

Workshop Manual OCTAVIA

**2.0-ltr./85 kW Engine,
Mechanical Components**

List of Supplements to Workshop Manual **OCTAVIA**

Edition: 04.03

2.0 I/85 kW Engine, Mechanical Components

Replaces List of Supplements - Edition: 01.02

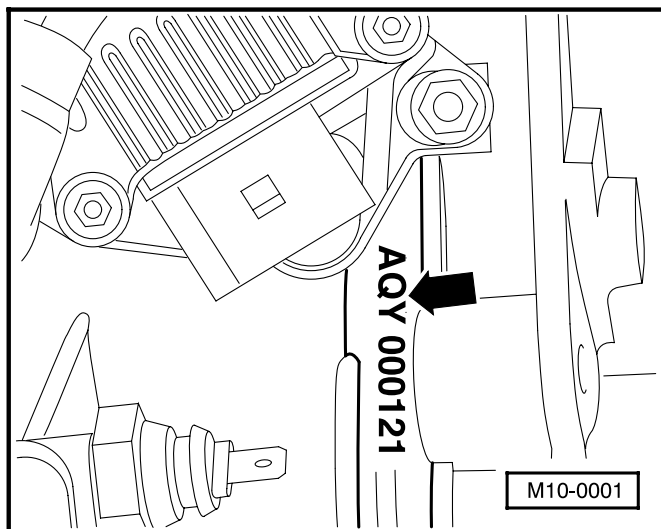
Supplement	Edition	Subject	Article Number
	08.99	Basic Edition of Workshop Manual	S00.5127.50.20
1	12.99	Modifications for Engine Code Letters APK	S00.5127.51.20
2	02.01	Supplement for 4x4 Models	S00.5127.52.20
3	01.02	Modifications to engine identification characters AEG, AZJ	S00.5127.53.20
4	04.03	Modifications to engine identification characters AZJ	S00.5127.54.20
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Technical data

Engine number

◀ The engine number („engine code“ and „serial number“) is located at the front at the joint of the engine and gearbox.

A sticker with „engine code“ and „serial number“ is affixed to the toothed belt guard.

The engine code is also additionally stated on the data sticker.

Engine features

Engine code	AEG	APK	AQY	AZH	AZJ
Manufactured	09.01 ►	03.00 ►	04.99 ► 02.02	05.00 ► 02.02	02.02 ►
Displacement ltr.	1.984	1.984	1.984	1.984	1.984
Power output kW at rpm	85/5400	85/5200	85/5200	85/5400	85/5400
Torque Nm at rpm	165/2800	170/2400	170/2400	170/2400	172/3200
Bore Ø mm	82.5	82.5	82.5	82.5	82.5
Stroke mm	92.8	92.8	92.8	92.8	92.8
Compression ratio	10 : 1	10.5 : 1	10.5 : 1	10.5 : 1	10.5 : 1
Fuel - RON min.	min. 87 leaded/ unleaded	95 unleaded ¹⁾	95 unleaded ¹⁾	95 unleaded ¹⁾	95 unleaded ¹⁾
Fuel injection/ignition system	M3.8.3	M5.9.2	M5.9.2	ME 7.5	ME 7.5
Knock control	yes	yes	yes	yes	yes
Lambda control	1 lambda probe	1 lambda probe	2 lambda probes	2 lambda probes	2 lambda probes
Catalytic converter	yes	yes	yes	yes	yes
Exhaust gas recirculation	no	no	no	no	no
Turbocharger	no	no	no	no	no
Secondary air injection system	no	no	yes	yes	yes
Intake manifold changeover	no	no	no	no	yes
Camshaft adjustment	no	no	no	no	no
Complies with emission limits conforming to and	TIER-1	EU-2	EU-4/EU-3 D-4 ²⁾	EU-4	EU-4

¹⁾ In exceptional cases at least 91 RON, but engine power output reduced

²⁾ Applies to models fitted with automatic gearbox

Removing and installing engine

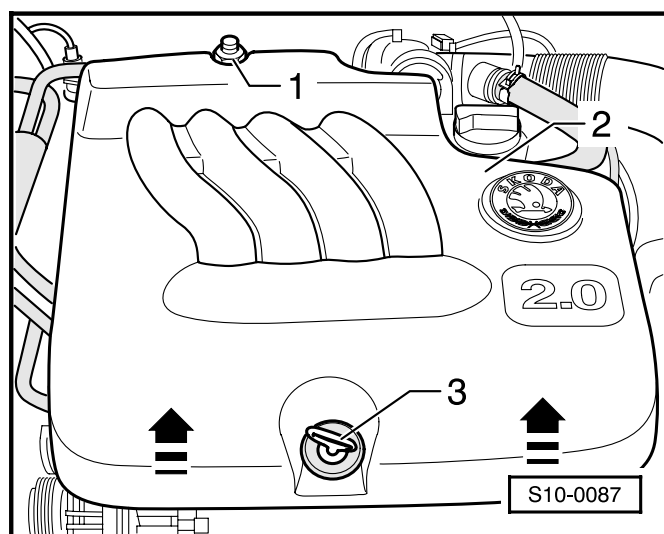
Special tools, testers and aids required

- ◆ Workshop crane (e.g. V.A.G 1202 A)
- ◆ Drip tray (e.g. V.A.G 1306)
- ◆ Torque wrench 5 ... 50 Nm (e.g. V.A.G 1331)
- ◆ Torque wrench 40 ... 200 Nm (e.g. V.A.G 1332)
- ◆ Engine/gearbox jack (e.g. V.A.G 1383 A)
- ◆ Pliers for spring strap clamps
- ◆ Engine holder T10012
- ◆ Spacer sleeves T30010
- ◆ Engine holder MP 1-202
- ◆ Repair stand MP 9-101
- ◆ Suspension device MP 9-201
- ◆ Grease G 000 100 (models with manual gearbox)
- ◆ Hot bolt paste G 052 112 A3
- ◆ Bolt M 10x25/8.8
- ◆ Wire
- ◆ Adhesive tape

Removing engine

Notes:

- ◆ *The engine is removed downward together with the gearbox.*
- ◆ *Hose connections are secured by screw-type, spring strap or collar clamps. Collar clamps must always be replaced by spring strap clamps or screw-type clamps.*
- ◆ *Fuel hoses at the engine must be secured only by spring strap clamps. It is not permitted to use collar screw-type clamps.*



- ♦ *It is recommended to use the pliers for spring strap clamps for removing and installing such clamps.*
- ♦ *Ensure the connectors are correctly assigned; mark if necessary.*

Procedure

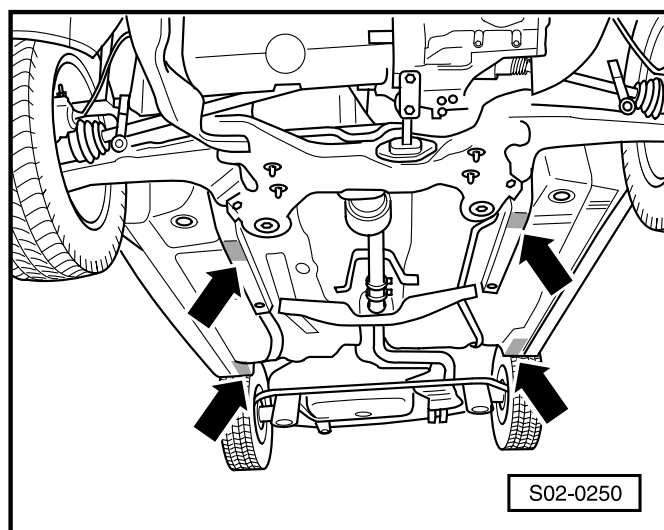
- On models fitted with coded radio set, pay attention to coding; determine if necessary.
- Switch off ignition (if not already off) and disconnect earth strap of battery.

- ◀ - Remove engine trim panel -2-.

Slacken nut -1- for this step, withdraw dipstick -3- and remove trim panel by pulling it up at the front with a jerk (arrows).

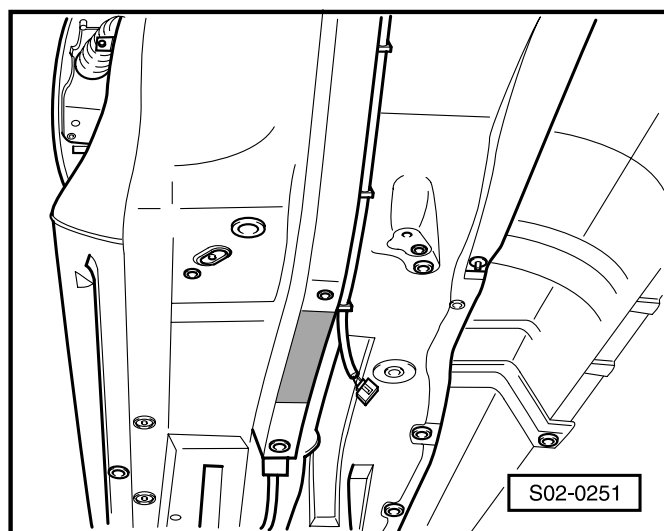
- Detach secondary air injection pump together with bracket ⇒ page 26-10.
- Raise vehicle with a lift platform. Pay attention to the following points:

- ◀ - The arms of the lift platform must be positioned only below the longitudinal members.



Warning!

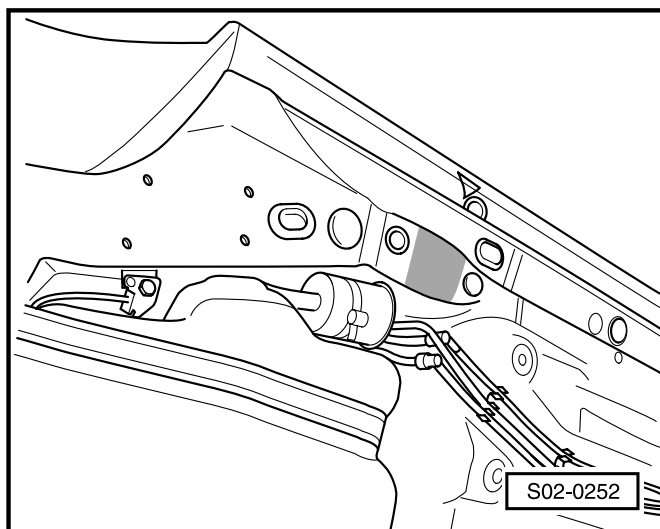
The arms must on no account be positioned below the sill, or the front and rear axles.



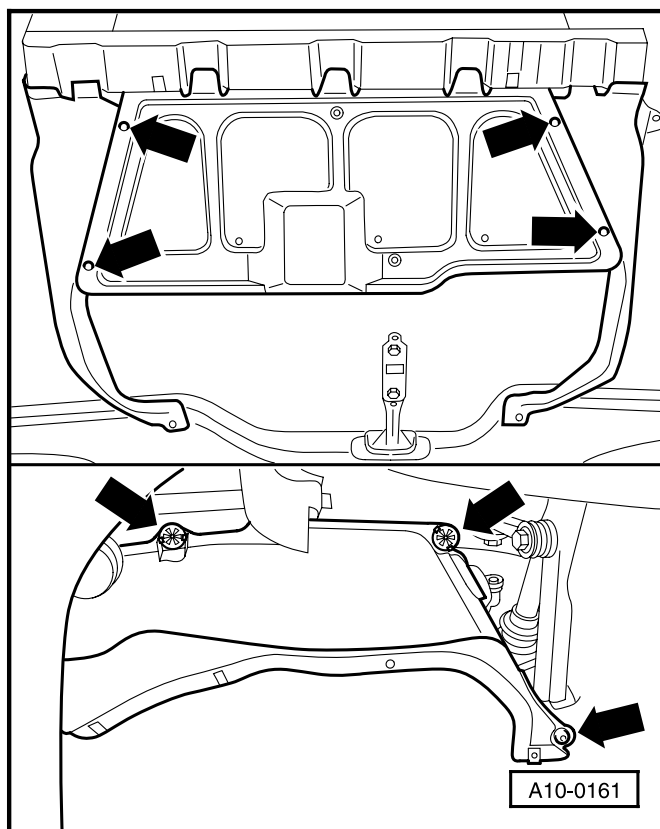
- ◀ - The two front jacking points are located at the front of the two side members at the level of the marking on the sill.

Warning!

Never start the engine and engage a gear when the vehicle is raised so long as only one driven wheel is still touching the ground.



- ◀ The two jacking points at the rear are located at the rear of the two side members, at the level of the marking on the sill.



- ◀ - Remove middle noise insulation panel -arrows-. First of all remove air ducts on outside.
- Unbolt heat shield for right drive shaft.
- Remove drive shafts
⇒ Running Gear; Repair Group 40; Removing and installing drive shaft.
- Remove front exhaust pipe ⇒ page 26-1.

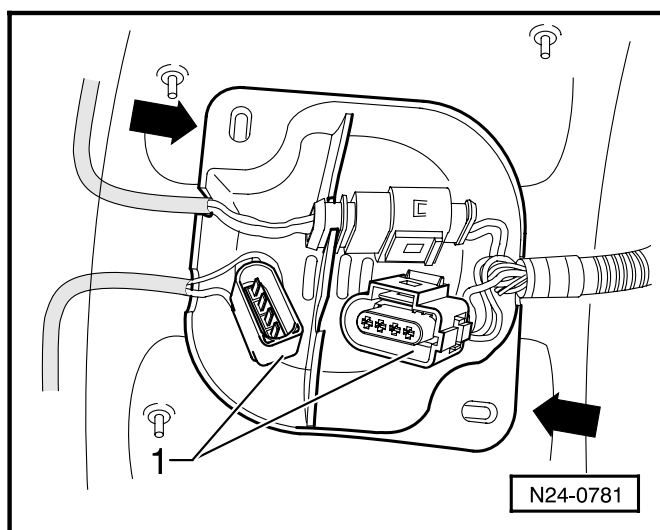
Note:

Avoid an excess of deflection of the decoupling element at the front exhaust pipe (max. 10°).

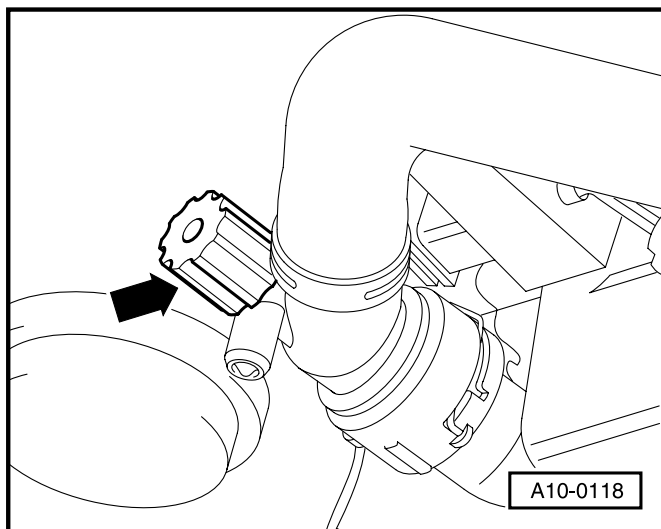
4x4 models

- Detach prop shaft from gearbox
⇒ 5-Speed Manual Gearbox 02C; Repair Group 39; Removing and installing prop shaft.

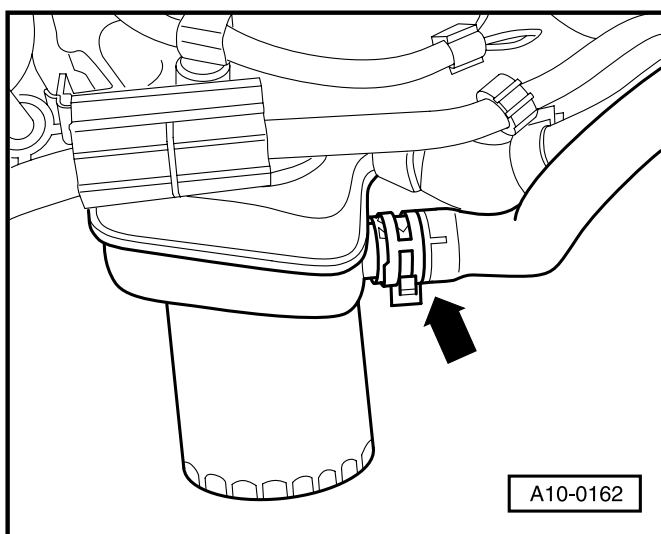
Continued for all models



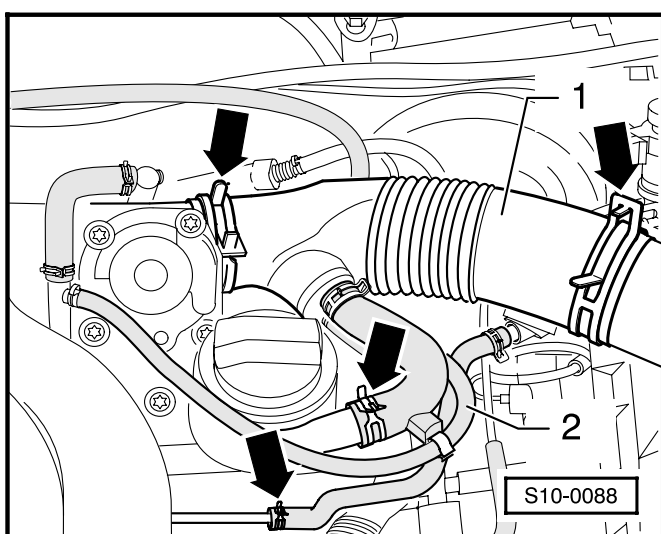
- ◀ - Unscrew the protective cover -arrows- and separate the plug connection (black) -1- to the catalytic converter lambda probe -G39-.
- Unclip the cable to the lambda probe from the guides.



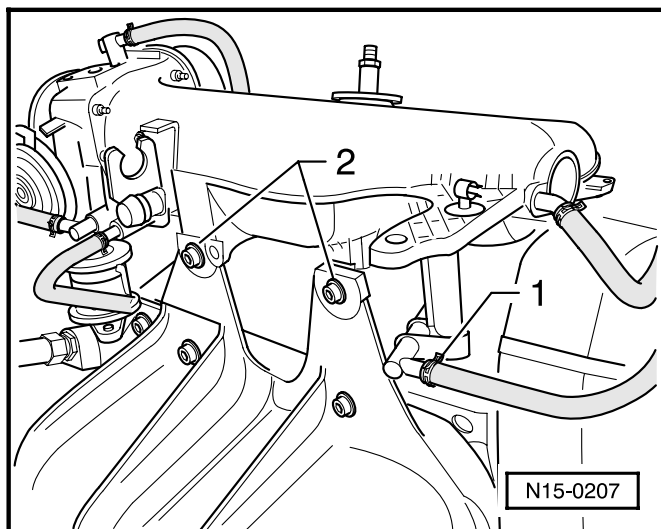
- Place drip tray (e.g. V.A.G 1306) below the engine.
- Open the cap of the coolant expansion reservoir.
- ◀ - Turn drain plug -arrow- at the radiator to the left and pull it back; fit hose onto the connection, if necessary.



- ◀ - In addition, detach front coolant hose at oil cooler -arrow- and allow the remaining coolant to flow out.
- Remove air filter.
- Remove battery and battery rack.
- ⇒ Electrical System; Repair Group 27; Removing and installing battery



- Remove the top part of the intake manifold as follows:
- ◀ - Detach intake hose -1- (arrows). Vent hose -2- remains connected.
- Remove throttle cable and unplug connector from the throttle valve control unit -J338-.
- Separate coolant hoses to throttle valve control unit (straight connection at quick-coupling at heat exchanger).
- Detach vacuum hose for fuel pressure regulator.
- Unscrew front bolts attaching top part and bottom part of intake manifold (tightening torque: 10 Nm).

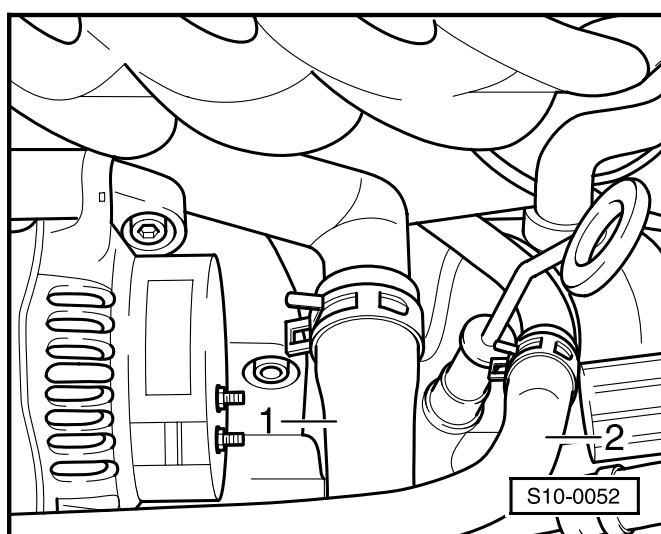


- ◀ - Detach vent hose -1-.
- Remove bolts -2- at the intake manifold support (tightening torque: 25 Nm).

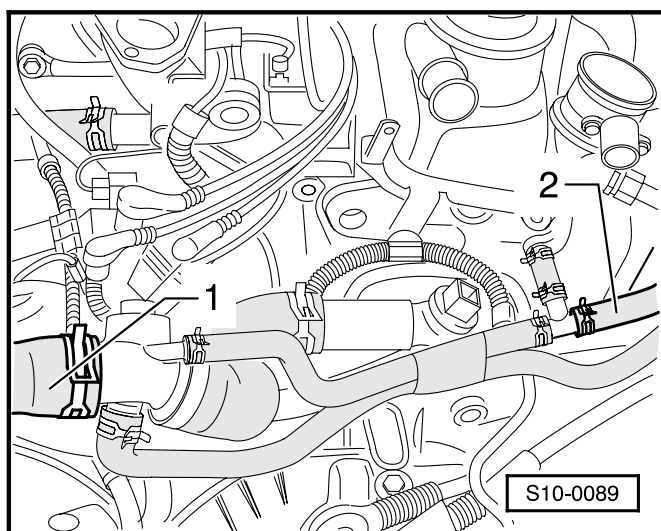
Note:

Seal off the intake passages in the bottom part of the intake manifold with a clean cloth.

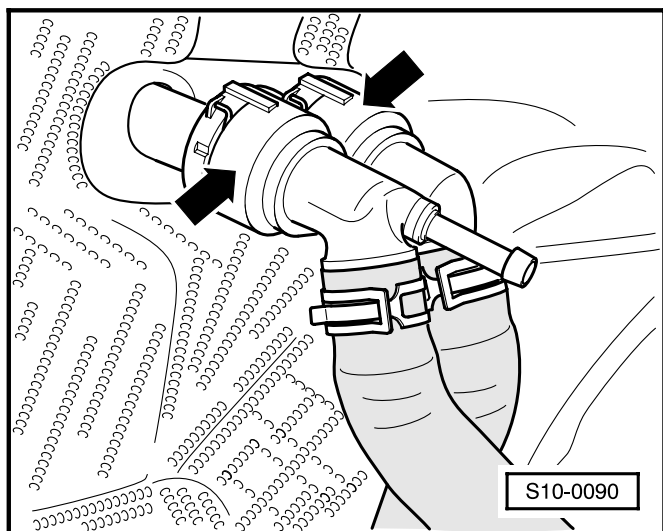
- Detach vacuum hose from the combination valve.



- Use pliers for spring strap clamps to detach the following coolant hoses:
- ◀ 1 - Coolant hose at bottom of thermostat housing
- 2 - Coolant hose to expansion reservoir



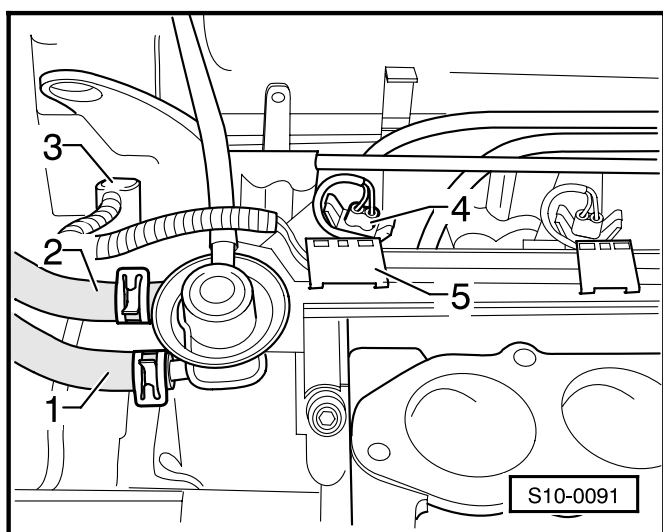
- ◀ 1 - Coolant hose to top of radiator at junction piece
- 2 - Coolant hose to expansion reservoir at T-piece, connection of cylinder head



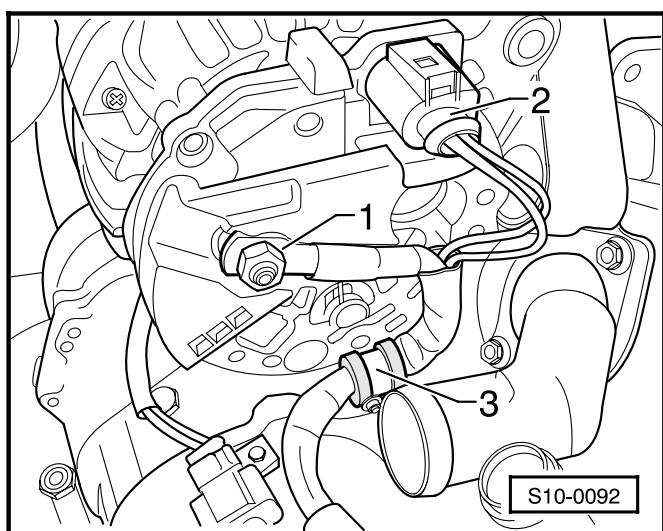
- ◀ - Detach quick-couplings at connection of heat exchanger -arrows-. Same system of attachment as radiator connection; pull retaining clasp down as far as the stop.

Warning!

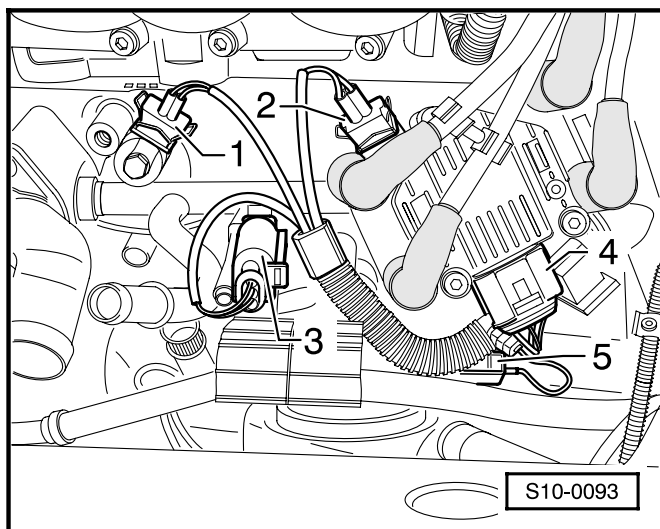
Fuel feed line is pressurized! Place cleaning cloths around the connection point before detaching the hose connections. Then, release pressure by carefully detaching the hose.



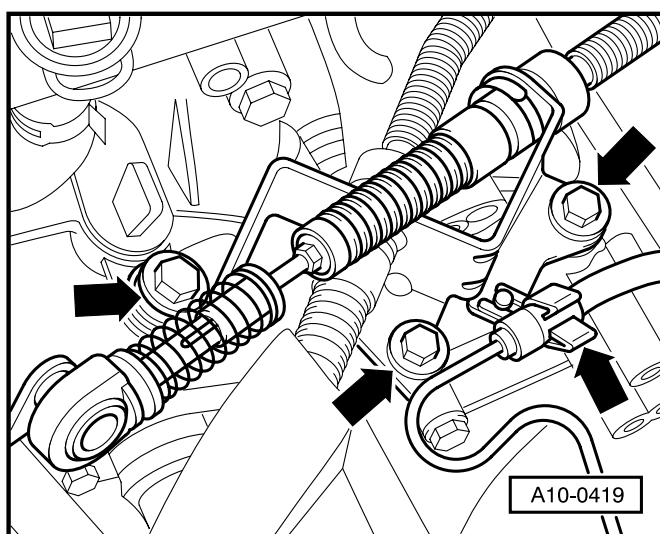
- ◀ - Detach the feed line -2- and the return-flow line -1- from the fuel pressure regulator and collect the fuel which flows out.
- Unplug the connector -3- from the camshaft position sensor -G40-.
- Unplug the connectors -4- from the injectors -N30...N33-. Unclip the cable guide -5- and expose the wiring loom.



- ◀ - Unbolt cable -1- (terminal 30/B+) at alternator.
- Unplug connector -2- from terminal D+.
- Remove cable clamp -3-.

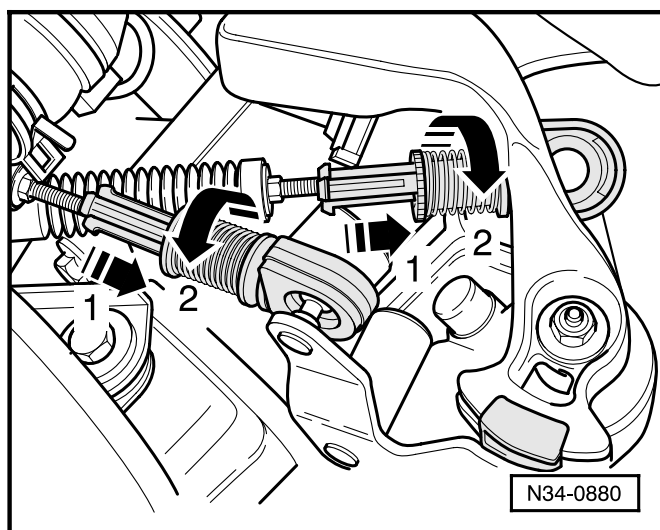


- ◀ - Unplug the following connectors:
 - 1 - at knock sensor 1 -G61-, black
 - 2 - at knock sensor 2 -G66-, brown
 - 3 - for engine speed sender -G28-
 - 4 - at ignition module with power output stage -N122-
 - 5 - at oil pressure switch -F1-
 - at coolant temperature sender -G62- (in coolant connection, on side of cylinder head)

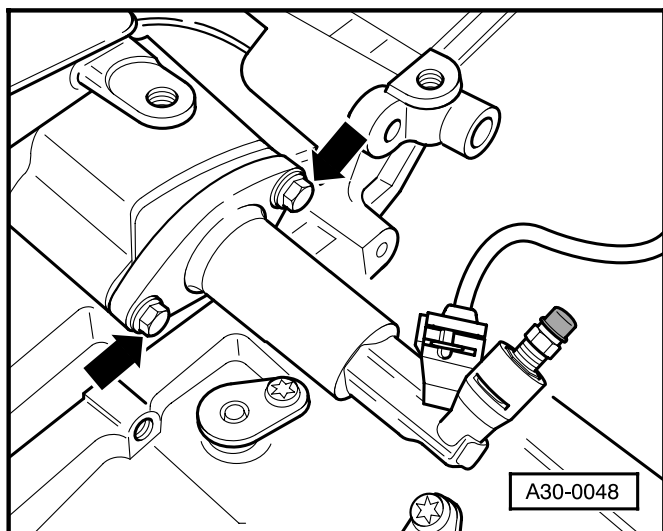


Models with manual gearbox

- ◀ - Unbolt the cable support bracket from the gearbox and unclip the hose line -arrows-.



- ◀ - Pull locking mechanism at shift cable and at selector cable fully forward as far as the stop (arrow -1-) and then lock to the left (arrow -2-).
- Place down cables and cable support bracket upward.

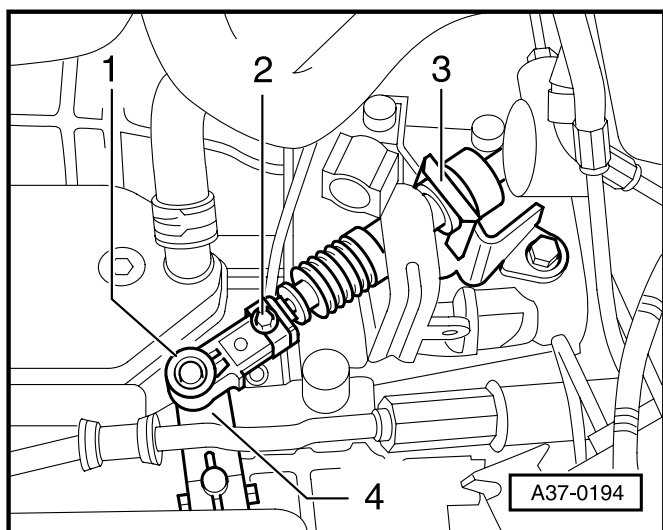


- Unplug connectors:
- at vehicle speed sender -G68-
- at reversing light switch -F4-

◀ - Remove slave cylinder -arrow- and place down to the side, secure with wire. Do not open line system.

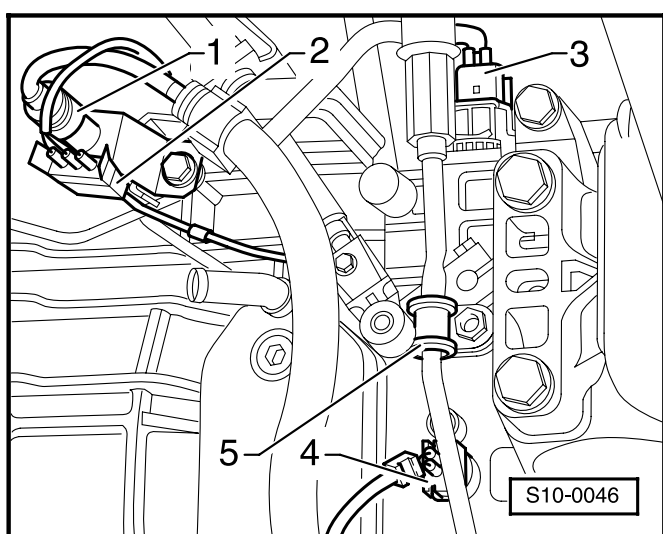
Note:

Do not depress clutch pedal.



Models with automatic gearbox

- ◀ - Use a screwdriver to press off selector lever cable -1- at selector lever of gearbox -4-. Pull off securing clasp -3- at support bracket.
- Take off selector lever cable and place to the side.

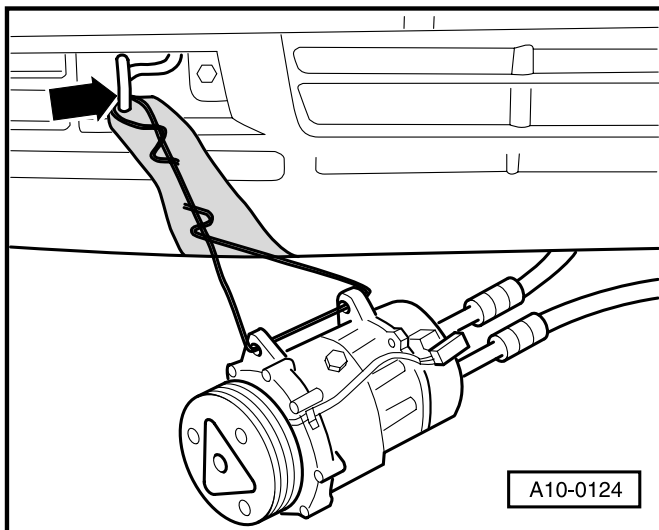


- ◀ - Unplug the following connectors:
- 1 - to solenoid valves (10-pin connector)
 - 2 - to vehicle speed sender -G68-
 - 3 - at multifunction switch -F125-
 - 4 - at gearbox speed sender -G38-
- Unbolt bracket for pressure line -5- of power steering and gearbox support.
 - Detach wiring loom from the fixtures and run out to the side.

Models with air conditioning

Warning!

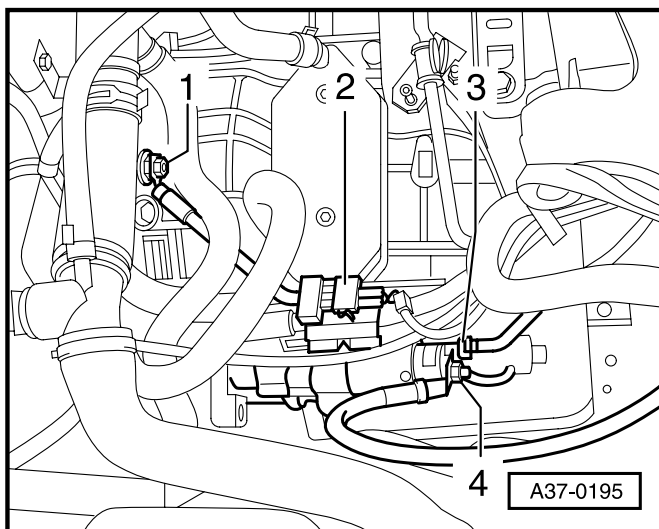
The refrigerant circuit of the air conditioning system must not be opened.



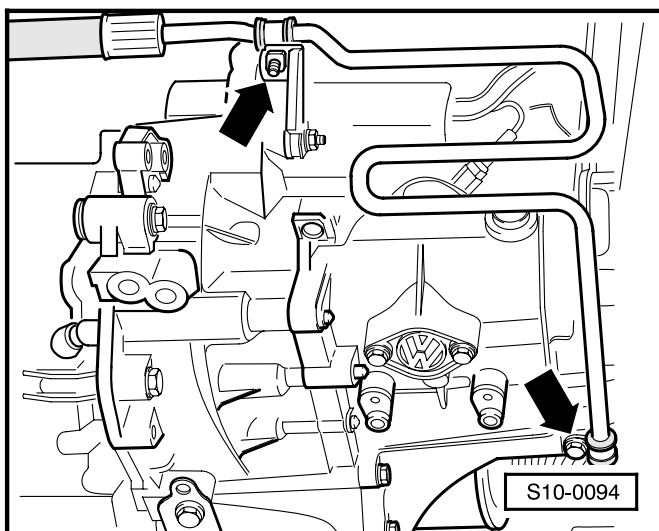
- Separate plug connection at the AC compressor.
- Unplug connector from the coolant temperature warning switch -F14- (in coolant junction piece).
- ◀ - Unbolt compressor of air conditioning system, lower together with connected refrigerant lines and tie up with wire at the towing eye on the inside of the bumper -arrow-.

Note:

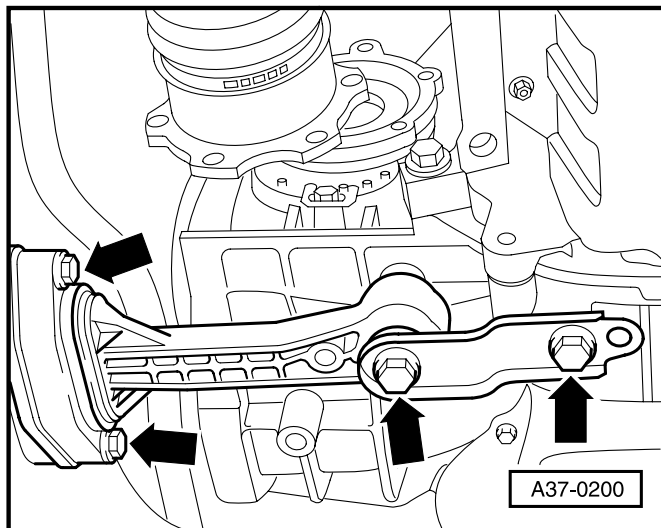
Use adhesive tape to protect bumper from scratches.

Continued for all models

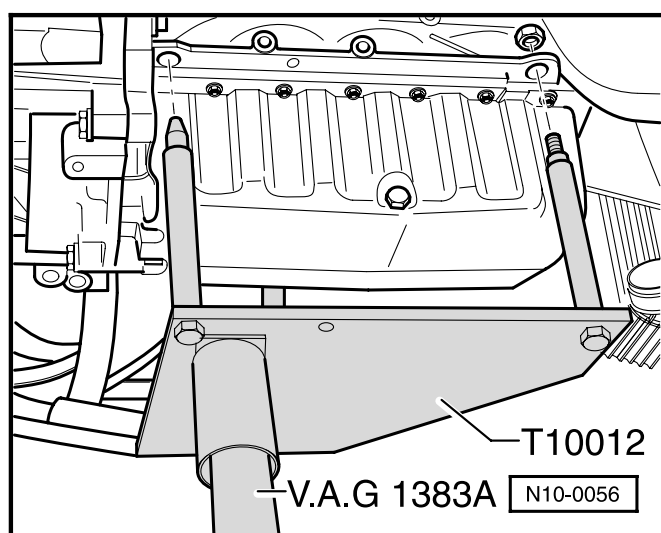
- ◀ - Detach earth cable -1- from the bolt connecting engine/gearbox at top.
- Separate plug connection -2- and pull out of the fixture.
- Disconnect cables -3- and -4- at starter.
- Detach wiring loom from the fixture at starter and place to the side.



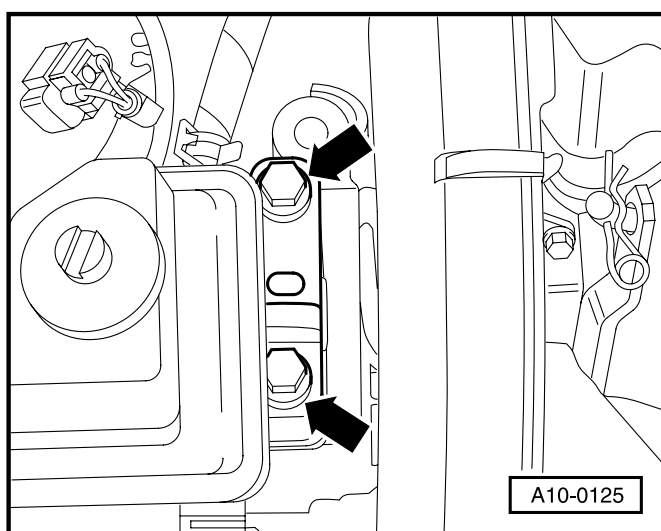
- Remove ribbed V-belt ⇒ page 13-1.
- ◀ - Unbolt 2 brackets for pressure line of power steering -arrows- (illustration shows model with manual gearbox).
- Unbolt belt pulley of hydraulic pump for power steering (counterhold with screwdriver).
- Unbolt hydraulic pump and tie up at the body with wire; hoses remain connected.



- ◀ - Unbolt pendulum support -arrows-.



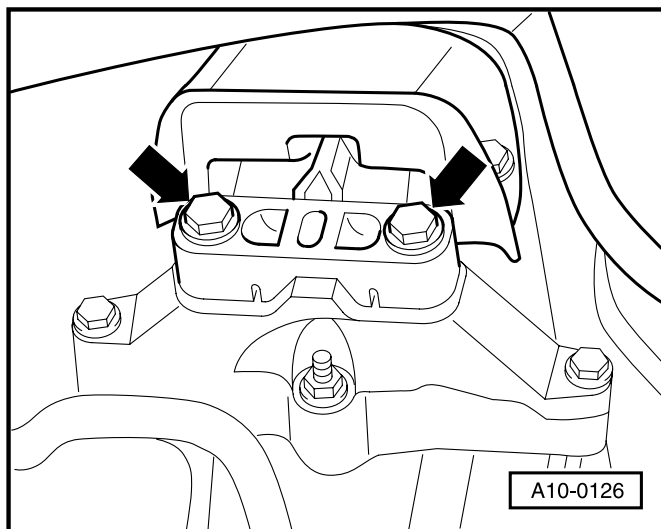
- Insert engine holder T10012 into engine/gearbox jack (e.g. V.A.G 1383 A).
- ◀ - Attach engine holder T10012 with nut and M10 bolt to cylinder block with a torque of 40 Nm.
- Raise engine and gearbox slightly with engine/gearbox jack (e.g. V.A.G 1383 A).



- ◀ - Slacken engine mount from above from the engine support -arrows-.

Note:

Use ladder, e.g. VAS 5085, to remove the bolts attaching the engine mount.



- ◀ - Slacken gearbox mount from the gearbox support from above -arrows-.
- Carefully lower engine and gearbox.
- Guide pressure line for power steering past the gearbox during this step.

Note:

It is important to carefully guide the engine and gearbox when lowering in order to avoid damaging the body.

Attaching engine to repair stand

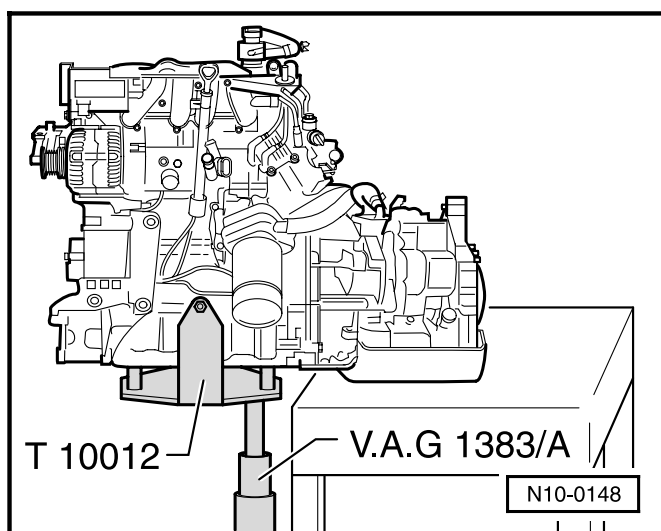
The engine must be attached to the repair stand MP 9-101 for carrying out removal and installation operations.

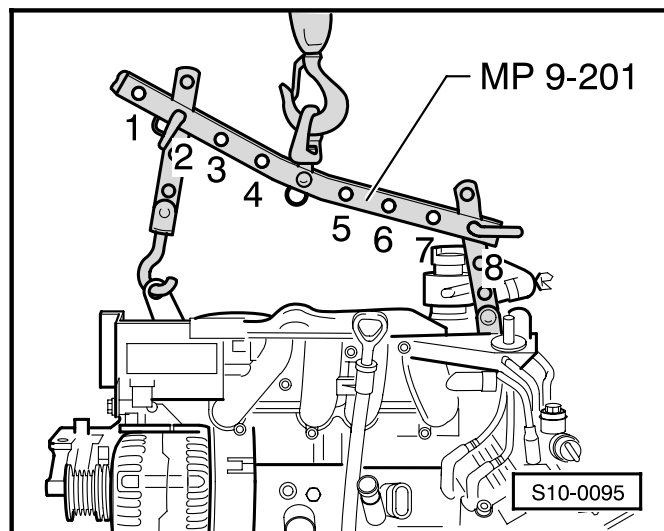
Procedure

- ◀ - Run engine/gearbox unit to the workbench with trolley jack (e.g. V.A.G 1383 A).
- Lower the engine/gearbox unit so that the gearbox is resting on the workbench.
- Remove the bolts connecting engine/gearbox.
- Press gearbox off the engine.

Models with automatic gearbox

- Unscrew nuts from torque converter.
- Detach hoses from ATF cooler.
- Secure torque converter to prevent it dropping out.





Continued for all models

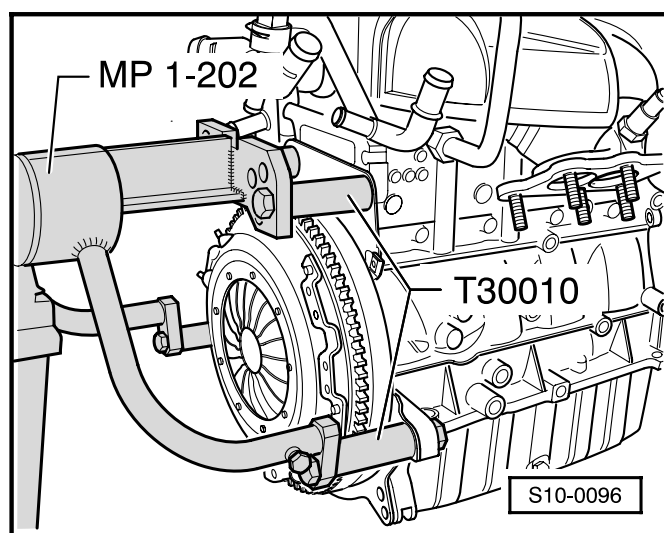
- ◀ - Attach suspension device MP 9-201 as described below, and lift out of engine/gearbox jack (e.g. V.A.G 1383 A) with workshop crane (e.g. V.A.G 1202 A).

Belt pulley side:
3rd hole of rail in position 2

Flywheel side:
3rd of rail in position 8

Warning!

Insert locking studs at the hooks and pins.



Notes:

- ♦ The positions for inserting the pins in the supporting arm, marked with 1...4, point toward the belt pulley.
- ♦ The holes in the rails are counted from the hook.
- ◀ - Attach engine with engine and gearbox holder MP 1-202 and spacer sleeves T30010 to the repair stand MP 9-101.

Installing engine

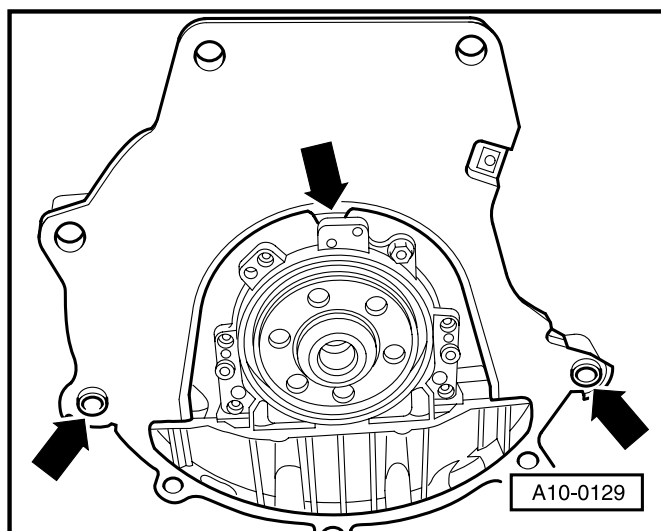
Notes:

- ♦ Always replace seals and gaskets when carrying out removal and installation operations.
- ♦ Always replace self-locking nuts.
- ♦ Coat stud bolts at exhaust manifold with hot bolt paste G 052 112 A3.
- ♦ Aligning unit mounting for engine and gearbox ⇒ page 10-15.
- ♦ Tightening torques ⇒ page 10-16.
- ♦ Unit mounting ⇒ page 10-17.

