

General Engine Data			
Type		V-Type, 4 cycle, water cooled, 12 Cylinder	
Aspiration		Turbocharged & Intercooled	
Cylinder Type		Replaceable dry liner	
Bore x Stroke	<i>mm (inch)</i>	128 x 142 (5.04 x 5.59)	
Displacement	<i>litre (in.<sup>3</sup>)</i>	21.927 (1338.1)	
Compression Ratio		14.2 : 1	
Valves per Cylinder	- Intake	2	
	- Exhaust	2	
Valves lashes at cold	- Intake <i>mm (inch)</i>	0.35 (0.0138)	
	- Exhaust <i>mm (inch)</i>	0.40 (0.0177)	
Valve Timing	- Intake	Opening: 24° BTDC	Close: 30° ABDC
	- Exhaust	Opening: 59° BBDC	Close: 21° ATDC
Combustion Type		Direct Injection	
Firing Order		1-12-5-8-3-10-6-7-2-11-4-9	
Injection Timing		12° BTDC	
Rotation		Counter Clockwise, viewed from flywheel	
Dimension (L x W x H)	<i>Approx. mm</i>	1,909 x 1,306 x 1,913	
Dry Weight	<i>Approx. kg (lb.)</i>	1,850 (4,079)	

Approved Ratings		1,470 rpm	1,760 rpm
DF22TiH-N Output	<i>kW (hp)</i>	623 (834)	724 (970)

\*To determine the maximum allowable pump load, a deduction of 10% must be made.

Fuel System			
Injection Pump		Bosch in-line "P" type	
Governor		RSV type (all speed control)	
Feed Pump		Mechanical type	
Injection Nozzle		Multi hole type	
Opening Pressure	<i>kPa (psi)</i>	27,949 (4,053.7)	
Fuel Filter		Full flow, cartridge type	
Used Fuel		Diesel fuel type 2-D Only	
Fuel consumption		See table no. 03.100.06FCEN.XX	
Minimum Supply line Size	<i>mm (inch)</i>	12 (0.47)	
Minimum Return line Size	<i>mm (inch)</i>	12 (0.47)	

Electrical System		24 Volts (Nominal)	
Starter motor	<i>kW</i>	1 x 7	
Recommended Battery Capacity	<i>Ah</i>	200	
Quantity per battery bank		2	
Cold Cranking Amperes	<i>@ -18°C (0°F)</i>	1,000	
Charging Alternator Output	<i>Amps</i>	45	

Air Induction System			
Air Cleaner Type		Drip proof	
Engine Air Flow	<i>m<sup>3</sup>/min.</i>	45.3 @ 1,470 rpm	52.5 @ 1,800 rpm
Air Inlet Restriction Dirty	<i>kPa (mmH<sub>2</sub>O)</i>	6.2 (635)	
Air Inlet Restriction Clean	<i>kPa (mmH<sub>2</sub>O)</i>	2.2 (220)	

**Lubrication System**

<b>Lub. Method</b>		Fully Forced pressure feed type
<b>Oil Pump</b>		Gear type driven by crankshaft
<b>Oil Filter</b>		Full Flow Cartridge type
<b>Oil pressure Range, normal</b>	<i>kPa (psi)</i>	100 (14.5) at idle 300-600 (43.5-87.0) at maximum speed
<b>Max. Oil Sump Temperature</b>	<i>°C (°F)</i>	108 (226)
<b>Oil Sump Capacity - High</b>	<i>litre (gal.)</i>	40 (10.6)
<b>- Low</b>	<i>litre (gal.)</i>	33 (8.7)
<b>Total Engine Oil Capacity</b>	<i>litre (gal.)</i>	40 (10.6)
<b>Minimum Oil Pressure</b>	<i>kPa (psi)</i>	75 (10.9)

**Cooling system**

<b>Heat Exchanger Minimum Raw Water Flow</b>		1 litre / minute per kW installed	
<b>Engine Water Pump</b>		Centrifugal type driven by belt	
<b>Water Pump Capacity</b>	<i>litre/min. (gal./min.)</i>	415 (109.6) @ 1,470 rpm	508 (134.2) @ 1,800 rpm
<b>Heat Exchanger Raw water Inlet</b>			
<b>Maximum Pressure</b>	<i>kPa (psi)</i>	1,500 (217.6)	
<b>Flow</b>	<i>litre/min. (gal./min.)</i>	555 (146)	
<b>Maximum Temperature</b>	<i>°C (°F)</i>	37.8 (100)	
<b>Thermostat Start to Open</b>	<i>°C (°F)</i>	71 (160)	
<b>Fully Opened</b>	<i>°C (°F)</i>	85 (185)	
<b>Coolant Capacity</b>	<i>litre (gal.)</i>	35 (9.4)	
<b>Coolant Pressure Cap</b>	<i>kPa (psi)</i>	95 (13.8)	
<b>Maximum Raw Water Supply pipe</b>			
<b>Connection to Heat Exchanger</b>	<i>inch</i>	2½" BSP	
<b>Maximum Raw Water Discharge pipe</b>			
<b>Connection from Heat Exchanger</b>	<i>inch</i>	3" BSP	
<b>Max. Engine Coolant Temperature</b>	<i>°C (°F)</i>	96 (204.8)	
<b>Pressure loss Engine Cooling Circuit</b>	<i>kPa (psi)</i>	80 (11.6)	

**Exhaust System**

<b>Exhaust Gas Flow</b>	<i>m<sup>3</sup>/min.</i>	119.3 @ 1,470 rpm	138.4 @ 1,800 rpm
<b>Exhaust Gas Temperature</b>	<i>°C (°F)</i>	590 (1,094) @ 1,470 rpm	561 (1,042) @ 1,800 rpm
<b>Max. Allowable Back Pressure</b>	<i>kPa (mmH<sub>2</sub>O)</i>	6.2 (630)	
<b>Minimum Exhaust Pipe Diameter</b>	<i>mm(inch)*</i>	2x 138.4 (5")	

\* Based on Nominal System. Flow analysis must be done to assure adherence to system limitations!

(Minimum exhaust pipe diameter is based on 15 feet of pipe, one elbow, and a silencer. Pressure drop no greater than one half the max. allowable back pressure)

**Heater System**

<b>Wattage (Nominal)</b>	<i>W</i>	3,000
<b>Voltage – AC</b>	<i>V</i>	230

**Engine Performance Data**

All data is based on the engine operating with fuel system, lubricating oil pump, air cleaner, and alternator; not included are compressor, fan, optional equipment, and driven components. Data is based on operation at SAE standard J1394 conditions of 300ft (91.4m) altitude, 29.61 in.(752mm) Hg dry barometer, and 77°F (25°C) intake air temperature, using No.2 diesel or a fuel corresponding to ASTM-D2.

<b>Altitude above which output should be Limited</b>	<i>m(ft.)</i>	91.4 (300)
<b>Correction Factor per 305m.(1000ft.) above Altitude Limit</b>		3 %
<b>Temperature above which output should be Limited</b>	<i>°C(°F)</i>	25 (77)
<b>Correction Factor per 11°C (10°F) above Temperature Limit</b>		2% (1%)