

Removal and Installation of Pistons with Connecting Rods

Job No.

03-11

A. OM 636

On the engines of the model OM 636 the pistons must be removed downwards after the removal of the crankshaft, because the diameter of the connecting rod is greater than the cylinder bore.

Note: For a subsequent installation of reinforced connecting rods in engines of the former production, the crankcase and the camshaft must be re-machined (see Figure 03-11/4).

Removal:

1. Remove the cylinder head (see Job No. 01-3). It is not essential to remove the cylinder head.
2. Remove the crankshaft with flywheel (see Job No. 03-5).
3. Pull out the connecting rods with pistons.
4. Use pliers to take the retaining rings out of the grooves in the piston pin bosses of the pistons.
5. Heat the pistons on a heating plate to approx. 40 to 60° C and press out the piston pins.

Installation:

6. Put the pistons without piston pin on a heating plate and heat them to approx. 50 to 60° C.

Thoroughly clean the small end of the connecting rod.

Put the heated piston on the connecting rod and pass a guide bolt through the piston pin bore in the piston and through the bore of the small-end bushing.

Then oil the piston pin and press it in, use a plastic hammer if necessary. Insert the piston pin so far that it is exactly in the middle and the grooves are free for installing the retaining rings. On no

account interchange the piston pins of the individual pistons. Look for the color code on the piston pin and the piston pin boss (see Job No. 03-13 and 03-15).

Note: Mount the piston on the con rod in such a way that the fixing lugs for the bearing shells and the marked side of the connecting rod (1-4) are on the left side (seen in driving direction) (Figure 03-11/1).

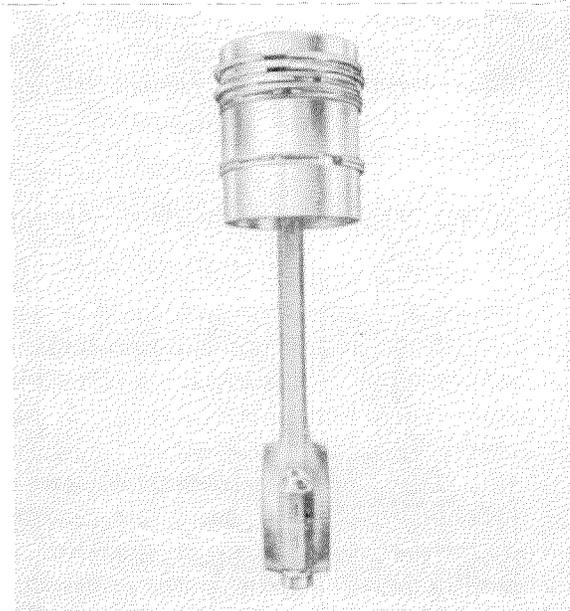


Figure 03-11/1

The arrow and designation "vorn" (front) marked on the piston crown indicates the direction of driving (see Figure 03-11/2),

7. Install the wire retaining rings in the piston pin bosses; they must be properly seated in the grooves.

8. Check parallelism and distortion of the connecting rod (see Job No. 03-13, Paragraph 5).
9. Turn the piston rings, so that the gaps of the piston rings are evenly distributed along the circumference. At the grooved piston ring (V) make sure that the securing pin is located between the two gap ends (see Figure 03-15/1).
10. Clean the working surfaces of the cylinders (do not use fuzzy rags for this purpose). Oil the pistons and working surfaces of the cylinders with graphited oil. Insert the pistons in the bores of the crankcase with the help of the Piston Ring Tightener Part No. 136 589 02 61.

Mount the piston ring tightener in such a way that the lock of the piston ring tightener does not come in contact with the crankcase. Also make sure that the piston is in the correct position (direction of driving) and is installed in the proper cylinder bore (see Figure 03-11/2).

The connecting rods are marked with the figures 1 through 4 corresponding to the 4 cylinder bores.

On no account use force when inserting the pistons.

If the piston ring tightener is poorly seated, there is the danger that a piston ring will be damaged. If resistance is observed, immediately check the seating of the piston ring tightener.

The piston and the connecting rod is installed correctly if the arrow on the piston crown points in the direction of driving and the number on the connecting rod is on the left-hand side when viewed in direction of driving and therefore facing the camshaft (see Figure 03-11/2).