Procedure

Installation is carried out in the reverse order. Pay attention to the following points:

- Check whether dowel sleeves for centering engine/gearbox are present in the cylinder block; insert if necessary.



- ◀ - Attach intermediate plate to sealing flange and push onto the dowel sleeves -arrows-.

Models with manual gearbox

- Inspect centering of the clutch driven plate, as appropriate.
- Inspect clutch release bearing for wear, replace if necessary.
- Apply a thin film of grease G 000 100 to clutch release bearing, guide sleeve for release bearing and splines of input shaft.
- Install slave cylinder of hydraulic clutch:
⇒ 5-Speed Manual Gearbox 02J; Repair Group 30; Servicing clutch control
- Attach shift mechanism and set cable shift:
⇒ 5-Speed Manual Gearbox 02J; Repair Group 34; Servicing shift mechanism

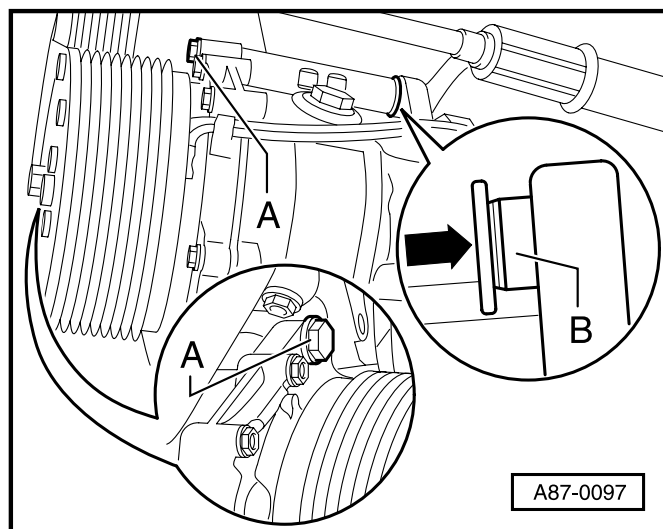
Models with automatic gearbox

- Replace lock washer at support bearing of selector lever cable.
- Install selector lever cable at gearbox, adjust if necessary:
⇒ Automatic Gearbox; Repair Group 37; Servicing shift mechanism; Disassembling and assembling shift mechanism

Continued for all models

- When installing the engine/gearbox unit, ensure adequate clearance to adjoining components.
- Guide pressure line of power steering past the gearbox.
- Align engine/gearbox unit ⇒ page 10-15.

Tightening torques ⇒ page 10-17, unit mounting.



Models with air conditioning

- Install the AC compressor.
- ⇒ Heating, Air Conditioning; Repair Group 87; Servicing heating and air conditioning - engine compartment
- ◀ - Knock back threaded bushes -B- for retaining bolts -A- slightly in direction of arrow to more easily fit on the AC compressor.

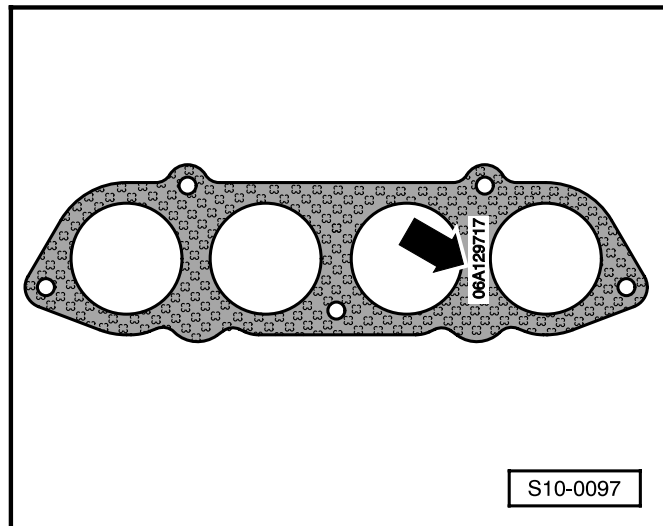
Continued for all models

- Install hydraulic pump for power steering.
- ⇒ Running Gear; Repair Group 48; Removing and installing hydraulic pump
- Install right drive shaft and bolt left drive shaft onto gearbox.
- ⇒ Running Gear; Repair Group 40; Removing and installing drive shafts
- Install front exhaust pipe together with catalytic converter ⇒ page 26-1, and align exhaust system free of stress ⇒ page 26-6.

Note:

Avoid excessively deflecting the decoupling element at the front exhaust pipe (max. 10°).

- Electrical connections and routing.
- ⇒ "Current Flow Diagrams, Electrical Fault Finding and Fitting Locations" binder



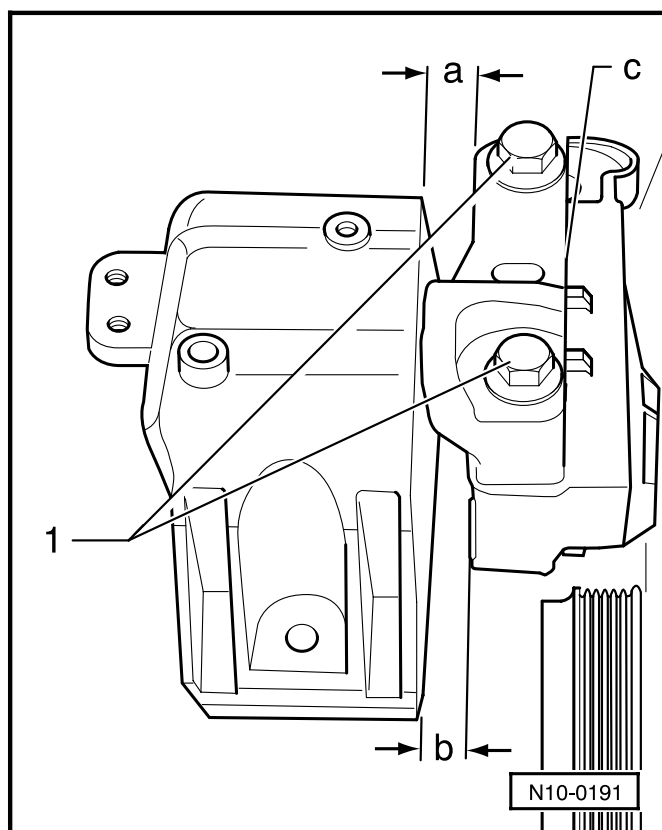
- ◀ - Install top part of intake manifold.
 - ◆ Pay attention to installation position of gasket:
Component number -arrow- at top left (in direction of arrow)
 - ◆ Attachment of top part of intake manifold at front:
Insert rear bolts into top part of intake manifold before installing.
- Adjust throttle cable ⇒ page 20-13
- Install ribbed V-belt ⇒ page 13-1.
- Attach coolant hoses ⇒ page 19-1.

Note:

Re-use drained coolant only if cylinder block, cylinder head, radiator or heat exchanger have not been replaced.

- Fill system with coolant ⇒ page 19-3.

- After re-connecting the battery:
 - Encode radio.
 - Set clock.
 - Initialise power windows.
- ⇒ Inspection and Maintenance
- Inspect oil level before starting the engine.
- Interrogate and erase fault memory.
 - ⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 01; Interrogating and erasing fault memory
- Generate readiness code.
 - ⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 01; Generating readiness code
- Carry out the "Procedure after interruption to voltage supply".
 - ⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Procedure after interruption to voltage supply



Aligning unit mounting for engine and gearbox

Warning!

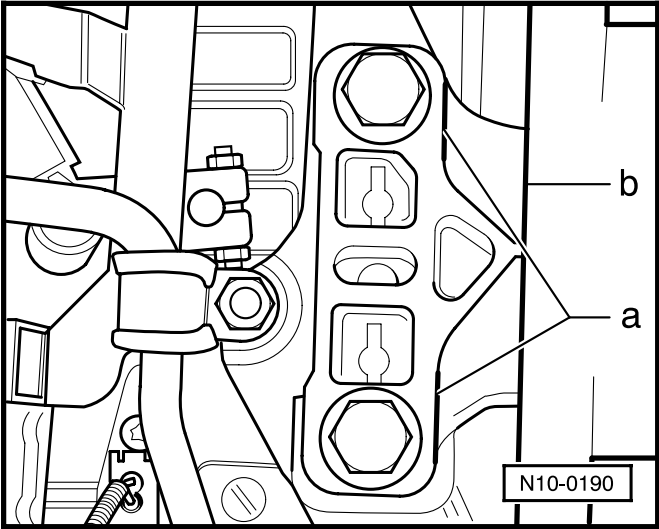
The engine/gearbox unit must be secured with the supporting device MP 9-200 before slackening the bolts.

◀ Mounting of engine

a = 14.0 mm

b = at least 10.0 mm

Both bolt heads -1- must finish flush with the edge -c-.



◀ Gearbox mounting

The edges -a- and -b- must be parallel to each other.

Tightening torques

Notes:

- ♦ Tightening torques apply only to nuts and bolts which have been lightly greased, oiled, phosphatized or blackened.
- ♦ Additional lubricants such as engine oil or gear oil, are permissible, but not Molykote.
- ♦ Do not use any degreased parts.
- ♦ Unless otherwise stated, the following tightening torques apply:

Component		Nm
Nuts/bolts	M6	9
	M7	13
	M8	20
	M10	40
	M12	70
In variation of this:		
Torque converter to driven plate		60
Engine mounts, gearbox mounts, pendulum support		⇒ Component mounting
Bolts connecting engine to gearbox ⇒ 5-Speed Manual Gearbox 02J; Repair Group 34 ⇒ 5-Speed Manual Gearbox 02C; Repair Group 34 ⇒ Automatic Gearbox; Repair Group 37		

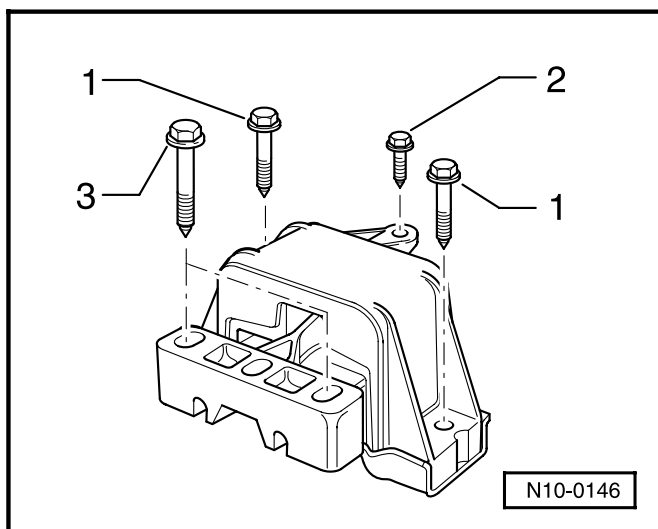
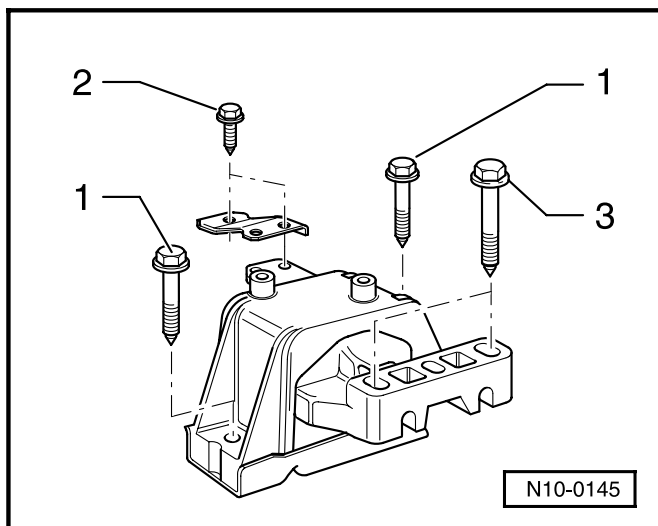
Component mounting

Tightening torques

◀ Engine mounts

- 1 - 40 Nm + 90° (¼ turn)¹⁾
- 2 - 25 Nm
- 3 - 100 Nm¹⁾

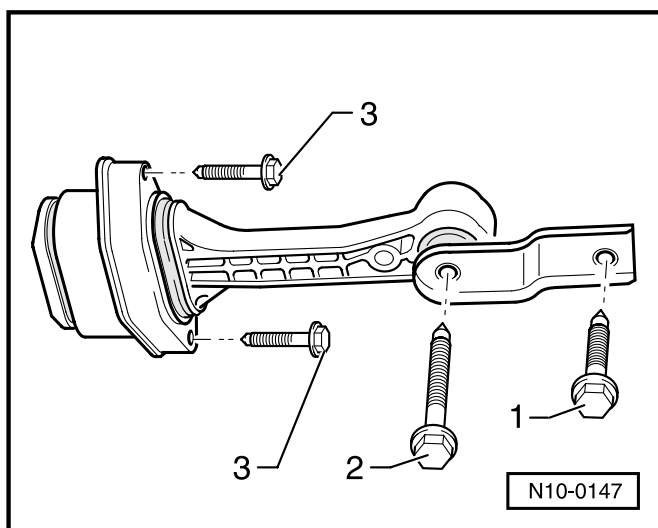
1) Replace bolts



◀ Gearbox mounts

- 1 - 40 Nm + 90° (¼ turn)¹⁾
- 2 - 25 Nm
- 3 - 100 Nm¹⁾

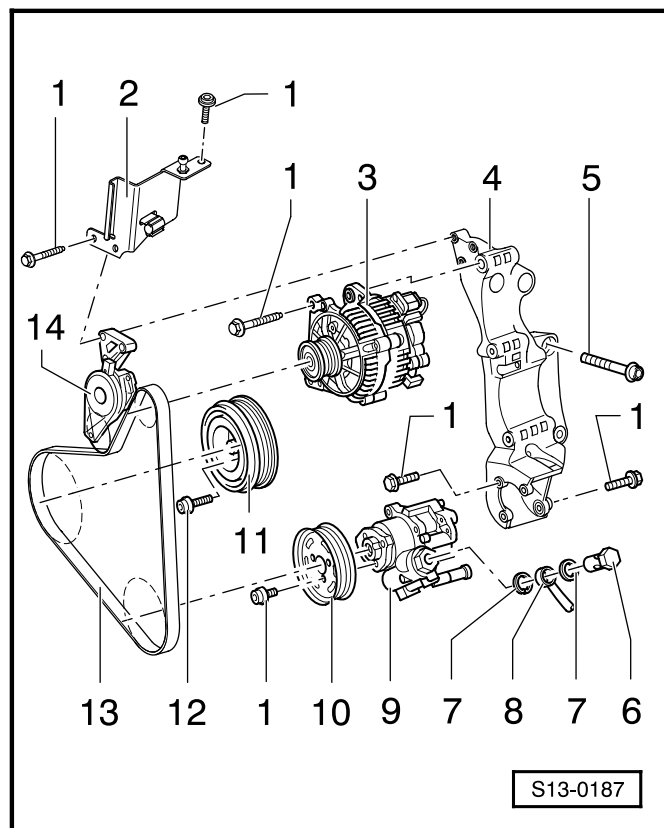
1) Replace bolts



◀ Pendulum support

- 1 - 40 Nm + 45°¹⁾
- 2 - 40 Nm + 45°¹⁾
- 3 - 20 Nm + 90° (¼ turn)¹⁾

1) Replace bolts

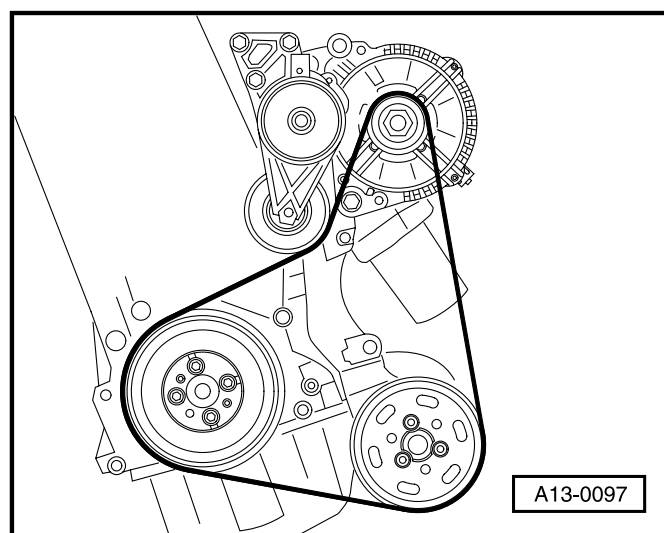


13 - Ribbed V-belt

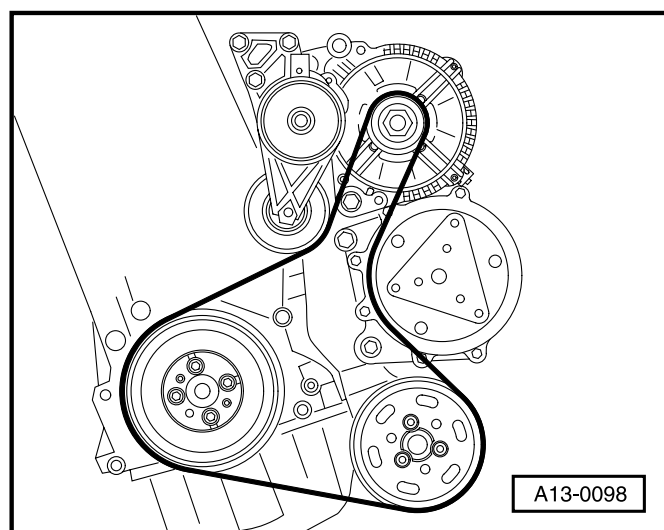
- ◆ Mark direction of running before removing
 - ◆ Inspect condition
- ⇒ Inspection and Maintenance; Descriptions of operations
- ◆ Do not kink
 - ◆ Routing of ribbed V-belt on models without air conditioning ⇒ Fig. 1
 - ◆ Routing of ribbed V-belt on models with air conditioning ⇒ Fig. 2
 - ◆ Removing ribbed V-belt ⇒ page 13-3
 - ◆ Installing ribbed V-belt ⇒ page 13-4
 - ◆ Engines with AC compressor are equipped with a double ribbed V-belt

14 - Tensioning element for ribbed V-belt

- ◆ Swivel with open-end wrench to slacken ribbed V-belt ⇒ page 13-3



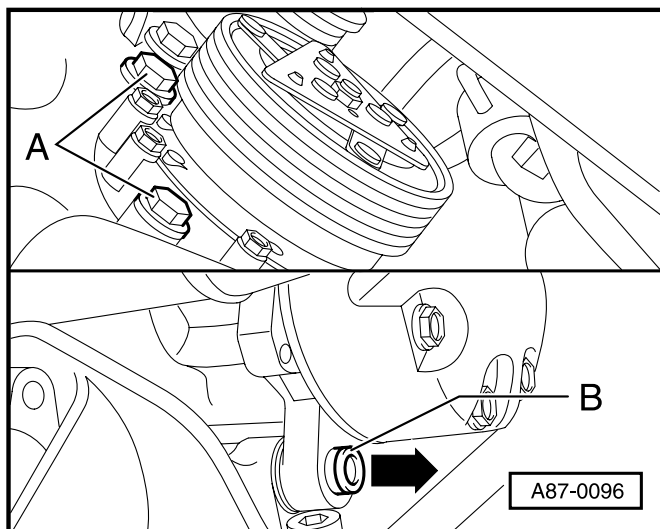
◀ Fig. 1 Routing of ribbed V-belt on models without air conditioning



◀ Fig. 2 Routing of ribbed V-belt on models with air conditioning

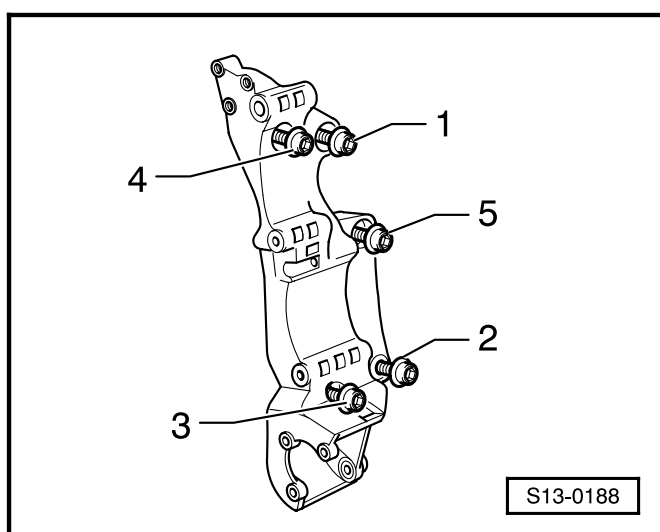
Note:

Engines with AC compressor are equipped with a double ribbed V-belt.

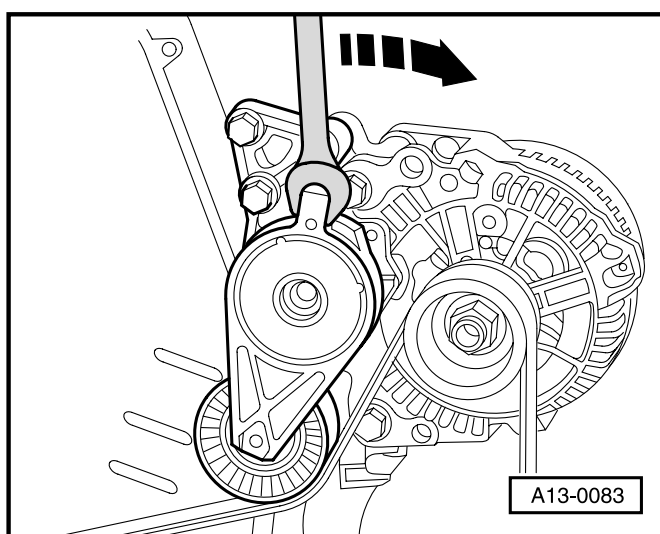


◀ Fig. 3 Installing AC compressor

- Knock back threaded bushes -B- for retaining bolts -A- slightly in direction of arrow to facilitate fitting on AC compressor.
- Tighten bolts to 45 Nm.

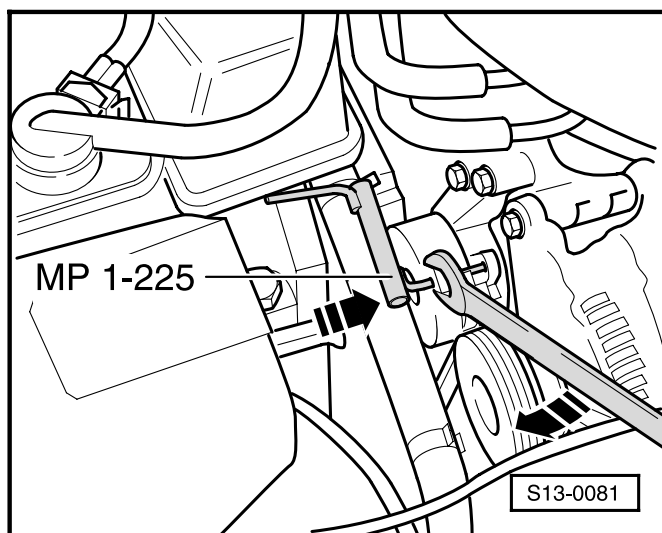


◀ Fig. 4 Tightening order of bolts for compact holder



Removing ribbed V-belt

- Mark direction of running of ribbed V-belt.
- ◀ - Swivel tensioning device in direction of arrow to slacken the ribbed V-belt.
- Take off ribbed V-belt.

**Note:**

- ◀ The tensioning device can be locked with a $\varnothing$ 4.5 mm drift, about 55 mm long.

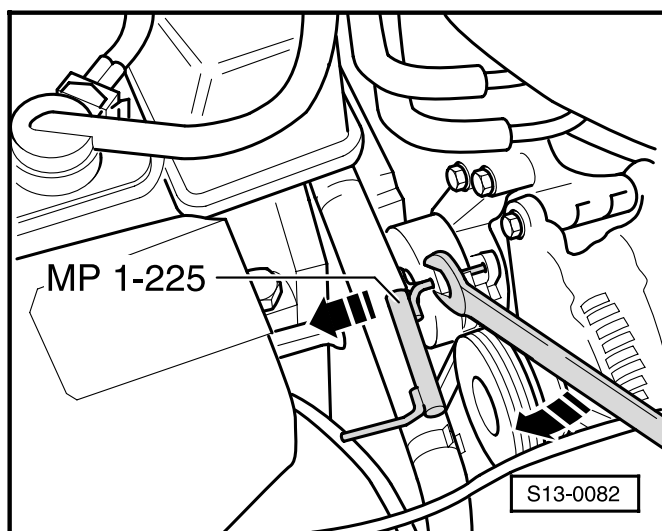
On models without headlamp cleaning system, it is also possible to use the conrod support MP 1-225, for this purpose.

Installing ribbed V-belt**Notes:**

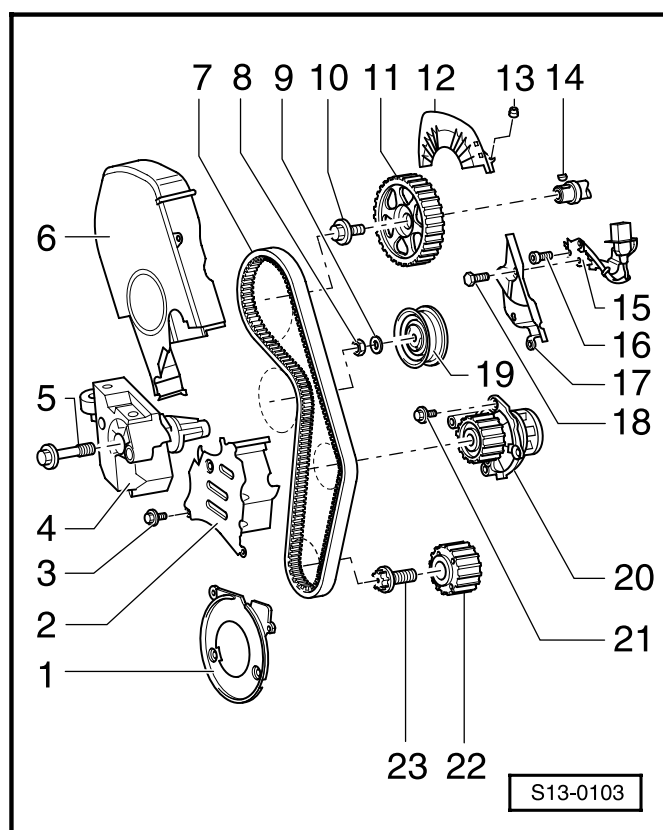
- ◆ Inspect ribbed V-belt for wear.
⇒ Inspection and Maintenance; Descriptions of operations; Ribbed V-belt - inspecting condition
- ◆ Before installing the ribbed V-belt, ensure that all the components (alternator, AC compressor, hydraulic pump) are firmly installed.
- ◆ Inspect smooth running of belt pulleys and tensioning pulley.
- Fit on ribbed V-belt.
- ◀ - Slacken tensioning device for ribbed V-belt. Withdraw drift or conrod support MP 1-225 -arrows-.
- Start engine and inspect running of belt.

Note:

Engines with AC compressor are equipped with a double ribbed V-belt.



Removing and installing, tensioning toothed belt



Note:

Mark direction of running of the toothed belt before removing. If a used belt is fitted on again to run in the opposite direction, it may be destroyed.

1 - Bottom part of toothed belt guard

- ◆ To remove, unbolt belt pulley/vibration damper ⇒ page 13-1

2 - Middle part of toothed belt guard

3 - 10 Nm

- ◆ Self-locking, replace

4 - Engine support

- ◆ Removing ⇒ page 13-7, Removing toothed belt

5 - 45 Nm

6 - Top part of toothed belt guard

7 - Toothed belt

- ◆ Mark direction of running before removing
- ◆ Inspect for wear
- ◆ Do not kink
- ◆ Removing ⇒ page 13-7
- ◆ Installing ⇒ page 13-10

8 - 25 Nm

9 - Washer

10 - 100 Nm

- ◆ Use counterholder T30004 or MP 1-216 for slackening and tightening

11 - Camshaft sprocket

- ◆ With sender rotor for camshaft position sensor -G40-
- ◆ For removing and installing, take off toothed belt ⇒ page 13-7
- ◆ Installation position set by parallel key -item 14-

12 - Toothed belt guard

13 - 10 Nm

14 - Parallel key

- ◆ Ensure tightly installed

15 - Camshaft position sensor -G40-

- ◆ When bolting on, pay attention to centering of base plate

16 - 10 Nm

17 - Rear toothed belt guard

18 - 20 Nm

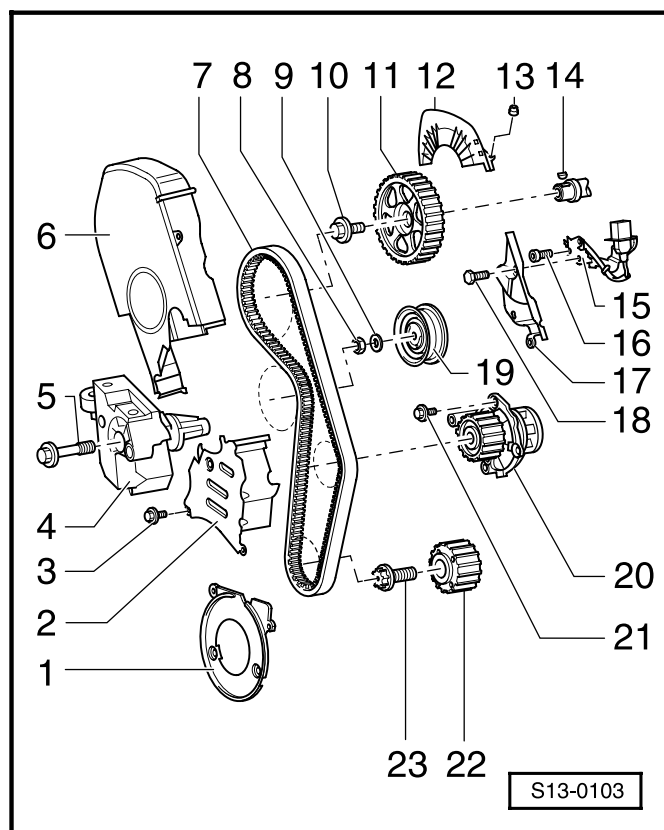
19 - Toothed belt tensioning pulley

- ◆ Inspecting semi-automatic toothed belt tensioning pulley ⇒ page 13-12
- ◆ Installation position ⇒ Fig. 1

20 - Coolant pump

- ◆ Removing and installing ⇒ page 19-10

21 - 15 Nm

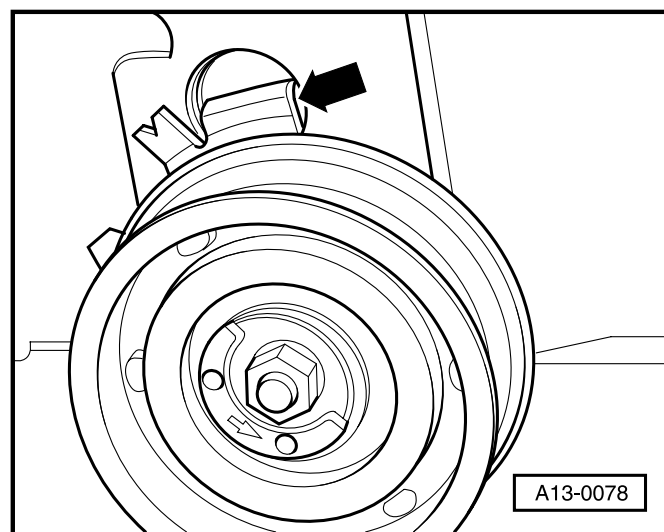


22 - Toothed belt sprocket of crankshaft

- ◆ There must not be any oil on the contact surface between toothed belt sprocket and crankshaft
- ◆ Can be installed only in one position

23 - 90 Nm + torque a further ¼ turn (90°)

- ◆ Replace
- ◆ Fit bolt in original condition, do not oil or degrease
- ◆ Use counterholder T30004 or MP 1-310 for slackening and tightening
- ◆ When bolting on counterholder MP 1-310, place two washers between toothed belt sprocket and counterholder



◀ Fig. 1 Installation position of toothed belt tensioning pulley

The retaining claw -arrow- must engage in the recess at the cylinder head.

Special tools, testers and aids required

- ◆ Torque wrench 5...50 Nm (e.g. V.A.G 1331)
- ◆ Torque wrench 40...200 Nm (e.g. V.A.G 1332)
- ◆ Two-hole nut turner T10020
- ◆ Counterholder MP 1-216
- ◆ Counterholder T30004 or MP 1-310
- ◆ Supporting device MP 9-200

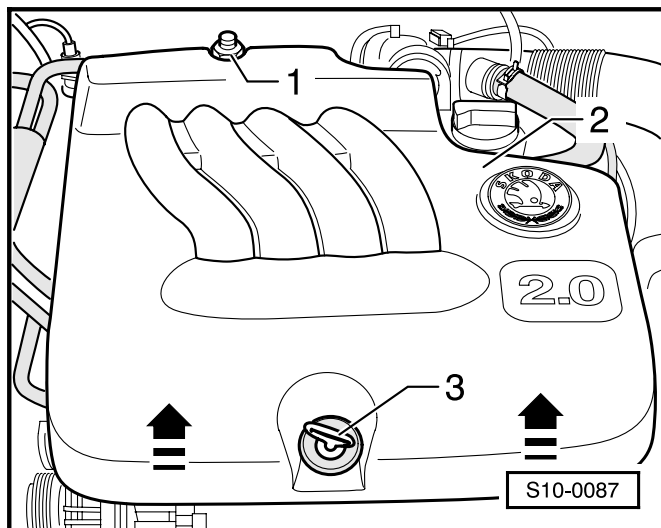
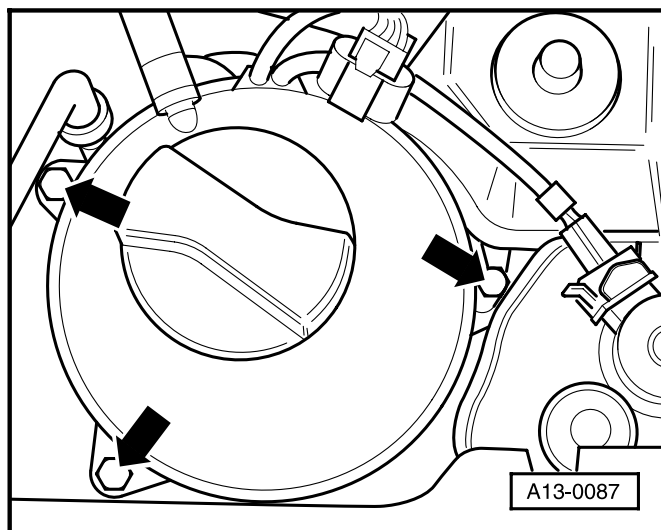
Removing toothed belt

- Engine installed

Note:

If it is only necessary to remove the toothed belt from a toothed belt sprocket or from the toothed belt tensioning pulley, the engine support as well as the engine mount must not be removed.

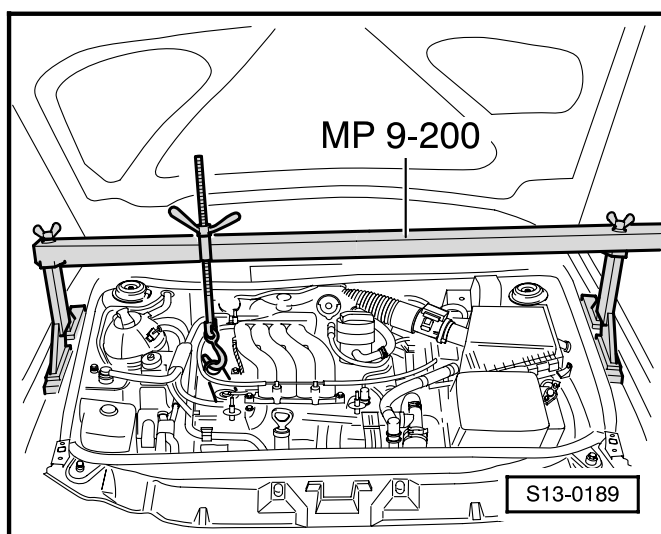
- Removing ribbed V-belt and tensioning device ⇒ page 13-1.
- Remove the plug at the expansion reservoir for coolant and activated charcoal filter hose.
- ◀ - Unbolt coolant expansion reservoir and PAS reservoir -arrows-; hoses remain connected.



- ◀ - Removing engine cover -2-.

Slacken nut -1- , pull out oil dipstick -3- and pull the front engine cover upwards with a sudden motion -arrows-.

- Removing top part of toothed belt guard.

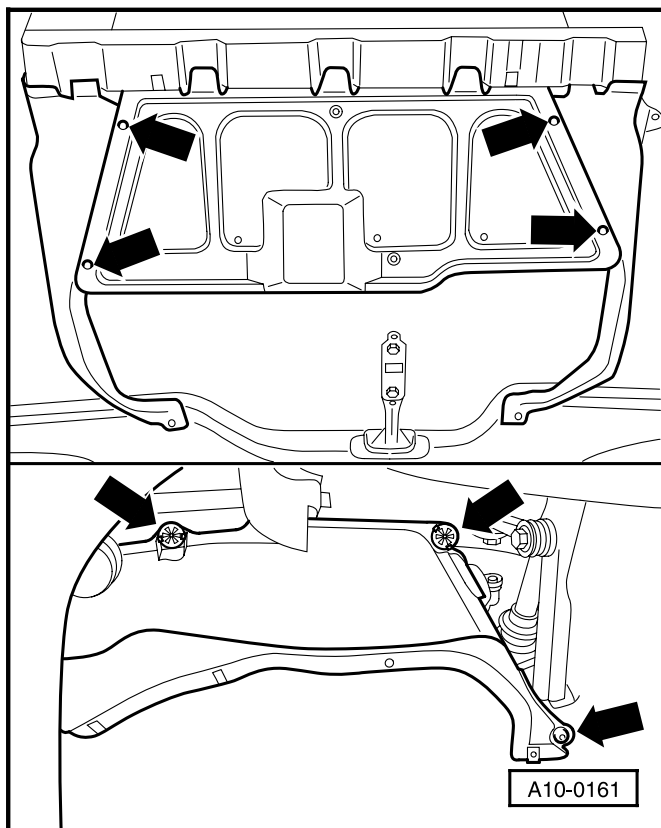


- ◀ - Insert supporting device MP 9-200.

- Slightly lift up the engine with the spindle of the supporting device MP 9-200

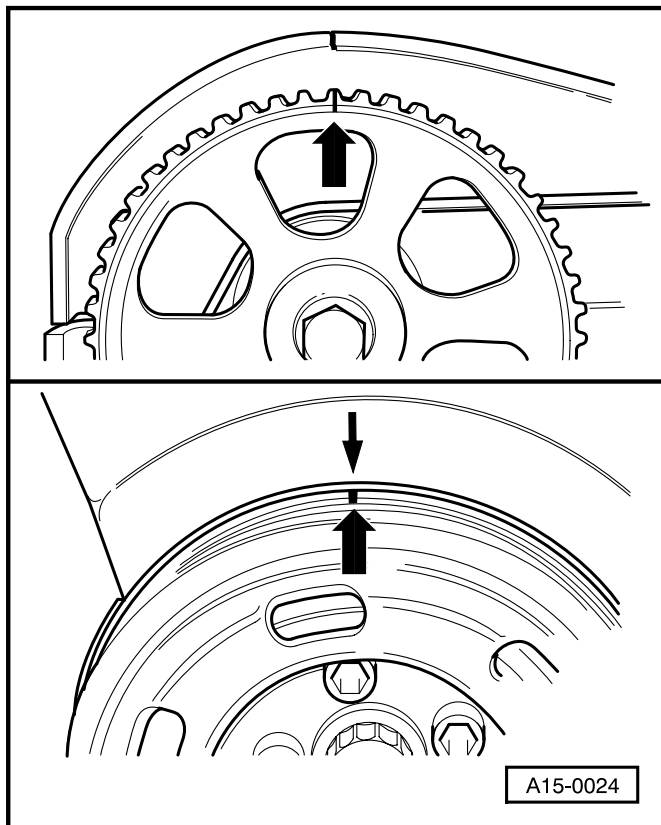
Note:

Tie up the coolant expansion reservoir and the PAS reservoirs to the supporting device.

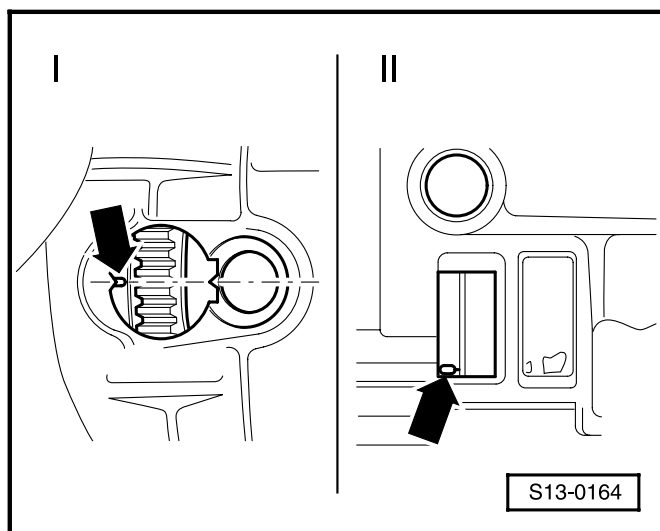


◀ - Remove noise insulation panel in the middle and on the right -arrows-.

Remove air guide at right on outside first of all.



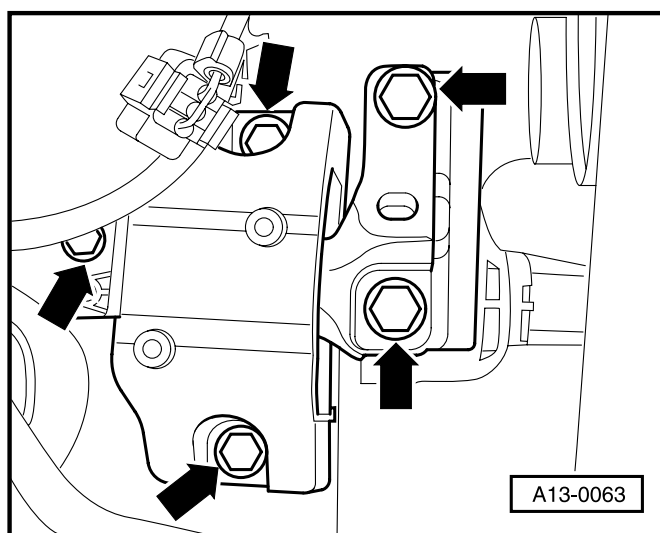
◀ - Rotate crankshaft at central bolt of the toothed belt sprocket of the crankshaft in direction of rotation of engine and position it to TDC marking of cyl. 1 -arrows-.



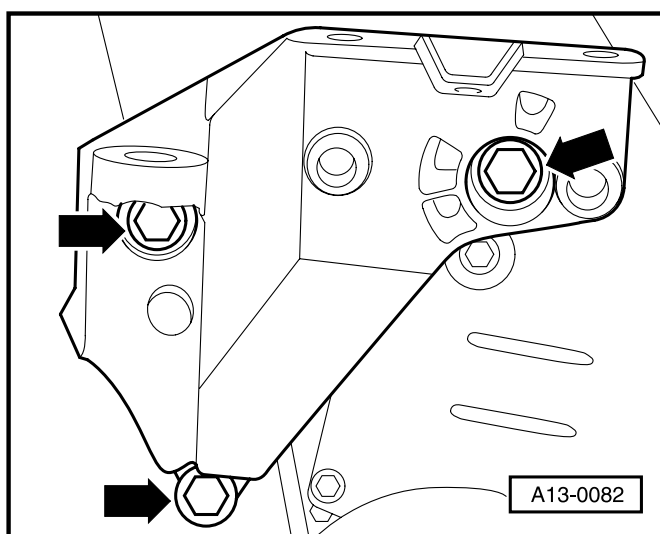
- ◀ - Inspect whether TDC marking of flywheel/ driven plate and reference mark are aligned -arrow-.

I - Manual gearbox

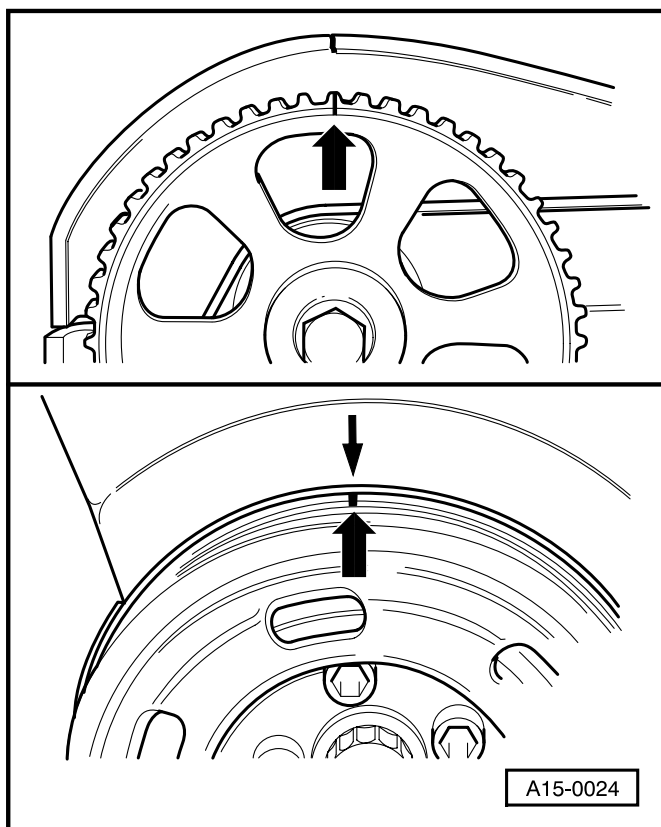
II - Automatic gearbox



- ◀ - Unbolt engine support from engine mount and engine mount from the body -arrows-.
- Remove the vibration damper without altering the TDC position.
- Remove the bottom part and middle part of the toothed belt guard.



- ◀ - Remove engine support -arrows- by raising or lowering engine slightly with supporting device MP 9-200.
- Mark the direction of running of the toothed belt with chalk or a felt pen.
- Slacken toothed belt tensioning pulley and take off toothed belt.
- Then, rotate the crankshaft back slightly.



Installing toothed belt

Note:

When the camshaft is rotated, the crankshaft must not be positioned at TDC otherwise there is a risk of damage to the valves and piston crowns.

Requirement

- The piston must not be positioned at top dead centre.
- ◀ - Align marking on camshaft sprocket with marking on toothed belt guard (TDC of cyl. 1).
- Fit toothed belt onto toothed belt sprocket of crankshaft and coolant pump (pay attention to direction of running).
- Bolt on engine support at cylinder block. Tightening torque: 45 Nm

Note:

Insert bolts into engine support before installing.

- Install centre and bottom parts of toothed belt guard. Replace bolts. Tightening torque: 10 Nm
- Install belt pulley/vibration damper. Tightening torque: 40 Nm
- Align marking on vibration damper with marking on bottom part of toothed belt guard (TDC of cyl. 1).

- ◀ - Check whether TDC marking of flywheel/driven plate and reference mark are aligned -arrow-.

I - Manual gearbox

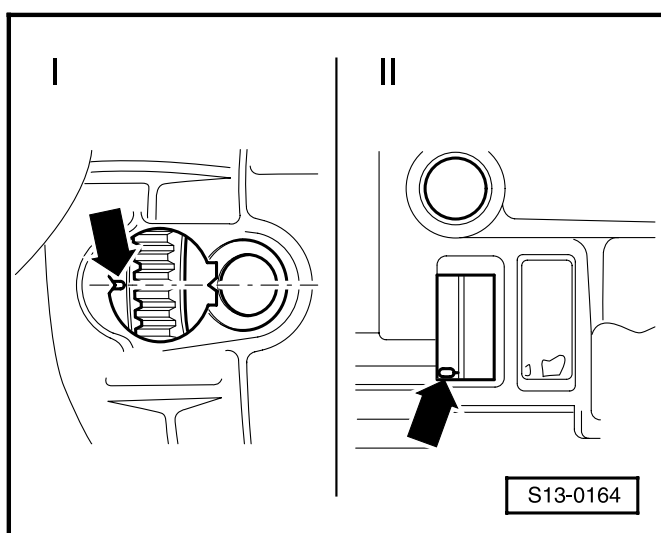
II - Automatic gearbox

- Install engine mount, replace bolts.

Aligning unit mounting for engine ⇒ page 10-15.

Tightening torques ⇒ page 10-16

- Take off supporting device MP 9-200.



- Install radiator expansion reservoir.
- Install power steering reservoir.
- Fit toothed belt onto camshaft sprocket and toothed belt tensioning pulley.
- Tension toothed belt ⇒ page 13-11.
- Install top part of toothed belt guard.
- Install tensioning element for ribbed V-belt.

Tightening torque: 25 Nm

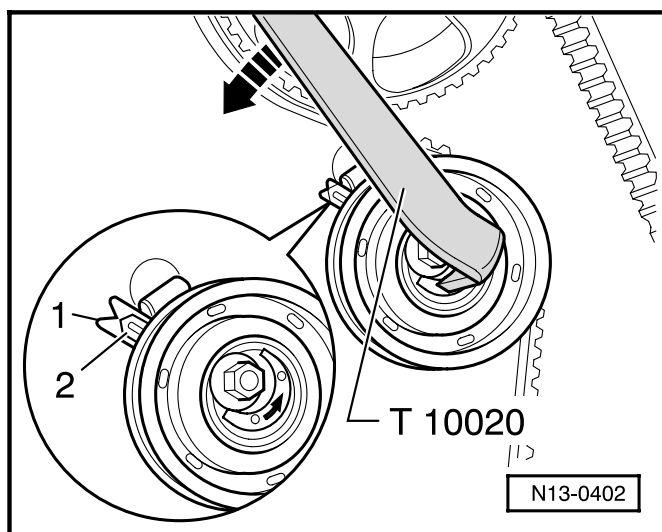
- Install ribbed V-belt ⇒ page 13-1.
- Install noise insulation panels and engine trim panel.

