

Crank Gear

The crankshaft and connecting rod bearing journals are to be reground to the specified undersizes and tolerances. The values given must by all means be adhered to. After the journals have been reground, lap the surfaces of journals and butting faces, in particular of the fitting bearing, perfectly smooth. When regrinding the fitting bearing butting faces and connecting rod bearing surfaces, be careful to remove as little material as possible.

After the crankshaft has been ground, it must be accurately balanced. Note that the crankshaft has a certain unbalance and has to be balanced with counterweight and flywheel mounted (see operation No. M 16).

As the counterweight and the flywheel have a certain unbalance as well, the entire system must be rebalanced when one of these parts is replaced. However, when replacing the flywheel, static balancing will normally suffice (see operation No. M 16 a).

Grinding of Crankshaft

Types 220 and 220a

Operation No.
M 4f

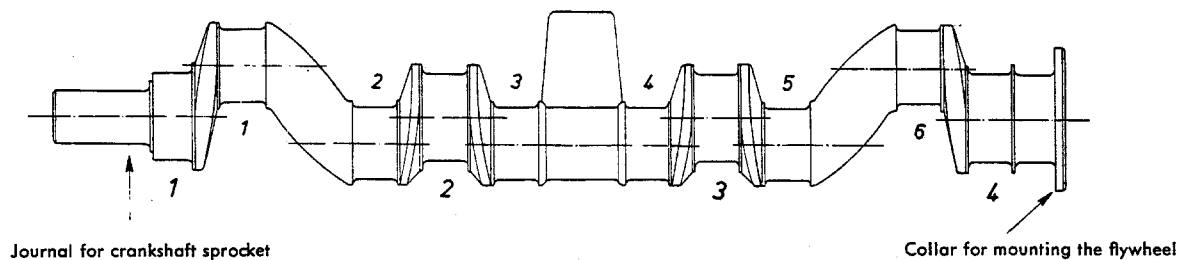


Fig. M 4f/00

Clean crankshaft and check for deformation, out of roundness of journals, hardness and cracks of bearing surfaces. If the shaft is cracked, discard it. If the shaft is deformed, straighten it. Recenter crankshaft prior to grinding. For checking and recentering the crankshaft is supported on crankshaft sprocket journal and on collar for flywheel flange (fig. M 4 f/00). These two parts must by no means be reground or re-turned.

If bearing surfaces are scored or more than 0.03 mm (0.0012") out of round regrind them to the next smaller undersize. Re-turn flywheel flange on side only. An Table 4 the various sizes and tolerances for reground crankshafts are given.

Note: To ensure correct side play, first check bore of crankshaft and connecting rod bearings with bearing shells inserted and consult Tables 5 and 7 to determine the tolerance to which the crankshaft is to be ground. Keep strictly within the upper and lower limits of the side plays given in these tables.

Test hardness of crankshaft and connecting rod bearing journals with a sclerograph. It should be
71 to 74
or Rockwell hardness

H Rc 57-61.

If at some point or the other the hardness is 3 % below the given values, this can be tolerated. If

the minimum hardness specified is not reached, the crankshaft must be rehardened.

Should the hardness within a journal fluctuate widely, normalize the journal prior to rehardening by heating to 400° C (750° F) and allowing to cool off. Note that the adjoining journals must be cooled during the normalizing operation.

After the crankshaft has been hardened, anneal it for two hours at a temperatur of 180° C (350° F). Then the shaft is checked for cracks, straightened, centered and reground.

When regrinding the crankshaft journals, be careful to maintain the journal width, in parti-

cular of the fitting bearing and the connecting rod bearing surfaces.

The maximum width in regrinding the crankshaft is 0.7 mm (0.0275") for the fitting bearing and 0.3 mm (0.012") for the connecting rod bearing relative to a standard width of 30.000 to 30.021 mm (1.18110 to 1.18194") in the case of the fitting bearing and 30.000 to 30.084 mm (1.18110 to 1.18441") in the case of the connecting rod bearing.

This means that the fitting bearing journal and connecting rod bearing journal can be reground

to a width of 30.70 mm (1.2085") and 30.30 mm (1.193"), resp. After these limits have been reached, the crankshaft is to be renewed. Lap the bearing surfaces and butting faces perfectly smooth.

Be sure that fillets at crankshaft and connecting rod journals are within 2.5 to 3 mm (0.1 to 0.12"); they should be nearer to 3 mm (0.12") than to 2.5 mm (0.1").

After the grinding operation has been finished, rebalance crankshaft with flywheel and front counterweight.

Table of Crankshaft Grinding Sizes

Table 4

in mm (in.)

Size	Crankshaft bearing journals			Connecting rod bearing journals	
	Dia. of journals 1-4	Width of journal 2 (fitting bearing)	Width of journals 3 and 4	Dia. of journals 1-6	Width of journals 1-6
Standard size	$\frac{59.96}{59.94}$ (2.3606) (2.3598)	$\frac{30.000}{30.021}$ (1.18110) (1.18194)	$\frac{30.50}{30.70}$ (1.2008) (1.2085)	$\frac{47.96}{47.94}$ (1.8882) (1.8874)	$\frac{30.000}{30.084}$ (1.18110) (1.18441)
1st undersize	$\frac{59.71}{59.69}$ (2.3508) (2.3500)	30.00 (1.1811)		$\frac{47.71}{47.69}$ (1.8783) (1.8776)	30.00 (1.1811) to 30.30 (1.193)
2nd undersize	$\frac{59.46}{59.44}$ (2.3409) (2.3401)			$\frac{47.46}{47.44}$ (1.8685) (1.8677)	
3rd undersize	$\frac{59.21}{59.19}$ (2.3303) (2.3303)			$\frac{47.21}{47.19}$ (1.8587) (1.8579)	
4th undersize	$\frac{58.96}{58.94}$ (2.3213) (2.3205)			$\frac{46.96}{46.94}$ (1.8488) (1.8480)	

Permissible out of roundness of crankshaft and connecting rod bearing journals

0.005 mm (0.0002")

Permissible taper of crankshaft and connecting rod bearing journals

0.01 mm (0.0004")

Permissible misalignment of connecting rod bearing journals as to crankshaft to length of bearing

0.01 mm (0.0004")

Permissible out of true of center crankshaft journals 2 and 3 with shaft sup-

ported in journals 1 and 4 0.02 mm (0.0008")

Permissible lateral out of true of fitting bearing journal

0.015 mm (0.0006")

Permissible vertical out of true of flywheel flange relative to four crankshaft bearing journals

0.02 mm (0.0008")

Permissible lateral out of true of flywheel flange relative to four crankshaft bearing journals, checked at a diameter of 90 mm (3.54")

0.012 mm (0.00047")