

Audi A4 1995 ➤

6-cylinder Engine (2-valve) Mechanics

Engine ID	AAH	ABC						
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Edition 11.1994



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List of Workshop Manual Repair GroupsList of Workshop Manual Repair Groups

Audi A4 1995 ➤

6-cylinder Engine (2-valve) Mechanics

Repair Group

- 00 - Technical data
- 10 - Removing and installing engine
- 13 - Crankshaft group
- 15 - Cylinder head, Valve gear
- 17 - Lubrication
- 19 - Cooling system
- 20 - Fuel supply system
- 26 - Exhaust system



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.

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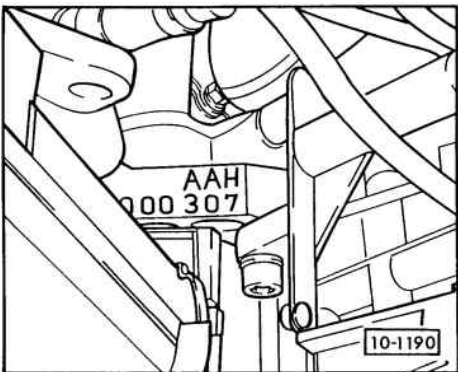
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00 - Technical data

1 - Technical data

1.1 - Technical data

1.2 - Engine number



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-> The engine number ("engine code" and "running number") is stamped into the right inner side of the engine block between cylinder head and hydraulic pump.

Additionally there is a sticker on the toothed-belt guard showing the engine code and serial number.

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

1.3 - Engine data

Code letters		AAH	ABC
Production		11.94 ä	11.94 ä
Capacity	ltrs.	2.771	2.598
Output	kW at rpm	128/5500 1)	110/5750
Torque	Nm at rpm	250/3000 1)	225/3500
Bore	ø mm	82.5	82.5
Stroke	mm	86.4	81
Compression		10.3	10.0 - 0.5
RON		951)	95
Injection-/Ignition system		MPI	MPFI
Knock control		yes	yes
self-diagnosis		yes	yes
Lambda control		yes	yes
Catalytic converter		yes	yes
Charging		no	no



Code letters	AAH	ABC
Exhaust gas recirculation system	no	no

1) Performance when using Super Plus lead-free 98 OCT

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



Audi

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10 - Removing and installing engine

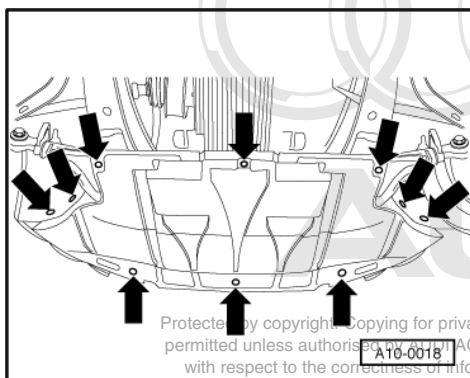
1 - Removing and installing engine

1.1 - Removing and installing engine

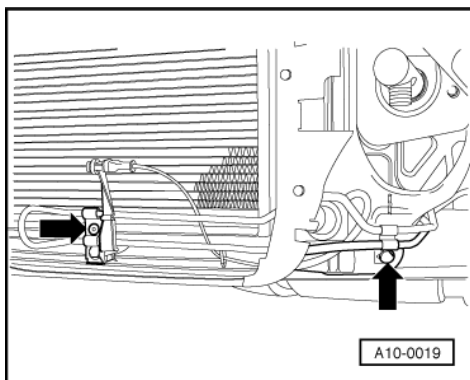
1.2 - Remove engine

Notes:

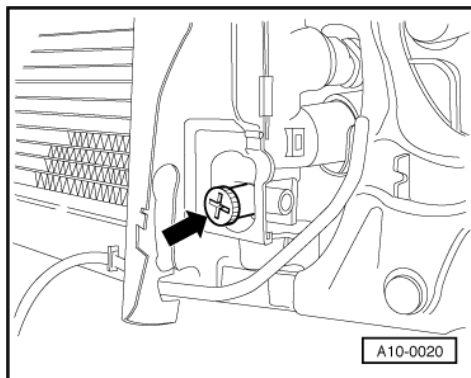
- Before disconnecting battery ask for anti-theft coding of radio unit, if necessary.
- Renew all cut and defective cable ties. Refit cable ties in the same position when installing the engine.
- The engine is removed from the front without the gearbox.
- Disconnect earthing strap at battery with ignition switched off.
- Unbolt bumper. For this purpose, unclip radiator grille on from left and right from bumper.
=>Workshop Manual
Audi A4 1995 ä
General Body Assembly
Edition 11.94



- -> Remove noise insulation.

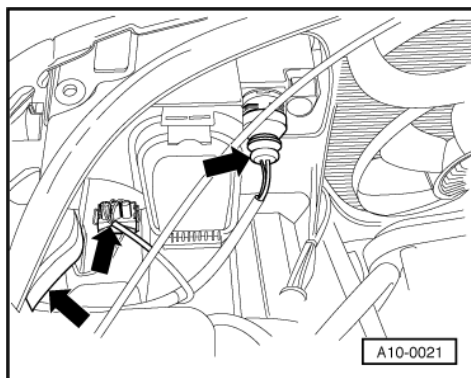


- -> Remove cooling hose for hydraulic fluid for power steering from bottom left of radiator.

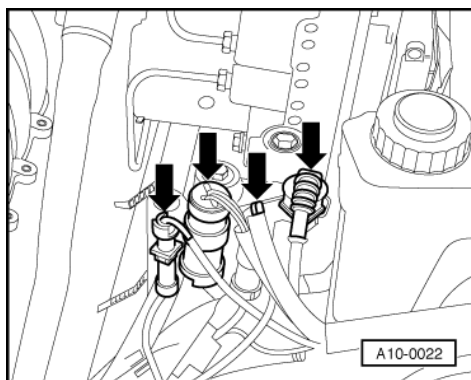


- -> Drain off coolant at radiator.
- Pull out retainer for coolant pipe connecting flange at the bottom of the radiator and pull off the connecting flange.

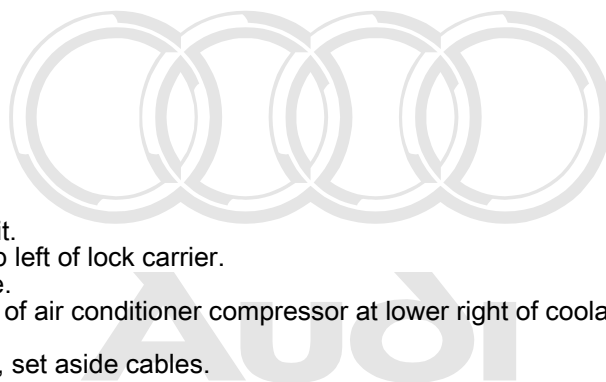
- Disconnect air duct to air cleaner and lift out.



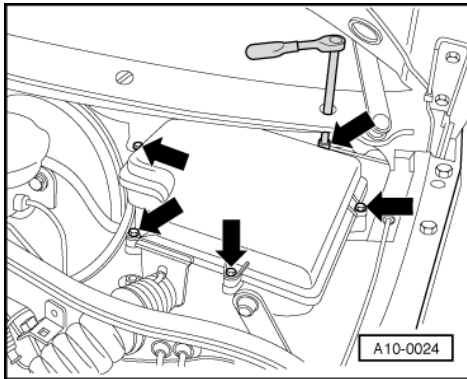
- -> Unplug connectors for headlights, headlight height adjustment and indicators.
- Unplug connections for radiator fan temperature sender in area of lower coolant hose on left of radiator.



- -> Unplug 4 connectors in front of ABS unit.
- Pull off connector for anti-theft alarm at top left of lock carrier.
- Unbolt coolant hose from top left of engine.
- Unclip connectors for solenoid connection of air conditioner compressor at lower right of coolant air guide and detach.
- Detach connectors from both signal horns, set aside cables.
- Remove lock carrier.
- Detach connector from air mass meter and AKF valve, unbolt wiring from plenum chamber and unclip.
- Detach hose connector from ACF valve.
- Remove air duct between air filter and throttle valve unit.
- Remove air filter housing.



- Detach fuel feed and return line.



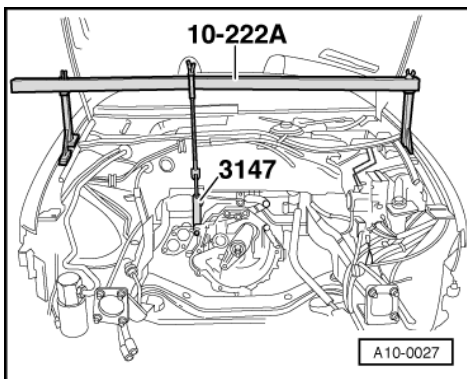
- Remove coolant expansion tank.
- -> Remove cover for electronic box.
- Unclip control unit.
- Detach connectors from control unit.
- Pull off connectors at connector point beneath control unit.
- Unbolt earth connection and bracket for connectors from plenum chamber.
- Detach both coolant lines to heat exchanger between plenum chamber and engine.
- Detach and set aside accelerator cable.
- Detach connectors (2x) from top of gearbox.
- Slacken ribbed belt and secure with special tool 3204.
- Counterhold pulley for viscous fan with screwdriver and unbolt with 3312.
- Tightening torque with torque wrench 1331 and fork wrench 3312 37 Nm, without fork wrench 3312 to 70 Nm.

Note:

For torque wrenches with different lengths see table, torque wrench length square drive to centre of handle.

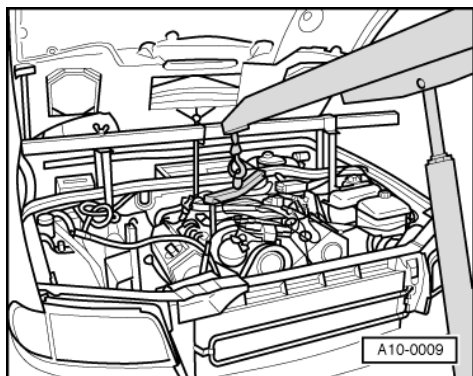
Length of torque wrench	Tightening torques
220 mm	33 Nm
280 mm	37 Nm
300 mm	39 Nm
440 mm	45 Nm

- Unbolt hydraulic pump from bracket.
- Pipes remain connected.
- Unbolt air conditioner compressor and suspend to one side.
- Pipes remain connected.
- Unbolt fixing bolts of top exhaust manifold front-exhaust pipe.
- Unbolt cable clamp for positive cable to starter from engine (right side), below exhaust manifold.
- Disconnect starter, remove isolator from positive wire of starter, unbolt bracket from engine block, unbolt earth connection from engine support.
- Unbolt fixing bolts of engine mounting (4x).



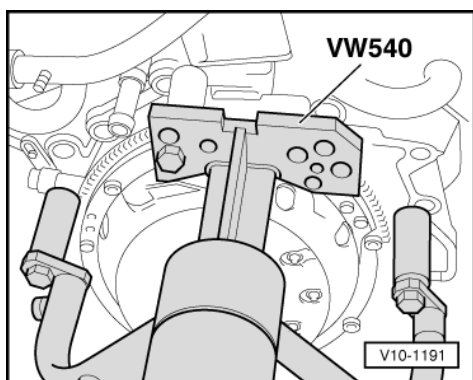


- -> Attach support bar 10-222 A to wing connection edge.
- Attach gearbox mounting 3147 to bolt bore of bell housing (illustrated with engine removed).



- -> Attach lifting tackle 2024 A to engine and workshop lifter 1202 A.

1.3 - Attaching engine to engine stand



- In order to carry out repairs the engine must be attached to the repair stand together with engine and gearbox bracket VW 540 by using supplementary parts VW 540/2.

Note:

The engine must not be attached to the repair stand when measuring the cylinder bore (Repair group 13).

1.4 - Installing engine

Installation is performed in the reverse order of removal paying particular attention to the following points:

- ♦ Check whether the dowel sleeves for centralising engine/gearbox are in the cylinder block, install, if necessary.
- ♦ Renew all self locking nuts.
- ♦ Renew all seals and gaskets
- ♦ If necessary, check that clutch plate is properly centred.
- ♦ Clean the splines of the input shaft. Thinly lubricate splines and clutch release bearing with G 000 100. Do not grease guide sleeve for release bearing.
- ♦ Installing engine mounts free of stress. Ensure that engine mounts are free of stress by shaking engine to align it before tightening engine mounts.

- ♦ Allow stop for torque reaction support to rest on rubber buffer for torque reaction support under its own weight, and tighten bolts to 45 Nm.
- ♦ Adjust exhaust system stress-free =>Repair group 26
- ♦ Adjust accelerator cable =>Repair group 20
- ♦ Only use drained coolant again when the crank housing or the cylinder head have not been replaced.
- ♦ Check oil level before starting engine.
- ♦ There is no needle bearing present in the crankshaft in vehicles with automatic gearbox.
- ♦ When using exchange engines with hand shift it must be checked whether the needle bearing is present in the crankshaft. If necessary, install.

1.5 - Tightening torques

Notes:

- The tightening torques listed on this page apply only to lightly greased, oiled, phosphated, or black finished nuts and bolts.
- Additional lubricant such as engine and gearbox oil may be used, but do not use molybdenum lubricant.
- Permissible deviations for tightening torques $\pm 15\%$

Bolted joint		Tightening torque
Bolts, nuts	M6	10 Nm
	M8	20 Nm
	M10	45 Nm
	M12	60 Nm
With the exception of		
Exhaust pipe at manifold	M8	25 Nm
A/C compressor to bracket	M8	25 Nm
Torque converter at carrier shield	M8	35 Nm
Engine support to engine mount	M10	45 Nm
Viscous clutch at bracket	M10	45 Nm
Hydraulic pump to bracket	M8	25 Nm
Alternator to mounting	M8	35 Nm



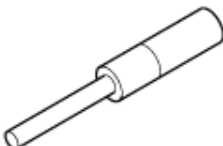
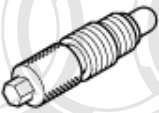
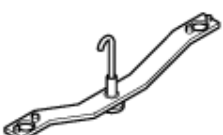
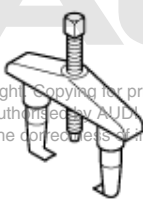
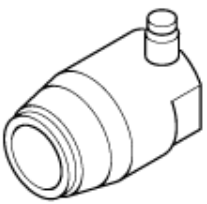
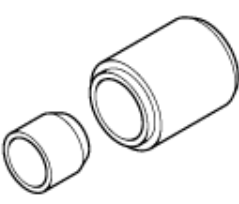
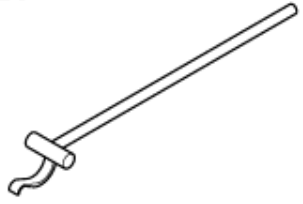
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13 - Crankshaft group

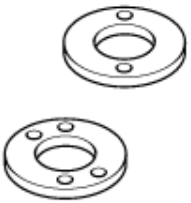
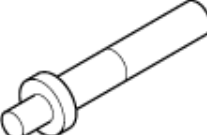
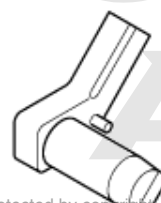
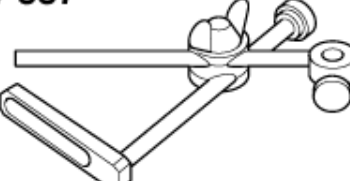
1 - Crank assembly

1.1 - Crank assembly

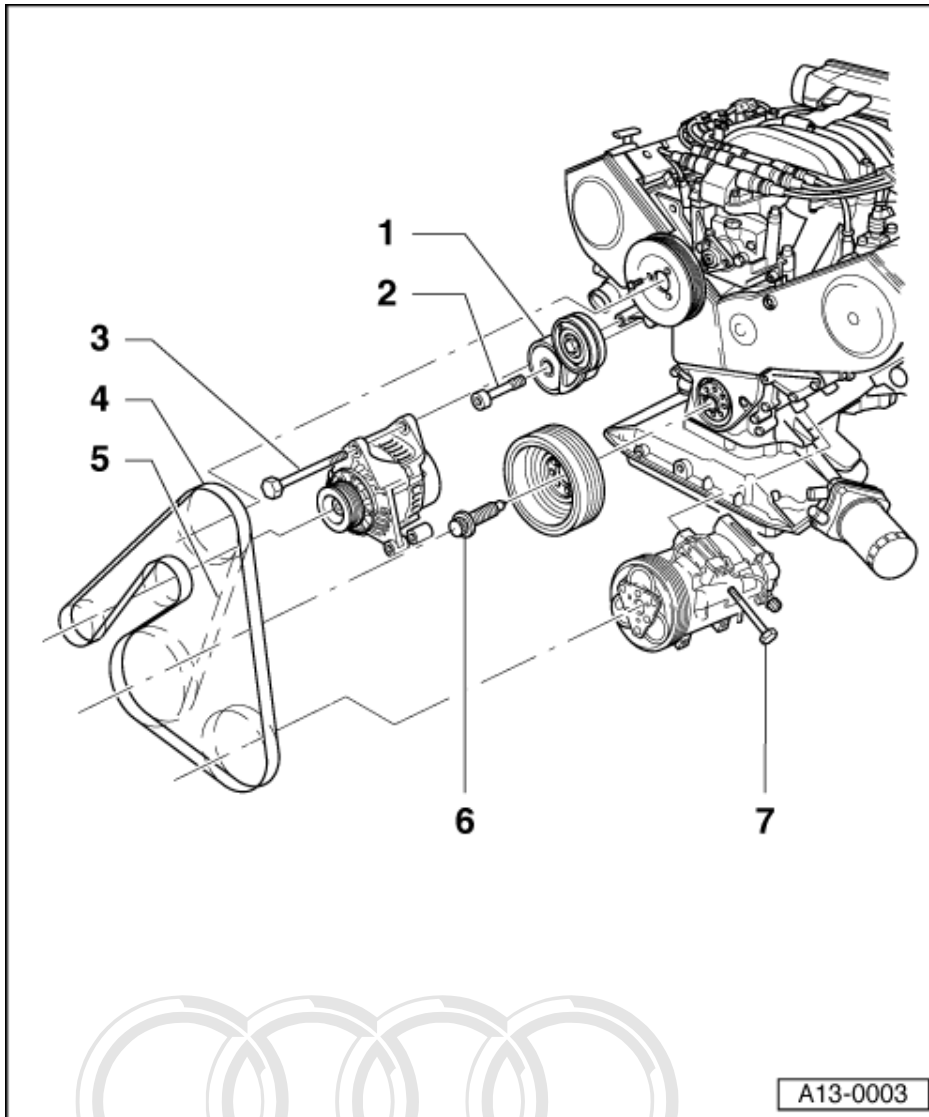
3204 	3242 
3243 	kukko 20/10  Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorized by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
3203 	3202 
3265 	10-221  A13-0004

The following special tools and testing devices are required for these repairs:

- 3204 Setting pin
- 3242 Fixing bolt
- 3243 Camshaft retainers
- KUKKO 20-10
- 3203 Oil seal extractor
- 3202 Fitting sleeve
- 3265 Fitting sleeve
- 10-221 Puller hook

VW 295 	kukko 21/2 
3264 	3308  Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
VW 387 	
	A13-0005

2003/3 Installing tool
KUKKO 21/2
3264 Fitting drift
3308 Adjusting device
VW 387 Universal dial gauge holder



6 Central bolt

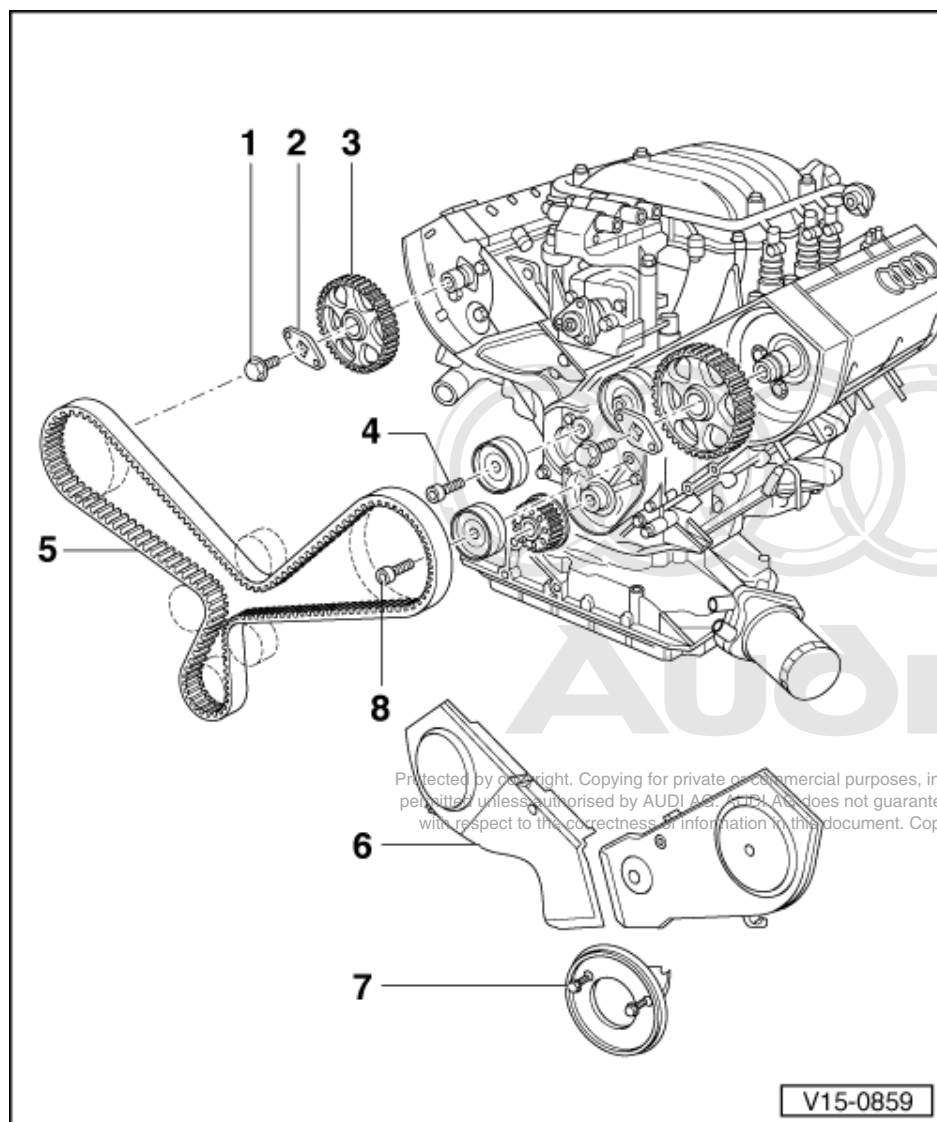
- ◆ 200 Nm + 180° (1/2 turn), twice by 90° are permissible.
- ◆ Replace bolt
- ◆ Grease thread

7 20 Nm

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1.3 - Toothed belt



1 30 Nm + 180° (1/2 turn)

2 Fixing plate

- ♦ Always install inscribed side "front" and rear" towards camshaft.

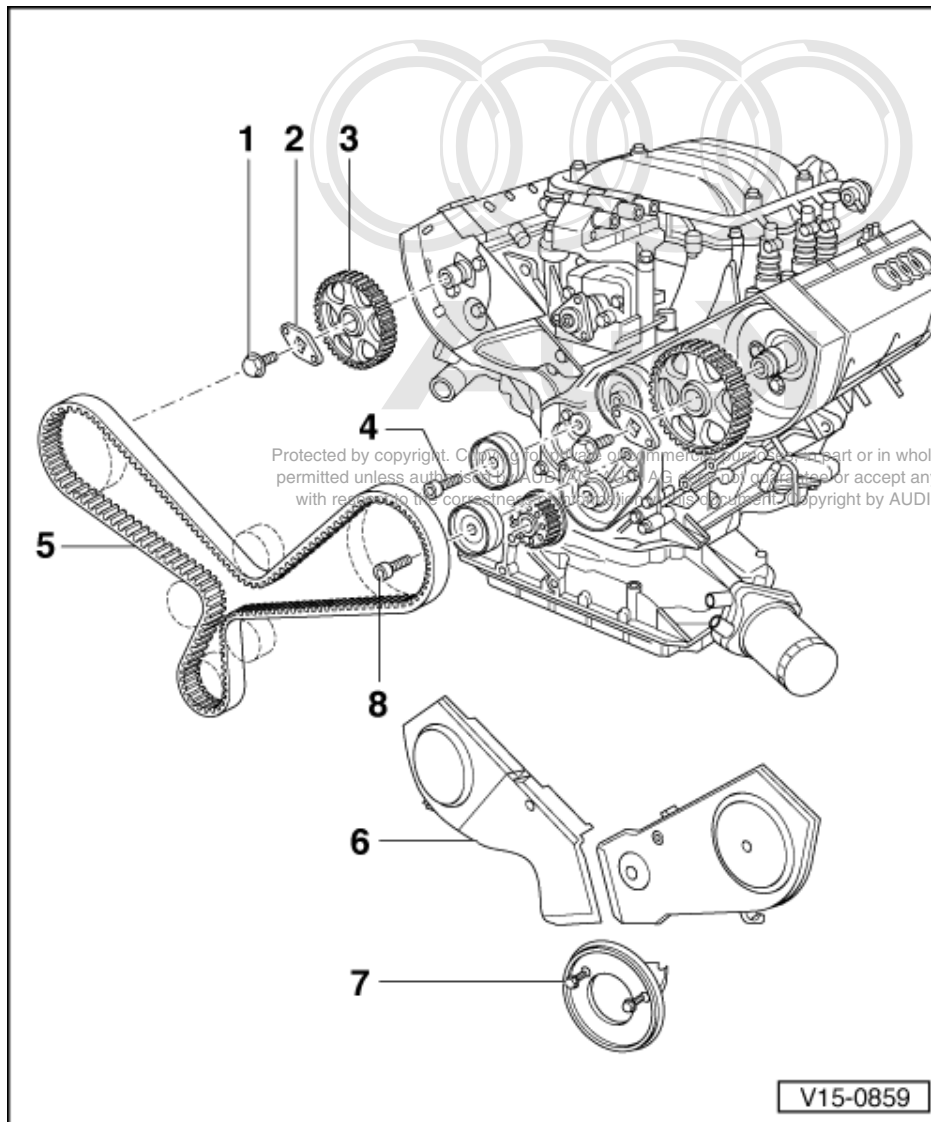
3 Camshaft wheels

- ♦ Pulling off =>Page 19

Note:

- ♦ Before attaching the camshaft wheels insert the camshaft bracket 3243.
- ♦ Only attach camshaft wheels after tensioning the toothed belt.

