

Workshop Manual OCTAVIA

**1.6-ltr. / 55 kW Engine -
Mechanical Components**

List of Supplements to Workshop Manual **OCTAVIA**

Edition: 07.02

1.6-ltr. / 55 kW Engine - Mechanical Components

Replaces List of Supplements - Edition: 12.99

Supplement	Edition	Subject	Article Number
	08.96	Basic Edition of Workshop Manual	S00.5106.50.20
1	10.96	Supplement of Basic Edition	S00.5106.51.20
2	06.97	Modifications to Repair Groups 13, 15, 17, 19	S00.5106.52.20
3	03.98	New Oil Pump	S00.5106.53.20
4	12.99	New Coolants and Sealing Materials	S00.5106.54.20
5	07.02	Modifications in Repair Group 10, 13, 15, 17, 19 and 26	S00.5106.55.20
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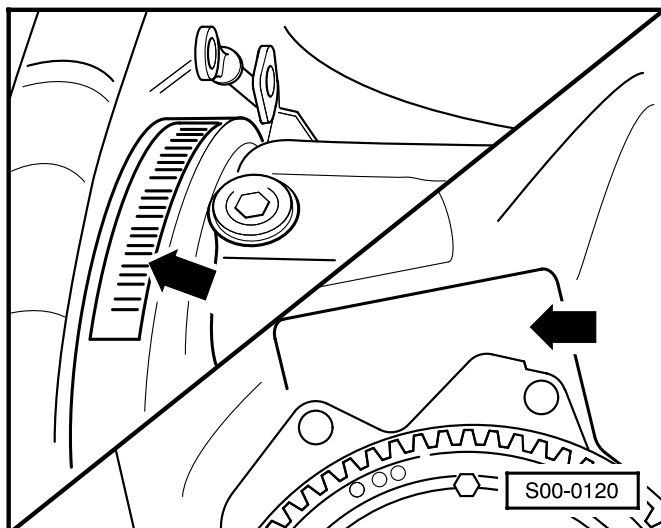
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Technical data

Engine number



◀ The engine number („engine code letters“ and „serial number“) is indicated on the end face of the cylinder block at the gearbox side, below the coolant thermostat housing.

In addition, a sticker with „engine code letters“ and „serial number“ is affixed to the toothed belt guard.

The engine code letters are also listed on the vehicle data sticker.

Example: AEE 001234

- ◆ AEE = engine code letters
- ◆ 001234 = serial number

Engine features

Code letters	AEE
Manufactured	08.96 ➤
Displacement ltr.	1.598
Power output kW at rpm	55/4800
Torque Nm at rpm	135/3200
Bore Ø mm	76.5
Stroke mm	86.9
Compression ratio	9.8 : 1
RON	95 unleaded ¹⁾
Fuel injection/ignition system	MPI - 1AVM
Knock control	yes
Self-diagnosis	yes
Lambda control	yes
Catalytic converter	yes
Charge air system	no
Exhaust limits conforming to	EU-2

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

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)
- ◆ Pliers for spring strap clamps
- ◆ Suspension device MP 9-201
- ◆ Grease G 000 100
- ◆ Cable straps
- ◆ Wire

If the engine is to be disassembled:

- ◆ Engine holder MP 1-202
- ◆ Counterholder MP 1-221
- ◆ Repair stand MP 9-101

Removing engine

Notes:

- ◆ *The engine is removed upward together with the gearbox.*
- ◆ *All the cable straps which are detached or cut open when removing the engine, should be fitted on again at the same point when installing the engine.*
- ◆ *Hose connections are secured with screw-type, spring strap or collar clamps.*
- ◆ *Always replace collar clamps with 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.*
- ◆ *It is recommended to use the pliers for spring strap clamps for removing and installing such clamps.*
- ◆ *Ensure the electrical connectors are correctly plugged in; mark if necessary.*

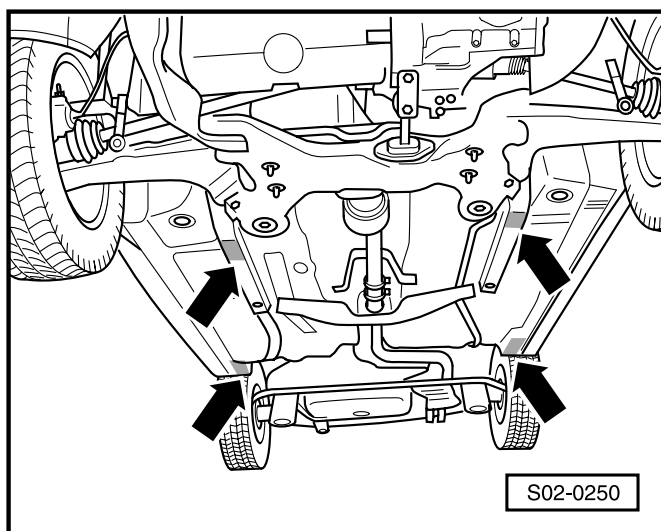
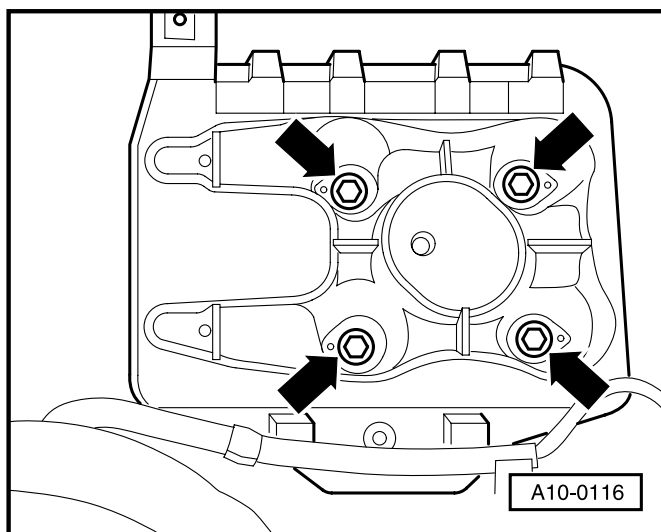
Procedure

- Remove bonnet at the hinges:
⇒ General Body Repairs; Repair Group 55; List of components of bonnet

- On models with coded radio set, pay attention to coding; determine if necessary.

- Remove battery:
⇒ Electrical System; Repair Group 27; Removing and installing battery

- ◀ - Remove battery mount -arrows-.

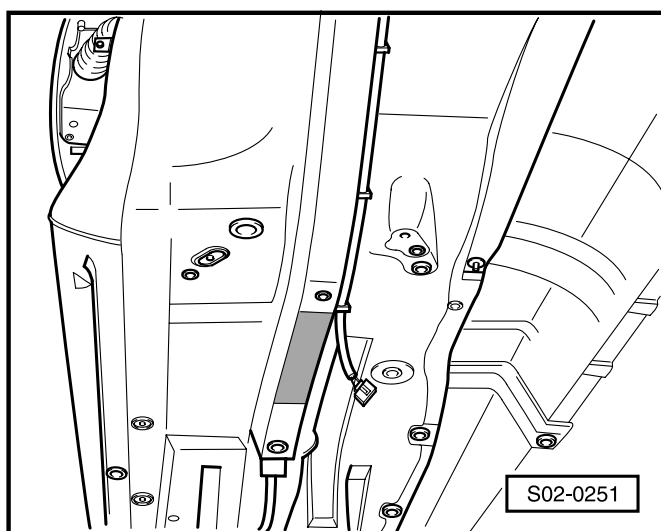


- Raise car with a lift platform; pay attention to the following points:

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

Important!

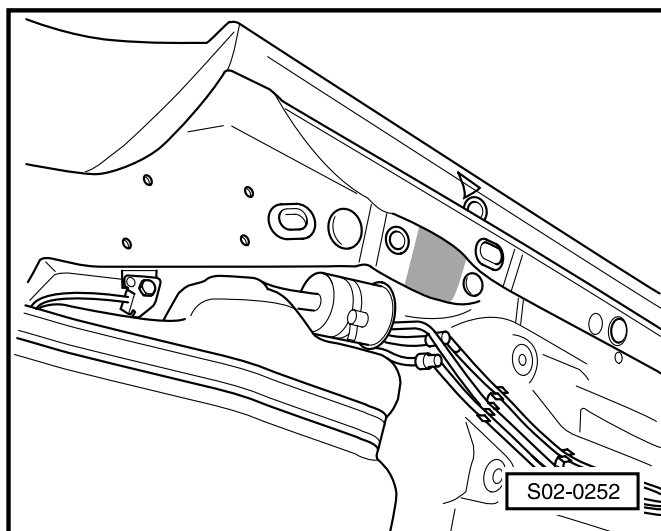
On no account may the arms of the lift platform be positioned below the sills, the front or rear suspension.



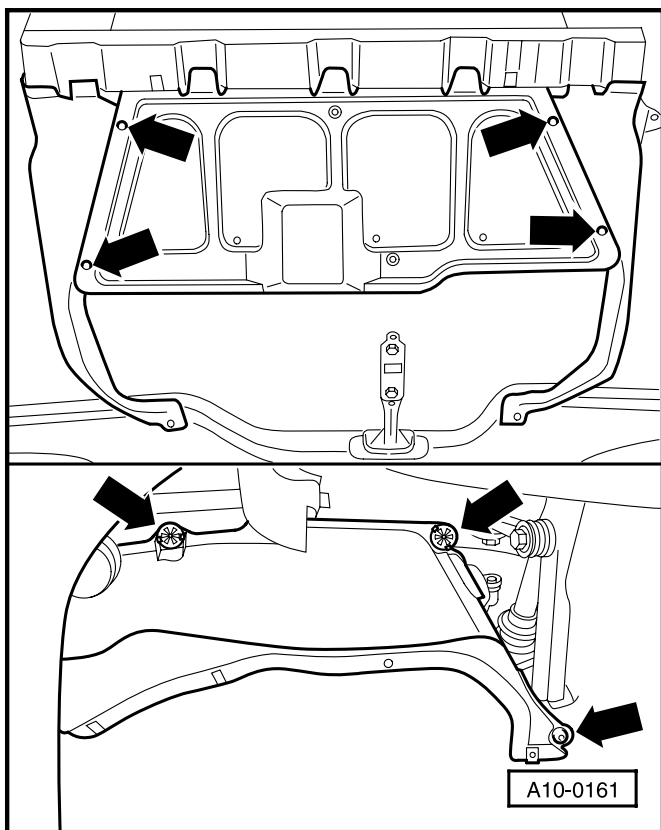
- ◀ The two jacking points at the front are located at the front side members at the level of the marking on the sill.

Important!

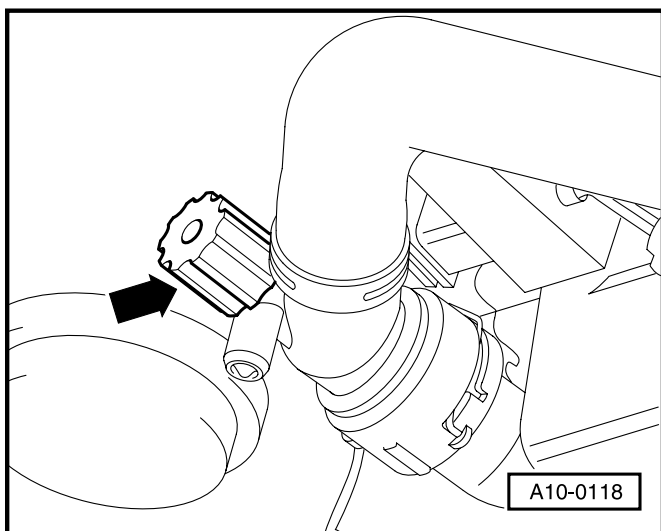
Never start the engine and engage a gear when the car is raised if even only one driven wheel is touching the ground.



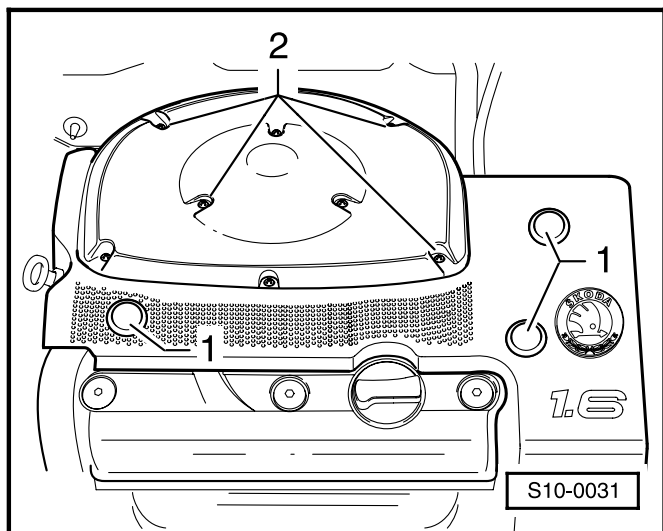
- ◀ The two rear jacking points are located at the rear side members at the level of the marking on the sill.



- ◀ - Remove noise insulation panel -arrows-.
- Open filler cap of coolant expansion reservoir.
 - Place drip tray (e.g. V.A.G 1306) below the engine.



- ◀ - Turn drain plug -arrow- at the radiator to the left (anti-clockwise) and pull to the rear; fit auxiliary hose onto connection if necessary.



◀ - Remove engine cover -1-.

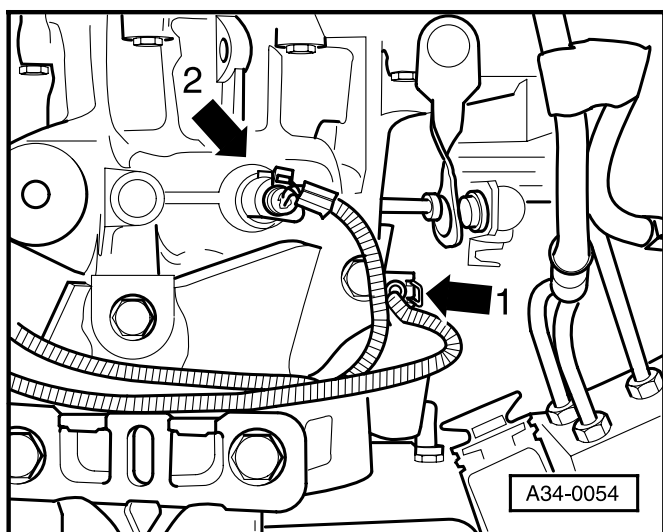
- Remove air filter -2-.

Note:

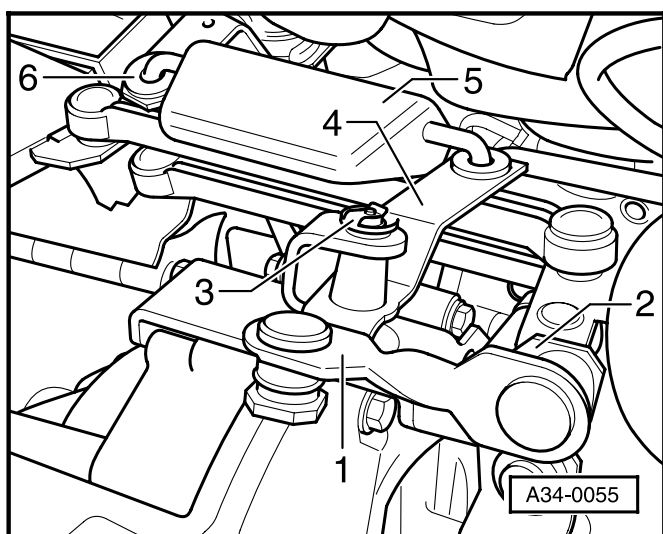
Do not use a power or air screwdriver.

- Detach vent hose for crankcase at air filter.

- Detach air hose at warm air manifold.

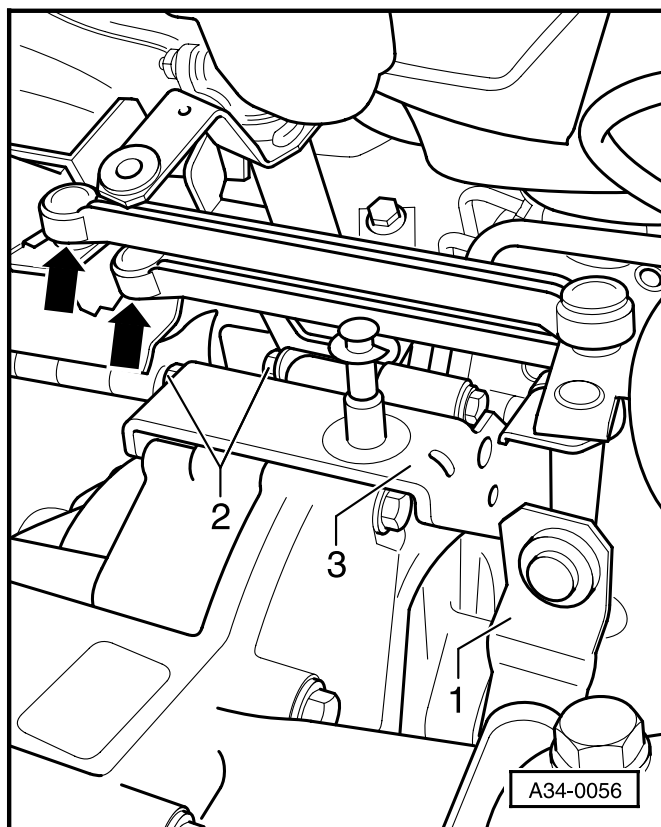


◀ - Unplug connector from speedometer sender (G22) -1- and switch for reversing lights (F4) -2-.

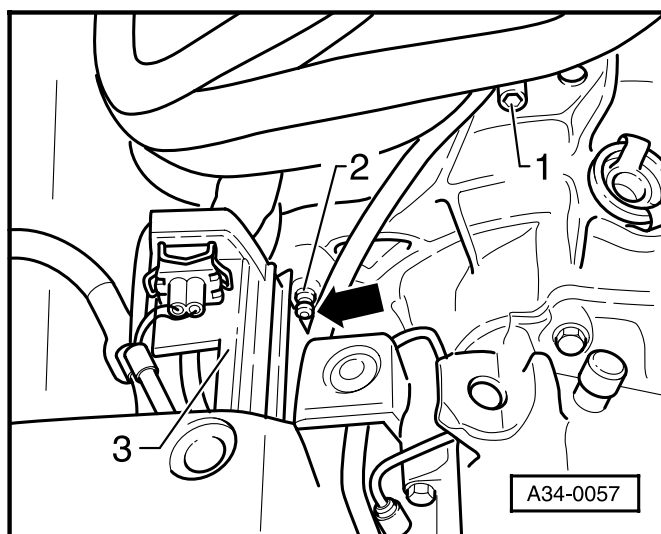


◀ - Use a screwdriver to lever front shift rod -1- off shift lever -2-, take off lock washers -3- and lift bracket -4- up and off.

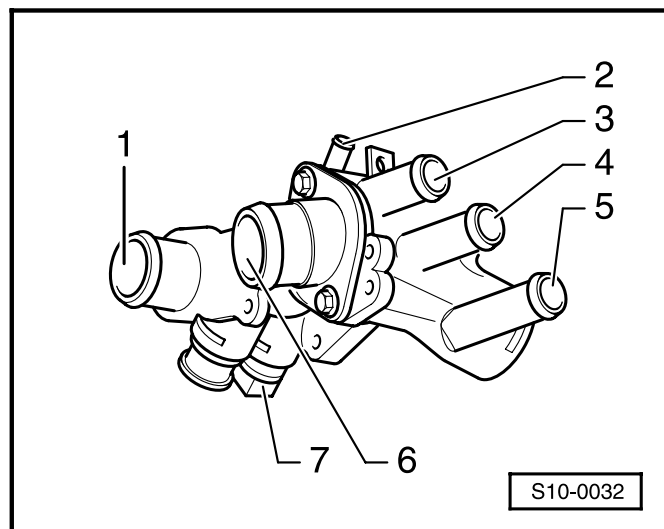
- Separate bracket -4- from shift rod with balancing weight -5- by turning 90° to the right, swivel shift rod and balancing weight up and separate from bearing bracket -6-.



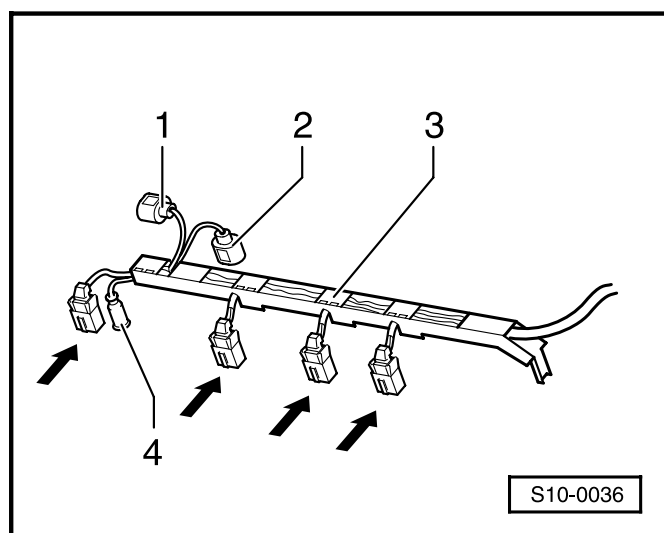
- Use a screwdriver to lever long coupling rods off selector lever -arrows-. Unbolt front shift lever -1- at gearbox.
- Unscrew bolts -2- and take shift bracket -3- together with coupling rods and front shift lever off the gearbox.



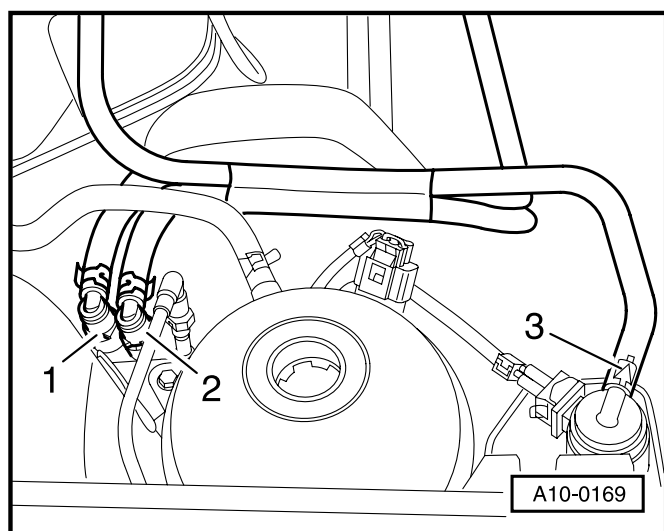
- Disconnect earth strap from top bolt connecting engine/gearbox -1-.
- Unbolt cable holder -3- at top of starter -arrow-.



- ◀ - Detach coolant hoses from connections -1 ... 6- of the coolant thermostat housing (spring strap clips).
- Unplug connector at coolant temperature sender (G62) -7-.
- Unplug connector at Hall sender (G40)/ distributor.
- Unplug connector at knock sensor 1 (G61) below the coolant pipe.
- Detach vacuum hose to the brake servo unit from the intake manifold (clamp-type clip).
- Detach coolant hose at top of radiator (quick-coupling).



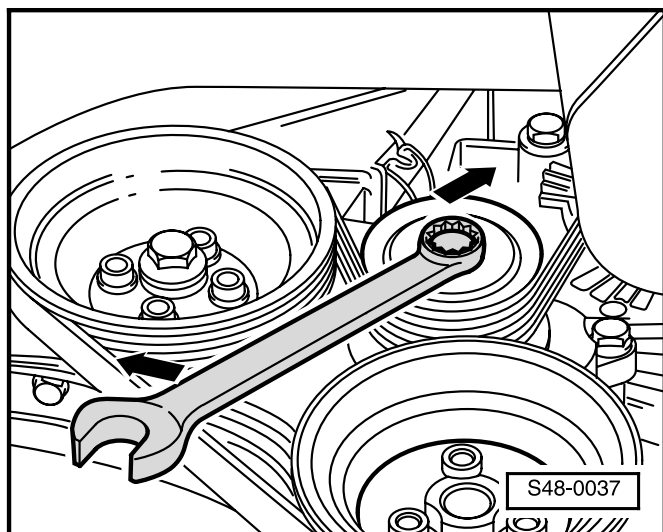
- ◀ - Unplug connectors -arrows- for injectors (N30 ... N33).
- Unplug connector -1- for intake air temperature/intake manifold pressure sender (G42/ G71).
- Unplug connector -2- for throttle valve control unit (J338).
- Unplug connector -4- for oil pressure switch (F22).
- Unclip cable guide -3- together with cables from fuel rail.
- Disconnect throttle cable at throttle valve control unit.



Important!

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

- ◀ - Detach fuel feed pipe -1- and fuel return flow pipe -2- by applying pressure to the release catches at the separation point. Pipes and connectors are colour-coded.
- Detach hose -3- at the ACF reservoir.



- Unbolt coolant expansion reservoir and place down to the outside (coolant hoses remain connected).

Note:

Before removing the ribbed V-belt, mark the direction of running. If a belt which was already used is re-fitted to run in the opposite direction, it may be destroyed. When installing the belt, ensure it is correctly located in the belt pulleys.

- ◀ Swivel tensioning element in direction of arrow in order to slacken the ribbed V-belt.

- Take off ribbed V-belt.

- Unbolt 2 brackets for delivery pipe of PAS (on left of gearbox and below starter).

- Unbolt belt pulley of hydraulic pump of PAS.

- Unbolt hydraulic pump of PAS and tie up to the front of the vehicle. The pipes remain connected.

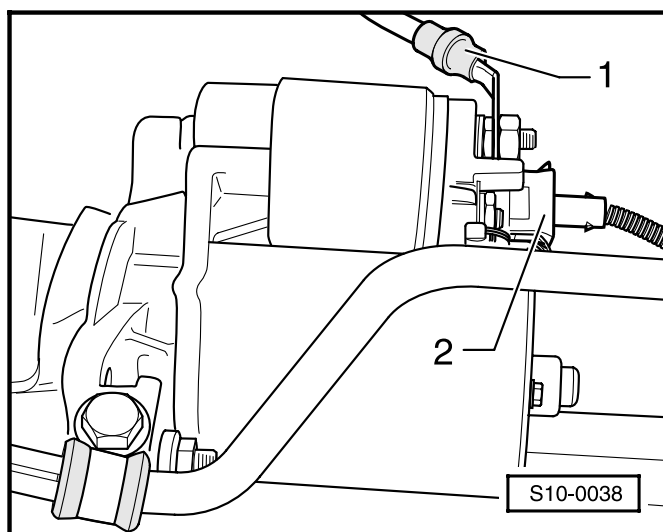
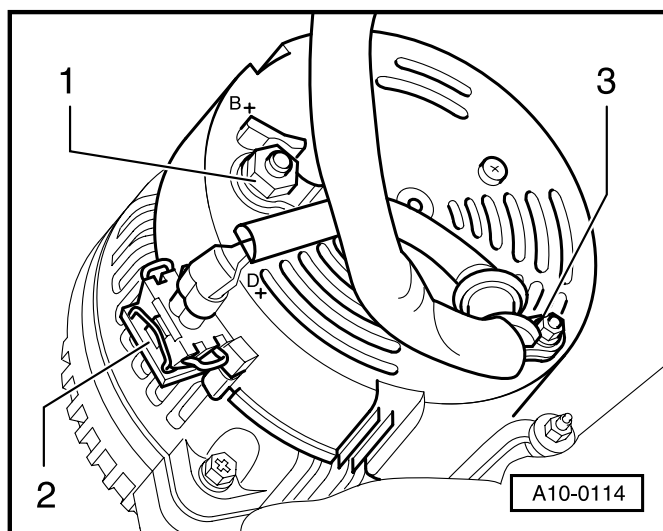
- Remove crankshaft belt pulley.

- ◀ Unbolt cable -1- from terminal 30/B+ at alternator.

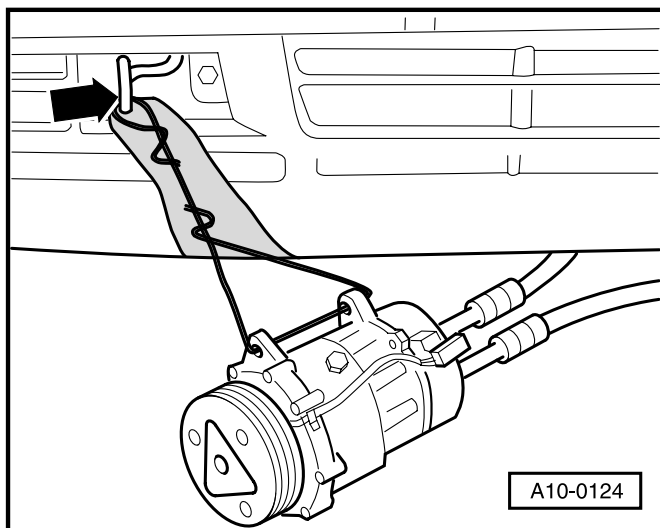
- Unplug connector -2- from terminal D+.

- Unscrew cable clip -3-.

- Take pipe out of guide tube (at exhaust manifold).



- ◀ Unbolt cable -1- from the starter and unplug connector -2-.



Models with air conditioning

Important!

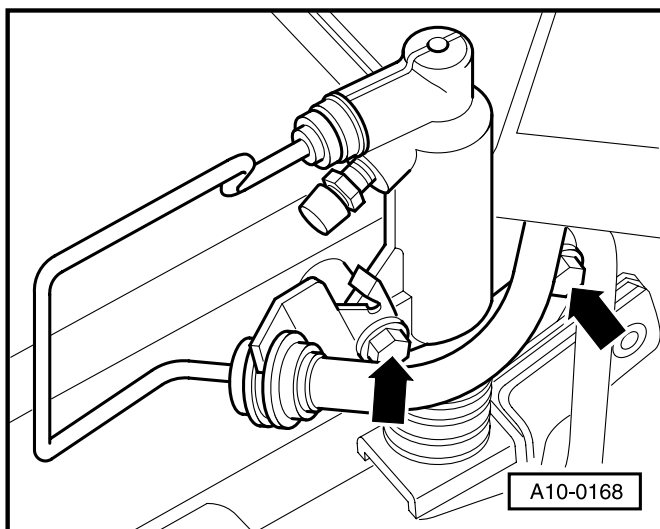
The refrigerant circuit of the air conditioning system must not be opened.

- Unbolt bracket for refrigerant hoses.
- ◀ - Unbolt compressor of air conditioning system, lower together with the connected refrigerant hoses and tie up at the towing eye on the inside of the bumper -arrow- with wire.

Note:

Place a soft protection around bumper to avoid it being damaged by the wire.

- Remove alternator.

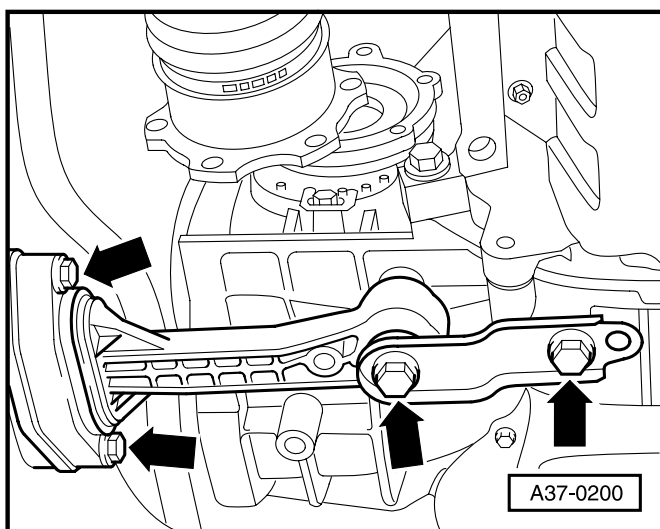


All models

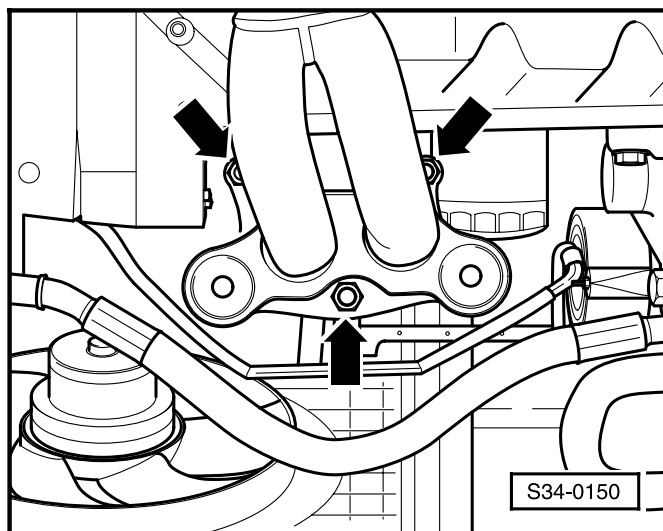
- ◀ - Unbolt clutch slave cylinder from gearbox -arrows-, place down and secure with wire. Do not open piping system.

