

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	16.12 983.7
Firing order			1-5-3-6-2-4
Bore		mm in	144 5.67
Stroke		mm in	165 6.50
Compression ratio			16,5:1
Dry weight	Engine only, excluding cooling system	kg lb	1480 3263
	GenPac	kg lb	1910 4211
Wet weight	Engine only, excluding cooling system	kg lb	1550 3417
	GenPac	kg lb	2020 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 lbft		2807 2071	2674 1972
	Standby Power	Nm lbft		3081 2272	2997 2211
Mean piston speed		m/s ft/sec		8.3 27.1	9.9 32.6
Effective mean pressure at:	Prime Power	MPa psi		2.2 317	2.1 302
Effective mean pressure at:	Standby Power	MPa psi		2.4 348	2.3 339
Max combustion pressure at:	Prime Power	MPa psi		16.4 2379	17.1 2480
Max combustion pressure at:	Standby Power	MPa psi		17.5 2538	18.2 2640
Total mass moment of inertia, J (mR ²)		kgm ² lbft ²		4.20 99.7	
Degree of irregularity at:	Prime Power			1:50	1:88
Friction Power		kW hp		36 48.96	53 72.08

Derating

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

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

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 Specific fuel consumption at:	25%	g/kWh	216	228	
		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 Specific fuel consumption at:	25%	g/kWh	217	233	
		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	

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	25	
	US gal/h	6.6	
System supply flow at rated speed	liter/h	170	190
	US gal/h	45	50
Fuel supply line max restriction	kPa	10	
	psi	1	
Fuel supply line max pressure, engine stopped	kPa	0.0	
	psi	0.0	
Fuel return line max restriction	kPa	20.0	
	psi	2.9	
Maximum allowable inlet fuel temp	°C	60	
	°F	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	m ³ /min	35.5	44
		77°F	cfm	1254	1554
	Standby Power	25°C	m ³ /min	38	45.8
		77°F	cfm	1342	1617
Air intake restriction, clean filter(s)			kPa	1.2	2
			in wc	4.8	8.0
Max allowable air intake restriction			kPa	5	5
			in wc	20.1	20.1
Air filter type	Single stage paper cartridge				
Air filter cleaning efficiency	%				
Heat rejection to exhaust at:	Prime Power		kW	326	373
			BTU/min	18539	21212
	Standby Power		kW	356	442
			BTU/min	20245	25136
Exhaust gas temperature after turbine at:	Prime Power		°C	443	436
			°F	829	817
	Standby Power		°C	455	479
			°F	851	893
Max allowable back pressure in exhaust line			kPa	10	10
			In wc	40.2	40.2
Exhaust gas flow at:	Prime Power		m ³ /min	85.0	100.6
			cfm	3002	3553
	Standby Power		m ³ /min	92.0	110.4
			cfm	3249	3899

Cooling system

		r/min	1500	1800
Heat rejection radiation from engine at:	Prime Power	kW	18	22
		BTU/min	1024	1251
	Standby Power	kW	20	24
		BTU/min	1137	1365
Heat rejection to coolant at:	Prime Power	kW	170	212
		BTU/min	9668	12056
	Standby Power	kW	184	231
		BTU/min	10464	13137
Radiator cooling system type		Closed circuit		
Standard radiator core area		m ² foot ²	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 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	86	
		°F	187	
	fully open	°C	96	
		°F	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		m ²	1.3	
		foot ²	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 rpm	Air on temp °C	PRIME POWER		STANDBY POWER	
		Air mass flow kg/s	External restriction Pa	Air mass flow kg/s	External restriction 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		

Engine management system

Functionality	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 Parameter	Alarm		Engine protection	
	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	-	-	>1500	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.

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	