Workshop Manual
Octavia 1997 ➢

1,6 l/75 kW Engine - Mechanical Components
Edition 01.01

Engine code	AVU	BFQ							

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List of Supplements to Workshop Manual

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Supple-ment	Edition	Subject	Article Number
	01.01	Basic Edition	S00.5134.50.20
1	08.02	Changes for engine BFQ	S00.5134.51.20
2	11.04	Modifications in Rep. Gr. 10, 13 and 15	S00.5134.52.20

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20 – Fuel Supply

26 – Exhaust System

00 – Technical Data

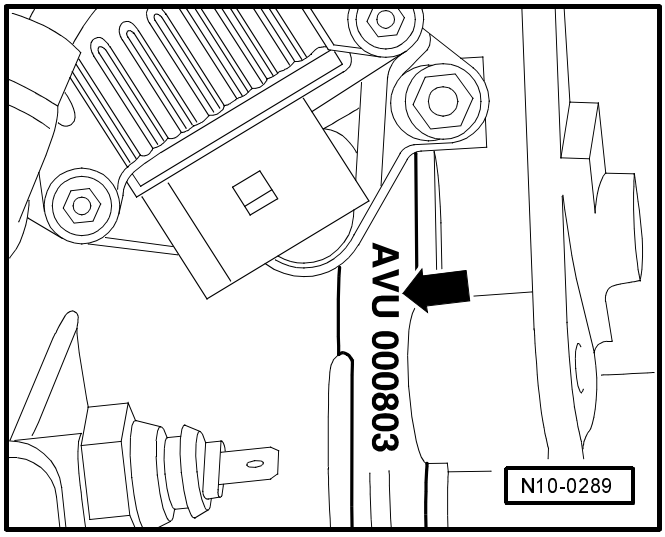
00-1 Technical Data

Engine number

The engine number („engine identification characters“ and „serial number“) is located in the front at the engine/ gearbox joint -arrow-.

In addition, a sticker with the „engine identification characters“ and „serial number“ is affixed to the timing belt guard.

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



Engine characteristics

Engine code letters		AVU	BFQ
Manufactured		10.00 ➤ 04.02	05.02 ➤
Displacement	l	1,595	
Power output	kW at rpm	75/5600	
Torque	Nm at rpm	148/3800	
Bore	∅ mm	81,0	
Stroke	mm	77,4	
Compression		10,5 : 1	
Firing order		1-3-4-2	
Fuel - RON	min.	95 unleaded[1)]	
Ignition system, fuel injection		Simos 3.3	
Knock control		yes	
Self-diagnosis		yes	
Lambda control		yes	
Catalytic converter		yes	
Exhaust gas recirculation		yes	
Intake manifold change-over		yes	
Secondary air system		yes	
Exhaust limits conforming to		EU-4	

1) At least 91 RON in exceptional cases, although engine output is reduced.

10 – Removing and installing engine

10-1 Removing and installing engine - Part 1

Special tools, test and measuring equipment and auxiliary items required

- Workshop crane (e.g. -V.A.G 1202 A -)
- Drip tray (e.g. -V.A.G 1306-)
- Torque wrench 5...50 Nm (e.g. -V.A.G 1331-)
- Torque wrench 40...200 Nm (e.g. -V.A.G 1332-)
- Engine/gearbox jack (e.g. -V.A.G 1383 A-)
- Pliers for spring strap clips (e.g. -VAS 5024- or -V.A.G 1921-)
- Ladder (e.g. -VAS 5085-)
- Engine mount -T10012-
- Bushing -T30010-
- Engine and gearbox mount -MP 1-202-
- Assembly stand -MP 9-101-
- Lifting device -MP 9-201-
- Grease -G 000 100- (for vehicles with gearbox)
- Hot screw paste -G 052 112 A3-
- Cable strap
- Wire
- Adhesive tape

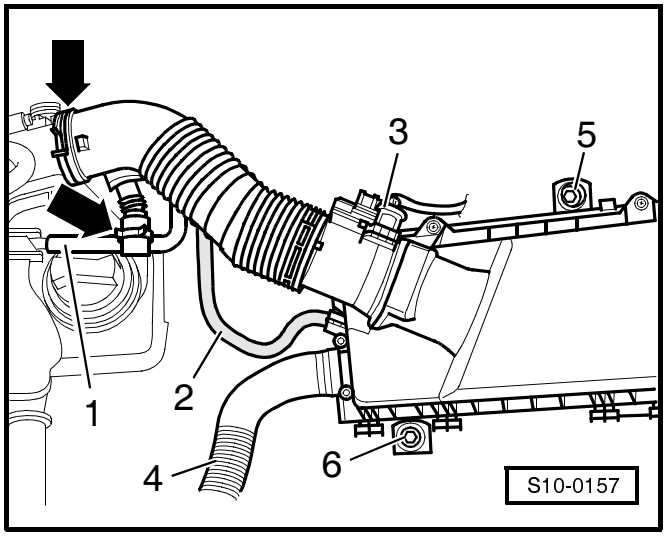
Removing engine

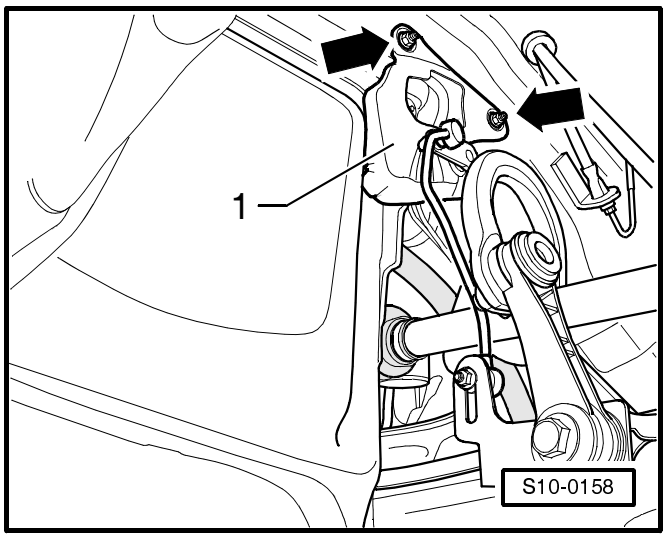
Note!

- *The engine is removed downwards together with the gearbox.*
- *All cable straps that have been loosened or cut open when the engine was removed must be fitted again in the same location when the engine is installed again.*
- *The hose connections are secured with screw-type clips, spring-type clips or clamp-type clips. Always replace clamp-type clips with spring-type clips or screw -type clips.*
- *Fuel hoses at the engine must only be secured with spring-type clips. The use of clamp-type or screw-type clips is not allowed.*
- *It is recommended to use pliers for spring-type clips to fit the spring-type clips (e.g. -VAS 5024- or -V.A.G 1921-)*
- *Pay attention to the correct assignment of the connectors, if necessary mark.*

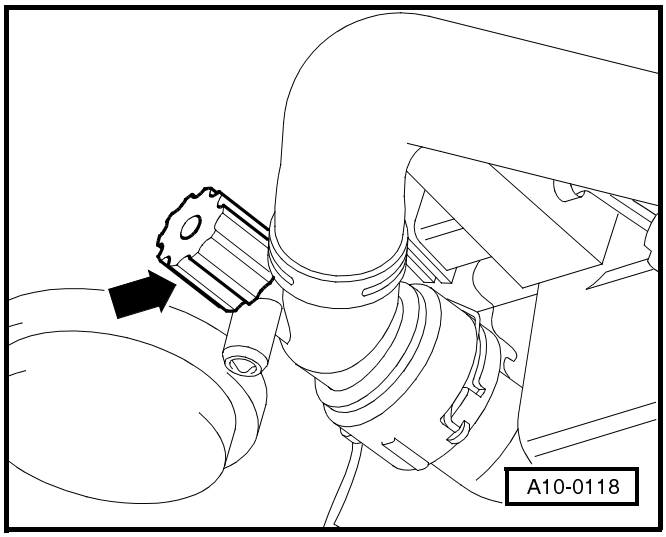
– On models fitted with a coded radio set, pay attention to the coding; determine if necessary.

– Disconnect the earth strap from the battery with the ignition off.
– Remove the engine cover.
– Detach air guide hose at throttle valve connection and at vent housing of the crankcase ventilation -arrows-.
– Disconnect ventilation hose -1- and -2-.
– Unplug connector -3- for air mass meter.
– Remove intake hose -4- for secondary air pump.
– Unscrew bolts -5- and -6-, remove air filter housing.
– Remove battery and battery tray ⇒ Electrical System; Rep. Gr. 27.
– Open the cap of the coolant expansion reservoir.
– Raise vehicle with a lift platform ⇒ Inspection and Maintenance.
– If fitted, unbolt bracket -1- for vehicle level sensor -G78- in left wheelhouse -arrows-.
– Remove noise insulation in middle as well as on left and right, remove air guide parts on outside first of all,

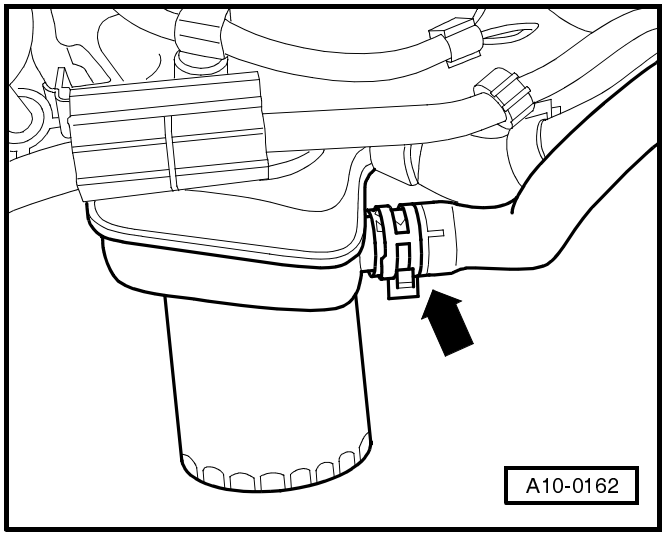




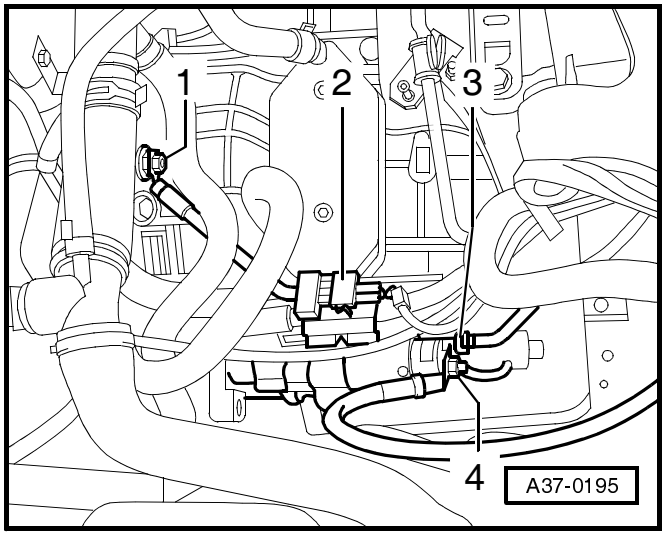
– Position drip tray (e.g. -V.A.G 1306-) under the engine.
– Turn the drain plug -arrow- on the radiator to the left and draw backwards, if necessary fit auxiliary hose onto connection.



– In addition, detach coolant hose at bottom of oil cooler -arrow- and allow remaining coolant to drain.



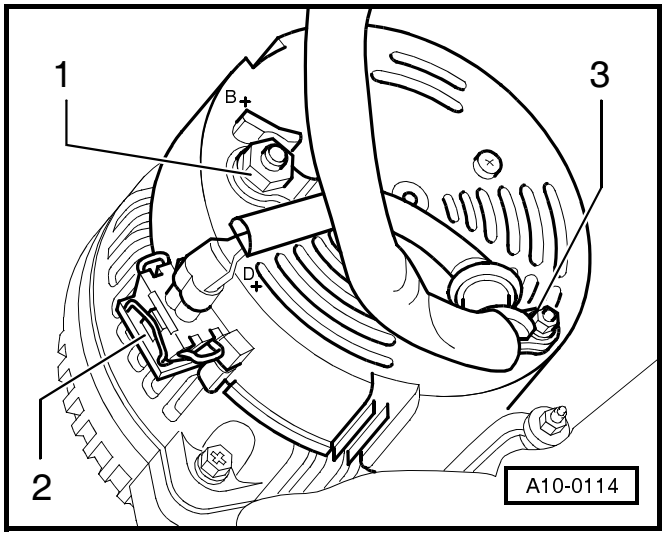
– Unbolt earth strap -1-.
– Detach cables -3- and -4- at starter.
– Separate plug connection -2- and pull out of fixture.
– Detach cables from fixture at starter and place down to the side.



– Unbolt cable -1- of terminal 30/B+ at alternator.
– Detach plug connection -2- of terminal D+.
– Unscrew cable clamp -3-.
– Detach cable from fixture.
– If fitted, unplug connector of pressure switch -F88- at power steering pump.

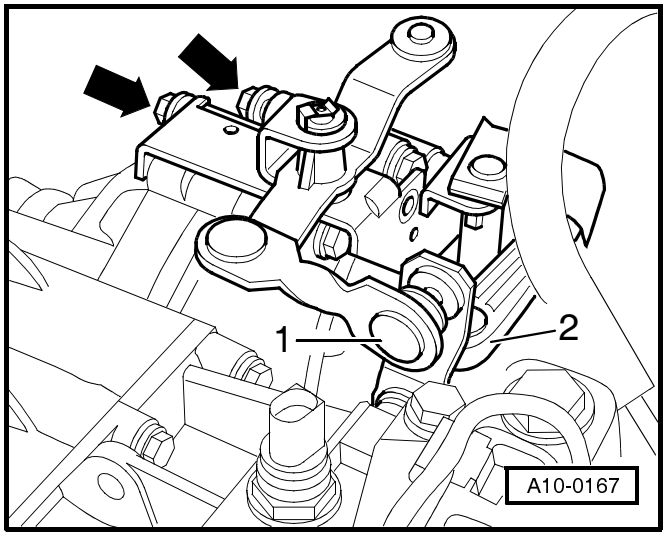
Vehicles with air conditioning

– Disconnect plug connection from AC compressor.

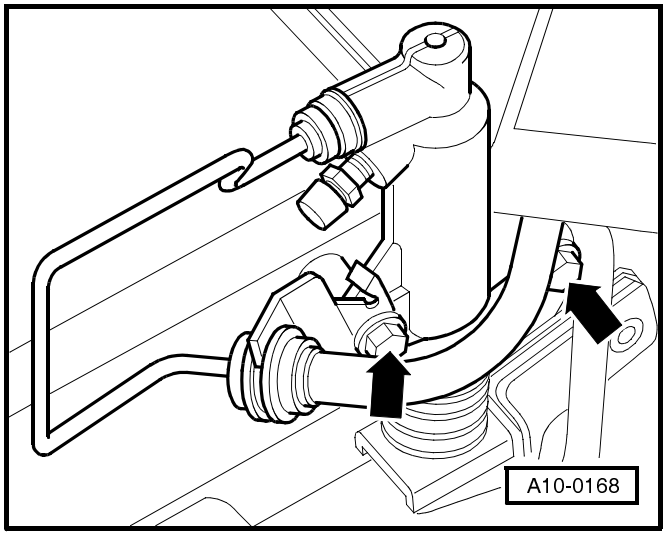


Vehicles with gearbox

– Press off shift rods -1- and -2- with a screwdriver.
– Unbolt shift mechanism at gearbox -arrows-.



– Remove the slave cylinder -arrows- and lay aside, secure with wire, do not open the line system.



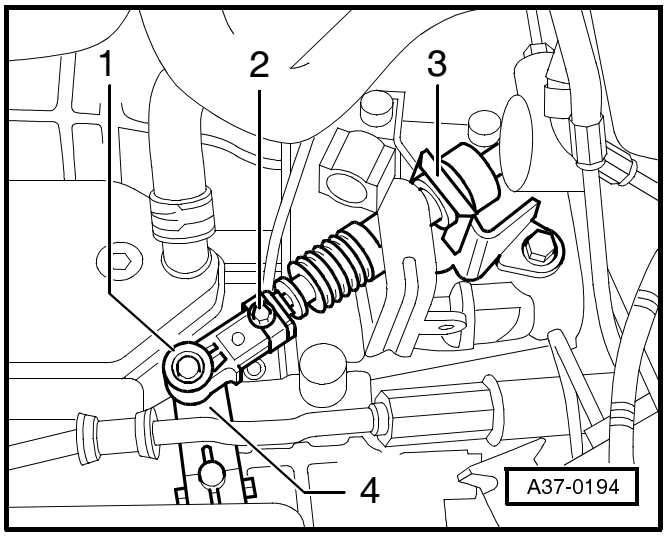
Note!

Do not depress the clutch pedal.

– Unplug connector at reversing light switch -F4-.
– Unplug the connector from the speedometer sender -G22-.
– Detach wiring harness from the fixtures and run out to the side.

Vehicles with automatic gearbox

– Use screwdriver to press off selector lever cable -1- at gearbox selector lever -4-, pull off securing clasp -3- at support bearing.
– Take off selector lever cable and place to the side.
– Unbolt bracket for pressure line of power-assisted steering at gearbox support.

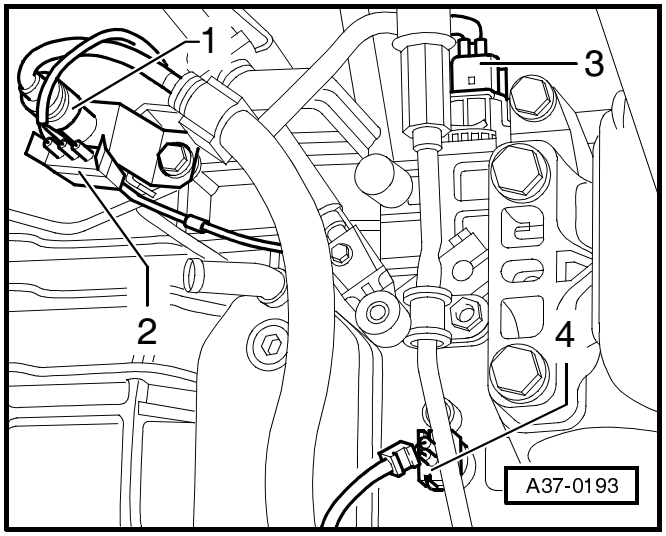


– Disconnect plug:

1 - to the solenoid valves
2 - to the vehicle speed sensor -G68-
3 - at the multifunction switch -F125-
4 - at the gearbox speed sensor -G38-

– Unplug the connector from the speedometer sender -G22-.

– Detach wiring harness from the fixtures and run out to the side.



Continued for all vehicles

Caution!

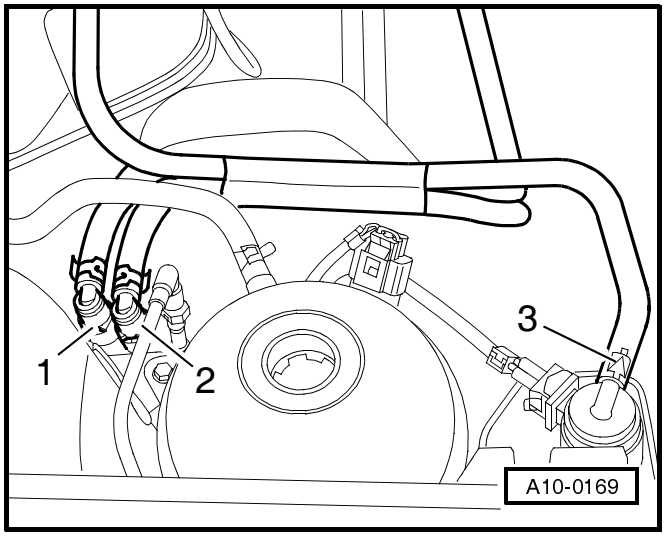
The fuel system is under pressure! Before opening the system lay cleaning cloths around the connection point. Reduce pressure by carefully releasing the connection point.

– Detach fuel feed line -1- and fuel return-flow line -2- by pressing on the release buttons at the separation point.

Lines and release buttons are colour-coded.

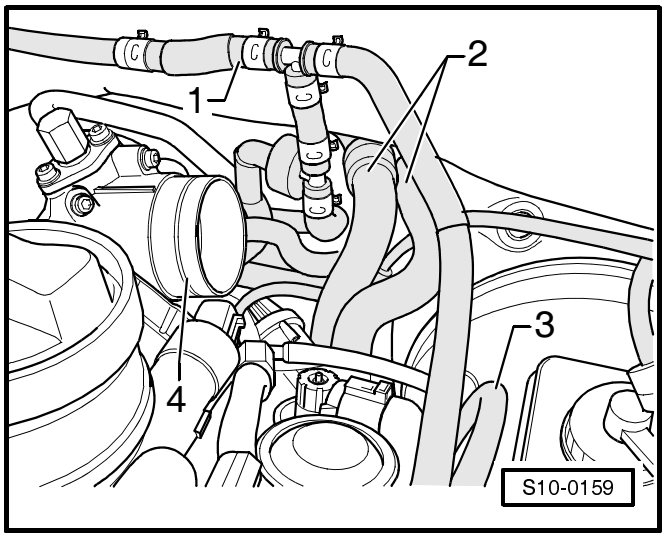
– Seal the lines so that no dirt can get into the fuel system.

– Detach hose -3- at the ACF tank.



– Detach coolant hoses:

- to expansion reservoir (at front coolant pipe)
- to thermostat housing (at bottom of radiator and at thermostat housing)
- Towards top radiator
- Vehicles with automatic gearbox: to ATF radiator
- at T-union to top coolant pipe -1-
- to heating system heat exchanger -2-



– Disconnect the vacuum line -3- from the brake servo unit.

– Unplug connector of throttle valve control unit -J338- and detach throttle valve control unit -4- from top part of the intake manifold.

– Unplug connector of second air pump motor -V101- ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.

– Unbolt secondary air pump motor and bracket and remove.

– Unplug connector of valve for valve for variable intake manifold changeover -N156- ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.

– Remove top part of intake manifold ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.

Note!

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

– As part of the further removal work, separate the plug connections at the following components:

- Ignition transformer -N152-
- Hall sender -G40-
- Injection valve -N30...N33-
- Sender for coolant temperature -G62-
- Engine speed sender -G28-
- Knock sensor -G61-
- EGR valve -N18- with EGR potentiometer -G212-
- Oil pressure switch -F1-
- Oil level/temperature sender -G266-

Fitting locations: ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

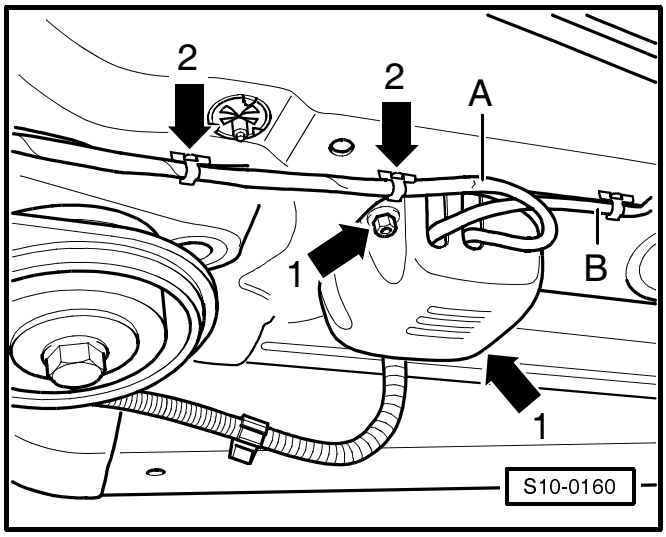
– Detach wiring harness from the fixtures and place down to the side.

– Unbolt protective cover at underfloor -arrows 1-.

– Disconnect the 6-pin plug connector (black) -A- to the lambda probe before catalyst -G39-.

– Unclip the line from the guides -arrows 2- and tie up the line at the exhaust manifold.

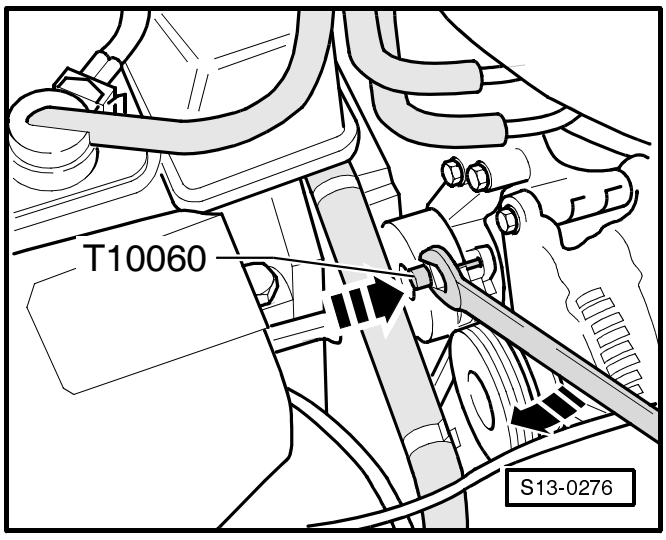
– After this, separte the 4-pin plug connection (brown) -B- to the lambda probe after catalyst -G130-.



Note!

Mark the rotation direction before removing the ribbed V-belt. Reversing the rotation direction of an already used belt may destroy it. Pay attention to the correct position of the ribbed V-belt in the belt pulley when installing it.

– Swivel tensioning device with open-end wrench in direction of arrow for slackening the ribbed V-belt and lock with locking pin -T10060-.



Note!

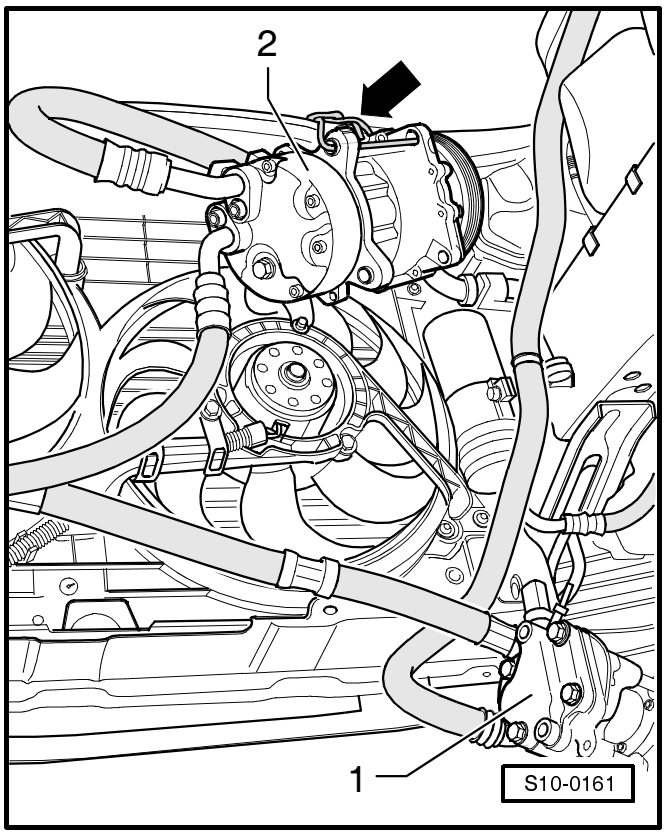
The tensioning device can also be locked with a 3 mm hexagon socket wrench.

– Remove the ribbed V-belt.

– Unbolt 2 brackets for the pressure line of power-assisted steering (on left at gearbox and below starter).

– Unbolt belt pulley of hydraulic pump for power-assisted steering.

– Unbolt hydraulic pump -1- of power-assisted steering and tie up to the front at the lock carrier. The hoses remain connected.



Vehicles with air conditioning

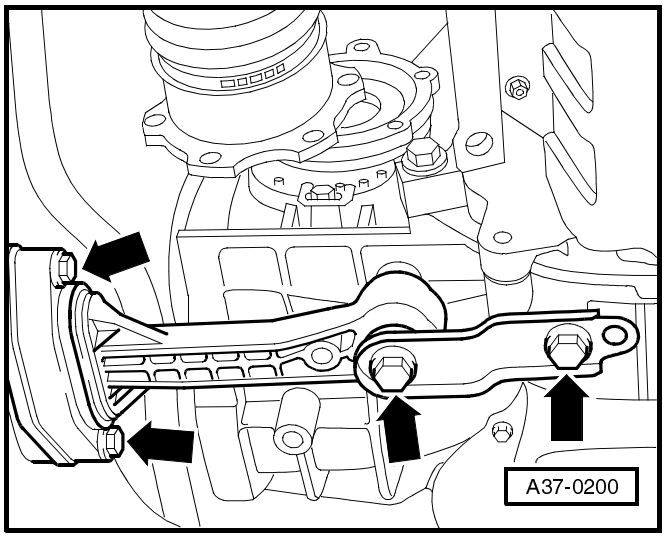
Warning!

Do not open the refrigerant circuit of the air conditioning system.

– Unbolt compressor -2- of air conditioning, tie up together with the connected refrigerant hoses to the top at the lock carrier -arrow-.

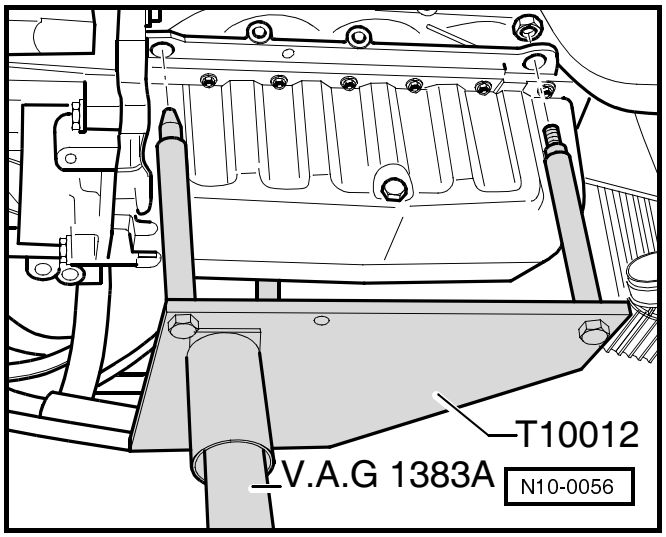
Continued for all vehicles

– Unbolt the pendulum support -arrows-.



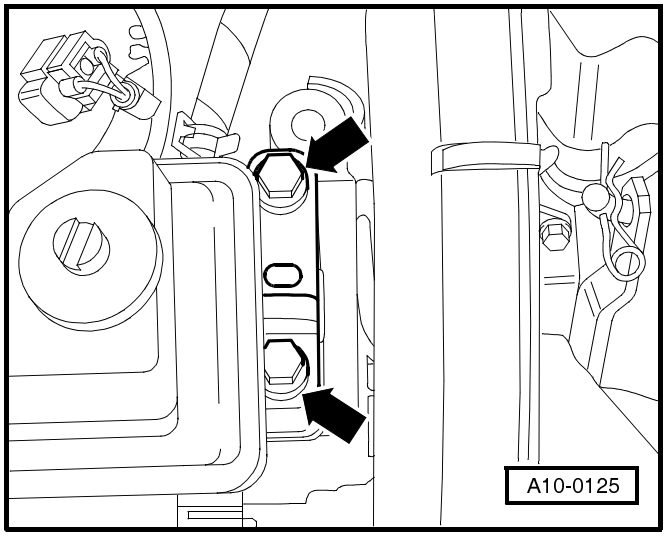
– Unscrew heat shield for inside right constant velocity joint from engine.
– Remove the right drive shaft and screw the left drive shaft onto the gearbox ⇒ Running gear; Rep. Gr. 40.
– Removing exhaust pipe ⇒ Chap. 26-1.

– Insert engine mount -T10012- into engine/gearbox jack (e.g. -V.A.G 1383 A-).
– Remove front threaded pin and attach engine holders -T10012- to cylinder block with nuts and M10 x 25/8.8 bolts with a torque of approx. 40 Nm.



– Slightly raise the engine and gearbox with the engine/gearbox jack.

– Unscrew the engine mounting from the engine support bracket from the top -arrows-.



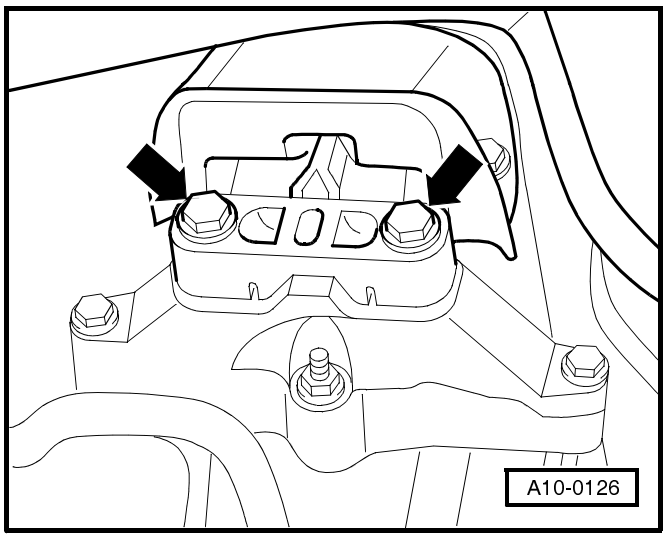
Note!

Use the ladder (e.g. -VAS 5085-) for removing the bolts.

– Unscrew the gearbox mount from the gearbox support bracket from the top -arrows-.

– Carefully lower the engine with gearbox.

– Run pressure line of power-assisted steering past the gearbox.



Note!

Engine and gearbox must be guided carefully when lowering in order to avoid damaging the body.

Attaching engine to assembly stand

Secure the engine with engine mount -MP 1-202- on the assembly stand -MP 9-101- before performing assembly work.

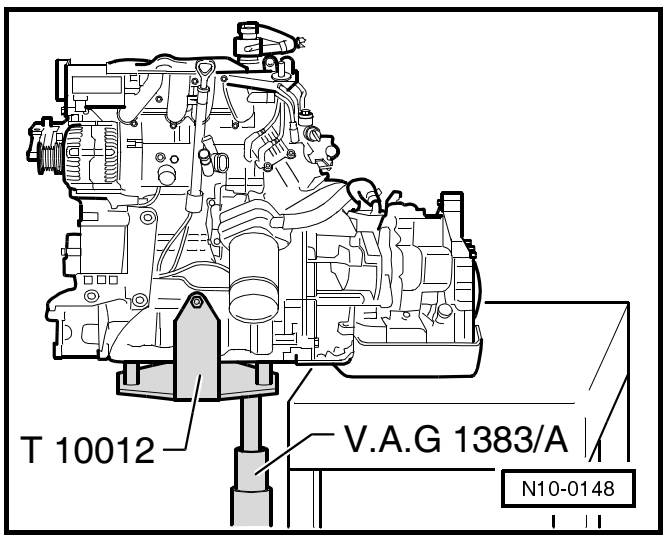
Note!

When measuring the cylinder bore ⇒ Chap. 13-5 the engine must not be fixed to the assembly support.

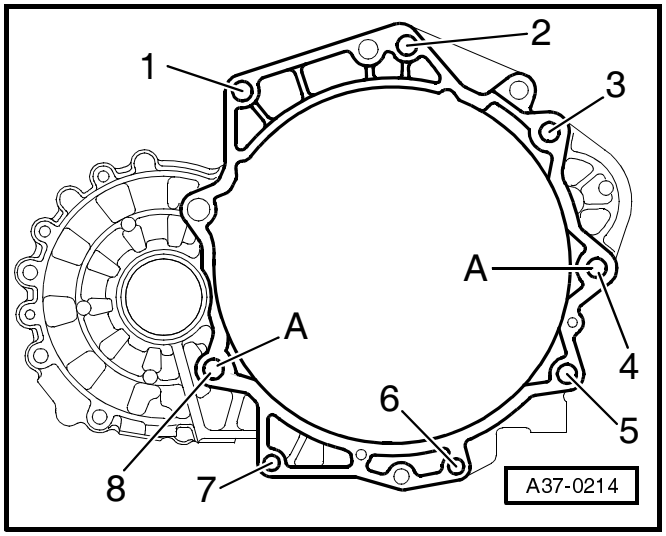
Procedure

– With a lifting device, e.g. -V.A.G 1383 A-, bring the engine/gearbox unit to the work bench.

– Lower the engine/gearbox unit in such a way that the gearbox is positioned on the support.

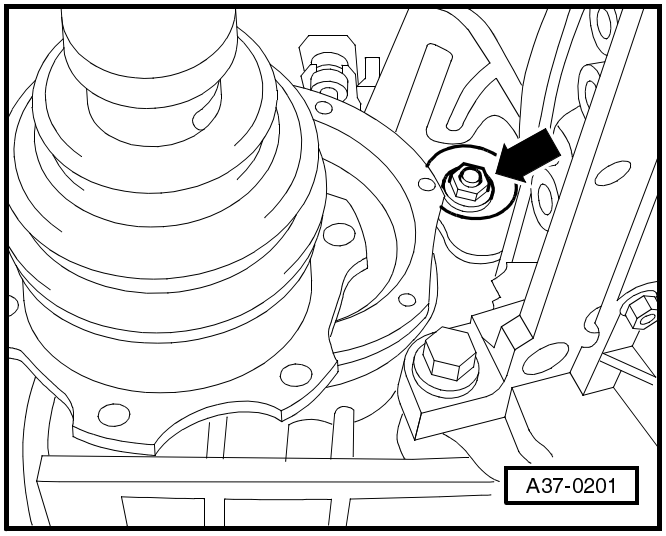


– Remove bolts -1 to 8- connecting engine/gearbox. ►
– If fitted, remove small cover plate for flywheel behind right flange shaft.
– Press gearbox from engine.



Vehicles with automatic gearbox

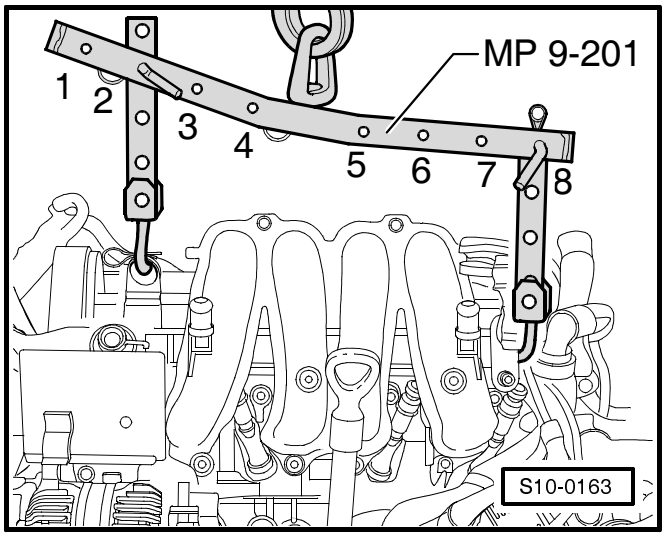
– Pull off plug in hole of torque converter cover plate.
– Unscrew 3 nuts -arrow- from torque converter, rotate crankshaft each time $^1/_3$ revolution for this step. ►
– Detach hoses from ATF cooler.
– After separating engine and gearbox, secure torque converter in gearbox to prevent it dropping out.



Continued for all vehicles

– Attach supporting device -MP 9-201- to the engine as follows and lift out of engine/gearbox lifting device (e.g. -V.A.G 1383 A-) with workshop crane (e.g. -V.A.G 1202 A-). ►

- On the belt pulley side: 3. Hole of the perforated bar in position 2
- On the flywheel side: 4. Hole of the perforated bar in position 8



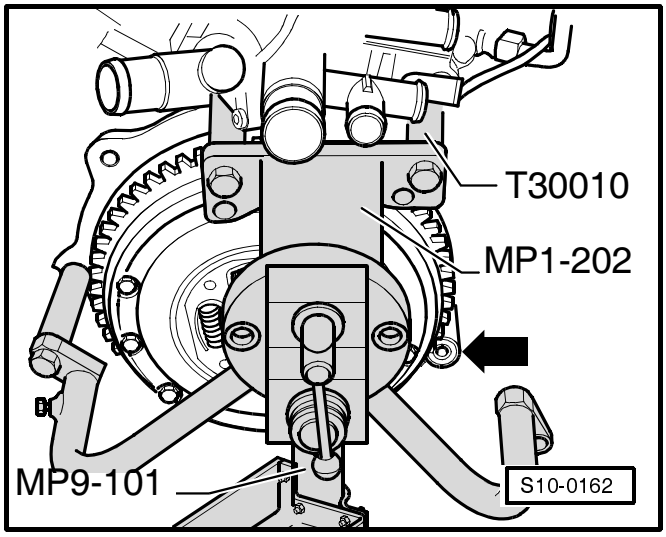
Warning!

Use securing pins on the hooks and rig pins.

Note!

- *The rig positions on the supporting bracket marked 1…4 point towards the belt pulley.*
- *The holes in the perforated bars are counted from the hook.*

– Attach engine to the assembly stand -MP 9-101- with the engine and gearbox mount -MP 1-202 - and the distance sleeves -T30010-.



Note!

Large inner diameter of the sleeves -T30010- points to dowel sleeve in engine block.

– The vacant hole -arrow- is used for mounting the counterholder -MP 1-221- for slackening the flywheel or driven plate.

10-2 Removing and installing engine - Part 2

Special tools, test and measuring equipment and auxiliary items required

- ⇒ Chapter 10-1

Installing the engine

Note

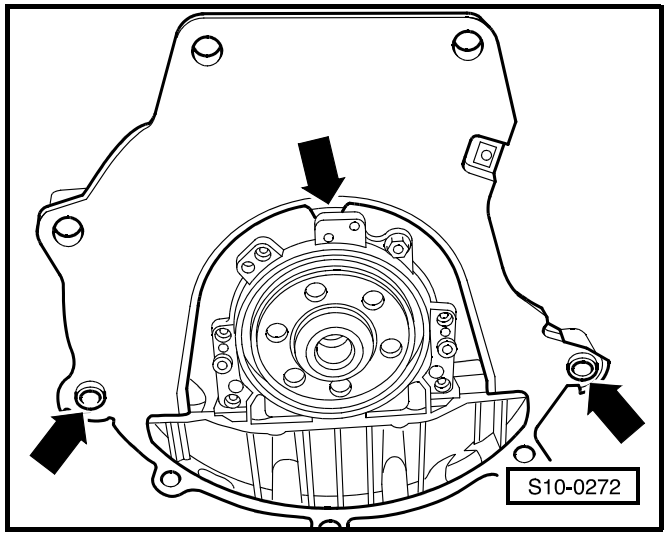
- *Always replace the seals and gaskets during assembly work.*
- *Replace the self-locking nuts and screws.*
- *Clean all threaded holes into which self-locking bolts are inserted, with a thread tap to remove residues of the locking fluid.*
- *Coat stud bolts of exhaust manifold with hot bolt paste -G 052 112 A3- before installing.*
- *Tightening torques ⇒ **10-2** page 3.*
- *Assembly bracket ⇒ **10-2** page 4.*
- *If the battery is disconnected and reconnected, carry out certain additional operations ⇒ Electrical System; Rep. Gr. 27.*

Procedure

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

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

– Insert intermediate plate on sealing flange and push onto the dowel sleeves -arrows-. ►



Vehicles fitted with a manual gearbox

– Grease the drive shaft serration with grease -G 000 100-.

– If necessary check the centering of the clutch disc.

– Install slave cylinder of hydraulic clutch ⇒ 5-Speed Manual Gearbox 02K; Rep. Gr. 30.

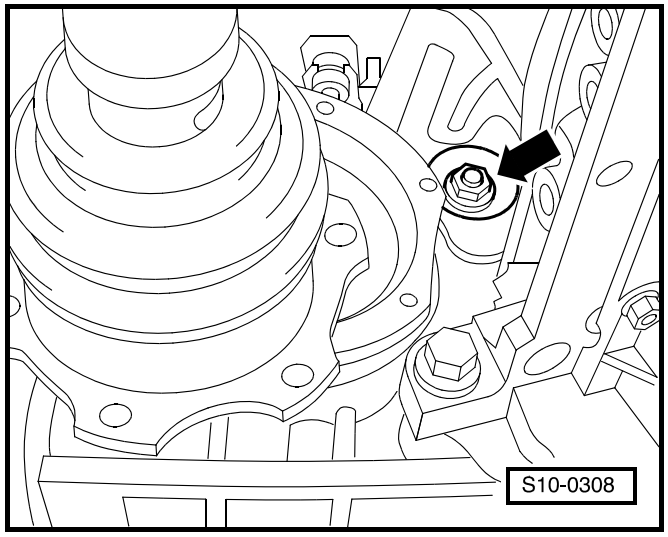
– Install shift mechanism ⇒ 5-Speed Manual Gearbox 02K; Rep. Gr. 34.

– Set shift mechanism ⇒ 5-Speed Manual Gearbox 02K; Rep. Gr. 34.

Vehicles with automatic gearbox

– Use only nuts -arrow- which are approved in the Parts List, for attaching torque converter to the driven plate. ►

– Replace lock washer at support bracket of selector lever cable.



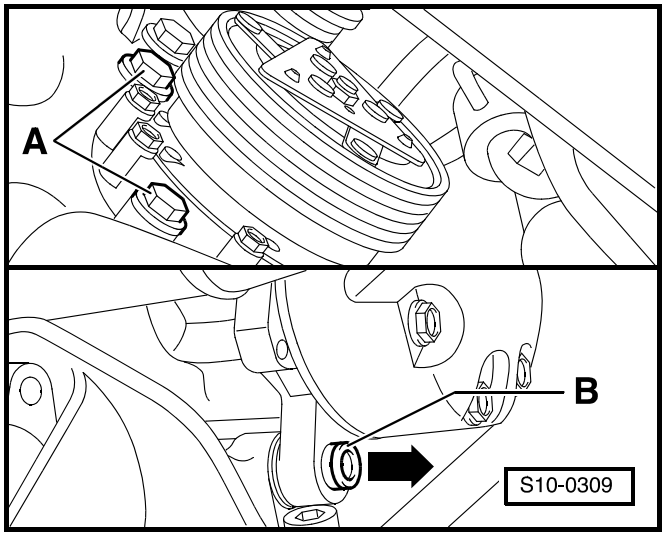
– Install selector lever cable at gearbox or adjust ⇒ Automatic Gearbox 01M; Rep. Gr. 37.

