fuel pressure regulating valve - N276- .
– Remove fuel hoses -2- and -3-.
– Unscrew bolts -arrows- alternately to make sure that high-pressure pump does not cant.
– Carefully pull out high-pressure pump. The roller plunger may possibly remain inserted in vacuum pump.



Installing

– Before inserting roller plunger, check it for damage and renew it, if necessary.
– Insert roller plunger into vacuum pump as shown.
– Inspect O-ring of high-pressure pump, and coat it slightly with clean engine oil.



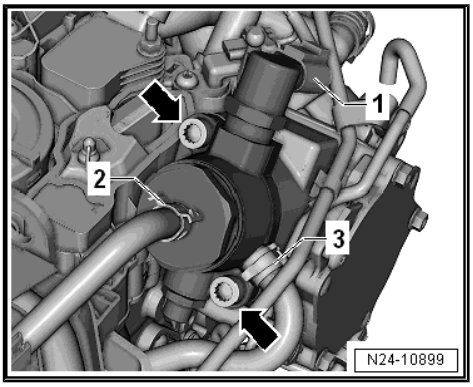
Note

- *Roller tappet must be at bottom dead centre to enable high-pressure pump to be installed.*
- *If union for high-pressure line ⇒ Item 10 (page 287) is released, it must be renewed.*

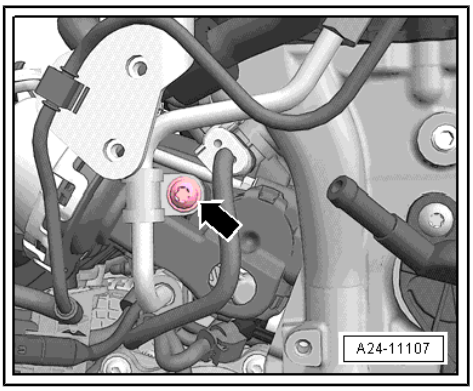
– Turn crankshaft until roller tappet is at bottom dead centre.
– Insert high-pressure pump into vacuum pump.

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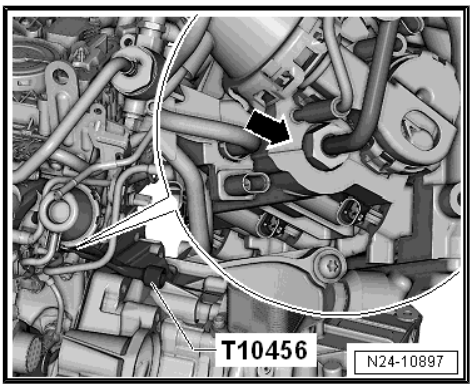
– Tighten bolts -arrows- alternately by hand to make sure that high-pressure pump does not cant.
– Tighten bolts one turn alternately until flange of high-pressure pump makes contact with vacuum pump. Specified torque ⇒ page 287 .
– Connect fuel hoses -2- and -3-, and secure them with spring-type clips.
– Connect connector -1- to fuel pressure regulating valve - N276- .
– Moisten balls of high-pressure line with engine oil, and install high-pressure line. Tighten union nuts by hand, and align high-pressure line free of stress.



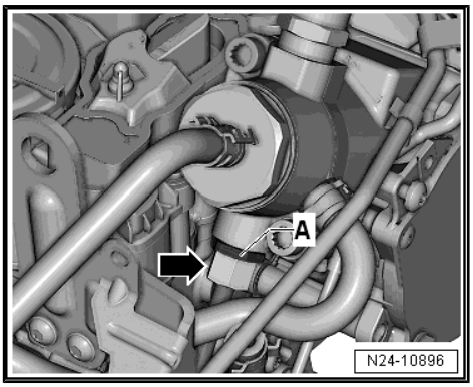
– Install clamp -arrow-, and tighten it to 5 Nm.



– Tighten union nut on fuel rail -arrow- using socket AF 17 mm - T10456- .



– Counterhold on hexagon -A-, and tighten union nut -arrow- using open end spanner insert, AF 17 mm - V.A.G 1331/6- .



Further assembly is basically the reverse of the removal procedure.

Note

Upon completion of any repair work, check fuel system for leaks.

Specified torques

◆ ⇒ “7.1 Assembly overview - high-pressure pump”, page 287

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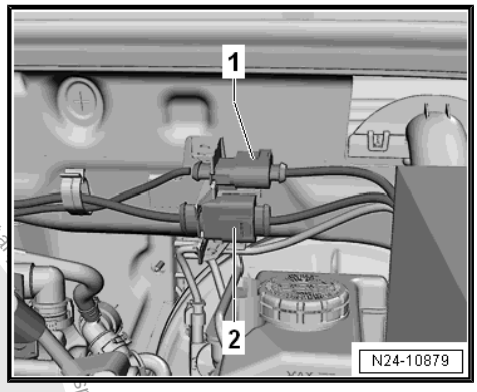
8 Lambda probe

⇒ “8.1 Assembly overview - Lambda probe”, page 292

⇒ “8.2 Removing and installing Lambda probe 1 before catalytic converter GX10 ”, page 293

⇒ “8.3 Removing and installing Lambda probe 1 after catalytic converter GX7 ”, page 294

8.1 Assembly overview - Lambda probe



Lambda probe connectors

1 - Connector for Lambda probe 1 before catalytic converter - GX10-

2 - Connector for Lambda probe 1 after catalytic converter - GX7-

Note

- *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue (ETKA)*
- *During installation, the electrical connecting cable of the Lambda probe must be secured at the same points. The wire must be prevented from touching the exhaust pipe.*

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1 - Lambda probe 1 after catalytic converter - GX7-

- ❑ Consisting of

  Lambda probe after catalytic converter - G130-

  Lambda probe 1 heater after catalytic converter - Z29-

- ❑ Specified torque: 55 Nm
- ❑ ⇒ “8.3 Removing and installing Lambda probe 1 after catalytic converter GX7 ”, page 294

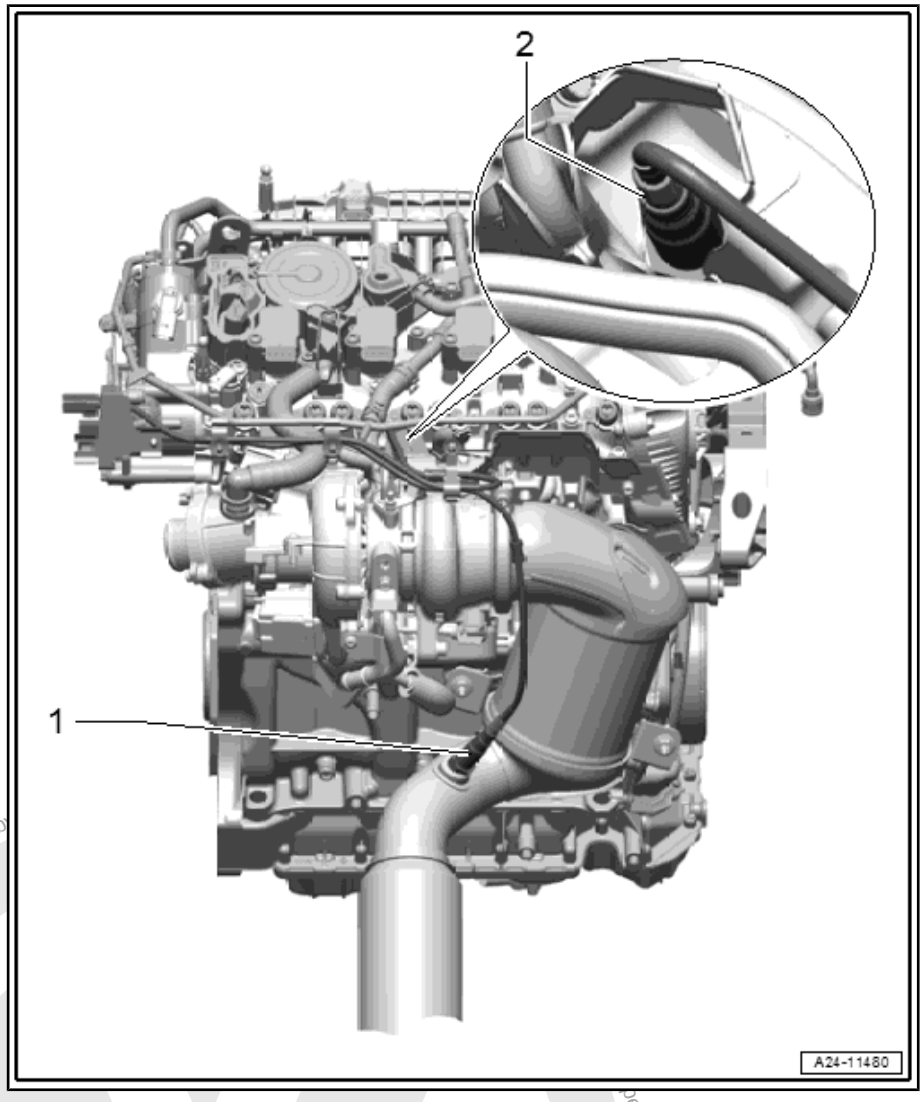
2 - Lambda probe 1 ahead of catalytic converter - GX10-

- ❑ Consisting of

  Lambda probe - G39-

  Lambda probe heater - Z19-

- ❑ Specified torque: 55 Nm
- ❑ ⇒ “8.2 Removing and installing Lambda probe 1 before catalytic converter GX10 ”, page 293



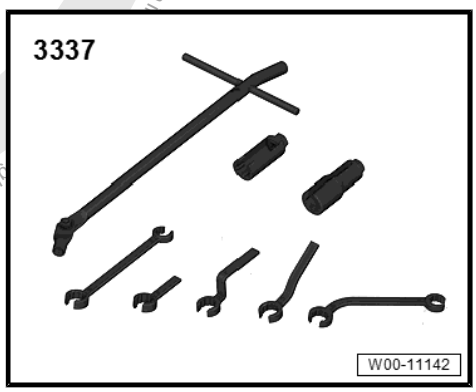
8.2 Removing and installing Lambda probe 1 before catalytic converter - GX10-

Lambda probe 1 before catalytic converter - GX10- consists of

- ♦ Lambda probe - G39-
- ♦ Lambda probe heater - Z19-

Special tools and workshop equipment required

- ♦ Lambda probe open ring spanner set - 3337-

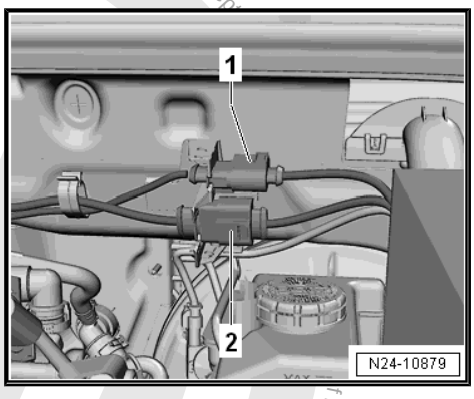


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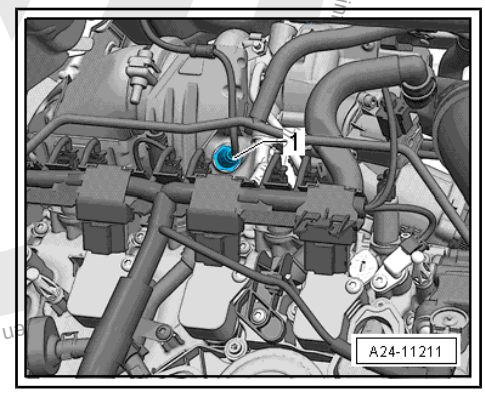
Arteon 2018 ➢ , Tiguan 2016 ➢ , Tiguan RUS 2017 ➢ 4-cyl. direct injection engine (2.0 l, 4 V, EA 888 gen III BZ, turbocharger, chain drive) - Edition 05.2017
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Removing

– Disconnect connector -1- of Lambda probe 1 before catalytic converter - GX10- .



