

TO: ALL MERCEDES-BENZ PASSENGER CAR DEALERS

DATE: November 1995 (Supercedes S.I. MBNA 00/57, October 1994) **REF. NO.**

MBNA 00/57A

Revision: *Revised checking/correcting oil level procedure*

SUBJECT: ALL MODELS
ENGINE OIL LEVEL

It has recently come to our attention that some Mercedes-Benz vehicles are being operated with too much engine oil. Additionally, it is important that the oil dipstick remain **fully inserted** in the oil dipstick tube for a minimum of 3 seconds before rechecking the oil level again. Removing the oil dipstick immediately after insertion, will result in an erroneous indication of the oil quantity within the engine.

Excess engine oil affects the engine's drivability and performance, and may lead to engine damage.

Dealers are reminded to fill the engine with the exact amount of engine oil specified for that engine (e.g. if specified quantity is 8.5 *quarts*, do not fill with 9.0 quarts or 9.0 liters of engine oil). The MAX mark on the oil dipstick must not be exceeded (upper arrow, Figure 1).

Also, please remind your customers of the proper procedure for checking/correcting the engine oil level. Emphasizing that the engine should be at normal operating temperature (80 °C) and that the vehicle is parked on a **level** surface. The engine must not have run for approx. 2 minutes, to allow the engine oil to drain into the oil pan.

Then after removing and wiping off and reinserting the oil dipstick, allow the oil dip stick to remain **fully inserted** in the oil dipstick tube for a minimum of 3 seconds before rechecking the oil level again.

Ideally, the engine oil level should be around halfway between the MAX and MIN marks on the oil dipstick.

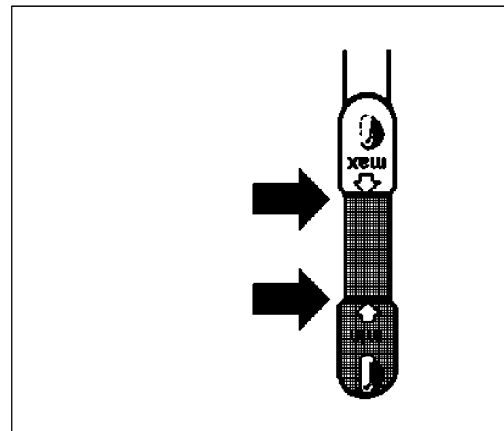


Figure 1

P01-0028-B81

Also, the customer should refrain from frequently "topping off" the engine oil level.

Never add engine oil above the MAX mark on the oil dipstick (upper arrow, Figure 1, page 1).

For approved engine oil classifications and correct viscosity grades, refer to the latest edition of the *Factory Approved Service Products* sheet.

01-0010 Engine and model survey

Engine	Model	Sales designation		Output in kW at rpm	Compr. ratio $\epsilon : 1$	Displace- ment in ccm
		as of 7/93	up to 6/93			
119.960 CIS CAT	129.066		500 SL	240/5500	10	4973
119.960 CIS	129.066		500 SL	245/5500	10	4973
119.960 CIS NV ¹⁾	129.066		500 SL	235/5500	8.8	4973
119.970 LH CAT	140.050		500 SE	240/5700	10	4973
119.970 LH NV ¹⁾	140.050		500 SE		8.8	4973
119.970 LH CAT	140.051		500 SEL	240/5700	10	4973
119.970 LH NV ¹⁾	140.051		500 SEL		8.8	4973
119.970 LH CAT	140.070		500 SEC	240/5700	10	4973
119.970 LH NV ¹⁾	140.070		500 SEC		8.8	4973
119.970 LH CAT	140.050	S 500		235/5600	10	4973
119.970 LH CAT	140.051	S 500 (LWB)		235/5600	10	4973
119.970 LH CAT	140.070	S 500 (Coupe)		235/5600	10	4973
119.971 LH CAT	140.042		400 SE	210/5700	10	4196
119.971 LH CAT	140.043		400 SEL	210/5700	10	4196
119.971 LH CAT	140.042	S 400		205/5700	11	4196
119.971 LH CAT	140.043	S 400 (LWB)		205/5700	11	4196
119.971 LH CAT	140.063	S 400 (Coupe)		205/5700	11	4196
119.972 LH CAT	129.067	SL 500	500 SL	235/5600	10	4973
119.974 LH CAT	124.036		500 E	240/5700	10	4973
119.974 LH	124.036	E 500		235/5600	10	4973
119.975 LH CAT	124.034		400 E	210/5700	10	4196
119.975 LH CAT	124.034	E 400		205/5700	11	4196

CIS = Continuous electronic fuel injection system

LH = LH-SFI = Air mass metering with hot wire

¹⁾ Fuel-economy



Engine	Model	Sales designation		Output in kW at rpm	Compr. ratio ε : 1	Displace- ment in ccm
		as of 7/93	up to 6/93			
119.980 ME CAT	140.050	S 500		235/5600	11	4973
119.980 ME NV ¹⁾	140.050	S 500		230/5600	9.1	4973
119.980 ME CAT	140.051	S 500 (LWB)		235/5600	11	4973
119.980 ME NV ¹⁾	140.051	S 500 (LWB)		230/5600	9.1	4973
119.980 ME CAT	140.070	S 500 (Coupe)		235/5600	11	4973
119.980 ME NV ¹⁾	140.070	S 500 (Coupe)		230/5600	9.1	4973
119.981 ME CAT	140.042	S 400		205/5700	11	4196
119.981 ME CAT	140.043	S 400 (LWB)		205/5700	11	4196
119.981 ME CAT	140.063	S 400 (Coupe)		205/5700	11	4196
119.982 ME CAT	129.067	SL 500		235/5600	11	4973
119.985 ME CAT	210.072	E 420		205/5700	11	4196
119.985 ME CAT	210.272	E 420T		205/5700	11	4196

CIS = Continuous electronic fuel injection system

LH = LH-SFI = Air mass metering with hot wire

ME = ME-SFI = Electronic engine management

¹⁾ Fuel-economy

01-0080 Hazard warnings when hood opened



Do not raise hood by the handle.

The windshield wiper arm must not be tilted forward when opening the hood.

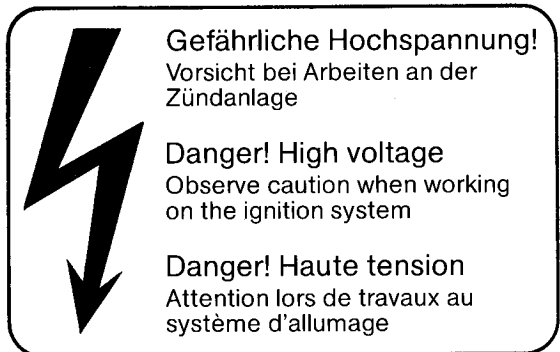
Risk of injury if the hood is opened and the engine is running.

The engine with DI ignition system is very hazardous because of the high ignition voltage.

Do not touch components of the ignition system (ignition coil, distributor, ignition cables, spark plug connectors, test socket) when

- the engine is running,
- the engine is started,
- the key in the steering lock is in position 2 and the engine is being cranked by hand.

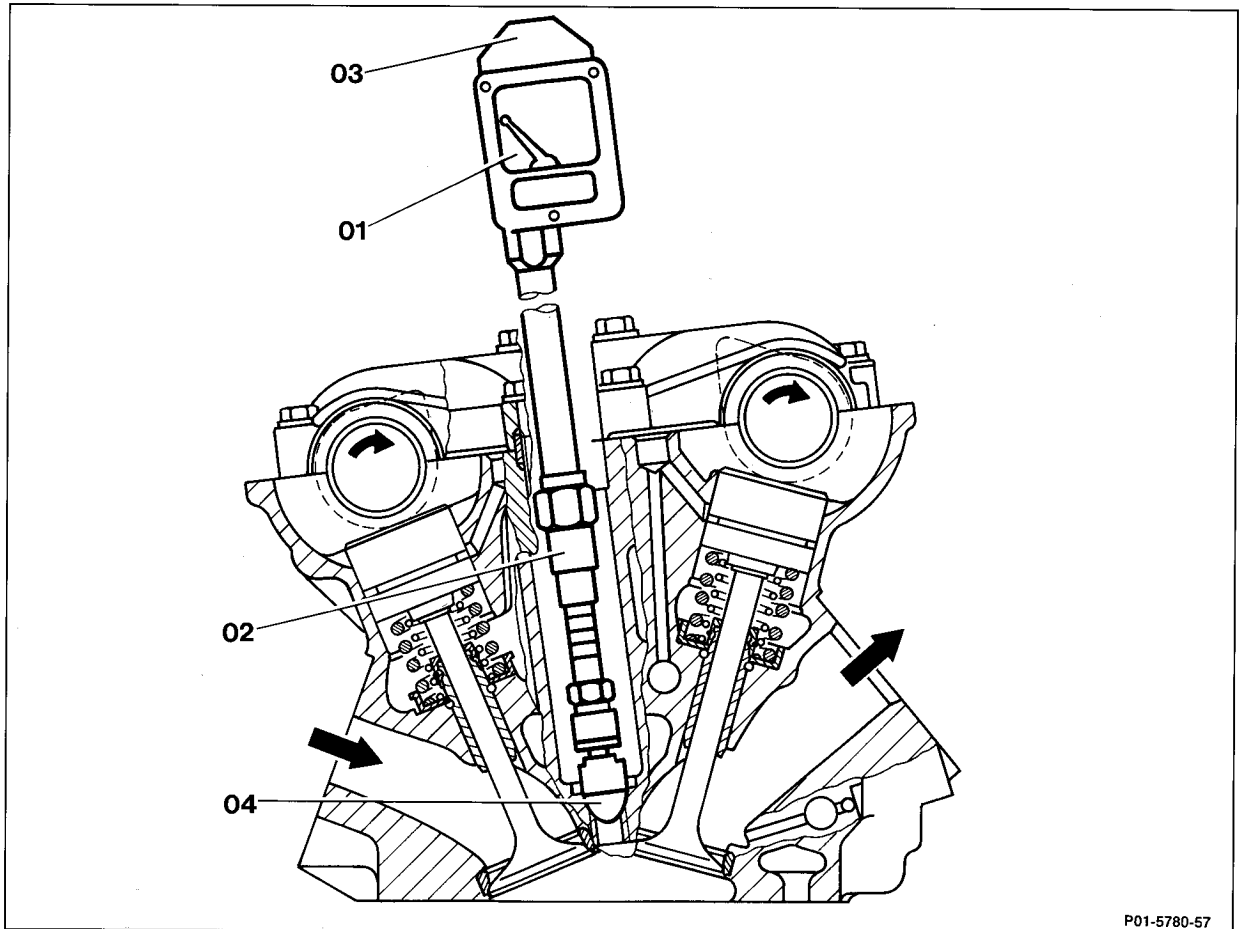
Pay attention to information regarding working on the breakerless transistorized ignition system (15-0505).



P15-0241-13

01-0100 Testing compression pressure

Operation no. of operation texts and work units or standard texts
and flat rates
01-1200



P01-5780-57

- 01 Compression tester, special tool 001 589 77 21 00
- 02 Adaptor
- 03 Diagram sheet
- 04 Sealing cone

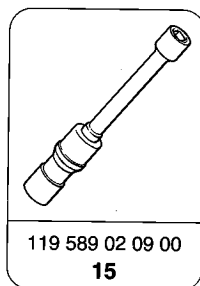
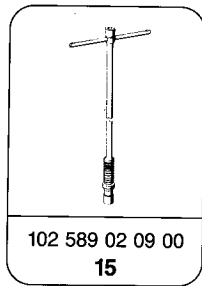
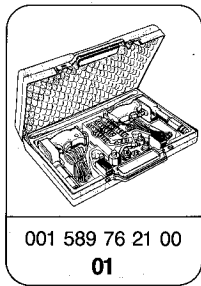
Engine	warm up to operating temperature.
Spark plugs	remove, install (15-1031).
Engine	crank with starter to expel residues and soot (01-0110).
Diagram sheets (03)	insert into compression tester (01).

- Compression push tester (01) into spark plug hole of relevant cylinder.
- Engine crank about 8 revolutions with starter (01-0110).
- All the cylinders check in this way.
- Spark plug recesses blow out with compressed air.
- If minimum compression pressure not reached, .. check cylinders for leaks (01-0150).

Test data for engine at normal operating temperature, pressure in bar

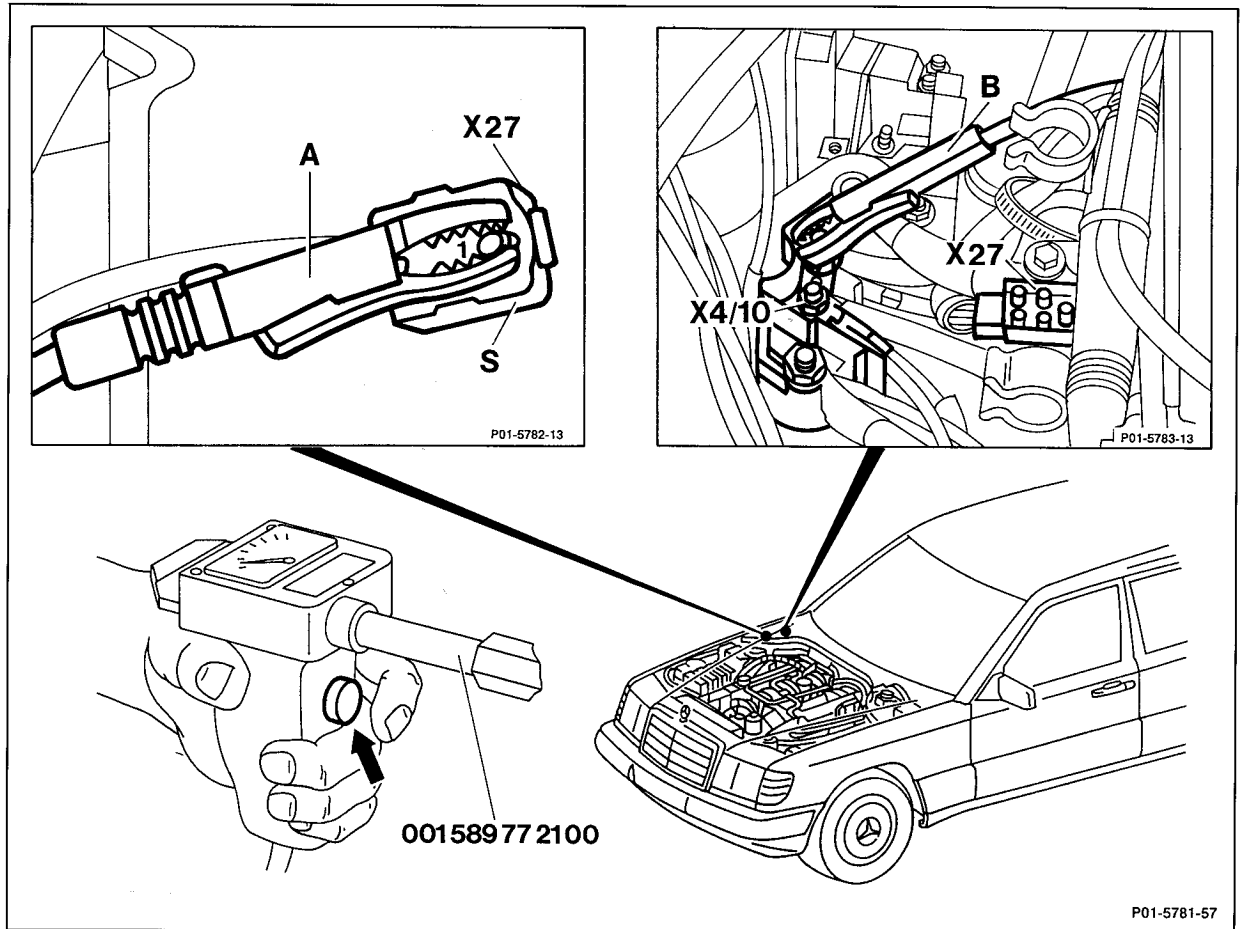
Compression pressure at	Normal compression	min. 10	max. 14
	Fuel-optimised	min. 6	max. 10
Permissible difference between individual cylinders		max. 1.5	

Special tools



01-0110 Cranking engine with starter

A. Model 124.034



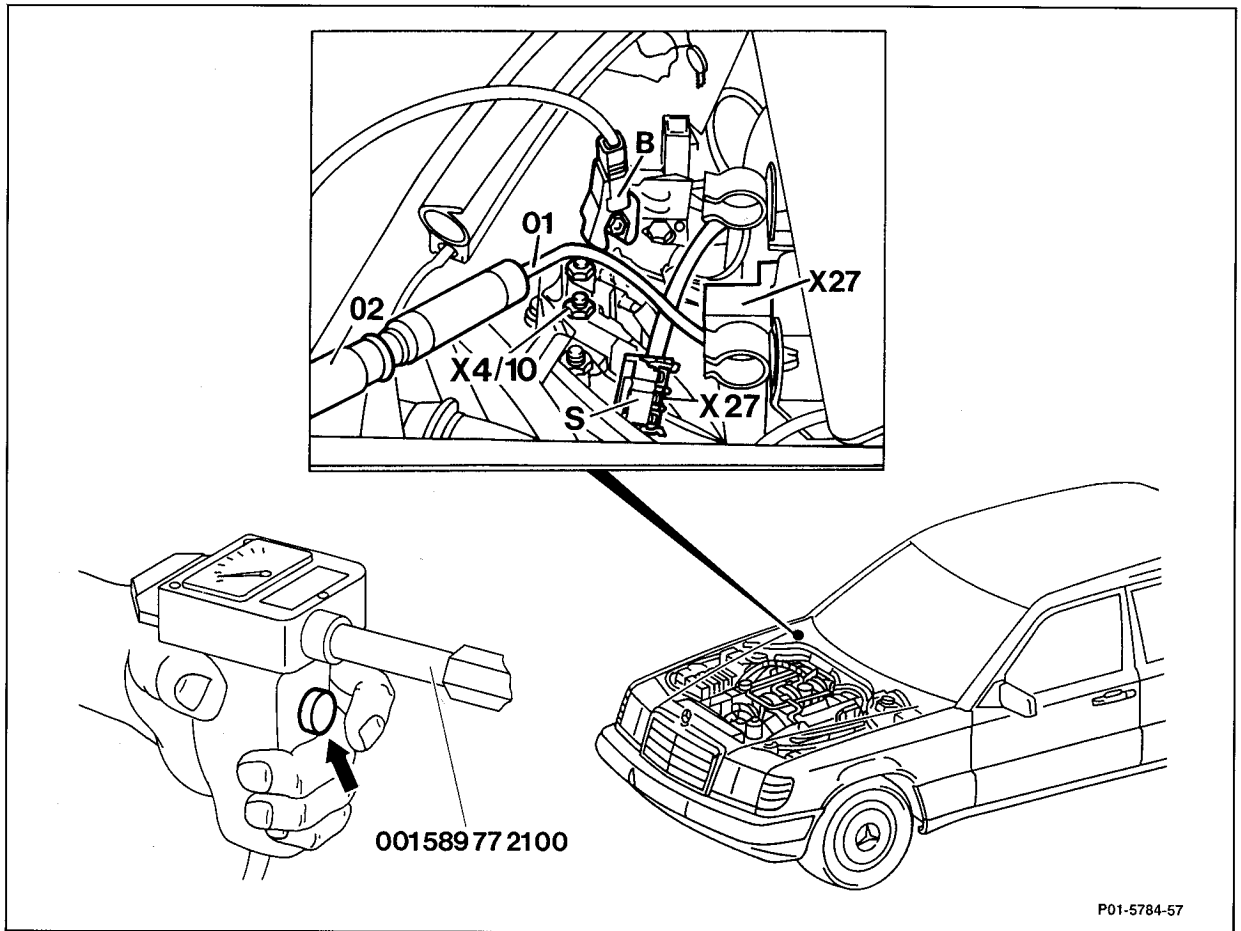
Ignition	switch off.
Cover over engine component compartment	detach, attach.
Cover of terminal block (X4/10)	open, close.
Connector (S) of plug connection (X27)	unplug, plug in.
Crocodile clamp (A) of compression tester at pin 1 of connector	connect, disconnect, special tool 001 589 77 21 00.
Crocodile clamp (B) of compression pressure recorder at the terminal block (X4/10)	connect, disconnect.
Engine	crank in idle speed position and with parking brake applied by pushing contact handle (arrow) on compression tester.



Do not crank engine using ignition starter switch.

Handwritten signature or mark

B. Model 124.036

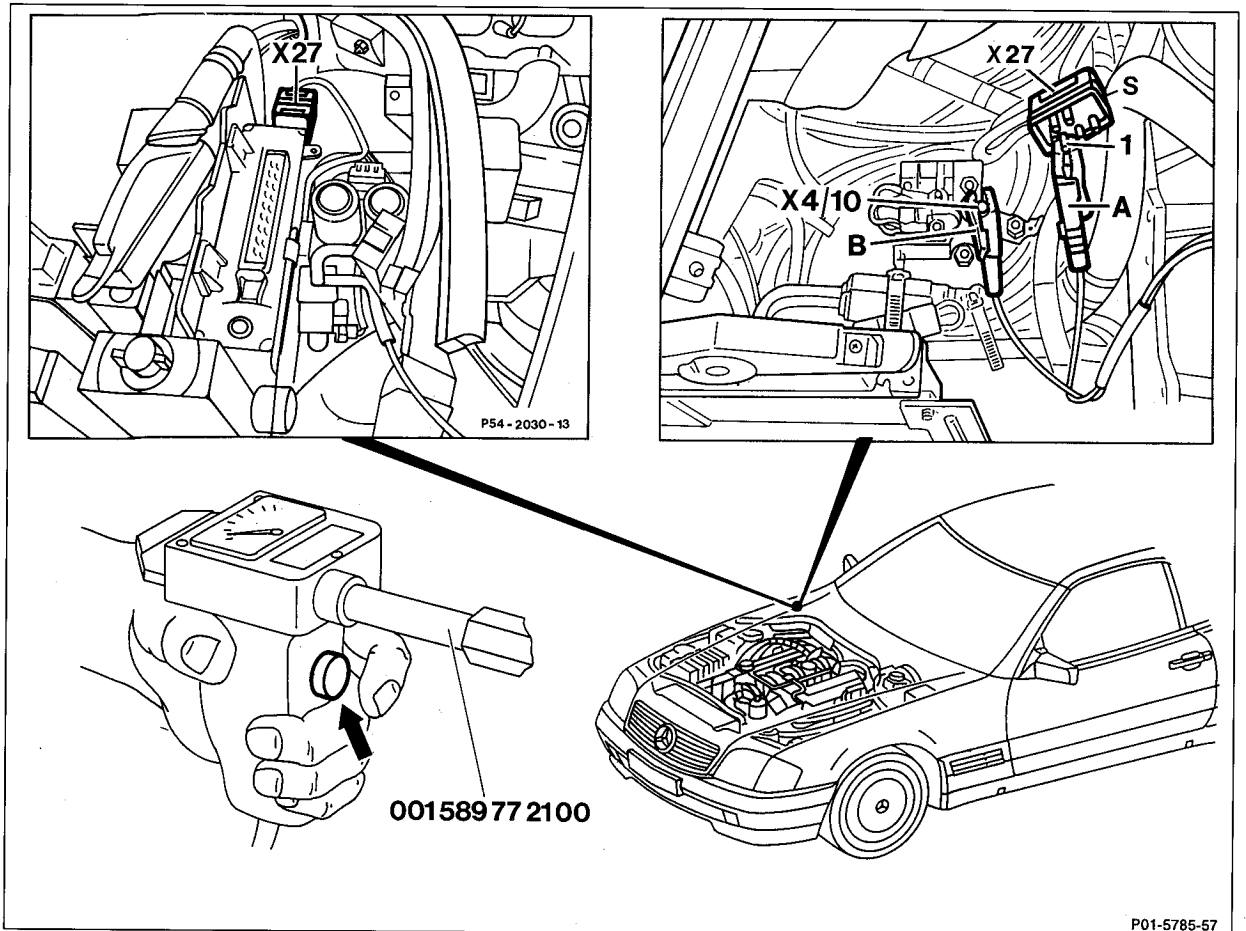


- | | |
|---|--|
| Ignition | switch off. |
| Cover over engine component compartment | take off, install. |
| Cover of terminal block (X4/10) | open, close. |
| Connector (S) of plug connection (X27) | unplug, plug in. |
| Adaptor cable (01) with plug connection (X27) . . . | connect, separate,
special tool 124 589 36 63 00. |
| Adaptor cable (01) with cable (02) of
compression tester | connect, separate,
special tool 001 589 77 21 00. |
| Crocodile clamp (B) of compression tester) | connect to terminal block (X4/10, disconnect. |
| Engine | crank in idle speed position and with parking
brake applied by pushing contact handle (arrow)
at the compression tester. |



Do not crank engine using ignition starter switch.

C. Model 129 with engine 119.960

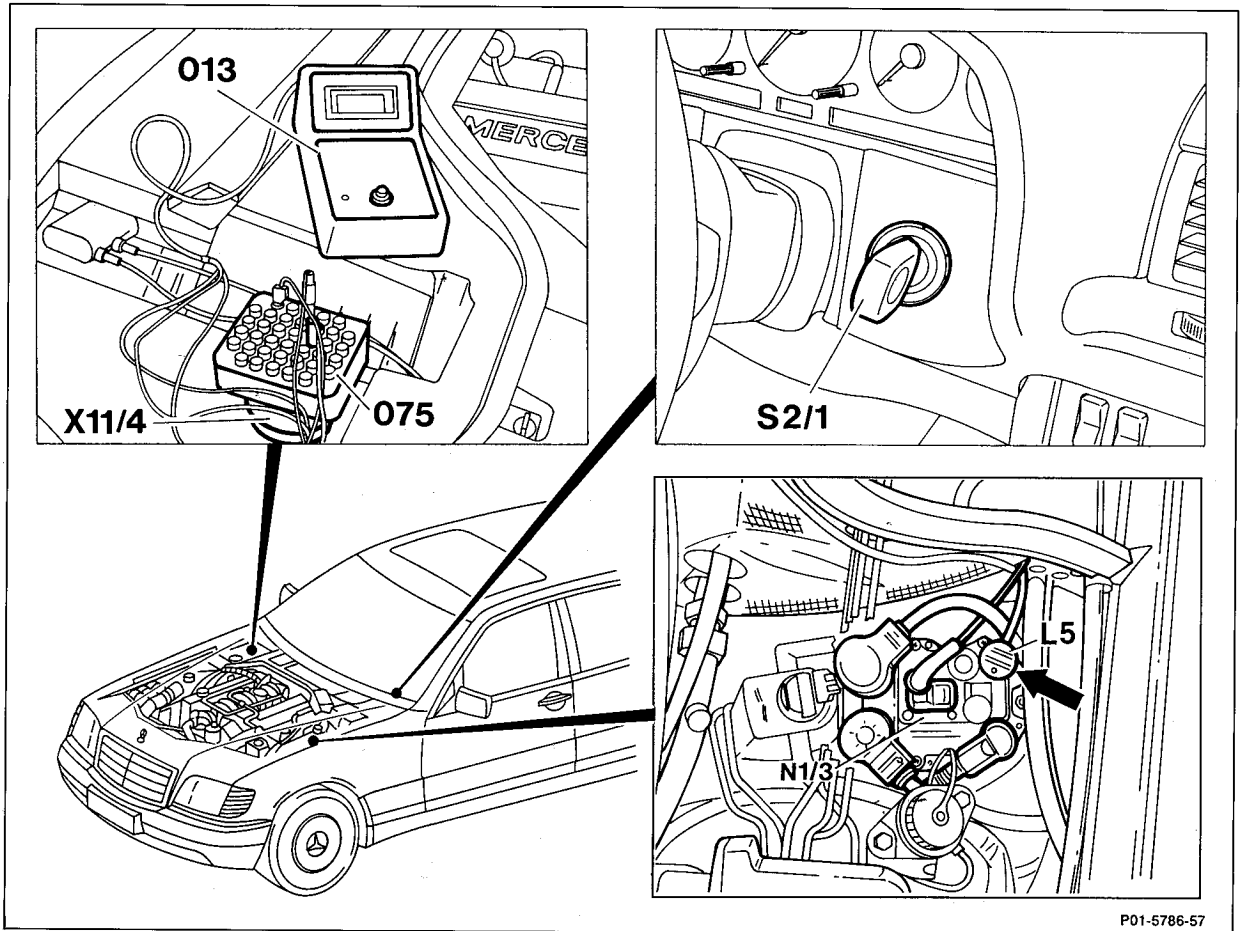


Ignition	switch off.
Cover over component compartment	remove, install.
Connector of plug connection (X27)	unplug, plug in.
Crocodile clamp (A) of compression tester	connect at pin 1 of connector (S), disconnect, special tool 001 589 77 21 00.
Cover of terminal block (X4/10)	open, close.
Crocodile clamp (B) of compression	connect tester to terminal block (X4/10), disconnect.
Engine	crank in idle speed position and with parking brake applied by pushing contact handle (arrow) on compression tester.



Do not crank engine using ignition starter switch.

D. Typ 140



P01-5786-57

- 013 Pulse counter
- 075 Pulse counter adaptor
- X11/4 Test coupling for diagnosis (38-pin)

Left cover over EZL ignition control unit	take off, fit on.
Crankshaft position sensor (L5) at EZL ignition control unit (N1/3)	unplug, plug in.
Engine	crank in idle speed position and with parking brake applied using ignition starter switch (S2/1).
EZL ignition control unit (N1/3) fault memory	read, erase (see Diagnosis Manual Engine Volume 2, Index 0).

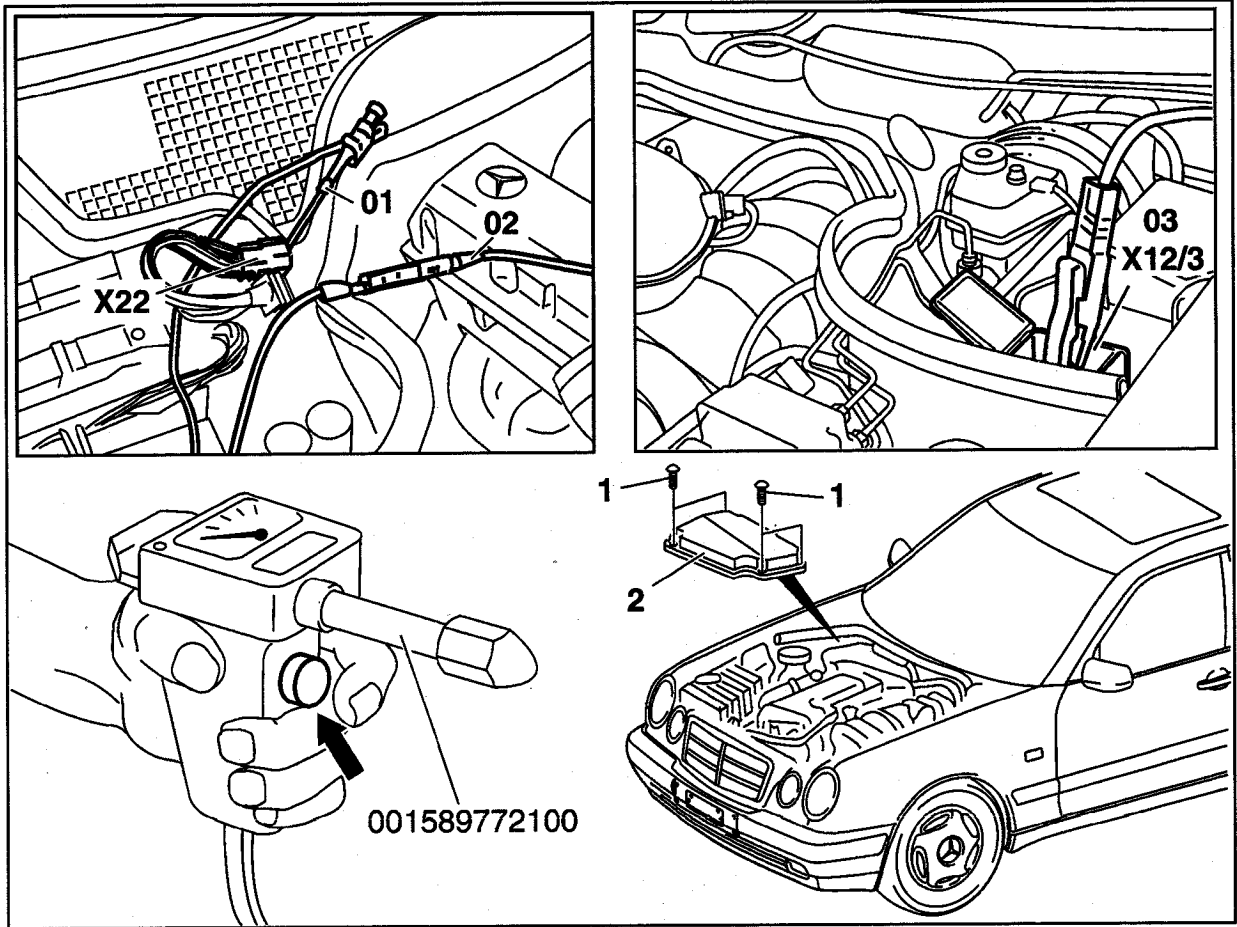
Note

If the engine is started with the crankshaft position sensor (L5) unplugged, a fault is stored in the EZL ignition control unit (N1/3) fault memory (contact 17, pulse readout 17). This must be erased after completing the work.

E. Model 210

Preceding work:

Hazard warnings when hood opened (01-0085).



P01.10-0263-57

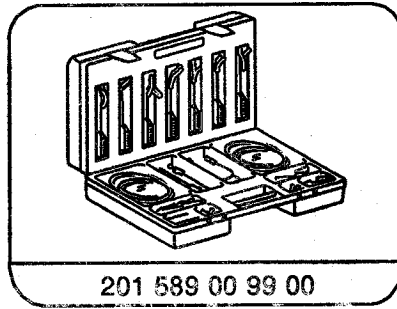
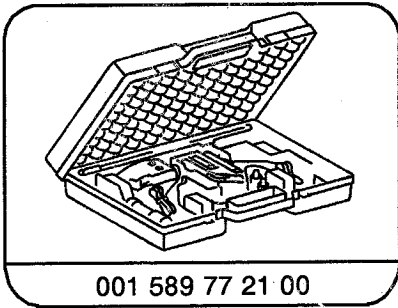
Ignition	switch off.
Cover (2) over engine component compartment .	remove, install.
Connector of plug connection (X22) (circuit 50) ..	unplug, plug in.
Clamp of cable (01)	connect to pin 1 of plug connection (X22) circuit 50, disconnect.
Cable (01)	connect to cable (02) of compression recorder, disconnect.
Cover of terminal block (X12/3)	open, close.
Clamp (03) of compression recorder	
001 589 76 21 00	connect to terminal block (X12/3) circuit 30, disconnect.

Engine crank by pressing the contact switch (arrow) on the compression recorder, transmission in Neutral and parking brake applied.





Do not crank engine at ignition/starter switch.

Special tools



01-0150 Testing cylinders for leaks

Operation no. of operation texts and work units or standard texts
and flat rates
01-1300

Engine	warm up to operating temperature.
Ground cable at battery	disconnect, connect.
Spark plugs	remove, install (15-1031).
Cap on coolant expansion reservoir	open, close.
	
	Do not open cap unless coolant temperature is below 90 °C. Risk of scalding!
Coolant level	adjust to correct level (20-0100).
Oil filler cap	open, close.
Cylinder leak tester	connect to compressed air system.
Tester	calibrate.
Connection hose	screw in to first spark plug hole, remove.
Piston of cylinder to be tested	position with adjuster by turning crankshaft to ignition TDC.
Piston in ignition TDC	see table.
Connection hose of tester	connect, disconnect.
Compression chamber	pressurise.
	
	The crankshaft must not rotate; if necessary secure crankshaft with locking device to prevent it rotating (03-5000).
Throttle valve	open by hand.
Pressure loss on tester in %	read off.
Pressure	determine whether leak through intake manifold, exhaust, oil filler opening, spark plug hole of adjacent cylinder or coolant filler opening (at reservoir).
All cylinders	test in firing order (1-5-4-8-6-3-7-2).

Data

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

Marking index	Piston in TDC
0	1 and 6
90	5 and 3
180	4 and 7
270	8 and 2

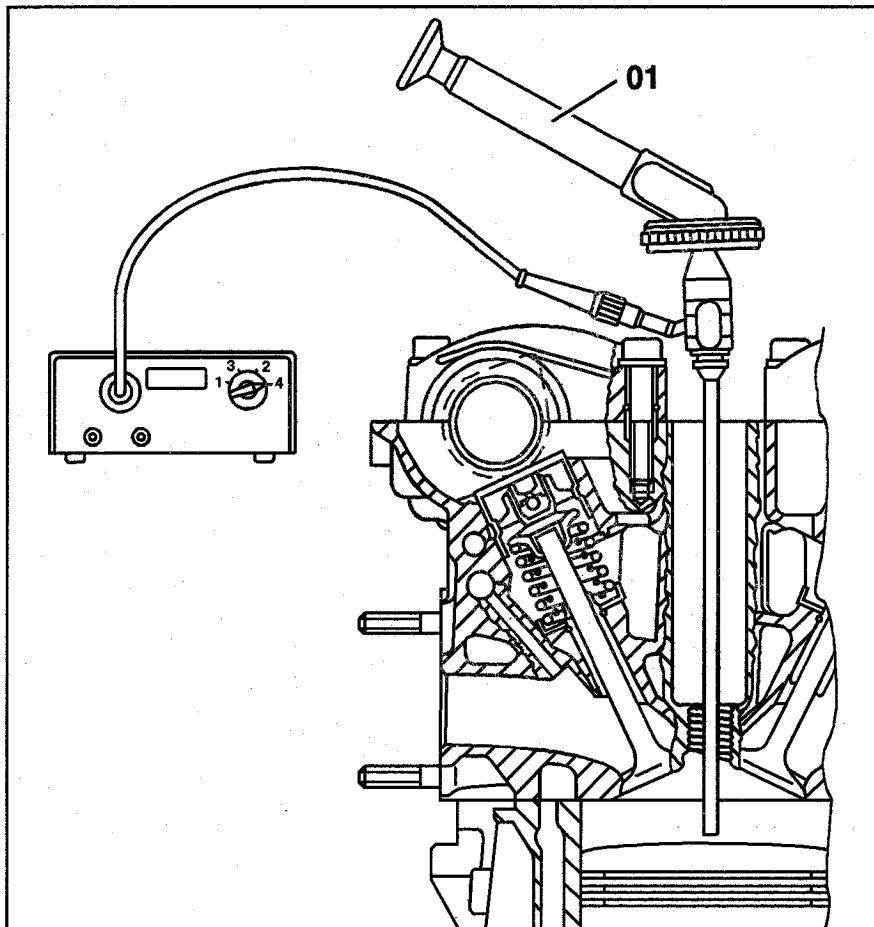
Commercially available tool

Cylinder leak tester	e. g.	Bosch, EFAW 210A Sun, CLT 228
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01-0200 Inspecting cylinders with light pobe, assessing cylinders

Preceding work:
 Removing, installing spark plugs (AP15.00-1580CA)
 Hazard warnings when hood opened (01-0085)

Operation no. of operation texts and work units or standard texts
 and flat rates
 01-1321



P01-6031-37

Piston	position to BDC, see table.
Motoskop and lens probe	connect. Motoskop TW 12 V to car battery Motoskop TW 220 V to mains.
Lens probe	insert into cylinder, remove.
Cylinder	inspect, assess, see note.

Commercially available tool

Cylinder inspection lamp

e.g. Karl Storz GmbH,
78532 Tuttlingen
Motoskop TW (cold light)
with lens probe
103 26 CT (210 mm)

Marking index on TDC pointer	Piston in BDC position
0	4 and 7
90	8 and 2
180	1 and 6
270	5 and 3

Note

If complaints are received regarding an engine because of noises, overheating, oil consumption etc., it is good practice to perform a visual inspection with a cylinder inspection lamp with the cylinder head installed.

The information which follows is designed to help in assessing the cylinder walls, in taking a proper professional decision regarding the condition and further use of the crankcase.

1. Normal condition

Mat grey surface, no honing pattern.

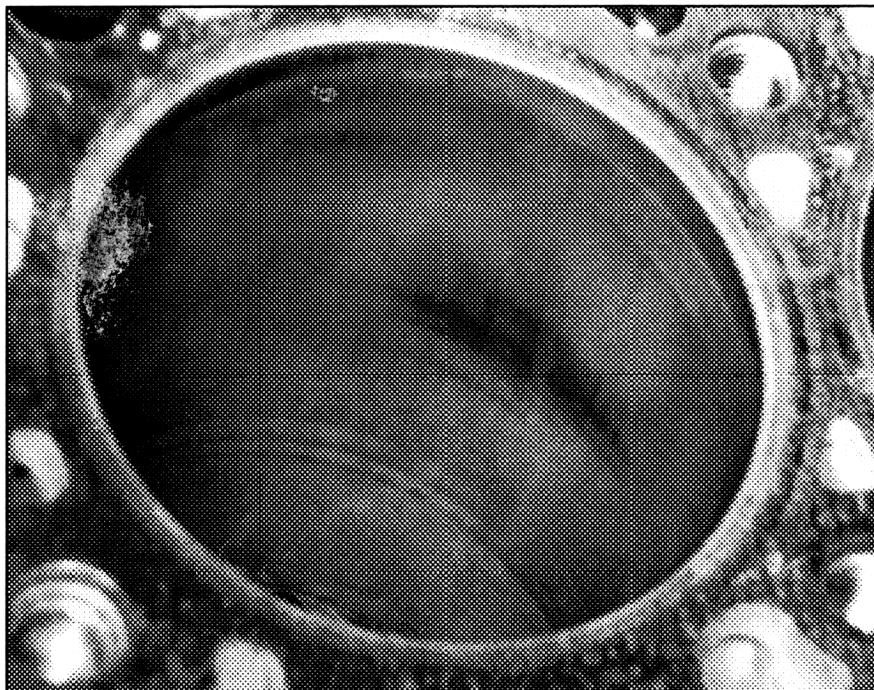
If it is not possible to assess the cylinders with sufficient certainty by means of a visual inspection with the cylinder inspection lamp, the cylinder head should then be removed.



2. Bright pressure marks, smoothing

Individual bright points e.g. in the middle of the cylinder or in the area of the cylinder head bolt pipes.

Continue using crankcase.

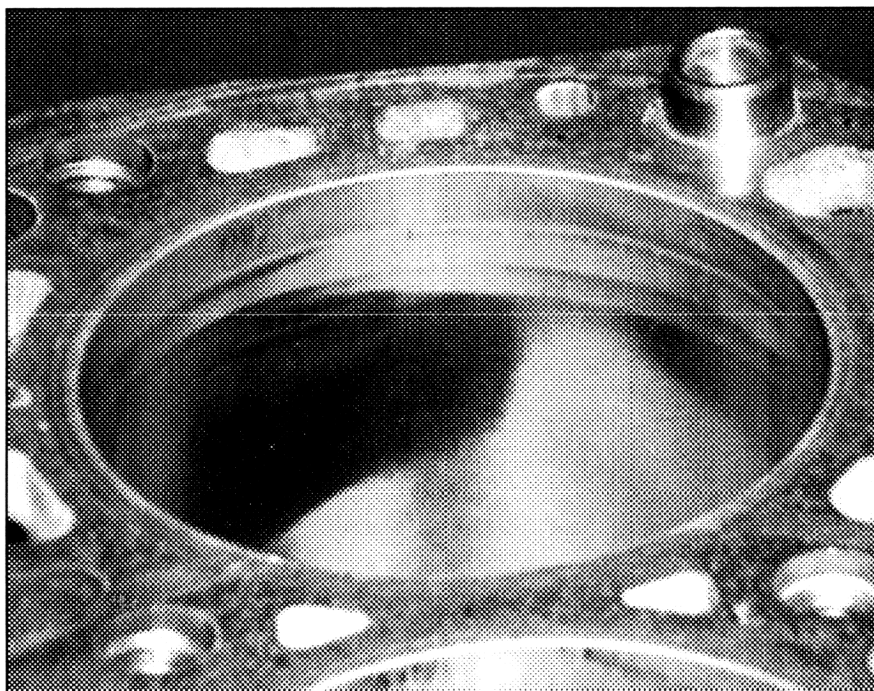


P01.40-0265-35

3. Bright cylinder surfaces, polished and reflective all round

Usually starting from the first piston ring, in the top area of cylinder, with measurable partial cylinder wear.

Cylinder wall un-serviceable.

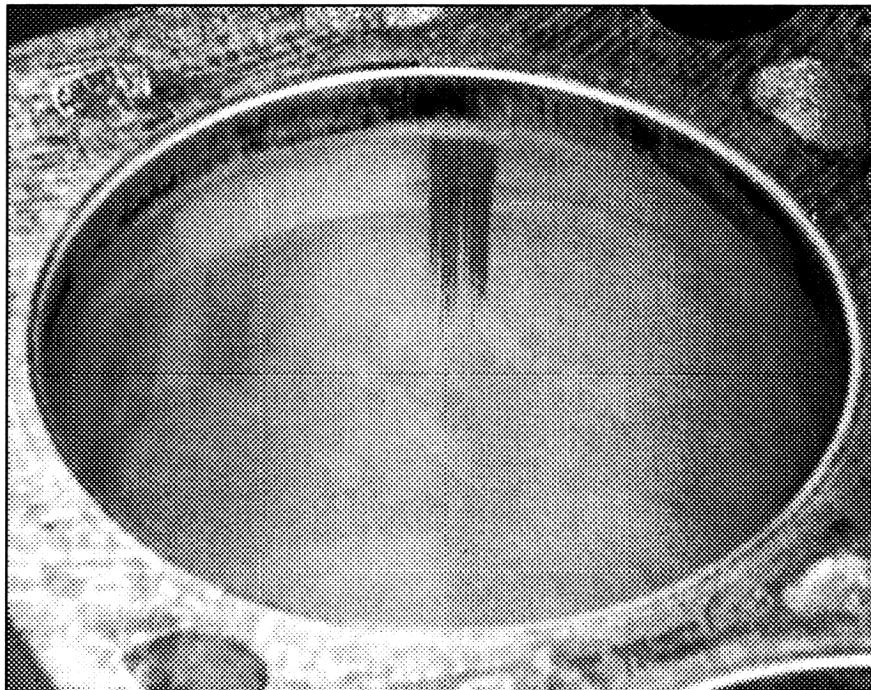


P01.40-0266-35



4. Visual streaks, traces of rubbing

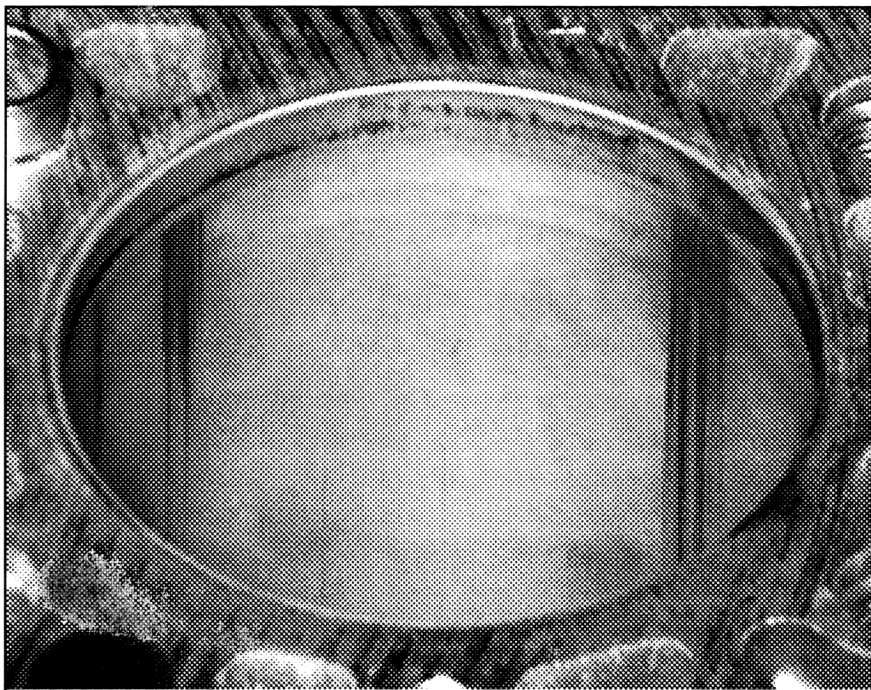
Starting from first piston ring, extending for about 30 mm. Traces of dry rubbing which cannot be felt, caused by fuel ablation of the oil film, e.g. frequent cold starting in short-distance driving. These traces of rubbing, which are likely to be found in the area of the cylinder head bolts and on the pressure side, are acceptable if smoothed. The piston rings are not damaged. Continue using crankcase.



