

Workshop Manual

Audi 80 1992 ►

Engine code	ABC				
Booklet 6 cylinder fuel injection engine (2.6 ltr. engine, 2 valve), mechanics					

Edition 04.92



Audi

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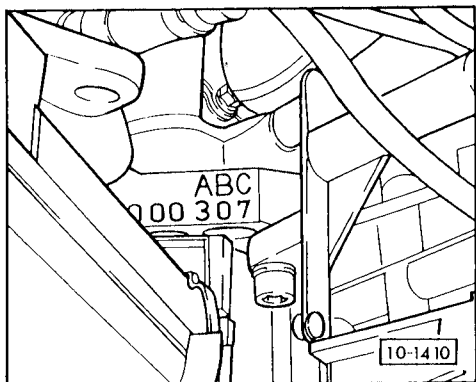
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Printed in Germany
000.5460.29.20

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Technical data

Engine number

The engine code letters as well as the engine number are stamped on a right side of the engine block between the cylinder head and hydraulic pump.

00-1

Engine overview

Code letters	ABC	
Engine data		
Manufactured	from to	08.91
Cylinder	Qty.:	6
Cubic capacity	l	2771
Output	kW at RPM	128/5500
Torque	Nm at RPM	250/3000
Bore	mm Ø 	82.5
Stroke	mm	81.0
Compression ratio		10.3

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Code letters	ABC
Control times with 1 mm valve opening and valve clearance of 0 mm	
Inlet opens after TDC	2°
Inlet closes after BDC	42°
Outlet opens before BDC	42°
Outlet closes before TDC	2°
RON at least	95
Fuel injection	Multi-Point Injection
Exhaust return	X
Catalytic converter	X
Lambda control	X
Exhaust turbo charge	—

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Removing and installing engine

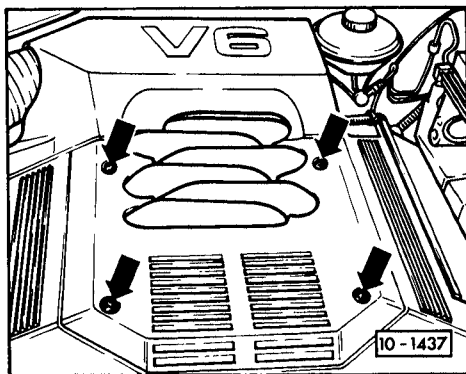
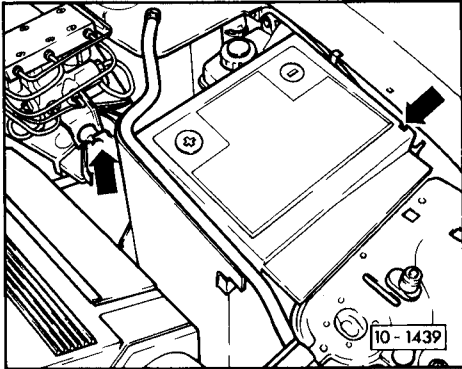
The engine is removed upwards without gearbox.

Notes:

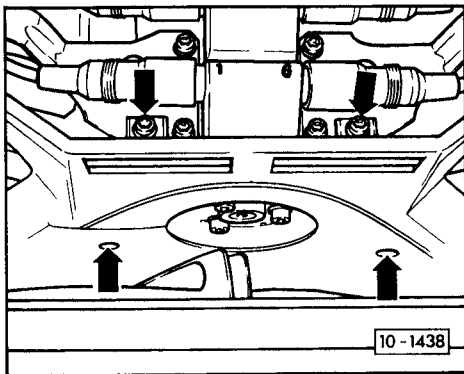
- All cable ties loosened or cut during removal of the engine must be renewed at the same place during engine installation.
- Before disconnecting the battery, determine the radio anti-theft code if applicable.
- Only disconnect the battery with the ignition switched off, as otherwise the control unit could be damaged.

Removing the engine

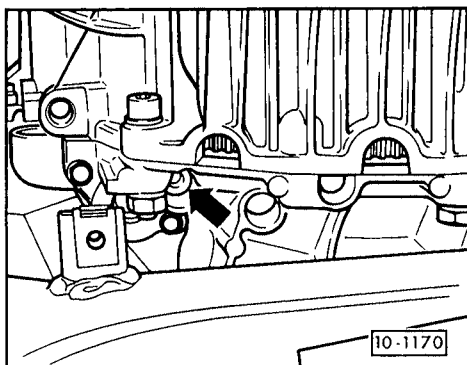
- ◀ – Disconnect battery cover and remove by sliding upwards.
On vehicles with air conditioner the battery is located under the rear bench seat.
- Disconnect battery earth terminal.



- ◀ – Unclip upper engine cover and remove.



- ◀ – Unscrew ribbed V-belt cover.

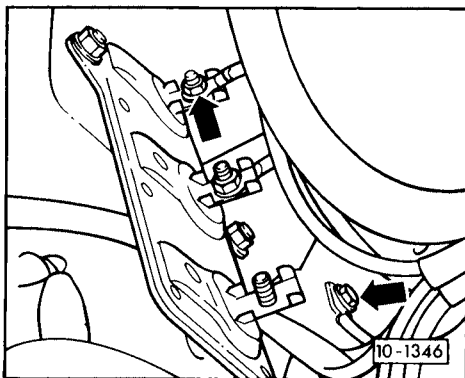


- ◀ – Using special tool 3247 drain coolant at the engine draining screw or draining screw fitted at bottom left of the radiator.
Use collector tray V.A.G 1306.

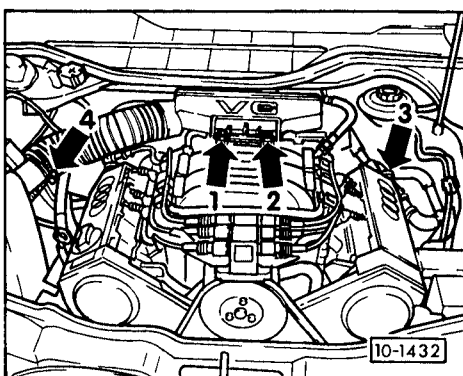


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- ◀ – Unscrew wires at the series resistor for radiator fan and earth connection of cross member and place aside.
- Unscrew radiator fan housing at top (3 bolts) and lift out upwards.

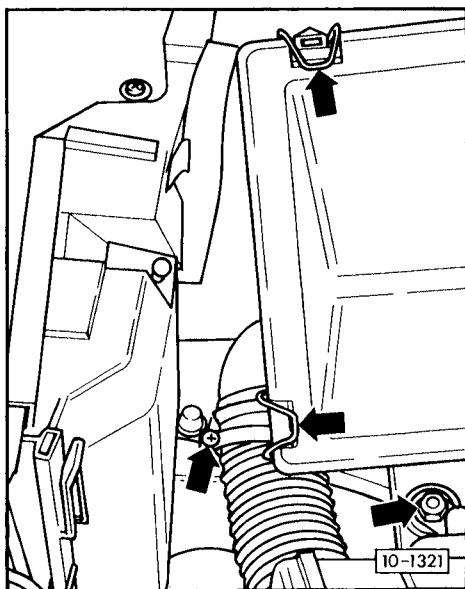


- ◀ – Unscrew air baffle from inlet manifold –1– and –2–.
- Disconnect plug connector from Hall sender –3–.
- Disconnect crankcase vent on cylinder head rear left and right and remove together with air baffle.

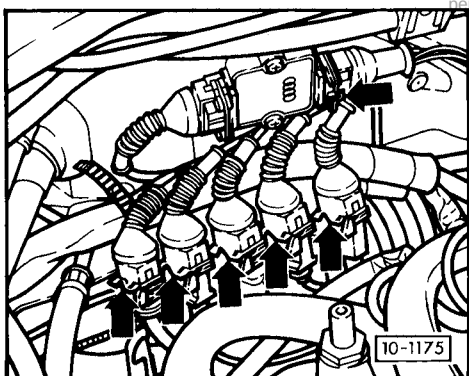
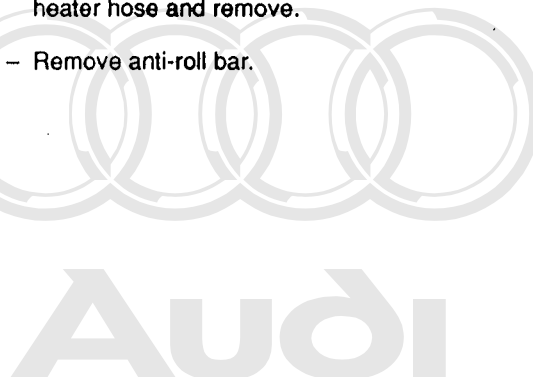
Vehicles with automatic gearbox

- Loosen crankcase vent on cylinder head left and on throttle valve part left and pull off.

10-3



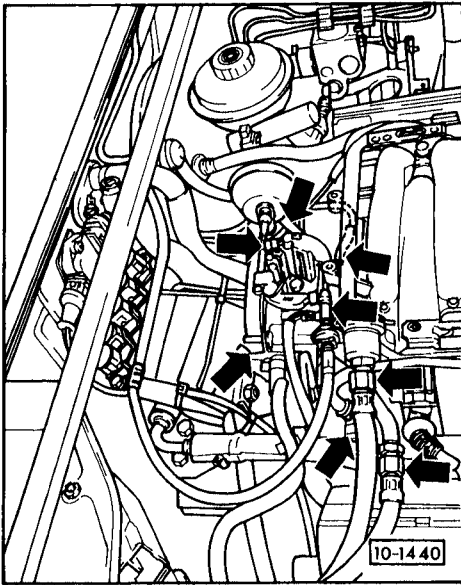
- Loosen suction hose on air filter (hose clip –4–).
- Press air baffle to rear and remove upwards.
- ◀ – Unclip upper part of air filter housing.
- Unscrew lower part of air filter housing and pre-heater hose and remove.
- Remove anti-roll bar.



Disconnect plug connectors on right of water box (5 off).

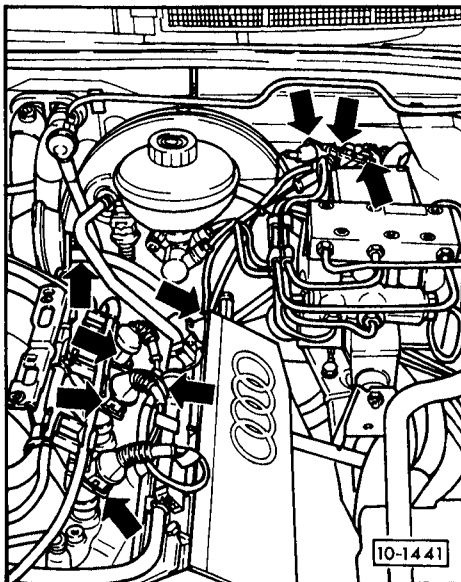
- Pull lower plug bodies from bracket, disconnect Lambda probe plug behind bracket and place aside.
- Disconnect the 3-pin plug connector of output end stage.

10-4



- ▲ - Unclip locking device for accelerator cable, unhinge accelerator cable and place aside.
- Disconnect plug connectors from inlet air temperature sensor and idling speed stabilizing valve.
- Unscrew fuel feed and return pipes.
- Unscrew earth connection behind throttle valve.
- Disconnect vacuum pipe to control unit in front of throttle valve.
- Disconnect plug connector from throttle valve switch.
- Disconnect vacuum hose for air conditioner and/or differential lock left of throttle valve.

10-5

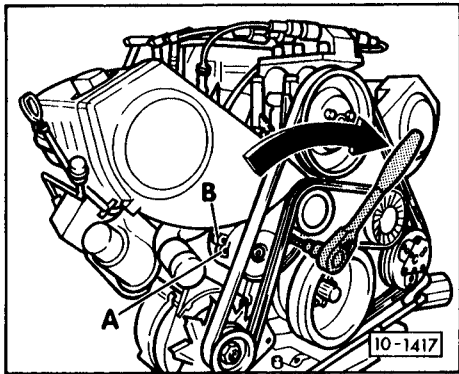


- ▲ - Disconnect plug from knock sensor and Lambda probe heater.
- Disconnect Lambda probe plug and place cables aside.
- Disconnect plug connector to oil pressure switch and oil temperature sender below the GRA-socket.
- Disconnect vacuum pipe from GRA-socket.
- Disconnect plug connector of electronic thermal switch in water pipe.
- Disconnect vacuum pipe (blue) to non-return valve.
- Disconnect plugs from left and right fuel injection valves.

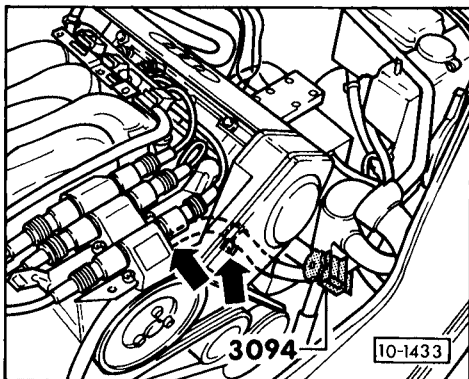
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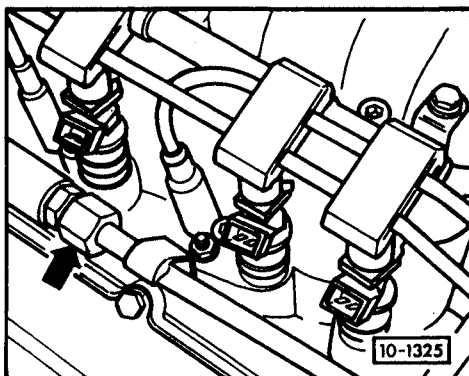


- ▶ - To release tension of ribbed V-belt press Allen key (SW 10 mm) downwards.
- Align bore A with bore B.
- Lock with special tool 3204.
- Remove ribbed V-belt.



- ▶ - Clamp feed pipe to vane pump using hose clamp 3094. Unscrew feed pipe at vane pump and bracket, pull out and place aside.
- Place on cloth to catch escaping oil.

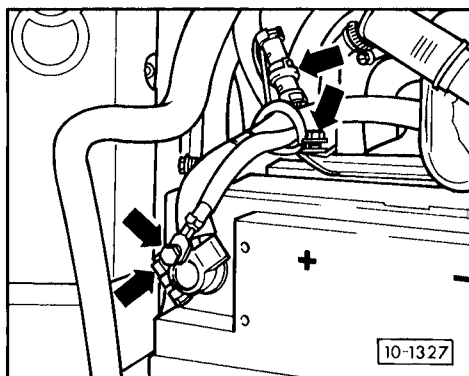
10-7



- ▶ - Disconnect pressure pipe to vane pump.
- Place on cloth to catch escaping oil.
- Unhinge pressure pipe at bracket behind throttle valve.
- Unscrew coolant pipe on engine top right.

For automatic gearbox

- Loosen vacuum hose to brake servo or suction jet pump at front left.
- Place vacuum hose with suction jet pump aside.

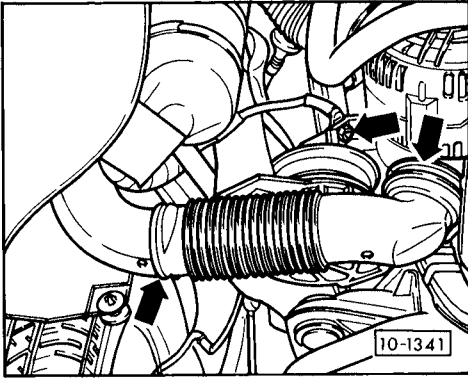


- ▶ - Unscrew positive terminal from battery and disconnect.
- Unscrew cable bracket from battery tray and engine bearer block.
- Disconnect plug connection.
- Place cables aside.

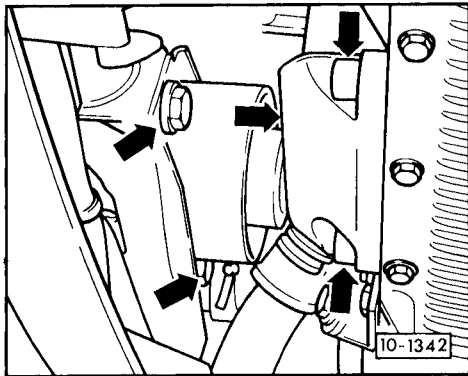
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10-8

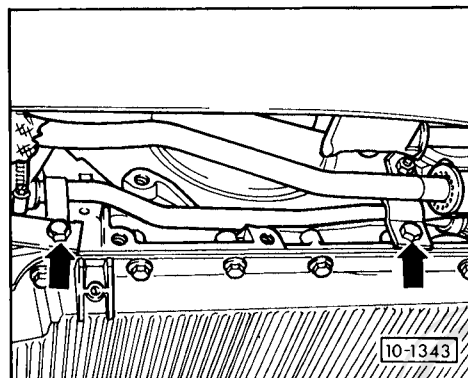


- ◄ - Disconnect air feed pipe to alternator.
- Unscrew engine – chassis earth connection.



- ◄ - Unscrew engine support at front of engine and from cross member.

10-9

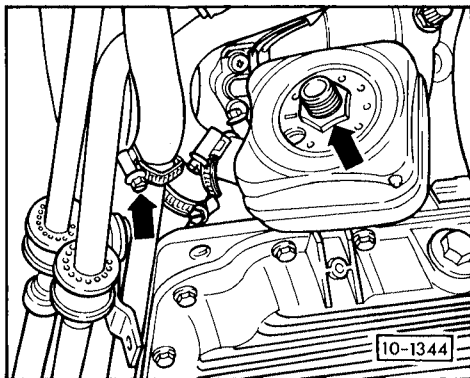


- ◄ - Unscrew pipe bracket for air conditioner and coolant pipe at front of oil sump.
- Unscrew coolant hose bottom right from coolant pipe and radiator.

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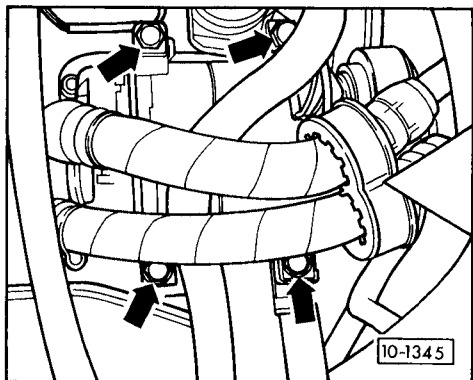


10-10



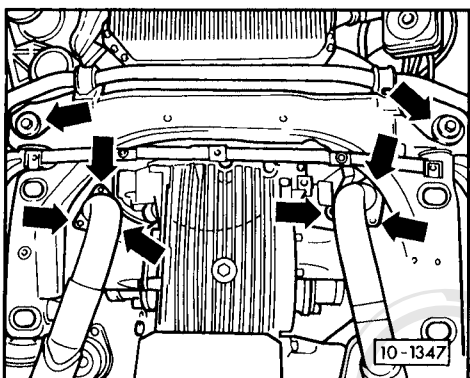
Vehicles with air conditioner

- Remove oil filter.
- ◄ - Unscrew oil cooler under oil filter and remove.
- Unscrew coolant pipe.
- Disconnect plug connector for magnetic clutch (single) and for RPM sender (double), open cable tie and place cables aside.



- ◄ - Unscrew air conditioner compressor from engine. Pipes remain connected and must not be kinked.
- Suspend air conditioner at side with wire.

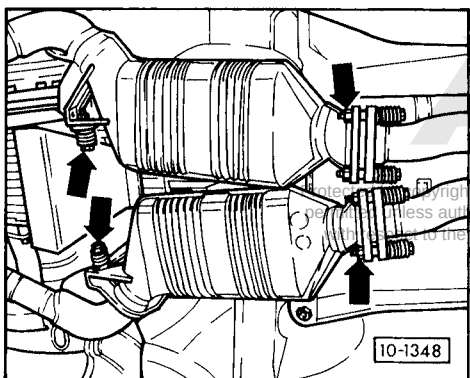
10-11



- ◄ - Unscrew exhaust pipe from manifold.
- Unscrew both front bolts from engine bearer.

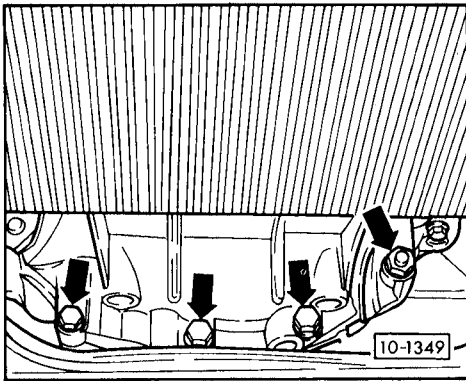
Attention!

The engine bearer will drop approx. 10 cm after the front bolts have been removed.



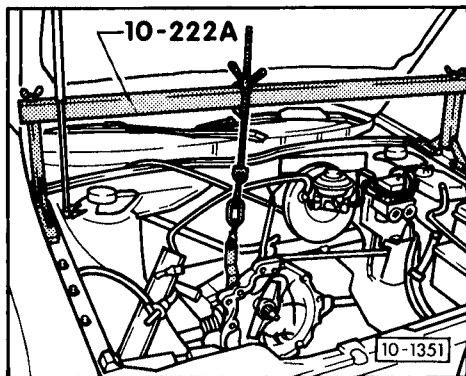
- ◄ - Remove both exhaust pipes together with catalytic converter.
- Remove starter motor.
- Unscrew drive coupling at right of gearbox.
- Pull starter motor bolts at bottom rear towards drive shaft.

10-12



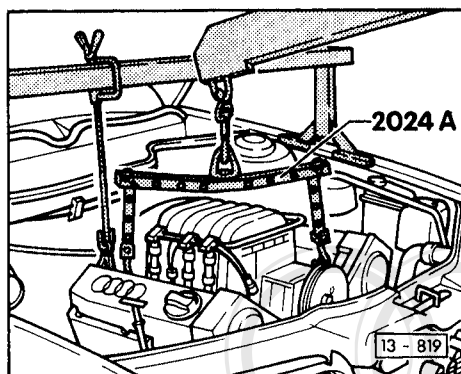
Vehicles with automatic gearbox

- Unscrew bolts for torque converter (in starter motor aperture) – 3 off.
- ◀ - Unscrew upper and lower engine – gearbox connecting bolts.



- ◀ - Support gearbox with support device 10-222 A, hook 10-222 A-2 and gearbox cradle 3147.
- Unscrew nut on right engine bearer.

10-13

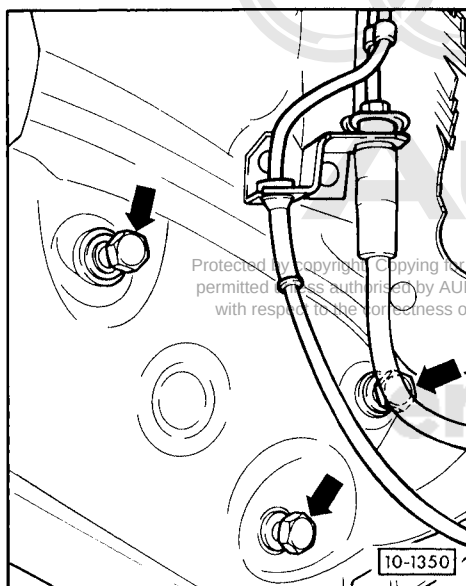


- ◀ → Hook up lifting beam 2042 A at rear and front and lock.

Note:

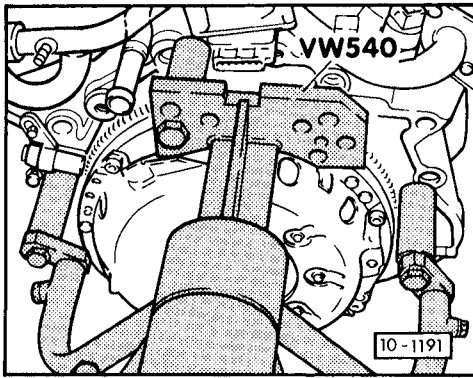
In order to ensure a good point of balance of the engine the perforated rails of the lifting device must be connected as shown in the illustration.

- Push in installation crane and connect lifting beam.



- Slightly lift the engine.
- ◀ - Unscrew left engine bearer.
- Carefully lift engine and follow up with cradle until the right engine bearer is released.
- Carefully pull engine forward until engine is free from obstruction.
- Lift out starter motor after engine has been separated from gearbox.
- Lift engine upwards and out.

10-14



Attaching engine to engine stand

- To carry out work on the engine install the engine with the mounting bracket VW 540 and support part VW 540/2 in the engine stand.

Attention!

When measuring the engine bore (⇒ Repair Group 13) the engine must not be mounted in the engine stand, so as to avoid possible distortion or stress.

10-15

Installing the engine

Installation of the engine is carried out in reverse order to removal and with due consideration of the following points:

- Check availability of centralizing dowels between engine and gearbox, install if not fitted.
- Always renew self-locking nuts.

Note:

The vacuum pipe to the control unit, fitted with an angle piece to the suction pipe behind the throttle valve must not be shortened nor is installation of another cross-section permitted ⇒ Workshop Manual Fuel Injection and Ignition System, Repair Group 24 (vacuum connections).

- When joining the engine to the gearbox, ensure the RPM sender is not damaged.

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Observe tightening torques.

- The arrows provided on the ends of the coolant pipes and coolant hoses must be aligned when connected.
- Only renew the coolant if the engine or one of the cylinder heads has been renewed or the coolant is dirty.

10-16

- Refill with coolant ⇒ Repair Group 19.
- Install exhaust system stress-free ⇒ Repair Group 26.
- Connect plug connectors on bulkhead ⇒ components of fully electric engine control, Repair Group 24.
- Check engine and automatic gearbox oil level.
- Replace cable ties cut or disconnected in original position.

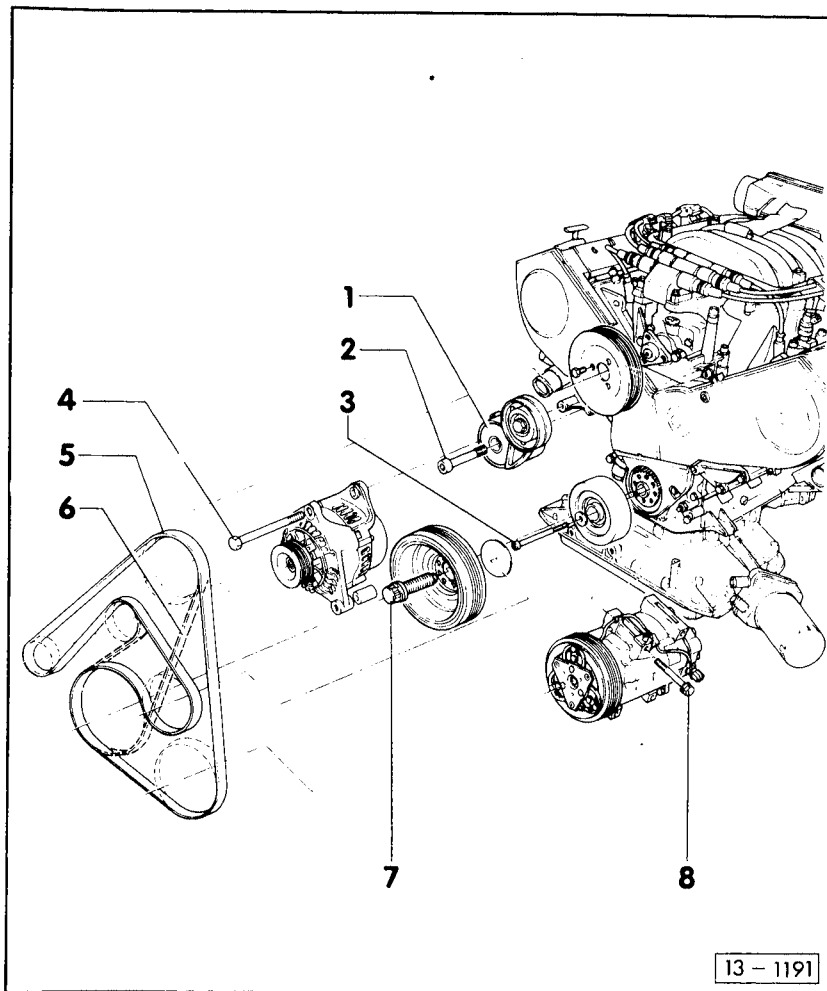
10–17

Tightening torques

Engine to gearbox	
M 10	45 Nm
M 8	25 Nm
Torque converter on drive gear cover	35 Nm
Engine bearer on left-hand chassis beam	45 Nm
Right-hand engine bearer	45 Nm
Alternator to bracket	
M 8	25 Nm
M 10	45 Nm
Catalytic convertor to exhaust manifold	25 Nm
Air conditioner to bracket	25 Nm
Renew engine bearer bolts	110 Nm + 90°
Hose clips on coolant hoses	3 ... 3.5 Nm

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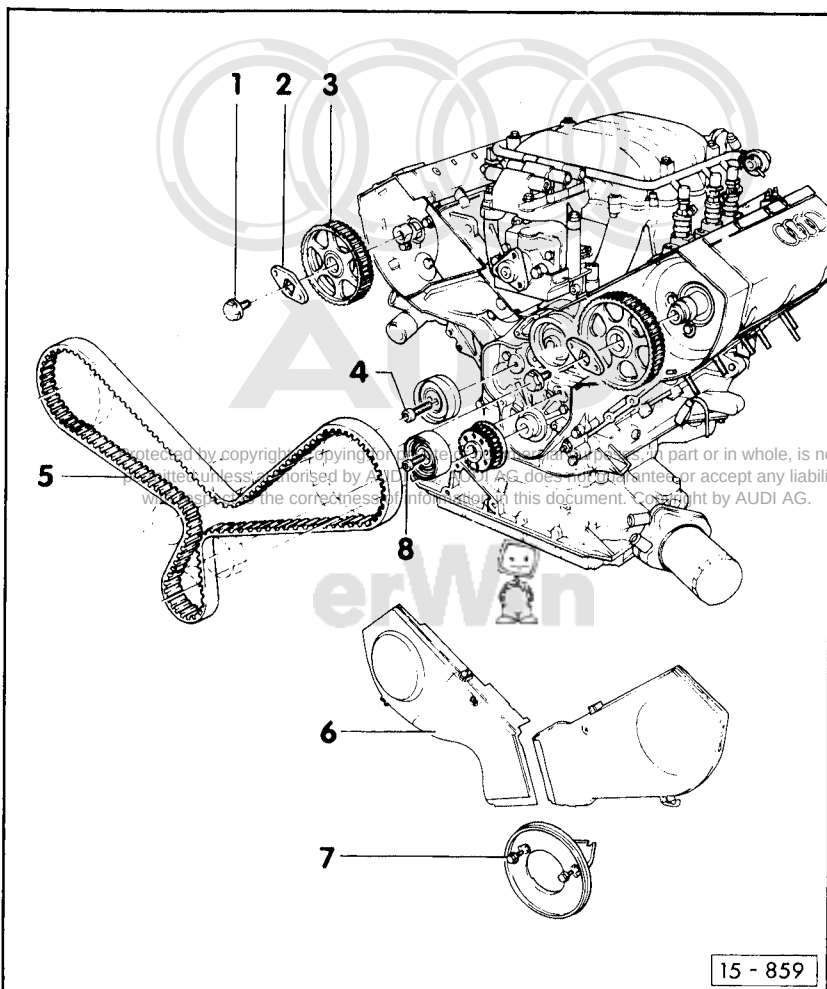


13 - 1191

Dismantling and assembling the engine

- 1 – Tensioning device for ribbed V-belt
 - Releasing tension ⇒ page 13-5
- 2 – 45 Nm
- 3 – 20 Nm
- 4 – 20 Nm
- 5 – Ribbed V-belt
 - For vehicles with air conditioner
 - Removing and installing ⇒ page 13-5
- 6 – Ribbed V-belt
 - For vehicles without air conditioner
 - Removing and installing ⇒ page 13-5
- 7 – Centre bolt, 400 Nm
 - without special tool 2079
 - Removing and installing ⇒ page 13-10
 - Insert crankshaft attachment 3242 ⇒ page 13-8
 - Attach belt pulley with 8 x M8 bolts to toothed belt pulley (20 Nm)
- 8 – 20 Nm

13-1



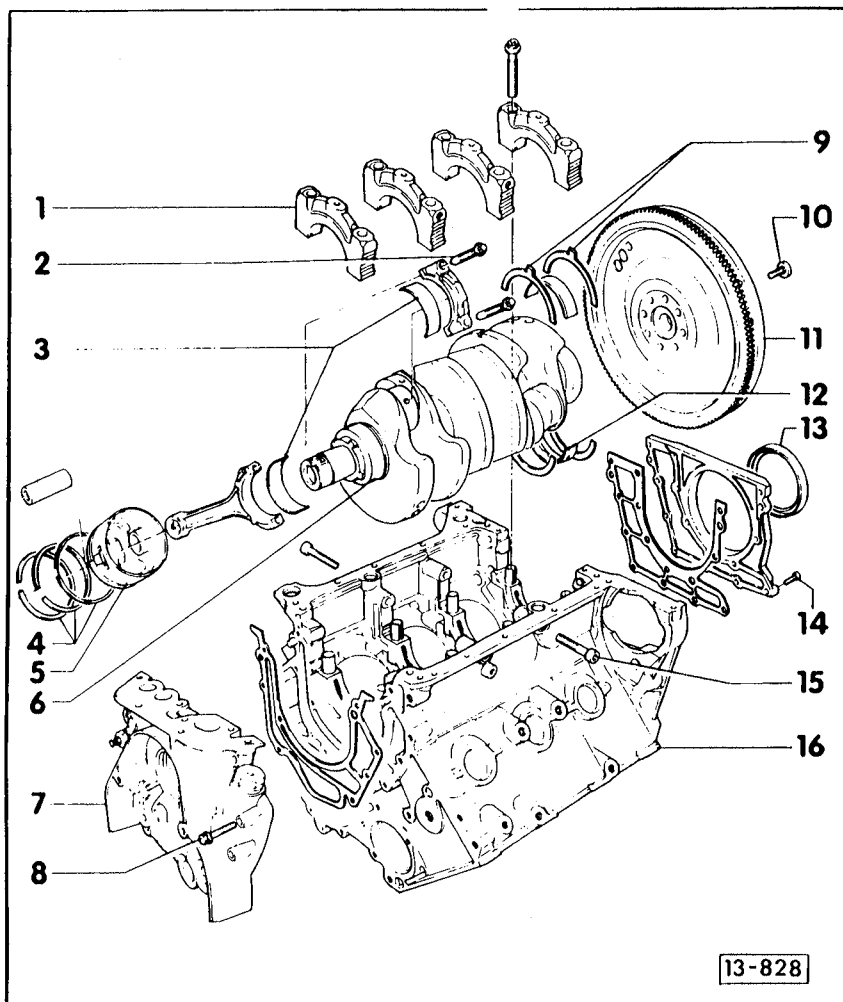
15 - 859

Notes:

- Install camshaft attachment 3243 before attaching the camshaft gears
- Only secure camshaft gears after tensioning of the toothed belt

- 1 – 70 Nm
- 2 – Fixing plate
 - Always install with inscription "front vorne" or "rear hinten" towards the camshaft
- 3 – Camshaft gears
 - Pulling off ⇒ "Removing and installing toothed belt", page 13-7
- 4 – Toothed belt tensioning roll, 45 Nm
- 5 – Toothed belt
 - Removing and installing ⇒ page 13-7
- 6 – Toothed belt cover
- 7 – 10 Nm
- 8 – 25 Nm

13-2



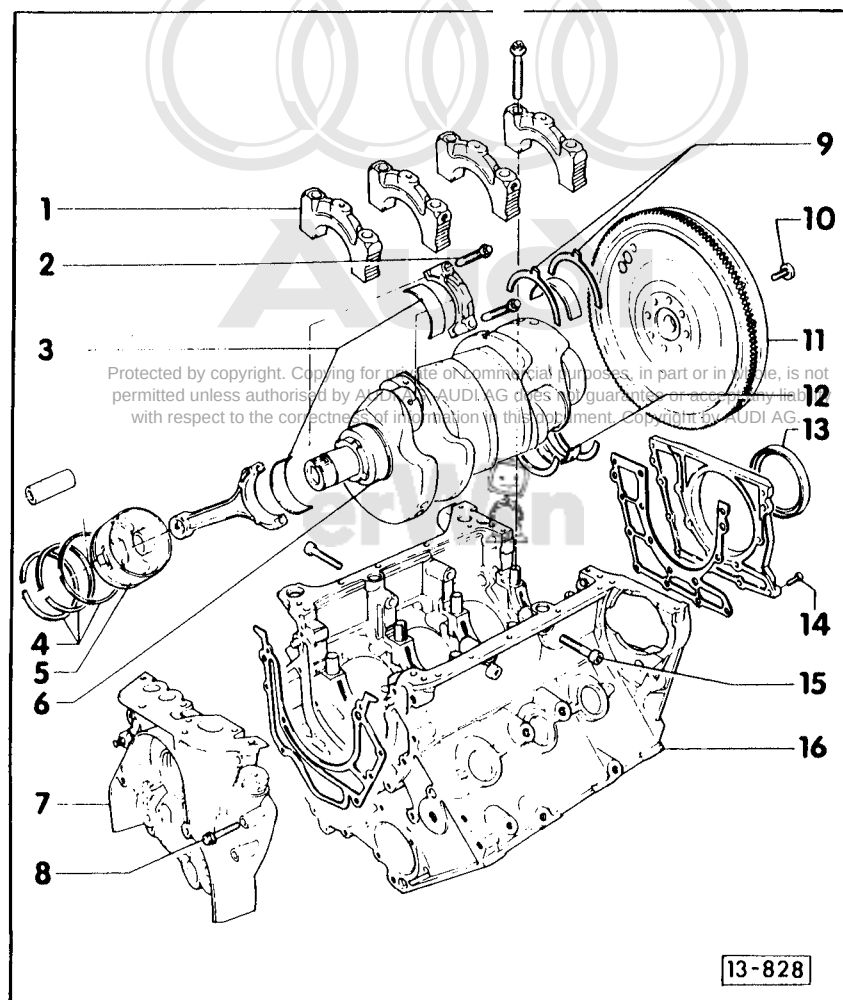
Dismantling and assembling cylinder – crankcase, crankshaft and flywheel

Note:

- Always renew seals and sealing rings.
- Connecting rod and connecting rod bearing ⇒ page 13–25.