Continued for all vehicles

– When installing the engine/gearbox units, ensure clearance to the subframe as well as to the radiator.
– Run pressure line of power-assisted steering past the gearbox.
– Align unit mounting for engine - gearbox ⇒ **10-2** page 3.

For vehicles with air conditioning

– Install AC compressor ⇒ Heating, Air Conditioning; Rep. Gr. 87.
– To facilitate the positioning of the AC compressor drive the threaded bushings -B- for fixing screws -A- slightly backwards in the direction of the arrow.



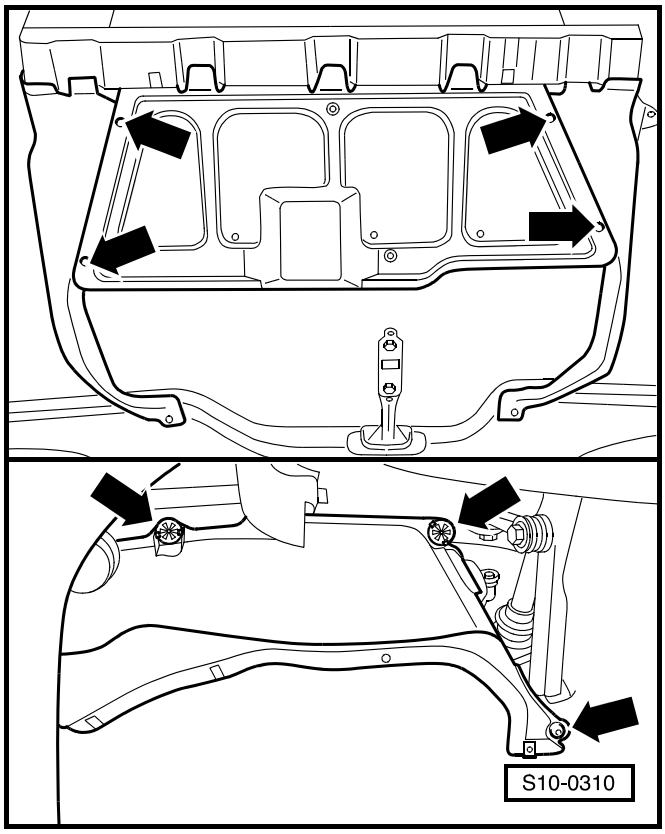
Continued for all vehicles

– Install power-assisted steering hydraulic pump ⇒ Chassis; Rep. Gr. 48.
– Install the V-ribbed belt ⇒ Chapter 13-1.
– Install the right drive shaft and screw the left drive shaft onto the gearbox ⇒ Chassis; Rep. Gr. 40.
– Install the exhaust pipe ⇒ Chap. 26-1.
– Install the coolant hoses ⇒ Chapter 19-1.

Note

The drained off coolant must only be then re-used if the cylinder head, cylinder block, radiator or heat exchanger were not replaced.

– Top up coolant ⇒ Chapter 19-1.
– Electrical connections and proper routing ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
– Install top part of intake manifold ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.
– Install secondary air pump.
– Install noise insulation panel in middle as well as on left and right -arrows-. Install air guide parts on outside.
– Before starting the engine, inspect oil level ⇒ Inspection and Maintenance.
– Adapt engine control unit to throttle valve control unit -J338- and to EGR valve ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.
– Read out and generate readiness code ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.



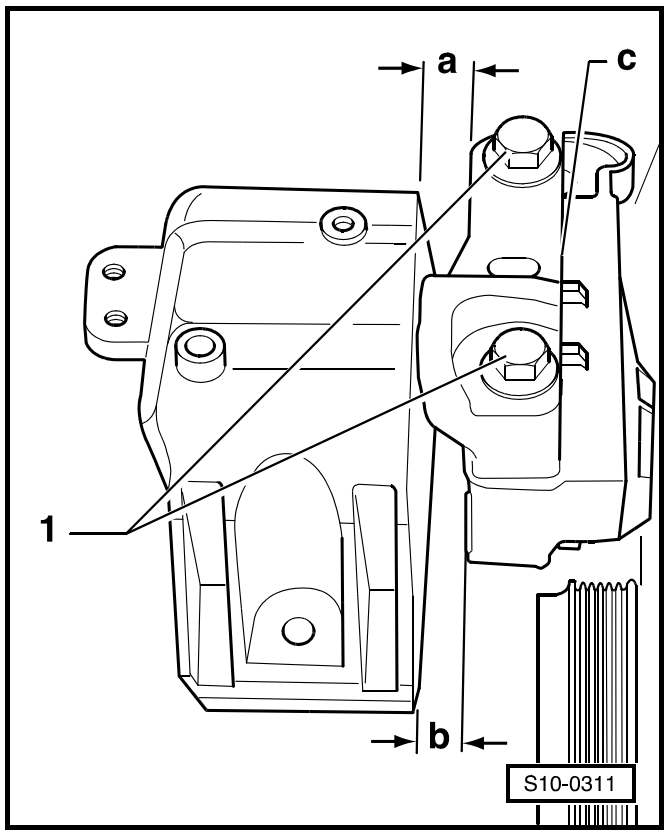
– The basic setting must always be additionally initiated on vehicles with an automatic gearbox ⇒ Automatic Gearbox 01M; Rep. Gr. 01.
– Undertake a test drive and interrogate and erase the fault memory ⇒ 1.6 litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

Align unit mounting for engine - gearbox

Caution!

Before slackening the bolts, the unit must be secured with the supporting device -MP 9-200-.

Engine mounting

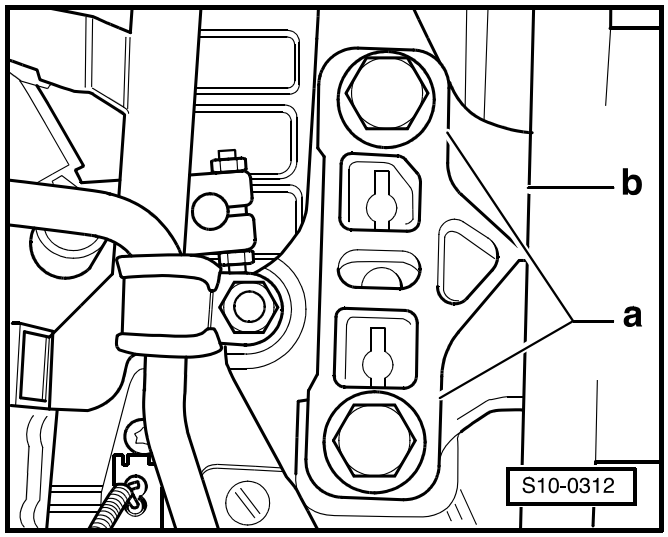


a = 14.0 mm

b = at least 10.0 mm

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

Gearbox mounting



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

Tightening torques

Note

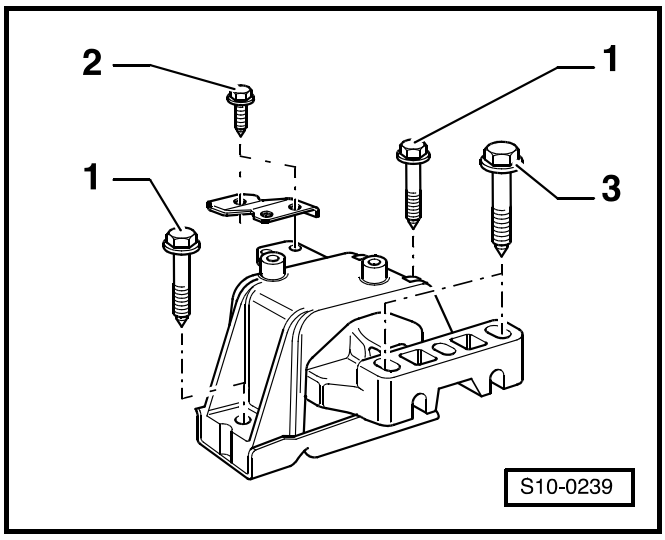
- *Tightening torques apply only for lightly greased, oiled, phosphatized or blackened nuts and screws.*
- *Other lubricants such as engine and gearbox oil are allowed. Under no circumstances use Molykote.*
- *Do not use degreased parts.*
- *Unless otherwise indicated the following tightening torques apply:*

Component		Nm
Screws and nuts	M6	9
	M7	13
	M8	20
	M10	40
	M12	70
In variation of this:		
Engine mounting, gearbox mount, pendulum support		⇒ Assembly bracket
Driver plate on the torque converter		60
Connecting bolts for the engine/the gearbox ⇒ 5-speed manual gearbox 02K; Rep. Gr. 34 ⇒ Automatic gearbox; Rep. Gr. 37.		

Assembly bracket

Tightening torques

Engine assembly bracket

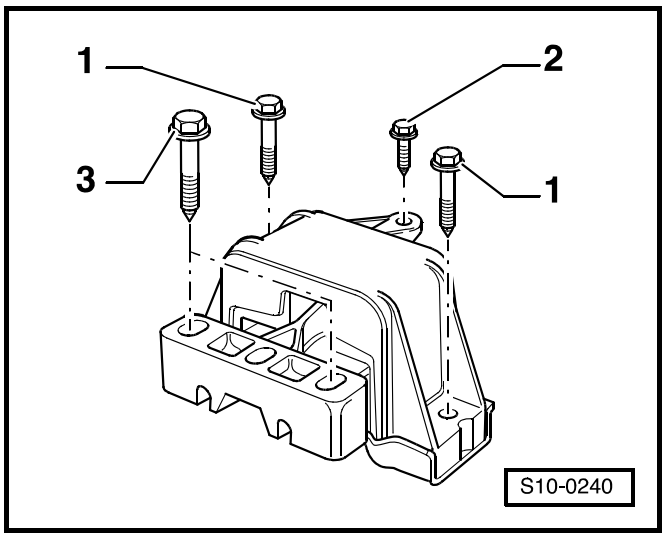


1 - 40 Nm + 90° ($^1/_4$ turn)[1)]

2 - 25 Nm[1)]

3 - 100 Nm[1)]

Gearbox assembly bracket

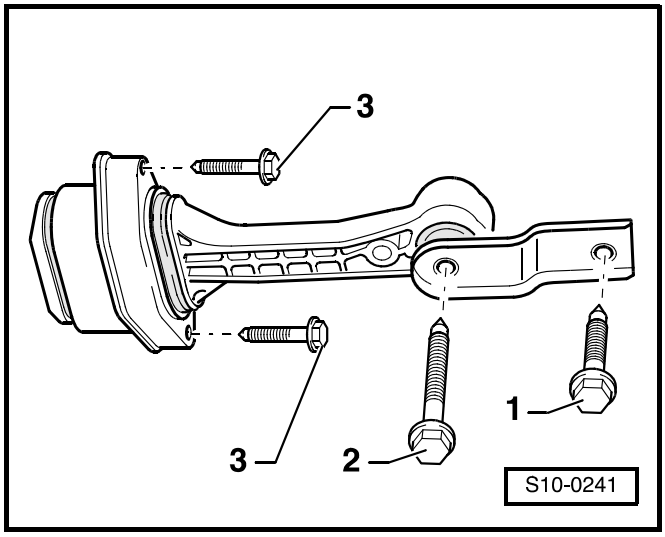


1 - 40 Nm + 90° ($^1/_4$ turn)[2)]

2 - 25 Nm[2)]

3 - 100 Nm[2)]

Hinged bracket



1 - 40 Nm +45°[3)]

2 - 40 Nm +45°[3)]

3 - 20 Nm + 90° ($^1/_4$ turn)[3)]

---

1) Replace bolts
2) Replace bolts
3) Replace bolts

13 – Crankgear

13-1 Disassembling and assembling engine

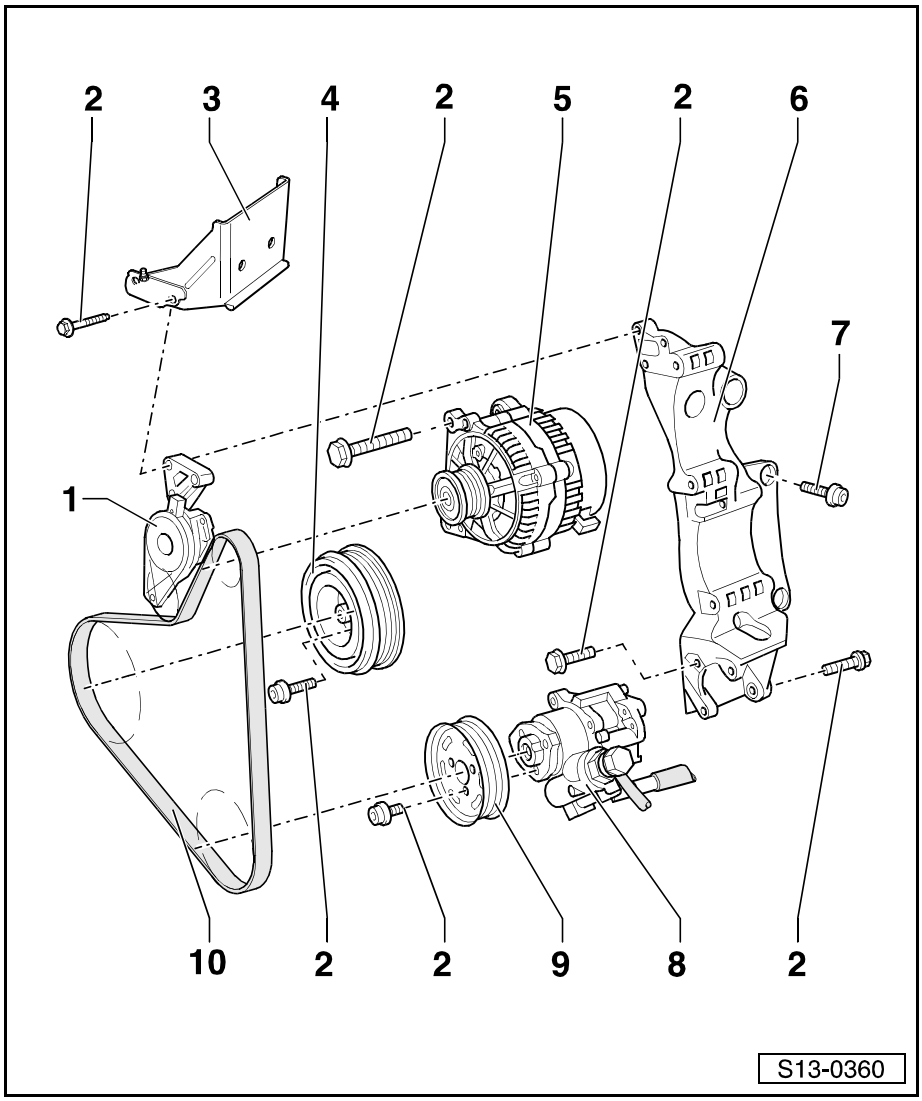
Removing and installing V-ribbed belt

Special tools, test and measuring equipment and aids required

- Torque wrench
- Locking pin -T10060-

Note

- *The following figure shows the belt drive of vehicles without air conditioning.*
- *Mark the rotation direction before removing the V-ribbed belt. Reversing the rotation direction of an already used belt may destroy it. Pay attention to the correct position of the V-ribbed belt in the belt pulley when installing it.*
- *Install AC compressor ⇒ Fig. 1 in **13-1** page 3.*



1 - Tensioning device for ribbed V-belt
- ❑ swivel tensioning device for V-ribbed belt with open-end wrench to slacken the V-ribbed belt ⇒ **13-1** page 2

2 - 25 Nm

3 - Bracket
- ❑ pay attention to the various different versions

4 - Belt pulley with vibration damper
- ❑ can be installed only in one position

5 - Generator
- ❑ to facilitate positioning of the generator on the holder, drive the threaded bushings of the retaining screws backwards

6 - Compact holder
- ❑ for tensioning pulley of ribbed V-belt, alternator, hydraulic pump for power-assisted steering and AC compressor
- ❑ Tightening order of bolts ⇒ Fig. 2 in **13-1** page 3

7 - 45 Nm

8 - The vane pump for the power-assisted steering
- ❑ to facilitate the positioning of the hydraulic pump on the holder drive the threaded bushings of the retaining screws slightly backwards
- ❑ removing and installing ⇒ Chassis; Rep. Gr. 48

9 - Belt pulley
- ❑ for hydraulic pump

10 - V-ribbed belt

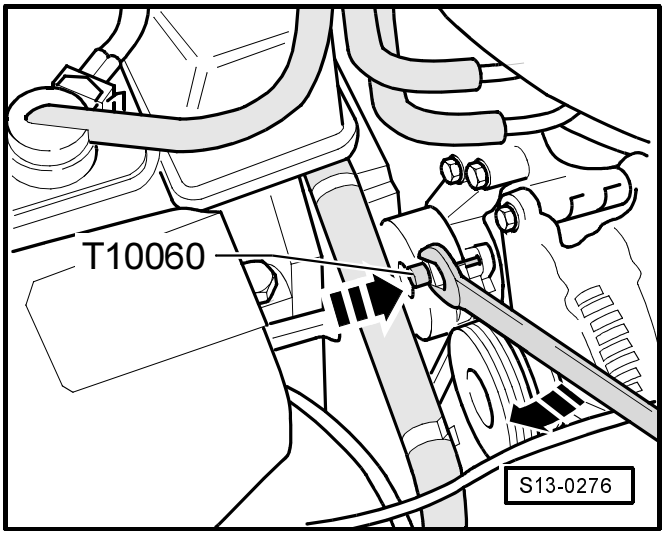
- ❑ before removing mark running direction
- ❑ check for wear
- ❑ do not kink
- ❑ engines fitted with an AC compressor are equipped with a double ribbed V-belt

Removing

Note

Mark the rotation direction before removing the V-ribbed belt. Reversing the rotation direction of an already used belt may destroy it. Pay attention to the correct position of the V-ribbed belt in the belt pulley when installing it.

– Swivel tensioning device in -direction of arrow- to slacken the V-ribbed belt and lock with locking pin -T10060-. ►



Note

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

– Remove the V-ribbed belt.

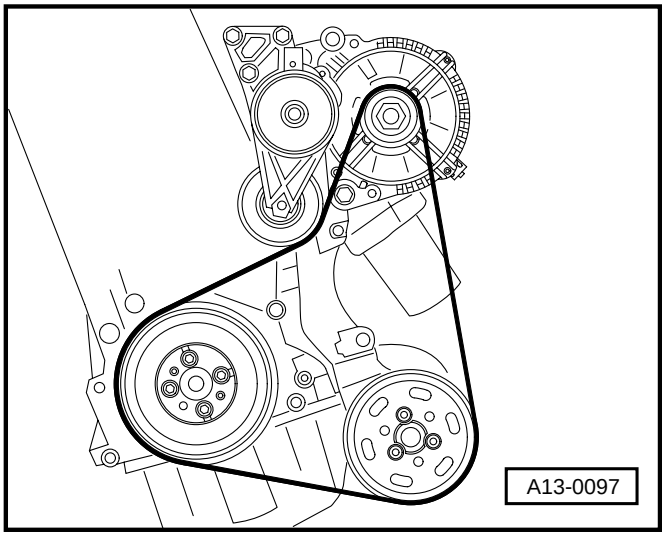
Installing

Note

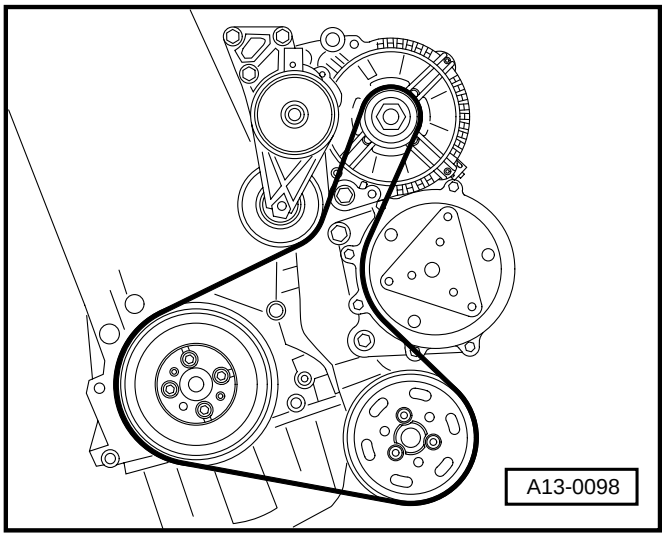
Before installing the ribbed V-belt, ensure that all components (alternator, AC compressor, hydraulic pump) are properly installed.

– Fit the ribbed V-belt.

Routing of ribbed V-belt on vehicles without air conditioning ►



Routing of ribbed V-belt on vehicles with air conditioning ►



Note

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

– Slacken tensioning device for ribbed V-belt and pull out locking pin -T10060- -arrows-.
– Start engine and check belt run.

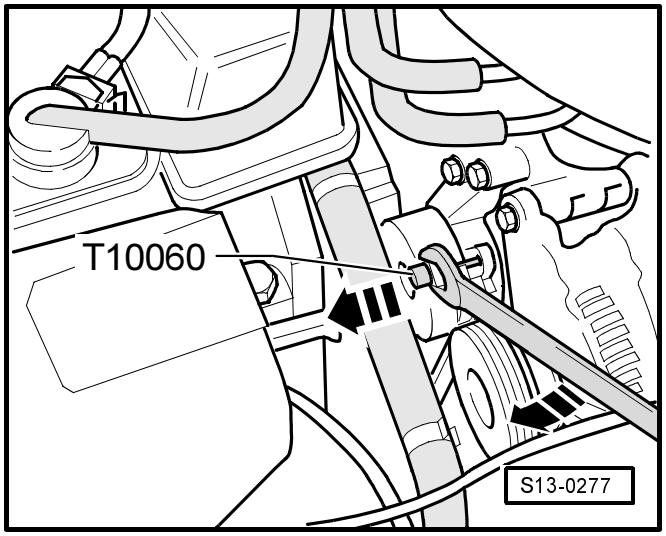


Fig. 1: Install AC compressor

– To facilitate the positioning of the AC compressor drive the threaded bushings -B- for fixing screws -A- slightly backwards in the direction of the arrow.
– Tighten bolts to 45 Nm.

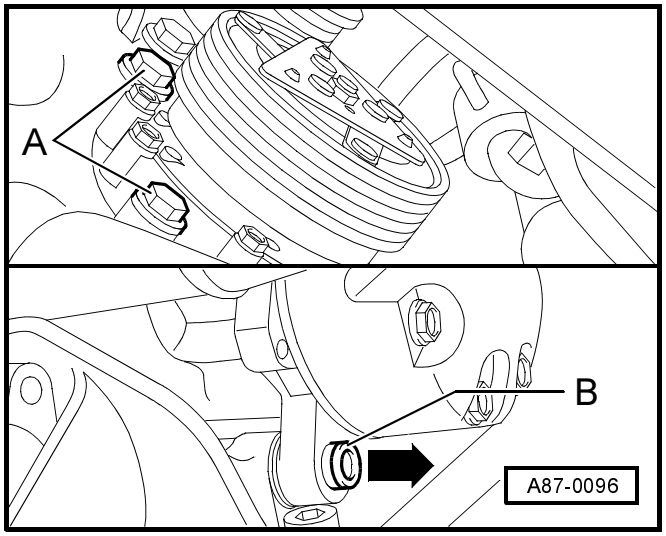
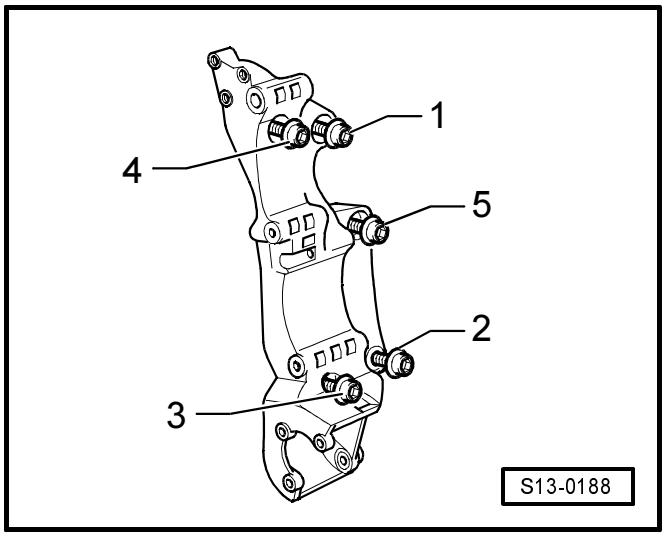


Fig. 2: Tightening order of bolts for compact bracket



13-2 Removing and installing, tightening the timing belt

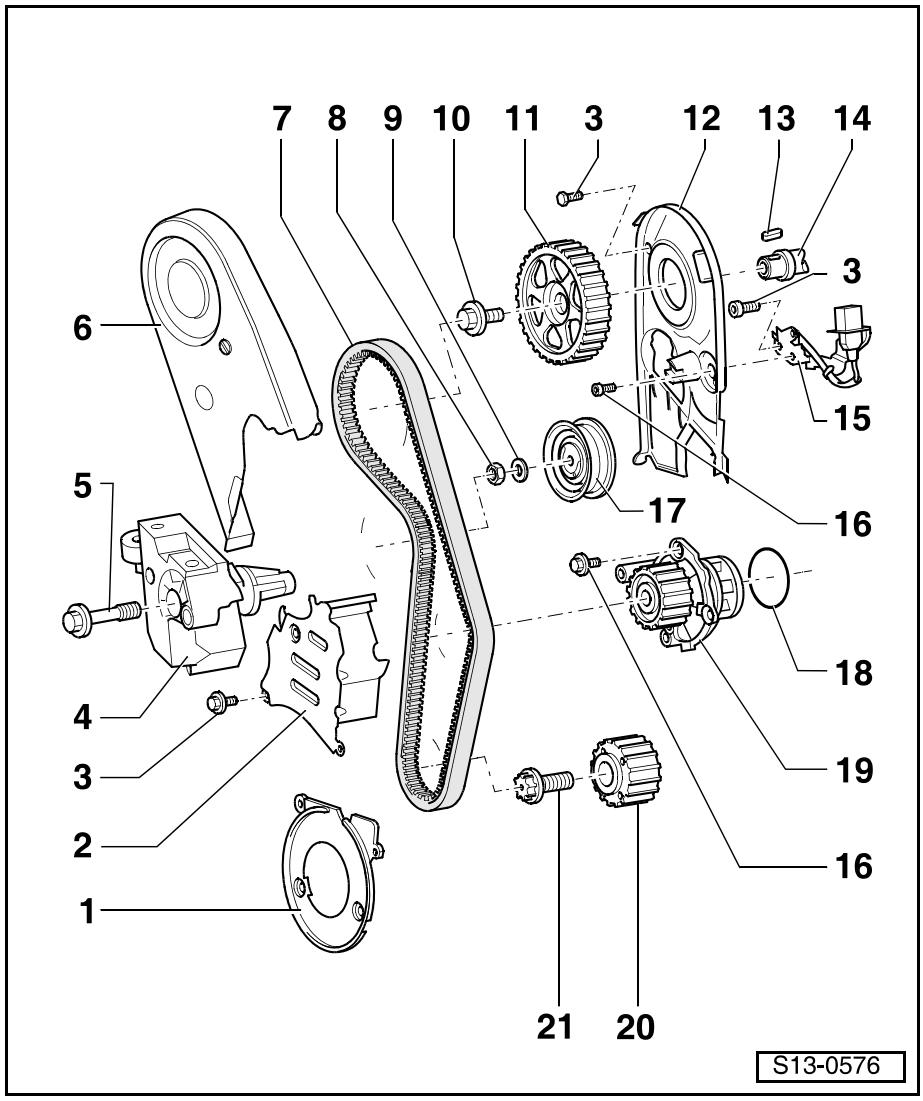
Summary of components

Special tools, test and measuring equipment and aids required

- Torque wrench
- Pressure pad -T30004-
- Two-hole nut turner -T10020-
- Supporting device -MP 9-200-

Note

Before removing the timing belt, mark direction of running. Reversing the rotation direction of an already used belt may destroy it.



1 - Bottom toothed belt guard
- ❑ unbolt vibration damper in order to remove ⇒ Chap. 13-1

2 - Middle toothed belt guard

3 - 10 Nm

4 - Engine support bracket
- ❑ removing ⇒ **13-2** page 2

5 - 45 Nm
- ❑ 3 pieces

6 - Top toothed belt guard
- ❑ removing ⇒ Fig. 1 in **13-2** page 2

7 - Timing belt
- ❑ before removing mark running direction
- ❑ check for wear
- ❑ do not kink
- ❑ removing ⇒ **13-2** page 2
- ❑ installing ⇒ **13-2** page 5

8 - 25 Nm

9 - Corrugated washer

10 - 100 Nm
- ❑ to release and tighten use counterholder -T30004-

11 - Camshaft sprocket
- ❑ for engines with engine identification characters AVU with rotor for camshaft position sensor -G163-
- ❑ for removing and installing, remove toothed belt ⇒ **13-2** page 2
- ❑ installation position fixed by parallel key ⇒ item 13

12 - Rear timing belt guard

13 - Parallel key
- ❑ check tightness

14 - Camshaft
- ❑ for engines with engine identification characters AVU without rotor for camshaft position sensor -G163-

15 - Camshaft position sensor -G163-
- ❑ for engines with engine code AVU

- ❑ camshaft position sensor -G163- is identical with Hall sender -G40-
- ❑ when bolting on, ensure base plate is centered

16 - 15 Nm

17 - Semi-automatic tensioning pulley

- ❑ inspecting semi-automatic timing belt tensioning pulley ⇒ **13-2** page 6
- ❑ Fitting position ⇒ Fig. 2 in **13-2** page 2

18 - O-ring

- ❑ replace

19 - Coolant pump

- ❑ removing and installing ⇒ Chapter 19-1

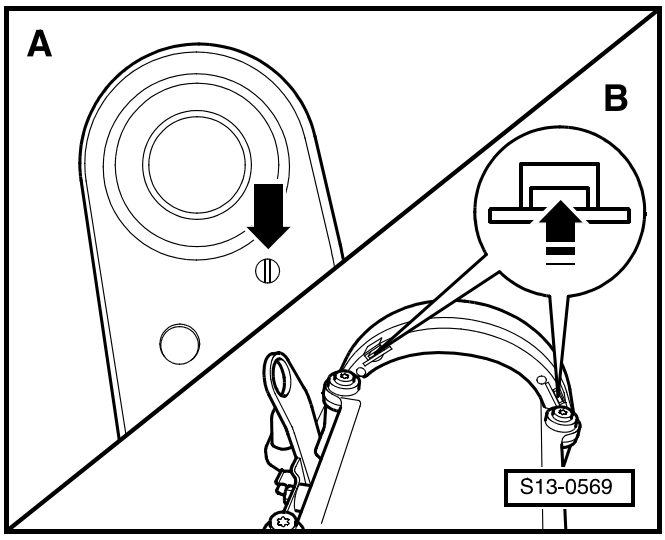
20 - Crankshaft toothed belt sprocket

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

21 - 90 Nm + torque a further 90° (1/4 turn)

- ❑ replace
- ❑ to release and tighten use counterholder -T30004-
- ❑ bolt on counterholder -T30004- ⇒ Removing and installing front sealing flange ⇒ Chap. 13-3

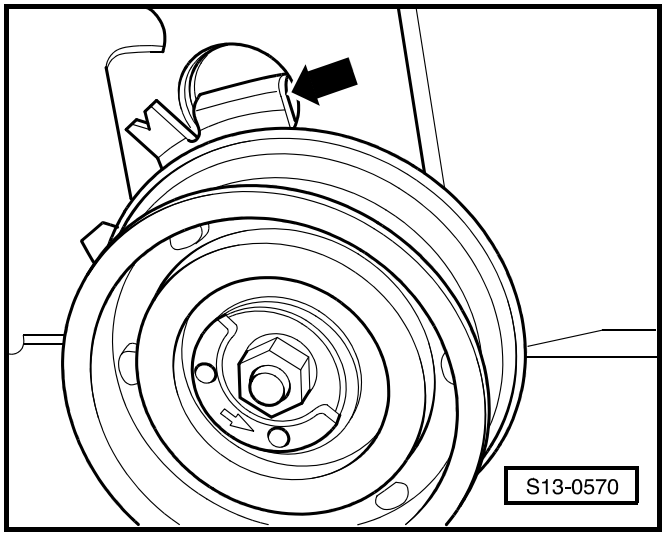
Fig. 1: Remove top toothed belt guard



– -A- Position securing bolt -arrow- vertically.

– -B- Push retaining lugs -arrow- up.

Fig. 2: Fitting position of the semi-automatic tensioning pulley



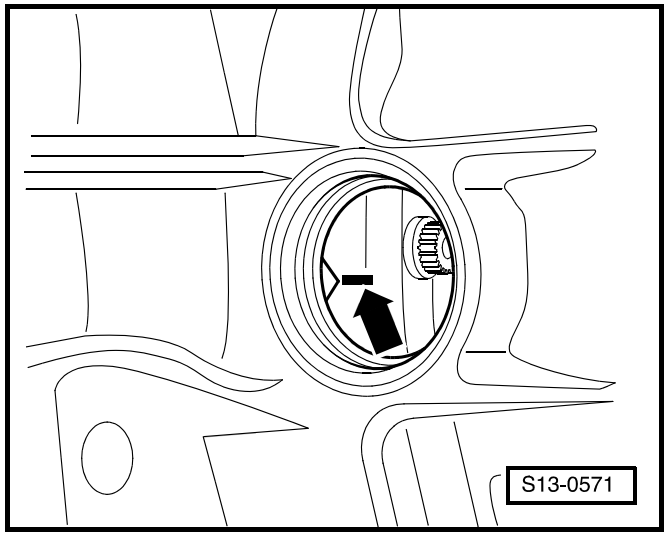
The angle bracket -arrow- must engage in the recess at the cylinder head.

Removing toothed belt

- Engine installed.

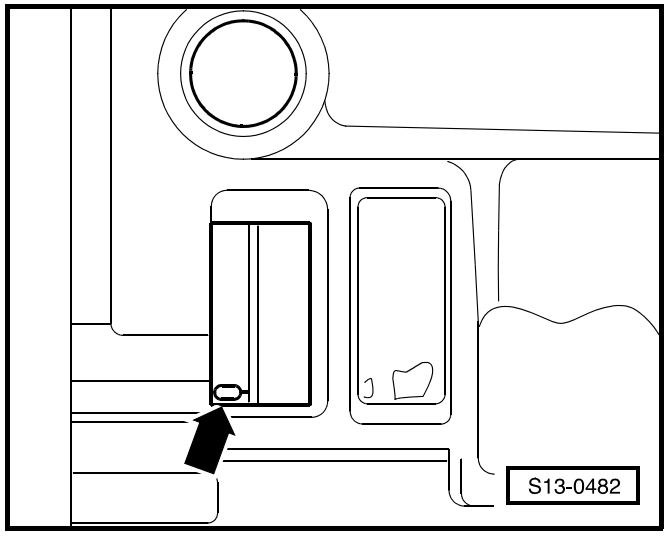
– Remove right noise insulation.
– Remove the V-ribbed belt ⇒ Chapter 13-1.
– Remove ribbed V-belt tensioning device.
– Rotate crankshaft to TDC cylinder 1 -arrow- (vehicles with manual gearbox). ►

TDC marking on flywheel and reference mark must be aligned.



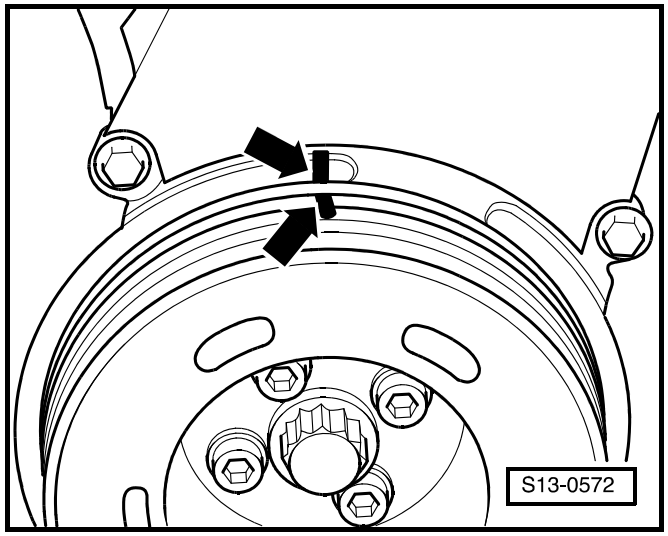
– Rotate crankshaft to TDC cylinder 1 -arrow- (vehicles with automatic gearbox). ►

TDC marking on drive plate and reference mark must be aligned.

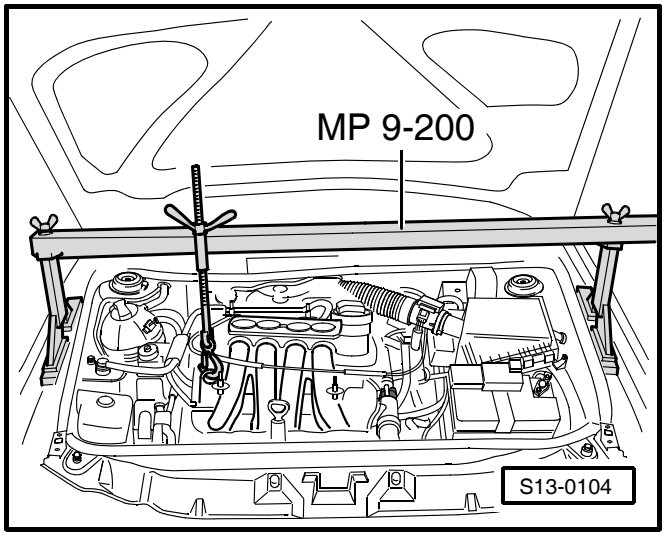


Note

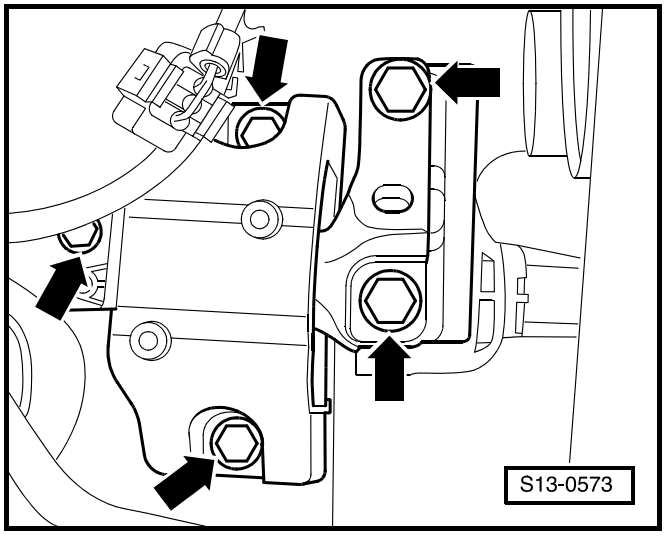
When engine removed, position vibration damper to TDC cylinder 1 -arrows-. ►



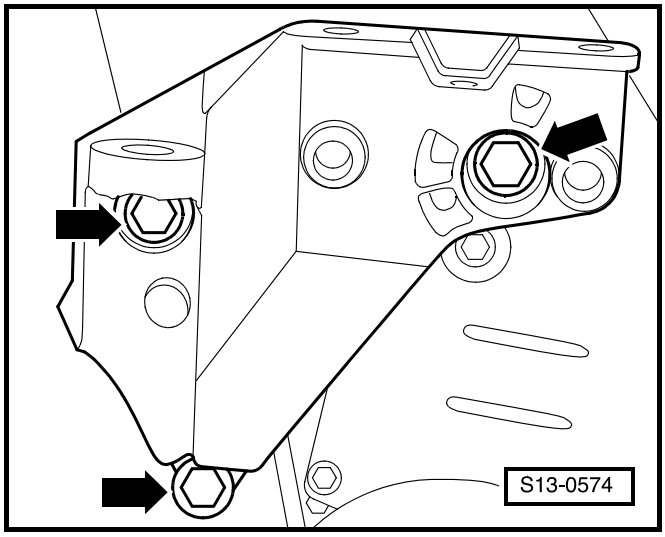
– Remove engine cover.
– Insert supporting device -MP 9-200- and take up weight of engine with the spindle of the supporting device (only on right).
– Remove vibration damper.
– Remove top toothed belt guard.
– Unbolt coolant expansion reservoir and power-steering reservoir; hoses remain connected.



– Unbolt engine support from engine mount and engine mount from body -arrows-.



– Unbolt engine support from engine -arrows-.



Note

- *To slacken the front bolt of the engine support, raise engine slightly with spindle of supporting device -MP 9-200-.*
- *To take off engine support, raise or lower engine, respectively with the supporting device -MP 9-200-.*

– Remove the vibration damper without altering the TDC position.
– Remove middle and bottom timing belt guard.
– Mark the rotation direction of the timing belt.
– Slacken semi-automatic tensioning pulley and take off toothed belt.
– Turn crankshaft slightly back.

Installing toothed belt, tensioning (setting timing)

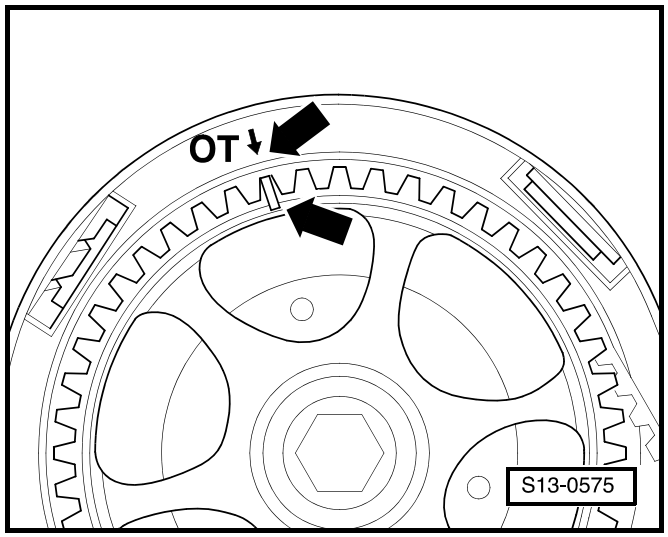
Note

- *Also when carrying out repairs which necessitate taking the toothed belt only off the camshaft sprocket, it is then necessary to carry out the installation of the toothed belt as follows.*
- *When rotating the camshaft, the crankshaft must not be positioned at TDC. Risk of damaging valves and piston crowns.*

Condition

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

– Bring the marking on the camshaft sprocket in line with the marking on the rear timing belt guard -arrows-.

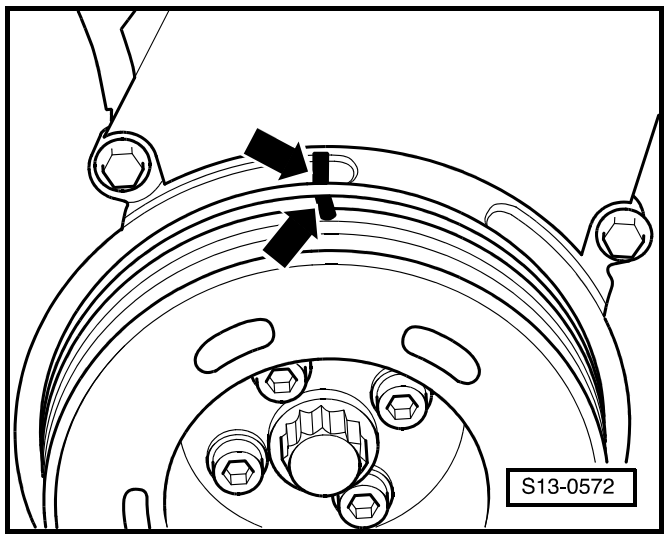


– Position crankshaft to TDC cylinder 1 ⇒ **13-2** page 2 (except when engine removed).

– Fit toothed belt onto toothed belt sprocket of crankshaft and coolant pump (pay attention to direction of running) ⇒ **13-2** page 1

Note

When engine removed, after this, install bottom toothed belt guard and vibration damper. Position crankshaft to TDC of cylinder 1 -arrows-.



– Fit timing belt onto tensioning pulley and onto camshaft sprocket.

Pay attention to installation position of semi-automatic tensioning pulley ⇒ Fig. 2 in **13-2** page 2

– Before tensioning the toothed belt, rotate the tensioning pulley at the eccentric with the two-hole nut turner -T10020- about 5 times in both directions as far as the stop.

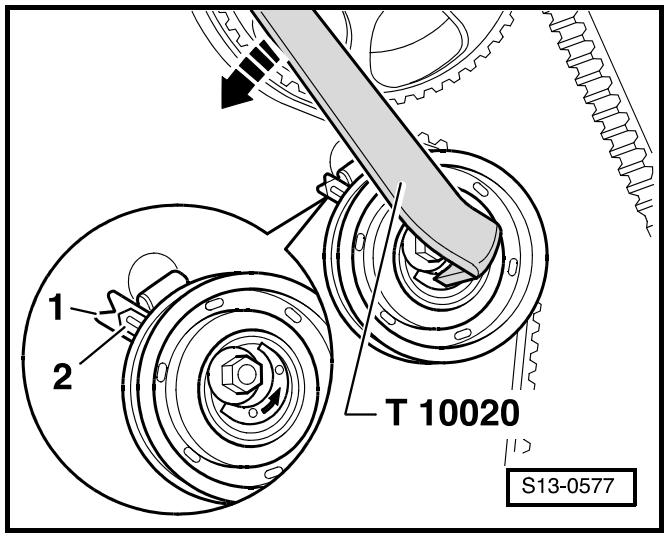
– Turn the semi-automatic tensioning pulley fully to the left with two-hole nut turner -T10020- -in direction of arrow-.

– Loosen tensioning pulley until the notch -1- and the pointer -2- are positioned opposite.

– Tighten nut securing semi-automatic tensioning pulley to 25 Nm.

– Turn crankshaft two turns further in the direction of running of the engine and again position on TDC for cylinder 1.

When doing this, it is important that the last 45° ($^1/_8$ turn) are rotated without any interruption.

