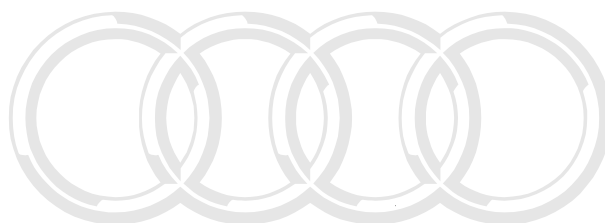


Workshop Manual Audi 80 1992 ►

Engine code	ABT	ABK								

Booklet 4 Cyl. Fuel injection engine
(2 valve), Mechanics

Edition 09.91



Audi

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Service.

List of Workshop Manual Repair Groups

Audi 80 1992 ►

Engine code	ABT	ABK											

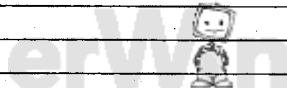
Booklet **4 Cyl. Fuel injection engine (2 valve),
Mechanics Edition 09.91**

[illegible]

Technical Information should always be available to all foremen and mechanics, because their compliance with the instructions given is essential to ensure vehicle roadworthiness and safety. In addition, the normal safety precautions to be observed when working on motor vehicles are also applicable.

The Workshop Manual is only intended for use within the Volkswagen and Audi organisation, and passing on to third parties is not permitted.

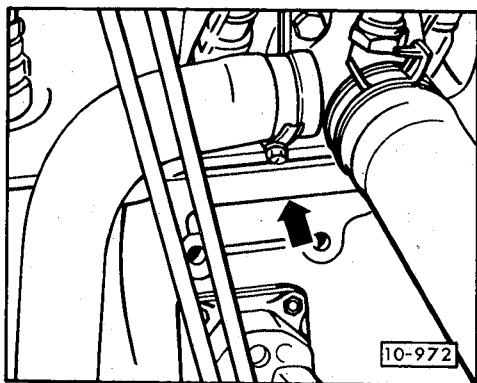
00	Technical data	Page
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	- Engine number	00-1
	- Engine characteristics	00-2
10	Removing and installing engine	Page
	Removing and installing engine	10-1
	- Tightening torques	10-9
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Servicing activated charcoal filter tank venting system	20-24
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26 Exhaust system	Page
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- Aligning exhaust system free of tension	26-3
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TECHNICAL DATA

ENGINE NUMBER

- ◀ The engine number is stamped on the left-hand side of the cylinder block.



00-1

ENGINE CHARACTERISTICS

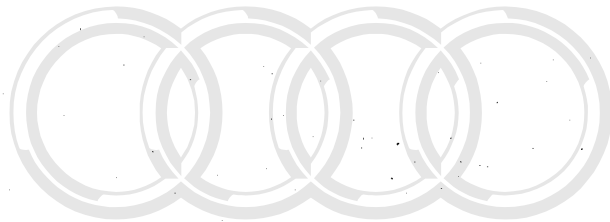
Engine code	ABT	ABK
Engine characteristics		
Manufactured from	07/91	07/91
Displacement ltr.	2.0	2.0
Output kW/rpm	66/5400	85/5400
Torque Nm/rpm	148/3000	166/3200
Bore dia. mm	82.5	82.5
Stroke mm	92.8	92.8
Compression ratio	8.9	10.5
Valve timing for 1 mm valve lift:		
Inlet opens after TDC	11°	11°
Inlet closes after BDC	50°	50°
Exhaust opens before BDC	37°	37°
Exhaust closes after TDC	2°	2°

00-2

RON min.	91 (unleaded)	95* (premium unleaded)
Fuel injection system	Mono-Motronic	Digifant
Ignition system	Mono-Motronic	Digifant
Catalyst	X	X
Lambda control	X	X
Knock control	-	X
Firing order	1-3-4-2	1-3-4-2

* 91 RON can be used if necessary,
but results in reduced output

00-3



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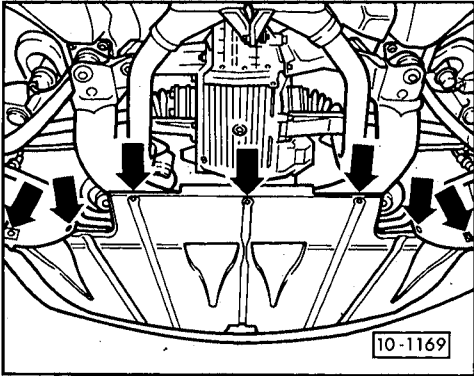
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REMOVING AND INSTALLING ENGINE

Notes on engine removal:

- o Engine is removed upwards without gearbox.
- o To prevent short circuits, disconnect battery earth strap.
- o On vehicles with radio units incorporating anti-theft code, call up the anti-theft code before disconnecting battery.
- o The battery is to be disconnected unconnected only when the ignition is switched off, as the Monomotronic control unit could otherwise be damaged.
- o All cable ties which are removed or cut open during engine removal are to be replaced in the same positions when the engine is reinstalled.



◀ Removal:

- Removing engine shield pan.

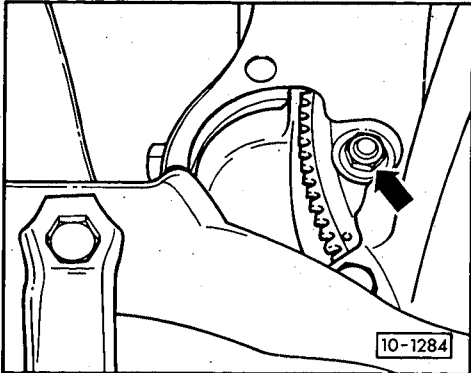
Vehicles with air conditioner:

- Remove a/c compressor and suspend it to the side with the lines remaining connected but free of tension.

Note:

- o The air conditioner refrigerant circuit is not to be opened.
- o Take care not to bend or kink refrigerant lines.
- o The refrigerant circuit is only to be opened in workshops with specially-trained personnel as well as the necessary range of tools and service equipment.

10-1



Vehicles with power-assisted steering:

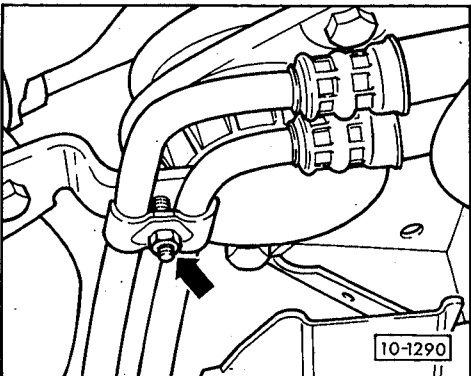
- Unbolt pump for power-assisted steering and suspend it from the body. The brackets remain on the cylinder block and the hoses are not disconnected.

Note:

- Ensure that the hoses to the pump are not bent.
- Remove starter.

Vehicles with automatic gear box:

- ◀ - Screw off torque converter nuts.
- The 3 nuts are located behind the starter and can be seen on the drive plate when the crankshaft is rotated.
- ◀ - Unscrew the bracket for the gearbox oil cooler from the left side of the sump.

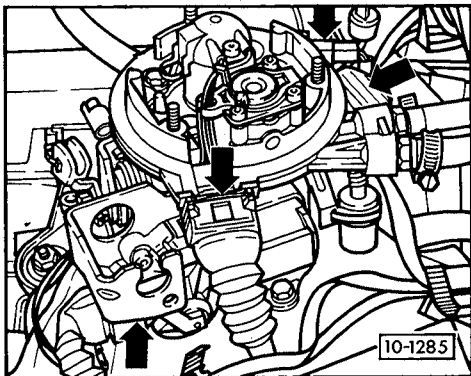


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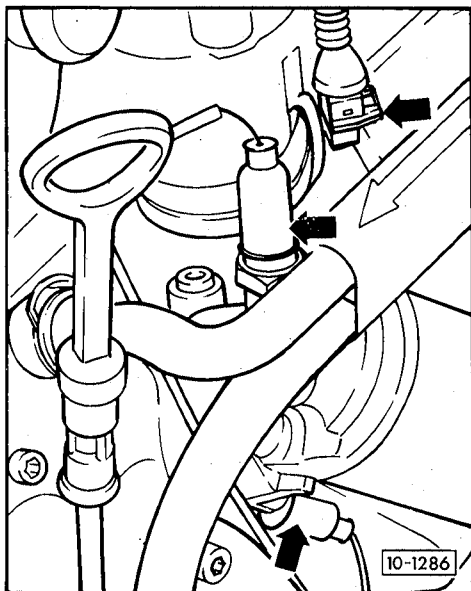
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10-2

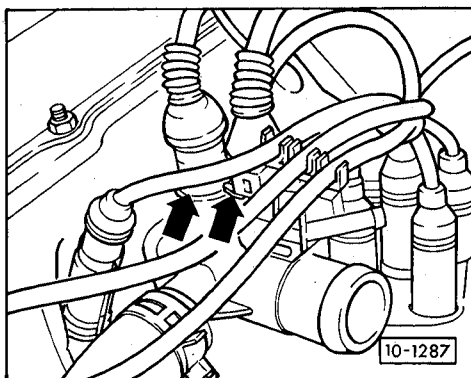
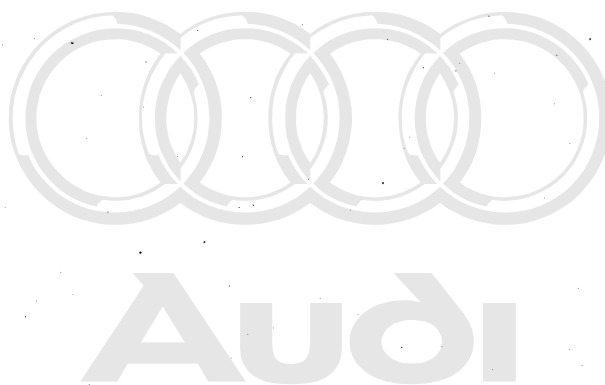
- Remove the cap from coolant expansion tank.
- Drain coolant at lower left side of radiator, using an auxiliary hose where necessary.
- Pull upper and lower coolant hoses from the engine.
- Remove coolant hoses to heater from rear of cylinder block.
- Remove coolant pipe from inlet manifold preheating thermostat by unscrewing engine/gear box retaining bolt.
- Remove vacuum hose for brake servo unit from the intake manifold.
- Remove throttle cable from the induction unit.
- ◀ - Remove connector plug from the injection unit.



10-3



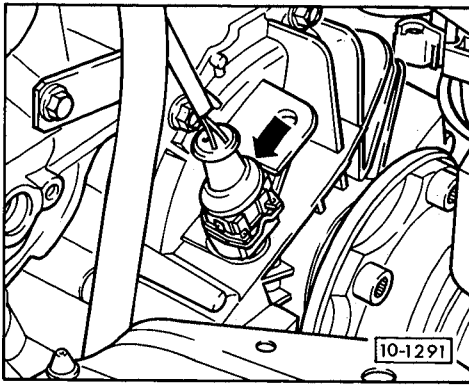
- ◀ - Remove Hall sensor plug from ignition distributor and remove both plugs from the oil pressure switch.



- ◀ - Remove connector plugs for coolant temperature sensor and gauge.

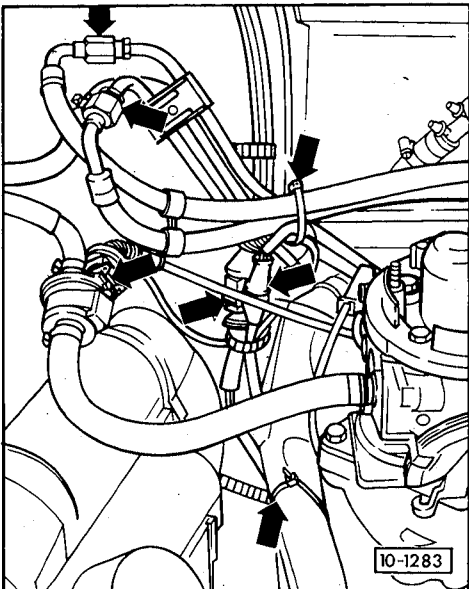


10-4



- Unscrew earth strap from left front cylinder head.
- Unscrew cap D+ wire from alternator and remove from the clamp.
- Unscrew gear box earth cable from battery carrier.
- ◀ - Remove speedometer sensor plug near left driveshaft flange.
- Pull out wiring harness to the rear.
- Remove high-tension lead from the distributor.
- Unscrew upper radiator fan shroud, pull shroud ?? entirely out through the top and lay it to the side. The electrical wires remain connected.
- Remove torque arm and bracket.
- Remove all those engine/gear box connecting bolts which are accessible from below.
- Unbolt exhaust pipe from exhaust manifold.
- Screw out upper engine/gearbox connecting bolts (except the topmost right-hand bolt).

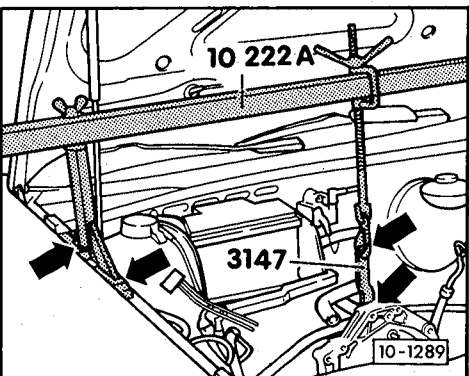
10-5



- ◀ - Separate fuel lines, undo cable ties, remove connector plugs from frequency valve for activated charcoal filter. Remove Lambda probe by unscrewing pre-heater plate, removing plug and opening cable tie.

Notes:

- o Thoroughly clean the area adjacent to the unions before removing fuel lines.
- o After removing fuel lines carefully cover them with foil.

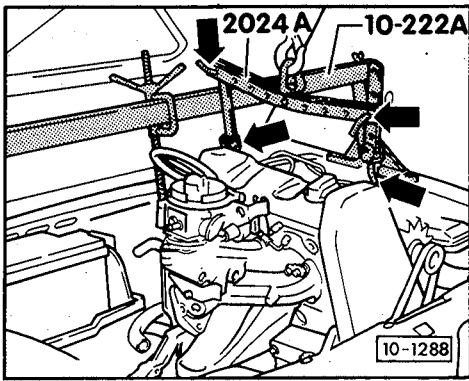


- ◀ - Insert gearbox support 3147 in the center bore of the gearbox.
- Place support mechanism 10-222 A on the fender bolts and insert hooks in gearbox support.

Notes:

- o The wingnuts on the hooks can be used to adjust gearbox height.
- o Turn the steering to the left or the right to facilitate insertion of gearbox support 3147 into the gearbox bore.

10-6



- ◀ - Install support mechanism 2024 A, as shown in the illustration and raise the engine slightly with V.A.G 1202 workshop crane.

Note:

The unit must be balanced with perforated rails of the support hooks being inserted and locked as shown in the illustration.

- Unscrew left and right-side motor mount nuts.
- Take up some of the unit's weight with support mechanism.
- Unscrew remaining bolt from the engine/gearbox connecting flange.
- Where necessary, use support mechanism to take up more weight while pulling engine toward the front, then lift out engine.

Note:

The engine must be guided carefully during removal to avoid damage to driveshaft, clutch, body, radiator and the two pins (timing sensors) on drive plate.

Attaching engine to assembly stand:

- The engine is to be attached to an engine stand with VM 540 engine support for assembly work.

10-7

Installation:

Engine installation is performed in reverse sequence, with special attention being given to the following points.

- Check clutch throwout bearing for wear, renew as necessary.
- Short engines are supplied with needle bearing in the crankshaft. Before installation in vehicles with automatic gearbox the needle bearing should be removed.
- Clean and lightly lubricate splines of gearbox input shaft with G 000 100 (do not lubricate release bearing guide sleeve).
- Check whether dowel sleeves are installed in engine block for centering the engine/gearbox and install if necessary.
- Always renew all self-locking nuts and gaskets.
- Install engine mounts free of tension (align by rocking engine)
- Align exhaust system free of tension - Repair Group 26.
- Adjust tension of A/C compressor belt using shims on the crankshaft pulley (see Repair Manual Heating, Air conditioner, Repair Group 87).
- Adjust tension of power-assisted steering pump - Repair Group 13.
- Check idle speed, CO content and ignition timing - Repair Group 24.

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10-8

Note:

- o Renew coolant (Topping up coolant – Repair Group 19).
- o Install new cable binders at all the same locations from which ties were previously removed.
- o Wires which were detached during engine removal are to be reattached at the same locations with no tension present.
- o All connector plugs which were detached during engine removal are to be reinserted.

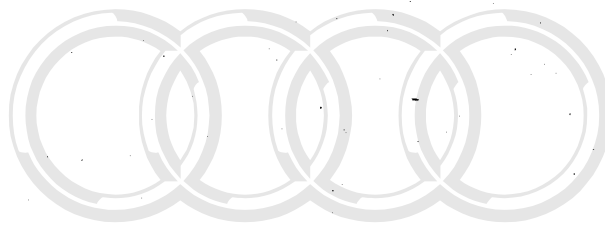
TIGHTENING TORQUES**Bolts/nuts in general:**

M6	10 Nm
M8	20 Nm
M10	45 Nm
M12	60 Nm

Deviating torque values:

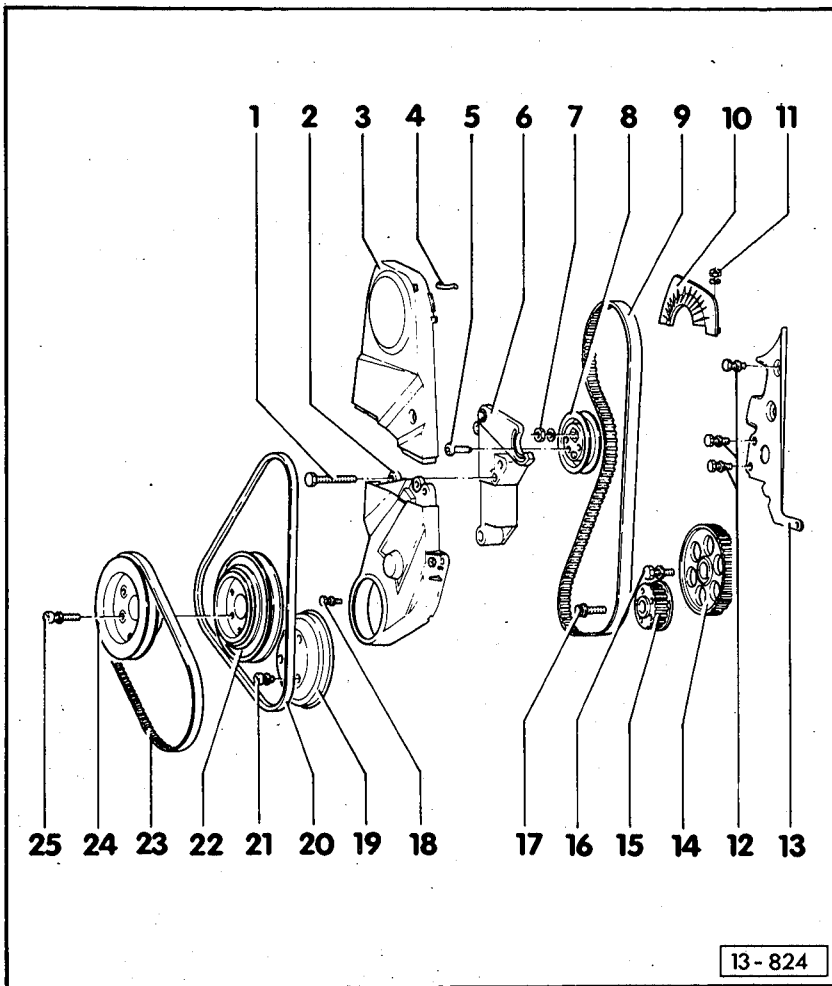
Engine mount to body	45 Nm
Engine support to engine mount	40 Nm
Engine/gearbox securing bolts	M8 25 Nm
	M10 45 Nm
	M12 65 Nm
Exhaust downpipe to exhaust manifold	35 Nm
A/C compressor to bracket	25 Nm
Torque convertor to drive plate	60 Nm

10-9

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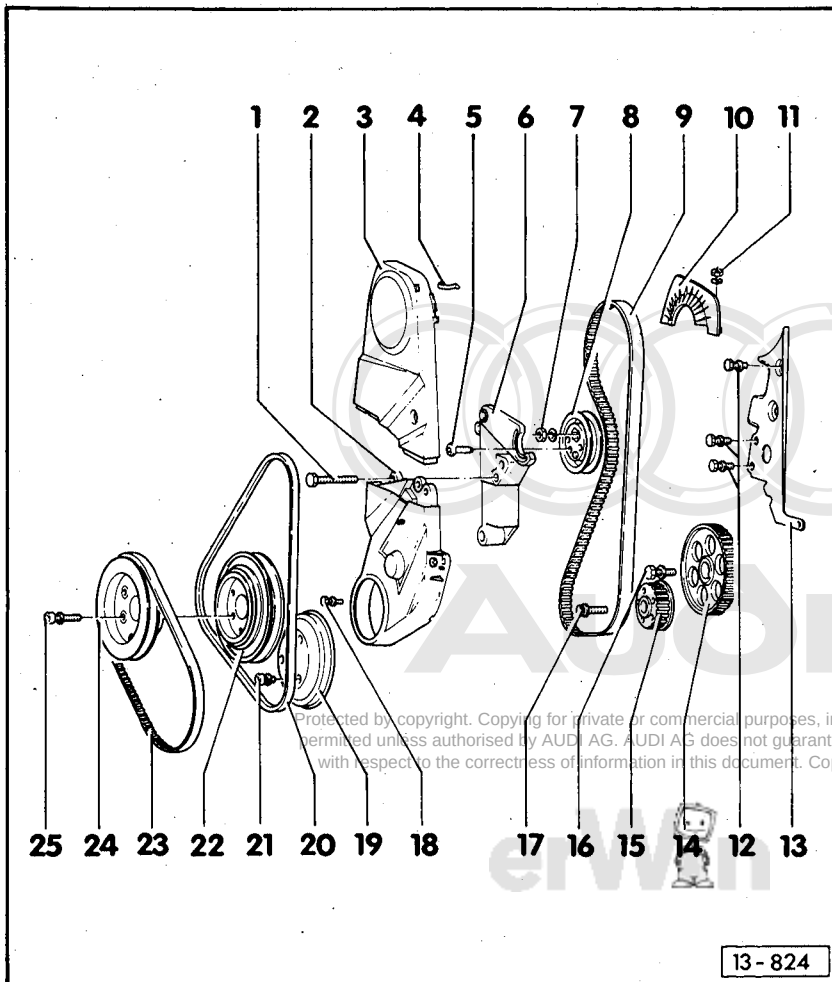




13-824

- 1- 10 Nm
- 2- Lower toothed belt guard
- 3- Upper toothed belt guard
- 4- Retaining clip
- 5- 20 Nm
- 6- Thermotensioner
 - o Only adjust toothed belt tension with engine cold - page 13-9
- 7- 10 Nm
- 8- Tensioner
 - o Only adjust toothed belt tension with engine cold - page 13-9
- 9- Toothed belt
 - o Installing - page 13-8
 - o Mark running direction of toothed belt before removal
 - o Do not bend toothed belt
- 10- Toothed belt guard