Note:

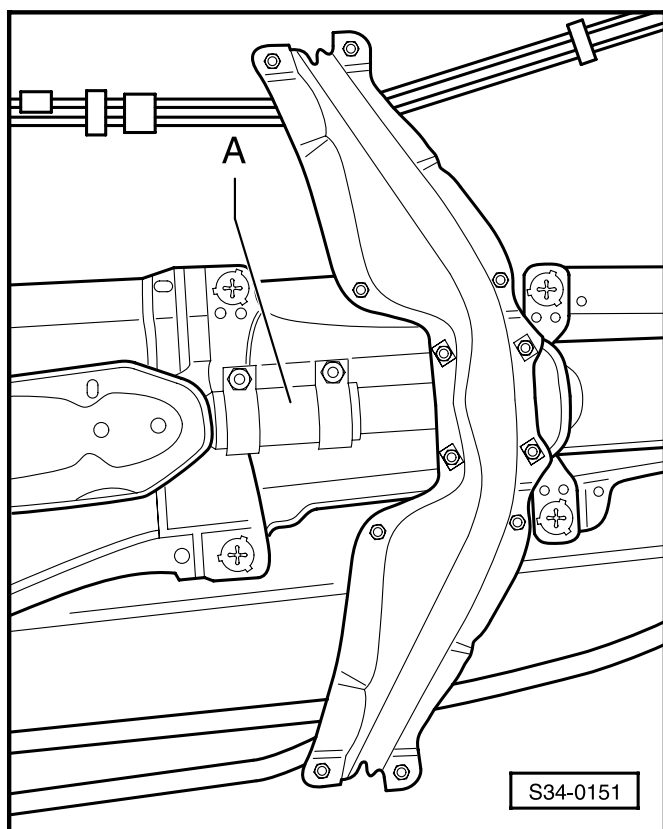
Do not depress clutch pedal.



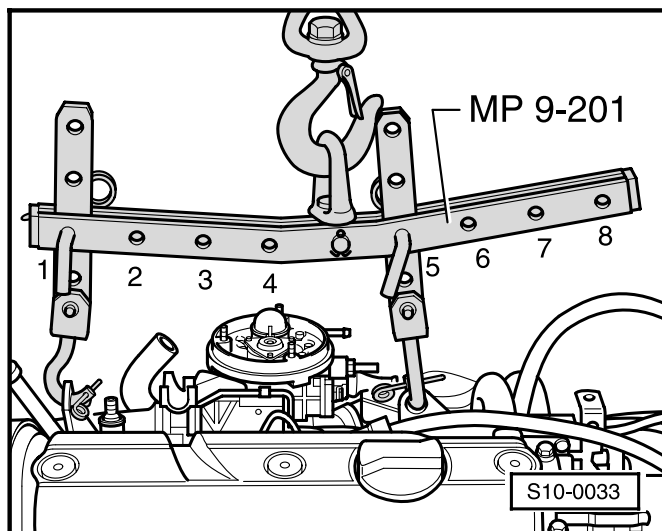
- ◀ - Unbolt pendulum support -arrows-.
- Unbolt drive shafts from the flanges of the gearbox.
- Place right drive shaft to the rear and tie tightly with wire to the subframe; allow left drive shaft to hang down.



- ◀ - Disconnect front exhaust pipe from exhaust manifold by unscrewing the nuts -arrows-.



- ◀ - Slacken double clip -A- and separate exhaust system.
- Place output pipe of catalytic converter as far up as possible (e.g. foam between pipe and double clip) so that the front exhaust pipe is positioned as far down as possible and does not obstruct removal of the engine.
- Place coolant hoses and electric cables to the side and attach.



- ◀ - Attach suspension device MP 9-201 as follows and take up weight of engine with workshop crane:

Belt pulley side:

2nd hole of rail in position 1 (unbolt bracket for engine cover first of all, if necessary)

Flywheel side:

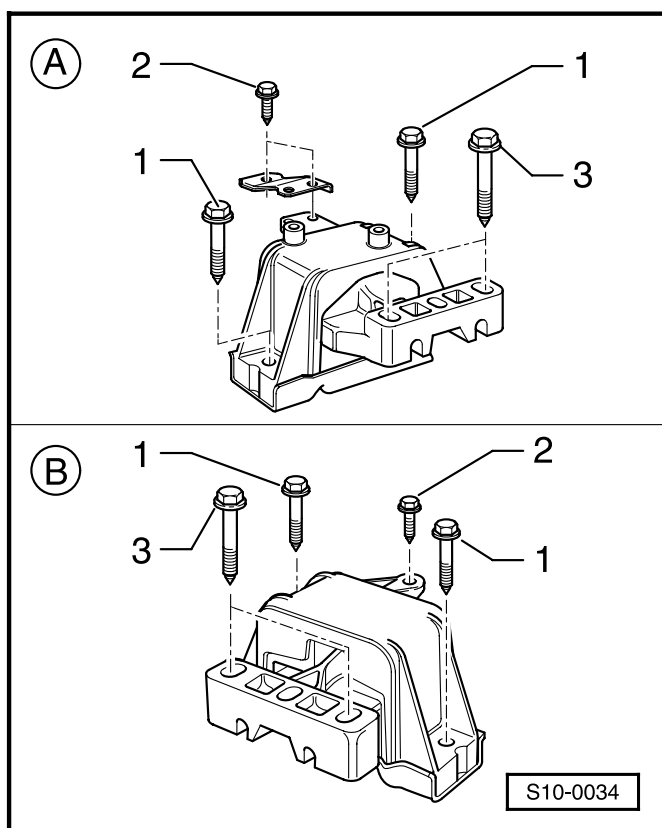
2nd hole of rail in position 5

Important!

Use locking pins at the hooks and inserted pins.

Notes:

- ♦ The pin positions of the supporting bar marked with 1 ... 4 point toward the belt pulley.
- ♦ The holes in the rails are counted from the hook.

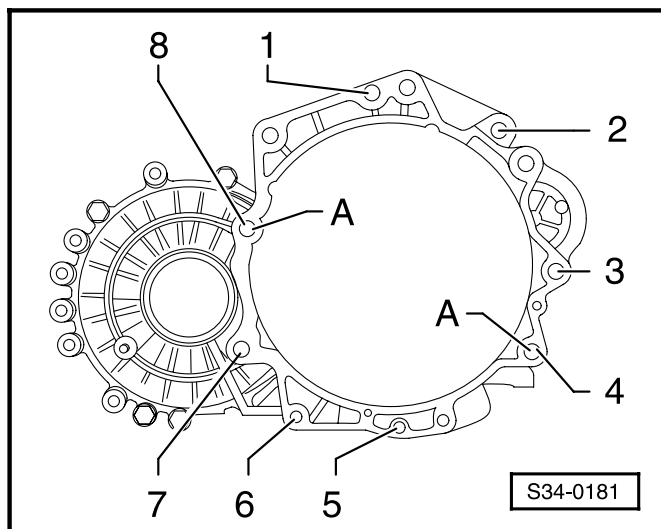


- ◀ - Remove engine mount -A- and gearbox mount -B- by unscrewing bolts -1 ... 3-. Unbolt the oil reservoir of the PAS before removing the engine mount.

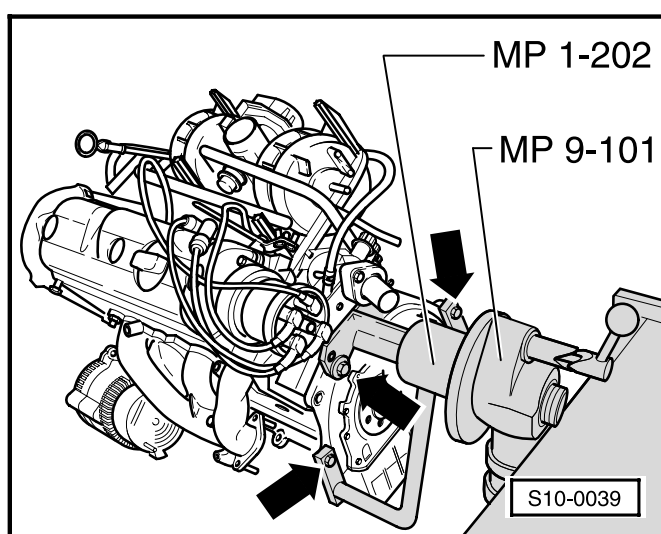
- Turn engine/gearbox slightly to the left (engine to the front, gearbox to the rear) and lift up and out.

Note:

When lifting engine/gearbox out, it is essential that a second fitter guides the assembly to avoid damage because of the tight clearance to the body.



- ◀ - Unscrew bolts -1 ... 8- at the engine/gearbox flange. Bolt -7- holds small cover plate in place.
- Separate engine and gearbox.



Attaching engine to repair stand

- Remove intermediate plate by taking out flywheel and pressure plate ⇒ page 13-8.
- ◀ - Bolt engine to engine holder MP 1-202 -arrows- (at the 2 dowel sleeves with long mounts, at the top only 1 bolt on left) and attach to the repair stand MP 9-101.

Note:

The engine must not be attached to the repair stand for measuring the cylinder bore (⇒ page 13-14).

Installing

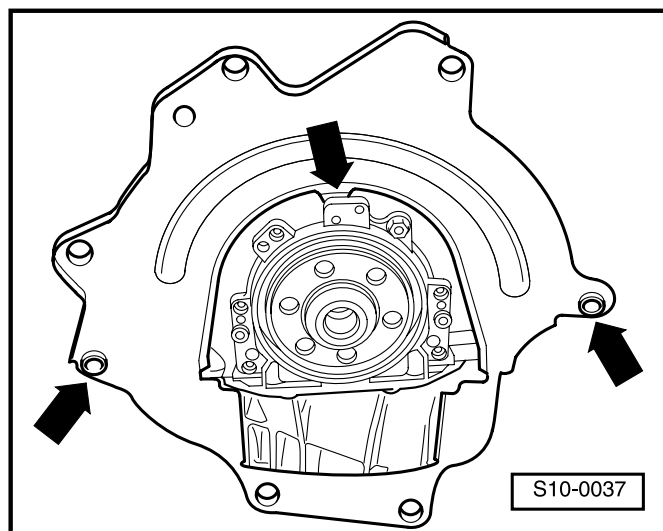
Notes:

- ◆ Always replace seals and gaskets when carrying out removal and installation work on the engine.
- ◆ Replace self-locking nuts.

Procedure:

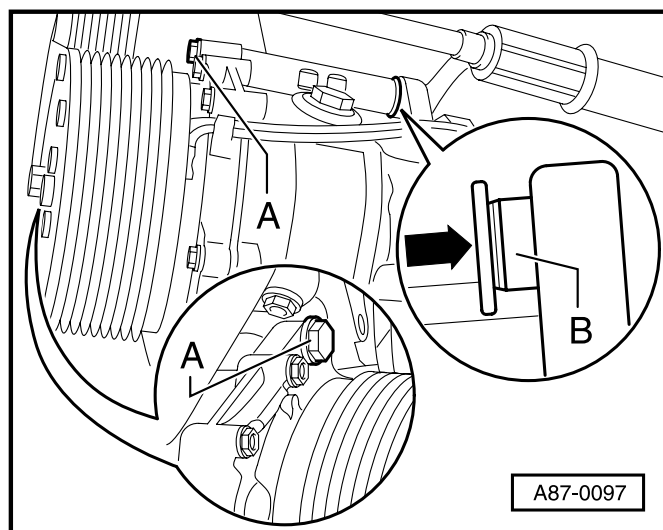
Installation is performed in the reverse order; pay attention to the following points:

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



- ◀ - Attach intermediate plate to sealing flange and fit onto the dowel sleeves -arrows-.
- Install pressure plate and flywheel ⇒ page 13-8.
- Grease the splines of the gearbox input shaft lightly with G 000 100.
- Install slave cylinder of the hydraulic clutch:
⇒ 5-speed Manual Gearbox 02K; Repair Group 30; Servicing clutch mechanism; List of hydraulic components
- Attach shift mechanism:
⇒ 5-speed Manual Gearbox 02K; Repair Group 34; Servicing shift mechanism
- Adjust shift mechanism:
⇒ 5-speed Manual Gearbox 02K; Repair Group 34; Servicing shift mechanism; Adjusting shift mechanism
- Align engine/gearbox free of stress by shaking and tighten securing bolts.
- Install hydraulic pump for PAS:
⇒ Running Gear; Repair Group 48; Removing and installing hydraulic pump of power assisted steering

Models with air conditioning



- Install AC compressor:
⇒ Heating, Air Conditioning; Repair Group 87; Air Conditioning; Detaching and attaching compressor at bracket
- ◀ - Push back threaded bushes -B- for retaining bolts -A- slightly in direction of arrow to more easily fit on the AC compressor.

All models

- Install ribbed V-belt ⇒ page 13-5.
- Install drive shafts:
⇒ Running Gear; Repair Group 40; Servicing front suspension; Removing and installing drive shafts

- Install catalytic converter and align exhaust system free of stress ⇒ page 26-1.
- Attach coolant hoses ⇒ page 19-1.
- Fill system with coolant ⇒ page 19-2.
- Do not re-use drained coolant if the cylinder head, cylinder block, cylinder head gasket, radiator or heat exchanger have been replaced.
- Before starting the engine, check oil level ⇒ page 17-4.
- Electrical connections and routing:
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder
- Adjust throttle cable ⇒ page 20-13.
- Interrogate fault memory:
⇒ 1.6 ltr./55 kW Engine, 1AV Fuel Injection and Ignition System; Repair Group 01; Self-Diagnosis; Interrogating and erasing fault memory

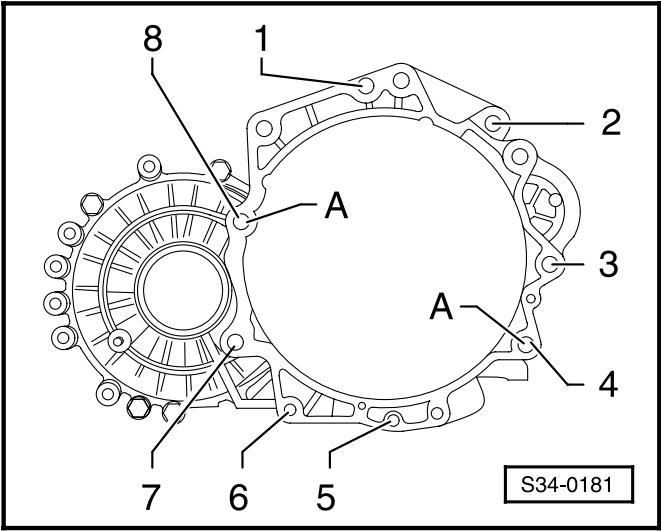
Note:

Faults are stored as a result of unplugging the connectors. After installing, interrogate fault memory and erase if necessary.

- Check ignition timing and adjust if necessary:
⇒ 1.6 ltr./55 kW Engine, 1AV Fuel Injection and Ignition System; Repair Group 28; Testing and setting ignition timing
- Carry out basic setting:
⇒ 1.6 ltr./55 kW Engine, 1AV Fuel Injection and Ignition System; Repair Group 24; Carrying out basic setting

Tightening torques**Notes:**

- ◆ *The tightening torques apply to nuts and bolts which have been only slightly greased, oiled, phosphatised or blackened.*
- ◆ *Additional lubricants such as engine or gear oil are approved, but not Molykote.*
- ◆ *Do not use any degreased parts.*
- ◆ *Tolerance for tightening torques ± 15 %.*



◀ Fixation for engine/gearbox

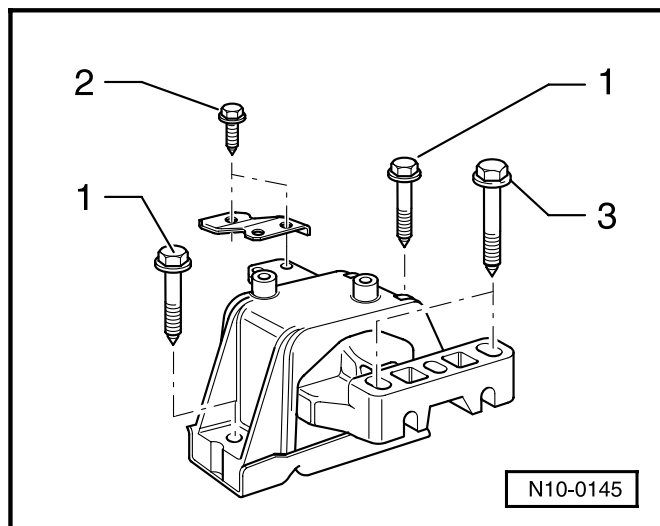
Position	Screw	Nm
1	M12 x 55	80
2	M12 x 55 ¹⁾	80
3	M12 x 120 ¹⁾	80
4	M12 x 55	80
5	M10 x 50	45
6	M10 x 50	45
7	M12 x 35	20
8	M12 x 55	80

1) Screw with threaded pin M8

A: Dowel sleeves for centering

Component		Nm
Screws and nuts	M6	9
	M8	20
	M10	40
	M12	70
deviations:		
Engine mounting, gearbox mount, pendulum support		⇒ Assembly bracket
Thrust plate on crankshaft		60 + 90° ¹⁾
Flywheel on thrust plate		20

1) Always replace screws and nuts



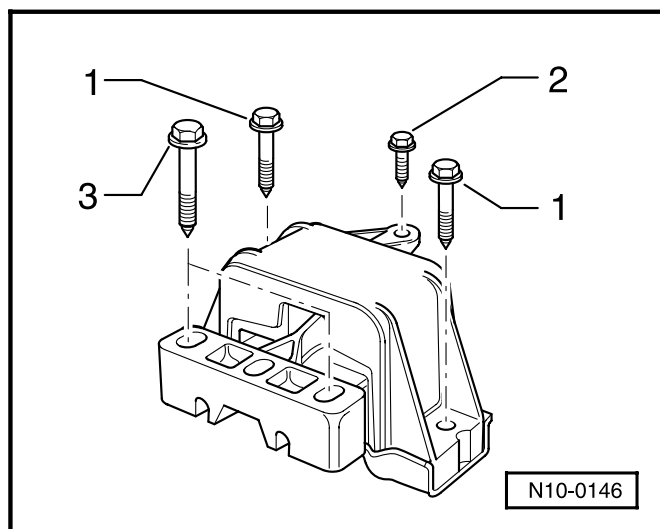
Assembly bracket

Tightening torques

◀ Engine assembly bracket

- 1 - 40 Nm + 90° ($\frac{1}{4}$ turn)¹⁾
- 2 - 25 Nm
- 3 - 100 Nm¹⁾

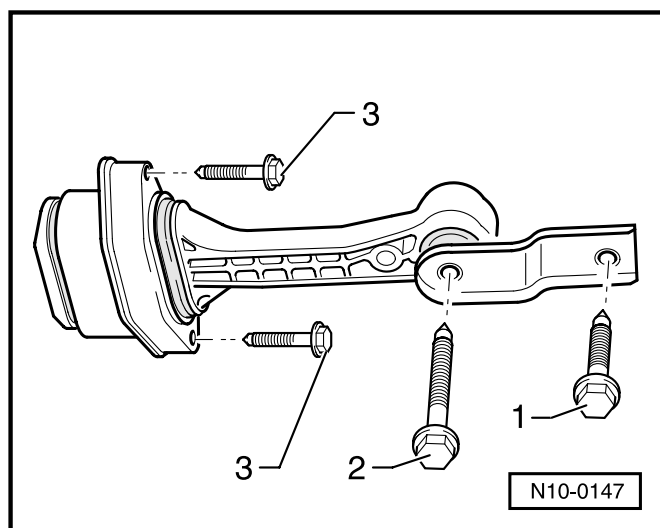
¹⁾ Replace bolts



◀ Gearbox assembly bracket

- 1 - 40 Nm + 90° ($\frac{1}{4}$ turn)¹⁾
- 2 - 25 Nm
- 3 - 100 Nm¹⁾

¹⁾ Replace bolts



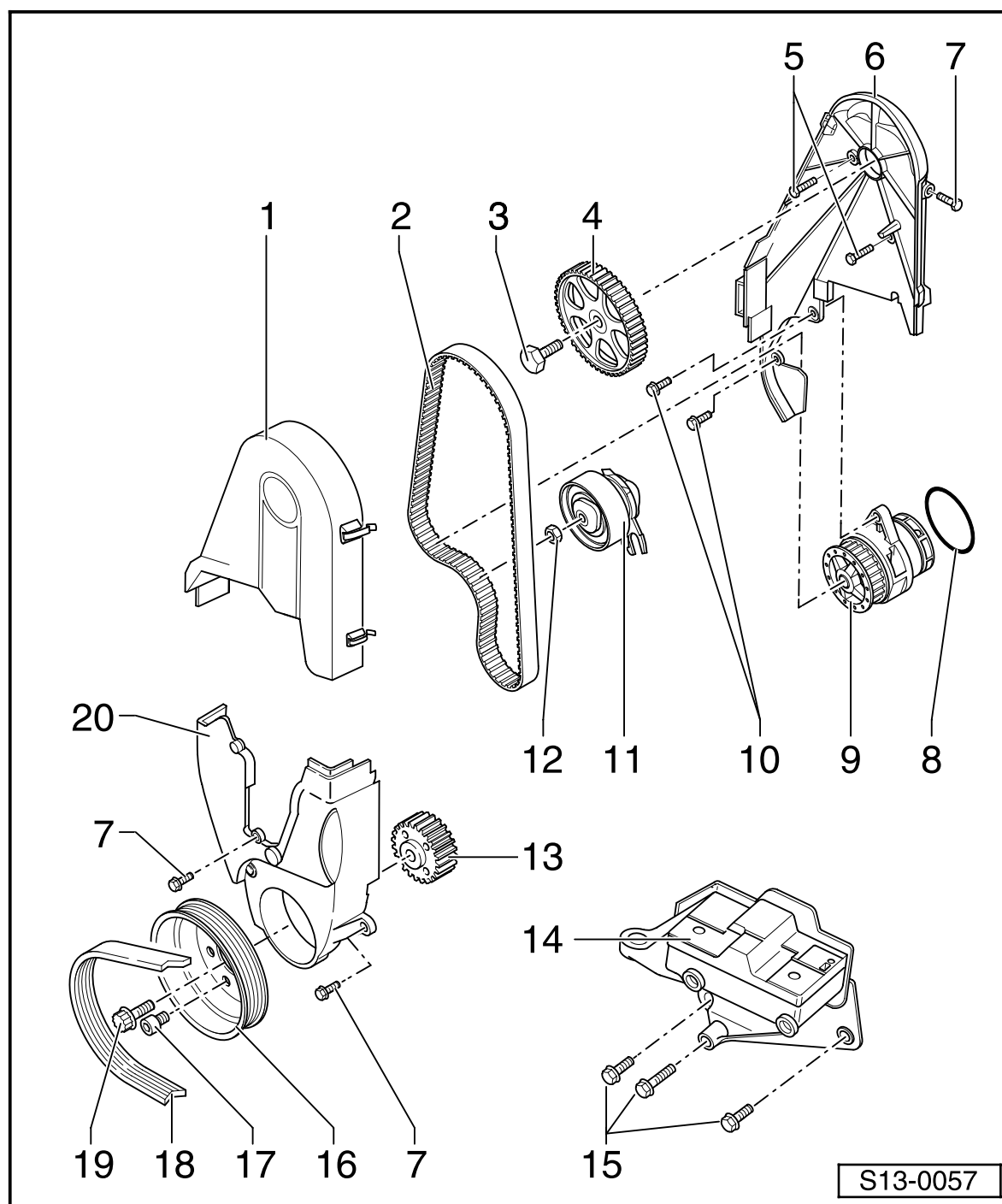
◀ Pendulum support

- 1 - 40 Nm + 45° ($\frac{1}{4}$ turn)¹⁾
- 2 - 40 Nm + 45° ($\frac{1}{4}$ turn)¹⁾
- 3 - 20 Nm + 90° ($\frac{1}{4}$ turn)¹⁾

¹⁾ Replace bolts

Disassembling and assembling engine

Belt pulley side



1 - Top part of toothed belt guard

2 - Toothed belt

- ◆ Mark direction of running before removing
- ◆ Inspect for wear
- ◆ Do not kink
- ◆ Removing and installing, tensioning
⇒ page 13-5

3 - 20 Nm + torque a further ¼ turn (90°)

- ◆ Replace

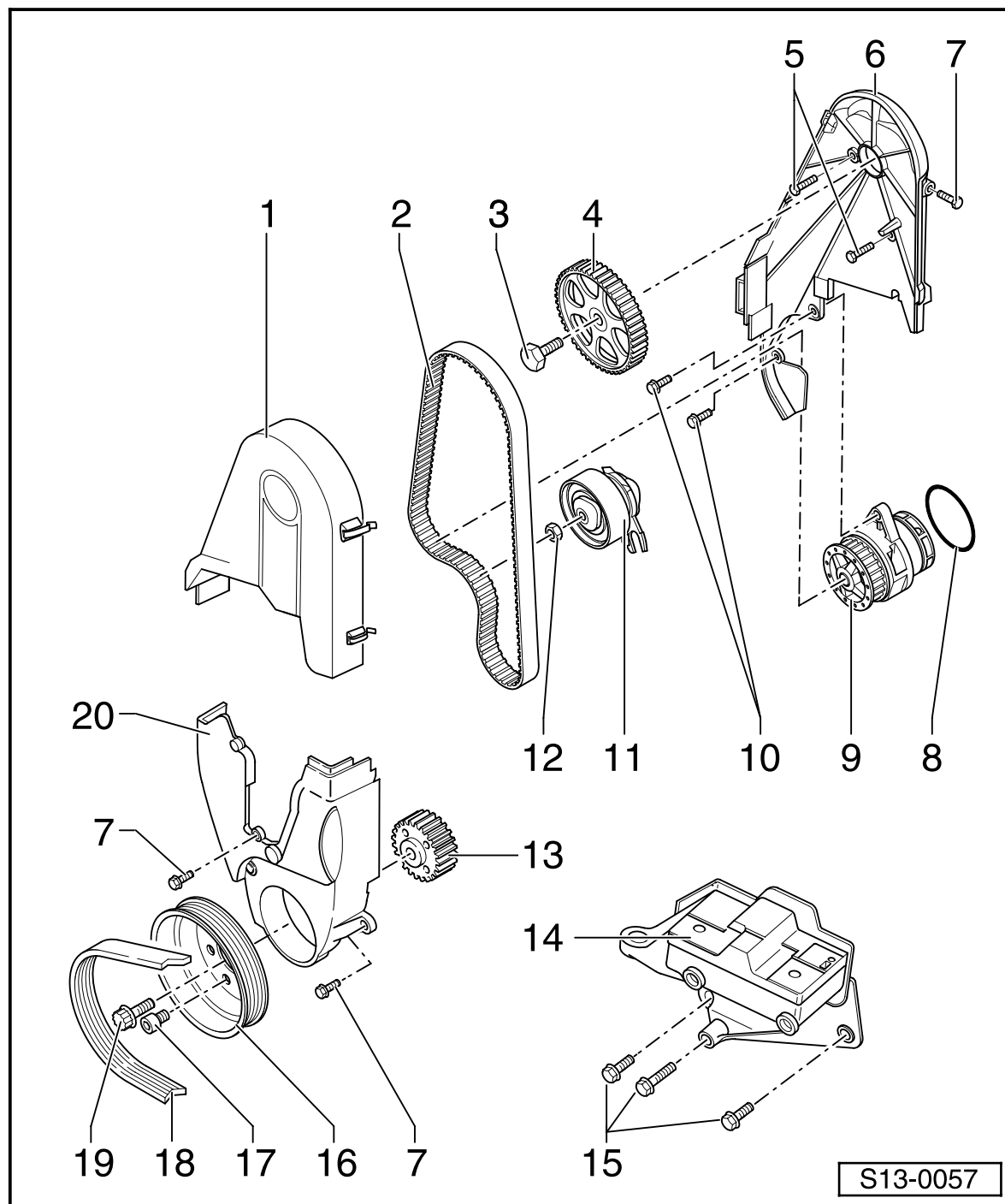
4 - Camshaft sprocket

- ◆ Pay attention to position when installing toothed belt ⇒ page 13-5

5 - 10 Nm

- ◆ Insert with D 000 600 A2

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**6 - Rear toothed belt guard**

7 - 10 Nm

8 - O-ring

♦ Replace

9 - Coolant pump

10 - 20 Nm

11 - Tensioning pulley

♦ Inspecting ⇒ page 13-7

12 - 20 Nm

13 - Crankshaft toothed belt sprocket

- ♦ Pay attention to position when installing toothed belt ⇒ page 13-5
- ♦ From engine No. 210158 (new oil pump) modified version, pay attention to part number

14 - Engine support

15 - 40 Nm + torque a further 1/4 turn (90°)

♦ Replace

16 - Belt pulley

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17 - 20 Nm

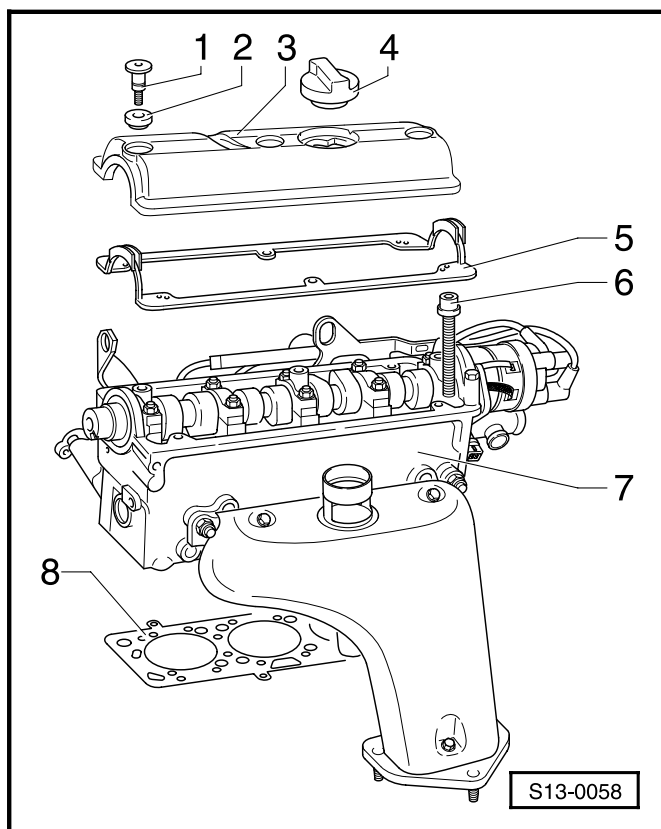
18 - Ribbed V-belt

- ◆ Before removing mark the direction of rotation
- ◆ Removing and installing ⇒ page 13-5

19 - 90 Nm + a further $\frac{1}{4}$ turn (90°)

- ◆ Replace
- ◆ Oil before mounting

20 - Timing belt guard - bottom part



Cylinder head cover

1 - 5 Nm + a further $\frac{1}{4}$ turn (90°)

- ◆ Replace

2 - Seal

- ◆ Replace

3 - Cylinder head cover

4 - Sealing cover

- ◆ Replace gasket if damaged

5 - Gasket for cylinder head cover

- ◆ Replace if damaged
- ◆ Coat with „D 454 300 A2“ before fitting contact faces of bearing cap/cylinder head cover.