P01.40-0267-35

5. Roughened streaks, traces of seizure

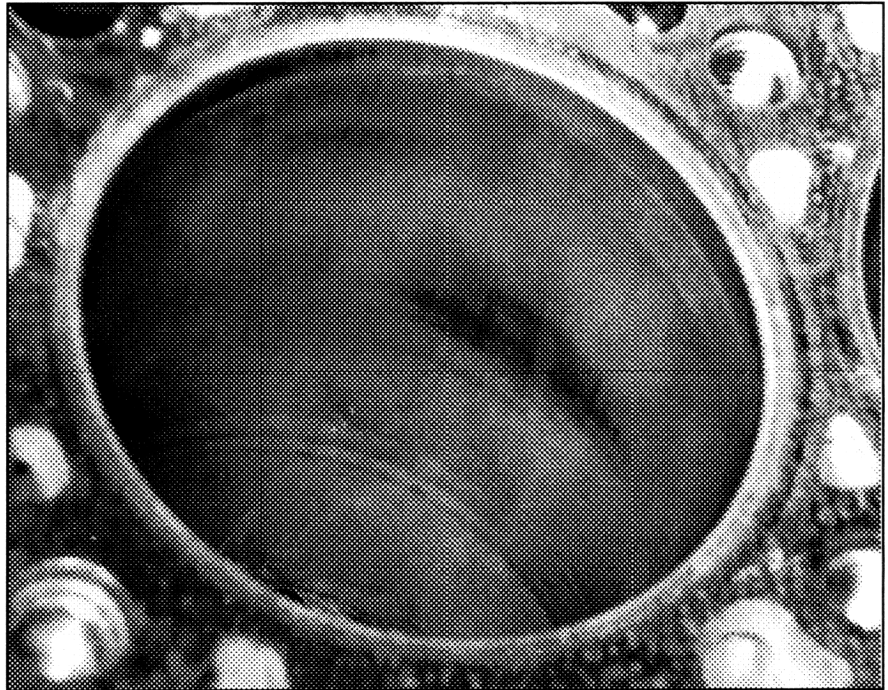
Starting from the first and second piston ring and extending initially to the bottom part of the cylinder. Traces of rubbing as described in section 4 have progressed to seizure. Piston rings may be damaged. If the streaks can be felt, cylinder wall unserviceable.



P01.40-0268-35

6. **Ring-shaped impressions**

Visible in the top and bottom piston ring reversal area, are acceptable.
Continue using crankcase.



P01.40-0265-35

7. **Traces of individual, continuous scratches**

Caused by dirt, e.g. by soot particles being pulsated back out of the exhaust.
Continue using crankcase.

8. **Piston seizure**

Cylinder wall usually roughened over the entire length to the extent that this can be felt.
Material accumulation and traces of seizure on cylinder wall and piston skirt which can be felt.
Cylinder wall unserviceable.

9. **Brown discoloration of cylinder surfaces**

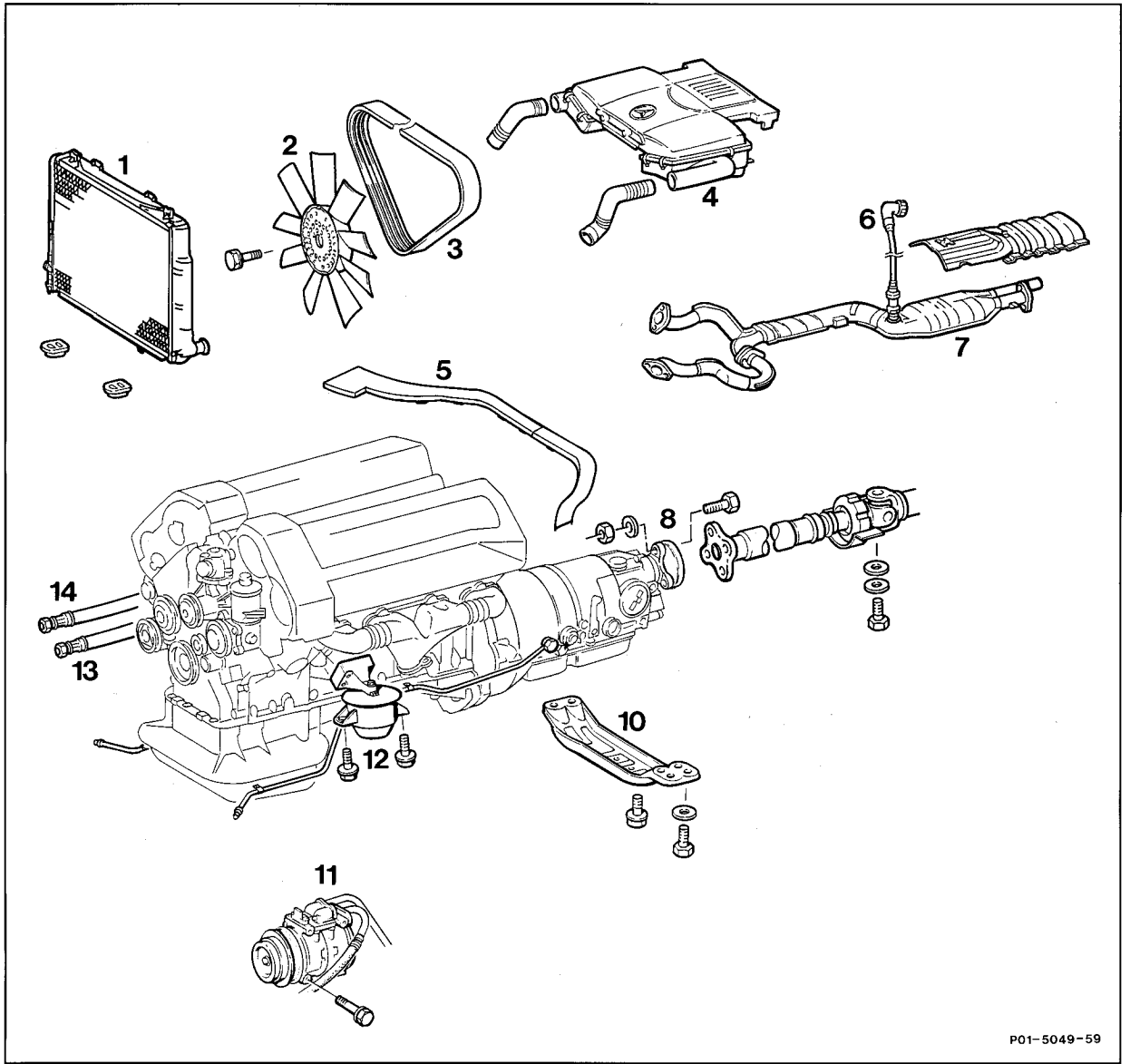
Oil varnish exists over considerable areas of the cylinder wall and indicates that the engine has been driven in a very high temperature level.
Continue using crankcase provided no impermissible cylinder distortion exists.
Oil varnish above the piston ring zone is normal and is acceptable.

01-0300 Removing and installing engine

Preceding work:
 Air cleaner (4) removed (09-0015).
 Bottom engine compartment panel removed
 (Maintenance Manual 6190).
 Radiator removed (20-4200).

Operation no. of operation texts and work units or standard texts
 and flat rates
 01-2400, 2800

A. Models 124, 129, 140



P01-5049-59

Engine 119, model 140

Ground cable at battery	disconnect, connect.
Coolant at crankcase	drain.

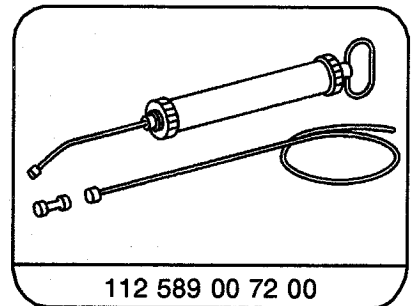
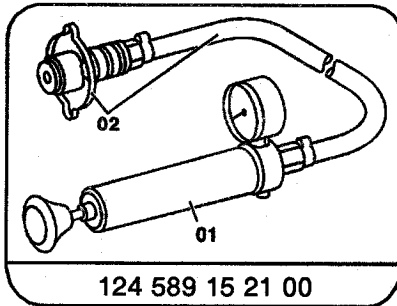
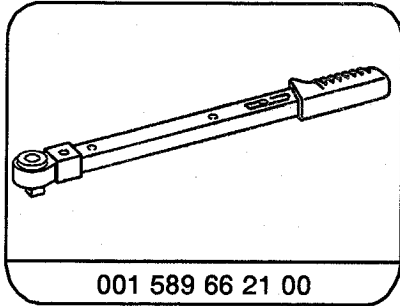
If AC fitted:	
guard plate at condenser	attach, remove.
Model 140: left Bowden cable (engine compartment lock)	detach, attach.
Heating water lines at rear of intake manifold and at connection pipe to rear of crankcase	detach, attach.
Viscous fan clutch with fan (2)	remove, install (20–3120).
If AC fitted:	
poly V-belt (3)	remove, install (13–3420).
Fuel lines	take off, seal with special tool 000 589 40 37 00, fit on. Open fuel filler cap briefly beforehand.
Electrical connections (engine wiring harness) .	detach, attach.
Vacuum lines	detach, attach.
Bowden cable (accelerator control)	remove, install (30–0025).
Model 124: accelerator control linkage at rear .	remove, install.
Vacuum line of brake servo unit	unbolt, bolt on.
Power steering pump, oil in reservoir	extract, special tool 112 589 00 72 00. Adjust oil to correct level (46–0715).
Oil lines of power steering pump	detach, seal, attach.
If air injection fitted: air pump plug connection .	detach, plug in.
Model 124: front bumper	remove, install (88–2000).
Model 124: right headlamp	remove, install (82–4730).
Model 124: air duct, left engine mount cooling .	remove, install.
Model 140: oil cooler line bracket	unbolt, bolt on.
Oil cooler lines at air-to-oil cooler (13) and (14)	unbolt, seal, bolt on (18–1300).
Model 124: left oil cooler line (13) at oil sump .	unbolt, bolt on.
If level control fitted: high pressure hose	unbolt, bolt on.
Model 124: left oil line, automatic transmission	unbolt, bolt on.
Bolt for piping behind AC compressor	unbolt, bolt on (25 Nm).
AC compressor (11) with piping connected . . .	detach, place to the side, attach (83–5300).
Plug connection, oxygen sensor (6) (lambda sensor)	disconnect, connect.
Exhaust system (7) complete	remove, install (49–0045, 49–0170).
Shield over starter	unbolt, bolt on.
Model 129: electrical connection, starter	detach, attach.
Wiring harness, starter and alternator from engine and transmission	unbolt, bolt on.
Model 124: strut below oil sump	unbolt, bolt on.

Propeller shaft of flexible coupling (8)	detach, attach. Replace self-locking nuts (41-0050).
	Note
	Flexible coupling remains on transmission.
Clamping nut and intermediate bearing attachment of propeller shaft	slacken, tighten (41-0050).
Ground cable at transmission	unbolt, bolt on.
Rear engine carrier (10) without engine mount	remove, install (22-2120).
Bracket of exhaust at transmission	unbolt, bolt on.
Shift rod at transmission	detach, attach.
Electrical connections at transmission	disconnect, connect.
Front engine mounts (12) on left and right from below	unbolt, bolt on (22-2110).
Model 124: sealing strip of component compartment panel	pull off, fit on.
Engine hoist at lifting eyes	attach, detach.
Engine with engine hoist	move into angled position and raise.
Model 129: wiring harness of alternator	unbolt, bolt on.
Engine	remove, install.
Front and rear engine mounts	examine.
Coolant, oil and fuel hoses	examine.
Automatic transmission, Bowden cable for control pressure	adjust (27-110).
Idle speed	check, adjust.
Oil drain plugs	check tightening torques.
Oil level in engine and transmission	adjust to correct level.
Coolant	pour in, check anti-corrosion/anti-freeze concentration and adjust to correct level (20-0100).
Cooling system	check for leaks, special tool 124 589 15 21 00 (20-0170).
Engine	run.
Engine leaks	check.

Note

Faults stored as a result of disconnecting cables or simulation during removal and installation or test operations, should be processed and erased in the fault memories after completing the work. Re-code or normalize radio and power windows, as appropriate. Perform final control actuations. Diagnosis Manual Volume 2, Index 0: Connecting and using test equipment.

Special tools



Commercially available tools

Engine hoist No. 3188
self-locking

e.g. Bäcker GmbH
und CO KG
D-42895 Remscheid

Shop-made tool

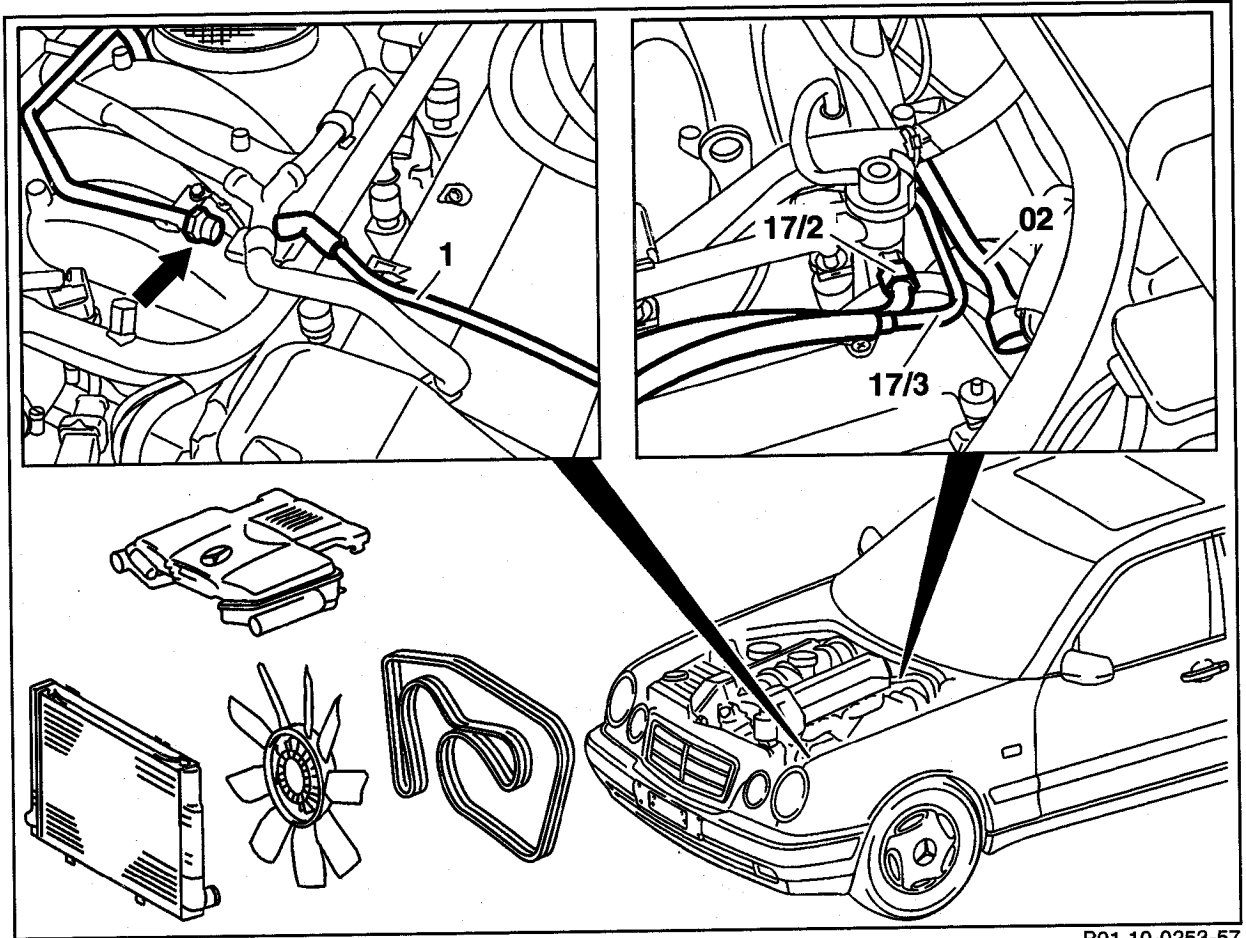
Guard plate for radiator/condenser

Dimensions approx. 400 × 680 × 1

B. Model 210

Preceding work:
 Bottom engine compartment panel removed
 (Maintenance Manual 6190)
 Viscous fan removed (20-3120)
 Radiator removed (20-4200)

Operation no. of operation texts and work units or standard texts
 and flat rates
 01-2400

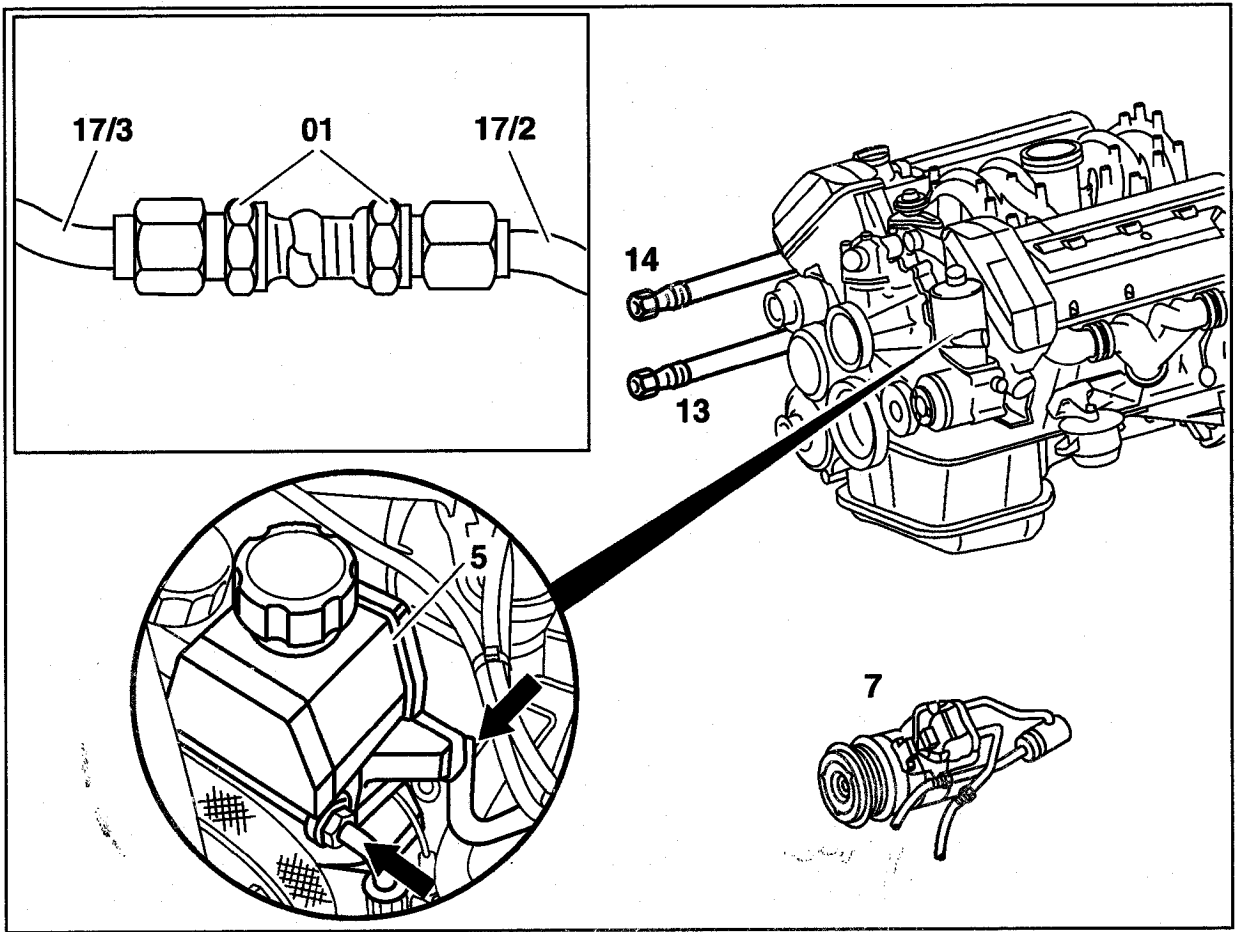


P01.10-0253-57

Cover over intake manifold	remove, install.
If A/C fitted: guard plate	attach at condenser, take off.
If A/C fitted: poly V-belt	remove, install (13-1200).
Engine wiring harness	disconnect, connect (01-0310).
Vacuum pipe (arrow) to brake servo unit at intake manifold	unbolt, bolt on.
Purge pipe (1)	disconnect, fit on.
Fuel filler cap	open to release pressure in fuel tank.
Fuel pipes (17/2) and (17/3) at fuel distributor pipe	disconnect, connect.

Note

Use box wrench bit (02) 000 589 68 03 00 to
 disconnect fuel pipe (17/3) and connect.



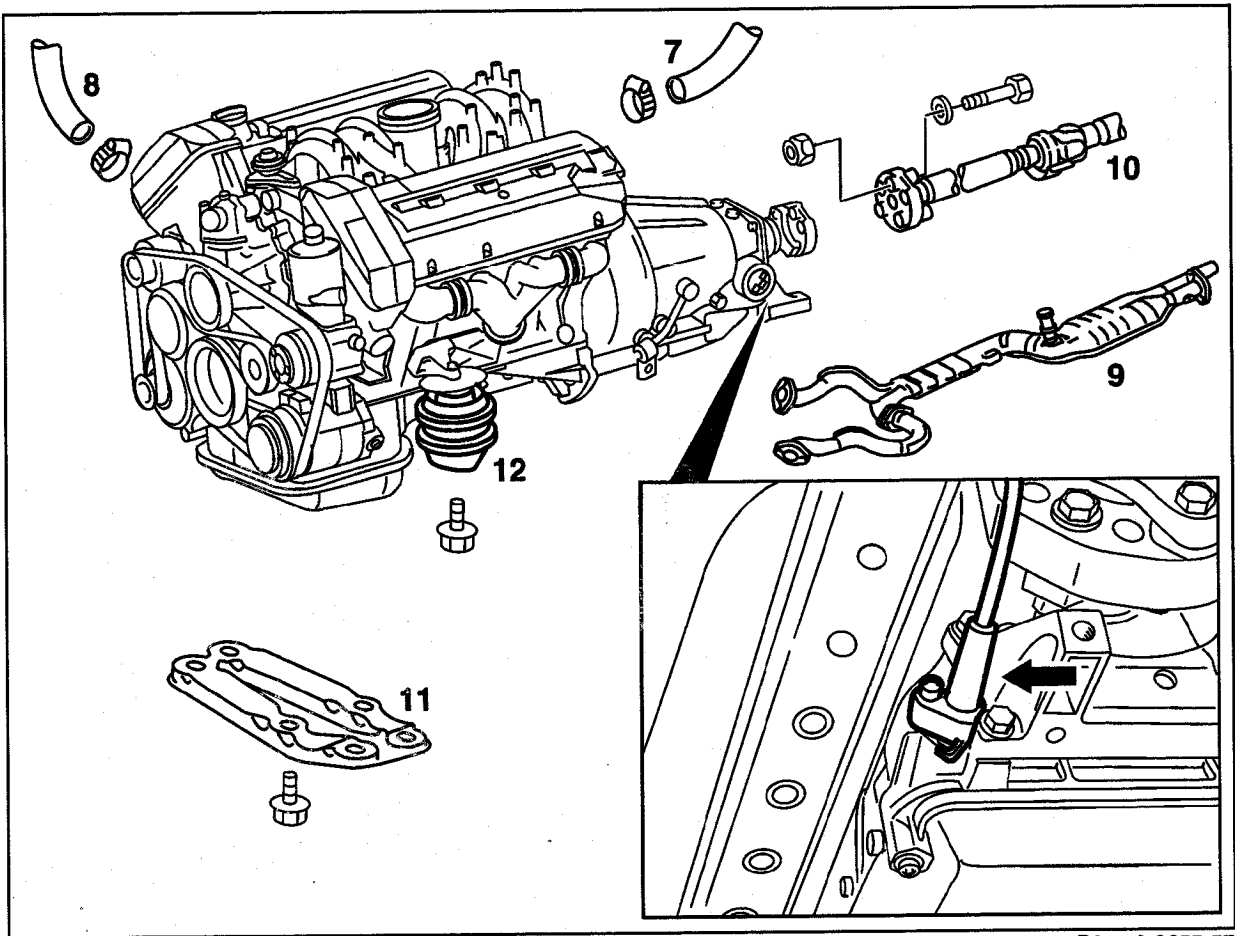
P01.10-0254-57

- Fuel pipes (17/2 and 17/3) seal with fitting (01) (shop-made).
- Power steering pump: extract oil from reservoir with priming pump
112 589 00 72 00 for sampling oil.

Note

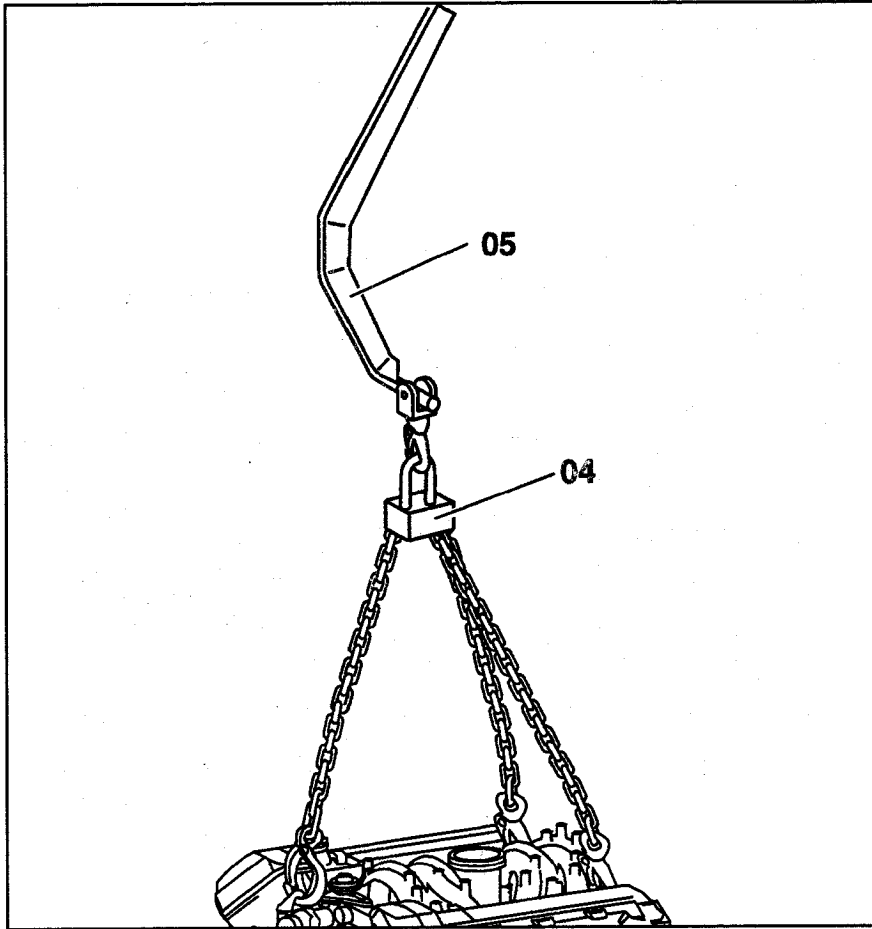
Fill, bleed power steering pump (AR46.30-0010A).

- Suction and delivery oil pipes (arrows) at power steering pump (5) disconnect, connect.
- Vacuum pipe at rear of intake manifold pull off, fit on.
- Electric wiring of O2 sensors at bracket at rear of transmission bell housing detach, attach.
- If air-oil cooling fitted: oil cooler pipes (13, 14) at oil cooler. unbolt, bolt on.
- If A/C fitted: A/C compressor (7) with connected piping unbolt, bolt on, attach to side of engine compartment.



P01.10-0255-57

Coolant at crankcase	drain (20-0100).
Coolant hoses (7) and (8)	disconnect, connect.
Exhaust system (9) at exhaust manifold and transmission intermediate mount	unbolt, bolt on.
Front propeller shaft (10) at transmission	unbolt, bolt on (AR41.10-0050B).
Propeller shaft (10)	push to the rear.
Rear engine support (11)	remove, install (22-2120).
Transmission cable (arrow) for park lock	unclip at transmission, clip into place (AR27.60-0500-05A).
⚠	
Selector rod	The cable must only be disconnected when selector lever in position "P".
Front engine mount (12) at front suspension carrier	detach, attach.
	unbolt, bolt on (22-2110).



P01.10-0256-37

Engine hoist (04)	attach to the three lifting eyes of the engine with engine supporting bar (05), detach.
Engine with transmission	move into sloping position.
Engine	remove, install.
Front and rear engine mounts	inspect.
Oil drain plugs	check tightening torques.
Engine and transmission oil level	adjust to correct level.
Coolant	pour in, check anticorrosion/antifreeze agent and adjust to correct concentration (20-0100).
Leaktightness	check.

Fault memory

read, erase.

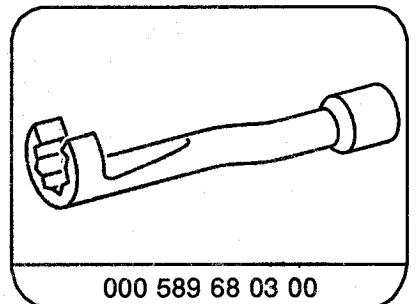
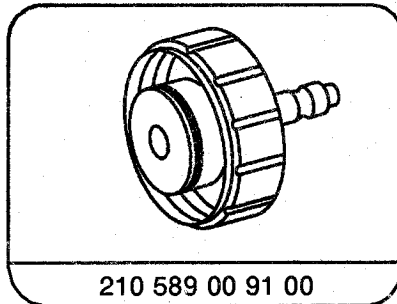
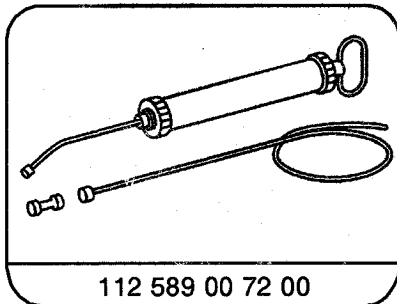
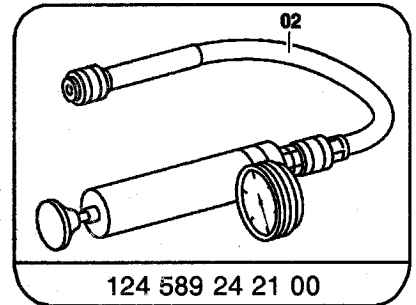
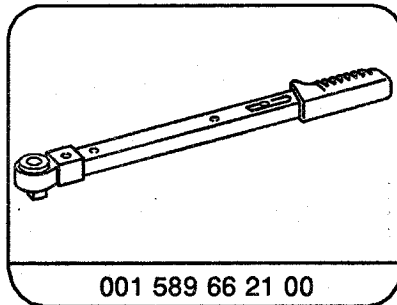
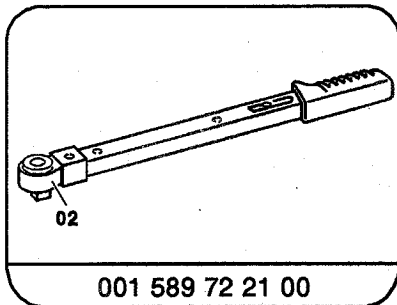
Faults stored as a result of disconnecting cables or simulation during removal and installation or test operations, should be processed and erased in the fault memories after completing the work. Re-code or normalize radio and power windows, as appropriate.

Perform final control actuations.

Diagnosis Manual Volume 2, Index 0:

Connecting and using test equipment.

Special tools



Commercially available tools

Removal device equipment model 3188
(lifting capacity 500 kg)e.g. Bäcker GmbH
und CO KG
42895 Remscheid

Engine supporting bare.g. Schairer
Weidenstraße 5
72459 Albstadt
Order no. 0304.01.001

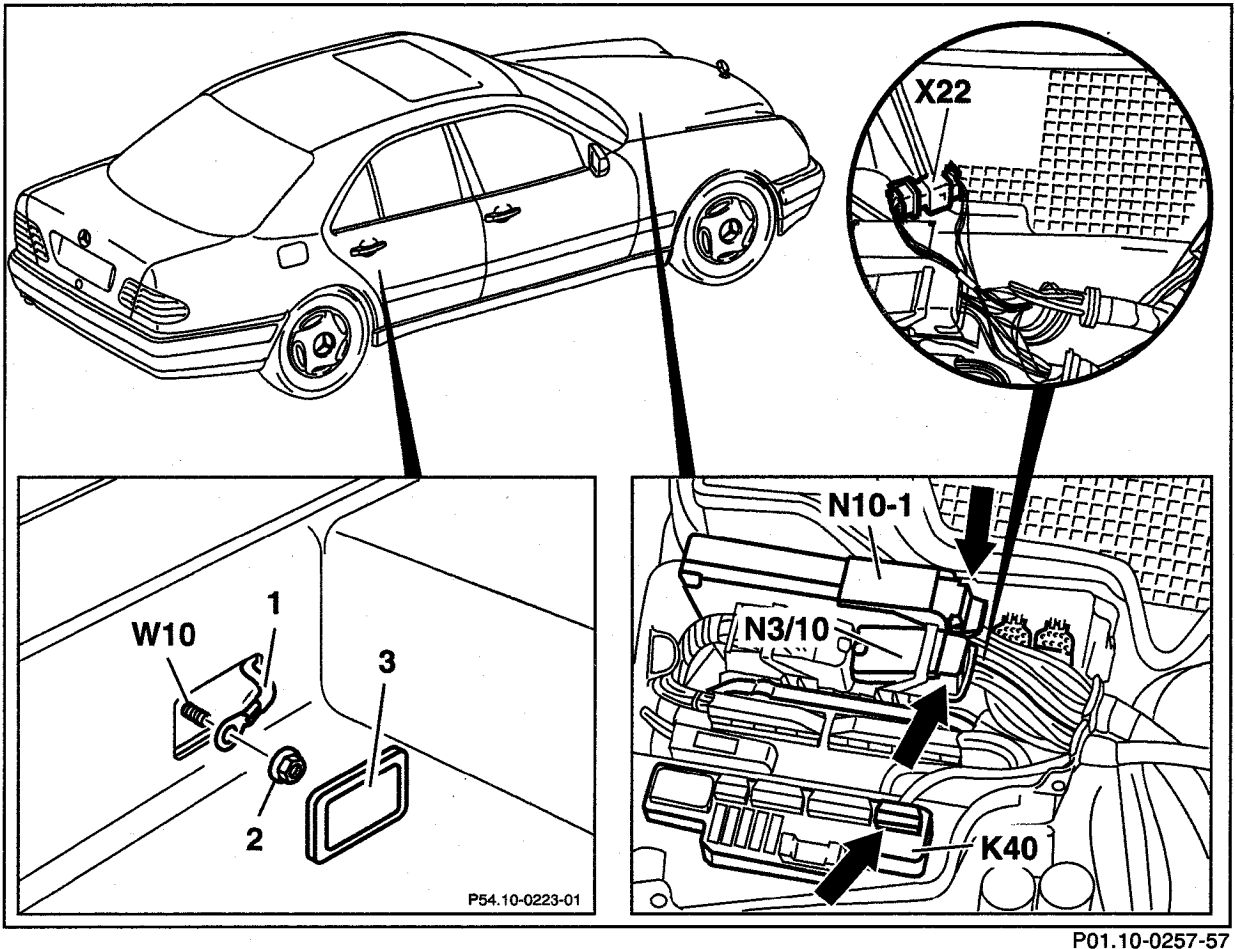
Shop-made tool

Guard plate for radiator/condenser

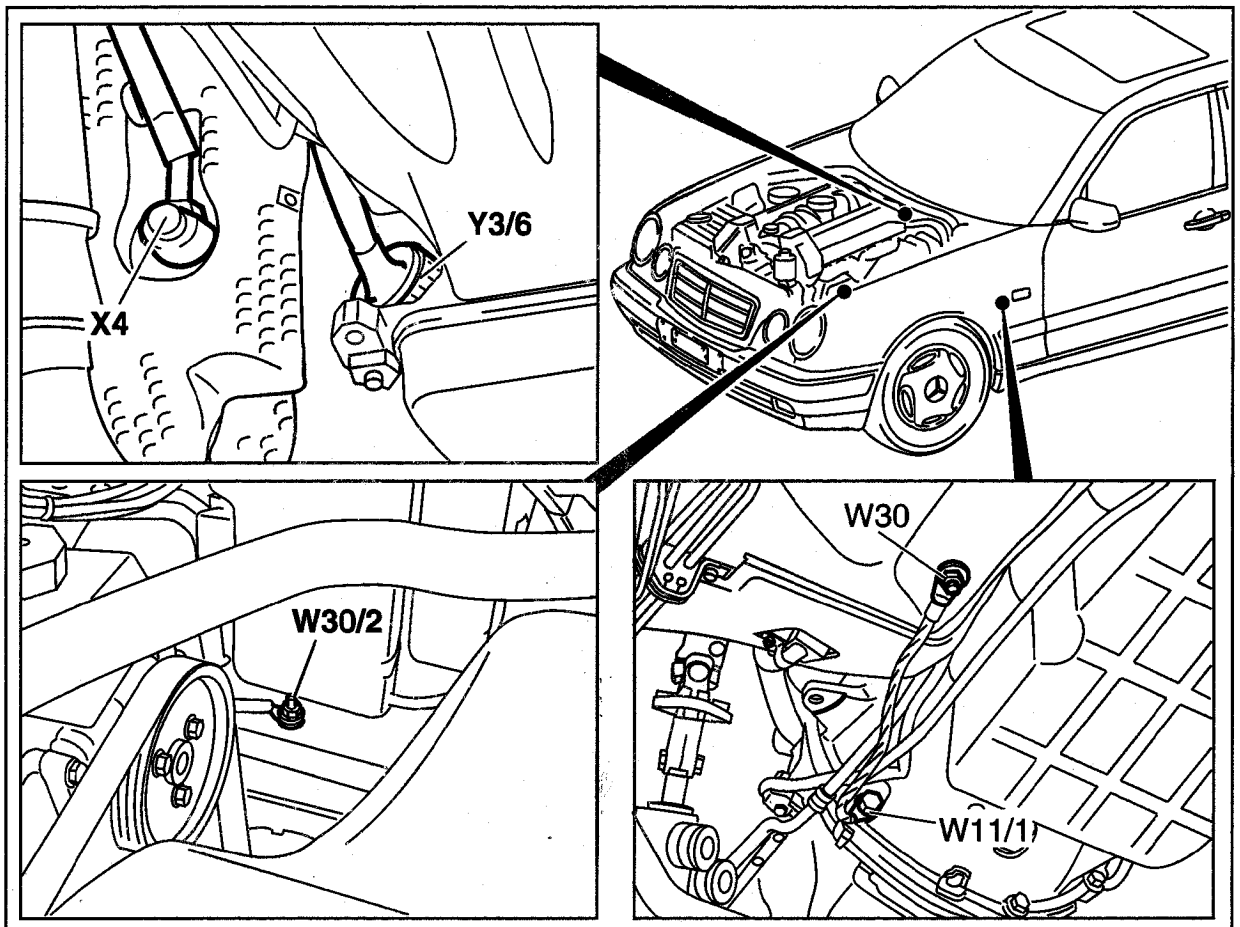
Dimensions approx. 400 × 680 × 1 mm

01-0310 Disconnecting, connecting engine wiring harness

Model 210

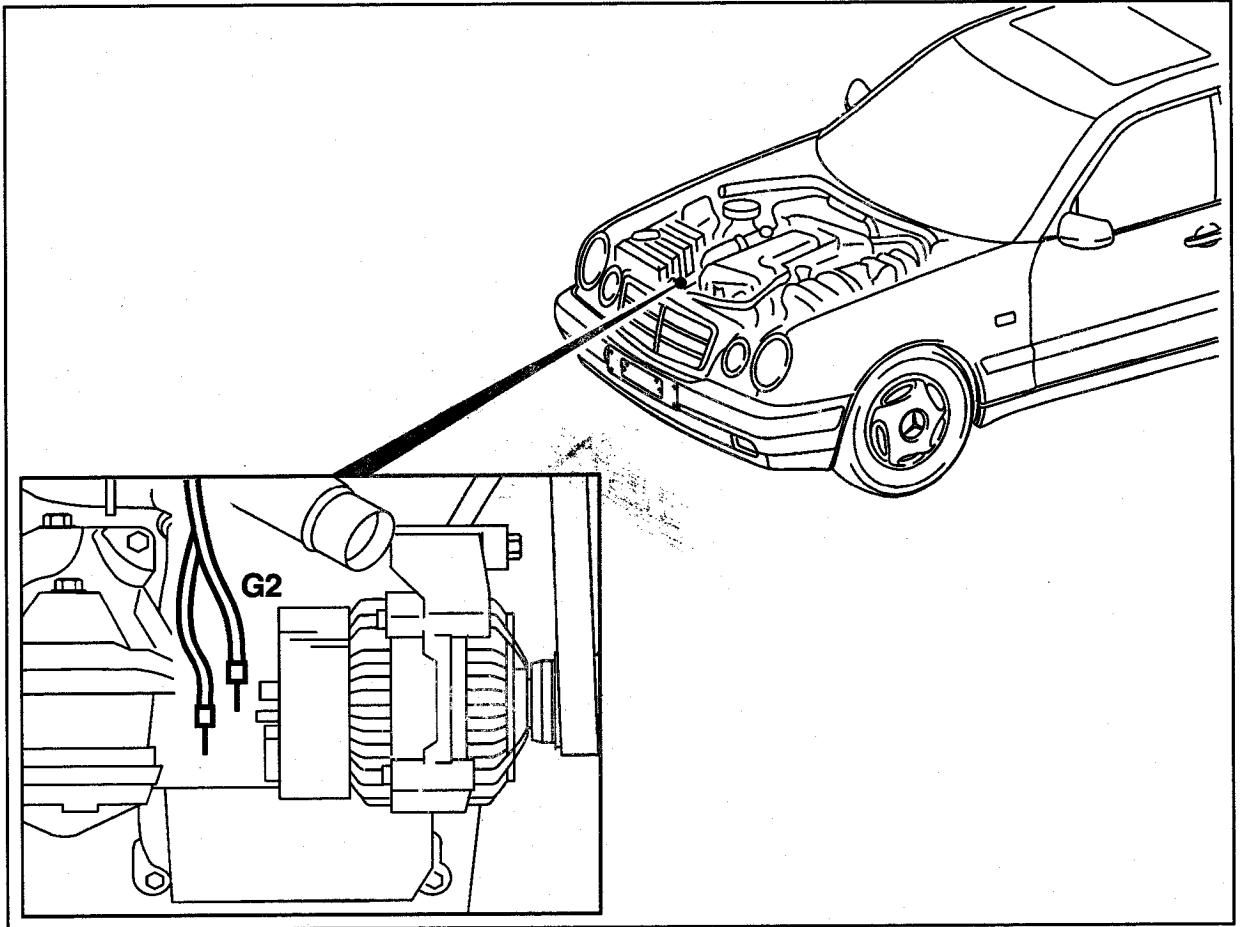


- | | |
|--|--|
| Ground cable at battery (W10) below rear seat on right | disconnect, connect (AR54.10-0003A). |
| Cover over engine component compartment | remove, install. |
| Connector (arrow) at control module (N10-1) | unplug, plug in to gain access to plug connection (X22). |
| Plug connection (X22) | separate, connect. |
| Connector (arrow) at control module (N3/10) of engine management system (ME-SFI) | unplug, plug in. |
| Connector (arrow) at relay unit (K40) | unplug, plug in. |



P01.10-0258-57

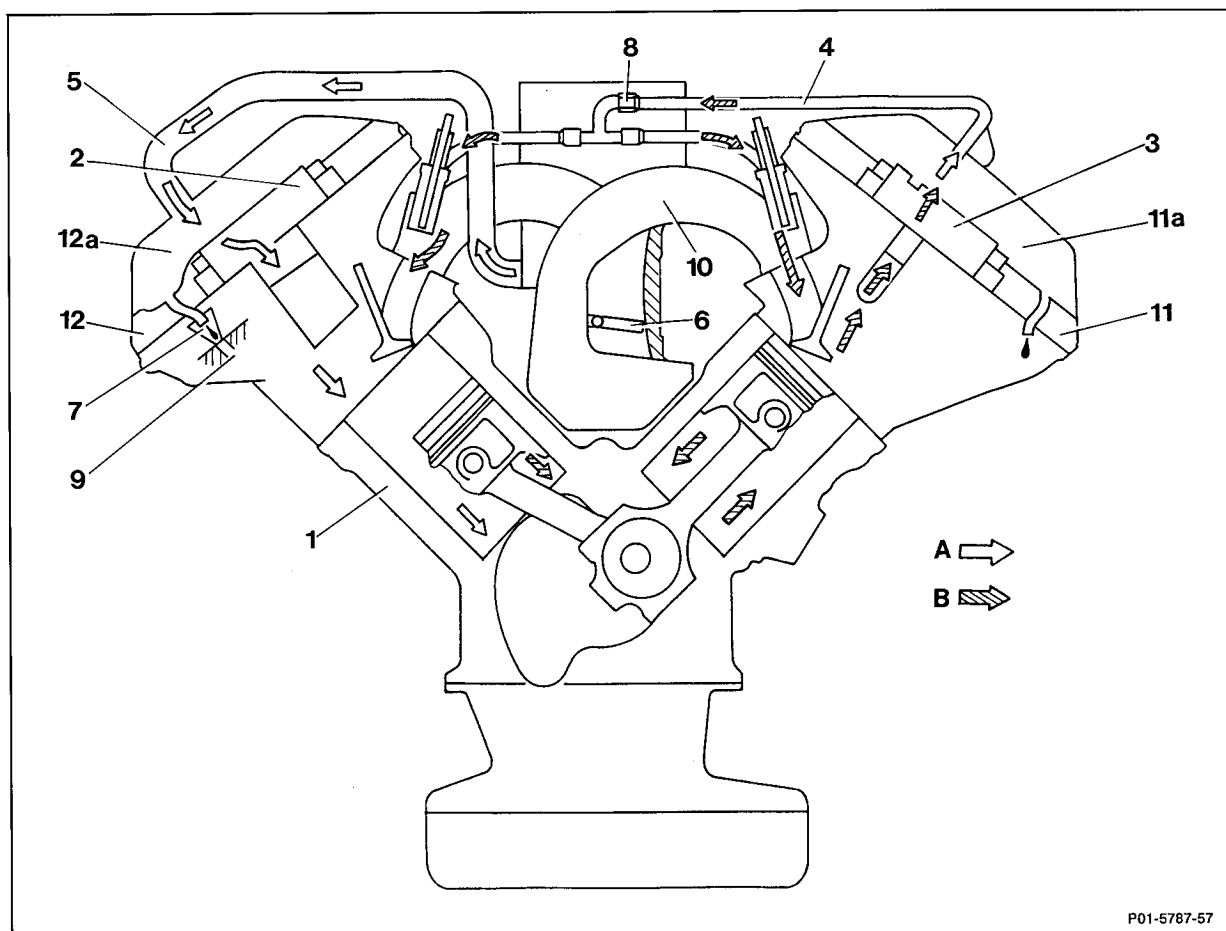
Shields over terminal block (X4) in right footwell and electric transmission control unit (Y3/6)	unbolt, bolt on.
Cable (circuit 30) with bracket at terminal block (X4) (right footwell) and electric transmission control unit (Y3/6)	unbolt, bolt on.
Power steering pump interference suppression ground (W30/2)	unbolt, bolt on.
Ground cable (W11/1) at engine	unbolt, bolt on.



