



Workshop Manual

2.0 litre Petrol Engine

LT

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Workshop Manual

LT

2.0 litre Petrol Engine

August 1978 Edition

Supersedes the June 1975 Edition
of the LT manual

This manual is valid for the LT from the start of production (August 1975). It describes all repair operations which require special instructions to ensure satisfactory work. All features peculiar to certain countries and modifications introduced up to date of issue are incorporated.

The manual is divided into separate booklets according to subject.

A list of the individual booklets is given inside the front cover and each booklet has the contents listed according to repair groups and items to make it easy to find the information required.

VW-Audi Special Tools and Workshop Equipment

Special tools and/or workshop equipment are required for many of the operations described in the manual. This equipment is listed in each booklet together with the Repair Operations.

Technical information should always be made available to all foremen and mechanics because 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.

Workshop Bulletins

Workshop bulletins will be allocated to the individual booklets and should be filed at the back of the booklet concerned. To remind you that bulletins have been published, please mark the manual pages given on the bulletin with the bulletin number.

Fault finding

General fault finding instructions are given in the workshop manual.

Further instructions on the elimination of current defects are given in the "Fault finding handbook".

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15 01 06 . .	Valve clearances, checking and adjusting	18	2038 2085	Ratchet with 3 mm socket (Matra W 165, 166)
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Repair operations and special tools

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LIST OF ENGINES AND INFORMATION SOURCES

The following table contains engine code letters and general information on all engines which have been installed in LT vehicles to date.

Code letters		CG	CH	CL
Engine data				
Manufactured	from to	1. 76	8. 75	5. 76
Capacity	litres	2.7	2.0	2.0
Output	kW at rpm	48/3600	55/4300	52/4300
Torque	Nm at rpm	152/2300	150/2400	132/2400
Bore	mm diam.	92	86.5	86.5
Stroke	mm	101.6	84.4	84.4
Compression ratio		21	8.3	7.0
Valve timing at 1 mm valve	inlet opens before TDC inlet closes after BDC exhaust opens before BDC exhaust closes after TDC	34° 68° 72° 30°	2° 35° 22° 11°	2° 35° 22° 11°
RON	min.	45 CN	85	80
Carburetor/Injection		Diesel	35 PDSIT	35 PDSIT
Distributor		—	060 905 205 A	060 905 205 A
Pistons, recess depth	mm	—	8.8	9.8
Exhaust afterburning		—	from 8. 77	from 8. 77
Engine is tuned specially for:				Countries with low octane fuel (M 240)
Information				
Order No. ³⁾				
Workshop Manual:				
Maintenance	000 537 301 ..	X	X	X
2.0 litre petrol engine	000 537 311 ..	—	X	X
4 Cyl. Diesel engine	000 537 321 ..	X	—	—
Fault Finding Programme:				
Carburetor engines	348 530 407 ..	—	X	X
Current defects:				
Service Handbook ¹⁾		X	X	—
Fault Finding Handbook ²⁾	000 530 451 ..	X	X	X

1) distributed in West Germany only

2) distributed to export countries only

3) foreign language index, see Service Department Information catalogue

4) at 0.25 mm valve lift

REMOVING AND INSTALLING ENGINE

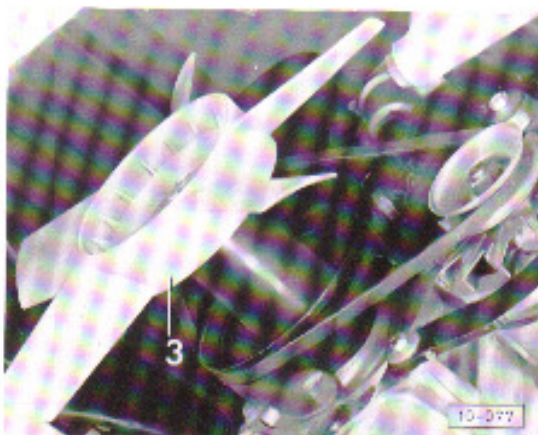
The engine is taken out upwards through the cab door.

Removing

- Remove front passenger seat and engine bonnet.
- Detach battery earthing strap at the battery.



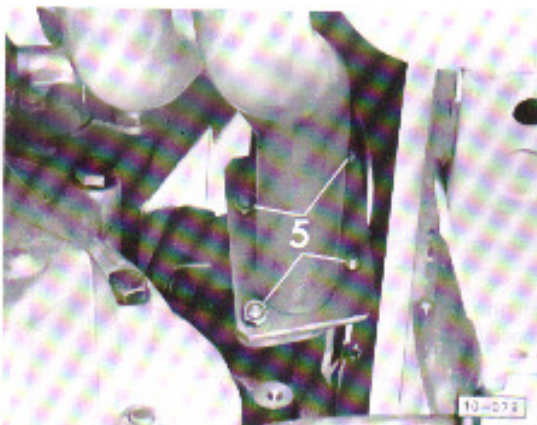
- Drain off the coolant at the radiator drain plug — 1 — and retain for further use (heater regulating valve open).
- Remove radiator — 2 — complete with air duct. Detach bottom hose at radiator, detach upper hose at thermostat and remove bolts at mounting bracket.



- Remove fan — 3 —.



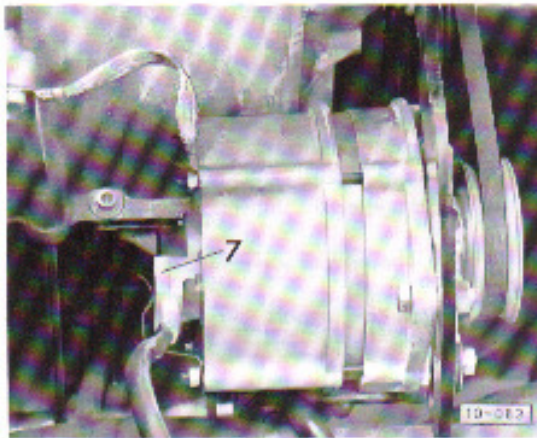
- Remove exhaust pipe bracket — 4 — from gearbox.



- Remove exhaust pipe — 5 — from exhaust manifold.
- Remove oil filter.



- Remove starter — 6 — and place in driver's cab with wiring attached.



- Detach plug — 7 — at generator.



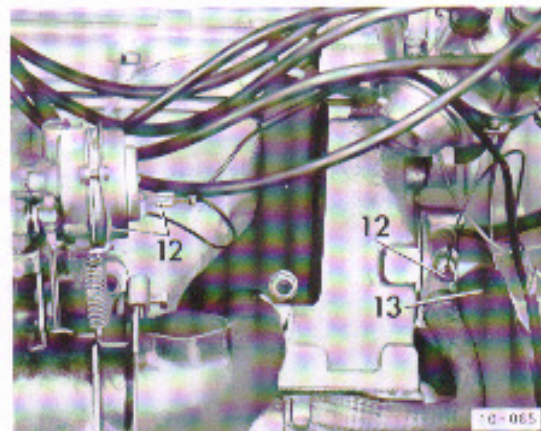
- Remove expansion tank — 10 — complete with mounting and hoses.
- Remove air cleaner — 11 — with intake neck and elbow.



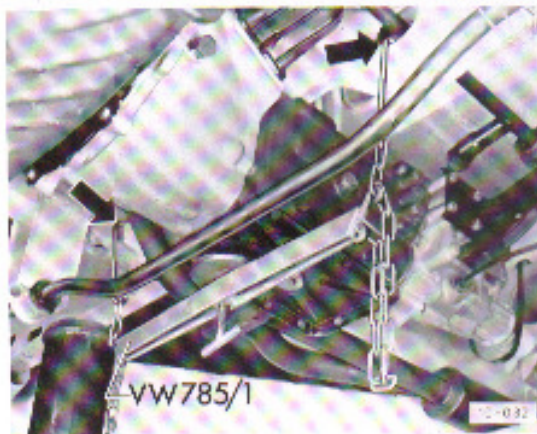
- Remove M 8 and M 12 bolts securing engine to gearbox.

Attention

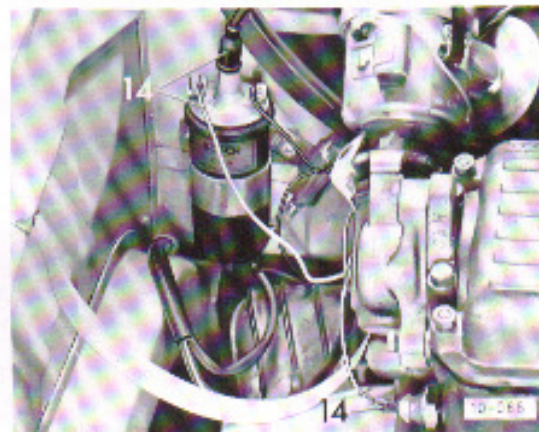
Do not remove the upper bolts at this stage.



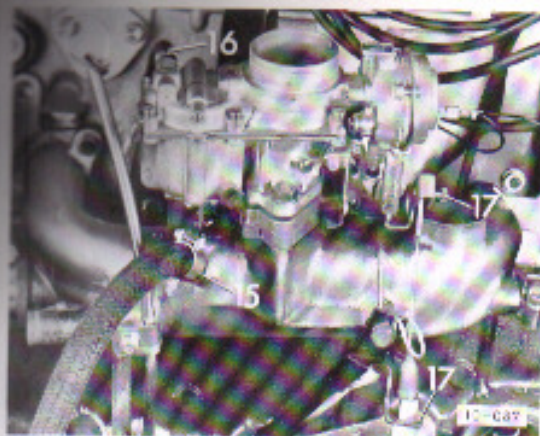
- Detach wires to carburetor — 12 — and temperature sender unit — 12 —.
- Pull off heater coolant hose — 13 —.



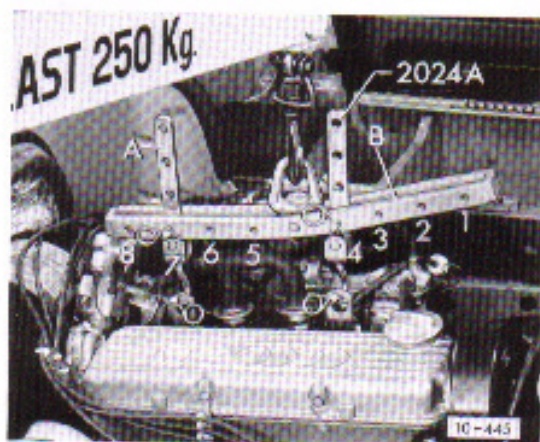
- Attach gear-box support.



- Detach wires at coil — 14 — and oil pressure switch — 14 —.



- Pull off servo unit vacuum hose – 15 –.
- Seal off fuel hose – 16 – with clip and detach.
- Detach throttle cable – 17 –.
- Working from inside the cab, remove the engine mounting nuts at right and left.



- Attach engine lifting tackle.
Pulley end: 1st hole in hook bar – A –
at position 4 in cross bar – B –.
- Flywheel end: 1st hole in hook bar – A –
at position 7 in cross bar.
- Using a crane, lift the engine until it is clear of the mounting studs.
- Screw the gearbox support in until it makes contact with the gearbox housing.
- Remove the upper bolt securing engine to gearbox.
- Push engine away from gearbox.
- By lifting and turning at the same time, carefully remove engine.

When removing the engine, great care must be taken to avoid damaging the input shaft, clutch and vehicle body.

Installing

When installing pay attention to the following points:

- By turning and lowering the engine, carefully guide it onto the gearbox, taking care not to damage the input shaft and clutch.
- Install and tighten the upper bolts.

Attention

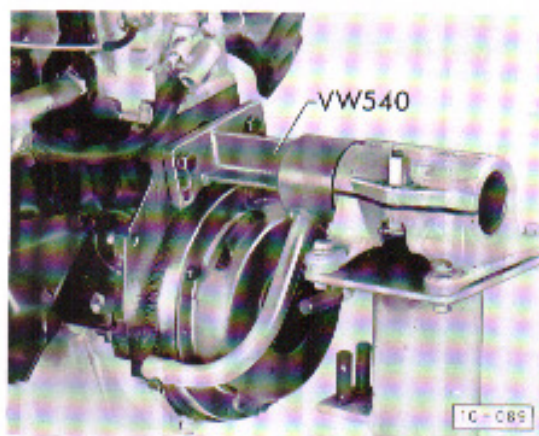
Remove gearbox support.

- Lower the engine, and at the same time guide it onto the left and right hand mounting studs. Remove lifting sling.
- Put coolant in – page 30.
- Adjust accelerator cable – page 33.
- Adjust ignition timing – page 41, idling – page 33 and clutch play – page 45. (This is only necessary when repairs have been carried out on distributor, intake manifold or clutch).

Tightening torques

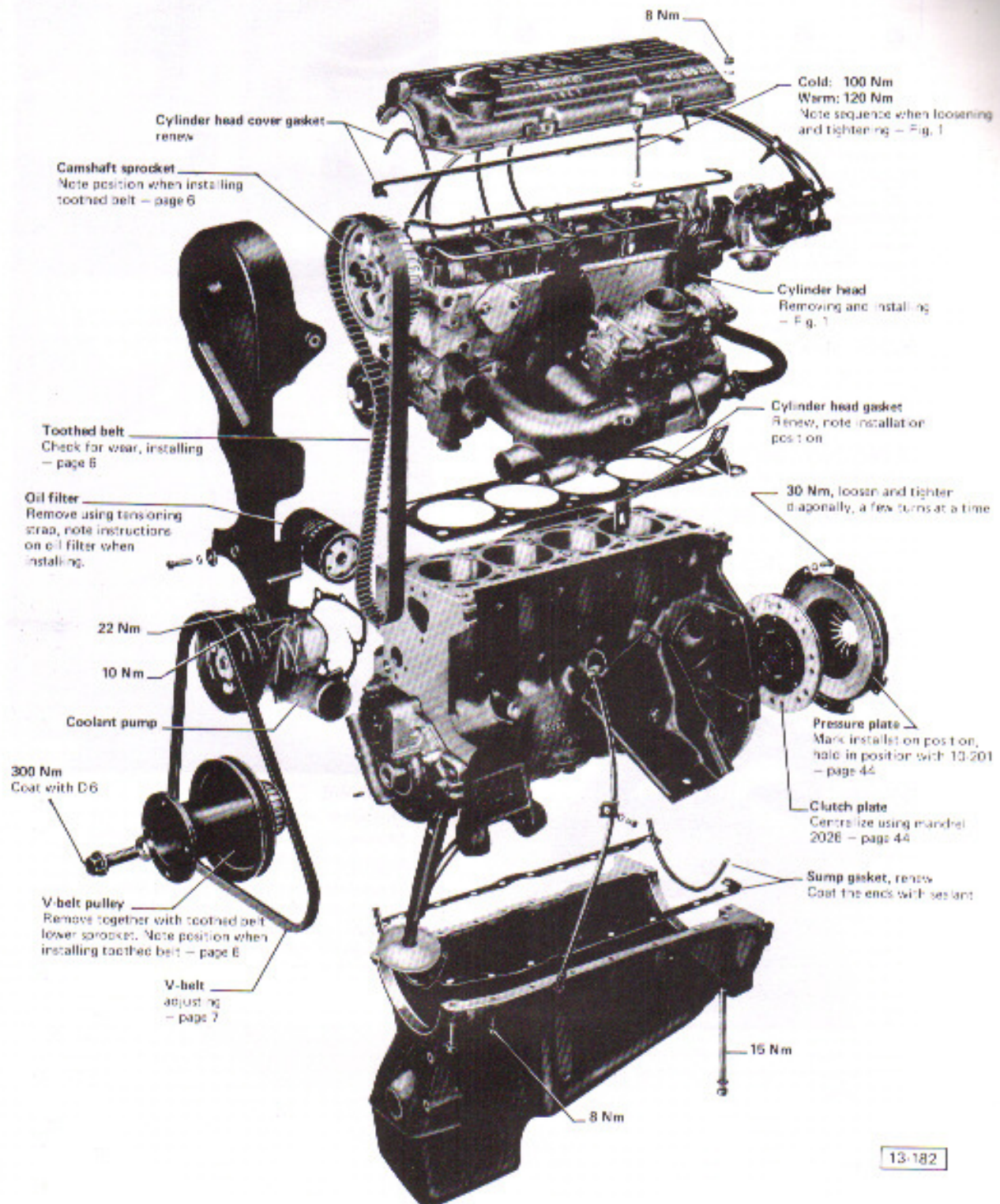
Engine to gearbox M 8:	25 Nm (2.5 mkg)
M 12:	75 Nm (7.5 mkg)
Engine mountings	45 Nm (4.5 mkg)

SECURING ENGINE ON STAND



If work is to be carried out on the engine once it has been removed, the engine must be secured to the assembly stand using the engine support VW 540.

DISMANTLING AND ASSEMBLING ENGINE



13-182



Fig. 1 Removing and installing cylinder head

02-024

Sequence when tightening: see illustration.

Sequence when loosening: reversed.

Tightening torque:

warm: 120 Nm

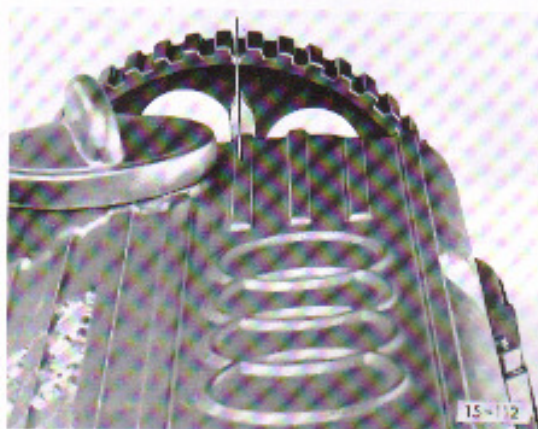
cold: 100 Nm

To simplify correct installation of the cylinder head there are two centralizing bushes in the cylinder block.

