

Dimensions of Piston Pin Bushing

Model	O. D.		I. D.	
	Standard Size	Overhaul Stage	Rough-turning Dimensions	Final Dimensions ¹⁾
180 a, 180 b, 190, 190 b, 190 SL	<u>28.048</u>	<u>28.548</u>	<u>24.500</u>	<u>25.007</u>
	28.035	28.535	24.552	25.013
180 c, 190 SL ²⁾	<u>29.108</u>	<u>29.608</u>	<u>25.705</u>	<u>26.012</u>
	29.070	29.570	25.603	26.018
220 and 219, 220 S 1 st Version	<u>25.048</u>	<u>25.548</u>	<u>21.500</u>	<u>22.007</u>
	25.035	25.535	21.552	22.013
219, 220 S 2 nd Version	<u>27.048</u>	<u>27.548</u>	<u>21.500</u>	<u>22.007</u>
	27.035	27.535	21.552	22.013
220 SE	<u>27.048</u>	<u>27.548</u>	<u>23.500</u>	<u>24.007</u>
	27.035	27.535	23.552	24.013

¹⁾ Tolerance subdivisions of final-turned piston pin bushing, refer to page 03-5/7

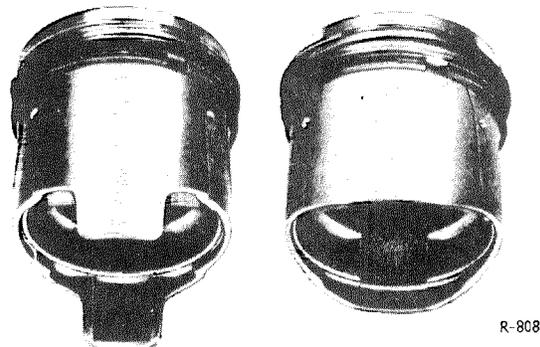
²⁾ 190 SL as from engine design 121.928.

For model 220 SE the connecting rod eyes are larger and the I. D. and O. D. of the pressed-in bushings are 2 mm larger. For reasons of standardization models 219 and 220 S are now also provided with heavier connecting rods, with the O. D. of the bushings also increased by 2 mm, while the I. D. remains the same.

D. Fitting Pistons, together with Rings, into Cylinders

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

Similar to model 190, models 190 SL, 220 a, 219, 220 S and 220 SE are provided with full-skirt autothermic pistons (so-called slipper pistons) with extended skirt. Models 180 a and 180 b on the other hand have full-skirt autothermic pistons without extended skirt (Fig. 03-5/4).



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Fig. 03-5/4

Piston for models
180 c, 190, 190 b, 190 SL,
220 a, 219, 220 S and 220 SE

Piston for models
180 a and 180 b

Pistons Available for Overhaul Stages

Model	Standard	Intermediate Stage	Piston Dia.		
			I. Overhaul Stage	II. Overhaul Stage	III. Overhaul Stage
180 a, 180 b, 180 c, 190 b, 190 SL	84.96–84.98	85.21–85.23	85.46–85.48	85.96–85.98	86.46–86.48
220 a, 219, 220 S, 220 SE	79.96–79.98	80.21–80.23	80.46–80.48	80.96–80.98	81.46–81.48

Piston Ring with Gap and Groove Clearance

Piston Rings		180 a, 180 b	180 c, 190, 190 b 190 SL	220 a, 219, 220 S	220 SE
Groove I		Compression ring 10 f 85/77.6×2 Cr S 001 037 38 16		Compression ring ¹⁾ 10 f 80/73×2 Cr S 001 037 57 16	Compression ring 10 f 80/73×2 Cr S 001 037 57 16
Groove II		Tapered compr. ring 11 f 85/77.6×2.5 001 037 43 16		Tapered compr. ring 11 f 80/73×2.5 KE 54 N 277	Tapered compr. ring 11 f 80/73×2.5 KE 54 N 277
Groove III		Stepped oil control ring 30 f 85/77.6×3 KE 54 N 278	Novix stepped ring with F3 S expander 85×3 T–16 Nova 000 037 00 17	80×3 T–16 Nova ²⁾ 000 037 10 17	Tapered compr. ring 1 f 80/73×3 KE 54 N 277
Groove IV		Novix slotted ring with F5 S expander 85×5 T–17 Nova 000 037 29 18			Wide channel oil control ring with Goetze expander spring 80/73.4×5 001 037 79 18
Gap	Groove I	0.55–0.70		0.55–0.70	0.55–0.70
	Groove II	0.45–0.60		0.30–0.45	0.30–0.45
	Groove III	0.30–0.45			
	Groove IV	0.25–0.40		0.25–0.40	0.25–0.40
Groove clearance	Groove I	0.035–0.062		Mahle 0.035–0.062	Nüral 0.030–0.057
	Groove II				
	Groove III			0.035–0.062	
	Groove IV			0.045–0.072	

¹⁾ Height of compression ring of former Mahle piston 2.5 mm.

