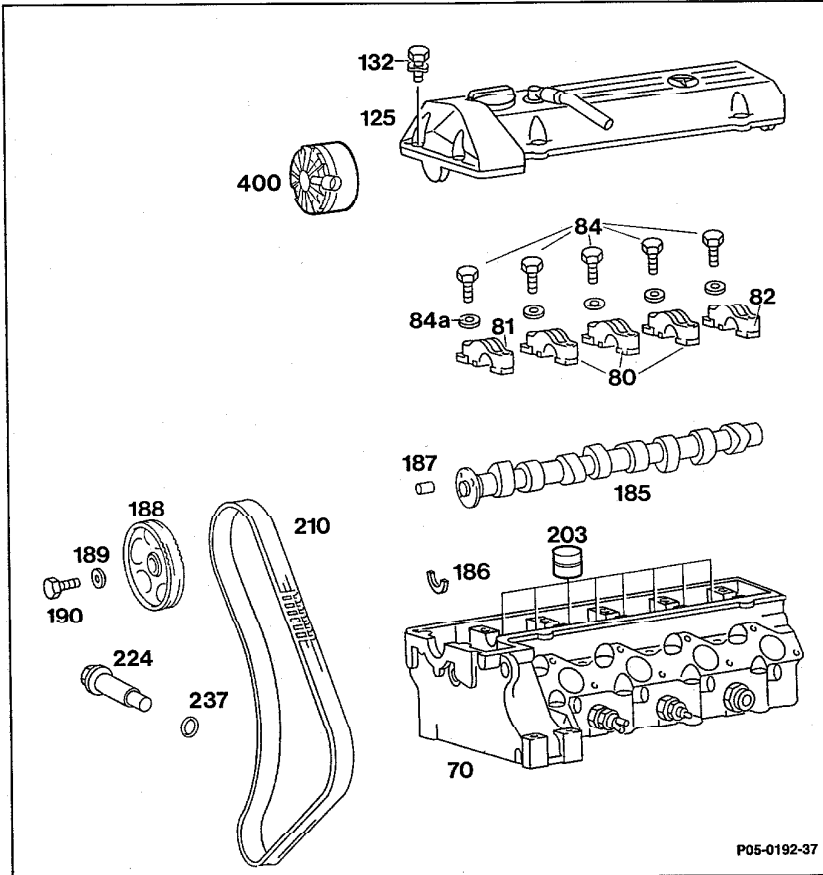


05-220 Removal and installation of camshaft

Operation no. of operation texts and work units or standard texts
and flat rates
05-6292



Turbo engine:

Boost air pipe remove, install.

Engine 601 in model 202

Air cleaner cross pipe remove, install.

Cylinder head cover (125) remove, install, 10 Nm.

Engine position on ignition TDC of No. 1 cylinder.



The engine must not be turned by the camshaft timing gear bolt.

Chain tensioner (224) remove, install, replace sealing ring (237) (05-310).

With self-levelling suspension:

Drive of the pressure oil pump (400) remove, install (05-437).

Camshaft timing gear (188) mark at timing chain (210). Remove, install camshaft timing gear. Different bolts (190) and washers (189). Hexagon bolt, 65 Nm, bihexagonal head bolt, 25 Nm/90° angle of rotation.



When assembling the camshaft timing gear ensure that the straight pin (187) is not pushed out rearwards.

Camshaft bearing cap (80, 81, 82) remove, install, note sequence, hexagon bolts (84) and washers (84a), 25 Nm.



Note slackening and tightening diagram!

Camshaft (185) remove, install. Check for ease of movement.

Lock washer (186) check.

Valve tappet (203) remove, install, check.

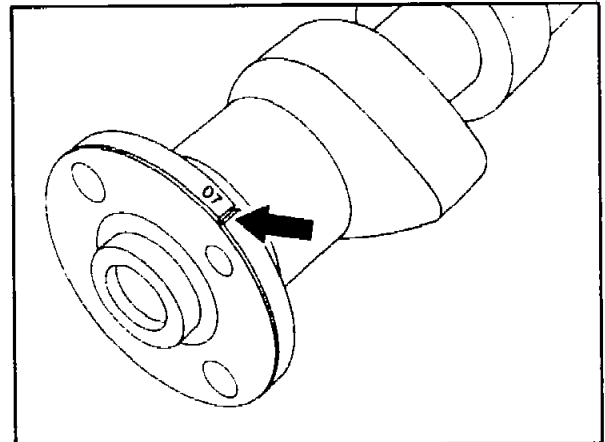
After installation allow engine to run, check for leaks.

