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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	16,12
		in^3	983,7
Firing order			1-5-3-6-2-4
Bore		mm	144
		in	5,67
Stroke		mm	165
		in	6,50
Compression ratio			16,5:1
Dry weight	Engine only, excluding cooling system	kg	1480
		lb	3263
	GenPac	kg	1910
		lb	4211
Wet weight	Engine only, excluding cooling system	kg	1550
		lb	3417
	GenPac	kg	2020
		lb	4453

Performance		**r/min**	**1500**	**1800**
Prime Power	without fan	kW	441	504
		hp	600	685
	with fan	kW	430	485
		hp	585	660
Standby Power	without fan	kW	484	565
		hp	658	768
	with fan	kW	473	546
		hp	643	743
Torque at:	Prime Power	Nm	2807	2674
		lbft	2071	1972
	Standby Power	Nm	3081	2997
		lbft	2272	2211
Mean piston speed		m/s	8,3	9,9
		ft/sec	27,1	32,6
Effective mean pressure at:	Prime Power	MPa	2,2	2,1
		psi	317	302
Effective mean pressure at:	Standby Power	MPa	2,4	2,3
		psi	348	339
Max combustion pressure at:	Prime Power	MPa	16,4	17,1
		psi	2379	2480
Max combustion pressure at:	Standby Power	MPa	17,5	18,2
		psi	2538	2640
Total mass moment of inertia, J (mR2)		kgm^2	4,20	
		$lbft^2$	99,7	
Degree of irregularity at:	Prime Power		1:50	1:88
Friction Power		kW	36	53
		hp	48,96	72,08

Derating

The engine may be operated up to 3130 m altitude without derating at 1500rpm.
The engine may be operated up to 1630 m altitude without derating at 1800rpm.
For operation at higher altitudes the power will be derated according to the graph below.
There is no derating for ambient temperature or humidity.

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Engine noise emission

Test Standards: ISO 3744-1981 (E) sound power (with fan & radiator, without intake and exhaust noise)

Tolerans ± 0.75 dB(A)		**r/min**	**1500**	**1800**
Measured sound power Lw	No load	dB(A)	113,1	116,9
	Prime Power	dB(A)	116,9	119
	Standby Power	dB(A)	116,9	119,4
Calculated sound pressure Lp at 1 m	No load	dB(A)	101,1	104,9
	Prime Power	dB(A)	104,9	107
	Standby Power	dB(A)	104,9	107,4

Unsilenced exhaust noise

Data calculated as sound pressure Lp. (Without fan & radiator)

Assumed microphone distance 1 m	**r/min**	**1500**	**1800**
Prime Power	dB(A)	115	119
Standby Power	dB(A)	116	120

Test conditions for load acceptance data

Warm engine.	Generator	Modell	Type of AVR
	Stamford	HCI 544 E1	SX 440

Load acceptance performance can vary due to actual alternator inertia, voltage regulator, type of load and local ambient conditions. UFRO: STD-setting 47 / 57 Hz.

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	2,4	2,6	1,3	1,2	20-100	24,1	28,9	4,7	7,8
0-40	4,0	4,1	1,3	1,3	40-100	12,6	14,2	3,4	4,5
0-54		10,0		2,5	54-100		8,3		3,0
0-59	10,0		2,5		59-100	7,5		2,8	
0-60	11,0	15,3	2,6	3,0	60-100	6,0	6,4	1,7	2,0
0-80	19,3	28,7	3,2	4,6	80-100	2,3	2,2	1,3	2,0
0-100	36,6	42,8	5,3	7,3					
100-0	9,3	10,3	2,5	2,5					

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	1,5	1,7	1,3	1,4	20-100	11,3	10,9	3,5	3,5
0-40	2,8	3,1	1,7	1,6	40-100	4,7	6,0	1,9	3,0
0-60	5,7	7,2	2,3	2,2	60-100	2,7	2,9	1,8	3,0
0-67		10,0		2,9	67-100		7,7		2,9
0-76	10,0		2,9		76-100	2,0		1,5	
0-80	11,0	15,3	2,9	3,7	80-100	1,6	1,7	1,3	1,4
0-100	19,7	23,7	4,0	4,0					
100-0	5,5	6,6	1,0	1,3					

Cold start performance			**r/min**	**1500**	**1800**
Time from start to stay within 0.5% of no load speed at ambient temperature:	°C	20	s	6,5	8,4
		5	s	6,7	8,7
		-15*	s	7,3	9,8
Time from start to stay within 0.8% of no load speed at ambient temperature:	°C	20	s	5,6	7,5
		5	s	6,2	8,2
		-15*	s	6,7	9,2

* With manifold heater kW engaged, lubrication oil 10W/30, block heater and MK1 fuel.

