

# General

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## Technical Specifications

Job. No.
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00-1
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*Change: Models 180 c and 180 Dc added, changes at \*)*

### I. Models 180, 180a, 180b, 180c and 190 SL

#### Models

Car model	180	180a	180b	180c	190 SL
Chassis type	120.01	120.01	120.01	120.01	121.04
Engine model	M 136.VII	M 121 B.IV	M 121 B.IV-b	M 121 B.VIII	M 121 B.II <sup>2)</sup> M 121 B.IX <sup>3)</sup> *
Engine type	136.925	121.923	121.923	121.927	121.921 <sup>2)</sup> 121.928 <sup>3)</sup> *

#### Engine

Operation	4-cycle carburetor				
No. of cylinders	4				
Bore/Stroke (mm)	75/100	85/83.6			
Total eff. piston displacement (cm <sup>3</sup> )	1767	1897			
Compression ratio $\epsilon$	6.7:1	6.8:1	7.0:1	8.8:1 <sup>4)</sup>	
Firing order	1-3-4-2				
Max. speed (rpm)	4500	6000			
Engine performance in metric HP at rpm acc. to DIN <sup>1)</sup> in gr. HP/rpm acc. to SAE	52/4000 58/4000	65/4500 74/4700	68/4400 78/4500	105/5700 120/5800	
Max. torque mkg/rpm acc. to DIN mkg/rpm acc. to SAE	11.4/1800 11.7/1800	13.0/2200 14.4/2800	13.2/2500 14.8/2500	14.5/3200 15.8/3800	
Crankshaft bearings	3 Babbit metal plain bearings with steel-backed shells	3 compound plain bearings with steel-backed shells			
Connecting rod bearings	compound plain bearings with steel-backed shells				
Valve arrangement	side	overhead			
Camshaft location	lateral	overhead			
Oil cooling	—	Oil-water heat exchanger			
Cooling system	Water circulation through pump, thermostat with by-pass pipe and fan				
Lubrication	Forced-feed lubrication by means of gear-type pump				

<sup>1)</sup> The HP output stated is actually available for the car at the clutch, since the power used by the engine accessories has already been deducted.

<sup>2)</sup> Up to use of further developed valve controls.

<sup>3)</sup> As from use of further developed valve controls.

<sup>4)</sup> Up to engine No. 6503803 compression ratio  $\epsilon = 8.5 : 1$ .

Model	180	180 a	180 b	180 c	190 SL
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### Electric Equipment

Battery	Voltage (V) Capacity (Ah)	6 84	12 56	12 52	12 56
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### Dimensions

Wheel track (mm) front rear	1420 1460 <sup>1)</sup>	1440 <sup>2)</sup> 1485 <sup>2)</sup>	1440 1485	1440 <sup>2)</sup> 1485 <sup>2)</sup>
Wheel lock, inner outer	39° 30°			
Min. turning circle (m)	approx. 11		approx. 10.7	
Wheel base (mm)	2650			2400
Length of vehicle (mm)	4460	4485	4500	4290
Width of vehicle (mm)	1740			1760
Height of vehicle, ready for driving (mm)	approx. 1560			app. 1320
Ground clearance, vehicle with 2 persons (mm)	approx. 195			app. 155

### Weights

Dry weight of vehicle without fuel, spare wheel and tools (kg)	1070	1085	1075 <sup>4)</sup>
Unladen weight of vehicle, ready for driving, with full fuel tank, spare wheel and tools (kg)	1150	1165	1160 <sup>5)</sup>
Perm. total weight (kg)	1160	1615	1440
Perm. axle load (kg) front/rear	720/880	735/880	690/750

### Capacities

Cool. system with heating (ltr.) Water	9	10
Fuel tank / fuel reserve (ltr.) Fuel	56/5	
Crankcase (ltr.) Engine oil max./min.	4/2.5	
Oil filter (ltr.) Engine oil	0.5	
Water pump (cm <sup>3</sup> ) Hypoid oil SAE 90	10	
Transmission (ltr.) Automatic Transmission Fluid	1.4	
Rear axle (ltr.) Hypoid oil SAE 90	2.25 <sup>6)</sup>	
Steering (ltr.) Hypoid oil SAE 90	0.3	
Brake system (ltr.) ATE blue brake fluid	0.5	
Wheel hub front g) Anti-friction bearing grease	65	

<sup>1)</sup> On model 180 with twin-jointed rear axle 1450 mm.

<sup>2)</sup> For rim size 5 JK × 13-B (2nd type); for rim size 4 1/2 K × 13-B (1st type) wheel track front 1430, rear 1475.

<sup>3)</sup> Previously 1470 mm.

<sup>4)</sup> Applies to roadster, for coupe 1095 kg.

<sup>5)</sup> Applies to roadster, for coupe 1180 kg.

<sup>6)</sup> On model 180 with 2-jointed rear axle 1.6 ltr.

Model	180	180 a	180 b	180 c	190 SL
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### Speeds, Consumption Figures and Operating Conditions

At rear axle ratio of $i =$	1:3.89	1:3.90		1:3.90 <sup>4)</sup>
Max. speed for individual gears (km/h) timed				
1st gear	34	42		50
2nd gear	58	74		76
3rd gear	90	117		120
4th gear	approx.126	approx. 135		approx.175
Climbing ability (%)				
1st gear	43	54		50
2nd gear	23	27.5		30
3rd gear	13	15.5		17
4th gear	8	8.8		9.5
Acceleration time in 4th gear from 20–100 km/h <sup>1)</sup> (sec)	38	33	32	25 <sup>2)</sup>
Engine speed at 100 km/h in 4th gear (rpm)	3390	3370	3350	3380
Fuel consumption for average high-way travel (ltr./100 km)	—	8–12	7.5–11.5	8.2–12.3
Fuel consumption acc. to DIN 70030 <sup>2)</sup> (ltr./100 km)	6)	10.9 at 101 km/h		10.9 at 110 km/h
Engine oil consumption (ltr./100 km)	0.15			
Cool. Water working temperature (° C)	70–95			
Fuel	regular fuel			premium <sup>7)</sup> (super)
Anti-Knock rating (Octane rating min. ROZ)	for optimal efficiency <sup>3)</sup>		82	86
	with max. retardation of ignition and corresponding drop in output		80	
				96
				90

<sup>1)</sup> Vehicle with 2 persons.

