General

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel.
Turbocharged

Number of cylinders			6
Displacement, total		litre in^3	12,78 779,7
Firing order			1-5-3-6-2-4
Bore		mm in	131 5,16
Stroke		mm in	158 6,22
Compression ratio			18,1:1
Wet weight	Engine only	kg lb	1325 2921
	Engine incl. cooling system, air filtration system, and frame	kg lb	1790 3946

Performance			**rpm**	**1500**	**1800**
Prime Power		without fan	kW hp	364 495	410 558
		with fan	kW hp	354 481	392 533
Standby Power		without fan	kW hp	399 543	449 611
		with fan	kW hp	389 529	431 586
Torque at:	Prime Power		Nm lbft	2317 1709	2175 1604
	Standby Power		Nm lbft	2540 1873	2382 1757
Mean piston speed			m/s ft/sec	7,9 26,0	9,5 31,2
Effective mean pressure at:	Prime Power		MPa psi	2,3 331	2,1 310
Effective mean pressure at:	Standby Power		MPa psi	2,5 362	2,3 340
Max combustion pressure at:	Prime Power		MPa psi	16,1 2335	17,2 2495
Max combustion pressure at:	Standby Power		MPa psi	17,2 2495	18,1 2625
Total mass moment of inertia, J (mR^2)			kgm^2 $lbft^2$	3,43 81,4	
Friction Power			kW hp	30 40,8	44 59,84
Derating see Technical Diagrams					

Engine noise emission

Test Standards: ISO 3744-1981 (E) sound power

Tolerance ± 0.75 dB(A)		**rpm**	**1500**	**1800**
Measured sound power Lw	No load	dB(A)	113	116,4
	Prime Power	dB(A)	116,2	118,5
	Standby Power	dB(A)	116,5	118,5
Calculated sound pressure Lp at 1 m	No load	dB(A)	97,1	100,4
	Prime Power	dB(A)	99,8	102,2
	Standby Power	dB(A)	100	102,3

Unsilenced exhaust noise

Data calculated as sound pressure Lp.

Assumed microphone distance 1 m	**rpm**	**1500**	**1800**
Prime Power	dB(A)	114	118
Standby Power	dB(A)	115	119

Test conditions for load acceptance data

Warm engine.	**Generator**	**Model**	**Type of AVR**
	Stamford	HCI544C	SX440

Load acceptance performance can vary due to actual alternator inertia, voltage regulator, type of load and local ambient conditions.

Single step load performance at 1500 rpm

Load (%)	Speed diff (%)		Recovery time (s)		Remaining load	Speed diff (%)		Recovery time (s)	
	Prime	Standby	Prime	Standby	(%)	Prime	Standby	Prime	Standby
0-20	1,1	1,3	1,5	1,5	20-100	20,7	23,9	3,3	4,0
0-40	2,8	3,4	1,7	1,7	40-100	6,8	6,8	1,6	1,6
0-60	7,0	9,9	2,8	2,5	60-100	2,6	2,9	1,5	1,6
0-80	18,9	23,2	3,1	3,6	80-100	1,2	1,1	1,5	1,8
0-61	7,0		2,8		61-100	2,4		1,6	
0-65	10,0		2,4		65-100	2,1		1,6	
0-55		6,9		2,8	55-100		3,4		1,8
0-60		10,0		2,5	60-100		2,9		1,7
100-0	5,0	5,5	2,1	2,1					

Single step load performance at 1800 rpm

Load (%)	Speed diff %		Recovery time (s)		Remaining load	Speed diff (%)		Recovery time (s)	
	Prime	Standby	Prime	Standby	(%)	Prime	Standby	Prime	Standby
0-20	1,0	1,1	1,7	1,8	20-100	6,5	8,4	1,9	3,4
0-40	2,2	2,4	2,2	2,0	40-100	3,0	3,7	2,0	1,7
0-60	4,1	4,2	2,2	1,6	60-100	1,9	2,2	2,5	2,3
0-80	8,7	9,3	3,2	2,6	80-100	0,9	0,9	1,9	2,0
0-78	6,5		2,1		78-100	0,9		2,2	
0-88	10,0		2,9		88-100	0,7		1,3	
0-71		6,4		1,4	71-100		1,5		2,1
0-80		10,0		3,0	80-100		1,0		1,8
100-0	3,7	4,0	2,1	2,1					

Cold start performance			rpm	1500	1800
Time from start to stay within 0.5% of no load speed at ambient temperature:	°C	20	s	4,8	4,6
		5	s	5,7	5,2
		-15*	s	6,6	6,0

* With manifold heater 4 kW engaged, lubrication oil 15W/40 and block heater.