Note:

If the cylinder head has been removed, the securing bolts must be retightened after approx. 1000 km further running. When doing this, loosen the bolts approx. 30° then retighten.

INSTALLING TOOTHED BELT



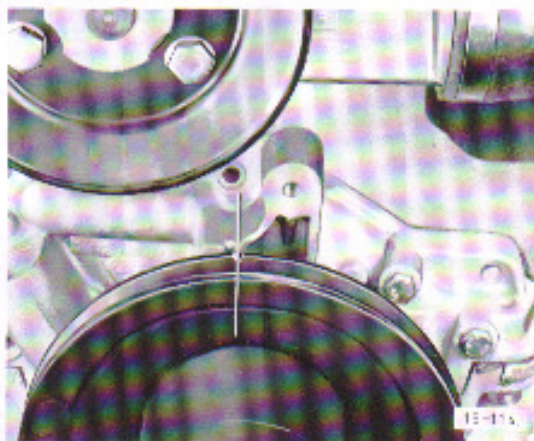
15-112

- The mark on the camshaft sprocket, and pointer on cylinder head cover must be in line with one another.



15-113

- Engine in:
The TDC marking on the flywheel, and the lug cast on the clutch bell housing must be in line with one another.



15-114

- Engine out:
The notch in the pulley and lug on oil pump housing must be in line with one another.
- Adjusting belt tension:
Tension toothed belt by turning tensioner anti-clockwise. The belt is correctly tensioned when it can just be twisted, with thumb and forefinger, through 90° between camshaft and crankshaft on the pull side.

ADJUSTING V BELT

- Slacken belt by loosening generator securing screws
- Adjust gauge VW 210 to the correct setting and place it on belt.

Settings:

New belt: 16.5–16.8 scale marks

Used belt: 15.7–16.0 scale marks



- Tension belt by lifting generator with a lever until the mark and sleeve on gauge are aligned.
- Tighten generator screws and check tension again.
- For new belts only:
Run engine for 5–10 minutes and tension belt to figure for new belt.

DISMANTLING AND ASSEMBLING CYLINDER BLOCK, CRANKSHAFT, FLYWHEEL

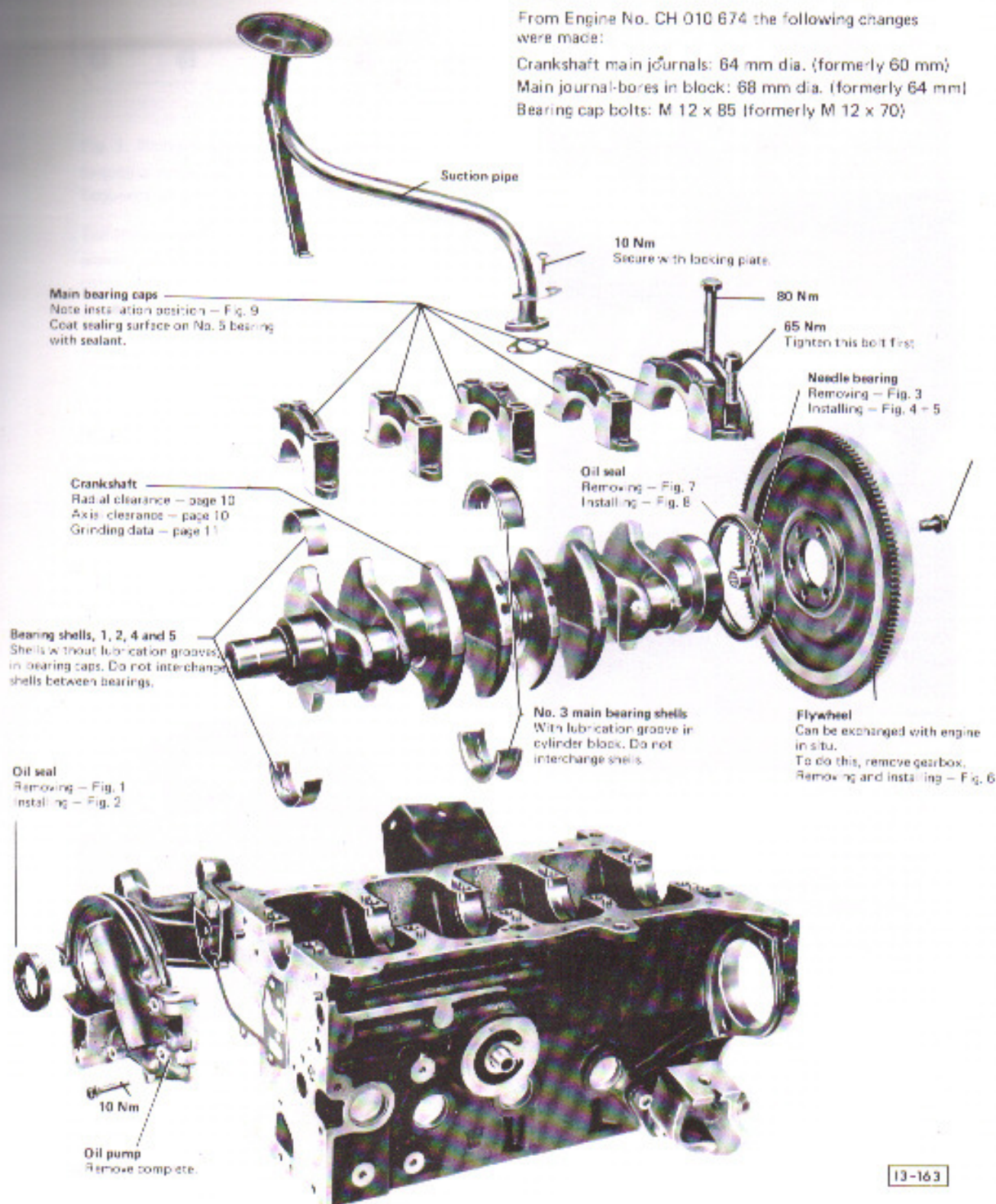
Note:

From Engine No. CH 010 674 the following changes were made:

Crankshaft main journals: 64 mm dia. (formerly 60 mm)

Main journal-bore in block: 68 mm dia. (formerly 64 mm)

Bearing cap bolts: M 12 x 85 (formerly M 12 x 70)



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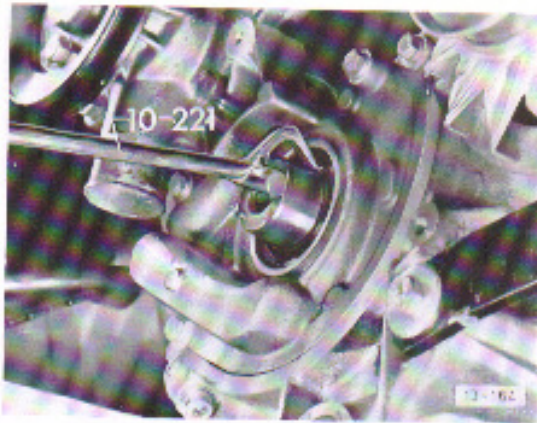


Fig. 1 Removing oil seal, pulley end
(or 2086)

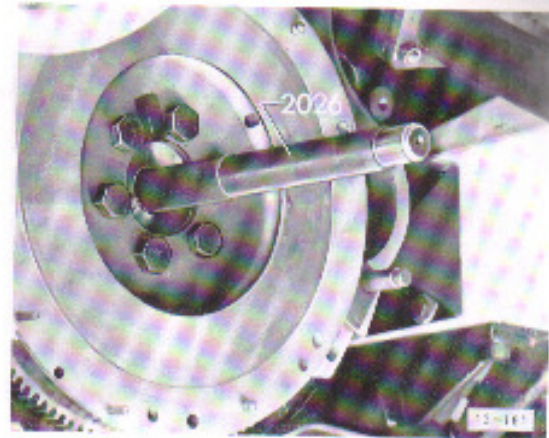


Fig. 4 Installing needle roller bearing
The lettered side must point outwards.

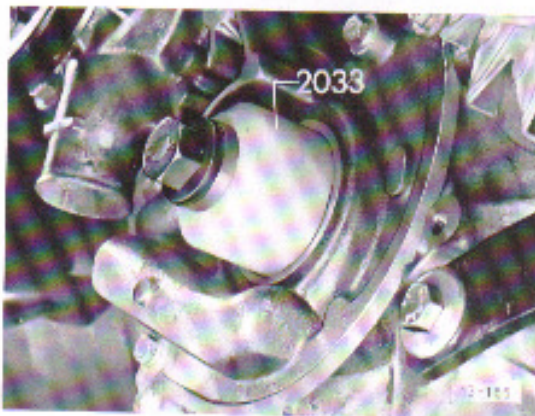


Fig. 2 Installing oil seal, pulley end
Press in flush. If crankshaft is scored,
press in fully.

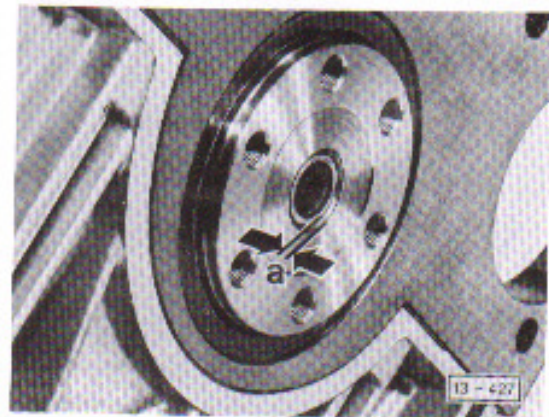


Fig. 5 Needle bearing — Insertion depth
"a" = 1.0 mm

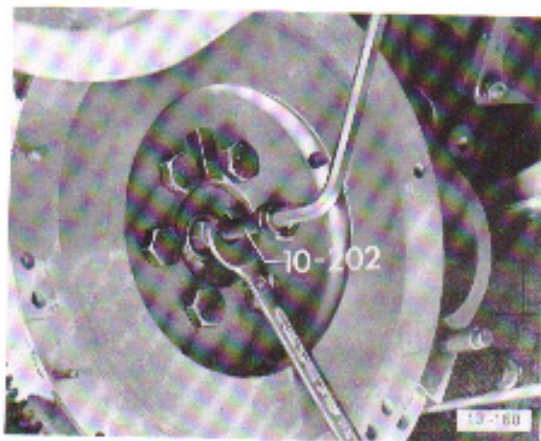


Fig. 3 Removing needle roller bearing

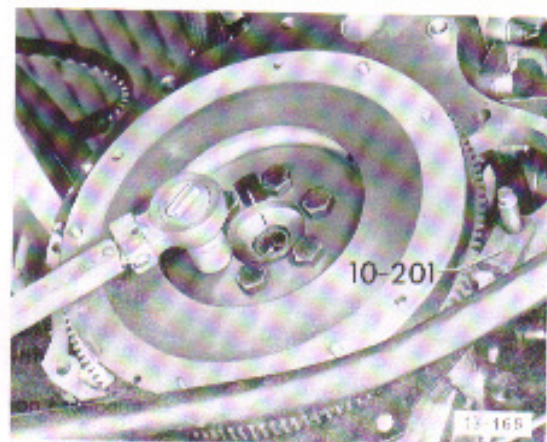


Fig. 6 Removing and installing flywheel
The flywheel and crankshaft markings must line
up with one another.

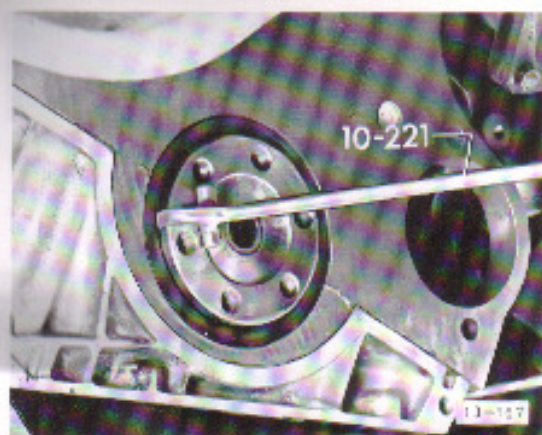


Fig. 7 Removing crankshaft oil seal, flywheel end (or 2086)

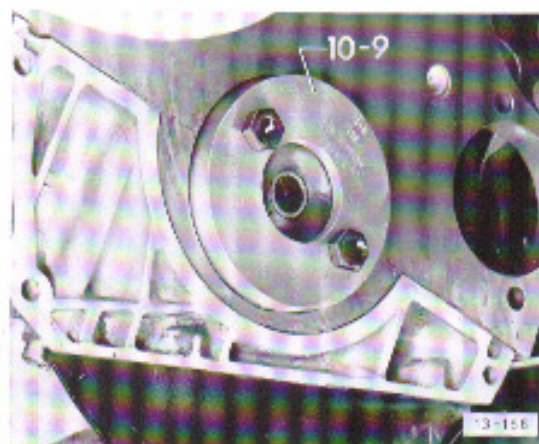


Fig. 8 Installing crankshaft oil seal, flywheel end Oil lips tight y.

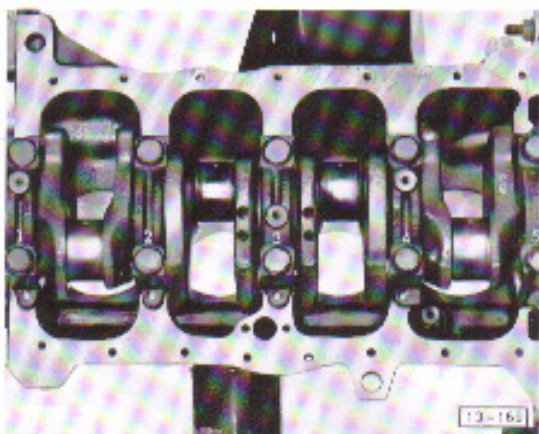


Fig. 9 Main bearing caps — installing position
No. 1 bearing — pulley and
No. 5 bearing — flywheel end

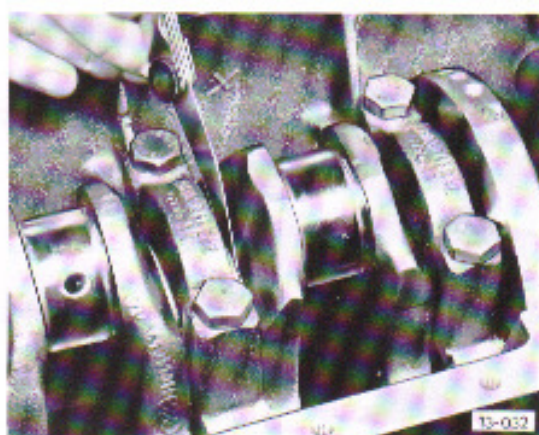


Fig. 10 Checking axial clearance

The end play is measured at No. 3 bearing with feelers.

Specified end play: 0.10–0.19 mm
Wear limit: 0.25 mm

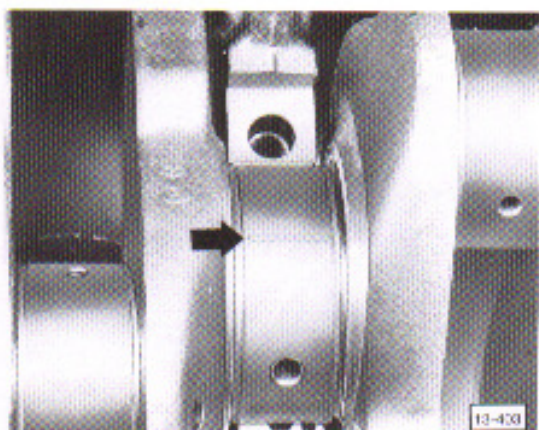
CHECKING CRANKSHAFT RADIAL CLEARANCE

Note:

Clearance can be checked with Plast gage — even with engine in.

Range	Colour	Type
0.025 to 0.075 mm	Green	PG 1
0.05 to 0.15 mm	Red	PR 1
0.10 to 0.23 mm	Blue	PB 1

- Remove crankshaft bearing caps.
- Clean bearing shells and journals.



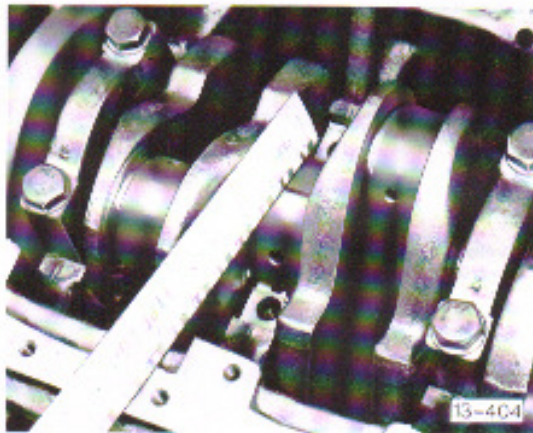
— Lay "Plast gage" on the journal or in shell in an axial direction.

- Install cap with shell and tighten bolts to 80 Nm.

Note

Do not turn crankshaft.

- Take cap off.