<sup>2)</sup> Measured at  $\frac{3}{4}$  of max. speed 110 km/h + 10 %.

<sup>3)</sup> Gasoline engines are set for optimal output in the factory using commercial fuels. If exceptional cases for a short period demand the use of fuels having an octane rating below that stated for optimum output, ignition should in all cases be retarded correspondingly.

<sup>4)</sup> For gear ratio 2nd type; for gear ratio 1st type und rear axle ratio  $i = 1 : 3.89/3.90$   $i = 1 : 3.70$   
Max. speed 52/89/140/approx. 175 54/93/148/approx. 175  
Hill climbing ability 48/26/15/9.0 45/23/13/8.5

<sup>5)</sup> Acceleration period in 4th gear from 30 to 100 km/h in sec.

<sup>6)</sup> Standard fuel consumption 8.7 ltr./100 km; measured at  $\frac{2}{3}$  of max. speed, 80 km/h + 10 %.

<sup>7)</sup> Gasoline-benzene mixture, respectively.

## II. Models 180 D, 180 Db, 180 Dc, 190 D and 190 Db

### Models

Car Model	180 D	180 Db	180 Dc	190 D	190 Db
Chassis Type	120.11	120.11	120.11	121.11	121.11
Engine Model	OM 636.VII	OM 636.VII	OM 621.IV	OM 621.I	OM 621.I
Engine Type	636.930	636.930	621.914	621.910	621.910

### Engine

Operation	4-cycle diesel Daimler-Benz constant flow principle precombustion chamber		
Number of cylinders	4		
Bore/Stroke (mm)	75/100	87/83.6	85/83.6
Total effective piston displacement (cm <sup>3</sup> )	1767	1988	1897
Compression ratio $\epsilon$	19:1	21:1	
Injection order	1-3-4-2		
Max. speed (rpm)	3600	3800	4000
Engine performance in metric HP at rpm acc. to DIN <sup>1)</sup> in gr. HP at rpm acc. to SAE	43/3500 46/3500	48/3800 52.4/3800	50/4000 55/4000
Torque max. in mkg/rpm acc. to DIN in mkg/rpm acc. to SAE	10.3/2000 10.6/2000	11/2200 11.4/2200	11/2200 11.5/2200
Crankshaft bearings	3 compound plain bearings with steel-backed shells		
Connecting rod bearings	compound plain bearings with steel-backed shells		
Valve arrangement	overhead		
Camshaft location	lateral	overhead	
Oil cooling	—	Oil-water heat exchanger	
Cooling system	Water circulation by means of pump, thermostat with by-pass pipe, fan		
Lubrication	Forced-feed lubrication by means of gear-type pump		

<sup>1)</sup> The metric horsepower specified is actually available at the clutch, since the power used by the engine accessories has already been deducted.

Model	180 D	180 Db	180 Dc	190 D	190 Db
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### Electrical Equipment

Battery	Voltage (V)	Capacity (Ah)	180 D	180 Db	180 Dc	190 D	190 Db
			12	12	12	12	12
			84	66	66	84	84

### Dimensions

Wheel track (mm) front	1420	1430	1440	1420	1430
rear	1460 <sup>1)</sup>	1475	1485	1460	1475
Wheel lock inner	39°				
outer					
Min. turning circle (m)	approx. 11	approx. 10.7			
Wheel base (mm)	2650				
Length of vehicle (mm)	4485	4500		4485	4500
Width of vehicle (mm)	1740				
Height of vehicle, ready for driving (mm)	approx. 1560				
Ground clearance, carrying 2 persons (mm)	approx. 195				

### Weights

Dry weight of vehicle (kg) without fuel, spare wheel and tools	1130	1140
Unladen weight of vehicle, ready for driving, with full fuel tank, spare wheel, tools (kg)	1210	
Perm. total weight (kg)	1650	1660
Perm. axle load (kg) front/rear	770/880	780/880

### Capacities

Cool. System with heating (ltr.) Water	8	10.3
Fuel tank / fuel reserve (ltr.) Fuel	56/5	
Crankcase (ltr.) Engine oil max./min.	4/2.5	
Oil filter (ltr.) Engine oil	0.5	
Water pump (cm <sup>3</sup> ) Hypoid oil SAE 90	10	
Transmission (ltr.) Autom. Transm. Fluid	1.4	
Rear axle (ltr.) Hypoid oil SAE 90	2.25 <sup>2)</sup>	
Steering (ltr.) Hypoid oil SEA 90	0.3	
Brake system (ltr.) ATE blue brake fluid	0.5	
Wheel hub front (g) anti-friction bearing grease	65 each	

<sup>1)</sup> For vehicles with twin-jointed rear axle 1450 mm.

<sup>2)</sup> On Model 180 D with twin-jointed rear axle 1.6 ltr.

