

Replacement of Crankshaft Bearing Shells

Types 220 and 220a

Operation No.
M 4g

Crankshaft End and Side Play in mm (in.)

Table 5

Side play	Fitting bearing end play	Overlap of bearing shells
0.055 –0.075 (0.0022–0.00295)	0.040 –0.094 (0.0016–0.0037)	+ 0.01 (0.0004)

Note: The side play given in the table has to be strictly adhered to.

The bearing shells for the various crankshaft sizes are supplied ready for installation. The upper crankshaft bearing shells (with lubricating groove and oil hole) are identical and can be interchanged. The lower bearing shells are likewise identical and interchangeable.

The 8 crankshaft bearing shells should always be exchanged together.

The 2nd crankshaft bearing is designed as fitting bearing. At first only the lower bearing shell had been provided with a shoulder on either side, then both upper and lower bearing shells came with a shoulder. Today the fitting bearing is no longer of the shoulder type; instead the bearing cap is provided with one retainer plate each on either side. The retainers are fastened with dowel pins (Fig. M 4g/1).

When replacement shells are ordered, retainers will be supplied even if formerly a shoulder bearing had been installed. In this case the holes for the dowel pins must be drilled subsequently (Fig. M 4g/2). The holes have a diameter of 4.00–4.12 mm (0.1575–0.1622") and a depth of 8.2 ± 0.1 mm (0.323–0.004"). Countersink the holes slightly. When installing the pins, be sure they do not project more than 1.5 ± 0.1 mm (0.059 ± 0.004 "). The must be recessed sufficiently in relation to the retainer plate.

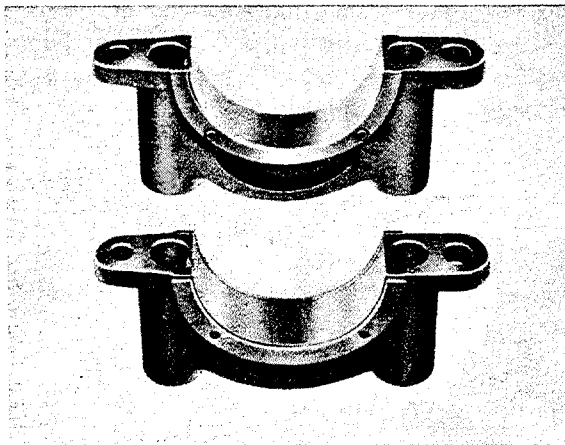


Fig. M 4g/1

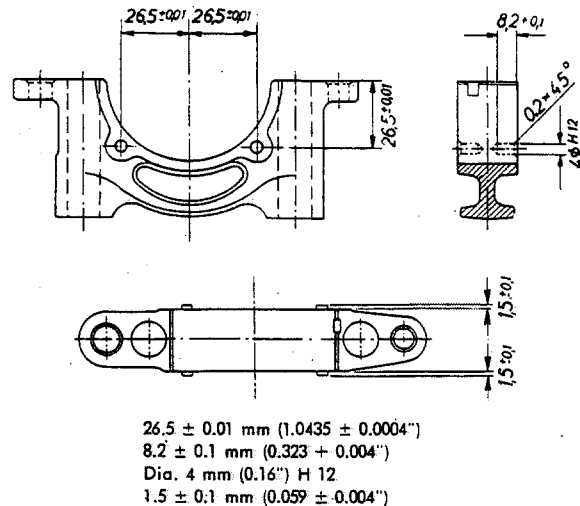


Fig. M 4g/2

The retainer plates are available with the following thicknesses:

3 mm (0.118"), 3.05 mm (0.120"), 3.10 mm (0.123") and 3.20 mm (0.126").

Select the retainers so that together with the journal width of the crankshaft fitting bearing the required end play of 0.040 to 0.094 mm (0.0016 to 0.0037") is achieved.

The overlap of the bearing shells is ± 0.01 mm (0.0004") at a diameter of 67.019 mm (2.63854"). This means that the overlap will be within -0.01 mm (0.0004") and $+0.03$ mm (0.0012"). On the average the overlap will be $+0.01$ mm (0.0004"). In actual practice the overlap is not checked.

Procedure:

Clean basic bores carefully and check with an inside gauge. Check bores with bearing caps screwed in place at 90° and 30° to the mating surface (Fig. M 4g/3 and 4). To determine the taper of the bearing bore, make the checks at the front and rear end of the bore.

Permissible out of roundness of basic bores	0.015 mm (0.0006")
Permissible taper	0.01 mm (0.0004")