4 Toothed belt tensioning roller 45 Nm



5 Toothed belt

- ♦ Removing and installing => Page **18**

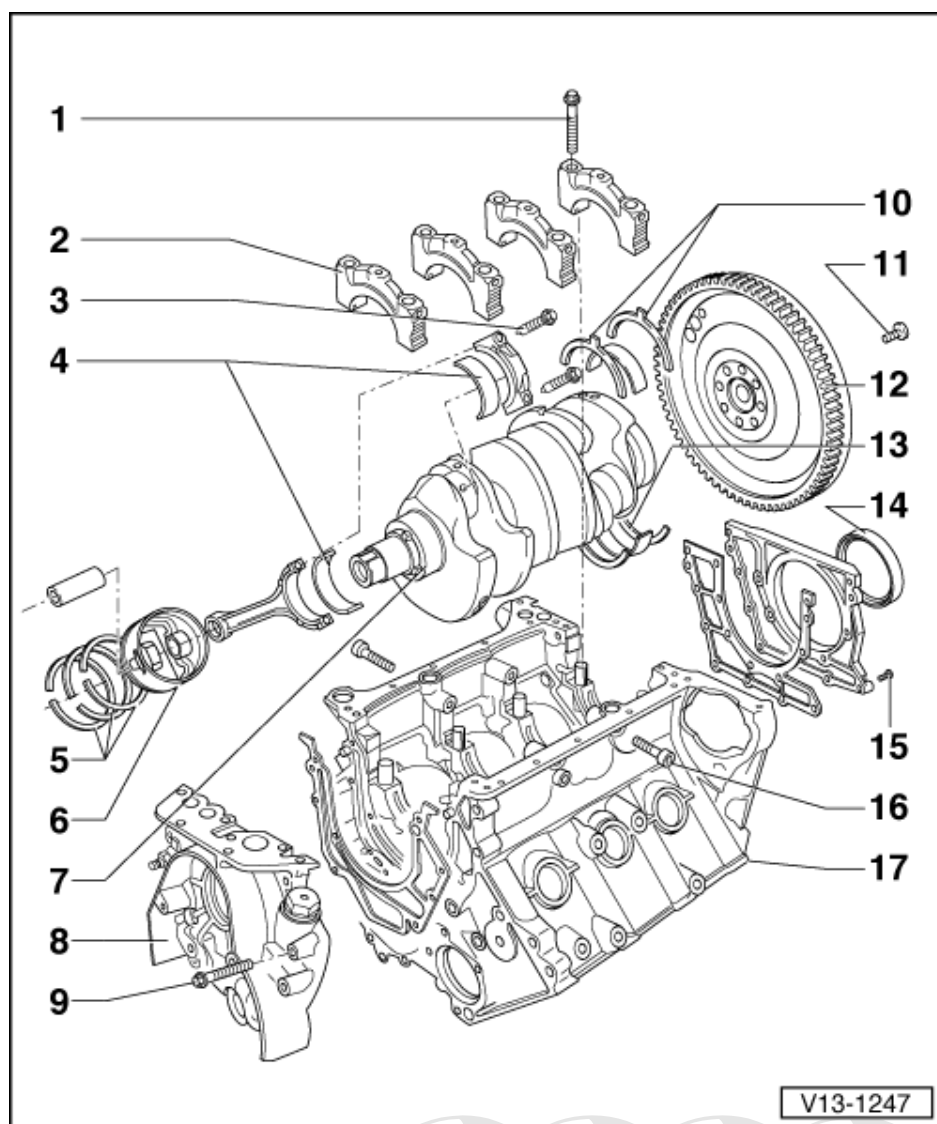
6 Cover of toothed belt

7 10 Nm

8 25 Nm



1.4 - Disassembling and assembling cylinder crankcase, crankshaft and flywheel

**Note:**

- ♦ Always replace seals and gaskets.

1 Main bearing cap bolts

- ♦ Replace
- ♦ 60 Nm + 180° (1/2 turn)

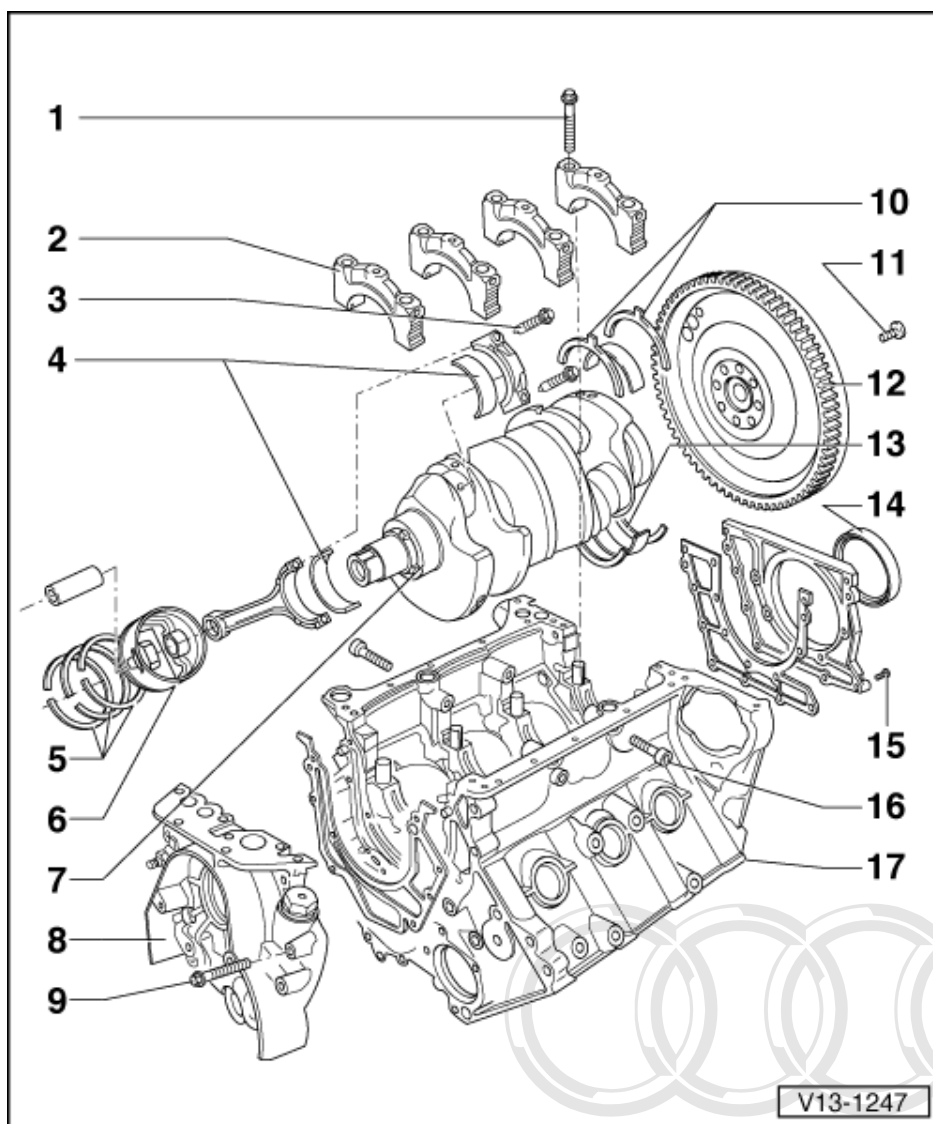
2 Crankshaft main bearing cap

- ♦ Identification -1- on oil pump side
- ♦ Replace bolt for main bearing caps
- ♦ Checking bearing clearance =>Page 24

3 Conrod bearing bolts

- ♦ Replace
- ♦ 30 Nm + 90° (1/4 turn)
- ♦ To measure radial clearance tighten to 20 Nm but not further

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4 Conrod journal

- ♦ Do not interchange used bearing shells
- ♦ Conrod, conrod bearing =>Page 27

5 Piston ring

- ♦ Checking => Page 25

6 Piston

- ♦ Checking => Page 25

7 Crankshaft

- ♦ Checking => Page 25

8 Oil pump

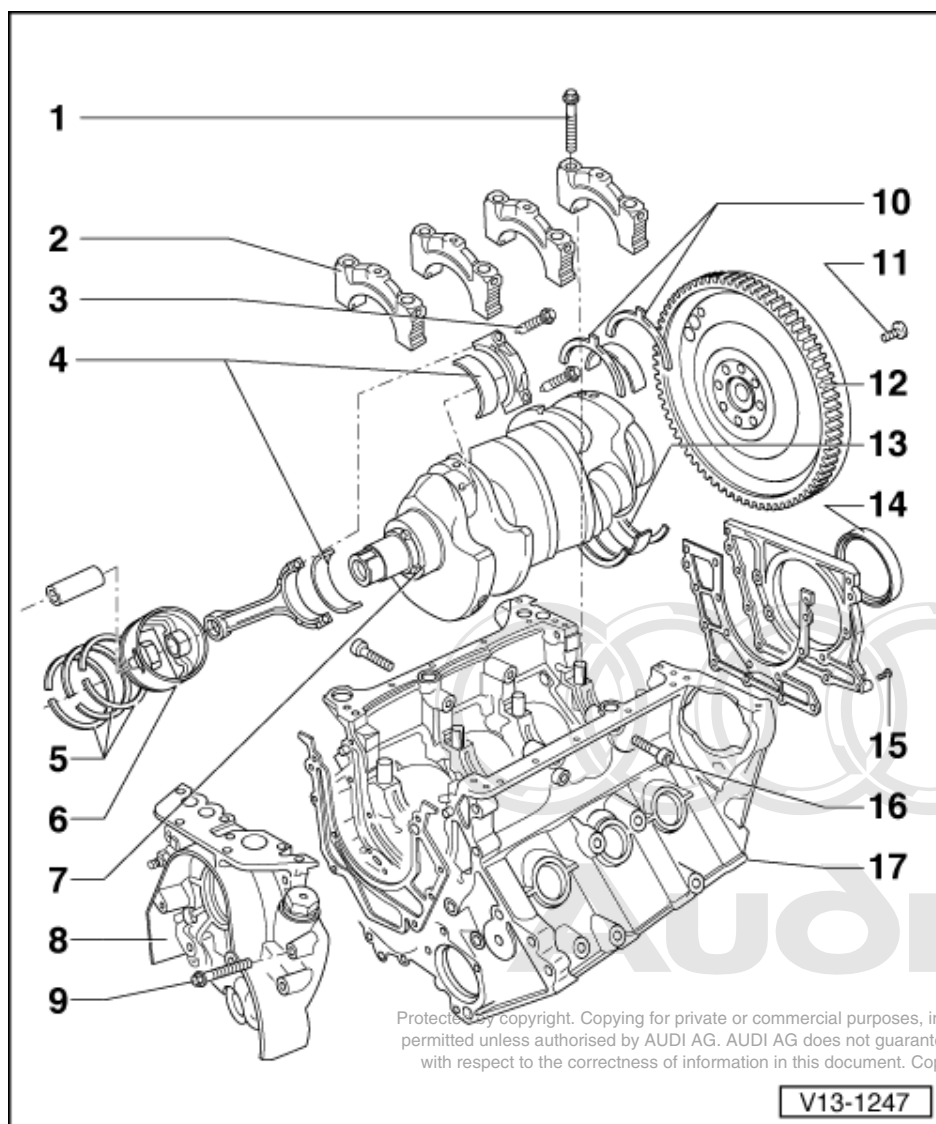
- ♦ Removing and installing => Page 51

9 10 Nm

10 Thrust washer

- ♦ Measuring axial clearance of crankshaft =>Page 24
- ♦ On 4th crankshaft bearing only

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11 60 Nm +90°(1/4 turn)

- ♦ Vehicles with automatic gearbox

11 - 40 Nm + 180° (1/2 turn)

- ♦ Vehicles with manual gearbox

12 Flywheel/driven plate

- ♦ Removing and installing =>Page 22
- ♦ Removing and installing needle bearing =>Page 22
- ♦ Adjust bracket of sender for engine speed, Repair Group 28

13 Crankshaft bearing

- ♦ Checking axial and radial clearance => Page 24

14 Sealing ring

- ♦ Replacing => Page 24 .

15 10 Nm

16 25 Nm

- ♦ Screw in bolts by hand before tightening the main bearing caps

17 Crankcase

1.5 - Removing and installing ribbed belt

Removing

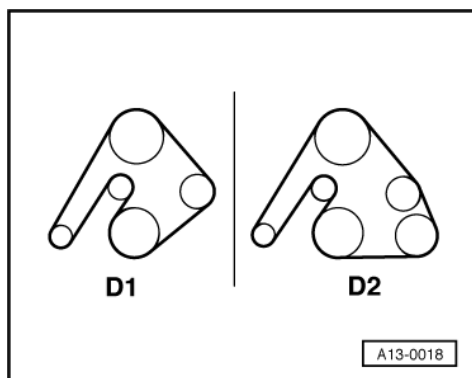
- Removing engine and ribbed belt cover
- To slacken ribbed belt
Turn 17 mm ring wrench towards the right and secure with mandrel 3204.

Note:

- ◆ Mark direction of ribbed belt. Running the belt in opposite direction can lead to damage.
- Remove ribbed belt.

Installing

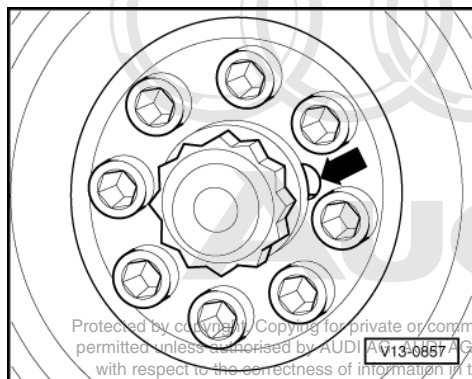
- First attach ribbed belt over the crankshaft pulley and idler wheel and lastly push over tensioning roller.
- Remove pin 3204.
- Install engine and ribbed belt cover.



- -> Routing of ribbed belt drive D
 - D1 without A/C
 - D2 with A/C

1.6 - Removing and installing impact absorber

Removing and installing ribbed belt =>Page 17



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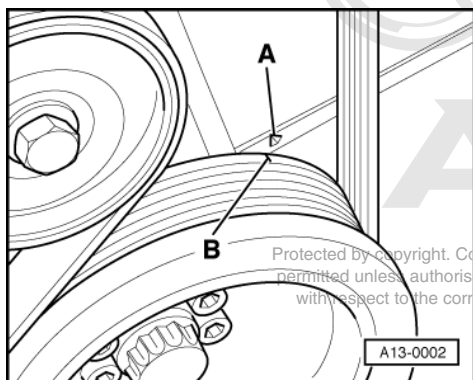


Note:

- ♦ The slackening of the central bolt is not necessary to remove the vibration damper.
- Slacken vibration damper.
- -> When installing ensure that the notch of the vibration damper is aligned with the arresting nose on the toothed belt wheel.
- Tightening torque: 25 Nm

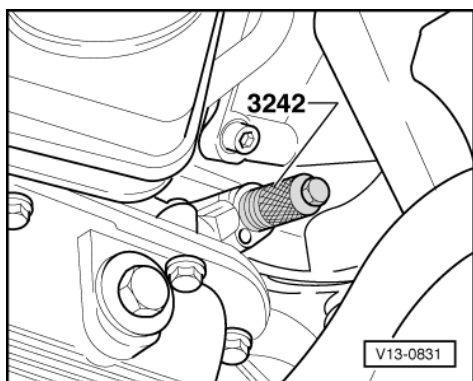
1.7 - Removing and installing toothed belt

Removing



Removing and installing ribbed belt =>Page 17

- Unclip toothed belt guard from both sides.
- -> Turn engine manually into TDC position.
- Inspect position of camshaft:
The large bore of the securing plates on the camshaft wheels must face each other internally, otherwise turn crankshaft further by one turn.
- Unbolt reference marking senders from left of crank housing.

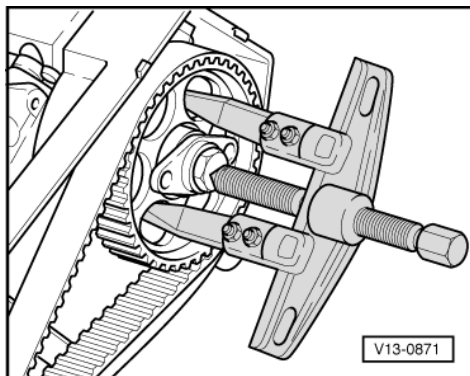


- The TDC bore of the crankshaft must be behind the bore of the removed ignition timer sender (cannot be seen or felt).
- -> Bolt crankshaft bracket 3242 into the bore of the removed ignition timer sender and tighten.
- Removing tensioning device for ribbed belt, =>Page 17
- Remove left and right toothed belt guard
- Removing and installing oscillation damper => Page 17
- Remove lower toothed belt guard

Note:

- ♦ Mark D.O.R. of toothed belt. Running the belt in opposite direction can lead to damage.
- Slacken toothed belt tensioning roller
- Removing toothed belt

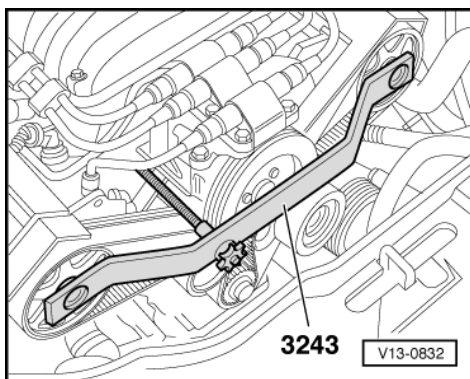
Installing



- -> Detach camshaft wheels from left and right with claw puller, e.g. KUKKO 20-10 from cone.

Note:

- ♦ The claws of the puller must grip the rear hub.
- Position toothed belt over both camshaft wheels.
- Position toothed belt onto all wheels (position tensioning roller last).



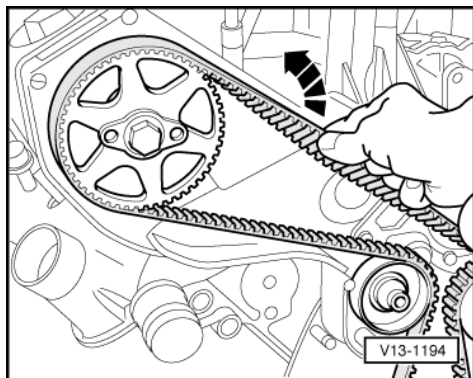
- -> Insert camshaft attachment 3243.

Note:

- ♦ The camshaft gears must be fitted sufficiently loosely onto the taper face so that they can still be moved on the camshafts but do not tilt.

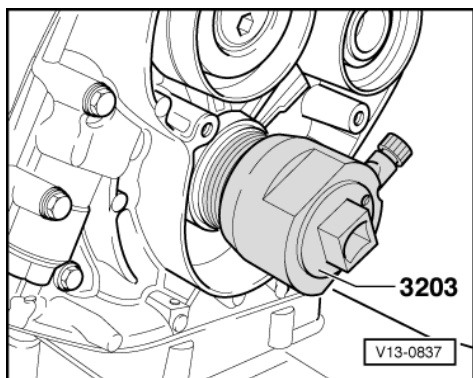
Tensioning toothed belt

- Turn toothed belt tensioning roller with Allen key (A/F 8 mm) towards right and secure.
- Tighten toothed belt tensioning roller with second Allen key (A/F 8 mm).
- Check toothed belt tension between right-hand camshaft wheel and coolant pump.



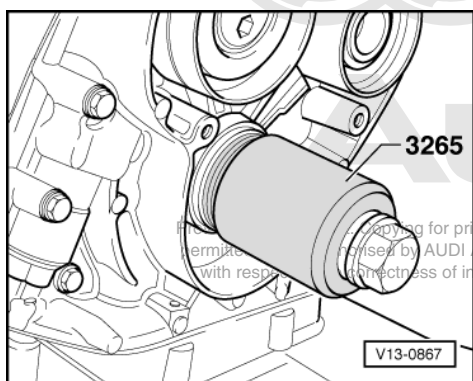
- -> It should be possible to turn the toothed belt between camshaft wheel and coolant pump with thumb and index finger just about 90°.
- Tightening torque of toothed belt tensioning roller 45 Nm
- Central bolt of crankshaft =>Page 14

1.8 - Replacing crankshaft seal



A-toothed belt end

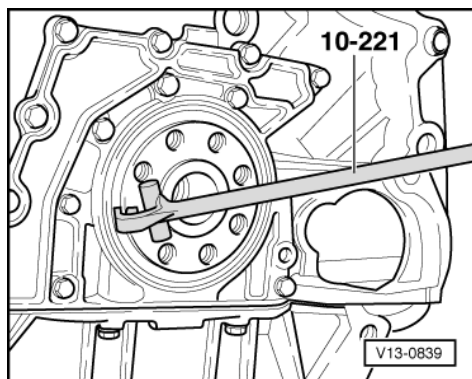
- Removing toothed belt =>Page 18
- Remove toothed belt sprocket of crankshaft.
- -> Removing sealing ring with sealing ring puller 3203.
- Clean contact surface and sealing surface.
- Do not lubricate sealing lip and external edge of sealing ring before pressing in.



- -> Pushing sealing ring on with puller sleeve 3202/1.
- Press in seal flush with insertion sleeve 3265 and central bolt.

Notes:

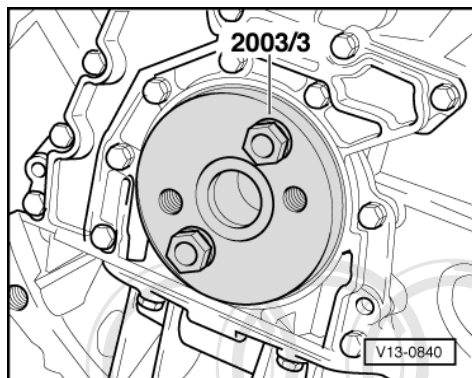
- ♦ Replace seal together with sealing flange.



- ♦ If no sealing flange is available proceed as described in -B-.
- ♦ Before removal drain coolant =>Repair group 19.

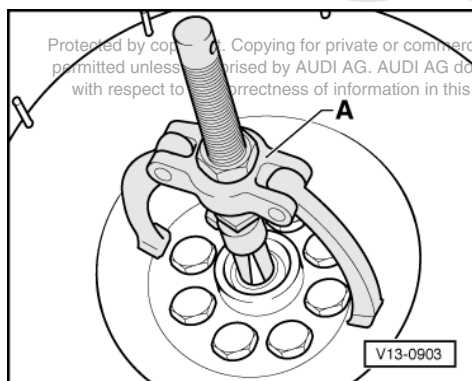
B - Flywheel side

- Unbolt clutch and flywheel or driven plate.
- -> Lever off sealing ring with puller 10-221.
- Clean contact surface and sealing surface.



- -> Do not lubricate sealing lip and external edge of sealing ring before pressing in.
- Use the assembly aid to fit seal onto the crankshaft.
 - Assembly aid is enclosed with the seal.
- Press in seal as far as the stop with installing tool 2003/3 and with the bolts of the flywheel or driven plate.

1.9 - Removing and installing needle bearing in flywheel

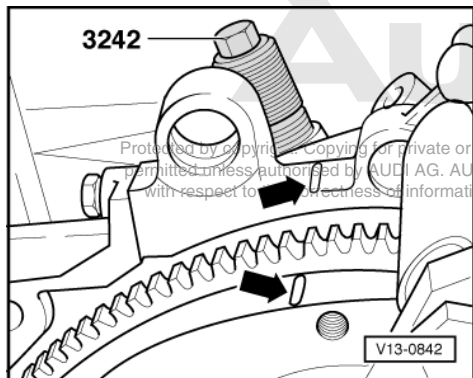




- -> Remove with puller, e.g. KUKKO 21/2 and KUKKO 22-1.
- Insert needle bearing with insertion drift 3264.

1.10 - Removing and installing flywheel/drive plate, installation dimensions

A - flywheel

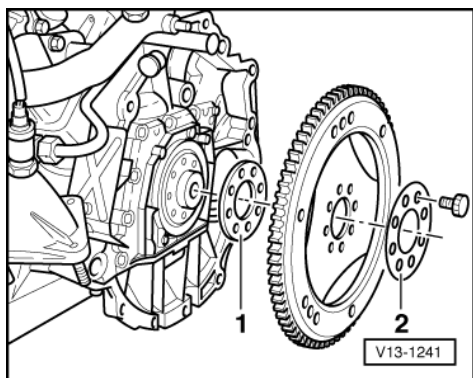


- -> Screw in crankshaft bracket 3242 at TDC-position.
- Mark position of flywheel relative to engine.
- Remove bolts.

