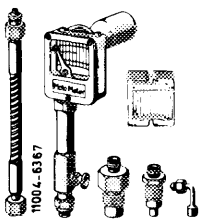
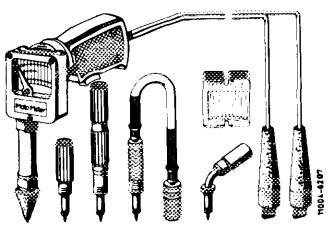
01–010 Checking compression pressure

Test values for engine at operating temperature in bar gauge pressure (atü)	
Normal compression pressure	24–30
Minimum compression pressure	approx. 15
Permissible difference between the individual cylinders	max. 3

Tightening torques	Nm
Cap nuts of injection lines	25
Injection nozzles in prechambers	70–80
Pencil element glow plugs	20–30

Special tools

Compression pressure recorder with accessories		001 589 47 21 00
Screw-in fitting for heating plug bore		617 589 03 21 00
Contact handle for rotating engine (Component of compression pressure recorder 001 589 46 21 00)		001 589 46 21 08

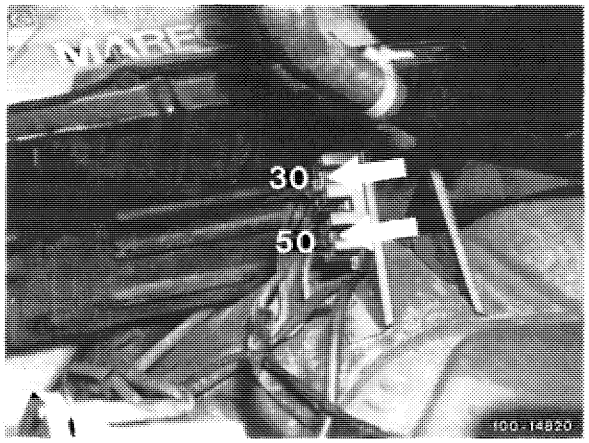
Note

Measure compression pressure at 80 °C coolant temperature. The compression pressure can be tested via heating plug bore or via prechambers. When pressure is below minimum compression pressure, check cylinders for leaks (01–015).

Checking

1 Remove heating plugs or injection nozzles.

2 Connect contact handle under battery to cable connector terminal 30 and 50.



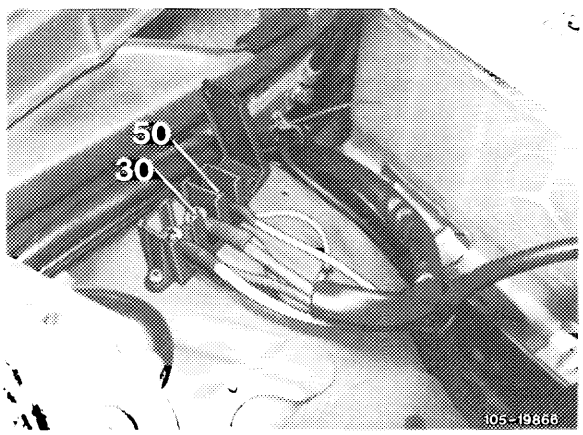
Model 116.120

The cable connector is attached at the following points:

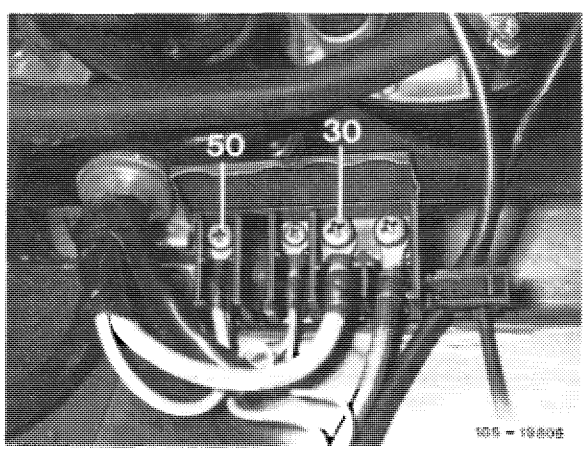
Model 116.120: Under battery.

Model 123 : On wheelhouse, right.

Model 126.120: On frame side member



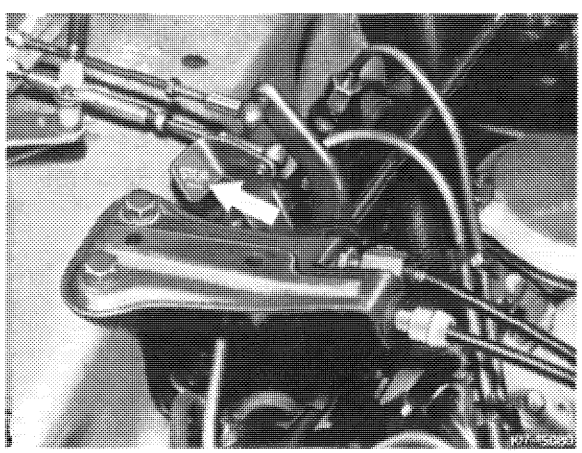
Model 123



Model 126.120

3 Rotate engine several times at transmission idle position, so that residue and soot are thrown out.

Attention!
For the above purpose, push shutoff lever (stop) in direction of engine so that the injection pump is not injecting.

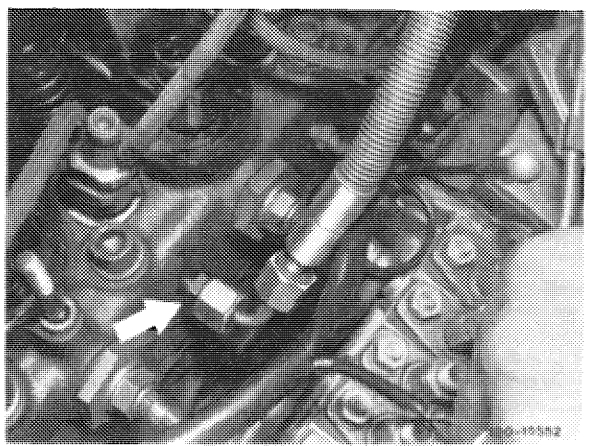


4 Enter screw fitting into glow plug bore or adaptor (component of compression pressure recorder) into prechamber.

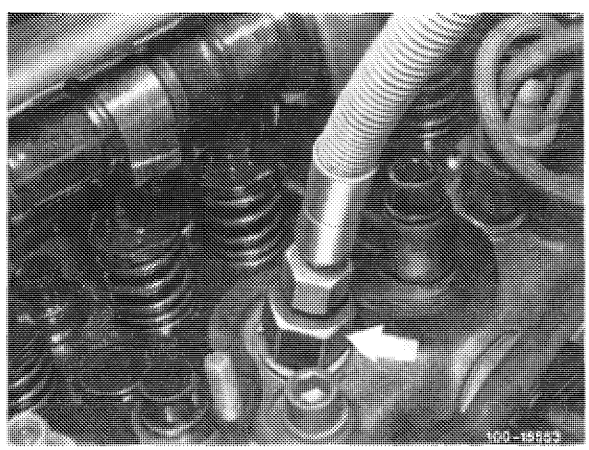
Connect compression pressure recorder.

Screw fitting

100-14819



Compression pressure recorder, connected to glow plug bore

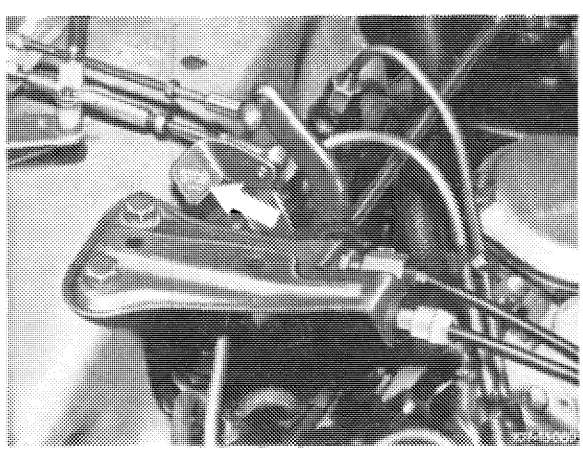


Compression pressure recorder, connected to prechamber

5 Rotate engine 8 revolutions for testing.

Attention!
For the above purpose, push shutoff lever (stop) in direction of engine so that the injection pump is not injecting.

6 Insert new nozzle reeds prior to installation of injection nozzle.

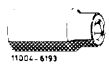


01–015 Checking cylinders for leaks

Data

Total pressure loss	max. 25 %
On valves and cylinder head gasket	max. 10 %
On pistons and piston rings	max. 20 %

Special tool

Socket 27 mm, 1/2" square socket for rotating engine		000 589 65 09 00
Screw fitting for glow plug bore		617 589 03 21 00

Conventional tool

Cylinder leak tester	e.g. made by Bosch, EFAW 210 A made by SUN, CLT 228

Checking

1 Run engine up to operating temperature.

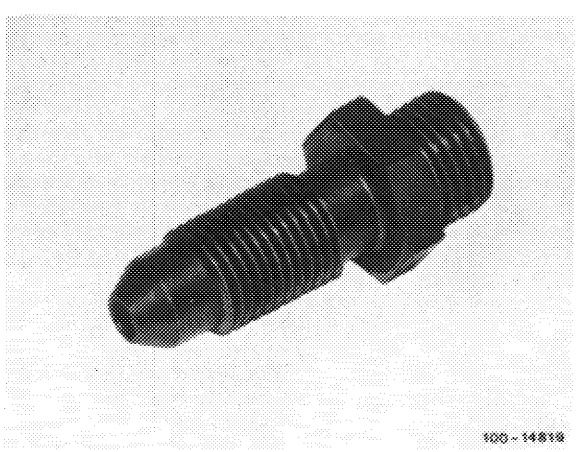
2 Unscrew pencil element glow plugs.

3 Remove air cleaner cap.

4 Remove oil filler plug.

5 Remove radiator cap and top up coolant.

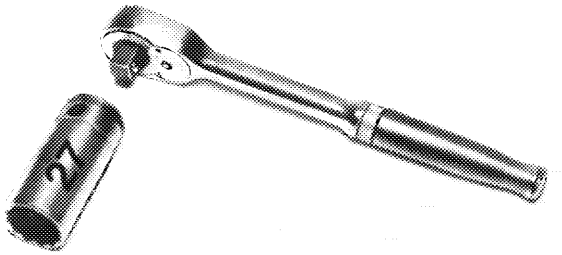
6 Enter screw fitting into glow plug bore of 1st cylinder.



7 Set piston of 1st cylinder to ignition TDC. For this purpose, rotate engine at crankshaft by means of tool combination.

8 Connect cylinder leak tester to a compressed air system. Calibrate tester.

9 Screw connecting hose of tester to screw fitting. Crankshaft should not rotate.

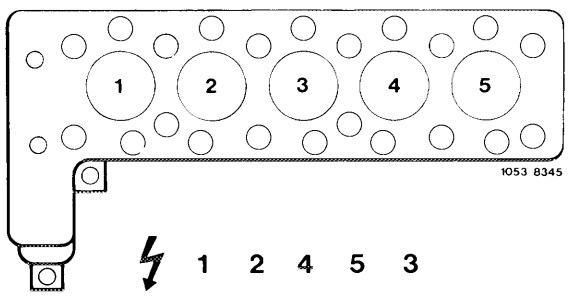


1100-6498/1

10 Read pressure loss on tester.

11 Check by listening whether pressure escapes via intake pipe, exhaust, oil filler cap, glow plug bore of adjacent cylinder or radiator cap.

12 Check all cylinders in ignition sequence.

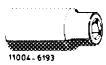


Note: There is the possibility that the piston ring gaps of individual pistons are directly one above the other, so that the test result will be misrepresented.

When in doubt, continue running vehicle and check cylinders for leaks once again later on.

Tightening torques	Nm
Cap nuts for injection lines	25
Nuts for cylinder head cover	15
Threaded ring for prechamber in cylinder head	150–180
Injection nozzle in prechamber	70–80

Special tools

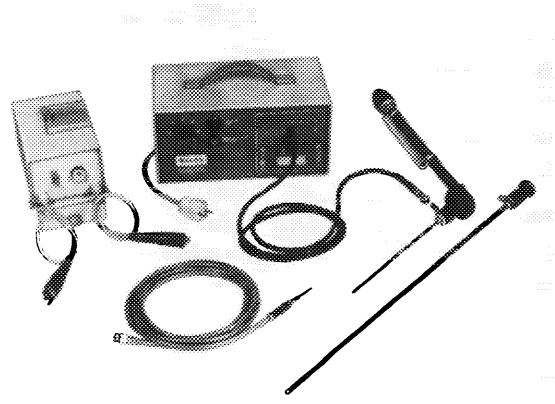
Box wrench socket, open, 17 mm, 1/2" square for injection lines	 11004-6359	000 589 68 03 00
Socket 27 mm, 1/2" square	 11004-6193	001 589 65 09 00
Socket wrench for threaded ring of prechamber	 11004-6360	615 589 00 07 00
Puller for prechambers	 11004-6365	615 589 00 33 00

Conventional tool

Cylinder illuminating lamp	Karl Storz GmbH, 7200 Tuttlingen Motoskop TW (Kaltlicht) with lens probes 103 26 CW (750 mm) and 103 26 CT (210 mm).

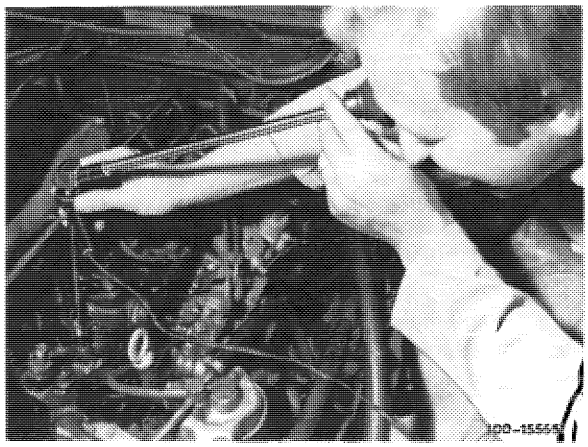
Note

A visual checkup can be made with cylinder head in place by means of a cylinder illuminating lamp. For this purpose, the prechambers must be removed (01–417).



103-15713

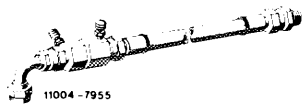
When evaluating scored or streaky cylinder walls, it is often difficult for a workshop to decide whether the damage is already extensive and requires removal or repair of the engine, or whether the evidence is harmless. The following instructions will help in making an expert and correct decision.



With regard to marks on cylinder walls, the first important difference is between "optical streaks" and "seizure streaks". As a rule, "optical streaks" are about 3 mm wide, they are produced by the piston ring gaps and do not destroy honing structure; "seizure streaks", however, obliterate honing structure.

With streaks in direction of "land" (in direction of piston pin) shaft streaks or seizures are not possible, since there is no contact between piston skirt and cylinder liner.

Special tools

Oil dipstick with millimeter scale	 11004-7663	115 589 15 21 00
Valve for interrupting oil return flow from air-oil cooler	 11004-7955	110 589 00 91 00
Telethermometer		116 589 27 21 00

Note

The oil consumption can be measured by means of oil dipstick with millimeter scale and the pertinent diagram on back of data sheet.

Since there are two oil dipsticks and different data sheets, the following instructions should be observed:

On this engine use only oil dipstick, part no. 115 589 15 21 00 (red handle).

Data sheet

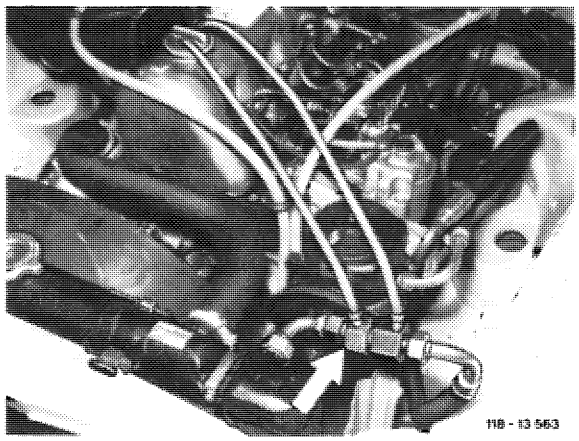
German/English, print no. 800.99.402.00 B
French/Spanish, print no. 800.99.402.01 B

The sequence for measuring consumption is described on front page of data sheet.

To avoid faulty measuring, check engine oil for dilution by fuel prior to measuring consumption.

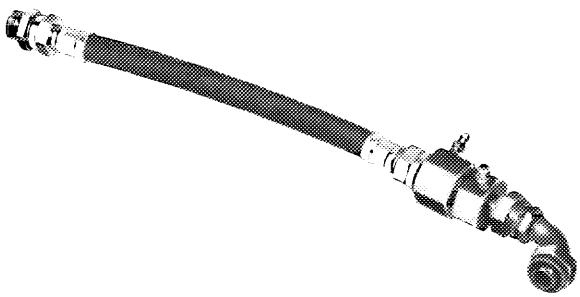
To prevent any return flow of oil from air-oil cooler while measuring, install check valve between air-oil cooler and upper oil hose.

If the check valves cannot be installed due to insufficient space, mount check valves with pipe elbow and connecting line.

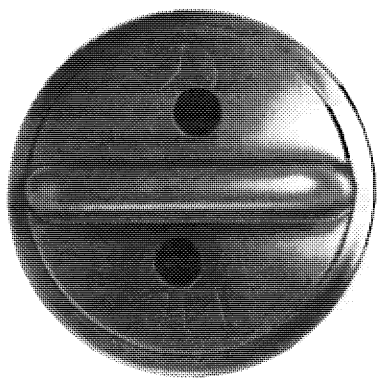


Bleed air-oil cooler prior to measuring consumption.

For this purpose, plug 2 transparent plastic hoses on bleed screws located on check valve. Remove oil filler hole plug on cylinder head cover and insert both hoses into filler hole.

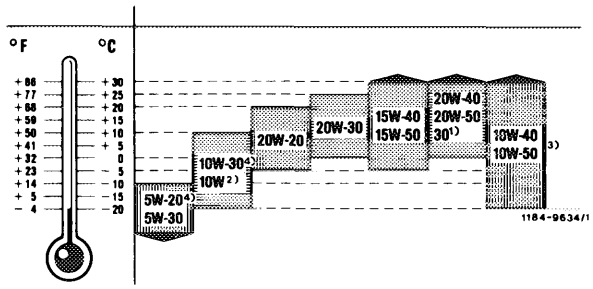


Attention!
To prevent oil ejections it is recommended to use an oil filler plug with two bores (OD of hoses).



Specified viscosity classes according to SAE during constant outside temperatures

1) During constant outside temperatures above + 30 °C (+ 86 °F) SAE 40 may be used.
2) Do not use.
3) All season oil
4) For oil types which are identified on pages 226.1 and 227.1 of Specifications for Service Products with footnote 1), the following applies:
   SAE 5W-20 below + 10 °C
   SAE 10W-30 in temperate zones all-year.

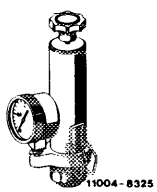
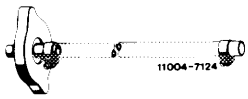
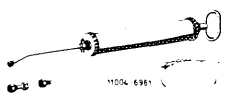


Attention!
Do not use single range oil grades of viscosity class SAE 10 for this engine.

Oil capacity in liters (for approved engine oil grades refer to Specifications for Service Products)	
Engine (total capacity during initial filling)	8.5

Tightening torques	Nm
Oil drain plug to oil pan	40
Nuts for oil filter cover	20–25
Bolts for engine carrier on engine mount front	70

Special tools

Tester for cooling system and closing radiator		001 589 48 21 00
Radiator cap with hose for leak test		605 589 00 25 00
Syringe for removing oil		112 589 00 72 00

Conventional tool

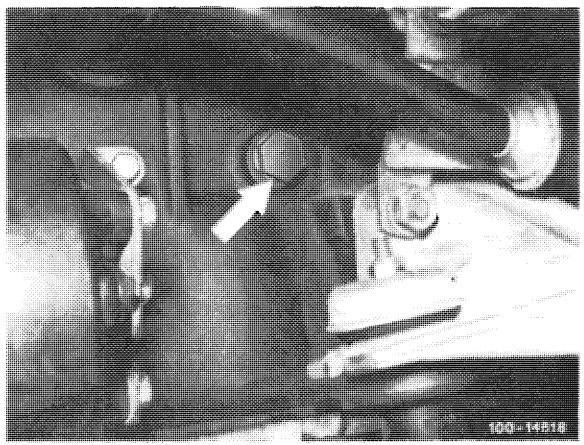
Engine hoist (Motordirigent) size 1.5	e.g. made by Bäcker, D-5630 Remscheid order no. 3178

Note

Remove and install engine with transmission.

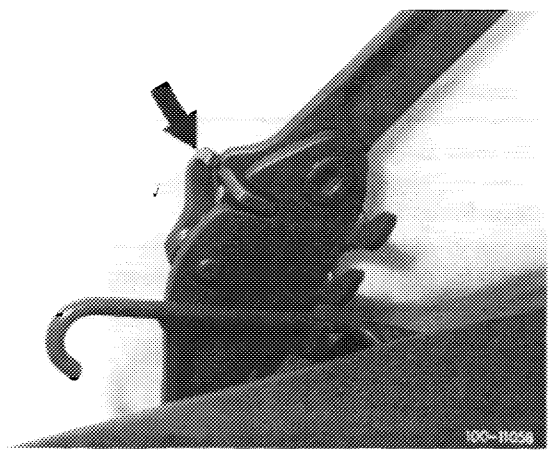
Removal

1 Completely drain coolant.



Drain plug on cylinder crankcase

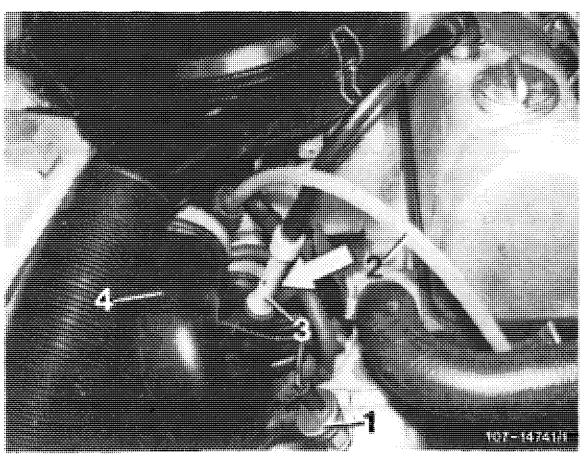
2 On model 116.120, remove engine hood.
On models 123 and 126.120 move engine hood into 90 ° position and engage detent lever (arrow).



3 Remove radiator and fan cover.

4 Remove viscofan coupling with fan.

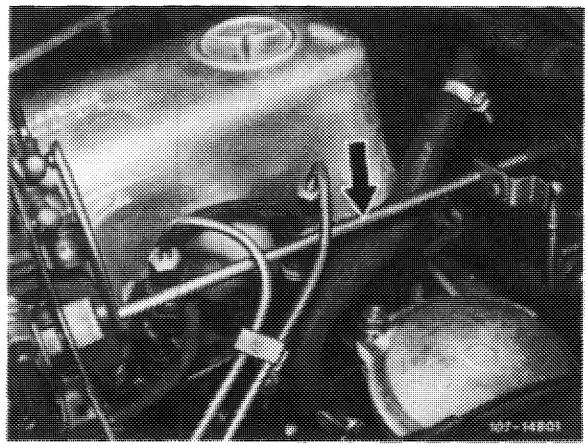
5 Remove air cleaner with intake line (4).
For this purpose, pull off engine vent line (3) and on model 116.120 with double diaphragm vacuum pump, pull off vacuum line (2) and cable on temperature switch (1).



