

Workshop Manual OCTAVIA

**1.8 ltr. / 92 kW Engine, Mechanical
Components**

List of Supplements to OCTAVIA Workshop Manual

Edition: 04.03

1.8 l/92 kW Engine, Mechanical Components

Replaces List of Supplements - Edition: 02.02

Supplement	Edition	Subject	Article Number
	08.96	Basic Edition Workshop Manual	S00.5104.50.20
1	11.96	Supplement to Basic Edition	S00.5104.51.20
2	08.98	Modifications with effect from 08.97	S00.5104.52.20
3	10.99	New Coolants; New Sealing Materials	S00.5104.53.20
4	04.01	Modifications to Repair Groups 10, 13, 15, 17 and 20	S00.5104.54.20
5	02.02	Modifications to Repair Groups 00, 10, 13, 15, 17, 19 and 26	S00.5104.55.20
6	04.03	Modifications to Repair Groups 13, 15 and 17	S00.5104.56.20
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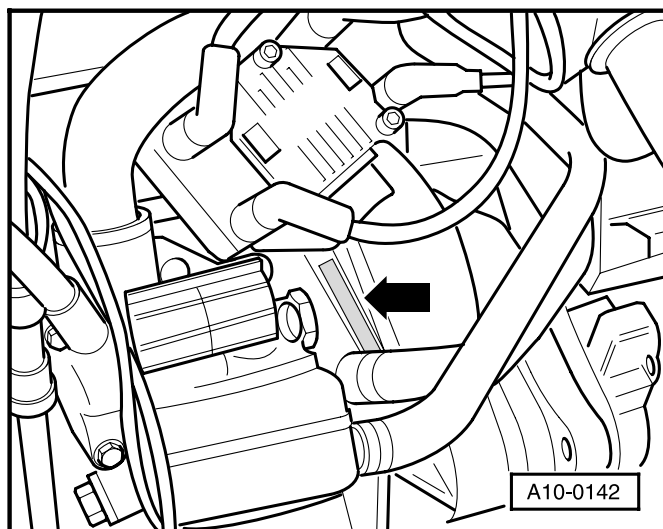
Technical data

Engine number

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

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

The engine code is also listed on the vehicle data sticker.



Engine features

Engine code		AGN	
Manufactured		08.96 ► 07.97	08.97 ► 05.99
Displacement	l	1.781	
Power output	kW at rpm	92/6000	
Torque	Nm at rpm	173/4100	170/4200
Bore	Ø mm	81	
Stroke	mm	86.4	
Compression ratio		10.3:1	
min. RON		95 unleaded ¹⁾	
Fuel injection / ignition system		Bosch Motronic	
Knock control		yes	
Self-diagnosis		yes	
Lambda control		yes	
Catalytic converter		yes	
Turbocharger		no	
Exhaust gas recirculation		no	
Camshaft adjustment		yes	
Intake manifold changeover		no	yes

¹⁾ In exceptional cases at least 91 RON, although engine power output is 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
- ◆ Engine holder MP 1-202
- ◆ Engine holder T10012
- ◆ Bolt M10 x 25/8.8
- ◆ Engine/gearbox jack, e.g. V.A.G 1383 A
- ◆ Ladder (e.g. V.A.S 5085)
- ◆ Holder MP 1-224
- ◆ Suspension device MP 9-201
- ◆ Grease G 000 100 (models with manual gearbox)
- ◆ Hot bolt paste G 052 112 A3
- ◆ Cable straps
- ◆ Wire
- ◆ Adhesive tape

Removing engine

Notes:

- ◆ *The engine is removed downward together with the gearbox.*
- ◆ *All the cable straps which have been 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 by spring strap clamps or screw-type clamps.*
- ◆ *Fuel hoses at the engine must be secured only with spring strap clamps. It is not permitted to use collar or screw-type clamps.*

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

Procedure

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

Models ► 07.97

- Detach throttle cable at the throttle valve control unit and support bracket at intake manifold (do not remove locking detent).
- Unclip throttle cable and ignition cables from the ignition cable guide.

- ◀ - Remove engine trim panel -arrows-.

Models 08.97 ►

- ◀ - Remove engine trim panel -arrows-.

- Detach throttle cable at the throttle valve control unit and support bracket at intake manifold (do not remove locking detent).
- Unclip throttle cable and ignition cables from the ignition cable guide.

Continued for all models

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

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

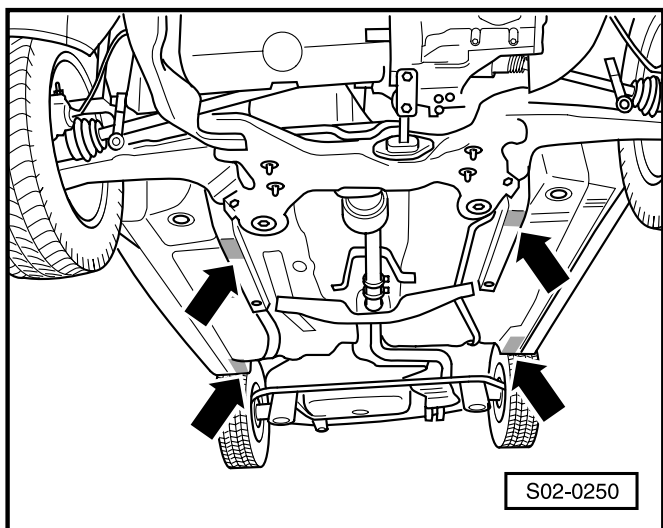
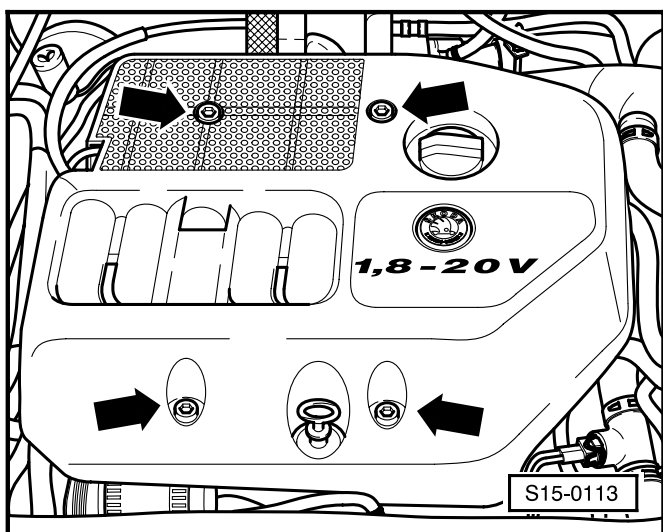
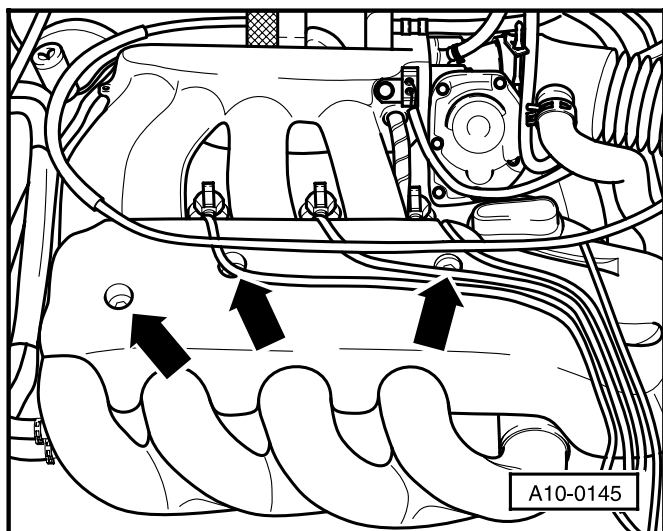
Warning!

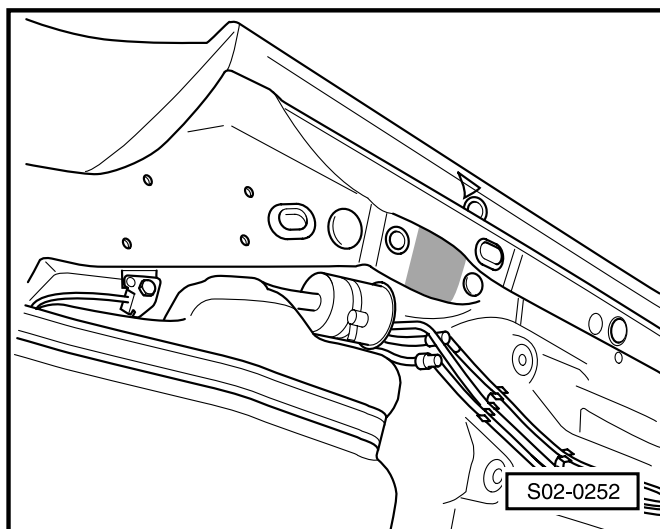
The arms of the lift platform must on no account be positioned below the sills, the front axle or rear axle.

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

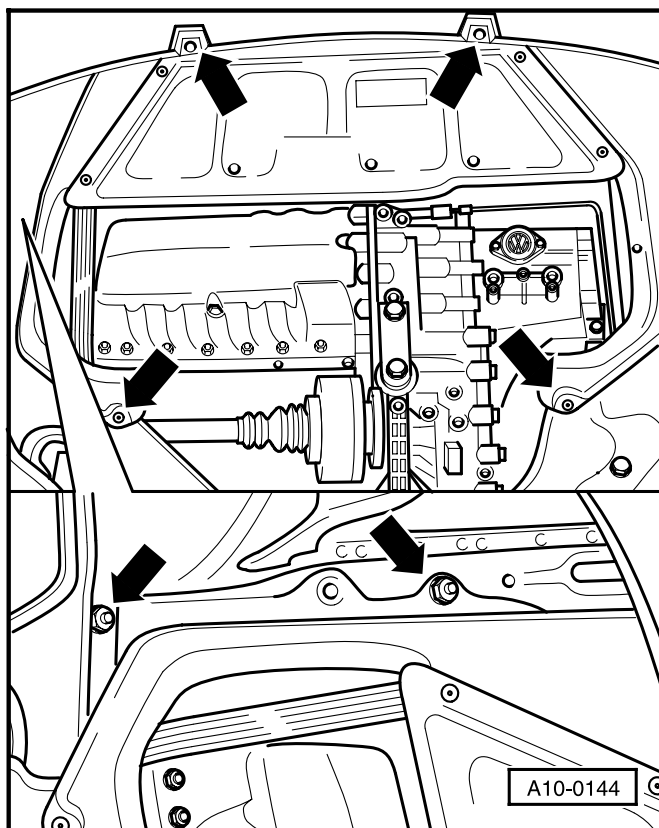
Warning!

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





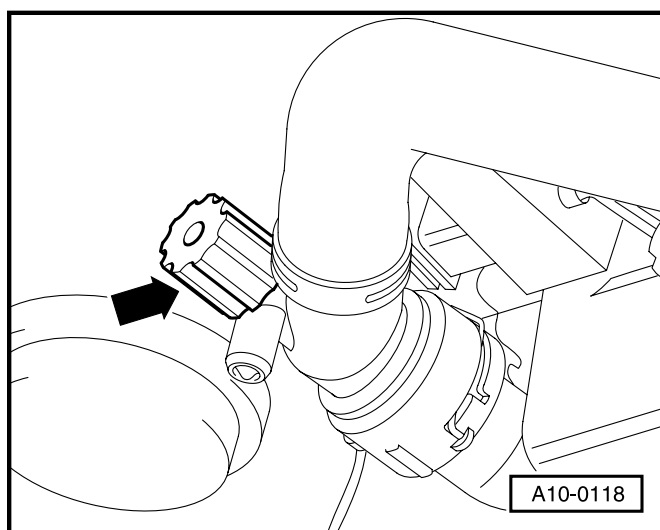
◀ The two rear jacking points are located at the rear of both side members at the level of the marking on the sill.



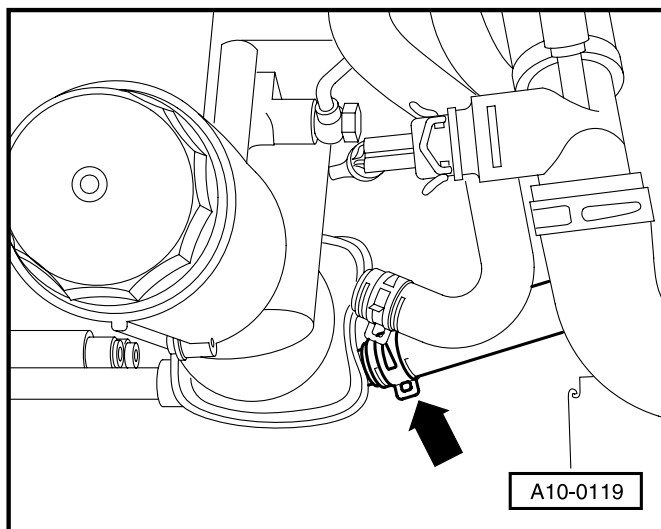
◀ - Remove noise insulation panel -arrow-.

- Open cap of coolant expansion tank.

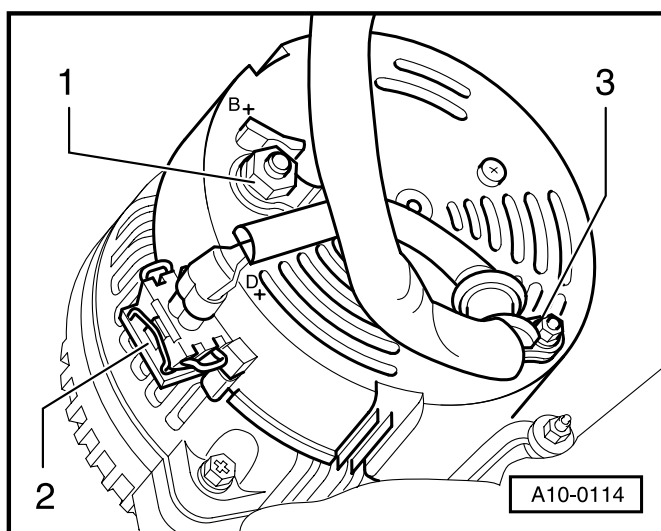
- Place drip tray (e.g. V.A.G 1306) below the engine.



◀ - Turn drain plug -arrow- at the radiator to the left; fit auxiliary hose onto connection if necessary.



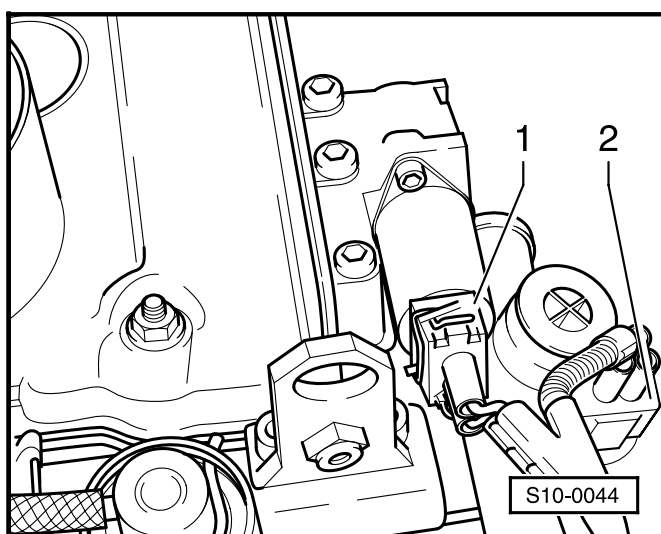
- ◀ - In addition, detach coolant hose at bottom at oil cooler -arrow- and drain the remaining coolant.



- ◀ - Unbolt terminal 30/B+ cable -1- at the alternator.
- Separate plug connection -2- from terminal D+.
- Unscrew cable clamp -3-.

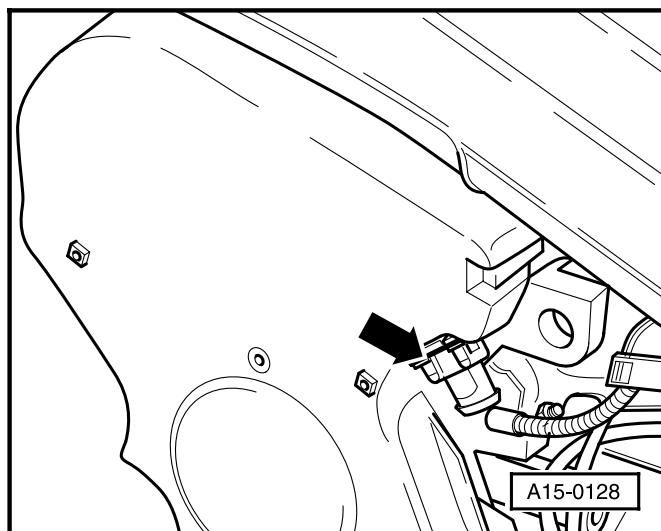
Models fitted with air conditioning

- Separate plug connection at AC compressor.
- Unplug connector of coolant temperature overheating switch (F14).

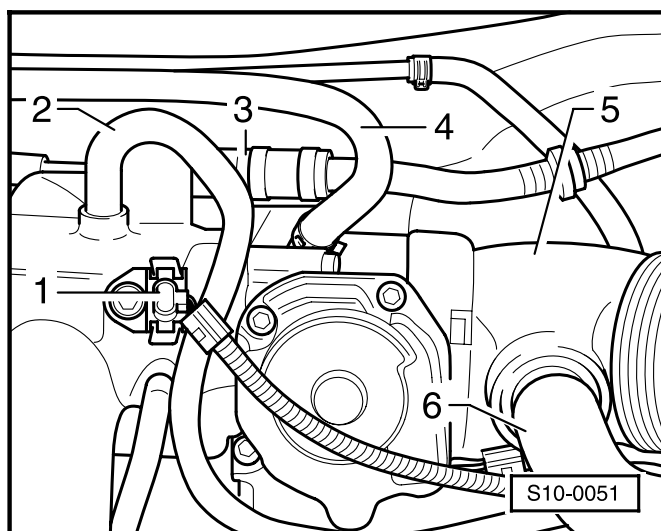


Continued for all models

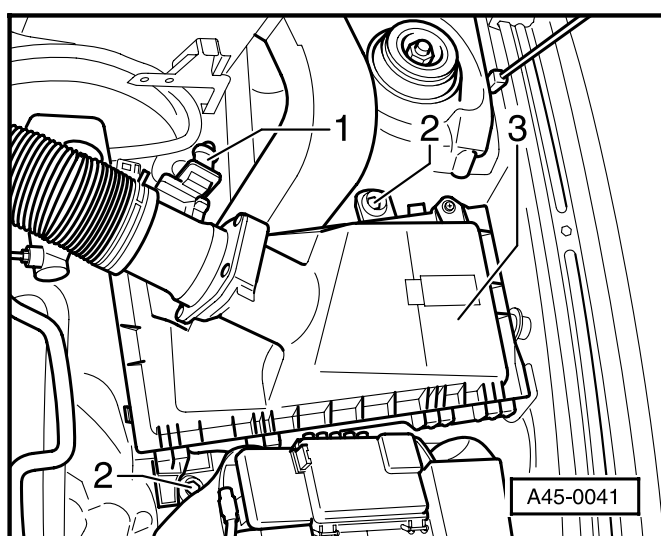
- ◀ - Unplug connector from camshaft adjustment valve (N205) -1- and from coolant temperature sender (G2/G62) -2-.



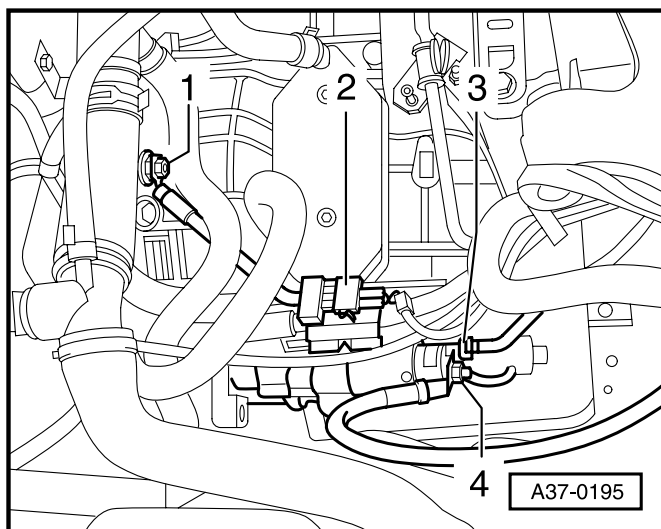
- ◀ - Unplug connector from the Hall sender (G40) -arrow-.



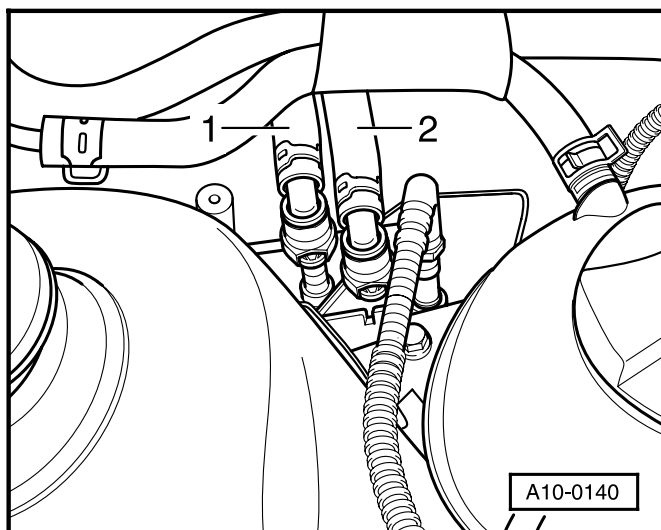
- ◀ - Unplug connector from the intake manifold temperature sender (G72) -1-.
- Detach connection hose -2- to the intake hose -5-.
- Detach vacuum hose -3- to the brake servo unit at the throttle valve control unit (J338).
- Detach vent hose -4- to the activated charcoal filter.
- Detach connection hose -6-.
- Remove intake hose -5- between top part of air filter and throttle valve control unit (J338).



- ◀ - Unplug connector -1- from the air mass meter (G70).
- Slacken the securing bolts -2- and remove air filter housing -3-.



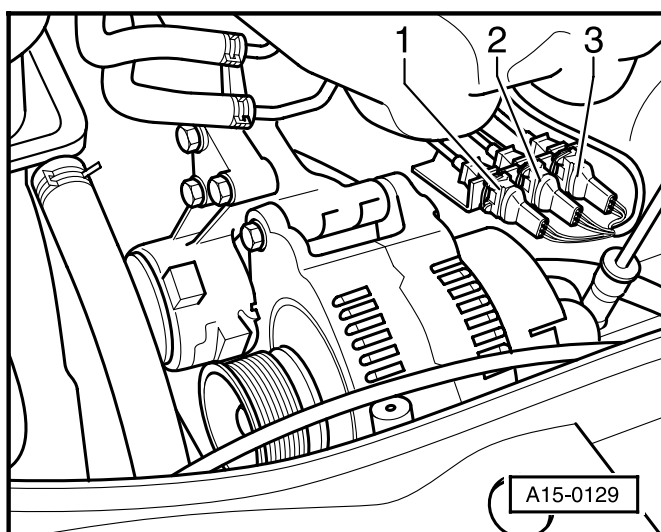
- ◀ - Detach the earth cable -1- from the top engine/gearbox connecting bolt.
- Unplug connector -2- and pull out of the fixture.
- Take off cable -3- and -4- at the starter.
- Detach cables from the fixture at the starter and place to the side. Unbolt fixture.



- ◀ - Detach fuel feed pipe -1- and fuel return flow pipe -2- (press release catches).

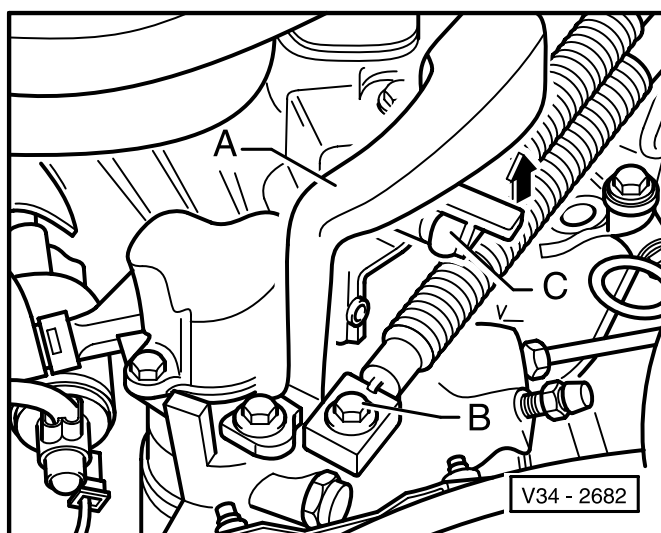
Important!

Fuel feed pipe is pressurised! Place cleaning rags around the connection point before detaching the hose connections. After this, release the pressure by carefully detaching the hose.



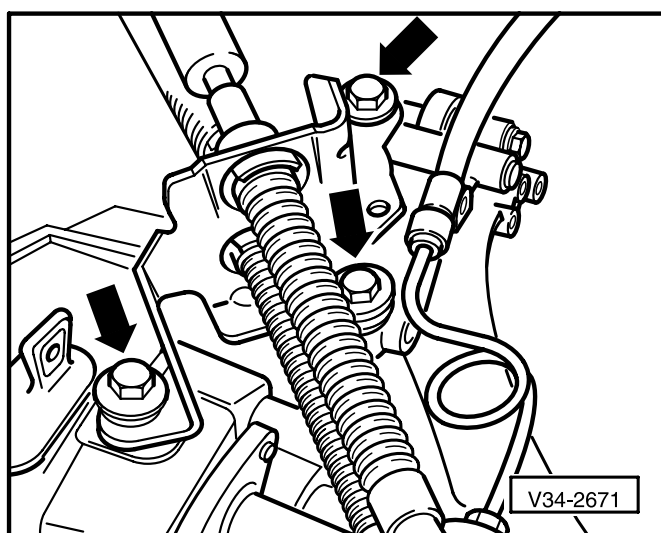
- ◀ - Unplug the following electrical connections:
 - 1 - Knock sensor I (G61) (black)
 - 2 - Knock sensor II (G66) (brown)
 - 3 - Engine speed sender (G28) (grey)

- Detach/unplug the following electric cables/connectors:
 - ◆ Connectors at the injectors (N30 ... 33).
 - ◆ Connector at oil pressure switch (F1).
 - ◆ Connector at ignition coil with power output stage (N70).
 - ◆ Connector at throttle valve control unit (J338).
 - ◆ Connector at vehicle speed sender (G68).
 - ◆ On models from 08.97, connector at power steering pressure switch (F88).
- Detach the wiring loom from the fixtures and run out to the side.

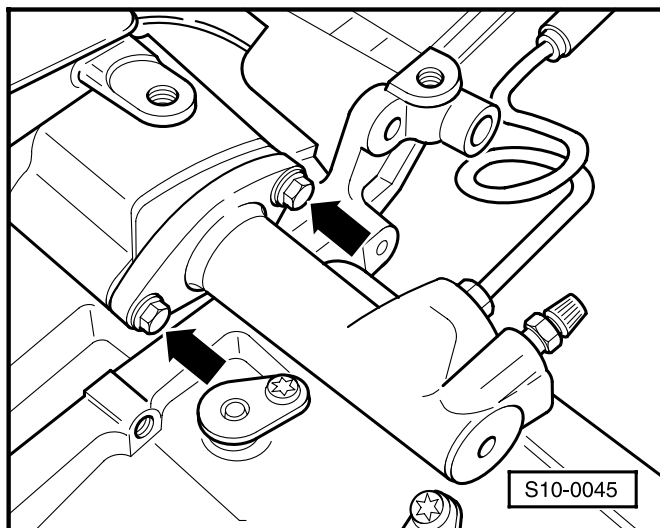


Models fitted with manual gearbox

- ◀ - Mark installation position of shift cable -B- relative to gearbox shift lever.
- Take off balancing weight -A- and shift cable -B- from the gearbox shift lever.
- Take off selector cable from the drive/relay lever -C-; raise lug in direction of arrow for this purpose.
- Unclip hose line of slave cylinder at cable support.



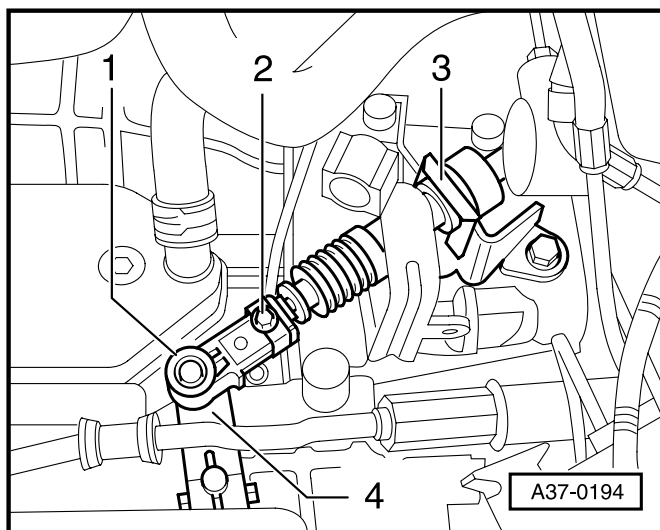
- ◀ - Detach cable support from gearbox -arrows- and place to the side.



- ◀ - Remove slave cylinder -arrows- and place to the side, secure with wire; do not open line system.

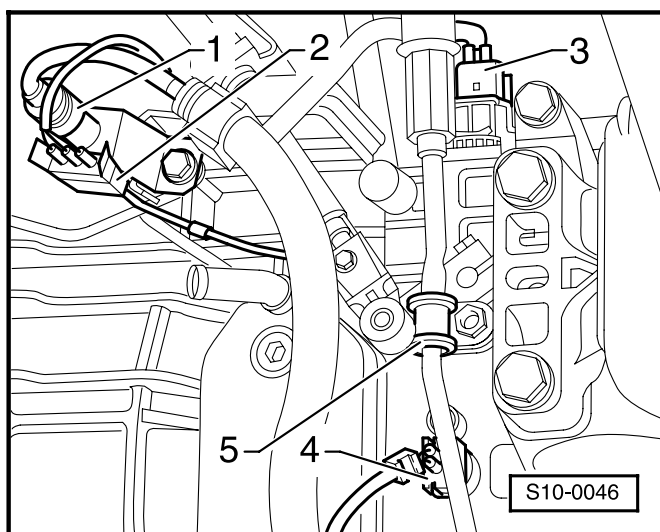
Note:

Do not depress clutch pedal.

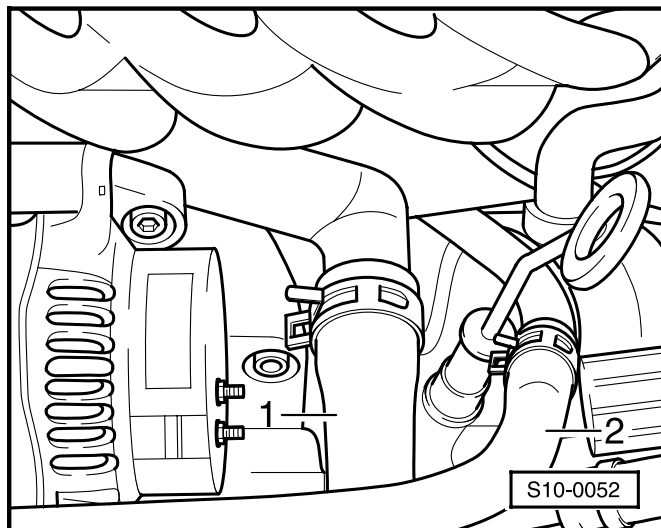


Models with automatic gearbox

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

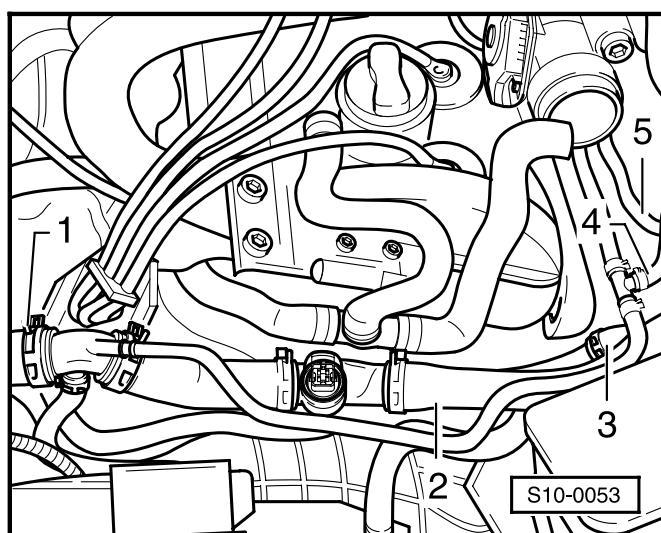


- ◀ - Unplug the following connectors:
 - 1 - to the solenoid valves (10-pin connectors)
 - 2 - to the vehicle speed sender (G68)
 - 3 - at the multifunction switch (F125)
 - 4 - at the gearbox speed sender (G38)
- Unbolt bracket for pressure line -5- of the power steering at the gearbox support.
- Detach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

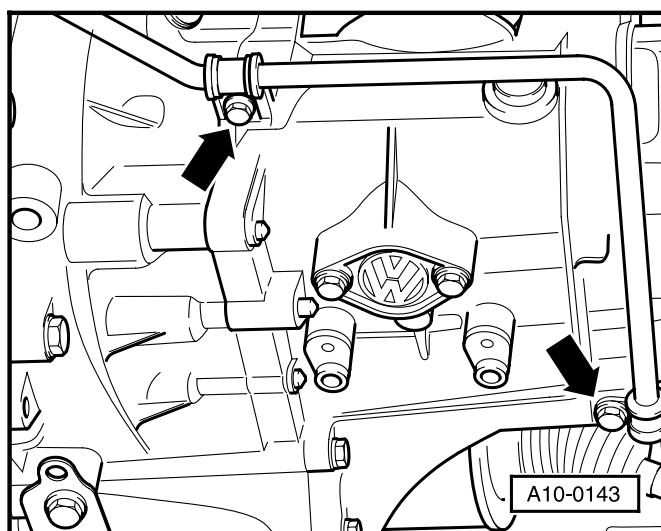
Continued for all models

- Use pliers for spring strap clamps to detach the following coolant hoses:

- 1 - Coolant hose at bottom of coolant thermostat housing
- 2 - Coolant hose to expansion reservoir



- 1 - Top coolant hose at branch connector
- 2 - Coolant hose to heat exchanger
- 3 - Coolant hose from heat exchanger
- 4 - Coolant hose to expansion reservoir
- 5 - Coolant hose from throttle valve control unit

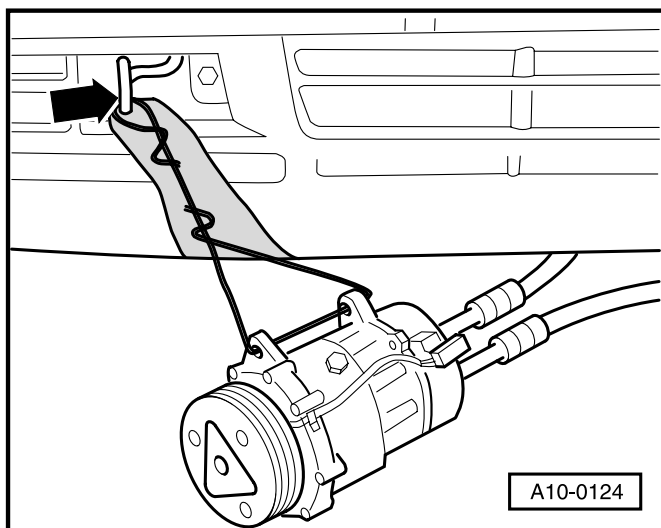


- Remove ribbed V-belt ⇒ page 13-1.

- Unbolt two brackets for power steering pressure line -arrows- (Fig. shows model fitted with manual gearbox).

- Unbolt belt pulley of power steering hydraulic pump (counterhold with screwdriver).

- Unbolt hydraulic pump and attach to the body with wire; hoses remain connected.



Models with air conditioning

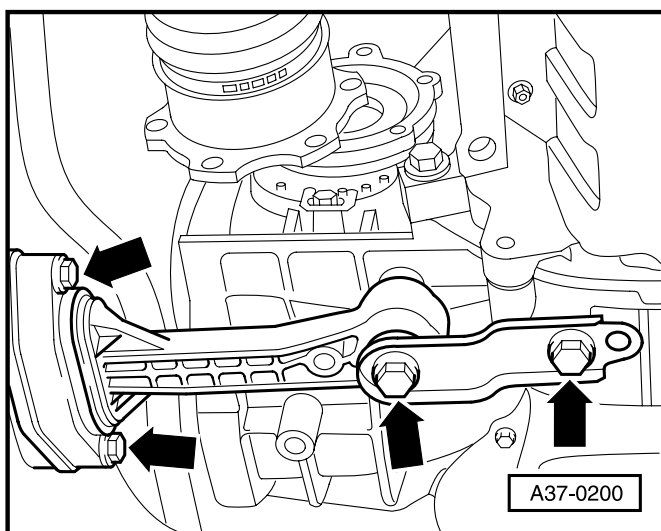
Warning!

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

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

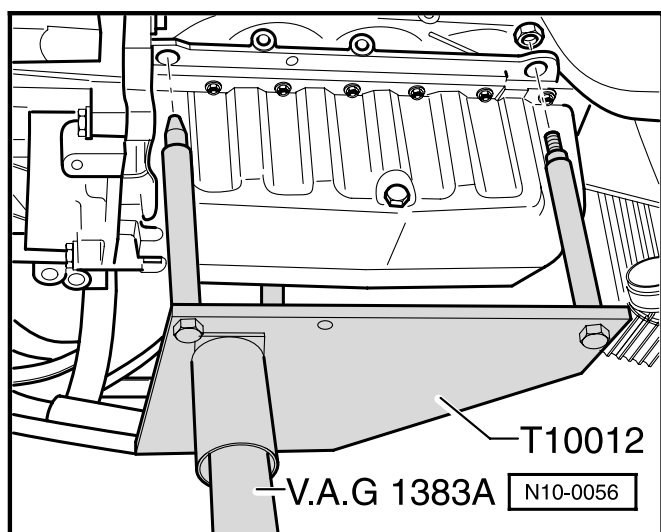
Note:

Protect bumper from scratches with adhesive tape.

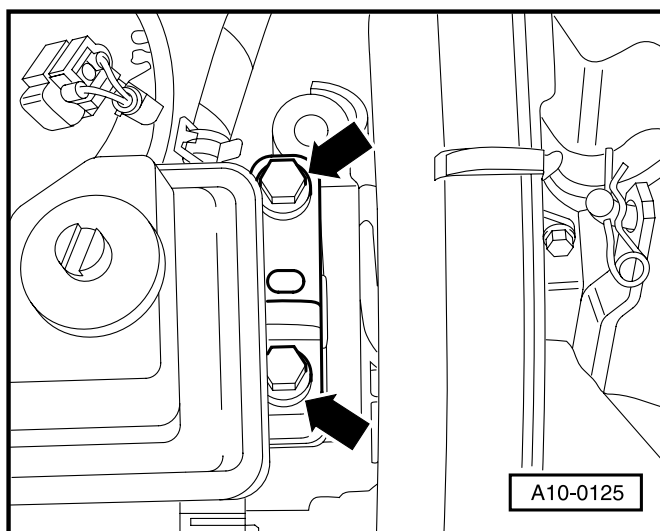


All models

- Remove drive shaft cover.
- Remove catalytic converter ⇒ page 26-1.
- ◀ - Unbolt pendulum support -arrows-.
- Unbolt drive shafts from flange shaft of gearbox.
- Place left drive shaft to the rear and secure with wire.
- Remove right drive shaft:
⇒ Running Gear; Repair Group 40; Servicing drive shaft



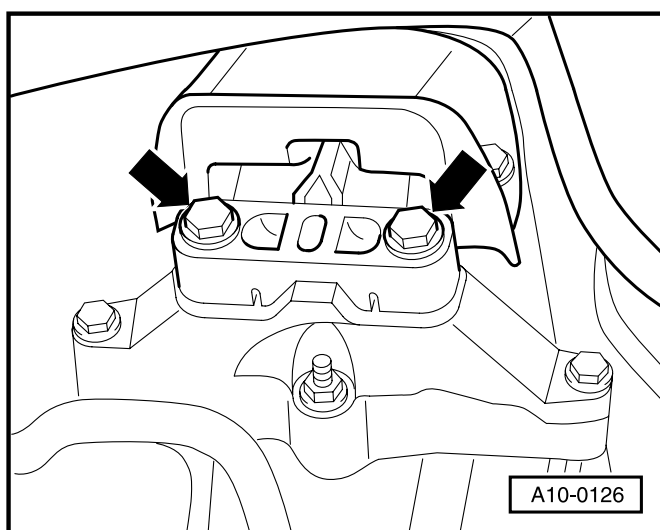
- Insert engine holder T10012 into engine/gearbox lift (e.g. V.A.G 1383 A).
- ◀ - Attach engine holder T10012 to the cylinder block using the securing nut and M10 bolt, tightened to a torque of about 40 Nm.
- Raise engine and gearbox slightly with engine/gearbox lift (e.g. V.A.G 1383 A).



- ◀ - Unscrew the bolts attaching the subframe on the right -arrows-.

Note:

Use ladder (e.g. V.A.S 5085) for removing the bolts.



- ◀ - Unscrew the bolts attaching the subframe on the left -arrows-.

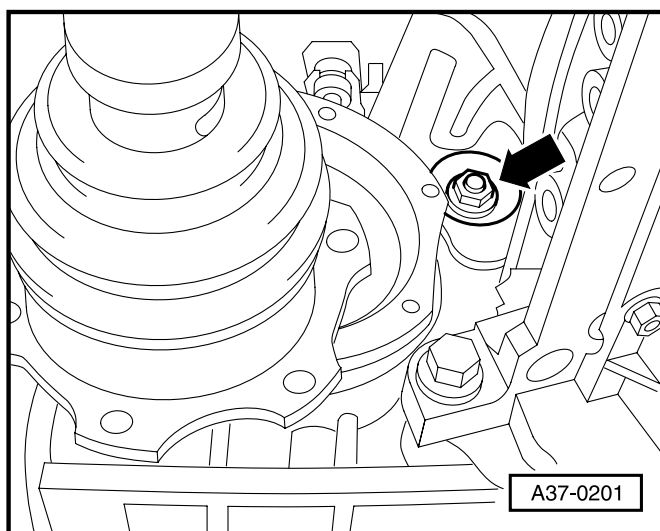
- Carefully lower engine and gearbox.

Note:

When lowering engine and gearbox, it is essential to have the aid of a second mechanic to guide the block in order to avoid damage to the bodywork because of the narrow clearance. Pay attention to the drive shaft boots.

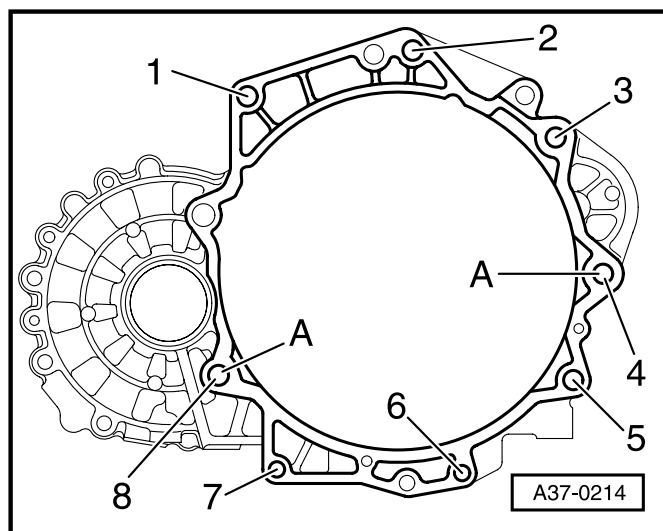
Models with automatic gearbox

- Detach coolant hoses at the ATF cooler.
- Remove plug in the hole of the torque converter cover panel.
- ◀ - Unscrew 3 nuts -arrow- from the torque converter; rotate crankshaft 1/3 turn in each case.
- After separating the engine and gearbox, secure torque converter in gearbox to prevent it dropping out.

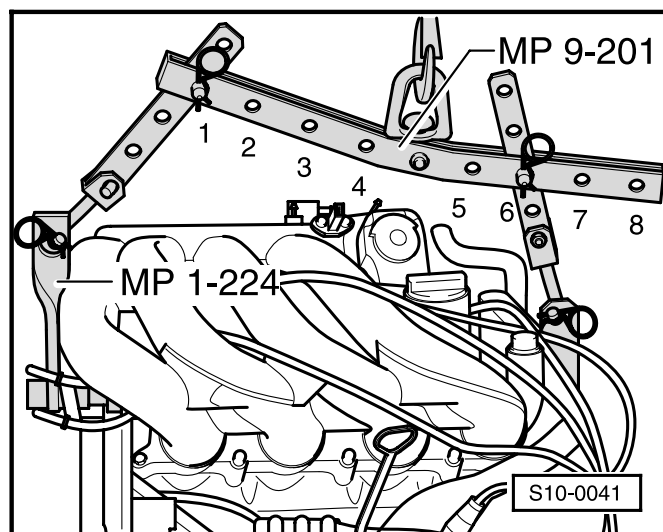


All models

- Detach cover panel of engine/gearbox.



- ◀ - Unscrew bolts -1...8- at the engine/gearbox flange.



- Separate engine and gearbox.
- ◀ - Attach suspension device MP 9-201 together with holder MP 1-224 as described below and raise slightly with workshop crane (e.g. V.A.G 1202 A):

Belt pulley side:
3rd hole of rail in position 1
Flywheel side:
2nd hole of rail in position 6

Warning

Use the locking clips and the hooks and pins.

Notes:

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

Attaching engine to repair stand

The engine should be attached to the repair stand with the engine holder MP 1-202 for carrying out removal and installation work.

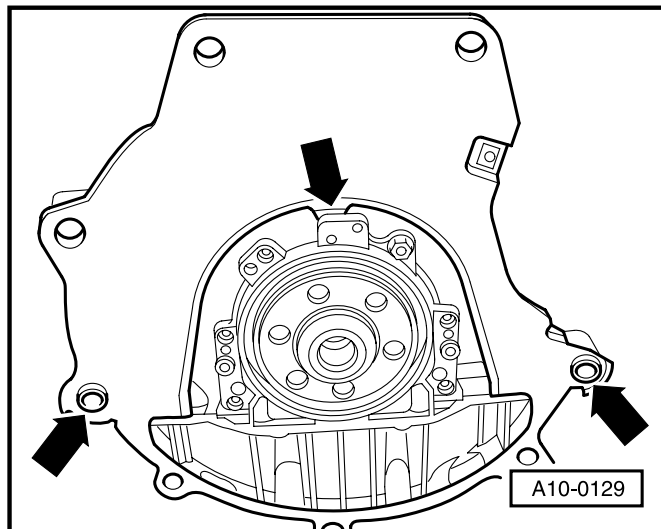
Note:

The engine must not be attached to the repair stand for measuring the cylinder bore (⇒ page 13-22).

Installing engine

Notes:

- ♦ Always replace seals and gaskets when carrying out removal and installation work.
- ♦ Always replace self-locking nuts.
- ♦ Coat stud bolts at exhaust manifold with hot bolt paste G 052 112 A3.



Procedure

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

- Check whether dowel sleeves for centering engine/gearbox are present in the cylinder block, insert if necessary.
- ◀ - Attach intermediate plate to sealing flange and push onto the dowel sleeves -arrows-.

Models with manual gearbox

- Inspect centering of clutch driven plate.
- Inspect clutch release bearing for wear, replace if necessary.
- Apply a thin film of grease G 000 100 to splines of input shaft.
- Install slave cylinder of hydraulic clutch:
⇒ 5-Speed Manual Gearbox 02J, Repair Group 30.

Models fitted with automatic gearbox

- Use only nuts which are approved in the list of parts for attaching the torque converter to the driven plate.