Note:

- ♦ The needle bearing is located in the flywheel and must be pressed in if a new flywheel is installed
- Tightening torque
60 Nm + 90° (1/4 turn) Vehicles with automatic gearbox
40 Nm + 180° (1/2 turn) Vehicles with manual gearbox

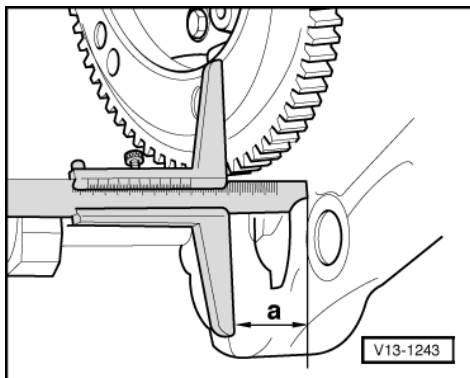
B - Driven plate



- Secure crankshaft with crankshaft bracket 3242 =>Page 18
- Mark hole pattern of driven plate and packing plate -1- and -2- in relation to crankshaft. Mark position of the shim in front of and position of the washer behind the driven plate.
- -> Attach driven plate with washers -2- 035 105 303 A and -1- shim 054 105 301 3.0 mm or -1- shim 054 105 202 4.0 mm.

Note:

- Short engines are supplied without bushes in the crankshaft. Before installing the driven plate in models with an automatic gearbox insert the bush.

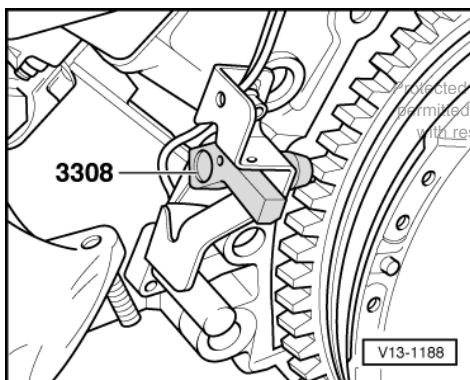


- -> Check dimension -a- at three positions and calculate middle value.
- Vehicles with gearbox marking VW AG4 dimension -a- 21.3 to 22.9
- Vehicles with gearbox marking 01F Dimension -a- 18.1 to 19.7
- Install a different shim, if necessary.

Note:

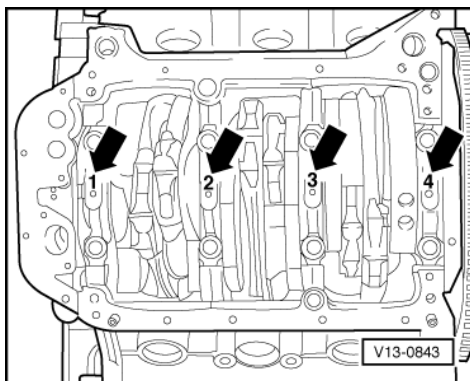
- ◆ Before installing the engine ensure that the fitting sleeves engine/gearbox are present in flange of engine.

1.11 - Adjusting bracket of engine speed sender -G28 with adjusting device 3308



Note:

- ◆ The crankshaft must be in TDC position and be secured with crankshaft bracket 3242 =>Page 18 .
- Remove engine speed sender; unbolt heat shield for this step.
- Slacken bracket.
- -> Insert adjusting device 3308 instead of sender, must engage in starting ring gear.
- Tighten bracket.



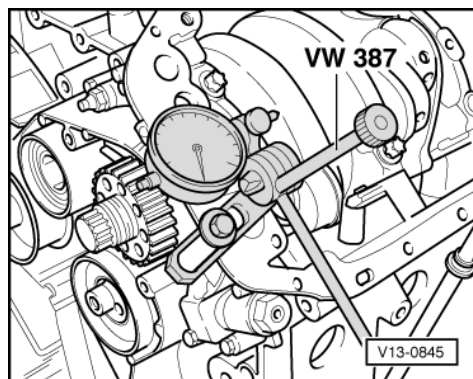


- Install sender.

Installing crankshaft bearing caps

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

1.12 - Measuring crankshaft axial and radial clearance



Axial clearance

Note:

- ♦ Do not interchange used bearing shells.
- -> Bolt dial gauge to oil pump with universal dial gauge bracket VW 387 and position against crank web.
- Press crankshaft against dial gauge by hand and set gauge to -0-.
- Press crankshaft away from front dial gauge.

Read off value.

- New: 0.07 to 0.23 mm.
- Wear limit: 0.25 mm

Radial clearance

The radial clearance is measured using plastigage thread.

Value

- New: 0.018 to 0.045 mm.
- Wear limit: 0.10 mm

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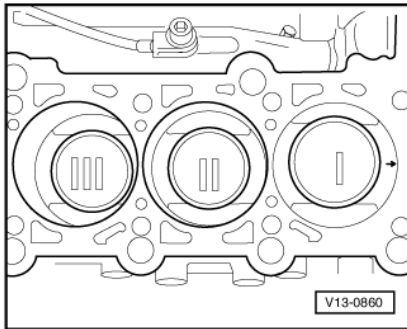
1.13 - Crankshaft dimensions

Figures in mm

Honing dimension	Crankshafts Pivot pin $\varnothing$	Crankshaft Conrod pin $\varnothing$
Basic dimension	-0.022 65.00 -0.042	-0.022 54.00 -0.042
Base size	-0.022 64.75 -0.042	-0.022 53.75 -0.042
Stage 2	-0.022	-0.022

Honing dimension	Crankshafts Pivot pin ø	Crankshaft Conrod pin ø
	64.50 -0.042	53.50 -0.042
Stage 3	-0.022 64.25 -0.042	-0.022 53.25 -0.042

1.14 - Pistons and piston rings

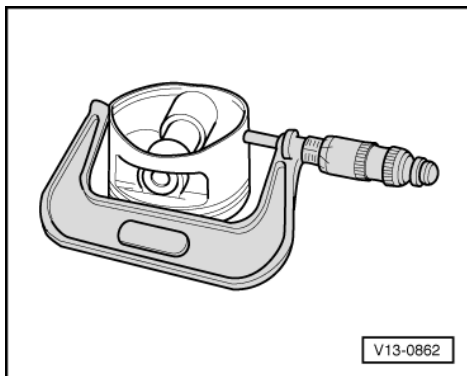


Piston

- -> Fitting position -arrow- must always point towards oil pump.
- Mark cylinder no. on piston crown with water proof felt pen.

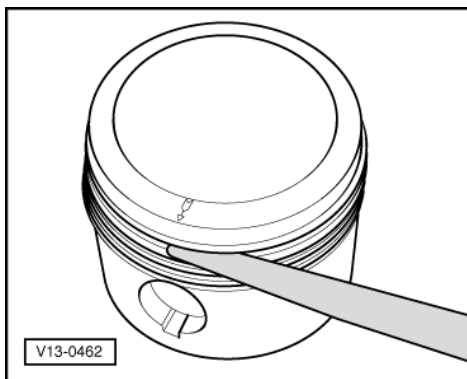
Note:

- ♦ Do not make any chisel punch marks as the piston is coated.



-> Check piston diameter.

- Measure approx. 10 mm from lower edge 90° offset to piston bolt axis.
- Deviation compared to specified dimension max. 0.04 mm

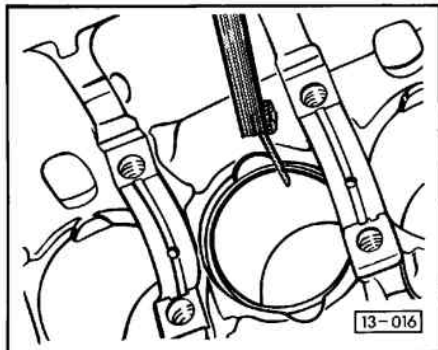


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-> Piston ring height clearance

- New: 0.02 to 0.08 mm.
- Wear limit: 0.1 mm

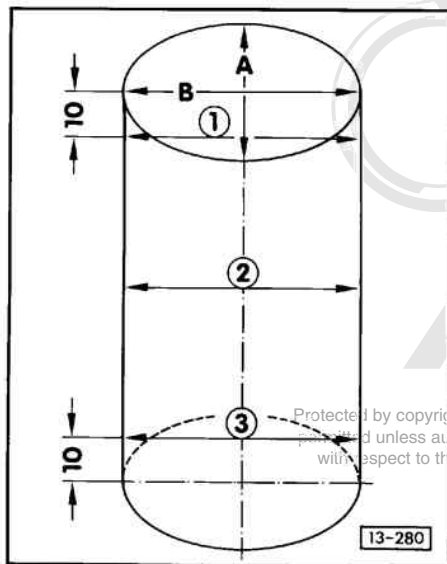


-> Check touch clearance of piston ring.

- Insert piston ring at right angles into the bottom cylinder opening, about 15mm 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

1.15 - Checking cylinder bore



- -> Measure diagonally at three positions to cross direction -A- and in longitudinal direction -B-.
- Use precision internal measuring instrument with range from 50 to 100 mm.
- Deviations compared to specified dimension max. 0.08 mm

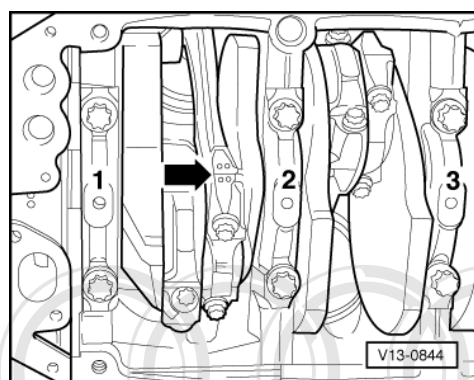
Piston and cylinder dimensions

Honing dimension	Piston $\varnothing$	Bore $\varnothing$
Basic dimension	82.48	82.51
Base size	82.74	82.76
Stage 2	82.98	83.01

Note:

- ♦ Only pistons with basic dimensions are available as spare parts.

1.16 - Conrods, conrod bearings



- Only replace conrods as a set.
- Do not interchange conrod bearings.
- > Mark conrod bearing cover before removal in relation to each other by lightly knocking them.

Checking radial play

- Remove conrod bearing cap. Clean bearing cap and bearing journal.
- Place a length of Plastigage of corresponding width on the bearing journal or in the bearing shells.
- Attach conrod bearing cover and tighten to 20 Nm but do not turn further. Do not rotate crankshaft.
- Remove conrod bearing cap again.
- Compare width of Plastigage with calibrated scale.
- New: 0.015 to 0.062 mm
- Wear limit: 0.12 mm
- Replace bolt for conrod bearings.

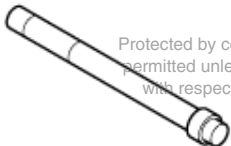
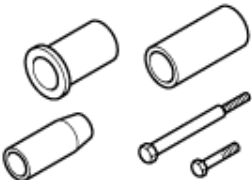
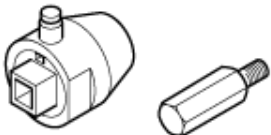
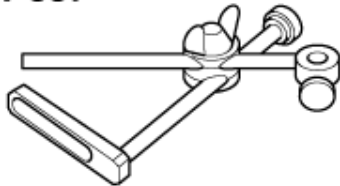
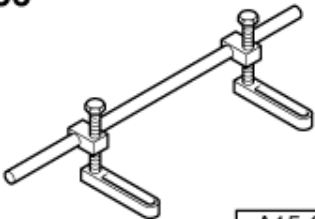
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15 - Cylinder head, Valve gear

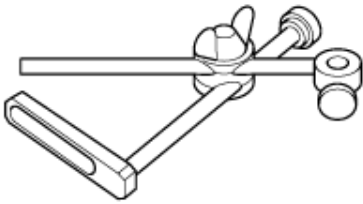
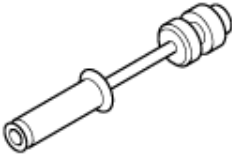
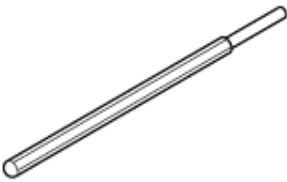
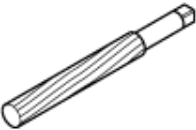
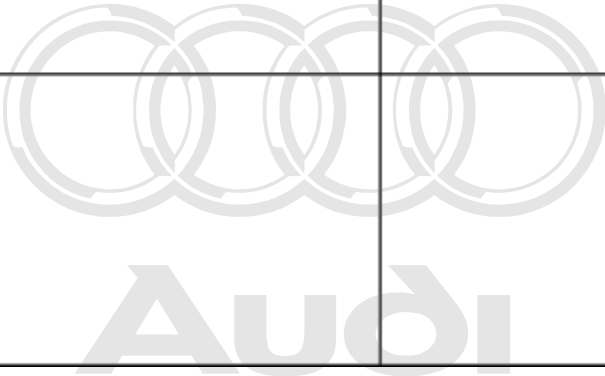
1 - Servicing valve gear

1.1 - Servicing valve gear

VW 295 	3240 
3241 	2085 
V.A.G 1323 A 	VW 387 
VW 653/3 	2036  A15-0014

The following special tools and testing devices are required for these repairs:

VW 295 Drift
3240 Oil seal extractor
3241 Puller
2085 Oil seal extractor
V.A.G 1381 Compression plate writer
VW 387 Universal dial gauge holder
VW 653/3 pressure hose
2036 Assembly equipment

VW 387 	3047 A 
10-206 	3120 
	 A15-0015

VW 541/1 Assembly tool

3047 A Valve shaft puller

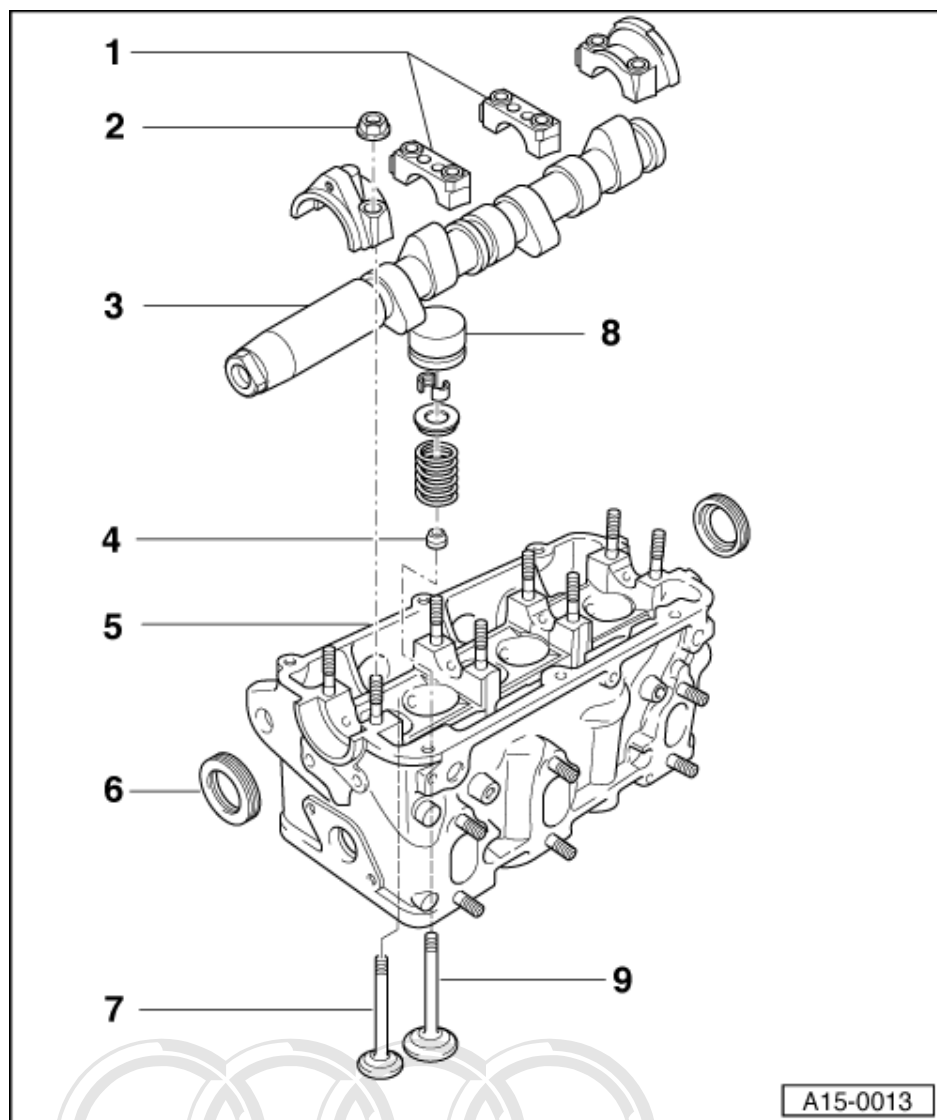
10-206 Drift

3120 Hand reamer

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1.2 - Servicing valve gear

**Note:**

- ♦ Seal and sealing rings must always be replaced.

1 Bearing cap

- ♦ Removing and installing
=> Page 42

2 17 Nm**3 Camshaft**

- ♦ Removing and installing
=>Page 42

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- ♦ Checking axial clearance
=> Page 43

- ♦ Runout 0.01 mm

4 Valve stem seal

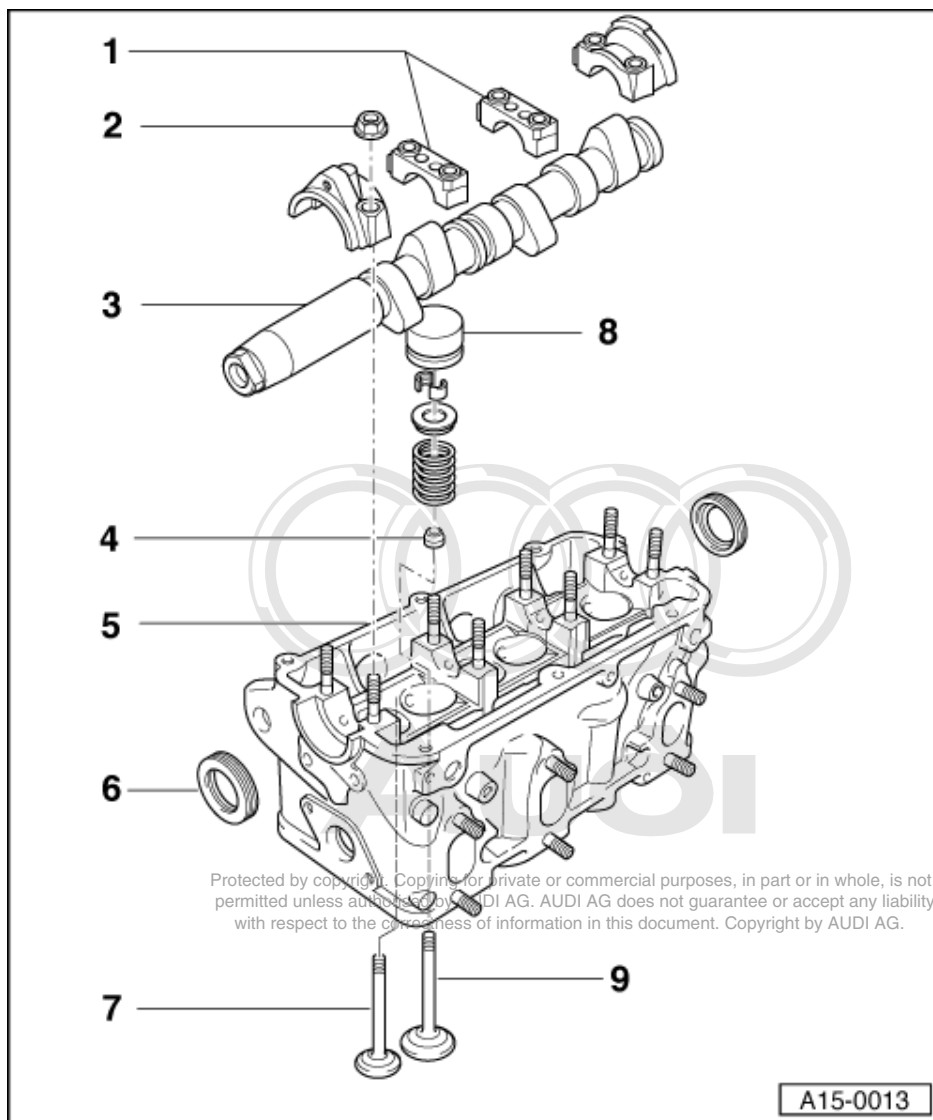
- ♦ Replacing => Page 44 .

5 Cylinder head

- ♦ Reworking cylinder head
=>Page 46
- ♦ Reworking valve seat =>Page 47

6 Shaft seal

- ♦ Replacing =>Page 37



7 Exhaust valve

- ♦ Checking and reworking
=>Page 46
- ♦ Checking valve guide and replace =>Page 46

8 Hydraulic bucket tappet

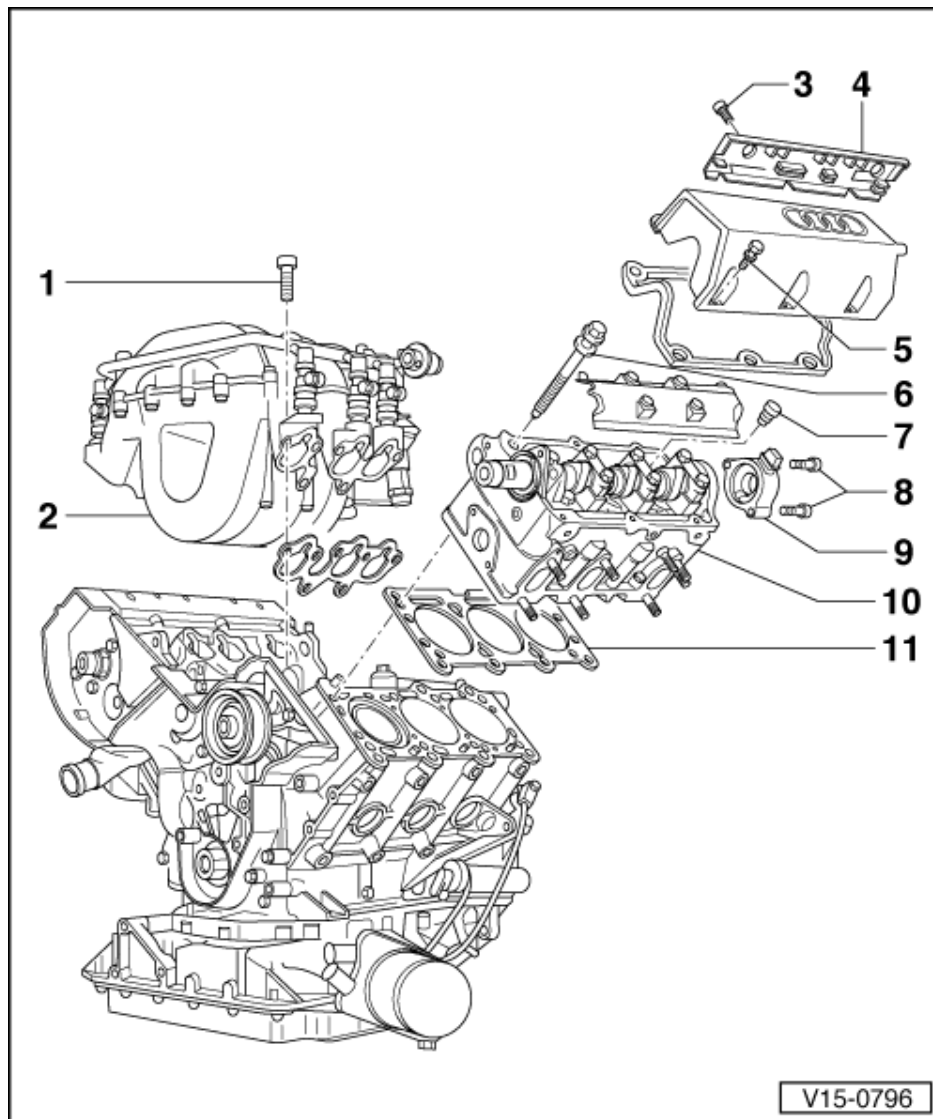
- ♦ Checking =>Page 43
- ♦ Lubricate bearing surface before installing
- ♦ Set down with cam bearing surface facing downwards.