1 Temperature switch 100 °C
2 Vacuum line
3 Vent line
4 Intake line

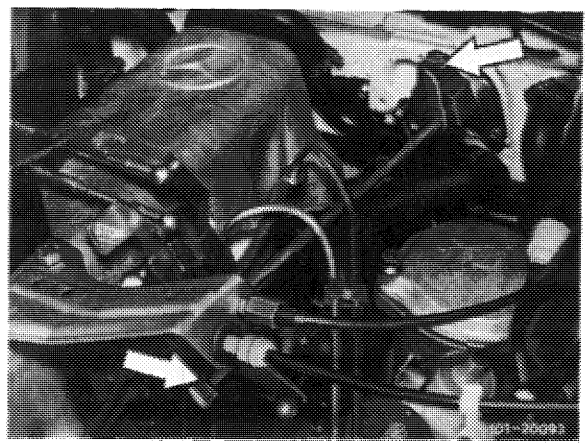
6 Disconnect regulating linkage.

7 Remove longitudinal regulating shaft while pulling out locking eye (arrow).



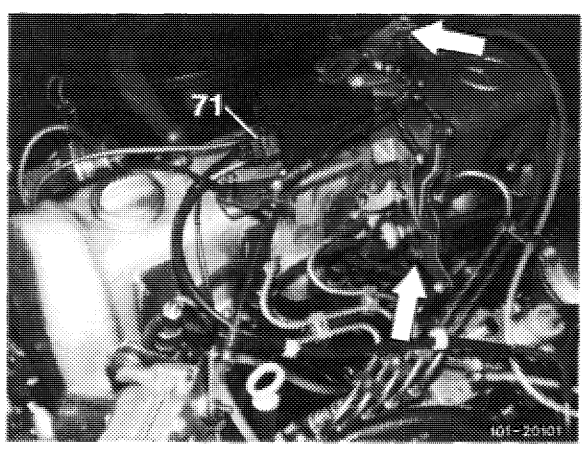
Model 116.120

On models 116.120 and 123, pull longitudinal regulating shaft out of rubber mount in forward direction and remove in rearward direction.



Model 123

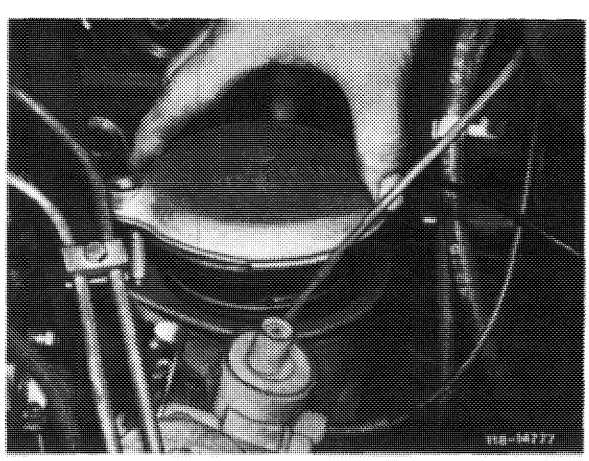
On model 126.120, pull longitudinal regulating shaft out of guide lever in rearward direction and remove in forward direction.



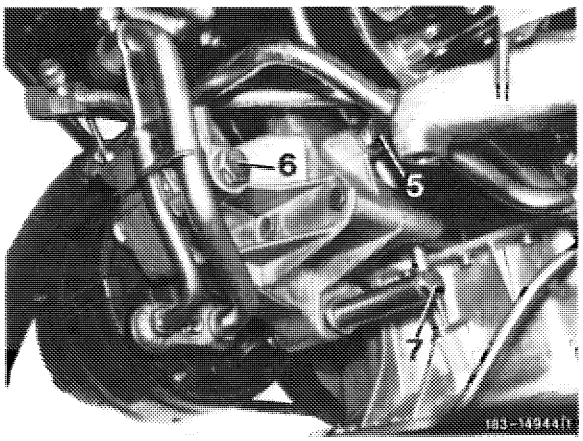
Model 126.120

8 Unscrew oil filter cover and pull up slightly.

9 Draw oil from reservoir of power-steering pump and disconnect hoses.



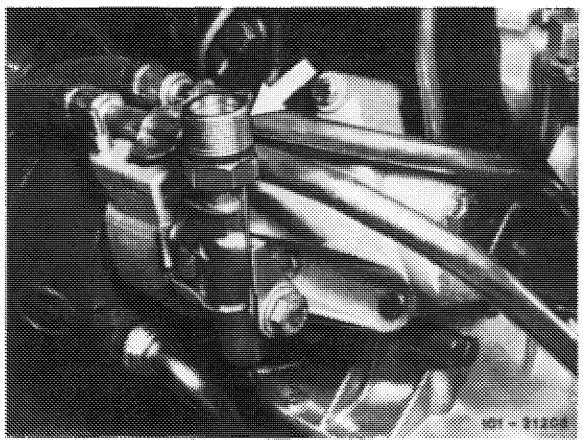
10 On model 116.120, remove refrigerant compressor with lines connected and put aside. For this purpose, unscrew 3 screws (5, 6 and 7).

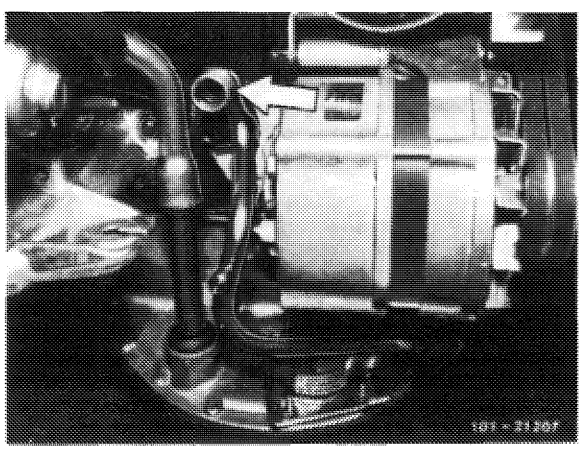


On models 123 and 126.120, drain air conditioning system and unscrew lines (arrows).

11 Disconnect heating water hoses.

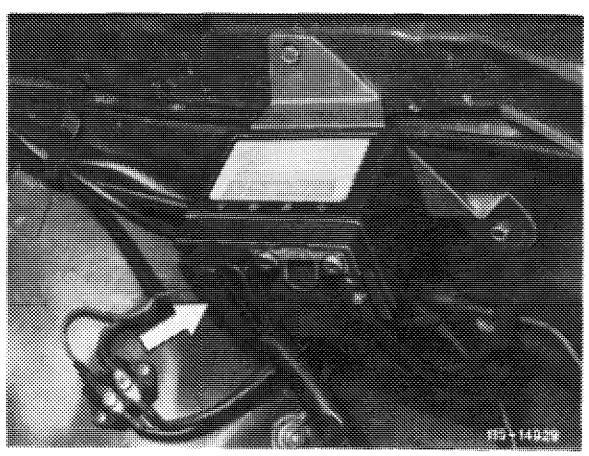
12 Disconnect fuel and vacuum lines.





13 Pull cable harness for pencil element glow plugs from preglow relay.

14 Disconnect coolant temperature indicator.

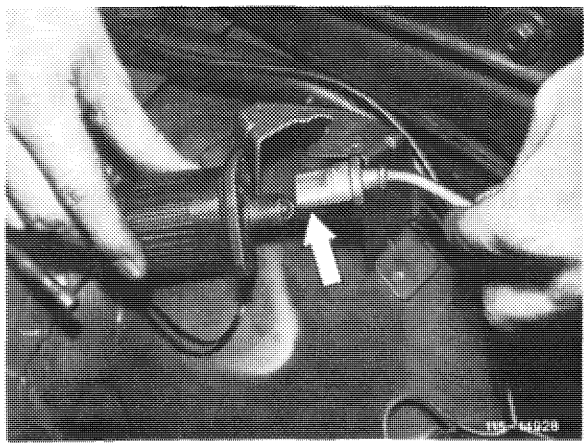


15 Disconnect TDC transmitter on test socket. Unscrew test socket for this purpose.

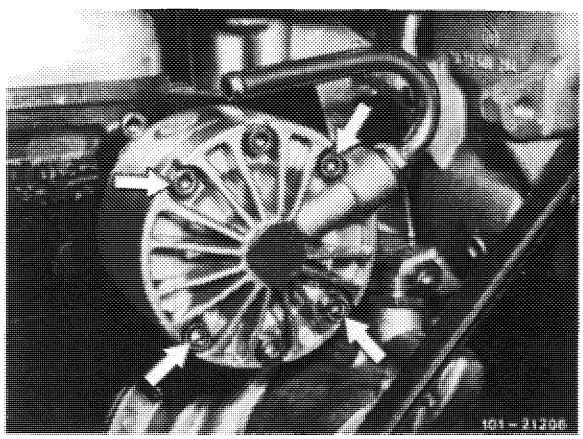
16 Pull cable plug from alternator.

17 Disconnect cable to starter on battery and on cable connector.

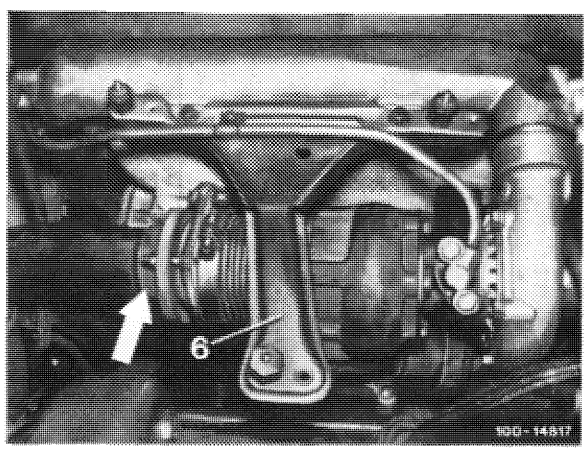
18 Unscrew oil pressure gauge on oil filter.



19 On model 123 with level control, unscrew hydraulic oil pump with lines connected and put aside. For this purpose, just loosen screws (arrows).



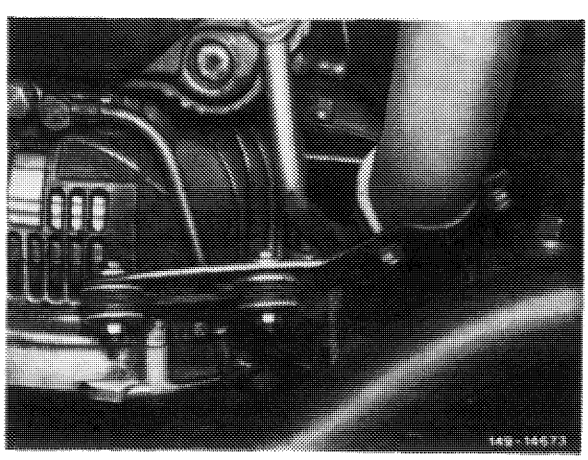
20 Unscrew exhaust on exhaust gas turbocharger.



21 Unscrew exhaust lateral support on transmission.

22 Disconnect ground connecting cable on body.

23 Unscrew bolts for engine carrier on engine mount from below.

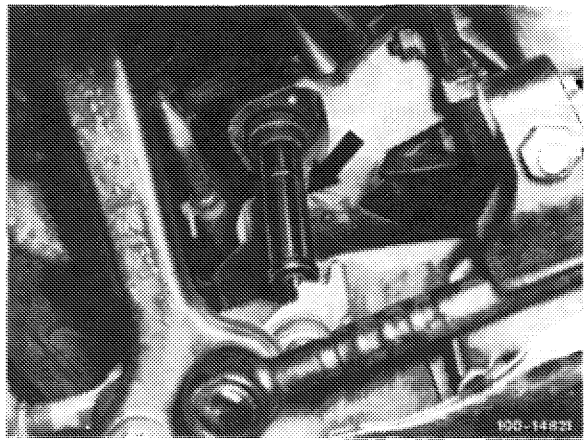


24 Unscrew both engine shock absorbers on frame cross member or console for lower contro arm.

25 Remove shielding plate in range of universal shaft intermediate bearing.

26 Loosen clamping nut of universal shaft.

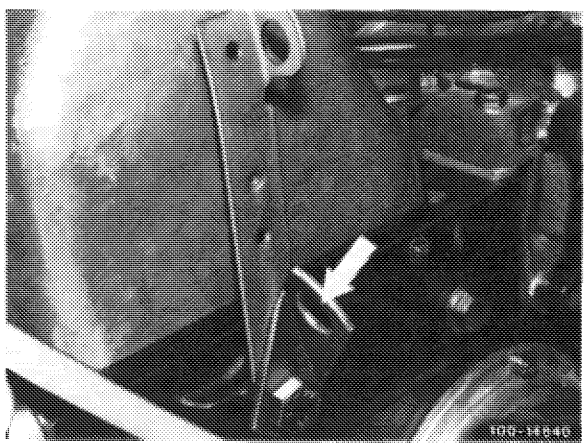
27 Unscrew universal shaft on transmission.



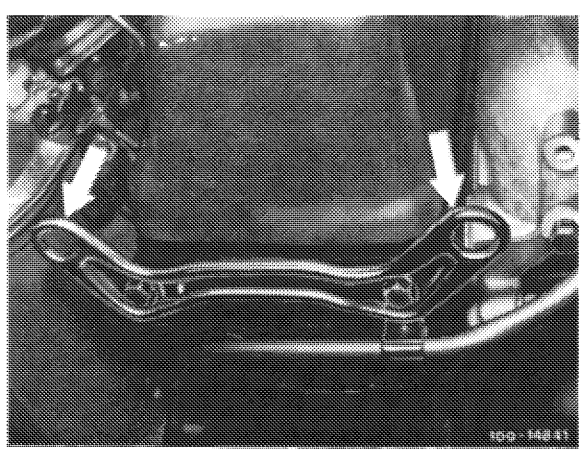
28 Loosen all connections and pull off selector rod on transmission.

29 Remove rear engine carrier with engine mount.

30 Attach ropes of engine hoist to suspension eyes.

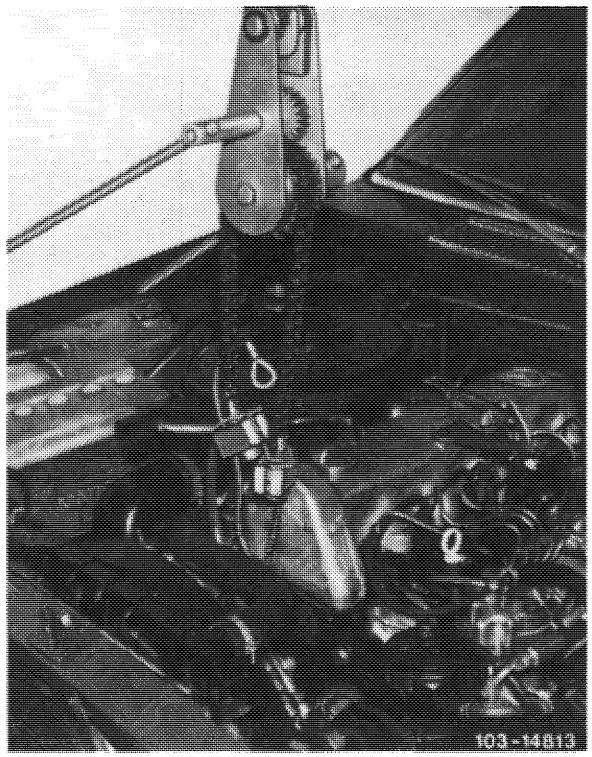


Suspension eye front



Suspension eyes rear

31 Lift out engine with transmission in a diagonal position of approx. 45°.



Installation

Attention!
When installing a new engine following previous bearing damage, flush oil cooler and oil hoses.

32 Check engine mounts, engine shock absorber, oil, coolant and fuel hoses and renew, if required.

33 Install engine and connect.

34 Screw-on universal shaft and adjust (41–020).

35 On model 116.120 unscrew intake scoop for inserting righthand holding spring (driving direction) on radiator.

36 Check all drain plugs for tight seat.

37 Add oil and coolant.

38 Check coolant for antifreeze (20–010).

39 Pressure-test cooling system with tester.

40 Clean air filter elements or renew.

41 Adjust idle speed (07.1–100).

42 On model 123, adjust engine stop (22–220).

A. Standard version, (USA) Federal up to 1980, (USA) California up to 1979, (J) starting 1981, (S) starting 1982

This engine has a closed, service-free crankcase breathing system.

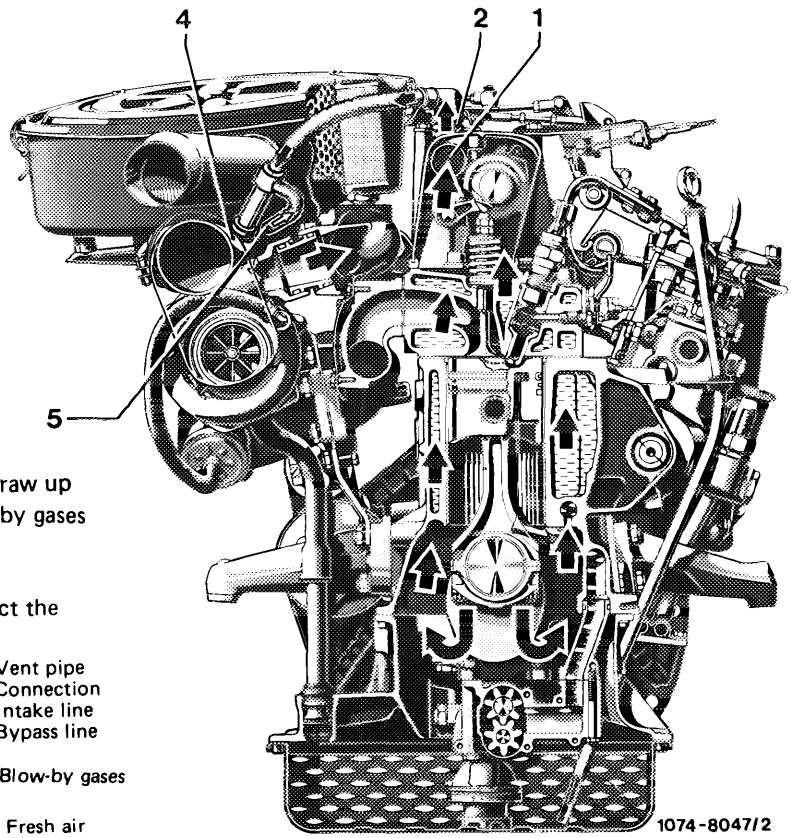
The engine blow-by gases and cylinder crankcase vapors flow through vent pipe (1) and connection (2) on cylinder head cover to intake line (4) in front of compressor.

From here, they are flowing into combustion chambers together with the intake air.

A bypass line (5) is located between clean air end of air filter and breather line.

By means of this line, the compressor can draw up clean air at high speeds in addition to blow-by gases and vapors.

The additional intake of clean air will restrict the vacuum in cylinder crankcase.



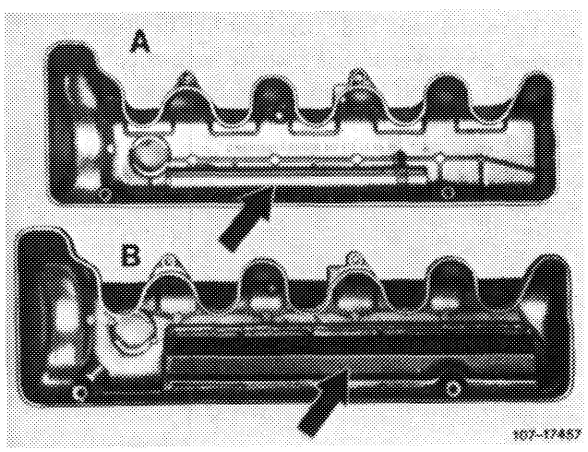
1 Vent pipe
2 Connection
4 Intake line
5 Bypass line

Blow-by gases

Fresh air

For (USA) Federal 1980 the vent pipe (A) screwed to inside of cylinder head cover has been replaced by a vent plate (B) which is riveted-on and sealed with silicone rubber. As a result, the volume of the oil separating space (damping chamber) has been enlarged.

This cylinder head cover is mounted as standard equipment and for (J) from start of series.



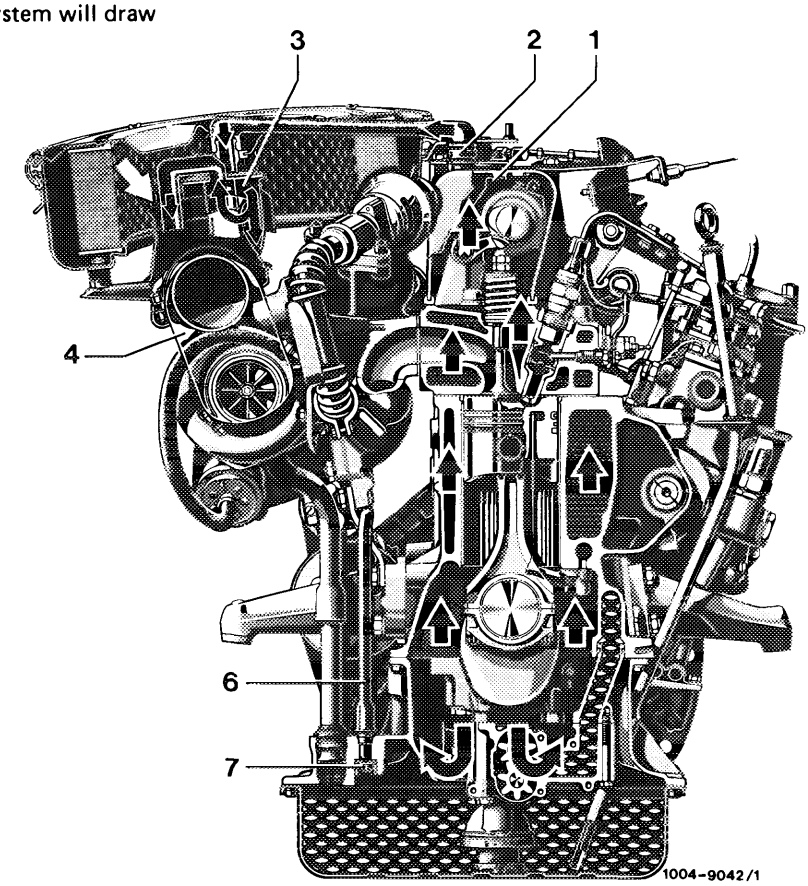
B. (USA) Federal starting 1981, (USA) California starting 1980

The complete engine breathing system requires no maintenance.

The engine blow-by gases and cylinder crankcase vapors are flowing via vent plate (1), which is revited to cylinder head cover, and connection (2) to cyclonic oil separator (3), which is located in air cleaner housing.

From there, they are flowing by way of the intake line (4) in front of compressor and together with the intake air into the combustion chambers.

The oil separated in cyclonic oil separator (3) flows through return line (6) and check valve (7) installed in oil pan upper half toward oil pan. The check valve prevents that the vacuum in intake system will draw oil vapors out of oil pan.

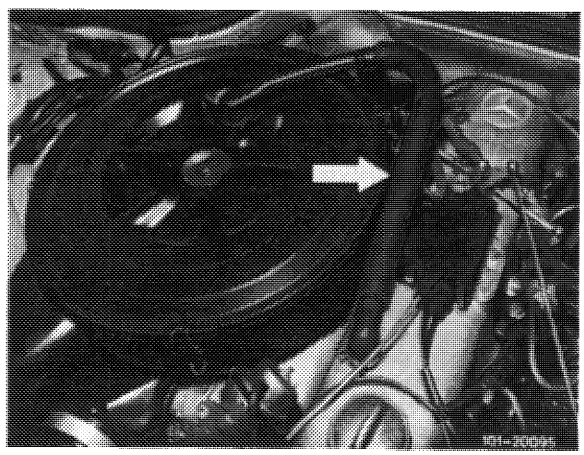


1 Vent plate
2 Connection
3 Oil separator
4 Intake line
6 Return line
7 Check valve

⇦ Fresh air

⬅ Blow-by gases

Starting model year 1981, the vent line between cylinder head cover and air cleaner has been changed from oval to round for better flow characteristics (arrow).



Coordination piston — cylinder

Version [1])	Group no.	Piston dia.	Cylinder dia.
Standard	0	90.845 - 90.855	90.898 - 90.908
	1	above 90.855 - 90.865	above 90.908 - 90.918
	2	above 90.865 - 90.875	above 90.918 - 90.928

Cylinder bore

Max. wear limit in forward or transverse direction		0.10
Permissible out-of-true and conicity	when new	0.014
	wear limit	0.05
Permissible deviation vertically in relation to crankshaft center line, with reference to cylinder height		0.05
Permissible roughness		0.002—0.004
Permissible waviness		50 % of roughness
Honing angle		25°
Chamfer of cylinder bores		refer to Fig.