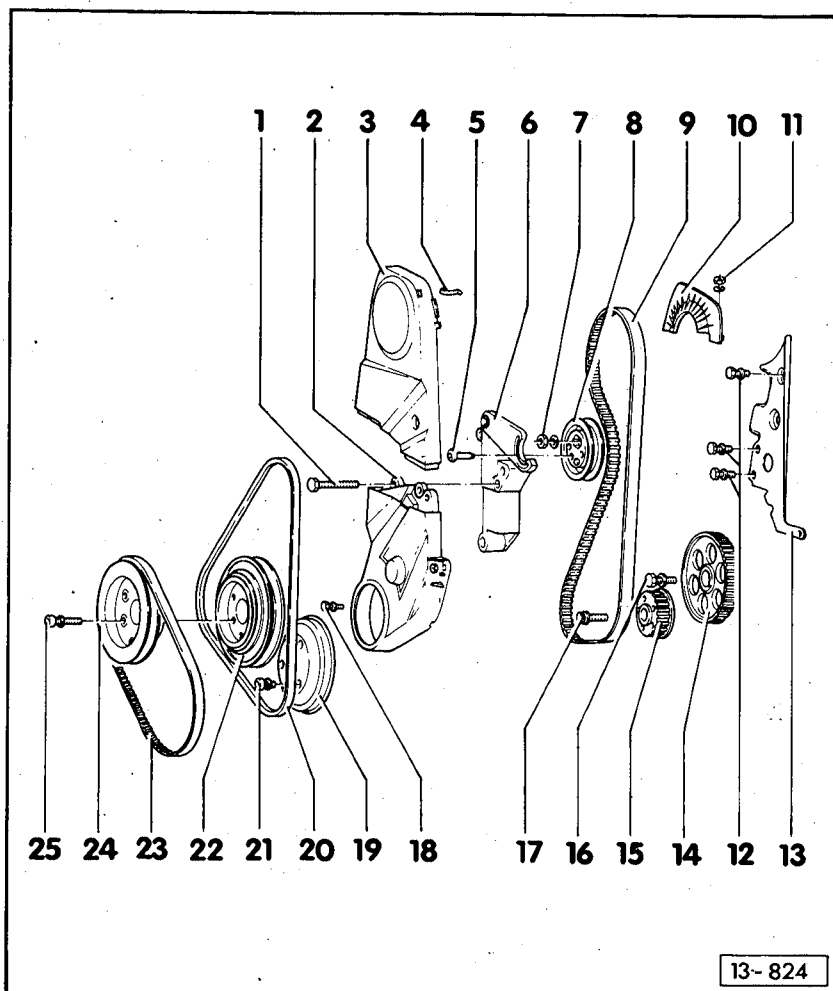
13-1



13-824

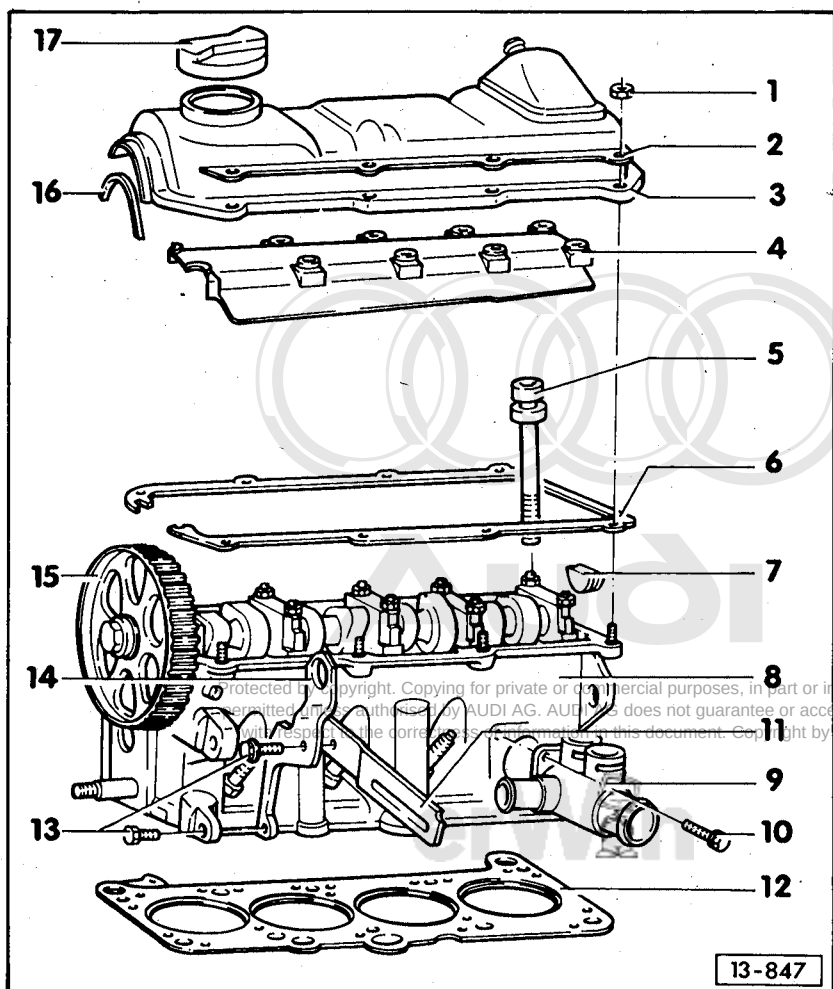
- 11- 10 Nm
- 12- 20 Nm
- 13- Rear toothed belt guard
- 14- Intermediate shaft sprocket
 - o Note position when installing toothed belt - page 13-8
- 15- Crankshaft sprocket
- 16- 80 Nm
- 17- 90 Nm, then further 90°
 - o Renew
 - o Use holder 3099 for loosening and tightening
 - o Oil threads
 - o Additional 90 ° turn can be performed in several steps
- 18- 10 Nm
- 19- Coolant pump pulley

13-2



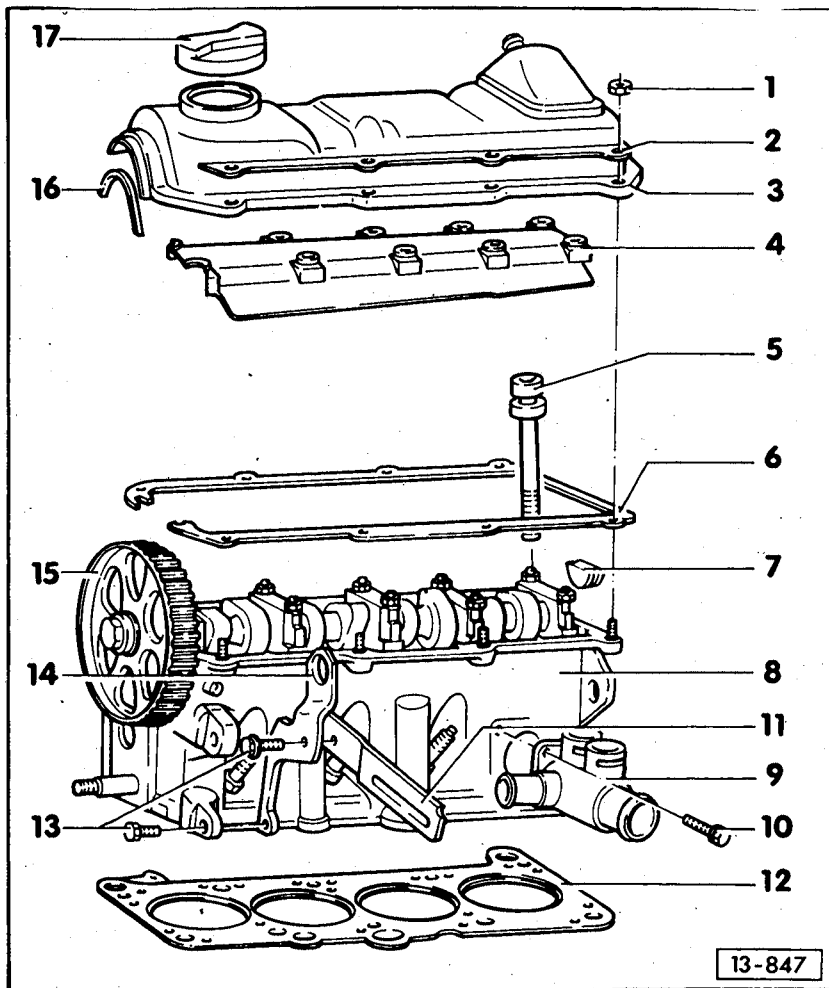
- 20- **Alternator V-belt**
 - o Check tension with thumb pressure
 - Deflection:
 - New belt = approx. 2 mm
 - Used belt = approx. 5 mm
 - o Adjusting belt tension - page 13-10
- 21- **20 Nm**
 - o Use V.A.G 1590 to apply counter pressure when loosening and tightening
- 22- **Vibration damper**
 - o Installation possible in only one position - bores offset
- 23- **V-belt for pump for power-assisted steering**
 - o Adjusting V-belt tension - page 13-11
- 24- **Pulley**
 - o Vehicles with air conditioner also have a second pulley with shims. Check V-belt tension with thumb pressure. Deflection approx. 5 mm. Use shims to adjust.
- 25- **20 Nm**

13-3



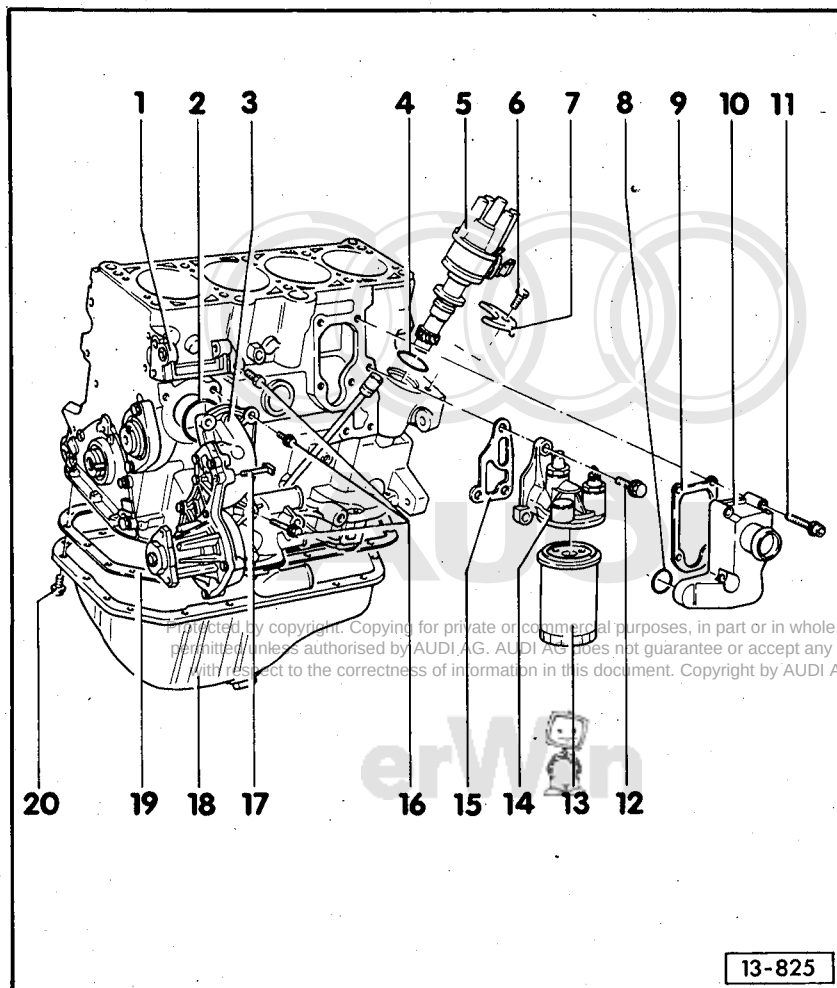
- Note:**
Always renew all seals and gaskets.
- 1- 10 Nm
 - 2- Reinforcing strip
 - 3- Cylinder head cover
 - 4- Oil deflector plate
 - 5- Cylinder head bolt
 - o Observe installation instructions and sequence when tightening and loosening - see Installing cylinder head, Repair Group 15
 - 6- Cylinder head cover gasket
 - 7- Plug
 - 8- Cylinder head
 - o Removing and installing - Repair Group 15
 - 9- Union
 - 10- 10 Nm

13-4



- 11- Alternator bracket
 - o Adjusting V-belt – page 13-10
- 12- Cylinder head gasket
 - o Ensure correct installation position
 - o Word "open" must be toward the cylinder head
 - o If renewed: renew coolant.
- 13- 20 Nm
- 14- Suspension eye
- 15- Camshaft sprocket
 - o Use holder 3036 for loosening and tightening
 - o Watch position when installing toothed belt – page 13-8
- 16- Cylinder head gasket
- 17- Cap

13-5

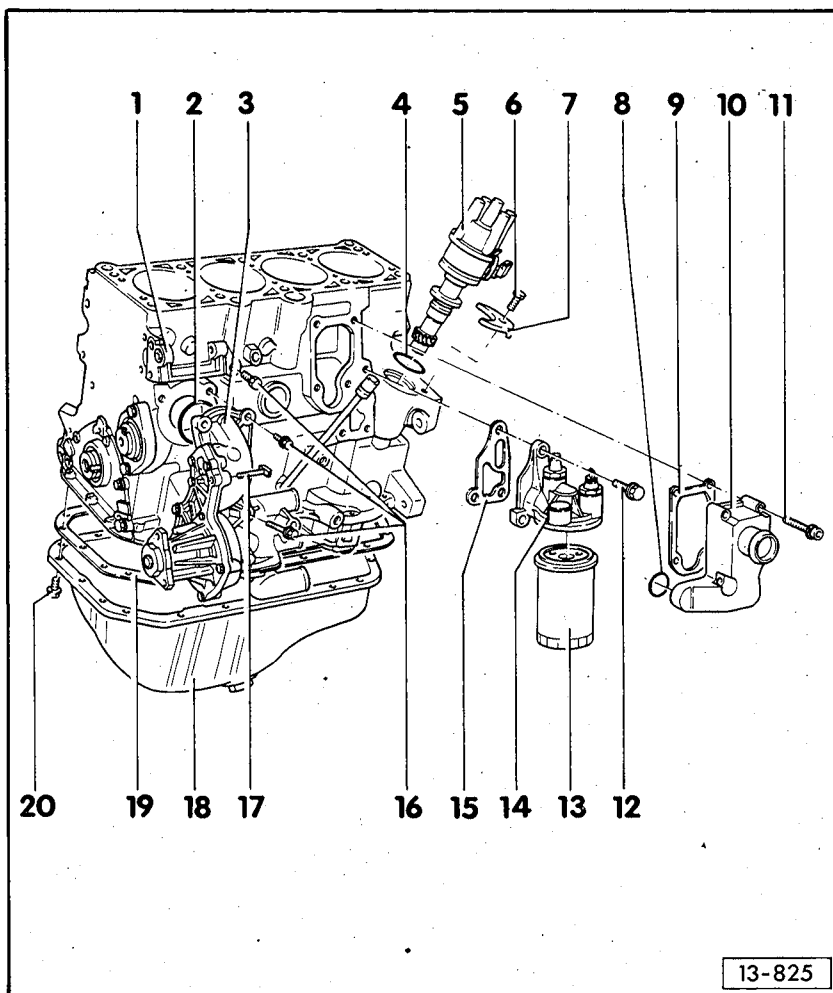


Note:

- o Always replace all gaskets and seals.
- o If large quantities of metal particles and filings – such as those caused by partial seizure of crankshaft and connecting rod bearing – are discovered in the engine oil during repairs, the oil passages should be cleaned thoroughly to avoid subsequent damage.

- 1- Alternator bracket
- 2- O-ring
 - o Renew
- 3- Coolant pump
- 4- O-ring
 - o Renew
- 5- Distributor
 - o Installing – see Repair Group 28
- 6- 20 Nm
- 7- Retainer
- 8- O-ring
 - o Renew

13-6



- 9- Gasket
 - o Renew
- 10- Crankcase breather
- 11- 20 Nm
- 12- 25 Nm
- 13- Oil filter
 - o Use oil filter wrench to loosen
 - o Observe installation instructions on oil filter
- 14- Oil filter mounting
 - o On engines with engine code ABK an oil cooler is located between the oil filter mounting and the filter
- 15- Gasket
 - o Renew
- 16- 20 Nm
- 17- Hammer-headed screw
- 18- Oil sump
- 19- Oil sump gasket
 - o Renew
 - o Do not use sealer, be sure to install in correct position
- 20- 20 Nm

13-7

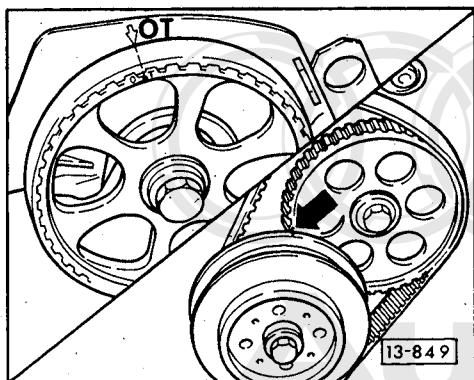
INSTALLING TOOTHED BELT

(adjusting valve timing)

Notes:

- o The adjustment of toothed belt tension must be carried out with engine cold (room temperature).
- o The toothed belt must not be bent.

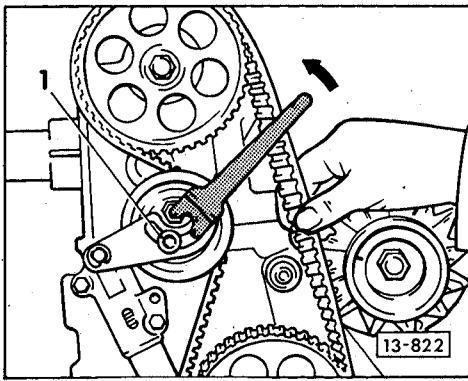
- Place toothed belt on crankshaft and intermediate shaft sprockets.
- Secure vibration damper with one bolt (ensure correct installation position).
- ◀ - Arrow on toothed belt guard must align with mark on camshaft sprocket.
- Align marks on vibration damper and intermediate shaft sprocket (cylinder 1 at TDC).
- Fit toothed belt to camshaft sprocket.



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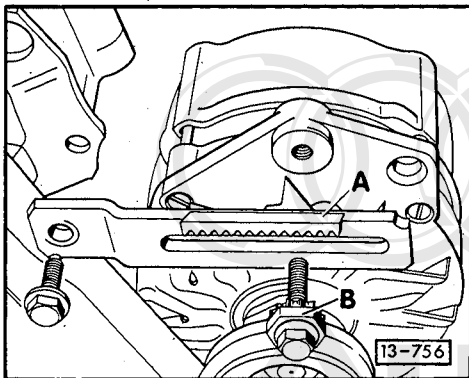


13-8



- ◀ - Tension toothed belt by turning tensioner in direction of arrow using a nut turner (e.g. Matra - V159), it should just be possible to twist toothed belt through 90 ° with thumb and forefinger halfway between camshaft and intermediate shaft sprockets.
- Tighten bolts -1- to 20 Nm.
- Turn crankshaft through two rotations and check adjustment.
- Remove vibration damper.
- Install lower toothed guard.
- Install upper toothed belt guard and vibration damper.
- Adjust alternator V-belt tension - 13-10.
- Adjust V-belt tension for pump for power-assisted steering - page 13-11.
- Check ignition timing, adjust as necessary - see Repair Group 28.

13-9



ADJUSTING TENSION OF ALTERNATOR V-BELT

- ◀ - Loosen all securing bolts in tensioning bracket-A- and alternator by at least one turn

Note:

The alternator must move easily.

- Tension V-belt by using a torque wrench to turn tensioning nut-B-

new V-belt	- 8 Nm
Used V-belt	- 4 Nm

Tighten securing bolt of tensioning nut to 35 Nm.

- Tighten alternator to mount securing bolts with 35 Nm and tensioning bracket to suspension eye/cylinder head with 20 Nm.

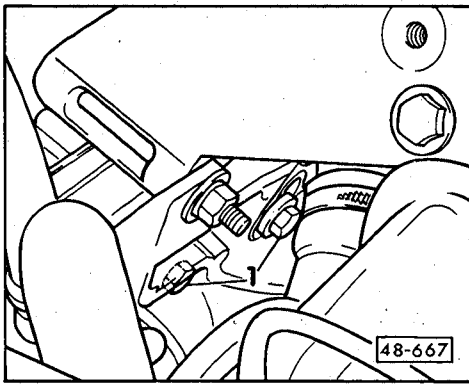
Note:

Torque wrench V.A.G 1410 employed in conjunction with ring spanner socket SW 22 - V.A.G 1410/2 is especially suitable for adjusting.

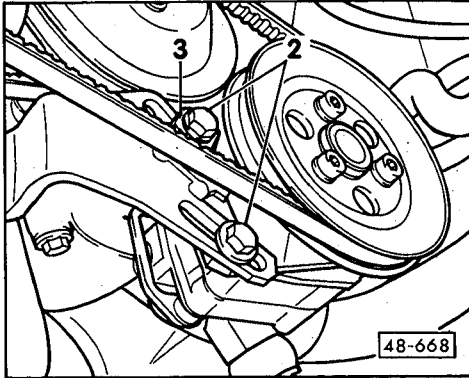
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ADJUSTING TENSION OF POWER-ASSISTED STEERING PUMP BELT



- ◀ - Loosen securing bolts -1-.



- ◀ - Loosen securing bolts -2-.
- Tension V-belt by turning tensioning nut -3- until the belt can be depressed by approx. 10 mm with thumb pressure applied midway between the two pulleys.
- Tighten securing bolts to 20 Nm.

13-11

DISMANTLING AND ASSEMBLING CYLINDER BLOCK, CRANKSHAFT AND FLYWHEEL

Notes:

- o Short engines are delivered with needle roller bearing and crankshaft. Needle roller bearing must be removed before engine is installed in vehicle with automatic gearbox.
- o Do not turn crankshaft when checking radial clearance.

1- Bearing cap

- o Bearing cap 1 is at vibration damper end
- o Bearing shell retaining lugs must be aligned

2- Bearing shell No. 3

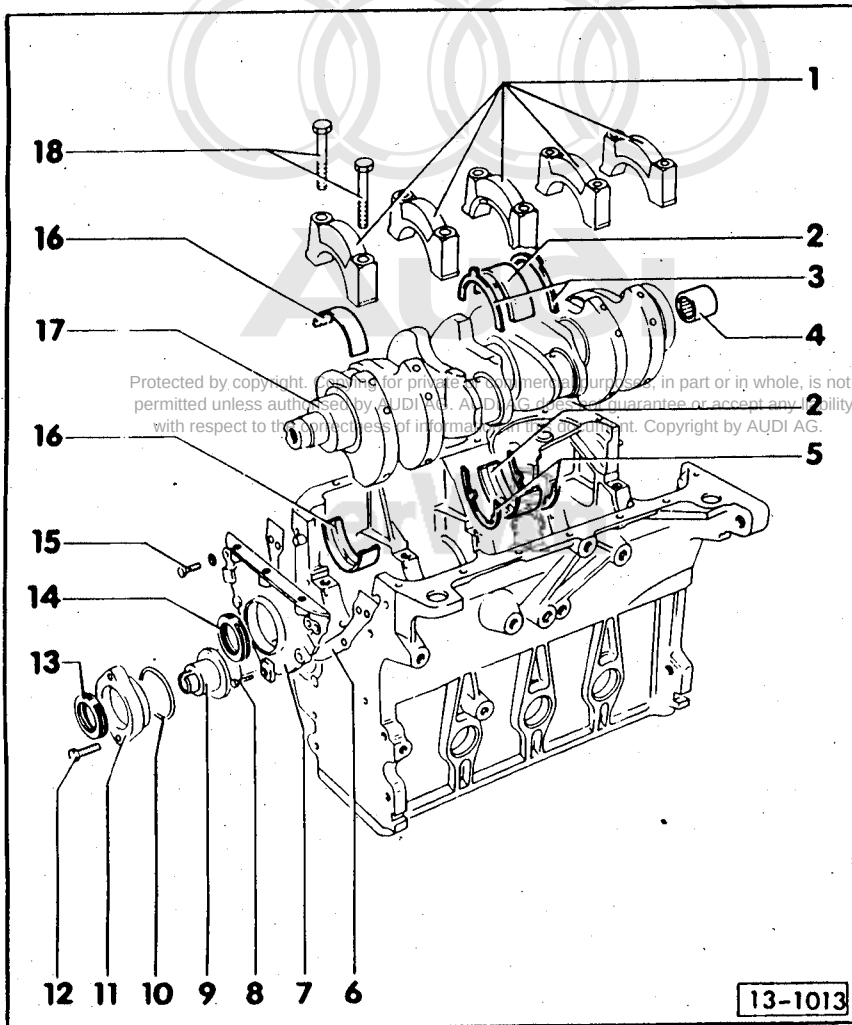
- o Thrust bearing
- o For cap without oil groove
- o For cylinder block with oil groove

3- Thrust washer

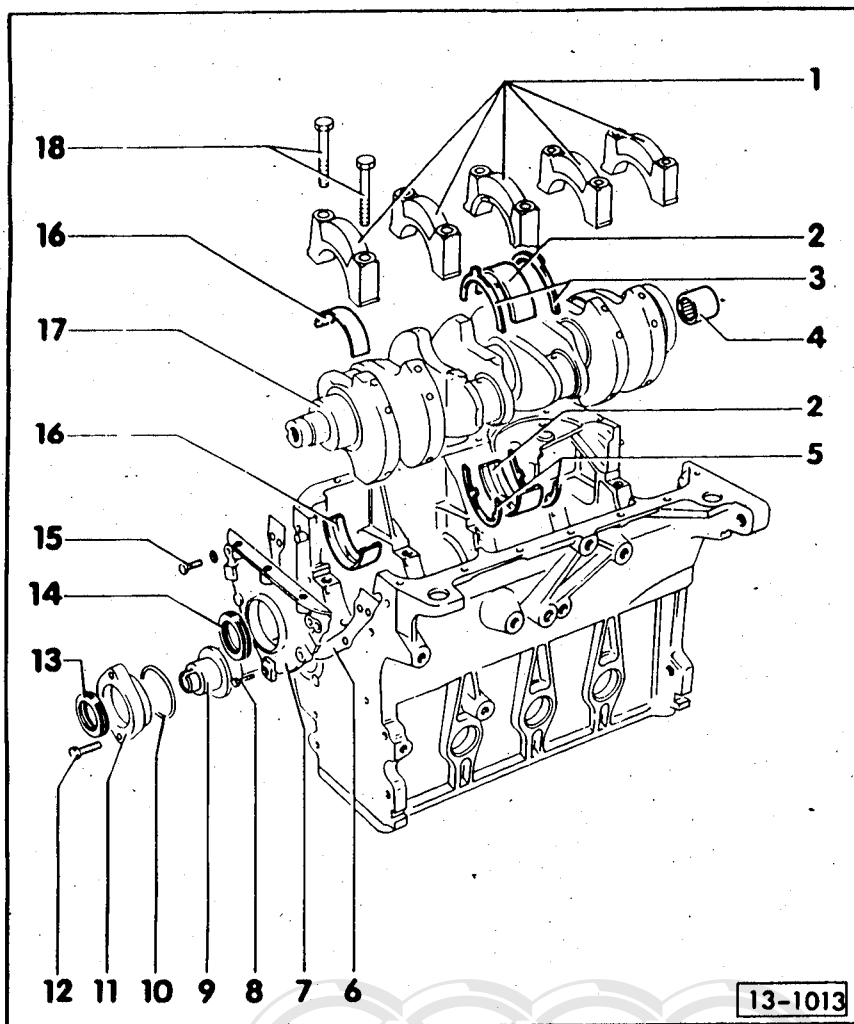
- o For cap
- o Note locating arrangement

