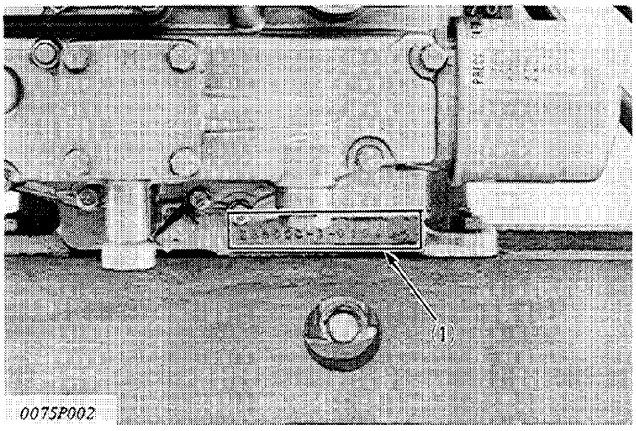
1. ENGINE IDENTIFICATION

Serial Number



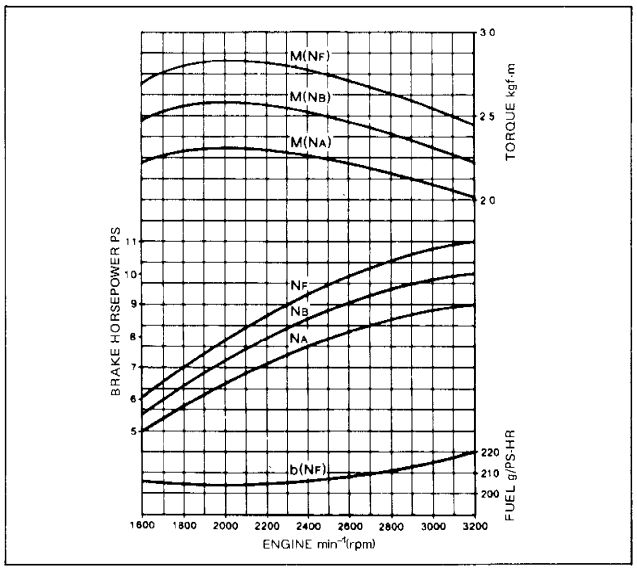
(1) Serial number

2. SPECIFICATIONS

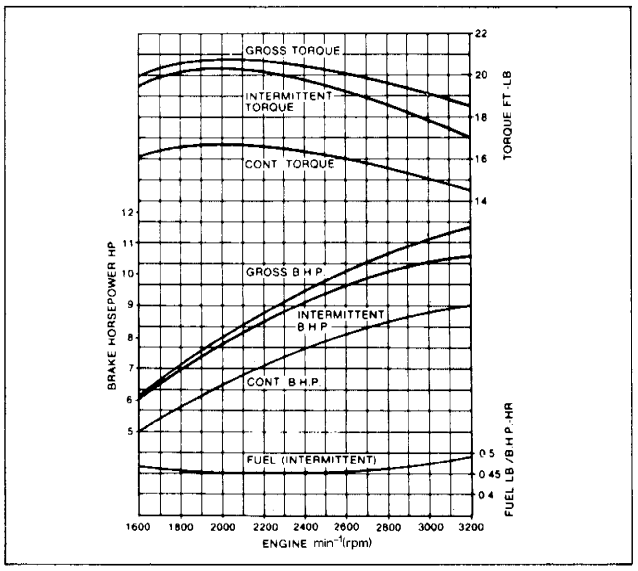
Model	ZB500C-1-B	ZB600C-1-B
Type	Horizontal, water-cooled 4-cycle diesel engine	
Number of Cylinders	2	
Bore and Stroke	68 x 70 L mm 2.68 x 2.76 L in.	72 x 70 L mm 2.83 x 2.76 L in.
Total Displacement	508 cm^3 31.00 cu. in.	570 cm^3 34.78 cu. in.
Brake H.P.		
DIN 6270-NA	6.6 kW / 3200 min^{-1}(rpm) 9.0 PS/ 3200 min^{-1}(rpm)	8.1 kW / 3200 min^{-1}(rpm) 11.0 PS/ 3200 min^{-1}(rpm)
DIN 6270-NB	7.4 kW / 3200 min^{-1}(rpm) 10.0 PS/ 3200 min^{-1}(rpm)	8.8 kW / 3200 min^{-1}(rpm) 12.0 PS/ 3200 min^{-1}(rpm)
DIN 70020	8.1 kW / 3200 min^{-1}(rpm) 11.0 PS/ 3200 min^{-1}(rpm)	9.6 kW / 3200 min^{-1}(rpm) 13.0 PS/ 3200 min^{-1}(rpm)
SAE Gross H.P.	8.6 kW / 3200 min^{-1}(rpm) 11.5 HP/ 3200 min^{-1}(rpm)	10.4 kW / 3200 min^{-1}(rpm) 14.0 HP/ 3200 min^{-1}(rpm)
SAE Intermittent H.P.	7.8 kW / 3200 min^{-1}(rpm) 10.5 HP/ 3200 min^{-1}(rpm)	9.3 kW / 3200 min^{-1}(rpm) 12.5 HP/ 3200 min^{-1}(rpm)
SAE Cont. H.P.	6.7 kW / 3200 min^{-1}(rpm) 9.0 HP/ 3200 min^{-1}(rpm)	8.2 kW / 3200 min^{-1}(rpm) 11.0 HP/ 3200 min^{-1}(rpm)