- Compare Plastigage strip with scale
New: 0.02–0.08 mm
Wear limit: 0.16 mm

from Engine No. CH 010 674:

Size	Main journals	Crankpins
Original	64.00 –0.022 –0.042	48.00 –0.022 –0.042
1st undersize	63.75 –0.022 –0.042	47.75 –0.022 –0.042
2nd undersize	63.50 –0.022 –0.042	47.50 –0.022 –0.042
3rd undersize	63.25 –0.022 –0.042	47.25 –0.022 –0.042

CRANKSHAFT GRINDING DATA (in mm)

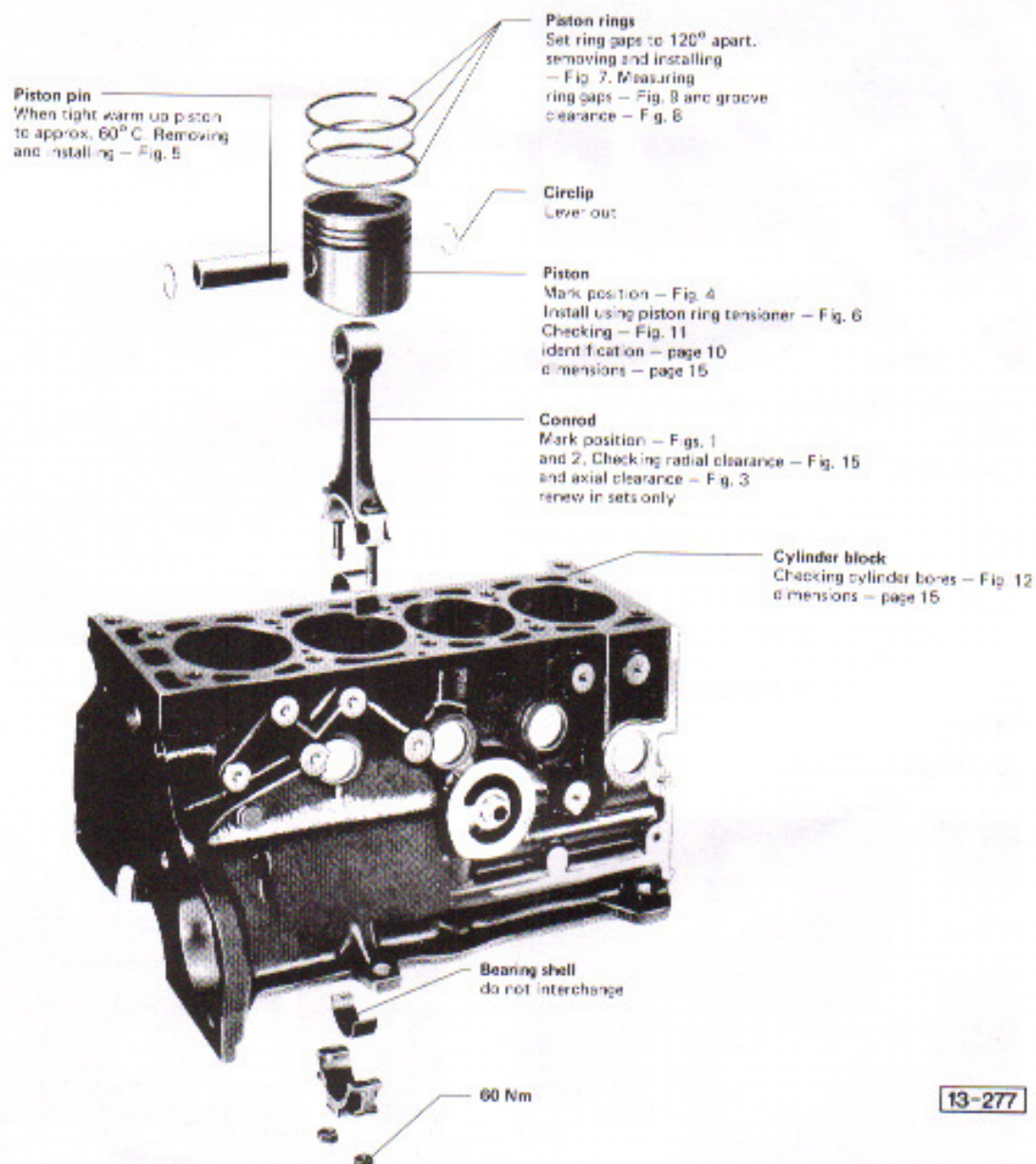
up to Engine No. CH 010 673:

Size	Main journals	Crankpins
Original	60.00 –0.022 –0.042	48.00 –0.022 –0.042
1st undersize	59.75 –0.022 –0.042	47.75 –0.022 –0.042
2nd undersize	59.50 –0.022 –0.042	47.50 –0.022 –0.042
3rd undersize	59.25 –0.022 –0.042	47.25 –0.022 –0.042

DISMANTLING AND ASSEMBLING PISTONS AND CONRODS

Note:

From Engine No. CH 031 093, conrods with an oil drilling are fitted.
These conrods can be installed in earlier engines.



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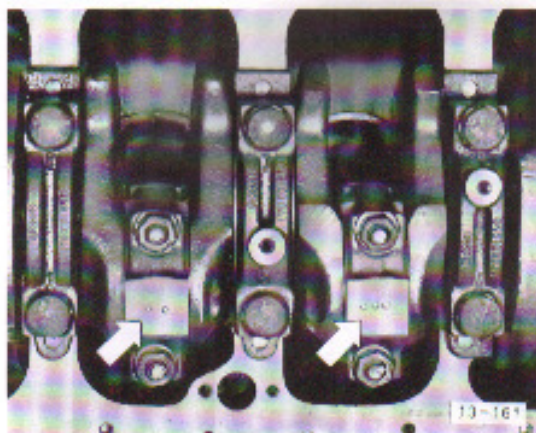


Fig. 1 Mark mating conrod/cylinder

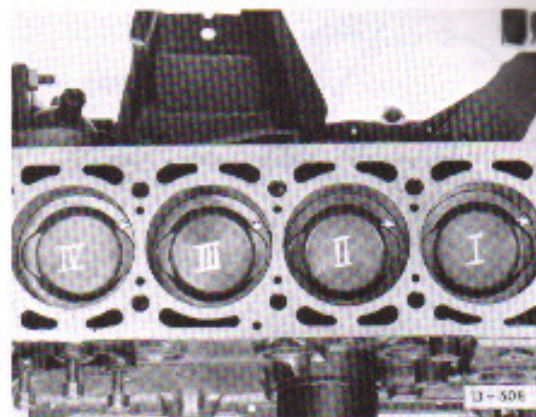


Fig. 4 Mark installation positions of pistons
Arrows point towards pulley end, mark pistons with cylinder number.

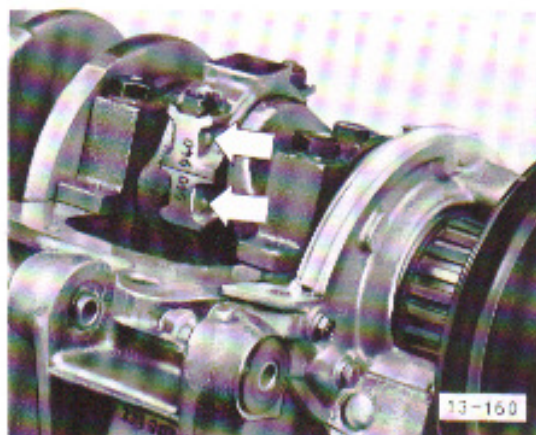


Fig. 2 Conrods — installation positions
Identification numbers on upper and lower halves of conrod must be on the same side, and the cast lugs must be towards the pulley end.



Fig. 5 Removing and installing piston pins



Fig. 3 Checking axial clearance
New: 0.05–0.3 mm
Wear limit: 0.4 mm

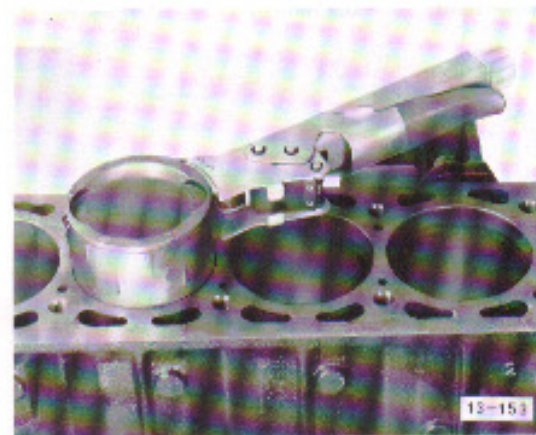


Fig. 6 Installing pistons



Fig. 7 Removing and installing piston rings
The side marked "Top" must be towards the piston crown.

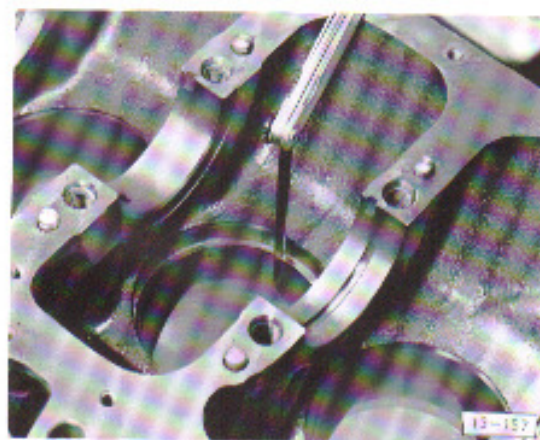


Fig. 9 Checking piston ring gaps
Push ring down squarely into cylinder until it is approximately 15 mm from the cylinder lower edge.
New: 0.3–0.5 mm
Wear limit: 1.0 mm



Fig. 8 Checking ring/groove clearance
New: 0.04–0.07 mm
Wear limit: 0.1 mm

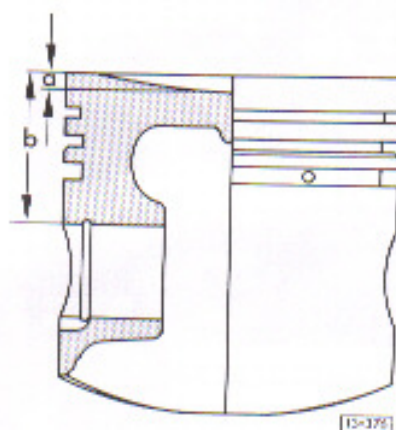


Fig. 10 Piston identification

Code letters	Dimension "a"	Dimension "b"
CH	8.8	28.7 mm
CL*	9.8	27.5 mm

* Recessed crown pistons (M 240I for countries with low octane petrol).



Fig. 11 Checking pistons

Measure pistons at 90° to piston pin axis and approx. 16 mm from lower skirt edge.

Deviation from nominal dimension (see table):
max. = 0.04 mm.

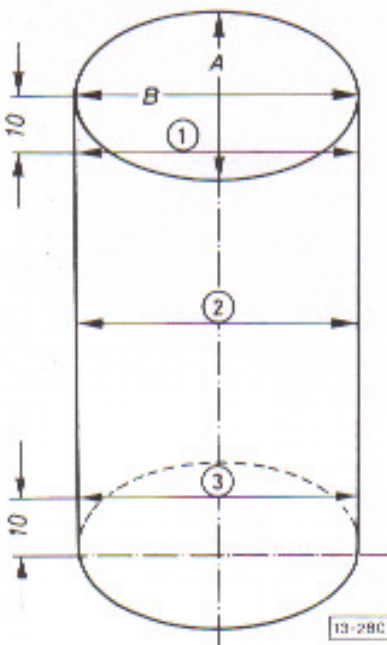


Fig. 12 Check cylinder bores

Measure each cylinder at three positions in the bore in both directions "A" = across "B" = in line.

Deviations from nominal dimensions (see table):
max. = 0.04 mm.

Note:

Do not measure when block is mounted on repair stand VW 540 because distortion will make measurements inaccurate.

PISTON AND CYLINDER SIZES (in mm)

Size	Piston dia.	Cylinder dia.
Basic dimension	86.48	86.51
	86.49	86.52
	86.50	86.53
1st oversize	86.73	86.76
	86.74	86.77
	86.75	86.78
2nd oversize	86.98	87.01
	86.99	87.02
	87.00	87.03
3rd oversize	87.48	87.51
	87.49	87.52
	87.50	87.53

CHECKING CONROD RADIAL CLEARANCE

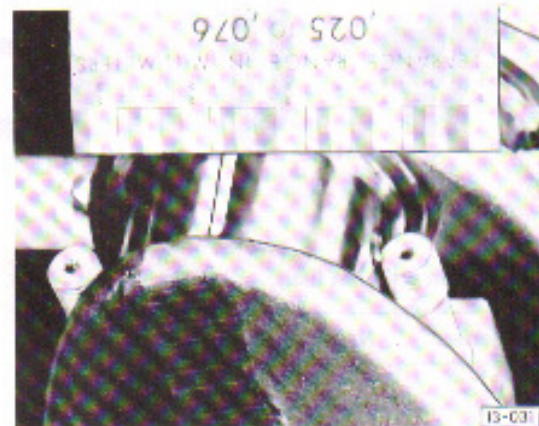
Note:

Clearance can be checked with Plastigage — even with engine in situ.

Range	Colour	Type
0.025—0.076 mm	green	PG-1
0.050—0.150 mm	red	PR-1
0.100—0.230 mm	blue	PB-2

- Remove bearing caps.
- Clean shells and journal.
- Place strip of Plastigage on journal or in cap in axial direction.
- Install cap and tighten nuts to 60 Nm.

Attention. Do not turn crankshaft.



- Compare width of Plastigage with the measuring scale.

New: 0.02—0.07 mm
Wear limit: 0.10 mm.

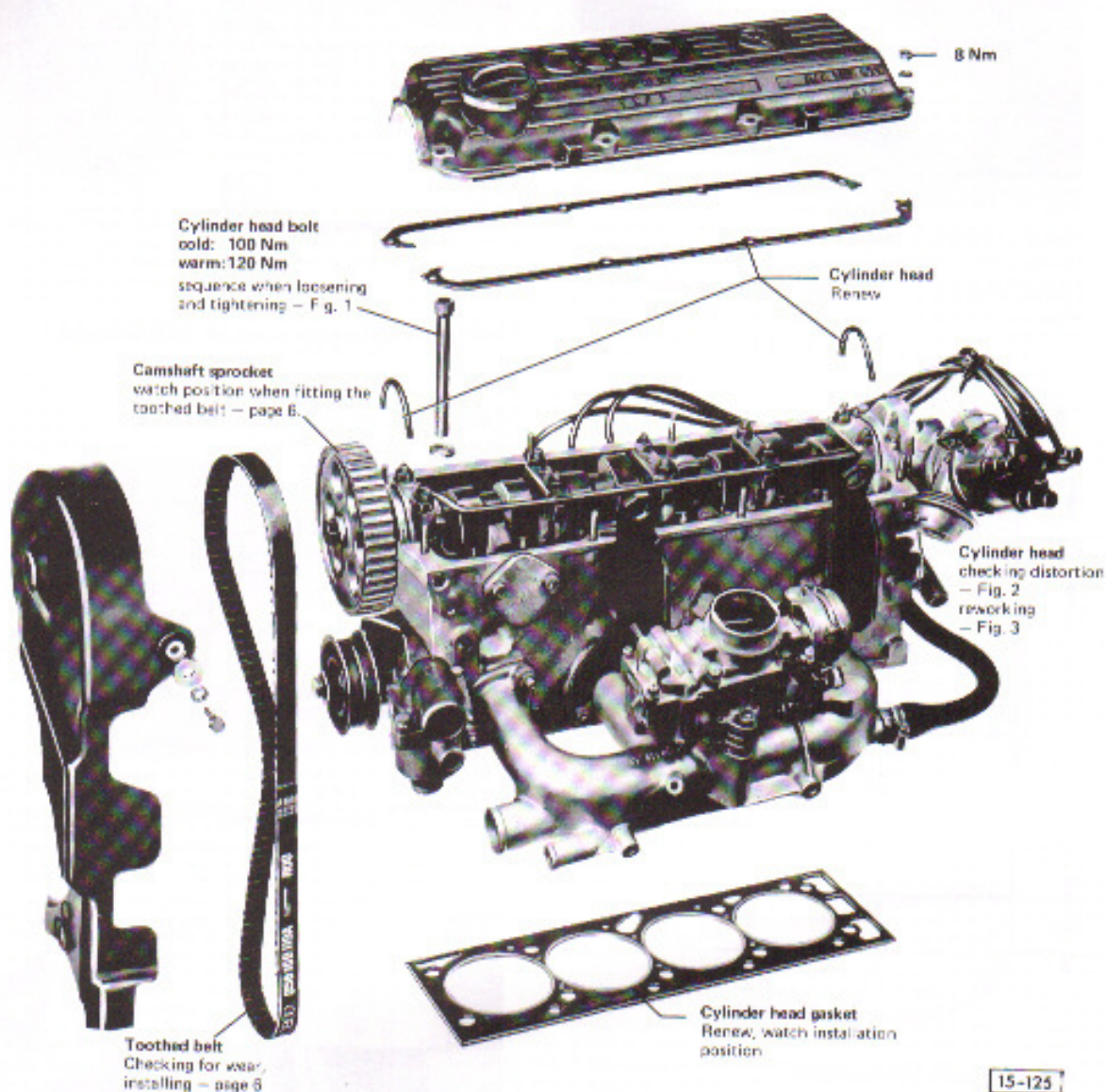
REMOVING AND INSTALLING CYLINDER HEAD

Note:

The cylinder head can be removed with the engine in situ.

When head has been off the bolts must be retightened after about 1000 km.

Loosen bolts individually about 30° first and then tighten them.



Compression pressures (bar):

Code letters	New	Wear limit
CH	8-11	6
CL	7-10	5

The difference between cylinders must not exceed 3 bar.

15-125



Fig. 1 Removing and installing cylinder head

Sequence when tightening: See illustration.
Sequence when loosening: Reversed.

Tightening torques:

warm: 120 Nm

cold: 100 Nm

To simplify the installation of the cylinder head
2 centralizing bushes are fitted in the cylinder block.

