

Workshop Manual

Octavia 1997 ➤

1.8 I/132 kW Engine, Mechanics
Edition 03.01

Engine code

AUQ



List of Supplements to Workshop Manual

Octavia 1997 ➤

1.8 I/132 kW Engine - Mechanical Components

Edition 03.01

Supple- ment	Edition	Subject	Article Number
	03.01	Basic Edition	S00.5136.50.20
1	07.02	Modifications in Rep. Gr. 10, 13, 15, 17	S00.5136.51.20

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00 – Technical data

00-1 Technical data

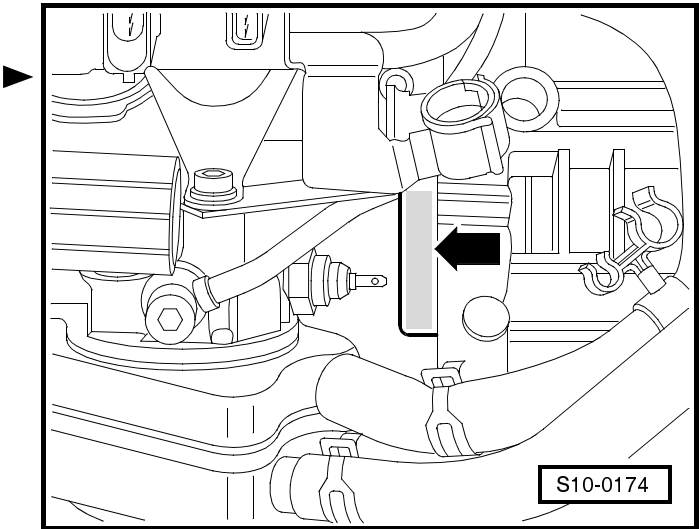
Engine number

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 toothed belt guard.

In addition, the engine code is indicated on the cylinder head in the area of the right lifting eye.

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



Engine characteristics

Identification characters		AUQ
Manufactured		12.00 >
Exhaust limits conforming to		EU-4
Displacement	l	1,781
Power output	kW at rpm	132/5500
Torque	Nm at rpm	235/1950...5000
Bore	Ø mm	81,0
Stroke	mm	86,4
Compression ratio		9,5 : 1
RON	min.	98 unleaded ^{a)}
Ignition system/fuel injection		Motronic
Knock control		yes
Self-diagnosis		yes
Lambda control		yes
Catalytic converter		yes
Exhaust gas recirculation		no
Turbocharging		yes
Secondary air system		yes
Camshaft adjustment		yes

^{a)} In exceptional cases at least 95 RON, although engine output reduced

10 – Removing and installing engine

10-1 Removing engine

Special tools, test and measuring equipment and auxiliary items required

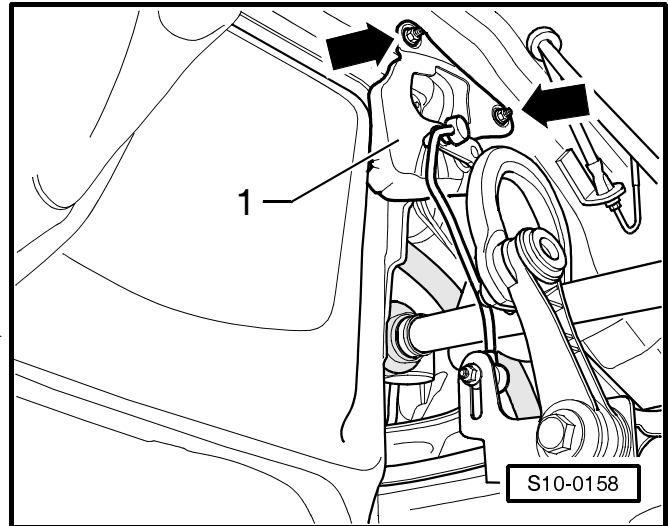
- ◆ Workshop crane (e.g. -V.A.G 1202 A -)
- ◆ Drip tray (e.g. -V.A.G 1306-)
- ◆ Torque wrench
- ◆ Engine/gearbox jack (e.g. -V.A.G 1383 A-)
- ◆ Pliers for spring strap clips
- ◆ Ladder (e.g. -VAS 5085-)
- ◆ Engine mount -T10012-
- ◆ Bushing -T30010-
- ◆ Engine and gearbox mount -MP 1-202-
- ◆ Assembly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



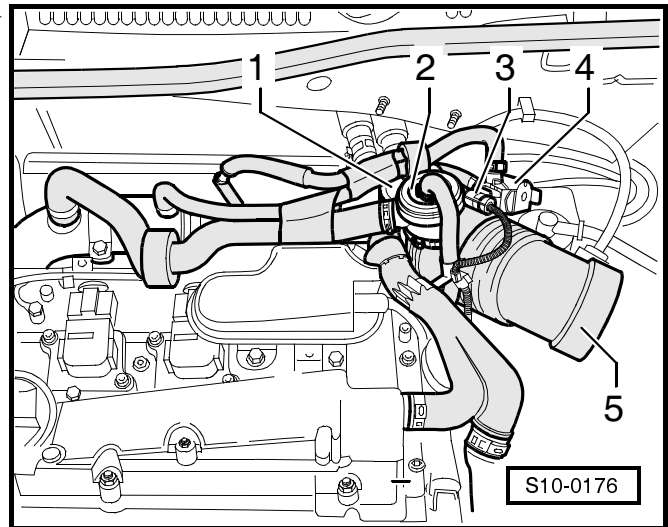
Note!

- ◆ *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.
- Removing engine trim panel and the trim panel in front of the intake manifold.
- Remove the 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.
- Detach bottom right wheelhouse liner.
- Detach the air guide pipe at the bottom to the charge air cooler at the right side member ⇒ Chap. 21-2.
- 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,
- Drain coolant ⇒ Chap. 19-1.

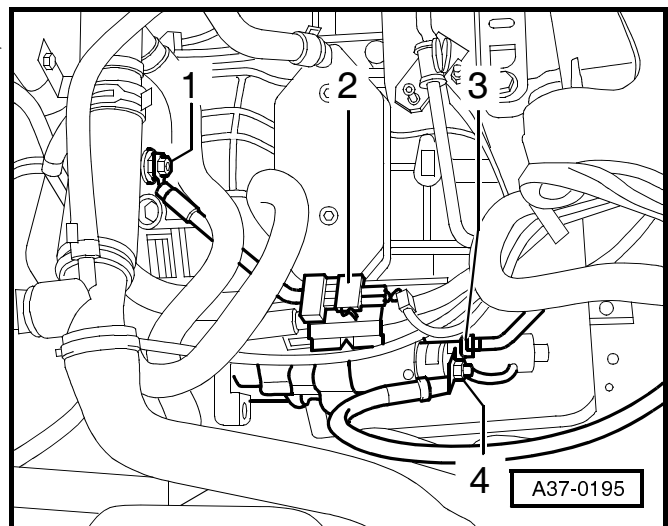


- Unplug connector -3- at the charge pressure control solenoid valve -N75-.
- Separate the following components from the intake air hose -5-:
 - ♦ Charge pressure control solenoid valve -N75- (-4-)
 - ♦ Mechanical charge pressure control divert air valve -2-
 - ♦ Crankcase ventilation pressure control valve -1-
- Pull out the locking clasp at the connection of the turbocharger as far as the stop and take off the intake air hose -5-.

**Note!**

Seal the opening in the intake tract of the turbocharger with a clean cloth.

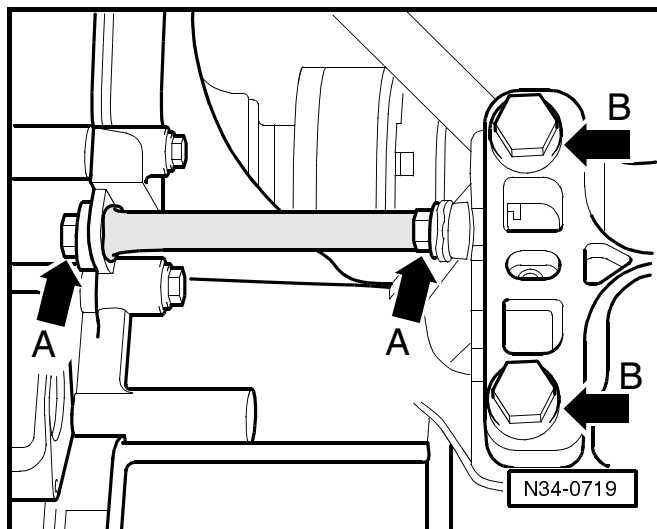
- Unbolt earth strap -1-.
- Detach cables -3- and -4- at starter.
- Separate plug connection -2- and pull out of fixture.
- Detach cables from fixture at starter and place down to the side.
- Unplug the connector from the speedometer sender -G22-.
- Release the cable lock for the selector and shift cable and unbolt the cable support from the gearbox as from ⇒ 5-Speed Manual Gearbox 02J; Rep. Gr. 34.



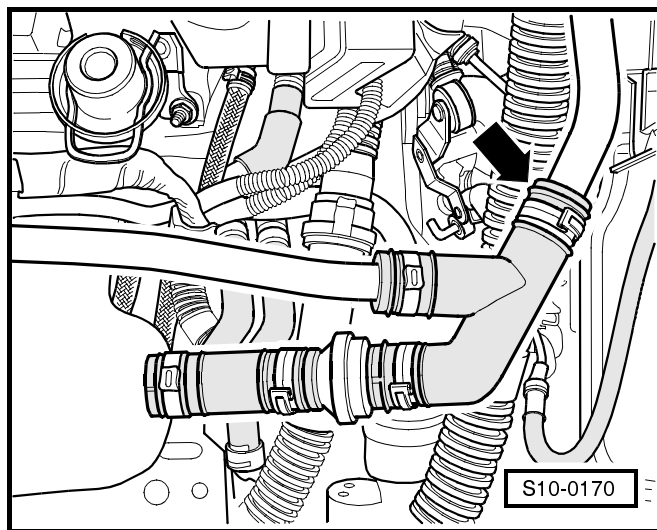
- Remove the gearbox strut from the gearbox -arrows A-.
- Remove clutch slave cylinder and secure with wire, do not open line system.

**Note!**

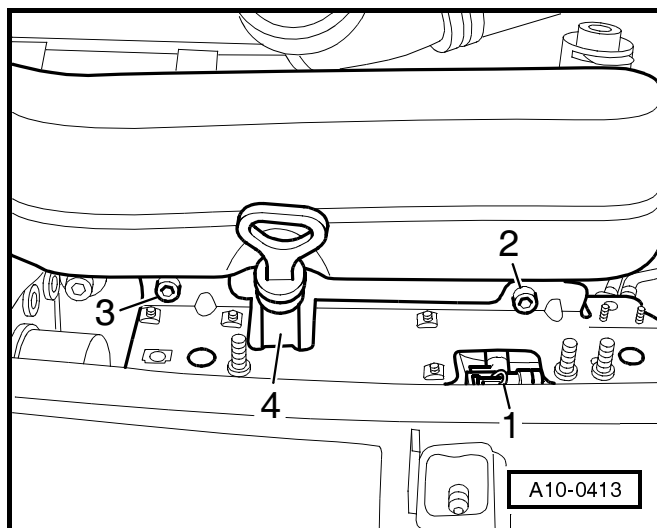
After removing the slave cylinder, do not operate the clutch pedal.



- Unplug connector at reversing light switch -F4-.
- Detach the vacuum line to the brake servo unit at the junction to the intake manifold -arrow-.
- Detach the secondary air injection pipe at the bracket ahead of the intake manifold.



- Unscrew bolts -2- and -3- and pull the bracket of the dipstick guide tube -4-.
- Separate the electrical plug connections -1- for the turbocharger divert air valve -N249- on the underside of the bracket.



- Detach coolant hose -1- at engine and remove the coolant hose. ►
- Unplug connector -2- to the engine speed sender -G28-.
- Expose cable -3-.
- Separate the electric plug connection -4- to the secondary air injection valve -N112-.
- Remove the coolant hose between junction connection/engine and top radiator connection.

**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. ►

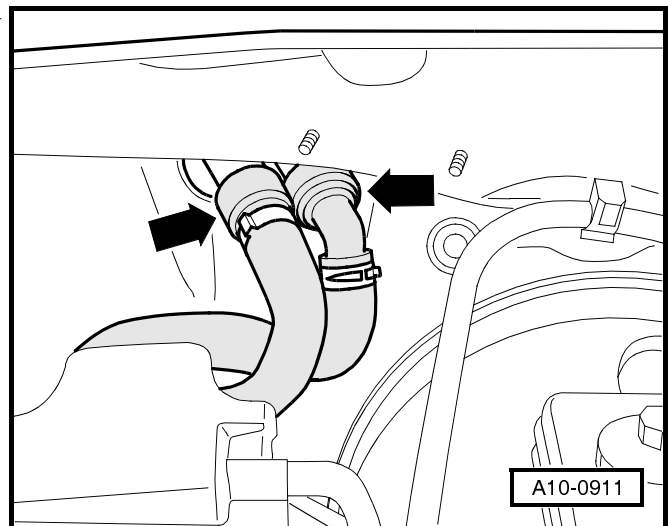
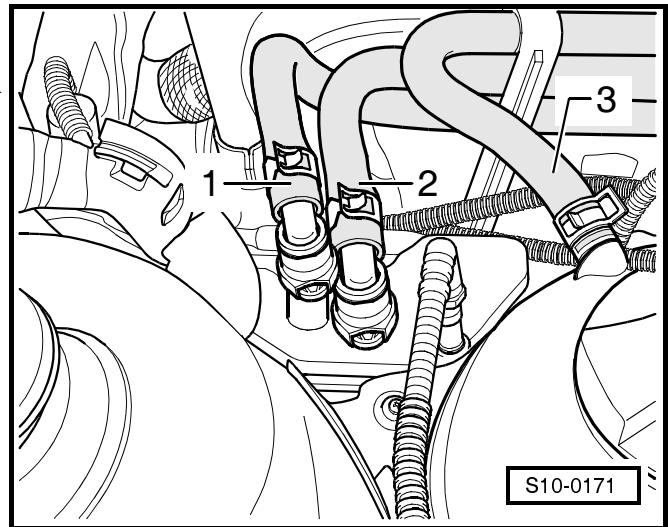
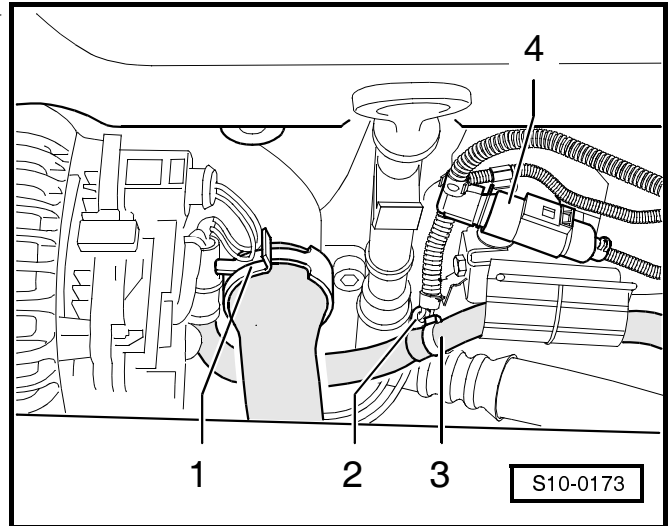
Lines and release buttons are colour-coded.

- Seal the lines so that no dirt can get into the fuel system.
- Detach the top coolant hose -3- and the bottom coolant hose from the expansion reservoir.
- Detach the coolant hoses to the heating system heat exchanger at the bulkhead -arrows-. ►

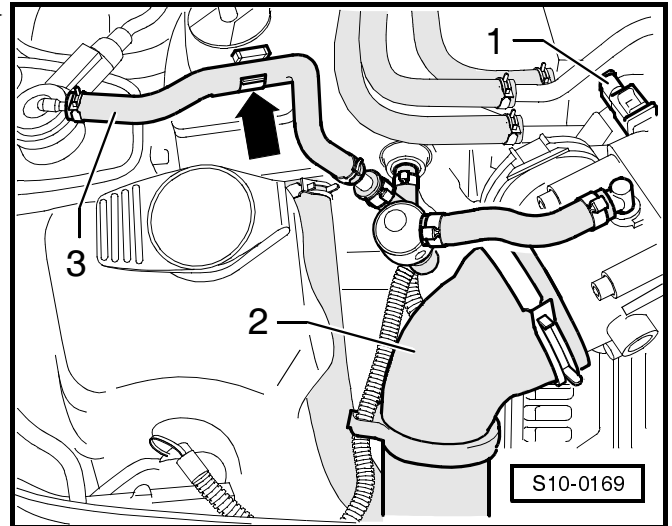
As part of the further removal work, separate the plug connections at the following components:

- ◆ Hall sender -G40-
- ◆ Ignition coils
- ◆ Earth cable close to ignition coil
- ◆ Injector -N30...N33-
- ◆ Sender for coolant temperature -G62-
- ◆ Knock sensor I -G61-
- ◆ Knock sensor II -G66-
- ◆ Oil pressure switch -F1-
- ◆ Camshaft adjustment valve 1 -N205-
- ◆ Oil level/temperature sender -G266-

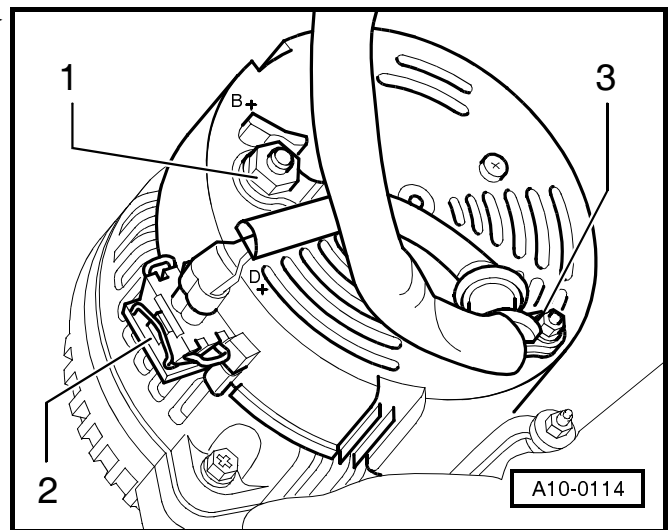
Fitting locations ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24



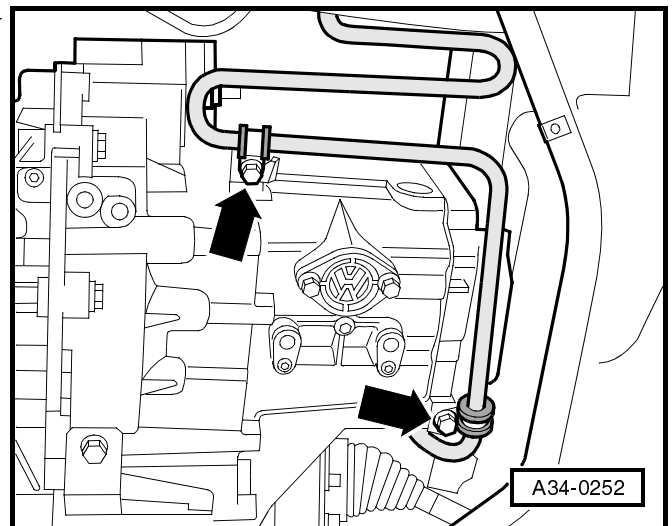
- Unplug connector -1- of intake air temperature sender -G42- and plug connection for throttle valve control unit -J338- (below throttle valve control unit).
- Detach charge air hose -2- at throttle valve control unit.
- Detach vacuum line -3- from ACF canister and release from clip -arrow-.
- Remove the right turn signal light ⇒ Electrical System; Rep. Gr. 94.
- Unplug the connector at charge pressure sender -G31- through the installation opening for turn signal light.
- Removing the ribbed V-belt ⇒ Chap. 13-1.



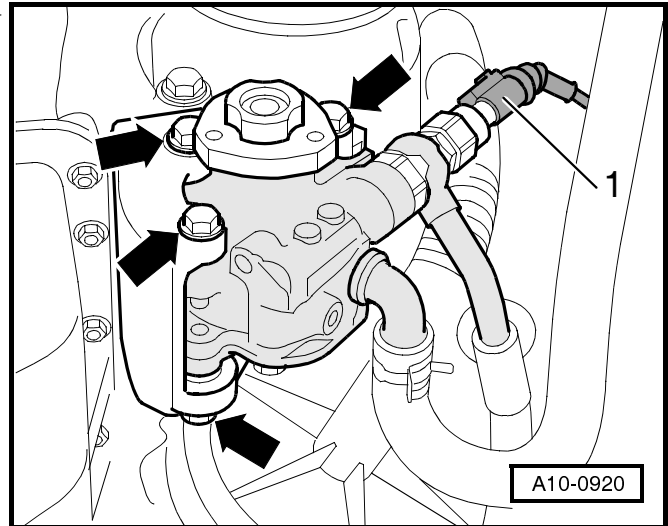
- Unbolt cable of terminal 30/B+ at alternator.
- Unplug connector -2- of terminal D+.
- Unscrew cable clamp -3-.
- Detach cable from fixture.
- Unplug connector at AC compressor.
- Remove both radiator fans together with fan rings ⇒ Chap. 19-1.
- Unplug connector and detach hoses at secondary air pump motor.



- Detach the PAS lines at the gearbox -arrows-.
- Unbolt belt pulley of hydraulic pump for power-assisted steering.



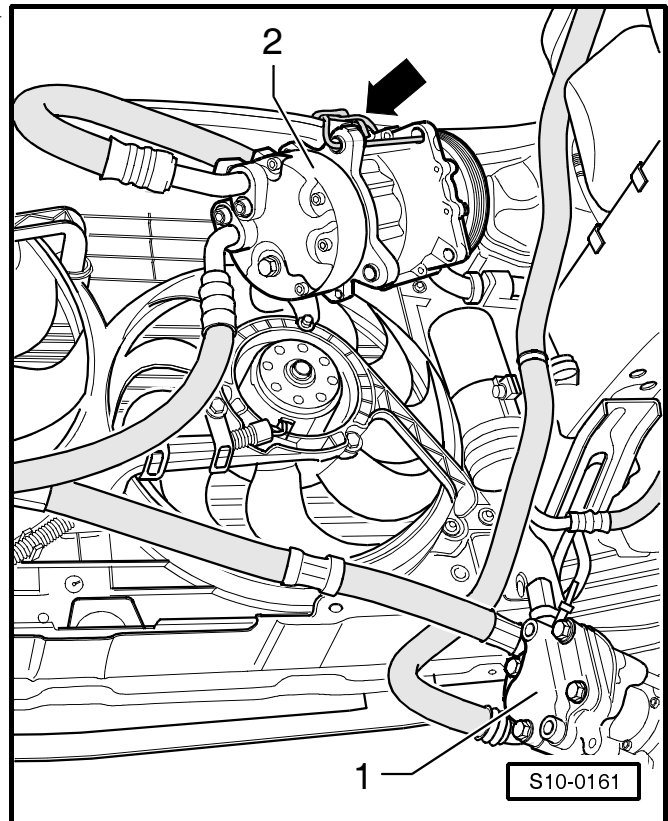
- Unplug connector -1- at PAS pressure switch -F88-.
- Detach wiring loom from the fixtures and place down on the left in the area of the air filter.



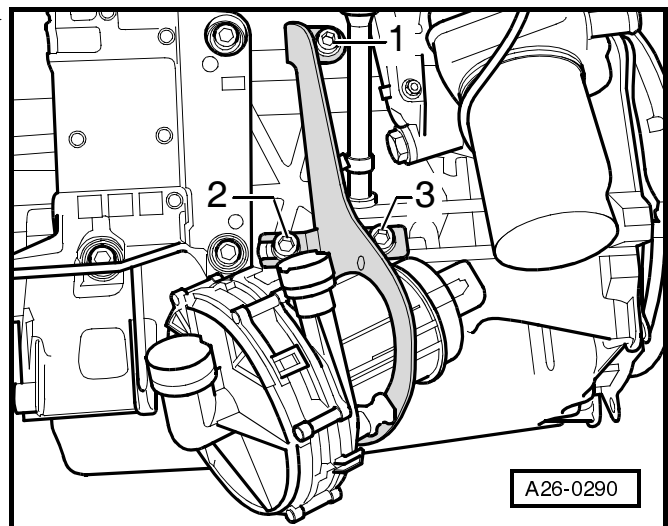
- Unbolt hydraulic pump -1- of power-assisted steering and tie up to the front at the lock carrier. The hoses remain connected.