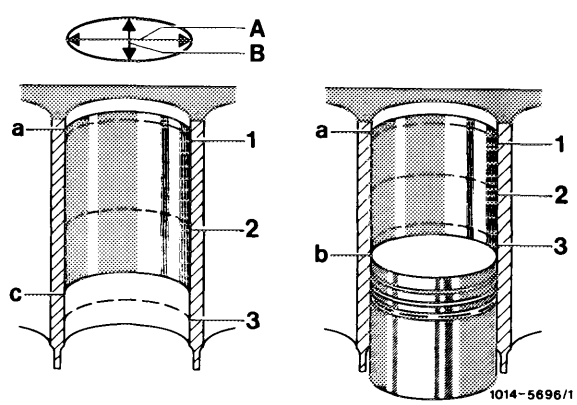
[1] These engines have no repair steps.

Note

In addition of a visual checkup, in particular in the event of complaints about "high oil consumption" measuring of cylinder bores is unavoidable.

For this purpose, measure the clean cylinder bores with internal measuring instrument at measuring points, 1, 2 and 3 in longitudinal direction A (piston pin center line) and in transverse direction B.

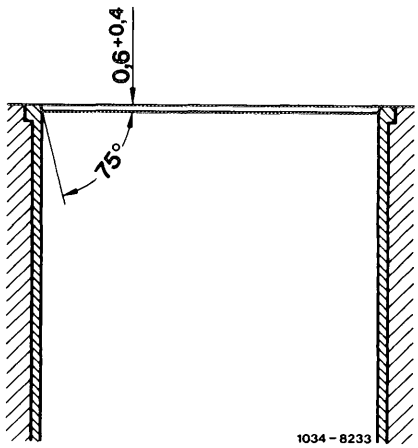
With piston installed, the measuring point 3 is barely above piston, at BDC.



a Upper reversing point of 1st piston ring
b BDC of piston
c Lower reversing point of oil scraper ring

Chamfer cylinder bores after boring.

For honing, the material allowance should not exceed 0.03 mm.



Coordination piston — cylinder

Version [1])	Group no.	Piston dia.	Cylinder dia.
Standard	0	90.845 - 90.855	90.898 - 90.908
	1	above 90.855 - 90.865	above 90.908 - 90.918
	2	above 90.865 - 90.875	above 90.918 - 90.928

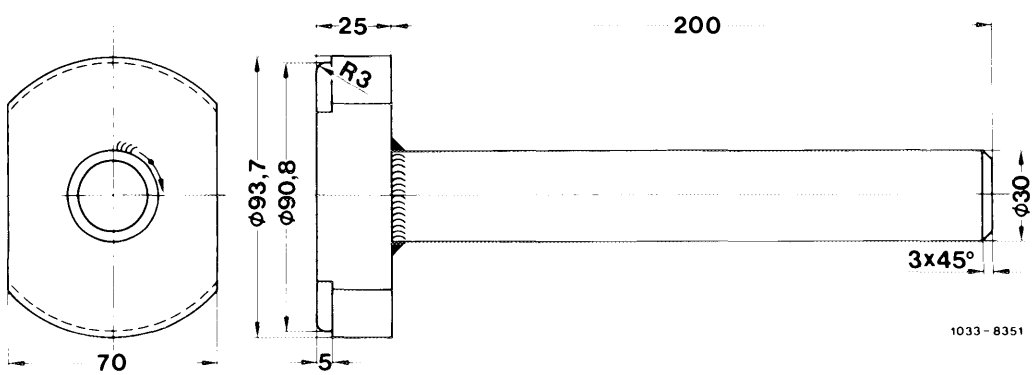
Cylinder crankcase

Basic bore in cylinder crankcase for cylinder liner	94.000 / 94.035
Permissible out-of-true of basic bore in cylinder crankcase	0.1
Roughness of cylinder crankcase parting surface	0.006—0.016

Cylinder bore

Permissible out-of-round and conicity of cylinder bore	0.014
Permissible roughness of cylinder bore	0.002—0.004
Permissible waviness of cylinder bore	50 % of roughness
Honing angle	25°
Chamfer of cylinder bores	refer to Fig.

Self-made tool



Mandrel for pressing or knocking out cylinder liners

Note

Always install approved cylinder liners only (refer to spare parts data).

Owing to different manufacturers, the cylinder liners are identified with notches at lower edge.

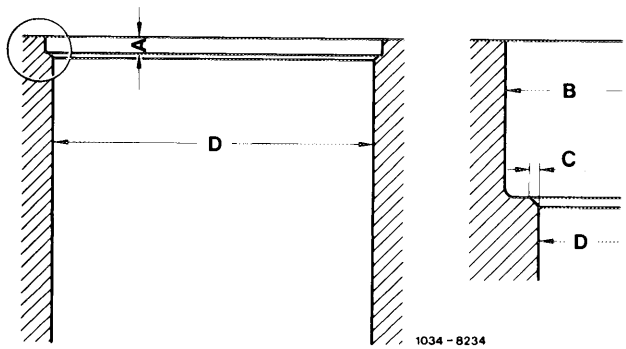
1 notch = Teves; 2 notches = Pleuco;
3 notches = Wizemann; 4 notches = Brico

Renewal

1 Press out cylinder liners with self-made mandrel and a press or knock out with a hammer.

2 Thoroughly clean basic bore.

A = 4.3–4.6 mm
B = 96.02–96.08 mm
C = 0.25–0.35 mm
D = 94.000–94.035 mm



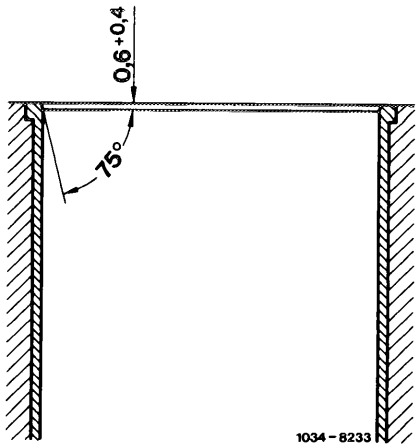
3 Measure basic bore (D) in cylinder crankcase.

If the out-of-true condition exceeds 0.1 mm, do not use cylinder crankcase any longer.

4 Position new cylinder liners. Place steel plate of pertinent size on liner flange and press-in liner with a press or knock in with a hammer.

After pressing or knocking in cylinder liner, leave for another approx. 7 seconds under press (setting pressure) or add a few setting blows with hammer.

5 Mill or grind off projecting liner flange. Remove as little as possible from cylinder crankcase parting surface. Guide milling cutter or grinding wheel centrally over cylinder bores.



6 Enlarge cylinder liner bores in two steps. For honing, leave an allowance of 0.03 mm in bores.

7 Chamfer cylinder liners.

8 Hone cylinder bores.

9 Measure cylinder bores and select pertinent pistons (02–316).

Data

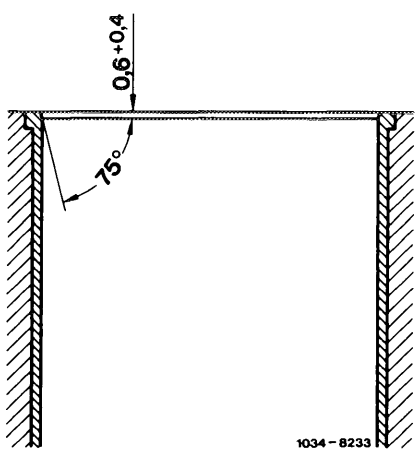
Height of cylinder crankcase when new		242.9—242.8
Minimum height following required removal of material		242.5
Permissible unevenness of parting surface	in longitudinal direction	0.10
	in transverse direction	0.05
Permissible roughness of upper parting surface		0.006—0.016
Permissible deviation in parallel of upper parting surface in relation to longitudinal direction		0.1
Pressure-test with air under water in bar gauge pressure		2.0
Chamfer of cylinder bores		refer to note

Note

Prior to facing, check piston standout. Do not exceed piston standout of 0.9 mm (03—316).

Chamfer cylinder bores after facing.

If the cylinder crankcase parting surface has been reconditioned, reset the timing (05—215).

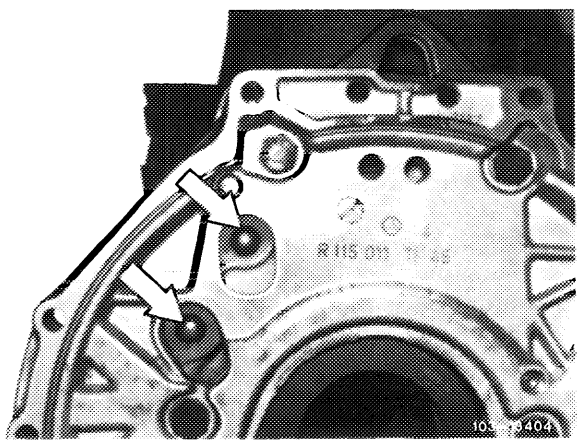


Self-made tool

Mandrel for knocking-in steel ball	refer to Fig. item 9

Note

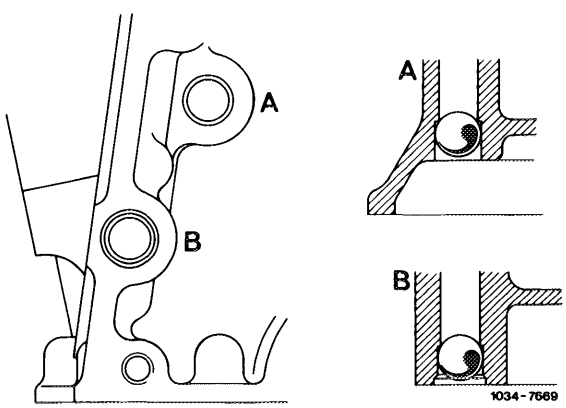
The main oil ducts in cylinder crankcase are closed at transmission end by means of a steel ball (17 mm dia.) (arrows).



During engine repairs, the steel balls must be knocked out to clean main oil ducts.

Undamaged steel balls can be used several times without refinishing ball seat.

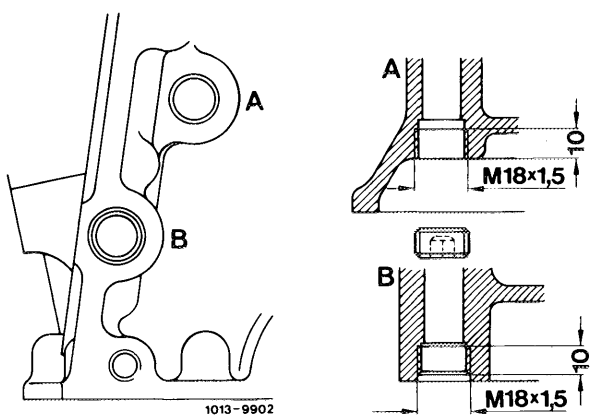
Replace damaged steel balls.



In the event of leaks, reset steel balls with knocking-in mandrel approx. 1 mm (dimension is indicated on knocking-in mandrel).

If the leaks are then not yet eliminated, knock-out the respective steel ball and replace by closing plug M 18 x 1.5, part no. 000 906 018 000.

For this purpose, cut thread M 18 x 1.5 to a depth of 10 mm as shown on drawing.



Thoroughly remove chips from oil duct.

Coat closing plug M 18 x 1.5 with sealing glue, part no. 002 989 94 71 and screw in.

Upper main oil duct

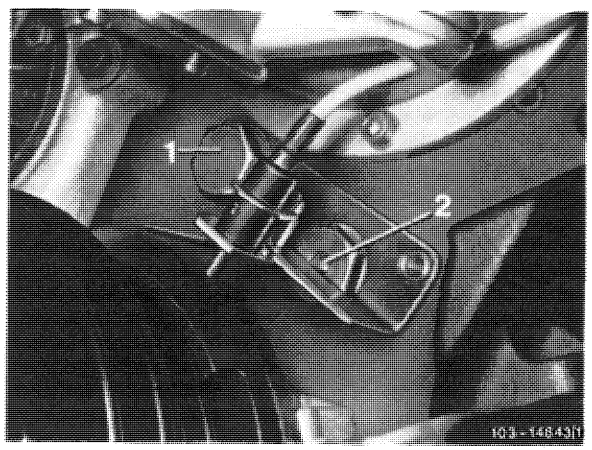
Knocking-out

1 Remove transmission and flywheel (03–410).

2 Remove radiator (20–420).

3 Unscrew closing plug (1) and adjacent hex. nut.

4 Knock out steel ball from the front by means of a round steel bolt (13 mm dia.) approx. 850 mm long.



Lower main oil duct

Knocking-out

1 Remove transmission and flywheel (03–410).

2 Remove radiator (20–420).

3 Remove pulley, vibration damper and balancing disc (03–340).

4 Unscrew closing plugs (1 and 2).

5 Remove inner slide rail in cylinder crankcase (05–340).

6 Tilt engine slightly toward the rear.

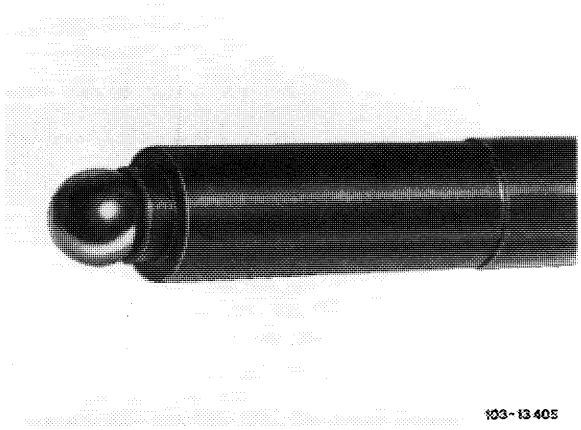
7 Knock out steel ball from the front by means of a round steel bolt (13 mm dia.) approx. 850 mm long.

Upper and lower main oil duct

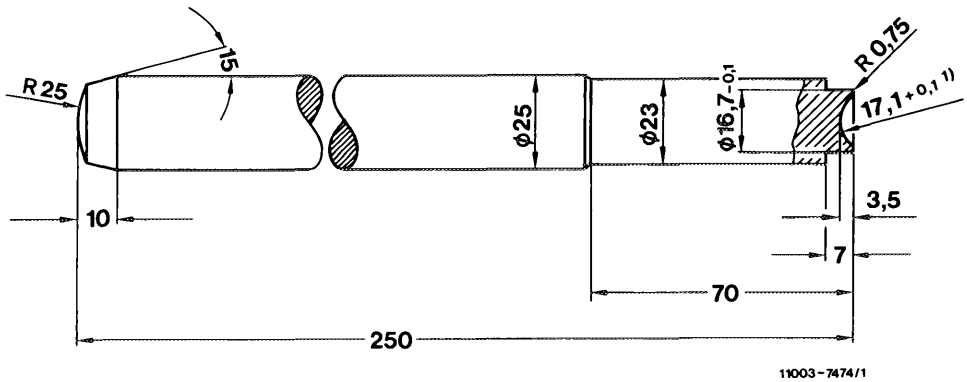
Knocking-in

8 Thoroughly clean bore in pressing-in range of steel ball.

9 Coat spherical cup on self-made knocking-in mandrel with grease and place steel ball into cup.



103-13405



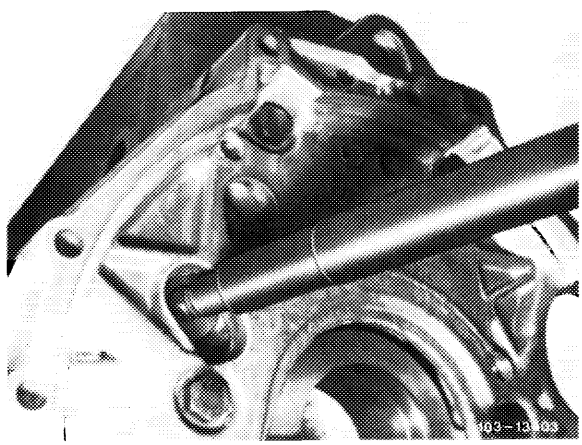
11003-7474/1

Knocking-in mandrel
Material: C 45
[1]) 17.1 + 0.1 = ball dia.

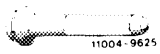
10 Position steel ball by means of knocking-in mandrel and knock in up to stop on mandrel.

11 Mount all removed parts.

12 Run engine warm and check for leaks.



Special tool

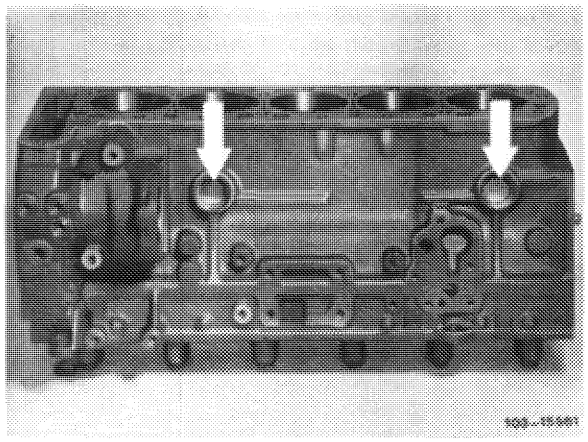
Mandrel for knocking-in core hole closing covers	 11004-9625	102 589 00 15 00

Note

Core holes in cylinder crankcase are closed with sheet metal covers (34 mm dia.).

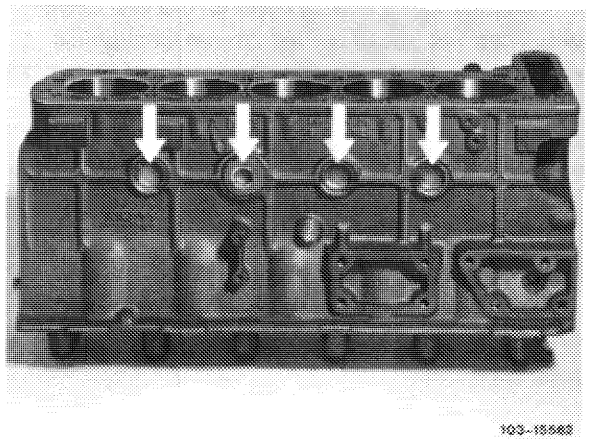
Replace leaking closing covers on principle.

At the right (driving direction) the closing plug (M 38 x 1.5) remains in place.

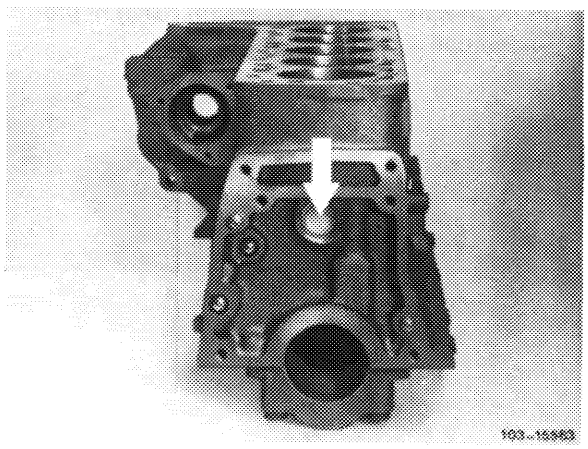


Driving direction left

This core hole can be used to insert cooling water preheater.



Driving direction right

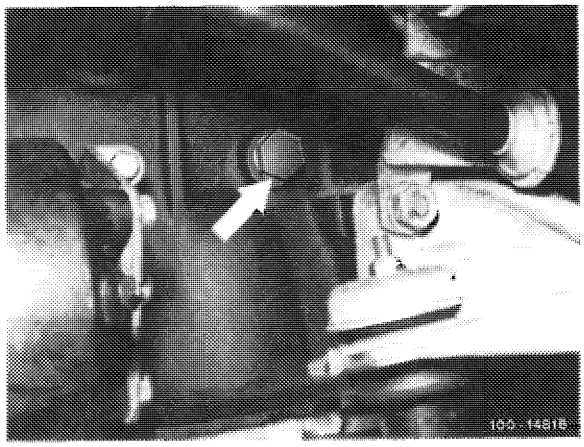


Transmission end

Replacement

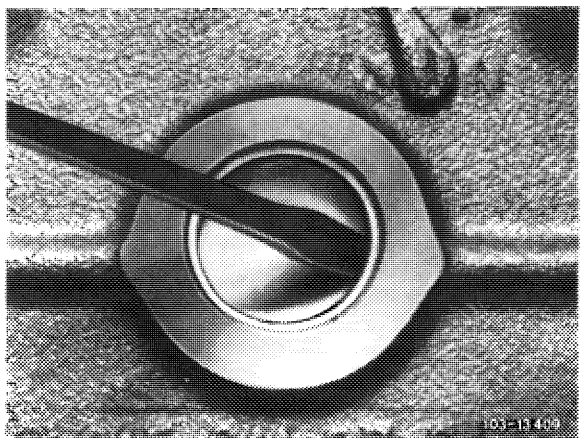
1 Completely drain coolant.

2 Remove components which obstruct access (e.g. transmission, intermediate flange, injection pump etc.).

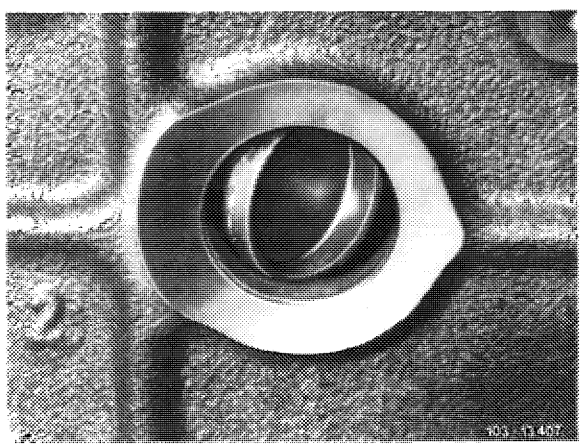


Drain plug on cylinder crankcase

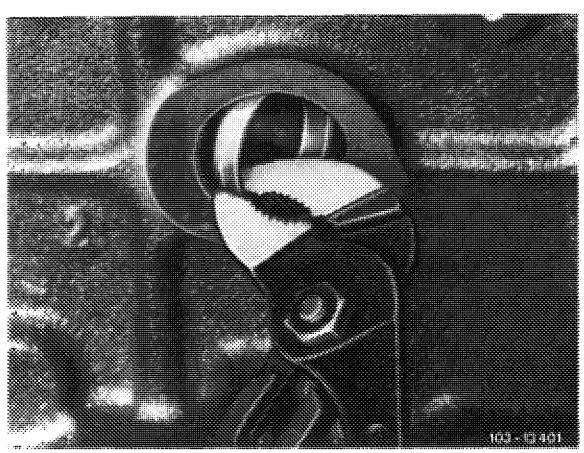
3 Position a chisel with a narrow blade or a screwdriver into deep drawn edge of closing cover.



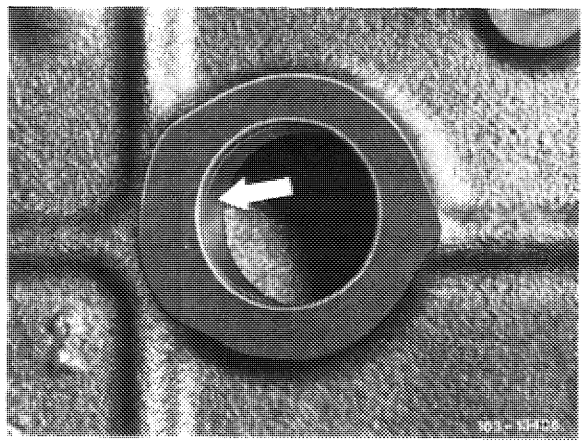
4 Carefully knock closing cover on one side down until cover has turned around its own longitudinal axis (approx. 90°).