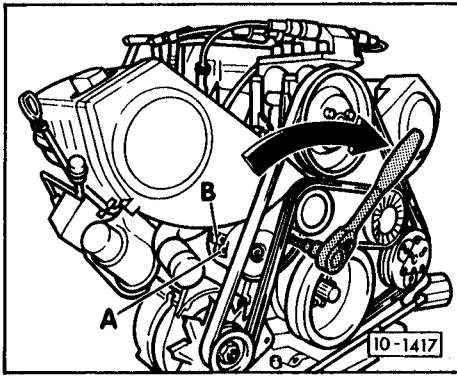
- 1 – Crankshaft main bearing cap**
 - Identification –1– on oil pump side
 - Renew main bearing cap bolts, tightening torque ⇒ page 13–8
 - Check bearing play ⇒ page 13–17
- 2 – Connecting rod bearing bolts**
 - Renew
 - 20 Nm + 1/2 turn further (180°)
 - For radial play measurement tighten to 20 Nm but no further
- 3 – Connecting rod bearing**
 - Do not interchange used bearing shells
 - Connecting rod, connecting rod bearing ⇒ page 13–25
- 4 – Piston rings**
 - Checking ⇒ page 13–21
- 5 – Piston**
 - Checking ⇒ page 13–21
- 6 – Crankshaft**
 - Checking ⇒ page 13–17

13–3



- 7 – Oil pump**
 - Removing ⇒ Repair Group 17
- 8 – 10 Nm**
- 9 – Thrust washers**
 - Measure axial play of crankshaft ⇒ page 13–17
 - Thrust washers only for 4th crankshaft bearing
- 10 – 30 Nm + 1/4 turn (90°)**
- 11 – Flywheel – Drive plate**
 - Removing and installing, installation dimensions ⇒ page 13–14
 - Forcing out and driving in needle roller bearing ⇒ page 13–13
 - Adjusting RPM sender bracket ⇒ Repair Group 28
- 12 – Crankshaft bearing**
 - Checking radial and axial play ⇒ page 13–17
- 13 – Sealing ring**
 - Renewing ⇒ page 13–11
- 14 – 10 Nm**
- 15 – 25 Nm**
 - Insert bolts hand-tight before tightening the main bearing cap bolts
- 16 – Cylinder – Crankcase**

13–4



Removing and installing ribbed V-belt

- Remove engine cover and ribbed V-belt cover ⇒ Repair Group 10.
- ◀ - To release tension on ribbed V-belt press Allen key (SW 10 mm) downwards.
- Align bore A with bore B.
- Use special tool 3204 for locking.
- Remove ribbed V-belt.

Note:

Mark the direction of movement of the ribbed V-belt with a felt-tip pen or crayon – do not scratch. Reverse direction of movement can lead to destruction.

- Position ribbed V-belt first over drive rollers and reversing rollers and **lastly** slide on to tensioning roller.
- Remove special tool 3204.
- Install engine cover.

13-5

Removing and installing ribbed V-belt pulley on crankshaft

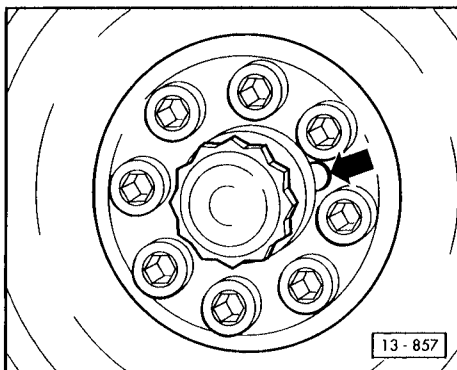
- Removing ribbed V-belt ⇒ page 13-5.

Note:

*It is **not** necessary to loosen the centre bolt to remove the pulley.*

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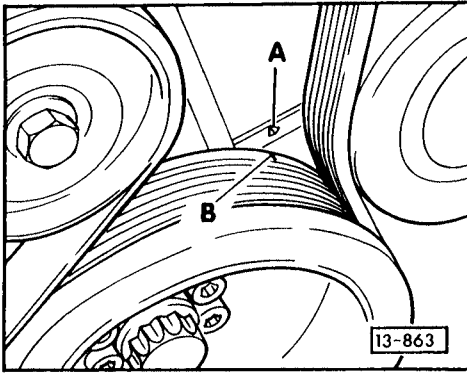
- Remove pulley by loosening the eight socket head bolts.



- ◀ When installing ensure that the slots in the pulley agree with the stop pointer on the toothed belt pulley.

Tightening torque: 25 Nm.

13-6



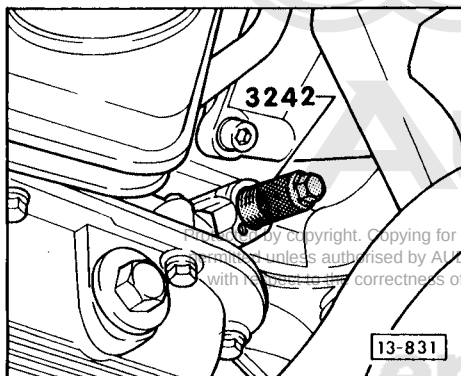
Removing and installing toothed belt

Removing:

Removing toothed belt ⇒ page 13-5.

- Remove tensioning device for ribbed V-belt.
- Unclip protective cover for toothed belt from both sides.
- ◀ - Manually turn the engine to TDC position. Notches A and B must align.
- Check camshaft position: The large holes of the attachment plates on the camshaft gears must be aligned inwards, otherwise turn camshaft a further revolution.
- Unscrew ignition timing point sender from left side of crankcase behind oil cooler and above the oil sump.
- The TDC hole of the crankshaft must be located behind the hole of the reference mark sender (visual or tangible).

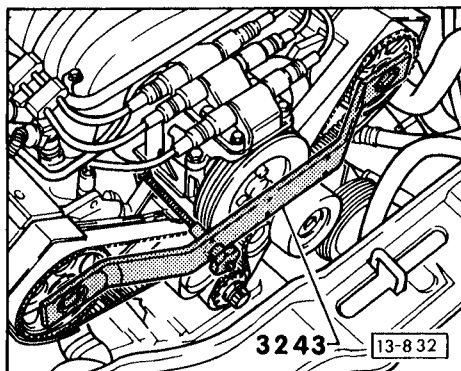
13-7



- ◀ - Screw crankshaft counter hold 3242 into the hole of the ignition timing point sender previously removed and tighten lightly.
- Remove crankshaft pulley ⇒ page 13-6.
- Remove lower protective cover for toothed belt.

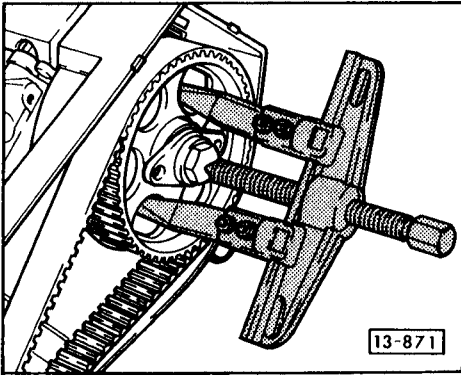
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Mark the direction of travel of the toothed belt, as reversed travel can lead to destruction.



- Install camshaft counter hold 3243.
- ◀ - Loosen bolts of left and right camshaft gears approx. 3 turns (do not remove).

13-8



- Remove camshaft counter hold 3243.

- ◀ – Using an extractor, e.g. KUKKO 20–10, remove left and right camshaft gears from shaft.

Note:

The hooks of the extractor must fit on the rear hub.

- Loosen toothed belt and remove.

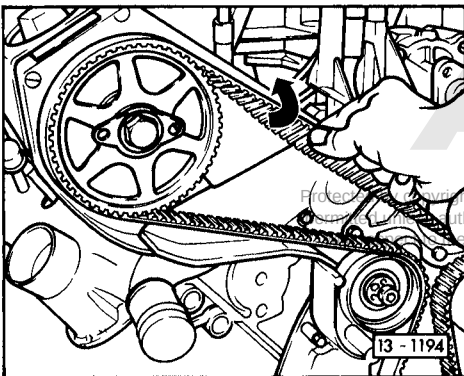
Installing:

- Position toothed belt over both camshaft gears.
- Install camshaft counter hold 3243.
- Position toothed belt on all gears (tension roller last).

Note:

The camshaft gears must be so loose on the shaft, that the camshafts can still be turned but do not tip.

13–9



Tensioning the toothed belt

- Using an Allen key (SW 8 mm) turn toothed belt tension roller to right and hold.
- Tighten toothed belt tension roller with second Allen key (SW 8 mm).
- Check toothed belt tension device between right camshaft gear and coolant pump.

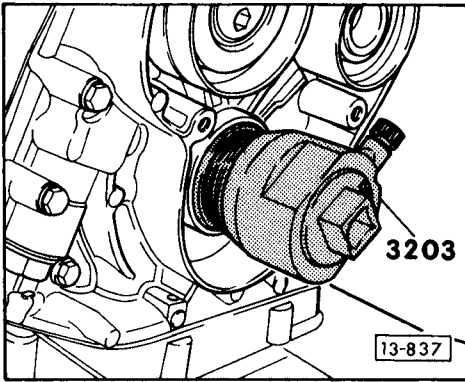
- ◀ – Apply light pressure with thumb and first finger between camshaft gear and coolant pump. It should be possible to turn toothed belt by 90°.

- Tightening torques:
Toothed belt tension roller 45 Nm
Centre bolt for crankshaft 450 Nm

Note:

The tightening torque for the crankshaft centre bolt has been given without special tool 2079.

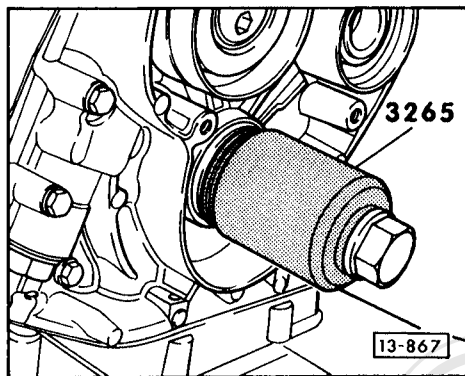
13–10



Renewing crankshaft sealing rings

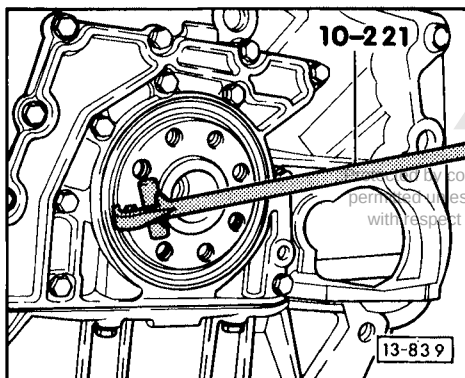
A – Toothed belt side

- Removing toothed belt ⇒ page 13–7.
- Removing crankshaft pulley.
- ◀ – Extract sealing rings with sealing ring extractor 3203.
- Clean running and sealing surfaces.
- Before pressing, lightly oil sealing lip and outer edge of sealing ring.



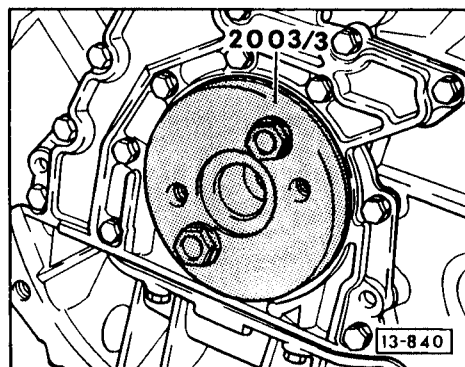
- Slide sealing ring over fitting sleeve (3202/1) of 3202.
- ◀ – Press sealing ring in evenly with fitting sleeve 3265 and centre bolt.

13–11



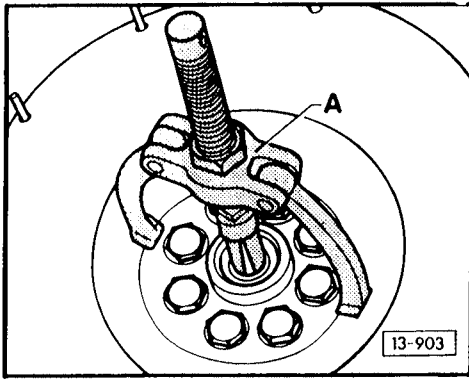
B – Flywheel side

- Remove clutch and flywheel or drive plate ⇒ page 13–15.
- ◀ – Lever out sealing ring with extractor hook 10-221.



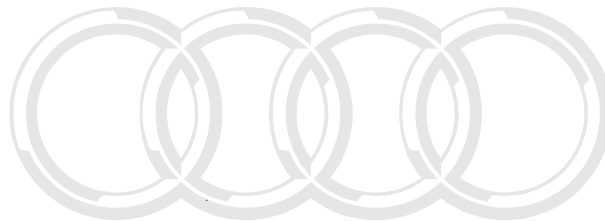
- Clean running and sealing surface.
- Before pressing, lightly oil sealing lip and outer edge of sealing ring.
- ◀ – Press in sealing ring up to end stop with fitting device 2003/3 and flywheel bolts or drive plate cover.

13–12

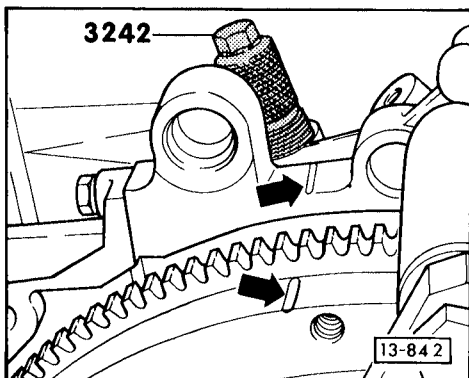


Extracting and driving in flywheel needle roller bearing

- ◄ – Extract with extractor, e.g. KUKKO 21/2 and KUKKO 22-1.
- Drive in with fitting mandrel 3264.



13-13



Removing and installing double mass flywheel/drive plate – installation dimension

Double mass flywheel

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◄ – Screw crankshaft counter hold device 3242 into position with engine at TDC.

- Mark position of flywheel to engine block.
- Remove bolts.

Note:

- Always renew bolts.
- Use only M10 x 1 x 43 bolts coated with locking agent.

The needle roller bearing is located in the flywheel and must be pressed in when renewing the flywheel.

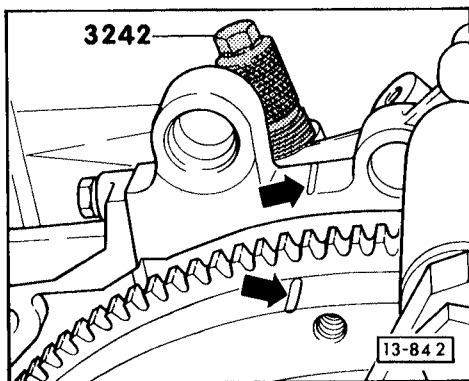
- Tightening torque:

40 Nm + 180° (1/2 turn)

After securing the double mass flywheel the bracket for the RPM sender –G28 must be reset using setting device 3308 ⇒ page 13-16.

Note:

Ensure the dowels in the engine-gearbox flange are fitted before installing the engine.



Drive plate

- ◀ - Lock crankshaft in TDC position with crankshaft counter hold 3242.
- Mark hole pattern of drive plate and washer to engine block.
- Mark position of washer in front and behind drive plate.

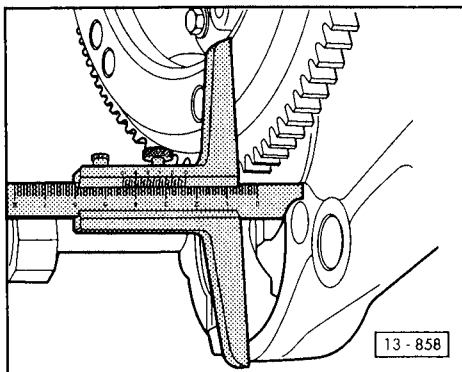
Notes:

- At least one washer **must** be fitted in front and behind the drive plate.
- Half engines are supplied without crankshaft bushing. On vehicles with automatic gearbox the bush must be driven in before installing the drive plate.
- Always renew all bolts and screws.
- Use only M10 x 1 x 17 bolts coated with locking agent.

Tightening torque

60 Nm + 90° (1/4 turn).

13-15



◀ Installation dimensions – drive plate

Vehicles with gearbox identification VW A4

Dimension –a– 21.3 ... 22.9

Vehicles with gearbox identification HP 18

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Dimension –a– 18.1 ... 19.7

or achieve measurement with relevant washer.

Note:

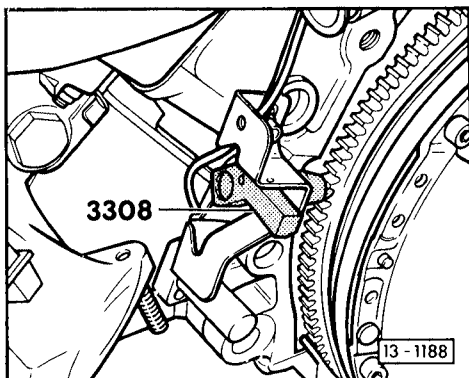
Ensure the dowels in the engine-gearbox flange are fitted before installing the engine.

Set RPM sender bracket –G28 with setting device 3308

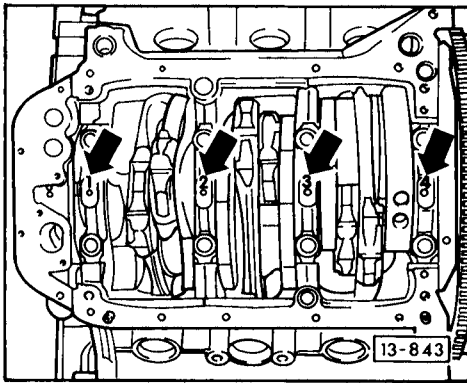
Note:

With the crankshaft at TDC, fit crankshaft counter hold 3242.

- Remove RPM sender. first remove heat shield.
- Loosen bracket.
- ◀ - Fit setting device 3308 in place of sender (must mesh with starter ring).
- Tighten bracket.
- Install sender.



13-16



Installation position crankshaft bearing caps

- Bearing –1– is on the oil pump side, bearing –4– is on the flywheel side.

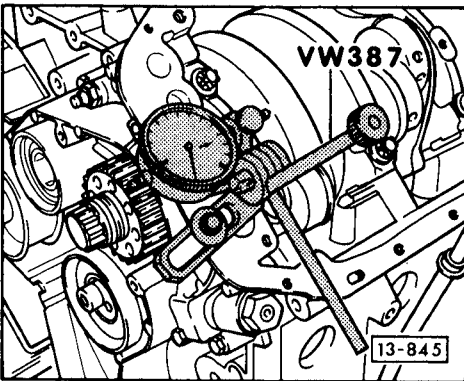
Measure crankshaft axial and radial play

a) Axial play

- Do not interchange used bearings.
- – Screw gauge together with gauge bracket VW 387 to oil pump and set against crank web.
- Press crankshaft manually against gauge and hold.
- Zero gauge.
- Press crankshaft away from gauge.
- Check reading.

New: 0.07 – 0.23 mm

Wear limit: 0.25 mm.



13-17

Radial play

Radial play measurement is carried out with a Plastigage cord.

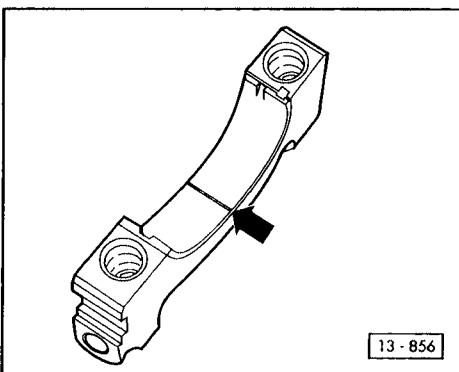
Measuring range of Plastigage cords:

Type	Colour	Measuring range
PG-1	Green	0.025 – 0.076 mm
PR-1	Red	0.050 – 0.150 mm

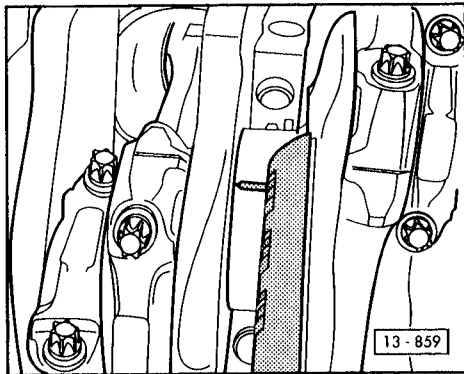
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- Remove crankshaft bearing cap.
- Clean bearing shell and crankshaft journal.
- – Place Plastigage cord over total bearing width on to journal or bearing shell.
- Install crankshaft bearing cap together with bearing shell and tighten to 60 Nm + 180°.

Do not turn crankshaft.



13-18



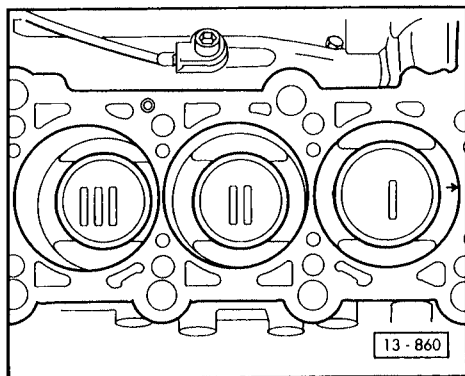
- Remove crankshaft bearing cap again.
 - ◀ - Compare width of plastigage cord with gauge.
- New: 0.018 – 0.045 mm
- Wear limit: 0.10 mm

Crankshaft dimensions

Measurements in mm.

Grinding measurements	Crankshaft bearing journal Ø	Crankshaft Connecting rod journal Ø
Basic dimension	– 0.022 65.00 – 0.042	– 0.022 54.00 – 0.042
Stage I	– 0.022 64.75 – 0.042	– 0.022 53.75 – 0.042
Stage II	– 0.022 64.50 – 0.042	– 0.022 53.50 – 0.042
Stage III	– 0.022 64.25 – 0.042	– 0.022 53.25 – 0.042

13–19



Pistons and rings

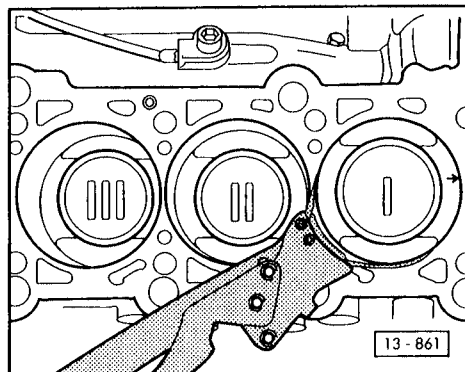
a) Pistons

- ◀ - Installation position –arrow– must always point to oil pump.
- Mark sequence on base of piston with waterproof felt-tip pen.

Note:

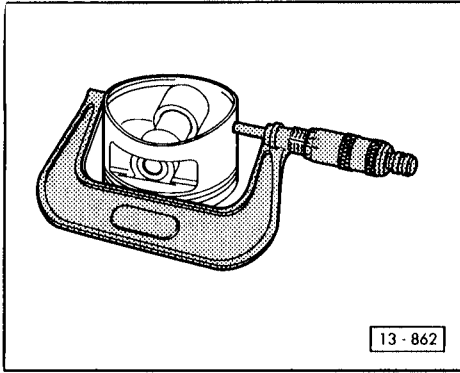
Do not scratch and do not use a centre punch, as the piston is coated.

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- ◀ - Install piston using piston ring clamp.

13–20

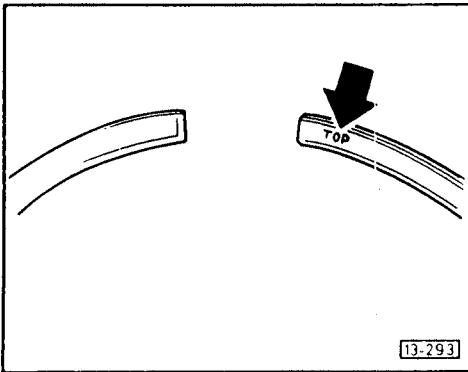


◀ -- Check piston.

Measure approx. 10 mm from lower edge 90° off-set to piston wrist pin axis.

Deviations from specified value

max. 0.04 mm

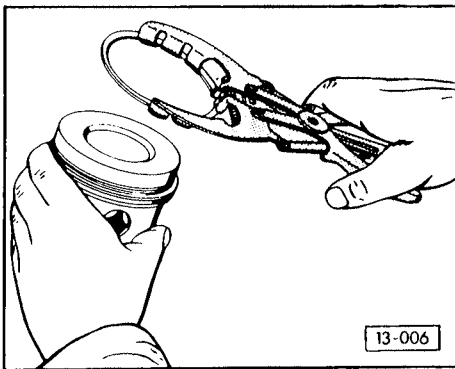


b) Piston rings

◀ Installation position:

- "TOP" must point to piston crown.
- The inner bezel on square ring must point to piston crown.
- Outer bezel on must point to piston crown.

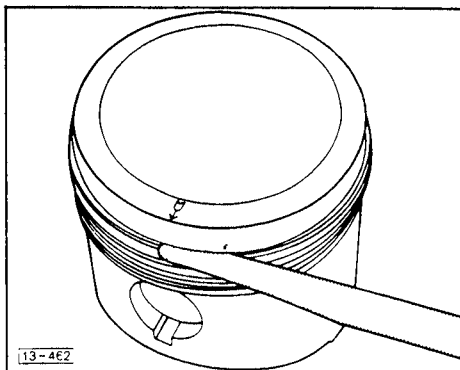
13-21



◀ -- Removing and installing piston rings.



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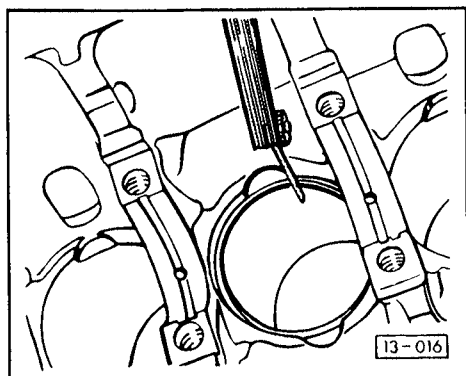
◀ -- Check piston ring clearance.

New: 0.02 – 0.08 mm.

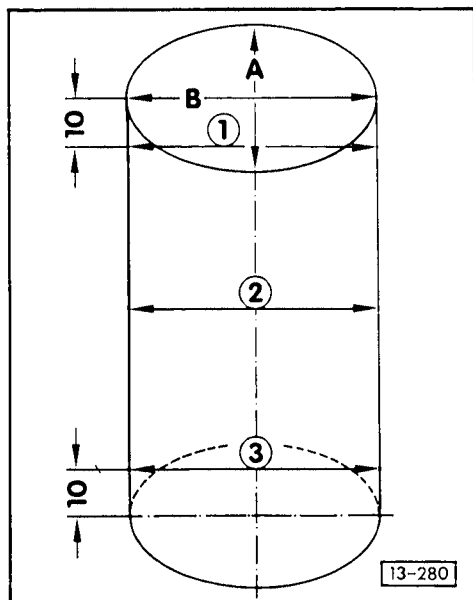
Wear limit: 0.1 mm.



13-22



- ◄ – Check piston ring gap.
 - Slide piston ring squarely into bottom of cylinder approx. 15 mm from cylinder edge.
- New: 0.2 ... 0.5 mm
- Wear limit: 1.0 mm



Checking the cylinder bore

- ◄ – Measure bore at three places crosswise in directions –A– and longitudinally in direction –B–.
- Use 50 ... 100 mm internal micrometer.
- Max. deviations from nominal dimension 0.08 mm.
- Piston and cylinder dimensions ⇒ page 13–24.

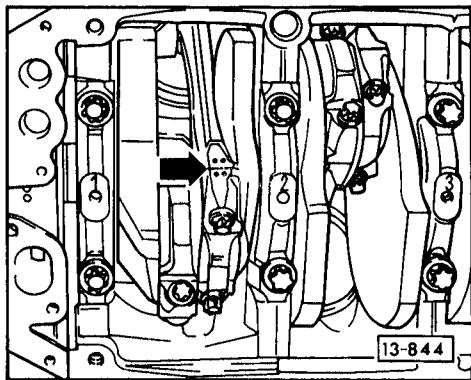
13–23

Piston and cylinder dimensions

Grinding measurements	Piston Ø	Cylinder bore Ø
Basic dimensions	82.48	82.51
Stage I	82.74	82.76
Stage II	82.98	83.01

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Connecting rod, connecting rod bearing

- Always renew connecting rod as a full set.
- Do not interchange connecting rod bearing caps.

- ◀ – Mark connecting rod bearing caps lightly with a centre punch before removing.

Checking radial play

- Remove connecting rod bearing cap.
- Clean bearing cap and bearing journal.
- Place Plastigage cord over total bearing width on to journal or bearing shell.
- Install connecting rod bearing cap and tighten to 20 Nm but **do not** tighten further. Do not turn crankshaft.
- Remove connecting rod bearing cap again.
- Compare width of plastigage cord with gauge.

New: 0.015 – 0.062 mm

Wear limit: 0.12 mm

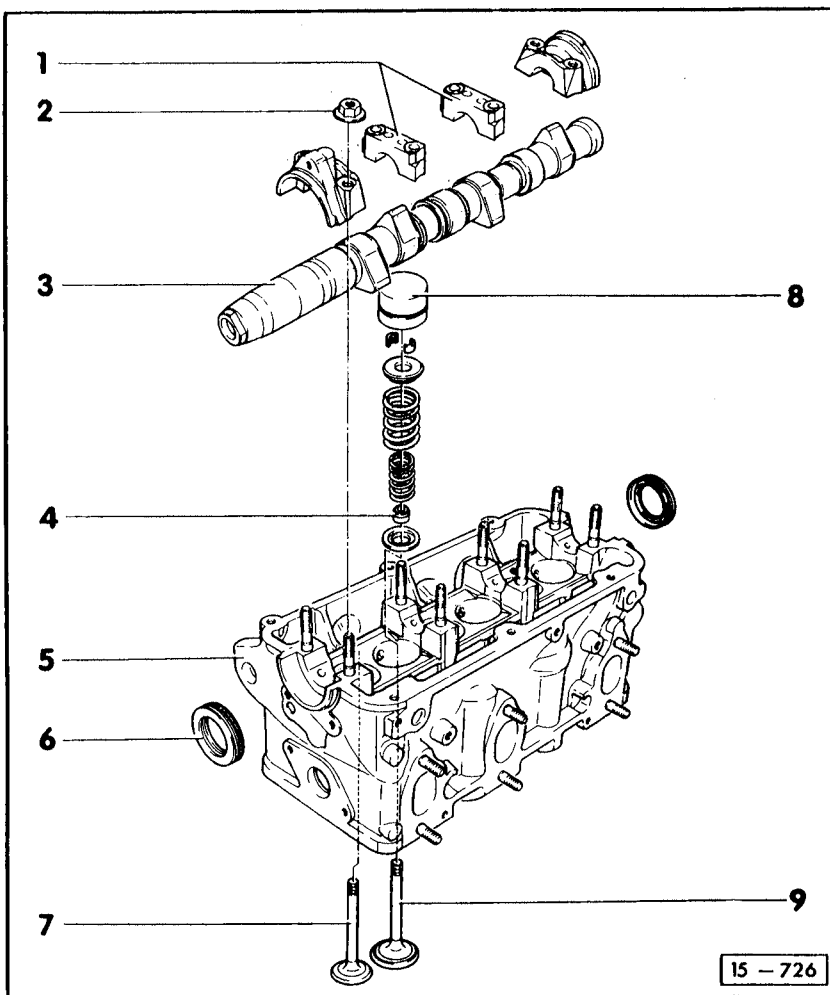
- Renew connecting rod bearing cap bolts.