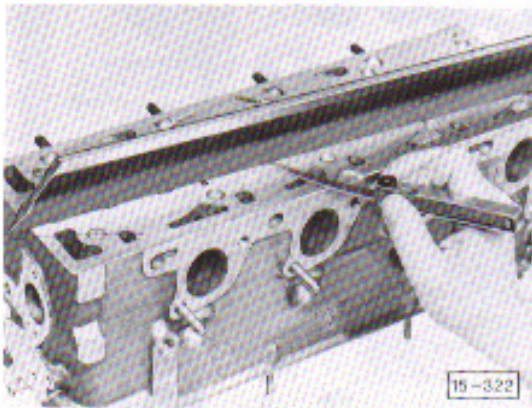


Fig. 2 Checking head for distortion

Wear limit: max. 0.1 mm

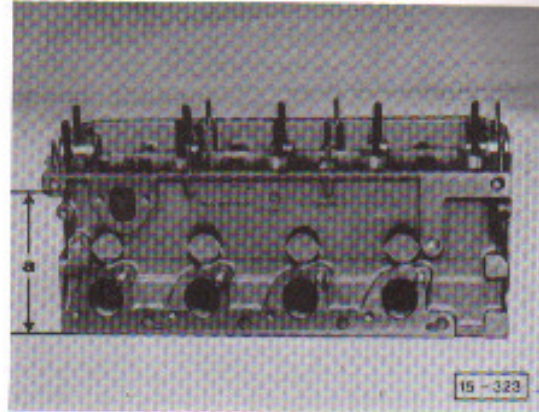


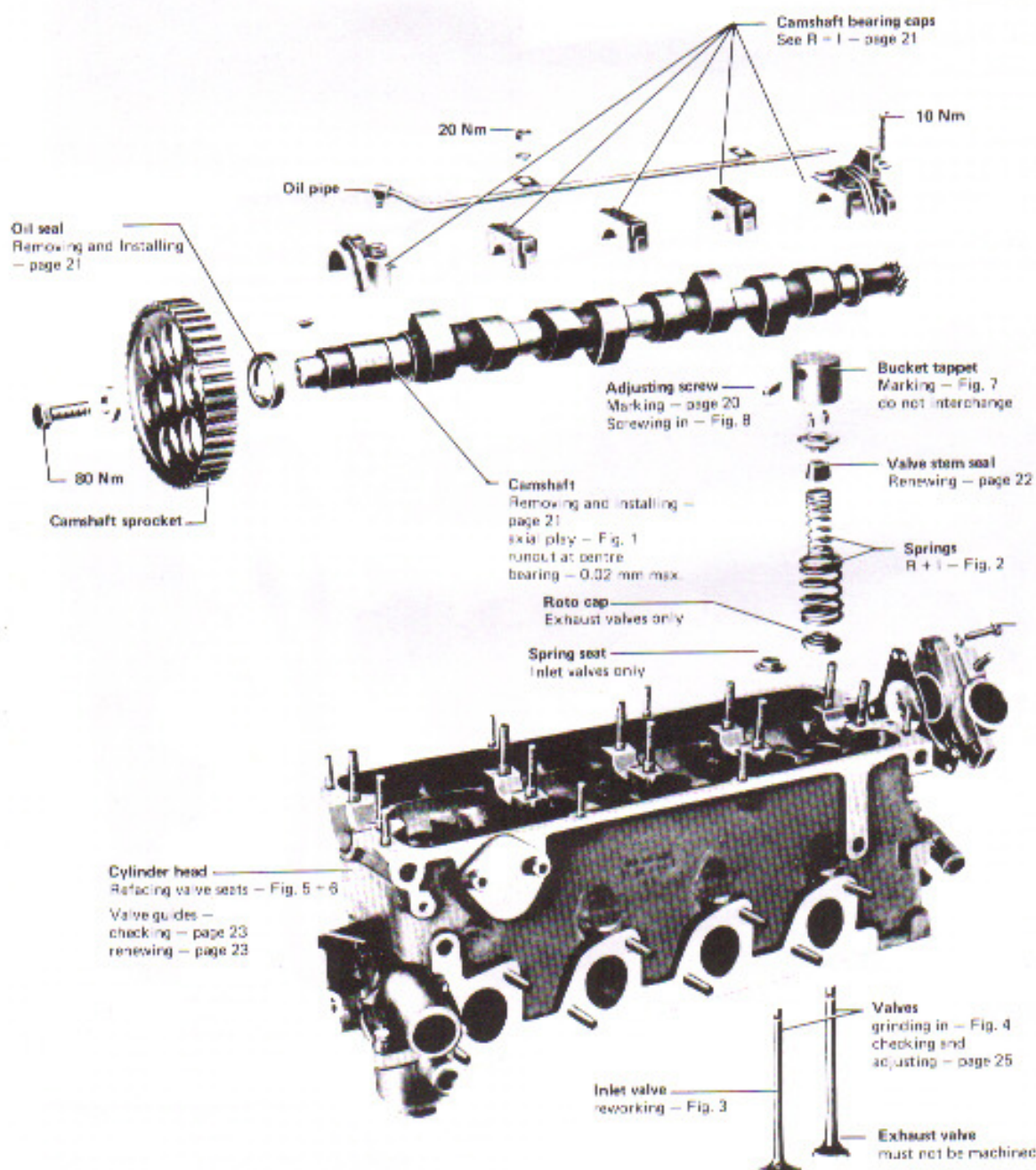
Fig. 3 Reworking cylinder head

Reworking dimension:

Minimum height "a" = 139.5 mm

(from lower edge of hole to sealing face).

DISMANTLING AND ASSEMBLING VALVE GEAR



15-223

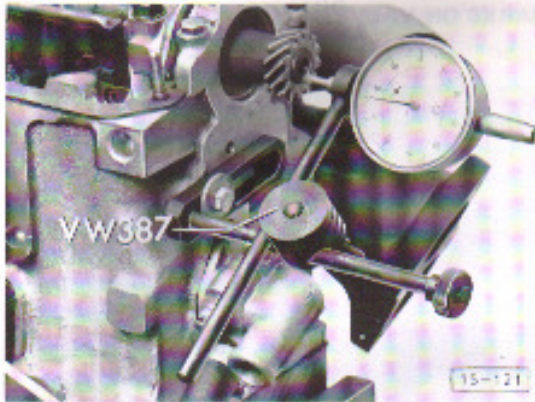


Fig. 1 Checking camshaft axial clearance
Maximum: 0.2 mm

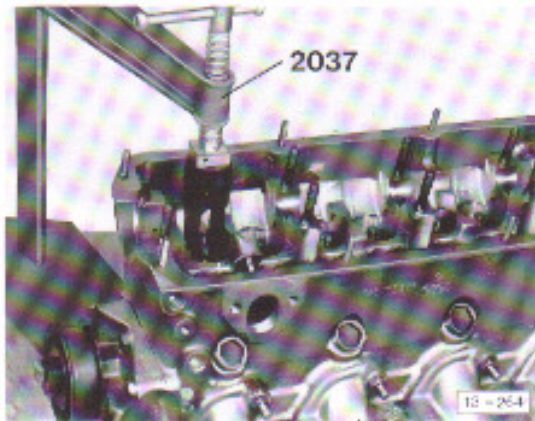


Fig. 2 Removing and installing valve springs
Inner springs: close coils to the cylinder head.

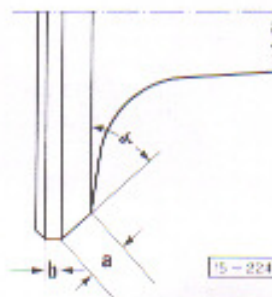


Fig. 3 Refacing inlet valves

$\alpha = 45^\circ$
 $a = \text{max. } 3.5 \text{ mm}$
 $b = \text{min. } 0.5 \text{ mm}$

Attention

The exhaust valves must **not** be refaced. Grinding in by hand only is permissible.

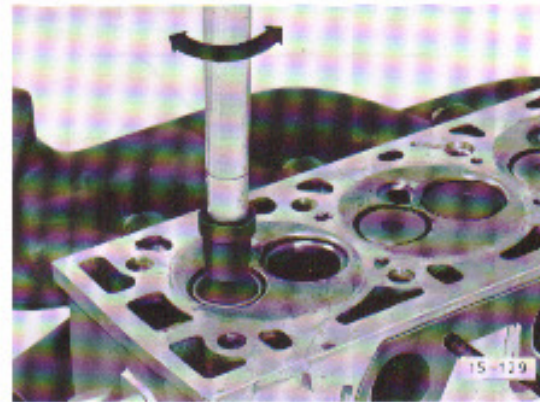


Fig. 4 Grinding in valves

When grinding in valves, lift valve and turn at regular intervals.

Attention

After grinding in, carefully remove all traces of grinding paste.

When new valves are installed and the valve seats have been properly refaced, it may not be necessary to grind in the valves.

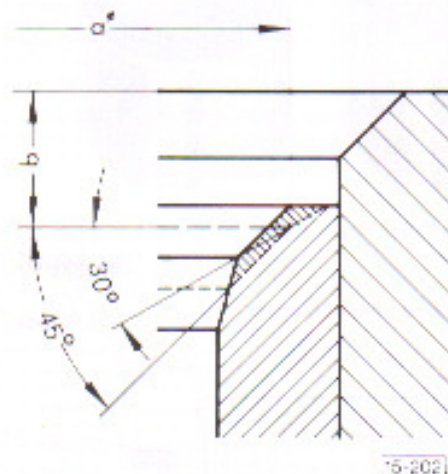


Fig. 5 Refacing inlet valve seats

$a = \text{max. } 36.5 \text{ mm diam.}$
 $b = \text{max. } 3.5 \text{ mm}$
 Seat width = 2.0 mm

Note

When a valve seat has been reworked, always use

valve adjusting screw

Part No. 046 109 453 C

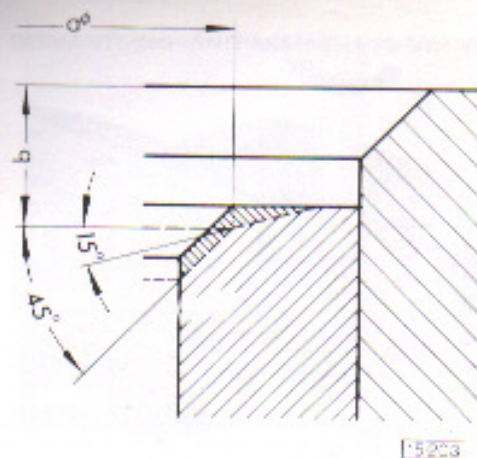


Fig. 6 Refacing exhaust valve seats

a = max. 31.5 mm diam.

b = max. 3.9 mm

Seat width = 2.4 mm

See "Note" under Fig. 5

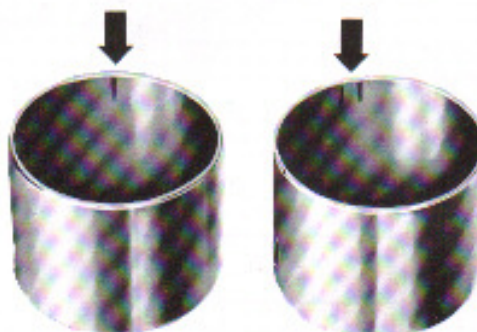


Fig. 7 Marking bucket tappets

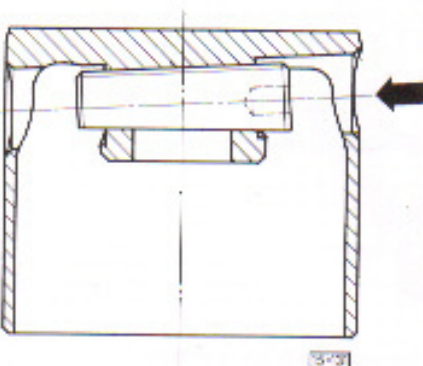


Fig. 8 Screwing in valve adjustment screw

MARKS ON VALVE ADJUSTING SCREW



The follow screws are used in production and also supplied as replacement parts:

Part No.	Identification mark
046 109 453 D	1 notch
046 109 453 E	2 notches
046 109 453 F	3 notches
046 109 453 G	4 notches

The service screw 046 109 453 C has no mark.

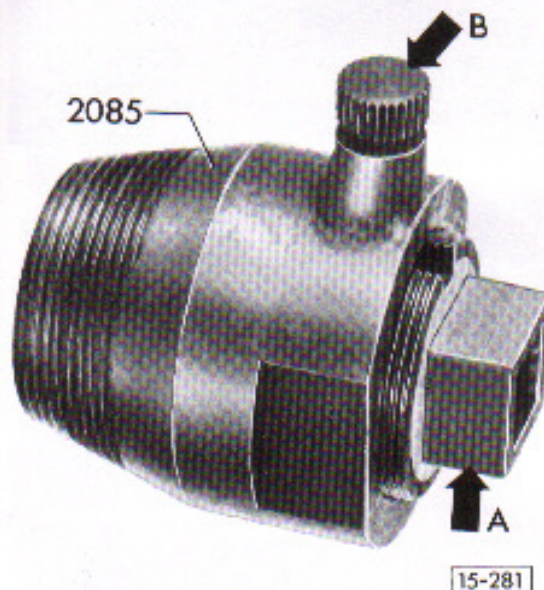
When a screw with the colour marking has to be renewed, use the notched screws as follows:

Old		New	
Part No.	Mark	Part No.	Mark
046 109 453 B	blue	= 046 109 453 D	1 notch
046 109 453 A	red	= 046 109 453 E	2 notches
046 109 453	yellow	= 046 109 453 G	3 notches

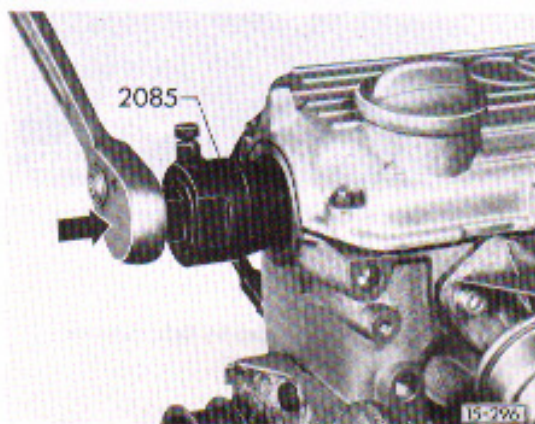
REMOVING AND INSTALLING CAMSHAFT OIL SEAL

Removing

- Removing toothed belt.
- Loosen radiator retainer and lower radiator slightly.
- Remove camshaft sprocket and take woodruff key out of shaft.



Unscrew the inner part (arrow A) two turns (approx. 3 mm) out of the outer part, and lock in position with the knurled screw (arrow B).

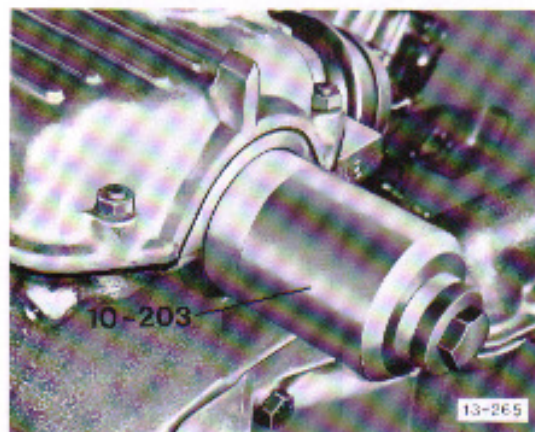


- Lubricate the threaded head of the oil seal extractor, set in position and by exerting pressure push it as far as possible into the oil seal (in direction of arrow).
- Slacken off knurled screw and turn the inner part against the camshaft until the oil seal is pulled out.

- Clamp the extractor in a vice and remove oil seal with a pair of pliers.

Installing

- Oil sealing lips lightly and push seal on.



- Press oil seal fully home.

Note

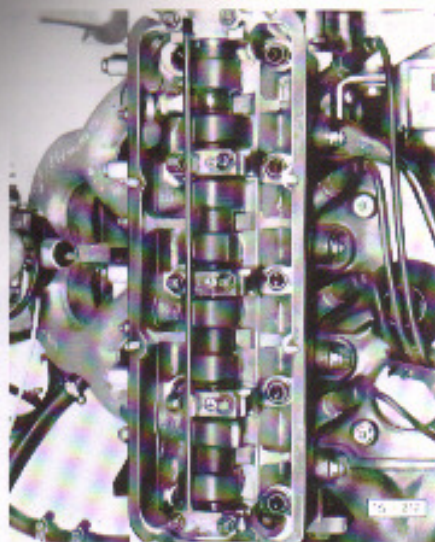
Use 2 washers.

- Installing toothed belt — see page 5.

REMOVING AND INSTALLING CAMSHAFT (engine in)

Removing

- Remove air cleaner.
- Remove cylinder head cover.
- Remove fuel pump.
- Remove distributor complete with drive gear housing.
- Remove "V" belt and timing belt guard.
- Loosen camshaft sprocket mounting bolt, first engage 4th gear and apply the brakes.
- Slacken and remove timing belt.
- Remove camshaft sprocket.



- Remove oil feed pipe, replace nuts on bearing caps 2 and 4 by hand.
- Remove bearing caps 1, 3 and 5.
- Remove bearing caps 2 and 4 by loosening the nuts alternately a few turns at a time.

Installing

Important

Watch position of offset bore when installing bearing caps: place caps in position before installation to determine correct position.

Never torque the camshaft bearing caps to more than

20 Nm (12.0 mkg);

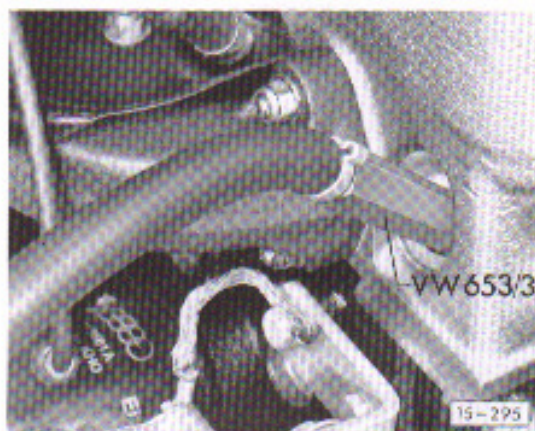
as this would distort the camshaft bearings.