Model	180 D	180 Db	180 Dc	190 D	190 Db
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### Speeds, Consumption Figures and Operating Conditions

At rear axle ratio of $i =$	1:3.70	1:3.90	1:3.70
Max. speed in the individual gears (km/h) timed 1st gear 2nd gear 3rd gear 4th gear	28 48 75 approx. 110 <sup>3)</sup>		30 53 84 approx. 120 <sup>4)</sup>
Climbing ability (%) 1st gear 2nd gear 3rd gear 4th gear	35 19 11 6	38 20 12 6.5	36 19 11 6
Acceleration time in 4th gear from 40–100 km/h <sup>1)</sup> (sec)	39	36	32
Engine speed at 100 km/h in 4th gear (rpm)	3220	3350	3220
Fuel consumption for average high-way travel (ltr./100 km)	5.7–7.8	6.0–8.0	5.7–8.0
Fuel consumption acc. to DIN 70030 <sup>2)</sup> (ltr./100 km)	6.8 at 82.5 km/h	7.1 at 82.5 km/h	7.1 at 90 km/h
Engine oil consumption (ltr./100 km)	0.15		
Cooling water working temperature (° C)	70–95		
Fuel	Diesel fuel acc. to DIN 51601		

<sup>1)</sup> Vehicle carrying 2 persons.

<sup>2)</sup> Determined at  $\frac{3}{4}$  of max. speed 110 km/h + 10 %.

<sup>3)</sup> For Model 180 Dc a max. speed of 117 km/h must on no account be exceeded on down grades.

<sup>4)</sup> On down grades a max. speed of 130 km/h must on no account be exceeded.

### III. Models 220 a, 219, 220 S, and 220 SE

Car model	220 a	219	220 S	220 SE		
Chassis type	180.01	105.01	180.01 <sup>2)</sup>	128.01 <sup>3)</sup>		
Engine model	M 180.II	M 180.II	M 180.III	M 127.I		
Engine model	180.921	180.921	180.924	127.980		
<b>A. Engine</b>						
Operation	Four-cycle carburetor			Four-cycle gasoline injection		
Number of cylinders	6					
Bore/stroke (mm)	80:72.8					
Total effective piston displacement (cc)	2195					
Compression ratio $\epsilon$	7.6:1	7.6:1	8.7:1	7.6:1	8.7:1	8.7:1
Firing or injection order	1—5—3—6—2—4					
Maximum R.P.M.	6000					
Engine performance in metric HP at R.P.M. according to DIN <sup>1)</sup> in gr HP at R.P.M. according to SAE	85/4800 92/4800	85/4800 92/4800	90/4800 100/5000	100/4800 112/5000	106/5000 120/5200	115/4800 130/5000
Maximum torque in mkg at R.P.M., DIN rating in mkg at R.P.M., SAE rating	16.0/2400 16.5/2500	16.0/2400 16.5/2500	17.0/2400 18.0/2700	16.3/3500 17.8/3800	17.5/3500 19.0/3600	19.0/3800 20.2/3800
Crankshaft bearings	4 Compound plain bearings with steel-backed shells					
Connecting rod bearings	Compound plain bearings with steel-backed shells					
Valve arrangement	Overhead					
Camshaft location	Top					
Oil cooling	Oil-water heat exchanger					
Cooling system	Water circulation through pump, thermostat with by-pass pipe and fan					
Lubrication	Force-feed lubrication by means of gear-type pump					

<sup>1)</sup> The metric horsepower specified is actually available at the clutch, since the power used by the engine accessories has already been deducted.

<sup>2)</sup> Chassis type for Convertible A 180.030 and Coupé A 180.037.

<sup>3)</sup> Chassis type for Convertible A 128.030 and Coupé A 128.037.

Model		220 a	219	220 S	220 SE
<b>B. Electrical Equipment</b>					
Battery	voltage (V) capacity (Ah)	12 56			
<b>C. Dimensions</b>					
Track (mm)	front rear	1430 1470			
Wheel lock	inner outer	39° 30°	39° 35°		
Minimum turning circle (m)		appr. 11			
Wheel base (mm)		2820	2750	Sedan 2820	Convertible and Coupé 2700
Length of vehicle (mm)		4715	4680	4750	4700
Width of vehicle (mm)		1740		1740	1790
Height of vehicle curb condition (mm)		appr. 1560		appr. 1560	appr. 1530
Ground clearance carrying 2 persons (mm)		appr. 215	appr. 205	appr. 215	
<b>D. Weights</b>					
Dry weight of vehicle (kg) without fuel, spare wheel and tools		1180	mech. clutch 1170 autom. clutch 1185	Sed. Conv. Coupé 1230 1290 1255 1245 1305 1270	Sed. Conv. Coupé 1250 1310 1275 1265 1325 1290
Unladen weight of vehicle, with full fuel tank, spare wheel and tools (kg)		1280	mech. clutch 1260 autom. clutch 1275	1325 1385 1350 1340 1400 1365	1345 1405 1370 1360 1420 1385
Load capacity (kg)		450	mech. clutch 465 autom. clutch 450	465 405 440 450 390 425	465 405 440 450 390 425
Permissible total weight (kg)		1730	1725	1790	1810
Permissible axle load (kg) front		810	825	840	860
rear		920	900	950	950
<b>E. Capacities</b>					
Cooling system with heating (ltr)		11.3			
Fuel tank / fuel reserve (ltr)		64/5.5	56/5	64/5.5	60/5.5
Crankcase (ltr) Engine oil max./min.		6/3.5			
Oil filter (ltr) Engine oil		0.5			
Water pump (cc) Hypoid oil SAE 90		10			
Transmission (ltr) Automatic transmission fluid		1.4			
Rear axle (ltr) Hypoid oil SAE 90		2.25			
Steering (ltr) Hypoid oil SAE 90		0.3			
Brake system (ltr) ATE blue brake fluid		0.5			
Wheel hub front (g) Anti-friction bearing grease		65 each			