P01.10-0271-57

Wiring at generator (G2) unbolt, bolt on.

Crankcase ventilation at idle speed and midpart load



Engine 119.97/98

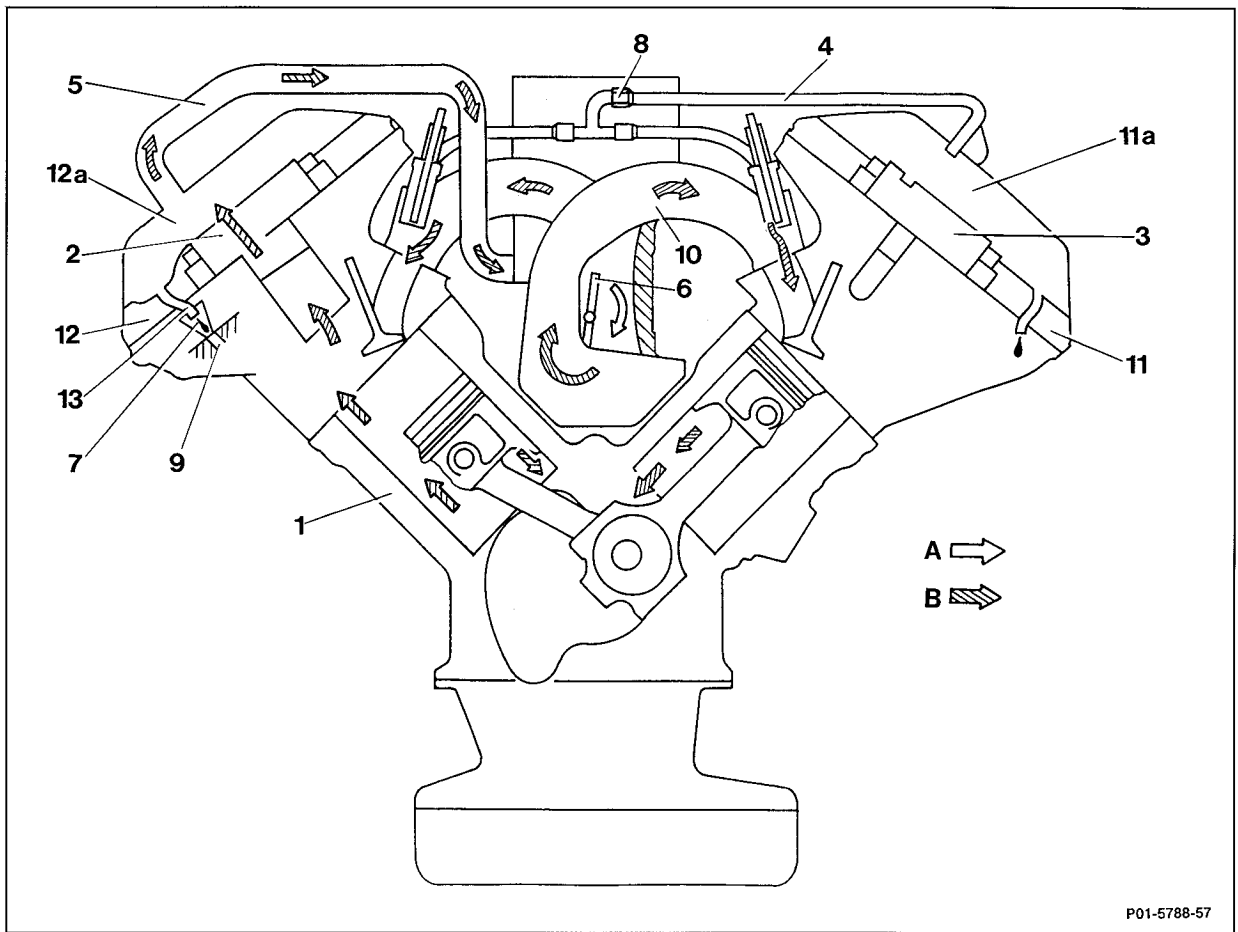
- | | | | |
|---|---|-----|---|
| 1 | Crankcase | 10 | Intake manifold |
| 2 | Right intake duct | 11 | Left cylinder head cover |
| 3 | Left intake duct | 11a | Oil separation chamber in left cylinder head cover |
| 4 | Ventilation line (idle speed/lower part load) | 12 | Right cylinder head cover |
| 5 | Ventilation line (upper part load/full load) | 12a | Oil separation chamber in right cylinder head cover |
| 6 | Throttle valve | 13 | Syphon |
| 7 | Rubber funnel | A | Fresh air |
| 8 | Restriction orifice, 1.5 mm dia. | B | Blowby gases |
| 9 | Oil separator in left cylinder head at rear | | |

The blowby gases flow at idle speed and at lower part load out of the front of the crankcase (1) along the left intake duct (3) into the oil separation chamber (11a) in the left cylinder head cover (11).

The blowby gases then flow along the connection line (4) with the 1.5 mm dia. restriction orifice (8) to the combustion chambers.

At the same time, fresh air flows into the crankcase (1) through the vent pipe (5), right cylinder head cover (12), oil separation chamber (12a) and intake shaft (2).
When performing repairs, check the flow through the vent pipes 4 and 5 and also the restrictor trimming (8).

Ventilation at upper part load and full load



P01-5788-57

Engine 119.97/98

1	Crankcase	9	Oil separator in left cylinder head at rear
2	Right intake duct	10	Intake manifold
3	Left intake duct	11	Left cylinder head cover
4	Ventilation line (idle speed/lower part load)	11a	Oil separation chamber in left cylinder head cover
5	Ventilation line (upper part load/full load)	12	Right cylinder head cover
6	Throttle valve	12a	Oil separation chamber in right cylinder head cover
7	Rubber funnel		
8	Restriction orifice, 1.5 mm dia.		
		A	Fresh air
		B	Blowby gases

The blowby gases flow at upper part load and at full load out of the front of the crankcase (1) along the right intake duct (2) into the oil separation chamber (12a) of the right cylinder head cover (12), along the ventilation line (5) into the intake manifold (10) and from there to the combustion chambers.

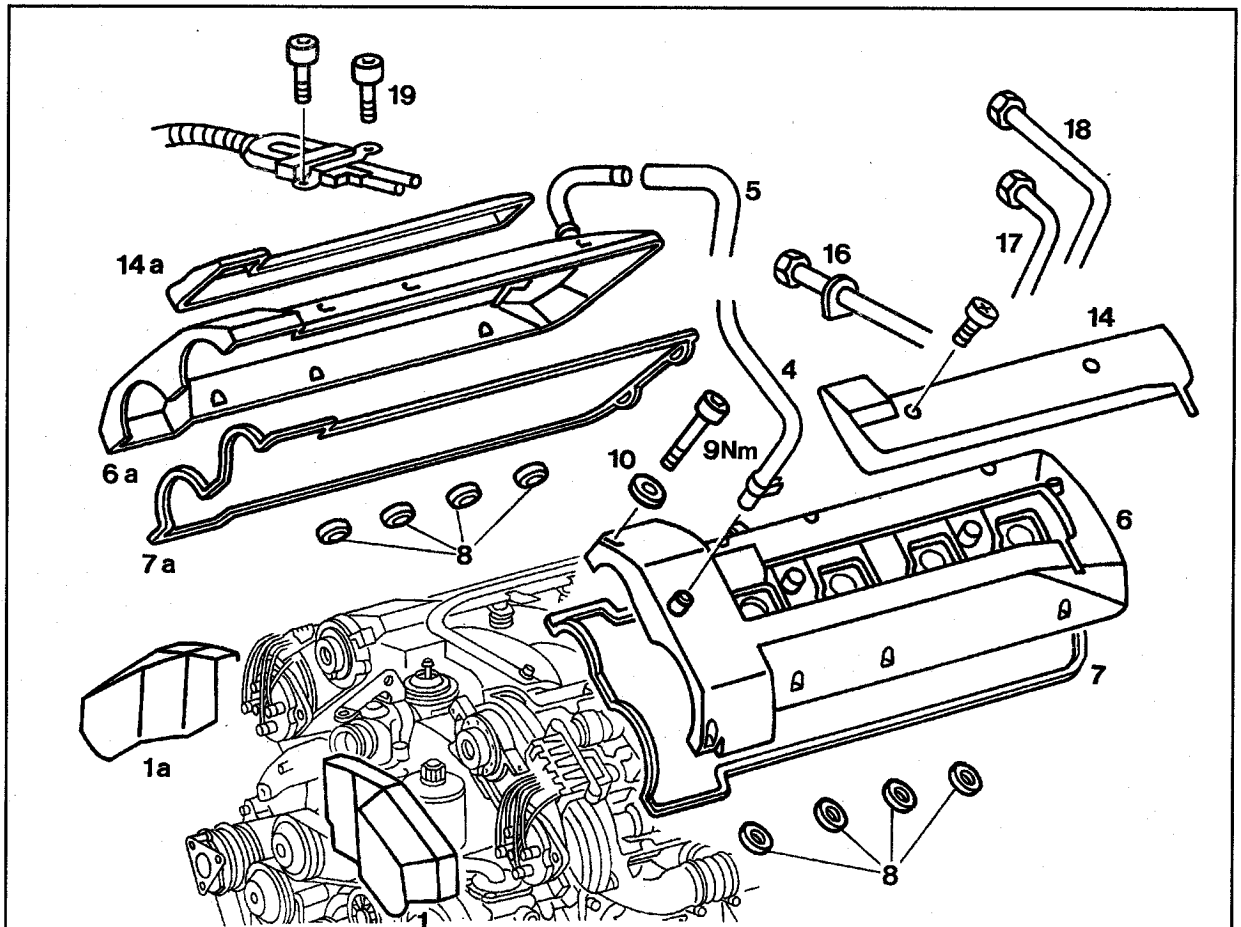
Entrained engine oil flows through the oil separation chamber (12a) and the downstream syphon (13) into the oil separator (9) in the right cylinder head.

The oil separator (9) with rubber funnel (7) defoams the entrained engine oil.

01-0500 Removing and installing cylinder head covers

Preceding work:
 Engine 119.96/97: Air cleaner removed (09-0015).


Operation no. of operation texts and work units or standard texts
 and flat rates
 01-5070



P01-5789-57

Engine 119.97

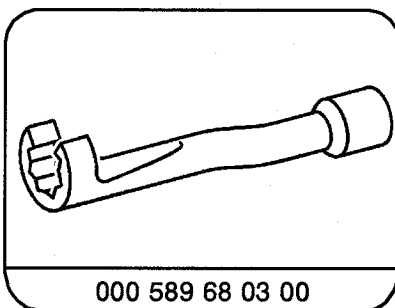
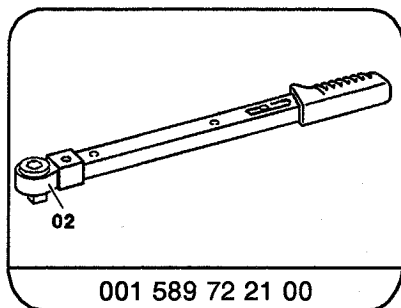
Model 210: cover over intake manifold	remove, install
Crankcase ventilation lines (4) and (5)	detach, fit on.
Engine 119.960: vacuum line at crankcase ventilation line (4)	detach, fit on.
Engine 119.960/97: engine wiring harness (19) at right cylinder head cover (6a)	unbolt, bolt on.
Vacuum line (16) of brake servo unit at intake manifold	unbolt, bolt on.
Covers (1) and (1a) over high voltage distributors	unclip, remove, install.
Fuel filler cap	open, release pressure, close.
Engine 119.960: fuel lines at pressure regulator and fuel distributor	disconnect, connect (07.3-1674).

Engine 119.97/98: fuel pipes (17) and (18) at fuel rail	disconnect, connect. Use box wrench bit 000 589 68 03 00; see note.
Shaft covers (14) and (14a) over spark plug cables and ignition coils	unscrew, take off, fit on.
Engine 119.96/97: spark plug connectors	unplug, plug in (15-1031).
Engine 119.98: ignition coils	unscrew, remove, install.
Engine 119.985 in model 210: windscreen washer fluid reservoir	unbolt, swing to the side with lines connected so that left cylinder head cover can be removed and installed.
Bolts of cylinder head covers with seals (10)	remove, screw on (9 Nm).
	
Pay attention to different lengths of bolts (see bolt diagram).	
Cylinder head covers (6) and (6a) with gaskets (7) and (7a) and shaft seals (8)	take off, fit on.
Note	
Replace all gaskets together, ensure crankcase ventilation syphon at left cylinder head cover is correctly located in the drain hole.	
Engine	run and check for leaks, particularly at rear; see installation note.

Tightening torque in Nm

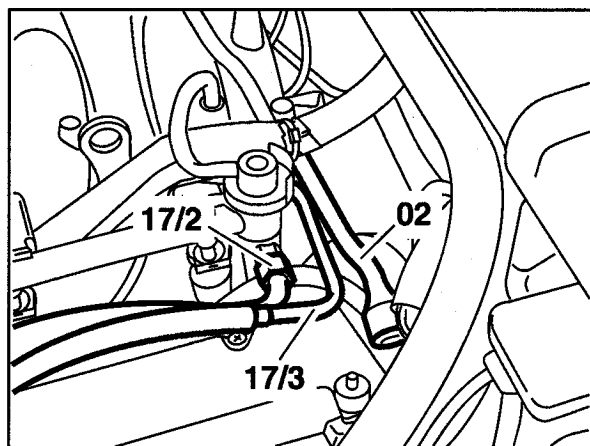
Bolts of cylinder head cover

Special tools



Note engine 119.97/98

Use box wrench bit (02) 000 589 68 03 00 to unscrew fuel pipes (17, 18) and to screw on.



P01.10-0261-13

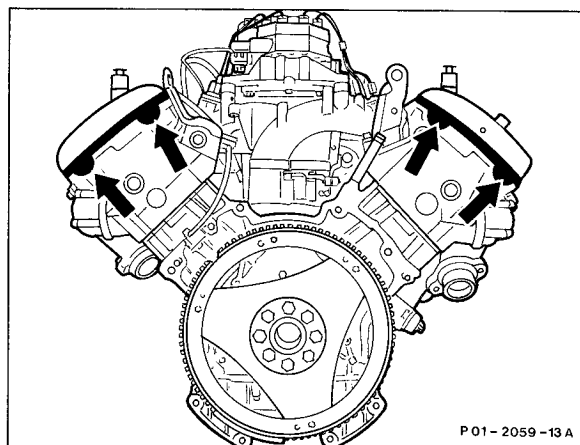
Installation note

Overlaps at the cylinder head cover gaskets at rear (arrows) must be correctly installed.

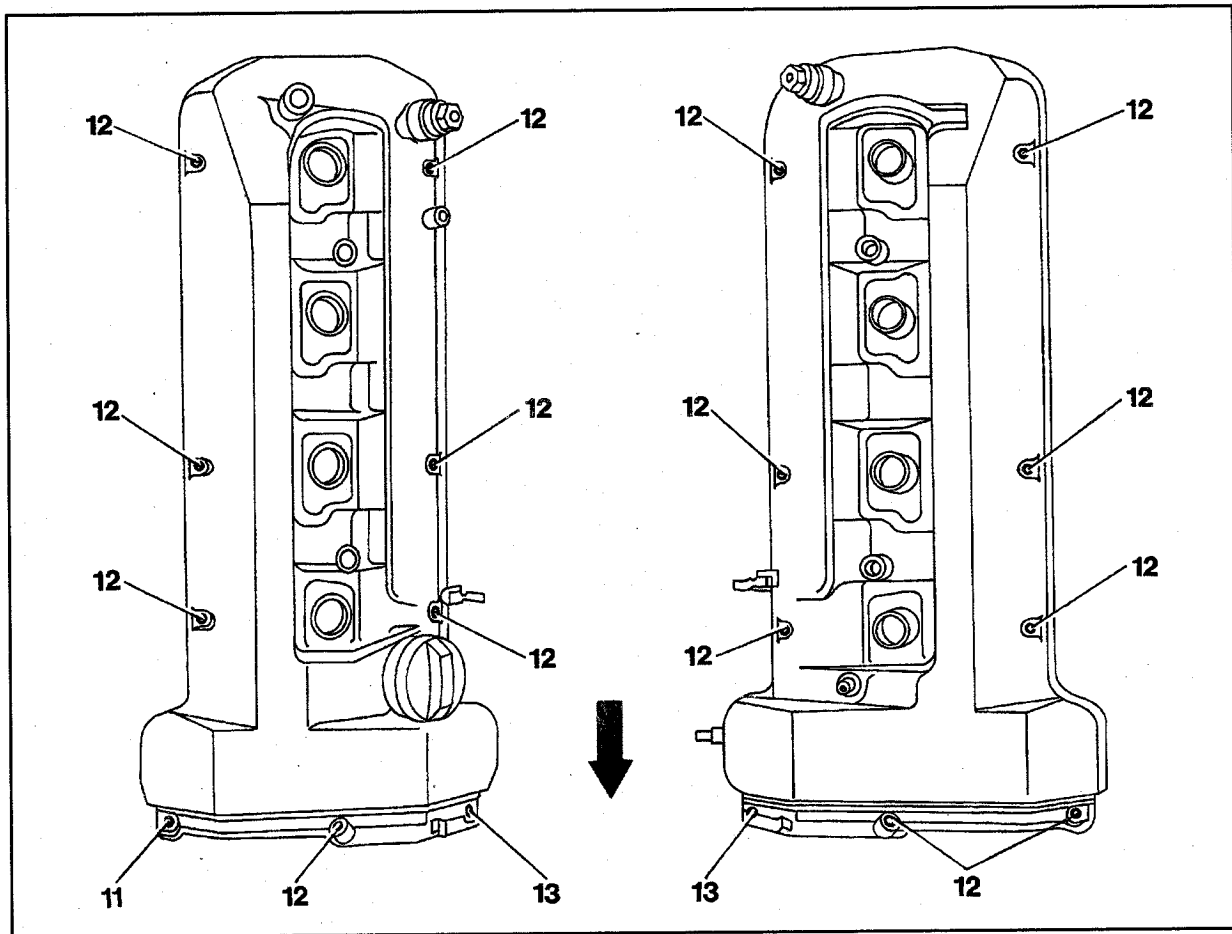


Replace gaskets which are kinked outwards or inwards at the side.

When performing repairs, install gaskets with identification 119 016 08 21 RA on right side and 119 016 07 21 LA on left side (identification in raised lettering).



Bolt diagram



P01-5790-57

Engine 119.97

1st version (bolt head height 6 mm)

- 11 M6 × 30 hexagon socket bolt
- 12 M6 × 35 hexagon socket bolt
- 13 M6 × 45 hexagon socket bolt

2nd version (bolt head height 4 mm)

- 12 M6 × 33 hexagon socket bolt
- 13 M6 × 45 hexagon socket bolt

01-1000 Notes on crankcase

Operation no. of operation texts and work units or standard texts and flat rates

Identification of model designations

The engine number 1st version is stamped at the rear left in the engine flange, behind cylinder 8.

Engine number 1st version up to January 1991:

119.960 12 up to end of production
119.970 12 000 265
119.971 12 000 531
119.972 12 000 016
119.974 12 000 300

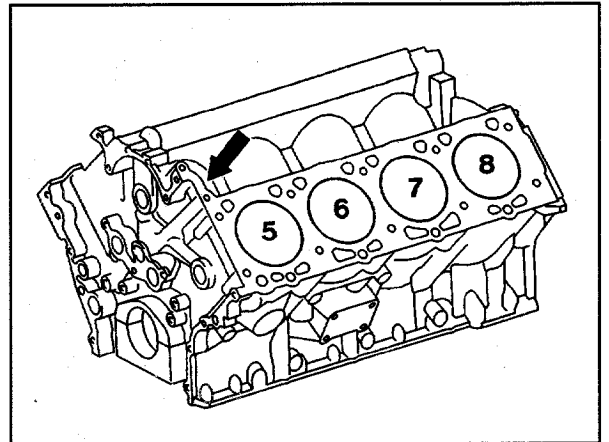
The engine number 2nd version is stamped at the top front left (arrow) in the crankcase.

Engine number 2nd version as of February 1991:

119.970 12 000 266
119.971 12 000 532
119.972 12 000 017
119.974 12 000 301
19.98 as of start of production

Replacement crankcases and short blocks are not stamped with an engine number or engine model designation.

To make it possible to identify the engine installed in a vehicle, the workshop performing repairs has to stamp the engine model designation in the crankcase in the engine number block.

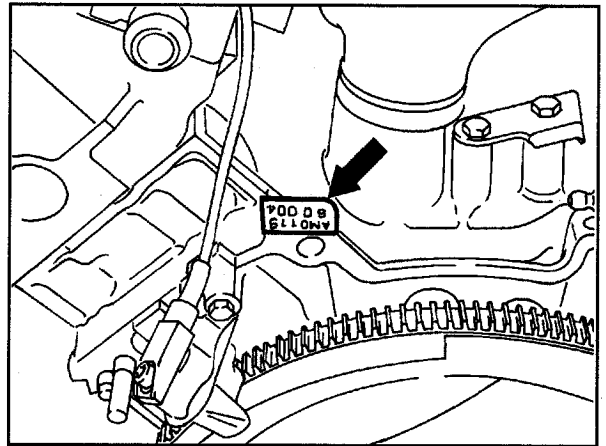


P01-0286-13



Example:

119.974 (engine model designation in model 124.036), see 01-0010 in this connection.



P01-5307-13

The "closed-deck" design of crankcases are fitted from the start of series production with HELI-COIL inserts for the cylinder head bolts.

Standard up to engine:

119.970 12 045 020

119.970 12 045 886 up to 045 892

119.971 12 017 446

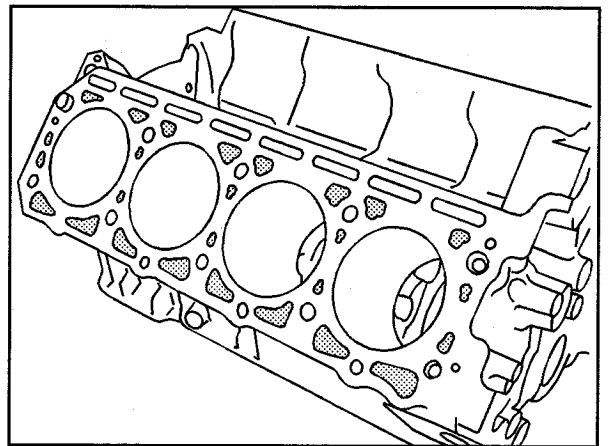
119.972 12 008 660

119.972 12 008 924 up to 008 998

119.974 12 008 760

119.974 12 008 820 up to 008 821

119.975 12 010 515



P01-6006-13

The "open-deck" design of crankcases are installed from the start of series production without HELI-COIL inserts for the cylinder head bolts.

Standard as of engine:

119.970 12 045 021 up to 045 886

119.970 12 045 893

119.971 12 017 447

119.972 12 008 661 up to 008 923

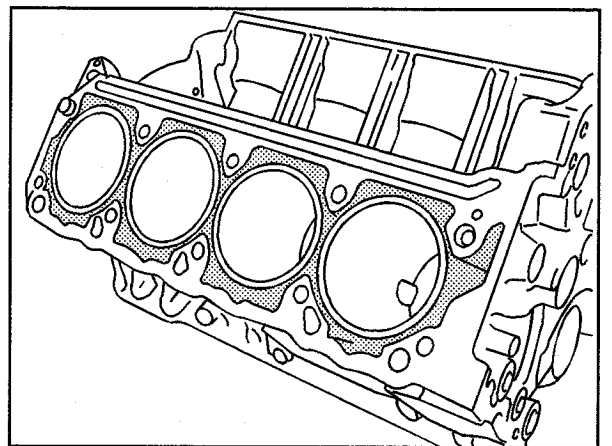
119.972 12 008 999

119.974 12 008 761 up to 008 819

119.974 12 008 822

119.975 12 010 516

The different crankcases can be recognized from the cast number when installed (01-1100).



P01-6005-13



01-1100 Installing cylinder liners

Cylinder liners

Engine	Crankcase cast number 1)	Cylinder liner part number 2)	Crankcase design
119.960	-	117 011 02 10	"closed deck"
119.971/975/ 981/985	119 011 06 01	119 011 02 10	"closed deck"
	119 011 08 01	119 011 02 10	"closed deck"
	119 011 10 01	119 011 02 10	"closed deck"
	119 011 12 01	119 011 02 10	"closed deck"
	119 011 14 01	119 011 02 10	"closed deck"
	119 011 16 01	119 011 02 10	"closed deck"
	119 011 18 01	119 011 02 10	"closed deck"
	119 011 22 01	119 011 02 10	"open-deck"
119.970/972/ 974/980/982	119 011 07 01	119 011 01 10	"closed deck"
	119 011 09 01	119 011 01 10	"closed deck"
	119 011 11 01	119 011 01 10	"closed deck"
	119 011 13 01	119 011 01 10	"closed deck"
	119 011 15 01	119 011 01 10	"closed deck"
	119 011 17 01	119 011 01 10	"closed deck"
	119 011 19 01	119 011 01 10	"closed deck"
	119 011 23 01	119 011 01 10	"closed deck"
119 011 24 01	119 011 01 10	"open-deck"	

1) The number is cast on the side left behind the engine support

2) The material of the cylinder liner is identical to the crankcase

Machining dimensions in crankcase

Cylinder liner 3)	119 01 02 10	117 011 02 10 119 011 01 10
Basic bore for cylinder liner	95.500 – 95.535	100.00 – 100.035
Basic bore for liner collar	97.500 – 97.535	102.00 – 102.035
Insertion depth for liner collar seat	4.4 – 4.5	4.4 – 4.5

3) The cylinder liner in the crankcase can be widened 3) to standard size and 1st repair size +0.5 mm (01-1120).



01-1120 Measuring, honing and silicon-lapping cylinder bores

Matching pistons to crankcase with numerical identification

Engine 119.960/970/972/974	Class identification	Index	Piston \varnothing^1	Cylinder \varnothing^2
Standard size Std 96.5 \varnothing	0	52	96.483-96.493	96.498-96.503
	0+	53	96.488-96.498	96.503-96.508
	1	54	96.493-96.503	96.508-96.513
	1+	55	96.498-96.508	96.513-96.518
	2	56	96.503-96.513	96.518-96.523
1st repair size + 0.5	0		96.983-96.993	96.998-97.003
	1		96.993-97.003	97.008-97.013
	2		97.003-97.013	97.018-97.023
2nd repair size + 1.0	0		97.483-97.493	97.498-97.503
	1		97.493-97.503	97.508-97.513
	2		97.503-97.513	97.518-97.523

1) Group identification stamped on piston crown with color.

2) Group identification stamped at top next to cylinder bore.

Matching pistons to crankcase with letter identification

Engine 119.980/982/970/972/974	Group identification	Index	Piston \varnothing^3	Cylinder \varnothing^2
Standard size Std 96.5 \varnothing	A	52	96.482-96.495	96.500-96.508
	B	54	96.491-96.504	96.508-96.516
	C	56	96.499-96.512	96.516-96.524
1st repair size + 0.5	A		96.982-96.995	97.000-97.008
	B		96.991-97.004	97.008-97.016
	C		96.999-97.012	97.016-97.024
2nd repair size + 1.0	A		97.482-97.495	97.000-97.508
	B		97.491-97.504	97.508-97.516
	C		97.499-97.512	97.516-97.524

2) Group identification stamped at top next to cylinder bore.

3) Group identification stamped on piston crown.

Matching pistons to crankcase with numerical identification

Engine 119.971/975/981/985	Group identification	Index	Piston Ø ¹⁾	Cylinder Ø ²⁾
Standard size Std 92.0 Ø	0	52	91.983–91.993	91.998–92.003
	0+	53	91.988–91.998	92.003–92.008
	1	54	91.993–92.003	92.008–92.013
	1+	55	91.998–92.008	92.013–92.018
	2	56	92.003–92.013	92.018–92.023
1st repair size + 0.5	0		92.483–92.493	92.498–92.503
	1		92.493–92.503	92.508–92.513
	2		92.503–92.513	92.518–92.523
2nd repair size + 1.0	0		92.983–92.993	92.998–93.003
	1		92.993–93.003	93.008–93.013
	2		93.003–93.013	93.018–93.023

1) Group identification stamped on piston crown with color.

2) Size stamped at top next to cylinder bore.

Matching pistons to crankcase with letter identification

Engine 119.971/975/981/985	Group identification	Index	Piston Ø ³⁾	Cylinder Ø ²⁾
Standard size Std 92.0 Ø	A	52	91.982–91.995	92.000–92.008
	B	54	91.991–92.004	92.008–92.016
	C	56	91.999–92.012	92.016–92.024
1st repair size + 0.5	A		92.482–92.495	92.500–92.508
	B		92.491–92.504	92.508–92.516
	C		92.499–92.512	92.516–92.524
2nd repair size + 1.0	A		92.982–92.995	93.000–93.008
	B		92.991–93.004	93.008–93.016
	C		92.999–93.012	93.016–93.024

2) Group identification stamped at top next to cylinder bore.

3) Group identification stamped on piston crown.

Piston clearance	When new	0.004–0.026
	Wear limit	0.08
Maximum wear limit of cylinder bores in direction of travel or transverse direction at top and bottom reversal point of 1st piston ring		0.10

Machining tolerances

Permissible variation of cylinder shape	When new	0.013
	Wear limit	0.05
Permissible variation of rectangularity related to cylinder height		0.05
Averaged peak-to-valley height (Rz) after polishing		0.001
Averaged peak-to-valley height (Rz) after silicon-lapping		0.001 – 0.003
Permissible wave depth (Wt)	50 % of peak-to-valley height after silicone-lapping	
Chamfer of cylinder bores	see ill. step 14	

Note

See pistons, matching and dimensions 03–3165 for further tolerances and assignments.

Commercial tools

Automatic cylinder repair machine
SUNNEN CK-10-G with honing oil filter and oil cooler
or CV 616

Honing head CK-3000 for dia. 76–127 mm
or CK-2600

SUNNEN honing oil MB 30¹⁾

Prehoning stone set C 30-A 53, 70 mm long²⁾

Final honing stone set C 30-J 84, 70 mm long²⁾

Polishing stone set C 30-C 03-81

Stone holder for felt insert CK-30 35

Felt insert holder set CK-3130

Felt insert C 30-F 85

SUNNEN silicon paste AN-30

Box for silicon paste and
felt inserts AN-35

Internal measuring instrument for 50 – 150 mm dia., with
0.01 mm indication and measuring point pressure relief,
e. g. SUNNEN GRM 2125

Setting micrometer for internal measuring instrument
GAM 2125 with setting range 50 – 200 mm, e.g. SUNNEN
CF-1000 M

1) When refilling approx. 170 liters.

2) These stones are available only with a length of 89 mm and must be shortened at the top to 70 mm with a hacksaw (see step 3).

Germany:

e. g. Hommel Handel GmbH
Donatusstraße 24, D-5000 Köln 71

other countries:

e. g. SUNNEN Products Comp.
USA-7910 Manchester
St. Louis, Mo. 63143

Hommel Handel Export Division
P.O. Box 1206
D-6806 Viernheim

Note

The light alloy cylinder bores are very sensitive to damage, scratching and also dirt and must therefore be handled with great care.

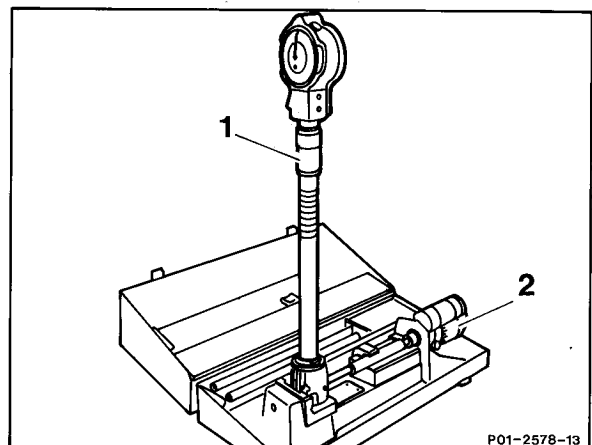
The cylinder bores should be adapted when honing to the sizes of the available repair size pistons with the Group No. 0, 1 or 2. The specified piston clearance must be observed.

Measuring

Use a measuring instrument with measuring point pressure relief for measuring the cylinder bores as the cylinder barrel will otherwise be scored by the measuring point tip and the measuring point tip of the instrument will wear prematurely.

Set the self-centering internal measuring instrument to the cylinder dia. before measuring. Measure the cylinder bores at a room temperature of 22 – 24 °C.

- 1 Internal measuring instrument
- 2 Setting micrometer



Following silicon-lapping (final state) it is only possible to measure the amount by which the aluminium surfaces stand back between the silicon crystals (0.5 – 1.5 μm) indirectly by means of the averaged peak-to-valley height (Rz).

The specified exposed depth of the silicon crystals results from the limited-time control during silicon-lapping and from the silicon paste used.

Honing and silicon-lapping

Where severe scoring and severe cylinder wear exists ($> 0.10\text{ mm}$) etc., the cylinder bores can be honed to the stated repair sizes.

The silicon crystals must be undamaged and be flattened on the cylinder surface following the honing operations.

After the honing operations (prehoning, final honing and polishing) it is essential to perform "silicon-lapping" based on the Sunnen method so that the silicon crystals are exposed.

If the "silicon-lapping" operation is not performed, this will inevitably result in piston seizure.



The following operations can only be performed with a honing machine with honing oil filter and oil cooler.

The silicon particles must be filtered out of the honing oil.

The honing oil must be cooled to a constant temperature of 20 °C to avoid excessive heating of the crankcase.

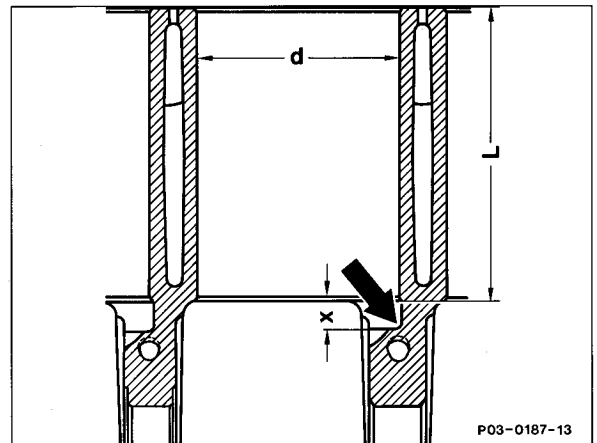
Only the specified honing oil may be used to achieve good honing quality.

1 Prepare honing machine CK-10-G.

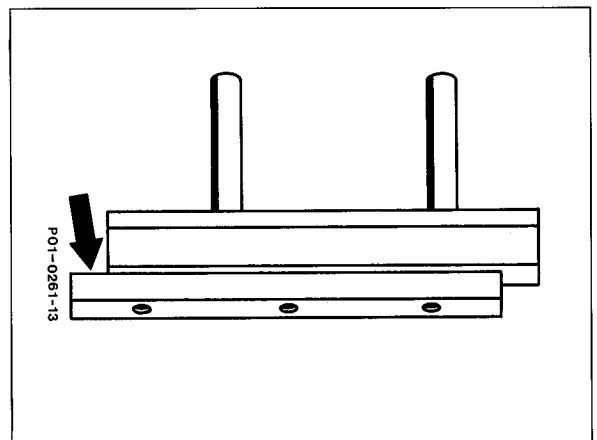
Perform all the honing and lapping operations without the direction guide shoes.

The honing stone runout (arrow) size x:

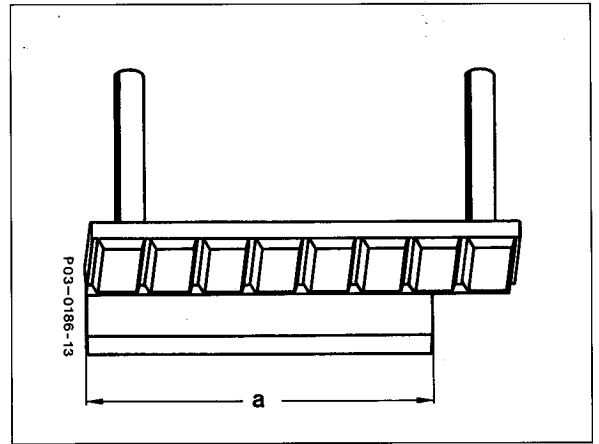
Engine 119.96	14 mm
Engine 119.97	13.5 mm



2 Cut off projection of bronze bars at bottom of main guide shoe (arrow) as only approx. 14 mm undercut for the honing stone runout is available at the cylinders.

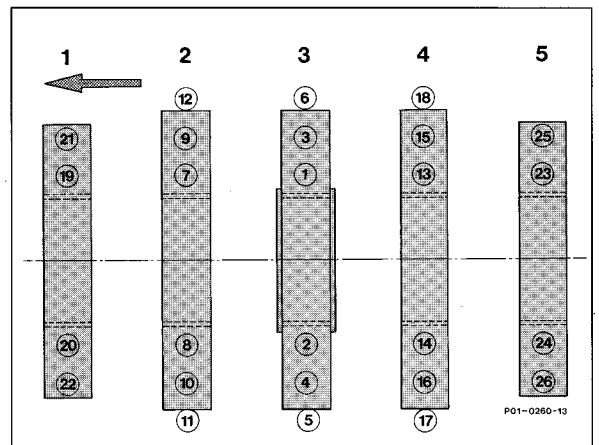


3 The specified stone sets of 89 mm length must be shortened to 70 mm. Only the honing stone, not the holder, should be cut off at the top with a hacksaw.

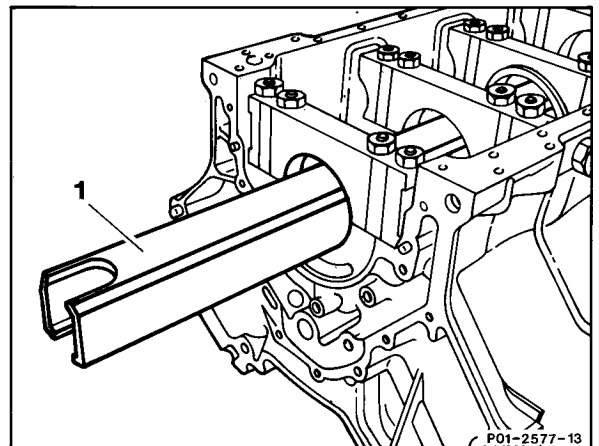


Size a = 70 mm

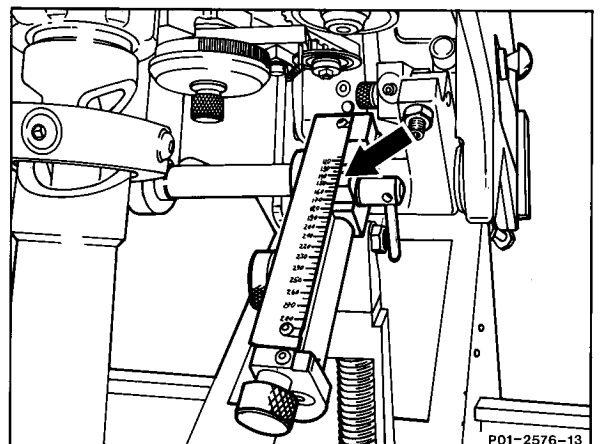
4 Tighten crankshaft bearing cap bolts and nuts to 50 Nm in the order of the tightening diagram.



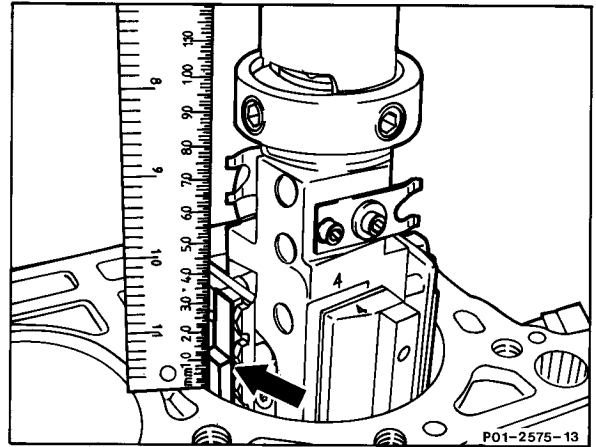
5 Fix disassembled and cleaned crankcase with crankshaft bearing caps installed and tightened in the honing machine with the square steel bar (1).



6 Set stroke setting (cylinder length) on the stroke scale (arrow) according to the "prehoning" table.

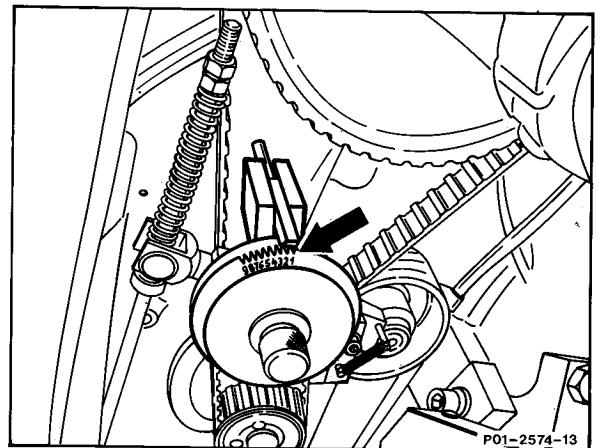


7 Set stone projection (arrow) with the gauge according to the table.



8 Set feed (arrow) according to table.

9 Set strokes/min and rpm according to table.



Prehoning

Setting of honing machine

Engine	119.960	119.970 119.974	119.971
Cylinder dia. setting for 1st repair size (+0.5)	96.5 mm	96.5 mm	92.0 mm
Cylinder length (L)	154 mm		137.5 mm
Stroke setting	156 mm		140 mm
Revolutions/min		125	
Strokes/min		49 (CK-10-G)	57 (CV616)
Feed		4	
Stone projection		approx. 12 mm	
Prehoning stone set		C 30-A 53 (C30-J55)	
Indication %		approx. 30	
Stock removal/min		0.07 mm	
Feed scale/stock removal		10 graduations/0.05 mm	

10 Prehone all the cylinder bores at full honing oil feed up to approx. 0.08 mm before final size otherwise the silicon crystals will be torn out or destroyed by the cutting pressure.



A deviation of approx. +0.02 mm is obtained when measuring immediately after pre honing as a result of heating.

The heating of the crankcase is dependent among other things on the outside temperature.

11 Insert stone set for final honing and cut to length as described in step 3.

12 Set honing machine according to the "precision honing" table.

Precision honing

Setting of honing machine

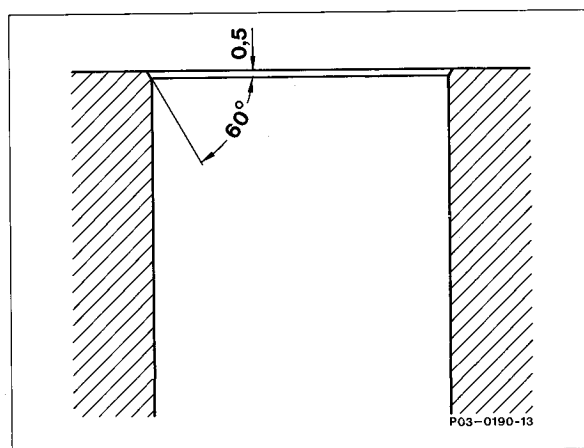
Engine	119.960	119.970 119.974	119.971
Cylinder dia. setting for 1st repair size (+0.5)	96.92 mm	96.92 mm	92.42 mm
Cylinder length (L)	154 mm		137.5 mm
Stroke setting	156 mm		140 mm
Revolutions/min		125	
Strokes/min		49 (CK-10-G) 57 (CV616)	
Feed		3	
Stone projection		approx. 12 mm	
Precision honing stone set		C 30-J 84	
Indication %		approx. 30	
Stock removal/min		0.05 mm	
Feed scale/stock removal		10 graduations/0.05 mm	

13 Precision-hone all cylinder bores at full honing oil feed up to approx. 0.02 mm before final size.

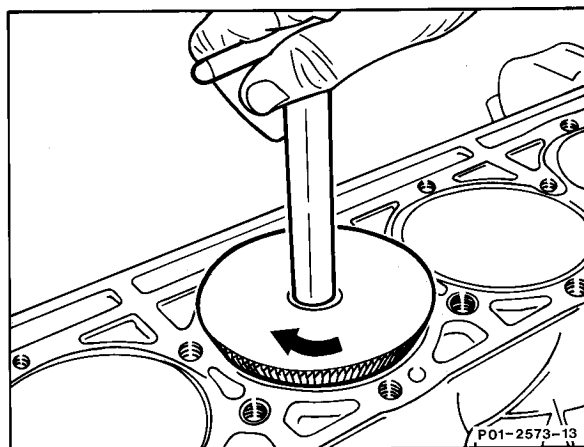


A deviation of approx. +0.01 mm is obtained when measuring directly after precision-honing as a result of heating. Heating of the crankcase is dependent among other things on the outside temperature.

14 Chamfer cylinder bores according to the sketch prior to "polishing".



15 For chamfering, use a suitable handmilling cutter with an angle as shown in the sketch above.



16 Insert stone set for polishing.

New polishing stones should be corrected in the tightest cylinder bore before starting machining.

17 Set honing machine according to "polishing" table.

Polishing

Setting of honing machine

Engine	119.960	119.970 119.974	119.971
Cylinder dia. setting for 1st repair size (+ 0.5)	96.98 mm	96.98 mm	92.48 mm
Cylinder length (L)	154 mm		137.5 mm
Stroke setting	156 mm		140 mm
Revolutions/min		125	
Strokes/min		49 (CK-10-G)	57 (CV616)
Feed		2	
Stone projection		approx. 12 mm	
Polishing stone set		C 30-C 03-81	
Indication %		approx. 30	
Stock removal/min		0.01 mm	
Feed scale/stock removal		10 graduations/0.01 mm	

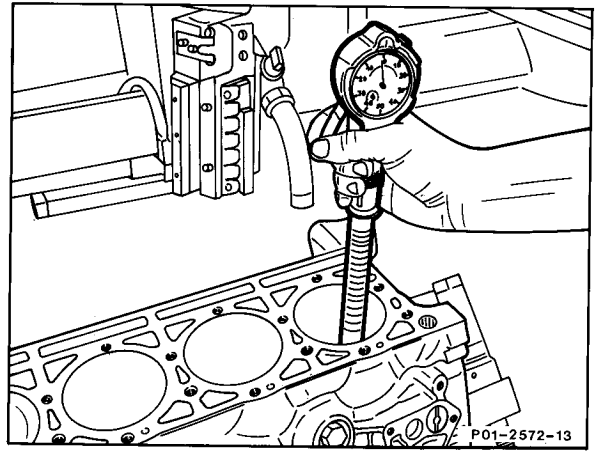
18 Polish all cylinder bores at full honing oil feed up to end size.