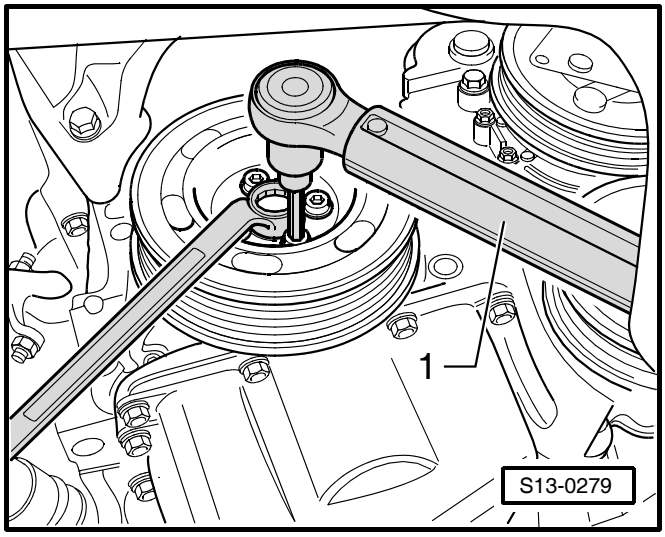


– Once again inspect tension of toothed belt.

Specified value: Pointer and notch are positioned opposite.

– Install bottom and middle toothed belt guard.

– Install belt pulley with vibration damper. Tightening torque: 25 Nm



Note

Before installing engine support, insert bolts into engine support.

– Install engine support and engine mounts. Tightening torques:

- Engine support to cylinder block: 45 Nm
- Engine mount to engine support ⇒ Chap. 10-2
- Engine mount to body ⇒ Chap. 10-2

– Align component mounting engine ⇒ Chap. 10-2.

– Remove supporting device -MP 9-200-.

– Install top toothed belt guard.

– Install tensioning device for V-ribbed belt. Tightening torque: 25 Nm.

– Install the V-ribbed belt ⇒ Chapter 13-1.

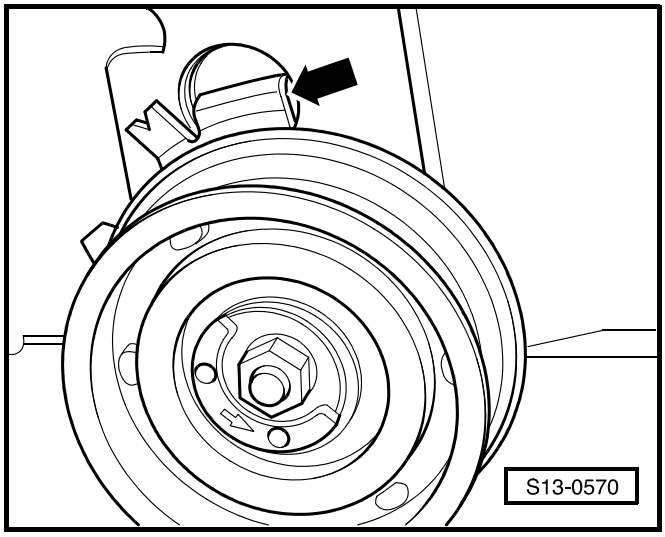
– Install coolant expansion reservoir.

– Install the reservoir for the power-assisted steering.

– Install noise insulation and engine cover

Inspecting the semi-automatic timing belt tensioning pulley

Fitting position



- The angle bracket -arrow- must engage in the recess at the cylinder head.

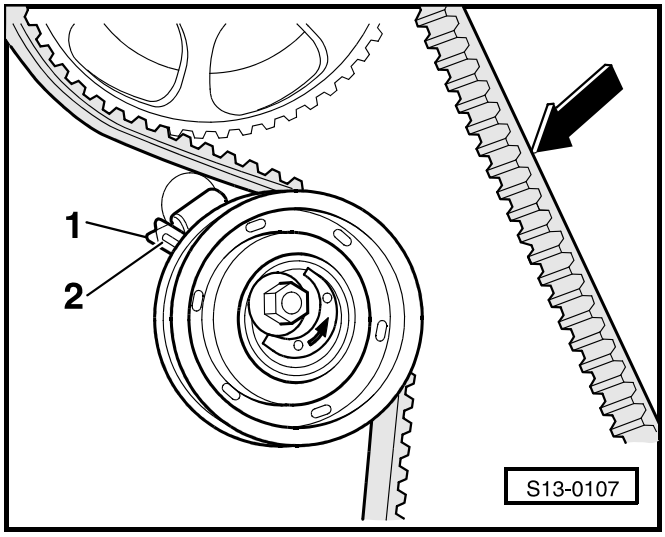
Test condition

- Toothed belt fitted on and tensioned.
- Engine temperature not above 30 °C.

Test sequence

– Position engine on TDC cylinder 1.

– Load timing belt by firmly pressing down with thumb. The pointer -2- must move.



– Relieve the pressure again on the timing belt and rotate crankshaft a further two revolutions in direction of rotation of engine and position again at TDC of cylinder 1.

When doing this, it is important that the last 45° ($^1/_8$ turn) are rotated without any interruption.

– The tensioning pulley must move back into its initial position (notch -1- and pointer -2- are again positioned opposite).

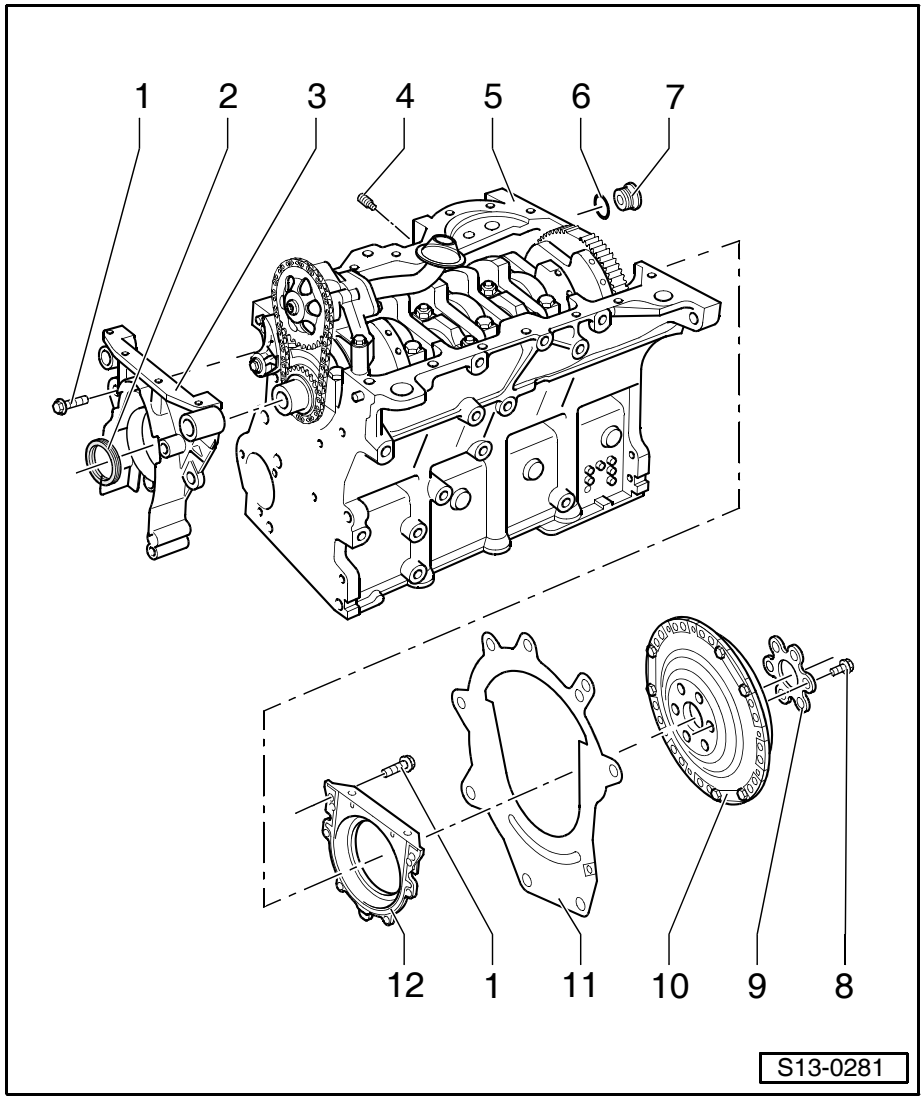
Note

For the inspection use a mirror.

13-3 Removing and installing sealing flange and pressure plate

Note

- *Repairs to clutch ⇒ 5-Speed Manual Gearbox 02K; Rep. Gr. 30.*
- *Secure the engine with engine mount -MP 1-202- and distance sleeves -T30010- on the assembly stand before performing assembly work.*



1 - 15 Nm

2 - Gasket ring
- ❑ do not oil sealing lip of gasket ring
- ❑ replace ⇒ **13-3** page 2

3 - Front sealing flange
- ❑ must be positioned on dowel sleeves
- ❑ removing and installing ⇒ **13-3** page 4
- ❑ remove oil pan for removing and installing

4 - Threaded pin, 10 Nm
- ❑ replace
- ❑ unscrew for attaching engine holder -T10012-

5 - Cylinder block
- ❑ removing and installing crankshaft ⇒ Chapter 13-4
- ❑ disassembling and assembling pistons and conrod ⇒ Chapter 13-5

6 - Gasket ring
- ❑ replace

7 - 100 Nm

8 - 60 Nm + torque a further 90° ($^1/_4$ turn)
- ❑ replace

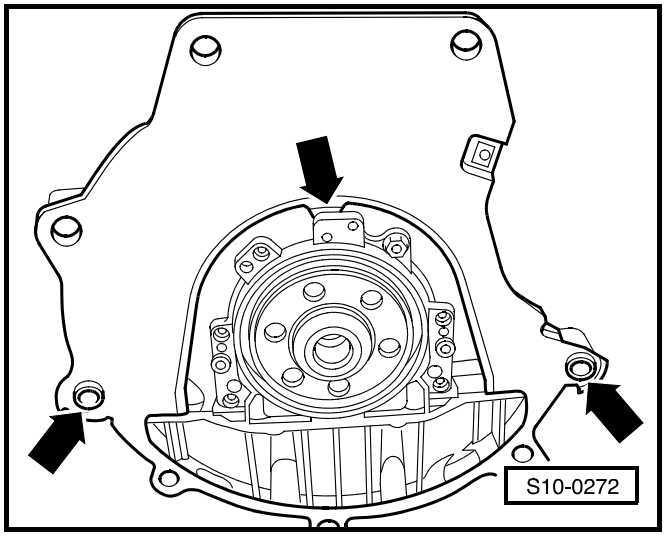
9 - Washer
- ❑ Check fitting position

10 - Pressure plate/driver disc
- ❑ remove and install flywheel and pressure plate ⇒ 5-Speed Manual Gearbox 02K; Rep. Gr. 30
- ❑ removing and installing drive plate ⇒ **13-3** page 6

11 - Intermediate plate
- ❑ hang on the sealing flange ⇒ Fig. 1 in **13-3** page 2
- ❑ must be positioned on dowel sleeves
- ❑ do not damage/bend during assembly work

12 - Rear sealing flange with gasket ring
- ❑ must be replaced completely
- ❑ use supporting sleeve supplied for installing
- ❑ remove oil pan for removing and installing
- ❑ Neither grease nor oil sealing lip of sealing ring
- ❑ before installing remove grease residue from crankshaft journal with a clean cloth
- ❑ supporting sleeve must not be removed until after pushing sealing flange onto the crankshaft journal

Fig. 1: Install intermediate plate



– Insert intermediate plate on sealing flange and push onto the dowel sleeves -arrows-.

Replacing gasket ring for crankshaft -on the belt pulley side-

Special tools, test and measuring equipment and auxiliary items required

- Torque wrench
- Gasket ring extractor -MP 1-226-
- Assembly device -T10053-
- Counterholder -T30004- or -MP 1-310-

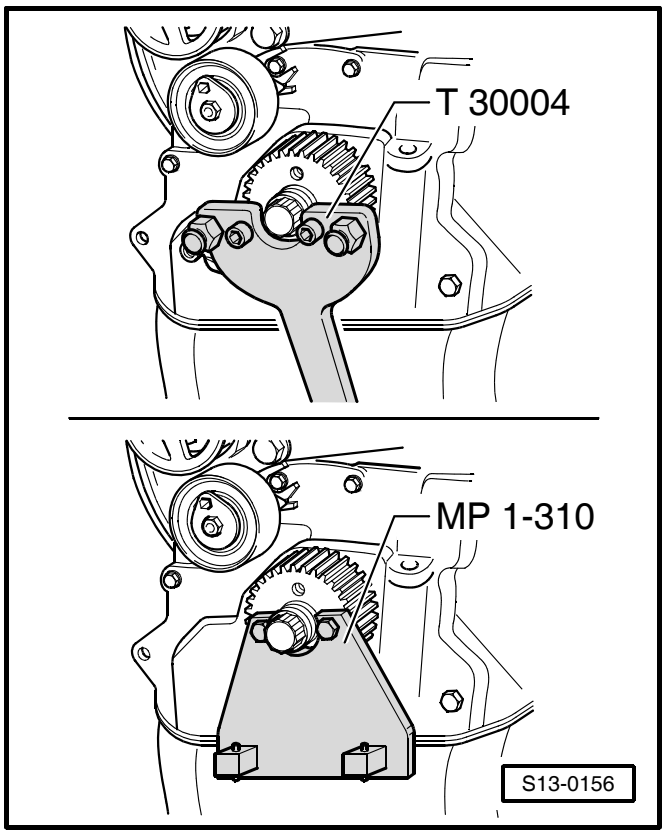
Removing

– Remove the V-ribbed belt ⇒ Chapter 13-1.

– Remove tensioning element for V-ribbed belt.

– Remove the timing belt ⇒ Chapter 13-2.

– Remove crankshaft toothed belt sprocket. To this end lock the toothed belt gear with counterholder -T30004- or -MP 1-310-.

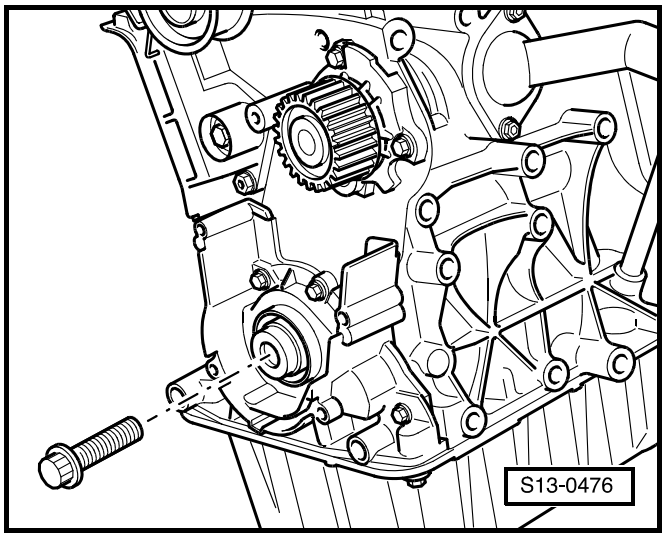


Note

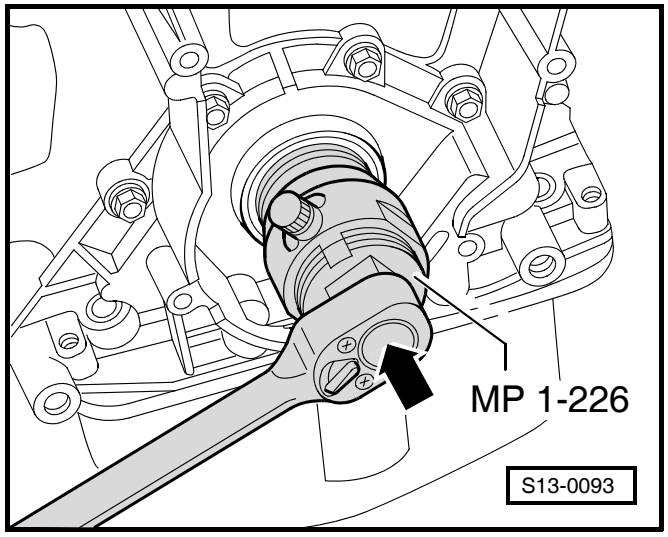
When attaching the counterholder -MP 1-310- place 2 washers between toothed belt sprocket and counterholder.

– To guide the gasket ring extractor, screw central bolt by hand fully into the crankshaft.

– Unscrew inner part of the gasket ring extractor -MP 1-226- nine turns (approx. 20 mm) out of the outer part and lock with knurled screw.



– Oil the thread head of the gasket ring extractor -MP 1-226-, position and forcefully screw it into the gasket ring as far as possible.
– Release knurled screw and turn the inner side against the crankshaft until the gasket ring is pulled out.

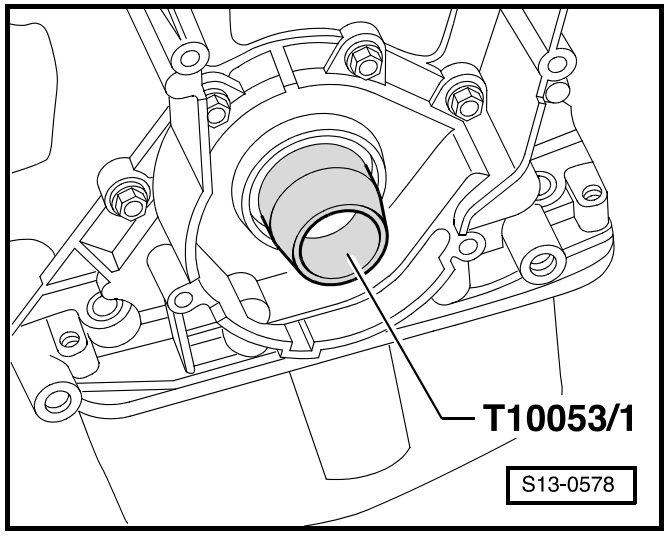


Installing

Note

Do not oil sealing lip of the gasket ring.

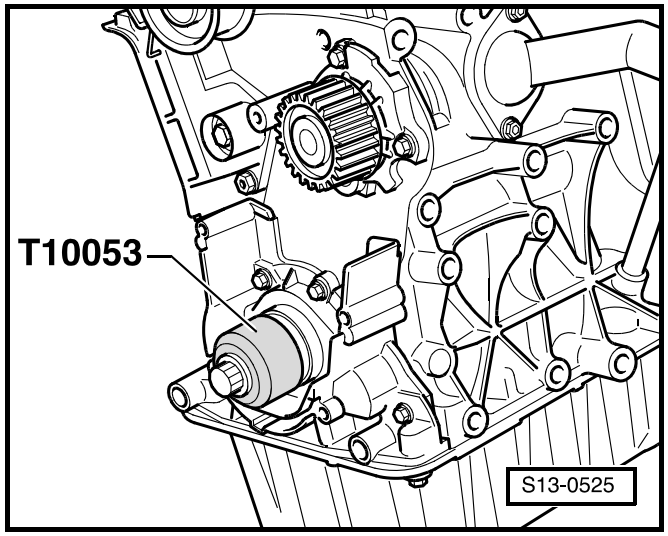
– Remove oil residue on the crankshaft stub with a clean cloth.
– Insert guide bushing -T10053/1- on the crankshaft stub.
– Slide gasket ring over the guide bushing onto the crankshaft stub.



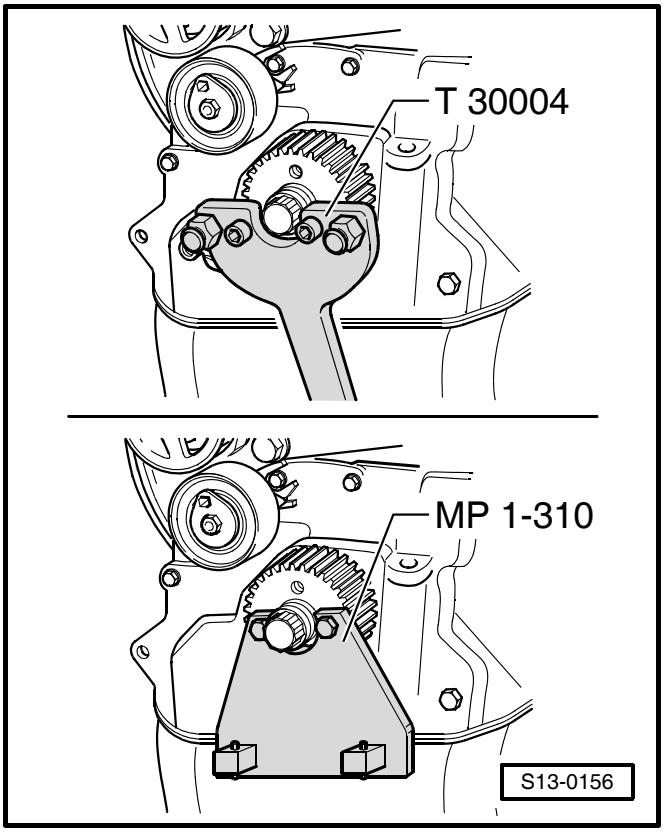
– Press in gasket ring fully with pressure sleeve -T10053- and bolt -T10053/2- (M16 x 1.5 x 60).

Note

If the bolt -T10053/2- (M16x1.5x60) is not available, the old central bolt for the crankshaft toothed belt sprocket can be used.



– Install timing belt gear crankshaft and lock with counterholder -T30004- or -MP 1-310-. Tightening torque: 90 Nm + torque a further 90° (1/4 turn)



Note

- *Thread and collar must be free of oil and grease.*
- *When attaching the counterholder -MP 1-310- place 2 washers between toothed belt sprocket and counterholder.*
- *Replace central screw for crankshaft toothed belt gear.*

– Installing the toothed belt and setting the timing ⇒ Chapter 13-2.

– Installing tensioning element for the V-ribbed belt.

– Install the V-ribbed belt ⇒ Chapter 13-1.

Removing and installing the front sealing flange

Special tools, test and measuring equipment and auxiliary items required

- Torque wrench
- Assembly device -T10053-
- Counterholder -T30004 - or -MP 1-310-
- Hand-held power drill with plastic brush insert
- Flat scraper
- Silicone sealant -D 176 404 A2-

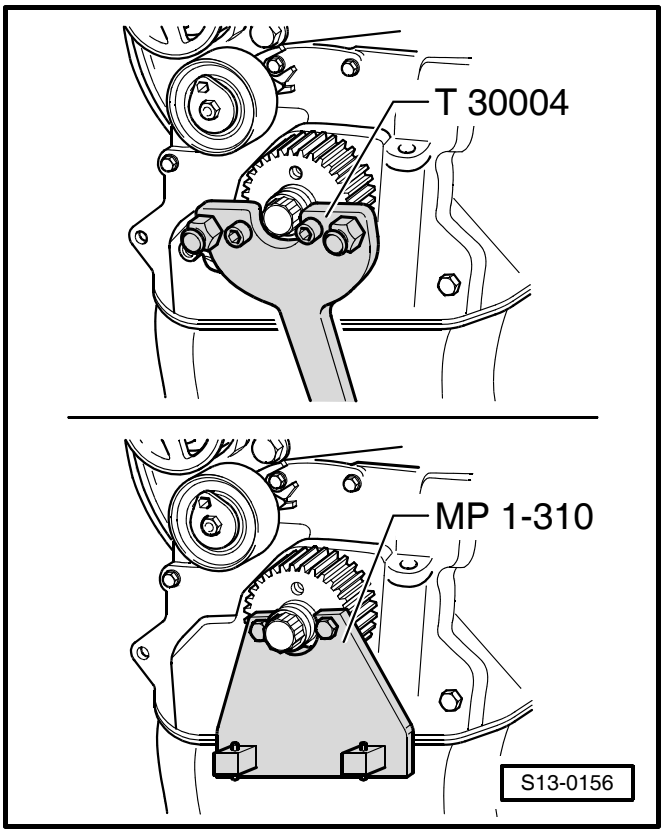
Removing

– Remove the V-ribbed belt ⇒ Chapter 13-1.

– Remove tensioning element for V-ribbed belt.

– Remove the timing belt ⇒ Chapter 13-2.

– Remove crankshaft toothed belt sprocket. To this end lock the toothed belt gear with counterholder -T30004- or -MP 1-310-.



Note

When attaching the counterholder -MP 1-310- place 2 washers between toothed belt sprocket and counterholder.

– Drain engine oil.

– Removing oil pan ⇒ Chapter 17-2.

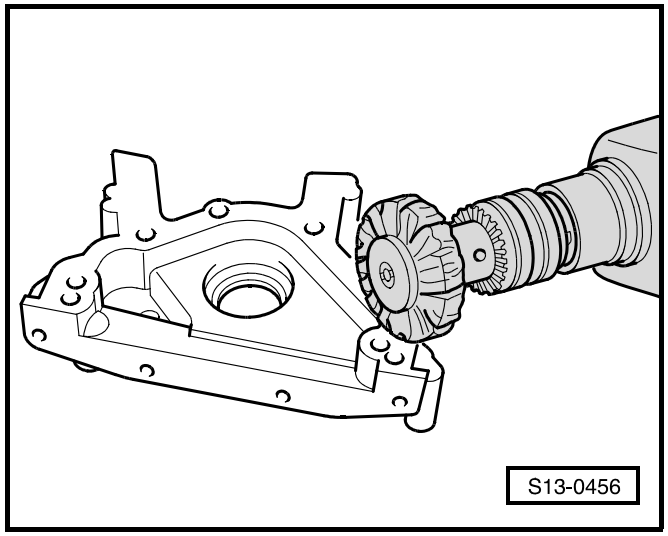
– Unscrew front sealing flange.

– Remove sealing flange, if necessary release by applying slight blows with a rubber-headed hammer.

– Use a flat scraper to remove sealant residues on the cylinder block.

– Cover the gasket ring with a clean cloth.

– Use a rotating plastic brush to remove sealant residues on the sealing flange (wear protective goggles).
– Clean the sealing surfaces. They must be free of oil and grease.



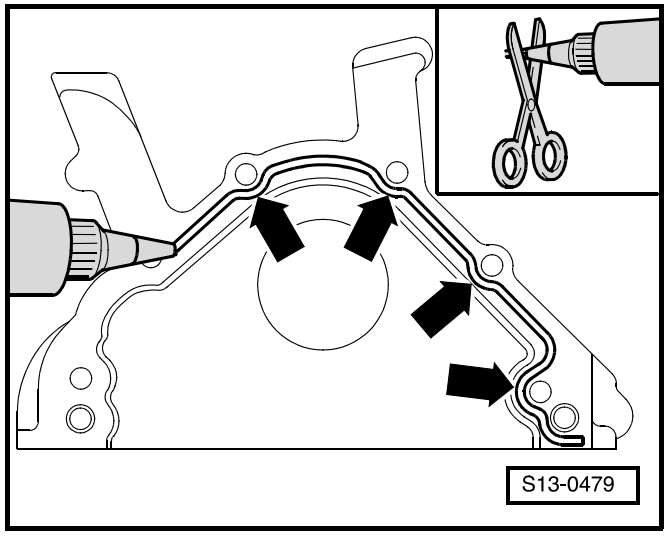
Installing

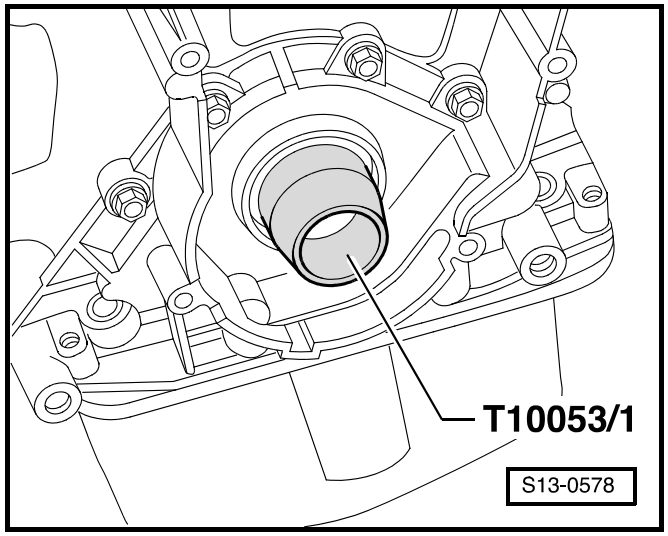
– Cut off nozzle tube at the front marking (∅ of nozzle approx. 3 mm).
– Apply silicone sealant to the clean sealing surface of the sealing flange, as shown in the illustration.

♦ Thickness of sealant bead -arrows-: 2…3 mm

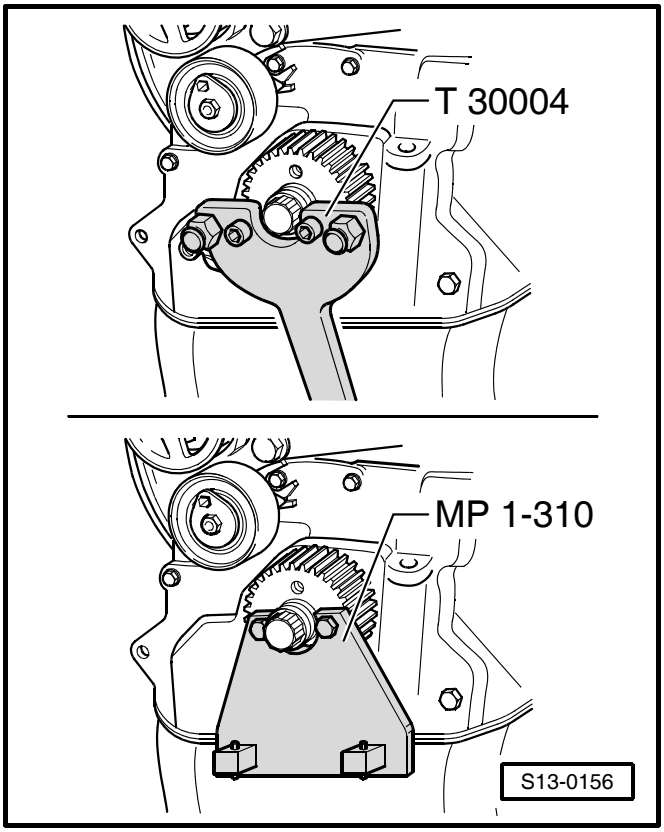
Note

♦ *Before applying the sealant bead cover over the gasket ring with a clean cloth.*
♦ *The sealant bead must not be thicker otherwise excess sealant can clog the strainer in the oil suction pipe.*
♦ *Pay attention to the 'use by date' on sealant.*
♦ *The sealing flange must be installed within 5 minutes after applying the silicone sealant.*
♦ *When installing the sealing flange with the gasket ring fitted use guide sleeve -T10053/1-.*
♦ *After installing, allow the sealant to dry for about 30 minutes. Only then may engine oil be filled in.*





– Fit sealing flange immediately and lightly tighten all bolts.
– Tighten the fixing screws of the sealing flange crosswise. Tightening torque: 15 Nm
– Remove excess sealant.
– Installing oil pan ⇒ Chapter 17-2.
– Install timing belt gear crankshaft and lock with counterholder -T30004- or -MP 1-310-. Tightening torque: 90 Nm + torque a further + 90° ($^1/_4$ turn)



Note

- *Thread and collar must be free of oil and grease.*
- *When attaching the counterholder -MP 1-310- place 2 washers between toothed belt sprocket and counterholder.*
- *Replace central screw for crankshaft toothed belt gear.*

– Installing the toothed belt and setting the timing ⇒ Chapter 13-2.
– Installing tensioning element for the V-ribbed belt.
– Install the V-ribbed belt ⇒ Chapter 13-1.

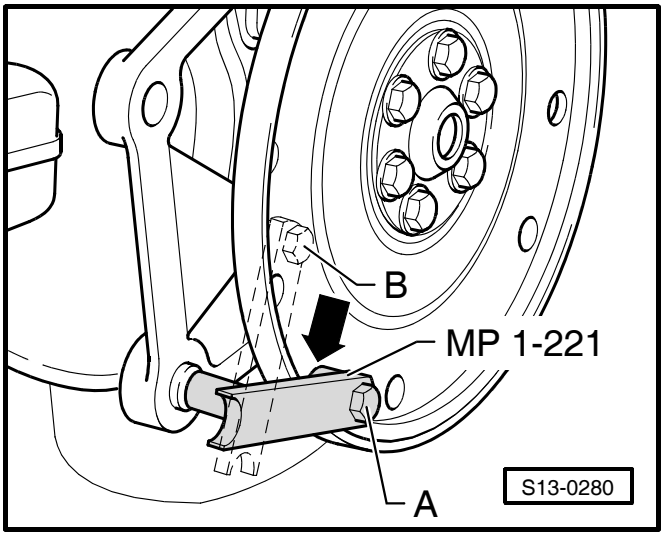
Removing and installing drive plate

Special tools, test and measuring equipment and auxiliary items required

- Torque wrench
- Pressure pad -MP 1-221-
- Depth gauge

Releasing and tightening the drive plate

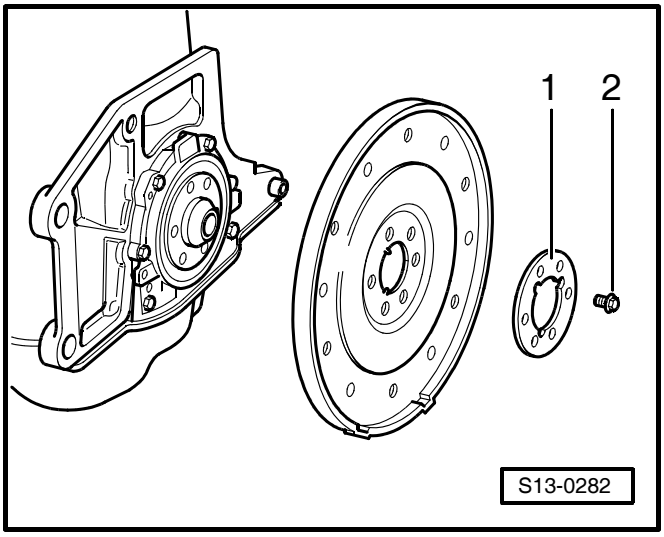
– Attach counterholder -MP 1-221- with M8x45 bolt to the drive plate. Place two M10 nuts -arrow- between the counterholder and the driver disc.



Fitting position of the counterholder:
A - for slackening
B - for tightening

Installing the drive plate

– Insert the drive plate using the washer with recesses -1-.
– Insert new bolts -2- and tighten to 30 Nm.



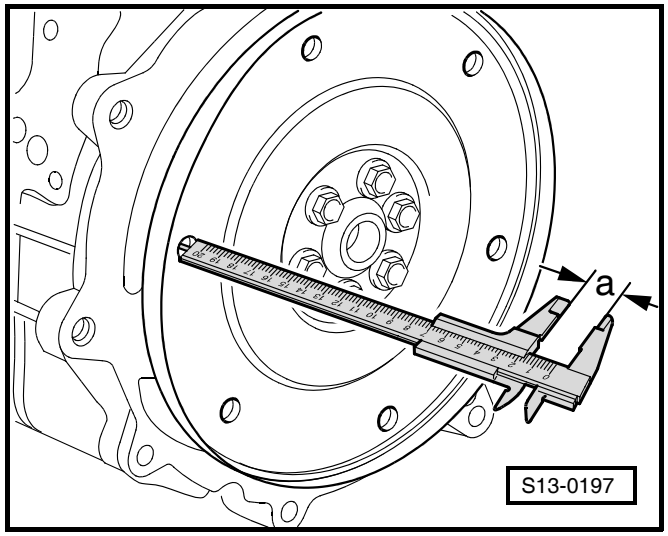
– Inspect installed dimension of drive plate at the 3 mounting holes for the torque converter and calculate mean value.

  Specification -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.

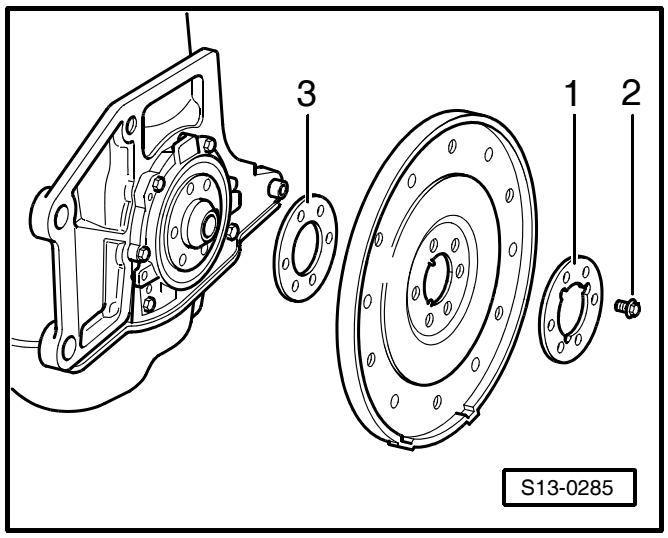
If the specified value is not reached:



– Once again remove drive plate and repeat measurement with the shim -3-.

If the specified value is reached:

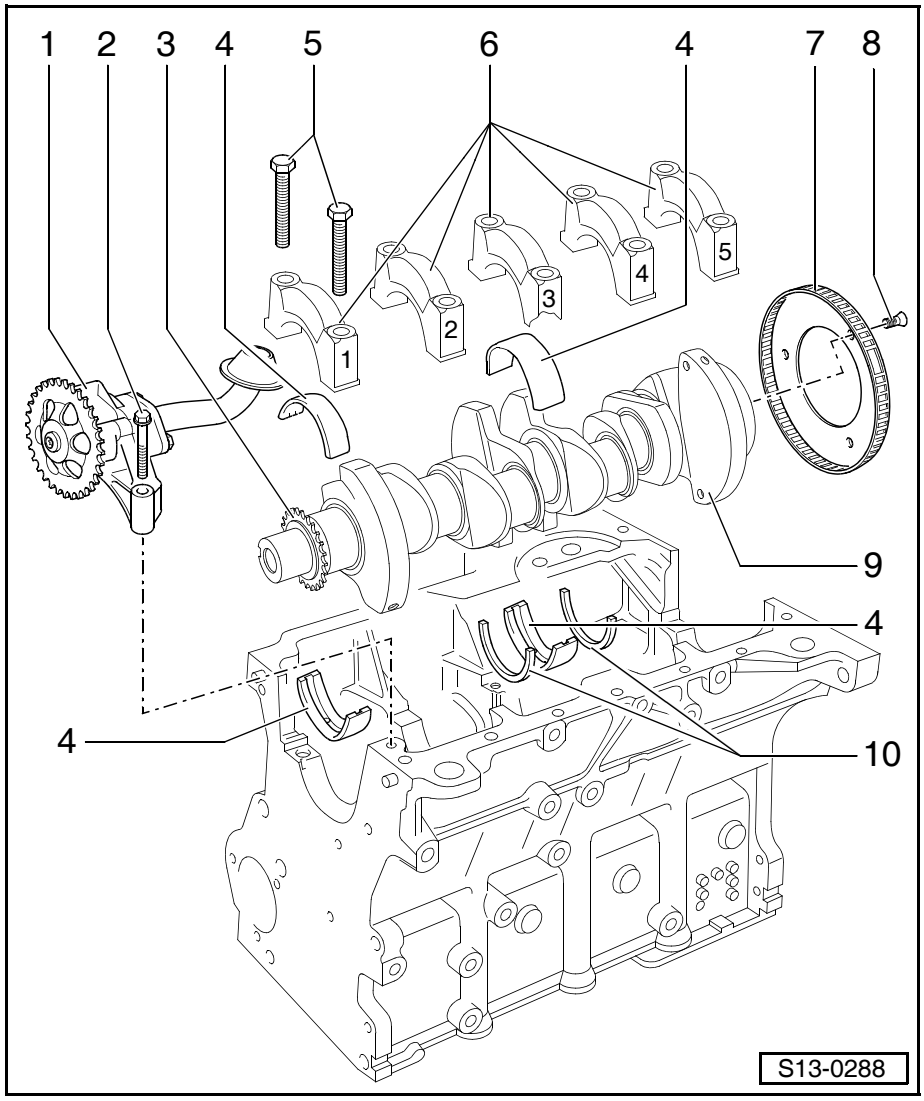
– Lock drive plate with counterholder -MP 1-221- and tighten new bolts -2- to 60 Nm and torque a further 90° ($^1/_4$ turn).



13-4 Removing and installing crankshaft

Note

- *Before removing the crankshaft, ensure a suitable place is available for placing it down so that the sensor rotor ⇒ item 7 in **13-4** page 1 does not rest on anything or get damaged.*
- *To carry out removal and installation operations, attach the engine with the engine holder -MP 1-202- and the sleeves -T30010- to the assembly stand -MP 9-101- ⇒ Chapter 10-1.*
- *Pay attention to colour coding when inserting bearing shells ⇒ Fig. 2 in **13-4** page 2*



1 - Oil pump
- ❑ removing and installing ⇒ Chapter 17-1

2 - 15 Nm

3 - Sprocket
- ❑ for oil pump drive

4 - Bearing shells 1, 2, 3, 4 and 5
- ❑ Identification for ordering replacement parts ⇒ Fig. 2 in **13-4** page 2
- ❑ for bearing cap without lubricating groove
- ❑ for cylinder block with lubricating groove
- ❑ do not mix up used bearing shells (mark)

5 - 40 Nm + torque a further 90° ($^1/_4$ turn)
- ❑ replace
- ❑ tighten thread

6 - Bearing caps
- ❑ Bearing cap 1: on the belt pulley side
- ❑ retaining lugs of the bearing shells of the cylinder block/ bearing cap must be on top of one another

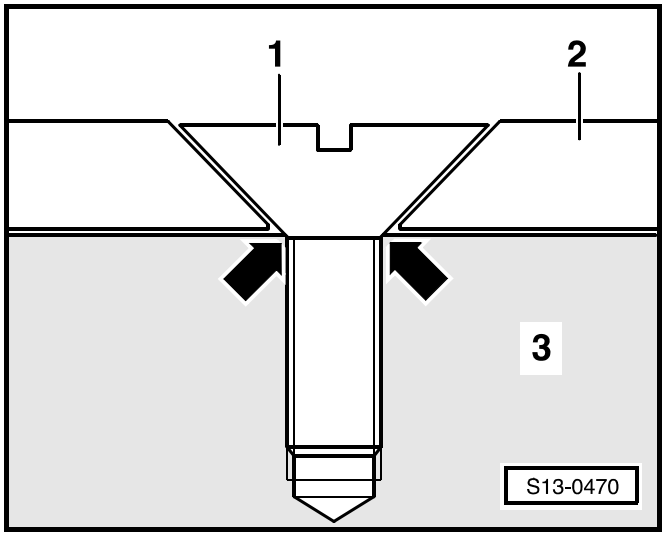
7 - Rotor
- ❑ for engine speed sender -G28-
- ❑ assembly only possible in one position -holes offset-
- ❑ replace sensor rotor each time the bolts are slackened
- ❑ removing and installing ⇒ Fig. 1 in **13-4** page 2

8 - 10 Nm + torque a further 90° ($^1/_4$ turn)
- ❑ replace

9 - Crankshaft
- ❑ Axial play when new: 0,07…0.23 mm
  Wear limit: 0.30 mm
- ❑ Crankshaft bearing journal: ∅ 48.00 mm
- ❑ Conrod bearing journal: ∅ 42.00 mm

10 - Thrust washer
- ❑ for bearing 3
- ❑ Fitting position: Oil grooves point to the crank webs

Fig. 1: Removing and installing sensor rotor ►

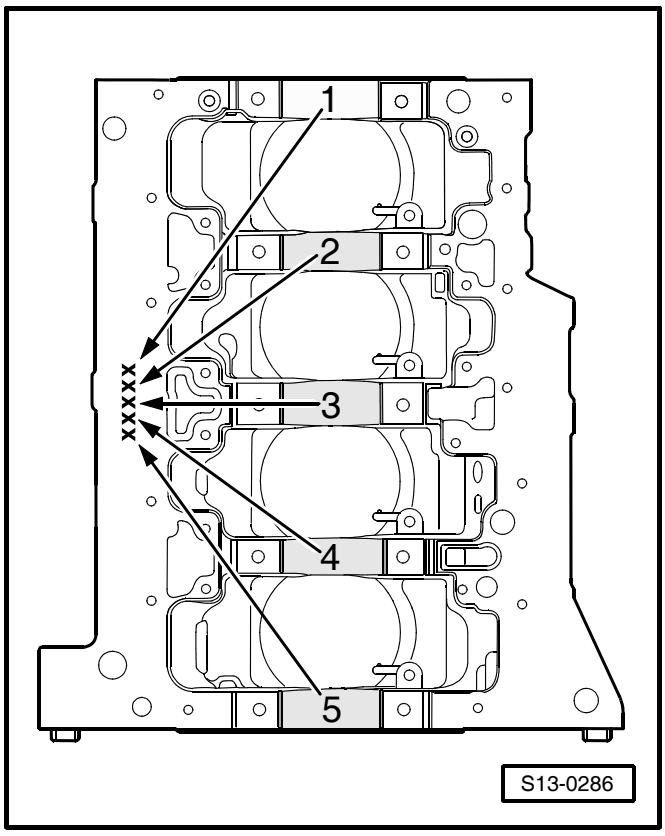


– Always replace the sensor rotor -2- each time the bolts -1- are slackened.

Note

- *After being attached a second time, the attachment point of the recess head screws in the sensor rotor is sufficiently misshapen that the bolt heads rest against crankshaft -3- -arrows- and the sensor rotor is positioned loosely below the screws.*
- *It is only possible to install the sensor rotor in one position, the holes are offset.*

Fig. 2: Marking on crankshaft bearing for ordering replacement parts ►



The crankshaft bearing shells are factory-classified. Align the top crankshaft bearing shells according to the marking on the cylinder block (stamped letters).

Note

Bearing 1 points toward belt pulley.