Tensioning toothed belt

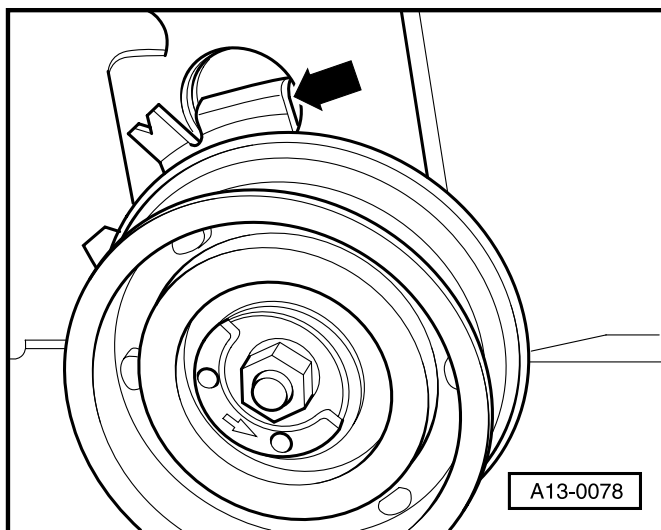
Requirement:

- Crankshaft positioned at TDC of cylinder 1.
- ◀ - Before tensioning the toothed belt, use the nut turner T10020 to turn the tensioning pulley at the eccentric five times in both directions as far as the stop.
- Tension the toothed belt by turning the two-hole nut turner T10020 to the left at the eccentric (direction of arrow) as far as the stop.
- Then, slacken the toothed belt until the notch -1- and the pointer -2- are positioned opposite (use a mirror).
- Tighten the securing nut finally to 25 Nm.
- Rotate crankshaft on two revolutions in direction of rotation of engine until engine is again positioned at TDC of cylinder 1.
It is important that the crankshaft is rotated the last 45° (1/8 turn) in a single step without any interruption.
- Once again inspect tension of toothed belt.

Specification: pointer and notch are positioned opposite.



Inspecting semi-automatic toothed belt tensioning pulley

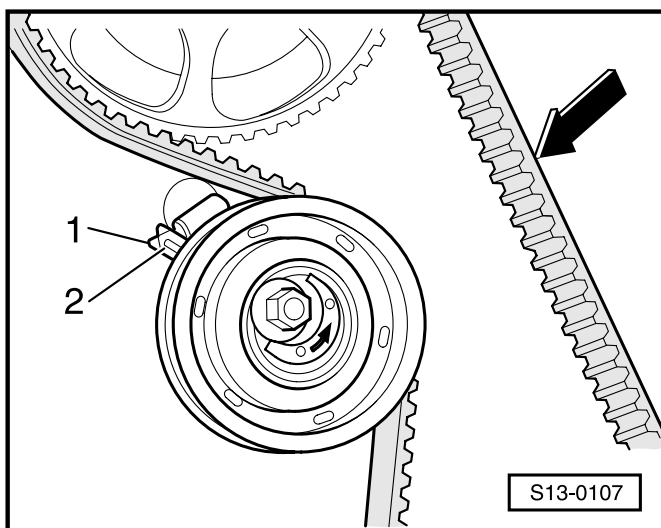


Fitting location:

- ◀ ● Lock bracket -arrow- in the recesses at the cylinder head.

Inspection procedure

- Set engine to TDC of piston of cylinder 1.



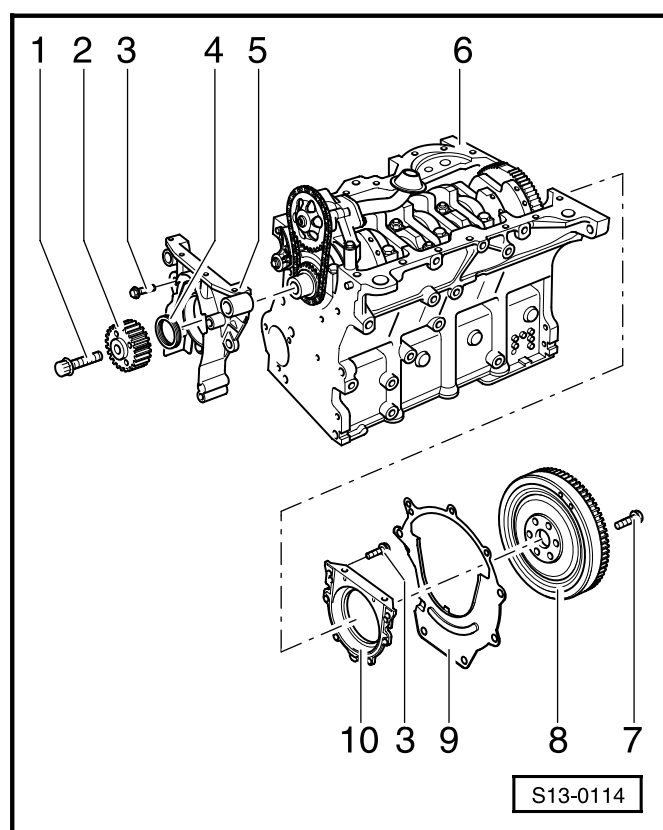
- ◀ - Apply pressure to the toothed belt with your thumb. Needle -2- must deflect.
- Release pressure on toothed belt and rotate crankshaft two revolutions in direction of rotation of engine until the engine is set to TDC of piston of cylinder 1. It is very important that the last 45° (1/8 turn) are rotated without any interruption.
- The tensioning pulley must move back again into its initial position (notch -1- and needle -2- again move together).

Note:

Use a mirror for inspecting.

Removing and installing sealing flange and flywheel

For engine with identification characters AEG, APK, AQY and AZH



Notes:

- ◆ **Servicing clutch:**
⇒ 5-Speed Manual Gearbox 02J; Repair Group 30; Servicing clutch.
⇒ 5-Speed Manual Gearbox 02C; Repair Group 30; Servicing clutch.
- ◆ **Attach engine with engine holder MP 1-202 and spacer sleeves T30010 to the repair stand for carrying out removal and installation operations.**

1 - Central bolt

- ◆ replace
- ◆ 90 Nm + torque a further ¼ turn (90°)
- ◆ fit bolt in original condition, do not oil or grease bolt
- ◆ use counterholder MP 1-310 or T30004 to slacken and tighten.
- ◆ when bolting on counterholder MP 1-310, place 2 washers between toothed belt sprocket and counterholder

2 - Crankshaft toothed belt sprocket

- ◆ assembly is only possible in one position
- ◆ removing and installing, tensioning toothed belt ⇒ page 13-5

3 - 15 Nm

4 - Sealing ring

- ◆ replace ⇒ page 13-15
- ◆ pay attention to different versions ⇒ Fig. 1

5 - Front sealing flange

- ◆ must be located on dowel sleeves
- ◆ removing and installing ⇒ page 13-18

6 - Cylinder block

- ◆ removing and installing crankshaft ⇒ page 13-23
- ◆ Disassembling and assembling pistons and connecting rod ⇒ page 13-25

7 - 60 Nm + torque a further ¼ turn (90°)

- ◆ replace
- ◆ tightening may occur in several stages
- ◆ same tightening torque on models fitted with drive plate

8 - Flywheel/drive plate

- ◆ assembly is only possible in one position -holes offset-
- ◆ for removing and installing lock flywheel with device MP 1-504 ⇒ Fig. 2
- ◆ installing and installing drive plate ⇒ page 13-21

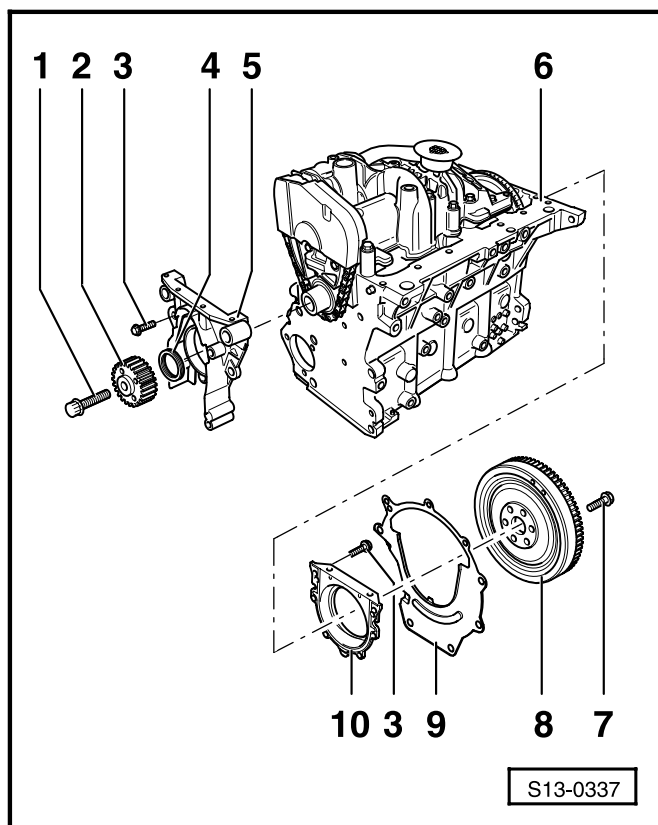
9 - Intermediate plate

- ◆ must be located on dowel sleeves
- ◆ do not damage/bend during assembly work
- ◆ is attached to sealing flange ⇒ Fig. 3

10 - Sealing flange with PTFE seal

- ◆ to remove and install, take off oil pan ⇒ page 17-3
- ◆ always replace complete
- ◆ only install sealing flange with PTFE seal (Polytetrafluorathylen)
- ◆ install seal dry, crankshaft journal must be free of grease
- ◆ install new sealing flange with sleeve (do not pull sleeve off sealing ring before installing)

For engine with engine identification characters AZJ



Notes:

- ◆ *Servicing clutch:*
⇒ 5-Speed Manual Gearbox 02J; Repair Group 30; Servicing clutch.
⇒ 5-Speed Manual Gearbox 02C; Repair Group 30; Servicing clutch.
- ◆ *Attach engine with engine holder MP 1-202 and spacer sleeves T30010 to the repair stand for carrying out removal and installation operations.*

1 - Central bolt

- ◆ replace
- ◆ 90 Nm + torque a further ¼ turn (90°)
- ◆ fit bolt in original condition, do not oil or grease bolt
- ◆ use counterholder MP 1-310 or T30004 to slacken and tighten.
- ◆ when bolting on counterholder MP 1-310, place 2 washers between toothed belt sprocket and counterholder

2 - Crankshaft toothed belt sprocket

- ◆ assembly is only possible in one position
- ◆ removing and installing, tensioning toothed belt ⇒ page 13-5

3 - 15 Nm

4 - Sealing ring

- ◆ replace ⇒ page 13-15
- ◆ pay attention to different versions ⇒ Fig. 1

5 - Front sealing flange

- ◆ must be located on dowel sleeves
- ◆ removing and installing ⇒ page 13-18

6 - Cylinder block

- ◆ removing and installing crankshaft ⇒ page 13-23
- ◆ Disassembling and assembling pistons and connecting rod ⇒ page 13-25

7 - 60 Nm + torque a further ¼ turn (90°)

- ◆ replace
- ◆ tightening may occur in several stages
- ◆ same tightening torque on models fitted with drive plate

8 - Flywheel/drive plate

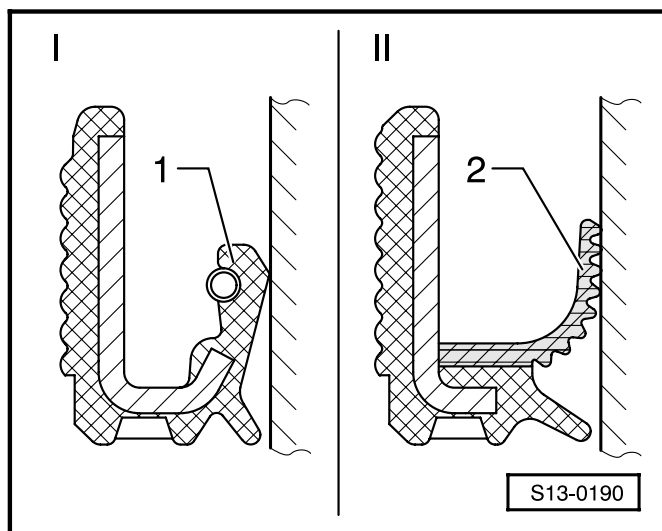
- ◆ assembly is only possible in one position -holes offset-
- ◆ for removing and installing lock flywheel with device MP 1-504 ⇒ Fig. 2
- ◆ installing and installing drive plate ⇒ page 13-21

9 - Intermediate plate

- ◆ must be located on dowel sleeves
- ◆ do not damage/bend during assembly work
- ◆ is attached to sealing flange ⇒ Fig. 3

10 - Sealing flange with PTFE seal

- ◆ to remove and install, take off oil pan ⇒ page 17-3
- ◆ always replace complete
- ◆ only install sealing flange with PTFE seal (Polytetrafluorathylen)
- ◆ install seal dry, crankshaft journal must be free of oil
- ◆ install new sealing flange with sleeve (do not pull sleeve off sealing ring before installing)



◀ Fig. 1 Seal versions

I Elastomer seal

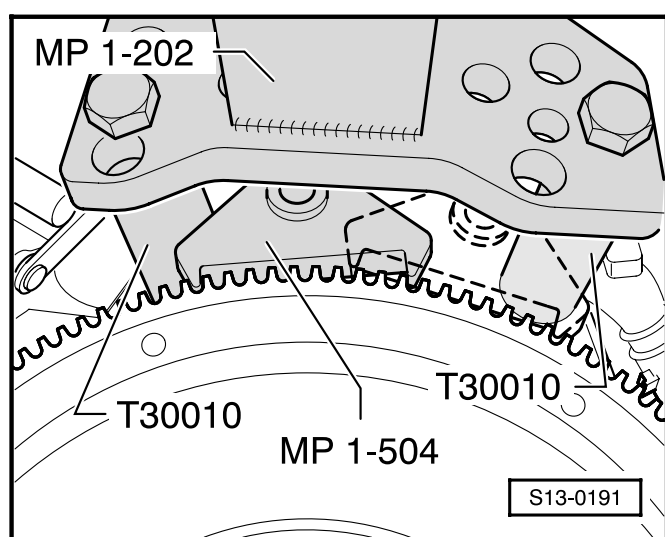
1 sealing lip -1-; with worm spring

II PTFE seal

Several sealing lips -2-; without worm spring

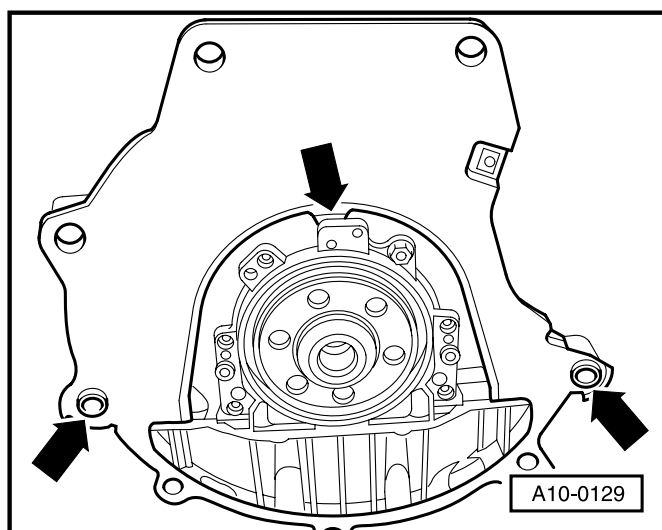
Notes:

Do not moisten PTFE seal with oil before installing. The shaft must also be free of oil and grease.



◀ Fig. 2 Locking flywheel

- Position the assembly device MP 1-504 on the ring gear and turn until it rests against the distance sleeve T30010.



◀ Fig. 3 Installing intermediate plate

- Attach intermediate plate to the sealing flange and fit onto dowel sleeves -arrows-.

Replacing crankshaft seal -belt pulley side-

Special tools, testers and aids required

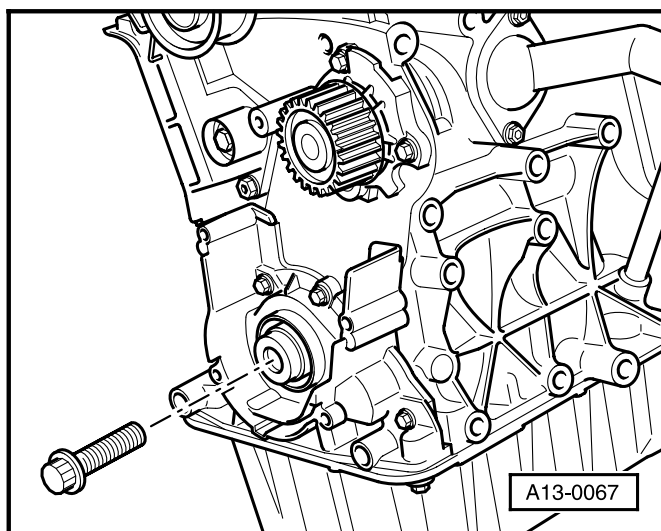
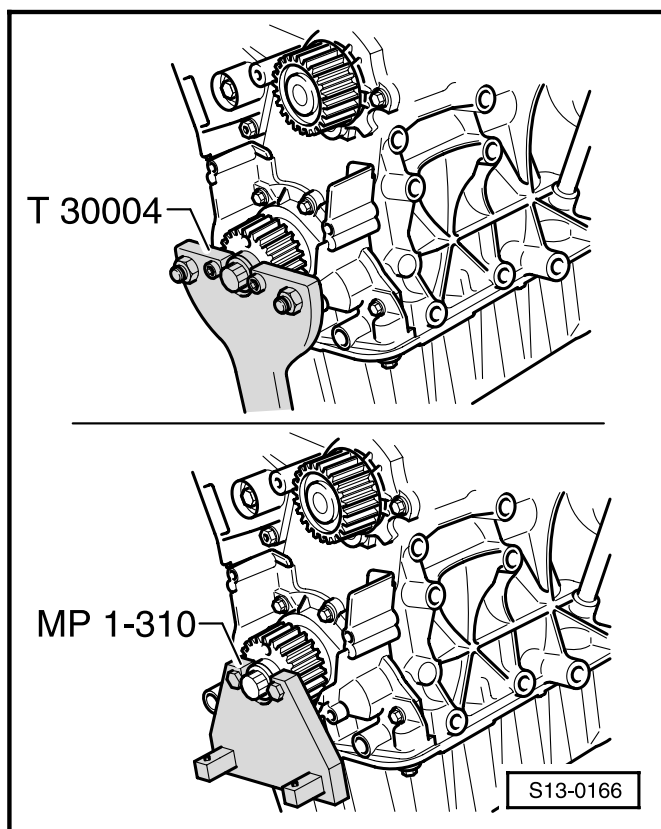
- ◆ Torque wrench
- ◆ Seal extractor MP 1-226
- ◆ Thrust sleeve MP 1-231/1
- ◆ Guide sleeve MP 1-314
- ◆ Thrust sleeve T10053
- ◆ Guide sleeve T10053/1
- ◆ Locking lever T30004 or counterholder MP 1-310

Removing

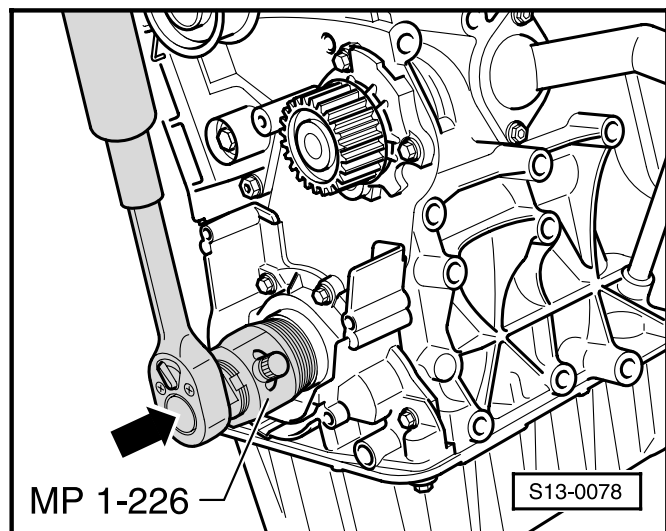
- Remove ribbed V-belt ⇒ page 13-5
- ◀ - Remove crankshaft toothed belt sprocket. Lock toothed belt sprocket with locking lever T30004 or counterholder MP 1-310

Note:

When bolting on counterholder, place 2 washers between toothed belt sprocket and counterholder.



- ◀ - Screw in the central bolt by hand in the crankshaft up to the stop.
- Turn out inner part of seal extractor MP 1-226 nine turns (about 17 mm) out of the outer part and lock with knurled screw.



- ◀ - Oil threaded head of seal extractor MP 1-226 and screw as far as possible into the seal using considerable pressure.
- Slacken knurled screw and turn inner part against the crankshaft until the seal is pulled out.

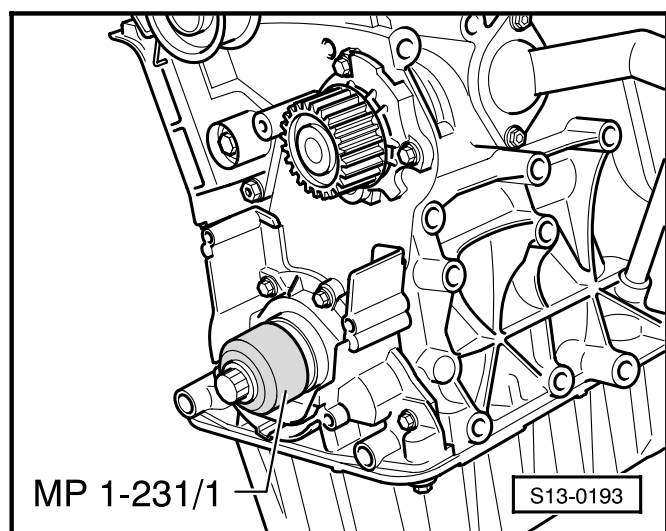
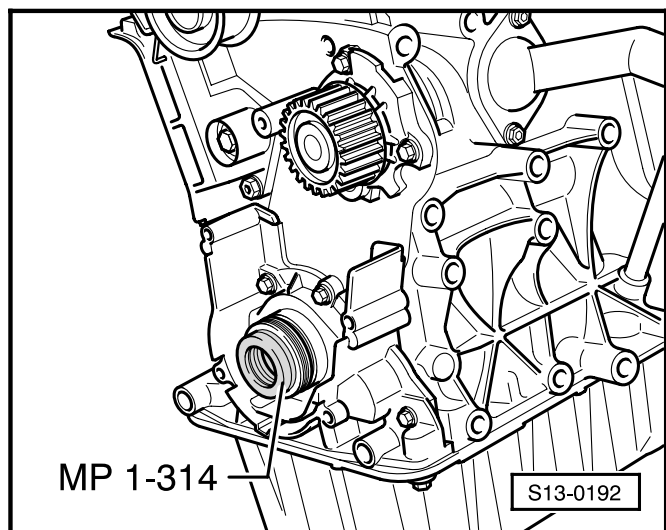
Installing

Notes:

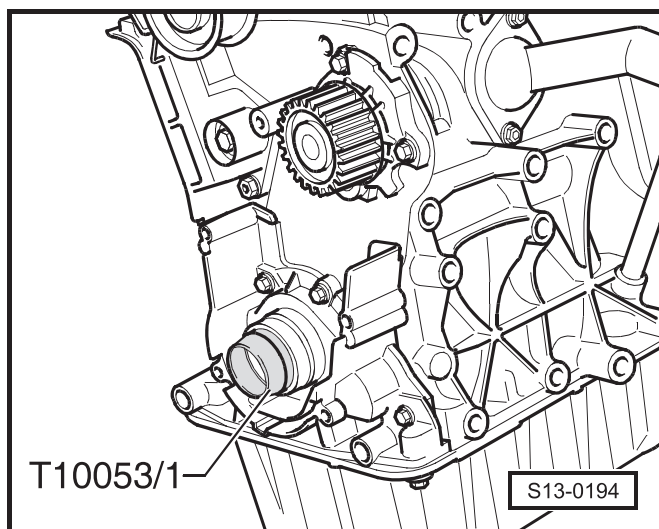
- ♦ Pay attention to different seal versions ⇒ page 13-14, Fig. 1.
- ♦ Never install an elastomer seal (old version) if a PTFE seal (new version) was installed.
- ♦ It is permitted to install a PTFE seal in order to replace an elastomer seal.

Installing elastomer seal

- Inspect crankshaft for signs of wear.
- Apply a thin film of oil to the sealing lip of the seal.
- ◀ - Fit guide sleeve from MP 1-314 onto the crankshaft journal.
- Push seal over guide sleeve.



- ◀ - Press seal in as far as the stop with pressure sleeve MP 1-231/1. Use old central bolt of crankshaft toothed belt sprocket for this step.

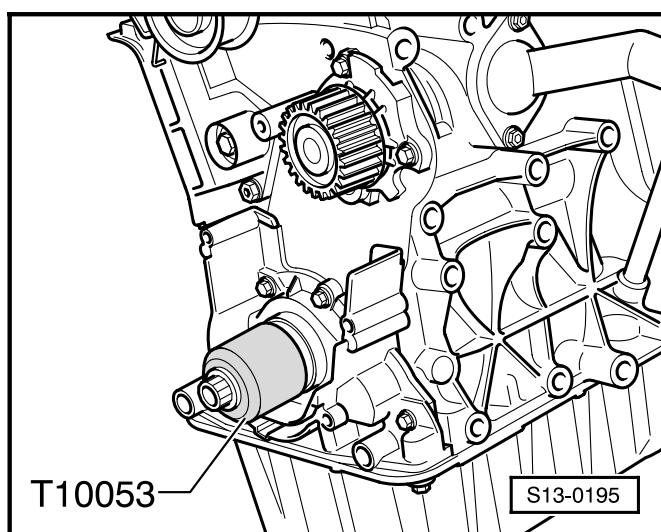


Installing PTFE seal

Note:

The sealing lips of the seal must not be oiled or greased.

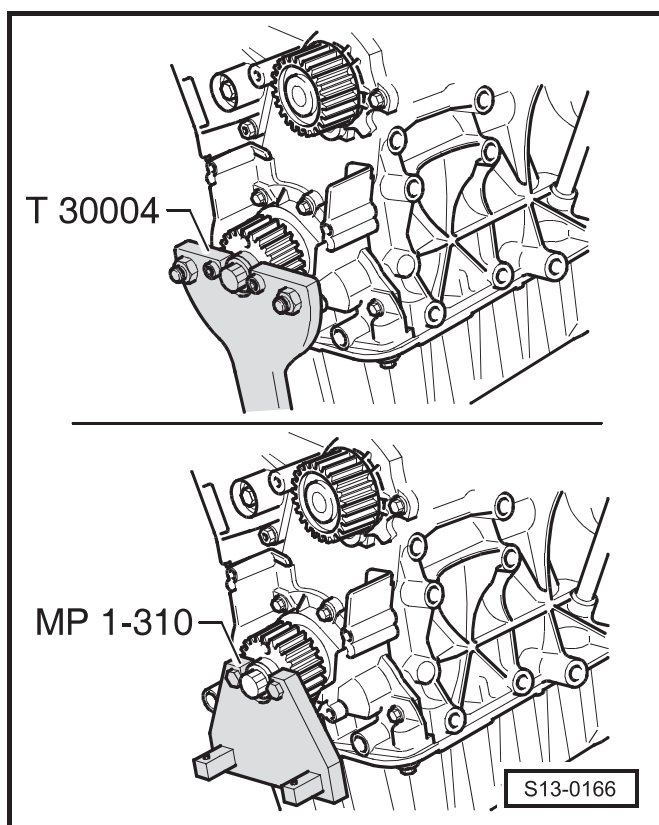
- Use a clean cloth to remove oil residues on the crankshaft journal.
- ◀ - Fit guide sleeve T10053/1 onto the crankshaft journal.



- Push seal over guide sleeve onto the crankshaft journal.

- ◀ - Use thrust sleeve T10053 to press in seal as far as the stop.

Use old central bolt of crankshaft toothed belt sprocket for this step.



Continued for both versions

- ◀ - Install crankshaft toothed belt sprocket and lock with locking lever T30004 or counterholder MP 1-310.

Notes:

- ◆ *When bolting on counterholder, place 2 washers between toothed belt sprocket and counterholder.*
- ◆ *Replacing central bolt for crankshaft toothed belt sprocket.*
- ◆ *When tightening the central bolt, the crankshaft must turn*
- Tighten central bolt for crankshaft toothed belt sprocket to 90 Nm + torque a further ¼ turn (90°).
- Installing toothed belt ⇒ page 13-5

Removing and installing front sealing flange

Special tools, testers and aids required

- ◆ Torque wrench
- ◆ Thrust sleeve MP 1-231/1
- ◆ Guide sleeve T10053/1 (for PTFE seals)
- ◆ Guide sleeve MP 1-314
- ◆ Thrust sleeve T10053
- ◆ Locking lever T30004 or counterholder MP 1-310
- ◆ Hand drill with brush attachment
- ◆ Flat scaper
- ◆ Silicone sealant D176 404 A2

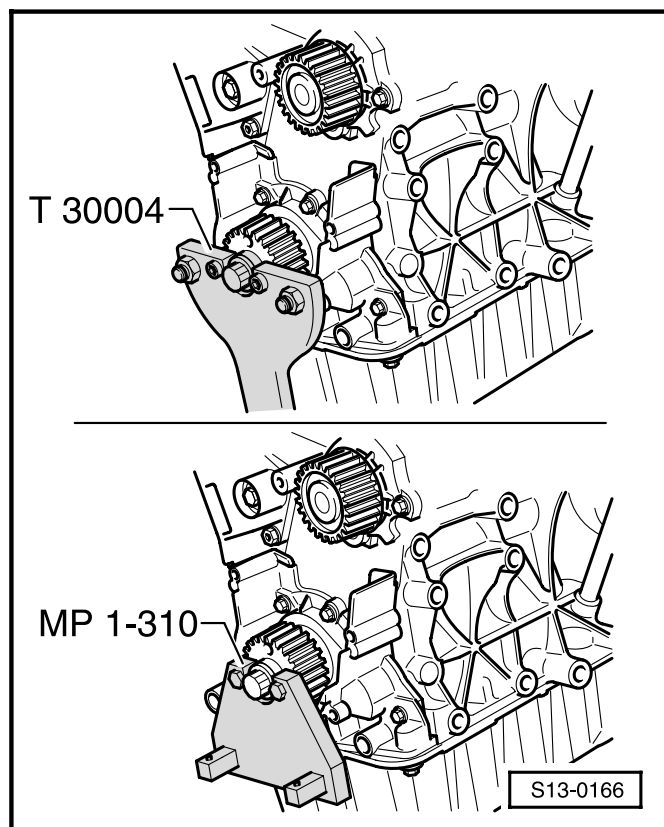
Removing

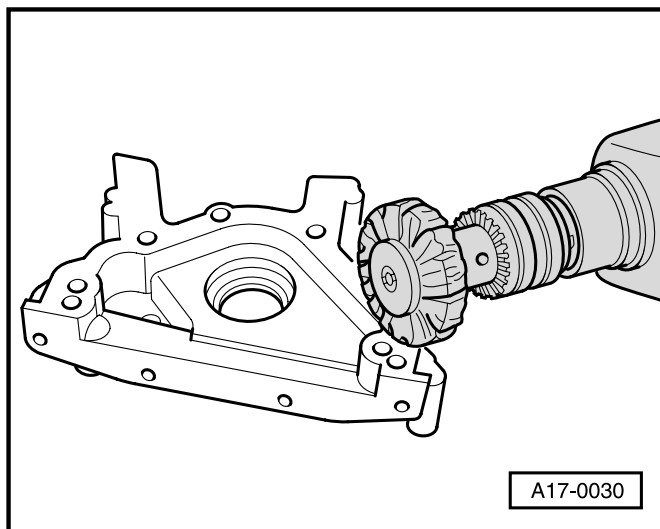
- Remove ribbed V-belt ⇒ page 13-5
- ◀ - Remove crankshaft toothed belt sprocket. Lock toothed belt sprocket with locking lever T30004 or counterholder MP 1-310.

Note:

When bolting on counterholder, place 2 washers between toothed belt sprocket and counterholder.

- Drain engine oil.
- Remove oil pan ⇒ page 17-3
- Unscrew front sealing flange.
- Remove sealing flange, if necessary release by applying slight blows with a rubber-headed hammer.
- Remove sealant residues on cylinder block with a flat scraper.



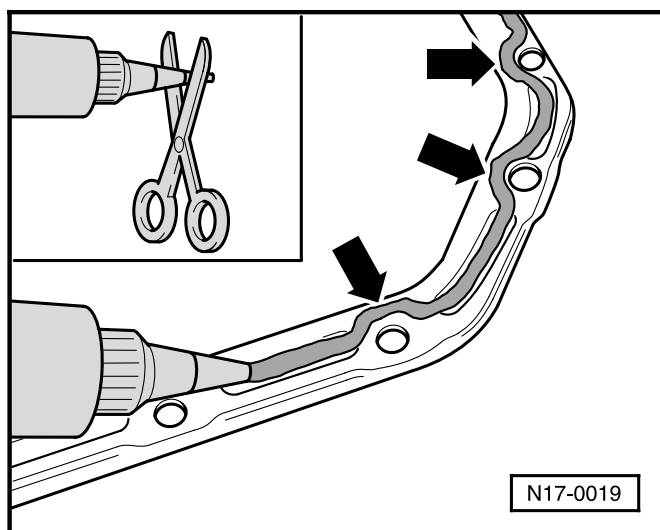


- ◀ - Use a rotating plastic brush to remove sealant residues on sealing flange (wear eye protection).
- Clean sealing surfaces; they must be free of oil and grease.

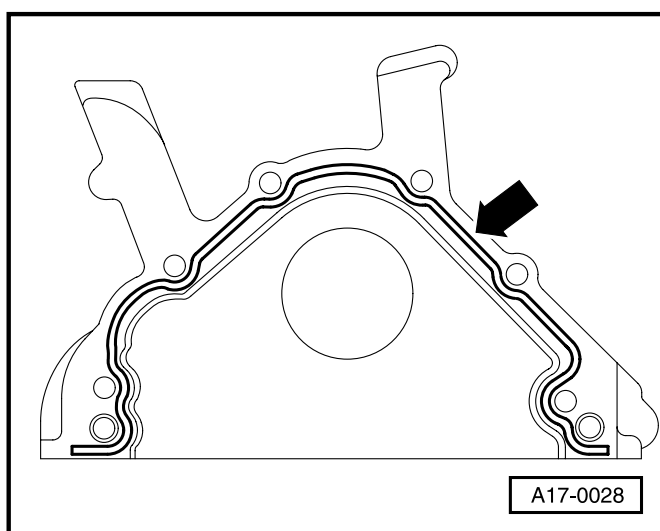
Installing

Notes:

- ◆ Refer to the use-before date of the sealant.
- ◆ The sealing flange must be installed within 5 minutes after applying the silicone sealant.



- ◀ - Cut off tube tip of silicone sealant "D176 404 A2" at the front marking (Ø of nozzle about 3 mm).

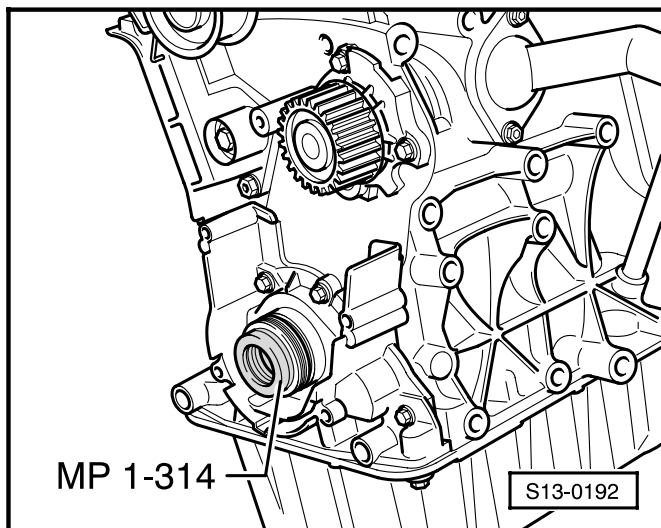


- ◀ - Apply silicone sealant bead to the clean sealing surface of the sealing flange, as shown in the illustration.
- ◆ Thickness of sealant bead -arrow-:
2...3 mm

Note:

The sealant bead must not be thicker than 3 mm otherwise excess sealant may get into the oil pan and block the strainer in the oil suction pipe.

- Fit on sealing flange immediately and tighten all the bolts slightly.

**Notes:**

- ♦ If a PTFE seal is fitted (⇒ page 13-14, Fig. 1, the crankshaft journal must be free of oil and grease and the seal must be oiled.
- ◀ ♦ Use the following devices for fitting on the sealing flange with the seal installed:
 - Elastomer - MP 1-314
 - PTFE seal - T10053/1
- Tighten fixing bolts of sealing flange diagonally across.
Tightening torque: 15 Nm
- Install oil pan ⇒ page 17-4.

Note:

After installing, allow the sealant to dry for about 30 minutes. Do not pour in any engine oil during this waiting period.

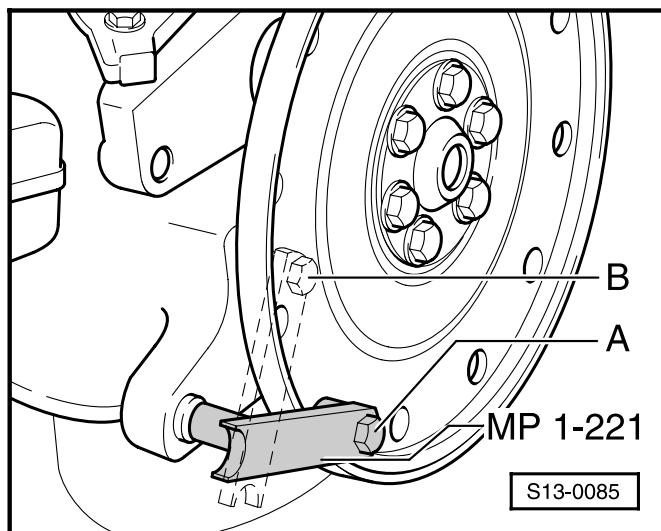
- Install toothed belt ⇒ page 13-5

Removing and installing drive plate

Special tools, testers and aids required

- ◆ Torque wrench
- ◆ Counterholder MP 1-221
- ◆ Depth gauge

Slackening and tightening drive plate

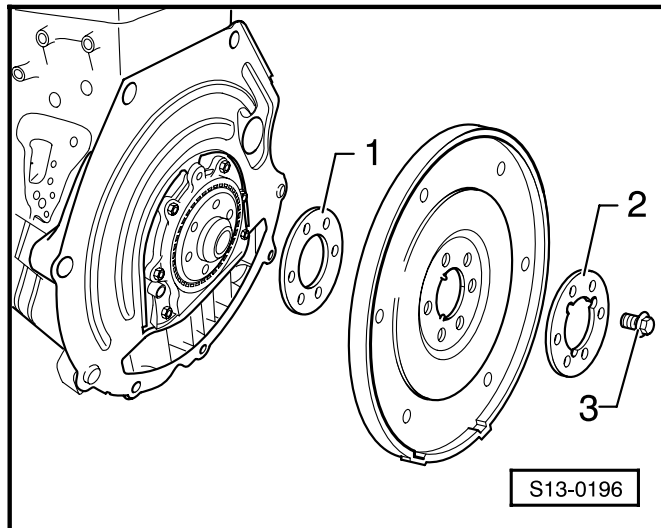


- ◀ - Attach counterholder MP 1-221 with hexagon screw M8x45 to the drive plate. Insert two M10 hexagon nuts between the counterholder and the drive plate.

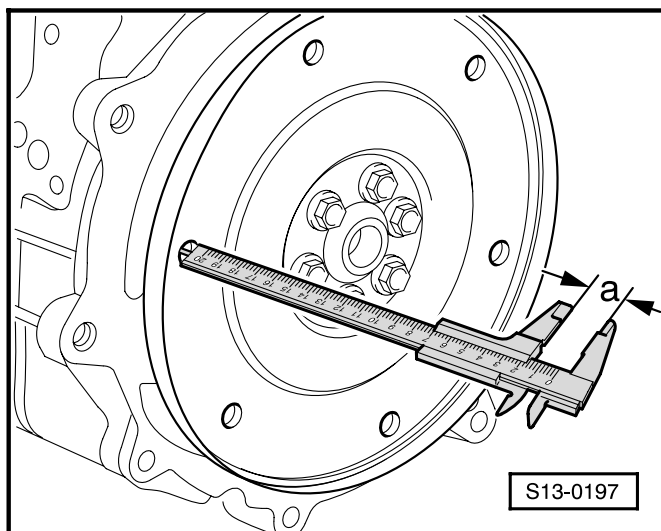
Fitting location of counterholder:

- ◆ A - for slackening
- ◆ B - for tightening

Installing drive plate



- ◀ - Insert the drive plate using the washer with recesses -2-.
- Insert at least 3 new bolts -3- and tighten to 30 Nm.

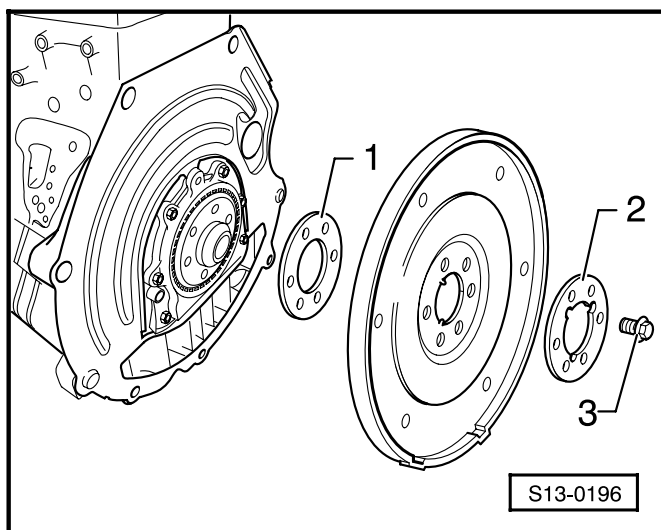


- ◀ - Check installation dimension in three points of the drive plate and determine mean value.

- ◆ Specified value
dimension -a-: 19.5...21.1 mm

Note:

The measurement is made through the hole of the drive plate to the milled surface of the cylinder block.



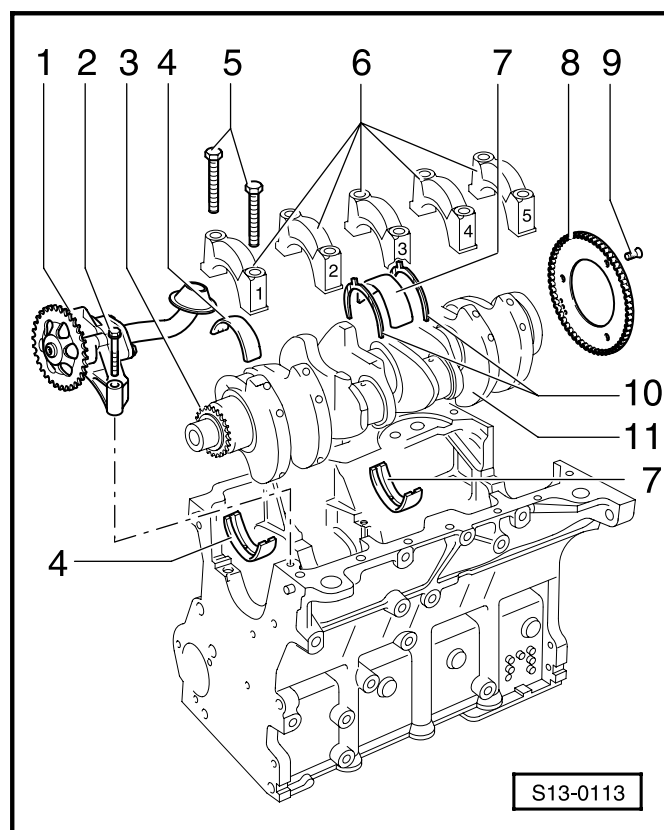
If the measurement is less than the specified value:

- ◀ - Once again remove drive plate and repeat measurement with compensating washer -1-.

If the specified value is reached:

- Lock drive plate with counterholder MP 1-221 and tighten the new bolts -3- to 60 Nm and torque a further 90° (¼ turn).

Removing and installing crankshaft



Notes:

- ◆ Before removing the crankshaft, ensure a suitable place is available for placing it down so that the sensor rotor (item 8) does not get damaged.
- ◆ Attach engine with engine holder MP 1-202 and the spacer sleeves T30010 to the repair stand MP 9-101 for carrying out removal and installation operations.

Note for engine with identification characters AZJ:

- ◆ Before removing the crankshaft, first of all remove the gearbox with the balancing shafts ⇒ page 17-8

1 - Oil pump

- ◆ for engines with identification characters AEG, APK, AQY and AZH
- ◆ removing and installing ⇒ page 17-1

2 - 15 Nm

3 - Chain sprocket

- ◆ for oil pump drive

4 - Bearing shells 1, 2, 4 and 5

- ◆ for bearing cap without lubricating groove
- ◆ for cylinder block with lubricating groove
- ◆ do not mix up used bearing shells (mark)
- ◆ in case of replacement only use bearing bearing shells with the same colour coding ⇒ Fig. 1 page 13-24

5 - 65 Nm + torque a further ¼ turn (90°)

- ◆ replace

6 - Bearing cap

- ◆ bearing cap 1; belt pulley side
- ◆ bearing cap 3; with recesses for thrust washers
- ◆ retaining lugs of bearing shells of cylinder block/bearing cap must be positioned one above the other

7 - Bearing shell 3

- ◆ ⇒ position 4

8 - Sensor rotor

- ◆ replace if damaged
- ◆ for engine speed sender -G28-
- ◆ can be installed only in one position -holes offset-

9 - 10 Nm + torque a further ¼ turn (90°)

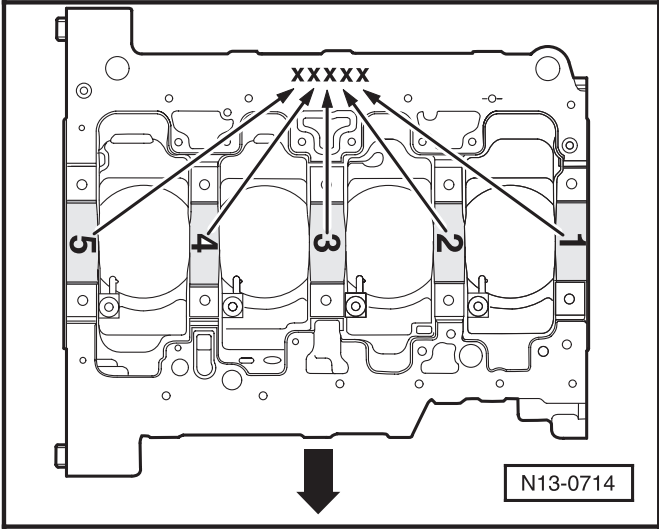
- ◆ replace

10 - Thrust washers

- ◆ in bearing 3, for cylinder block or bearing cap
- ◆ pay attention to the marking

11 - Crankshaft

- ◆ pay attention to different versions
- ◆ axial play of new part: 0.07 to 0.23 mm
wear limit: 0.30 mm
- ◆ crankshaft bearing journal: Ø 54.00 mm
- ◆ conrod bearing journal: Ø 47.80 mm



◀ Fig. 1 **Marking top crankshaft bearing**

The top bearing shells are allocated to the cylinder block with the right thickness at the factory. Coloured points are used to mark the bearing shell thickness.

Notes:

Arrow points in the driving direction

The letters on the sealing surface of the bottom cylinder block mark, which bearing thickness was applied on which point.

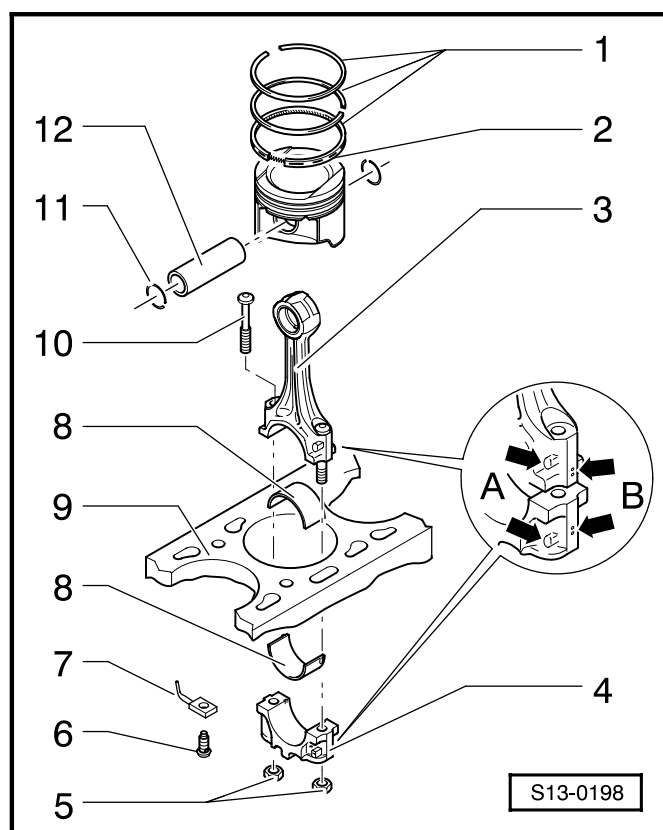
Colour codings

The letters on the cylinder block.	Bearing colour
S	black
R	red
B	yellow

- The bottom crankshaft bearing shells are always supplied as replacement parts with the colour coding “yellow”.

Disassembling and assembling pistons and connecting rod

For engine with identification characters AEG, APK, AQY and AZH



Note:

The engine should be attached with the engine holder MP 1-202 and the spacer sleeves T30010 to the repair stand MP 9-101 for carrying out removal and installation operations.

1 - Piston rings

- ♦ pay attention to different versions
- ♦ offset joints 120°
- ♦ use piston ring pliers for removing and installing
- ♦ marking "TOP" must point toward piston crown
- ♦ oil scraper ring, 2-part
- ♦ inspecting gap clearance ⇒ Fig. 1
- ♦ inspecting end clearance ⇒ Fig. 2

2 - Piston

- ♦ pay attention to different versions
- ♦ inspecting ⇒ Fig. 3
- ♦ mark installation position relative to conrod and matching cylinder with waterproof felt pen
- ♦ arrow on piston crown points toward belt pulley side
- ♦ piston $\varnothing = 82.465$ mm

3 - Connecting rod

- ♦ pay attention to different versions
- ♦ always replace as a set
- ♦ mark matching cylinder see -arrow B-
- ♦ installation position: markings -A- must be positioned one above the other and point to the belt pulley side
- ♦ with oil drilling for lubricating piston pin

4 - Conrod bearing cap

- ♦ pay attention to different versions
- ♦ mark matching cylinder see -arrow B-
- ♦ installation position: markings -A- must be positioned one above the other and point to the belt pulley side.