Continued for all models

- Align engine/gearbox mounting ⇒ page 10-15.
- Attach shift cables to gearbox and adjust:
⇒ 5-Speed Manual Gearbox 02J, Repair Group 34.
⇒ Automatic Gearbox; Repair Group 37.

Models fitted with AC

- Install AC compressor:
⇒ Heating and Air Conditioning, Repair Group 87.

Continued for all models

- Install power steering hydraulic pump
⇒ Running Gear; Repair Group 48.
- Install catalytic converter and align exhaust system free of stress ⇒ page 26-1.
- Fit on coolant hoses ⇒ page 19-1.

Note:

Only re-use drained coolant if cylinder block, cylinder head, cylinder head gasket, radiator, or heat exchanger have not been replaced.

- Pour in coolant ⇒ page 19-3.
- Inspect engine oil level before starting engine ⇒ Inspection and Maintenance.
- Electrical connections and routing:
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
- Adjust throttle cable ⇒ page 20-13.

Note:

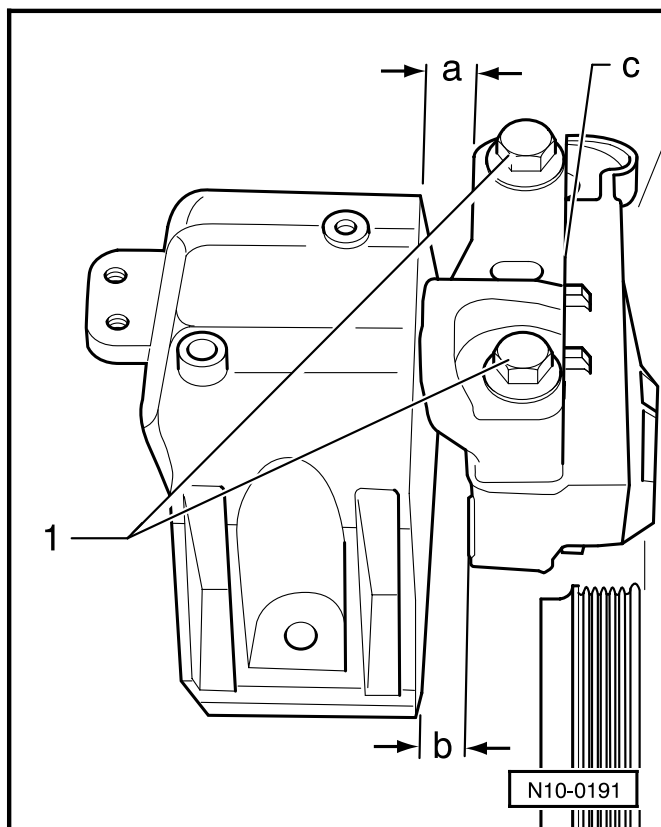
If the battery earth strap is disconnected and re-connected, additional operations have to be performed

⇒ *Electrical System; Repair Group 27.*

Tightening torques**Notes:**

- ♦ *Tightening torques apply only to nuts and bolts which have been lightly greased, oiled, phosphatized or blackened.*
- ♦ *Additional lubricants such as engine or gear oil, are permissible, but not Molykote.*
- ♦ *Do not use degreased parts.*
- ♦ *Tolerance of tightening torques ± 15 %.*

Component	Nm
Nuts/bolts	M6 9
	M7 13
	M8 20
	M10 40
	M12 70
In variation of this:	
Driven plate to torque converter	60
Engine mounts, gearbox mounts, pendulum support	⇒ page 10-16
Bolts connecting engine to gearbox ⇒ 5-Speed Manual Gearbox 02J; Repair Group 34 ⇒ Automatic Gearbox; Repair Group 37	



Aligning engine/gearbox mounting

Warning!

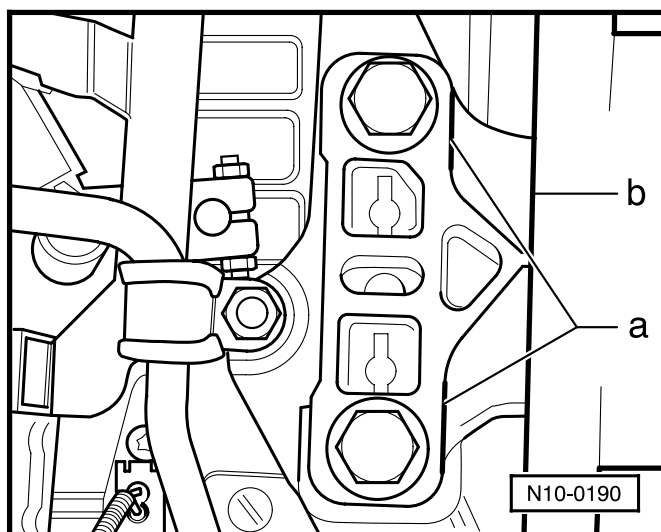
The engine/gearbox must be supported with the supporting device MP 9-200 before slackening the bolts.

◀ Engine mounting

a = 14.0 mm

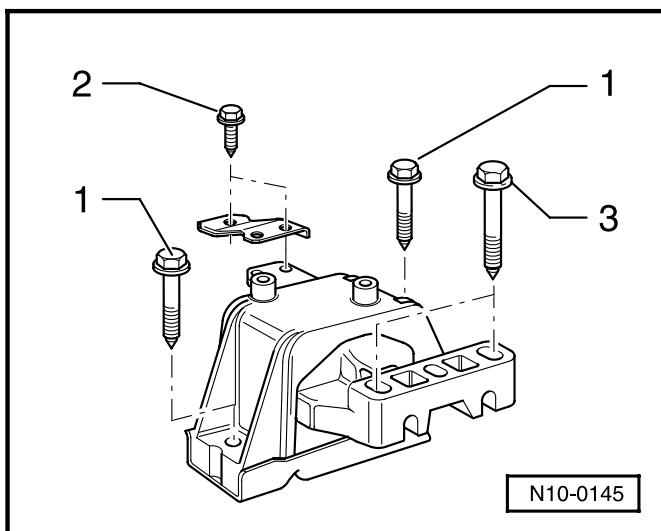
b = at least 10.0 mm

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



◀ Gearbox mounting

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



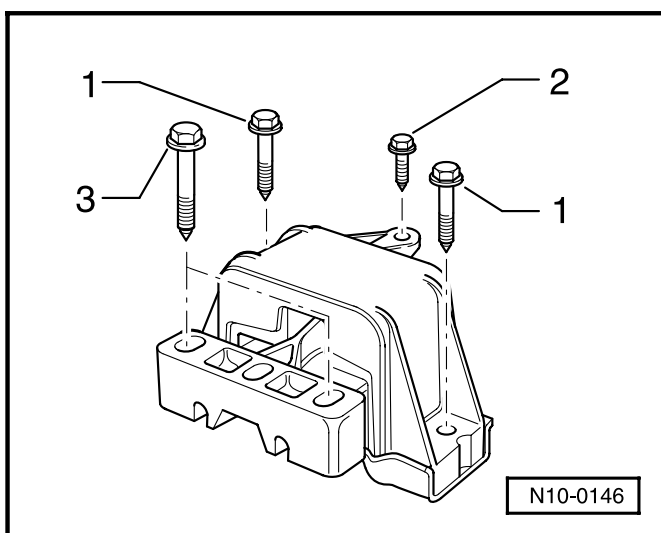
Engine/gearbox mounting

Tightening torques

◀ Engine mounting

- 1 - 40 Nm + 90° (1/4 turn)¹⁾
- 2 - 25 Nm
- 3 - 100 Nm¹⁾

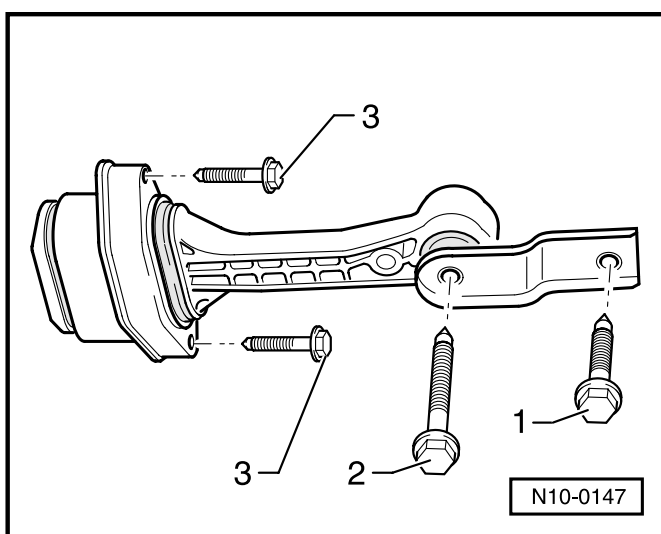
1) Replace bolts



◀ Gearbox mounting

- 1 - 40 Nm + 90° (1/4 turn)¹⁾
- 2 - 25 Nm
- 3 - 100 Nm¹⁾

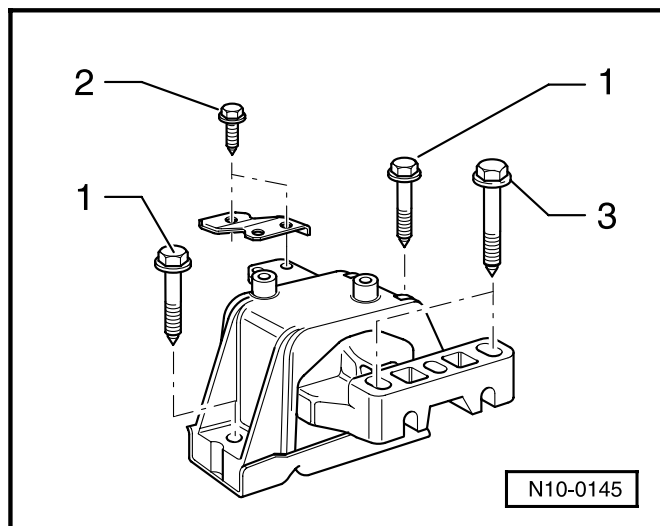
1) Replace bolts



◀ Pendulum support

- 1 - 40 Nm + 45° (1/8 turn)¹⁾
- 2 - 40 Nm + 45° (1/8 turn)¹⁾
- 3 - 20 Nm + 90° (1/4 turn)¹⁾

1) Replace bolts

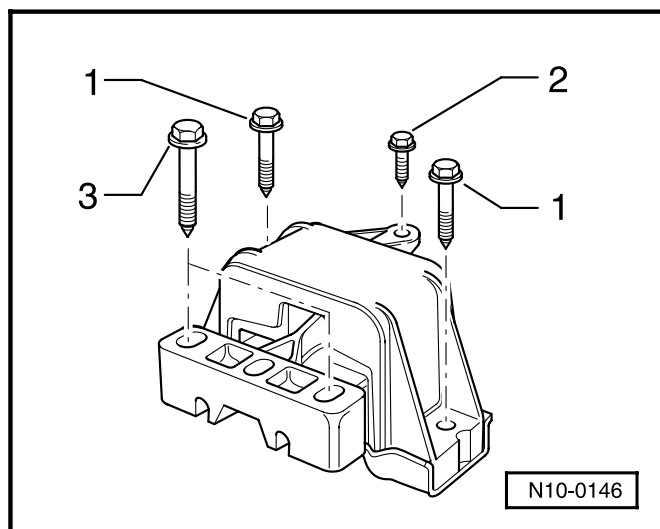


Unit mounting

Tightening torques

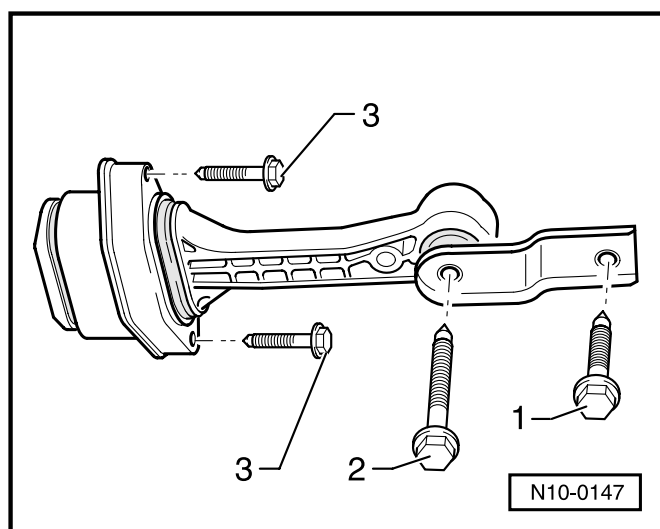
◀ Unit mounting of engine

1 - Mount/body	40 Nm + 90° ($\frac{1}{4}$ turn) ¹⁾
2 - Mount/body	25 Nm
3 - Mount/engine support	60 Nm + 90° ($\frac{1}{4}$ turn) ¹⁾



◀ Unit mounting of gearbox

1 - Mount/body	40 Nm + 90° ($\frac{1}{4}$ turn) ¹⁾
2 - Mount/body	25 Nm
3 - Mount/gearbox support	60 Nm + 90° ($\frac{1}{4}$ turn) ¹⁾



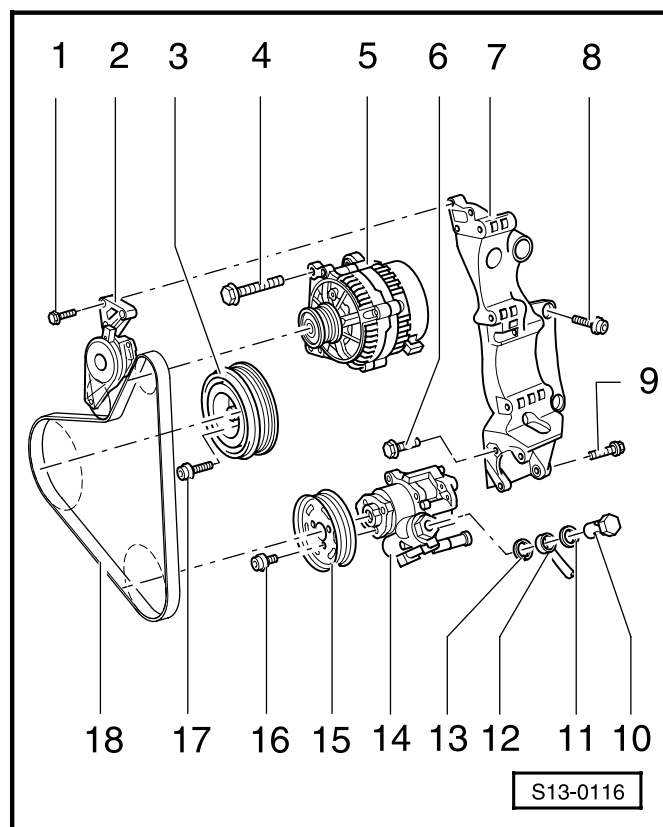
◀ Pendulum support

1 - Pendulum support/ gearbox	40 Nm + 90° ($\frac{1}{4}$ turn) ¹⁾
2 - Pendulum support/ gearbox	40 Nm + 90° ($\frac{1}{4}$ turn) ¹⁾
3 - Pendulum support/ subframe	20 Nm + 90° ($\frac{1}{4}$ turn) ¹⁾

¹⁾ Replace bolts

Disassembling and assembling engine

Removing and installing ribbed V-belt



Special tools, testers and aids required

- ◆ Torque wrench
- ◆ Drift T10060

Notes:

- ◆ Figs. 1 and 2 show the routing of the ribbed V-belt.
- ◆ Mark the direction of running of the ribbed V-belt before removing it. If an already used belt is fitted on to run in the opposite direction, it may be destroyed. When installing the belt, ensure it is correctly located in the belt pulleys.
- ◆ Removing and installing AC compressor
⇒ Heating, Air Conditioning; Repair Group 87.

1 - 25 Nm

2 - Ribbed V-belt tensioning device

- ◆ swivel with open-end wrench for slackening ribbed V-belt ⇒ page 13-3

3 - Vibration damper

- ◆ can be installed only in one position

4 - 25 Nm

5 - Alternator

- ◆ push back threaded bushes for securing bolts slightly to more easily fit alternator onto bracket

6 - 25 Nm

7 - Bracket

8 - 45 Nm

9 - 25 Nm

10 - Banjo bolt, 30 Nm

11 - Seal

- ◆ replace

12 - Pressure line

13 - Seal

- ◆ replace

14 - Hydraulic pump

- ◆ for power steering
- ◆ push back threaded bushes for securing bolts slightly to more easily fit hydraulic pump onto bracket
- ◆ removing and installing:
⇒ Running Gear; Repair Group 48

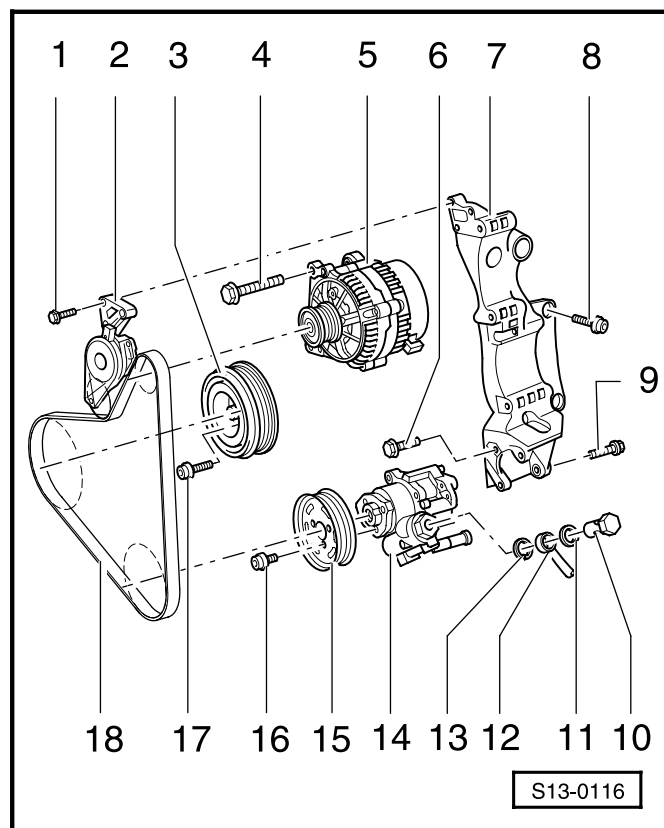
15 - Belt pulley

- ◆ for hydraulic pump

16 - 25 Nm

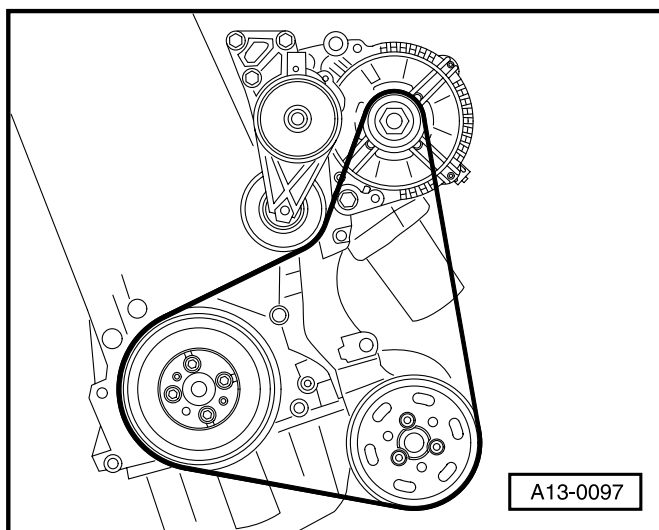
17 - Bolt for attaching vibration damper

- ◆ replace bolt of strength class 8.8 by bolt of strength class 10.9 ⇒ Parts List
- ◆ bolt of strength class 10.9: 40 Nm
- ◆ it is not permissible to combine bolts of different strength classes

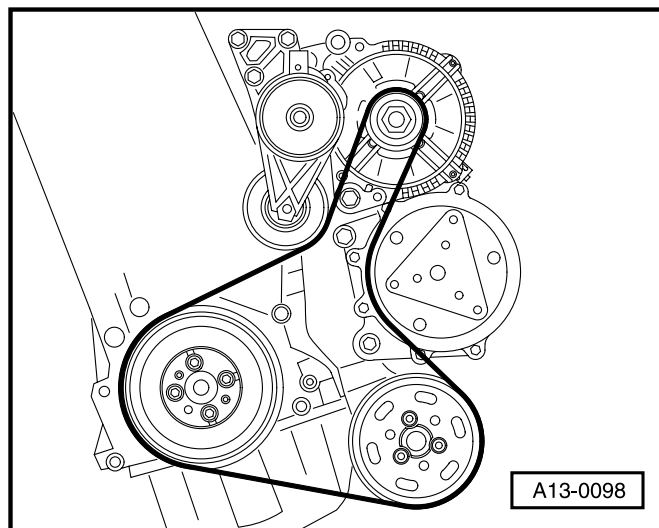


18 - Ribbed V-belt

- ◆ mark the direction of running before removing it.
- ◆ inspect for wear
- ◆ do not kink
- ◆ routing of ribbed V-belt on models not fitted with AC ⇒ Fig. 1
- ◆ routing of ribbed V-belt on models fitted with AC ⇒ Fig. 2
- ◆ removing ribbed V-belt ⇒ page 13-3
- ◆ installing ribbed V-belt ⇒ page 13-3



◀ Fig. 1 Routing of ribbed V-belt on models not fitted with AC



◀ Fig. 2 Routing of ribbed V-belt on models fitted with AC

Note:

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

Removing ribbed V-belt

Note:

Mark direction of running of the ribbed V-belt before removing it. If an already used belt is fitted on 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 device in direction of arrow in order to slacken the ribbed V-belt, and secure with drift -T10060-.

Note:

The tensioning device can be locked with a 3 mm hexagon wrench.

- Take off ribbed V-belt.

Installing ribbed V-belt

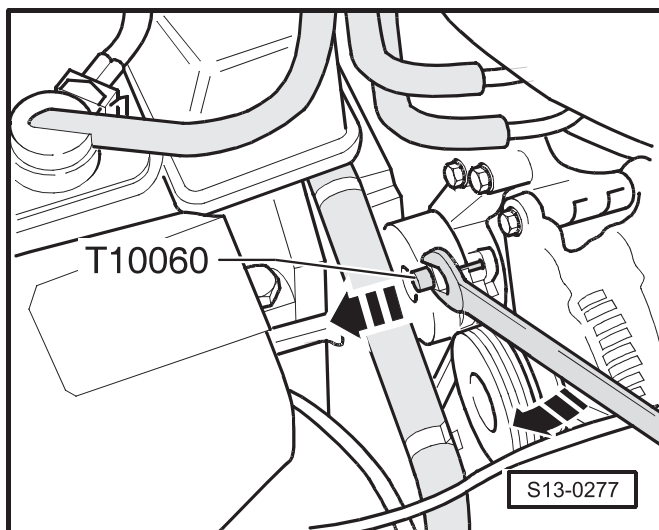
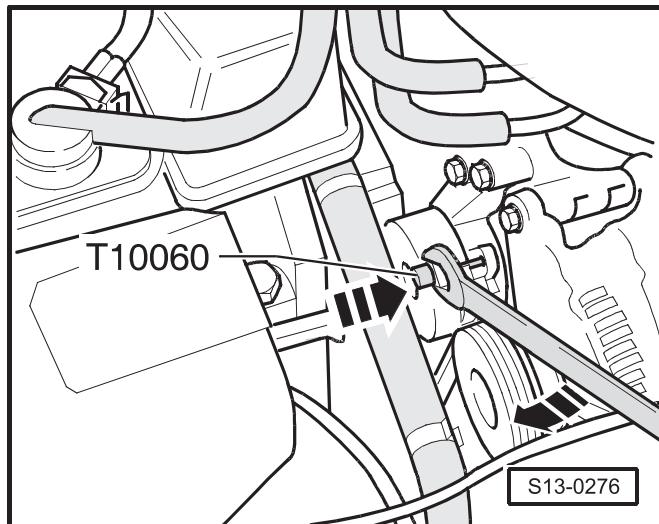
Note:

Before installing the ribbed V-belt, ensure that all the components (alternator, AC compressor, hydraulic pump) are tightly fitted on.

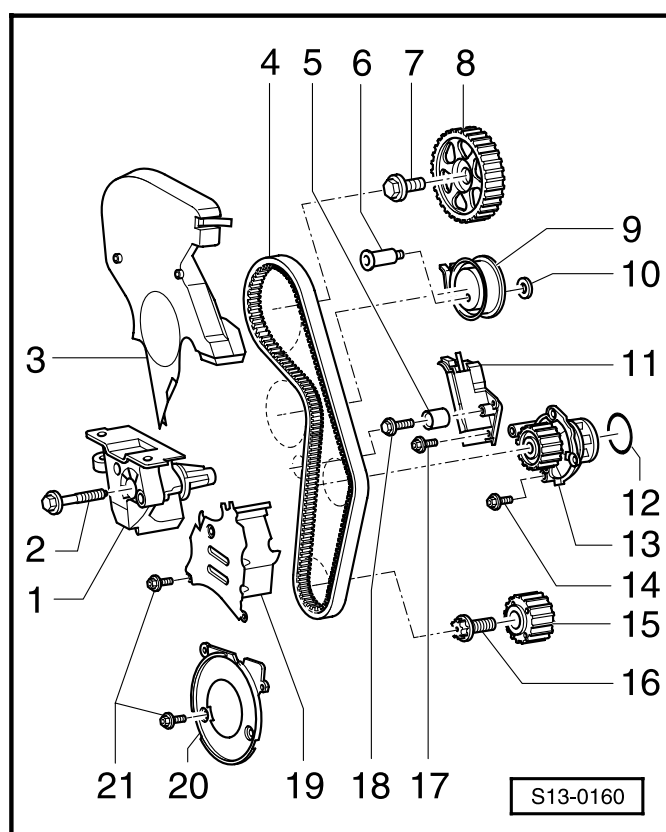
- Fit on ribbed V-belt.
- Slacken tensioning device for ribbed V-belt. Remove drift T10060 -arrows-.
- Start engine and check running of belt.

Note:

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



Removing and installing, tensioning toothed belt



Note:

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

1 - Engine support

- ♦ removing ⇒ page 13-6, Removing toothed belt

2 - 45 Nm

3 - Top part of toothed belt guard

- ♦ to remove, unbolt bracket for coolant line to turbocharger, if necessary

4 - Toothed belt

- ♦ mark direction of running before removing
- ♦ inspect for wear
- ♦ do not kink
- ♦ removing ⇒ page 13-6
- ♦ installing, tensioning ⇒ page 13-8

5 - Guide pulley

6 - 27 Nm

7 - 65 Nm

- ♦ use counterholder MP 1-216 for slackening and tightening

8 - Camshaft sprocket

- ♦ for exhaust camshaft
- ♦ take off toothed belt for removing and installing ⇒ page 13-6
- ♦ pay attention to installation position: the narrow web of the camshaft sprocket faces out and the TDC marking of cyl. 1 is visible

9 - Tensioning pulley

10 - Washer

11 - Toothed belt tensioning device

12 - O-ring

- ♦ replace, moisten with coolant when installing

13 - Coolant pump

14 - 15 Nm

15 - Crankshaft toothed belt sprocket

- ♦ there must not be any oil on the contact surface between toothed belt sprocket and crankshaft
- ♦ can be installed only in one position

16 - 90 Nm + torque a further 1/4 turn (90°)

- ♦ replace
- ♦ use counterholder MP 1-310 or T30004 for slackening and tightening
- ♦ when bolting on counterholder MP 1-310, place two washers between toothed belt sprocket and counterholder

17 - 15 Nm

18 - 20 Nm

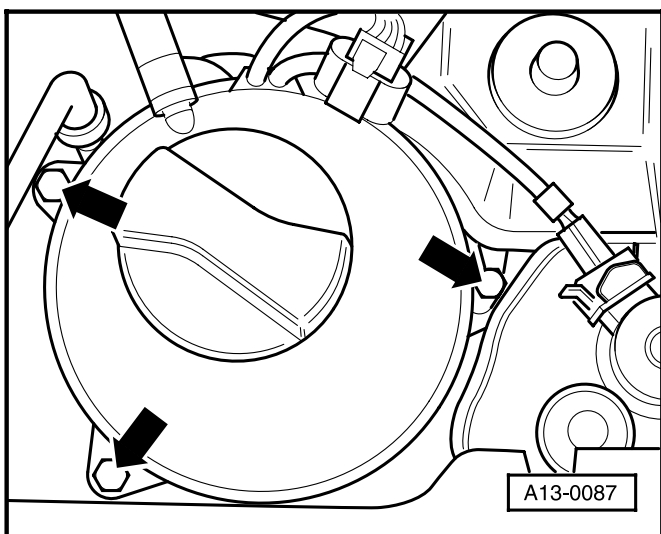
19 - Middle part of toothed belt guard

20 - Bottom part of toothed belt guard

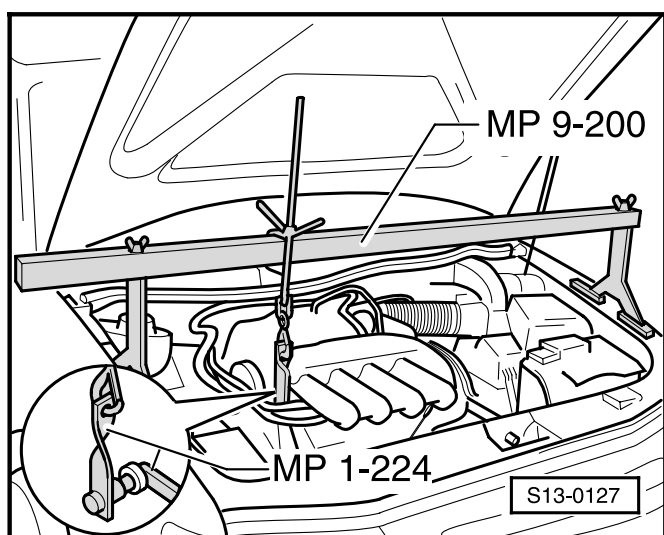
21 - 10 Nm

Special tools, testers and aids required

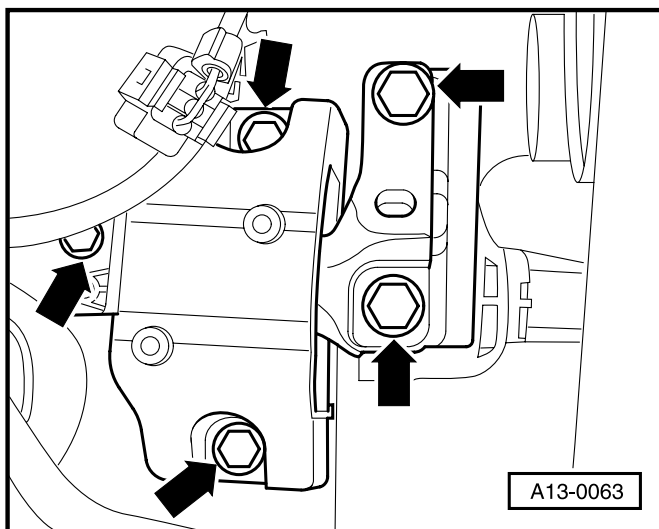
- ◆ Torque wrench
- ◆ Counterholder MP 1-216
- ◆ Holder MP 1-224
- ◆ Counterholder MP 1-310
- ◆ Supporting device for engine MP 9-200
- ◆ Locking pin, e.g. T40011
- ◆ Tensioning bolt T 10092

Removing toothed belt**(engine installed)**

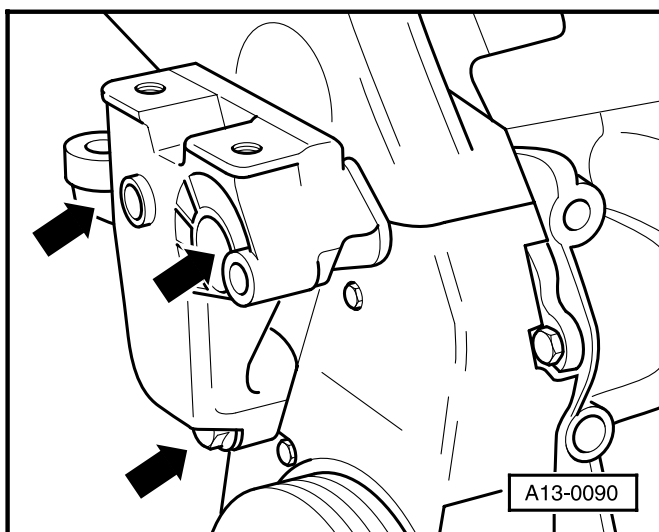
- Remove ribbed V-belt and tensioning device
⇒ page 13-1.
- ◀ - Unbolt coolant expansion reservoir -arrows- and PAS reservoir and place down to the side; hoses remain connected.
- Remove top part of toothed belt guard.



- ◀ - Insert supporting device MP 9-200.
- Bolt holder MP 1-224 tight to the right lifting eye and attach to supporting device MP 9-200.
- Take up weight of engine with the spindle of the supporting device MP 9-200.



- ◀ - Unbolt engine support from engine mount and engine mount from the body -arrows-.

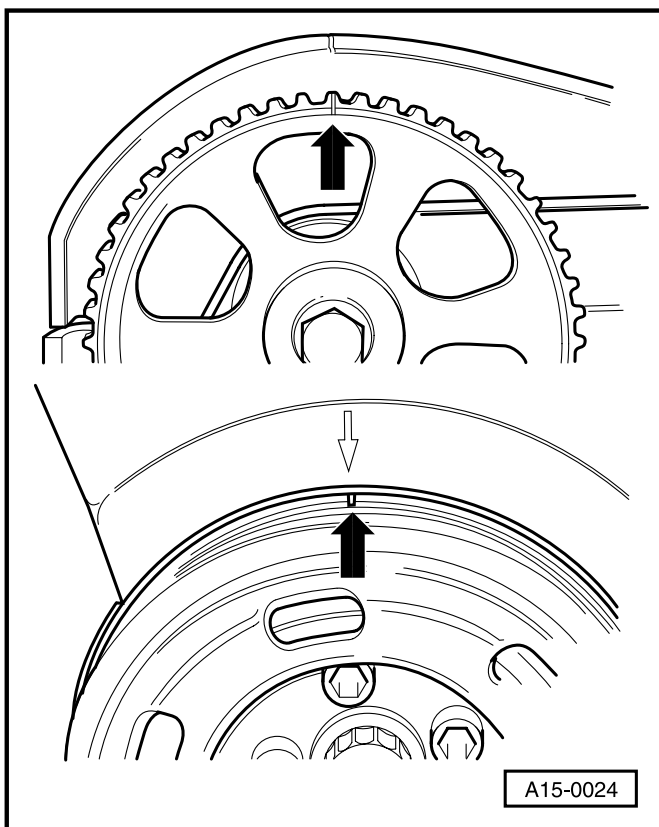


- ◀ - Remove engine support -arrows-.

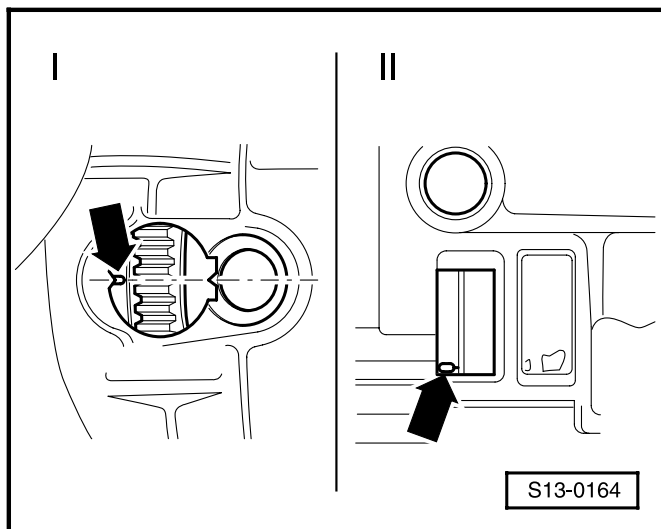
Note:

Raise engine slightly with the spindle of the supporting device MP 9-200, if necessary.

- Remove middle part of toothed belt guard.



- ◀ - Rotate crankshaft at the central bolt of the crankshaft toothed belt gear in direction of rotation of engine until it is positioned at the TDC marking of cylinder 1 -arrows-.

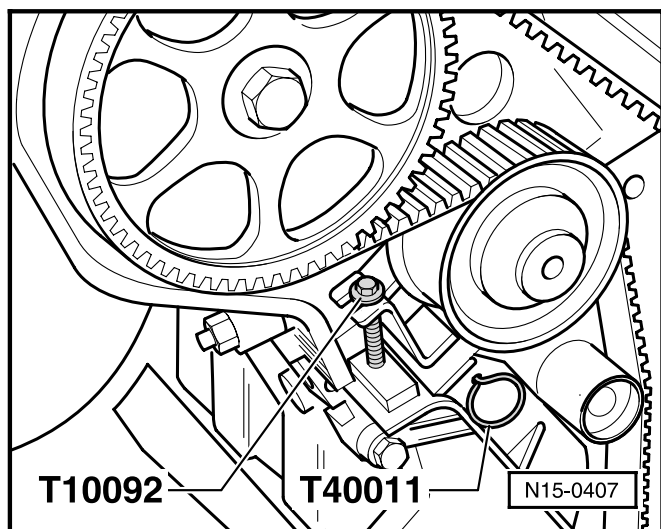


- ◀ - Check whether TDC marking on flywheel and reference mark on driven plate are aligned -arrow-.

I - Manual gearbox

II - Automatic gearbox

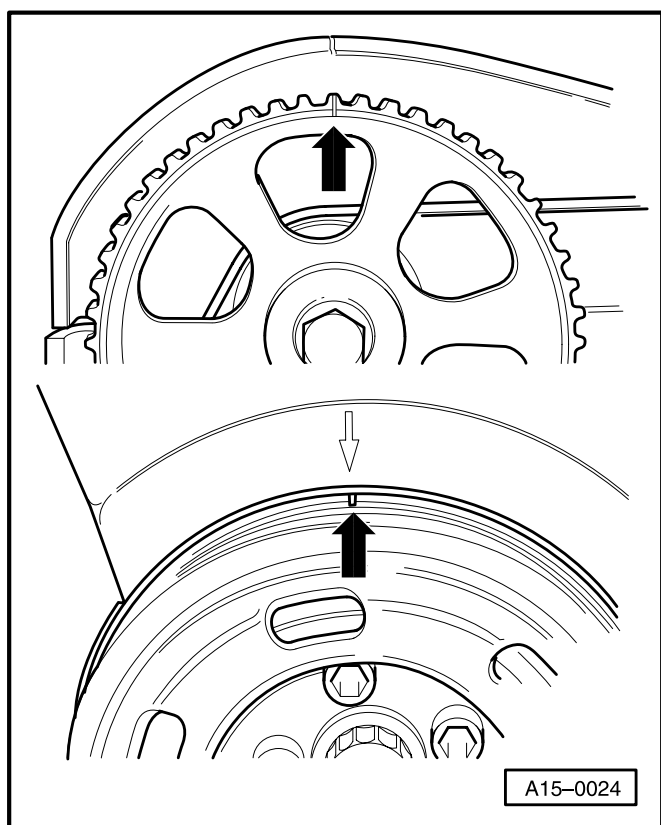
- Remove vibration damper.
- Remove bottom part of toothed belt guard.
- Mark direction of running of toothed belt.



- ◀ - Screw tensioning bolt T 10092 into the toothed belt tensioning device.

- Tension pressure plunger of tensioning device only sufficiently to allow the pressure plunger to be secured with a locking pin (e.g. T 40011).

- Take off toothed belt.

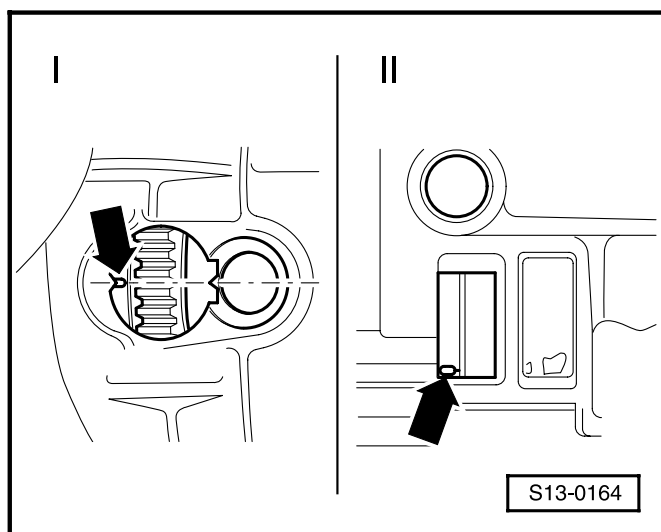


Installing, tensioning toothed belt

Note:

When the camshaft is rotated, the valves may strike the pistons if they are positioned at TDC. For this reason, the pistons must not be positioned at TDC. Risk of damage to valves and pistons.

- ◀ - Align marking on camshaft sprocket with the marking on the cylinder head cover.
- Fit toothed belt onto toothed belt sprocket of crankshaft (pay attention to direction of running).
- Install bottom part of toothed belt guard.
Tightening torque: 10 Nm
- Install vibration damper for crankshaft (pay attention to installation position, holes offset).
Tightening torque: 25 Nm



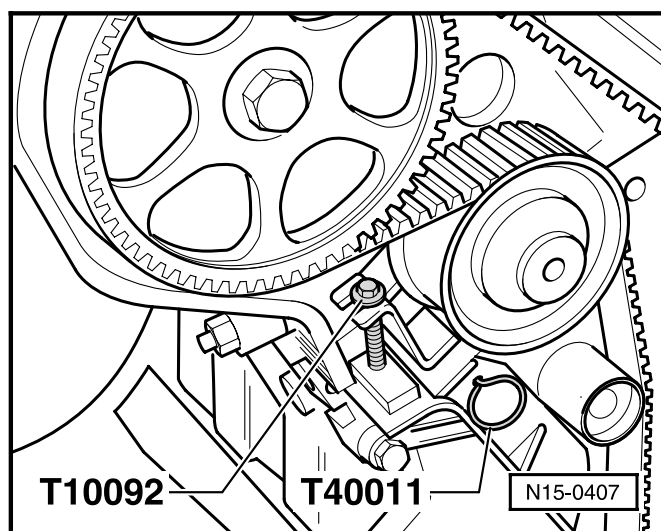
- Align marking on ribbed V-belt pulley with marking on bottom part of toothed belt guard

- ◀ - Check whether TDC marking on flywheel and drive plate with reference mark are aligned -arrow-.

I - Manual gearbox

II - Automatic gearbox

- Fit toothed belt onto camshaft sprocket.



- ◀ - Pull out locking pin and slacken pressure piston of tensioning device for toothed belt T 10092.

- Turn crankshaft twice in the running direction of the engine, position again to TDC and check setting.

- Install top part of toothed belt guard.
Tightening torque: 10 Nm

- Install engine console.
Tightening torque: 45 Nm

- Install engine mount.
Tightening torques ⇒ page 10-16

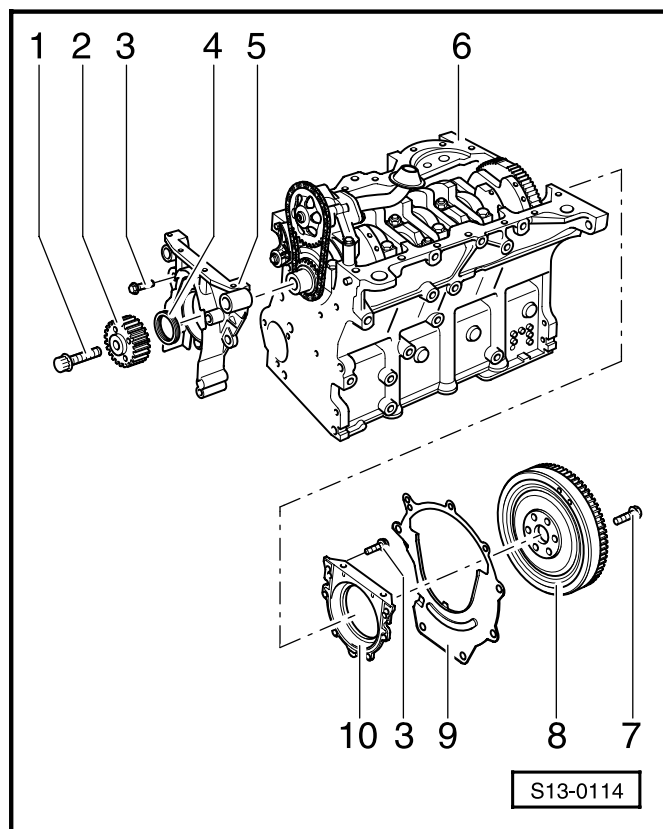
- Remove supporting device MP 9-200 with bracket MP 1-224.

- Install top part of toothed belt guard.

- Screw on coolant expansion reservoir and PAS reservoir.
Tightening torque: 10 Nm

- Install V-ribbed belt and tensioning device
⇒ page 13-1

Removing and installing sealing flange and flywheel



Notes:

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

1 - Central bolt

- ◆ replace
- ◆ 90 Nm + torque a further 1/4 turn (90°)
- ◆ do not oil or grease bolt
- ◆ use counterholder MP 1-310 to slacken and tighten.
- ◆ when bolting on counterholder, place 2 washers between toothed belt sprocket and counterholder

2 - Crankshaft toothed belt sprocket

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

3 - 15 Nm

4 - Sealing ring

- ◆ replace ⇒ page 13-12
- ◆ pay attention to different versions ⇒ Fig. 2

5 - Front sealing flange

- ◆ must be located on dowel sleeves
- ◆ removing and installing ⇒ page 13-13.2

6 - Cylinder block

- ◆ removing and installing crankshaft ⇒ page 13-18
- ◆ Disassembling and assembling pistons and connecting rod ⇒ page 13-20

7 - 60 Nm + torque a further 1/4 turn (90°)

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

8 - Flywheel/drive plate

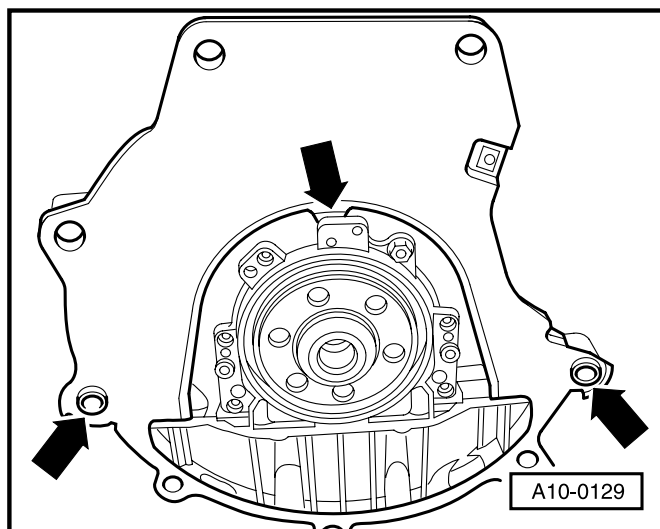
- ◆ assembly is only possible in one position -holes offset-
- ◆ removing and installing flywheel ⇒ page 13-13
- ◆ installing and installing drive plate ⇒ page 13-14

9 - Intermediate plate

- ◆ must be located on dowel sleeves
- ◆ do not damage/bend during assembly work
- ◆ is attached to sealing flange ⇒ Fig. 1

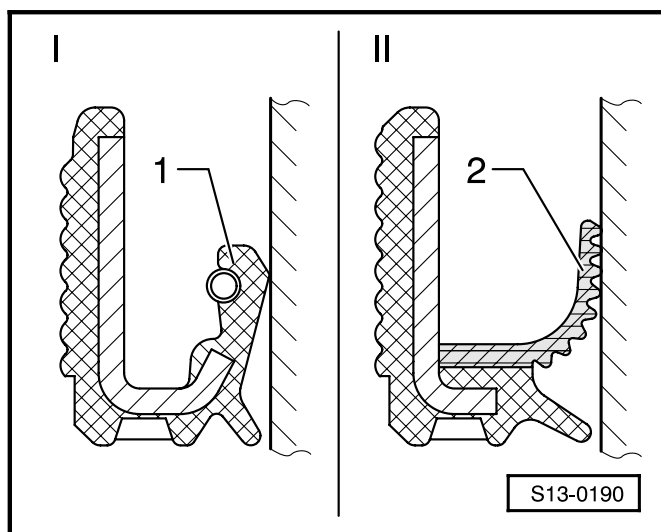
10 - Rear sealing flange with seal

- ◆ always replace complete
- ◆ must be located on dowel sleeves
- ◆ to remove and install, take off oil pan ⇒ page 17-6
- ◆ clean sealing surface before installing
- ◆ with gasket for cylinder block
- ◆ install new sealing flange with sleeve (do not pull sleeve off sealing ring before installing)
- ◆ sealing flange is supplied with PTFE seal as replacement part
- ◆ install seal dry, crankshaft journal must be free of grease



◀ Fig. 1 Installing intermediate plate

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



◀ Fig. 2 Seal versions

I Elastomer seal

1 sealing lip -1-; with worm spring

II PTFE seal

Several sealing lips -2-; without worm spring

Notes:

- ◆ Do not moisten PTFE seal with oil before installing. The shaft must also be free of oil and grease.
- ◆ Do not replace a PTFE seal (new version) with an elastomer seal (old version).
- ◆ A PTFE seal may be installed in place of an elastomer seal.