9 Inlet valve

- ♦ Checking and reworking
=> Page 46
- ♦ Check valve guide and replace
=>Page 46



1.3 - Cylinder head



Note:

- ♦ Install cylinder head cover
=>Page 36

1 20 Nm

2 Inlet manifold

- ♦ Removing and installing
=>Page 40

3 10 Nm

4 Cover

5 10 Nm

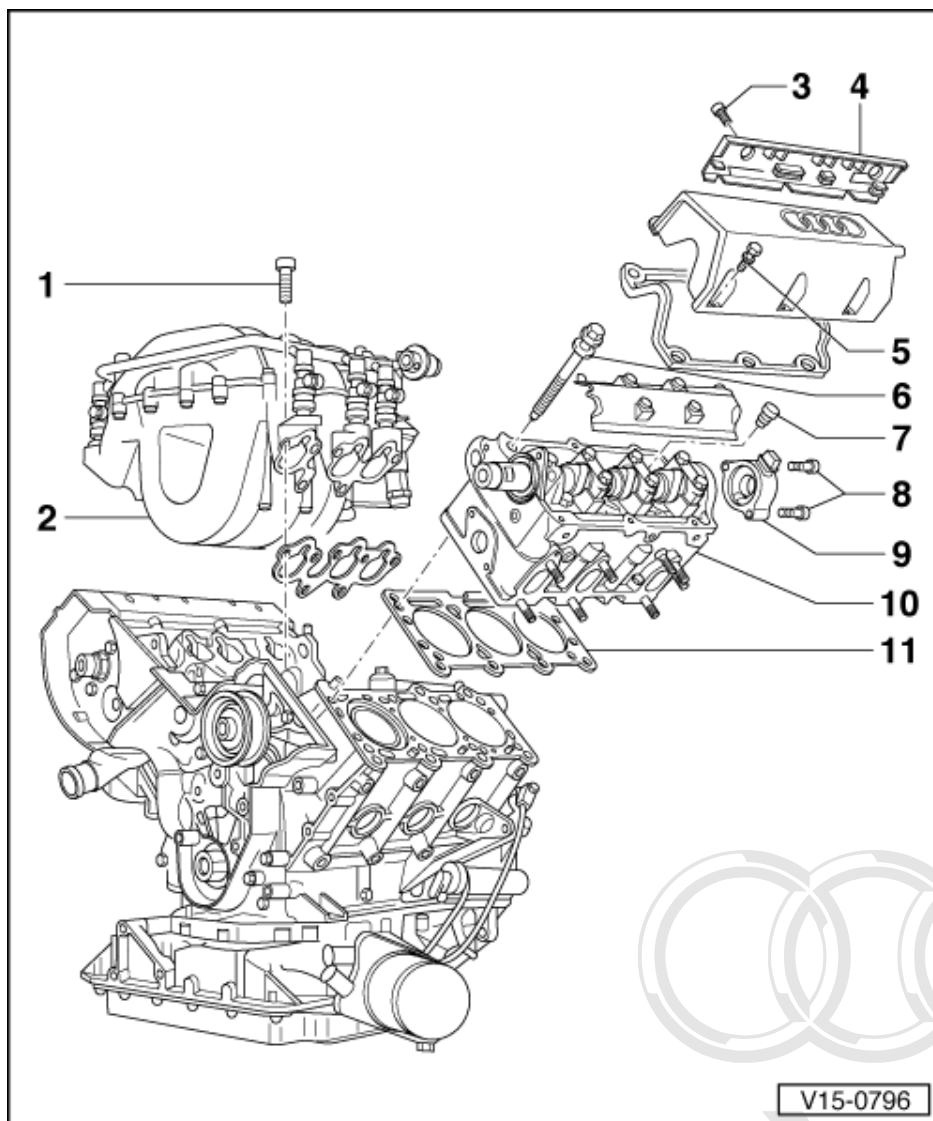
6 Cylinder head bolts

- ♦ Tightening method
=>Page 41
- ♦ Replace bolts.

7 Pressure limiting valve

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- ♦ When loud valve noises occur which effect complete cylinder rows replace pressure relief valve.



- ♦ Secure with locking fluid
AMV 197 000 01
- ♦ Replace valves which came loose off their bolting.
- ♦ 25 Nm

8 10 Nm

9 Housing Hall sender

10 cylinder head

- ♦ Check for distortion
=>Page 41
- ♦ Reworking dimension
=>Page 46

Note:

- ♦ The cylinder head which is available as a replacement part can be fitted on the left or right and is provided with an end cover at the respective front side.
- ♦ Stamping of cover
=>Page 36

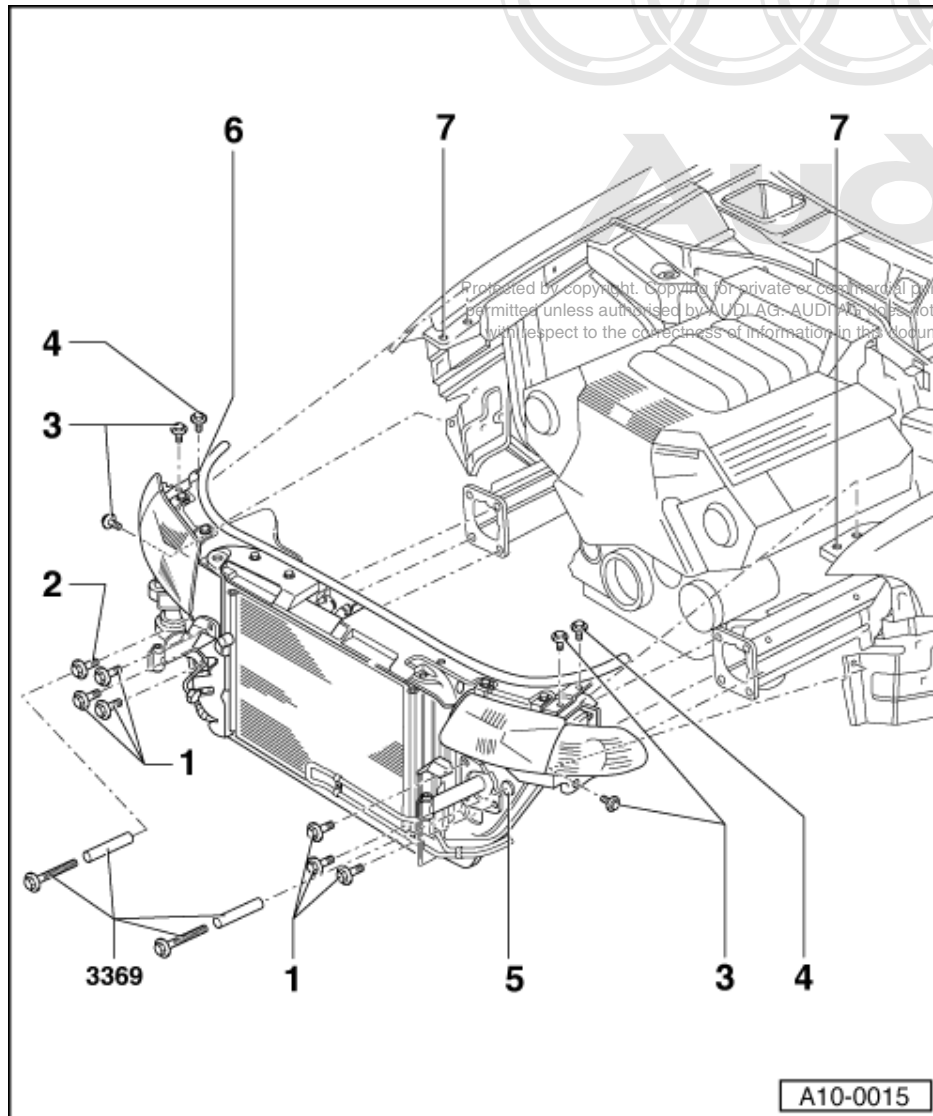
11 Cylinder head gasket

- ♦ Identification:

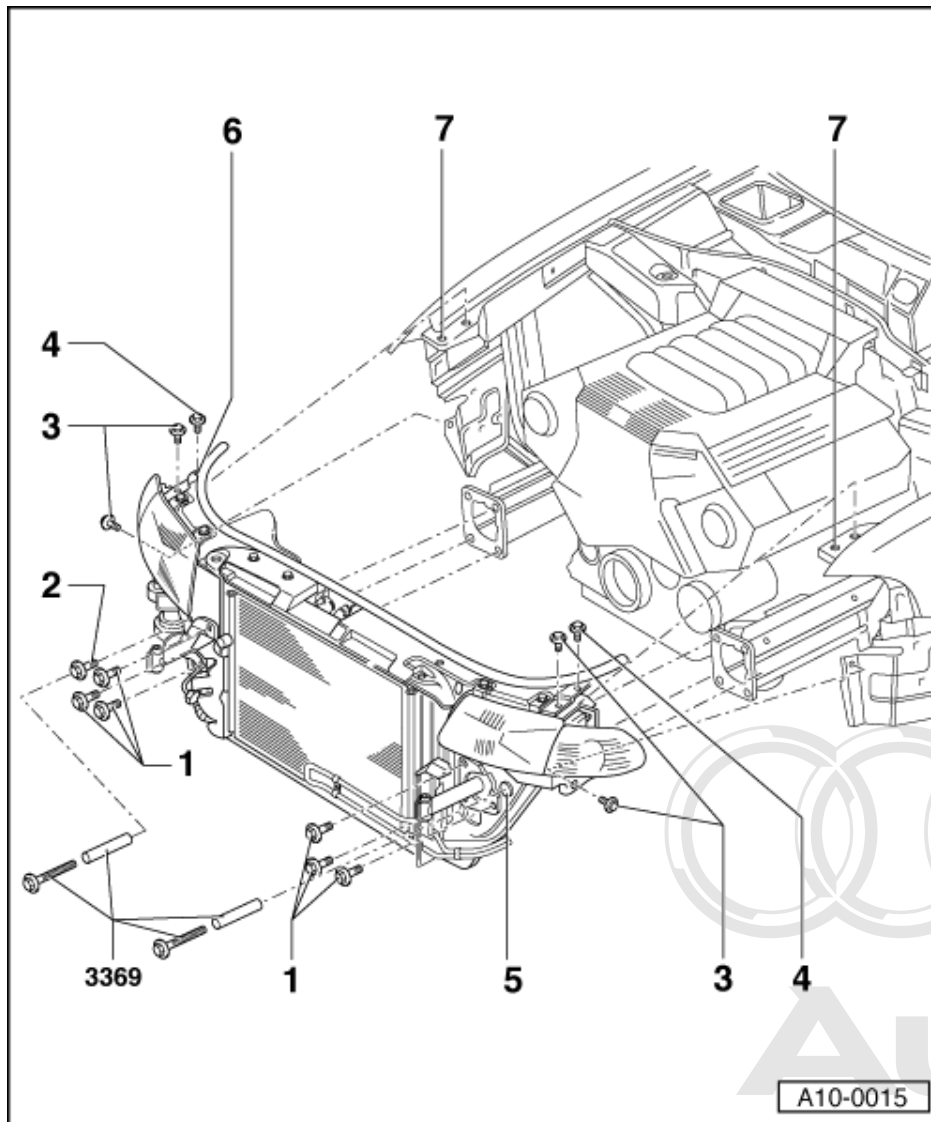
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Writing must face upwards.

1.4 - Set lock carrier to service position



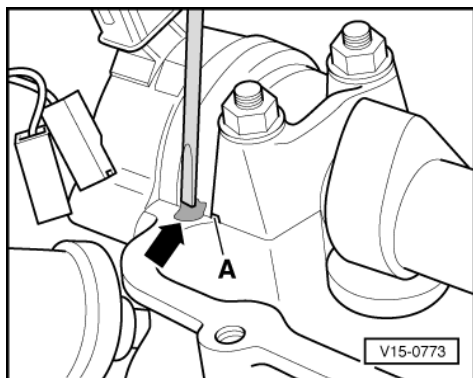
- 1 Bolt 8 x 45
 - 45 Nm
- 2 Bolt 8 x 45
 - 45 Nm
- 3 Bolt 6 x 20
 - 10 Nm
- 4 Bolt 6 x 20
 - 10 Nm
- 5 Bore for special tool V.A.G 3369
- 6 Hole: Air duct
- 7 Bore side panel



- Unbolt air duct between lock carrier and air filter at lock carrier and remove.
- Unbolt right-hand side fixing bolt -2- and screw in V.A.G 3369.
- Screw in left side of V.A.G 3369 into bore -5-
- Unbolt fixing bolts 1 and 3
- Unbolt fixing bolt -4-, pull lock carrier forward and screw in fixing bolt -4- through rear fixing bore of lock carrier -6- and front fixing bore side panel -7-.



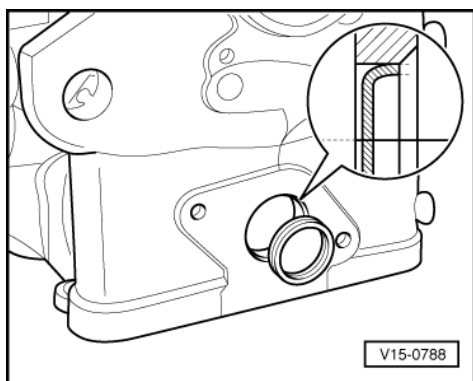
1.5 - Installing cylinder head bolts



Note:

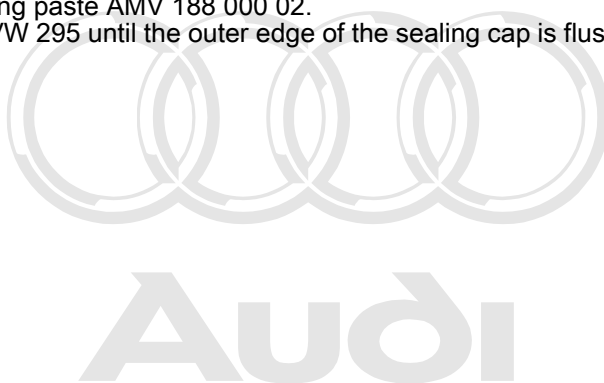
- ♦ Before fitting, coat inside and outside of gasket for cylinder head cover with small quantity of silicone lubricant D 007 000 04.
- -> Carefully coat the 4 edges of the sealing surfaces of the cylinder head with Silmate AMV 174 004 01 using a small screwdriver. The oil bore -A- must not be blocked with Silmate.

1.6 - Inserting end cover in cylinder head



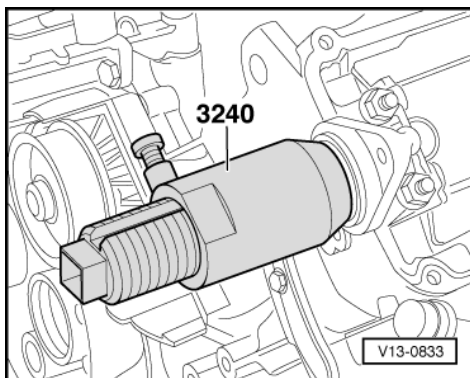
The cylinder head which is available as a replacement part can be fitted on the left or right and is provided with an end cover at the respective front side.

- Coat edge of end cover with sealing paste AMV 188 000 02.
- -> Drive in sealing cap with thrust VW 295 until the outer edge of the sealing cap is flush with the phase end of the cylinder head.

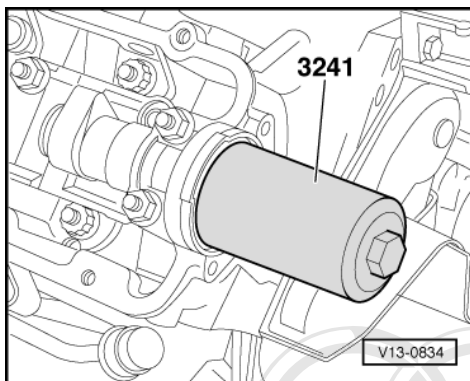


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1.7 - Replacing seals at front of cylinder heads on right and left



- Removing toothed belt =>Page 18
- Remove bolts from cylinder head cover.
- Unbolt rear toothed belt guard.
- -> Pull out sealing ring with sealing ring puller 3240.
- Clean contact surface and sealing surface.
- Do not grease sealing lip and outer edge



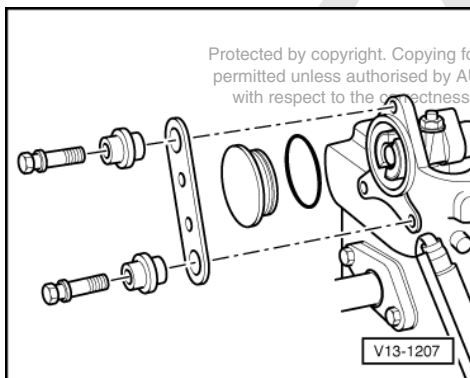
Front left:

- -> Knock in seal until stop using installing tool 3241.

Front right:

- Attach puller sleeve to camshaft.
- Press in sealing ring with puller tool 3241.

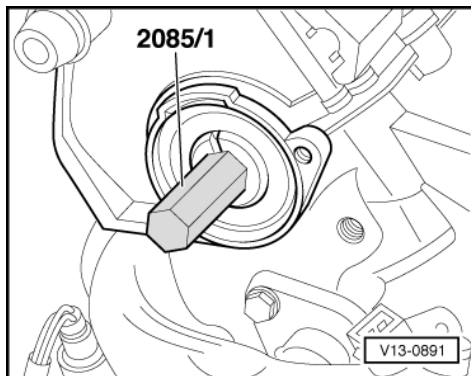
Rear right cylinder head



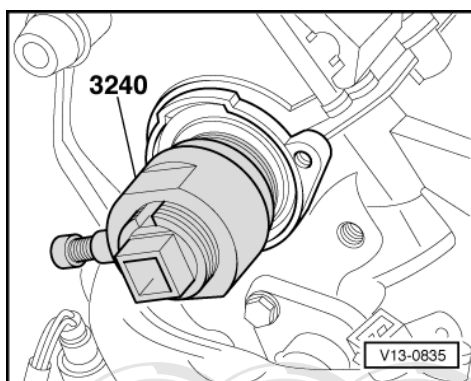
- -> Remove bolts. For this purpose, remove spacer and locking devices.
- Take out sealing cap.



- Renew O-ring.
- Unbolt Hall sender housing



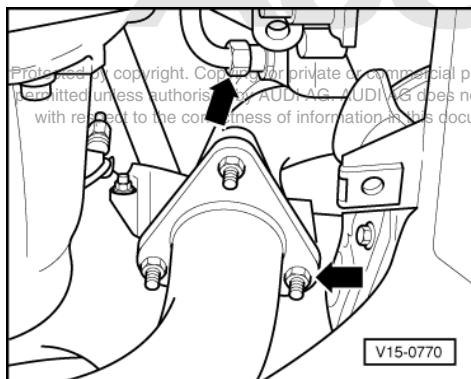
- Twist bolt out of Hall orifice with 20 Nm
- Carefully lever off Hall orifice using screwdriver.
- -> Screw in bolt for sealing ring puller 2085/1.



- -> Pull out sealing ring with sealing ring puller 3240 or 2085 and bolt 2085/1.
- Clean contact surface and sealing surface.
- Do not lubricate sealing lip and external edge of sealing ring before pressing in.
- Press in sealing ring with puller sleeve and puller tool 3241 until stop.

1.8 - Removing and installing cylinder head (with engine installed)

Removal is described for the left-hand cylinder head.



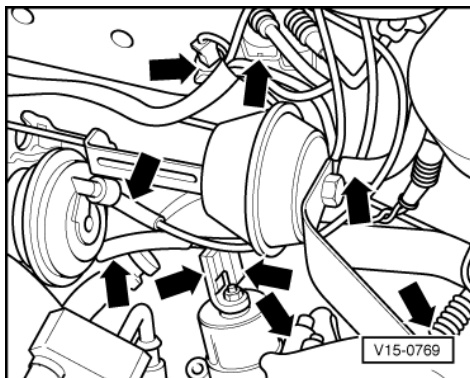
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Removing

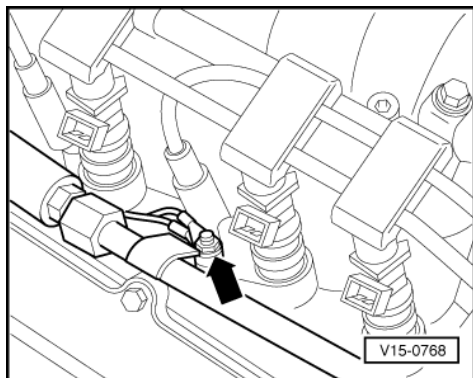
- Remove ribbed belt =>Page 17
- Remove toothed belt =>Page 18
- > Unbolt exhaust tube from manifold.



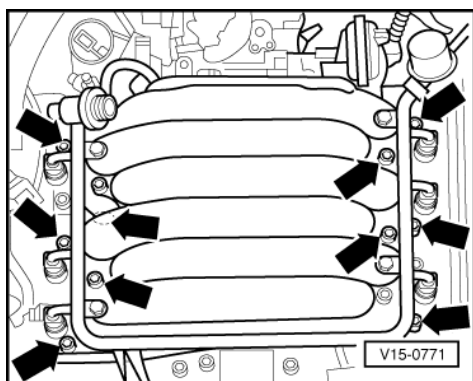
- -> Drain off coolant at drain plug -arrow- with special tool 3247 and at lower drain plug of radiator.
- Remove air duct hose between air mass meter and intake tube.
- Remove all spark plug connectors.
- Remove all electric connectors from injection valves.
- Unbolt crank housing vent from left and right of cylinder head cover.
- Unbolt fuel feed and return line.
- Unclip cover from intake silencer.
- Unbolt both bolts from underneath cover.
- Press silencer towards rear and lift upwards.
- Pull off vacuum pipe from left of silencer.
- Remove silencer.
- Unbolt left-hand cover for injection valve lines.
- Disengage clutch cable and release.
- Unbolt line from ACF valve to throttle valve unit from throttle flap unit.
- Pull off connector from idling stabilising valve and from throttle flap potentiometer.



- -> Pull off vacuum line from GRA bush.
- Pull off connector from oil pressure sender and switch.
- Pull connector off Hall sender.
- Pull off vacuum line from valve for inlet manifold change-over (blue) as well as from AGR valve (brown).
- Detach connector for lambda probe and heater from bulkhead and set aside.
- Unbolt vacuum line to cycle valve for ACF at throttle valve unit.
- Unbolt AGR valve.



- -> Unbolt bracket of hydraulic line and earth wire to inlet hose.



- -> Unbolt intake pipe and remove
- Close opening with clean cloth.
- Unbolt coolant pipe at the rear of the cylinder head.

Notell!:

- ♦ After loosening the fixing bolts all cylinder head bolts must be tightened to 90°(1/4 turn)!!

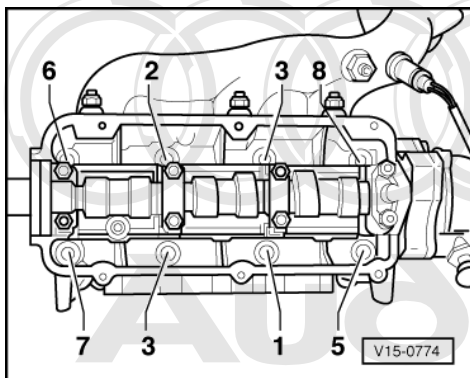
- Remove lambda probe.
- Remove heat shield at exhaust manifold.
- Remove bolts from cylinder head cover.
- Unbolt rear toothed belt guard.
- Unbolt line from hydraulic container to hydraulic pump.
- Unscrew cylinder head.

Installing:

- Clean sealing surfaces.
- Cylinder head gasket:
Marking must face cylinder head.
- Attach cylinder head- observe centring pins in cylinder block.
- Insert cylinder head bolts and tighten by hand.

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1.9 - Cylinder head tightening method



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> Tightening sequence:

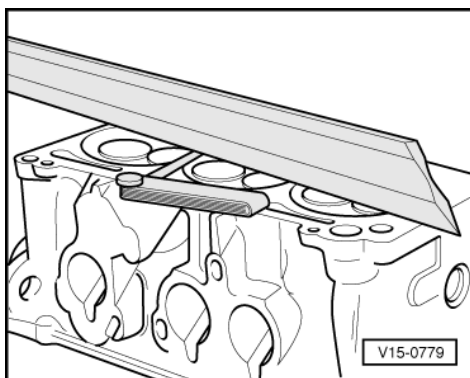
Tighten cylinder head bolts in two stages.

- 1st Stage, 60 Nm
- 2nd Stage 180°(1/2 turn) turn further with fixed wrench (2 x 90°further turns are permitted).

Note:

- ♦ Retightening of cylinder head bolts after repair or during control service is not necessary.

1.10 - Check cylinder head for distortion.



- -> Measure at several positions with straightedge.
- Max. permissible distortion: 0.05 mm

1.11 - Check compression pressure

- ♦ Engine oil temperature at least 30 °C.
- ♦ Throttle valve fully open.
- Detach both connectors from output stage
- Detach all electric connectors from injection valves.
- Test compression pressure using compression pressure tracer V.A.G 1381 and adapter V.A.G 1381/5.

Note:

- ♦ Refer to operating instructions for how to use tracer.
- Actuate starter until measuring instrument shows no further increase in pressure.



Compression pressure values:

Compression pressure in bar over pressure		
Engine code letters	New	Wear limit
AAH	9 to 14	7.5

- Permissible difference between all cylinders: 3 bar

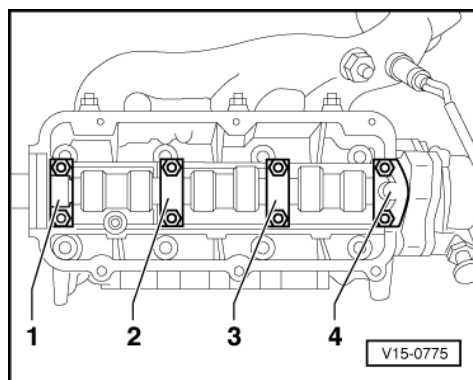
Note:

- ♦ If above-mentioned values are not achieved the compression pressure test must be repeated after a test drive.