Usage of manifold heater:	Time preheating, minutes	Time postheating, minutes
	0,5	1,7

Ambient temp. °C	Block heater type and Make	Power kW	Engaged hours	Cooling water temp engine block, °C
-15	External Volvo	2	12	17

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Lubrication system			**r/min**	**1500**	**1800**
Lubricating oil consumption	Prime Power		liter/h	0,10	0,11
			US gal/h	0,026	0,029
	Standby Power		liter/h	0,10	0,12
			US gal/h	0,026	0,032
Oil system capacity including filters			liter	48	
			US gal	12,7	
Oil sump capacity:		max	liter	42	
			US gal	11,1	
		min	liter	32	
			US gal	8,5	
Oil change intervals/specifications:	VDS-2*		h	600	
	VDS, ACEA, E3*		h	400	
	ACEA E2, API CD, CF, CF-4, CG-4*		h	200	
Engine angularity limits:		front up	°	30	
		front down	°	30	
		side tilt	°	30	
Oil pressure at rated speed			kPa	300 - 650	
			psi	44 - 94	
Lubrication oil temperature in oil sump:		max	°C	130	
			°F	266	
Oil filter micron size			mm	0,040	

* See also general section in the sales guide

Fuel system		**r/min**	**1500**	**1800**
Prime Power	25%	g/kWh	216	228
Specific fuel consumption at:		lb/hph	0,350	0,369
	50%	g/kWh	199	204
		lb/hph	0,322	0,331
	75%	g/kWh	196	202
		lb/hph	0,318	0,328
	100%	g/kWh	199	206
		lb/hph	0,322	0,334
Standby Power	25%	g/kWh	217	233
Specific fuel consumption at:		lb/hph	0,351	0,377
	50%	g/kWh	197	205
		lb/hph	0,320	0,332
	75%	g/kWh	196	203
		lb/hph	0,318	0,330
	100%	g/kWh	200	210
		lb/hph	0,324	0,340

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Fuel system	**r/min**	**1500**	**1800**
Fuel to conform to	ASTM-D975-No1 and 2-D JIS KK 2204, EN 590		
System return flow	liter/h US gal/h	25 6,6	
System supply flow at rated speed	liter/h US gal/h	170 45	190 50
Fuel supply line max restriction	kPa psi	10 1	
Fuel supply line max pressure, engine stopped	kPa psi	0,0 0,0	
Fuel return line max restriction	kPa psi	20,0 2,9	
Maximum allowable inlet fuel temp	°C °F	60 140	
Prefilter / Water separator	mm	0,010	
Governor type/make, standard	Volvo / EMS 2		
Injection pump type/make	Delphi / E1		

Intake and exhaust system			**r/min**	**1500**	**1800**
Air consumption at:	Prime Power	25°C 77°F	m^3/min cfm	35,5 1254	44 1554
	Standby Power	25°C 77°F	m^3/min cfm	38 1342	45,8 1617
Air intake restriction, clean filter(s)			kPa in wc	1,2 4,8	2 8,0
Max allowable air intake restriction			kPa in wc	5 20,1	5 20,1
Air filter type			Single stage paper cartridge		
Air filter cleaning efficiency			%	99,85	
Heat rejection to exhaust at:		Prime Power	kW BTU/min	326 18539	373 21212
		Standby Power	kW BTU/min	356 20245	442 25136
Exhaust gas temperature after turbine at:		Prime Power	°C °F	443 829	436 817
		Standby Power	°C °F	455 851	479 893
Max allowable back pressure in exhaust line			kPa In wc	10 40,2	10 40,2
Exhaust gas flow at:		Prime Power	m^3/min cfm	85,0 3002	100,6 3553
		Standby Power	m^3/min cfm	92,0 3249	110,4 3899

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Cooling system			**r/min**	**1500**	**1800**
Heat rejection radiation from engine at:	Prime Power		kW BTU/min	18 1024	22 1251
	Standby Power		kW BTU/min	20 1137	24 1365
Heat rejection to coolant at:	Prime Power		kW BTU/min	170 9668	212 12056
	Standby Power		kW BTU/min	184 10464	231 13137
Coolant	Volvo coolant or Volvo anticorrosion additive together with clean fresh water				
Radiator cooling system type			Closed circuit		
Standard radiator core area			m² foot²	1,32 14,21	
Standard radiator core thickness			mm in	52 2,05	
Fan diameter			mm in	890 35,04	
Fan power consumption			kW hp	11 15	19 26
Fan drive ratio				1,04 : 1	
Coolant capacity,	engine		liter US gal	33 8,72	
	Engine + std radiator with with hoses.		liter US gal	60 15,85	
Coolant pump			drive/ratio	Belt / 1,85:1	
Coolant flow with standard system			l/s US gal/s	6,4 1,69	7,7 2,04
Minimum coolant flow			l/s US gal/s	6,4 1,69	7,7 2,04
Maximum external coolant system restriction, including piping			kPa in wc	40 161	60 241
Thermostat		start to open	°C °F	86 187	
		fully open	°C °F	96 205	
Maximum static pressure head (expansion tank height + pressure cap setting)			kPa in wc	100 402	
Minimum static pressure head (expansion tank height + pressure cap setting)			kPa in wc	70 281	
Standard pressure cap setting			kPa in wc	75 301	
Maximum top tank temperature			°C °F	103 217	
Draw down capacity	4% of total cooling system capacity				