Maximum Bare Speed	3450 min^{-1}(rpm)	3500 min^{-1}(rpm)
Minimum Bare Idling Speed	700 to 800 min^{-1}(rpm)	750 to 850 min^{-1}(rpm)
Combustion Chamber	Spherical Type	
Fuel Injection Pump	Bosch K Type Mini Pump	
Plunger Bore	5 mm 0.197 in.	
Governing	Centrifugal Ball Mechanical Governor	
Injection Nozzle (Model)	Throttle type (DN 12 SD 12)	
Injection Timing	See page 128	
Injection Pressure	13.73 Mpa 140 kgf/cm^2 1991 psi	
Compression Ratio	22	
Lubricating System	Forced lubricating by trochoid pump	
Cooling System	Pressurized Radiator (88.3 kPa) (0.9 kgf/cm^2) (12.8 psi) Natural Circulation (with water pump)	
Starting System	Electric Starting with Cell Starter	
Starter	12 V, 0.8kW	
Starting Support Device	By glow plug in combustion chamber	
Dynamo for Charging	12 V, 50 W	
Fuel	Diesel Fuel No.2-D (ASTM D975)	
Weight (Dry)	74.2 kg 163.6 lbs.	75.1 kg 165.6 lbs.
Battery	12 V, 45AH, equivalent	
Direction of Rotation	Counterclockwise viewed from flywheel	
Application	General Power Source	

3. PERFORMANCE CURVES

ZB500C-1-B

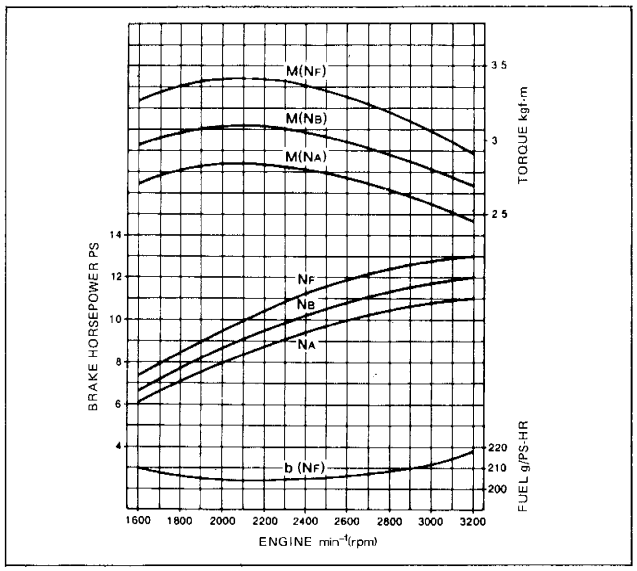


Note:
Each performance curves, obtained in accordance with DIN 6270 and DIN 70020, are corrected to 101kPa (760mmHg), and 20°C, 60% humidity.

