

## Technical Data

Type	220	220 a
<b>Engine:</b>		
Model	M 180.I	M 180.II
Operating principle	Four-stroke gasoline engine	Four-stroke gasoline engine
Number of cylinders	6	6
Bore and stroke in mm (in.)	80 × 72.8 (3.15 × 2.865)	80 × 72.8 (3.15 × 2.865)
Total effective piston displacement in ccm (cu.in.)	2,195 (133.95)	2,195 (133.95)
Compression ratio	6.5:1	7.6:1
Ignition timing	5° after TDC	2° after TDC
Spark advance	automatically through centrifugal and vacuum control, and manually by means of octane value compensator	
Firing order	1 - 5 - 3 - 6 - 2 - 4	1 - 5 - 3 - 6 - 2 - 4
R.p.m. at 100 km/h (62 m. p. h.)	3,470	3,530
Max. r.p.m.*	5,300	6,000
Engine power**	80 metric h.p. at 4,600 r.p.m. (acc. SAE: 86 h.p.)	85 metric h.p. at 4,800 r.p.m. (acc. SAE: 92 h.p.)
Max. torque in mkg (ft.lb.)	14.5 (105) at 2,500 r.p.m.; acc. SAE: 15 (108.5) at 2,600 r.p.m.	16 (116) at 2,400 r.p.m.; acc. SAE: 16.5 (120) at 2,500 r.p.m.
Crankshaft bearings	4 steel backed precision bearings	4 steel backed precision bearings
Connecting rod bearings	Steel-backed precision bearings	Steel-backed precision bearings
Valve arrangement	In head	In head
Valve play (engine cold) in mm (in.)		
Intake	0.08 (0.003)	0.08 (0.003)
Exhaust	0.20 (0.008)	0.20 (0.008)
Settings for checks at a valve play of 0.4 mm (0.016")		Camshaft with number
Intake opens	8° 30' before TDC	14/14/1 9° before 12° before TDC
closes	48° 30' after BDC	41° after 44° after BDC
Exhaust opens	36° 30' before BDC	51° before 51° before BDC
closes	8° 30' after TDC	15° after 15° after TDC
Distributor (Bosch)	VJU 6 AR 8 m. K.	VJU 6 BR 24 m. K. or VJUR 6 BR 24 m. K.
Ignition coil (Bosch)	TK 6 A 3	TK 12 A 10
Spark plugs (Bosch)	W 225 T 7 D	W 225 T 7 D
(Beru)	225/14 L u <sub>2</sub>	225/14 L u <sub>2</sub>
Electrode gap in mm (in.)	0.7 + 0.1 (0.028 + 0.004)	0.7 + 0.1 (0.028 + 0.004)

\* The maximum engine speed is not identical with the car top speed, but indicates the number of revolutions at which the engine can turn for a short time without adverse effects. The r.p.m. at car top speed is considerably lower.

\*\* The metric horsepower specified is available at the clutch for propelling the car after deduction of the power used by the engine accessories.

Type	220	220 a
Fuel pump (Solex diaphragm pump)	PE 10 284 d	PE 10 284 d
Carburetor (Solex)	Double-type downdraft carburetor 30 PAAI	Double-type downdraft carburetor 32 PAATI
Carburetor adjustment:	old design      new design	
Venturi "K"	24                      24	24
Main jet "Gg"	0115                      0125	0130
Air compensating jet "a"	140                      160	170
Mixing tube "s"	0                              0	0
Mixing tube carrier	Res. 5                      Res. 4.8	Res. 4.8
Idle jet "g"	g 50                      g 52.5 (Convertible A g 50)	g 47.5
Idle air jet "u"	Idle tube      Idle tube	Idle tube
Injection pump No.	94 lean, 40°      92	92
Injection volume in ccm (cu.in.)/stroke	1.0-1.2      1.3-1.5 (0.06-0.075)      (0.08-0.09)	1.3-1.5 (0.08-0.09)
Injection pipe	low                      low, calibrated	low, 0.5 calibrated
Injection pipe jet	2 × 0.5      2 × 0.5	2 × 0.5
Starting fuel jet "Gs"	200                      200	150
Starter air jet "Ga"	4.5                      4.5	—
Starter air jet orifice	—                              —	5.5
Float needle valve	2.0                      2.0	2.0
Weight of float	21 g (0.74 oz.)      21 g (0.74 oz.)	21 g (0.74 oz.)
Fuel level in mm (in.)	13-15      13-15 (0.5-0.6)      (0.5-0.6) At altitudes of more than 2,000 m (6,560 ft.)	13-15 (0.5-0.6)
Fuel filter	main jet "Gg" 0110 (0105)      0120 (0115)	0125 (0120)
Air filter (Mann & Hummel) (Knecht)	Strainer in change-over cock A 472-10	Strainer in change-over cock A 472-11
Full-flow oil filter (Knecht)	GD 782/1	
Oil cooler	Coil filter FO 79	Coil filter FO 99/5 with fine filtering element
Cooling system	Cooling coil in cooling water chamber (oil-water-heat exchanger). Water circulation through pump, thermostat with by-pass line and ventilator	
Operating temperature of the water	75-95°C (165-200°F)	75-95°C (165-200°F)
Average fuel consumption in liters/100 km at 80 km/h (50 miles)	10.9 (21.5 miles/US gal; 25.9 miles/Imp. gal)	9.8 (23.9 miles/US gal; 28.7 miles/Imp. gal)
Oil consumption (liters/100 km)	approx. 0.15 (195 miles/US pint; 225 miles/Imp. pint)	approx. 0.15 (195 miles/US pint; 225 miles/Imp. pint)
<b>Clutch</b>		
Clutch Lining	F & S KF 12 Z Bisterfeld or Rusko	F & S KF 12 Z Bisterfeld