Replacing crankshaft seal -belt pulley side-

Special tools, testers and aids required

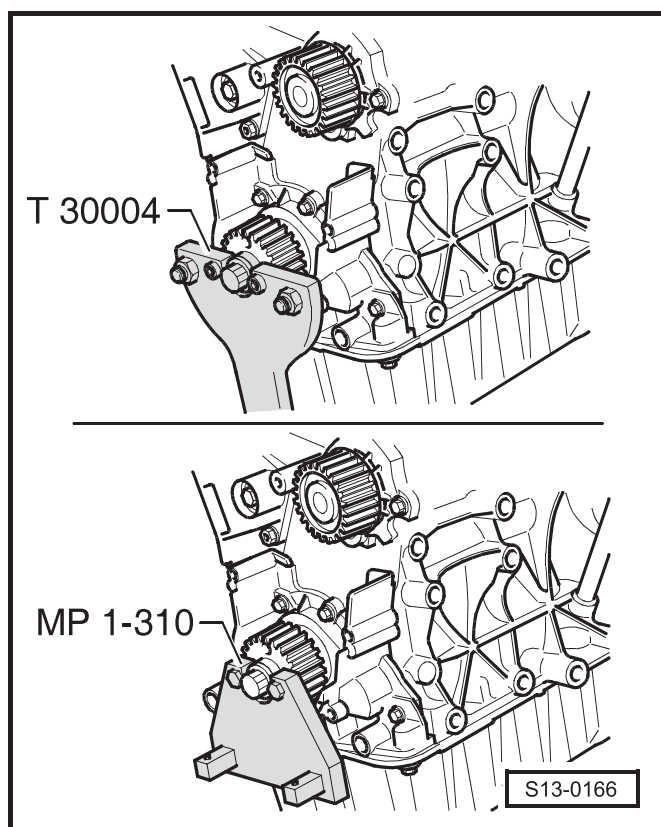
- ◆ Torque wrench
- ◆ Seal extractor MP 1-226
- ◆ Guide sleeve MP 1-314
- ◆ Thrust sleeve MP 1-315
- ◆ Guide sleeve T10053/1
- ◆ Thrust sleeve T10053
- ◆ Counterholder T30004 or MP 1-310

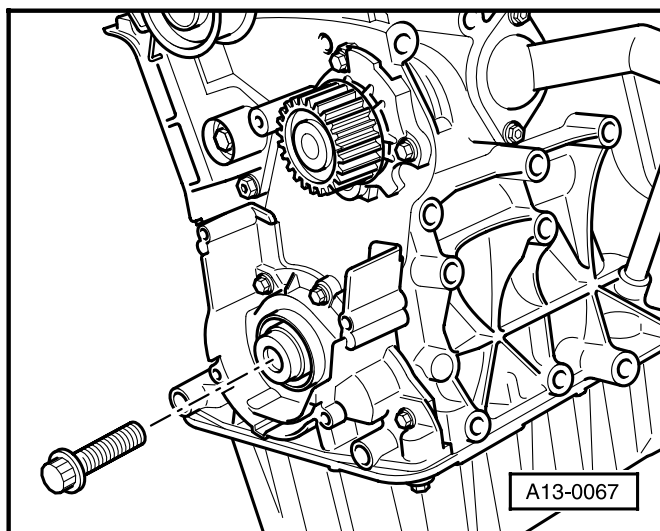
Removing

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

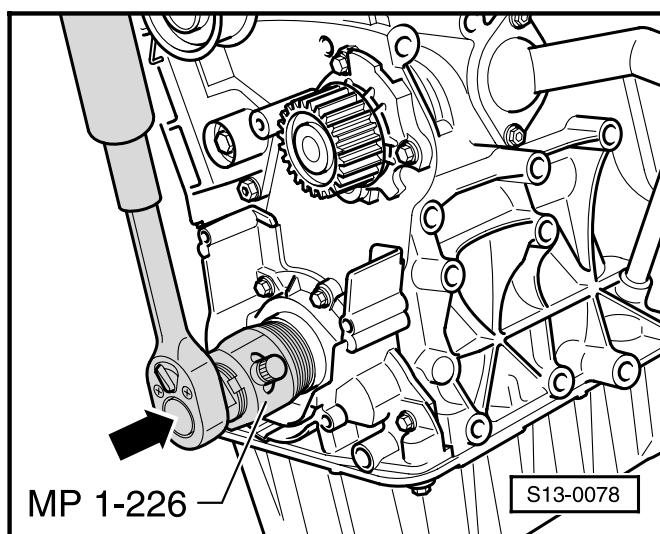
Note:

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



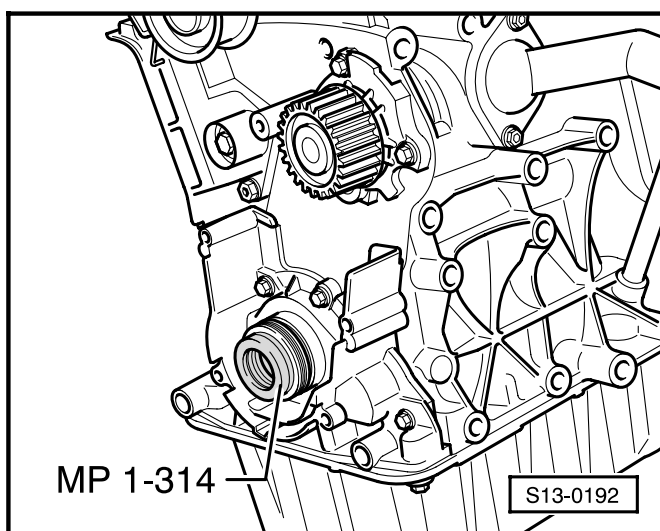


- ◀ - Screw central bolt by hand into the crankshaft as far as the stop in order to guide the seal extractor.
- Turn inner part of seal extractor MP 1-226 two turns out of the outer part, and lock with knurled screw.

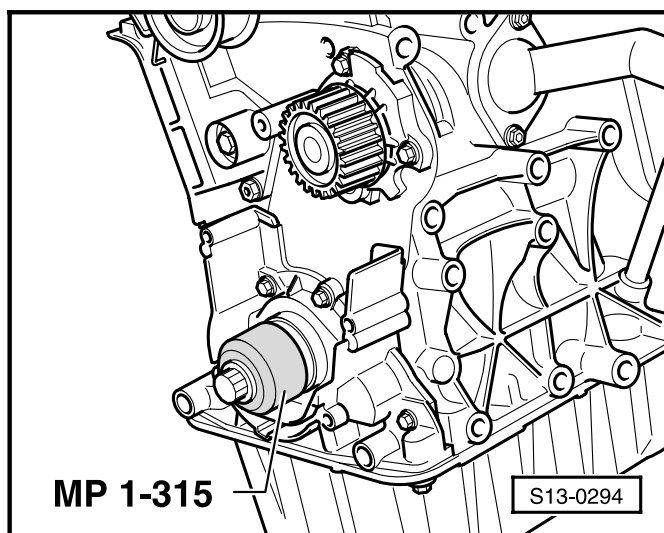


- ◀ - Oil threaded head of seal extractor MP 1-226, fit on and screw as far as possible into the seal with considerable force.
- Slacken knurled screw and turn inner part against the crankshaft until the seal is pulled out.

Installing elastomer seal



- Inspect crankshaft for traces of wear from seal.
- Lightly oil sealing lip of seal.
- ◀ - Fit guide sleeve from MP 1-314 onto the crankshaft journal.
- Push seal over guide sleeve.



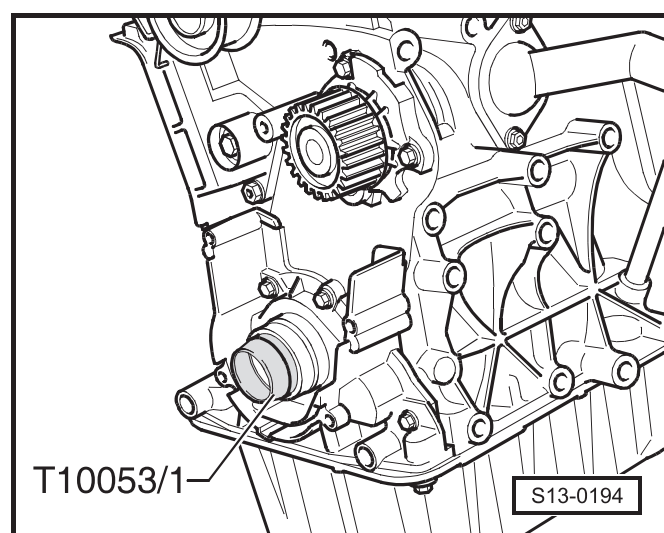
- ◀ - Press in seal with thrust sleeve MP 1-315. Use old central bolt of crankshaft toothed belt sprocket for this step:

No traces of wear on crankshaft from seal:

- Press in seal flush.

Traces of wear on crankshaft from seal:

- Press in seal as far as the stop.

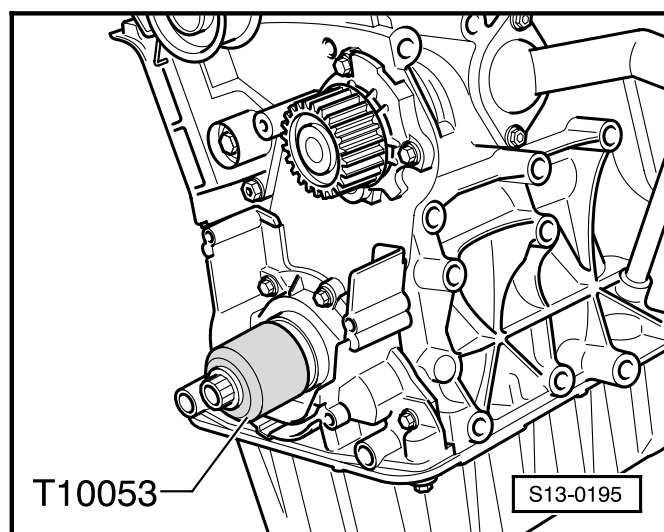


Installing PTFE seal

Note:

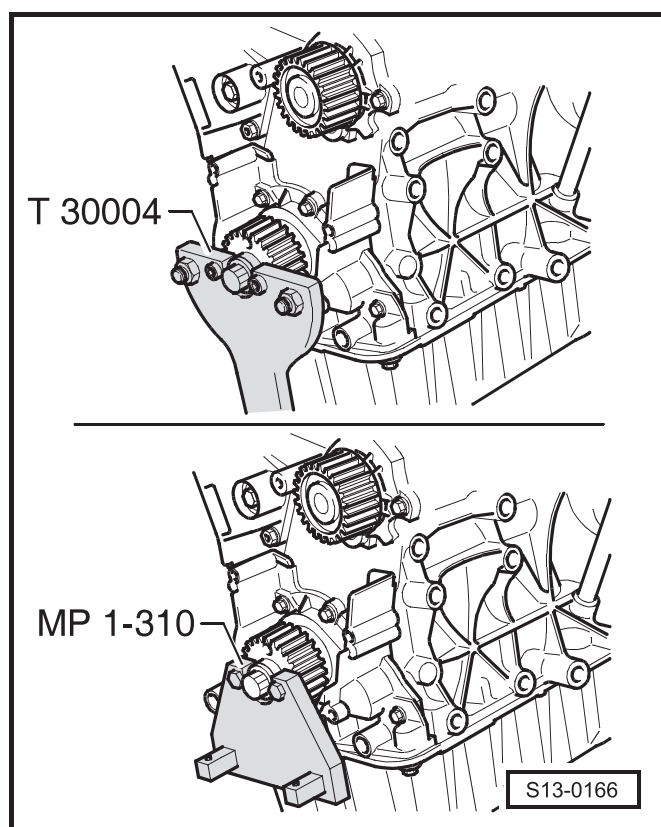
The sealing lips of the seal must neither be oiled nor greased.

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



- Push seal over guide sleeve onto the crankshaft journal.
- ◀ - Use thrust sleeve T10053 to press in seal as far as the stop.

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



Continued for both versions

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

Notes:

- ♦ *When attaching counterholder, place 2 washers between toothed belt sprocket and counterholder.*
- ♦ *Replace central bolt of crankshaft toothed belt sprocket.*
- ♦ *The crankshaft must not rotate when tightening the central bolt.*
- Tighten new central bolt of crankshaft toothed belt sprocket to 90 Nm + torque a further 90° (1/4 turn).
- Install toothed belt ⇒ page 13-5.
- Install ribbed V-belt and tensioning device ⇒ page 13-1.

Removing and installing flywheel

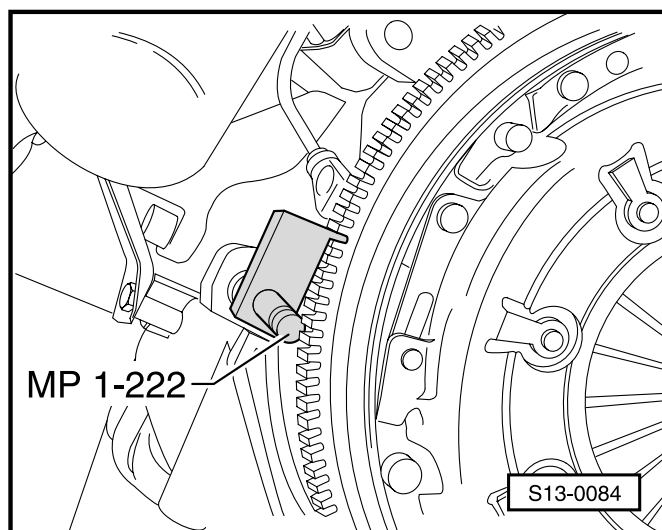
- ♦ Torque wrench
- ♦ Counterholder MP 1-222

Removing

- Mark installation position of flywheel relative to crankshaft with a waterproof felt pen.
- ◀ - Remove flywheel. Lock flywheel with counterholder MP 1-222 for this step.

Installing

- Mount flywheel into the position on the crankshaft marked before removing.
- Insert new bolts for attaching flywheel and tighten by hand.
- Tighten bolts to 60 Nm and torque a further 90° (1/4 turn) (torquing to 90° can be performed in several stages).



Removing and installing drive plate

Special tools, testers and aids required

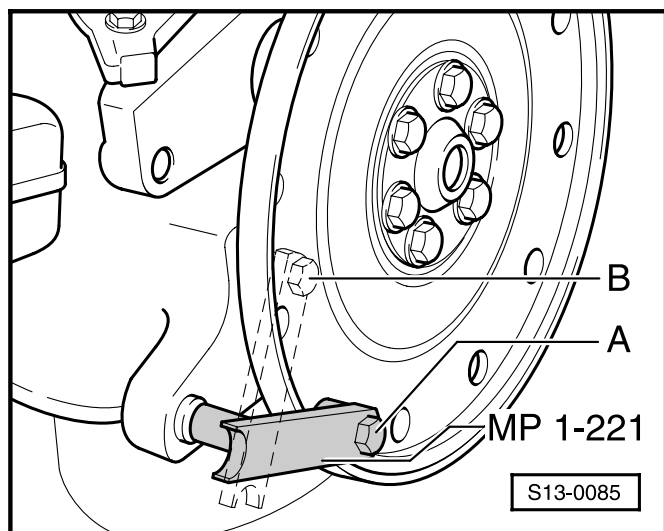
- ◆ Torque wrench
- ◆ Counterholder MP 1-221
- ◆ Depth gauge

Slackening and tightening drive plate

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

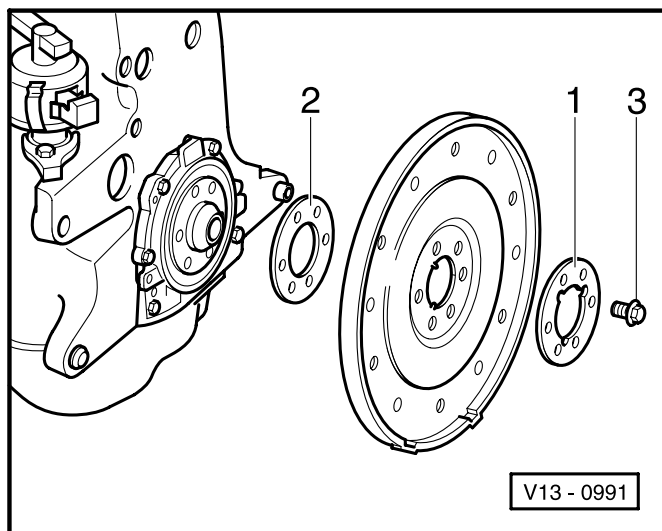
Fitting location of counterholder:

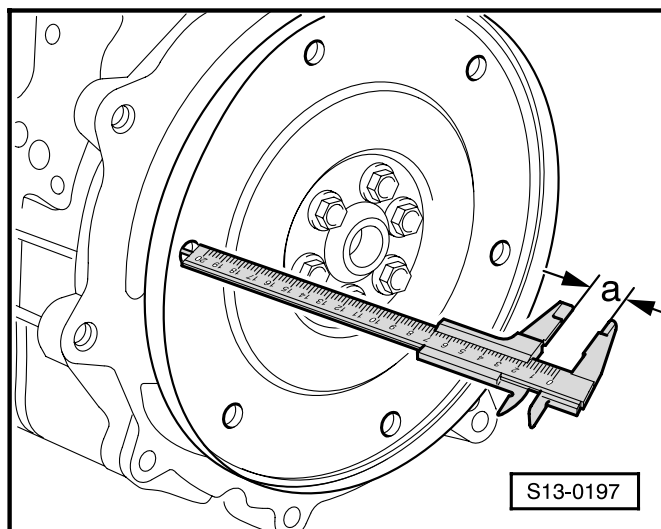
- ◆ A - for slackening
- ◆ B - for tightening



Installing driven plate

- ◀ - Insert the drive plate using the washer with recesses -1-.
- Insert at least 3 new bolts -3- and tighten to 30 Nm.



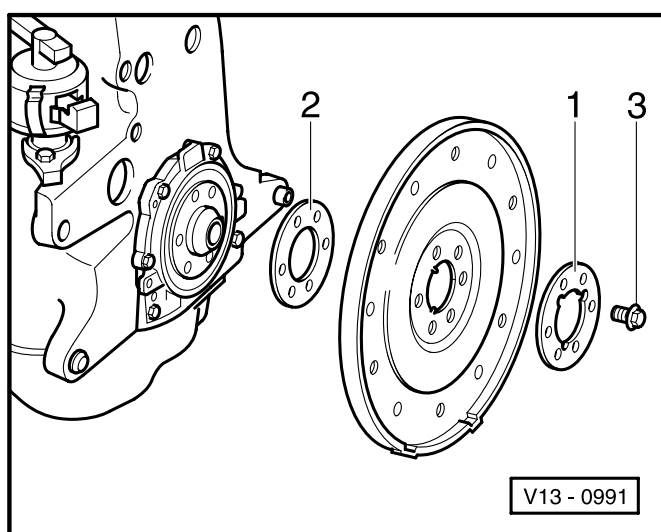


- Check installation dimension in three points of the drive plate and determine mean value.

Specified value -a- 19.5...21.1 mm

Note:

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



If the specified value is not reached:

- Remove drive plate and use a suitable compensating washer -2-.

If the specified value is reached:

- Lock drive plate with counterholder MP 1-221 and tighten the new bolts -3- to 60 Nm and torque a further 90° (1/4 turn).

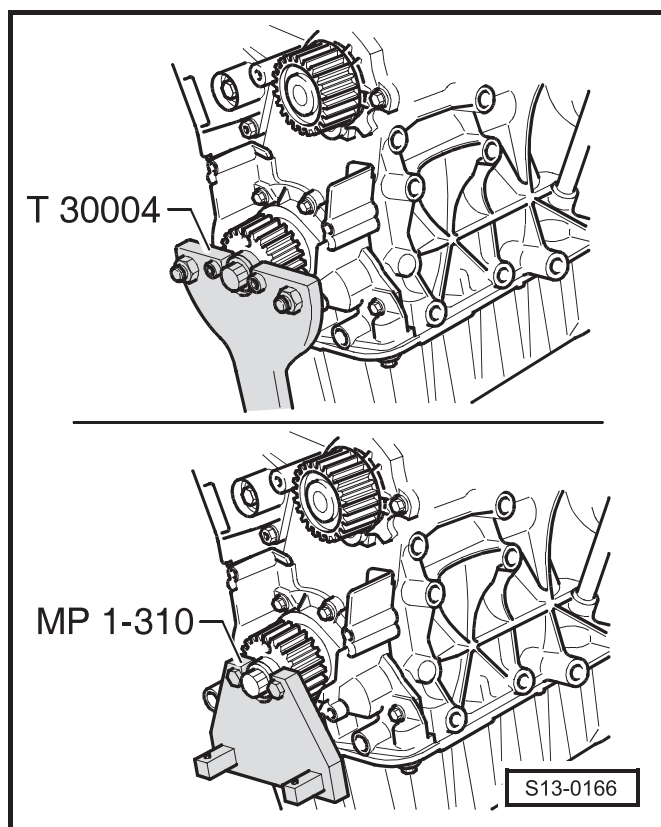
Removing and installing front sealing flange

Special tools, testers and aids required

- ♦ Guide sleeve T10053/1
- ♦ Counterholder T30004
- ♦ Counterholder MP 1-310
- ♦ Silicone sealant D176 404 A2

Removing

- Removing ribbed V-belt and tensioning device ⇒ page 13-1.
- Removing toothed belt ⇒ page 13-5.

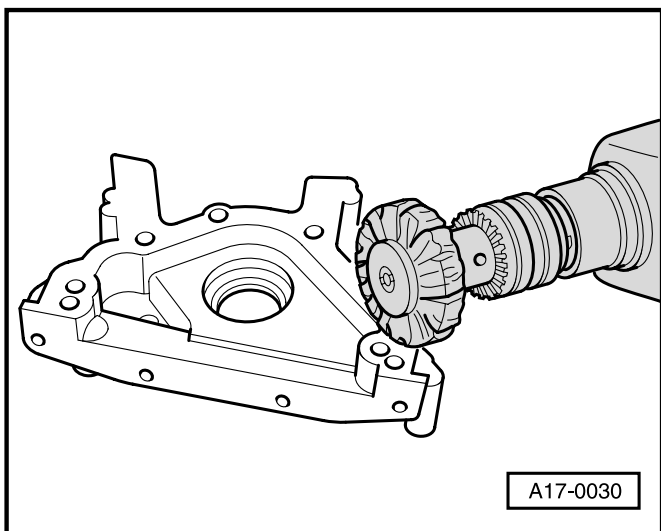


- ◀ - Remove crankshaft toothed belt sprocket. Lock toothed belt sprocket with counterholder T30004 or MP 1-310 for this step.

Note:

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

- Drain engine oil.
- Remove oil pan ⇒ page 17-6.
- Unbolt front sealing flange.
- Take off sealing flange; detach with light blows from a rubber-headed hammer if necessary.
- Use a flat scraper to remove sealant residues on cylinder block.

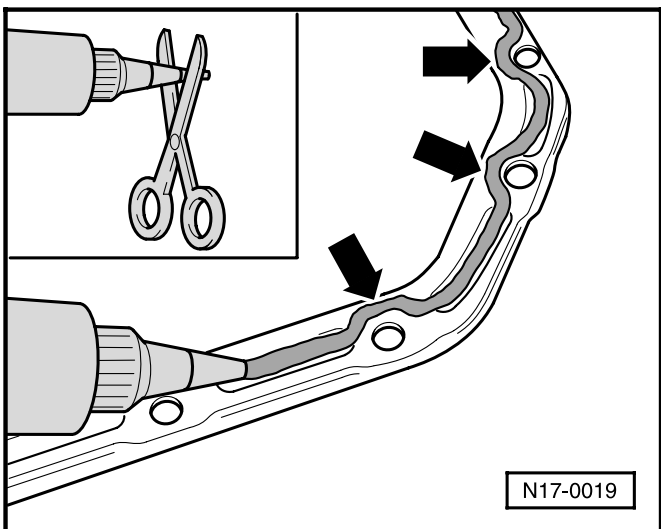


- ◀ - Use a rotating plastic brush to remove sealant residues on sealing flange (wear eye protection).
- Clean sealing surfaces; they must be free of oil and grease.

Installing

Note:

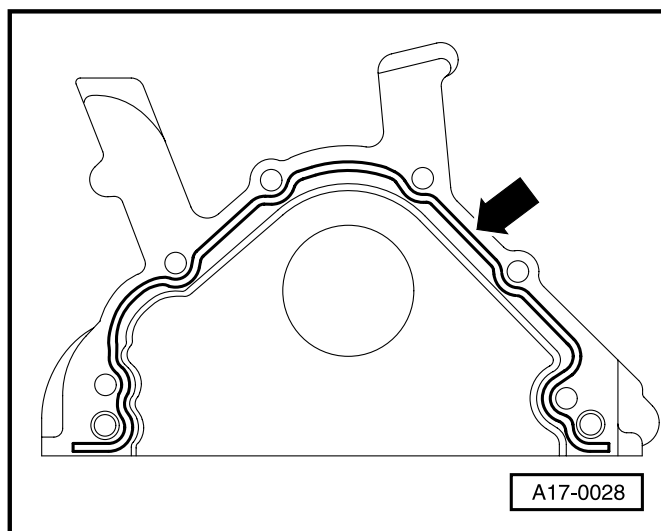
The sealing flange must be installed within 5 minutes after applying the silicone sealant.



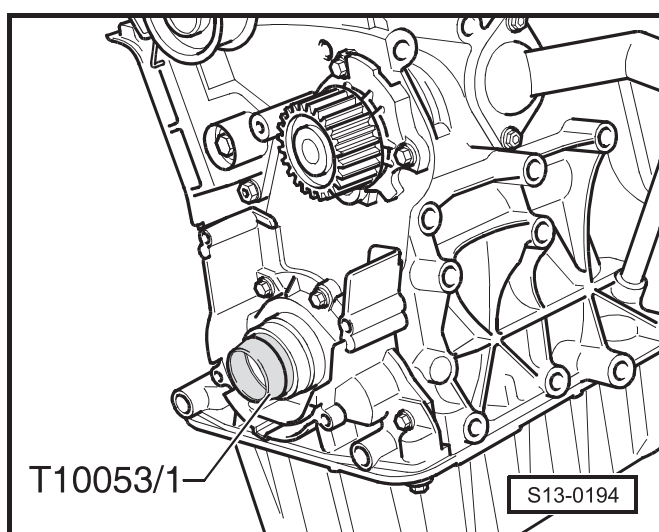
- ◀ - Cut off tube nozzle of silicone sealant „D176 404 A2“ at the front marking (Ø of nozzle about 3 mm).
 - ◆ Thickness of sealant bead -arrow-: 2...3 mm

Note:

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



- ◀ - Apply silicone sealant bead to the clean sealing surface of the sealing flange as shown in the illustration.
- Fit on sealing flange immediately and tighten all the bolts slightly.

**Notes:**

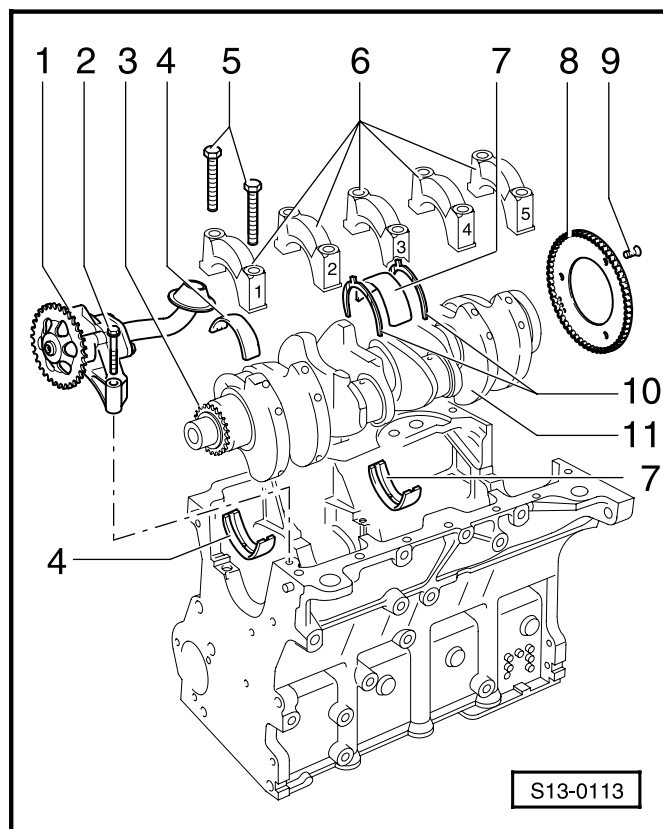
- ♦ If a PTFE seal is fitted ⇒ page 13-11, Fig. 2, the crankshaft journal must be free of oil and grease and the seal must not be oiled.
- ◀ ♦ Use the following devices for fitting on the sealing flange with the seal installed:
 - Elastomer seal - MP 1-314
 - PTFE seal - T10053/1
- Tighten bolts of sealing flange across to 15 Nm.
- Install oil pan ⇒ page 17-6.

Note:

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

- Install toothed belt ⇒ page 13-5.
- Installing ribbed V-belt and tensioning device ⇒ page 13-1, removing and installing ribbed V-belt.

Removing and installing crankshaft



Notes:

- ♦ Before removing the crankshaft, ensure a suitable place is available for placing it down so that the sensor rotor (⇒ item 8) does not get damaged.
- ♦ Attach engine with engine holder MP 1-202 to the repair stand MP 9-201 for carrying out removal and installation operations.

1 - Oil pump

- ♦ removing and installing ⇒ page 17-1
- ♦ disassembling and assembling ⇒ page 17-5

2 - 15 Nm

3 - Chain sprocket

- ♦ for oil pump drive

4 - Bearing shells 1, 2, 4 and 5

- ♦ for bearing cap without lubricating groove
- ♦ for cylinder block with lubricating groove
- ♦ do not mix up used bearing shells (mark)
- ♦ in case of replacement pay attention to different versions. On engines with different coloured bearing shells, bearing shells of the same colour must be installed ⇒ Fig. 1

5 - 65 Nm + torque a further 1/4 turn (90°)

- ♦ replace
- ♦ tighten thread

6 - Bearing cap

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

7 - Bearing shell 3

- ♦ ⇒ position 4

8 - Sensor rotor

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

9 - 10 Nm + torque a further 1/4 turn (90°)

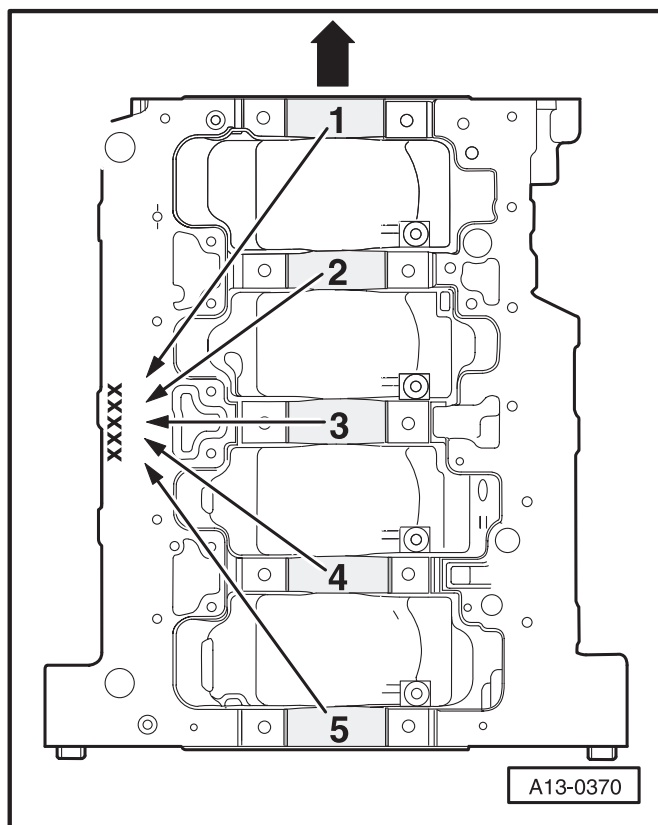
- ♦ replace

10 - Thrust washers

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

11 - Crankshaft

- ♦ axial play of new part: 0.07 to 0.23 mm
wear limit: 0.30 mm
- ♦ crankshaft bearing journal: Ø 54.00mm
- ♦ conrod bearing journal: Ø 47.80 mm



◀ Fig. 1 Marking top crankshaft bearing

Different coloured bearing shells

For engines with identification characters
AGN approx. 03. 1997 ➤

For engines with identification characters
AGU, ARX, AUM, AUQ approx. 09. 2000 ➤

The top bearing shells are allocated to the cylinder block with the right thickness at the factory.

Coloured points are used to mark the bearing shell thickness.

Notes:

Arrow points in the driving direction

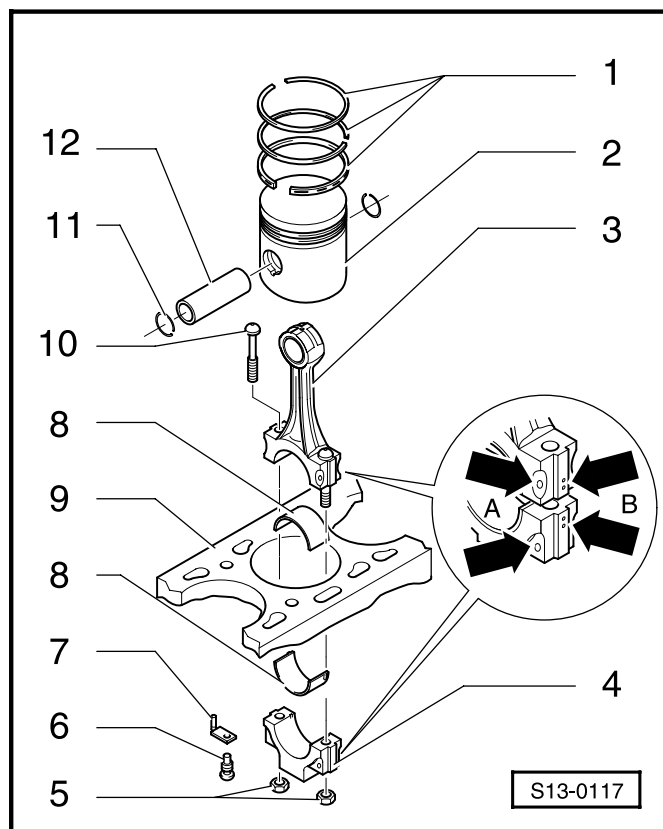
The letters on the sealing surface of the bottom cylinder block mark, which bearing thickness must be applied on which point.

Colour codings

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

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

Disassembling and assembling pistons and connecting rod



Note:

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

1 - Piston rings

- ◆ offset joints 120°
- ◆ use piston ring pliers for removing and installing
- ◆ marking "TOP" must point toward piston crown
- ◆ oil scraper ring, 2-part or 3-part, mixed lining is not admissible
- ◆ inspecting gap clearance ⇒ Fig. 1
- ◆ inspecting end clearance ⇒ Fig. 2

2 - Piston

- ◆ inspecting ⇒ Fig. 2
- ◆ mark installation position relative to conrod and matching cylinder with waterproof felt pen
- ◆ arrow on piston crown points toward belt pulley side
- ◆ use piston ring tensioning strap for installing
- ◆ piston $\varnothing = 80.965$ mm

3 - Connecting rod

- ◆ always replace as a set
- ◆ mark matching cylinder see installation position -B- markings -A- must be positioned one above the other
- ◆ with oil drilling for lubricating piston pin

4 - Conrod bearing cap

- ◆ mark matching cylinder -B-
- ◆ installation position: markings -A- must be positioned one above the other

5 - 30 Nm + torque a further 90° (1/4 turn)

- ◆ replace
- ◆ oil thread and head contact surface

6 - Pressure relief valve, 27 Nm

- ◆ opens at: 0.25 to 0.32 MPa overpressure
- ◆ replace without sealant

7 - Oil spray nozzle

- ◆ for cooling piston

8 - Bearing shell

- ◆ pay attention to installation position ⇒ Fig. 3
- ◆ do not mix up used bearing shells (mark)
- ◆ ensure tightly seated in the retaining lugs
- ◆ axial play
new part: 0.1 to 0.35mm
wear limit: 0.37 mm
- ◆ with oil drilling for lubricating piston pin

9 - Cylinder block

- ◆ inspecting cylinder bore ⇒ Fig. 4
- ◆ cylinder $\varnothing = 81.01$ mm

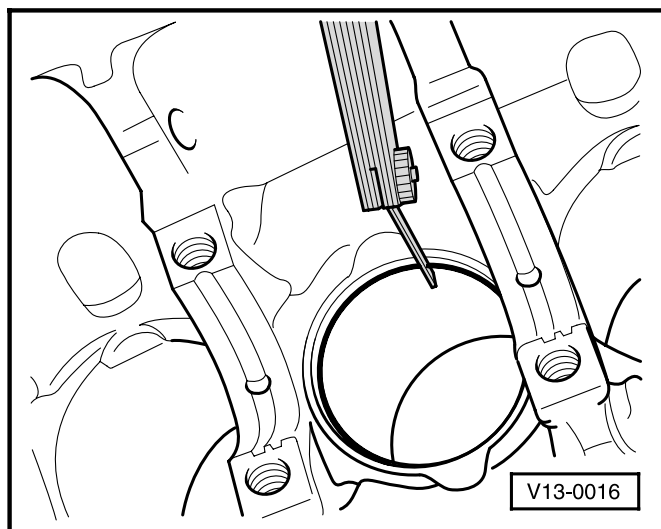
10 - Conrod

- ◆ replace together with nut -item 5-

11 - Circlip

12 - Piston pin

- ◆ if tight, heat piston to approx. 60°C
- ◆ use drift MP 3-400 for removing and installing



◀ Fig. 1 Inspecting piston ring gap clearance

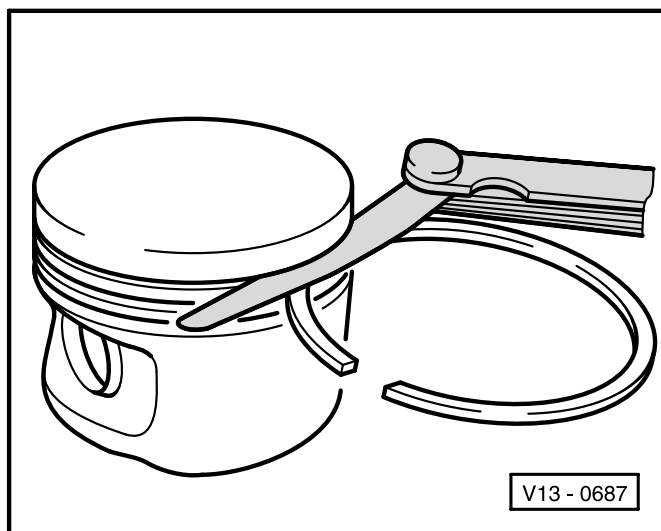
Special tools, testers and aids required

- ◆ Feeler gauge

Inspection procedure

- Insert ring at right angles to cylinder wall from above into the lower cylinder opening, about 15 mm away from edge of cylinder. Use piston without rings for inserting.

Piston ring		Gap clearance	
		new	wear limit
Compression rings	mm	0.15 ... 0.40	0.80
2-part oil scraper ring	mm	0.25 ... 0.50	1.00
3-part oil scraper ring	mm	max. 1.00	1.30

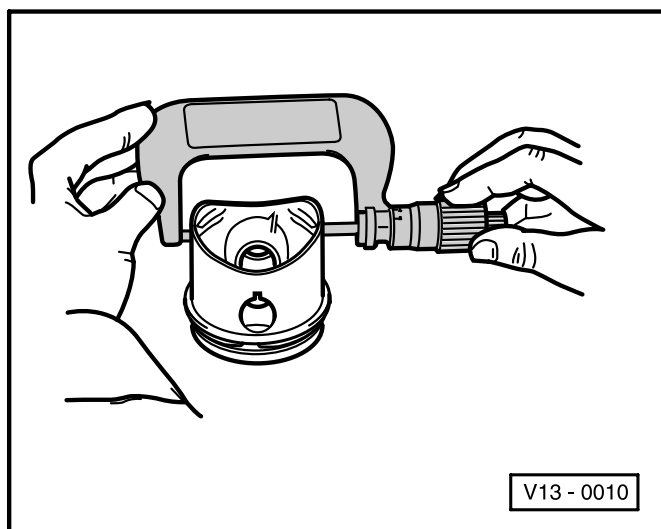


◀ Fig. 2 Inspecting piston ring end clearance

Special tools, testers and aids required

- ◆ Feeler gauge
- Clean annular groove before inspecting.

Piston ring		End clearance	
		new	wear limit
Compression rings	mm	0.02 ... 0.07	0.12
2- and 3-part oil scraper ring	mm	0.02 ... 0.06	0.12



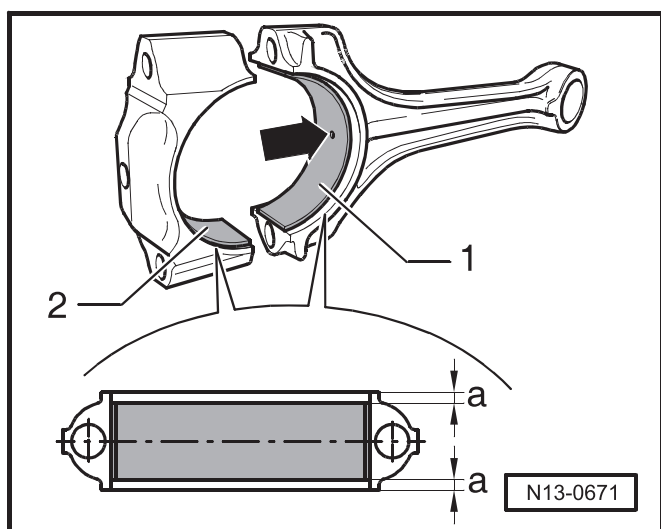
◀ Fig. 2 Inspecting pistons

Special tools, testers and aids required

- ◆ External micrometer 75 to 100 mm

Inspection procedure

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

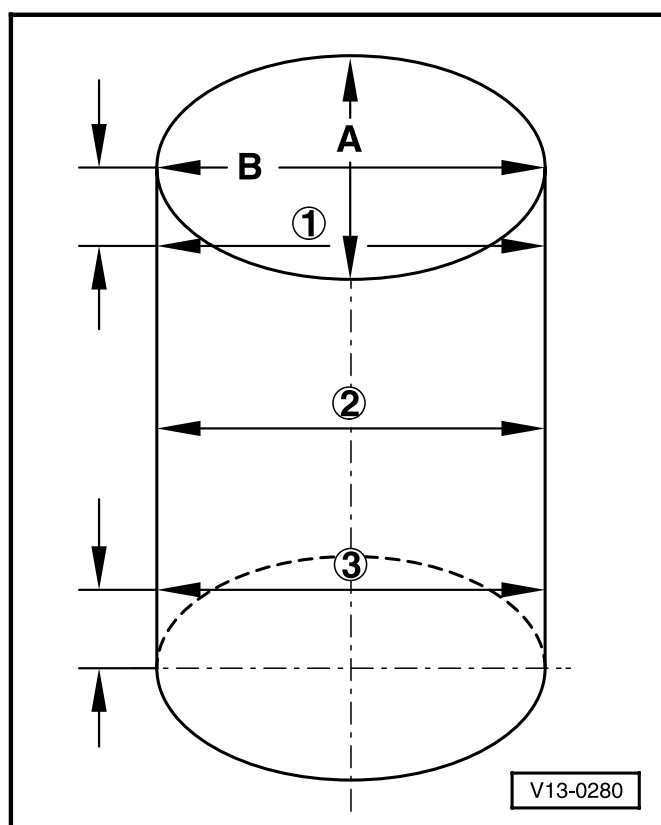


◀ Fig. 3 Bearings installation position

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

Bearing shell -2- with oil drilling for connecting rod.

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



◀ Fig. 4 Inspecting cylinder bore

Special tools, testers and aids required

- ◆ Internal precision measuring instrument 50 to 100 mm

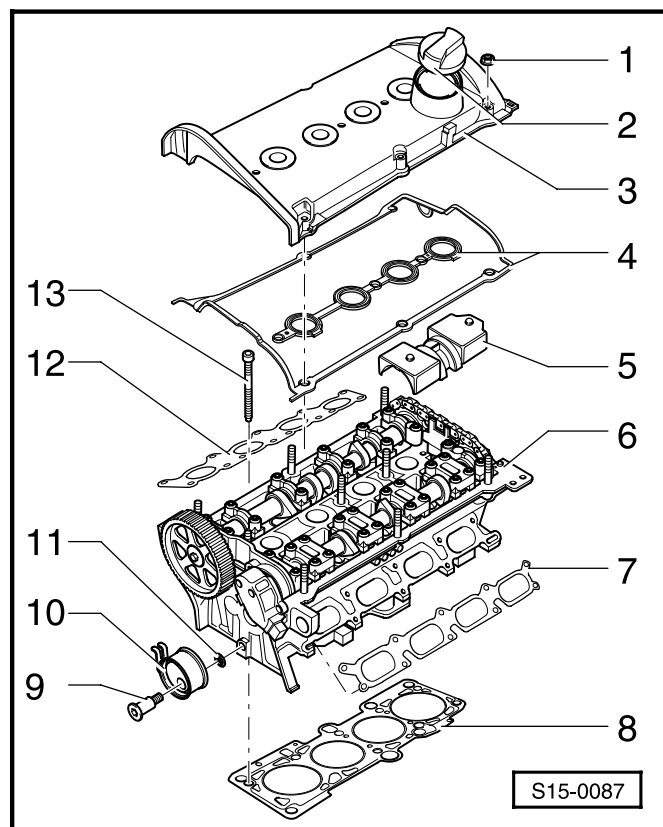
Inspection procedure

- Measure at 3 points diagonally across in transverse direction -A- and in longitudinal direction -B-
- ◆ Variations compared to nominal dimension
max. 0.10 mm

Note:

The measurement of the cylinder bore must not be performed when the cylinder block is attached with Engine holder MP 1-202 to the repair stand otherwise incorrect measurements may result.

Removing and installing cylinder head



Note:

- ◆ Always replace cylinder head bolts
- ◆ Always replace self-locking nuts.
- ◆ If a reconditioned cylinder head with the camshaft installed is fitted, it is necessary to oil the contact surfaces between bucket tappet and cam track after installing the cylinder head.
- ◆ The plastic bases supplied as a protection for the open valves must not be removed until just before fitting on the cylinder head.
- ◆ If the cylinder head is replaced, the entire system must be filled with fresh coolant.
- ◆ Always replace seals and gaskets when carrying out removal and installation operations.

