

Removal and Installation of Camshaft and Bearings OM 636

Job No.

05-35

The removal and installation of the camshaft, the camshaft bearings and the valve tappets is similar for the engines of all types.

The camshaft runs in three bearings, the first bearing is designed as a locating bearing. The front and the center bearings are in two pieces each, because the journals are smaller in diameter than the cams. The outer diameters of the bearings are different to make assembly easier; the front bearing (locating bearing) has the largest diameter and the rear bearing the smallest diameter.

Removal:

1. Drain the oil from the oil pan.
2. On engines with fan bearing bracket remove the fan bearing bracket with support, belt pulley and fan (see Job No. 20-15).

On engines with fan on the pulley of the water pump or on the pulley of the crankshaft remove the fan (see Figure 03-1/4 and 20-8/14).

3. Mount the engine in the Engine Assembly Trestle BE 10 488/1-6 (see Figure 00-20/1).
4. Remove the timing housing cover with injection pump (see Job No. 01-15 and Job No. 07-11).
5. Remove the tappet housing cover after unscrewing the two fixing screws.
6. Remove the cylinder head cover after loosening the fixing nuts.
7. Unscrew the fixing nuts of the rocker brackets and remove the rocker brackets with rockers (see Figure 05-1/1).

8. Pull out the push rods.

Note: Caution; make sure that the tappets do not stick when pulling out the push rods. The push rods must be lifted carefully and have to be turned, if necessary, until tappets and push rods are separated.

9. Take the valve tappets out of the bores in the crankcase and put them away and/or mark them in the proper sequence of 1 through 8, so that they can again be inserted in the same bores during installation.

10. Unscrew the locating screws (1, 2 and 3) (see Figure 05-35/1). The oil line must first be disconnected at the screw (1), which is designed as an adapter and connector for the oil line lubricating the rockers.

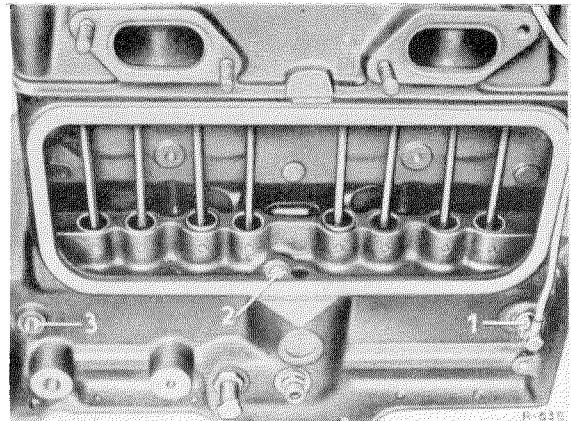


Figure 05-35/1

- 1 Locating screw of the 1st camshaft bearing with connector for the oil line to lubricate the rockers
- 2 Locating screw of the center and 2nd camshaft bearing inside the tappet housing
- 3 Locating screw of the 3rd camshaft bearing

11. Turn the engine in the assembly trestle and remove the oil pan after unscrewing of the fixing screws.

12. Unscrew the hexagon screw securing the oil pump in the crankcase and remove the oil pump. If the oil pump jams in the

crankcase drive it out carefully with a plastic hammer (see Figure 18-11/1).

13. Unbend the locking plate (32) and unscrew the fixing screw (33) of the intermediate gear and camshaft timing gear (right-hand thread) (see Figure 07-27/4).
14. Pull off the two wheels with the Extractor Part No. 136 589 01 33 (see Figure 05-31/1).
15. Pull the camshaft with the camshaft bearings out of the crankcase with the Extractor Part No. 136 589 10 33 (see Figure 05-35/2).

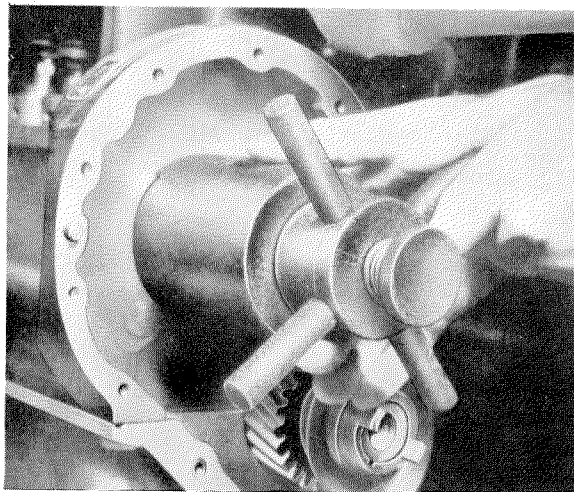


Figure 05-35/2

16. Drive out the rear and 3rd camshaft bearing (2), from the front towards the rear, with the Assembly Bolt Part No. 136 589 03 39 (see Figure 05-35/3).
17. Force the retaining rings (10) out of the grooves of the first (6) and second (7) camshaft bearing and remove the bearing halves from the journals (see Figure 05-35/4).