11. Install the crankshaft with flywheel (see Job No. 03-5, Section A, Paragraph 9 to 23).
12. Measure the distance from the contact surface of the crankcase to the piston crown, the so-called gap measure, with a depth gauge.

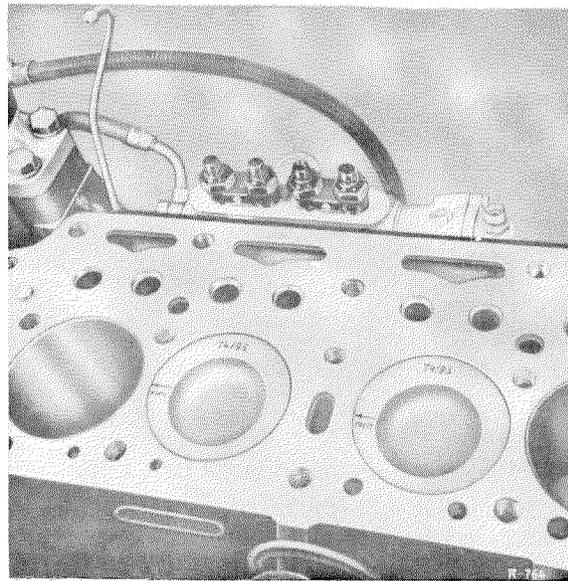


Figure 03-11/2

Gap measure = 0 ± 0.3 mm, meaning the piston crown should not be more than 0.3 mm above or below the contact surface of the cylinder block, in top dead center position.

13. Install the crankshaft timing gear, the oil pump etc. (see Job No. 03-5, Section A, Paragraph 24 to 29).
14. Mount the cylinder head (see Job No. 01-3).
15. Fill in motor oil (4.5 or 7 lit. depending on design of oil pan, see Capacities, Pages 0-1/11 to 0-1/31).
16. Take the engine out of the assembly trestle and on engines with fan bearing bracket install the support of the fan bearing bracket with fan bearing bracket, belt pulley and fan (see Job No. 20-15).

On engines with fan attached to pulley of water pump or to pulley of crankshaft, install the fan.

17. If new pistons have been installed, then the running-in instructions must be observed (see Job No. 0-3).

Subsequent Installation of Reinforced Connecting Rods in Engines of former Production OM 636

The engines of the type 636.931, 636.930, 636.917 and 636.914 and starting with the Engine End No. listed below are equipped with reinforced connecting rods Part No. 636 030 10 20, wide milled recesses in the crankcase and modified camshafts.

Type	starting with Engine End No.
636.931	55 02710
636.930	55 11622
636.917	55 01069
636.914	55 02406

If reinforced connecting rods Part No. 636 030 10 20 are subsequently installed in engines of the former production, the following modifications have to be carried out:

1. Machining of the former Milled Recesses in the Crankcase

Before the installation of reinforced connecting rods Part No. 636 030 10 20 the former milled recesses, for the 3rd and 4th connecting rod, on the starter side of the crankcase, must be enlarged to approx. 40 mm wide (see Figure 03-11/3 and 03-11/4).

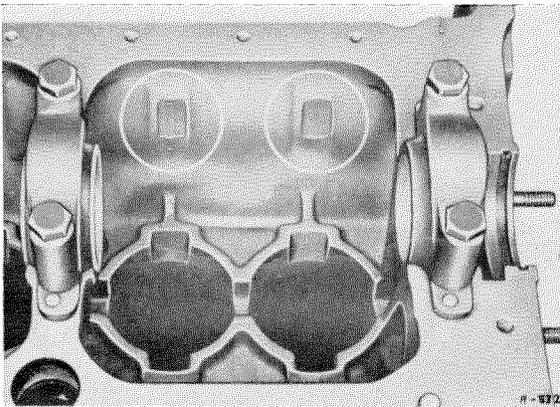


Figure 03-11/3

Milled recess approx. 20 mm wide in the crankcase for the connecting rods of former production