4- Needle roller bearing

- o Removing and installing - Fig. 2 - 4
- o Lubricate with G 000 100



13-12



5- Thrust washer
o For cylinder block

6- Gasket
o Renew

7- Front seal flange

8- 10 Nm

9- Intermediate shaft
o Remove distributor first
o Axial clearance: max. 0.25 mm

10- O-ring
o Renew if damaged

11- Seal flange

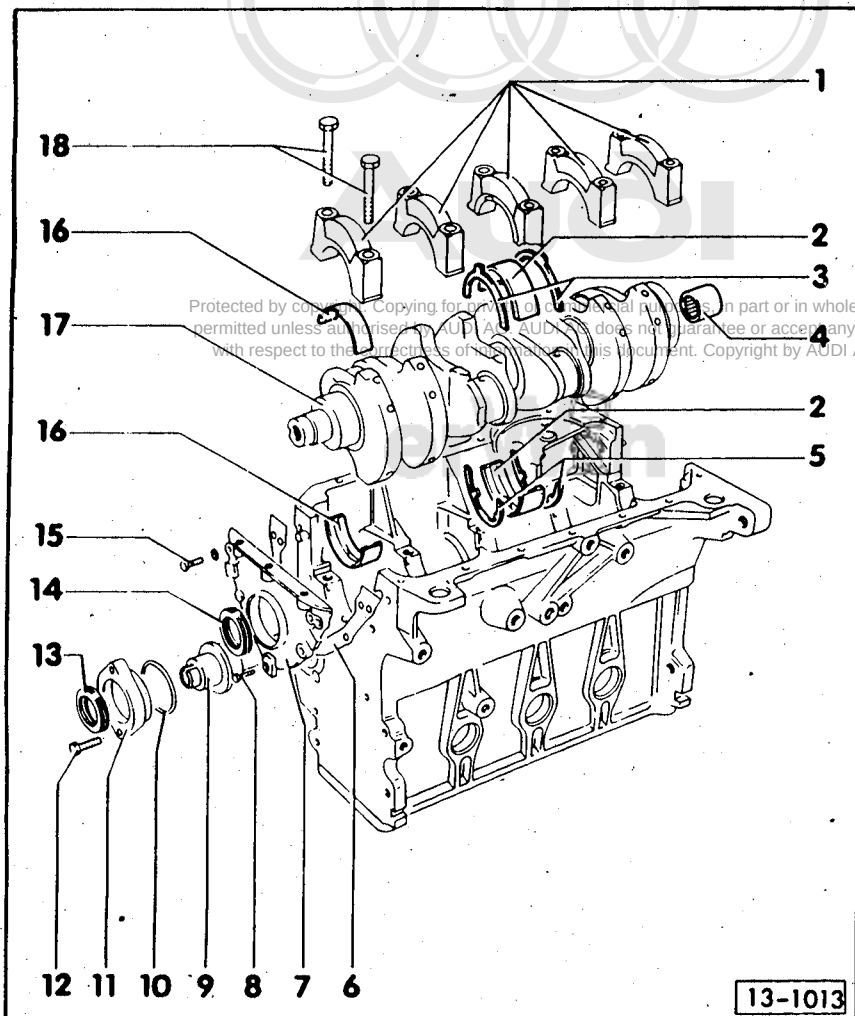
12- 25 Nm

13- Seal
o Take off seal flange to remove
o Install with 10-203
o Lightly oil sealing lip and outer edge before installation

14- Seal
o Removing and installing - page 13-19

15- 20 Nm

13-13

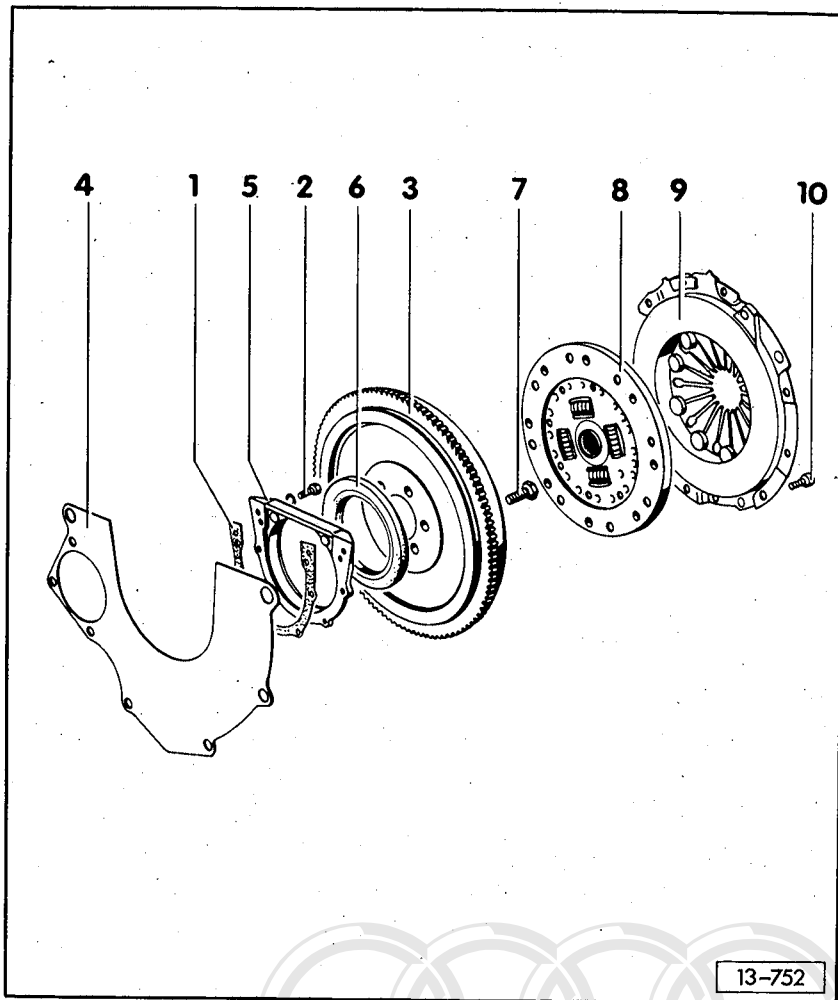


16- No. 1, 2, 4 and 5 bearing shells
o For caps 1, 2 and 5 without oil groove
o For cap No. 4 and cylinder block with oil groove
o Do not interchange used bearing shells

17- Crankshaft
o Axial clearance, new: 0.07 - 0.17 mm
o Check radial clearance with Plastigage
New: 0.03 - 0.08 mm
Wear limit: 0.17 mm
o Do not turn crankshaft while measuring radial clearance
o Crankshaft dimensions - page 13-20

18- 65 Nm

13-14



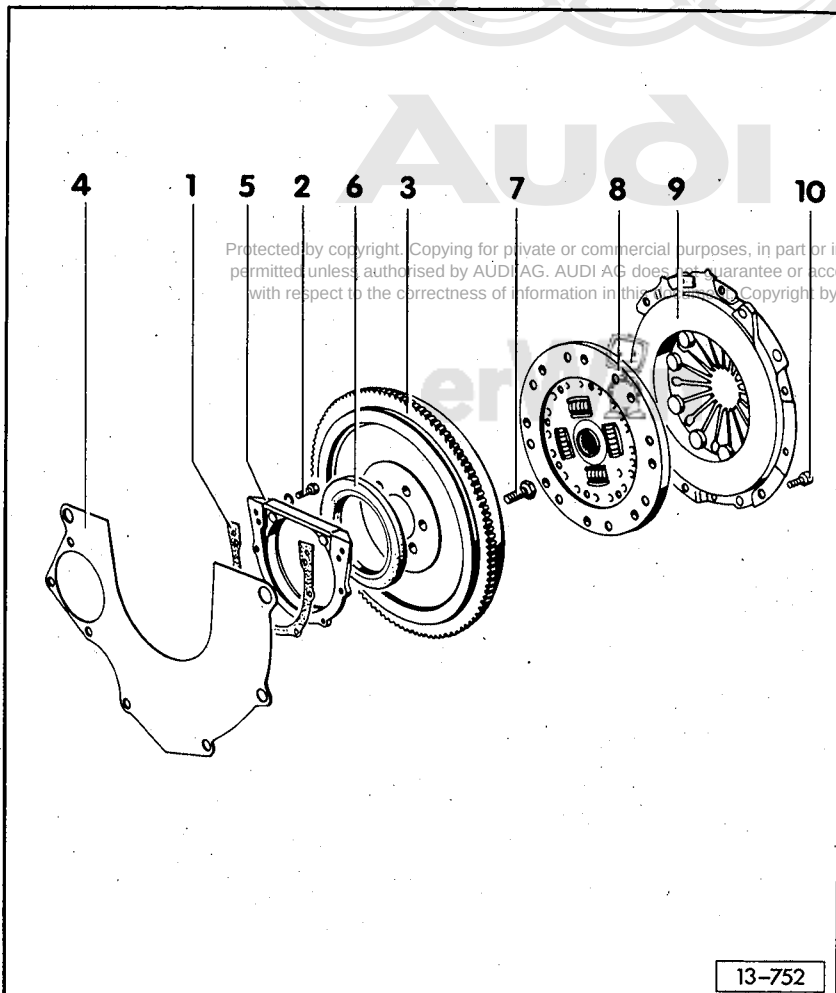
13-752

Note:

Servicing clutch – see Repair Manual for 5-speed manual gearbox 012 or Repair Group 30, 5-speed manual gearbox 01A all wheel drive.

- 1- Gasket
 - o Renew
- 2- 10 Nm
- 3- Flywheel
 - o Removing and installing – Fig. 1
 - o Installing drive plate (for vehicles with automatic gearbox) – page 13-21
 - o Providing ignition timing notch – page 13-22
- 4- Intermediate plate
 - o Do not damage/distort during installation
- 5- Rear seal flange
- 6- Oil seal
 - o Remove with 10-221
 - o Lightly lubricate sealing lip and outer edge before installation
 - o Fit over sleeve 2003/1A
 - o Pull in all the way with 2003/1

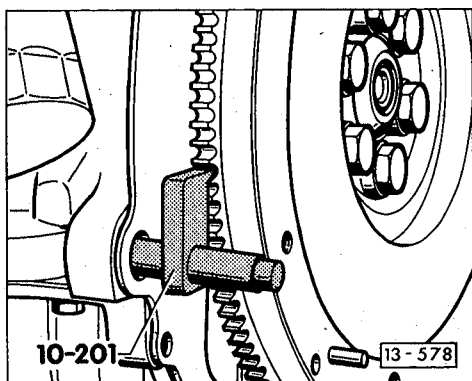
13-15



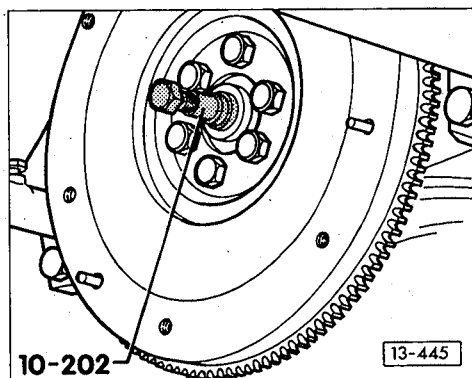
13-752

- 7- 30 Nm then additional 1/4 turn (90°)
 - o Renew
 - o Tighten in cross pattern
- 8- Clutch disk
 - o Installing: center with 3176
- 9- Pressure plate
 - o Mark installation position
- 10- 25 Nm
 - o Tighten in cross pattern and in stages

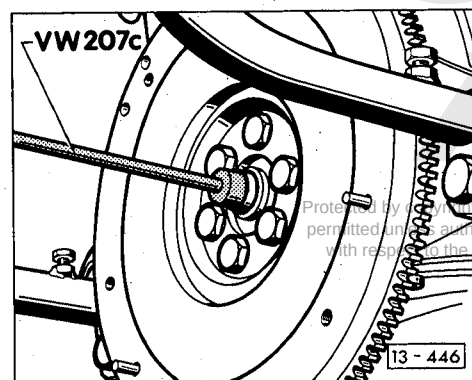
13-16



◀ Fig. 1 Removing and installing flywheel



◀ Fig. 2 Removing needle roller bearing



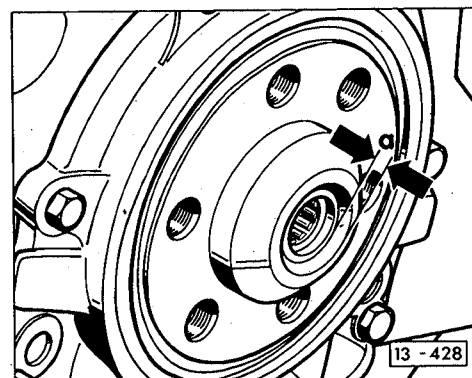
◀ Fig. 3 Installing needle roller bearing

With VW 207 C or 3176.

It should be possible to read lettering on needle roller bearing when bearing is installed.

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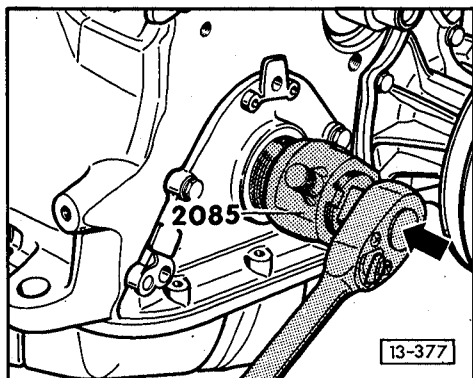
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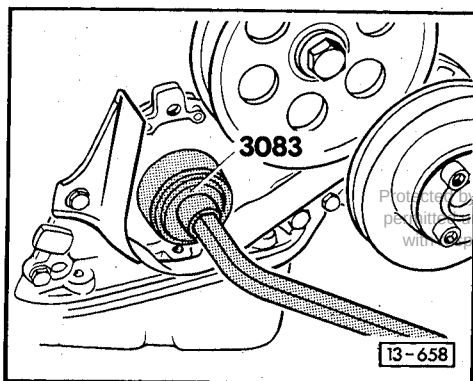
◀ Fig. 4 Installation depth "a" = 1.5 mm

RENEWING CRANKSHAFT OIL SEAL ON VIBRATION DAMPER END

- Remove toothed belt.
- Remove toothed belt sprockets (loosen center bolts by applying counter pressure with 3099).
- Unscrew inner part of oil seal extractor 2085 two turns (approx. 3 mm) from outer section and use knurled screw to lock in position.
- Screw cylinder bolts from 3083 all the way into crankshaft as a guide for oil seal extractor.
- Lubricate threaded head of oil seal extractor, position it, then apply strong pressure while screwing it into oil seal as far as possible.
- Loosen knurled-head screw and turn inner part against crankshaft until oil seal is removed.
- Clamp oil seal extractor between vice jaws and remove oil seal with pliers.
- Lightly oil sealing lip and outer edge of oil seal before installing.



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- Fit guide sleeve from 3083 to front of crankshaft and slide oil seal over sleeve.
- Press oil seal in as far as the stop using sleeve and cylinder bolt.
- Install toothed belt (adjust valve timing) -

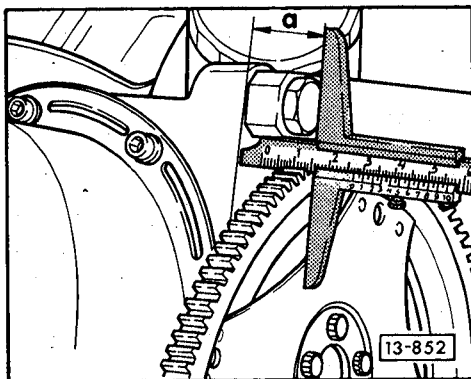
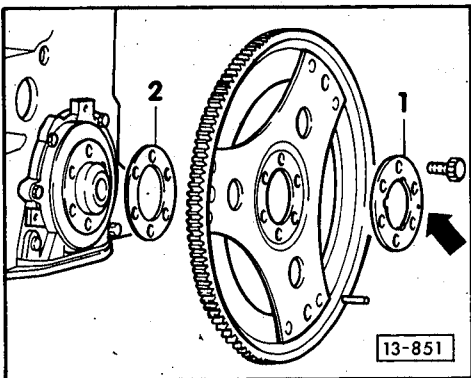
page 13-8

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CRANKSHAFT DIMENSIONS

(in mm)

Honing size	Crankshaft/ main journal diameter	Crankshaft/ connecting rod journal diameter
Basic dimension	-0.022	-0.022
	54.00	47.80
	-0.042	-0.042
Undersize I	-0.022	-0.022
	53.75	47.55
	-0.042	-0.042
Undersize II	-0.022	-0.022
	53.50	47.30
	-0.042	-0.042
Undersize III	-0.022	-0.022
	53.25	47.05
	-0.042	-0.042



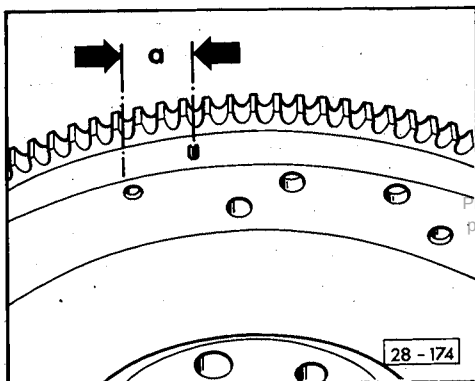
INSTALLING DRIVE PLATE

- ◀ - Fit drive plate with base plate -1-. Bead -arrow- must face toward torque converter.
- Replace bolts and tighten to 30 Nm.

- ◀ - Check dimension "a" at 3 points and calculate average.

Specification: 27 ± 1 mm

If the figure obtained is below specification, remove drive plate again and the reinstall with shim -2-. Tighten bolts to 30 Nm + 1/4 turn (90 °).



PROVIDING IGNITION TIMING NOTCH

Replacement flywheels and drive plates have only the TDC marking "O".

If a new flywheel or drive plate is installed, then it must be provided with the appropriate ignition timing mark.

- ◀ - Punch ignition timing notch a = 14.6 mm to left of center of TDC mark. The distance is to be measured along the periphery.

DISMANTLING AND ASSEMBLING PISTONS AND CONNECTING RODS

Note:

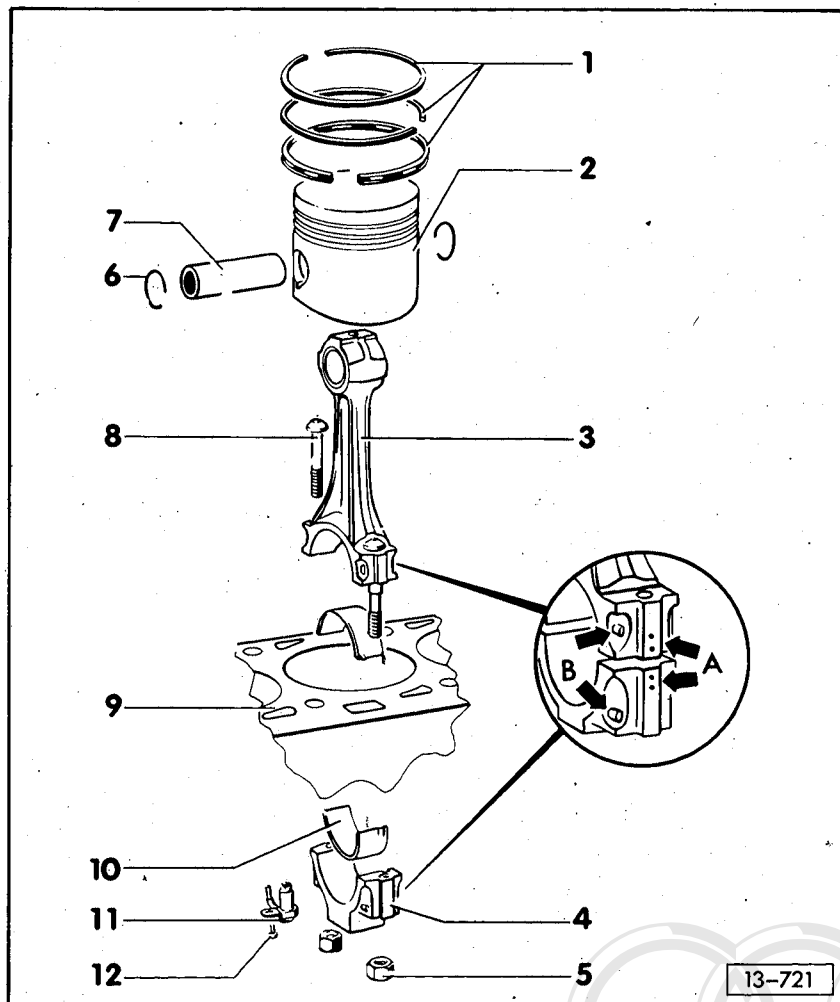
Do not turn crankshaft when measuring radial clearance.