19 Allow crankcase to cool.

20 Measure cylinder bores.

When performing this step, allow for the required cylinder dia. (Group No.) for the existing pistons and the specified piston clearance.

Re-polish once again if necessary.

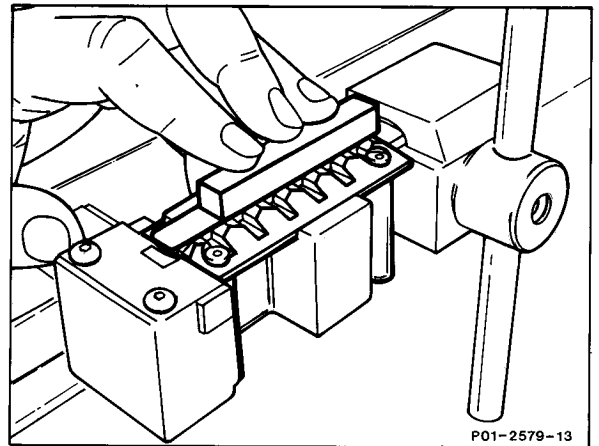


21 Clean cylinder walls with filtered honing oil so that all silicon particles are removed and do not cause any scratches during the subsequent silicon-lapping operation.

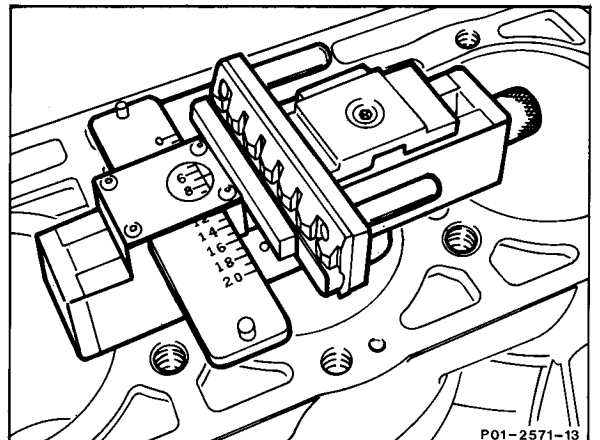
22 Press felt inserts C 30-F 85 into the holders CK-3130 and the latter into the stone holders CK-3035.



After pressing in the felt inserts, remove all material deposits on the holder.



23 Perform setting of cylinder diameter with the setting gauge.



24 Soak felt inserts with filtered honing oil and insert into the honing head.

25 Shut off honing oil feed.

26 Set honing machine according to "silicon-lapping" table.

Silicon-lapping

Setting of honing machine

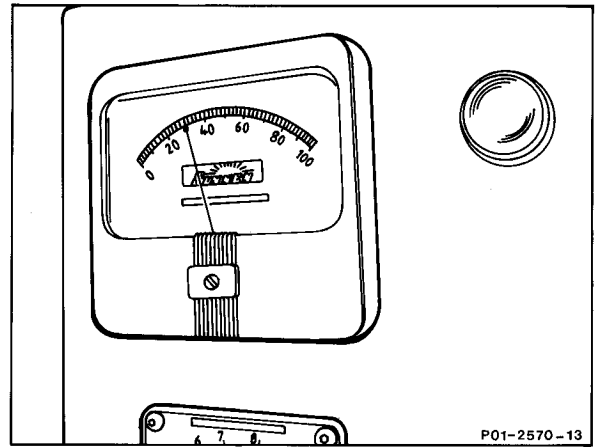
Engine	119.960	119.970 119.974	119.971
Cylinder dia. setting for 1st repair size (+0.5)	97 mm	97 mm	92.5 mm
Cylinder length	154 mm	137.5 mm	
Stroke setting	140 mm	124 mm	
Revolutions/min		185 (CK-10-G)	230 (CV616)
Strokes/min		73 (CK-10-G)	80 (CV616)
Infeed		2	
Felt insert projection		2 mm	
Felt insert		C 30-F 85	
Indication %		ca. 30	
Stock removal/min		not measurable	
Feed scale		18 graduations approx. 70 seconds operation	

27 Thoroughly stir AN-30 silicon paste and then rub into the dry cylinder walls fully.

28 Likewise apply silicon paste to felt inserts.

29 Introduce honing head with felt inserts into cylinder bore.

30 With honing machine running, slowly turn the feed wheel to the right until the indicating instrument has reached 30 %.

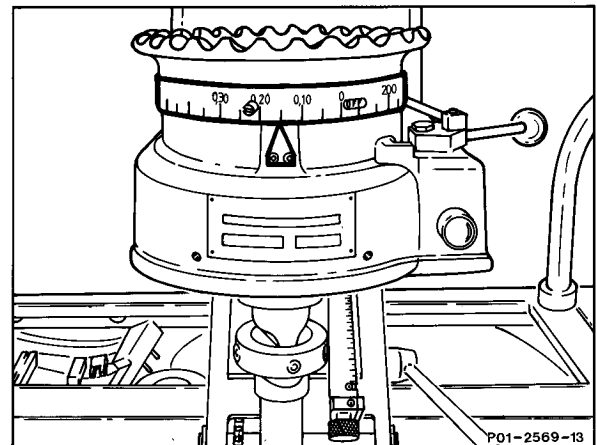


31 Set feed scale to 18 graduations.

The honing machine switches off after approx. 70 seconds. The cylinder surface then has a mat appearance.

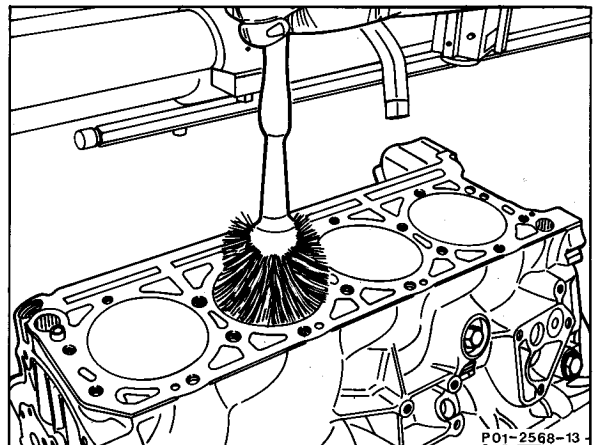
No honing angle is visible.

The peak-to-valley height is 0.001 – 0.003 mm.



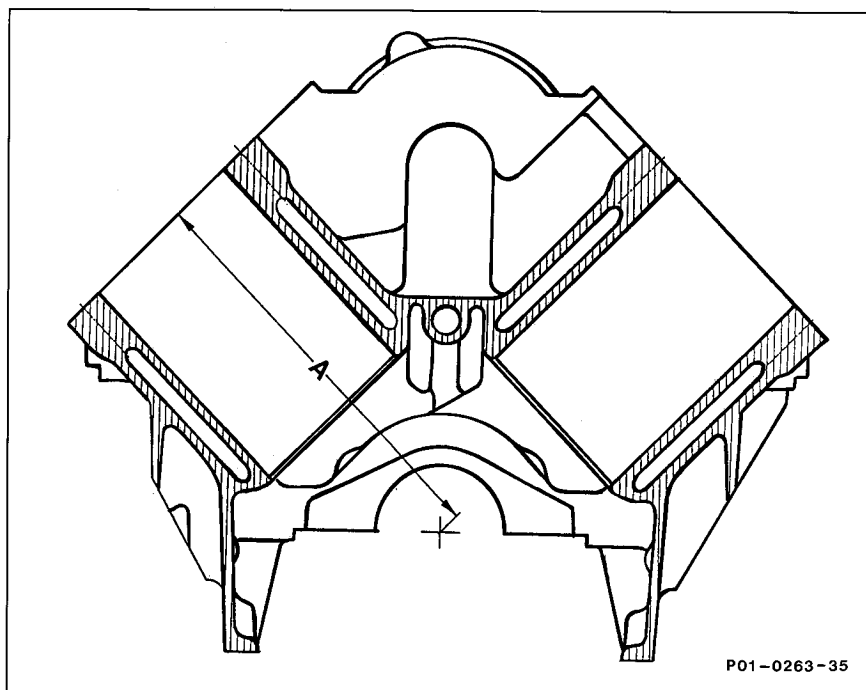
32 Thoroughly clean all silicon paste residues from cylinder bores with filtered honing oil and a suitable soft-bristle brush and dry cylinder bores.

Used silicon paste must not be re-used!



01-1200 Facing crankcase mating surface

Preceding work:
Engine, pistons, cylinder heads and crankshaft removed.



Data

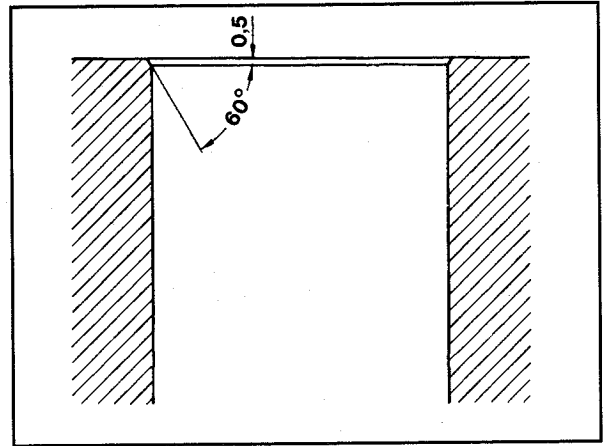
Engine		119.96	119.97/98
Height "A" of crankcase		245.35-245.45	228.90-229.00
Minimum height after required stock removal ¹⁾		245.25	228.80
Permissible variation of parallelism of top mating surface to crankshaft centre	in longitudinal direction	0.08	
	in transverse direction	0.05	
Permissible variation of evenness of top mating surfaces		0.02	
Averaged peak-to-valley height (Rz) of top mating surface		0.006-0.016	
Pressure-testing pressure: water chamber with air under water in bar gauge		3	
Chamfers of cylinder bores		see note	

¹⁾ The stock removal at the crankcase and at the cylinder head of an engine must together be not more than 0.4 mm (see 01-4180).

Note

Face crankcase together with timing case cover.
Always face right and left bank of cylinders by
the same amount.

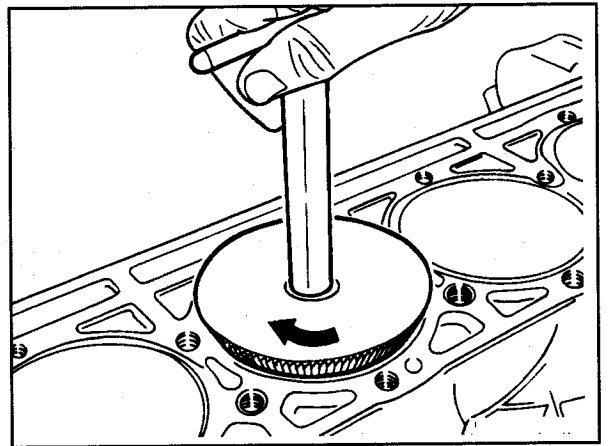
After facing, chamfer the cylinder bores as
shown in the sketch.



P03-0190-13

Chamfer cylinder bores with a suitable
handmilling cutter as shown in the sketch.
Equalize bottom edge of chamfer with polishing
stone.

If the crankcase mating surface is machined, the
timing must be checked (see 05-2150).

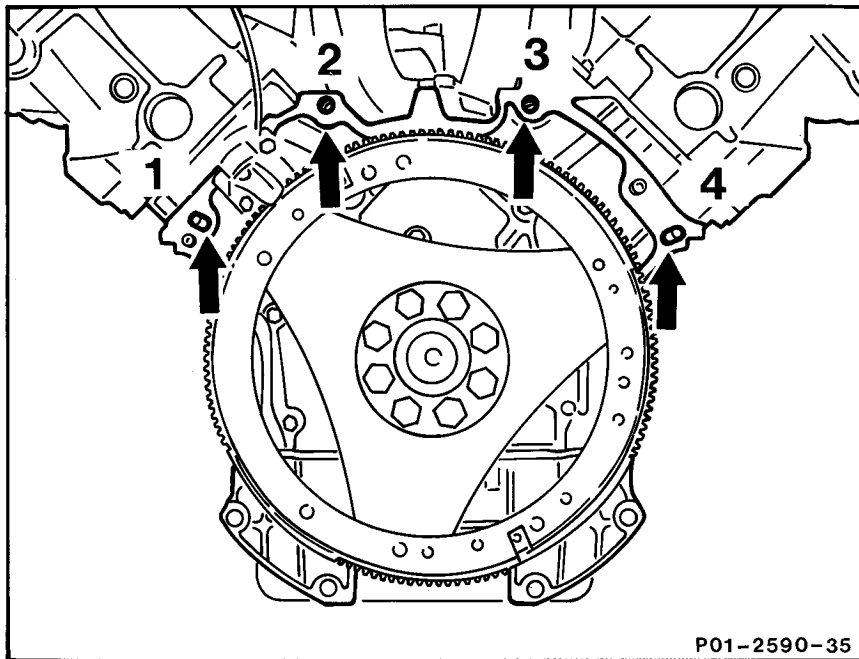


P01-2573-13



01-1240 Repairing tapped holes for transmission mounting

Preceding work:
Engine removed (01-0300)

Engine 119.960



P01-2590-35

- | | |
|---|----------------------------|
| Core hole with HSS twist drill | bore out (step 1). |
| Swarf | blow out (step 2). |
|
 | |
|  | |
| Bore (4) with oil return duct | connect (step 2). |
| Right cylinder head | remove, install (01-4150). |
| Oil sump | remove, install (01-3100). |
| Swarf in oil duct | blow out from above. |
| HELI-COIL mounting thread | tap (step 3). |
| Swarf | blow out (step 4). |
|
 | |
| HELI-COIL threaded insert M10 | screw in (step 5). |
|
 | |
|  | |
| Insertion depth | observe (step 5). |

Tang of HELI-COIL threaded insert	break off with a drift, remove.
Ease of movement of threads	check (step 7).
Stud bolts	screw into bore 1 and 4 (step 8).

Commercial tools

HELI-COIL tap M10
 Art. No. 0140 0100104

HELI-COIL threaded insert M10
 Standard Art. No. 0130 0100020

e. g. Böllhoff & Co.
 D-4800 Bielefeld 14

HELI-COIL hand installation tool M10
 Art. No. 0150 0410000-1

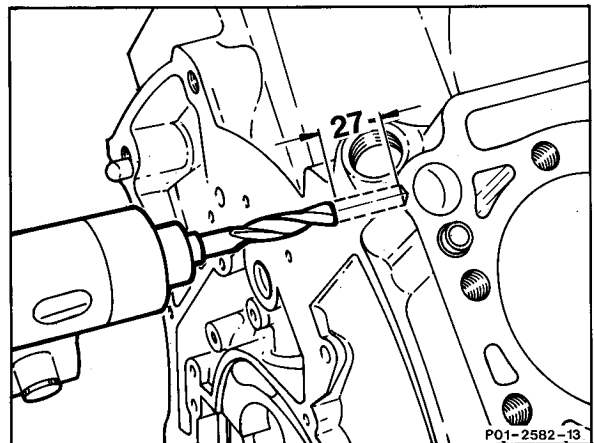
Note

Torn threads for transmission mounting should be replaced by HELI-COIL standard threaded inserts, Art. No. 0130 0100020 with a length corresponding to twice the diameter of the bolts (11 threads).

Reconditioning

1 Drill core hole approx. 27 mm deep with an 10 mm dia. HSS twist drill.

Minimum core hole diameter 10 mm,
 maximum 10.3 mm.



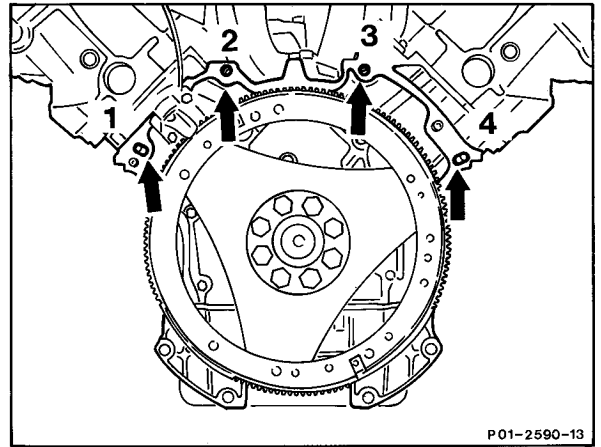
Handwritten signature or mark

2 Blow out swarf.



Bore (4) merges into oil return duct.
When repairing bore (4), remove and install right cylinder head (01-4150).
Remove and install oil sump (01-3100).

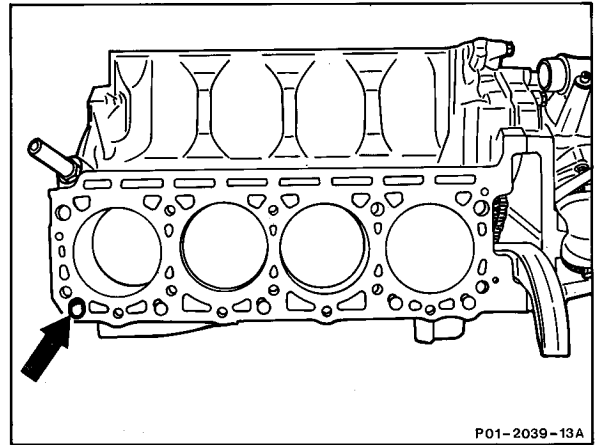
1 and 4 M10 stud bolt
2 and 3 M10 thread



P01-2590-13



Blow swarf from bore (4) out of oil duct from above (arrow).



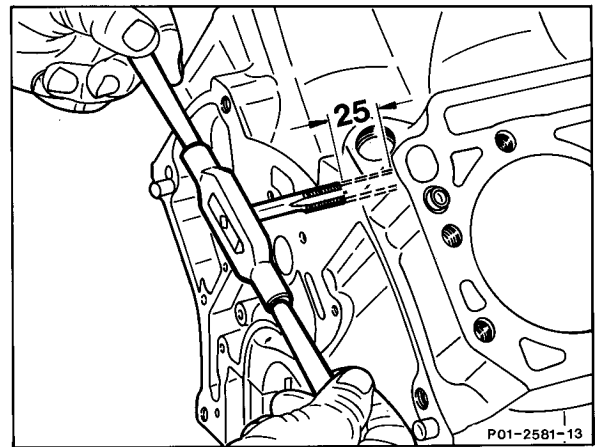
P01-2039-13A

3 Tap HELI-COIL mounting thread with HELI-COIL M10 tap (outer diameter 12.0 mm), Art. No. 0140 0100104, approx. 25 mm deep.
Lubricate tap with honing oil when performing this step.

4 Blow out swarf.



Bore (4, see step 2).



P01-2581-13

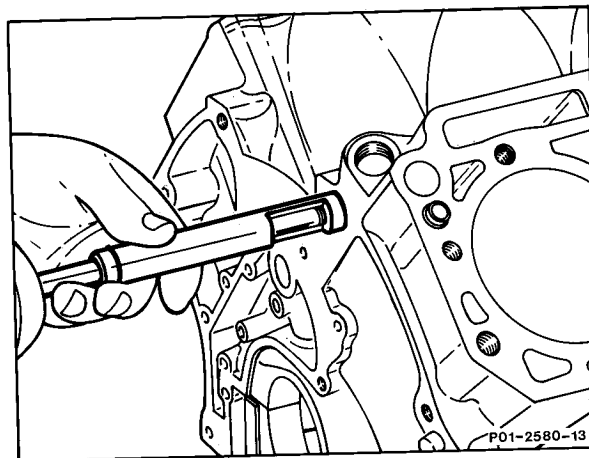
01.1311-1240/3

5 Screw in oiled HELI-COIL M10 standard threaded insert, Art. No. 0130 0100020, with the M10 hand installation tool, Art. No. 0150 0410000-1.



The top thread must stop approx. 2 mm below the mating surface.

6 Break off tang of HELI-COIL threaded insert with a drift.



7 Examine inserted thread for possible misalignment and for ease of operation of threads by screwing in a bolt.

The insertion depth should be approx. 23 mm.

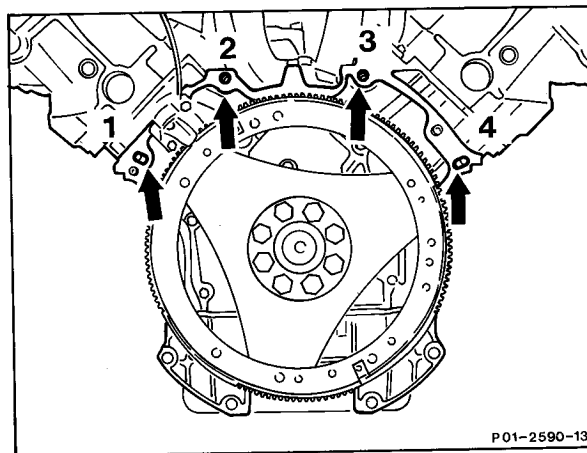
8 Install stud bolts (1) and (4).



The microencapsulated stud bolt (4) seals the oil duct in the crankcase.

The stud bolts lose their sealing effect after being removed. They may only be used once.

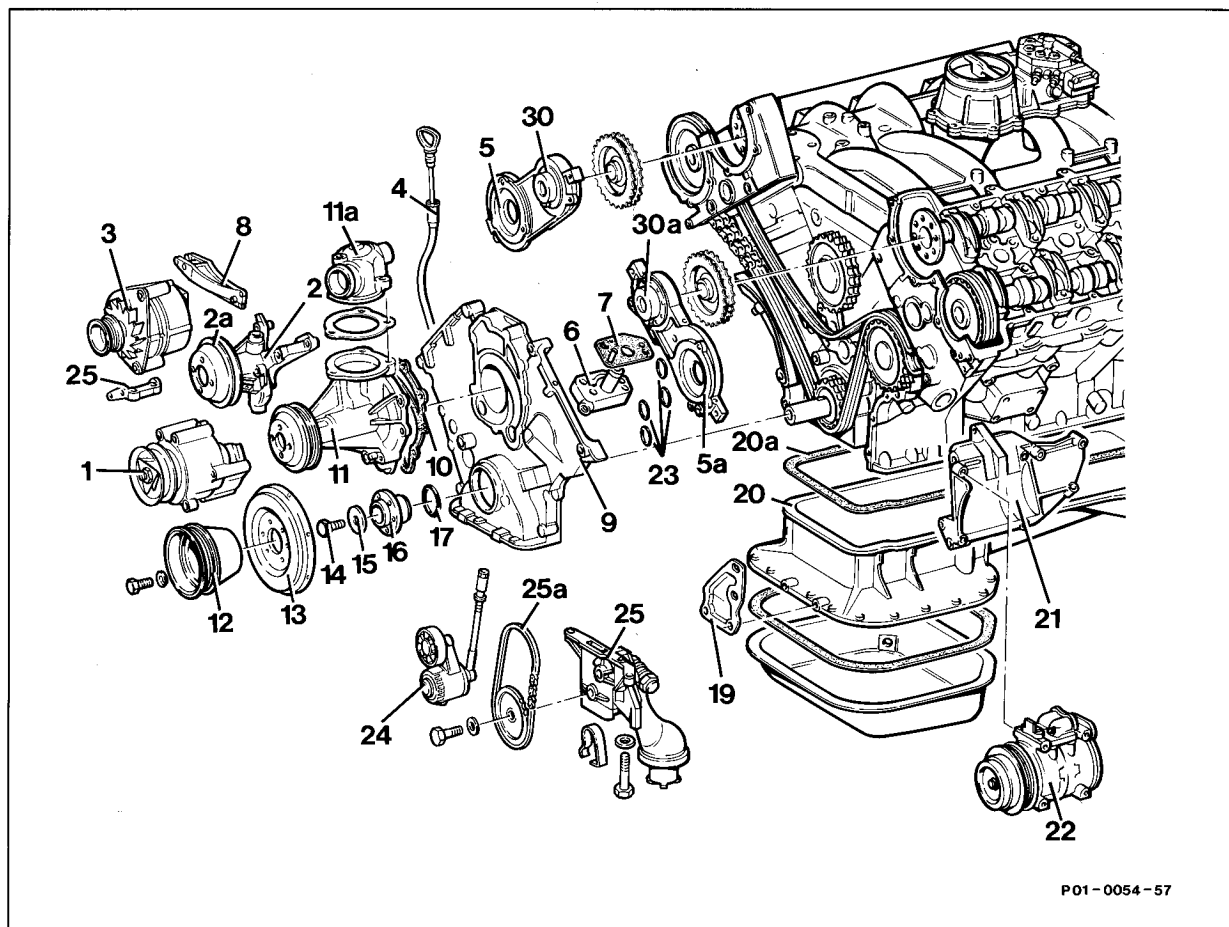
1 and 4 M10 stud bolt
2 and 3 M10 thread



01-2100 Removing and installing timing case cover

Operation no. of operation texts and work units or standard texts
and flat rates
01-0080, 8009

A. Engine 119.960



P01-0054-57

Viscous fan clutch	remove, install (20-3120).
Bolts of belt pulley fan support	slacken, tighten (10 Nm, step 2).
Front covers at top (30, 30a)	remove, install (01-2120).
Poly V-belt and tensioning device (24)	remove, install (13-3450).
Engine	set to 45° before ignition TDC at No. 1 cylinder (step 5).
Bottom engine compartment panel	remove, install (step 6).
Left exhaust pipe and cover of starter mounting	detach, attach (step 7).
Engine retaining lock	insert (step 8), special tool 116 589 01 40 00.
All four camshaft gears together with timing chain	mark and pin, special tool 111 589 03 15 00 (steps 9 and 10).

Nut at left and right camshaft adjuster	slacken, tighten (65 Nm, step 12).
Alternator (3) together with carrier (8)	remove, install, seal bolts (step 13).
Chain tensioner (6)	remove, install (05-3100).
Top slide rails	remove, install (05-3350).
Both camshaft adjusters (5, 5a) partially	remove, install (05-2170).
Coolant at radiator	drain, pour in (20-0100).
Coolant hoses at fan carrier (2) and thermostat housing	take off, install (step 18).
Fan carrier belt pulley (2a)	unscrew, screw on (step 19).
Air pump (1) with angle bracket (25)	remove, install (step 20).
Fan carrier (2)	remove, install (step 21).
Belt pulley (12) with vibration damper (13) and hub (16)	remove, install (03-3420).
Radial seal (17)	remove, install (03-3240).
Coolant pump cover (11a)	remove, install (step 24).
Coolant pump (11)	remove, install (step 25).
Carrier with guide pulley	remove, install (step 26).
If air conditioning fitted: air conditioning compressor (22) with lines connected	detach, attach (step 27).
TDC sensor	remove, install (step 28).
Carrier (21), air conditioning compressor or guide pulley	remove, install (step 29).
Oil pump (25)	remove, install (18-2100).
Dipstick guide tube (4)	remove, install. Special tool 117 589 00 31 00 (step 31).
Top section of oil sump (20)	detach, install (01-3100).
Bolts of timing case cover at front and on cylinder head	unscrew, screw on (steps 33, 38 and 39).
Timing case cover (9) with oil pump chain (25a)	remove, install (steps 34 to 37).
O-rings (23) of timing case cover	renew.
Leaktightness	check.

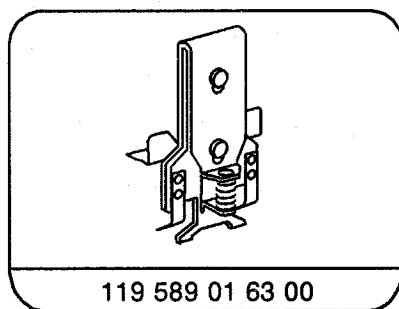
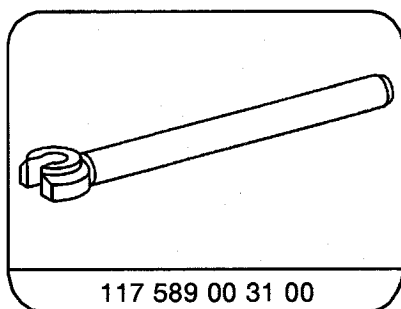
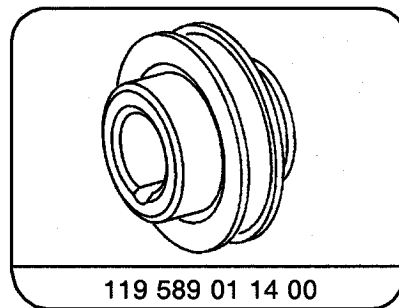
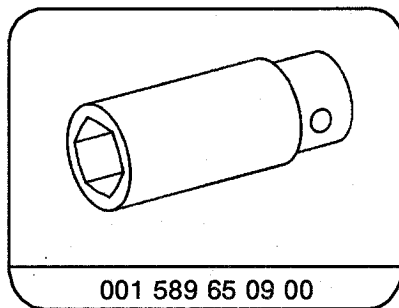
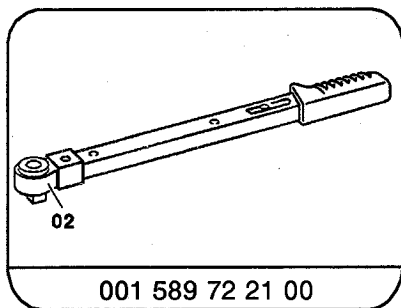
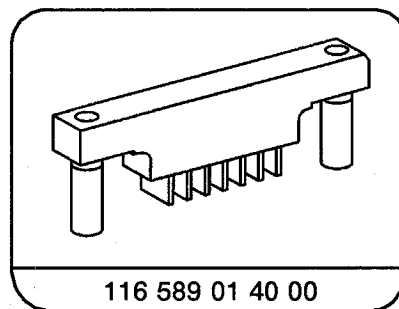
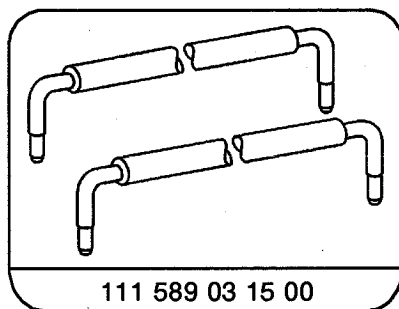
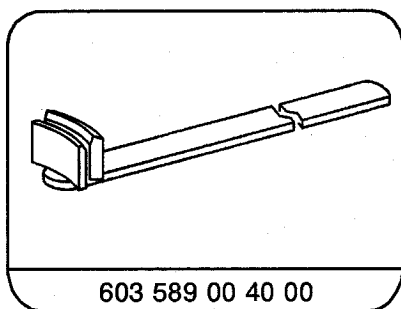
Tightening torques in Nm

Armature of camshaft adjuster	7
Nut of camshaft adjuster	65
Angle bracket to fan bearing bracket	25
Bolts of belt pulley to hub	35
Coolant pump to crankcase	21

Tightening torques in Nm

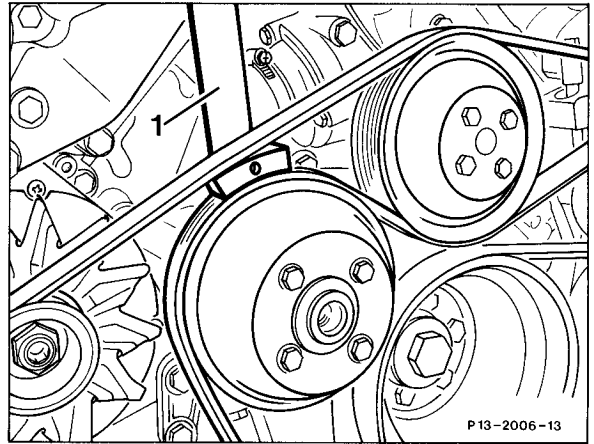
Air conditioning compressor or guide pulley to carrier	21
Bracket of air conditioning compressor to crankcase	21
Bolts of cylinder head to timing case cover	21
Radiator drain plug (reference value)	1.5-2
Belt pulley to fan carrier	10
Timing case cover to crankcase	21
Mounting bracket of alternator	21

Special tools



Removing, installing

- 1 Remove viscous fan clutch (20-3120).
- 2 Slacken bolts of fan belt pulley, using tool (1) 603 589 00 40 00 to hold tight.
- 3 Remove front covers at top (01-2120).
- 4 Remove poly V-belt and tensioning device (13-3450).

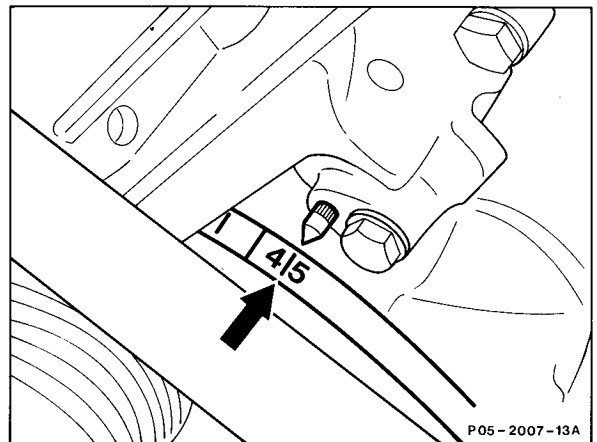


- 5 Set engine to 45° before ignition TDC at No. 1 cylinder.

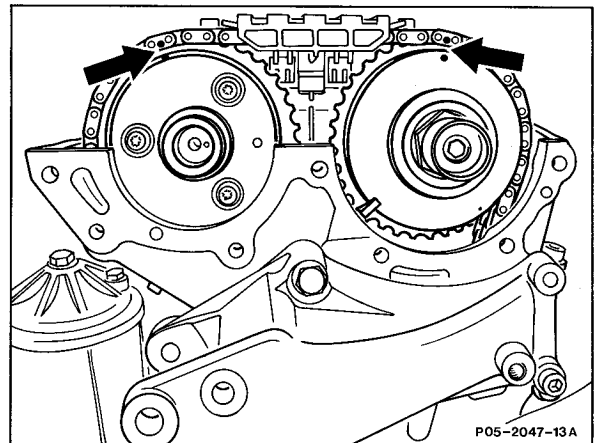
- 6 Unscrew bottom engine compartment lining (Maintenance Manual 6190).

- 7 Unscrew left exhaust pipe and cover of starter mounting.

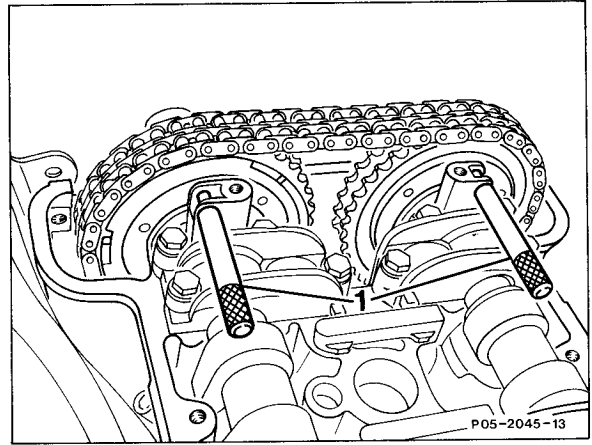
- 8 Use locking tool 116 589 01 40 00 to prevent engine from turning.



- 9 Mark all four camshaft timing gears and the timing chain with coloured dots (arrows).



10 Secure all camshaft gears on left and right side with pins (1) 111 589 03 15 00 to prevent them turning.

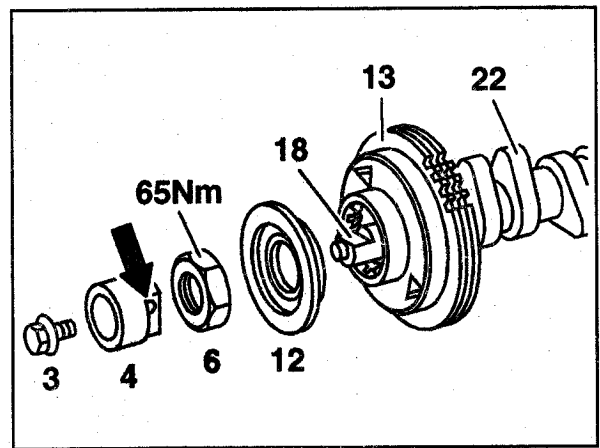


11 Unscrew armature (4) of camshaft adjuster.

Installation note

The roll pin (arrow) in the armature (4) must be aligned with the flat face on the timing plunger (18).

12 Slacken nut (6) on left and right camshaft adjuster.



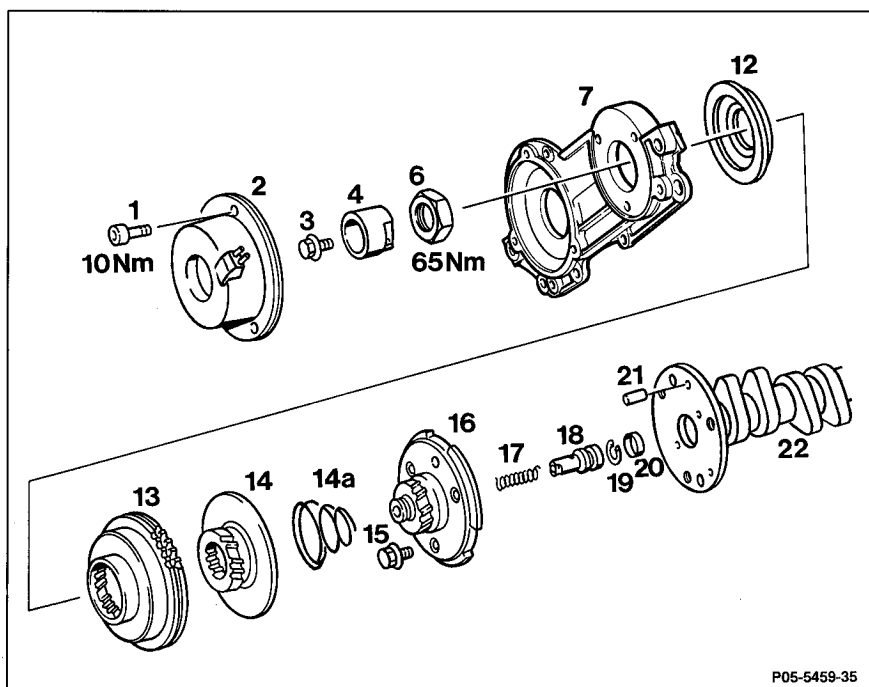
13 Remove alternator together with carrier.

Installation instruction

The bolts must be coated with sealant when fitted.

14 Remove chain tensioner (05-3100).

15 Remove top slide rails (05-3350).



16 Detach both camshaft adjusters by unscrewing nut (6) and raising timing chain. Take off cover with ring (12) and camshaft gear (13) together with adjusting piston (14) and spring (14a).

Installation Instruction

Fit timing chain onto the markings beginning at the left exhaust camshaft.

17 Drain coolant at radiator (20-0100).

18 Remove coolant hoses at the fan carrier and thermostat housing.

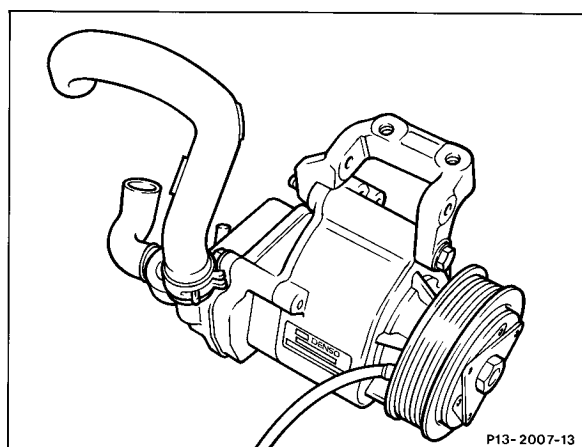
19 Unscrew belt pulley of fan carrier.

20 Unscrew air pump with angle bracket and take off.

Installation instruction

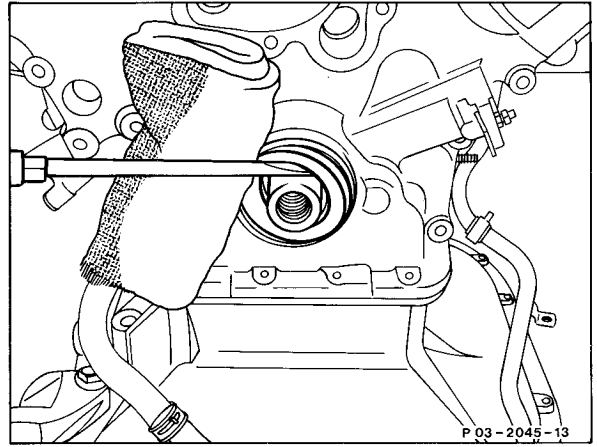
Install angle bracket free of tension.

21 Unscrew fan carrier from crankcase.



22 Remove belt pulley together with vibration damper, hub and seal (03-3420).

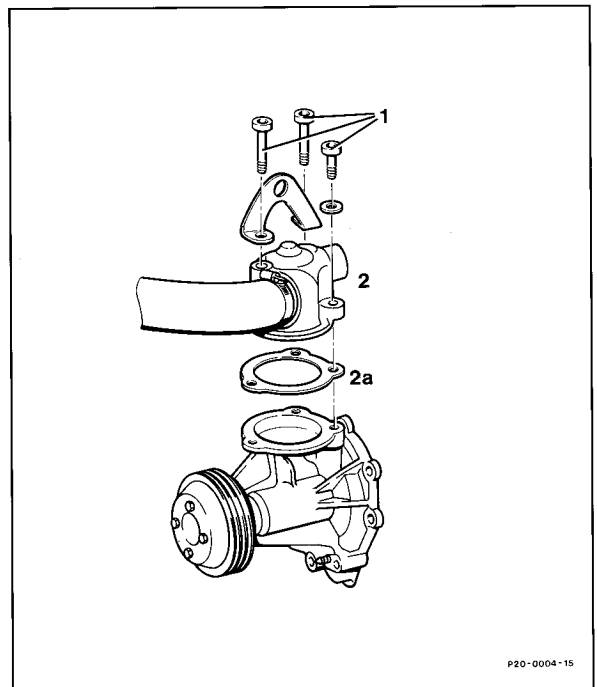
23 Remove radial seal (03-3240).



24 Unscrew bolts (1), take off cover (2) of coolant pump with engine lifting eye.

Installation instruction

Renew gasket (2a).

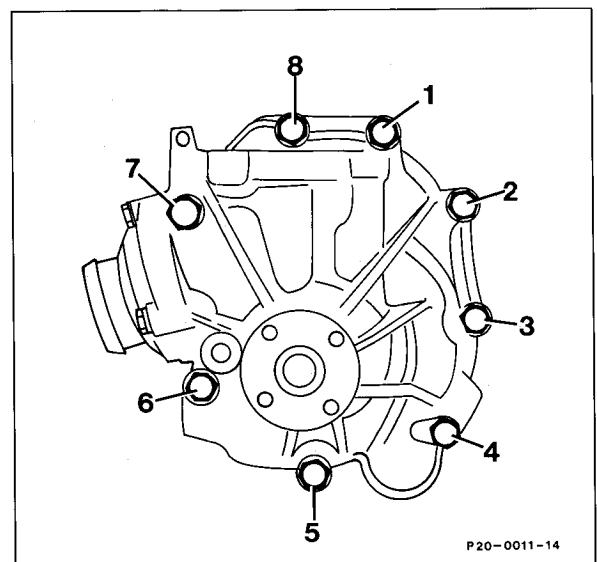


25 Unscrew coolant pump, take off.

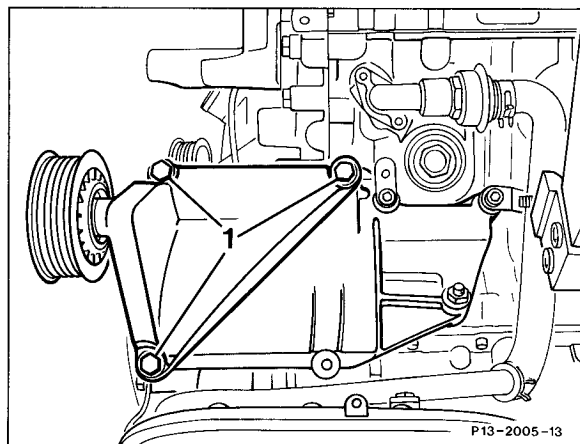
Installation instruction

Replace gasket, install bolts with washers as specified in diagram.

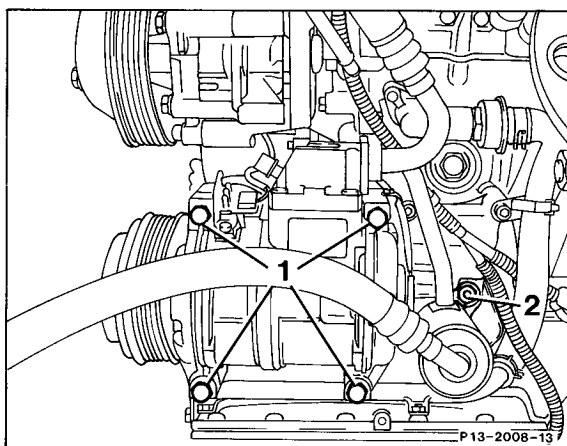
- | | |
|----------------|----------------|
| 1 Bolt M8 × 60 | 5 Bolt M8 × 60 |
| 2 Bolt M8 × 60 | 6 Bolt M8 × 90 |
| 3 Bolt M8 × 60 | 7 Bolt M8 × 35 |
| 4 Bolt M8 × 85 | 8 Bolt M8 × 65 |



26 Unscrew bolts (1) with washers. Take off carrier with guide pulley.

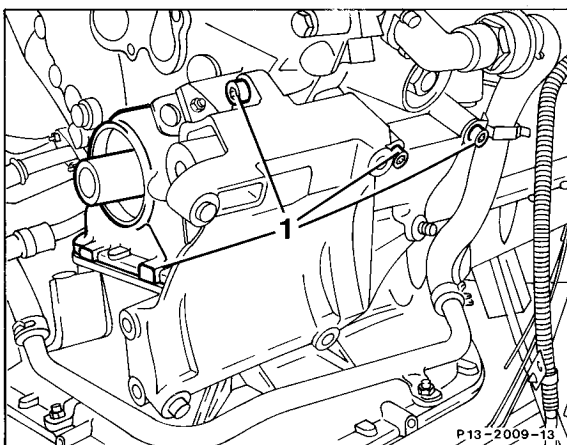


27 If air conditioning fitted: unscrew bolts (1) with washers and nut (2). Place air conditioning compressor to the side with lines connected.



28 Unscrew TDC sensor on timing case cover and take off.

29 Unscrew bolts (1) with washers, take off bracket.



30 Remove oil pump (18-2100).

31 Use a plastic-headed hammer to knock out dipstick guide tube upward.

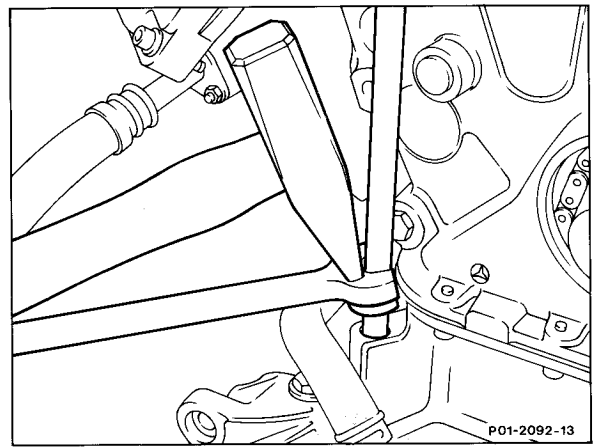
Installation instruction

Use special tool 117 589 00 31 00 to knock in dipstick guide tube.