Type	220	220a
<b>Transmission</b>	D.B. four-speed transmission, all forward speeds positively synchronized, with steering column gear shift	
Gear ratios:	1st 2nd 3rd 4th 5th design design design design design	1st 2nd design design
1st speed	1:2.95 1:3.06 1:2.98 1:3.33 1:3.68	1:3.40 1:3.52
2nd speed	1:2.12 1:2.12 1:2.12 1:2.12 1:2.25	1:2.32 1:2.32
3rd speed	1:1.46 1:1.46 1:1.45 1:1.45 1:1.42	1:1.52 1:1.52
4th speed	1:1 1:1 1:1 1:1 1:1	1:1 1:1
Reverse (not synchronized)	1:3.18 1:3.18 1:2.78 1:2.78 1:3.08	1:3.29 1:3.29
<b>Climbing ability:</b>		
1st speed	41 % 46 %	52 %
2nd speed	23.5 % 25 %	30 %
3rd speed	14.5 % 14 %	18 %
4th speed	9 % 10 %	10 %
<b>Top speed in km/h (m.p.h.):</b>		
1st gear	46 (28.5) 42 (26)	44 (27.25)
2nd gear	72 (44.75) 68 (42.25)	68 (42.25)
3rd gear	110 (68.5) 111 (69)	110 (68.5)
4th gear	approx. approx. 140 (87) 140 (87)	150 (93.2)
<b>Rear axle:</b>	Convertible A approx. 145 Oscillating axle with hypoid gears	Single-joint oscillating axle with hypoid gears
Rear axle ratio	4.44:1	4.10:1 (formerly 4.11:1)
Rear wheel camber, car ready for travel	+ 4°	+ 1° to + 1° 30'
<b>Steering gear:</b>	ZF Type 542 (formerly) DB recirculating ball system (later)	DB recirculating ball system
Front wheel camber, loaded*	+ 1°	0° 30' ± 15'
Front wheel toe-in, in mm (in.) loaded*	0 to 2 (0.08)	0 to 2 (0.08)
Front wheel caster, loaded*	3° with ZF steering gear 4° with DB steering gear	4° ± 30'
King pin inclination	2°	5°
Steering gear shock absorbers	Tdz 20 × 140 H	T 20 × 125
Wheel turning angle inside	39°	39°
outside	30°	30°
Min. diameter of turning circle in m (ft.)	approx. 11 (36)	approx. 11 (36)

\* 5 × 65 + 40 kg (5 × 145 + 88 lb.) with Type 220 and 6 × 65 + 60 kg (6 × 145 + 135 lb.) with Type 220 a  
2 × 65 + 130 kg (2 × 145 + 285 lb.) with Type 220 Convertible A.  
5 × 65 + 40 kg (5 × 145 + 88 lb.) with Type 220 Convertible B.