- Tighten bearing caps 1, 3 and 5 alternately a few turns at a time.
- Install bearing caps 2 and 4 with oil feed pipe.
- Position camshaft sprocket and tighten bolt.
- Installing distributor — page 41.
- Installing toothed belt — page 5.

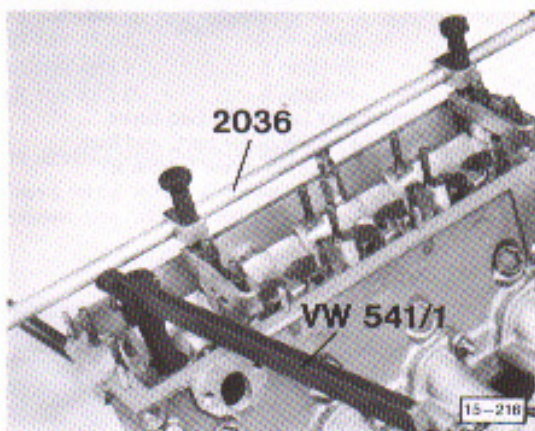
REPLACING VALVE STEM SEALS

(cylinder head in place)

- Remove camshaft and bucket tappets.
- Remove spark plugs.
- Engage 4th gear and apply handbrake.



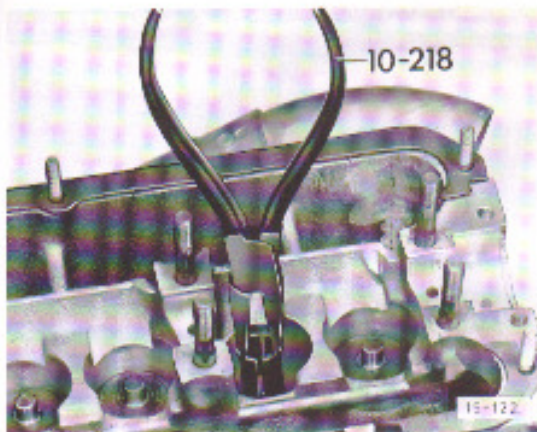
- Screw compressed air line into spark plug thread and maintain a constant pressure.



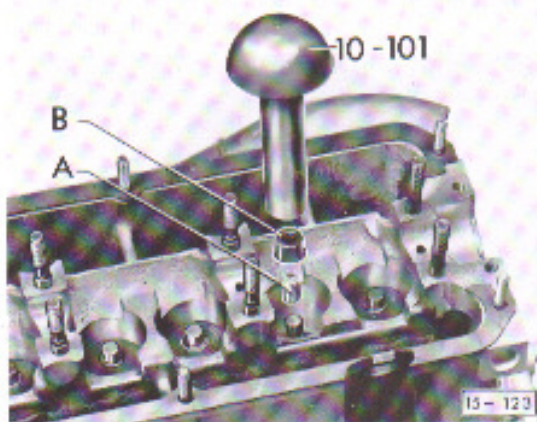
- Remove valve springs, attaching special tool to bearings 2 and 5.

Note

Jammed cotters can be released by light hammer blows on the assembly tool lever.



- Pulling off valve stem seal.



- Install valve stem seal on valve stem, using plastic sleeve — A —, Oil valve stem seal — B — and push seal down on to valve guide with special tool.

Important

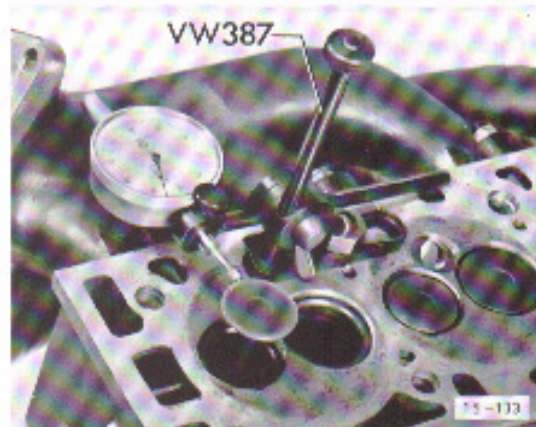
If the valve stem seals are installed without using plastic sleeve — A — they will be damaged.

CHECKING VALVE GUIDES

When repairing engines with leaking valves it is not always sufficient to rework or renew the valve seats and valves. It is also necessary to check the valve guides for wear. This is particularly important on engines which have been in service for a considerable time.

- Remove deposits with cleaning reamer.
- Insert new valve into guide. End of valve stem should be flush with end of guide.

As the stem diameters differ slightly ensure that an inlet valve is used in the inlet guide and an exhaust valve in the exhaust guide.



- Measure rock.
- | | | |
|-------------|---------|----------------|
| Wear limit: | Inlet | guide = 0.9 mm |
| | Exhaust | guide = 1.1 mm |

RENEWING VALVE GUIDES

- Clean and examine cylinder head. If the valve seats are not fit for reworking do not consider renewing the valve guides.



- Press worn guides out.

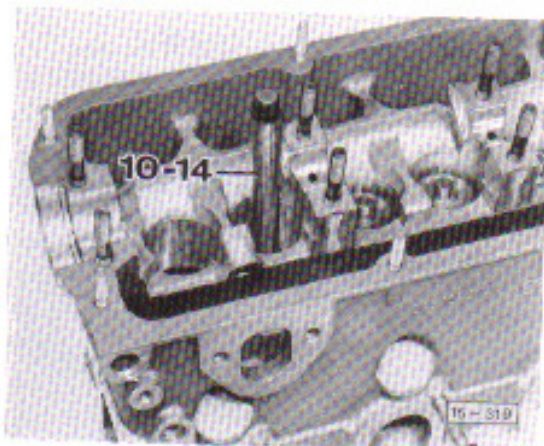
15 Cylinder head, Valve gear



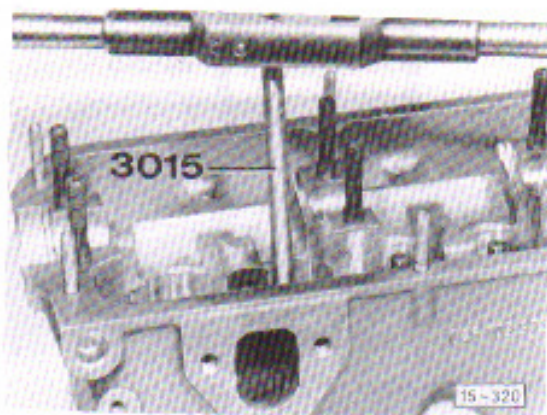
- Check the identification of the old guide and select a service guide from following table:

New service guide with circlip	Identification Production and service	Distance from circlip to end of guide — in mm.
048 103 415 A	none	Inlet: 17
046 103 415 A	none	Exhaust: 23.7
048 103 419 A	one groove	Inlet: 17
046 103 419 A	one groove	Exhaust: 23.7
048 103 423 A	two grooves	Inlet: 17
046 103 423 A	two grooves	Exhaust: 23.7

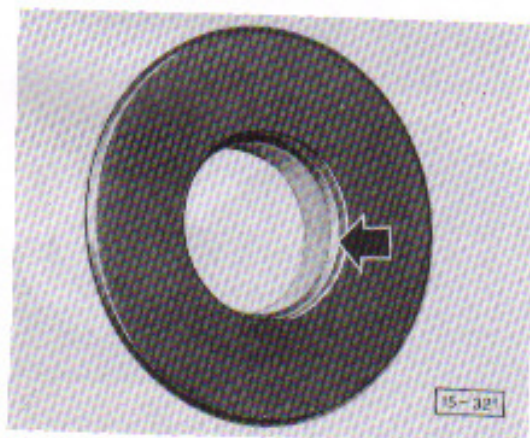
- Install circlip — Part No. N 12.460.1 in the groove in the new valve guide.



- Press guide in until circlip makes contact.



- Ream guide out with a hand reamer. Clean reamer several times.
- Rework valve seats.



Note:

When the service valve guide (with circlip) is used the valve spring seat without shoulder must be replaced by the spring seat with shoulder — Part No. 046 109 629.

ADJUSTING VALVE CLEARANCE

Check and adjust valve clearance with the engine warm (coolant temperature **above** 35° C).

Specified clearances, engine warm:

inlet valve: 0.20–0.25 mm

exhaust valve: 0.45–0.50 mm

Valve clearance can also be adjusted with the engine cold after repairs to the cylinder head.

Specified clearances, engine cold:

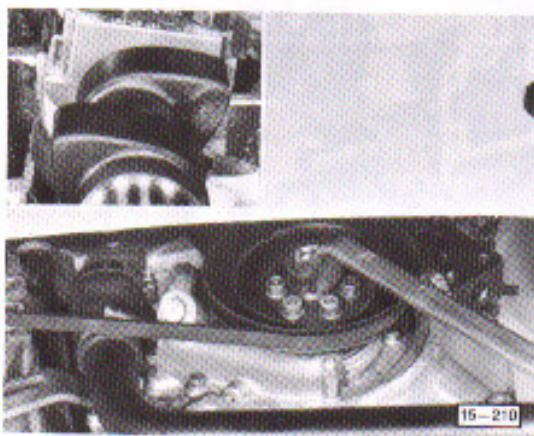
inlet valve: 0.10–0.15 mm

exhaust valve: 0.40–0.45 mm

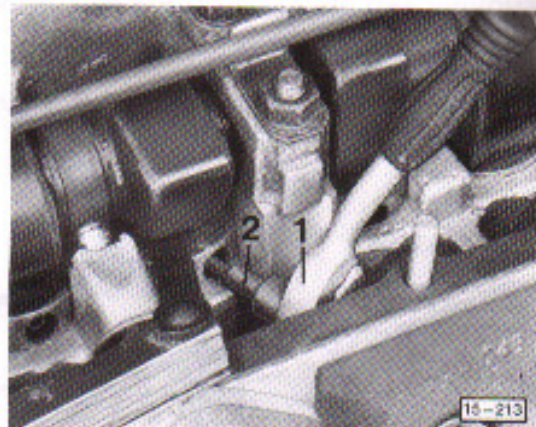
Note:

The clearance must then be checked again after 1000 km with the engine at operating temperature, and readjusted if necessary.

- Remove cylinder head cover.



- Turn crankshaft until the pair of cams of cylinder to be adjusted are facing upwards at similar angles.
- Turn tappet until adjustment hole is visible.



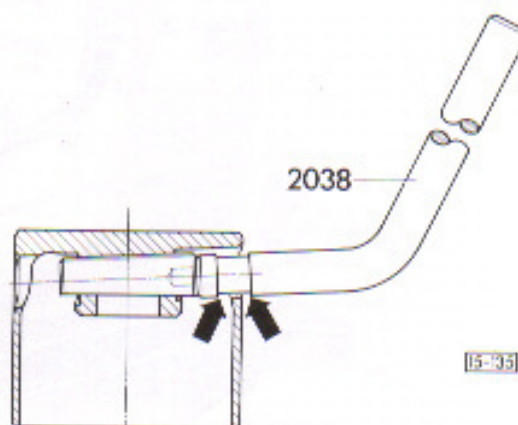
- Check valve clearance, if necessary adjust with ratchet handle – 1 – (Matra W 166) and socket – 2 – SW 3 mm (Matra W 165) by turning adjusting screw one or more **complete** turns.

Note:

Each complete turn of the adjusting screw alters the valve clearance by 0.05 mm.

Important

Check the position of the adjusting screw with gauge – 2038 – after adjusting the valve clearance.



- Checking position of adjusting screw.
The outer edge of the tappet must be between the notches on the gauge (green area).
If this is not the case, the valve adjusting screw must be renewed (screw in from correct side – see page 20).

REMOVING AND INSTALLING PARTS OF LUBRICATION SYSTEM

Checking oil pressure — page 28

Oil pressure switch
10 Nm
Checking — page 28
Coat with sealant
when installing.

Capacities:
without filter change — 4.5 l
with filter change — 4.5 l

Dipstick
Maximum oil level = 4.5 litres
Minimum oil level = 3.5 litres
Oil consumption max. 1.5 l/1000 km
Oil sorts — Fig. 1

Oil filter
Remove using tensioning strap,
note instructions on filter.

Lockplate
renew
10 Nm

Gasket
renew

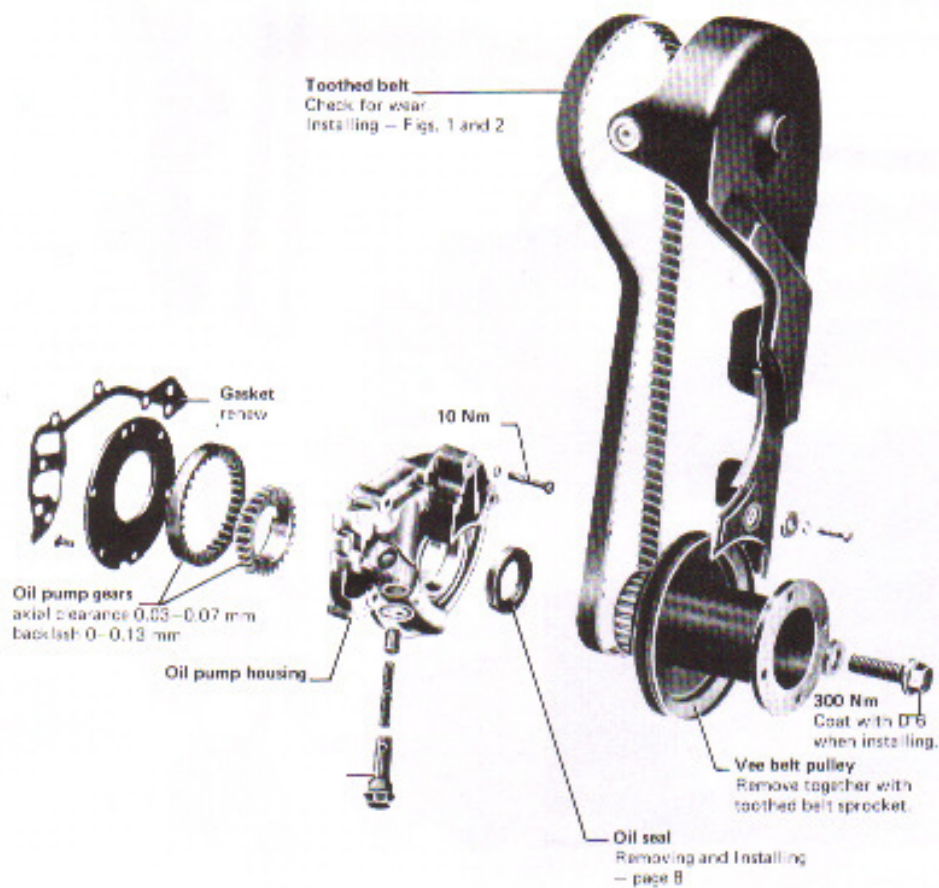
Suction pipe

Sump gasket
Renew, coat the ends
with sealant.

8 Nm for M 8

15 Nm for M 8

40 Nm



17-053

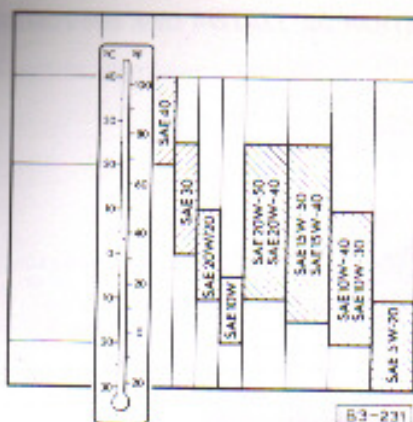
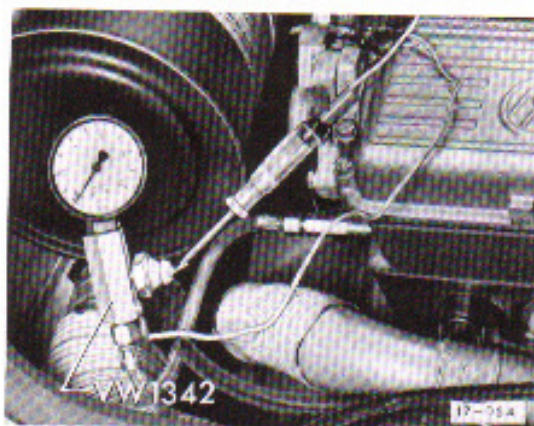


Fig. 1 Engine oil viscosity classes

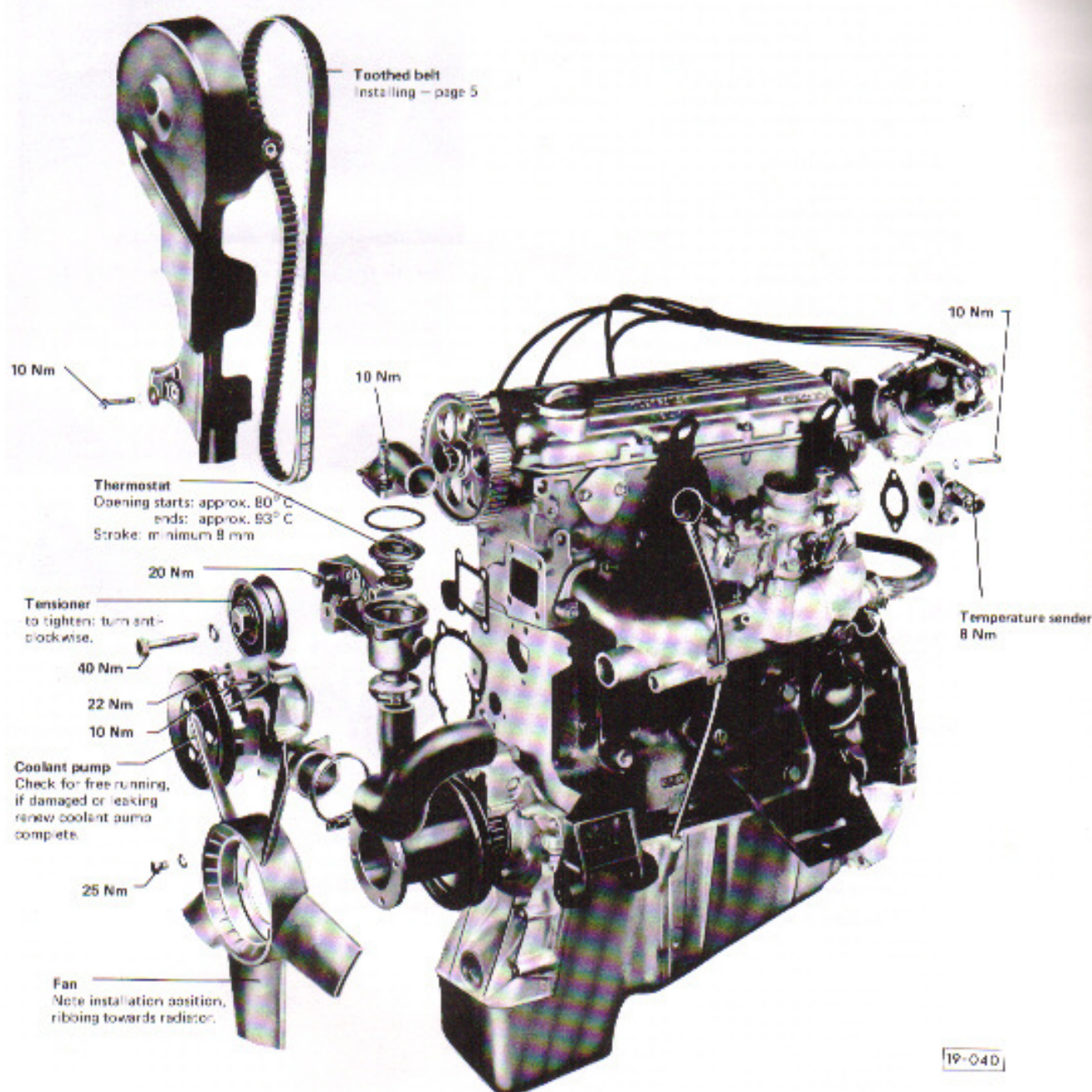
Grade: SE according to API specifications

CHECKING OIL PRESSURE AND PRESSURE SWITCH



- Remove oil pressure switch and screw it into tester.
- Screw tester into cylinder block in place of switch, connect test lamp to switch and battery +.
Test lamp must light up, otherwise replace switch.
- Start engine and increase speed slowly. At a pressure of 0.15–0.45 bar the lamp should go out.
- Increase speed further
At 2000 rpm and an oil temperature of 80°C the minimum oil pressure should be 3.0–4.0 bar.
Wear limit: min. 2.0 bar.