6 - Cylinder head bolt

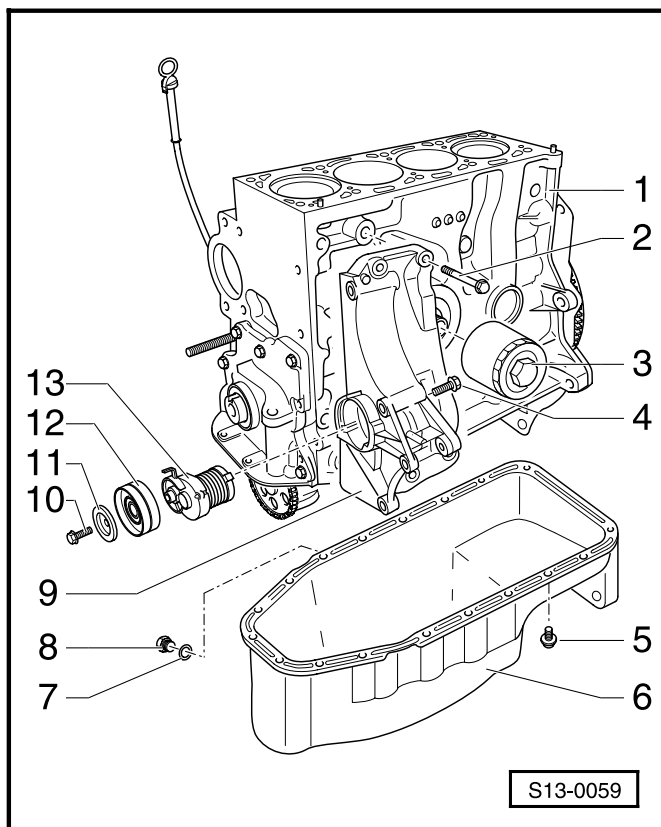
- ◆ Replace
- ◆ Mounting instructions and sequence for loosening and tightening ⇒ page 15-3

7 - Cylinder head

- ◆ Removing and installing ⇒ page 15-3

8 - Cylinder head gasket

- ◆ Replace
- ◆ Metal gasket
- ◆ After replacing, fill entire system with fresh coolant



Cylinder block

Note:

Repair work on the clutch:

⇒ 5-speed manual gearbox 02K; Repair Group 30; Servicing clutch

1 - Cylinder block

- ◆ Disassembling and assembling cylinder block, crankshaft and flywheel ⇒ page 13-8
- ◆ disassembling and assembling piston and conrod ⇒ page 13-12

2 - 50 Nm

- ◆ Tightening sequence:
first of all tighten the top right bolt, then bottom right bolt, and the last of all the left bolts (looking in direction of travel)

3 - Oil filter

- ◆ Use tensioning strap for slackening
- ◆ Lightly oil seal
- ◆ 20 Nm
- ◆ After pouring in oil, check for leaks

4 - 20 Nm

5 - 15 Nm

6 - Oil sump

- ◆ Clean sealing surfaces before installing
- ◆ Apply silicone sealant D 176 404 A2 to the sealing surfaces ⇒ page 17-5, installing oil sump

7 - Seal

- ◆ Replace

8 - Oil drain plug, 20 Nm

9 - Bracket

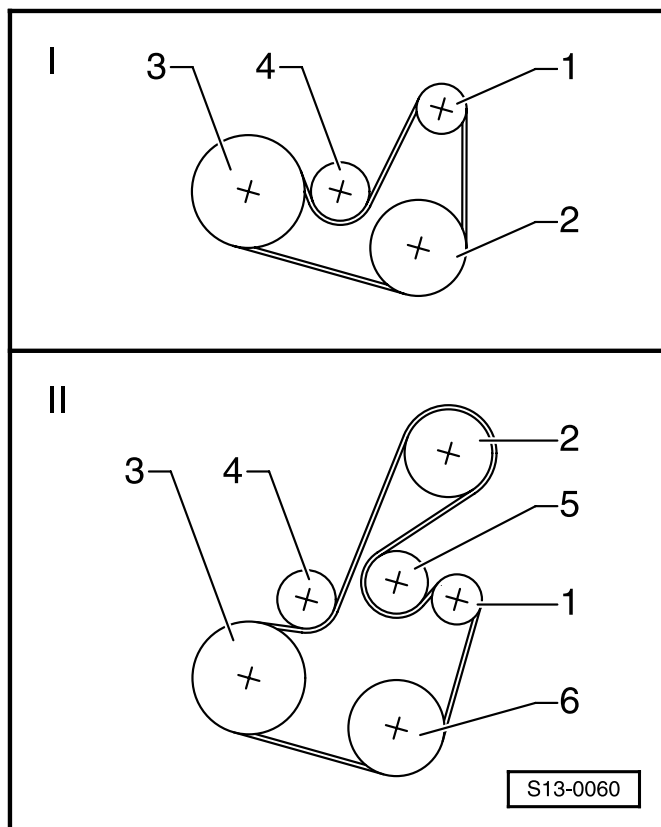
- ◆ for vane pump and alternator

10 - 45 Nm

11 - Washer

12 - Tensioning pulley

13 - Tensioning element



Removing and installing ribbed V-belt

Note:

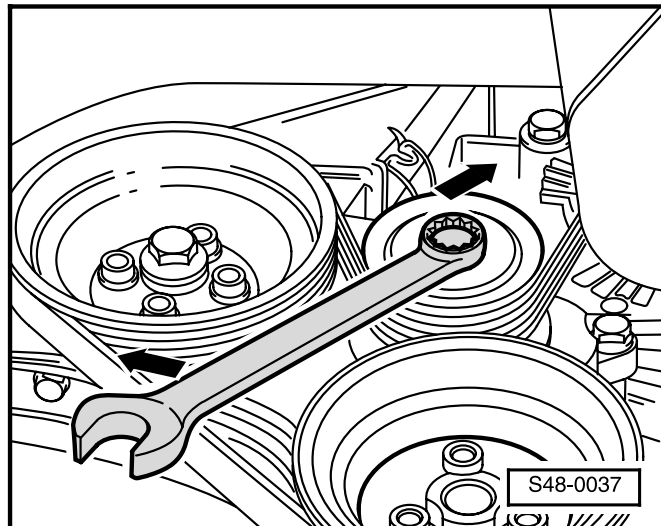
Mark the direction of running of the ribbed V-belt before removing it. When installing belt, ensure it is correctly located in the belt pulleys.

◀ Belt drive

I - without AC compressor

II - with AC compressor

- 1 - Alternator
- 2 - Power steering hydraulic pump
- 3 - Crankshaft
- 4 - Tensioning pulley
- 5 - Guide pulley
- 6 - AC compressor



Continued for all models:

- ◀ - Attach a wrench to the bolt securing the tensioning pulley and swivel tensioning pulley in direction of arrow.
- Take off ribbed V-belt, fit on.

Removing and installing, tensioning toothed belt

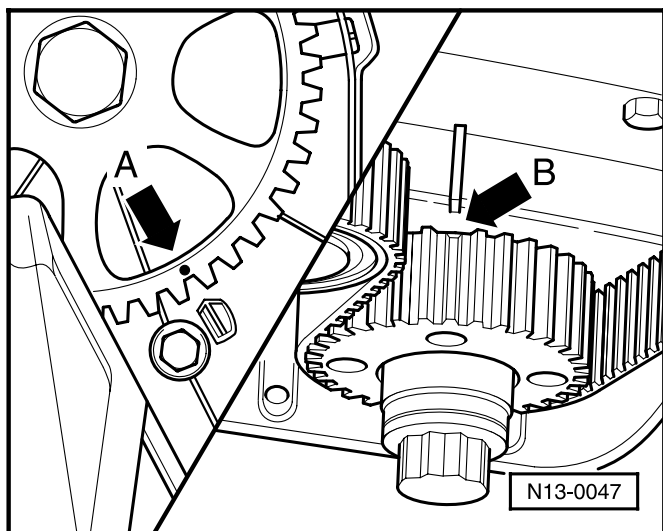
(Setting timing)

Special tools, testers and aids required

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

Removing

- Remove ribbed V-belt ⇒ page 13-5.
- Remove belt pulley and top and bottom parts of toothed belt guard.



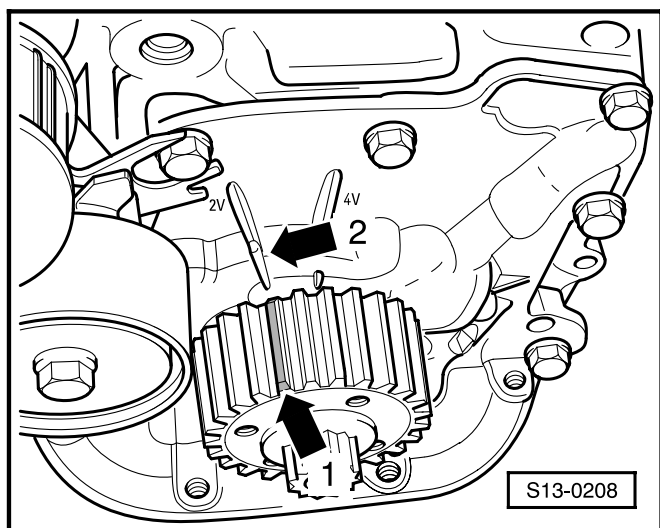
- Position crankshaft to TDC
⇒ page 13-6, Installing toothed belt.
- Mark direction of running of toothed belt.
- Slacken tensioning pulley and take off toothed belt.

Installing

- ◀ Position camshaft sprocket to marking -arrow A-.

Models up to engine No. 518016

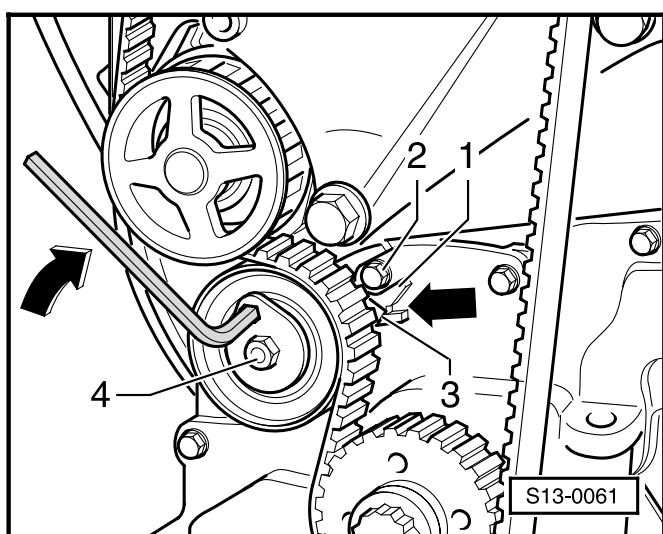
- Position crankshaft to TDC of cyl. 1. The ground tooth at the toothed belt sprocket of the crankshaft must be aligned with the marking on the sealing flange -arrow B-.



Models from engine No. 518017

- ◀ Position crankshaft to TDC of cyl. 1. The ground tooth -arrow 1- at the toothed belt sprocket of the crankshaft must be aligned with the marking at the 2V sealing flange -arrow 2-.

Continued for all models



- Fit on toothed belt. If fitting on the previous belt, pay attention to the direction of running.
- ◀ Install tensioning pulley and tighten securing nut -4- by hand. The recess of the base plate -1- must fit around the securing bolt -2-.
- Tension toothed belt by turning tensioning pulley in direction of arrow until the pointer -3- is positioned above the notch in the base plate -arrow-.
- Tighten clamping nut at the tensioning pulley.

Tightening torque: 20 Nm

- Rotate crankshaft twice in direction of rotation of engine, position again to TDC and check setting.
- Install top and bottom parts of toothed belt guard.
- Install belt pulley.
- Install ribbed V-belt ⇒ page 13-5.
- Check ignition timing, set if necessary:
⇒ Repair Group 28; Injection and ignition system; Checking and setting ignition timing

Inspecting semi-automatic toothed belt tensioning pulley

Inspection condition

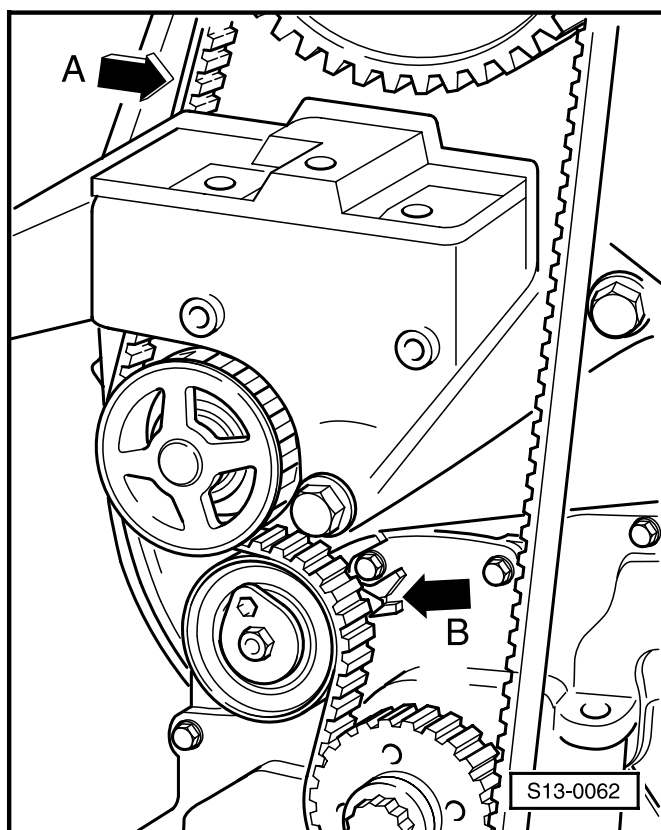
- Toothed belt fitted on and tensioned

Inspection procedure

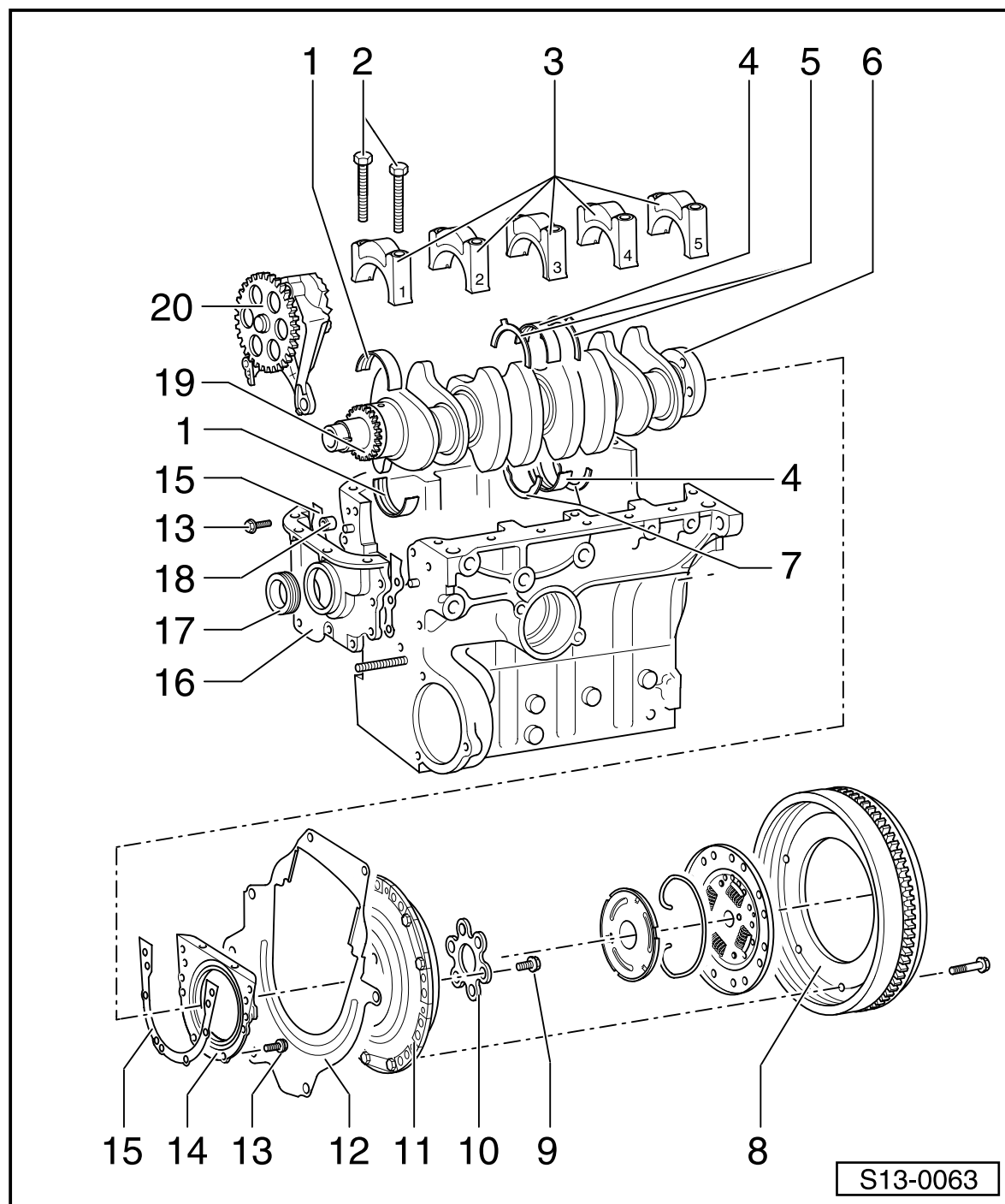
- Rotate crankshaft twice in direction of rotation of engine and position to TDC of cylinder 1.
- ◀ - Apply firm pressure with your thumb to the toothed belt -arrow A-
The pointer on the tensioning pulley -arrow B- should alter its position.
- Release the pressure on the toothed belt.
- Rotate crankshaft twice in direction of rotation of engine.
- Check position of the pointer of the tensioning pulley. It should have returned to its original position.

If the pointer of the tensioning pulley is not in its original position:

- Replace tensioning pulley.



Disassembling and assembling cylinder block, crankshaft and flywheel



S13-0063

1 - Bearing shell 1, 2, 4 and 5

- ◆ Do not mix up used bearing shells (mark)

2 - 65 Nm

3 - Bearing caps

- ◆ Bearing cap 1: belt pulley end
- ◆ Bearing cap 3 with recesses for thrust washers

- ◆ Retaining lugs of the bearing shells of cylinder block/bearing caps should be positioned one above the other

4 - Bearing shell 3

5 - Thrust washer

- ◆ For bearing cap 3
- ◆ Pay attention to positioning element

6 - Crankshaft

- ◆ New axial play:
0.07 to 0.18 mm
Wear limit: 0.20 mm
- ◆ Ø Crankshaft bearing journal:
54.00 mm
- ◆ Ø Conrod bearing journal: 47.80 mm

7 - Thrust washer

- ◆ For cylinder block, bearing 3

8 - Flywheel

- ◆ Removing and installing with components of clutch

⇒ 5-speed Manual Gearbox 02K; Repair Group 30; repairing clutch

9 - 60 Nm + a further $\frac{1}{4}$ turn (90°)

- ◆ Replace

10 - Washer

- ◆ Pay attention to fitting location

11 - Thrust plate

- ◆ Removing and installing thrust plate
⇒ Fig. 1

12 - Intermediate plate

- ◆ Inserted on sealing flange
- ◆ Must be positioned on dowel sleeves
- ◆ Do not damage/bend during assembly work

13 - 10 Nm**14 - Sealing flange with sealing ring**

- ◆ Only replace completely

15 - Gasket

- ◆ Replace

16 - Sealing flange/ oil pump

- ◆ As of Engine No. 210158 with integrated oil pump
- ◆ Removing and installing oil pump
⇒ page 17-4.2

17 - Sealing ring

- ◆ Replace ⇒ page 13-10
- ◆ As of Engine No. 210158 modified version

18 - Sealing bush

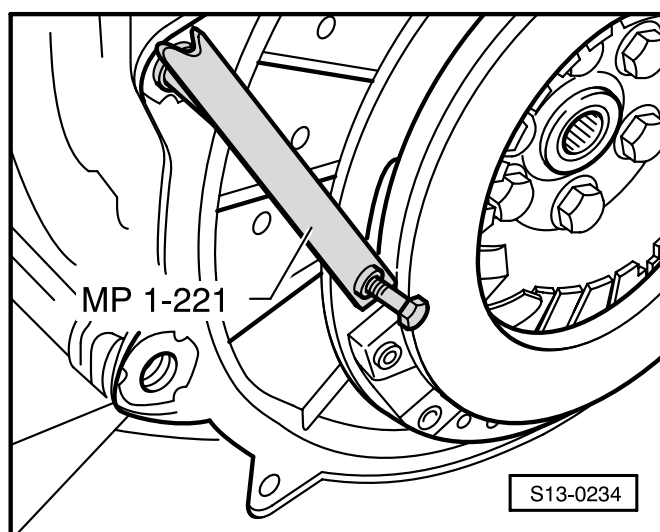
- ◆ Replace if damaged
- ◆ Insert first in the sealing flange
- ◆ Oil before mounting

19 - Sprocket

- ◆ For oil pump drive

20 - Oil pump

- ◆ Version up to Engine No. 210157
- ◆ Removing and installing ⇒ page 17-4.2



◀ **Fig. 1 Removing and installing thrust plate**

- Insert counterholder MP 1-221 into hole of cylinder block and screw onto thrust plate.
- Loosen bolts for thrust plate.

Note:

Replace bolts for thrust plate

- Tighten bolts with tightening torque 60 Nm and a further $\frac{1}{4}$ turn (90°)

Replace gasket ring for crankshaft and belt pulley side

- Engine installed

Special tools, testers and aids required

- ◆ Counterholder T 30004 or MP 1-310
- ◆ Torque wrench

Vehicles up to Engine No. 210157

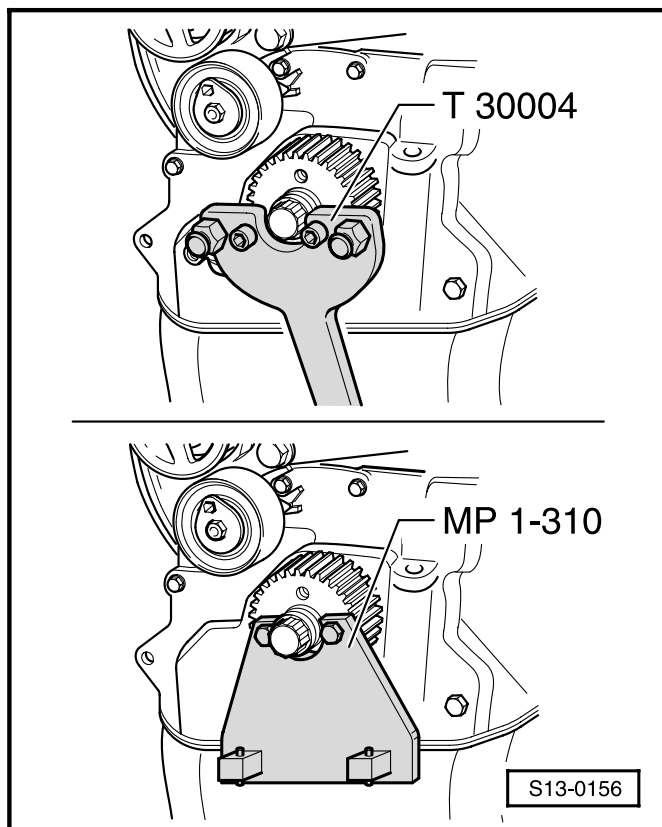
- ◆ Inserting device MP 1-207
- ◆ Gasket ring extractor MP 1-215

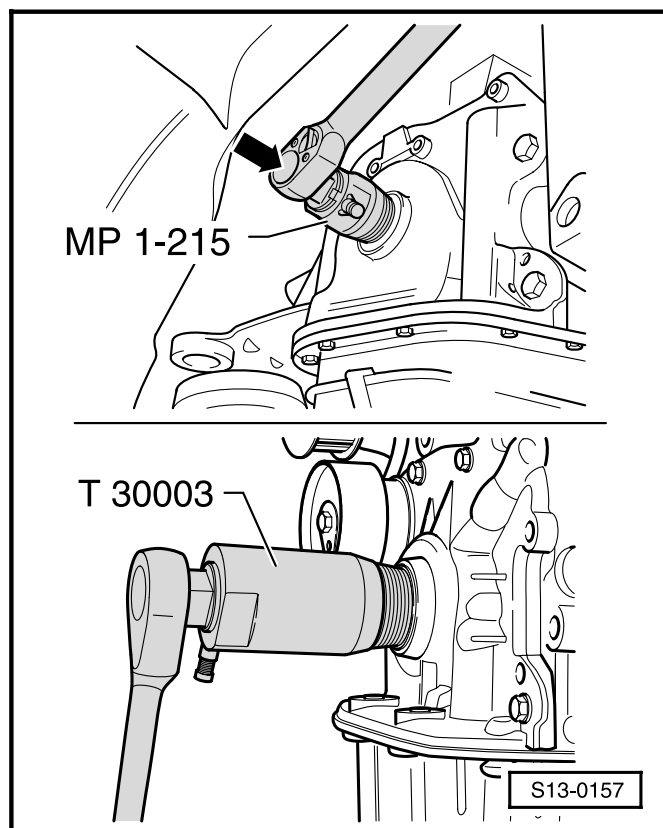
Vehicles as of Engine No. 210158

- ◆ Sleeve T 10022
- ◆ Thrust plate T 10022/1
- ◆ Spindle T 10022/2
- ◆ Gasket ring extractor T 30003

Removing

- Remove ribbed V-belt ⇒ page 13-5
- Remove bottom right engine trim panel
- Remove toothed belt ⇒ page 13-5.
- ◀ - Remove crankshaft toothed belt sprocket. Lock toothed belt sprocket with counterholder T 30004 or MP 1-310.
- To guide the gasket ring extractor, screw in fixing screw for toothed belt sprocket as far as the stop in the crankshaft

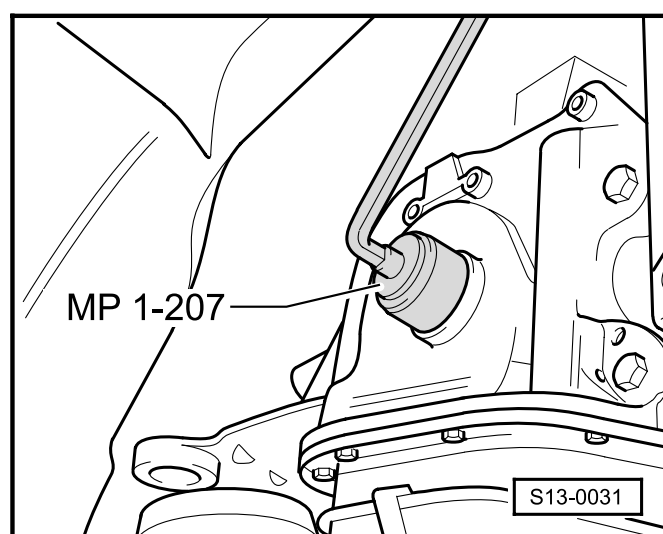




- ◀ - Unscrew inner part of seal extractor two turns (about 3 mm) out of the outer part and lock with knurled screw.

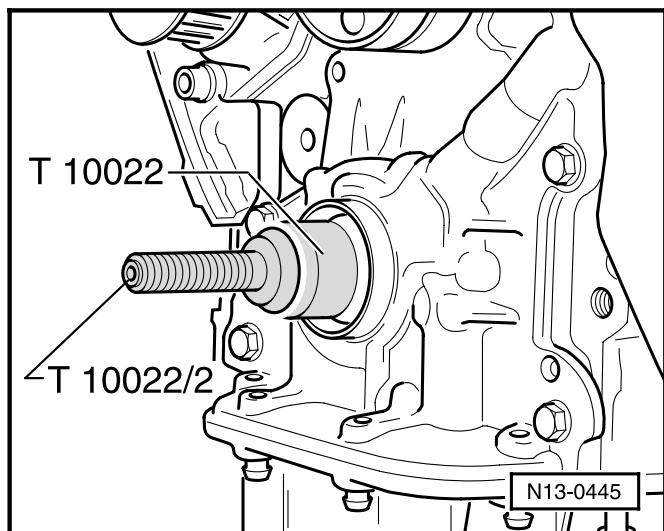
Up to engine No. 210157: MP 1-215
From engine No. 210158: T 30003

- Oil threaded head of seal extractor, position and screw into the seal as far as possible using considerable force.
- Slacken knurled screw and turn inner part against the crankshaft until the seal is pulled out.

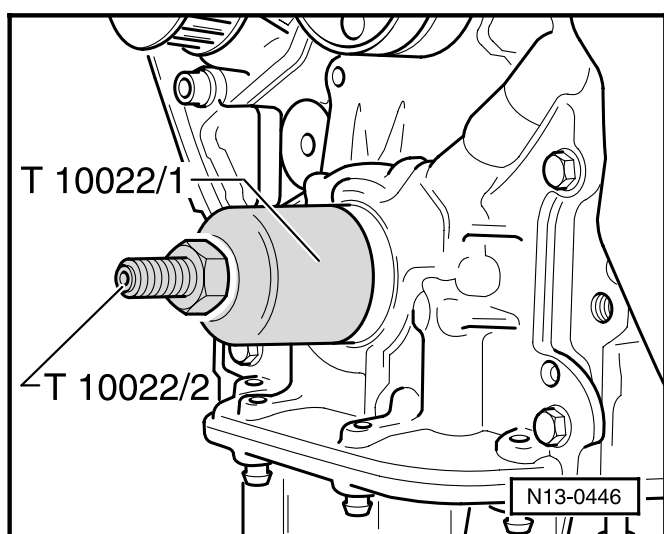


Installing, up to engine No. 210157

- Oil the sealing lip of the seal slightly.
- Mount the guide sleeve from MP 1-207 onto crankshaft.
- Push seal over guide sleeve.
- ◀ - Use thrust sleeve from MP 1-207 to press in seal until flush.
- Remaining installation is carried out in the reverse order to removing.

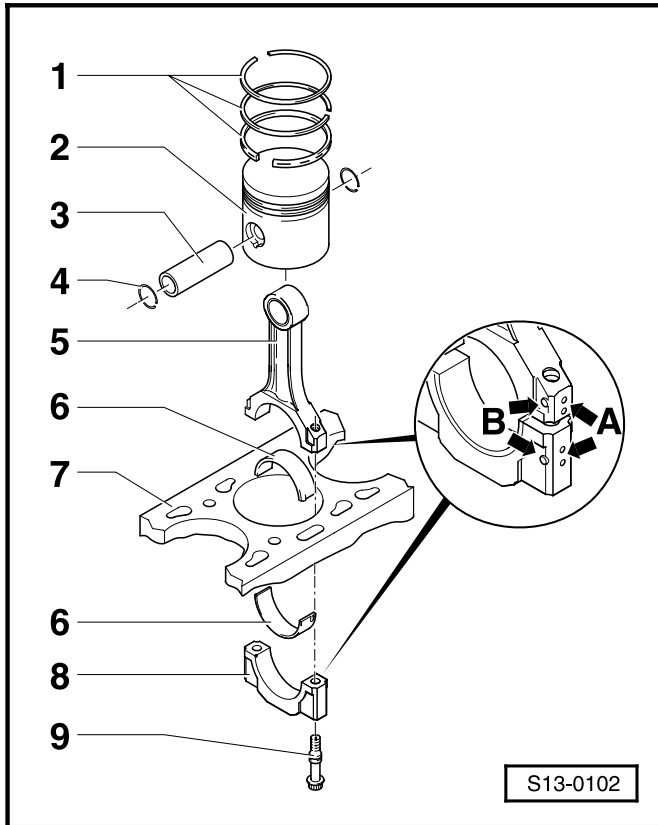
**Installing, from engine No. 210158**

- Oil sealing lip of seal (modified version) slightly.
- ◀ - Fit sleeve T 10022 onto the crankshaft journal and turn in as far as the stop with spindle T 10022/2.
- Push seal over sleeve T 10022.



- ◀ - Use thrust piece T 10022/1 to press in seal as far as the stop.
- Remaining installation is carried out in the reverse order to removing.

Disassembling and assembling piston and conrod



1 - Piston rings

- ◆ Set the thrust to 120°
- ◆ Removing and installing with piston ring pliers
- ◆ Marking „TOP“ faces piston crown
- ◆ Inspecting gap clearance ⇒ Fig. 1
- ◆ Inspecting end clearance ⇒ Fig. 2

2 - Piston

- ◆ Inspection ⇒ Fig. 3
- ◆ Mark installation position and matching cylinder
- ◆ Arrow on piston crown faces toward belt pulley side
- ◆ Use piston ring tensioning strap for installing
- ◆ Ø Piston: 76.485

3 - Piston pins

- ◆ If stiff, heat piston to 60 °C
- ◆ Removing and installing with MP1-205

4 - Circlip

5 - Conrod

- ◆ Replace as a set only
- ◆ Mark matching cylinder -A-
- ◆ Fitting location:
Markings -B- point toward the belt pulley side
- ◆ Clean contact surfaces with compressed air
- ◆ Located axially by pistons

6 - Bearing shell

- ◆ Pay attention to fitting location
- ◆ Do not mix up used bearing shells
- ◆ Check tight connection in the retaining lugs, to do this measure pre-tension ⇒ Fig. 5

7 - Cylinder block

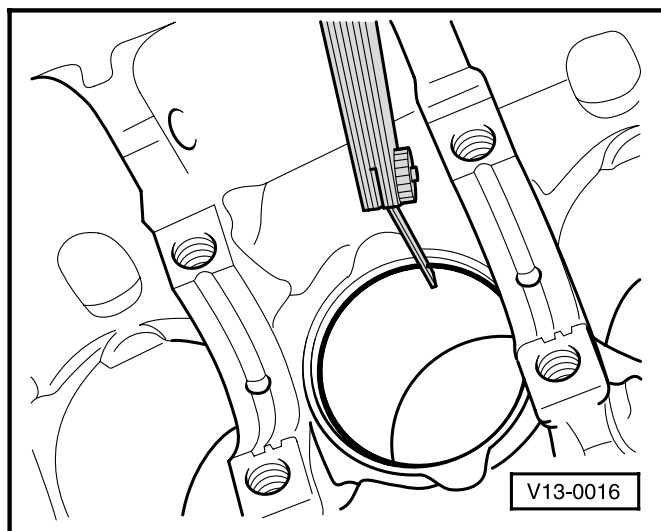
- ◆ Inspect cylinder bore ⇒ Fig. 4
- ◆ Ø Cylinder: 76.51

8 - Conrod cover

- ◆ Pay attention to fitting location
- ◆ Clean contact surfaces with compressed air

9 - Conrod bolt 30 Nm + a further 1/4 turn (90°)

- ◆ Replace

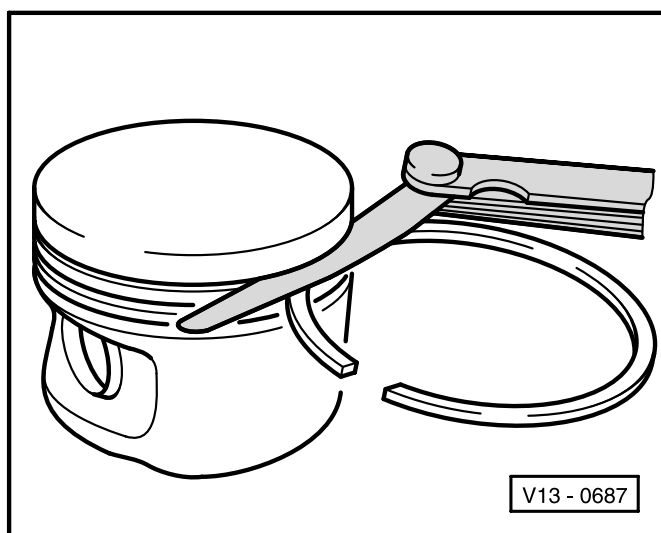


◀ Fig. 1 Inspecting piston ring gap clearance

- Push ring at right angle from above in as far as the bottom cylinder opening, about 15 mm away from edge of cylinder.