1.12 - Removing and installing camshaft

Removing

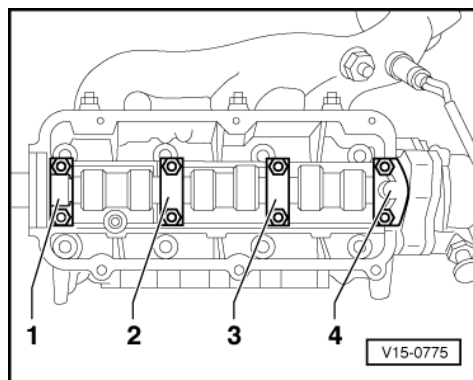
- Remove ribbed belt =>Page 17
- Remove toothed belt =>Page 18



- Unbolt hall sender housing at left cylinder head or plug at right cylinder head.
- Unbolt toothed belt sprocket.
- -> Remove bearing cap 2 and 3.
- Loosen bearing caps 1 and 4 alternately and diagonally.

Note:

- ♦ Do not interchange bearing caps.

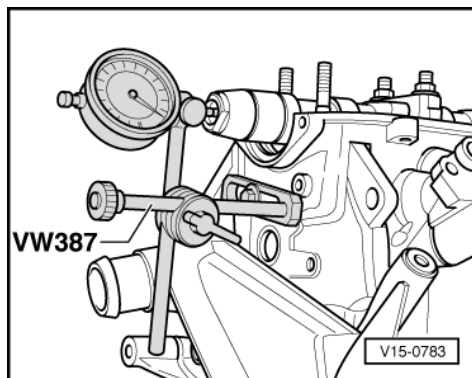


Installing

- -> Remove bearing caps 1 and 3.

Tightening torque 17 Nm

1.13 - Checking camshaft axial clearance



Hall sender housing, bucket tappet and bearing cap 2 and 4 are removed.

- -> Attach dial gauge with universal dial gauge bracket VW 387 at front cylinder head.
- Press camshaft by hand against the dial gauge.
- Set dial gauge to -0-
- Press crankshaft away from dial gauge.

New: 0.04 to 0.15 mm.

Wear limit: 0.35 mm

1.14 - Checking hydraulic bucket tappets

Note:

- ◆ After installation of new bucket tappets the engine must not be started for approx. 30 minutes (valves knock on piston).
 - ◆ Set down removed bucket tappets on a clean surface with bearing surface (camshaft side) facing downwards.
 - ◆ Bucket tappets cannot be adjusted.
 - ◆ After repairs of valve gear carefully turn engine at least two turns to ensure that no valve is knocking when starting.
 - ◆ Irregular valve noises during starting are normal
- Start engine and run until the radiator fan has switched on once.
 - Increase engine speed for 2 minutes to roughly 2500 rpm.

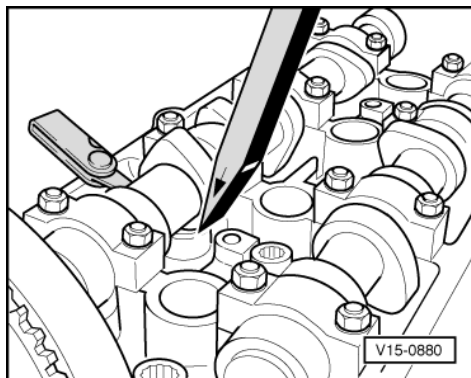
Note:

- ◆ If the irregular valve noises disappear but occur again during short distances the oil retention valves must be replaced.

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If the hydraulic bucket tappets are still noisy find defective tappets as follows.

- Remove cylinder head cover.
- Turn crankshaft in clockwise direction until notch of the bucket tappet to be tested faces upwards.



- -> Push bucket tappet down with wooden or plastic wedge. If a feeler gauge of 0.20 mm can be inserted between camshaft and bucket tappet, replace tappet.

Note:

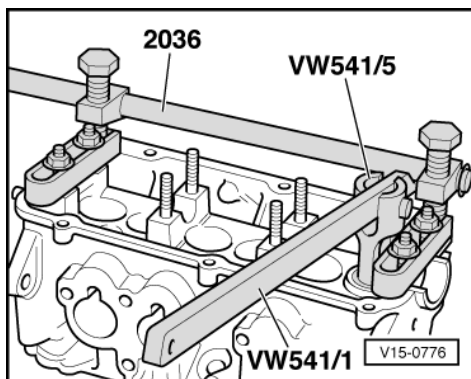
- ♦ After installation of new bucket tappets the engine must not be started for approx. 30 minutes (valves knock on piston).

1.15 - Replacing valve shaft seal

With cylinder head installed

- Remove toothed belt =>Page 18
- Remove camshaft and bucket tappet.
- Unscrew spark plugs.
- Position piston of corresponding cylinder on "lower dead point".
- Screw in pressure hose VW 653/3 with sealing ring handtight into spark plug thread and supply constant pressure of at least 6 bar.

Inlet side:

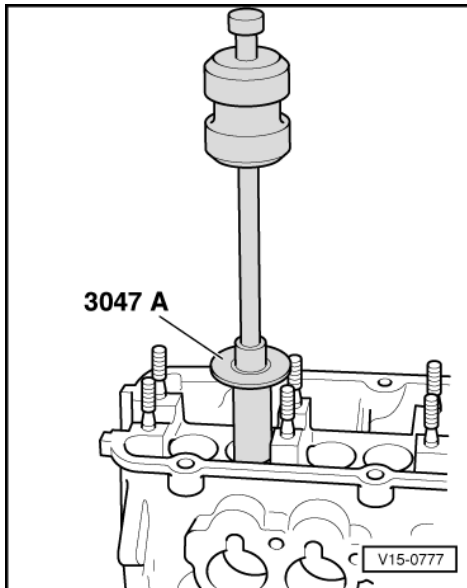


- -> Insert assembly device 2036 and set bearing to stand bolt height.
- Use assembly lever VW 541/1 and thrust piece VW 541/5 to remove valve spring.

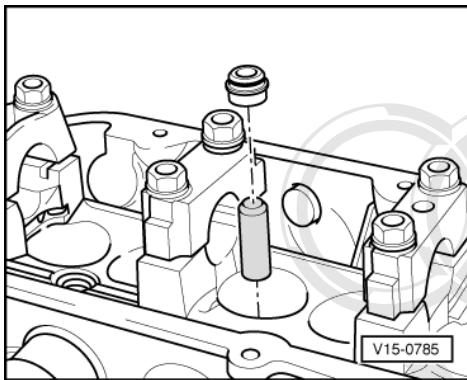
Note:

- ♦ Loosen tight valve cotters by lightly tapping with hammer onto assembly lever.

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- Remove valve spring.
- -> Pull of valve stem seal with 3047 A.

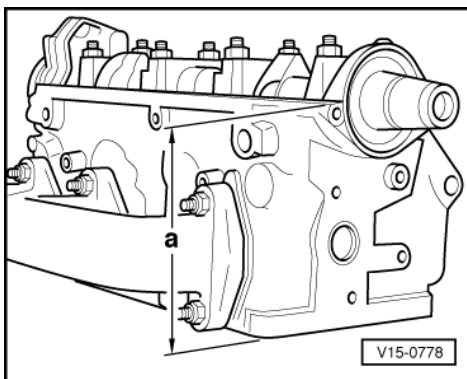


- Install valve stem seal.
- -> Position plastic sleeve onto valve stem, grease valve stem seal and carefully push onto valve guide.

Note:

- ◆ To install valve stem seals always use enclosed plastic sleeve.
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1.16 - Rework cylinder head



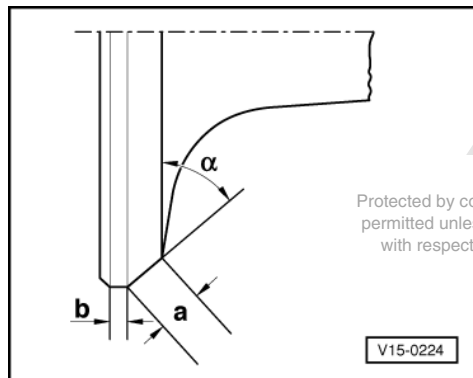


-> Minimum dimension a = 132.75 mm

1.17 - Check and rework valves

Checking valves

- Visually inspect stem and seat for running-in marks. When scoring is clearly visible replace valve,



-> Rework inlet valve

= 45°

a = max. 3.5 mm

b = min. 0.5 mm

Machining exhaust valve

Important!

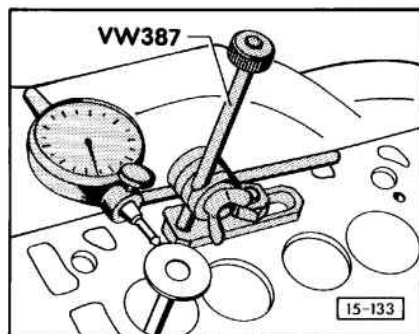
Valves must not be reworked. Only grinding in is permitted.

Exhaust valves with nitride filling which are worn out must not be disposed of indiscriminately. They must be cut in two with an iron saw between centre of stem and valve disc. They must not come into contact with water when this is done. Then throw the valves into a bucket of water (not more than ten at a time). Then step back because a chemical reaction occurs when the sodium filling burns. Following such treatment, the parts can then be handled as normal scrap.

1.18 - Checking and replacing valve guides

Check valve guide

When repairing engines with leaking valves, it is not sufficient to reface the valve seats and renew the valves. The valve guide must also be checked for wear. Especially important is testing the engines with high performance



- -> Insert valve into guide. Valve stem end must be flush with guide. Due to the slight difference in stem diameters, ensure that only an inlet valve is used in the inlet guide and an exhaust valve in the exhaust guide.
- Determine lateral play.

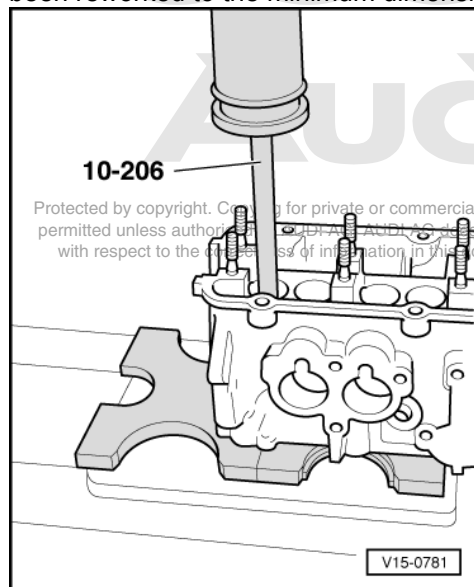
Wear limit:

Inlet valve guide = 1.0 mm

Outlet valve guide = 1.3 mm

Renewing valve guides

Do not repair cylinder heads whose valve seat rings cannot be reworked or cylinder heads which have already been reworked to the minimum dimension.



- -> Press out worn valve guides with 10-206 from side of camshaft (valve guides with collar repair from engine side).
- Clean new guides with oil and press in with 3121 from the camshaft side (cylinder head cold) until shoulder makes contact.

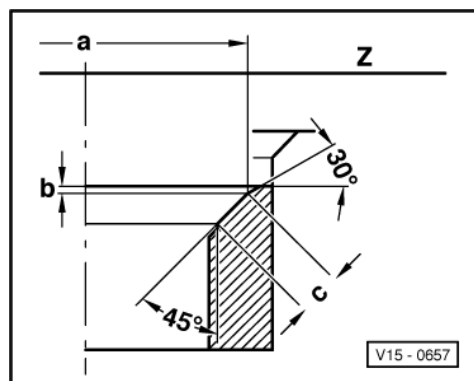
Note:

- ♦ After the guides are attached with shoulder the pressing-in pressure must not be increased above 1.0 t as otherwise the shoulder could break.
- Ream valve guides with hand reamer 3120. Use plenty of cutting fluid.

1.19 - Reworking valve seats

Note:

- ♦ When reworking the valve seats observe minimum dimension =>Page 49





-> Rework inlet valve

$a = \varnothing 39.2 \text{ mm}$

b^* = observe maximum permissible reworking dimension

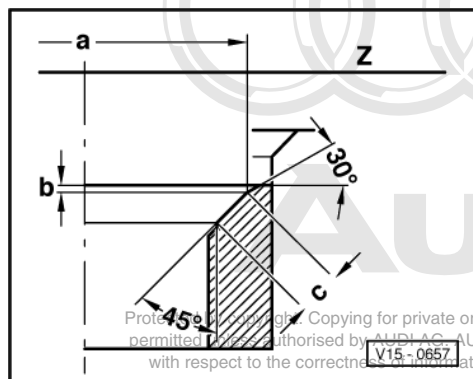
$c = 2.0 \text{ mm}$

30° = upper correction angle

45° = Valve seat angle*

Z = lower edge of cylinder head

*) max. permissible reworking dimension =>Page 48



-> Reworking outlet valve seat

$a = \varnothing 32.4 \text{ mm}$

b^* = observe maximum permissible reworking dimension

$c = 2.4 \text{ mm}$

30° = upper correction angle

45° = Valve seat angle*

Z = lower edge of cylinder head

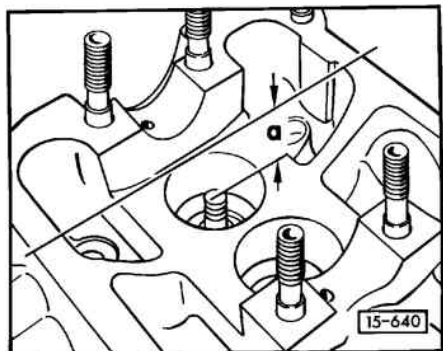
Note:

- ♦ Valve seats are only to be reworked to the extent necessary to achieve a proper appearance of the bearing surface. Before starting to rework the valve seats, calculate the maximum permissible reworking dimension. If the reworking dimension is exceeded the function of the hydraulic valve lifters is no longer ensured

*) max. permissible reworking dimension =>Page 48

Calculating maximum permissible reworking dimension

- Insert valve in valve seat and press firmly against valve seat.





- -> Measure distance -a- between valve stem end and upper edge of cylinder head.

Measured distance minus minimum dimension equals max. permissible reworking dimension.

Minimum dimension:
Inlet valve = 33.8 mm
Outlet valve = 34.1 mm



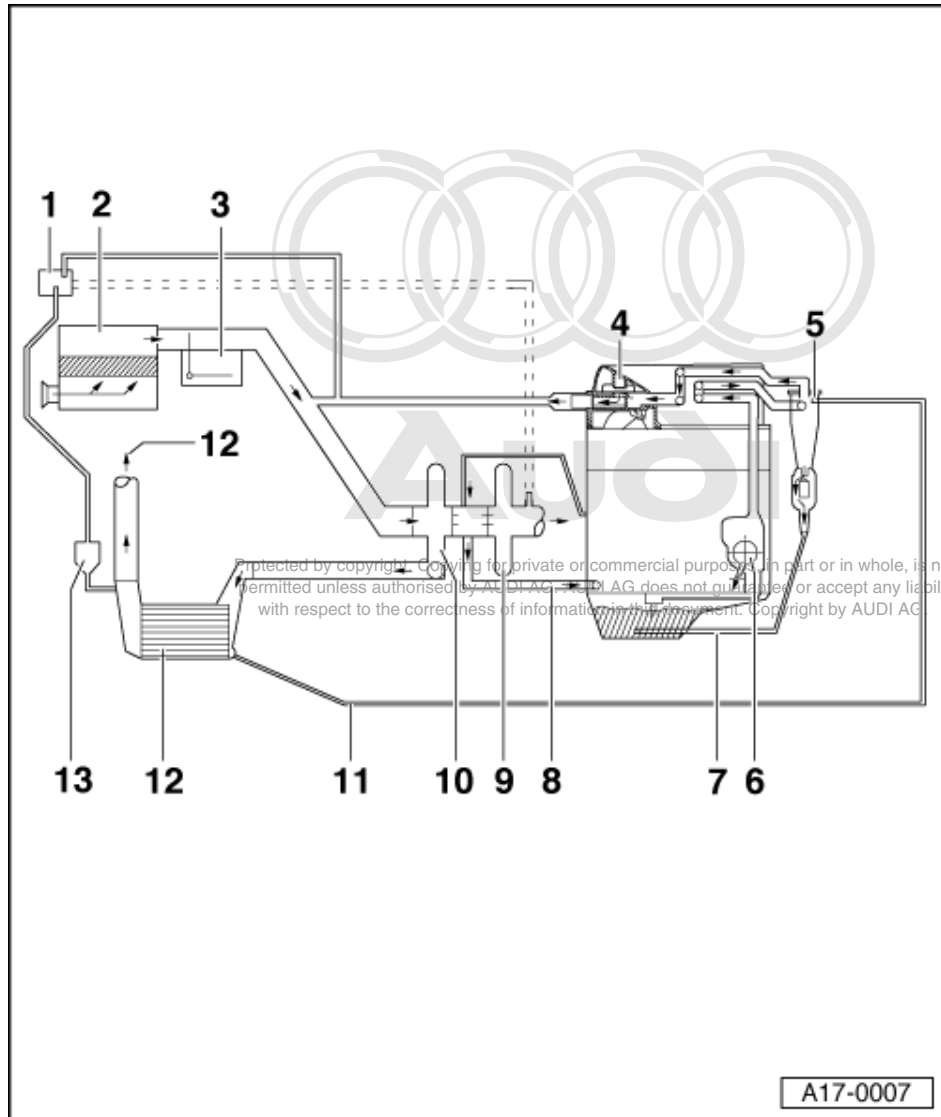
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17 - Lubrication

1 - Removing and installing parts of the lubrication system

1.1 - Removing and installing parts of the lubrication system



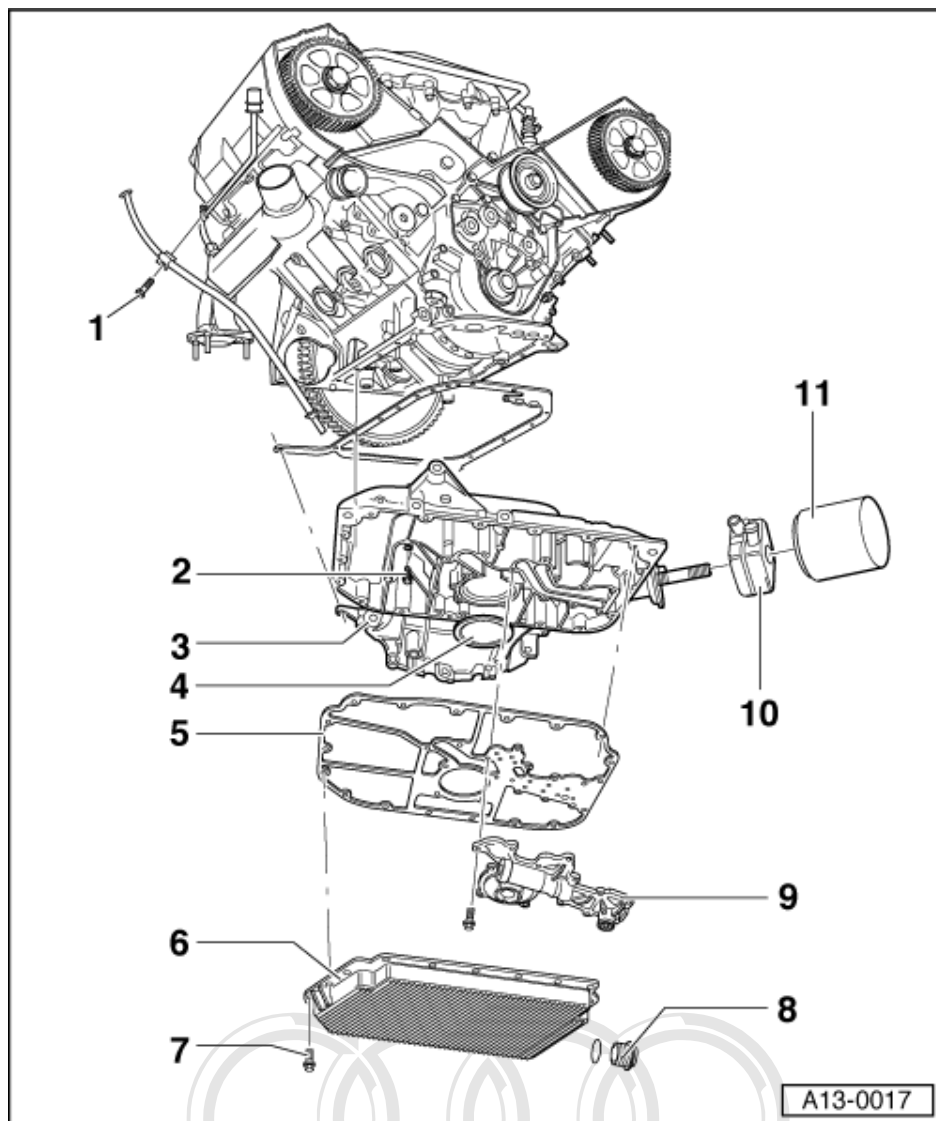
The following special tools and testing devices are required for these repairs:

V.A.G 1342 oil pressure test device

V.A.G 1527 tensioning tester

Exploded view diagram of the engine oil pan assembly. The diagram shows the engine block at the top, with the oil pan assembly components numbered 1 through 11. Component 1 is a hose. Component 2 is the oil pan gasket. Component 3 is the oil pan. Component 4 is the oil pan flange. Component 5 is the oil pan cover. Component 6 is the oil pan cover gasket. Component 7 is the oil pan cover flange. Component 8 is the oil pan cover. Component 9 is the oil pan cover. Component 10 is the oil pan cover. Component 11 is the oil pan cover.

- ## 1.2 - Removing and installing oil pump 51



7 10 Nm

8 Oil drain plug, 40 Nm

9 Cap

- With integrated 5 bar pressure relief valve and 11 bar pressure relief valve

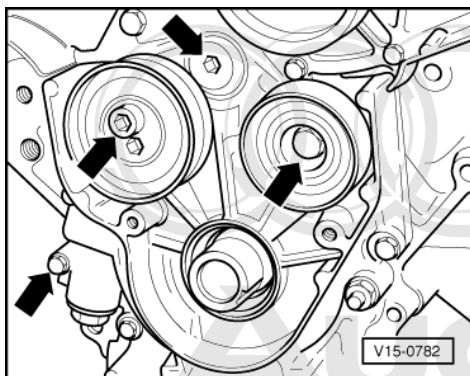
10 Oil cooler

11 Oil filter

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Removing oil pump

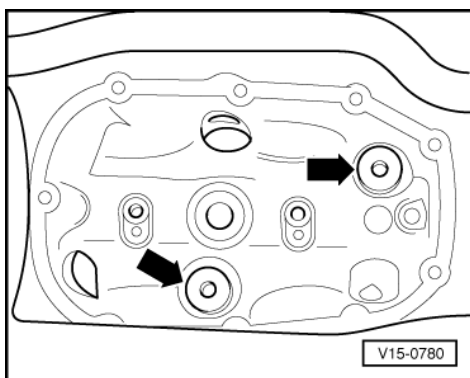
Note:



If there are irregular valve noises which stop after the car is driven for a long time, but recur repeatedly during short trips, replace the oil retention valves.

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- Pull out oil dipstick, drain engine oil and remove upper and lower section of oil sump.
- Remove toothed belt =>Page 12
- -> Remove toothed belt tensioning roller (45 Nm) and idler wheel (20 Nm) from oil pump. Unbolt screw plug (30 Nm).
- Unbolt oil pump (10 Nm).



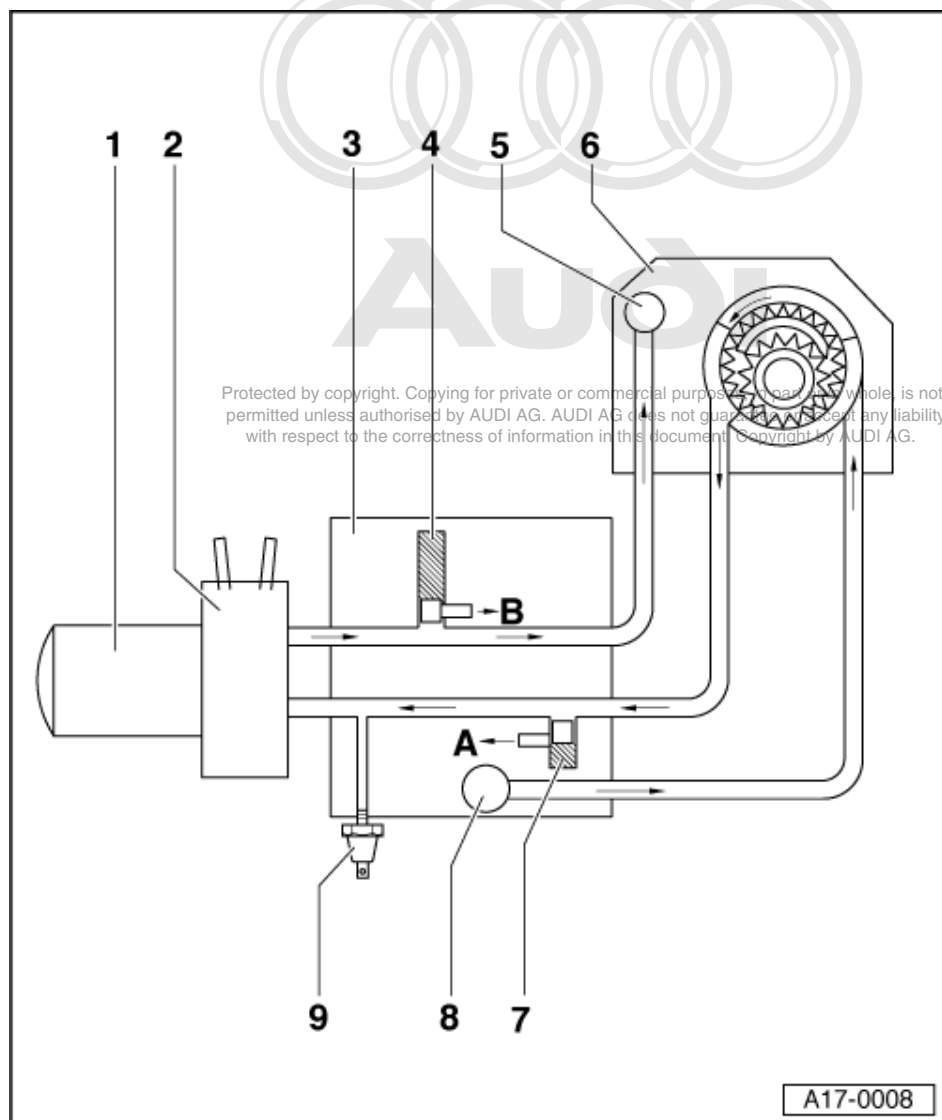
Replacing oil retention valves

Note:

When installing the oil pump ensure that the driver on the crankshaft engages in the oil pump.