Colour coding of bearing shells matches the letters on the cylinder block

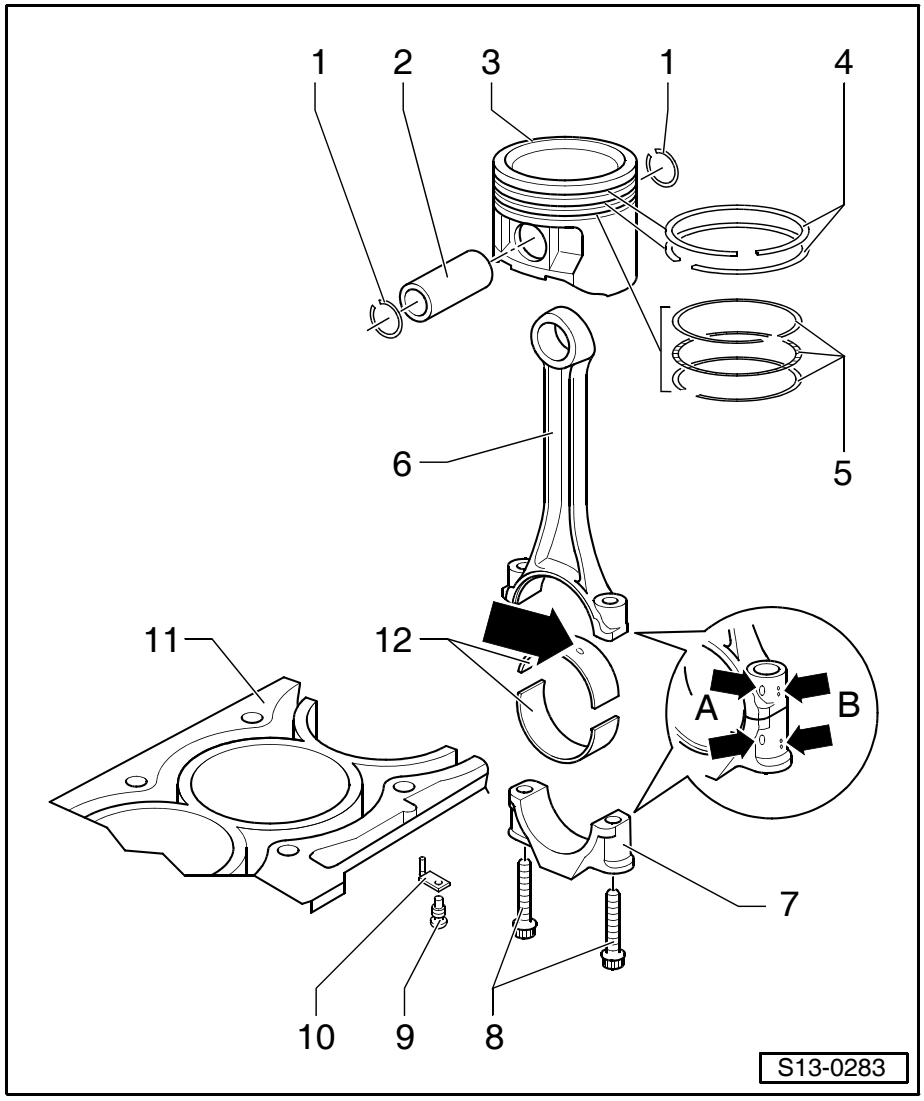
S	=	black
R	=	red
G	=	yellow
B	=	blue
W	=	white

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

13-5 Disassembling and assembling piston and conrod

Note

For carrying out removal and installation operation, attach the engine with the engine holder -MP 1-202- and the sleeves -T30010- to the assembly stand -MP 9-101-.



- **1 - Circlip**
- **2 - Piston pin**
  - ❑ if stiff, heat piston to 60°C
  - ❑ use drift -VW 222A- for removing and installing
- **3 - Piston**
  - ❑ check ⇒ Fig. 3 in **13-5** page 3
  - ❑ mark installation position relative to conrod and mark matching cylinder with felt pen
  - ❑ arrow on piston crown faces towards the belt pulley side
  - ❑ use piston ring tensioning strap for installing
  - ❑ ∅ Piston 80.965 mm
- **4 - Piston ring (compression ring)**
  - ❑ Offset joint 120°
  - ❑ use piston ring pliers for removing and installing compression rings
  - ❑ marking „TOP“ must face towards piston crown
  - ❑ inspect gap clearance ⇒ Fig. 1 in **13-5** page 2
  - ❑ inspect end clearance ⇒ Fig. 2 in **13-5** page 2
- **5 - Piston ring (oil scraper ring)**
  - ❑ carefully remove and install by hand
  - ❑ marking „TOP“ must face towards piston crown
  - ❑ inspect gap clearance ⇒ Fig. 1 in **13-5** page 2
  - ❑ inspect end clearance ⇒ Fig. 2 in **13-5** page 2
- **6 - Conrod**
  - ❑ replace as a set only
  - ❑ mark assignment to cylinder -B-
  - ❑ Fitting position:
    Markings -A- must be positioned one above the other and point to the belt pulley side
  - ❑ with oil drilling for lubricating piston pin
- **7 - Conrod bearing cap**
  - ❑ as a result of the conrod separated in the cracking process, the cover fits only in one position and only to the relevant conrod
  - ❑ mark assignment to cylinder -B-
  - ❑ Fitting position:
    Markings -A- must be positioned one above the other and point to the belt pulley side

8 - 30 Nm + torque a further 90° ($^1/_4$ turn)
- ❑ replace
- ❑ oil thread and head contact surface

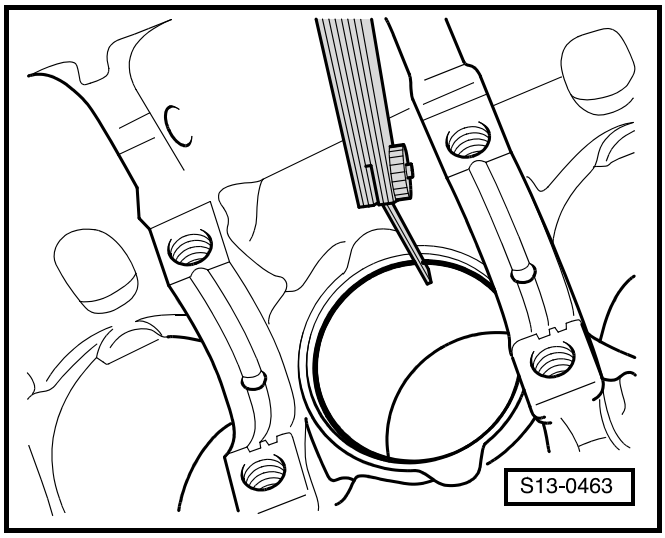
9 - Pressure relief valve, 27 Nm
- ❑ opens at:
  0,13…0.16 MPa (1.3…1.6 bar) overpressure
- ❑ replace without sealant

10 - Oil injection nozzle
- ❑ For piston cooling

11 - Cylinder block
- ❑ inspect cylinder bore ⇒ Fig. 5 in **13-5** page 3
- ❑ ∅ Cylinder 81.01 mm

12 - Bearing shell
- ❑ check fitting position ⇒ Fig. 4 in **13-5** page 3
- ❑ do not mix up used bearing shells
- ❑ insert bearing shells in the centre
- ❑ Axial play when new: 0,05…0.31 mm
  Wear limit: 0.37 mm
- ❑ with oil drilling -arrow- for lubricating piston pin

Fig. 1: Inspecting piston ring gap clearance ►



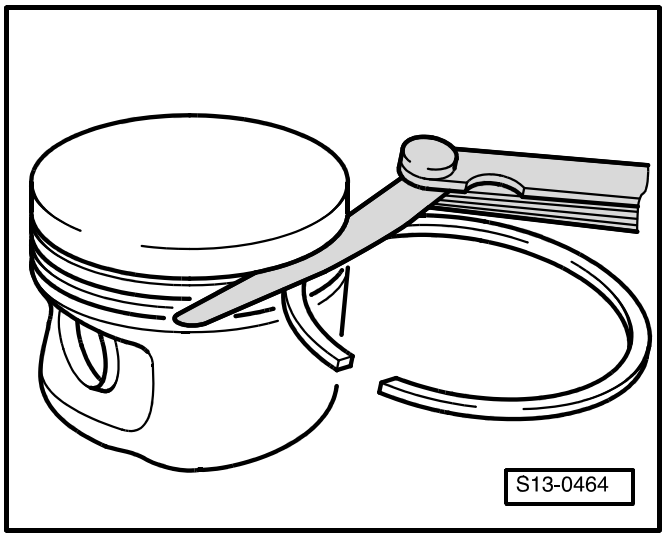
Special tools, test and measuring equipment and auxiliary items required

♦ Feeler gauge

– Insert ring at right angles from above down into lower cylinder opening, about 15 mm away from edge of cylinder. To insert use piston without rings.

Piston ring	Gap clearance	
	new (mm)	Wear limit (mm)
Compression ring	0,20…0,40	0,80
Oil scraper ring	0,25…0,50	0,80

Fig. 2: Inspect piston ring end clearance ►



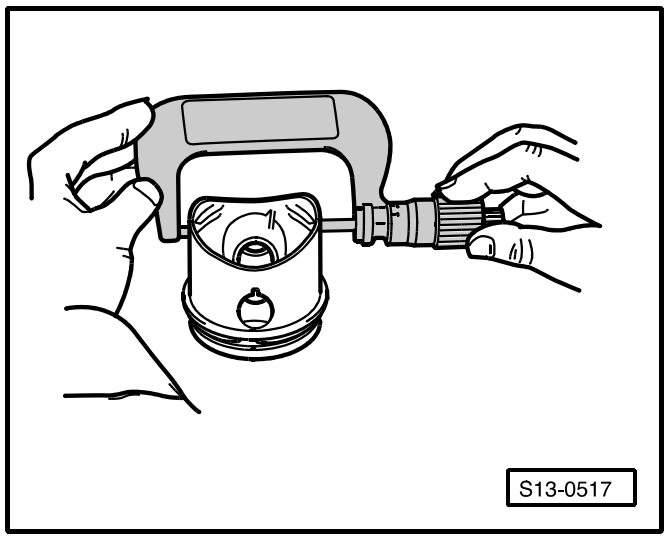
Special tools, test and measuring equipment and auxiliary items required

♦ Feeler gauge

– Clean ring groove before inspecting.

Piston ring	End clearance	
	new (mm)	Wear limit (mm)
Compression ring	0,06…0,09	0,20
Oil scraper ring	0,03…0,06	0,15

Fig. 3: Inspecting pistons



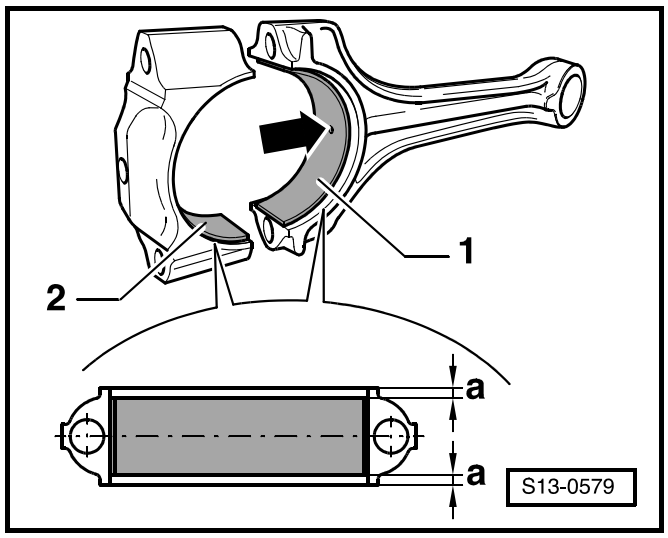
Special tools, test and measuring equipment and auxiliary items required

- External micrometer 75...100 mm

– Measure about 10 mm from the lower edge, offset at right angles to the piston pin shaft.

Deviations from specified dimension: max. 0.04 mm

Fig. 4: Bearing shell installation position



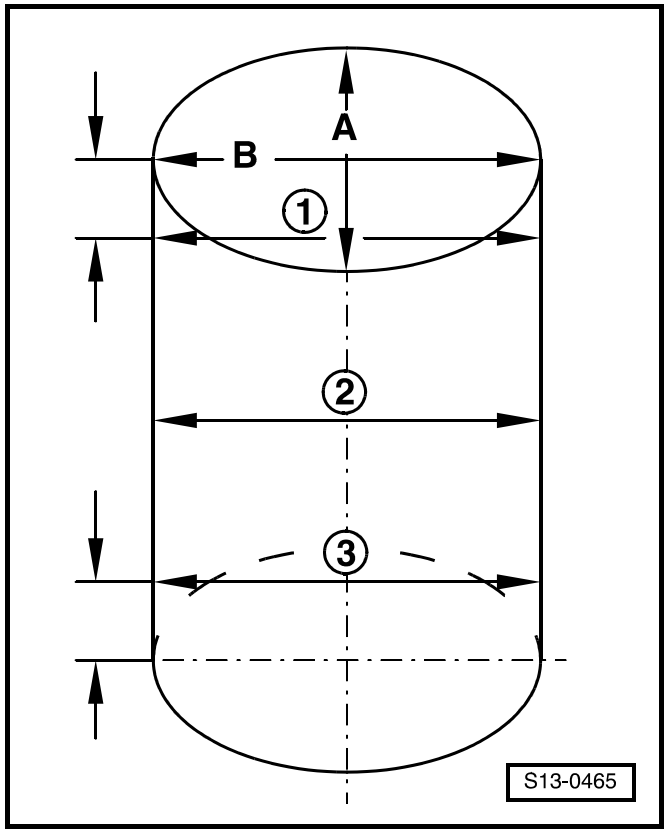
Bearing shell -1- with oil drilling -arrow- for conrod.

Bearing shell -2- without oil drilling for conrod bearing cap.

– Insert bearing shells into conrod and into conrod bearing cap centred.

Dimension -a- must be the same on right and left, max. variation: 0.2 mm.

Fig. 5: Inspecting cylinder bore



Special tools, test and measuring equipment and auxiliary items required

- Internal precision measuring instrument 50...100 mm

Test sequence

– Measure at three points crosswise in a transverse direction -A- and lengthwise -B-.

Deviations from specified dimension: max. 0.10 mm

Note

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

15 – Cylinder Head, Valve Gear

15-1 Removing and installing cylinder head

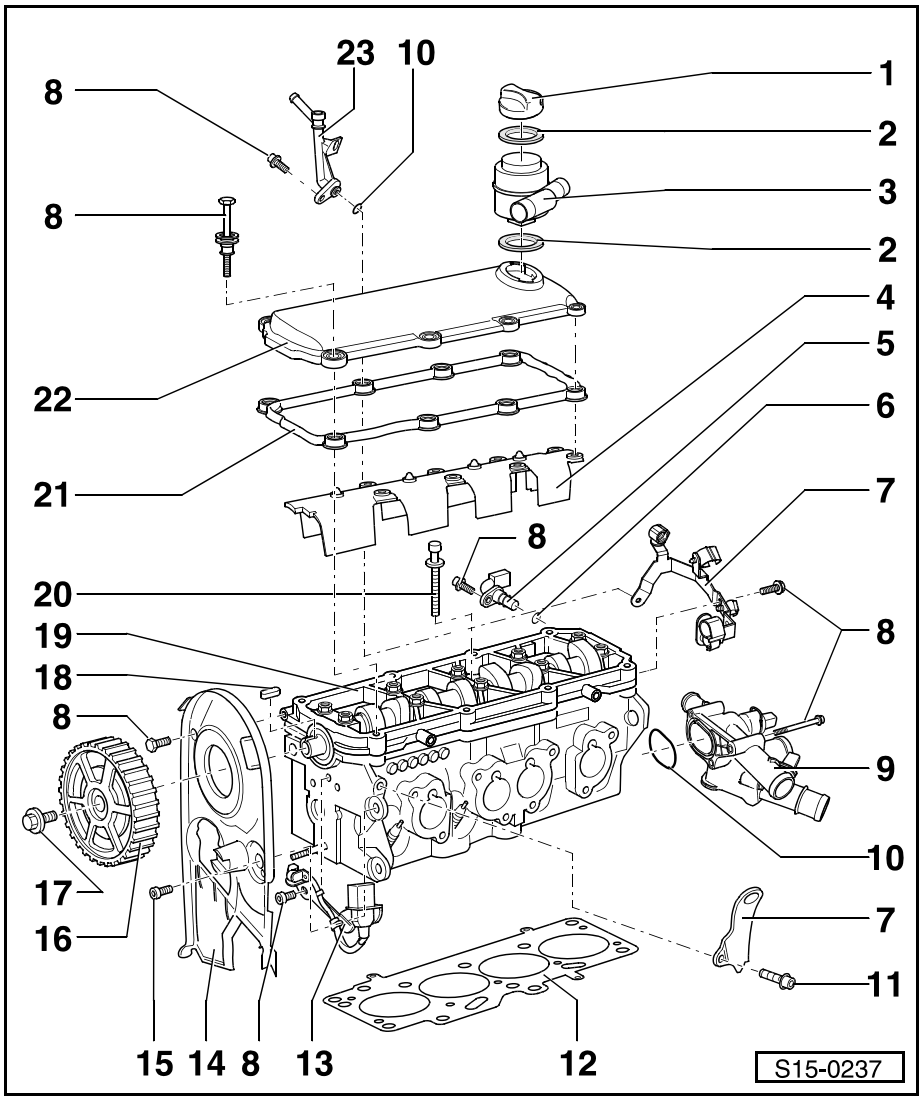
Removing and installing toothed belt ⇒ Chapter 13-2

Test compression pressure ⇒ **15-1** page 6

Note

- *Always replace cylinder head bolts.*
- *Always replace self-locking nuts.*
- *Always replace the seals and gaskets during assembly work.*
- *When installing a cylinder head, all the contact surfaces between the hydraulic tappets, roller rocker arms and the cam tracks must be oiled before installing the cylinder head cover.*
- *Do not remove the plastic bases supplied as a protection for the open valves until just before fitting on the cylinder head.*
- *If the cylinder head is replaced, the system must be completely filled with fresh coolant.*
- *Disassembling and assembling intake manifold ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.*

Cylinder head - summary of components



1 - Cap

2 - Gasket
- ❑ replace if damaged

3 - Breather housing
- ❑ to disassemble, turn to the left

4 - Oil deflector

5 - Camshaft position sensor -G163-
- ❑ for engines with engine code BFQ

6 - Gasket ring
- ❑ replace if damaged
- ❑ before fitting moisten with clean engine oil

7 - Bracket

8 - 10 Nm

9 - Coolant distributor housing
- ❑ Disassembling and assembling coolant distributor housing ⇒ Chapter 19-2

10 - Gasket ring
- ❑ replace

11 - 20 Nm

12 - Cylinder head gasket
- ❑ replace ⇒ **15-1** page 3

13 - Camshaft position sensor -G163-
- ❑ for engines with engine code AVU

14 - Rear timing belt guard

15 - 15 Nm

16 - Camshaft sprocket

17 - 100 Nm
- ❑ to release and tighten use counterholder -T30004-

18 - Parallel key

19 - Cylinder head
- ❑ removing and installing ⇒ **15-1** page 3
- ❑ check for distortion ⇒ **15-1** page 6
- ❑ rework cylinder head ⇒ **15-1** page 6
- ❑ after replacing fill entire system with fresh coolant

20 - Cylinder head bolt
- ❑ replace
- ❑ pay attention to order for slackening ⇒ **15-1** page 4
- ❑ pay attention to order for tightening ⇒ **15-1** page 5
- ❑ removing and installing with socket insert -T10070-

21 - Gasket for cylinder head cover
- ❑ replace if damaged
- ❑ press into the spacer sleeves

22 - Cylinder head cover

23 - Vent connection
- ❑ to the expansion reservoir

Removing and installing cylinder head

Special tools, test and measuring equipment and auxiliary items required

- Guide bolt -T30011/2A-
- Removal tool -T30011/3-
- Assembly tool -T10112-
- Socket insert -T10070-
- Catch pan (e.g. -V.A.G 1306-)
- Torque wrench
- Pliers for spring strap clips

Requirements

- Engine temperature not above 30 °C.

Note

- *If the battery is disconnected and reconnected, carry out certain additional operations ⇒ Electrical System; Rep. Gr. 27.*
- *All cable straps which are detached or cut open when removing, should be fitted on again in the same place when installing.*

Removing cylinder head

– Remove engine cover.

– Remove connecting part for exhaust gas recirculation.

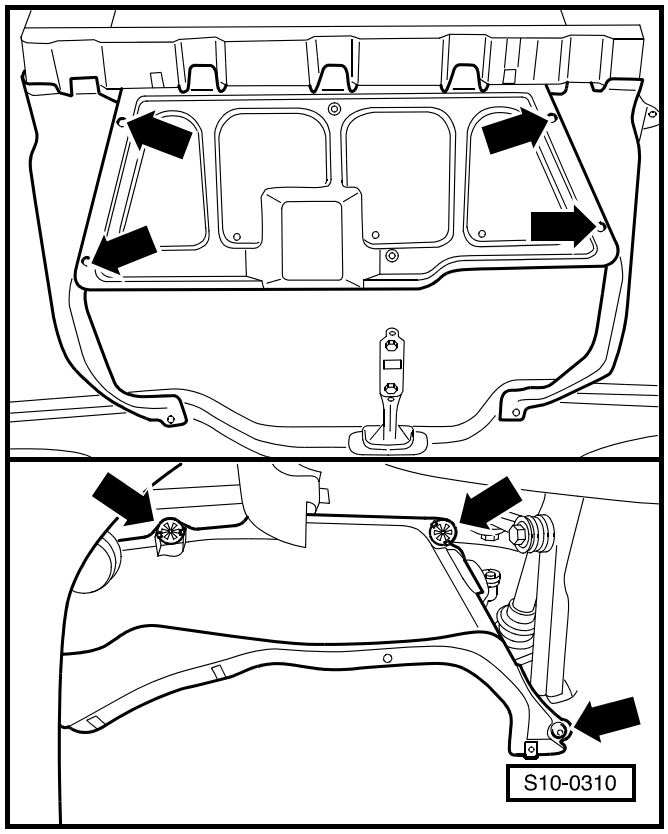
– Open the cap of the coolant expansion reservoir.

– Remove noise dampening in the middle and on the right -arrows-. ►

– Unbolt front exhaust pipe together with catalytic converter and holder ⇒ Chapter 26-1.

– Drain coolant ⇒ Chapter 19-1.

– Remove intake hose and air filter ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.



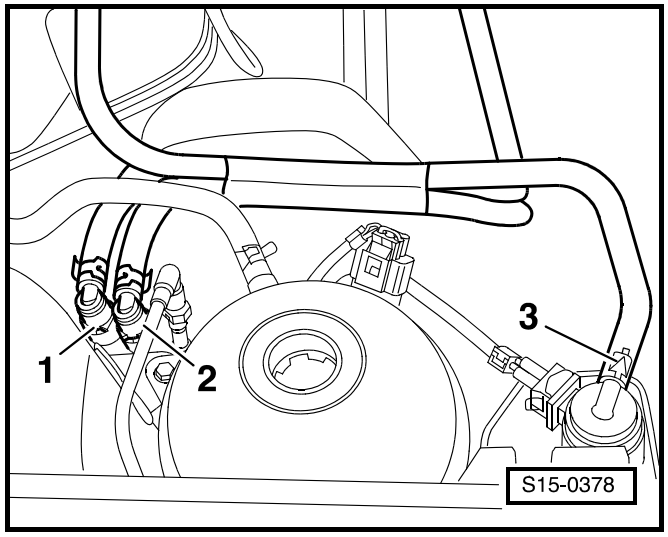
WARNING!

The fuel system is under pressure! Before opening the system lay cleaning cloths around the connection point. Reduce pressure by carefully releasing the connection point.

– Remove fuel feed line -1- and fuel feed line -2-, to do so press latch clips. Lines and line connections are colour-coded. ►

– Detach hose -3- at the ACF tank.

– Remove inlet line and pressure line of secondary air pump.

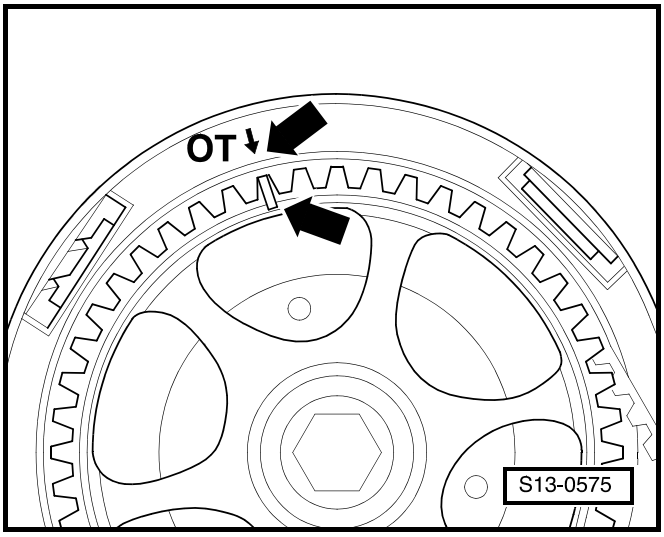


– Remove the secondary air pump with pressure hose and holder.
– Remove top part of intake manifold ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.

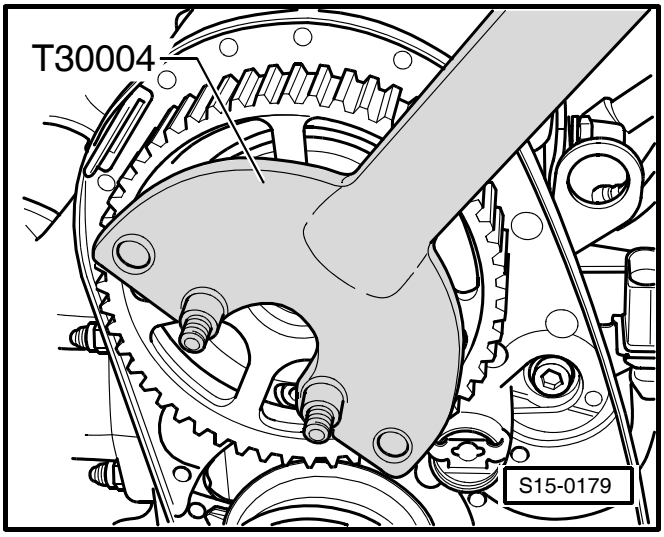
Note

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

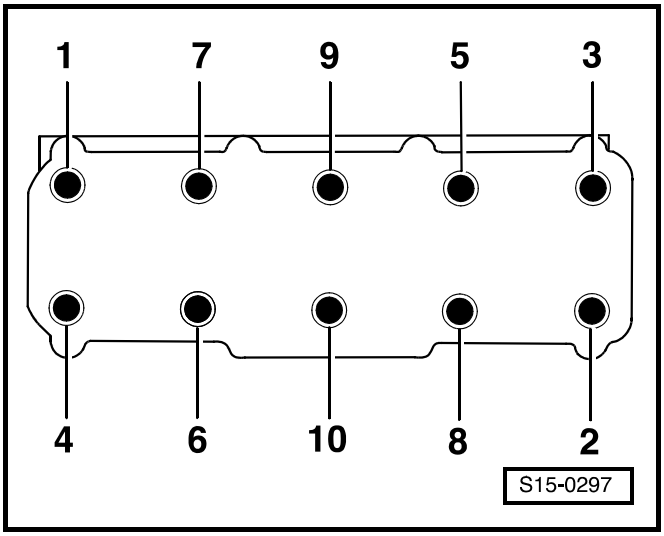
– Disconnect plug for camshaft position sensor -G163- on all four injection valves -N30...N33-.
– Detach the unplugged wiring loom from the holders and lay to the side.
– Use assembly tool -T10112- to unplug spark plug connector and place to the side.
– Detach coolant hose from cylinder head.
– Unscrew coolant distributor housing.
– Remove top toothed belt guard.
– Position camshaft sprocket to TDC marking of cylinder 1. Marking on camshaft sprocket must be aligned with arrow on the toothed belt guard.



–
– Then turn crankshaft slightly backwards.
– Remove camshaft sprocket. Hold the camshaft sprocket tight with counterholder -T30004- to slacken the bolts.



– Remove parallel key from the camshaft.
– Remove rear timing belt guard.
– Slacken the bolts of the cylinder head cover from the outside to the inside.
– Remove cylinder head cover.
– Slacken the cylinder head bolts using the socket insert -T10070- in the specified order and unscrew.



– Carefully remove the cylinder head.

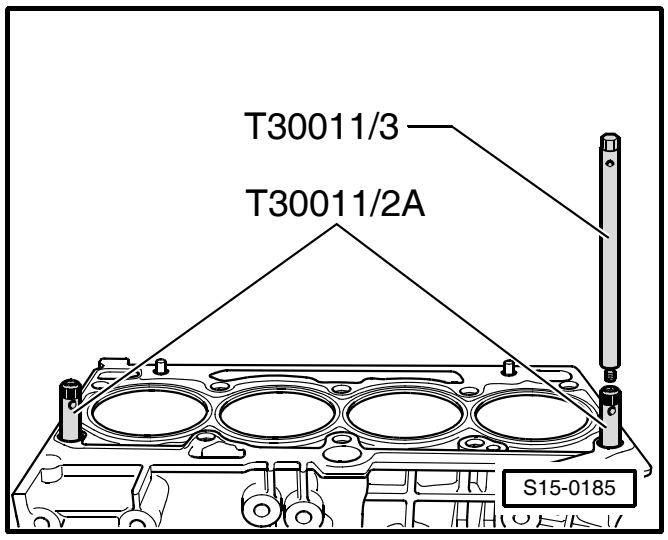
Installing cylinder head

Note

- *There must not be any oil or coolant present in the holes for the cylinder head bolts.*
- *Remove the new cylinder head seal from its wrapping immediately before fitting.*
- *Treat the new seal with the utmost care. Any damage will result in leaks.*

– Make sure that when cleaning the cylinder head and cylinder block no foreign bodies can get into the cylinder or into the oil and coolant galleries.

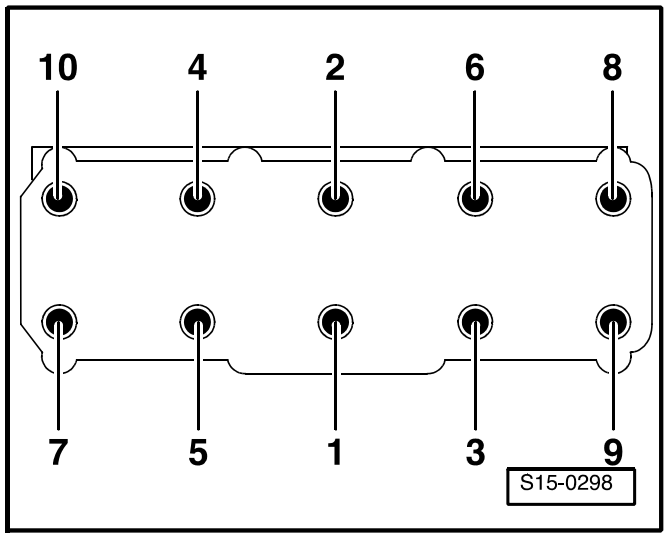
– When conducting repairs sealant residues should be removed from the contact surface of the cylinder head/cylinder block using a chemical cleaner.
– If the crankshaft was rotated in the meantime: Position piston for cyl. 1 on TDC and turn back crankshaft slightly.
– For centering screw guide pins -T30011/2A- into the front outer holes for cylinder head bolts.



Note

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

– Fit on new cylinder head gasket. Text (part number) must be visible.
– Insert the cylinder head. Screw in the remaining 8 cylinder head bolts and tighten by hand.
– Use the removal tool to unscrew guide bolts -T30011/3-. Turn the removal tool to the left for this step until the bolts are free.
– Screw in the remaining cylinder head bolts and tighten by hand.
– Tighten cylinder head bolts in the tightening order shown as follows:



- Tighten all bolts initially to 40 Nm.
- Then, torque all bolts a further 90° ($^1/_4$ turn) using a rigid wrench.
- Then once again turn all bolts through a further 90° ($^1/_4$ turn).

Further installation occurs in a similar way in reverse order to removal.

– Install toothed belt and tension ⇒ Chapter 13-2.
– Install the V-ribbed belt ⇒ Chapter 13-1.
– Top up coolant ⇒ Chapter 19-1.
– Generate readiness code ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.
– Adapt engine control unit to throttle valve control unit -J338- and to EGR valve ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.
– The basic setting must always be additionally initiated on vehicles with an automatic gearbox ⇒ Automatic Gearbox 01M; Rep. Gr. 01.

Inspecting the cylinder head for distortion

Special tools, test and measuring equipment and auxiliary items required

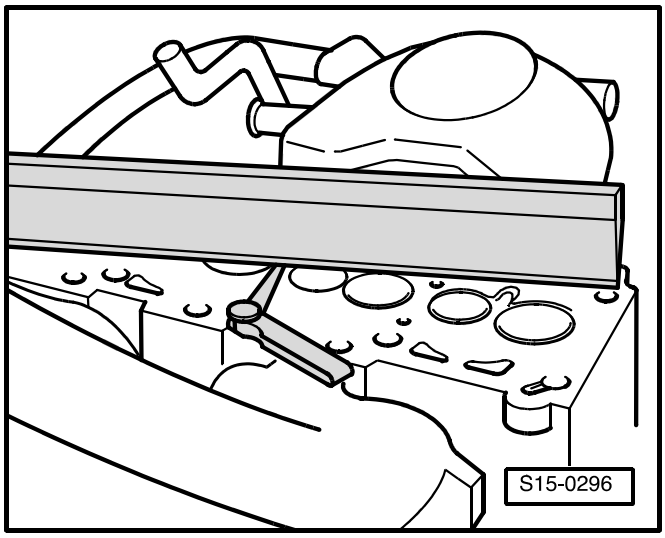
- Feeler gauge
- Knife-edge straightedge

Test sequence

– Inspect cylinder head at several points for distortion using a knife-edge straightedge and feeler gauge. ►

- Max. permissible distortion: 0.1 mm (minimum clearance of straightedge base: 100 mm)

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



Reworking a cylinder head

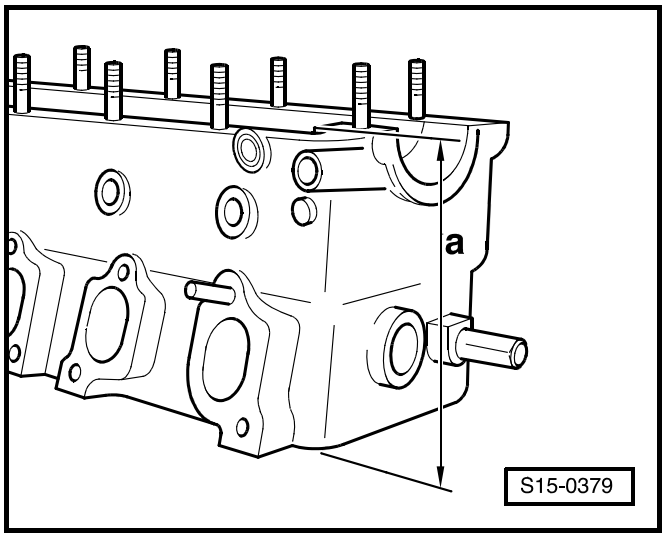
Procedure

– Reworking of the sealing surface of the cylinder head (face-grinding) is only permissible up to minimum dimension -a-. ►

- Minimum dimension -a-: 132.6 mm

Note

If the sealing surface is reworked, the valves should be set lower by the same amount (rework valve seat rings) otherwise the valves will strike the pistons. When doing this, ensure that the permissible maximum dimension - ⇒ Chap. 15-4 - is not exceeded.



Testing the compression

Special tools, test and measuring equipment and auxiliary items required

- Spark plug wrench (e.g. -3122 B-)
- Assembly tool -T10112-
- Torque wrench
- Compression tester (e.g. -V.A.G 1381- or -V.A.G 1763-)

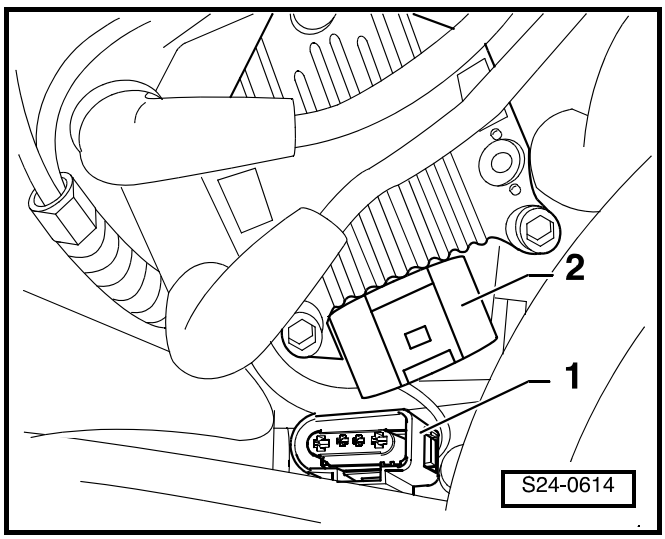
Test condition

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

Test sequence

– Unplug 4-pin plug (-1-) from ignition transformer -N152- (-2-). ►

– Disconnect the connector of the injection valves.



– Use assembly tool -T10112- to unplug spark plug connector and unscrew spark plugs with spark plug wrench.
– Check compression pressure using the compression tester.

Note

Use of tester ⇒ Operating instructions

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

Compression readings

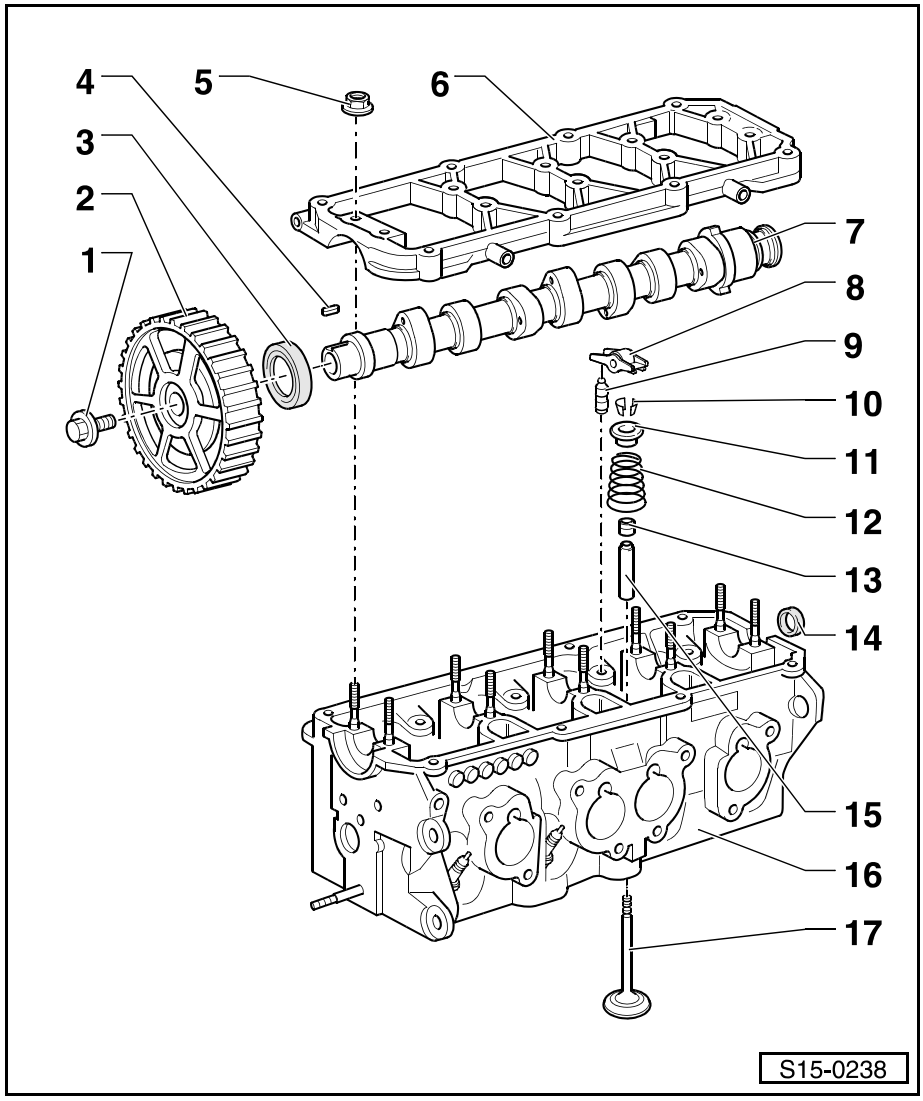
Engine new	Wear limit	Difference between cylinders
1,0…1.3 MPa (10…13 bar)	0.75 MPa (7.5 bar)	max. 0.3 MPa (3 bar)

– Conclude by deleting the fault memory of the engine control unit ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

15-2 Repairing Valve Gear

Note

- *Cylinder head and ladder frame must always be replaced together.*
- *After carrying out work on the valve gear, carefully crank engine at least 2 revolutions to ensure that no valve touches the piston when the engine is started.*



1 - 100 Nm
- ❑ to release and tighten use counterholder -T30004-

2 - Camshaft sprocket
- ❑ to remove and install, remove toothed belt ⇒ Chapter 13-2
- ❑ installation position fixed by parallel key ⇒ item 4
- ❑ for engines with engine identification characters AVU with rotor for hall sender -G40-

3 - Gasket ring
- ❑ do not oil sealing lip of gasket ring
- ❑ replacing ⇒ Chapter 15-3

4 - Parallel key

5 - 20 Nm

6 - Ladder frame
- ❑ Reworking of sealing surfaces not permissible
- ❑ with integrated camshaft bearing
- ❑ Bearing 1 for camshaft sprocket
- ❑ pay attention to tightening order of camshaft bearings ⇒ Chapter 15-3
- ❑ Apply sealant -D 188 800 A1- carefully in the sealant groove and to the bottom sealing surface

7 - Camshaft
- ❑ The rework of the camshaft is not permissible
- ❑ inspecting axial play ⇒ Fig. 1 in **15-2** page 2
- ❑ removing and installing ⇒ Chapter 15-3
- ❑ Slack: max. 0.01 mm
- ❑ for engines with engine identification characters AVU without rotor for hall sender -G40-

8 - Roller rocker arm
- ❑ do not interchange
- ❑ inspect roller bearings
- ❑ oil contact surface
- ❑ for installing, clip onto hydraulic supporting element with locking clip

9 - Supporting element
- ❑ do not interchange
- ❑ with hydraulic valve clearance compensation
- ❑ oil contact surface

10 - Valve collets

11 - Valve spring retainer

12 - Valve spring

- ❑ removing and installing
- – with cylinder head removed:
  with -MP 1-211- and -MP 1-213- with valve supporting plate -MP 1-218-
- – with cylinder head installed ⇒ Chapter 15-4

13 - Valve stem seal

- ❑ replacing ⇒ Chapter 15-4

14 - Cap

- ❑ insert flush
- ❑ for removal, only push the rubber through the middle using a screwdriver and release

15 - Valve guide

- ❑ inspect ⇒ Chapter 15-4

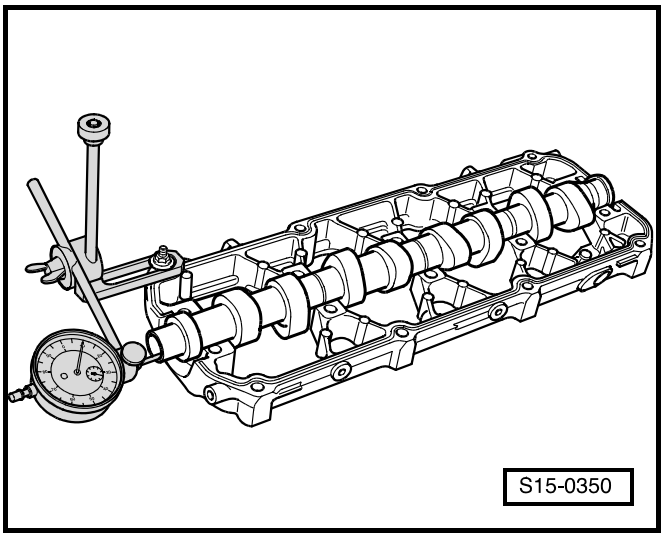
16 - Cylinder head

- ❑ reworking valve seats ⇒ Chapter 15-4

17 - Valve

- ❑ do not rework, only grinding in is permissible
- ❑ Valve dimensions ⇒ Fig. 2 in **15-2** page 2

Fig. 1: Checking the axial play of the camshaft ►



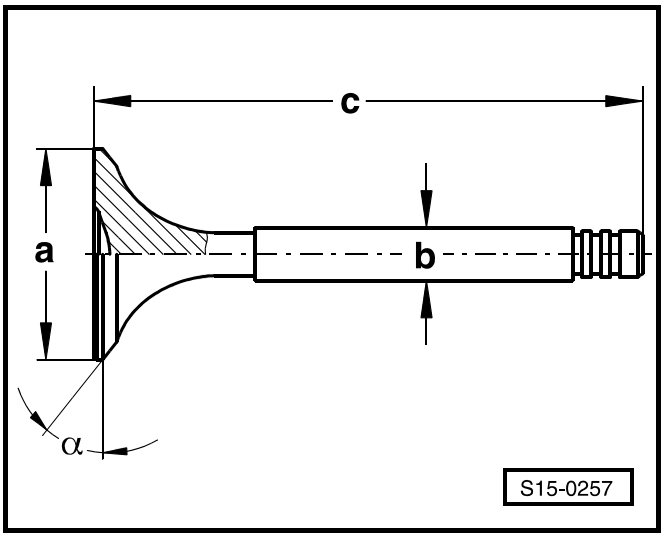
Special tools, test and measuring equipment and auxiliary items required

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

Measurement with ladder frame removed.

Wear limit: max. 0.17 mm

Fig. 2: Valve dimensions ►



Note

The valves must not be reworked. Only grinding in is permissible.