Removing and installing toothed belt ⇒ page 13-5

Testing compression ⇒ page 15-11

1 - 10 Nm

2 - Sealing cover

- ◆ replace gasket if damaged

3 - Cylinder head cover

- ◆ removing and installing ⇒ page 15-2

4 - Gaskets for cylinder head cover

- ◆ replace if damaged
- ◆ pay attention to installation position

5 - Oil deflector

- ◆ pay attention to installation position above intake camshaft between cylinder 3 and 4

6 - Cylinder head

- ◆ after replacing, fill entire system with fresh coolant
- ◆ removing ⇒ page 15-6
- ◆ check for distortion ⇒ page 15-8
- ◆ reworking ⇒ page 15-8
- ◆ installing ⇒ page 15-9

7 - Gasket for top part of intake manifold

- ◆ replacing
- ◆ pay attention to installation position

8 - Cylinder head gasket

- ◆ replace
- ◆ metal gasket
- ◆ pay attention to installation position: Marking: Part no. must be legible from the inlet side

9 - 45 Nm

10 - Tensioning pulley

11 - Washer

12 - Exhaust manifold gasket

- ◆ replace
- ◆ pay attention to installation position:

13 - Cylinder head bolt

- ◆ replace
- ◆ pay attention to slackening sequence ⇒ page 15-6
- ◆ pay attention to tightening sequence ⇒ page 15-9

Removing and installing cylinder head cover

- Engine installed.

Notes:

- ◆ *Hose connections are secured with screw-type, spring strap or collar clamps.*
- ◆ *Always replace collar clamps by spring strap clamps or screw-type clamps.*
- ◆ *Fuel hoses at the engine must be secured only with spring strap clamps. It is not permitted to use collar or screw-type clamps.*
- ◆ *It is recommended to use the pliers for spring strap clamps for removing and installing such clamps.*

Special tools, testers and aids required

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

Removing

- Switch off ignition (if not already off) and disconnect earth strap at the battery.

Note:

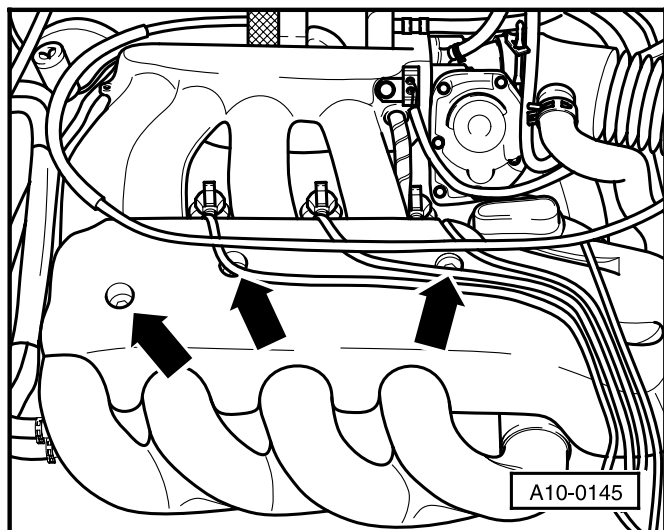
If vehicle is fitted with radio set with anti-theft coding, determine code, if necessary, first of all.

- All the cable straps which have been detached or cut open when removing, should be fitted on again at the same point when installing.

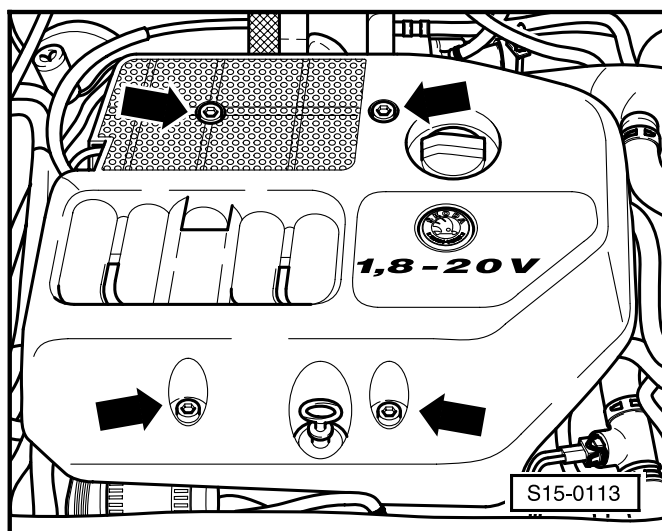
Models ► 07.97

- Detach throttle cable at the throttle valve control unit and release support at the intake manifold (do not remove locking detent).
- Unclip throttle cable and ignition cables from the ignition cable guide.

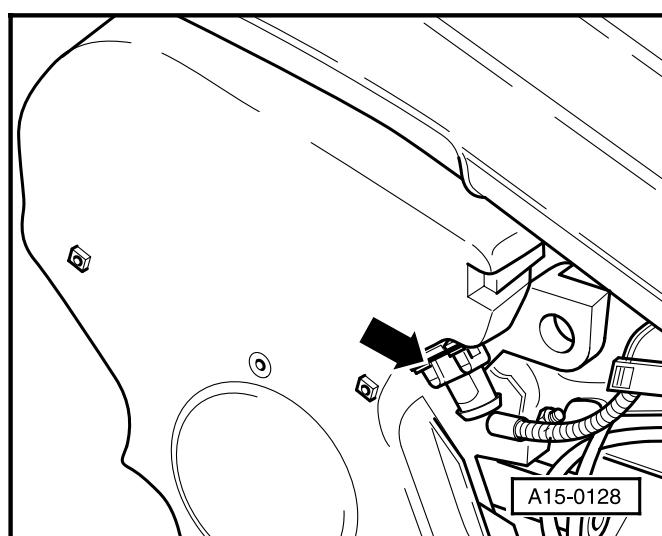
- ◀ - Remove engine trim panel -arrows-.



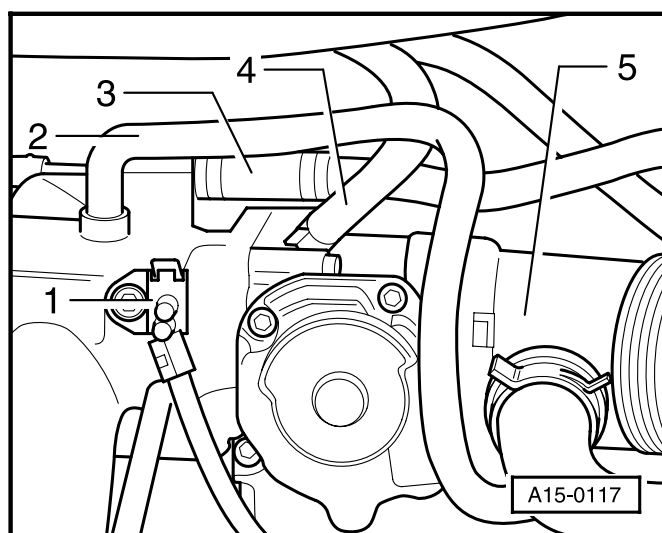
A10-0145

**Models 08.97 ►**

- ◄ - Remove ignition cable guide -arrows-.
- Detach throttle cable at the throttle valve control unit and support bearing at intake manifold (do not remove catch).
- Unclip throttle cable and ignition cables from the ignition cable guide.

**All models**

- ◄ - Unplug connector from the Hall sender (G40) -arrow-.

**Models ► 07.97**

- ◄ - Unplug connector from the intake manifold temperature sender (G72) -1-.

All models

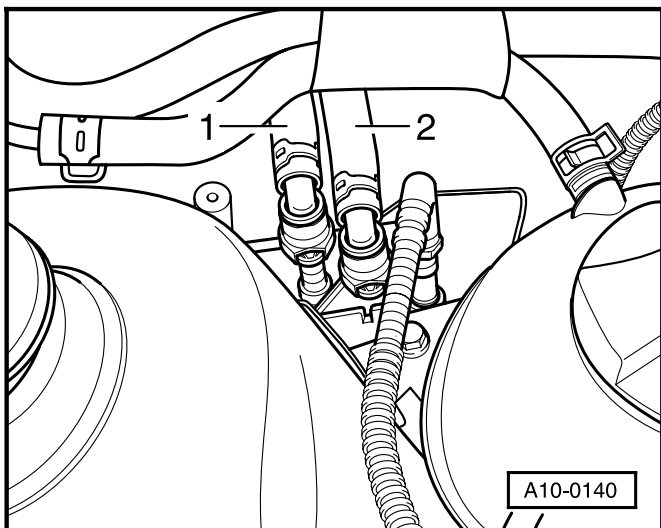
- Detach connection hose -2- to the intake hose -5-.
- Detach vacuum hose -3- to the brake servo unit at the throttle valve control unit (J338).
- Detach vent hose -4- to activated charcoal filter.
- Detach intake hose -5- from the throttle valve control unit.
- Unplug connector from the throttle valve control unit (J338).

Models ► 07.97

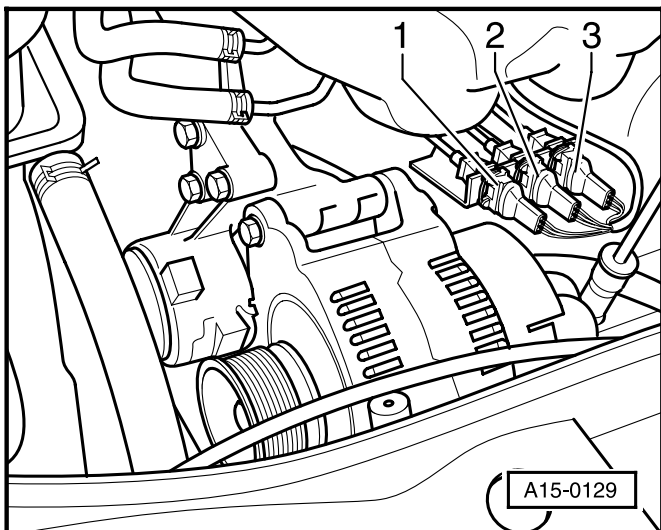
- Mark coolant hoses of the throttle valve control unit, detach and seal (release pressure from cooling system first).

All models

- ◄ - Detach fuel feed line -1- and fuel return-flow line -2- (press release buttons).

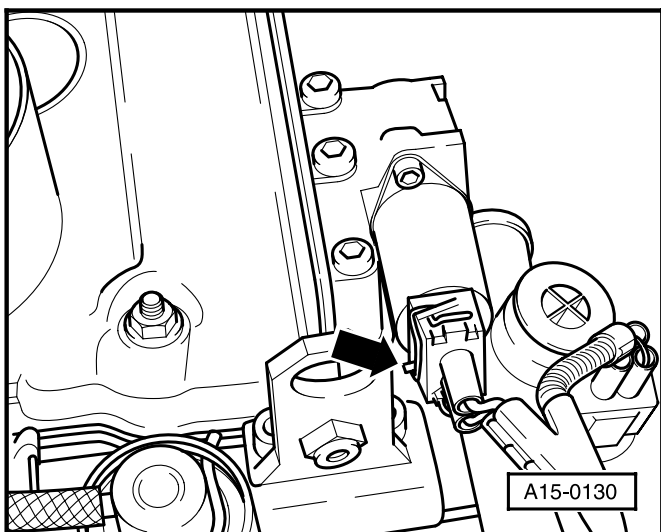
**Warning!**

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

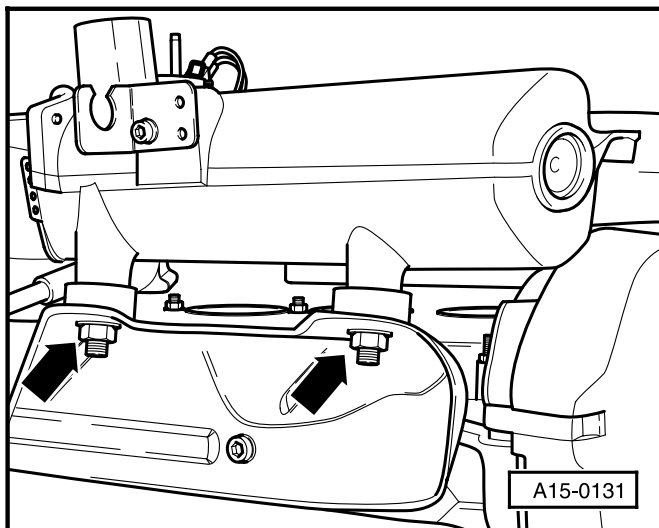


- ◄ - Separate the following electrical plug connections:

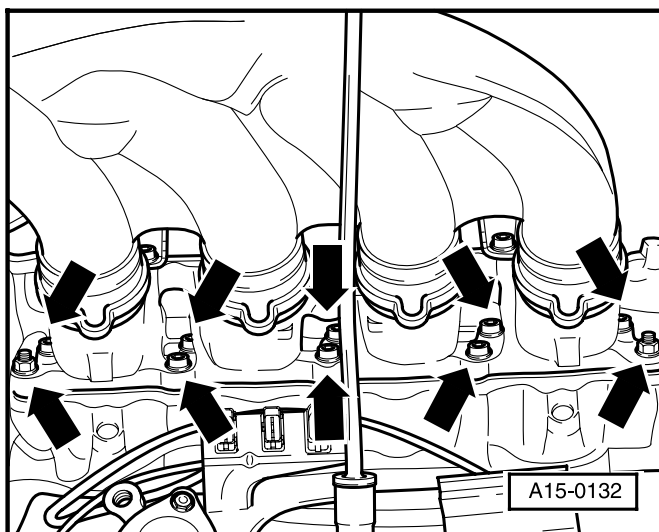
- ◆ Knock sensor II (G66) -1-
- ◆ Knock sensor I (G61) -2-
- ◆ Engine speed sender (G28) -3-



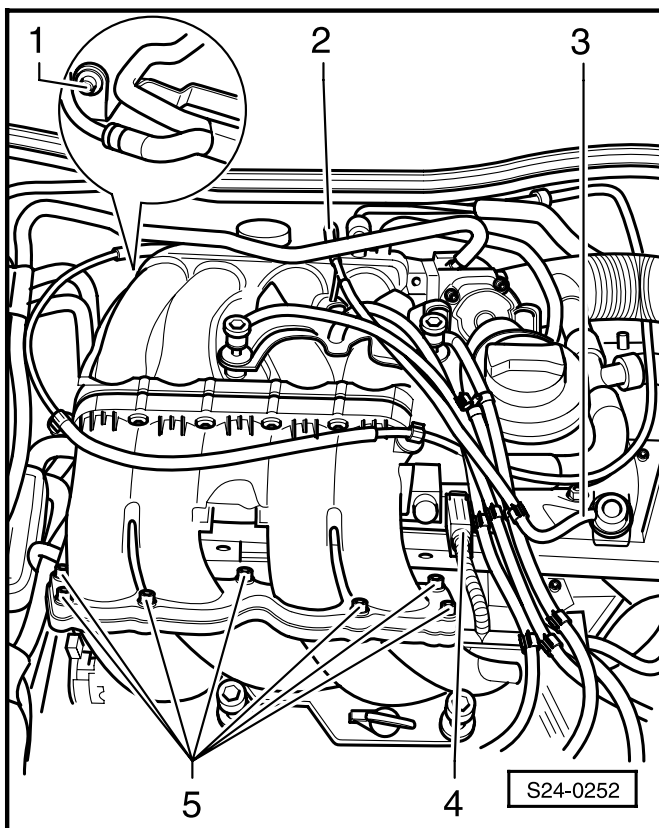
- ◄ - Unplug connector from the camshaft adjustment valve (N205) -arrow-.
- Take wiring harness out of the fixtures.

**Models ► 07.97**

- ◄ - Unbolt top part of intake manifold at the bracket -arrow-.



- ◄ - Unbolt bottom part of the intake manifold at cylinder head -arrows-.
- Remove intake manifold (top and bottom parts) together with throttle valve control unit.

**Models 08.97 ►**

- ◄ - Unplug connector from the variable intake manifold changeover valve (N156) -4-.
- Detach ignition cables from the spark plugs and vacuum hose -3- from the fuel pressure regulator.
- Detach vacuum hose -2- to the top part of the intake manifold.
- Unscrew bolts -5- from top part and bottom part of the intake manifold.
- Unscrew rear bolts attaching top part of intake manifold -1- and raise top part of intake manifold slightly.
- Mark coolant hoses of the throttle valve control unit, detach and seal (release pressure from cooling system first).
- Detach earth strap of throttle valve control unit (J338).
- Take out top part of intake manifold together with throttle valve control unit (J338).

Continued for all models**Note:**

Seal intake galleries in cylinder head with clean cloth.

- Remove top part of toothed belt guard.
- Remove cylinder head cover.

Installing

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

Notes:

- ◆ *Replace gaskets of cylinder head cover if damaged or leaking.*
- ◆ *Replace gasket of bottom part of intake manifold.*
- ◆ *Tighten bottom part of intake manifold first to cylinder head, then tighten top part of intake manifold to bracket.*
- ◆ *Ensure the fuel hoses are tightly connected.*
- Adjust throttle cable ⇒ page 20-13.
- Top up coolant if necessary ⇒ page 19-3.
- Electrical connections and routing of cables
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

Note:

*If the battery earth strap is disconnected and re-connected, it is necessary to carry out additional operations
⇒ Electrical System; Repair Group 27.*

Tightening torques**Notes:**

- ◆ *Tightening torques apply only to lightly greased, oiled, phosphatized or blackened nuts and bolts.*
- ◆ *Additional lubricants such as engine oil or gearbox oil are permissible, but not Molykote.*
- ◆ *Do not use degreased parts.*
- ◆ *Tolerance for tightening torques $\pm 15\%$.*

Bolted connection	Tightening torque
Cylinder head cover to cylinder head	10 Nm
Intake manifold with bottom part of intake manifold to cylinder head	10 Nm
Intake manifold with top part of intake manifold to bracket/cylinder head (for models ► 07.97)	25 Nm
Top part of intake manifold to bottom part (for models 08.98 ►)	10 Nm

Removing cylinder head

- Engine installed

Requirements

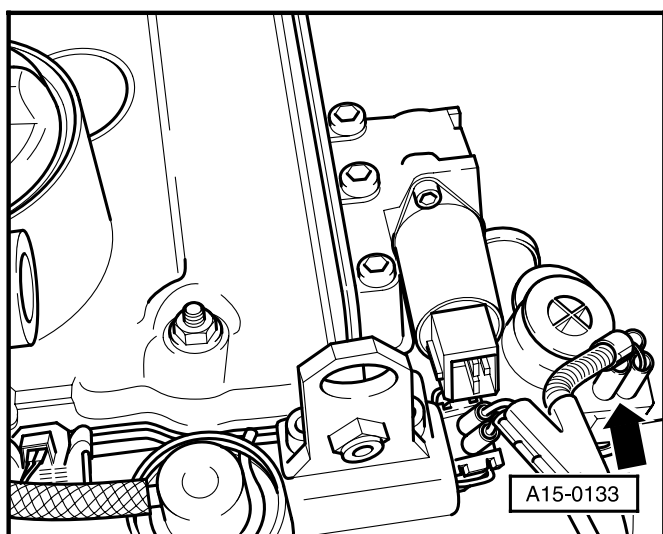
- Engine cold

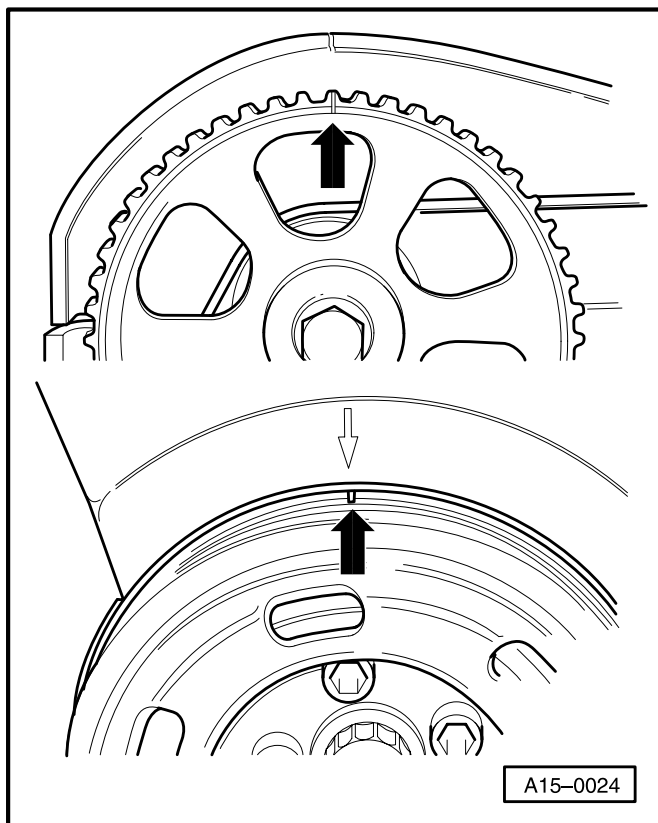
Special tools, testers and aids required

- ◆ Connecting rod support MP 1-225
- ◆ Locking pin from supporting device MP 9-201
- ◆ Tensioning bolt T 10092
- ◆ Wrench for cylinder head bolts (e.g. 3452)

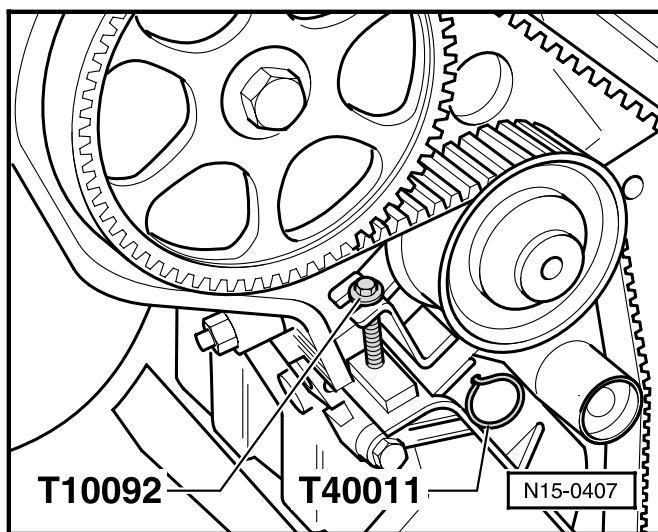
Procedure

- Remove cylinder head cover ⇒ page 15-2.
- Drain coolant ⇒ page 19-3.
- Detach coolant hoses from cylinder head.
- Unbolt bracket for coolant pipe at connection fitting of cylinder head.
- ◀ - Unplug connector from coolant temperature sender (G2/G62) -arrow-.
- Unbolt catalytic converter from front silencer and push to the rear.
- Remove ribbed V-belt and tensioning device ⇒ page 13-1.

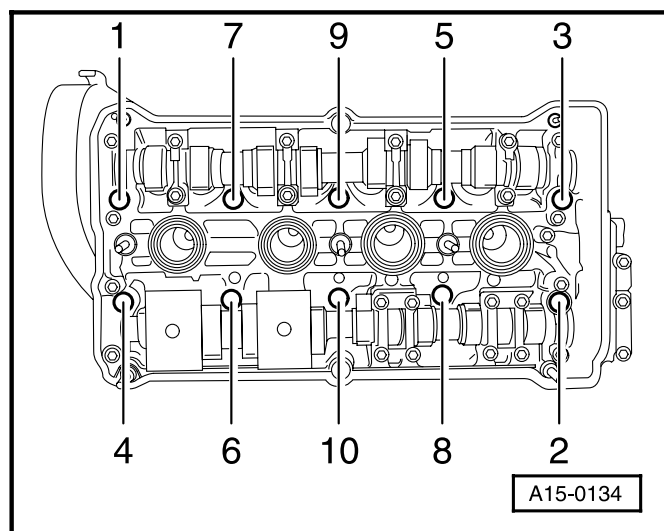




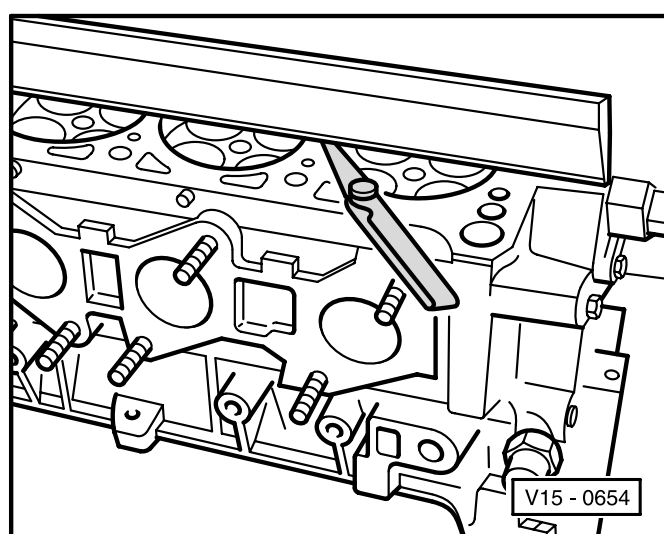
- ◀ - Rotate crankshaft at the central bolt of the toothed belt sprocket of the crankshaft in direction of rotation of engine and position it at the TDC marking of cylinder 1 -arrows-.
- Check whether TDC marking on the flywheel and reference mark are aligned ⇒ page 15-10.



- ◀ - Screw tensioning bolt T 10092 into the tensioning device of the toothed belt.
- Tension pressure plunger of tensioning device only sufficiently to allow the pressure plunger to be secured with a locking pin (e.g. T 40011) -arrow-.
- Take toothed belt off camshaft sprocket.



- ◀ - Slacken the cylinder head bolts in the correct order.
- Remove cylinder head together with cylinder head gasket.
- For cylinder head bolts from 04.98, use wrench (e.g. 3452).



Inspecting cylinder head for distortion

Special tools, testers and aids required

- ◆ Feeler gauge
- ◆ Knife-edge straightedge

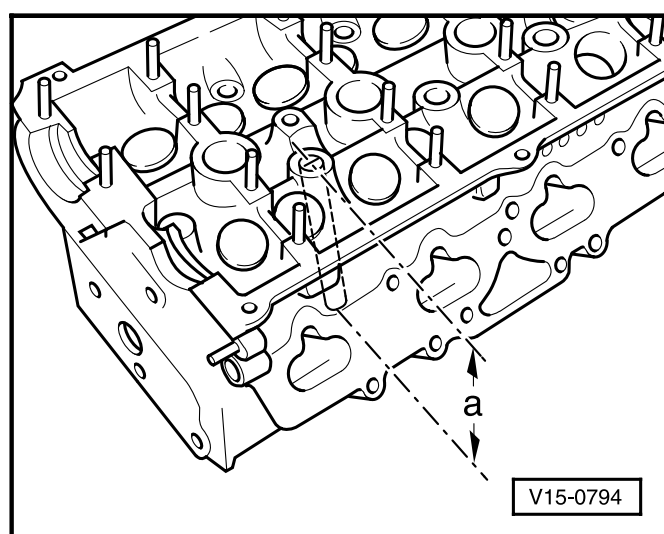
Inspection procedure

- ◀ - Use a knife-edge straightedge and feeler gauge to inspect the cylinder head for distortion at several points.
- ◆ max. permissible distortion: 0.1 mm

Reworking cylinder head

Procedure

- ◀ - It is only permissible to rework the cylinder head (face grind) down to the minimum dimension -a-.
- ◆ Minimum dimension -a-: 139.25 mm



Installing cylinder head

Requirements

- Pistons are not positioned at TDC

Notes:

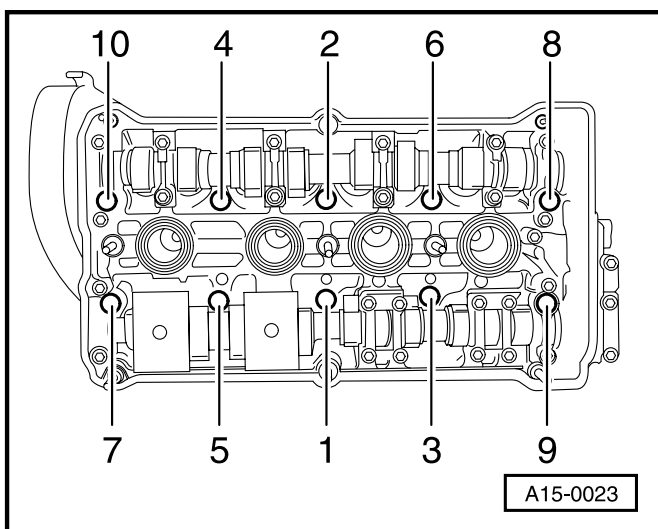
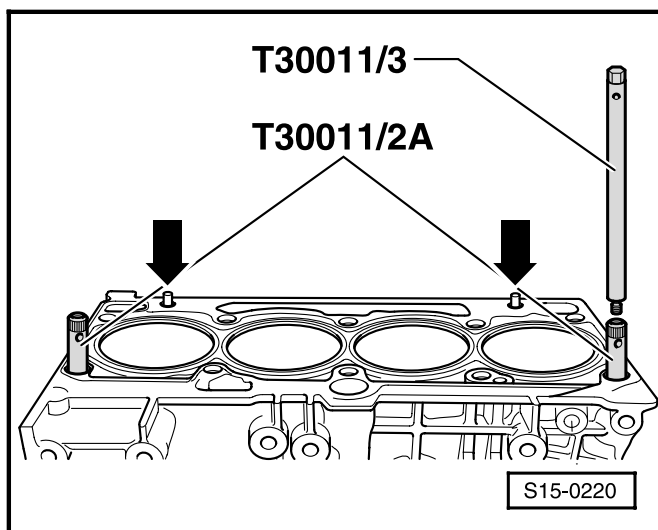
- ◆ Always replace cylinder head bolts with new bolts.
- ◆ There must not be any oil or coolant in the blind holes of the cylinder head bolts in the cylinder block.
- ◆ Do not remove the new cylinder head gasket from its wrapping until just before installing it.
- ◆ Treat the new gasket with particular care. Damage results in leakages.

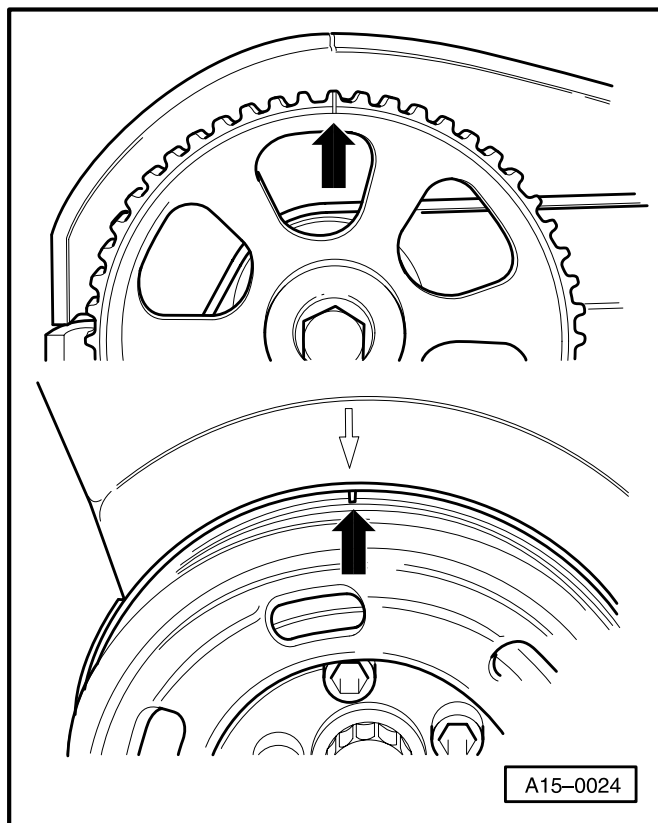
Special tools, testers and aids required

- ◆ Torque wrench
- ◆ Wrench for cylinder head bolts (e.g. 3452)
- ◆ Guide pin T 30011/2A
- ◆ Screwdriver T 30011/3
- ◆ Tensioning bolt T 10092

Procedure

- Carefully remove gasket residues. When doing this, ensure that no lengthy streaks or scratches are produced (if emery paper is used, the roughness must not be less than 100).
- Carefully remove any emery and sanding residues.
- Fit on cylinder head gasket.
- ◆ Pay attention to centering pins in cylinder block -arrows-.
- ◆ Pay attention to installation position of cylinder head gasket. Marking: Part No. must be legible from the inlet side.
- Screw guide pins T 30011/2A into the outer holes at the inlet side.
- Fit on cylinder head, insert the remaining 8 cylinder head bolts and tighten by hand.
- Use screwdriver T 30011/3 to unscrew the guide pins through the bolt holes and insert cylinder head bolts.
- ◆ Tighten cylinder head in two stages in the tightening order shown as follows:
- For cylinder head bolts from 04.98, use wrench for cylinder head bolts (e.g. 3452).
- 1st stage: 40 Nm





- 2nd stage: torque a further 180° (1/2 turn) with a rigid wrench; torquing 2x90° is also permissible.

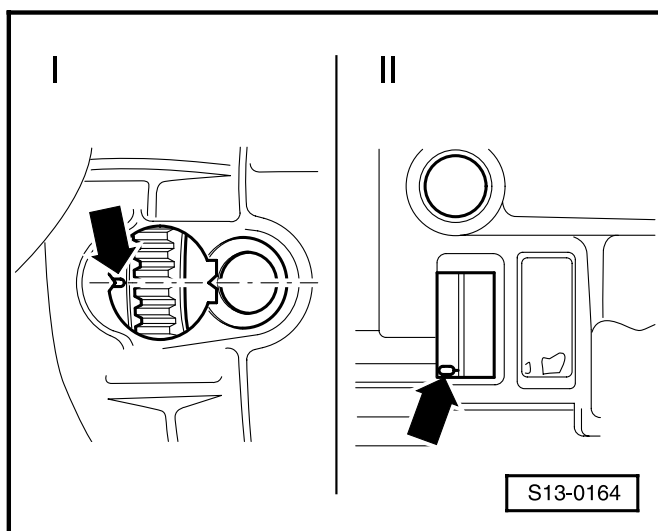
Note:

It is not necessary to subsequently tighten the cylinder head bolts after carrying out repairs.

- Install cylinder head cover ⇒ page 15-2.
- ◀ - Align marking on camshaft sprocket with marking on cylinder head cover.

Note:

When the camshaft is rotated, the valves may strike the pistons if they are positioned at TDC. For this reason, pistons must not be positioned at TDC. Risk of damage to valves and pistons.



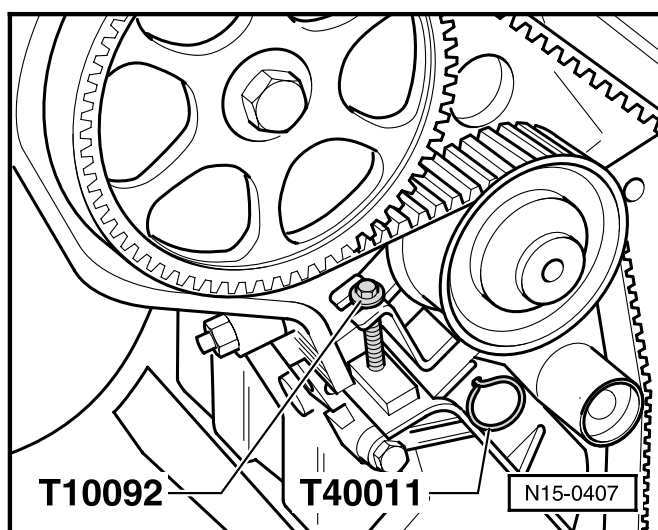
- Align marking on vibration damper with marking on bottom part of toothed belt guard.

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

I - Manual gearbox

II - Automatic gearbox

- Fit toothed belt onto the camshaft sprocket.



- ◀ - Pull out locking pin and relieve tension of pressure plunger of tensioning device for toothed belt. Unscrew tensioning bolt.

- Rotate crankshaft twice in direction of rotation of engine, position again to TDC and check setting.

- Install ribbed V-belt and tensioning device ⇒ page 13-1.

Testing compression

Test condition

- Coolant temperature at least 30 °C

Special tools, testers and aids required

- ◆ Compression tester, (e.g. V.A.G 1381 or V.A.G 1763)
- ◆ Spark plug wrench

Test procedure

- Unplug connector from ignition transformer and connectors from injectors.
- Remove spark plug connectors and unclip ignition cables.
- Use spark plug wrench to remove spark plugs.
- Open throttle valve fully.
- Use compression tester, (e.g. V.A.G 1381 or V.A.G 1763), to test compression.

Note:

Use of tester:

⇒ *Operating Instructions.*

- Continue operating starter until no further pressure rise is indicated by the tester.

Specified compression:

(MPa pressure)

Engine code	Engine new	Wear limit	Difference between cylinders
AGN	0.9 ... 1.4	0.75	max. 0.3
AGU, ARZ, AUM, ARX	1.0 ... 1.3	0.7	max. 0.3
AUQ	1.0 ... 1.3	0.75	max. 0.3

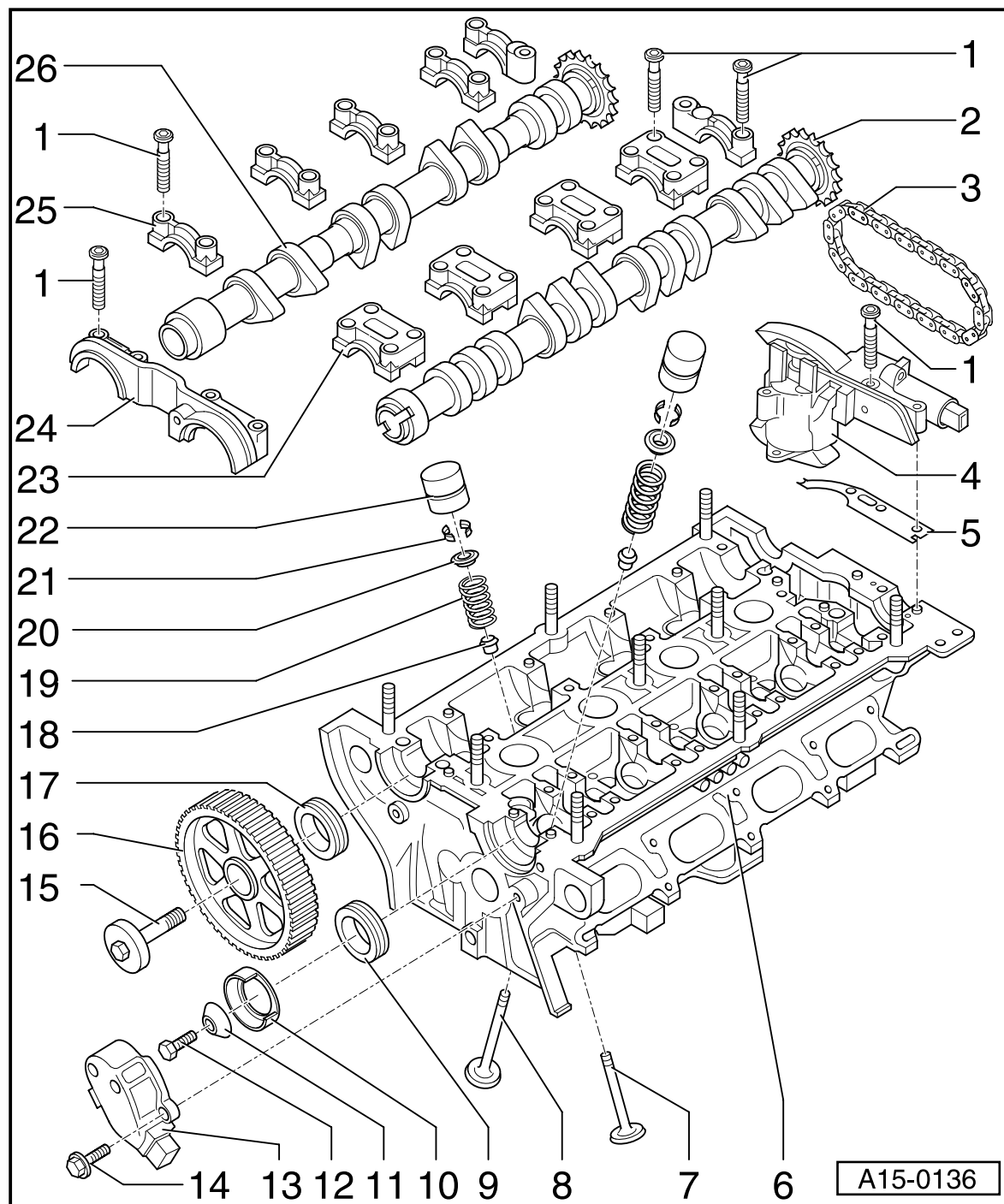
- Interrogate fault memory:
⇒ Motronic Fuel Injection and Ignition System of corresponding engine; Repair Group 01.

Note:

If the fault memory was erased, interrogate fault memory and generate readiness code:

⇒ *Repair Group 01 of corresponding engine - Motronic Fuel Injection and Ignition System.*

Servicing valve gear

**Notes:**

- ♦ Cylinder heads with cracks between the valve seats or between a valve seat ring and the spark plug thread may continue to be used without any reduction in life provided these are slight initial cracks not more than 0.3 mm wide or only the first 4 turns of the spark plug thread are cracked.
- ♦ After installing new bucket tappets, wait about 30 minutes before starting the engine

(otherwise, valves may strike the pistons); after this, rotate crankshaft twice.

- ♦ After working on the valve gear, carefully crank engine at least 2 revolutions to ensure that no valve strikes the piston when engine is started.

1 - 10 Nm

2 - Inlet camshaft

- ◆ runout: max. 0.03...0.05 mm
- ◆ inspecting axial play ⇒ page 15-15
- ◆ removing and installing camshaft ⇒ page 15-16

3 - Drive chain

- ◆ inspecting for wear
- ◆ mark running direction (installed position) before removing ⇒ page 15-16

4 - Camshaft adjuster

- ◆ must be located on dowel sleeves
- ◆ seal the joints between the camshaft adjuster/cylinder head ⇒ Fig. 2
- ◆ removing and installing ⇒ page 15-16
- ◆ inspecting with camshaft adjuster valve -N205- ⇒ Repair Group 28 of corresponding Engine, Fuel injection and Ignition system; Motronic

5 - Rubber metal gasket

- ◆ replacing ⇒ page 15-16

6 - Cylinder head

- ◆ seal joints ⇒ Fig. 1 and Fig. 2
- ◆ removing ⇒ page 15-6
- ◆ check for distortion ⇒ page 15-8
- ◆ reworking ⇒ page 15-8
- ◆ installing ⇒ page 15-9
- ◆ inspecting valve guides, grinding in valve seats ⇒ page 15-31

7 - Outlet valve

- ◆ with sodium filling
- ◆ pay attention to regulation for scraping the valves with sodium filling ⇒ page 15-27
- ◆ do not rework, only grinding in is permissible
- ◆ valve dimensions ⇒ page 15-27
- ◆ inspecting valve guides, grinding in valve seats ⇒ page 15-31

8 - Inlet valve

- ◆ do not rework, only grinding in is permissible
- ◆ valve dimensions ⇒ page 15-27
- ◆ inspecting valve guides, grinding in valve seats ⇒ page 15-31

9 - Seal

- ◆ for inlet camshaft
- ◆ replacing ⇒ page 15-21
- ◆ pay attention to different versions ⇒ page 13-11, Fig. 2

10 - Cover for hall sender

- ◆ assembly is only possible in one position
- ◆ pay attention to installation position: insert notch in the inlet camshaft.

11 - Washer

- ◆ pay attention to installation position:
- ◆ with cone

12 - 25 Nm**13 - Housing for hall sender (G40)****14 - 10 Nm****15 - 65 Nm**

- ◆ use counterholder MP 1-216 for slackening and tightening

16 - Camshaft sprocket

- ◆ for inlet camshaft
- ◆ pay attention to installation position:
- ◆ the small stay on the camshaft sprocket points outwards and the TDC marking is visible on the 1st cylinder.

17 - Seal

- ◆ for outlet camshaft
- ◆ replacing ⇒ page 15-21
- ◆ pay attention to different versions ⇒ page 13-11, Fig. 2

18 - Valve stem seal

- ◆ replacing ⇒ page 15-28

19 - Valve spring

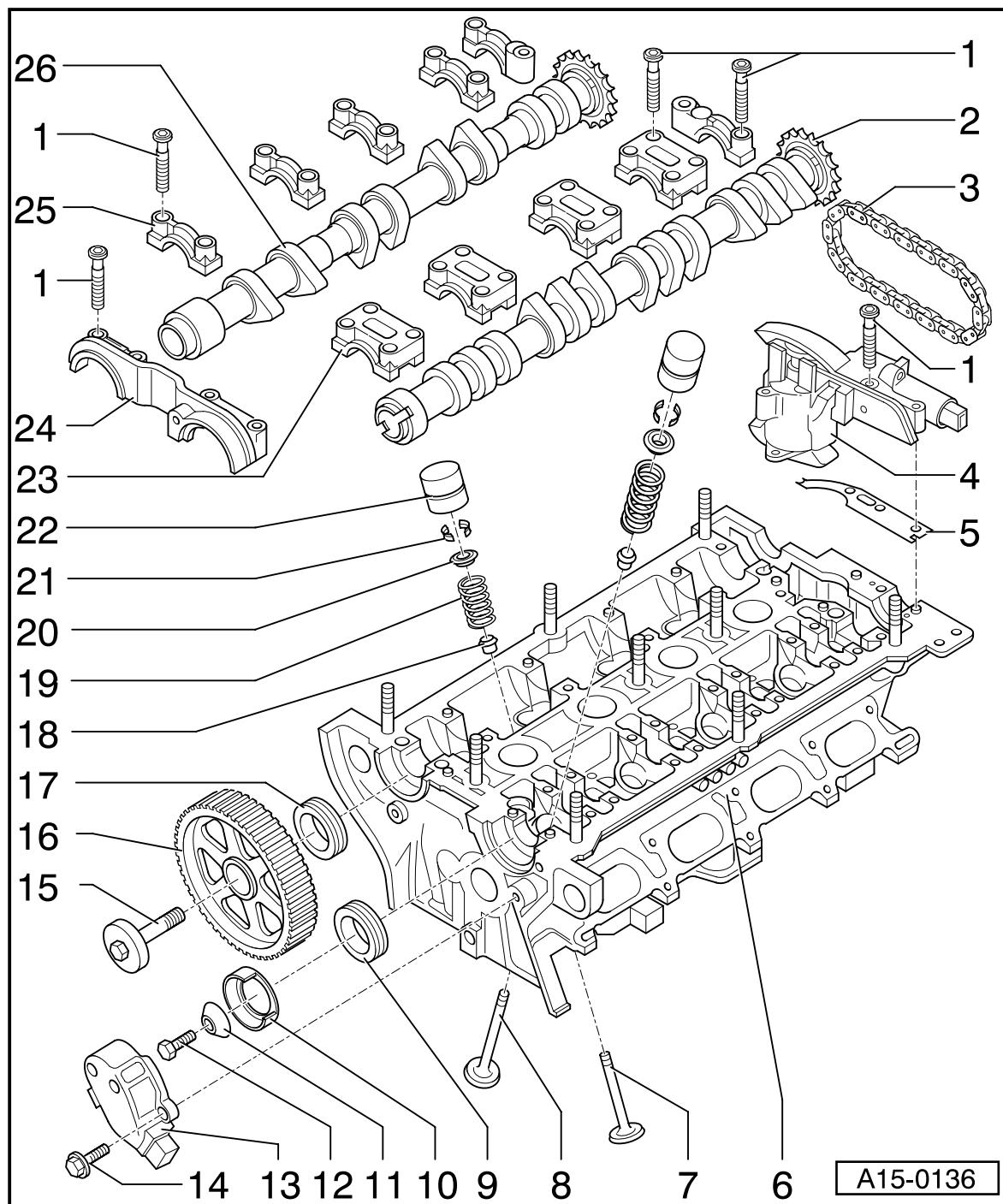
- ◆ removing and installing ⇒ page 15-28

20 - Valve spring retainer**21 - valve collets****22 - Bucket tappet**

- ◆ do not mix up
- ◆ oil contact surface
- ◆ place down with contact surface facing down
- ◆ before installing, inspect axial play of camshaft ⇒ page 15-15
- ◆ inspecting ⇒ page 15-27
- ◆ removing and installing ⇒ page 15-28

23 - Bearing cap/inlet camshaft

- ◆ must be located on dowel sleeves
- ◆ pay attention to installation position
- ◆ installation sequence ⇒ page 15-16

**24 - Double bearing cap**

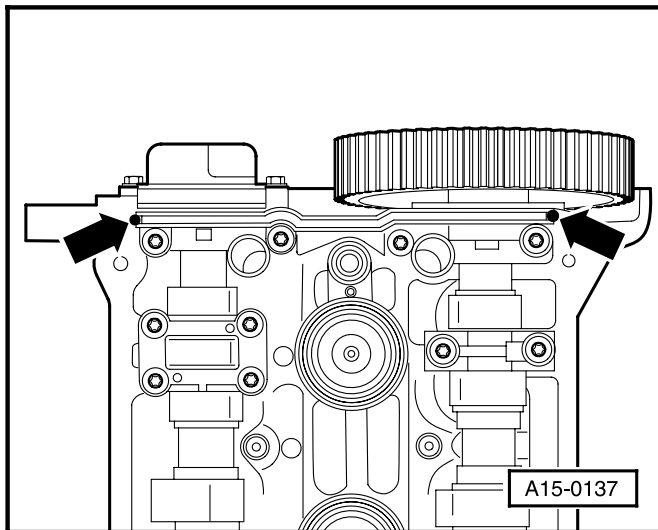
- ◆ must be located on dowel sleeves
- ◆ seal the joints between the double bearing cap/cylinder head ⇒ Fig. 1
- ◆ lightly coat the sealing surfaces with sealant "D 454 300 A2" before installation ⇒ page 15-16

25 - Bearing cap/ outlet camshaft

- ◆ must be located on dowel sleeves
- ◆ pay attention to installation position
- ◆ installation sequence ⇒ page 15-16

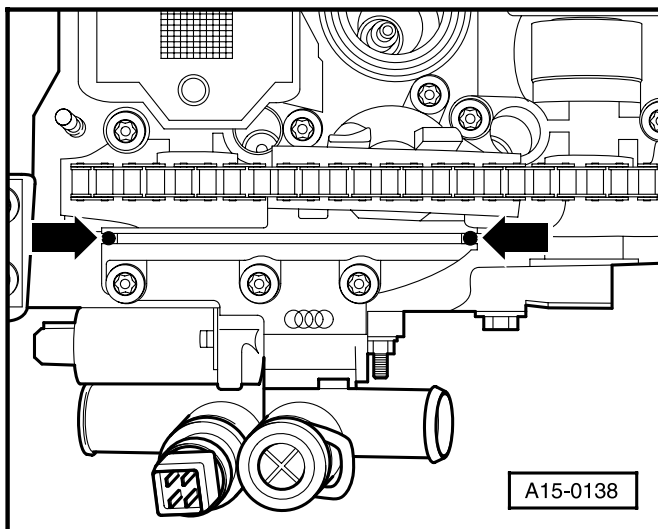
26 - Camshaft

- ◆ runout: max. 0.03...0.05 mm
- ◆ timing ⇒ page 00-1, Engine characteristics
- ◆ inspecting axial play ⇒ page 15-15
- ◆ removing and installing camshafts ⇒ page 15-16



◀ Fig. 1 Sealing connections of double bearing cap/cylinder head

- Use a small screwdriver to carefully apply a thin film of sealants "D 454 300 A2" to the two edges at the sealing surfaces of double bearing cap/cylinder head -arrows-.