**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-.
- Unscrew bolts attaching alternator and take alternator down and out.
- Slacken bolt -2- and unscrew bolts -1- and -3-.
- Pull bracket together with secondary air pump to the side off bolt -2-.
- 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.
- Unbolt pendulum support.



- Attach engine holder -T10012- with nut and bolt M10 x 25 to cylinder block with a torque of 40 Nm. ►
- Slightly raise the engine and gearbox with the engine/gearbox jack.
- Slacken engine and gearbox mounts from above.

Note!

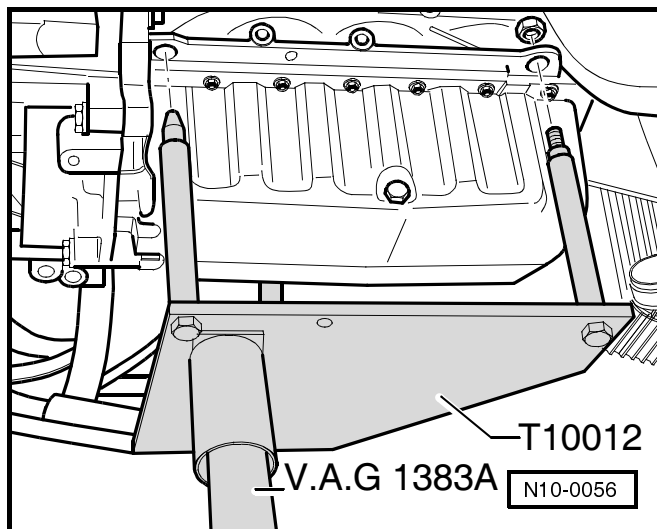
Use the ladder (e.g. -VAS 5085-) for removing the bolts.

- Pull engine/gearbox unit as far forward as possible and lower carefully.

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.
- ♦ Pay particular attention to clearance to turbocharger vacuum unit.



Securing the engine to the assembly stand

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

Note!

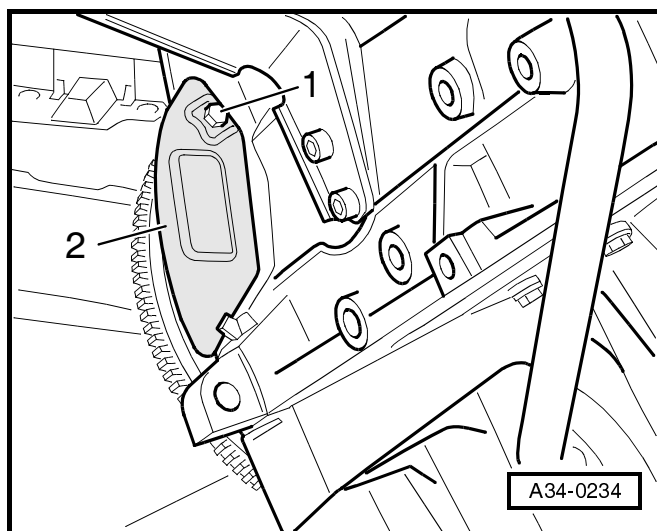
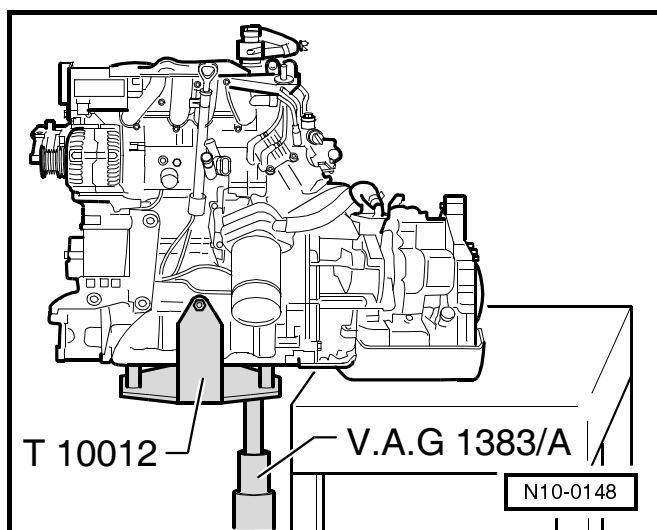
When measuring the cylinder bore ⇒ Chap. 13-4 the engine must not be fixed to the assembly support.

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.
- Unscrew bolt -1-.
- Lift cover plate -2- up and off.

Note!

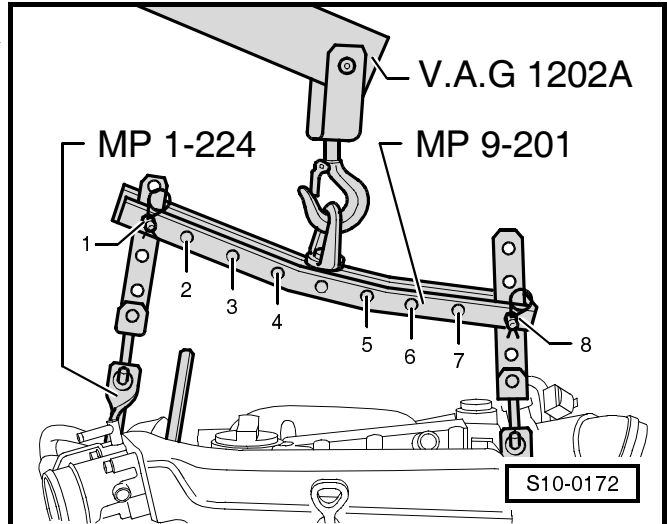
The illustration shows the gearbox removed.



- Remove engine/gearbox connecting screws.
- Press gearbox from engine.
- Attach suspension device -MP 9-201- with bracket -MP1-224- to the engine as follows and lift out of engine/gearbox jack (e. g. -V.A.G 1202 A-) with workshop crane (e. g. -V.A.G 1383 A-).
- ◆ On the belt pulley side: 3. Hole of the perforated bar in position 1
- ◆ On the flywheel side: 2. 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.

10-2 Installing the engine

Special tools, test and measuring equipment and auxiliary items required

♦ ⇒ Chapter 10-1



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 052 211 2 A3- before installing.*
- ♦ *Tightening torques ⇒ **10-2** page 2.*
- ♦ *Assembly bracket ⇒ **10-2** page 3.*

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

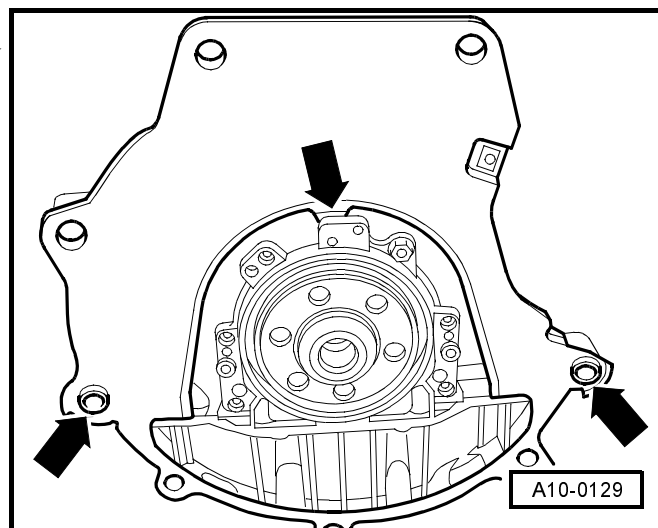
- Check whether the dowel sleeves for centering the engine/gearbox are present in the cylinder block; insert if necessary.
- Check whether the intermediate plate has been inserted on the sealing flange and rests on the dowel sleeves -arrows-.
- Slightly grease the clutch release bearing, guide bushing for clutch release bearing and serration of the drive shaft with grease -G 000 100 -.
- If necessary check the centering of the clutch disc.
- Install slave cylinder of hydraulic clutch ⇒ 5-Speed Manual Gearbox 02J; Rep. Gr. 30.
- Attach shift mechanism and set ⇒ 5-Speed Manual Gearbox 02J; Rep. Gr. 34.
- 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 2.

When tightening up the bolts for the engine and gearbox mounts, the engine support and the gearbox mounting bracket must be resting fully against the mount.

- Install alternator ⇒ Electrical System; Rep. Gr. 27
- Install AC compressor ⇒ Heating, Air Conditioning; Rep. Gr. 87.
- Install power-assisted steering hydraulic pump ⇒ Running Gear; Rep. Gr. 48.
- Install the coolant hoses ⇒ Chapter 19-1.



- Electrical connections and proper routing ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations.
- Install secondary air pump with bracket ⇒ Chapter 26-3.
- Before starting the engine, inspect oil level ⇒ Inspection and Maintenance.
- When the battery is disconnected and reconnected, carry out additional operations ⇒ Electrical System; Rep. Gr. 27.
- Make a test drive and interrogate the fault memory ⇒ Vehicle Diagnosis, Measuring and Information System VAS 5051; .

**Note**

If a charger is used as a starting aid there is the risk of damaging the control units on the vehicle.

Aligning unit mounting for engine and gearbox

**Warning!**

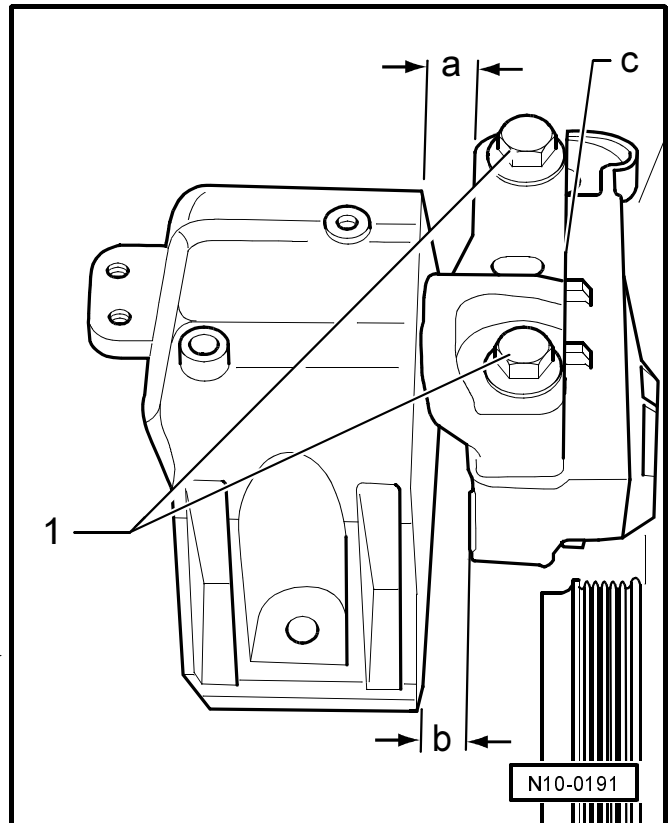
Before slackening the bolts, the unit must be secured with the supporting device -MP 9-200-.

Engine assembly bracket

a = 14.0 mm

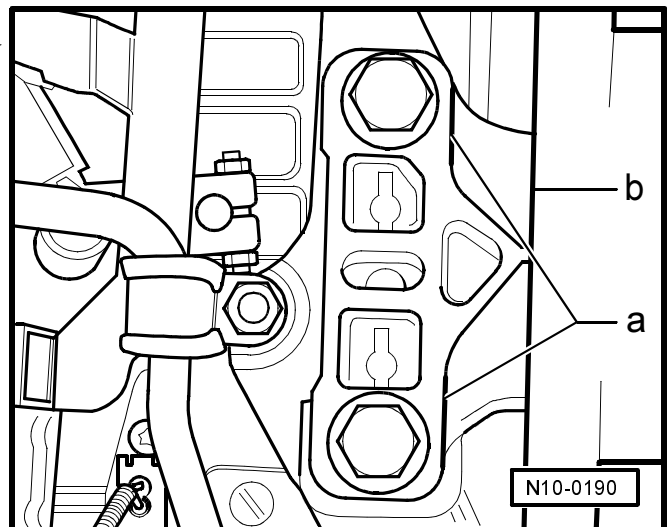
b = at least 10.0 mm

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



Gearbox assembly bracket

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. Do not use Molykote.
- ♦ Do not use degreased parts.
- ♦ Unless otherwise indicated the following tightening torques apply:

Component		Nm
Screws/nuts	M6	9
	M7	13
	M8	20
	M10	40
	M12	70
deviations:		
Engine mounting, gearbox mount, pendulum support		⇒ Assembly bracket
Engine to gearbox connecting screws		⇒ 5-Speed Manual Gearbox 02J; Rep. Gr. 34

Assembly bracket

Engine mounting

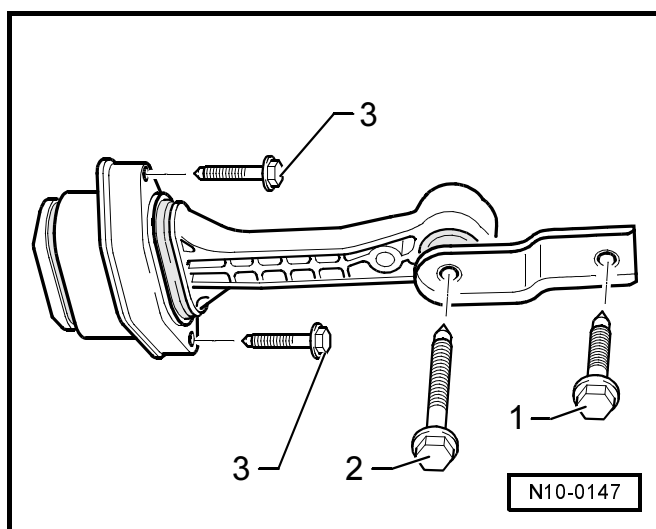
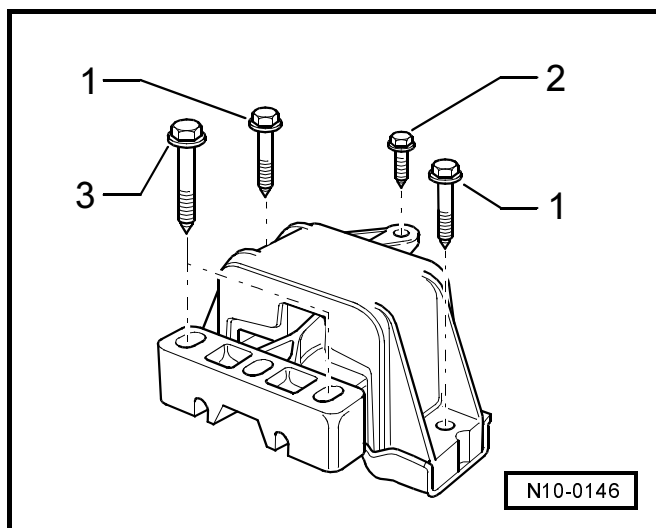
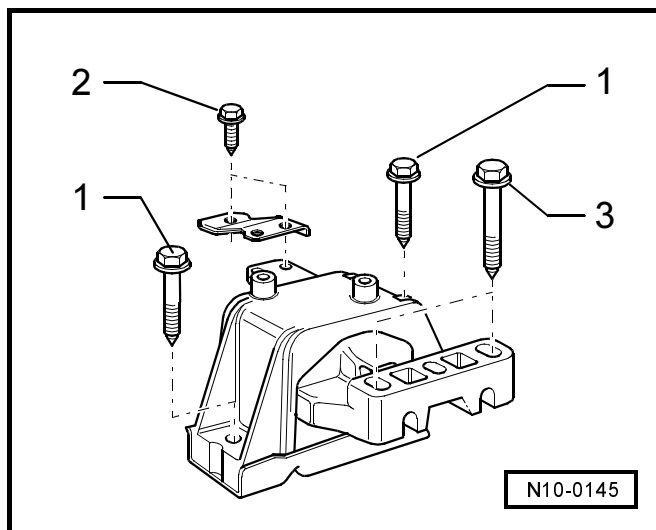
- 1 - 40 Nm + 90° ($\frac{1}{4}$ turn)¹⁾
- 2 - 25 Nm
- 3 - 100 Nm¹⁾

Gearbox mounting

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

Hinged bracket

- 1 - 40 Nm + 45° ($\frac{1}{8}$ turn)¹⁾
- 2 - 40 Nm + 45° ($\frac{1}{8}$ turn)¹⁾
- 3 - 20 Nm + 90° ($\frac{1}{4}$ turn)¹⁾



¹⁾ Replace bolts

13 – Crankgear

13-1 Removing and installing V-ribbed belt

⇒ 1.8 litre/92 kW Engine - Mechanics; Rep. Gr. 13

13-2 Removing and installing, tightening the toothed belt

⇒ 1.8 I/110 kW Engine, Mechanical Components;
Rep. Gr. 13

13-3 Removing and installing sealing flanges and fly-wheel

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 13

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 8 does not rest on anything or get damaged.
- ♦ 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-.
- ♦ Pay attention to colour coding when inserting bearing shells ⇒ Fig. 1 in **13-4** page 2

1 - Bearing shells 1, 2, 3, 4 and 5

- ☐ classification for ordering replacement parts ⇒ Fig. 1 in **13-4** page 2
- ☐ for cylinder block with lubricating groove
- ☐ do not mix up used bearing shells (mark)

2 - Sprocket

- ☐ for oil pump drive

3 - Bearing shell

- ☐ for bearing cap without lubricating groove
- ☐ do not mix up used bearing shells
- ☐ classification for ordering replacement parts ⇒ Fig. 1 in **13-4** page 2

4 - Thrust washers

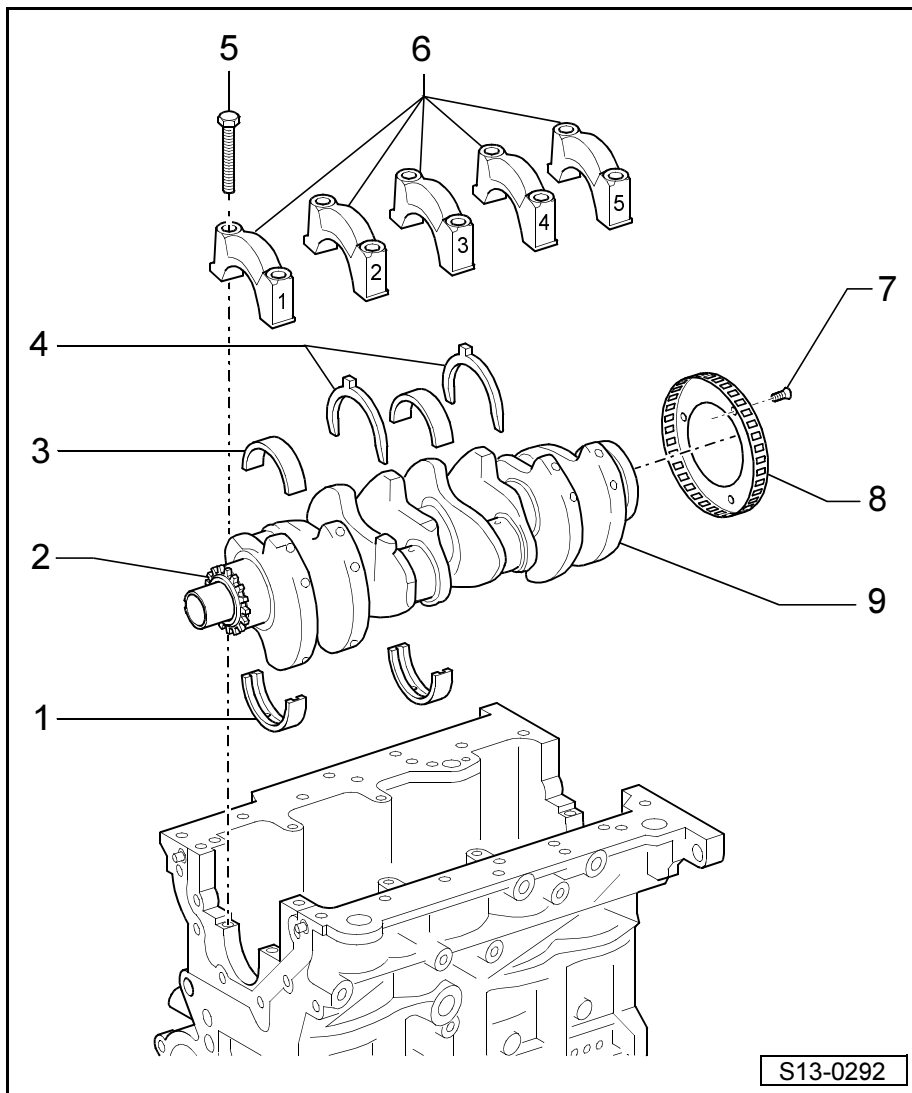
- ☐ for bearing 3
- ☐ pay attention to the marking

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

- ☐ replace

6 - Bearing caps

- ☐ bearing cap 1: on the belt pulley side
- ☐ bearing cap 3: with recesses for thrust washers
- ☐ retaining lugs of the bearing shells of the cylinder block/ bearing cap must be on top of one another



S13-0292

7 - 10 Nm + torque a further 90° (1/4 turn)

- ☐ replace
- ☐ replace sensor rotor each time the bolts are slackened

8 - Rotor

- ☐ for engine speed sender -G28-
- ☐ replace each time the bolts are slackened
- ☐ removing and installing ⇒ Fig. 2 in **13-4** page 2

9 - Crankshaft

- ☐ axial play when new: 0.07...0.23 mm
wear limit: 0.30 mm
- ☐ Crankshaft bearing journal: $\varnothing$ 54.00 mm
- ☐ Conrod bearing journal: $\varnothing$ 47.80 mm

Fig. 1: 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).

1	=	Marking for bearing 1
2	=	Marking for bearing 2
3	=	Marking for bearing 3
4	=	Marking for bearing 4
5	=	Marking for bearing 5

i 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

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

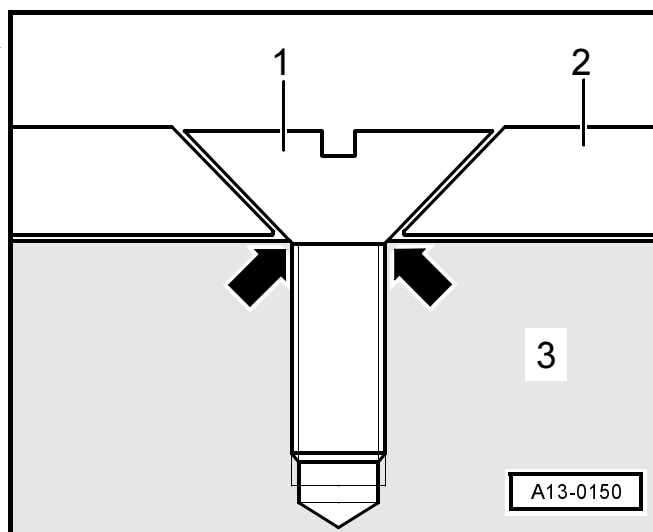
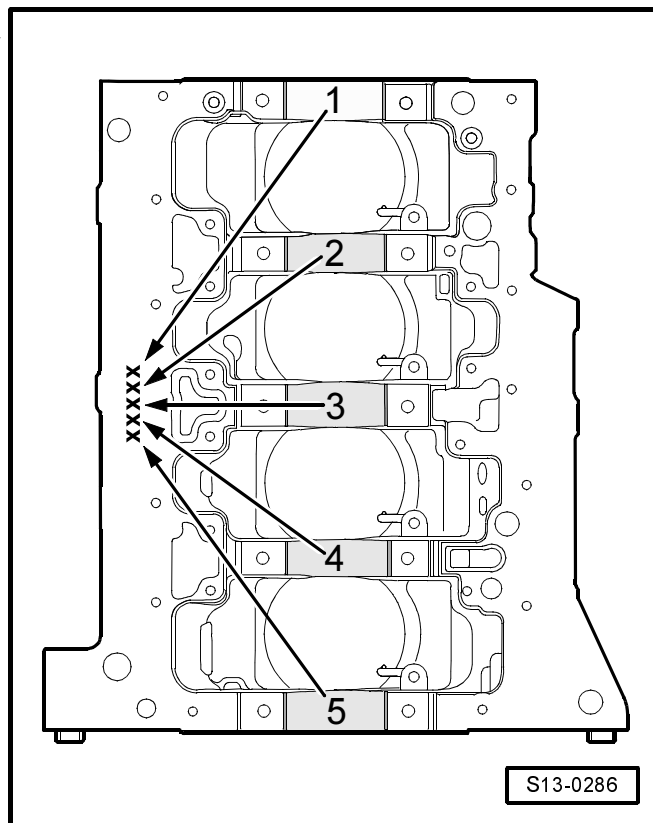
Fig. 2: Removing and installing sensor rotor ►

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

Tightening torque: 10 Nm + torque a further $\frac{1}{4}$ turn (90°).

i 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.