Data

| | | | | |
|--|------------------------------|-------|-------|-------|
| Permitted eccentricity of center bearing pins and camshaft gear seat when locating the camshaft in the outer bearing positions | Bearing position/engine | 601 | 602 | 603 |
| | Camshaft timing gear seat | 0.025 | 0.025 | 0.025 |
| | 2nd and 4th bearing position | 0.030 | - | - |
| | 3rd bearing position | 0.050 | - | - |
| | 2nd and 5th bearing position | - | 0.030 | - |
| | 3rd and 4th bearing position | - | 0.050 | - |
| | 2nd and 6th bearing position | - | - | 0.030 |
| | 3rd and 5th bearing position | - | - | 0.045 |
| | 4th bearing position | - | - | 0.060 |
| Scleroscope hardness of cam | 70-82 | 70-82 | 70-82 | |

Camshaft code numbers

The code number is stamped on the flange next to the TDC notch (arrow).



TDC marking (arrow) and code number

P05-2263-13

| Engine | Thread for sprocket wheel | Camshaft code number |
|----------|---------------------------|---|
| 601 | M10 | 05, 06, 08 ¹⁾ |
| | M11 | 10, 12 ¹⁾ , 13 ²⁾ |
| 602, 603 | M10 | 07, 09 ¹⁾ |
| | M11 | 11, 13 ¹⁾ , 16 ³⁾ |

1) Repair camshaft with 0.5 µm larger bearing dia.

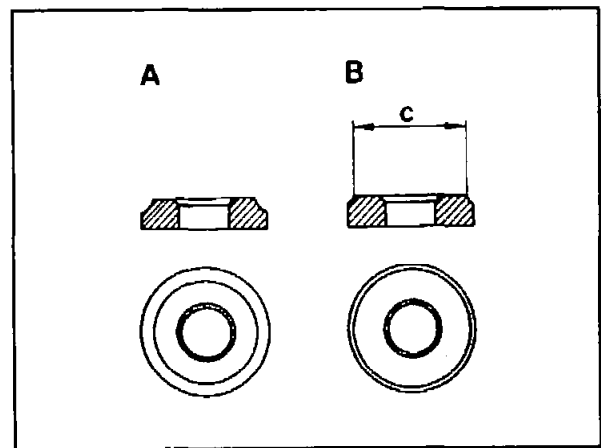
2) Engine 601.913 in model 202

3) Engine 602.982 in model 210

Washer for camshaft timing gear bolt

A modified washer with larger outer diameter (c) has been installed since 12/86 to prevent the camshaft timing gear bolt from loosening.

A 1st version
B 2nd version



P05-0205-13

Camshaft timing gear bolt

As of 11/88 the camshaft timing gear bolt has been changed from a M10 hexagon bolt to a M11 12-point necked down bolt on all engines.

Tightening torques

Hexagon bolt (A) 65 Nm

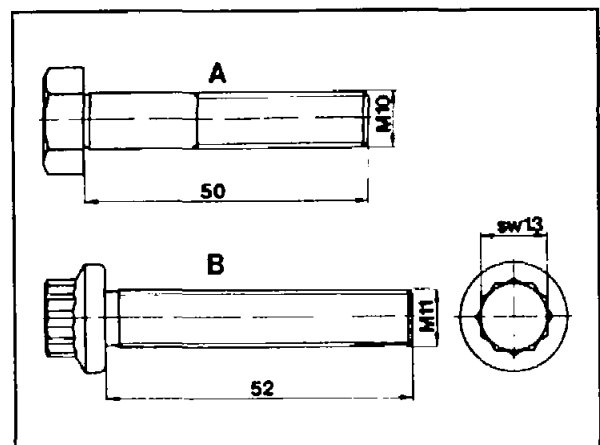
12-point necked down bolt (B)

Pre-torque 25 Nm

Tightening angle 90°

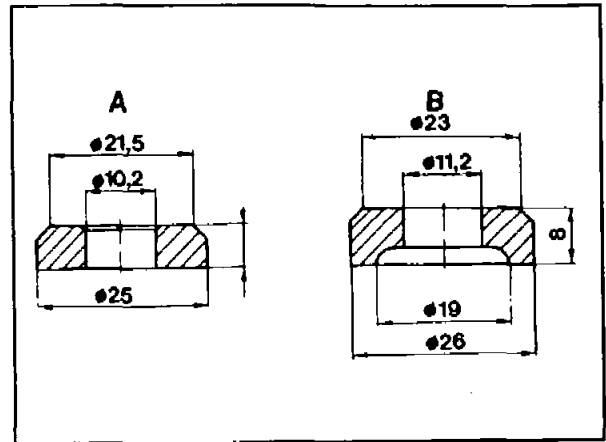


Note modified plain washer!