◀ Fig. 2 Sealing connections of camshaft adjuster/cylinder head

- Use a small screwdriver to carefully apply a thin film of sealants "D 454 300 A2" to the two edges at the sealing surfaces of camshaft adjuster/cylinder head -arrows-.

Inspecting axial play of camshafts

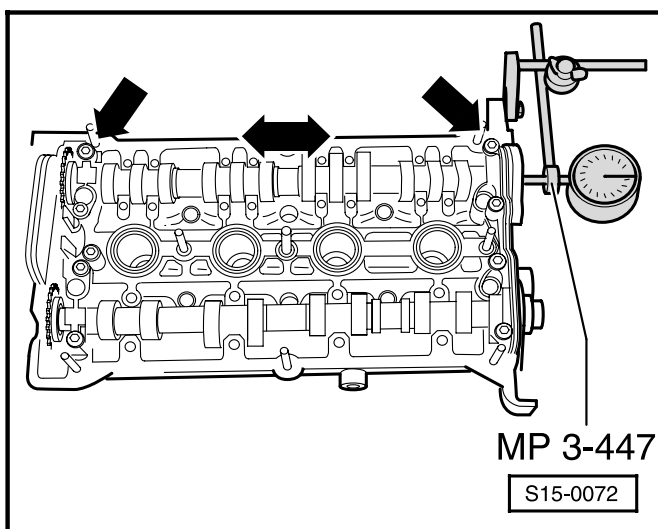
Perform measurement with bucket tappets removed and bearing cap at the chain sprocket side installed and the double bearing cap at the camshaft side installed.

Special tools, testers and aids required

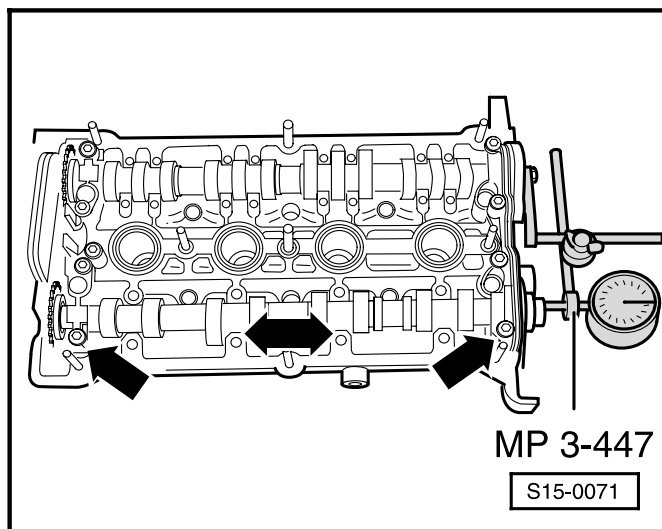
- ♦ Universal dial gauge holder MP 3-447
- ♦ Dial gauge

Inspection procedure

- Attach universal dial gauge holder MP 3-447 and dial gauge to cylinder head:



◀ Inlet camshaft



◀ Inlet camshaft

Wear limit for inlet and intake camshaft

- ◆ Wear limit: max. 0.20 mm

Removing and installing camshafts and camshaft adjuster

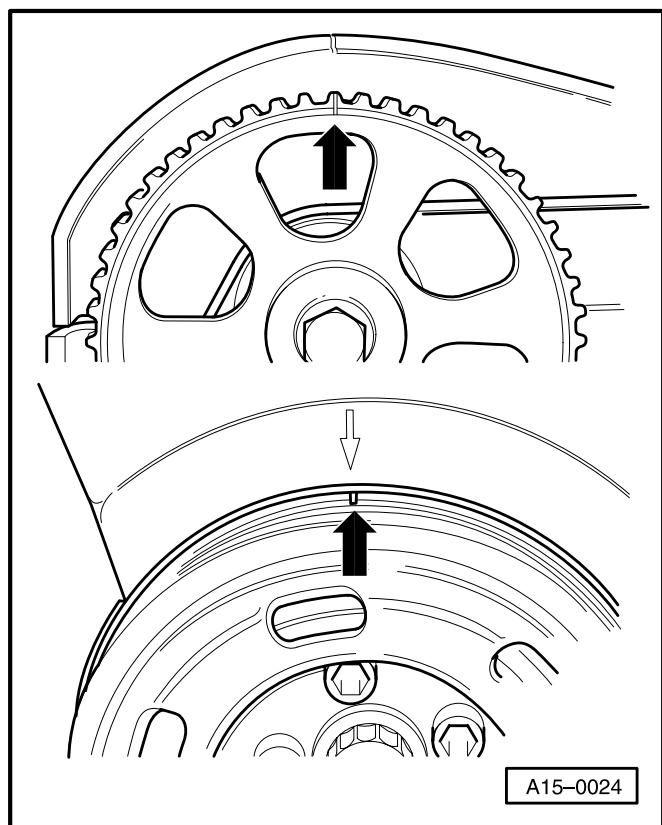
(with cylinder head installed)

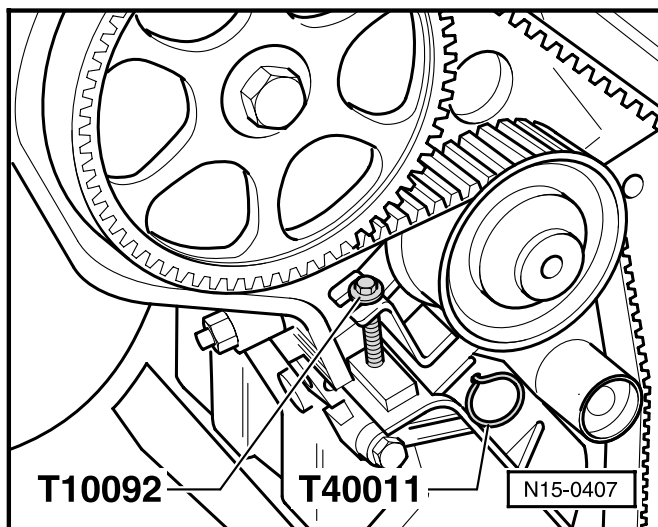
Special tools, testers and aids required

- ◆ Torque wrench
- ◆ Counterholder MP 1-216
- ◆ Holder for the chain tensioner 3366
- ◆ Safety drift e.g. T 40011
- ◆ Tensioning screw T 10092
- ◆ Sealant D 454 300 A2

Removing

- Remove v-ribbed belt and tensioning device
⇒ page 13-1
- Remove top part of toothed belt guard.
- ◀ - Rotate crankshaft at central bolt of crankshaft timing belt sprocket in direction of rotation of engine and position to TDC marking of cylinder 1 -arrows-.
- Removing cylinder head cover
⇒ page 15-2.

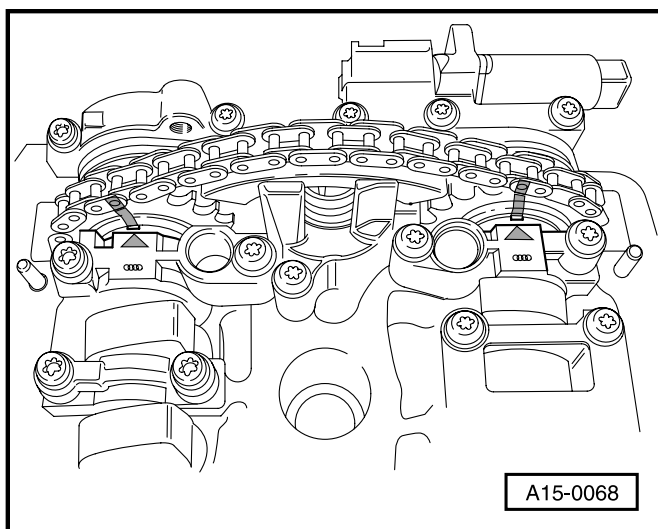
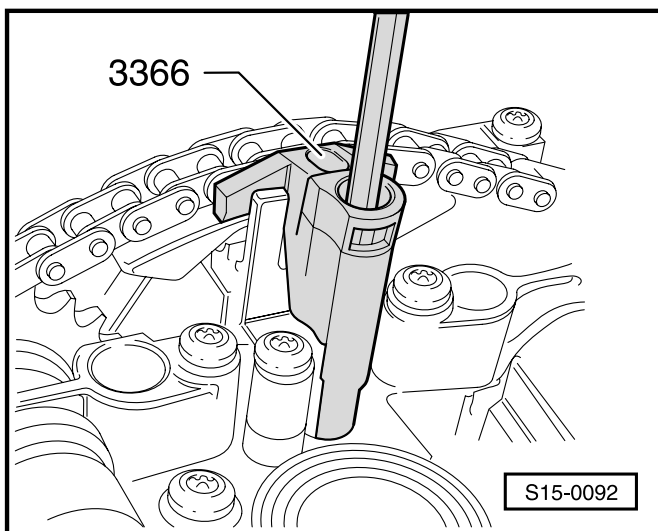




- ◀ - Screw tensioning bolt T 10092 into the toothed belt tensioning device.
- Tension pressure plunger of tensioning device only sufficiently to allow the pressure plunger to be secured with a locking pin (e.g. T 40011).
- Take toothed belt off camshaft sprocket.
- Slacken camshaft sprocket (use counter-holder MP 1-216).
- Pull off camshaft sprocket.
- Remove housing of Hall sender.
- Remove rotor and orifice plate of Hall sender.
- ◀ - Secure camshaft adjuster with holder for chain tensioner 3366.

Note:

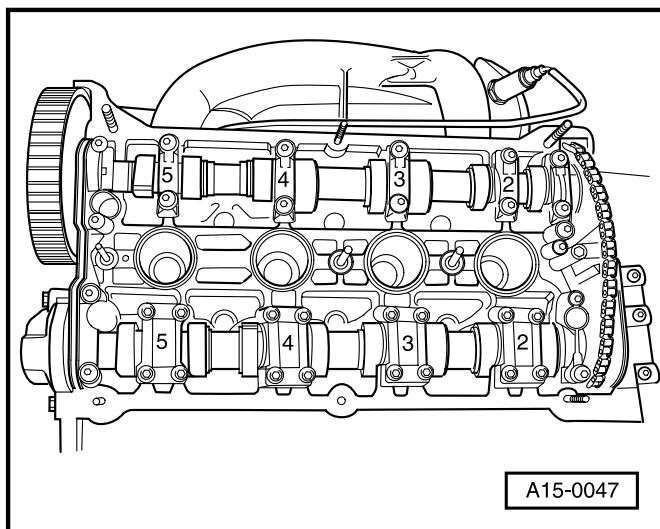
If the holder of the chain tensioner is tightened excessively, the camshaft adjuster may be damaged.



- ◀ - Clean drive chain and chain sprockets of the camshafts opposite the two arrows on the bearing caps and mark installation position with the coloured marking.
- ◆ The distance between the two arrows or coloured markings is 16 rollers on the drive chain.

Note:

Do not use a chisel punch, notch or similar to mark the chain!

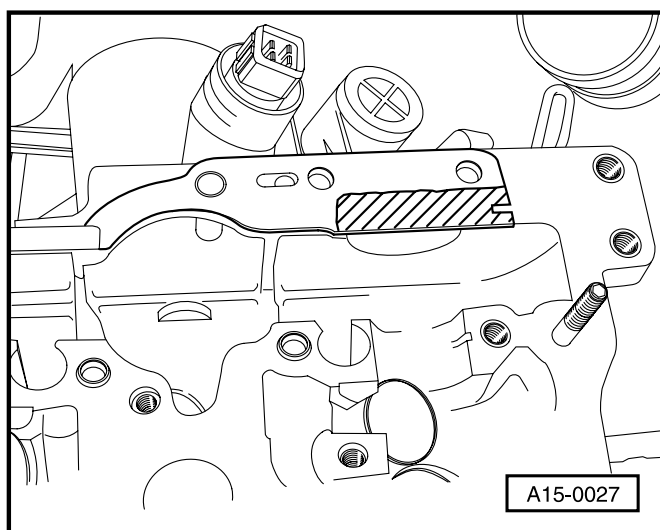


- ◀ - First of all remove bearing caps 3 and 5 of the inlet camshaft and exhaust camshaft.
- Remove double bearing cap.
- Remove the two bearing caps at the chain sprockets of the inlet camshaft and exhaust camshaft.
- Unscrew the bolts attaching the camshaft adjuster.
- Slacken bearing caps 2 and 4 of the inlet camshaft and exhaust camshaft alternately diagonally across, and remove.
- Remove inlet camshaft and exhaust camshaft together with camshaft adjuster.

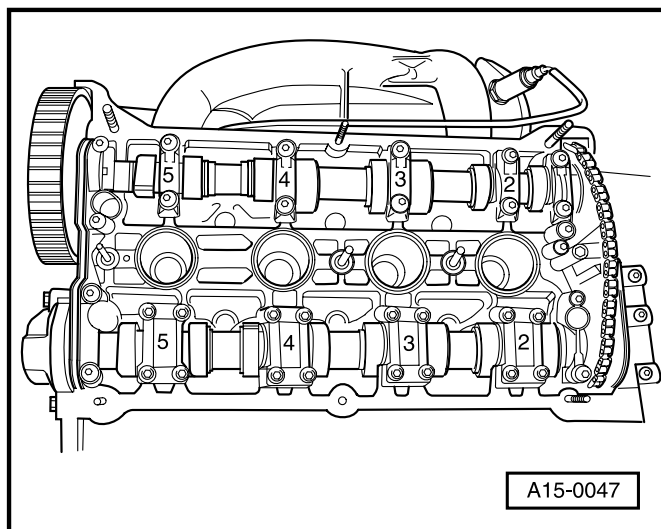
Installing

Notes:

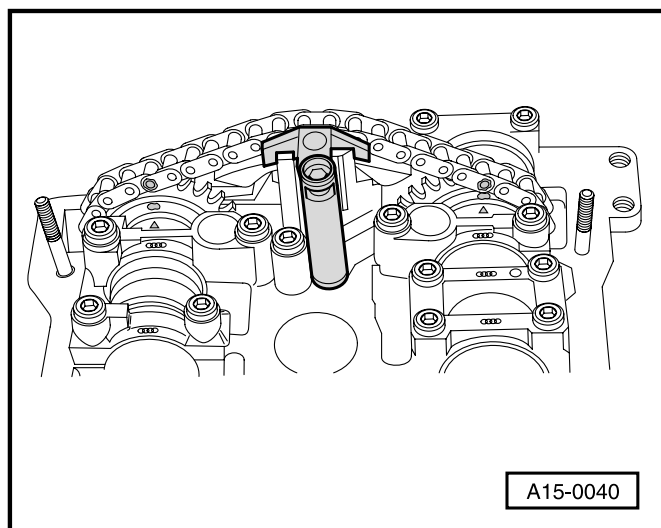
- ♦ When installing the camshafts, the cams of cylinder 1 must be facing up.
- ♦ When installing the bearing caps, ensure that the marking of the caps is legible from the inlet side of the cylinder head.
- Fit drive chain onto both camshafts according to the coloured marking.
- ♦ The distance between the two arrows of the coloured markings is 16 rollers on the drive chain.



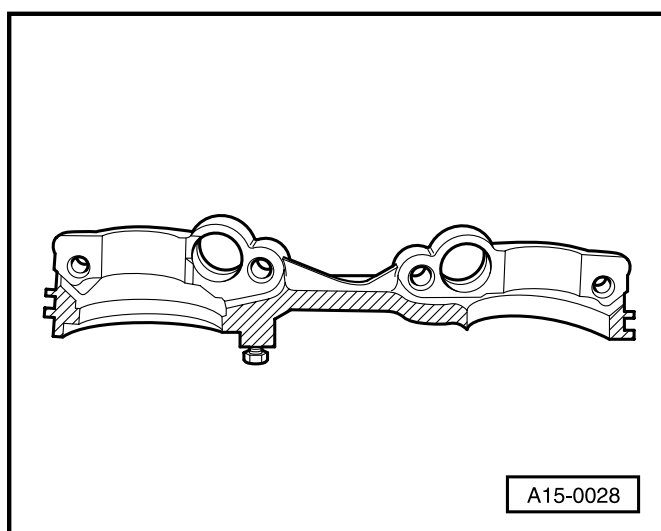
- ◀ - Replace rubber-metal gasket for camshaft adjuster and apply a thin coat of sealant "D 454 300 A2" to the shaded area.
- Push in camshaft adjuster between drive chain.
- Oil contact surfaces of camshafts.
- Insert camshafts with drive chain and camshaft adjuster into the cylinder head.
- Tighten camshaft adjuster to a final torque of 10 Nm (pay attention to dowel sleeves).



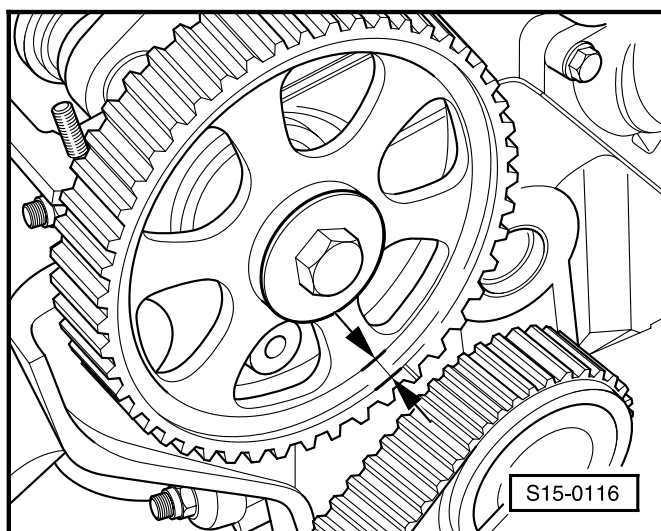
- Initially tighten bearing caps 2 and 4 of the inlet camshaft and exhaust camshaft alternately diagonally across, and tighten to a final torque of 10 Nm (pay attention to dowel sleeves).



- Install the two bearing caps at the chain sprockets of the inlet camshaft and exhaust camshaft. Inspect correct setting of camshafts and tighten bearing caps to a final torque of 10 Nm (pay attention to dowel sleeves).
- Remove holder for chain tensioner 3366.



- Apply a thin coat of sealant "D 454 300 A2" to shaded area of double bearing cap, install and tighten to a final torque of 10 Nm (pay attention to dowel sleeves).
- Install the remaining bearing caps and likewise tighten to a final torque of 10 Nm (pay attention to dowel sleeves).
- Replace seal for inlet camshaft and exhaust camshaft, install ⇒ page 15-21.

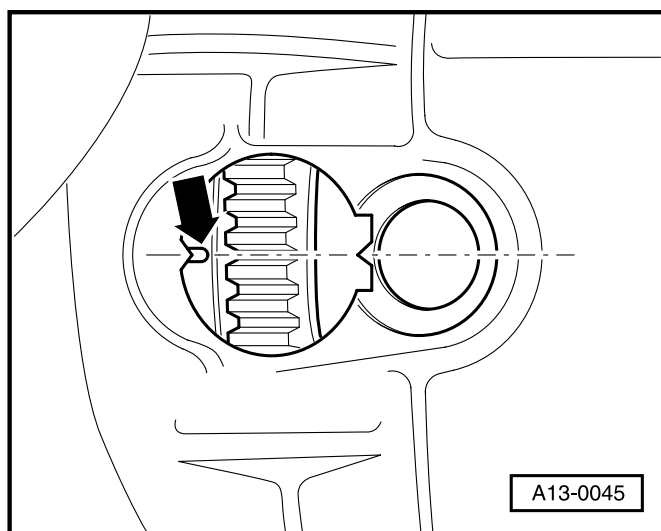
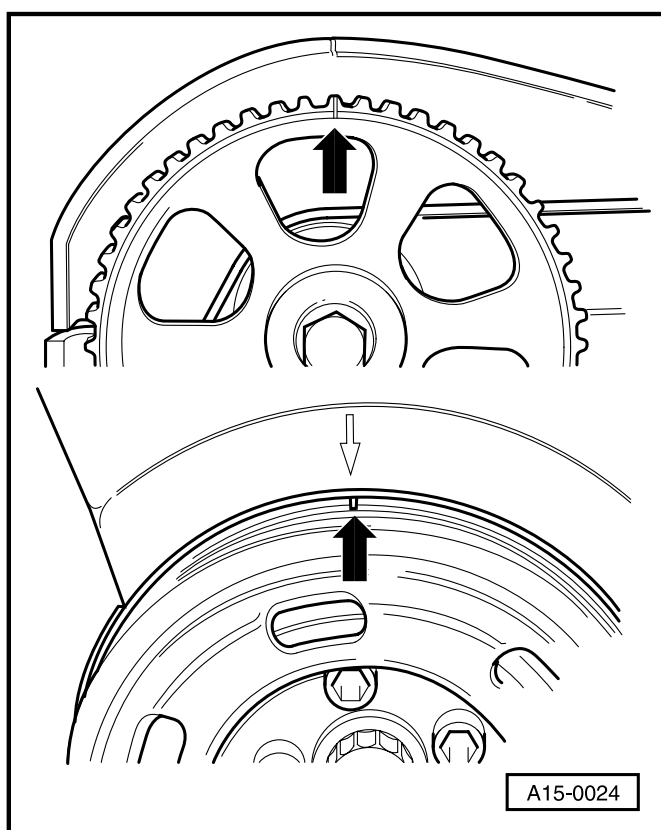


- ◀ - Install camshaft sprocket.
 - ◆ Pay attention to installation position:
The narrow web of the camshaft sprocket points out -arrows- and the TDC marking of cyl. 1 is visible.
- Install the bolt for attaching camshaft sprocket and tighten to 65 Nm (use counterholder MP 1-216).
- Insert orifice plate for Hall sender with the notch engaging in the inlet camshaft.
- Install washer (with taper facing out) and tighten the securing bolt to 25 Nm.
- Install housing for Hall sender and tighten to 10 Nm.
- Install cylinder head cover ⇒ page 15-2.
- ◀ - Align marking on camshaft sprocket with marking on cylinder head cover.

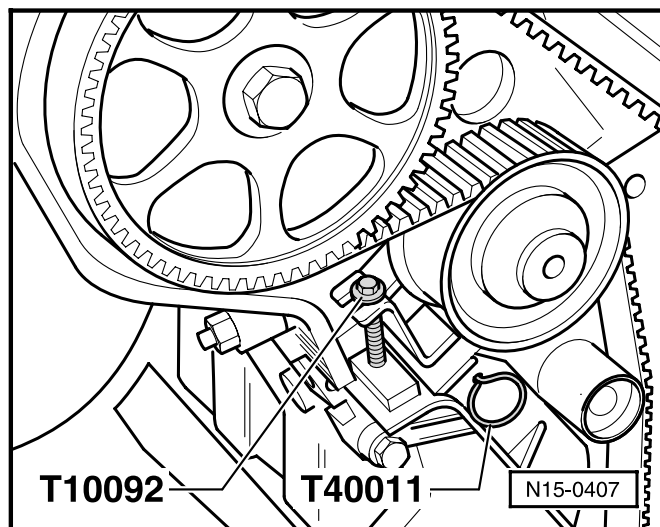
Note:

When the camshaft is rotated, the valves may strike the pistons if they are positioned at TDC. For this reason, the pistons must not be positioned at TDC. Risk of damage to valves and pistons.

- Align marking on vibration damper with marking on bottom part of toothed belt guard.



- ◀ - Inspect whether TDC marking on flywheel and reference mark are aligned -arrows-.
- Fit toothed belt onto the camshaft sprocket.



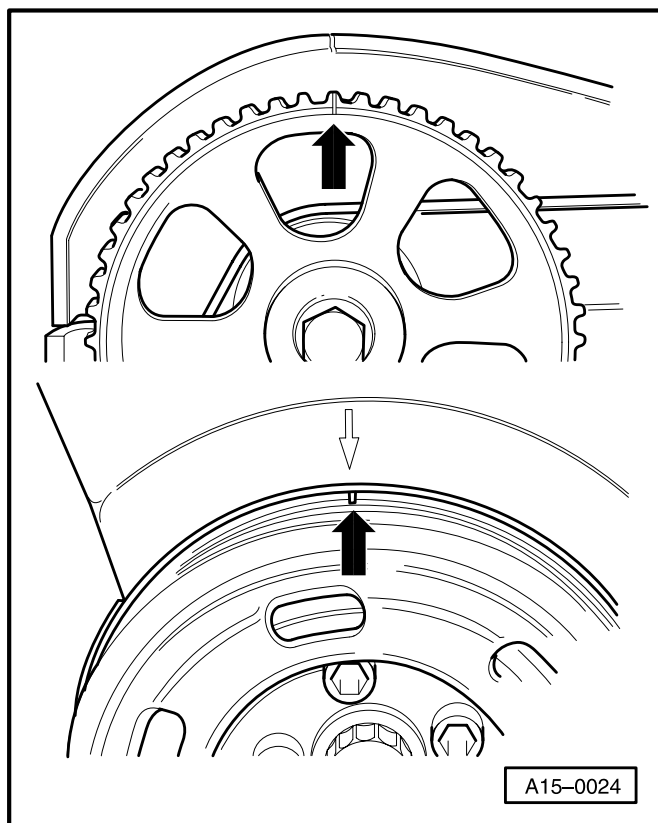
- ◀ - Pull out locking pin and relieve tension of pressure plunger of toothed belt tensioning device. Unscrew tensioning bolt.
- Rotate crankshaft twice in direction of rotation of engine, position again to TDC and check setting.
- Install top part of toothed belt guard.
- Install ribbed V-belt and tensioning device
⇒ page 13-1.

Notes:

- ◆ After installing the camshafts, wait about 30 minutes before starting the engine. The hydraulic valve clearance compensation elements must settle (otherwise valves will strike the pistons).
- ◆ After carrying out work on the valve gear, carefully crank engine at least 2 revolutions to ensure that no valve strikes a piston when the engine is started.

Replacing seals for camshafts**Special tools, testers and aids required**

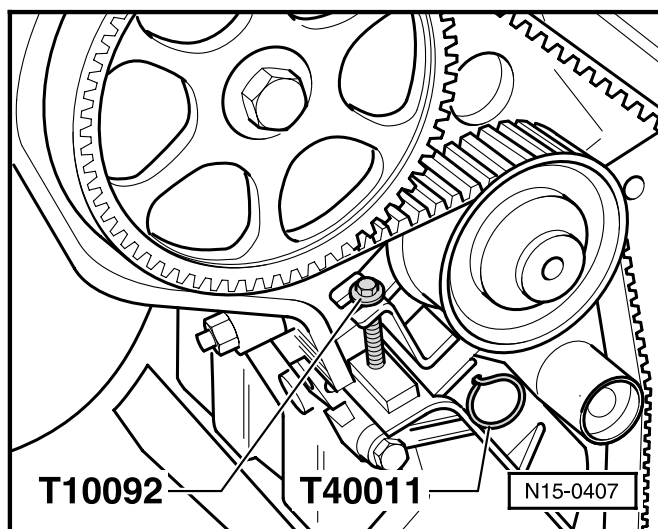
- ◆ Seal extractor MP 1-215
- ◆ Bolt MP 1-215/1
- ◆ Counterholder MP 1-216
- ◆ Pressure sleeve MP 1-228/1
- ◆ Guide sleeve MP 1-228/2
- ◆ Pressure sleeve T1007 1/3
- ◆ Guide sleeve T10071/1
- ◆ Bolt MP 1-228/3
- ◆ Bolt MP 1-228/5
- ◆ Locking pin, e.g. T40011
- ◆ Tensioning bolt T 10092



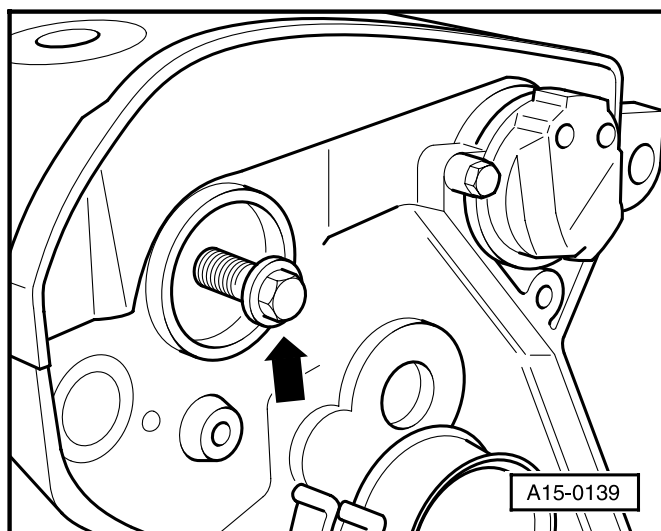
Replacing seal for exhaust camshaft

Removing

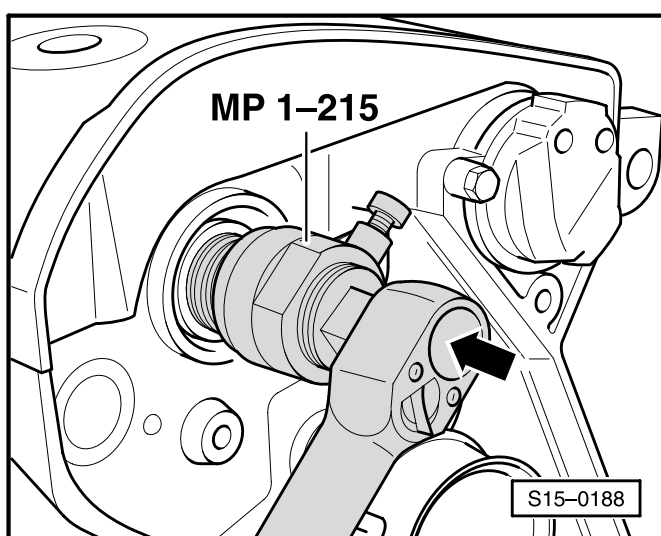
- Remove ribbed V-belt and tensioning device
⇒ page 13-1.
- Remove top part of toothed belt guard.
- ◀ - Rotate crankshaft at the central bolt of the crankshaft toothed belt sprocket in direction of rotation of engine and position to TDC marking of cylinder 1 -arrows-.



- ◀ - Screw tensioning bolt T 10092 into the toothed belt tensioning device.
- Tension pressure plunger of tensioning device only sufficiently to allow the pressure plunger to be secured with a locking pin (e.g. T 40011).
- Take toothed belt off camshaft sprocket.
- Slacken camshaft sprocket (use counter-holder MP 1-216).
- Pull off camshaft sprocket.

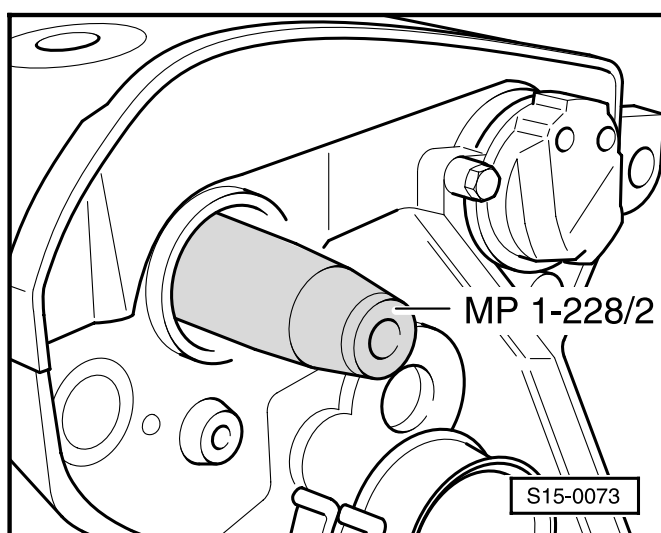


- ◀ - Screw bolt for attaching camshaft sprocket -arrow- by hand into the camshaft as far as the stop in order to guide the seal extractor.
- Turn inner part of seal extractor MP 1-215 two turns (about 3 mm) out of the outer part, and lock with knurled screw.

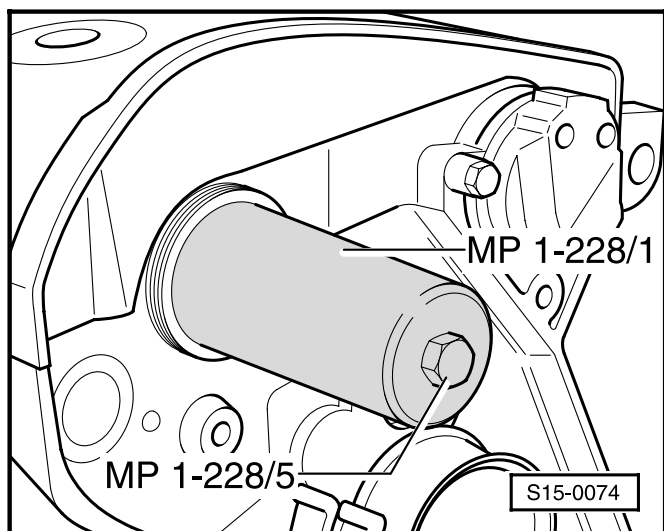


- ◀ - Oil threaded head of seal extractor MP 1-215, fit on and screw as far as possible into the seal using considerable pressure.
- Slacken knurled screw and turn inner part of the seal extractor against the camshaft until the seal is pulled out.

Installing elastomer seal



- Lightly oil sealing lip of seal.
- ◀ - Fit guide sleeve MP 1-228/2 onto the camshaft journal.
- Push seal over guide sleeve.

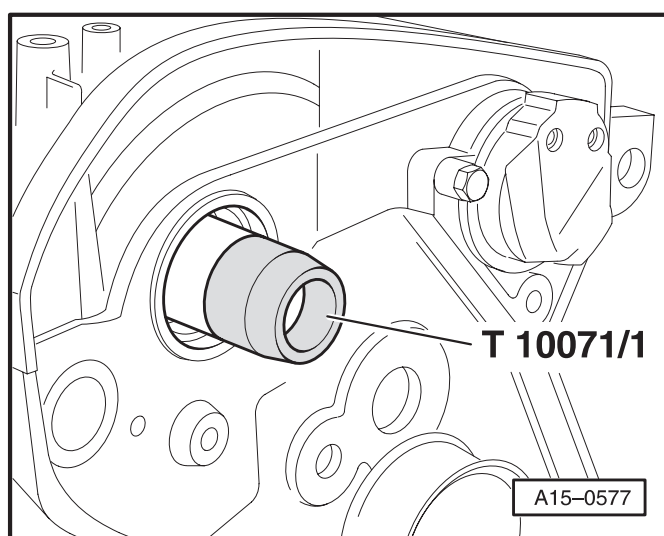


- ◀ - Use thrust sleeve MP 1-228/1 to press in seal as far as the stop. Use bolt MP 1-228/5.

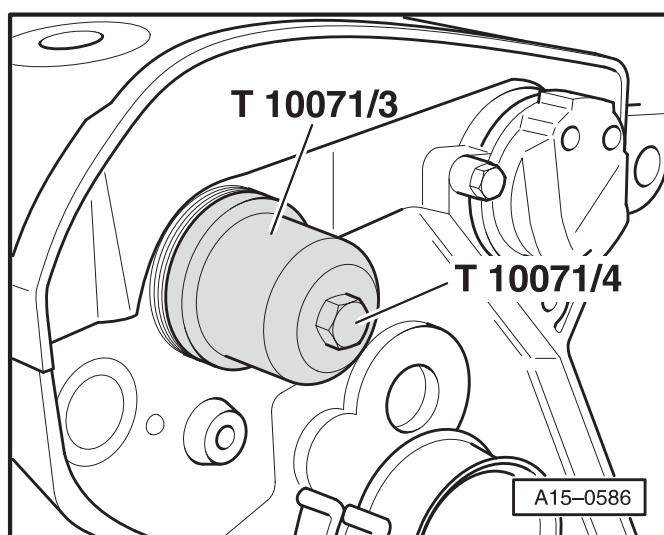
Installing PTFE seal

Note:

Do not oil sealing lips of the seal.

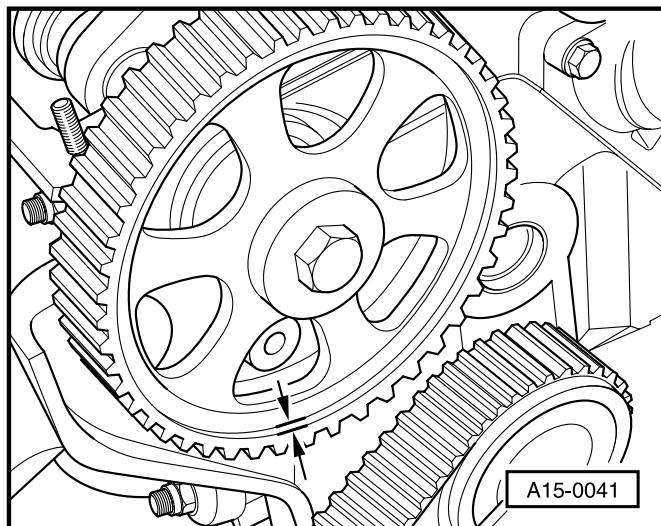


- Use a clean cloth to remove oil residues on the camshaft journal.
- ◀ - Fit guide sleeve T10071/1 onto the camshaft journal.
- Fit seal over guide sleeve onto the camshaft journal and take off sleeve.

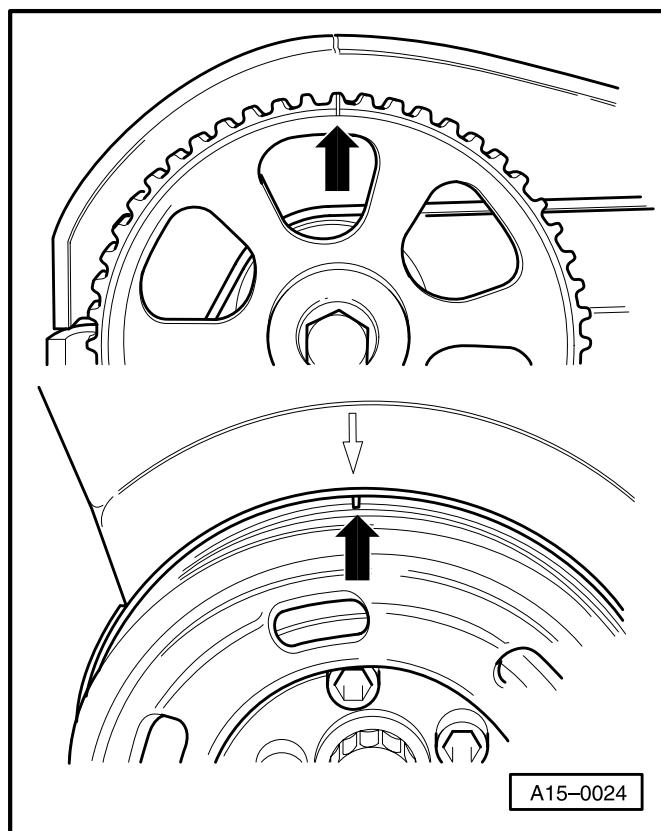


- ◀ - Use thrust sleeve T10071/3 and bolt T10071/4 to press in seal as far as the stop.

Continued for both versions



- ◀ - Install camshaft sprocket.
 - ◆ Pay attention to installation position: the narrow web of the camshaft sprocket points out -arrows- and the TDC marking of cyl. 1 is visible.
- Install bolt attaching camshaft sprocket and tighten to 65 Nm (use counterholder MP 1-216).

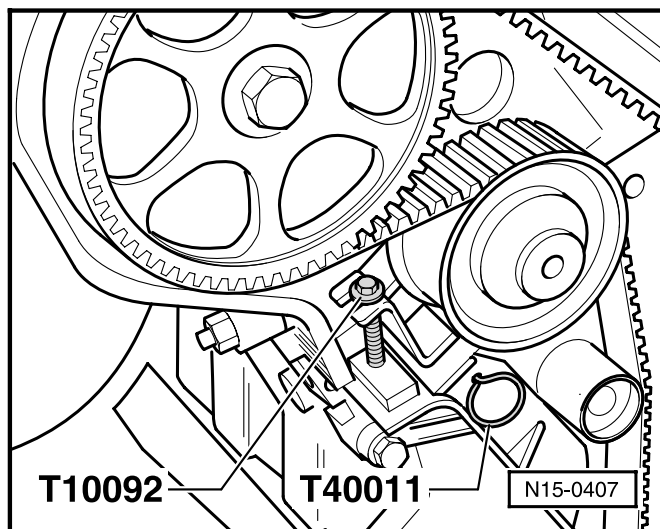


- ◀ - Align marking on camshaft sprocket and marking on cylinder head cover.
- Align marking on vibration damper and marking on bottom part of toothed belt guard.

Note:

When the camshaft is rotated, the valves may strike the pistons if they are positioned at TDC. Risk of damage to valves and pistons.

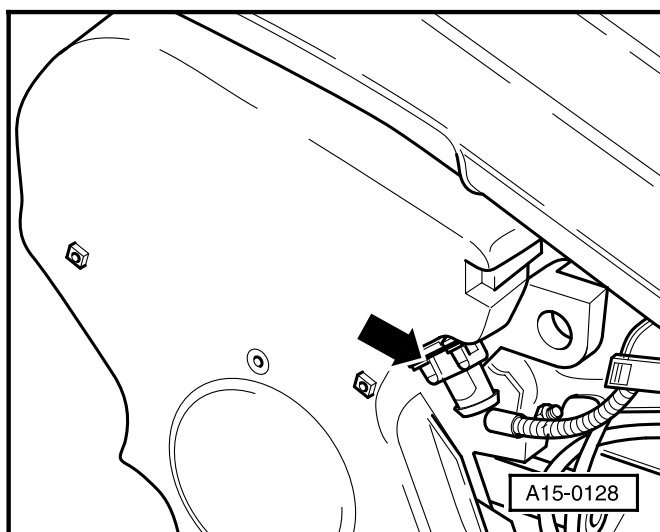
- Fit toothed belt onto camshaft sprocket.



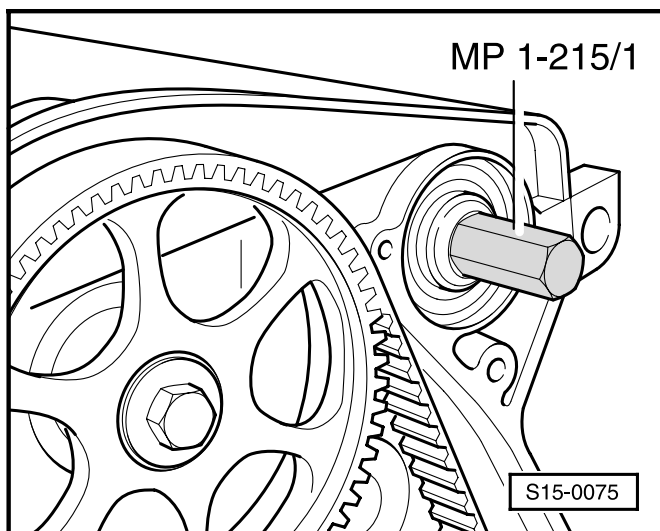
- ◀ - Pull out locking pin and relieve tension of pressure plunger of toothed belt tensioning device. Unscrew tensioning bolt.
- Rotate crankshaft twice in direction of rotation of engine, position again to TDC and check setting.
- Install top part of toothed belt guard.
- Install ribbed V-belt and tensioning device ⇒ page 13-1.

Replacing seal of inlet camshaft

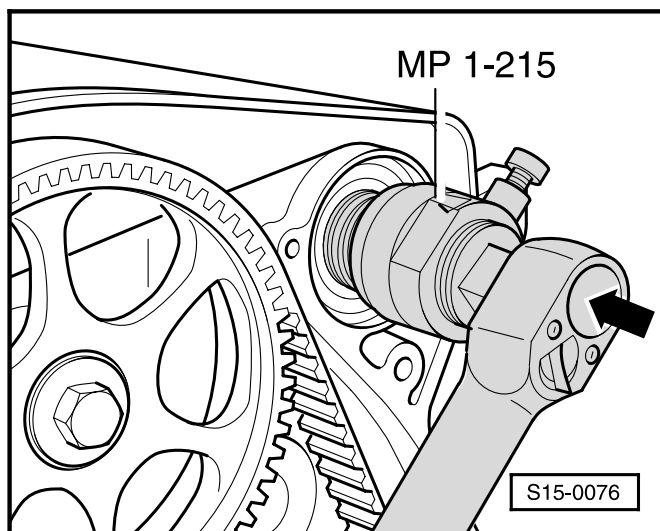
Removing



- Take off ribbed V-belt ⇒ page 13-1.
- ◀ - Unplug connector of Hall sender (G40) -arrow-.
- Remove top part of toothed belt guard.
- Remove housing of Hall sender.
- Remove rotor and orifice plate of Hall sender.