Model	220 a	219	220 S	220 SE
<b>F. Speeds, Consumption Figures, and Operating Conditions</b>				
At rear axle ratio $i =$	1:4.11/4.10	1:4.10 1:3.90	1:4.10	1:4.10
Maximum speeds in the individual gears (km/h) timed				
1st gear	44	40 42	49	49
2nd gear	68	69 74	76	76
3rd gear	110	110 117	119	119
4th gear	appr. 150	appr. 148 appr. 184	appr. 160	appr. 160
Climbing ability (%)			=7.6:1 $\epsilon=8.7:1$	
1st gear	52	52 55	52 55	60
2nd gear	30	30 31.5	30 31.5	34
3rd gear	18	18 18.5	18 18.5	19
4th gear	10	10.5 10.6	10.5 10.6	10.7
Acceleration time in 4th gear from 20 to 100 km/h (sec.)	27	$\epsilon=7.6:1$ $\epsilon=8.7:1$ 27 26	$\epsilon=7.6:1$ $\epsilon=8.7:1$ 27 25	23
Engine speed at 100 km/h in 4th gear (rpm)	3470	3580 3370	3470	3470
Fuel consumption Fuel consumption for average highway travel (ltr/100 km)	—	$\epsilon=8.7:1$ mech. cl. 9.0—12.5 aut. cl. 9.3—13.0	$\epsilon=8.7:1$ 9.0—12.0 9.3—12.5	8.7—12 9.0—12
Fuel consumption according to DIN 70030 <sup>1)</sup> (ltr/100 km)	—	$\epsilon=8.7:1$ mech. cl. 11.2 at 110 km/h aut. cl. 11.4 at 110 km/h	$\epsilon=8.7:1$ mech. cl. 10.7 at 110 km/h aut. cl. 10.9 at 110 km/h	mech. cl. 10.7 at 110 km/h aut. cl. 10.9 at 110 km/h
Rated fuel consumption <sup>2)</sup> (ltr/100 km)	9.8	$\epsilon=7.6:1$ 9.8	$\epsilon=7.6:1$ 9.6	—
Engine oil consumption (ltr./100 km)	0.15			
Cooling water working temperature (°C)	70—95			
Fuel	Premium or benzol-gasoline fuel			
Anti-knock rating (octane rating ROZ) <sup>3)</sup>	—	$\epsilon=7.6:1$ $\epsilon=8.7:1$ — 96—99	$\epsilon=7.6:1$ $\epsilon=8.7:1$ — 96—99	— 96—99
Minimum anti-knock rating ROZ <sup>4)</sup>	87	87 90	87 90	93

1) Determined at  $\frac{3}{4}$  of the maximum speed, at a maximum of 110 km/h with a 10% increase.

2) Determined at  $\frac{2}{3}$  of the maximum speed, at a maximum of 80 km/h with a 10% increase.

3) The gasoline engines are adjusted at our works with commercial fuels of the anti-knock rating given above (measured in accordance with the research method, ROZ). When fuels of a lower octane rating are used the ignition must be adjusted accordingly.

4) In Models 219 and 220 S with a compression ratio of  $\epsilon = 6.8:1$  (optional extra, see Job-No. 01-3/3, Section B) the minimum octane rating ROZ is 80.

## Measuring Runs

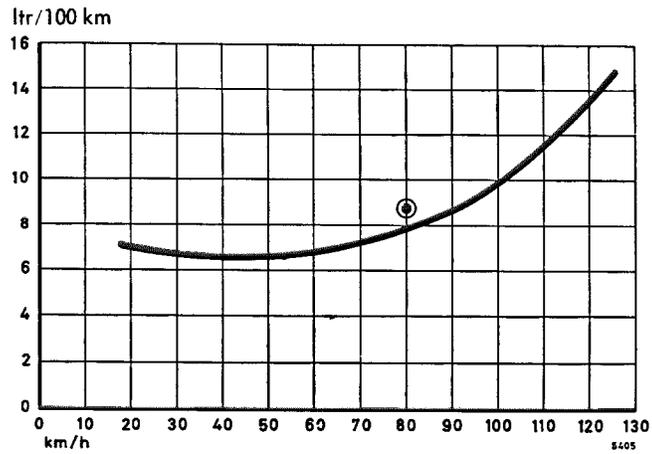
Job No.
00-4

The directions given in the Model 190 Workshop Manual for measuring fuel consumption, oil consumption, acceleration, and maximum speed, apply, with the necessary modifications, also to Models 180 to 220 SE.

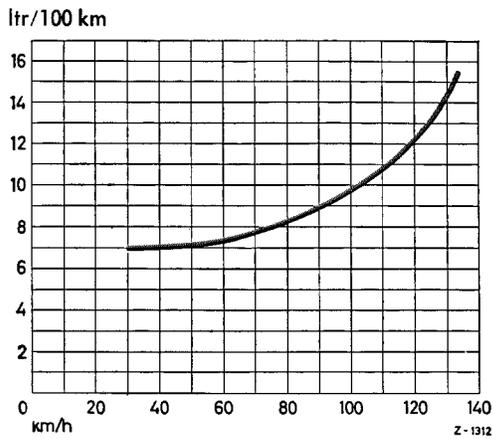
The prescribed weights (unladen weight and total weight of vehicle) of these Models are listed in the Section "Technical Specifications" (see Job No. 00-1), and the values for partial-load fuel consumption and for acceleration are given in the graphs on the following pages 00-4/2 to 00-4/6.