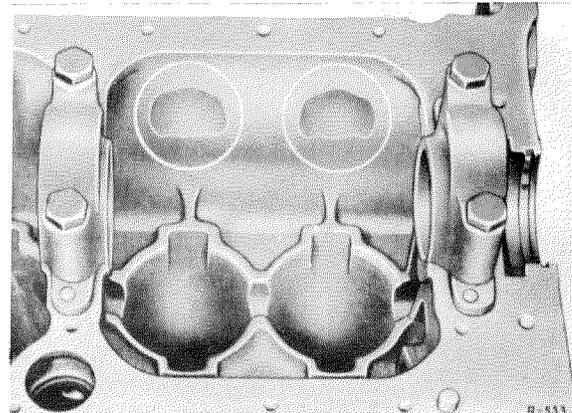


Figure 03-11/4

Milled recess approx. 40 mm wide in the crankcase for the reinforced connecting rod design

The milled recesses can be machined with a milling cutter or a grinding tool (see Figure 03-11/4).

Before the final assembly of the crank mechanism install the connecting rods 3 and 4 with pistons and also the crankshaft, turn the crankshaft and measure with feeler gauge the distances between connecting rods and crankcase (min. distance = 1 mm).

The connecting rods should never be machined, because this would cause an undue weakening and an unbalance of the crank assembly.

2. Subsequent Machining of the Camshaft

The sides of the cams on the camshaft must be subsequently machined to prevent touching between connecting rods and cams under unfavorable conditions. The necessary measurements can be taken from Figure 03-11/5. The specified measurements are in relation to the inner surface of the lapped bearing collar. The fillet radius between camshaft and cams should at least be 2.5 mm.

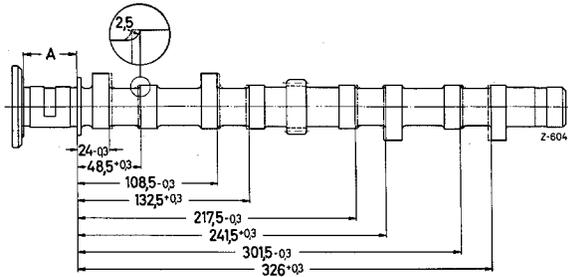


Figure 03-11/5

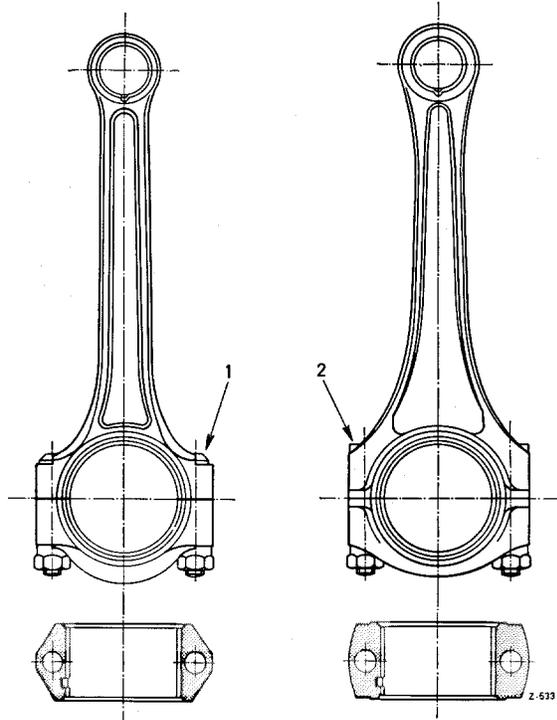


Figure 03-11/6

Connecting rod
former design
1 connecting-rod bolt
with safety lug

Figure 03-11/7

Connecting rod
reinforced design
2 connecting-rod
bolts with toothed
head

The cams can either be machined on a lathe or a grinding machine. The turning, however, demands a certain skill and should only be done by a good lathe operator. Use a side tool with cemented-carbide tip; Titanit can be recommended. Due to the hard surface of the cams the tool must have a negative cutting edge to prevent breaking-out. The tool tip must be ground for the specified fillet radius of at least 2.5 mm. The cutting tool is adjusted to the diameter of the camshaft and the side of the cam is cut off in one operation.

If a grinding machine is available, grinding of the cams will be better than turning.

After the subsequent machining of the camshaft, chamfer the sharp edges of the cams with an oil-stone.