– Unscrew Lambda probe 1 before catalytic converter - GX10- -1- using tool from Lambda probe open ring spanner set - 3337- .



Installing

When installing, note the following:

Note

- *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue (ETKA) .*
- *During installation, the electrical connecting cable of the Lambda probe must be secured at the same points. The wire must be prevented from touching the exhaust pipe.*

Specified torques

- ⇒ “8.1 Assembly overview - Lambda probe”, page 292

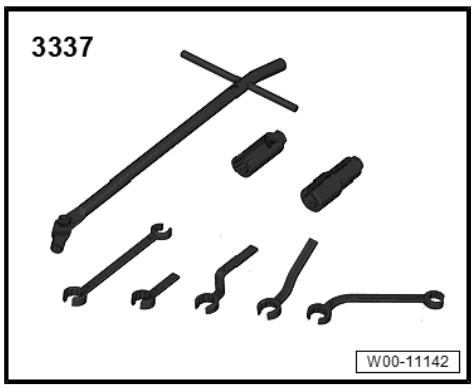
8.3 Removing and installing Lambda probe 1 after catalytic converter - GX7-

Lambda probe 1 after catalytic converter - GX7- consists of

- Lambda probe after catalytic converter - G130-
- Lambda probe 1 heater after catalytic converter - Z29-

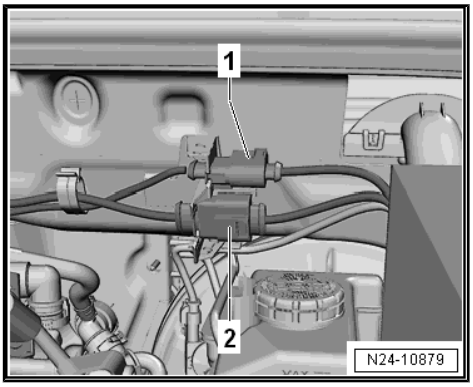
Special tools and workshop equipment required

- Lambda probe open ring spanner set - 3337-

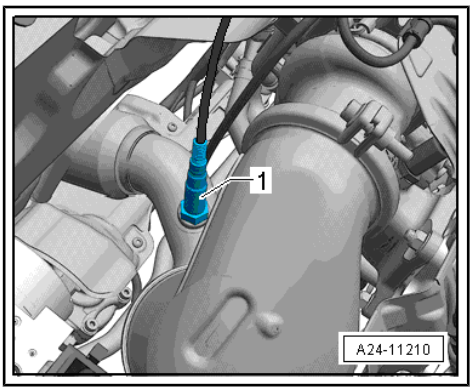


Removing

– Disconnect connector -2- of Lambda probe 1 after catalytic converter - GX7- .



– Unscrew Lambda probe -1-, using tool from Lambda probe open ring spanner set - 3337- .



Installing

When installing, note the following:

Note

- *New lambda probes are coated with an assembly paste. This paste must not get into the slots on the Lambda probe body.*
- *In the case of a used Lambda probe, grease only the thread with high-temperature paste. This paste must not get into the slots on the Lambda probe body. High-temperature paste ⇒ Electronic parts catalogue (ETKA) .*
- *During installation, the electrical connecting cable of the Lambda probe must be secured at the same points. The wire must be prevented from touching the exhaust pipe.*

Specified torques

- ⇒ “8.1 Assembly overview - Lambda probe”, page 292

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26 – Exhaust system

1 Exhaust pipes, silencers

⇒ “1.1 Assembly overview - silencers”, page 296

⇒ “1.2 Removing and installing silencer”, page 299

⇒ “1.3 Separating exhaust pipes/silencers, Arteon”, page 300

⇒ “1.4 Aligning exhaust system free of stress”, page 303

⇒ “1.5 Check exhaust system for leaks”, page 303

1.1 Assembly overview - silencers

⇒ “1.1.1 Assembly overview - silencers, Tiguan”, page 296

⇒ “1.1.2 Assembly overview - silencer, Arteon”, page 297

1.1.1 Assembly overview - silencers, Tiguan

Note

- *Renew seals and self-locking nuts after they have been removed.*
- *After working on the exhaust system, ensure that the system is not under stress and that there is sufficient clearance to the bodywork. If necessary, loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the bodywork at all points and the mountings are evenly loaded.*

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1 - Bolt

- ❑ 25 Nm

2 - Bracket

3 - Mounting

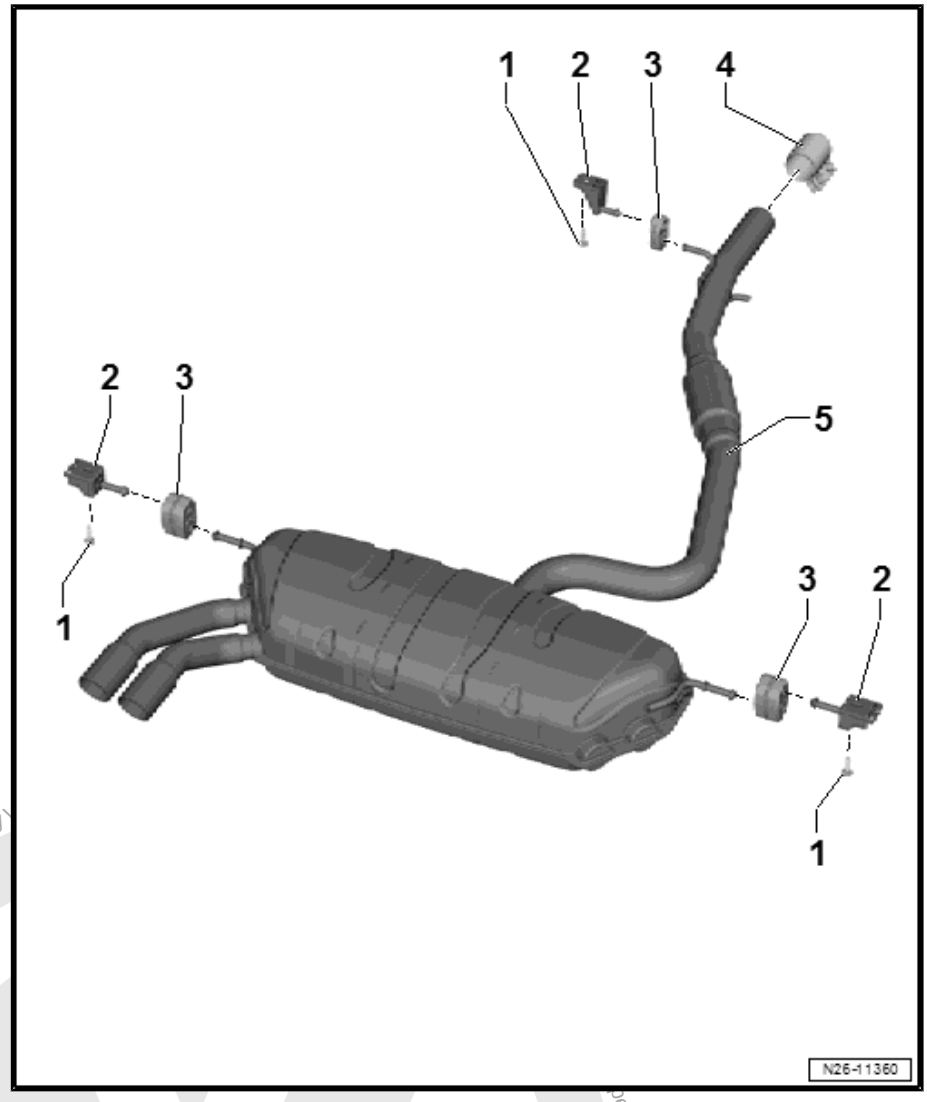
- ❑ Renew if damaged

4 - Clamping sleeve

- ❑ Tighten bolted connections evenly to 30 Nm
- ❑ Turn clamp in such a way that there is sufficient clearance to adjacent components

5 - Rear silencer

- ❑ Aligning exhaust system free of stress

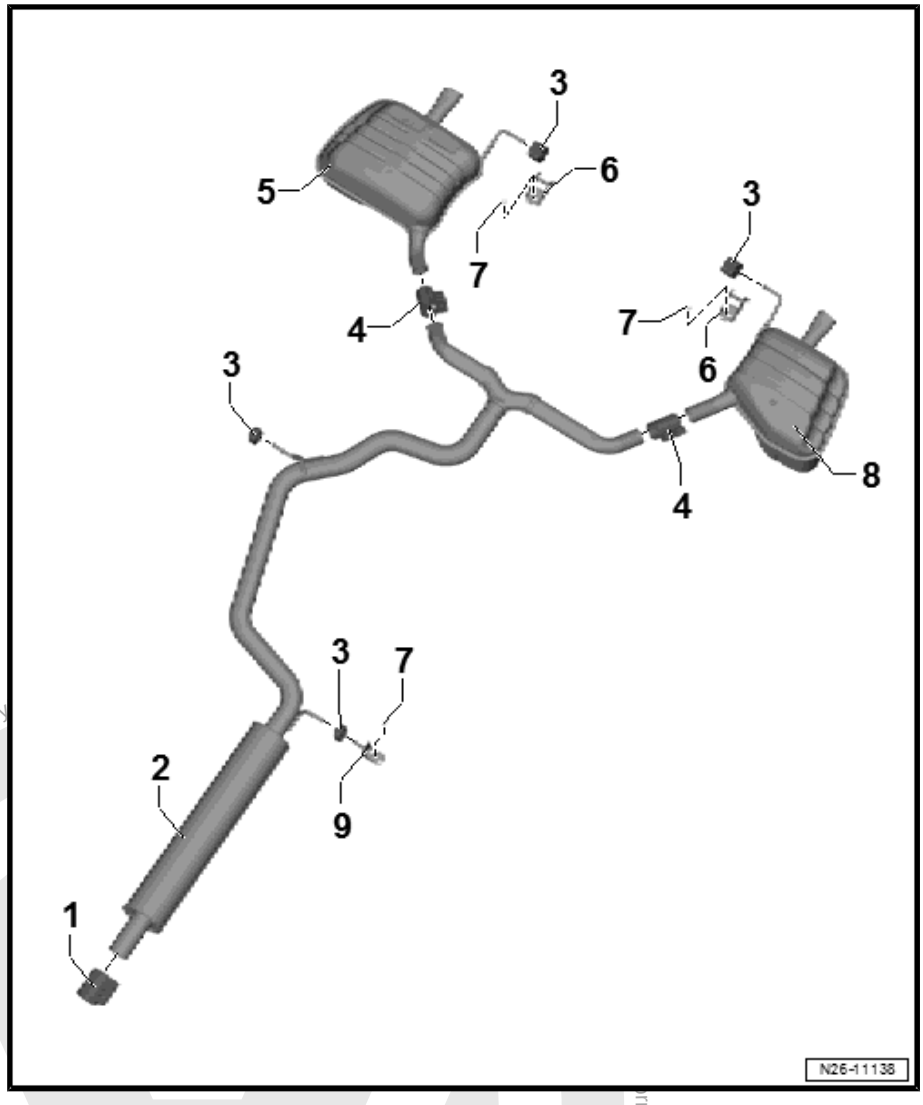


1.1.2 Assembly overview - silencer, Arteon

Note

- *Renew seals and self-locking nuts after they have been removed.*
- *After working on the exhaust system, ensure that the system is not under stress and that there is sufficient clearance to the bodywork. If necessary, loosen clamp and align silencers and exhaust pipe so that sufficient clearance is maintained to the bodywork at all points and the mountings are evenly loaded.*

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1 - Front clamp

- ❑ Align exhaust system free of tension before tightening ⇒ page 303 .
- ❑ Tighten bolted connections evenly to 30 Nm

2 - Centre silencer

- ❑ Combined in one unit with rear silencer as original equipment. Can be renewed individually for repair purposes.
- ❑ Removing and installing ⇒ page 299
- ❑ Cutting point ⇒ page 300
- ❑ Aligning exhaust system free of tension ⇒ page 303 .