13–25



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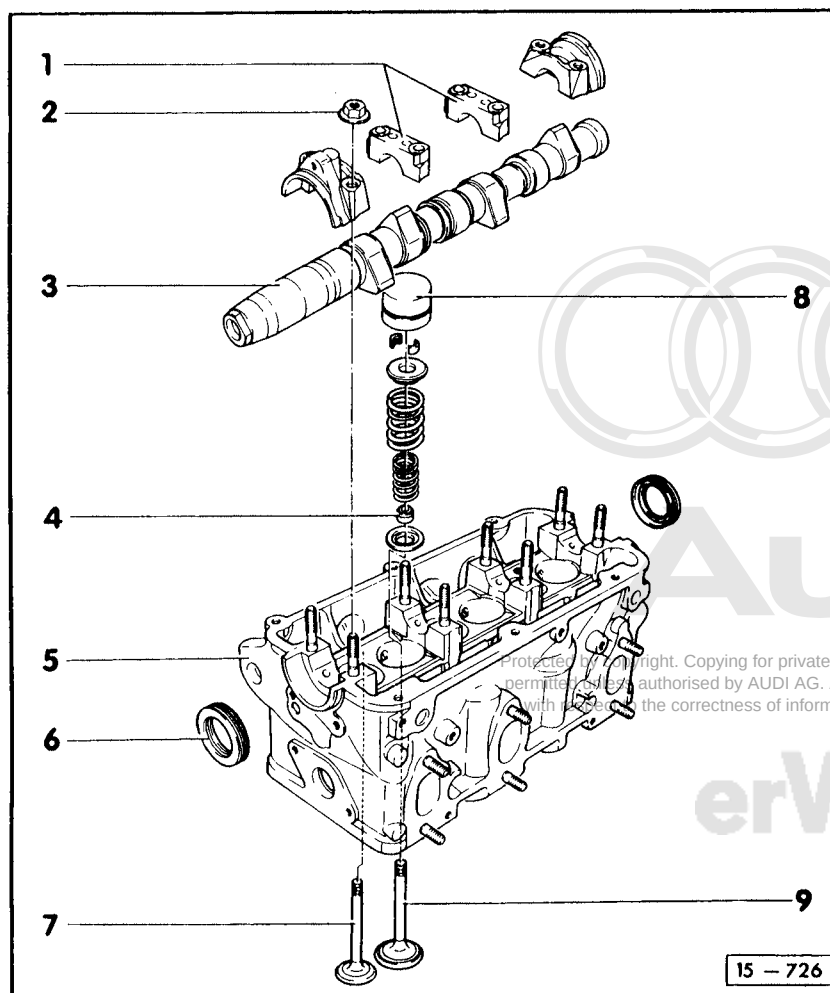




Servicing valve drive gear

- 1 – **Bearing cap**
 - Installation position ⇒ page 15-17
- 2 – 15 Nm
- 3 – **Camshaft**
 - Removing and installing ⇒ page 15-17
 - Checking axial play ⇒ page 15-18
 - Run-out 0.01 mm
- 4 – **Valve stem seal**
 - Renewing ⇒ page 15-20
- 5 – **Cylinder head**
 - Regrinding cylinder head ⇒ page 15-22
 - Regrinding valve seat ⇒ page 15-25
- 6 – **Shaft sealing ring**
 - Renewing ⇒ page 15-6
- 7 – **Exhaust valve**
 - Checking ⇒ page 15-22

15-1



- 8 – **Hydraulic bucket tappets**
 - Checking ⇒ page 15-18
 - Oil running surface before installing
 - Store with cam face downwards
- 9 – **Inlet valve**
 - Checking ⇒ page 15-22

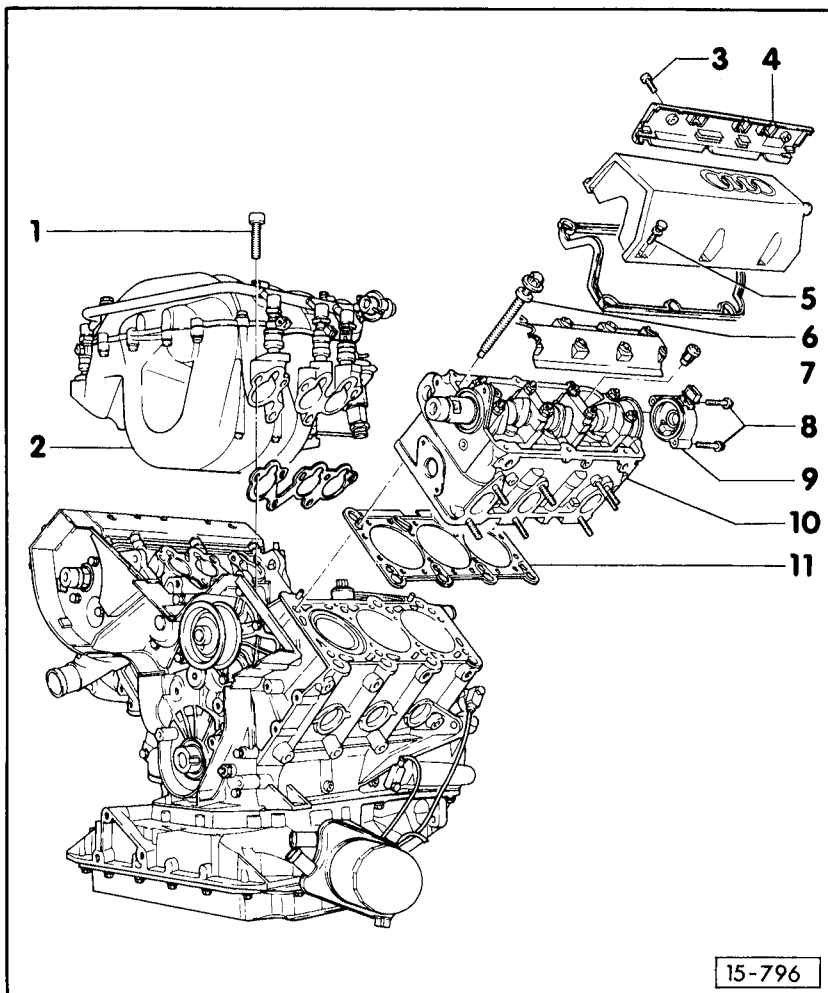
Notes:

- Checking valve guides ⇒ page 15-23.
- Always renew all seals and sealing rings.

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15-726

15-2



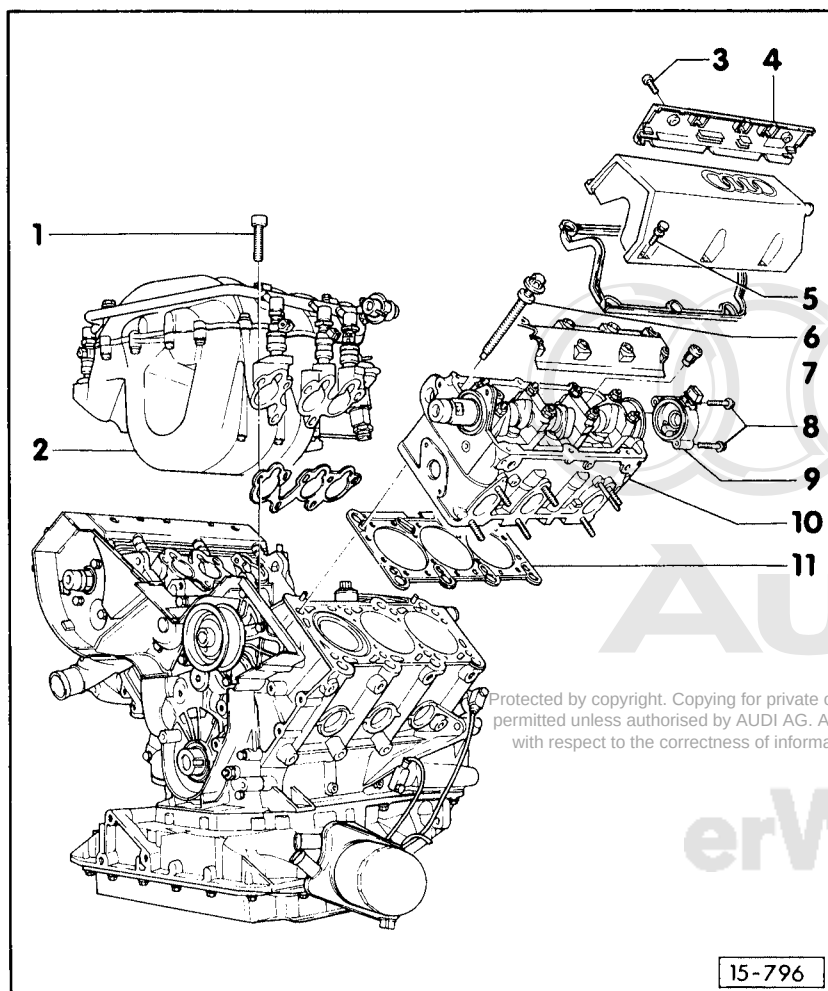
Removing and installing cylinder head

Note:

Removing and installing cylinder head
⇒ page 15-5.

- 1 – 20 Nm
- 2 – Inlet manifold
 - Removing and installing
⇒ page 15-8
- 3 – 10 Nm
- 4 – Cover
- 5 – 10 Nm
- 6 – Cylinder head bolt
 - Tightening method ⇒ page 15-15
- 7 – Pressure relief valve 10 Nm
 - Renew if loud noise relates to whole
of cylinder head bank
 - Lock with locking agent
AMV 197 000 01
- 8 – 10 Nm
- 9 – Hall sender housing

15-3



- 10 – Cylinder head
 - Check for distortion ⇒ page 15-15
 - Regrinding dimensions
⇒ page 15-22

Note:

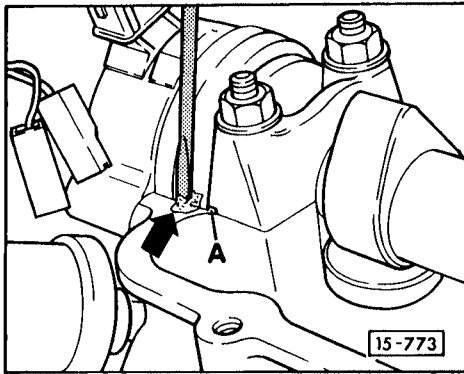
The cylinder head listed in the spare part programme can be used for left and right banks and must therefore be fitted with a sealing cover.

- Fitting sealing cover ⇒ page 15-5
- 11 – Cylinder head gasket
 - Identification marking: Writing must
point upwards

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15-796

15-4

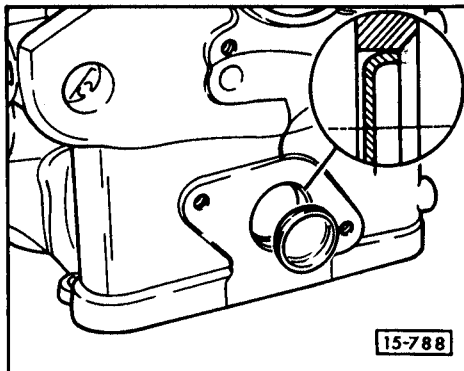


Installing the cylinder head cover

Note:

Lightly coat the inner and outer face of the cylinder head cover gasket with silicone grease D 007 000 04 before installing.

- ▶ – Carefully apply Simate AMV 174 004 01 with a small screwdriver to all four faces of the cylinder head. Ensure that the oil opening –A– is not blocked with Simate.

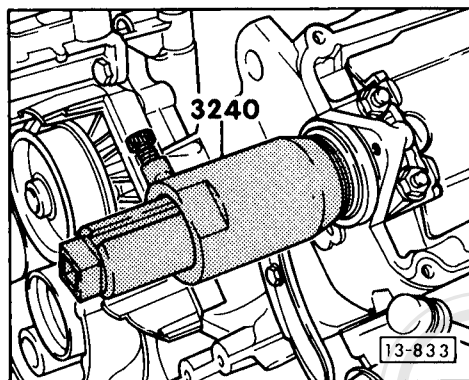


Fitting sealing cover to cylinder head.

The cylinder head listed in the spare part programme can be used for left and right banks and must therefore be fitted with a sealing cover.

- Coat the edge of the sealing cover with sealing paste AMV 188 000 02.
- ▶ – Force the sealing cover in with punch VW 295 until the outer edge of the sealing cover is flush with the cylinder head.

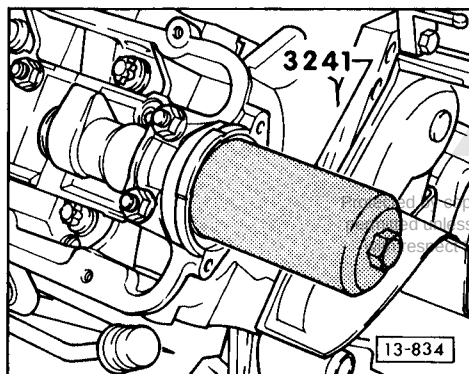
15-5



Renewing cylinder head sealing rings

A – Cylinder head, front, right and left

- Remove toothed belt ⇒ Repair Group 13.
- Remove cylinder head cover.
- Unscrew rear toothed belt cover.
- ▶ – Lever out sealing ring with sealing ring extractor 3240.



- Clean running and sealing surfaces.

- Do not lubricate sealing lip and outer edge of sealing ring with oil before pressing in.

Front left:

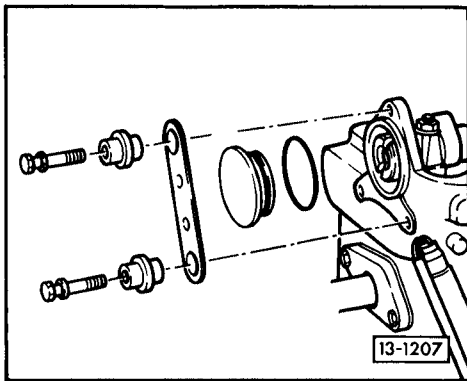
- Press in sealing ring up to end stop with fitting tool 3241.

Front right:

- fit fitting sleeve to camshaft.

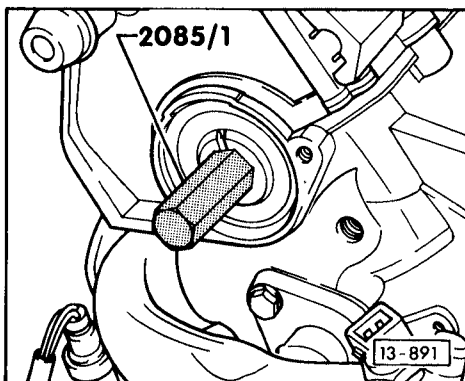
- ▶ – Press in sealing ring with fitting tool 3241 until flush.

15-6



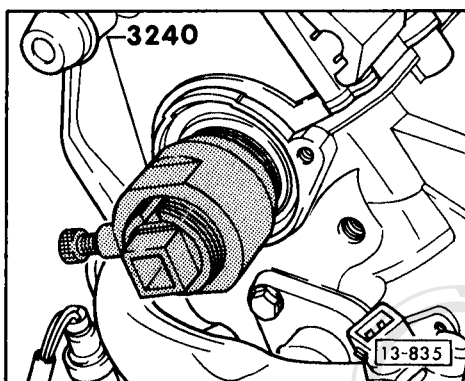
B – Cylinder head, rear right

- ▶ – Remove bolts, first removing spacer and sealing cover.
- Remove sealing cover.
- Renew toroidal sealing ring.

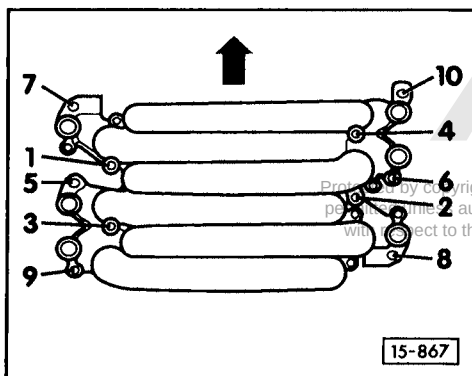


C – Cylinder head, rear left

- Unscrew Hall sender housing.
- Remove screw from Hall panel (20 Nm).
- **Carefully lever off** Hall panel.
- ▶ – Screw in bolt for sealing ring extractor 2085/1.



- ▶ – Pull out sealing ring using sealing ring extractor 3240 or 2085 and bolt 2085/1.
- Clean running and sealing surfaces.
- **Do not lubricate** sealing lip and outer edge of sealing ring with oil before pressing in.
- Using fitting sleeve and fitting tool 3241 press in sealing ring up to end stop.



Removing and Installing Inlet manifold.

- ▶ – When installing the inlet manifold, adhere to tightening sequence as shown in illustration (arrow points in direction of travel).

Tightening of the bolts is carried out in four stages:

1. 5 Nm
2. 10 Nm
3. 20 Nm
4. 20 Nm



Removing and installing cylinder head (with engine installed)

- The description of the procedure is based on the left cylinder head.

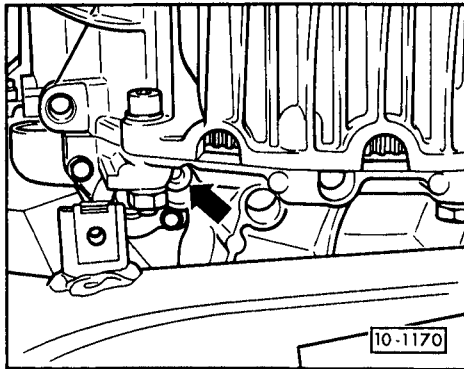
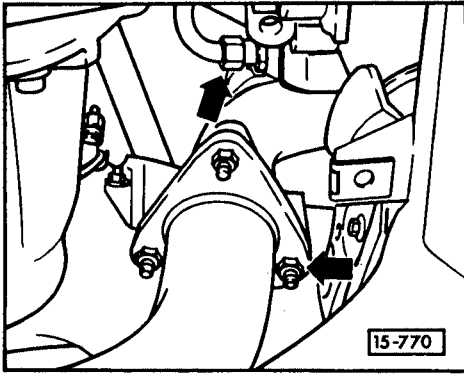
Removing:

- Remove engine cover and ribbed belt cover ⇒ Repair Group 10.
- Remove ribbed belt ⇒ Repair Group 13.
- Remove toothed belt ⇒ Repair Group 13 (the pulley remains fitted).
- ◀ – Remove exhaust pipe from exhaust manifold.

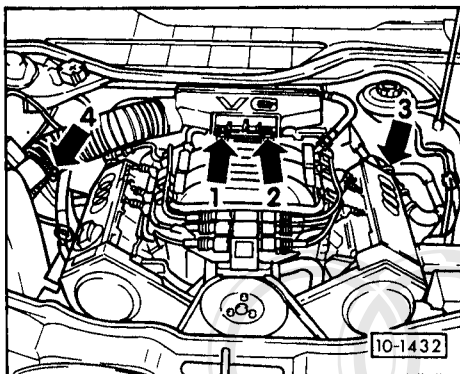
Note:

The engine does not have an exhaust return.

- ◀ – Drain coolant on draining screw of engine and at bottom right of radiator.



15-9

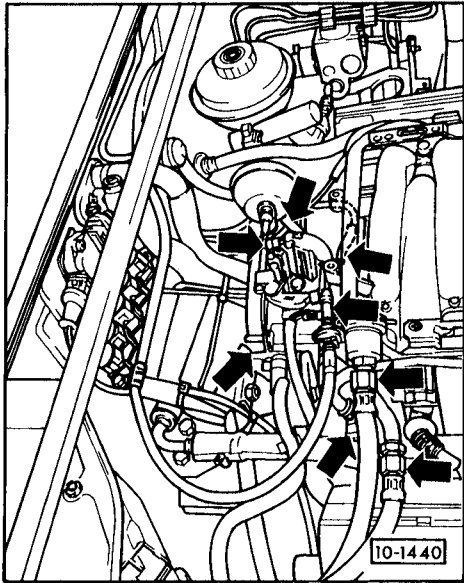


- ◀ – Unscrew air baffle from inlet manifold –1– and –2–.
- Disconnect plug –3– from Hall sender.
- Disconnect crankcase breather from left and right cylinder head.
- Loosen intake hose on air filter –4–.
- Disconnect vacuum hose for air conditioner and/or differential lock from left of throttle valve.
- Press air baffle rearwards and lift out upwards together with crankcase breather hoses.

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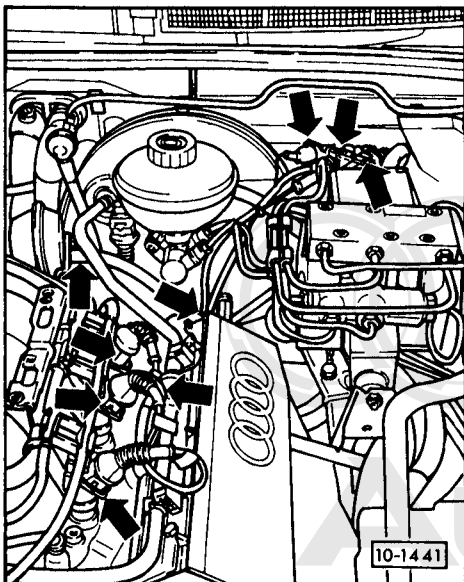
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erWin 



- ◀ – Unclip security devices for accelerator cable, unhinge accelerator cable and place aside.
- Disconnect plug connectors from inlet air temperature sensor and idling speed stabilizer valve.
- Unscrew fuel feed and return pipes.
- Unscrew earth connection behind throttle valve.
- Disconnect vacuum line to control unit in front of throttle valve.
- Disconnect plug connector to throttle valve switch.
- Disconnect vacuum hose for air conditioner and/or differential lock from left of throttle valve.
- Unscrew vacuum line to AKF valve on right of throttle valve.

15-11

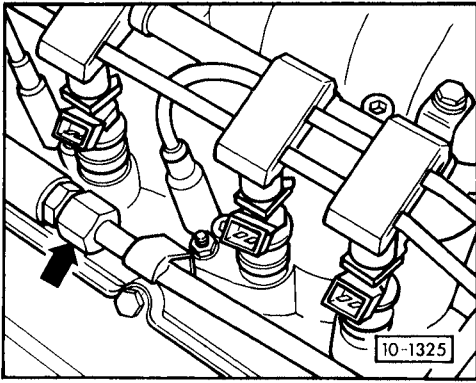


- Disconnect all spark plug caps.
- ◀ – Disconnect all electrical plugs from fuel injection valves.
- Disconnect plugs for knock sensor and Lambda probe heating.
- Disconnect special plug for Lambda probe and place cables aside.
- Disconnect plug connectors for oil pressure switch and oil temperature sender below GRA-socket.
- Disconnect vacuum line from GRA-socket.
- Disconnect plug for electronic thermostat in water pipe.
- Disconnect vacuum line (blue) to non-return valve in brake servo line.
- Disconnect plugs on left and right fuel injection valves.

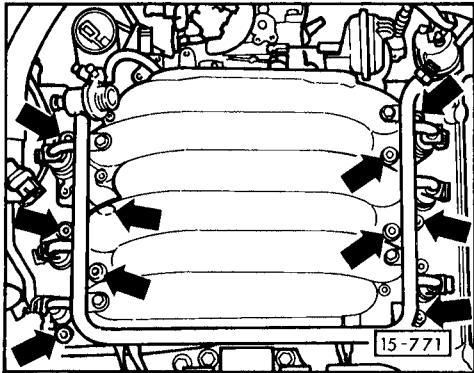
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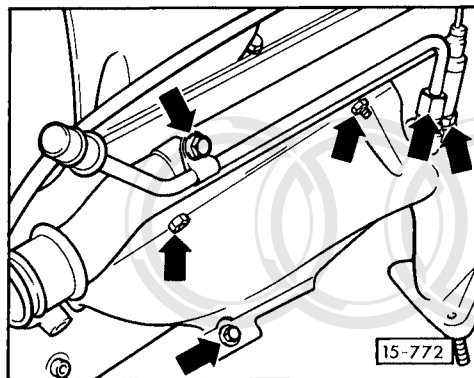
15-12



- ▲ – Unscrew hydraulic pipe brackets in inlet manifold.
- Do not disconnect hydraulic pipe (arrow).



- ▲ – Remove inlet manifold.
- Seal openings with a clean cloth.
- Unscrew coolant pipe on rear of cylinder head.



- ▲ – Remove CO bleed pipe.
- Remove Lambda probe.
- Remove heat shield from exhaust manifold.
- Remove cylinder head cover.
- Remove rear toothed belt cover.
- Remove hydraulic pipe from reservoir to pump from cylinder head.
- Remove cylinder head.

Installation:

- Clean sealing surfaces.

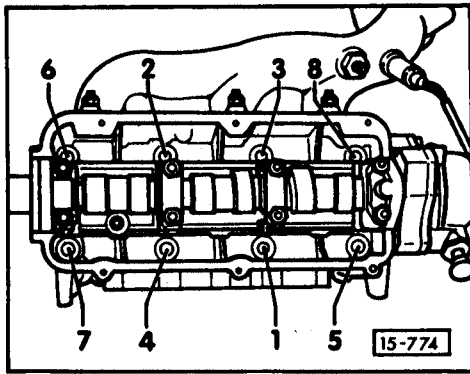
- **Cylinder head gasket:** Identification letters must point to cylinder head.

- Fit centralizing dowels, noting centralizing dowels in cylinder block.

- Install cylinder head bolts and tighten hand-tight.

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Cylinder head – tightening method

▶ Tightening sequence:

Tighten cylinder head bolts in two stages:

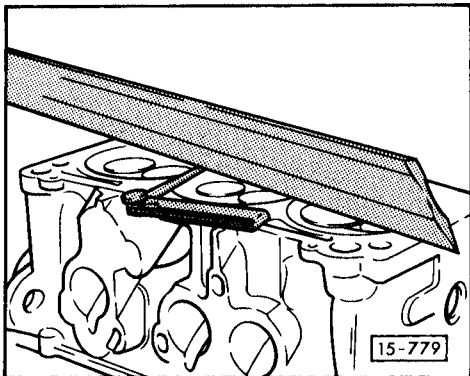
1st stage: 60 Nm

2nd stage: 1/2 turn (180°).

Two stages each of 90° is permissible in place of 180°.

Note:

It is not necessary to retighten the cylinder head bolts during normal servicing.



▶ Checking cylinder head for distortion

Measure the surface on several places with a straight-edge.

Max. permissible distortion: 0.1 mm.

15-15

Checking compression

- Engine temperature at least 30°.
- Throttle valve fully open.

Note:

When testing No. 2 and No. 5 cylinder, disconnect the ignition cable holders on the fuel pipe of cylinders 3 and 4.

- Disconnect both plugs at output end stage.
- Disconnect all electric plugs from fuel injection valves.

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Use compression recorder V.A.G 1381 with adaptor 1381/5.

- Use starter motor until the gauge no longer registers a pressure increase.

Compression bar excessive pressure	
New	Wear limit
11 ... 16	9.0

Permissible difference between all cylinders: 3 bar.

15-16

Removing and installing camshaft

Removing:

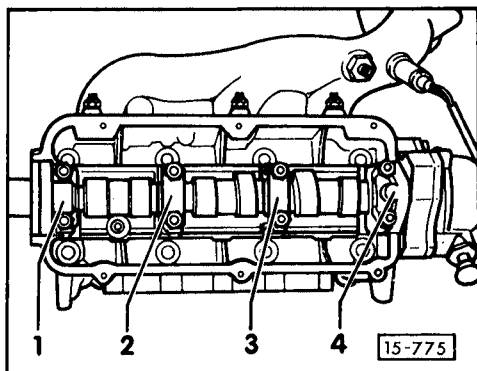
- Removing ribbed belt ⇒ Repair Group 13.
- Removing toothed belt ⇒ Repair Group 13.
- Remove cylinder head cover.
- Unscrew Hall sender housing left cylinder head.
- Unscrew toothed belt pulley.
- ▶ - Remove bearing caps 2 and 3.
- Loosen bearing caps 1 and 4 alternatively in diagonal sequence.

Note:

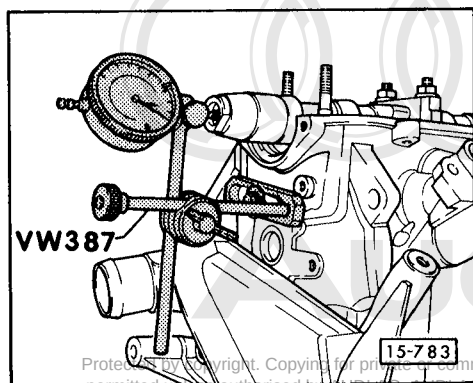
Do not interchange bearing caps.

Installing:

- Tighten bearing caps 1 and 4 alternatively in diagonal sequence.
- Install bearing caps 2 and 3. Tightening torque: 20 Nm.



15-17



Camshaft, checking axial play

- Sealing cover or Hall sender housing, bucket tappets and bearing caps 1 and 3 removed.
- ▶ - Attach gauge with universal gauge bracket VW 387 at front of cylinder head.
- Press camshaft by hand against the gauge.
- Zero gauge.
- Press camshaft away from gauge.

New: 0.04 – 0.15 mm
Wear limit: 0.35 mm

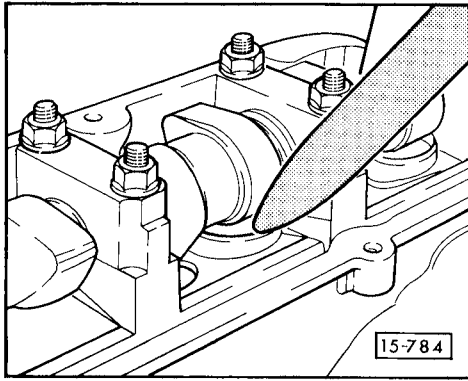
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Checking hydraulic bucket tappets

- Start engine and run until the radiator fan has switched in once.
- Increase RPM to approx. 2500 RPM for 2 minutes.
- If the irregular valve noise disappears but return for short periods, renew the oil retaining valves ⇒ Repair Group 17.
- If the irregular valve noise **does not disappear**, check hydraulic bucket tappets as follows:

15-18



- Remove cylinder head cover.
- Turn crankshaft in clockwise direction until the cam of the bucket tappet to be checked is upmost.
- ▶ - Press bucket tappet downwards with a piece of wood or plastic wedge. If the play is more than 0.1 mm until the opening of the valve is noted, renew tappet.

Notes:

- After installing the new bucket tappet, do not start the engine for approx. 30 minutes. Valves could contact top of piston.
- Place removed bucket tappets with running area (camshaft side) downwards on a clean surface.
- Bucket tappets cannot be serviced.
- After working on valve drive gear, carefully turn engine at least 2 revolutions, to ensure that no valve contacts the top of the piston when starting up.
- Irregular valve noise during starting is normal.

15-19

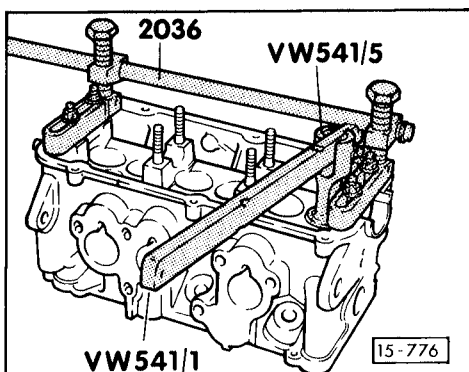
Renewing valve stem seals (with cylinder head installed)

- Removing toothed belt ⇒ Repair Group 13.
- Remove camshafts and bucket tappets.
- Remove spark plugs with spanner 3122 B.
- Position piston of relevant cylinder at "BDC".

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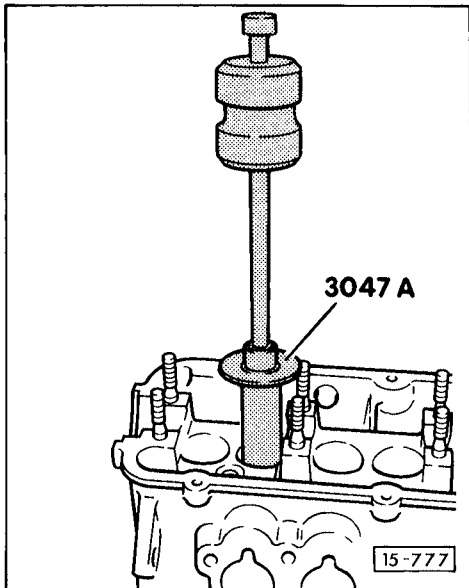
Screw pressure hose VW 653/3 together with sealing ring hand-tight into the spark plug hole and provide at least 6 bar steady pressure.

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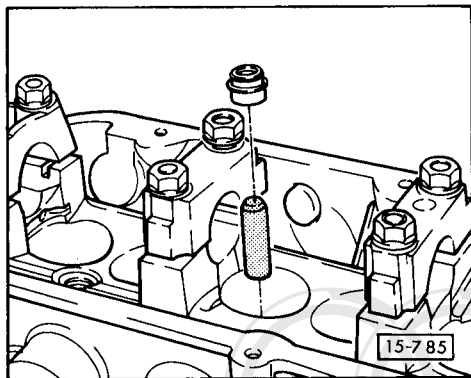


- ▶ - Fit installation device 2036 and set position to stud height.
- Remove valve springs with valve lever VW 541/1 and pressure pad VW 541/5.
- Lightly tap valve lever to release seized valve collets.
- Remove valve springs.

15-20



- ◀ – Remove valve stem seals with tool 3047 A.



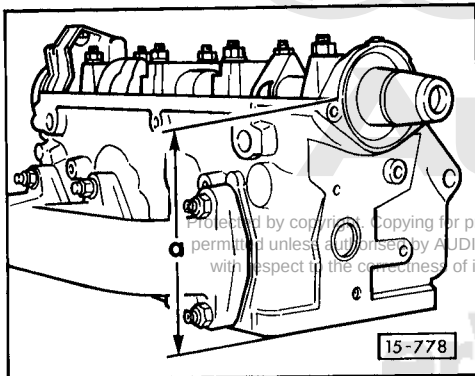
- Install valve stem seals.

- ◀ – Position plastic sleeve onto valve stem. Oil valve stem seal and carefully slide onto valve guide.

Note:

Always use the plastic sleeve provided with the valve stem seals when installing valve stem seals.

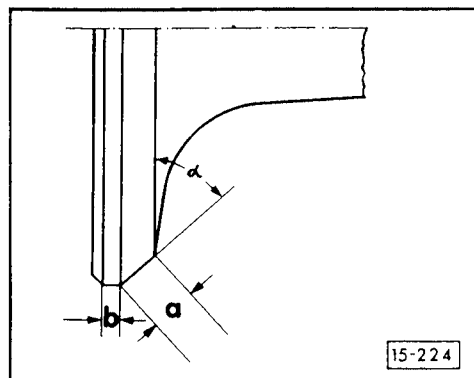
15-21



Reworking cylinder head

- ◀ Min. dimension a = 132.75 mm.

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Checking and reworking valves

- Visual check for signs of burning on valve stem and valve seat. If marked, renew valves.

- ◀ a) Reworking inlet valves

= 45°

a = max. 3.5 mm

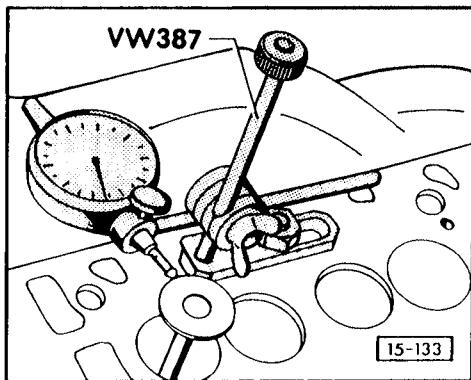
b = min. 0.5 mm

- b) Reworking exhaust valve

Note:

Exhaust valves cannot be reworked, only regrinding is permitted.

15-22



Checking and renewing valves guides

Checking valve guides

When servicing engines with leaking valves it is not enough to rework or regrind valves and valve seats. It is also necessary to check the valve guides for wear, especially on engines which have been in service for a long time.

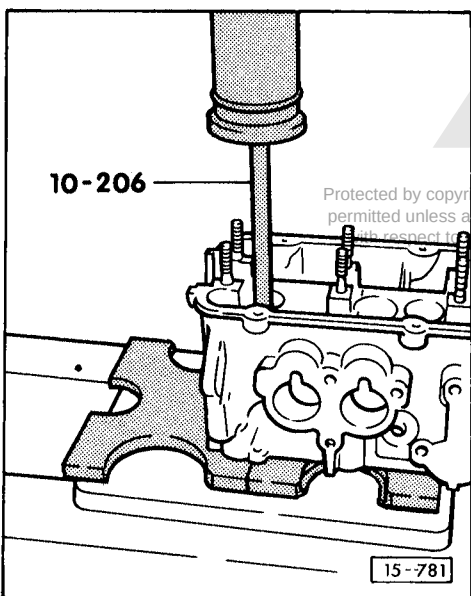
- – Fit new valve into guide. Valve stem end must be flush with guide. Because of different valve stem diameters, use only inlet valves in inlet guides and exhaust valves in exhaust guides.

- Determine rock.

Wear limit:

Inlet valve guide: = 1.0 mm

Exhaust valve guide: = 1.3 mm



Renewing valve guide

Cylinder heads, whose valve seat rings can no longer be reworked or cylinder heads, which have already been reworked to the minimum dimension, can no longer be serviced.