5 Position water pump pliers against flange of projecting section and pull out closing cover.

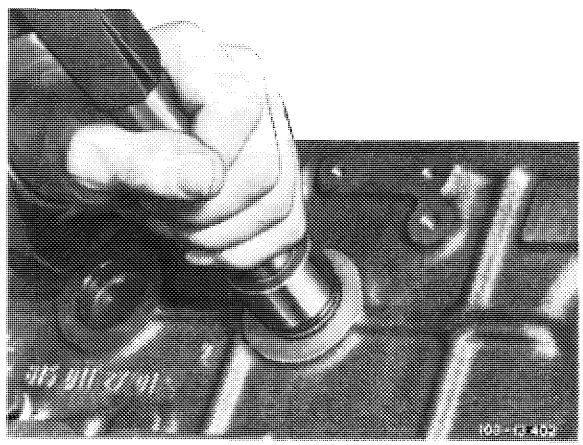


6 Thoroughly clean core hole from residue. Sealing surface should be free of grease (arrow).



7 Coat core hole with sealing glue, part no. 002 989 94 71.

8 Knock-in new closing cover by means of mandrel.



9 Attach removed components.

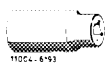
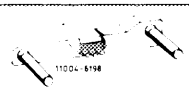
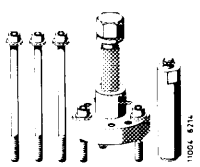
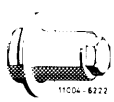
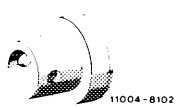
10 Add coolant.

Note: The sealing glue should cure for approx. 45 minutes before adding coolant.

11 Run engine warm and check for leaks.

Tightening torques		Nm
Screw M 18 x 1.5 x 45 on crankshaft		270–330
Screws M 8 x 30		35
Drain plug radiator	Model 116.120	6–10
	Model 123, 126.120	1.5–2

Special tools

Socket 27 mm, 1/2" square		001 589 65 09 00
Torque wrench 150–500 Nm, 3/4" square		001 589 31 21 00
Detent		110 589 00 40 00
Puller for balancing disc		116 589 10 33 00
Installation tool for radial sealing ring		130 589 00 61 00
Sleeve for centering front cover and oil pan		617 589 00 14 00

Conventional tool

Connection 3/4" square socket to 1/2" square head	e.g. made by Hazet, D-5630 Remscheid order no. 1058 R-1

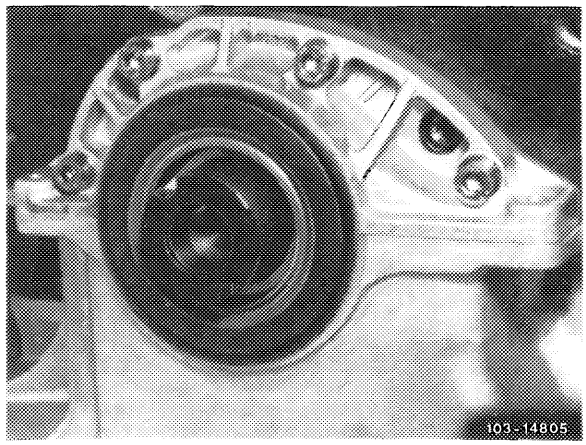
Removal

1 Remove pulley, vibration damper and balancing disc (03–340).

2 Remove front crankshaft radial sealing ring (03–324).

3 Unscrew cover and remove.

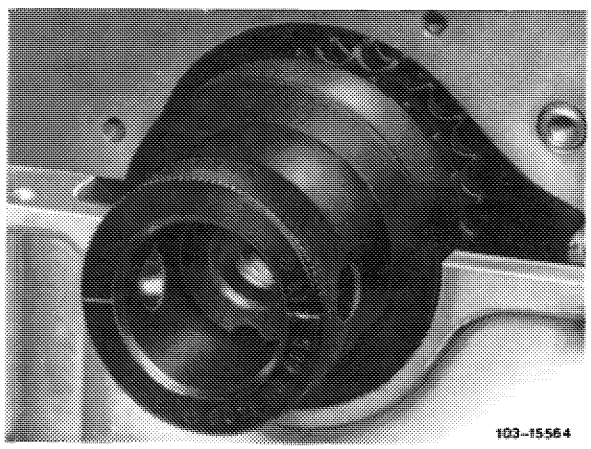
4 Thoroughly clean sealing surfaces of cover and on oil pan top.



Installation

5 Slip sleeve for centering cover on crankshaft journal.

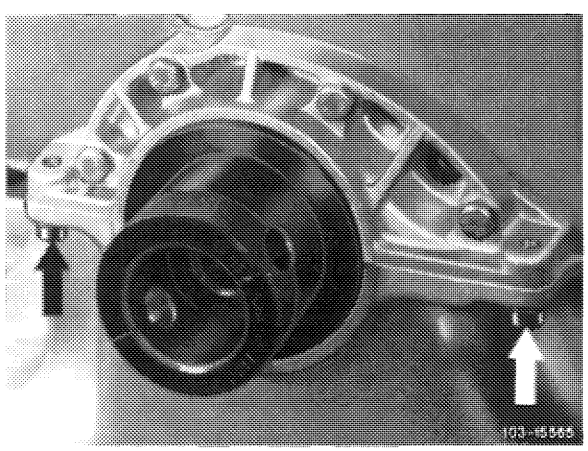
Attention!
If except for the cover, the complete oil pan has also been installed, reinstall oil pan again first. For this purpose, place sleeve on crankshaft journal.



6 Coat all sealing surfaces with sealing compound, part no. 001 989 46 20.

7 Position cover and screw down.

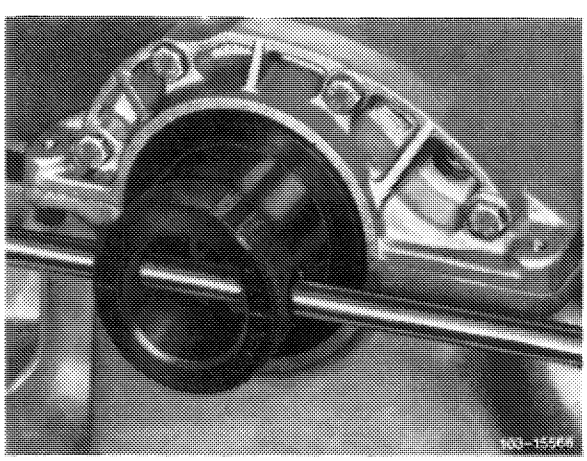
Attention!
Tighten screws in oil pan first (arrows).



8 Remove sleeve. If sleeve cannot be removed, insert mandrel into cross hole and turn out.

9 Install new crankshaft radial sealing ring (03–324).

10 Install pulley, vibration damper and balancing disc (03–340).

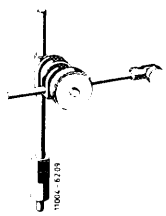
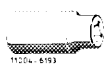


Data

Vertical runout of intermediate flange		max. 0.10

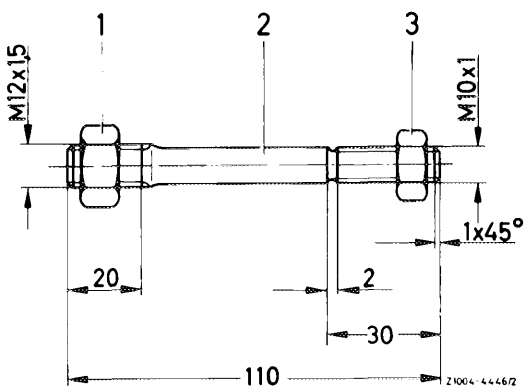
Tightening torques		Nm
Fastening screws for intermediate flange		50
Necked-down screw for driven plate and flywheel	initial torque	40
	angle of rotation torque	90–100°

Special tools

Dial gauge holder (2 each required)		363 589 02 21 00
Socket 27 mm, 1/2" square for rotating engine		001 589 65 09 00

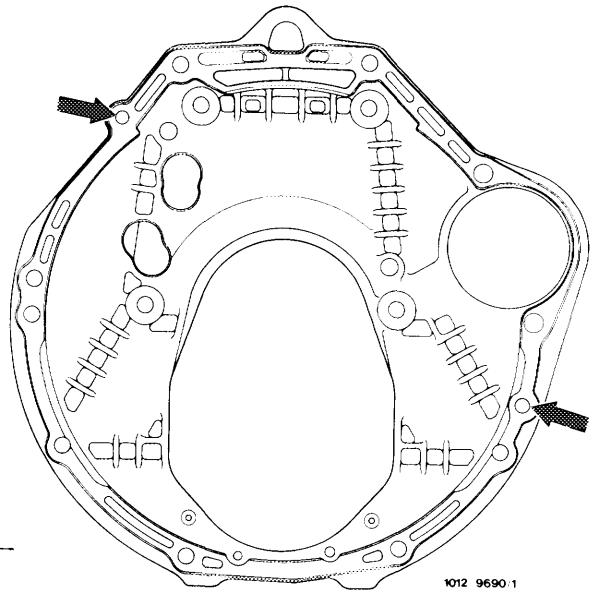
Self-made tool

Threaded bolt



The intermediate flange is provided with two additional bores for centering the fitted pins of automatic transmission 722.303 (W 4 A 040).

This intermediate flange is also installed on engines with automatic transmission 722.120 (W 4 B 025). Part no. 615 011 02 45.



Start of series: February 1980

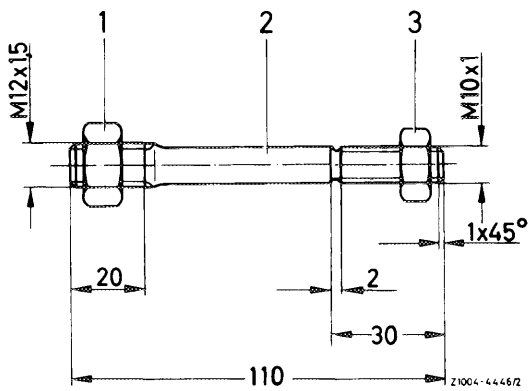
Model	Engine	Engine end no.	Chassis end no.
116.120	617.950	022432	022082
123	617.952	start of series	
126.120	617.951	start of series	

Installation and centering

1 Insert intermediate flange into fitted pins on cylinder crankcase.

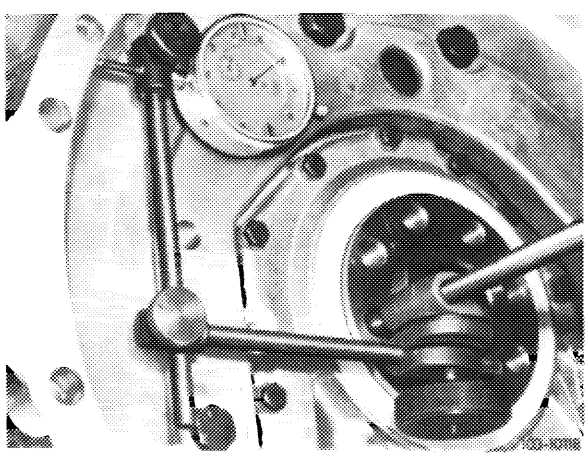
2 Slightly tighten the four fastening screws.

3 Screw threaded bolt (self-made) into crankshaft and counterlock with hex. nut.



4 Attach dial gauge holder with dial gauge to threaded bolt.

5 Position feeler pin against OD of round center.

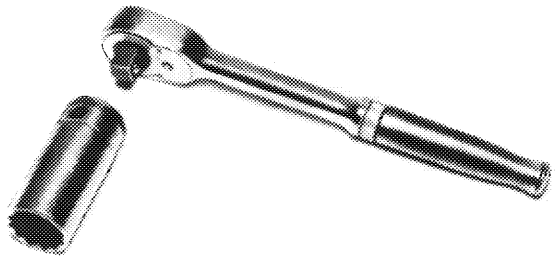


Shown on engine 116

6 Turn crankshaft with tool combination and measure vertical runout. Vertical runout should not exceed max. 0.10 mm.

Note: When turning crankshaft, make sure that feeler pin of dial gauge is not getting stuck.

7 Correct vertical runout by means of light blows against intermediate flange.



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8 Tighten fastening screws.

Note: If the vertical runout exceeds 0.10 mm, remove intermediate flange.

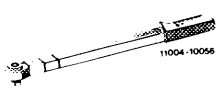
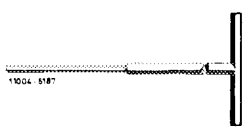
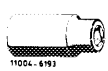
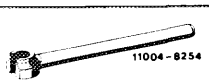
9 Drill both fitted bores in intermediate flange to 12.1 mm.

10 Repeat item 1–8.

Oil capacity in liters	
Oil pan	6.0
Oil filter	1.5
Air-oil cooler	approx. 0.7

Tightening torques	Nm
Oil drain plug to oil pan	40
Oil pan upper half to cylinder crankcase	10
Oil pan lower half to upper half	
Engine carrier to engine mount front	70

Special tools

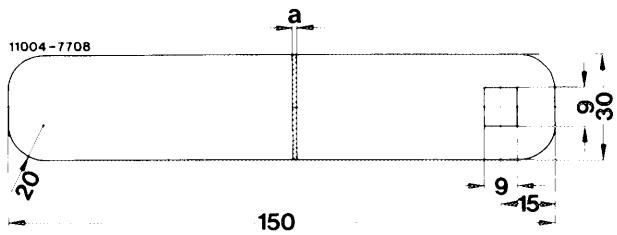
Torque wrench with plug-in ratchet, 1/2" square, 25–130 Nm		001 589 66 21 00
Torque wrench with plug-in ratchet, 1/2" square, 40–200 Nm		001 589 67 21 00
Screwdriver (Allen wrench) with tommy handle for hex. socket screws 5 mm, 300 mm long		116 589 02 07 00
Knock-out mandrel		110 589 02 15 00
Socket 27 mm, 1/2" square for rotating engine		001 589 65 09 00
Knocking-in tool for oil dipstick guide tube		117 589 00 31 00

Conventional tool

Engine hoist (Motordirigent) size 1.5	e.g. made by Bäcker, D-5630 Remscheid order no. 3178

Self-made tool

Gauge for cutting off rear radial sealing ring



Dimension a = 1.0 mm

Note

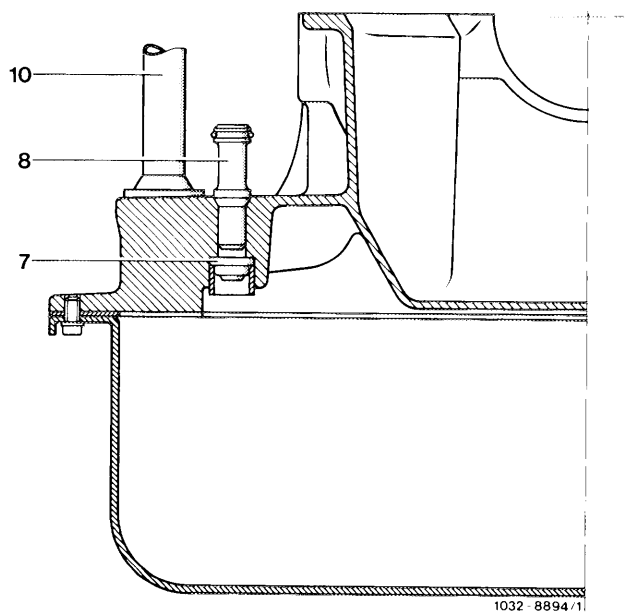
There are four oil pan upper half versions.

a) Oil pan upper half with a connection for oil return line (10) from exhaust gas turbocharger.

Installed on engines 617.950 (model 116.120) without EGR (USA) and 617.952 (model 123) with automatic transmission 722.120 (W4B025).

b) Oil pan upper half with two connections for oil return line (10) from exhaust gas turbocharger and from cyclonic oil separator (8) in air cleaner.

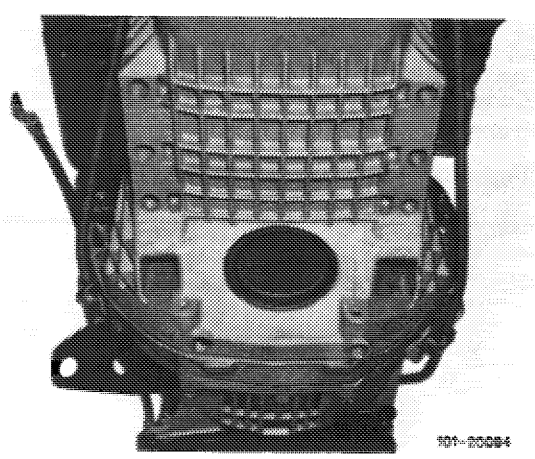
Installed in engine 617.950 (model 116.120) with EGR (USA).



7 Check valve
8 Oil return line from cyclonic oil separator
10 Oil return line from exhaust gas turbocharger

c) Oil pan upper half with integrated supporting shell and a connection for oil return line (10) from exhaust gas turbocharger.

Installed on engine 617.952 (model 123) with automat transmission 722.303 (W4A040).



d) Oil pan upper half with integrated supporting shell and two connections for oil return line (10) from exhaust gas turbocharger and from cyclonic oil separator (8) in air cleaner.

Installed on engine 617.951 (model 126.120) and 617.952 (model 123) with automatic transmission 722.303 (W4A040).

Spare part oil pan upper halves for engines with EGR (USA) are provided with check valve (7) and oil return line (8).

They can not be installed on engines without EGR.

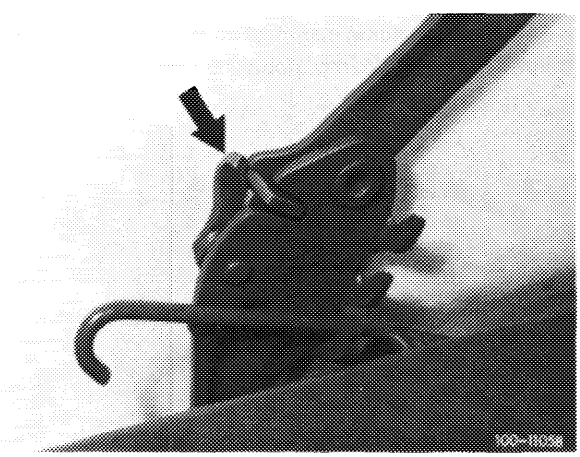
On model 126.120 with engine, remove and install (01–030).

Removal

1 Drain engine oil.

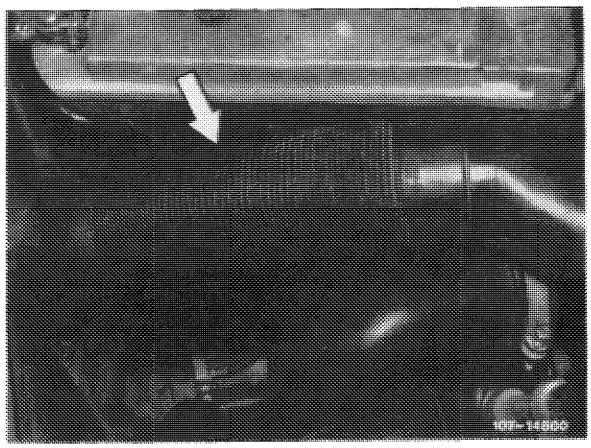
2 On model 116.120, remove engine hood.

On model 123, move engine hood into 90 ° position and engage detent lever (arrow).

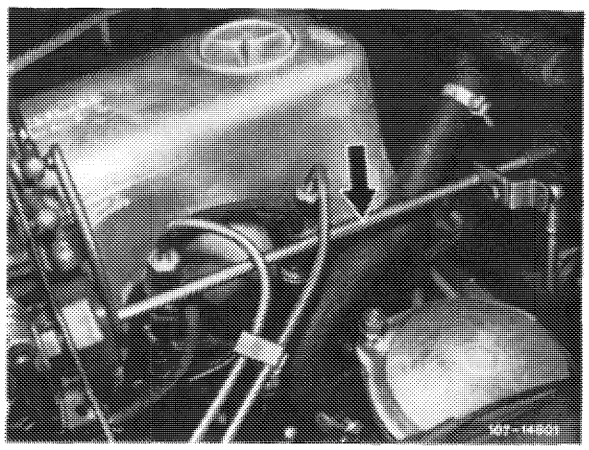


3 Remove intermediate member on air cleaner (arrow).

4 Unscrew fan cover and place over fan; loosen radiator.

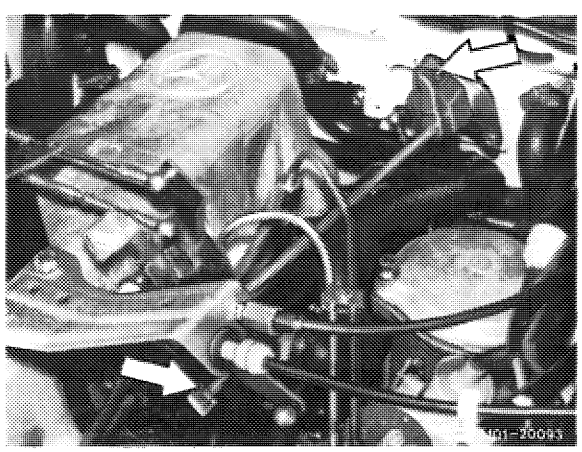


5 Remove longitudinal regulating shaft. For this purpose, pull out locking eye (arrow).



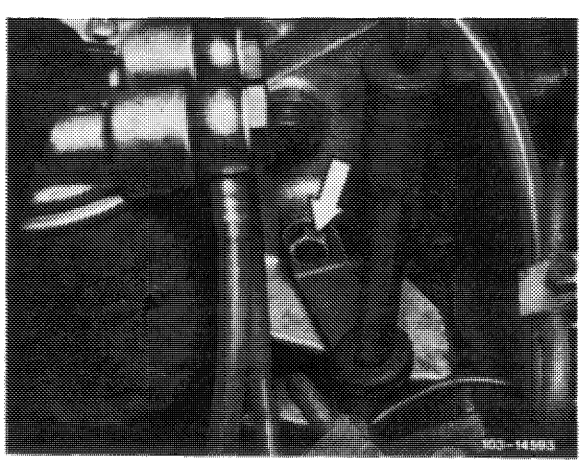
Model 116.120

On models 116.120 and 123, pull longitudinal regulating shaft out of rubber mount in forward direction and remove in rearward direction.



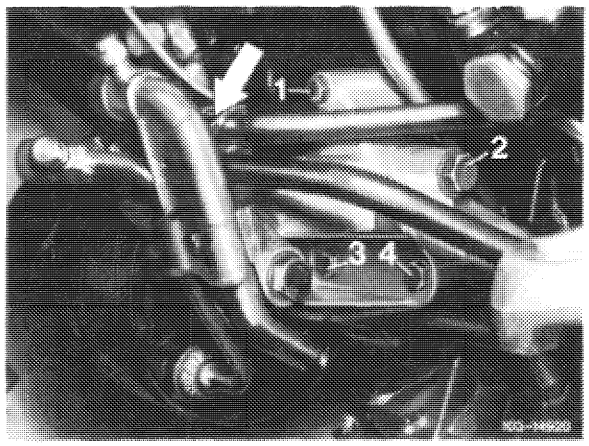
Model 123

6 Unscrew holding clamp of oil dipstick guide tube on power steering pump mounting bracket.

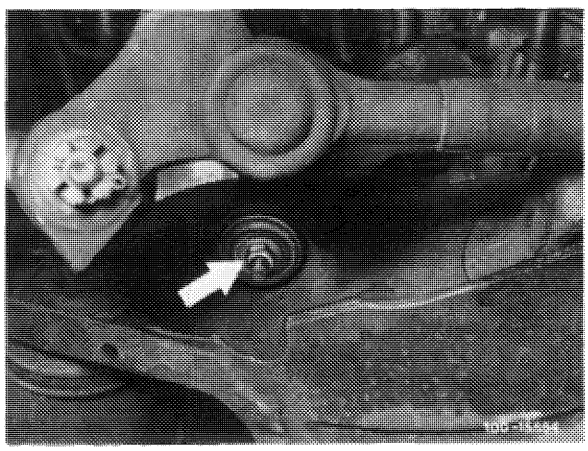


7 Slacken V-belt of refrigerant compressor and remove.

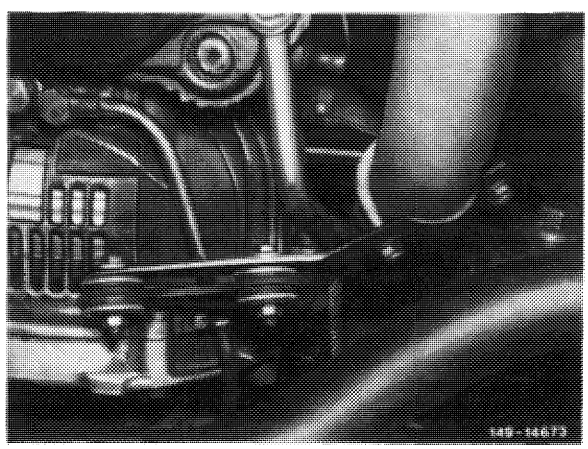
Unscrew refrigerant compressor with carrier. For this purpose, unscrew screws (1—4) and loosen clamp (arrow) of air-oil cooler lines.