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-.
- ◆ Spray nozzle and pressure relief valve ⇒ Fig. 8 in **13-4** page 5

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

- ☐ replace
- ☐ oil thread and head contact surface

2 - Conrod cap

- ☐ mark assignment to cylinder -B-
- ☐ Fitting position: markings -A- point toward belt pulley side

3 - Bearing shell

- ☐ top bearing shell with oil drilling to piston
- ☐ fitting position ⇒ Fig. 6 in **13-4** page 5
- ☐ do not mix up used bearing shells (mark)
- ☐ axial clearance
New: 0.05...0.31
wear limit: 0.37 mm

4 - Conrod

- ☐ replace as a set only
- ☐ mark assignment to cylinder -B-
- ☐ Fitting position: markings -A- point toward belt pulley side

5 - Circlip

6 - Piston pin

- ☐ if stiff, heat piston to 60 °C
- ☐ use drift -VW 222A- for removing and installing

7 - Piston

- ☐ check ⇒ Fig. 5 in **13-4** page 4
- ☐ mark installation position and matching cylinder
- ☐ arrow on piston crown faces towards the belt pulley side
- ☐ use piston ring tensioning strap for installing
- ☐ replace if cracks present
- ☐ Ø Pistons: 80.965 mm
- ☐ Ø Cylinder: 81.01 mm
- ☐ inspect cylinder bore ⇒ Fig. 7 in **13-4** page 5

8 - Piston rings

- ☐ offset joint 120°
- ☐ use piston ring pliers for removing and installing
- ☐ marking „TOP“ must face towards piston crown
- ☐ inspect gap clearance ⇒ Fig. 3 in **13-4** page 4
- ☐ inspect end clearance ⇒ Fig. 4 in **13-4** page 4

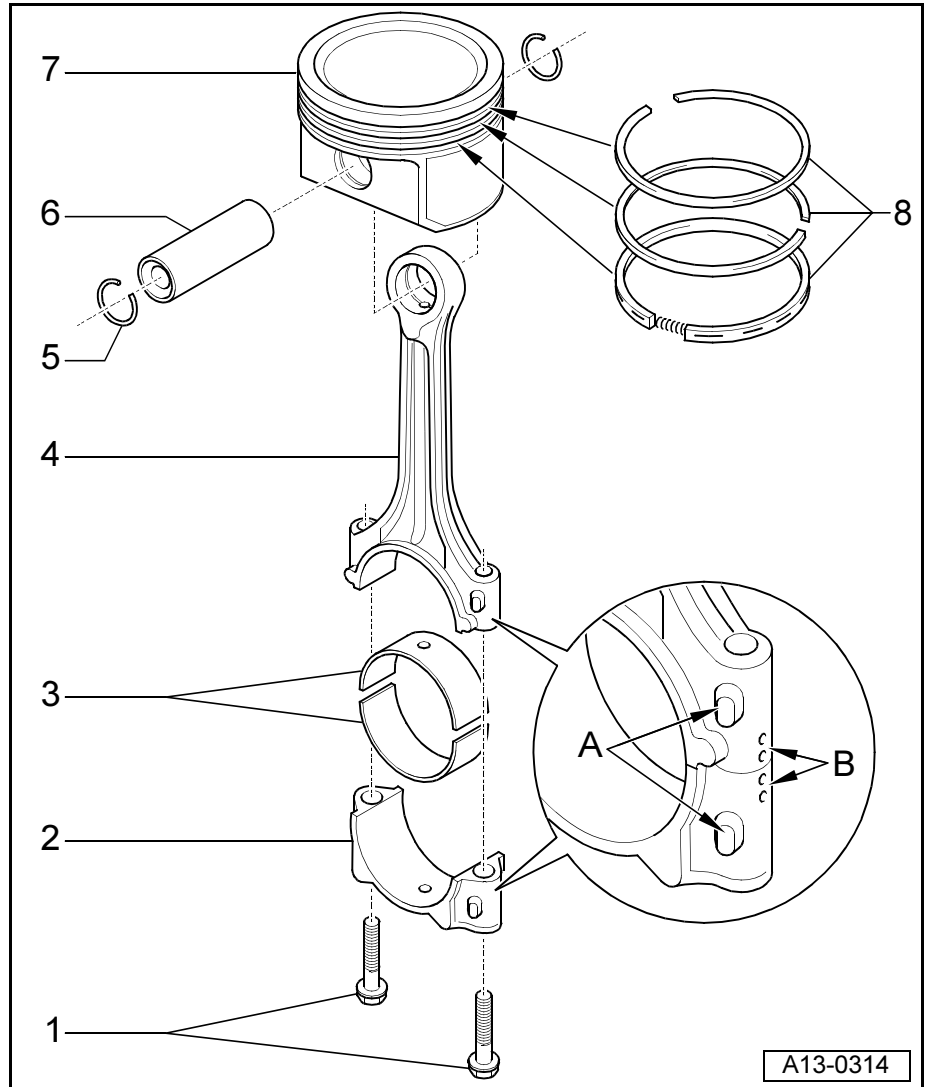


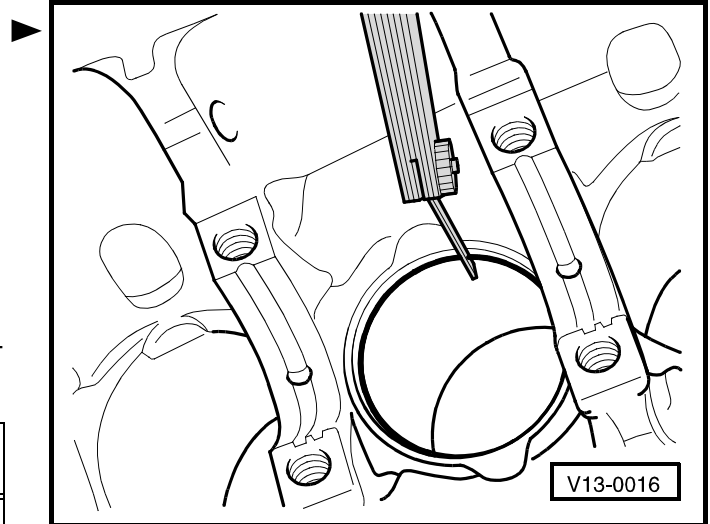
Fig. 3: Inspecting piston ring gap clearance**Special tools, test and measuring equipment and auxiliary items required**

- ♦ Feeler gauge

Test sequence

- Push in ring at right angles to the cylinder wall from the top through to the bottom cylinder opening, about 15 mm from the cylinder edge. To insert use piston without rings.

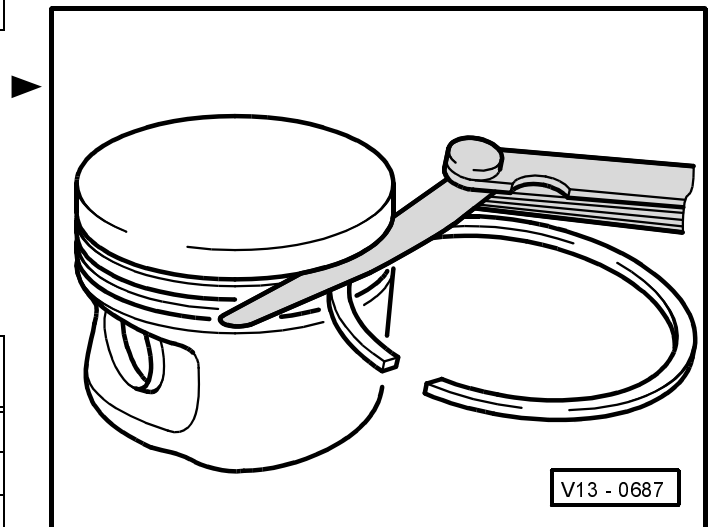
Piston ring	new (mm)	Wear limit (mm)
1. Compression ring	0.20...0.40	0,8
2. Compression ring	0.20...0.40	0,8
Oil scraper ring	0.25...0.50	0,8

**Fig. 4: Inspect piston ring end clearance****Special tools, test and measuring equipment and auxiliary items required**

- ♦ Feeler gauge

- Clean ring groove before inspecting.

Piston ring	new (mm)	Wear limit (mm)
1. Compression ring	0.06...0.09	0,20
2. Compression ring	0.05...0.08	0,20
Oil scraper ring	0.03...0.06	0,15

**Fig. 5: 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, at right angles to the piston pin shaft.

Deviations from specified dimension: max. 0.04 mm

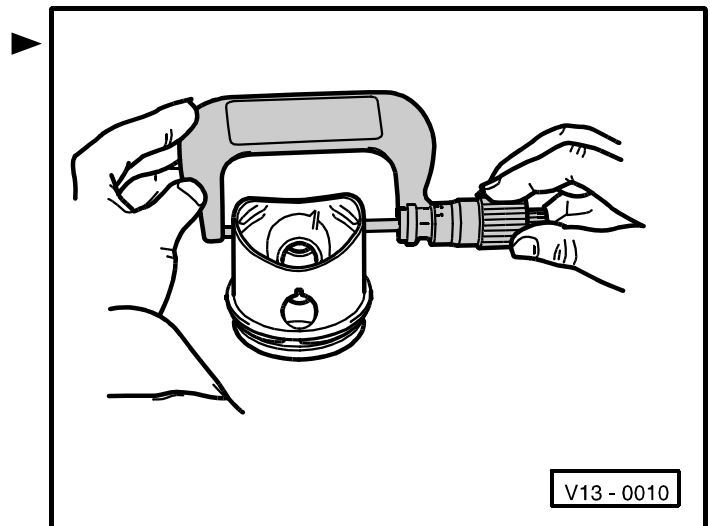


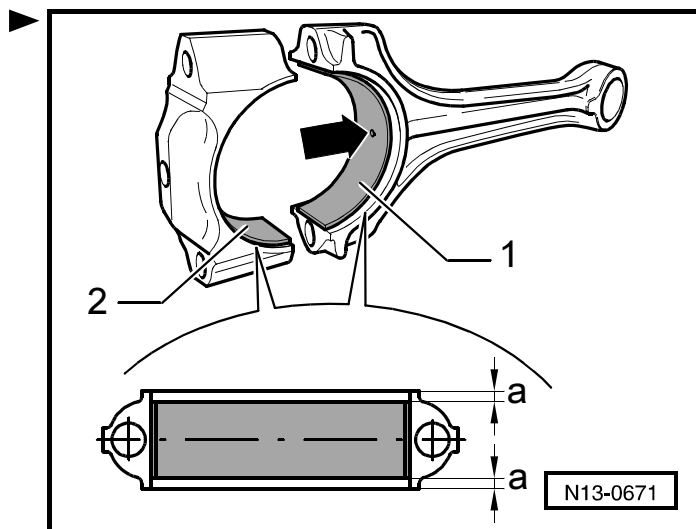
Fig. 6: Bearing shell installation position

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

Bearing shell -2- without oil drilling for conrod cover.

- Insert bearing shells into conrod and into conrod cover centred.

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

**Fig. 7: Inspecting cylinder bore**

Special tools, test and measuring equipment and auxiliary items required

- ◆ Internal precision measuring instrument 50...100 mm

Test sequence

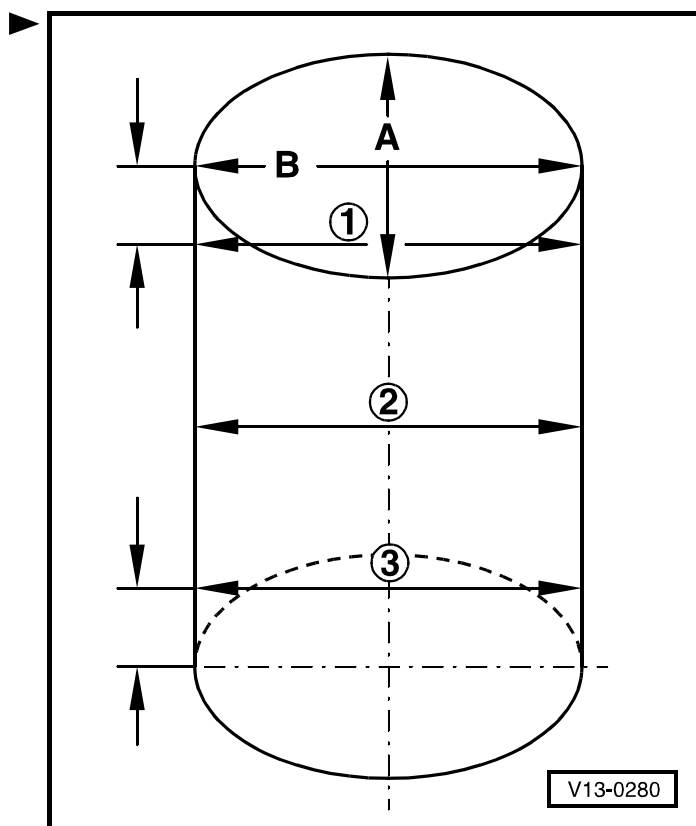
- Measure at 3 points crosswise in a transverse direction -A- and lengthwise -B-.

Deviations from specified dimension: max. 0.10 mm



Note

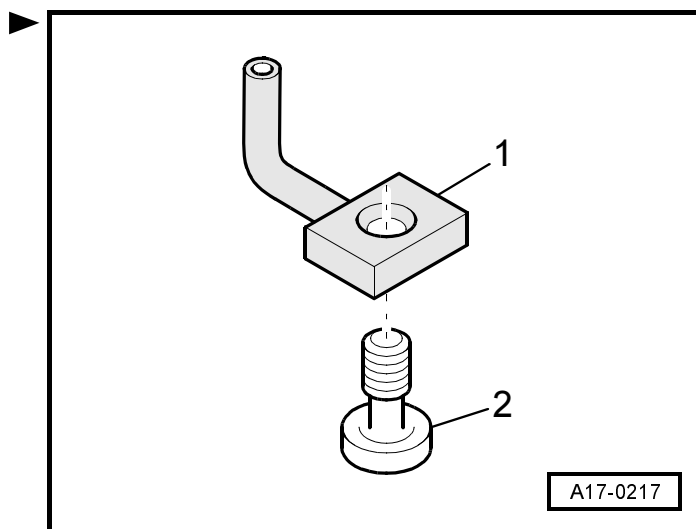
Do not measure the cylinder bore if the cylinder block is fixed to the assembly stand with the engine mount -MP 1-202-, as this may result in incorrect measurements.

**Fig. 8: Oil spray nozzle and pressure relief valve**

1 - Oil spray nozzle (for cooling piston)

2 - Bolt with pressure relief valve - 27 Nm

- ◆ Opening pressure 0.13...0.16 MPa (1.3... 1.6 bar)



15 – Cylinder Head, Valve Gear

15-1 Removing and installing cylinder head



Note

- ◆ Always replace cylinder head bolts.
- ◆ Always replace self-locking nuts.
- ◆ Hose connections and hoses for charge air system must be free of oil and grease before being installed.
- ◆ When installing an exchange cylinder head with the camshaft installed, it is necessary to oil the contact surfaces between bucket tappets and the cam track.
- ◆ Do not remove the plastic covers supplied as a protection for the open valves until just before fitting on the cylinder head.
- ◆ If the cylinder head is replaced, the system must be completely filled with fresh coolant.

Removing and installing intake manifold ⇒ 1.8 litre/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

Removing and installing timing belt ⇒ 1.8 litre/110 kW Engine, Mechanics; Rep. Gr. 13

Testing compression pressure ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 15

Summary of components

1 - Cover plate

- ☐ replace seal if damaged

2 - 10 Nm

3 - Cylinder head cover

- ☐ for removing
 - ♦ Vacuum reservoir
 - ♦ Ignition coils
 - ♦ Wiring loom
 - ♦ Crankcase ventilation hose
 - ♦ Remove timing belt guard - top part

4 - Gasket for cylinder head cover

- ☐ replace if damaged
- ☐ before fitting on, coat contact points of bearing cap and camshaft adjuster to cylinder head with -D 454 300 A2-
⇒ 1.8 l/92 kW Engine, Mechanical Components; Rep. Gr. 15

5 - Oil deflector

- ☐ check fitting position: above inlet camshaft

6 - Cylinder head

- ☐ inspect for distortion ⇒ 1.8 l/92 kW Engine, Mechanical Components; Rep. Gr. 15
- ☐ reworking dimension ⇒ 1.8 litre/110 kW Engine, Mechanics; Rep. Gr. 15
- ☐ removing and installing ⇒ **15-1** page 2
- ☐ after replacing, fill entire system with fresh coolant

7 - Intake manifold gasket

- ☐ replace

8 - Cylinder head gasket

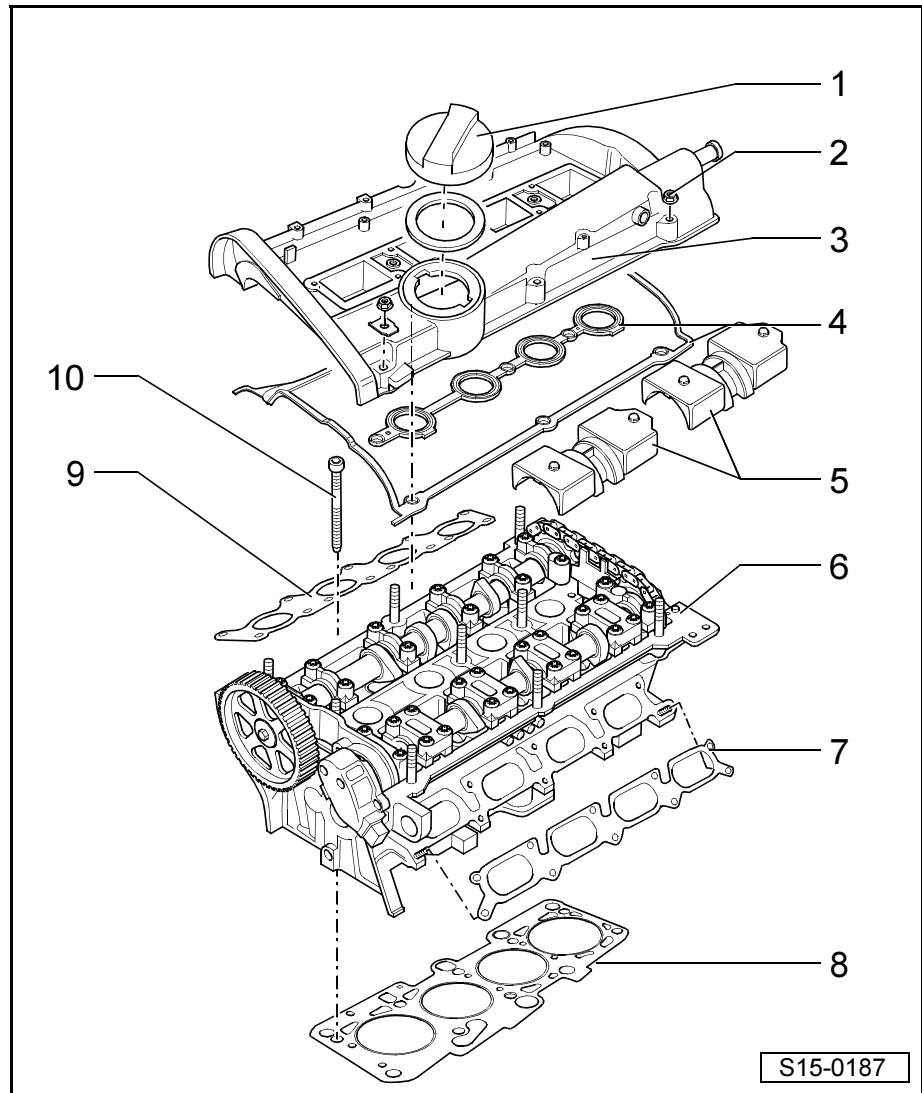
- ☐ replace
- ☐ metal gasket
- ☐ check fitting position: Identification: The spare part number must be legible

9 - Exhaust manifold gasket

- ☐ replace
- ☐ check fitting position

10 - Cylinder head bolt

- ☐ replace
- ☐ pay attention to specified order when slackening and tightening ⇒ **15-1** page 2



Removing and installing cylinder head

- Engine installed

Special tools, test and measuring equipment and auxiliary items required

- ◆ Torque wrench
- ◆ Pliers for spring strap clips
- ◆ Catch pan (e.g. -V.A.G 1306-)
- ◆ Locking pin (e. g. -T40011-)
- ◆ Clamp bolt -T10092-
- ◆ Wrench (e.g. -3452-)
- ◆ Guide bolts -T30011/2A-
- ◆ Screwdriver -T30011/3-
- ◆ Hot screw paste -G 052 112 A3-

Removing



Note

When the battery is disconnected and reconnected, carry out additional operations ⇒ Electrical System; Rep. Gr. 27.

- Disconnect the earth strap from the battery with the ignition off.
- All cable straps which are detached or cut open when removing, should be fitted on again in the same place when installing.
- Remove intake manifold ⇒ 1.8 litre/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.
- Disconnect air hose -2- from top air guide pipe -1- (quick-coupling).
- Screw off clamp -8- on the bottom bracket of top air guide pipe.
- Disconnect the air hose -6- from outlet connection -5- of turbocharger.
- Unbolt the shield plate -7- -arrow-.
- Remove the air filter housing.
- Unplug connector -4-.
- Disconnect hose connections -2-, -3-, -6- and -7-.
- Pull out the locking clasp at the connection of the turbocharger as far as the stop and take off the intake air hose -5-.