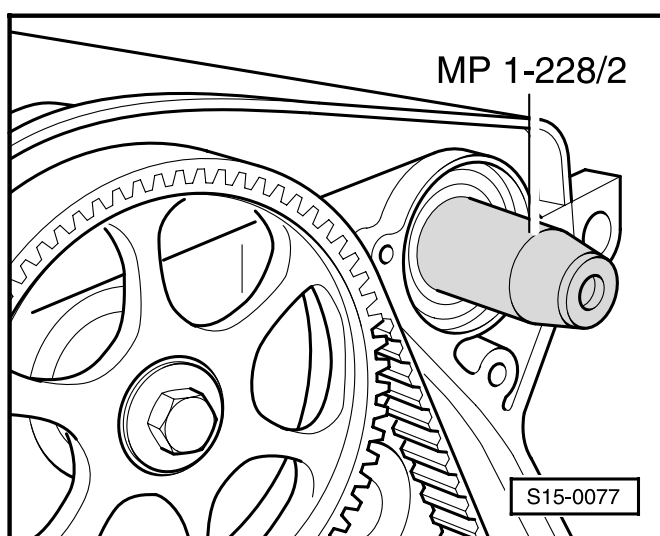


- ◀ - As a guide for the seal extractor, screw bolt MP 1-215/1 by hand into the camshaft as far as the stop.
- Turn inner part of seal extractor MP 1-215 out of the outer part two turns (about 3 mm) and lock with knurled screw.

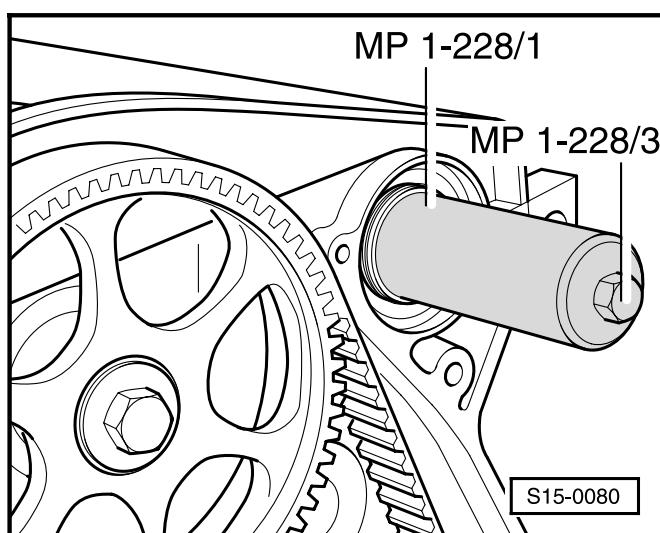


- ◀ - Oil threaded head of seal extractor MP 1-215, fit on and screw as far as possible into the seal using considerable force.
- Slacken knurled screw and turn inner part of the seal extractor against the camshaft until the seal is pulled out.

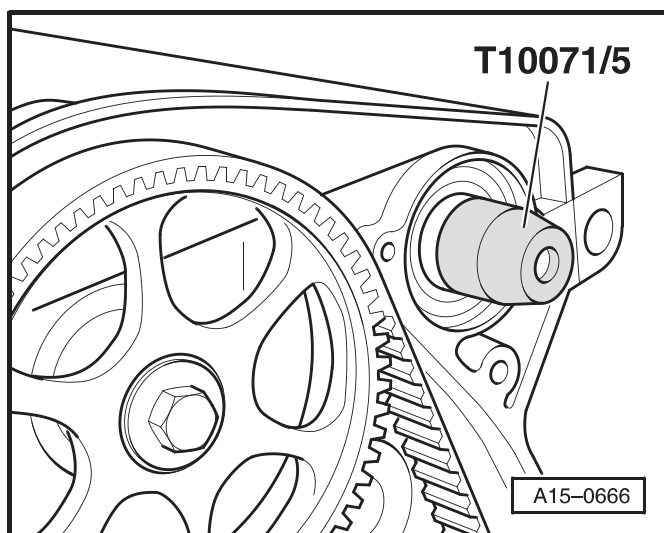
Installing elastomer seal



- Lightly oil sealing lip of seal.
- ◀ - Fit guide sleeve MP 1-228/2 onto the camshaft journal.
- Push seal over guide sleeve.



- ◀ - Use thrust sleeve MP 1-228/1 to press in seal as far as the stop. Use bolt MP 1-228/3.

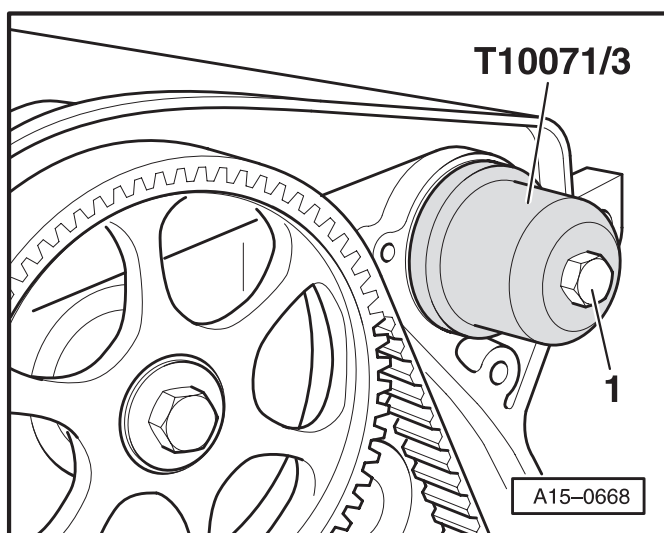


Installing PTFE seal

Note:

Do not oil sealing lips of the seal.

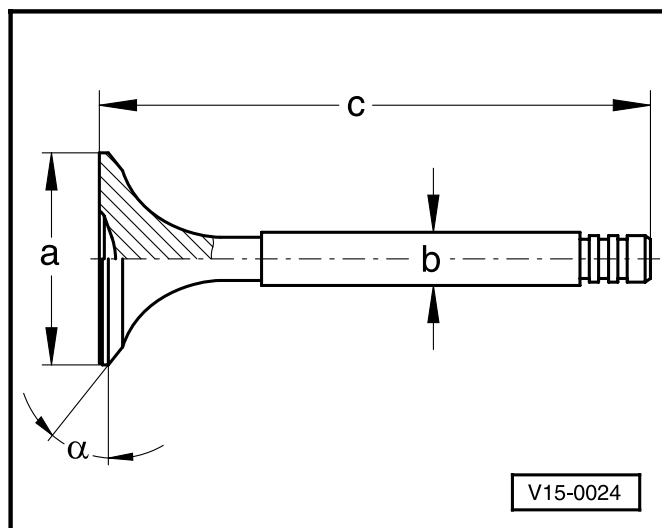
- Use a clean cloth to remove oil residues on the camshaft journal.
- ◀ - Fit guide sleeve T10071/6 onto the camshaft journal.
- Fit seal over guide sleeve onto the camshaft journal and take off sleeve.



- ◀ - Use thrust sleeve T10071/3 and M8x60 bolt to press in seal as far as the stop.

Continued for both versions

- Insert orifice plate for Hall sender with notch into the inlet camshaft.
- Install disc (with tapered side facing out) and tighten securing bolt to 25 Nm.
- Install housing for Hall sender and tighten to 10 Nm.
- Install top part of toothed belt guard.
- Plug in connector of Hall sender.
- Install ribbed V-belt ⇒ page 13-1.



Valve dimensions

Dimensions for inlet and exhaust valves

Note:

Inlet and exhaust valves must not be reworked. It is only permissible to grind them in.

Dimension		Inlet valve	Exhaust valve
$\varnothing a$	mm	26.80 ... 27.00	29.80 ... 30.00
$\varnothing b$	mm	5.95 ... 5.97	5.94... 5.95
c	mm	104.84...105.34	103.64...104.14
α	$^{\circ}$	45	45

Instruction for scrapping exhaust valves

Important!

Worn exhaust valves filled with sodium must not simply be disposed of as normal scrap.

The valves have to be sawn into two parts with a hacksaw between the centre of the stem and the valve disc. They must not come into contact with water when carrying out this step. Once the valves have been cut in this way, place not more than ten into a bucket filled with water. Then, stand back as a sudden chemical reaction takes place in which the sodium in the valves combusts.

Valves which have been treated in this way can then be disposed of with normal scrap.

Inspecting hydraulic bucket tappets

Notes:

- ◆ *Always replace bucket tappets 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 (otherwise, valves may strike the pistons); after this, rotate crankshaft twice.*
- ◆ *After carrying out work on the valve gear, carefully crank engine at least 2 revolutions to ensure that no valve strikes a piston when the engine is started.*

Special tools, testers and aids required

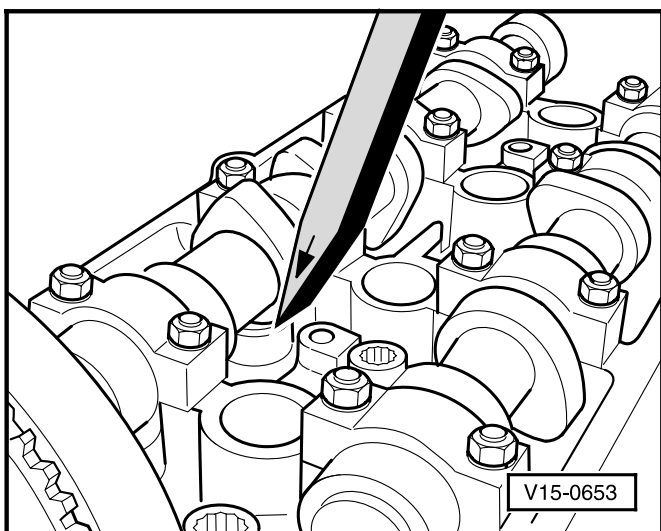
- ◆ Feeler gauge
- ◆ Wooden or plastic wedge

Inspection procedure

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

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

- Remove cylinder head cover ⇒ page 15-2.
- Rotate crankshaft at the central bolt of the crankshaft toothed belt sprocket in clockwise direction until the cams of the bucket tappets to be inspected are facing up.



- ◀ - Use a wooden or plastic wedge to press down the bucket tappet. If an idle travel of more than 0.20 mm exists, replace bucket tappet.

Replacing valve stem seals

(cylinder head installed)

Special tools, testers and aids required

- ◆ Pressure hose MP 1-210
- ◆ Assembly lever MP 1-211 with thrust piece
- ◆ Assembly device MP 1-213

- ◆ Valve depressor MP 1-229
- ◆ Thrust piece MP 1-229/1
- ◆ Puller MP 1-230
- ◆ Fitting tool MP 1-233
- ◆ Spark plug wrench

Removing

- Remove camshafts ⇒ page 15-16.
- Remove bucket tappets (do not mix up) and place down with the running surface facing down.
- Use spark plug wrench to remove spark plugs.
- Position piston of the relevant cylinder to „bottom dead centre“.

Exhaust side

- ◀ - Insert assembly device MP 1-213 and set bearing to height of stud bolt.

Note:

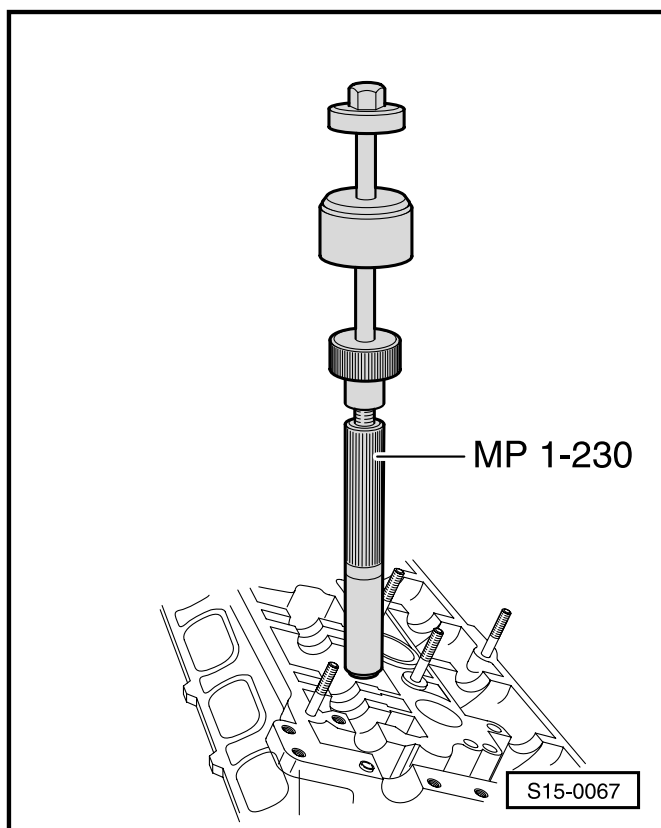
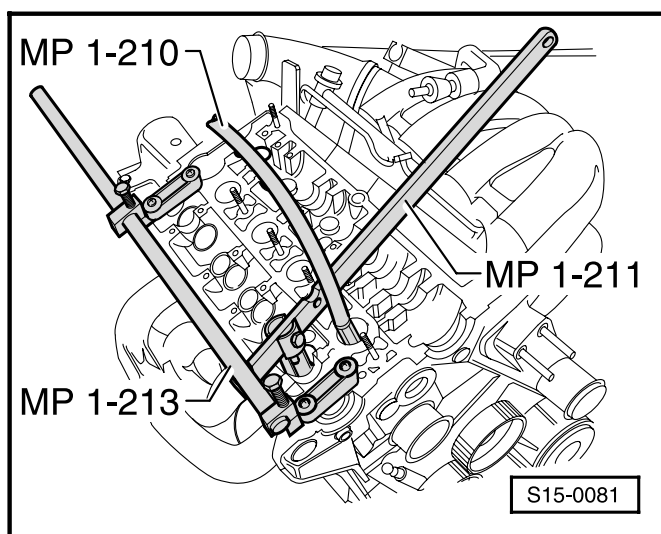
The rear stud bolts on the exhaust side should be unscrewed in order to install the assembly device MP 1-213 on the exhaust side.

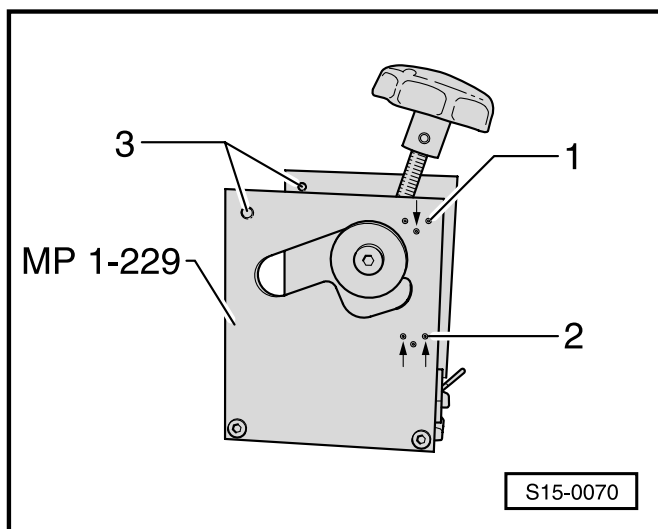
- Screw pressure hose MP 1-210 into the spark plug thread and apply a constant pressure at least 0.6 MPa
- Use assembly lever and thrust piece MP 1-211 to remove valve springs.

Note:

If valve collets are tight, detach with light blows from a hammer on the assembly lever.

- ◀ - Use puller MP 1-230 to pull off valve stem seals.

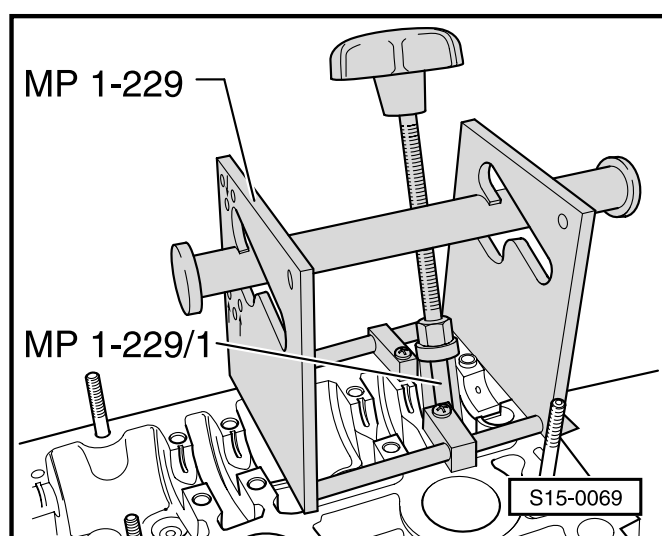




Inlet side

◀ The inlet valves have a different installation angle in the cylinder head. The valve depressor MP 1-229 has two different positions:

- ◆ 1 - Top position for centre inlet valve
- ◆ 2 - Bottom position, for the two outer inlet valves
- ◆ 3 - Threaded holes on left and right into which an M6x25 bolt is inserted which is used for attaching the valve depressor to the cylinder head.



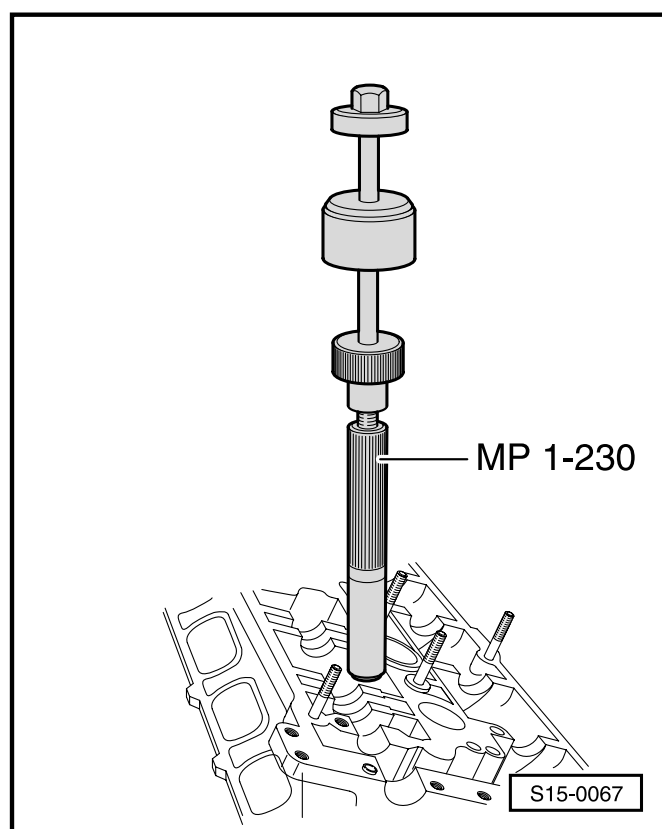
◀ - Attach valve depressor MP 1-229 on the inlet side to the cylinder head using the two M6x25 bolts.

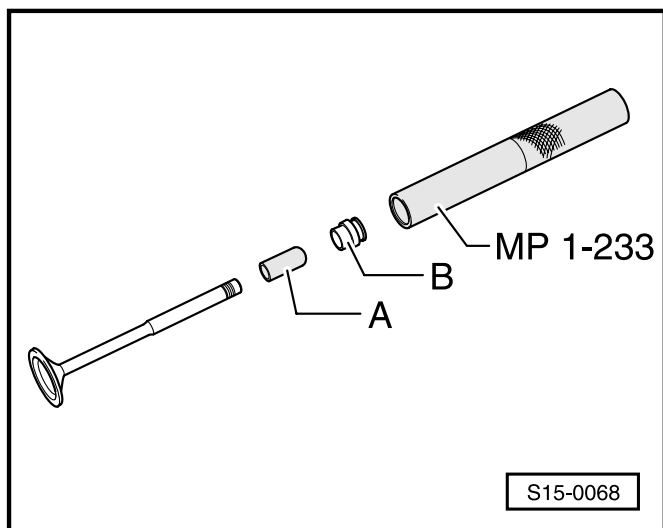
- Screw pressure hose MP 1-210 into the spark plug thread and apply a constant pressure at least 0.6 MPa
- Set position for the corresponding inlet valve.
- Use threaded spindle and thrust piece MP 1-229/1 to press valve springs down and remove.

Note:

If valve collets are tight, detach with light blows with a hammer.

◀ - Use puller MP 1-230 to pull off valve stem seals.





Installing (inlet and exhaust side)

- ◀ - Fit plastic sleeve -A- onto the valve stem in order to avoid damage to the new valve stem seals.
- Apply a light film of oil to the sealing lip of the valve stem seal.
- Insert valve stem seal -B- into the insertion tool MP 1-233 and carefully push onto the valve guide.

Note:

When replacing the inlet and exhaust valves, lightly oil valve stem before installing.

- Install camshafts ⇒ page 15-16.

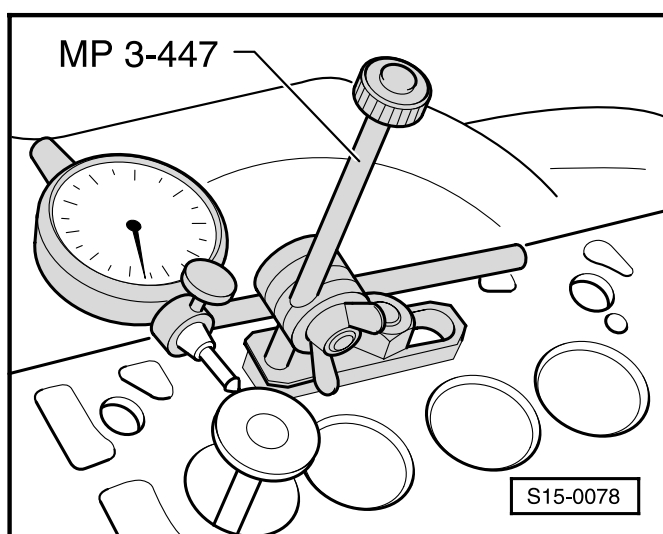
Notes:

- ◆ *After installing the camshafts, wait about 30 minutes before starting the engine to allow the hydraulic valve clearance compensation elements to settle (otherwise, the valves will strike the pistons).*
- ◆ *After carrying out work on the valve gear, carefully crank engine for at least 2 revolutions to ensure that no valve strikes a piston when the engine is started.*

Inspecting valve guides

Special tools, testers and aids required

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



- ◀ - Insert valve into guide. Valve stem end should be flush with guide.
- Determine valve rock.

Wear limit

Inlet valve guide	Exhaust valve guide
0.80 mm	0.80 mm

Notes:

- ♦ If the wear limit is exceeded, repeat measurement with new valves. If the wear limit is still exceeded, replace cylinder head.
- ♦ If the valve is replaced when carrying out repairs, use new valve for the measurement.

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

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

Notes:

- ♦ When repairing 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 to obtain a perfect contact pattern. Before reworking, calculate the maximum permissible reworking dimension. If the reworking dimension is exceeded, proper operation of the hydraulic valve clearance compensation is no longer assured. In this case, replace the cylinder head.

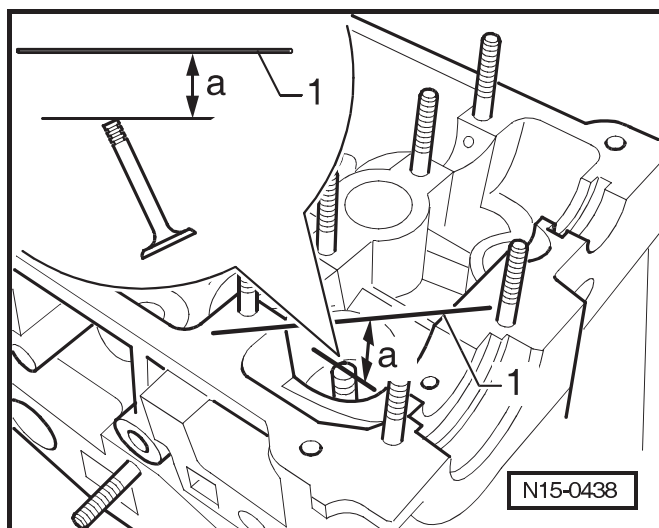
Calculating maximum permissible reworking dimension

- Insert valve and press firmly against the valve seat.

Note:

If the valve is replaced when carrying out repairs, use new valve for the measurement.

- ◀ - Measure distance -a- between end of valve stem and top edge of cylinder head -1-.



- Calculate maximum permissible reworking dimension from the distance -a- measured and from the minimum dimension.

Minimum dimension:

Inlet valves on outside 31.0 mm

Inlet valve in middle 32.3 mm

Exhaust valve 31.9 mm

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

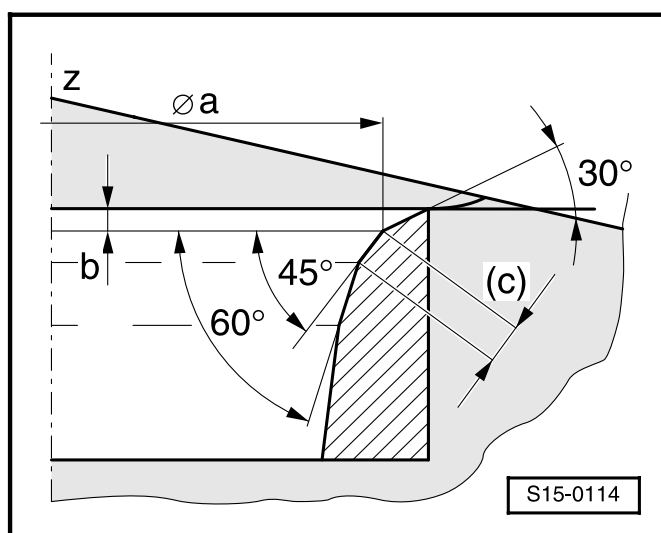
Example:

Distance -a- measured	31.4 mm
- Minimum dimension	31.0 mm
= Max. permissible reworking dimension	0.4 mm

Note:

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

If the maximum permissible reworking dimension is still 0 mm, replace cylinder head.



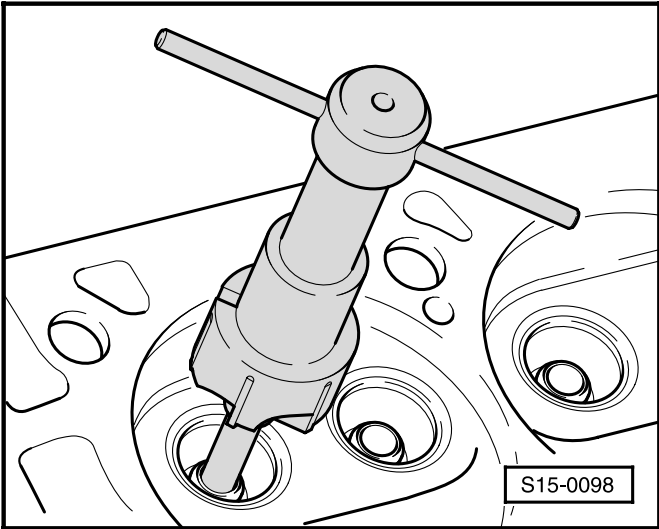
◀ Reworking valve seats

Dimension		Valve seats	
Ø a	mm	Valve seat diameter	26.2 - inlet valve 29.0 - exhaust valve
b	mm	Max. permissible reworking dimension	
c	mm	Valve seat width	1.5 to 1.8 - inlet valve 1.8 - 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 manually or with a machine. It is important that the following conditions are met:

- Wear limit of valve guides must not be greater than permissible dimension ⇒ page 15-31.
- Use NAC milling tool with carbide metal blades (min. 90 HRC).



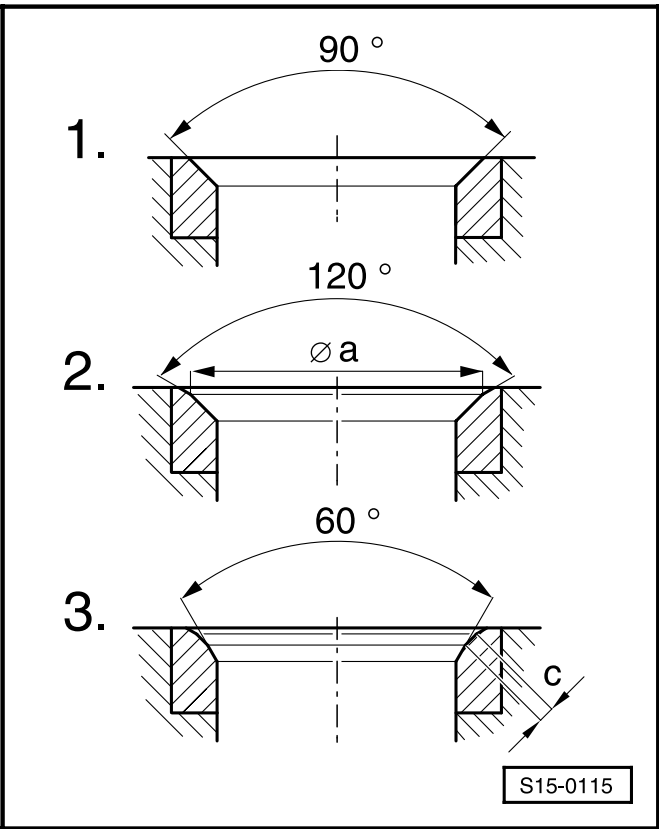
◀ Reworking valve seats with NAC hand miller

- Place cylinder head onto a felt base and secure against turning.
- Match diameter of guide mandrel to diameter of valve guide.

Valve guide	Guide mandrel Ø mm
Inlet valve	6.0 –0.01
Exhaust valve	

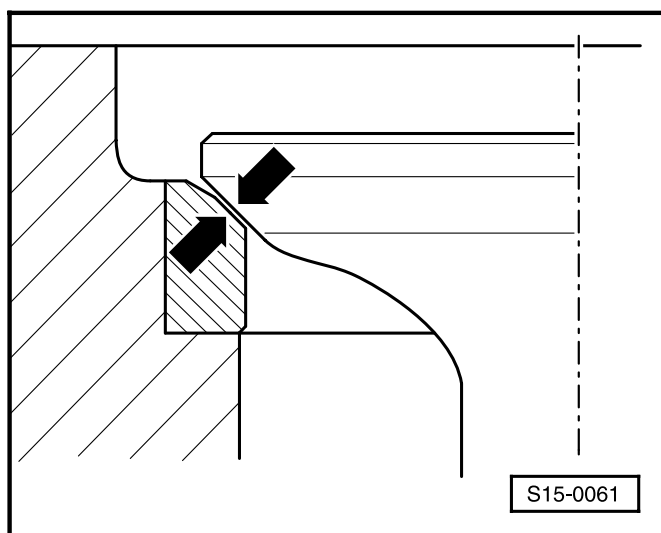
- Match diameter of milling tool to diameter of valve seat.

Valve seat	Milling tool Ø mm		
	90°	120°	60°
Inlet valve	28	28	30
Exhaust valve	32	32	32



◀ Sequence of milling

1. Machine valve seat with 90° milling tool until a proper pattern is achieved (do not exceed max. permissible reworking dimension).
2. Chamfer top correction angle with 120° milling tool until valve seat diameter „a“ is achieved (⇒ page 15-33).
3. Chamfer bottom correction angle with 60° milling tool until valve seat width „c“ is achieved (⇒ page 15-33).



◀ - Use fine grinding paste to grind in valve/valve seat -arrows- until a proper honing pattern is achieved.

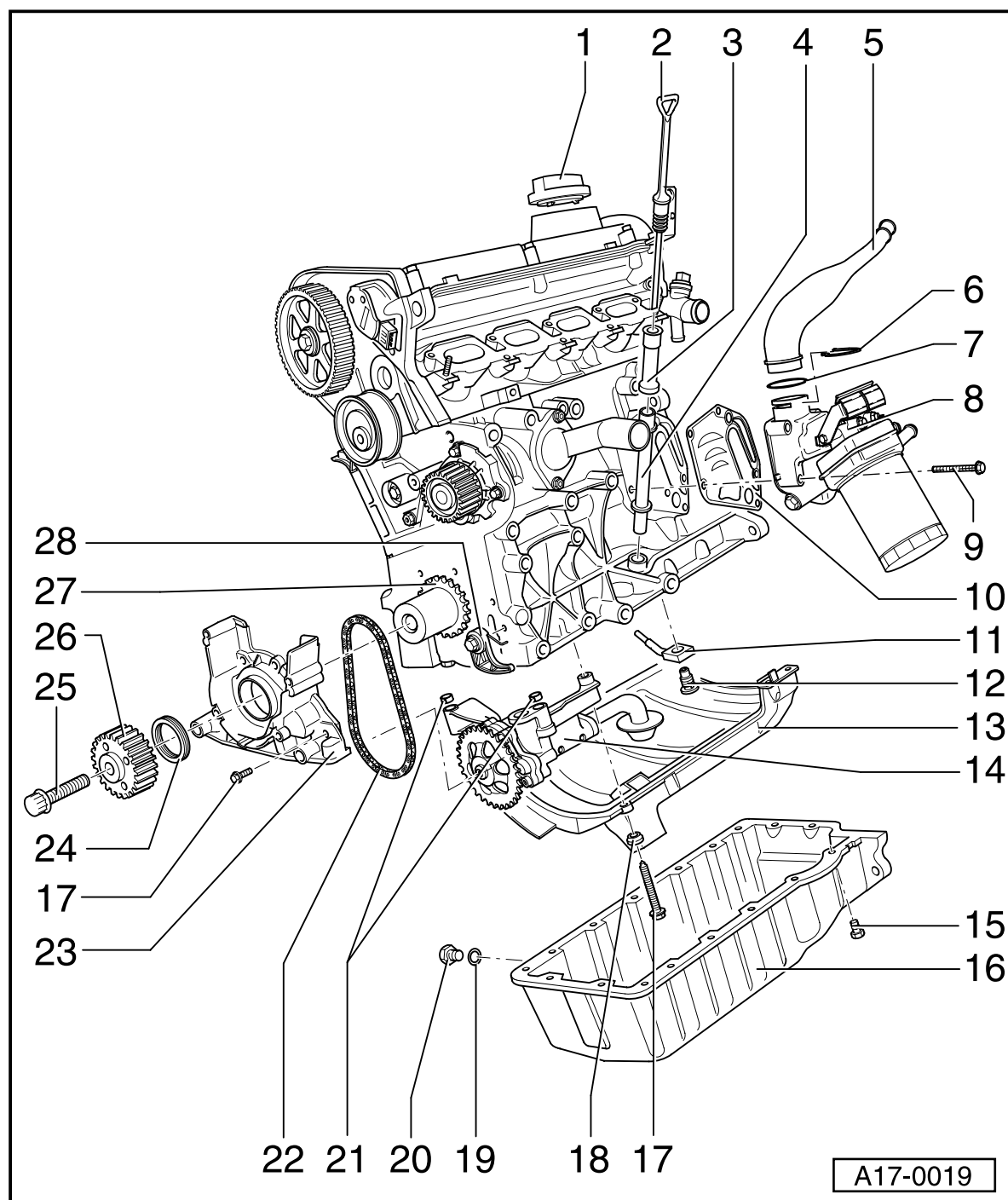
- Inspect valve for leaks.

The inspection can be carried out using water colour (proper honing pattern around entire circumference) or by pouring 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 15-27.

Removing and installing parts of the lubrication system



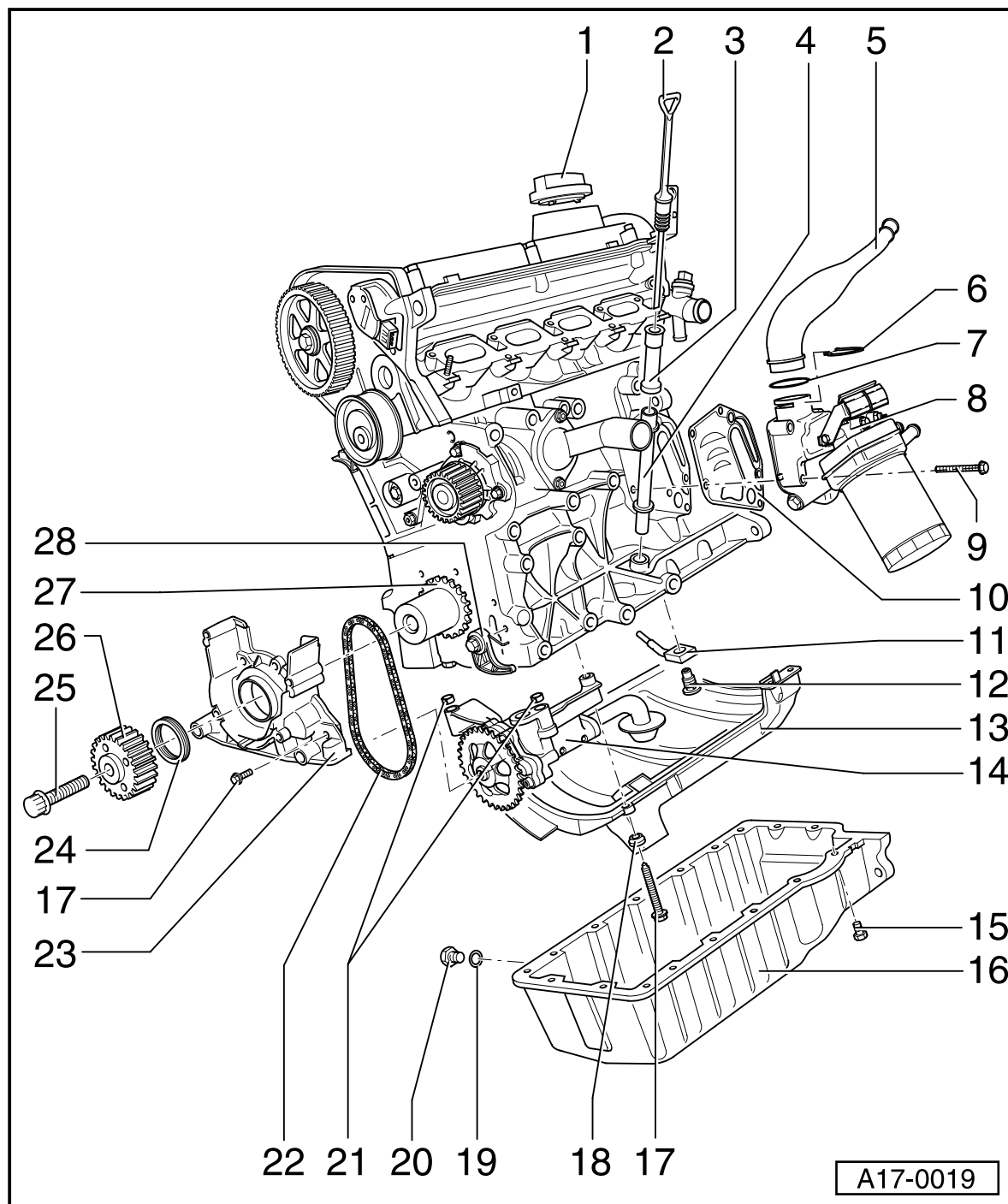
Notes:

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

Inspecting engine oil level, oil capacity and oil specification:

⇒ Inspection and Maintenance

Inspecting oil pressure and oil pressure switch
⇒ page 17-8.



A17-0019

1 - Plug

- ♦ replace seal if damaged

2 - Dipstick

- ♦ oil level must not extend beyond the max. marking!

3 - Filler hopper

- ♦ pull off for extracting oil

4 - Guide tube**5 - Connecting tube**

- ♦ between oil filter holder and connection hose to intake hose

6 - Retaining clip

- ♦ check to ensure tight

7 - O-ring

- ♦ replace if damaged

8 - Oil filter holder

- ♦ disassembling and assembling
⇒ page 17-4

9 - 15 Nm + torque a further 90° (1/4 turn)

10 - Gasket with baffle plate

- ◆ Replace
- ◆ Pay attention to installation position

11 - Oil spray nozzle

- ◆ For cooling pistons

12 - Pressure relief valve, 27 Nm

- ◆ Opens at:
0.25 ... 0.32 MPa
- ◆ Insert without sealant

13 - Baffle plate

- ◆ Install only if oil pump in place

14 - Oil pump with chain sprocket

- ◆ For removing and installing, take out oil pan ⇒ page 17-6
- ◆ Disassembling and assembling
⇒ page 17-5
- ◆ Testing oil pressure and oil pressure switch ⇒ page 17-8

15 - 15 Nm

- ◆ Slacken and tighten with hinged wrench and wrench bit

16 - Oil pan

- ◆ Removing and installing
⇒ page 17-6

17 - 15 Nm**18 - Spacer sleeve**

- ◆ Pay attention to installation position

19 - Seal

- ◆ Replace

20 - Oil drain plug, 40 Nm**21 - Dowel sleeve**

- ◆ For centering oil pump/cylinder block

22 - Chain for oil pump

- ◆ Mark direction of running before removing
- ◆ Inspect for wear

23 - Front sealing flange

- ◆ Should be located on dowel sleeves
- ◆ Removing and installing
⇒ page 13-15

24 - Seal

- ◆ Replace ⇒ page 13-11

25 - Central bolt

- ◆ Replace
- ◆ 90 Nm + torque a further 90 (¼ turn)
- ◆ Use counterholder MP 1-310 for slackening and tightening
- ◆ When attaching counterholder, place 2 washers between toothed belt sprocket and counterholder

26 - Crankshaft toothed belt sprocket

- ◆ Can be installed only in one position

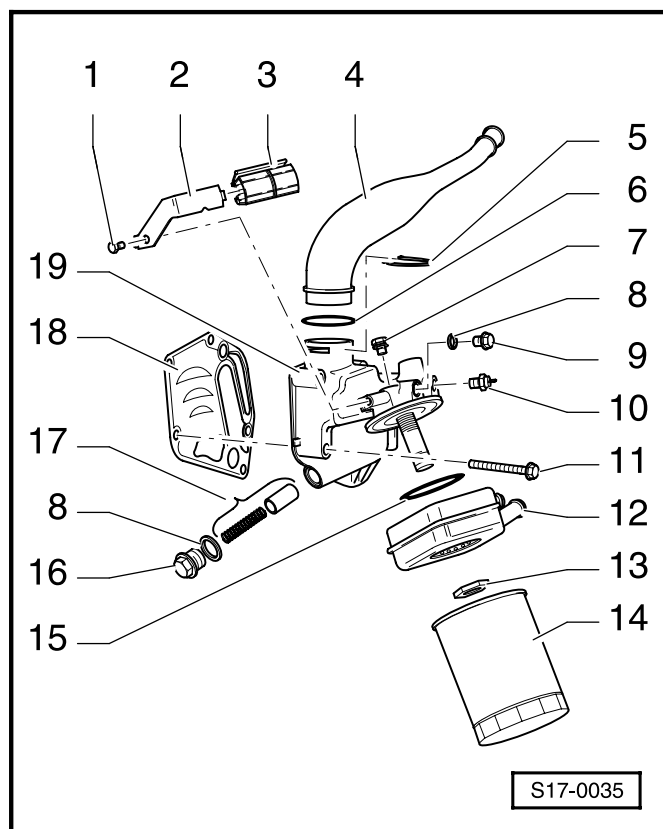
27 - Chain sprocket

- ◆ For oil pump drive

28 - Chain tensioner with tensioning rail, 25 Nm

- ◆ Pay attention to installation position
- ◆ If spring broken, replace complete chain tensioner

Disassembling and assembling oil filter holder



1 - 10 Nm

2 - Bracket

3 - Line guide

- ◆ Clipped into bracket item 2

4 - Connecting pipe

- ◆ Between oil filter holder and connection hose to intake hose

5 - Retaining clamp

- ◆ Ensure tightly fitted

6 - O-ring

- ◆ Replace if damaged

7 - 15 Nm

- ◆ Cut open seal if leaking, and replace

8 - Seal

- ◆ Replace

9 - 25 Nm

10 - 0.14 MPa oil pressure switch (F1), 25 Nm

- ◆ Black insulation
- ◆ Cable: green/black
- ◆ Testing ⇒ page 17-8
- ◆ Cut open seal if leaking, and replace

11 - 15 Nm + torque a further 90° (1/4 turn)

- ◆ Replace

12 - Oil cooler

- ◆ Coat contact surfaces outside of seal with AMV 188 100 02
- ◆ Ensure clearance to surrounding components
- ◆ Connection diagram for coolant hoses ⇒ page 19-1

13 - 25 Nm

14 - Oil filter

- ◆ Use tensioning strap for slackening
- ◆ Tighten to 20 Nm
- ◆ Tighten by hand
- ◆ Pay attention to installation notes on oil filter
- ◆ Pay attention to change intervals

15 - O-ring

- ◆ Replace
- ◆ Oil before installing

16 - 40 Nm

17 - Pressure relief valve

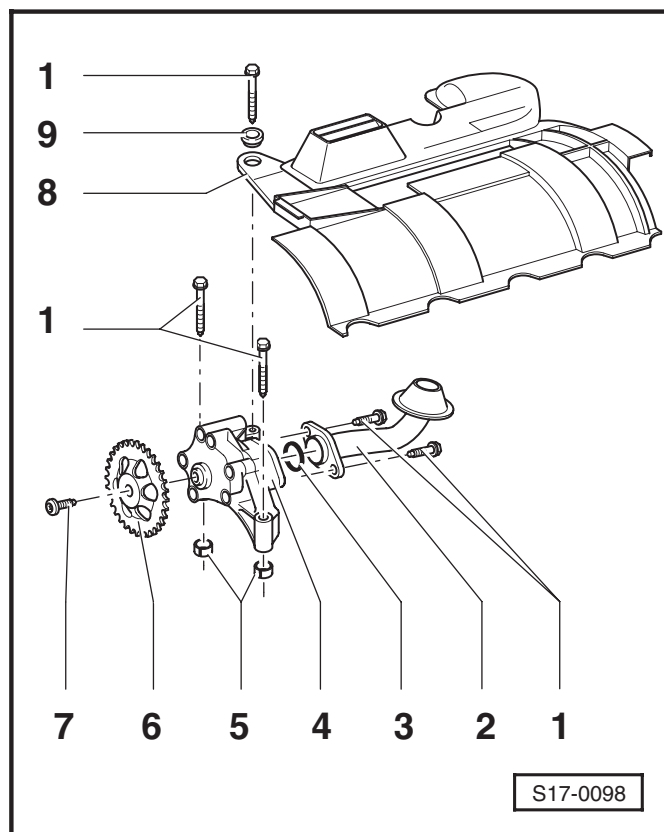
- ◆ Opens at: 0.35 ... 0.45 MPa
- ◆ Testing oil pressure and oil pressure switch ⇒ page 17-8

18 - Gasket with splash guard

- ◆ Replace
- ◆ Pay attention to installation position

19 - Oil filter holder

Disassembling and assembling oil pump



1 - 15 Nm

2 - Suction line

- ◆ clean strainer if soiled

3 - O-ring

- ◆ replace

4 - Oil pump

- ◆ if scores exist on running surfaces and gears, replace
- ◆ with pressure relief
- ◆ opens at:
1.1...1.3 MPa pressure relief valve
- ◆ testing oil pressure and oil pressure switch ⇒ page 17-8

5 - Dowel sleeve

- ◆ for centering oil pump/cylinder block

6 - Chain sprocket

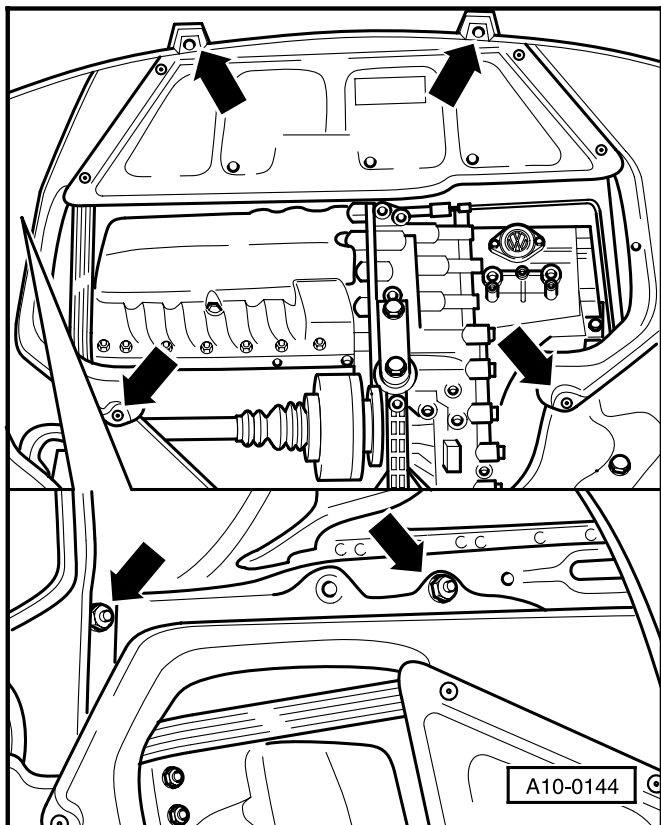
7 - 20 Nm

8 - Baffle

- ◆ install only on installed oil pump

9 - Spacer sleeves

- ◆ pay attention to installation position



Removing and installing oil pan

Special tools, testers and aids required

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

Removing

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

Note:

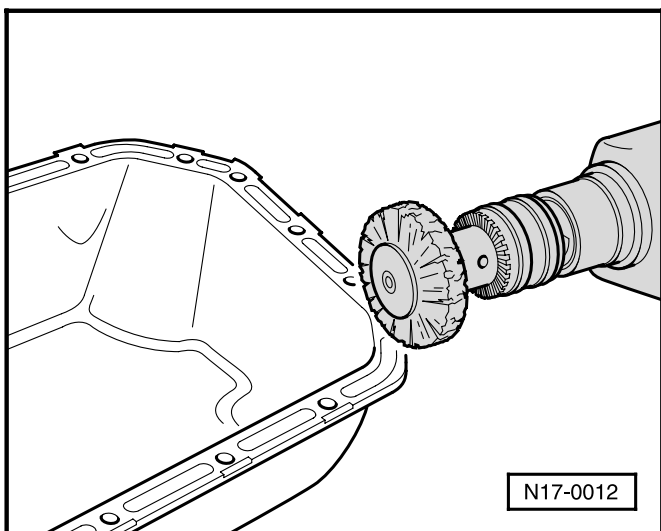
Use hinged wrench 3185 to slacken oil pan bolts at flywheel side and unscrew with wrench bit 3249.