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Intercooler system		**r/min**	**1500**	**1800**
Cooling power	Prime Power	kW	91	127
		BTU/min	5175	7222
	Standby Power	kW	110	147
		BTU/min	6256	8360
Combustion air inlet temp. (Charge air temp after turbo compressor)	Prime Power	°C	184	210
		°F	363	410
	Standby Power	°C	202	230
		°F	396	446
Max allowable Comb. Air temp after CAC at 25 degree ambient. (Charge air temp after intercooler)	Standby Power	°C	45	45
		°F	113	113
Maximum pressure droop over intercooler, incl. piping		kPa	10	18
		psi	1,5	2,6
Boost pressure		kPa	240	252
		psi	34,8	36,5
Standard intercooler core area		m²	1,3	
		foot²	13,99	
Standard intercooler core thickness		mm	68	
		in	2,68	

Cooling performance

Cooling air flow and external restriction at different radiator air temperatures based on 103°C TTT and 40% antifreeze (radiator and cooling fan, see optional equipment)

Engine speed	Air on	PRIME POWER		STANDBY POWER	
rpm	temp	Air mass flow	External restriction	Air mass flow	External restriction
	°C	kg/s	Pa	kg/s	Pa
1500	40	5,1	966	5,6	876
	45	5,7	866	6,2	780
	50	6,4	769	7,0	708
	55	7,3	710	8,0	650
	60	8,5	595	9,4	285
	62			10,1	0
	65	10,1	0		
1800	40	6,0	1473	6,9	1286
	45	6,7	1339	7,7	1156
	50	7,6	1195	8,7	1059
	55	8,7	1085	10,0	918
	60	10,1	928	11,7	203
	61			12,4	0
	65	12,4	0		

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Engine management system

Functionallity		Alternatives	Default setting
Governor mode		Isochronous/droop	Isochronous
Governor droop		0-8%	4%
Dual speed		1500/1800	According to customer
Low Idle speed select		600-1200	900
Stop function		Energized to Run / Stop	Energized to stop
Lamp test		On / Off	On
Pre-heat on ignition		On / Off	Off
Governor characteristic			
Gain			
Stability			

Engine protection	Alarm		Engine protection	
Parameter	Selectable span	Default setting	Protection at	Protective action
Oil temperature C	120 - 130	125	Setting +5	Shut down / off *
Oil pressure kPa				
Low idle 900rpm	-	190	Default -30	Shut down / off *
1500 rpm	-	250	::	::
1800 rpm	-	300	::	::
Oil level	-	Min level	-	-
Piston cooling pressure kPa				
>1000rpm	-	150	150	Shut down / off *
Coolant temp	95 - 101	98	Setting +5	Shut down / off *
Coolant level	-	On	Low level	Shut down / off *
Fuel feed pressure kPa				
Low idle 900rpm	-	150	-	-
> 1400 rpm	-	300	-	-
Water in fuel	-	High level	-	-
Crank case pressure kPa	-	-	-	Shut down
Air filter diff pressure kPa	-	5,0	-	-
Altitude, above sea m	-	-	-	Automatic derating,
Charge air temp after cac	-	80	+5	Shut down
Charge air pressure kPa	-	290	300	Shut down
Overspeed	100 - 120% of rated	120% / off *	Alarm level	Shut down / on
Low voltage V	-	25,5	-	-

*Off means no shutdown , alarm only.

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Electrical system		**r/min**	**1500**	**1800**
Voltage and type		24V / insulated from earth		
Alternator:	make/output	Amp	Bosch / 80	
	tacho output	Hz/alt. Rev	6	
	drive ratio		3,9 : 1	
Starter motor		make	Melco	
		type	105P70	
		kW	7,0	
Starter motor solenoid,	pull current	Amp	-	
	hold current	Amp	2,3	
Number of teeth on:	flywheel		153	
	starter motor		12	
Inrush current at +20°C		Amp	700	
Cranking current at +20°C		Amp	280	
Crank engine speed at 20°C		rpm	150	
Starter motor battery capacity:	max	Ah	2 x 225	
	min at +5°C	Ah		
Inlet manifold heater (at 20 V)		kW	4,0	
Power relay for the manifold heater		Amp	1	

Power take off		**r/min**	**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		1,31:1 / anti-clockwise		
Timing gear at servo pump PTO max:		Nm lbft	100 74	
Max allowed bending moment in flywheel housing		Nm lbft	15000 11063	
Max. rear main bearing load		N lbf	5000 1124,0	