1- Piston rings

- o Offset gaps 120 °
- o Use piston ring pliers for removal and installation
- o Check ring gap - Fig. 1
- o Check clearance in groove - Fig. 2
- o "TOP" mark is towards piston crown

2-Piston

- o Checking - Fig. 3
- o Mark installation position and cylinder number
- o Use piston ring clamp to install
- o Arrow on piston crown points toward vibration damper
- o Use pistons of the same weight class only



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3- Connecting rod

- o Always renew in sets
- o Mark cylinder number -A-
- o Installation position: Marks -B- toward vibration damper end

4- Connecting rod cap

- o Installation position: Mark -B- toward vibration damper end

5- 30 Nm + 1/4 turn (90 °)

- o Lubricate contact surfaces to measure radial clearance, tighten to 30 Nm but no further

6- Circlip

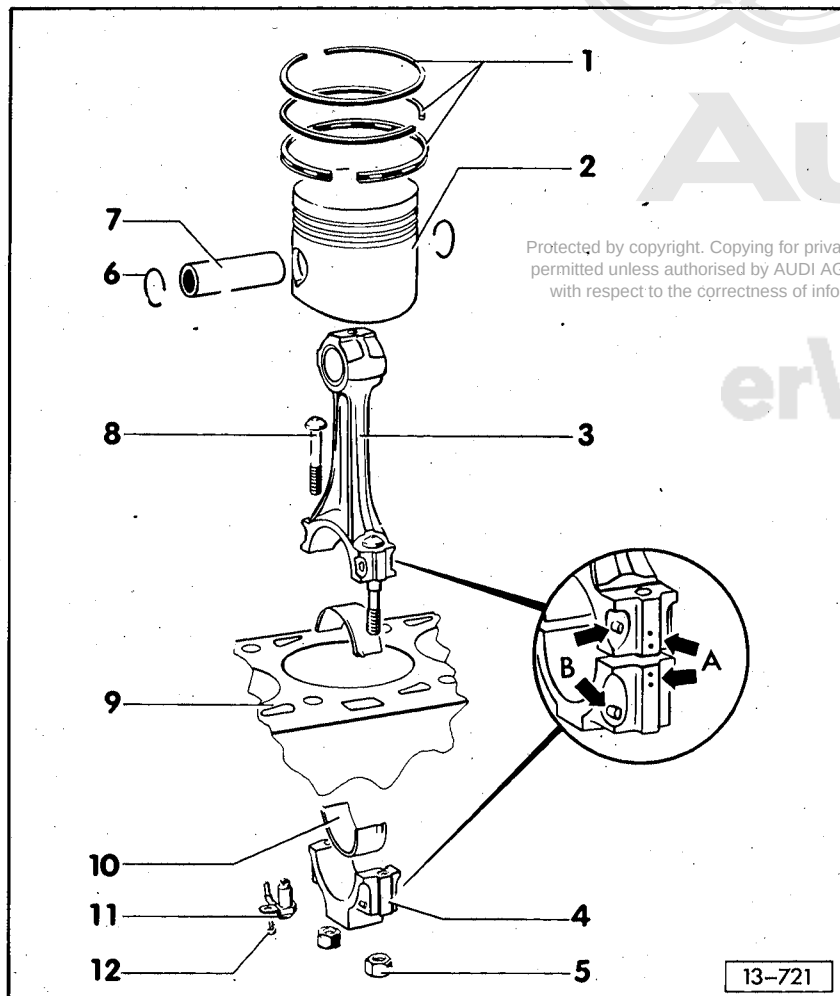
7- Piston pin

- o If tight, heat piston to approx. 60 ° C
- o Remove and install with VW 222a
- o Use only piston and piston pins of the same version

8- Connecting rod bolt

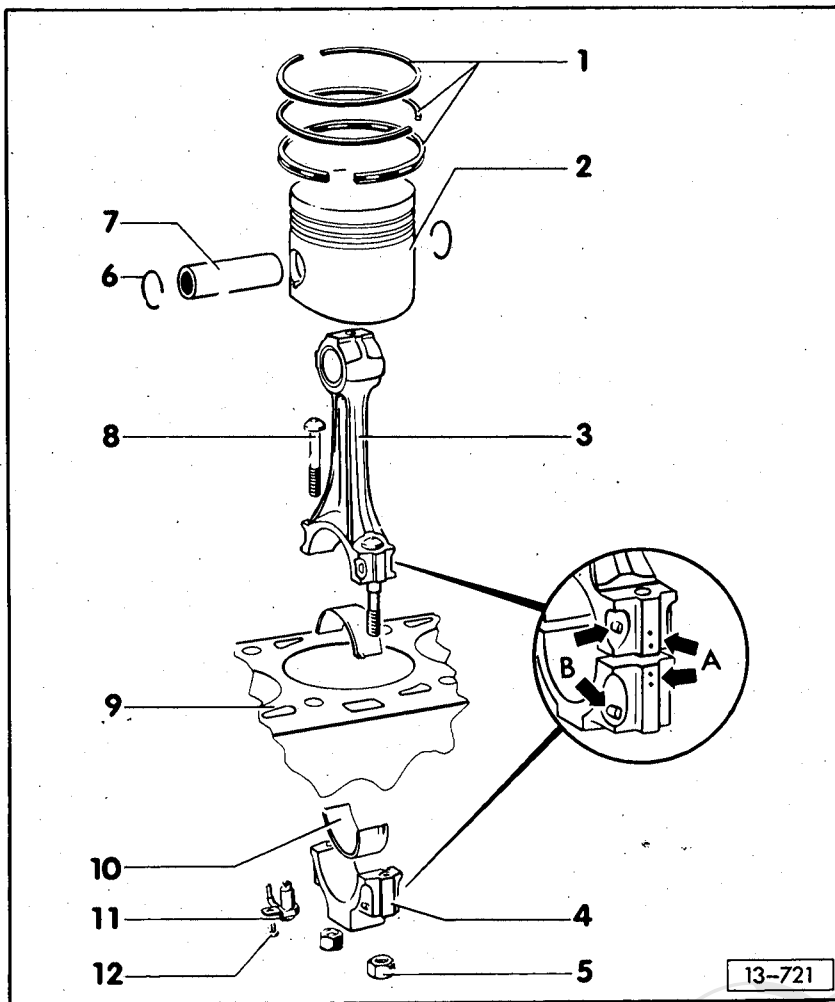
9- Cylinder block

- o Check cylinder bore - Fig. 4
- o Piston and cylinder dimensions - page 13-28



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10- Bearing shell

- o Note installation position
- o Do not interchange
- o Ensure proper fit in lugs
- o Axial clearance
- Wear limit: 0.37 mm
- o Check radial clearance with Plastigage
- Wear limit: 0.12 mm

11- Oil spray nozzle

- o For piston cooling
- o Engine code ABK only

12- 10 Nm

- o Install with AMV 188 100 02
- o Engine code ABK

13-25

◀ Fig. 1 Piston rings - Checking gap

Push rings squarely into bottom end of cylinder approx. 15 mm from edge of cylinder.

New:

Compression rings 0.30 - 0.45 mm
Oil scraper ring 0.25 - 0.45 mm

Wear limit:

1.0

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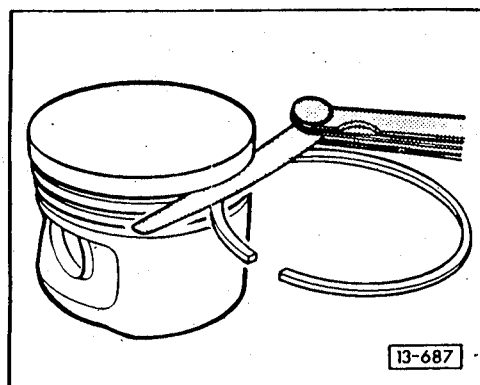
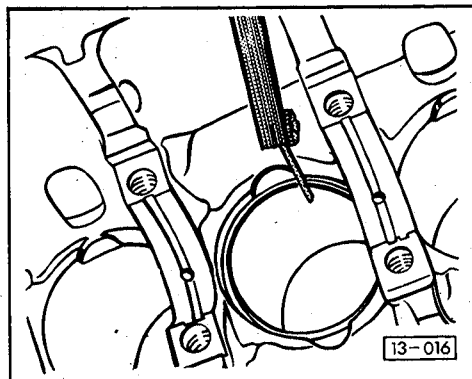
◀ Fig. 2 Piston rings - Checking groove clearance

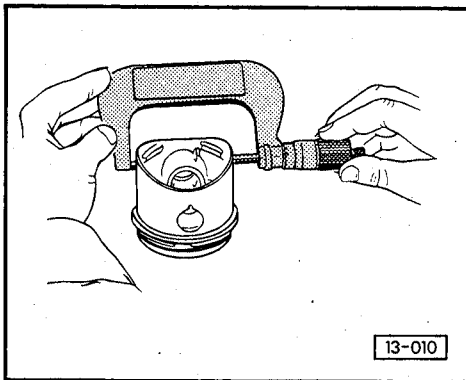
New:

0.02 - 0.5 mm

Wear limit:

0.15 mm

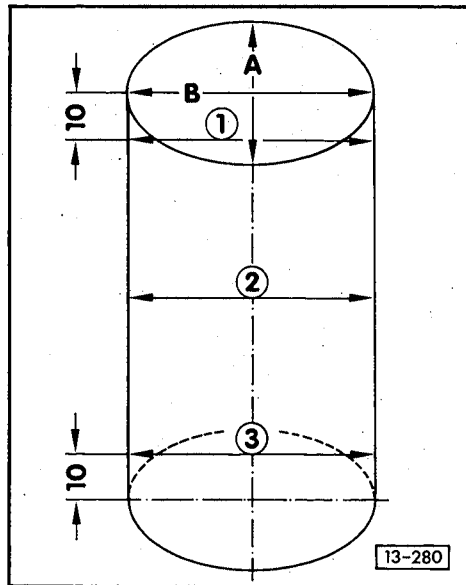




◀ Fig. 3 Checking pistons

Measure approx. 10 mm from lower edge of skirt at 90 ° to piston pin axis.

Deviation from specification = max. 0.04 mm.



◀ Fig. 4 Checking cylinder bores

Measure at three transecting points both laterally -A- and lengthwise -B-.

Use internal dial gauge 50 - 100 mm.

Deviation from specification = max. 0.08 mm.

Note:

The cylinder bores are not to be measured when the block is mounted on assembly stand with VW 540 engine support, as this could distort the results.

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PISTON AND CYLINDER DIMENSIONS

(in mm)

Honing size	Piston diameter	Cylinder bore diameter
Basic dimension	82.48	82.51
Oversize I	82.73	82.76
Oversize II	82.98	83.01

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REMOVING AND INSTALLING CYLINDER HEAD

Notes:

- o The cylinder head can be removed with the engine installed.
- o Contact surfaces between bucket tappets and cam lobes must be oiled when exchange cylinder head is installed. Coolant must also be renewed.
- o Engine must not be started for a period of about 30 minutes after installation of new bucket tappets (valve-piston contact).
- o Always use new gaskets during reassembly.
- o Check engine compression - page 15-5.

1- Upper toothed belt guard

2- Toothed belt guard

3- 10 Nm

4- Rear toothed belt guard

5- Camshaft sprocket

- o Use 3036 to apply counter pressure when tightening and loosening
- o Note position when installing toothed belt - Repair Group 13

6- Cylinder head cover gasket
o Renew

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15-1

7- Cap

8- Cylinder head cover

9- Reinforcing strip

10- 10 Nm

11- Oil deflector plate

12- Cylinder head bolt

- o Observe instructions and sequence when loosening and tightening - see installing cylinder head, page 15-4

13- Sealing plug
o Renew

14- Cylinder head
o Checking for distortion - Fig. 1
o Installing - page 15-4

15- Cylinder head gasket

- o Install in correct position
- o Word "oben" must be toward cylinder head
- o When renewing:
Renew coolant

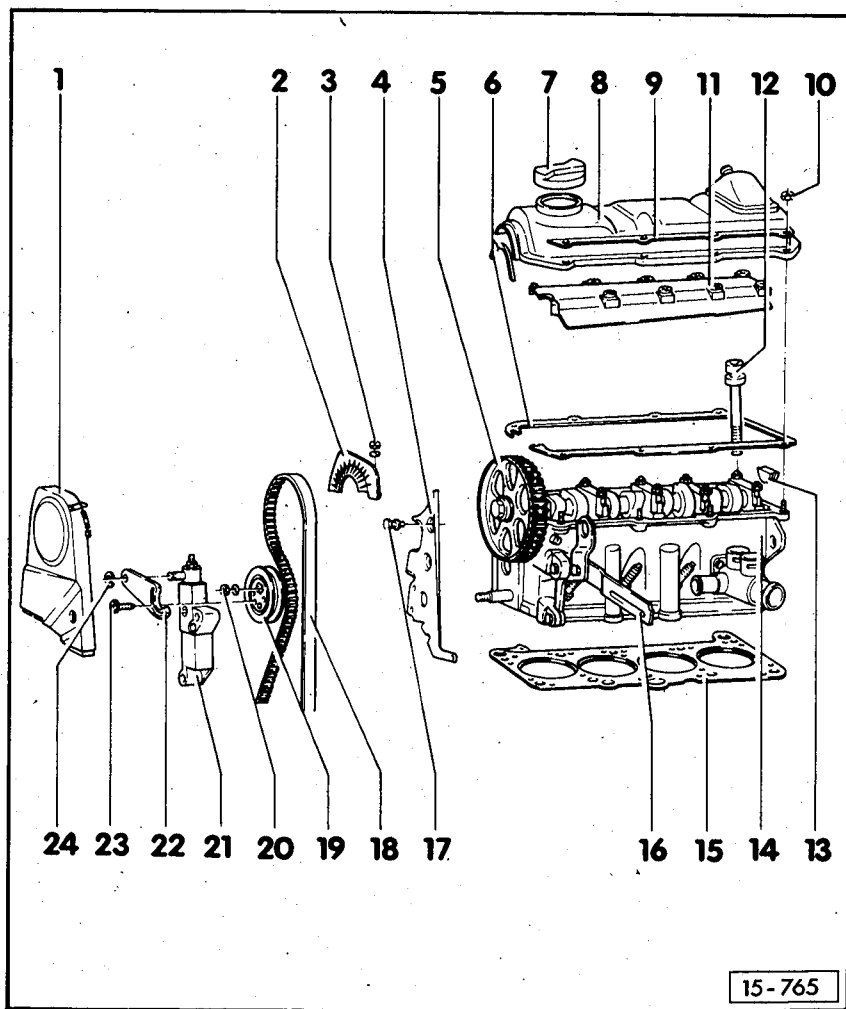
16- Alternator bracket

- o Adjusting V-belt tension - Repair Group 13

17- 20 Nm

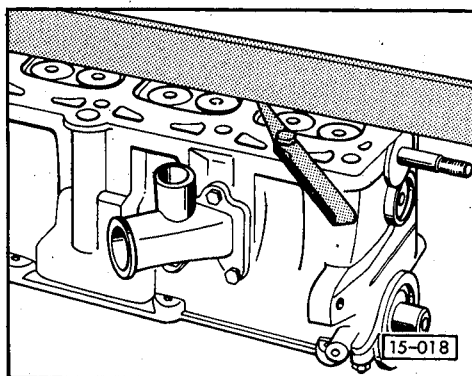
15-765

15-2



- 18- Toothed belt
 - o Removing and installing - Repair Group 13
- 19- Tensioner
 - o Only adjust tension of toothed belt with engine cold - see Installing toothed belt - Repair Group 13
- 20- 10 Nm
- 21- Thermo tensioner
 - o Only adjust tension of toothed belt with engine cold - see Installing toothed belt - Repair Group 13
- 22- Bracket
- 23- 20 Nm
- 24- Lock washer

15-3



◀ Fig. 1 Checking cylinder head for distortion

Max. permissible distortion: 0.1 mm

Installing cylinder head

- o Crankshaft is not at TDC
- Watch location of locating pins while fitting cylinder head gasket to cylinder head.
- Fit cylinder head, install cylinder head securing bolts and tighten by hand.
- ◀ - Tighten cylinder head bolts in three stages, see illustration for sequence.

Tightening torque Cold engine

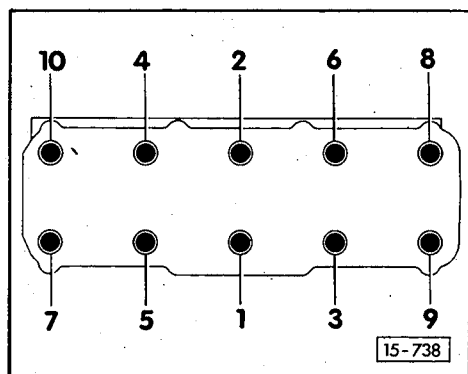
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Stage I = 40 Nm
 Stage II = 60 Nm
 Stage III = 1/2 turn (180 °)

Stage three is performed with a rigid spanner and without stopping (2 x 90 ° turns is also permissible).

Notes:

- o Cylinder head bolts are loosened in reverse sequence.
- o It is not necessary to retighten cylinder head bolts after repairs.
- o Do not reuse coolant (renew).



CHECKING COMPRESSION PRESSURE

- o Engine oil temperature at least 30 °C.
- o Throttle valve fully open.
- Unplug connectors from ignition coil output stage and from injection valve.
- Check compression with V.A.G 1381 compression recorder.

Note:

See instructions for using compression tester.

- Operate starter until the compression displayed by the tester no longer increases.

Compression specifications:

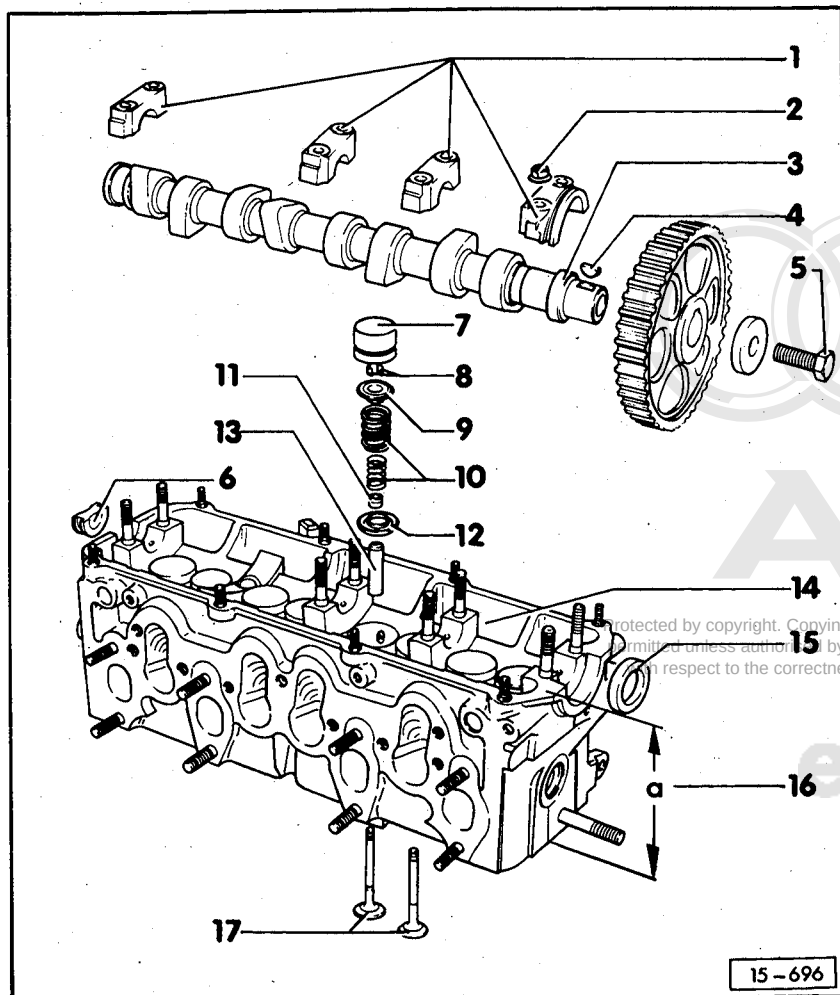
Compression pressure in bar		
Engine code	New	Wear limit
ABT	9 - 12	7.0
ABK	11 - 16	9.0

Permissible difference between all cylinders:

On engines with engine code

ABT	ABK
3 bar	2 bar

15-5



SERVICING VALVE GEAR

Note:

Cylinder head which have cracks between valve seats or valve seat inserts and spark plug threads can be used without reducing service life provided cracks do not exceed a maximum 0.5 mm in width, or only the first spark plug thread is cracked.

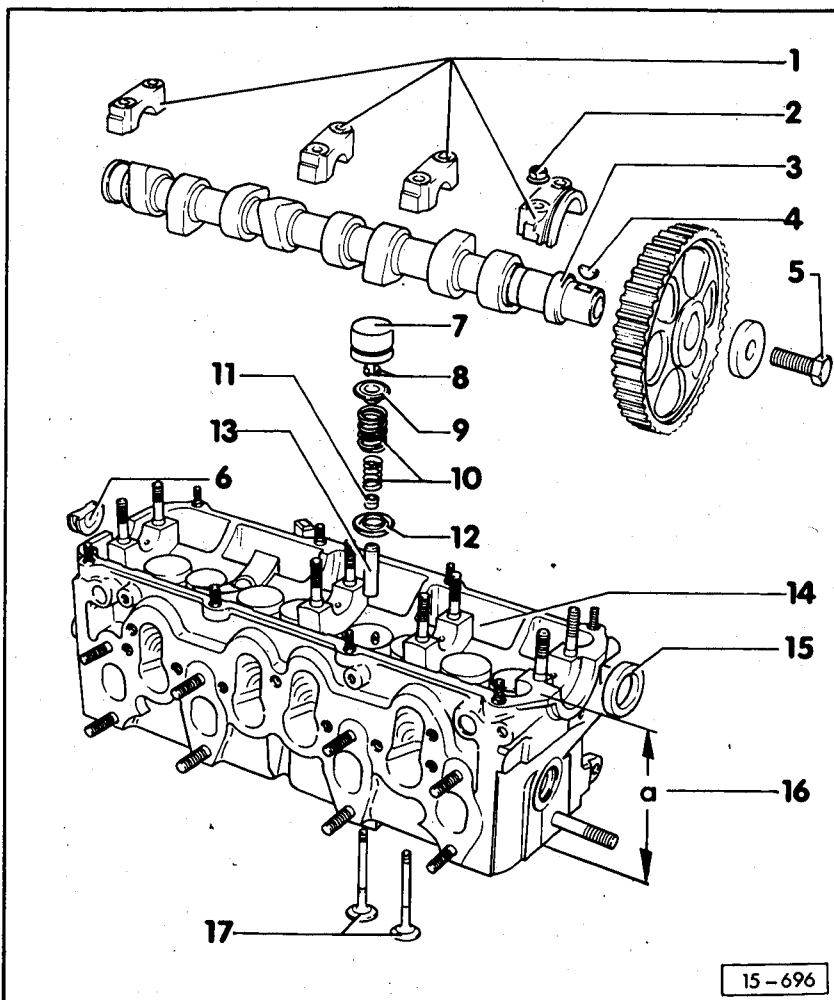
1- Bearing cap

- o Bearing cap 4 is not shown in the illustration
- o Note bore offset - Fig. 2
- o Installation sequence, see Removing and installing camshaft - page 15-15

2- 20 Nm

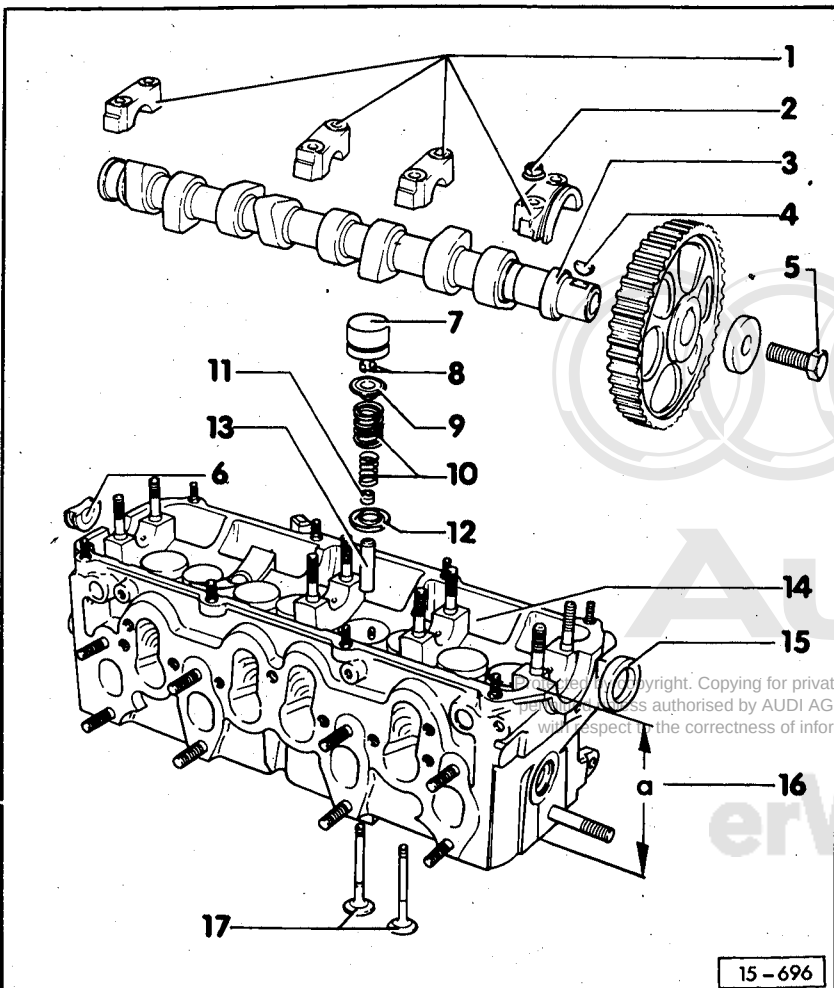
3- Camshaft

- o Checking axial clearance - Fig. 1
- o Removing and installing - page 15-15
- o Check radial clearance with Plastigage
- Wear limit: 0.1 mm
- o Runout: Max 0.01 mm



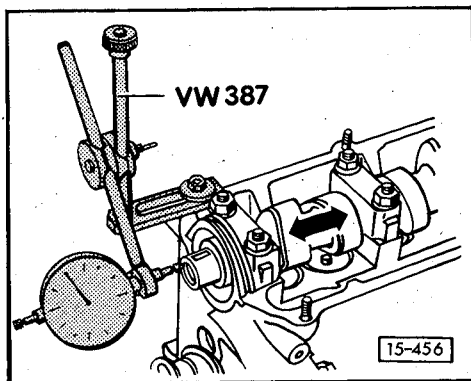
- 4- Woodruff key
 - o Check for proper fit
- 5- 80 Nm
- 6- Plug
 - o Renew
- 7- Hydraulic bucket tappet
 - o Check axial clearance of camshaft before installation - Fig. 1
 - o Oil contact surface
 - o Do not interchange
 - o Store with cam contact surface downwards, checking - page 15-3 -
- 8- Cotter
- 9- Upper valve spring seat
 - o Identification:
 - Wide chamfer outwards
 - Chamfer on inside
- 10- Outer valve spring
 - Inner valve spring
 - o Removing and installing:
 - Cylinder head removed - with 2037
 - Cylinder head installed - page 15-19
- 11- Valve stem oil seal
 - o Renewing - page 15-19
- 12- Lower valve spring seat
 - o Remove and install with 3047

15-7



- 13- Valve guide
 - o Checking wear - page 15-17
 - o Renewing - page 15-18
- 14- Cylinder head
 - o Reworking valve seats - page 15-11
 - o When renewing: Renew coolant.
- 15- Oil seal
 - o Renewing - 15-14
- 16- Cylinder head resurfacing dimension
 - o Dimension: a = 132.6 mm
- 17- Valves
 - o Grind in only, do not rework
 - o Valve dimensions - Fig. 3

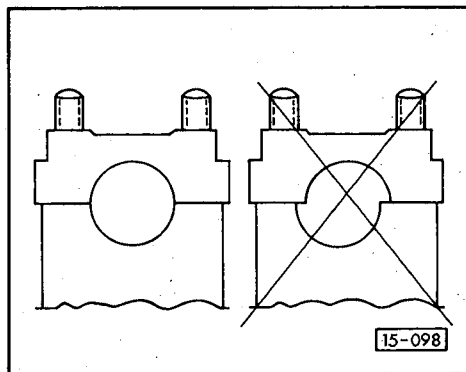
15-8



◀ Fig. 1 Camshaft, checking axial clearance

Wear limit: 0.15 mm

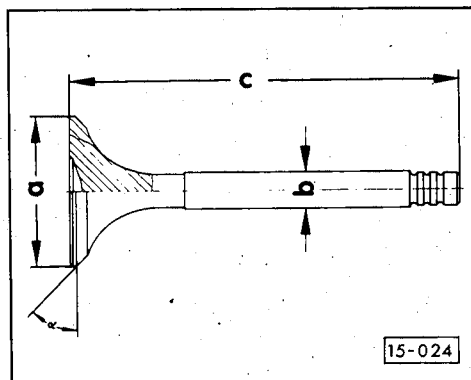
Perform measurement with bucket tappets removed and bearing caps 1 and 5 installed.