3 - Retainer

- ❑ Renew if damaged

4 - Rear clamp

- ❑ Only for repair work
- ❑ Align exhaust system free of tension before tightening ⇒ page 303 .
- ❑ Tighten bolted connections evenly to 30 Nm

5 - Rear left silencer

- ❑ In initial equipment, component with centre silencer. Can be renewed individually for repair purposes.
- ❑ Removing and installing ⇒ page 299
- ❑ Cutting point ⇒ page 300
- ❑ Aligning exhaust system free of tension ⇒ page 303 .

6 - Bracket

7 - Bolt

- ❑ 20 Nm

8 - Rear right silencer

- ❑ In initial equipment, component with centre silencer. Can be renewed individually for repair purposes.
- ❑ Removing and installing ⇒ page 299
- ❑ Cutting point ⇒ page 300
- ❑ Aligning exhaust system free of tension ⇒ page 303

9 - Bracket

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1.2 Removing and installing silencer

⇒ “1.2.1 Removing and installing silencer, Tiguan”, page 299

⇒ “1.2.2 Removing and installing silencer, Arteon”, page 300

1.2.1 Removing and installing silencer, Tiguan

Special tools and workshop equipment required

- Tensioning strap - T10038-

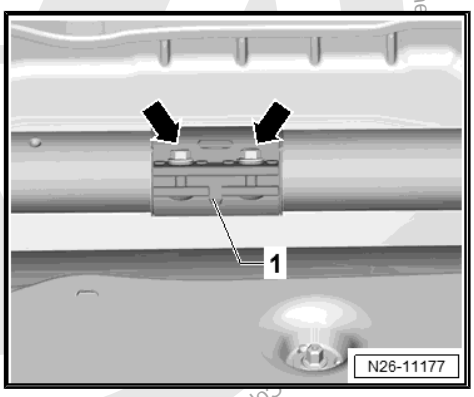


Removing

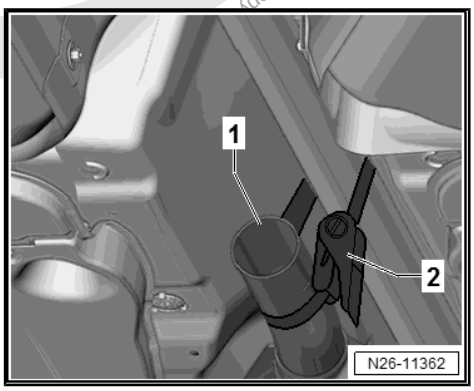
⚠ CAUTION

Risk of accident caused by high weight of silencers.
– Seek help from a second a mechanic for the following work.

– Loosen clamp -arrows- and push to rear.



– Secure exhaust pipe -1- on propshaft with tensioning strap -2-.



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– Unscrew bolts -1- for mounting -2-.
– Remove silencer -3-.

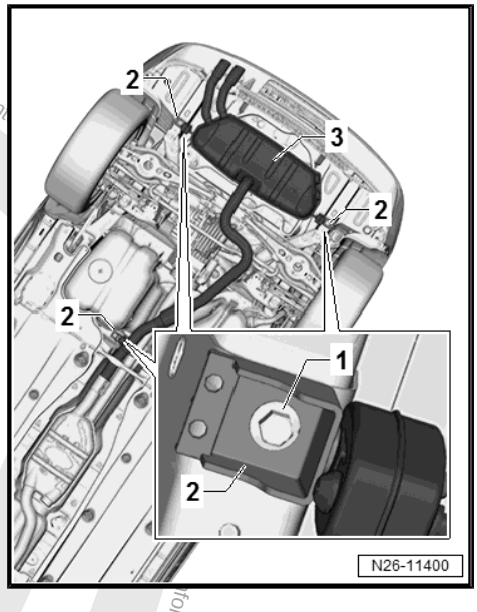
Installing

Install in reverse order of removal, observing the following:

– Align exhaust system free of stress ⇒ page 303 .

Specified torques ⇒ page 296

♦ ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Assembly overview - underbody cladding

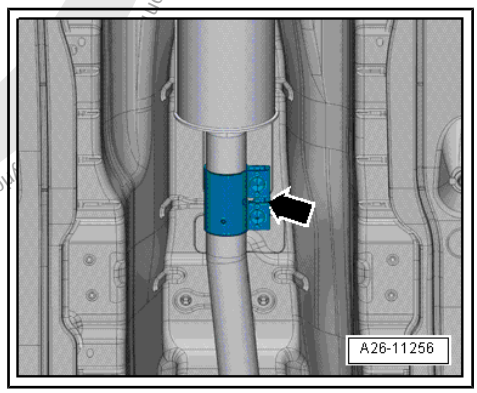


1.2.2 Removing and installing silencer, Arteon

– Loosen bolt connections for front clamp -arrow-.

CAUTION

Risk of accident caused by high weight of silencers.
– Seek help from a second a mechanic for the following work.



– Detach exhaust hanger -1-, and unbolt exhaust hangers -2, 3 and 4- from body. Remove exhaust system -A-.

Installing

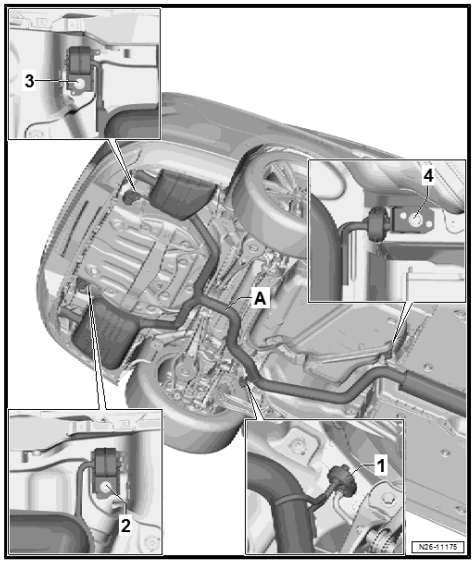
Install in reverse order of removal, observing the following:

– Align exhaust system free of stress ⇒ page 303 .

Specified torques

♦ ⇒ “1.1.2 Assembly overview - silencer, Arteon”, page 297

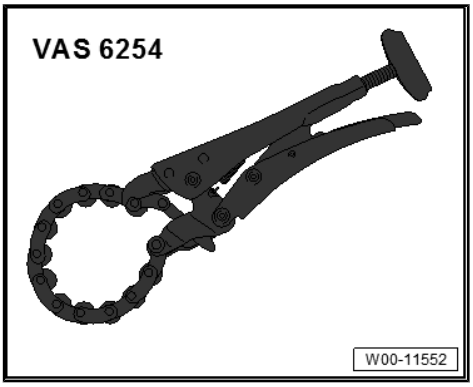
♦ Underbody cover; Assembly overview - underbody covers ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cover; Assembly overview - underbody covers .



1.3 Separating exhaust pipes/silencers, Arteon

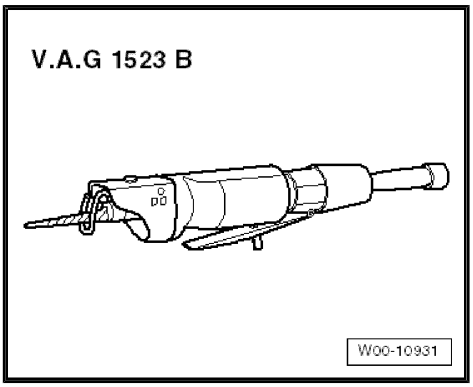
Special tools and workshop equipment required

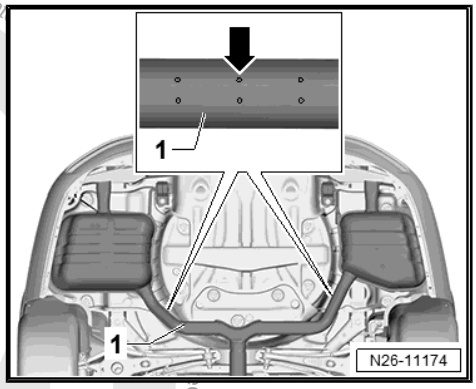
- Chain-type pipe cutter - VAS 6254-



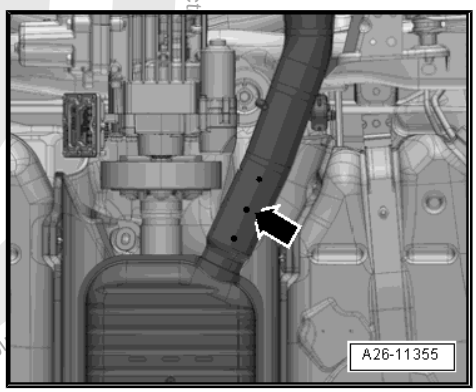
Or

- Pneumatic sabre saw - V.A.G 1523B-





- The connecting pipe -1- can be cut through at the separating points in order to renew the rear silencers separately.
- For individual renewal of the centre silencer, a cutting point is provided in the connecting pipe.
- The separating point -arrow- is marked with indentations on the outside of the exhaust pipe.
- A second mechanic is required for the procedure.

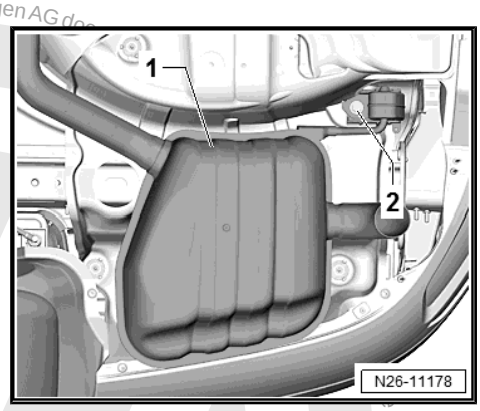


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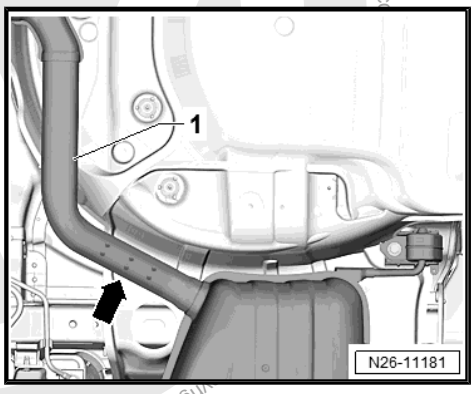
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Separating right rear silencer

– Unscrew bolt -2- for rear right silencer -1-.

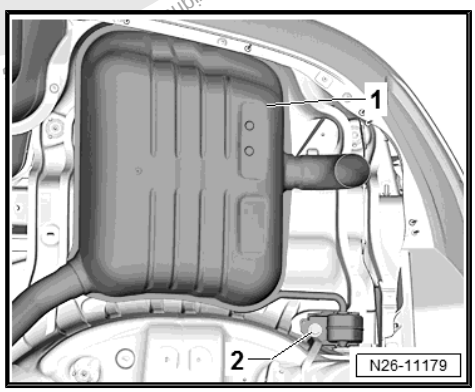


– Cut through exhaust pipe -1- at right angles at separating point -arrow- using chain pipe cutter - VAS 6254- or pneumatic sabre saw - V.A.G 1523B- .

