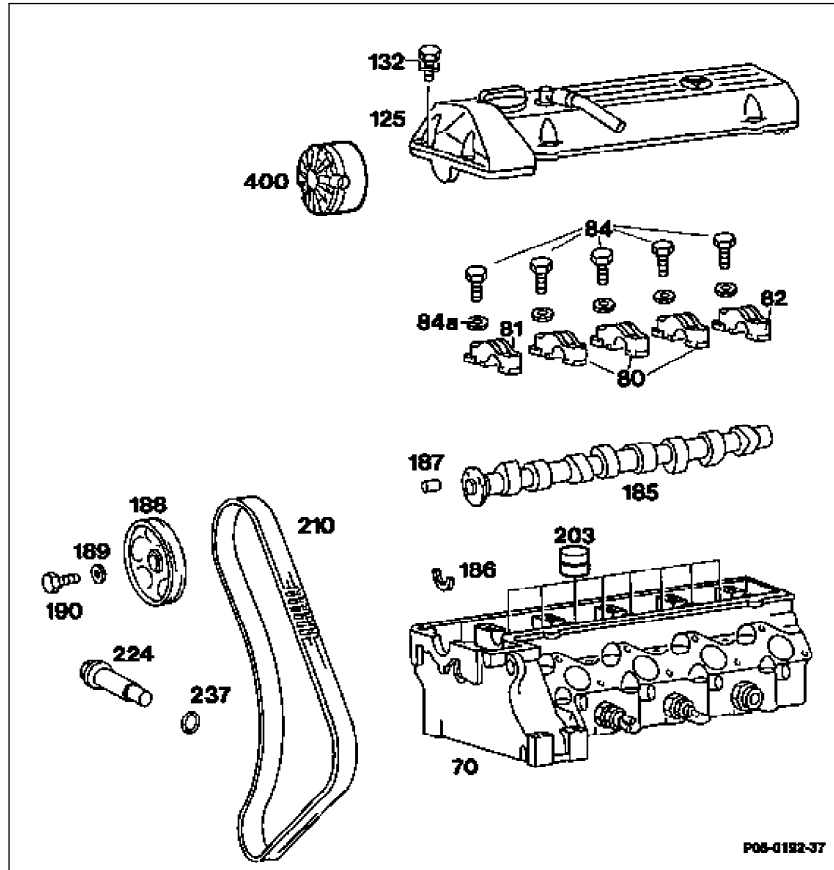


05-220 Removal and installation of camshaft

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



P05-0192-37

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.

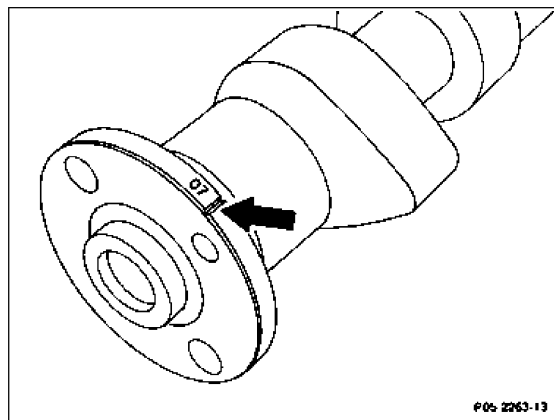
Data

	Bearing position/engine	601	602	603
Permitted eccentricity of center bearing pins and camshaft gear seat when locating the camshaft in the outer bearing positions	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

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

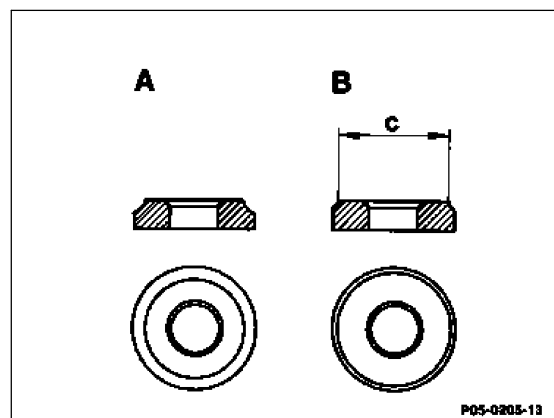
Engine	Thread for sprocket wheel	Camshaft code number
601	M10	05, 06, 081)
	M11	10, 121), 132)
602, 603	M10	07, 091)
	M11	11, 131) 163)

