

Removal and Installation of Crankshaft with Flywheel

Job No.

03-5

A. OM 636

The design of the crankshaft and the crankshaft bearings is essentially similar for the engines of all types. The engines of the type 636.912, which were partly equipped with thick-walled bearing shells, are not mentioned in this description.

The removal and installation of the crankshaft is similar for all engines with thin-walled bearing shells.

Removal:

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

On engines with fan on the belt pulley of the water pump or on the pulley of the crankshaft, remove fan (see Job No. 20-12).

3. Install the engine in the Assembly Trestle BE 10488/1-6 (see Figure 00-20/1).
4. Remove the oil pump (see Job No. 18-11).
5. Unscrew the nuts of the connecting rod. Partly drive out connecting-rod bolts with a plastic hammer, then loosen the big-end bearing caps and remove the latter.

Note: If the connecting rods and the big-end bearing caps are not marked, they must be marked with 1 through 4 on the big-end bearing cap at the side opposite to the camshaft before the loosening of the nuts (see Figure 03-13/2).

6. Unscrew the hexagon screws fixing the crankshaft bearing caps and remove bearing caps with bearing shell halves. On the engines of the type 636.915 and partly on the engines of the type 636.916 the bearing caps are fixed with fixing studs and nuts. If a bearing cap does not come off easily, it can be loosened from the dowel pins by light hammer punches.

7. Take the crankshaft with flywheel and bearing shell halves out of the crankcase. During this operation mark the order and location (upper or lower) of the bearing shells. The bearing shells must only be marked on the outside of the steel support; etching ink is best for this purpose.
8. Pull off the crankshaft timing gear and the spacer with the Extractor Part No. 1365890833 (see Figure 03-5/1). Take the two Woodruff keys out of the grooves in the shaft.

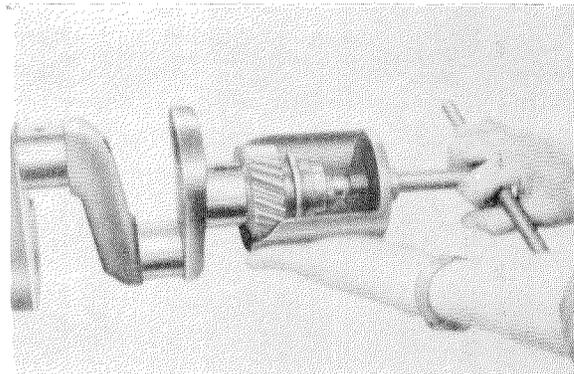


Figure 03-5/1

Installation:

9. Check the dowel pins in the crankcase for damages and drive in new ones if necessary.
10. On engines, which are still equipped with fixing studs to secure the main bearing caps, unscrew the fixing studs. The main bearing caps are always secured now with hexagon screws M 12x75 DIN 931-10 K only.

11. Chase the thread for the hexagon screws in the crankcase with a tap M 12×1.75. This is especially true for crankcases with very clogged threads. The hexagon screws must go far enough into the blind hole. If not, the screw will be tightened with the specified torque but does not apply the pressure to the main bearing cap which is indicated by the torque. The same is true if an oil cushion is formed in the blind hole, therefore, never put oil into the blind hole to lubricate the thread. There is also the danger that the crankcase will crack here. Before the mounting of the main bearing caps make sure that the screws can be screwed in far enough.

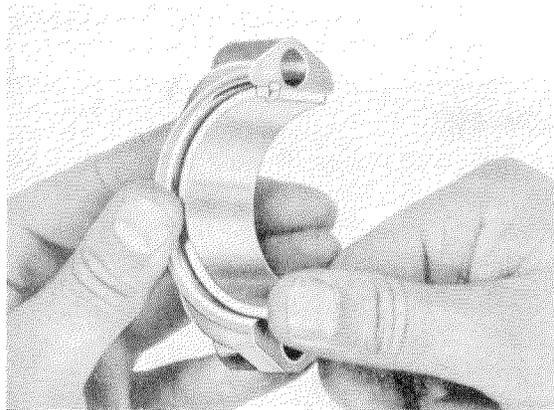


Figure 03-5/3

12. Clean the main bearing bores and the bearing shell halves with a soft and clean leather. Only then insert the bearing shell halves in the main bearing bores (consider the markings).