32 Unscrew top section of oil sump and lower oil sump downward (01-3100).

33 Unscrew bolts on front of timing case cover and on cylinder head. Refer to steps 37 and 38 for bolt diagram.

Bolt diagram, see steps 38 and 39.



34 Take off timing case cover and detach the oil pump chain from the crankshaft gear when performing this step.



Do not damage cylinder head gaskets.

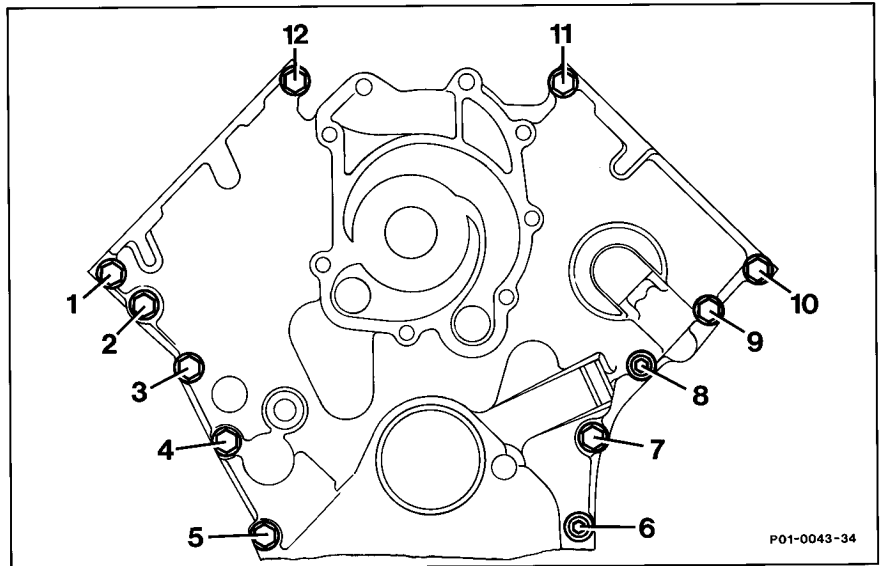
Installation instruction

Renew all four O-rings for sealing the water ducts.

35 Clean sealing surfaces and coat sealing surface of timing case cover with sealant 002 989 47 20 10.

36 Coat cylinder head gaskets with engine oil.

37 When fitting on timing case cover, fit the oil pump chain onto the crankshaft gear with a bent sheet of metal.



38 Screw on timing case cover. Install bolts with washers 1, 5, 7, 9, 10, 11 and 12 and tighten to 21 Nm.

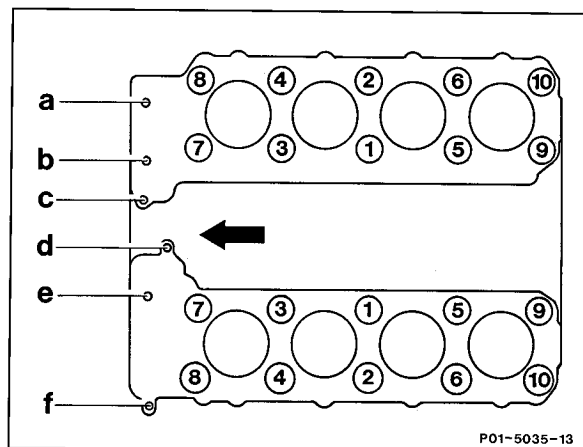
1	Bolt	M8 × 50
2	Bolt	M8 × 75
3	Bolt	M8 × 70
4	Bolt	M8 × 150
5	Bolt	M8 × 50
6	Hexagon socket bolt	M8 × 80
7	Bolt	M8 × 30
8	Hexagon socket bolt	M8 × 60
9	Bolt	M8 × 50
10	Bolt	M8 × 50
11	Bolt	M8 × 50
12	Bolt	M8 × 50

39 Tighten bolt-and-washer assemblies of cylinder heads to timing case cover as shown in diagram with a torque of 25 Nm.

- | | | |
|---|------------------------------|----------|
| a | Hexagon socket bolt + washer | M8 × 120 |
| b | Hexagon socket bolt + washer | M8 × 90 |
| c | Hexagon socket bolt + washer | M8 × 75 |
| d | Hexagon socket bolt + washer | M8 × 50 |
| e | Hexagon socket bolt + washer | M8 × 75 |
| f | Hexagon socket bolt + washer | M8 × 50 |

40 Install in the reverse order as from step 30.

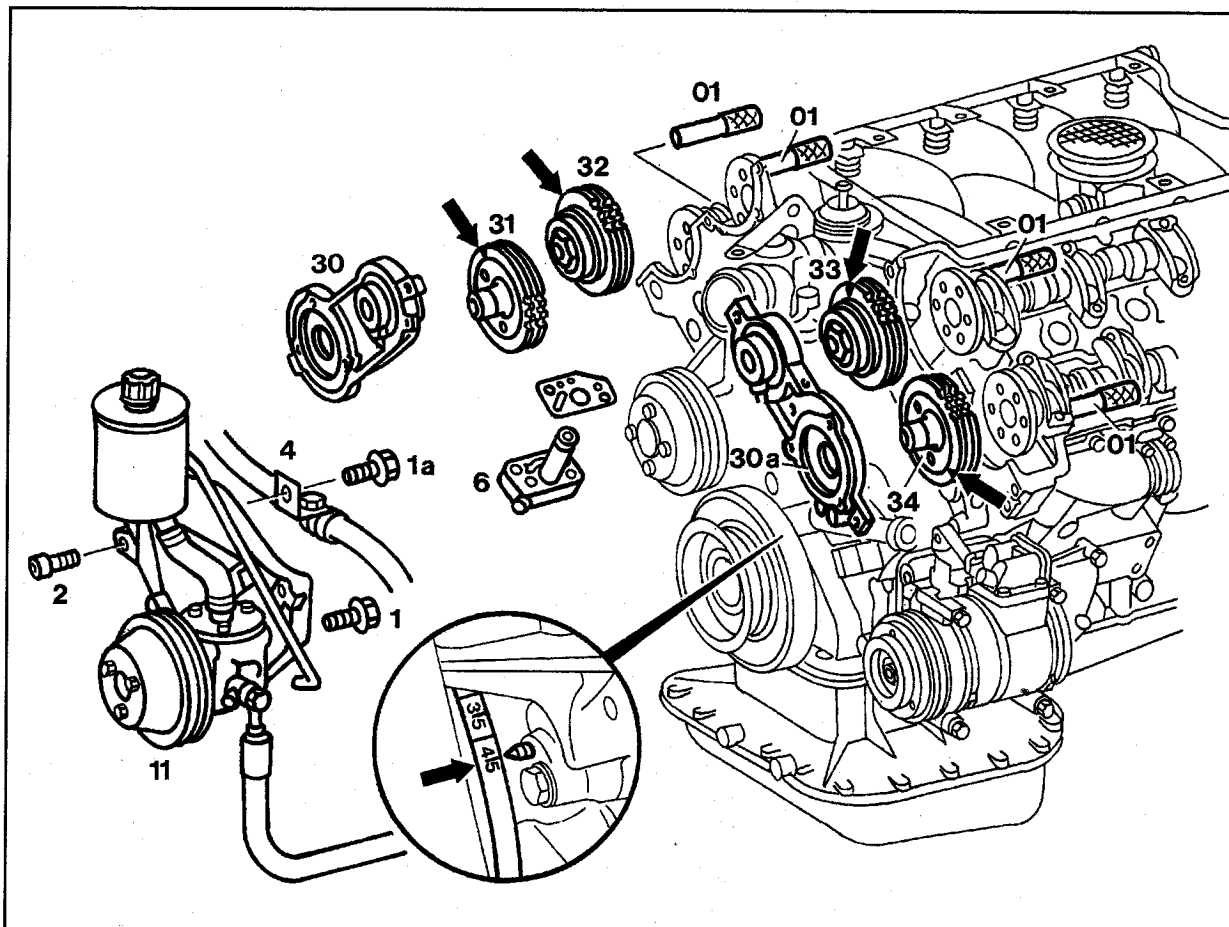
41 Check for leaks.



B. Engine 119.97/98

Preceding work:
Tensioning device removed (13-3450).
Cylinder head covers removed (01-0500).

Operation no. of operation texts and work units or standard texts
and flat rates
01-5800



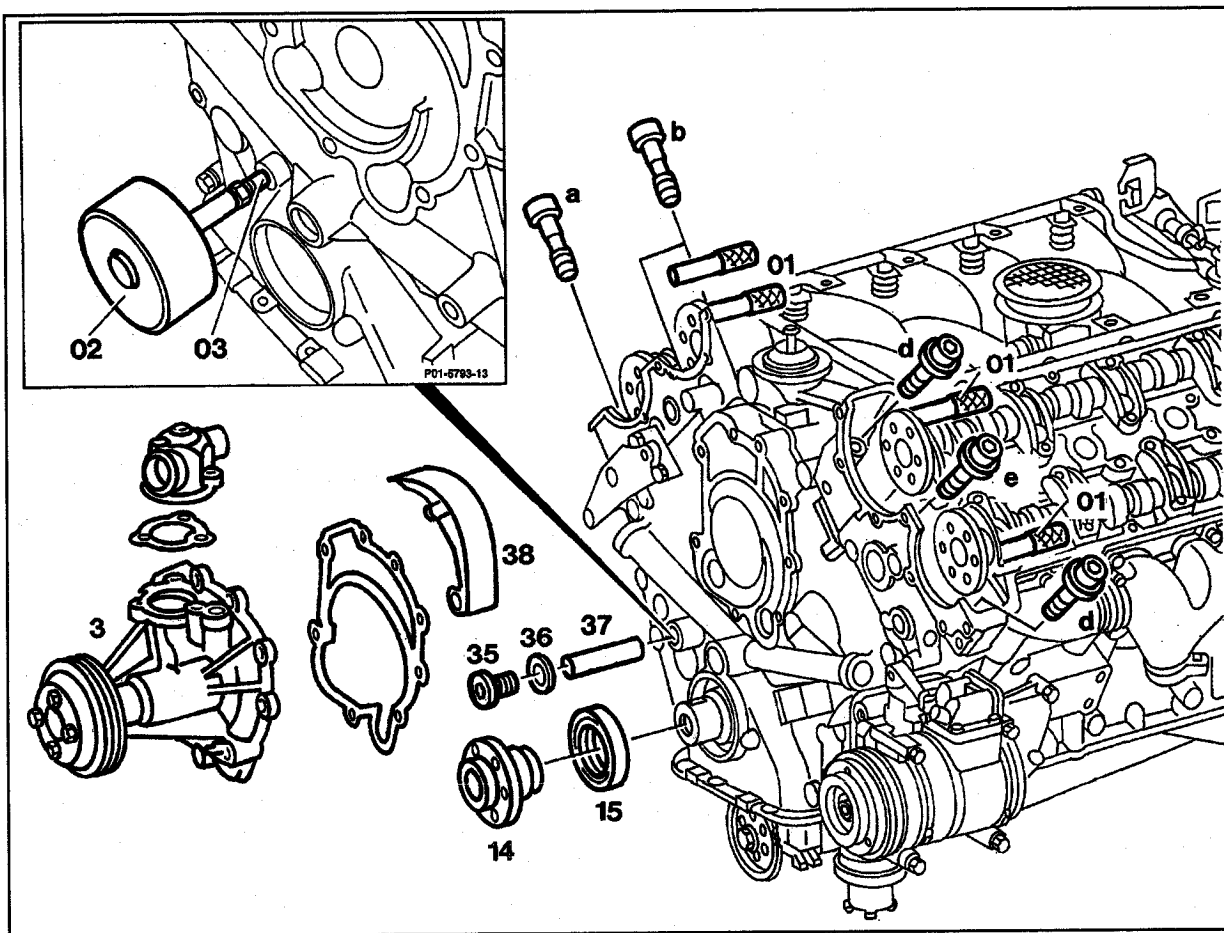
P01-5791-57

Cylinder 1	position to 45° before ignition TDC (arrow).
Camshafts	fix in position with pins (01), special tool 111 589 03 15 00.
Left cylinder head: bolts (1), (1a) and (2)	unscrew, screw on (21 Nm).
Mounting plate with power steering pump (11) and oil lines connected	place to the side, install.
Front covers at top (30) and (30a)	Installation note Coat bolt (2) with sealant 002 989 47 20 10. Engine 119.97: install bolt (1a) with retaining bracket (4) of wiring harness.
Timing chain	remove, install (01-2120). mark relative to camshaft sprockets (31), (32), (33) and (34) with coloured marking (arrows).

Chain tensioner (6)	remove, install (05-3100).
Camshaft adjusters (32), (33) and exhaust camshaft sprockets (31) and (34)	remove, install (05-2170).
Vibration damper	remove, install (03-3420).
Oil sump	detach, lower, bolt on(01-3100).



Do not damage oil sump gasket; remove oil sump, if necessary, and replace gasket (01-3100).



P01-5792-57

- a M8×120 hexagon socket fit collar bolt or M8×120 bolt+washer
- b M8×74 hexagon socket fit collar bolt or M8×74 bolt+washer
- d M8×50 hexagon socket bolt+washer
- e M8×75 hexagon socket bolt+washer

Coolant pump (3)	remove, install (20-2100).
Screwplug (35) with seal (36)	unscrew, screw on (15 Nm).

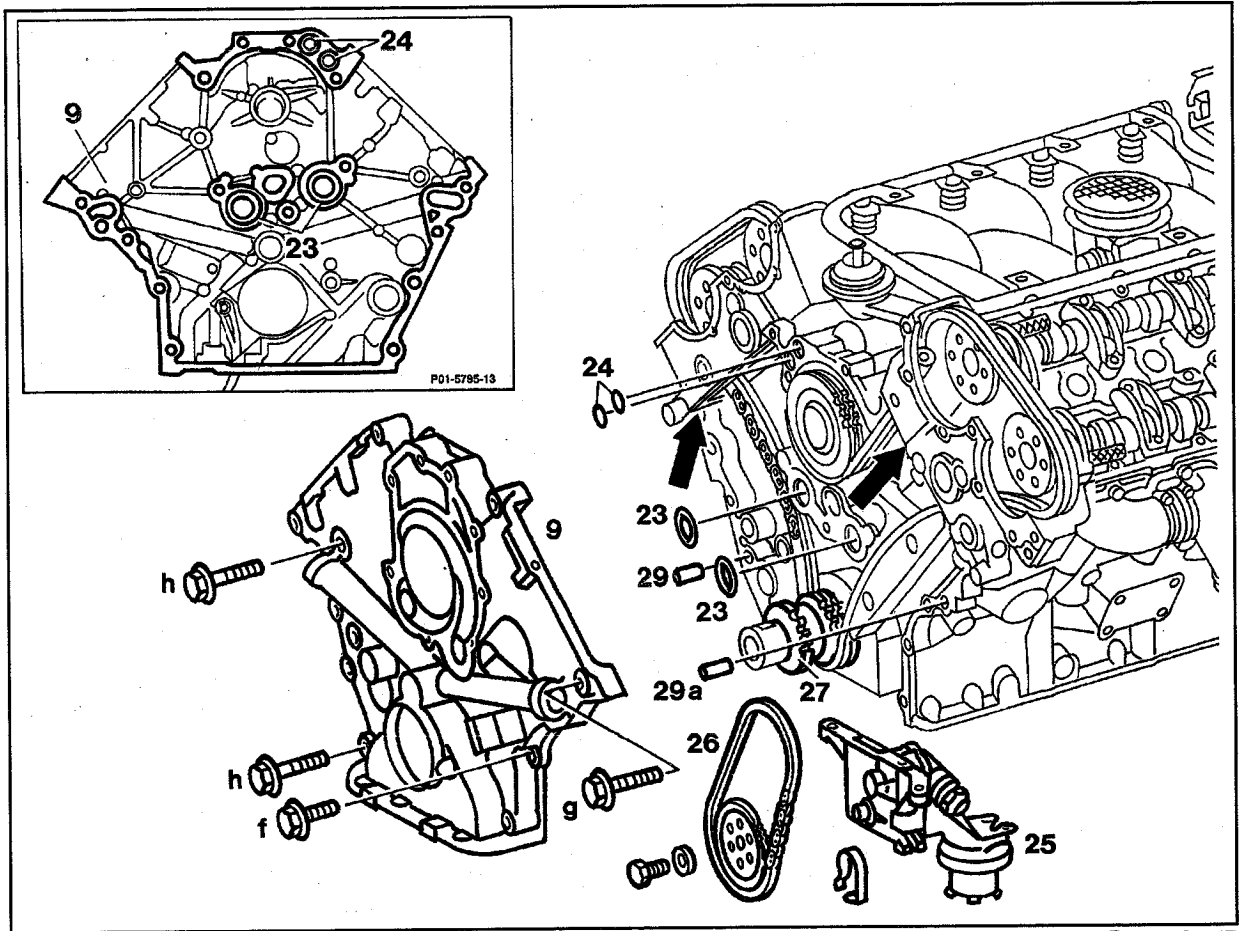
Installation note

Replace seal (36) according to condition.

- Tensioning rail pin (37) remove with impact puller (02) and threaded insert (03), special tools 116 589 20 33 00 and 116 589 01 34 00.
- Tensioning rail (38) remove, install.
- Fit collar bolts (a) and (b) and bolts (d) and (e) of timing case cover unscrew, screw on (21 Nm).

Note

When performing repairs, fit collar bolts or the bolts + washers should be installed depending on the bolts fitted previously.
 On engines 119.98, the center bolts (b and e) are discontinued; if the timing case cover is replaced on engines 119.97, it should be bolted on to the left and right cylinder head with two bolts each.



- f M8 x 30 bolt + washer
- g M8 x 40 bolt + washer
- h M8 x 50 bolt + washer

Front crankshaft radial seal (15)	remove, replace (03-3240).
Oil pump (25)	remove, install (18-2100).
Bolts (f), (g) and (h) at front of timing case cover (9)	unscrew, screw on (21 Nm).
Timing case cover (9)	take off, fit on.

Note

Use a bent piece of metal to detach oil pump chain (26) at the crankshaft sprocket (27) and attach.

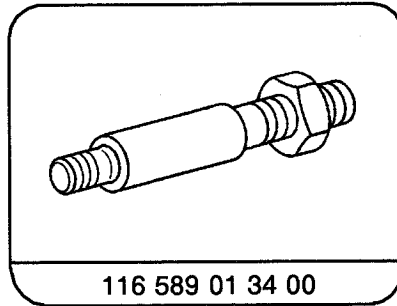
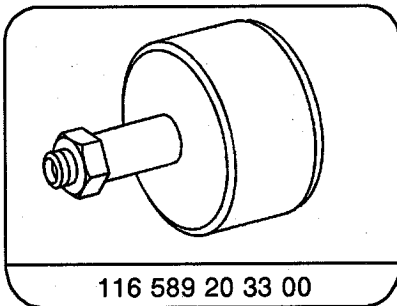
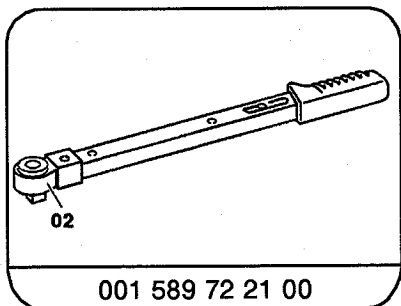
Replace front crankshaft radial seal (03-3240).



Do not damage cylinder head gaskets (arrows).

O rings (23) and (24) for sealing the coolant ducts	replace.
Sealing surfaces	clean.
Sealing surfaces	coat with sealant 002 989 47 20 10
Cylinder head gaskets (arrows)	coat with engine oil.
Dowel sleeve (29) and dowel pin (29a)	note.
Leaks	check with engine running.

Special tools

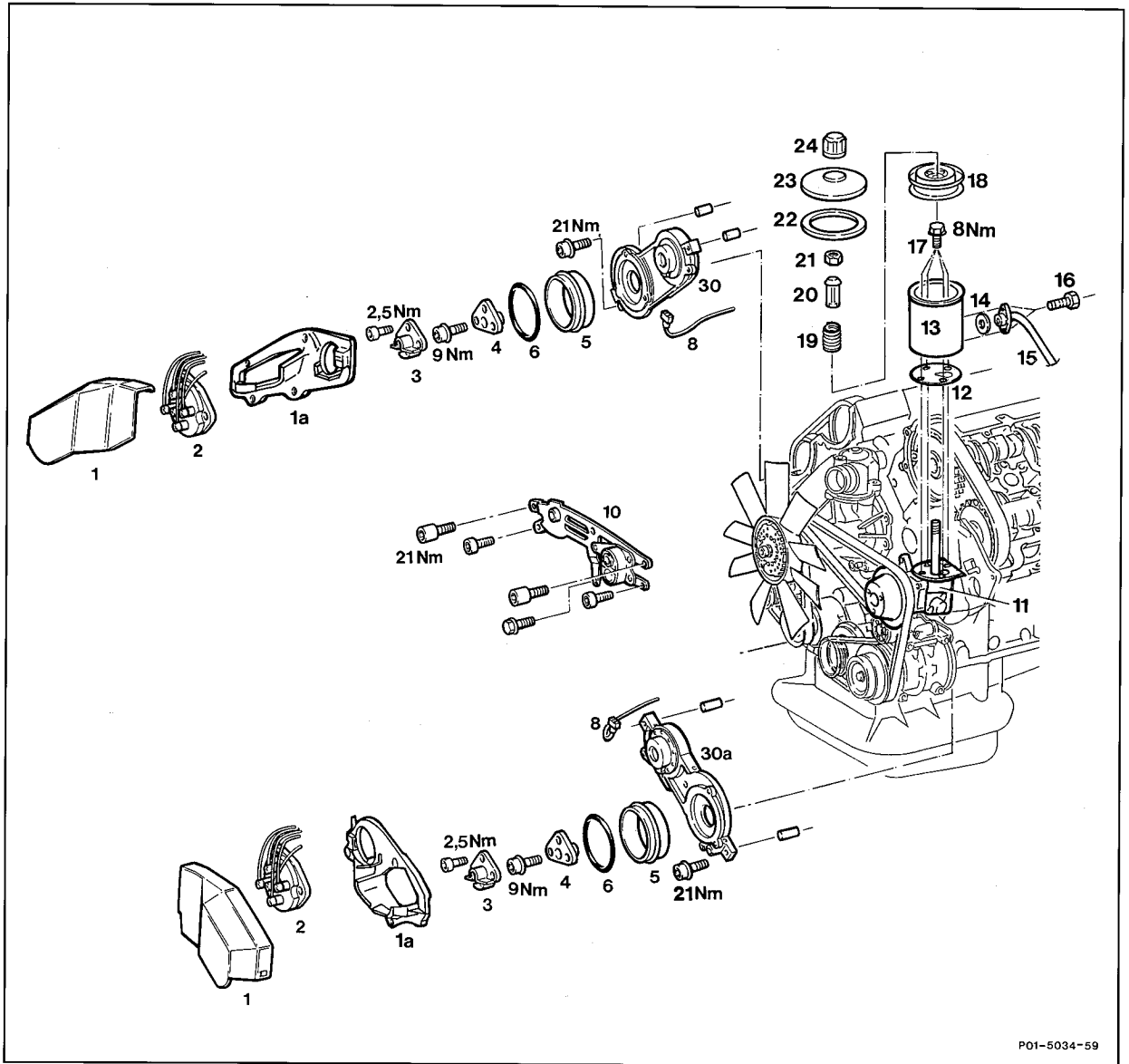


01-2120 Removing and installing front covers at top

Preceding work:
 Hazard warnings when hood opened (01-0080).
 Removing, installing cylinder head covers (01-0500).

Operation no. of operation texts and work units or standard texts
 and flat rates
 01-5700

A. Engine 119.960 in model 129



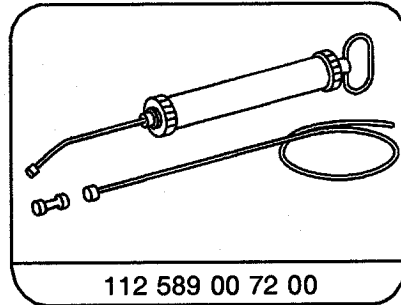
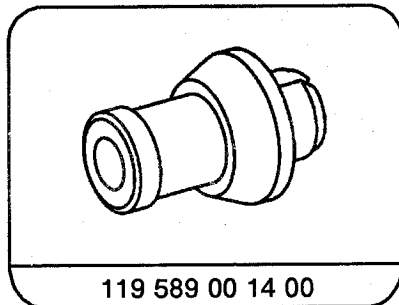
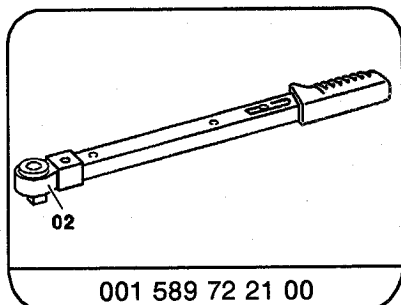
- | | |
|---|----------------------------------|
| Bracket (10) of actuator | detach, attach (21 Nm) (step 1). |
| Shielding caps (1) and high voltage distributor (2) | remove, install. |
| Covers (1a) | remove, install. |

Ignition cable holder, right side	unbolt, bolt on.
Power steering pump (11) (1st version) with mounting plate	remove, install (step 5) (46–710).
Poly V-belt	slacken, tension (13–3420).
Bracket of poly V-belt tensioning device	unbolt, bolt on (21 Nm).
Power steering pump (11) with mounting plate and lines/wiring connected	unbolt, place to the side, bolt on (21 Nm) (step 7) (46–710).
Power steering pump (11) (2nd version) with reservoir (13)	remove, install (step 8).
Power steering pump (11), oil in reservoir (13) . .	extract, adjust oil to correct level (step 9).
Oil line (15) at reservoir (13)	unbolt, bolt on (step 10).
Seal (14)	replace according to condition.
Filter (18)	remove, install.
Reservoir (13)	unbolt, bolt on (8 Nm) (step 12).
Gasket (12)	replace according to condition.
Distributor rotor (3) and follower (4)	remove, install.
Protective cover (5) and seals (6)	take off, fit on.
Connector of solenoid (8) of camshaft adjuster . .	unplug, plug in.
Front covers at top (30), (30a)	remove.
Sealing surfaces	clean.
Sealing surfaces	coat with sealant 002 989 47 20 10.
Front covers (30), (30a)	install with insertion sleeve, special tool 119 589 00 14 00.
Leaks	check with engine running.

Tightening torques in Nm

Cylinder head cover to cylinder head	9
Distributor rotor to follower (reference value)	2.5
Front cover at top to cylinder head	21
Mounting plate of power steering pump	21
Reservoir to power steering pump (Torx)	8

Special tools



Removing, installing

- 1 Unscrew bolts from bracket of actuator.

Installation note

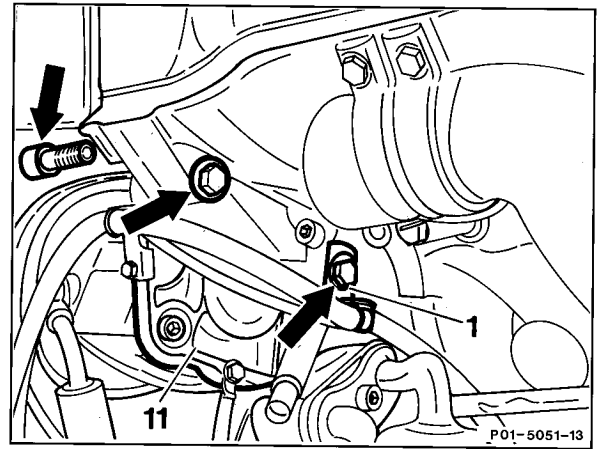
Bolts should be coated with sealant
002 589 47 20 10 when installing.

- 2 Unbolt shielding caps and high voltage distributors and take off.
- 3 Unbolt coverings from front cover.
- 4 Unbolt right ignition cable holder at cylinder head.
- 5 If power steering fitted with non-removable reservoir (1st version) perform steps 8 to 9.
- 6 Slacken poly V-belt (13-3420).

7 Unscrew bolts (arrows). Place mounting plate with power steering pump (11) and lines/wiring connected to the side. Tightening torque 21 Nm.

Installation note

The bolt which is screwed into the cylinder head at the front must be coated with sealant when installed. Pay attention to angle bracket (1) of wiring harness.

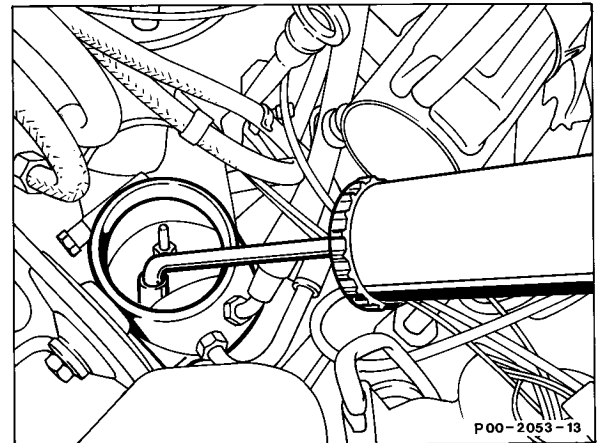


8 If power steering pump with detachable reservoir (2nd version) is fitted perform steps 11 to 14.

9 Extract oil from the reservoir of the power steering pump with the handpump, special tool 112 589 00 72 00 for extracting oil.

Installation note

Fill power steering pump and bleed.



10 Unbolt oil line (15) at reservoir.

Installation note

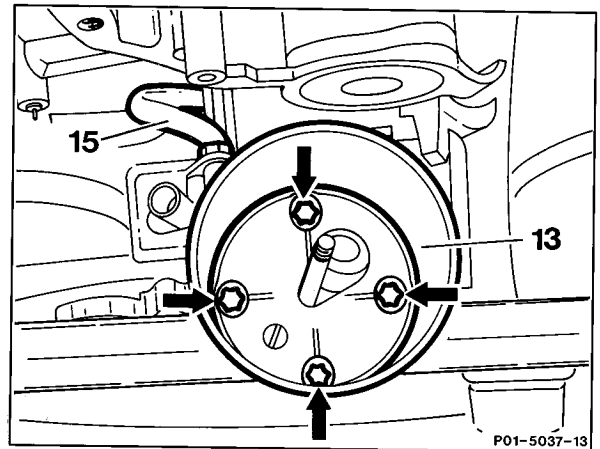
Replace seal according to condition.

11 Remove filter in reservoir of power steering pump.

12 Unscrew bolts (Torx) (arrows). Take off reservoir (13). Tightening torque 8 Nm.

Installation note

Replace gasket of reservoir (13) according to condition.



13 Unbolt distributor rotor and follower.

Installation note

The slot of the follower must engage over the pin in the camshaft.

14 Unplug connector of solenoid of camshaft adjuster.

15 Unscrew bolts of covers at front, take off cover.

16 Clean sealing surfaces.

17 Coat front covers with sealant
002 989 47 20 10.

Fit insertion sleeve, special tool
119 589 00 14 00, onto exhaust camshaft
sprockets and install front covers.

18 Coat front cover bolts with sealant.
Tightening torque 21 Nm.

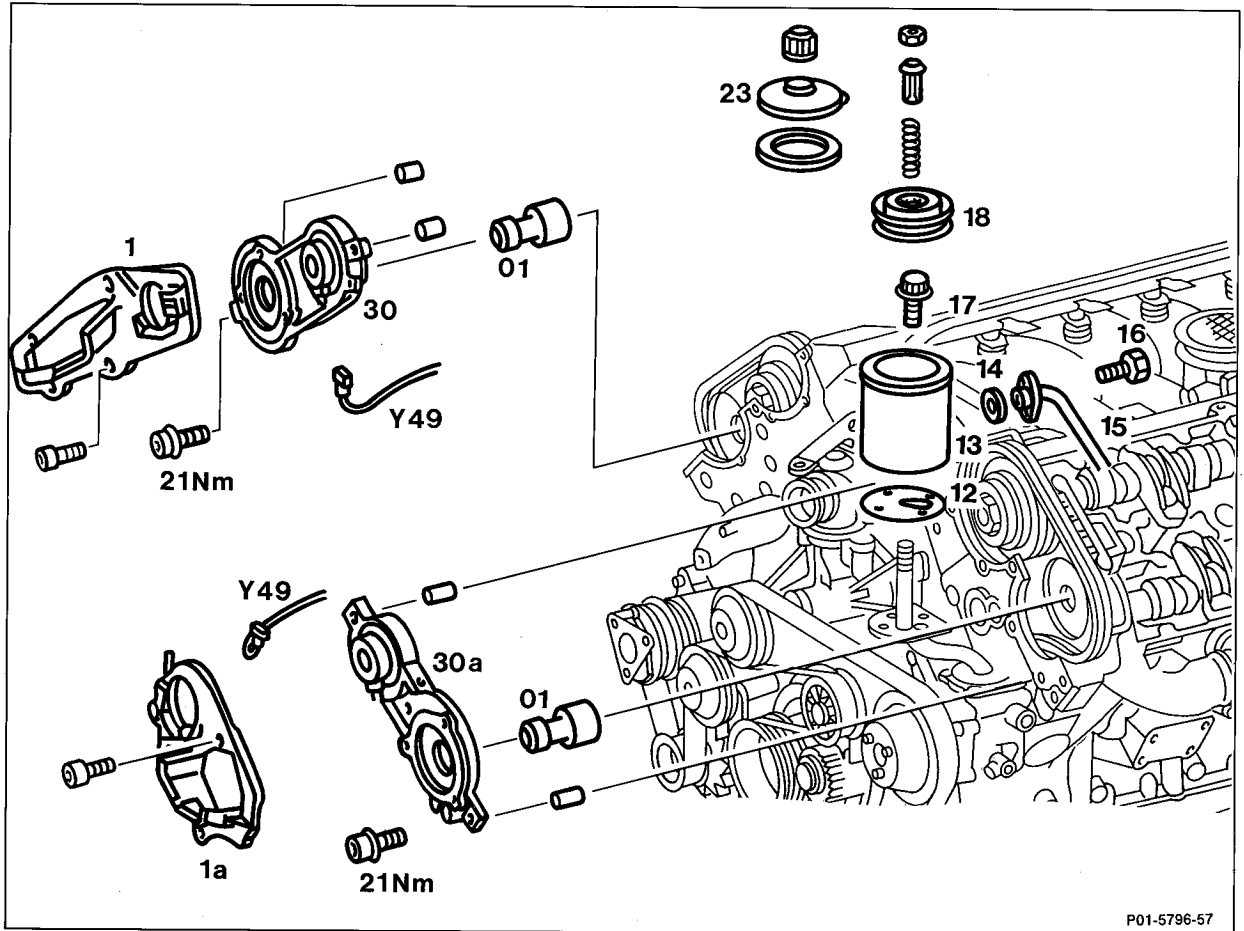
19 Install in reverse order.

20 Run engine, check for leaks.

B. Engine 119.97

Preceding work:
Cylinder head cover removed (01-0500).
Driver removed (01-2130).

Operation no. of operation texts and work units or standard texts
and flat rates
01-5700



- | | | |
|--|-------|--|
| Left front cover (30a): cap (23) and filter (18)
at reservoir (13) of power steering pump | | remove, install. |
| Left front cover (30a): oil in reservoir (13) | | extract with handpump, special tool
112 589 00 72 00. |
| Installation note | | |
| Fill power steering pump and bleed. | | |
| Left front cover: oil line (15) | | unbolt, bolt on. |
| Installation note | | |
| Replace O-ring (14). | | |
| Left front cover (30a): bolts (17) (Torx E8) | | unscrew, screw on. |

Left front cover (30a): reservoir (13) with gasket (12) remove, install.

Installation note

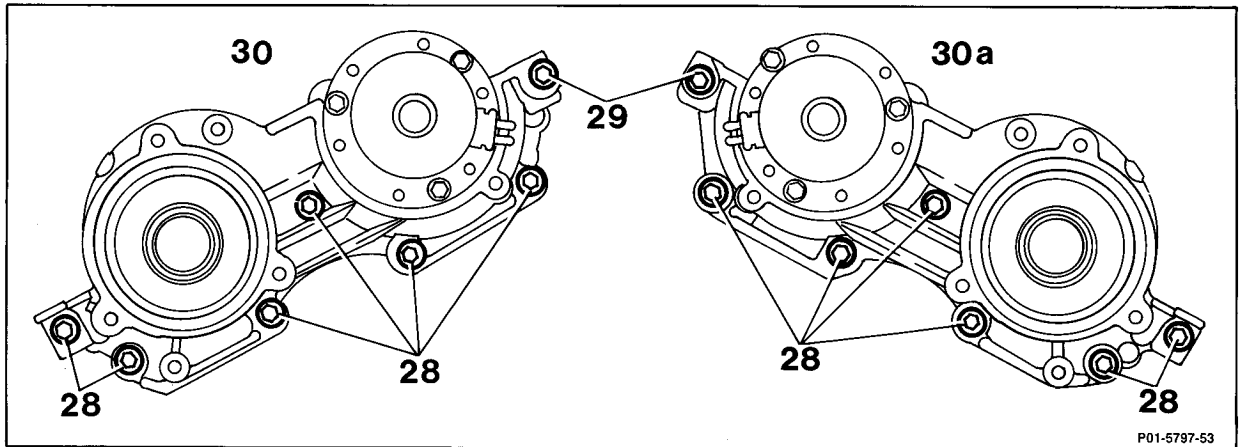
Replace gasket (12) according to condition.

Connector of solenoid (Y49) of camshaft adjuster unplug, plug in.

Bracket of cover (1) or (1a) unbolt, bolt on.

Installation note

Clip ignition cable and ignition cable duct into bracket of cover (1) or (1a).



- 28 M8 x 25 hexagon socket bolt + washer
- 29 M8 x 35 hexagon socket bolt + washer

Front covers (30) and (30a) unbolt, remove.

Sealing surfaces clean.

Front covers (30) and (30a) at contact surfaces to cylinder head coat with sealant 002 989 47 20 10.

Bolts (28) and (29) coat with sealant 002 989 47 20 10.

Insertion sleeve (01) fit onto exhaust camshafts, pull off, special tool 119 589 00 14 00.

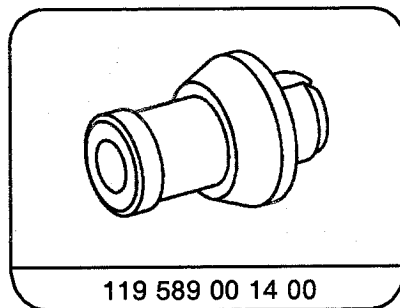
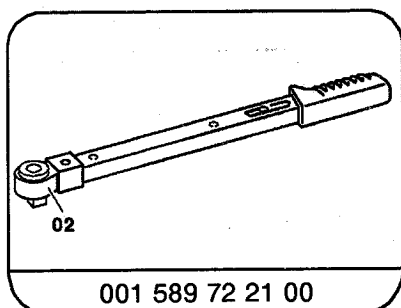
Front covers (30) and (30a) fit on, bolt on (21 Nm).

Leaks check with engine running.

Tightening torques in Nm

Bolts of front covers	25
Reservoir at power steering pump (Torx E8)	9

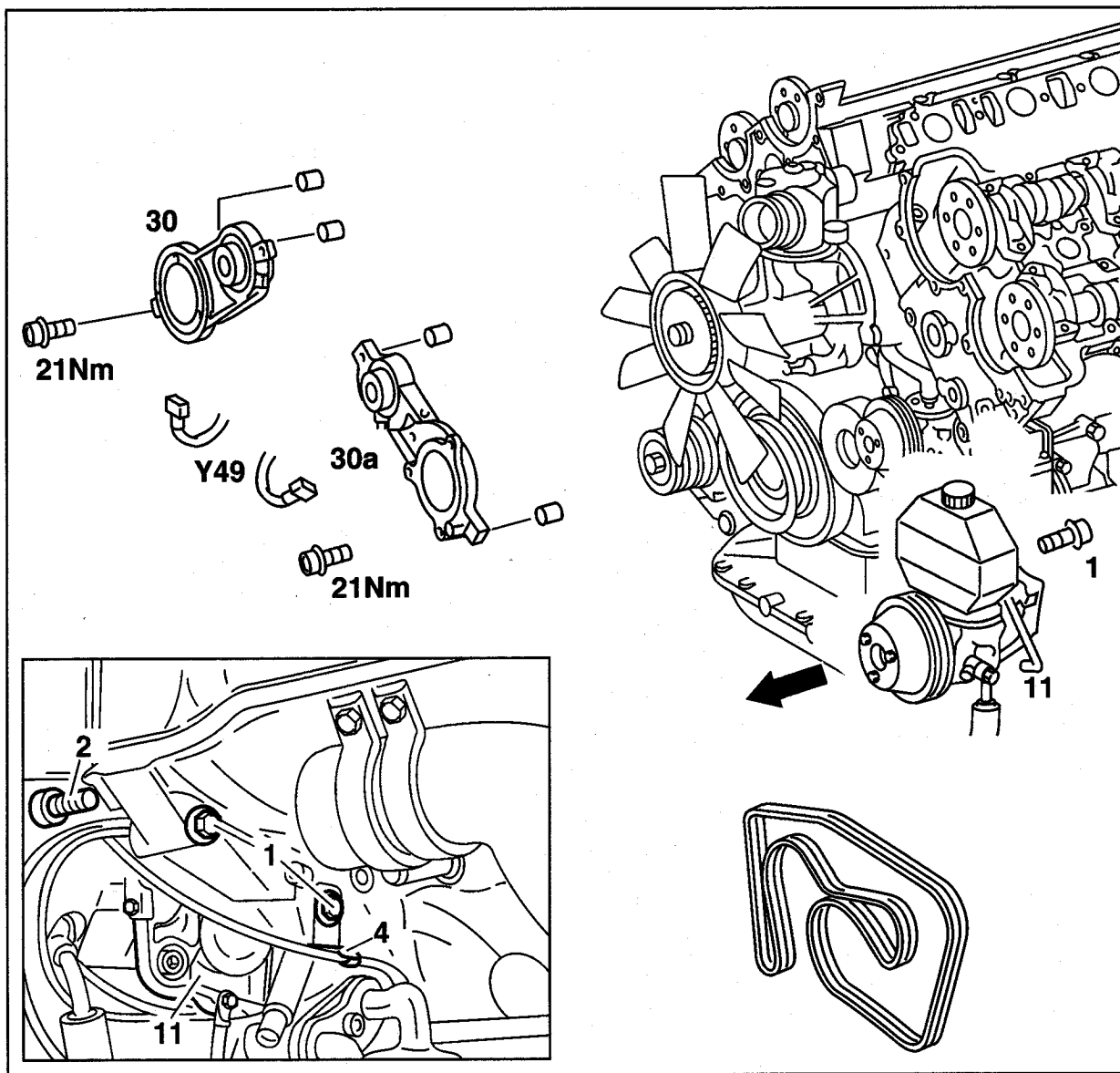
Special tools



C. Engine 119.98 in model 210

Preceding work:
 Cylinder head covers removed (01-0500).
 Poly V-belt removed (13-3420)

Operation no. of operation texts and work units or standard texts
 and flat rates
 01-5700



P01.10-0260-59

Left front cover (30a) on version with power steering pump:

unbolt power steering pump with supporting plate (11), bolt on (25 Nm).

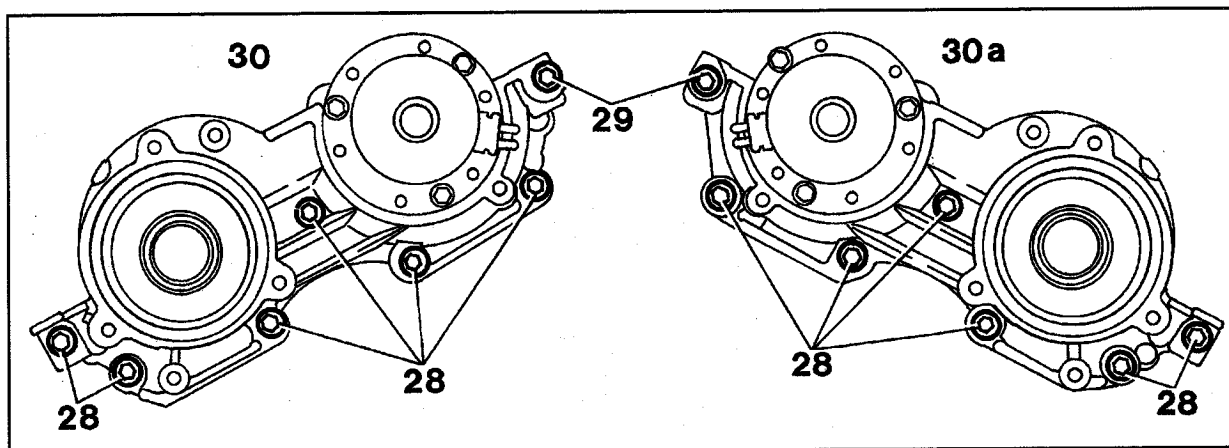
Note

This is done by removing bolt at front (2) and bolts at rear (1).

When installing bolt at front (2), coat with sealant 002 989 47 20 10.

If tandem pump fitted, pump remains installed; unscrew bottom left bolt for front cover with extended hexagon socket bit.

- Right front cover with secondary air injection: . . . unbolt secondary air injection valve at air pump support, push to the side, bolt on.
- Connector of camshaft adjuster solenoid (Y49) . . . unplug, plug in.
- Front cover (30) and (30a) unbolt, remove.



P01-5797-53

- 28 M8 x 25 hexagon socket bolt + washer
 29 M8 x 35 hexagon socket bolt + washer

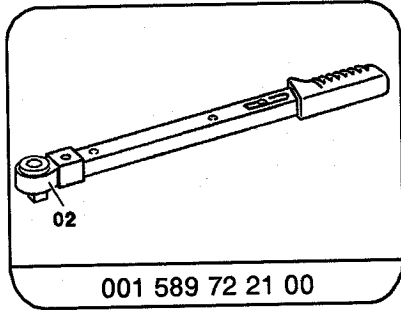
- Sealing surfaces clean.
- Contact surfaces of front cover (30) and (30a) to cylinder head coat with sealant 002 989 47 20 10.
- Bolts (28) and (29) coat with sealant 002 989 47 20 10.
- Front covers (30) and (30a) fit on, pay attention to dowel pins, screw on (25 Nm).
- Engine rund and check for leaks.