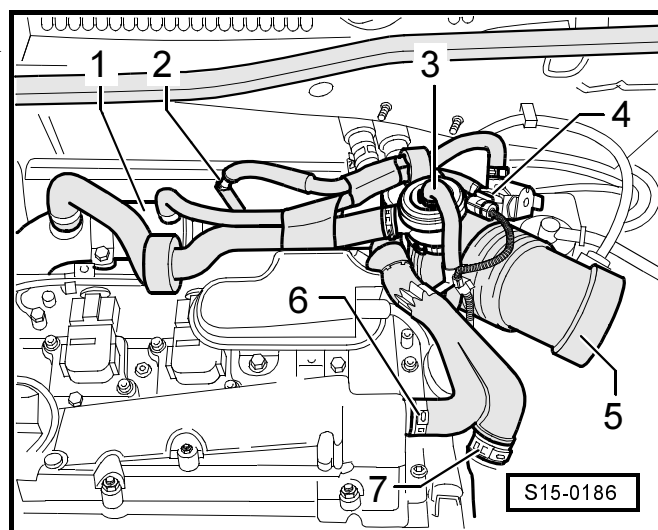
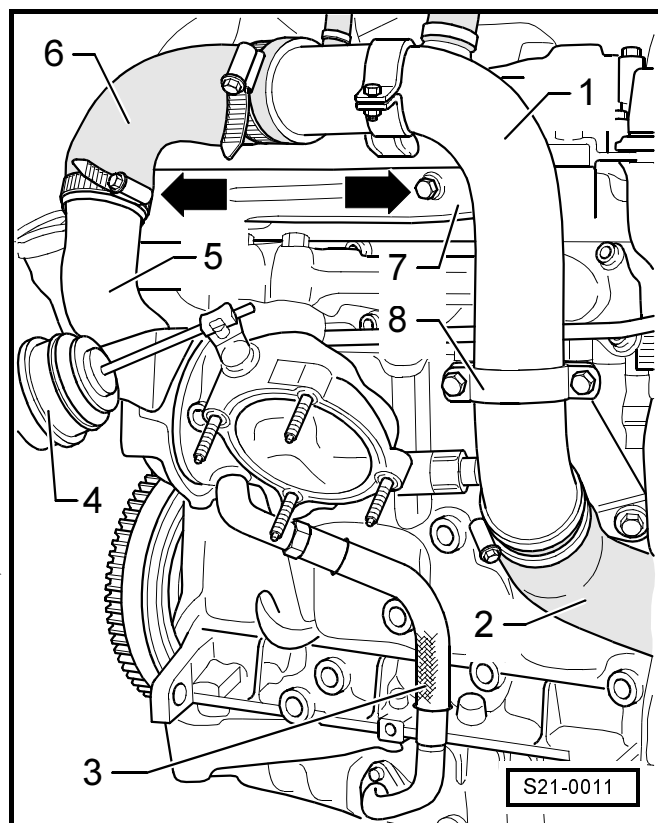


Note

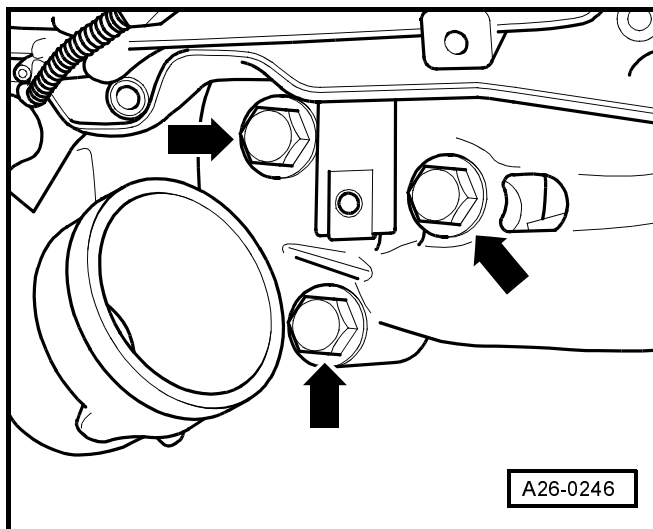
Seal off the opening in the intake tract of the turbocharger with a clean cloth.

- Detach the top air guide pipe -1- and the intake air hose -5-.

The hoses remain connected.



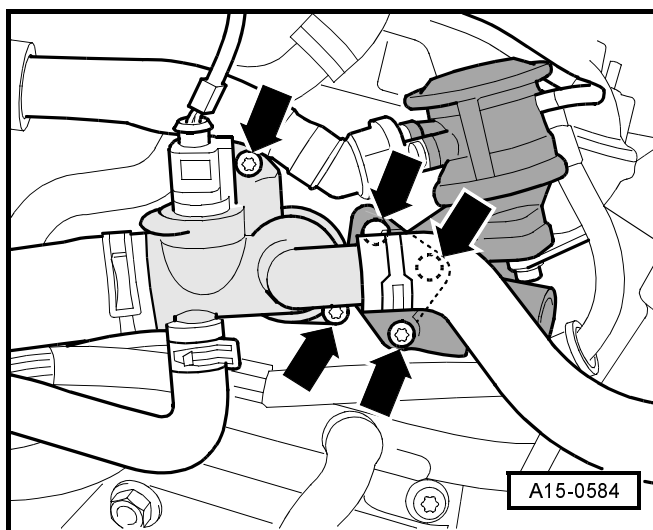
- Unscrew exhaust supercharger -arrows- from the exhaust manifold. ▶
- Pull out plug connector on the camshaft adjuster.



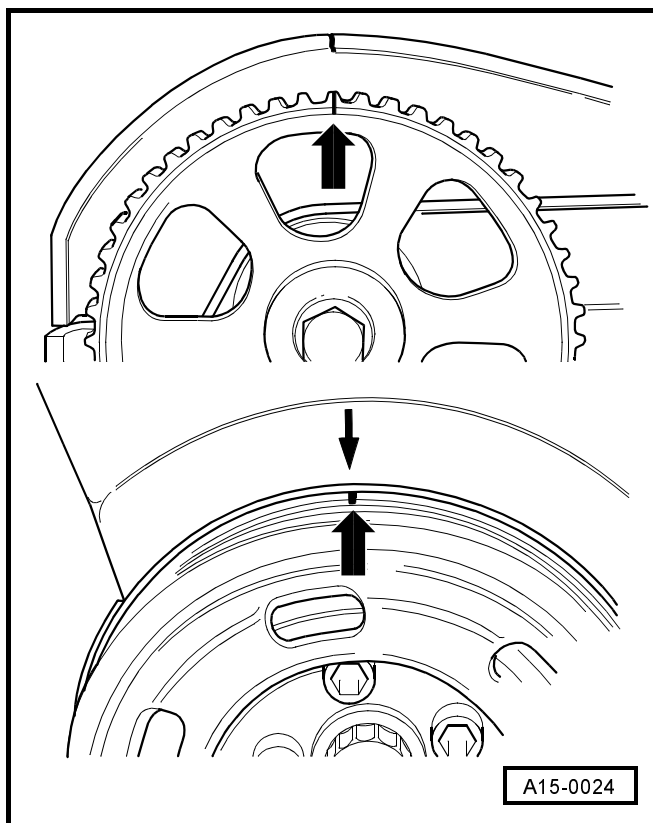
- First unbolt the coolant flange and then the flange for the secondary air injection combination valve at the cylinder head -arrows-.

**Note**

The plug connections and hoses remain connected.



- Rotate crankshaft at central bolt of crankshaft timing belt sprocket in direction of rotation of engine and position to TDC marking of cylinder 1 -arrows-.

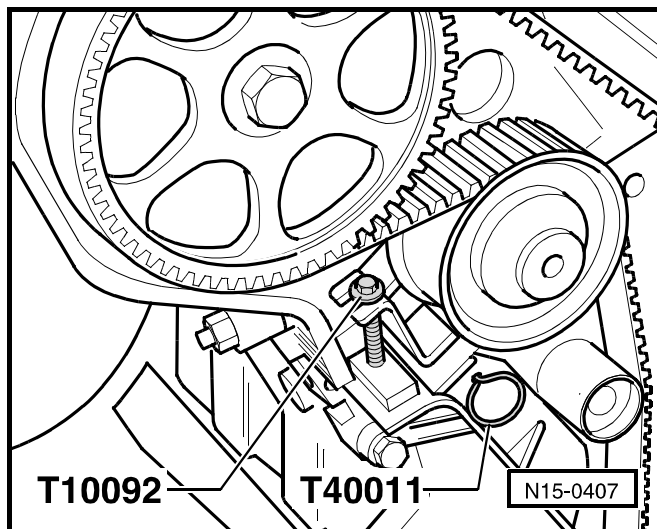


- Screw the clamping bolt -T10092- into the clamping fixture for the timing belt. ►
- Tension pressure piston of tensioning device just sufficiently to enable the pressure piston to be secured with a locking pin (e.g. locking pin -T40011-).

**Note**

Angle locking pin approx. 90° to more easily insert it.

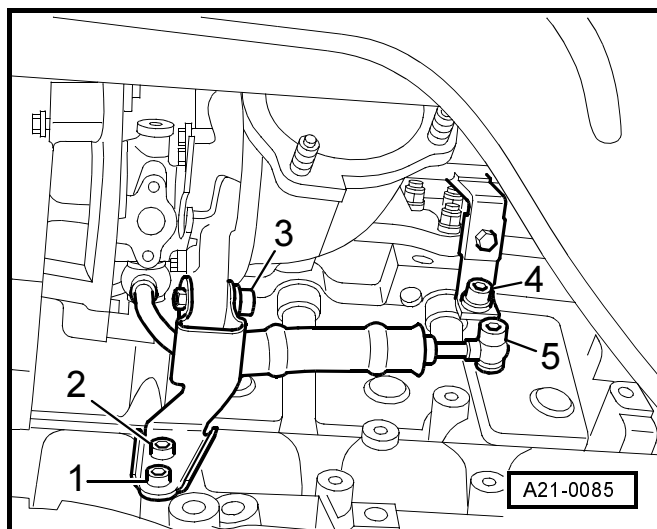
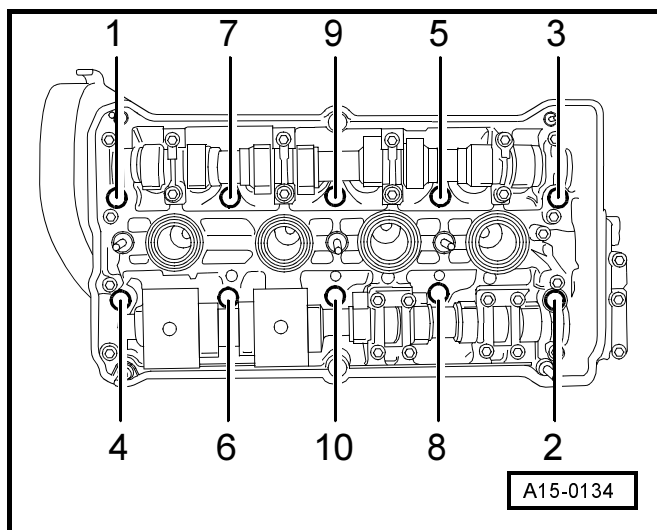
- Take toothed belt off camshaft sprocket.
- Turn crankshaft back slightly onto the TDC marking.
- Remove cylinder head cover ⇒ item 3 in **15-1** page 2.
- Slacken the cylinder head bolts in the specified order ►

**Installing**

- Pistons are not positioned at TDC

**Note**

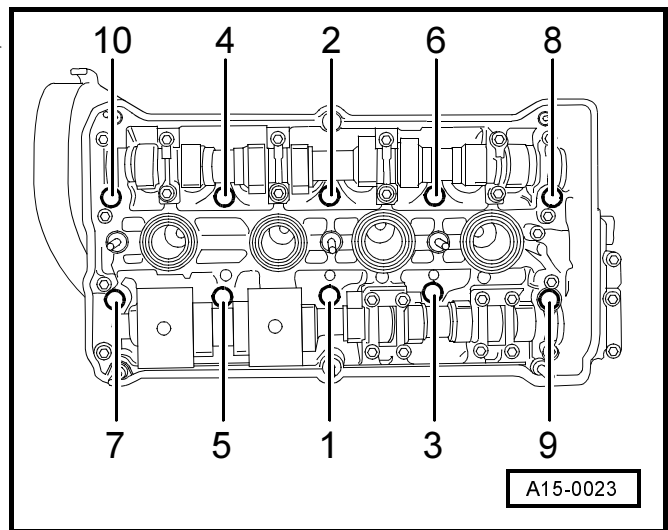
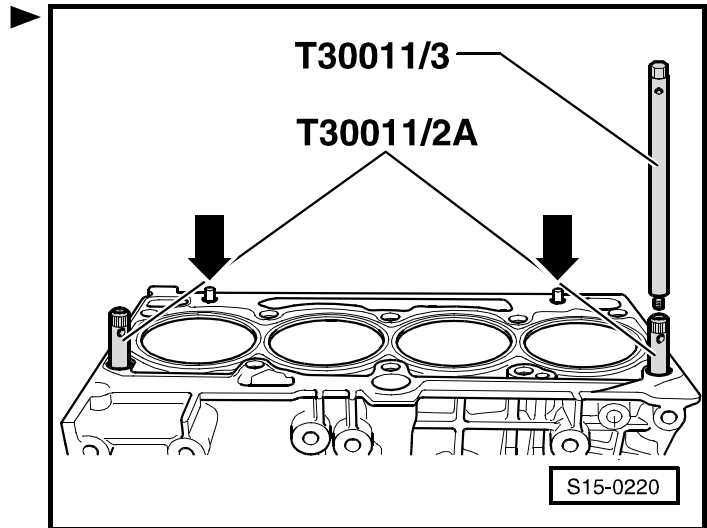
- ◆ Always replace cylinder head bolts.
- ◆ When conducting repairs sealant residues should be removed from the contact surface of the cylinder head using a chemical cleaner.
- ◆ Remove the new cylinder head seal from its wrapping immediately before fitting.
- ◆ Treat the new seal with the utmost care. Damage to the silicone layer and in the area of the bead results in leakages.
- ◆ There must not be any oil or coolant present in the holes for the cylinder head bolts.
- Slacken bolts -1-, -2- and -3- at the turbocharger bracket by about 2 turns in order to avoid any stresses when installing the cylinder head. ►
- Ensure that no piston is positioned at TDC.



- Position the new cylinder head gasket:
- ◆ Pay attention to centring pins in cylinder block -arrows-.
- ◆ Pay attention to installation position of cylinder head gasket, identification: The spare part number must be legible.
- To centre the cylinder head screw guide pins -T30011/2A- into the front outer holes for cylinder head bolts 8 and 10.
- Insert the cylinder head. Insert the remaining 8 cylinder head bolts and tighten by hand.
- Screw out guide bolts using a bolt tightener -T30011/3 -.
- Insert the remaining cylinder head bolts and tighten by hand.
- Tighten cylinder head bolts with wrench (e. g. -3452-) in the tightening order shown as follows:
- ◆ Tighten up all bolts to 40 Nm.
- ◆ Then, torque all bolts a further 90° (1/4 turn) using a rigid wrench.
- ◆ Finally, once again torque all bolts 90° (1/4 turn).

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

- Bolt turbocharger with new gasket to the exhaust manifold and bolt the bracket to the cylinder block ⇒ Chapter 21-2.
- Install cylinder head cover ⇒ item 3 in **15-1** page 2.
- Install timing belt, tension ⇒ 1.8 litre/110 kW Engine, Mechanics; Rep. Gr. 13.
- Install intake manifold ⇒ 1.8 litre/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.
- Replace the coolant if a new cylinder head has been installed ⇒ Chapter 19-1.



Note

When the battery is disconnected and reconnected, carry out additional operations ⇒ Electrical System; Rep. Gr. 27.

Testing compression

⇒ 1.8 I/92 kW Engine - Mechanical Components; Rep. Gr. 15

15-2 Repairing valve gear



Note!

- ♦ The valve gear is identical to that of the 1.8 I/92 kW engine.
- ♦ With the exception of the items listed below, all the information and items correspond to those in the Workshop Manual 1.8 I/92 kW Engine, Mechanical Components; Repair Group 15.

2 - Inlet camshaft

- ☐ slack: max. 0.035 mm
- ☐ removing and installing
⇒ Chap. 15-3

4 - Camshaft adjuster

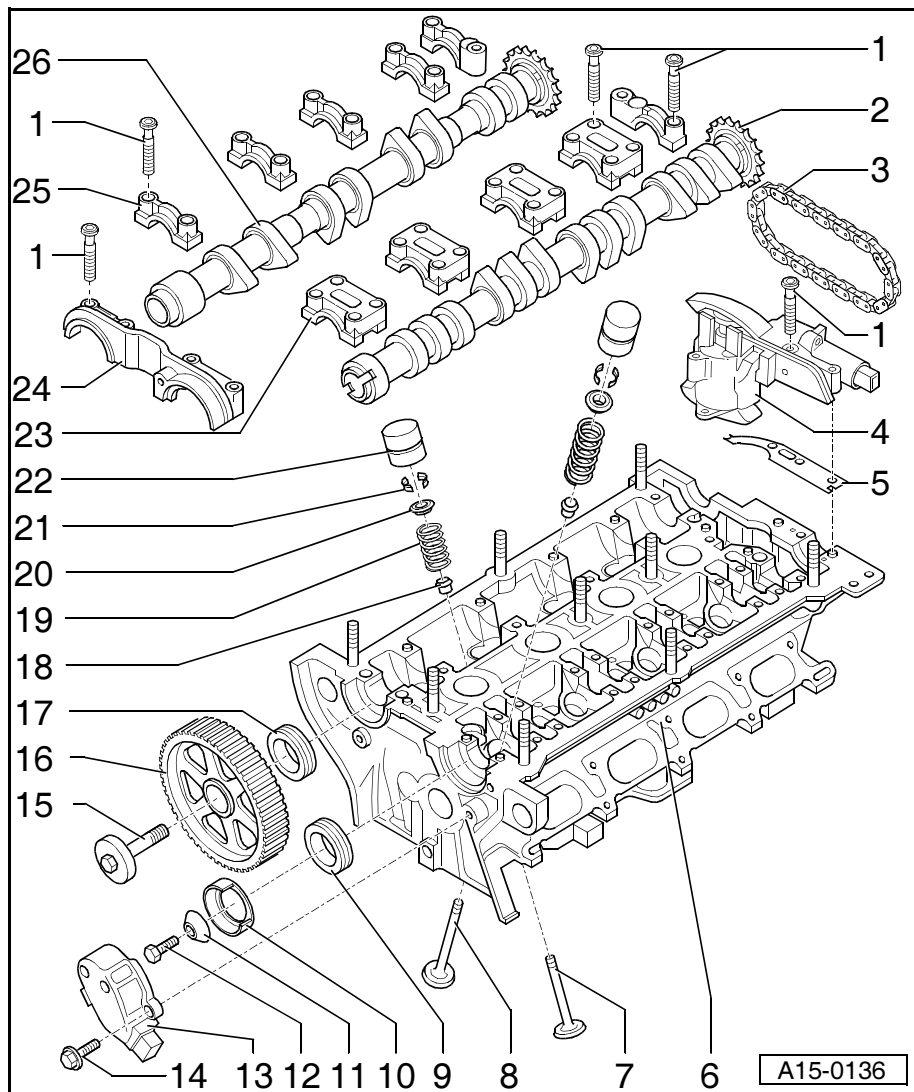
- ☐ removing and installing
⇒ Chap. 15-3

6 - Cylinder head

- ☐ removing and installing
⇒ Chap. 15-1
- ☐ reworking valve seats
⇒ Chap. 15-4

26 - Exhaust camshaft

- ☐ removing and installing
⇒ Chap. 15-3



15-3 Camshaft

Inspecting axial play of camshaft

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

Removing and installing camshafts and camshaft adjuster

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

Variation:

- ♦ Removing and installing cylinder head cover ⇒ Chap. 15-1

Replacing exhaust camshaft seal

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

Replacing inlet camshaft seal

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

Testing hydraulic bucket tappets

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

15-4 Valve dimensions/Valve stem seals/Valve guides/Valve seats

Valve dimensions

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

Replacing valve stem seals

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

Inspecting valve guides

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

Reworking valve seats

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 15

Variations:

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- vertically between end of valve stem and top edge of cylinder head -1-.
- Calculate max. permissible reworking dimension from the distance measured and the minimum dimension.

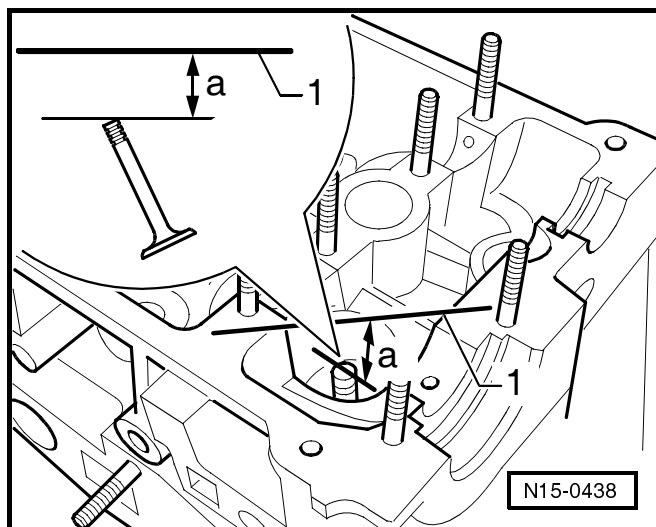
Minimum dimension:

- ♦ Inlet valve on outside: 31.0 mm
- ♦ Inlet valve in middle: 32.3 mm
- ♦ Exhaust valve: 31.9 mm

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

Example:

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



**Note!**

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

17 – Lubrication

17-1 Removing and installing parts of the lubrication system

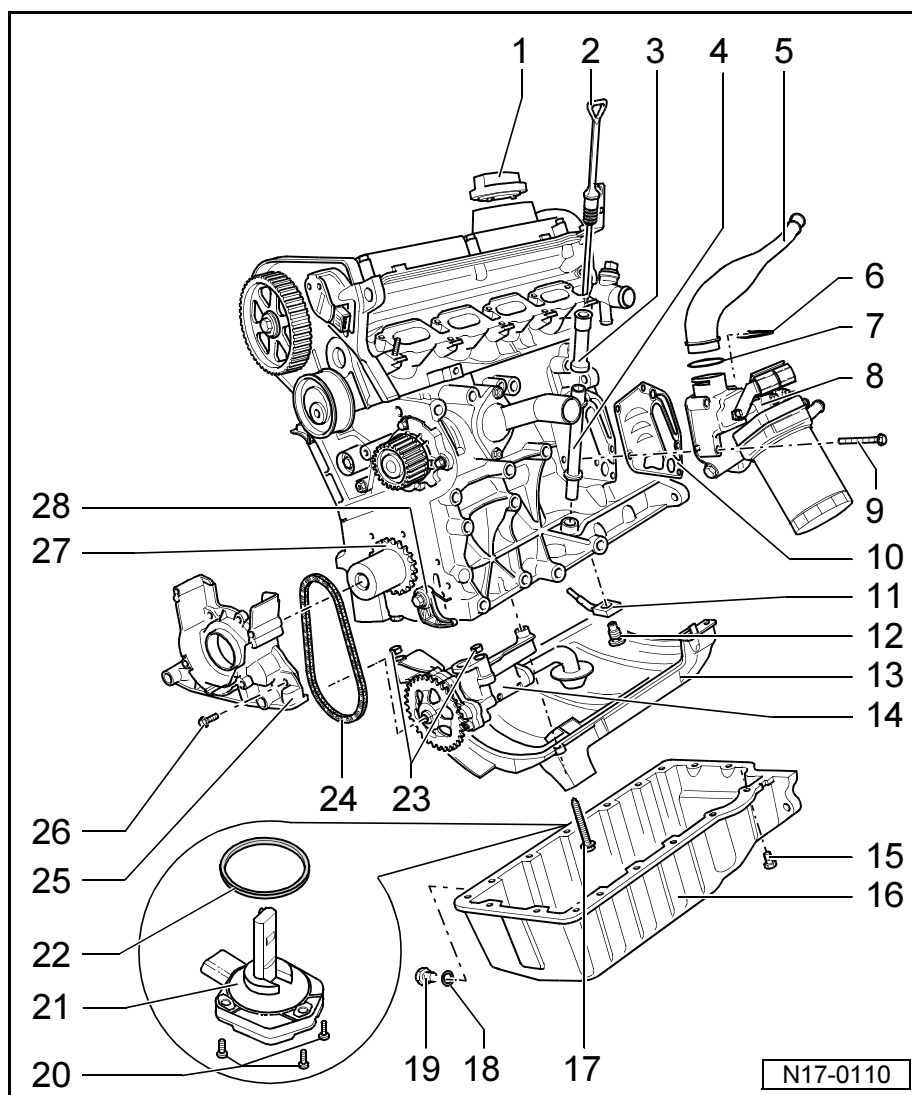


Note

- ♦ 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, it is necessary to determine the cause of the rubbing damage and replace the damaged parts, then carefully clean the oil galleries in order to avoid consequential damage.
- ♦ The oil level must not be above the max. marking - risk of damage to catalytic converter!