²⁾ Height of stepped ring of former Nüral piston 2.5 mm.

Note: The designations of pistons and piston rings refer to the standard size, while the gap and groove clearances of the rings apply to all overhaul stages.

To maintain piston pin clearance or overlap, pistons and piston pins having the same color code should be used.

Color Code for Associated Piston Pins and Pistons

Pistons pins, connecting rods and pistons	Color code	Piston pin O.D.	Bore of piston pin bushing	Running	Bore in piston	
					Nüral	Mahle
180 a, 180 b, 190, 190 b, 190 SL	black	$\frac{24.997}{24.994}$	$\frac{25.007}{25.010}$	0.010–0.016	$\frac{24.994}{24.997}$	$\frac{24.994}{24.997}$
	white	$\frac{25.000}{24.097}$	$\frac{25.010}{25.013}$		$\frac{24.997}{25.000}$	$\frac{24.997}{25.000}$
180 c, 190 SL ¹⁾	black	$\frac{25.997}{25.994}$	$\frac{26.012}{26.015}$	0.015–0.021	—	$\frac{25.994}{25.997}$
	white	$\frac{26.000}{25.997}$	$\frac{26.015}{26.018}$		—	$\frac{25.997}{26.000}$
220 a, 219, 220 S	black	$\frac{21.997}{21.994}$	$\frac{22.007}{22.010}$	0.010–0.016	$\frac{21.994}{21.997}$	$\frac{21.992}{21.995}$
	white	$\frac{22.000}{21.997}$	$\frac{22.010}{22.013}$		$\frac{21.997}{22.000}$	$\frac{21.995}{21.998}$
220 SE	black	$\frac{23.997}{23.994}$	$\frac{24.007}{24.010}$	0.010–0.016	—	$\frac{23.992}{23.995}$
	white	$\frac{24.000}{23.997}$	$\frac{24.010}{24.013}$		—	$\frac{23.995}{23.998}$

¹⁾ 190 SL as from engine design 121.928.

E. Replacement of Starter Rim Gear

For models 180 a, 180 b, 180 c, 190 SL, 220 a, 219, 220 S and 220 SE with standard clutch and for models 219, 220 S and 220 SE with hydraulic-automatic clutch procedure is the same as for model 190. However, the flywheel for models 219, 220 S and 220 SE with hydraulic-automatic clutch is designed as a disk (Fig. 03–5/5). On this flywheel the ring gear is mounted to project uniformly on both sides. Then, the runout of clamping face B should be checked over a diameter of 200 mm. It should not exceed 0.05 mm.

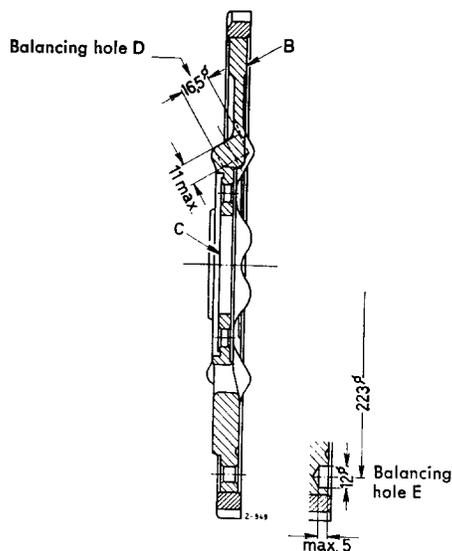


Fig. 03–5/5

Flywheel for hydraulic-automatic clutch

B = Clamping face for hydraulic-automatic clutch
C = Clamping face for crankshaft

Following attachment of a new ring gear on models 220 a, 219, and 220 S having a flywheel acc. to Fig. 03–5/7 the ring gear requires six thread holes for attachment of the clutch. First drill six holes of 6.7 mm dia. accurately centered with holes in flywheel, then chamfer and cut 8 mm threads (M 8).