Piston ring dim. in mm	New	Wear limit
1. Compression ring	0.20 ... 0.50	1.0
2. Compression ring	0.40 ... 0.70	1.0
Oil scraper ring		
1-part	0.25 ... 0.50	1.0
3-part	0.40 ... 1.40	— 1)

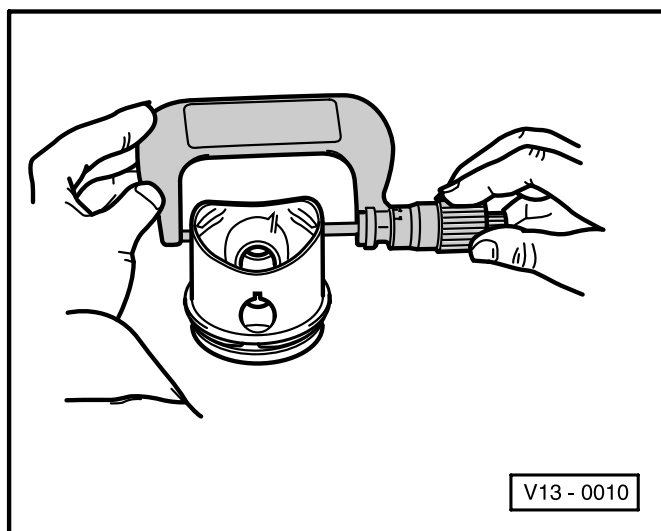
1) not possible to state wear limit



◀ Fig. 2 Inspecting piston ring end clearance

Clean ring groove before inspecting.

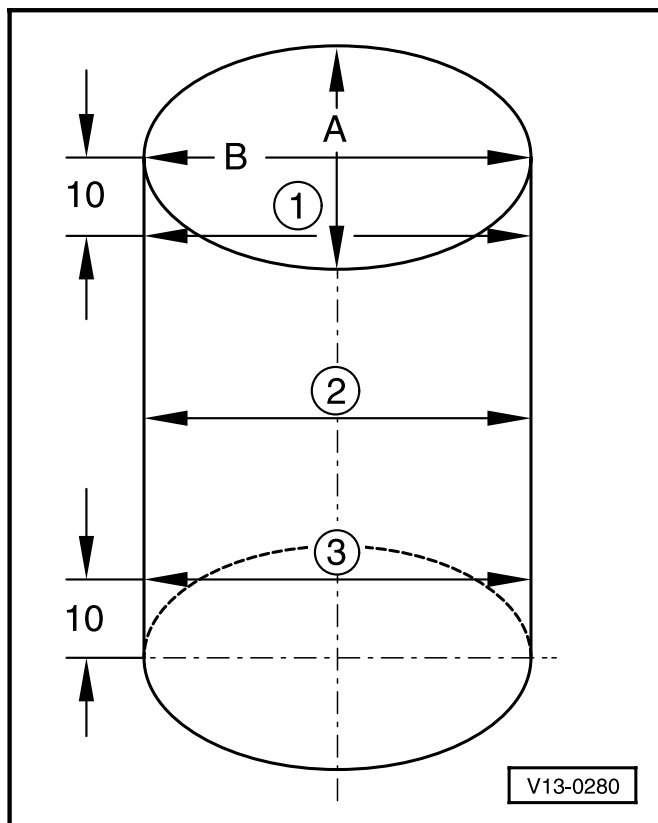
Piston ring dim. in mm	New	Wear limit
1. Compression ring	0.04 ... 0.08	0.15
2. Compression ring	0.04 ... 0.08	0.15
Oil scraper ring		
1-part	0.04 ... 0.08	0.15
3-part	cannot be measured	



◀ Fig. 3 Inspecting pistons

Special tools, testers and aids required

- ♦ External micrometer 75 ... 100 mm
- Measure at about 10 mm from bottom edge, offset 90° to piston pin axis. Difference compared to nominal size max. 0.04 mm



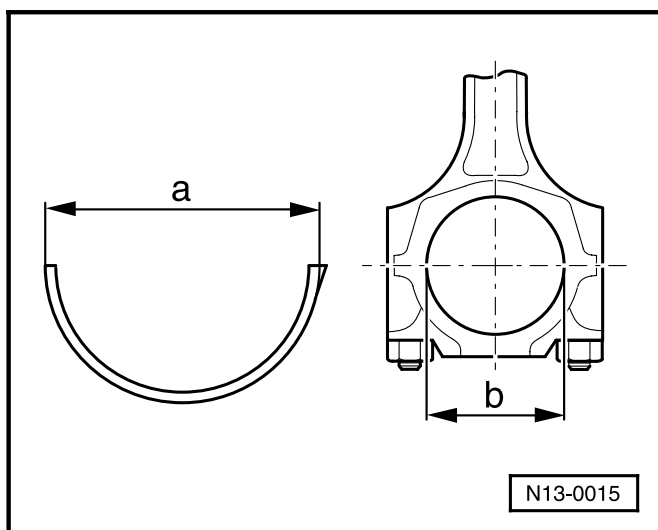
◀ Fig. 4 Inspect cylinder bore

Special tools, testers and aids required

- ♦ Internal precision measuring instrument 50 to 100 mm
- Measure at 3 points crosswise in a transverse direction -A- and lengthwise -B-. Deviations from specified dimension max. 0.08 mm.

Note:

Do not measure the cylinder bore if the cylinder block is fixed to the assembly stand with the engine mount MP 1-202 as this may result in incorrect measurements.



◀ Fig. 5 Measure pretension of bearing shells

Special tools, testers and aids required

- ♦ Caliper gauge

The pretension of the bearing shell is calculated as follows:

$$\begin{array}{r} \text{Dimension -a- of bearing shell} \\ - \text{Diameter of conrod -b-} \\ \hline = \text{Pretension} \end{array}$$

Minimum dimension: 1.5 mm

If pretension is not reached:

- Replace bearing shell

Replace ring gear

- Flywheel removed

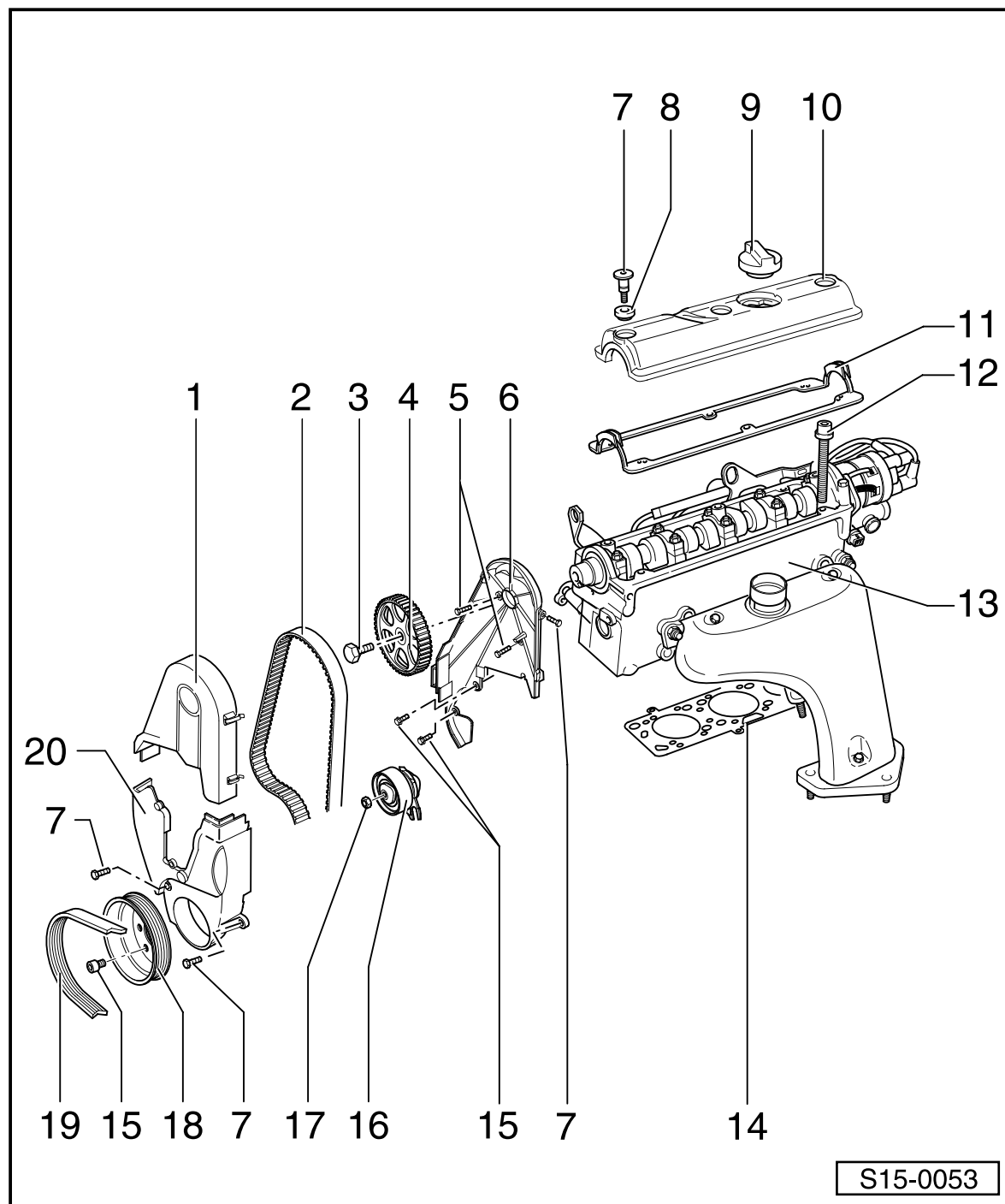
Removing

- Fit on flywheel and position ring gear in stages by striking over the entire circumference. Heat ring gear if stiff.

Installing

- Heat ring gear to approx 150 °C and fit onto the flywheel evenly; knock on as far as the stop with a drift over the entire circumference, if necessary.

Removing and installing cylinder head



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Testing compression pressure ⇒ page 15-5

Notes:

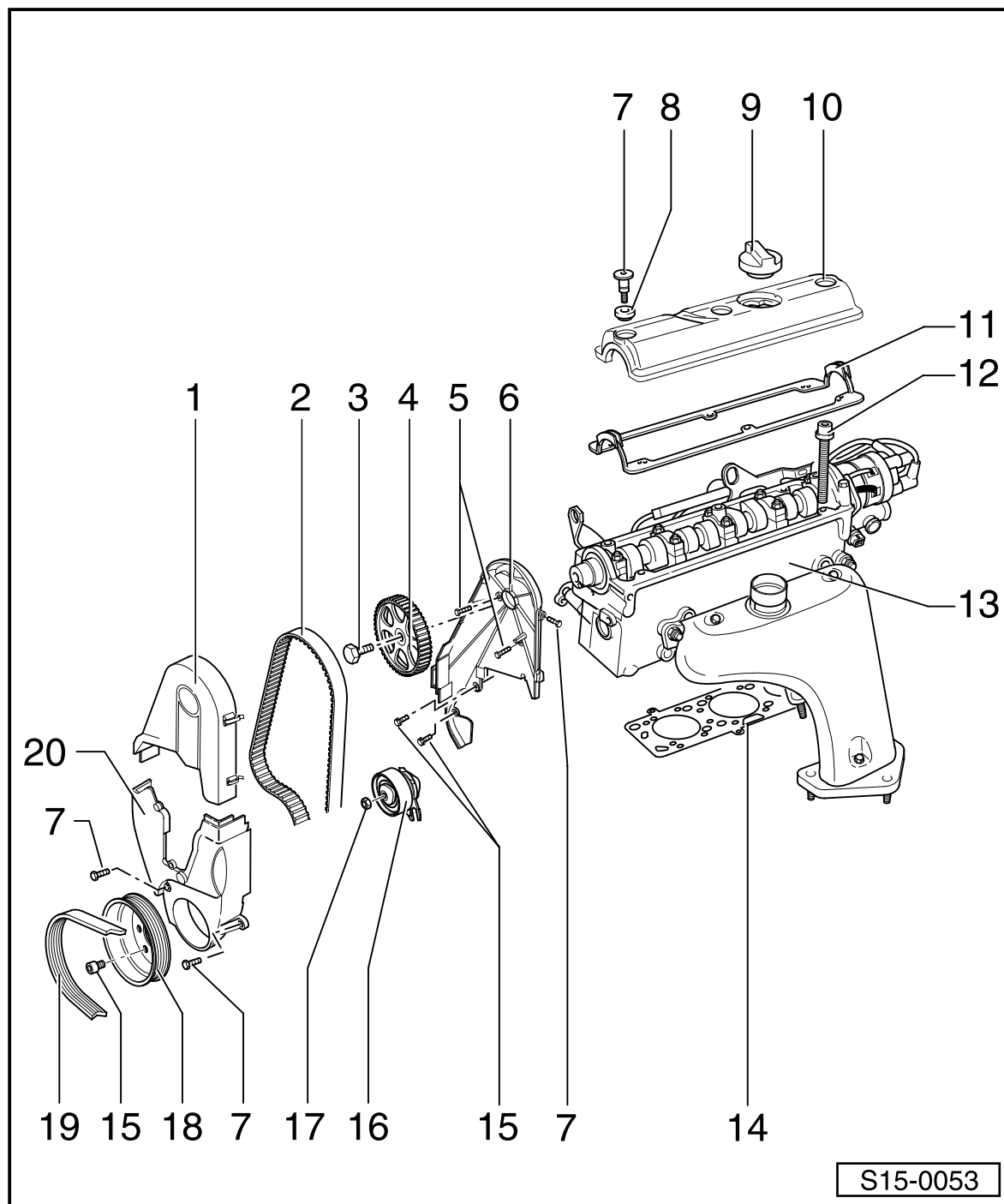
- ◆ If installing a replacement cylinder head with a camshaft in place, the contact faces between bucket tappets and cam sliding surface have to be oiled after installing the head.
- ◆ The plastic bases supplied as a protection for the open valves must not be removed until just before fitting on the cylinder head.

- ◆ When replacing the cylinder head the entire coolant has to be changed.

1 - Top part of toothed belt guard

2 - Tooth belt

- ◆ Inspect for wear
- ◆ Do not kink
- ◆ Removing and installing, tensioning ⇒ page 13-5



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3 - 20 Nm + a further $\frac{1}{4}$ turn (90°)

◆ Replace

4 - Camshaft sprocket

◆ Pay attention to position of toothed belt when installing ⇒ page 13-5

5 - 10 Nm

Insert with „D 000 600 A2“.

6 - Rear toothed belt guard

7 - 5 Nm + a further $\frac{1}{4}$ turn (90°)

◆ Replace

8 - Seal

◆ Replace

9 - Sealing cover

◆ Replace gasket if damaged

10 - Cylinder head cover

11 - Gasket for cylinder head cover

◆ Replace if damaged

◆ Coat with „D 454 300 A2“ before fitting contact faces of bearing cap/cylinder head cover

12 - Cylinder head bolt

- ◆ Replace
- ◆ Sequence for loosening and tightening ⇒ page 15-4, install cylinder head

13 - Cylinder head

- ◆ Inspect for distortion ⇒ Fig. 1
- ◆ Installation ⇒ page 15-4
- ◆ After replacing, fill entire system with fresh coolant

14 - Cylinder head gasket

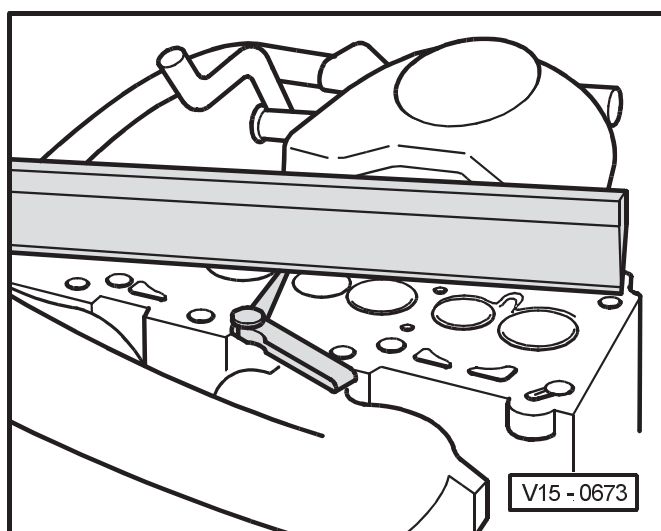
- ◆ Replace
- ◆ Metal gasket

15 - 20 Nm**16 - Tensioning pulley**

- ◆ Tighten the toothed belt ⇒ page 13-5

17 - 20 Nm**18 - Belt pulley****19 - Ribbed V-belt**

- ◆ Mark the direction of rotation
- ◆ Removing and installing ⇒ page 13-5

20 - Timing belt guard - bottom part

◀ Fig. 1 Inspect cylinder head for distortion

Max. permissible distortion: 0.05 mm

Removing and installing cylinder head**Special tools, testers and aids required**

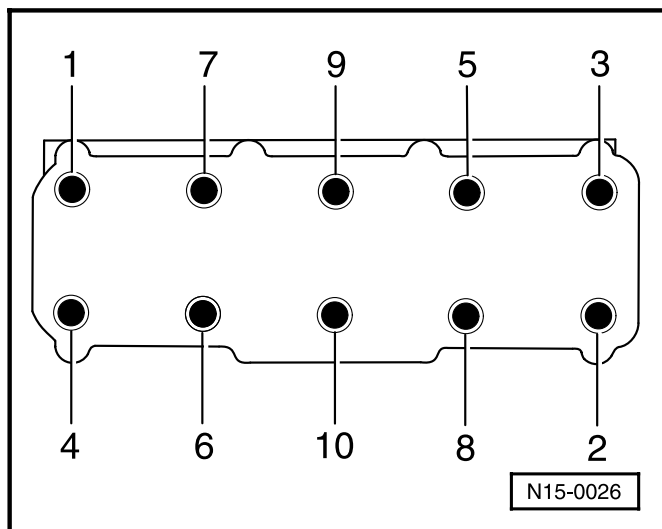
- ◆ Guide pins MP 1-208
- ◆ Torque wrench

Test conditions

- Engine cold
- Piston not positioned in TDC

Work sequence**Notes:**

- ◆ Do not remove the new cylinder head gasket from its wrapping until just before installing.
- ◆ Treat the new gasket with extreme care. Damages can lead to leakages.
- ◆ Install new cylinder head bolts.

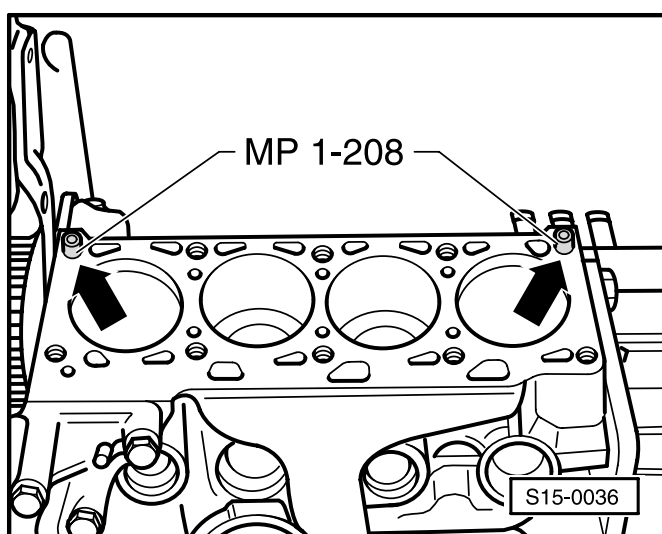


Removing

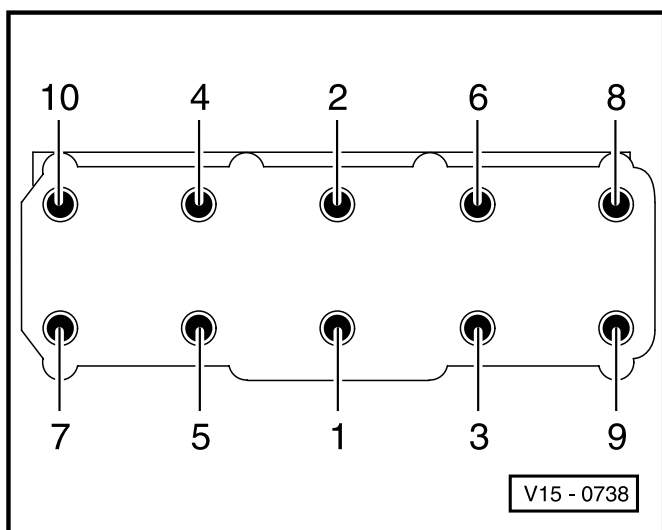
- Follow the sequence when slackening the cylinder head bolts.

Installing

- Carefully remove any gasket residues. Ensure that no long scores or scratches are produced during this step (if using emery paper, the roughness must not be less than 100).
- Carefully remove any sanding and grinding residues.



- To centre the cylinder head, screw guide bolts form MP 1-208 into the rear outer holes for the cylinder head bolts -arrows-.
- Fit on cylinder head gasket. Inscription (part number) should be legible.
- Fit on cylinder head, insert the remaining 8 cylinder head bolts and tighten by hand.
- Use bolt turner from MP 1-208 to unscrew guide bolts through the bolt holes and insert cylinder head bolts.



- Tighten cylinder head in four stages in the tightening sequence shown, as follows:
 - 1. Tighten initially with torque wrench:
 - stage I = 40 Nm
 - stage II = 60 Nm
 - 2. Torque further with rigid wrench:
 - stage III = 1/4 turn (90°)
 - stage IV = 1/4 turn (90°)

Testing compression pressure

Special tools, testers and aids required

- ◆ Compression pressure tester, e.g. V.A.G 1381 or V.A.G 1763

Test condition

- Engine oil temperature at least 30 ° C

Procedure

- Unplug connector from the Hall sender (distributor).
- Open throttle valve fully.
- Use compression pressure tester, e.g. V.A.G 1381 or V.A.G 1763, to test compression pressure.

Note:

Using the tester ⇒ Operating instructions.

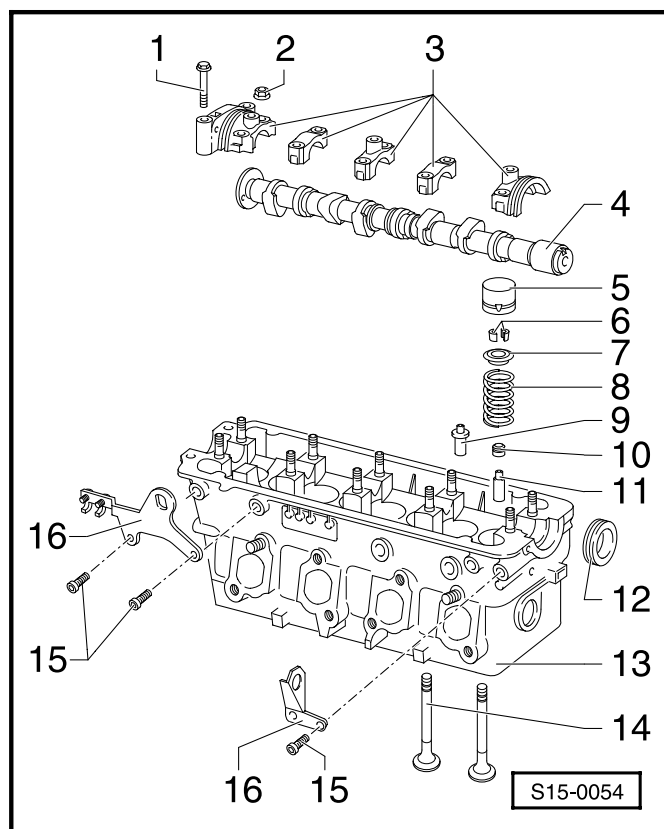
- Operate starter for as long as necessary until no further pressure rise is indicated by the tester.

Compression pressures

new: 10...15 bar
wear limit: 7 bar

Permissible difference between all cylinders:
3 bar

Servicing valve gear



Note:

Cylinder heads with cracks between 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 0.5 mm wide or cracks existing only at the first turns of the spark plug thread.

1 - 10 Nm

2 - 6 Nm + a further $\frac{1}{4}$ turn (90°)

3 - Bearing cap

- ◆ Fitting location and order of installation ⇒ page 15-12, removing and installing camshaft
- ◆ Slightly coat contact surface of bearing cap 1 and 5 with sealant „D 454 300 A2“

4 - Camshaft

- ◆ Inspect axial play ⇒ Fig. 2
- ◆ Removing and installing ⇒ page 15-12
- ◆ Identification and timing ⇒ page 15-7, Fig. 3

5 - Bucket tappets

- ◆ Do not interchange
- ◆ With hydraulic valve clearance compensation
- ◆ Inspect ⇒ page 15-11
- ◆ Lay aside with contact surface facing down
- ◆ Before installing check axial play of the camshaft ⇒ Fig. 2
- ◆ Oil contact surfaces

6 - Collets

7 - Valve spring retainer

8 - Valve spring

- ◆ Removing and installing
 - On removed cylinder head: with MP 1-211 and MP 1-213 with valve supporting plate MP 1-218
 - On installed cylinder head: ⇒ page 15-15, replacing valve stem seal

9 - Valve guide with collar

- ◆ Carry out repair

10 - Valve stem seal

- ◆ Replace ⇒ page 15-15

11 - Valve guide

- ◆ Inspect ⇒ page 15-13
- ◆ Replace ⇒ page 15-14

12 - Sealing ring

- ◆ Oil slightly sealing lips of sealing rings
- ◆ Replace ⇒ page 15-10

13 - Cylinder head

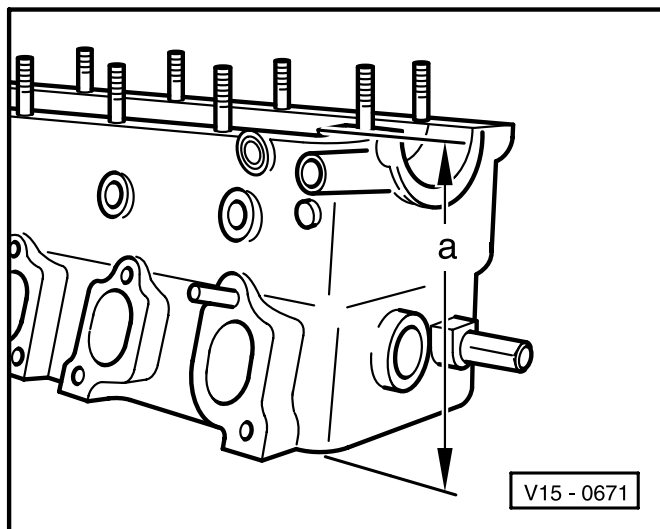
- ◆ Rework valve seat ⇒ page 15-8
- ◆ Rework sealing surface ⇒ Fig. 1

14 - Valves

- ◆ Do not rework, only grinding in is permissible
- ◆ Valve dimensions ⇒ Fig. 4

15 - 20 Nm

16 - Lifting eye

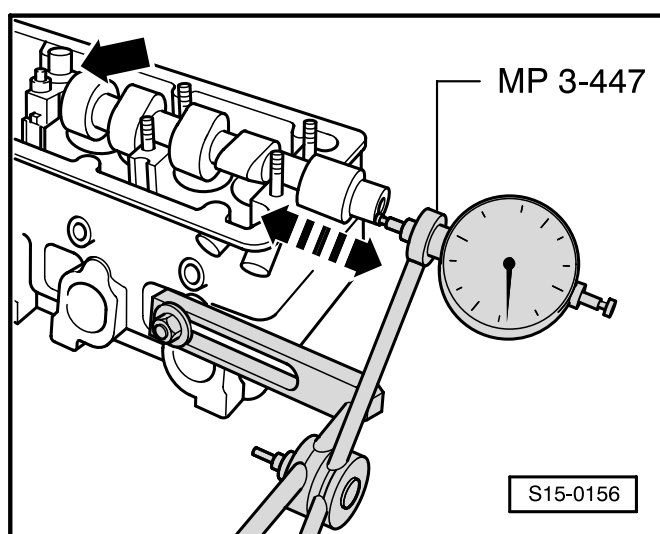


◀ Fig. 1 Reworking sealing surface of cylinder head

Reworking dimension of cylinder head:
a = at least 135.6 mm

Note:

If the sealing surface is reworked, the valve should be positioned lower by the same dimension (rework valve seat rings) otherwise the valves will strike the pistons. When carrying out this step, ensure that the reworking dimension is not less than the permissible minimum dimension ⇒ page 15-8.



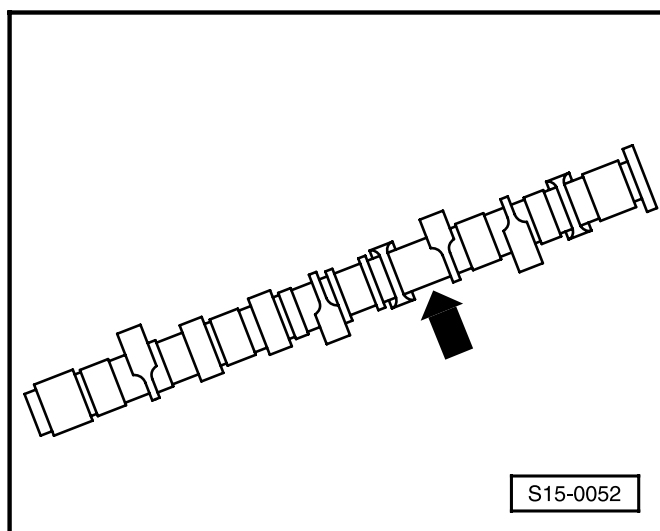
◀ Fig. 2 Inspecting axial play of camshaft

Special tools, testers and aids required

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

Wear limit: max. 0.15 mm

- Place cylinder head down on a flat metal plate and attach universal dial gauge holder MP 3-447.
- Carry out measurement with bucket tappets removed and bearing cap 3 -arrow- installed.



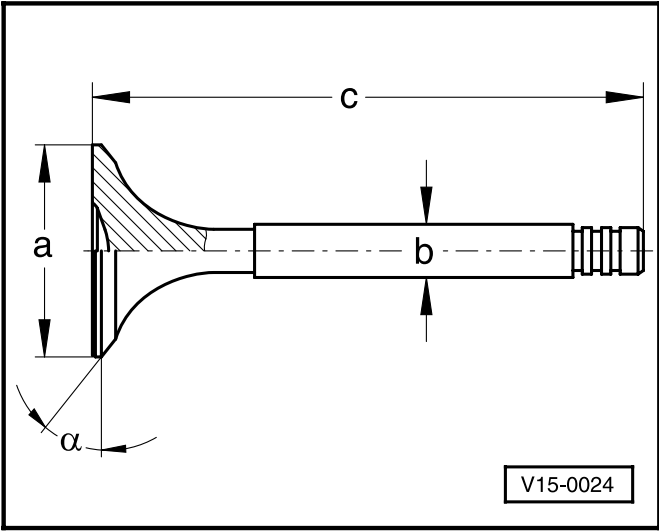
◀ Fig. 3 Camshaft marking, timing

Marking

"032S" is stamped between the inlet cam and exhaust cam of cylinder 3 -arrow-.

Timing at 1 mm valve lift (032S)

Inlet valve opens	7.5° after TDC
Inlet valve closes	31.5° after BDC
Exhaust valve opens	32.5° before BDC
Exhaust valve closes	8.5° before TDC



◀ Fig. 4 Valve dimensions

Note:
Valves must not be reworked. Only grinding-in is permissible.