- – Press out worn valve guides with 10-206 from camshaft side (valve guides with collar = repair guides – from compression chamber side).

- Oil new guides and press into cold cylinder head up to collar with 10-206 from camshaft side.

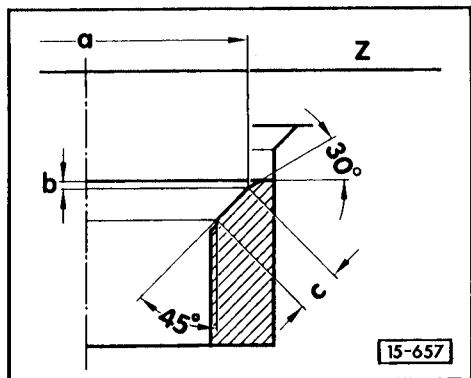
Note:

After the guide is positioned on the collar, the pressing in pressure must not be increased to more than 1.0 t, otherwise the collar might break off.

- Ream valve guide with hand reamers 3120, making sure to use drilling fluid as lubricant.

Note:

After renewing of valve guides, rework valve seats. Note min. dimension.



Reworking valves seats

Notes:

- Only rework valve seats up to good surface appearance.
- On engines with hydraulic valve clearance adjustment calculate the max. permissible reworking measurement. If the reworking measurement is exceeded, the operation of the hydraulic valve clearance adjustment is not guaranteed and the cylinder head must be renewed.

◀ Reworking exhaust valve seat

- a = Ø 32.4 mm
- b*) = max. permissible reworking
- c = 2.4 mm
- 30° = Upper correction angle
- 45° = Valve seat angle
- Z = Lower edge – cylinder head

*) Calculating max. permissible reworking measurement ⇒ page 15–26.

Reworking inlet valve seat

- a = Ø 39.2 mm
- b*) = max. permissible reworking
- c = 2.0 mm
- 30° = Upper correction angle
- 45° = Valve seat angle
- Z = Lower edge – cylinder head

*) Calculating max. permissible reworking measurement ⇒ page 15–26.

15–25

Calculating the max. permissible dressing measurements

- Install valve on to valve seat and press tightly against valve seat.

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Calculate max. permissible reworking measurement from dimensions of distance and minimum measurement.

Minimum measurement

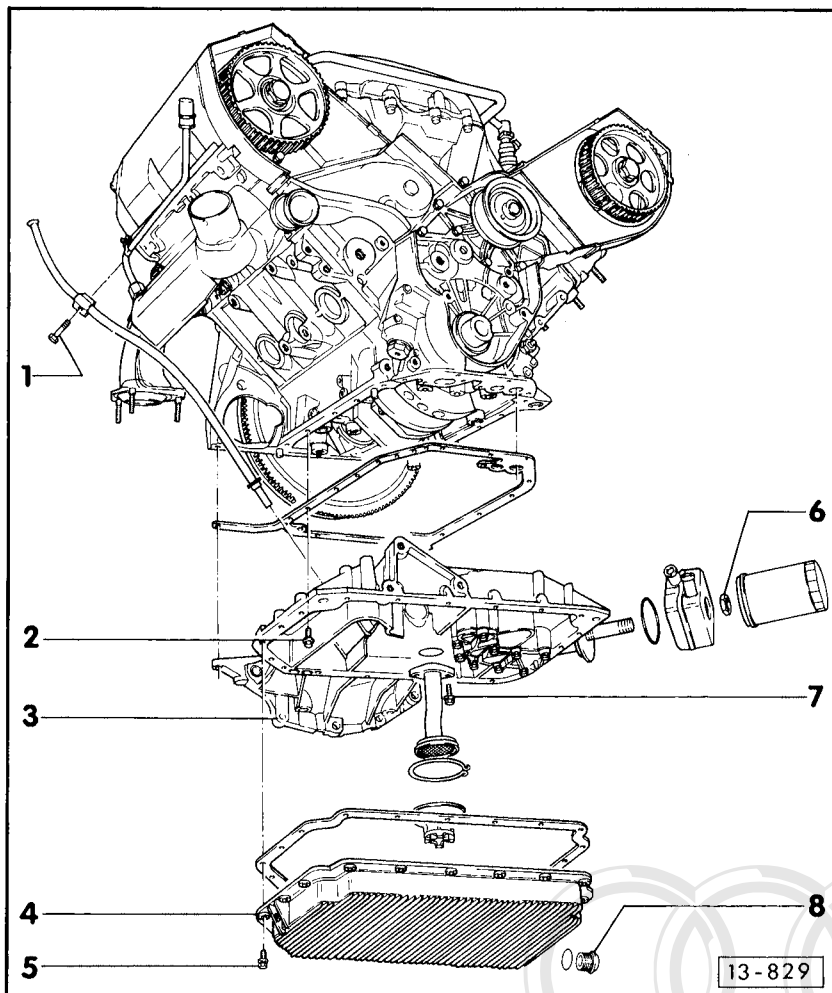
Inlet valve = 33.8 mm

Exhaust valve = 34.1 mm

Measured distance –a– minus minimum measurement.

Result = max. permissible reworking measurement *)

- *) – Reworking inlet valve ⇒ page 15–22.
- Reworking exhaust valve ⇒ page 15–22.



Removing and installing lubricating system components

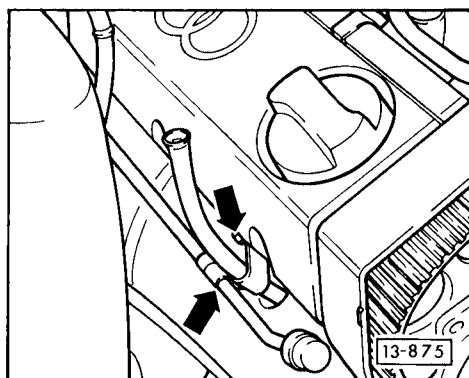
- Engine oil capacity with filter 5.0 ltr.

Notes:

- Oil level must not be above Max. – Min. marking on dipstick. (Danger to catalytic converter).
- Always renew seals and sealing rings.
- Renewing crankshaft sealing rings ⇒ Repair Group 13.
- Checking oil pressure switch and oil pressure ⇒ page 17-8.

- 1 – 10 Nm
- 2 – 10 Nm
- 3 – Oil sump, upper part
- 4 – Oil sump, lower part
- 5 – 10 Nm
- 6 – 30 Nm
- 7 – 10 Nm
- 8 – Oil draining screw, 40 Nm

17-1



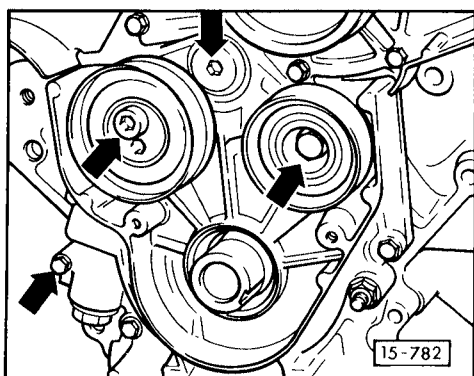
Removing oil pump

- Removing and installing ribbed belt ⇒ Repair Group 13.
- Removing and installing toothed belt ⇒ Repair Group 13.
- Remove noise suppression material.

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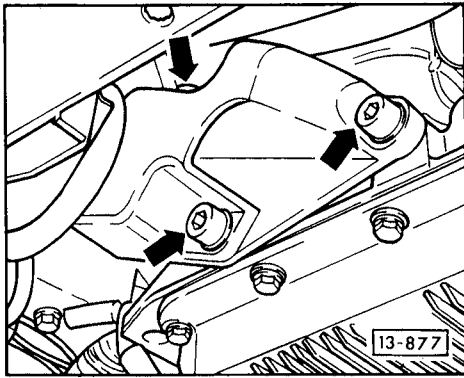
Remove oil dipstick

- Unscrew oil measuring pipe and pull up out of oil sump.
- Drain engine oil.

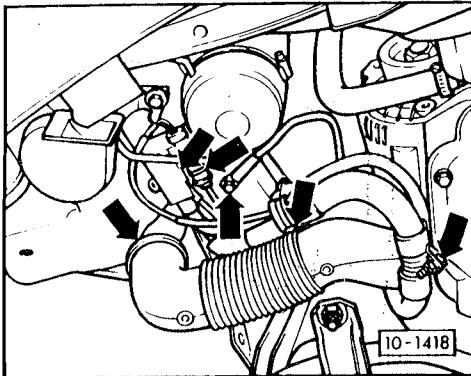


- Unscrew vibration damper from toothed belt gear.
- Remove toothed belt.
- Unscrew centre bolt for crankshaft toothed belt gear, remove toothed belt.
- Remove toothed belt tensioner (45 Nm) and reversing roller (20 Nm) from oil pump. Disconnect plug from temperature sensor.
- Remove water pipe to oil cooler and bracket for air conditioner hose from oil sump.

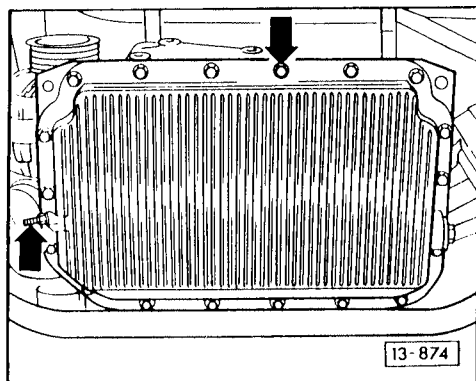
17-2



- ◄ – Remove engine support bracket from oil sump.



- ◄ – Remove pipe bracket from oil sump.
- Remove engine – chassis earth connection from chassis beam.
- Remove air pipe to generator.



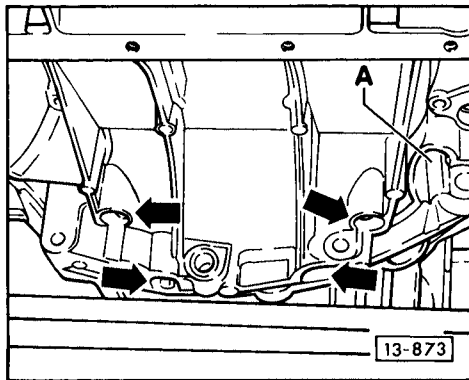
- Remove oil filter.
- Unscrew oil cooler underneath oil filter and pull off from hollow-core screw. Coolant pipes remain connected.
- Remove both front bolts from engine bearer.

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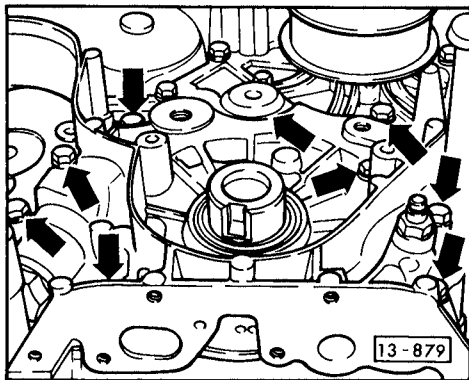
Attention! The engine bearer will drop suddenly by approx. 10 cm.

- Remove starter motor. Cables remain connected.
- ◄ – Remove lower part of oil sump.

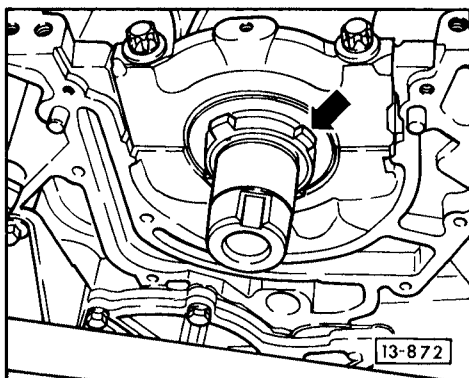
17-3



- Remove oil sump upper part and oil suction snorkel.
- ▶ - The upper part of the oil sump has four flush fitting bolts.
- Do not unscrew the coolant drain plug –A–.



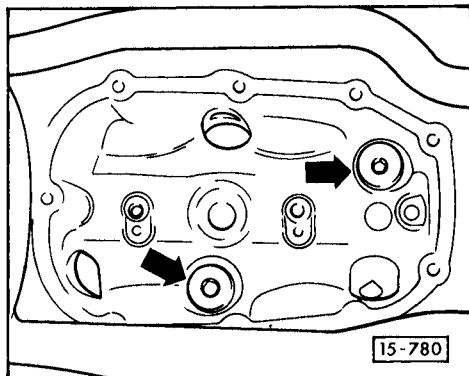
- ▶ - Remove oil pump (10 Nm).
- Remove closing limiter (45 Nm).
- Clean sealing face of oil pump and oil sump.



- ▶ - Check cogs of oil pump and crankshaft for alignment.
- To protect the shaft sealing ring, when sliding the oil pump on to the crankshaft, use fitting sleeve 3202/1 from drawing in sleeve 3202.
- Installation of the oil pump is in reverse sequence.

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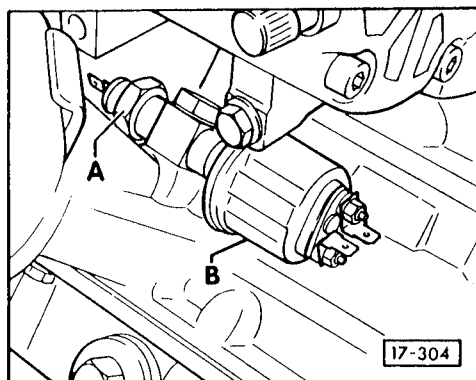
Renewing oil retaining valve

Note:

Change the oil retaining valve if irregular valve noise is heard during short journeys but disappears during longer ones.

- Remove oil suction pipe (20 Nm).
- Remove cover underneath suction pipe (10 Nm)
- ◀ – Renew oil retaining valve (45 Nm).

17-7



Checking oil pressure switch and oil pressure

- ◀ The oil pressure switch is located on the oil sump on the left behind oil filter (optical and acoustic oil pressure indication).

- A – Oil pressure switch 1.8 bar
- B – Oil pressure switch 0.3 bar. On vehicles with oil pressure indication the sender is integrated in the switch

Check prerequisites:

- Oil level is correct.
- Oil pressure warning light –K3 must light up with ignition switched on. On vehicles with Auto-Check system the indication must be in order (call up symbols).
- Engine oil temperature approx. 80°C (radiator fan must have cut in once).

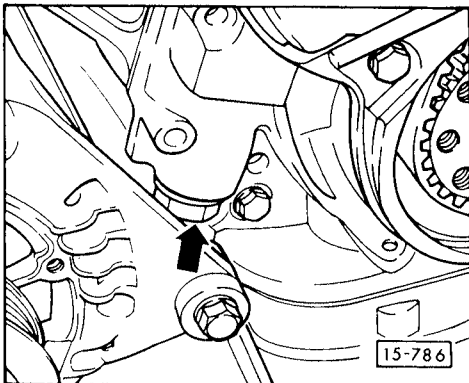
17-8

Checking oil pressure

Notes:

- On vehicles with automatic gearbox unscrew bracket for oil cooler pipes on sump.
 - Place oil collector tray under vehicle.
 - White plug – 1.8 bar switch.
 - Blue plug – 0.3 bar switch.
 - Black plug – oil pressure indication sender.
- Unscrew oil pressure switch or sender –B– and screw in oil pressure test device. Do not connect electrical connections of test device.
 - Install oil pressure test device V.A.G 1342 in place of oil pressure switch.
 - Connect oil pressure test device or sender with car services.
 - Start engine.

17-9



- Run engine at 2000 RPM. At 2000 RPM the oil pressure excess pressure should read 4.5 – 6 bar. This pressure must not be exceeded by much.

Notes:

- With considerably exceeded oil pressure (oil pressure relief valve is sticking or wrongly installed), the hydro tappets are over-pressurised. The engine dies shortly after start-up and turns noticeably quickly with subsequent starting attempts due to low compression.
- If the wires to the oil pressure sender are wrongly connected, the Auto-Check system will display warning symbol for engine oil pressure (oil can).

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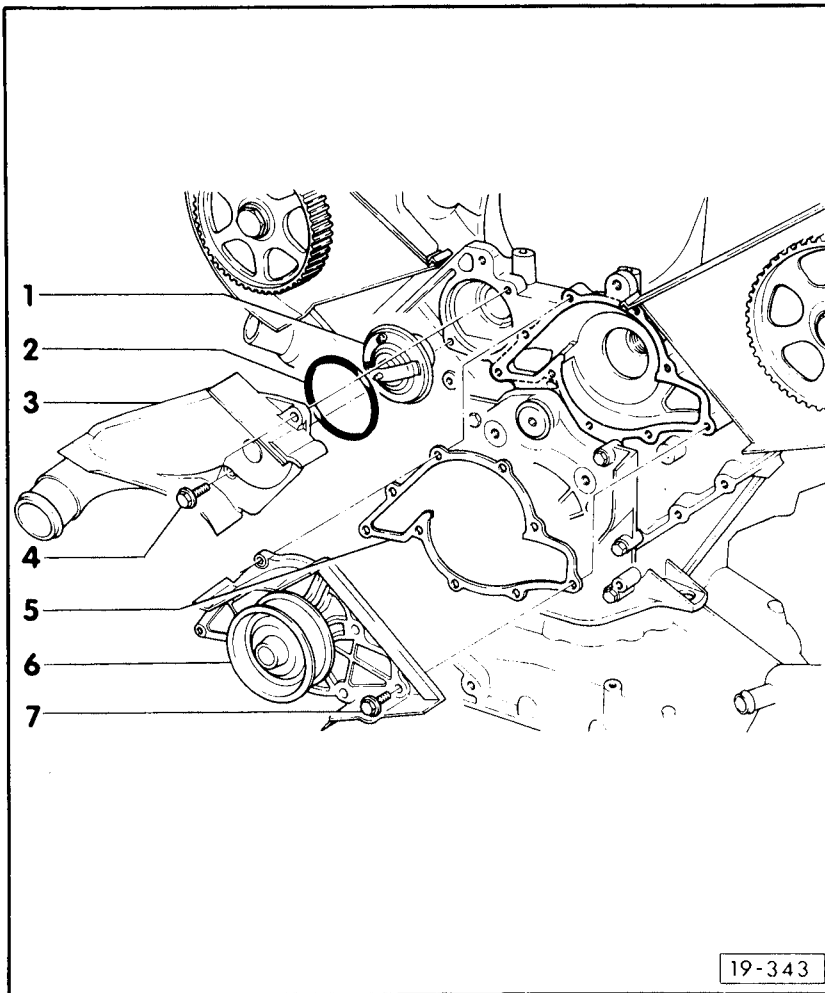


Removing and installing cooling system components

Notes:

- **Do not remove toothed belt to remove thermostat.**
- **Arrows on coolant pipes and coolant hose ends must be aligned.**
- **Tightening torque for hose clamps:**
3 ... 3.5 Nm.

- 1 – Thermostat
 - Renewing ⇒ page 19-3
 - Start of opening ⇒ page 19-3
- 2 – Sealing ring
 - Renew
- 3 – Thermostat housing
- 4 – 10 Nm
- 5 – Gasket



19-343

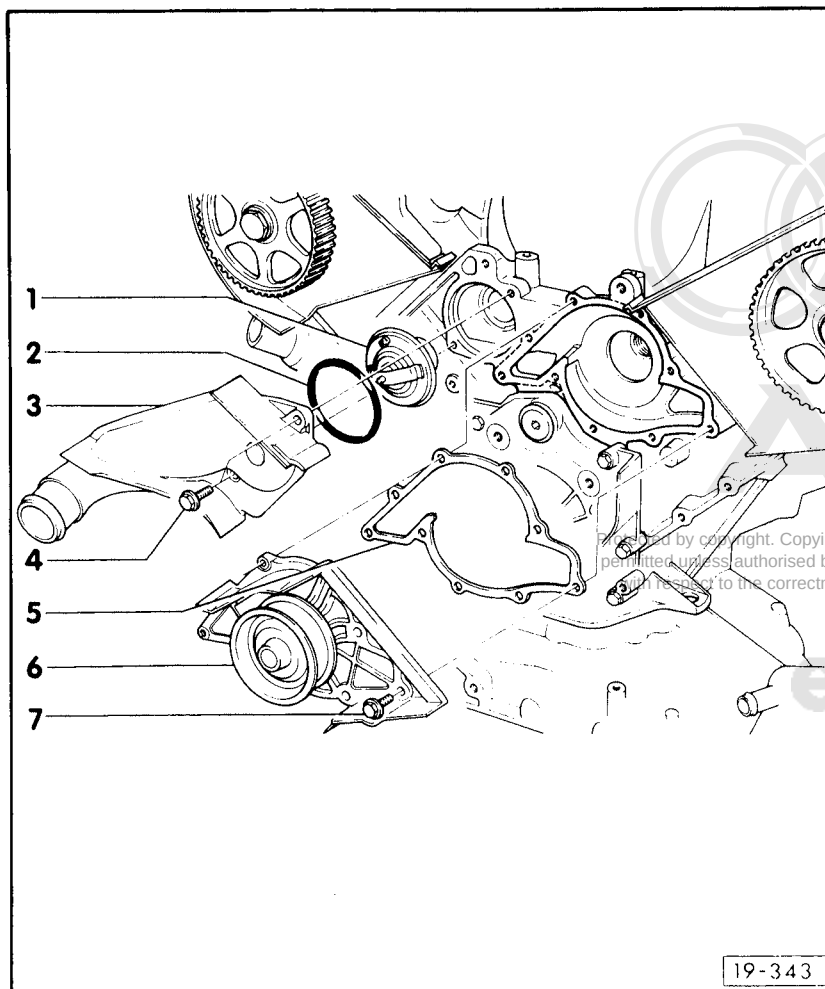
19-1

- 6 – Coolant pump
 - Remove ribbed and toothed belts to remove pump ⇒ Repair Group 13

7 – 10 Nm

Notes:

- **Always renew gaskets and sealing rings.**
- **Check temperature switch for radiator fan**
⇒ Workshop Manual, Electrical System.
- **Between oil filter bracket and oil filter is an oil cooler, which is connected to coolant circuit fi Repair Group 17.**

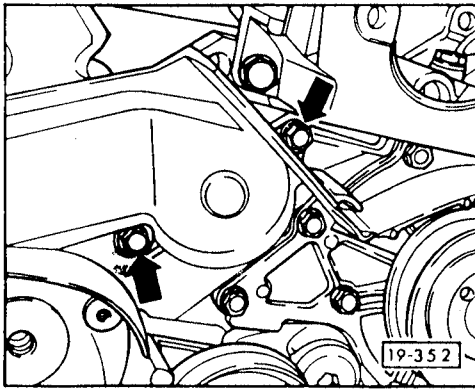


19-343

19-2

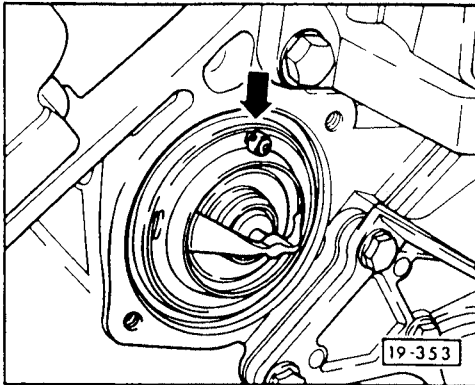
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Renewing thermostat

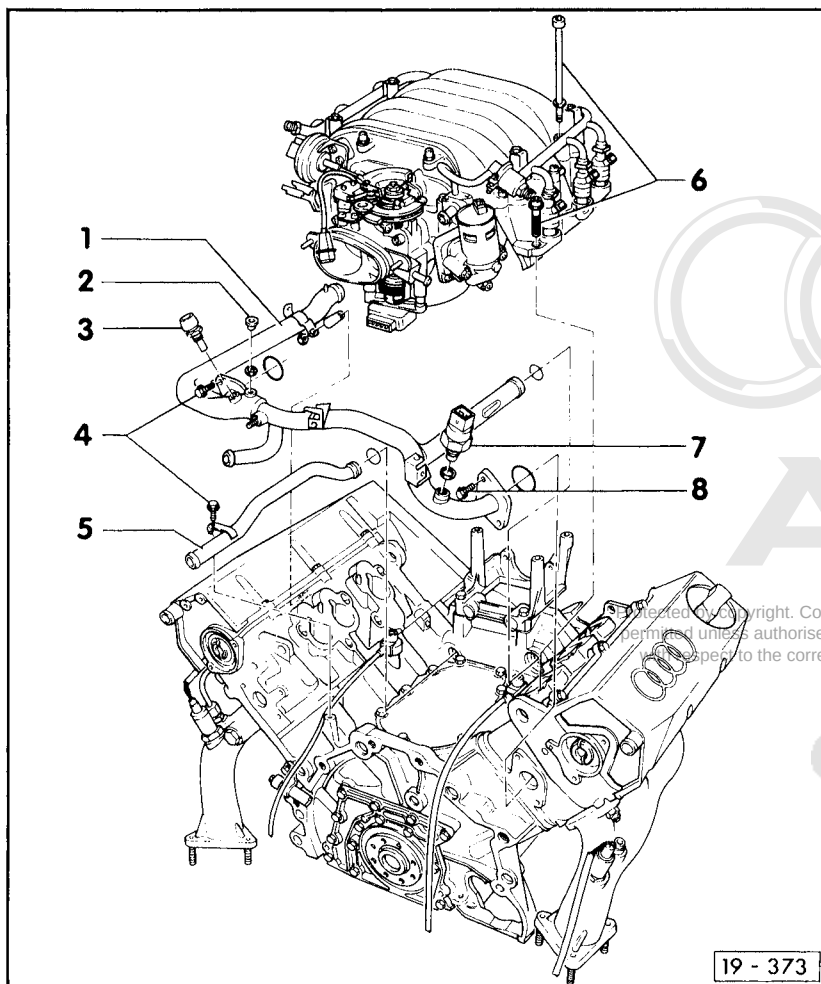
- Removing ribbed belt ⇒ Repair Group 13.
- Drain coolant.
- Unscrew thermostat housing and carefully lift toothed belt over housing.
- ▲ – Remove housing.



- ▲ – Installation position of thermostat. Vent valve must be positioned on top.

Starts to open 87°C
Stops opening 102°C
Opening stroke 8 mm

19-3



Removing coolant pipe

Notes:

- **Do not remove toothed belt to remove thermostat.**
- **Arrows on coolant pipes and coolant hose ends must be aligned.**
- **Tightening torque for hose clamps:**
3 ... 3.5 Nm.

1 – Large coolant pipe

2 – Vent screw, 15 Nm

3 – Coolant temperature sender –G62,
15 Nm

- Checking ⇒ Repair Group 01

4 – 10 Nm

5 – Small coolant pipe

6 – 20 Nm

7 – Electronic temperature switch –F76

- Checking ⇒ Workshop Manual,
Electrical System

8 – 10 Nm

19 - 373

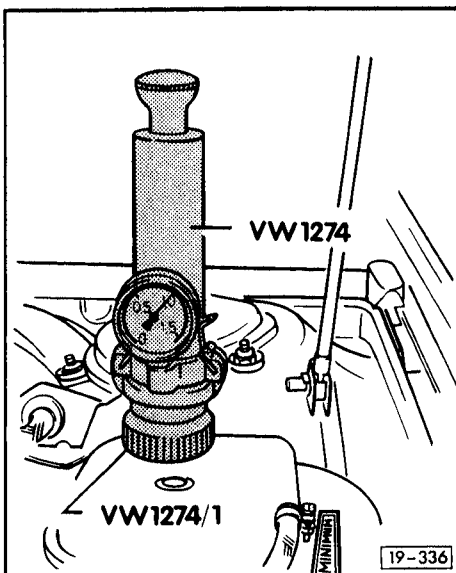
19-4

Checking temperature switch –F54 for radiator fan

The temperature switch is located in radiator at bottom left.

Switch	Switching temperature	
	On	Off
3 pin 1 = 1. stage	92 ... 97°C	Approx. 84°C
2 = 2. stage	99 ... 105°C	Approx. 91°C
3 = plus feed		

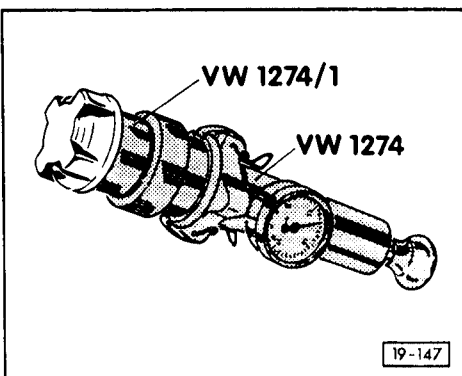
19-5



Checking coolant system for leaks

Only carry out check with engine at operating temperature.

- ◀ – Screw test device VW 1274 with adaptor 1274/1 on to expansion tank.
- Produce excess pressure of approx. 1 bar with test device hand pump. If pressure drops quickly, find leak in coolant system and rectify.



Checking excess pressure in sealing cap

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- ◀ – Screw sealing cap on to test device.

- Operate hand pump.
- With excess pressure of 1.2 ... 1.5 bar the pressure relief valve must open.

19-6

Draining coolant and refilling

Notes:

The coolant system is filled with water and anti-frost and corrosion protection agent G 011V 8B, intended to last the whole year.

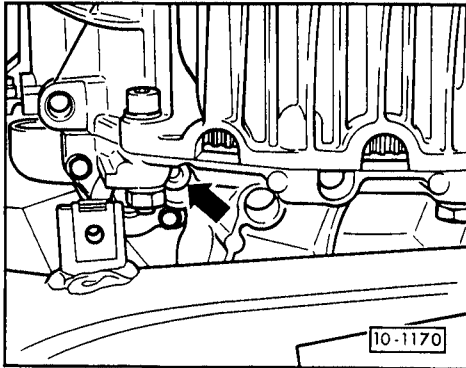
G 011V 8B prevents frost and corrosion damage, scaling and also raises the coolant boiling temperature. For these reasons it is essential that the coolant system is filled the whole year with G 011V 8B. Especially in hot climates and the engine under high loading the higher boiling point of the coolant contributes to operational safety

Note:.

Only renew the coolant if the engine or one of the cylinder heads has been renewed or the coolant has been contaminated.

Draining:

- Drain coolant at draining plug of the engine with special tool 3247 and at the draining plug at bottom left of radiator.
- Open expansion tank sealing cap.



19-7

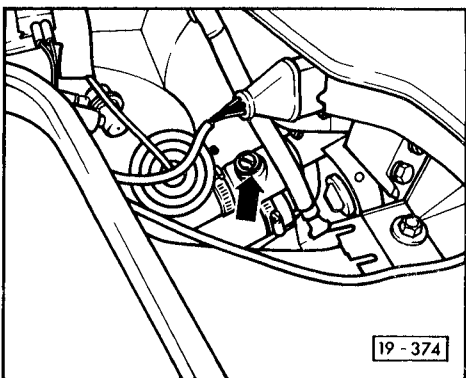
Filling:

Recommended mixing ratio with 8 ltr. content.

Frost protection up to	Content G 011 V8 BA1	Content Water
- 25°C	3.2 ltr.	4.8 ltr.
- 35°C*	4.0 ltr.	4.0 ltr.

* for cold climates.

- Loosen vent screw approx. 2 turns.
- Vent screw in coolant hose to heat exchanger right, next to brake servo.
- Vent screw in large water pipe right, next to temperature sensor ⇒ Fig. 19-373, page 19-3.
- Fill expansion tank with coolant.
- Watch vent screws and close when coolant is emitted.
- Fill expansion tank up to lip.



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19-8

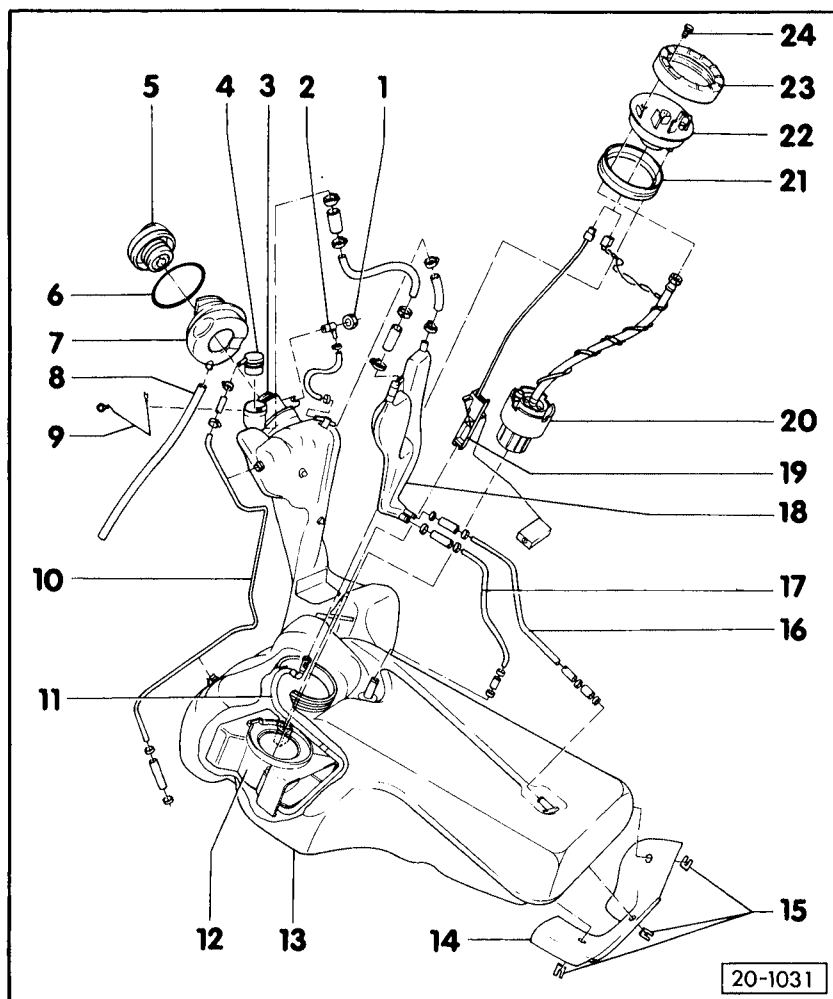
Fit expansion tank sealing cap.

- **Run engine.**
- **Increase RPM several times during approx. 30 seconds to 3000 RPM and open vent screw every time until no more air is emitted and radiator fan has cut in once.**
- **Switch off engine.**
- **Check coolant level in expansion tank and refill to Max. mark if required.**



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Removing and installing fuel system components

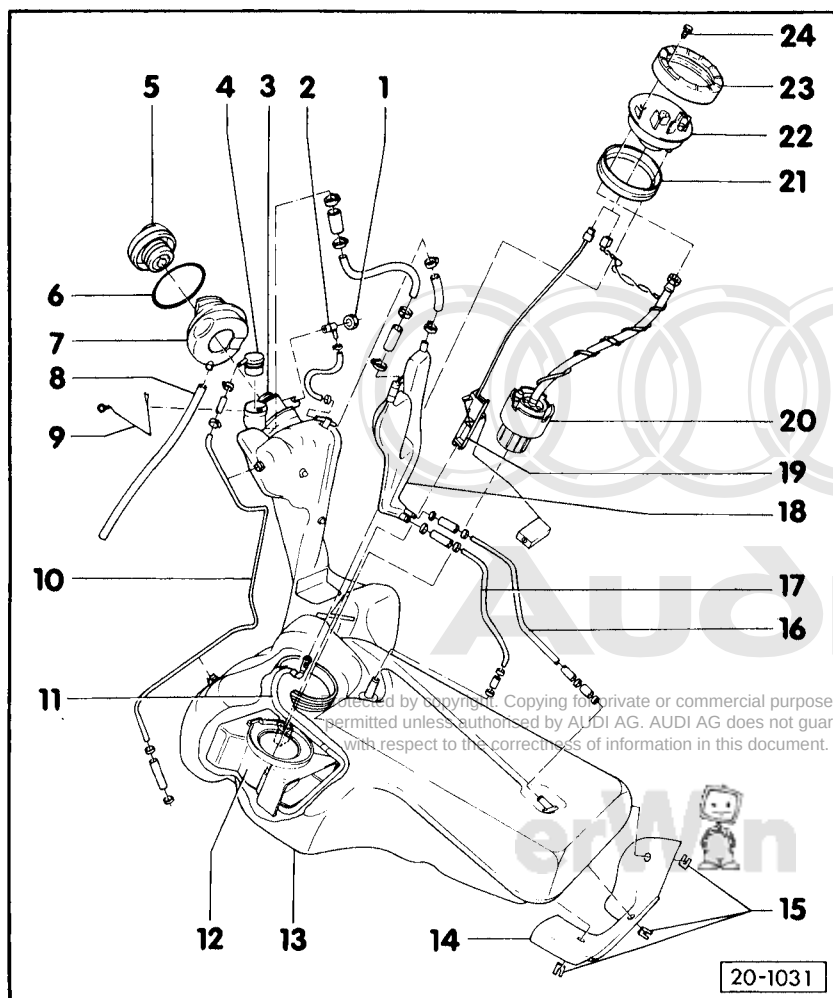
Attention!