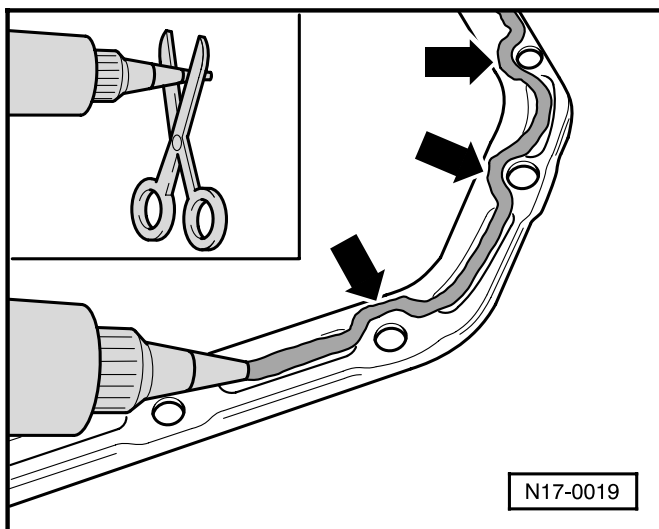
- Take off oil pan; detach with light blows with rubber-headed hammer, if necessary.
- Use flat scraper to remove sealant residues on cylinder block.
- ◀ - Use rotating plastic brush to remove sealant residues on oil pan (wear eye protection).
- Clean sealing surfaces; they should be free of oil and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

Installing

Notes:

- ◆ *After applying the silicone sealant, the oil pan should be installed within 5 minutes.*
- ◆ *Use wrench bit 3249 to fit on oil pan bolts at flywheel side and tighten with hinged wrench 3185.*
- ◆ *A second person is required for installing the oil pan.*



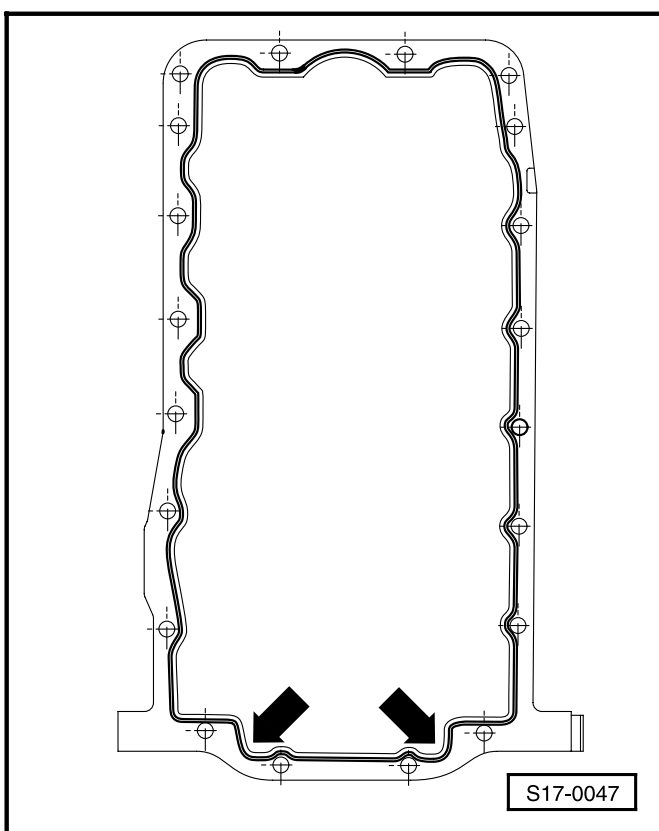


- ◀ - Cut off tip of tube of silicone sealant „D 176 404 A2“ at the front marking ($\varnothing$ of tip about 3 mm).

♦ Thickness of sealant bead: 2 ... 3 mm

Note:

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



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

Note:

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

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

Notes:

- ♦ *When fitting the oil pan onto the engine when removed, ensure that the oil pan finishes flush with the cylinder block at the flywheel side.*
- ♦ *After fitting on the oil pan, allow the sealant to dry for about 30 minutes. Do not pour in engine oil until after this waiting period.*

Testing oil pressure and oil pressure switch

Special tools, testers and aids required

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

Operation of dynamic oil pressure warning system

Testing warning lamp

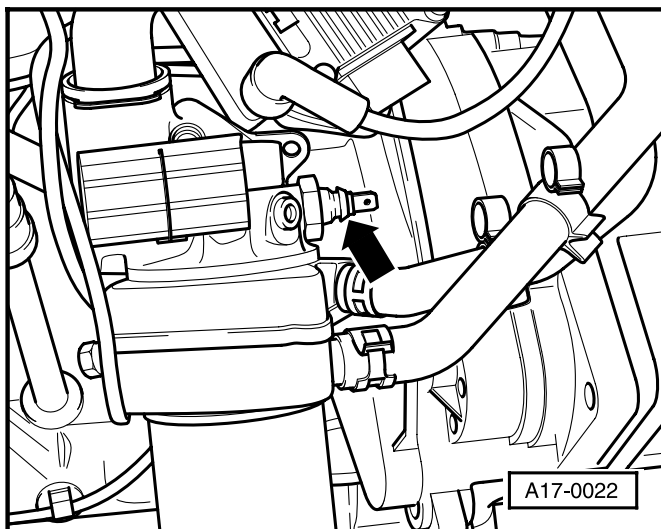
After ignition on („terminal 15 on“) and engine not running, the oil pressure warning lamp flashes (not on models with Auto Check System).

Warning criteria

- Engine not running and oil pressure switch closed.
- Coolant temperature greater than 60 °C, engine speed greater than 1500 rpm and oil pressure switch open.
- At an engine speed of more than 5000 rpm an active oil warning is not cancelled, irrespective of the position of the oil pressure switch.
- If the voltage supply of the control unit is o.k. (terminal 15) and the oil pressure switch is open for longer than 0.5 seconds at engine speeds of more than 1500 rpm, this is stored. If this condition occurs three times during „terminal 15 on“, the warning becomes or remains active even at engine speeds of less than 1300 rpm.

Test conditions

- Engine oil level o.k.; inspect ⇒ page 17-10
- Oil pressure warning lamp (K3) should come on when ignition switched on.
- The o.k. readout on vehicles with Auto Check System should come on (select symbol)
- Engine oil temperature at least 80 °C (radiator fan should have cut in once)



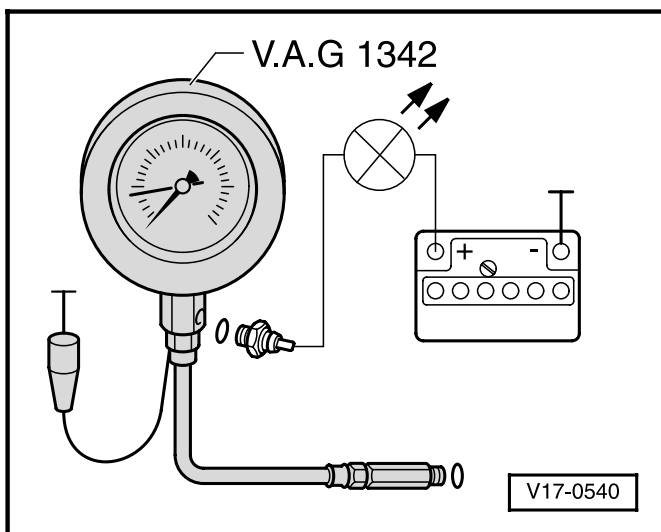
Testing oil pressure

- ◀ - Unplug connector of 0.14 MPa oil pressure switch (black insulation) and remove oil pressure switch -arrow-.
- Screw oil pressure switch into the oil pressure tester.
- Screw oil pressure tester into the oil filter holder in place of the oil pressure switch.
- Start engine (engine oil temperature at least 80 °C).
 - ♦ Oil pressure at idling speed: 0.2 MPa
 - ♦ Oil pressure at 3000 rpm: 0.30...0.45 MPa

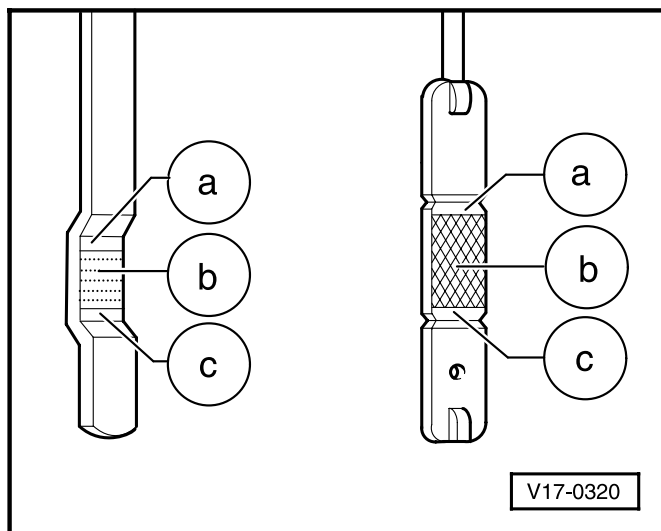
If the specified pressures are not achieved:

- Replace pressure relief valve in oil filter holder ⇒ page 17-4 or oil pump ⇒ page 17-5, respectively.

Testing oil pressure switch



- Unplug connector of 0.14 MPa oil pressure switch (black insulation) and remove oil pressure switch -arrow-.
- ◀ - Screw oil pressure switch into the oil pressure tester.
- Screw oil pressure tester into the oil filter holder in place of the oil pressure switch.
- Connect brown cable of tester to earth (-).
- Connect diode test lamp to oil pressure switch and to battery positive (+) using auxiliary cables.
- Start engine and slowly increase engine speed.
 - ♦ The LED should light up at a pressure of 0.12...0.16 MPa; if not, replace oil pressure switch.



◀ Marking range on dipstick:

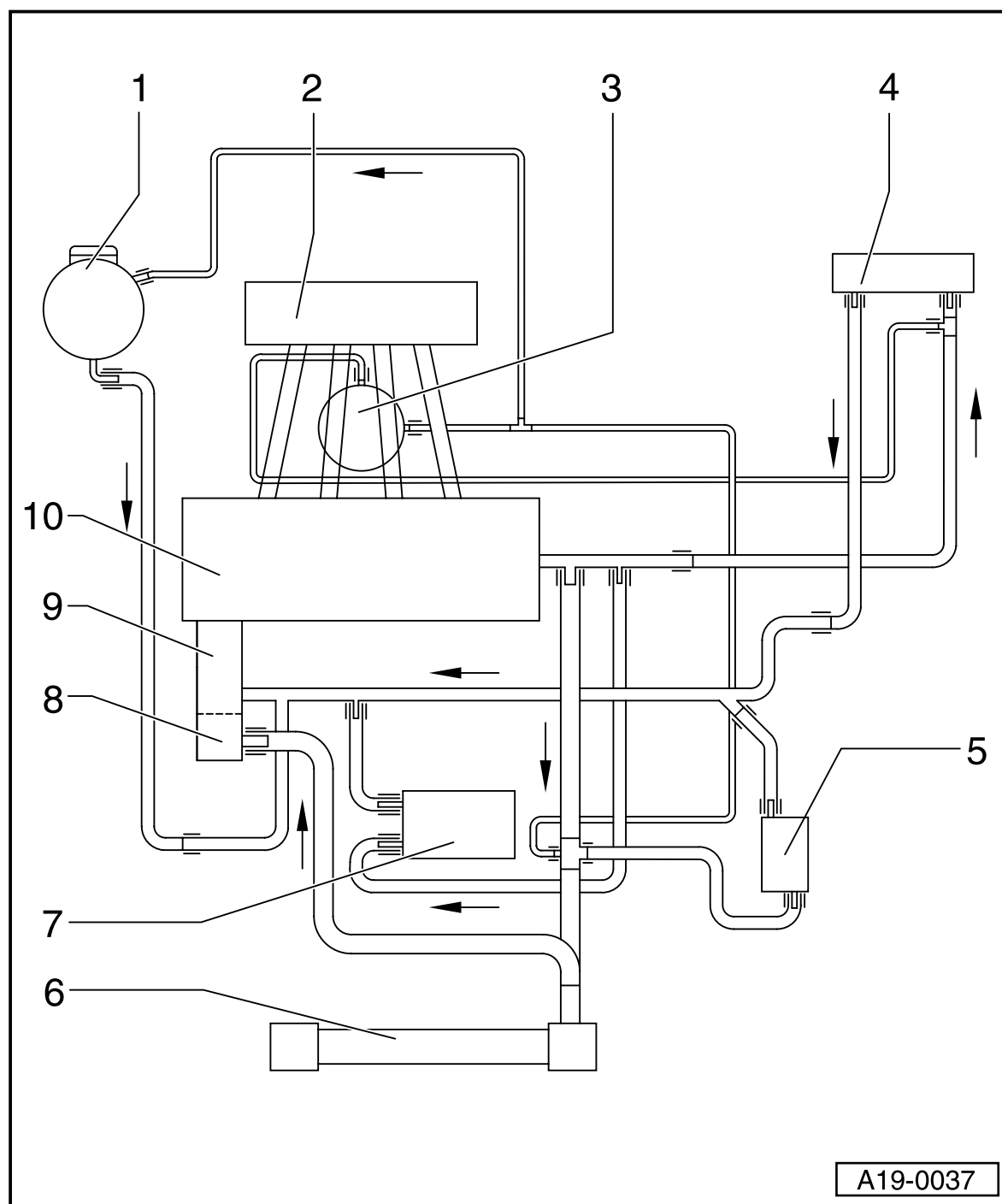
- a - Oil must not be topped up.
- b - Oil may be topped up. After topping up, it is possible that the oil level will then be within the range -a-.
- c - Oil should be topped up. It is sufficient, after topping up, for the oil level to be within the range -b- (chequered area).

Note:

The oil level must not extend beyond the max. marking of the dipstick.

Removing and installing parts of the cooling system

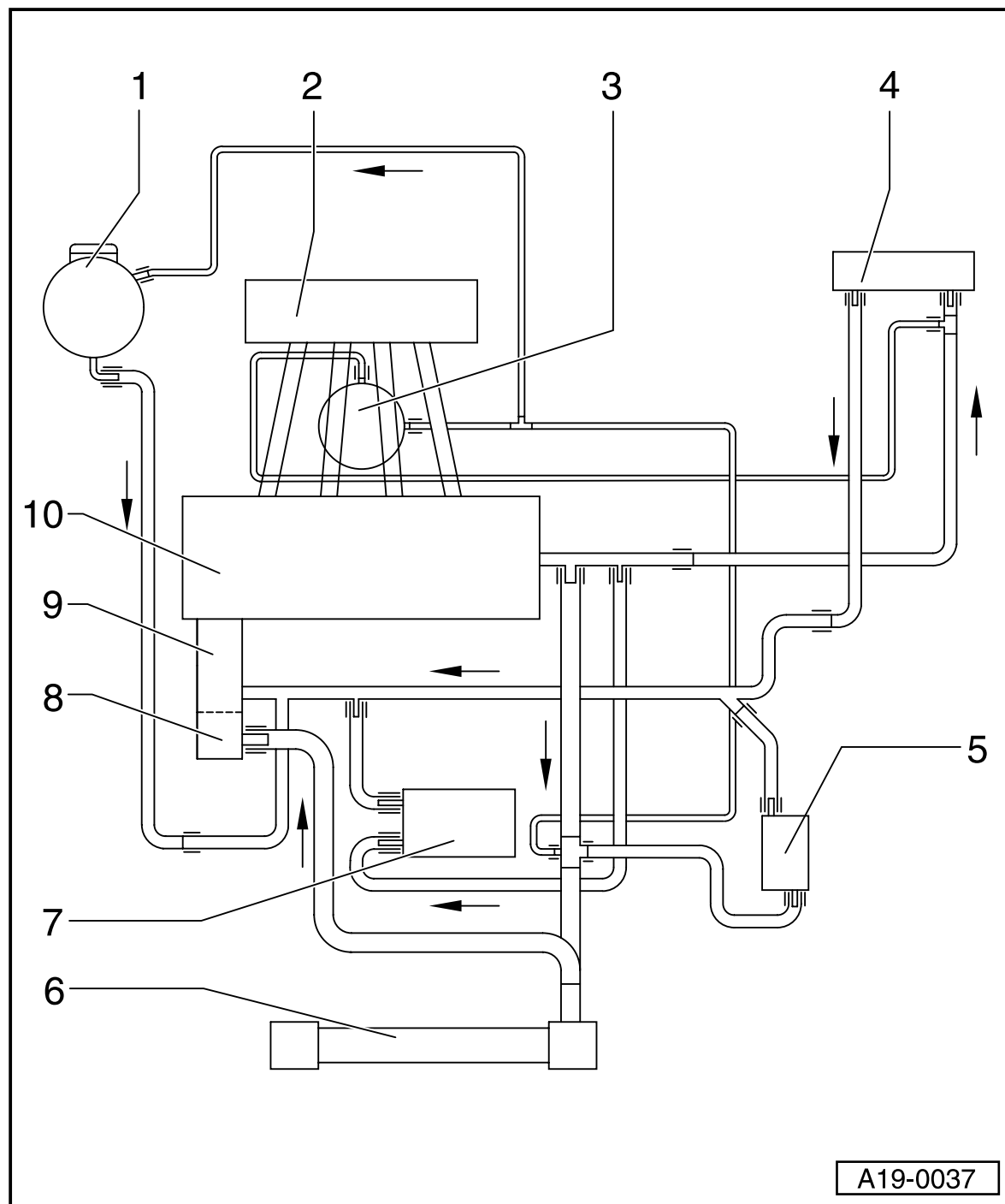
Parts of the cooling system



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. Use only spring strap clamps when carrying out repairs.
- ◆ It is recommended to use the pliers for spring strap clamps for removing and installing such clamps.
- ◆ Route coolant hoses free of stress when installing so as to avoid contact with other components (pay attention to marking on coolant connection and on hose).

Draining and filling system with coolant
⇒ page 19-3.



Coolant mixing ratios ⇒ page 19-3.

Inspecting cooling system for leaks
⇒ page 19-8.

Note:

Always replace seals and gaskets.

1 - Expansion reservoir

2 - Intake manifold

3 - Connection fitting with throttle valve control unit

4 - Heat exchanger for heating system

5 - ATF cooler

- ◆ Only on models with automatic gear-box

6 - Radiator

- ◆ After replacing, fill entire system with fresh coolant
- ◆ Removing and installing
⇒ page 19-9

7 - Oil cooler**8 - Coolant thermostat**

- ◆ Removing and installing
⇒ page 19-6
- ◆ Testing ⇒ page 19-6

9 - Coolant pump

- ◆ Removing and installing
⇒ page 19-5

10 - Cylinder block**Draining and filling system with coolant**

Coolant quantity approx. 5 ltr.

Special tools, testers and aids required

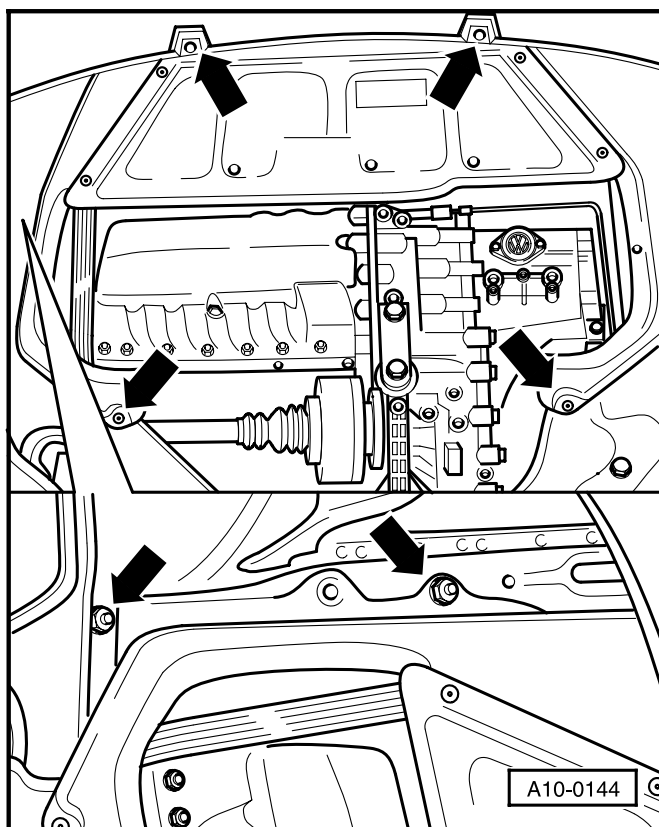
- ◆ Drip tray (e.g. V.A.G 1306)
- ◆ Pliers for spring strap clamps

Draining system

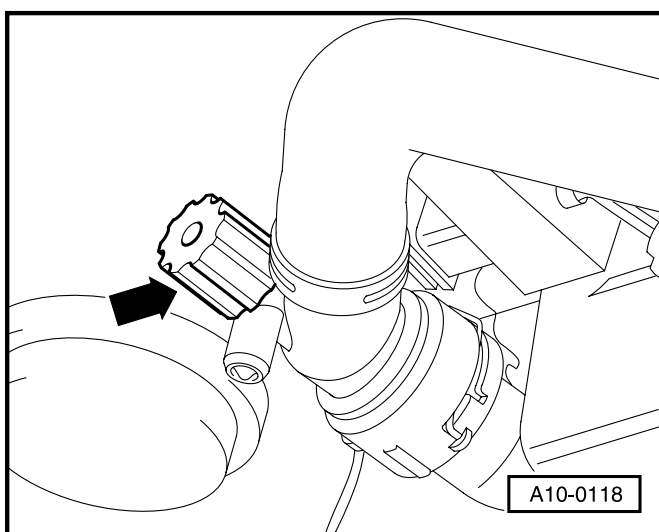
- Open cap of coolant expansion reservoir.

Warning!

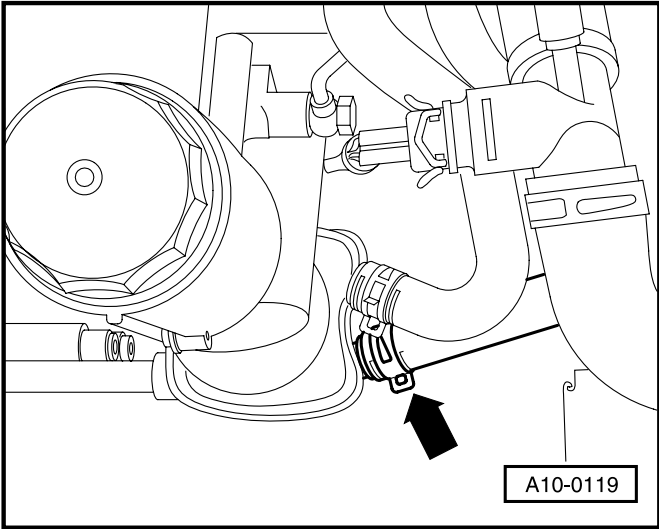
Hot steam may escape when the expansion reservoir is opened. Place cleaning rags around cap with and open carefully.



- ◀ - Remove noise insulation panel -arrows-.
- Place drip tray below the engine.



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



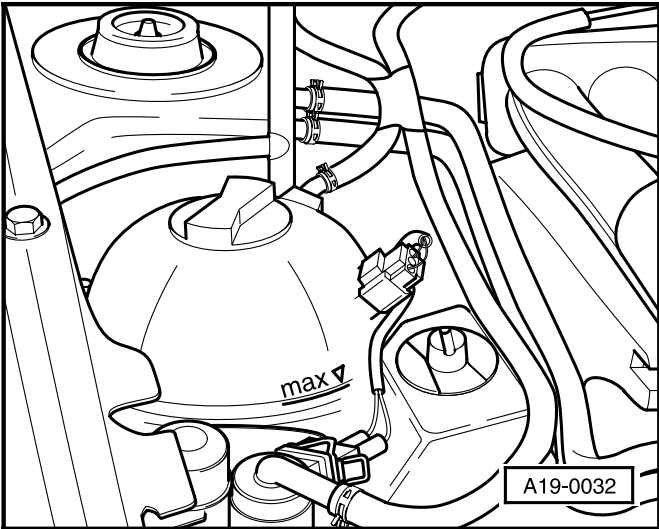
- ◀ - In addition, detach bottom coolant hose at oil cooler -arrow- and drain the remaining coolant.

Filling system

Select coolant additives from the ŠKODA Genuine Parts Catalogue or also from the list of approved coolants ⇒ Inspection and Maintenance; Replacing coolant

Recommended mixing ratios:

Antifreeze protection down to	Antifreeze concentration ¹⁾²⁾	Water ²⁾
-25 °C	40 % (2.0 ltr.)	60 % (3.0 ltr.)
-35 °C	50 % (2.5 ltr.)	50 % (2.5 ltr.)



- 1) Antifreeze concentration must not exceed 60 % otherwise antifreeze protection and cooling efficiency will be reduced at higher concentrations.
- 2) The quantity of coolant may differ depending on the vehicle equipment.
- Screw in coolant drain plug.
- ◀ - Pour in coolant up to max. marking on expansion reservoir.
- Start engine, run at about 1500 rpm for not more than 2 minutes and pour in coolant up to the overflow hole at the expansion reservoir.
- Close expansion reservoir.
- Run engine until fan cuts in.
- Inspect coolant level. When engine is at operating temperature, the coolant level must be at the max. marking, when the engine is cold it must be between the min. and max. markings; top up coolant if necessary.

Warning!

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

Coolant additives from the Škoda Genuine Parts List conforming to Specification TL VW 774 D:

Coolant additives	Manufacturer
Glysantin G30-72	BASF AG
XT 4030	ELF OIL AG
Coolant ETX 6280	TEXACO
FROSTOX SF-D 12	HENKEL HAERTOL GmbH

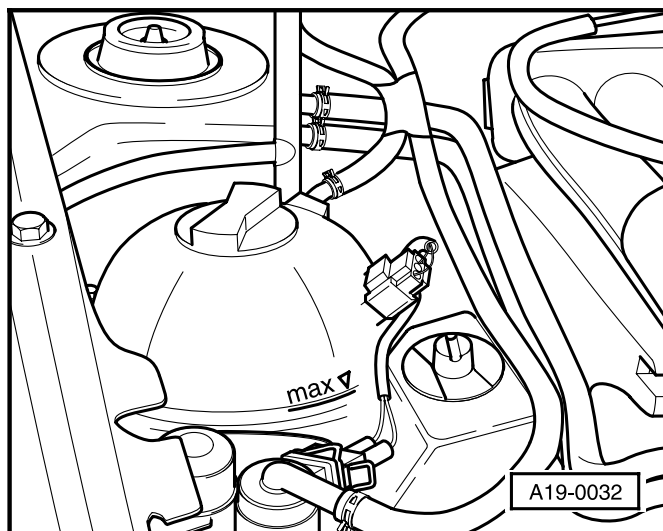
Note:

The coolant additives stated can be intermixed.

Recommended mixing ratios:

Antifreeze protection down to	Antifreeze concentration ¹⁾²⁾	Water ²⁾
-25 °C	40 % (2.0 ltr.)	60 % (3.0 ltr.)
-35 °C	50 % (2.5 ltr.)	50 % (2.5 ltr.)

- 1) Do not exceed an antifreeze concentration of 60 %; antifreeze protection and cooling efficiency are reduced at higher concentrations.
- 2) Coolant quantity may vary depending on equipment of vehicle.



- Screw in drain plug for coolant.
- ◀ - Pour in coolant up to „max“ marking on expansion reservoir.
- Start engine, run for not more than 2 minutes at about 1500 rpm and at the same time pour in coolant up to the overflow hole at expansion reservoir.
- Close expansion reservoir.
- Run engine until the fan cuts in.
- Inspect coolant level. When engine is at normal operating temperature, the coolant level must be at the max. marking; when engine is cold, it must be between the min. and max. markings. Top up coolant, if necessary.

Warning!

Hot steam may escape when the expansion reservoir is opened. Place cleaning rags around cap with and open carefully.

Removing and installing coolant pump

Notes:

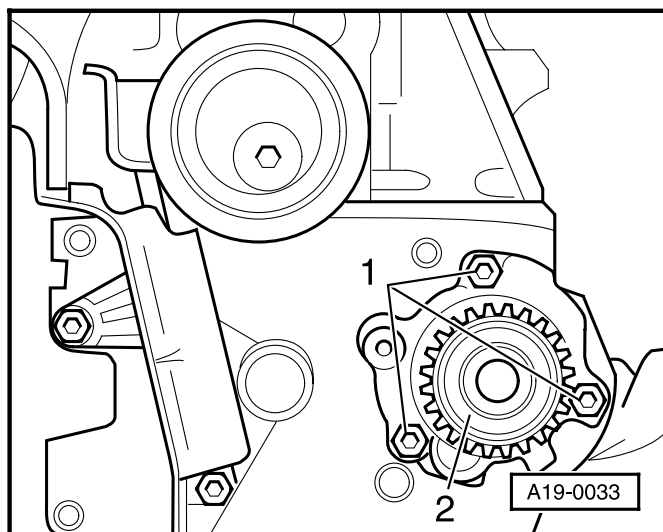
- ◆ Always replace seals and gaskets.
- ◆ The vibration damper and the bottom part of the toothed belt guard can remain installed.
- ◆ The toothed belt remains fitted on to the crankshaft toothed belt sprocket.
- ◆ Cover over toothed belt with a cloth before removing the coolant pump as a protection against coolant.

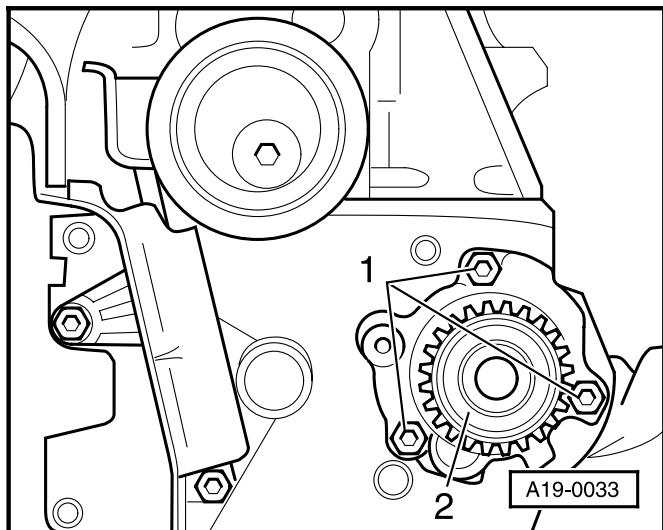
Special tools, testers and aids required

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

Removing

- Drain coolant ⇒ page 19-3.
- Remove ribbed V-belt ⇒ page 13-1, Removing and installing ribbed V-belt.
- Take toothed belt off toothed belt sprocket of coolant pump ⇒ page 13-5.
- ◀ - Unscrew bolts -1- attaching the coolant pump and remove coolant pump -2-.





Installing

- Moisten new O-ring with coolant.
- Insert coolant pump. Installation position: plug-in housing points down.
- ◀ - Insert coolant pump -2- into the cylinder block and tighten securing bolts -1-.
Tightening torque: 15 Nm
- Install toothed belt, tension ⇒ page 13-5.
- Install ribbed V-belt ⇒ page 13-1.
- Fill system with coolant ⇒ page 19-3.

Removing and installing, testing coolant thermostat

Special tools, testers and aids required

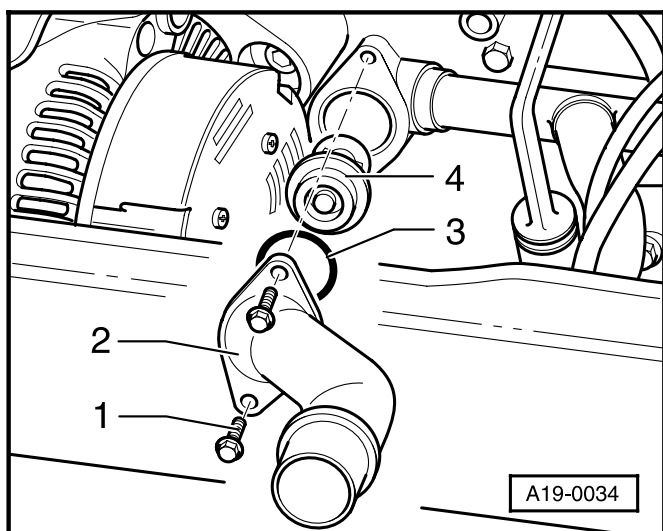
- ♦ Torque wrench 5...50 Nm
(e.g. V.A.G 1331)
- ♦ Pliers for spring strap clamps

Note:

Always replace seals and gaskets.

Removing

- Drain coolant ⇒ page 19-3.
- ◀ - Detach coolant hose at connection fitting -2-.
- Unscrew bolts -1-, take off connection fitting together with O-ring -3- and coolant thermostat -4-.

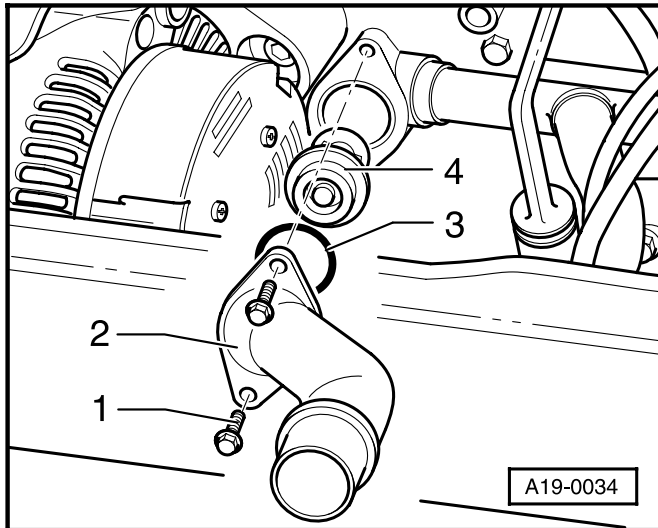


Testing coolant thermostat

- Heat thermostat in a water bath.

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

¹⁾ cannot be tested

**Installing**

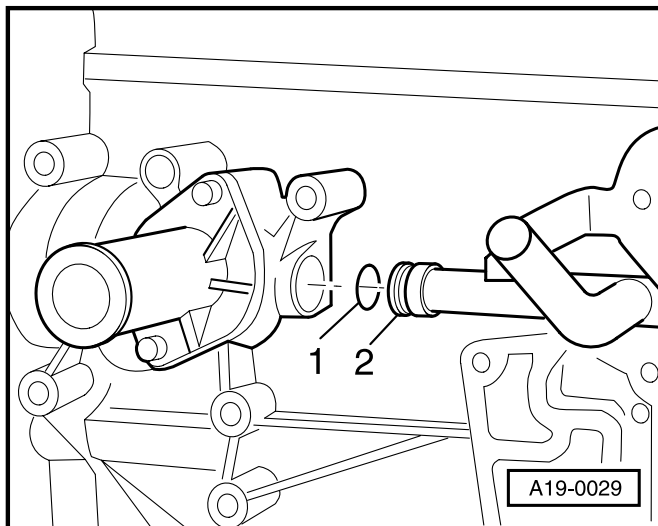
- Moisten O-ring -3- with coolant.
- Insert coolant thermostat -4- into the cylinder block and tighten bolts -1- of connection fitting -2- fully.
Tightening torque: 15 Nm
- Fill system with coolant ⇒ page 19-3.

Installing coolant pipe**Special tools, testers and aids required**

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

Note:

Always replace seals and gaskets.



- Moisten O-ring -1- with coolant and fit onto coolant pipe -2-.
- Insert coolant pipe into the hole at the cylinder block.
- Bolt bracket of coolant pipe to a final torque of 10 Nm.

Testing cooling system for leaks

Special tools, testers and aids required

- ◆ Cooling system tester V.A.G 1274
- ◆ Adapter V.A.G 1274/8
- ◆ Adapter V.A.G 1274/9

Test condition

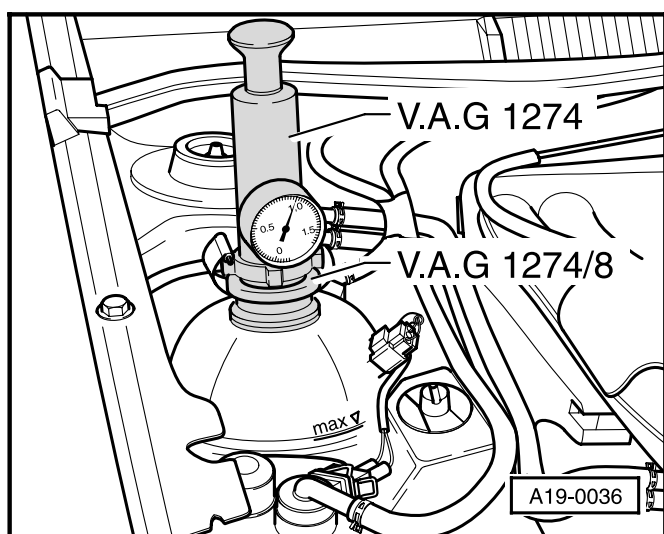
- Engine at operating temperature

Test procedure

- Open cap of coolant expansion reservoir.

Important!

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



- ◀ - Mount tester V.A.G 1274 with adapter V.A.G 1274/8 onto the expansion reservoir.
- Operate 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 radiator

Notes:

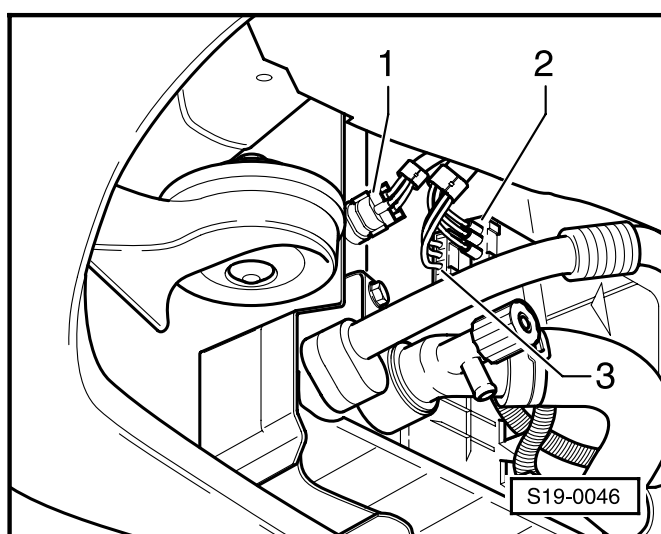
- ◆ Always replace seals and gaskets.
- ◆ Lifting vehicle with lift platform ⇒ page 10-1, Removing and installing engine.

Special tools, testers and aids required

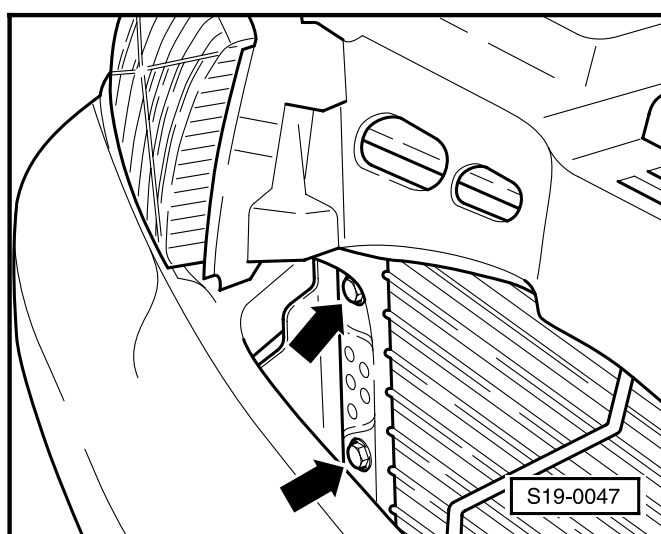
- ◆ Torque wrench 5...50 Nm (e.g. V.A.G 1331)
- ◆ Wire

Removing

- Drain coolant ⇒ page 19-3.



- ◀ - Unplug connector of thermostatic switch (F18) -1- and separate plug connections -2- and -3- at the fan shroud (press locking catches).
- Detach coolant hoses at connection fitting of the radiator (pull off retaining clip).



Models with air conditioning

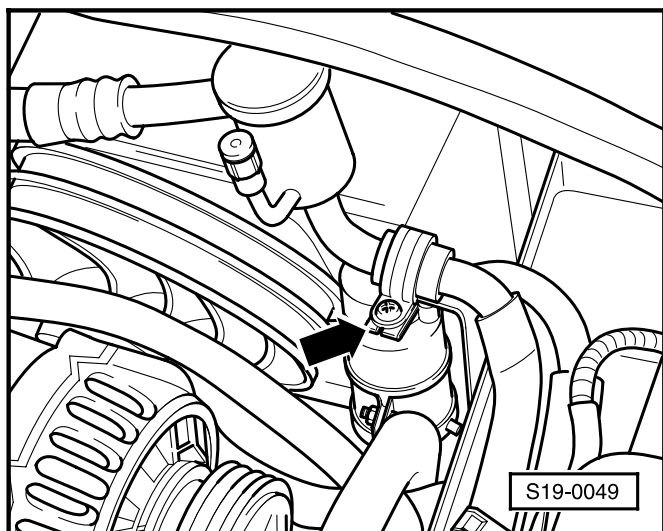
- ◀ - Unscrew the 4 bolts -arrows- attaching the condenser.

Important!

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

Note:

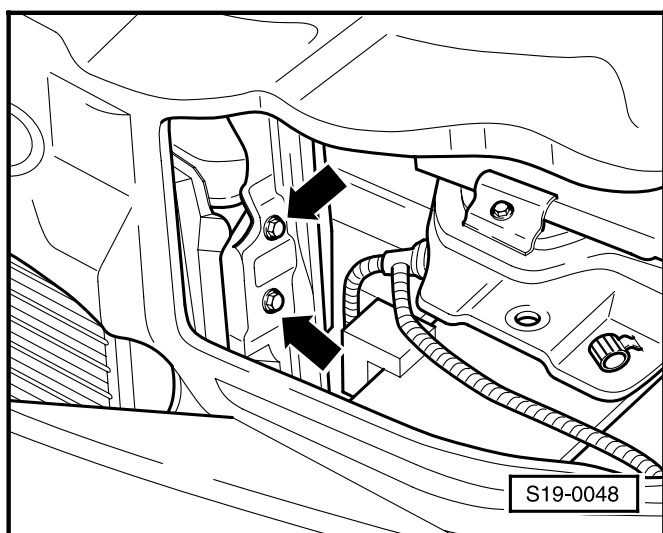
In order to avoid damage to the condenser and also to the refrigerant pipes/hoses, ensure that the pipes and hoses are not over-tensioned, kinked or bent.



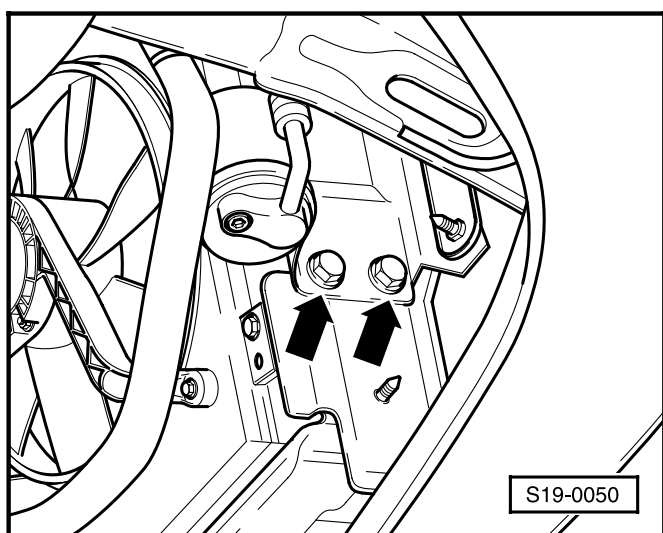
- ◀ - Detach bracket -arrow- for refrigerant pipe.

Continued for all models

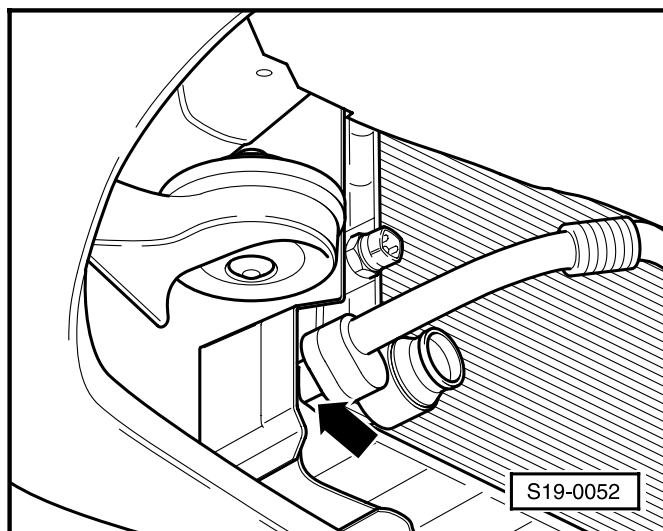
- Remove both headlights:
⇒ Electrical System; Repair Group 94; Removing and installing headlights



- ◀ - Remove the 4 bolts -arrows- for attaching the top radiator mount.



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



Models with air conditioning

- Pull out radiator slightly together with condenser.
- ◀ - Detach clip -arrow- for attaching refrigerant pipe.

Continued for all models

- Remove fan shroud (4 bolts).

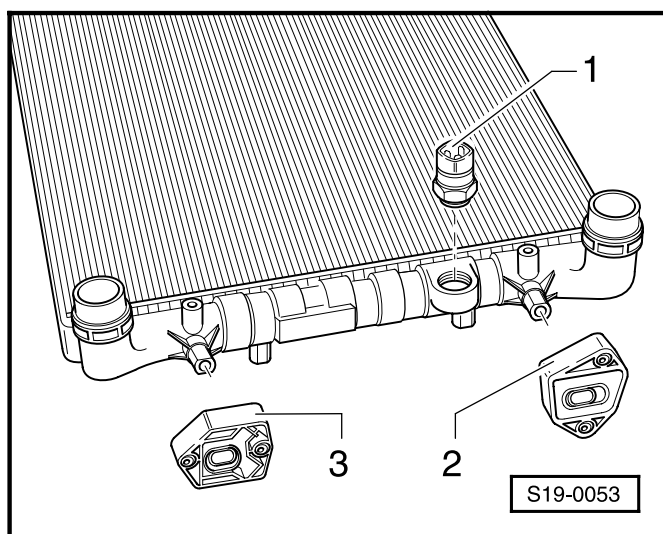
Note:

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

- Carefully take out the radiator downward.