The bearing shell halves are furnished with a nose to safeguard against dislocation. During assembly the nose must first be inserted in the groove of the base bore (see Figure 03-5/2). Only then can the bearing shell half be forced home (see Figure 03-5/3). The bearing shell halves must be properly seated in the base bore.

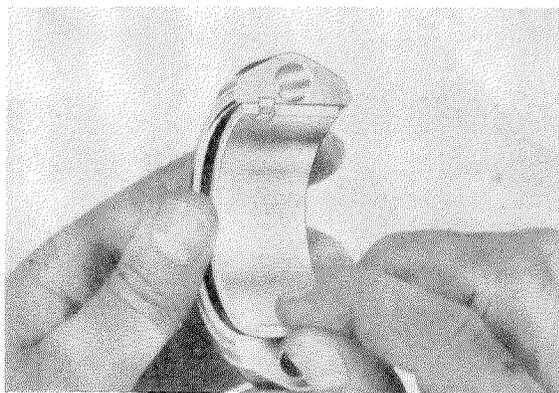


Figure 03-5/2

The figures 03-5/2 and 03-5/3 show the inserting of the bearing shell halves in a big-end bearing cap.

Note: The center main bearing is designed as a lapped bearing. Formerly, only the bearing shell half in the crankcase was designed as a lapped bearing with a collar. The subsequent installation of a bearing shell half with collar in the main bearing cap is possible without difficulties on all engines of the Model OM 636.

The upper and lower bearing shell halves of the 1st main bearing are similar. Also the upper and the lower bearing shell halves of the center main bearing.

The bearing shell halves of the 3rd main bearing, however, are different. During the installation of the crankshaft bearing shell halves make sure that the bearing shell halves with the oilway and on the 3rd main bearing also with the H-shaped lubricating groove are inserted in the base bore of the crankcase (see Figure 03-5/5).

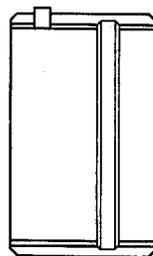


Figure 03-5/4

Bearing shell half of the main bearing cap

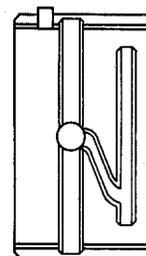


Figure 03-5/5

Bearing shell half of the crankcase

13. Clean the installed bearing shell halves and the bearing surfaces of the crankshaft with a clean and soft leather and apply graphited oil.
14. **Carefully insert the crankshaft, so that the lapped bearing collar of the crankshaft does not jam at the thrust surface of the bearing shell halves in the crankcase and does not damage the thrust surface.**
15. Install the main bearing caps with bearing shell halves. Then lightly oil the washers* and the thread of the hexagon screws with graphited oil. Proper running ease of the screws prevents undue friction during tightening, so that the specified contact pressure will actually be applied to the main bearing caps. Install the hexagon screw with washer* and tighten in steps with a torque wrench with a range of 0 to 13 mkg as follows:

1st tightening with	2 mkg
2nd tightening with	5 mkg
3rd tightening with	8 mkg
4th tightening (checking)	8 mkg

Note: The hexagon screws of the main bearing cap and/or the nuts of the big-end bearing cap are no longer protected by a locking plate or a split pin. In case of repair, locking plates are no longer installed in engines of the former production. A hardened washer* Part No. 121 990 12 40 is installed between the screw head and the main bearing cap to prevent the screw head from working itself into the softer bearing cap.

16. Turn the crankshaft by hand and check if it is running freely. Then measure with feeler gauge the end clearance of the crankshaft at the center main bearing (lapped bearing) (see Figure 03-5/6). For this purpose press the crankshaft against the thrust surfaces of the centering bearing.

The end clearance of the crankshaft should be 0.08 to 0.14 mm.

* Recently, the spring washer B 12 DIN 137 is installed instead of the washer Part No. 121 990 12 40 between the main bearing cap and the hexagon screw.