Note: Grinding the camshaft (see Job No. 05-38).
 Re-bedding of Camshaft (see Job No. 05-39).
 Checking and repairing rockers and rocker bearings (see Job No. 05-2).

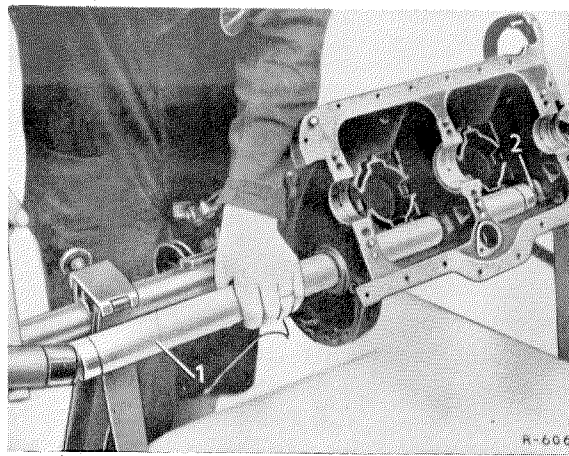


Figure 05-35/3

- 1 Assembly Bolt Part No. 136 589 03 39
- 2 Rear and 3rd camshaft bearing

Installation:

18. Clean all parts before assembly.
19. Apply sealing compound to the outside of the 3rd camshaft bearing (8) approx. 20 mm wide at the end where the screw plug (9) is located (see Figure 05-35/4).

Then drive in the 3rd camshaft bearing with the Assembly Bolt Part No. 136 589 03 39 from the rear towards the front, so that the bores of the locating screw (3) in the 3rd camshaft bearing and in the crankcase coincide (see Figure 05-35/1).

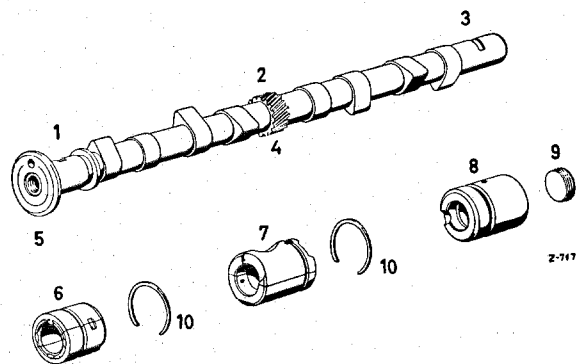


Figure 05-35/4

- 1 Journal of the 1st camshaft bearing (lapped bearing)
- 2 Journal of the 2nd camshaft bearing
- 3 Journal of the 3rd camshaft bearing
- 4 Spiral gear of the oil pump drive
- 5 Flange to mount the camshaft timing gear
- 6 1st camshaft bearing
- 7 2nd camshaft bearing
- 8 3rd camshaft bearing
- 9 Screw plug in 3rd camshaft bearing
- 10 Retaining rings holding together the 1st and 2nd camshaft bearing halves

20. Apply graphited oil to the bearing surfaces of the camshaft and the camshaft bearings. Then mount the bearing halves of the 1st and 2nd camshaft bearings on the camshaft, so that the grooves to turn the bearings face towards the journal (3) (see Figure 05-35/4). Install the retaining rings (10) in the grooves to hold the bearings together.
21. Drive the camshaft into the crankcase with the Assembly Bolt Part No. 136 589 02 39, so that the bores for the locating screws in the 1st and 2nd camshaft bearing coincide with the holes in the crankcase (see Figure 05-35/1).

If the camshaft bearings are not aligned properly, they can be turned at the grooves (1) (see Figure 05-35/5).

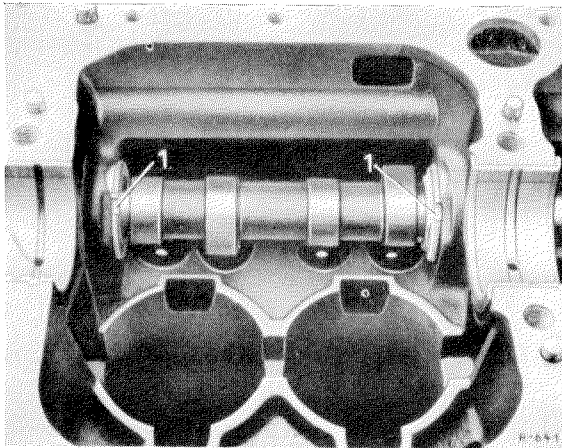


Figure 05-35/5

1 Groove to turn the bearings

22. If the bores for the locating screws in the camshaft bearings coincide with the bores (tapped bores) in the crankcase, screw in the locating screws 1, 2 and 3 to secure the camshaft bearings (see Figure 05-35/1). The screws must run easily. Special care has to be taken at the screw (1) of the 1st camshaft bearing, so that the opening of the adapter is not covered by a chip, thus stopping the oil supply to the rockers. The locating screws 1 and 3 must be mounted with aluminium sealing rings to seal against external influences.