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

- 1 - Cover plate**
 - ☐ replace seal if damaged
- 2 - Dipstick**
 - ☐ oil level must not exceed max. marking!
- 3 - Filler funnel**
 - ☐ remove for extracting oil
- 4 - Guide tube**
- 5 - Connecting tube**
- 6 - Retaining clip**
 - ☐ check tightness
- 7 - O-ring**
 - ☐ replace if damaged
- 8 - Oil filter holder**
 - ☐ disassembling and assembling ⇒ **17-1** page 3
- 9 - 15 Nm + torque a further 90° (1/4 turn)**
- 10 - Gasket**
 - ☐ replace
- 11 - Oil injection nozzle**
 - ☐ for piston cooling
- 12 - Pressure relief valve, 27 Nm**
 - ☐ opening pressure: 0.25...0.32 MPa (2.5...3.2 bar)
- 13 - Baffle**
- 14 - Oil pump with sprocket**
 - ☐ with pressure relief valve 1.2 MPa (12 bar)
 - ☐ before installing, check whether both dowel sleeves for centering oil pump/cylinder block are present



- ☐ if there is any scoring on contact surfaces and gears, replace

15 - 15 Nm**16 - Oil pan**

- ☐ clean sealing surface before installing
- ☐ before installing, coat with silicone sealant - D 176 404 A2- ⇒ Chapter 17-2

17 - 15 Nm**18 - Gasket**

- ☐ replace

19 - Oil drain plug, 30 Nm**20 - 10 Nm****21 - Oil level and oil temperature sender -G266-**

- ☐ check ⇒ Current Flow Diagrams, Electrical Fault Finding and Fitting Locations

22 - Gasket

- ☐ replace

23 - Dowel sleeves**24 - Chain****25 - Sealing flange**

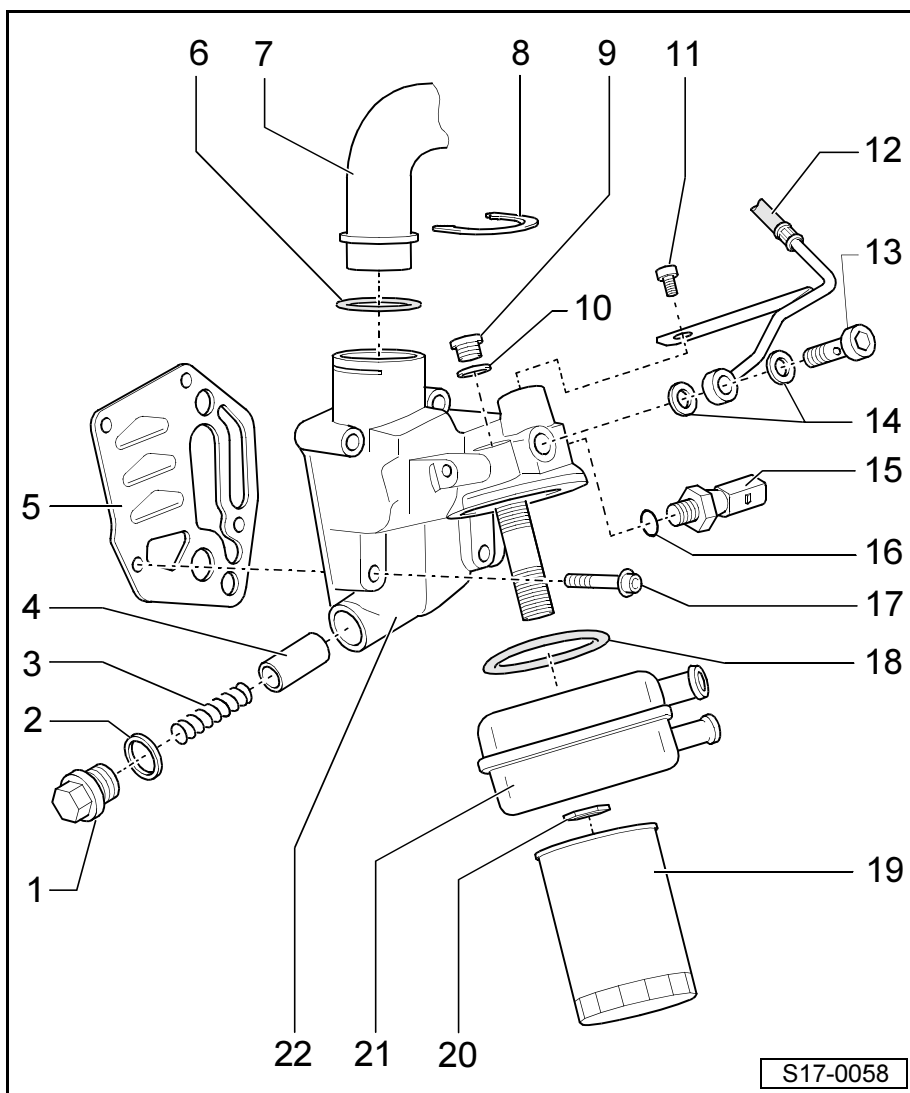
- ☐ removing and installing ⇒ Chapter 13-3

26 - 15 Nm**27 - Oil pump sprocket****28 - Chain tensioner with tensioning rail, 15 Nm**

- ☐ when installing, pretension spring and attach

Disassembling and assembling the oil filter holder

- 1 - Screw plug, 40 Nm**
- 2 - Gasket**
 - ☐ replace
- 3 - Spring**
 - ☐ for pressure relief valve approx. 0.4 MPa (4 bar)
- 4 - Piston**
 - ☐ for pressure relief valve approx. 0.4 MPa (4 bar)
- 5 - Gasket**
 - ☐ replace
- 6 - O-ring**
 - ☐ replace
 - ☐ push onto tube as far as the collar ⇒ item 7
- 7 - Pipe section**
 - ☐ replace
 - ☐ push onto tube as far as the collar ⇒ item 7
- 8 - Retaining clip**
- 9 - Screw plug, 15 Nm**
- 10 - Gasket**
 - ☐ cut open if leaking and replace
- 11 - 20 Nm**
- 12 - Oil feed line**
 - ☐ to exhaust turbocharger
- 13 - Hollow screw, 30 Nm**
- 14 - Seals**
 - ☐ replace
- 15 - 0.14 MPa (1.4 bar) oil pressure switch - F1-, 25 Nm**
 - ☐ black insulation
 - ☐ inspecting ⇒ Chapter 17-3
- 16 - Gasket**
 - ☐ cut open if leaking and replace
- 17 - 15 Nm + torque a further 90° (1/4 turn)**
 - ☐ replace
- 18 - Gasket**
 - ☐ replace
 - ☐ fit into the grooves on the oil cooler
- 19 - Oil filter**
 - ☐ slacken with tensioning strap
 - ☐ tighten by hand
 - ☐ pay attention to installation instructions on oil filter
 - ☐ pay attention to change intervals
- 20 - 25 Nm**
- 21 - Oil cooler**
 - ☐ pay attention to the notes ⇒ **17-1** page 1
 - ☐ ensure clearance to surrounding components
 - ☐ Connection diagram for coolant hoses ⇒ Chapter 19-1.



22 - Oil filter holder

- ☐ with pressure relief valve approx. 0.4 MPa (4 bar)
- ☐ with interference-fit return-flow check valve
- ☐ for vehicles > 06.02:

The following parts must be replaced if leaks are found in the area of the connection of the oil feed line (⇒ item 12 in **17-1** page 3) to the oil filter holder. the complete holder, oil feed line, hollow screw and gasket rings

17-2 Removing and installing oil pan

⇒ 1.8 I/110 kW Engine, Mechanical Components;
Rep. Gr. 17

17-3 Testing oil pressure and oil pressure switch

⇒ 1.8 I/110 kW Engine, Mechanical Components;
Rep. Gr. 17

19 – Cooling

19-1 Removing and installing parts of the cooling system - Part 1

Parts of the cooling system



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 for installing 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 and hose).
- ◆ Draining and filling up coolant ⇒ **19-1** page 2.
- ◆ Coolant mixing ratios ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 19.
- ◆ Inspecting cooling system for leaks ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 19.

1 - Radiator

- ☐ removing and installing
⇒ Chap. 19-2
- ☐ after replacing, fill entire system with fresh coolant

2 - Oil cooler

- ☐ removing and installing
⇒ Chap. 17-1

3 - Coolant thermostat

- ☐ removing and installing, inspecting ⇒ Chap. 19-2

4 - Coolant pump

- ☐ removing and installing
⇒ Chap. 19-2

5 - Expansion reservoir

6 - Cylinder block

7 - Exhaust turbocharger

8 - Heat exchanger of heating system

9 - Quick coupling

- ☐ Replace gasket rings, moisten with coolant additives

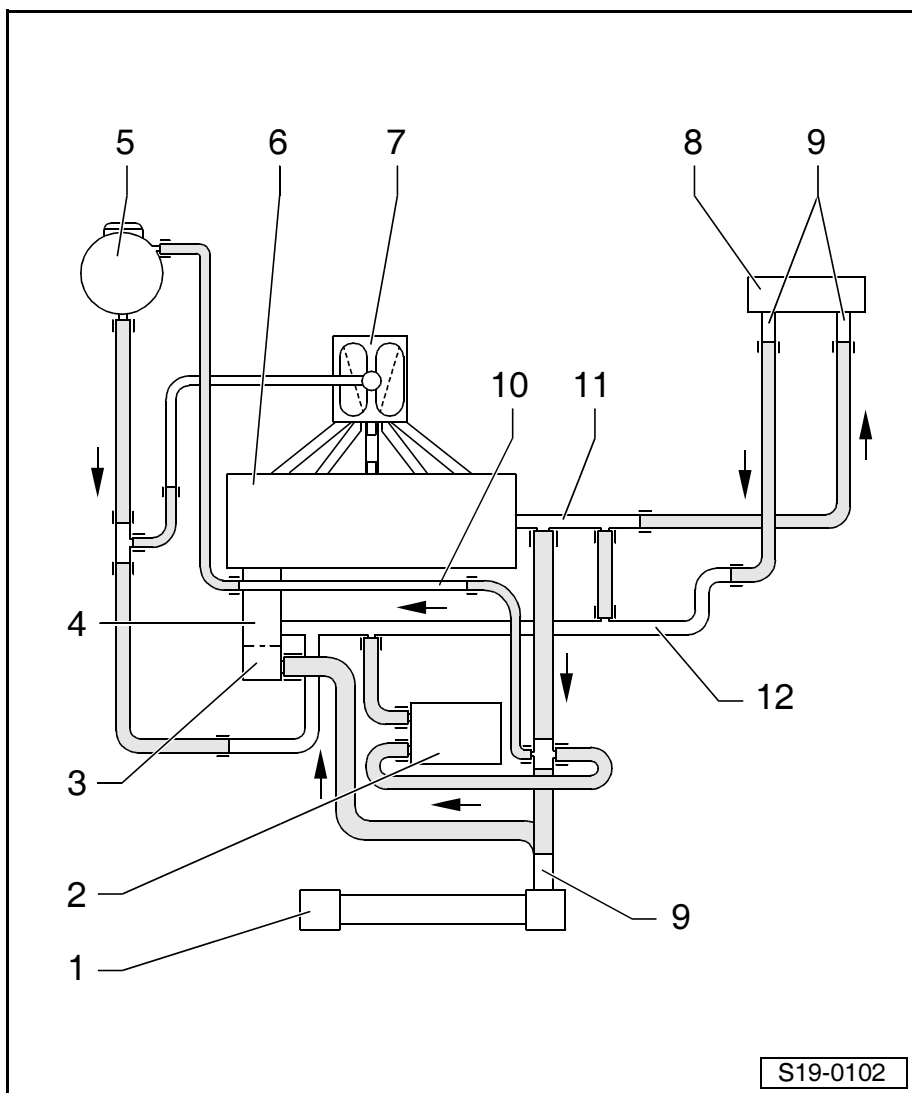
10 - Top coolant pipe

- ☐ for vent line, at intake manifold

11 - Connection fittings

- ☐ at cylinder head

12 - Coolant pipe



S19-0102

Draining and filling up coolant

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 19

Variation for replenishing

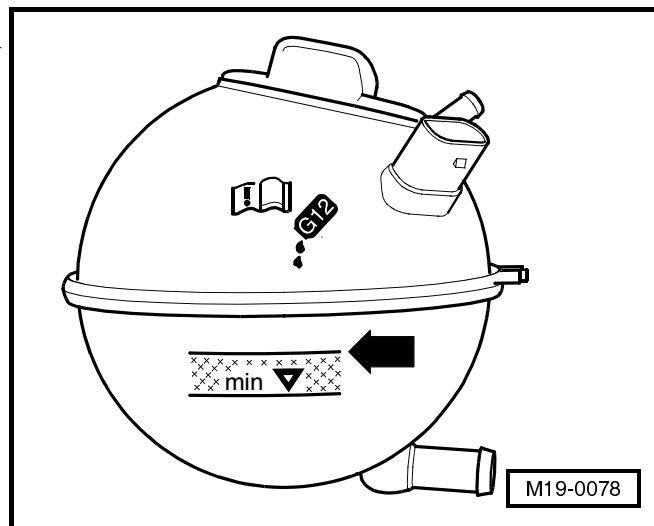
- Fit coolant hose onto oil cooler.
- Insert and tighten the coolant drain plug.
- Pour in coolant up to top marking -arrow- on expansion reservoir. ►
- Seal expansion reservoir.
- Start engine and run for not more than 3 minutes at 2000 rpm.
- Run engine until fan starts.



Warning!

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

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



Checking the coolant system for tightness

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 19

19-2 Removing and installing parts of the cooling system - Part 2

Removing and installing radiator

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 19

Variations

- ♦ Take out the right radiator fan motor with fan ring before removing the fan shroud.
- ♦ Top up coolant ⇒ Chap. 19-1.

Removing and installing coolant pump

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 19

Variations

- ♦ Removing and installing ribbed V-belt ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 13.
- ♦ Take toothed belt off toothed belt sprocket of coolant pump and install toothed belt, tension ⇒ 1.8 I/110 kW Engine, Mechanical Components; Rep. Gr. 13.
- ♦ Top up coolant ⇒ Chap. 19-1.

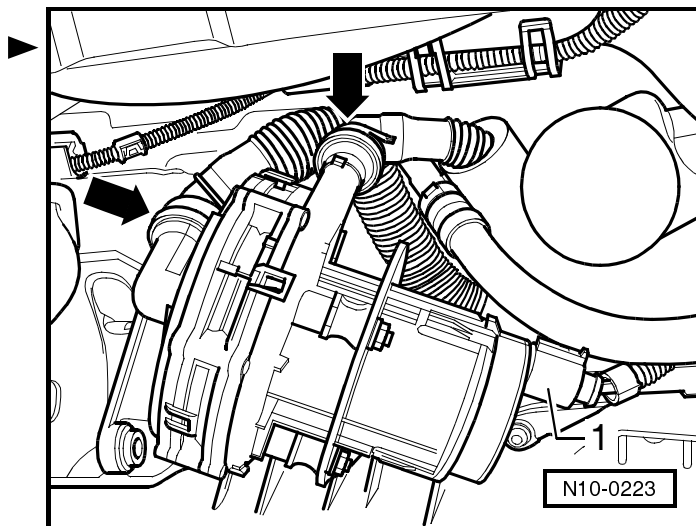
Installing coolant pipe

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 19

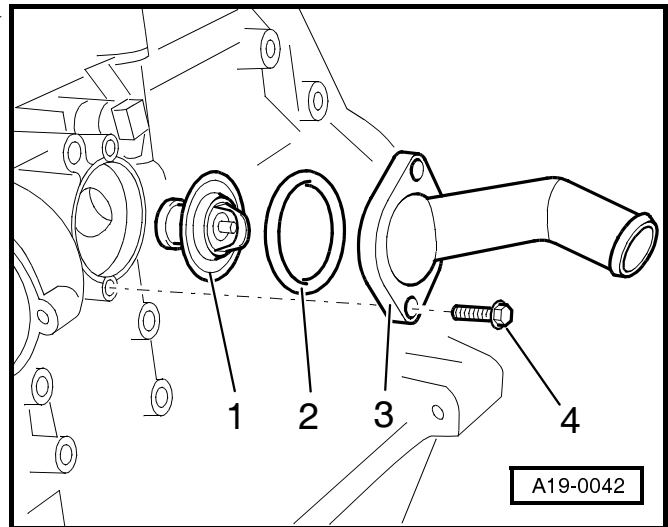
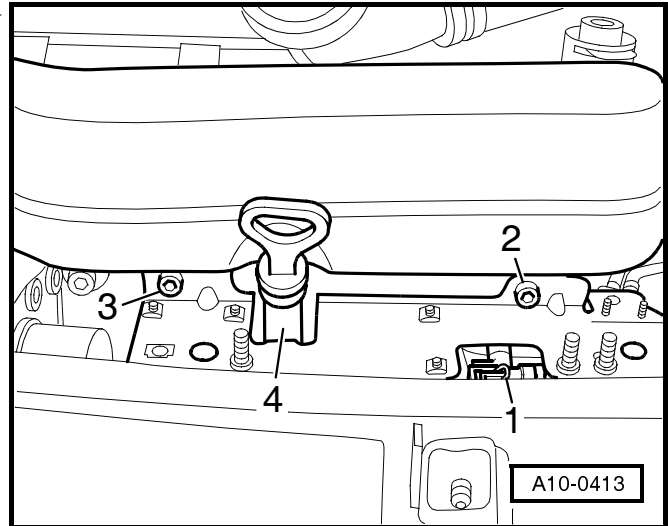
Removing and installing coolant thermostat

Removing

- Drain coolant ⇒ Chap. 19-1.
- Detach both hoses -arrows- at the secondary air pump.
- Remove the engine trim panel.
- Remove the trim panel ahead of the intake manifold.
- Detach the secondary air injection pipe from the bracket ahead of the intake manifold.



- Unscrew bolts -2- and -3- and pull off the bracket of the dipstick guide tube -4-.
- Separate the electrical plug connections -1- for the turbocharger divert air valve -N249- and secondary air injection valve -N112- on the underside of the bracket.
- Detach the vacuum hose to the electric switchover valves at the intake manifold.
- Place bracket to the side.
- Remove ribbed V-belt and take it off the alternator belt pulley ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 13.
- Slacken the bolted connections for the alternator and place the alternator forward. The hoses remain connected.
- Detach coolant hose from connection fitting -3-.
- Unscrew bolts -4-, take off connection fitting -3-, O-ring -2- and thermostat -1-.



Installing

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

Note!

Always replace seals and gasket rings.

- Clean sealing surface for O-ring or smoothen.
- Insert coolant thermostat.

Installation position:

The clamp of the coolant thermostat must be positioned vertically.

- Moisten new O-ring with coolant additive.
- Install ribbed V-belt ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 13.
- Top up coolant ⇒ Chap. 19-1.

Tightening torques

Component	Nm
Connection fitting to cylinder block	15
Alternator to bracket	25

Testing coolant thermostat

Start of opening	End of opening	Opening stroke
approx. 87 °C	approx. 102 °C ^{a)}	min. 8 mm

^{a)} cannot be tested

20 – Fuel supply

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

**Note!**

- ♦ *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.*
- ♦ *Always replace the seals and gaskets during assembly work.*

Pay attention to rules for cleanliness ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20.

Pay attention to rules for cleanliness ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20.

Test electronic power control (electronic throttle) ⇒ 1.8 I/110 kW Engine, Mechanical Components; Rep. Gr. 20.

Activated charcoal filter system ⇒ **20-1** page 3.

Removing and installing fuel tank with attached parts and fuel filter

⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20

Variation

- ♦ Test holding pressure ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

Safety precautions when working on the fuel supply system

⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20

Rules of cleanliness

⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20

Removing and installing the fuel delivery unit

⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20

Removing and installing the fuel gauge sender

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 20; Removing and installing fuel level sender

Removing and installing the fuel tank

⇒ 1.8 I/92 kW Engine, Mechanical Components;
Rep. Gr. 20

Variation

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

Function of activated charcoal filter system

A greater or smaller quantity of fuel vapours form above the level of the fuel in the tank - depending on 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°) and the pressure holding valve, with a quantity restrictor, into the activated charcoal filter.

The activated charcoal stores 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 stored in 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 is opened and intake manifold vacuum is present. It thus ensures that priority is given to emptying the activated charcoal tank.

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

Repairing parts of the activated charcoal filter system



Note!

- ♦ The hose connections are secured with spring-type clips or clamp-type clips.
- ♦ Always replace clamp-type clips with spring-type clips.

Pay attention to safety precautions ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20.

Pay attention to rules for cleanliness ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20.

1 - Activated charcoal filter

- ☐ fitting location: in right of engine compartment
- ☐ with solenoid valve 1 for activated charcoal filter system -N80-
- ☐ valve is actuated (pulsed) by engine control unit when engine is warm
- ☐ test ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

2 - Pressure holding valve with connection hose

- ☐ closes fuel tank ventilation when solenoid valve -N80- open

3 - Connector

- ☐ black, 2-pin
- ☐ for solenoid valve 1

4 - Vent line

- ☐ white
- ☐ check tightness
- ☐ from gravity valve to fuel tank

5 - Ventilation hose

6 - Connecting tube

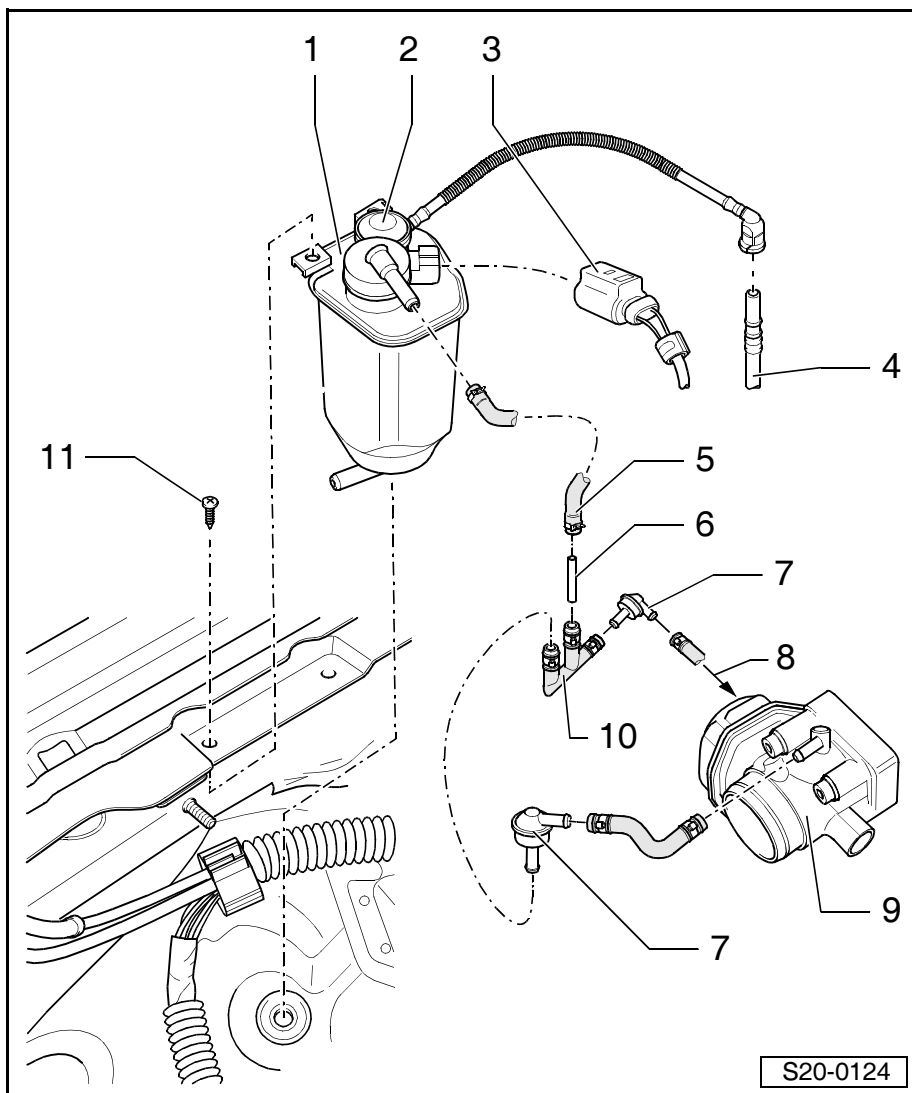
7 - Non-return valve

8 - to inlet connection at turbo-charger

9 - Throttle valve control unit

10 - Distributor

11 - 10 Nm



S20-0124

20-2 Testing parts of fuel supply system

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.

