Grinding of Crankshaft

Job No.
03–6

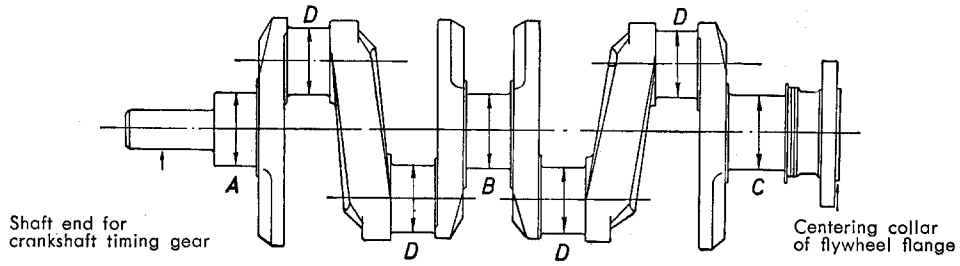

Figure 03–6/1

The crankshaft is similar for all versions of OM 636. After cleaning, the crankshaft of the OM 636 and OM 621 must be examined for distortion and the bearing surfaces for out-of-roundness, hardness and cracks. If there are cracks, the crankshaft must be discarded. Distorted crankshaft can be realigned. The crankshaft must be recentered before grinding. Lathe holding points for checking and recentering are the crankshaft timing gear shaft end in front and the centering collar of the flywheel flange in the rear (Figure 03–6/1). These two points should never be machined. Only the side of the flywheel flange may be re-finished.

If the bearing surfaces are more than 0.03 mm out-of-round or scored, they must be reground to the next overhaul stage dimensions.

Re-grinding of crankshaft journals and crankpins must be done according to the specified overhaul stage dimensions and tolerances (see Job No. 03–0). No deviation from this regulation can be permitted. The bearing surfaces and the thrust surfaces, especially of the lapped bearing, must be lapped properly after the grinding operation. When re-grinding the thrust surfaces of the lapped bearing and the crankpins remove as little material as possible. This operation is not subjected to overhaul stages. The grinding should only serve to just refinish the thrust surfaces.

After the grinding, the crankshaft must be dynamically balanced. The permissible unbalance is 15 cmg. The balancing of the crankshaft should be done while the flywheel is mounted on the OM 621 the counter weights should also be mounted (see Job No. 03–7).

In order to obtain the specified radial play (see "Bearing Clearances of the Crankshaft" Job No. 03–0), the bores of crankshaft journals and crankpins must first be measured while the bearing shells are installed. After that, determine the diameter of the bearing surface to be ground by subtracting the bearing clearance from the bearing diameter. The radial running clearances must be within the tolerances specified in the table.

The hardness of the crankshaft journals and crankpins can be measured with a scleroscope and is 68 to 74 or Rockwell hardness HRc 55 to 61. Individual points with values 3 % lower than specified are permitted.

If the minimum hardness is not reached, the crankshaft must be hardened again.

Before hardening, the oil tubing (3) on the OM 636 and on newer crankshafts the oil jets (4) must be punched out with a suitable drift (Figure 03–6/2 and 03–6/3).

If the crankshaft must be hardened, make sure that the counterweights stay soft. The crankshafts must be tempered for two hours at 180° C after the hardening operation, then check for cracks, align, center and grind.

If an individual journal or crankpin shows differences in hardness, normalize this section before hardening. For this purpose heat the journal to 400° C and allow to cool off; the adjacent journals must be cooled during this operation.

Special care must be taken to conserve the width of the journals during the grinding operation, especially as far as the 2nd crankshaft journal and the crankpins are concerned.
The bearing surfaces and the thrust surfaces must be properly lapped.

The fillet radii of the crankshaft journals and crankpins must strickly be kept within the specified 2.5 to 3 mm; they should be closer to 3 mm than to 2.5 mm and must be completely free of scores.

On the OM 636, reinstall the oil tubings or oil jets after the grinding operation. **The boreholes in the crankshaft must first be chased with a reamer 6.95 mm in diameter.** This is very important, because scale and residues are formed in the boreholes during the heating of crankshaft. They must definitely be removed. Satisfactory cleaning is impossible while the oil tubes or oil jets are installed.