8 Unscrew both engine shock-absorbers on frame cross member or console for lower control arm.

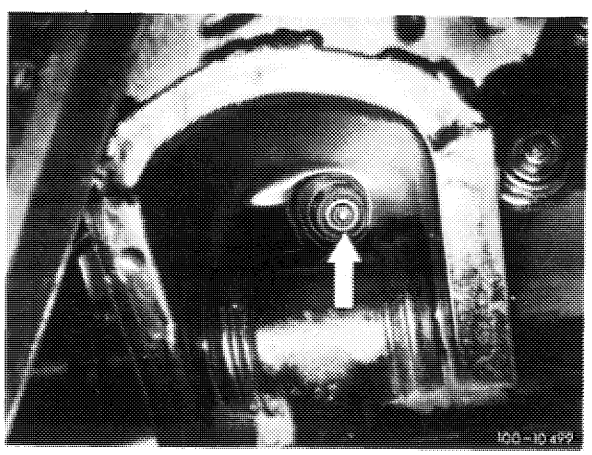


9 Loosen exhaust lateral support on transmission.



10 Unscrew fastening screws of engine carrier on engine mount from below.

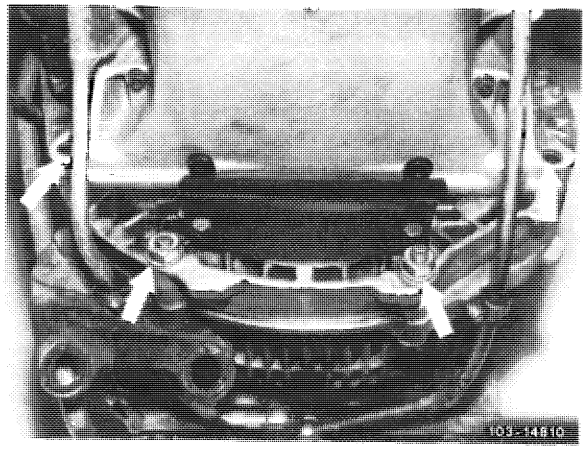
11 Unscrew oil cooler lines for automatic transmission, on transmission, on intermediate flange and on oil pan upper half.



12 Unscrew the 4 lower screws on intermediate flange (arrows).

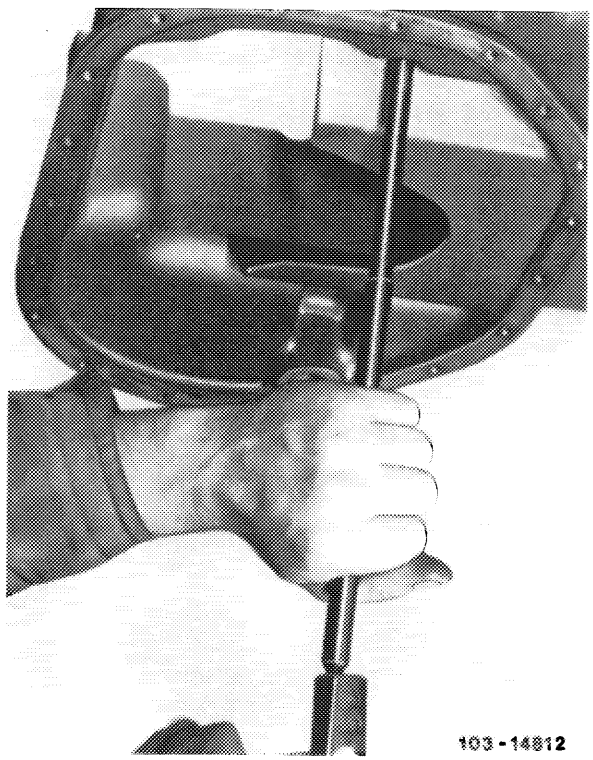
13 Unscrew cover plate on intermediate flange.

14 Unscrew oil pan lower half and remove.



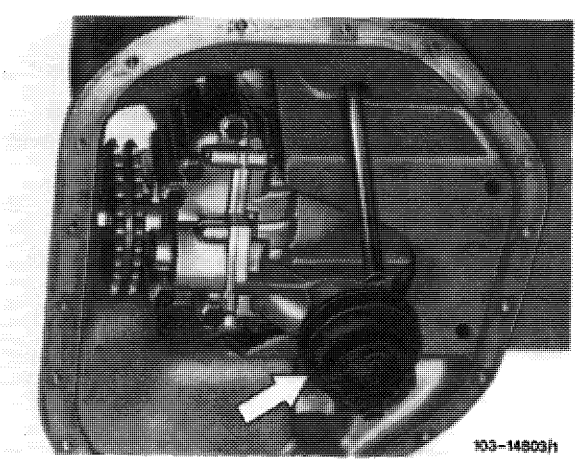
15 Knock-out oil dipstick guide tube as far as possible by means of knocking-out mandrel 9 mm dia. for valve guides.

Attention!
The oil dipstick guide tube cannot yet be pulled out.

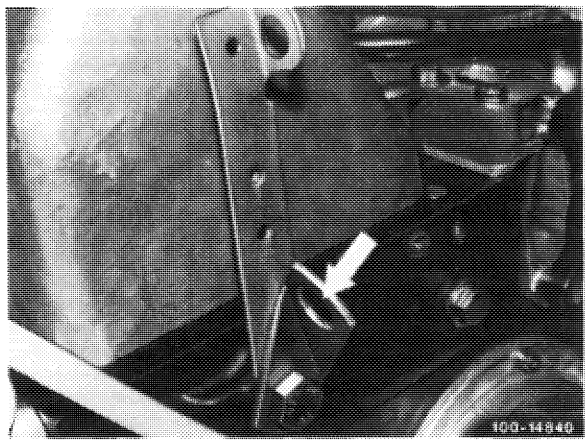


16 Pull off adaptor with strainer on oil pump (arrow).

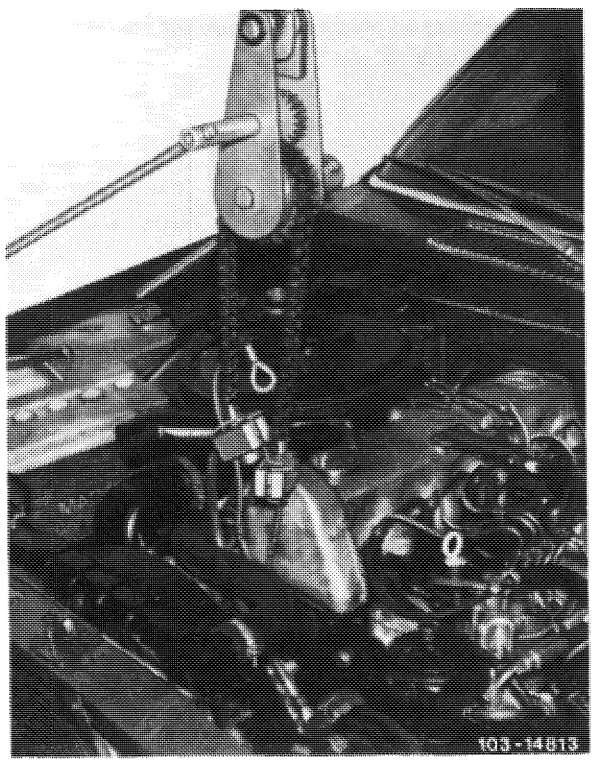
17 Unscrew oil pan upper half.



18 Attach rope of engine hoist (Motordirigent) to suspension eye at front on cylinder head (arrow).



19 Lift engine as far as possible by means of engine hoist and a crane. For this purpose, on model 123, open rear clamp on air cleaner so that it will not abut against battery while lifting.

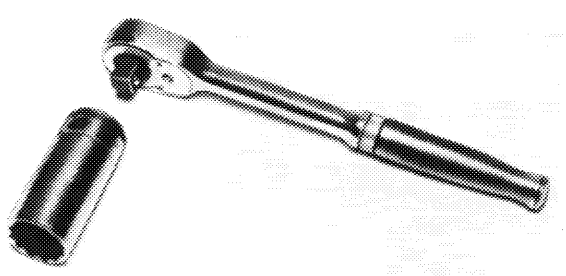


20 Pull out oil dipstick guide tube.

21 Pull oil pan in downward direction and remove in forward direction.

To remove oil pan, turn crankshaft with tool combination until oil pan upper half can be pulled past connecting rod or crankshaft webs.

22 Thoroughly clean parting surface on cylinder crankcase, on oil pan upper and lower half.



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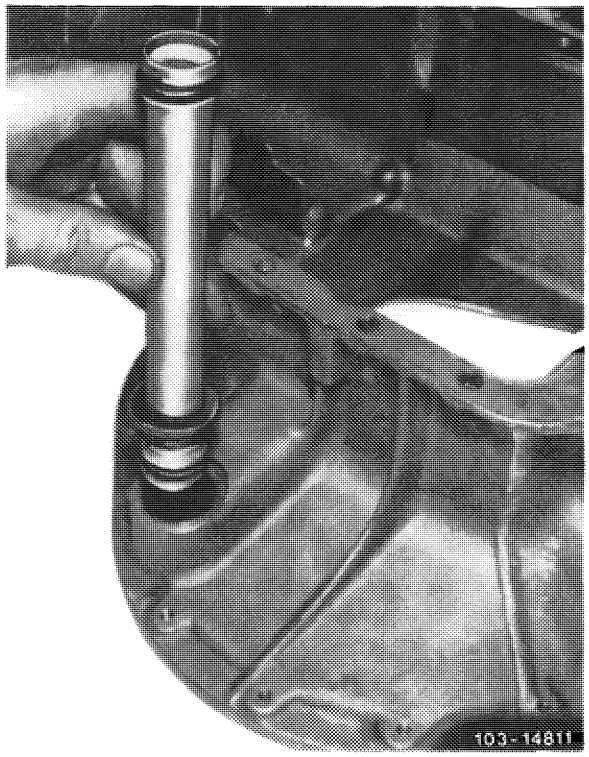
Installation

Note: If a new oil pan upper half is installed, insert oil return pipe and contoured gasket first.

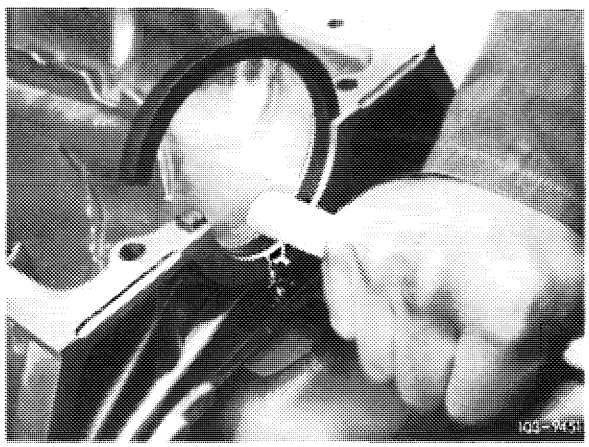
Renew damaged or porous contour gaskets and O-rings.



When removing oil return pipe, push out contoured sealing ring from oil pan first.

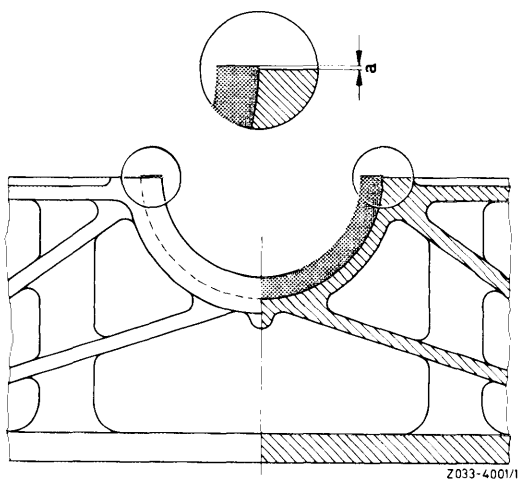
23 Renew rear radial sealing ring in oil pan according to condition.

Insert new radial sealing ring into groove and work in with a lubricated hammer handle.



24 To obtain an overlap, cut off radial sealing ring 1 mm above parting surface, using self-made gauge.

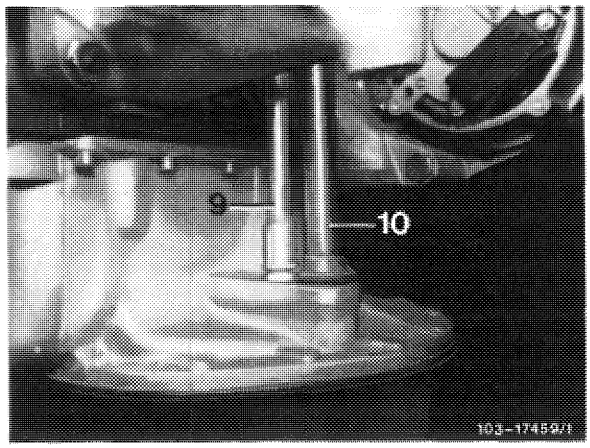
25 Provide radial sealing ring with engine oil.



Dimension a = 1.0 mm

26 Coat parting surface of oil pan top uniformly with sealing compound, part no. 001 989 46 20. Use this type of sealing compound only.

27 Position oil pan upper half, while inserting oil dipstick guide pipe, oil return pipe from exhaust gas turbocharger and from cyclonic oil separator (on engines with EGR only).



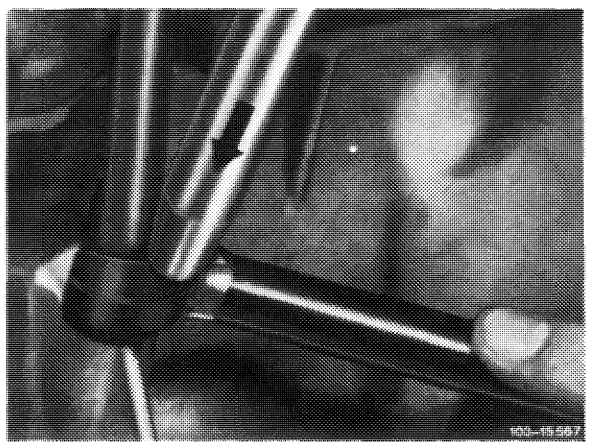
9 Oil return line from cyclonic oil separator
10 Oil return line from exhaust gas turbocharger

28 Screw down oil pan upper half.

29 Knock-in oil dipstick guide tube up to flange by means of knocking-in tool.

30 Lower engine. Pay attention to installation position of shielding plates and guide engine shock-absorbers into bores on frame cross member.

31 Insert adaptor with strainer at oil pump.



32 Screw-on oil pan lower half with new gasket.

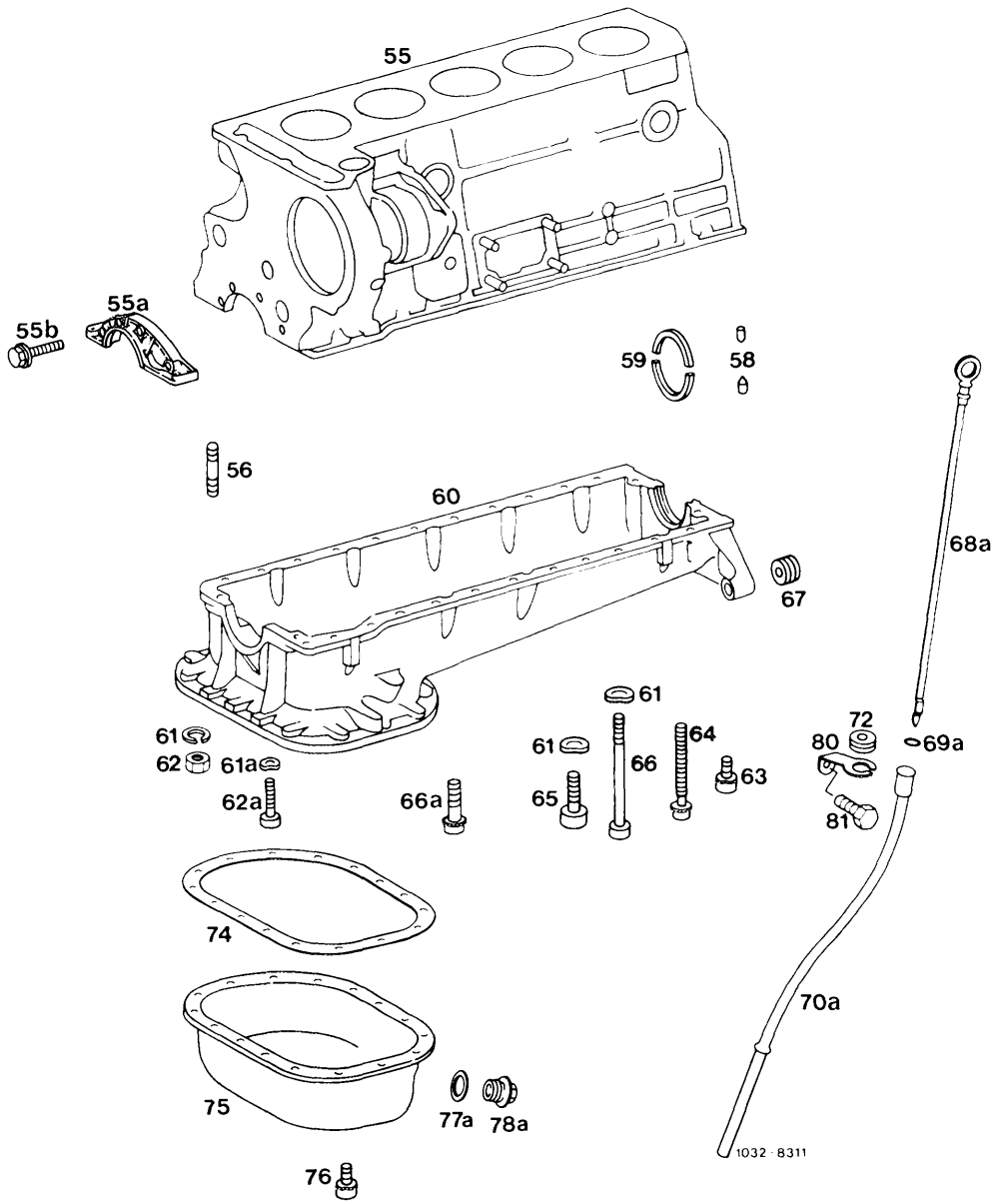
33 For further installation proceed vice versa.

34 Add engine oil.

35 Run engine and add gear oil.

36 Run engine warm and check for leaks.

Cylinder crankcase and oil pan



55 Cylinder crankcase
55a Cover
55b 4 combination screws M 6 x 25
56 2 screws M 8 x 25
58 Locking pin
59 Crankshaft radial sealing ring
60 Oil pan top
61 4 spring washers B 8
61a 2 spring washers B 6
62 2 nuts M 8
62a 2 screws M 6x20
63 16 combination screws M 6x15 (engine 617.950/952)
14 combination screws M 6x15 (engine 617.951)
64 2 combination screws M 6x60 (engine 617.950/952)
8 combination screws M 6x60 (engine 617.951)
65 4 combination screws M 6x30 (engine 617.950/952
66 2 screws M 8x95
66a 2 screws M 8x20
67 2 threaded inserts 10/14x20 (engine 617.950/952)
68a Oil dipstick
69a O-ring
70a Oil dipstick guide tube
72 Rubber grommet
74 Gasket
75 Oil pan lower half
76 Combination screw M 6x15 (19 each)
77a Sealing ring A 12x17
78a Oil drain plug M 12
80 Holder for oil dipstick guide tube
81 Screw M 8x12

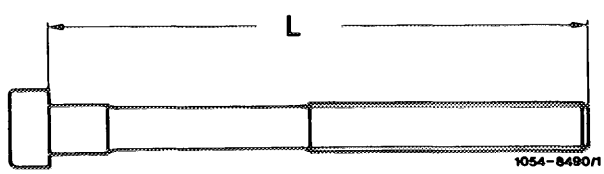
Tightening torques and angle of rotation for cylinder head bolts on cold engine

Cylinder head bolt version	Tightening steps	Nm	Angle of rotation
Hex. socket cylinder head bolts (cylinder head bolts with cylindrical shank)	Step 1	70	—
	Step 2	90	—
	Setting interval	10 min	
	Step 3	100	—
Double hex. socket cylinder head bolts (necked-down cylinder head bolts)	Step 1	40	—
	Step 2	70	—
	Setting interval	10 min	
	Step 3	—	90°
	Step 4	—	90°

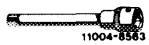
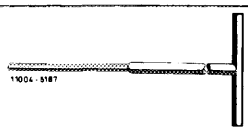
Tighten M 8—cylinder head bolts by means of Allen wrench with tommy handle.

Dimensions of double hex cylinder head bolts

Thread dia.	Length when new	Max. length (renew)
M 12	104	105.5
M 12	119	120.5
M 12	144	145.0

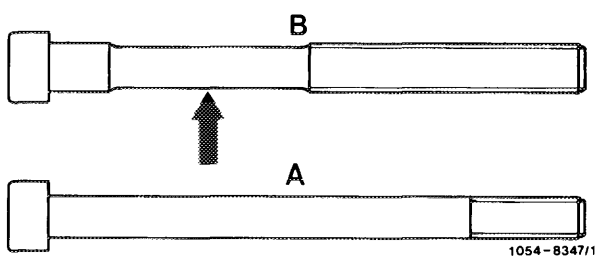


Special tools

Socket 10 mm, 1/2" square, 140 mm long for hex. socket cylinder head bolts		000 589 05 07 00
Socket 1/2" square, 140 mm long for double hex. socket cylinder head bolts		617 589 00 10 00
Screwdriver (Allen wrench) with tommy handle for hex. socket screws 6 mm, 440 mm long		116 589 03 07 00
Torque wrench with plug-in ratchet 1/2" square, 40–200 Nm		001 589 67 21 00

Notes

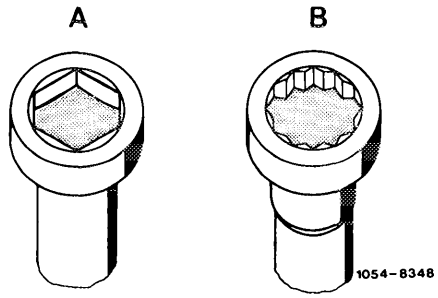
To obtain a more uniform and higher initial bolt preload, the cylinder head bolts with cylindrical shank (A) used up to now on engine 617.950 have been replaced by necked-down cylinder head bolts (B) starting February 1979. On engines 617.951/952, they are installed from start of series.



A Cylinder head bolt with cylindrical shank
B Cylinder head bolt with necked-down shaft

These cylinder head bolts have a reduced shank section (arrow) and longer threads.

In installed condition, the cylinder head bolts are identified by the double hex. socket (B), formerly hex. socket (A).

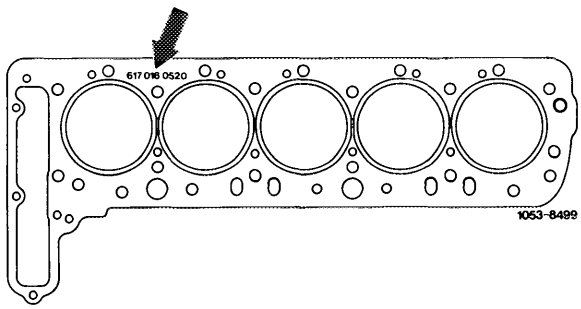


A Hex. socket cylinder head bolt
B Double hex. socket cylinder head bolt

The cylinder head gasket has been simultaneously provided with an improved impregnation and the washers have been made harder.