Dimension		Inlet valve	Exhaust valve
Ø a	mm	35.6	29.0
Ø b	mm	6.963	6.943
c	mm	94.8	95.0
α	∠°	45	45

Reworking valve seats

Special tools, testers and aids required

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

Notes:

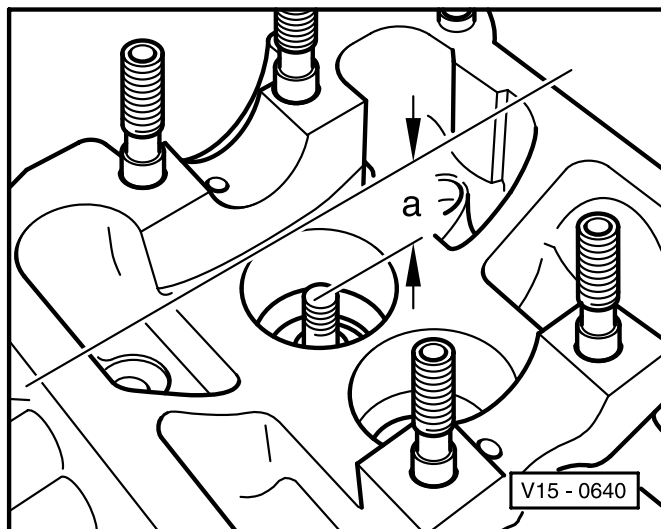
- ◆ *When carrying out repairs to engines with leaking valves, it is not sufficient to machine or replace the valve seats and valves. It is also necessary to inspect the valve guides for wear, particularly on engines with a high mileage.*
- ◆ *Rework valve seats only sufficiently in order to achieve a proper contact pattern. Before reworking, it is necessary to calculate the maximum permissible reworking dimension. If the reworking dimension is exceeded, proper operation of the hydraulic valve clearance compensation elements is not assured and the cylinder head has to be replaced.*

Calculating maximum permissible reworking dimension

- Insert valve and press firmly against the valve seat.

Note:

If the valve is replaced as part of repair work, use a new valve for the measurement.



- Measure distance -a- between end of valve stem and top edge of cylinder head.
- Calculate maximum permissible reworking dimension from the distance measured and the minimum dimension.

Minimum dimensions:

Inlet valve 35.8 mm
Exhaust valve 36.1 mm

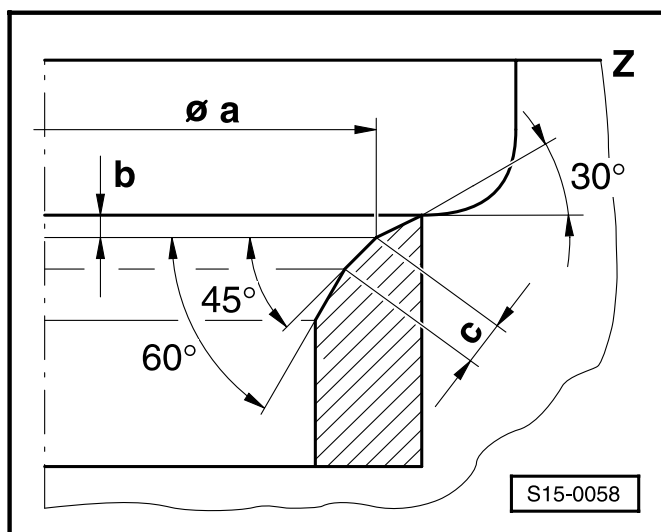
Distance measured less minimum dimension
= max. permissible reworking dimension.

Example:

Distance measured	36.5 mm
- Minimum dimension	35.8 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 once again 0 mm, replace cylinder head.



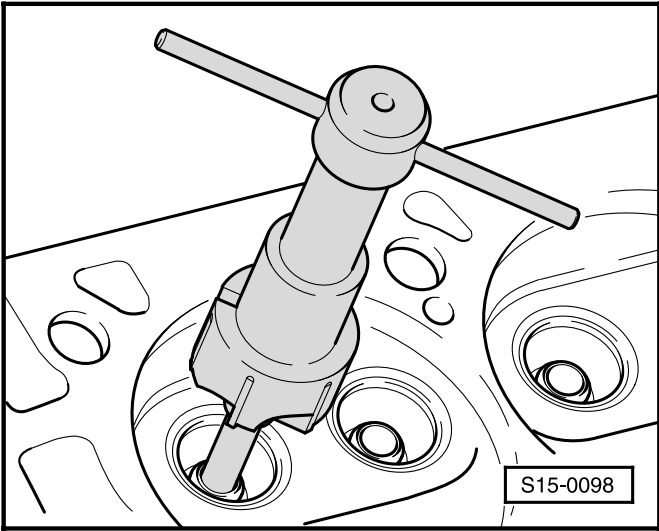
◀ Reworking valve seats

Dimension	Valve seats	
Ø a mm	Valve seat diameter	34.4 -0.1 - inlet valve 27.8 -0.1 - exhaust valve
b mm	max. perm. reworking dimension	
c mm	Valve seat width:	1.7 ... 2.0 for inlet and exhaust valve
Z	Bottom edge of cylinder head	
45°	Valve seat angle	
30°	Top correction angle	
60°	Bottom correction angle	

Procedure

Reworking can be carried out by machine or by hand. The following conditions have to be met:

- Wear limit of valve guides must not exceed the permissible dimension $\Rightarrow$ page 15-13.
- Use NAC milling cutter with carbide metal tips (min. 90 HRC).



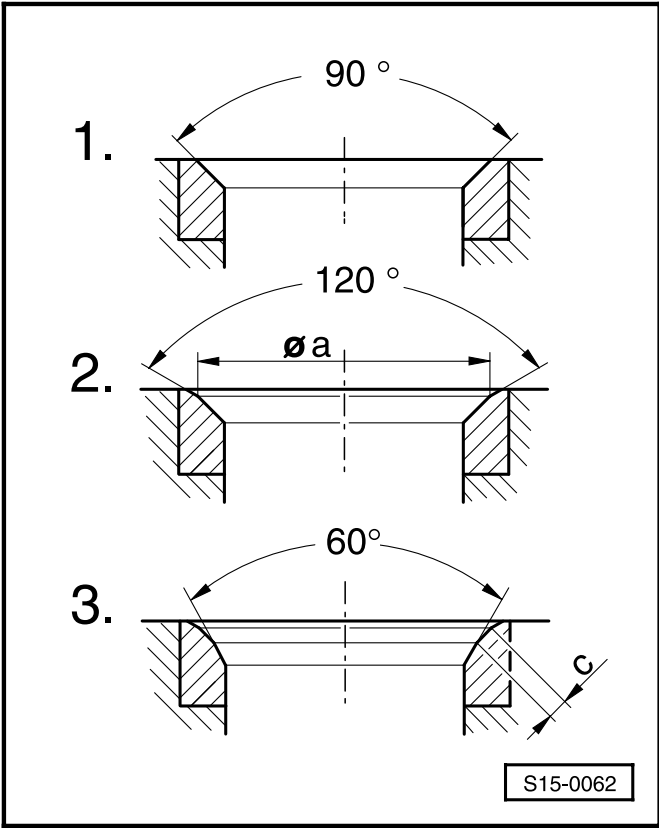
◀ Reworking valve seats with NAC hand milling cutter

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

Valve guide	Guide drift $\varnothing$ mm
Inlet valve	7.0 -0.01
Exhaust valve	

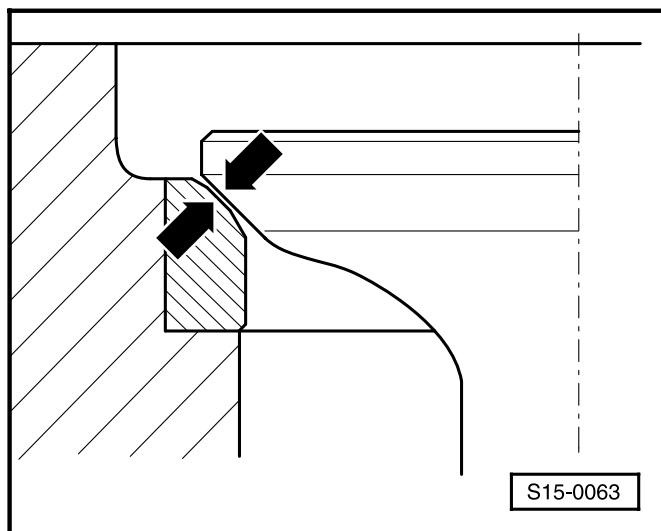
- Match diameter of milling cutter to diameter of valve seat.

Valve seat	Milling cutter 90° $\varnothing$ mm	Milling cutter 120° $\varnothing$ mm	Milling cutter 60° $\varnothing$ mm
Inlet valve	37	38	21/34
Exhaust valve	30	32	21/34



◀ Sequence of milling

1. Machine valve seat with 90° milling cutter until a proper contact pattern is achieved (do not exceed max. permissible reworking dimension).
2. Mill top correction angle with 120° milling cutter until valve seat diameter „a“ is achieved ($\Rightarrow$ page 15-9).
3. Rework bottom correction angle with 60° milling cutter until the valve seat width „c“ is achieved (page 15-9).



◀ - Use fine grinding paste to grind in valve/valve seat -arrows- so that a proper contact pattern is achieved.

- Inspect valve for leaks.

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

Note:

After installing the cylinder head, inspect hydraulic bucket tappets ⇒ page 15-11.

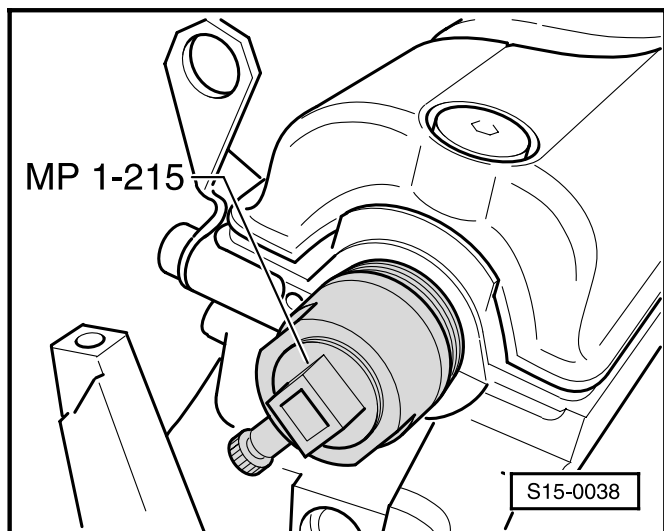
Replacing camshaft seal

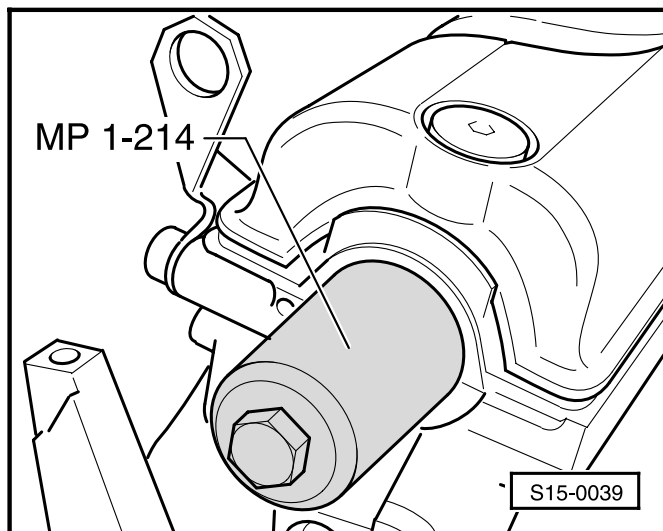
Special tools, testers and aids required

- ◆ Sprocket lock MP 1-216
- ◆ Seal extractor MP-1-215
- ◆ Guide sleeve from insertion tool MP 1-207
- ◆ Seal insertion tool MP 1-214
- ◆ Torque wrench, e.g. V.A.G 1332 (40...200 Nm)

Removing

- Remove ribbed V-belt ⇒ page 13-5.
- Remove belt pulley and top and bottom parts of toothed belt guard.
- Slacken camshaft sprocket (use Sprocket lock MP 1-216)
- Slacken tensioning pulley and take off toothed belt.
- Pull off camshaft sprocket.
- Remove rear toothed belt guard.
- Unscrew inner part of the seal extractor MP 1-215 two turns (about 3 mm) from the outer part and lock in place with knurled bolt.
- ◀ - Oil thread head of seal extractor and knock extractor into the seal with light blows from a plastic-headed hammer. The knurled bolt should be positioned as illustrated during this step.
- Screw extractor as far as possible into the seal using considerable force.
- Slacken knurled bolt and turn inner part against the camshaft until the seal is pulled out.





Installing

- Lightly oil sealing lip of the seal.
- Use guide sleeve from MP 1-207 to fit on seal.
- Take off guide sleeve.
- ◀ - Use MP 1-214 to press in seal as far as the stop. Fit two washers between thrust sleeve and hexagon bolt.
- Install toothed belt ⇒ page 13-5.

Inspecting hydraulic bucket tappets

Special tools, testers and aids required

- ◆ Feeler gauge
- ◆ Wooden or plastic wedge

Notes:

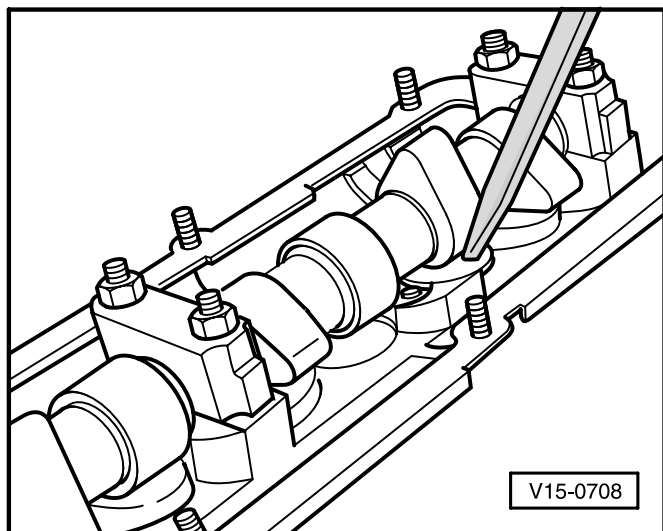
- ◆ *If the bucket tappet is faulty, always replace complete (cannot be adjusted or repaired).*
- ◆ *Irregular valve noises during starting are normal.*
- ◆ *After installing new bucket tappets, wait about 30 minutes before starting the engine. The hydraulic valve clearance compensation elements have to settle (otherwise valves will strike the pistons).*
- ◆ *Place removed bucket tappets down on a clean surface with the contact face (camshaft side) facing down.*

Inspection procedure

- Start engine and continue running 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, inspect all the tappets as follows:

- Remove cylinder head cover



- Rotate crankshaft in clockwise direction until the cams of the bucket tappet to be inspected are facing up.

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

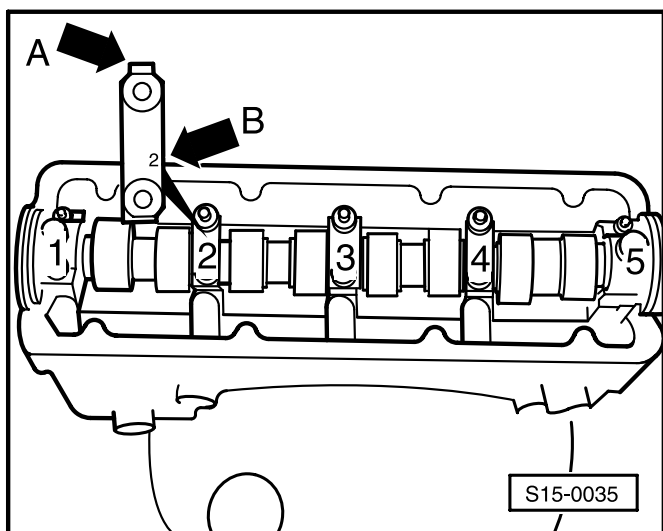
Removing and installing camshaft

Special tools, testers and aids required

- ♦ Counterholder MP 1-216
- ♦ Torque wrench, e.g. V.A.G 1331 (5...50 Nm)
- ♦ Torque wrench, e.g. V.A.G 1332 (40...200 Nm)

Removing

- Remove ribbed V-belt ⇒ page 13-5.
- Remove belt pulley and top and bottom parts of toothed belt guard.
- Slacken camshaft sprocket (use counterholder MP 1-216).
- Slacken tensioning pulley and take off toothed belt.
- Pull off camshaft sprocket.
- Remove rear toothed belt guard.
- Remove cylinder head cover.
- Remove distributor.
- ◀ - First of all remove bearing caps 5, 1 and 3.
- Slacken bearing caps 2 and 4 alternately and diagonally.



Installing

- Pistons are not at TDC

Note:

Pay attention to installation position of bearing caps: Wide shoulder -arrow A- points toward intake side and number of bearing cap -arrow B- is legible from the exhaust side.

- Oil contact surfaces of camshaft.
- Initially tighten bearing caps 2 and 4 alternately diagonally across and tighten to a final torque of 6 Nm.
- Apply a thin film of sealant of D 454 300 A2 to contact surface of bearing caps 1 and 5.
- Install bearing caps 3, 1 and 5 and likewise tighten to a final torque of 6 Nm.
- Torque all nuts by a further $\frac{1}{4}$ turn (90°).
- Insert bolts for bearing cap 5 and tighten to a final torque of 10 Nm.
- Install camshaft sprocket with new bolt (use counterholder MP 1-216).
Tightening torque: 20 Nm + torque a further $\frac{1}{4}$ turn (90°).
- Install toothed belt $\Rightarrow$ page 13-5.

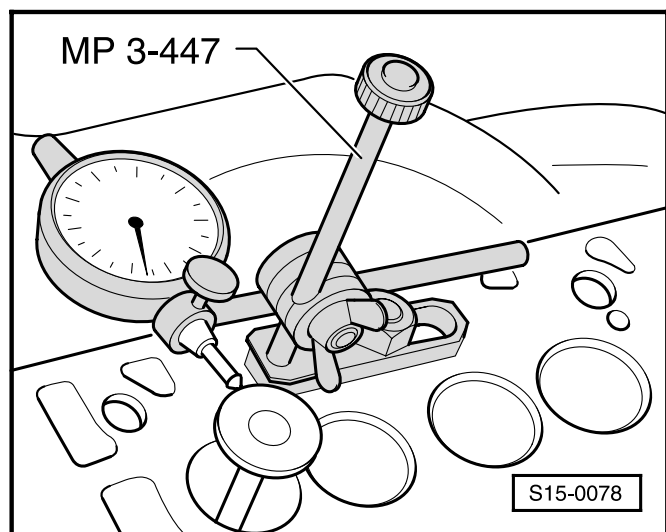
Note:

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

Inspecting valve guides

Special tools, testers and aids required

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



Inspection procedure

- Place cylinder head down on a flat metal plate.
- ◀ - Insert new valve into guide. End of valve stem must be flush with guide.
- Determine valve rock.
Wear limit:
Inlet valve guide = 1.0 mm
Exhaust valve guide = 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 the valve seat rings of a cylinder head can no longer be reworked, or if the cylinder head has already been machined to the minimum dimension, it is not suitable for replacing the valve guides ⇒ page 15-8.
- 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 guides with oil and use MP 1-205 to press into the cold cylinder head from the camshaft side as far as the collar.

Note:

After the guide makes contact with the collar, the force applied for pressing it in must not be increased beyond 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 15-8.

Replacing valve stem seals

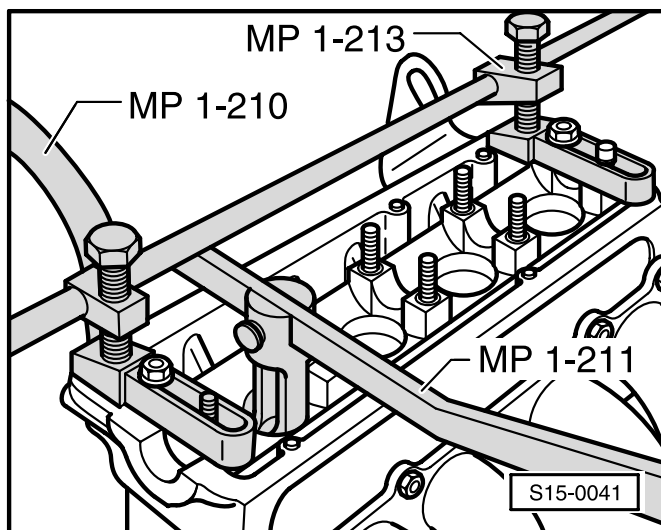
(cylinder head installed)

Special tools, testers and aids required

- ◆ Pulling device MP 1-206
- ◆ Assembly device MP 1-213
- ◆ Pressure hose MP 1-210
- ◆ Assembly lever MP 1-211
- ◆ Valve stem seal fitting tool MP 1-212

Removing

- Remove camshaft ⇒ page 15-12.
- Remove bucket tappets (do not mix up) and place down with the contact surface facing down.
- Unscrew spark plugs.
- Position piston of the relevant cylinder to "bottom dead centre".
- ◀ - Insert assembly device MP 1-213 and position mounting to height of stay bolts.
- Screw pressure hose MP 1-210 into the spark plug thread and apply a constant pressure to the cylinder.
min. 6 bar
- Use assembly lever MP 1-211 to remove valve springs.



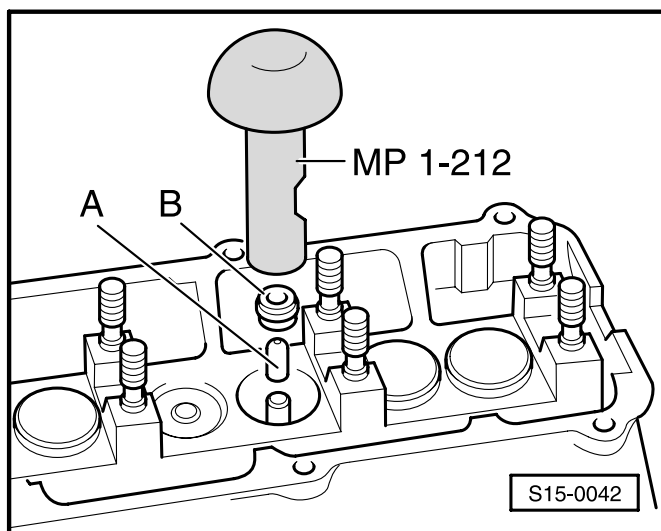
Note:

If the valve collets are tight, detach by applying light blows with the hammer to the assembly lever.

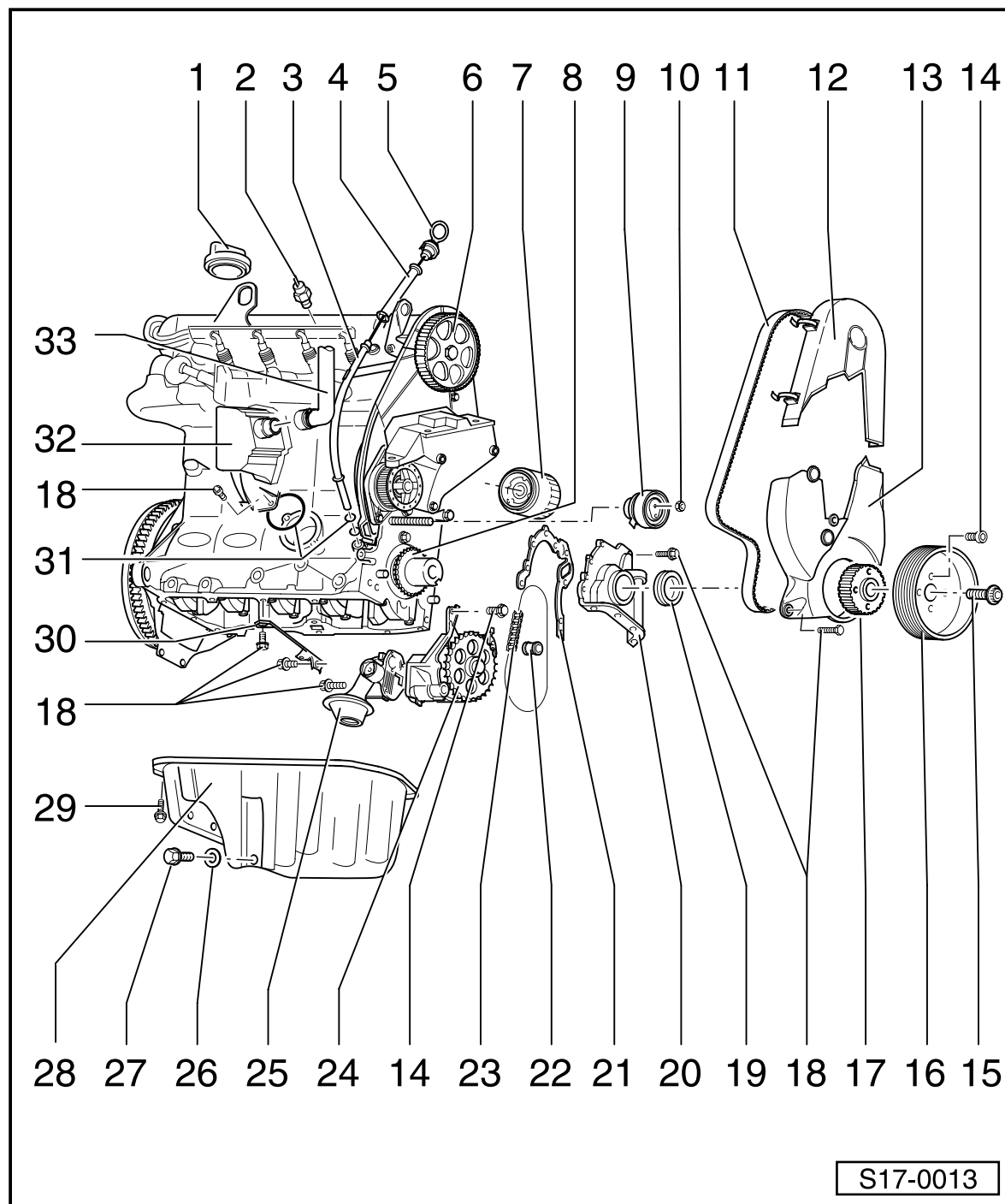
- Use MP 1-206 to pull off valve stem seals.

Installing

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



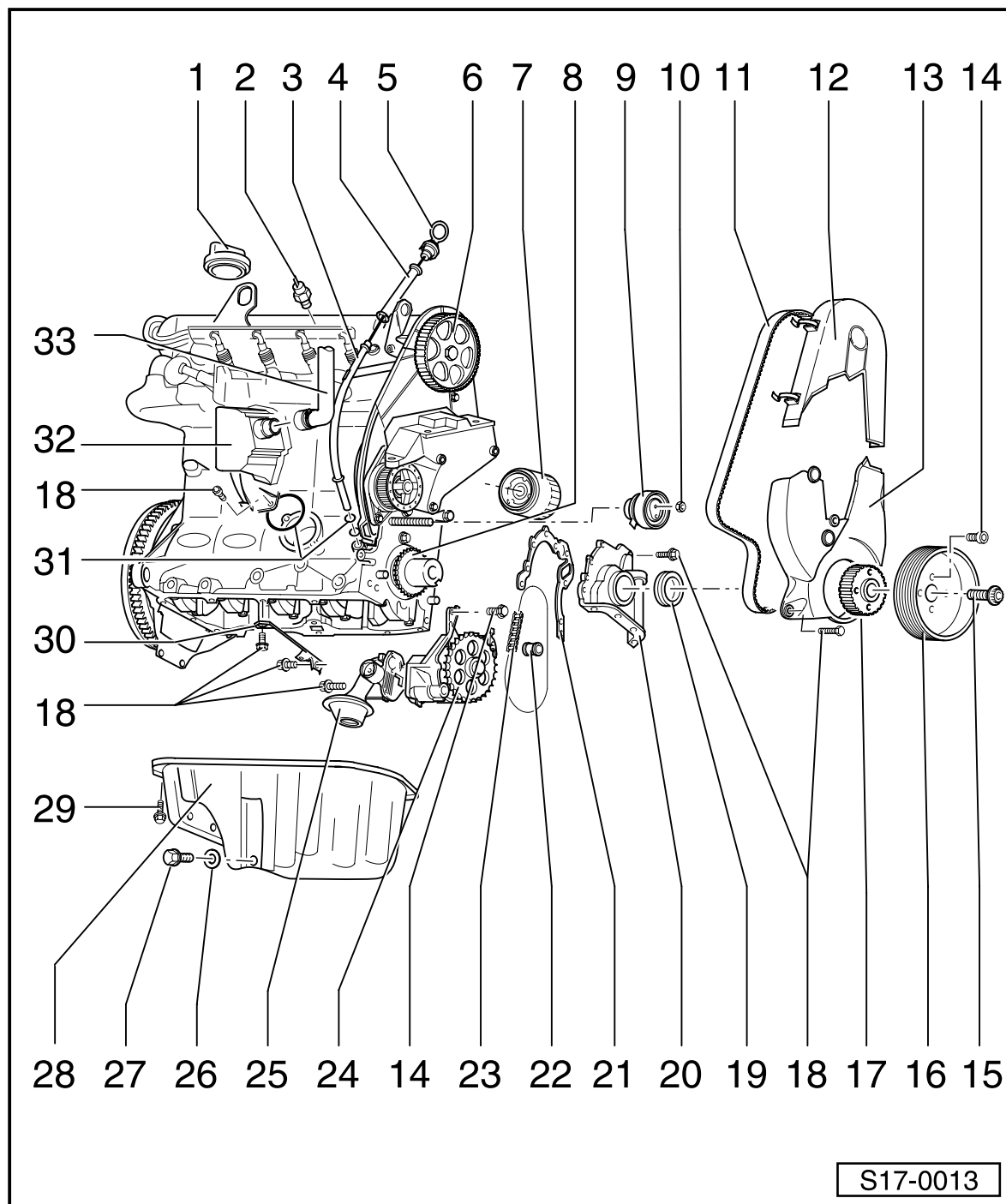
Removing and installing parts of the lubrication system



Notes:

- ◆ If considerable quantities of metal swarf or abrasion is found in the engine oil when carrying out engine repairs, carefully clean the oil galleries in order to avoid consequential damage.
- ◆ The engine oil level must never exceed the max marking - risk of damage to catalytic converter!

Inspect engine oil level, oil capacity and oil specification ⇒ Inspection and Maintenance



S17-0013

1 - Sealing cover

- ◆ Replace gasket if damaged

2 - Oil pressure switch (0.05 MPa) -F1-, 20 Nm

- ◆ Range of operation 0.03...0.06 MPa
- ◆ Identification: green
- ◆ Inspect ⇒ page 17-5
- ◆ Replace gasket if damaged

3 - Guide tube**4 - Filler funnel**

- ◆ Remove for extracting oil

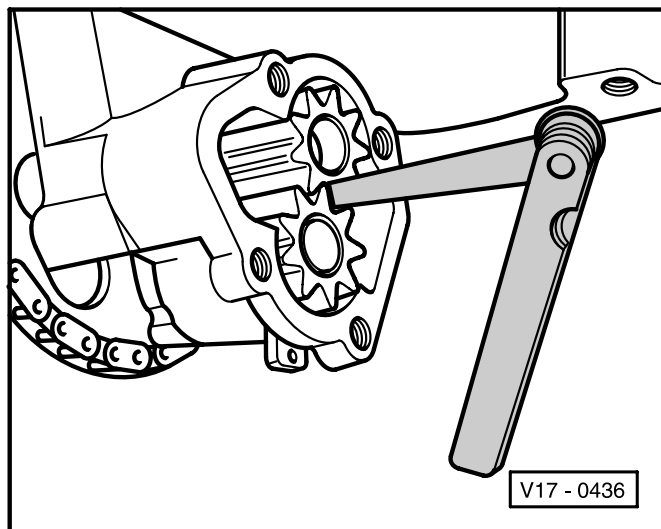
5 - Oil dipstick

- ◆ Oil level must not exceed marking!