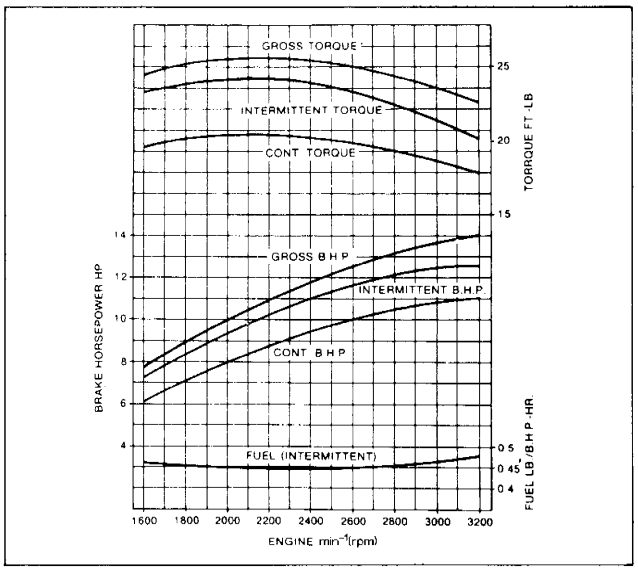


Note:
Each performance curves, obtained in accordance with SAE J816b, are corrected to 101kPa (760mmHg), and 20°C, 60% humidity.