23. Apply sealing compound to the thread of the screw plug (9) of the 3rd camshaft bearing and screw the plug into the 3rd camshaft bearing, so that approx. 2 to 3 leads of the thread are still protruding.

Then lightly caulk the protruding part of the screw with a suitable piece of pipe, so that the thread seals properly. The caulking must be done with a pipe, so that the box hexagon of the screw is not damaged. After the caulking of the screw plug (9) screw it in with a hexagon end screwdriver 19 mm wide, so that the plug will be properly and tightly seated (see Figure 05-35/4).

24. Turn the camshaft and check for proper operating ease. You should be able to turn the camshaft with 2 fingers. If this is not the case, then a prevailing tension acting on the camshaft can be eliminated by a few punches on the camshaft using a brass punch.

(Be careful during punching and/or applying of brass punch to avoid damaging a cam.)

25. Install the camshaft timing gear and the intermediate gear (drive gear on the camshaft) (see Job No. 05-31, Paragraph 10 and 11).
26. Insert the oil pump and secure with lock washer and hexagon screw (see Job No. 8-11).
27. Apply tallow or oil to a new fabric sealing ring half and insert it in groove of oil pan, cut the sealing ring at the contact surface. The sealing ring must be cut, so that it protrudes slightly.
28. Mount the oil pan (see Job No. 01-21, Paragraph 6 to 9).
29. Turn the engine in the assembly trestle and insert the valve tappets. The bores in the crankcase must first be well oiled with graphited oil. If the removed valve tappets are installed again, insert the valve tappets

in the same bore from which they have been removed (also see Paragraph 9).

The valve tappets must fall into the oiled bore through their own weight (see Job No. 05-8).

30. Check the push rods for wear and deflection and insert them with oil in the valve tappets.
31. Mount the rocker brackets with rocker shafts and rockers on the fixing studs of the cylinder head (see Figure 05-1/1).

Note: The contact surfaces must be clean. Poor and soiled surfaces cause loss of oil. Mount lock washers on the rocker brackets, screw on fixing nuts (8) and tighten.

32. Adjust the valve clearance (see Job No. 00-3, Section A).
Valve clearance
of the inlet valves = 0.20 mm
of the exhaust valves = 0.15 mm

33. Remove the old gasket of the tappet housing cover and stick on a new gasket.

Note: Dried-up and therefore too small cork gaskets must first be submerged in warm water, so that they swell up and return to normal size.

34. Attach the tappet housing cover to the crankcase with two hexagon screws. Mount the screws with washers and sealing rings. They must not be tightened too firmly to prevent distortion of the tappet housing cover.

35. Attach the oil line for the lubrication of the rockers to the connector at the 1st camshaft bearing. Make sure that the line is properly connected here, because the access to the connector is obstructed while the injection pump is installed. Always use new sealing rings.

36. Set the piston of the 1st cylinder to TDC. The marked teeth of the camshaft and crankshaft timing gear must be engaged (see Figure 05-31/6).

37. Install the timing housing cover with injection pump (see Job No. 01-15 and Job No. 07-11).

Note: The adjustment and checking of feed beginning is not necessary, because the injection pump has not been loosened and removed from the timing housing cover.

38. Connect the injection lines to the injection pump with the cap nuts and tighten the cap nuts with a torque of 3 to 3.5 mkg. If screwed on too tightly the sealing cones can be compressed and become leaky.

39. Connect the vacuum line and the fuel hoses to the injection pump.

40. Install the fuel main filter (see Job No. 09-1).

41. Clean the oil filter (see Job No. 18-9).

42. Fill in motor oil (4.5 or 7 lit. depending on the design of the oil pan see Capacities Page 0-1/11 through 0-1/31).

43. Install the cylinder head cover with faultless gasket. Place aluminum sealing rings over the fixing studs, screw on the fixing nuts and do not secure too tightly to prevent distortion of the cylinder head cover.

44. Take the engine out of the assembly trestle and on engines with fan bearing bracket install the fan bearing bracket complete with support, belt pulley and fan (see Job No. 20-15).

On engines with fan attached to the belt pulley of the water pump or the belt pulley of the crankshaft, install the fan (see Job No. 03-1/4 and Figure 20-8/14).