Tightening torques in Nm

Bolts of front covers

25

Special tool



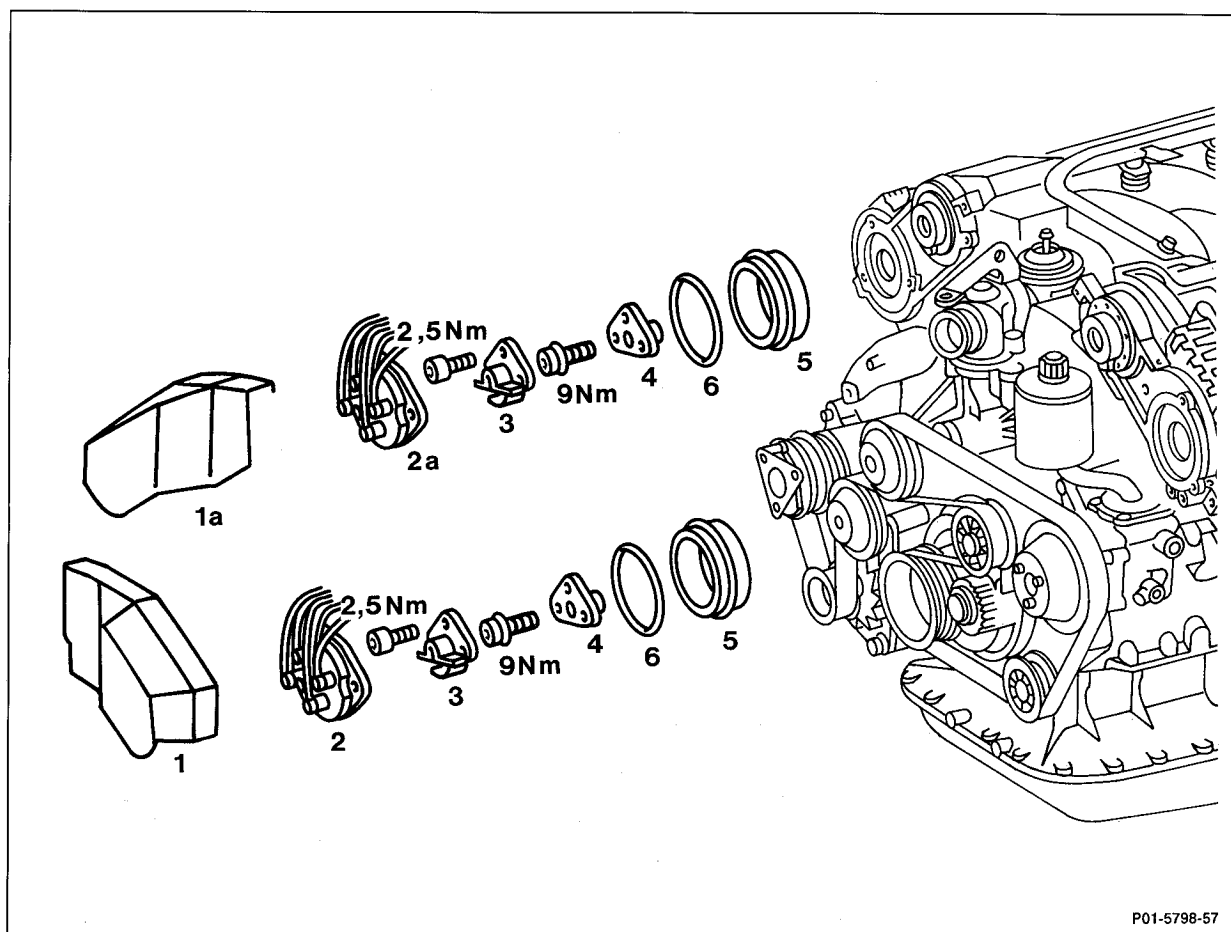
01-2130 Removing and installing driver on camshaft

Preceding work:

Removing and installing intake air hoses (09-0015).

Model 124: removing and installing intake air scoops (09-0060).

Engine 119.96/97



P01-5798-57

Shielding caps (1) and (1a) at the side	unclip, take off, fit on.
High voltage distributors (2) and (2a)	unbolt, bolt on.
Distributor rotor (3)	unbolt, bolt on (2.5 Nm).
Driver (4)	unbolt, bolt on (9 Nm).

Installation note

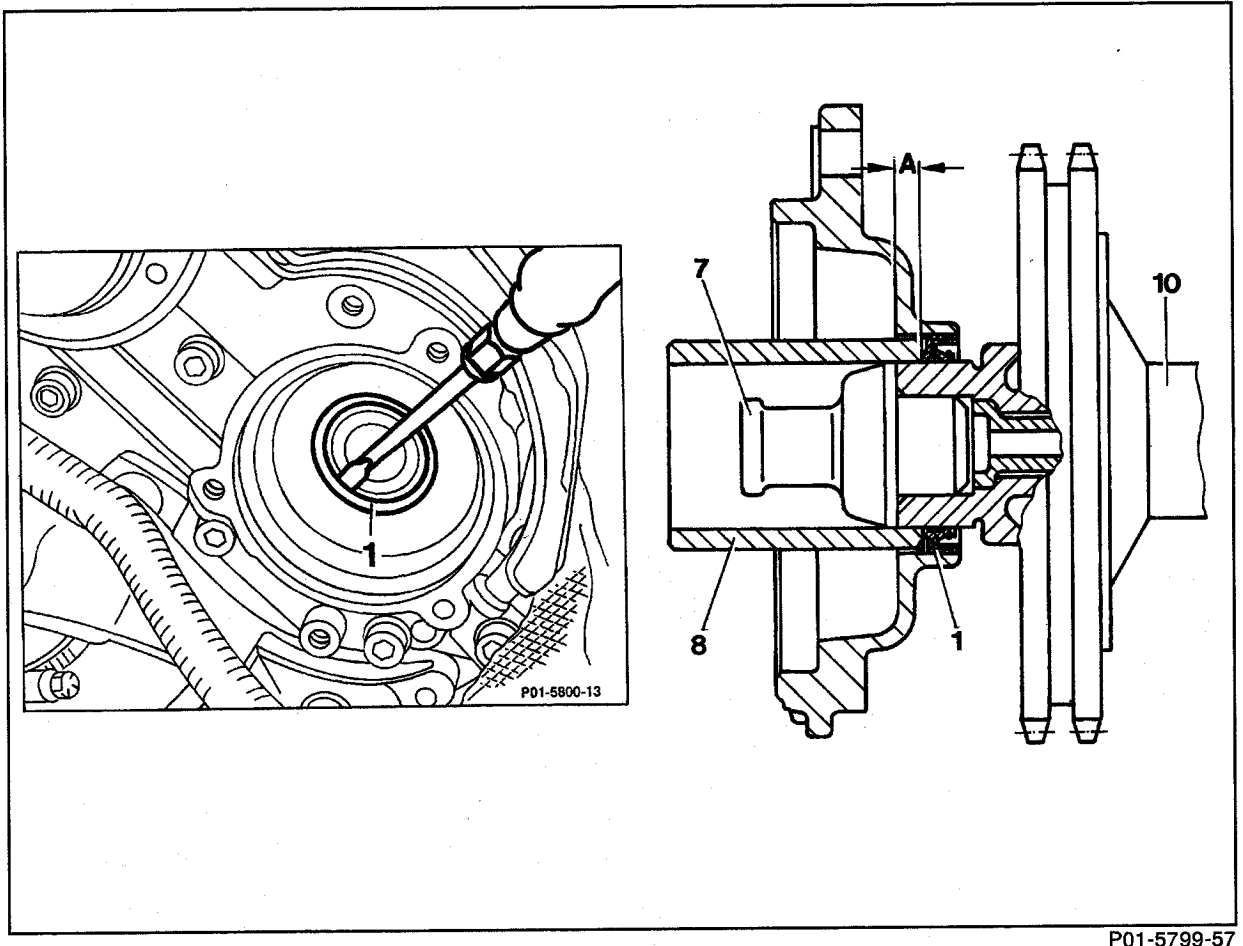
The slot of the driver (4) must engage in the locating pin in the camshaft.

Protective cover (5) together with seal (6)	take off, fit on.
---	-------------------

01-2140 Replacing radial shaft seals in front covers at top

Preceding work:
Follower at camshaft removed (01-2130)

A. Engine 119.96/97 with front cover installed



P01-5799-57

- Insertion sleeve (7) fit on to exhaust camshaft (10), special tool 119 589 00 14 00.
- Sealing lip of radial seal (1) coat with engine oil.



Do not use grease! Grease prevents the return delivery swirl on the sealing lip of the radial shaft seal (1) transporting back the engine oil.

- Radial shaft seal (1) fit onto insertion sleeve (7).

Radial shaft seal (1) press in with sleeve (8) (shop-made) to size "A=5 mm".

Note

The radial shaft seal (1) must be positioned vertically to the camshaft (10) in order to provide a proper seal.

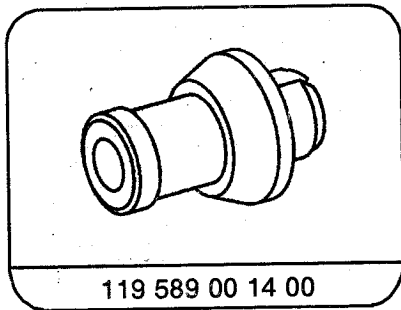
Holder of shield caps of high tension distributors . remove, install.

Radial shaft seal (1) press out with a screwdriver.



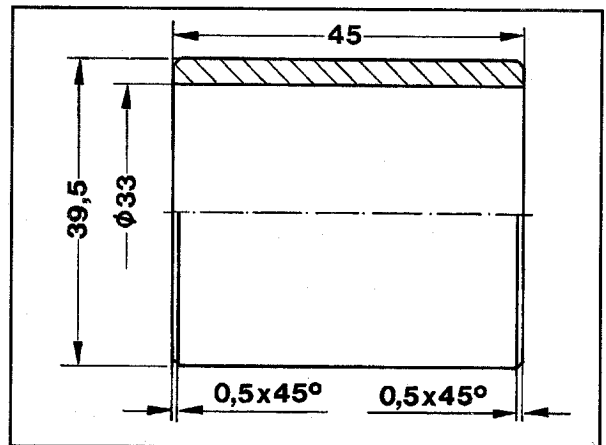
Do not damage camshaft (10) and mounting hole for radial shaft seal (1).

Special tool



Shop-made tool

Sleeve (8) for pressing radial shaft seal into the front cover.

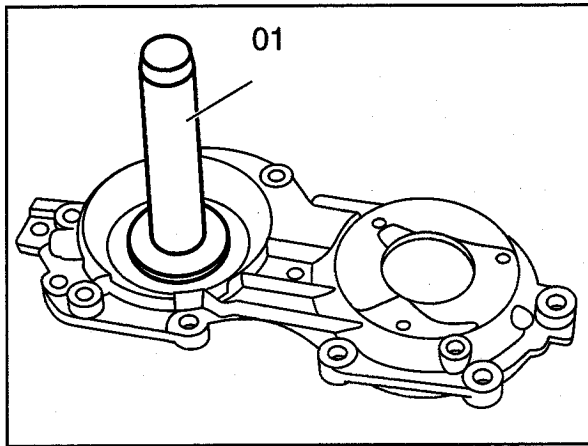


P01-5807-13

B. Engine 119.96/97 with front cover removed

Preceding work:
Front covers removed (01-2120).

Operation no. of operation texts and work units or standard texts
and flat rates:




P01.10-0275-13

Radial shaft seal

press out with a screwdriver.

Radial shaft seal (1)


Do not damage mounting hole for the radial
shaft seal.

Radial shaft seal

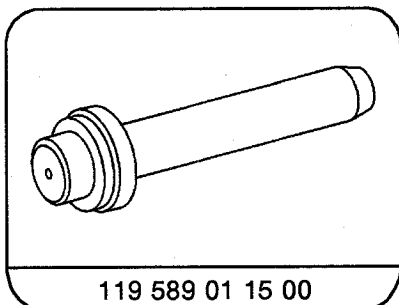
fit onto drift (01) 119 589 01 15 00.

press in with drift (01).

Note

The insertion depth of 5 mm is obtained by
using the drift (01).

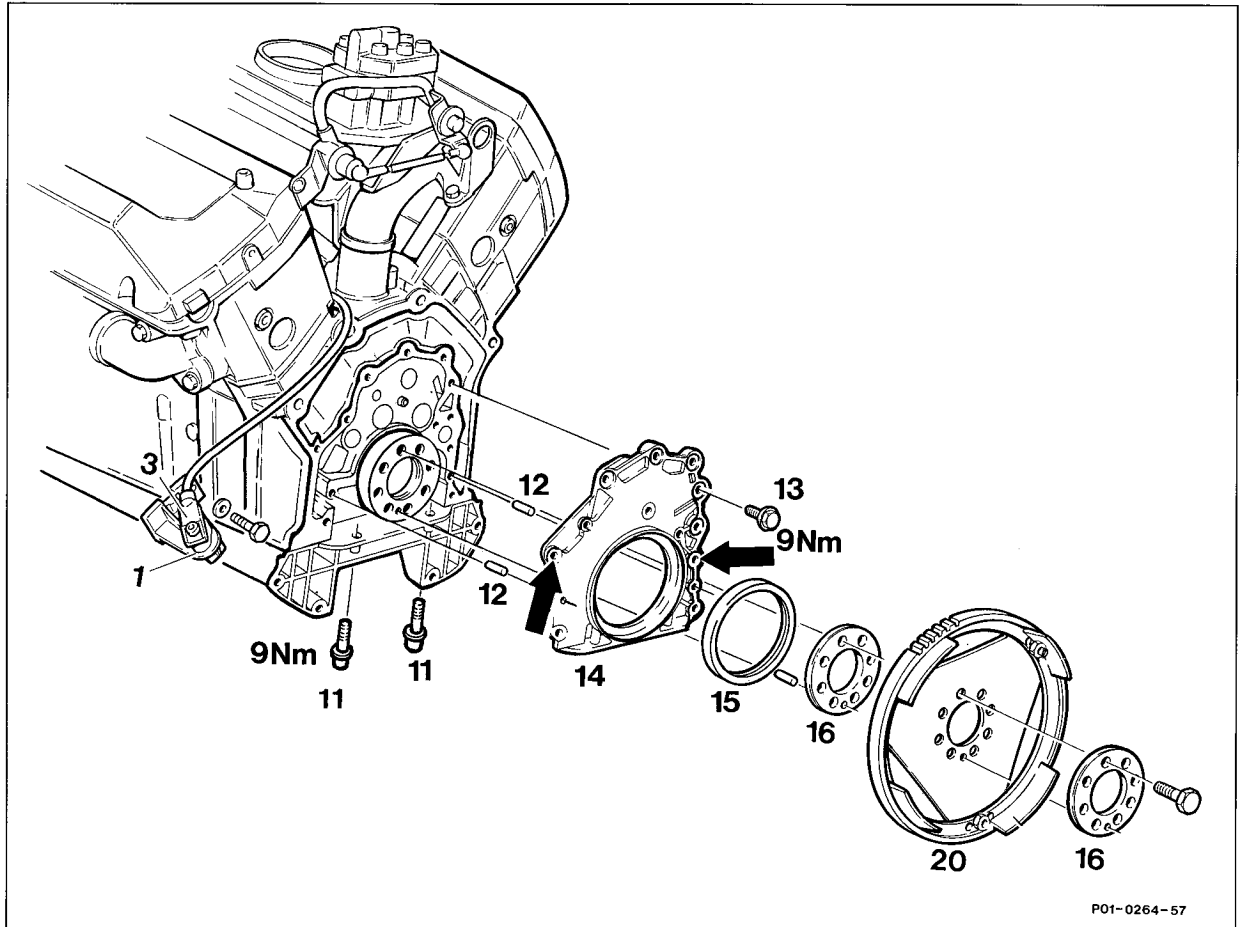
Special tool



01-2220 Removing and installing end cover

Preceding work:
Transmission removed (27-6000).

Operation no. of operation texts and work units or standard texts
and flat rates
01-8913



Driven plates (20)	remove (03-4100).
Bolts (11 and 13)	unscrew.
End cover (14) with radial seal (15)	press off (step 3) using M8 bolts at tapped holes (arrows).
Sealing surfaces	clean.
Sealant	apply (step 5).
Sealing lip of radial seal	coat with engine oil (step 6).
Bottom side of end cover	coat with sealant (step 7). Sealant 002 989 45 20.
End cover (14) with radial seal (15)	press on over insertion tool, special tool 117 589 00 43 00 (step 8).

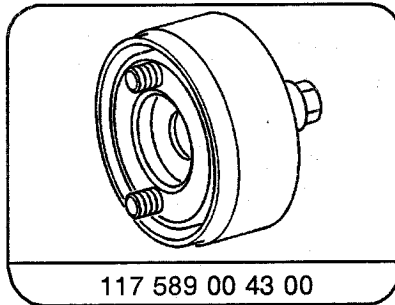
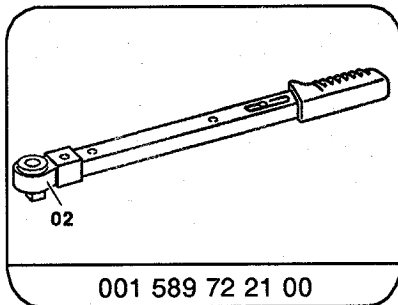
Bolts (13)	tighten first of all (9 Nm).
Bolts (11)	tighten (9 Nm).
Leaks	check at rear of engine when running (01-2240).

Tightening torques in Nm

End cover to crankcase

9 Nm

Special tools

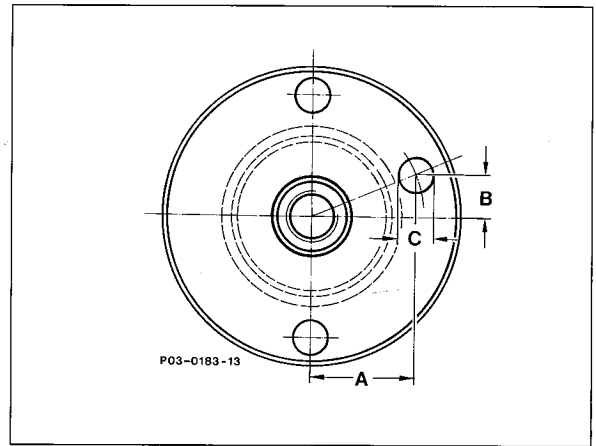


Insertion tool

Use only insertion sleeve 117 589 00 43 00 (2nd version) with hole for locating pin.

Insertion sleeve 117 589 00 43 00 (1st version) can be modified by hole with the dimensions "A, B, C" as shown in drawing.

Size A = 38 mm
 B = 15.6 mm
 C = 10 mm

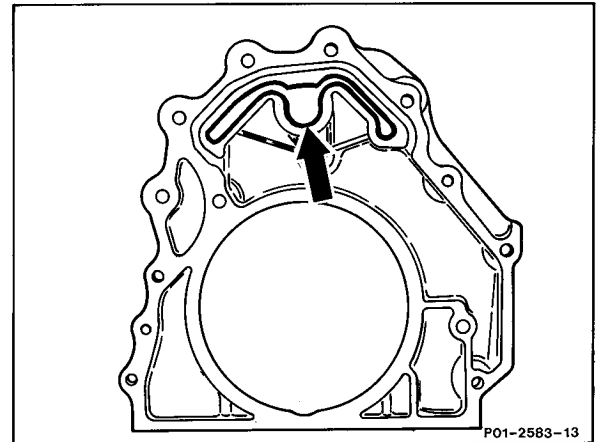


Note

The end cover seals the main oil gallery (arrow); for this reason, particular care must be employed when installing.

The sealing surfaces of the crankcase and of the end cover must not have any scoring.

The tapped holes in the crankshaft flange are drilled through. When the bolts are removed and the engine is tilted, engine oil runs out of the tapped holes.



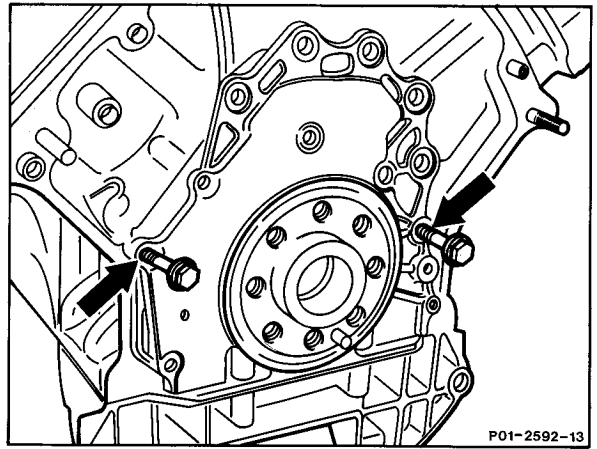
Removal

- 1 Remove driven plates together with ring gear (03-4100).
- 2 Unscrew end cover together with radial seal.

3 Use bolts at M8 tapped holes (arrows) to press off tight end cover.



Do not damage gasket of oil sump.

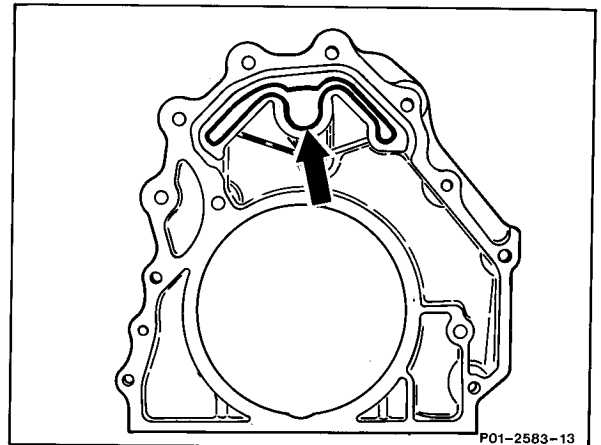


P01-2592-13

Installation

4 Carefully clean sealing surface on crankcase and on end cover.

5 Coat the sealing surface of the end cover evenly with sealant 002 989 45 20. When doing this, ensure that no sealant gets into the oil gallery (arrow).



P01-2583-13

6 Coat radial seal between dust and sealing lip with engine oil.



Do not use grease. Grease prevents the angled webs on the sealing lip transporting back the engine oil.

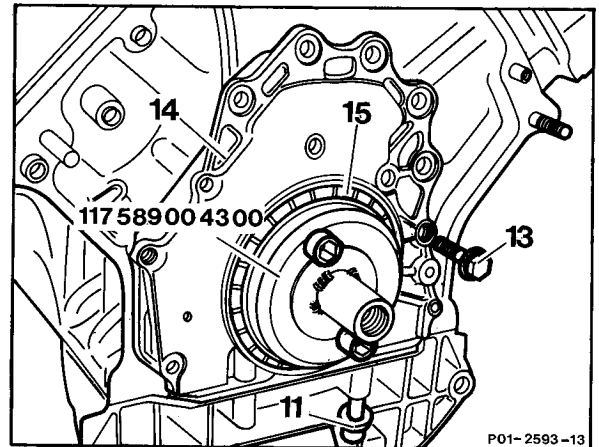
7 Coat underside of end cover with sealant 002 989 00 20 10.

8 Push end cover (14) together with radial seal (15) over the inner part of the bolted-on insertion tool, special tool 117 589 00 43 00, and bolt on. Do not damage oil sump gasket. If necessary, replace oil sump gasket. First of all tighten bolts (13), then bolts (11).



Pay attention to different length of bolts (13).

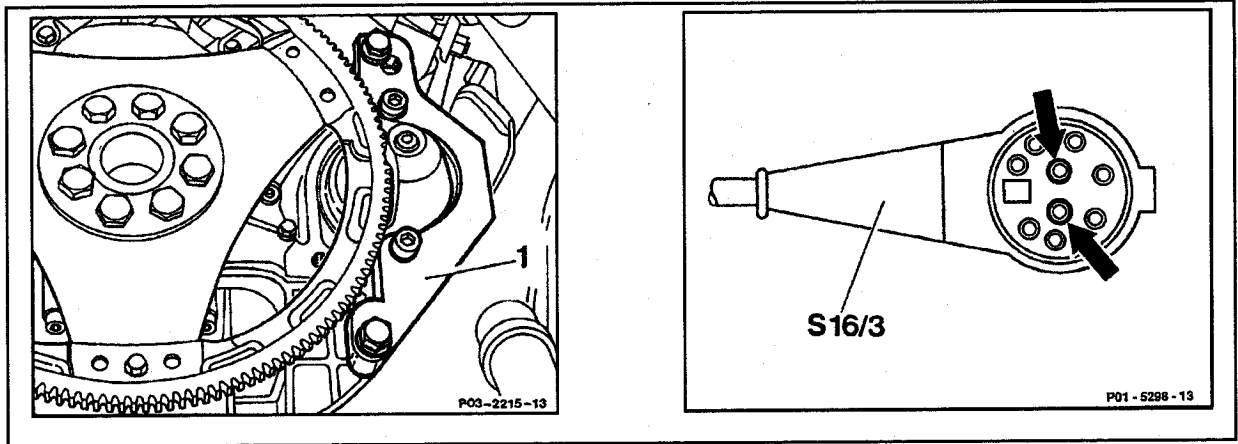
9 Check for leaks at rear of engine when running (01-2240).



01-2240 Checking rear of engine for leaks when running

Preceding work:
Driven plates removed (03-4100).

Transmission 722.3



P01-5801-53

Rear of engine	clean.
Dried surrounding area	spray with Mercedes-Benz white contrast spray, part no. 000 989 03 59.
Oil level in engine	check, adjust to correct level (18-0020).
Driven plates with ring gear	install (03-4100).
Starter with bracket (1)	bolt to crankcase, special tool 119 589 00 40 00.
Engine in installation position	support at rear and secure.
Automatic transmission	bridge contact at starter lockout switch (S16/3) (arrows).
Engine	start, check for leaks.

Note

Stored faults which may originate from testing work involving disconnecting wiring or simulation, must be erased in the fault memory after completing work.

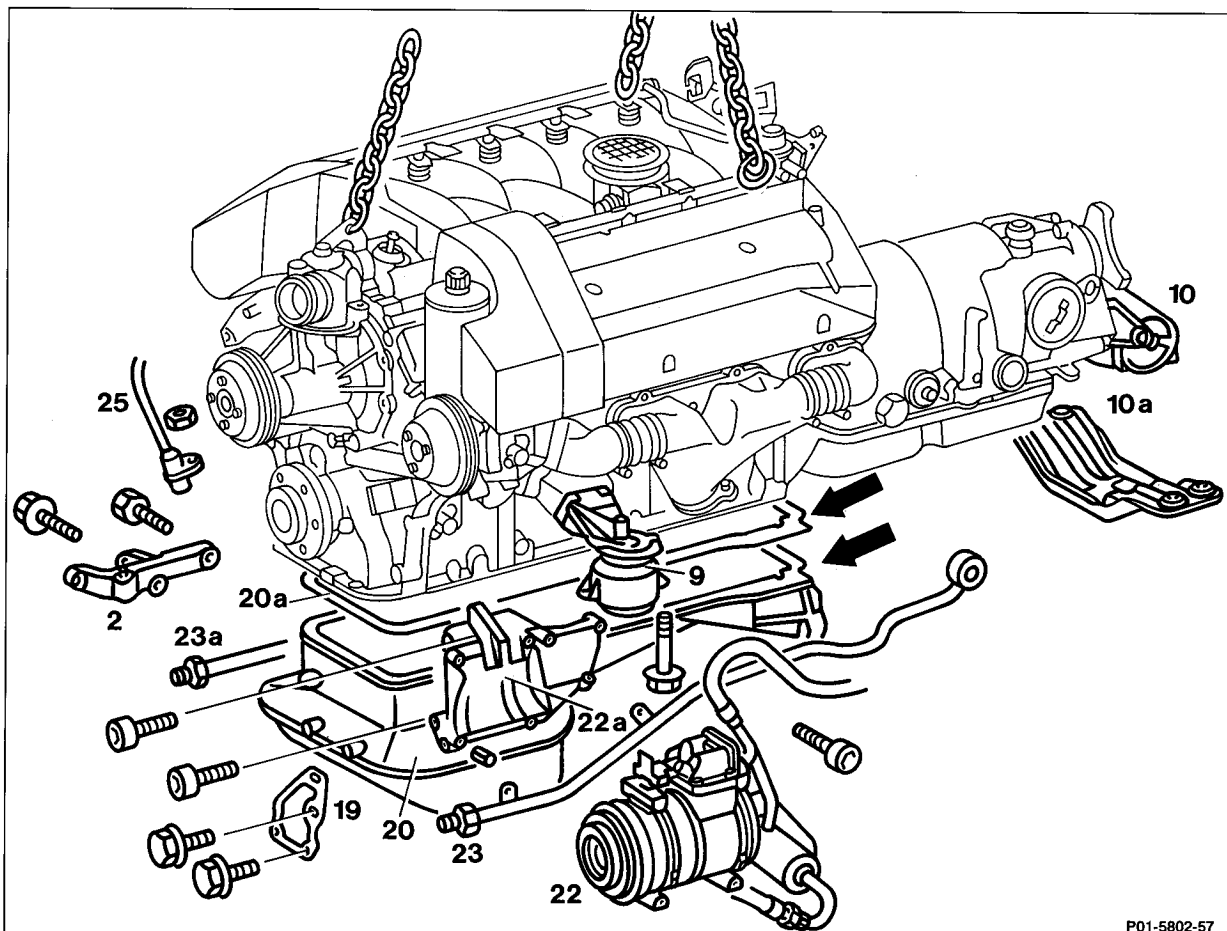
01-3100 Removing and installing oil sump

Preceding work:

Air cleaner removed (09-0015).
 Dipstick guide tube removed (18-0023).
 Vibration damper removed (03-3420).
 Tensioning device removed (13-3450).

Operation no. of operation texts and work units or standard texts
 and flat rates
 01-7500

A. Model 124



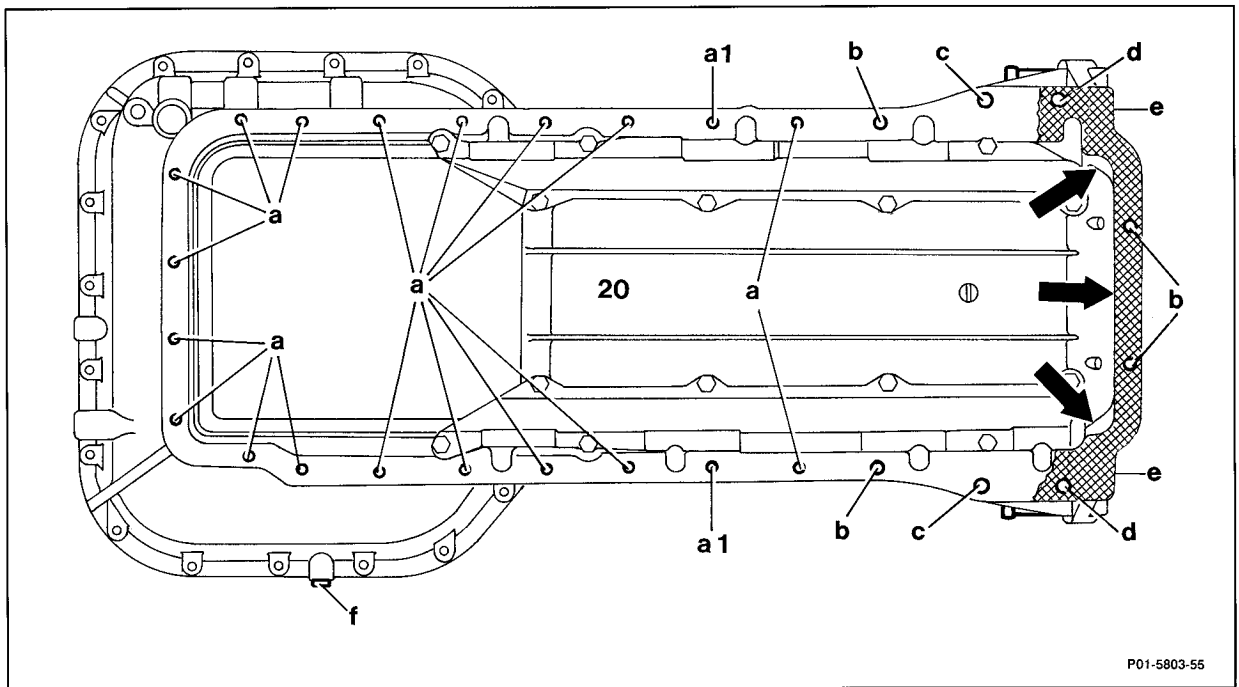
P01-5802-57

Engine oil	drain, pour in (18-0020).
AC compressor (22) with lines/wiring connected .	take off, fit on (21 Nm).
TDC sensor (25) at timing case cover	unbolt, bolt on.
Carrier (22a) of AC compressor with retaining plate (19)	remove, install (M6: 9 Nm; M8: 21 Nm).
Carrier (2) of alternator at oil sump	unbolt, bolt on (21 Nm).

Installation note

Align carrier (2) relative to alternator.

Oil lines (23) and (23a) of automatic transmission at oil sump	unbolt, bolt on.
Exhaust system at exhaust manifold	unbolt, bolt on (49-0170).
Exhaust system at carrier at transmission	unbolt, bolt on (49-0071).
Front engine mounts (9)	unbolt from below, bolt on (22-2110).
Engine carrier (10a) at rear engine mount (10) ..	unbolt, bolt on (22-2120).
Engine hoist	attach to front and rear engine lifting eyes.
Engine hoist	adjust so that engine is raised evenly at front and rear.
Engine	raise.



- | | | | |
|----|---|--------|---|
| a | M6 × 20 hexagon socket bolt + washer | d | M8 × 75 bolt + washer |
| a1 | M6 × 20 hexagon socket bolt + washer with bracket of automatic transmission oil lines | e | M10 × 55 bolt + washer |
| b | M6 × 40 hexagon socket bolt + washer | f | Tapped hole for bracket of automatic transmission oil lines |
| c | M8 × 65 bolt + washer | Arrows | Areas for coating with sealant |

Bolts (a), (a1), (b), (c), (d) and (e)	unscrew, screw on.
Oil sump (20)	remove to the front, rotate crankshaft if necessary so that sump (20) does not touch conrod and crankshafts.

Sealing surfaces clean.
 Gasket (20a) replace.
 Sealant 002 989 45 20 (Omnivisc) apply in rear area of oil sump and crankcase (arrows).
 Oil sump (20) install; align to rear contact face on transmission.



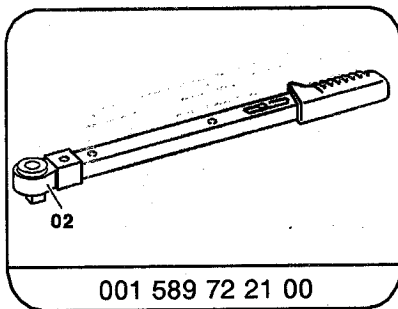
If oil sump (20) is not aligned relative to the transmission, this may cause noises and vibration problems.

Leaks check with engine running.

Tightening torques in Nm

Oil sump to crankcase	M6 bolts	9
	M8 bolts	21
	M10 bolts	40

Special tool

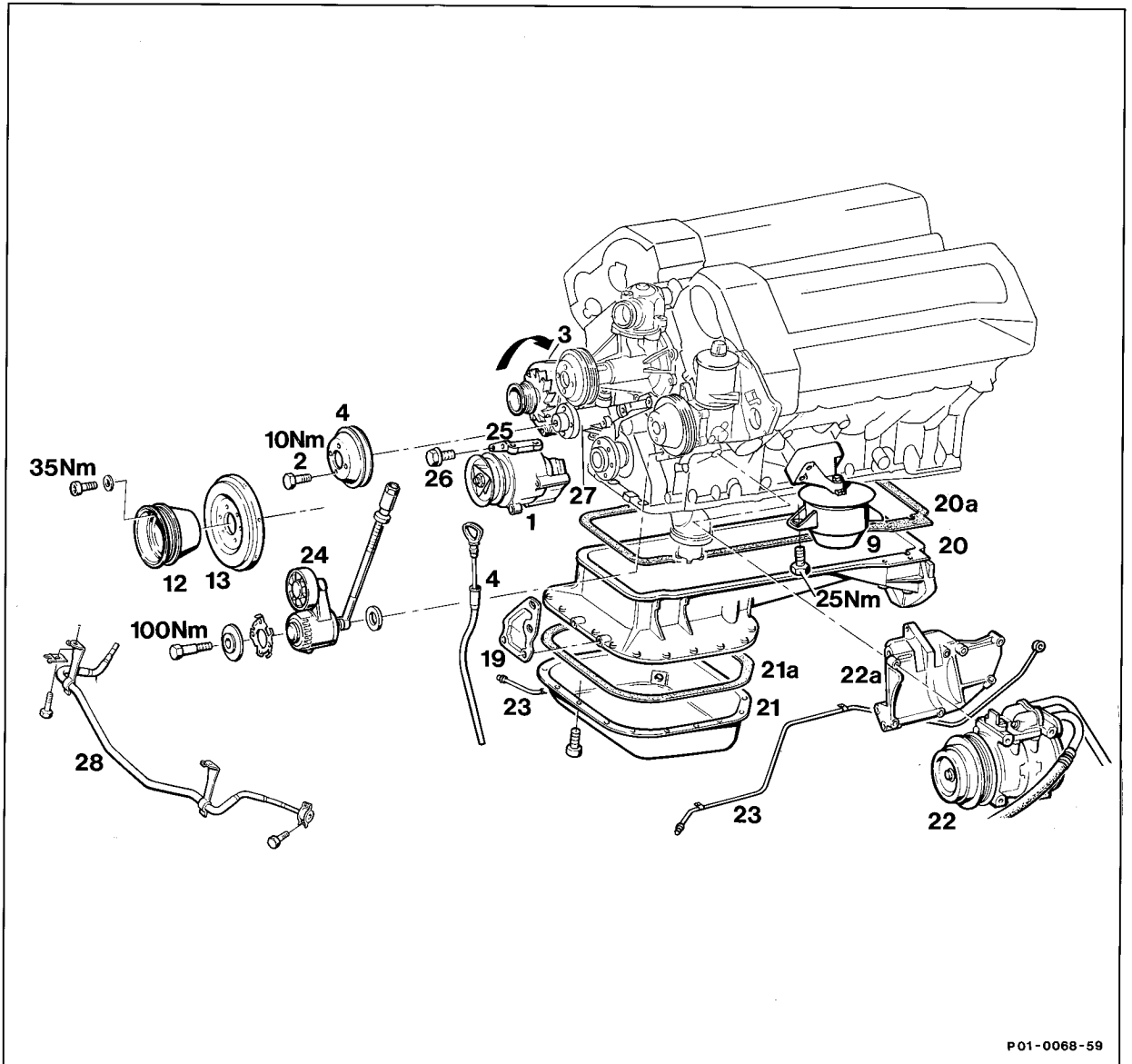


Commercially available tool

Removing device equipment type 3188 (lifting capacity 500 kg)	e. g. Bäcker GmbH und CO KG D-42853 Remscheid
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B. Model 129 with engine 119.960

Operation no. of operation texts and work units or standard texts
and flat rates
01-7500



P01-0068-59

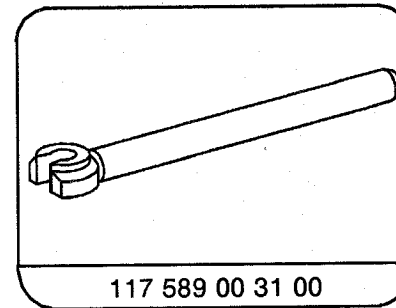
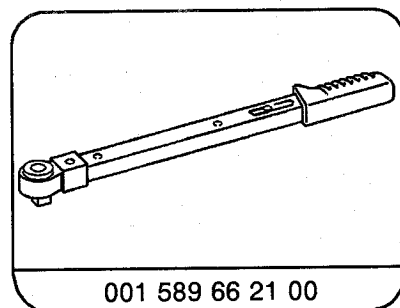
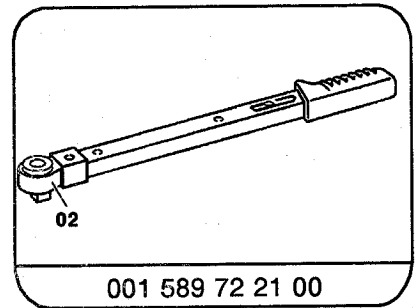
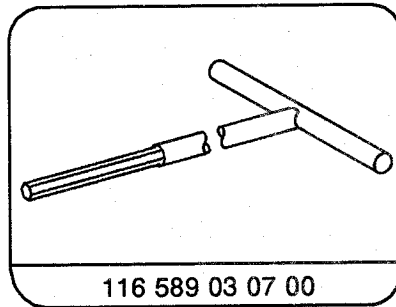
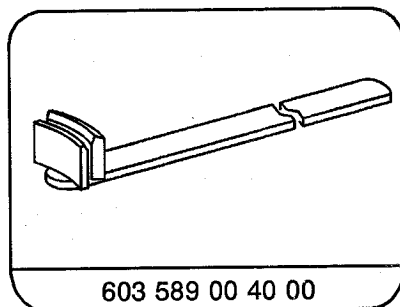
Hood	raise to vertical position (01-0080).
Ground cable at battery	disconnect, connect.
Air scoops	remove, install (09-0015).
Viscous fan clutch	remove, install (20-3120).
Bolts (2) of fan carrier belt pulley (4)	slacken, tighten, use holder 603 589 00 40 00 (10 Nm) (step 5).

Poly V-belt and tensioning device	remove, install (13–3450).
Fan carrier belt pulley (4)	unbolt, bolt on.
Cylinder 1 of engine	turn to TDC.
Bottom engine compartment panel	remove, install (Maintenance Manual 6190).
Engine oil	drain, pour in, oil drain plug (40 Nm) (step 10).
Belt pulley (12) with vibration damper (13) . . .	remove, install (35 Nm) (03–3420).
Carrier (22a) with guide pulley	remove, install (21 Nm) (step 12).
If AC fitted: AC compressor (22) with lines/wiring connected	detach, attach (21 Nm) (step 13).
TDC sensor at timing case cover	unbolt, bolt on.
Carrier (22a) of AC compressor	remove, install (21 Nm) (step 15).
Bottom bolt (26) of alternator	unscrew, screw on (step 16).
Alternator (3)	swivel up.
Air pump (1) with angle bracket (25)	unbolt, bolt on (21 Nm) (step 18).
Fan carrier (27) at timing case cover	unbolt, push forward, bolt on (21 Nm). (Cooling hoses remain connected).
Oil lines of automatic transmission (23)	unbolt, bolt on.
Torsion bar (28)	remove, install (32–3000).
Bottom part of oil sump (21)	remove, install, seal (step 22).
Dipstick guide tube (4)	remove, install. Special tool 117 589 00 31 00 (step 23).
Both front engine mounts (9)	unbolt from below, bolt on (25 Nm) (step 24).
Engine	raise, lower (step 25).
Oil sump (20)	unbolt at crankcase, bolt on M6 (11 Nm).
Oil sump (20)	remove, seal, install (step 27).
Leaks	check.

Tightening torques in Nm

Dipstick guide tube to alternator bracket	21
Oil drain plug to oil sump	40
Oil sump	11
Fan carrier	21
AC compressor to carrier	21
AC compressor or guide pulley carrier	21
Air pump to bracket	21

Special tools



Shop-made tool

Guard plate for radiator/condenser

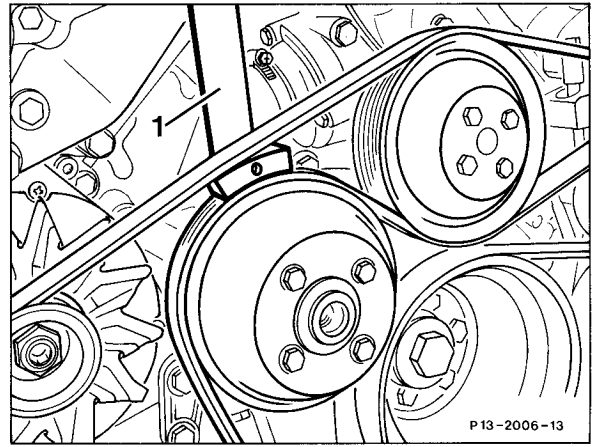
Dim.: approx. 480 × 600

Note

The oil sump is sealed to the crankcase by a gasket.

Removing, installing

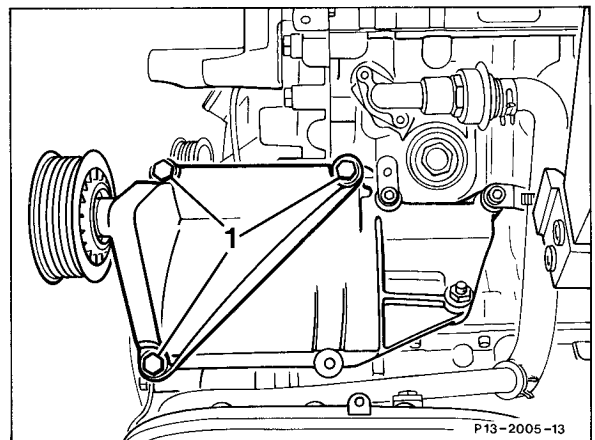
- 1 Raise hood to vertical position (01-0080).
- 2 Disconnect ground cable at battery.
- 3 Remove air scoops (09-0060).
- 4 Remove viscous fan clutch (20-3120).
- 5 Slacken bolts of fan carrier belt pulley; to do this, counter-hold with counter-holder 603 589 00 40 00.
- 6 Remove poly V-belt tensioning device (13-3450).
- 7 Unbolt belt pulley – fan carrier.
- 8 Rotate engine until cylinder 1 at TDC.
- 9 Unscrew bolts and remove bottom engine compartment panel (Maintenance Manual 6190).
- 10 Drain engine oil (approx. 8 l) into a suitable vessel. Replace seal. Tightening torque of oil drain plug 40 Nm.



- 11 Unscrew bolts together with circlips, take off belt pulley and vibration damper (03-3420).
- 12 Unscrew bolts (1) together with washers, take off carrier together with guide pulley.

Installation note

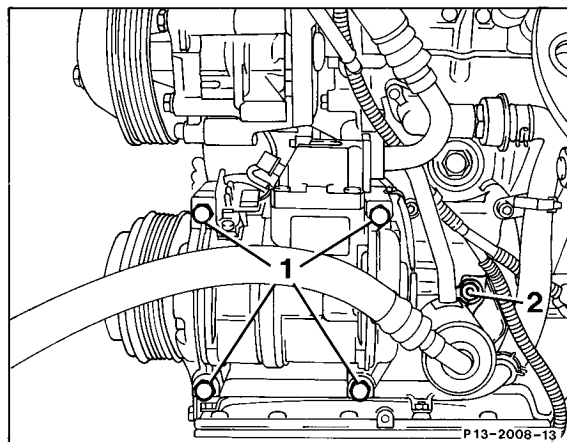
Pay attention to fixing sleeves.



13 If AC fitted: unscrew bolts (1) together with washers and nut (2). Place AC compressor to the side with lines/wiring connected.

Installation note

Pay attention to fixing sleeves.

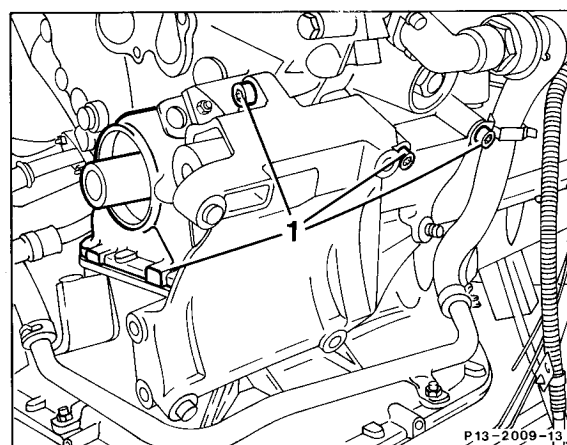


14 Unbolt TDC sensor from timing case cover.

15 Unscrew bolts (1) with washers, take off front bracket and side carrier.

16 Unscrew bottom bolt of alternator. Slacken top bolt.

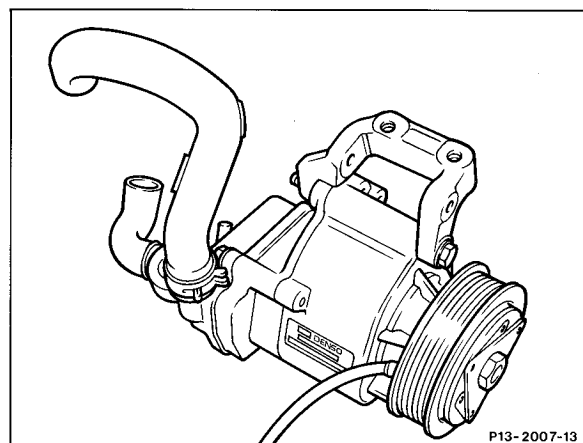
17 Swivel alternator up.