- 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

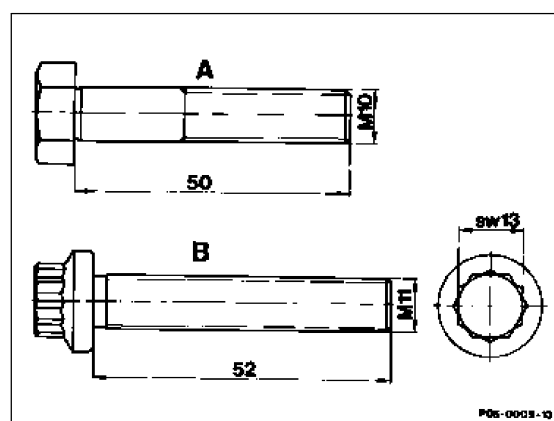
As of 11/88 the camshaft timing gear bolt has been changed from a M10 hexagon bolt to a M11 12-point necked down bolt on all engines.

Tightening torques

Hexagon bolt (A) 65 Nm
12-point necked down bolt (B)
Pre-torque 25 Nm
Tightening angle 90°

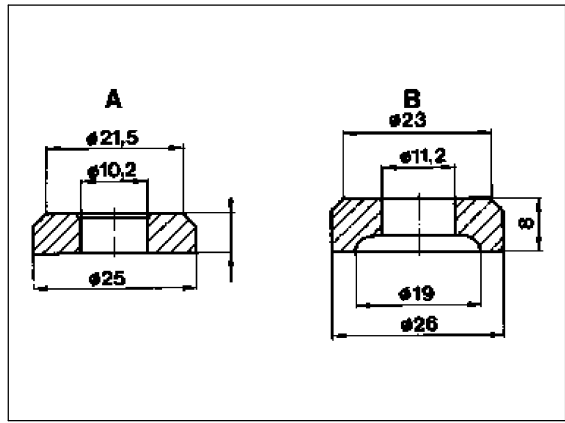


Note modified plain washer!



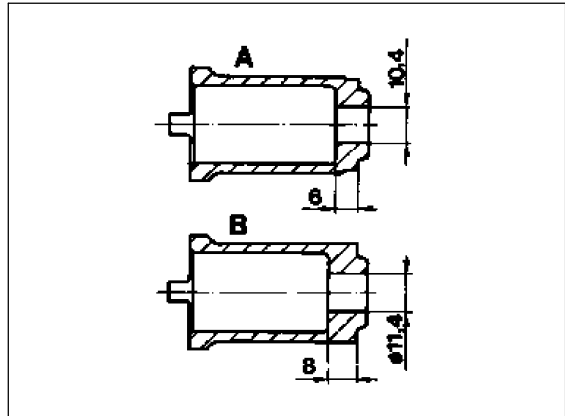
P05-0009-13

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.

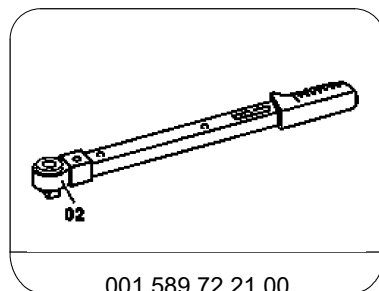
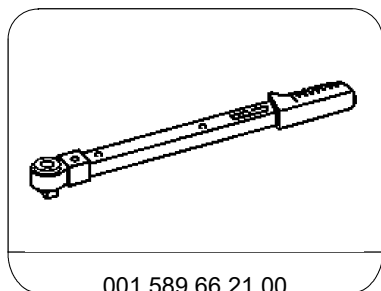


P05-0002-13

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:

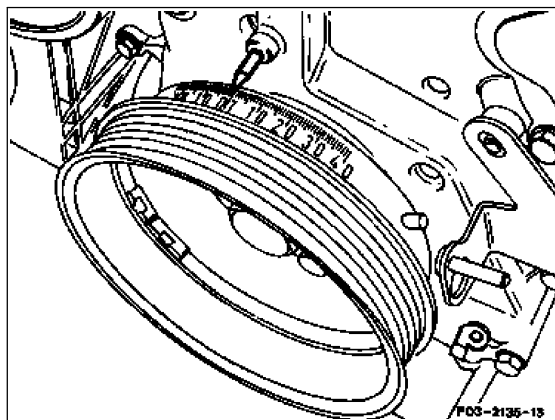
- 1 Remove boost air pipe.

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.