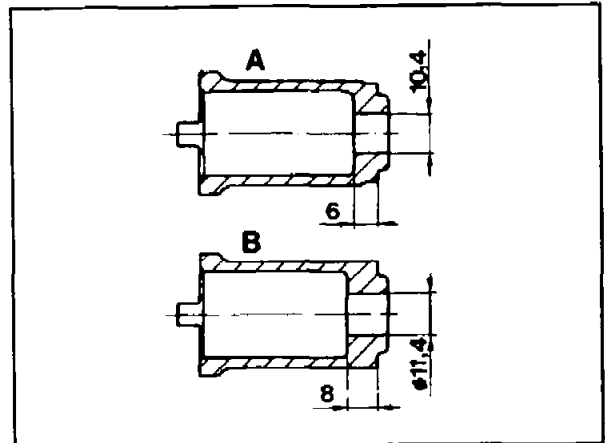
P05-0009-13

Use the plain washer (A) for the hexagon bolt, and plain washer (B) for the 12-point necked down bolt.



P05-0003-13

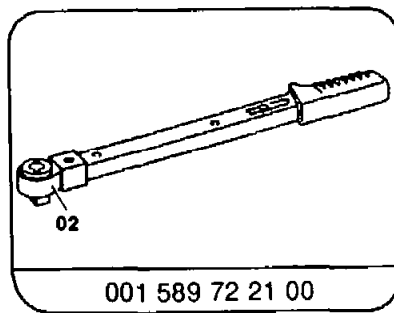
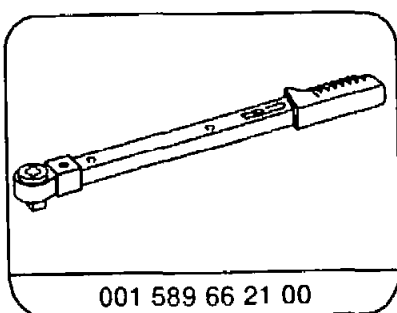
Use carrier (A) for previous hexagon bolt, carrier (B) for bihexagon necked down bolt.



P05-0002-13

| Tightening torques and tightening angles | | Nm |
|--|------------------|-----|
| Hexagon bolts on cylinder head cover | | 10 |
| Hexagon bolts on camshaft timing gear | | 65 |
| 12-point bolt on camshaft timing gear | initial torque | 25 |
| | tightening angle | 90° |
| Hexagon bolts on camshaft bearing cap | | 25 |

Special tools



Commercially available tools and testers

| Designation | e.g. Make | Order no. |
|--------------------------------|---|-----------|
| Rubber suction cup, dia. 30 mm | Hazet Postfach 100461 42804 Remscheid | 795-3 |

Removal

Turbo engine:

- 1 Remove boost air pipe.

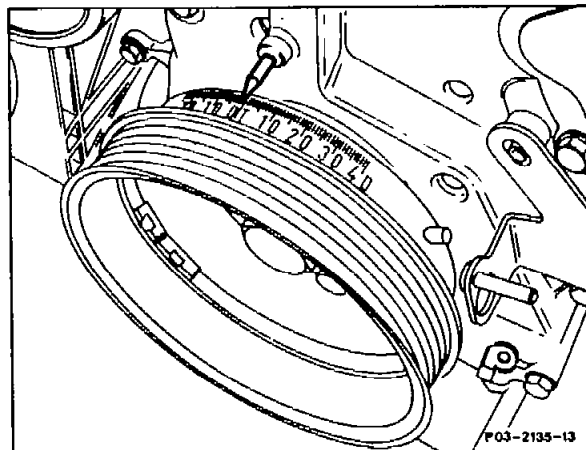
Engine 601 in model 202

- 2 Remove air cleaner cross pipe.
- 3 Remove cylinder head cover.