REMOVING AND INSTALLING PARTS OF LUBRICATION SYSTEM



DRAINING AND FILLING COOLING SYSTEM

Note:

The cooling system is filled at the VW factory with a mixture of water and VW frost and corrosion protective solution G 10, which should be used in the system all the year round. G 10 prevents frost and corrosion damage, the formation of chalk, and in addition it raises the boiling point of the water.

For these reasons the cooling system must be filled with this coolant mixture all the year round. Due to the higher boiling point the coolant is an aid to operational efficiency, when the engine is operating on full load, particularly in tropical climates.

Recommended mixtures

Frost protection down to	Capacities G 10	Water
-25°C	4.0 litres	6.0 litres
-35°C*	4.8 litres	5.2 litres

* Optional extra 542 is available in cold climate countries.

Draining

- Fully open the heater control valve.
- Open the expansion chamber.
- Drain coolant via drain plug on radiator.

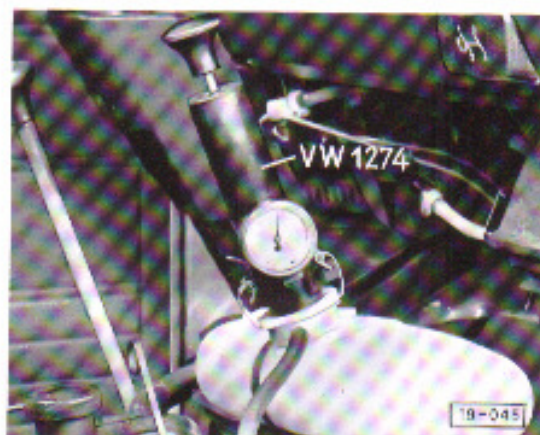
Note:

As the coolant contains G 10, it should be saved for further use.

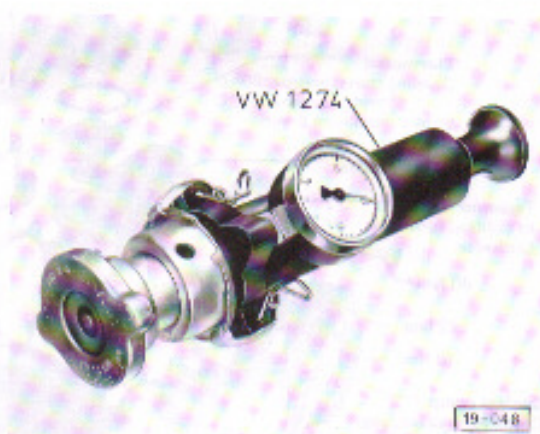
Filling

- Fully open the heater control valve.
- Fill cooling system up to the mark in the expansion chamber.
- Close expansion chamber and run the engine at fast idling speed for approx. 1 minute so that the cooling system is bled.
- Check coolant level and if necessary top up to marking.

CHECKING COOLING SYSTEM AND CAP



- Set the test appliance up on expansion chamber.
- Using the hand pump, pump up a pressure of approx. 1 bar. If the pressure remains constant the cooling system is in order.



- Place cap on tester.
- Using the hand pump, pump up a pressure between 0.9 and 1.15 bar. The valve must open within this pressure range.

REMOVING AND INSTALLING RADIATOR



- Remove protective grille – 1 –.
- Drain coolant – 2 –.
- Detach lower hose – 3 – from radiator.
- Detach the upper coolant hose.
- Remove bolts – 4 – from bracket.
- Pull bellows – 5 – off cowlings and take radiator – 6 – out downwards complete with cowlings.

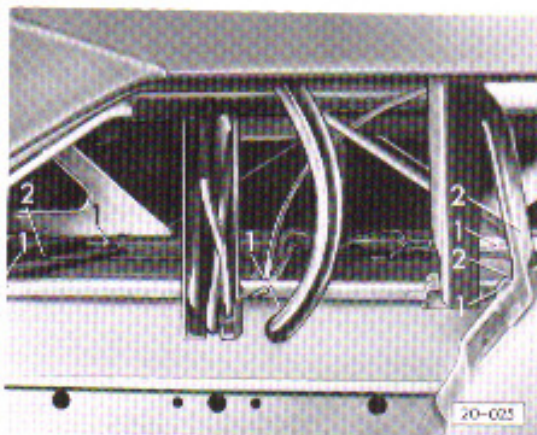
Note the following points when reinstalling:

- Ensure that the radiator is properly attached at the upper mounting.
- Align the radiator bracket in such a manner that the radiator is vertical.

REMOVING AND INSTALLING FUEL TANK

Removing

- Disconnect battery earth.
- *Only vehicles with platform*
Remove spare wheel. Remove rear bolts in side spare wheel holder and loosen front bolts.
Turn holder to one side.



- Remove three bolts — 2 —.
- Drain fuel by loosening filler neck and turning it downwards, lifting tank on left or pumping tank dry with vehicle fuel pump.
- Pull filler neck off.
- Up to Chassis No. 287 2513 106.
Pull five breather hoses — 1 — off.
- From Chassis No. 287 2513 107.
Pull one breather hose off.
- Disconnect fuel hoses.
- Pull wires and fuel hose off fuel gauge sender (Lower tank slightly if necessary).
- Take tank out.

Installing

Install by reversing removal sequence.

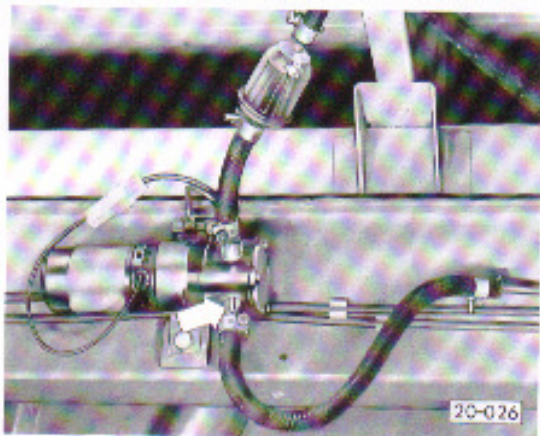
REMOVING AND INSTALLING FUEL PUMP

Up to Chassis No. 286 2506 977

Removing

- Disconnect battery earth.
- Pull wiring and hoses off.
- Remove securing screws and take pump off.

Installing



- Do not interchange hoses. The connection to the carburetor is marked with an arrow.

From Chassis No. 286 2506 978

Removing

- Remove fuel gauge sender with the fuel pump.

Installing

- Secure pump to sender with new screw clip.
- Coat sealing ring on sender with graphite powder before installing.

Renewing fuel filter

The arrow must point towards the pump.

SERVICING 35 PDSIT CARBURETOR

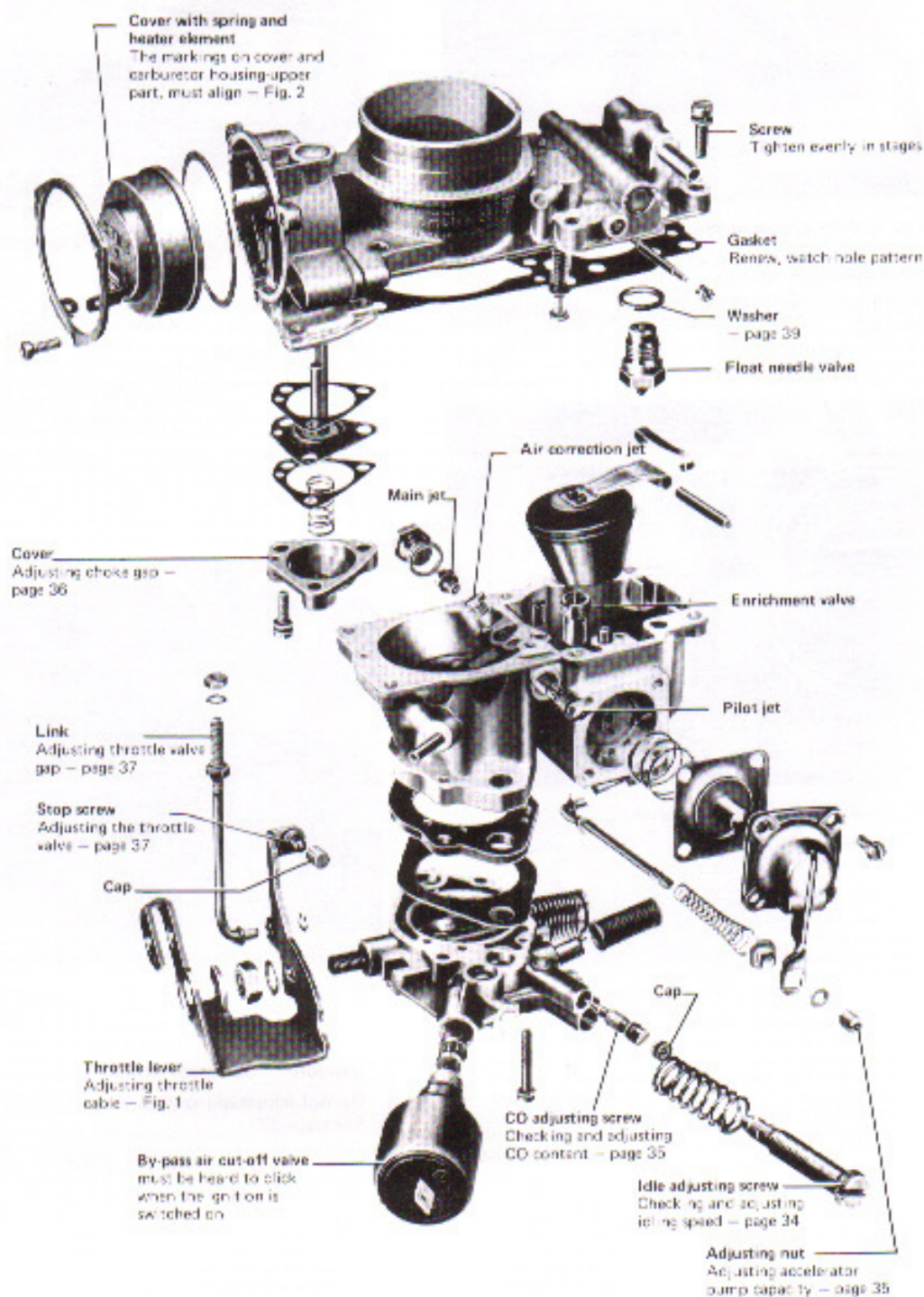
Note:

Lubricate linkage with MoS₂ grease.

Note:

From Engine No. CH 032 935 the carburetor is fitted with a dashpot and a delay valve.

Testing and adjusting instructions — page 38.



22-652

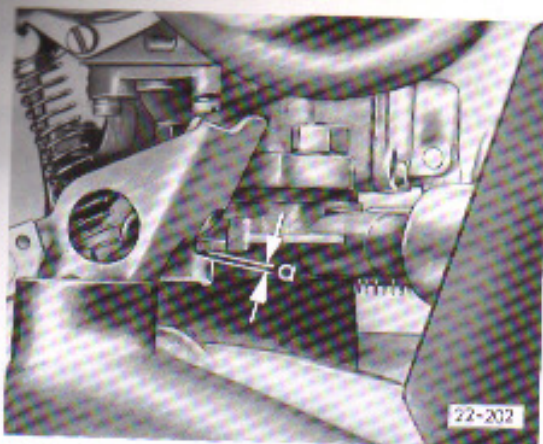


Fig. 1 Adjusting accelerator cable

With the accelerator pedal in the full throttle position there must be a clearance of 1 to 1.5 mm between the throttle lever and the stop on the carburetor housing.

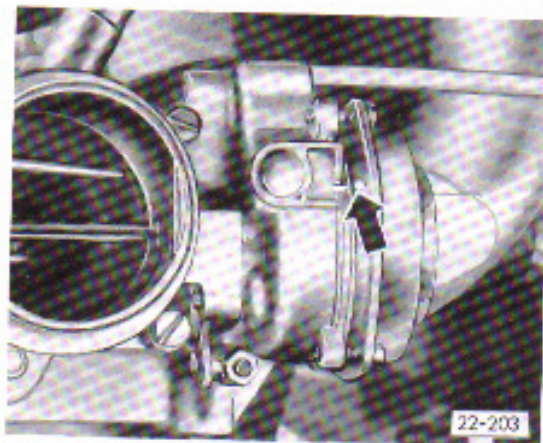
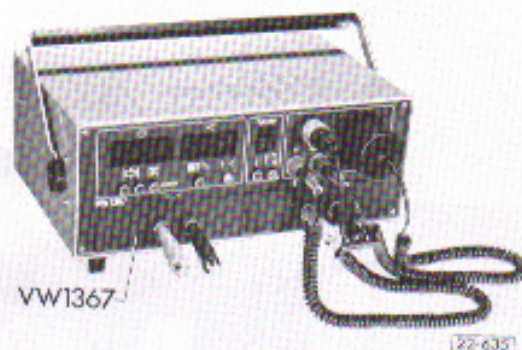


Fig. 2 Adjusting automatic choke

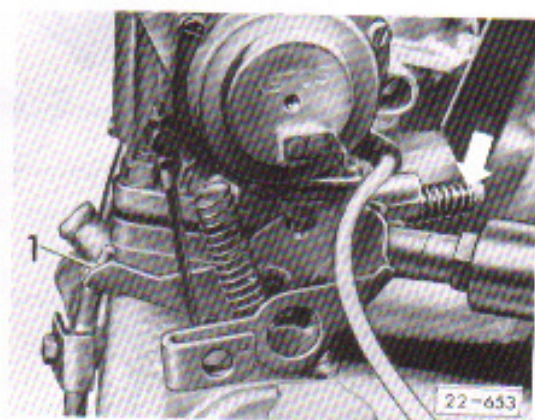
The markings on the cover and carburetor housing — upper part — must be aligned.

ADJUSTING IDLING SPEED

(min. engine oil temperature 60° C)



- Connect tester in accordance with instructions.
- Fully open choke.
- Pull crankcase breather hose off at air cleaner.
- Switch all electrical consumers off.



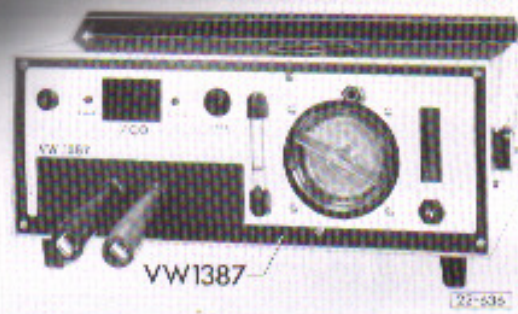
- Adjust idling speed to 950 ± 50 rpm with screw — arrow — (radiator fan must not be running).

Caution

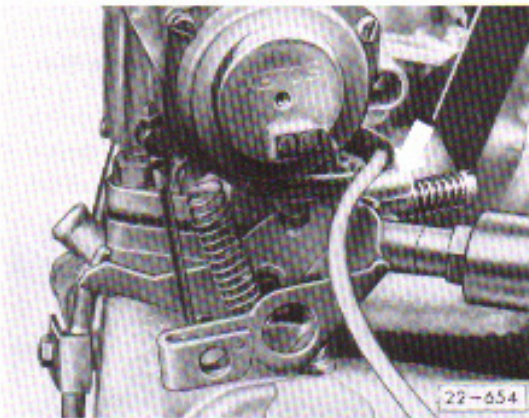
Do not adjust idling with stop screw (1). See page 37.