5 - 30 Nm + torque a further 90° (¼ turn)

- ♦ replace
- ♦ oil thread and head contact surface

6 - Pressure relief valve, 27 Nm

- ♦ opens at: 0.25 to 0.32 MPa (2.5...3.2 bar) over-pressure
- ♦ replace without sealant

7 - Oil spray nozzle

- ♦ for cooling piston

8 - Bearing shell

- ♦ pay attention to installation position
- ♦ do not mix up used bearing shells (mark)
- ♦ ensure tightly seated in the retaining lugs
- ♦ axial play
new part: 0.10 to 0.35 mm
wear limit: 0.40 mm
- ♦ with oil drilling for lubricating piston pin

9 - Cylinder block

- ♦ pay attention to different versions
- ♦ inspecting cylinder bore ⇒ Fig. 5
- ♦ cylinder $\varnothing = 82.51$ mm

4 - Circlip**5 - Conrod**

- ♦ always replace as a set
- ♦ mark matching cylinder
see -arrow B-
- ♦ installation position:
markings -arrow A- must be positioned one above the other
and point to the belt pulley side

6 - Bearing shell

- ♦ pay attention to installation position
⇒ Fig. 4
- ♦ do not mix up used bearing shells (mark)
- ♦ insert bearing shells in the middle
- ♦ axial play
new part: 0.10 to 0.35 mm
wear limit: 0.40 mm

7 - Cylinder block

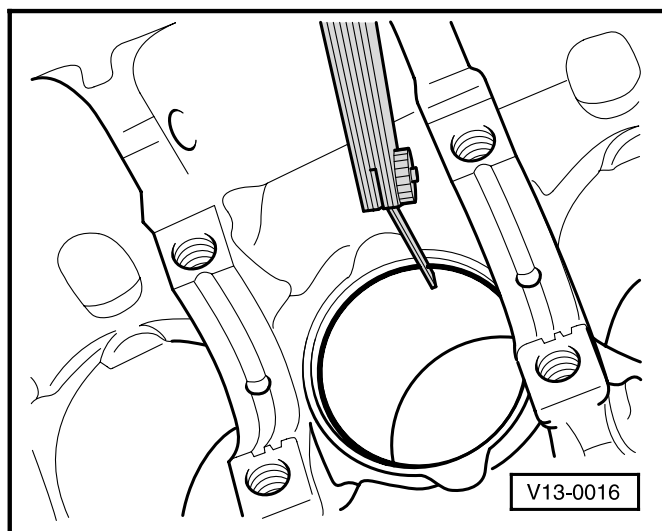
- ♦ inspecting cylinder bore ⇒ Fig. 5
- ♦ cylinder $\varnothing = 82.51$ mm

8 - Conrod bearing cap

- ♦ pay attention to installation position
- ♦ mark matching cylinder
see -arrow B-

9 - 30 Nm + torque a further 90° (¼ turn)

- ♦ replace
- ♦ oil thread and head contact surface



◀ Fig. 1 Inspecting piston ring gap clearance

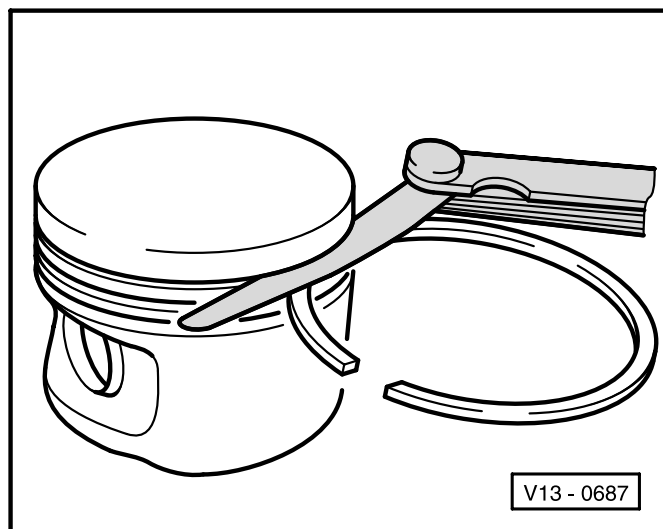
Special tools, testers and aids required

- ♦ Feeler gauge

Inspection procedure

- Insert ring at right angles to cylinder wall, from above as far as the lower cylinder opening, about 15 mm away from edge of cylinder. To insert use piston without rings.

Piston ring		Gap clearance	
		new	wear limit
Compression rings	mm	0.20...0.40	0.80
Oil scraper ring	mm	0.25...0.50	0.80



◀ Fig. 2 Inspecting piston ring end clearance

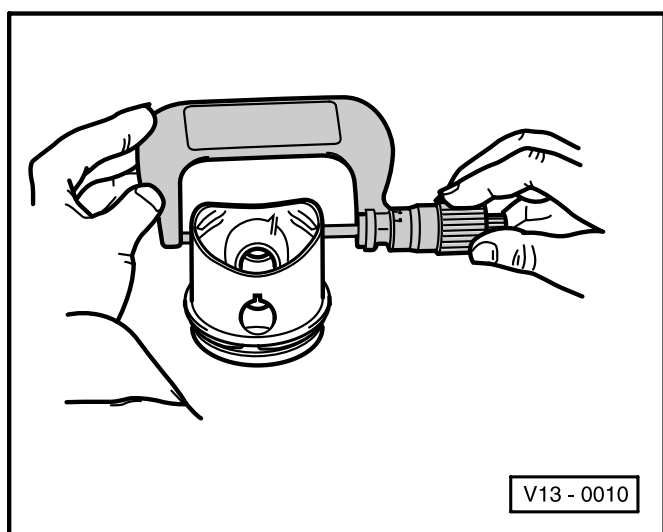
Special tools, testers and aids required

- ♦ Feeler gauge

Inspection procedure

- Clean ring groove before inspecting.

Piston ring		End clearance	
		new	wear limit
Compression ring	mm	0.06...0.09	0.20
Oil scraper ring	mm	0.03...0.06	0.15



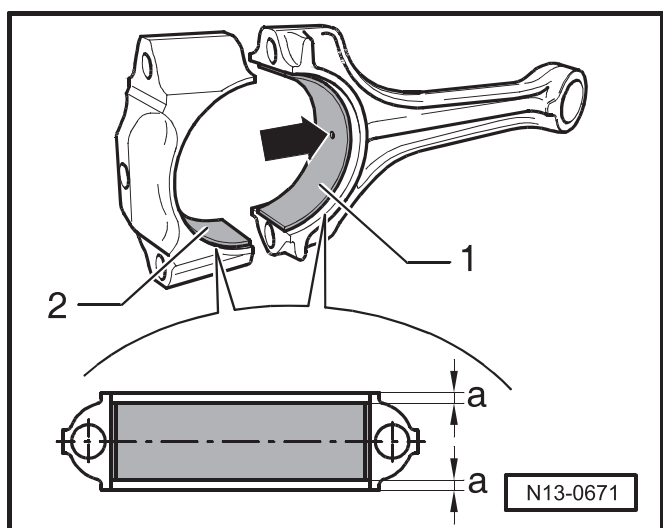
◀ Fig. 3 Inspecting pistons

Special tools, testers and aids required

- ♦ External micrometer 75 to 100 mm

Inspection procedure

- Measure about 10 mm from bottom edge, at right angles to piston pin axis.
- ♦ Variations compared to nominal size: max. 0.04 mm



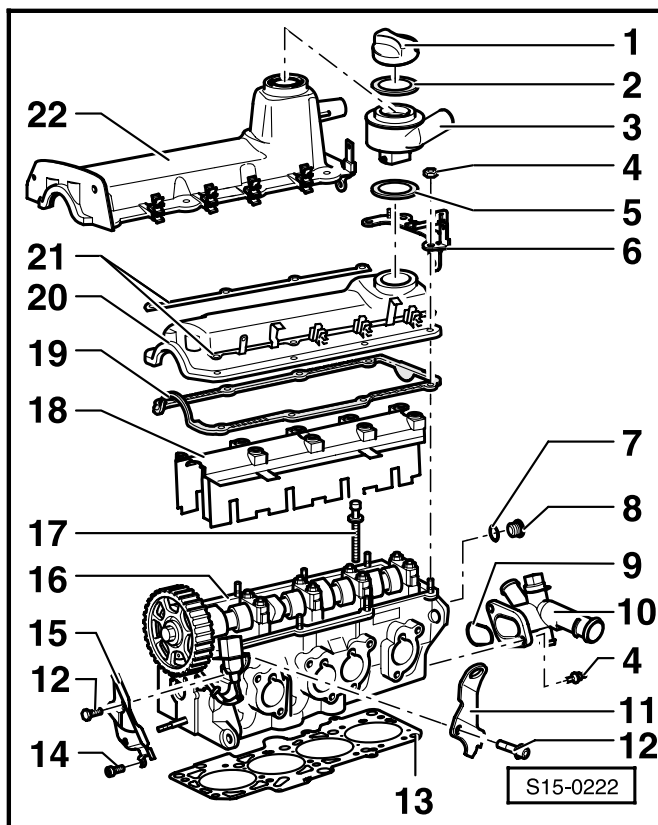
◀ Fig. 4 Bearings installation position

Bearing shell -1- with oil drilling -arrow- for connecting rod.

Bearing shell -2- with oil drilling for conrod bearing cap.

- Position bearing shell in the middle of the connecting rod and conrod bearing cap. The dimension -a- must be the same on right and left, max. variation 0.2 mm.

Removing and installing cylinder head



Testing compression pressure ⇒ page 15-9

Notes:

- ◆ When installing a replacement cylinder head with the camshaft in place, it is necessary to oil the contact surfaces between bucket tappets and cam track after installing the head.
- ◆ Do not remove the plastic covers supplied as a protection for the open valves until just before fitting on the cylinder head.
- ◆ If the cylinder head is replaced, it is then necessary to refill the entire system with fresh coolant.
- ◆ Removing and installing intake manifold:
⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24.
- ◆ Removing from front exhaust pipe ⇒ page 26-1.

1 - Plug

2 - Gasket

3 - Breather housing

- ◆ for engine codes AEG, APK, AQY and AZH
- ◆ turn out to the left for removing

4 - 10 Nm

5 - Gasket

- ◆ for engine codes AEG, APK, AQY and AZH
- ◆ replace if damaged

6 - Supporting plate

- ◆ for engine codes AEG, APK, AQY and AZH

7 - Gasket

- ◆ replace

8 - Screw plug, 15 Nm

- ◆ replace
- ◆ with seal fitted on

9 - Seal

- ◆ replace

10 - Connection

11 - Lashing eye

12 - 20 Nm

13 - Cylinder head gasket

- ◆ replace

14 - 15 Nm

15 - Rear toothed belt guard

16 - Cylinder head

- ◆ inspect for twisting ⇒ page 15-8
- ◆ rework. sealing surface ⇒ page 15-8
- ◆ removing and installing ⇒ page 15-2
- ◆ after replacing, refill system with fresh coolant

17 - Cylinder head screw

- ◆ replace
- ◆ order for slackening and tightening
⇒ page 15-2, Removing and installing cylinder head

18 - Oil separator

19 - Gaskets for cylinder head cover

- ◆ replace if damaged
- ◆ before fitting on, coat surfaces of bearing cap and camshaft housing with sealant „D 454 300 A2“

20 - Cylinder head cover

- ◆ for engine codes AEG, APK, AQY and AZH

21 - Brace

- ◆ for engine codes AEG, APK, AQY and AZH

22 - Cylinder head cover

- ◆ for engine code AZJ

Removing and installing cylinder head

Special tools, testers and aids required

- ◆ Guide pin T30011/2A
- ◆ Extractor MP 1-208
- ◆ Assembly tool T10029
- ◆ Wrench 3452
(for polydrive cylinder head bolts)
- ◆ Drip tray (e.g. V.A.G 1306)
- ◆ Torque wrench 40...200 Nm
(e.g. V.A.G 1332)
- ◆ Pliers for spring strap clamps

Requirement

- The pistons must not be positioned at top dead centre.

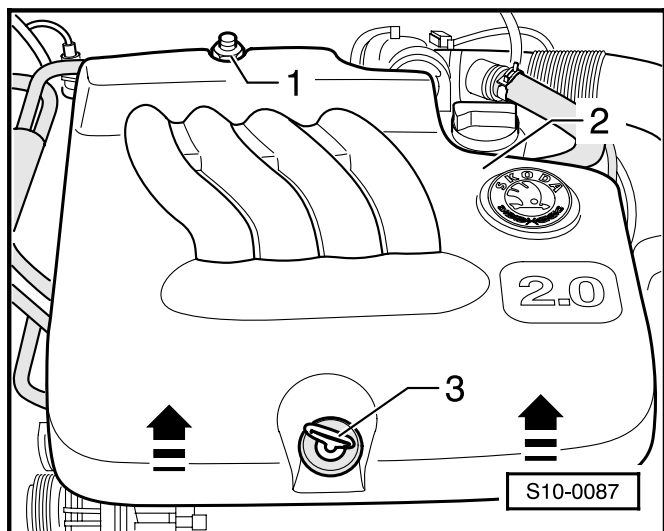
Removing cylinder head

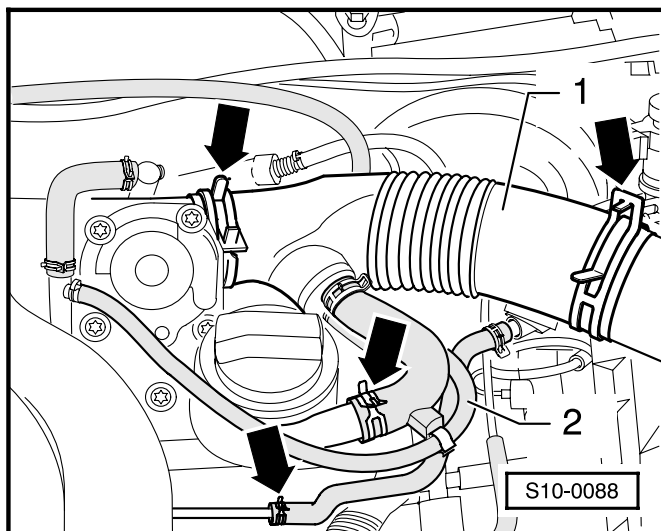
- First of all check whether a coded radio set is fitted, in this case, determine the anti-theft coding.
- Switch off ignition (if not already off) and disconnect the earth strap of the battery.

- ◀ - Remove the engine trim panel -2-.

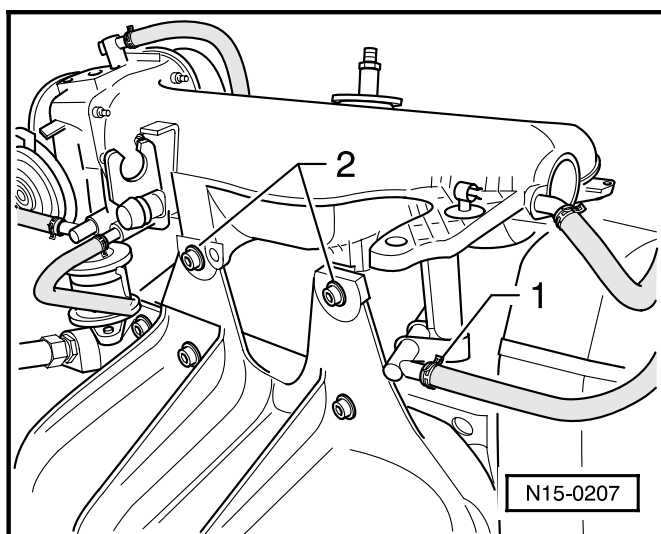
Slacken nut -1- for this step, withdraw dipstick -3- and remove cover by pulling it up at the front with a jerk (arrows).

- Now, drain the coolant ⇒ page 19-2.





- Remove the top part of the intake manifold as follows:
- Detach intake hose -1- (arrows). Vent hose -2- remains connected.
- Remove throttle cable. Unplug connector of throttle valve control unit -J338-.
- Separate coolant hoses to throttle valve control unit (straight connection at quick-coupling at heat exchanger).
- Detach vacuum hose for fuel pressure regulator.



- Unscrew front bolts attaching top part and bottom part of intake manifold (tightening torque 10 Nm).
- Detach vent hose -1-.
- Unscrew bolts -2- at intake manifold support (tightening torque 25 Nm).

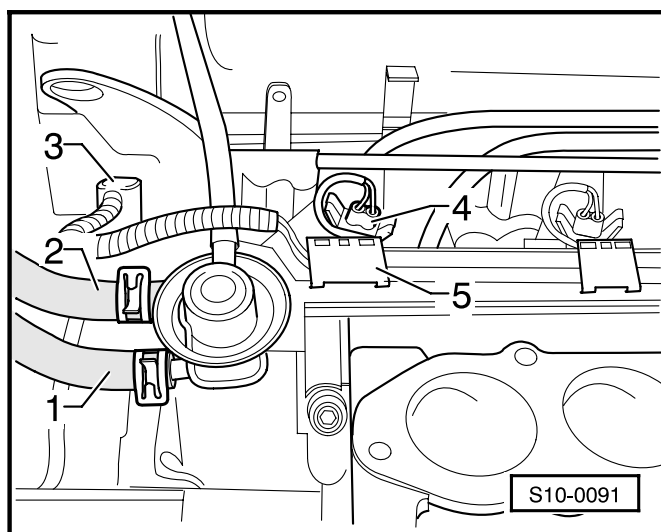
Note:

Seal the intake passages in the bottom part of the intake manifold with a clean cloth.

- Detach vacuum hose from the combination valve.

Warning!

Fuel feed line is pressurized! Place cleaning cloths around the connection point before detaching the hose connections. Then, release pressure by carefully detaching the hose.



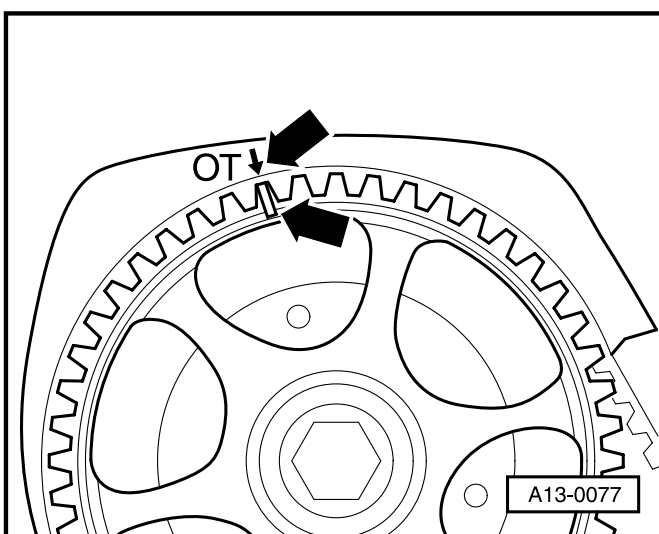
- Detach the feed line -2- and the return-flow line -1- by from the fuel pressure regulator and collect the fuel which flows out.

Unplug the connector -3- of the camshaft position sensor -G40-.

- Unplug the connectors -4- of the injectors -N30...N33-, unclip the cable guide -5- and expose the wiring loom.

- Remove suction line and pressure line of secondary air injection pump.
- Unplug the following connectors:
 - ◆ for motor of secondary air injection pump
 - ◆ for spark plugs; use T10029 (unclip cables)
 - ◆ for coolant temperature sender
- Detach coolant hose at cylinder head.
- Detach the connection fitting and coolant hoses from the cylinder head.

Unbolt cable fixture from cylinder head cover for this step and push coolant pipe up.



- Remove the bracket (item 2, page 13-1) at the tensioning element for the ribbed V-belt.
- Remove top part of toothed belt guard.

- ◀ - Rotate crankshaft and position camshaft sprocket to TDC of cylinder 1.

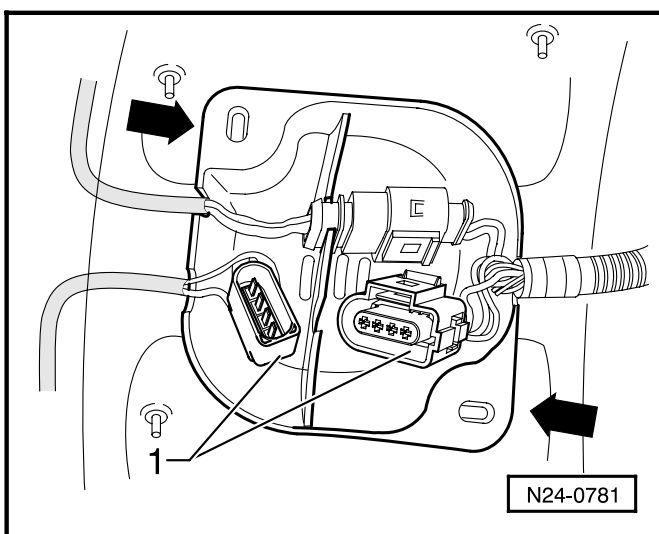
Marking on camshaft sprocket must be aligned with the arrow on the toothed belt guard.

- Slacken tensioning pulley and take toothed belt off the camshaft sprocket.

- Now, turn the crankshaft back slightly.

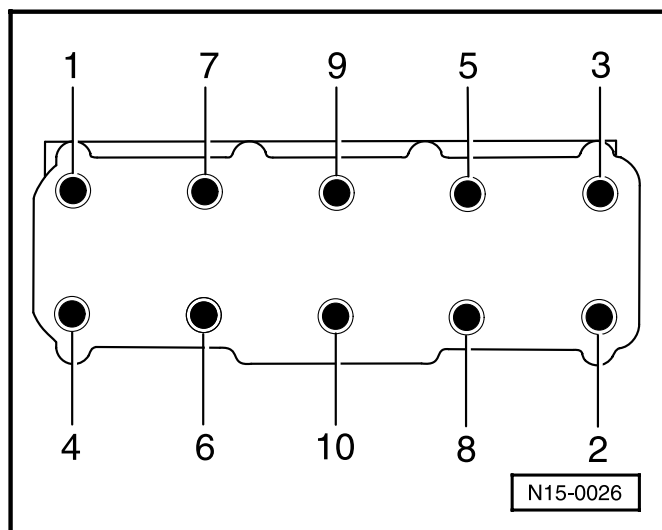
- Unscrew top bolt of rear toothed belt guard.

- Unbolt front exhaust pipe together with catalytic converter and exhaust manifold support.



- ◀ - Unscrew the protective cover -arrows- and separate the 4-pin plug connection (black) -1- to the lambda probe upstream of catalytic converter -G39-.

- Unclip the cable to the lambda probe from its guides.



- Remove cylinder head cover
- ◀ - Slacken the cylinder head bolts in the specified order and unscrew.

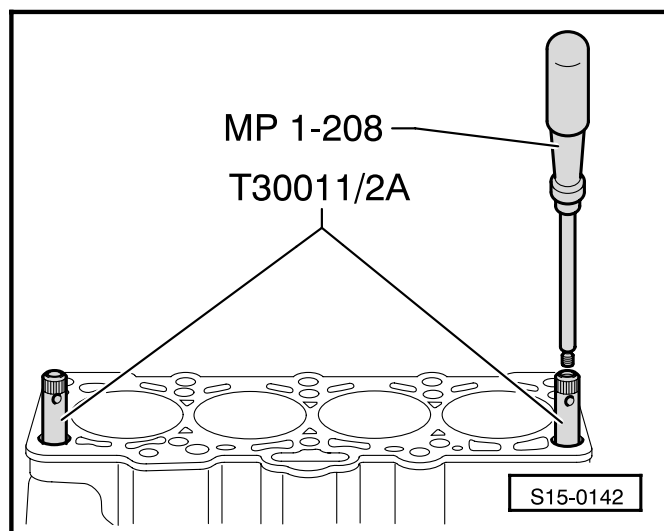
Note:

Use spanner 3452 to remove the Polydrive cylinder head bolts.

- Carefully remove the cylinder head.

Installing cylinder head**Notes.**

- ◆ *There must be no oil or coolant in the blind holes of the cylinder head bolts in the cylinder block.*
- ◆ *Remove the new cylinder head seal from its wrapping immediately before fitting.*
- ◆ *Treat the new gasket with the utmost care. Any damage will result in leaks.*
- Make sure that when cleaning the cylinder head and cylinder block that no dirt gets into the cylinder or into the oil ducts as well as the coolant.
- In the case of repairs the cylinder head contact surface and the engine block should be rendered clean of sealant residues using a chemical device.
- Position piston of cylinder 1 to top dead centre and turn back crankshaft slightly again.

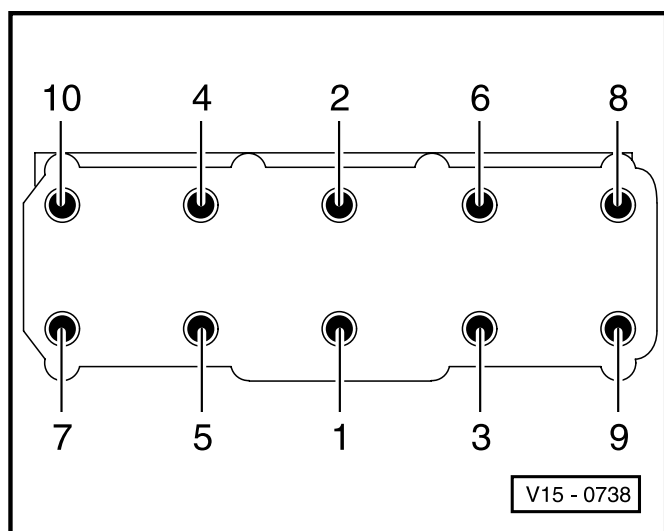


- ◀ - Screw guide pin T30011/2A into the front outer holes for the cylinder head bolts for centering.

Note:

The tolerance of the centering holes has been restricted in the upper range. For this reason, before fitting on cylinder head, check whether the guide pins can be removed upward. If necessary, grind off the knurling of the guide pins slightly.

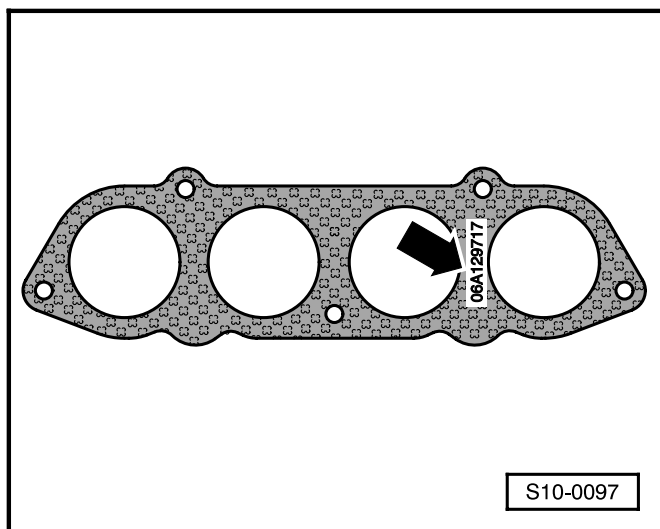
- Fit on the new cylinder head gasket.
- Fit on cylinder head, insert remaining 8 cylinder bolts and tighten by hand.
- Use turning tool MP 1-208 to unscrew guide pins through the bolt holes. Turn the extraction tool to the left for this step until the pins are free.
- Now, insert the two remaining cylinder head bolts and likewise tighten these by hand.



- ◀ - Tighten the cylinder head bolts in the order shown opposite, as follows:
- Tighten all bolts initially to 40 Nm.
- Then, torque all bolts a further ¼ turn (90°) with a rigid wrench.
- Finally, once again torque all the bolts a further ¼ turn (90°).

The remaining assembly is carried out in the reverse order of removal.

- Install toothed belt, tension ⇒ page 13-5.
- Install ribbed V-belt ⇒ page 13-1.



- ◀ - Install top part of intake manifold.
 - ♦ Pay attention to installation position of gasket:
Component number at top left -arrow-
 - ♦ Attachment of top part of intake manifold at front:
Insert rear bolts in top part of intake manifold before installing.
- Fill system with coolant ⇒ page 19-2.
- After re-connecting the battery:
 - Encode radio.
 - Set clock.
 - Initialise power windows.
- ⇒ Inspection and Maintenance
- Interrogate and erase fault memory.
 - ⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 01; Interrogating and erasing fault memory
- Generate readiness code.
 - ⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 01; Generating readiness code
- Carry out the "Procedure after interruption to voltage supply".
 - ⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Procedure after interruption to voltage supply

Inspecting cylinder head for distortion

Special tools, testers and aids required

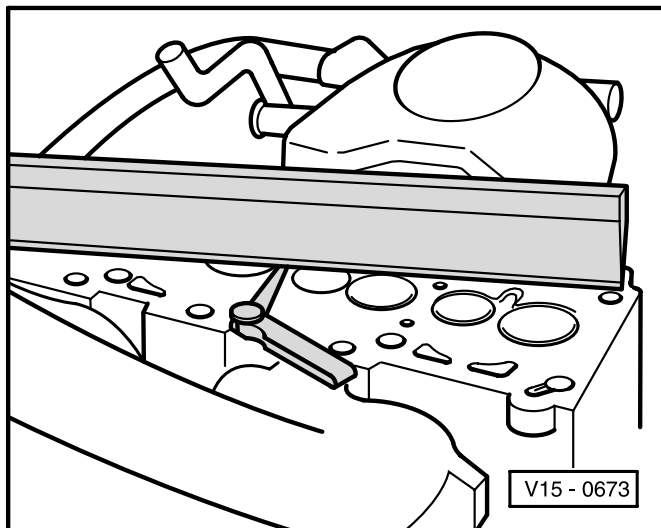
- ◆ Feeler gauge
- ◆ Knife-edge straightedge

Inspection procedure

- ◀ - Use a knife-edge straightedge and feeler gauge to measure distortion of cylinder head at several points.

Max. permissible distortion: 0.1 mm
(Minimum distance over which straightedge is resting: 100 mm)

- If the distortion is greater than 0.1 mm, rework or replace cylinder head.



Reworking cylinder head sealing surface

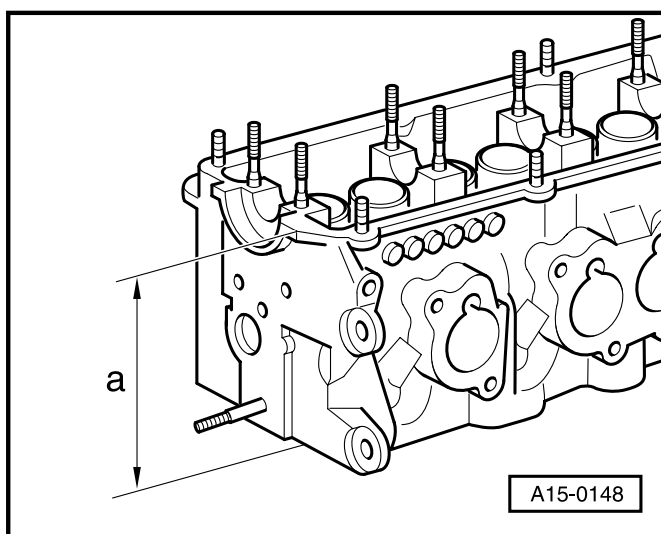
Procedure

- ◀ - It is only permissible to rework the sealing surface of cylinder head (surface grinding) to the minimum dimension -a-.

- ◆ Minimum dimension -a-: 132.6 mm

Note:

If the sealing surface is reworked, the valves must be set lower by the same amount (rework valve seat rings) otherwise the valves will strike the pistons. When doing this, ensure that the permissible maximum dimension is not exceeded ⇒ page 15-22.



Testing compression

Special tools, testers and aids required

- ◆ Spark plug wrench (e.g. 3122 B)
- ◆ Assembly tool T10029
- ◆ Torque wrench 5...50 Nm
(e.g. V.A.G 1331)
- ◆ Compression tester
(e.g. V.A.G 1763)

Test condition

- Engine oil temperature must be at least 30 °C.

Test procedure

- ◀ - Unplug the 4-pin plug connector -1- from the power output stage of ignition coil -2-.
- Remove fuse 32.

Note:

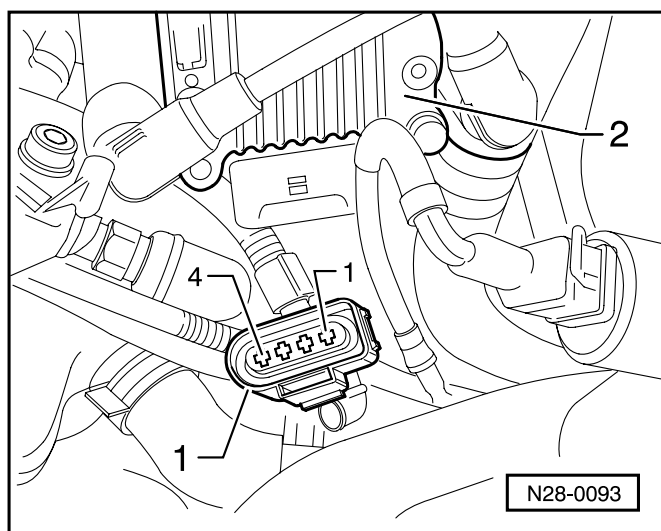
Removing fuse 32 interrupts the voltage supply of the injectors.

- Use assembly tool T10029 to unplug the spark plug connectors and use spark plug wrench (e.g. 3122 B) to remove the spark plugs.
- Test compression pressure with compression tester (e.g. V.A.G 1763).

Note:

Use of tester ⇒ Operating instructions.

- Have a second mechanic operate the starter with the throttle valve fully open until no further pressure rise is indicated by the tester.



Compression pressures:

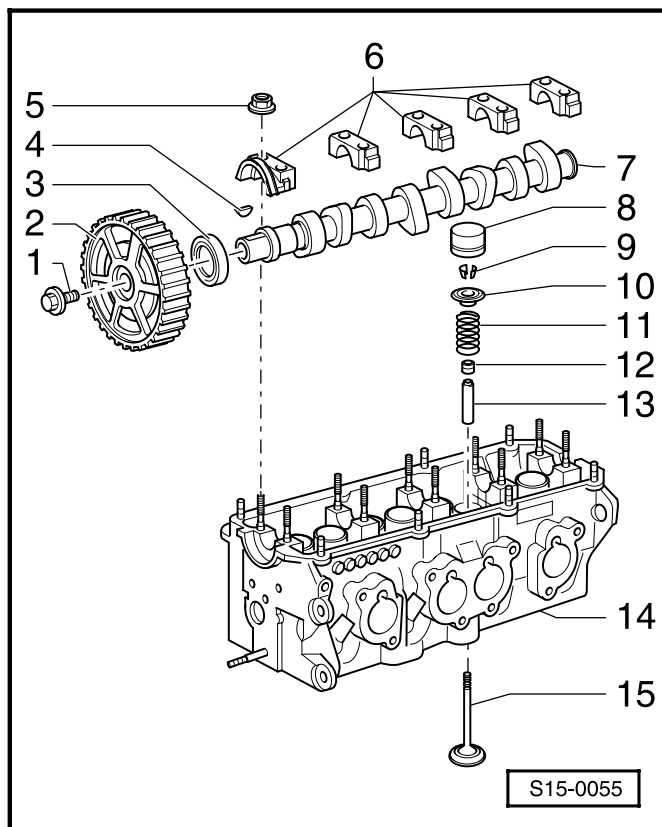
(in MPa)

New engine	Wear limit	Difference between cylinders
1.0 to 1.3	0.75	max. 0.3

- Interrogate fault memory and erase.

⇒ 2.0 l/85 kW Engine, Fuel Injection and Ignition System; Repair Group 01; Interrogating and erasing fault memory

Repairing Valve Gear



Notes:

- ♦ *Cylinder heads with cracks between the valve seats or between a valve seat ring and the spark plug thread may continue to be used without any reduction in life provided these are slight initial cracks which are not more than 0.3 mm wide, or cracks exist only at the first 4 turns of the spark plug thread.*
- ♦ *After installing new bucket tappets, the engine must not be started for about 30 minutes (otherwise valves would strike the pistons).*
- ♦ *After carrying out work on the valve gear, carefully crank engine at least 2 revolutions to ensure that no valve touches the piston when the engine is started.*

1 - 100 Nm

- ♦ use counterholder T30004 for slackening and tightening.

2 - Camshaft

- ♦ with sensor rotor for Hall sender -G40-
- ♦ to remove and install, take off toothed belt ⇒ page 13-7 installation position fixed by parallel key -item 4-

3 - Seal

- ♦ replace ⇒ page 15-14

4 - Parallel key

- ♦ ensure tightly fitted

5 - 20 Nm

6 - Bearing cap

- ♦ installation position ⇒ Fig. 2
- ♦ installation sequence ⇒ page 15-16, Removing and installing camshaft
- ♦ apply a thin film of sealant AMV 174 004 01 to contact surface of bearing cap 1

7 - Camshaft

- ♦ inspecting axial play ⇒ Fig. 1
- ♦ removing and installing camshaft ⇒ page 15-16
- ♦ runout: max. 0.01 mm
- ♦ marking, timing ⇒ Fig. 4

8 - Bucket tappet

- ♦ do not mix up
- ♦ with hydraulic clearance compensation
- ♦ inspecting ⇒ page 15-18
- ♦ place down with contact surface facing down
- ♦ before installing, inspect axial play of camshaft ⇒ Fig. 1
- ♦ oil contact surface

9 - Collets

10 - Valve spring retainer

11 - Valve spring

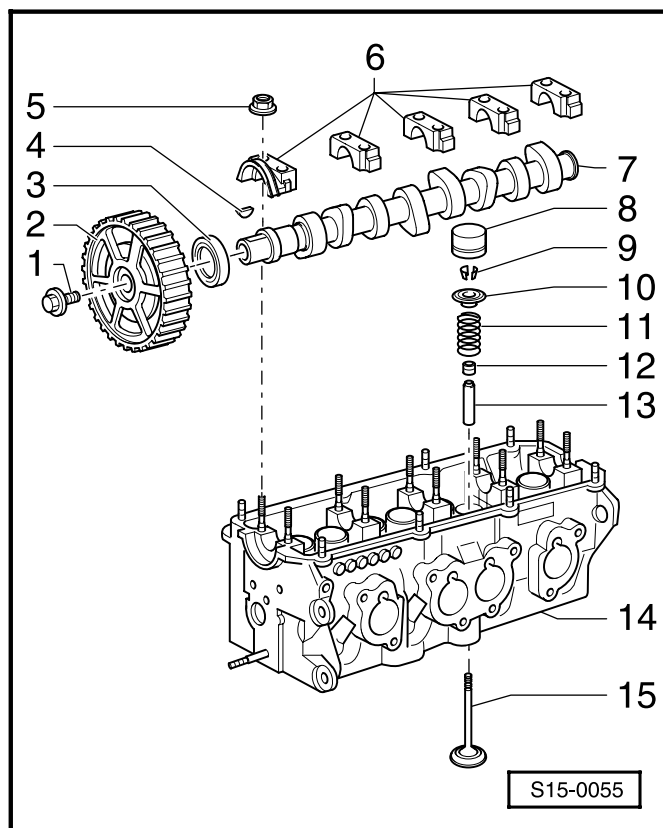
- ♦ removing and installing
- with cylinder head removed: use MP 1-211 and MP 1-213 together with supporting plate MP 1-218
- with cylinder head installed: ⇒ page 15-19, Replacing valve stem seals

12 - Valve stem seal

- ♦ replacing ⇒ page 15-19

13 - Valve guide

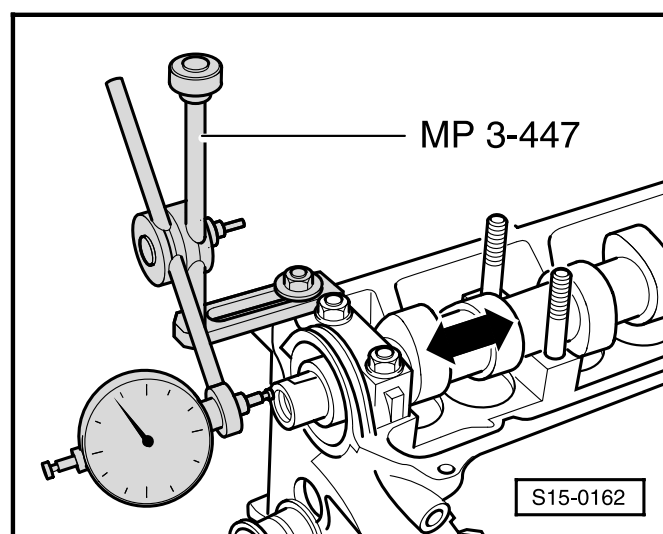
- ♦ inspecting ⇒ page 15-21
- ♦ replacing ⇒ page 15-21
- ♦ repair version with collar

**14 - Cylinder head**

- ♦ reworking valve seats ⇒ page 15-22

15 - Valve

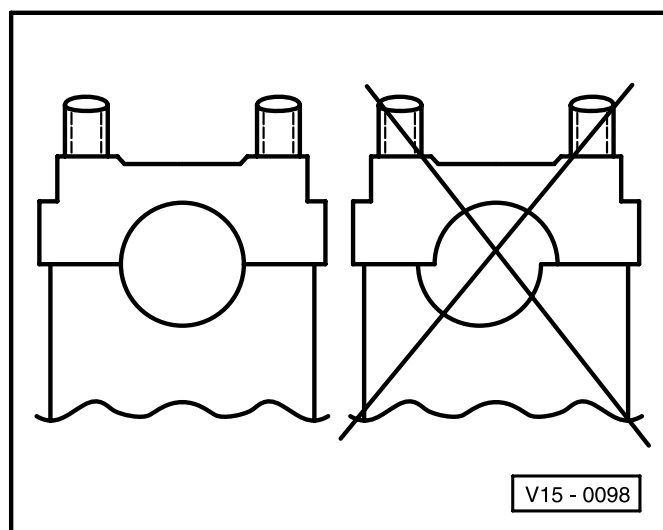
- ♦ do not rework, only grinding in is permissible
- ♦ valve dimensions ⇒ Fig. 3

◀ **Fig. 1 Inspecting camshaft axial play****Special tools, testers and aids required**

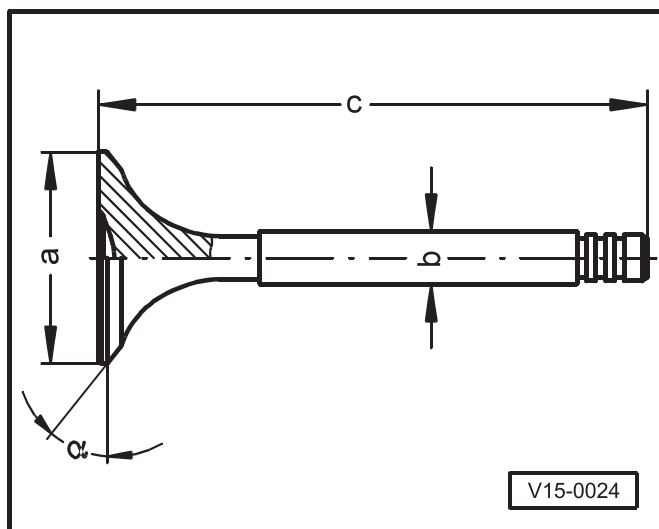
- ♦ Universal dial gauge holder MP 3-447
- ♦ Dial gauge

Wear limit: max. 0.15 mm

Carry out measurement with bucket tappets removed and first and last bearing caps installed.

◀ **Fig. 2 Installation position of camshaft bearing caps**

Pay attention to off-centred fit. Numbers on bearing cap must be visible from the front.

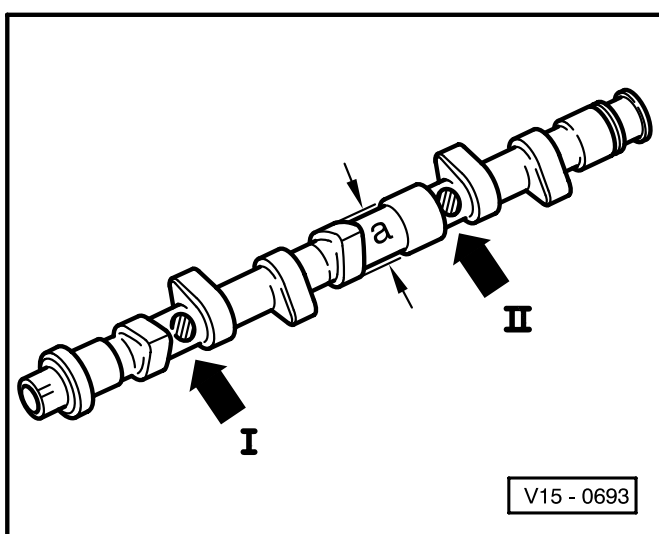


◀ Fig. 3 Valve dimensions

Note:

Valves must not be reworked. Only grinding in is permissible.

Dimension		Inlet valve	Outlet valve
Ø a	mm	39.5 ± 0.15	32.9 ± 0.15
Ø b	mm	6.92 ± 0.02	6.92 ± 0.02
c	mm	91.85	91.15
α	∠°	45	45



◀ Fig. 4 Camshaft marking, timing

Marking

- ♦ Base circle of cam: $a = \varnothing 34$ mm
- ♦ Marking by means of stamped numbers and letters between inlet cam and exhaust cam

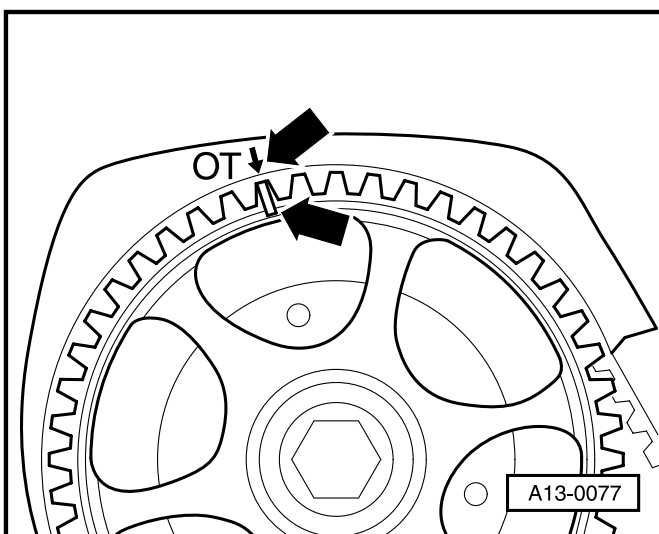
Cylinder 1 -arrow I-	E or A
Cylinder 3 -arrow II-	050

Replacing camshaft seal

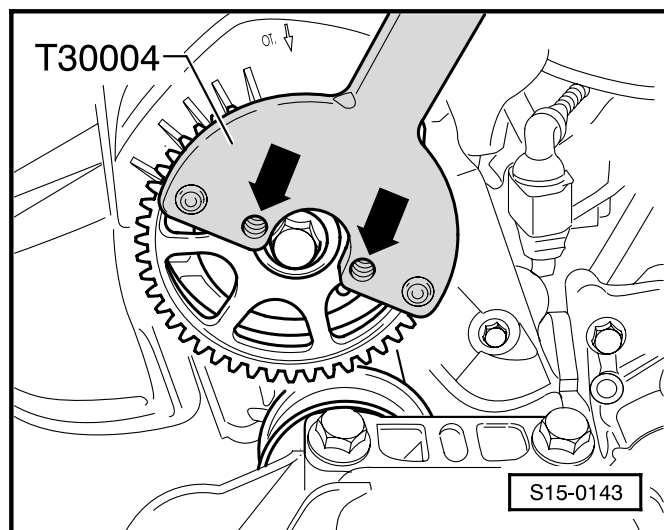
Special tools, testers and aids required

- ◆ Ring inserter MP 1-214
- ◆ Ring extractor MP 1-215
- ◆ Counterholder T30004
- ◆ Torque wrench 5...50 Nm
(e.g. V.A.G 1331)
- ◆ Torque wrench 40...200 Nm
(e.g. V.A.G 1332)

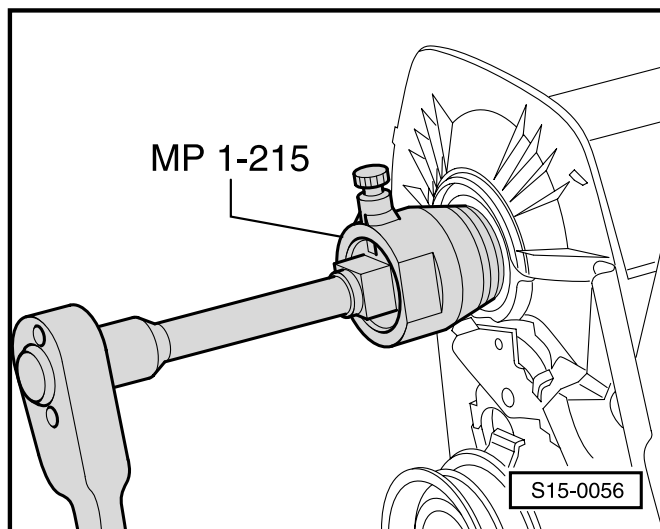
Removing



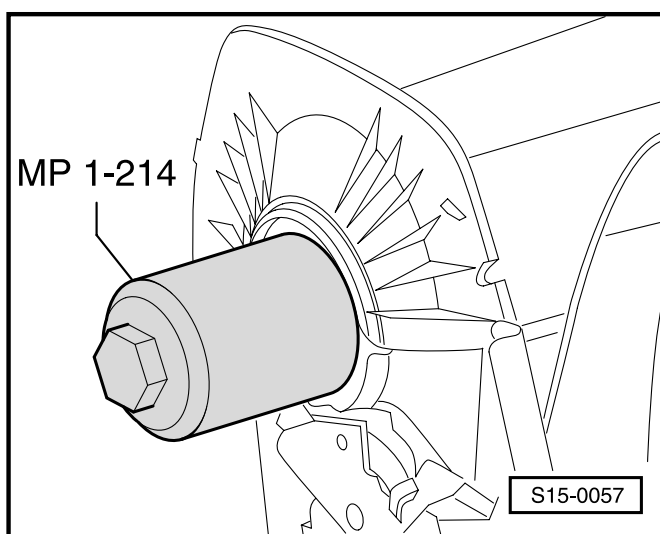
- Remove top part of toothed belt guard.
- ◀ - Rotate crankshaft and position camshaft sprocket to TDC marking of cyl. 1. Marking on camshaft sprocket must be aligned with arrow on toothed belt guard.
- Slacken tensioning pulley and take off toothed belt.