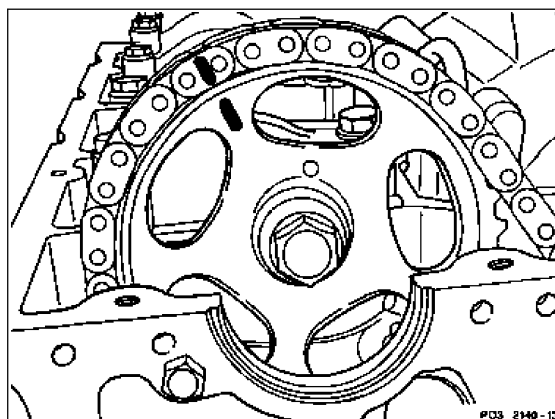


P03-2135-13

- 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.



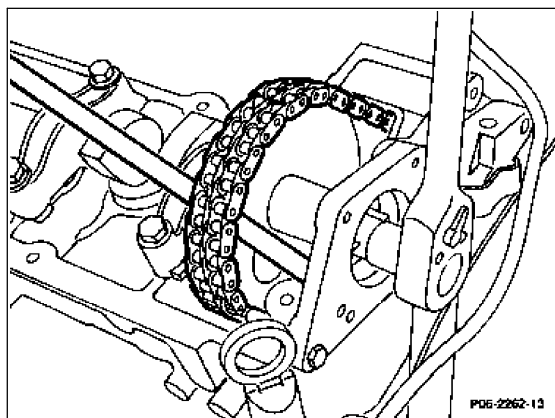
P03-2140-13

- 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.



P05-2262-13



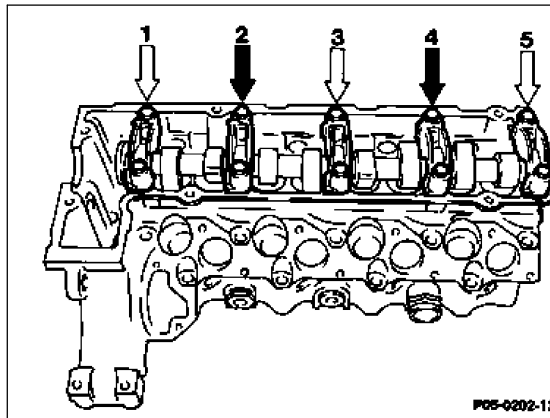
Note different bolt and washer.



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).



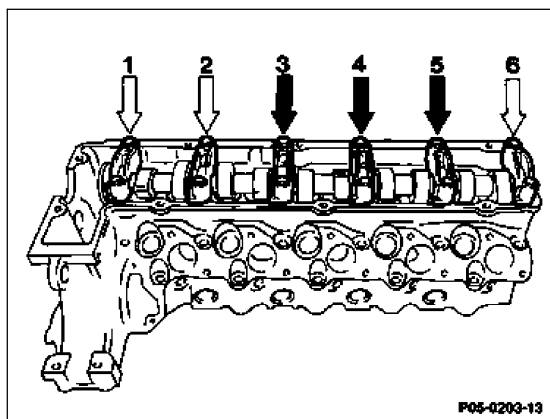
P05-0202-13

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).



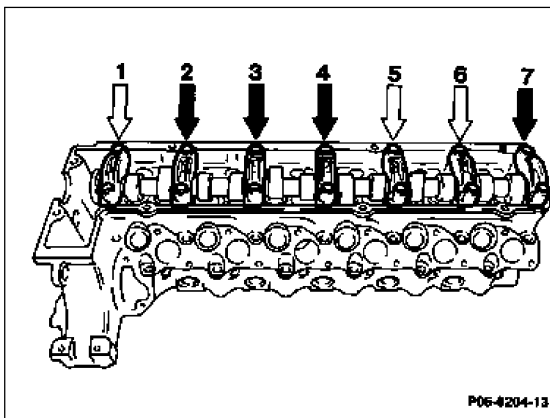
P05-0203-13

Engine 603

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

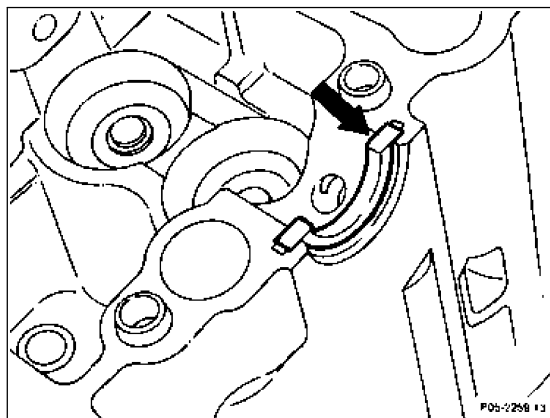
Slacken both hexagon bolts on camshaft bearing caps 2, 3, 4 and 7 in increments of one turn respectively, until counterpressure is reduced (dark arrows).