◀ Fig. 2 Bearing cap - camshaft installation position

Watch offset. Before installing camshaft, fit bearing cap to determine correct installation position.

15-9



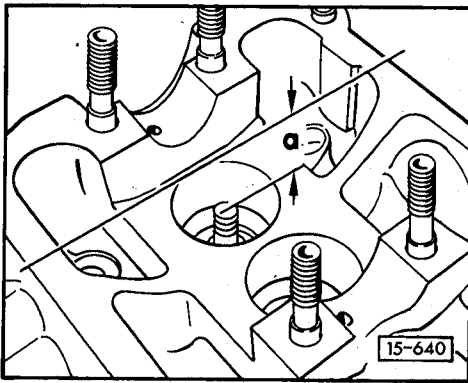
◀ Fig. 3 Valve dimensions

	Inlet valve	Exhaust valve
a dia. in mm	40.00	33.00
b dia. in mm	7.97	7.95
c in mm	91.90	91.20
°	45	45

Note:
Valves are not to be reworked.
Only grinding in is permissible.

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REWORKING VALVE SEATS

Note:

Valve seats should only be reworked just enough to produce a perfect seating pattern. Maximum approved reworking dimension must be calculated before the operation begins. If the reworking dimension is exceeded, hydraulic valve clearance compensation may no longer function correctly and cylinder head must be renewed.

Calculating max. permissible reworking dimension

- ◀ - Insert valve and press firmly against seat.
- Measure distance -a- end of valve stem and cylinder head upper edge.

Use measured distance and minimum dimension to calculate max. approved reworking dimension.

Minimum dimension

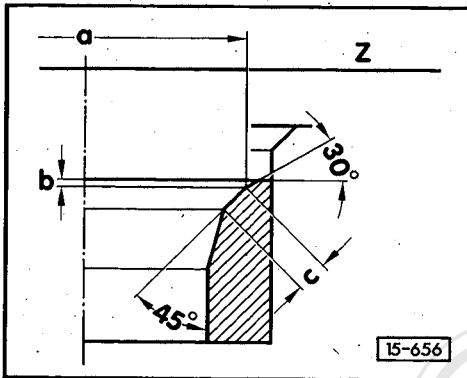
Inlet valve = 33.80 mm
Exhaust valve = 34.10 mm

Measured distance -a-
- minimum dimension

= max. approved reworking dimension *)

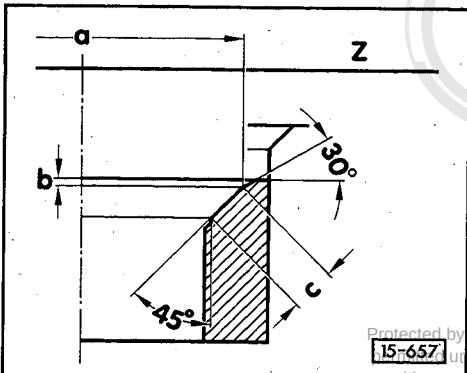
*) Page 15-12

15-11



◀ Reworking inlet valve seat

a = 39.2 mm dia.
*)b = Max. approved working dimension
c = Approx. 2.0 mm
Z = Cylinder head lower edge
30° = Upper correction angle
45° = Valve seat angle



◀ Reworking exhaust valve seat

a = 32.4 mm dia.
*)b = Max. approved working dimension
c = Approx. 2.4 mm
Z = Cylinder head lower edge
30° = Upper correction angle
45° = Valve seat angle

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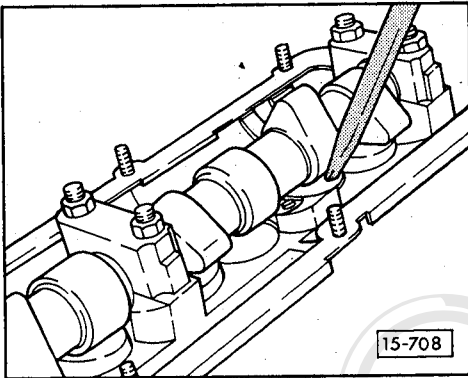
Exhaust valve seats always have reduced internal diameter. When reworking seats, great care should be taken to ensure that radius of reduction is not damaged.

CHECKING HYDRAULIC BUCKET TAPPETS

Notes:

- o Place removed bucket tappets on clean surface with contact surface (camshaft side) down.
- o Bucket tappets must be renewed complete (can not be adjusted or repaired).
- o Irregular valve noise during engine starting is normal.
- Start engine and allow it to run until radiator fan has switched on once.
- Increase engine speed to approx. 2500 rpm for 2 minutes.
If the hydraulic bucket tappets are still noisy, locate faulty tappet in the following manner:
- Remove cylinder head cover.
- Turn crankshaft until cam lobes of tappet to be checked are pointing upward.

15-13



- ◀ - Use wooden or plastic wedge to press down the bucket tappet. If free travel of more than 0.1 mm is felt before the valve starts to open, renew tappet.

Note:

Engine must not be started for approx. 30 minutes after new bucket tappets are installed (valve/piston contact).

RENEWING CAMSHAFT OIL SEAL

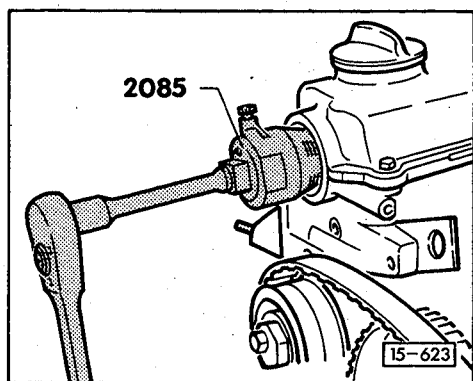
Removing:

- Remove upper toothed valve guard.
- Turn crankshaft to Cylinder 1 TDC.
- Release tension on toothed belt and remove.
- Remove camshaft sprocket.
- Remove Woodruff key from camshaft.
- Screw camshaft sprocket securing bolt with shim into camshaft until it stops.
- Unscrew inner part of oil seal extractor 2085 by two turns (approx. 3 mm) from outer part and lock in position with knurled screw.

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15-14



- ◀ - Lubricate threaded head of oil seal extractor, bring it into position and exert strong pressure while screwing it into the oil seal as far as possible.
- Loosen knurled screw and turn inner part against camshaft until oil seal has been extracted.
- Clamp extractor between vice jaws and remove oil seal with pliers.

Installing:

- Lightly lubricate sealing lip and outer edge of oil seal.
- Use sleeve from 10-203 to fit oil seal and then press in flush using thrust sleeve 10-203.
- Install toothed belt (adjust valve timing) - see Repair Group 13.

REMOVING AND INSTALLING CAMSHAFT

Removing:

- Remove upper toothed belt guard.
- Remove cylinder head cover.
- Rotate crankshaft to cylinder 1 TDC.

15-15

- Release tension on toothed belt and remove.
- Remove camshaft sprocket.
- Remove Woodruff key from camshaft.
- Remove camshaft bearing caps 5, 1 and 3. Alternately loosen bearing caps 2 and 4 in diagonal pattern.

Installing:

Note:

- o When camshaft is installed, lobes for cylinder 1 must point upward.
- o Note bore offset when installing bearing caps. Place caps in position before installation to determine correct position.
- o Engine must not be started for about 30 minutes after new bucket tappets are installed (valve/piston contact).

- Alternately tighten bearing caps 2 and 4 in diagonal pattern.

Tightening torque: 20 Nm

- Install bearing caps 5, 1 and 3.

Tightening torque: 20 Nm

- Install and tighten down camshaft sprocket.

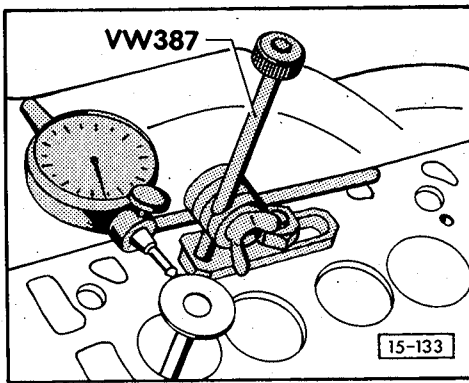
Tightening torque: 80 Nm

- Install toothed belt (adjust valve timing) - see Repair Group 13.

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erW

15-16



CHECKING VALVE GUIDES

- ◀ - Insert new valve into guide. Valve stem end must be flush with guide. Do to the variation in stem diameters, use only inlet valves with inlet guides and outlet valves with outlet guides.
- Determine rock.

Wear limit:

Inlet valve guide = 1.0 mm
Exhaust valve guide = 1.3 mm

15-17

RENEWING VALVE GUIDES

Clean and check cylinder head. Cylinder heads in which valve seats can no longer be reworked or cylinder heads which have already been machined to minimum dimension can no longer be repaired.

- Use 10-206 to press out worn valve guides from the camshaft side (valve guides with shoulder - service version - from combustion chamber side).
- Coat new guides with oil and use 10-206 to press in from camshaft side until shoulder makes contact with cold cylinder head.

Note:

When shoulder on guide makes contact, pressure must not exceed 1.0 ton as shoulder could otherwise break off.

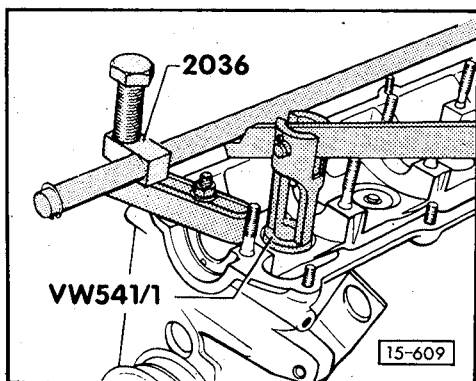
- Ream valve guides out with hand reamer 10-215 using plenty of cutting fluid.

- Reworking valve seats - page 15-11.

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15-18



RENEWING VALVE STEM OIL SEALS

(with cylinder head installed)

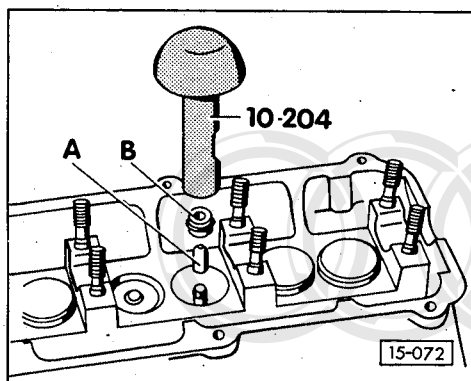
- Remove camshaft and bucket tappets.
- Screw out spark plugs.
- Run piston of cylinder being worked on to bottom dead center.
- ◀ - Install 2036 assembly tool and adjust to height of studs.
- Screw VW 653/3 compressed air hose into spark plug socket and apply continuous pressure of
at least 6 bar.
- Remove valve springs with VW 541/1 assembly lever.

Note:

Frozen valve cotters can be loosened by tapping lightly on the assembly lever.

- Remove valve stem seals with 3047 A.

15-19



- ◀ - Installing valve stem seals: Place plastic sleeve -A- on valve stem, lubricate valve stem seal -B-, place in press-on tool and carefully push down onto valve guide.

Note:

To prevent damaging valve stem seals during installation always use plastic sleeve.

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erWin

15-20

REMOVING AND INSTALLING LUBRICATION

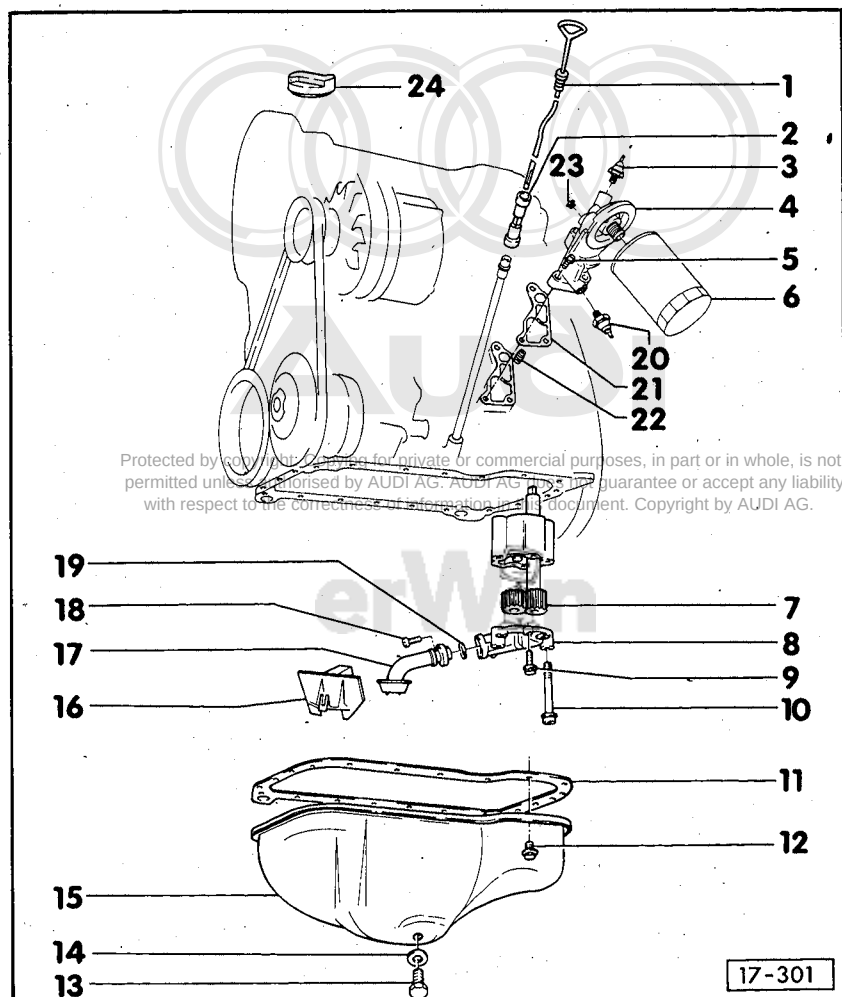
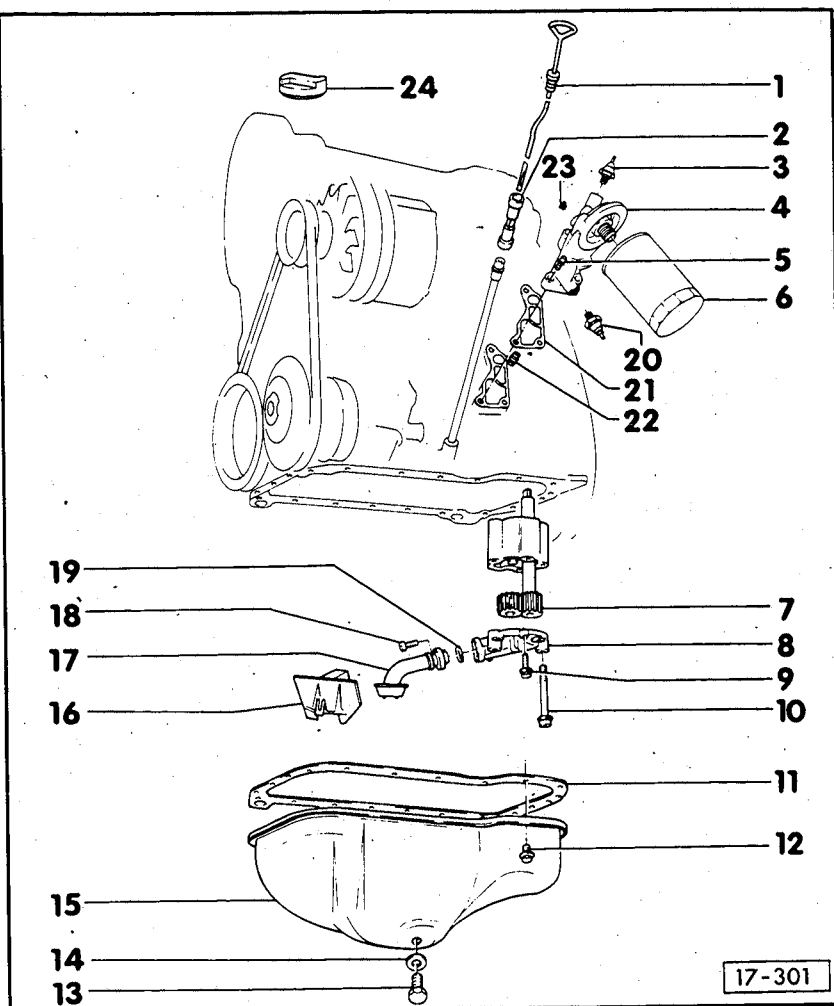
SYSTEM COMPONENTS

Notes:

- o Engine with code caps ABK is equipped with an oil-jet piston cooling arrangement.
- o Oil level must not exceed max. mark on oil dipstick (danger of catalyst damage).
- o All components illustrated can be removed and installed with engine in place.
- o Always renew all gaskets and seals.
- o If large quantities of metal particles and filings – such as caused by partial seizure of crankshaft and connecting rod bearings – are found in engine oil during repairs, thoroughly clean all oil passages in order to avoid further engine damage.

Lubrication system		Capacity
with		without
	filter change	
3.0 ltr		2.5 ltr

17-1



1- Oil dipstick

- o Difference between min. and max. marks = 1 ltr.
- o Oil level above max. can cause catalyst damage

2- Dipstick tube

3- 0.3 bar oil pressure switch

- F22, 25 Nm
- o Checking – page 17-4

4- Oil filter mounting

- o Engines with code ABK are equipped with an oil cooler between filter and mounting

5- 25 Nm

6- Oil filter

- o Loosen with filter wrench
- o Twist off by hand
- o Observe installation instructions on filter

7- Gears

8- Oil pump cover with relief valve

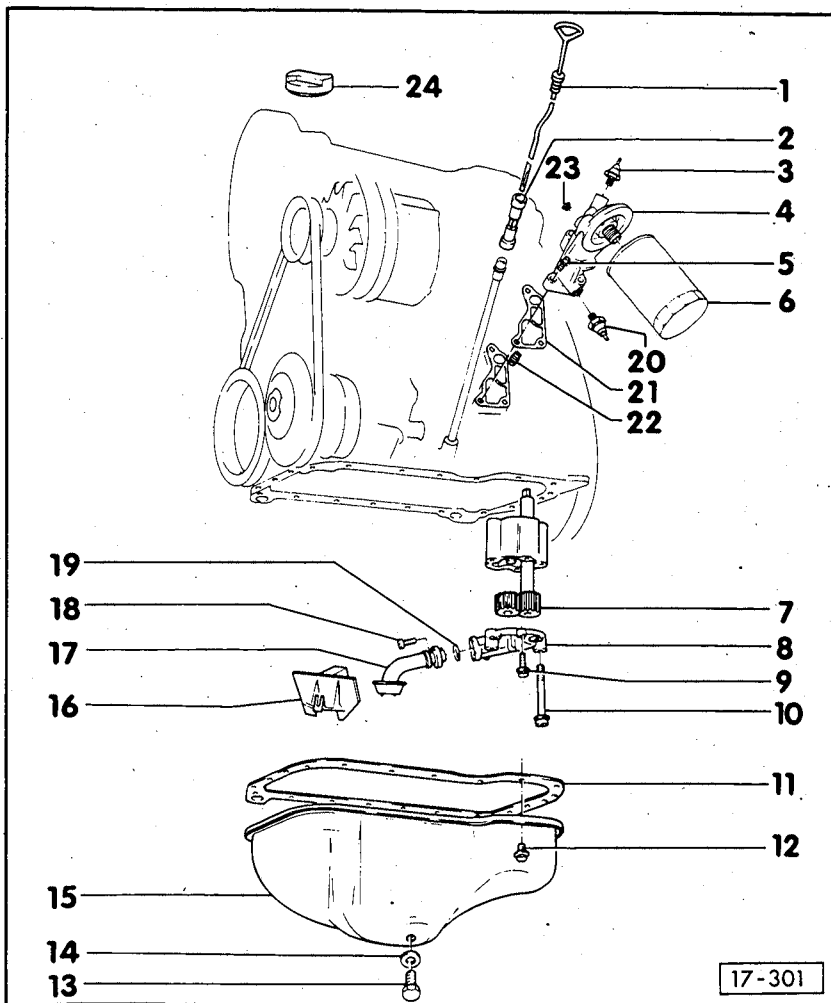
9- 10 Nm

10- 20 Nm

11- Oil sump gasket

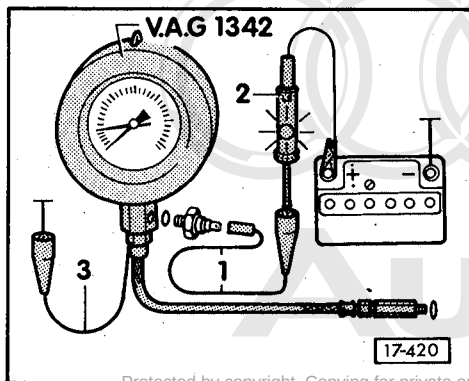
- o Renew
- o Do not use sealer, watch installation position

17-2



- 12- 20 Nm
- 13- Oil drain plug, 30 Nm
- 14- Washer
o Renew
- 15- Oil sump
- 16- Baffle plate
- 17- Intake pipe
- 18- 10 Nm
- 19- O-ring
o Renew if damaged
- 20- 1.8 bar oil pressure switch
-F1, 25 Nm
o Checking - page 17-5
- 21- Gasket
Renew
- 22- Oil return check valve for hydraulic
bucket tappets, 6 Nm
o Install with -D6- adhesive
- 23- Socket screw with washer
- 24- Caps

17-3



CHECKING OIL PRESSURE SWITCH AND OIL PRESSURE (optical and acoustic oil pressure warning system)

Note:

Checking operation and servicing of optical and
acoustic oil pressure warning system - see
Repair Manual "Electrical system".

0.3 bar oil pressure switch (-F22)

- ◀ - Remove 1.8 bar oil pressure switch (white
insulation) and screw it into tester.
- Screw tester into oil filter mounting in place
of oil pressure switch.
- Remove wire from 0.3 bar oil pressure switch
(brown insulation) and plug on wire -1- (blue)
from tester.
- Connect test lamp -2- to wire -1- and positive
pole of battery (+).
- Connect wire -3- (brown) to earth (-).
Test lamp should light up.
- Start engine and slowly increase rpm.

The test lamp must go out at 0.15 - 0.45 bar
pressure, otherwise renew oil pressure switch.

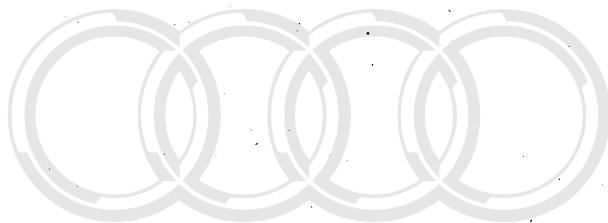
Note:

Activation point of oil pressure switch can be
tested at engine starter speed if necessary.

1.8 bar oil pressure switch (-F)

- Remove wire -1- from 0.3 bar switch and connect it to 1.8 bar oil pressure switch (white insulation).
- Slowly increase engine speed.
- The test lamp should light up at 1.6 - 2.0 bar pressure, otherwise renew oil pressure switch.
- Continue to increase engine speed. Oil pressure should be at least 2.0 bar at 2000 rpm and 80 ° oil temperature.