Always observe the relevant safety precautions when working on the fuel system.

Notes:

- Always renew gaskets and sealing rings.
- Hoses are connected by either screw or clamp connections.
- Always renew clamp connections.
- Observe **safety precautions** when working on the fuel tank ⇒ page 20-9.
- Observe **rules for cleanliness** ⇒ page 20-10.
- Installation position of fuel filter ⇒ page 20-12.
- Connect remote control ⇒ page 20-13.
- Checking fuel pump relay and control ⇒ page 20-18.
- Servicing tank venting with activated charcoal canister ⇒ page 20-35.
- Checking tank and tank venting for leaks ⇒ page 20-11.

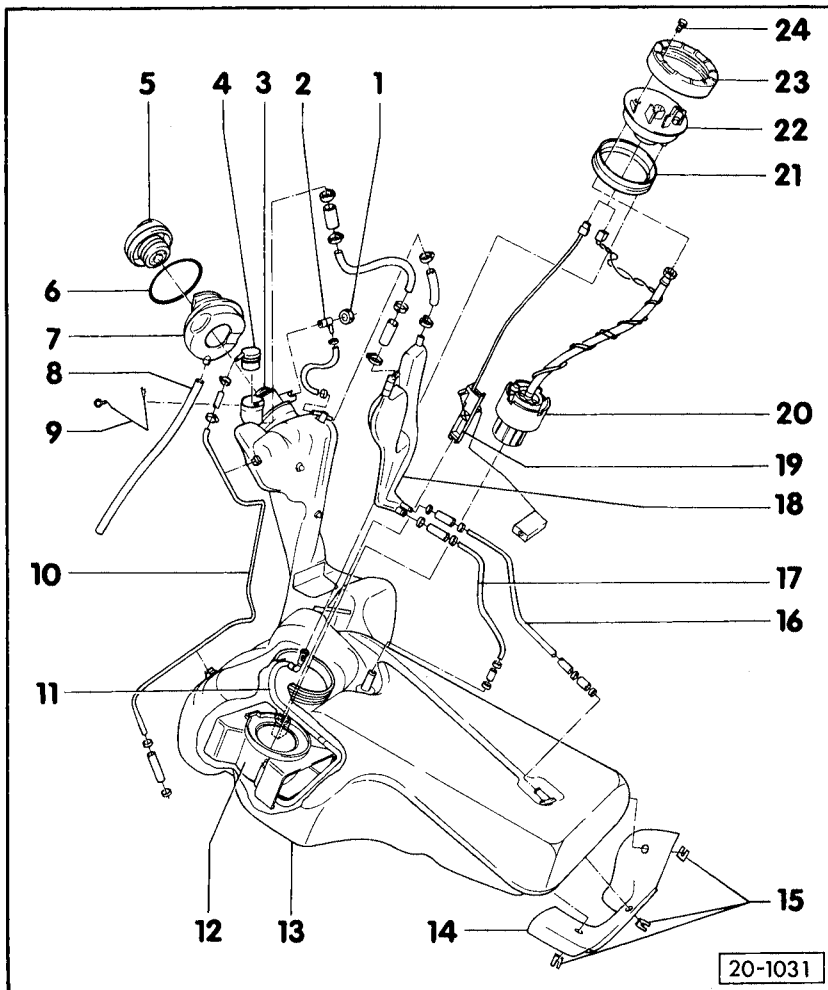
20-1



Fuel tank for vehicles with front-wheel drive

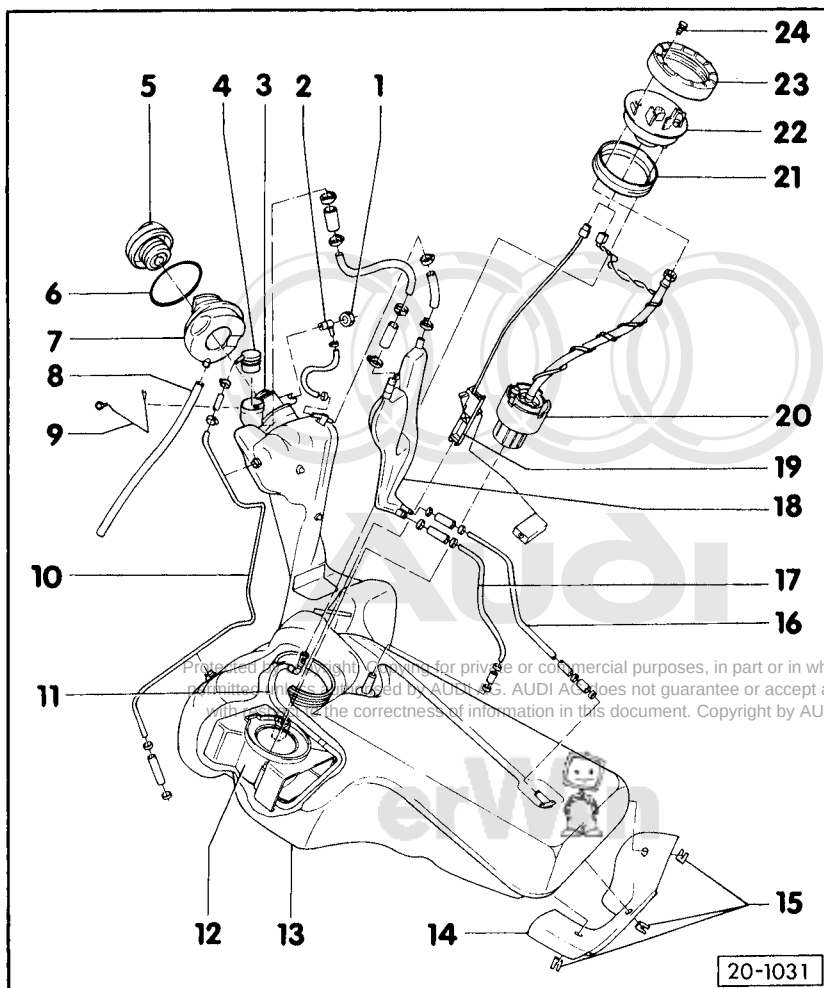
- 1 – Union nut
- 2 – Vent valve
- 3 – Filler pipe
- 4 – Gravity valve
- 5 – Sealing cap
- 6 – Clamping ring
- 7 – Rubber pot
- 8 – Drain hose
- 9 – Earth cable
 - Connected to filler pipe and to upper attachment screw of fuel tank
- 10 – Vent pipe
 - To activated charcoal canister ⇒ page 20-35
- 11 – Return pipe in fuel tank

20-2



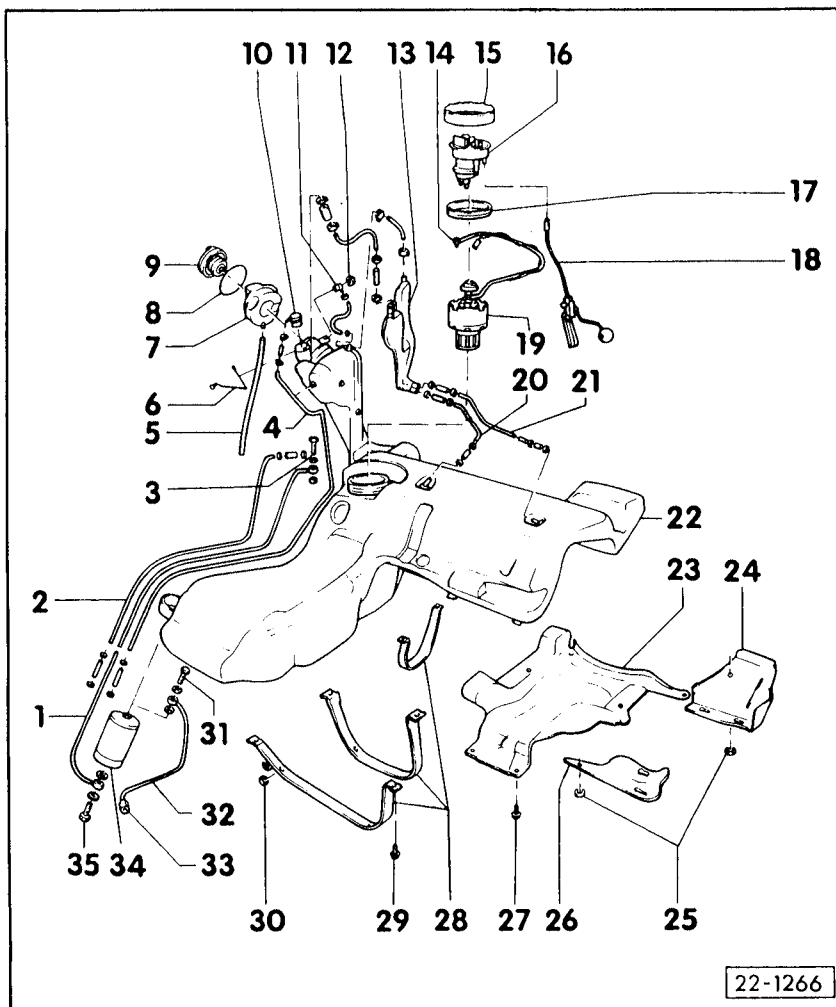
- 12 – Bracket in fuel tank
 - For fuel pump and fuel gauge sender
- 13 – Fuel tank
 - Removing and installing
⇒ page 20–33
- 14 – Guard plate
- 15 – Retaining clips
- 16 – Balance pipe – long
 - From fuel reservoir to fuel tank
- 17 – Balance pipe – short
 - From reservoir to fuel tank
- 18 – Fuel tank reservoir
- 19 – Fuel gauge sender
 - Removing and installing
⇒ page 20–24

20–3



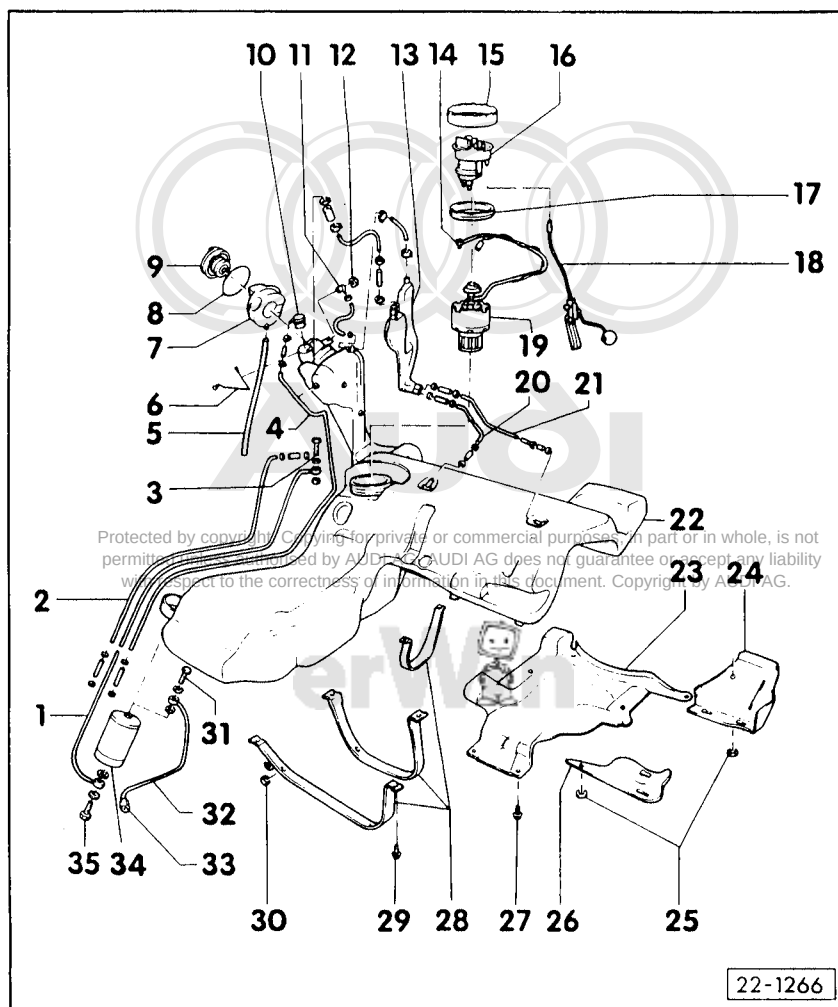
- 20 – Fuel pump
 - Checking ⇒ page 20–14
 - Checking delivery ⇒ page 20–16
 - Checking fuel pump non-return valve
⇒ page 20–22
 - Removing and installing
⇒ page 20–27
 - Dismantling and assembling
⇒ page 20–30
- 21 – Seal
 - Only renew if damaged
 - Wet with fuel before installing
- 22 – Sealing flange
 - Note installation position
⇒ page 20–26
- 23 – Union nuts
- 24 – Banjo bolt, 20 Nm

20–4



- 21 – **Balance pipe – long**
 - From fuel tank reservoir to fuel tank
- 22 – **Fuel tank**
 - Removing and installing
⇒ page 20–33
- 23 – **Support plate**
- 24 – **Rear heat shield**
 - For fuel tank
- 25 – **Clamping washer**
- 26 – **Front heat shield**
- 27 – **25 Nm**
- 28 – **Retaining straps**
- 29 – **25 Nm**
- 30 – **Metal screw**
 - For retaining straps on fuel tank
- 31 – **banjo bolt**
 - 20 Nm
- 32 – **Feed pipe**
- 33 – **15 Nm**

20-7



- 34 – **Fuel filter**
 - Installation position ⇒ page 20–12
- 35 – **Banjo bolt**
 - 20 Nm

20-8

Safety precautions when working on fuel tank

When removing or installing fuel pumps or fuel gauge senders from full or partially full fuel tanks the following should be noted:

- Before starting any work in the vicinity of the fuel tank aperture a hose pipe from an exhaust suction installation must be positioned so as to suck away the fuel gases when the aperture is opened. If no suction installation is available, a radial fan with a sucking volume in excess of 15 m³/h can be used (engine is outside the air flow).
- If, during removal or installation of a fuel pump, it is necessary to reach into the fuel tank, fuel resistant gloves must be worn.

20-9

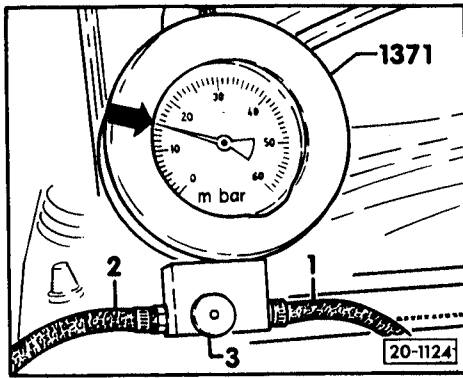
Rules cleanliness when working on the supply system

- Thoroughly clean any connections and surrounding areas before disconnecting.
- Deposit removed parts on a clean base and cover. Use foil or paper. Do not use fluffy cloths.
- Carefully cover opened components or seal, if the repair cannot be carried out immediately.
- Install only clean parts.
 - Unpack replacement parts only when ready to install.
 - Do not use parts which were stored unpacked (e.g. in tool boxes etc.).
- With opened system:
 - Do not move vehicle unless absolutely necessary.

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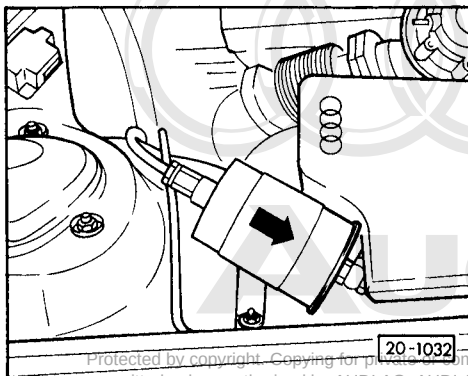
20-10



Checking tank and tank opening for leaks

- ◀ 1 – Connection for vent pipe to gravity valve
- 2 – Connection to tyre valve
- 3 – Adjusting screw
 - Slowly open adjusting screw until a pressure of 15 mbar is indicated
 - Close adjusting screw
 - Pull connection –2– from tyre valve
 - After 2 minutes the pressure must not drop more than 2 mbar
 - After further 5 minutes, the pressure must not drop at all
 - If the pressure drops earlier, check tank sealing cap, sealing flange and vent pipes for leaks

20-11

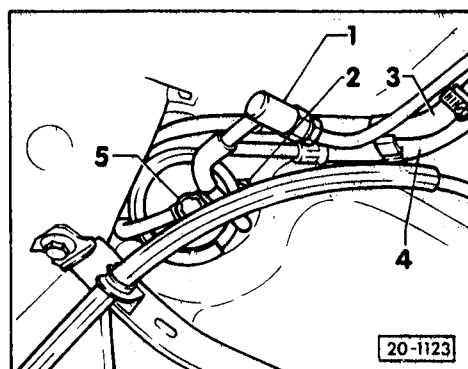


Installation position of fuel filter for vehicles with front-wheel drive

- ◀ Arrow indicates direction of flow.

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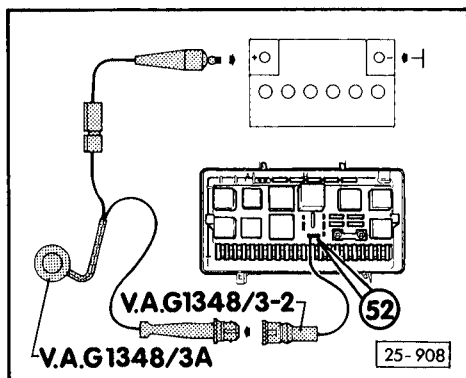
erWin



Installation position of fuel filter for vehicles with four-wheel drive

- ◀ 1 – Fuel filter feed pipe from filter
 - 20 Nm
- 2 – Attachment bolt
- 3 – Pipe to activated charcoal canister
- 4 – Fuel return pipe
- 5 – Fuel feed pipe up to filter

20-12



Connecting remote control V.A.G 1348/3A with adapter cable V.A.G 1348/3-2

- Fuse No. 13 on order.
- ▶ – Pull fuel pump relay from relay board (relay position 10).
- Connect adapter cable plug to contact 52.
- Connect pick-up clamp to battery positive (+) terminal.

20-13

Checking fuel pump

Checking power supply

- Fuse No. 13 in order.
- Switch on ignition.
Fuel pump must audibly start up for short time. If the fuel pump does not start up, connect remove control V.A.G 1348/3A ⇒ page 20-13.

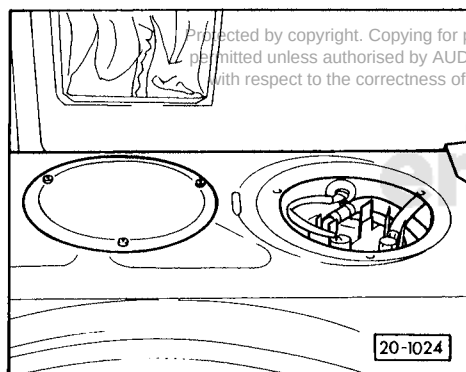
Operate remote control.

If the fuel pump runs:

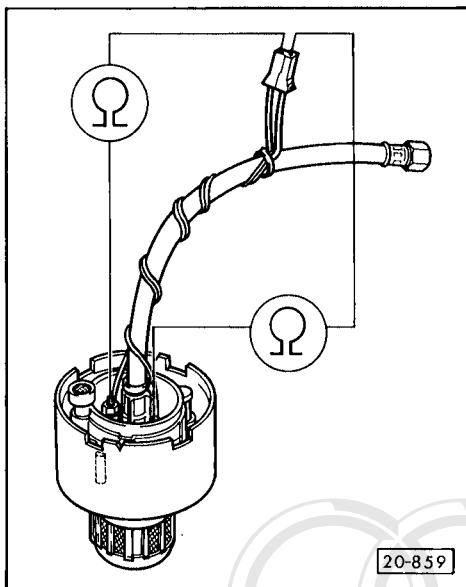
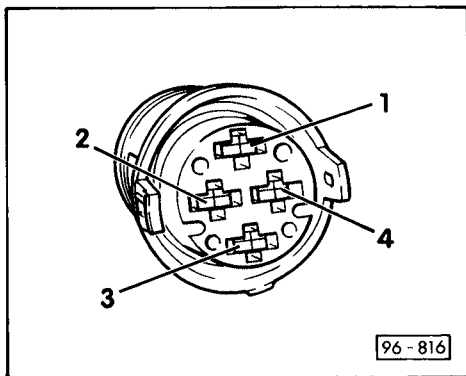
- Check fuel pump relay ⇒ page 20-18.

If the fuel pump **does not** run:

- ▶ – Remove panel for fuel gauge and fuel pump (under luggage compartment lining).
- Disconnect plug connector for fuel pump and fuel gauge.

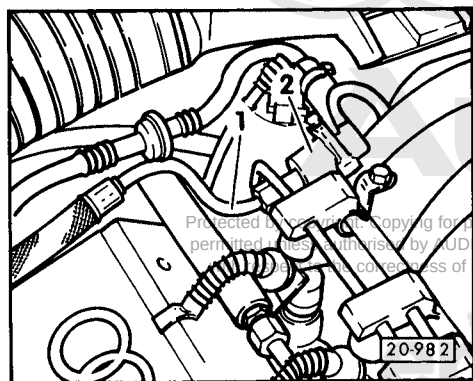


20-14



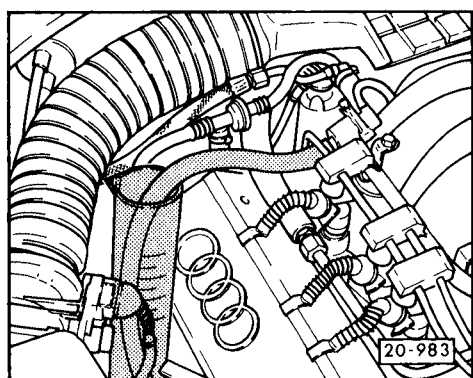
- ▶ - Connect hand multimeter V.A.G 1526 with auxiliary cables from V.A.G 1594 to contacts 1 (green/yellow) and 4 (brown).
- Operate remote control.
- Specified reading: approx. battery voltage.
- If the specified reading is **not** obtained:
- Determine interruption in circuit and rectify.
- If the specified reading is obtained:
- Remove sealing flange ⇒ page 20-24.
- ▶ - Using the hand multimeter and auxiliary cables check pipes from sealing flange to fuel pump for flow and, if necessary, remove obstructions.
- If no obstructions are noted, renew fuel pump (removing and installing fuel pump ⇒ page 20-27).

20-15



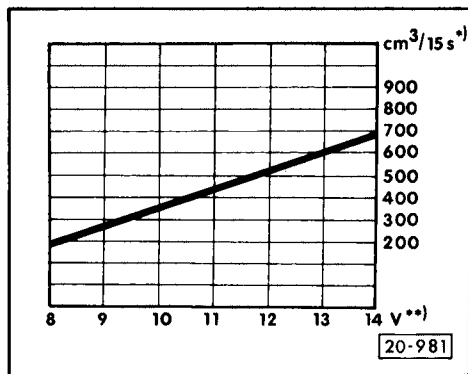
Checking fuel pump output

- Power supply in order.
- Serviceable fuel filter.
- Battery fully charged (min. 12 V).
- Connect remote control V.A.G 1348/3A ⇒ page 20-13.
- Remove sealing cap from filler pipe.
- Remove upper engine cover.
- ▶ - Remove return pipe -1- from fuel collector.



- ▶ - Connect auxiliary hose to return connection of fuel collector -2- and hold in a measuring container.

20-16



– Continue to press the remote control switch for 15 seconds.

◀ – Compare quantity supplied with specified amount ⇒ diagram.

• Minimum output in cm³/15 secs.

** Voltage at fuel pump with engine idle and running pump (approx. 2 V less than battery voltage).

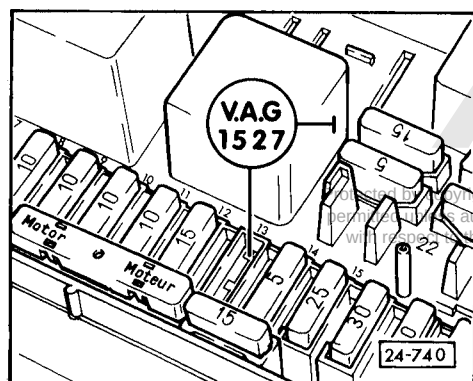
– If these values are not obtained,

• Check pipe position.

• Check fuel pump mesh filter for contamination.

– If no faults are found, renew fuel pump.

20–17



Checking fuel pump relay

Operational check

Note:

The fuel pump relay is located in the main fuse box in left-hand side of water box, relay position 10.

– Remove cover of main fuse box in water box.

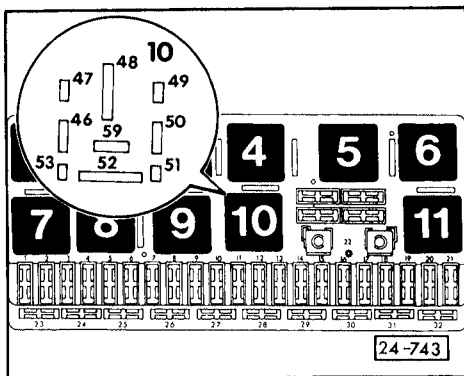
◀ – Pull fuse 13 and connect diode test lamp V.A.G 1527 and auxiliary cables from auxiliary measuring set V.A.G 1594 between earth and rear contact for fuse 13 (arrow).

– Briefly operate starter motor.

– Specified reading: fuel pump relay must pick up (tangible and audible), diode test lamp must light up.

– If the fuel pump relay does not pick up, check control circuit ⇒ page 20–20.

20–18



- ▶ - If the fuel pump relay does pick up, but the diode lamp does not light up, pull off fuel pump relay and check connection from fuse 13 to contact 52 from relay position 10 for continuity according to circuit diagram and renew relay plate if necessary.
- If no interruption is noted, renew fuel pump relay.
- Pull out supplementary fuse 28 at bottom (fuse cover red, engine) and connect diode test lamp V.A.G 1527 with cables from auxiliary measuring set V.A.G 1594 to earth and on one of the two contacts for fuse 28.
- Briefly operate starter motor.
- Specified reading: fuel pump relay must pick up (tangible and audible), diode test lamp must light up.
- If the fuel pump relay does not pick up, check control circuit ⇒ page 20-20.

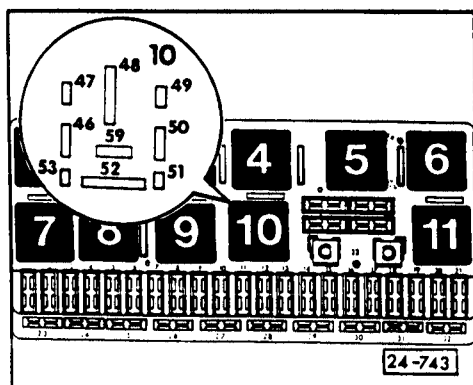


20-19

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- If the fuel pump relay does pick up but the diode test lamp does not light up, repeat check on other contact of fuse holder.
- If the diode test lamp does again not light up, pull off fuel pump relay and check cable connection from fuse 28 to contact 59 from relay position 10 according to circuit diagram and rectify interruption if necessary.
- If no interruption is noted, renew fuel pump.

Checking power supply and control circuit of fuel pump relay -J17

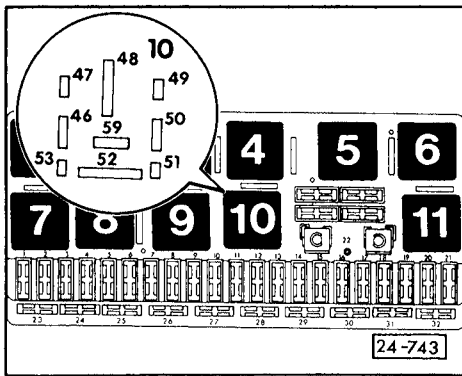


- ▶ - Pull fuel pump relay -J17 from relay plate, relay position 10.

Checking power supply

- Switch on ignition.
- Connect hand multimeter V.A.G 1526 (voltage measuring) one after the other between contacts 46 (positive) and 50 as well as 48 (positive) and 50 of the relay socket.
- Specified reading: in each case approx. 12 V.
- Switch off ignition.

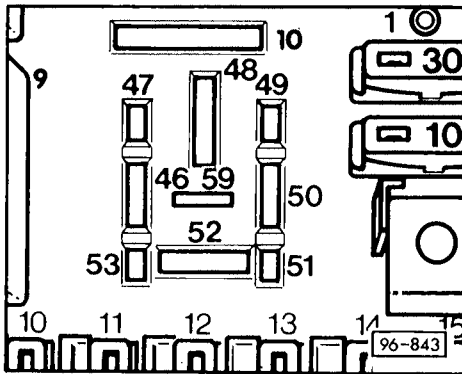
20-20



- If the specified readings are not obtained, determine circuit interruption according to circuit diagram and rectify.

Checking control circuit

- ◀ - Connect diode test lamp V.A.G 1527 to contacts 46 (positive) and 47 of the relay socket.
- When the ignition is switched on, the diode test lamp must light up for approx. 1 second and, when operating the starter motor, the diode test lamp must remain on.
- If the diode test lamp does not light up, check cables as follows:
 - Connect test box V.A.G 1598 with adapter cable V.A.G 1598/12 to cable harness of the MPI control unit ⇒ Repair Group 01. The numbers of the connecting plug are identical to the numbers of the test box.
 - ◀ - Connect hand multimeter between contact 47 of the relay socket and contact 15 of the test box and check cable connection for continuity.
 - Specified reading: max. 1.0 Ω.
 - If the specified reading is not obtained, determine circuit interruption and rectify.



20-21

- If no interruption is noted and the diode test lamp does not light up, renew MPI control unit.
- If the control circuit as well as the cable connection on order, renew fuel pump relay.
- Replace fuse 13.

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Replace fuel pump relay -J17.



Checking fuel pump non-return valve

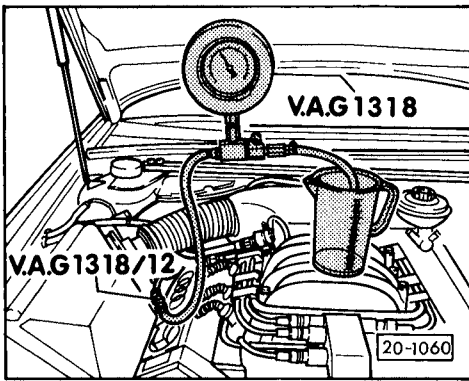
Note:

Prerequisite for the test is the correct operation of the pressure controller, fuel pump and fuel injection valves as well as a leak-free pipe system.

Test prerequisites:

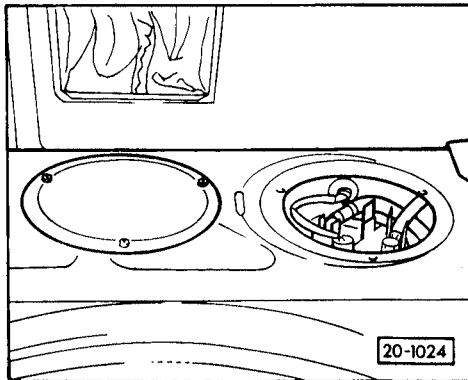
- Fuse 13 in fuse holder in order.
- Serviceable fuel filter.
- Battery fully charged (min. 12 V).
- Fuel pump output in order, checking ⇒ page 20-16.
- Connect remote control V.A.G 1348/3A ⇒ page 20-13.

20-22



- ◀ – Connect pressure test device V.A.G 1318 to the fuel feed and fuel collector. Lever of pressure test device in open position.
- Press remote control switch for approx. 30 seconds.
- Lever of pressure test device in closed position.
- Briefly operate remote control switch until max. 5.1 bar is indicated.
- Observe pressure drop: max. drop after 10 minutes 0.5 bar to 4.6 bar.
- If the specified reading is not obtained, carry out the following tests:
 - Check pressure test device connections for leaks.
 - Check fuel pipes for leaks.
- If no leaks are apparent, the non-return valve in the electric fuel pump is defective.
- Renew fuel pump ⇒ page 20–27.

20–23



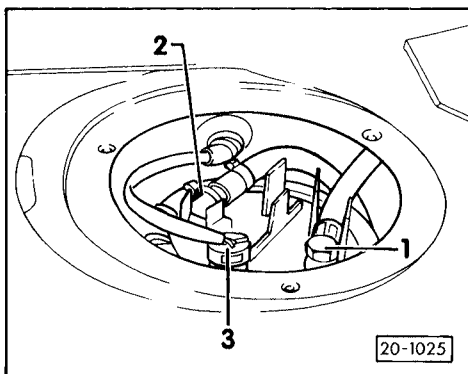
Removing and installing fuel gauge sender

- Observe safety precautions ⇒ page 20–9.
- The fuel tank must be no more than 3/4 full, if necessary use fuel suction device V.A.G 1433 A to remove excess fuel.

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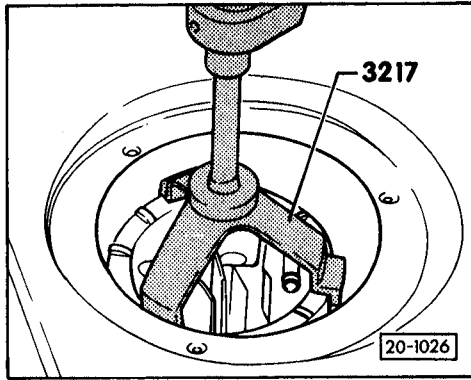
Removing:
– Remove battery cover front left and disconnect battery earthing strap.

- ◀ – Remove cover for fuel gauge and fuel pump (under panel in luggage compartment).

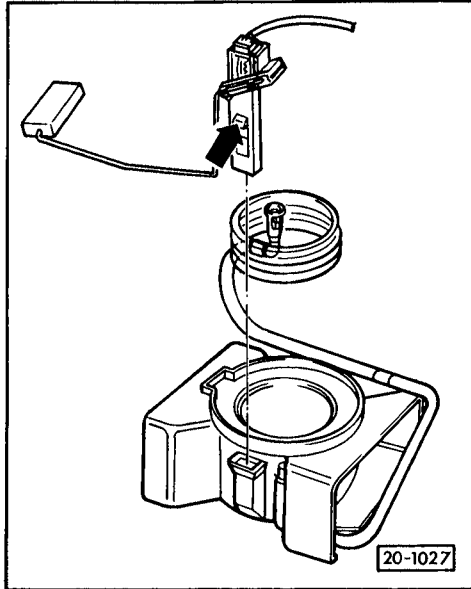


- ◀ – Disconnect plug connector –3– for fuel gauge and fuel pump. Unscrew feed pipe –1– and pull off return pipe –2– with adapter from sealing flange.