- 4 Position engine on ignition TDC of no. 1 cylinder (arrow).



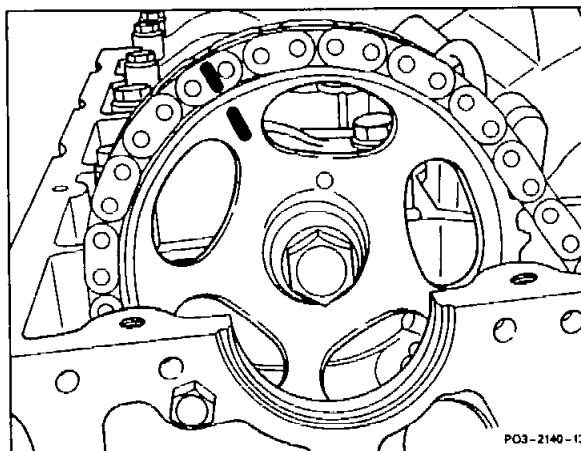
Do not turn engine by the camshaft timing gear bolt. Do not turn engine backwards.



- 5 Remove chain tensioner (05-310).

With self-levelling suspension

- 6 Remove pressure oil pump (05-437).
- 7 Align camshaft timing gear and timing chain.

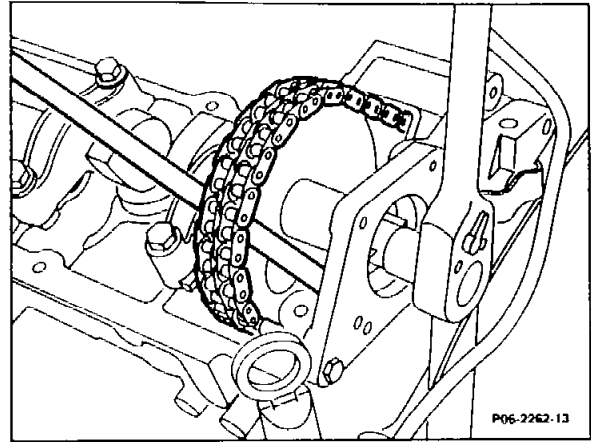


8 Unscrew hexagon bolt or 12-point head bolt on camshaft timing gear, whilst holding the camshaft with a mandrel.

9 Remove camshaft timing gear and allow timing chain to sag.

Note

The timing chain is prevented from twisting when the timing case cover is assembled.



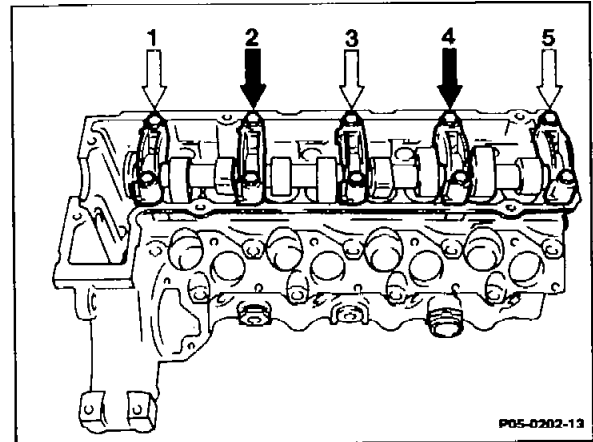
Note different bolt and washer.



10 It is absolutely essential to observe the following sequence during **removal and installation** in order to avoid damage to the camshaft:

Engine 601

Unscrew both hexagon bolts on camshaft bearing caps 1, 3 and 5 (light arrows).

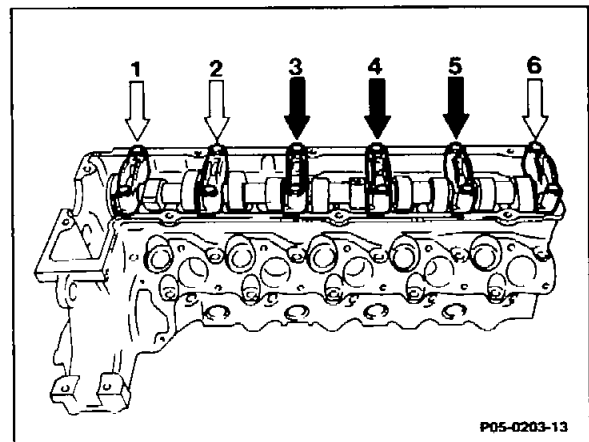


Slacken both hexagon bolts on camshaft bearing caps 2 and 4 alternately in increments of one turn respectively until counterpressure is reduced (dark arrows).