## A. Partial Load Fuel Consumption Curves

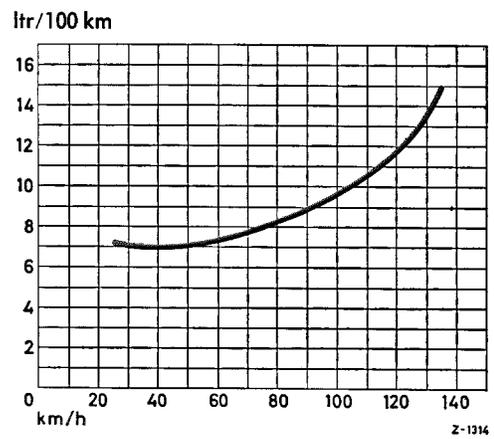
Load: Two persons and full fuel tank



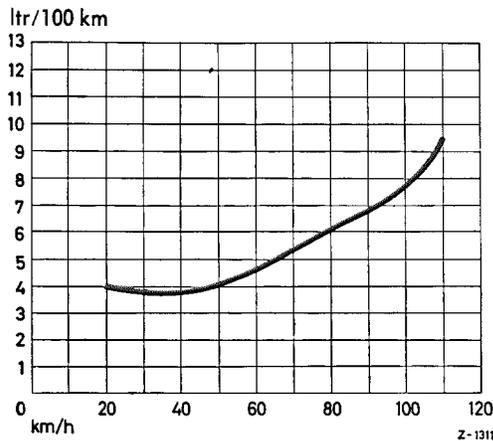
Model 180



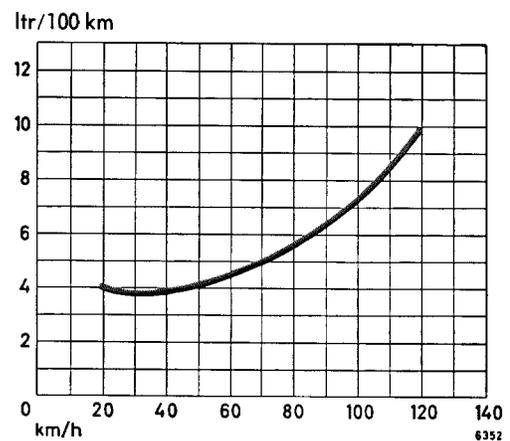
Model 180 a



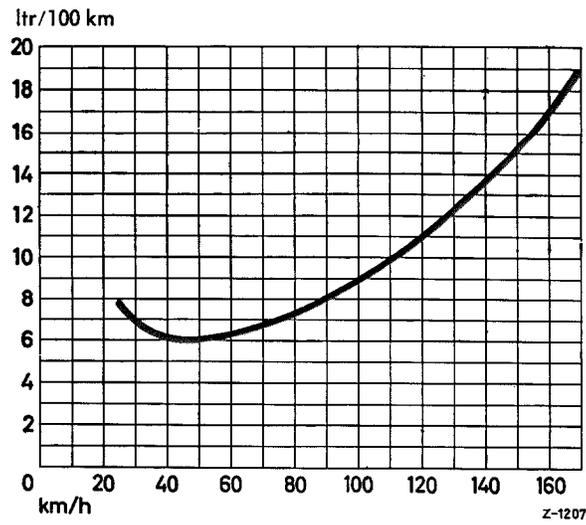
Model 180 b



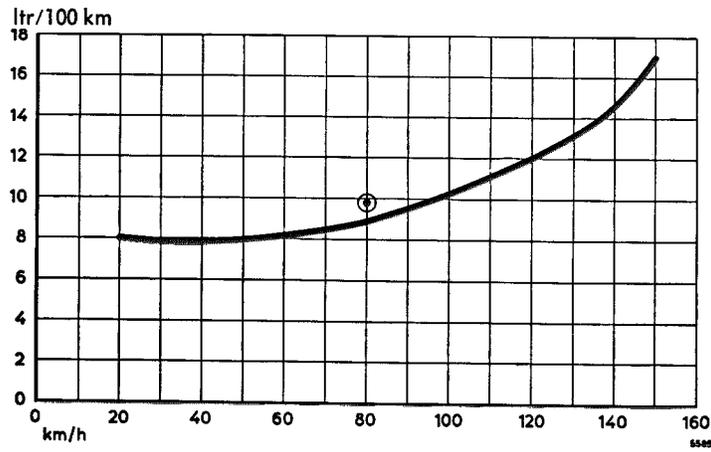
Models 180 D and 180 Db



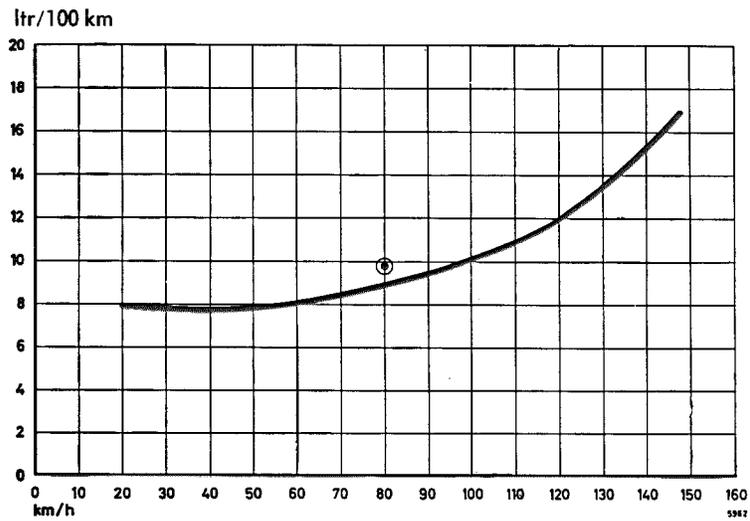
Models 190 D and 190 Db



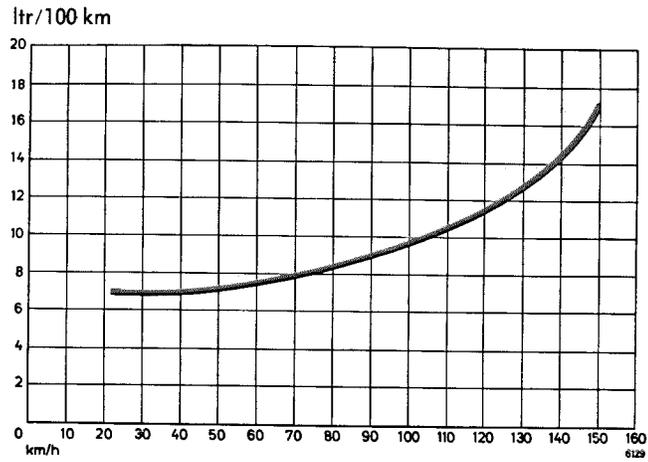