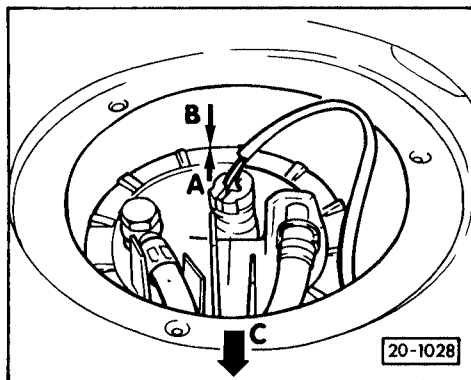
20–24



- ◄ - Using special tool 3217 remove union nut and lift out sealing flange.
- Disconnect plug connectors for fuel pump and fuel gauge as well as feed and return pipes on inside of sealing flange.



- ◄ - Remove sender by pressing locating lug -arrow-.



Installing:
Installation is carried out in reverse sequence. Ensure that the electric wires do not foul the float.

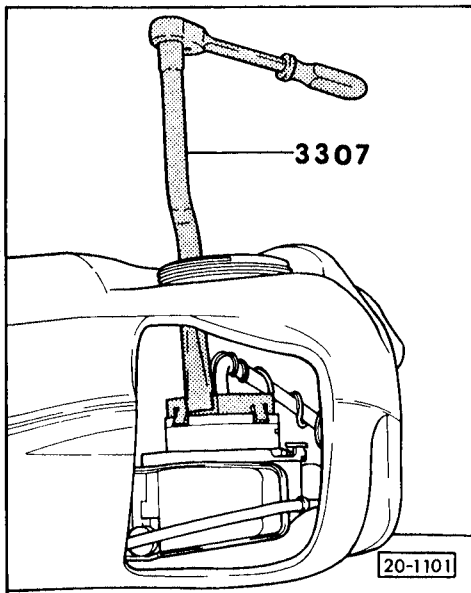
Note installation position:

- ◄ • Marking -A- of sealing flange must align with marking -B- of fuel tank.
- C - direction of travel.

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20-25



Removing and installing fuel pump

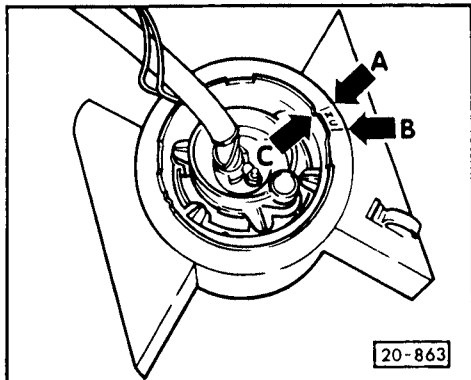
Removing:

- ▶ - Remove fuel gauge sender ⇒ page 20-24.
- Insert spanner 3307 for fuel pump through tank inlet opening and fit to reservoir housing inner part.
- Turn reservoir inner part to left with spanner 3307 by approx. 15° up to stop and remove together with fuel pump.

Installing:

Vehicles with front-wheel drive:

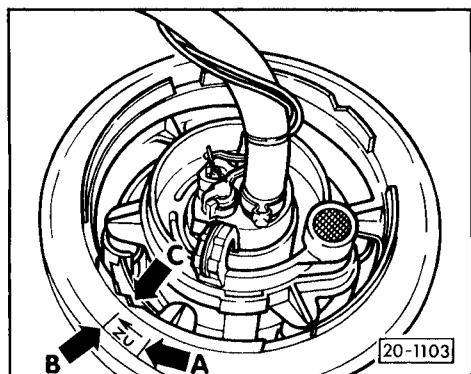
- ▶ - Insert fuel pump and reservoir housing upper part into fuel tank so that single notches -C- align with marking -A- on reservoir housing upper part.
- Fit fuel pump spanner 3307 and turn reservoir upper part to right up to stop. Markings -C- and -B- must align.



20-27

Vehicles with four-wheel drive:

- ▶ - Insert fuel pump with upper part of reservoir housing into fuel tank so that double notches -C- align with marking -A- on reservoir housing inner part.
- Fit fuel pump spanner 3307 and turn reservoir inner part to right up to stop.



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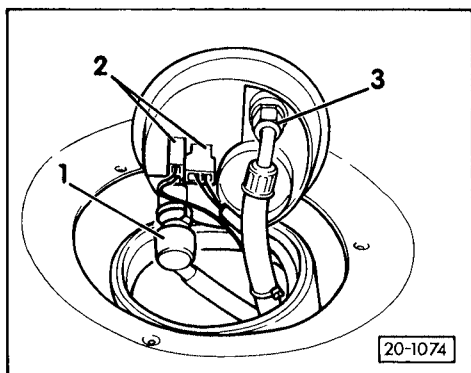
- ▶ - Attach return pipe -1- to sealing flange so that clamping ring latches on lug of sealing flange.

Note:

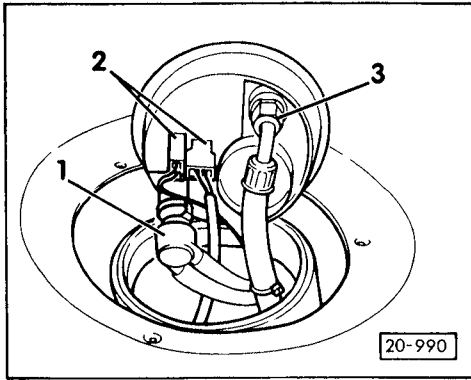
Do not tilt return pipe.

On vehicles with front-wheel drive:

- Connect fuel gauge plug -2- to sealing flange so that cable is **above** the feed pipe.



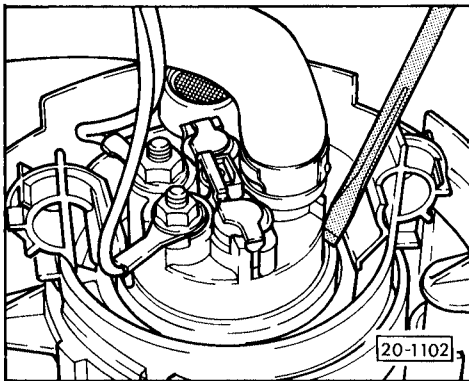
20-28



On vehicles with four-wheel drive:

- ◀ – Connect fuel gauge plug –2– to sealing flange so that cable is above the return pipe.

20-29



Dismantling and assembling fuel pump

- ◀ – Press both locking lugs on reservoir housing outwards with a screwdriver until locking lugs locate on side of pump housing metal cylinder.
- Pull fuel pump with turning movements out of reservoir housing.

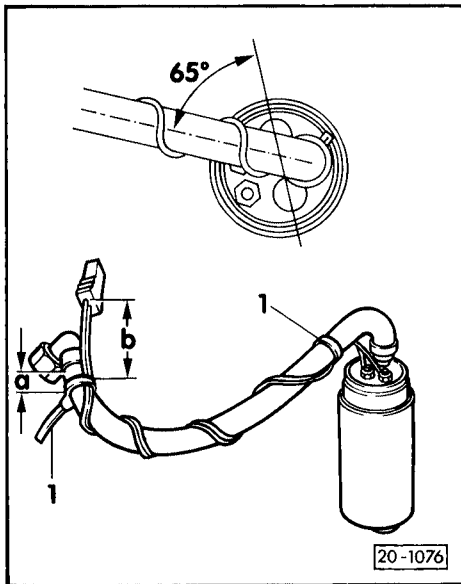
Notes:

- Ensure that locking lugs do not lock in position during removal of fuel pump.
- If renewing fuel pump, carefully note position of feed pipe during installation!

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- Remove clamp and hose from fuel pump.
- Briefly dip hose end in fuel.
- Push hose with clamp on to fuel pump up to stop.

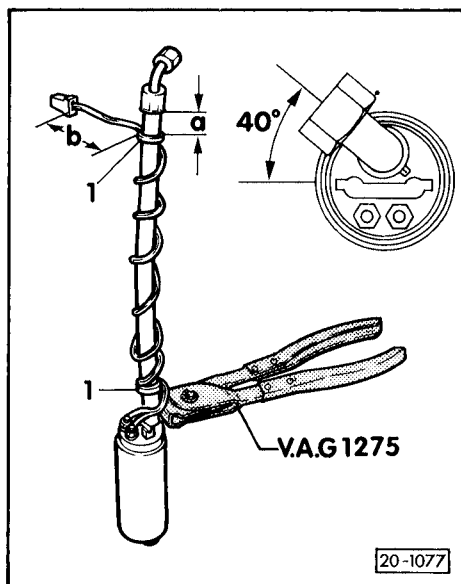
20-30



Vehicles with front-wheel drive:

- ◀ – Turn hose to position shown in illustration.
- Press clamps together with hose clamping tool V.A.G 1275.
- 1 – Cable tie
- a – 25 mm
- b – 75 mm

20-31



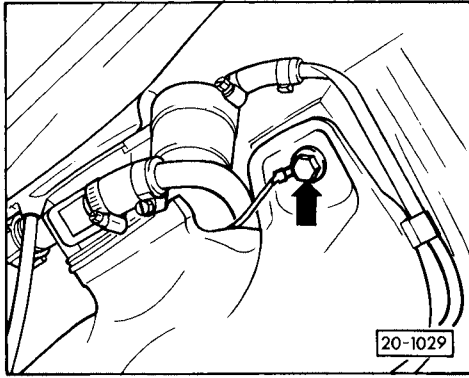
Vehicles with four-wheel drive:

- ◀ – Turn hose to position shown in illustration.
- Press clamps together with hose clamping tool V.A.G 1275.
- 1 – Cable tie
- a – 25 mm
- b – 100 mm

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20-32



Removing and installing fuel tank

Notes for removal:

- Empty fuel tank before removing.
- Remove cover from battery front left.
- Before disconnecting the battery on vehicles fitted with radio anti-theft coding, enquire as to anti-theft code.
- Connecting and disconnecting must only be carried out with the ignition switched off, otherwise the control unit can be damaged.
- Disconnect earthing strap from battery.
- Support fuel tank with cradle V.A.G 1383 A.

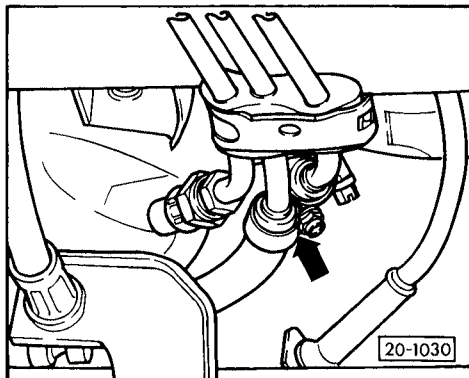
Only with Quattro:

Remove rear final drive ⇒ Workshop Manual Running gear and gearbox.

Removing:

- Remove filler cap.
- Disconnect plug connectors and wires for fuel gauge and fuel pump on fuel tank as described on page 20–24.
- Remove right rear wheel.
- Remove inner wheel arch.
- Unscrew fuel tank attachment bolt behind inner wheel arch.

20–33

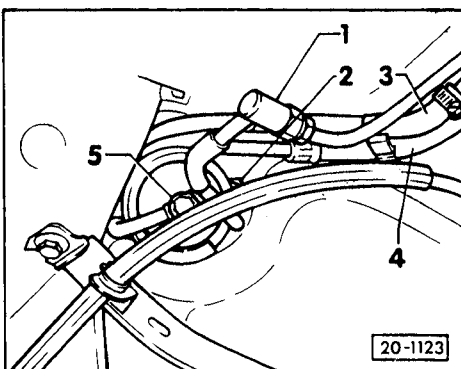


- On vehicles with front-wheel drive, disconnect vent pipe at front of fuel tank.
- Remove bolts from fuel tank support straps.
- Remove fuel tank by turning to side and downwards.

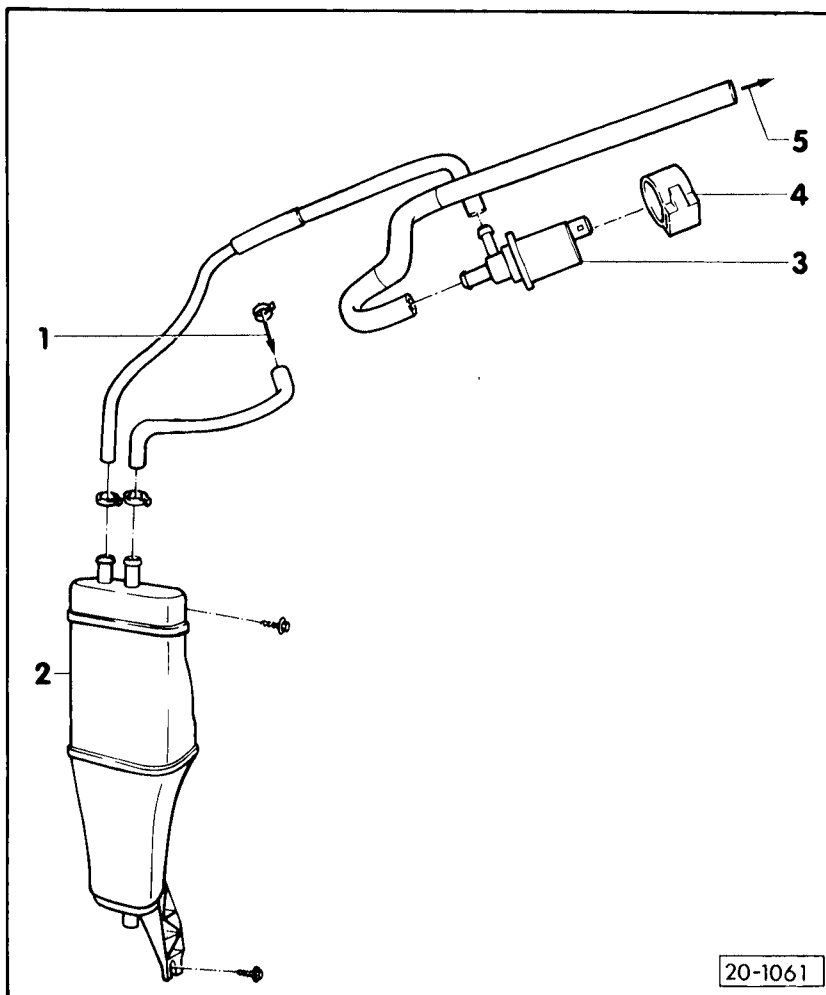
Note for installation:

Fit pipe attachment devices to new fuel tank as per removed tank. Installation is carried out in reverse sequence.

- Vent pipe at front of fuel tank on vehicles with four wheel drive.



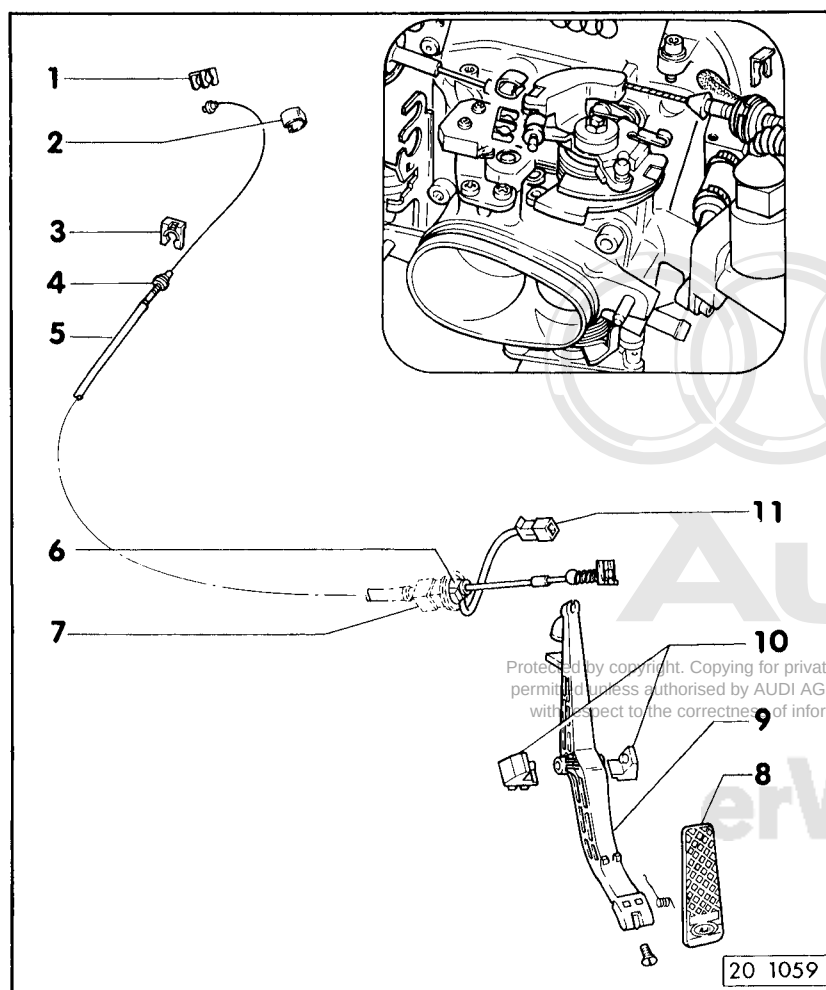
20–34



Servicing tank venting system with activated charcoal canister

- 1 – Vent pipe
- 2 – Activated charcoal canister
 - Installation location: Behind inner wheel arch, front right
- 3 – Solenoid valve for activated charcoal canister
 - Checking ⇒ Repair Group 24
 - Checking control circuit ⇒ Repair Group 01
- 4 – Rubber retaining strap
- 5 – To throttle valve

20-35



Servicing accelerator system

- 1 – Clip
- 2 – Locking clip
- 3 – Lock plate for longitudinal adjustment
- 4 – Accelerator cable abutment
- 5 – Accelerator cable
 - Adjusting ⇒ page 20-37
- 6 – Square bearing
- 7 – Kick-down switch
 - Checking ⇒ Workshop Manual "Automatic Gearbox 097, Repair Group 01"
- 8 – Accelerator pedal
- 9 – Accelerator lever
 - Assemble only with bearing bracket
- 10 – Bearing bracket
 - When removing accelerator pedal, break off lugs (do not use damaged bearing bracket)
- 11 – Plug for kick-down switch

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20-36

Adjusting accelertaor cable

Notes:

- The accelerator cable is easily kinked, so use particular care when installing. A single light kink can later lead to fracture during driving. Cables, which are kinked, must therefore not be used.
When installing ensure that the accelerator cable is aligned between support brackets and cable attachment points.
- Accelerator cable is connected to the accelerator pedal and angled washer. Longitudinal adjustment at accelerator sleeve not secured by locking device –1–.

– Fully depress accelerator pedal.

– Pull accelerator sleeve back until the throttle valve lever is at full power stop.

◀ – Secure longitudinal adjustment with locking device –1–.

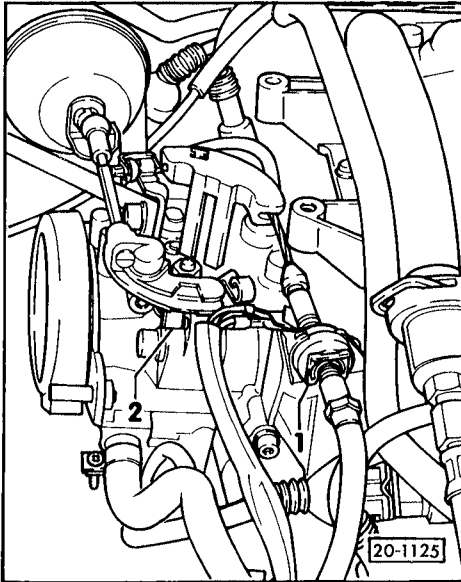
Checking:

– Fully depress accelerator pedal.

- Throttle valve lever must be at full power stop.

– Release accelerator pedal.

- Throttle valve lever must be at idling stop –2–. If necessary, repeat adjustment as described above.



20-37



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Removing and installing exhaust system

The illustration shows the exhaust system of a vehicle with front-wheel drive and manual gearbox. Deviations for vehicles with front-wheel drive and automatic gearbox as well as vehicles with four-wheel drive are also described.

Notes:

- Always renew self-locking nuts, seals and gaskets.
- Always renew clamping sleeves.
- Load exhaust system suspension elements evenly.
- Align exhaust system stress-free ⇒ page 26-8.
- Check exhaust system for leaks ⇒ page 26-13.

Vehicles with four-wheel drive:
Separating point between centre and rear silencers ⇒ Fig. 1, page 26-5.

1 – Sealing cap CO tapping pipe

2 – CO tapping pipe

3 – Lambda probe

- 50 Nm
- Checking ⇒ Repair Group 24
- Lubricate thread with G5 grease, but ensure no grease comes into the slot

4 – Stud

- 30 Nm

5 – Exhaust manifold

6 – 30 Nm

- Observe tightening torques, Fig. 6, page 26-7

7 – Hexagon-head nut (captive)

- Renew if damaged

8 – Sealing rings

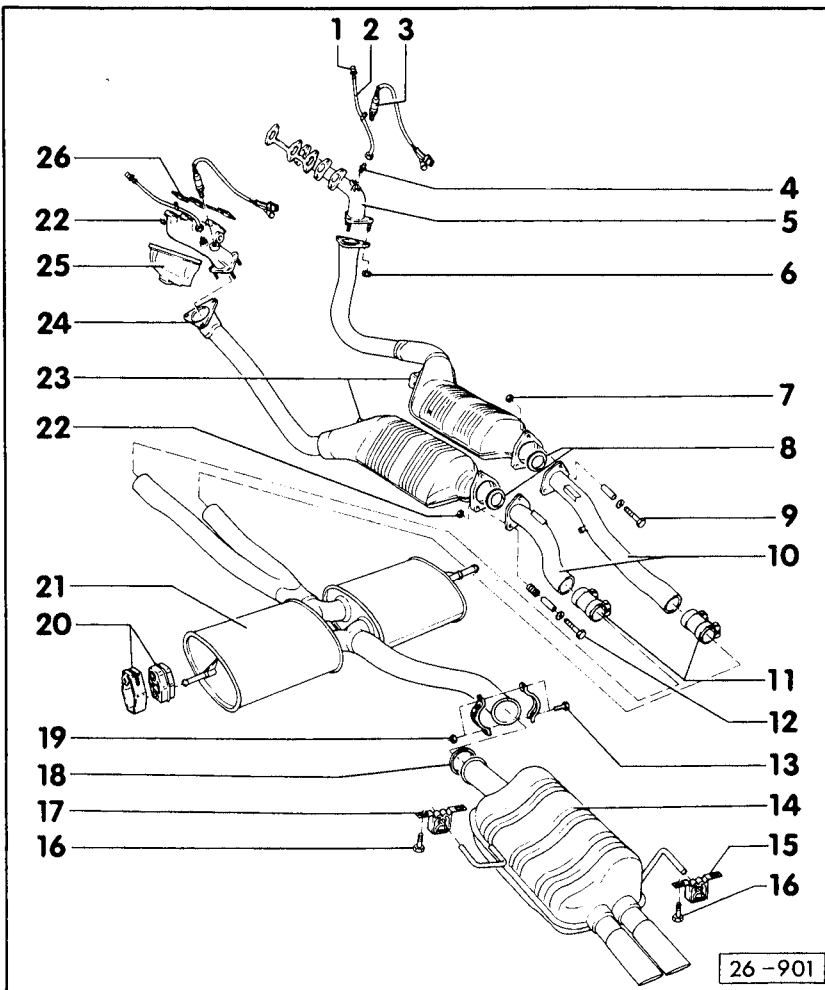
- Camber to catalytic converter
- Cone to intermediate pipe

9 – Hexagon-head bolt M8 x 42

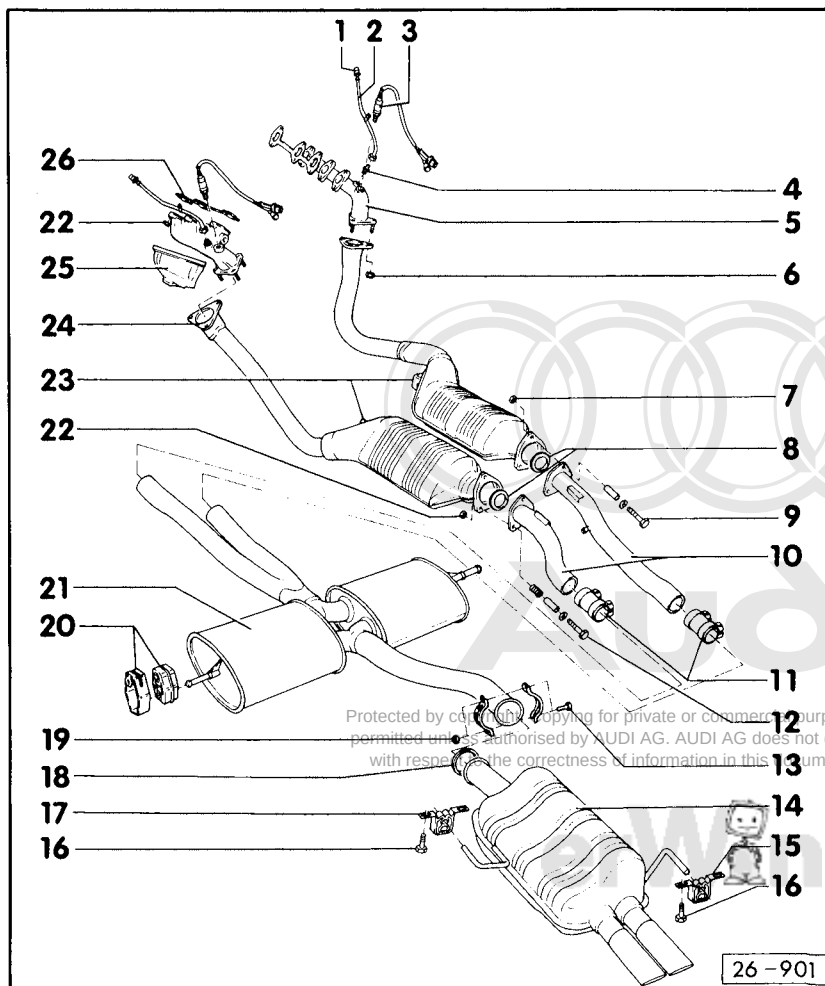
- 25 Nm
- Connecting bolts on both intermediate pipes without washer

10 – Intermediate pipes

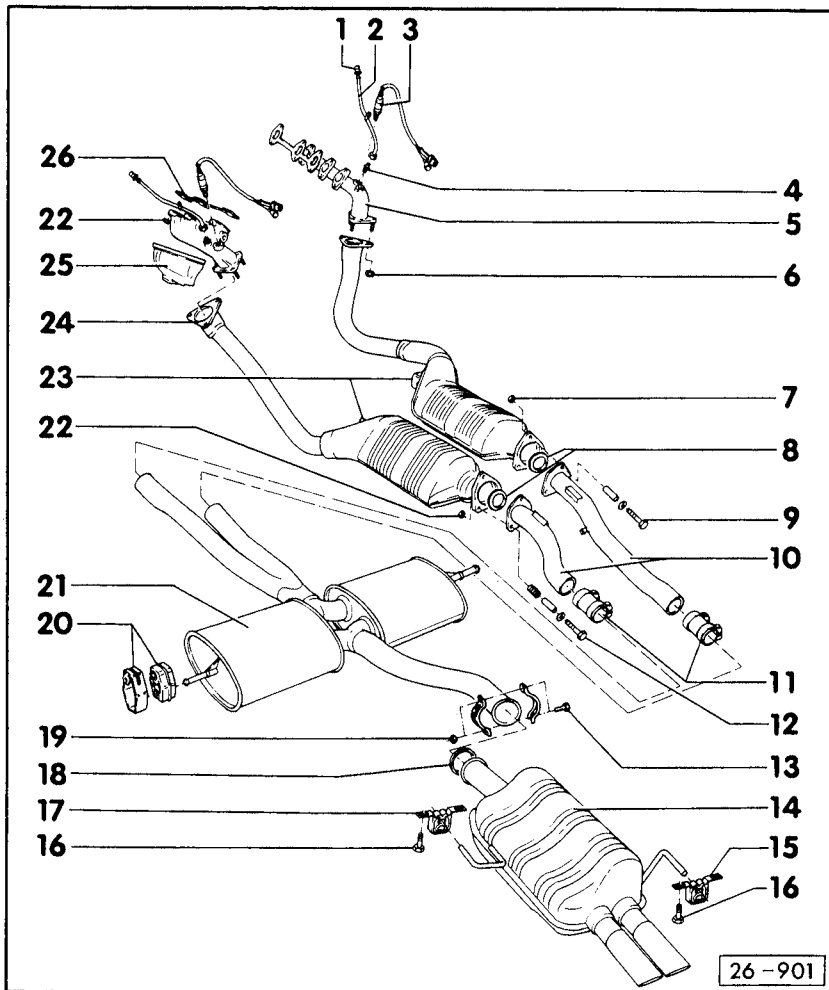
- Align ⇒ page 26-12



26-1

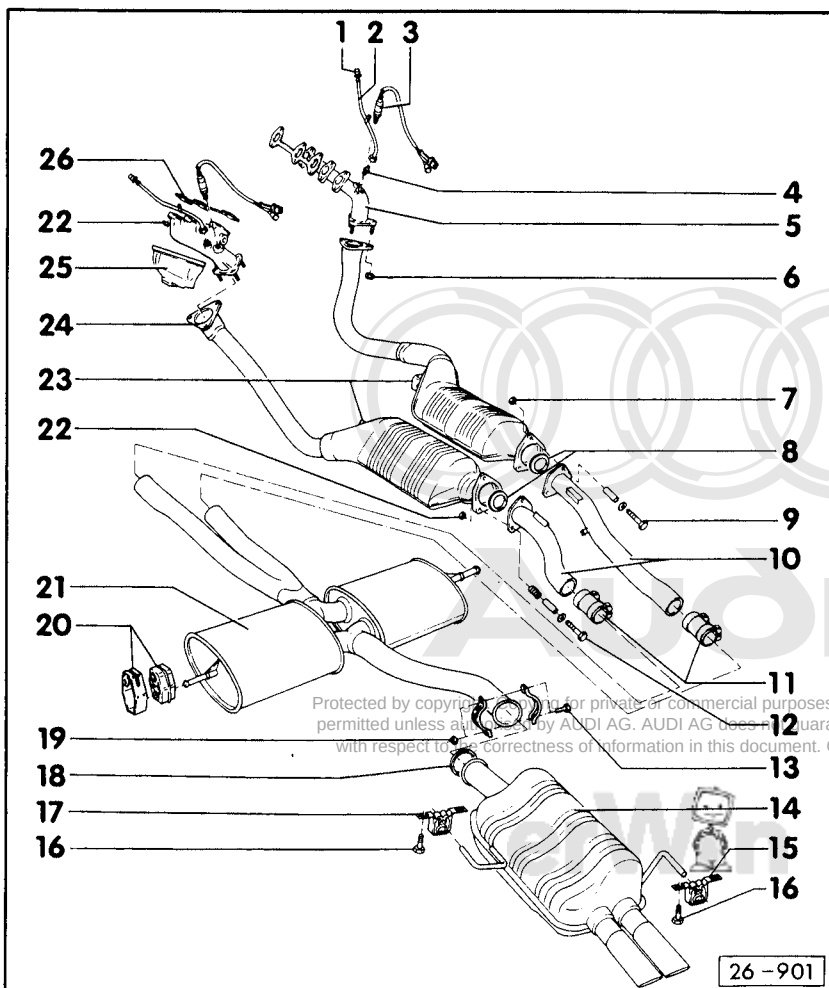


26-2



- 11 – **Clamping sleeves**
 - 40 Nm
 - Installation position of clamping sleeves ⇒ page 26–11
 - Renew every time they are loosened
- 12 – **Hexagon-head bolt M8 x 70**
 - Lower connecting bolts on both intermediate pipes with washer
- 13 – **Hexagon-head bolt M8 x 48**
 - Bolt heads must point to fuel tank
- 14 – **Rear silencer**
 - Centralize end pipes ⇒ page 26–9
 - Align attachment bolts in suspension bracket ⇒ page 26–10
 - Separating point on vehicles with four-wheel drive ⇒ fig. 1, page 26–5
- 15 – **Suspension bracket**
 - Align suspension brackets ⇒ page 26–10
- 16 – **Hexagon-head bolt M8 x 20**
 - 25 Nm
 - Loosen at rear to remove silencer
 - Tighten after centralizing end pipes

26–3



- 17 – **Suspension bracket**
 - Remove at rear to remove silencer
- 18 – **Sealing ring**
- 19 – **25 Nm**
 - Installation position of screw bracket ⇒ page 26–10
- 20 – **Suspension loop with stop buffer**
 - Always fit first to bodywork attachment point
 - Unhook to remove centre silencer, unhook left loop
- 21 – **Centre silencer**
- 22 – **25 Nm**
- 23 – **Catalytic converter suspension**
 - Installation sequence of parts ⇒ Figs. 3–5, page 26–6 or 26–7
- 24 – **Exhaust pipe with catalytic converter**
 - Align catalytic converter ⇒ Fig. 2, page 26–5
- 25 – **Heat shield**
- 26 – **Exhaust manifold gasket**

26–4

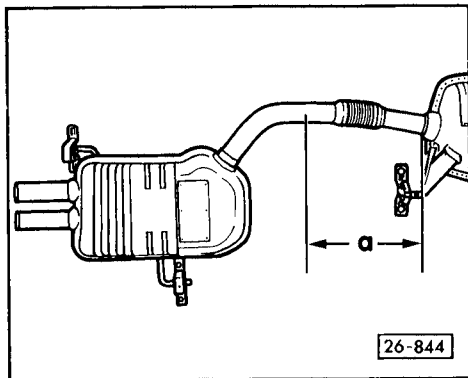


Fig. 1 Separating point between centre and rear silencers (Vehicles with four-wheel drive)

- For use of centre or rear silencers a separating point has been provided.
- Separate connecting pipe between centre and rear silencers at place marked by a notch: dimension –a– approx. 300 mm.
- In case of repairs, a short clamping sleeve is provided for connecting centre and rear silencers.
- Install clamping sleeve **horizontally**.
- Bolts must be on **right side** of exhaust pipe.

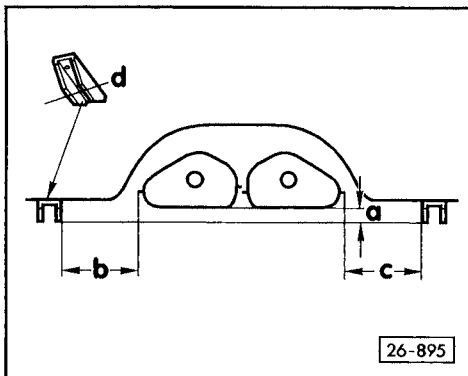


Fig. 2 Align catalytic converter

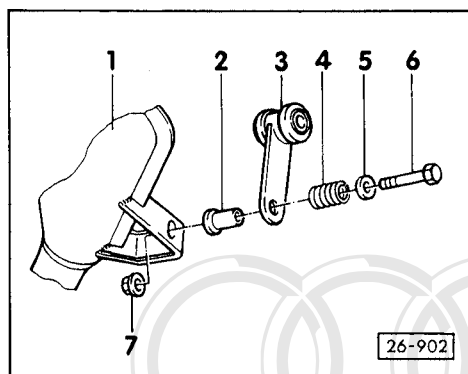
Notes:

- The exhaust system is illustrated from rear up to catalytic converters.
- Measurements must be carried out in the centre –d– of catalytic converter protective rail.