Type	220	220 a
<b>Wheels:</b>	Sheet steel disc wheels	Sheet steel disc wheels
Type of rim	Drop center rim	Drop center rim
Rim size	4½ K × 15	5 K × 13 unsymmetrical
Tire size	6.40 × 15	6.70 × 13
Tire pressure (cold) in atü (p.s.i.)	front 1.6 (22.7) rear 1.8 (25.6)	1.6 (22.7) 1.7 (24.15)
<b>Springs:</b>	front Coil springs with auxiliary rubber bumper and torsion bar stabilizer	
	rear Coil springs with auxiliary spring and rubber bumper	Coil springs
<b>Shock absorbers:</b>		
	front Tov 36 × 140	Tov 36 × 130
	rear Tdz 36 × 120	Tov 36 × 140
<b>Brakes:</b>		
Foot brake	Hydraulic internal shoe brake acting on all four wheels, in front two leading shoes	Hydraulic internal shoe brake acting on all four wheels, in front two leading shoes Brake drum with turbo cooling Brake shoes are automatically readjusted
Hand brake	Mechanical stick-type hand brake acting on rear wheels	Mechanical stick-type hand brake acting on rear wheels
<b>Dimensions and weights:</b>		
Tread in mm (in.)	front 1,315 (51.77) rear 1,435 (56.50)	1,430 (56.30) 1,470 (57.87)
Wheel base in mm (in.)	2,845 (112.01)	2,820 (111.02)
Length of car in mm (in.)	4,510 (177.56) Convertible A: 4,540 (178.74)	4,715 (185.63)
Width of car in mm (in.)	1,685 (66.34)	1,740 (68.50)
Height of car unloaded, in mm (in.)	1,610 (63.38) Convertible A: 1,550 (61.02)	1,560 (61.42)
Ground clearance in mm (in.)		
Car occupied by 2 persons	approx. 185 (7.29)	approx. 215 (8.47)
Car fully occupied		approx. 162 (6.37)
Car dry weight in kg (lb.)	1,270 (2,800)	1,180 (2,600)
Car dead weight in kg (lb.)	1,355 (2,980) Convertible A: 1,460 (3,220) Convertible B: 1,420 (3,130)	1,280 (2,820)
Useful load in kg (lb.)	365 (805) Convertible A: 260 (575)	450 (990)
Permissible total weight in kg (lb.)	1,720 (3,790) Convertible B: 1,785 (3,935)	1,730 (3,810)

Type	220	220 a
Permissible axle load in kg (lb.)		
front	750 (1,655) Convertible A: 780 (1.720) Convertible B: 785 (1.730)	810 (1,785)
rear	970 (2,140) Convertible A: 940 (2.070) Convertible B: 1,000 (2.205)	920 (2,030)
<b>Capacities:</b>		
Water (without DB heating system) in liters	14.7 (3.88 US gal., 3.23 Imp. gal.)	
(with DB heating system) in liters	15.2 (4.01 US gal., 3.34 Imp. gal.)	11.3 (2.98 US gal., 2.48 Imp. gal.)
Fuel (including reserve) in liters	65 (17.16 US gal., 14.30 Imp. gal.) Reserve: 5 (1.32 US gal., 1.10 Imp. gal.) Up to car No. 1016/52: 47 (12.40 US gal., 10.34 Imp. gal.) Reserve: 3.5 (0.92 US gal., 0.77 Imp. gal.)	64 (16.90 US gal., 1408 Imp. gal.) Reserve: 5 (1.32 US gal., 1.10 Imp. gal.)
Oil in engine, liters, max.	6 (12.68 US pints, 10.56 Imp. pints)	6 (12.68 US pints, 10.56 Imp. pints)
(without oil filter) min.	3.5 (7.40 US pints, 6.16 Imp. pints)	3.5 (7.40 US pints, 6.16 Imp. pints)
Oil filter, in liters	0.25 (0.53 US pints, 0.44 Imp. pints)	0.5 (0.53 US pints, 0.44 Imp. pints)
Water pump, in ccm (cu.in.)	10 (0.61)	10 (0.61)
Transmission, in liters	1.4 (2.96 US pints, 2.46 Imp. pints)	1.4 (2.96 US pints, 2.46 Imp. pints)
Rear axle, in liters	2.6 (5.50 US pints, 4.58 Imp. pints)	2.25 (4.75 US pints, 3.96 Imp. pints)
Steering gear, in liters	ZF steering gear: 0.175 (0.32 US pints, 0.26 Imp. pints) DB steering gear: 0.4 (0.85 US pints, 0.70 Imp. pints)	0.3 (0.64 US pints, 0.52 Imp. pints)
Brake fluid Ate blue, in liters	0.5 (1.06 US pints, 0.88 Imp. pints)	0.5 (1.06 US pints, 0.88 Imp. pints)
Central lubricating system, in liters	0.53 (1.12 US pints, 0.93 Imp. pints)	
Grease for front wheel hubs, in g (oz.)	80 (2.82) each	65 (2.29) each
<b>Electrical Equipment:</b>		
Battery (voltage/capacity)	6 V/84 Ah	12 V/42 Ah (formerly 12 V/42 Ah)
Generator (Bosch)	LJ/GJH 130/6-2200 R	LJ/GEG 160/12-2600 R 2
Starter (Bosch)	EGD 0,6/6 AR 5	EED 0,8/12 R 25

Today a high-compression cylinder head ( $\varepsilon = 7.6$ ) and the camshaft of Type 220 a are standard on the engine of Type 220, Convertible A. This means that the specifications for valve play and valve settings are the same as for Type 220 a.