- Remove intake manifold (20 Nm) and remove cover below intake manifold (10 Nm).
- -> Replace oil retention valve (25 Nm).

1.3 - Changed oil circuit



Notes:

- ♦ Alterations in comparisons to previous V6
- ♦ Changed components can only be used with this engine

- 1 Oil filter
 - Outer dimensions larger
- 2 Oil cooler
 - Flow cross-section larger
- 3 End cover for oil sump, new
- 4 Pressure relief valve, new
- 5 Oil supply to engine
- 6 Oil pump, new
- 7 11 bar pressure relief valve, new
- 8 Oil intake, new
- 9 Oil pressure switch 1.8 bar brown
 - Checking =>Page 56

- ### 1.3 - Changed oil circuit 55

1.5 - Checking oil pressure switch and oil pressure

Note:

Function test and repair of optical and acoustic oil pressure display:

Visual and acoustic oil pressure indicator

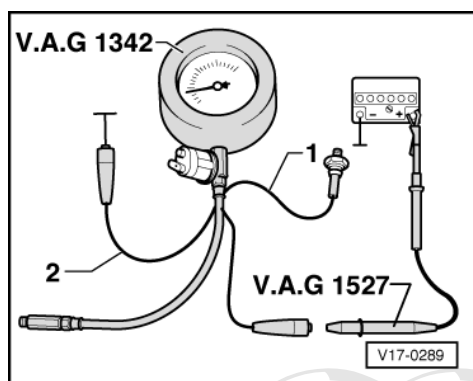
=> Current Flow Diagrams, Electrical Fault-finding and Fitting Locations

Test requirements

- Oil level OK
- Oil pressure warning lamp (K3) must light with ignition switched on.
- In vehicles with auto check system display OK must illuminate (call up symbol).
- Engine oil temperature approx. 80 °C (vent for radiator must have run once).

Checking oil pressure switch.

- Disconnect wire from oil pressure switch.



- -> Unbolt oil pressure switch and screw in oil pressure testing device V.A.G 1342.
- Connect wire -2- (brown) to earth (-).
- Connect wire -1- (blue) to oil pressure switch.
- Attach diode test lamp V.A.G 1527 to line -1- and battery positive (+).
- Start engine and gradually raise rpm. At 1.6 ... 2.0 bar overpressure the LED lamp must be illuminated, otherwise replace 1.8 bar oil pressure switch.

Function of dynamic oil pressure warning system

Testing warning lamp

After ignition on (terminal 15 on) and engine not running the oil pressure warning lamp flashes (not in vehicles with auto checking system).

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Warning criteria:

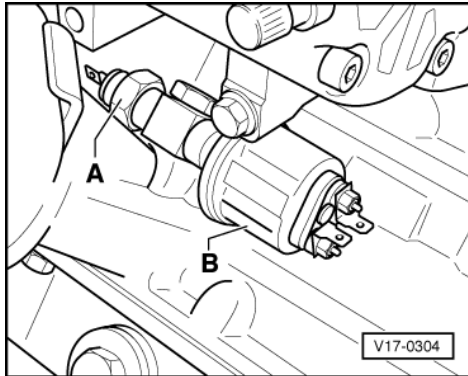
Engine not running; oil pressure switch closed.

Coolant temperature higher than 60°, engine speed higher than 1500 rpm and oil pressure switch opened.

Coolant temperature lower than 60°, engine speed higher than 300 rpm and oil pressure switch opened.

With engine speed higher than 5000 rpm an active oil warning does not go out, independent from condition of oil pressure switch.

If the voltage supply of the control unit is OK (terminal 15) and if oil pressure switch above 1500 rpm is opened for longer than 0.5 s during engine running this occurrence is stored. If this condition occurs three times during "terminal 15 on" the warning becomes or remains active even below 1300 rpm.



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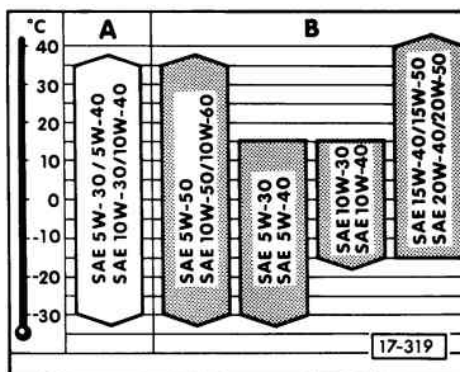
Check oil pressure

- -> Unbolt oil pressure switch and screw in V.A.G 1342 (oil pressure sender is not installed in A4).
- Screw oil pressure switch into V.A.G 1342.
- Start engine.
- Engine oil temperature at least 80 °C.
 - Oil pressure at idling speed 1 to 2.5 bar
 - Oil pressure at 3000 rpm 3 to 5 bar

1.6 - Engine oil

At the factory a special quality multiple-use oil is used to top up the tank, which can be used throughout the year except in extremely cold climate zones.

The specific stated here must be indicated individually or together with other specifications on the container.



When topping up, different types of oil may be mixed if necessary.

-> The viscosity classes of the oil must be selected according to illustration. If the outside temperature briefly exceeds the ranges stated it is not necessary to change the oil.

- A - Multiple application high lubricity oils, specification VW 500 00 1)
- A - Multiple application high lubricity oils, specification VW 501 01 1)
- A - Multiple high lubricity oils, specification API-SF 2) or SG 2)



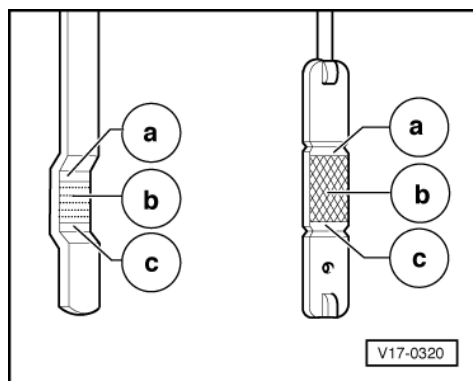
- 1) The date behind this VW standard must not be older than 10.91.
- 2) These oils may only be used when no approved engine oil is available.

1.7 - Check oil level

The vehicle must be standing on level ground when checking the oil level. Wait a few minutes after switching off the engine to allow the oil to flow back into the sump. Then pull out dipstick, wipe with a clean cloth and insert it again as far as it will go. Pull out dipstick again and read off oil level.

Carry out oil level check only with warm engine (oil temperature higher than 60 °C).

-> Marking area on oil dipstick:



a - Oil must not be topped up.

b - Oil can be topped up.
It can happen that the oil level is then in area -a-.

c - Oil can be topped up.
It is sufficient that the oil level is then somewhere within measuring range -b- (ribbed area).

Notes:

- ♦ The oil level may not exceed the maximum marking of oil dipstick.
- ♦ Amount for topping up oil: current values in =>Binder "Exhaust Emission Test"

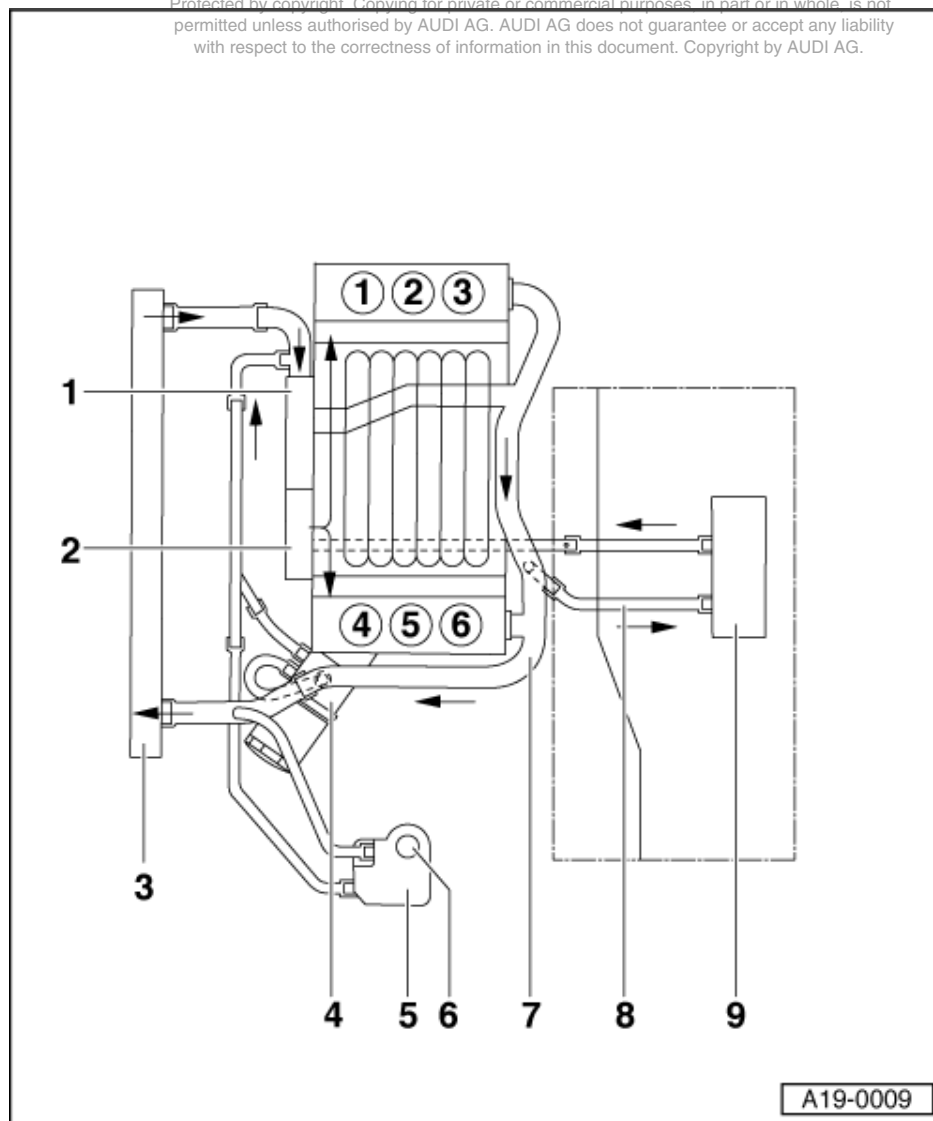
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19 - Cooling system

1 - Removing and installing parts of the cooling system

1.1 - Removing and installing parts of the cooling system

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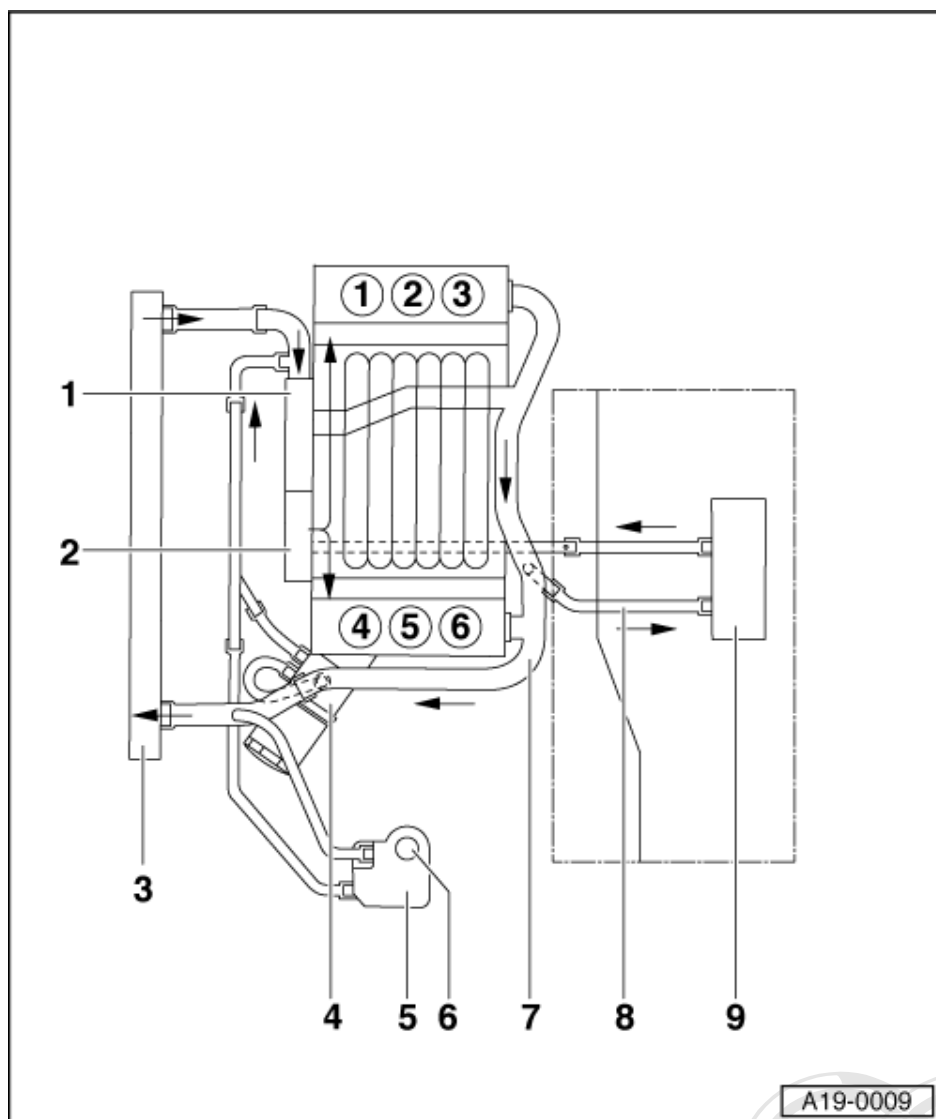


Note:

- ◆ Renew all gaskets and seals.
- ◆ Drain coolant and top up => Page 63
- ◆ Check coolant system for leaks => Page 65
- ◆ Do not remove toothed belt to remove thermostat.
- ◆ The arrow markings on the coolant pipes and on the ends of the hoses must be aligned with each other.
- ◆ Tightening torque for hose clamps of coolant hoses 3 to 3.5 Nm.

1 Thermostat

2 Coolant pump

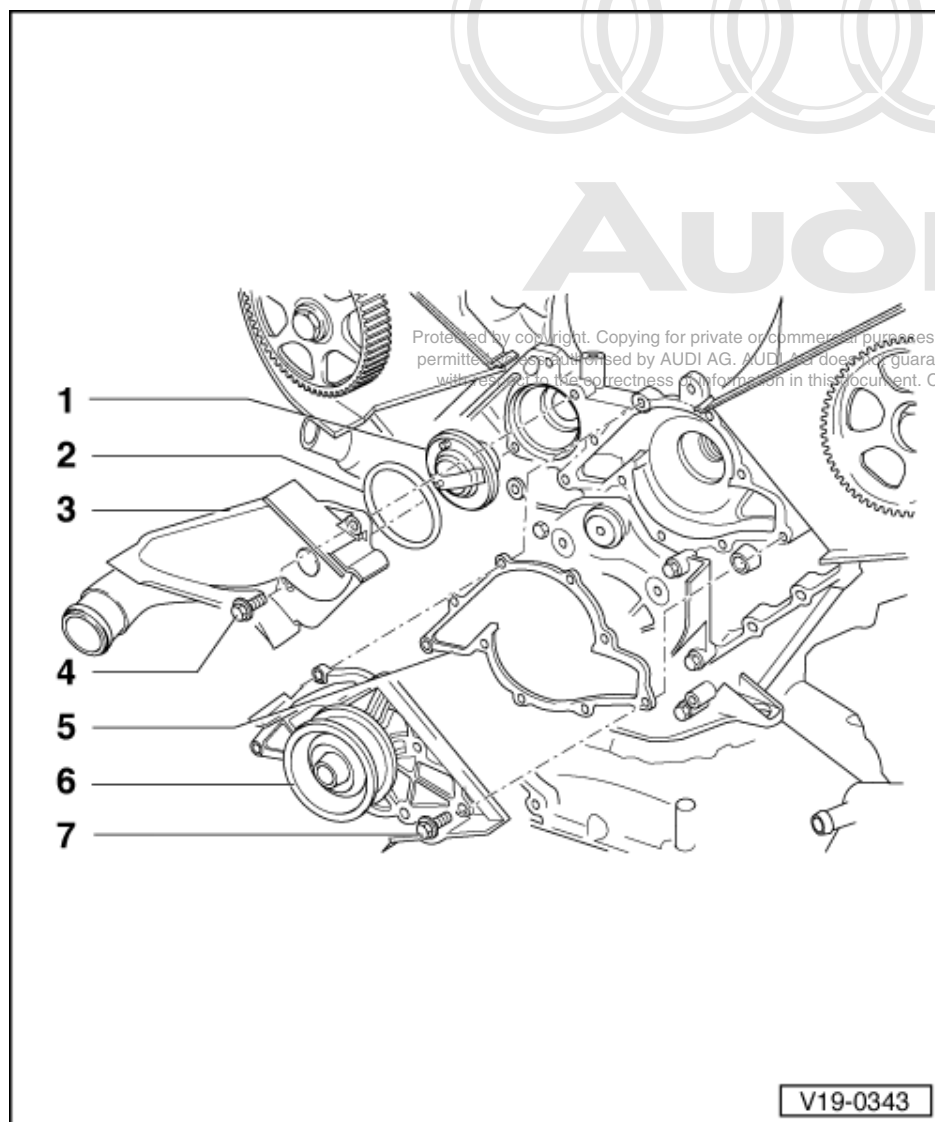


- 3 Radiator
- 4 Oil cooler
- 5 Expansion tank
- 6 Cap
 - ♦ Checking =>Page 66
- 7 Coolant pipe
- 8 Feed pipe to heat exchanger
- 9 Heating system heat exchanger
- 10 Vent bore in return pipe from heating exchanger



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1.2 - Removing and installing coolant pump



Note:

- ♦ Renew all gaskets and seals.
- ♦ Drain coolant and top up => Page 63
- ♦ Check coolant system for leaks => Page 65

1 Thermostat

- ♦ Replacing =>Page 62
- ♦ Start of opening => Page 62

2 Sealing ring

- ♦ Replace

3 Coolant thermostat housing

4 10 Nm

5 Gasket

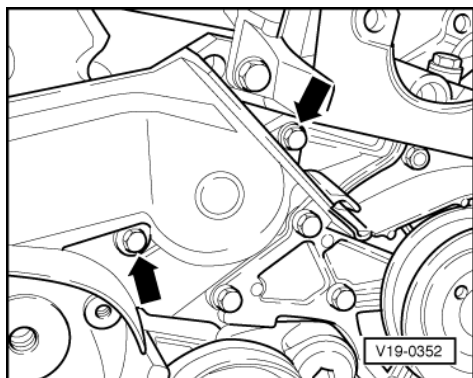
6 Coolant pump

- ♦ Removing and installing ribbed belt =>Page 17
- ♦ Removing and installing toothed belt =>Page 12

7 10 Nm



1.3 - Removing and installing cooling system thermostat

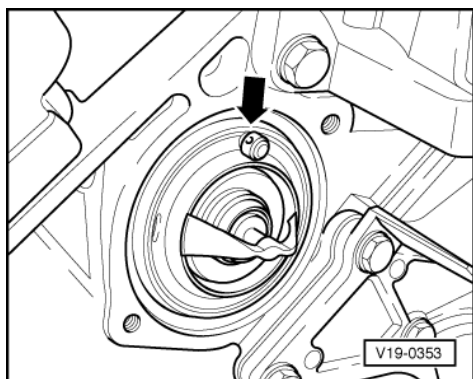


Removing and installing ribbed belt =>Page 17

Tensioning toothed belt =>Page 19

- -> Unbolt housing for thermostat and carefully pull out from underneath the toothed belt.

1.4 - Thermostat, installation position



- -> The vent hole must be installed upwards.
- Start of opening 87 °C
- End of opening 102 °C
- Opening stroke 8 mm

1.5 - Checking thermostat -F54 for coolant vent

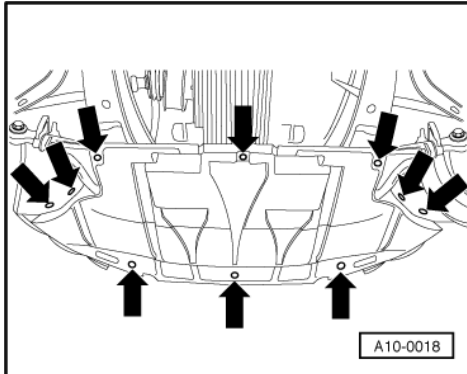
The thermostat is below left in radiator.

PIN assignment 3-pin	Switching temperature	
	on	off
1 = 1st Stage	92 to 97 °C	approx. 84 °C
2 = 2nd Stage	90 to 105 °C	approx. 91 °C

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3 = plus feed pipe		
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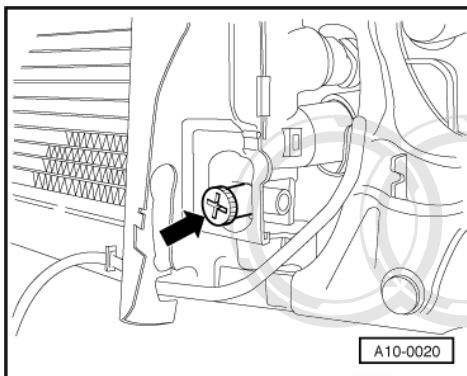
1.6 - Draining and filling cooling system



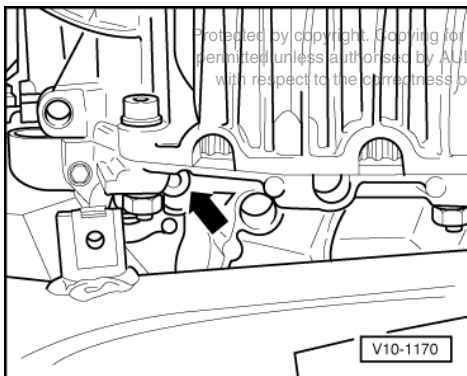
Draining

Notes:

- ◆ When the engine is warm the cooling system is under pressure. If necessary release pressure before commencing repair work.
- Remove cap from coolant expansion tank.
- -> Remove noise insulation.



- -> Drain off coolant at radiator.
- Pull out retainer for coolant pipe connecting flange at the bottom of the radiator and pull off the connecting flange.



- -> Drain drain plug on engine -arrow- with special tool 3247.



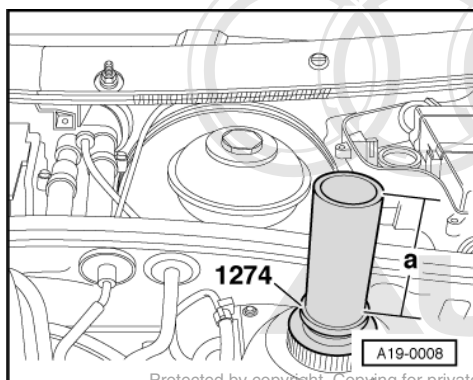
fill up

Note:

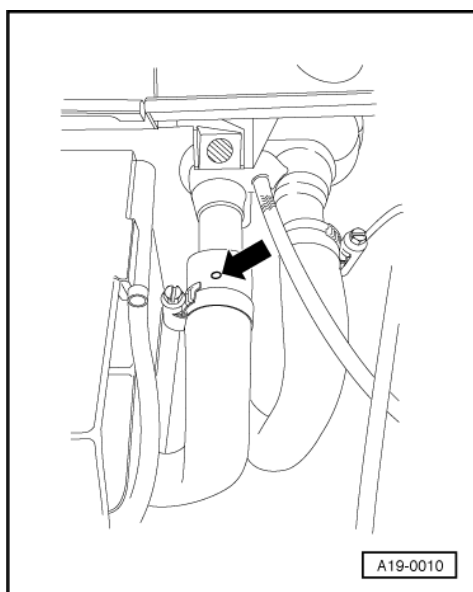
- ♦ The cooling system is filled all year round with a mixture of water and G 011 A8 C combined anti - freeze and corrosion protection agent. G 011 A 8 C and coolant additives with the note "according to TL VW 774 C" prevent frost and corrosion damage, limescale and also increase the boiling point of the coolant. For these reasons the cooling system must be filled all year round with the correct anti freeze and anti corrosion additive. Because of its high boiling point, the coolant improves engine reliability under heavy loads, particularly in countries with tropical climates.
- ♦ If radiator, heat exchanger, cylinder head or cylinder head gasket is replaced, do not reuse old coolant.
- ♦ Coolant quantity approx. 8.5 l
- ♦ Recommended mixture ratio: 40:60

Frost protection to	Anti-freeze-part1)	G 112)	Water2)
-25 °C	40 %	2.5 l	3.5 l
-35 °C	50 %	3.0 l	3.0 l

- 1) Anti-freeze must not exceed 60 %; anti-freeze and coolant effectiveness decrease with higher part.
- 2) Coolant quantity may vary depending upon the vehicle equipment.