Front-wheel drive: –a– = 5 ... 8 mm
 –b– = 250 ... 255 mm
 –c– = 210 ... 215 mm

Four-wheel drive: –a– = 8 ... 12 mm
 –b– = 265 ... 270 mm
 –c– = 220 ... 225 mm

26–5



Catalytic converter suspension

A – Vehicles with front-wheel drive and manual gearbox:

Fig. 3 Installation sequence, left-hand side

- 1 – Catalytic converter
- 2 – Spacer sleeve
- 3 – Bracket
- 4 – Compression spring
- 5 – Washer
- 6 – Hexagon-head bolt
- 7 – Lock nut, 25 Nm

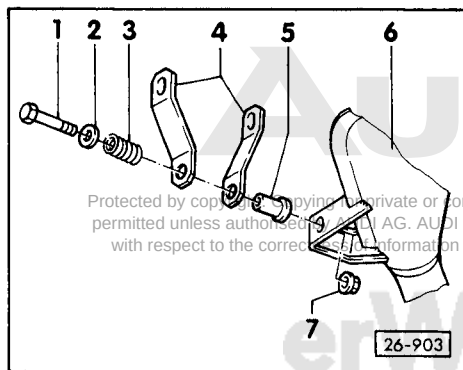


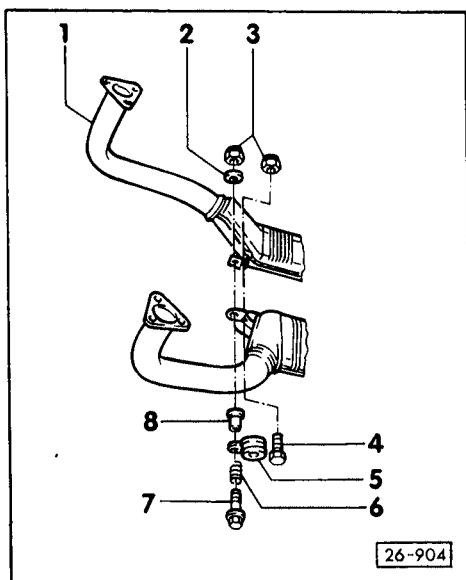
Fig. 4 Installation sequence, right-hand side

- 1 – Hexagon-head bolt
- 2 – Washer
- 3 – Compression spring
- 4 – Brackets
- 5 – Spacer sleeve
- 6 – Catalytic converter
- 7 – Lock nut, 25 Nm

B – Vehicles with front-wheel drive and automatic gearbox:

- For installation sequence for left and right-hand sides, see front-wheel drive with manual gearbox, right-hand side (Fig. 4).

26–6



C – Vehicles with four-wheel drive:

◀ Fig. 5 Installation sequence:

- 1 – Catalytic converter
- 2 – Washer
- 3 – Lock nut, 25 Nm
- 4 – Hexagon-head bolt
- 5 – Bracket
- 6 – Compression spring
- 7 – Combination bolt
- 8 – Spacer sleeve

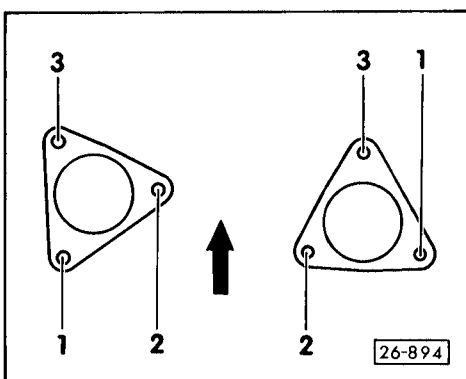


Fig. 6 Tightening procedure, front pipes

- ◀ – Tightening of both front pipes with catalytic converters to the exhaust manifold must be carried out evenly and in sequence shown in illustration. Arrow points in direction of travel.
- Tightening torque: 30 Nm.

26-7

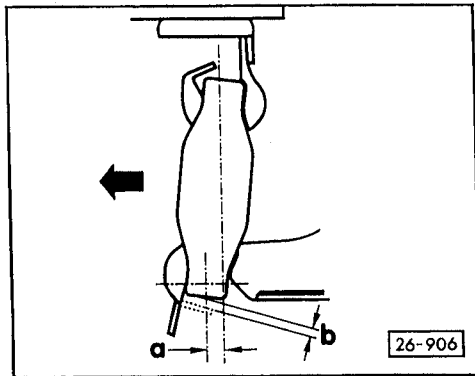
Aligning exhaust system stress-free

Notes:

- If exhaust system is stressed or to be newly aligned, all bolted connections (except front pipes and connection of catalytic converter/gearbox) and exhaust system suspension must be loosened on the bodywork.
- Align exhaust system when cold.
- Subsequent work must be carried out in prescribed sequence.
- Spacings quoted in illustration are **approx.** dimensions.

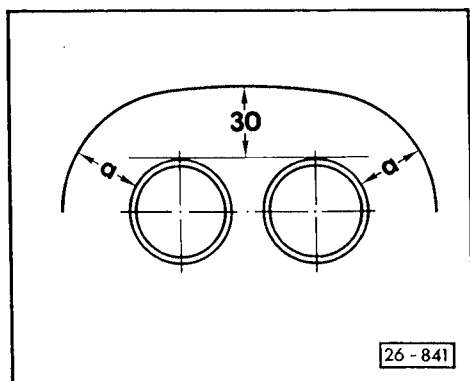
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Preliminary tensioning of exhaust system (only for four-wheel drive vehicles)

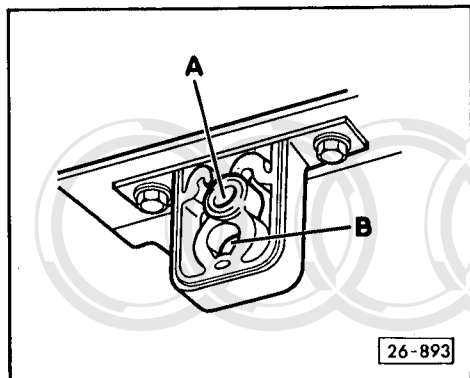
- Preliminary tensioning is carried out at front suspension loop of centre silencer.
- ◀ - Dimension -a- 6-9 mm is to be corrected by movement within clamping sleeve, arrow points in direction of travel.
- Peen locking tabs of brackets over to 90° after installation of suspension loops.
- ◀ - Spacing b between suspension loop and locking tabs must be at least 2 mm on both suspensions.



Centralizing end pipes

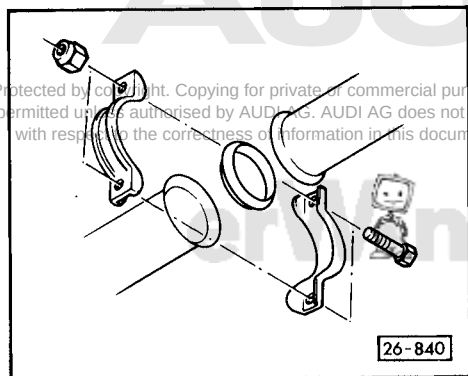
- ◀ - Distance -a- right = distance -a- left.
- ◀ - Check that distance to top bumper bar cut-out is approx. 30 mm.

26-9



Aligning suspension brackets

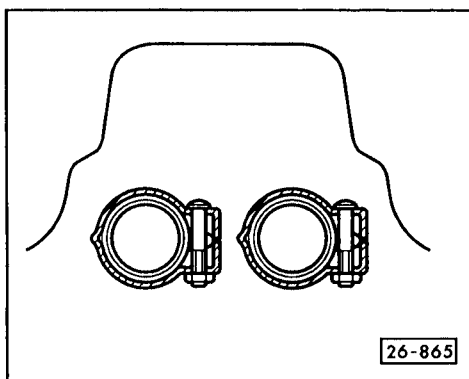
- ◀ - The left suspension bolt on rear silencer must be protrude at least 18 mm from suspension bracket -A-.
- ◀ - After tightening of suspension brackets aperture -B- but not make contact with the block.
- Permanently deformed or damaged suspension brackets must be renewed.



Installation position of bolted clamp

- The bolted clamp must be fitted parallel to fuel tank, bolt heads must point to fuel tank.
- Contact surfaces of both pipe ends must be parallel to sealing faces of sealing rings.

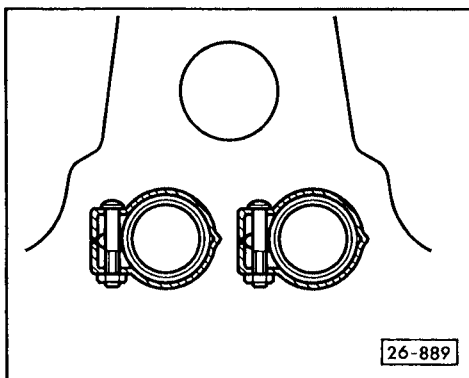
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Clamping sleeve installation position

Vehicles with front-wheel drive:

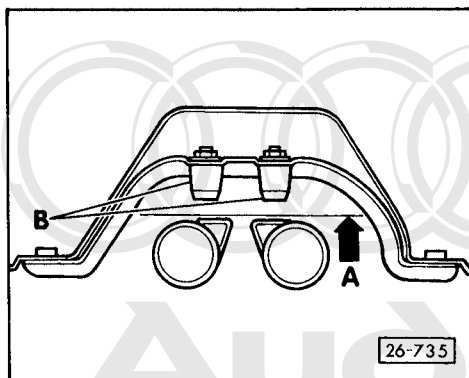
- ◄ – Install so that bolted joints of both clamping sleeves are on right-hand side.
- Renew clamping sleeves after they have been loosened.



Vehicles with four-wheel drive:

- ◄ – Install so that bolted joints of both clamping sleeves are on left-hand side.
- Renew clamping sleeves after they have been loosened.

26-11



Centralizing end pipes

- To do this the bolted joints of catalytic converter to end pipes must be loose.
- ◄ – Angles of intermediate pipes must be horizontal to each other, see –A–.
- Bolted joints of flange connections catalytic converter/intermediate pipe must be tightened so that flange faces are circumferentially evenly spaced.
- ◄ – Stop buffers –B– must not be damaged. The exhaust system must not make contact with stop buffers.

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26-12

Checking exhaust system for leaks

Exhaust system leaks before the Lambda probe can lead to

- Difficult starting
- Engine dying
- Vibrations during idling speed
- Jerky acceleration
- Poor change-over behaviour.

Before fault-finding activities on fuel preparation system, Repair Group 24 or Ignition System, Repair Group 28, check exhaust system as follows for leaks:

- Engine cold or luke-warm
- Ensure engine is switched off.
- Install pressure pistol into one exhaust end pipe and seal with a cloth.
- Also seal second end pipe with a cloth.
- Adjust operating pressure of pressure system to approx. 0.3 bar test pressure.

26–13



- Continuously operate pressure pistol.
- Connecting points:
Spray cylinder/exhaust manifold, exhaust manifold/exhaust pipe etc. with leak detector spray (commercially available) and observe formation of bubbles.
- Rectify leaks observed.

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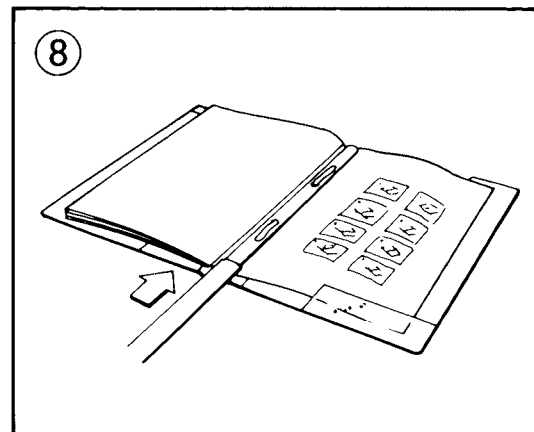
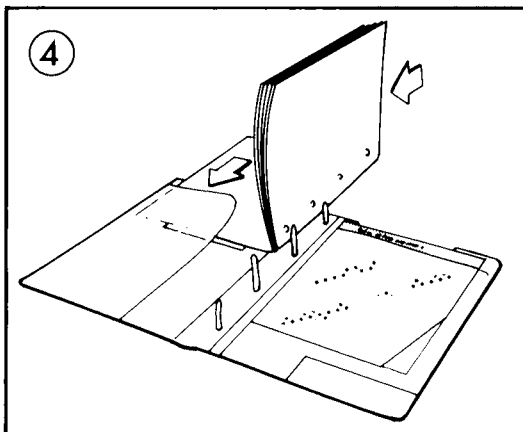
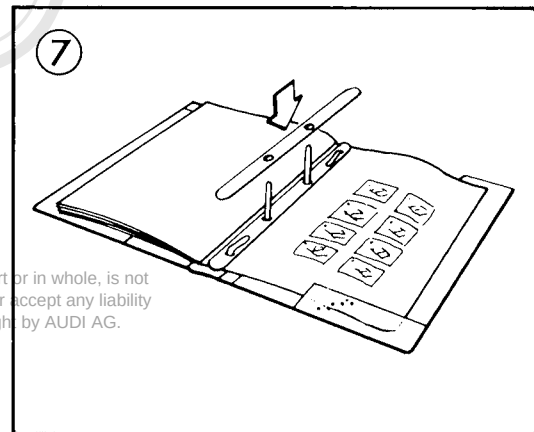
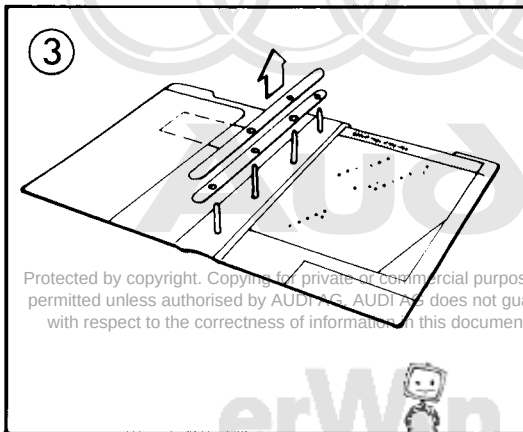
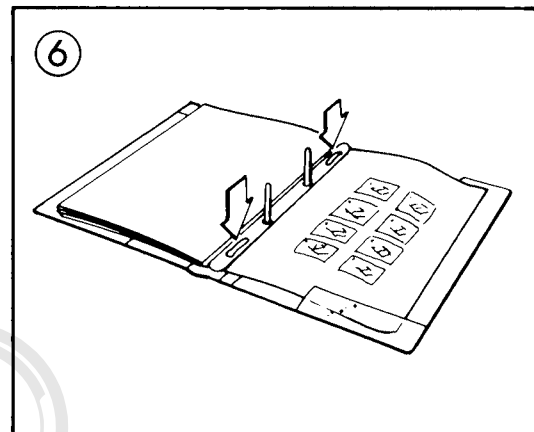
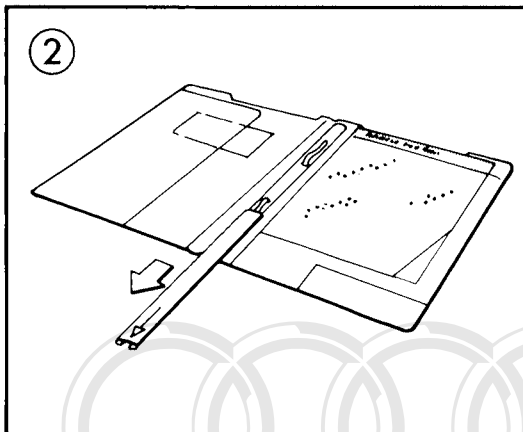
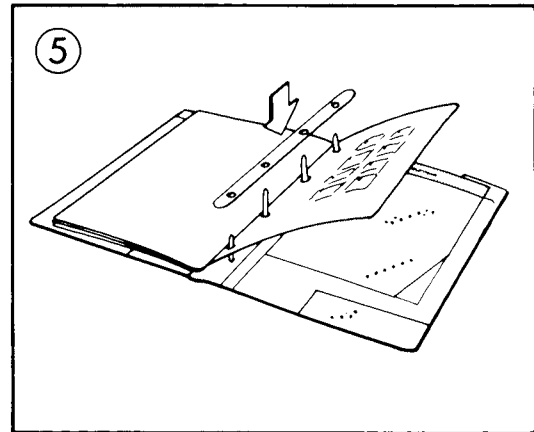
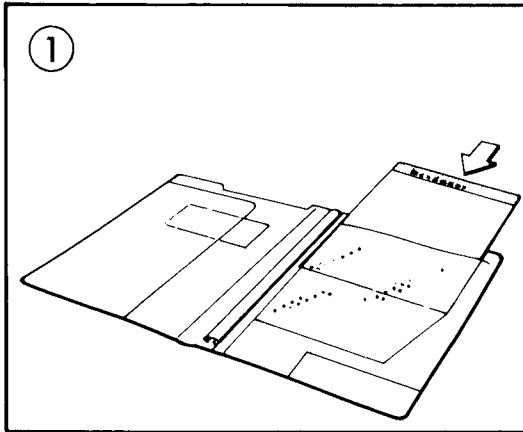
26–14



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Technical Bulletin to Workshop Manual

Audi 80 1992 ►

Engine code	ABC									
Booklet		6-cyl. fuel injection engine (2.6 litre engine, 2-valve), mechanics								Edition 04.92

Enter in Repair Group list

Repair Group 00, 13, 17, 19, 20

Bulletin No. **1**

Affected: All vehicles

Subject

AMENDMENTS

=====

Contents	Bulletin page	Booklet from page
Engine overview	1	00-2
Dismantling and assembling crankcase, crankshaft and flywheel	3	13-3
Checking cylinder head for distortion	3	15-15
Removing oil pump	3	17-5
Draining and refilling with coolant	4	19-8
Position of fuel filter on vehicles with front-wheel drive	4	20-12

430/434/-

ENGINE OVERVIEW

Code letters	ABC
Engine data	
Manufactured from to	07.92
Number of cylinders	6
Cubic capacity ltr.	2598
Output kW at rpm	110/5750
Torque Nm at rpm	225/3500
Bore mm dia.	82.5
Stroke mm	81.0
Compression ratio	10.0

1

Code letters	ABC
Valve timing with 1 mm valve lift and 0 mm valve clearance	
Inlet opens after TDC	4°
Inlet closes after BDC	44°
Exhaust opens before BDC	40°
Exhaust closes before TDC	0°
RON at least	91
Fuel injection	Multi-point fuel injection
Exhaust gas recirculation	--
Catalytic converter	X
Lambda control	X
Turbocharger	--

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2

Amendment to page 13-3:

Dismantling and assembling crankcase, crankshaft and flywheel

Item 2: Connecting rod bearing bolts

The tightening torque for the connecting rod bearing bolts is 30 Nm + 1/4 turn further (90°).

Amendment to page 15-15:

Checking cylinder head for distortion

Maximum permissible distortion: 0.5 mm

Amendment to page 17-5:

Removing oil pump

In the second step next to illustration 13-879 change the words "closing limiter" to "screw plug" by hand.

3

Amendment to page 19-8:

Draining and refilling with coolant

Alter the page reference -19-3- next to illustration 13-374 by hand to read 19-4. Delete page 19-9 in the Workshop Manual and use the following procedure for bleeding the cooling system:

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- Screw filler cap onto expansion tank.
- Run engine at idle until the radiator fan cuts in once, and then increase engine rpm to 2000 rpm for approx. 30 sec. Switch off engine.
- Check coolant level in expansion tank, and top up to max. mark if required.

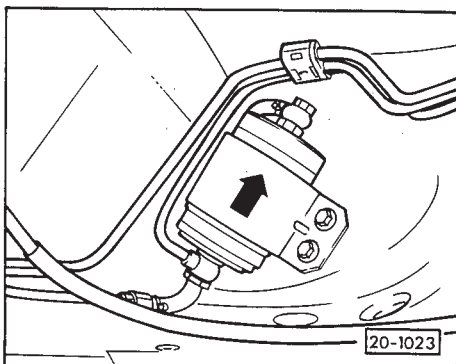
Amendment to page 20-12:

Position of fuel filter for vehicles with front-wheel drive

- Delete the illustration 20-1032 in the Workshop Manual and replace with illustration 20-1023 (left).

4

000.5460.01.20



Technical Bulletin to Workshop Manual

Audi 80 1992 ►

Engine code	ABC									
Booklet 6-cylinder fuel injection engine (2.6 litre engine, 2-valve), Mechanics Edition 04.92										

Enter in Repair Group list
Repair Group 26

Bulletin No. **2**

Affected: All vehicles

Subject

Changeover from dual to single catalyst system on vehicles with front-wheel drive (gradual introduction)

Modified tightening procedure for front exhaust pipes

Modified method for checking exhaust system for leaks

Contents	Bulletin page	Booklet from page
Removing and installing exhaust system	1	26-1
- Removing and installing single catalytic converter and front exhaust pipes	1	-
- Modified procedure for tightening front exhaust pipes	4	26-7
Stress-free alignment of exhaust system	4	26-8
Checking exhaust system for leaks	8	26-13

Removing and installing exhaust system

Removing and installing single catalytic converter and front exhaust pipes

Notes:

- ◆ Position of double clamp between centre and rear silencers ⇒ page 6
- ◆ Tightening torque of hexagon bolts for attaching cross member to substructure, 22 Nm.

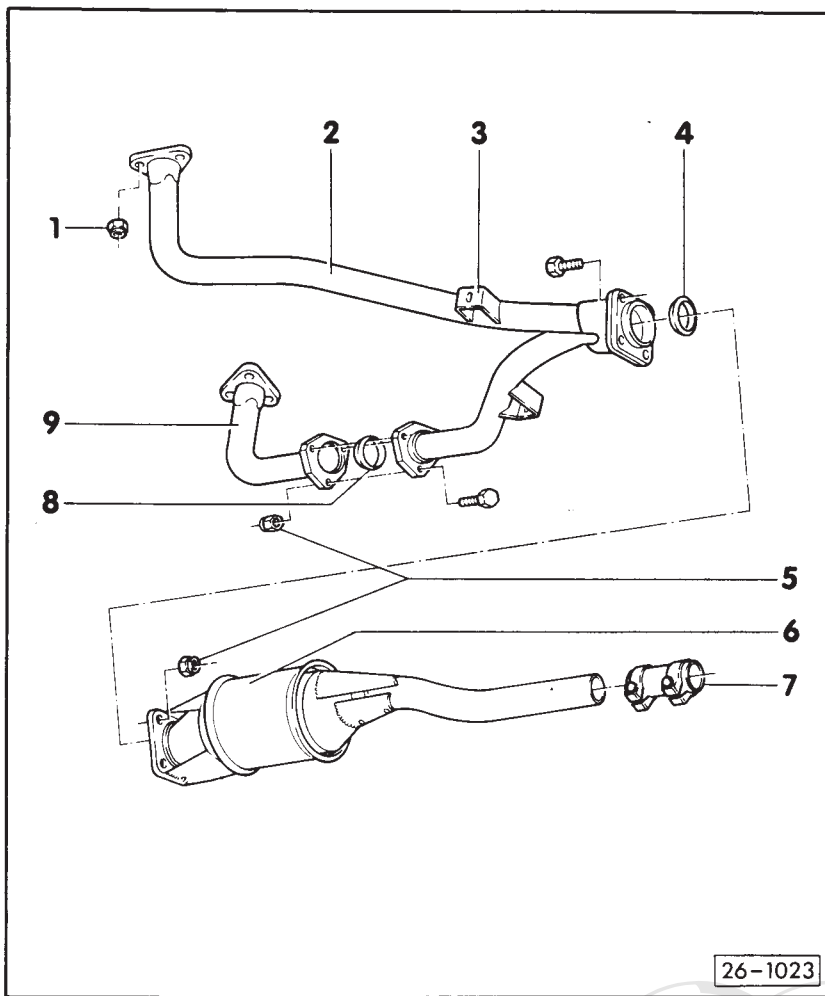
1 - Hexagon nut, 30 Nm

- ◆ See tightening procedure, ⇒ page 4

2 - Exhaust pipe, front left

3 - Bracket for exhaust pipe, front

- ◆ Position of parts on vehicles with manual or automatic gearbox ⇒ page 3



1

4 - Seal

5 - Hexagon nut

- ◆ 25 Nm

6 - Catalytic converter

- ◆ Aligning ⇒ page 5

7 - Double clamp

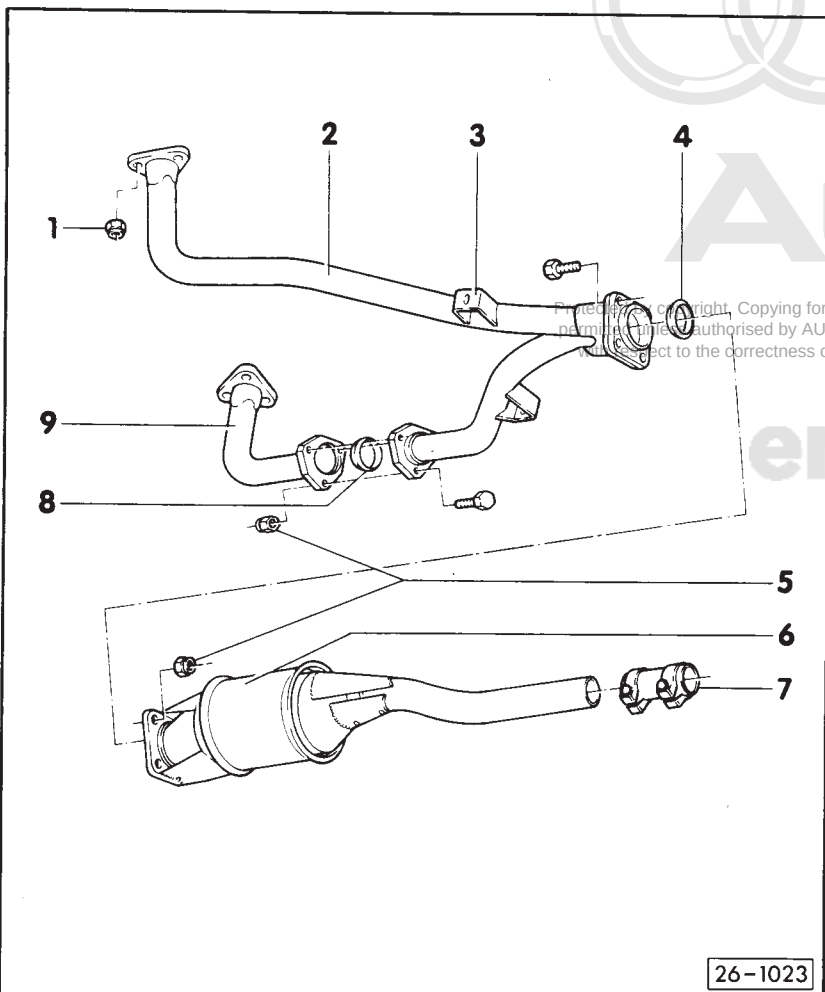
- ◆ Tighten evenly, 40 Nm

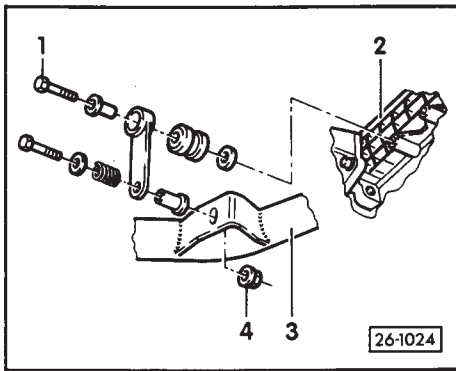
- ◆ Position ⇒ page 7

- ◆ Clamp must be replaced if bolts have been slackened

8 - Seal

9 - Exhaust pipe, front right



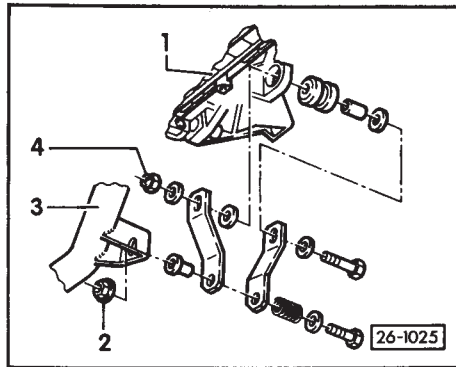


Front exhaust pipe mounting

A- Vehicles with manual gearbox

◀ **Fig. 1 Position of parts on left side**

- 1- Hexagon bolt, 25 Nm
- 2- Gearbox
- 3- Front left exhaust pipe
- 4- Hexagon nut, 25 Nm



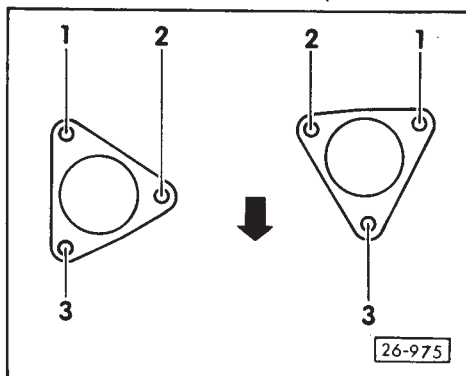
◀ **Fig. 2 Position of parts on right side**

- 1- Gearbox
- 2- Hexagon nut, 25 Nm
- 3- Front right exhaust pipe
- 4- Hexagon nut, 25 Nm

B- Vehicles with automatic gearbox

- Position of parts on left and right sides is the same as for the right side on vehicles with manual gearbox, Fig. 2

3



Modified tightening procedure for front exhaust pipes

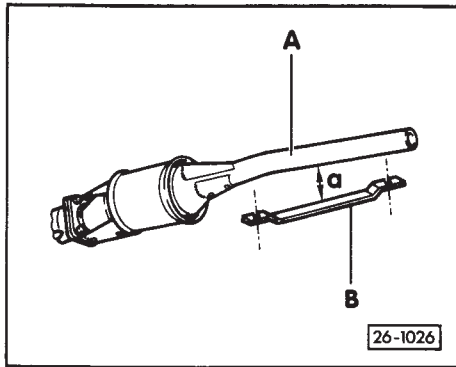
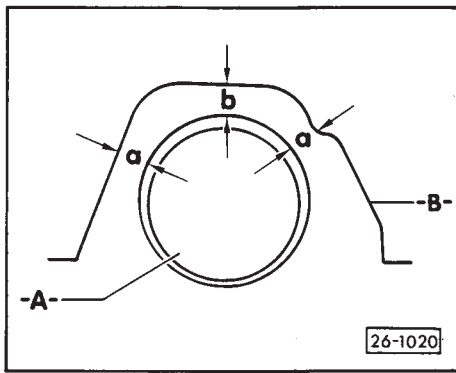
- The flanges on the front exhaust pipes are shown as seen from underneath. Arrow indicates direction of travel.
- ◀ - Tighten the two front exhaust pipes onto the exhaust manifold evenly and in the sequence illustrated.
- Tightening torque 30 Nm.

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Stress-free alignment of exhaust system

Notes:

- ♦ Slacken all bolted connections on the exhaust system (except exhaust manifold) including front exhaust pipe/gearbox mounting
- ♦ The dimensions given in illustrations are approximate values for guidance



♦ The following steps must be performed in the sequence given below

♦ Align exhaust system when cold

- Hand-tighten the hexagon nuts for the flange connections on the left and right between the front exhaust pipe and exhaust manifold.

Note:

Use tightening procedure described on page 4

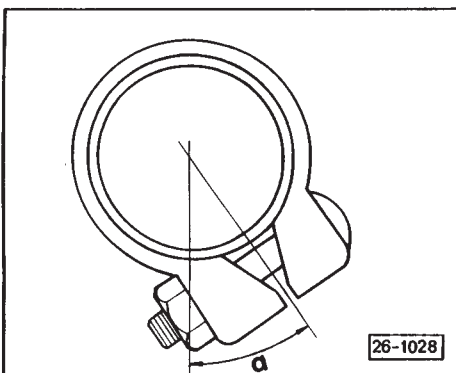
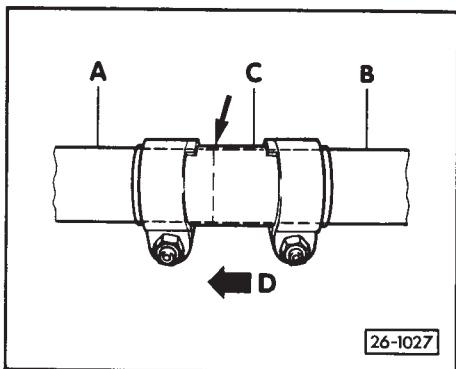
- ◀ - Align catalytic converter -A- with substructure -B- on left and right: distance -a- is at least 20 mm. Distance -b- is approx. 30 mm

Note:

Catalytic converter is shown as seen from rear in direction of travel

- ◀ - Distance -a- between the catalytic converter outlet pipe -A- and cross member -B- must be approx. 50 mm.
- Bolt front left exhaust pipe onto right exhaust pipe, 25 Nm.
- Tighten hexagon nuts on flange connection between front left exhaust pipe and exhaust manifold, 30 Nm.

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- Tighten hexagon nuts on flange connection between front right exhaust pipe and exhaust manifold, 30 Nm.

- Aligning end pipes, ⇒ Booklet, page 26-9

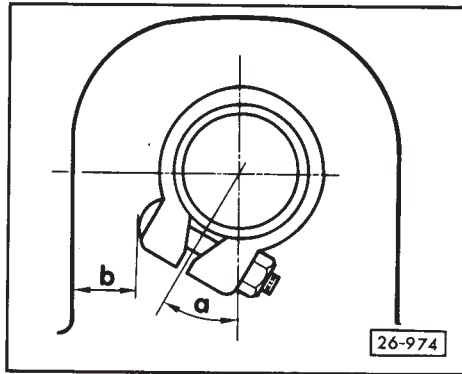
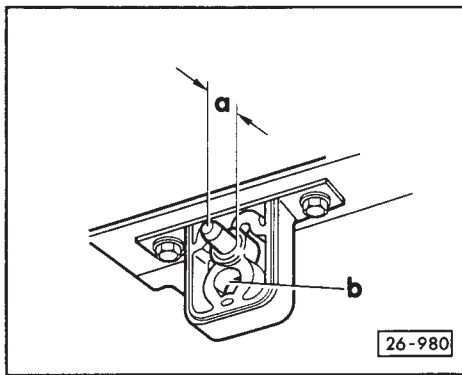
- ◀ - Fit centre silencer outlet pipe -A- and rear silencer inlet pipe -B- into double clamp -C- until they come into contact as shown, see arrow. Arrow -D- indicates direction of travel.

- ◀ - Align bolts on clamp -A- between centre silencer and rear silencer as illustrated, angle -a- is approx. 30°.

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Notes:

- ♦ The bolt heads must point towards the fuel tank.
- ♦ The double clamp is shown as seen from the rear in the direction of travel.



- Press rear silencer and centre silencer in the direction of travel until the left retaining pin on the rear silencer protrudes at least 18 mm (distance *a*) out of the mounting bracket.
- Tighten mounting bracket (25 Nm). Make sure that opening *b* is able to move freely. Renew mounting bracket if it has been permanently deformed or damaged.

- Align bolts on double clamp *A* between catalytic converter and centre silencer as illustrated.
- Angle *a* is 30°.
- Distance *b* is approx. 38 – 40 mm.
- Tighten evenly, 40 Nm.

Note:

The double clamp is shown as seen from rear in direction of travel.

7

- Tighten hexagon nuts for flange connection between front exhaust pipe and catalytic converter.
- Tighten front exhaust pipe mounting.

Note:

The retaining bolts at right angles to direction of travel must not be under stress when installed.

Checking exhaust system for leaks

Check exhaust system for leaks as follows:

- Start engine.
- Seal end pipes while performing check, e.g. using cloth or plugs
- Joints:

Listen for leaks at joints: cylinder head/manifold, manifold/front exhaust pipe, etc.

- Repair any leaks that are found.

Technical Bulletin to Workshop Manual

Audi 80 1992 ➤

Engine code	ABC									
Booklet		6-Cyl. Fuel Injection Engine (2.6-ltr. Engine, 2-Valves), Mechanical Components Edition 04.92								

Enter in Repair Group List
Repair Group 13, 15, 17, 19

Bulletin No. **3***

Affected:

**This Bulletin replaces Bulletin No. 3 Edition 09.94*

Subject

With the introduction of the A6, also the engine of the Audi 80 has been modified; the engine code letter has not changed.

The technical data and inspections which differ from engine code ABC ➔ 11/94 are contained in this Bulletin.