ADJUSTING CO CONTENT

(min. engine oil temperature 60° C)



- Connect tester in accordance with instructions.
- Open choke fully.
- Pull crankcase breather hose off at air cleaner.
- Switch all electrical components off.
- From Engine No. CH 032 925: Disconnect afterburning hose with pliers.
- Check idling speed — page 34.



- Check CO content and adjust if necessary with screw — arrow —. Setting: 1.5 ± 0.5 vol. %.
- (Radiator fan must not be running)
- Adjust idling speed again if necessary.
- After adjusting, fit blue antitamper cap on CO adjusting screw.

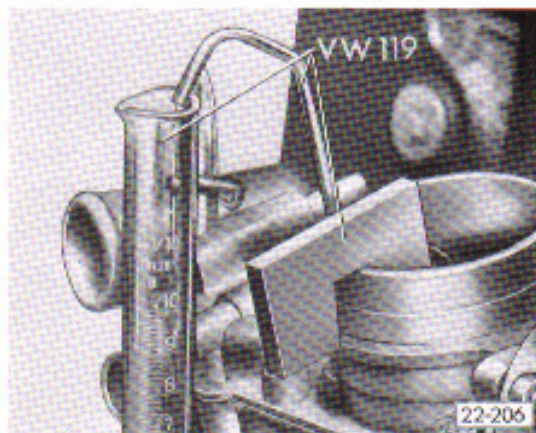
Note:

When the CO content has been adjusted, the crankcase breather hose must be connected again. If the CO content then rises it does not mean that the adjustment is wrong but is due to enrichment from oil dilution in the crankcase resulting from frequent stop/start operation. A long fast run will reduce the amount of petrol in the oil and the CO content will normalize. At short notice this can be done by driving fast for about 30 minutes or an oil change if one is due.

ADJUSTING ACCELERATOR PUMP

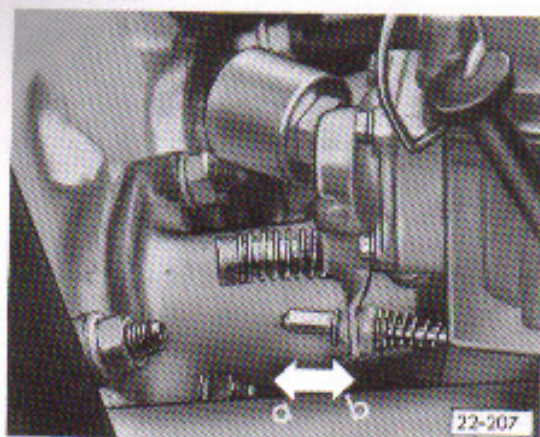
The tester can be used with carburetor on or off vehicle.

- Run engine briefly to fill float chamber.
- Take air cleaner off.



- Open choke and fix it in position.
- Push small diameter tube over the injection tube in carburetor.
- Operate throttle until fuel comes out of tube.
- Hold measuring glass under the tube, open throttle fully and slowly five times (at least 3 seconds per stroke).

- Divide the ejected fuel amount by 5 and compare with specified figure on page 39.



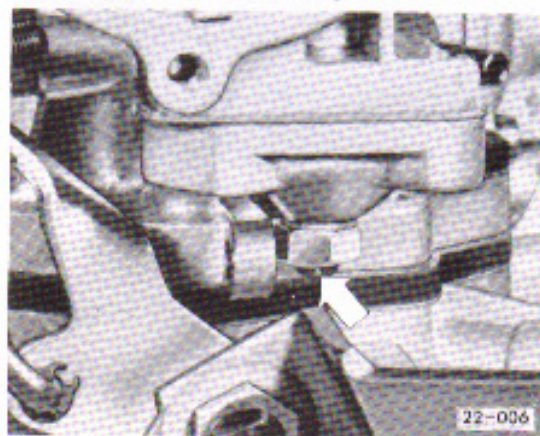
- Adjust amount if necessary:
 - a — reduces amount
 - b — increases amount
- Seal adjusting nut with paint.
- The jet of fuel must go into the throttle gap. Correct with bending appliance if necessary.

ADJUSTING CHOKE VALVE GAP

- Remove choke cover.
- Open throttle about halfway then close choke and release throttle.



- Press diaphragm pull rod on to stop with a screwdriver. Measure gap in this position with a drill.
- Setting: page 39



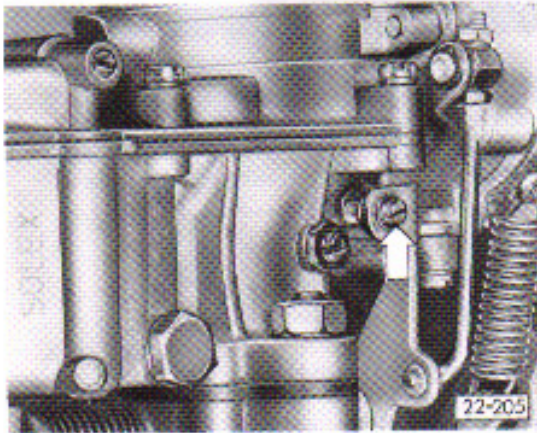
- Adjust choke valve gap with screw — arrow —.

THROTTLE VALVE BASIC ADJUSTMENT

The stop screw is set at the factory and should not be altered. If the screw is moved accidentally at any time, it can be adjusted as follows.

(Min. engine oil temperature 60° C).

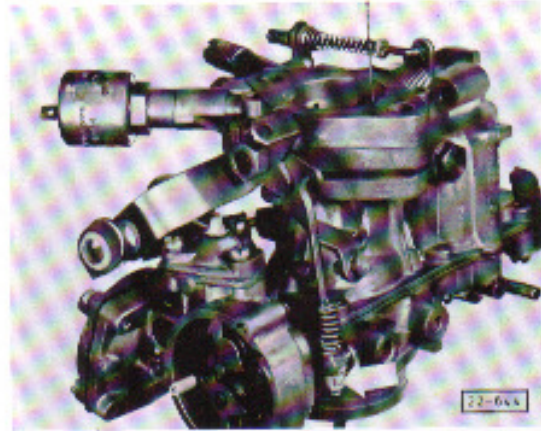
- Run engine at idling speed.
- Pull vacuum advance hose off at carburetor and connect vacuum gauge.



- Open throttle by turning the stop screw — arrow — in until the gauge indicates a vacuum.
- Turn screw out until the vacuum reading drops to 0. From this position, turn screw out 1/4 of a turn further.
- Adjust idling speed and CO content.
- Fit blue cap on screw.

ADJUSTING THROTTLE VALVE GAP

- Remove carburetor.
- Close choke valve, open throttle about halfway and release it again.



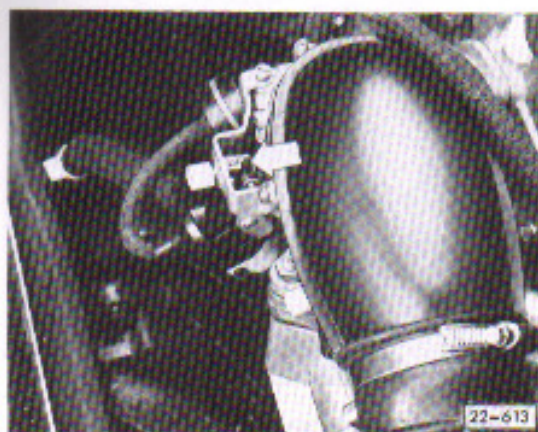
- Check throttle valve gap with a drill or wire gauge. Specified setting: page 39.
- Adjust gap with nut — arrow — or both nuts on older carburetors.
- Lock nuts with paint.

CHECKING AND ADJUSTING DASHPOT AND DELAY VALVE

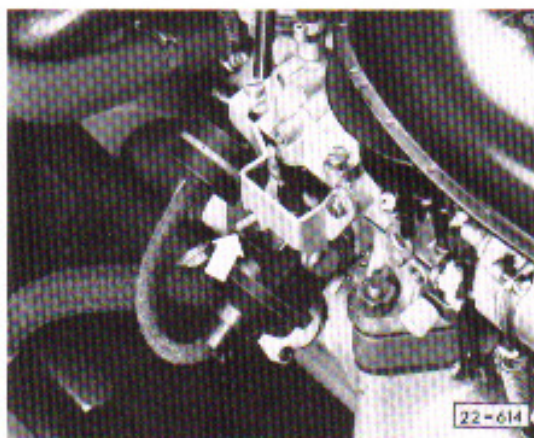
from Engine No. CH 032 935

(min. engine oil temperature 50° C)

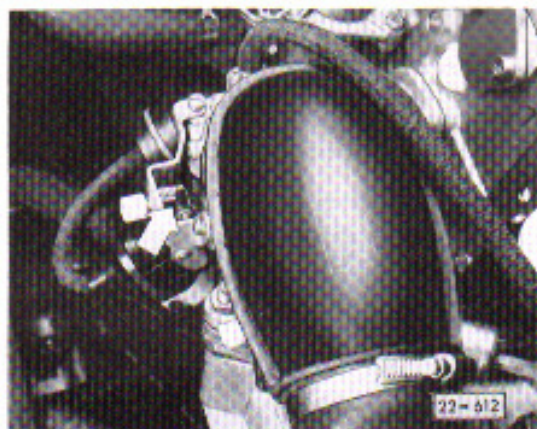
- Run engine at idling speed.



- Press control lever against the adjusting screw by hand — arrow.



- Check speed. If necessary, remove cap from screw — arrow — and adjust speed.
Specified setting: 1400 ± 50 rpm
- When setting is correct, fit new blue cap on adjusting screw.



- Increase engine speed to about 3000 rpm. The control lever on the dashpot is then pulled against the adjusting screw — arrow —.
- Release throttle lever. The control lever should move slowly off the adjusting screw and the throttle should close fully.

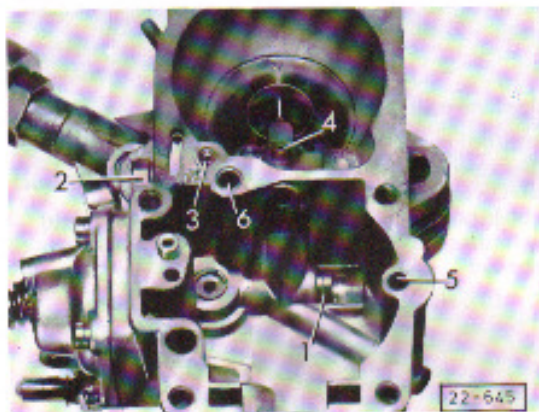
Delay valve fitting position

The white connection must point towards the carburetor.

CARBURETOR DATA

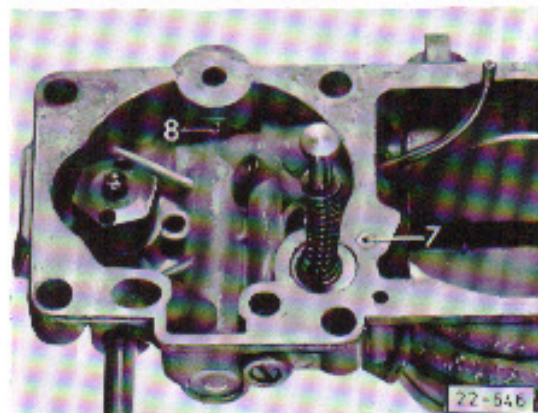
Engine	Introduced Engine No.	8. 1975 CH 000 001	4. 1976 CH 013 231	8. 1977 CH 032 935	8. 1975 CL 000 001 (V 240)
Carburetor	Type	35 PDSIT	35 PDSIT	35 PDSIT	35 PDSIT
	Part No.	060 129 015 B	060 129 015 B	060 129 015 E	060 129 015 C
	Mod. state	VW 515-1	VW 515-4	37-2	VW 547-3
Jets and settings	Venturi	mm dia.	28	28	28
	Main jet		X 162.5	X 162.5	X 160
	* Air correction jet with emulsion tube		145	145	85
	Pilot jet		52.5	65	47.5
	* Pilot air jet		200	200	120
	* Auxiliary fuel jet		57.5	57.5	50
	* Auxiliary air jet	mm dia.	1.04	1.04	1.04
	Enrichment jet with ball		60	60	60
	Injection capacity	cm ³ /stroke	2.0 ± 0.2	1.85 ± 0.2	1.85 ± 0.2
	Float needle valve	mm dia.	1.5	1.5	1.5
	Float needle washer	mm	1.5	1.5	1.5
	Throttle valve gap	mm	0.95 ± 0.05	0.95 ± 0.05	1.2 ± 0.05
	Choke gap	mm	5.0 ± 0.5	5.0 ± 0.5	4.0 ± 0.2
	Choke cover marking		128	128	128
Idling		rpm	950 ± 50	950 ± 50	950 ± 50
	CO content	vol. %	1.5 ± 0.5	1.5 ± 0.5	1.5 ± 0.5

* Jet or calibration cannot be exchanged.



Jet layout — body

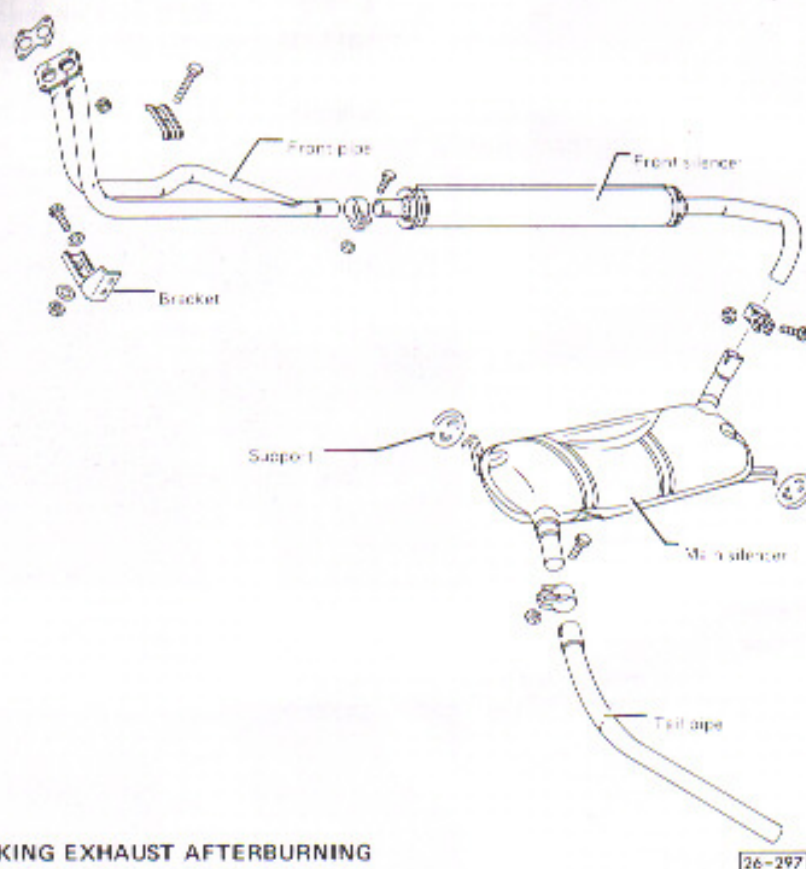
- 1 — Main jet
- 2 — Pilot jet
- 3 — Pilot air jet
- 4 — Air correction jet with emulsion tube
- 5 — Auxiliary fuel jet
- 6 — Ball for enrichment



Jet layout — top

- 7 — Enrichment jet
- 8 — Auxiliary air jet

SERVICING EXHAUST CONTROL SYSTEM



CHECKING EXHAUST AFTERBURNING

from Engine No. CH 032 935

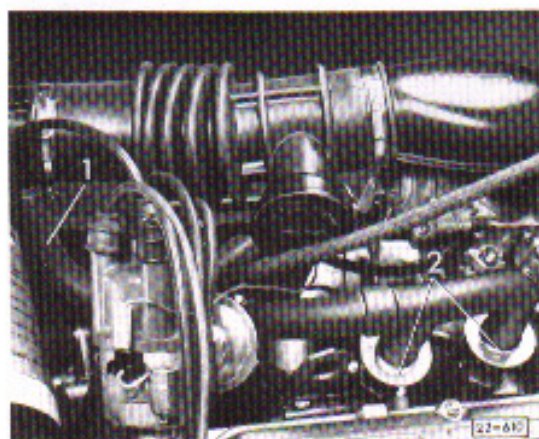
Function

To reduce the contaminants in the exhaust gas, air is fed into the exhaust ports. This causes afterburning and eliminates to a large extent the CO-HC components in the exhaust gas.

Air is drawn from the intake manifold – 1 – by the suction of the exhaust gas and fed via check valves – 2 – into the cylinder head.

Checking instructions

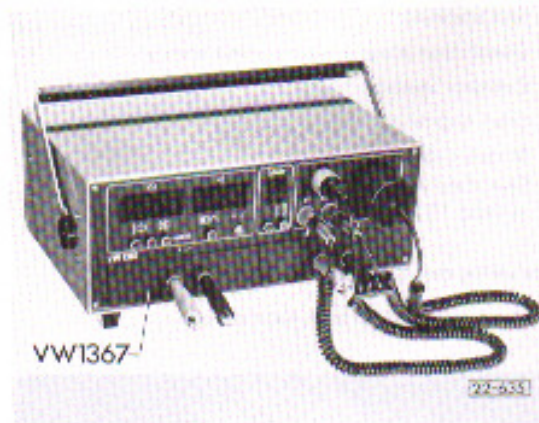
Damaged check valves have a detrimental effect on the exhaust gas composition. When a valve is defective it turns blue due to the heat and the rubber hoses connecting the valves are damaged. In such cases the check valves and the hoses must be renewed.