17-5



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REMOVING AND INSTALLING COOLING SYSTEM

COMPONENTS

Notes:

- o Perform cooling system leak test with V.A.G 1274 and 1274/1A.
- o Draining and refilling with coolant - page 19-5.
- o Always renew coolant.
- o Coolant mixture ratios - page 19-5.
- o Always renew all gaskets and seals.
- o Hose connections are secured with either spring-type or screw-type clamps. The spring-type clamps can be replaced by screw-type clamps during repairs.
- o Conventional pliers, e.g. Hazet 798-5 are recommended for spring clamp installation.
- o Engines with code ABK are equipped with an oil cooler.

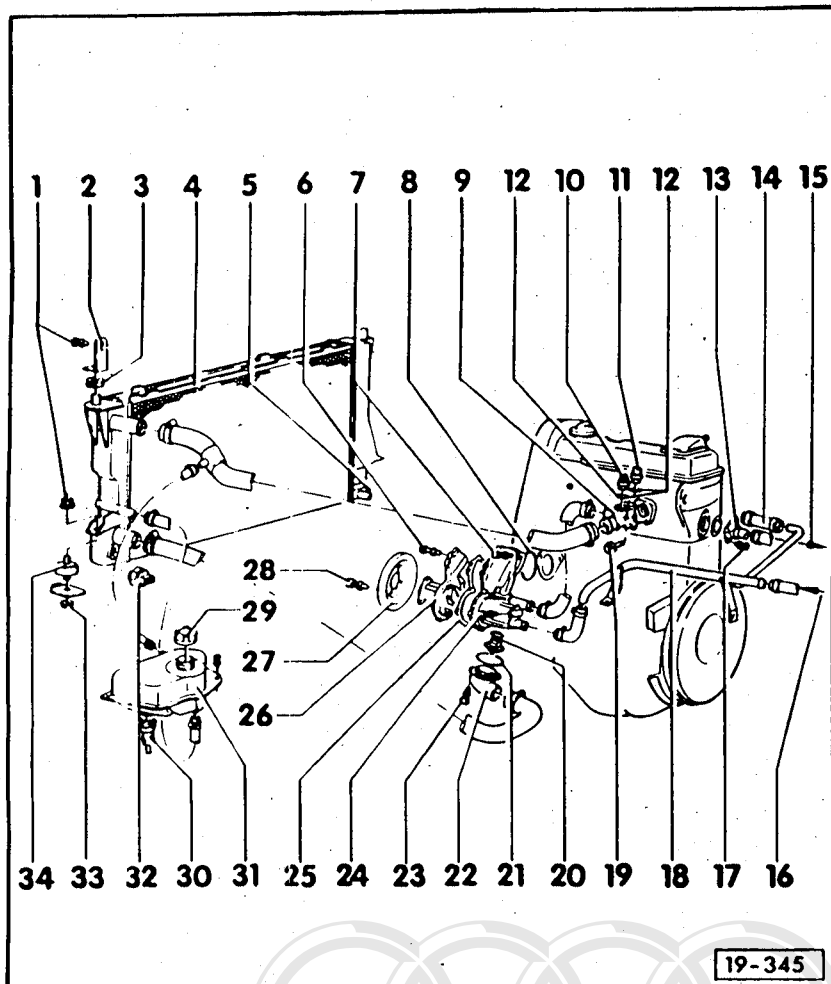
1- 10 Nm

2- Bracket

3- Rubber bush

4- Radiator

- o In vehicles with air conditioner the refrigerant circuit must not be opened, coolant pipes bend easily



19-1

5- Drain plug

- o Drain coolant - page 19-5

6- 10 Nm

7- 20 Nm

8- O-ring
o Renew

9- Union

10- Sensor for coolant temperature display -G2 and switch for overheating warning lamp -F14

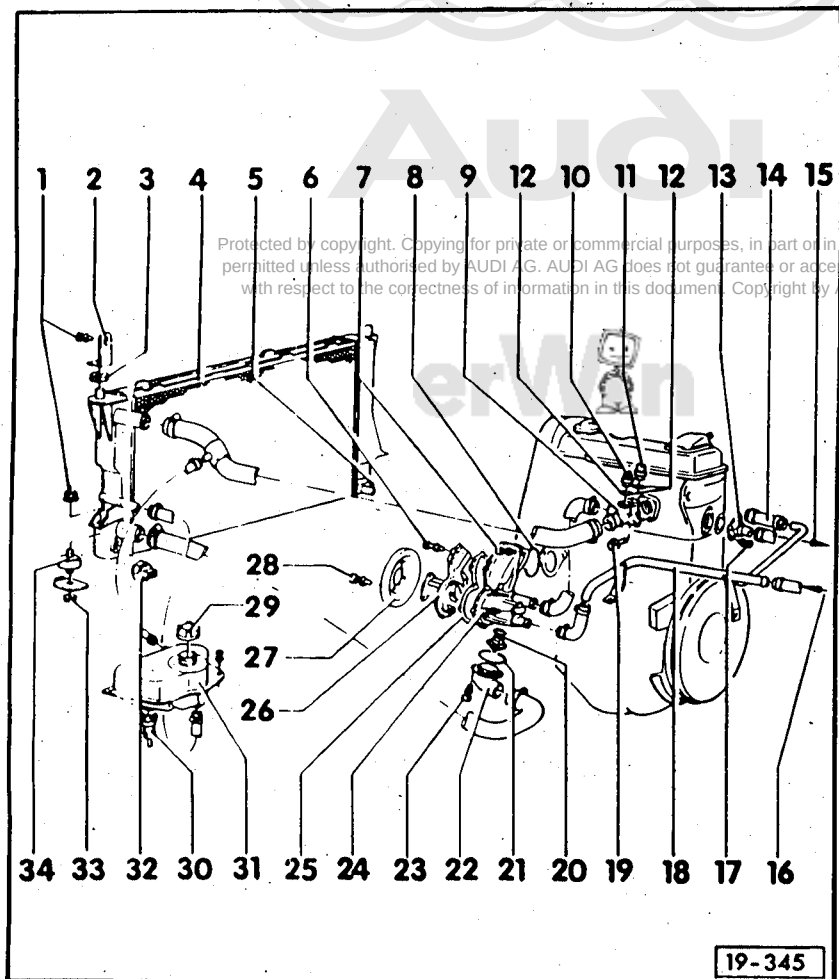
11- Coolant temperature sensor -G62
o Checking - see Repair Group 01, self-diagnosis

12- O-ring
o Renew

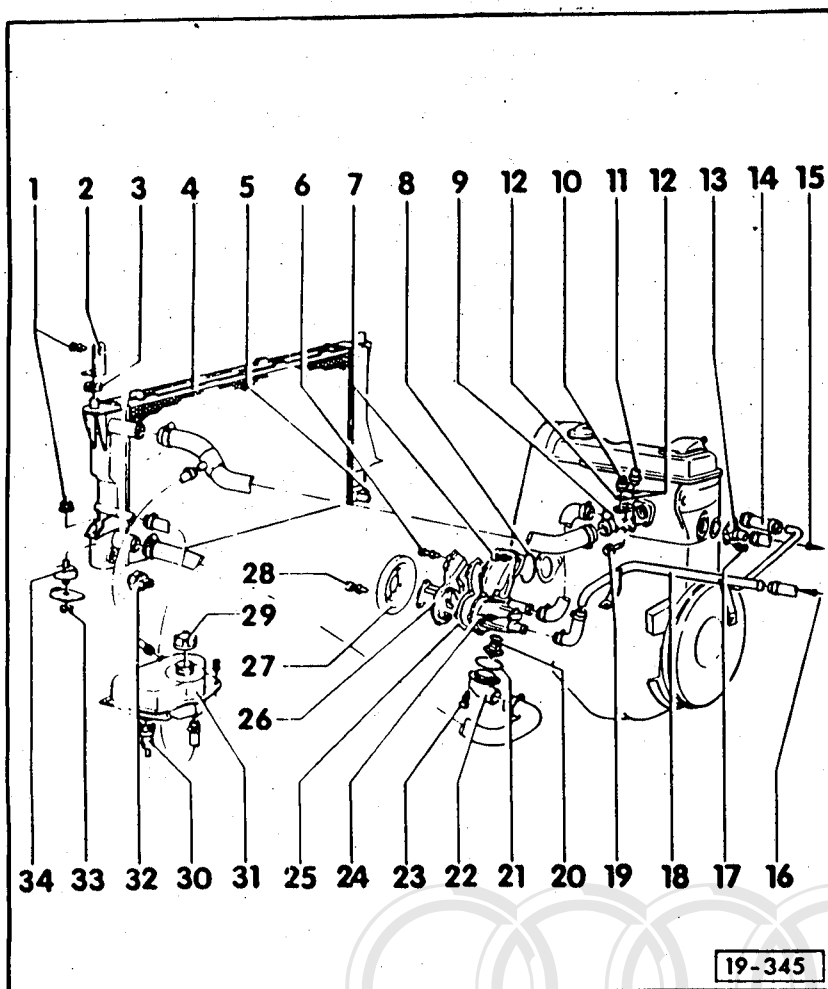
13- Union

14- To intake manifold
o This connection not present with engine code ABK

15- To heat exchanger

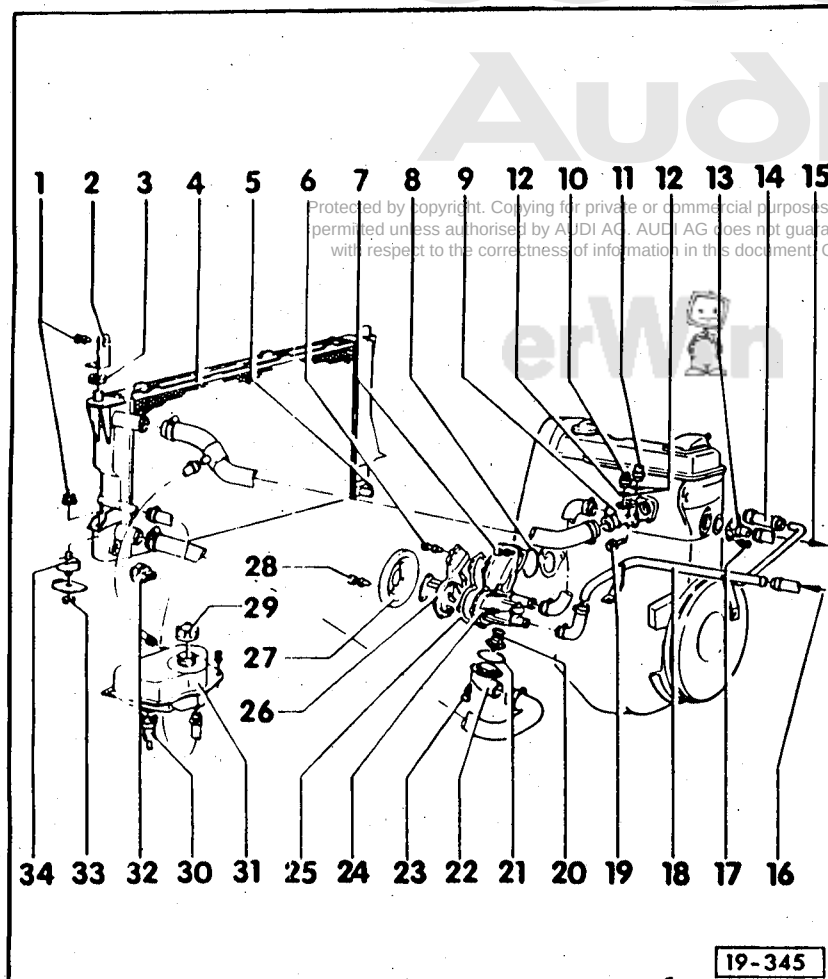


19-2



- 16- From heat exchanger
- 17- 10 Nm
- 18- Coolant pipe
- 19- 10 Nm
- 20- Thermostat
 - o Checking:
 - Heat thermostat in water.
 - o Begins opening at approx. 87 °C
- 21- O-ring
 - o Renew
- 22- Union
- 23- 10 Nm
- 24- 20 Nm
- 25- Gasket
 - o Renew
- 26- Coolant pump
 - o Check to ensure that shaft moves easily
- 27- Pulley
- 28- 20 Nm
 - o Loosen and tighten with V.A.G 1590

19-3



- 29- Cap
 - o Check with V.A.G 1274 and 1274/1A
 - o Test pressure: 1.2 - 1.5 bar
- 30- Connection
 - o For low coolant level display switch in expansion tank
- 31- Expansion tank
 - o With low coolant level display switch -F66
- 32- Thermostatic switch for fan, 25 Nm
 - o Switching temperature:
 - + = Supply
 - 1 = 1st stage On 92 - 97° C
 - Off 84 - 91° C
 - 2 = 2nd stage On 99 - 105° C
 - Off 91 - 98° C
- 33- 10 Nm
- 34- Bonded rubber bush

19-4

DRAINING AND REFILLING WITH COOLANT

Note:

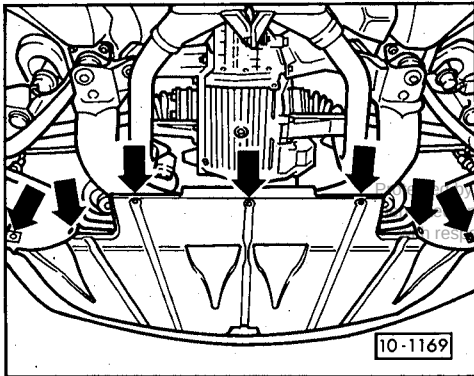
The cooling system is filled year-round with a mixture of water and G11 antifreeze and corrosion protectant. G11 and additives labeled "conforms to TL VW 774 A" prevent freezing while inhibiting corrosion damage and deposits. They also raise the boiling point. For these reasons, it is essential that the cooling system be filled with antifreeze and corrosion protectant throughout the year. The increase in boiling point makes a particular contribution to reliable operation under extreme conditions in countries with tropical climates.

Recommended mixture ratios:

Protection to	G11	Water
=====	=====	=====
-25° C	2.8 ltr.	4.2 ltr.
-35° C*	3.5 ltr.	3.5 ltr.

*) For operation in cold climates

19-5

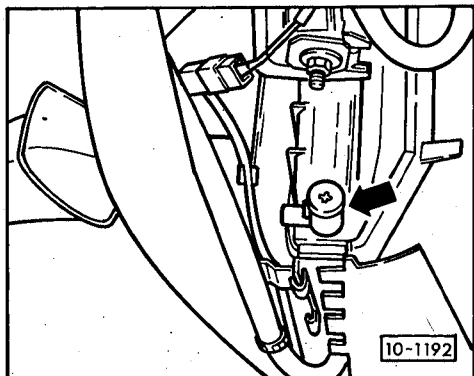


Draining

- Set heater controls to -warm- (heating valve fully open).
- Remove expansion tank cap.

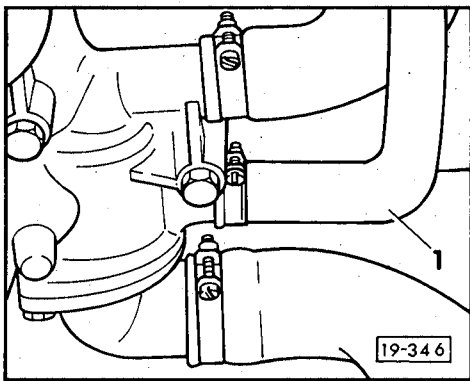
Remove sound insulation

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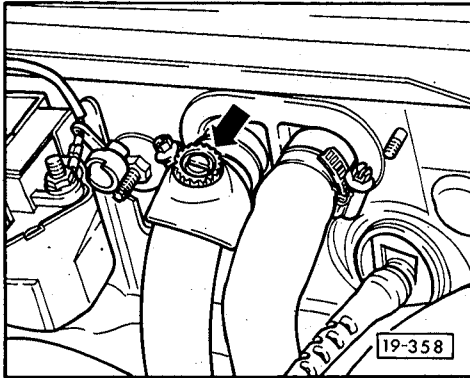
- Drain coolant from radiator, use auxiliary hose if necessary.

19-6



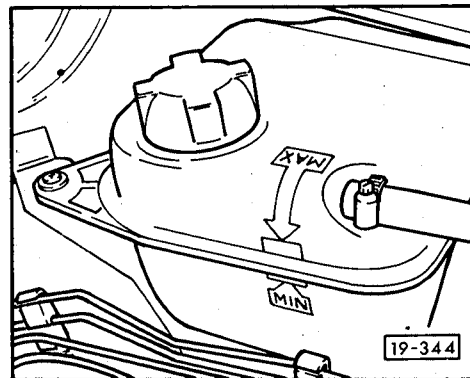
- ◀ - Drain coolant through coolant hose -1-.

Filling



- Close drain on radiator and connect coolant hose.
- Refill with new coolant.
- ◀ Open bleed valve on heater hose.
- Refill with coolant until level reaches upper edge of expansion tank while gently lifting upper coolant hose to radiator.
- Replace cap on expansion tank.
- Close bleed screw. Where necessary, open again once engine has warmed. Close when no more air emerges.
- Allow engine to run until the electric fan cuts in.

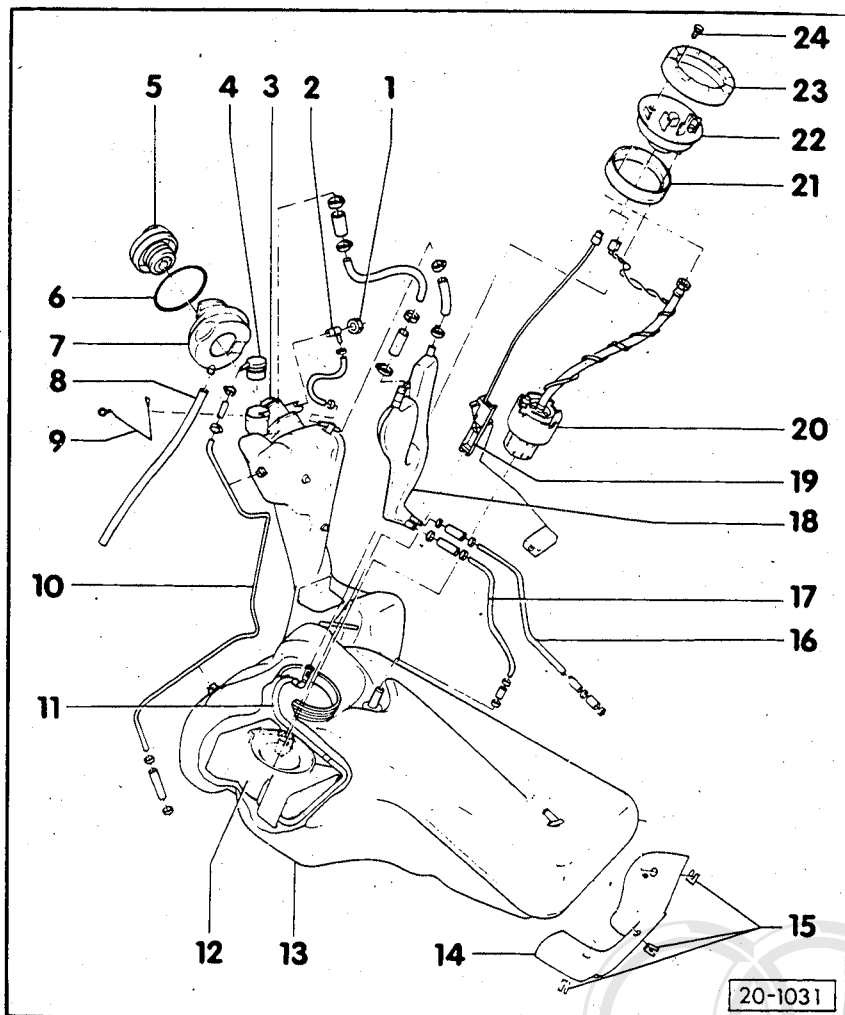
19-7



- ◀ - Check coolant level and fill up to mark where necessary. When engine is at normal operating temperature level should be slightly above Max. mark, and between Max. and Min. mark with engine cold.

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REMOVING AND INSTALLING FUEL SYSTEM

COMPONENTS

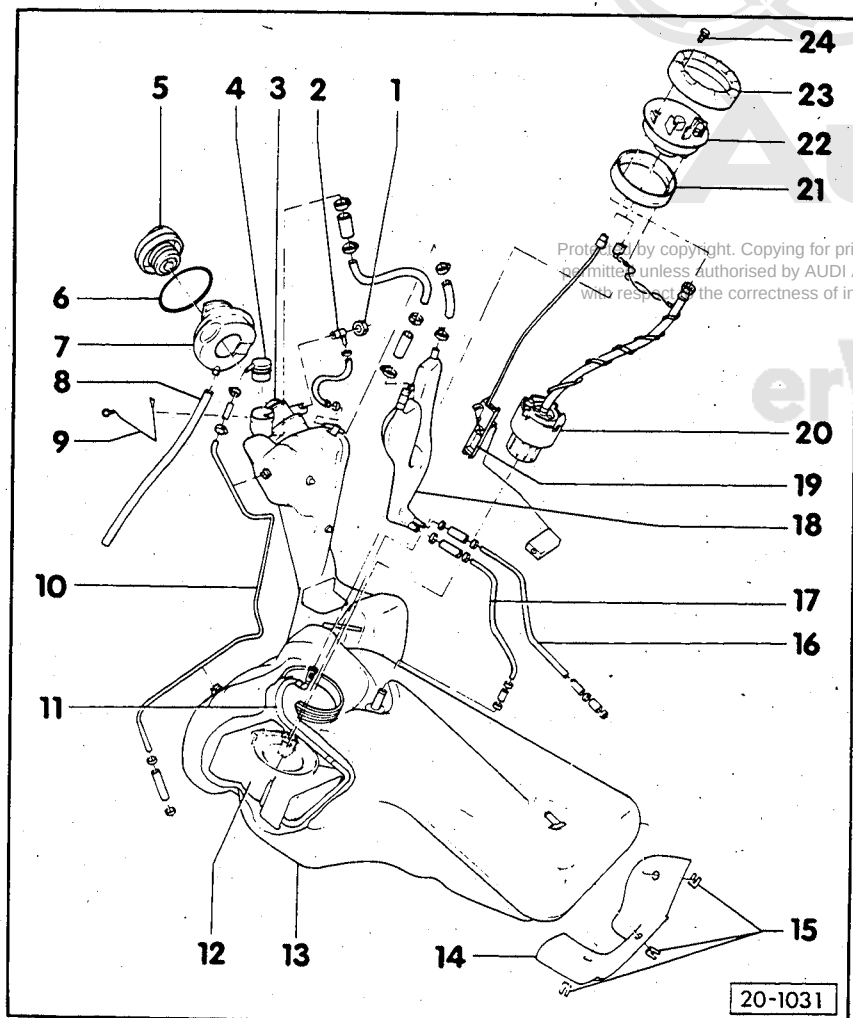
Caution!

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

Notes:

- o Illustration shows fuel system for vehicles with front wheel drive.
- o Always renew all seals during assembly.
- o Hose connections are secured with either screw-type or spring-type clamp.
- o Always reheat spring-type clamps.
- o Observe safety precautions when working on fuel tanks - page 20-5.
- o Observe rules for cleanliness - page 20-6.
- o Fuel filter position - page 20-7.
- o Connecting remote control - page 20-7.
- o Checking fuel pump relay and control circuit - page 20-13.
- o Servicing tank ventilation system with activated charcoal filter - page 20-24.