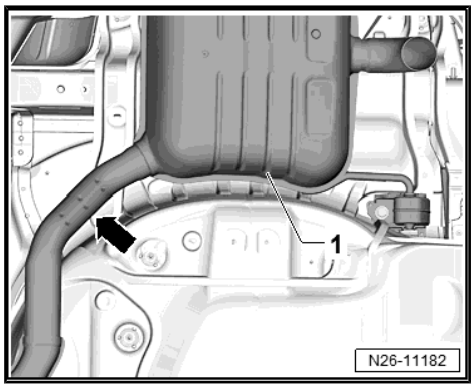


Separating left rear silencer

– Unscrew bolt -2- for rear left silencer -1-.



– Cut through exhaust pipe of rear silencer -1- at right angles at separating point -arrow- using chain pipe cutter - VAS 6254- or pneumatic sabre saw - V.A.G 1523B- .



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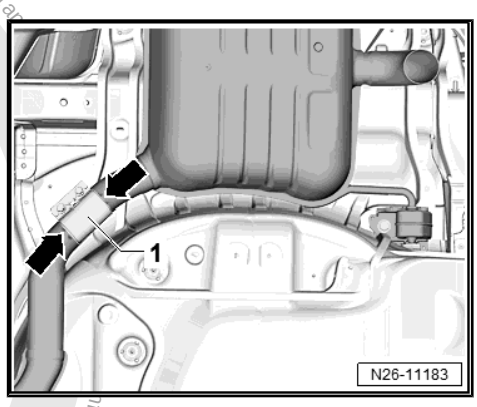
Installing rear silencer

– Position clamp -1- centrally at side marks -arrows- when installing.

– Turn clamp in such a way that there is sufficient clearance to adjacent components.

– Align exhaust system free of stress ⇒ page 303 .

– Tighten threaded connections evenly. Specified torque ⇒ page 296 .

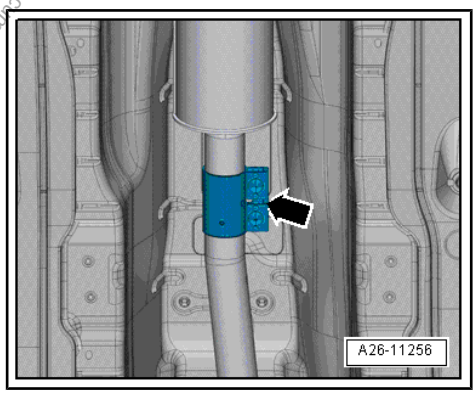


1.4 Aligning exhaust system free of stress

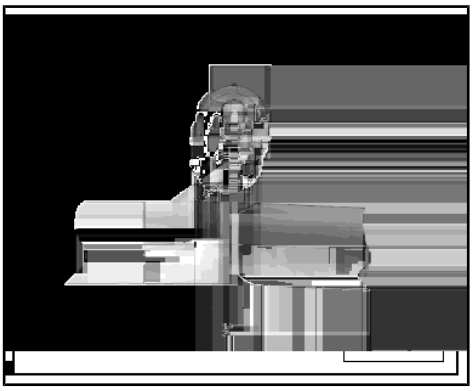
Procedure

• The exhaust system must be aligned when cold.

– Loosen bolt connections for front clamp -arrow-.



– Push exhaust system towards front of vehicle until preloading at mounting for exhaust pipe -a- = 5 mm.



1.5 Check exhaust system for leaks

– Start engine and run it at idling speed.

– Seal end exhaust pipes with cloths or plugs, for example, for the duration of the leakage test.

– Check (by listening) points of connection between exhaust manifold and the cylinder head, between turbocharger and front exhaust pipe etc. to make sure there are no leaks.

– Repair any leaks found.

2 Exhaust gas cleaning

⇒ “2.1 Assembly overview - emission control”, page 304

⇒ “2.2 Removing and installing bracket for catalytic converter, Tiguan”, page 307

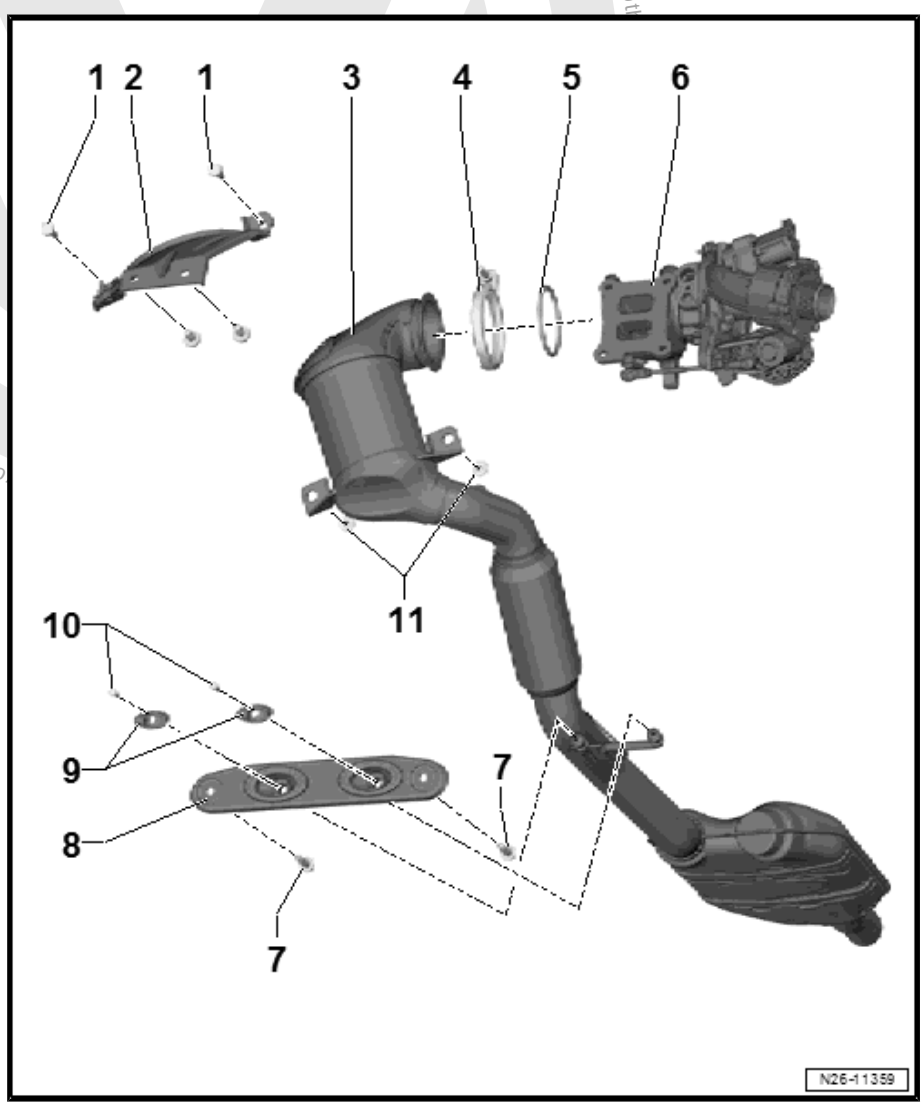
⇒ “2.3 Removing and installing catalytic converter”, page 309

2.1 Assembly overview - emission control

⇒ “2.1.1 Assembly overview - exhaust gas treatment, Tiguan”, page 304

⇒ “2.1.2 Assembly overview - emission control, Arteon”, page 306

2.1.1 Assembly overview - exhaust gas treatment, Tiguan



1 - Bolt
- ❑ Pressed into holder

2 - Bracket
- ❑ For catalytic converter

3 - Catalytic converter
- ❑ With front exhaust pipe
- ❑ Protect catalytic converter from damage by knocks and impact
- ❑ Removing and installing ⇒ page 309
- ❑ Aligning exhaust system free of tension ⇒ page 303 .

4 - Screw-type clamp
- ❑ Renew
- ❑ Fitting position ⇒ page 305
- ❑ Specified torque and tightening sequence ⇒ page 305

5 - Seal
- ❑ Renew

6 - Exhaust turbocharger
- ❑ Removing and installing ⇒ page 227

7 - Bolt
- ❑ 20 Nm

8 - Bracket
- ❑ Renew if damaged
- ❑ Removing and installing bracket with lock washers ⇒ page 307

9 - Securing clip
- ❑ Not fitted in all vehicles
- ❑ Removing and installing lock washers ⇒ page 307

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10 - Pop rivet

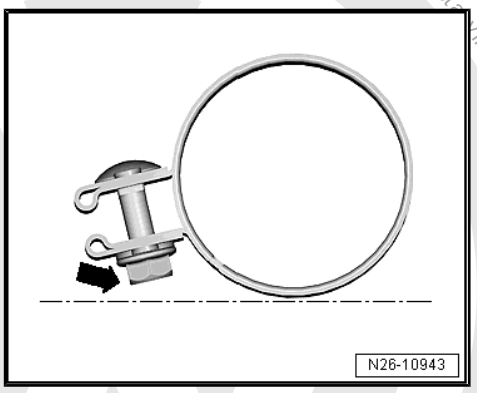
❑ If bracket is to be renewed, drill out pop rivet ⇒ page 307

11 - Nut

Specified torque and tightening sequence ⇒ page 305

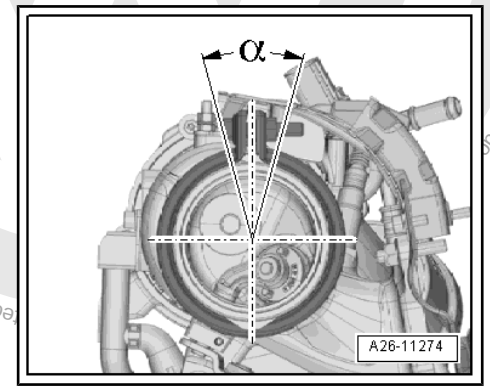
Installation position of front clamp

– Fit clamp in position shown. Bolt -arrow- must not protrude beyond lower edge of clamp.



Installation position of screw-type clip for catalytic converter

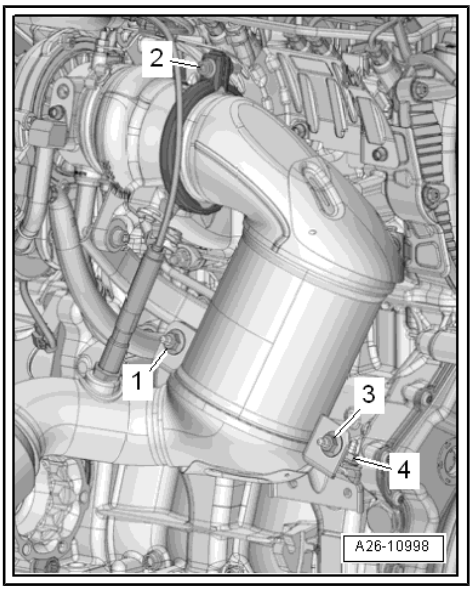
– Fit screw-type clip in position shown. Make sure there is sufficient clearance between bolted connection and other components.