18 Unbolt air pump together with angle bracket and take off.

Installation note

Install angle bracket free of tension.



19 Unbolt fan carrier from timing case cover and push forward with cooling hoses connected.

20 Unbolt oil lines of automatic transmission.

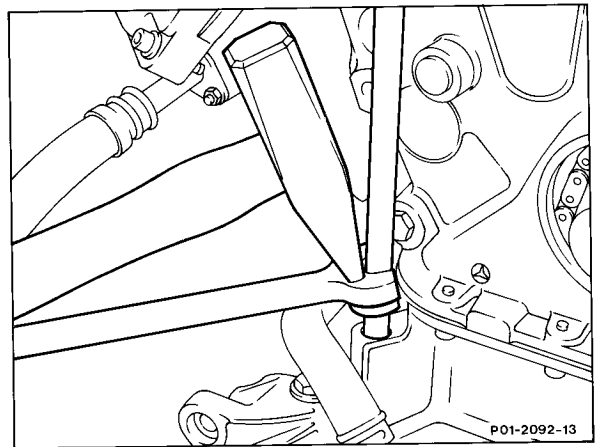
21 Remove torsion bar at front (32-3000).

22 Unscrew bolts, slacken cable straps, take off bottom part of oil sump.

23 Unscrew bolt of dipstick guide tube and knock out from below.

Installation note

Knock in dipstick guide tube from above with tool 117 589 00 31 00.



24 Unscrew bolts at left and right front engine mounts from below.

Tightening torque 25 Nm.

25 Raise engine until oil sump can be removed forward and down.

26 Unbolt oil sump at crankcase. Unscrew bolts. Tightening torque M6: 11 Nm.

Installation note

The rear contact surface of the oil sump must be aligned to the rear contact surface of the crankcase. If the oil sump is not aligned to the crankcase, this may result in noise and vibration problems.

27 Remove oil sump down and forward.

Installation note

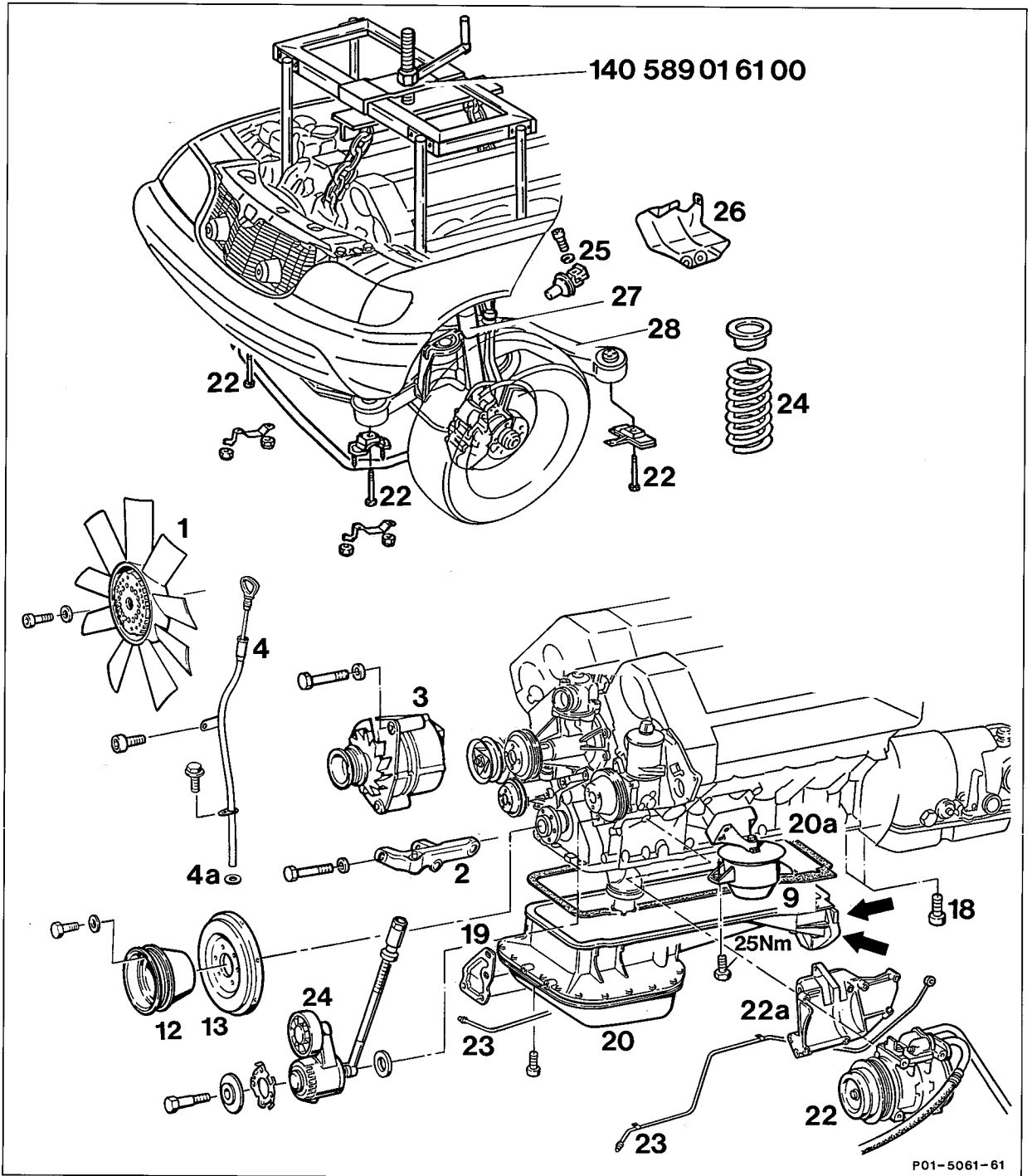
Replace gasket. Apply sealant 002 989 45 20 (Omnivisc) in the rear area of the oil sump and on the crankcase.

Install in the reverse order.

28 Run engine. Check for leaks.

C. Model 140

Operation no. of operation texts and work units or standard texts
and flat rates:
01-7500



- | | |
|-------------------------------|---------------------------------------|
| Hood | raise to vertical position (01-0080). |
| Ground cable at battery | disconnect, connect. |
| Air scoops | remove, install. |

Viscous fan clutch (1)	remove, install (20–3120).
Tensioning device (24) for poly V-belt	remove, install (13–3450).
TDC sensor	unbolt, bolt on.
Dipstick guide tube (4) at air pump bracket	unbolt, bolt on.
Bottom engine compartment panels	remove, install (Maintenance Manual 6190).
Engine oil	drain, pour in. Oil drain plugs (40 Nm).
Bracket (19)	remove, install.
Belt pulley (12) and vibration damper (13)	remove, install (03–3420).
Carrier with guide pulley	remove, install (21 Nm).

Installation note

Pay attention to fixing sleeves.

If AC fitted: AC compressor (22) with lines/wiring connected

detach, attach (21 Nm).

Installation note

Pay attention to fixing sleeves.

AC compressor (22)
 Carrier (22a) of AC compressor or guide pulley
 Alternator (3)
 Bracket (2) of alternator
 Dipstick guide tube (4) at oil sump (20)

attach at side in engine compartment.
 remove, install (21 Nm).
 remove upward, install (15–510).
 remove, install (21 Nm).
 unbolt, bolt on.

Installation note

Replace seal (4a) according to condition.

Both engine mounts (9)
 Springs (24) of front axle (28)
 Shock absorber (27)
 Engine supporting bar
 Shield (26) of steering coupling (25)
 Steering coupling (25)
 Front axle (28) with vehicle jack attachment
 Rear covers of bolts (22) of front axle
 Microencapsulated bolts (22) of front axle (28)

unbolt from below, bolt on (25 Nm).
 remove, install (32–200).
 unbolt at top, bolt on (32–100).
 install, special tool 140 589 01 61 00.
 remove, install.
 unbolt, detach, install (33–100).
 support, special tool 140 589 00 62 00.
 take off, fit on.
 unscrew, screw on (33–100).

Note

Use 6-point wrench insert, WAF 21, for this operation.

Before installing	re-tap thread in body with M14×1.5 thread tap (clean).
Microincapsulated bolts (22)	replace.
Front axle (28)	lower sufficiently until oil sump (22) can be removed.



When lowering, pay attention to hydraulic oil lines of brake and steering gear.

Oil lines of automatic transmission (23) and air-to-oil cooler at oil sump (20)	unbolt, bolt on.
Electric cable of knock sensors at bracket of power steering pump at rear	disconnect, connect.
Bolts of oil sump	unscrew, screw on.

Note

Pay attention to hexagon socket bolts (18) at rear of oil sump (20).

Oil sump (20)	take off down and to the front, install.
---------------------	--

Installation note

The rear contact surface of the oil sump (20) has to be aligned to the rear contact surface of the crankcase (arrows).

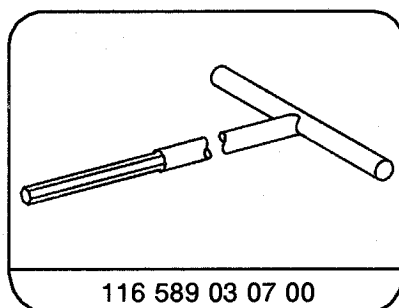
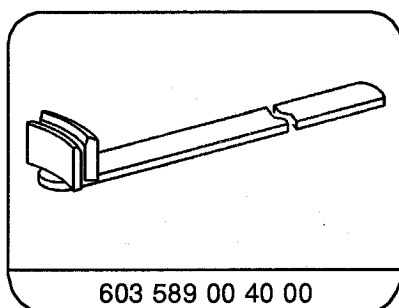
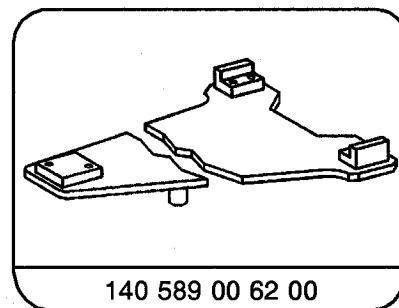
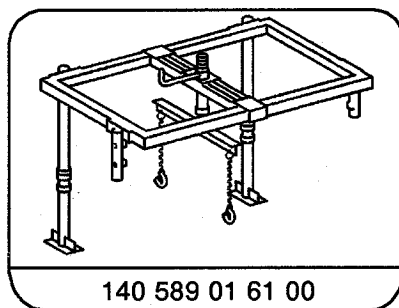
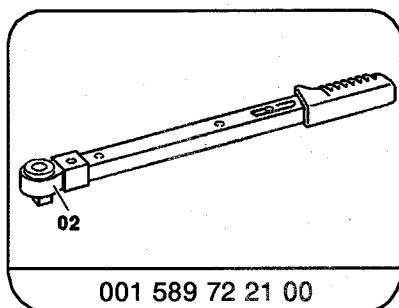
If the oil sump (20) is not aligned to the crankcase, this can result in noise and vibration problems.

Gasket (20a)	replace.
Sealant 002 989 45 20 (Omnivisc)	apply in rear area of oil sump and on crankcase.
Engine	run and check for leaks.

Tightening torques in Nm

Oil drain plug to oil sump	40
Oil sump to crankcase	
M6 bolts	11
M8 bolts	25
M10 bolts	40
AC compressor to carrier	21
Carrier of AC compressor or guide pulley	21
Bracket of alternator to oil sump	21

Special tools



Commercially available tool

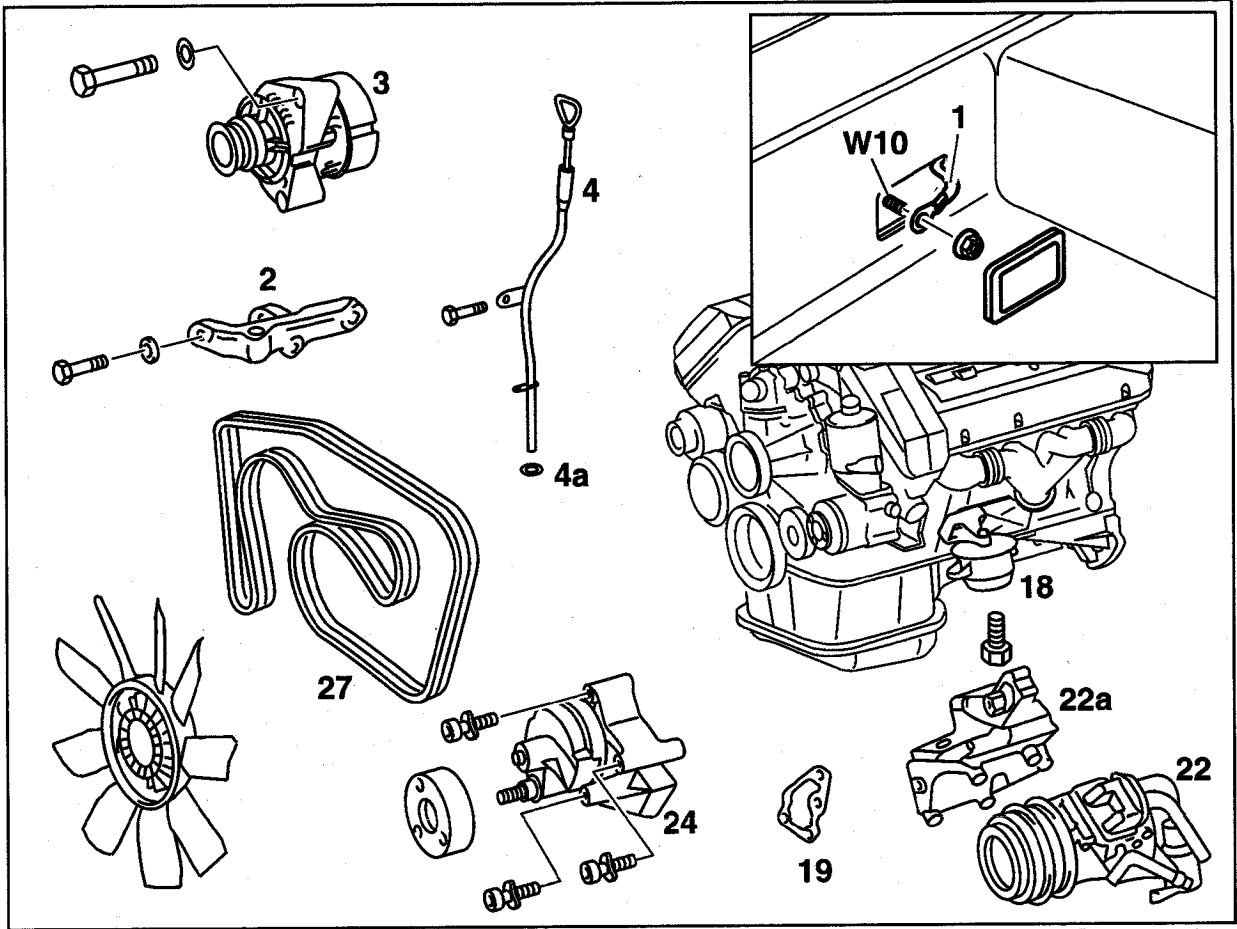
21 mm 6-point wrench socket, 1/2" drive

e.g. Hazet Werk
D- 42853 Remscheid 1
Order no. 900-21

D. Model 210

Preceding work:
 Bottom engine compartment panel removed
 (Maintenance Manual 6190).
 Viscous fan coupling removed (20-3140).

Operation no. of operation texts and work units or standard texts
 and flat rates
 01-7500



P01.45-0222-57

Ground cable (1) at battery	disconnect, connect (AR54.10-0003A).
Poly V-belt tensing device (24)	remove, install (13-3450).
Dipstick guide tube (4) at air pump bracket	unbolt, bolt on.

Installation note

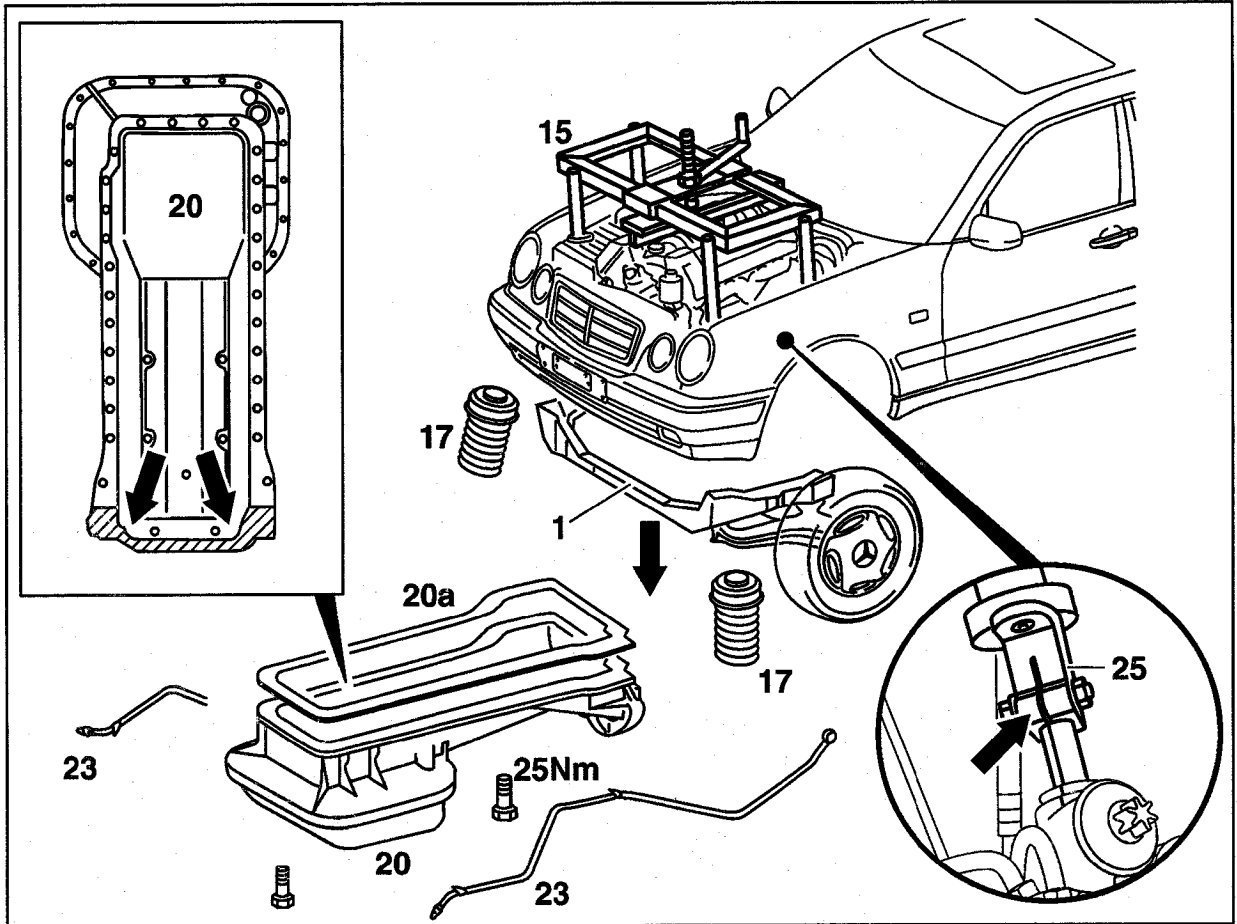
Engine oil	drain, pour in (18-0020).
A/C compressor (22) with lines connected	take off, fit on (25 Nm).
Carrier (22a) of A/C compressor with retaining plate (19)	remove, install (M6 = 10 Nm, M8 = 25 Nm)
Generator (3)	remove, install.

Carrier (2) of generator at oil sump unbolt, bolt on (25 Nm).

Installation note


Align carrier (2) to generator.

Front engine mount (18) at bottom unbolt, bolt on (22-2210).



P01.45-0223-57

- | | |
|--|--|
| Front springs (17) | remove (AR32.20-0200B). |
| Engine supporting arm (15) | fit on, take off (AR33.10-0100-01A). |
| Engine | raise, lower. |
| Steering coupling (25) | unbolt, bolt on (25 Nm). |
| Front suspension carrier (1) | support with inspection pit or assembly lift (AR33.10-0100-03A). |
| Front suspension carrier (1) | unbolt, bolt on (120 Nm) |
| Front suspension carrier (1) | lower, raise. |
| ATF pipes of automatic transmission (23) | unbolt, bolt on. |

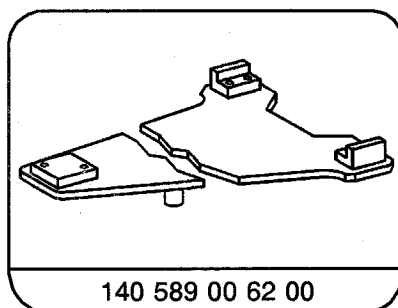
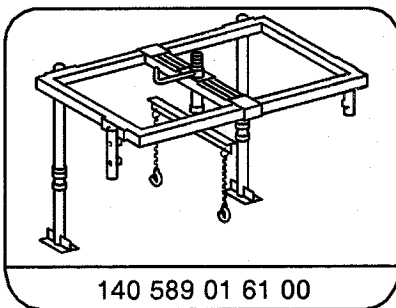
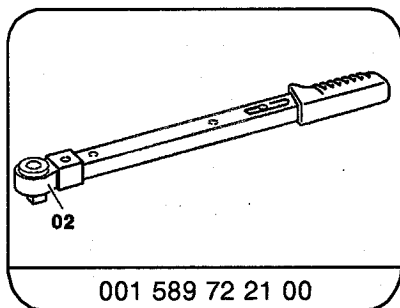
Oil sump (20)	unbolt, bolt on.
	Note
	To enable the oil sump bolts at the front to be unscrewed, turn vibration damper accordingly and remove oil sump bolts through the openings in the vibration damper.
Oil sump (20)	remove forward and down.
Sealing surfaces	clean.
Sealant 002 989 45 20 (Omnivisc)	apply in rear area of oil sump and to crankcase (arrows).
Gasket (20a)	replace.
Oil sump (20)	install; align to rear contact surface on transmission.
	
	If the oil sump (20) is not aligned to the transmission, this can result in noise and vibration problems.
Engine	run and check for leaks.

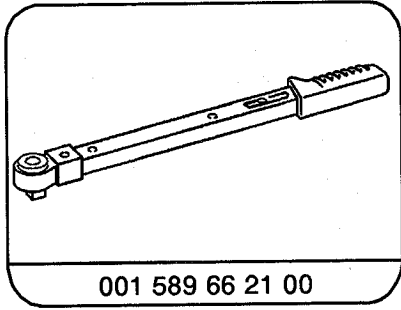
Tightening torque in Nm

Oil sump to crankcase

M6 bolts	9
M8 bolts	21
M10 bolts	40

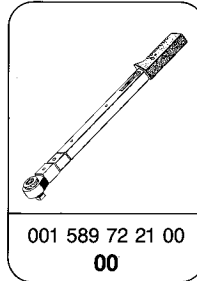
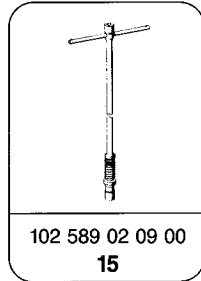
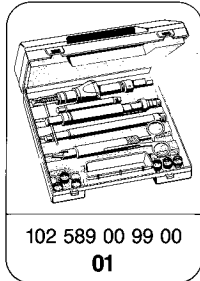
Special tools





01-4070 Repairing spark plug threads

Special tools



Note

The spark plug threads in the cylinder head can be repaired with the HELI-COIL Repair Set.

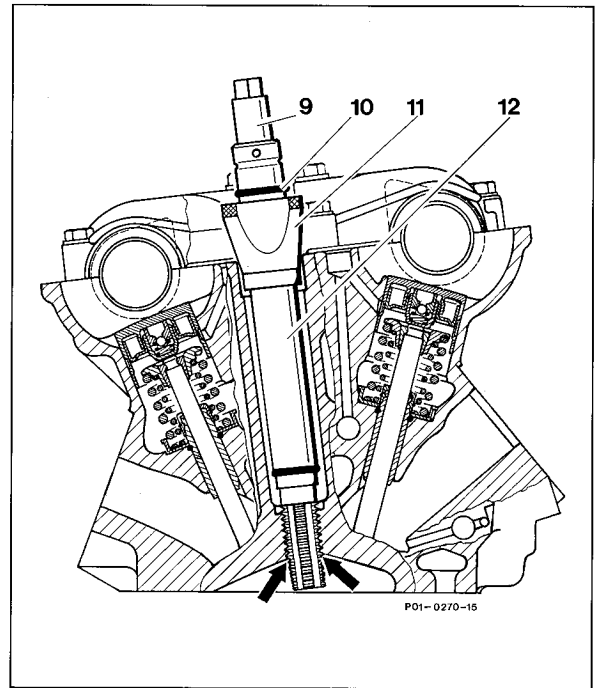
Repairing

- 1 Remove appropriate cylinder head cover, install (01-0500).
- 2 Set piston at respective cylinder to 20° – 30° before TDC.

3 Pack grooves (arrows) of the combination thread tap (9) of the thread tapping unit with grease and screw combination thread tap into the damaged thread. When performing this step, push the guide bush (11) into the spark plug recess.

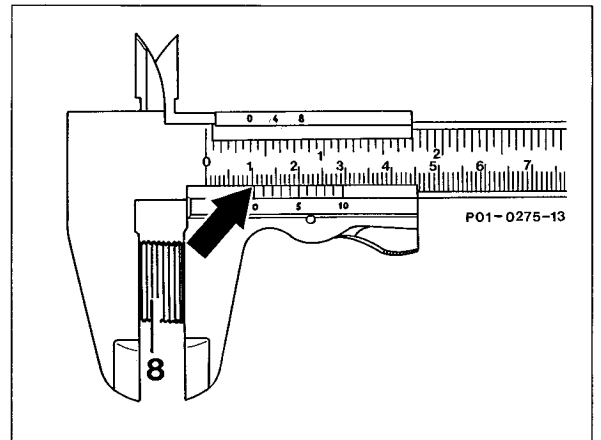


If cylinder head is fitted, unscrew combination tap after approx. each five turns, clean grooves of swarf and grease and re-pack with grease.



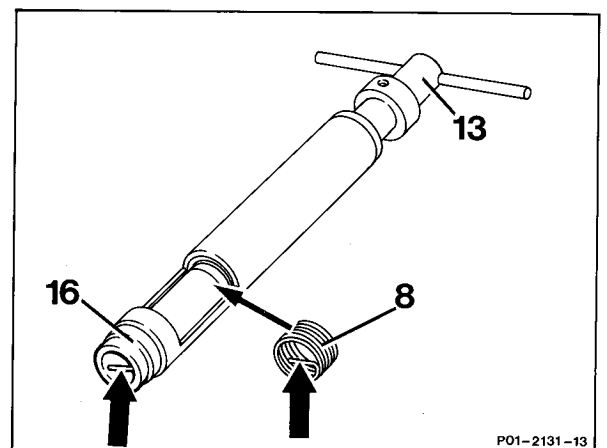
4 Check length of HELI-COIL threaded insert (8).

Use only the HELI-COIL insert with 10.2 mm block length.



5 Install HELI-COIL threaded insert.

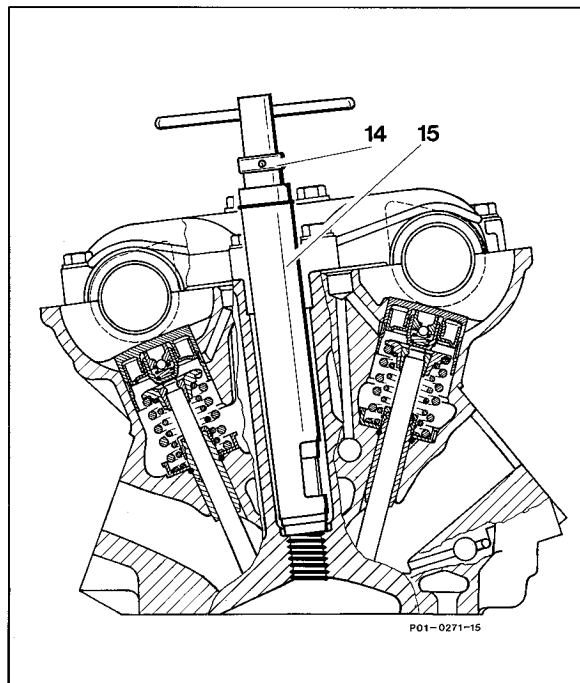
To do this, place HELI-COIL insert (8) into the installation tool so that the tang (arrow) of the insert is facing the pretensioning cartridge (16). Turn HELI-COIL insert with fitting spindle (13) through the pretensioning cartridge far enough for the tang (arrow) to be flush with the face end of the pretensioning cartridge.



Fit installation tool onto the tapped hole, hold jacket sleeve (15) tight and turn insertion spindle until the stop ring (14) is resting against the jacket sleeve.

Note

When screwing in the HELI-COIL threaded insert, turn back jacket sleeve (15) slightly if it jams.



6 Break off tang (arrow) of HELI-COIL threaded insert.

This is done by fitting sleeve (18) of tang breaking unit over the tang, introducing opened pliers (17) into the sleeve as far as the marking (arrow) and closing pliers. The serrated lock (S) must engage.

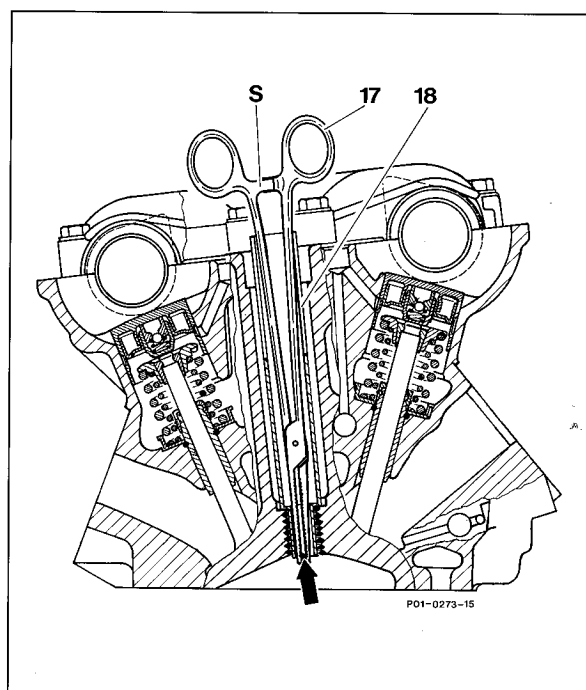
Turn sleeve (18) to the left as far as the stop and hold tight.

Move pliers slightly up and down and break off tang.

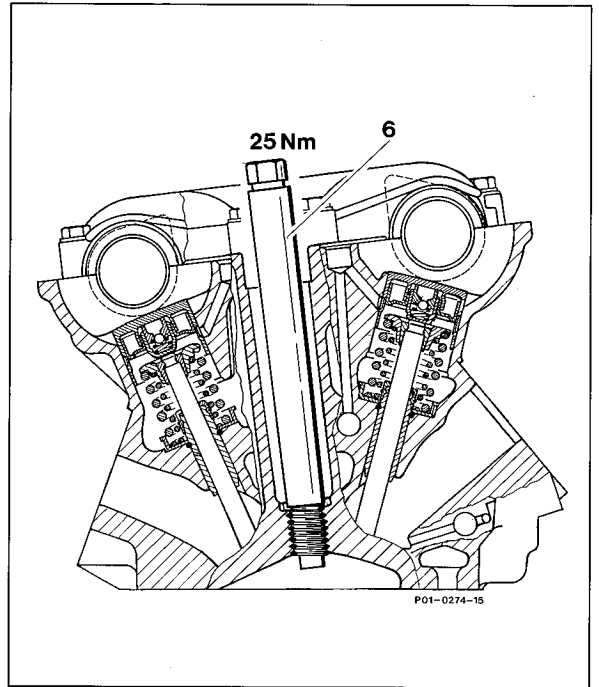


If tang inadvertently drops onto piston crown, it must be removed with a magnet.

Rotate crankshaft several times with starter and contact handle in order to remove any swarf which may have dropped onto the piston crown.



7 Caulk HELI-COIL threaded insert. To do this, grease the tapered thread of the caulking tool (6), screw caulking tool into the installed HELI-COIL insert, tighten to 25 Nm and remove caulking tool.

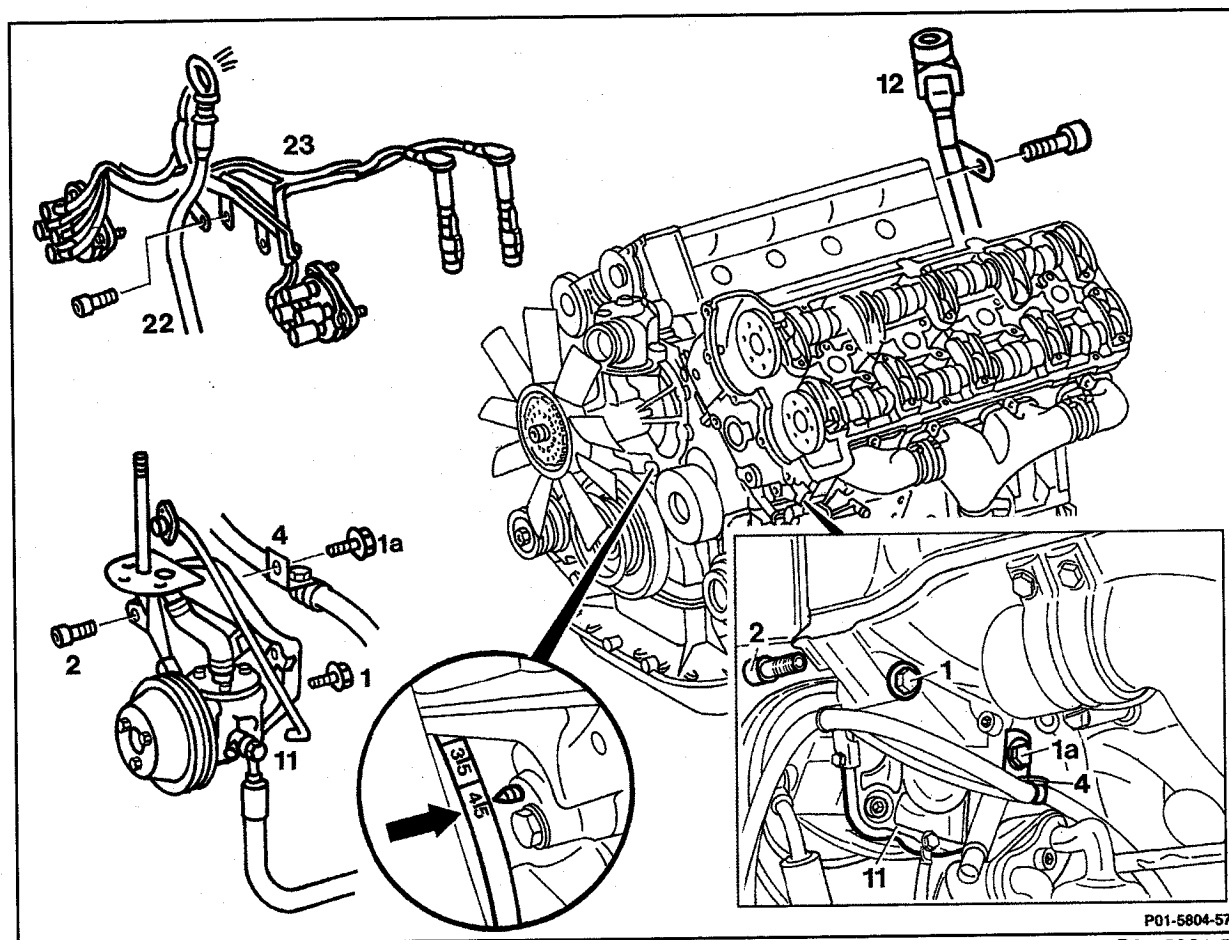


01-4150 Removing and installing cylinder heads

Preceding work:
Coolant drained (20-0100).
Cylinder head covers removed (01-0500).

Operation no. of operation texts and work units or standard texts
and flat rates
01-5800

A. Models 124, 140, 210



P01-5804-57
P01-5804-57

Intake manifold	remove, install.
Front cover at cylinder head to be removed	remove, install (01-2120).
Guide rail of cylinder head at cylinder head to be removed	remove, install (05-3350).
Camshaft adjuster at cylinder head to be removed	remove, install (05-2170).
Left cylinder head: bolts (1), (1a) and (2)	unscrew, screw on (21 Nm).

Retaining plate with power steering pump (11)
and oil lines connected

place to the side, install.

Installation note

Coat bolt (2) with sealant 002 989 47 20 10.
Engine 119.97: install bolt (1a) with retaining
bracket (4) of wiring harness.

Right cylinder head: dipstick guide tube (22)

unbolt, bolt on.

Guide rail (23) for ignition cables

remove, install.

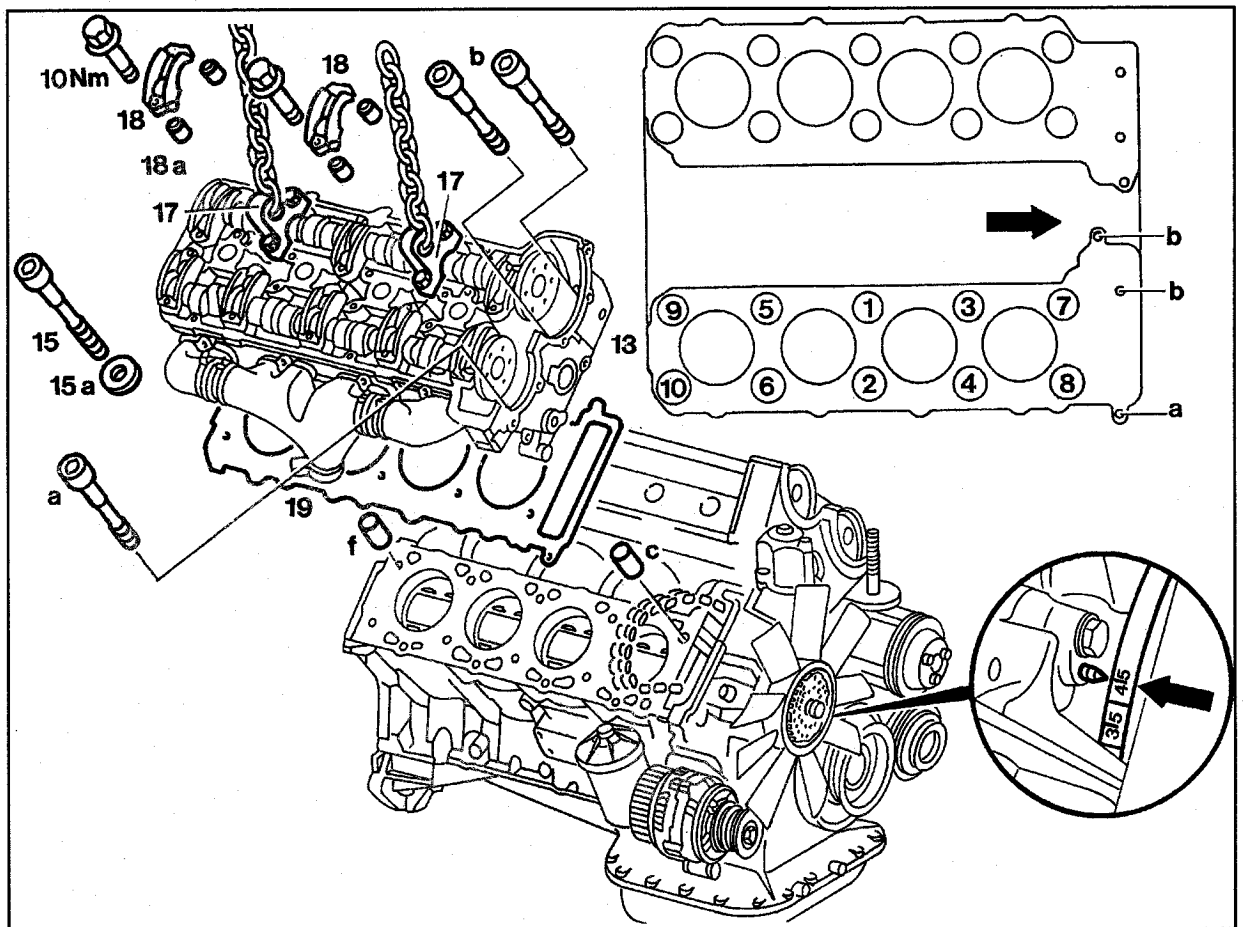
Right cylinder head: dipstick guide tube (12),
automatic transmission

unbolt, bolt on.

Front exhaust system at exhaust manifold

unbolt, bolt on (49-0170).

Right cylinder head

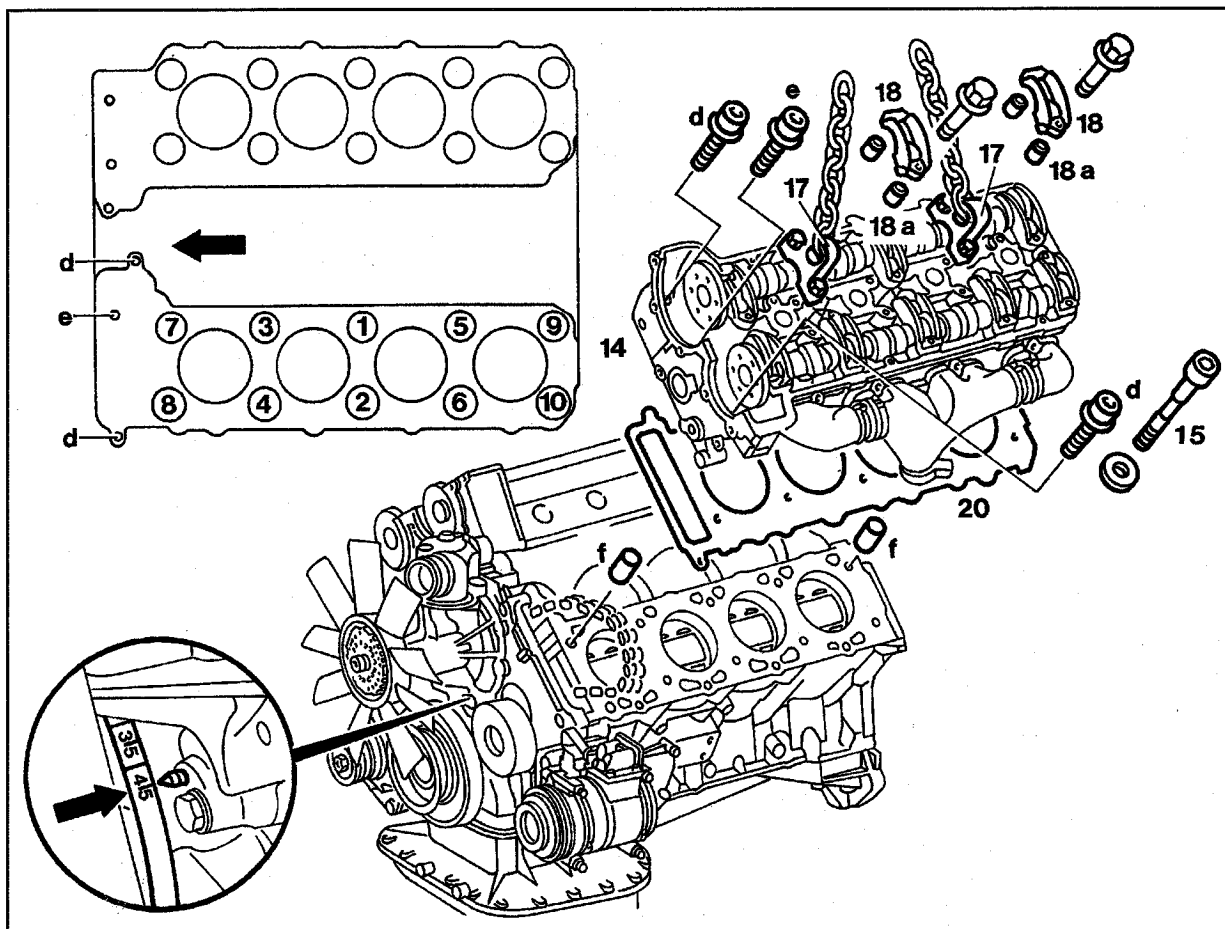


P01-5805-57

- a M8 x 120 hexagon socket fit collar bolt or bolt + washer
- b M8 x 74 hexagon socket fit collar bolt or bolt + washer

- c Roll pin
- f Dowel sleeve

Left cylinder head



P01-5806-57

- d M8 × 50 hexagon socket bolt + washer
- e M8 × 75 hexagon socket bolt + washer
- f Dowel sleeves

Right-hand cylinder head: fit collar bolts or bolts + washers (a) and (b) to timing case cover

unscrew, screw on (25 Nm).

Note:

When performing repairs, install fit collar bolts or the bolts + washers depending on the bolts used previously.

Left-hand cylinder head: bolts (d) and (e) to timing case cover

unscrew, screw on (25 Nm).

01.1313-4150/3

Cylinder head bolts when engine cold slacken with screwdriver bit in stages in reverse order of tightening diagram, beginning with 10, remove, special tool 119 589 00 10 00.

Note

Models 124, 140: cylinder head bolt 10 cannot be removed with cylinder head installed; for this reason, raise and secure.

Model 210: cylinder head bolts 9 and 10 of both cylinder heads cannot be removed with cylinder head installed; for this reason, raise and secure. On "closed-deck" crankcases, the cylinder head bolts installed have different lengths; refer to bolt diagram.

First and fourth camshaft bearing caps (18) of inlet camshaft
Bracket (17)

slacken, unscrew.
bolt on with bearing cap bolts and dowel sleeves (18a) instead of first and fourth camshaft bearing caps (18), unbolt, special tool 119 589 01 40 00.

Engine hoist
Cylinder heads (13) and (14)
Cylinder head contact surface
Tapped holes of cylinder head bolts

attach to bracket (17).
raise, remove.
examine (01-4180).
clean.



Free of oil and water.

Cylinder head gaskets (19) and (20)

replace.



The cylinder head gasket is not watertight until the engine has reached normal operating temperature, in other words until a swelling process has taken place. For this reason, the cooling system must not be pressure-tested until after the engine has reached normal operating temperature.