The diameter of the borehole is normally 6.95 to 7.10 mm. The oil tubes are installed with a slight force-fit. The standard diameter of the oil tube is 7 mm. There are oil tubes available which are 0.2, 0.3 and 0.5 mm larger in diameter than standard, so that an adequate force-fit will be given in every case. The oil tube must be tightly seated, if not, take the next size of oil tubes; the bore must be reamed to fit if necessary.

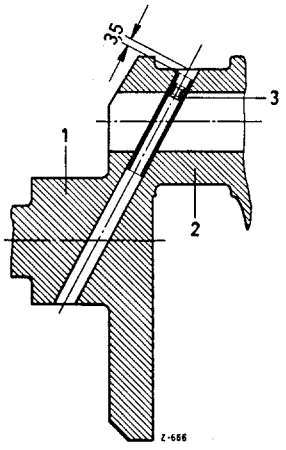

Figure 03–6/2

Crankshaft with hollow crankpins OM 636

1 Crankshaft journal
2 Crankpin
3 Oil tube with oil jet

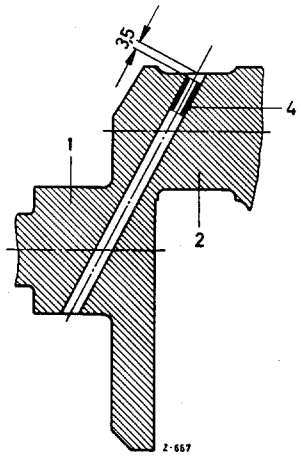

Figure 03–6/3

Crankshaft with solid crankpins OM 636

1 Crankshaft journal
2 Crankpin
4 Oil jet

The oil tubes (3) must be installed in such a way that the jet points towards the crankpin (see Figure 03–6/2). Widen with suitable conical punch both ends of the oil tube (3) after installation of same, so that it will be properly and tightly seated in the borehole. The oil jets (4), however, are pressed in with a force-fit of 0.2 to 0.25 mm (see Figure 03–6/3). Jets 7.20 to 7.45 mm in diameter in steps of 0.05 to 0.05 mm are available for this purpose. In this case the high force-fit must definitely be observed to guarantee an oiltight seating.

After the grinding of the crankshaft the edges of the oil bores must be rounded with a grinder to a radius of 1 mm.

Regarding the OM 621: If the shaft had been hardened, drill out the screw plug (6) (aluminium) (see Figure 03–6/4). Clean the bores (3, 4, and 5) from scale and residues. Normally, the dia. of the bore (4) amounts to 6.0 mm. In order to ensure a sufficient overlap in any case, the screw plugs are available with oversizes of: 0.15 mm, part No. 121 997 01 12; 0.30 mm, part No. 121 997 02 12 and 0.45 mm, part No. 121 997 03 12.

Now insert a suitable steel bolt into the bore (5), only then knock in the screw plug (6) and caulk (see Figure 03–6/4). Again remove the steel bolt from the bore (5) and check bore for free passage, if necessary, re-drill the bore.

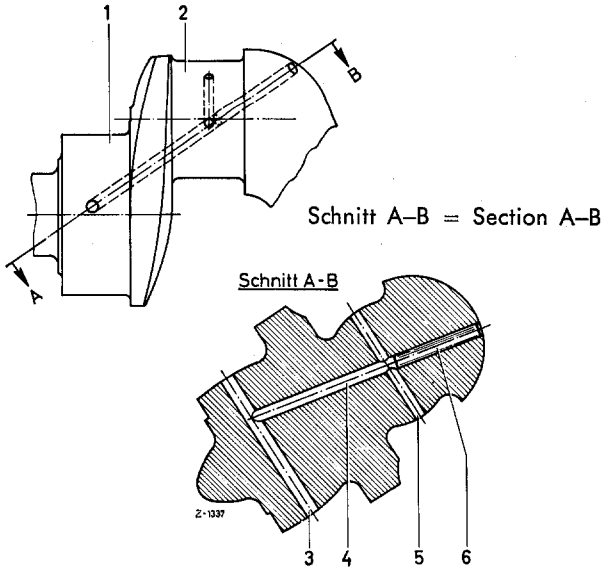

Figure 03–6/4

Crankshaft OM 621

1 Main bearing journal
2 Crankpin
3 Oil bore through the main bearing journal
4 Oil bore from journal to crankpin
5 Oil bore through the crankpin
6 Plug

Note: When overhauling the engine do not fail to pull out and check the annular grooved bearing (9) in the crankshaft (see Figure 03–7/2 and Job No. 03–17).