If the crankshaft does not run easily, check the alignment of the main bearing caps and correct with light punches of a plastic hammer. If necessary, locate the point of bearing where the crankshaft is seated too tightly. For this purpose loosen one main bearing cap after the other and turn the crankshaft, until the trouble is located. If necessary, replace the bearing shell halves as long as new ones are installed. Remove again the main bearing caps and take out the crankshaft.

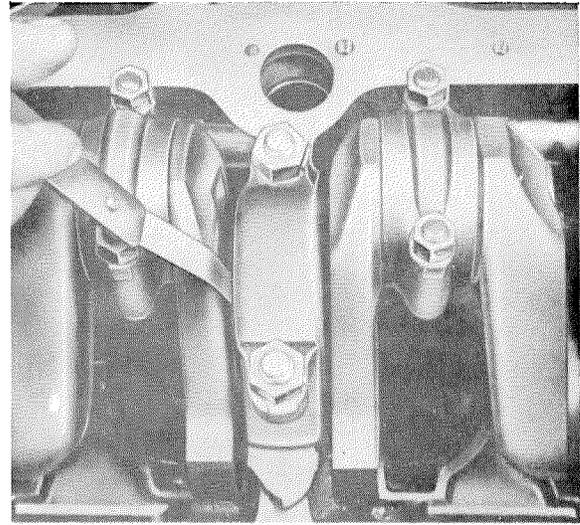


Figure 03-5/6

In the figure the nuts are still secured with locking plates (see Note of Paragraph 15).

17. Insert the fabric sealing ring at the flywheel side of the crankcase and the oil pan only after checking the running ease of the crankshaft. Apply tallow or oil to the fabric sealing ring and insert it in the provided groove. The fabric sealing ring should not be pressed in too tightly. Then cut the sealing ring with a sharp knife at the contact surface. The sealing ring must be cut in such a way that it protrudes slightly.
18. Apply oil to the bearing shell halves, the bearing surfaces of the crankshaft and the fabric sealing ring. Insert the crankshaft, mount the main bearing caps again and tighten in steps with the specified torque (see Paragraph 15).

19. Manually turn the crankshaft and check whether it is not running too stiffly (also see Paragraph 16).
20. Install and partly tighten the oil pan complete with oiled fabric sealing ring and check if the crankshaft can be turned. The fabric sealing ring should never be too tight. Remove the oil pan again.

Note: If too much force is needed to turn the crankshaft, then remove the compression marks on the fabric sealing ring with a suitable round tool (handle of a hammer). Do not damage the sealing ring during this operation!

21. Pull the connecting rods against the crankshaft journals, turn the crankshaft accordingly and install the big-end bearing caps, so that the numbers 1 through 4 correspond with the connecting rods. Further, the number of the connecting rod and the fixing lugs for the bearing shells must be on the opposite side of the camshaft (driving direction, left).

22. Screw on the hex nuts with the collar towards the big-end bearing cap; use only faultless nuts.

The hex nuts and/or connecting-rod bolts are installed without locking plate and are tightened until an expansion of 0.1 mm is reached, which corresponds to a tightening

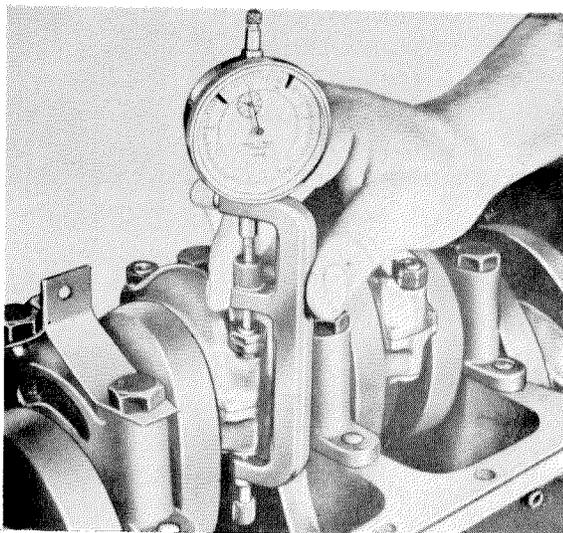


Figure 03-5/7

torque of 3.75 to 3.80 mkg. The expansion should be measured with a dial gauge or a micrometer (see Figure 03-5/7).