- Turn back crankshaft slightly.
- ◀ - Remove camshaft sprocket. Hold camshaft sprocket tight with counterholder T30004 to slacken the bolt (unscrew bolts -arrows- first of all).
- Remove parallel key from the camshaft.
- Screw bolt attaching camshaft sprocket into the camshaft as far as the stop.
- Position inner part of seal extractor MP 1-215 flush with the outer part and lock with knurled screw.



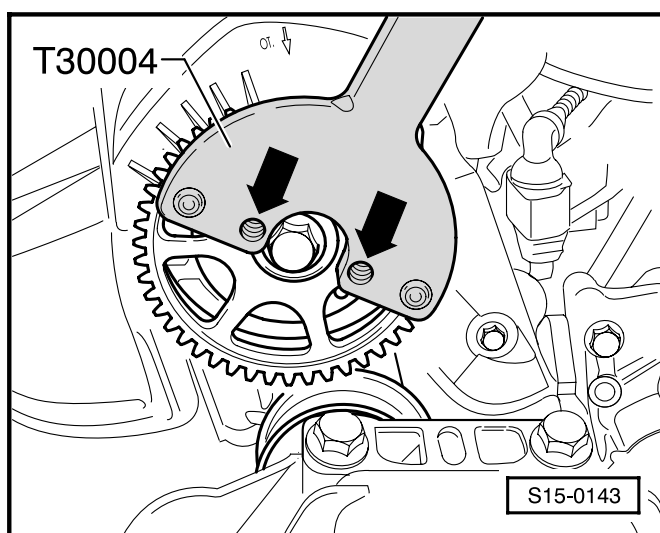
- ◀ - Oil threaded head of seal extractor, fit on and screw as far as possible into the seal with firm pressure.
- Slacken knurled screw and turn inner part against the camshaft until the seal is pulled out.
- Clamp seal extractor in a vice at the flats and remove seal with pliers.



Installing

Requirement

- The pistons must not be positioned at top dead centre.
- Lightly oil sealing lip of seal.
- ◀ - Use guide sleeve from MP 1-214 to fit on seal and use thrust sleeve from MP 1-214 to press in flush.
- Insert parallel key.



- ◀ - Install camshaft sprocket. Hold camshaft sprocket tight with counterholder T30004 for tightening the bolt (unscrew bolts -arrows-first of all).

Tightening torque: 100 Nm

Note:

The crankshaft must not be positioned at TDC when rotating the camshaft otherwise risk of damage to valves and piston crowns.

- The remaining assembly is carried out in the reverse order to removal.
- Install toothed belt, tension ⇒ page 13-5.

Removing and installing camshaft

Special tools, testers and aids required

- ◆ Torque wrench 5...50 Nm
(e.g. V.A.G 1331)
- ◆ Torque wrench 40...200 Nm
(e.g. V.A.G 1332)
- ◆ Counterholder T30004
- ◆ Sealant AMV 174 004 01

Removing

- Remove engine trim panel ⇒ page 10-2.
- Take off top part of intake manifold ⇒ page 15-3.

Notes:

- ◆ The coolant hoses remain connected at the throttle valve control unit (unbolt throttle valve control unit, if necessary).
- ◆ Seal off intake passages with clean cloths.

- Remove top part of toothed belt guard.
- ◀ - Rotate crankshaft and position crankshaft sprocket to TDC marking of cyl. 1. Marking on camshaft sprocket must be aligned with arrow on toothed belt guard.

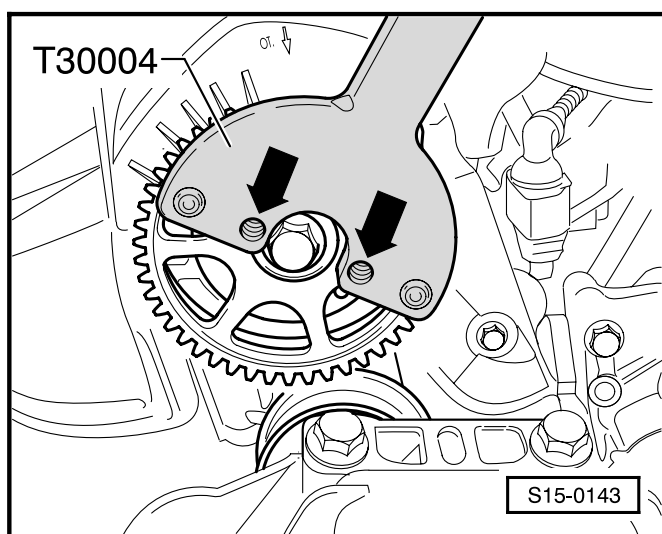
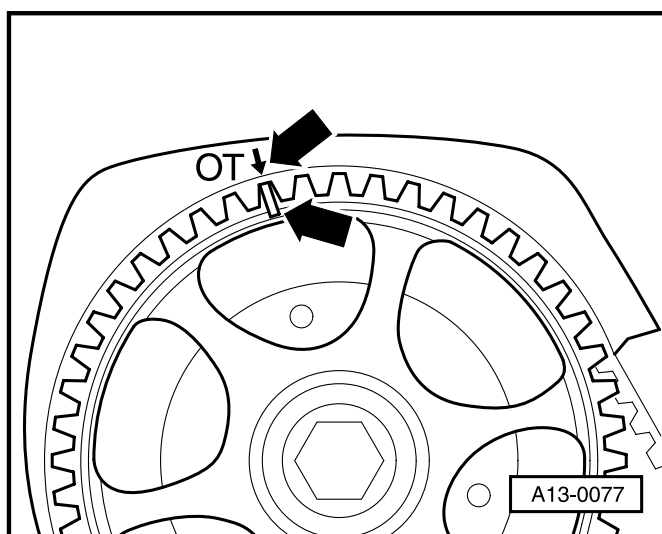
- Slacken tensioning pulley and take off toothed belt.

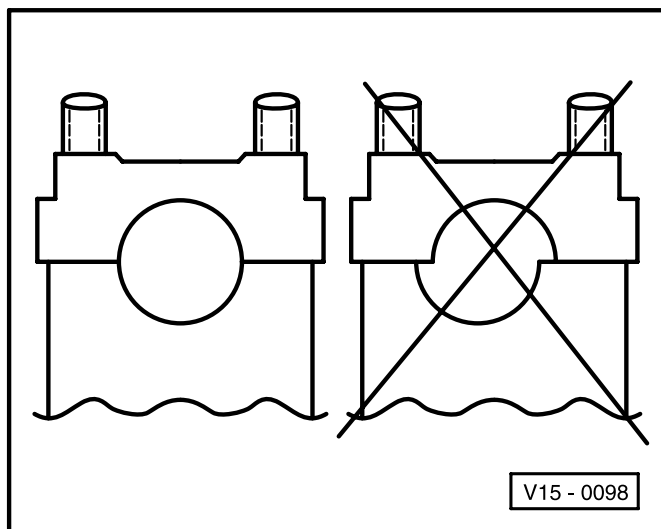
- Turn back crankshaft slightly.

- ◀ - Remove camshaft sprocket.

Hold camshaft sprocket tight with counterholder T30004 to slacken the bolt (unscrew bolts -arrows- first of all).

- Remove parallel key from the camshaft.
- Remove cylinder head cover.
- Remove bearing caps 5, 1 and 3 first of all. Slacken bearing cap 2 and 4 alternately diagonally across.





Installing

Requirement

- Pistons must not be positioned at top dead centre.

Notes:

- ◆ The cams for cylinder 1 must be pointing up when installing the camshaft.

◀ ◆ When installing the bearing caps, pay attention to off-centering of hole. Fit on bearing caps and determine installation position before installing camshaft.

- Oil contact surfaces of camshaft.
- Insert camshaft.
- Tighten bearing caps 2 and 4 alternately diagonally across and tighten to final torque of 20 Nm.
- Apply a thin coat of sealant AMV 174 004 01 to contact surface of bearing cap 1.
- Install bearing caps 3, 1 and 5 and likewise tighten to final torque of 20 Nm.
- Insert parallel key into camshaft.
- ◀ - Install camshaft sprocket.
- Hold camshaft sprocket tight with counter-holder T30004 for tightening the bolt (unscrew bolts -arrows- first of all).

Tightening torque: 100 Nm

Note:

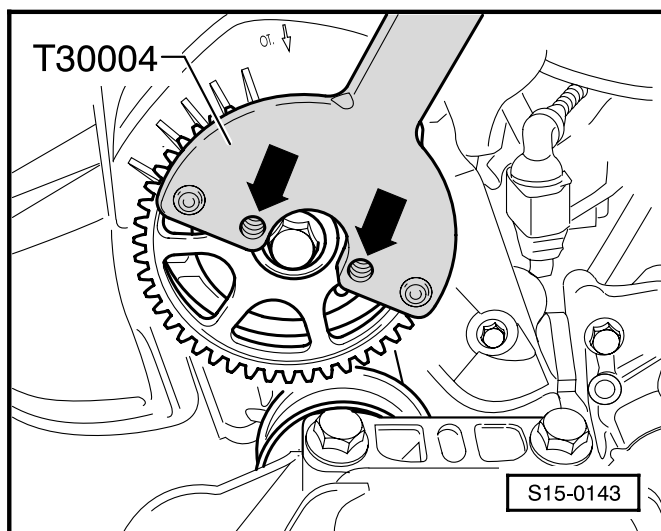
The crankshaft must not be positioned at TDC when rotating the camshaft otherwise risk of damage to valves and piston crowns.

The remaining assembly is carried out in the reverse order to removal.

- Install toothed belt, tension ⇒ page 13-5.

Note:

After installing the camshaft, wait about 30 minutes before starting the engine to allow the hydraulic valve clearance compensation elements to settle (otherwise valves will strike pistons).



Inspecting hydraulic bucket tappets

Special tools, testers and aids required

- ◆ Feeler gauge
- ◆ Wooden or plastic wedge

Notes:

- ◆ *Always replace faulty bucket tappets complete (cannot be adjusted or repaired).*
- ◆ *Irregular valve noises when starting the engine are normal.*

Inspection procedure

- Start engine and run until the radiator fan has cut in once.
- Increase engine speed to about 2500 rpm for 2 minutes.

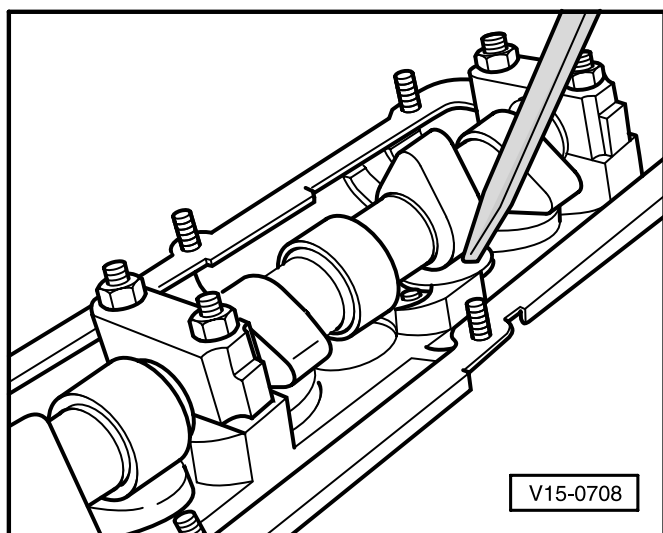
If the hydraulic bucket tappets are still loud, determine the faulty tappet or tappets as follows:

- Remove top part of intake manifold and cylinder head cover ⇒ page 15-2.
- Rotate crankshaft in clockwise direction until the cam of the bucket tappet to be inspected is positioned at the top.

- ◀ - Use a wooden or plastic wedge to push bucket tappet down slightly. If it is possible to insert a 0.20 mm feeler gauge between camshaft and bucket tappet, replace the tappet.

Note:

After installing new bucket tappets, do not start the engine for about 30 minutes to allow the hydraulic valve clearance compensation elements to settle (otherwise valves will strike the pistons).



Replacing valve stem seals

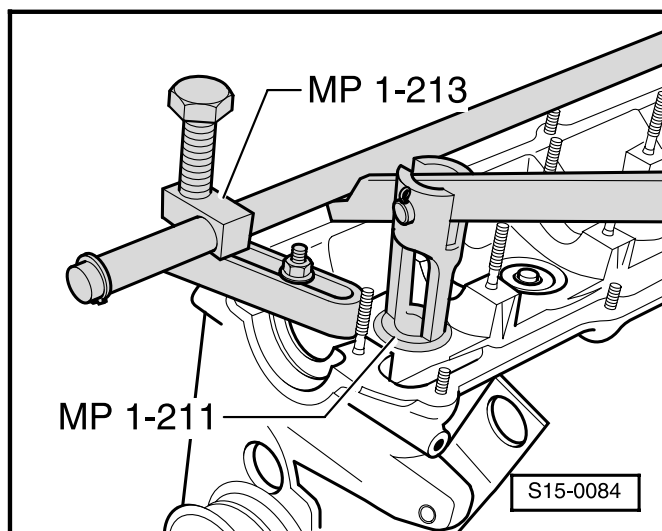
- Cylinder head installed

Special tools, testers and aids required

- ◆ Puller MP 1-206
- ◆ Pressure hose MP 1-210
- ◆ Assembly lever MP 1-211
- ◆ Insertion tool MP 1-212
- ◆ Assembly device MP 1-213
- ◆ Spark plug wrench (e.g. 3122 B)
- ◆ Assembly tool T10029

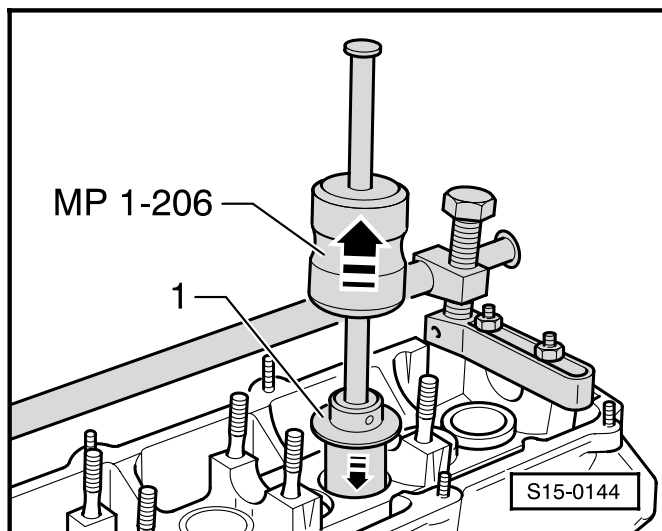
Removing

- Remove camshaft ⇒ page 15-16.
- Remove bucket tappets (do not mix up) and place down with contact surface facing down.
- Use assembly tool T10029 to unplug the spark plug connectors and use spark plug wrench (e.g. 3122 B) to remove the spark plugs.
- Position piston of the relevant cylinder to "bottom dead centre".
- ◀ - Insert assembly device MP 1-213 and set mounting to height of stud bolt.
- Screw pressure hose MP 1-210 into the spark plug thread and constantly apply pressure to the cylinder.
min. 0.6 MPa
- Use assembly lever and thrust piece MP 1-211 to remove valve springs.

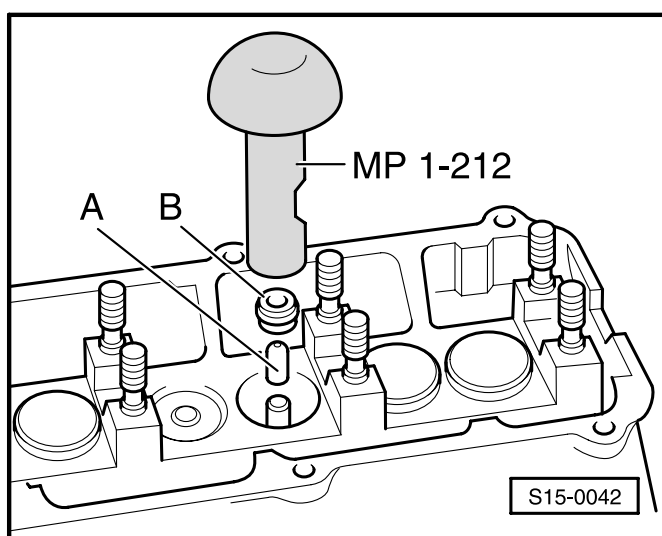


Note:

If valve collets are tight, detach by striking the assembly lever lightly with a hammer.



- ◀ - Use MP 1-206 to pull off valve stem seals.
Push sleeve -1- down slightly for this step.

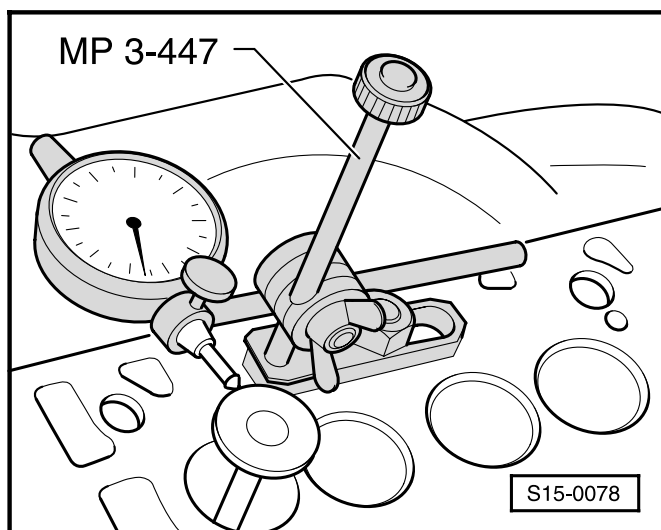


Installing

- ◀ - Fit plastic sleeve -A- onto the valve stem to avoid damaging the new valve stem seals.
- Oil valve stem seal -B-, insert into fitting tool MP 1-212 and carefully push onto the valve guide.
- Take off plastic sleeve again.

Notes:

- ♦ After installing the camshaft, do not start the engine for about 30 minutes to allow the hydraulic valve clearance compensation elements to settle (otherwise valves will strike the pistons).
- ♦ After carrying out work on the valve gear, carefully crank engine at least 2 revolutions to ensure that no valve strikes a piston when the engine is started.



Inspecting valve guides

Special tools, testers and aids required

- ◆ Universal dial gauge holder MP 3-447
- ◆ Dial gauge

Procedure

- ◀ - Insert new valve into guide. End of valve stem must be flush with guide.
- Determine valve rock.

Wear limit

Inlet valve guide	Exhaust valve guide
1.0 mm	1.3 mm

Replacing valve guides

Special tools, testers and aids required

- ◆ Driver MP 1-205
- ◆ Hand reamer MP 1-204 and diluted soluble oil

Removing

- Clean cylinder head and inspect. If it is no longer possible to rework the valve seat rings of a cylinder head, or if the cylinder head has already been machined down to the minimum dimension, it is not suitable for replacing the valve guides.
- Use MP 1-205 to press out worn valve guides from the camshaft side (press out valve guide with collar -repair version- from the combustion chamber side).

Installing

- Moisten new valve guides with oil and press into the cold cylinder head as far as the collar with MP 1-205 from the camshaft side.

Note:

After the guide makes contact with the collar, the force applied to the guide must not be greater than 10 kN otherwise the collar may shear off.

- Use hand reamer MP 1-204 to widen valve guides. It is essential to use diluted soluble oil for this step.
- Install new valves.
- Rework valve seats ⇒ page 15-22.

Reworking valve seats**Special tools, testers and aids required**

- ◆ Depth gauge/caliper gauge
- ◆ NAC milling tool for reworking valve seats
- ◆ Grinding paste

Notes:

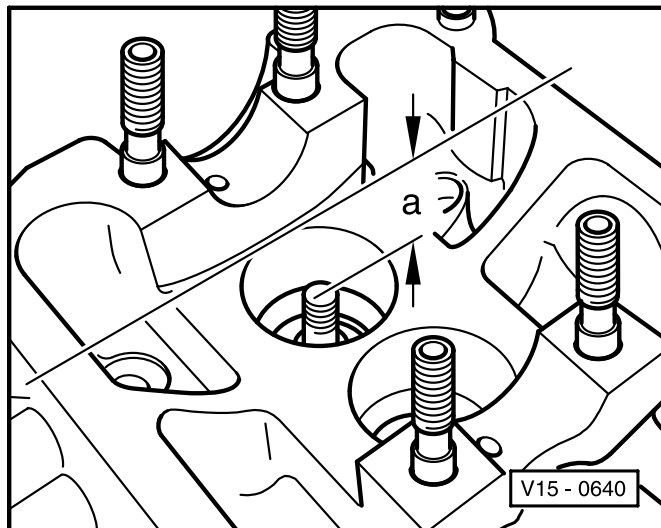
- ◆ *When repairing engines with leaking valves, it is not sufficient to rework or to replace the valve seats and valves. It is also necessary to inspect the valve guides for wear, particularly on engines with a high mileage.*
- ◆ *Rework valve seats only sufficiently to obtain a proper contact pattern. Before commencing reworking, calculate the maximum permissible reworking dimension. If the reworking dimension is exceeded, proper operation of the hydraulic valve clearance compensation elements is no longer assured and the cylinder head must be replaced.*

Calculating maximum permissible reworking dimension

- Insert valve and press firmly against the valve seat.

Note:

If the valve is replaced when carrying out repair work, use a new valve for the measurement.



- Measure distance -a- between the valve stem end and the upper face of the cylinder head.
- Calculate max. permissible reworking dimension from the distance -a- and measure the minimum dimension.

Minimum dimension:

Inlet valve 33.8 mm

Outlet valve 34.1 mm

Minimum dimensions less distance measured
= max. permissible reworking.

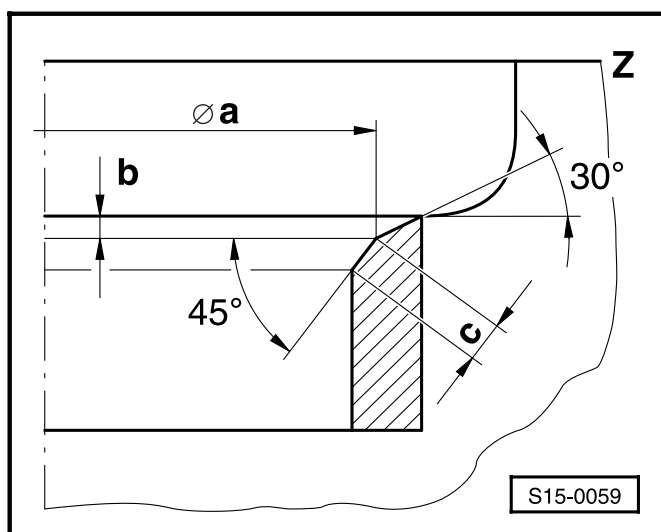
Example:

Minimum dimension	33.1 mm
- distance measured	33.8 mm
= max. permissible reworking dimension	0.7 mm

Note:

If the max. permissible reworking dimension is 0 mm, repeat measurement with a new valve.

If the max. permissible reworking dimension is again 0 mm, replace cylinder head



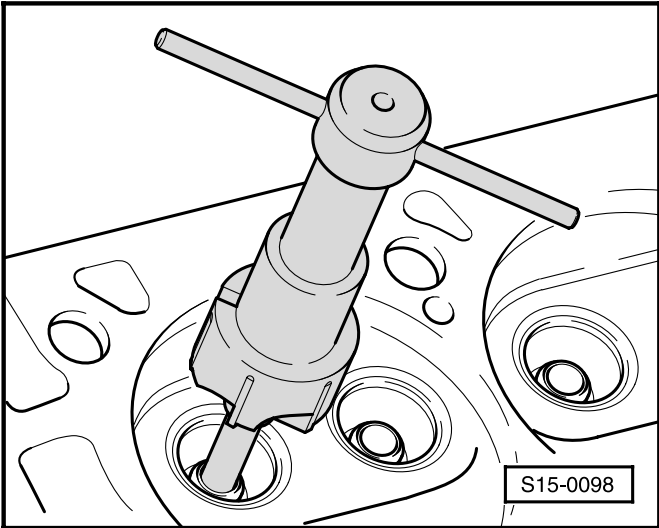
◀ Reworking valve seats

Dimension	Valve seats	
Ø a mm	Valve seat diameter	39.2 - 0.1 - Inlet valve 32.4 - 0.1 - Outlet valve
b mm	max. permissible reworking dimension	
c mm	Valve seat width	1.9....2.1- Inlet valve 2.3....2.5 - Outlet valve
Z	Bottom edge of cylinder head	
45°	Valve seat angle	
30°	Top correction angle	

Procedure

Reworking can be carried out with a machine or by hand. It is essential that the following conditions are met:

- Wear limit of valve guides must not be greater than the permissible dimension ⇒ page 15-21.
- Use NAC milling tool with carbide metal tips (min. 90 HRC).



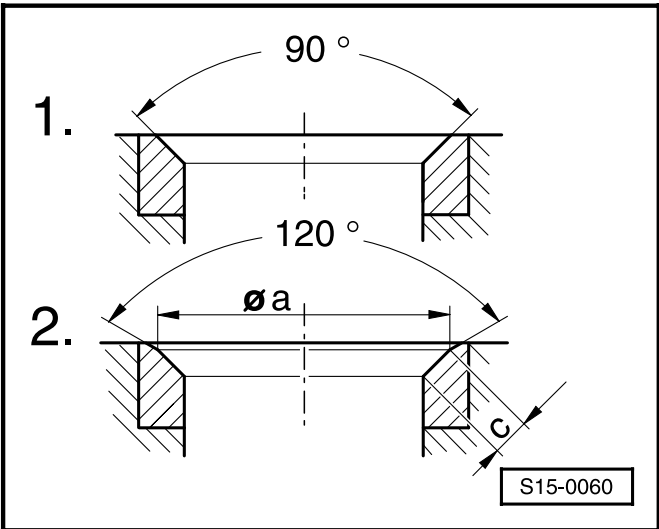
◀ Reworking valve seats with NAC hand milling tool

- Place cylinder head down on a felt base and secure to prevent it turning.
- Match diameter of guide drift to diameter of valve guide.

Valve guide	Guide drift Ø mm
Inlet valve	7.0 -0.0
Exhaust valve	

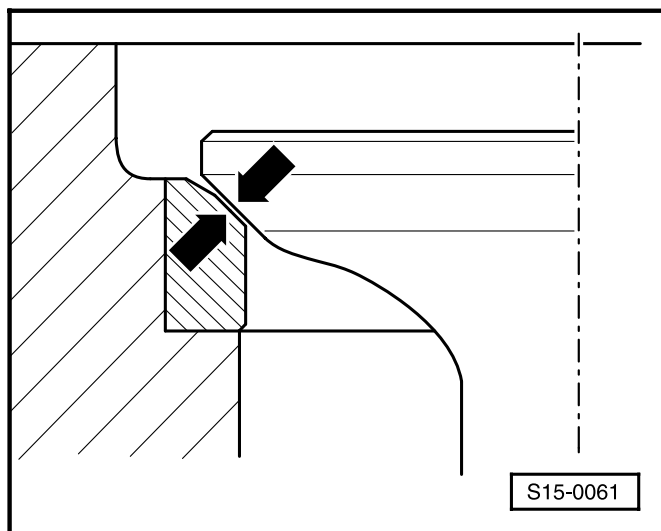
- Match diameter of milling tool to diameter of valve seat.

Valve seat	Milling tool 90° Ø mm	Milling tool 120° Ø mm
Inlet valve	41	41
Exhaust valve	34	34



◀ Order of milling operation

1. Machine valve seat with 90° milling tool until a proper contact pattern is achieved (do not exceed max. permissible reworking dimension).
2. Chamfer top correction angle with 120° milling tool until valve seat diameter „a“ or valve seat width ”c“ is reached (⇒ page 15-23).



◀ - Grind in valve/valve seat -arrows- with fine grinding paste so as to obtain a proper contact pattern.

- Inspect valve for leaks.

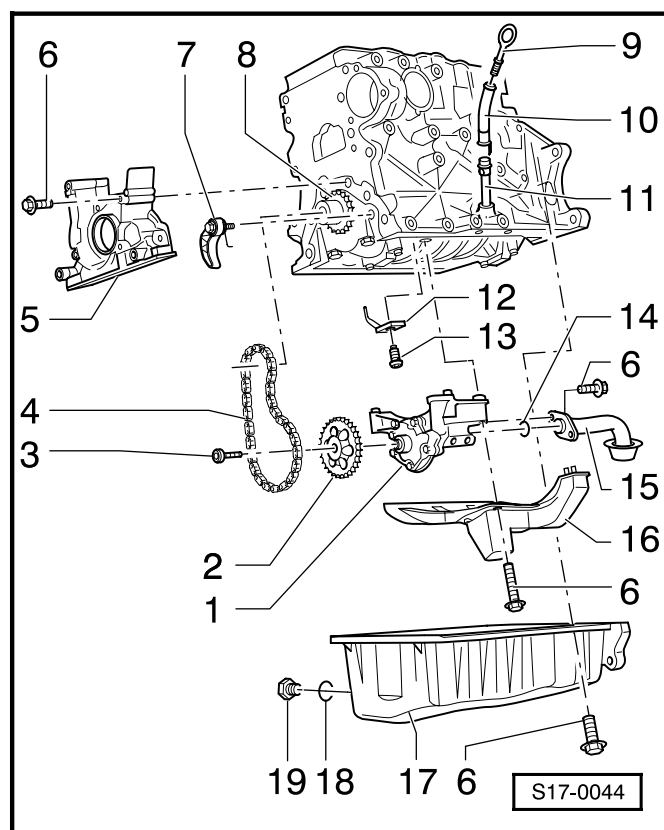
The inspection can be carried out with water colour (proper contact pattern around entire circumference) or by pouring fuel into the combustion chamber (no fuel must flow out at the valve seat).

Note:

After installing the cylinder head, inspect hydraulic bucket tappets ⇒ page 15-18.

Removing and installing parts of the lubrication system

Engine codes AEG, APK, AQY and AZH



Notes:

- ♦ If considerable quantities of metal swarf, or abrasion are found in the engine oil when carrying out engine repairs, it is then necessary to carefully clean the oil galleries and, in addition, to replace the oil cooler in order to avoid consequential damage.
- ♦ The engine oil level must not extend beyond the max. marking - risk of damage to catalytic converter!

Oil quantity and oil change:

⇒ Inspection and Maintenance

Oil specification:

⇒ Inspection and Maintenance

1 - Oil pump

- ♦ with pressure relief valve 1.2 MPa (12 bar)
- ♦ before installing, check whether the two dowel sleeves for centering oil pump/cylinder block are present
- ♦ if scoring is present on the contact surfaces and gears, replace pump

2 - Chain sprocket for oil pump

- ♦ pay attention to installation position
- ♦ can be fitted onto the oil pump shaft only in one position

3 - 25 Nm

4 - Chain for oil pump

5 - Sealing flange

- ♦ insert with silicone sealant „D 176 404 A2“ ⇒ page 13-18
- ♦ replace crankshaft seal ⇒ page 13-15

6 - 15 Nm

7 - Chain tensioner, 15 Nm

- ♦ when installing, pretension spring and attach

8 - Chain sprocket

9 - Dipstick

- ♦ oil level must not extend beyond the max. marking!
- ♦ inspecting engine oil level ⇒ Inspection and Maintenance

10 - Filler funnel

- ♦ detach for extracting oil

11 - Guide pipe

12 - Oil spray nozzle

- ♦ for cooling piston

13 - Pressure relief valve, 27 Nm

- ♦ opens at 0.25...0.32 MPa (2.5...3.2 bar)
- ♦ insert without sealant

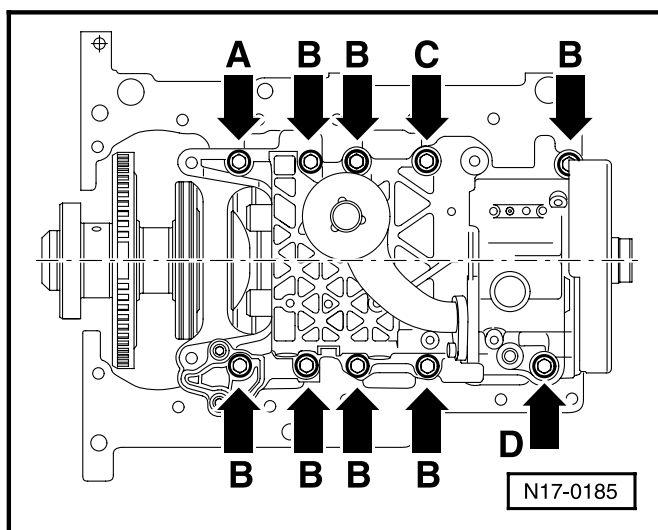
14 - O-ring

- ♦ replace

15 - Suction line

- ♦ clean strainer if soiled

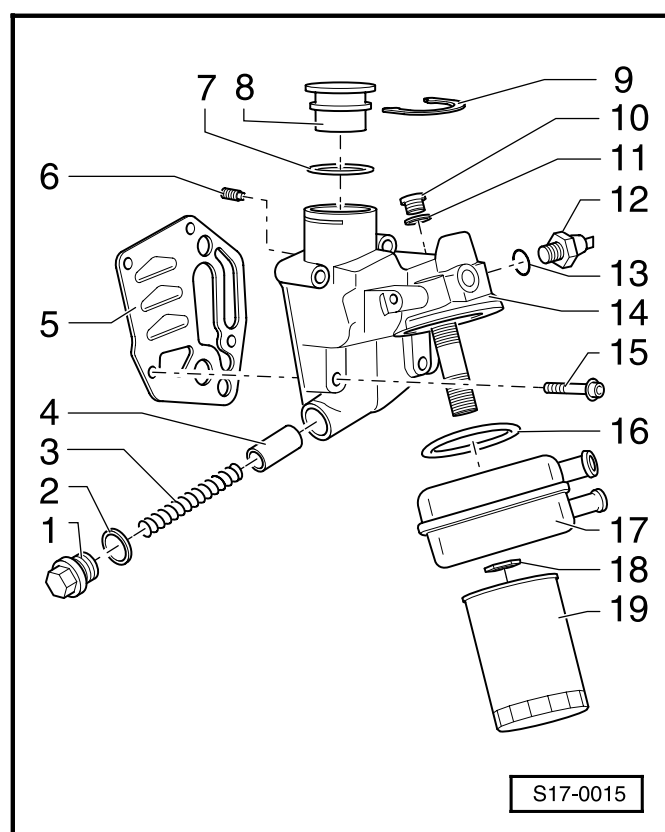
- 5 - Filler funnel**
♦ detach for extracting oil
- 6 - Guide tube**
- 7 - Oil spray nozzle**
♦ for cooling piston
- 8 - Pressure relief valve, 27 Nm**
♦ insert without sealant
- 9 - Gearbox with balance shafts and oil pump**
♦ with pressure relief valve 1.2 MPa (12 bar)
♦ removing and installing ⇒ page 17-8
♦ disassembling and assembling ⇒ page 17-11
- 10 - 15 Nm + torque a further 90° (¼ turn)**
♦ pay attention to different lengths of bolts
- 11 - 15 Nm**
- 12 - Oil pan**
♦ install with silicone sealant „D 176 404 A2“ ⇒ page 17-4
- 13 - Seal**
♦ replace
- 14 - Oil drain plug, 30 Nm**
- 15 - Chain sprocket**
- 16 - 10 Nm**
- 17 - Oil level and oil temperature sender -G266**
- 18 - Seal**
♦ replace
- 19 - 20 Nm**
- 20 - Chain cover**
- 21 - 25 Nm**
- 22 - Drive chain**
- 23 - Sealing flange**
♦ insert with silicone sealant „D 176 404 A2“ ⇒ page 13-18
♦ replace crankshaft seal ⇒ page 13-15



◀ Fig. 1 Arrangement of bolts on gearbox with balance shafts

- A - M7x40 bolt
B - M7x55 bolt
C - M7x90 bolt
D - Bolt with O-ring

Disassembling and assembling oil filter holder



1 - Cap, 30 Nm

- ♦ replace

2 - Seal

- ♦ is part of -item 1-

3 - Spring

- ♦ of pressure relief valve approx. 0.4 MPa (0.04 bar)

4 - Piston

- ♦ for pressure relief valve

5 - Gasket

- ♦ replace

6 - Oil retention valve

- ♦ tightening torque 8 Nm
- ♦ integrated in oil filter holder

7 - Seal

- ♦ push on as far as collar of cap -item 8-

- 8 - Cap**
- 9 - Retaining clamp**
- 10 - Screw plug, 15 Nm**
- 11 - Seal**
 - ◆ Cut open and replace if leaking
- 12 - 0.14 MPa oil pressure switch -F1-, 25 Nm**
 - ◆ Black
 - ◆ Testing ⇒ page 17-5
- 13 - Seal**
 - ◆ Cut open and replace if leaking
- 14 - Oil filter holder**
- 15 - 15 Nm + torque a further ¼ turn (90°)**
 - ◆ Replace
- 16 - Gasket**
 - ◆ Replace
 - ◆ Fit into lugs at oil cooler
- 17 - Oil cooler**
 - ◆ Ensure clearance to surrounding components
 - ◆ Pay attention to Note ⇒ page 17-1
- 18 - 25 Nm**
- 19 - Oil filter**
 - ◆ Use tensioning strap for slackening
 - ◆ Tighten by hand
 - ◆ Pay attention to installation notes on oil filter

Removing and installing oil pan

Special tools, testers and aids required

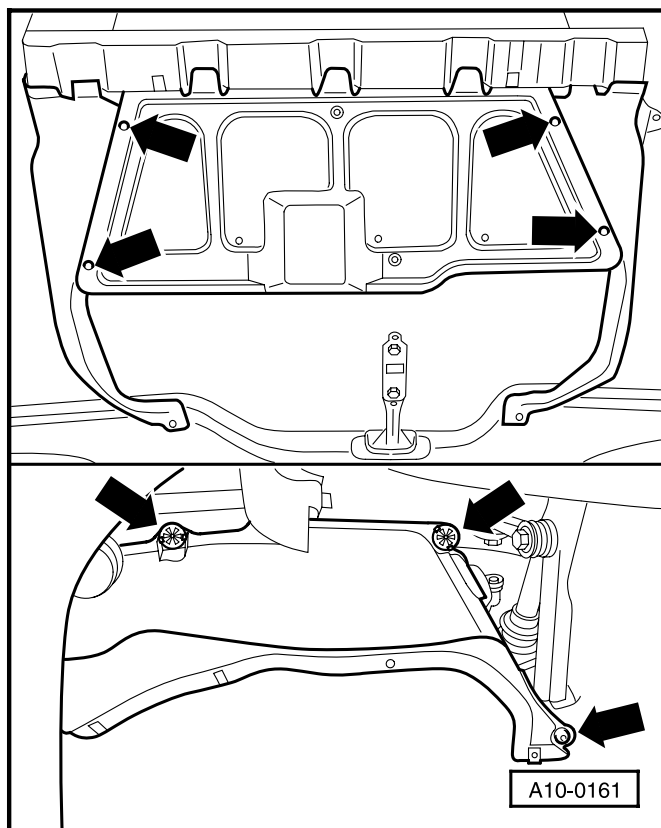
- ◆ Hinged wrench 3185
- ◆ Wrench socket 3249
- ◆ Hand drill with plastic brush attachment
- ◆ Flat scraper
- ◆ Torque wrench 5...50 Nm (e.g. V.A.G 1331)
- ◆ Silicone sealant D 176 404 A2

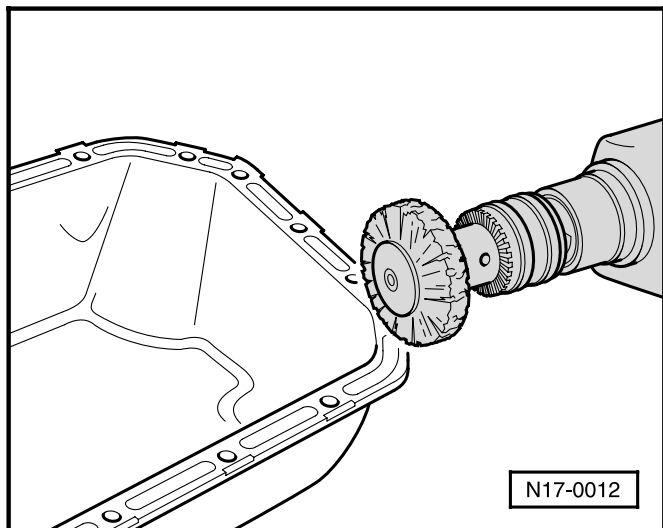
Removing

- ◀ - Remove noise insulation panel in middle and also on left and right -arrows-. Remove air guides on outside first of all.
- Drain engine oil.
- Unbolt oil pan.

Note:

Use hinged wrench 3185 to slacken oil pan bolts at flywheel side and unscrew with wrench socket 3249.



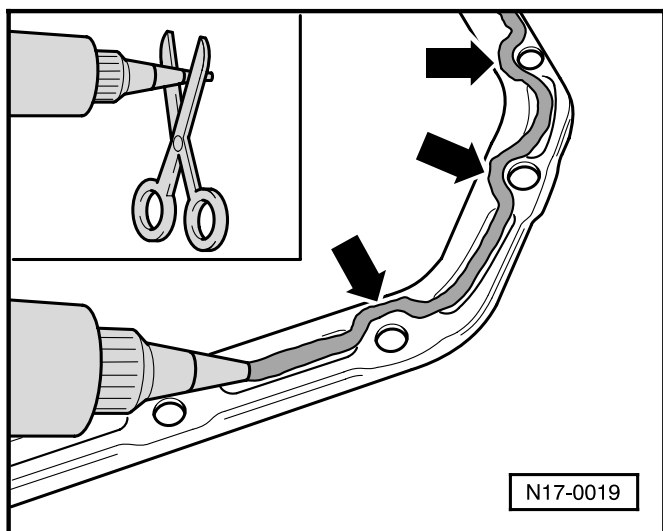


- Take off oil pan; detach with light blows with a rubber-headed hammer if necessary.
- Use a flat scraper to remove sealant residues at the cylinder block.
- ◀ - Use a rotating plastic brush to remove sealant residues on the oil pan (wear eye protection).
- Clean sealing surfaces; they must be free of oil and grease.

Installing

Notes:

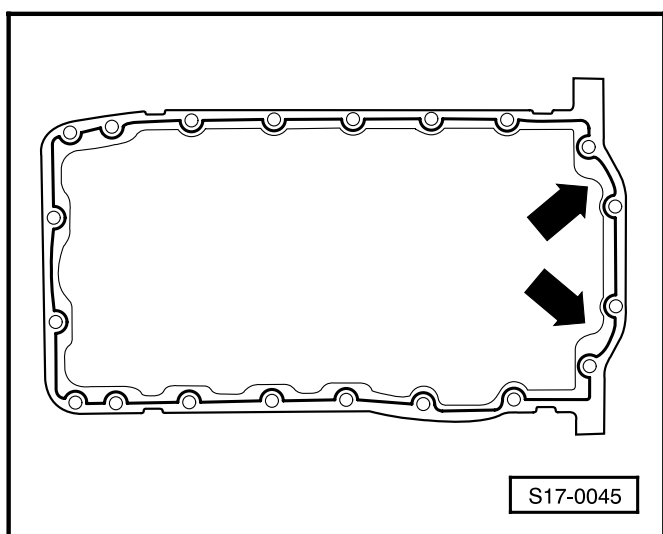
- ♦ The oil pan must be installed within 5 minutes after applying the silicone sealant.
- ♦ Use wrench socket 3249 to feed in the oil pan bolts of the flywheel side and tighten fully with hinged wrench 3185.
- ♦ A second person is required for installing the oil pan.



- ◀ - Cut off tip of tube of silicone sealant "D 176 404 A2" at the front marking ($\varnothing$ of nozzle approx. 3 mm).
 - ♦ Thickness of sealant bead: 2 ... 3 mm
 - ♦ Run past the area of the bolt holes on the inside -arrows-.

Note:

The sealant bead must not be thicker than 3 mm otherwise excess sealant may get into the oil pan and block the strainer in the oil suction pipe.



- ◀ - Apply silicone sealant to the clean sealing surface of the oil pan, as shown in the illustration.

Note:

Apply sealant bead with particular care in the area of the sealing flange at the rear -arrows-.

- Fit on oil pan immediately and tighten bolts as follows:
 1. Tighten all the bolts of oil pan/cylinder block only very slightly and diagonally across.
 2. Tighten the three bolts of oil pan/gearbox slightly.
 3. Tighten all the bolts of the oil pan/cylinder block further slightly, and diagonally across.
 4. Tighten the three bolts of the oil pan/gearbox to a final torque of 45 Nm.
 5. Tighten all the bolts of the oil pan/cylinder block diagonally across to a final torque of 15 Nm.

Notes:

- ◆ *When installing the oil pan on the removed engine, ensure that the oil pan ends flush with the cylinder block at the flywheel side.*
- ◆ *Allow the sealant to dry for about 30 minutes after installing the oil pan. Do not pour in engine oil until after this time has elapsed.*

Testing oil pressure and oil pressure switch**Special tools, testers and aids required**

- ◆ Oil pressure tester (e.g. V.A.G 1342)
- ◆ Diode test lamp (e.g. V.A.G 1527)
- ◆ Adapter cable set (e.g. V.A.G 1594)
- ◆ Current flow diagram

Function of dynamic oil pressure warning system

The oil pressure switch is opened when pressureless and closes when the operating pressure is reached.

The oil pressure warning is activated about 10 s after the ignition is switched on („terminal 15 on“).

On delay of oil pressure warning:
about 3 s

Off delay of oil pressure warning:
about 5 s

Testing warning lamp

After the ignition is switched on, engine not running, the oil pressure warning lamp in the dash panel insert must come on for about 3 s and then go out. The check is ended if the engine is switched on.

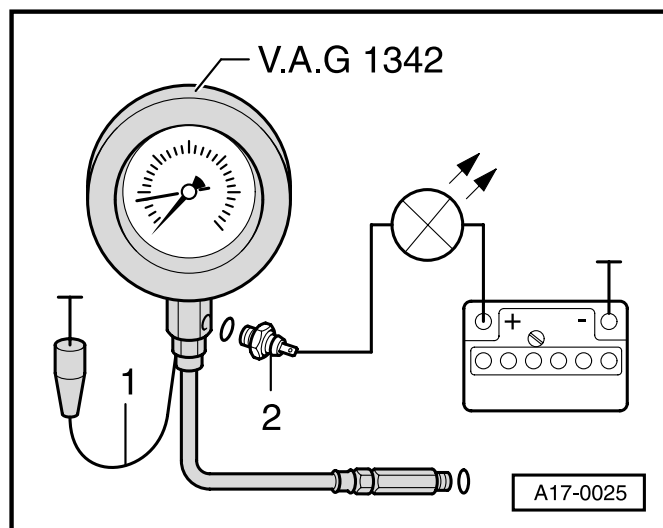
Warning criteria

The visual oil pressure warning (oil pressure warning lamp flashes) is switched on, and the buzzer sounds 3 times as an audible warning, if one of the following conditions exists:

- „Ignition on“, engine not running, oil pressure switch closed
- Engine speed greater than 1500 rpm, oil pressure switch opened
 - At an engine speed of more than 5000 rpm, the oil pressure warning is not cancelled, also not, if the oil pressure switch is closed. Oil pressure warning cancelled once engine speed drops below 5000 rpm.
 - If the oil pressure switch is open for only 0.5...3 s when engine speed is greater than 1500 rpm, this is stored in the combination processor of the dash panel insert. If this state occurs 3 times when the engine is running, the oil pressure warning is immediately activated and is also not cancelled when engine speed drops below 1500 rpm.
The oil pressure warning is cancelled if the oil pressure switch is closed for more than 5 s at an engine speed of more than 1500 rpm, or in the case of „Ignition off“.

Test conditions

- Engine oil level o.k.; testing ⇒ page 17-8
- Oil pressure warning lamp (K3) must come on for about 3 s when ignition is switched on
- Engine oil temperature at least 80 °C (radiator fan must have cut in once)



Testing oil pressure switch

- Detach cable from oil pressure switch.
- ◀ - Unscrew oil pressure switch and screw in oil pressure tester (e.g. V.A.G 1342).
- Screw oil pressure switch -2- into V.A.G 1342.
- Connect brown cable -1- of the tester to earth (-).
- Connect diode test lamp (e.g. V.A.G 1527) to oil pressure switch -2- and to battery positive (+).

The LED must not come on.

- If the LED comes on, replace oil pressure switch.
- Start engine and slowly increase engine speed.
- At a pressure of 0.12... 0.16 MPa the LED must come on; if not, replace oil pressure switch.

Testing oil pressure

- Unscrew oil pressure switch and screw in V.A.G 1342.
- Screw on oil pressure switch into V.A.G 1342.
- Start engine (engine oil temperature at least 80 °C).
 - ♦ Oil pressure at idling speed: min. 0.2 MPa
 - ♦ Oil pressure at 2000 rpm: 0.30...0.45 MPa

If the specifications are not achieved:

- Rectify mechanical damage, e.g. bearing damage.
- Replace oil filter holder with pressure relief valve
⇒ page 17-2, item 14, or oil pump ⇒ page 17-1, item 1.

At higher engine speeds, the oil pressure must not be greater than 0.7 MPa.

If the specification is exceeded:

- Inspect oil galleries.
- Replace pressure relief valve in oil filter holder, if necessary ⇒ page 17-2, item 14.