Model 190 SL



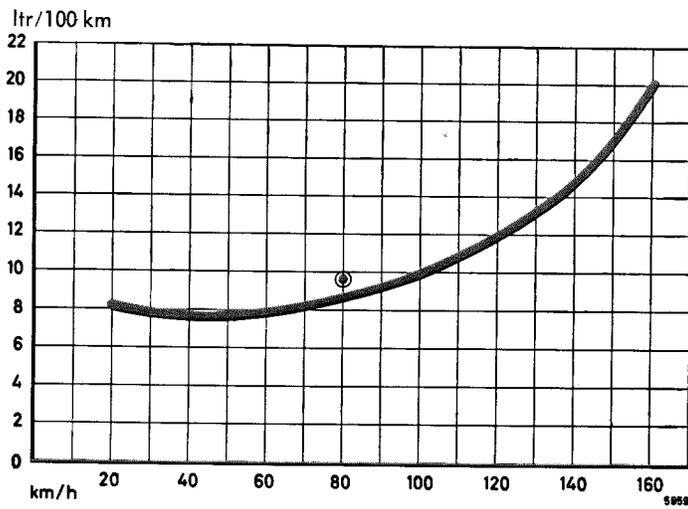
Model 220 a



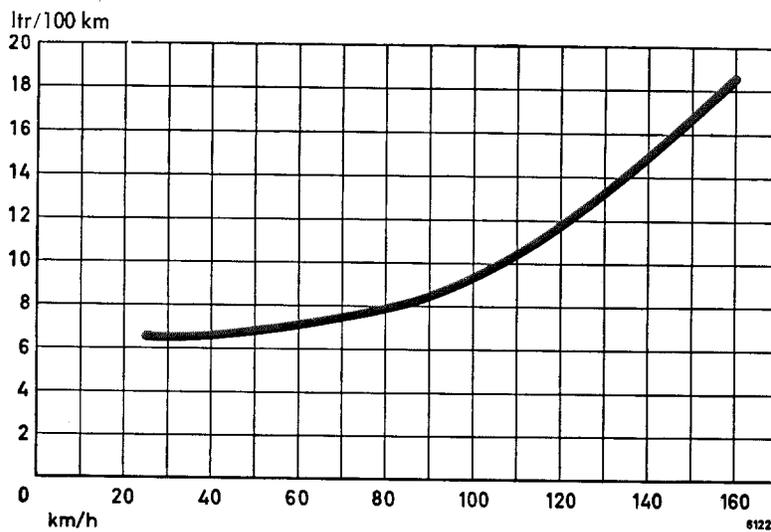
Model 219 with compression ratio  $\epsilon = 7.6:1$



Model 219 with compression ratio  $\epsilon = 8.7:1$



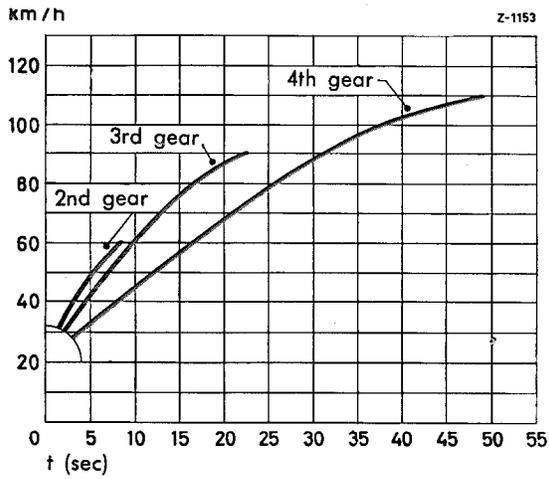
Model 220 S with compression ratio  $\epsilon = 7.6:1$



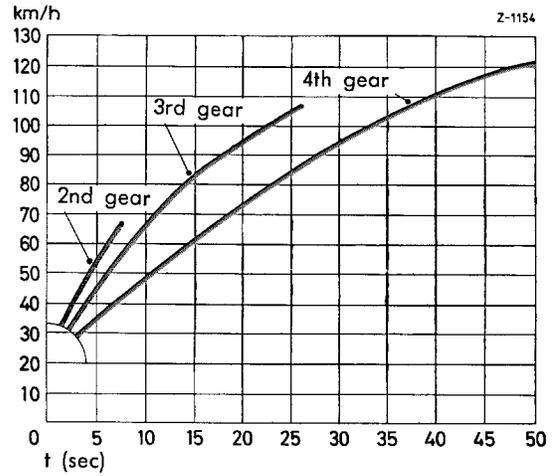
Model 220 S with compression ratio  $\epsilon = 8.7:1$  and Model 220 SE