Dimension		Inlet valve	Exhaust valve
∅ a	mm	39,5 ± 0,15	32,9 ± 0,15
∅ b	mm	5,98 ± 0,007	5,965 ± 0,007
c	mm	93,85	93,85
α	∠°	45	45

15-3 Camshaft

Replacing camshaft gasket ring

Special tools, test and measuring equipment and auxiliary items required

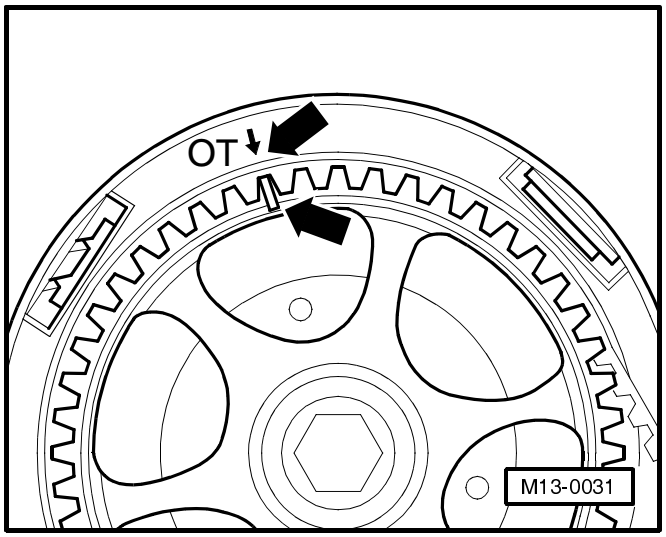
- Pressure pad -T30004-
- Gasket ring extractor -MP 1-215-
- Insertion sleeve -MP 1-315-
- Inserting device -T10071-
- Torque wrench 5...50 Nm (e.g. -V.A.G 1331-)
- Torque wrench 40...200 Nm (e.g. -V.A.G 1332-)

Removing

– Remove the engine cover.

– Remove toothed belt guard - top part.

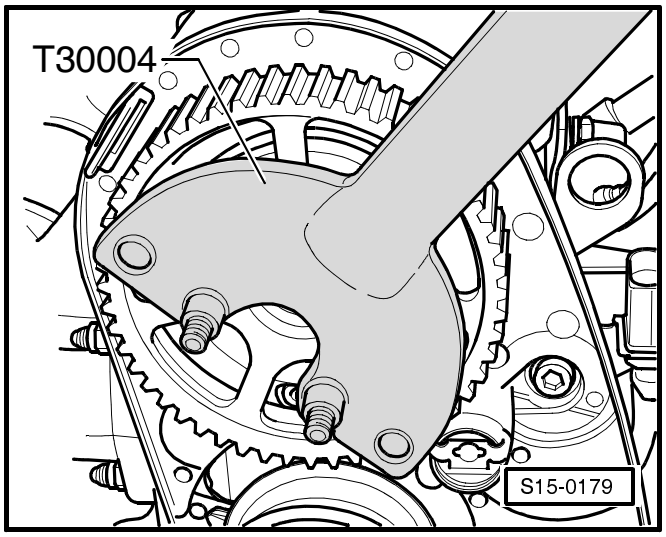
– Position camshaft sprocket to TDC marking of cylinder 1 by rotating at crankshaft. Marking on camshaft sprocket must be aligned with arrow at toothed belt guard.



– Slacken tensioning pulley and take toothed belt off camshaft sprocket.

– Then, turn the crankshaft back slightly.

– Remove camshaft sprocket. Hold the camshaft sprocket tight with the counterholder -T30004- for slackening the bolt.

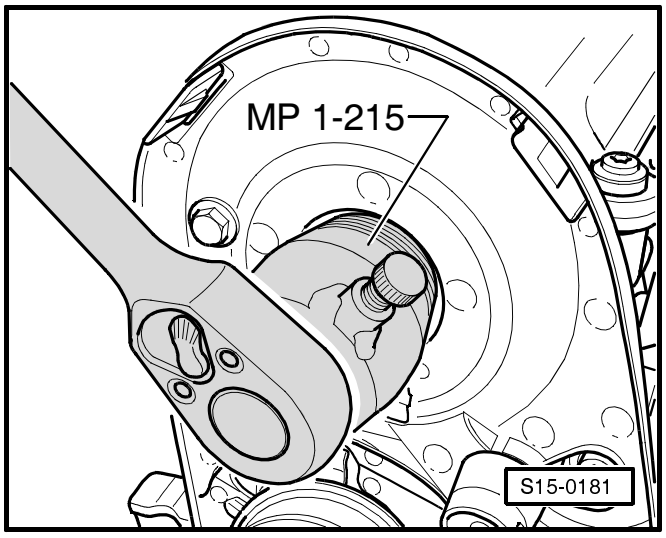


– Remove parallel key from the camshaft.

– Screw in bolt for attaching camshaft sprocket fully into the camshaft.

– Turn inner part of gasket ring extractor -MP 1-215- two turns (approx. 3 mm) out of the outer part and lock with knurled screw.

– Oil the thread head of the gasket ring extractor, position and forcely screw into the gasket ring as far as possible.



– Slacken knurled screw and turn inner part against the camshaft until the gasket ring is pulled out.

– Clamp gasket ring extractor into the vice at the flats. Remoe gasket ring with pliers.

Installing

Condition

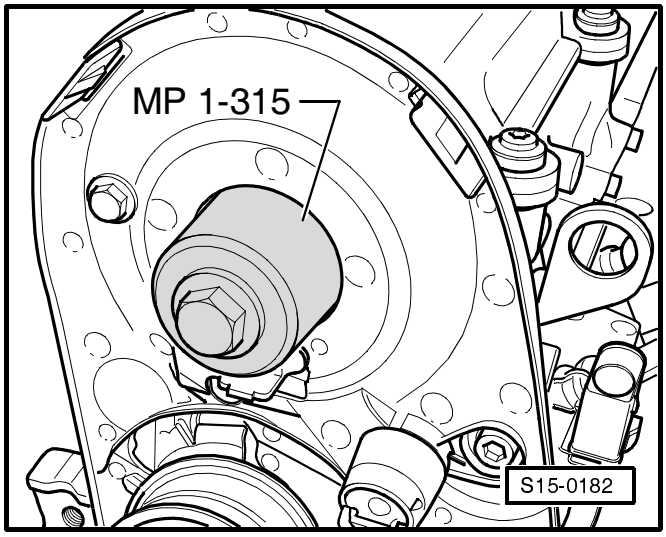
- The pistons must not be positioned at top dead centre.

– Remove the oil residues on the camshaft with a clean cloth.

Note!

Do not oil sealing lip of the gasket ring.

– Fit on gasket ring with guide sleeve -T10071/1- and press in fully with insertion sleeve -MP 1-315- and bolt -T10071/2-.

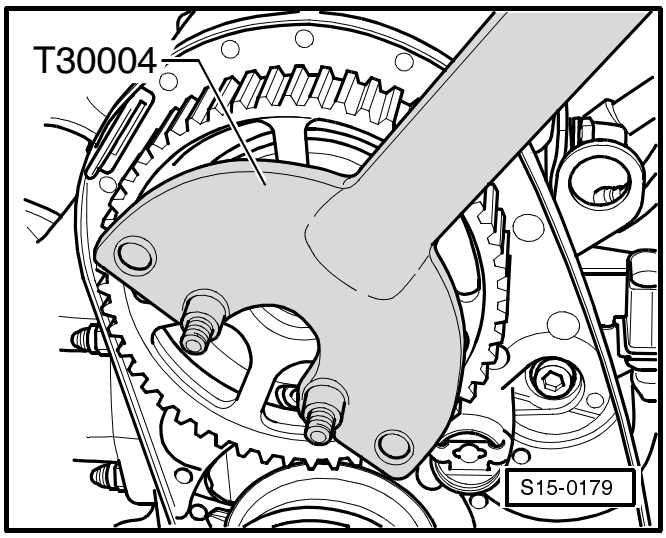


Note!

Place a larger commercially available M12 washer below the bolt in order to avoid wear to the pressure sleeve.

– Insert parallel key into camshaft.

– Install camshaft sprocket and tighten to 100 Nm (use counterholder -T30004-).



Note!

When rotating the camshaft, the crankshaft must not be positioned at TDC. Risk of damaging valves and piston crowns.

The further assembly is carried out in reverse order to disassembly.

– Installing toothed belt, tensioning (setting timing) ⇒ Chap. 13-2.

Removing and installing camshaft

Special tools, test and measuring equipment and auxiliary items required

- Pressure pad -T30004-
- Torque wrench 5...50 Nm (e.g. -V.A.G 1331-)
- Torque wrench 40...200 Nm (e.g. -V.A.G 1332-)
- Sealant -D 188 800 A1-

Removing

Note!

- *The sealing surfaces at the bottom of the ladder frame and at the top of cylinder head must not be machined.*
- *The camshaft bearings are integrated in the cylinder head and in the ladder frame. Before removing the ladder frame, it is necessary to slacken the toothed belt.*
- *If the ladder frame has been detached, it is necessary to replace the seal of the camshaft and the rear end cover.*
- *Pay attention to the sell by date of the sealant.*

– Remove the engine cover.

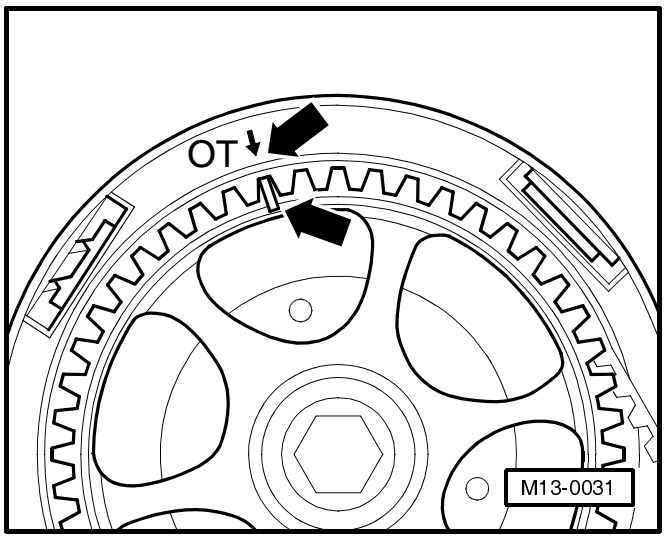
– Remove top part of intake manifold ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.

Note!

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

– Remove toothed belt guard - top part.

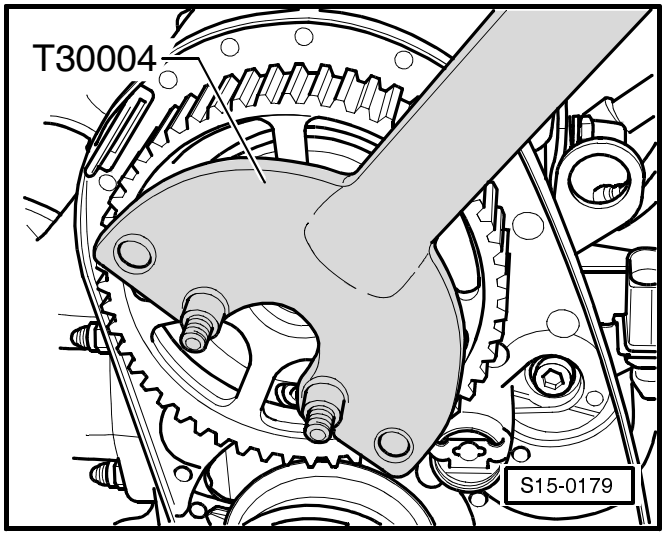
– Position camshaft sprocket to TDC marking of cylinder 1. Marking on camshaft sprocket must be aligned with arrow at toothed belt guard.



– Slacken tensioning pulley and take off toothed belt.

– Then, turn the crankshaft back slightly.

– Remove camshaft sprocket. Hold the camshaft sprocket tight with the counterholder -T30004- for slackening the bolt.



– Remove parallel key from the camshaft.

– Slacken the bolts of the cylinder head cover from outside to the inside.

– Remove cylinder head cover.

– Remove rear toothed belt guard.

– Unscrew the nuts of bearings 5, 1 and 3. Then, slacken bearings 2 and 4 alternately diagonally across.

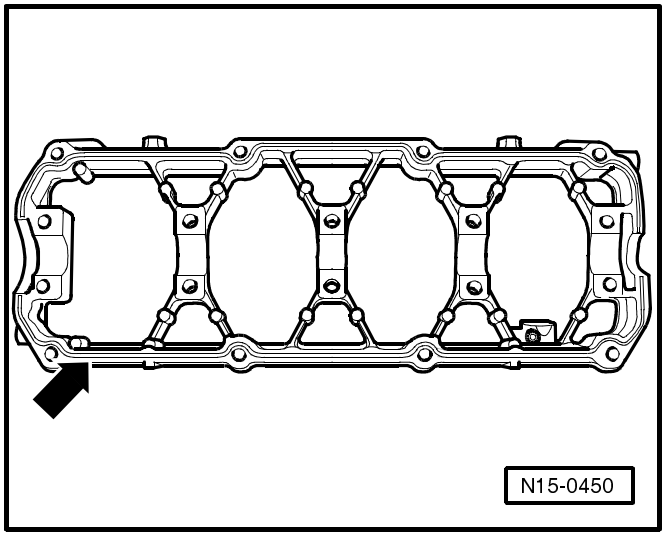
– Take off ladder frame.

– Carefully lift out camshaft and place down on a clean surface.

– Take out the roller arms together with supporting elements. Place the parts down on a clean surface.

– Ensure that the roller arms and the supporting elements are not mixed up.

– Remove the old sealant from the groove -arrow- of the ladder frame as well as from the sealing surfaces.



– Ensure no dirt and sealant residues get into the cylinder head.

Installing

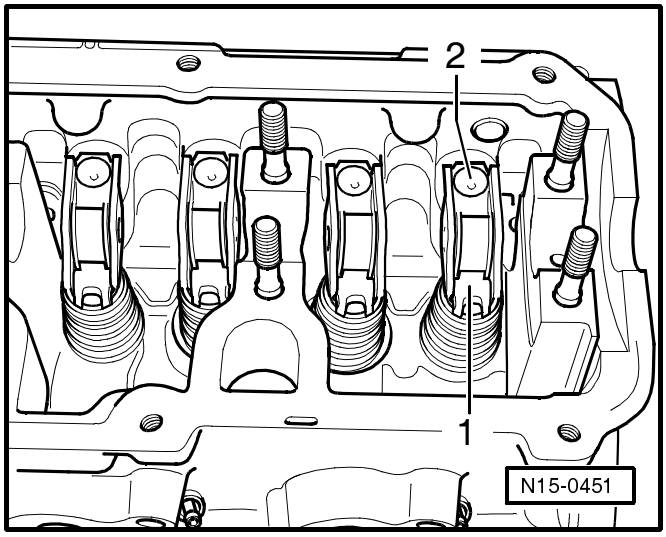
Conditions

- The sealing surfaces must be free of oil and grease.
- When installing the ladder frame and camshaft, the cams of cylinder 1 must be pointing up.
- The pistons must not be positioned at top dead centre.

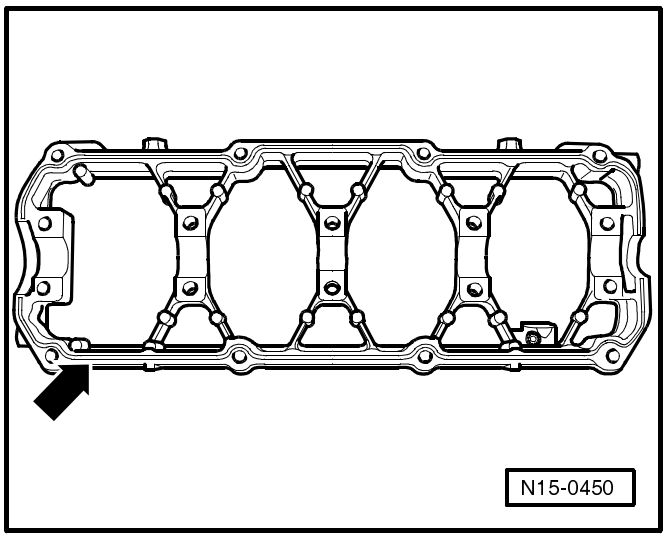
Procedure

– Insert the supporting elements into cylinder head and place the roller arms onto the valve stem ends and supporting elements, respectively.

– Ensure that all the roller arms are correctly positioned on the valve stem ends -1- and are clipped in place on the relevent supporting elements -2-.
– Oil contact surfaces of camshaft.
– Carefully place camshaft into the camshaft bearings of the cylinder head.



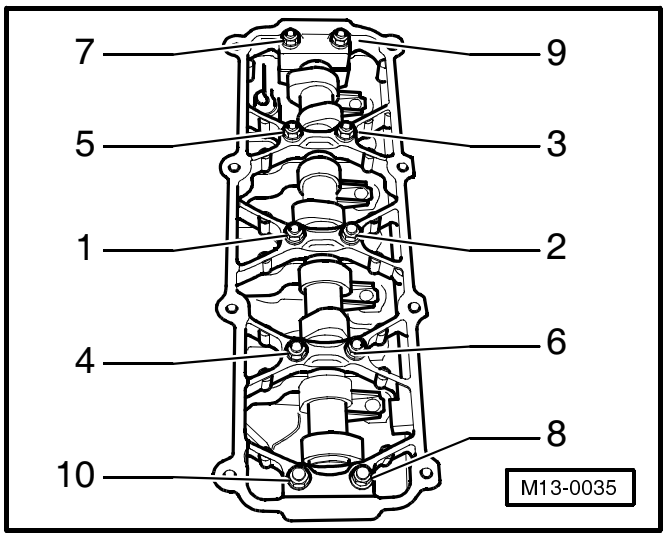
– Apply an even, slightly raised bead of sealant -D 188 800 A1- into the clean groove of the ladder frame -arrow-. Distribute the sealant evenly over the sealing surface.



Note!

- *The sealant must not be applied too thick. Wipe off any excess sealant with a non-fluffing cleaning cloth.*
- *The ladder frame should be fitted on and bolted without any interruption as the sealing surfaces immediately begin hardening as soon as they come into contact.*
- *Pay attention to the sell by date of the sealant.*

– Insert the rear end cover flush.
– Fit on the ladder frame and tighten the nuts of bearings 2 and 4 slightly alternately diagonally across. Then, slightly tighten the nuts of bearings 3, 1 and 5.
– After this, tighten the nuts fully in the order shown to 20 Nm.



– Install cylinder head cover, tighten the bolts fully diagonally across from inside to outside.
– Install rear toothed belt guard.
– Install new gasket ring of camshaft ⇒ **15-3** page 1.
– Insert parallel key into camshaft.
– Install camshaft sprocket and tighten to 100 Nm (use counterholder -T30004-).

Note!

When rotating the camshaft, the crankshaft must not be positioned at TDC. Risk of damaging valves and piston crowns.

The further assembly is carried out in reverse order to disassembly.

– Installing toothed belt, tensioning (setting timing) ⇒ Chap. 13-2.

Note!

- *After installing the ladder frame and the cylinder head cover, allow the sealant to dry for about 30 minutes.*
- *After working on the valve gear carefully rotate the engine at least 2 turns to ensure no valve strikes when the engine is started.*

15-4 Valve stem seals, valves guides, valve seats

Replacing valve stem seals

Cylinder head fitted

Special tools, test and measuring equipment and auxiliary items required

- Extractor for valve stem seal -MP 1-230-
- Pressure hose -MP 1-210-
- Valve lever -MP 1-211-
- Valve stem seal insertion tool -MP 1-233-
- Assembly device -MP 1-213-
- Spark plug wrench (e.g. -3122B-)
- Assembly tool -T10112-
- Valve supporting plate -MP 1-218-

Note

With cylinder head removed, place cylinder head onto the valve supporting plate -MP 1-218-.

Removing

– Removing camshaft ⇒ Chap. 15-3.

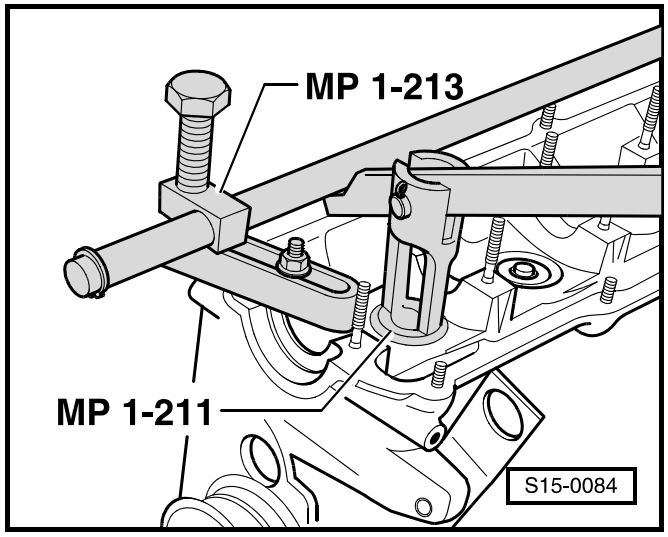
– Remove the roller rocker arm together with the supporting element. Lay aside on a clean surface.

– Ensure that the roller rocker arm and the supporting element is not mixed up.

– Use assembly tool -T10112- to unplug spark plug connector and unscrew spark plugs with spark plug wrench.

– Put the piston of the relevant cylinder at „bottom dead centre“.

– Insert assembly device -MP 1-213- and adjust bearing ► to stay bolt height.



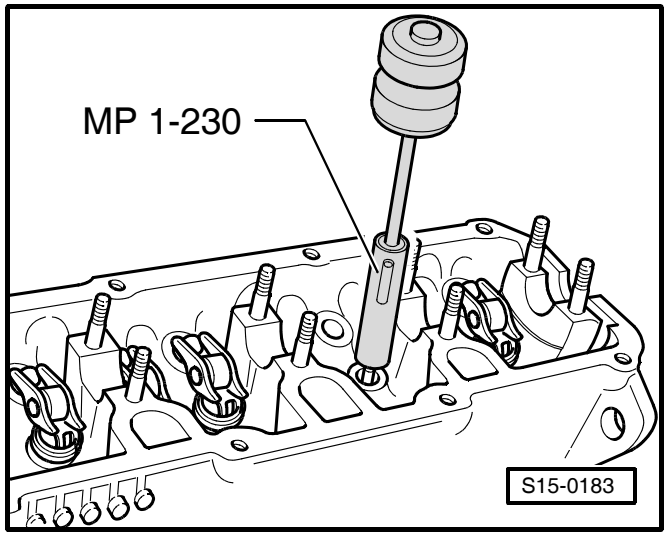
– Screw the pressure hose -MP 1-210- into the spark plug thread and apply constant pressure of at least 0.6 MPa (6 bar) in the cylinder.

– Remove valve springs with valve lever -MP 1-211-.

Note

If valve collets are tight, slacken with slight blows of a hammer on the valve lever.

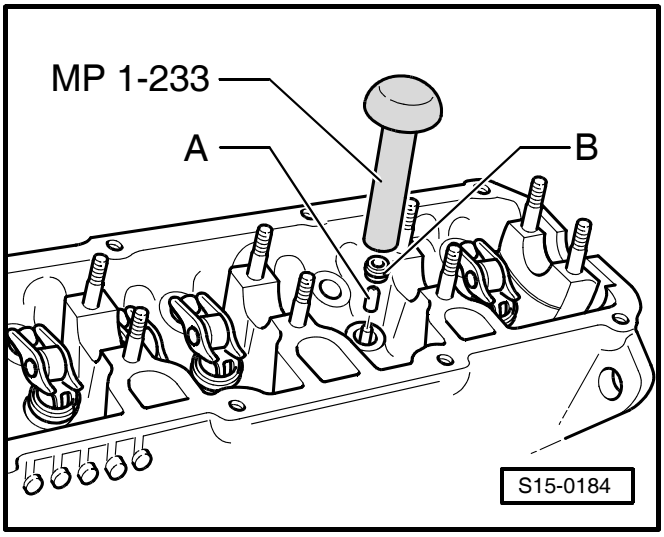
– Pull off valve stem seal with extractor for valve stem seal -MP 1-230-. ►



Installing

– In order to avoid damage to the new valve stem seals, fit the supplied plastic sleeve -A- onto the valve stem.
– Oil valve stem seal -B-, insert into the valve stem seal insertion tool -MP 1-233- and carefully push onto the valve guide.
– Remove plastic sleeve.

Further installation occurs in a similar way in reverse order to removal.



Note

After carrying out work on the valve gear, carefully crank engine at least 2 revolutions to ensure that no valve touches the piston when the engine is started.

Inspect valve guides

Special tools, test and measuring equipment and auxiliary items required

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

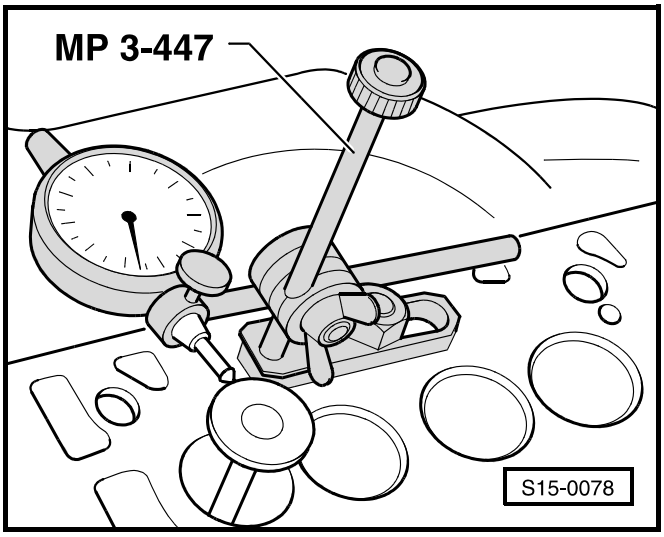
Note

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

Procedure

– Insert valve into guide. End of valve stem must end flush with the guide (because of the different stem diameter, use only inlet valve in inlet guide and exhaust valve in exhaust guide).
– Determine valve rock.

  Wear limit: 0.6 mm



Note

If the wear limit is exceeded, repeat measurement with new valves. If the wear limit is again exceeded, replace cylinder head.

Reworking valve seats

Note

If no perfect contact pattern is achieved by grinding in the valve seats, rework the valve seats.

Special tools, test and measuring equipment and auxiliary items required

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

Note

- *When carrying out repairs on 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 ⇒ **15-4** page 2.*
- *Rework valve seats only sufficiently in order to obtain a proper contact pattern.*
- *Calculate the maximum permissible reworking dimension before commencing.*
- *If the reworking dimension is exceeded, proper operation of the hydraulic valve clearance compensation is no longer assured and the cylinder head must be replaced.*

Calculating maximum permissible reworking dimension

– Insert valve and press firmly against the valve seat.

Note

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

– Measure distance -a- between the end of the valve stem and the upper face of the cylinder head.

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

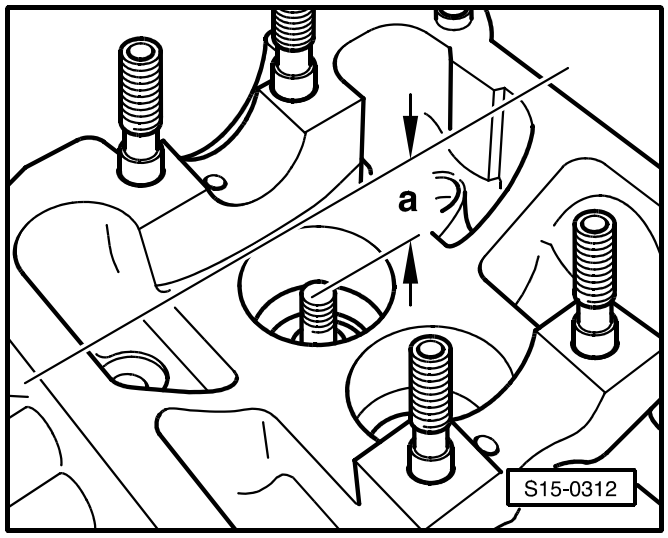
- Minimum dimension for inlet and exhaust valve: 31.7 mm.

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

Example:

	Measured distance	32.0 mm
-	Minimum dimension	31.7 mm
=	max. permissible reworking dimension[1)]	0.3 mm

[1)] The max. permissible reworking dimension is shown in the figures for reworking the valve seats as dimension „b“.

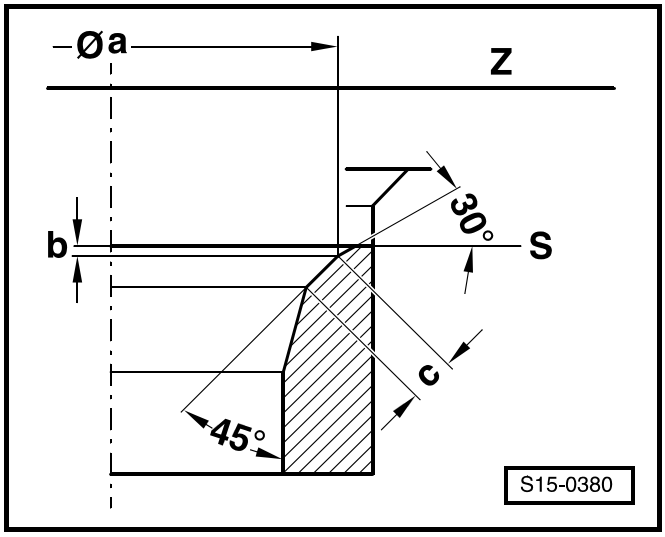


Note

If the max. permissible reworking dimension is 0 mm or less than 0 mm, repeat measurement with a new valve. If the measuring result is still 0 mm or less than 0 mm, replace cylinder head.

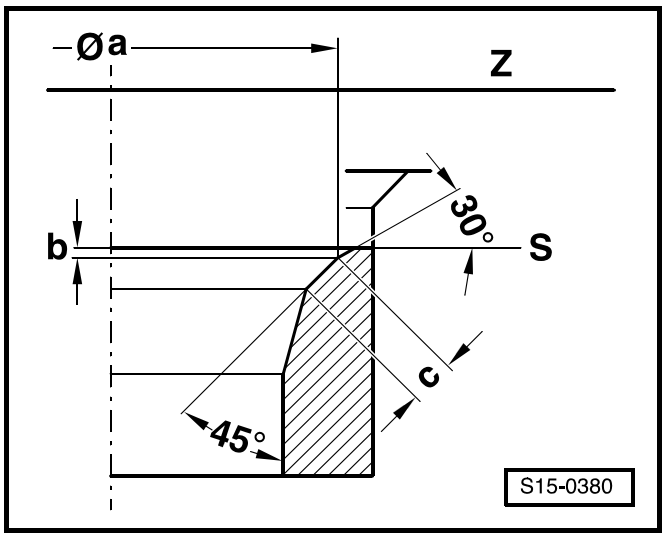
Reworking inlet valve seat

Dimension		Inlet valve seat
∅ a	mm	39,2
b	mm	Max. permissible reworking dimension
c	mm	1,8 … 2,2
Z		Bottom edge of cylinder head
45°		Valve seat angle
30°		Top correction angle
S		Combustion chamber floor area



Reworking exhaust valve seat

Dimension		Exhaust valve seat
∅ a	mm	32.4 mm
b	mm	Max. permissible reworking dimension
c	mm	2,2 … 2.6 mm
Z		Bottom edge of cylinder head
45°		Valve seat angle
30°		Top correction angle
S		Combustion chamber floor area



Procedure

Reworking can be carried out with a machine or by hand. The following conditions must be met:

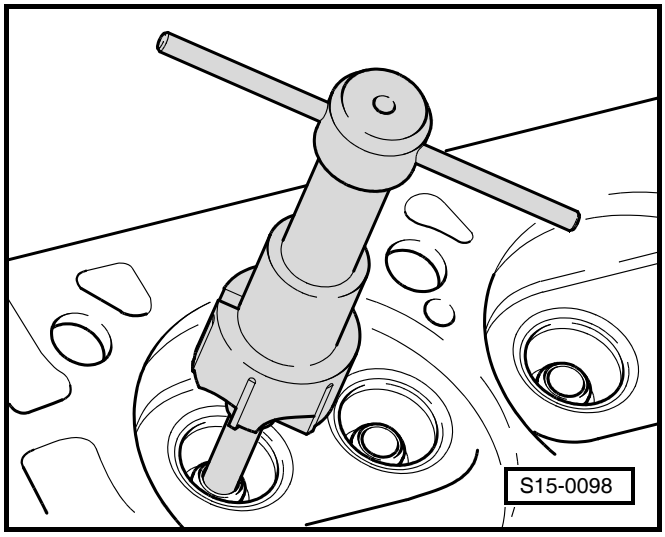
- Wear limit of valve guides must not exceed the permissible dimension ⇒ **15-4** page 2.
- Use NAC milling cutter with carbide metal tips (min. 90 HRC).
- Mill with the milling cutter using slight pressure in such a way that an even removal of swarfs is ensured over the whole working surface.

Reworking valve seats with NAC milling cutter

– Place cylinder head on a felt base and secure to prevent it from turning.

– Match diameter of guide drift to diameter of valve guide.

Valve guide	∅ Guide drift in mm
Inlet valve	$6,0^{-0,01}$
Exhaust valve	



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

Valve seat	Milling cutter 90°∅ mm	Milling cutter 120°∅ mm
Inlet valve	41	41
Exhaust valve	34	34

Milling sequence

1. Machine valve seat with 90° milling tool until until a perfect contact pattern is achieved. (Do not exceed maximum permissible reworking dimension!)
2. Initially mill top correction angle with 120° milling cutter until the valve seat diameter -a- or valve seat width -c- is achieved ⇒ **15-4** page 4.

– Grind in valve/valve seat -arrows- with fine grinding paste so as to achieve a perfect contact pattern.

– Check contact pattern e.g. with water colour (perfect contact pattern over entire circumference).

– Install valve springs.

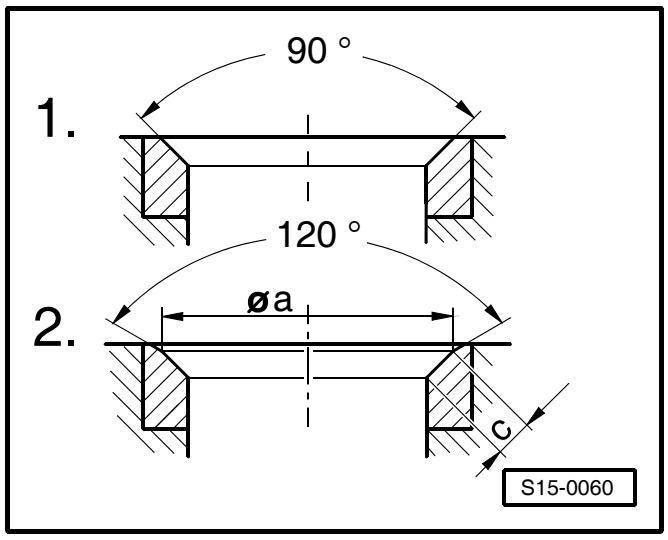
– Inspect valve for leaks.

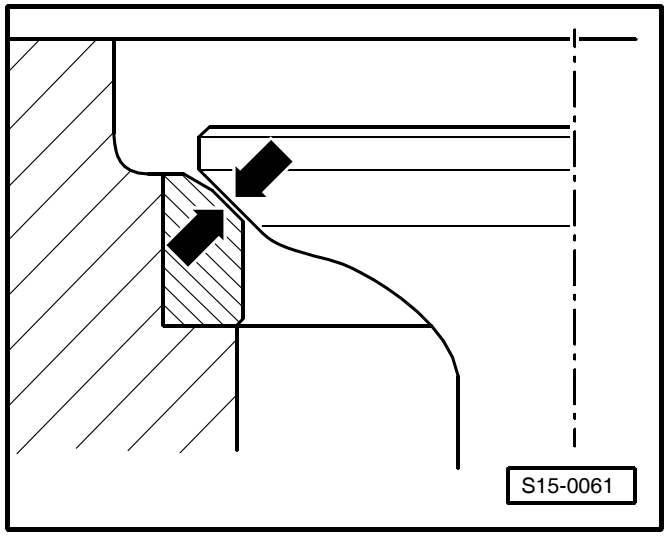
The tightness of the valve can be checked by filling petrol into the inlet and outlet canal (no petrol must flow out at the valve seat)

After completing the repair measure the dimension -a- again and calculate the maximum permissible reworking dimension ⇒ **15-4** page 3.

Note

If the reworking dimension is exceeded, proper operation of the valve gear is no longer assured and the cylinder head must be replaced.





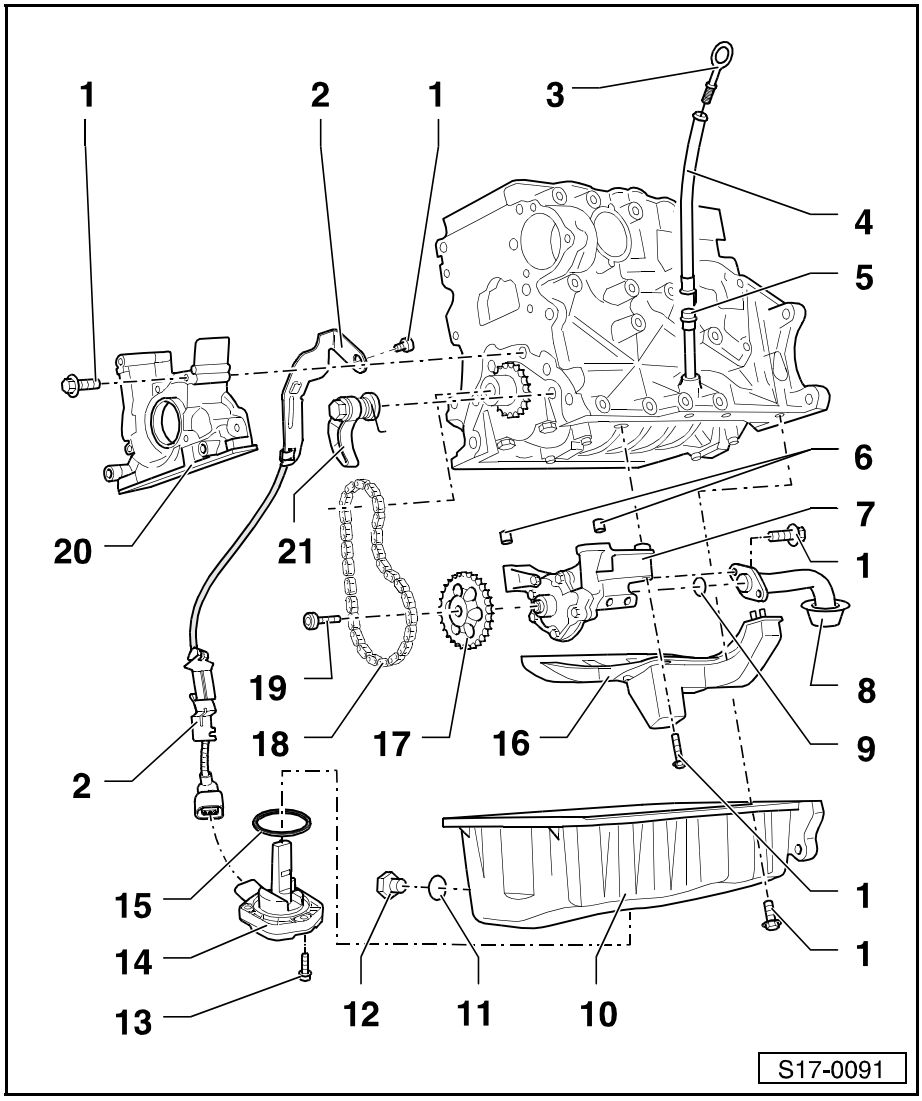
17 – Lubrication

17-1 Removing and installing parts of the lubrication system

Note

- *If considerable quantities of metal swarf or abrasion (caused by rubbing damage such as damage to the crankshaft and conrod bearings) is found in the engine oil when carrying out engine repairs, establish the cause, remove the damaged parts and carefully clean the oil galleries and oil chambers in order to avoid consequential damage. Apart from undertaking very careful cleaning of oil channels and oil chambers one should also replace the oil cooler.*
- *The oil level must not be above the max. marking - risk of damage to catalytic converter!*
- *Testing oil pressure and oil pressure switch ⇒ Chapter 17-3.*

Check the engine oil condition, oil level and oil specification ⇒ Inspection and Maintenance



1 - 15 Nm

2 - Bracket
- ❑ for wiring loom from the oil level and oil temperature sender
- ❑ different versions: screwed on or clipped in

3 - Dipstick
- ❑ oil level must not exceed max. marking!

4 - Filler funnel
- ❑ remove for extracting oil

5 - Guide tube

6 - Dowel sleeves

7 - Oil pump
- ❑ with pressure relief valve 1.2 MPa (12 bar)
- ❑ before installing, inspect whether the two dowel sleeves ⇒ item 6 for centering oil pump/cylinder block are present
- ❑ if there is any scoring on contact surfaces and gears, replace

8 - Suction line
- ❑ clean strainer if dirty

9 - O-ring
- ❑ replace

10 - Oil pan
- ❑ clean sealing surface before installing
- ❑ fit with silicone sealant - D 176 404 A2- ⇒ Chapter 17-2

11 - Gasket
- ❑ replace

12 - Oil drain plug, 30 Nm
- ❑ cut open seal if leaking and replace

13 - 10 Nm

14 - Oil level and oil temperature sender -G266-
- ❑ test ⇒ Electrical System; Rep. Gr. 90

15 - Gasket
- ❑ replace

16 - Baffle

17 - Sprocket

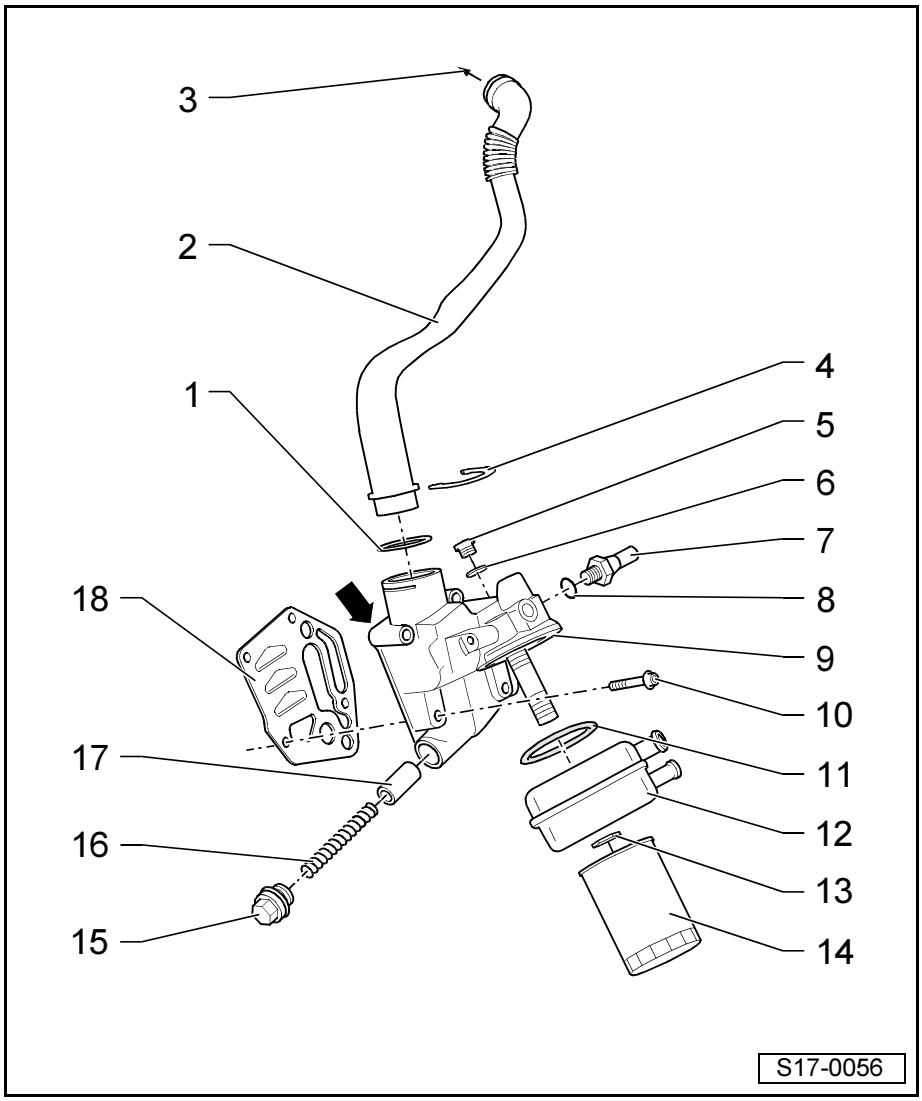
18 - Chain

19 - 20 Nm

20 - Front sealing flange
- ❑ removing and installing ⇒ Chapter 13-3
- ❑ insert with silicone sealant - D 176 404 A2- ⇒ Chapter 13-3
- ❑ replace sealing ring for crankshaft at belt pulley side ⇒ Chapter 13-3

21 - Chain tensioner with tensioning rail, 15 Nm
- ❑ when installing, pretension spring and attach

Disassembling and assembling the oil filter holder



- **1 - Gasket**
  - ❑ push on as far as collar of connecting tube ⇒ item 2
- **2 - Connecting tube**
- **3 - To vent housing of cap**
- **4 - Retaining clip**
- **5 - Screw plug, 15 Nm**
- **6 - Gasket**
  - ❑ cut open if leaking and replace
- **7 - 0.14 MPa (1.4 bar) oil pressure switch - F1-, 25 Nm**
  - ❑ black
  - ❑ inspect ⇒ Chapter 17-3
- **8 - Gasket**
  - ❑ cut open if leaking and replace
- **9 - Oil filter holder**
  - ❑ with pressure relief valve approx. 0.4 MPa (4 bar)
  - ❑ with interference-fit return-flow check valve -arrow-
- **10 - 15 Nm + torque a further 90° (1/4 turn)**
  - ❑ replace
- **11 - Gasket**
  - ❑ replace
  - ❑ fit into the grooves on the oil cooler
- **12 - Oil cooler**
  - ❑ ensure clearance to surrounding components
- **13 - 25 Nm**
- **14 - Oil filter**
  - ❑ slacken with tensioning strap
  - ❑ tighten by hand
  - ❑ pay attention to installation instructions on oil filter
- **15 - Screw plug, 40 Nm**
  - ❑ with own ring gasket
  - ❑ replace
- **16 - Spring**
  - ❑ for pressure relief valve approx. 0.4 MPa (4 bar)
- **17 - Piston**
  - ❑ for pressure relief valve approx. 0.4 MPa (4 bar)
- **18 - Gasket**
  - ❑ replace

17-2 Removing and installing oil pan

Special tools, test and measuring equipment and auxiliary items required

- Hinged wrench -3185-
- Socket insert -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-
- Protective goggles

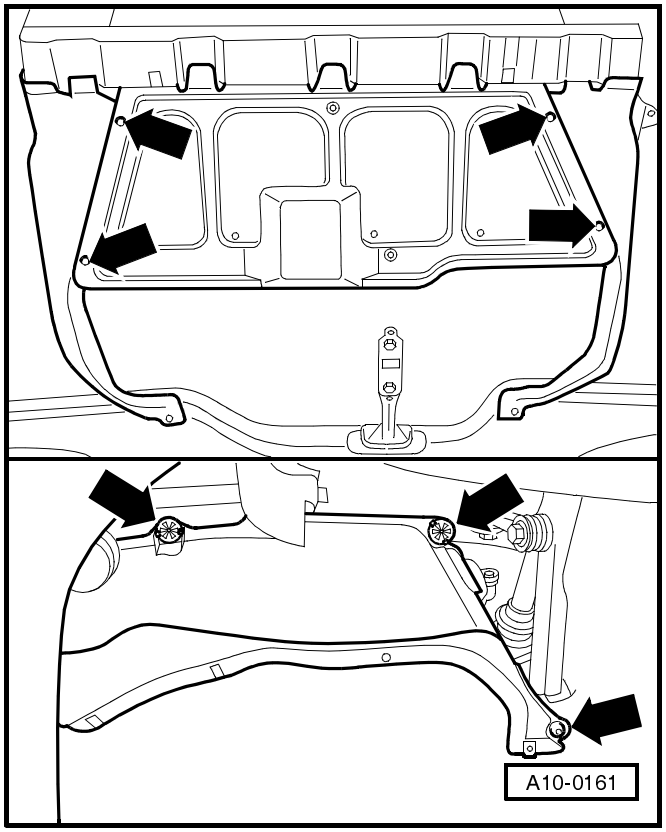
Removing

– Remove noise insulation in middle as well as on left and right -arrows-, remove air guide parts on outside first of all.