6 - Camshaft sprocket

- ◆ Pay attention to position of toothed belt when installing ⇒ page 13-5

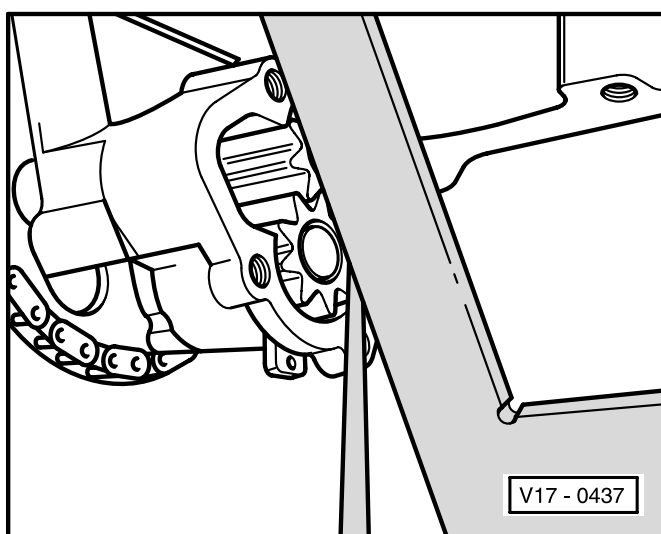
- 7 - Oil filter**
- ◆ Use tensioning strap for slackening
 - ◆ Lightly oil seal
 - ◆ 20 Nm
 - ◆ After pouring in oil, inspect for leaks
- 8 - Chain sprocket**
- 9 - Tensioning pulley**
- ◆ Tensioning toothed belt ⇒ page 13-5
- 10 - 20 Nm**
- 11 - Toothed belt guard**
- ◆ Mark direction of running before removing
 - ◆ Inspect for wear
 - ◆ Do not kink
 - ◆ Removing and installing, tensioning ⇒ page 13-5
- 12 - Top part of toothed belt guard**
- 13 - Bottom part of toothed belt guard**
- 14 - 20 Nm**
- 15 - 90 Nm + torque a further ¼ turn (90°)**
- ◆ Replace
 - ◆ Oil before inserting
- 16 - Belt pulley**
- 17 - Toothed belt sprocket of crankshaft**
- ◆ Pay attention to position when installing toothed belt ⇒ page 13-5
 - ◆ Modified version from engine No. 210158; pay attention to part number
- 18 - 10 Nm**
- 19 - Seal**
- ◆ Replace ⇒ page 13-10
 - ◆ Modified version from engine No. 210158; pay attention to part number
- 20 - Sealing flange of oil pump**
- ◆ With integrated oil pump from engine No. 210158 ⇒ Fig. 4
 - ◆ Removing and installing oil pump ⇒ page 17-4.2
- 21 - Gasket**
- ◆ Replace
- 22 - Sealing bush**
- ◆ Replace if damaged
 - ◆ Oil for installing
 - ◆ Insert first of all into sealing flange
- 23 - Chain**
- ◆ Tensioning ⇒ Fig. 3
- 24 - Oil pump**
- ◆ Version up to engine No. 210157
 - ◆ Inspecting backlash ⇒ Fig. 1
 - ◆ Inspecting axial play ⇒ Fig. 2
- 25 - Oil pump cover with pressure relief valve**
- ◆ Opening pressure: 4.0...5.0 bar (0.40...0.50 MPa)
 - ◆ Clean strainer if dirty
- 26 - Seal**
- ◆ Replace
- 27 - Oil drain plug, 20 Nm**
- 28 - Oil pan**
- ◆ Clean sealing surface before installing
- 29 - 15 Nm**
- 30 - Bracket**
- 31 - O-ring**
- ◆ Replace
- 32 - Oil separator**
- 33 - Vent hose**
- ◆ To air filter



◀ Fig. 1 Inspecting backlash of oil pump

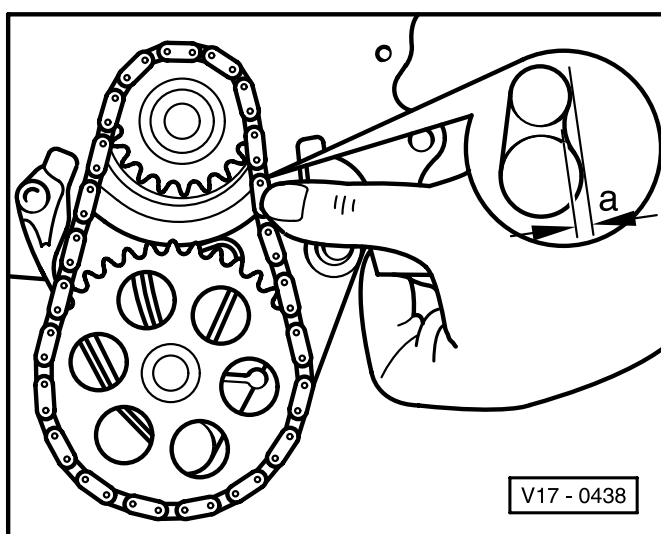
New: 0.05 mm

Wear limit: 0.20 mm



◀ Fig. 2 Inspecting axial play of oil pump

Wear limit: 0.15 mm



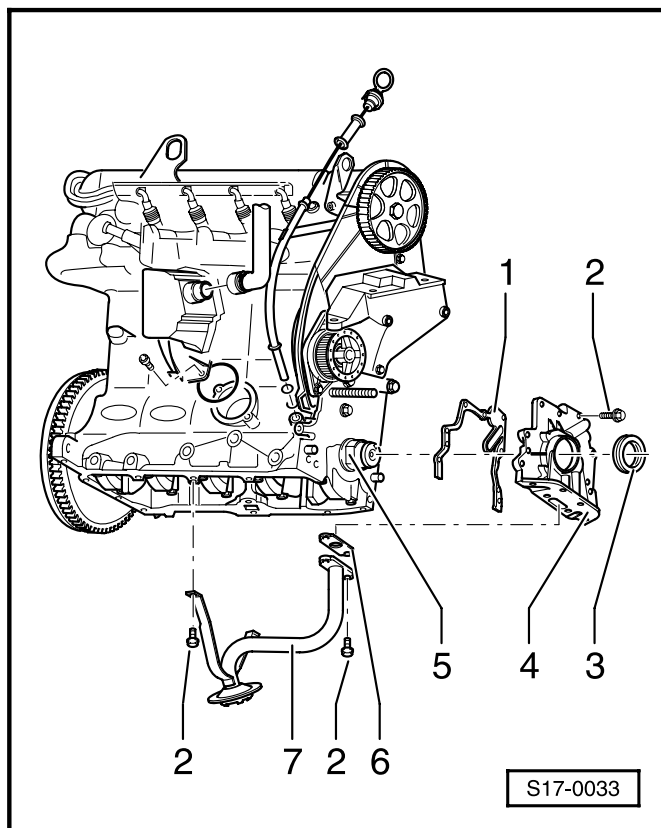
◀ Fig. 3 Tensioning drive chain

Tension chain by altering position of pump. Inspect tension by applying slight pressure with your thumb.

Deflection

Inspection value: $a = 3.5 \dots 5.0$ mm

Setting: $a = 3.5 \dots 4.5$ mm



◀ Fig. 4 Oil pump, as of Engine No. 210158

1 - Gasket

- ◆ Replace
- ◆ Must be positioned on dowel sleeves

2 - 10 Nm

3 - Gasket ring

- ◆ Replace ⇒ page 13-10

4 - Oil pump

- ◆ Replace only as a set
- ◆ Must be positioned on dowel sleeves
- ◆ Removing and installing ⇒ page 17-4.2

5 - Driver/crankshaft (polygonal cams)

- ◆ Before installing coat oil pump with oil
⇒ page 17-4.3

6 - Gasket

- ◆ Replace

7 - Suction line

- ◆ Clean strainer if dirty

Removing and installing oil pump, as of Engine No. 210158

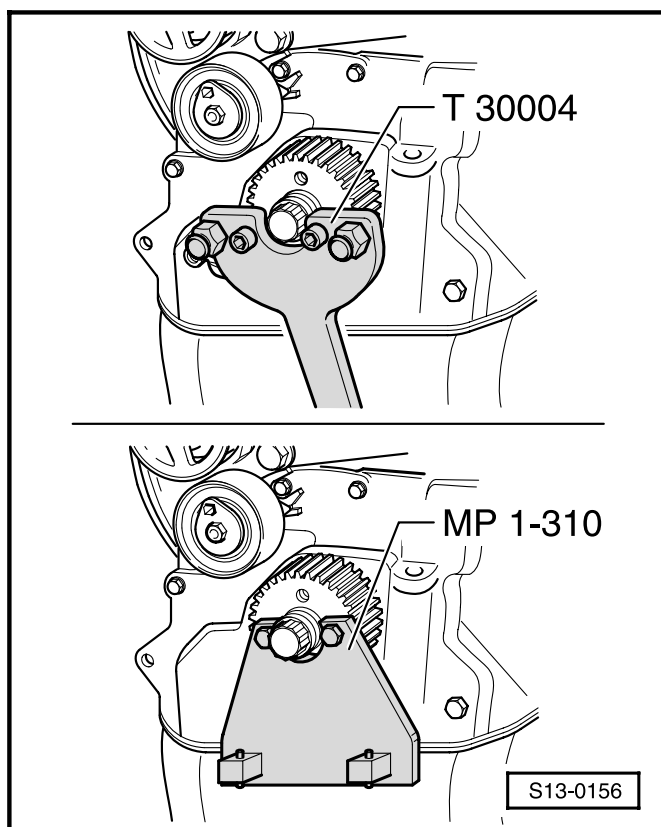
- Engine removed

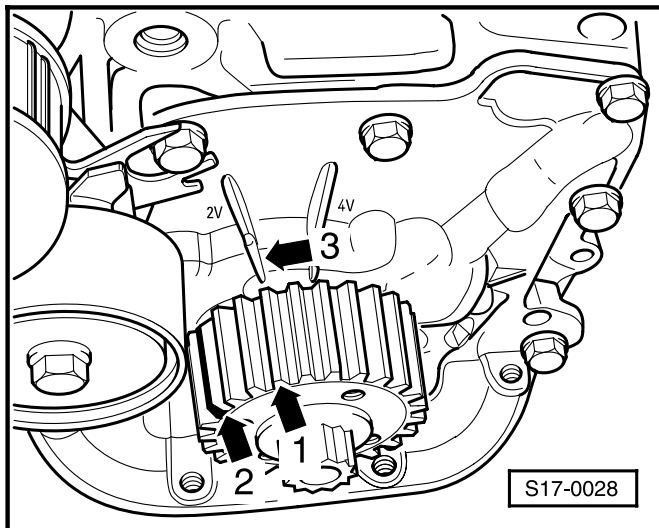
Special tools, testers and aids required

- ◆ Inserting device MP 1-207
- ◆ Sleeve T 10022
- ◆ Counterholder T 30004 or MP 1-310
- ◆ Torque wrench

Removing

- Remove ribbed V-belt ⇒ page 13-5
- Remove bottom right engine trim panel
- Remove toothed belt and tensioning pulley ⇒ page 13-5
- ◀ - Remove crankshaft toothed belt sprocket. Lock toothed belt sprocket with counterholder T 30004 or MP 1-310
- Replace gasket ring if oil pump is re-used. ⇒ page 13-10.





- ◀ - Turn crankshaft 3 teeth to the left from TDC marking. *Use mirror.*

3rd tooth -arrow 1- to the right of the ground tooth (TDC marking) -arrow 2- should be aligned with the TDC marking on the oil pump housing (2V) -arrow 3-.

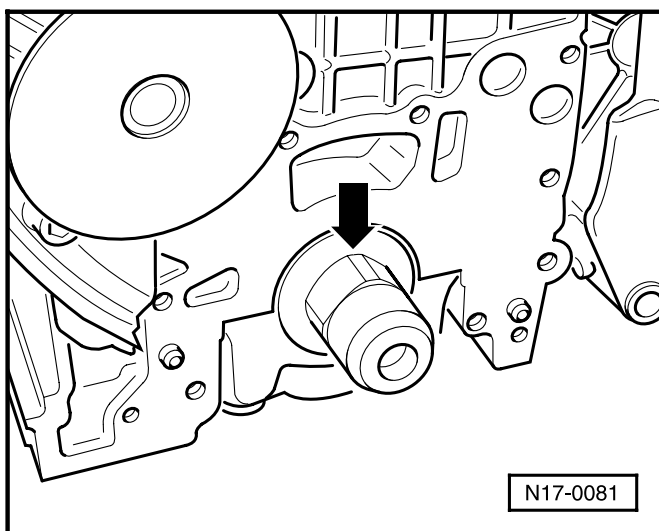
Note:

As a result of this setting the crankshaft is in the correct position for installing the oil pump. One of the four polygon drive ring cams on the crankshaft is facing up.

- Remove crankshaft toothed belt sprocket and tensioning pulley of the toothed belt.
- Remove oil sump ⇒ page 17-5.2.
- Remove suction line ⇒ page 17-4.1, Fig. 5.
- Unbolt oil pump and pull it off the crankshaft.
- Take off gasket at cylinder block and clean sealing surface.
- If the oil pump is re-used, clean sealing surfaces (remove residues of sealant with flat scraper); the surfaces should be free of oil and grease.

Note:

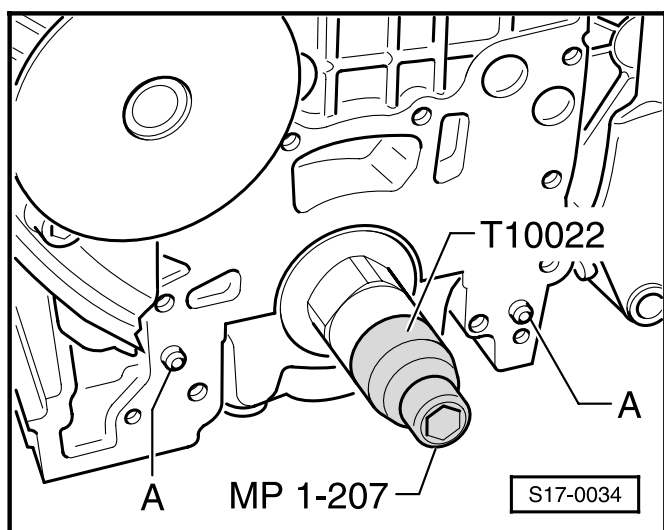
Cover over the intake recess (attachment for suction line) and the inner rotor of the oil pump before cleaning, to avoid dirt getting into the oil pump.



Installing

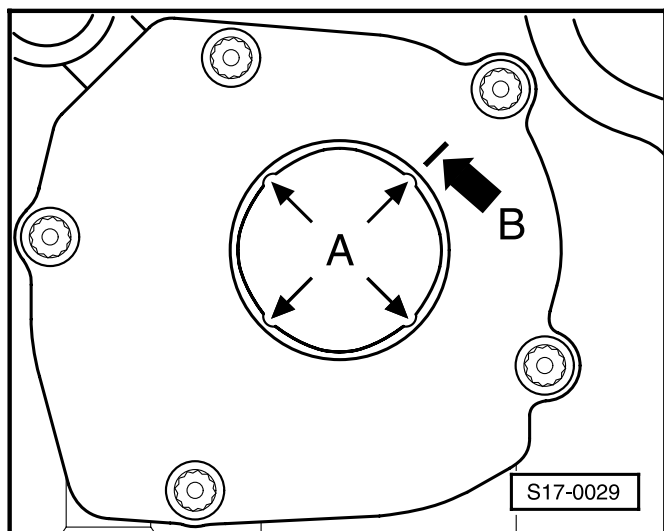
Requirement

- ◀ ● On of the four polygon driving cams -arrow- on the crankshaft is facing up.



Procedure

- ◀ - Fit hexagon socket bolt from MP 1-207 together with sleeve T 10022 onto the crankshaft and tighten by hand.
- Fit new gasket onto the dowel sleeves -A-.
- Moisten the 4 polygon driving cams of the crankshaft with oil.
- Lightly oil the sealing lip of the seal of the oil pump.



- ◀ - Rotate inner rotor of the oil pump so that one of the 4 marking slots -arrows A- is aligned with the marking on the oil pump housing cover -arrow B-.
 - Carefully guide oil pump onto the polygon driving cams of the crankshaft.
- Turn inner rotor slightly, if necessary, to align it with the polygon driving cams of the crankshaft.
- Push oil pump onto the dowel sleeves and tighten bolts to 10 Nm.
 - Remove sleeve T 10022.
 - Install suction line with new gasket, 10 Nm.
 - Install oil sump ⇒ page 17-5.2.
 - The remaining installing is carried out in the reverse order to removing.

Testing oil pressure and oil pressure switch

Special tools, testers and aids required

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

Operation of dynamic oil pressure warning system

The oil pressure switch is opened when pressureless and closed when the switching pressure is reached.

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

Cut-in delay of oil pressure warning: about 3 s

Cut-off delay of oil pressure warning: about 5 s

Testing warning lamp

After switching on the ignition (engine not running), the oil pressure warning lamp in the dash panel insert should come on for about 3 s and then go out. The check is interrupted if the engine runs.

Warning criteria

The visual oil pressure warning comes on (oil pressure warning lamp flashes) 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 open
 - 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. The oil pressure warning is cancelled when engine speed is less than 5000 rpm.

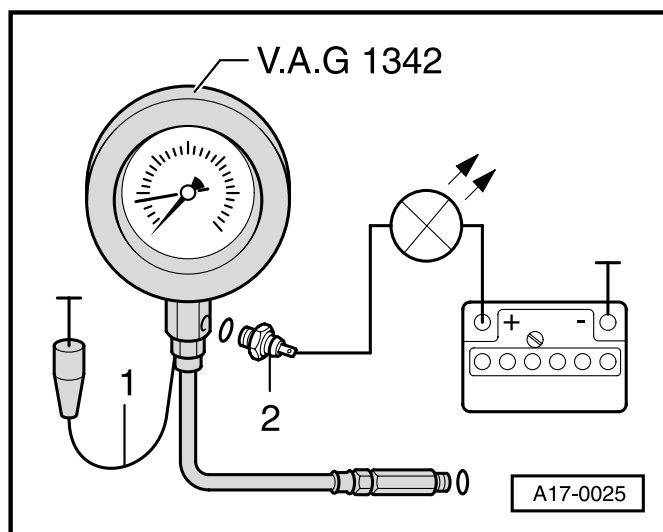
- If the oil pressure switch is open for only 0.5...3 s at an engine speed of more than 1500 rpm, this is stored in the combination processor of the dash panel insert. If this condition occurs 3 times when the engine is running, the oil pressure warning is immediately activated and is also not cancelled when engine speed is less than 1500 rpm.

The oil pressure warning is cancelled once the oil pressure switch is closed for more than 5 s at an engine speed of more than 1500 rpm, or with „Ignition off“.

Test conditions

- Engine oil level o.k., inspecting ⇒ page 17-4
- Oil pressure warning lamp (K3) should come on for about 3 s when ignition switched on
- Engine oil temperature at least 80 °C (radiator fan should have cut in once)

Testing oil pressure switch



- Disconnect cable from the 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 (+).
- Start engine and slowly increase engine speed.
- At a pressure of 0.03...0.06 MPa, the LED should come on; if not, replace oil pressure switch.

Testing oil pressure

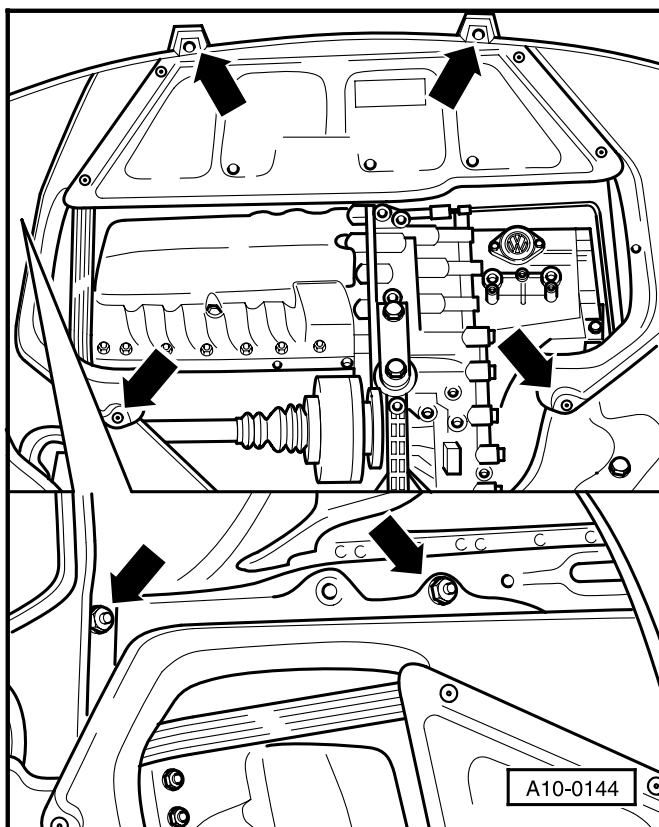
- Unscrew oil pressure switch and screw in V.A.G 1342.
- Screw oil pressure switch into V.A.G 1342.
- Start engine (engine oil temperature at least 80 °C).
 - ◆ Oil pressure when engine idling: min. 0.1 MPa
 - ◆ Oil pressure at 2000 rpm: 0.2...0.5 MPa

If the specifications are not achieved:

- Replace pressure relief valve in oil pump cover ⇒ page 17-3.

Removing and installing oil sump**Special tools, testers and aids required**

- ◆ Socket bit 3249
- ◆ Hand electric drill with plastic brush
- ◆ Flat scraper
- ◆ Torque wrench 5...50 Nm
(e.g. V.A.G 1331)
- ◆ Silicone sealant D 176 404 A2

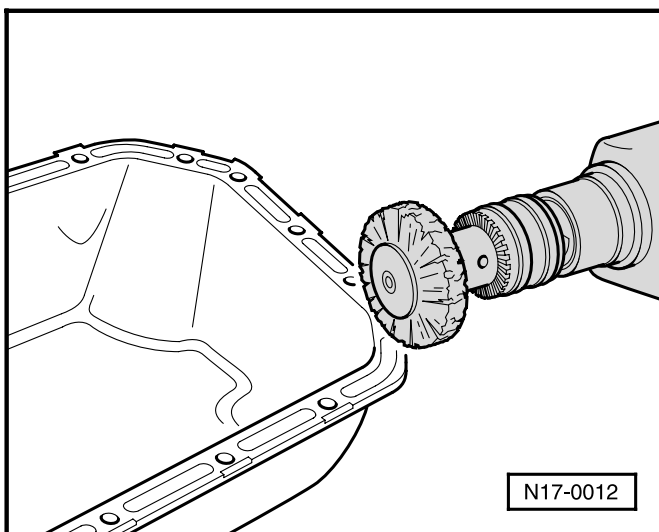


Removing

- ◀ - Remove noise insulation panel -arrows-.
- Drain engine oil.
- Unbolt oil sump.

Notes:

- ♦ Use wrench socket 3249 to unscrew oil sump bolts at the flywheel side.
- ♦ If the bolts drop behind the intermediate plate (page 13-9, item 12), press intermediate plate off slightly after removing the oil sump and take out bolts.
- Take off oil sump; detach with light blows from a rubber-headed hammer if necessary.

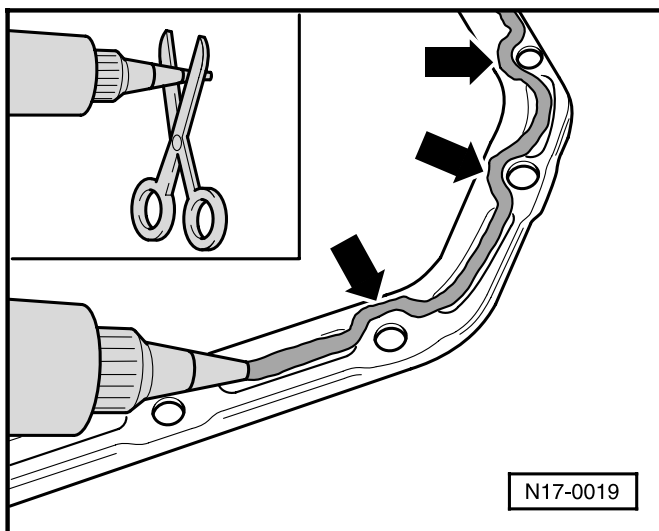


- Remove residues of sealant on cylinder block with a flat scraper.
- ◀ - Remove residues of sealant on the oil sump with rotating plastic brush (wear eye protection).
- Clean sealing surfaces; they should be free of oil and grease.

Installing

Notes:

- ♦ The oil sump has to be installed within 5 minutes after applying the silicone sealant.
- ♦ Use socket insert 3249 to fit on and tighten oil sump bolts at the flywheel side.
- ♦ A second fitter is required for installing the oil sump.

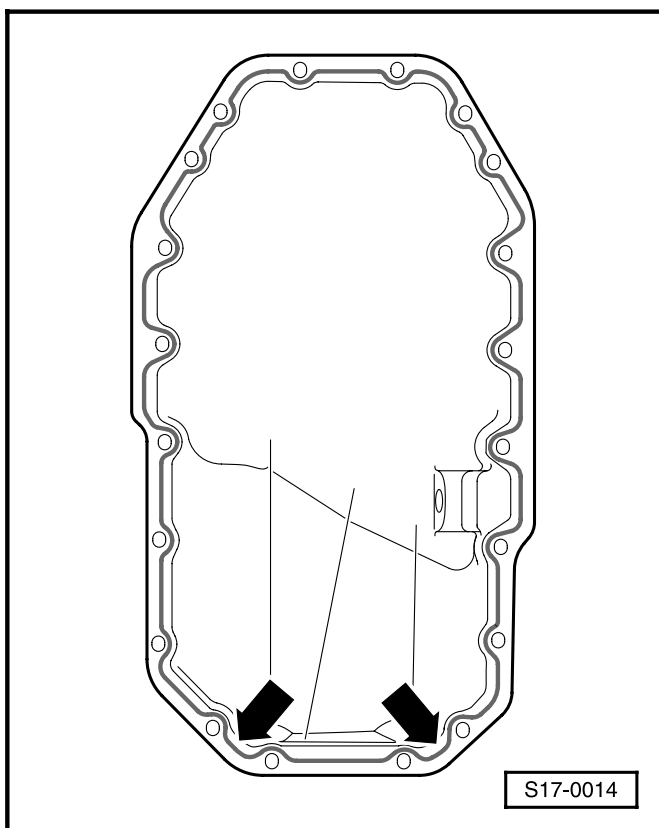


- ◀ - Cut off end of tube of silicone sealant „D 176 404 A2“ at the front marking ($\varnothing$ of nozzle about 3 mm).

- ◆ Thickness of sealant bead: 2 ... 3 mm
- ◆ Run past on the inside at the area of the bolt holes -arrows-.

Note:

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



- ◀ - Apply silicone sealant to the clean sealing surface of the oil sump.

Note:

Apply the sealant bead particularly carefully in the area of the rear sealing flange -arrows-.

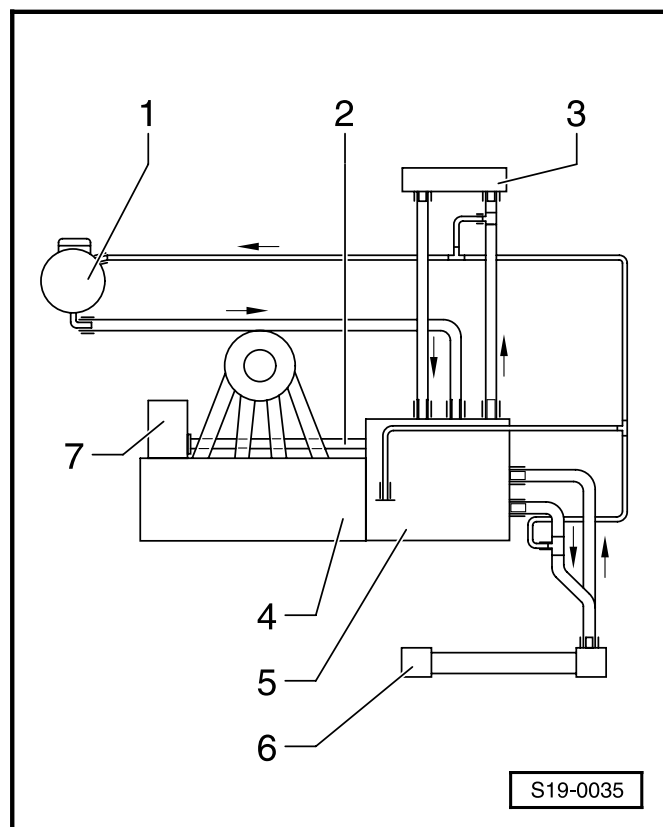
- Insert the rear oil sump bolt at the flywheel side into the oil sump and hold with wrench socket 3249. Fit oil sump onto the cylinder block and first of all screw up the aforementioned bolt.
- Tighten the other bolts as follows:
 1. Tighten all the oil sump/cylinder block bolts only very slightly diagonally opposite.
 2. Tighten the two oil sump/gearbox bolts slightly.
 3. Re-tighten all the oil sump/cylinder block bolts slightly diagonally across.
 4. Tighten the two oil sump/gearbox bolts to a final torque of 45 Nm.
 5. Tighten all the oil sump/cylinder block bolts diagonally across to a final torque of 15 Nm.

Notes:

- ◆ *When installing the oil sump on the removed engine, ensure that the oil sump is flush with the cylinder block at the flywheel side.*
- ◆ *After removing the oil sump, the sealant should be allowed to dry for about 30 minutes. Do not pour in engine oil until after this time has elapsed.*

Removing and installing parts of the cooling system

Parts of cooling system



1 - Expansion reservoir

2 - Coolant pipe

- ◆ Removing and installing
⇒ page 19-7

3 - Heating system heat exchanger

4 - Cylinder block

5 - Coolant thermostat housing

- ◆ With coolant thermostat
- ◆ Removing and installing
⇒ page 19-7

6 - Radiator

- ◆ After replacing radiator, fill complete system with fresh coolant
- ◆ Removing and installing
⇒ page 19-5

7 - Coolant pump

- ◆ Removing and installing
⇒ page 19-8

Notes:

- ◆ The cooling system is pressurized when the engine is warm. Release pressure, if necessary, before commencing repairs.
- ◆ Hose connections are secured with spring strap clamps. Always use 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.
- ◆ Route coolant hoses free of stress when installing and avoid contact with other components (pay attention to marking on the coolant connection and on hose).
- ◆ Draining and filling system with coolant
⇒ page 19-2.
- ◆ Coolant mixing ratios ⇒ page 19-4.
- ◆ Testing cooling system for leaks
⇒ page 19-9.

Draining and filling system with coolant

Quantity of coolant approx. 5.0 litres

Special tools, testers and aids required

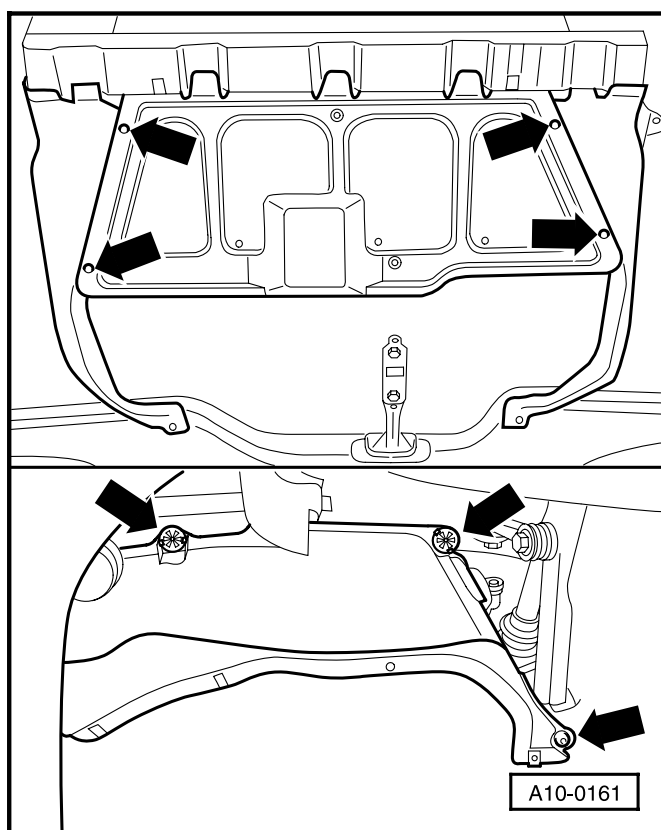
- ◆ Drip tray (e.g. V.A.G 1306)
- ◆ Antifreeze concentration tester

Draining system

Warning!

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

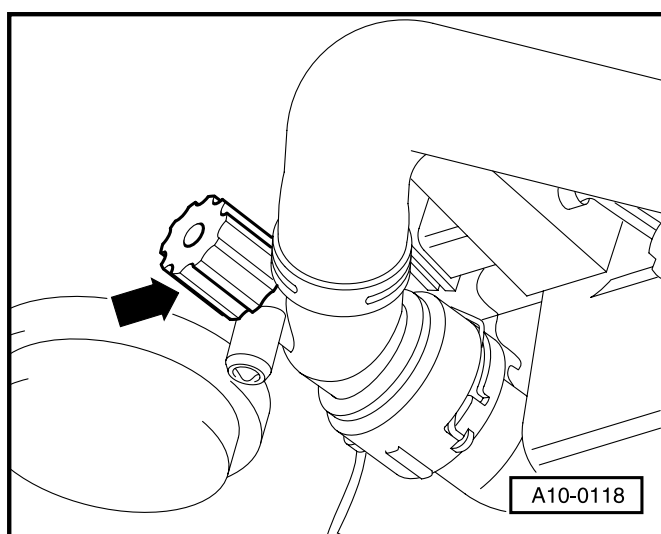
- Open cap of expansion reservoir.
- ◀ - Remove noise insulation panel in middle -arrows in top half of illustration-.
- Place drip tray (e.g. V.A.G 1306) below the engine.



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

Notes:

- ◆ Collect drained coolant for proper disposal.
- ◆ Pay attention to disposal regulations for coolant.



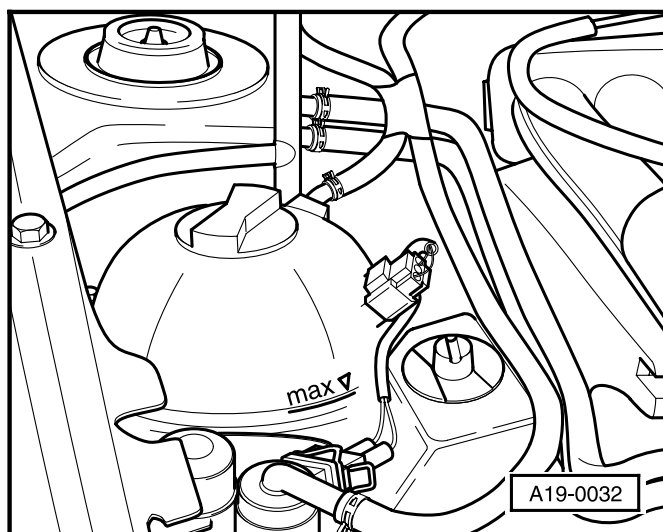
Filling up

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

Recommended mixture ratios:

Antifreeze protection down to	Antifreeze concentration ¹⁾²⁾	Drinking water ²⁾
-25 °C	40% (2.0l)	60% (3.0l)
-35 °C	50% (2.5l)	50% (2.5l)

- 1) The antifreeze concentration 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



- Screw in drain valve for coolant
- ◀ Fill with coolant gradually up to „max“ marking on the expansion reservoir.
- Start engine and run for max. 2 minutes at approx 1500 rpm; fill up coolant to overflow opening of expansion reservoir.
- Close expansion reservoir.
- Run engine until the fan starts

Caution!