When opening the fuel system, pay attention to safety precautions ⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20.

Testing fuel pump relay ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.

Connecting remote control

⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20

Testing fuel pump

⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20

Variation

- ♦ Testing holding pressure ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24
- ♦ Testing fuel pump relay ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.

Testing delivery of fuel pump

⇒ 1.8 I/92 kW Engine, Mechanical Components; Rep. Gr. 20

Testing electronic power control

⇒ 1.8 I/110 kW Engine, Mechanical Components; Rep. Gr. 20

21 – Turbocharging

21-1 Charge air system with turbocharger



Note!

- ♦ Pay attention to rules for cleanliness ⇒ 1.8 I/110 kW Engine, Mechanical Components; Rep. Gr. 21.
- ♦ Pay attention to safety precautions ⇒ 1.8 I/110 kW Engine, Mechanical Components; Rep. Gr. 21.
- ♦ The hose connections are secured with clamps.
- ♦ The charge-air system must be tight.

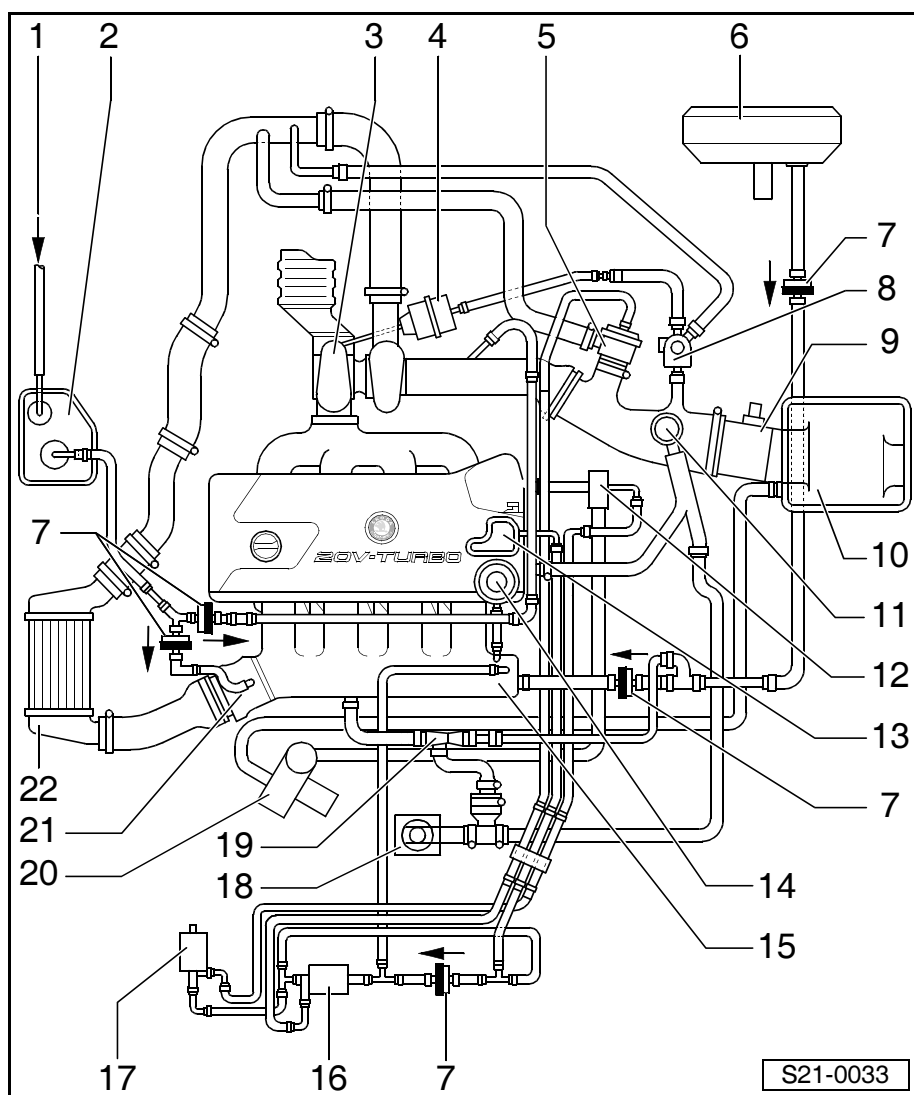
Connecting diagram for charge pressure control



Note!

The non-return valves may differ depending on their as-built configuration. If no colour differences are present, the tapered connection corresponds to the dark side.

- 1 - from fuel tank
- 2 - Activated charcoal filter
 - ☐ with solenoid valve 1 for activated charcoal filter system -N80-
- 3 - Exhaust turbocharger
 - ☐ Test charge pressure ⇒ **21-1** page 2
- 4 - Charge pressure control valve pressure unit
 - ☐ test ⇒ 1.8 I/110 kW Engine, Mechanical Components; Rep. Gr. 21
- 5 - Mechanical divert air valve
 - ☐ check ⇒ **21-1** page 5
- 6 - Brake servo unit
- 7 - Non-return valve
 - ☐ fitting location (bright/dark side):
as shown in Fig., arrow points in flow direction
- 8 - Solenoid valve for charge pressure control -N75-
 - ☐ test ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24
- 9 - Air mass meter -G70-
- 10 - Air filter
- 11 - Crankcase ventilation pressure control valve
- 12 - Secondary air injection combination valve



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13 - Vacuum reservoir

- ❑ bolted to cylinder head cover

14 - Fuel pressure regulator**15 - Intake manifold**

- ❑ with intake air temperature sender -G42-

16 - Turbocharger divert air valve -N249-

- ❑ test ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

17 - Secondary air injection valve -N112-**18 - Crankcase ventilation****19 - Suction spray pump****20 - Secondary air pump motor -V101-****21 - Throttle valve control unit -J338-****22 - Charge air cooler**

- ❑ with charge pressure sender -G31-

Rules of cleanliness

⇒ 1.8 I/110 kW Engine, Mechanical Components;
Rep. Gr. 21

Safety measures

⇒ 1.8 I/110 kW Engine, Mechanical Components;
Rep. Gr. 21

Checking charge pressure control**Special tools, test and measuring equipment and auxiliary items required**

- ♦ Turbocharger tester (e. g. -V.A.G 1397 A-)

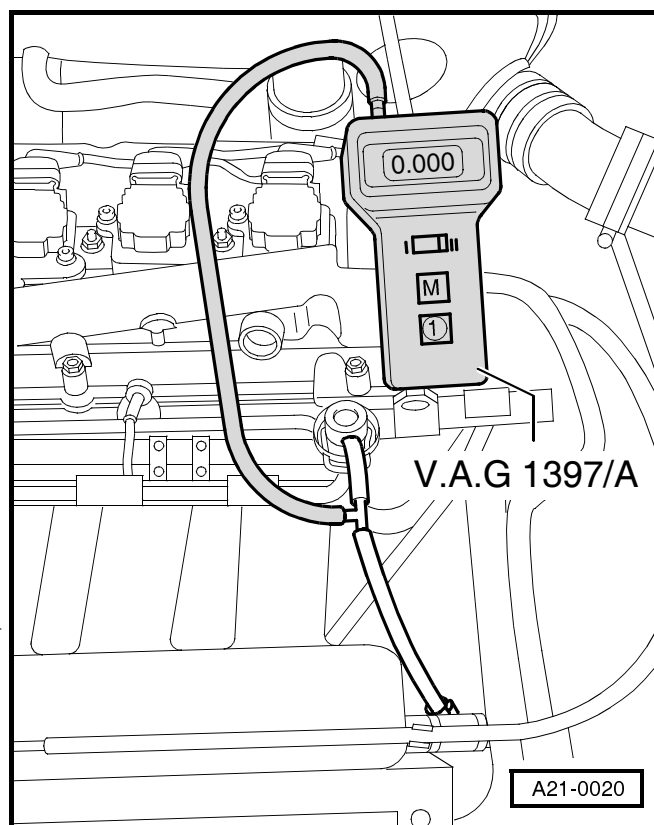
Test conditions

- All hoses and lines inspected for tight connection and leaktightness.
- Fault memory interrogated.
- Final control diagnosis performed.

Test sequence**Note!**

Pay attention to rules for cleanliness and safety precautions ⇒ 1.8 I/110 kW Engine, Mechanical Components; Rep. Gr. 21.

- Remove the engine cover.
- Connect the T piece with test hose of turbocharger tester -V.A.G 1397 A- to front of intake manifold. ►
- Run the test hose over the rear edge of the engine bonnet and through the right-hand window opening into the interior of car.



- Switch on the turbocharger tester and move the measuring range selector switch into position „I“ (absolute pressure).
- Fit the test hose onto connection „I“.

**Note!**

- ◆ The hose lines must be connected absolutely leaktight otherwise measuring errors are possible.
 - ◆ Ensure that the test hose is not jammed in-between at the bonnet and side window.
 - ◆ If the memory button „M“ on the turbocharger tester is pressed, the last measured value is stored until the memory button „M“ is pressed once again, or the tester switched off.
 - ◆ The decimal comma in the display block flashes to indicate that the measured value has been stored.
 - ◆ If the battery voltage of the turbocharger tester drops below the permissible specified voltage, an arrow appears in top left corner of the display.
 - ◆ Before testing, drive vehicle at the brisk speed for at least 3 km (without stopping at traffic lights or similar).
 - ◆ For safety reasons, have the turbocharger tester operated by a second person.
- Accelerate vehicle in 3rd gear at full throttle from 2000 rpm and press the memory button „M“ on the turbocharger tester at 2800 rpm.

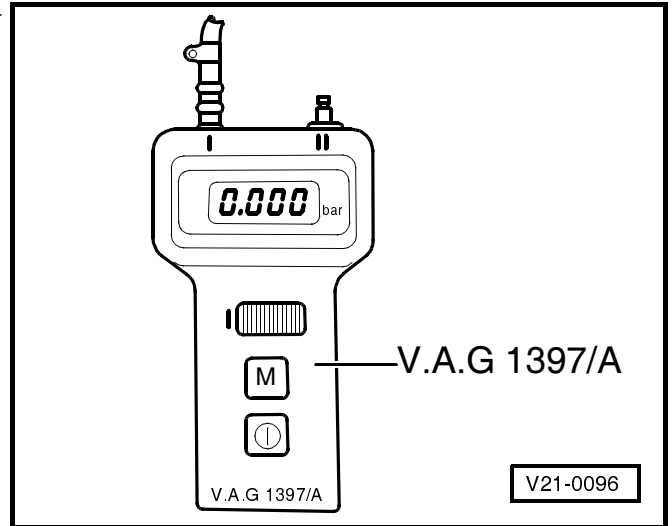
Specified value: 0.16...0.17 MPa

If the specification is not achieved ⇒ Fault table ⇒ **21-1**
page 4

Testing charge pressure control valve pressure unit

Variation

- ◆ Interrogating and erasing fault memory ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24.



Fault in charge pressure control

Fault	Possible causes of fault	Rectifying fault
Charge pressure below specification	◆ Charge pressure control solenoid valve -N75- faulty ◆ Hose to charge pressure control solenoid valve -N75- faulty ◆ Charge pressure control valve in turbocharger jamming in opened position ◆ Leak between turbocharger and intake manifold ◆ Mechanical divert air valve faulty ◆ Turbocharger divert air valve -N249- faulty ◆ Turbocharger faulty	– test ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24 – test ⇒ 21-1 page 1, connection diagram – replace turbocharger ⇒ Chap. 21-2 – ⇒ 21-1 page 4, effects – check ⇒ 21-1 page 5 – test ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24 – replace ⇒ Chap. 21-2
Charge pressure above specification ^{a)}	◆ Charge pressure control valve pressure unit faulty ◆ Leak in hose through charge pressure control solenoid valve -N75- to charge pressure control valve pressure unit ◆ Charge pressure control valve in turbocharger jamming in closed position	– replace turbocharger ⇒ Chap. 21-2 – test ⇒ 21-1 page 1, connection diagram – replace turbocharger ⇒ Chap. 21-2

^{a)} If charge pressure is too high, the fuel feed is shut off in order to protect the engine. The engine misfires at high revs.

Effects of leaks at charge air system

Leak downstream of air mass meter

Possible sources of fault:

- 1 - Connection hoses between air mass meter and turbocharger
- 2 - Connection hose to crankcase ventilation
- 3 - Connection hose to mechanical divert air valve

Effect:

Poor performance

Leaks downstream of turbocharger (inlet side)

Possible sources of fault:

- 1 - Connection hoses and pipe between turbocharger and charge air cooler
- 2 - Hose between charge air cooler and intake manifold
- 3 - Charge air cooler
- 4 - Gasket of charge pressure sender -G31- (in charge air cooler)
- 5 - Gasket between throttle valve control unit and intake manifold
- 6 - Gasket between intake manifold and cylinder head

Effect:

Insufficient charge pressure

Leak downstream of turbocharger (exhaust side)

Possible sources of fault:

- 1 - Connection turbocharger/exhaust manifold
- 2 - Connection exhaust manifold/cylinder head

Effect:

Insufficient charge pressure, possible exhaust odour, traces of soot in engine compartment

Testing mechanical divert air valve



Note!

- ◆ *The mechanical divert air valve is located upstream of the turbocharger. It is opened by vacuum in the over-run, idle speed and part load ranges. As a result, the charge pressure present upstream of the throttle valve is reduced. The turbocharger is maintained at a higher speed.*
- ◆ *The mechanical divert air valve is controlled through the turbocharger divert air valve -N249-.*
- ◆ *If poor performance or load change jolts exist, inspect the mechanical divert air valve.*

Special tools, test and measuring equipment and auxiliary items required

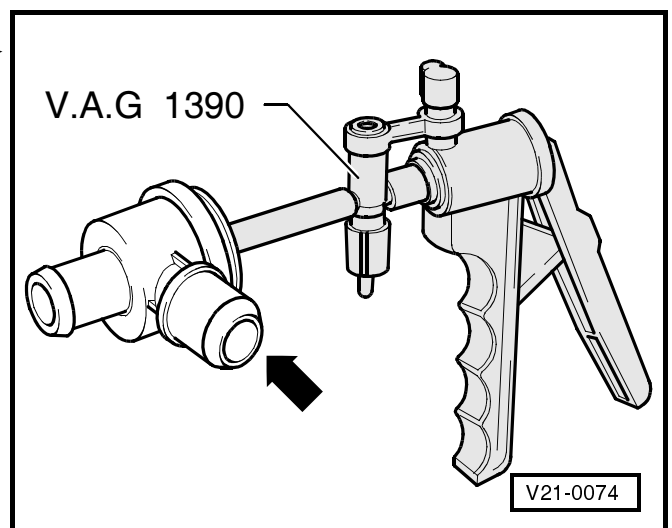
- ◆ Hand vacuum pump (e.g. -V.A.G 1390-)

Test sequence

- Fit the hand vacuum pump (e. g. -V.A.G 1390-) onto the divert air valve. ►
- Operate the hand vacuum pump.
- ◆ Divert air valve must open -arrow-
- Operate the air inlet valve of the hand vacuum pump after about 30 seconds.
- ◆ Divert air valve must close -arrow-

If the divert air valve does not open or close or if the valve plate is not closed leaktight when the divert air valve is closed:

- Replace divert air valve.



21-2 Servicing charge air system with turbocharger

Removing and installing turbocharger - Summary of components

Pay attention to rules for cleanliness ⇒ 1.8 I/110 kW Engine, Mechanical Components; Rep. Gr. 21



Note!

- ♦ All hose connections are secured with clamps.
- ♦ The charge air system must be tight.
- ♦ Always replace self-locking nuts.
- ♦ Always replace seals and gaskets.
- ♦ Charge air hoses and pipes must be free of oil and grease before being installed again.

Part 1

1 - 40 Nm

- ☐ replace
- ☐ Insert with hot bolt paste
-G 052 112 A3-

2 - Gasket

- ☐ replace

3 - Exhaust turbocharger

- ☐ Inspecting charge pressure control ⇒ Chap. 21-1
- ☐ Charge pressure regulating valve and pressure box for charge pressure regulating valve are component parts of the exhaust turbocharger and must not be replaced individually.
- ☐ before connecting the oil feed line fill the exhaust turbocharger on the connection fitting with engine oil.
- ☐ After installing the exhaust turbocharger run the engine approx. 1 minute in idle and do not increase speed immediately in order to ensure the supply of oil to the turbocharger.

4 - O-ring

- ☐ replace

5 - 10 Nm

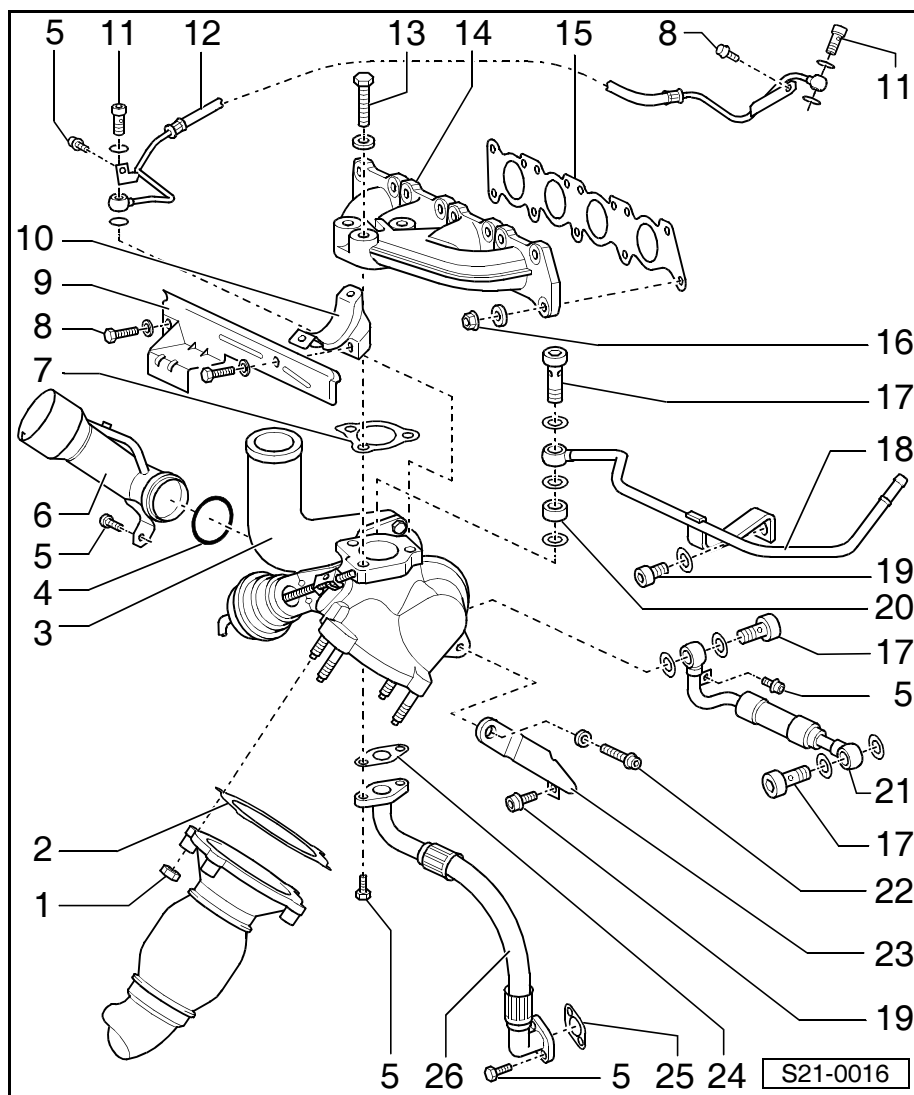
6 - Inlet connection

7 - Gasket

- ☐ replace
- ☐ pay attention to fitting position

8 - 25 Nm

9 - Shield



10 - Bracket at top

- ☐ for air guide pipe at top

11 - Banjo bolt, 30 Nm**12 - Oil feed line**

- ☐ from oil filter holder

13 - 35 Nm

- ☐ replace
- ☐ coat thread and head contact surface with hot bolt paste -G 052 112 A3- before inserting

14 - Exhaust manifold**15 - Gasket**

- ☐ replace
- ☐ pay attention to fitting position

16 - 30 Nm

- ☐ insert with hot bolt paste -G 052 112 A3-

17 - Banjo bolt, 35 Nm**18 - Coolant return-flow line****19 - 25 Nm****20 - Spacer sleeve****21 - Coolant feed line****22 - 45 Nm**

- ☐ use only original bolt ⇒ Parts List

23 - Bracket

- ☐ for exhaust turbocharger
- ☐ different version possible depending on as-built configuration

24 - Gasket

- ☐ replace

25 - Gasket

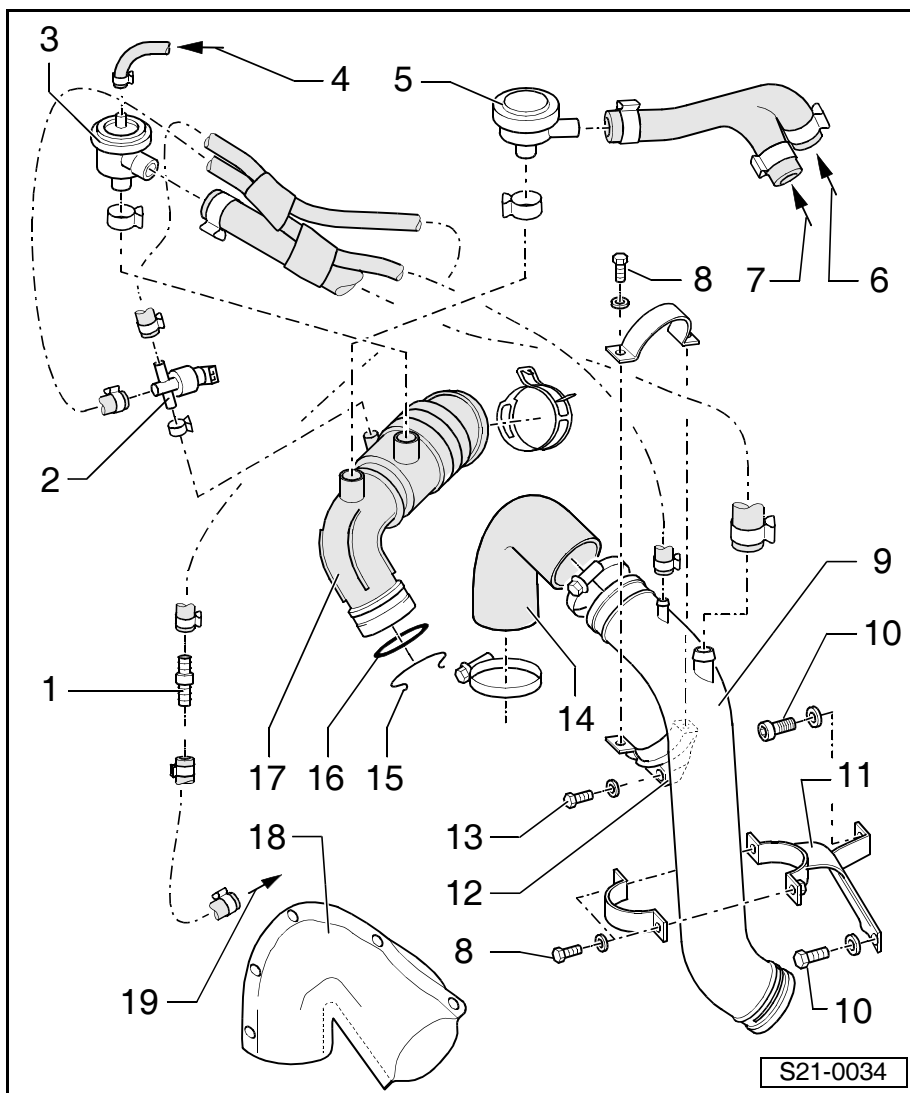
- ☐ replace

26 - Oil return line

- ☐ to oil pan

Part 2

- 1 - Connecting piece
- 2 - Solenoid valve for charge pressure control -N75-
- 3 - Mechanical divert air valve
- 4 - from turbocharger divert air valve -N249-
- 5 - Pressure control valve
 - ☐ for crankcase ventilation
- 6 - from oil filter bracket
- 7 - from cylinder head cover
- 8 - 10 Nm
- 9 - Air guide pipe at top
- 10 - 25 Nm
- 11 - Bracket at bottom
 - ☐ for air guide pipe at top
- 12 - Bracket at top
 - ☐ for air guide pipe at top
- 13 - 25 Nm
- 14 - Air hose
 - ☐ to exhaust turbocharger
- 15 - Retaining clip
- 16 - O-ring
 - ☐ replace
- 17 - Intake air hose
 - ☐ to connection at turbocharger
- 18 - Heat shield
 - ☐ for air hose ⇒ item 14
 - ☐ can be pulled off
- 19 - To charge pressure control valve pressure unit