- Close drain plug on engine block and on radiator lower left.
- Push connection flange of coolant hose on bottom of radiator, attach safety for connection flange.
- -> Attach connection with expansion tank, adapter V.A.G 1274/1 and extend by $\varnothing 42$ mm 100 mm with auxiliary hose.



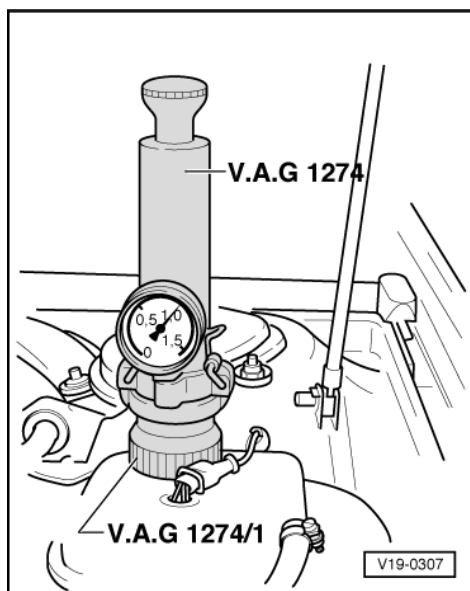
- -> Open hose clamp, pull back coolant hose back until the vent bore is no longer covered by connections.
- Open vent bolt on coolant pipe in the area below the expansion tank.
- Pour in coolant until it flows out at the bleeder screw, then tighten screw to 15 Nm. Top up coolant until it emerges on vent bore.
- Push on coolant hose and tighten.
- Close filler cap on expansion tank.
- Heater/air conditioner position Hot
- Start engine and maintain engine speed at approx. 2000 rpm for about 3 minutes.
- Leave engine idling until lower radiator connection becomes hot.

Warning!

When opening expansion tank hot steam can escape, cover sealing cap with cloths and open carefully.

- Check the coolant level in expansion reservoir and top up to the max. marking, if necessary.
- Stop engine.

1.7 - Checking cooling system for leaks



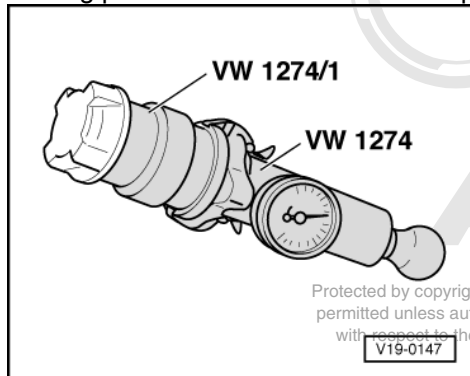
Only carry out when engine is warm.

Warning!

When opening expansion tank hot steam can escape, cover sealing cap with cloths and open carefully.

- -> Attach test unit VW 1274 with adapter VW 1274/1 to expansion tank.
- Produce overpressure of approx. 1.0 bar with hand pump of test device. If this pressure is not maintained, locate and rectify leaks.

Testing pressure relief valve in filler cap.



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- -> Screw sealing cap onto test unit with adapter.
- With hand pump overpressure of 1.2 to 1.5 bar the overpressure valve must open.



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20 - Fuel supply system

1 - Removing and installing parts of fuel supply system

1.1 - Removing and installing parts of fuel supply system

Follow the safety instructions => Page 67 .

Observe cleanliness rules => Page 67 .

Adjusting accelerator cable => Page 75

Notes:

- ◆ Connect hose connections with bolt, spring straps or spring-strap clips.
- ◆ Always replace collar-strap clips with spring strap or screw-type clips.

1.2 - Rules for cleanliness

When working on the fuel supply/injection system, pay careful attention to the following 5 cleanliness rules:

- ◆ Thoroughly clean all unions and the adjacent areas before disconnecting.
- ◆ Place removed parts on a clean surface and cover. Use lint-free cloths.
- ◆ Carefully cover or seal open components if repairs cannot be carried out immediately.
- ◆ Only install clean components:
Only remove replacement parts from packaging immediately prior to installation.
Do not use parts that have been stored loose (e.g. in toolboxes etc.).
- ◆ When the system is open:
Do not work with compressed air if this can be avoided.
Do not move vehicle unless absolutely necessary.

1.3 - Safety precautions when working on the fuel supply system

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When removing and installing the sender for fuel gauge or the fuel pump (fuel pumping unit) from topped up or partly topped up fuel containers the following must be observed:

- ◆ Before commencing work, switch on exhaust extraction system and place an extraction hose close to the sender opening in the fuel tank to extract escaping petrol fumes.
If no exhaust suction system is available a radial vent (engine is outside of the air flow) with a delivery volume greater than 15 m³/h.
- ◆ Avoid skin contact with petrol. Wear fuel-resistant gloves.

1.4 - Removing and installing sealing flange and sender for fuel gauge

Observe the safety instructions =>Page 67

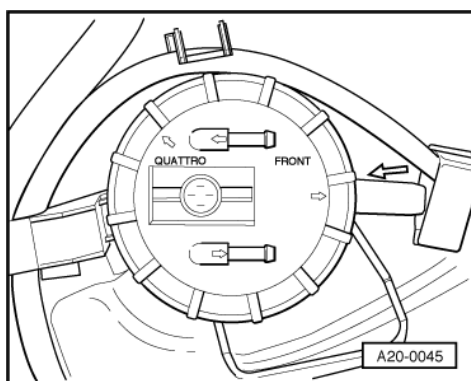
Cleanliness rules =>Page 67



Removing

Notes:

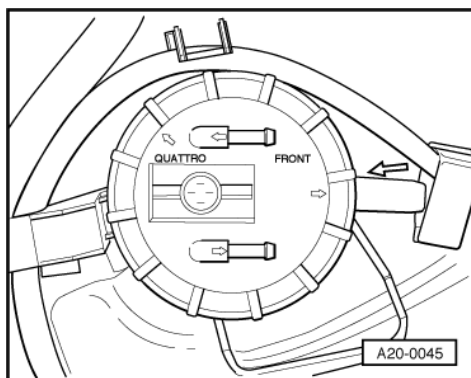
- ♦ Ask customer for radio anti-theft code.
- ♦ The fuel tank should not be more than two-thirds full.
- Disconnect battery earthing strap.
- Remove cover for sealing flange from below boot trim.
- Pull off connector from sealing flange.



- -> Pull off return pipe Blue and feed pipe.
- Use special tool 3217 to open locking ring.
- Carefully pull out sealing flange and set aside.
- Unclip sender for fuel gauge and remove.

Installing:

- Install in reverse order.



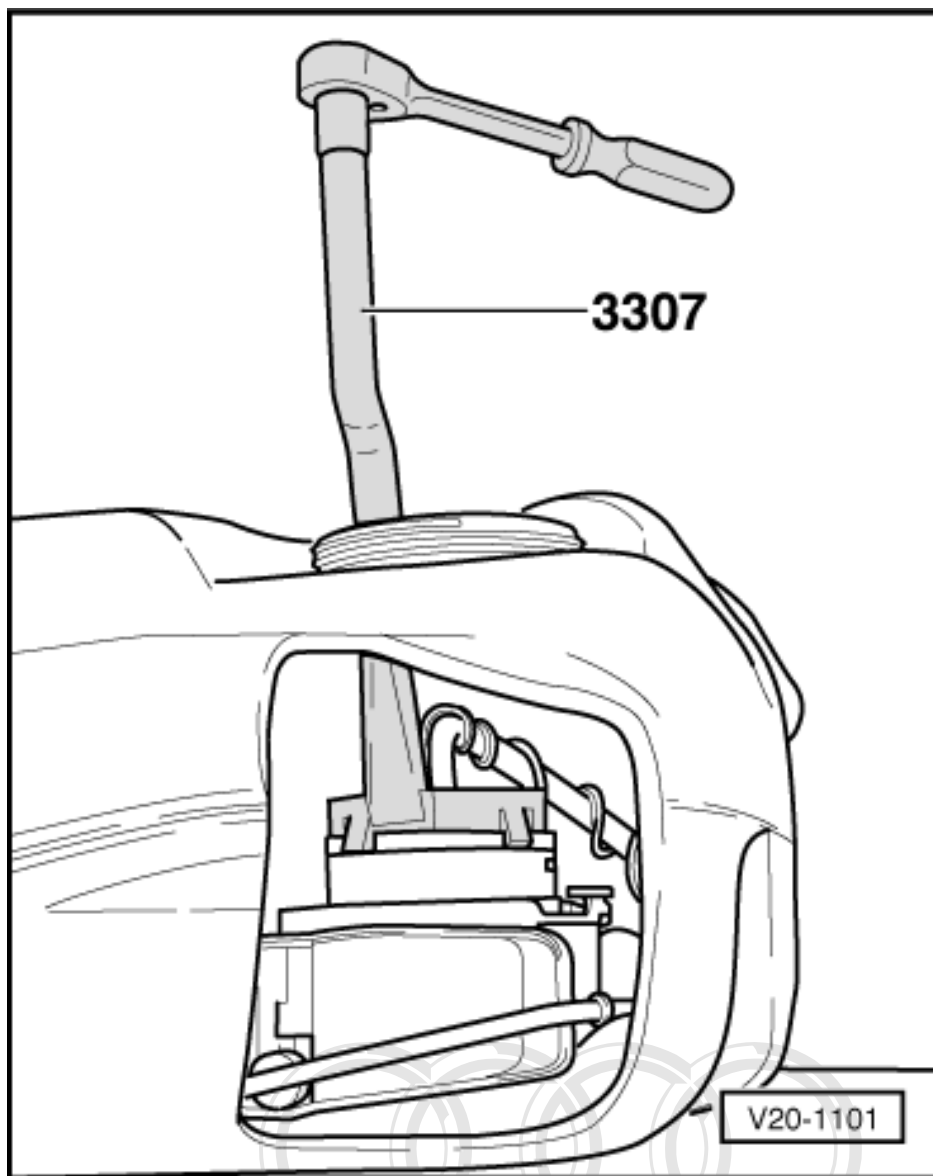
- With vehicles with front wheel drive elec. cable for sender fuel gauge must be routed between return pipe and fuel tank housing.
- In vehicles with 4 wheel drive elec. cable for sender fuel gauge must be routed between suction pump line and fuel tank housing.
- -> When installing the sealing flange ensure that both arrows point exactly towards each other.
 - Front and Quattro have one arrow each.



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1.5 - Removing and installing fuel delivery unit

Removing



Observe the safety instructions => Page 67 .

Cleanliness rules =>Page 67

Removing and installing sealing flange =>Page 67

Removing

- -> Insert special tool 3307 through fuel container opening and attach at baffle housing
- Turn inner section of baffle housing with key 3307 by approx. 15° towards left and remove fuel pump with inner section of baffle housing.

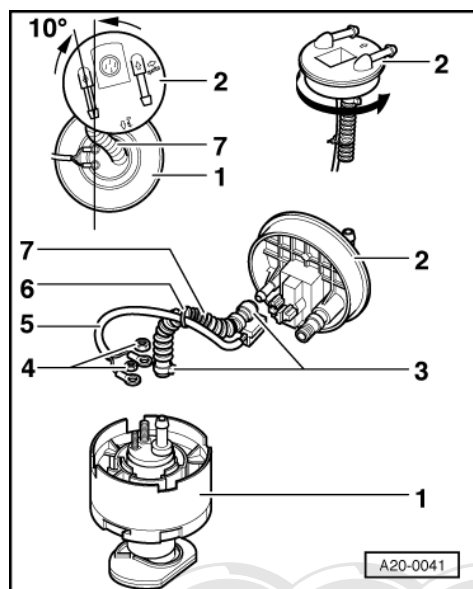


Installing

Installing the fuel pump is carried out in reverse order of removal.

Notes:

- ♦ Moisten flange seal with fuel when fitting.
- ♦ Installation position of sealing flange => Page 68



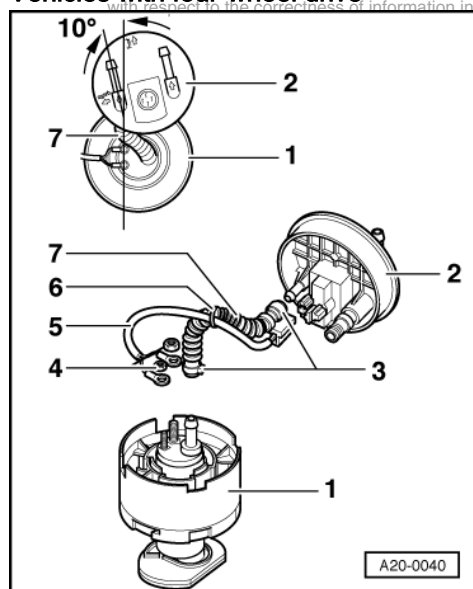
Vehicles with front-wheel drive

- -> Twist hose -7- and elec. line -5- into the position as illustrated above. When installing turn sealing flange in direction of arrow as shown in top right in illustration.
- -3- Press together with pliers V.A.G 1275.
 - 1 Baffle housing
 - 2 Sealing flange
 - 3 Clamps
 - 4 Fixing bolt
 - 5 Elec. wire
 - 6 Cable ties
 - 7 Hose

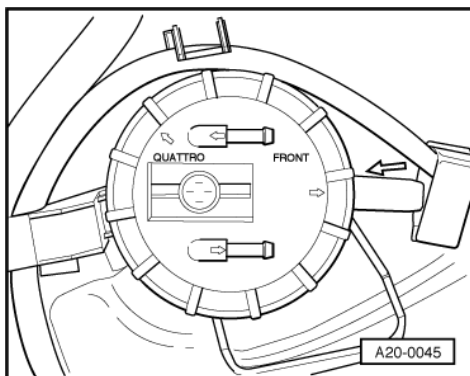
- Elec. cable for sender fuel gauge must be routed between return pipe and fuel tank housing.

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Vehicles with four-wheel drive



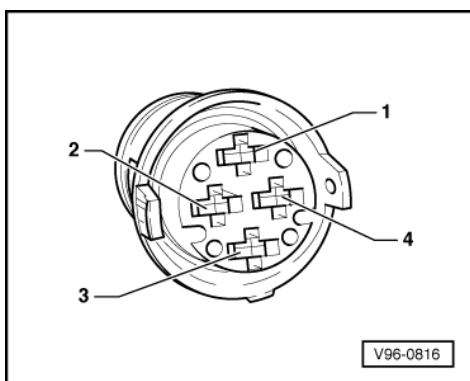
- -> Twist hose -7- and elec. wire -5- into position as shown in upper left part of illustration.
- Press clamps -3- together with clamping pliers V.A.G 1275.
 - 1 Baffle housing
 - 2 Sealing flange
 - 3 Clamps
 - 4 Fixing bolt
 - 5 Elec. Wire
 - 6 Cable ties
 - 7 Hose
- Install baffle housing with sealing flange into tank.
- Elec. cable for sender fuel gauge must be routed between suction pump pipe and fuel tank housing.



- -> Turn sealing flange towards left until arrows face each other.

1.6 - Test fuel pump

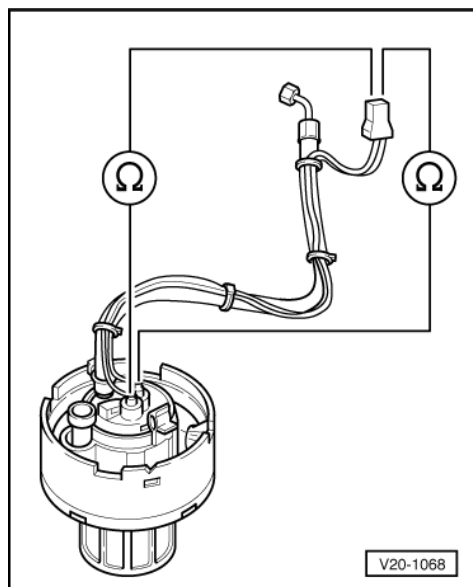
- Battery voltage OK.
- Fuse 28 in fuse carrier OK
- Check voltage supply to terminal 28 => Workshop Manual
- Audi A4 1995 ä
- MPI Injection and ignition system
- Edition 11.94
- Engine code AAH,
- Repair Group 24.
- Power supply OK.



- Remove cover for fuel gauge and fuel pump from below rear right of rear boot trim.
- Pull off connectors for fuel pump and fuel gauge.
- Supply voltage to fuel pump via final control diagnosis function 03.
- -> Check voltage at connector with voltage meter between terminal 1 (green) and 4 (brown).

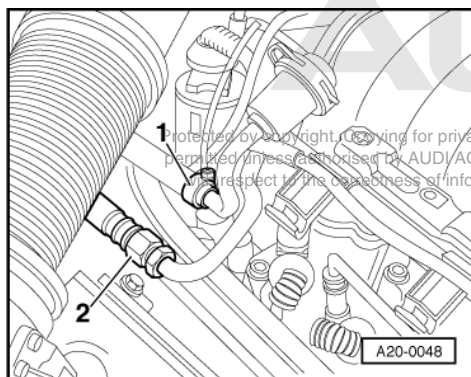
Specified value: Approx. battery voltage

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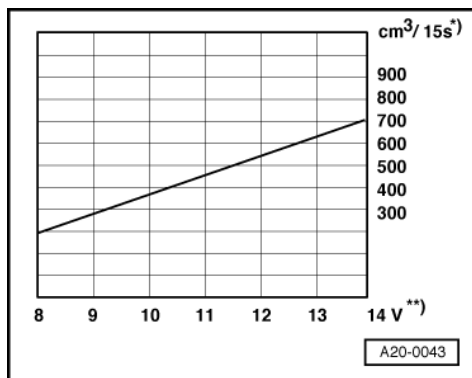
- If specified value is attained, reattach connector.
- -> Check pipe between connector (on exterior of housing), electric connection and fuel pump with ohmmeter for through flow.
- Through flow OK, replace fuel pump => Page 69 .
- Install cover for fuel gauge and fuel pump from below rear boot trim.

1.7 - Check fuel pump delivery rate



Test requirements

- Fuse 28 in fuse carrier OK
 - Relay in relay position 6 OK
 - Fuel filter OK
 - Battery fully charged.
- > Separate return line -1- from bulkhead and hold into measuring container.
Connect remote control V.A.G 1348/3A with auxiliary line V.A.G 1348/3.2 to fuse 28 + attach line to battery.



- -> Check delivery rate. For this purpose, switch on switch of remote control V.A.G 1348/3 A for 15 seconds (continuously press head).

Take specific values from diagram.

font=symbol charset=fontspecific code=042Minimum capacity cm³/15s.

font=symbol charset=fontspecific code=042font=symbol charset=fontspecific code=042Voltage at fuel pump with engine standstill and running pump (approx. 2 V lower than battery voltage).

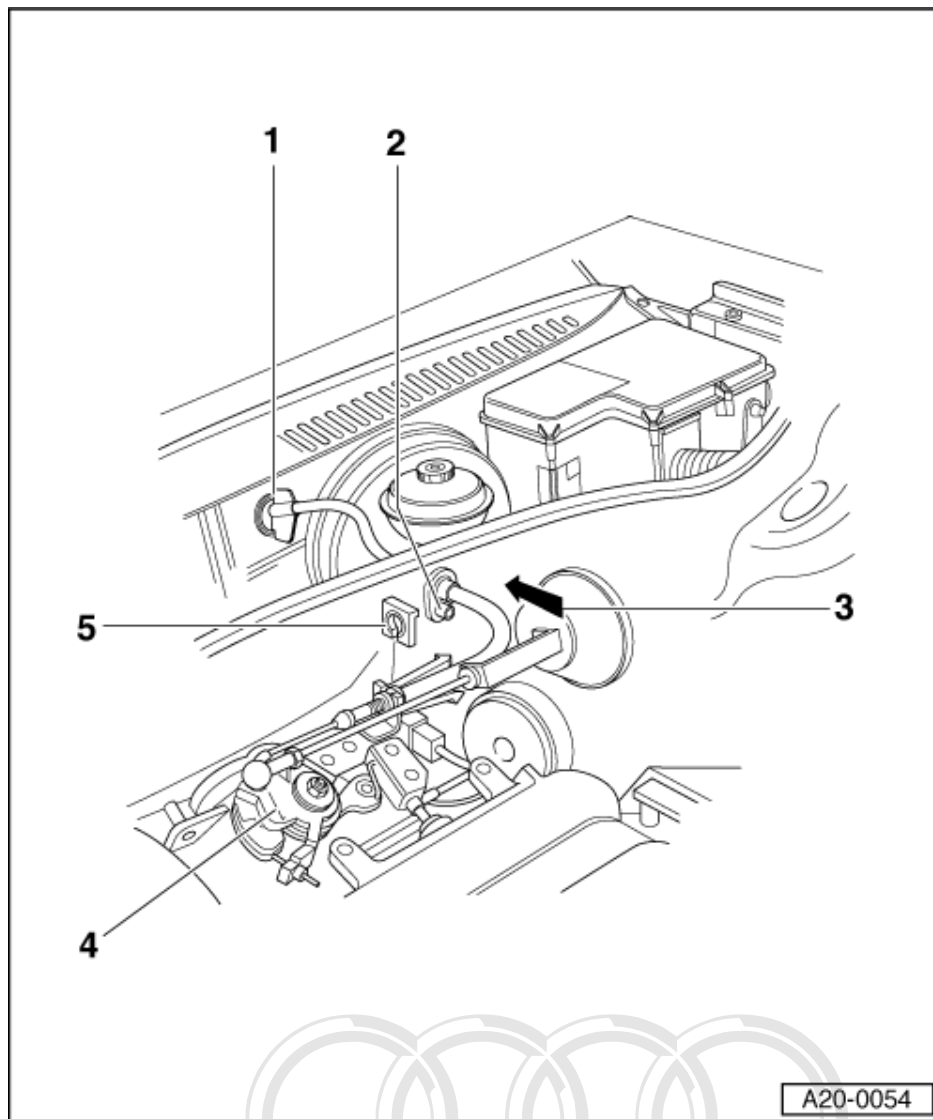
1.8 - Testing check valve of fuel pump

=> Injection and ignition system; Repair group 24

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1.9 - Servicing accelerator mechanism



1 Throttle cable attachment

- ♦ Removing and installing => Page 75

2 10 Nm

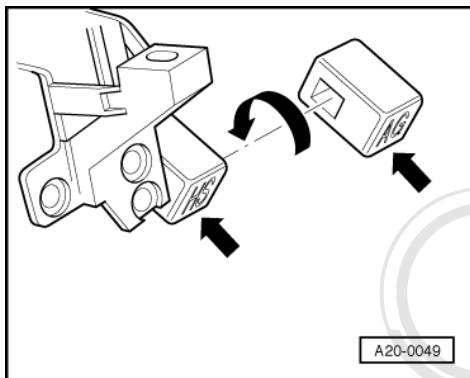
3 Installation direction of acceleration cable

4 Cam plate

- ♦ Adjusting =>Page 75

5 Retainer clip for accelerator cable

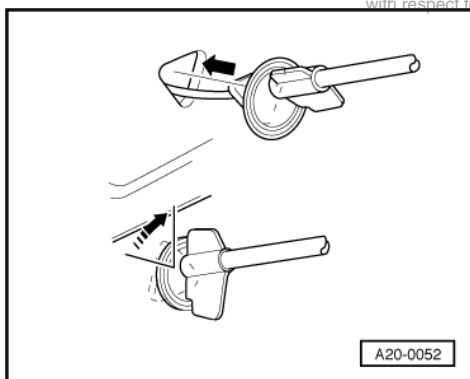
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-> Installation position of buffer stop

- ◆ 1 - HS = manual gearbox (hand shift)
- ◆ 2 - AG = automatic gearbox
- Marking -HS- or -AG- must be readable.

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-> Attachment of accelerator cable sleeve

- Push accelerator cable through bulkhead, push accelerator cable into bulkhead and turn anti-clockwise by approx. 90°

Adjust throttle cable

Notes:

- ◆ The throttle cable is very sensitive to kinking and must therefore be handled carefully when installing. A single slight kink can cause it to break when driving. Bent cables must not be installed.
- ◆ When installing ensure that the accelerator cable is aligned between its support bearings and the cable attachment points.
- Pull off guard for accelerator cable to throttle valve unit.
- Depress accelerator pedal into full throttle position.

Note:

This requires a second mechanic or it must be supported with spring rod against steering wheel.

Vehicles with manual gearbox

- Pull off accelerator cable sleeve from cam plate on throttle valve until throttle flap is fully opened.

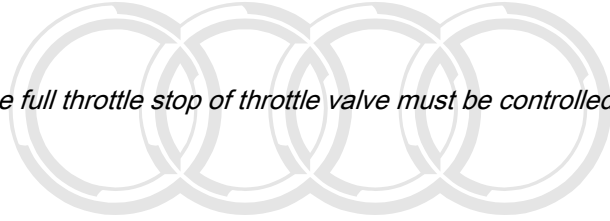


Vehicles with automatic gearbox:

- Pull back accelerator cable sleeve in full throttle position until throttle flap is fully opened and the kick down switch audibly clicks in. Hold tight
- Insert retainer clip for accelerator cable sleeve.
- Release accelerator pedal or remove spring tensioning rod.

Note:

After adjusting the idling and the full throttle stop of throttle valve must be controlled.