– Drain engine oil.

– Unplug the 3-pin connector from oil level/temperature sensor -G266-.

– Unscrew bolts attaching oil pan.



Note!

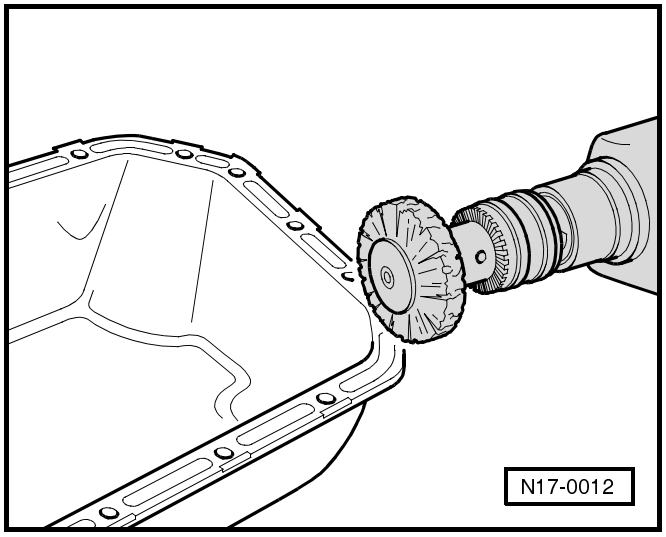
Use hinged wrench -3185- to slacken oil pan bolts at flywheel side and unscrew with socket insert -3249-.

– Remove oil pan, if necessary release by applying slight blows with a rubber-headed hammer.

– Use a flat scraper to remove sealant residues on the cylinder block.

– Use a rotating plastic brush to remove sealant residues on the oil pan (wear protective goggles).

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



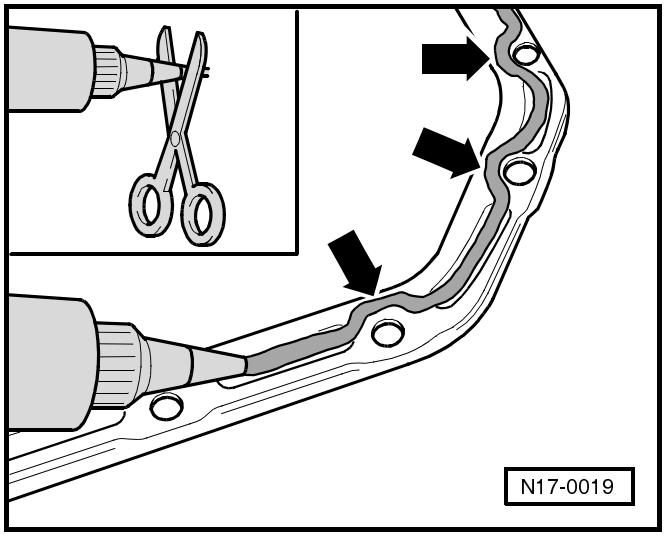
Installing

Note!

- *Pay attention to the sell by date of the sealant.*
- *The oil pan must be installed within 5 minutes after applying the silicone sealant.*
- *Use wrench socket -3249- to insert the oil pan bolts at flywheel side and tighten with hinged wrench -3185-.*

– Cut off nozzle tube of the silicone sealant -D 176 404 A2- at the front marking (∅ of nozzle approx. 3 mm).

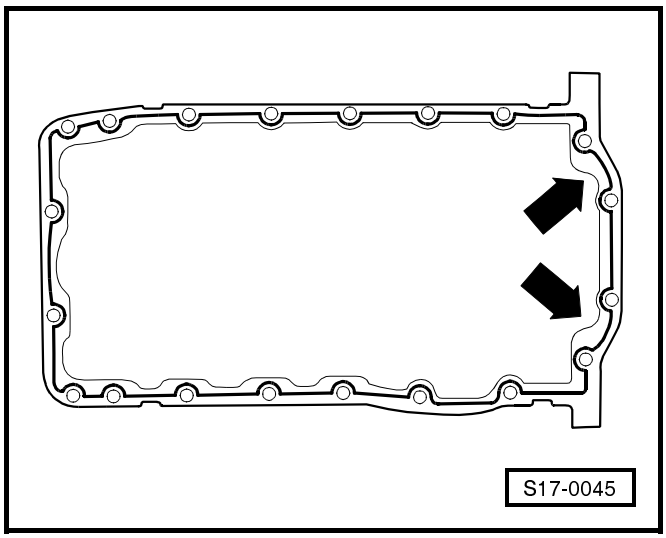
- Thickness of sealant bead: 2…3 mm
- Run past the area around the bolt holes on the inside -arrows-.



Note!

The sealant bead must not be thicker than 3 mm otherwise excess sealant may get into the oil pan and clogg 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!

Take particular care when applying sealant bead in the area of the sealing flange at the rear -arrows-.

– Fit on oil pan immediately and tighten the bolts as follows:

1 - Initially tighten all bolts attaching oil pan/cylinder block only very slightly diagonally across.
2 - Tighten the three bolts of oil pan/cylinder block slightly.
3 - Tighten all the bolts of oil pan/cylinder block slightly diagonally across.
4 - Tighten the three bolts of oil pan/gearbox to 25 Nm.
5 - Tighten all the bolts of oil pan/cylinder block diagonally across to 15 Nm.

Note!

- *When installing the oil pan with the engine removed, ensure that the oil pan is flush with the cylinder block at the flywheel side.*
- *After installing the oil pan, allow the sealant to dry for about 30 minutes. Only then may engine oil be filled in.*

The further assembly is carried out in reverse order to disassembly.

17-3 Testing oil pressure and oil pressure switch

Special tools, test and measuring equipment and auxiliary items required

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

Function of dynamic oil pressure warning system

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

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

Activation delay of oil pressure warning: approx. 3 s

Off delay of oil pressure warning: approx. 5 s

Test warning light

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

Warning criteria

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

- „Ignition on“, engine not running, oil pressure switch closed
- Engine speed greater than 1500 rpm, oil pressure switch open

– At an engine speed greater than 5000 rpm, the oil pressure warning is also not cancelled if the oil pressure switch is closed. Oil pressure switch cancelled below 5000 rpm.

– If the oil pressure switch is opened for only 0.5…3 s at an engine speed of more than 1500 rpm, this is stored in the combination processor of the dash panel insert. If this situation occurs 3 times when the engine is running, the oil pressure warning is immediately activated and is also not cancelled below 1500 rpm. The oil pressure warning is cancelled if the oil pressure switch is closed for more than 5 s at a speed of more than 1500 rpm, or at „Ignition off“.

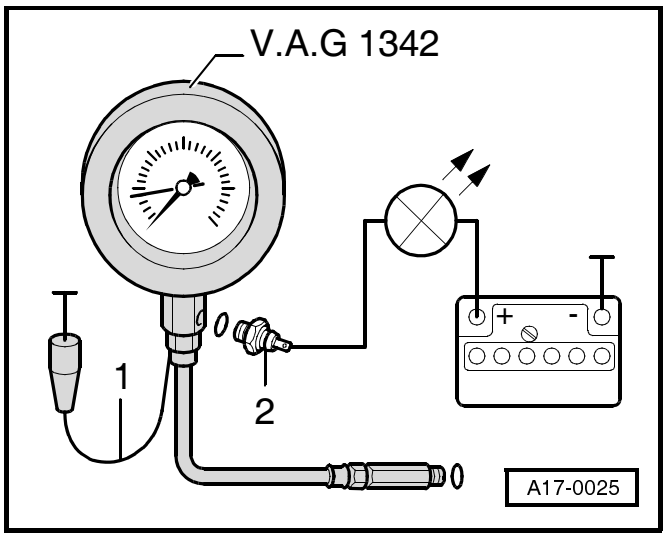
Test conditions

- Engine oil at correct level, inspecting ⇒ Chap. 17-1
- Oil pressure warning light -K3- must come on for about 3 s when the ignition is switched on.
- Engine oil temperature at least 80 °C (radiator fan must have run once).

Testing oil pressure switch

Detach cable from oil pressure switch.

– Unscrew oil pressure switch and screw in oil pressure tester (e. g. -V.A.G 1342-).



– Screw oil pressure switch -2- into -V.A.G 1342-.

– Connect brown cable -1- of tester to earth (-).

– Connect diode test lamp (e. g. -V.A.G 1527-) to oil pressure switch -2- and battery positive (+).

The LED must not light up.

– If the LED lights up, replace the oil pressure switch.

– Start engine and slowly increase engine speed.

– At 0.12…0.16 MPa (1.2…1.6 bar) the LED must light up, if not replace oil pressure switch.

Testing oil pressure

– Unscrew oil pressure switch and -V.A.G 1342- scew in.

– Screw oil pressure switch into -V.A.G 1342-.

– Start engine (engine oil temperature at least 80 °C).

- Oil pressure when engine idling: min. 0.2 MPa (2 bar)
- Oil pressure at 2000 rpm: 0,27… 0.45 MPa (2.7 … 4.5 bar)

If the nominal values are not reached:

– Eliminate any mechanical damage, e. g. bearing damage.

– Replace oil filter holder with pressure relief valve or oil pump ⇒ Chap. 17-1.

– At a higher engine speed the oil pressure must not be greater than 0.7 MPa (7 bar).

If the specified pressure is exceeded:

– Inspect oil galleries.

– Replace oil filter bracket with pressure relief valve if necessary ⇒ Chap. 17-1.

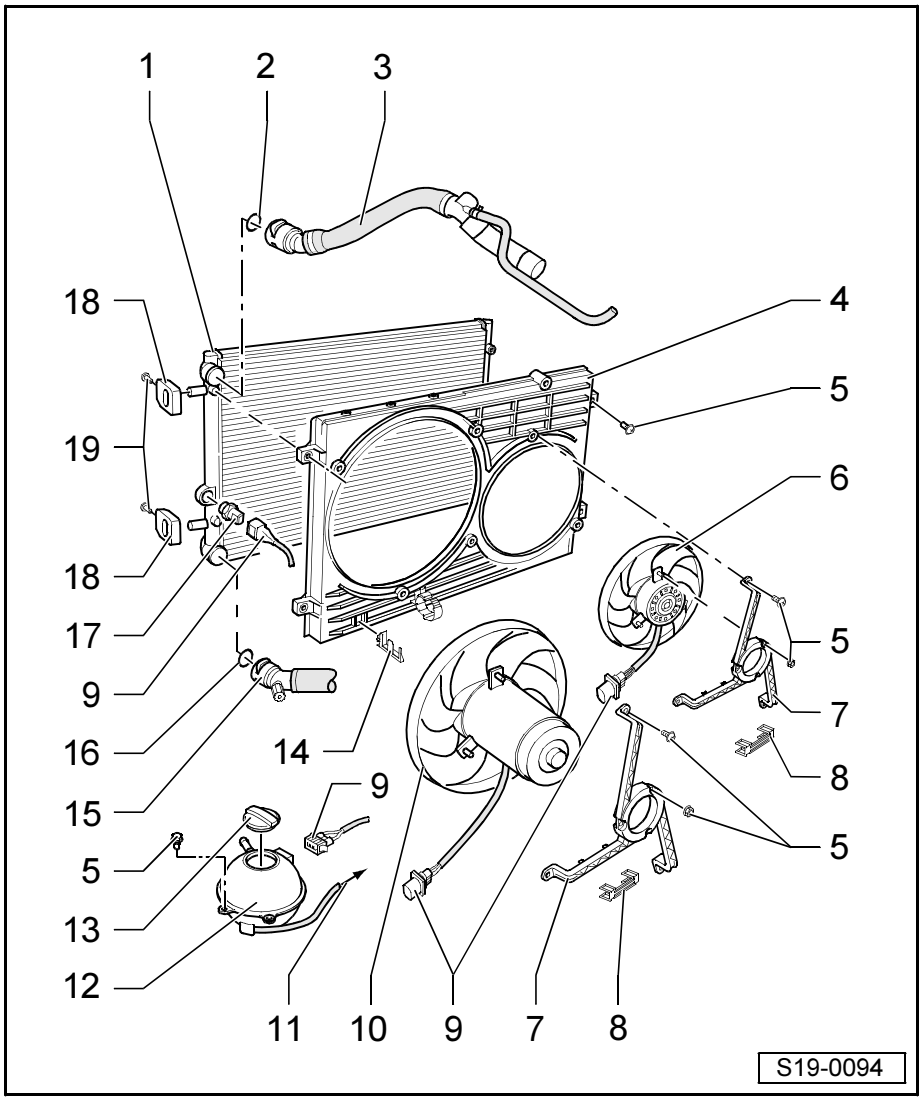
19 – Cooling

19-1 Parts of cooling system - Summary of components

Parts of the cooling system fitted to body

Note

- *When the engine is warm the cooling system is under pressure. If necessary reduce pressure before repairs.*
- *The hose connections are secured with spring-type clips. In the event of repairs only use spring-type clips.*
- *Use pliers for spring strap clips to fit the spring strap clips.*
- *Always replace seals and gasket rings.*
- *When installing fit the coolant hoses free of stress, without them touching any other components (pay attention to the marking on the coolant connection).*
- *Draining and filling system with coolant ⇒ **19-1** page 3*
- *Information concerning the mixture ratios ⇒ **19-1** page 4*
- *Inspecting cooling system for leaks ⇒ 1.6 litre/74 kW Engine, Mechanical Components; Rep. Gr. 19.*



1 - Radiator
- ❑ removing and installing ⇒ **19-1** page 5
- ❑ after replacing, fill entire system with fresh coolant

2 - O-ring
- ❑ replace

3 - Top coolant hose
- ❑ attached to radiator by retaining clips
- ❑ connection diagram for coolant hoses ⇒ **19-1** page 3

4 - Air duct scoop

5 - 10 Nm

6 - Auxiliary fan
- ❑ on vehicles with air conditioning

7 - The fan ring

8 - Retaining clip
- ❑ check tightness

9 - Connector

10 - Radiator fan -V7-

11 - To coolant pipe
- ❑ connection diagram for coolant hoses ⇒ **19-1** page 3

12 - Expansion bottle
- ❑ Inspect cooling system for leaks ⇒ 1.6-litre/74 kW Engine, Mechanical Components; Rep. Gr. 19
- ❑ Test pressure 0.14…0.16 MPa (1.4…1.6 bar) - overpressure

13 - Cover plate

14 - Bracket
- ❑ for fan connector

15 - Bottom coolant hose
- ❑ attached to radiator by retaining clips
- ❑ connection diagram for coolant hoses ⇒ **19-1** page 3

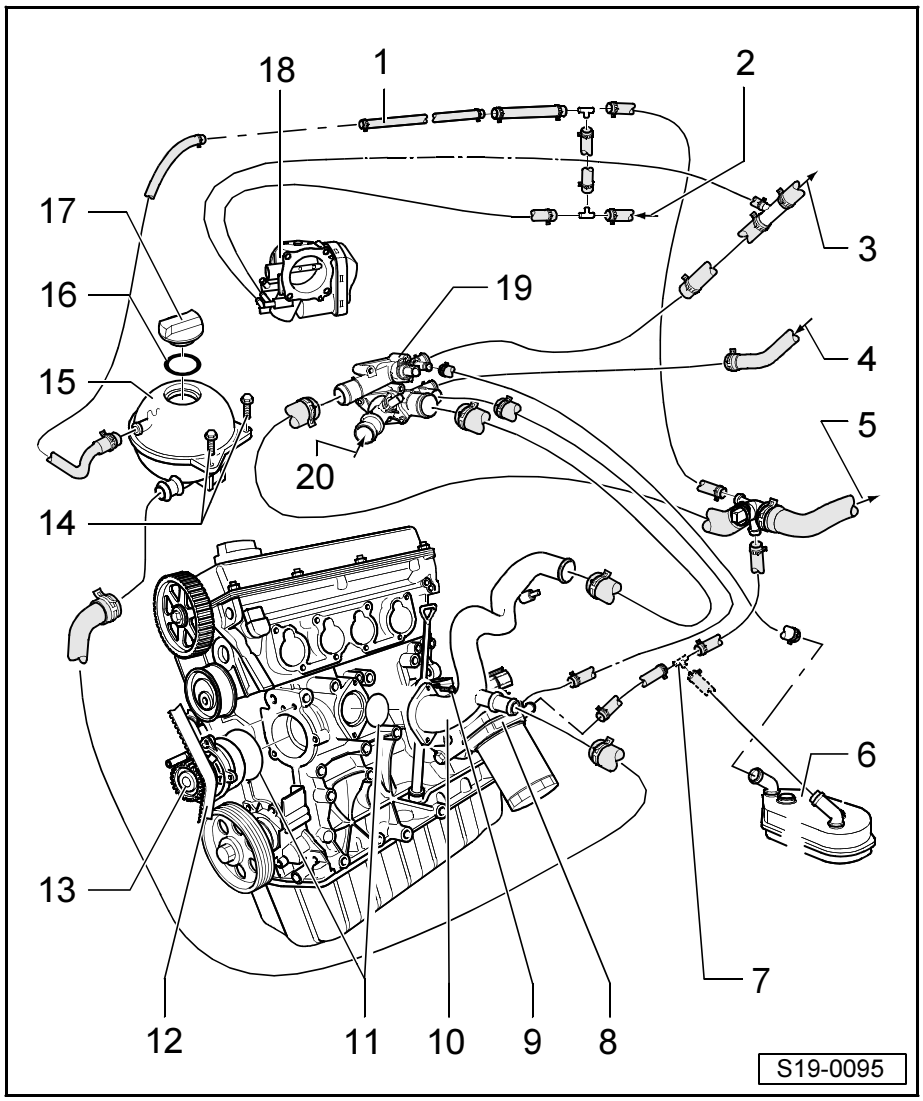
16 - O-ring
- ❑ replace

17 - Coolant temperature sensor radiator outlet -G83-, 35 Nm
- ❑ check ⇒ **19-1** page 9
- ❑ pay attention to different version

18 - Bracket
- ❑ for radiator
- ❑ check fitting position

19 - 10 Nm

Parts of cooling system engine side



1 - Top coolant pipe
- ❑ clipped in place at bulkhead

2 - From cylinder head vent pipe

3 - To heater valve

4 - From heat exchanger
- ❑ connection diagram for coolant hoses ⇒ **19-1** page 3

5 - Towards top radiator

6 - ATF radiator
- ❑ only on vehicles with automatic gearbox

7 - "T" union
- ❑ only on vehicles with automatic gearbox

8 - Oil cooler

9 - 10 Nm

10 - Coolant pipe

11 - O-ring
- ❑ replace

12 - Timing belt
- ❑ before removing mark running direction
- ❑ check for wear
- ❑ do not kink
- ❑ removing and installing, tensioning ⇒ Chapter 13-2

13 - Coolant pump
- ❑ check smooth operation
- ❑ if damage and leak present, replace complete
- ❑ removing and installing ⇒ **19-1** page 8

14 - 10 Nm

15 - Expansion bottle

16 - O-ring
- ❑ replace if damaged

17 - Cover plate

18 - Throttle valve control unit
- ❑ heated by coolant

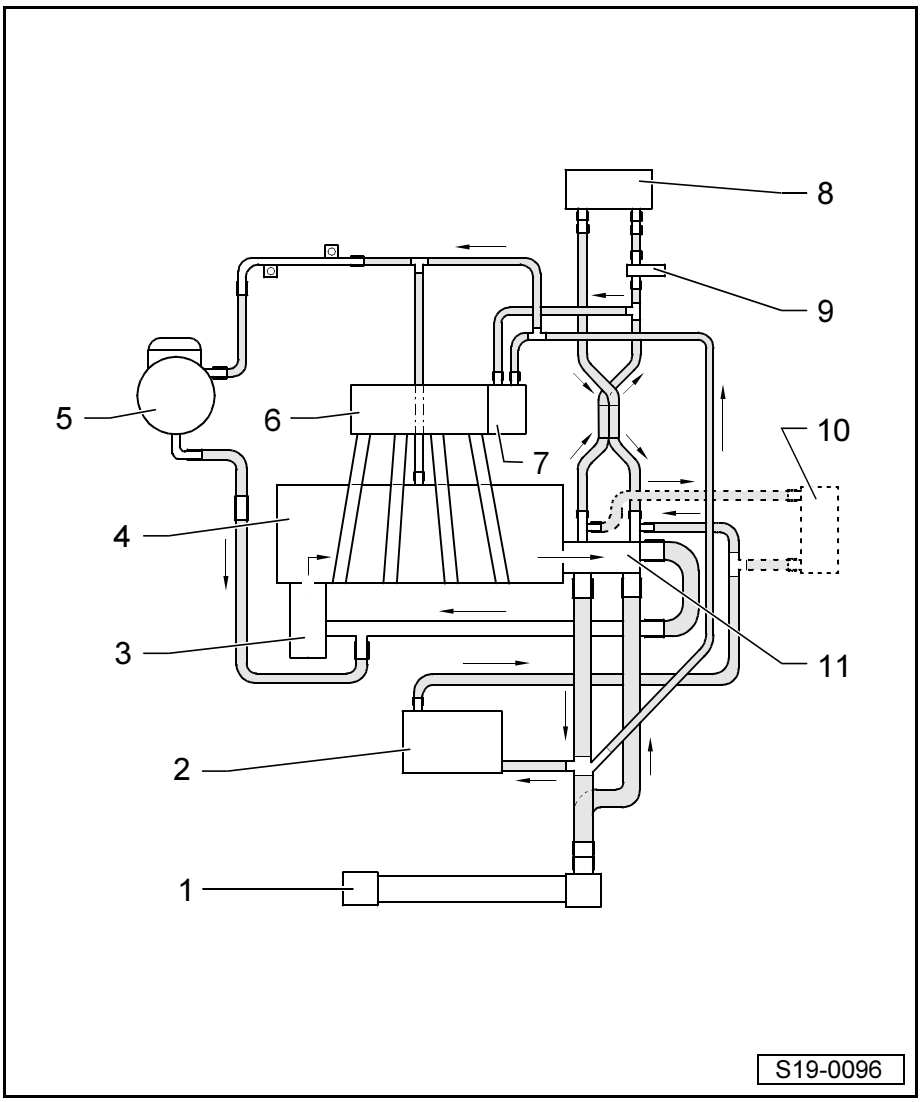
19 - Coolant distributor housing
- ❑ disassembling and assembling ⇒ Chapter 19-2

20 - from bottom of radiator
- ❑ connection diagram for coolant hoses ⇒ **19-1** page 3

Connection diagram for coolant hoses

1 - Radiator
2 - Oil cooler
3 - Coolant pump
4 - Cylinder head/cylinder block
5 - Expansion bottle
6 - Induction pipe
7 - Throttle valve control unit
8 - Heat exchanger
9 - Heating valve
10 - ATF radiator
- ❑ only on vehicles with automatic gearbox

11 - Coolant distribution housing with thermostat for map-controlled engine cooling -F265-



Draining and filling up coolant

Coolant capacity approx. 5.0 litres

Special tools, test and measuring equipment and auxiliary items required

- Catch pan (e.g. -V.A.G 1306-)
- antifreeze tester
- Pliers for spring strap clips

Draining

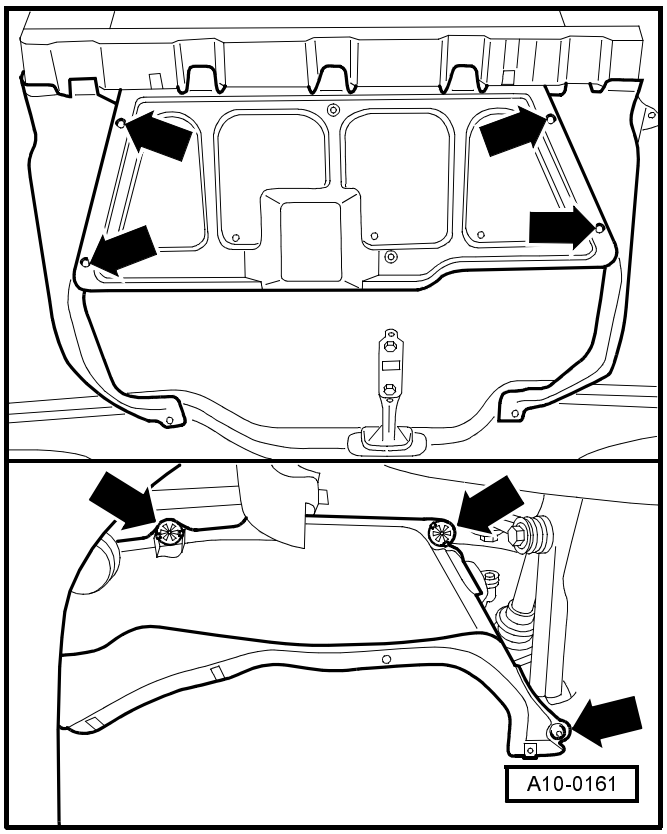
Warning!

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

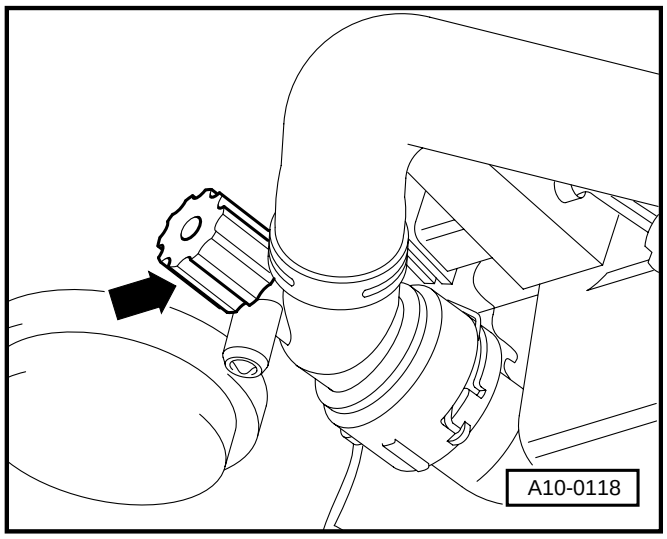
– Open the coolant cap on the coolant expansion bottle.

– Remove noise insulation -arrows- in the top half of the figure. ➢

– Position drip tray (e.g. -V.A.G 1306-) under the engine.



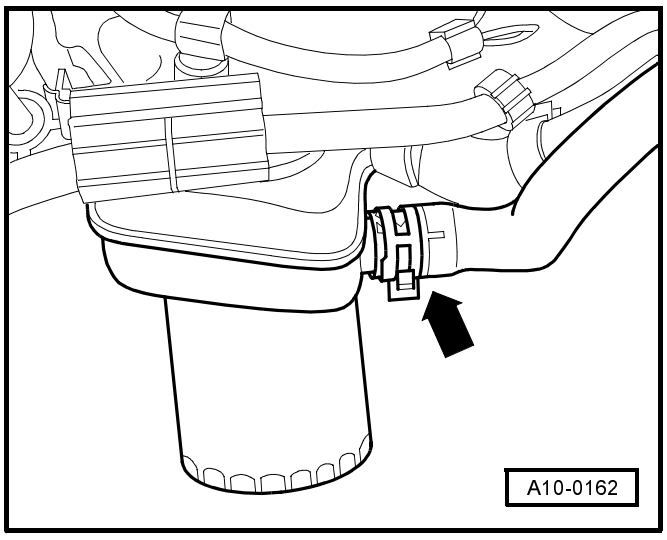
– Turn drain valve -arrow- at radiator to the left and pull to the rear, fit auxiliary hose onto connection if necessary. ➢



– In addition, detach coolant hose at bottom of oil cooler -arrow- and allow remaining coolant to drain. ➢

Note

- *Collect drained coolant for proper disposal.*
- *Observe the disposal instructions for coolant.*



Filling up

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

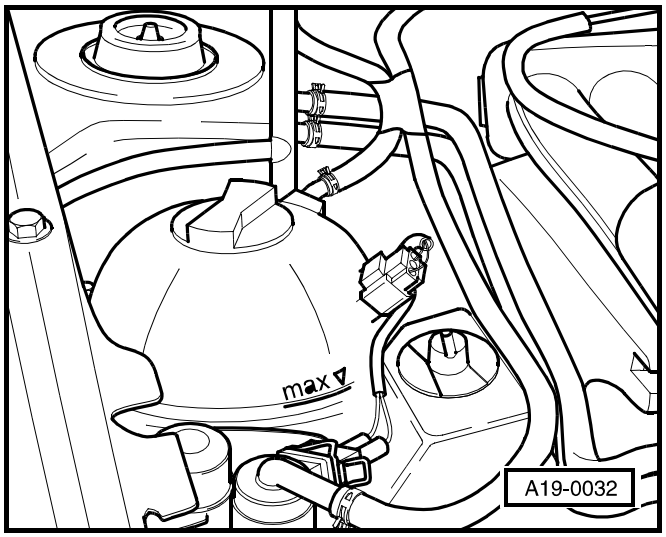
Recommended mixture ratios:

Antifreeze protection down to	Antifreeze concentration[1)2)]	Drinking water[2)]
-25°C	40% (2,0 ltr.)	60% (3.0 litres)
-35°C	50% (2.5 litres)	50% (2.5 litres)

1) In order to obtain adeqaute corrosion protection the antifreeze concentration must not be less than 30% and not more than 60%; the antifreeze protection and cooling efficiency are reduced as the concentration increases.

2) The coolant amount may differ according to the version of the vehicle.

– Attach coolant hose to bottom of oil cooler.
– Screw in drain valve for coolant.
– Fill up coolant up to maximum marking on the compensation bottle.
– Seal expansion reservoir.
– Run engine until fan starts.



Warning!

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

– Top up with coolant. If the engine is warm the coolant level must be on the „max“ mark. If the engine is cold the coolant level must between the „min“ and the „max“ mark.

Removing and installing radiator

Note

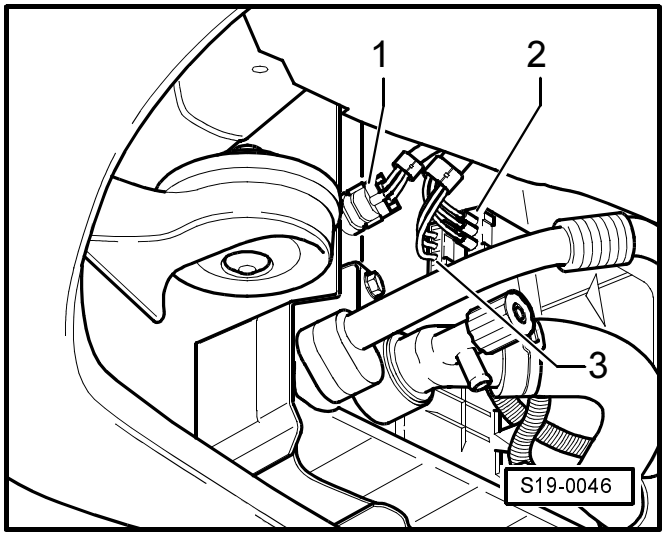
- *Always replace seals and gasket rings.*
- *Raise vehicle with the lift platform ⇒ Inspection and Maintenance.*

Special tools, test and measuring equipment and auxiliary items required

- Torque wrench
- Wire

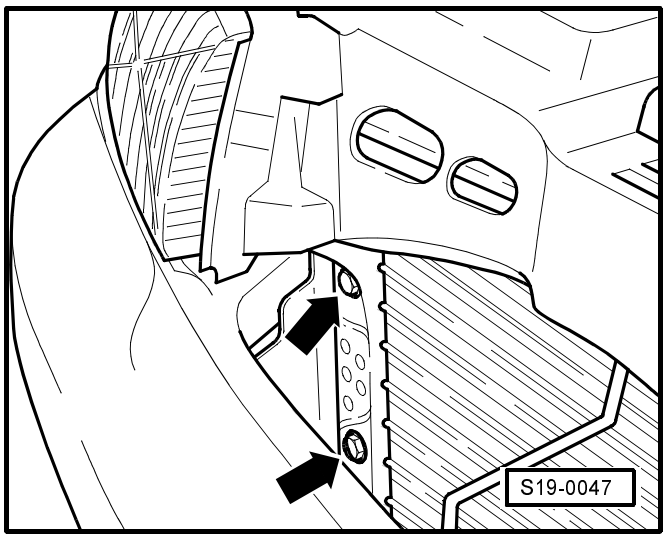
Removing

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



For vehicles with air conditioning

– Unscrew the 4 bolts -arrows- attaching the condenser. ►



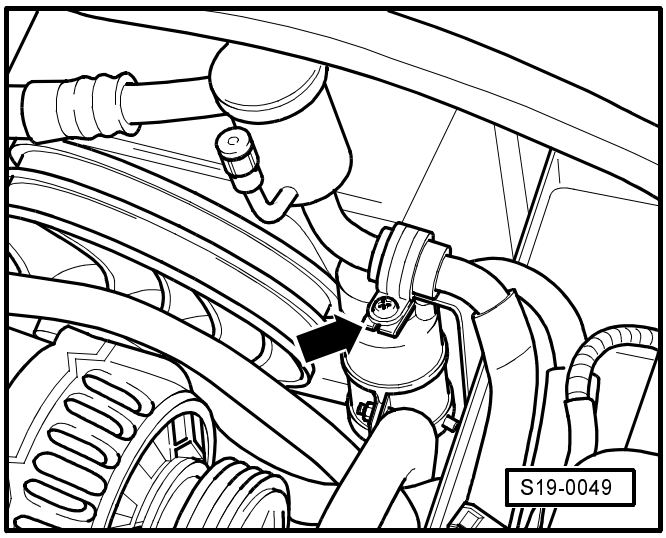
Warning!

Do not open the refrigerant circuit of the air conditioning system.

Note

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

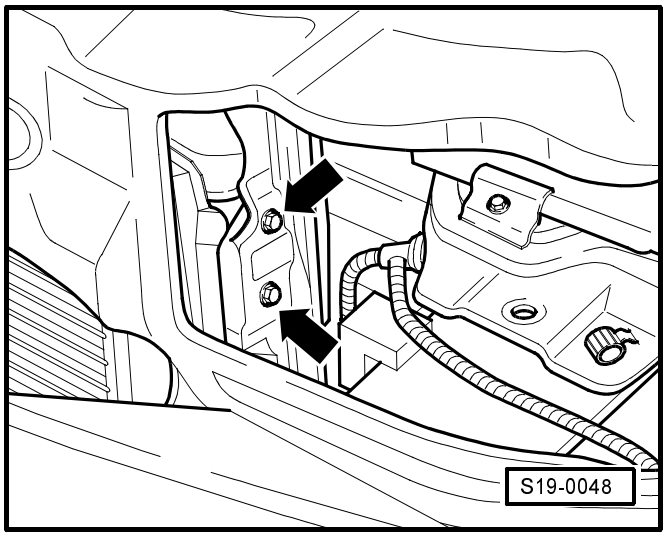
– Take off bracket -arrow- for refrigerant line. ►



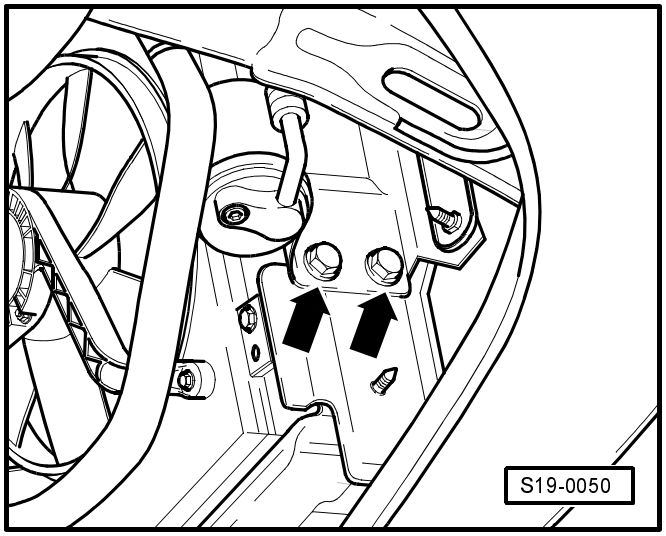
Continued for all vehicles

– Remove both headlights ⇒ Electrical System; Rep. Gr. 94.

– Unscrew 4 bolts -arrows- attaching top radiator mount. ►



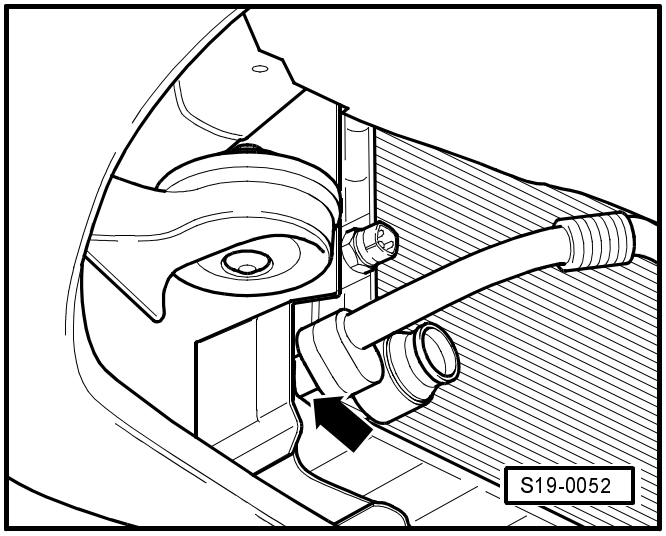
– Unscrew 4 bolts -arrows- attaching bottom radiator mount.



For vehicles with air conditioning

– Pull out radiator and condenser slightly.

– Take off clip -arrow- attaching refrigerant line.



Continued for all vehicles

– Remove fan shroud (4 bolts).

Note

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

– Carefully remove radiator downward.

Installing

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

– Tighten thermoswitch -1- to 35 Nm.

– Fit on brackets -2- and -3- at radiator as shown.

– Tighten bolts attaching fan shroud and radiator mounts to 10 Nm.

– On vehicles with air conditioning, tighten bolts attaching condenser and bracket for refrigerant lines to 10 Nm.

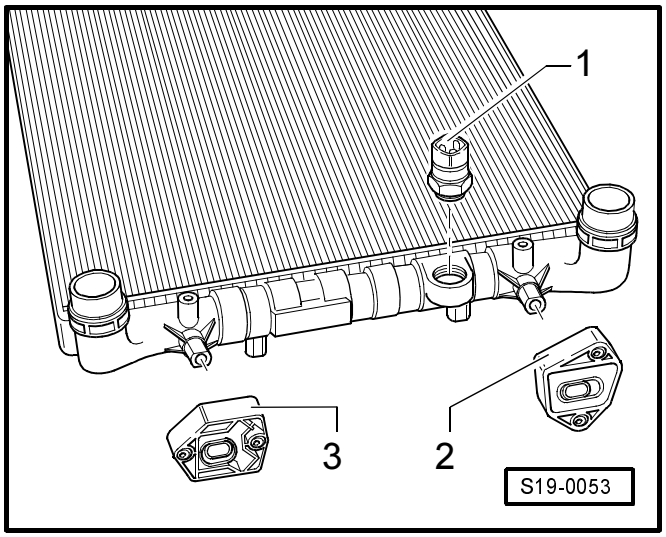
– Replace O-rings in the connection fittings of the coolant hoses.

– Insert and tighten the coolant drain plug.

– Filling system with coolant ⇒ **19-1** page 3.

– Install headlights ⇒ Electrical System; Rep. Gr. 94.

– Electrical connections and proper routing ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.



Removing and installing coolant pump

Special tools, test and measuring equipment and auxiliary items required

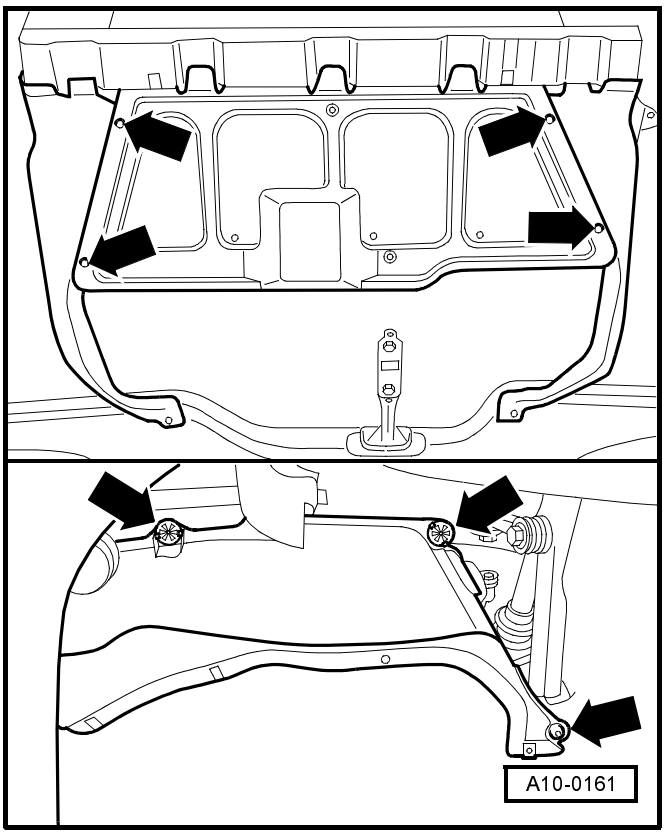
- Torque wrench
- Wire

Removing

– Remove the engine trim panel.

– Drain coolant ⇒ **19-1** page 3.

– Install noise insulation -arrows- in the lower part of the figure. ►



– Remove the V-ribbed belt ⇒ Chapter 13-1.

– Remove tensioning device for V-ribbed belt ⇒ Chapter 13-1.

– Remove top and middle toothed belt guard ⇒ Chapter 13-2.

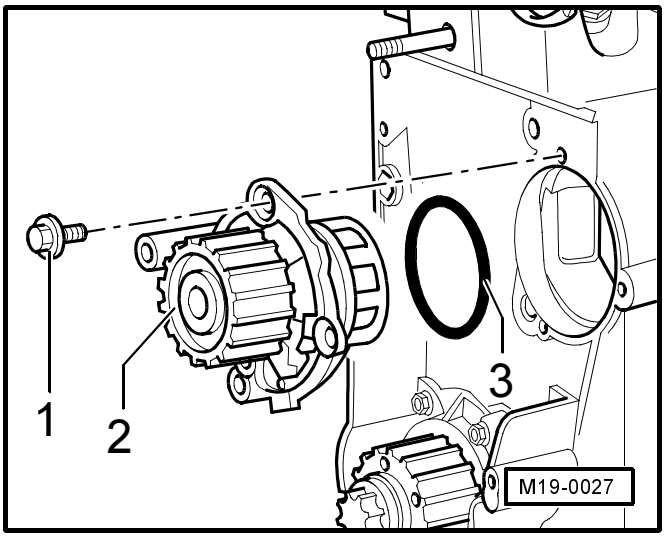
– Position camshaft at TDC of cylinder 1 ⇒ Chapter 15-3.

– Take timing belt off the camshaft sprocket ⇒ Chapter 13-2.

Note

- *The vibration damper and the bottom toothed belt guard can remain installed.*
- *The timing belt remains fitted onto the crankshaft timing belt sprocket.*
- *Pay attention to all the notes for removal and installation of the toothed belt ⇒ Chapter 13-2.*

– Unscrew bolts -1- attaching coolant pump and carefully remove coolant pump -2-. ►



Installing

– Clean sealing surface for O-ring or smoothen.

– Moisten new O-ring -3- with coolant. ►

– Installation position of coolant pump: Plugs in housing point downwards.

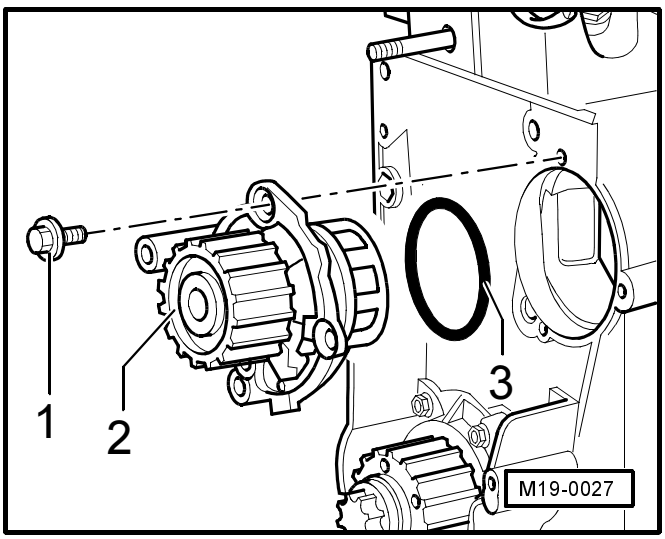
– Position the coolant pump -2- in the cylinder block and tighten the fixing screws -1-. Tightening torque: 15 Nm.