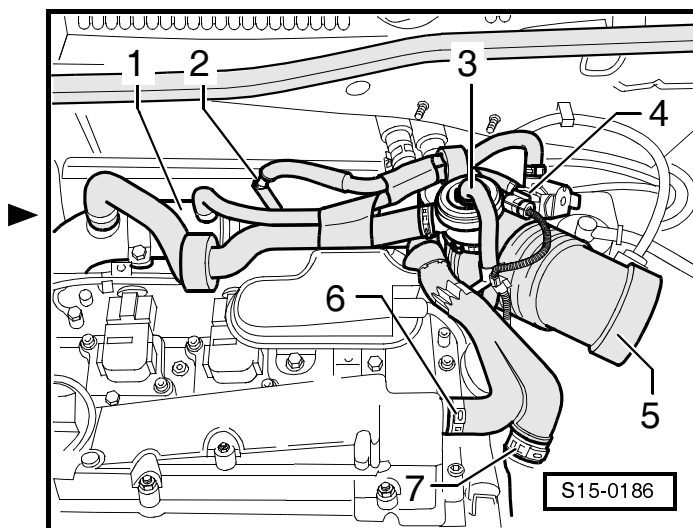


Removing and installing turbocharger

⇒ 1.8 I/110 kW Engine, Mechanical Components;
Rep. Gr. 21

Variations

- ◆ Top up coolant ⇒ Chap. 19-1
- ◆ The text relating to Fig. S21-0017 (items 1 and 2) is deleted. Perform the following steps in place:
 - Unplug connector -4-.
 - Separate hose connections -5-, -6-, -7-.
- ◆ Modified tightening torques:



Component	Nm
Bracket for turbocharger to turbo-charger	45
Shield to cylinder head	25
Turbocharger to exhaust manifold	35 ^{a)}
Exhaust manifold to cylinder head	30 ^{a)}

^{a)} Replace nuts and bolts

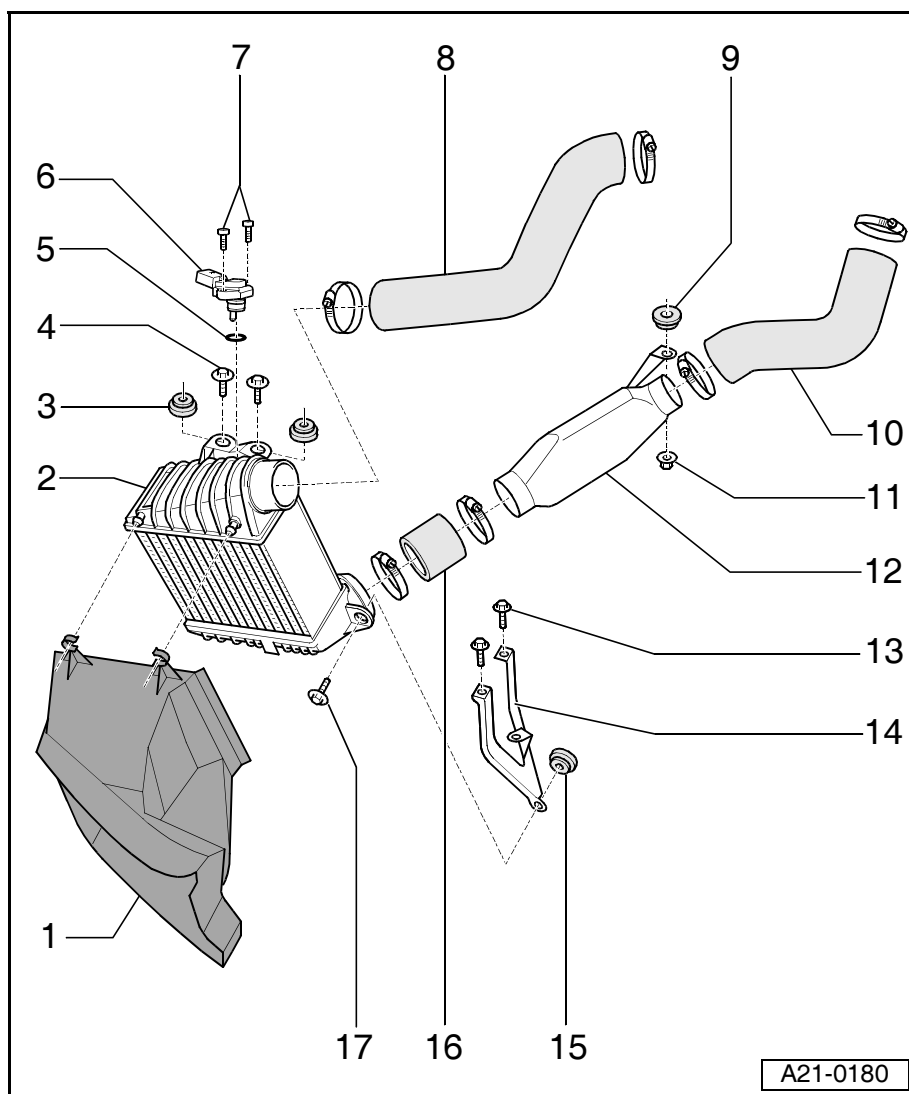
Removing and installing parts of the charge-air cooling



Note!

- ♦ All hose connections are secured with clamps.
- ♦ The charge air system must be tight.
- ♦ Charge air hoses and pipes must be free of oil and grease before being installed again.

- 1 - Air deflector
- 2 - Charge air cooler
 - ☐ removing and installing
⇒ **21-2** page 5
- 3 - Rubber grommet
 - ☐ with sleeve
- 4 - 10 Nm
- 5 - O-ring
 - ☐ replace if damaged
- 6 - Charge pressure sender -G31-
- 7 - 3 Nm
- 8 - Charge air hose
 - ☐ between intake manifold and charge air cooler
- 9 - Rubber grommet
 - ☐ with sleeve
- 10 - Charge air hose
 - ☐ between air guide pipe at top and air guide pipe at bottom
 - ☐ at top with plug-type fitting depending on version
- 11 - 10 Nm
- 12 - Air guide pipe at bottom
- 13 - 10 Nm
- 14 - Bracket
- 15 - Rubber grommet
 - ☐ with sleeve
- 16 - Hose
- 17 - 10 Nm

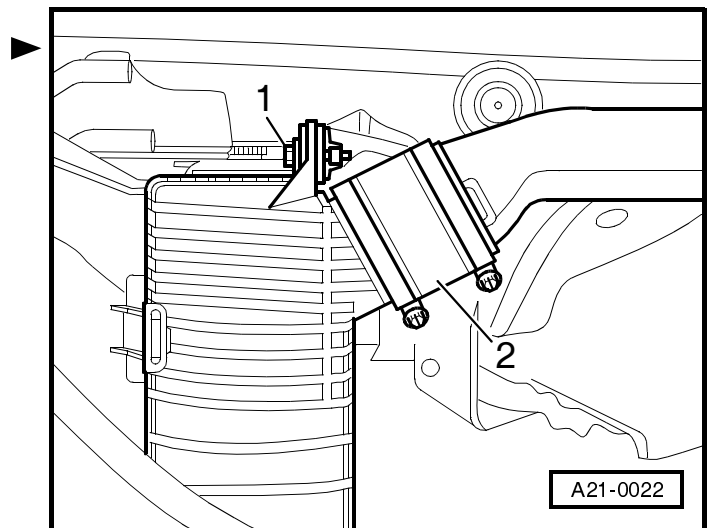
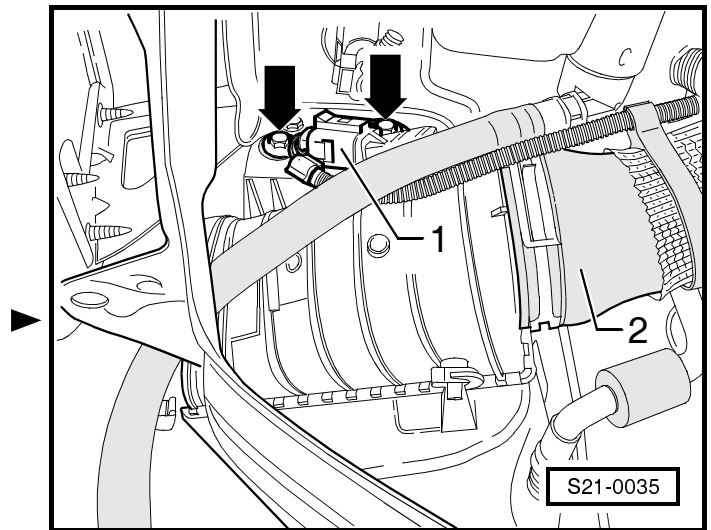


Removing and installing charge air cooler

Special tools, test and measuring equipment and auxiliary items required

- ◆ Torque wrench
- ◆ Pliers for spring strap clips

- Remove the right headlight ⇒ Electrical System; Rep. Gr. 94.
- Unplug connector -1- of charge pressure sender -G31-.
- Detach hose -2- from charge air cooler.
- Remove the top bolts of the charge air cooler -arrows-.
- Remove the noise insulation panel in the middle and on the right.
- Slacken the right wheelhouse liner half-way, beginning from the front.
- Separate air hose -2- at bottom at charge air cooler.
- Unscrew the bottom bolt -1- attaching the charge air cooler.
- Pull the wheelhouse liner back sufficiently until the charge air cooler can be taken out.



Installing

Installation is carried out in the reverse order.

26 – Exhaust system

26-1 Removing and installing parts of the exhaust system - Part 1



Note!

- ♦ Always replace gaskets and self-locking nuts.
- ♦ Use a screwdriver to slacken and tighten the clamps of the heat shields.
- ♦ Avoid a large deflection of the decoupling element at the front exhaust pipe (max. 10°).

1 - Tunnel bridge

- ☐ with hole for aligning exhaust system ⇒ Chap. 26-2

2 - Hanger

- ☐ fitting position ⇒ Fig. 1 in **26-1** page 2

3 - 25 Nm

4 - Front exhaust pipe with catalytic converter

- ☐ protect against shocks and blows
- ☐ with decoupling element
- ☐ do not twist decoupling element more than 10° - risk of damage
- ☐ removing and installing ⇒ **26-1** page 2
- ☐ align exhaust system free of stress ⇒ Chap. 26-2

5 - 40 Nm

- ☐ replace
- ☐ before bolting on, coat stud bolts of turbocharger with hot bolt paste -G 052 112 A3-

6 - Spacer tube

- ☐ 4 in total

7 - Gasket

- ☐ replace

8 - Exhaust turbocharger

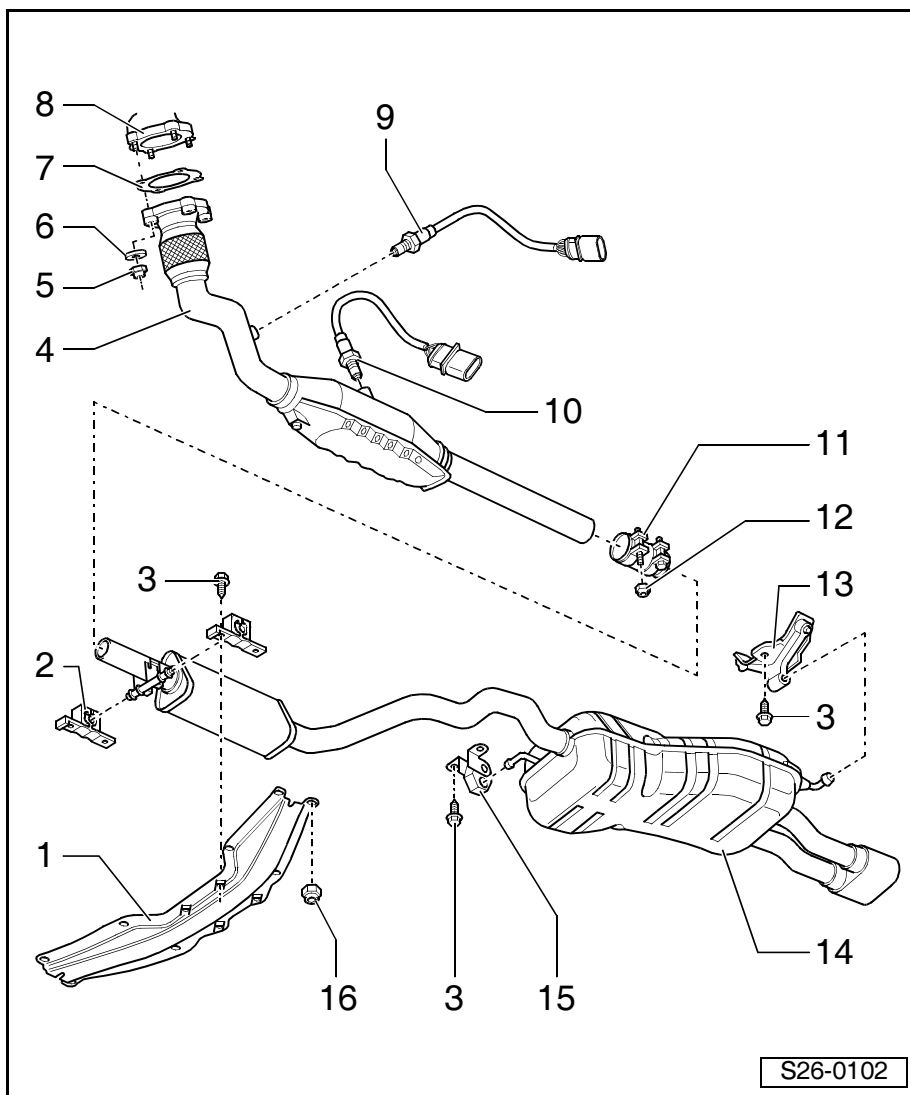
- ☐ removing and installing ⇒ Chap. 21-2

9 - Lambda probe I upstream of catalytic converter -G39-, 50 Nm

- ☐ grease only thread with hot bolt paste -G 052 112 A3-, -G 052 112 A3- must not get into the slots of the probe body
- ☐ separate 6-pin plug connection for lambda probe below protective cover ⇒ **26-1** page 2
- ☐ test ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24

10 - Lambda probe II downstream of catalytic converter -G130-, 50 Nm

- ☐ grease only thread with hot bolt paste - G 052 112 A3-, -G 052 112 A3 - must not get into the slots of the probe body
- ☐ separate 4-pin plug connection for lambda probe below protective cover ⇒ **26-1** page 2
- ☐ test ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 24



11 - Double clamp

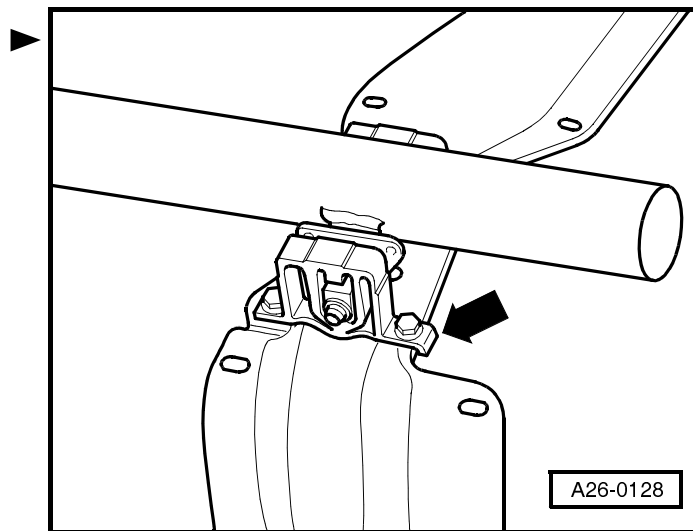
- ☐ before tightening, align exhaust system free of stress ⇒ Chap. 26-2
- ☐ fitting position: horizontally in vehicle, bolted connections pointing to the left
- ☐ tighten bolted connections evenly

12 - 40 Nm**13 - Hanger****14 - Front and rear silencer**

- ☐ replace individually when repairing ⇒ Chap. 26-2
- ☐ align exhaust system free of stress ⇒ Chap. 26-2

15 - Hanger**16 - 25 Nm****Fig. 1: Installation position for hanger**

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

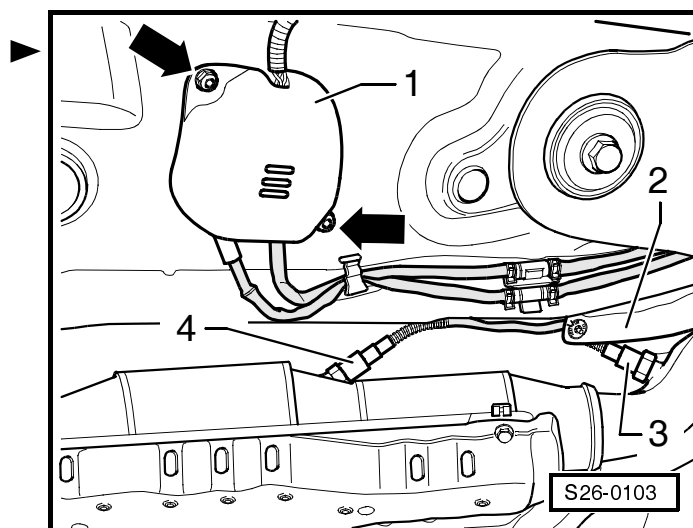
**Removing and installing front exhaust pipe with catalytic converter**

Special tools, test and measuring equipment and auxiliary items required

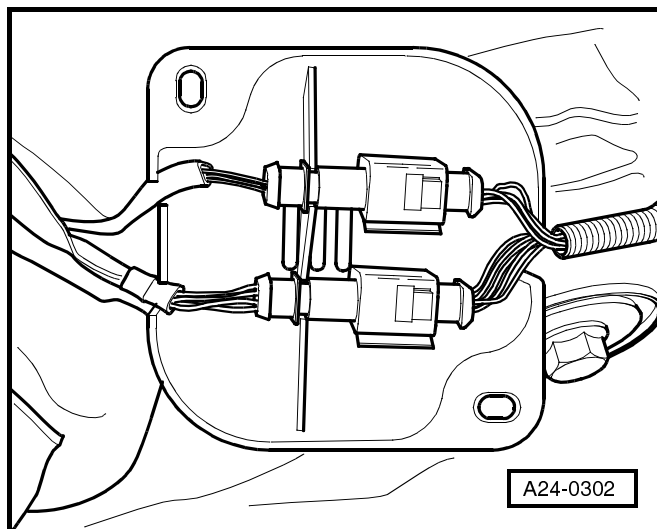
- ◆ Torque wrench
- ◆ Hot bolt paste -G 052 112 A3-

Removing**Note!**

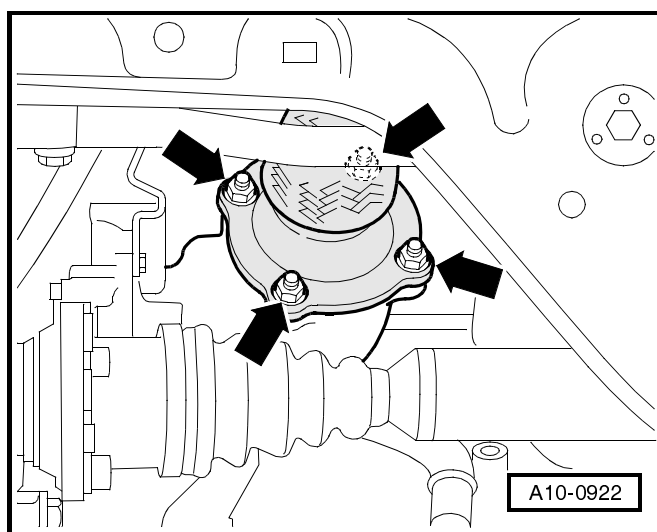
- ◆ *Avoid a large deflection of decoupling element, max. deflection 10°.*
- ◆ *Always replace self-locking nuts.*
- Detach cover -1- for plug connection of lambda probes -arrows-.
- Detach heat shield -2- and take off.
- Detach the cables for the lambda probes -3- and -4- from heat shield.



- Pull plug connections out of cover and separate. ►



- Unbolt front exhaust pipe from turbocharger -arrows-.
- Slacken bolted connections of double clamp between catalytic converter and front silencer and push to the rear.
- Take off front exhaust pipe.



Installing

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

- Coat stud bolts of the turbocharger with hot bolt paste -G 052 112 A3-.
- align exhaust system free of stress ⇒ Chap. 26-2
- Interrogate fault memory ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

Tightening torques

Components	Nm
Front exhaust pipe to turbocharger	40 ^{a)} b)
Lambda probe to front exhaust pipe	50 ^{a)}
Nuts for double clamps	40

a) insert with hot bolt paste -G 052 112 A3-

b) Replace nuts

Removing and installing exhaust manifold

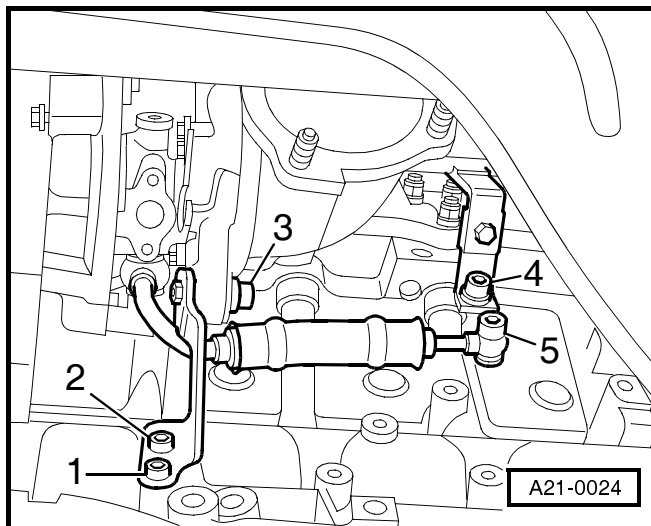
Removing

- Remove the engine trim panel.
- Unbolt heat shield for right drive shaft.
- Remove front exhaust pipe ⇒ **26-1** page 2.

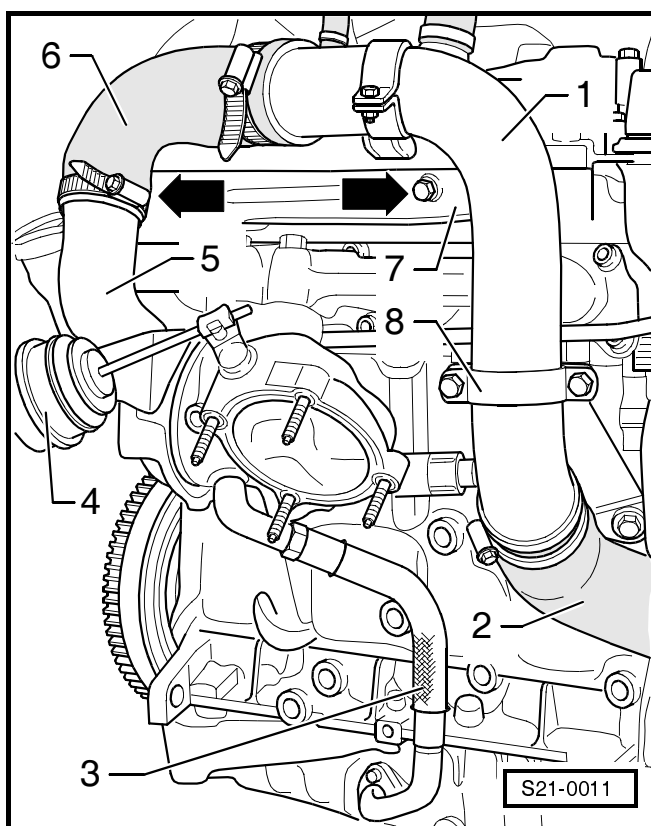
i Note!

