

A. Grinding Crankshaft

For Models 180 a, 180 b, 190 SL, 220 a, 219, 220 S, and 220 SE this procedure is the same as described for Model 190.

Table of Crankshaft Grinding Overhaul Stages

Model	Overhaul stage	Crankshaft journals		Crankpins	
		Diameter of journals	Width of journals at locating bearing	Crankpin diameter	Crankpin width
180 a, 108 b, 190, 190 b 190 SL	Standard size	$\frac{69.96}{69.94}$	$\frac{34.000}{34.025}$	$\frac{51.96}{51.94}$	$\frac{32.000}{32.100}$
	1 st Overhaul stage	$\frac{69.71}{69.69}$	$\frac{34.000}{34.025}$ to $\frac{34.700^1)}{34.725}$	$\frac{51.71}{51.69}$	32.000 to 32.300
	2 nd Overhaul stage	$\frac{69.46}{69.44}$		$\frac{51.46}{51.44}$	
	3 rd Overhaul stage	$\frac{69.21}{69.19}$		$\frac{51.21}{51.19}$	
	4 th Overhaul stage	$\frac{68.96}{68.94}$		$\frac{50.96}{50.94}$	
220 a, 220 S, 219, 220 SE	Standard size	$\frac{59.96}{59.94}$	$\frac{30.000}{30.021}$	$\frac{47.96}{47.94}$	$\frac{30.000}{30.084}$
	1 st Overhaul stage	$\frac{59.71}{59.69}$	$\frac{30.000}{30.021}$ to $\frac{30.700^1)}{30.725}$	$\frac{47.71}{47.69}$	30.300 to 30.000
	2 nd Overhaul stage	$\frac{59.46}{59.44}$		$\frac{47.46}{47.44}$	
	3 rd Overhaul stage	$\frac{59.21}{59.19}$		$\frac{47.21}{47.19}$	
	4 th Overhaul stage	$\frac{58.96}{58.94}$		$\frac{46.96}{46.94}$	

¹⁾ In steps of 0.1 mm, according to the available check plates.

The tolerances given in the above table for the various overhaul stages must on no account be exceeded, and it goes without saying that all journals and pins must be ground to the same overhaul stage. Make sure that the fillet radii (2.5–3 mm) on the crankshaft journals and crankpins are strictly adhered to.

Machining Tolerances of Crankshaft

Model		180 a 180 b 190 190 b 190 SL	219 220 a 220 S 220 SE
Permissible out-of-round tolerance of crankshaft journals and crankpins		0.005	
Permissible conicity of crankshaft journals and crankpins		0.01	
Permissible misalignment of crankpins with regard to crankshaft journals, related to bearing length		0.01	
Permissible run-out of center crankshaft journal with crankshaft supported on the outside journals		0.02	
Permissible lateral deflection of locating journal		0.015	
Permissible radial deflection of flywheel flange related to the crankshaft journals		0.02	
Permissible lateral deflection of flywheel flange related to the crankshaft journals, measured at external diameter		0.01	0.012
Fillet radii on the crankshaft journals and crankpins		2.5—3	
Hardness of crankshaft journals and crankpins	Scleroscope hardness	68—74	70—74
	Rockwell hardness	55—61	57—61
Permissible unbalance of crankshaft		15 cmg ¹⁾	

¹⁾ The crankshaft is balanced together with the front counterweight and the flywheel.

B. Re-Bedding of Crankshaft

The procedure for models 180 a, 180 b, 180 c, 190 SL, 220 a, 219, 220 S and 220 SE is the same as for model 190.

Bearing Play of Crankshaft

Models 180 a, 180 b, 180 c, 190, 190 b, 190 SL, 220 a, 219, 220 S and 220 SE

Radial ¹⁾	End Play of locating bearing ²⁾
0.045–0.060	0.09–0.236*

¹⁾ The above radial play for new engines is attained by proper selection of crankshafts and bearing shells, with a bearing play of 0.05 mm the goal. This radial play should be definitely maintained also during repairs.

²⁾ During repairs, an end play of 0.30 mm is permitted.

Diameter of Crankshaft Bearings with Bearing Shell Halves Fitted

Model	Standard	Overhaul Stages			
		I	II	III	IV
180 a, 180 b	69.99	69.74	69.49	69.24	69.99
180 c, 190	70.02	69.77	69.52	69.27	69.02
190 b, 190 SL					
220 a, 219	59.99	59.74	59.49	59.24	58.99
220 S, 220 SE	60.02	59.77	59.52	59.27	59.02

Base Bore in Crankcase

Model	180, 180 b, 180 c, 190, 190 b, 190 SL	220 a, 219, 220 S, 220 SE
Housing bore	74.500–74.519	67.000–67.019
Perm. out-of-round of base bore	0.01	
Perm. conicity of base bore	0.01	
Crush of bearing shell halves	+ 0.01	

Thickness of Check Plates on Locating Bearing

Model	Overhaul Stages							
	Standard	I	II	III	IV	V	VI	VII
180 a, 180 b, 190, 190 b, 190 SL	1.980	2.030	2.080	2.130	2.180	2.230	2.280	2.330
	1.965	2.015	2.065	2.115	2.165	2.215	2.265	2.315
220 a, 219, 220 S, 220 SE	2.980	3.030	3.080	3.130	3.180	3.230	3.280	3.330
	2.965	3.015	3.065	3.115	3.165	3.215	3.265	3.315

To fix crankshaft in axial direction the engines were provided with a shouldered locating bearing, as well as with check plates. The check

plates are fastened to the second crankshaft bearing cap on both sides with heavy dowel pins (Fig. 03-5/1).

Here, the heavy dowel pins may not project more than 1.5 mm from the hole. They should be sufficiently withdrawn with regard to the check plate that any contact with the crankshaft is made impossible.

When repairs are made, and the crankshaft bearings are replaced, the former, and now still partially used check plates are replaced on all our engines by a shouldered locating bearing in the cylinder crankcase (upper bearing shell half) and in part also in the crankshaft bearing cap (lower bearing shell half). For the overhaul stages these shouldered bearings – bearing shell halves also as to width – are supplied in oversizes for refinishing to the specified end play.

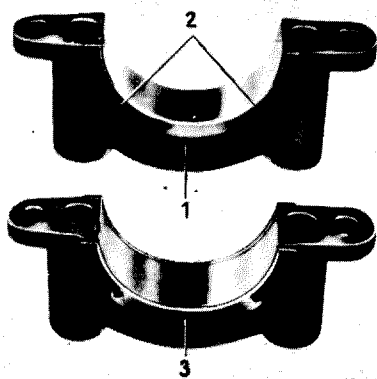


Fig. 03-5/1

1 Crankshaft bearing cap 2 Heavy dowel pin 3 Check plates