Catalytic converter - specified torque and tightening sequence

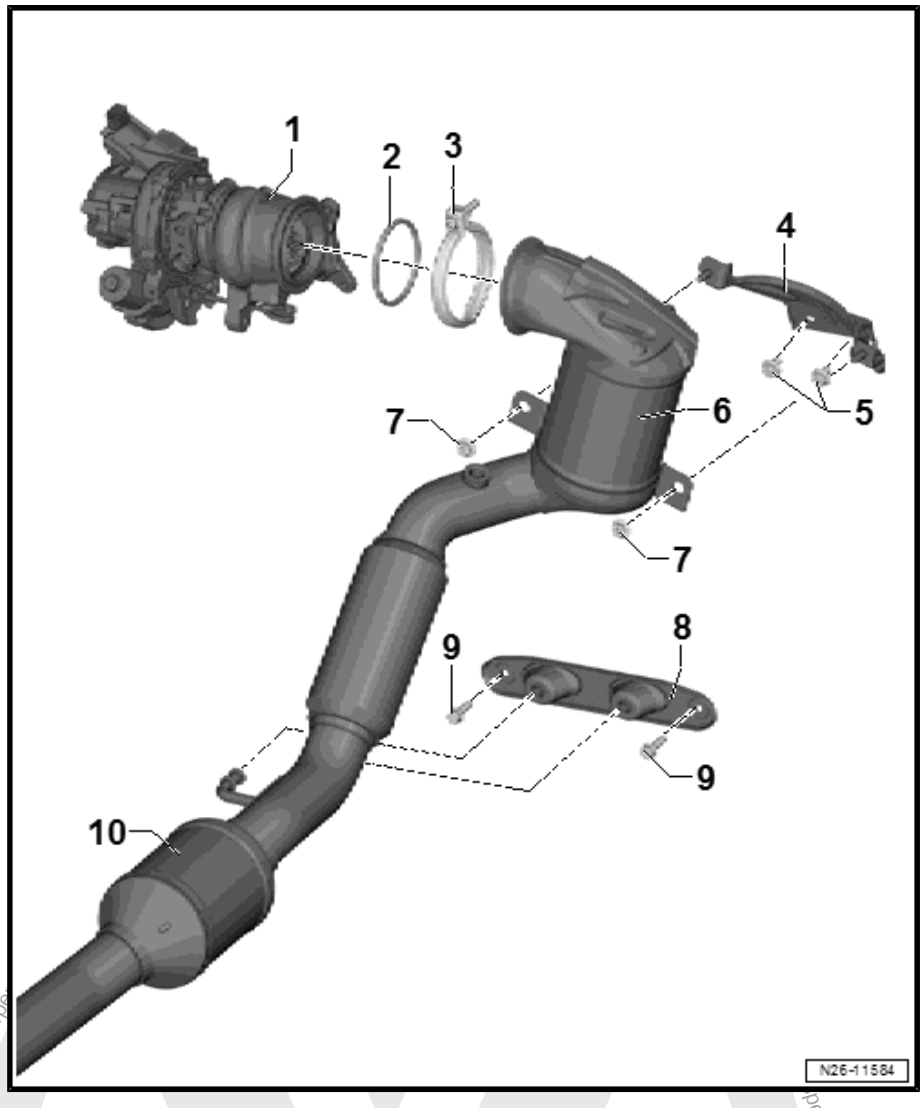
– Tighten bolted connections in stages in the sequence shown:

Stage	Screw-type clip/ nuts	Specified torque
1.	-1, 3, 4-	Screw in by hand as far as stop • It should still be possible to move catalytic converter and bracket.
2.	-2-	Tighten screw-type clip to 15 Nm. Note installation position ⇒ page 305
3.	-1, 3, 4-	Tighten to 20 Nm



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2.1.2 Assembly overview - emission control, Arteon



1 - Exhaust turbocharger

- ❑ Removing and installing ⇒ page 227

2 - Seal

- ❑ Renew

3 - Screw-type clamp

- ❑ Renew after removal
- ❑ Fitting position ⇒ page 306
- ❑ Specified torque and tightening sequence ⇒ page 307

4 - Bracket

- ❑ For catalytic converter

5 - Bolts

Specified torque and tightening sequence ⇒ page 307

6 - Catalytic converter

- ❑ With front exhaust pipe
- ❑ Protect catalytic converter from damage by knocks and impact
- ❑ Removing and installing ⇒ page 309

7 - Nuts

Specified torque and tightening sequence ⇒ page 307

8 - Bracket

- ❑ Renew if damaged

9 - Bolts

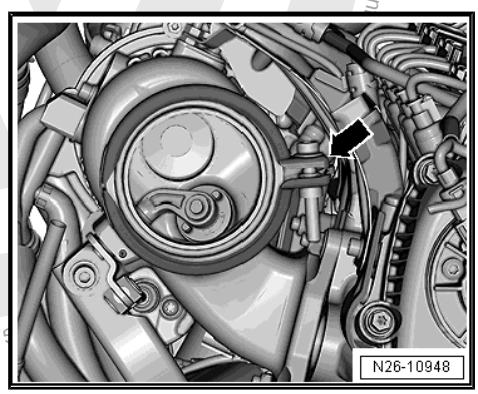
- ❑ 20 Nm

10 - Catalytic converter

- ❑ Protect catalytic converter from damage by knocks and impact
- ❑ Removing and installing ⇒ page 309

Installation position of screw-type clip for catalytic converter

– Fit screw-type clip in position shown. Make sure there is sufficient clearance between bolted connection -arrow- and other components.

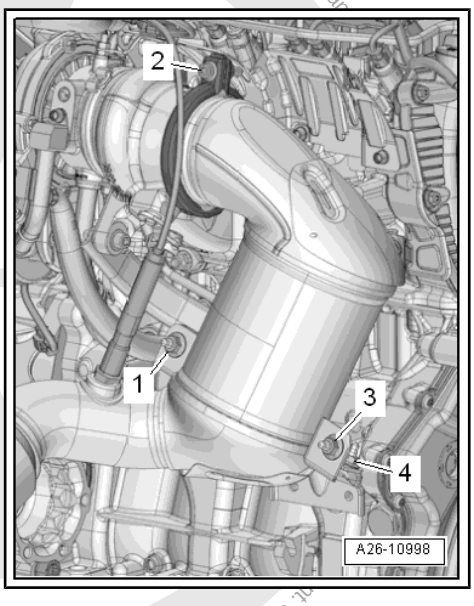


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Catalytic converter - specified torque and tightening sequence

– Tighten bolted connections in stages in the sequence shown:

Stage	Screw-type clip/ nuts	Specified torque
1.	-1, 3, 4-	Screw in by hand as far as stop • It should still be possible to move catalytic converter and bracket.
2.	-2-	Tighten screw-type clip to 15 Nm. Note installation position ⇒ page 306
3.	-1, 3, 4-	Tighten to 20 Nm



2.2 Removing and installing bracket for catalytic converter, Tiguan

Special tools and workshop equipment required

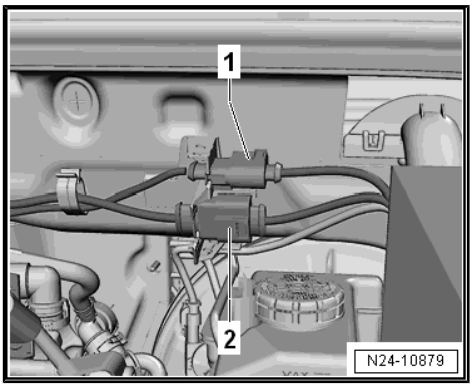
♦ Rivet pliers, e.g. rivet pliers - VAS 6759-

Note

Depending on the equipment level of the vehicle, a securing clip ⇒ Item 9 (page 304) for the bracket of the catalytic converter may be installed. When the vehicle »hits the ground«, the lock washer prevents the catalytic converter from slipping out of the bracket. The lock washer can also be retrofitted if necessary. For retrofit parts, refer to ⇒ Electronic parts catalogue (ETKA) .

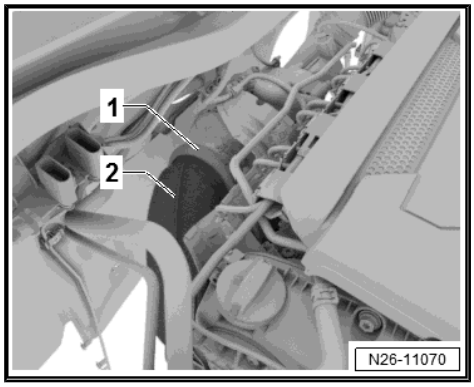
To detach bracket from catalytic converter:

– Take electrical connector -2- out of bracket, unplug it and move electrical wiring clear.

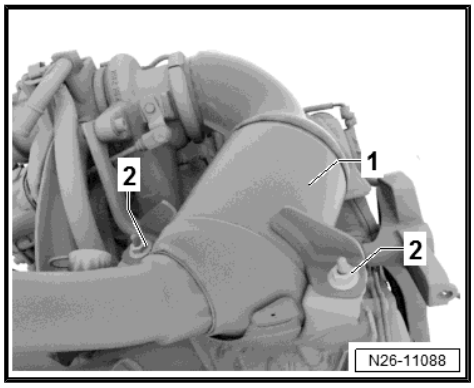


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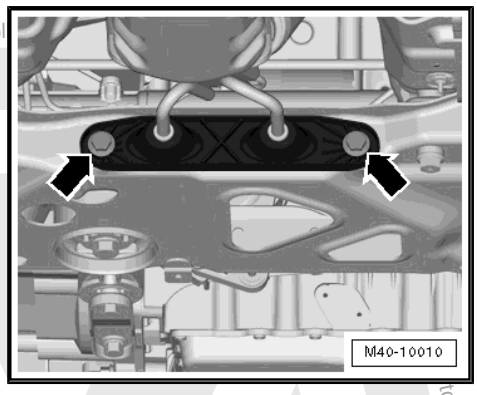
– Loosen clamp -1- for catalytic converter -2-, and push clamp onto turbocharger.
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
– If fitted, remove middle underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Removing and installing underbody cladding .



– Unscrew nuts -2-.



– Unscrew bolts -arrows-, and lower catalytic converter as far as possible.
– Drill out pop rivets ⇒ Item 10 (page 305) , and detach lock washer.
– Detach bracket from catalytic converter.

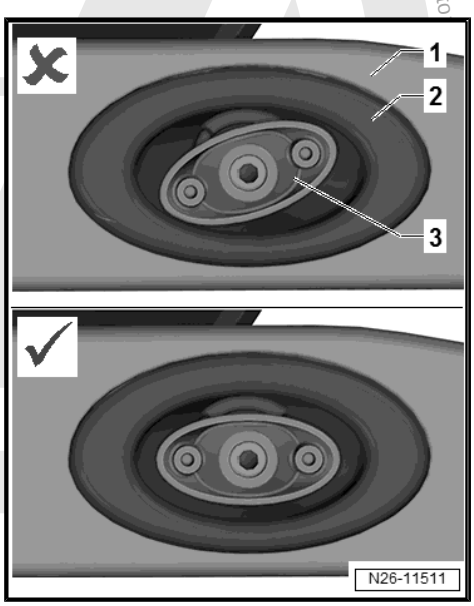


To fit bracket with lock washers:

– Check if pop rivets can be inserted into mounting on catalytic converter. If necessary, widen holes to 7 mm with a drill.
– Fit bracket -1- to mountings on catalytic converter.
– Secure lock washers -3- with rivets as shown in illustration, parallel to rubber part -2-.

Further assembly is basically the reverse of the removal procedure.