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

- Slacken bracket for turbocharger several turns at bolted connection -3-.
- Remove bracket for turbocharger from cylinder block (bolts -1- and -2-).
- Unbolt bracket for coolant return-flow line -4-.

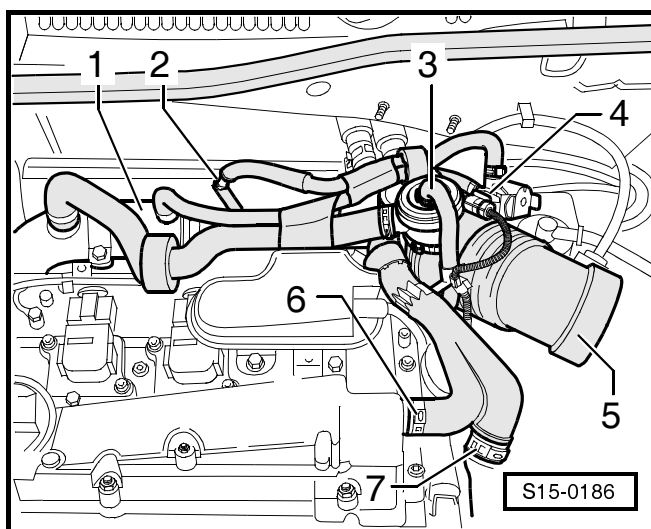


- Separate charge air hose -2- from top air guide pipe -1- (push-fit coupling).
- Unbolt clamp -8- at bottom bracket for top air guide pipe.
- Detach hose at charge pressure control valve pressure unit -4-.
- Separate air hose -6- from outlet connection -5- of turbocharger (screw clip).
- Unbolt shield -7- -arrows-.



- Unplug connector -4-.
- Separate hose connections -5-, -6-, -7-.
- Pull out locking clasp at connection of turbocharger and separate intake air hose from connection fitting.
- Place intake air hose and top air guide pipe to the side, with hoses connected.

The top bracket can remain bolted on to the top air guide pipe.

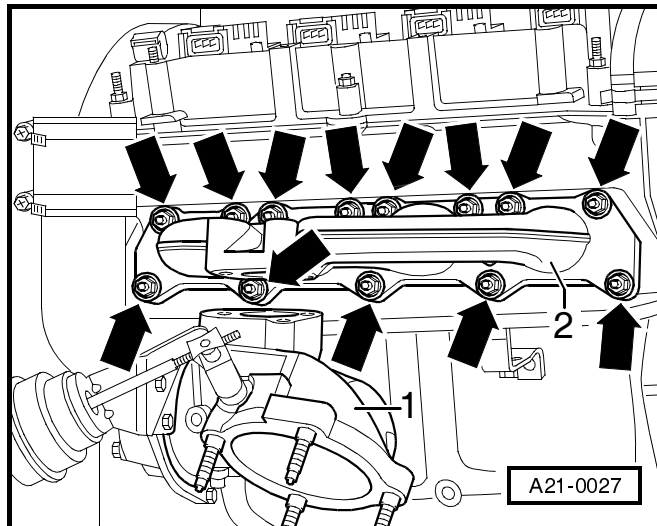


- Unbolt turbocharger -1- from exhaust manifold -2-.
- Take off the gasket; the turbocharger moves down slightly.
- Unscrew all the nuts of the exhaust manifold -arrows- (accessible from above).
- Take off the washers and the exhaust manifold.

Installing

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

- Replace nuts and bolts for attaching exhaust manifold, turbocharger and exhaust pipe and coat thread with hot bolt paste -G 052 112 A3-.



Tightening torques

Component	Nm
Bracket for turbocharger to turbocharger	45
Bracket for turbocharger to cylinder block	25
Turbocharger to exhaust manifold	35 ^{a)}
Exhaust manifold to cylinder head	30 ^{a)}
Front exhaust pipe to turbocharger	40 ^{a)}
Heat shield for drive shaft to cylinder block	35
Nuts for double clamps	40

^{a)} Replace nuts and bolts

26-2 Removing and installing parts of the exhaust system - Part 2

Replacing front or rear silencer

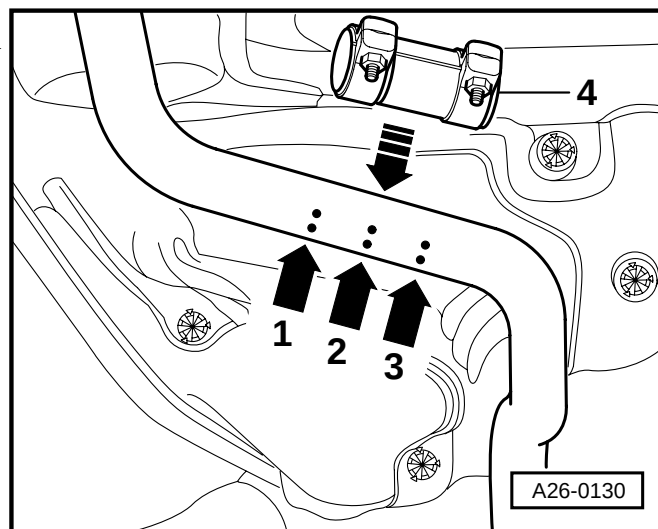
Special tools, test and measuring equipment and auxiliary items required

- ♦ 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 double clamp -4- at the side markings -arrow 1- and -arrow 3-.
- Align exhaust system free of stress ⇒ **26-2** page 1.
- Align rear silencer horizontally.
- Tighten bolted connections of double clamp evenly to 40 Nm.

Installation position of double clamp: horizontally 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 in accordance with stated dimensions from an M10 or M14 bolt for aligning the exhaust system.

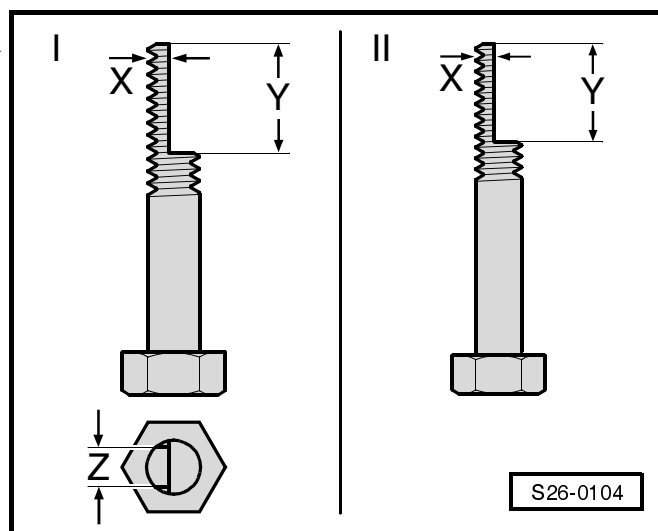
Size of bolt	I - M14	II - M10
Dimension -x-	6 mm	4 mm
Dimension -y-	25 mm	25 mm
Dimension -z-	10 mm	---



Note!

The size of the bolt (M10 or M14) depends on the diameter of the rear hole in the tunnel bridge ⇒ **26-2** page 2, Fig. A26-0134.

- ♦ A second person is required for aligning the exhaust system.

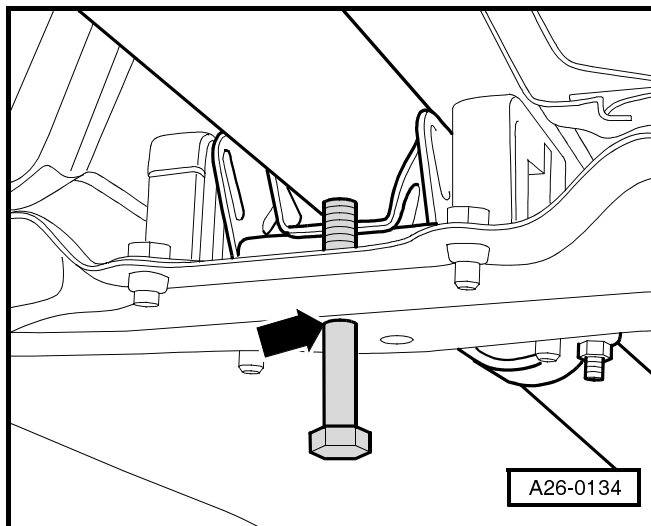


- Slacken bolted connections of double clamp between catalytic converter and front silencer.
- Insert shop-made tool through rear hole -arrow- of tunnel bridge, the flat points toward the hanger pin of the exhaust system.

i Note!

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

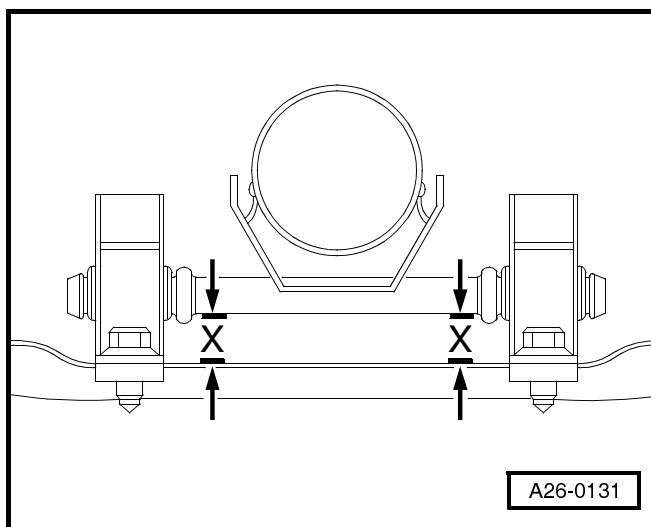
- Align front and rear silencers horizontally:



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

i Note!

On vehicles with separation point between front and rear silencer, additionally inspect horizontal position of rear silencer at tail pipe.



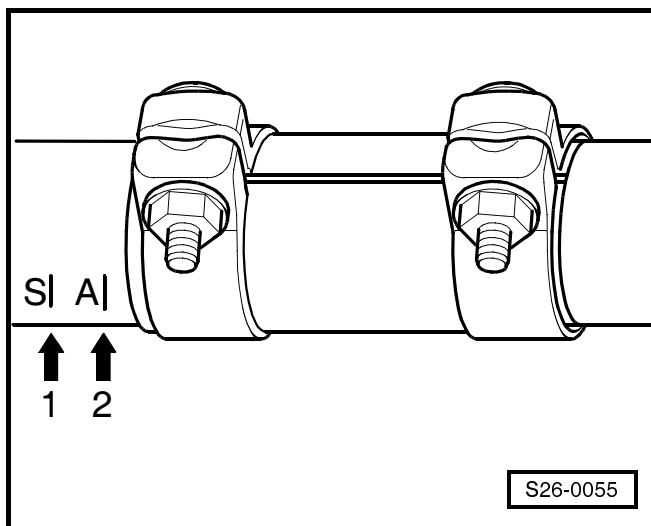
- Position double clamp with a distance of about 5 mm to the line of the marking „A“ -arrow 2- and tighten evenly to 40 Nm in the horizontal position.

i Note!

The marking „A“ applies to vehicles with 5-Speed Manual Gearbox 02J (MQ gearbox). Marking „S“ does not apply to this engine.

Checking the exhaust system for leaks

- Start engine and run in idle.
- Seal end pipes for the duration of the leak check (e.g. with cloths or plugs).
- Inspect connection points of cylinder head/exhaust manifold, exhaust manifold/front exhaust pipe with catalytic converter, etc. for leaks by listening.
- Eliminate any leak found.



26-3 Secondary air injection system

Operation

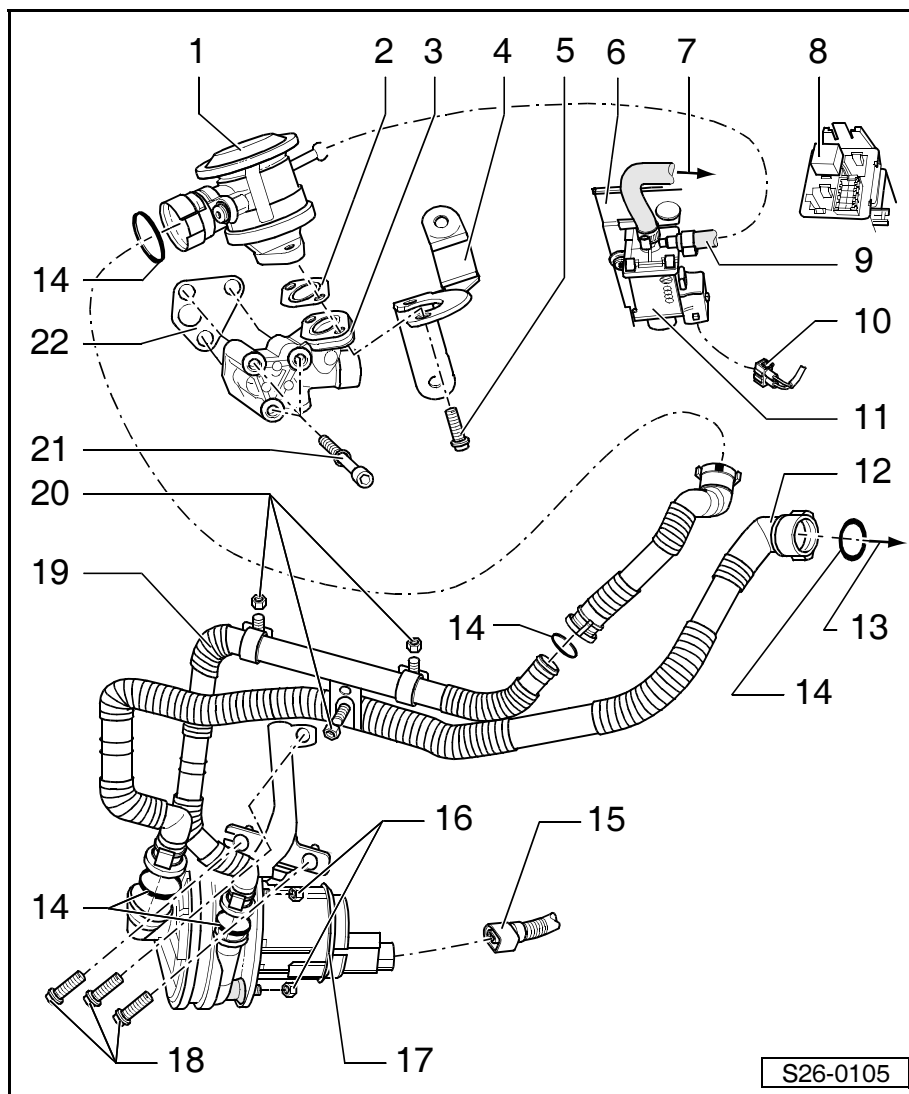
Air is injected downstream of the exhaust valves by the secondary air system for up to 100 seconds after a cold start (+5 °C...+33 °C coolant temperature). This enriches the exhaust gas with oxygen, initiates a post-combustion and thus shortens the heating-up phase of the catalytic converter. Actuation is performed by the Motronic control unit -J220- through the secondary air pump relay -J299- to the secondary air injection valve -N112- (changeover valve) and combination valve. In addition, after each subsequent engine start (up to an engine temperature of max. 96 °C), the secondary air system is switched on in the idle speed range for 10 seconds and checked by the self-diagnosis. The lambda control must be active for this purpose.

Removing and installing parts of the secondary air system - Summary of components

Note!

- ♦ Components marked with * are tested by self-diagnosis ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.
- ♦ Components marked with ** are tested by final control diagnosis ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

- 1 - Combination valve**
 - ☐ check ⇒ **26-3** page 3
- 2 - Gasket**
 - ☐ replace
- 3 - Flange for combination valve**
 - ☐ attached to cylinder head
- 4 - Bracket**
- 5 - 10 Nm**
- 6 - Bracket**
 - ☐ attached to intake manifold
- 7 - to vacuum reservoir**
- 8 - Secondary air pump relay -J299 -****
 - ☐ in relay protective housing in engine compartment next to brake servo unit
- 9 - Vacuum hose**
- 10 - Connector**
 - ☐ 2-pin
- 11 - Secondary air injection valve -N112-*/****
 - ☐ attached to bracket with 6 Nm
 - ☐ resistance 25...35 Ω
 - ☐ check ⇒ **26-3** page 4
- 12 - Air intake hose**
 - ☐ for secondary air pump
 - ☐ 2-part with push-fit coupling
 - ☐ check tightness
 - ☐ press together at front to unlock
- 13 - To air filter**
- 14 - O-ring**
 - ☐ replace
- 15 - Connector**
 - ☐ 2-pin
 - ☐ for secondary air pump motor
- 16 - 10 Nm**
- 17 - Secondary air pump motor -V101-****
 - ☐ check ⇒ **26-3** page 3
- 18 - 40 Nm**
- 19 - Pressure hose**
 - ☐ check tightness
 - ☐ press together at front to unlock



20 - 10 Nm

- ❑ attached to bracket ⇒ item 6

21 - 10 Nm**22 - Gasket**

- ❑ replace

Testing combination valve**Special tools, test and measuring equipment and auxiliary items required**

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

Test conditions

- No fault in fault memory ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.
- Final control diagnosis performed ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.
- No leaks in vacuum lines and hose connections.
- Vacuum lines not blocked or kinked.

Test sequence

- Remove engine trim panel and trim panel ahead of intake manifold.
- Detach vacuum hose -arrow- at combination valve. ►
- Connect hand vacuum pump (e. g. -V.A.G 1390-) to combination valve -1- with hose -2-. ►

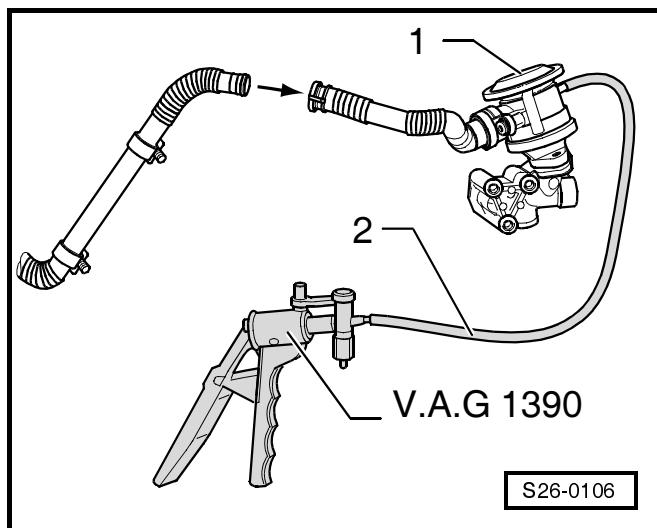
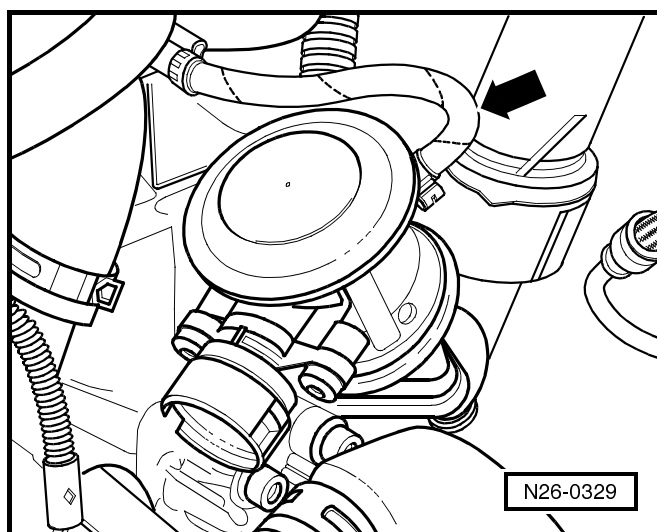
**Note!**

Do not use any compressed air during the subsequent test!

- Separate pressure hose at coupling on left next to intake manifold and blow into hose with slight pressure -arrow-. Combination valve must be closed.
- Operate hand vacuum pump. Valve must open.

If the combination valve does not open:

- Replace combination valve ⇒ Chap. 26-3.

**Testing secondary air pump motor****Special tools, test and measuring equipment and auxiliary items required**

- ◆ Vehicle system tester -V.A.G 1552-
- ◆ Diagnostic cable -V.A.G 1551/3-

Test conditions

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

Test sequence

- Remove the noise insulation panel in the middle.
- Detach the pressure hose at the secondary air pump motor. ►
- Actuate the secondary air pump relay by means of the final control diagnosis ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

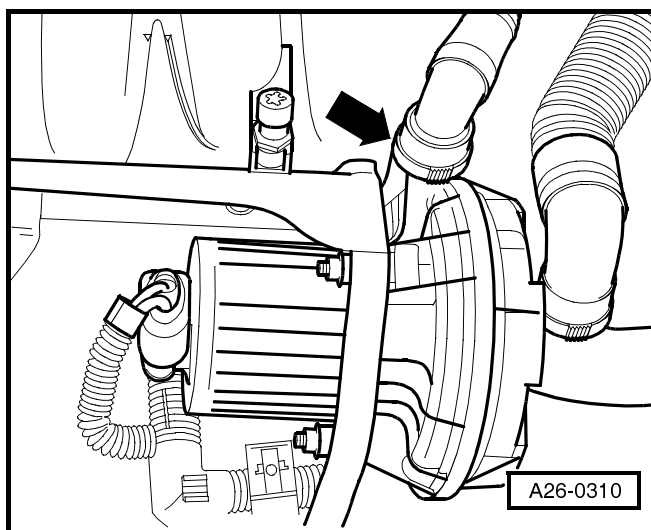
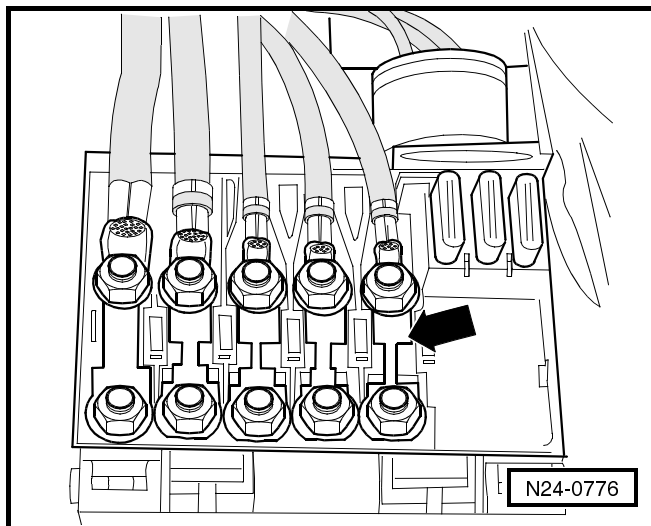
The secondary air pump motor must start at intervals and air must flow out at the outlet connection.

If the motor starts, but no air flows out:

- Replace secondary air pump motor.

If the secondary air pump motor does not start at intervals:

- Test actuation of secondary air pump motor ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.



Testing secondary air injection valve

Test condition

- Coolant temperature 5...33 °C
- Secondary air pump motor o.k.

Test sequence

- Remove engine trim panel and trim panel ahead of intake manifold.
- Detach vacuum hose at combination valve -arrow-. ►
- Start engine and run in idle.

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

If no vacuum can be felt:

- Switch engine off.
- Test actuation of secondary air injection valve ⇒ 1.8 I/132 kW Engine, Fuel Injection and Ignition System; Rep. Gr. 01.