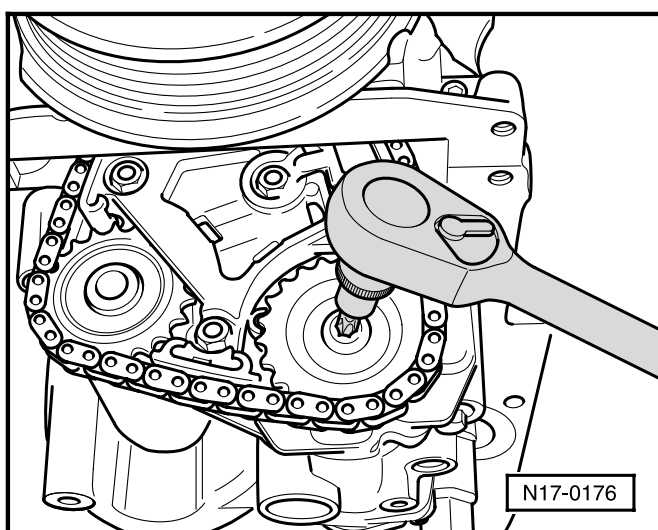
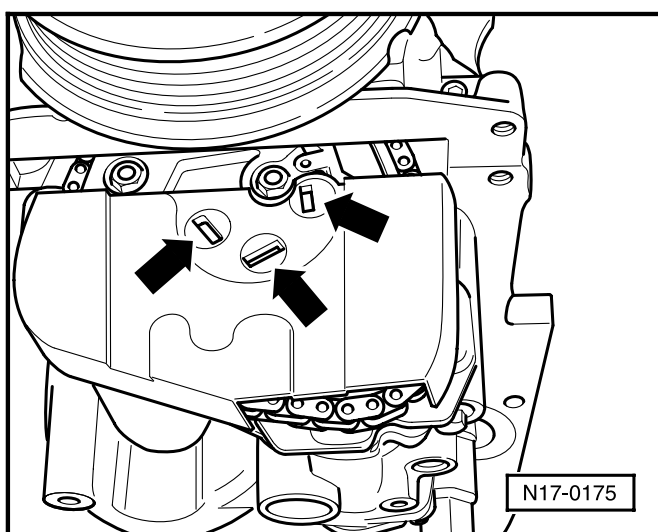
Removing and installing gearbox with balance shafts and oil pump

Special tools, testers and aids required

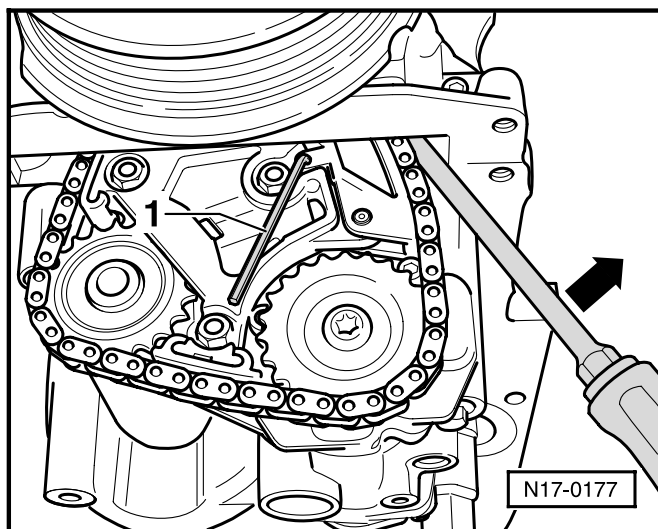
- ◆ Compensating drift T 10060

Removing

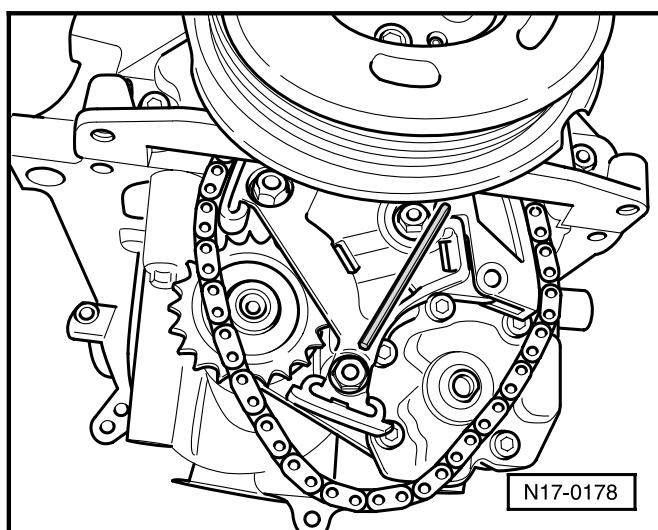
- Remove oil pan ⇒ page 17-3.
- ◀ - Take off chain cover, release cover by inserting a screwdriver through hole -arrows-.



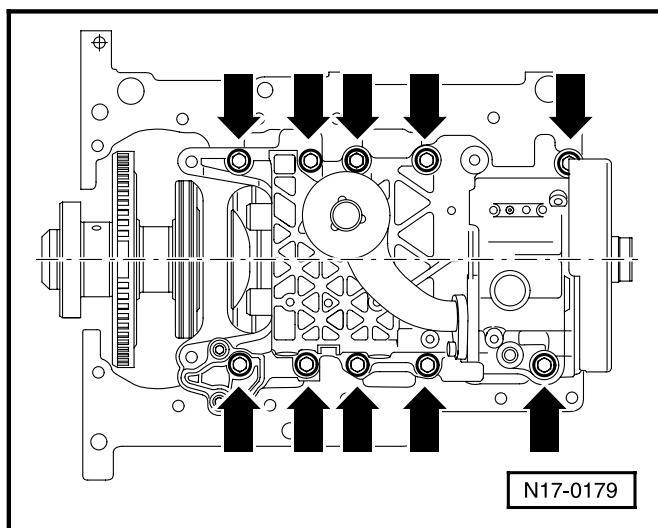
- ◀ - Slacken bolt on oil pump.



- ◀ - Expose chain tensioner with a screwdriver -arrow- and lock with Allen key -1-.



- ◀ - Remove chain sprocket for oil pump and release chain from the gearbox with balance shafts.



- ◀ - Unscrew bolts on gearbox with balance shafts by working from the outside into the middle.
- Take off gearbox with balance shafts and oil pump.

Installing and setting gearbox with balance shafts and oil pump

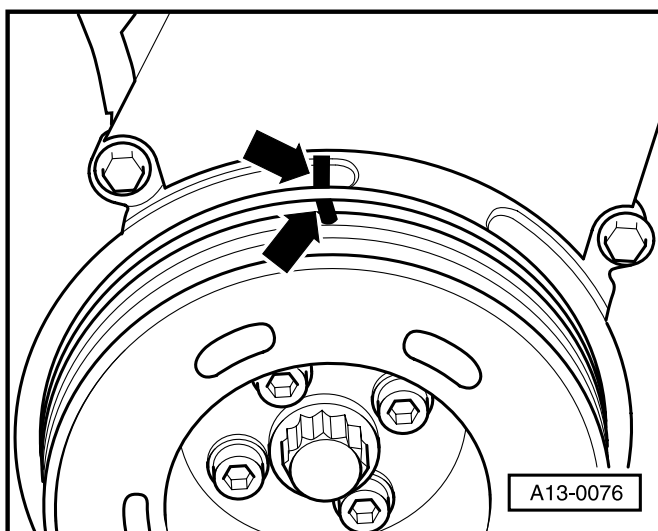
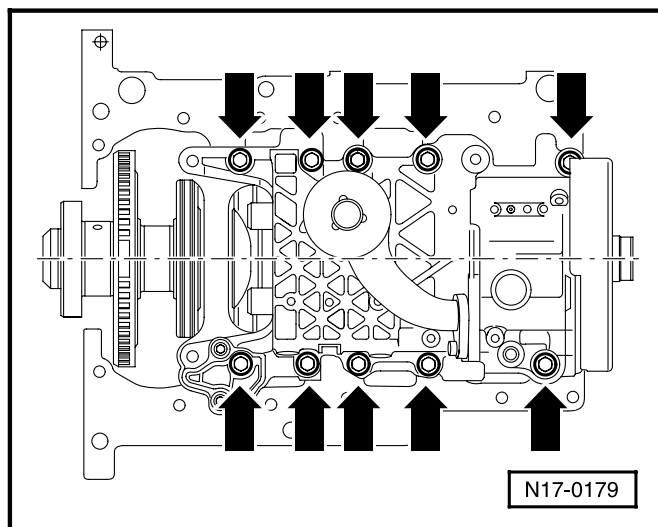
Conditions

- Chain tensioner pretensioned
⇒ page 17-12.

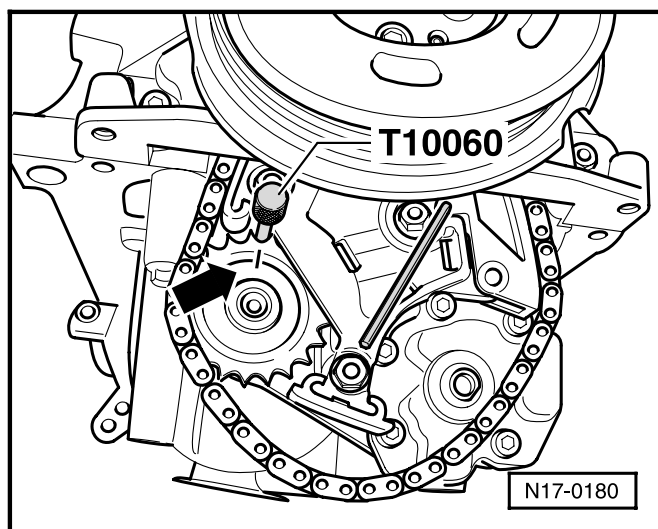
- ◀ - Insert gearbox with balance shafts.
- Insert bolts working from the middle toward the outside and tighten to 15 Nm and then torque a further 90° (¼ turn).

Note:

Pay attention to arrangement of bolts on gearbox with balance shafts ⇒ page 17-1.2.



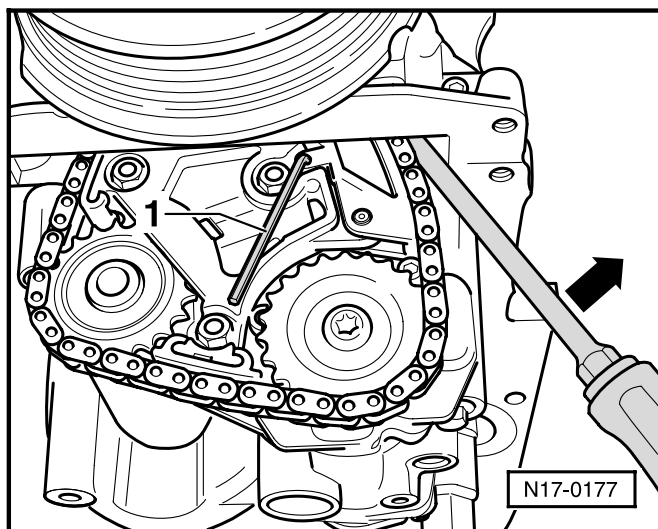
- ◀ - Position crankshaft to top dead centre of cylinder 1.



- ◀ - Align marking on balance shaft chain sprocket -arrow- with adjusting hole and lock with a pin T 10060.
- Fit chain onto the balance shaft chain sprocket.
- Set milled side of oil pump shaft at right angles to direction of travel.
- Install chain sprocket for oil pump and tighten bolt by hand.

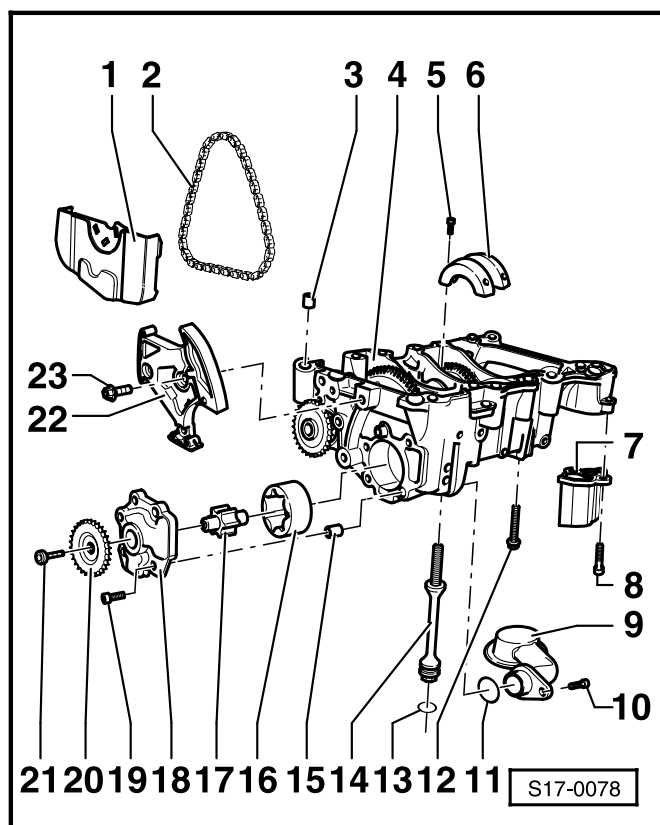
Note:

It is only possible to fit on chain sprocket for oil pump in one position. When installing, rotate with oil pump.



- ◀ - Pull out pin T 10060 and hexagon wrench.
- Tighten chain sprocket for oil pump to 20 Nm.
- The remaining assembly is performed in the reverse order of removal.

Disassembling and assembling gearbox with balance shafts and oil pump



1 - Chain cover

2 - Drive chain

- ♦ mark direction of running before removing

3 - Dowel sleeve

4 - Gearbox with balance shafts and oil pump

- ♦ inspect whether both dowel sleeves are fitted before installing

5 - 3 Nm

- ♦ secure with „D 000 600 A2“

6 - Cover

- ♦ to prevent engine oil foam

7 - Connection from oil return flow

- ♦ with gasket

8 - 9 Nm

9 - Suction line

- ♦ clean strainer if soiled

10 - 8 Nm

11 - O-ring

- ♦ replace

12 - 15 Nm + torque a further 90° (¼ turn)

- ♦ pay attention to arrangement of bolts
⇒ page 17-1.2

13 - O-ring

- ♦ replace

14 - Bolt with O-ring

- ♦ 15 Nm + torque a further 90° (¼ turn)

15 - Dowel sleeve**16 - Outer rotor**

- ♦ inspect contact surface for wear
- ♦ marking must be visible

17 - Inner rotor

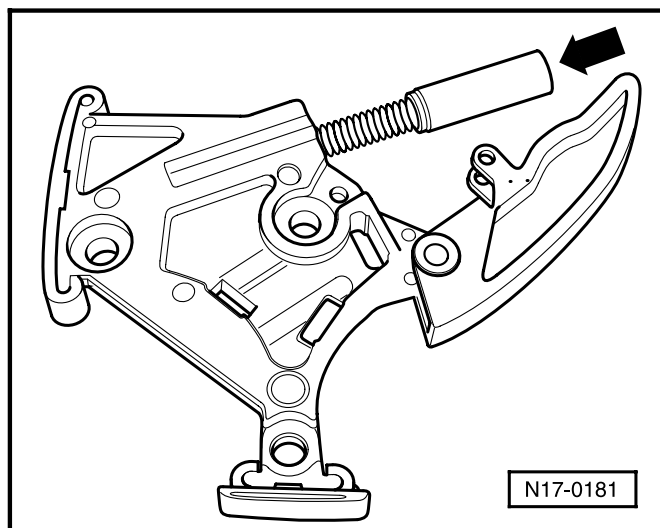
- ♦ inspect contact surface for wear

18 - Oil pump cover**19 - 8 Nm****20 - Chain sprocket****21 - 20 Nm****22 - Chain tensioner with tensioning slide**

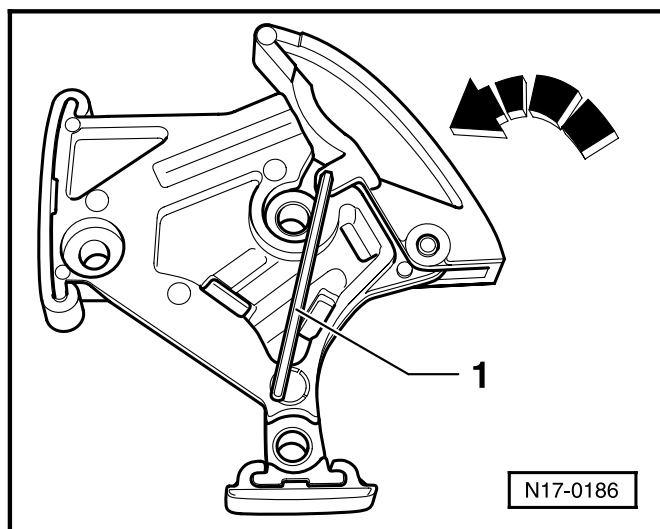
- ♦ pretension when installing ⇒ page 17-12

23 - 15 Nm**Tensioning chain tensioner**

- ◀ - Press piston in -direction of arrow- with your hand.

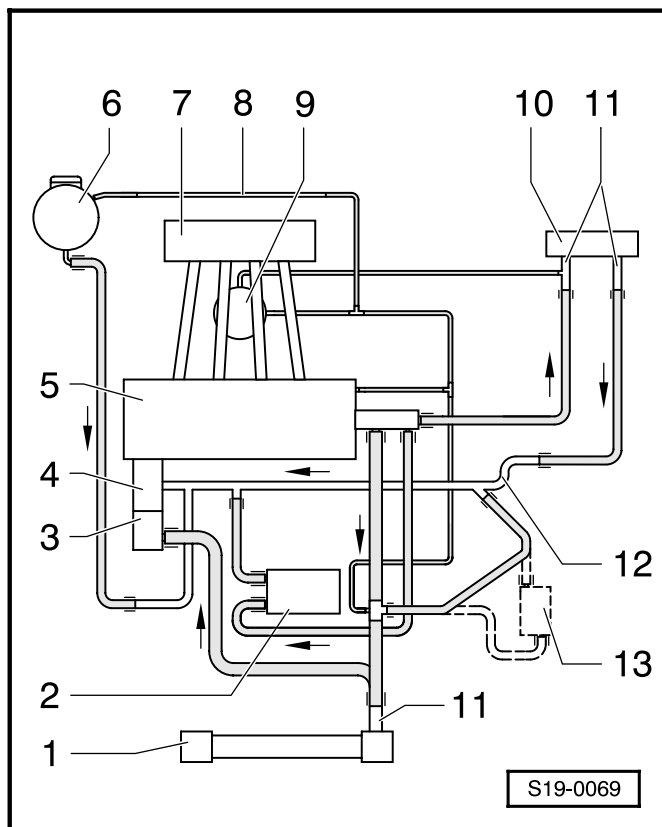


- ◀ - Press tensioning slide in -direction of arrow- and lock with Allen key -1-.



Removing and installing parts of the cooling system

Parts of cooling system



1 - Radiator

- ◆ After replacing, fill complete system with fresh coolant

2 - Oil cooler

- ◆ Removing and installing
⇒ page 17-3, item 17

3 - Coolant thermostat

- ◆ Removing and installing
⇒ page 19-12
- ◆ Testing, data ⇒ page 19-12

4 - Coolant pump

- ◆ Removing and installing
⇒ page 19-10
- ◆ Inspect for smooth running

5 - Cylinder block

6 - Expansion reservoir

7 - Intake pipe

8 - Coolant pipe

- ◆ At cross panel

9 - Throttle valve control unit

10 - Heating system heat exchanger

11 - Quick-coupling

12 - Coolant pipe

- ◆ At engine

13 - ATF cooler

- ◆ Only fitted to models with automatic gearbox

Notes:

- ◆ When the engine is warm, the cooling system is pressurized. Release pressure, if necessary, before commencing repairs.
- ◆ Hose connections are secured with spring strap clamps. Use only spring strap clamps when carrying out repairs.
- ◆ It is recommended to use the pliers for spring strap clamps for removing and installing such clamps.
- ◆ Always replace seals and gaskets.
- ◆ When installing coolant hoses, route them free of stress and ensure they do not touch other components (pay attention to marking on coolant connection and on hose).
- ◆ Draining and filling system with coolant
⇒ page 19-2.
- ◆ Coolant mixing ratios ⇒ page 19-3.
- ◆ Testing cooling system for leaks ⇒ page 19-5.

Draining and filling system with coolant

Quantity of coolant approx. 5.0 litres

Special tools, testers and aids required

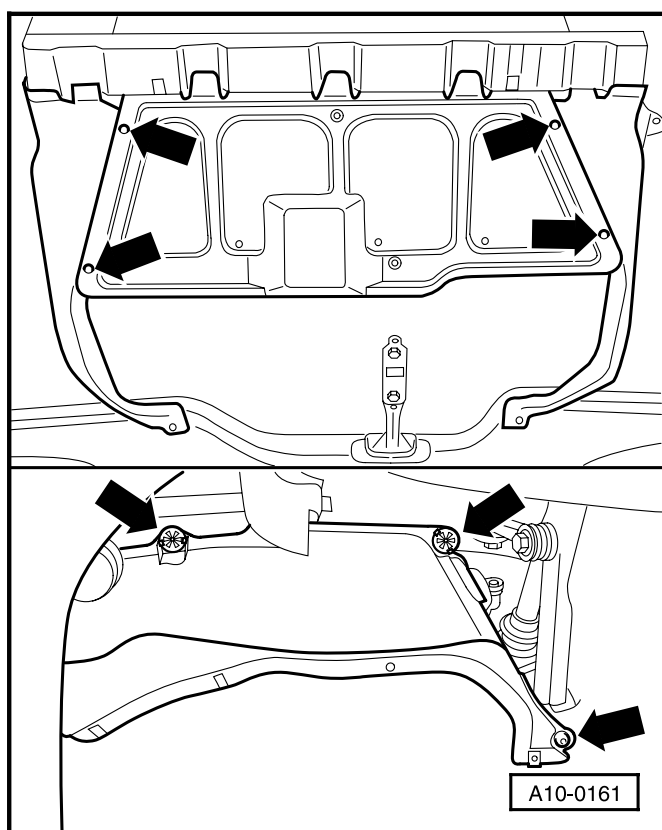
- ◆ Drip tray (e.g. V.A.G 1306)
- ◆ Antifreeze concentration tester

Draining system

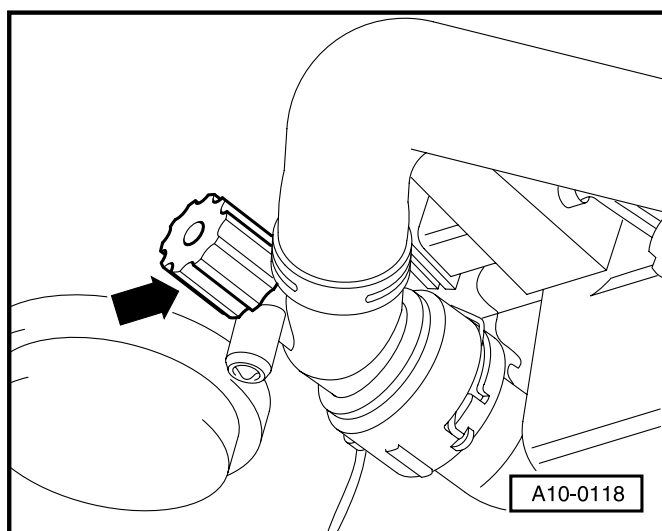
Warning!

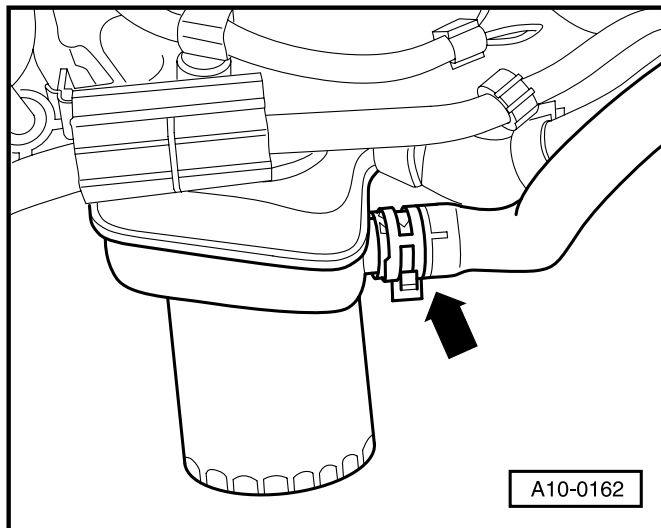
Hot steam may escape when the expansion reservoir is opened. Cover over cap with a cloth and open carefully.

- Open cap of expansion reservoir.
- ◀ - Remove noise insulation panel in middle -arrows in top half of illustration-.
- Place drip tray (e.g. V.A.G 1306) below the engine.



- ◀ - Turn drain plug -arrow- at the radiator to the left and pull back; fit hose onto connection, if necessary.





- ◀ - In addition remove coolant hose at bottom on the oil cooler -arrow- and drain residual coolant.

Notes:

- ◆ *Drained coolant must be caught for disposal.*
- ◆ *Observe the disposal instructions for coolant.*

Filling up

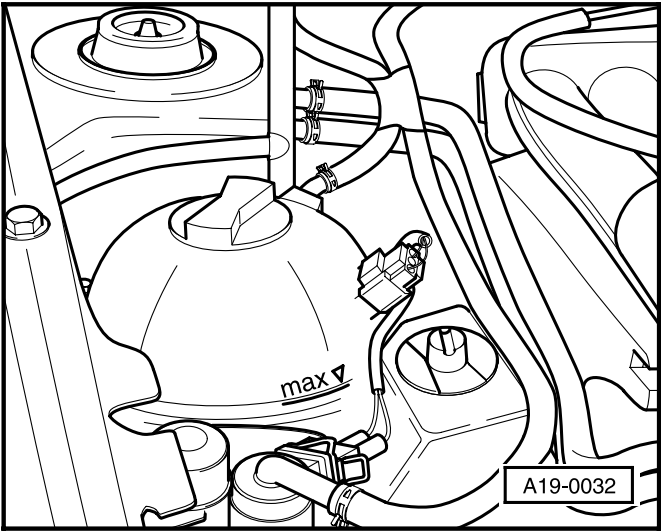
Select the appropriate coolant additive from the original spare parts catalogue ŠKODA or from the list of allowed coolant additives ⇒ Inspection and Maintenance; Rep Gr. 02.

Recommended mixture ratios:

Antifreeze protection down to	Antifreeze concentration ¹⁾²⁾	Drinking water ²⁾
-25 °C	40 % (2.8 l)	60 % (4.1l)
-35 °C	50 % (3.45 l)	50 % (3.45 l)

- 1) Because of inadequate corrosion protection, the antifreeze concentration must not be under 30 % and must not exceed 60 %, the antifreeze protection and cooling efficiency are reduced as the concentration increases.
- 2) The coolant amount may differ according to the version of the vehicle.

- Attach coolant hose to bottom of oil cooler.
- Insert and tighten coolant drain plug
- ◀ - Fill up coolant gradually up to max marking on the expansion reservoir.
- Close expansion reservoir.
- Start engine and run for not more than 3 minutes at 2000 rpm.
- Run engine until the fan starts.



Warning!

Hot steam may escape when the expansion reservoir is opened. Cover over cap with a cloth and open carefully.

- Inspect coolant level and top up, if necessary. When the engine is at normal operating temperature, the coolant level must be at the „max“ marking; when engine is cold, the level should be between the „min“ and „max“ markings.

Testing cooling system for leaks**Special tools, testers and aids required**

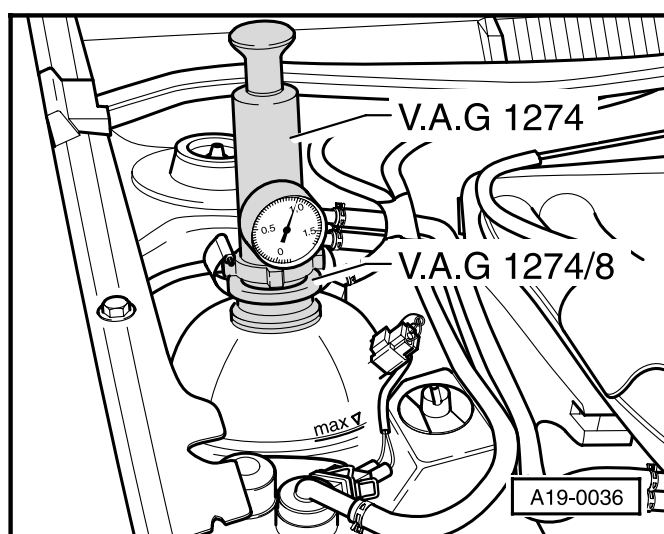
- ◆ Cooling system tester (e.g. V.A.G 1274)
- ◆ Adapter (e.g. V.A.G 1274/8)
- ◆ Adapter (e.g. V.A.G 1274/9)

Test condition

- Engine at operating temperature

Test procedure**Warning!**

Hot steam may escape when the expansion reservoir is opened. Cover over cap with a cloth and open carefully.



- Open cap of coolant expansion reservoir.
- ◀ - Fit tester V.A.G 1274 with adapter V.A.G 1274/8 onto the expansion reservoir.
- Operate the hand pump of the tester to produce a pressure of about 0.1 MPa.
- If the pressure drops, determine the leakage point and rectify.

Testing pressure relief valve in cap

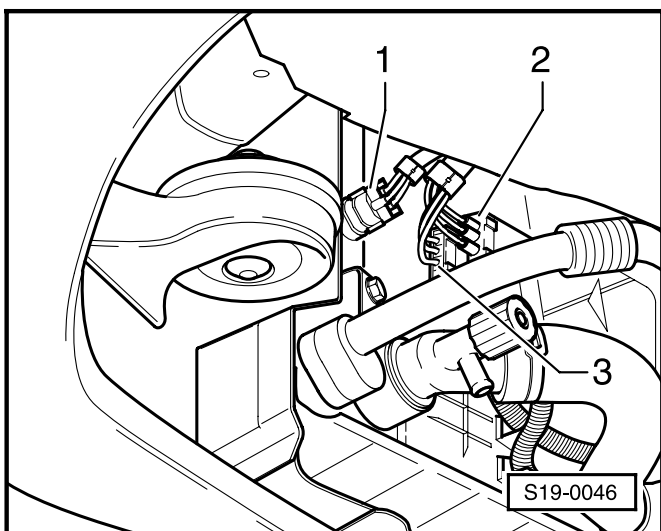
- Screw cap onto the tester using adapter V.A.G 1274/9.
- Operate the hand pump of the tester to produce a pressure of about 0.15 MPa.
- The pressure relief valve must open at a pressure of 0.12 ... 0.15 MPa.

Removing and installing radiator**Notes:**

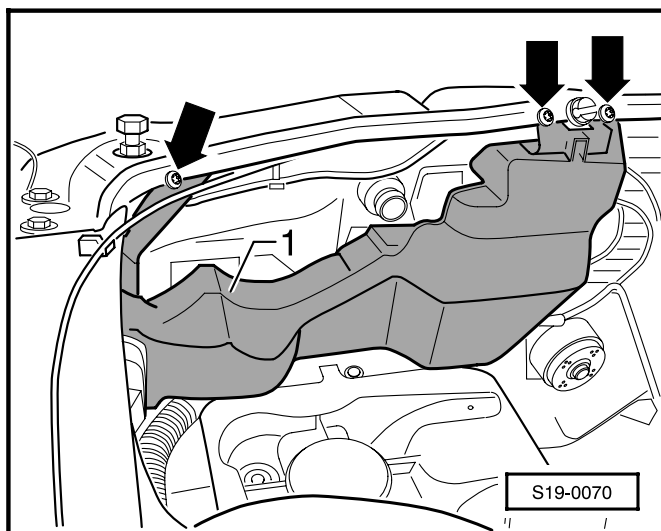
- ♦ Always replace seals and gaskets.
- ♦ Raise vehicle with lift platform ⇒ page 10-1, Removing and installing engine.

Special tools, testers and aids required

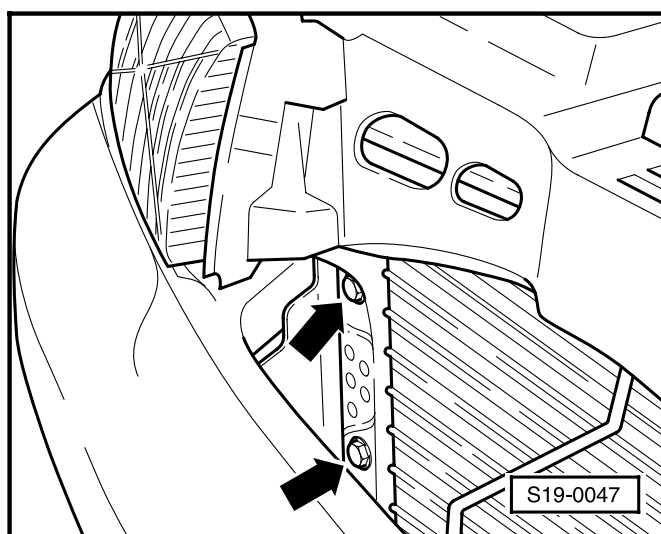
- ♦ Torque wrench 5...50 Nm (e.g. V.A.G 1331)

Removing

- On vehicles fitted with coded radio set, pay attention to code; determine if necessary.
- Remove battery.
- Drain coolant ⇒ page 19-2.
- ◀ - Unplug connector from thermoswitch (F18)
-1- and separate plug connections -2- and -3- at the fan shroud (press catches).
- Remove both headlamps.
⇒ Electrical System; Repair Group 94; Removing and installing headlamps
- Separate coolant hoses at the connection fitting of the radiator (pull off retaining clip as far as the stop).



- ◀ - Unbolt air intake connection -1- from the lock carrier -arrow-.



Models fitted with air conditioning

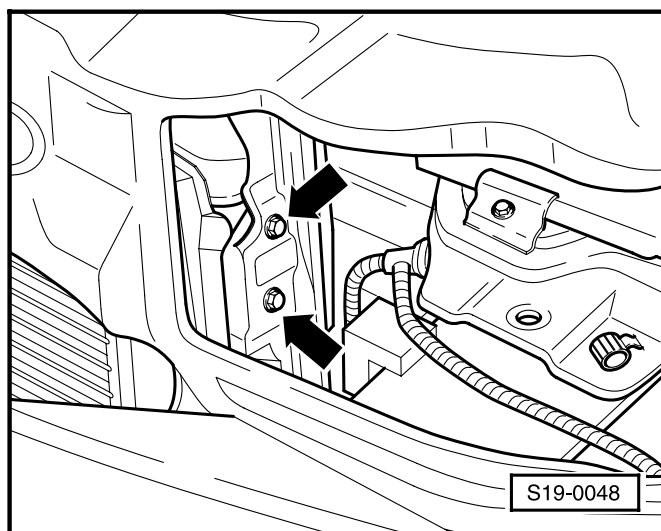
- ◀ - Unscrew the 4 bolts -arrows- attaching the condenser.

Warning!

The refrigerant circuit of the air conditioning system must not be opened.

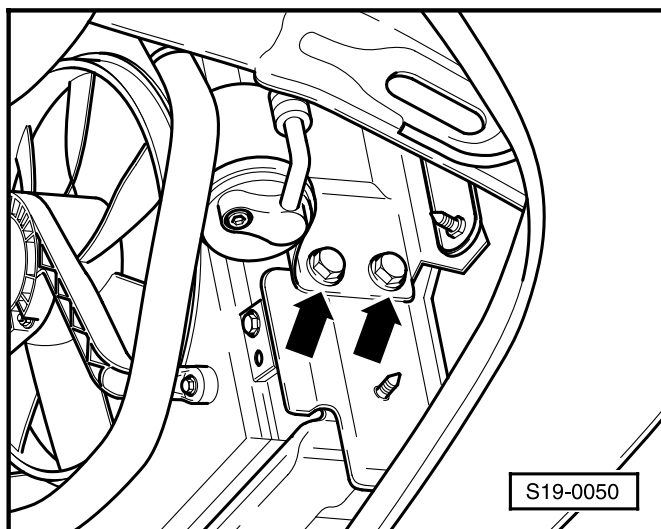
Note:

To avoid damage to the condenser and also to the refrigerant lines and hoses, ensure that the lines and hoses are not overtensioned, kinked or bent.



Continued for all models

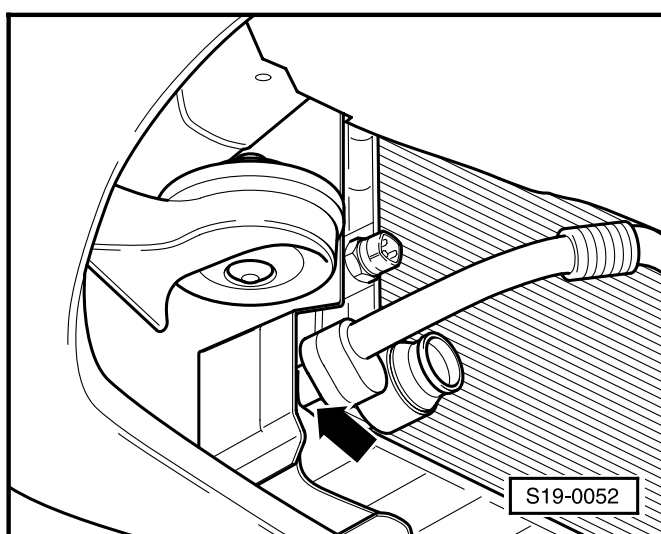
- ◀ - Unscrew the 4 bolts -arrows- attaching the radiator mount at the top right and left.



- Unbolt bottom horn.
- ◀ - Unscrew the 4 bolts -arrows- attaching the radiator mount at the bottom right and left.

Models with air conditioning

- Pull out radiator and condenser a little.
- ◀ - Take off retaining clamp -arrow- for refrigerant line.



Continued for all models

- Remove radiator mounts.
- Unplug front connector from control unit for radiator fan.
- Remove fan shroud (4 bolts).

Note:

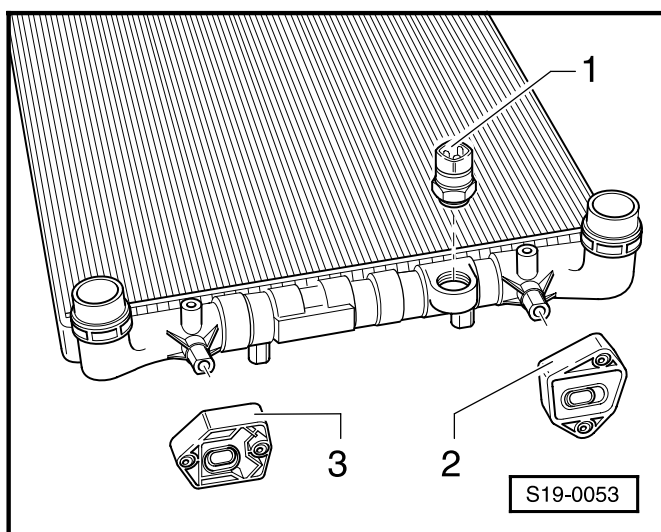
When removing and installing the fan shroud, ensure that the radiator fins are not damaged.

- Remove radiator by carefully taking it down and out.

Installing

Installation is carried out in the reverse order. Pay attention to the following points:

- ◀ - Tighten thermoswitch -1- to 35 Nm.
- Fit radiator mounts -2- and -3- onto radiator, as shown.
- Tighten the bolts attaching the fan shroud and radiator mounts to 8 Nm.
- On models fitted with air conditioning, tighten the bolts attaching condenser and fixture for refrigerant lines to 8 Nm.



- Replace O-rings in the connection fittings of the coolant hoses.
- Screw in coolant drain plug.
- Fill system with coolant ⇒ page 19-3.
- Install headlamps:
⇒ Electrical System; Repair Group 94; Removing and installing headlamps
- Install battery.
⇒ Electrical System; Repair Group 27; Removing and installing battery
- After re-connecting the battery:
 - Encode radio.
 - Set clock.
 - Initialise power windows.
- ⇒ Inspection and Maintenance
- Interrogate fault memory and erase.
⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 01; Interrogating and erasing fault memory
- Generate readiness code.
⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 01; Generating readiness code
- Carry out the "Procedure after interruption to voltage supply".
⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Procedure after interruption to voltage supply

Removing and installing coolant pump

Special tools, testers and aids required

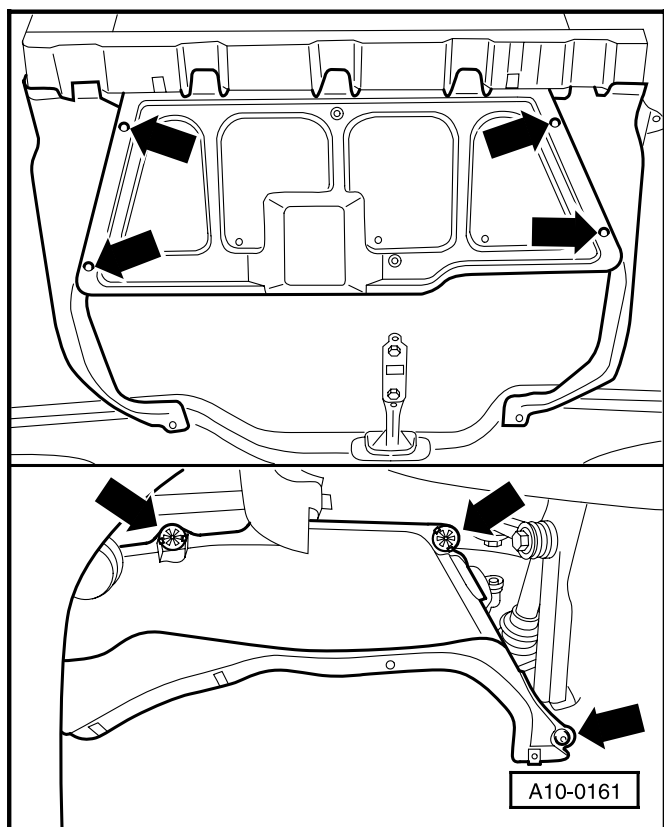
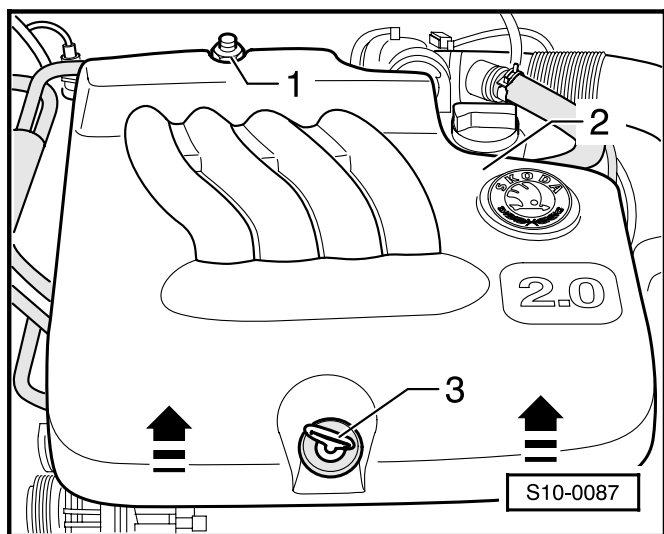
- ♦ Torque wrench 5...50 Nm
(e.g. V.A.G 1331)

Removing

- ◀ - Remove engine trim panel -2-.

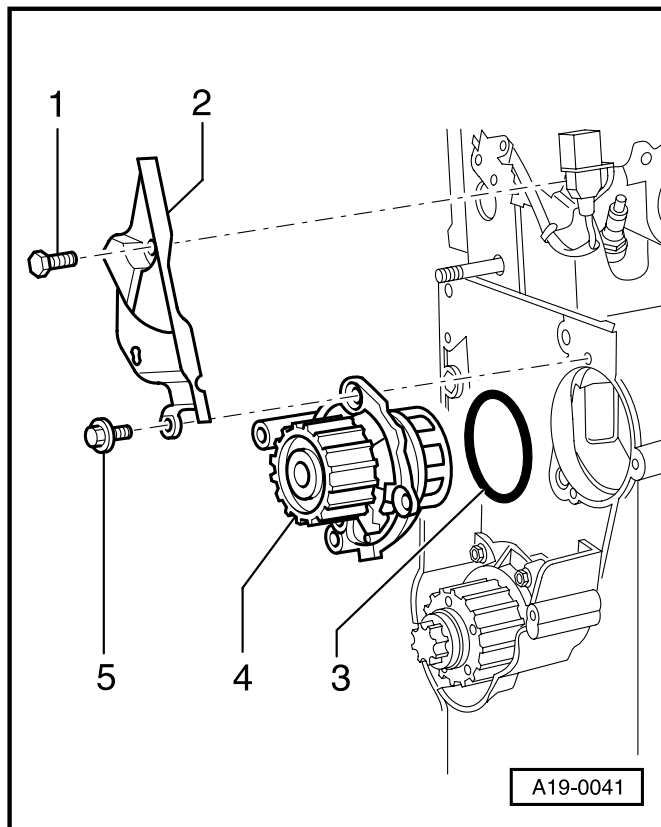
Slacken nut -1- for this step, withdraw dipstick -3- and remove cover by pulling it up at the front with a jerk (arrows).

- Drain coolant ⇒ page 19-2.



- ◀ - Remove noise insulation panel in the middle and on the right -arrows-. Remove air guide on right on outside first of all.

- Remove ribbed V-belt ⇒ page 13-3.
- Remove tensioning device for ribbed V-belt ⇒ page 13-1.
- Remove toothed belt guard at top and middle ⇒ page 13-5.
- Position crankshaft to TDC of cylinder 1 ⇒ page 13-8.
- Take off toothed belt at camshaft sprocket ⇒ page 13-7, Removing toothed belt.

**Notes:**

- ♦ The belt pulley/vibration damper and the toothed belt guard at the bottom can remain installed.
- ♦ The toothed belt remains fitted onto the crankshaft sprocket.
- ♦ Pay attention to all the notes for removal and installation of toothed belt ⇒ page 13-5.

◀ - Unscrew bolts -1- and -5- and take off rear toothed belt guard -2-.

- Unbolt coolant pump -4- and carefully guide out along the engine support.

Installing

- Clean sealing surface for O-ring, or smooth if necessary.
- Moisten new O-ring -3- with coolant additive.
- Insert coolant pump. Installation position: plug in housing faces down.
- Insert rear toothed belt guard, and tighten bolt -1- to 20 Nm.
- Tighten bolts -5- of coolant pump to 15 Nm.
- Install toothed belt, tension ⇒ page 13-5.
- Install ribbed V-belt ⇒ page 13-4.
- Fill system with coolant ⇒ page 19-3.

Removing and installing, testing coolant thermostat

Special tools, testers and aids required

- ◆ Torque wrench 5...50 Nm (e.g. V.A.G 1331)
- ◆ Pliers for spring strap clamps

Note:

Always replace seals and gaskets.

Removing

- Drain coolant ⇒ page 19-2.
- ◀ - Detach coolant hose from connection fitting -3-.
- Use hinged wrench to unscrew bolts -4-, take off connection fitting together with O-ring -2- and coolant thermostat -1-.

Testing coolant thermostat

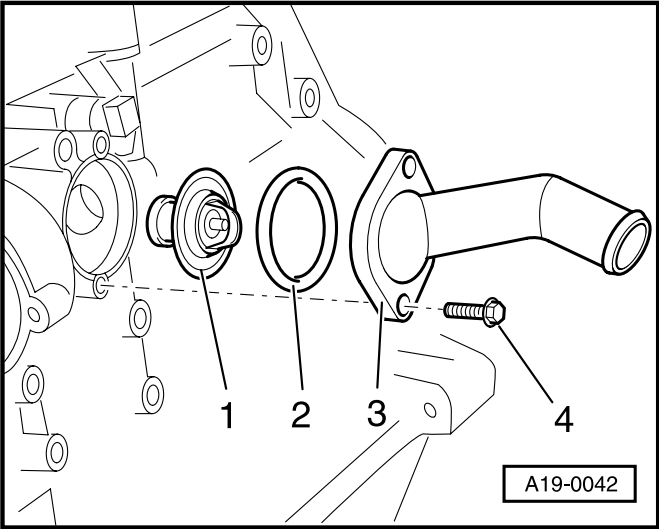
- Heat thermostat in a water bath.

Start of opening	End of opening	Opening stroke
approx. 87 °C	approx. 102 °C ¹⁾	min. 7 mm

¹⁾ cannot be tested

Installing

- Clean sealing surface for O-ring.
- Insert coolant thermostat. Installation position: hoop of coolant thermostat must be vertical.
- Moisten new O-ring with coolant additive.
- Tighten bolts to 15 Nm.
- Fill system with coolant ⇒ page 19-3.



Installing coolant pipe

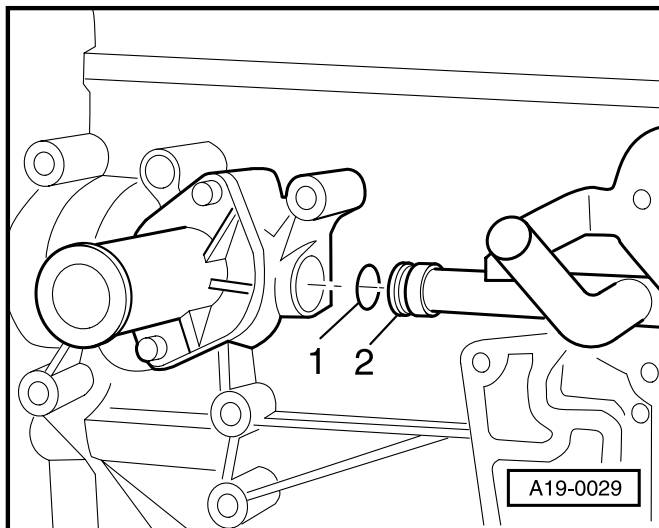
Special tools, testers and aids required

- ◆ Torque wrench 5...50 Nm
(e.g. V.A.G 1331)
- ◆ Pliers for spring strap clamps

Note:

Always replace seals and gaskets.

- ◀ - Moisten O-ring -1- with coolant additive and push onto coolant pipe -2-.
- Push coolant pipe into the hole at the cylinder block.
- Tighten clamp for coolant pipe to 10 Nm.