Specified torques ⇒ page 304



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2.3 Removing and installing catalytic converter

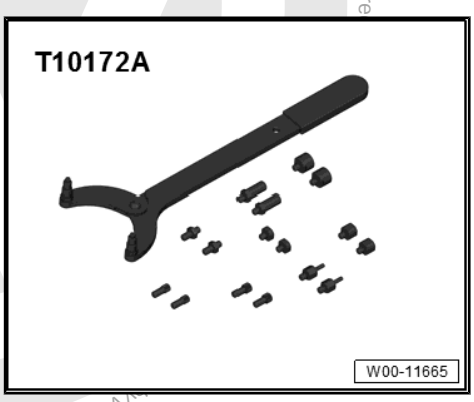
⇒ "2.3.1 Removing and installing catalytic converter, all-wheel drive", page 309

⇒ "2.3.2 Removing and installing catalytic converter, front-wheel drive", page 313

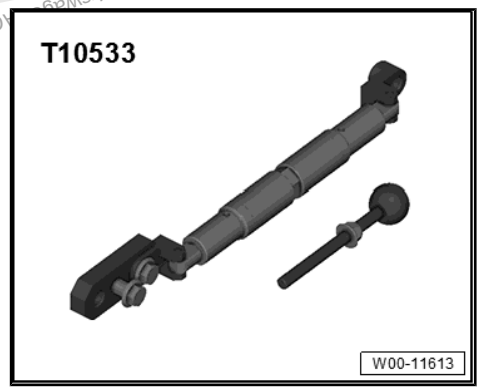
2.3.1 Removing and installing catalytic converter, all-wheel drive

Special tools and workshop equipment required

- High-temperature paste ⇒ Electronic parts catalogue (ETKA) .
- Counter-hold tool - T10172-



- Engine support - T10533-

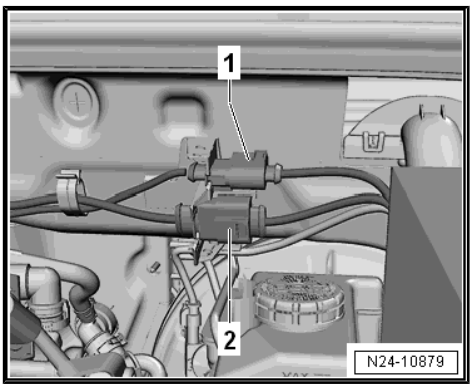


Removing

Note

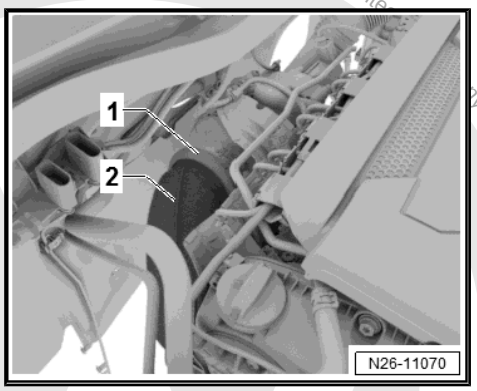
Attach cable ties in all the same places when installing.

– Remove electrical connector -2- from retainer and separate, and lay electrical wire for lambda probe to one side.

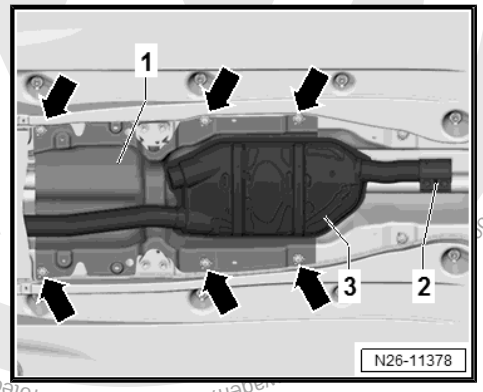


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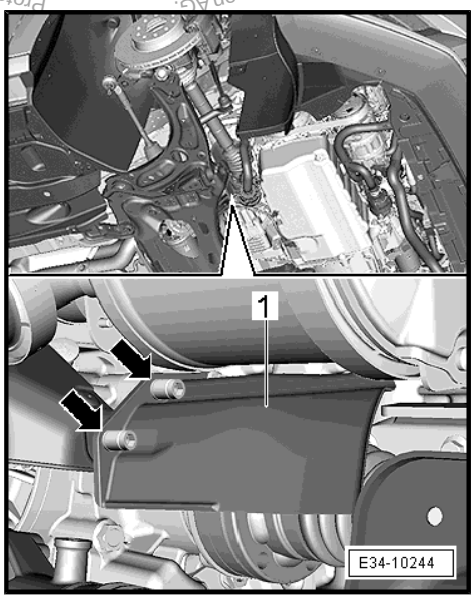
– Loosen clamp -1- for catalytic converter -2-, and push clamp onto turbocharger.
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
– Remove middle underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Removing and installing underbody cladding .



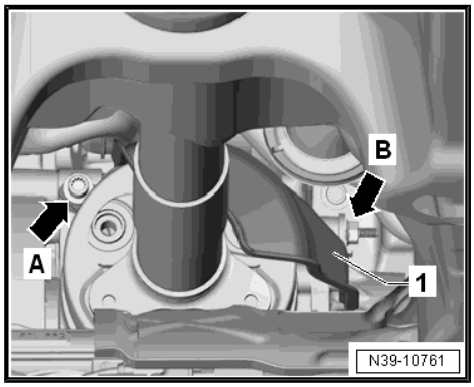
– Release retainers -arrows- for heat shield -1-.
– Loosen clamp -2- and push towards rear.
– Lower front silencer -3- slightly and remove heat shield -1-.
– Push clamp -2- back onto both exhaust pipes.



– Unscrew bolts -arrows-, and remove heat shield -1-.

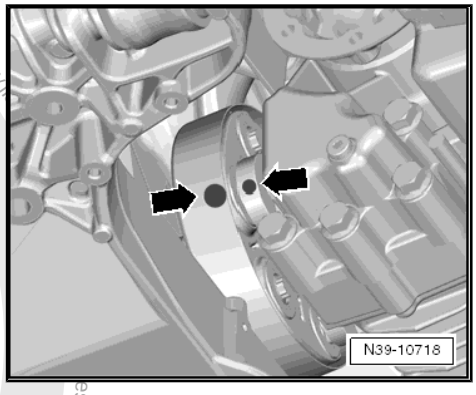


– Unscrew bolts -A- and -B- from bevel box and remove heat shield -1-.

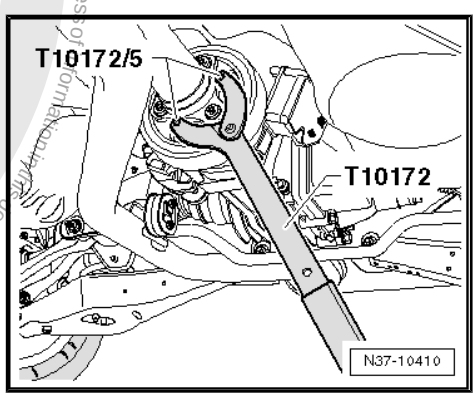


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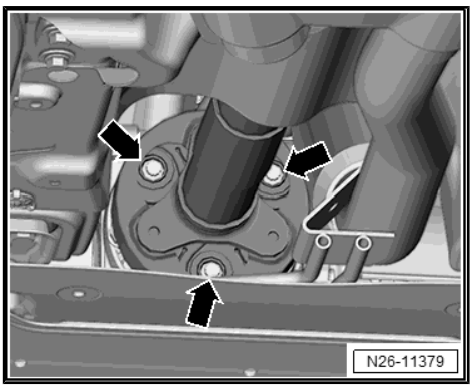
– Mark position of propshaft relative to bevel box flange.



– Counterhold at rear final drive when loosening or tightening propshaft.



– Unbolt propshaft at front from bevel box -arrows-.
– Remove pendulum support ⇒ page 31 .



– When pulling off or pushing on propshaft, always ensure that sleeve -arrow- is not damaged.

– Fit engine support - T10533- as shown in illustration, and tighten bolts by hand.

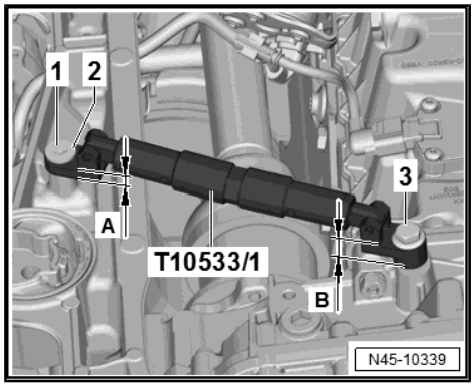
– Using engine support - T10533- , push engine as far forwards as possible.

♦ Bolt -3- = original pendulum support bolt

♦ Screw a bolt M8 x 30 mm -1- fitted with a washer -2- into threaded hole in noise insulation.

♦ -A- thin end

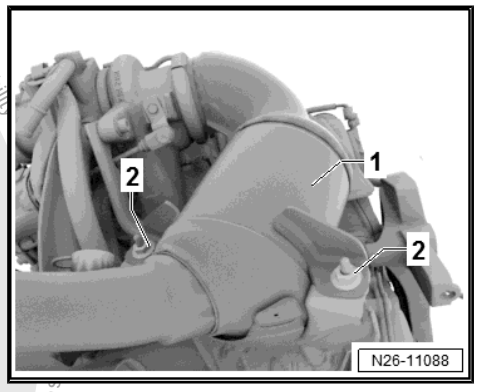
♦ -B- thick end



– Pull propshaft off bevel box, and lay it to left side.

– Mask off propshaft in front area or cover it with a cloth to prevent any damage to surface protection.

– Unscrew nuts -2-.

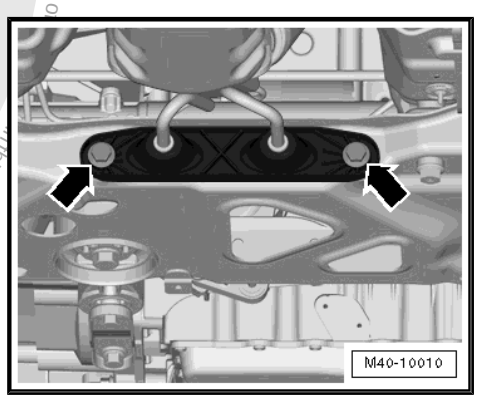


Note

♦ *Avoid damage to the flexible joint!*

♦ *Do not allow the decoupling element to kink by more than 10°. Do not damage wire mesh on decoupling element.*

– Unscrew bolts -arrows-.



– Loosen clamp -arrow-, and push it to rear. When doing this, have a second mechanic hold the exhaust pipe.

– Detach catalytic converter with front exhaust pipe.



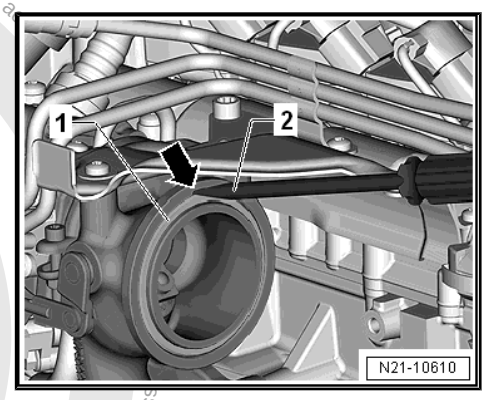
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Installing

– Insert screwdriver -2- into recess -arrow- on turbocharger, and lever out seal -1-.

– Insert new seal.



– Fit screw-type clip on turbocharger.

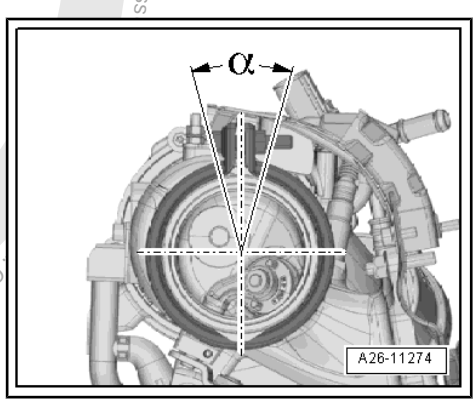
– If securing clips ⇒ Item 9 (page 304) were fitted, fit before installing catalytic converter bracket and securing clips ⇒ page 307 .

– Fit catalytic converter to turbocharger. Attach screw-type clip of catalytic converter loosely without tightening it.

– Tighten nuts and screw-type clip ⇒ page 305 . Note installation position of screw-type clip ⇒ page 305 .

– Bolt on propshaft ⇒ Rep. gr. 39 ; Propshaft; Removing and installing propshaft .

– Align exhaust system free of stress ⇒ page 303 .



Further assembly is basically the reverse of the removal procedure.