Block heater type	Make	Power kW	Engaged hours	Cooling water temp engine block
	Volvo	2	12	10°C 50°F

Lubrication system			rpm	1500	1800
Lubricating oil consumption	Prime Power		litre/h US gal/h	0,04 0,011	0,05 0,013
	Standby Power		litre/h US gal/h	0,04 0,011	0,05 0,013
Oil system capacity including filters			litre US gal	36 9,5	
Oil sump capacity:		max	litre US gal	30 7,9	
		min	litre US gal	19 5,0	
Oil change intervals/specifications:	VSD3		h	600	
	VSD2		h	400	
			h	200	
Engine angularity limits:		front up	°	20	
		front down	°	20	
		side tilt	°	20	
Oil pressure at rated speed			kPa psi	370 - 520 54 - 75	
Lubrication oil temperature in oil sump:		max	°C °F	130 266	
Oil filter micron size			µ	40	

* See also general section in the sales guide

Fuel system			rpm	1500	1800
Prime Power Specific fuel consumption at:	25%		g/kWh lb/hph	219 0,355	229 0,371
	50%		g/kWh lb/hph	200 0,324	205 0,332
	75%		g/kWh lb/hph	197 0,319	200 0,324
	100%		g/kWh lb/hph	194 0,314	201 0,326
Standby Power Specific fuel consumption at:	25%		g/kWh lb/hph	215 0,349	225 0,365
	50%		g/kWh lb/hph	199 0,323	204 0,331
	75%		g/kWh lb/hph	198 0,321	201 0,326
	100%		g/kWh lb/hph	195 0,316	202 0,327

Fuel system			rpm	1500	1800
Fuel to conform to			ASTM-D975-No1 and 2D JIS KK 2204, EN 590		
System supply flow at:			litre/h US gal/h	120,0 31,7	130,0 34,3
Fuel supply line max restriction (Measured at fuel inlet connection)			kPa psi	30,0 4,4	30,0 4,4
Fuel supply line max pressure, engine stopped			kPa psi	20,0 2,9	20,0 2,9
System return flow			litre/h US gal/h	18,0 4,8	18,0 4,8
Fuel return line max restriction (Measured at fuel return connection)			kPa psi	20,0 2,9	20,0 2,9
Maximum allowable inlet fuel temp (Measured at fuel inlet connection)			°C °F	50 122	50 122
Prefilter / Water separator micron size			µ	10	
Fuel filter micron size			µ	5	
Governor type/make, standard			Volvo / EMS 2.2		
Injection pump type/make			Delphi E3		

Intake and exhaust system			rpm	1500	1800
Air consumption at: (+25°C and 100kPa)	Prime Power		m^3/min cfm	27 954	33 1165
	Standby Power		m^3/min cfm	28 989	33 1165
Max allowable air intake restriction including piping			kPa psi	5 0,7	5 0,7
Air filter restriction clean Volvo Penta filter			kPa psi		
Heat rejection to exhaust at:		Prime Power	kW BTU/min	243 13819	280 15923
		Standby Power	kW BTU/min	266 15127	324 18426
Exhaust gas temperature after turbine at:		Prime Power	°C °F	440 824	440 824
		Standby Power	°C °F	465 869	490 914
Max allowable back pressure in exhaust line		Prime Power	kPa psi	9 1,3	9 1,3
		Standby Power	kPa psi	10 1,5	10 1,5
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)		Prime Power	m^3/min cfm	63,5 2243	77,0 2719
		Standby Power	m^3/min cfm	67,5 2384	82,0 2896

Cooling system			rpm	1500	1800
Heat rejection radiation from engine at:	Prime Power		kW	13	22
			BTU/min	739	1251
	Standby Power		kW	15	23
			BTU/min	853	1308
Heat rejection to coolant at:	Prime Power		kW	143	165
			BTU/min	8132	9383
	Standby Power		kW	155	180
			BTU/min	8815	10236
Coolant	Volvo Penta coolant "ready mix" or Volvo Penta coolant mixed with clean fresh water 40 / 60				
Radiator cooling system type			Closed circuit		
Standard radiator core area			m²	0,8	
			foot²	8,61	
Fan diameter			mm	890	
			in	35,04	
Fan power consumption - LOW fan ratio			kW	6	11
			hp	8	15
Fan power consumption - STD fan ratio			kW	10	18
			hp	14	24
Fan drive ratio - LOW				0,84 : 1	
Fan drive ratio - STD				0,99 : 1	
Coolant capacity,	engine		litre	20	
			US gal	5,28	
	std radiator and hoses		litre	24	
			US gal	6,34	
Coolant pump			drive/ratio	Belt / 1,43 :1	
Coolant flow with standard system			l/s	5	5,5
			US gal/s	1,32	1,45
Minimum coolant flow			l/s	5,0	5,5
			US gal/s	1,32	1,45
Maximum outer circuit restriction, including piping			kPa	39	47
			psi	5,7	6,8
Thermostat	start to open		°C	82	
			°F	180	
	fully open		°C	92	
			°F	198	
Maximum static pressure head (expansion tank height + pressure cap setting)			kPa	100	
			psi	14,5	
Minimum static pressure head (expansion tank height + pressure cap setting)			kPa	70	
			psi	10,2	
Standard pressure cap setting			kPa	70	
			psi	10,2	
Maximum top tank temperature			°C	107	
			°F	225	
Draw down capacity. The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still are functioning			litre	1,8	
			US gal	0,48	