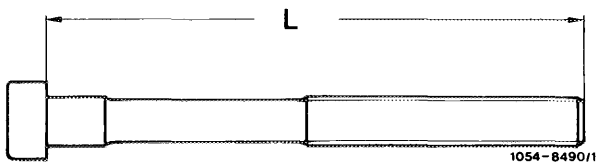
The cylinder head gasket is identified by the impressed part no., the washers by the olive-colored chromate surface.

Cylinder head gasket part no. 617 016 05 20.



The double hex. socket cylinder head bolts are tightened to an initial torque preload and an angle of rotation (refer to table).

Since these cylinder head bolts are subject to a permanent elongation upon tightening, they must be replaced as soon as the max. longitudinal dimensions shown in table below are exceeded.



Dimensions of cylinder head bolts

Thread dia.	Length when new (L)	Max. length (L) (renew)
M 12	104	105.5
M 12	119	120.5
M 12	144	145.0

Owing to the permanent elongation, the threaded bores in cylinder crankcase have been made longer and the cylinder head bolts have been shortened by 1 mm.

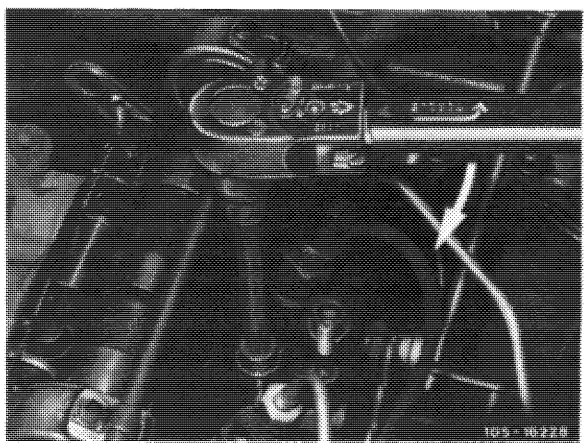
For this reason, they must not be installed in engine 617.950 with hex. socket cylinder head bolts.

The above applies also to the installation of short blocks and new cylinder crankcases.

Always use the cylinder bolt version of removed engine.

It is also not permitted to install mixed cylinder head bolts on one and the same engine.

In the event of repairs on engines with double hex. socket cylinder head bolts only the cylinder head gasket with improved impregnation and harder washers may be installed.



Tighten cylinder head bolts to initial torque preload and angle of rotation torque.

Estimate angle of rotation. For this purpose, place adjustable torque wrench **in release position** (locked) into plug-in ratchet. Position adjustable torque wrench with plug-in ratchet longitudinally in relation to engine and turn until wrench is positioned transverse to engine.

When tightening to angle of rotation torque, do not use a bending bar-torque wrench.

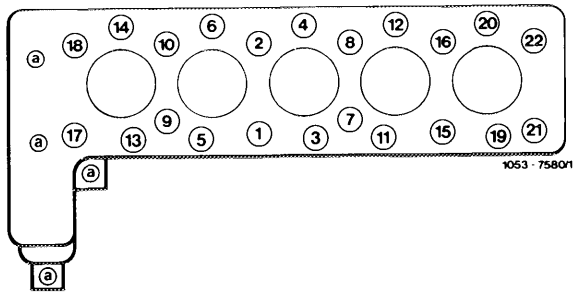
On engine 617.950 with hex. socket cylinder head bolts, the cylinder head gasket with improved impregnation and harder washers may also be installed.

Tighten hex. socket cylinder head bolts always according to torque.

When tightening according to **torque,** the former warm tightening is no longer required. Instead, a 10-minute setting interval must be maintained between tightening step 2 and 3 (refer to table). In addition, tightening step 3 has been increased by 10 Nm to 100 Nm.

Tighten cylinder head bolts in steps in sequence of tightening diagram.

Do not loosen cylinder head bolts after setting interval, but directly continue tightening.



Independent of cylinder head bolt version, retightening of cylinder head bolts is no longer required during inspection 1000—1500 km or in the event of repairs after approx. 100—1500 km.

Valve clearance	with engine cold (appr. 20 °C)	with engine warm (appr.60 °C ± 15 °C)
Intake	0.10[1]	0.15[1]
Exhaust	0.35	0.40

[1] 0.05 mm higher during lasting outside temperatures below -20 °C.

Timing at 2 mm valve lift

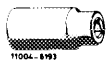
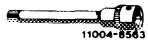
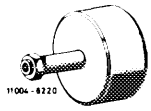
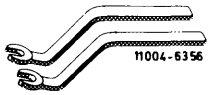
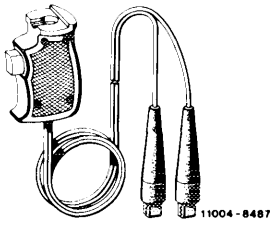
Engine	Camshaft code number[1]	Intake valve opens after TDC	closes before BDC	Outlet valve opens before BDC	closes before TDC
617.950[2]	00 08[4]	with new timing chain			
		11.5°	13.5°	21°	19°
		with used timing chain (starting at approx. 20 000 km)			
		13.5°	15.5°	19°	17°
617.950[3] 617.951 617.952	05[4]	with new timing chain			
		9°	15°	27°	16°
		with used timing chain (starting at approx. 20 000 km)			
		11°	17°	25°	14°

[1] The camshaft code number is punched into rear end of camshaft.
[2] (USA) up to model year 1979
[3] (USA) model year 1980
[4] Camshaft made of chilled cast iron

Tightening torques		Nm
Nuts for cylinder head cover		15
Hex. socket cylinder head screws (with engine cold)	Step 1 Step 2 Setting interval Step 3	70 90 10 min 100
Hex. socket cylinder head screws (with engine cold)	Step 1 Step 2 Setting interval Step 3 Step 4	40 70 10 min 90° 90°
Necked-down screw for camshaft sprocket		80

Closing plug for chain tensioner	90
Nozzle holder in prechamber	70–80
Nuts for oil filter cover	20–25
Oil supply line to exhaust gas turbocharger	23
Screws for rocker arm bearing brackets to cylinder head	40

Special tools

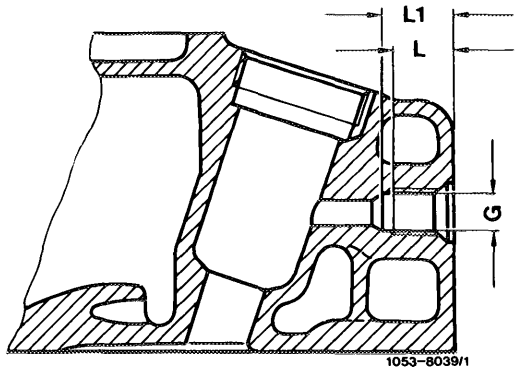
Socket 27 mm, 1/2" square socket for rotating engine		001 589 65 09 00
Socket 10 mm, 1/2" square, 140 mm long for hex. socket cylinder head bolts		000 589 05 07 00
Socket 1/2" square, 140 mm long for double hex. cylinder head bolts		617 589 00 10 00
Screwdriver (Allen wrench) with tommy handle for hex. socket screws, 6 mm, 440 mm long		116 589 03 07 00
Impact puller for bearing bolt (basic unit)		116 589 20 33 00
Threaded bolt for impact puller M 6, 50 mm long		116 589 01 34 00
Threaded bolt for impact puller, M 6, 150 mm long		116 589 02 34 00
Valve adjusting wrench 14 mm (2 each)		615 589 00 01 00
Holding wrench for valve spring retainer		615 589 00 03 00
Contact handle for rotating engine (component of compression pressure recorder 001 589 46 21 00)		001 589 46 21 08
Torque wrench with plug-in ratchet, 1/2" square, 40–200 Nm		001 589 67 21 00

Note

Remove cylinder head only from cooled-down engine. Remove together with exhaust manifold and boost air pipe.

On engine 617.950 (USA) starting 1980, threaded bore (G) and seat bore in cylinder head for quick-start pencil element glow plugs have been extended by 3 mm (L and L 1).

L 19 mm
L 1 22.5 mm



This cylinder head has been installed on engines 617. 951/952 from start of series.

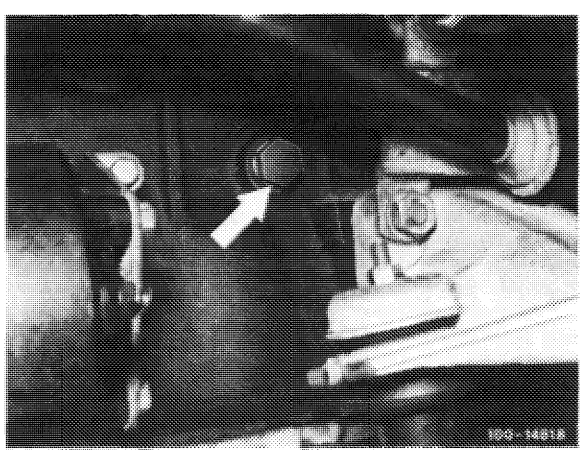
In the event of repairs, the head can also be installed on engines 617.950 made at an earlier date. On the other hand, the cylinder head with shorter thread and seat bores should not be installed on engines with quick-start system, since a part of the quick-start effect will be lost.

For these engines the cylinder head gaskets require no retightening. As a result, no retightening of cylinder head bolts is required during 1st inspection (1000–1500 km) and in the event of repair, after driving 1000–1500 km.

The cylinder head gaskets welded in-between sheeting may be removed from package only directly prior to assembly, since they are sensitive to light and ozone.

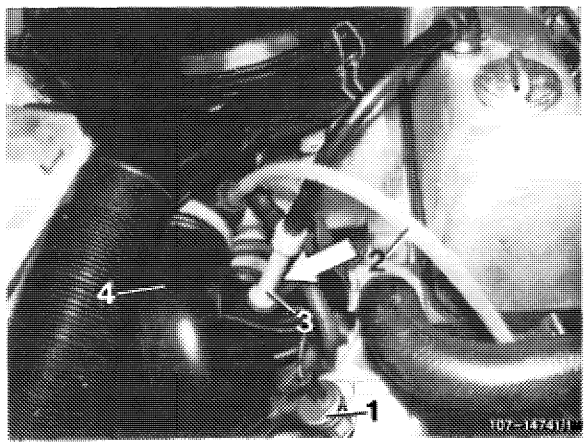
Removal

1 Completely drain coolant.



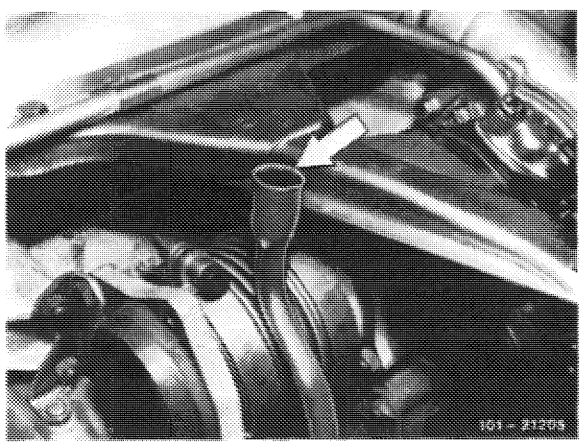
Drain plug on cylinder crankcase

2 Remove air cleaner with intake line (4). For this purpose, pull off engine vent line (3) and on model 116.120 with double diaphragm vacuum pump, pull vacuum line (2) and cable from temperature switch (1).

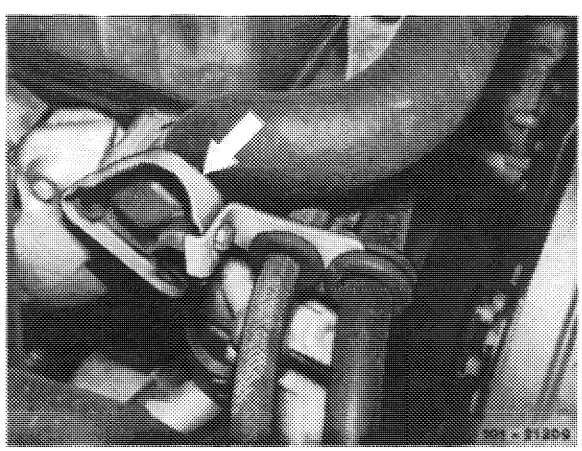


Model 116.120
1 Temperature switch 100 °C
2 Vacuum line
3 Vent line
4 Intake line

3 On engines with EGR (USA) cover return line from cyclonic oil separator to oil pan (arrow).

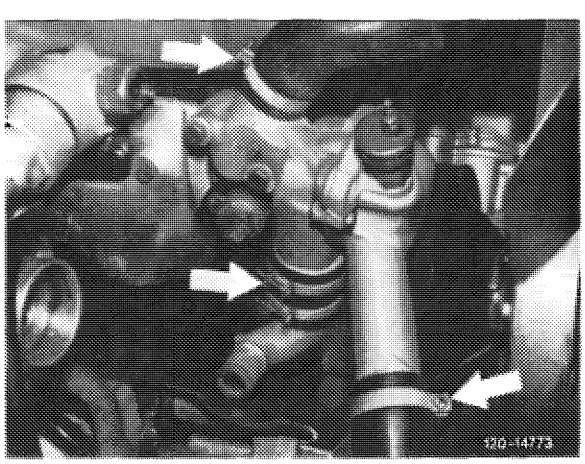


4 On model 123 with level control, unscrew line holder from thermostat housing (arrow).



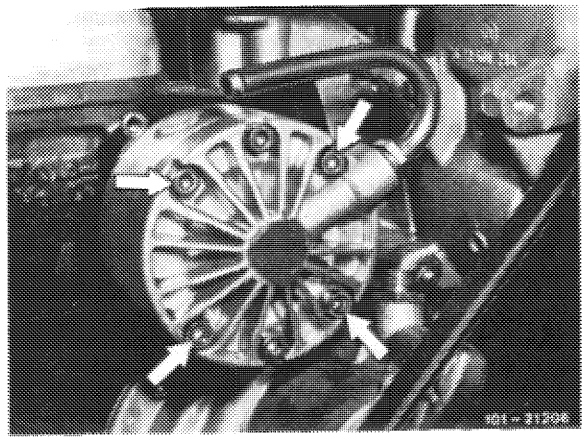
5 Disconnect the three coolant hoses (arrows) on thermostat housing and heater supply hose on cylinder head. Remove upper coolant hose to radiator.

6 Unscrew bleed line between cylinder head and water pump housing.

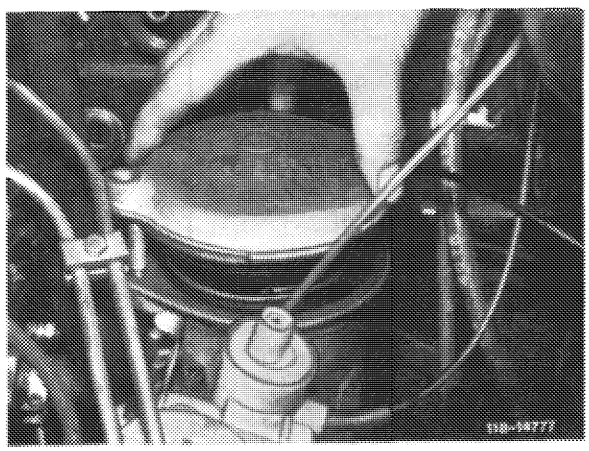


7 On model 123 with level control, remove hydraulic oil pump with connected lines and put aside.

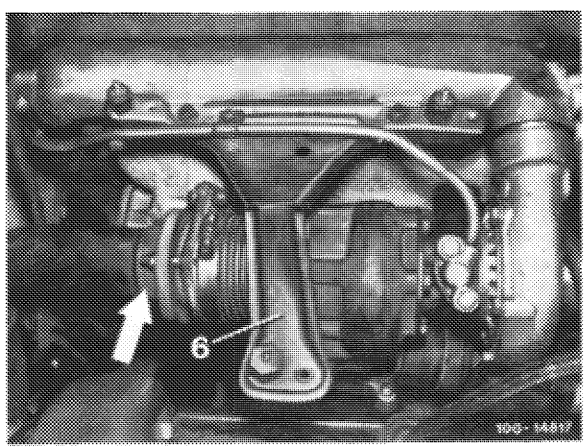
For this purpose, unscrew screws (arrows).

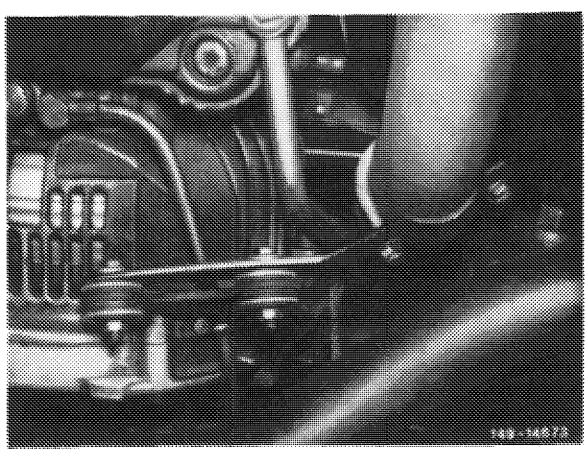


8 Loosen oil filter cover and pull up for a short distance.

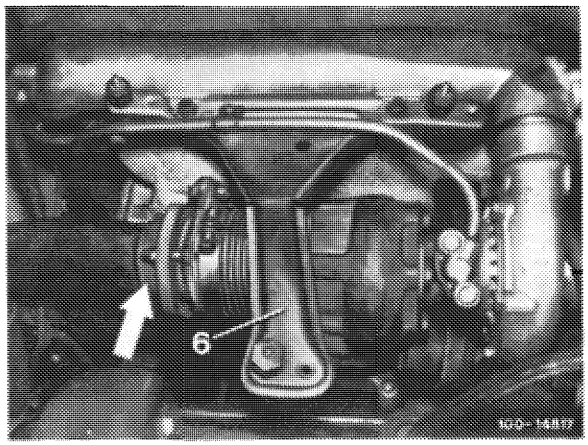


9 Unscrew exhaust on exhaust gas turbo-charger (arrow) and on transmission.





10 Unscrew oil dipstick guide tube of automatic transmission on boost air pipe.

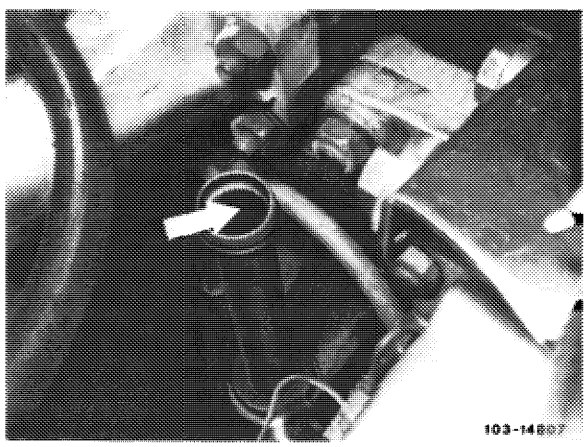


11 Completely unscrew oil feed line for exhaust gas turbo-charger.

12 Unscrew line (a) on boost air pipe.

13 Remove injection line and cover connections.

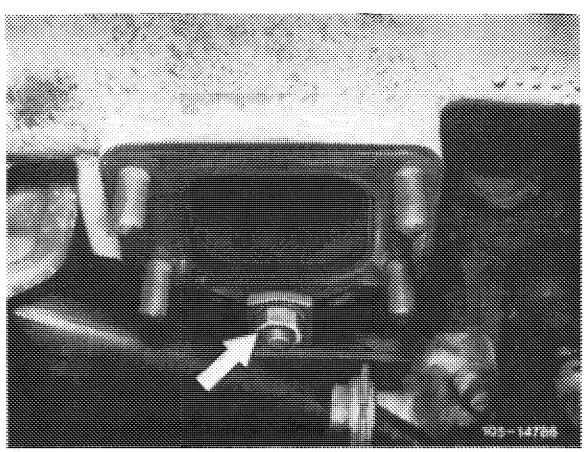
14 Unscrew or pull off cable harness on pencil element glow plugs, on pressure switch in boost air pipe and on (USA) up to 1980 on temperature switch.



15 Pull fuel return line from 1st injection nozzle.

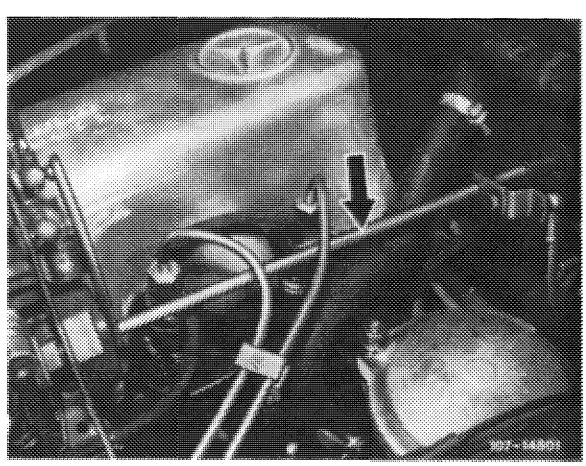
16 On models 123 and 126.120 with cruise control/ tempomat, unscrew actuator with holder on power steering pump carrier, disconnect linkage and put actuator aside.

17 Remove power steering pump with bracket and fuel filter and put aside.



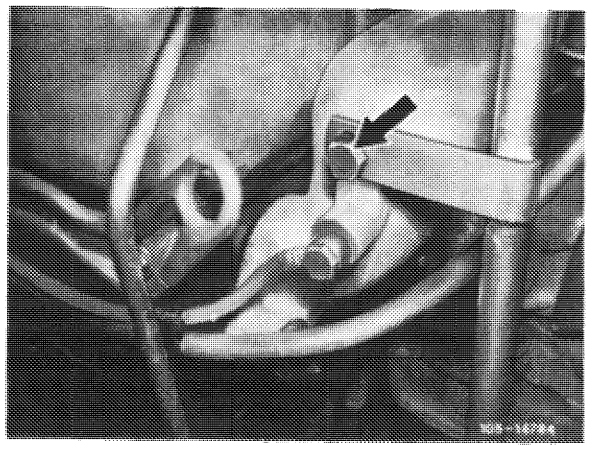
For this purpose, unscrew the five screws indicated by arrows.

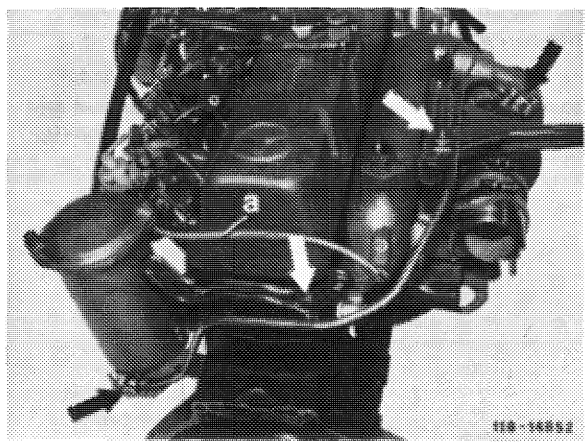
Do not disconnect hoses and lines.



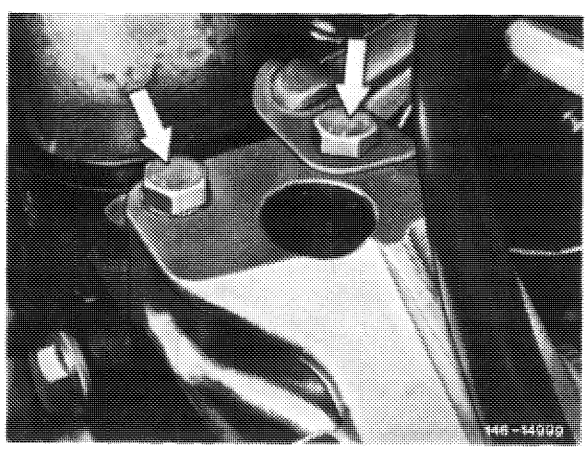
18 Remove exhaust turbo-charger.

For this purpose, unscrew holder (6) for air filter. Cover oil return pipe (arrow).