ZB600C-1-B

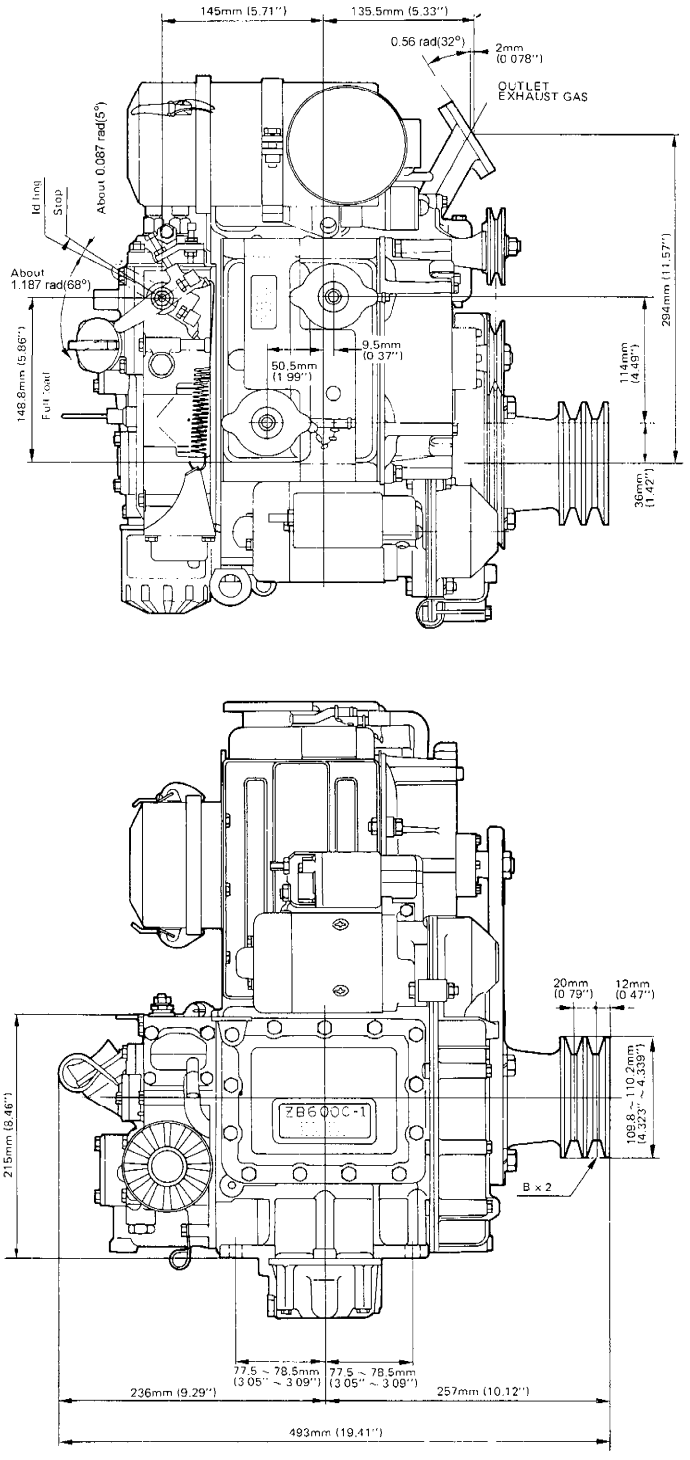


Note:
Each performance curves, obtained in accordance with DIN 6270 and DIN 70020, are corrected to 101kPa (760mmHg), and 20°C, 60% humidity.



Note:
Each performance curves, obtained in accordance with SAE J816b, are corrected to 101kPa (760mmHg), and 20°C, 60% humidity.

4. DIMENSIONS



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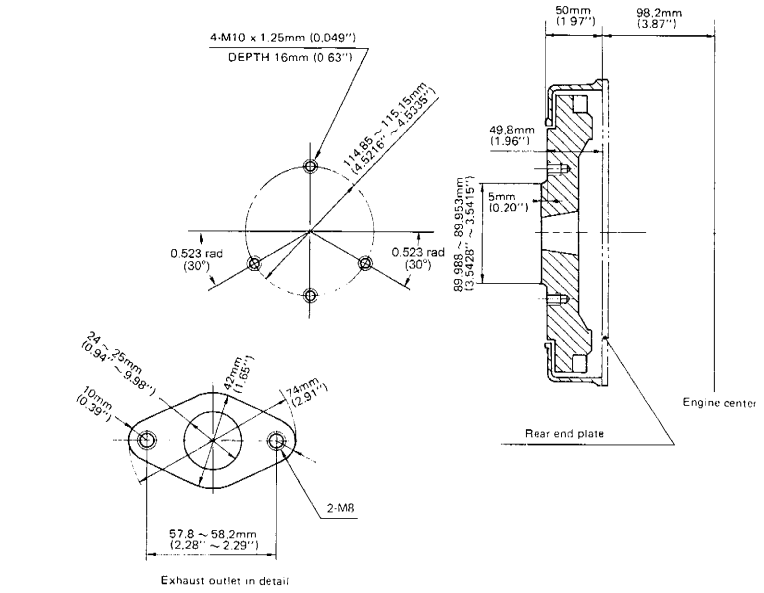
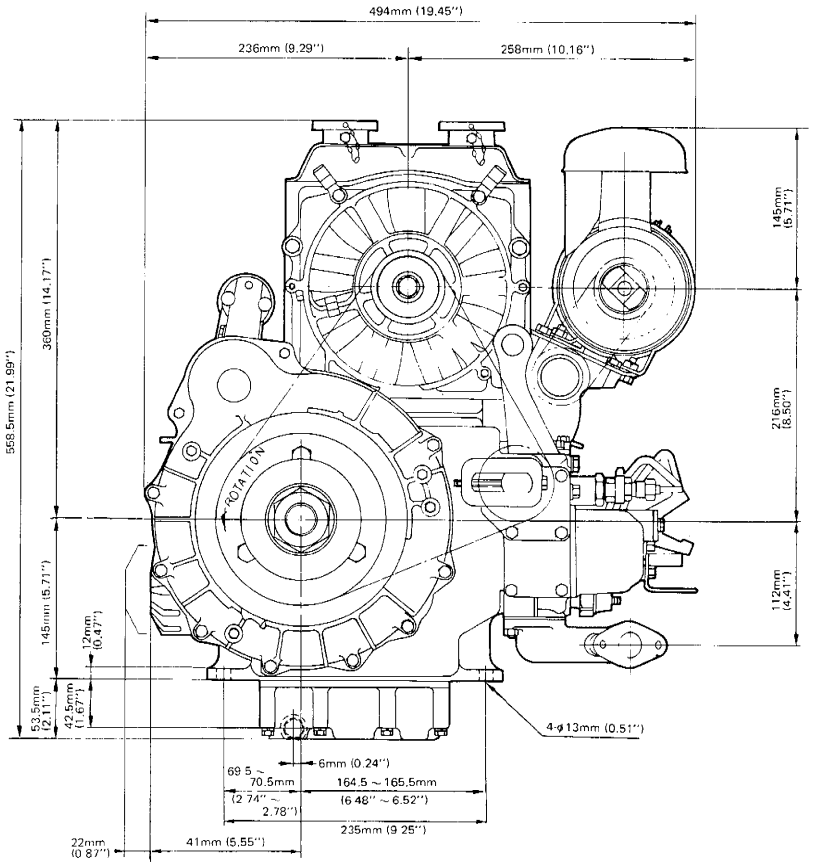