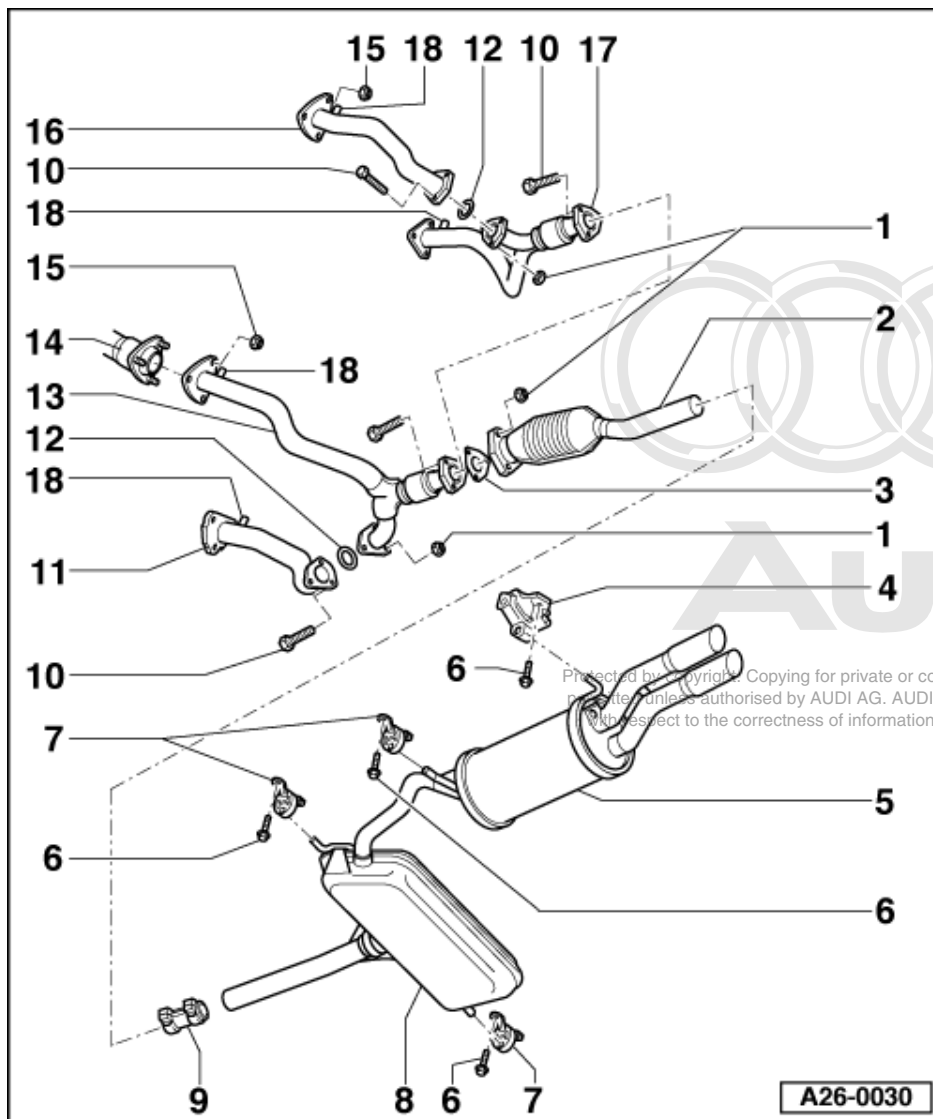
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26 - Exhaust system

1 - Removing and installing parts of exhaust system

1.1 - Removing and installing parts of exhaust system



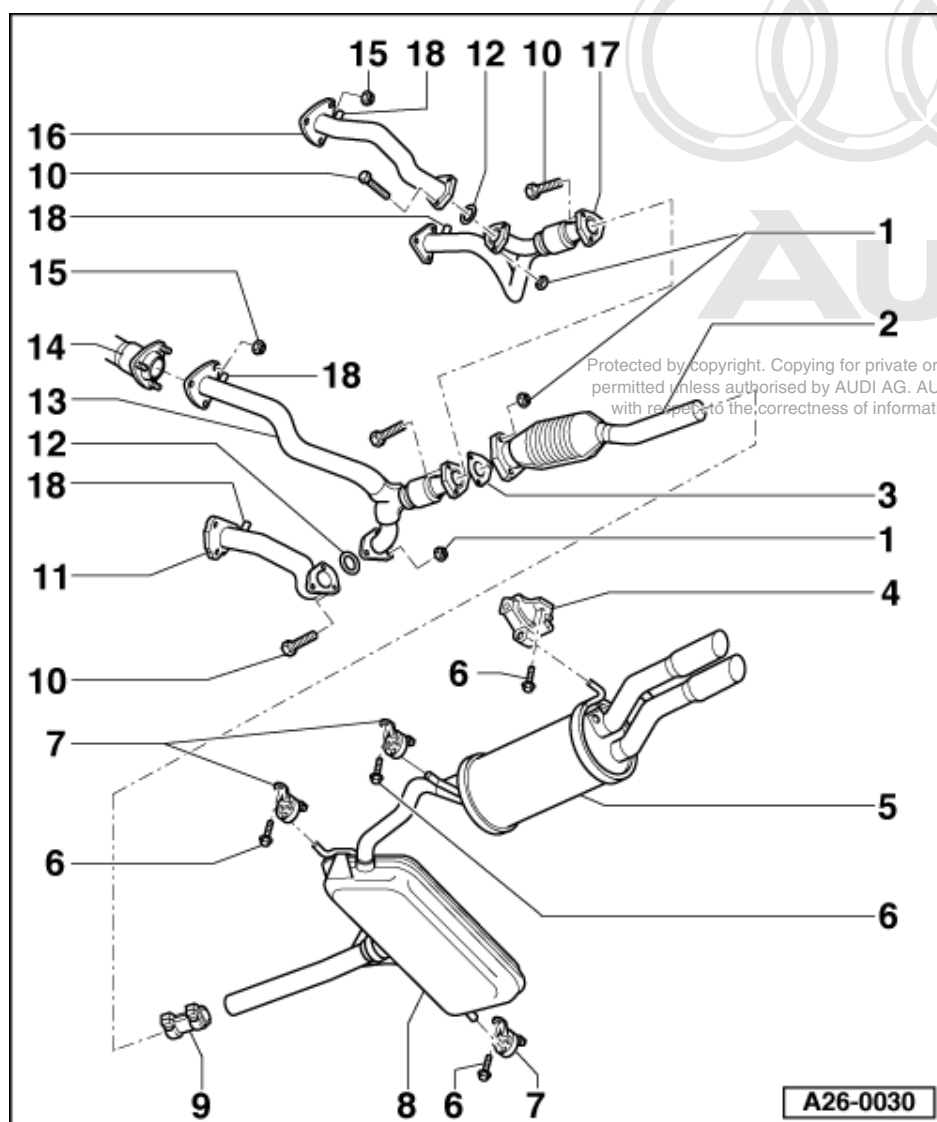
Notes:

- ◆ Always replace gaskets, locking nuts and clamping sleeves.
- ◆ Install hanger loops and bolted connections as specified in Parts Catalogue.
- ◆ Ensure that there is adequate clearance to the body.

Instructions for stress-free adjustment of exhaust systems will be supplied in a technical datasheet.

1.2 - Vehicles with front wheel drive, engine codes ABC, AAH

- 1 Lock nut, 25 Nm



2 Catalytic converter

3 Gasket

4 Retainer

When replacing retainers use lubricants, if necessary and avoid damage to the rubber.

5 Rear silencers

6 Hexagon bolt - 25 Nm

7 Retainer

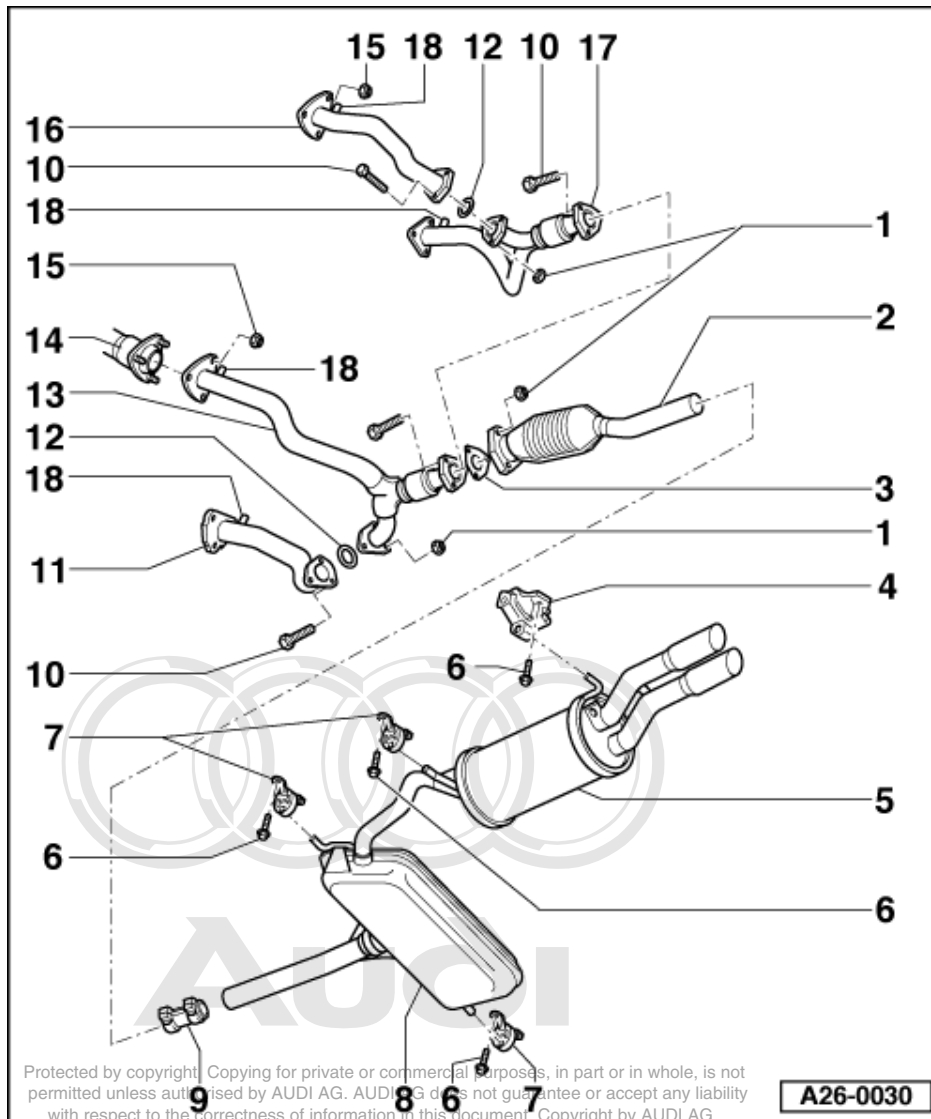
8 Centre silencers

9 Clamp 40 Nm

♦ Tighten evenly

♦ Installation position horizontally in vehicle

10 Hexagon bolt



11 Exhaust pipe front right

- ♦ For vehicles with automatic gearbox only

12 Sealing ring

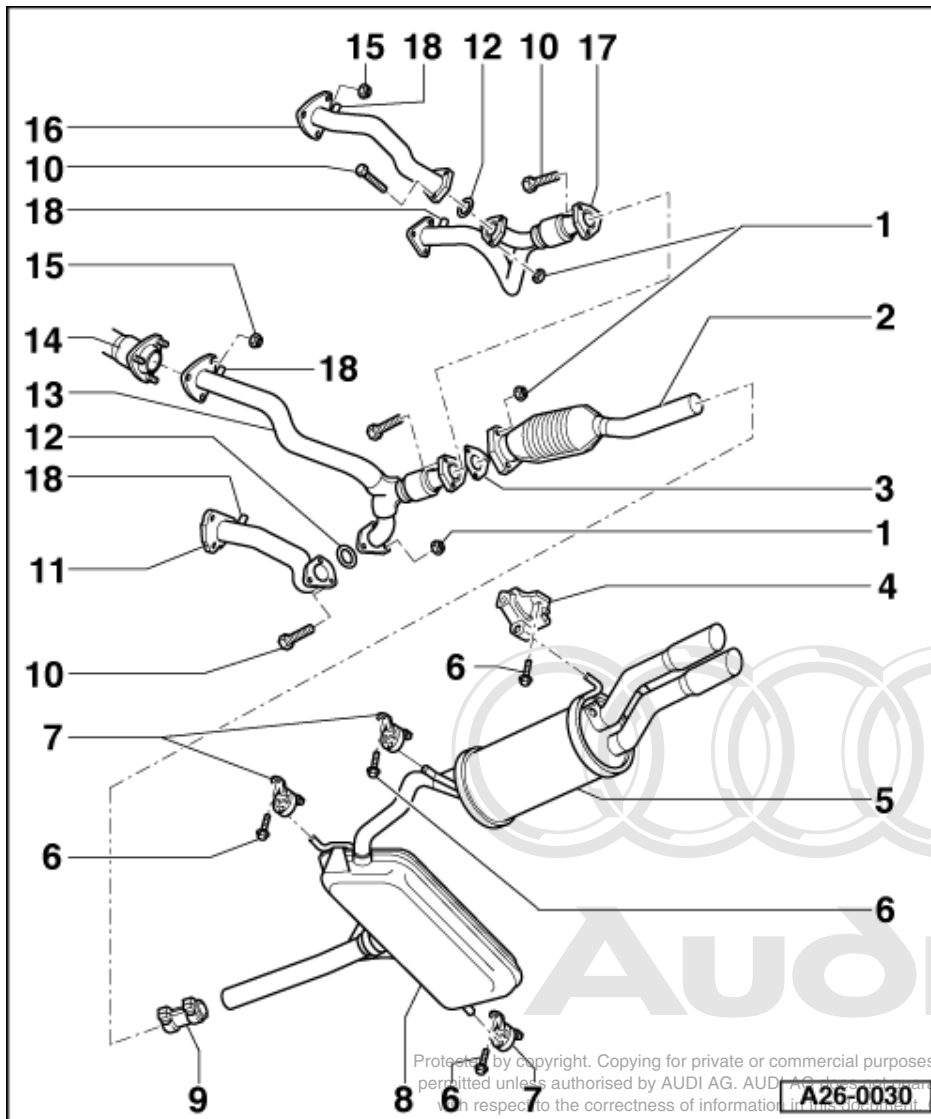
13 Front left exhaust pipe with decoupling element

- ♦ For vehicles with automatic gearbox only

Decoupling elements must be treated carefully, protect from hit-type demands and large deflections Max. deflection 10°

14 Exhaust manifold

15 Hexagon nut 30 Nm



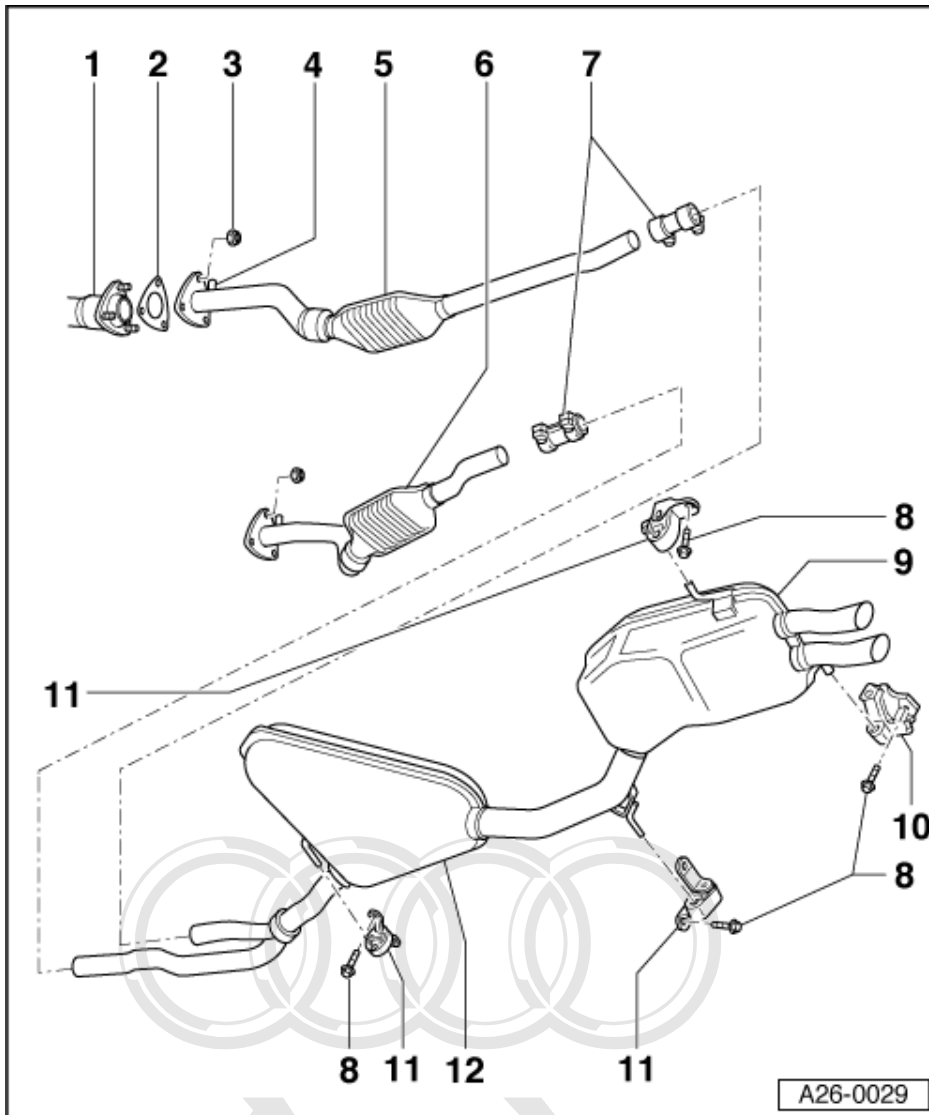
16 Exhaust pipe, front left

17 Front right exhaust pipe with decoupling element

18 Lambda probes, 50 Nm

- ♦ Checking =>Repair Group 24
- ♦ Grease thread with G5. Keep grease away from slits in probe body.

1.3 - Vehicles with four-wheel drive, engine codes ABC, AAH



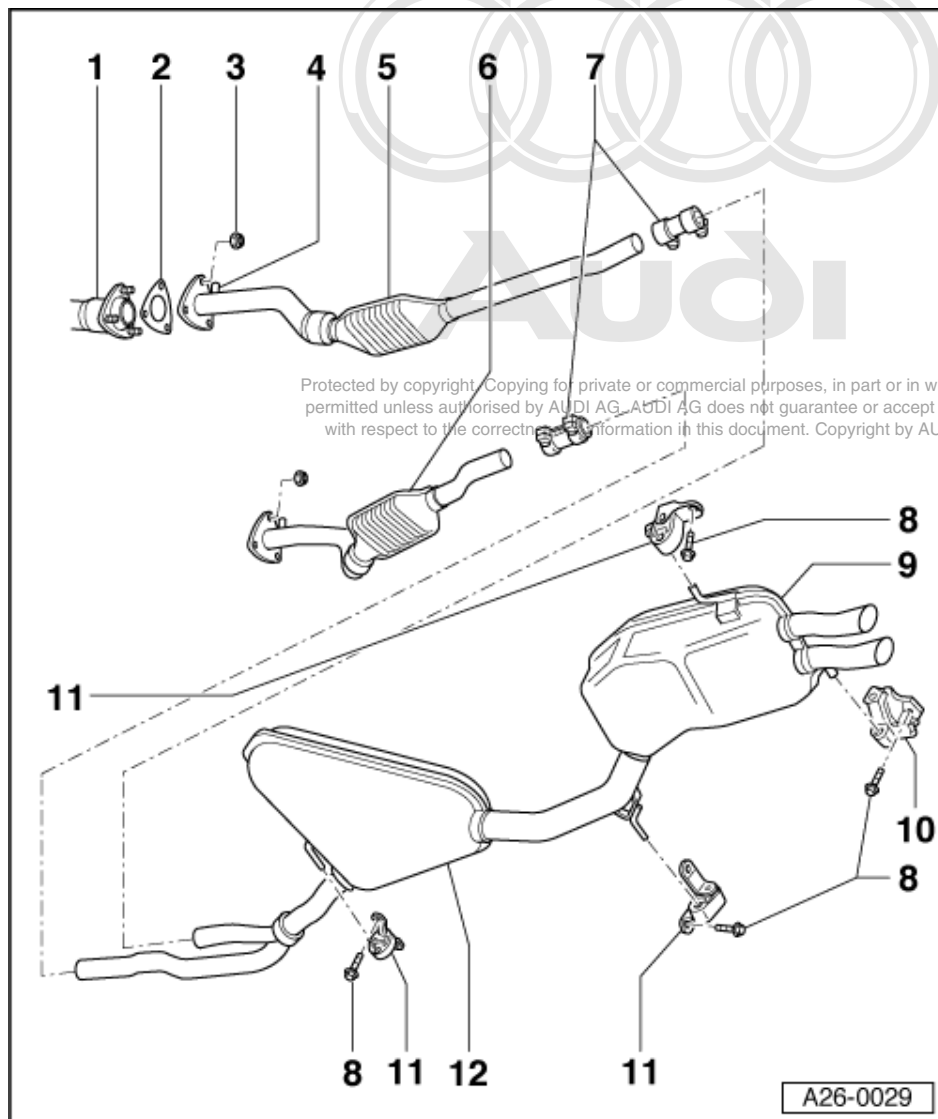
1 Exhaust manifold

2 Gasket

3 Hexagon nut 30 Nm

4 Lambda probes, 50 Nm

- ♦ Checking => Repair Group 24
- ♦ Grease thread with G5. Keep grease away from slits in probe body.



5 Left catalytic converter with decoupling element

Decoupling elements must be treated carefully, protect from hit-type demands and large deflections Max. deflection 10°

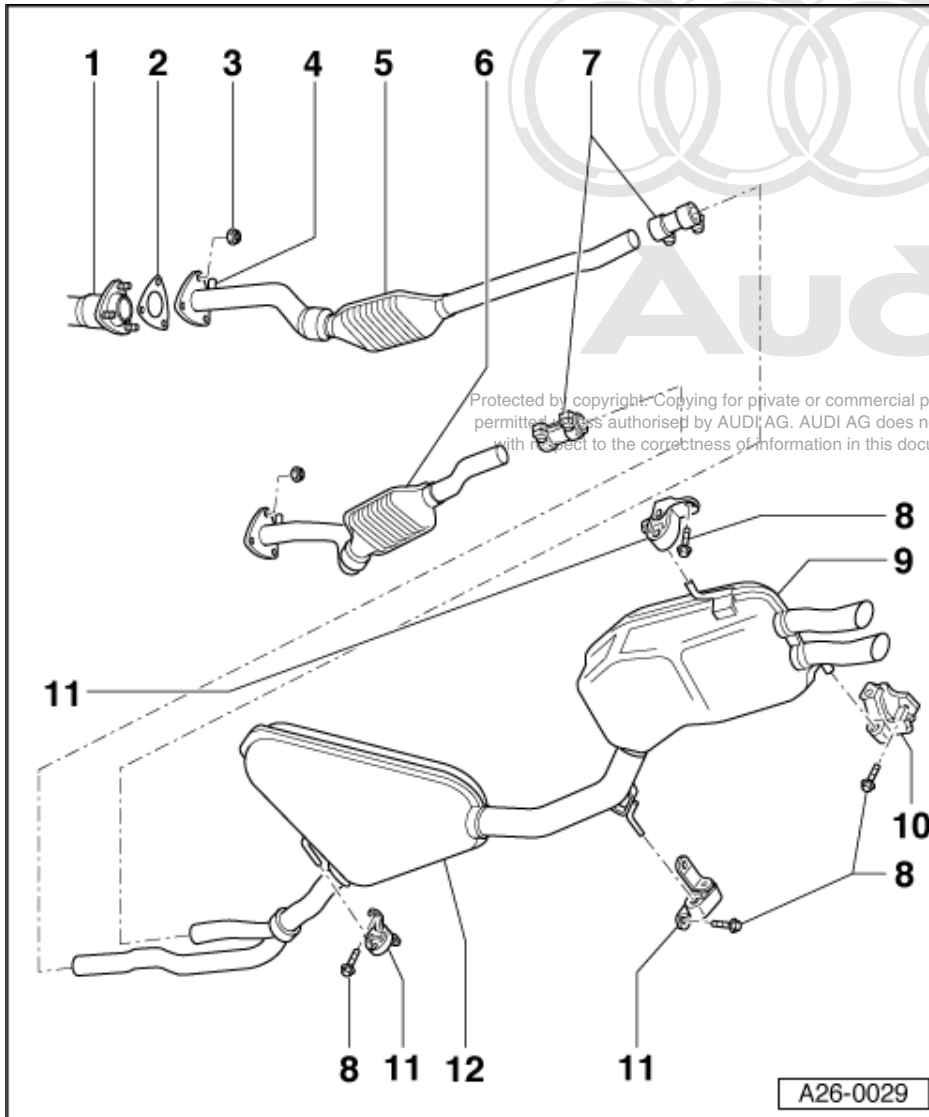
6 Right catalytic converter with decoupling element

7 Clamp 40 Nm

- ♦ Installation position horizontally in vehicle

8 Hexagon bolt - 25 Nm

9 Rear silencers



10 Retainer
11 Retainer

When replacing retainers use lubricants, if necessary and avoid damage to the rubber.

12 Centre silencer