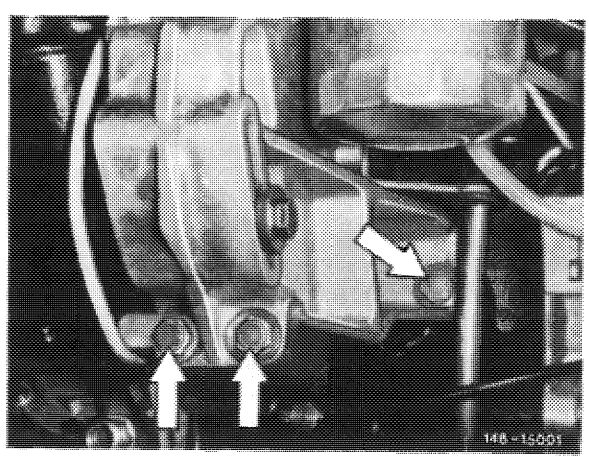


19 Unscrew exhaust manifold support on manifold (arrow).



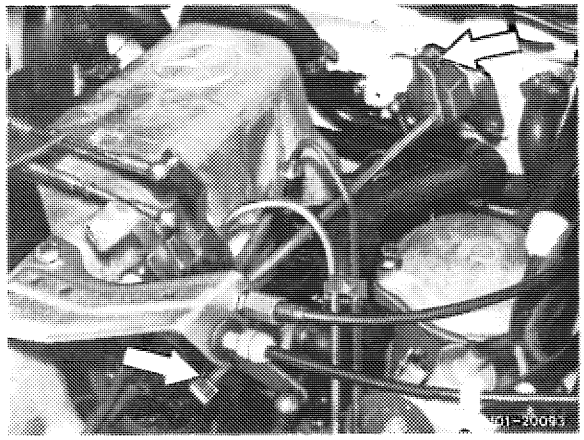
20 Remove cylinder head cover. For this purpose, disconnect regulating linkage. Pull out locking eye of longitudinal regulating shaft (arrow).

On models 116.120 and 123, pull longitudinal regulating shaft out of rubber mount in forward direction and remove in rearward direction.



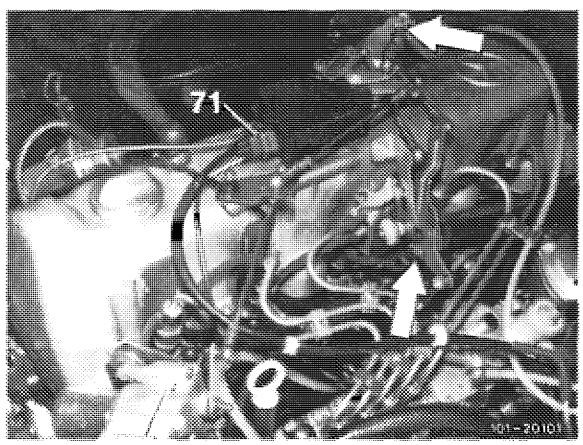
Model 116.120

On model 126.120, pull longitudinal regulating shaft out of guide lever in rearward direction and remove in forward direction.



Model 123

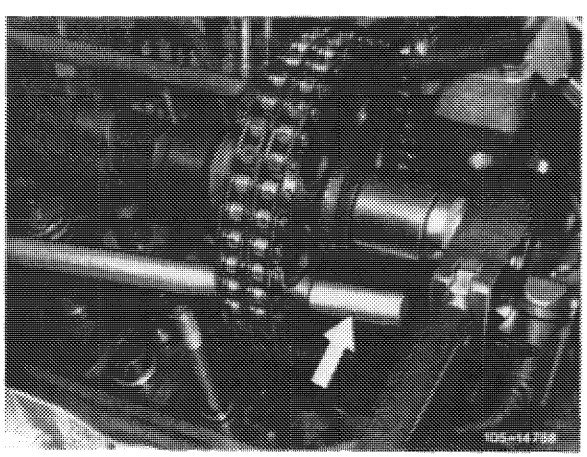
On models 123 with automatic transmission 722.303 (W4A 040) and 126.120, pull off central plug for vacuum lines (71) or vacuum lines. Disconnect bowden wire, compress black plastic clip (arrow) and pull bowden wire out of holder in rearward direction.



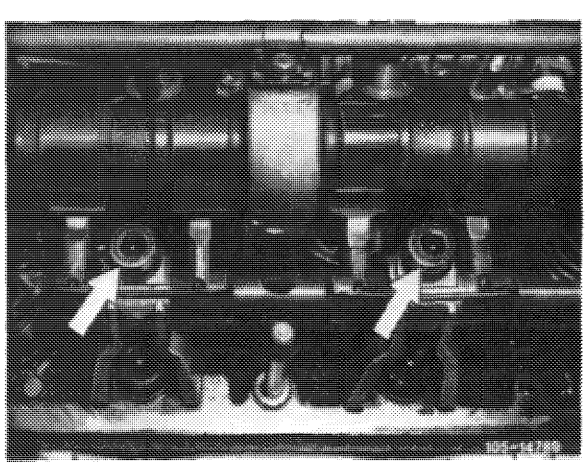
Model 126.120

21 Loosen necked-down screw for attaching camshaft sprocket, do not screw out.

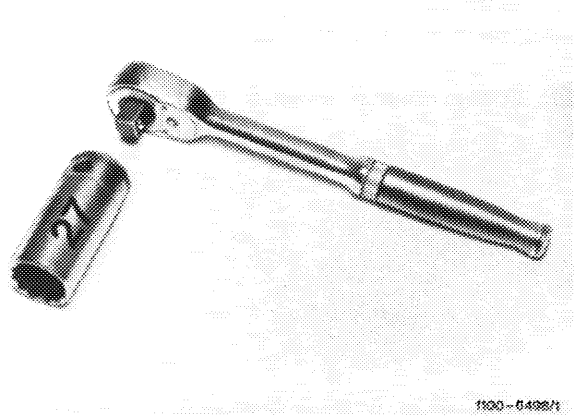
For loosening camshaft sprocket, apply counterhold with a screw driver or a steel bolt.



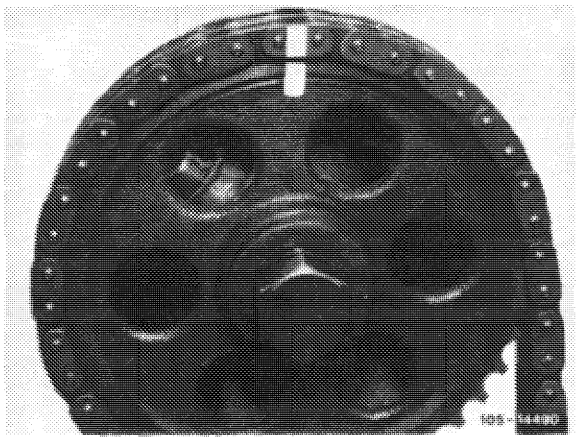
22 Remove both rocker arm groups. For this purpose, set camshaft in such a manner that the rocker arms are not under load.



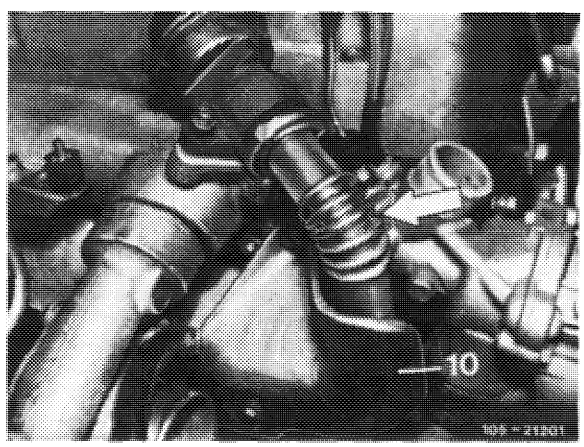
23 Set engine to ignition TDC of 1st cylinder. For this purpose, rotate engine at crankshaft by means of tool combination.



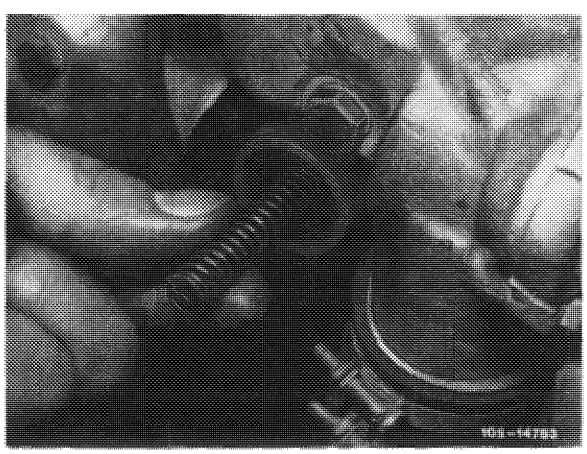
24 Mark camshaft sprocket and timing chain in relation to each other.



25 On engines with EGR (USA), remove pipe line between EGR valve and exhaust manifold (arrow). For this purpose, unscrew shielding plate (10).

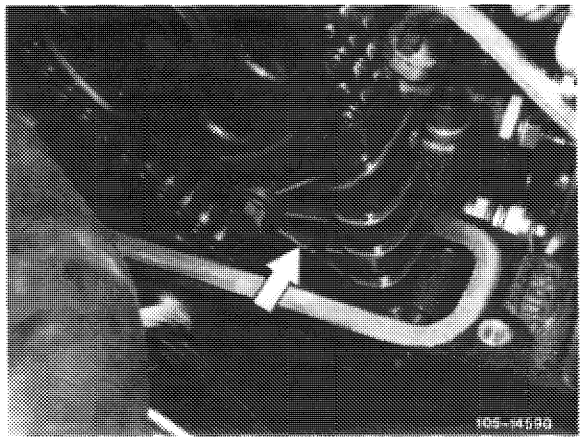


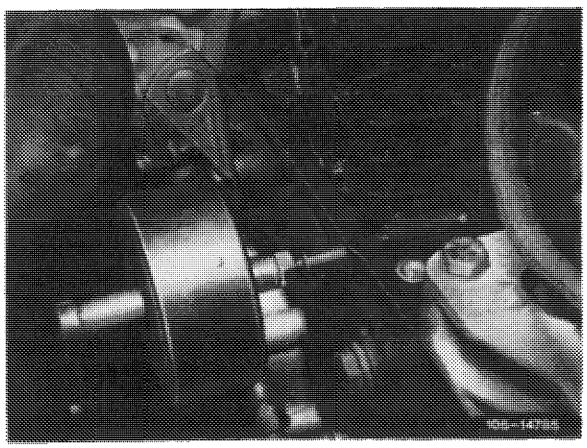
26 Unscrew closing screw of chain tensioner and remove compression spring.



27 Remove slide rail in cylinder head. Pull out bearing bolt by means of impact puller.

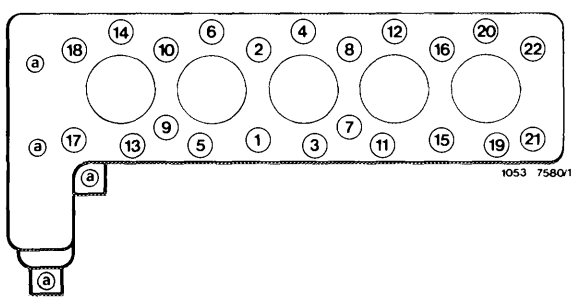
28 Remove camshaft sprocket.



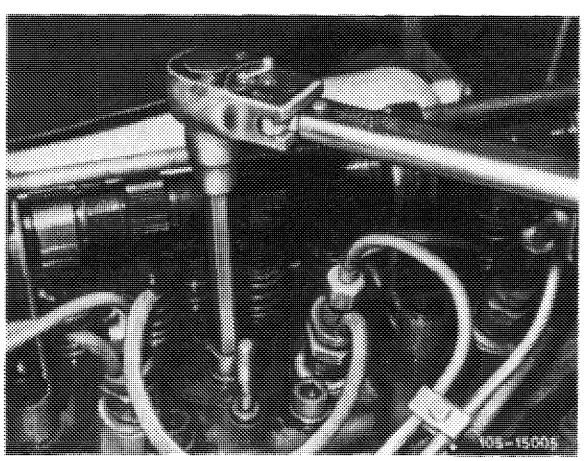


29 Loosen cylinder head bolts in reverse order of tightening diagram by means of Allen wrench insert and screw out.

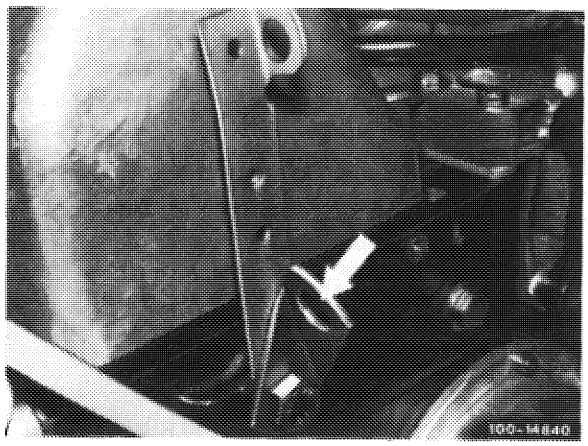
Unscrew the M 8-screws by means of Allen wrench 6 mm, 440 mm long.



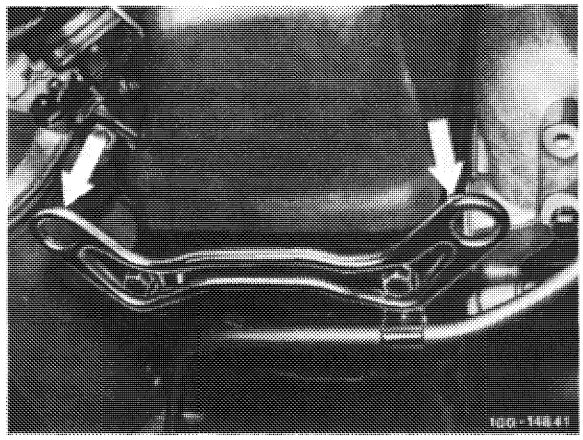
30 Remove injection nozzles to remove the 5 screws adjacent to injection nozzles.



31 Lift out cylinder head. This can also be done by means of a crane and an engine hoist (Motordirigent). Suspend the cables for this purpose at the three suspension eyes.



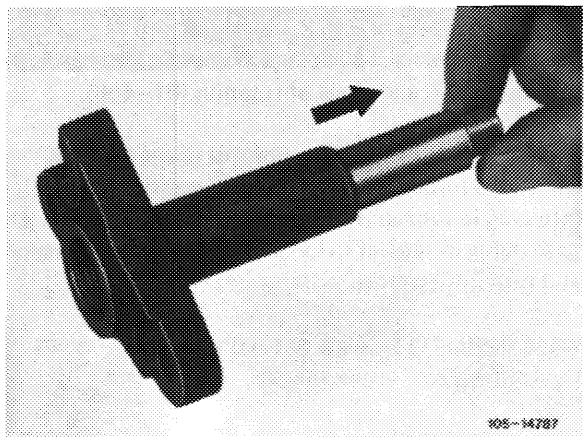
Suspension eye front



Suspension eyes rear

32 Pull out thrust bolts of installed chain tensioner in inward direction (arrow).

33 Thoroughly clean cylinder crankcase and cylinder parting surface.



Installation

34 Mount new cylinder head gasket.

35 Mount cylinder head while paying attention to hollow dowel pins for locating cylinder head.

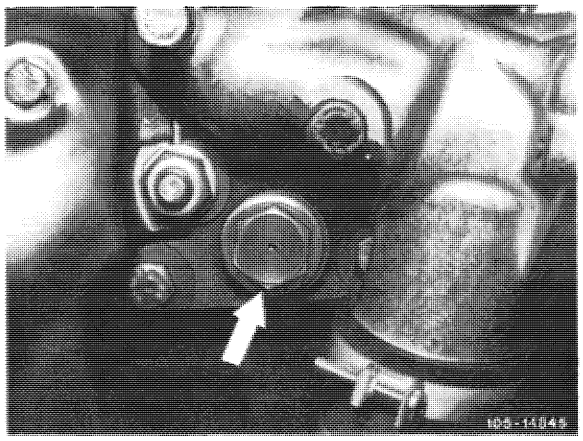
36 With double hex. cylinder head bolts, measure

L

43 Install slide rail.

44 Insert thrust bolts and compression spring of chain tensioner from outside.

Position closing plug with new sealing ring and tighten to 90 Nm.

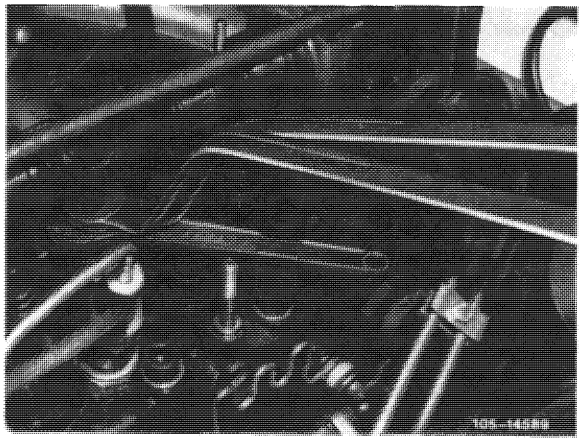


45 Adjust valve clearance (05–210).

46 Install injection nozzles. Insert new nozzle reeds first.

47 Screw-on exhaust manifold support.

48 Install exhaust gas turbo-charger with new gasket. When positioning turbo-charger, pay attention to oil return pipe. Remove cover.



49 Unscrew oil feed line for exhaust gas turbo-charger. Insert new gasket for exhaust gas turbo-charger.

50 For further installation proceed vice versa to removal.

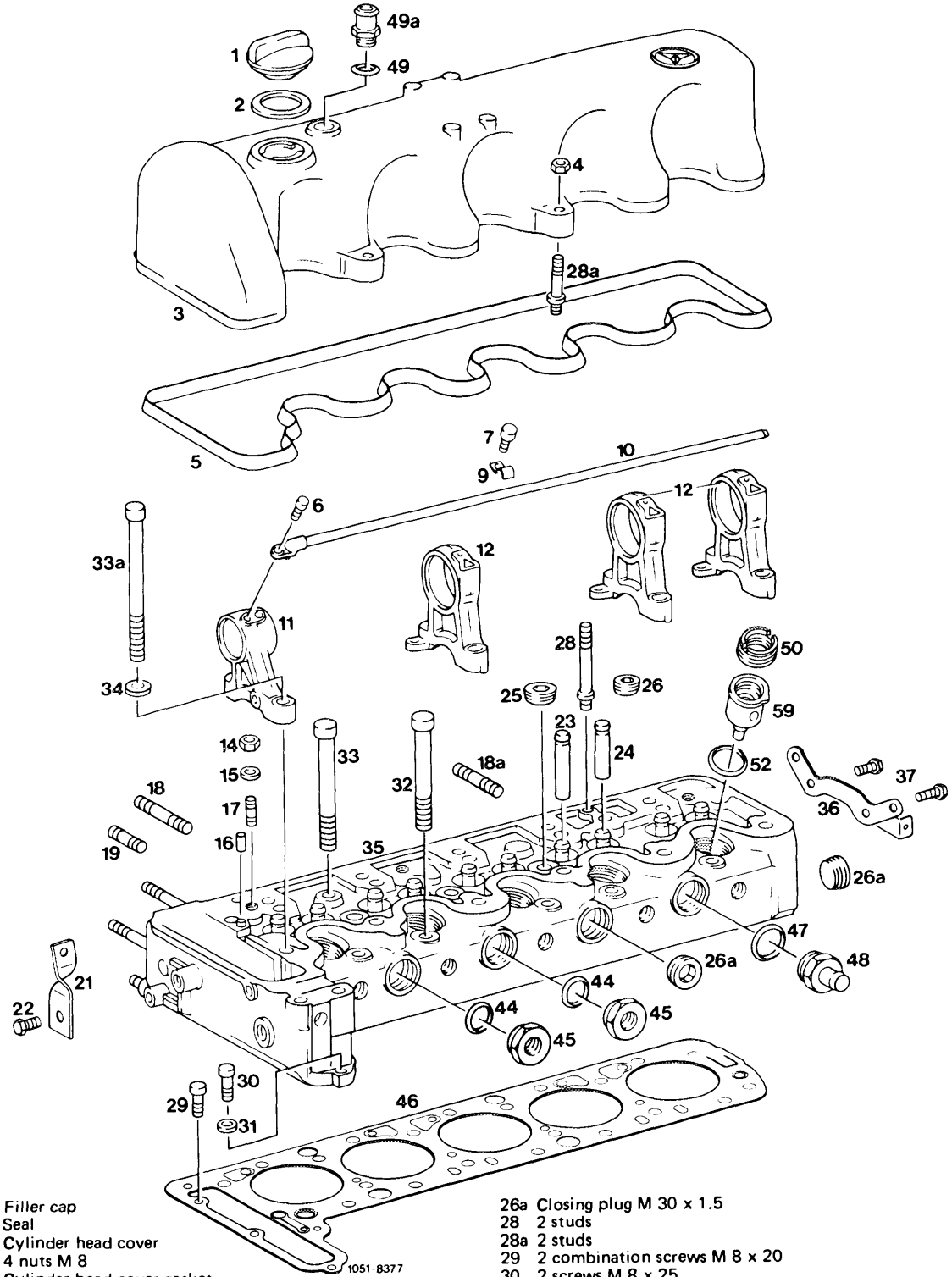
51 Add coolant (20–010) and pressure-test cooling system.

52 Bleed injection system by means of a hand pump.

53 Run engine and check for leaks.

Note: Retightening of cylinder head bolts and setup of valve clearance on warm engine not required.

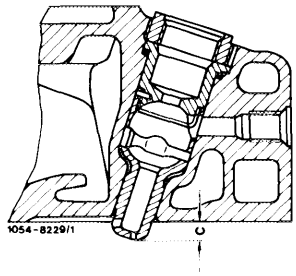
Cylinder head and cylinder head cover



1 Filler cap
2 Seal
3 Cylinder head cover
4 4 nuts M 8
5 Cylinder head cover gasket
6 Combination screw M 6 x 12
7 3 combination screws M 5 x 10
9 3 fastening clips
10 Oil pipe
11 Camshaft bearing crank end
12 Camshaft bearing
14 4 nuts M 8
15 4 washers 8.4
16 8 cyl. pins 8 x 8
17 4 studs M 8 x 18
18 5 studs M 10 x 52
18a Stud M 10 x 40
19 Stud M 10 x 30
21 Suspension eye
22 Screw
23 5 valve guides intake
24 5 valve guides exhaust
25 4 closing plugs M 26 x 1.5
26 Closing plug M 22 x 1.5
26a Closing plug M 30 x 1.5
28 2 studs
28a 2 studs
29 2 combination screws M 8 x 20
30 2 screws M 8 x 25
31 2 washers
32 5 cylinder head bolts M 12 x 105 or 104
33 9 cylinder head bolts M 12 x 120 or 119
33a 8 cylinder head bolts M 12 x 145 or 144
34 22 washers
35 Cylinder head
36 Suspension eye
37 Screw M 8 x 16
44 Sealing ring A 30 x 36
45 Screw connection
46 Cylinder head gasket
47 Sealing ring A 30 x 36
48 Thread connection for heater
49 Sealing ring A 18 x 24
49a Connection
50 5 threaded rings
52 5 sealing rings
59 5 pre-chambers

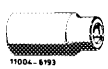
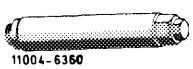
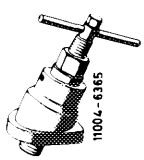
Data

Pre-chamber standout on cylinder head
dimension "c" 7.8–8.4 mm



Tightening torques	Nm
Coupling nuts of injection lines	25
Nuts for cylinder head cover	15
Pre-chamber in cylinder head (threaded ring)	150–180
Nozzle holder in pre-chamber	70–80

Special tools

Open box wrench insert, 17 mm, 1/2" square socket for injection lines	 11004-6359	000 589 68 03 00
Socket 27 mm, 1/2" square socket	 11004-6193	001 589 65 09 00
Socket wrench for threaded ring of pre-chamber	 11004-6360	615 589 00 07 00
Puller for pre-chamber	 11004-6365	615 589 00 33 00

Note

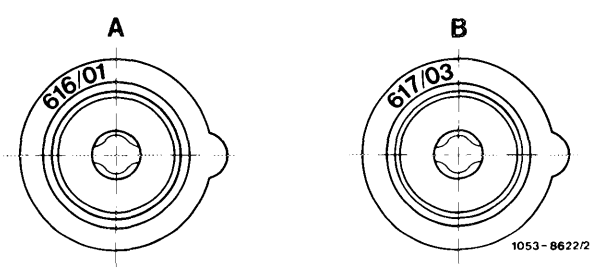
The prechambers of engines 616.912 and 617.912 may not be installed on these engines.