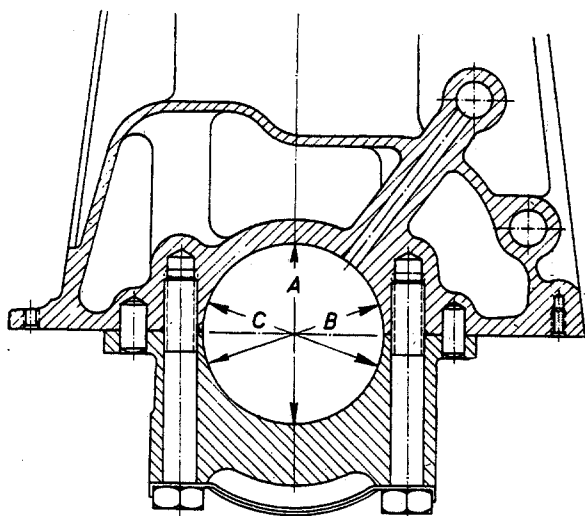


Fig. M 4g/3

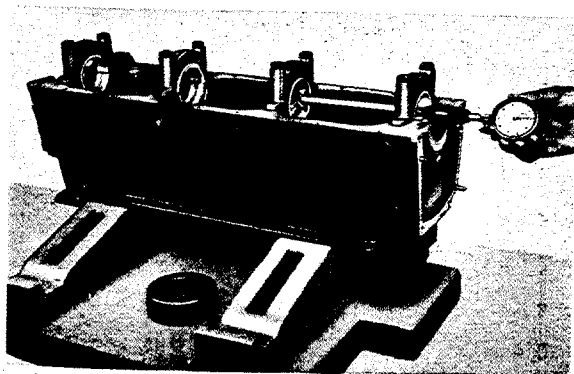


Fig. M 4g/4

M 4g/2

The diameter of the basic bore is 67.000–67.019 mm (2.63779–2.63854").

Run your fingers over the joints with bearing cap tightened and bring cap into optimum middle position by tapping it lightly with a brass punch and hammer. The cap will be perfectly centered when all three checks yield the same result. In the same way check bores with bearing shells inserted.

The standard diameter of the crankshaft bearings with shells installed is 59.99 to 60.02 mm (2.3618 to 2.3630"); the diameters of undersizes I, II, III and IV are smaller by 0.25 mm (0.0098") each.

Consult Table 5 showing the crankshaft plays and determine the tolerances to which the crankshaft journals must be reground.

Keep within the limits of the side play specified in the table.

To achieve correct and satisfactory support of the crankshaft, we recommend to proceed as follows: Clean bearing bores and bearing shells with utmost care before installing the shells in the bores.

Both upper and lower bearing shells are provided with a nose. When assembling the bearings, first insert nose of bearing shell into groove in basic bore, then press shell into bore (Figs. M 4g/5 and 6). Make sure that the shells are properly seated in the bores.



Fig. M 4g/5

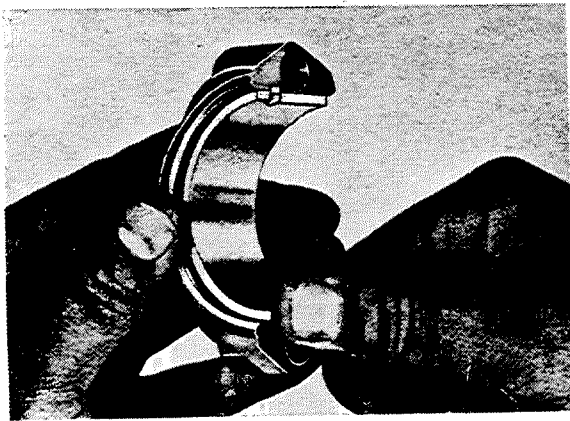


Fig. M 4g/6

Note: It is not permitted to rework the mating surfaces of bearing caps and bearing shells.

Now place crankshaft into bearing shells, put on bearing caps and tighten them evenly in four steps:

1st pull	2 mkg (14.5 ft.lb.)
2nd pull	5 mkg (36 ft.lb.)
3rd pull	8 mkg (58 ft.lb.)
4th pull (checking)	8 mkg (58 ft.lb.)

Rotate crankshaft by hand to see whether it turns freely. Check end play at fitting bearing (0.040 to 0.094 mm = 0.0016 to 0.0037") by displacing the shaft endwise (Fig. M 4g/7).

Note: If crankshaft turns with difficulty, check whether bearing caps are properly aligned. If necessary, correct their position by tapping them lightly with a hammer. To find out which of

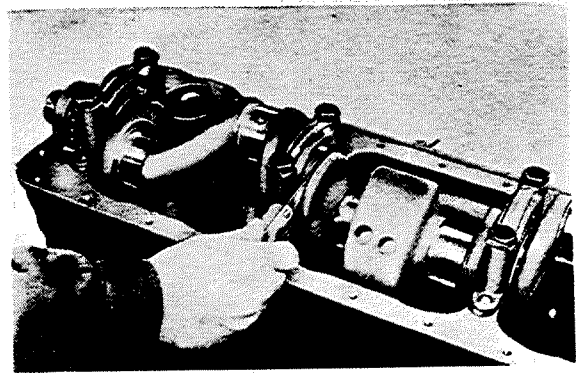


Fig. M 4g/7

the bearings is binding, loosen one bearing after the other and turn crankshaft. Continue until the responsible bearing has been found. If required, exchange the bearing shells.

Take bearing caps off again; clean bearing shells and crankshaft carefully.

Insert sealing ring retainer half on flywheel side into cylinder crankcase only after crankshaft has been checked for easy turning.

Oil all sliding surfaces and insert crankshaft. Put on bearing caps and tighten to the prescribed torque.

Note: The crankshaft bearing cap screws are no longer secured.

Fasten the strap for the oil pump suction pipe at the second bearing. In Type 220a this strap had at first not been provided (see also page M3/15). Note that the length of the straps for Type 220 and 220a is different.