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

- Inspect coolant level. If the engine is warm the coolant level must be on the „max“ marking, if the engine is cold the level must lie between the „min“ and „max“ marking.

Removing and installing radiator

Notes:

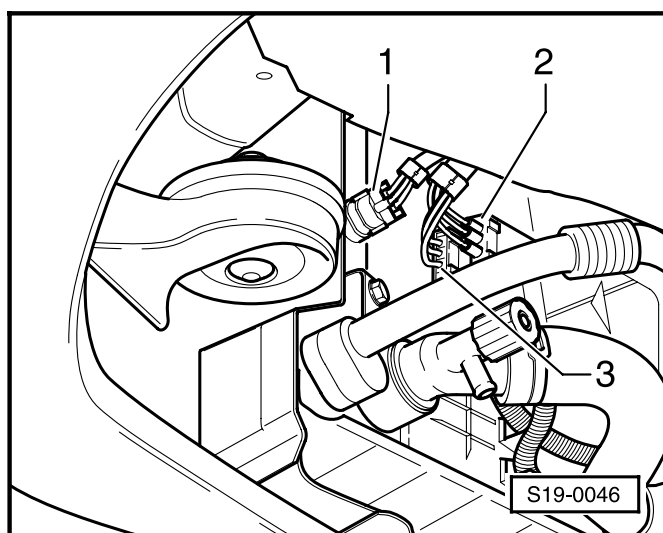
- ◆ Always replace seals and sealing rings
- ◆ Raise vehicle with lift platform ⇒ page 10-1, removing and installing engine

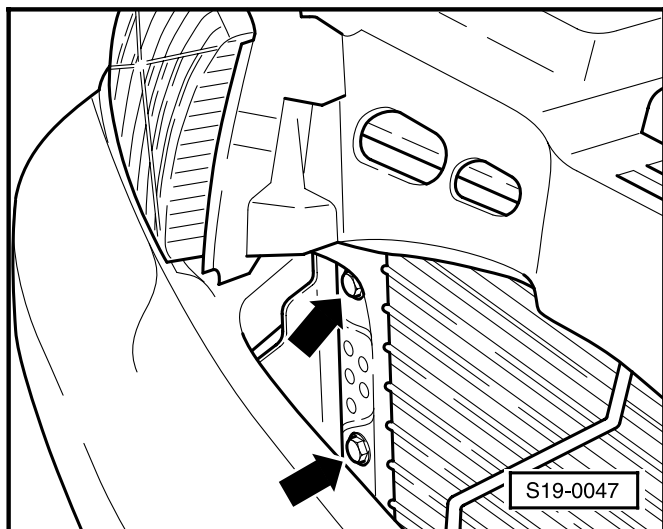
Special tools, testers and aids required

- ◆ Torque wrench
- ◆ Wire

Removing

- Drain coolant ⇒ page 19-2
- ◀ - Unplug connector from thermoswitch (F18) -1- and separate plug connections -2- and -3- at fan shroud (press catches).
- Separate coolant hoses at connection fittings of radiator (pull off retaining clip).



**Models with air conditioning**

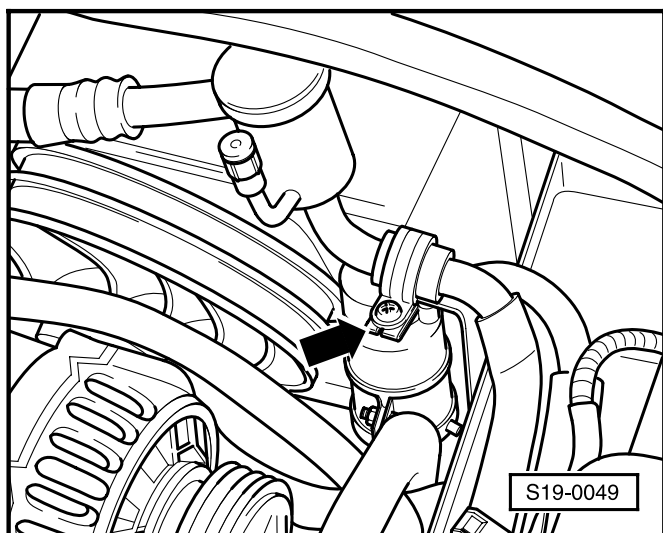
- ◀ - Unscrew the 4 securing bolts -arrows- of the condenser.

Important!

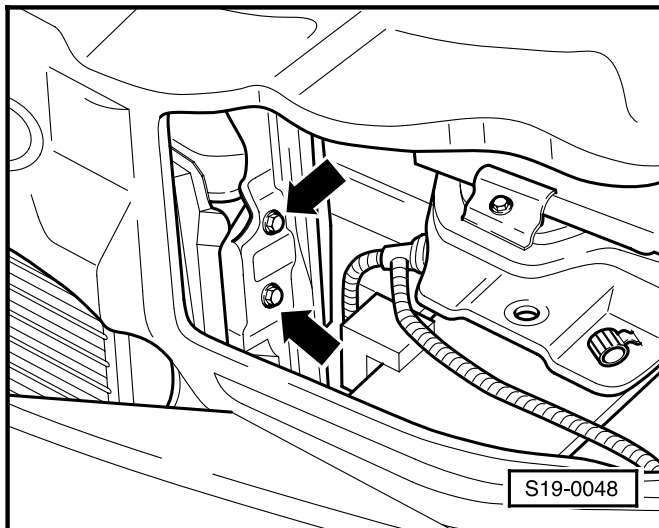
The refrigerant circuit of the air conditioning system must not be opened.

Note:

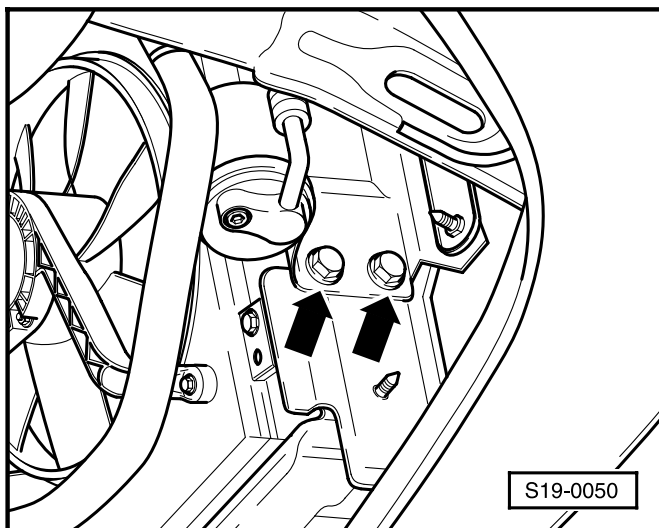
In order to avoid damage to the condenser and also to the refrigerant pipes and hoses, ensure that the pipes and hoses are not over-tensioned, kinked or bent.



- ◀ - Detach bracket -arrow- for refrigerant pipe.
- Remove right headlight:
 - ⇒ Electrical System; Repair Group 94; Removing and installing headlights

**Continued for all models**

- Remove left headlight:
⇒ Electrical System; Repair Group 94; Removing and installing headlights
- ◀ - Unscrew the 4 bolts -arrows- for attaching the top radiator mount.



- ◀ - Unscrew the 4 bolts -arrows- for attaching the bottom radiator mount.

Models with air conditioning

- Lift out radiator and condenser slightly.

- ◀ - Take off retaining clip -arrow- for refrigerant pipe.

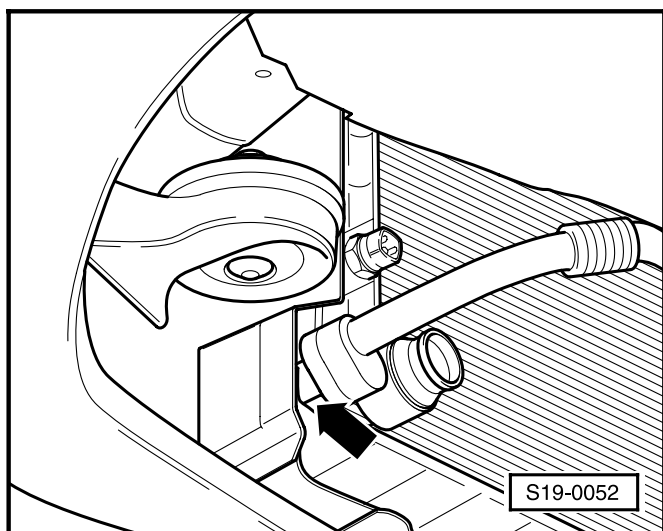
Continued for all models

- Remove fan shroud (4 bolts).

Note:

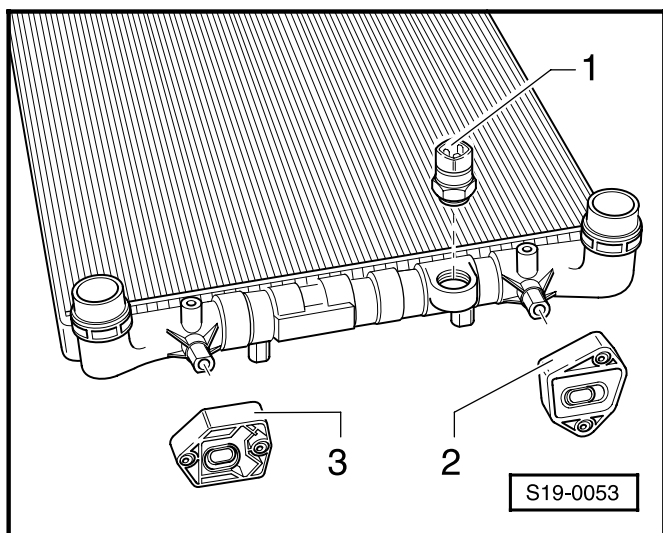
When removing and installing the fan shroud, ensure that the radiator fins are not damaged.

- Carefully lift radiator down and out.

**Installing**

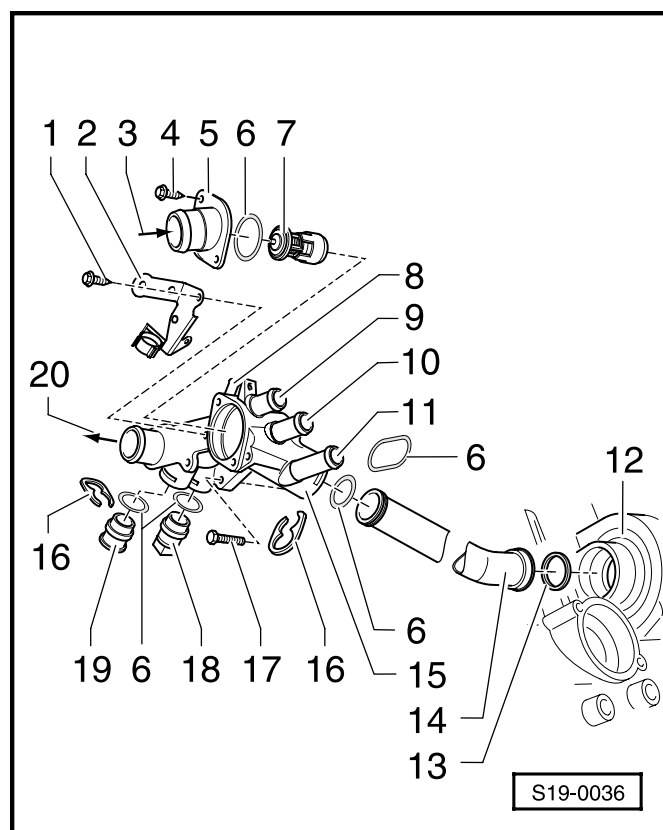
Installation is carried out in the reverse order; pay attention to the following points:

- ◀ - Tighten thermoswitch -1- to 35 Nm.
- Fit on mounts -2- and -3- at the radiator, as shown.
- Tighten the bolts for attaching the fan shroud and radiator mounts to 10 Nm.
- On models with air conditioning, tighten the bolts for attaching the condenser and bracket for refrigerant pipes to 10 Nm.



- Replace O-rings in the connection fittings of the coolant hoses.
- Screw in drain plug for coolant.
- Fill system with coolant ⇒ page 19-2.
- Install headlight:
⇒ Electrical System; Repair Group 94;
Removing and installing headlight.
- Electrical connections and routing:
⇒ Current Flow Diagrams, Electrical Fault
Finding and Fitting Locations binder

Removing and installing coolant thermostat, coolant thermostat housing, coolant pipe



1 - Self-tapping screw, 4 Nm

2 - Bracket

- ◆ for wiring loom

3 - from bottom of radiator

4 - Self-tapping screw, 9 Nm

5 - Connection fitting

6 - O-ring

- ◆ Replace

7 - Coolant thermostat

- ◆ Testing operation: heat thermostat in water bath. The pin of the thermostat element should move out.
- ◆ Testing temperature: start of opening about 84 °C, end of opening about 98 °C

8 - to expansion reservoir

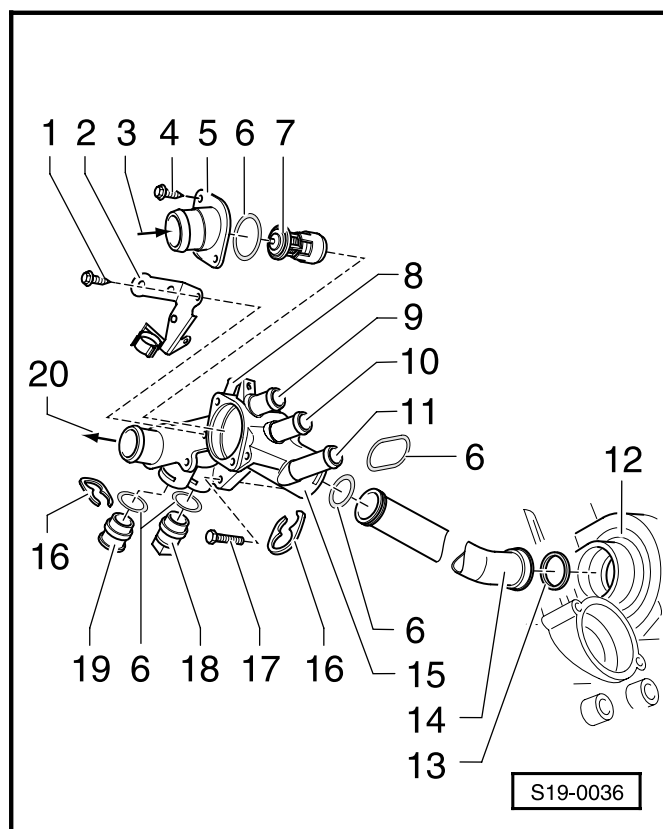
9 - to heat exchanger

10 - from expansion reservoir

11 - from heat exchanger

Notes:

- ◆ Draining and filling system with coolant
⇒ page 19-2.
- ◆ Replace seals and gaskets.



12 - Coolant pump housing at cylinder block

13 - Seal

♦ Replace

14 - Coolant pipe

♦ Removing: unbolt coolant thermostat housing first of all

15 - Coolant thermostat housing

16 - Retaining clip

17 - 10 Nm

18 - Coolant temperature sender (G62)

♦ with coolant temperature gauge sender (G2)

19 - Plug

20 - to top of radiator

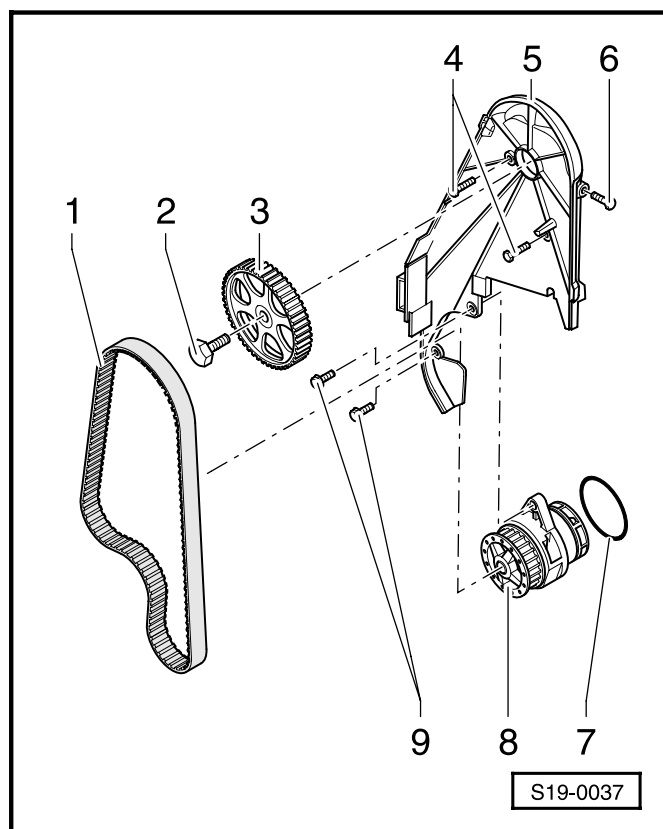
Removing and installing coolant pump

Special tools, testers and aids required

- ♦ Locking device MP 1-216
- ♦ Torque wrench 5 ... 50 Nm (e.g. V.A.G 1331)
- ♦ Locking fluid D 000 600 A2

Removing

- Drain coolant ⇒ page 19-2.
- Remove ribbed V-belt ⇒ page 13-5.
- ◀ - Remove toothed belt -1- ⇒ page 13-5.
- Remove camshaft sprocket -3- (lock with MP 1-216)
- Remove toothed belt guard -5- (bolts -4, 6, 9-).
- Remove coolant pump -8-.



Installing

Installation is performed in the reverse order; pay attention to the following points:

- Replace O-ring -7- and moisten with coolant additive.
- Insert bolts -4- 10 Nm
with D 000 600 A2
- Replace bolts -6- 10 Nm
- Bolts - 9- 20 Nm
- Bolts -2- 20 Nm + torque a
further 1/4 turn (90°)
- Install toothed belt -1- ⇒ page 13-5.
- Install ribbed V-belt ⇒ page 13-5.
- Fill system with coolant ⇒ page 19-2.

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

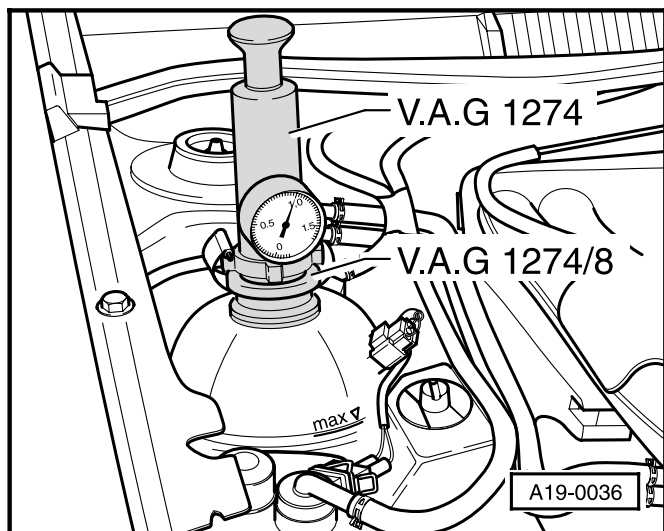
- Engine at operating temperature

Test procedure

Important!

Hot vapours may escape when the expansion reservoir is opened. Cover over cap with cleaning rags 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.
- Use the priming pump of the tester to produce a pressure of about 0.1 MPa.
- If the pressure drops, locate 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 priming pump of the tester to produce a pressure of about 0.15 MPa.
- The pressure relief valve should open at a pressure of 0.12 ... 0.15 MPa.

Removing and installing parts of the fuel supply system

Notes:

- ◆ *Always replace seals and gaskets when carrying out removal and installation work.*
- ◆ *Always replace collar clamps by spring strap clamps or.*
- ◆ *Fuel hoses at the engine must be secured only with spring strap clamps. It is not permitted to use collar or screw-type clamps.*
- ◆ *It is recommended to use the pliers for spring strap clamps for removing and installing such clamps.*

Pay attention to safety precautions

⇒ page 20-4.

Pay attention to rules for cleanliness

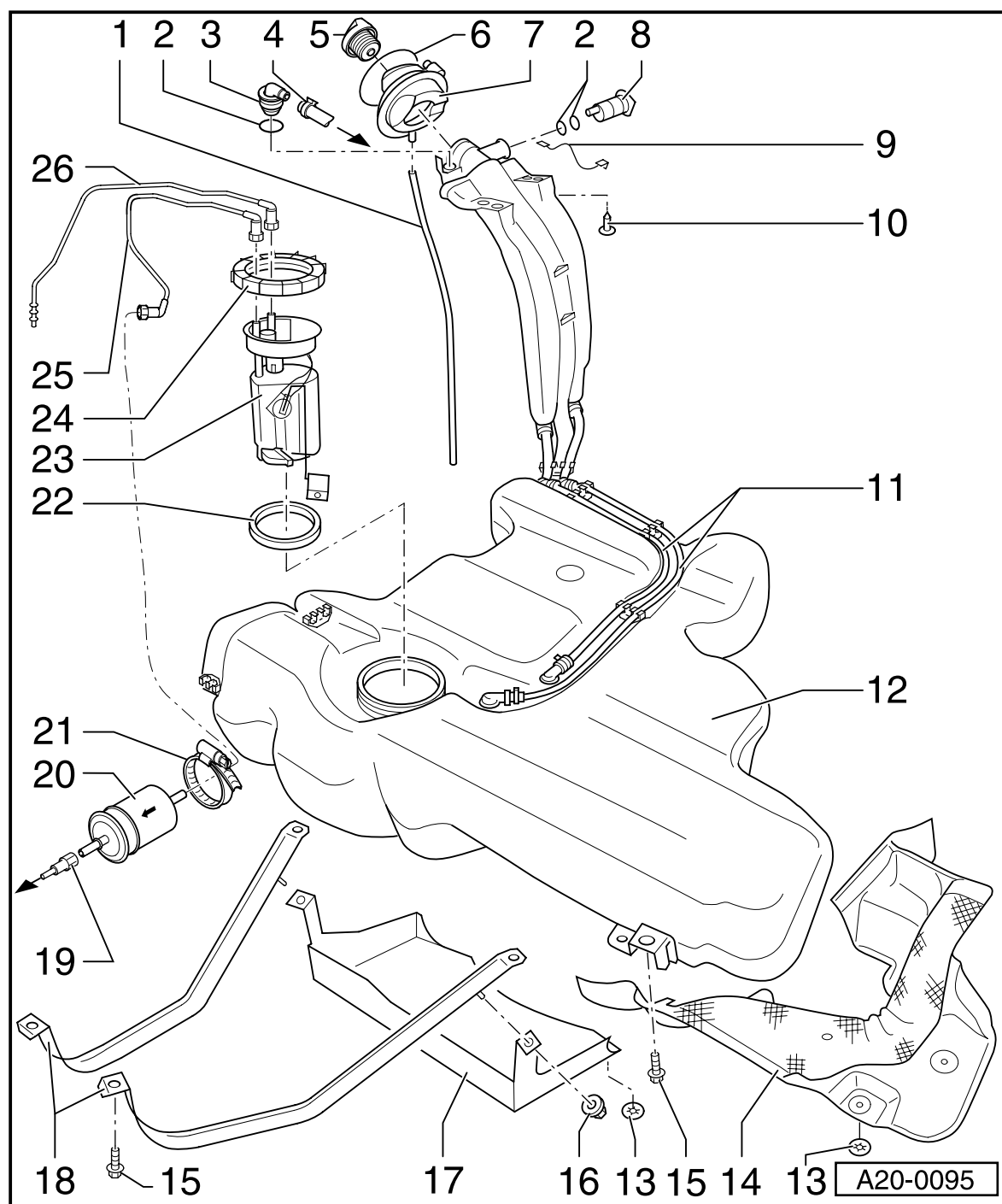
⇒ page 20-4.

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

Servicing throttle mechanism ⇒ page 20-12.

Adjusting throttle cable ⇒ page 20-13.

Removing and installing fuel tank with attached parts and fuel filter



1 - Overflow hose

2 - O-ring

- ◆ Replace

3 - Gravity valve

- ◆ For removing, unclip valve and lift out of the filler neck
- ◆ Inspect valve for blockage
valve vertical: open
valve tilted 45°: closed

4 - Breather pipe

- ◆ to activated charcoal filter
⇒ page 20-12, item 5

5 - Filler cap

- ◆ Replace seal if damaged

6 - Tensioning ring

7 - Rubber bowl

8 - Breather valve

- ♦ Testing ⇒ Fig. 1

9 - Earth connection**10 - 10 Nm****11 - Breather pipe****12 - Fuel tank**

- ♦ Removing and installing
⇒ page 20-6

13 - Clamping washer

- ♦ to remove: turn to the left
- ♦ to install: tighten to 2 Nm

14 - Heat shield

- ♦ for fuel tank

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

- ♦ installing: tighten to 2 Nm

17 - Cover

- ♦ for fuel tank
- ♦ not fitted to all models

18 - Tensioning strap

- ♦ Pay attention to different lengths

19 - Feed pipe

- ♦ black
- ♦ to fuel rail
- ♦ to disconnect, press release catches at connector

20 - Fuel filter

- ♦ Installation position: arrow faces in direction of flow

21 - Retaining clip

- ♦ 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:
⇒ 1.6 ltr./55 kW Engine, 1AV Fuel Injection and Ignition System; Repair Group 24; Testing fuel pressure regulator and holding pressure

24 - Union nut

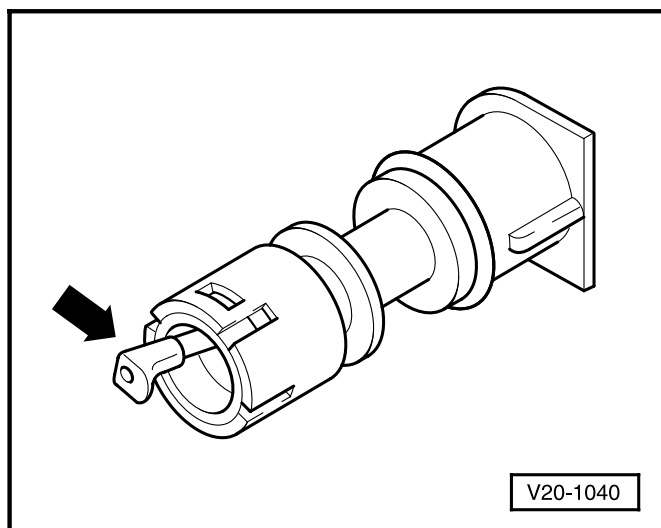
- ♦ Use wrench MP 1-227 for removing and installing

25 - Feed pipe

- ♦ black
- ♦ to fuel filter
- ♦ Fitted to connection marked with „V“ at flange
- ♦ To detach from flange, press release buttons on connector

26 - Return flow pipe

- ♦ blue
- ♦ from fuel rail
- ♦ Fitted to connection marked with „R“ at flange
- ♦ For detaching from flange, press release buttons on connector



◀ **Fig. 1 Testing bleeder valve**

Lever in off position: closed

Lever pressed in direction of arrow: open

Safety precautions when working on the fuel supply system

Important!

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

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

- ◆ Fuel tank must not be more than 2/3 full.
- ◆ An exhaust extraction system should be positioned close to the assembly opening of the fuel tank for extracting the fuel vapours which escape and should be switched on even before starting the work.
If no exhaust extraction system is available, a radial fan (motor positioned outside of the air flow) with a delivery volume of more than 15 m³/h should be used.
- ◆ Avoid fuel coming into contact with your skin!
Wear fuel-resistant gloves!

Rules for cleanliness

Pay careful attention to the following „5 rules“ for cleanliness when working on the fuel supply/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 cloth!
- ◆ Carefully cover over or seal open 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 open:
Avoid working with compressed air, if possible.
Avoid moving the vehicle, if possible.

Removing and installing fuel delivery unit

Pay attention to safety precautions
⇒ page 20-4.

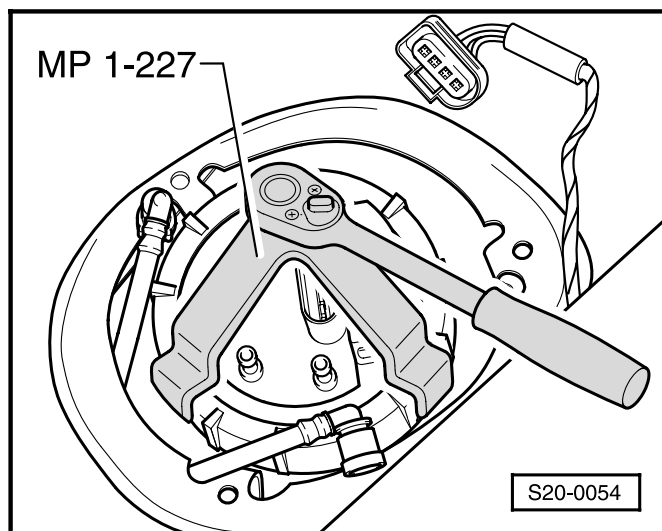
Pay attention to rules for cleanliness
⇒ page 20-4.

Special tools, testers and aids required

- ◆ Wrench for union nut MP 1-227

Removing

- If vehicle fitted with coded radio set, pay attention to coding; determine if necessary.
- Switch off ignition (if not already off) and disconnect earth strap at the battery.
- Unbolt cover (below rear seat).
- Disconnect feed and return flow pipes from the flange of the fuel delivery unit (press release catches).
- Release and unplug 4-pin connector from the flange at the 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:

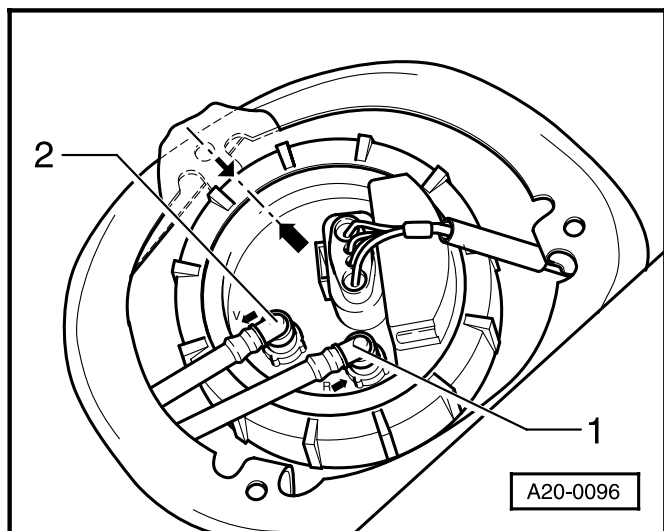
If the fuel delivery unit is still filled with fuel, empty before replacing.

Installing

Installation is carried out in the reverse order; 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 the flange with fuel for installing.*
- ◆ *Ensure the fuel hoses are tightly connected.*

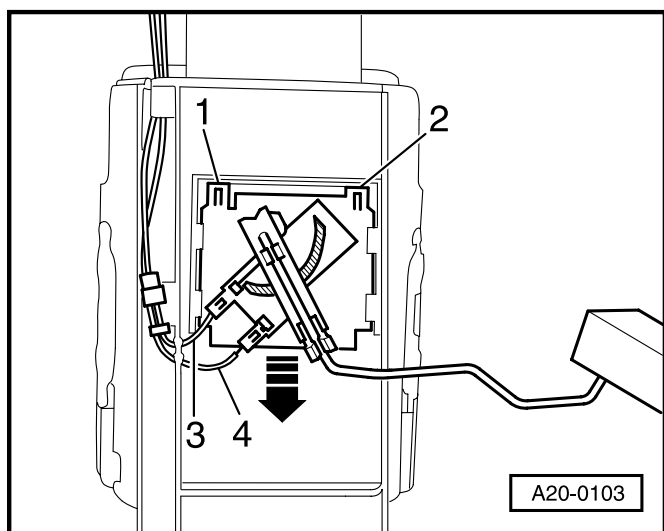


- ◀ - Pay attention to installation position:
 - ◆ Marking on the end flange must be aligned with the marking on the fuel tank -arrows-.
 - ◆ Blue return flow pipe -1- fitted to connection marked with -R-.
 - ◆ Black feed pipe -2- fitted to connection marked with -V-.