4-M10 x 1.25mm (0.049")
DEPTH 16mm (0.63")
114.65 ~ 115.15mm
(4.5216" ~ 4.5335")
0.523 rad
(30°)
0.523 rad
(30°)
50mm
(1.97")
98.2mm
(3.87")
49.8mm
(1.96")
5mm
(0.20")
89.988 ~ 89.953mm
(3.5428" ~ 3.5415")
Engine center
Rear end plate
24 ~ 25mm
(0.94" ~ 0.98")
10mm
(0.39")
42mm
(1.65")
74mm
(2.91")
2-M8
57.8 ~ 58.2mm
(2.28" ~ 2.29")
Exhaust outlet in detail


494mm (19.45")
236mm (9.29")
258mm (10.16")
558.5mm (21.99")
360mm (14.17")
145mm (5.71")
12mm (0.47")
53.5mm (2.11")
42.5mm (1.67")
145mm (5.71")
216mm (8.50")
112mm (4.41")
ROTATION
4-φ13mm (0.51")
6mm (0.24")
69.5 ~ 70.5mm
(2.74" ~ 2.78")
164.5 ~ 165.5mm
(6.48" ~ 6.52")
235mm (9.25")
22mm
(0.87")
41mm (5.55")

6. BOLT TORQUES

As some of bolts and nuts in the engine are special shape, be careful to tighten them correctly using a torque wrench. When tightening, follow this method: First tighten the all bolts 50% of the regular torque, then tighten them fully.

6-1 TIGHTENING BOLTS OF IMPORTANT PARTS

Important bolts must be tightened after applying oil.

	ZB500C–1	ZB600C–1
Head bolts	39.2 to 44.1 Nm 4.0 to 4.5kgf·m 28.9 to 32.5ft-lbs	64.7 to 69.6Nm 6.6 to 7.1kgf·m 47.7 to 51.4ft-lbs
Connecting rod bolts	26.5 to 30.4Nm 2.7 to 3.1kgf·m 19.5 to 22.4ft-lbs	
Flywheel nuts	294 to 343Nm 30 to 35kgf·m 216.9 to 253.1ft-lbs	
Bearing case bolt 2	29.4 to 34.3Nm 3.0 to 3.5kgf·m 21.7 to 25.3ft-lbs	
Bearing case bolt 1	26.5 to 30.4Nm 2.7 to 3.1kgf·m 19.5 to 22.4ft-lbs	
Rocker arm bracket stud	16.7 to 20.6Nm 1.7 to 2.1kgf·m 12.3 to 15.2ft-lbs	
Glow plug (No need applying oil)	19.6 to 24.5Nm 2.0 to 2.5kgf·m 14.5 to 18.1ft-lbs	
Drain plug (No need applying oil)	44.1 to 53.9Nm 4.5 to 5.5kgf·m 32.5 to 39.8ft-lbs	
Nozzle holder (No need applying oil)	29.4 to 49.0Nm 3 to 5kgf·m 21.7 to 36.2ft-lbs	
Injection pipe (No need applying oil)	14.7 to 24.5Nm 1.5 to 2.5kgf·m 10.8 to 18.1ft-lbs	
Crankshaft nut	137.3 to 156.9Nm 14 to 16kgf·m 101.3 to 115.7ft-lbs	
Fanshaft	52.0 to 77.5Nm 5.3 to 7.6kgf·m 38.3 to 55.0ft-lbs	
Oil Switch (No need applying oil) Bis	1.37 to 1.96Nm 0.14 to 0.20kgf·m 1.01 to 1.45ft-lbs	
Oil Switch (No need applying oil) Taper screw	14.7 to 19.6Nm 1.5 to 2.0kgf·m 10.8 to 14.5ft-lbs	
Fuel limit lock nut (No need applying oil)	27.6 to 34.3Nm 2.8 to 3.5kgf·m 20.3 to 25.3ft-lbs	
Fuel limit cap nut (No need applying oil)	24.5 to 29.4Nm 2.5 to 3.0kgf·m 18.1 to 21.7ft-lbs	