Removing and installing parts of the fuel supply system

Notes:

- ◆ *Hose connections are secured with spring strap or collar clamps.*
- ◆ *Collar clamps must always be replaced by spring strap clamps or screw-type clamps.*
- ◆ *Fuel hoses at the engine must be secured only with spring strap clamps. It is not permitted to use collar or screw-type clamps.*
- ◆ *Always replace seals and gaskets when carrying out removal and installation work.*

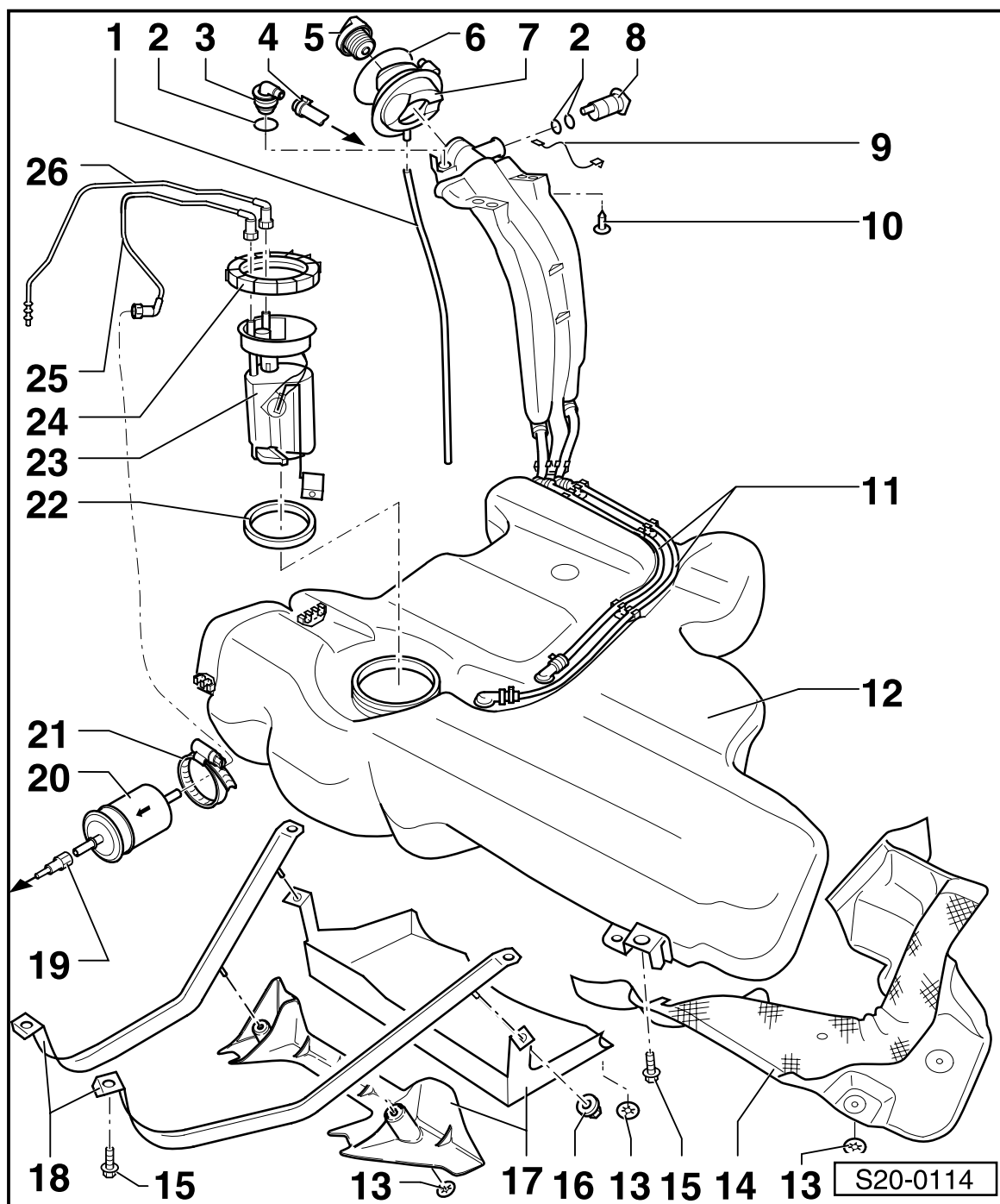
Pay attention to safety precautions
⇒ page 20-4.

Pay attention to rules for cleanliness
⇒ page 20-4.

Removing and installing parts of the activated charcoal filter system ⇒ page 20-12.

Servicing throttle mechanism ⇒ page 20-13.

Removing and installing fuel tank with attached parts and fuel filter



S20-0114

1 - Overflow hose

2 - O-ring

♦ replace

3 - Gravity valve

♦ to remove, unclip valve and lift up and out of the filler neck

♦ checking valve for blockage:
valve vertical: open
valve tilted 45°: closed

4 - Vent line

♦ to activated charcoal filter

5 - Cap

♦ replace seal if damaged

6 - Tensioning ring

7 - Rubber bowl

8 - Vent valve

- ♦ Inspecting ⇒ Fig. 1

9 - Earth connection**10 - 10 Nm****11 - Vent line****12 - Fuel tank**

- ♦ Removing and installing
⇒ page 20-6

13 - Clamping washer

- ♦ Removing: turn to the left
- ♦ Installing: tighten to 2 Nm

14 - Heat shield

- ♦ For fuel tank

15 - 25 Nm**16 - Clamping nut**

- ♦ Installing: tighten to 2 Nm

17 - Cover panel

- ♦ For fuel tank
- ♦ Not fitted to all models

18 - Tensioning strap

- ♦ Pay attention to different length

19 - Feed line

- ♦ black
- ♦ To fuel rail
- ♦ For detaching, press in release buttons on connection piece

20 - Fuel filter

- ♦ Installation position: arrow points in direction of flow

21 - Retaining clamp

- ♦ For fuel filter

22 - Seal

- ♦ Moisten with fuel for installing
- ♦ Replace if damaged

23 - Fuel delivery unit

- ♦ Removing and installing
⇒ page 20-5
- ♦ Testing fuel pump ⇒ page 20-9
- ♦ Removing and installing fuel gauge sender ⇒ page 20-6
- ♦ Testing holding pressure:
⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Testing fuel pressure regulator and holding pressure

24 - Union nut

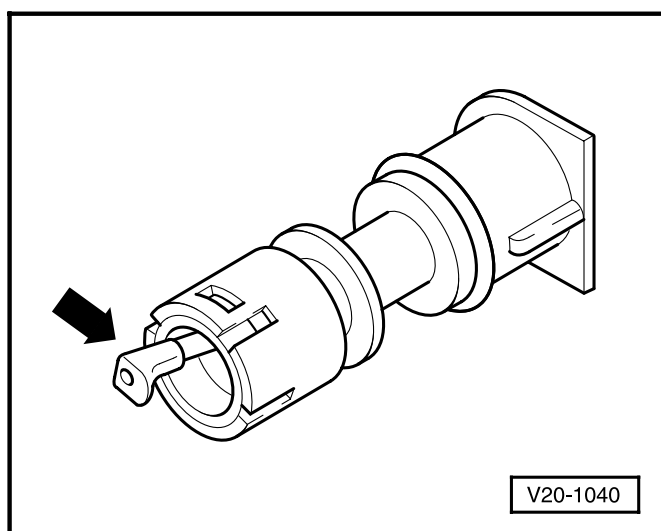
- ♦ Use wrench MP 1-227 for removing and installing

25 - Feed line

- ♦ black
- ♦ To fuel filter
- ♦ Attached to connection marked with „V“ at flange
- ♦ For detaching from flange, press in release buttons on connection piece

26 - Return-flow line

- ♦ blue
- ♦ From fuel rail
- ♦ Is attached to connection marked with „R“ at flange
- ♦ For detaching from flange, press in release buttons on connection piece



◀ **Fig. 1 Inspecting vent valve**

Lever in off position: closed

Lever pushed in direction of arrow: open

Safety precautions when carrying out work on fuel supply system

Warning!

Fuel system is pressurized! Place cleaning cloth around the connection point before opening the system. Then, release the pressure by carefully detaching the connection point.

Pay attention to the following points when removing and installing the fuel gauge sender or the fuel pump (fuel delivery unit) from the fuel tank:

- ◆ Fuel tank must be filled to not more than two-thirds.
- ◆ The exhaust hose of an operating exhaust extraction system must be positioned close to the assembly opening of the fuel tank to extract the fuel gases which are released, before commencing the work.
If no exhaust extraction system is available, a radial fan (motor not in air flow) with a delivery volume of more than 15 m³/h can also be used.
- ◆ Avoid skin contact with fuel! Wear fuel-resistant gloves!

Rules for cleanliness

Pay careful attention to the following „5 rules“ for cleanliness when carrying out work on the fuel supply and fuel injection system:

- ◆ Thoroughly clean connection points and the surrounding area before disconnecting.
- ◆ Place removed parts down on a clean surface and cover over. Do not use fluffing cloths!
- ◆ Carefully cover over or seal opened components if repairs are not carried out immediately.
- ◆ Install only clean parts:
Do not remove replacement parts from their wrapping until just before installing.
Do not use parts which have been stored unwrapped (e.g. in tool boxes etc.).
- ◆ If the system is opened:
Avoid working with compressed air.
Avoid moving the vehicle.

Removing and installing fuel delivery unit

Pay attention to safety precautions
⇒ page 20-4.

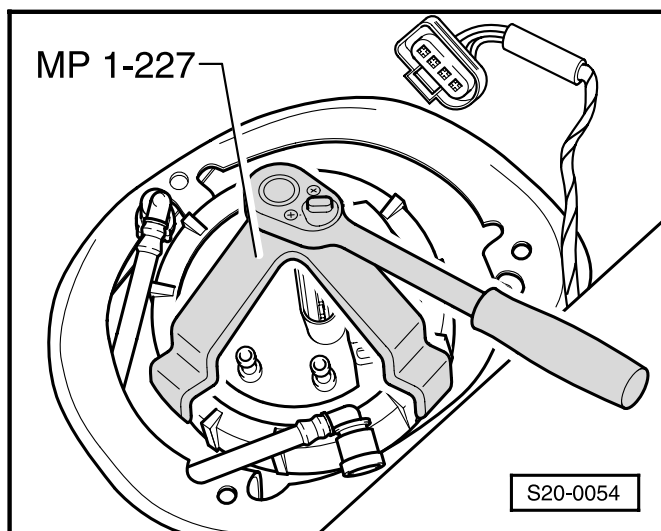
Pay attention to rules for cleanliness
⇒ page 20-4.

Special tools, testers and aids required

- ◆ Wrench for union nut MP 1-227

Removing

- On models fitted with coded radio set, pay attention to code; determine if necessary.
- Switch off ignition (if not already off) and disconnect earth strap at the battery.
- Unbolt cover (below rear seat).
- Detach feed and return-flow lines from flange of fuel delivery unit (press release buttons).
- Unlock and unplug 4-pin connector from flange at fuel tank.
- ◀ - Use wrench MP 1-227 to unscrew union nut.
- Pull fuel delivery unit and seal out of the opening of the fuel tank.



Note:

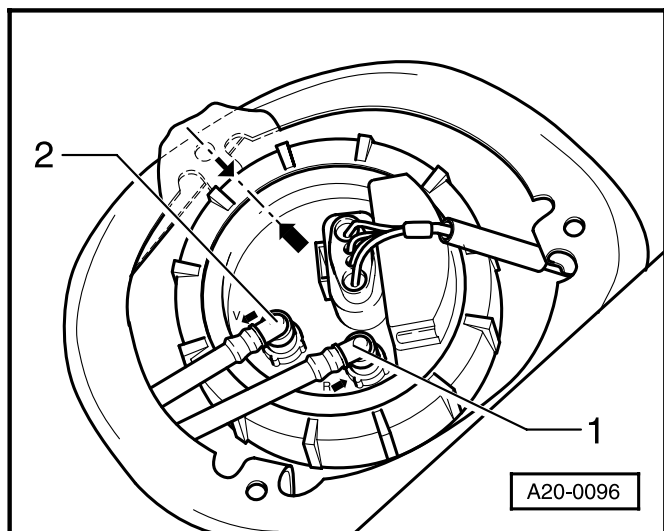
If the fuel delivery unit is still filled with fuel, empty it before replacing.

Installing

Installation is carried out in the reverse order to removal. Pay attention to the following points:

Notes:

- ◆ When inserting the fuel delivery unit, ensure that the fuel gauge sender is not bent.
- ◆ Moisten seal of flange with fuel for installing.
- ◆ Ensure the fuel hoses are tightly connected.

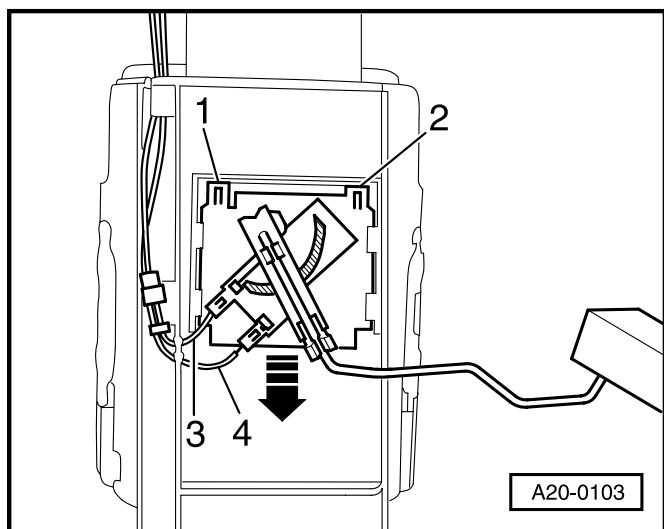


- ◀ - Pay attention to installation position:
 - ◆ Marking on closing flange must be aligned with marking on fuel tank -arrows-.
 - ◆ Blue return-flow line -1- attached to connection marked with -R-.
 - ◆ Black feed line -2- attached to connection marked with -V-.

Removing and installing fuel gauge sender

Removing

- Remove fuel delivery unit ⇒ page 20-5.
- ◀ - Release connector tongues of cables -3- and -4- and unplug.
- Use a screwdriver to raise catches -1- and -2- and pull fuel gauge sender down and off -arrow-.



Installing

- Insert fuel gauge sender into the guides at the fuel delivery unit and press up until it locks in place.

Removing and installing fuel tank

Pay attention to safety precautions
⇒ page 20-4.

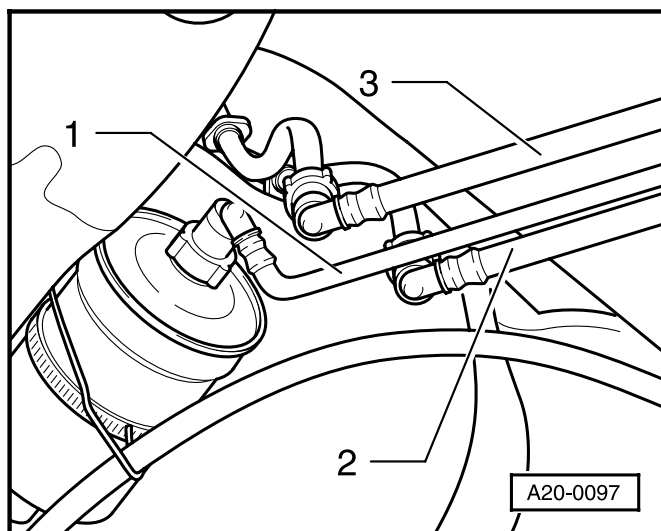
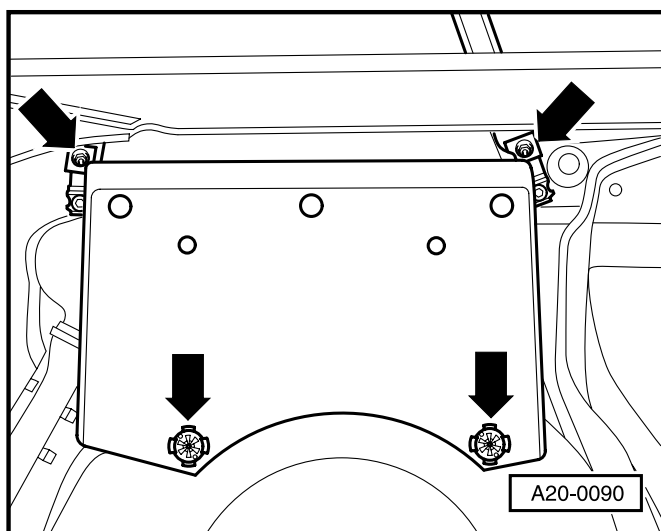
Pay attention to rules for cleanliness ⇒ page 20-4.

Special tools, testers and aids required

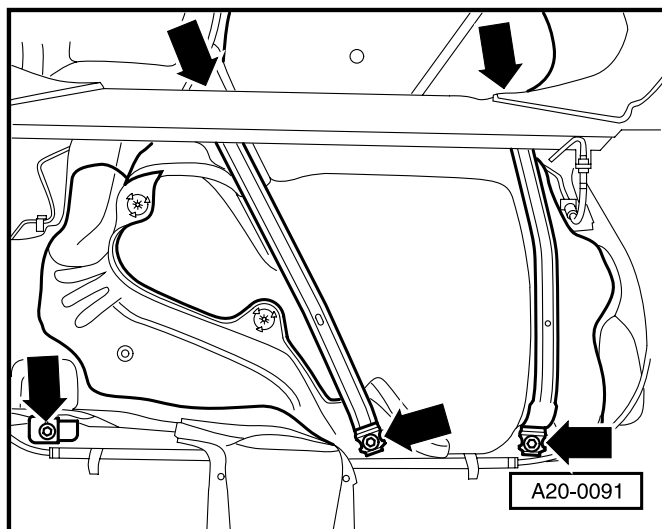
- ◆ Engine/gearbox jack
(e.g. V.A.G 1383 A)
- ◆ Fuel extraction equipment
(e.g. V.A.G 1433 A)

Removing

- On models fitted with coded radio set, pay attention to code; determine if necessary.
- Switch off ignition (if not already off) and disconnect earth strap at the battery.
- Drain fuel tank with fuel extraction equipment (e.g. V.A.G 1433 A).
- Remove rear axle:
⇒ Running Gear; Repair Group 42; Servicing rear axle; Removing and installing rear axle
- Unbolt cover (below rear seat).
- Release and unplug 4-pin connector from flange at fuel tank.
- Open fuel filler flap and lever out tensioning ring in rubber bowl (around filler neck).
- Push rubber bowl through to the inside.
- Remove wheelhouse liner at rear right.
- Unbolt fuel filler neck below wheelhouse liner.
- ◀ - Remove cover panel below fuel tank -arrows- (if fitted).



- ◀ - Separate return-flow line -2- (blue), feed line -1- (black) and vent line -3- (white) at front right of fuel tank (press release buttons).
- Position engine/gearbox jack (e.g. V.A.G 1383 A) below the fuel tank to support it.

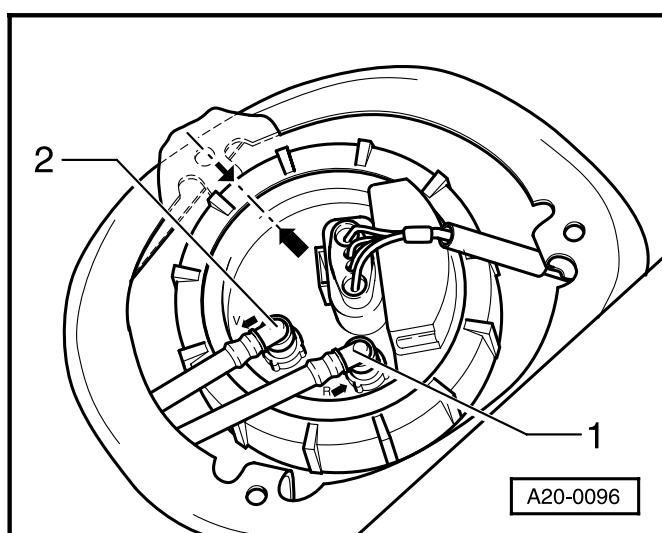


- ◀ - Slacken bolted connections -arrows- at front left and at the retaining straps.
- Lower fuel tank.

Installing

Installation is carried out in the reverse order to removal. Pay attention to the following points:

- ◀ - Connect fuel lines at flange of fuel delivery unit:
 - ◆ Blue return-flow line -1- attached to connection marked with -R-.
 - ◆ Black feed line -2- attached to connection marked with -V-.



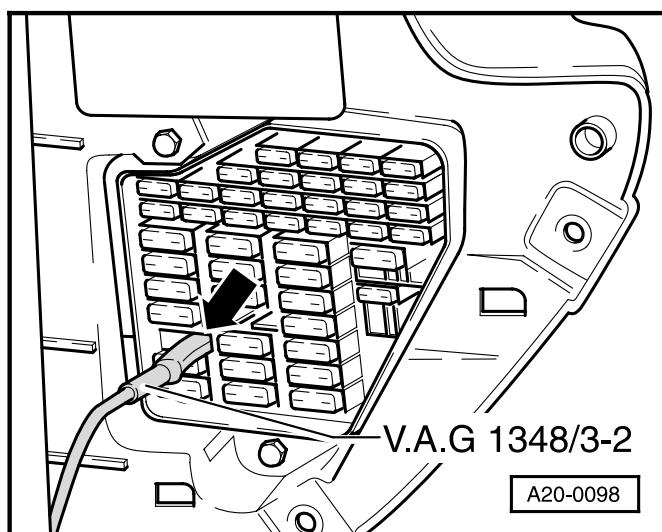
Connecting remote control

Special tools, testers and aids required

- ◆ Remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2

Procedure

- Open cover of fuse box at left side of dash panel.
- Pull out fuse 28 at fuse carrier (left-hand row, 5th large fuse from above).
- ◀ - Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 to the fuse base of fuse 28 -arrow-.
- Connect clamp to vehicle battery (+).



Testing fuel pump

Special tools, testers and aids required

- ◆ Hand-held multimeter (e.g. V.A.G 1526)
- ◆ Adapter cable set (e.g. V.A.G 1594 A)
- ◆ Wrench for union nut MP 1-227
- ◆ Current flow diagram

Test conditions

- Holding pressure o.k.; testing:
⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Testing fuel pressure regulator and holding pressure
- Battery voltage at least 12 V
- Fuse 28 o.k.
- Fuel filter o.k.

Test procedure

- Switch on ignition.

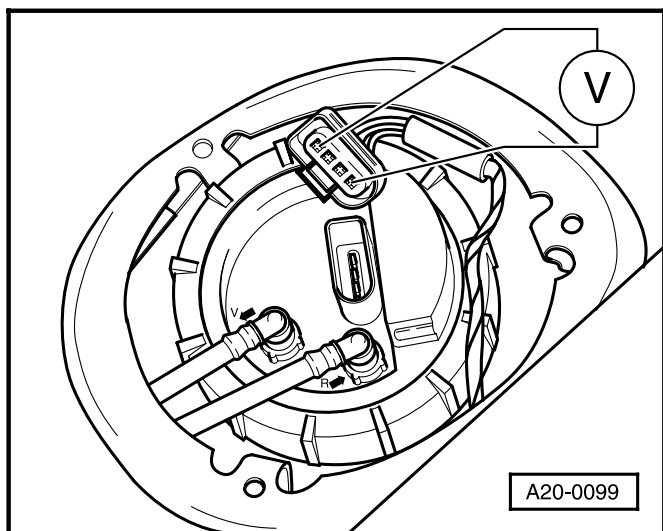
The fuel pump must be heard to run. (A second person is required for this if there is a high level of surrounding noise).

If the fuel pump does not run:

- Switch off ignition.
- Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 ⇒ page 20-8.
- Operate remote control.

If the fuel pump runs:

- Test actuation of fuel pump relay according to current flow diagram:
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder



If the fuel pump does not run:

- Unbolt cover (below rear seat).
- Release and unplug 4-pin connector from flange at fuel tank.
- ◀ - Connect hand-held multimeter (e.g. V.A.G 1526) to the outer contacts of the connector using adapter cables (e.g. from V.A.G 1594 A).
- Operate remote control.
Specification: approx. battery voltage

If the specification is not achieved:

- Determine and rectify open circuit in wiring according to current flow diagram:
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

If the specification is achieved:

- Use MP 1-227 to unscrew union nut.
- Check whether the electric cables are connected between flange and fuel pump; test for continuity, if necessary.

If no open circuit in the wiring can be found:

Fuel pump is faulty.

- Replace fuel delivery unit
⇒ page 20-5.

Testing delivery of fuel pump

Special tools, testers and aids required

- ◆ Adapter (e.g. V.A.G 1318/17)
- ◆ Measuring vessel

Test conditions

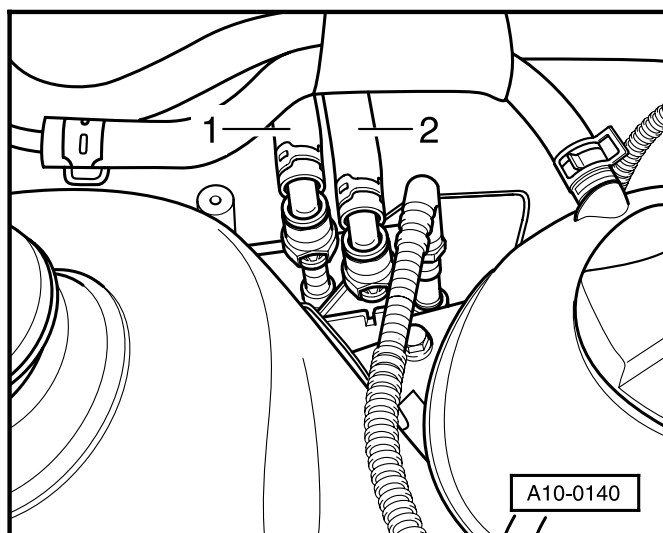
- Battery voltage at least 12 V
- Voltage supply o.k.
- Fuel filter o.k.

Test procedure

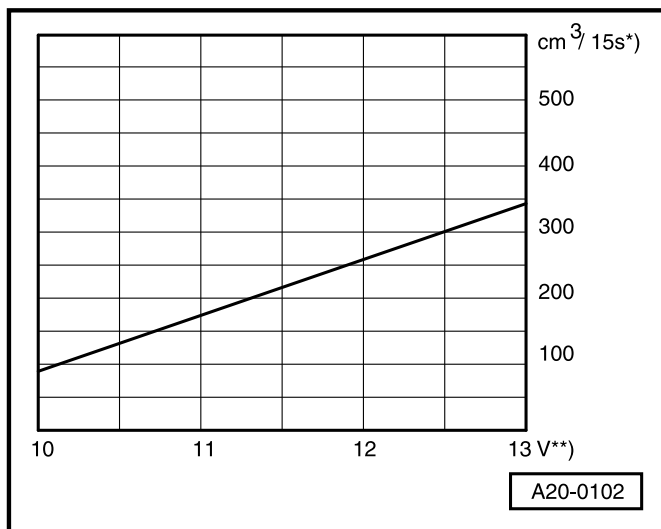
- Switch off ignition.
- Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 ⇒ page 20-8.
- Remove cap of fuel filler neck.

Warning!

Fuel system is pressurized! Place cleaning cloth around the connection point before opening the system. Then, release the pressure by carefully detaching the connection point.



- ◀ - Detach fuel return-flow line -2- (press release buttons).
- Connect auxiliary hose to adapter V.A.G 1318/17 and fit on to the fuel return-flow line of the engine and hold in a measuring vessel.
- Operate remote control for 15 seconds (press button and hold).

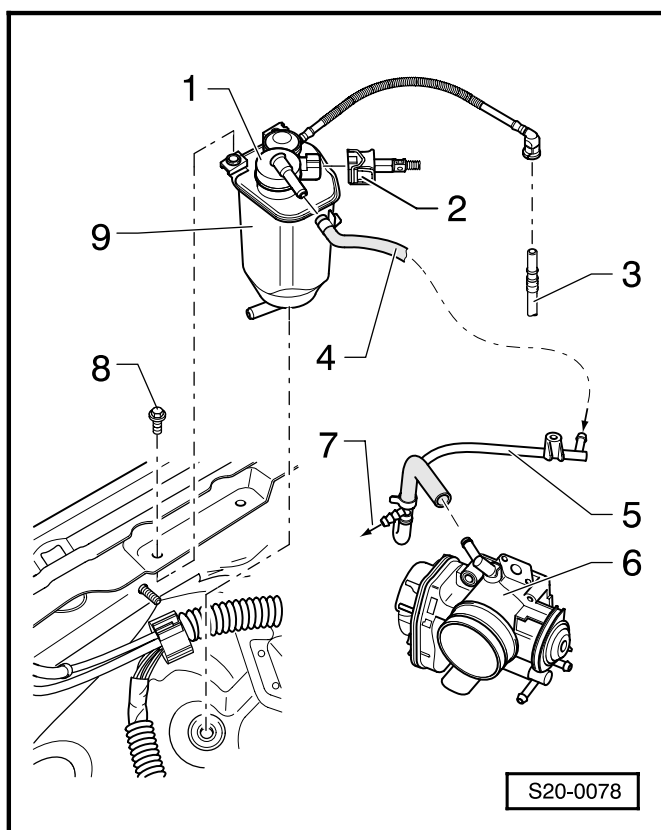


◀ - Compare quantity of fuel pumped with specification.

*) Minimum delivery cm³/15 s

**) Voltage at fuel pump when engine switched off and pump running (approx. 2 V less than battery voltage).

Removing and installing parts of activated charcoal filter system



1 - Solenoid valve 1 -N80-

- ♦ Testing function and actuation:

⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Testing solenoid valve 1 for activated charcoal filter (N80)

2 - Connector

3 - Vent line

- ♦ From gravity valve at fuel tank
- ♦ For detaching, press release buttons on connection piece

4 - Vent hose

5 - Connection pipe

6 - Throttle valve control unit

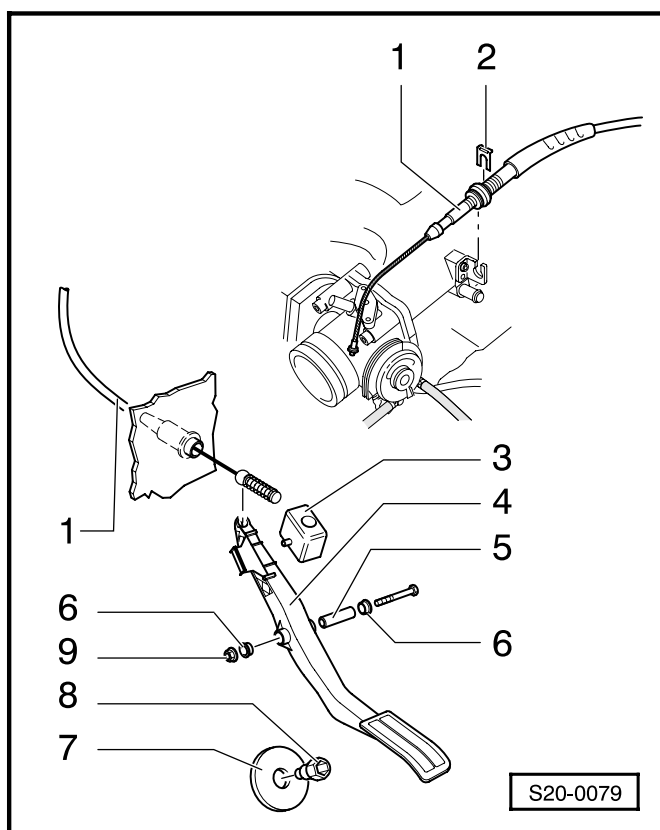
7 - To intake hose

8 - 10 Nm

9 - Activated charcoal filter

- ♦ With solenoid valve 1 -N80-
- ♦ Installation position: in right of engine compartment
- ♦ For removing, take off power steering reservoir and press to the side

Servicing throttle mechanism



1 - Throttle cable

- ◆ Set by turning over locking element at detent ⇒ page 20-13

2 - Retaining clip

3 - Balancing weight

4 - Accelerator pedal

5 - Spacer sleeve

6 - Bearing bush

7 - Washer

8 - Stop bolt

9 - 20 Nm

Adjusting throttle cable

Notes:

- ◆ The throttle cable is very sensitive to kinking and must be handled with particular care when being installed.
- ◆ A single slight kink can result in a subsequent fracture when driving. Throttle cables which have been kinked, must therefore not be installed.
- ◆ When installing, ensure that the throttle cable is aligned between its support bearings and the cable attachment points.

Special tools, testers and aids required

- ◆ Spring-tensioned bracing rod

Procedure

- Attach throttle cable at accelerator pedal and at the cam of the throttle valve control unit.
- Pull off locking element for throttle cable at the detent.

- Depress accelerator pedal into full throttle position.

Note:

A second person is required for this step or support accelerator pedal against steering wheel with spring-tensioned bracing rod.

Models fitted with manual gearbox

- Adjust throttle cable by turning over locking element of detent at support bracket so that full throttle position is reached at throttle valve lever.

Models fitted with automatic gearbox

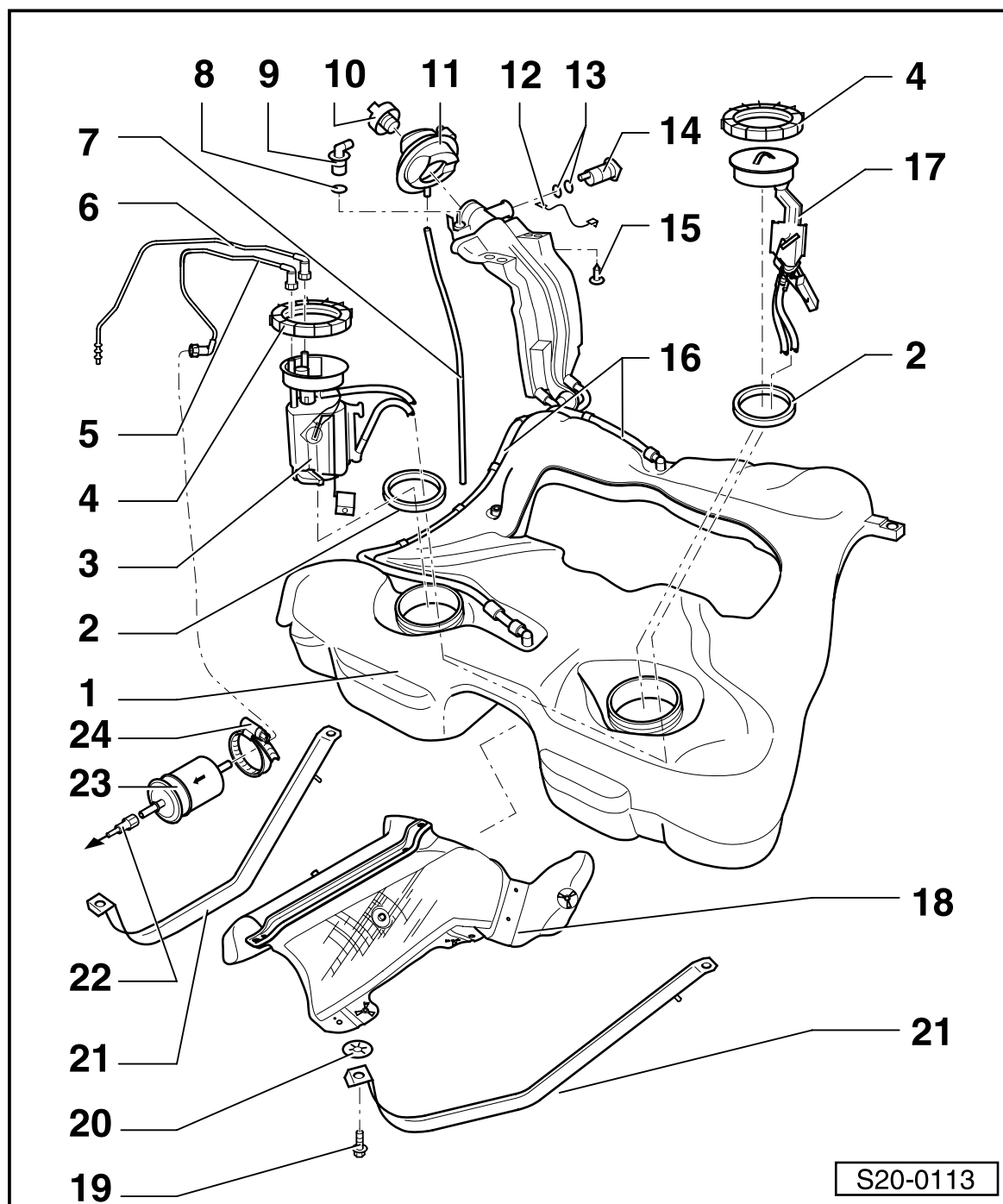
- Adjust throttle cable by turning over locking element of detent at support bracket so that throttle valve opens fully and the kickdown switch is heard to click.

All models

- Release accelerator pedal or remove bracing rod, as appropriate.
- After completing adjustment, check idle speed and full throttle stop of throttle valve.

Removing and installing parts of the fuel supply system - 4x4 models

Removing and installing fuel tank with attached parts - 4x4 models



Notes:

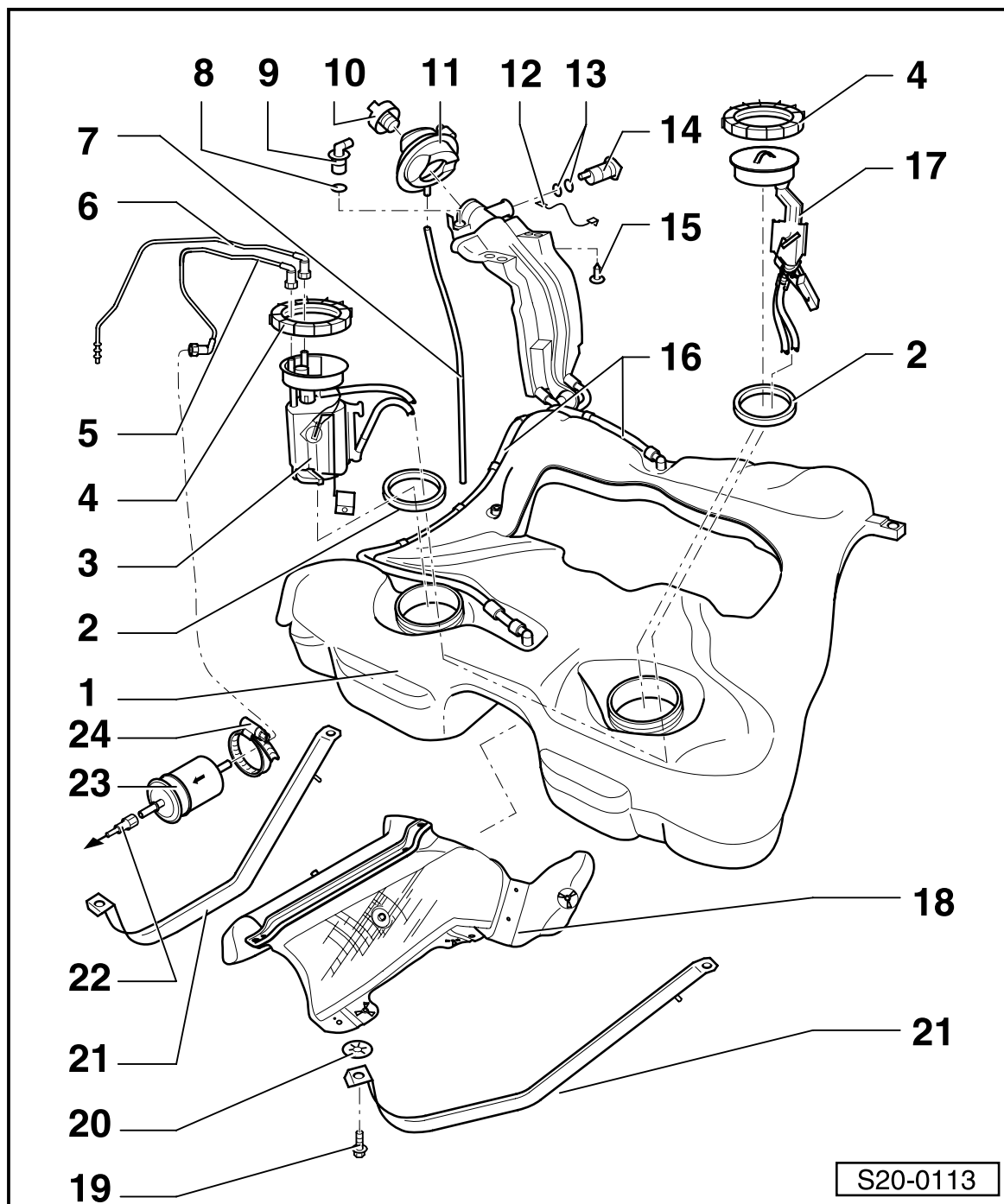
- ♦ Pay attention to safety precautions ⇒ page 20-4.
- ♦ Pay attention to rules for cleanliness ⇒ page 20-4.
- ♦ Always replace seals and gaskets.

1 - Fuel tank

- ♦ removing and installing ⇒ page 20-19

2 - Seal

- ♦ moisten with fuel for installing
- ♦ before installing fuel gauge sender, carefully insert seal into fuel tank



3 - Right fuel gauge sender

- ◆ with pump for pumping over fuel
- ◆ with closing flange
- ◆ removing and installing ⇒ page 20-17
- ◆ sender with strainer basket can be moved relative to top part

4 - Union nut, 80 Nm

- ◆ use wrench MP 1-227 to remove and install

5 - Feed line

- ◆ black
- ◆ is attached to connection marked "V" at closing flange
- ◆ press release button on connector in order to pull off flange

6 - Return-flow line

- ◆ blue
- ◆ is attached to connection marked "R" at closing flange
- ◆ press release button on connector in order to pull off flange

7 - Overflow hose

- 8 - O-ring**
 - ◆ replace
- 9 - Gravity valve**
 - ◆ to remove, unclip valve and lift up and out of the filler neck
 - ◆ checking valve for blockage:
valve vertical: open
valve tilted 45°: closed
- 10 - Cap**
- 11 - Rubber bowl**
- 12 - Earth connection**
- 13 - O-rings**
- 14 - Vent valve**
- 15 - 10 Nm**
- 16 - Vent hose**
- 17 - Left fuel gauge sender**
 - ◆ with closing flange
 - ◆ removing and installing ⇒ page 20-18
 - ◆ sender can be moved relative to top part
- 18 - Heat shield**
 - ◆ for fuel tank
- 19 - 25 Nm**
- 20 - Clamping washer**
 - ◆ removing: turn to left
 - ◆ installing: tighten to 2 Nm
- 21 - Tensioning straps**
 - ◆ pay attention to different lengths
- 22 - Feed line**
 - ◆ black
 - ◆ to fuel rail
 - ◆ press release button on connector to pull off
- 23 - Fuel filter**
 - ◆ fitting location: arrow points in direction of flow
- 24 - Retaining clamp**
 - ◆ for fuel filter

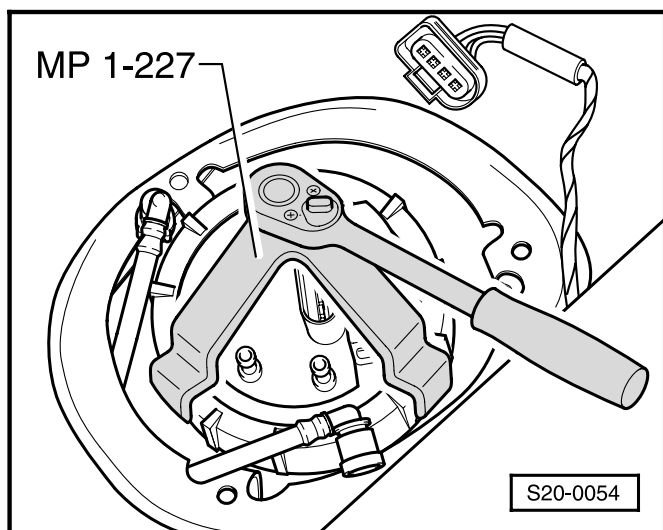
Removing and installing fuel gauge sender - 4x4 models

Special tools, testers and aids required

- ◆ Wrench for union nut MP 1-227

Removing right fuel gauge sender

- Unscrew cover below rear seat on right.
- Press release button and detach feed line and return-flow line.
- Separate plug connection for fuel gauge sender.
- ◀ - Use wrench MP 1-227 to slacken union nut and pull closing flange together with sender out of the fuel tank.

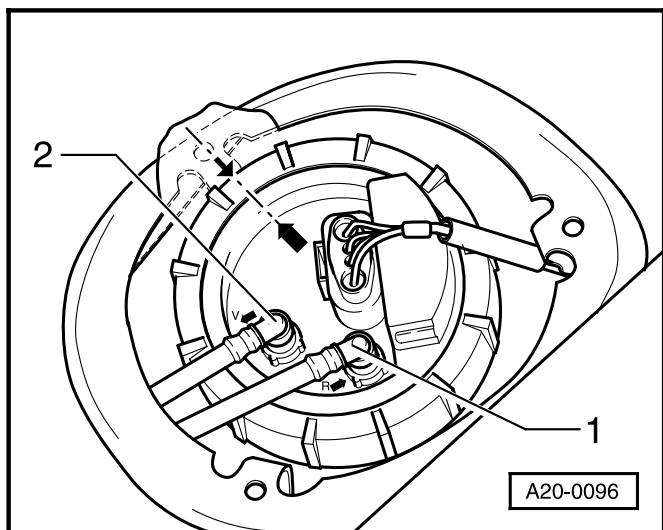


Removing left fuel gauge sender

- Unscrew cover below rear seat on left.
- Use wrench MP 1-227 to slacken union nut and pull closing flange together with sender out of the fuel tank.

Installing right fuel gauge sender

- ◀ - Pay attention to installation position:
 - ♦ Marking on flange must be aligned with marking on fuel tank -arrows-.
 - ♦ Blue return-flow hose -1- to connection marked -R-.
 - ♦ Black feed hose -2- to connection marked -V-.
 - ♦ Plug in connector for fuel gauge.

**Installing left fuel gauge sender**

- Pay attention to installation position.
 - ♦ Marking on flange must be aligned with marking on the fuel tank -arrows-.

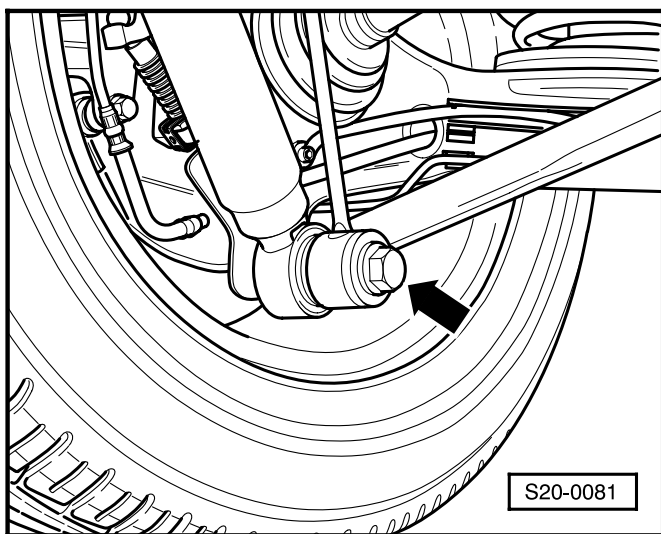
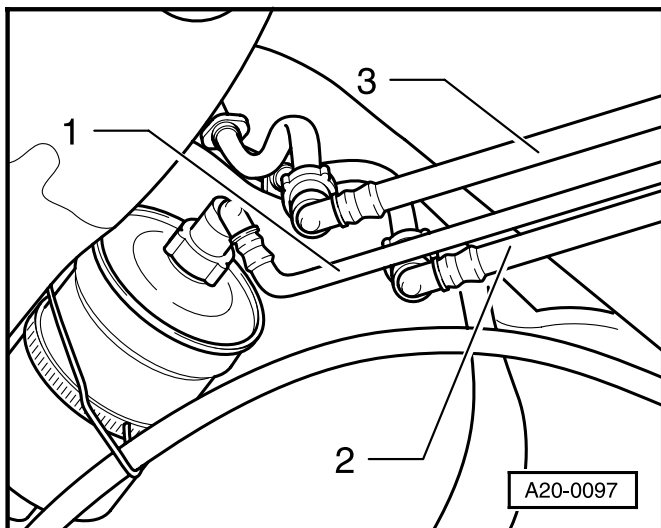
Removing and installing fuel tank - 4x4 models

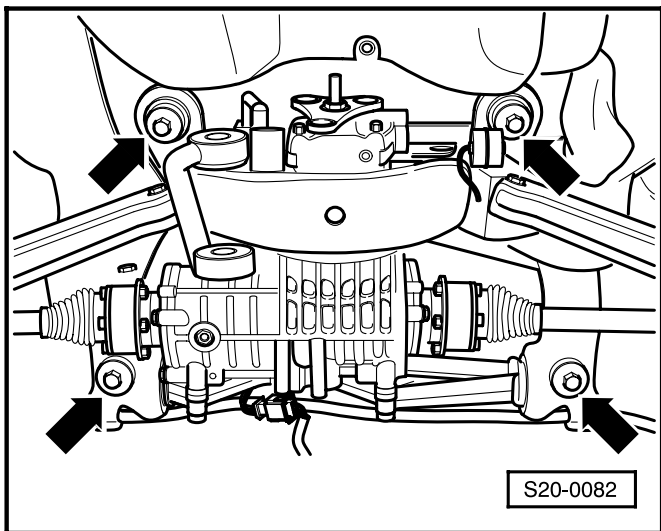
Special tools, testers and aids required

- ♦ Engine and gearbox jack, (e.g. V.A.G 1383 A)
- ♦ Fuel extractor, (e.g. V.A.G 1433 A)

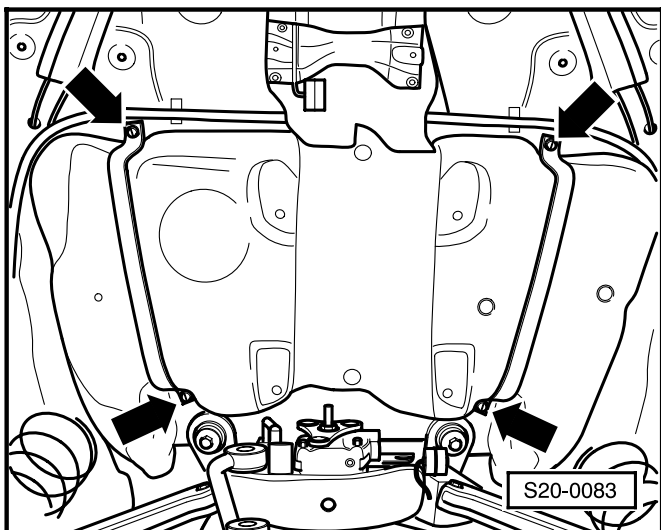
Removing

- Use the fuel extractor, (e.g. V.A.G 1433 A), to empty the fuel tank.
- Unscrew cover below rear seat on right.
- Separate connector for fuel gauge.
- Open fuel filler flap and lever out tensioning ring in rubber bowl (around filler neck).
- Take off rear right wheel.
- Remove rear right plastic wheelhouse liner
⇒ Body Fitting Work, Repair Group 66.
- Slacken screws of fuel filler neck below wheelhouse liner.
- ◀ - Press on release button at quick-coupling to separate fuel lines 1...3 on front right at fuel tank.
- Remove exhaust pipes (except front exhaust pipe) ⇒ page 26-7.1.
- Remove rear part of propshaft
⇒ 5-Speed Manual Gearbox 02C; Repair Group 39; Removing and installing propeller shaft.
- ◀ - Remove bottom bolt -arrow- attaching shock absorber and anti-roll bar on both sides of the vehicle.