Cylinder heads (13) and (14)
Dowel sleeves (f) or roll pins (c)
Cylinder head bolts (15)

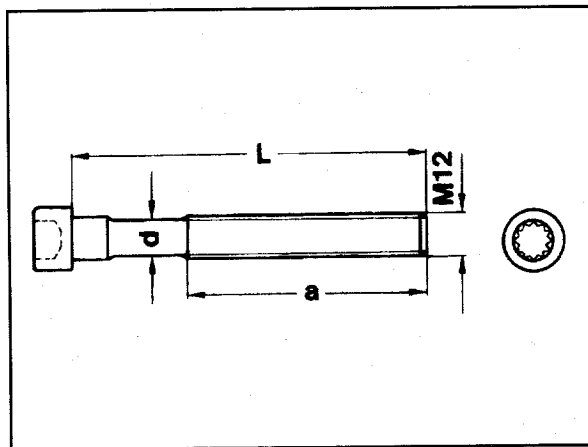
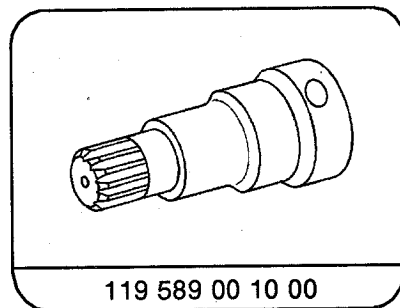
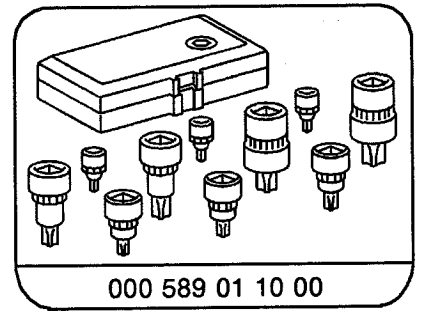
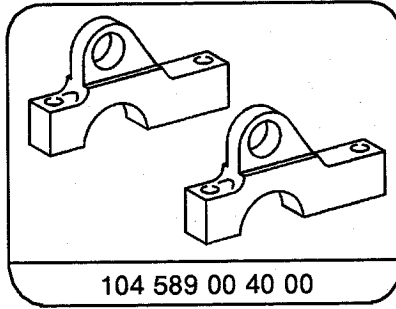
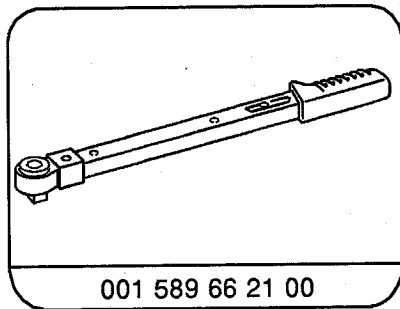
install.
note.
examine.

Note

The cylinder head bolts (15) are subjected to a certain permanent stretch each time they are tightened. If the maximum length is exceeded (see table), the bolts should be replaced with new ones.

- | | |
|---|--|
| Cylinder head bolts (15) | oil at thread and at contact surface of bolt head. |
| Cylinder head bolts (15) with washers (15a) | insert. |
| Cylinder head bolts | tighten in stages in sequence of tightening diagram, beginning with 1. Tightening torques see table. |

Special tools



P01-0072-13

Cylinder head bolts (twelve-point socket with "closed-deck")

Thread Ø	D		M12
Stretch shank Ø	d	when new	10.75 ± 0.05 mm
Thread length	a		135 mm
Bolt length	L	when new	160 ± 0.8 mm
		max. bolt length	162.70 mm

Cylinder head bolts (twelve-point socket with "open-deck")

Thread Ø	D		M12
Stretch shank Ø	d	when new	10.75 ± 0.05 mm
Thread length	a	short bolt	135 mm
		long bolt	190 mm
Bolt length	L	when new	
		short bolt	160 ± 0.8 mm
		long bolt	218 ± 0.9 mm
		max. bolt length	
		short bolt	162.70 mm
		long bolt	221.60 mm

Tightening torques in Nm and tightening angle

Cylinder head bolts, engine cold ¹⁾	1st stage	55
	2nd stage	90° tight. angle
	3rd stage	90° tight. angle
Bolts of camshaft bearing caps	M7	15
Bolts of cylinder head timing case cover	M8	25

¹⁾ Moisten washers and thread and contact surface of bolts with oil before installing.

Bolt diagram

"closed-deck"

cylinder head bolts 1 to 10 =

M12 x 160 mm

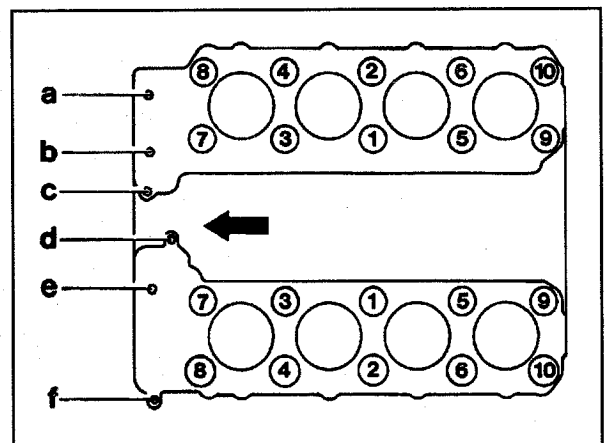
"open-deck"

cylinder head bolts 1, 3 and 5 =

M12 x 218 mm

cylinder head bolts 2, 4, 6,7, 8, 9, 10 =

M12 x 160 mm



P01-5035-13

Note**Cylinder head bolts**

Cylinder head bolts match with washers.

"closed-deck" cylinder head bolts are phosphatized, washers chrome-plated.

"open-deck" cylinder head bolts are chrome-plated, washers are phosphatized.

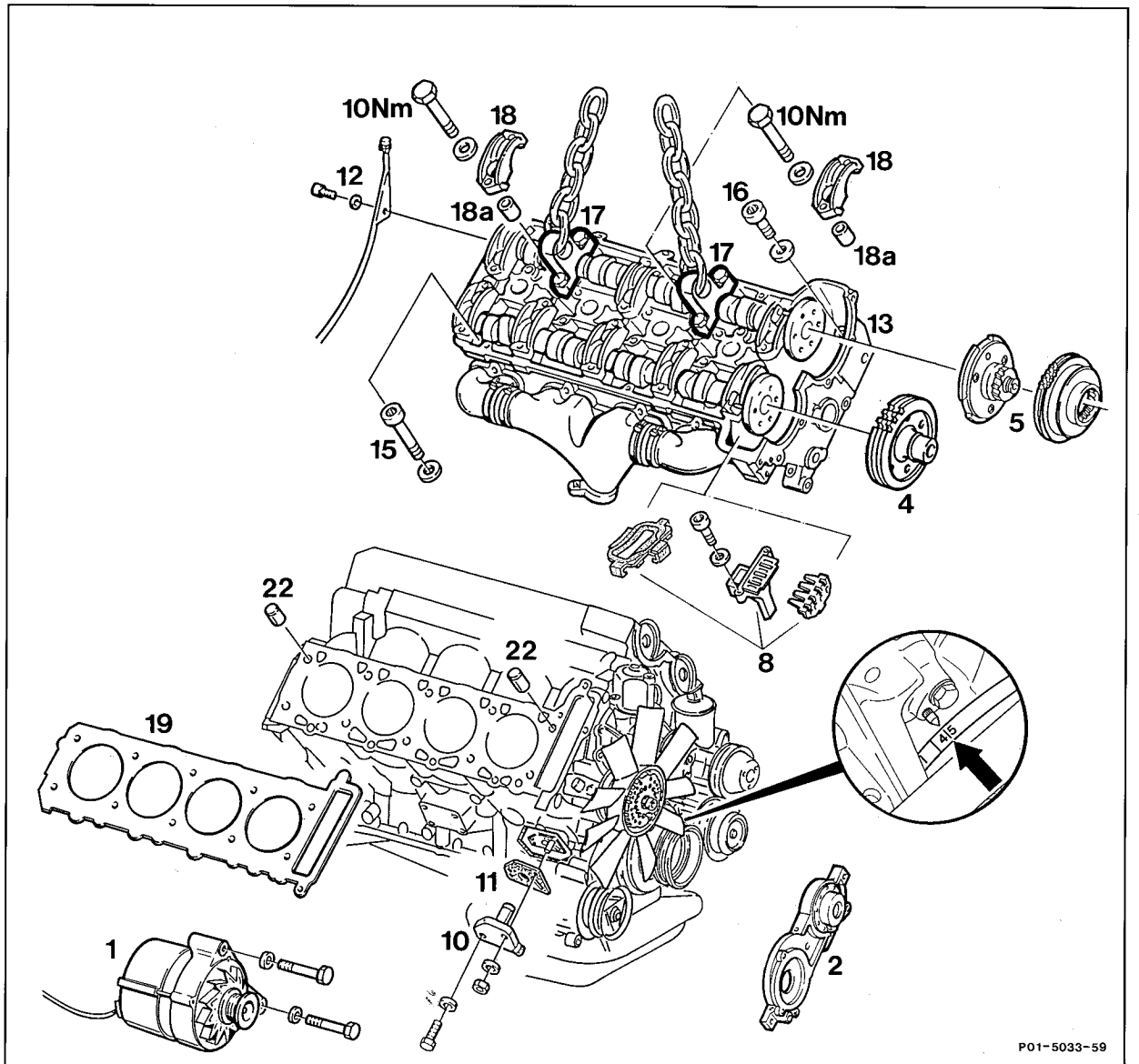
No "HELI-COIL" inserts are installed in crankcase of "open-deck" version.

HELI-COIL inserts may be used when performing repairs.

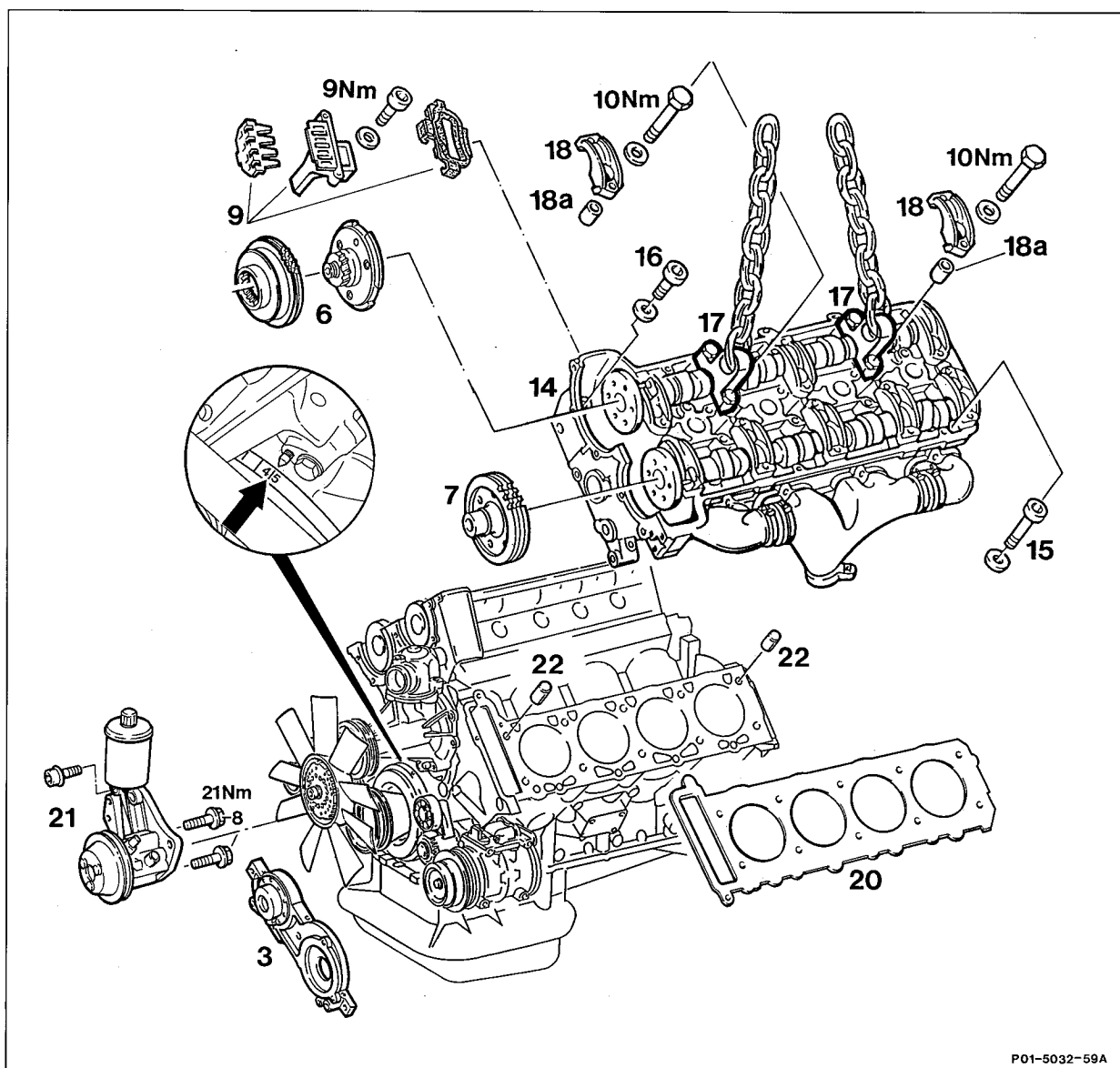
B. Model 129 with engine 119.960

Right cylinder head

Operation no. of operation texts and work units or standard texts
and flat rates
01-5800-5855



Left cylinder head



P01-5032-59A

- | | |
|---|--|
| Hood | raise to vertical position (01-0080). |
| Ground cable at battery | disconnect, connect. |
| Coolant | drain, pour in (20-0100). |
| Poly V-belt | slacken, tension (13-3420). |
| Left cylinder head: power steering pump (21)
with mounting plate and lines/wiring connected .. | unbolt, place to the side, bolt on (step 5). |
| Right cylinder head: alternator (1) | unbolt, place to the side, bolt on. |
| Cylinder head covers | remove, install (01-0500). |

Front cover of cylinder head to be removed (2) or (3)	remove, install (01-2120).
Engine at cylinder 1	position to 45° before ignition TDC (step 11).
All four camshaft sprockets (4), (5), (6) and (7) together with timing chain	mark (step 12).

Installation note

Check, adjust basic setting of camshafts (05-2230).

Chain tensioner (10)	remove, install (05-3100).
Top guide rails (8) and (9)	remove, install (05-3350).
Exhaust camshaft sprockets (4) and (7) and camshaft adjusters (5) and (6) at cylinder head to be removed	unbolt, install (05-2170).
Intake manifold	remove, install (14-1310).
Left cylinder head: coolant hose at rear	detach, attach.
Right cylinder head: dipstick guide tube (12), automatic transmission	unbolt, bolt on.
Exhaust system at cylinder head to be removed (13) or (14) at exhaust manifold	unbolt, bolt on.
Exhaust system at transmission bracket	slacken, tighten.
Right cylinder head: wiring harness at bottom right	unbolt, bolt on.
Cylinder head bolts (15) and bolts of timing case cover (16) at cylinder head to be removed ..	unscrew, special tool 119 589 00 10 00 (steps 20 to 21).
Bracket (17) of special tool 119 589 01 40 00 in place of camshaft bearing cap (18) at the cylinder head to be removed	attach, detach (step 22).
Engine hoist	attach to bracket (17), detach, special tool 119 589 01 40 00.
Cylinder heads (13) and (14)	take off, fit on (step 23).
Cylinder head contact surface	examine, face (01-4180).
Tapped hose of cylinder head bolts	clean.



Free of oil and water.

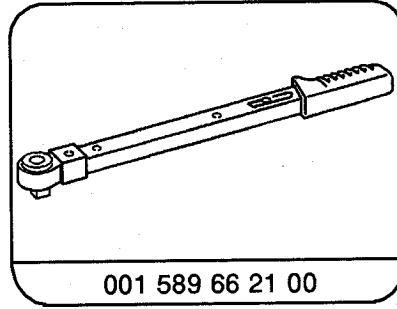
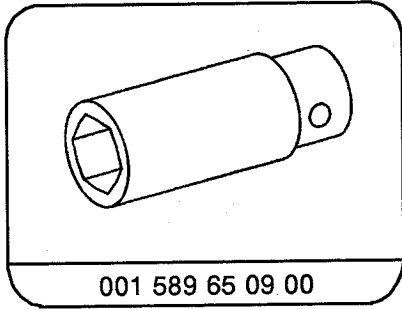
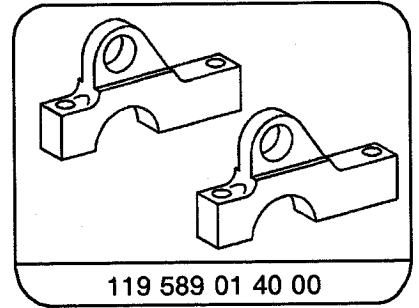
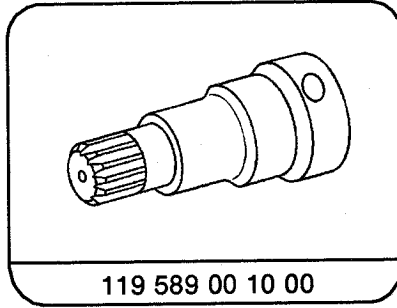
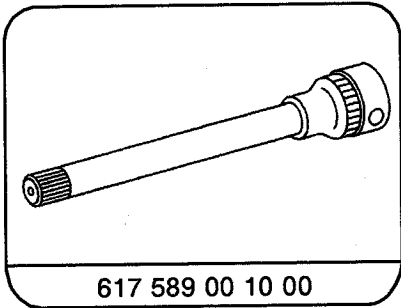
Cylinder head gaskets (19) and (20)	replace (step 26).
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The cylinder head gasket is not watertight until the engine has reached normal operating temperature, in other words until a swelling process has taken place. For this reason the cooling system must not be pressure-tested until after the engine has reached normal operating temperature.

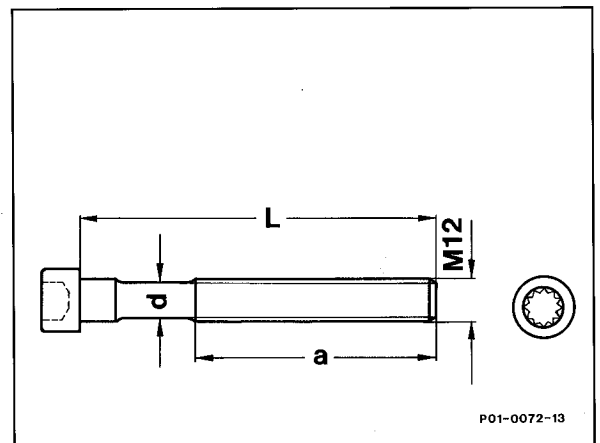
Cylinder head bolts (15)	examine, tighten (step 27 to 29).
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Special tools



Cylinder head bolts (twelve-point socket head)

Thread dia.	D		M12
Stretch shaft dia.	d	When new	10.75 ± 0.05 mm
Length of thread	a		135 mm
Length of bolt	L	When new	160 ± 0.8 mm
		Max. bolt length	162.70 mm



Tightening torques in Nm

Cylinder head bolts, engine cold ¹⁾	1st stage	55
	2nd stage 90° angle of rotat.	
	3rd stage 90° angle of rotat.	
Bolts of cylinder head, timing case cover	M8	25
Bolts of camshaft bearing caps	M7	15

¹⁾ Moisten thread and contact surface of bolts and washers with oil before installing.

Note

Take off cylinder head together with camshafts and exhaust manifold once engine has cooled down.

Removing, installing

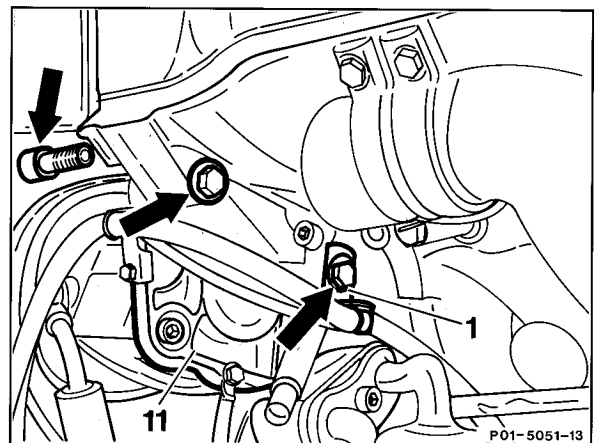
- 1 Raise hood to vertical position (01-0080).
- 2 Disconnect ground cable at battery.
- 3 Drain coolant at crankcase (20-0100).
- 4 Remove poly V-belt (13-3420).
- 5 Left cylinder head: unscrew bolts (arrows). Detach mounting plate with power steering pump (11) from tensioning device and place to the side with lines/wiring connected.

Installation note

The bolt which is screwed into the cylinder head from the front must be coated with sealant when installed.

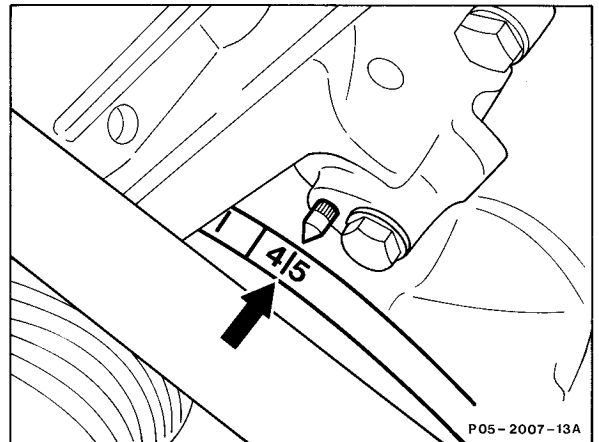
Pay attention to angle bracket (1) of wiring harness.

- 6 Right cylinder head: unbolt alternator from bracket and place to the side with wiring connected and secure.



- 7 Remove cylinder head covers (01-0500).
- 8 Remove front cover of cylinder head to be taken off (01-2120).

9 Rotate engine at cylinder 1 to 45° before ignition TDC.

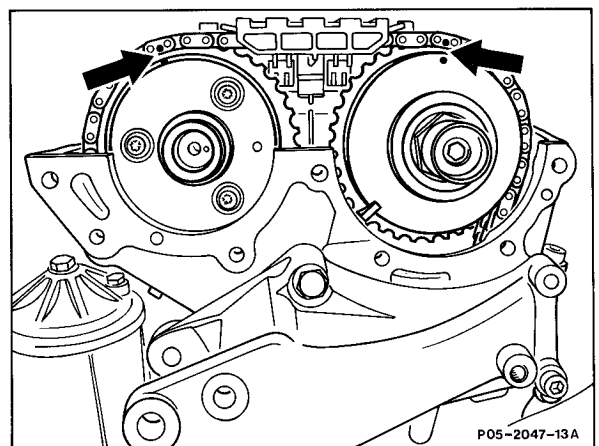


10 Mark all four camshaft sprockets and the timing chain with coloured dots (arrows).

Installation note

Examine, adjust basic setting of camshafts (05-2230).

- 11 Remove chain tensioner (05-3100).
- 12 Remove top guide rails (05-3350).
- 13 Unbolt exhaust camshaft sprockets and camshaft adjusters at the cylinder head to be removed (05-2170).



14 Remove intake manifold (14-1310).

15 Left cylinder head: detach coolant hose at the rear.

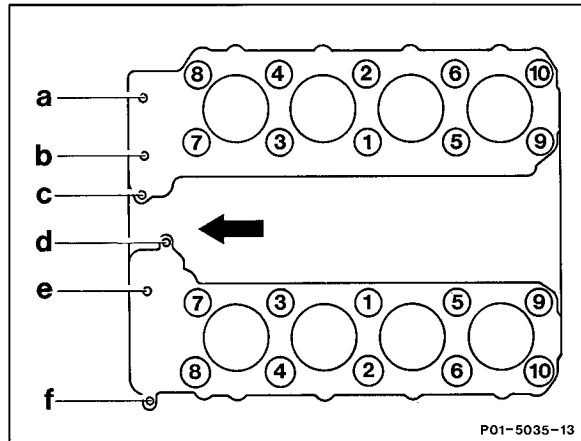
16 Right cylinder head: unbolt dipstick guide tube at rear of automatic transmission.

17 Unbolt exhaust system at the cylinder to be removed at exhaust manifold.

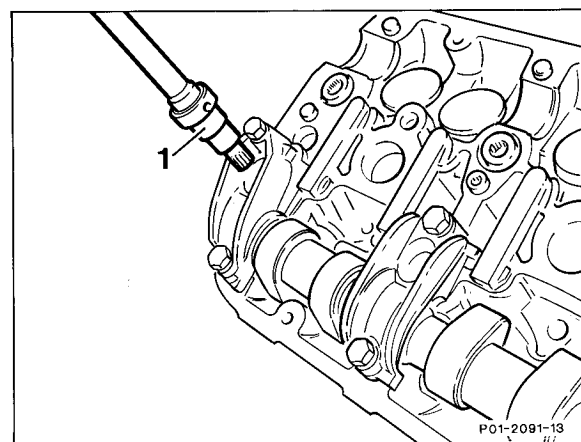
18 Detach exhaust system at transmission bracket.

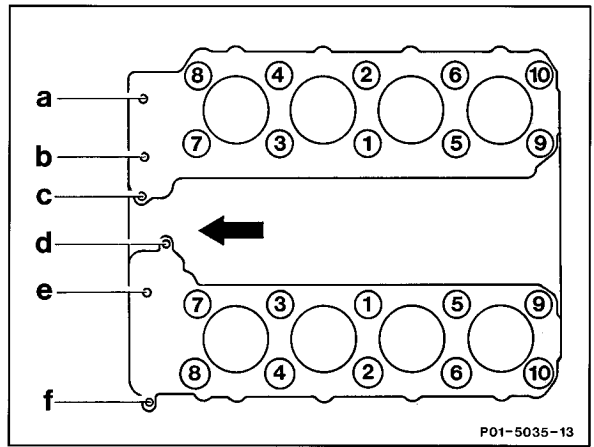
19 Right cylinder head: unbolt wiring harness at bottom right.

20 Unscrew bolts + washers (a), (b), (c), (d), (e), (f) of cylinder head to be removed.

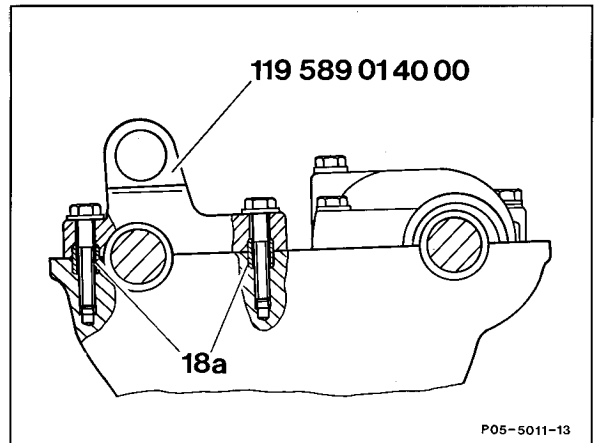


21 Slacken cylinder head bolts at the cylinder head to be removed with screwdriver insert (1) 119 589 00 10 00 in stages in reverse order of tightening diagram, beginning with 10, when engine cold.





22 Install bracket 119 589 01 40 00 at the cylinder heads to be removed. To do this, unbolt second and fourth camshaft bearing caps of the inlet camshaft at the right and left cylinder head, respectively, and install bracket with dowel sleeves (18a).



23 Attach engine hoist to bracket, raise cylinder heads and remove.



Do not damage guide rails and pay attention to exhaust manifold.

24 Examine cylinder head contact surface, face (01-4180).

25 Clean tapped holes of cylinder head bolts.



Free of oil and water.

26 Replace cylinder head gaskets.



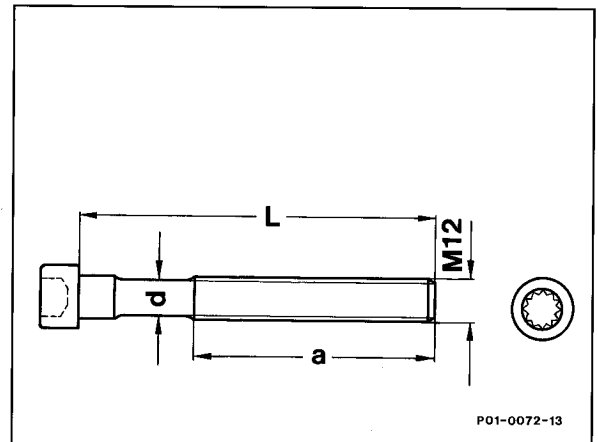
The cylinder head gasket is not watertight until the engine has reached normal operating temperature, in other words until a swelling process has taken place. For this reason, the cooling system must not be pressure-tested until after the engine has reached normal operating temperature.

Installation note

Pay attention to dowel sleeves or roll pins for fixing cylinder head in position on crankcase.

27 Examine cylinder head bolts. The cylinder head bolts are subject to a permanent stretch each time they are tightened. If the maximum length (L) of 162.70 mm is reached or exceeded before re-using, replace the bolts with new ones.

28 Oil the thread of the cylinder head bolts and the contact surface of the bolt heads and insert.



29 Tighten cylinder head bolts in stages in the order of the tightening diagram, beginning with 1.

1st tightening stage 55 Nm.

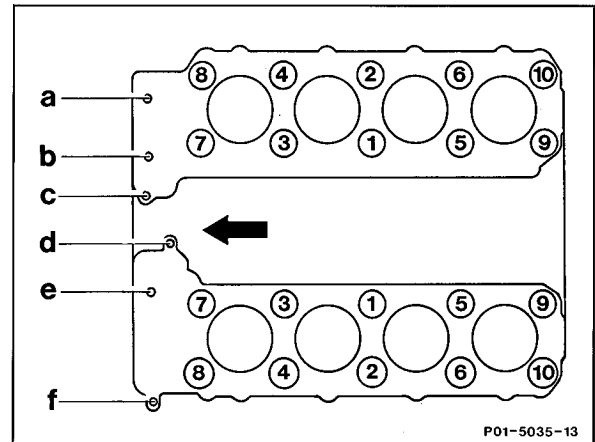
2nd tightening stage 90° angle of rotation.

3rd tightening stage 90° angle of rotation.

Installation note

Tighten bolts + washers according to diagram to 25 Nm once the intake manifold is installed.

- a M8 × 120 hexagon socket bolt + washer
- b M8 × 90 hexagon socket bolt + washer
- c M8 × 75 hexagon socket bolt + washer
- d M8 × 50 hexagon socket bolt + washer
- e M8 × 75 hexagon socket bolt + washer
- f M8 × 50 hexagon socket bolt + washer

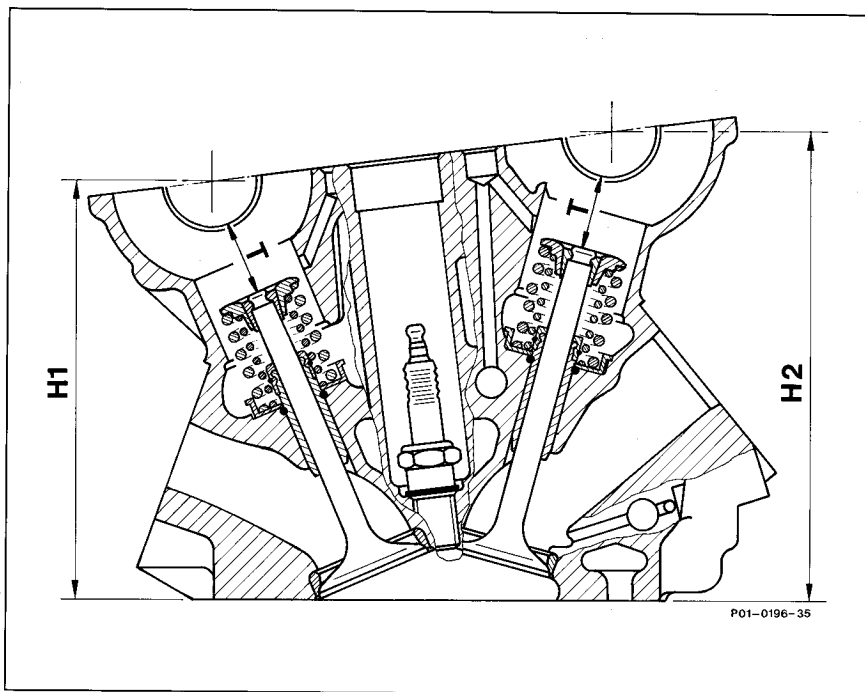


30 Install in the reverse order.

01-4180 Checking cylinder head mating surface, facing

Preceding work:
Valves removed.

Operation no. of operation texts and work units or standard texts
and flat rates
01-7162



Data

Reference sizes	H1	H2	T
When new	<u>130.6</u> ¹⁾ 130.7	<u>145.9</u> ¹⁾ 146.0	-
Minimum height after stock removal	130.4 ¹⁾	145.7 ¹⁾	-
With camshaft bearing dia. Standard size			<u>23.07</u> 23.81
Permissible variation from evenness of mating surface	in longit. dir.	0.08	
	in transv. dir.	0.0	
Permissible variation of parallelism of top to bottom mating surface in longitudinal direction		0.1	
Peak-to-valley height		0.003-0.010	
Test pressure with air under water in bar gauge		2	

- 1) Measure by inserting a shaft and dressing half the diameter. The stock removal at the cylinder head and at the crankcase of an engine must together not be more than 0.4 mm (see 01-1200).

Commercially available tools

Surface grinding machine with milling tool for light alloy surfaces	e.g. P. Schoenleber GmbH Caorle Cramer-Klettstr. 8 D-83229 Aschau Order no. 9033 0006
Set of mounts for side attachment M119	Order no. 90330037
Knife-edge straightedge approx. 500 mm long	e.g. Roaro u. Fi. Schio / Italien

Note

Only machine cylinder head mating surface if porous or damaged points exist or if an impermissible variation has been measured from the evenness in the longitudinal direction.



The top cylinder head mating surface must not be machined otherwise the basic bores of the camshaft bearings will be altered.
If cracking is suspected (internal loss of coolant), the cylinder head must be pressure-tested (01-4200).

Facing

- 1 Measure reference sizes H1 and H2 and note.
- 2 Face cylinder head mating surface. Deburr sharp edges at edge of combustion chamber.
- 3 Again measure reference sizes H1 and H2. Determine stock removal and note.
- 4 Re-position valve seats by the same amount of the stock removal at the cylinder head (05-2910).
- 5 Measure reference size (T) between end of valve stem and base of camshaft bearing.

Note

To do this, insert \varnothing 6 mm round bar in the middle of the base of the camshaft bearing and measure size "T" with caliper gage.



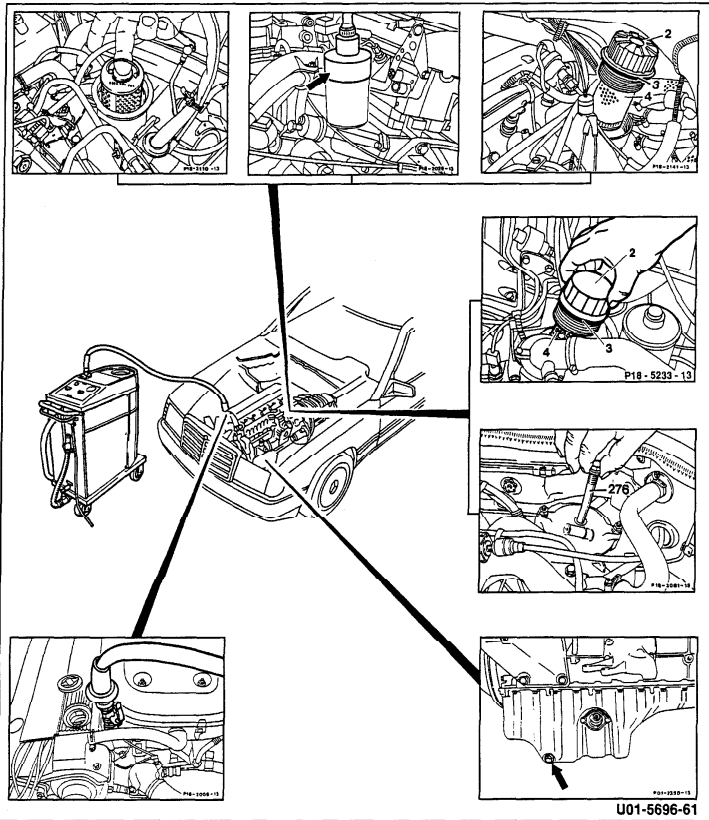
If the size obtained is less than the size "T", it is no longer possible to achieve correct valve clearance compensation; replace valve seat ring or cylinder head.

6 Check timing (05-2150).



It is not permitted to rework the valves. If the valve seat has to be reworked, the valve should be replaced.

All models



⚠ Note:

Change oil only when engine is at operating temperature.

Engine 104 In model 140

Air cleaner Remove, install (job 09-0015).

Engine 119 in models 124, 129, 140

Flexible air duct Remove, install (step 1).

Engine 120

Left air cleaner housing Remove, install (step 2).

All engines

Filter cartridge Remove, install. Empty oil filter housing before draining oil (step 3).

Engine oil (with suction unit) Remove through dipstick tube using suction unit. (step 4).

Engine oil (without suction unit) Drain (step 5).

Engine oil Fill according to quantities listed in table.

Leakage Check with engine running.

Oil level Check 2 minutes after shutting off engine at normal operating temperature

Oil capacity in liters (gasoline engines)

Engine	Model	Total capacity during oil and filter change	Oil dipstick identification	
			Oil dipstick color code	Identification on dipstick handle
104	124, 129, 202	7.5	-	10407
104	140	7.5	-	60322
111	202	5.8	-	11102
119	124, 129, 140	8	grey	-
120	129	9.5	red	12011
120	140	9.5	red	12010

Torque specifications (Nm) (gasoline engines)

Engine	Oil pan drain plug	Center bolt, oil filter cover	Cartridge	Threaded cover
104	25	-	-	20, 25 ¹⁾
111	25	-	-	25
119	40	20	-	-
120	40	-	-	20

¹⁾ Plastic cover

Oil capacity in liters (Diesel engines)

Engine	Model	Total capacity during oil and filter change	Oil dipstick identification		
			Oil dipstick color code round handle	Oil dipstick color code bottle opener shaped handle	Identification on dipstick handle
603.971	140	8.0	-	-	60324
606	124	7.0	-	-	60600

Torque specifications (Nm) (Diesel engines)

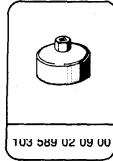
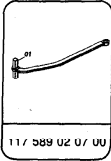
Engine	Center bolt, oil filter cover	Oil pan drain plug	Oil return tube in oil filter cover ¹⁾
603, 606	25	30 ²⁾ 25 ³⁾	25

¹⁾ Engine 603 in models 124 and 140.

²⁾ 12 x 1.5 x 13

³⁾ 14 x 1.5 x 22

Special tools



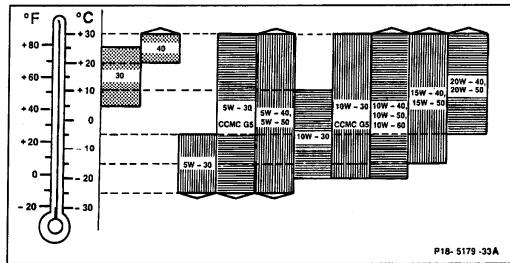
Special tool applications

Special tool	Engines
117 589 02 07 00	all
001 589 72 21 00	all
103 589 02 09 00	104, 111, 120


Specified SAE viscosity classes during continuous ambient temperatures

Following the SAE grades exactly according to the ambient air temperatures would result in frequent engine oil changes. The temperature ranges for the SAE grades should therefore be regarded as a guideline which may be exceeded for brief periods.

Gasoline engines and Diesel engines 603, 606.



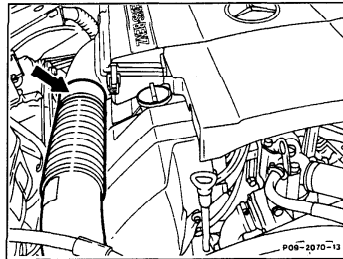
Procedure

 **Note:**
Change oil only when engine is at operating temperature.

Engine 119 in model 124, 129, 140

1. Remove flexible air duct (arrow).

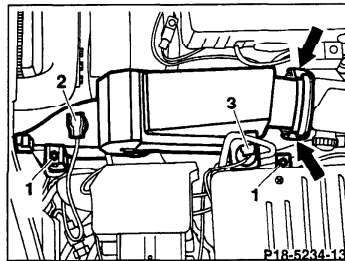
Engine 119



Engine 120

2. Remove left air filter housing by loosening clips (arrows), removing nuts (1), and pulling off intake air temperature sensors (2) and purge valve (3).

Engine 120 shown in model 129



3. Removing/Installing oil filter cartridge

Engines 104, 111, 120

Prior to suctioning or draining of engine oil, unscrew screw cover (2) with special tool 103 589 02 09 00.

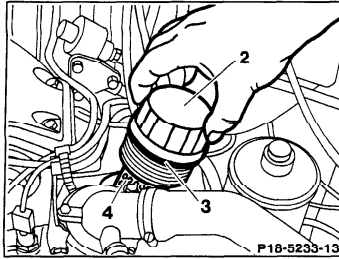
Remove threaded cover (2) with oil filter element (4).

Installation note:

Replace seal (3). Insert filter cartridge (4) into oil filter housing. Install cover (2).

Torque values:

Aluminum cover	20 Nm
Plastic cover	25 Nm.

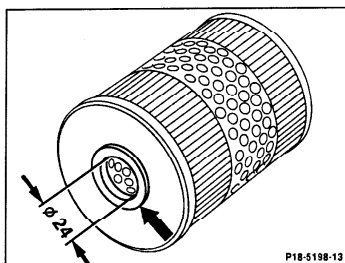
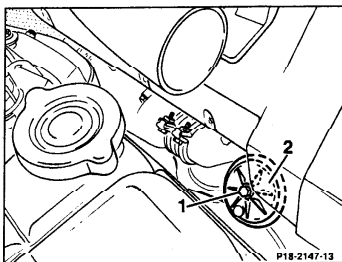


Engine 111

Engine 119

Drain oil filter prior to suctioning or draining engine oil. For this purpose, loosen center screw (1) and remove together with oil filter cover.

Engine 119



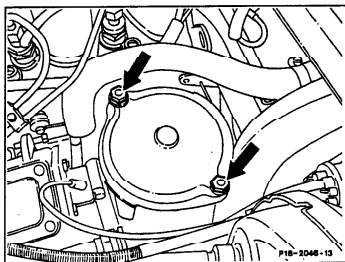
Engines 603, 606

Drain oil filter prior to suctioning or draining engine oil. Remove the nuts (arrows) and then the cover.

On vehicle with air-to-oil coolers (turbo engines), it is not necessary to drain the oil from the oil cooler.

Installation note:

Replace filter cartridge and rubber sealing ring.

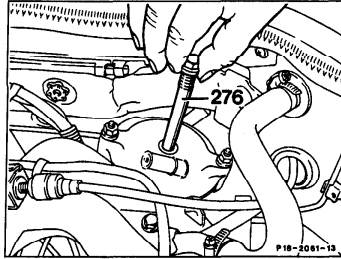


0101

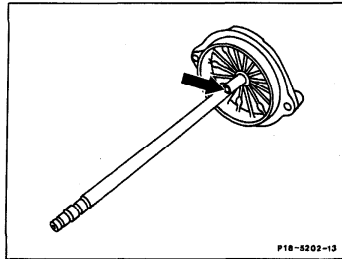
Engine oil and filter change

With two-piece oil filter cover

Unscrew return pipe (276) and remove. Unscrew oil filter cover retaining nuts and remove cover.

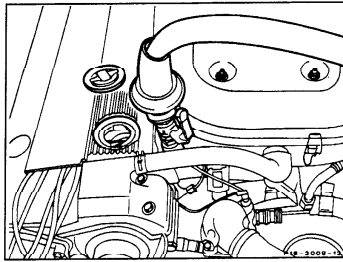


Check the oil port on the oil tube for foreign matter (arrow). If it is blocked, remove the foreign matter by hand. Then blow through the oil port with compressed air; air must noticeably come out of the bottom of oil tube. If the oil port is not open or if no air comes out, replace oil filter cap and oil tube.



4. Removing old oil

Suction engine oil via dipstick tube with engine at operating temperature.



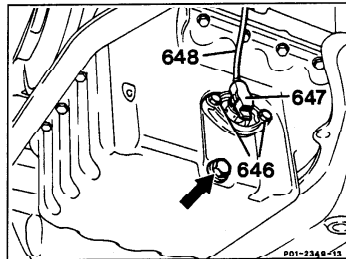
5. Draining old oil

First remove engine compartment lower panel (job 6190 or 9490), and reinstall upon completion of maintenance jobs.

Remove drain plug from oil pan (arrow).

Installation note:

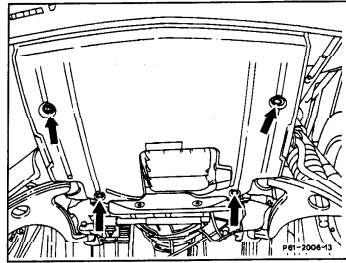
Replace drain plug seal ring. Refer to chart for correct torque value.



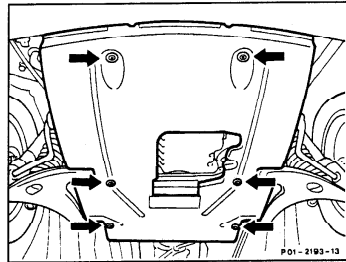
Removing and installing engine compartment lower panel 6190

Models 124.0 129 140

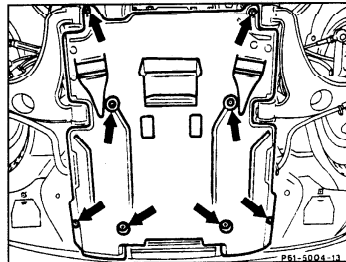
- Unscrew small bolts (arrows) and remove engine compartment lower panel.
- Install in reverse sequence.



Model 124 Engine compartment lower panel, short version

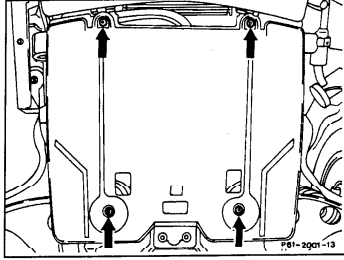


Model 124 Engine compartment lower panel, long version

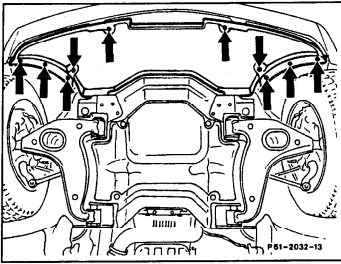


Model 124.036

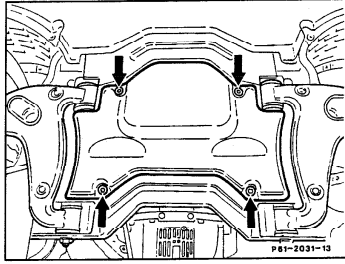
6190 Removing and installing engine compartment lower panel



Model 129



Model 140 front section



Model 140 rear section

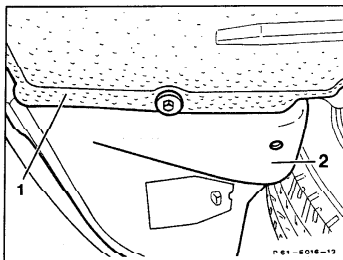
Removing and installing engine compartment lower panel

6190

Models 124.036, 140

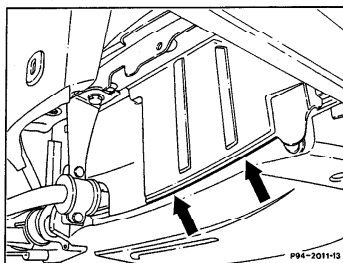
Install lower engine compartment cover (1) so that it overlaps the wheel well covers (2).

Model 124.030



Models 124 (except 124.036), 202

Install the side panels so that the edges overlap the engine compartment cover.



Model 129

Install lower engine compartment cover (1) so that the side panels (3) are positioned inside the lower engine compartment cover.