– Installing timning belt, tensioning (setting timing) ⇒ Chapter 13-2.

– Installing tensioning element for V-ribbed belt. Tightening torque: 25 Nm.

– Install the V-ribbed belt ⇒ Chapter 13-1.

– Filling system with coolant ⇒ **19-1** page 3.

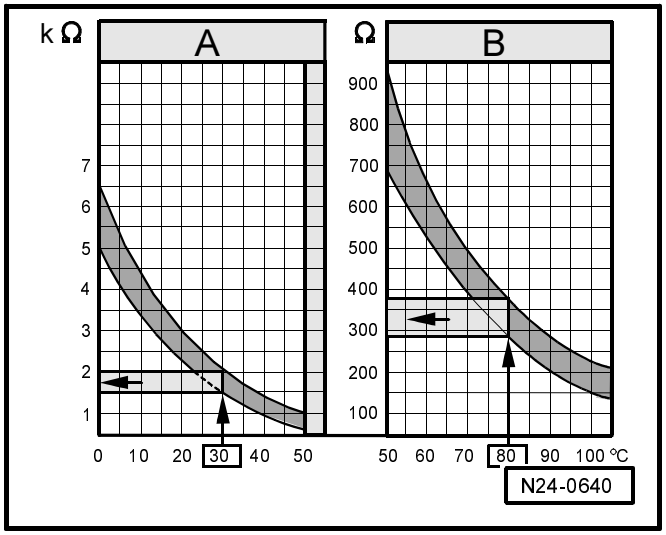


Testing coolant temperature sensor -G83- (radiator outlet)

– Unplug the 2-pin plug from the coolant temperature sensor -G83- and connect the sensor to the multimeter using adapter cables.

– Measure the resistance.

The nominal value in field -A- applies for the temperature range 0…50°C; the nominal value in field -B- applies for the temperature range 50…100°C.



– Read out examples:

- 30°C is within range A and equals a resistance of 1.5…2.0 kΩ
- 80°C is within range B and equals a resistance of 275…375 Ω

If the specification is not achieved

– Replace the coolant temperature sender -G83 -.

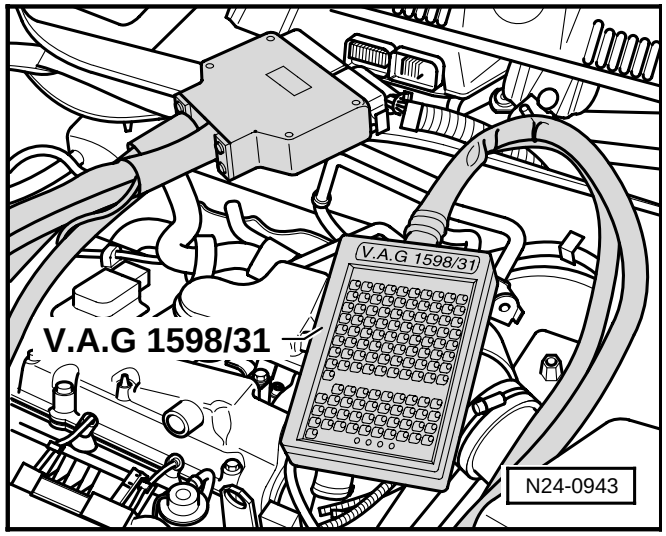
If the specified value is reached:

– Connect test box -V.A.G 1598/31 - to wiring loom of the control unit. The engine control unit is not connected.

– Check wiring between the test box and the 2-pin plug for interruption according to the Current Flow Diagram:

Contact 1 and test box socket 25 (signal)
Contact 2 and test box socket 47 (earth)
Cable resistance: max. 1.5 Ω

– Additionally check the wiring for short-circuiting, as well as for short-circuiting to positive and earth.



19-2 Electronically controlled cooling system

Operation

Operation

The cooling system of this engine is map-controlled by the engine control unit.

The highlights of this new system are the set temperature specified in line with the engine load, the thermostatic control of the coolant temperature and the control of the fan stages.

A higher engine temperature in the part load ranges offer the following advantages:

- Reduction in fuel consumption in part load ranges
- Reduction in CO and HC untreated emissions

Further information ⇒ Self Study Programme No. 45.

– Parts of cooling system attached to engine ⇒ Chap. 19-1.

– Connection diagram for coolant hoses ⇒ Chap. 19-1.

– Disassembling and assembling coolant distributor housing ⇒ **19-2** page 3.

Testing electronically controlled cooling system

Special tools, test and measuring equipment and auxiliary items required

- Vehicle system tester -V.A.G 1552- with diagnostic cable -V.A.G 1551/3-

Test sequence

– Connect vehicle system tester -V.A.G 1552-. Then, start the engine and select the engine control unit with „address word“ 01 ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

– Select the function „Read measured value block“ and display group number 130.

Readout on display:

```
Reading measured value block 130      ->
 96.0 °C   85.5 °C    0.0 °C   Syst.ok
```

– Read off the result of the system check in display block 4. Specified value: „Syst. o.k.“

Note!

What is checked here is the plausibility of the system. It is therefore possible that „Syst. o.k.“ is displayed although an electrical fault has already been detected.

– Press on the vehicle system tester - V.A.G 1552- ⇧.

Readout on display:

```
Reading measured value block 131      ->
 97.5 °C    94.5 °C    87.0 °C    0.0 %
```

– Read off the coolant temperatures in display blocks 1 and 3. Specified value: The temperature at the engine outlet (display block 1) must always be greater than at the radiator outlet (display block 3).

– Press on the vehicle system tester -V.A.G 1552- [↑].

Readout on display:

```
Reading measured value block 132      ->
 97.5 °C     9.0 °C     5.1 V    101100
```

– Leave engine running at idling speed and observe the left-hand bit in display block 4: Specified value: „0“

If „1“ is displayed:

– Interrogate fault memory ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

Note!

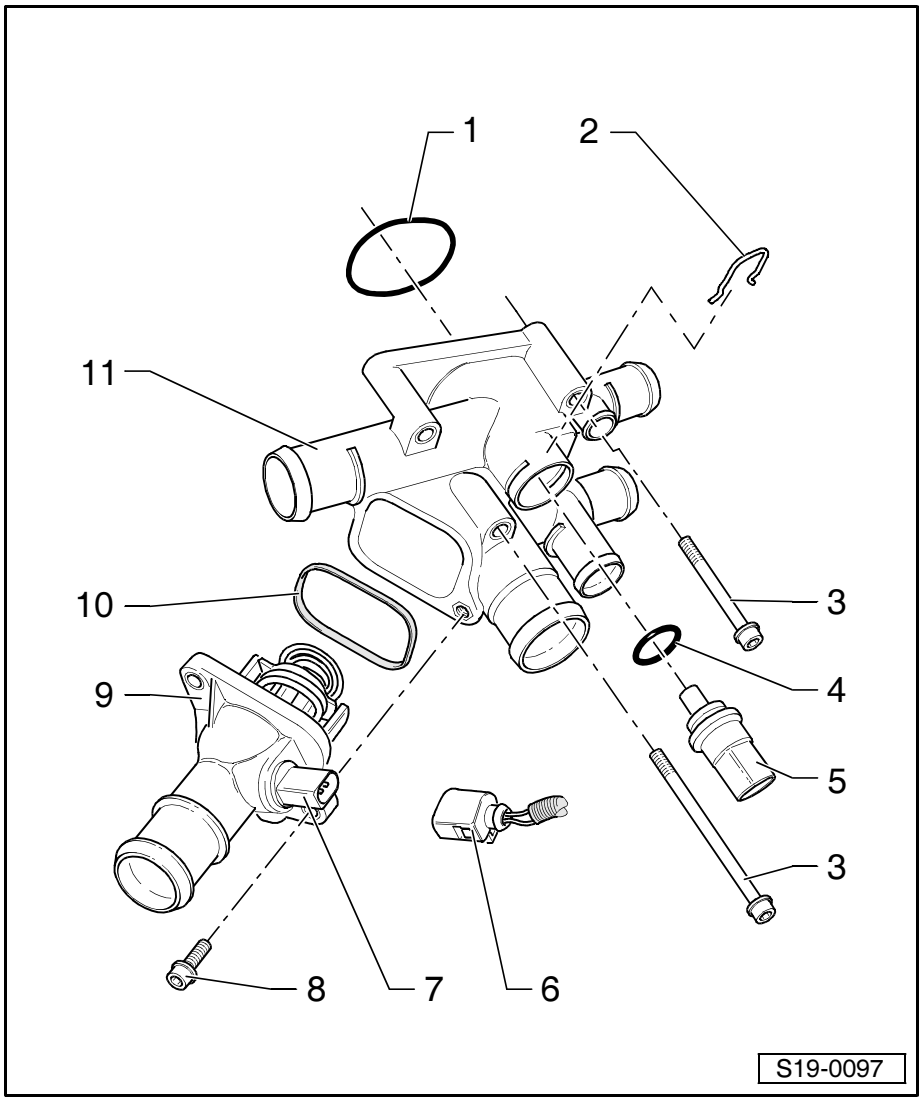
If faults exist at the coolant temperature sensors -G62- or -G83- or at the cable connections or at the fan output stages, the fan stages are actuated by the engine control unit.

– Analyse the other bits in display block 4 of display group 132 ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

– Press [→].

– Press [0] and [6] for the function „End output“ and confirm the entry with [Q].

Disassembling and assembling coolant distributor housing



- **1 - Seal**
  - ❑ replace
- **2 - Retaining clip**
  - ❑ check tightness
- **3 - 10 Nm**
- **4 - O-ring**
  - ❑ replace
- **5 - Sender for coolant temperature -G62-**
  - ❑ with coolant temperature gauge sensor -G2-
  - ❑ Contacts gold-plated
  - ❑ for engine control unit
  - ❑ before removing, reduce pressure in cooling system if necessary
  - ❑ testing ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01
- **6 - Connector**
- **7 - Heating resistor connection**
  - ❑ 14…16 Ω at 25 °C
- **8 - 10 Nm**
- **9 - Thermostat for map-controlled engine cooling -F265-**
  - ❑ with connection fitting
  - ❑ check ⇒ **19-2** page 3
  - – Start of opening approx. 105 °C
  - – Opening stroke at least 7 mm
- **10 - Seal**
  - ❑ replace
- **11 - Coolant distributor housing**
  - ❑ depending on version with connection for ATF cooler

Testing thermostat for map-controlled engine cooling

Special tools, test and measuring equipment and auxiliary items required

- Vehicle system tester -V.A.G 1552- with diagnostic cable -V.A.G 1551/3-
- Test box -V.A.G 1598/31-
- Hand-held multimeter (e. g. -V.A.G 1526- or multimeter -V.A.G 1715-)
- Adapter cable set (e.g. -V.A.G 1594 A-)

Test condition

- The engine must be cold.

Test sequence

– Unplug the 2-pin connector from the thermostat for map-controlled engine cooling -F265-.

– Measure the resistance of the heating wire at the thermostat for map-controlled engine cooling with the auxiliary cables -V.A.G 1594 A-. Specification at 25 °C: 14…16 Ω

If the specified value is not reached:

– Replace the thermostat for map-controlled engine cooling -F265-.

If the specified value is reached:

– Connect vehicle system tester -V.A.G 1552-. Then, start the engine and select the engine control unit with „address word“ 01 ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

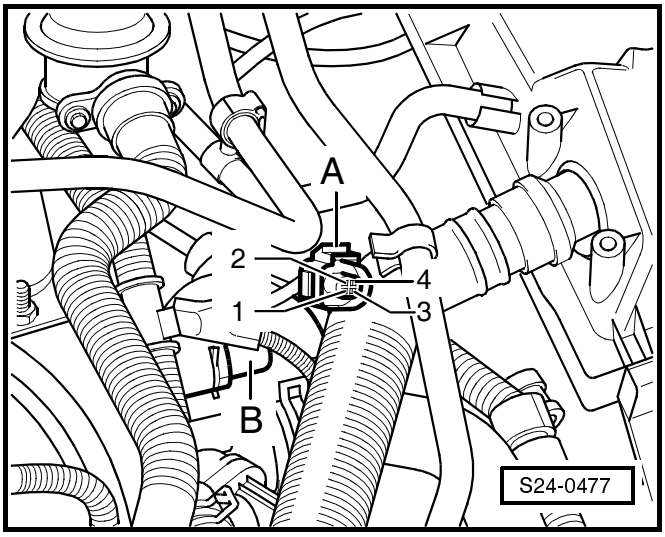
– Select function „Read measured value block“ and display group number 132.

Readout on display:

```
Reading measured value block 132      ->
 97.5 °C     9.0 °C     5.1 V    101100
```

– Connect the multimeter for voltage measurement to 2-pin connector of thermostat contact 1 and 2.

– Unplug the 4-pin connector (-A-) from the coolant temperature sensor -G62- (-B-).



– Leave the engine running at idling speed and observe the right-hand bit in display block 4: If „1“ is displayed after a few seconds, the fault is detected.

– Now, read off the voltage at the multimeter. Specified value: approx. alternator voltage.

If the specified value is reached:

– Plug in the 4-pin connector of the coolant temperature sensor -G62- again.

– Test the operation of the thermostat ⇒ **19-2** page 5.

If the specified value is not reached:

– Switch off the engine.

– Connect the multimeter for voltage measurement to the 2-pin connector contact 1 and earth.

– Switch on the ignition. Specified value: at least 11.5 V

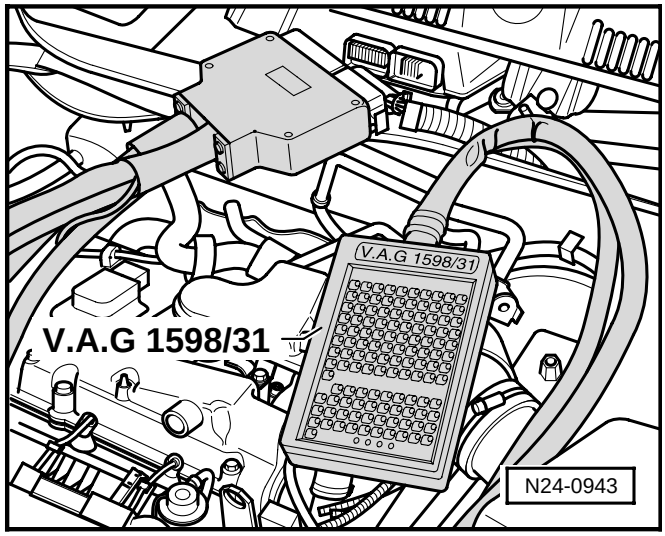
If the specified value is not reached:

– Test the cable connection to the power supply relay for Simos control unit (in protective housing for relays, in engine compartment) ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If the specified value is reached:

– Switch off the ignition.

– Connect the test box -V.A.G 1598/31- to the control unit wiring loom. The engine control unit is not connected.



– Test the wiring between the test box and the 2-pin plug connection for open circuit according to the Current Flow Diagram.

  Contact 2 and test box socket 116
  Cable resistance: max. 1.5 Ω

– In addition, test the cable for short circuit to battery positive and to earth. Specified value: ∞ Ω

If no fault is found in the wiring and the resistance of the heating wire was o.k., test the operation of the thermostat as follows:

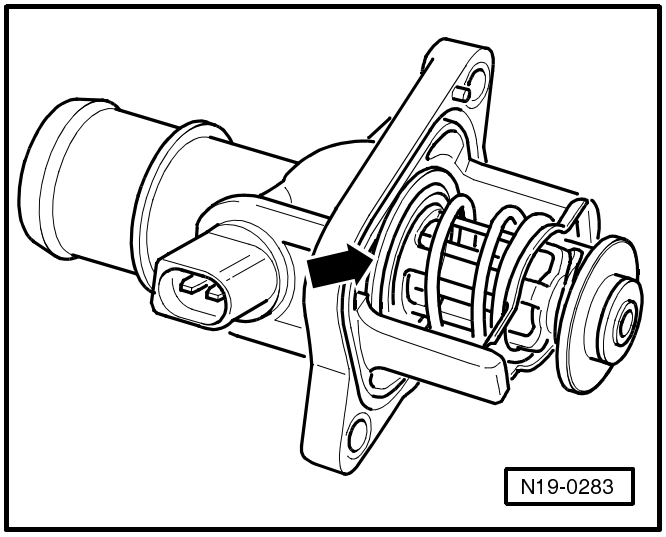
Operational test of thermostat for map-controlled engine cooling -F265-

– Remove the thermostat for map-controlled engine cooling -F265-.

Note!

- *How to drain the coolant ⇒ Chap. 19-1.*
- *Always replace seals and gasket rings.*
- *How to fill system with coolant ⇒ Chap. 19-1.*

– Test the thermostat when cold.



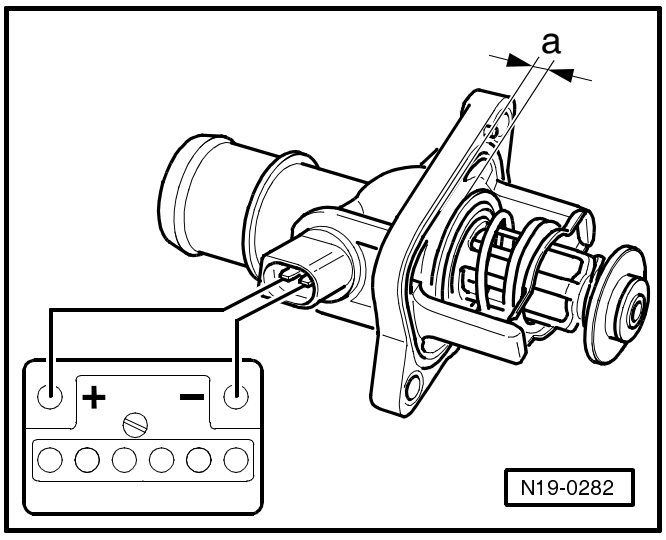
The large valve disc must provide a proper seal to the connection flange all round.

If this is not the case:

– Replace the thermostat for map-controlled engine cooling -F265-.

– Connect the contacts of the thermostat for map-controlled engine cooling -F265- using adapter cables from -V.A.G 1594 A- to the battery.

– Use a clamp to carefully place it vertically up to the flange in a bowl filled with boiling coolant (mixing ratio: 50 % G12).



Warning!

The metal parts of the thermostat must not be touched otherwise they heat up.

The resistance heater now additionally heats up the wax in the thermostat.

– Observe whether the minimum stroke of 7 mm -dimension -a- is reached after 10 minutes.

– If the stroke of 7 mm is reached:

– Separate the voltage supply to the battery.

Note!

This test must not be carried out on air. Otherwise there is a risk of damaging the expansion element!

If the minimum stroke is not reached:

– Replace the thermostat for map-controlled engine cooling -F265-.
– In conclusion, erase the fault memory of the engine control unit as faults have been stored as result of unplugging the connectors ⇒ 1.6-ltr./75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

20 – Fuel Supply

20-1 Removing and installing parts of the fuel supply system

Note

- *The hose connections are secured with spring-type clips or clamp-type clips.*
- *Always replace clamp-type clips with spring-type clips.*
- *Fuel hoses at the engine must only be secured with spring-type clips. The use of clamp-type or screw-type clips is not allowed.*
- *Use pliers for spring strap clips to fit the spring strap clips.*
- *Always replace the seals and gaskets during assembly work.*

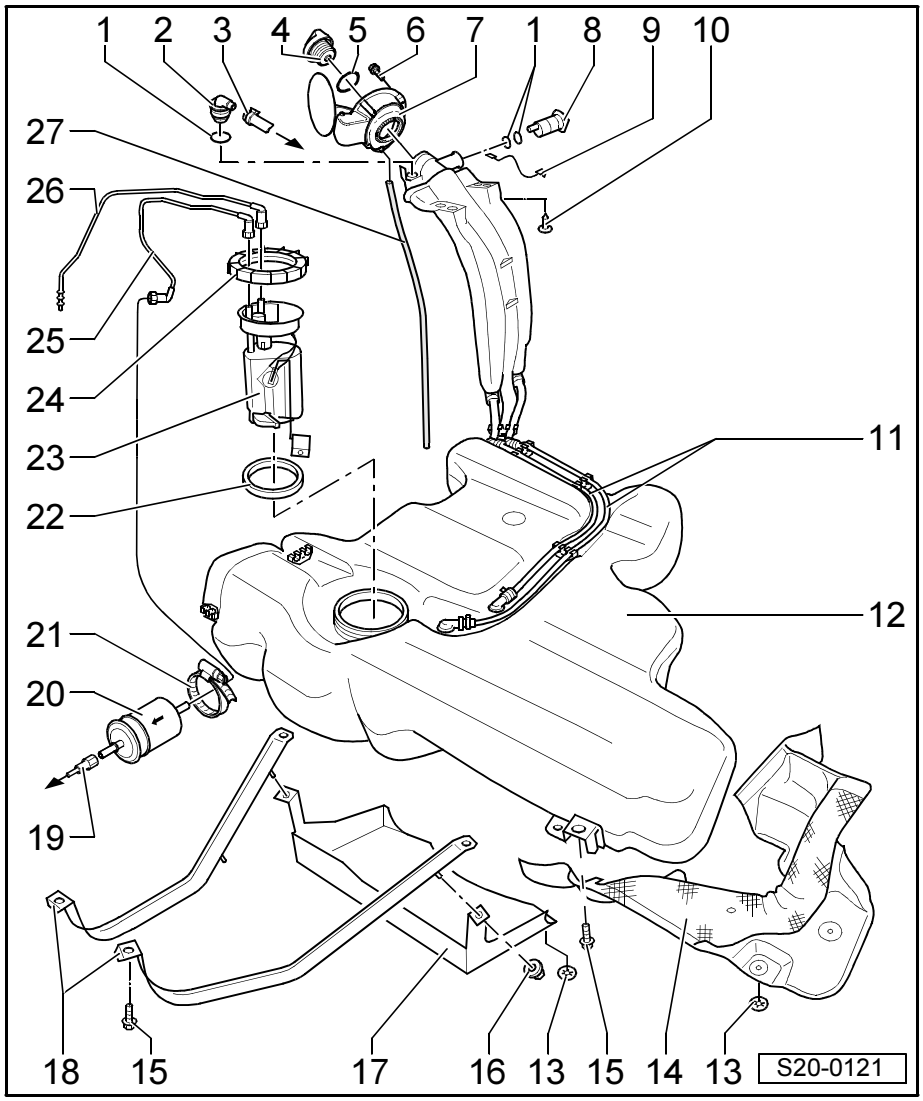
Observe safety measures ⇒ **20-1** page 3.

Observe rules for cleanliness ⇒ **20-1** page 3.

Test electronic power control (electronic throttle)
⇒ Chapter 20-2

Activated charcoal filter system ⇒ Chapter 20-3

Removing and installing the fuel tank with component parts and fuel filter



1 - O-ring
- ❑ replace

2 - Gravity valve
- ❑ to remove, unclip valve and lift up and out of the filler neck
- ❑ inspect valve for blockage
- ♦ valve vertical: open
- ♦ valve tilted 45°: closed

3 - Vent line
- ❑ to activated charcoal filter ⇒ Chapter 20-3
- ❑ clipped in place at top of fuel tank

4 - Cover plate

5 - Gasket
- ❑ replace if damaged

6 - Fixing screw

7 - Fuel tank lid unit
- ❑ with rubber bowl

8 - Vent valve
- ❑ to remove, unclip valve at side and take out of filler neck.
- ❑ before installing, unscrew cap ⇒ item 4
- ❑ check ⇒ Fig. 1 in **20-1** page 3

9 - Earth connection
- ❑ check for correct fitting

10 - 10 Nm

11 - Vent lines

12 - Fuel tank
- ❑ removing and installing ⇒ **20-1** page 5

13 - Circlip

14 - Heat shield

15 - 20 Nm + torque a further 90° ($^1/_4$ turn)
- ❑ replace

16 - 2 Nm

17 - Cover

18 - Tensioning strap
- ❑ pay attention to different lengths

19 - Feed line
- ❑ black
- ❑ to fuel rail ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

20 - Fuel filter
- ❑ Fitting position: arrow points in direction of flow

21 - Retaining clip
- ❑ for fuel filter

22 - Gasket
- ❑ moisten with fuel before installing
- ❑ replace if damaged

23 - Fuel delivery unit
- ❑ removing and installing ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24
- ❑ inspecting fuel pump ⇒ **20-1** page 7
- ❑ removing and installing fuel gauge sensor ⇒ **20-1** page 5
- ❑ Testing holding pressure ⇒ 1.6 litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

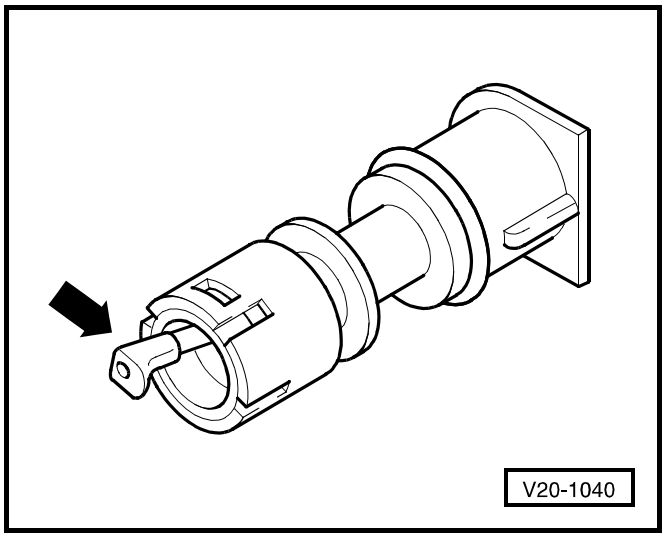
24 - Union nut
- ❑ use wrench -MP 1-227- for removing and installing

25 - Feed line
- ❑ black
- ❑ to fuel filter
- ❑ runs to connection with marking „V“ at closing flange

26 - Return-flow line
- ❑ blue
- ❑ from fuel rail
- ❑ runs to connection with marking „R“ at closing flange

27 - Overflow hose

Fig. 1: Inspecting vent valve ►



Lever in off position: Valve closed

Lever pushed in direction of arrow: Valve open

Note

Before installing the vent valve, unscrew cap of fuel tank.

Safety precautions when working on the fuel supply system

Caution!

The fuel feed line is pressurized! Before opening the system lay cleaning cloths around the connection point. Reduce pressure by carefully releasing the connection point.

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

- Fuel tank must be filled to not more than $^2/_3$.
- The extraction hose of an exhaust extraction system which is switched on, must be positioned close to the assembly opening of the fuel tank in order to extract the released fuel gases, even before the work is commenced. If no exhaust extraction system is available, a radial fan (motor not in air flow of fan) with a delivery volume of more than 15 m^3/h must be used.
- Avoid skin contact with fuel! Wear fuel-resistant gloves!

Rules of cleanliness

When working on the fuel supply/fuel injection system, pay careful attention to the following „5 rules“ for cleanliness.

- Thoroughly clean the connection points and their surroundings before releasing.
- Place removed parts on a clean surface and cover. Do not use fuzzy cloths!
- Carefully cover or close opened components if the repair is not completed immediately.
- Only install clean parts: Remove spare parts from their wrapping immediately before fitting. Do not use any parts which have been stored unwrapped (e.g. in tool boxes etc.).
- When the system is open: avoid working with compressed air. Avoid moving the vehicle.

Removing and installing the fuel delivery unit

Observe safety measures ⇒ **20-1** page 3.

Observe rules for cleanliness ⇒ **20-1** page 3.

Special tools, test and measuring equipment and auxiliary items required

- Wrench for union nut -MP 1-227-

Removing

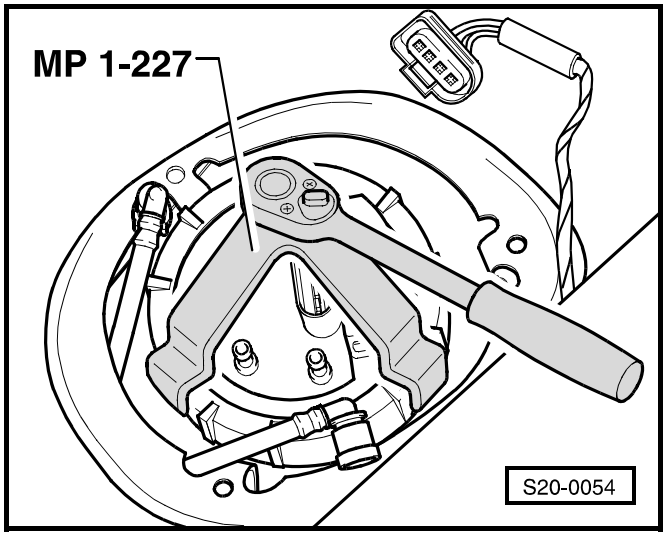
– Unscrew cover (below rear seat).

– Detach feed and return-flow line from flange of fuel delivery unit (press release buttons).

– Unlock and unplug 4-pin connector of flange at fuel tank.

– Unscrew union nut with wrench -MP 1-227-.

– Pull the fuel delivery unit and the gasket ring out of the opening of the fuel tank.



Note

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

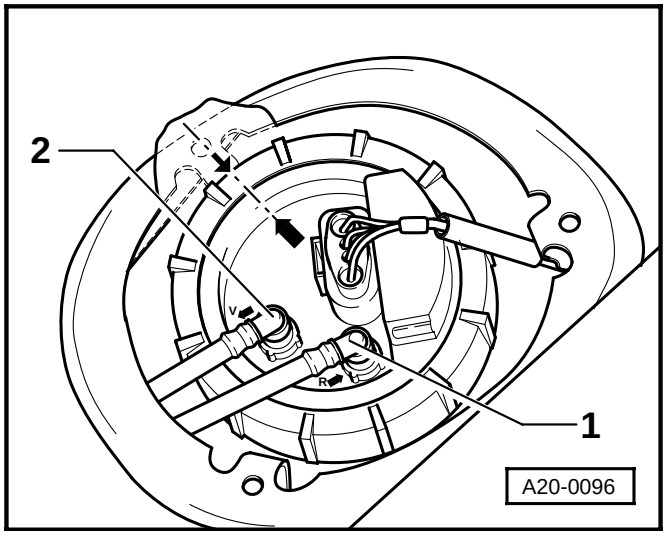
Installing

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

Note

- *When inserting the fuel delivery unit, ensure that the fuel gauge sensor is not bent.*
- *Moisten the gasket ring of the flange with fuel before fitting.*
- *Make sure the fuel hoses fit tightly.*

check fitting position:



- Marking on closing flange must be aligned with marking on fuel tank -arrows-.
- Blue return-flow line „1“ on the connection with the marking -R-.
- Black feed line „2“ on the connection with the marking -V-.

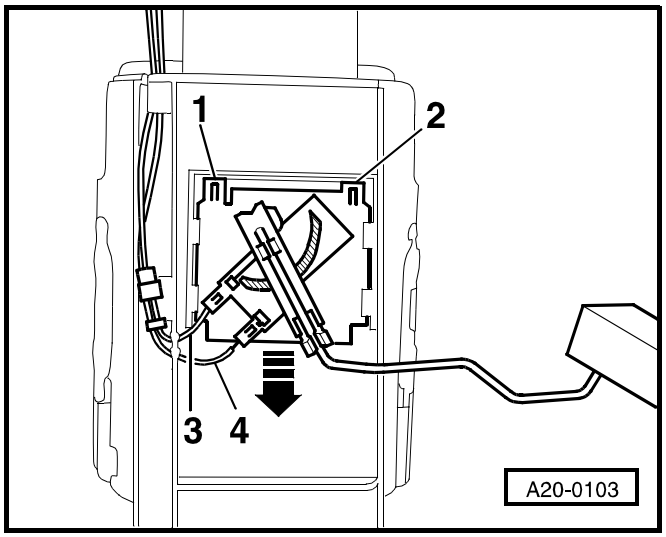
Removing and installing the fuel gauge sender

Removing

– Removing fuel delivery unit ⇒ **20-1** page 4.

– Unlatch and disconnect the line contact studs -3- and -4-. ►

– Raise catches -1- and -2- with a screwdriver and remove the fuel gauge sender from the bottom -arrow-.



Installing

– Insert the fuel gauge sender in the fuel delivery unit guides and press upwards until they latch into position.

Removing and installing the fuel tank

Observe safety measures ⇒ **20-1** page 3.

Observe rules for cleanliness ⇒ **20-1** page 3.

Special tools, test and measuring equipment and auxiliary items required

- Engine/gearbox jack (e.g. -V.A.G 1383 A-)
- Fuel extraction device (e.g. -VAS 5190-)

Removing

– Empty fuel tank with fuel extraction equipment (e. g. -VAS 5190-).

– Unscrew cover (below rear seat).

– Unlock and unplug 4-pin connector of flange at fuel tank.

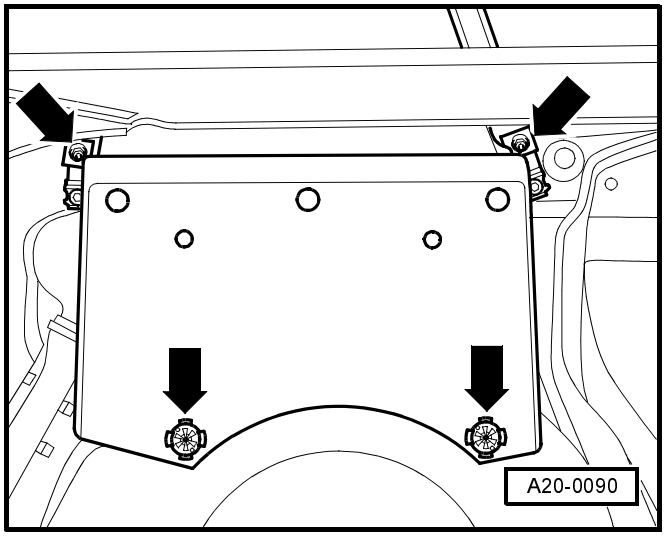
– Unscrew securing bolt and remove fuel filler flap unit with rubber bowl.

– Remove rear right wheelhouse liner.

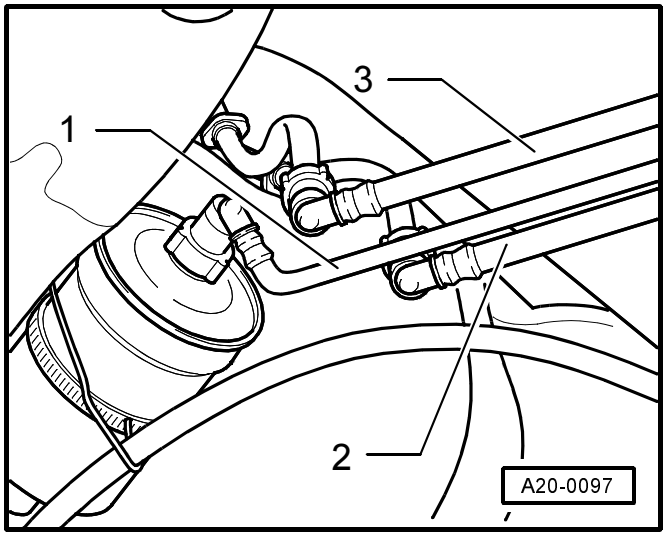
– Unscrew fuel filler neck below wheelhouse liner.

– Remove cover below fuel tank -arrows- (if fitted). ►

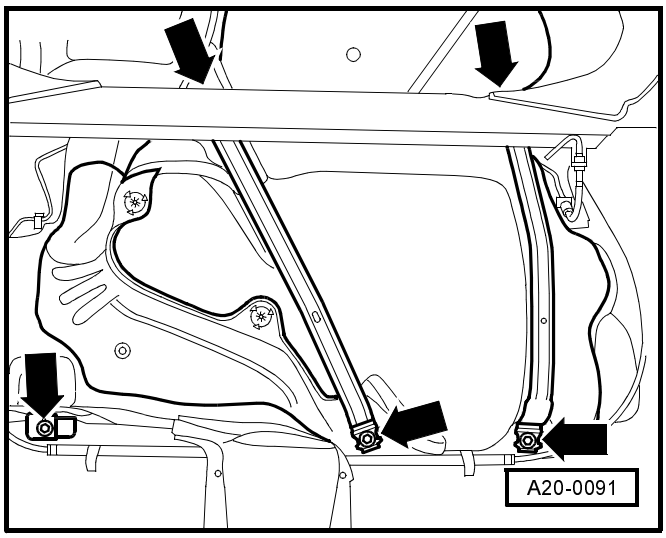
– Removing rear axle ⇒ Running Gear; Rep. Gr. 42.



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



– Detach bolted connections -arrows- at front left and at the retaining straps.
– Lower the fuel tank.

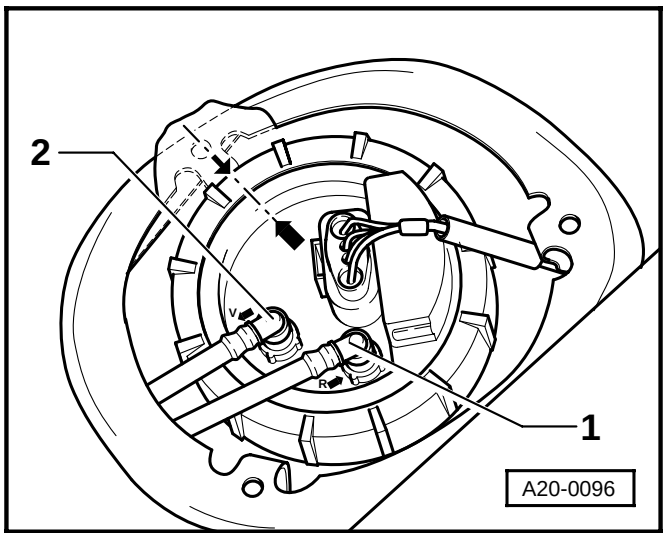


Installing

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

– Connect fuel lines to the flange of the fuel delivery unit:

- Blue return-flow line „1“ on the connection with the marking -R-.
- Black feed line „2“ on the connection with the marking -V-.



Connecting remote control

Special tools, test and measuring equipment and auxiliary items required

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

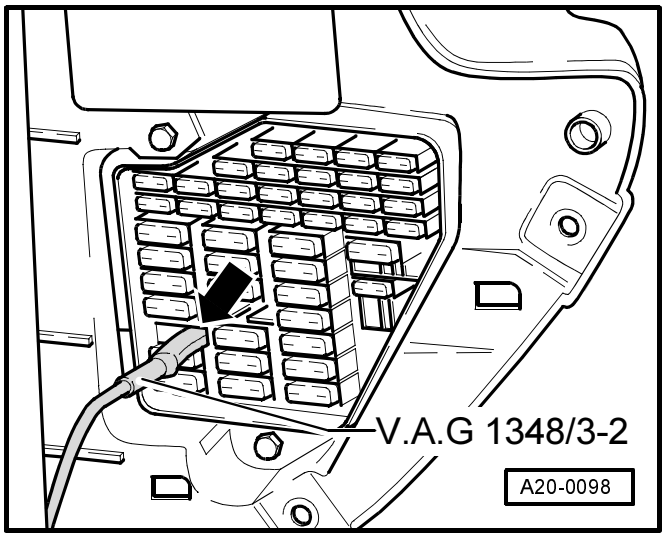
Procedure

– Open cover of fuse box on left side of dash panel.

– Remove fuse no. 28 from the fuse holder.

– Connect remote control -V.A.G 1348/3A- using adapter cables -V.A.G 1348/3-2- to fuse holder of fuse no. 28 -arrow-.

– Connect terminal to vehicle battery (+).



Disconnecting the fuel delivery unit with crash signal

Vehicles fitted with airbags are equipped with a crash fuel shut-off. It is intended to reduce the risk of a vehicle fire after a crash as the fuel pump is disconnected by the fuel pump relay.

Observe safety instructions when opening the fuel system ⇒ **20-1** page 3.

Test fuel pump relay ⇒ 1.6 litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

Testing fuel pump

Special tools, test and measuring equipment and auxiliary items required

- Hand multimeter (e.g. -V.A.G 1715 -)
- Adapter cable set (e.g. -V.A.G 1594 A- or -V.A.G 1594 C -)
- Remote control -V.A.G 1348/3A- with adapter cables -V.A.G 1348/3-2-
- Wrench for union nut -MP 1-227-
- Current flow diagram

Test conditions

- Battery voltage at least 12 volts
- Fuse 28 OK
- Fuel filter OK

Test sequence

– Switch on ignition.

– The fuel pump must be heard to start (a second person is required for this purpose if the level of surrounding noise is high).

If the fuel pump does not run:

– Switch off ignition.

– Connect up remote control -V.A.G 1348/3A- using adapter cables -V.A.G 1348/3-2- ⇒ **20-1** page 6

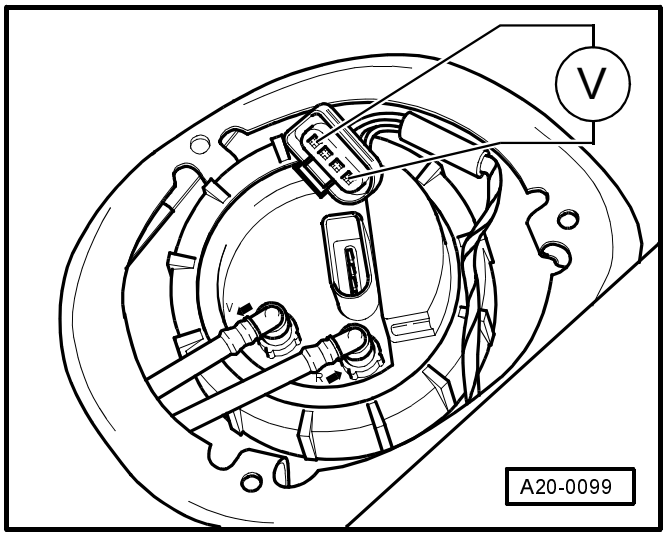
– Activate remote control.

If the fuel pump starts running:

– Test fuel pump relay ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

If the fuel pump does not run:

– Unscrew cover (below rear seat).
– Unlock and unplug 4-pin connector of flange at fuel tank.
– Connect hand-held multimeter (e.g. -V.A.G 1715-) to the outer contacts of the plug using adapter cables. ►
– Activate remote control. Specified value: approx. battery voltage.



If the specified value is not reached:

– Determine and remove open circuit in the wiring according to the current flow diagram ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.

If the specified value is reached:

– Unscrew union nut with wrench -MP 1-227-.
– Check whether the electric cables are connected between flange and fuel pump, and test for continuity if necessary.

If no open circuit was detected:

Fuel pump faulty.

– Replacing fuel delivery unit ⇒ **20-1** page 4.

Inspecting fuel flow rate

Special tools, test and measuring equipment and auxiliary items required

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

Test conditions

- Battery voltage at least 12 volts
- Voltage supply OK
- Fuel filter OK

Test sequence

– Switch off ignition.
– Connect up remote control -V.A.G 1348/3A- using adapter cables -V.A.G 1348/3-2- ⇒ **20-1** page 6
– Take cap off fuel filler neck.

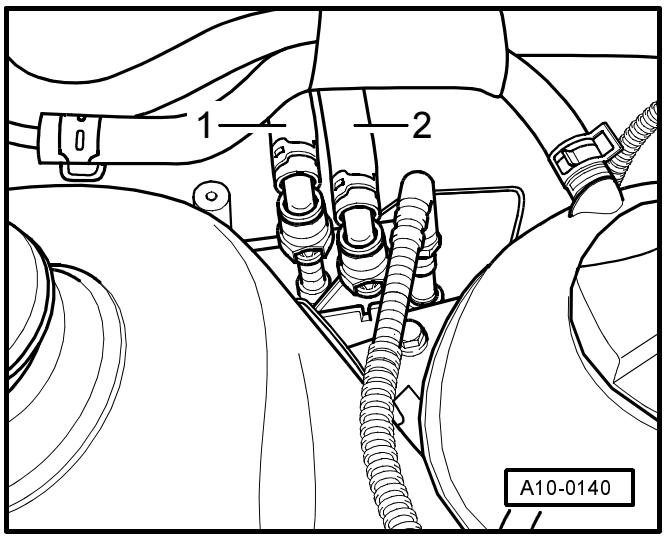
Caution!

The fuel system is under pressure! Before opening the system lay cleaning cloths around the connection point. Reduce pressure by carefully releasing the connection point.

– Detach fuel return-flow line -2- (press release button). ►

– Connect up auxiliary hose using adapter -V.A.G 1318/17-, fit onto the fuel return line from engine and hold in a measuring vessel.

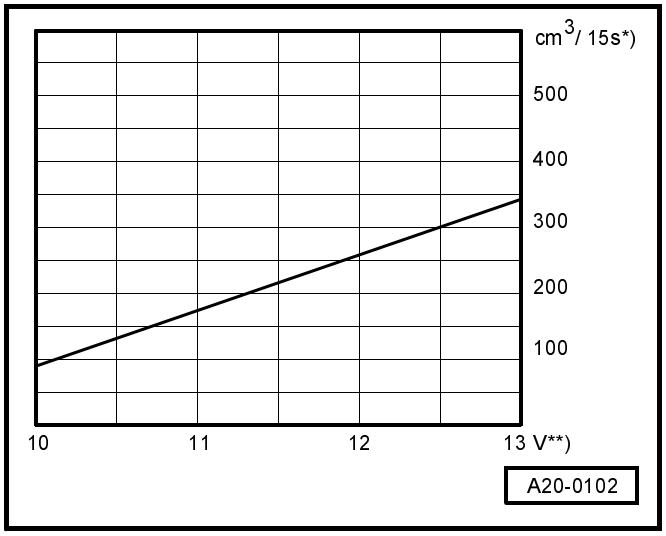
– Operate remote control for 15 seconds (press and hold down button).