Specified torques

- ⇒ “2.1 Assembly overview - emission control”, page 304
- Underbody cover; Assembly overview - underbody covers ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cover; Assembly overview - underbody covers .
- Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

2.3.2 Removing and installing catalytic converter, front-wheel drive

Special tools and workshop equipment required

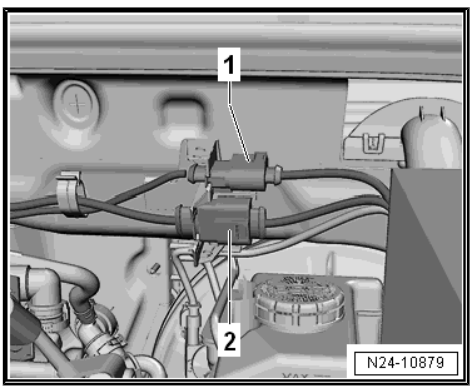
- High-temperature paste ⇒ Electronic parts catalogue (ETKA) .

Removing

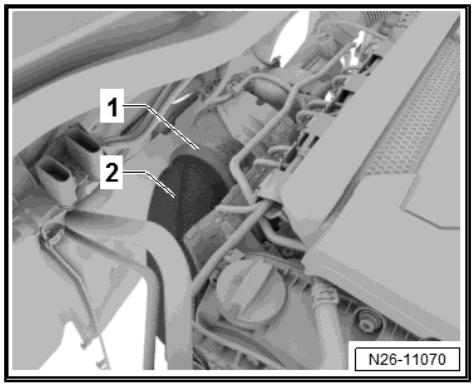
Note

Attach cable ties in all the same places when installing.

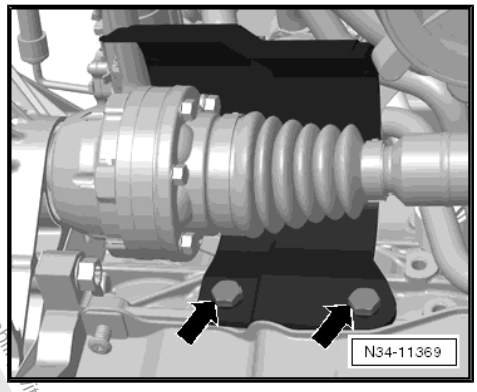
– Remove electrical connector -2- from retainer and separate, and lay electrical wire for lambda probe to one side.



– Loosen clamp -1- for catalytic converter -2-, and push clamp onto turbocharger.
– Remove noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .
– Remove middle underbody cladding ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cladding; Removing and installing underbody cladding .



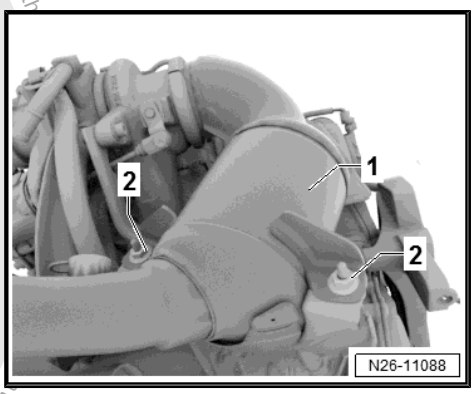
– Unscrew bolts -arrows-.
– Remove heat shield for right drive shaft.



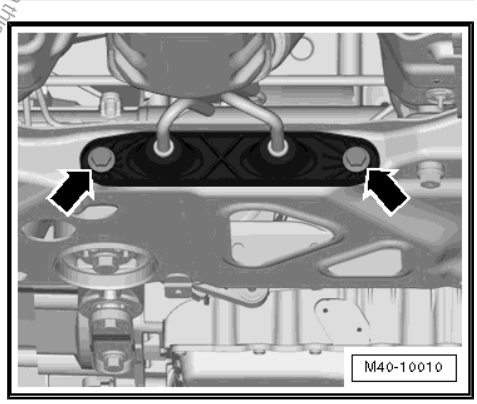
– Unscrew nuts -2-.

Note

- *Avoid damage to the flexible joint!*
- *Do not allow the decoupling element to kink by more than 10°. Do not damage wire mesh on decoupling element.*

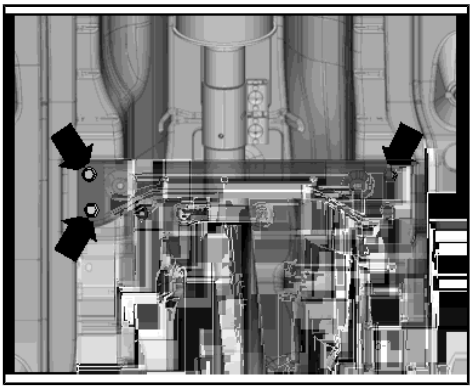


– Unscrew bolts -arrows-.



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– If fitted, remove cross piece -1-.

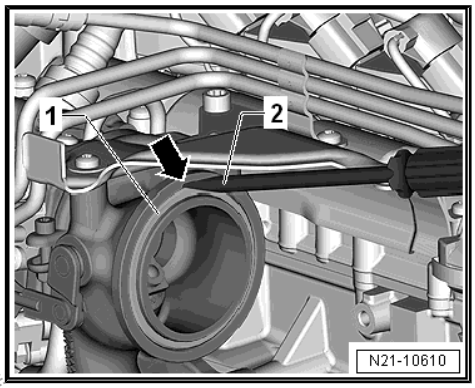


– Loosen clamp -arrow-, and push it to rear. When doing this, have a second mechanic hold the exhaust pipe.
– Detach catalytic converter with front exhaust pipe.



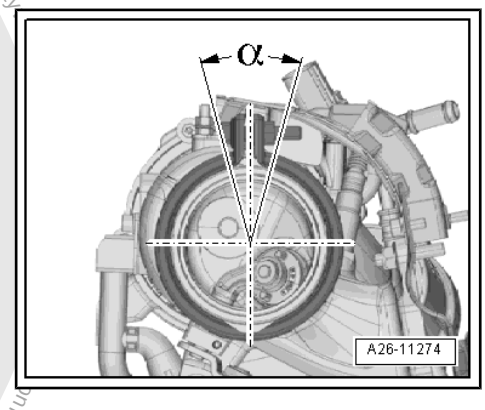
Installing

– Insert screwdriver -2- into recess -arrow- on turbocharger, and lever out seal -1-.
– Insert new seal.



– Fit screw-type clip on turbocharger.
– Fit catalytic converter to turbocharger. Attach screw-type clip of catalytic converter loosely without tightening it.
– Tighten nuts and screw-type clip ⇒ page 305 . Note installation position of screw-type clip ⇒ page 305 .
– Align exhaust system free of stress ⇒ page 303 .

Further assembly is basically the reverse of the removal procedure.



Specified torques

- ⇒ “2.1 Assembly overview - emission control”, page 304
- Underbody cover; Assembly overview - underbody covers ⇒ General body repairs, exterior; Rep. gr. 66 ; Underbody cover; Assembly overview - underbody covers .
- Noise insulation; Assembly overview - noise insulation ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation

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28 – Ignition system

1 Ignition system

⇒ “1.1 Assembly overview - ignition system”, page 316

⇒ “1.2 Removing and installing ignition coils with output stage”, page 317

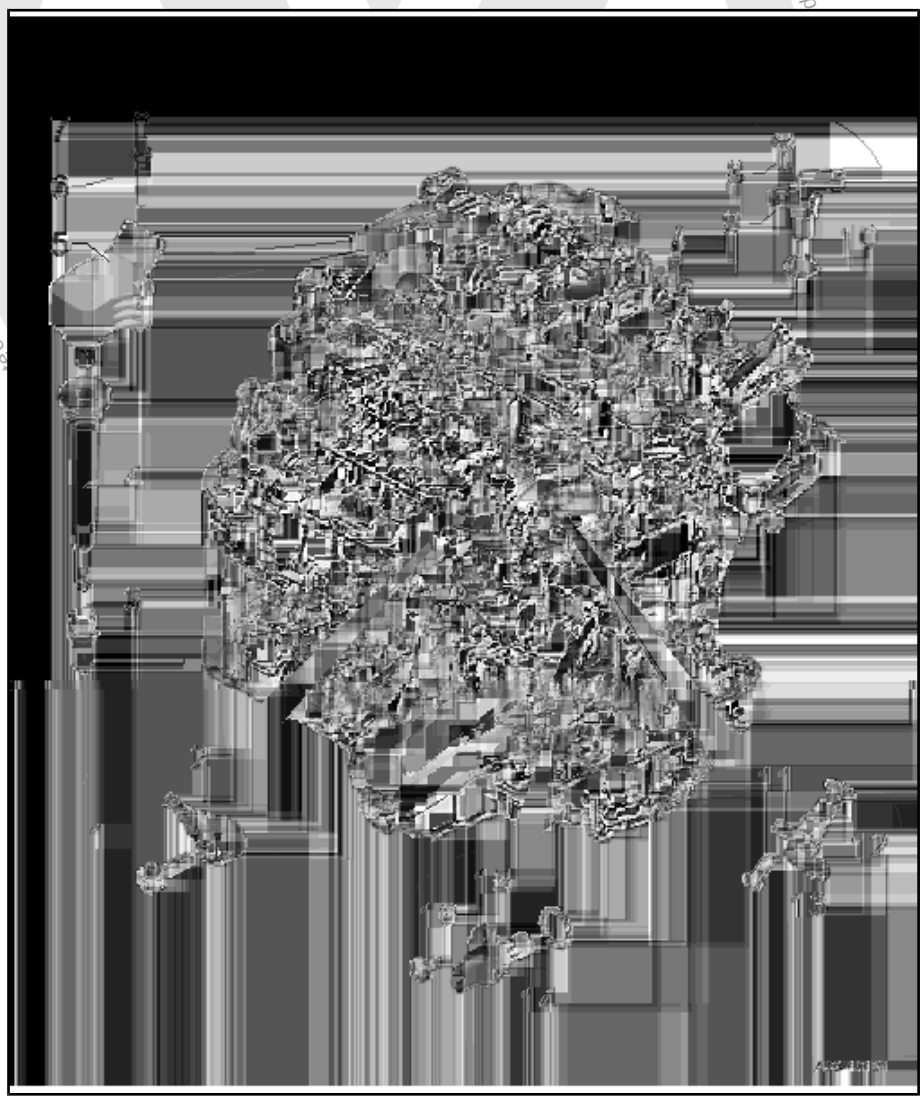
⇒ “1.3 Removing and installing knock sensor I G61 ”, page 319

⇒ “1.4 Removing and installing Hall sender”, page 320

⇒ “1.5 Removing and installing engine speed sender G28 ”, page 321

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1.1 Assembly overview - ignition system



1 - Bolt

- ❑ Renew
- ❑ 8 Nm +90° further
- ❑ The specified torque influences the function of the knock sensor.