6-2 OTHER BOLT TORQUES

Material Grade / Nominal Dia.	Standard Bolt SS41, S20C	Special Bolt S43C, S48C (Refined)	Special Bolt SCr435, SCM435 (Refined)
M 6	7.8 – 9.3 Nm 0.80 – 0.95 kgf·m 5.8 – 6.9 ft-lbs	9.8 – 11.3 Nm 1.00 – 1.15 kgf·m 7.2 – 8.3 ft-lbs	12.3 – 14.2 Nm 1.25 – 1.45 kgf·m 9.0 – 10.5 ft-lbs
M 8	17.7 – 20.6 Nm 1.80 – 2.10 kgf·m 13.0 – 15.2 ft-lbs	23.5 – 27.5 Nm 2.40 – 2.80 kgf·m 17.4 – 20.3 ft-lbs	29.4 – 34.3 Nm 3.00 – 3.50 kgf·m 21.7 – 25.3 ft-lbs
M10	39.2 – 45.1 Nm 4.00 – 4.60 kgf·m 28.9 – 33.3 ft-lbs	48.0 – 55.9 Nm 4.90 – 5.70 kgf·m 35.4 – 41.2 ft-lbs	60.8 – 70.6 Nm 6.20 – 7.20 kgf·m 44.8 – 52.1 ft-lbs
M12	62.8 – 72.6 Nm 6.40 – 7.40 kgf·m 46.3 – 53.5 ft-lbs	77.5 – 90.2 Nm 7.90 – 9.20 kgf·m 57.1 – 66.5 ft-lbs	103.0 – 117.7 Nm 10.50 – 12.00 kgf·m 75.9 – 86.8 ft-lbs
M14	107.9 – 125.5 Nm 11.00 – 12.80 kgf·m 79.6 – 92.6 ft-lbs	123.6 – 147.1 Nm 12.60 – 15.00 kgf·m 91.1 – 108.5 ft-lbs	166.7 – 196.1 Nm 17.00 – 20.00 kgf·m 123.0 – 144.7 ft-lbs
M16	166.7 – 191.2 Nm 17.00 – 19.50 kgf·m 123.0 – 141.0 ft-lbs	196.1 – 225.5 Nm 20.00 – 23.00 kgf·m 144.7 – 166.4 ft-lbs	259.9 – 304.0 Nm 26.50 – 31.00 kgf·m 191.7 – 224.2 ft-lbs
M18	245.2 – 284.4 Nm 25.00 – 29.00 kgf·m 180.0 – 209.8 ft-lbs	274.6 – 318.7 Nm 28.00 – 32.50 kgf·m 202.2 – 235.1 ft-lbs	343.2 – 402.0 Nm 35.00 – 41.00 kgf·m 253.2 – 296.5 ft-lbs
M20	333.4 – 392.2 Nm 34.00 – 40.00 kgf·m 245.9 – 389.3 ft-lbs	367.7 – 431.5 Nm 37.50 – 44.00 kgf·m 271.2 – 318.2 ft-lbs	490.3 – 568.7 Nm 50.00 – 58.00 kgf·m 361.6 – 419.5 ft-lbs

Bolt material grades are shown by numbers punched on the bolt heads. Prior to tightening, be sure to check out the numbers as shown below:

Punched Number	Bolt Material Grade
None	Standard Bolts SS41, S20C
7	Special Bolts S43C, S48C (Refined)
9	Special Bolts SCM435, SCr435 (Refined)