The measuring is carried out as follows:

Measure first the length (L) of the connecting rod bolt without screwed-on nut, then tighten the nut so much that the bolt has expanded 0.1 mm (see Figure 03-5/8).

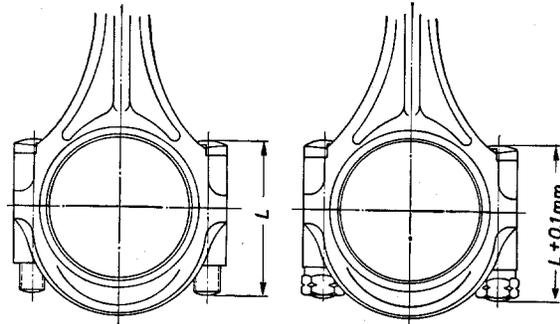


Figure 03-5/8

If you have the impression that a bolt expands too much, then loosen the nut again. By loosening the nut the bolt should return to its original length. Small deviations up to 0.01 mm are permissible. **A greater deviation is an indication that the bolt has been tightened too much, meaning that it was stretched too far; such bolts must be replaced.**

Note: In exceptional cases the connecting-rod bolts can also be tightened with a torque wrench. Make sure, however, that only a torque wrench with a range of 0 to 6 mkg is used. A larger wrench is not accurate enough for smaller torques.

Presently, the hexagon screws and/or the hex nuts are no longer secured with locking plates or split pins, similar to the hexagon screws of the main bearing caps. **In case of repair the locking plates are no longer installed in engines of the former version.**

23. Manually turn the crankshaft and check whether it is not running too stiffly.

24. Insert the Woodruff keys (5) in the grooves of the crankshaft (see Figure 03-1/3).
25. Put the crankshaft timing gear on the crankshaft, so that the high collar of the crankshaft timing gear faces towards the crankshaft and that the marked teeth of the crankshaft and camshaft timing gear are engaged (see Figure 05-31/6).

If necessary, force the crankshaft timing gear with the Punching Sleeve Part No. 136 589 08 39 (pipe), so that the gear is properly pressed against the collar of the crankshaft. On no account punch against the front of the teeth during installation of the crankshaft timing gear.

Note: Before the installation heat the crankshaft timing gear, possibly in oil or in water or on a heating plate, to well hand-warm.

26. Check with a feeler gauge or a strip of paper 0.03 to 0.04 mm thick the backlash between the camshaft timing gear and the crankshaft timing gear at several points.

The backlash should be 0.03 to 0.04 mm.

If necessary, the camshaft timing gear must be replaced.

B. OM 621

Removal:

1. Remove the camshaft gear (see Job No. 01-3, Section B, items 3, 4, 9 and 10).
2. Dismount the counterweight (see Job No. 03-2).
3. Dismount the oil pan (see Job No. 01-21).
4. Dismount the oil pump (see Job No. 18-11).
5. Unscrew the connecting rod nuts. Using a plastic hammer, apply slight blows to knock the connecting rod bolts back; then loosen the caps and remove them.

Turn the crankshaft and check by feeling the smooth running of the gears.

27. Depending on version and/or type put the spacer (6) (see Figure 03-1/3). or the oil deflector (2) (see Figure 03-1/4) on the crankshaft; watch out for the front Woodruff key (5).
28. Install the oil pump (see Job No. 18-11).
29. Clean the oil filter (see Job No. 18-9).
30. 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).
31. Take the engine out of the assembly trestle and on engines with fan bearing bracket install the support of the fan bearing bracket complete with fan bearing bracket belt pulley and fan (see Job No. 20-15).

On engines with fan attached to the belt pulley of the water pump or to the pulley of the crankshaft, install the fan (see Job No. 20-12).

Dismount the main bearing caps accordingly.

Note: When disassembling, identify the sequence of the bearing shells and the bearing caps. On the left side (seen in driving direction), the connecting rod bearings are marked ex factory with the number of the respective cylinder or crank pin by a corresponding number of stroke marks. The embossed numbers, right (in driving direction) are destined for the production and identify appertaining bearing cap and connecting rod.

6. Use the puller part No. 187 589 07 33 to extract the lower pivot pin for the right guide rail (seen in driving direction).