Installing

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



- ◀ - Tighten thermostatic switch -1- to 35 Nm.
- Fit on the brackets -2- and -3- at the radiator, as illustrated.
- Tighten the bolts for attaching the fan shroud and radiator mounts to 10 Nm.
- On models with air conditioning, tighten the bolts for attaching condenser and brackets for refrigerant pipes to 10 Nm.
- Replace O-rings in the connection fittings of the coolant hoses.
- Insert drain plug for coolant.
- Fill system with coolant ⇒ page 19-3.
- Install headlights:
⇒ Electrical System; Repair Group 94; Removing and installing headlights
- Electrical connections and routing:
⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations binder

Removing and installing parts of the fuel supply system

Notes:

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

Pay attention to safety precautions
⇒ page 20-4.

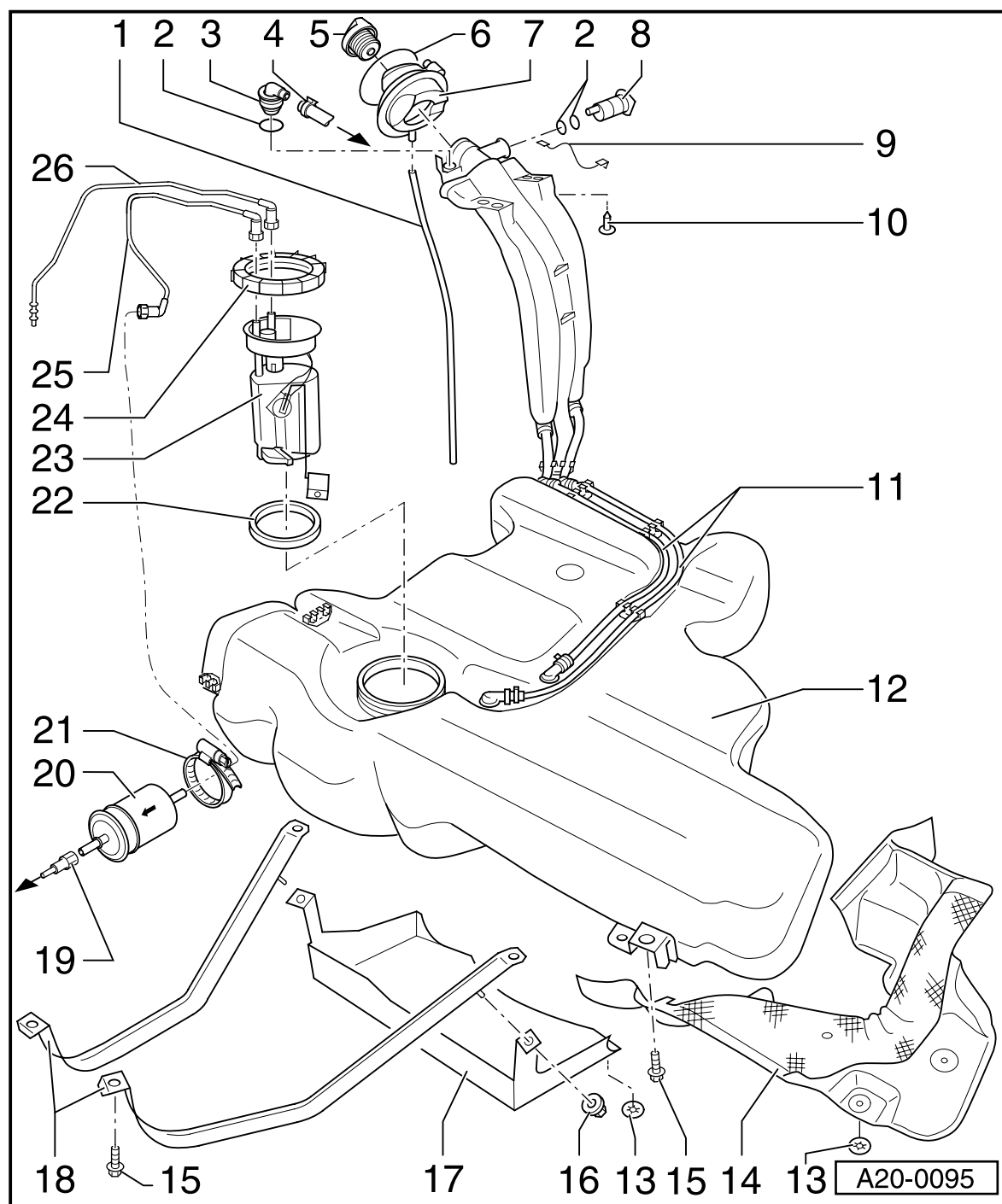
Pay attention to rules for cleanliness
⇒ page 20-4.

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

Servicing throttle mechanism ⇒ page 20-12.

Setting 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

- ◆ To remove, unclip valve and lift up and out of filler neck
- ◆ Inspect valve for blockage
valve vertical: open
valve tilted 45°: closed.

4 - Vent pipe

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

5 - Cap

- ◆ Replace seal if damaged

6 - Tensioning ring

7 - Rubber bowl

8 - Vent valve

- ♦ inspecting ⇒ Fig. 1

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

- ♦ removing and installing ⇒ page 20-6

13 - Clamping washer

- ♦ removing: turn to the left
- ♦ installing: tighten to 2 Nm

14 - Heat shield

- ♦ for fuel tank

15 - 20 Nm + 90°

- ♦ replace

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 line

- ♦ black
- ♦ to fuel rail
- ♦ to detach, press unlocking button at connector

20 - Fuel filter

- ♦ installation position: arrow points in direction of flow

21 - Retaining clip

- ♦ for fuel filter

22 - Seal

- ♦ moisten with fuel for installing
- ♦ replace if damaged

23 - Electric fuel delivery unit

- ♦ removing and installing ⇒ page 20-5
- ♦ testing fuel pump ⇒ page 20-9
- ♦ removing and installing fuel level sender ⇒ page 20-6
- ♦ testing holding pressure:
⇒ 1.8 l/92 kW Engine - Motronic Fuel Injection and Ignition System; Repair Group 24

24 - Union nut, 80 Nm

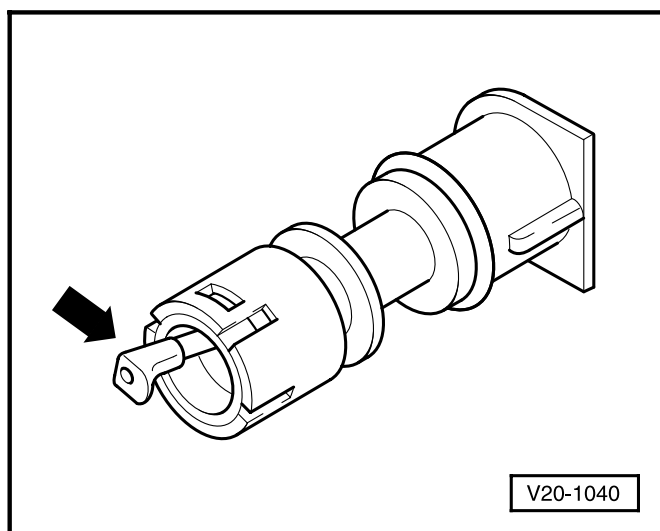
- ♦ use wrench MP 1-227 for removing and installing

25 - Feed line

- ♦ black
- ♦ to fuel filter
- ♦ fitted onto connection marked „V“ at closing flange
- ♦ for detaching from flange, press unlocking button on connector

26 - Return-flow line

- ♦ blue
- ♦ from fuel rail
- ♦ fitted onto connection marked „R“ at closing flange
- ♦ for detaching from flange, press unlocking button on connector



◀ **Fig. 1 Inspecting vent valve**

Lever in off position:
Valve closed

Lever pushed in direction of arrow:
Valve open

Safety precautions when carrying out work on fuel supply system

Important!

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

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

- ◆ Fuel tank should be not more than $\frac{2}{3}$ full.
- ◆ The extraction hose of an exhaust extraction system should be placed close to the assembly opening of the fuel tank and the extraction system switched on before commencing work in order to extract the fuel vapours which are released.
If no exhaust extraction system is available, it is possible to use a radial fan with a delivery volume of more than 15 m³/h (motor not positioned in the air flow).
- ◆ Avoid skin contact with fuel! Wear fuel-resistant gloves!

Rules for cleanliness

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

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

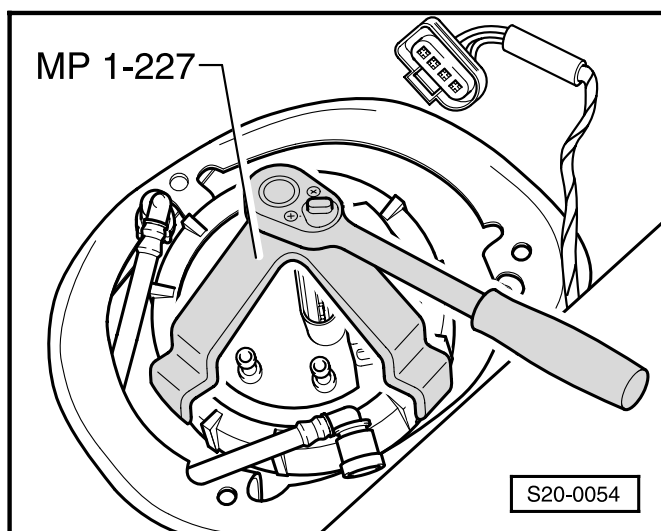
Pay attention to rules for cleanliness ⇒ page 20-4.

Special tools, testers and aids required

- ◆ Wrench for union nut MP 1-227

Removing

- If car is fitted with a coded radio set, determine coding, if necessary.
- Switch off ignition (if not already off) and disconnect earth strap at the battery.
- Unbolt cover (below the rear seat).
- Disconnect feed and return flow pipes from the flange of the fuel delivery unit (press release buttons).
- Release 4-pin connector from the flange at the fuel tank and unplug.
- ◀ - Use wrench MP 1-227 to unscrew union nut.
- Pull fuel delivery unit and seal out of the opening of the fuel tank.



Note:

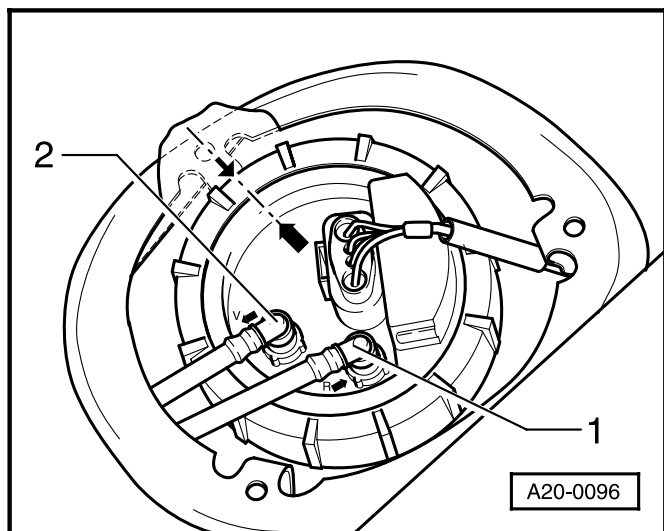
If the delivery unit is still filled with fuel, empty before replacing.

Installing

Installation is performed 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 before installing.*
- ◆ *Ensure the fuel hoses are tightly connected.*

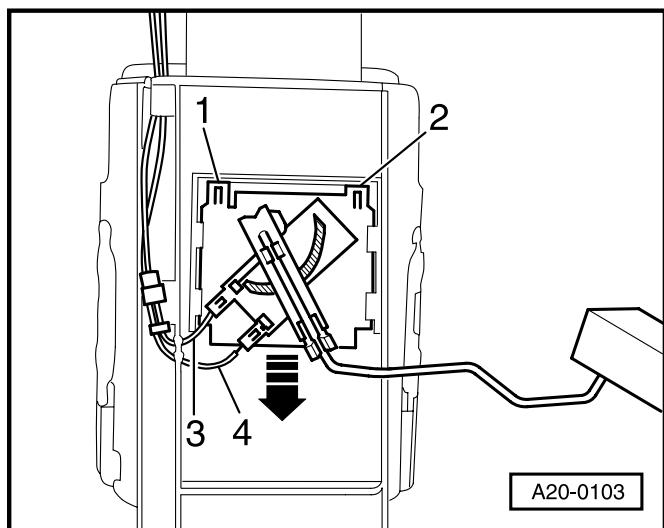


- ◀ - Pay attention to installation position:
 - ◆ Marking on the flange should be aligned with the marking on the fuel tank -arrows-.
 - ◆ Blue return flow pipe -1- to connection with marking -R-.
 - ◆ Black feed pipe -2- to connection with marking -V-.

Removing and installing fuel gauge sender

Removing

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



Installing

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

Removing and installing fuel tank

Pay attention to safety precautions
⇒ page 20-4.

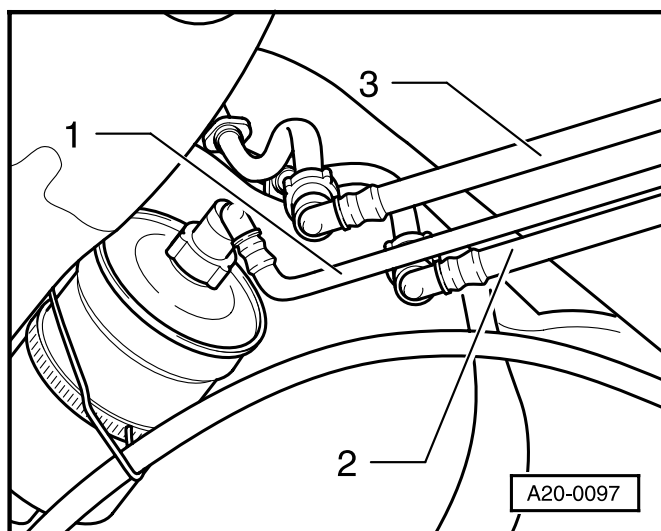
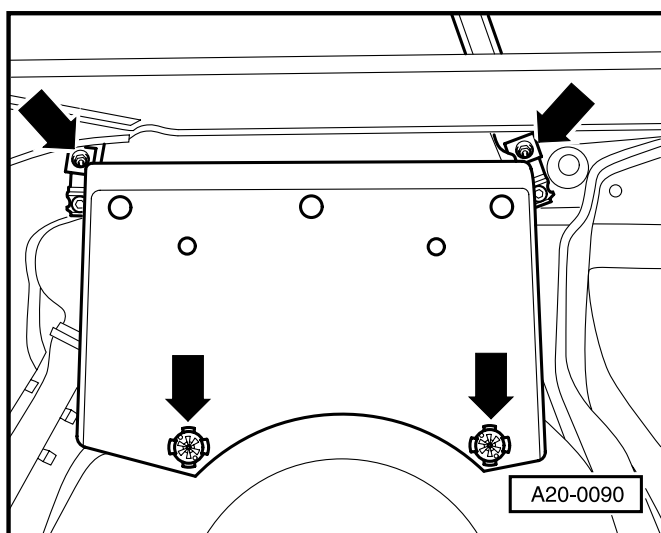
Pay attention to rules for cleanliness ⇒ page 20-4

Special tools, testers and aids required

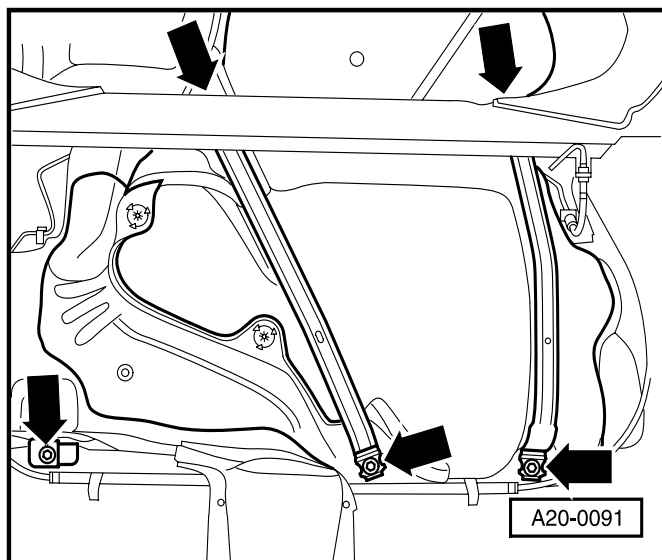
- ◆ Engine/gearbox jack (e.g. V.A.G 1383 A)
- ◆ Fuel extraction unit (e.g. V.A.G 1433 A)

Removing

- If car is fitted with a coded radio set, pay attention to coding; determine if necessary.
- Switch off ignition (if not already off), and disconnect earth strap at the battery.
- Empty fuel tank with fuel extraction unit (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 the rear seat).
- Release 4-pin connector from the flange at fuel tank and unplug.
- Open fuel filler flap and lever out tensioning ring in rubber bowl (around filler neck).
- Push rubber bowl through to the inside.
- Remove rear right wheelhouse liner.
- Unscrew 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 buttons).
- Place engine/gearbox jack (e.g. V.A.G 1383 A) below the fuel tank to support it.



- ◀ - Detach screw connections -arrow- 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 to 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-.

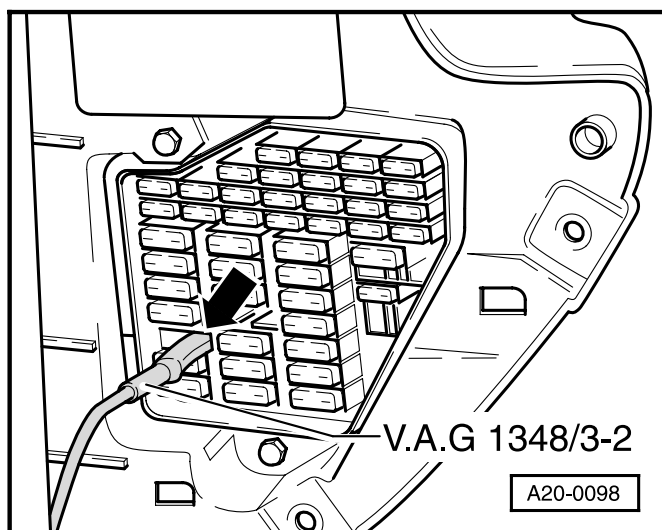
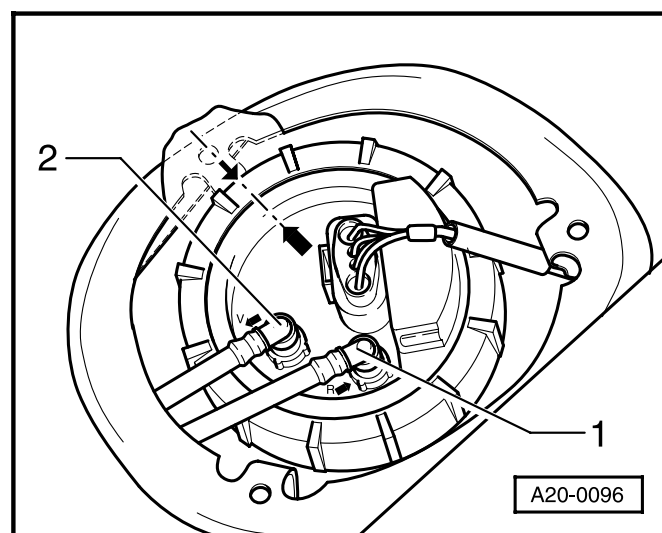
Connecting remote control

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 the fuse box on the left-hand side of the dash panel.
- Remove fuse 28 at the fuse carrier (left-hand row, 5th large fuse from the 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 clamp to car battery (+).



Testing fuel pump

Special tools, testers and aids required

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

Test conditions

- Holding pressure o.k.; testing:
⇒ 1.8 ltr./92 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Testing fuel pressure regulator and holding pressure
- Battery voltage at least 12 V
- Fuse 28 o.k.
- Fuse filter o.k.

Test procedure

- Switch on ignition.

The fuel pump should be heard to operate. (A second mechanic may be required if there is a high level of surrounding noise)

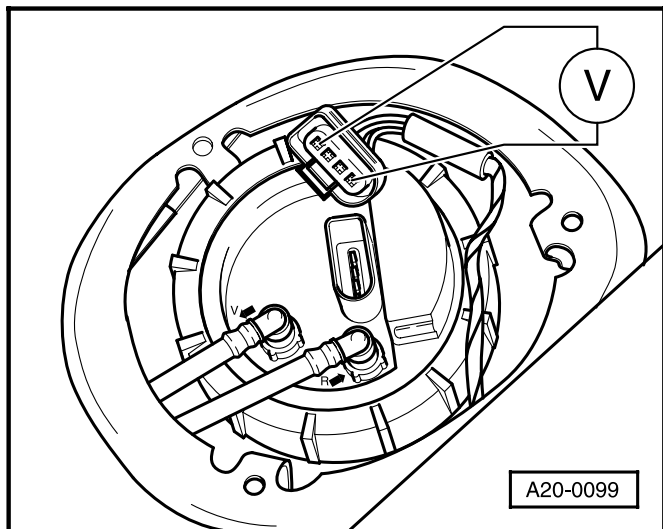
If the fuel pump does not run:

- 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:

- ⇒ 1.8 ltr./92 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Servicing Motronic fuel injection system; testing fuel pump relay and actuation



If the fuel pump does not run:

- Unbolt cover (below the rear seat).
- Release 4-pin connector from the flange at the fuel tank and unplug.
- ◀ - Connect hand-held multimeter (e.g. V.A.G 1526) with auxiliary 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 open circuit in the wiring on the basis of the current flow diagram and rectify:
⇒ 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 in the wiring can be found:

Fuel pump faulty.

- Replace fuel delivery unit ⇒ page 20-5.

Testing delivery of the fuel pump

Special tools, testers and aids required

- ◆ Adapter V.A.G 1318/17
- ◆ Measuring vessel

Test conditions

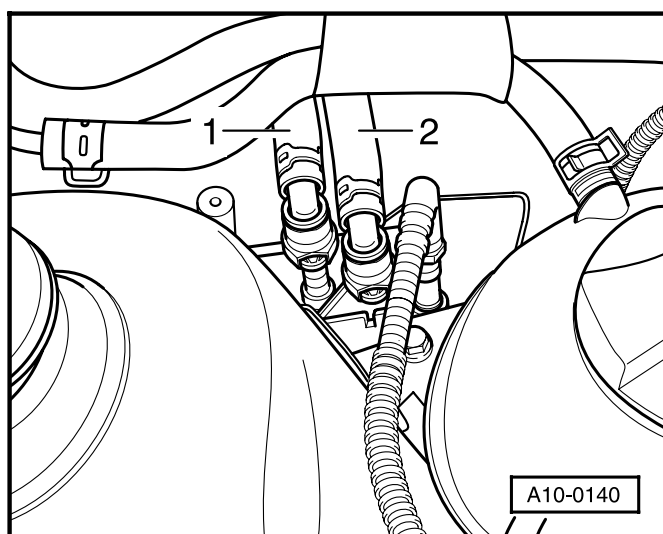
- Battery voltage at least 12 V
- Voltage supply o.k.
- Fuel filter o.k.

Test procedure

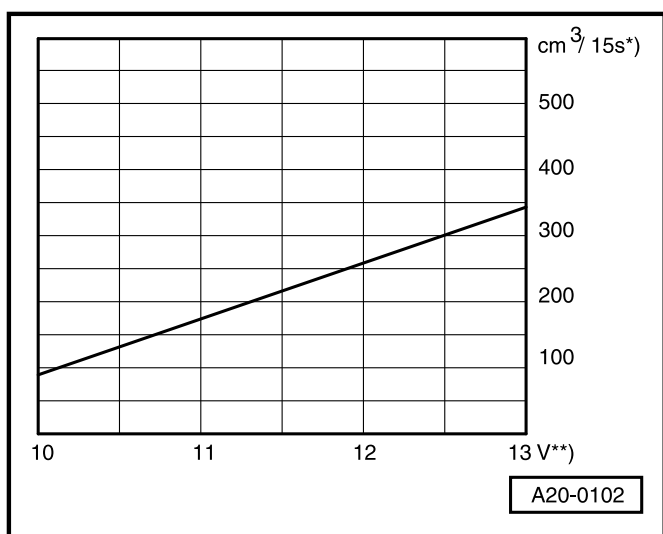
- Switch off ignition.
- Connect remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2 ⇒ page 20-8.
- Remove cap from the fuel filler neck.

Important!

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



- Disconnect fuel return flow pipe -2- (press release buttons).
- 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 button and hold).

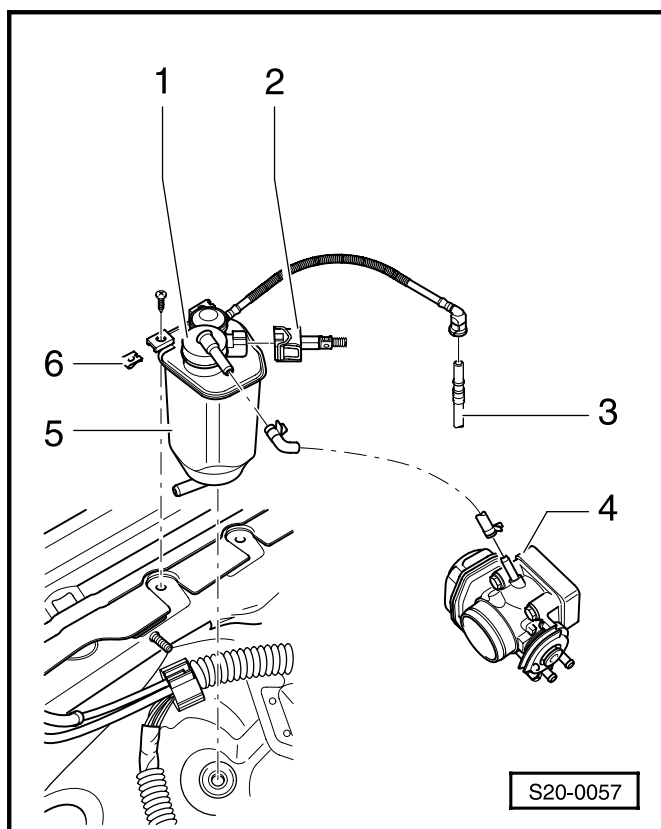


- Compare quantity of fuel supplied with specification.

*) Minimum delivery cm³/15 s

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

Removing and installing parts of the activated charcoal filter system



1 - Solenoid valve 1 (N80)

- ♦ Testing operation and actuation:
- ⇒ 1.8 ltr./92 kW Engine, Motronic Fuel Injection and Ignition System; Repair Group 24; Testing tank breather; Testing solenoid valve 1 for activated charcoal filter

2 - Connector

3 - Vent pipe

- ♦ From gravity valve at fuel tank ⇒ page 20-2, item 4
- ♦ To disconnect, press release buttons on connector

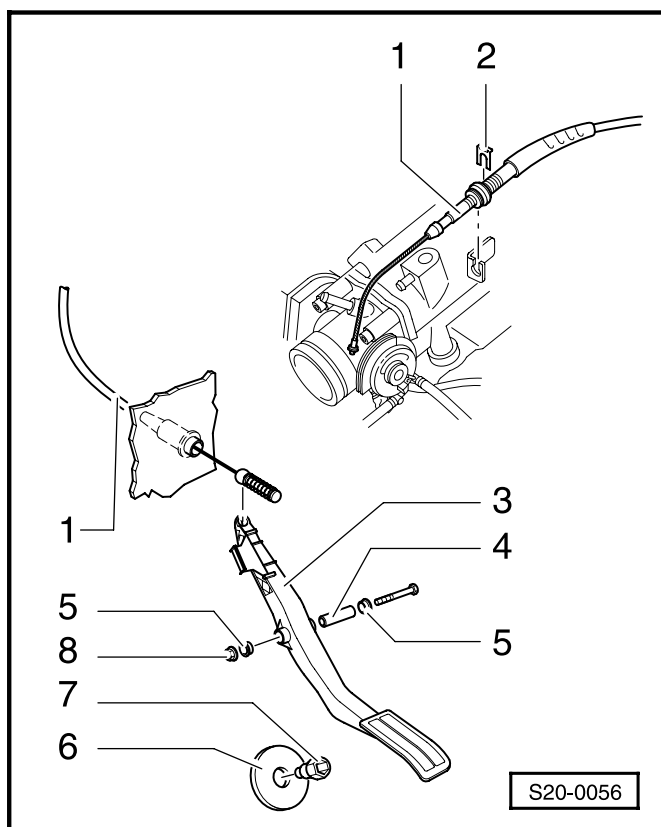
4 - Throttle valve control unit

5 - Activated charcoal filter

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

6 - Spring nut

Servicing throttle mechanism



1 - Throttle cable

- ♦ Adjust by re-positioning locking element on detent ⇒ page 20-13

2 - Locking element

3 - Accelerator pedal

4 - Spacer bush

5 - Bearing bush

6 - Washer

7 - Stop screw

8 - 20 Nm

Adjusting throttle cable

Notes:

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

Special tools, testers and aids required

- ◆ Spring stretcher rod

Procedure

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

Note:

A second mechanic is required for this step or depress accelerator pedal using spring stretcher rod supported against steering wheel.

Models with manual gearbox

- Adjust throttle cable by repositioning the detent on the support bracket so that full throttle position is reached at the throttle valve lever.

Models with automatic gearbox

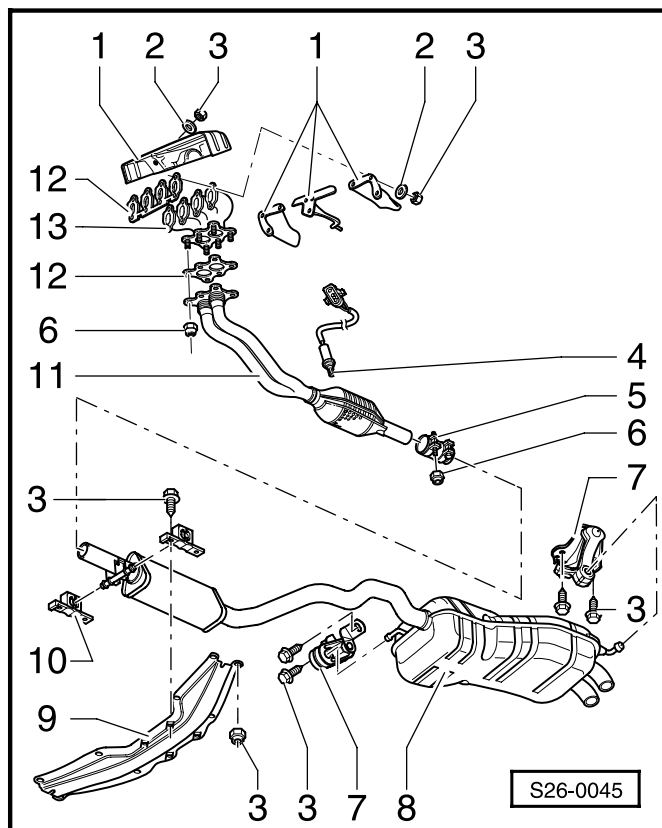
- Adjust throttle cable by repositioning the detent on the support bracket so that the throttle valve has opened fully and the kickdown switch is heard to click.

For all models

- Release accelerator pedal or remove stretcher rod.
- After completing adjustment, check idling speed and full throttle stop of the throttle valve.

Removing and installing parts of the exhaust system

Assembly overview of the exhaust system



1 - Shield

2 - Washer

3 - 25 Nm

4 - Lambda probe (G39), 50 Nm

- ◆ grease only thread with „G052 112 A3“; on no account allow „G052 112 A3“ to get onto the slot of the probe body
- ◆ use lambda probe wrench for removing and installing (e.g. 3337)
- ◆ testing:

⇒ 1.8-ltr./92 kW Engine - Fuel Injection and Ignition System; Repair Group 24

5 - Clamping sleeve

- ◆ aligning exhaust system free of stress
⇒ page 26-5
- ◆ installation position: horizontal in vehicle; bolted connection pointing to the left
- ◆ tighten bolted connections evenly

6 - 40 Nm

- ◆ replace
- ◆ coat thread with hot bolt paste „G 052 112 A3“

7 - Hanger

8 - Front and rear silencer

- ◆ front and rear silencers are installed as a single part in production. For repairs, front and rear silencer are supplied separately and for connecting with a double clamp.
- ◆ aligning exhaust system free of stress
⇒ page 26-5
- ◆ replacing front and rear silencer
⇒ page 26-4

9 - Tunnel bridge

- ◆ with hole for aligning exhaust system
⇒ page 26-5

10 - Hanger

- ◆ pay attention to installation position
⇒ page 26-5

11 - Front exhaust pipe

- ◆ with catalytic converter

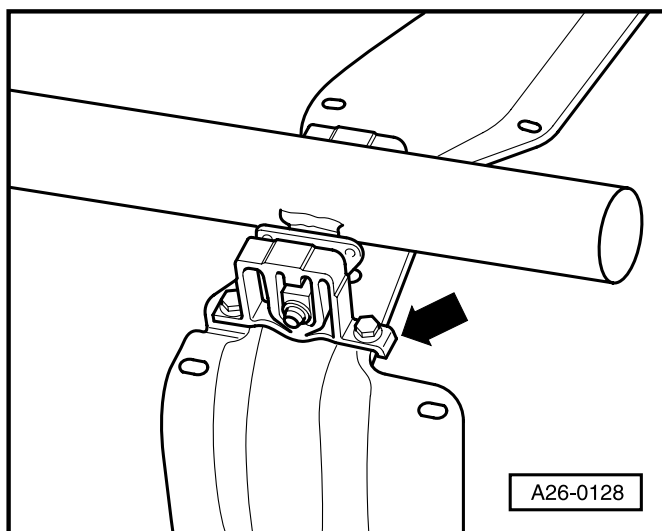
12 - Gasket

- ◆ replace

13 - Exhaust manifold

Notes:

- ◆ Always replace gaskets, self-locking nuts and clamping sleeves.
- ◆ After carrying out removal and installation work on the exhaust system, ensure that the exhaust system is not tensioned and that adequate clearance exists to the body. If necessary, slacken clamping sleeve and align silencer and exhaust pipe so that adequate clearance exists at all points to the body and the weight of the exhaust system is evenly distributed over the hangers.
- ◆ Use a screwdriver to slacken and tighten the clamping plates for the heat shields. Tightening torque: 2 Nm
- ◆ Installation position of hangers at tunnel bridge:
 - ◀ The angled side -arrow- at the base of the hanger points in direction of travel.



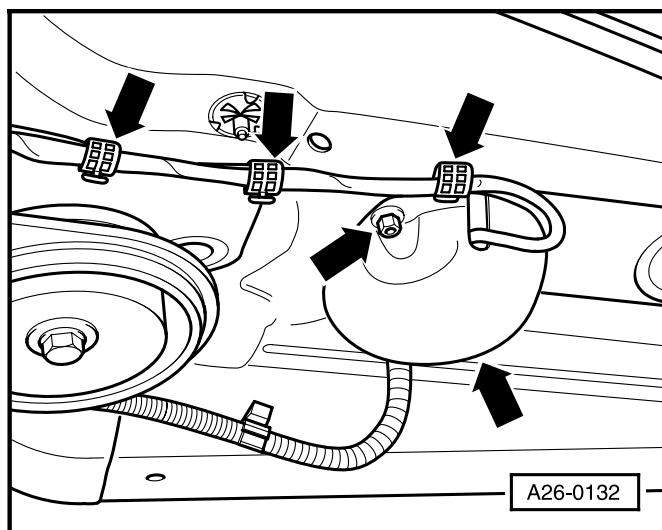
Removing and installing front exhaust pipe

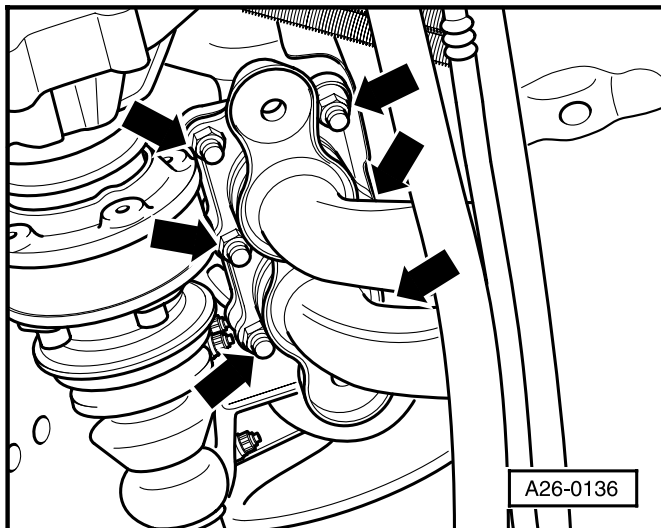
Special tools, testers and aids required

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

Removing

- ◀ - Take off cover for the plug connection of the lambda probe and detach electric cable from the heat shield together with retaining clips -arrows-.
- Pull plug connection out of the cover and separate.





- ◀ - Unscrew the nuts attaching the front exhaust pipe -arrows-.
- Slacken bolted connections of double clamp between catalytic converter and front exhaust pipe and push to the rear.
- Turn front exhaust pipe in longitudinal direction 180° and pull down and out.

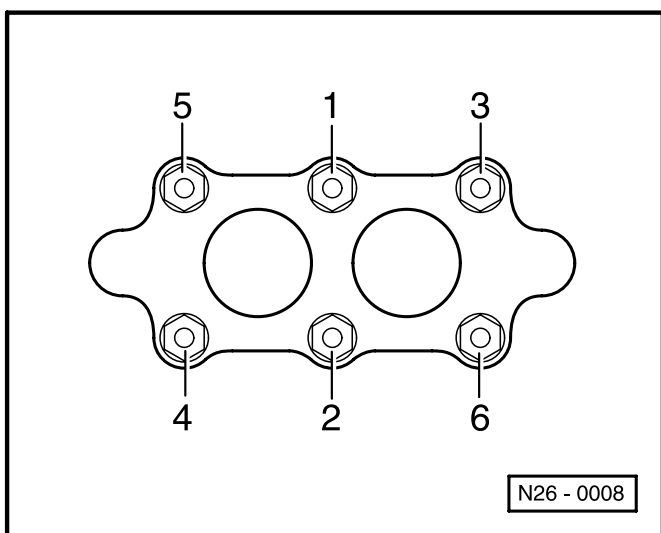
Note:

Ensure that the heat shields are not damaged.

Installing

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

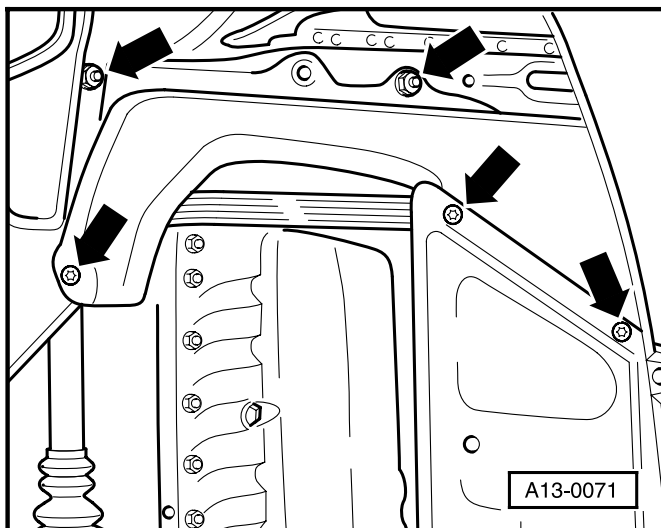
- Fit front exhaust pipe with new gasket onto exhaust manifold.
- ◀ - Tighten the nuts of the front exhaust pipe in the tightening order shown.
- ◆ Always replace gaskets and self-locking nuts.
- ◆ Tightening torques ⇒ page 26-1.
- ◆ Grease only thread with "G 052 112 A3".
- Replace double clamp and align exhaust system free of stress ⇒ page 26-5.
- Tighten clamping nuts of cover of plug connection of lambda probe to a final torque of 2 Nm.

**Removing and installing exhaust manifold****Special tools, testers and aids required**

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

Removing

- Remove front exhaust pipe ⇒ page 26-2.
- Remove shield at exhaust manifold.
- ◀ - Remove front noise insulation panel -arrows-.
- Unscrew nuts attaching exhaust manifold and pull exhaust manifold down and out to the right.



Installing

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

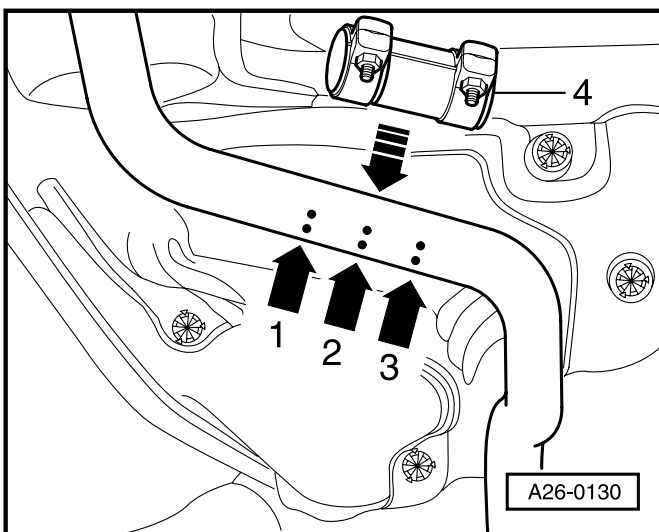
- Fit exhaust manifold onto the cylinder head with new gasket.
- Fit on washers and tighten the securing nuts evenly diagonally across.
Tightening torque: 25 Nm
- Attach shield tight to exhaust manifold.
Tightening torque: 25 Nm
- Install front exhaust pipe ⇒ page 26-2.

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 separation point is provided for repair operations in order to replace the centre silencer or the rear silencer.



- ◀ Use body saw (e.g. V.A.G 1523) to separate exhaust pipe at right angles at the separation point -arrow 2-.
- Position clamping sleeve -4- at the side markings -arrows 1 and 3- when installing.
- Align exhaust system free of stress ⇒ page 26-5.
- Align rear silencer horizontally.
- Tighten the bolted connections of the clamping sleeve evenly to 40 Nm.
- Installation position of clamping sleeve: horizontal in vehicle, bolted connections facing forward.

Aligning exhaust system free of stress

Special tools, testers and aids required

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

Procedure

- The exhaust system is aligned when cold.

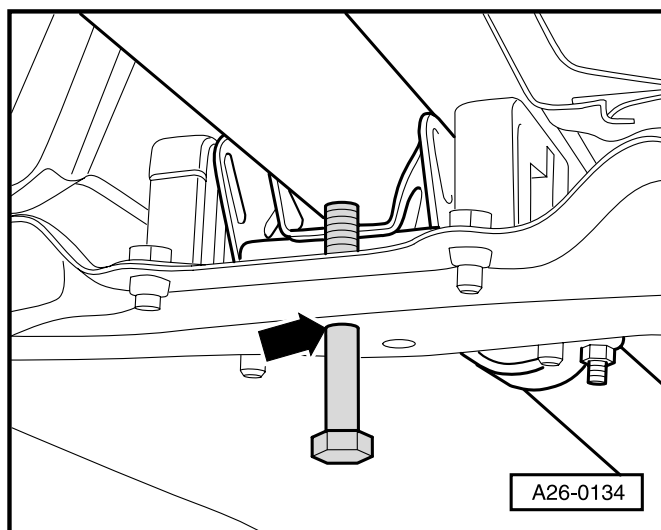
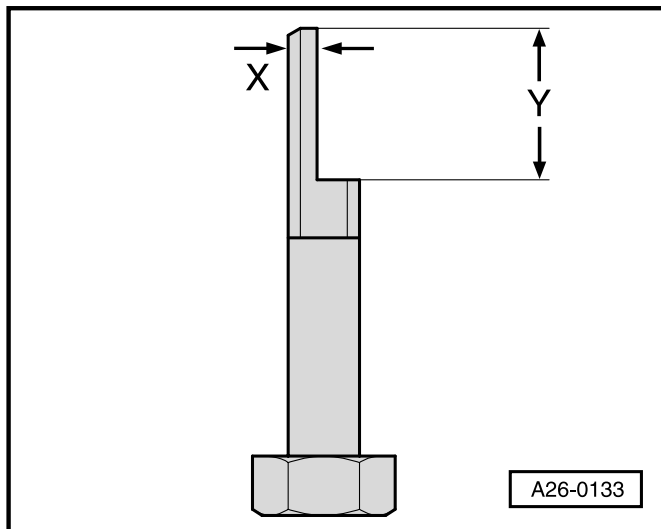
- ◀ - To align the exhaust system, shop-make tool from an M10 bolt to the dimensions stated.

- ◆ Dimension x = 4 mm
- ◆ Dimension y = 25 mm

Note:

Two mechanics are required for aligning the exhaust system.

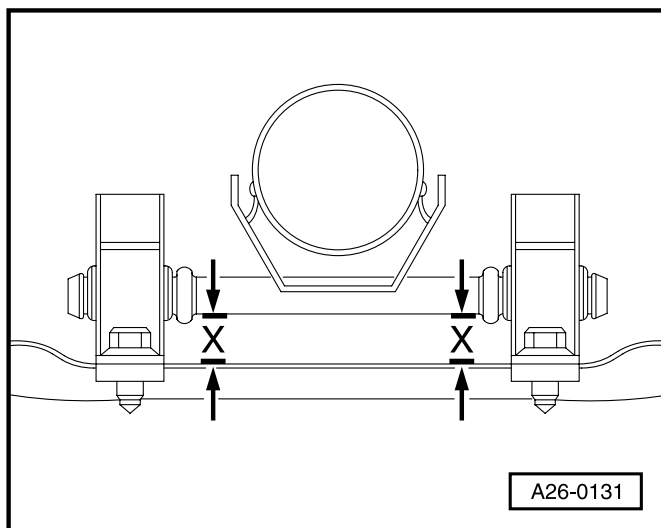
- Slacken bolted connections of clamping sleeve between front exhaust pipe and centre silencer.



- ◀ - Insert shop-made tool through the rear hole -arrow- of the tunnel bridge; the flat points 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.

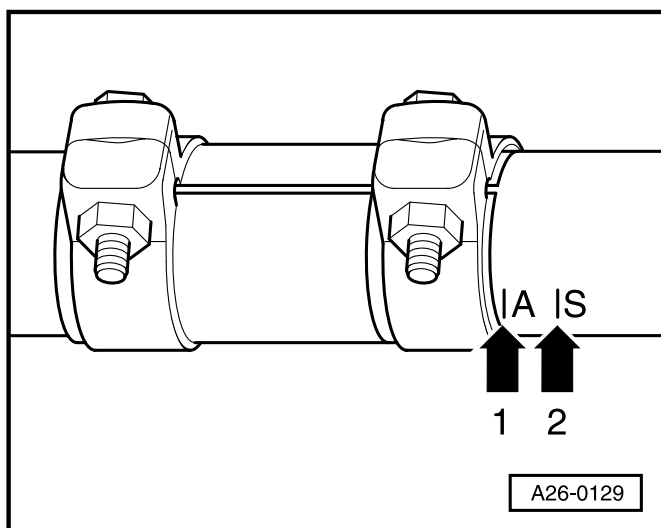


- Align rear silencer horizontally:

- ◀ - The suspension bolt at the exhaust pipe should be positioned parallel to the tunnel bridge (dimension -X- identical on left and right).

Note:

On models with separation point ⇒ page 26-4, additionally check horizontal position of rear silencer at the tail pipes.



- ◀ - Position clamping sleeve with a distance of about 5 mm at the line of the marking „A“-arrow 1- and tighten evenly to 40 Nm in horizontal position.

Inspecting exhaust system for leaks

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