Engine 602

Unscrew both hexagon bolts on camshaft bearing caps 1, 2 and 6 (light arrows).

Slacken both hexagon bolts on camshaft bearing caps 3, 4 and 5 in increments of one turn respectively, until counterpressure is reduced (dark arrows).

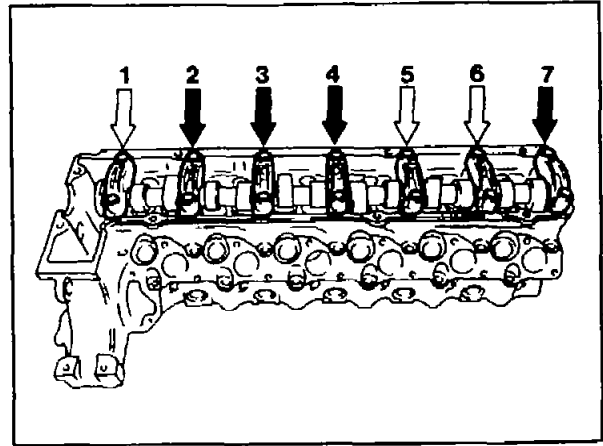


Engine 603

Unscrew both hexagon bolts on camshaft bearing caps 1, 5 and 6 (light arrows).

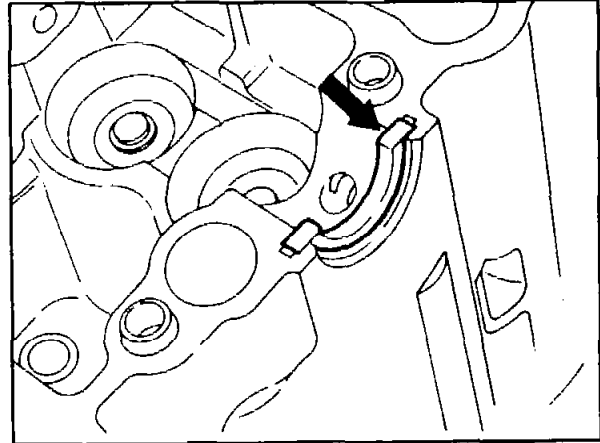
Slacken both hexagon bolts on camshaft bearing caps 2, 3, 4 and 7 in increments of one turn respectively, until counterpressure is reduced (dark arrows).

11 Remove camshaft upwards.



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12 Remove lock washer for axial location (arrow) and check condition.



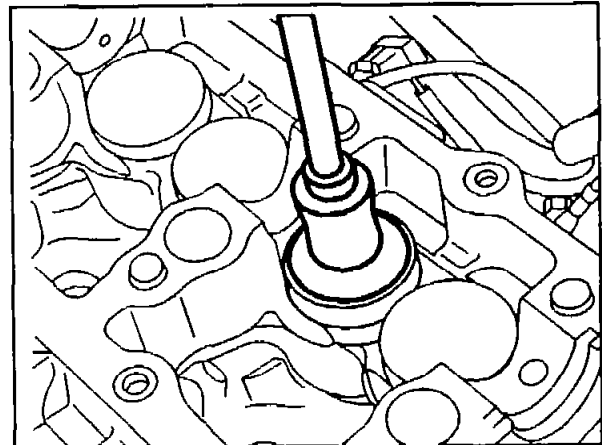
P05-2259-13

13 Pull out valve tappet with rubber suction cup.

14 Check condition of valve tappet (visual check), replace, if required.



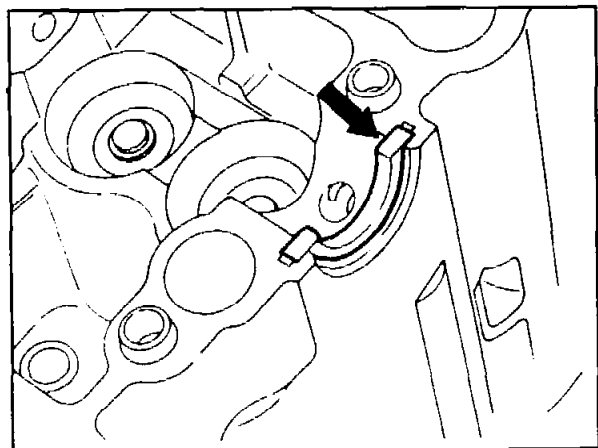
Install valve tappet in the same position again.