20-1



1- Union nut

2- Vent valve

3- Filler neck

4- Gravity valve

5- Cap

6- Retaining ring

7- Rubber insert

8- Overflow line

9- Earth wire

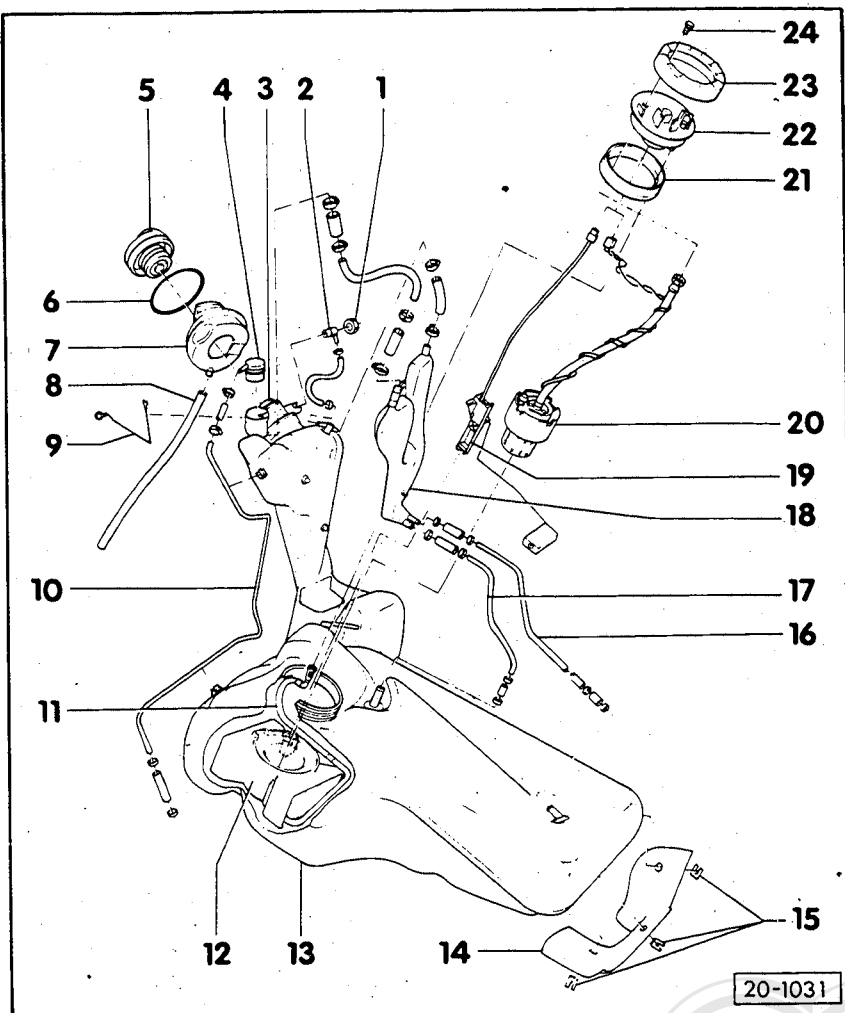
- o Is plugged onto filler neck and retained by upper fuel tank screw

10- Vent line

- o To activated charcoal filter - page 20-24

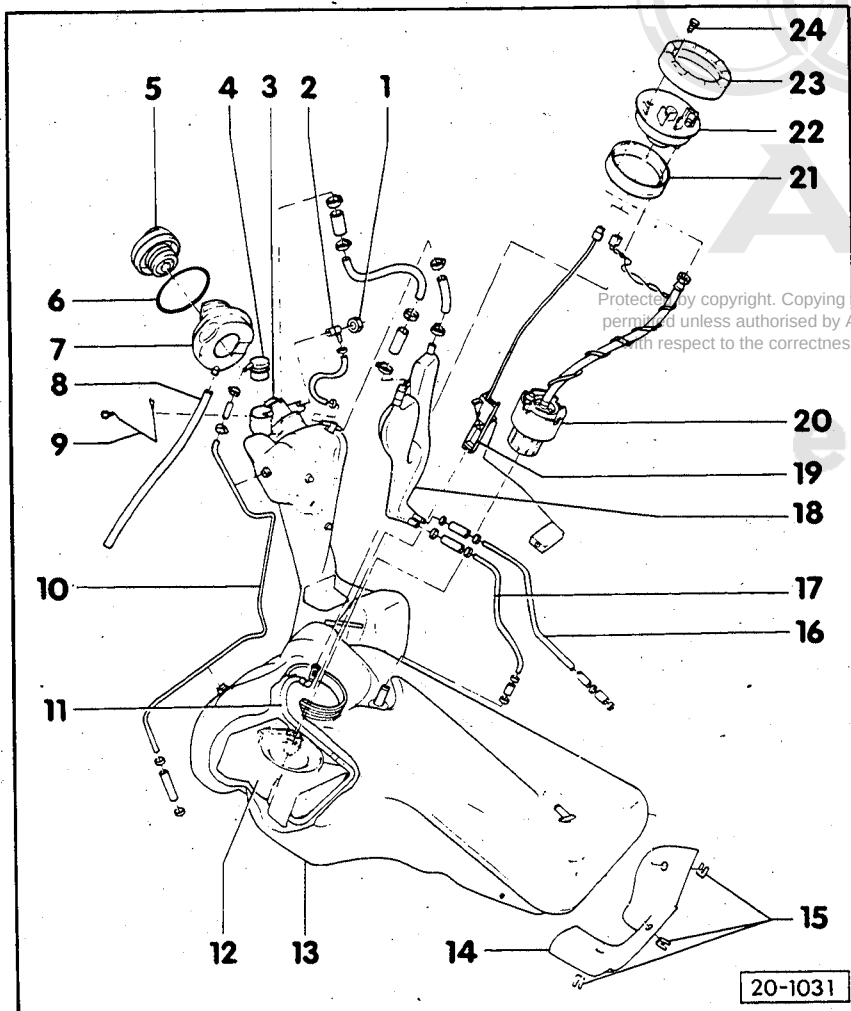
11- Return line in fuel tank

20-2



- 12- Bracket in fuel tank
 - o For fuel pump and fuel level display sensor
- 13- Fuel tank
 - o Removing and installing - page 20-22
- 14- Shield
- 15- Clips
- 16- Long balance tube
 - o From expansion tank to fuel tank
- 17- Short balance tube
 - o From expansion tank to fuel tank
- 18- Expansion tank
- 19- Sensor for fuel level display
 - o Removing and installing - page 20-17

20-3



- 20- Fuel pump
 - o Checking - page 20-8
 - o Checking delivery rate - page 20-10
 - o Checking fuel pump non-return valve - page 20-15
 - o Removing and installing - page 20-20
 - o Dismantling and assembling - page 20-21

21- Seal ring

22- Sealing flange
o Note position

23- Union nut

24- Banjo bolt, 20 Nm

20-4

SAFETY PRECAUTIONS WHEN WORKING ON FUEL TANK

Pay special attention to the following points when removing or installing fuel pumps or fuel gauge senders from filled or partially filled fuel tanks:

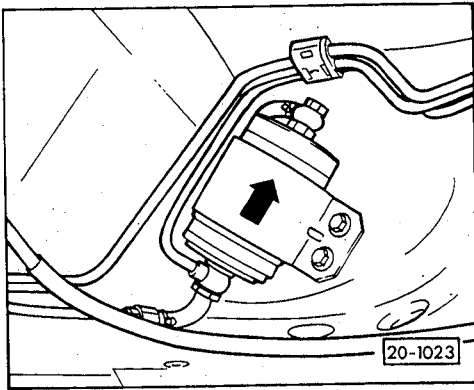
- o Before beginning with the procedures, a suction hose from an exhaust extraction system must be placed close to the opening of the fuel tank in order to be able to extract escaping fuel vapors immediately the cap is removed. If an exhaust extraction system is not available, a radial fan (motor not an air stream) with a delivery rate exceeding 15 m³/h may be used.
- o Fuel-resistant gloves must be worn when it is necessary to reach into the fuel while removing or installing fuel pump.

20-5

RULES FOR CLEANLINESS WHEN WORKING ON FUEL SYSTEM

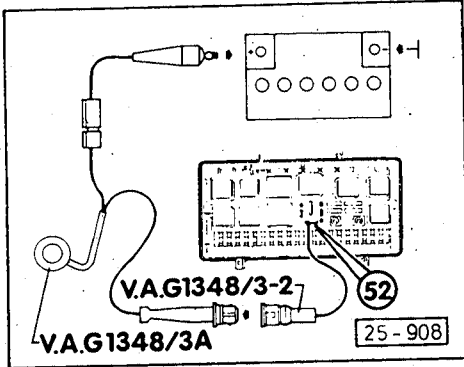
- o Thoroughly clean all unions and adjacent areas before disconnecting.
- o Place removed parts on clean surface and cover over. Use paper or plastic sheeting. Use only lint-free cloths.
- o Cover or seal open components if the repair can not be carried out immediately.
- o Install clean components only.
 - Only unpack replacement parts immediately prior to installation.
 - Do not use parts that have been stored loose (for instance, in tool boxes).
- o With fuel system open:
 - Avoid moving vehicle.

20-6



INSTALLATION POSITION OF FUEL FILTER

- ◀ Flow in direction indicated by arrow.



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

o Fuse No. 13 OK.

- ◀ - Remove fuel pump relay from the relay plate (relay position 10).
- Connect adapter lead plug to contact 52.
- Connect clip to battery (+).

20-7

CHECKING FUEL PUMP

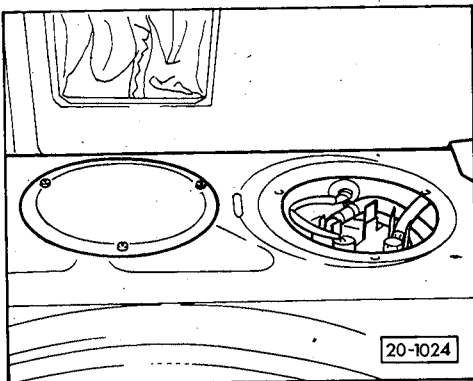
Checking voltage supply

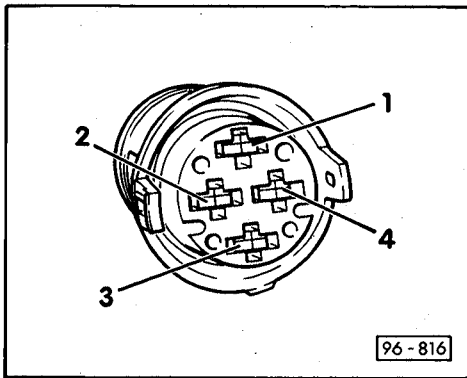
o Fuse No. 13 OK.

- Switch on ignition.
Fuel pump must be briefly heard running. If fuel pump does not start running, connect V.A.G 1348/3A remote control - page 20-7.
- Operate remote control.
- Fuel pump runs:
- Check fuel pump relay - page 20-11.

Fuel pump does not run:

- ◀ - Remove cover for fuel gauge and fuel pump (under luggage compartment trim).
- Unplug connector for fuel pump and fuel gauge.





- ◀ - Use auxiliary leads from V.A.G 1594 to connect V.A.G 1526 hand multimeter to contacts 1 (green/yellow) and 4 (brown).

- Operate remote control.

Specified voltage: Approx. battery voltage.

If specified voltage is not obtained:

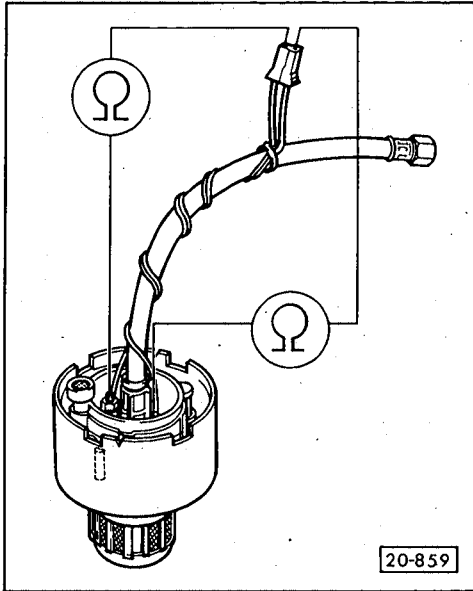
- Consult current flow diagram to locate and repair open circuit.

If specified voltage is obtained:

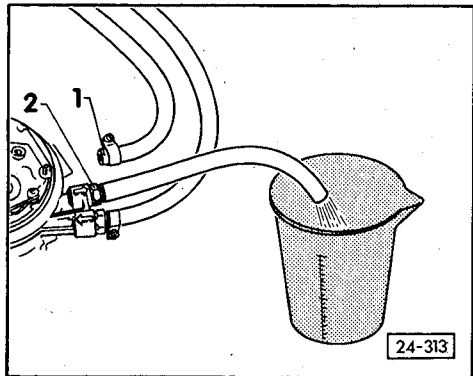
- Remove sealing flange - page 20-17.

- ◀ - Use hand multimeter and auxiliary leads to check wiring between sealing flange and fuel pump for continuity, repair open circuit where necessary.

- If the wiring is in order, renew fuel pump. (Removing and installing fuel pump - page 20-20).



20-9



CHECKING DELIVERY RATE

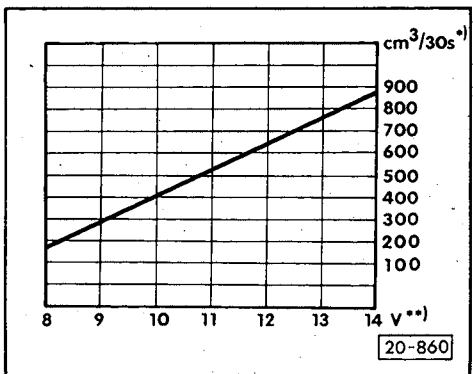
- o Voltage supply OK.
- o Fuel filter not plugged.
- o V.A.G 1348/3A remote control connected.

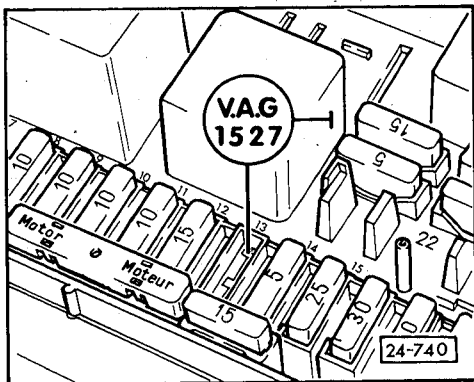
- Remove cap from fuel neck.
- ◀ - Pull return line -1- from injection unit union -2-.
- Install test hose on union -2- and hold it in a graduated container.
- Press remote control switch for 30 sec.

- ◀ - Compare fuel quantity obtained with specified value - see diagram.

*) Minimum delivery rate in $\text{cm}^3/30 \text{ sec.}$

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





CHECKING FUEL PUMP RELAY

Checking operation

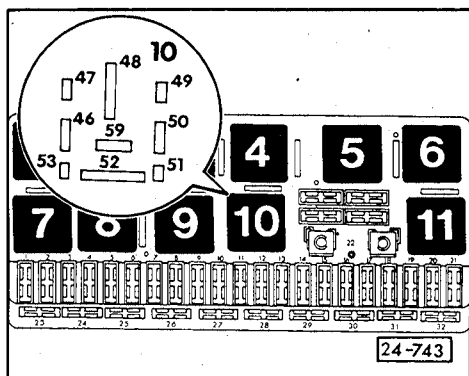
Note:

Fuel pump relay is located at socket 10 of central relay plate at left side of plenum chamber.

Remove cover of central relay plate at left side of plenum chamber.

- ◀ - Remove Fuse 13 and use auxiliary leads from V.A.G 1594 test set to connect V.A.G 1527 diode test lamp between earth and rear contact for Fuse 13.
- Briefly operate starter.
- Specification: Fuel pump relay must click in (can be felt and heard) diode test lamp must light up.
- If fuel pump relay is not activated, check control - page 20-13.

20-11



- ◀ - If fuel pump relay is activated, but test lamp does not light up, remove fuel pump relay and consult current flow diagram to check continuity in circuit between fuse 13 and contact 52 in relay socket to renew relay plate where indicated.
- If no open circuit is found, renew fuel pump relay.
- Reinstall fuse 13.

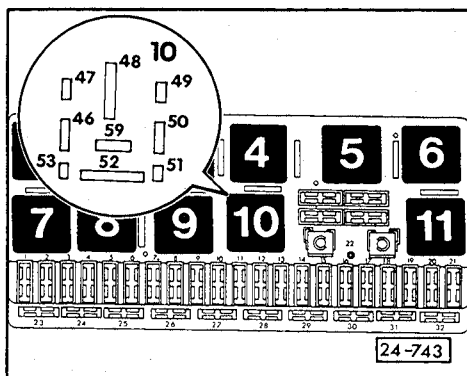
- Remove auxiliary fuse 25 and use leads from V.A.G 1594 auxiliary test set to connect diode test lamp V.A.G 1527 to earth and to one of the two contacts for fuse 25.

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- ◀ - Briefly operate starter.
- Specification: Fuel pump relay must be activated (can be felt and heard), diode test lamp must light up.
- If fuel pump relay is not activated, check control - page 20-13.

20-12

- If fuel pump relay is activated, but diode test fails to light up, repeat test with other contact of fuse holder.
- If the diode test lamp fails to light up, remove fuel pump relay and consult current flow diagram to check continuity in circuit from fuse 25 to contact 59 of relay socket 10, repairing break as necessary.
- If no open circuit is found, renew fuel pump relay.
- Reinstall fuse 25.



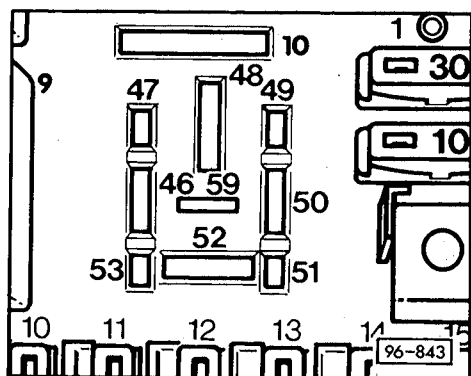
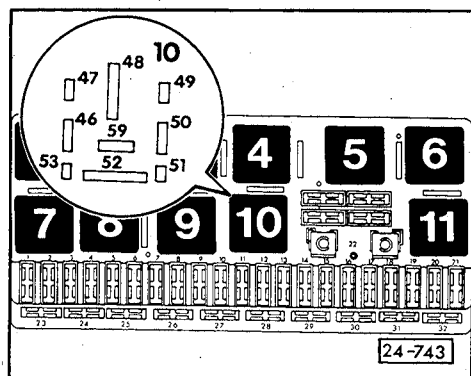
Checking voltage supply and control circuit of fuel pump relay-J17

- ◀ - Remove fuel pump relay -J17 from relay plate, socket 10.

Checking voltage supply

- Switch on ignition.
- Connect V.A.G 1526 hand multimeter (voltage measurement), first between contacts 47 (plus) and 50, then 48 (plus) and 50 of the relay socket.
- Specification: Approx. 12 V for both.
- Switch off ignition.

20-13



- If the specified voltage is not obtained, consult current flow diagram to repair open circuit.

Checking control circuit

- ◀ - Connect V.A.G 1527 diode test lamp to contacts 46 (plus) and 47 on the relay socket.
- When ignition is switched on, the diode test lamp must light up for approx. 1 sec., and remain lit constantly when starter is activated.
- If diode test lamp does not light up, check circuit as follows.
- Remove Monomotronic control unit - page 01-22, Monomotronic Repair Manual.
- Use V.A.G 1598/3 adapter lead to connect V.A.G 1598 test box to Monomotronic wiring harness. The numbers of the connector plug match those of the test box.
- ◀ - Connect hand multimeter between contact 47 of relay socket and contact 12 of test box and check circuit between them for continuity.
- Specification: Max. 1.0 ohms.

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- If specified resistance is not obtained, consult current flow diagram to repair open circuits.

- If the circuit is not open and diode test lamp fails to light up, renew Monomotronic control unit.
- If both fuel pump relay control circuit and circuit wiring are OK, renew fuel pump relay.
- Reinstall fuse 13.

CHECKING FUEL PUMP NON-RETURN VALVE

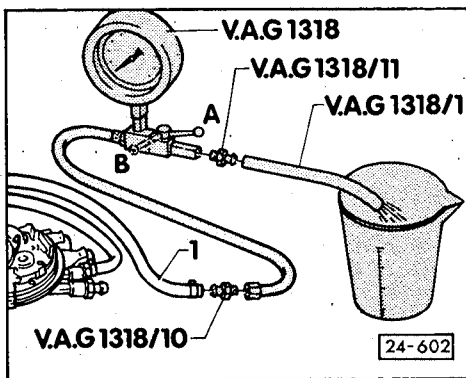
Note:

In this test, fuel supply line connections between fuel pump and connection of V.A.G 1318 pressure tester are also checked for leaks.

o Fuse No. 1 OK.

- Connect V.A.G 1348/3A remote control - page 20-7.

20-15



- ◀ - Connect V.A.G 1318 pressure tester to fuel supply line -1- (use V.A.G 1318/10 adapter).
- Install V.A.G 1318/1 hose on V.A.G 1318/11 adapter at the pressure tester and hold in graduated container.
- Open pressure tester cock (lever in direction of flow) - position -A- and operate remote control approx. 15 sec.
- Close pressure tester cock (position B).
- Press remote control switch at short intervals, until a pressure of:
approx. 2 bar
is obtained. (Reduce pressure above 2 bar to approx. 2 bar by opening cock carefully and slightly).

Note:

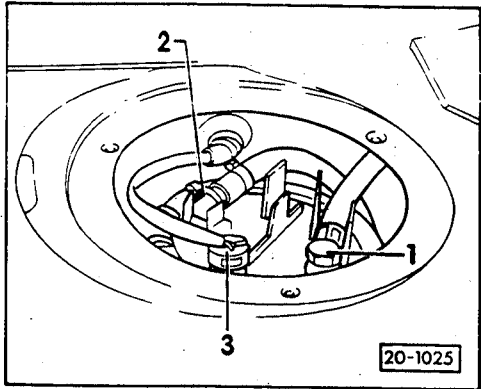
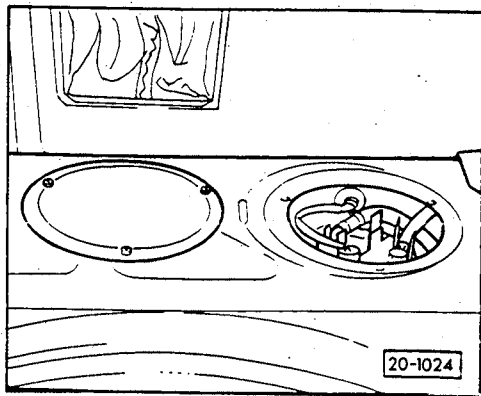
If pressure of 2 bar has still not been obtained after one minute, either hose connections or non-return valve is leaking.

- Note pressure drop. After 5 minutes, pressure must not have dropped below 0.5 bar, where indicated, check hose connections for leaks or renew fuel pump.

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20-16



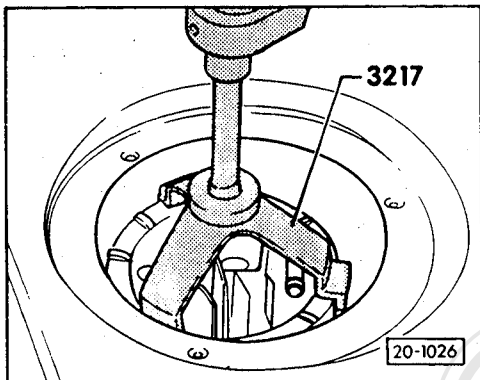
REMOVING AND INSTALLING FUEL GAUGE SENDER

- o Observe safety precautions – page 20-5.
- o Fuel tank may be filled to max. 3/4 capacity; where necessary, use V.A.G 1433 A fuel suction device to remove necessary amount of fuel from tank.

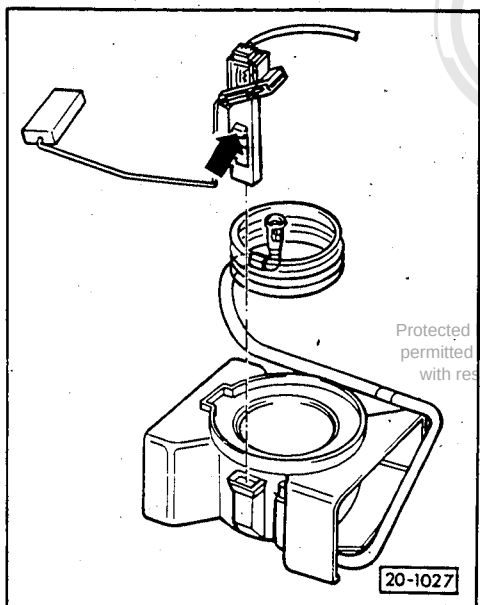
Removing:

- Remove cover at right of plenum chamber and remove battery earth strap.
- ◀ - Remove cover for fuel gauge sender and fuel pump (under luggage compartment trim).
- ◀ - Remove plug -3- for fuel gauge and fuel pump. Unscrew supply line -1- and remove return line -2- with adapter on sealing flange.

20-17



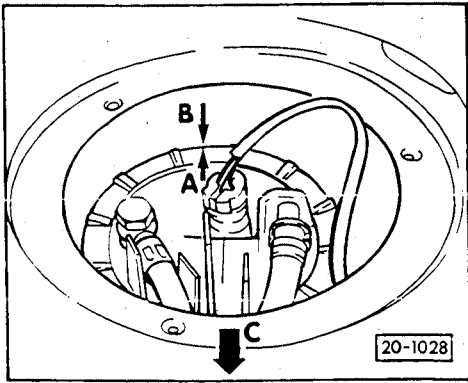
- ◀ - Use special tool 3217 to unscrew union nut and lift out sealing flange.
- Pull off connector plugs for fuel pump and fuel gauge. Remove supply return lines on inside of sealing flange.



- ◀ - Press detent tab -arrow- to pull out sender.