Removing and installing fuel gauge sender

Removing

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

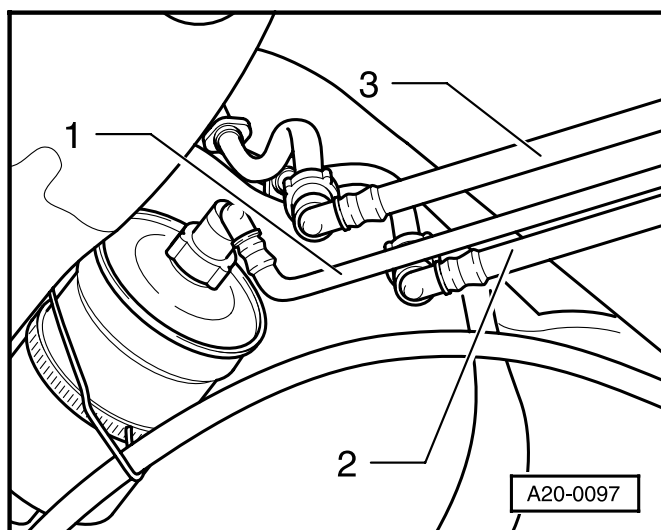
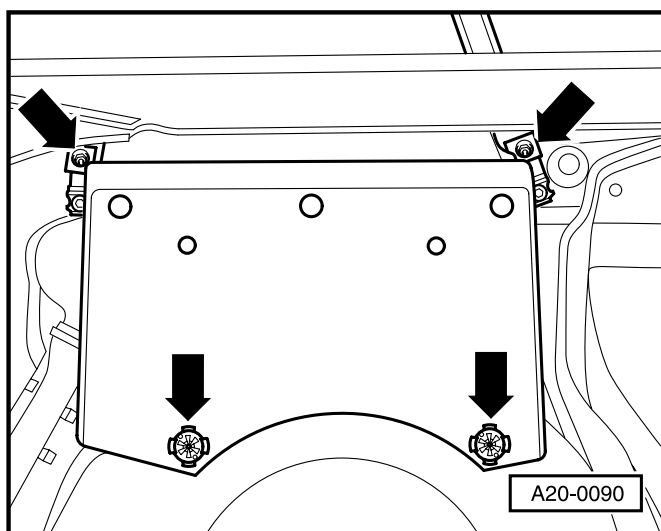
Pay attention to rules for cleanliness
⇒ page 20-4.

Special tools, testers and aids required

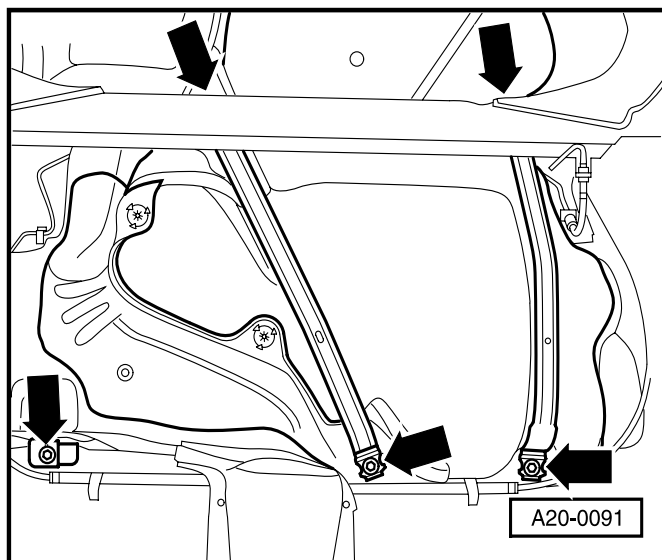
- ◆ Engine/gearbox jack
(e.g. V.A.G 1383A)
- ◆ Fuel extraction appliance
(e.g. V.A.G 1433A)

Removing

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



- ◀ - Disconnect return flow pipe -2- (blue), feed pipe -1- (black) and breather pipe -3- (white) at the front right of the fuel tank (press release catches).
- Position engine/gearbox jack (e.g. V.A.G 1383 A) below the fuel tank for supporting it.

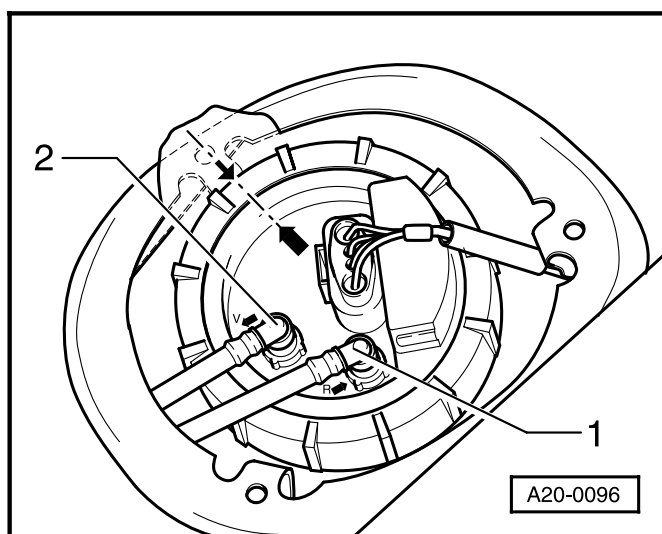


- ◀ - Slacken the bolted connections -arrows- at the front left and at the retaining straps.
- Lower fuel tank.

Installing

Installation is performed in the reverse order; pay attention to the following points:

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



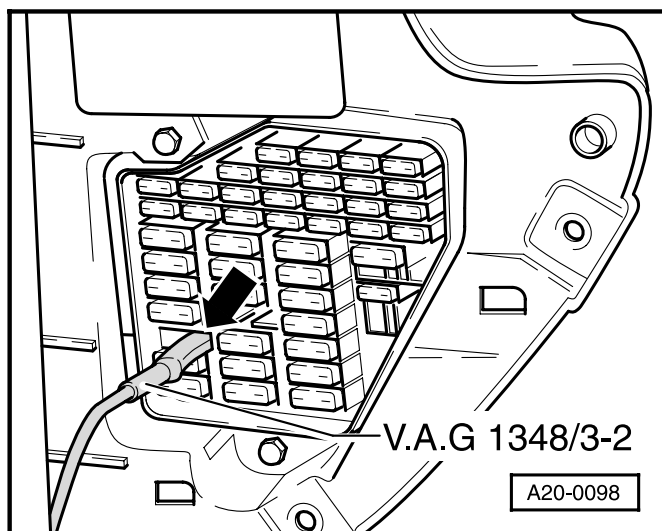
Connecting remote control

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 fuel box at the left side of the dash panel.
- Remove fuse 28 at the fuse carrier (left row, 5th large fuse from top).
- ◀ - 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 crocodile clamp to car 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)
- ◆ Remote control V.A.G 1348/3A with adapter
cable V.A.G 1348/3-2
- ◆ Wrench for union nut MP 1-227
- ◆ Current flow diagram

Test conditions

- 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 mechanic is required for this step 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.

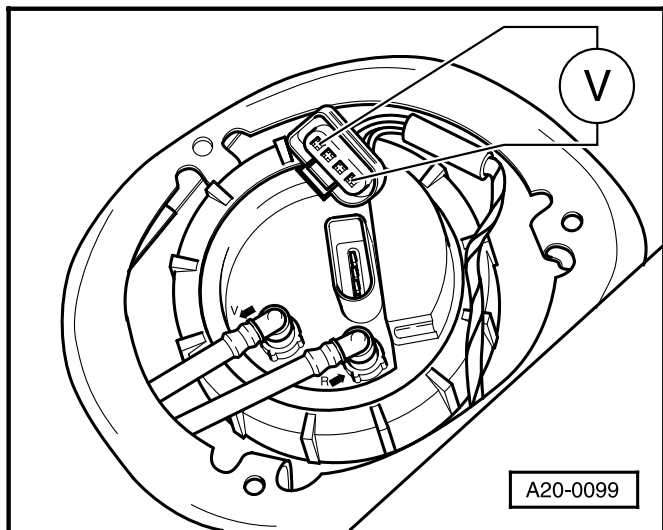
If the fuel pump runs:

Test fuel pump relay:

- ⇒ 1.6 ltr./55 kW Engine, 1AV Fuel Injection and
Ignition System; Repair Group 01; Final
Control Diagnosis

If the fuel pump does not run:

- Unbolt cover (below rear seat).
- Release and unplug 4-pin connector from the flange at the fuel tank.



- ◀ - Connect hand-held multimeter (e.g. V.A.G 1526) with adapter cables (e.g. from V.A.G 1594) to the outer contacts of the connector.

- Operate remote control.
Specification: about battery voltage

If the specification is not achieved:

- Determine and rectify open circuit in wiring on the basis of the 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 between flange and fuel pump are connected and test for continuity.

If no open circuit 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

- ◆ Remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2
- ◆ Adapter V.A.G 1318/17
- ◆ Measuring vessel

Test conditions

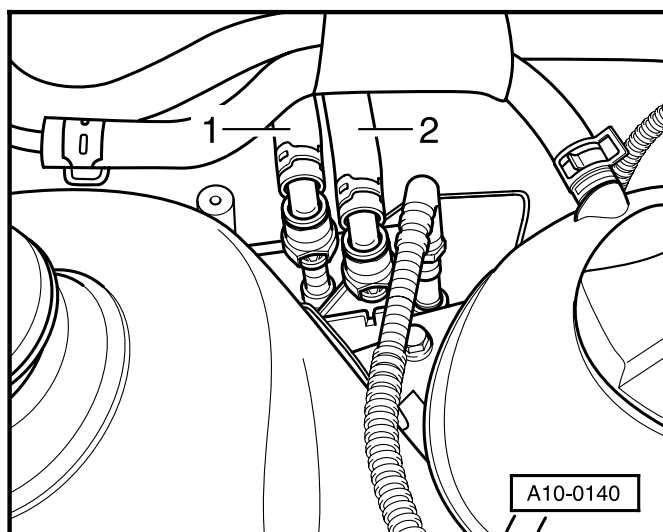
- Battery voltage at least 12 V
- Voltage supply o.k.
- Fuel filter o.k.

Test procedure

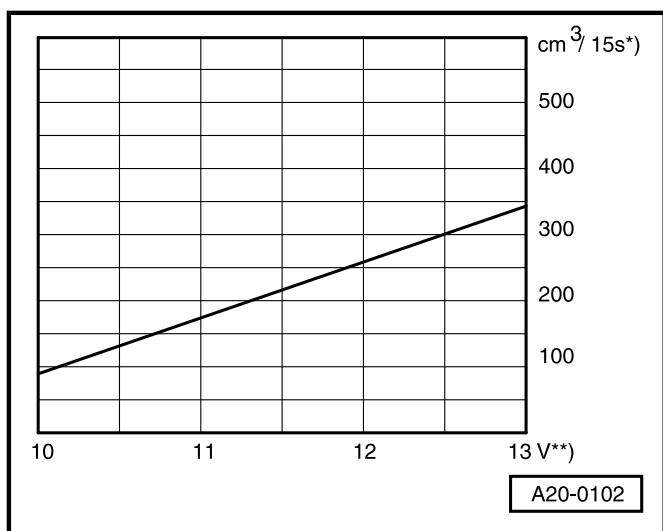
- Switch off ignition.
- Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 ⇒ page 20-8.
- Take filler cap off fuel filler neck.

Important!

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



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

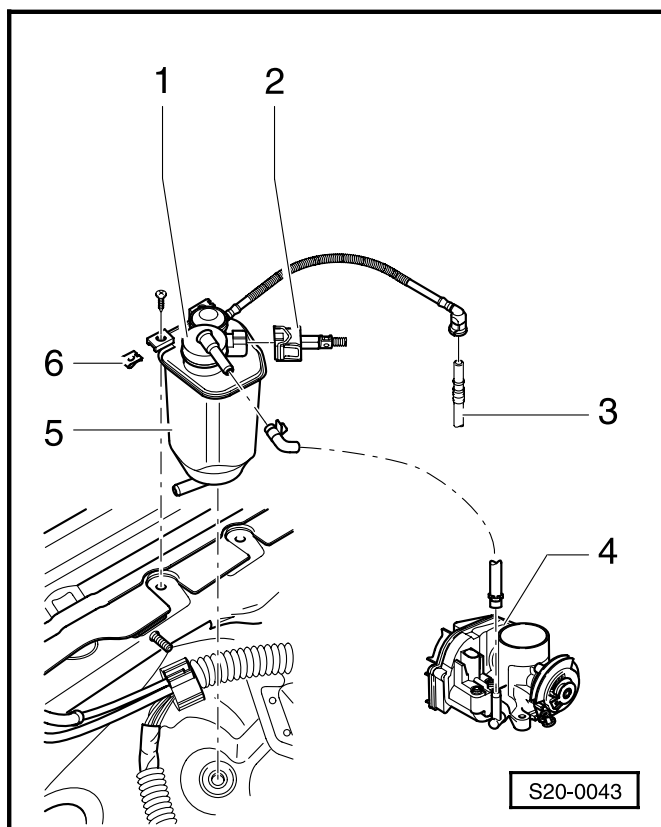


- Compare quantity of fuel pumped with specification.

*) Minimum delivery cm³/15 s

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

Removing and installing parts of the activated charcoal filter system



1 - Solenoid valve 1 (N80)

- ♦ Testing operation and actuation

⇒ 1.6 ltr./55 kW Engine, 1AV Fuel Injection and Ignition System; Repair Group 01; Final Control Diagnosis

2 - Connector

3 - Breather pipe

- ♦ From gravity valve to fuel tank ⇒ page 20-2, item 4
- ♦ For disconnecting, press release catches at connector

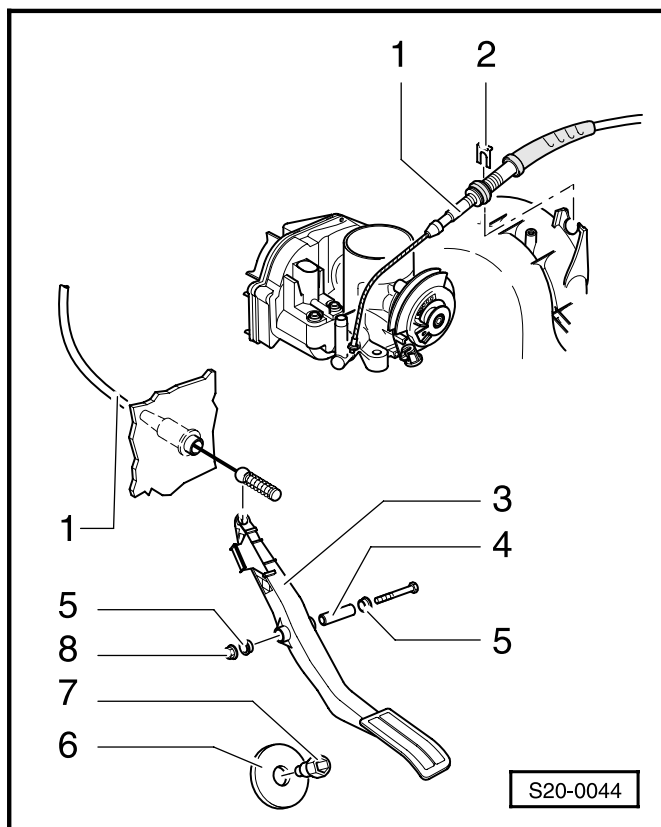
4 - Throttle valve control unit

5 - Activated charcoal filter

- ♦ with solenoid valve 1 (N80)
- ♦ Installation point: in right of engine compartment
- ♦ To remove, disconnect reservoir for PAS and press to the side

6 - Spring nut

Servicing throttle mechanism



1 - Throttle cable

- ♦ Set by re-positioning locking plate at detent ⇒ page 20-13

2 - Locking plate

3 - Accelerator pedal

4 - Spacer bush

5 - Bearing bush

6 - Washer

7 - Stop bolt

8 - 20 Nm

Adjusting throttle cable

Notes:

- ♦ *The throttle cable is very sensitive to kinking and must therefore be treated with particular care when being installed.*
- ♦ *A single slight kink can result in it subsequently fracturing when driving. Throttle cables which have been kinked, must therefore not be installed.*
- ♦ *When installing throttle cable, ensure that it is aligned between its support brackets and the cable attachment points.*

Special tools, testers and aids required

- ♦ Spring expanding rod

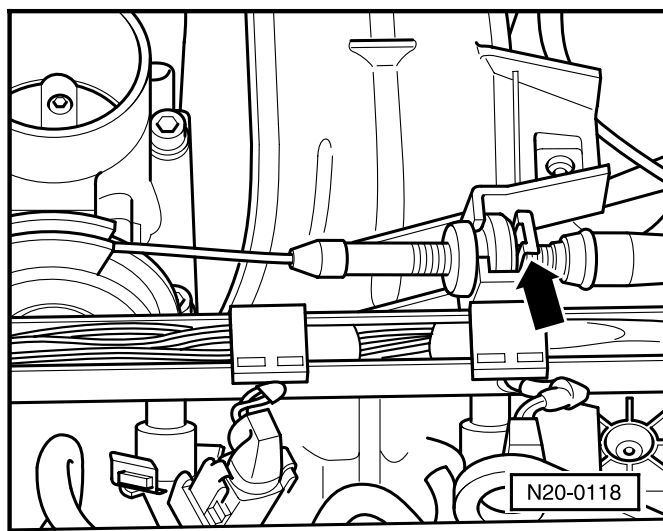
Procedure

- Attach throttle cable at the accelerator pedal and at the cam of the throttle valve control unit.
- ◀ - Pull off locking plate for throttle cable -arrow at the detent plate.
- Depress accelerator pedal into full throttle position.

Note:

A second fitter is required for this step or support accelerator pedal against steering wheel with spring expanding rod.

- Set throttle cable by re-positioning the detent at the support bearing so that the full throttle position is reached at the throttle valve lever.
- Release accelerator or remove expanding rod.
- After completing the setting, check idling speed and full throttle stops of the throttle valve.

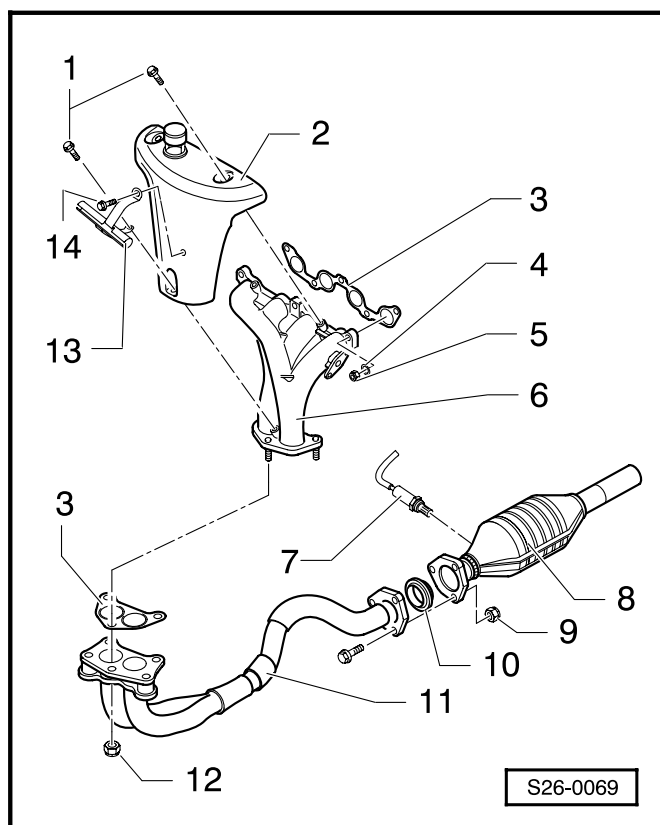


Removing and installing parts of the exhaust system

Notes:

- ◆ Always replace gaskets and self-locking nuts
- ◆ When performing installation work on the exhaust system, make sure the exhaust system is not mounted with pretension and has adequate clearance from the body. If necessary slacken double clamp and collar clamp and align silencer and exhaust pipe so that adequate clearance from the body and the weight of the exhaust system is evenly distributed over the hangers.
- ◆ Slacken and tighten clamping plates for the heat shields with screw driver
Tightening torque: 2 Nm

Exhaust manifold, front exhaust pipe with catalytic converter, lambda probe



Notes:

Front exhaust pipe and catalytic converter are welded together according to standard, supplied separately as a spare part.

When carrying out repairs separate parts with body saw (e.g. V.A.G 1523).

1 - 10 Nm

2 - Hot air collector

3 - Gasket

- ◆ Replace

4 - Washer

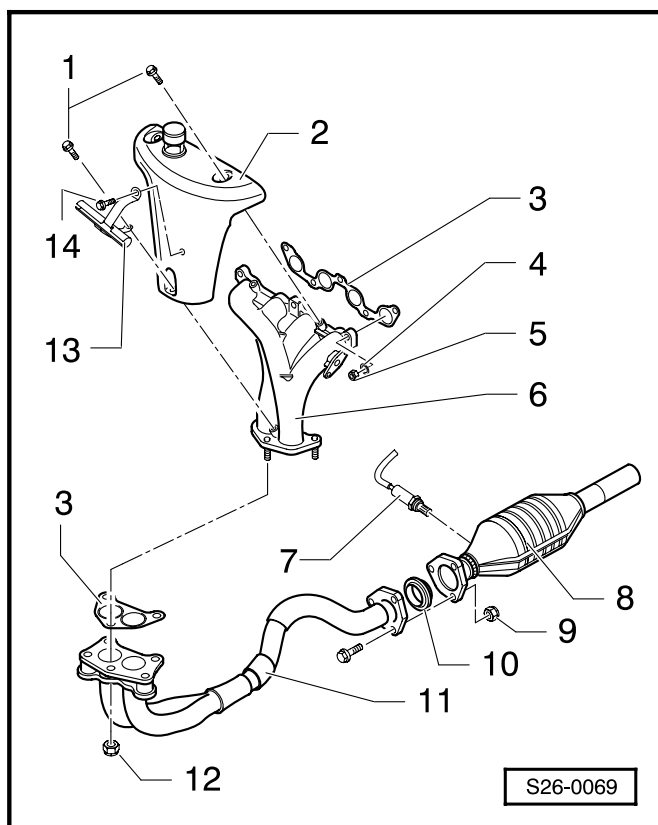
5 - 25 Nm

- ◆ Replace
- ◆ Before inserting coat with hot bolt paste G 052 112 A3

6 - Exhaust manifold

7 - Lambda probe, 55 Nm

- ◆ Removing and installing with lambda probe wrench
 - ◆ Coat thread only with G 052 112 A3
G 052 112 A3 must not get into the slot of the probe body
 - ◆ Inspect:
- ⇒ 1.6ltr/55 kW Engine, 1 AVM injection and ignition system; Repair Group 24

**8 - Catalytic converter****9 - 20 Nm**

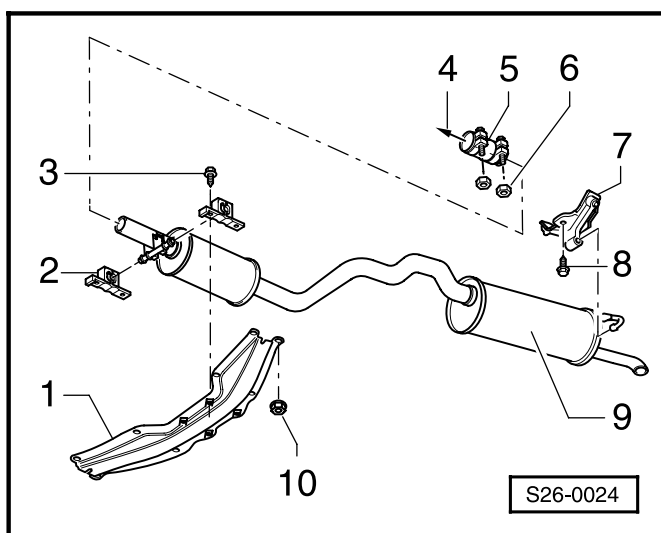
- ◆ Replace

10 - Sealing ring

- ◆ Replace
- ◆ Wide side toward front exhaust pipe

11 - Front exhaust pipe**12 - 40 Nm**

- ◆ Replace
- ◆ Before inserting coat with hot bolt paste G 052 112 A3

13 - Holder with guide pipe**14 - Tapping screw, 2 Nm****Silencer with hangers****1 - Tunnel bridge**

- ◆ Align with bore of exhaust system
⇒ page 26-4

2 - Hanger

- ◆ Fitting location ⇒ Fig. 1

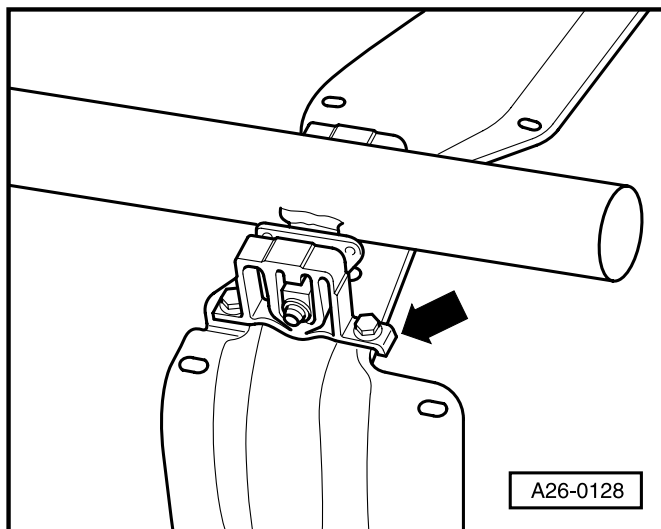
3 - 25 Nm**4 - To catalytic converter****5 - Clamping sleeve**

- ◆ Before tightening, align exhaust system free of tension ⇒ page 26-4
- ◆ Fitting location: horizontal in vehicle, screw connection points toward left
- ◆ Tighten screw connections evenly

6 - 40 Nm**7 - Hanger****8 - 25 Nm****9 - Front and rear silencer**

- ◆ Replace individually when carrying out repairs ⇒ page 26-3
- ◆ Align exhaust system free of tension
⇒ page 26-4

10 - 25 Nm



◀ Fig. 1 Installation position for hanger

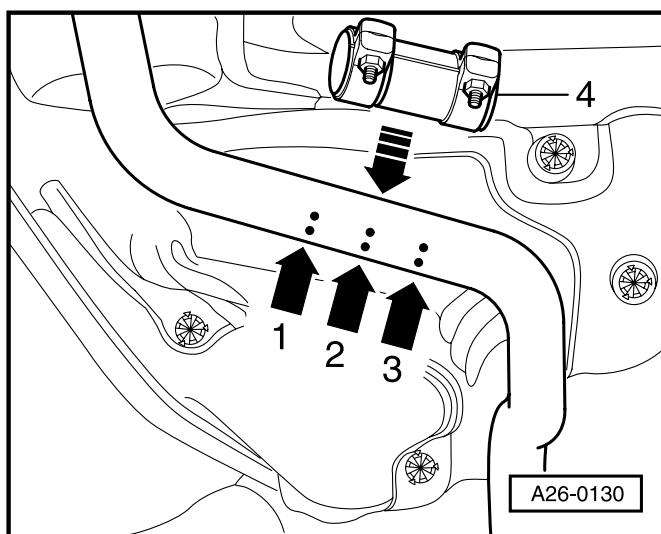
The angled side -arrow- at the base of the hanger faces in direction of travel.

Replacing front or rear silencer

Special tools, testers and aids required

- ♦ Torque wrench 5 ... 50 Nm
(e.g. V.A.G 1331)
- ♦ Body saw
(e.g. V.A.G 1523)

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



- ◀ - Cut exhaust pipe at the cutting point -arrow 2- with the body saw (e.g. V.A.G 1523) at right angles.
- Position clamping sleeve -4- at the side markings -arrows 1 and 3- when installing.
- Align exhaust system free of stress ⇒ page 26-4.
- Align rear silencer horizontally.
- Tighten the bolted connections of the clamping sleeve evenly to 40 Nm.
- Installation position of clamping sleeve: horizontally in vehicle, bolted connections facing to the front.

Aligning exhaust system free of stress

Special tools, testers and aids required

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

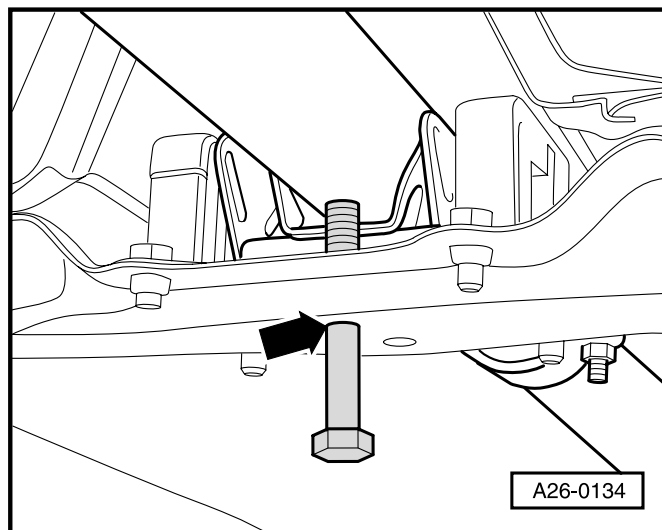
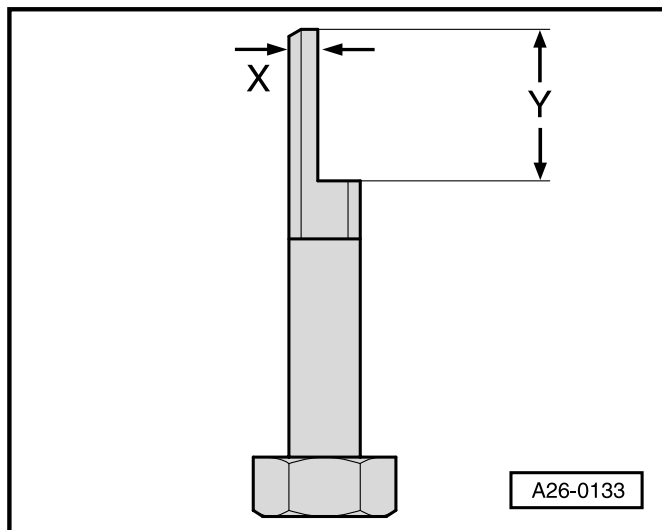
Procedure

- The exhaust system is aligned when cold.
- ◀ - Make up a tool from an M10 bolt according to the dimensions stated for aligning the exhaust system.
 - ◆ Dimension -X- = 4 mm
 - ◆ Dimension -Y- = 25 mm

Note:

A second fitter is required for aligning the exhaust system.

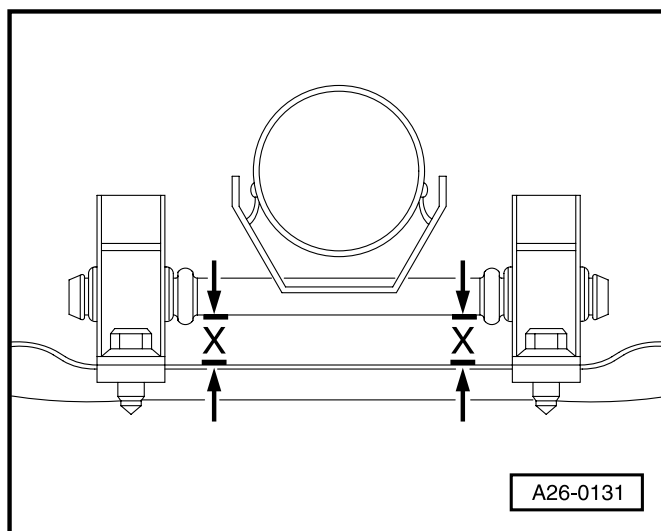
- Slacken the bolted connections of the clamping sleeve between catalytic converter and front silencer.



- ◀ - Insert workshop made tool through the rear hole -arrow- of the tunnel bridge. The flat faces toward the suspension bolt of the exhaust system.

Note:

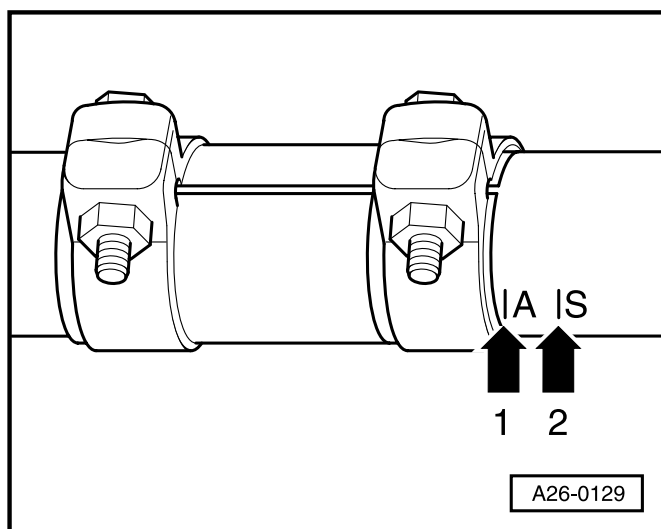
The exhaust system is pretensioned in direction of travel when the shop-made tool is inserted.



- Align front and rear silencer horizontally:
- The bolt of the hanger at the exhaust pipe must be positioned parallel to the tunnel bridge (dimension -X- on left and right identical).

Note:

On models with separation point ⇒ page 26-3, inspect horizontal position of rear silencer additionally at tail pipe.



- Position clamping sleeve with a distance of about 5 mm at the line of the marking "S" -arrow 2- and tighten evenly to 40 Nm in horizontal position.

Inspecting exhaust system for leaks

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