2 - Knock sensor 1 - G61-

- ❑ Removing and installing ⇒ page 319

3 - Spark plug

- ❑ 30 Nm
- ❑ Remove and install using spark plug socket and extension - 3122 B- .
- ❑ Renew spark plugs ⇒ Maintenance ; Booklet ; Spark plugs: Renewing

4 - Spark plug connector

- ❑ Assembling ⇒ page 319

5 - Ignition coil with output stage

- ❑ Ignition coil 1 with output stage - N70-
- ❑ Ignition coil 2 with output stage - N127-
- ❑ Ignition coil 3 with output stage - N291-
- ❑ Ignition coil 4 with output stage - N292-
- ❑ Removing and installing ⇒ page 317

6 - Bolt

- ❑ 10 Nm

7 - Nut

- ❑ For earth wire

- ❑ Depending on version.
- ❑ 10 Nm

8 - Bolt

- ❑ 9 Nm

9 - Hall sender 3 - G300-

- ❑ Check O-ring for damage before installing
- ❑ Removing and installing ⇒ page 320

10 - O-ring

- ❑ Renew if damaged

11 - O-ring

- ❑ Renew if damaged

12 - Hall sender - G40-

- ❑ Check O-ring for damage before installing
- ❑ Removing and installing ⇒ page 320

13 - Bolt

- ❑ 9 Nm

14 - O-ring

- ❑ Renew if damaged

15 - Engine speed sender - G28-

- ❑ Check O-ring for damage before installing
- ❑ Removing and installing ⇒ page 321

16 - Bolt

- ❑ 4 Nm +45° further

1.2 Removing and installing ignition coils with output stage

Special tools and workshop equipment required

- ♦ Puller - T10530-

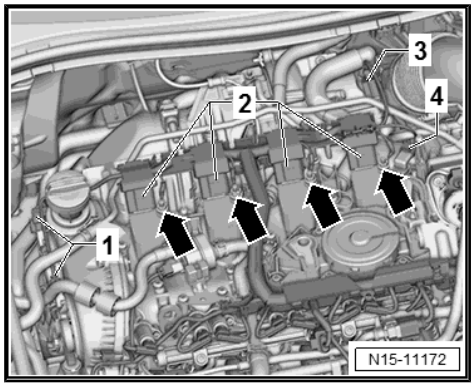
Note

- ♦ *The ignition coils are easier to remove when the engine is warm. The grease added during installation of the ignition coils makes it easier to remove them and the ignition plug connectors when the engine is warm.*
- ♦ *Ignition coils with output stage and spark plug connectors are available individually for repairs ⇒ Electronic parts catalogue (ETKA)*
- ♦ *If the spark plugs are to be renewed, refer to ⇒ Maintenance ; Booklet ; Spark plugs: Renewing .*

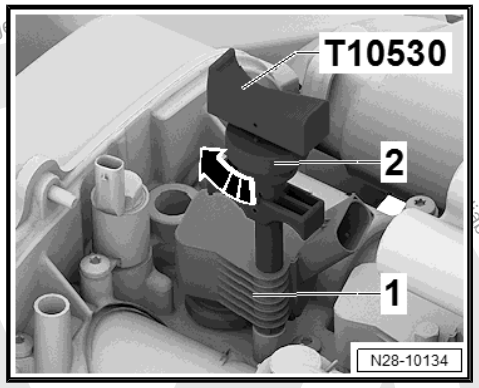
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Removing:

– Remove engine cover panel ⇒ page 41 .
– Unscrew earth wires -arrows-.
– Pull off connectors -1-, -2-, -3- and -4-.
– Unclip wiring harness, and lay it to one side.
– Unscrew securing bolt for ignition coil to be removed.



– Insert puller - T10530- into hole -1- in ignition coil.
– Turn knurled nut -2- clockwise until puller is fixed in position.



– Using puller - T10530- , carefully pull ignition coil vertically upwards to remove.



Note

- *Ignition coils with output stage and spark plug connectors are available individually for repairs ⇒ Electronic parts catalogue (ETKA)*
- *The spark plug connectors are removed from the ignition coils by hand.*

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Assembling ignition coil with output stage and spark plug connector

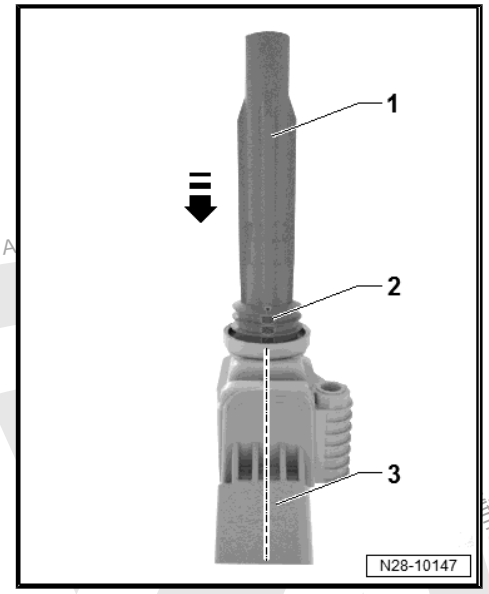
– Slide spark plug connector -1- by hand onto ignition coil as far as stop.

The vent drilling -2- must be centred relative to connector housing -3- while doing so.

Installing ignition coil with output stage and spark plug connector

– Press ignition coils onto spark plugs by hand evenly (do not use tools).

– Tighten ignition coils to 10 Nm.



1.3 Removing and installing knock sensor I - G61-

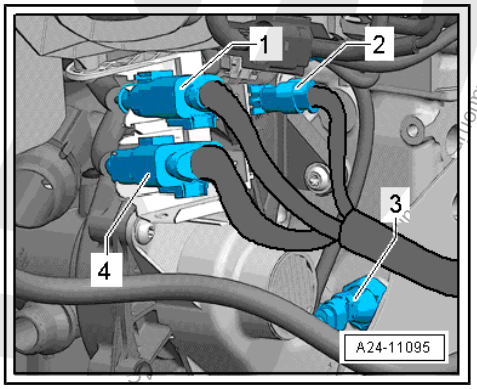
Removing

– Pull connector -2- off knock sensor 1 - G61- .

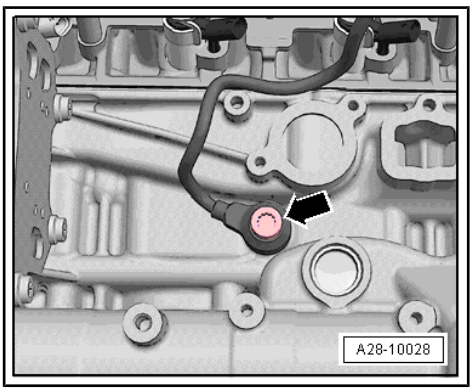
– Remove actuator for engine temperature regulation - N493- ⇒ page 211 .

Note

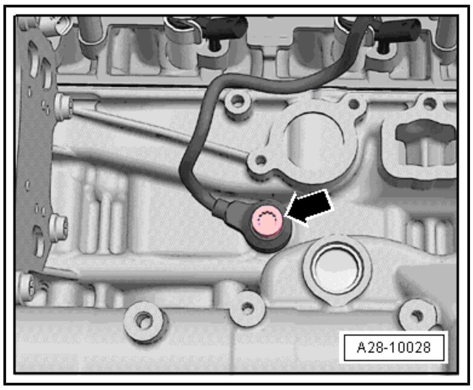
The knock sensor I - G61- is located under the intake manifold behind the coolant pump.



– Unscrew knock sensor 1 - G61- -arrow-.



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Installing

- Install in reverse order of removal.
- Note installation position of knock sensor 1 - G61- .
- Install actuator for engine temperature regulation - N493- ⇒ page 211 .

Specified torques

- ⇒ “1.1 Assembly overview - ignition system”, page 316

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1.4 Removing and installing Hall sender

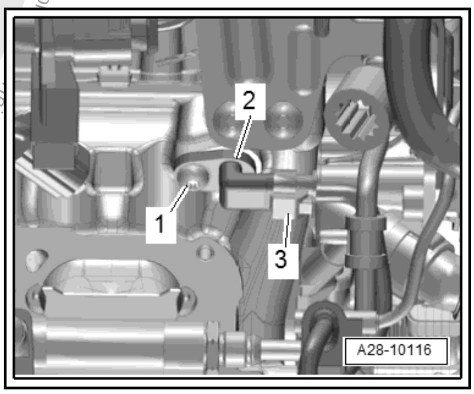
⇒ “1.4.1 Removing and installing Hall sender G40 ”, page 320

⇒ “1.4.2 Removing and installing Hall sender 3 G300 ”, page 320

1.4.1 Removing and installing Hall sender - G40-

Removing

- Remove engine cover panel ⇒ page 41 .
- Remove intake manifold ⇒ page 266 .
- Separate electrical connector -3-.
- Unscrew bolt -1-, and remove Hall sender -2-.



Installing

Install in reverse order of removal, observing the following.

- Renew O-ring.

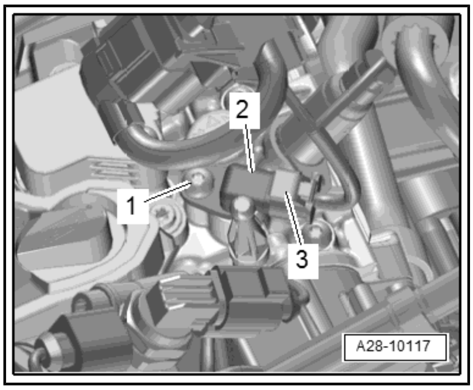
Specified torques

- ⇒ “1.1 Assembly overview - ignition system”, page 316

1.4.2 Removing and installing Hall sender 3 - G300-

Removing

- Remove engine cover panel ⇒ page 41 .
- Separate electrical connector -3-.
- Unscrew bolt -1-, and remove Hall sender -2-.



Installing

Install in reverse order of removal, observing the following.

- Renew O-ring.

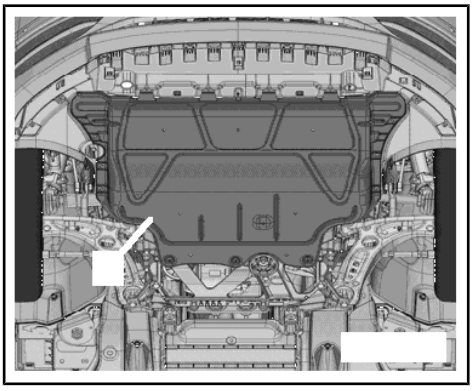
Specified torques

- ⇒ “1.1 Assembly overview - ignition system”, page 316

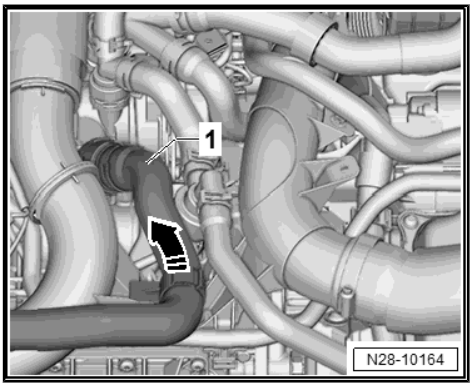
1.5 Removing and installing engine speed sender - G28-

Removing

– Remove noise insulation -1- ⇒ General body repairs, exterior; Rep. gr. 66 ; Noise insulation; Assembly overview - noise insulation .

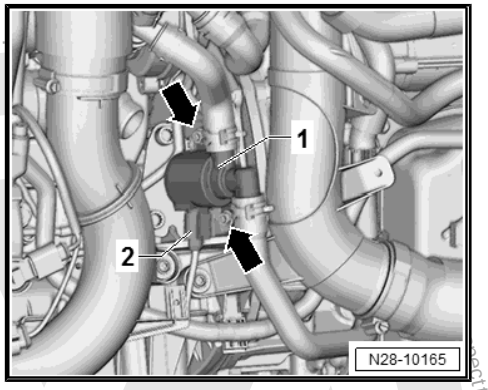


– Disconnect coolant hose -1- from charge air pipe, and push it upwards.



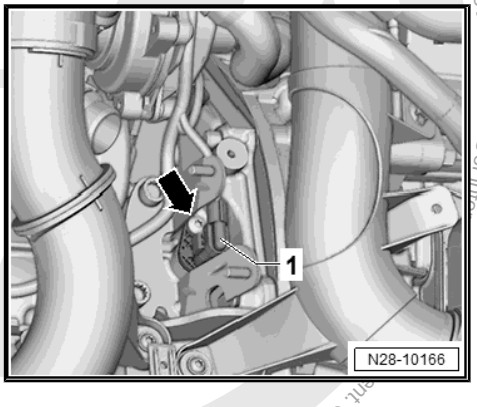
– Separate electrical connector -2-.

– Unscrew nuts -arrows-, and push coolant valve -1- to one side.



– Disconnect electrical connector -1- from engine speed sensor - G28- .

– Unscrew securing bolt -arrow-, and pull out engine speed sender - G28- .



Installing

Install in reverse order of removal.

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

Specified torques

◆ ⇒ “1.1 Assembly overview - ignition system”, page 316

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