P05-5470-13

Installation

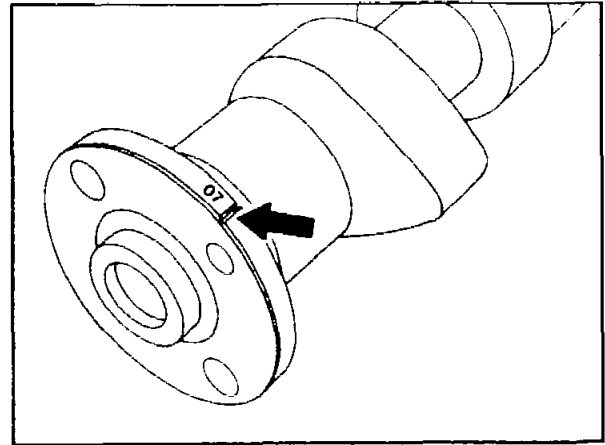
15 Insert lock washer for axial fixing (arrow) in cylinder head.



P05-2259-13

16 Lubricate camshaft and place on the cylinder head so that the TDC marking (arrow) points vertically upwards.

17 Install camshaft bearing caps. Note marking on bearing caps.



P05-2283-13

Assemble camshaft bearing cap bolts (dark arrows) and tighten up alternately in increments of one turn respectively in accordance with tightening diagram, see work step 10.

Engine 601; camshaft bearing caps 2 and 4
Engine 602; camshaft bearing caps 3, 4 and 5
Engine 603; camshaft bearing caps 2, 3, 4 and 7

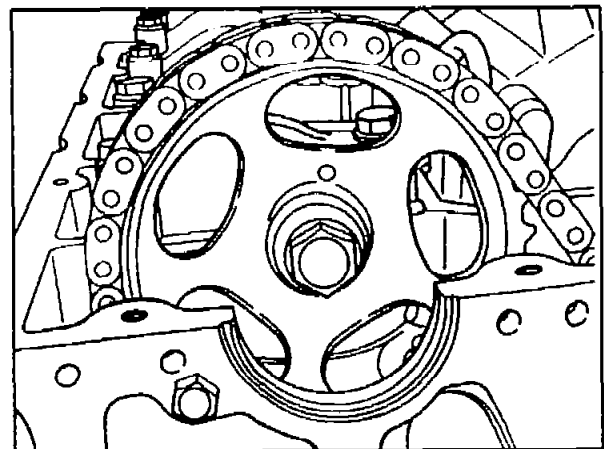
The remaining camshaft bearing caps (light arrows) can then be assembled at random.

Tightening torque 25 Nm.

18 Install camshaft sprocket according to marking and tighten. Check straight pin to ensure it is correctly fitted.

Tightening torques and tightening angle
Hexagon bolt 65 Nm,
12-point head bolt 25 Nm, 90°

19 Install chain tensioner (05-310).



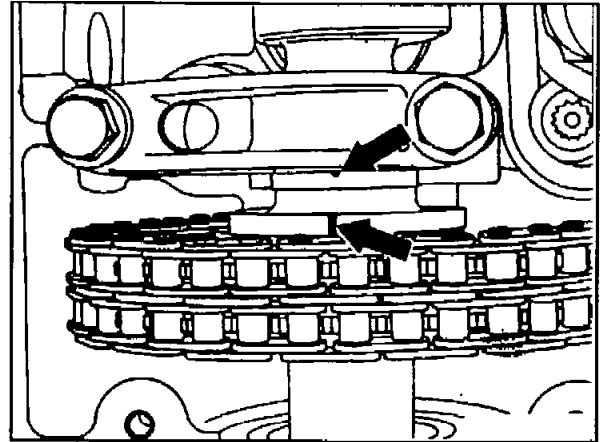
P03-2140-13

If car fitted with level control:

20 Install pressurized oil pump (05-437).

21 Position engine to ignition TDC of cylinder 1 and check markings (arrows).

22 Install cylinder head cover. Tightening torque 10 Nm.



P05-2206-13

Turbo engine:

23 Install boost air pipe.

Engine 601 in model 202

24 Install air cleaner cross pipe.

After installation:

25 Run engine and check for leaks.