## B. Acceleration Curves

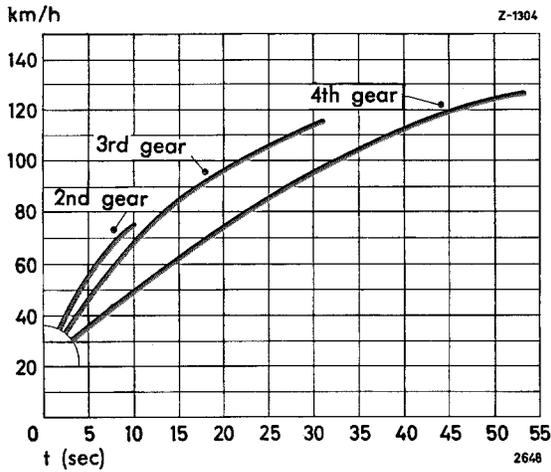
Load: Two persons and full fuel tank



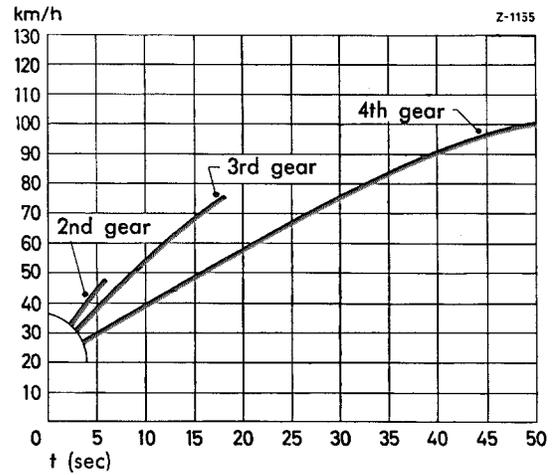
Model 180



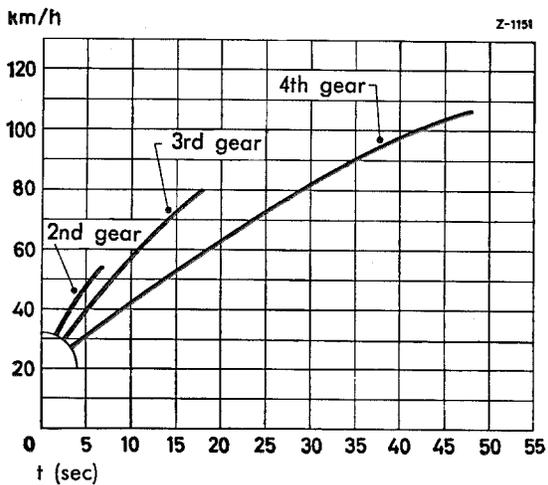
Model 180 a



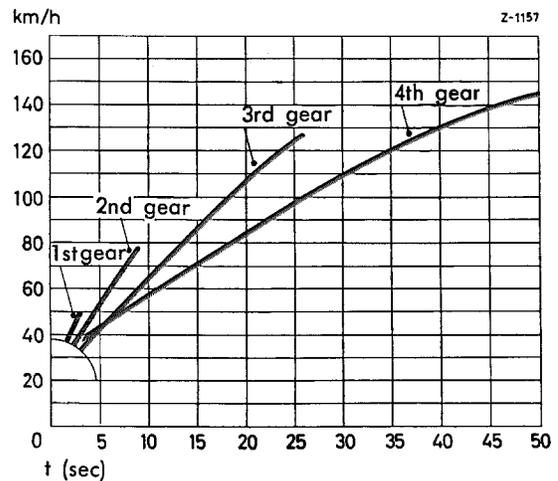
Model 180 b



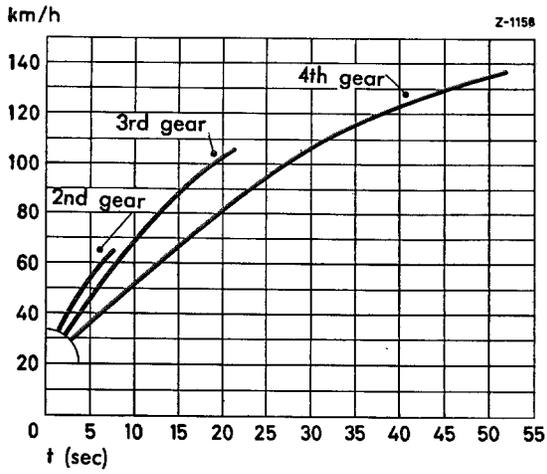
Model 180 D



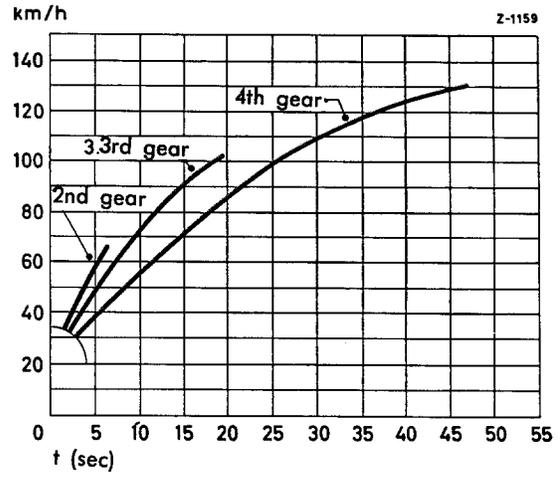
Model 190 D



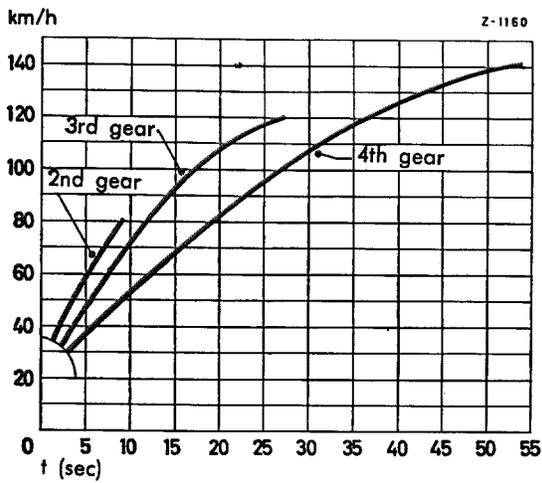
Model 190 SL



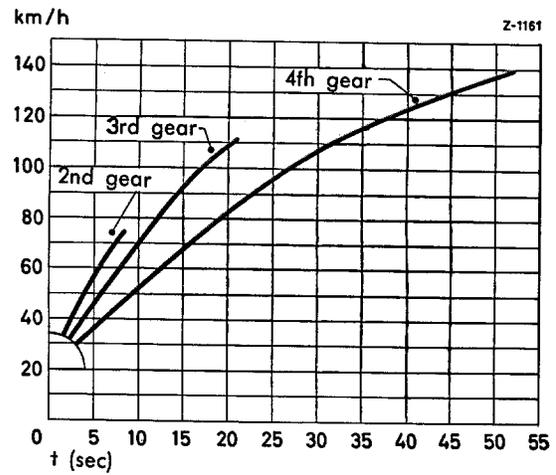
Model 220 a



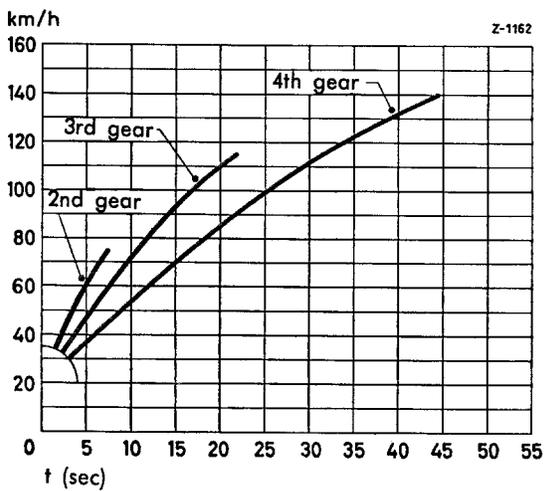
Model 219 ( $\epsilon = 7.6:1$ )



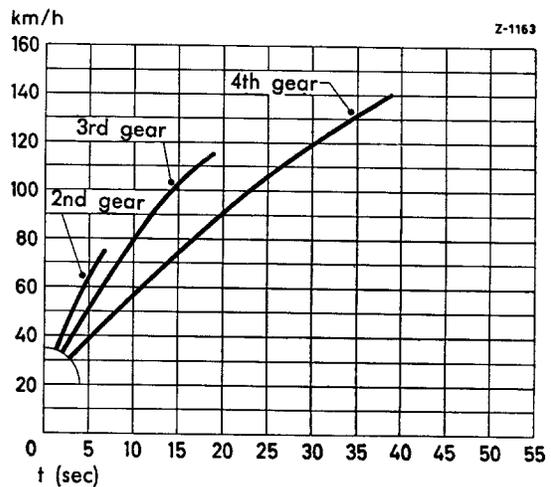
Model 219 ( $\epsilon = 8.7:1$ )



Model 220 S ( $\epsilon = 7.6:1$ )



Model 220 S ( $\epsilon = 8.7:1$ )



Model 220 SE

# Running-In Instructions for New and Replacement Engines

Job No.

00-7

Strict adherence to the running-in instructions is of vital importance for the reliable operation, service life, and economical running of every engine.

New and completely overhauled engines (replacement engines) are given their initial running-in in our works before they are installed in a vehicle or are shipped to a repair shop.

We recommend, therefore, that engines which have been repaired, e. g. by installing new bearings or new pistons, should be run in for a short period of time before they are installed in the vehicle. Since in most cases, however, a test stand and brake will not be available, the following short instructions show how engines can be run in on an ordinary test bench with outside cooling and without a braking system. Water temperature (appr. 80° C) and oil pressure must be checked at regular intervals.

## Running-in Instructions

Engine speed rpm	Running-in period (minutes)		
	Models 180, 180a, 180b, 190, 190b	Models 190 SL, 220 a, 219, 220 S	Model 220 SE
1500 *)	30	30	30
1800—2000	20	20	30
1800	10	20	30
2000	10	20	20
2500	5	5	20
2500—3000	5	5	20

\*) When the engine has been run in at 1500 rpm, the cylinder head screws should be retightened according to our instructions, and in addition all screws and nuts for fastening the intake pipe, the carburetor, the exhaust manifold, the starter, and the generator should be retightened.

Running-in has the additional advantage that the engine, while removed from the car, can be checked for leakage, oil pressure, quiet operation, and idle.

Furthermore it is advisable to make an oil change directly after running in the engine and to clean the air filter at the same time. It is a common experience that very many impurities are left in the corners and cavities of the housing even if the engine components are carefully cleaned before assembly; these impurities are loosened by the splashing oil when the engine is being run in and are removed when the oil is drained off.

When the engine is installed in the car, the running-in instructions given in the Owner's Manual should be followed.