– Compare the fuel rate with the specified value. ►

*) - Minimum delivery cm^3/15 s

**) - Voltage at fuel pump when engine not running and pump operating (approximately 2 volts less than the battery voltage)



If the minimum flow rate is not reached:

– Remove the fuel delivery unit and check that the pump strainer is not clogged up with dirt.

If a fault is also not discovered after this:

– Replacing fuel delivery unit ⇒ **20-1** page 4.

20-2 Inspecting the electronic power control (electronic throttle)

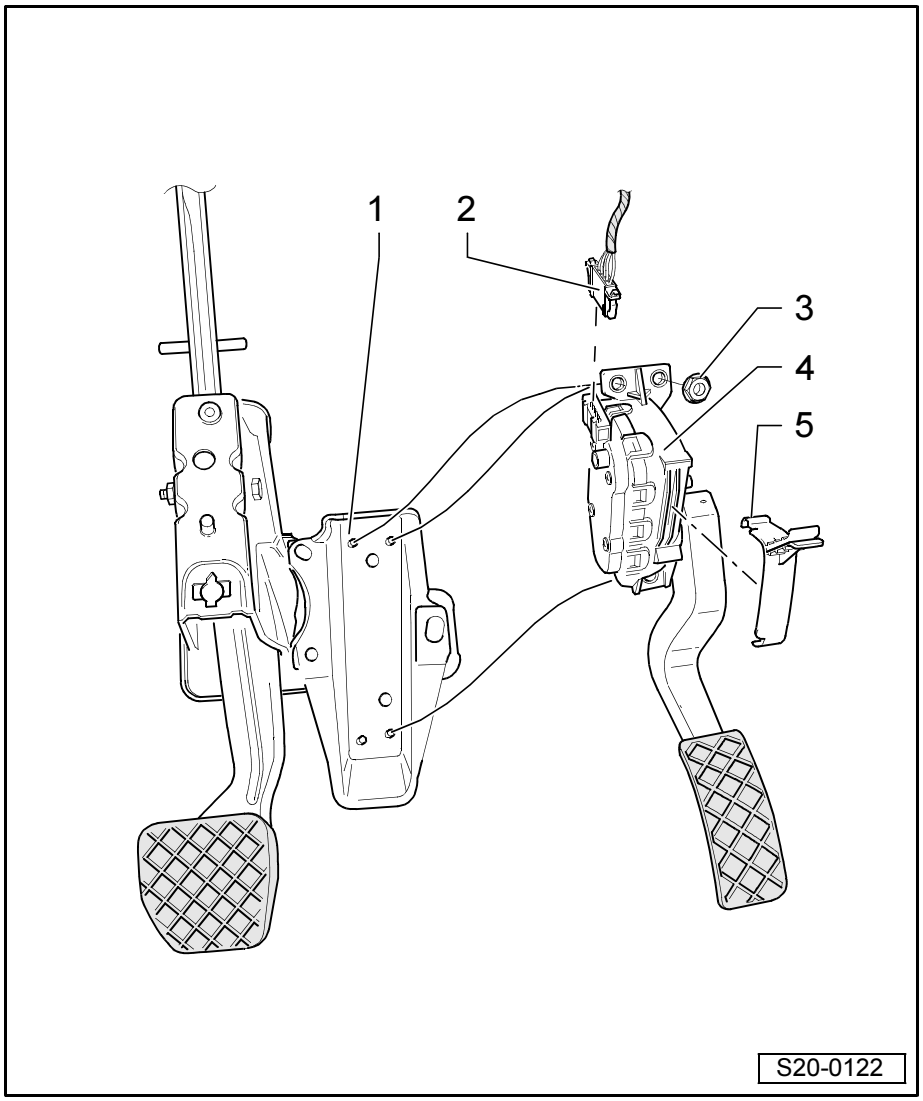
1 - Bracket
- ❑ removing and installing ⇒ Chassis; Rep. Gr. 46

2 - Connector
- ❑ black, 6 pin

3 - 10 Nm

4 - Accelerator pedal position sender -G79- and -G185-
- ❑ test ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24
- ❑ to remove, remove bottom part of dash panel and footwell cover

5 - Bracket
- ❑ for footwell cover
- ❑ clipped in place at accelerator pedal position sender



20-3 Activated charcoal filter system

Operation

A greater or smaller quantity of fuel vapours form above the level of the fuel in the tank - depending on the atmospheric pressure and ambient temperature.

The activated charcoal filter system prevents these HC emissions escaping into the air we breath.

The fuel vapours flow from the highest point of the fuel tank through the gravity valve (is connected at an angle of 45°) into the activated charcoal filter.

The activated charcoal absorbs these gases in the same way as a sponge.

When driving with the lambda control active (engine warm), the solenoid valve -N80- (also known as purge control or regeneration valve) is actuated (pulsed) by the engine control unit in line with engine load and speed. The opening time is dependent on the incoming signals.

During the purging process (regeneration of the activated charcoal) fresh air is inducted as a result of the vacuum in the intake manifold, through the air admission opening on the bottom of the activated charcoal tank. The fuel vapours and fresh air absorbed by the activated charcoal are metered back to the combustion process.

The pressure holding valve prevents fuel vapours being drawn out of the fuel tank when the solenoid valve on the activated charcoal filter system is opened and adequate intake manifold vacuum is present. It thus ensures that priority is given to emptying the activated charcoal tank.

The solenoid valve is closed when de-energized (e.g. open circuit in wiring). The activated charcoal tank is not emptied in this case.

Note

- *The hose connections are secured using spring-type clips or quick couplings.*
- *Always replace clamp-type clips with spring-type clips.*

Observe the safety precautions ⇒ Chapter 20-1.

Observe the rules for cleanliness ⇒ Chapter 20-1.

Repairing parts of the activated charcoal filter system

1 - Activated charcoal filter
- ❑ fitting location: in right of engine compartment
- ❑ test activated charcoal filter solenoid valve 1 -N80 - ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

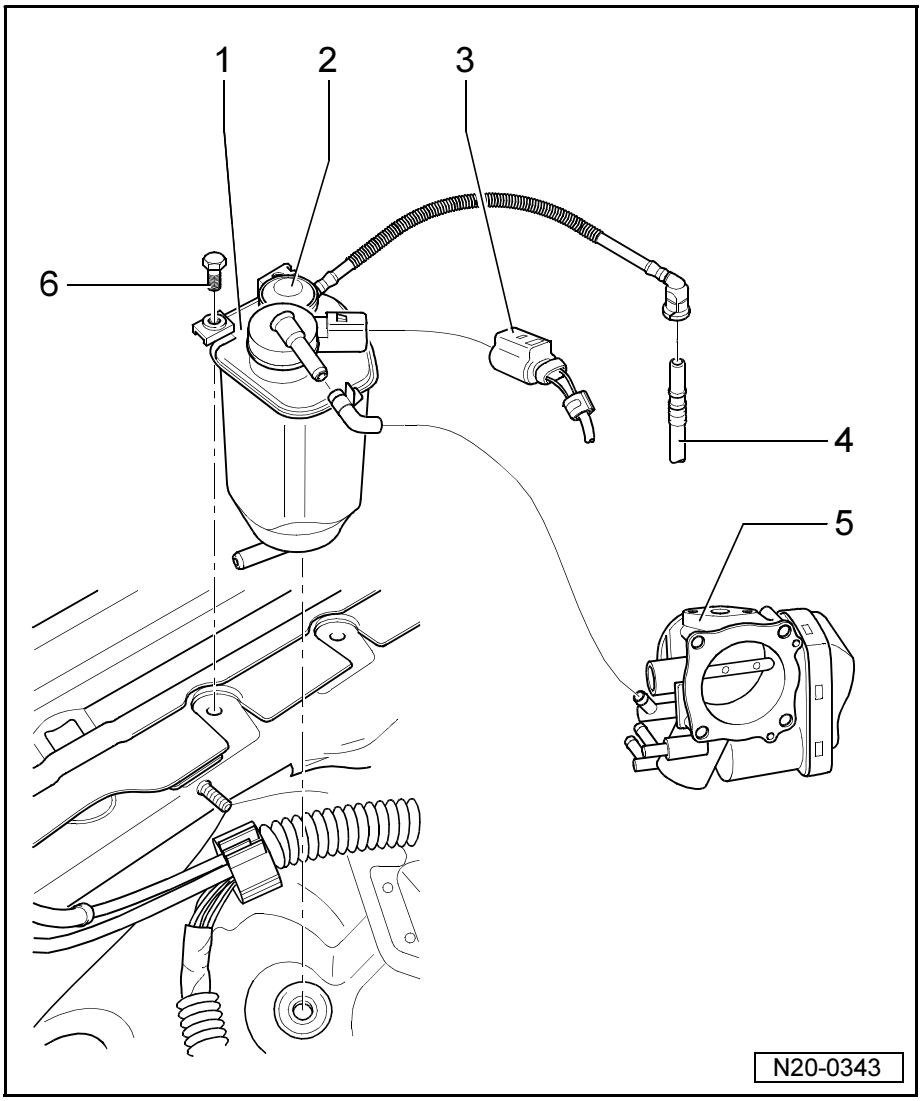
2 - Pressure holding valve with connection hose
- ❑ closes the tank ventilation system when activated charcoal filter solenoid valve -N80- and intake manifold vacuum hose are open

3 - Connector
- ❑ black, 2 pin
- ❑ for solenoid valve -N80-

4 - Vent line
- ❑ white
- ❑ check for correct fitting
- ❑ from gravity valve to fuel tank

5 - Throttle valve control unit

6 - 10 Nm



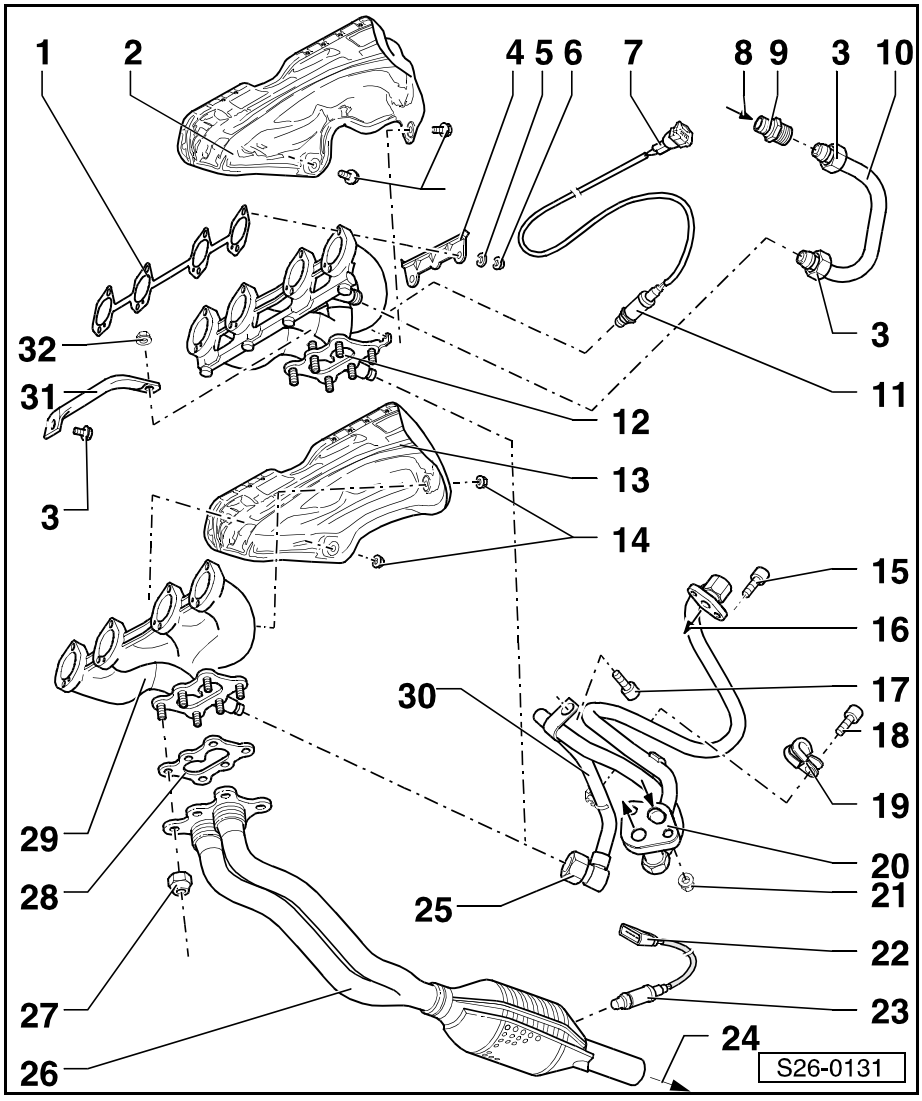
26 – Exhaust System

26-1 Removing and installing parts of the exhaust system

Exhaust manifold, exhaust pipe with catalytic converter and attached parts

Note

Always replace gaskets and self-locking nuts.



- **1 - Gasket**
  - ❑ replace
- **2 - Shield**
  - ❑ for engines with engine code AVU
- **3 - 25 Nm**
  - ❑ for engines with engine code AVU
- **4 - Bracket**
- **5 - Washer**
  - ❑ if collar nut fitted, then not present
- **6 - 25 Nm**
  - ❑ replace
  - ❑ coat with hot screw paste - G 052 112 A3- before inserting
- **7 - 6-pin plug connection**
  - ❑ black for lambda probe 1 upstream of catalytic converter - G39- and lambda probe heater -Z19-
  - ❑ on underside of vehicle on right
- **8 - From combination valve**
  - ❑ for engines with engine code AVU
  - ❑ the secondary air system ⇒ Chapter 26-2
- **9 - Bolted connection, 35 Nm**
  - ❑ for engines with engine code AVU
- **10 - Connecting tube**
  - ❑ for engines with engine code AVU
  - ❑ the secondary air system ⇒ Chapter 26-2
- **11 - Lambda probe 1 downstream of catalytic converter -G39-, 50 Nm**
  - ❑ only coat the thread with hot screw paste - G 052 112 A3-; hot screw paste must not get into the slot of the probe body
  - ❑ test ⇒ 1.6 l/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24
- **12 - Exhaust manifold**
  - ❑ for engines with engine code AVU
  - ❑ removing and installing ⇒ **26-1** page 4
- **13 - Shield**
  - ❑ for engines with engine code BFQ

14 - 25 Nm
- ❑ for engines with engine code BFQ

15 - 10 Nm

16 - To throttle valve control unit -J338-

17 - 25 Nm

18 - 4 Nm

19 - Retaining clip
- ❑ for attaching cable of lambda probe upstream of catalytic converter

20 - Flange
- ❑ for attaching connection pipe at EGR valve

21 - 25 Nm
- ❑ replace

22 - 4-pin plug connection
- ❑ brown for lambda probe 2 downstream of catalytic converter -G130- and lambda probe heater -Z29-
- ❑ on underside of vehicle on right

23 - Lambda probe 2 after catalytic converter -G130-, 50 Nm
- ❑ only coat the thread with hot screw paste - G 052 112 A3-; hot screw paste must not get into the slot of the probe body
- ❑ test ⇒ 1.6 l/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

24 - To front silencer

25 - 60 Nm

26 - Front exhaust pipe with catalytic converter

27 - 40 Nm
- ❑ replace
- ❑ coat with hot screw paste - G 052 112 A3- before inserting

28 - Gasket
- ❑ replace

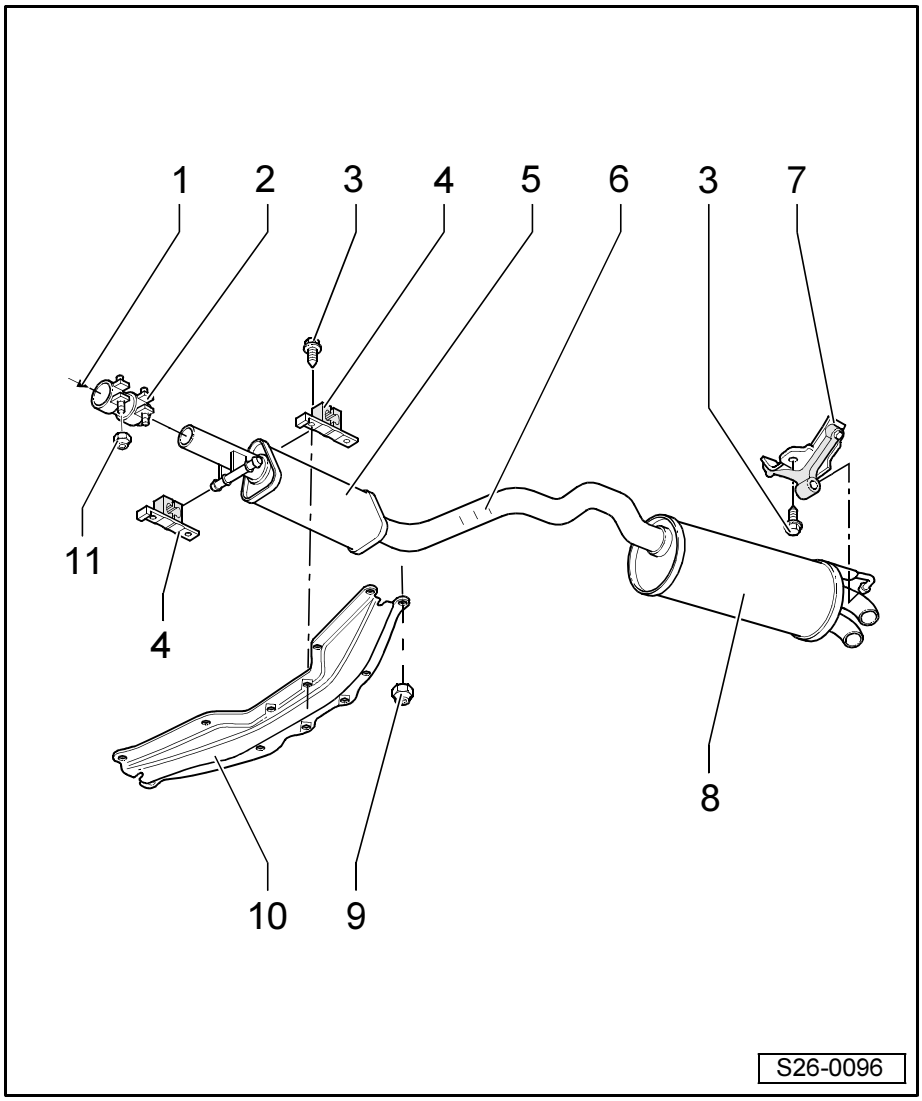
29 - Exhaust manifold
- ❑ for engines with engine code BFQ
- ❑ removing and installing ⇒ **26-1** page 4

30 - Connecting tube
- ❑ Exhaust gas recirculation system ⇒ Chapter 26-3

31 - Support
- ❑ for engines with engine code AVU

32 - 20 Nm
- ❑ for engines with engine code AVU
- ❑ replace

Silencer with hanger



1 - From catalytic converter

2 - Clamping sleeve
- ❑ align exhaust system free of stress before tightening ⇒ **26-1** page 5
- ❑ Fitting position: horizontal in vehicle, bolted connection pointing to left
- ❑ tighten bolted connections evenly

3 - 25 Nm

4 - Hanger
- ❑ fitting position ⇒ Fig. 1 in **26-1** page 3

5 - Front silencer
- ❑ replace individually when carrying out repairs ⇒ **26-1** page 5
- ❑ align exhaust system free of stress ⇒ **26-1** page 5

6 - Separation point
- ❑ replacing front or rear silencer ⇒ **26-1** page 5

7 - Hanger

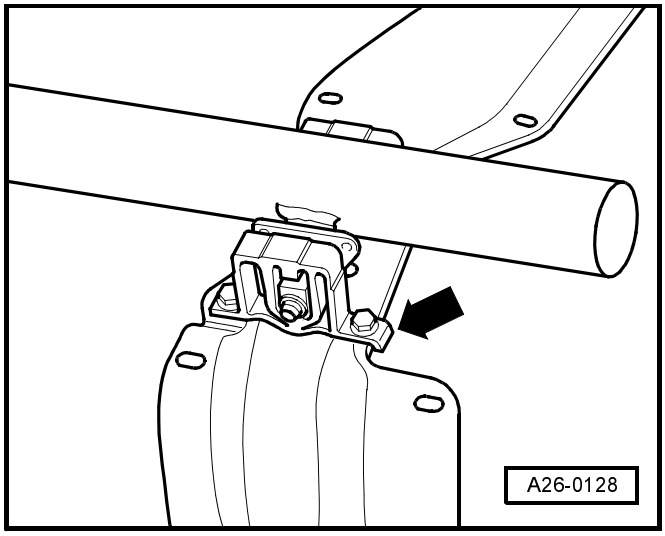
8 - Rear silencer
- ❑ replace individually when carrying out repairs ⇒ **26-1** page 5
- ❑ align exhaust system free of stress ⇒ **26-1** page 5

9 - 25 Nm

10 - Tunnel bridge
- ❑ with hole for aligning exhaust system ⇒ **26-1** page 5

11 - 40 Nm

Fig. 1: Installation position for hanger ►



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

Removing and installing front exhaust pipe

Special tools, test and measuring equipment and auxiliary items required

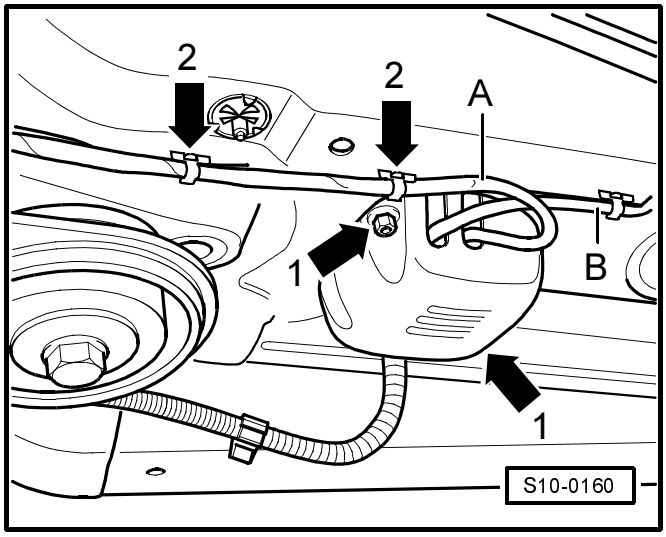
♦ Torque wrench

Removing

Note

Avoid a large deflection of decoupling element, max. deflection 10°.

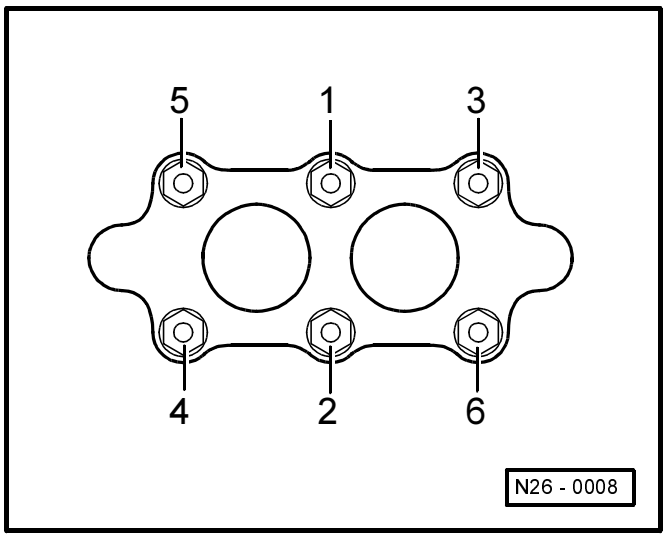
– Unbolt protective cover -arrows 1-, disconnect 4-pin plug for lambda probe and unclip cable -A- on heat shield -arrows 2-.
– Unbolt heat shield for drive shaft.
– Remove heat shield.
– Detach clamping sleeve.
– Unbolt front exhaust pipe from exhaust manifold.
– Swivel front exhaust pipe down 180° and take off.



Installing

Installation is carried out in the reverse order.

Tightening order of front exhaust pipe to exhaust manifold.



– Align exhaust system free of stress ⇒ **26-1** page 5.
– Interrogate fault memory ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

Removing and installing exhaust manifold

Special tools, test and measuring equipment and auxiliary items required

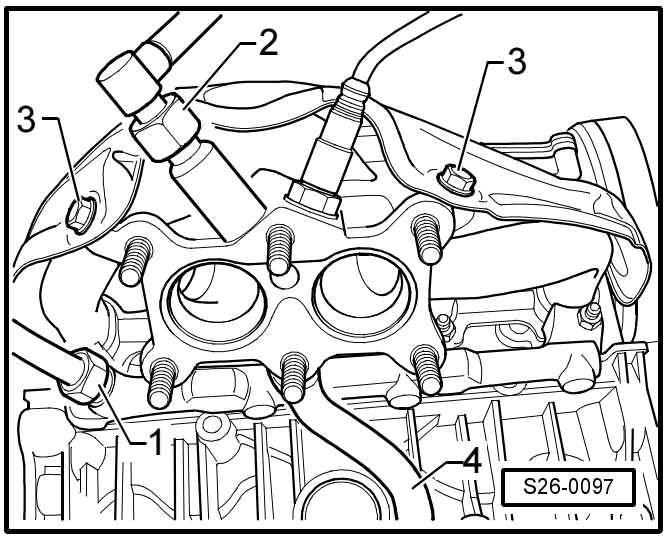
♦ Torque wrench

Removing

– Remove top part of intake manifold ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.
– Remove front exhaust pipe ⇒ **26-1** page 3.

For engines with engine code AVU

– Unscrew union nut on connecting pipe for the secondary air system -1-.



Continued for all engines

– Unscrew union nut on connecting pipe for the exhaust gas recycling -2-.
– Unscrew bolts or nuts -3- for shield palte and remove shield plate.

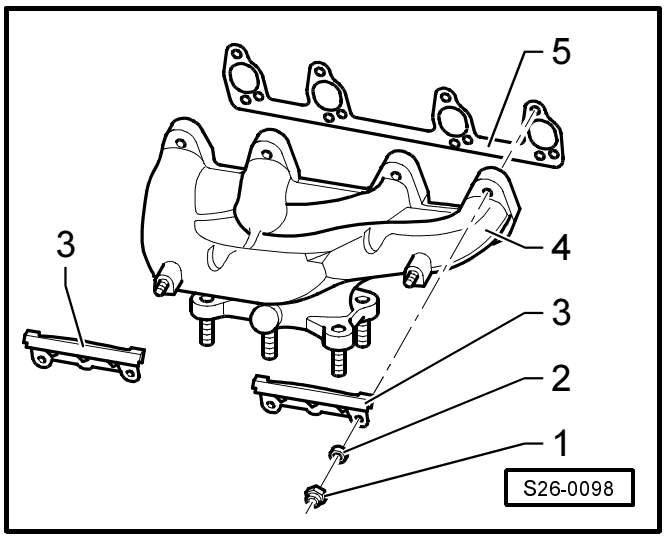
For engines with engine code AVU

– Unbolt support -4- on the exhaust manifold and engine block.

Continued for all engines

– Unbolt protective cover and unplug 6-pin lambda probe plug.

– Slacken retaining clip for lambda probe cable and remove lambda probe.
– Unscrew nuts -1- on both brackets -3-, take off washers -2- (if fitted). ►
– Unscrew remaining nuts at exhaust manifold -4-, take off washers (if fitted).
– Take off exhaust manifold and gasket for exhaust manifold -5-.



Installing

Note

- *Replace gasket for exhaust manifold.*
- *Replace self-locking nuts (if collar nuts are not fitted, use 4 mm thick washers).*

Installation is carried out in the reverse order.

– Align exhaust system free of stress ⇒ **26-1** page 5.
– Install front exhaust pipe ⇒ **26-1** page 3.

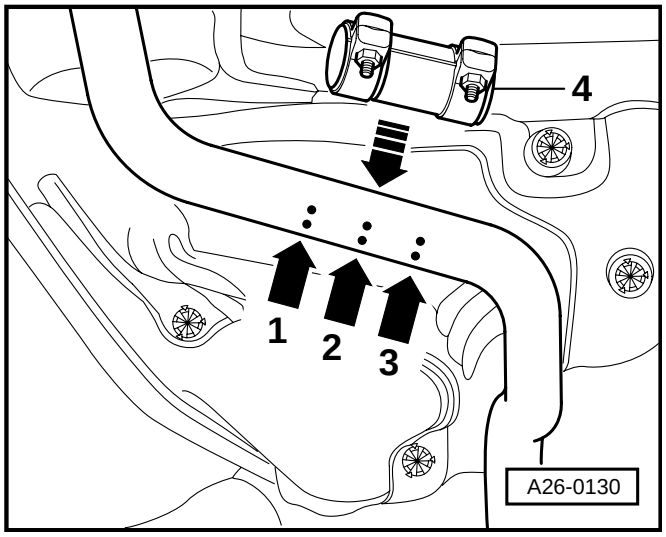
Replacing front or rear silencer

Special tools, test and measuring equipment and auxiliary items required

- Torque wrench
- Body saw (e.g. -V.A.G 1523 -)

A separation point is provided for repair purposes for replacing the front silencer or rear silencer.

– Use body saw (e. g. -V.A.G 1523-) to separate exhaust pipe at right angles at separation point -arrow 2-. ►
– When installing, position clamping sleeve -4- at the side markings -arrow 1- and -arrow 3-.
– Align exhaust system free of stress ⇒ **26-1** page 5:
– Align rear silencer horizontally.
– Tighten bolted connections of clamping sleeve evenly to 40 Nm.



Installation position of clamping sleeve: horizontal in vehicle, bolted connections pointing forward.

Aligning exhaust system free of stress

Special tools, test and measuring equipment and auxiliary items required

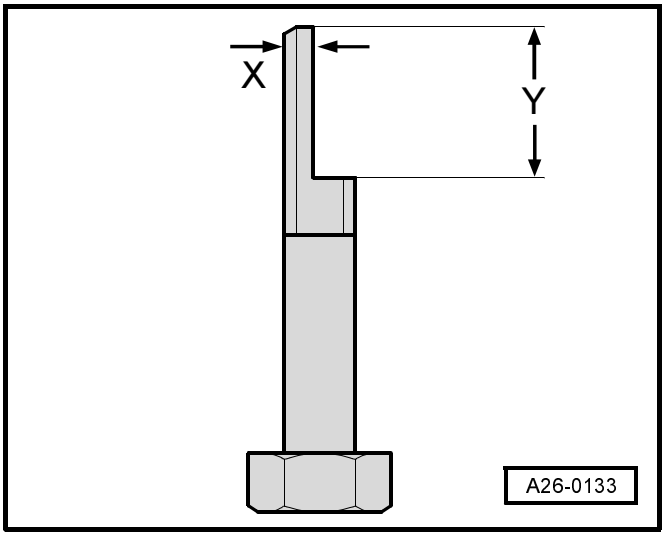
- Torque wrench

Procedure

- The exhaust system is aligned when cold.

– Shop-make tool from an M10 bolt to the dimensions stated for aligning the exhaust system. ►

- Dimension -X- = 4 mm
- Dimension -Y- = 25 mm

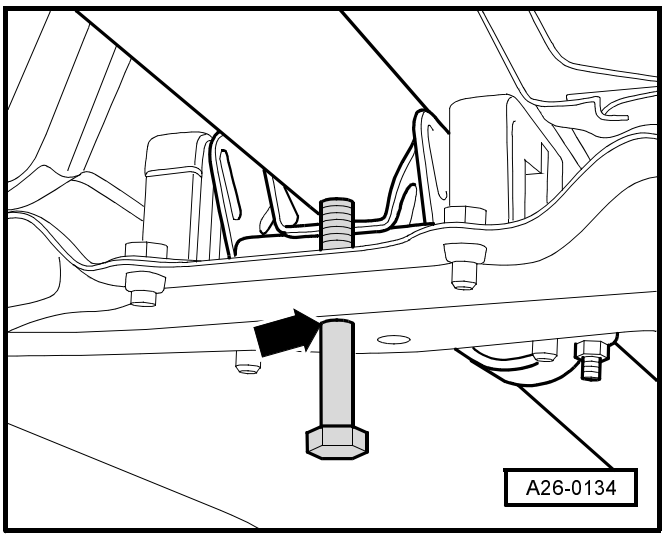


Note

A second mechanic is required for aligning the exhaust system.

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

– Insert shop-made tool through the rear hole -arrow- of the tunnel bridge, the flat side points toward the hanger pin of the exhaust system. ►

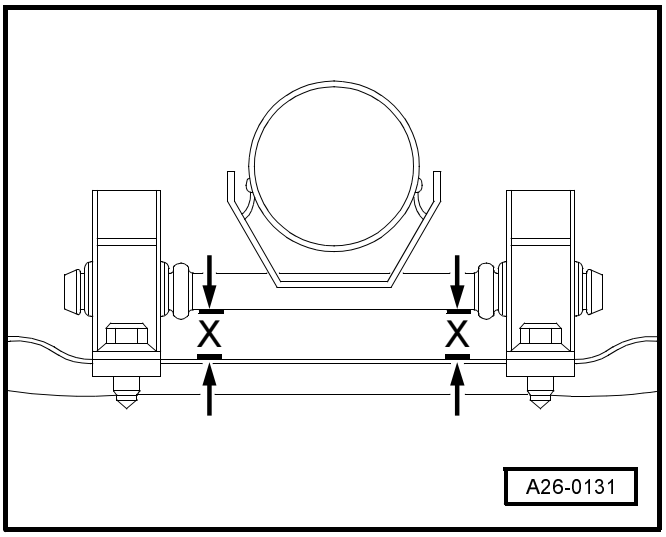


Note

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

– Align front and rear silencers horizontally:

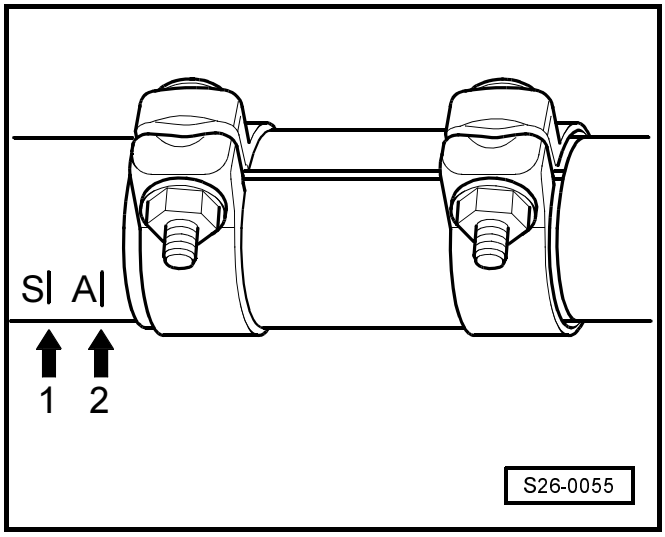
The hanger pin at the exhaust pipe must be parallel to the tunnel bridge (dimension -X- on left and right identical). ►



Note

*On vehicles with a separation point ⇒ **26-1** page 5, also inspect horizontal position of rear silencer at the tail pipe.*

– Position double clamp with a clearance of about 5 mm to the line of the particular marking and tighten evenly in horizontal position to 40 Nm. ►



Different markings apply depending on the gearbox version:

- -Arrow 1- - vehicles fitted with an automatic gearbox
- -Arrow 2- - vehicles with a manual gearbox

Checking the exhaust system for leaks

– Start engine and run in idle.

– Seal off tail pipe for the duration of the leak check (e.g. with cloth or plug).

– All connection points should checked by listening for the sound of gas escaping: cylinder head/exhaust manifold, exhaust manifold/catalytic converter etc.

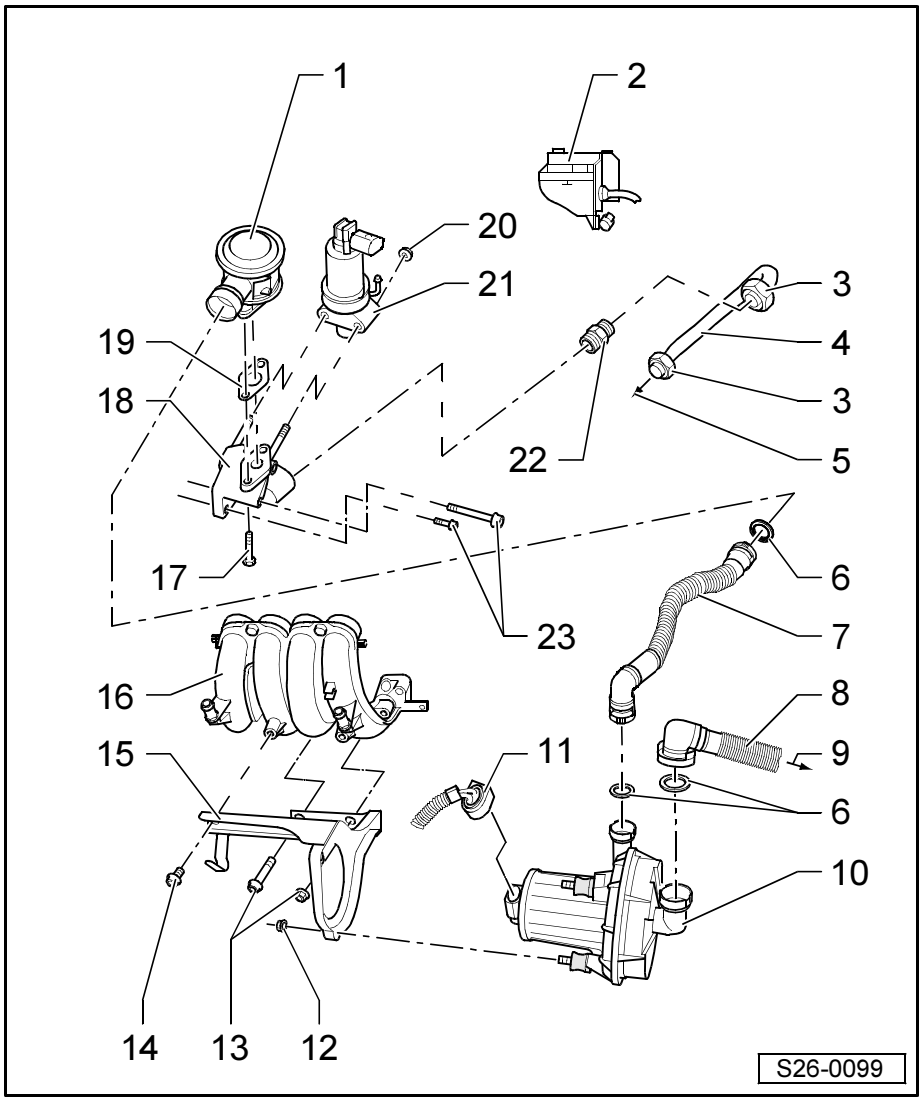
– Eliminate any leak found.

26-2 Secondary air system

Removing and installing parts of the secondary air injection system

Note

*Components marked with * are tested by the self-diagnostic system ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.*



1 - Combination valve

2 - Secondary air pump relay -J299 -*

- ❑ in protective housing for relays (in the engine compartment) ⇒ Fig. 1 in **26-2** page 2

3 - 25 Nm

- ❑ for engines with engine code AVU

4 - Connecting tube

- ❑ for engines with engine code AVU

5 - To connection on exhaust manifold

- ❑ for engines with engine code AVU

6 - O-ring

- ❑ replace

7 - Pressure hose

- ❑ check for correct fitting
- ❑ to release, press together at front

8 - Air intake hose

9 - To air filter

10 - Secondary air pump -V101-

- ❑ test ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01

11 - Connector

- ❑ 2-pin

12 - 10 Nm

13 - 25 Nm

14 - 15 Nm

15 - Bracket

16 - Bottom part of intake manifold

17 - 10 Nm

18 - Connecting piece

- ❑ with mount for combination valve and EGR valve -N18-

19 - Gasket

- ❑ replace

20 - 25 Nm

21 - EGR valve - N18- with EGR potentiometer -G212-

- ❑ Exhaust gas recirculation system ⇒ Chapter 26-3

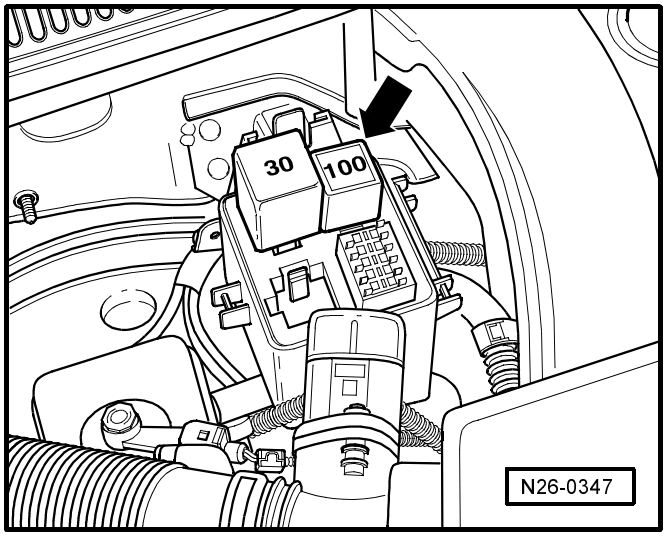
22 - Bolted connection, 35 Nm

- ❑ for engines with engine code AVU

23 - 10 Nm

- ❑ one short and one long bolt each

Fig. 1: Secondary air pump relay -J299- (-arrow-) ►



Note

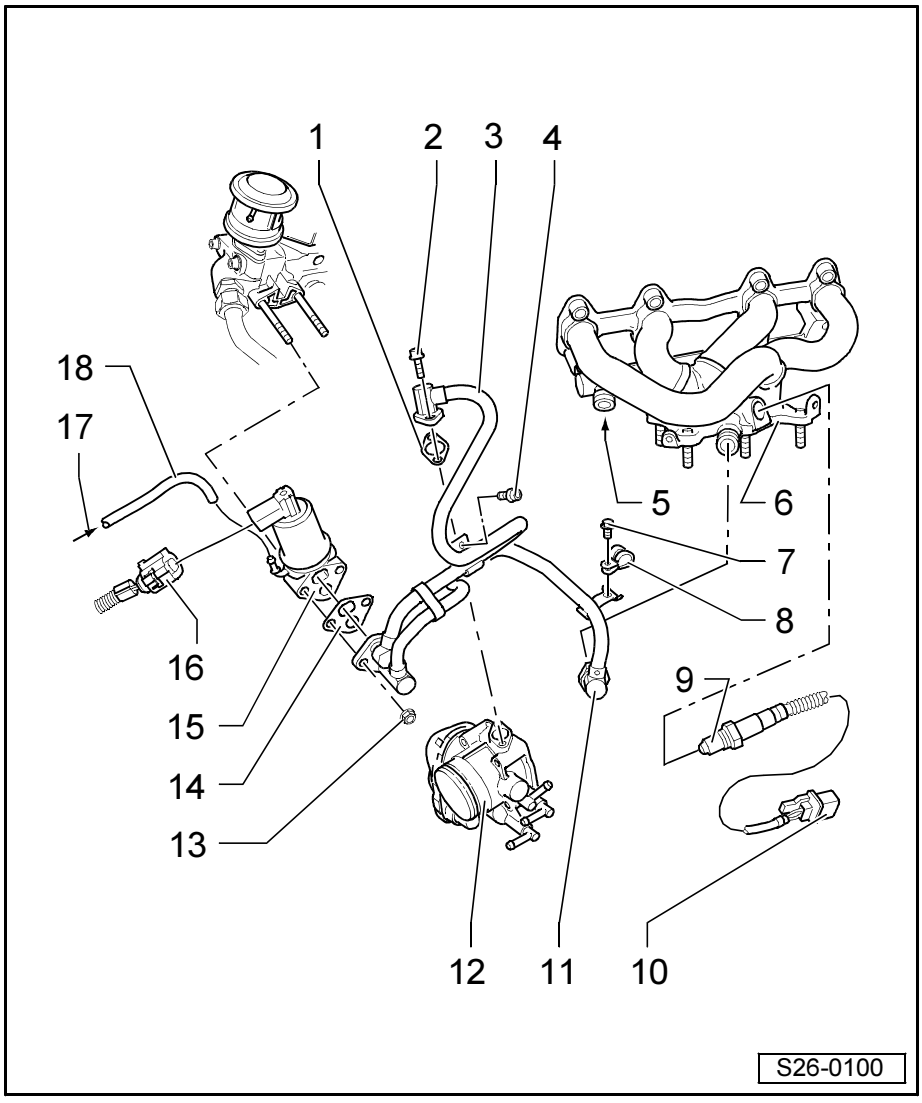
- *If a tool is required for removing relay from the relay plate, disconnect earth strap of battery first of all.*
- *If the battery is disconnected and reconnected, carry out additional operations ⇒ Electrical System; Rep. Gr. 27.*

26-3 Exhaust gas recirculation system

Exhaust gas recirculation system - summary of components

Note

- *The operation and control of the exhaust gas recirculation system is checked by the self-diagnosis of the Simos control unit -J361-.*
- *Any desired valve position is possible as a result of the pulsed operation.*
- *Test EGR valve - N18- ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.*
- *The EGR valve with cone-shaped valve plunger makes it possible to achieve different opening cross-sections at different valve strokes.*
- *Components marked with * are tested by self-diagnosis ⇒ 1.6 litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.*
- *Components marked with ** are tested by final control diagnosis ⇒ 1.6 litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.*



1 - Gasket
- ❑ replace

2 - 10 Nm

3 - Connecting tube

4 - 25 Nm

5 - From combination valve
- ❑ for engines with engine code AVU
- ❑ the secondary air system ⇒ Chapter 26-2

6 - Exhaust manifold

7 - 4 Nm

8 - Retaining clip
- ❑ for lambda probe upstream of catalytic converter

9 - Lambda probe 1 upstream of catalytic converter -G39-*
- ❑ removing and installing ⇒ Chapter 26-1

10 - 6-pin plug connection
- ❑ black for lambda probe 1 upstream of catalytic converter - G39- and lambda probe heater -Z19-

11 - 60 Nm

12 - Throttle valve control unit -J338-*

13 - 25 Nm

14 - Gasket
- ❑ replace

15 - EGR valve - N18-*/ with EGR potentiometer -G212-***
- ❑ Test EGR valve -N18 - ⇒ 1.6-litre/75 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01

16 - 6-pin plug connection

17 - From air filter

18 - Ventilation hose