Contents	Bulletin page	Booklet from page
Technical data	1	00-1
Central bolt for belt pulley	5	13-1
Checking piston ring gap clearance	6	13-23
Servicing valve gear	7	15-1
Attachment of intake manifold/cylinder head	12	15-8
Modified oil circuit	13	17-1
Coolant	18	19-1

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Technical data

Engine number

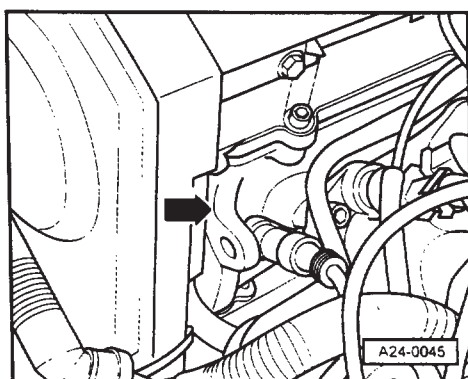
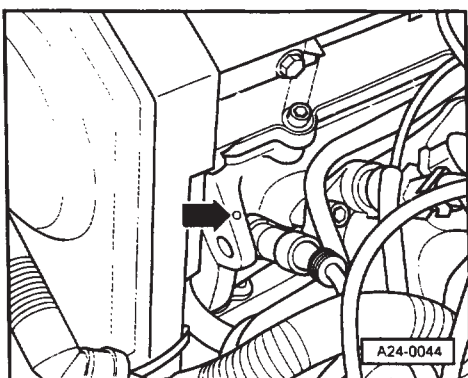
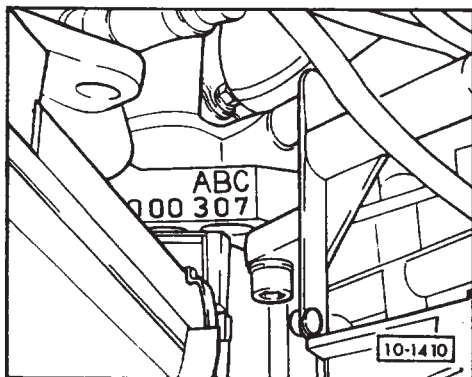
- ◀ The engine number ("engine code letters" and "consecutive number") is stamped on the right-hand inside of the engine block between cylinder head and hydraulic pump.

In addition a sticker with "engine code letters" and "consecutive number" is affixed to the toothed belt guard.

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

- ◀ Engines from 12.94 **lightweight valve gear**, are recognizable from a chisel punch marking on the lifting eye,

or ...



- ◀ ... from a milled surface on the lifting eye.



Audi

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erWin

Engine features

Code letters		ABC	ABC
Manufactured		03/92 > 11/94	12.94 >
Displacement	ltr.	2.598	2.598
Output	kW at rpm	110/5750 ¹⁾	110/5750 ¹⁾
Torque	Nm at rpm	225/3500 ¹⁾	225/3500 ¹⁾
Bore	Ø mm	82.5	82.5
Stroke	mm	81	81
Compression ratio		10	10
RON	min.	95 ¹⁾	95 ¹⁾
Fuel injection/ignition system		MPFI	MPFI
Knock control		yes	yes
Self-diagnosis		yes	yes
Lambda control		yes	yes
Catalytic converter		yes	yes
Turbocharger		no	no
Exhaust gas recirculation		no	no

¹⁾ Engine output if 98 RON unleaded premium plus fuel is used

Code letters	ABC	ABC
Valve timing at 1 mm valve lift and 0 mm valve clearance		
Inlet valve opens after TDC	4°	10.5°
Inlet valve closes after BDC	44°	45.45°
Exhaust valve opens before BDC	40°	37.5°
Exhaust valve closes before TDC	0°	2.55°

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✍ Please alter the figures on page 13-1, and enter Bulletin Number 3*, respectively.

Central bolt for belt pulley, tightening torque changed

- Replace bolt.

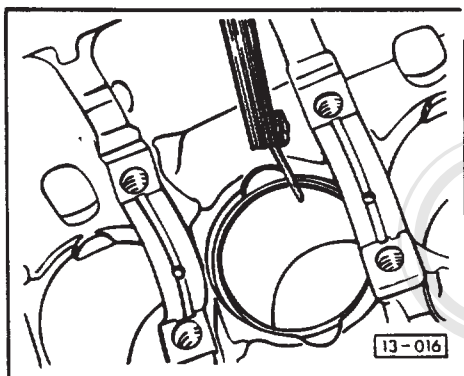
With immediate effect only the new twelve-point bolt of quality class 9.8 may be used.

Tightening torque:

Bolt oiled 200 Nm + 180° 1/2 turn

(2 x 90° is permitted).

✍ Please alter the figures on page 13-23 and enter Bulletin Number 3*, respectively.



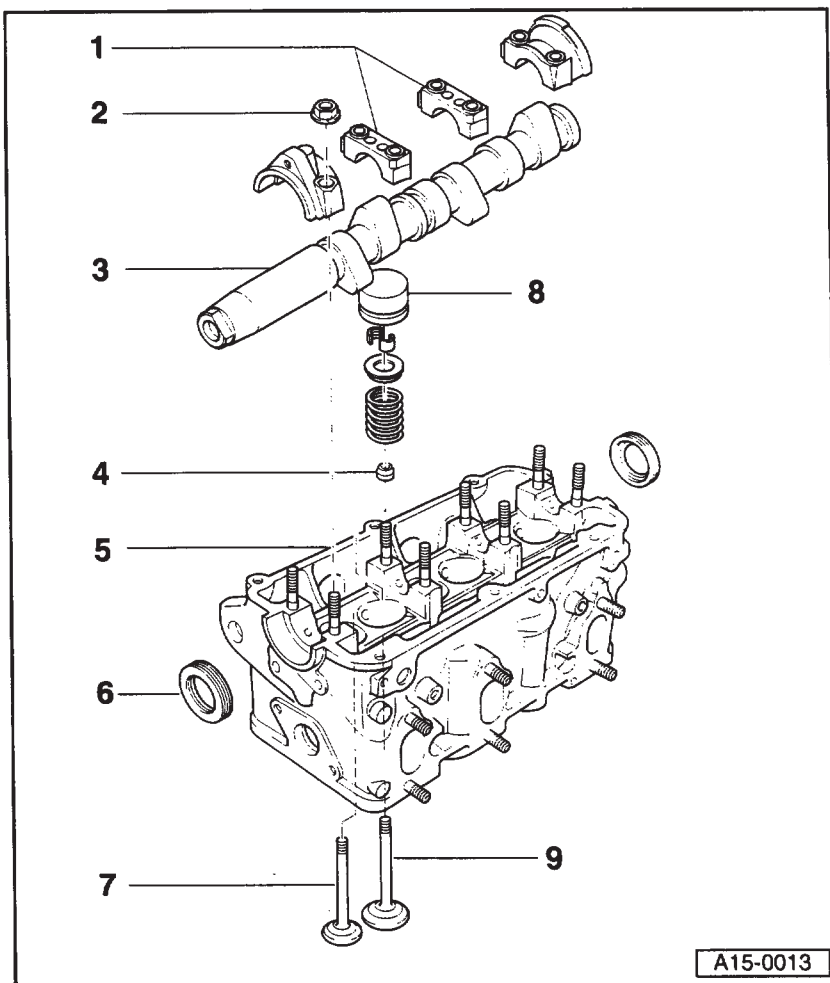
Checking piston ring gap clearance

- Insert piston ring at right angles into the bottom cylinder opening about 15 mm away from the edge of the cylinder.

Piston ring	Gap clearance when new	Wear limit
1	0.35 to 0.5 mm	1.0 mm
2	0.5 to 0.7 mm	1.4 mm
3	0.25 to 0.5 mm	0.8 mm

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Servicing valve gear

All the modifications for the lightweight valve gear are identified with **-I-** and modifications to the Workshop Manual are identified with **-R-** and are described on the pages which follow, as necessary.

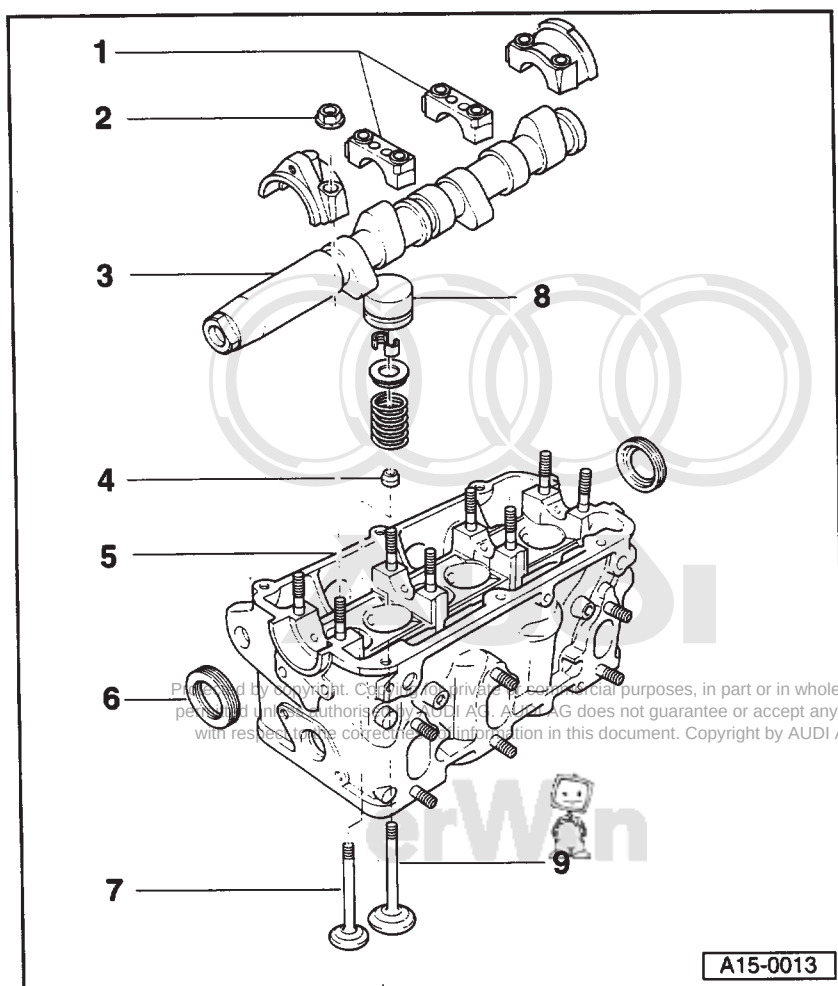
For identifying engines with lightweight valve gear ⇒ page 1

Note:

♦ Always fit new gaskets and seals.

- 1- **Bearing cap**
♦ Remove and install
- 2- **-I-R- 17 Nm**
- 3- **Camshaft**
♦ Remove and install
♦ Check axial play
♦ Max. runout 0.01 mm
- 4- **-I- Valve stem seal**
♦ Replacing ⇒ page 15-20

7



- 5- **Cylinder head**
♦ Machine cylinder head
♦ Machine valve seat
- 6- **Shaft seal**
♦ Replace
- 7- **-I- Exhaust valve**
♦ Stem diameter 7 mm
♦ Examining and machining ⇒ page 15-22
♦ Examining and replacing valve guide ⇒ page 15-22
- 8- **Hydraulic bucket tappet**
♦ Oil contact surface before installing
♦ Place down with the cam contact surface facing downward
- 9- **-I- Inlet valve**
♦ Examining and machining ⇒ page 15-22
♦ Examining and replacing valve guide ⇒ page 15-22

8

Cylinder head

Note:

♦ Installing cylinder head cover ⇒
page 15-5

1- 20 Nm

2- Intake manifold

♦ Removing and installing
⇒ page 15-13
⇒ page 12

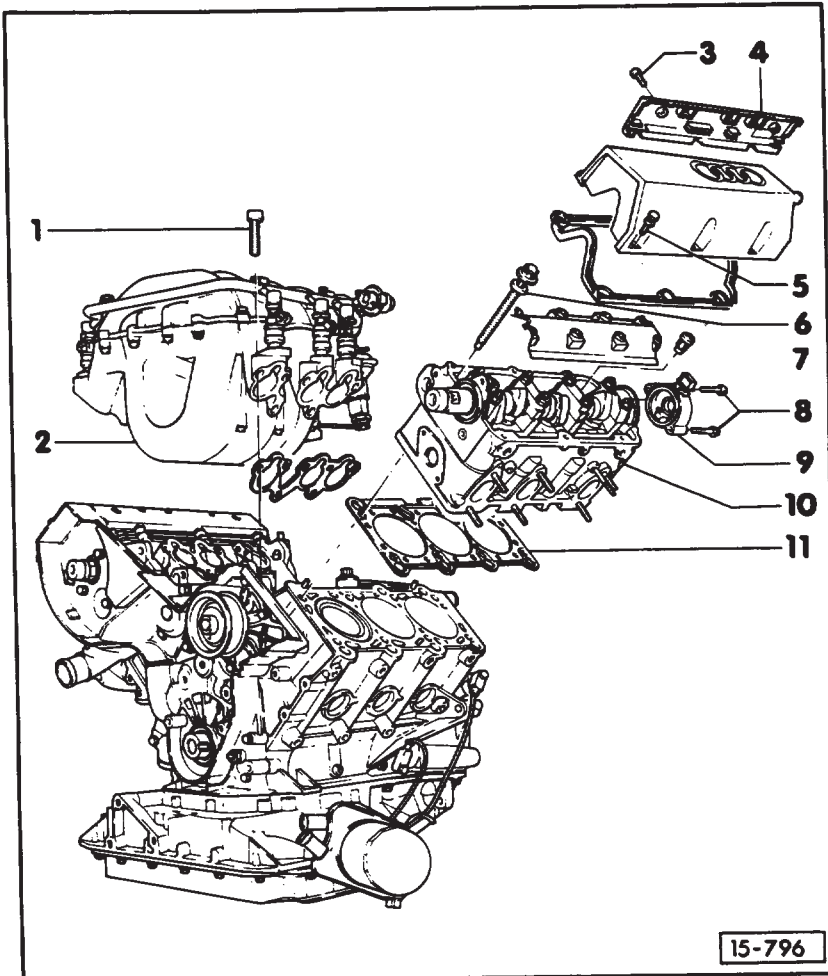
3- 10 Nm

4- Cover

5- 10 Nm

6- Cylinder head bolts

♦ Tightening method
⇒ page 15-15
♦ Replace bolts



7 -Pressure limiting valve

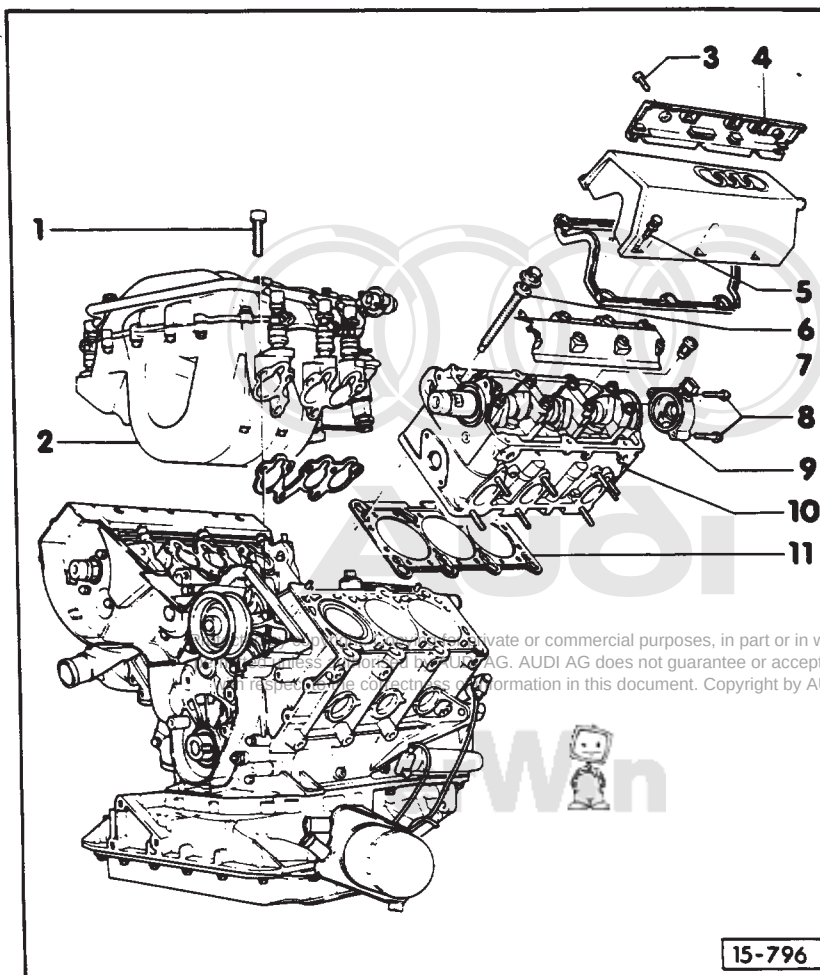
- ♦ If valves are noisy and affect entire banks of cylinders, replace pressure limiting valve.
- ♦ Secure with locking fluid AMV 197 000 01
- ♦ Replace valves which have slackened in the screw fitting.
- ♦ 25 Nm

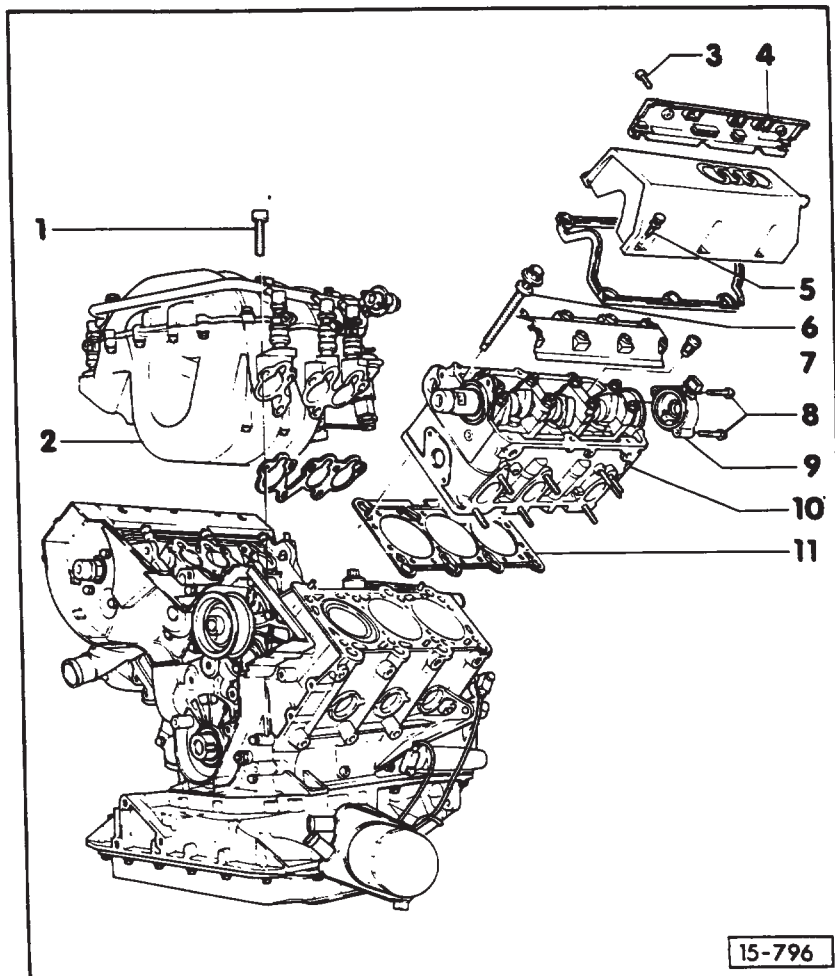
8 -10 Nm

9 -Hall sender housing

10 -Cylinder head

- ♦ Check for distortion
⇒ page 15-15
- ♦ Reworking dimension
⇒ page 15-22





Note:

- ♦ The cylinder head available as a replacement part can be used both on the left and right sides and must be fitted with an end cover at the front end.
- ♦ Knocking in cover
⇒ page 15-5

11 -Cylinder head gasket

- ♦ Identification:
Lettering must face up

Replacing valve guides

- Ream 8 mm valve guides with hand reamer 10-215. It is essential to use soluble oil when performing this step.
- Ream 7 mm valve guides with hand reamer 3120. It is essential to use soluble oil when performing this step.

✎ Please add the following note on page 15-8 or enter Bulletin Number 3*.

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Attachment of intake manifold/ cylinder head

Note:

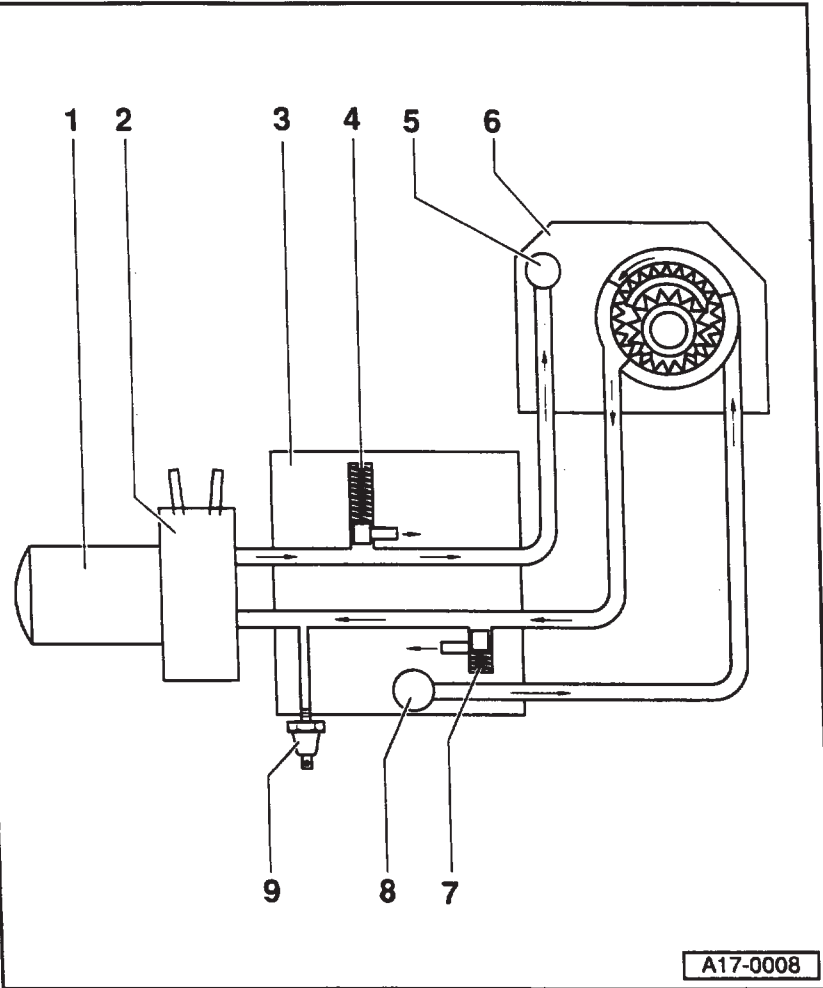
After slackening the bolts securing the intake manifold, all the cylinder head bolts must be re-tightened by 90° (1/4 turn).

Modified oil circuit

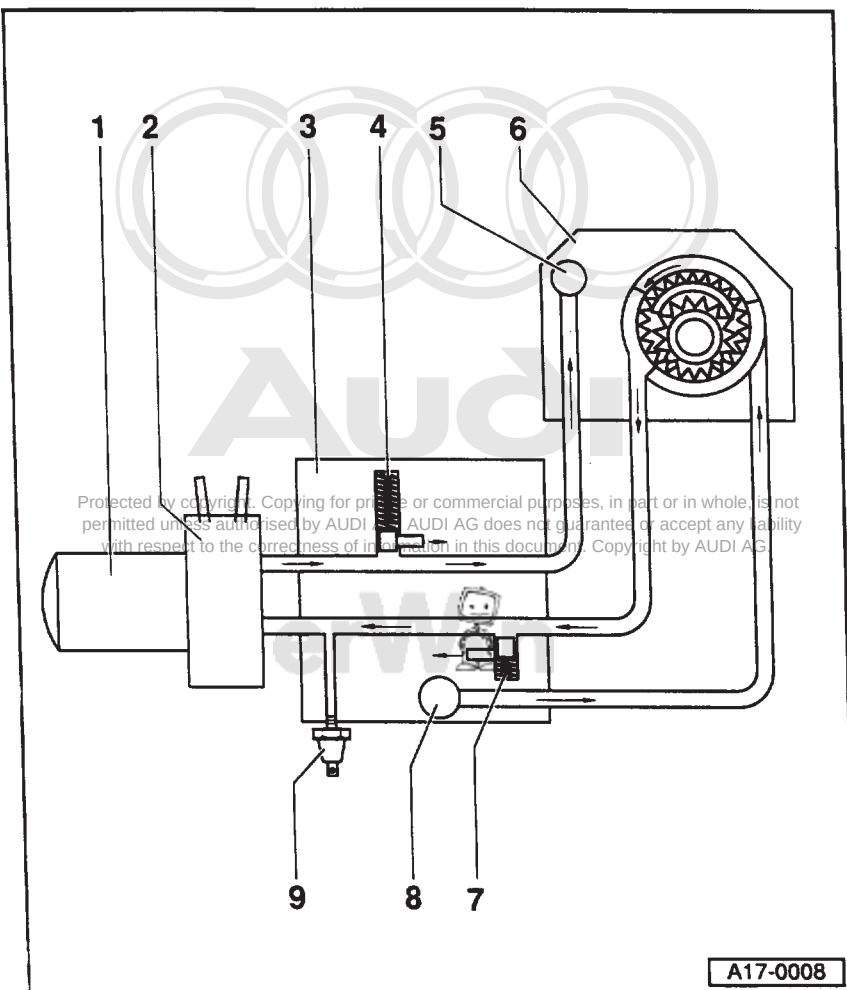
Notes:

- ♦ Modified components should only be fitted to this engine.
- ♦ The modified circuit is recognizable from the lack of the screw plug for the pressure relief valve at the oil pump.

- 1- Oil filter
 - Larger outer dimensions
- 2- Oil cooler
 - Larger flow cross-section
- 3- New end cover for oil sump



- 4- New pressure relief valve
- 5- Oil supply to engine
- 6- New oil pump
- 7- New 11 bar pressure relief valve
- 8- New oil intake
- 9- Brown 1.8 bar oil pressure switch
 - Testing ⇒ page 17-8
 - Operation ⇒ page 17

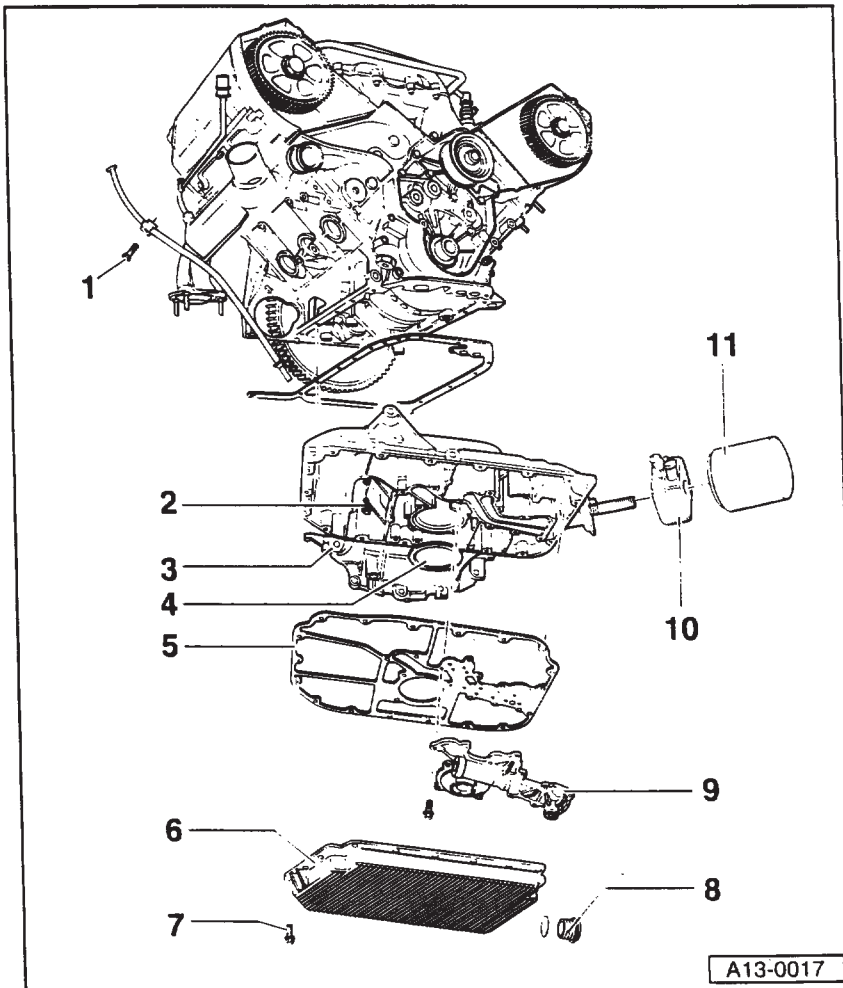


Removing and installing oil pump

Notes:

- ♦ The oil level must not exceed the Max marking on the dipstick otherwise there is a risk of damage to the catalytic converter.
- ♦ Always fit new seals and gaskets.

- 1- 10 Nm
- 2- 10 Nm
- 3- Top part of oil sump
- 4- Oil strainer
 - Engages in top part of oil sump with three lugs



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5 -Gasket

6 -Bottom part of oil sump

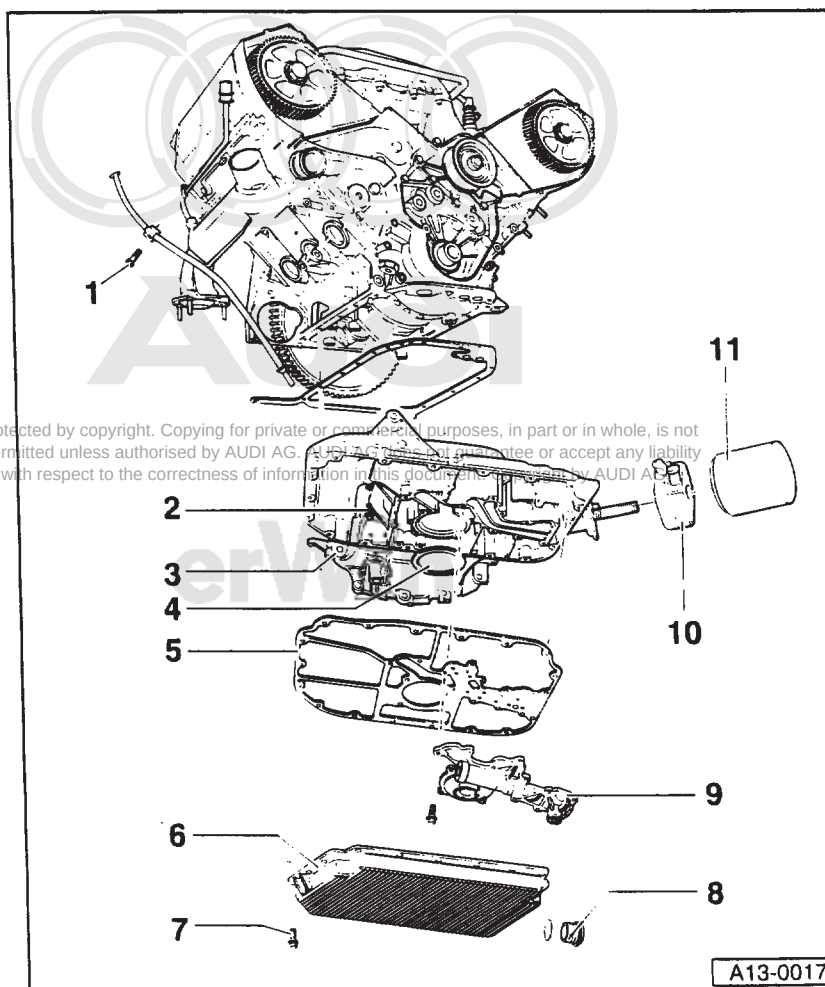
7 -10 Nm

8 -Oil drain plug, 40 Nm

9 -End cover
 • Integrated with 5 bar pressure relief valve and 11 bar pressure relief valve

10 -Oil cooler

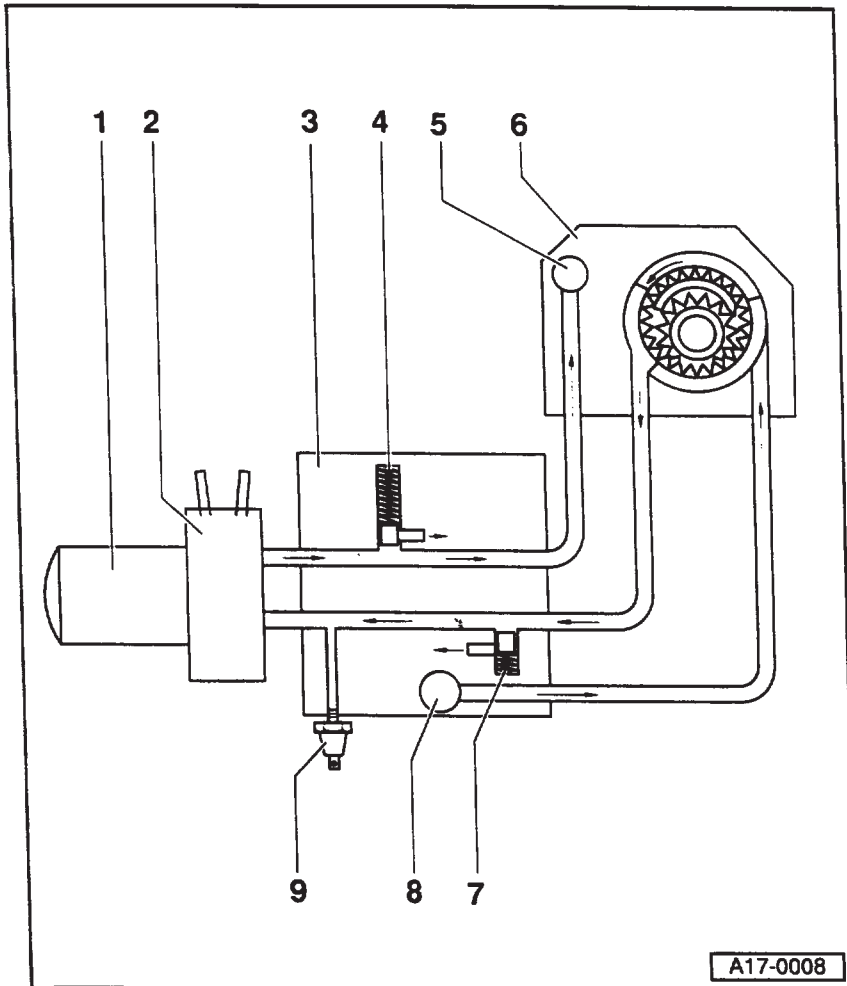
11 -Oil filter



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Operation of modified oil circuit

Intake end:

Oil is drawn in by the oil pump -6- through the oil intake -8-.

Delivery end:

The oil pressure flows from the oil pump -6- through the top part of the sump past the pressure relief valve -7-, oil pressure switch -9-, oil cooler -2-, oil filter -1- to the pressure relief valve -4-.

The pressure relief valve -4- regulates the oil pressure to the engine -5-.

● Benefits:

The oil pressure is regulated downstream of the oil filter and oil cooler which ensures that the oil pressure which is supplied by the pressure relief valve -4- and the oil pump exists at the lubrication points.

The pressure relief valve -7- is a safety valve and opens only at high engine speeds and when the engine is cold.

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✎ Please alter the text on page 19-7 or enter Bulletin Number 3*.

Coolant

The approved designations for coolant additive are G 011 A 8 B or C; there are coolant additives which comply with TL VW ... but which are not approved by VW/Audi.

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Use only coolant additives with the designation G 011 A 8 B or C.