11 Remove camshaft upwards.



P05-0204-13

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



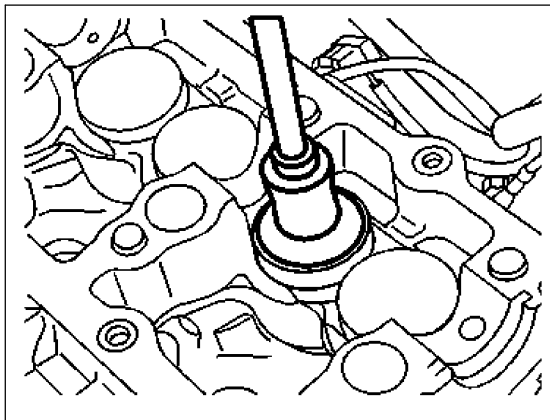
P05-2259-13

13 Pull out valve tappet with rubber suction cup.

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



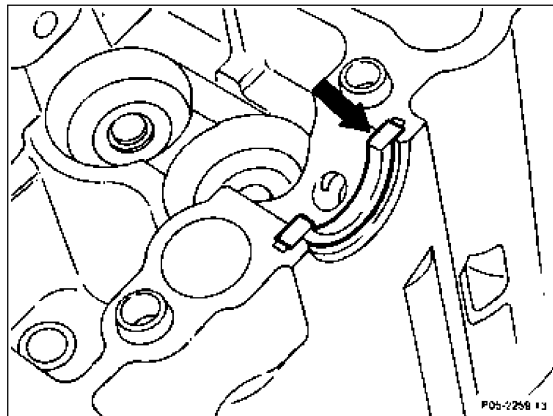
Install valve tappet in the same position again.



P05-5470-13

Installation

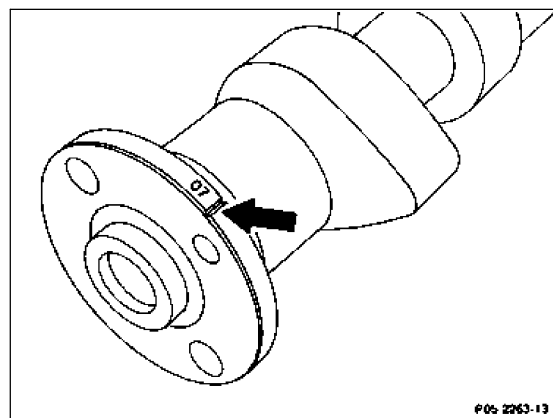
15 Insert lock washer for axial fixing (arrow) in cylinder head.



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.



P05-2263-13

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.

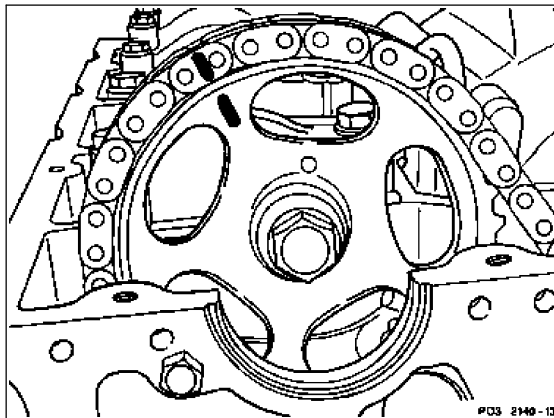
Tightening torque 25 Nm.

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).



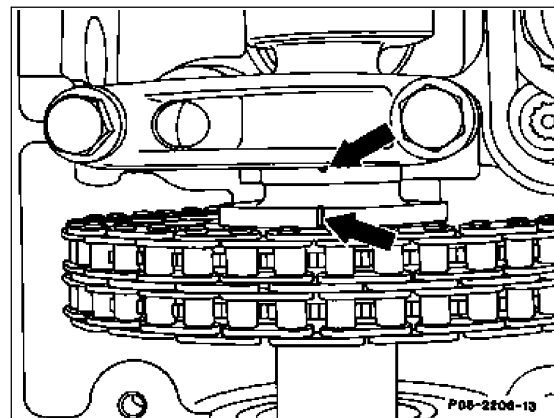
P03-2140-13

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.