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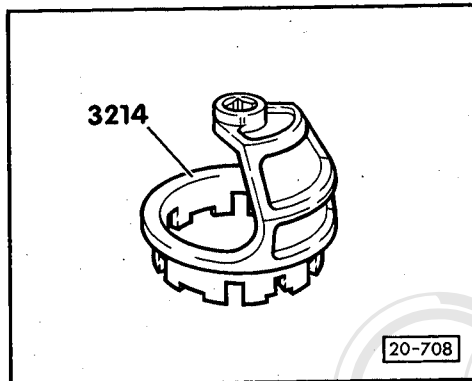
Installing:

Installation is performed in reverse sequence. Ensure that electric wires do not interfere with float.

◀ Note installation position:

- Mark -A- of sealing flange must be in alignment with mark -B- of fuel tank.
- C - Front of vehicle

20-19

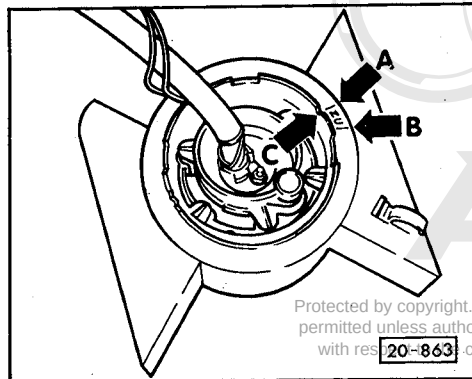


REMOVING AND INSTALLING FUEL PUMP

- Observe safety precautions – page 20-5.

Removing:

- ◀ - Turn fuel pump counter-clockwise approx. 15 mm using 3214.
- Pull fuel pump out the top.



Installing:

Installation is in reverse sequence of removal.

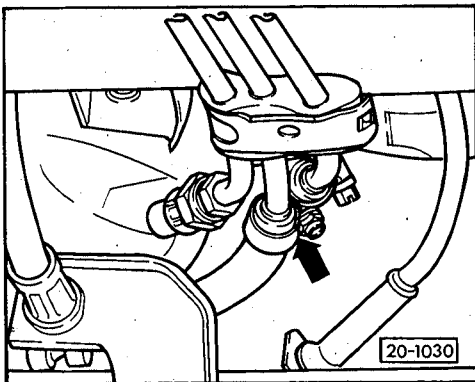
Install fuel pump as follows:

- ◀ - Place fuel pump in housing with V mark -C- in alignment with mark -A-.
- Apply special tool 3214 to fuel pump.
- Turn fuel pump clockwise until cap V mark -C- is aligned with mark -B- (snap into place).

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20-20



- ◀ - Remove vent line in front of fuel tank.
- Remove fuel tank support strap securing bolts
- Turn fuel tank to remove down and out side.

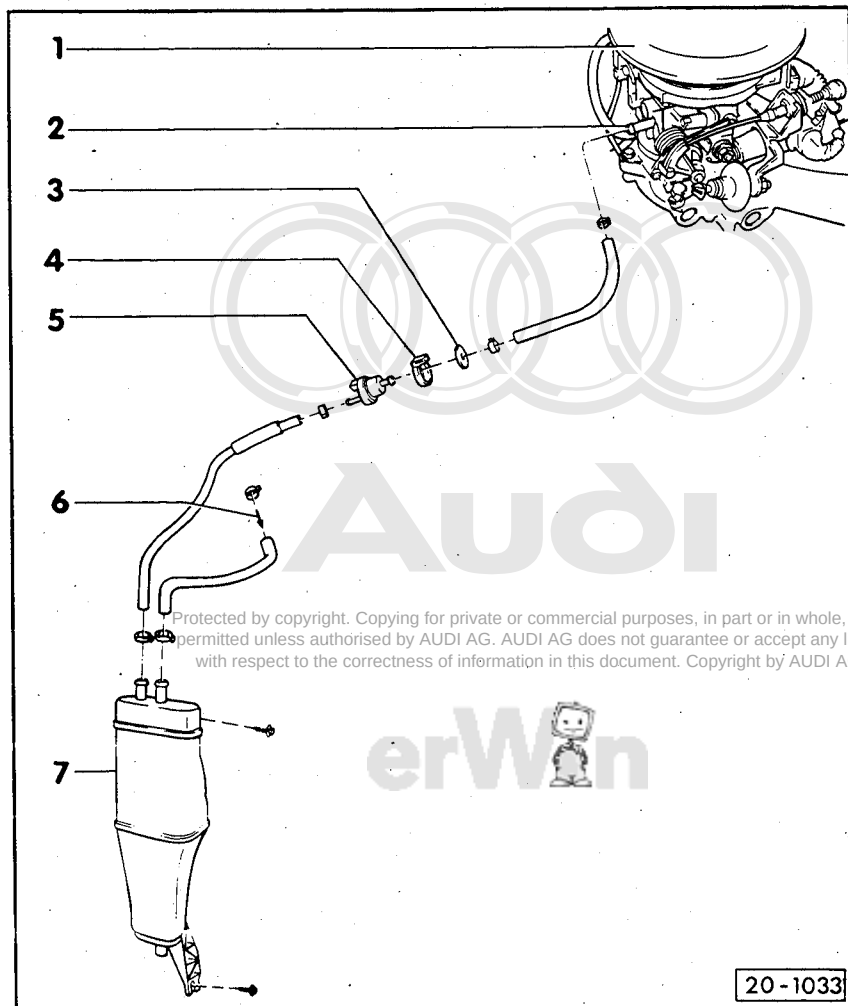
Notes on installation:

Lines are to be secured on the new fuel tank in the same manner as that which was removed. Installation is in reverse sequence.

quattro only:

- Install rear axle final drive - see Repair Manual, 5-speed Manual Gearbox 016 all-wheel drive Repair Group 39.

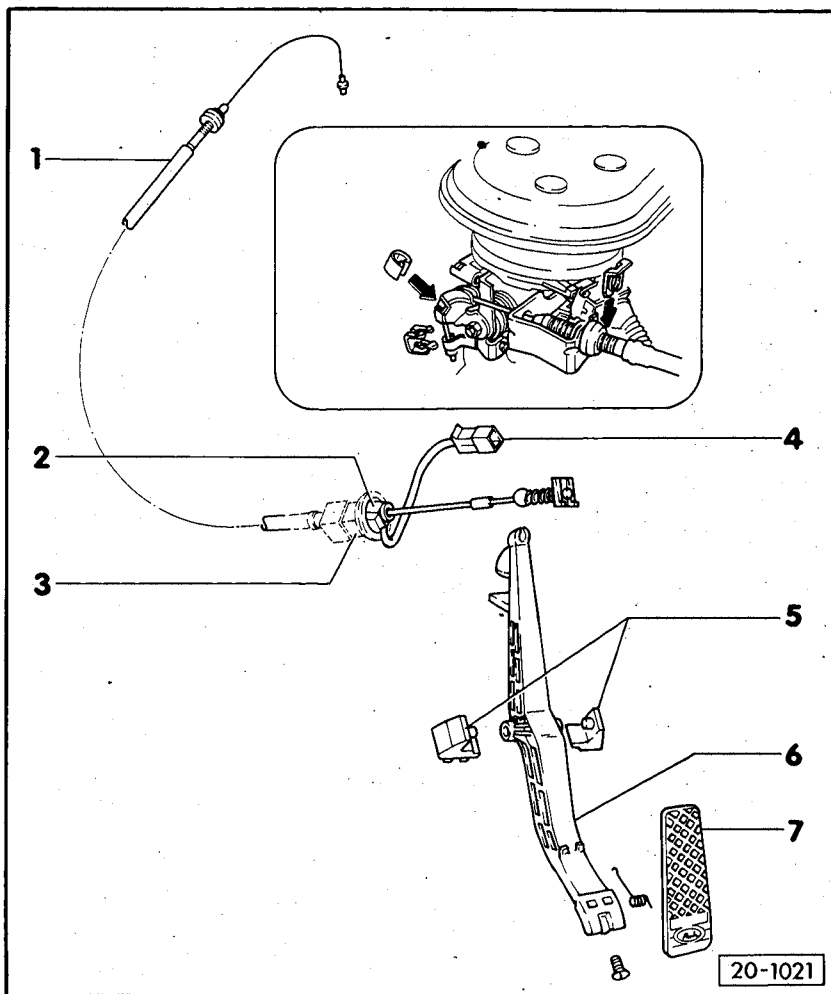
20-23



**SERVICING FUEL TANK VENTILATION WITH
ACTIVATED CHARCOAL CANNISTER**

- 1- Injection unit
- 2- Connection for vent line
- 3- Countersupport
- 4- Rubber retainer
- 5- Activated charcoal filter solenoid valve -N80
 - o Checking - see Repair Group 24
 - o Checking control circuits - see Repair Group 01
- 6- Vent line
 - o From gravity valve
- 7- Activated charcoal filter
 - o Installation location: Behind trim in right front wheel housing

20-24



SERVICING THROTTLE LINKAGE

- 1- Throttle cable
 - o Adjusting - page 20-26
- 2- Square mounting
- 3- Kickdown switch
 - o Checking - see Repair Manual "Automatic Gearbox 097, Repair Group 01"
- 4- Plug for kickdown switch
- 5- Mounting
 - o Remove to gas pedal, break off detent tabs (do not use damaged mounting)
- 6- Accelerator lever
 - o Only remove end install with mounting
- 7- Accelerator pedal

20-25

ADJUSTING THROTTLE CABLE

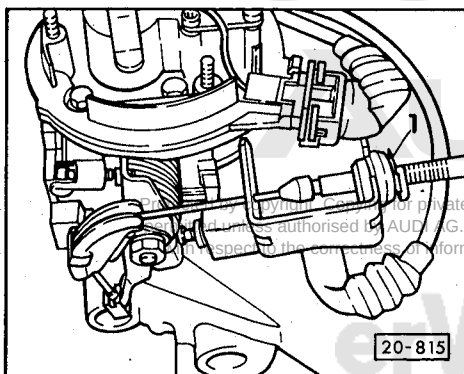
Notes:

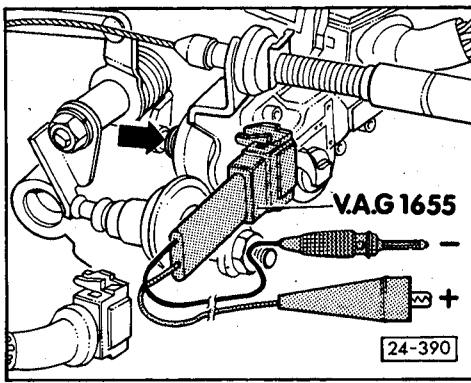
- o The throttle cable is prone to kinking and should therefore be handled carefully during installation. A single slight kink can lead to cable fracture later on. Throttle cables which have been bent must therefore **never** be installed.
- When installing throttle cable ensure that cable is aligned properly between supports and fixing points.
- o Throttle cable is attached to accelerator pedal and cam disk. Longitudinal adjustment of throttle cable sleeve is not fixed by securing clip.

- ◀ - Change position of clip -1- in countersupport detent slots to obtain correct full-throttle position.

Note:

After adjustment check position of throttle valve at idle - page 20-27.





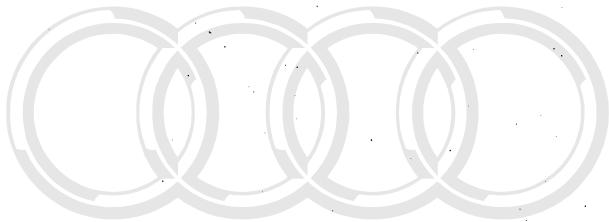
Checking adjustment

- ◀ - With ignition off, remove connector from throttle valve control (-V60).
- Attach V.A.G 1655 adapter to throttle valve control and connect adapter leads to earth and battery (+) or to B+ at alternator until the plunger -arrow- has retracted completely.
- Throttle valve lever must be against idle stop when accelerator pedal is not depressed.
- Depress accelerator pedal to full-throttle pressure point (no kickdown). Throttle valve lever must be against full-throttle stop. The full-throttle pressure point is approx. 15 - 20 mm above accelerator pedal stop.

Engine code ABK

- Pull back throttle cable sleeve on throttle valve section (to accelerator pedal) until throttle cable is against eccentric disk of throttle valve section with no play present. Accelerator cable is secured when clip is installed on counter support.

20-27



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REMOVING AND INSTALLING EXHAUST SYSTEM

COMPONENTS

Notes:

- o Always renew self-locking nuts and gaskets.
- o Note retaining ring version.
- o Align exhaust system free of tension - page 26-3.
- o Coat Lambda probe threads with G5. G5 must not get into slot of probe.
- o Checking Lambda probe - see Repair Group 01.

1- Bracket on gearbox

2- Gasket
o Renew

3- 35 Nm

4- Exhaust downpipe
o Engine code ABK exhaust pipe with double flange

5- Flange ring

6- Support hanger

7- Support hanger

8- Flange ring

9- Center silencer

10- Retaining sleeve

11- 40 Nm

26-1

12- Catalyst

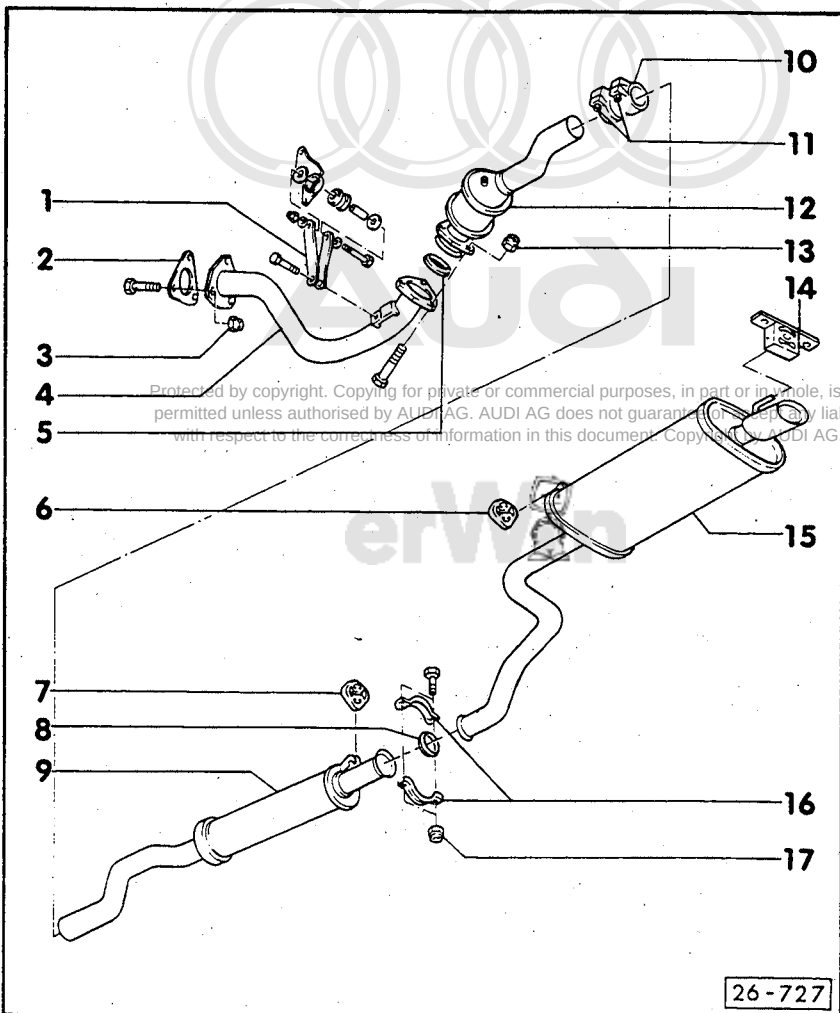
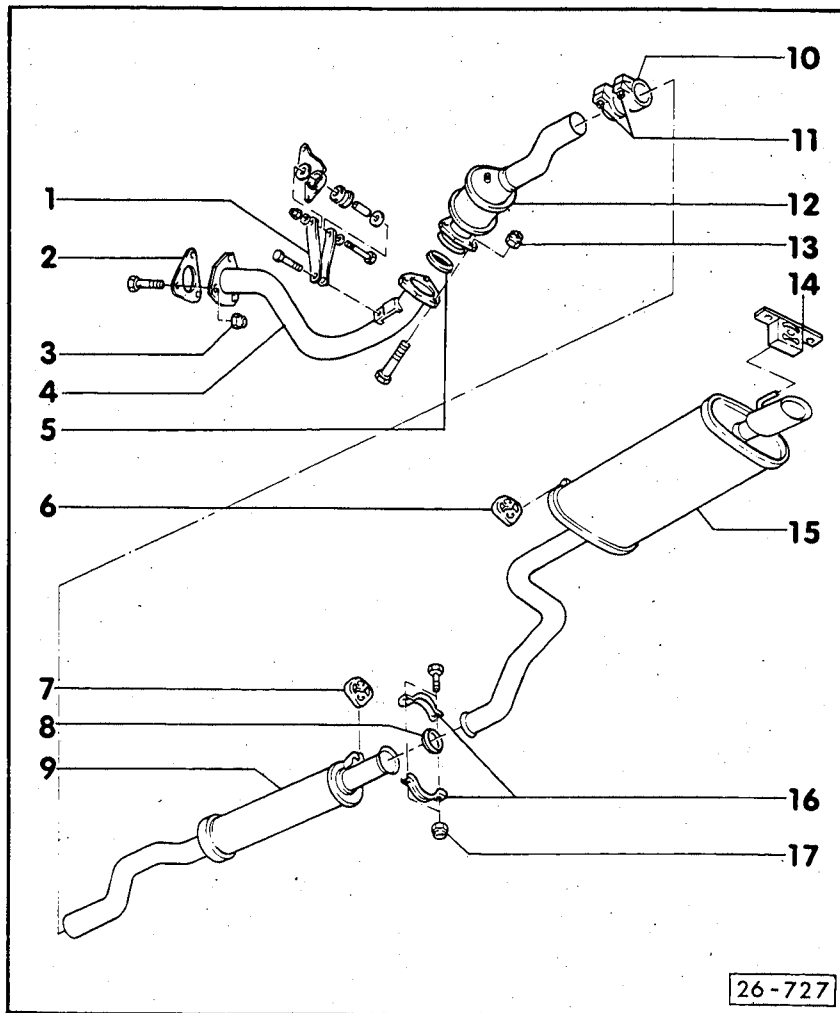
13- 25 Nm

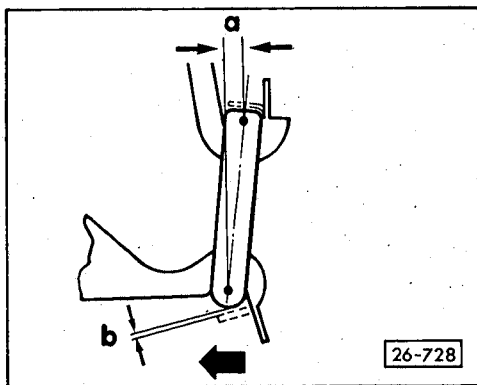
14- Suspension bracket

15- Rear silencer

16- Clamp

17- 15 Nm





ALIGNING EXHAUST SYSTEM FREE OF TENSION

Notes:

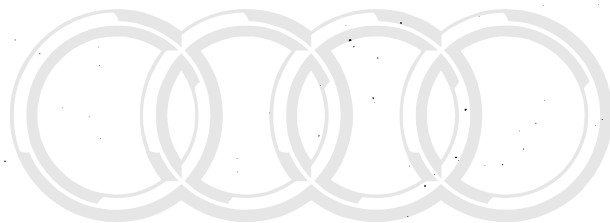
- o Exhaust system is aligned while cold.
- o Ensure that distances between bodywork and exhaust system are adequate before tightening bolts on flanges.
- o Double clamp must be installed horizontally.
- ◀ - Note pre-tension a (approx. 7 mm) at rear suspension of main silencer (front-wheel drive) or of front silencer (quattro). Arrow toward front of vehicle.
- Securing tabs on retainers should be bent back approx. 90° after assembly of support hangers.
- Dimension b, between support hanger and securing tab, must be at least 2 mm at both suspension points.

TIGHTENING TORQUES

Exhaust manifold to cylinder head	25 Nm
Exhaust downpipe at exhaust manifold	35 Nm
Catalyst to exhaust pipe	25 Nm
Lambda probe to manifold	50 Nm
Double clamp	40 Nm

Front wheel drive

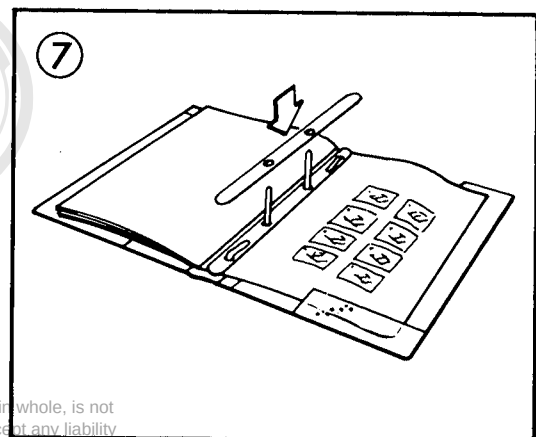
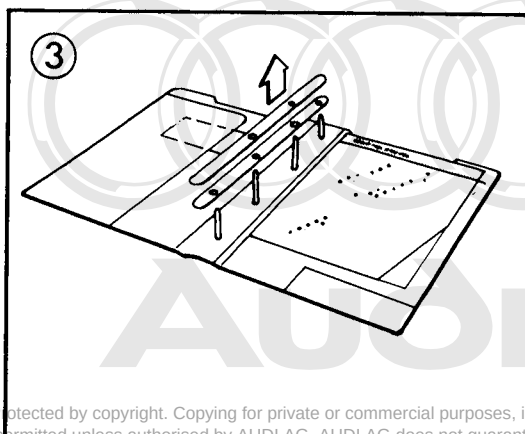
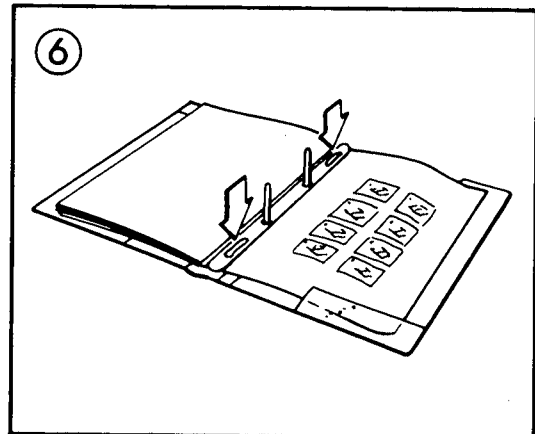
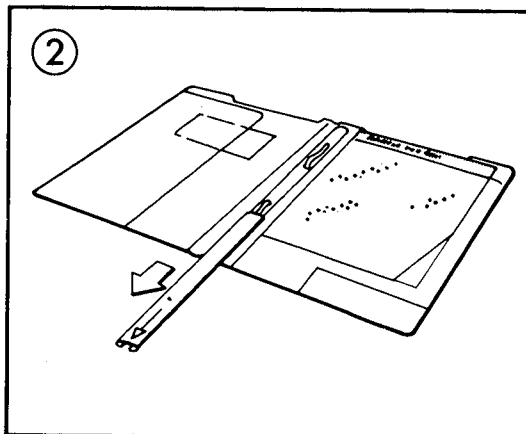
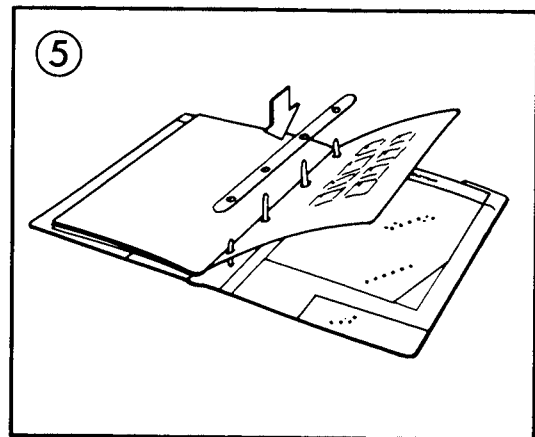
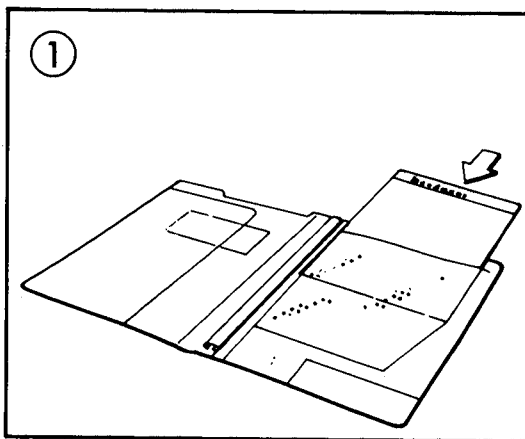
Clamp between main silencer and rear silencer 15 Nm



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