Charge air cooler system		rpm	1500	1800
Heat rejection to charge air cooler	Prime Power	kW	64	94
		BTU/min	3640	5346
	Standby Power	kW	77	92
		BTU/min	4379	5232
Charge air mass flow	Prime Power	kg/s	0,48	0,62
	Standby Power	kg/s	0,51	0,63
Charge air inlet temp. (Charge air temp after turbo compressor)	Prime Power	°C	184	199
		°F	363	390
	Standby Power	°C	197	199
		°F	387	390
Charge air outlet temp. (Charge air temp after intercooler)	Prime Power	°C	44	44
		°F	111	111
	Standby Power	°C	45	45
		°F	113	113
Maximum pressure drop over charge air cooler incl. piping		kPa	8	
		psi	1,16	
Charge air pressure (After charge air cooler)		kPa	221	
		psi	32,05	
Standard charge air cooler core area		m²	0,89	
		foot²	9,58	

Cooling performance

Cooling air flow and external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm. (radiator and cooling fan, see optional equipment)

Engine speed rpm	Air on temp °C	PRIME POWER		STANDBY POWER	
		Air flow m^3/s	External restriction Pa	Air flow m^3/s	External restriction Pa
1500					
	50	4,3	788	5,0	528
	55	5,1	482	5,8	246
	59	5,6	211	6,5	0
	63	6,5	0		
1800	40	4,2	1600	4,7	1308
	50	5,5	1019	6,0	812
	60	7,2	311	8,1	0
	63	8,1	0		
1500 (LOW 0,84)	35	3,1	680	3,5	582
	45	3,8	502	4,4	300
	50	4,3	338	4,9	115
	53	4,6	230	5,3	0
	58	5,3	0		
1800 (LOW 0,84)	35	3,9	940	4,2	850
	40	4,3	810	4,7	675
	45	4,8	630	5,2	480
	50	5,4	430	5,9	270
	54	6,0	240	6,6	0
	57	6,6	0		

Note! External restrictions are calculated for values >0 Pa

Engine management system

Functionality	Alternatives	Default setting
Governor mode	Isochronus / Droop	Isochronus
Governor droop	0-8 %	0,0
Governor response	Adjustable PID-constants (VODIA)	Standard
Dual speed	YES	1500 or 1800
Idle speed	600-1200	900
Fine speed adjustment	± 120	0
Stop function	Energized to Run / Stop	Energized to Stop
Preheating function	On / Off	On
Lamp test	On / Off	On

Engine sensor and switch settings

			Alarm level		Engine protection	
Parameter		**Unit**	**Setting range**	**Default setting**	**Level**	**Action. Default/Alternative**
Oil temp		°C	120 - 130	125	Setting +5	Shut down.
Oil pressure	Low idle	kPa	-	150,0	2,0	Shut down.
	1500 rpm	kPa	250 -220	250,0	-30,0	Shut down.
	1800 rpm	kPa	300 - 270	300,0	-30,0	Shut down.
Oil level			-	Min level	-	-
Piston cooling pressure >1000 rpm		kPa	-	150	150,0	Shut down.
Coolant temp		°C	95 - 101	98	Setting +2	Shut down.
Coolant level			See cooling system	On	Low level	
Fuel feed pressure	Low idle	kPa	-	100	-	-
	>1400 rpm		-	200	-	-
Water in fuel			-	High level	-	-
Crank case pressure		kPa	-	Increased pressure	Increased pressure	Shut down.
Air filter pressure droop		kPa	-	5	-	-
		0,0	Alarm level		Engine protection	
Altitude, above sea		m	-	-	-	Automatic derating, see section derating
Charge air temp		°C	-	80	85	Shut down.
Charge air pressure		kPa	-	350	360	Shut down.
Engine speed		rpm	100 - 120% of rated speed	120% of rated speed	Alarm level	Shut down.

Engine protection can be disabled. For consequences please see VP International Limited Warranty Policy

Electrical system

Voltage and type		24V / insulated from earth	
Alternator:	make/output	A	Bosch 80 A
	tacho output	Hz/alt. Rev	6
	drive ratio		5,3:1
Starter motor		make	Melco
		type	105P70
		kW	7,0
Number of teeth on:	flywheel		153
	starter motor		12
Max wiring resistance main circuit		mΩ	2
Cranking current at +20°C		A	180
Crank engine speed at 20°C		rpm	155

Starter motor battery capacity:	max	Ah/A	2x225
	min at +5°C	Ah/A	-
Inlet manifold heater (at 20 V)		kW	4,0
Power relay for the manifold heater		A	1

Power take off		**rpm**	**1500**	**1800**
Front end in line with crank shaft max:		Nm lbft	-	
Front end belt pulley load. Direction of load viewed from flywheel side:	max left	kW hp	-	-
	max down	kW hp	-	-
	max right	kW hp	-	-
Timing gear at compressor PTO max:		Nm lbft	160 118	
Speed ratio direction of rotation viewed from flywheel side		0,91:1/clockwise		