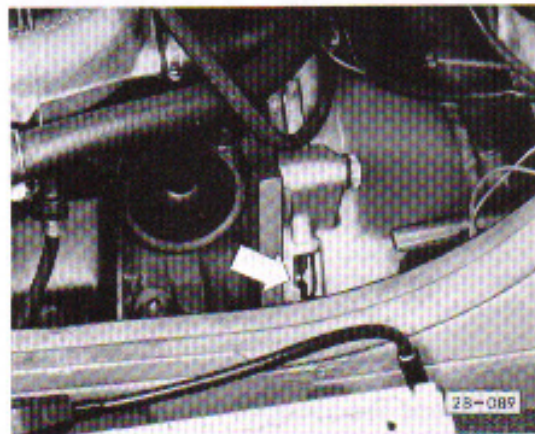
SERVICING IGNITION SYSTEM

ADJUSTING IGNITION TIMING

(min. engine oil temperature 30° C)

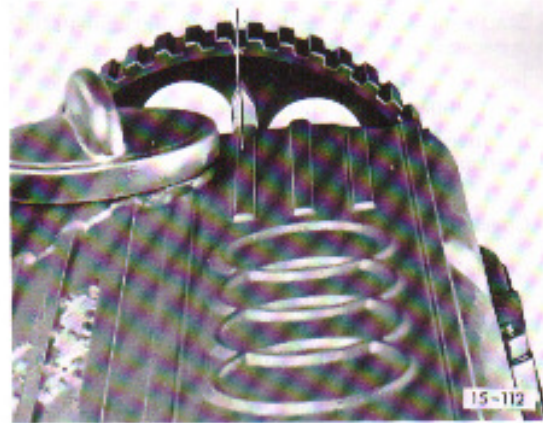


- Connect tester in accordance with instructions.
- Pull hose off vacuum unit.
- Adjust dwell angle and timing.
See page 43 for settings.

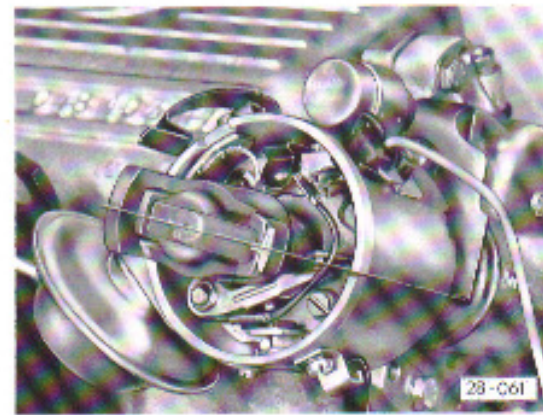


- When using a tester with a stroboscopic pistol, the flashes must be directed on to the timing mark.
The mark on the flywheel must be in line with the reference mark on the bell housing.

INSTALLING DISTRIBUTOR



- Set the No. 1 cylinder to the firing point.
The marking on the camshaft sprocket and the pointer on the cylinder head cover must align with one another.



- Set the rotor arm so that it points towards No. 1 cylinder mark on the distributor housing.
- Install distributor, clean and check distributor cap for cracks and signs of tracking.
Ensure cap seats correctly.
- Adjust firing point.

CHECKING DISTRIBUTOR

a - Checking centrifugal advance

- Connect tester according to instructions.
- Pull hose off vacuum unit on distributor.
- Start engine. Check ignition timing and adjust if necessary.
- Increase speed slowly. Note beginning of advance and compare with data on page 43.
- Set speed to values given in table and compare with data on page 43.

b - Checking vacuum advance

- Connect vacuum gauge, timing and rev counter appliance according to instructions.
- With engine running at about 2500 rpm check whether vacuum is effective at vacuum unit. If no vacuum is indicated, the adaptor on the carburetor is blocked.
- Increase speed until a higher vacuum is shown on gauge than is required in test at end of spark control. See page 43.
- Switch vacuum gauge so that vacuum is held on the vacuum unit side.
- Stop engine. The vacuum must not drop more than 10 % in one minute. Otherwise the vacuum unit or the hose are leaking.
- Start engine. Check timing, adjust if necessary.
- Increase engine speed until vacuum is higher than the test values for end of spark control. See page 43.
- Switch instrument so that the vacuum is held on the vacuum unit side. Let engine continue to run at idling speed.
- Lower vacuum at tester to the required level — advance begin or end.
- Note advance and compare with table on page 43.

CHECKING COIL

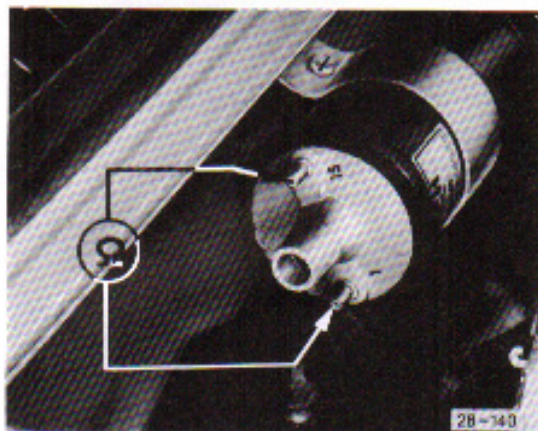
Measuring ignition voltage

Imn. engine oil temperature 50° C!

- Clean and dry insulating cap to prevent sparking and tracking.
- Check that plugs are connected firmly.
- Connect ignition coil tester.
- Start engine and run at idle (900—1000 rpm).
- Measure ignition voltage.
Specified voltage:
at least 15 kV with a load of 1 MOhm.

Measuring resistances

- Disconnect all wires at ignition coil.



- Connect ohmmeter between terminal 1 and terminal 15 of ignition coil.
Specified resistance: 1.7—2.1 Ohm.
- Connect ohmmeter between terminal 15 (+) and terminal 4 at ignition coil.
Specified resistance: 7—12 kOhm.

SUPPRESSION RESISTANCES

Location	Specified in k Ohm
Rotor arm	5 ± 1
Lead from coil to distributor (including connector)	
without radio	0
with radio	1 ± 0.2
Leads from distributor to plugs (including connector)	
without radio	1 ± 0.2
with radio	6 ± 1.2

TABLE OF DISTRIBUTORS AND SETTINGS

Introduced	from	8. 1975
Engine No.	from	CH 000 001
Distributor part No.		060 905 205 A
Firing point		5° before T.D.C.
Marking		



28-062

Speed	rpm	850 – 950
Vacuum hose		off [†]
Dwell angle	setting	47 ± 3° (53 ± 3%)
	wear limit	42 – 58° (47 – 64%)
Centrifugal advance		
Begins	rpm	1100 – 1500
	rpm	2400
	degrees	12 – 16
	rpm	3400
	degrees	23 – 27
Ends	rpm	4200
	degrees	32 – 36
Vacuum advance		
Begins	mbar (mmHg)	133 (100)
Ends	mbar (mmHg)	413 (310)
	degrees	17 – 21
Spark plugs	Type	Bosch W 200 T 30 Beru 200/14/3 A Champion N 7 Y
	Electrode gap mm	0,6 – 0,7

REPAIRING CLUTCH

Remove gearbox first.

For instructions on repairs to clutch release shaft and bearing see Manual Gearbox 0.15 booklet, Repair Group 34.

Tools and equipment

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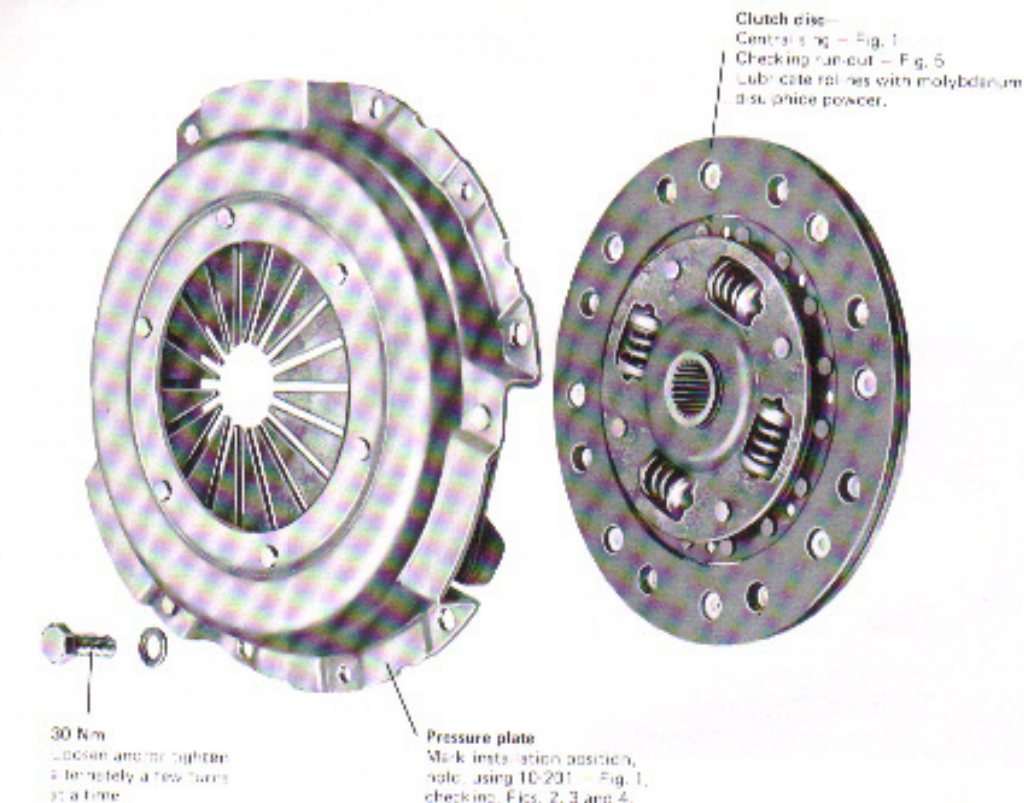
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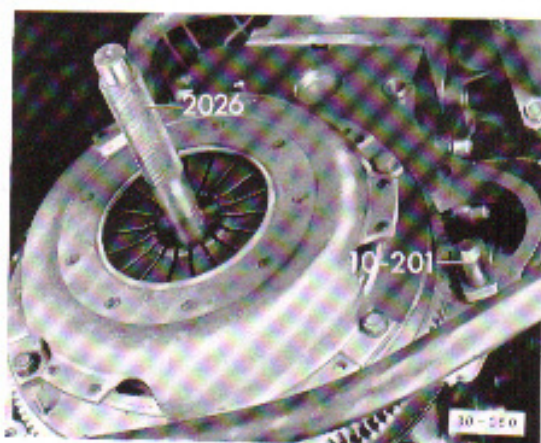


Fig. 1 Removing and installing clutch
Mark installation position.

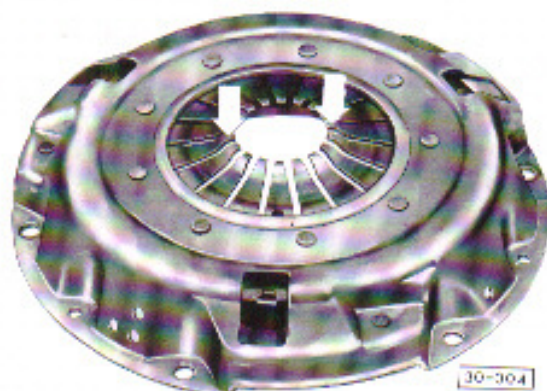


Fig. 2 Checking the ends of the diaphragm spring
Scoring to a depth of 0.3 mm is permissible.

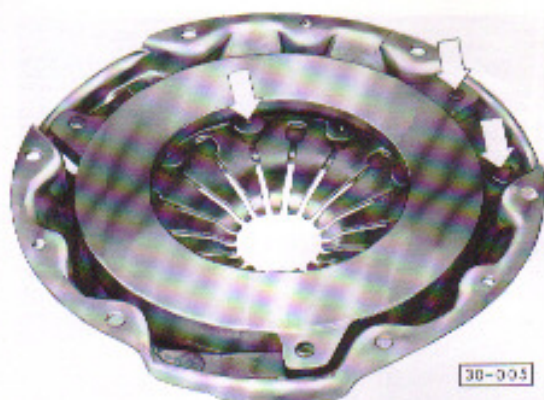


Fig. 3 Check the spring connections between pressure plate and cover for cracks, and tightness of rivets

Clutches with damaged or loose rivets should be renewed.

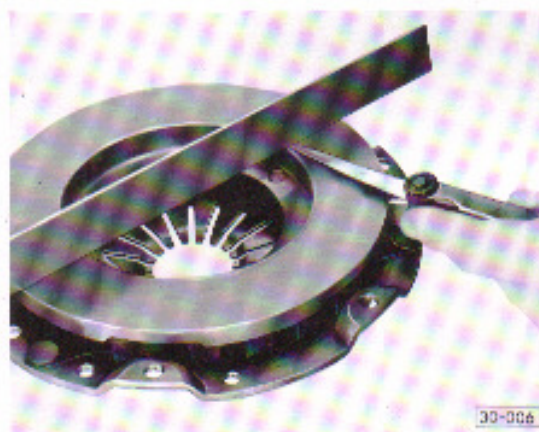


Fig. 4 Checking the pressure plate surface for cracks, signs of burning and wear

Pressure plates which are bowed inwards to a maximum of 0.3 mm are still serviceable.

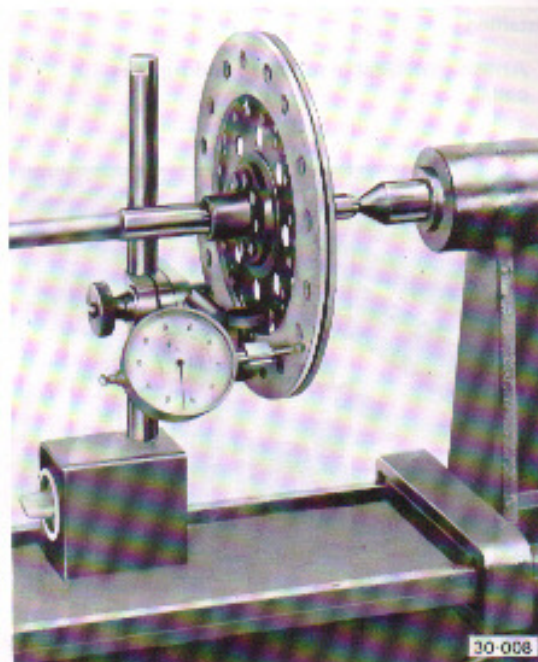


Fig. 5 Clutch disc – Checking run-out

Max. = 0.5 mm on a 220 mm diameter plate.

REMOVING AND INSTALLING CLUTCH CABLE

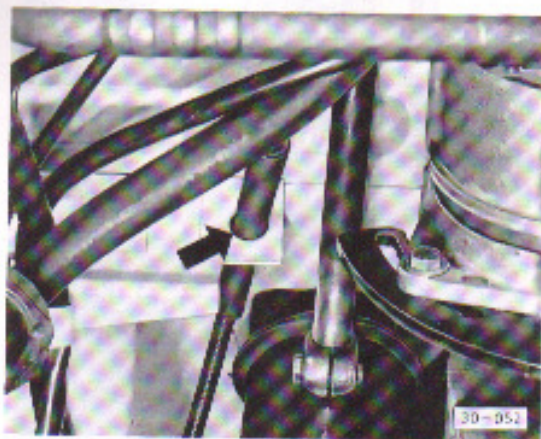
Removing



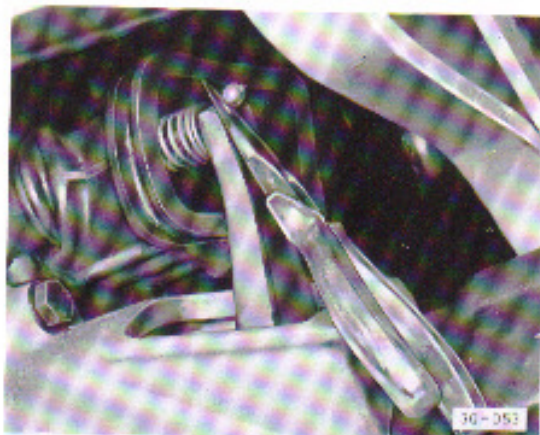
- Release the tension on the cable by turning the adjusting nut (1) at the gearbox mounting.
- Detach the clutch cable from the clutch release lever (2). Remove the cap together with return spring and unscrew the cable from the gearbox support.
- Detach the cable from the clutch pedal and take out from below.

Installing

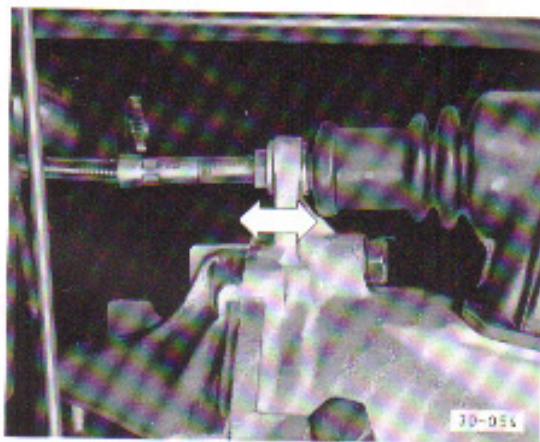
- Attach clutch cable to pedal, and support pedal.



- Guide the clutch cable through the cleat on the body.
- Secure the cable to the gearbox support.



- Attach the clutch cable to the clutch release lever using pliers.
- Ensure that the cap on the gearbox and the rubber grommet in the body are correctly located.



- The clearance is adjusted by turning the adjusting nut on the gearbox support.
The clearance at the clutch pedal = 20 mm.

Volkswagen Technical Site: <http://volkswagen.msk.ru> <http://vwts.info> <http://vwts.ru>
огромный архив документации по автомобилям Volkswagen, Skoda, Seat, Audi