For identification, a code number (617/03) is shown at upper flange of pre-chamber.

In addition, the pre-chamber can be identified by means of the smaller bore (0–9 mm dia.) for glow plug.

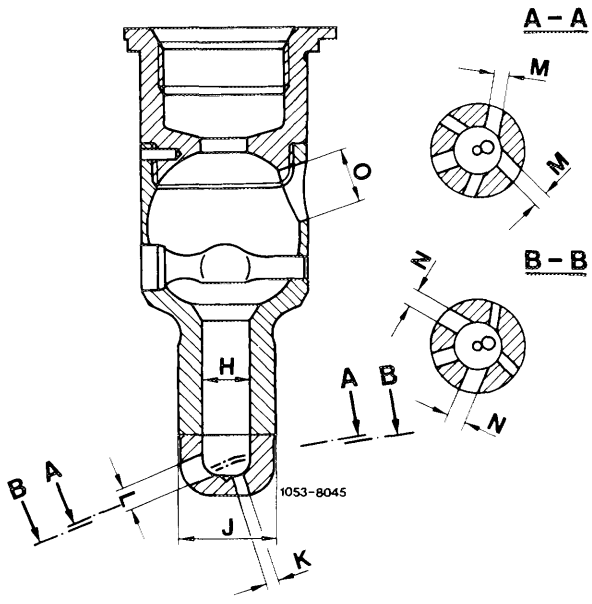
A Prechamber engines 616.912/617.912

B Prechamber engines 617.950/951/952



Six burner bores of different diameter are in place in pre-chamber lower half (burner neck) at different levels and angle positions.

The firing duct (H) has a diameter of 8 mm, the burner neck (J) of 16 mm.



H	Firing duct	8 mm dia.
J	Burner neck	16 mm dia.
K	Burner bore	2 mm dia.
L	Burner bore	3.5 mm dia.
M	Burner bore	2.5 mm dia.
N	Burner bore	3.2 mm dia.
O	Bore for glow plug	9 mm dia.

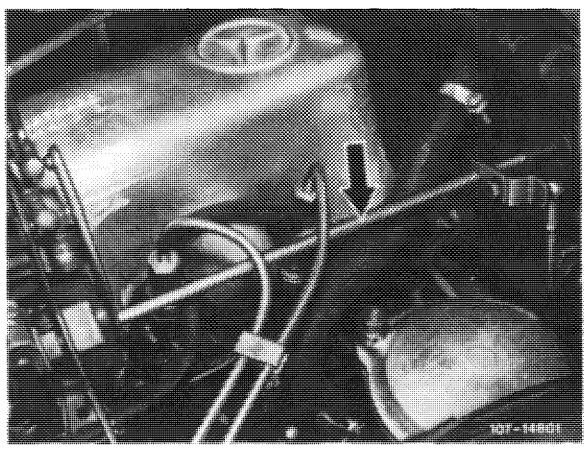
In addition, the pre-chamber bottom is of spherical shape.

The spherical shape provides uniform wall thickness in range of burner bores.

Removal

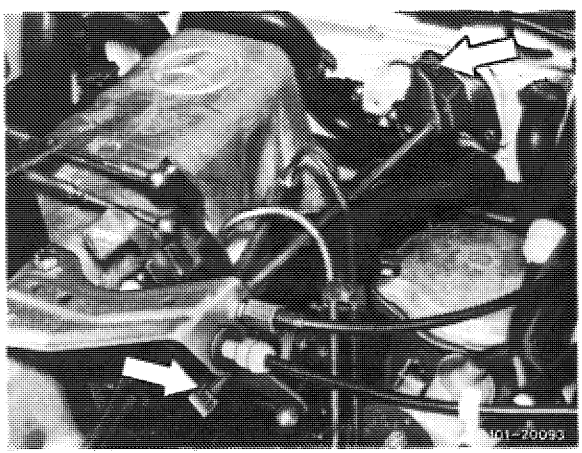
1 Disconnect regulating linkage to remove cylinder head cover. Pull out locking eye of longitudinal regulating shaft (arrow).

On models 116.120 and 123, pull longitudinal regulating shaft out of rubber mount in forward direction and remove in rearward direction.



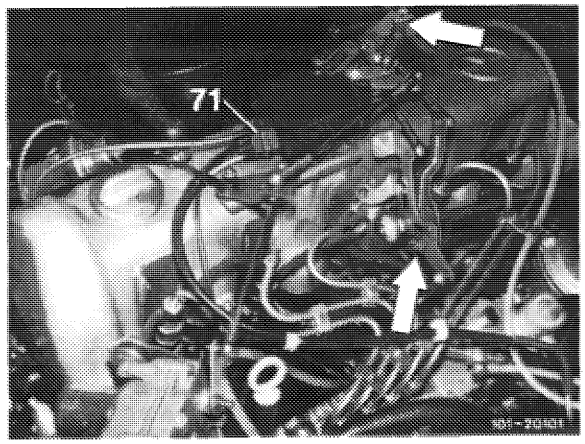
Model 116.120

On model 126.120, pull longitudinal regulating shaft out of guide lever in rearward direction and remove in forward direction.



Model 123

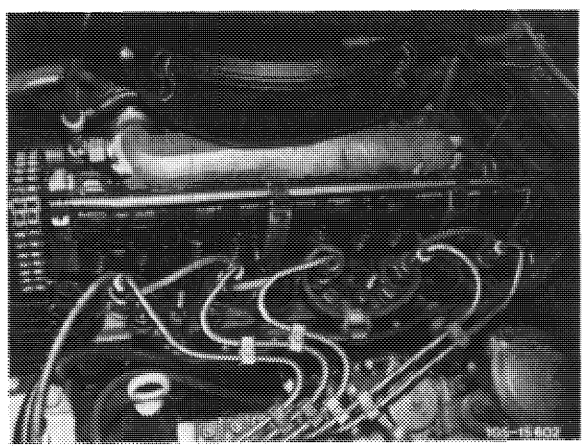
On models 123 with automatic transmission 722.303 (W4A 040) and 126.120, pull off central plug for vacuum lines (71) or vacuum lines. Disconnect bowden wire, compress black plastic clip (arrow) and pull bowden wire out of holder in rearward direction.



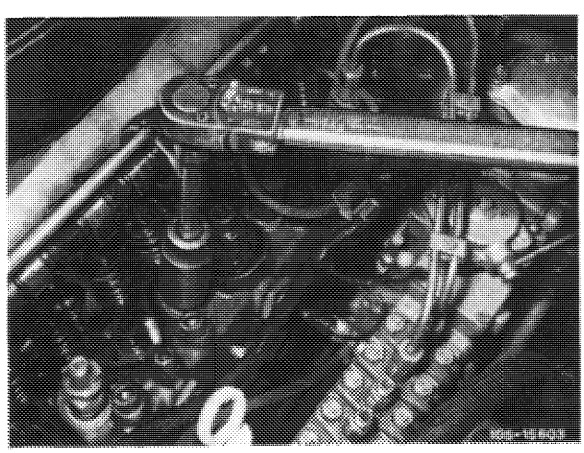
Model 126.120

2 Remove injection lines.

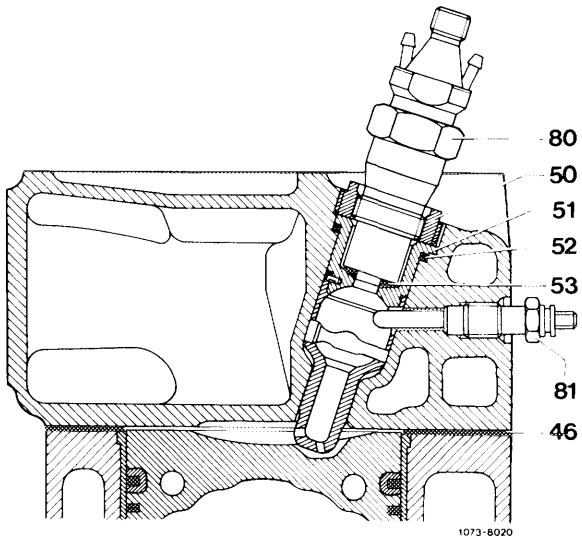
3 Pull fuel return hoses from injection nozzles.



4 Unscrew complete nozzle holder by means of socket (27 mm).



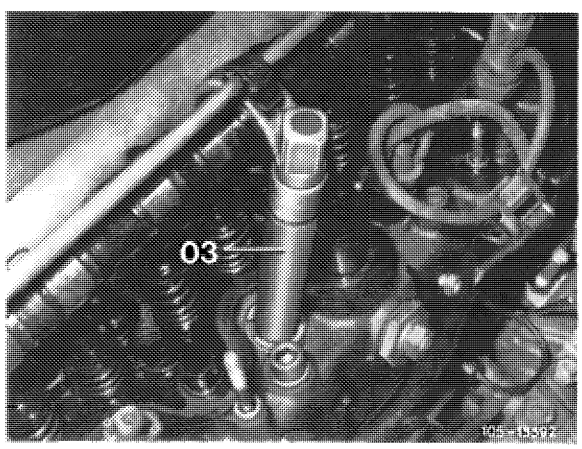
5 Unscrew rod-type glow plugs (81).



46 Cylinder head gasket
50 Threaded ring
51 Pre-chamber
52 Sealing ring
53 Nozzle reed
80 Nozzle holder
81 Rod-type glow plug

6 Unscrew threaded ring (50) by means of socket wrench.

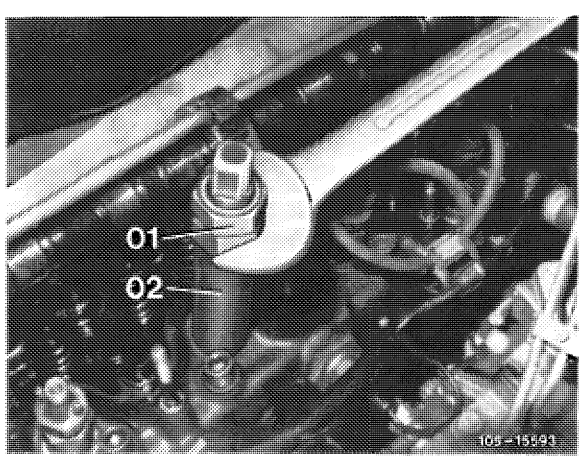
For this purpose, screw insert (03) into threaded ring, place sleeve (02) into grooves of threaded ring (arrows) and tighten with nut (01).



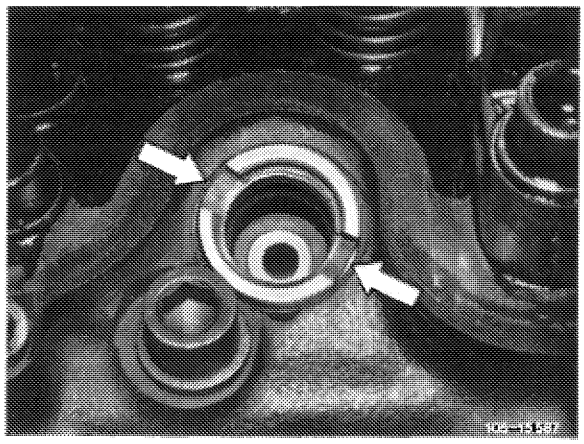
03 Screw insert

Sleeve (02) should be seated in grooves tight enough to prevent slipping out of grooves when the threaded ring is released.

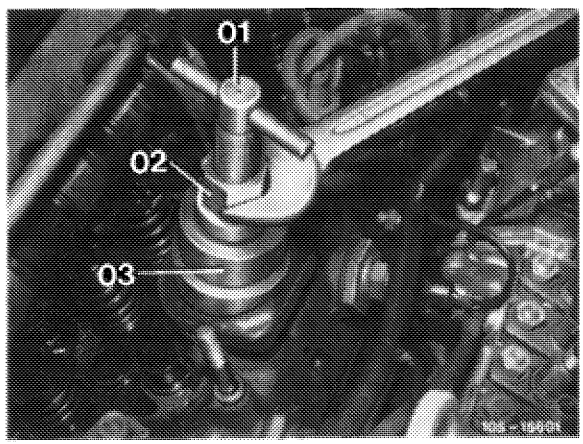
Position wrench against hex. head of sleeve (02) and unscrew threaded ring.



01 Nut
02 Sleeve



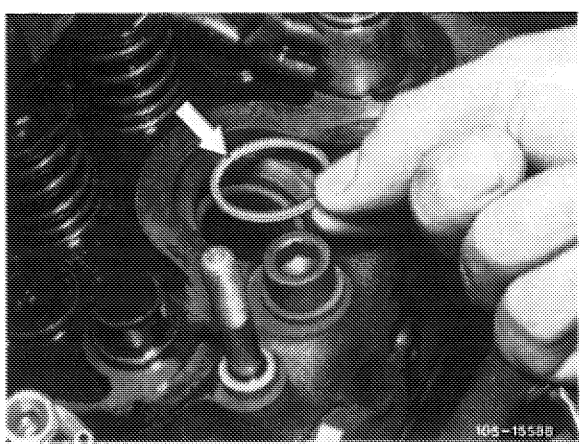
7 Pull-out pre-chamber by means of puller. Screw spindle (01) into pre-chamber. Place bell-shaped member (03) on cylinder head. The contact surface of the bell-shaped member is provided with 2 lugs. One lug each should be seated in hex. or double hex. socket of cylinder head bolt adjacent to pre-chamber. Pull-out pre-chamber by rotating nut (02) with an open-end wrench.



01 Spindle
02 Nut
03 Bell

8 Remove sealing ring (arrow) from cylinder head.

9 Cover bore in cylinder head.



Installation

Note: If the removed pre-chambers are installed again, check for perfect condition.

Ball pin should not be burnt or scaled.

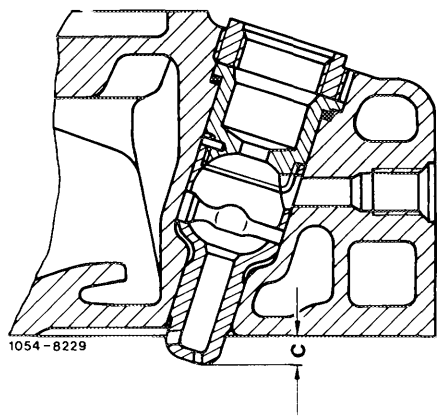
In addition, if burner tops are scorched or if pre-chamber lower half shows cracks, remove boost air pipe and check inside for traces of oil.

If oil-moist spots are found, check diaphragm of vacuum pump on engine 617.950 (USA) up to 1979 for cracks and other damage or renew vacuum control unit on injection pump of all engines.

The faulty component is identified by means of the vacuum lines (blackened by oil).

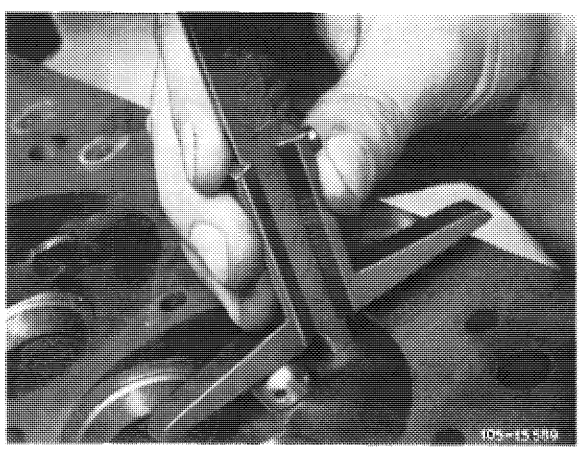
10 Place new sealing ring (52) into cylinder head. Use original sealing ring of specified thickness and shape only, so that the required distance (c) of 7.8–8.4 mm between pre-chamber and cylinder head is maintained.

Note: If a cylinder head has been faced at parting surface, add thicker sealing rings (52) between cylinder head and pre-chamber when installing pre-chambers.



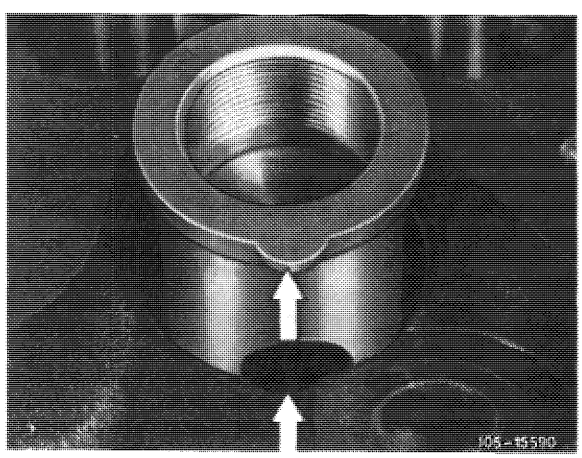
The following sealing rings are available:

Thickness	Part No.
1.9–2.1 (standard)	615 017 00 60
2.2–2.4	615 017 01 60
2.5–2.7	615 017 02 60
2.8–3.0	615 017 03 60



11 Screw spindle (01) of puller into pre-chamber (illustration item 7). Position pre-chamber in such a manner that the lug faces recess in cylinder head (arrows).

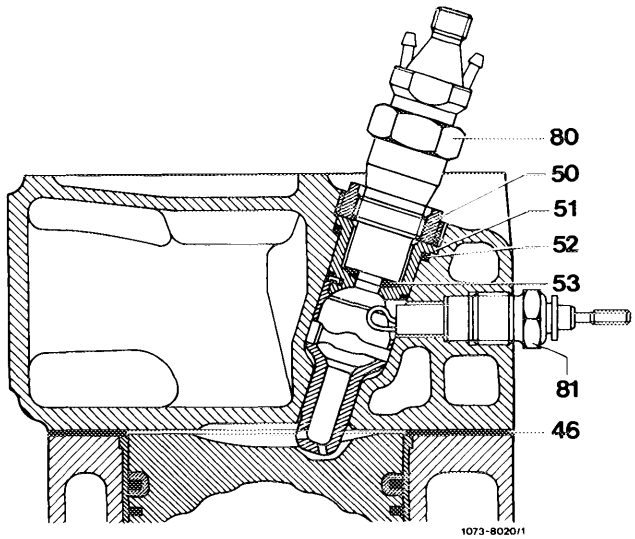
Insert pre-chamber by means of light blows with a plastic hammer against spindle. Pull bell-shaped member (03) with one hand in upward direction and hold in place (illustration item 7).



12 Lubricate threaded ring (50) and tighten to specified torque of 150—180 Nm by means of pertinent socket wrench.

13 Screw-in pencil element glow plugs and connect.

14 Insert new nozzle plate (53 Fig. item 5).
The resilient nozzle plate can be installed on all engines.



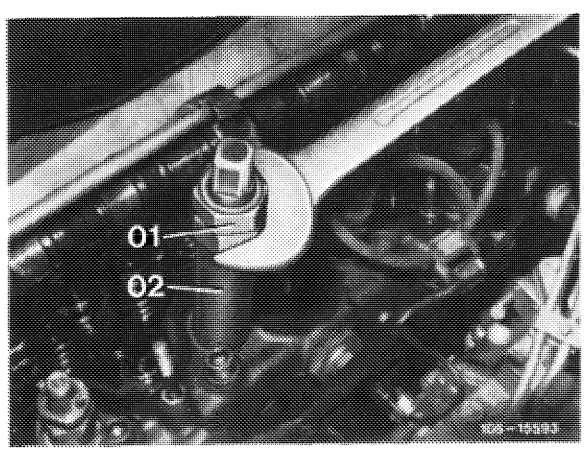
53 Nozzle plate
80 Nozzle holder
81 Pencil element glow plug

15 Completely screw-in nozzle holder and tighten to 70—80 Nm.

16 Install injection lines.

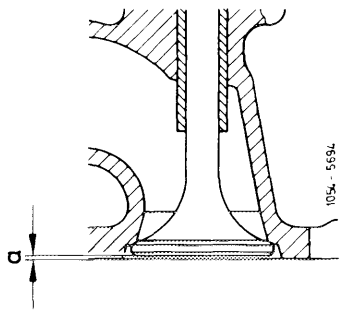
17 Plug fuel return hoses to injection nozzles.

18 Mount cylinder head cover.



Data

Total height of cylinder head		84.8–85.0
Minimum height upon machining		84.0
Permissible unevenness of parting surfaces	in longitudinal direction	0.08
	in transverse direction	0.0
Permissible deviation in parallel of upper parting surface in relation to lower parting surface in longitudinal direction		0.1
Roughness		0.016
Test pressure with air under water in bar gauge pressure (atü)		2
Minimum distance "a" with new valves and new valve seats		
Intake		+ 0.17 to –0.23
Exhaust		+ 0.12 to –0.28
Max. distance "a" with new valves and machined valve seats		
Intake		1.0
Exhaust		

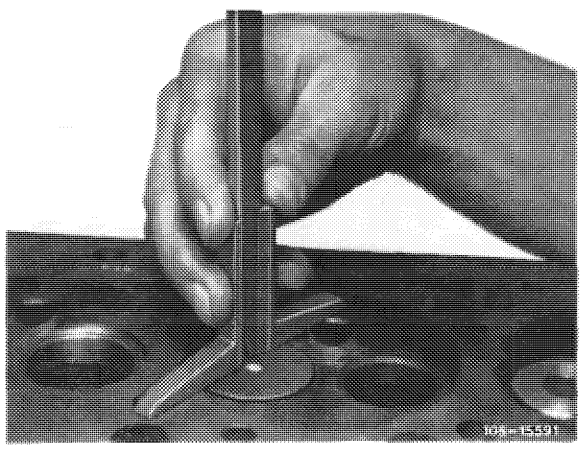


Facing

1 Face parting surface of cylinder head.

2 Refinish valve seats until minimum distance "a" is attained.

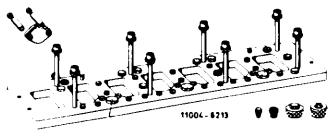
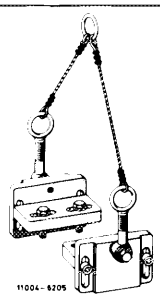
3 Check timing (05–215).



Data

Test pressure with air under water in bar gauge pressure (atü)	2

Special tools

Pressure plate		617 589 01 25 00
Suspension device		115 589 34 63 00

Conventional tool

Electrically heated water basin	e.g. made by Otto Dürr, D-7123 Sachsenheim-Ochsenbach

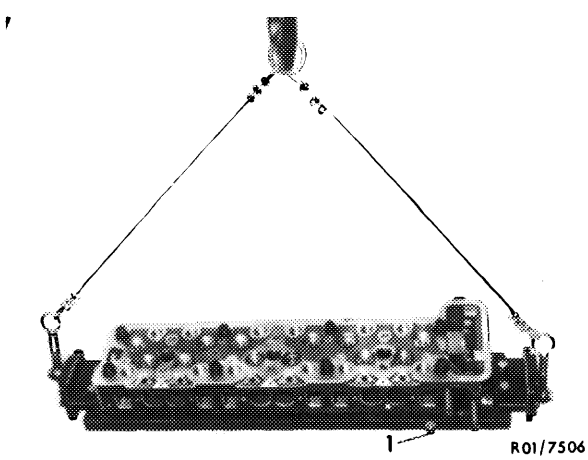
Pressure test

If cylinder seems to have cracks (coolant loss), a pressure test is required.

1 Screw pressure plate on clean cylinder head.

2 Close bores and connections.

3 Connect compressed air hose (1) and set compressed air to 2 bar gauge pressure.



4 Attach cylinder head to suspension device and lower into water heated to 80 °C.

5 If air bubbles are rising, find leaks.