- Separate plug connections of ABS and Haldex clutch.
- Detach bleeder hoses for Haldex clutch.
- Place engine/gearbox jack, (e.g. V.A.G 1383 A), below the differential as a support.
- Mark installation position of axles.
- ◀ - Unscrew bolts at rear axle -arrows-.
- Lower axle with engine/gearbox jack and slowly tilt out of the way.
- Remove heat shield of fuel tank.
- Remove bottom bolts of fuel tank.



- ◀ - Unscrew bolts of fuel tank at retaining straps -arrows-.
- Lower fuel tank.

Installing

- Installation is carried out in the reverse order.

Note:

Pay attention to installation position of rear axle.

Removing and installing parts of the exhaust system

Notes:

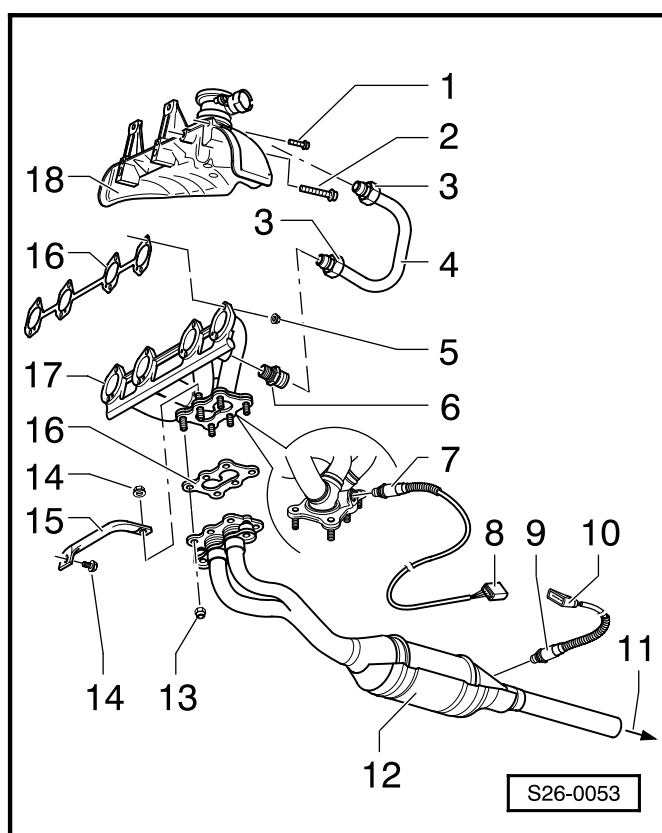
- ◆ When carrying out removal and installation operations on the exhaust system, ensure that the exhaust system is not installed with a pre-stress and that there is adequate clearance to the body. If necessary, slacken the double clamps and align silencers and exhaust pipe so that adequate clearance exists to the body exists at all points and the weight of the exhaust system is evenly distributed over the hangers.

ists to the body exists at all points and the weight of the exhaust system is evenly distributed over the hangers.

- ◆ Always replace self-locking nuts.
- Testing catalytic converter ⇒ page 26-8.

Exhaust manifold, front exhaust pipe with catalytic converter and attached parts

Engine codes AEG, APK, AQY and AZH



1 - 10 Nm

2 - 25 Nm

3 - 30 Nm

- ◆ only for engine codes AQY, AZH

4 - Connecting pipe

- ◆ only for engine codes AQY, AZH

5 - 25 Nm

- ◆ replace

6 - Bolted connection, 35 Nm

- ◆ only for engine codes AQY, AZH

7 - Lambda probe 1 upstream of catalytic converter (G39), 50 Nm

- ◆ coat only thread with hot bolt paste "G 052 112 A3"; hot bolt paste must not get into the slot of the probe body
 - ◆ use lambda probe wrench (e.g. 3337) for removing and installing
 - ◆ testing:
- ⇒ 2.0-ltr./85 kW Engine, Fuel Injection and Ignition System; Repair Group 24

8 - Connector

- ◆ black
- ◆ 4-pin for engine codes AEG, APK and AQY
- ◆ 6-pin for engine code AZH
- ◆ for lambda probe and lambda probe heater

9 - Lambda probe 2 downstream of catalytic converter (G130), 50 Nm

- ◆ only for engine codes AQY, AZH
 - ◆ coat only thread with hot bolt paste "G 052 112 A3"; hot bolt paste must not get into the slot of the probe body
 - ◆ use lambda probe wrench (e.g. 3337) for removing and installing
 - ◆ testing:
- ⇒ 2.0-ltr./85 kW Engine, Fuel Injection and Ignition System; Repair Group 24

10 - 4-pin plug connection

- ◆ only for engine codes AQY, AZH
- ◆ brown
- ◆ contacts 3 and 4 gold-plated
- ◆ for lambda probe and lambda probe heater

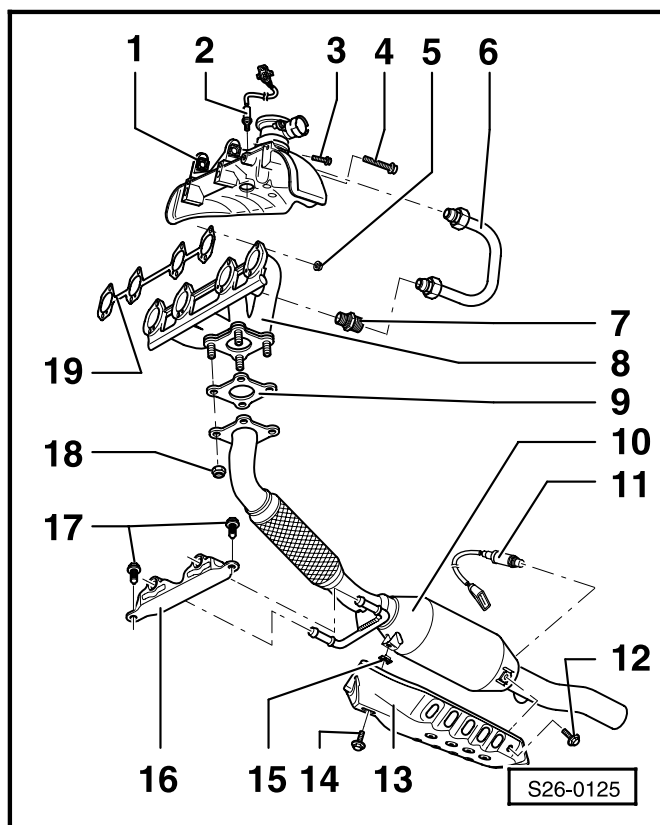
11 - To front silencer

12 - Front exhaust pipe with catalytic converter

- ◆ to remove, separate plug connection for lambda probe -item 10- and take cable out of fixtures
- ◆ testing catalytic converter
⇒ page 26-8

13 - 40 Nm

- ◆ replace
- ◆ before inserting, coat with hot bolt paste „G 052 112 A3“

14 - 25 Nm**Engine code AZJ****1 - Heat shield****2 - Lambda probe 1 upstream of catalytic converter (G39), 50 Nm**

- ◆ coat only thread with hot bolt paste “G 052 112 A3”; hot bolt paste must not get into the slot of the probe body
- ◆ use lambda probe wrench (e.g. 3337) for removing and installing

3 - 10 Nm**4 - 25 Nm****5 - 25 Nm**

- ◆ replace

15 - Brace**16 - Gasket**

- ◆ replace
- ◆ pay attention to installation position: slot for lambda probe points to the rear

17 - Exhaust manifold

- ◆ removing and installing ⇒ page 26-3

18 - Heat shield**6 - Connecting pipe**

- ◆ for secondary air injection system

7 - Bolted connection, 35 Nm**8 - Exhaust manifold****9 - Gasket**

- ◆ replace

10 - Front exhaust pipe with catalytic converter

- ◆ with compensation element

11 - Lambda probe 2 downstream of catalytic converter (G130), 50 Nm

- ◆ coat only thread with hot bolt paste “G 052 112 A3”; hot bolt paste must not get into the slot of the probe body
- ◆ use lambda probe wrench (e.g. 3337) for removing and installing

12 - 10 Nm**13 - Protective plate**

- ◆ for catalytic converter

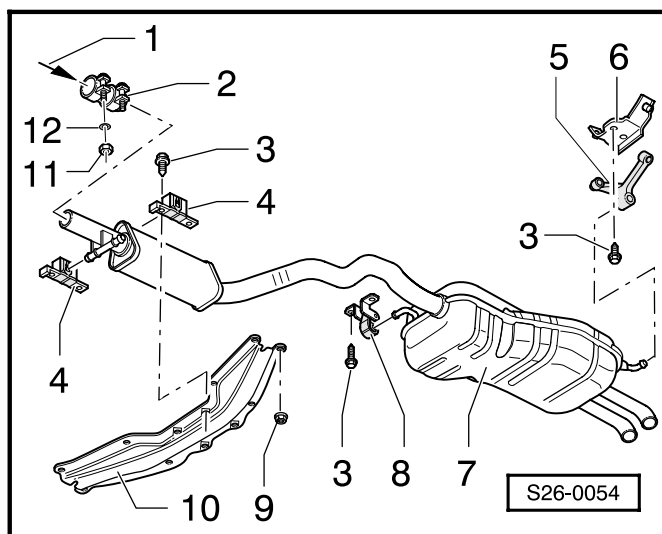
14 - 10 Nm**15 - Securing nut****16 - Supporting plate****17 - 25 Nm****18 - 40 Nm**

- ◆ replace

19 - Gasket

- ◆ replace

Silencer with hangers



1 - From catalytic converter

2 - Double clamp

- ♦ before tightening, align exhaust system free of stress ⇒ page 26-6
- ♦ installation position: horizontal in vehicle, bolted connection pointing to the left
- ♦ tighten bolted connections evenly

3 - 25 Nm

4 - Hinge

- ♦ pay attention to installation position ⇒ Fig. 1

5 - Hinge

6 - Supporting plate

7 - Front and rear silencer

- ♦ can be replaced separately when carrying out repairs ⇒ page 26-5
- ♦ before tightening, align exhaust system free of stress ⇒ page 26-6

8 - Hinge

- ♦ with retaining ring

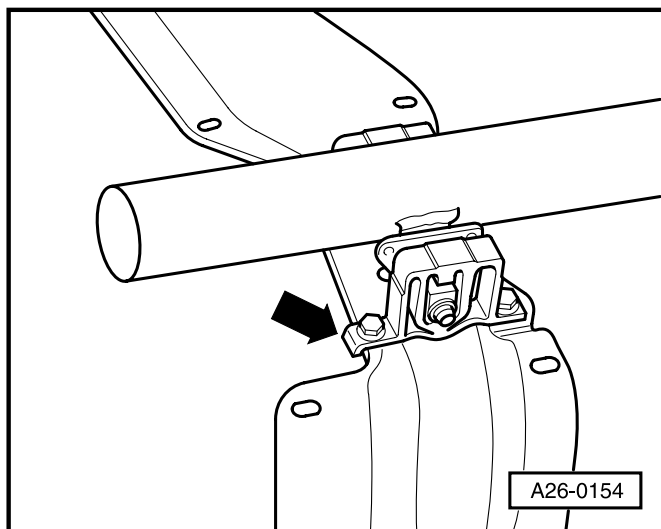
9 - 25 Nm

10 - Tunnel bridge

- ♦ with hole for aligning exhaust system ⇒ page 26-6

11 - 40 Nm

12 - Washer



◀ Fig. 1 Installation position of hanger

- The angled side -arrow- at the base of the hanger points in direction of travel.

Removing and installing exhaust manifold

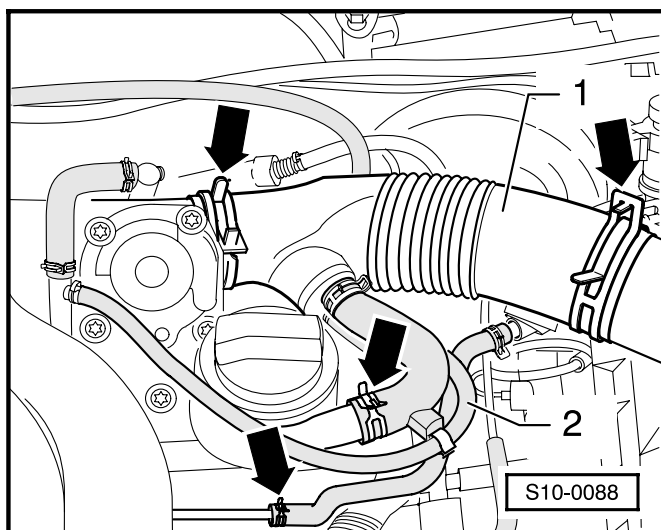
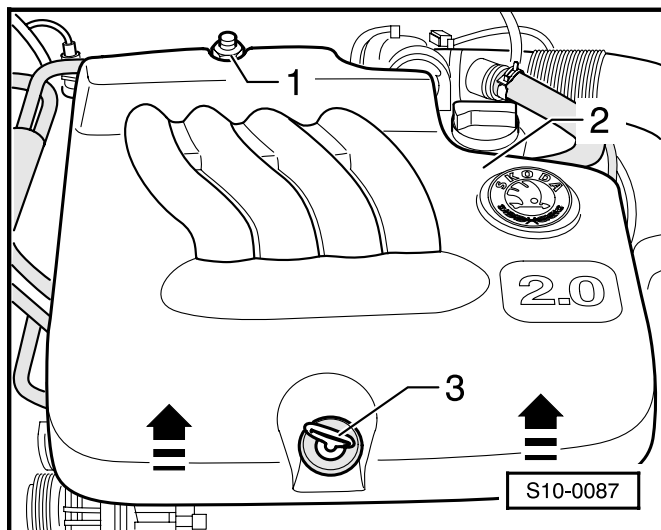
Special tools, testers and aids required

- ◆ Torque wrench

Removing

- ◀ - Remove engine trim panel.

To do this, slacken nut -1-, pull out dipstick -3- and pull trim panel -2- up and off at the front with a jerk (arrows).



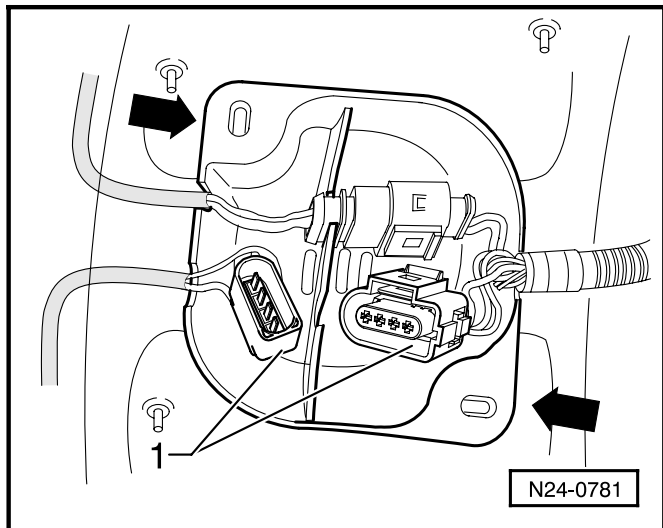
- ◀ - Detach intake hose -1-.

Engine codes AQY, AZH, AZJ

- Detach pressure hose and vacuum hose of combination valve.

Continued for all models

- Take off protective cap for inner right CV joint from engine.



- Unbolt right drive shaft from gearbox.
⇒ Running Gear; Repair Group 40; Removing and installing drive shafts
- Remove the connection pipe between combination valve and exhaust manifold.
- Unbolt the intake manifold support.
- ◀ - Unscrew the protective cover -arrows- and separate the 4-pin plug connection (black) -1- to the lambda probe upstream of catalytic converter (G39).
- Unclip the cable to the lambda probe from the guides.
- Remove the front exhaust manifold together with catalytic converter.
- Unbolt the exhaust manifold; the bottom nuts from below, the top nuts from above.
- Take exhaust manifold and lambda probe down and out.

Installing

Installation is carried out in the reverse order. Pay attention to the following points:

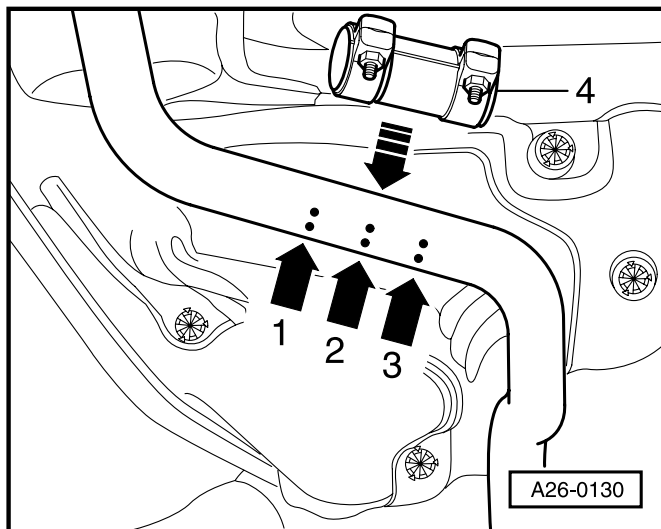
- ◆ Replace seals and gaskets and self-locking nuts.
- ◆ Tightening torques ⇒ page 26-1.

Removing front and rear silencer

Special tools, testers and aids required

- ◆ Torque wrench 5...50 Nm
- ◆ Body saw

A separation point is provided for replacing the front silencer or the rear silencer when carrying out repairs.



- Cut through exhaust pipe at right angles with a body saw at the separation point -arrow 2-.
- Position double clamp -4- at the side markings -arrows 1 and 3- when installing.
- Align exhaust system free of stress ⇒ page 26-6.
- Align rear silencer horizontally.
- Tighten bolted connections of double clamp evenly to 40 Nm.
- Installation position of double clamp: horizontal in vehicle, bolted connections pointing forward.

Aligning exhaust system free of stress

Special tools, testers and aids required

- ◆ Torque wrench 5...50 Nm
(e.g. V.A.G 1331)

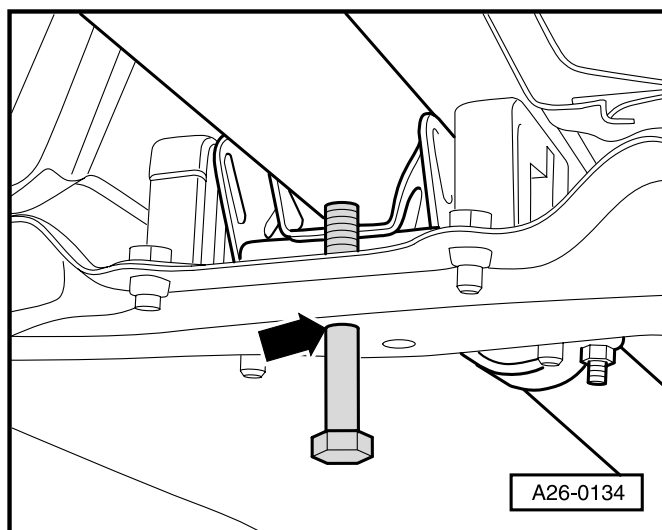
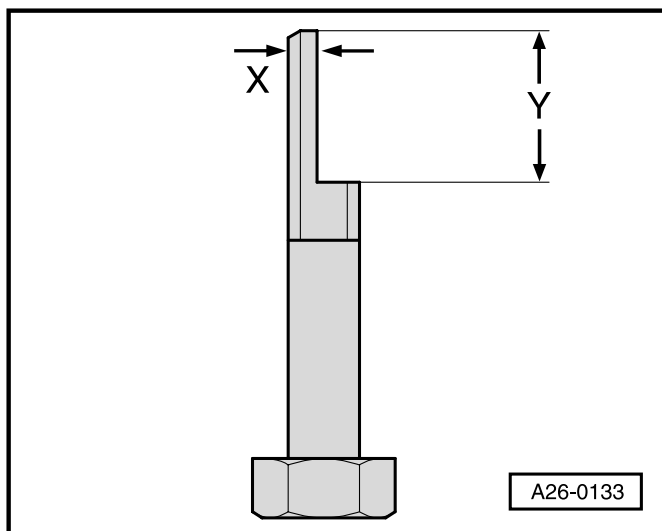
Procedure

- The exhaust system is aligned when cold.
- ◀ - To align the exhaust system, shop-make tool from an M10 bolt to the dimensions stated.
 - ◆ Dimension -X- = 4 mm
 - ◆ Dimension -Y- = 25 mm

Note:

A second person is required for aligning the exhaust system.

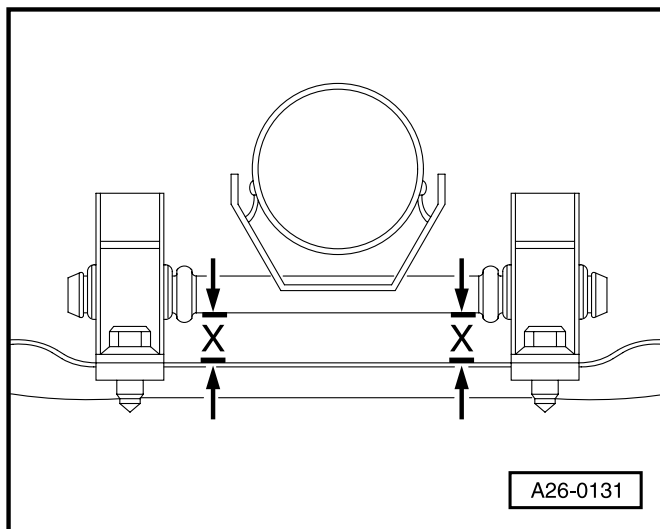
- Slacken bolted connections of clamping sleeve between catalytic converter and front silencer.



- ◀ - Insert shop-made tool through the rear hole -arrow- of the tunnel bridge; the flat points toward the hanger bolt of the exhaust system.

Note:

The exhaust system is pretensioned in direction of travel when the shop-made tool is inserted.

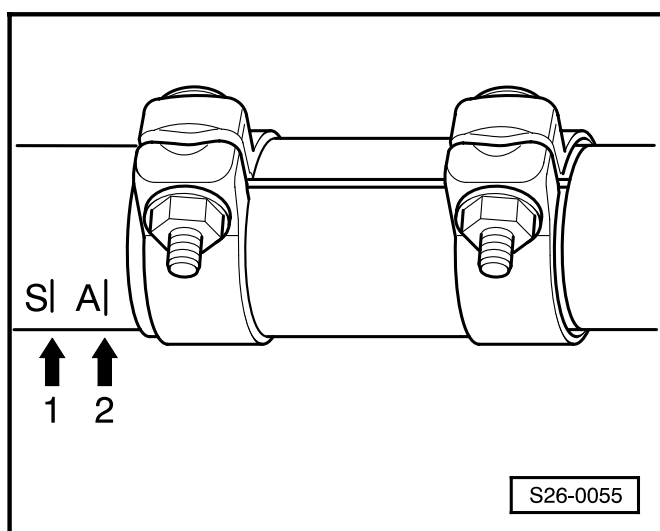


- Align centre and rear silencer horizontally:

- ◀ - The hanger bolt at the exhaust pipe must be positioned parallel to the tunnel bridge (dimension -X- on left and right the same).

Note:

On vehicles with separation point ⇒ page 26-5, additionally check horizontal position of rear silencer at the tail pipe.



- ◀ - Position double clamp spaced about 5 mm away from the marking at front exhaust pipe with catalytic converter, and tighten evenly in horizontal position to 40 Nm.

♦ Marking S -arrow 1- for models with manual gearbox

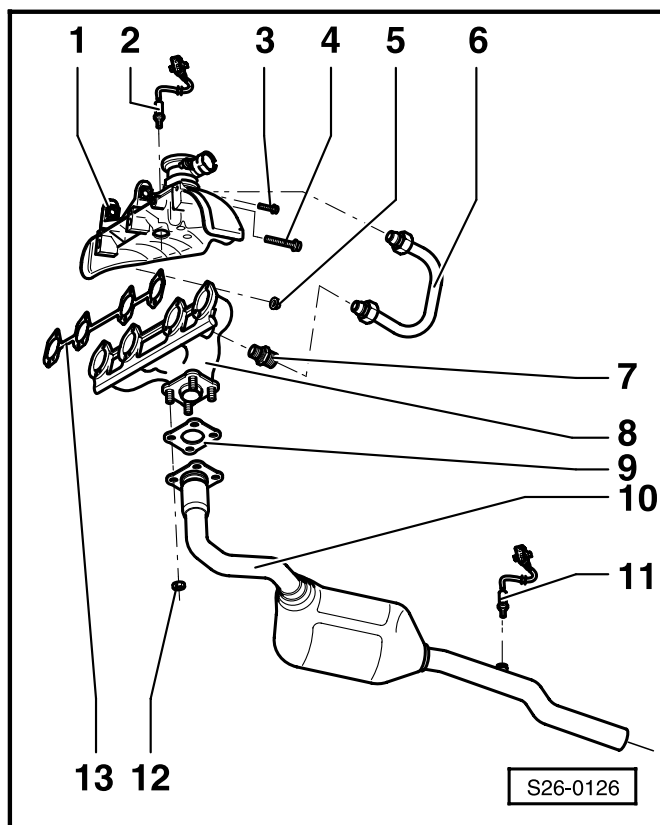
♦ Marking A -arrow 2- for models with automatic gearbox

Inspecting exhaust system for leaks

- Start engine and run at idling speed.
- Seal off tail pipe for the duration of the leak test (e.g. with cloths or plug).
- Inspect connection points for leaks, by listening: cylinder head/exhaust manifold/exhaust pipe with catalytic converter, etc.
- Rectify any leakages found.

Removing and installing parts of the exhaust system - 4x4 models

Exhaust manifold, front exhaust pipe with catalytic converter and attached parts



1 - Heat shield

2 - Lambda probe 1 upstream of catalytic converter (G39), 50 Nm

- ◆ coat only thread with hot bolt paste "G 052 112 A3"; hot bolt paste must not get into the slot of the probe body
- ◆ use lambda probe wrench (e.g. 3337) for removing and installing

3 - 10 Nm

4 - 25 Nm

5 - 25 Nm

- ◆ replace

6 - Connecting pipe

- ◆ for secondary air injection system

7 - Bolted connection, 35 Nm

8 - Exhaust manifold

9 - Gasket

- ◆ replace

10 - Front exhaust pipe with catalytic converter

11 - Lambda probe 2 downstream of catalytic converter (G130), 50 Nm

- ◆ coat only thread with hot bolt paste "G 052 112 A3"; hot bolt paste must not get into the slot of the probe body
- ◆ use lambda probe wrench (e.g. 3337) for removing and installing

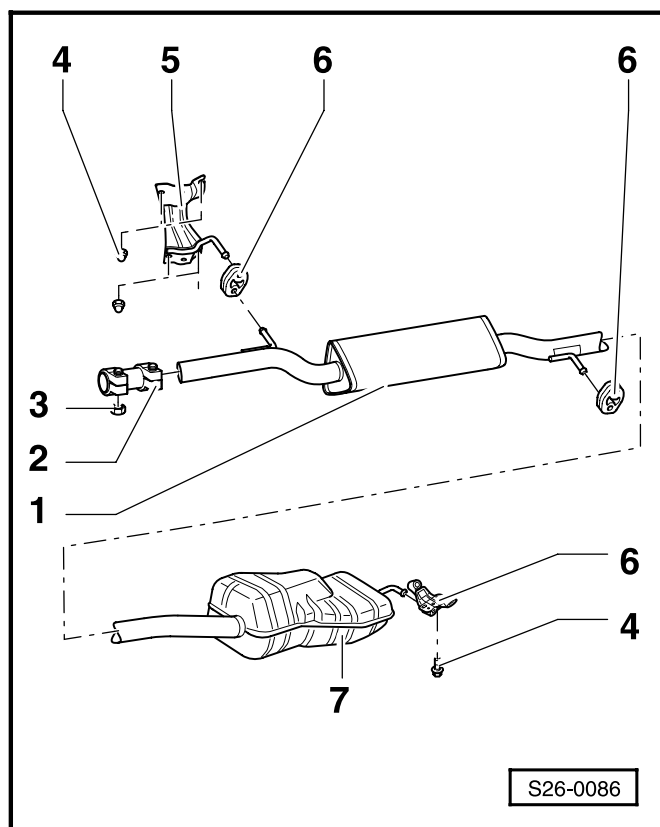
12 - 40 Nm

- ◆ replace

13 - Gasket

- ◆ replace

Silencer with hangers



1 - Centre silencer

- ♦ installed as standard with part -7-; supplied separately for repairs
- ♦ exhaust pipe with separation point ⇒ page 26-7.3
- ♦ align free of stress

2 - Double clamp

- ♦ installation position: bolted connection points to the left; installation position marked by three lugs on centre silencer
- ♦ tighten bolts evenly

3 - 40 Nm

4 - 25 Nm

5 - Supporting plate

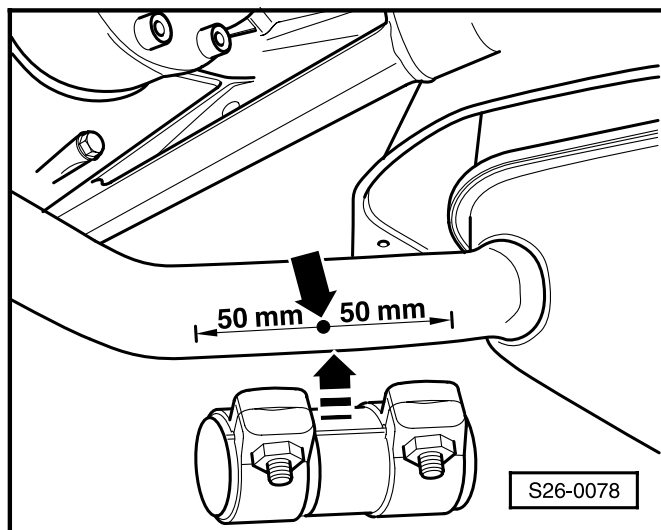
6 - Hinge

7 - Rear silencer

- ♦ installed as standard with part -1-; supplied separately for repairs
- ♦ exhaust pipe with separation point ⇒ page 26-7.3

Notes:

- ♦ *When carrying out removal and installation operations on the exhaust system, ensure that the exhaust system is not installed with a pre-stress and that there is adequate clearance to the body. If necessary, slacken the double clamps and align silencers and exhaust pipe so that adequate clearance exists to the body exists at all points and the weight of the exhaust system is evenly distributed over the hangers.*
- ♦ *Always replace self-locking nuts.*



◀ Fig. 1 Separation point

- ◆ when replacing centre silencer or rear silencer
- ◆ marked by indentation on circumference of exhaust pipe

Replacing centre silencer or rear silencer - 4x4 models

Special tools, testers and aids required

- ◆ Torque wrench
- ◆ Body saw, e.g. V.A.G 1523

Procedure

- Cut exhaust pipe at right angles with body saw at the separation point.
- Mark 50 mm away from the separation point on both sides (for both connecting pipes).
- Position double clamp at the side markings.
- Align rear silencer horizontally.
- Tighten bolts of double clamp evenly to 40 Nm.
- Installation position of double clamp: bolted connection points to the left.

Inspecting catalytic converter (only engine codes AQY, AZH, AZJ)

Special tools, testers and aids required

- ♦ Vehicle system tester V.A.G 1552 with cable V.A.G 1551/3A, 3B or 3C

Test procedure

- Connect vehicle system tester V.A.G 1552, start engine and select address word 01.
⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 01; Connecting vehicle system tester V.A.G 1552 and selecting engine electronics

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Enter 04 for the function "Initiate basic setting" and select display group 046.

Engine codes AQY and AZH

System in basic setting	46	→
2900 rpm 360 °C 0.55	Test runs	

- ◀ Increase engine speed to 2800...3200 rpm and hold until the readout in display field 4 changes from "Test OFF" to "Test runs".

Engine code AZJ

Depress brake pedal and accelerator at the same time.

System in basic setting	46	→
2300 rpm 360 °C 0.00	Test runs	

- ◀ - Engine speed is increased and the readout in display field 4 changes from "Test OFF" to "Test runs".

Continued for all engines

- Catalytic converter temperature in display field 2 must be at least 352 °C.

Note:

This procedure may take a few minutes.

- Maintain increased engine speed until the specification "CatR1 o.k." appears in display field 4.

Engine codes AQY and AZH

- Check amplitude ratio in display field 3:
Specification: max. 0.55

Engine code AZJ

- Check efficiency of catalytic converter in display field 3:
Specification: at least 1.00

Continued for all engines**Note:**

The diagnosis of the catalytic converter takes about 100 seconds. If no result is displayed after 150 seconds, alter engine speed.

	Display fields			
	1	2	3	4
Display group 46: Diagnosis catalytic converter bank 1				
Display	xxxx rpm	xxx °C	xx.x s	Test OFF/Test runs CatR1 o.k. CatR1 n.o.k.
Readout	Engine speed	Catalytic converter temperature	Measured value of cat conversion (amplitude ratio) Efficiency of catalytic converter ¹⁾	Diagnostic status and diagnosis result
Working range	—	—	—	—
Specification	2800...3200 rpm approx. 2300 rpm ¹⁾	> 352 °C	0.0...0.55 min. 1.00 ¹⁾	CatR1 o.k.

¹⁾ Engine code AZJ.

If "CatR1 n.o.k." is shown in display field 4:

- Interrogate fault memory:
⇒ 2.0-ltr./85 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 01;
Interrogating and erasing fault memory

If the specification is achieved "CatR1 o.k.":

- Press → key.

Test of vehicle systems
Select function XX

HELP

◀ Readout in display:

- Enter 06 for the function "End output" and confirm the entry with the key Q.

Secondary air injection system (only for engines AQY, AZH, AZJ)

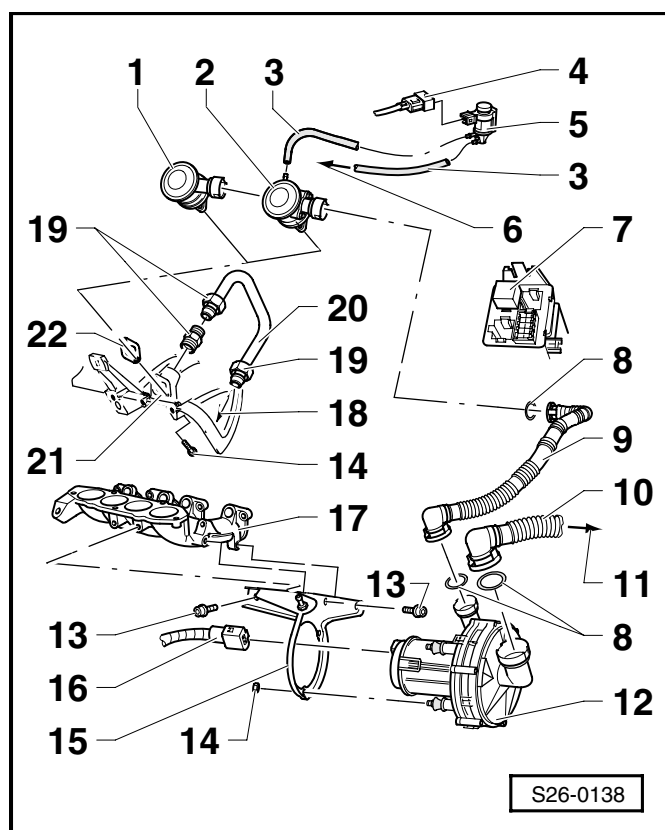
Function

The secondary air injection system blows air behind the escape valve during a cold start. This enriches the exhaust gas with oxygen, initiates a post-combustion and thus shortens the heating-up phase of the catalytic converter.

The actuation of the combination valve and the secondary air injection pump (V 101) is performed by the Motronic control (J 220) unit through the air pump relay for secondary air pump (J 299).

Removing and installing parts of the secondary air injection system

For engines with engine identification characters AQY and AZH



Notes:

- ◆ Components marked with an * are tested by self-diagnosis
⇒ 2.0 litre/85 kW Engine, Fuel Injection and Ignition System; Rep Gr. 01.
- ◆ Components marked with ** can be checked by final control diagnosis
⇒ 2.0 litre/85 kW Engine, Fuel Injection and Ignition System; Rep Gr. 01.

1 - Combination valve 08.2000 ►

- ◆ valve closed in still motion
- ◆ valve is opened through the air pressure of the secondary air pump
- ◆ inspecting ⇒ page 26-12
- ◆ removing and installing ⇒ page 26-14

2 - Combination valve ► 07.2000

- ◆ inspecting ⇒ page 26-11
- ◆ removing and installing ⇒ page 26-14

3 - Vacuum hose ► 07.2000

4 - Connector ► 07.2000

- ◆ 2-pin

5 - Secondary air injection valve -N112- */** ► 07.2000

- ◆ in the holder above the brake servo unit.
- ◆ inspecting ⇒ page 26-14

6 - For connection at pipe to brake servo unit

7 - Secondary air pump relay -J299- */**

- ◆ in relay protective housing in engine compartment next to brake servo unit

8 - O-ring

- ◆ replace

9 - Pressure hose

- ◆ ensure tightly fitted
- ◆ press together in order to unlock

10 - Intake hose

- ◆ for secondary air pump

11 - To air filter

12 - Secondary air pump -V101-**

- ◆ testing ⇒ page 26-13

13 - 25 Nm

14 - 10 Nm

15 - Holder

- ◆ for secondary air pump
- ◆ attached to intake manifold

16 - Connector

- ◆ 2-pin

17 - Top part of intake manifold

18 - For connection at exhaust manifold

19 - 30 Nm

20 - Connection pipe

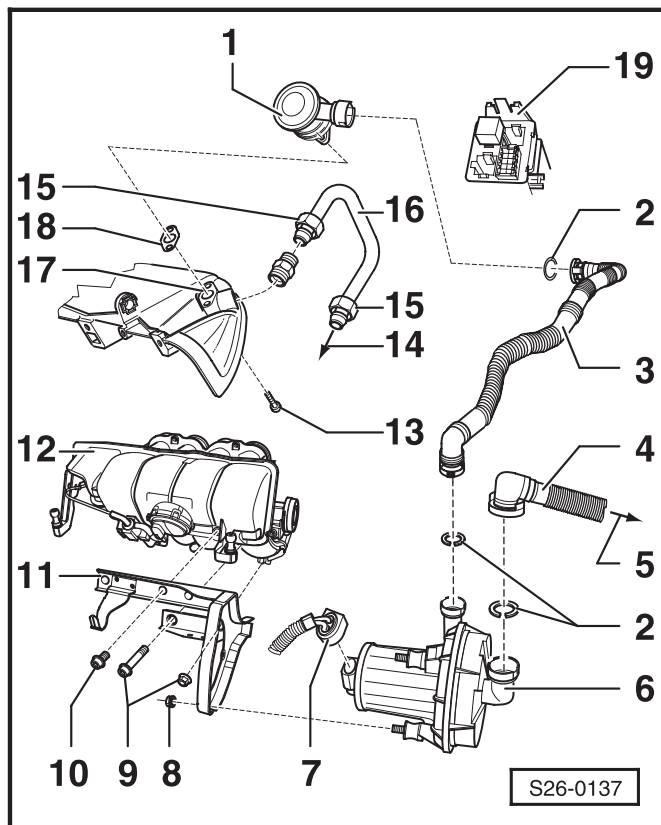
21 - Heat shield

- ◆ with mount for combination valve

22 - Gasket

- ◆ replace

For engine with engine identification characters AZJ



1 - Combination valve

- ◆ valve closed in still motion
- ◆ valve is opened through the air pressure of the secondary air pump
- ◆ inspecting ⇒ page 26-12
- ◆ removing and installing ⇒ page 26-14

2 - O-ring

- ◆ replace

3 - Pressure hose

- ◆ ensure tightly fitted
- ◆ press together in order to unlock

4 - Intake hose

- ◆ for secondary air pump

5 - To air filter

6 - Secondary air pump -V101-**

7 - Connector

- ◆ 2-pin

8 - 10 Nm

9 - 25 Nm

10 - 15 Nm

11 - Support panel

- ◆ for secondary air pump
- ◆ attached to intake manifold

12 - Top part of intake manifold

13 - 10 Nm

14 - For connection at exhaust manifold

15 - 30 Nm

16 - Connection pipe

17 - Heat shield

- ◆ with mount for combination valve

18 - Gasket

- ◆ replace

19 - Secondary air pump relay -J299-*/**

- ◆ in relay protective housing in engine compartment next to brake servo unit

Inspecting combination valve

For engines with identification characters
AQY and AZH ► 07.2000

Special tools, testers and aids required

- ◆ Hand vacuum pump (e.g. V.A.G 1390)

Test conditions

- No fault in fault memory
⇒ 2.0 litre/85 kW Engine, Fuel Injection and Ignition System; Rep Gr. 01.
- Carry out final control diagnosis:
⇒ 2.0 litre/85 kW Engine, Fuel Injection and Ignition System; Rep Gr. 01.
- Vacuum hoses and hose connections are tight.
- Vacuum hoses are not blocked.

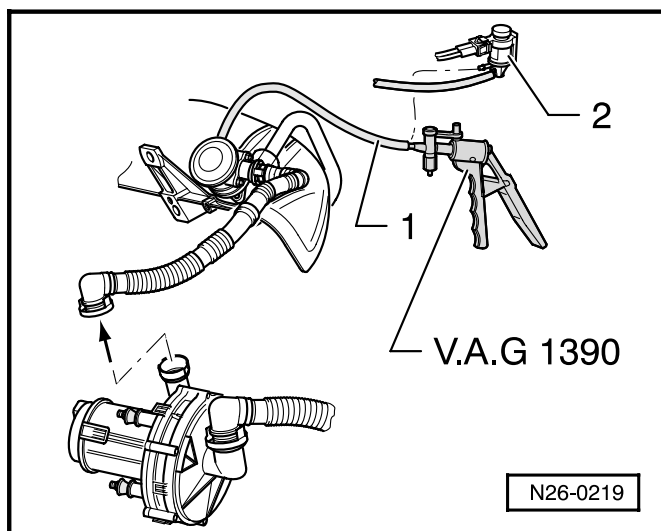
Test procedure

- ◀ - Detach vacuum hose -1- from secondary air injection valve -N112- -2-
- Connect hand vacuum pump (e.g. V.A.G 1390) at vacuum hose -1-.

Note:

Do not use any compressed air during the following test!

- Detach pressure hose from the secondary air pump and blow in -arrow-.
Combination valve must be closed.



- Build up hand vacuum pump with vacuum.
Valve must open.

If the combination valve does not open

- Replace combination valve
⇒ page 26-14

**For engines with identification characters
AQY and AZH ► 08.2000**

For engine AZJ

Special tools, testers and aids required

- ◆ Vehicle system tester V.A.G 1552 with cable
V.A.G 1551/3, 3A, 3B or 3C

Test conditions

- No fault in fault memory
⇒ 2.0 litre/85 kW Engine, Fuel Injection and
Ignition System; Rep Gr. 01.
- Vacuum hoses and hose connections are
tight.
- Vacuum hoses are not blocked.
- Secondary air pump O.K.
- Relay -J299- O.K.

Test procedure

Note:

*In still motion the valve is closed and is opened
through the air pressure of the secondary air
pump.*

- Removing engine cover ⇒ page 26-3.
- Remove intake hose between throttle valve
and air filter ⇒ page 26-3.
- Slacken top union nut at connection pipe
between combination valve and exhaust
manifold, or slacken connection pipe by pull-
ing slightly.
- Actuate the secondary air pump relay via the
actuator diagnosis ⇒ 2.0 litre/85 kW En-
gine, Fuel Injection and Ignition System; Rep
Gr. 01.
Air should flow out in regular intervals
from the open connection point behind the
combination valve.
- If the combination valve does not open, re-
place combination valve ⇒ page 26-14

Testing secondary air pump

Special tools, testers and aids required

- ◆ Vehicle system tester V.A.G 1552 with cable V.A.G 1551/3, 3A, 3B or 3C
- ◆ Multimeter e.g. V.A.G 1526 A

Test conditions

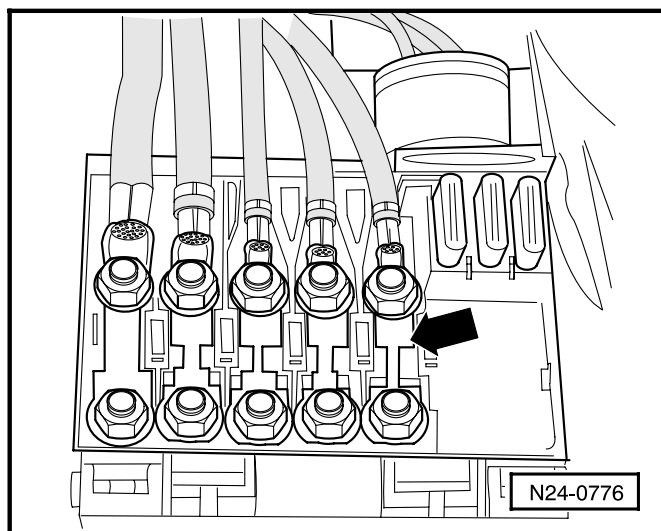
- Fuse for secondary air pump relay -J299- -arrow- in main fuse box on battery o.k.
- Relay -J299- O.K.
- Intake hose for secondary air pump is not blocked or kinked.

Test procedure

- Removing engine cover ⇒ page 10-2.
- Remove pressure hose leading from secondary air pump to combination valve.
- Actuate the secondary air pump relay via the actuator diagnosis
⇒ 2.0 litre/85 kW Engine, Fuel Injection and Ignition System; Rep Gr. 01, Actuator diagnosis.

Secondary air pump must start at regular intervals and air must flow out at the outlet connection

- If the pump does not start, test the voltage supply of the pump.
- Disconnect the 2-pin plug on the secondary air pump and connect the multimeter to the voltage measurement.
- Actuate the secondary air pump relay via the actuator diagnosis.
- Specified value: alternately 0....12V in shift rhythm of the pump relay
- If the specified value is not reached, inspect cables according to Current Flow Diagram.
- If the specified value is reached, replace secondary air pump.



Testing secondary air injection valve -N112-

For engines with identification characters AQY and AZH ► 07.2000

Test conditions

- Coolant temperature 5...33 °C
- Secondary air pump and relay O.K.
- Vacuum lines are not blocked.

Test procedure

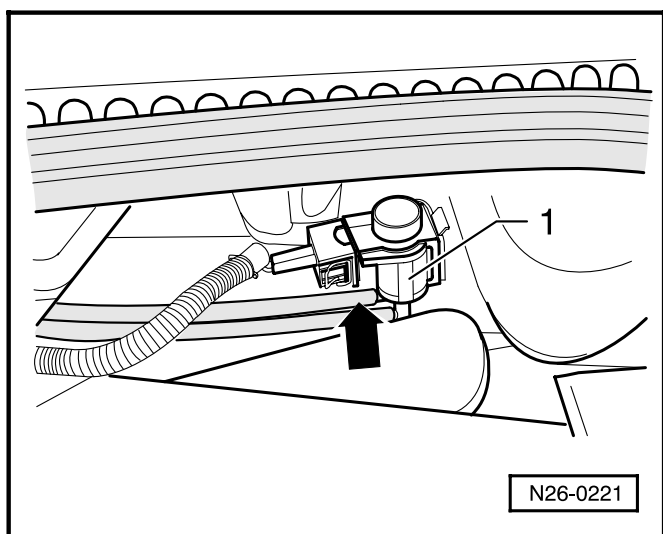
- ◀ - Detach top part of vacuum hose -1- from secondary air injection valve.

- Start engine and run in idle.

If the secondary air pump motor starts, vacuum must be felt at the vacuum hose.

If no vacuum can be felt:

- Switch off engine.
- Inspect actuation of secondary air injection valve:
⇒ 2.0 litre/85 kW Engine, Fuel Injection and Ignition System; Rep Gr. 01.



Removing and Inspecting combination valve

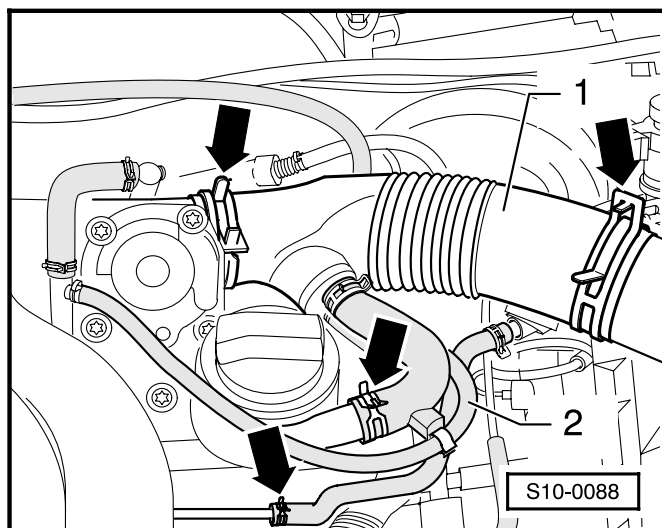
- Procedure for engines with identification characters AQY and AZH ► 07.2000
- The procedure is similar for other engines

Special tools, testers and aids required

- ◆ Torque wrench

Notes:

- ◆ Always replace all gaskets and gasket rings.
- ◆ The assistance of a second mechanic is required for the installation.



Removing

From above:

- Removing engine cover ⇒ page 10-2.
- Removing intake hose -1- (arrows).
- The vent hose -2- remains connected.
- Detach pressure and vacuum hose from combination valve.
- Slacken top union nut at connection pipe leading from secondary air pump to combination valve.

From below:

- Remove protective cap for inner constant velocity joint from engine.
- Unscrew connection pipe from exhaust manifold.
- Unscrew combination valve with joint insert.

Installing

- Insert the fixing screw from below through the heat shield with a special tool.
- Hold the screw from above (the assistance of a 2nd mechanic is required)
- Insert 5 mm Allan key with joint insert into the screw head.
- Fit on combination valve from above (the assistance of a 2nd mechanic is required) and tighten the fixing screws to 10 Nm.

Further installation is carried out in reverse order.

