

Technical data TWD1643GE

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	1700 3748
	GenPac	kg lb	2200 4850
Wet weight	Engine only, excluding cooling system	kg lb	1770 3902
	GenPac	kg lb	2370 5225

Performance		r/min	1500	1800
Prime Power	without fan	kW hp	553 752	615 836
	with fan	kW hp	536 729	585 796
Standby Power	without fan	kW hp	613 834	674 917
	with fan	kW hp	596 811	644 876
Torque at:	Prime Power	Nm lbft	3521 2596	3263 2406
	Standby Power	Nm lbft	3902 2878	3576 2637
Mean piston speed		m/s ft/sec	8,3 27,1	9,9 32,6
Effective mean pressure at:	Prime Power	MPa psi	2,7 398	2,5 369
	Standby Power	MPa psi	3,0 441	2,8 404
Max combustion pressure at:	Prime Power	MPa psi	18,8 2727	19,6 2843
	Standby Power	MPa psi	20,0 2901	19,8 2872
Total mass moment of inertia, J (mR ²)		kgm ² lbft ²	4,20 99,7	
Degree of irregularity at:	Prime Power		1:33	1:55
	Standby Power		1:29	1:51
Friction Power		kW hp	38 52,088	55 74,936

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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)

Tolerance ± 0.75 dB(A)

		r/min	1500	1800
Measured sound power Lw	No load	dB(A)	113	117
	Prime Power	dB(A)	117	120
	Standby Power	dB(A)	117	120
Calculated sound pressure Lp at 1 m	No load	dB(A)	101	105
	Prime Power	dB(A)	105	108
	Standby Power	dB(A)	105	108

Unsilenced exhaust noise

Data calculated as sound pressure Lp.

Assumed microphone distance 1 m

	r/min	1500	1800
Prime Power	dB(A)	116	120
Standby Power	dB(A)	117	120

Test conditions for load acceptance data

Warm engine.	Generator	Model	Type of AVR
	Stamford	HCI534F1	MX341

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

UFRO: STD-setting 47 / 57Hz / 400V/ Dipp=50%.

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	2,8		1,8		20-100	11,6		3,7	
0-40	5,6		1,9		40-100	7,3		2,7	
0-48	7,0		2,6		48-100	6,3		2,1	
0-60	8,8		2,8		60-100	5,5		1,9	
0-65	10,0		3,1		65-100	4,6		1,5	
0-80	13,6		4,0		80-100	3,1		1,5	
0-100	18,7		5,5						
100-0	8,8		2,4						
0-20		3,2		1,9	20-98		12,5		9,2
0-40		6,3		2,1	40-98		7,5		9,0
0-44		7,0		2,7	44-98		7,0		7,8
0-59		10,0		3,3	59-98		5,8		4,3
0-60		10,2		3,4	60-98		5,7		3,9
0-80		15,9		4,5	80-98		3,0		1,6
0-98		20,4		8,8					
98-0		9,1		2,4					

Recovery time = Speed within 1% of nominal speed.

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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	1,6		1,4		20-100	7,3		2,2	
0-40	3,6		1,5		40-100	4,8		2,0	
0-60	5,5		1,7		60-100	3,7		1,6	
0-69	7,0		1,8		69-100	2,9		1,3	
0-80	8,6		2,0		80-100	1,8		1,3	
0-86	10,0		2,0		86-100	1,2		1,2	
0-100	11,9		2,0						
100-0	5,8		2,6						
0-20		1,8		1,5	20-99		7,7		14,8
0-40		4,0		1,7	40-99		5,5		11,2
0-60		6,2		1,8	60-99		3,8		4,4
0-64		7,0		1,8	64-99		3,6		4,3
0-79		10,0		1,9	79-99		1,8		1,4
0-80		10,2		1,9	80-99		1,7		1,3
0-99		13,5		8,1					
99-0		6,6		2,6					

Recovery time = Speed within 1% of nominal speed.

Cold start performance

		r/min	1500	1800	
Time from start to no load speed at ambient temperature:	°C	20	s	4,2	6,0
		5	s	6,8	7,7
		-15*	s	4,8	5,7

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

Usage of manifold heater (c.w). Engaged below:	°C	+20°C
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Ambient temp. °C	Block heater type and make	Power kW	Engaged hours	Cooling water temp engine block
-15°C	Volvo Penta no: 889858	2000 W	10 h	+16°C

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Lubrication system		r/min	1500	1800
Lubricating oil consumption	Prime Power	litre/h US gal/h	0,10 0,026	0,10 0,026
	Standby Power	litre/h US gal/h	0,11 0,029	0,11 0,029
Oil system capacity including filters		litre US gal	48 12,7	
Oil sump capacity:	max	litre US gal	42 11,1	
	min	litre US gal	32 8,5	
Oil change intervals/specifications:	VDS-2/VDS-3*	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 psi	300 - 650 44 - 94	
Lubrication oil temperature in oil sump:	max	°C °F	130 266	
Oil filter micron size		µ	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 lb/hph	215 0,349	224 0,363
	50%	g/kWh lb/hph	196 0,318	201 0,326
	75%	g/kWh lb/hph	196 0,318	197 0,319
	100%	g/kWh lb/hph	199 0,323	202 0,327
Standby Power Specific fuel consumption at:	25%	g/kWh lb/hph	210 0,340	220 0,357
	50%	g/kWh lb/hph	195 0,316	200 0,324
	75%	g/kWh lb/hph	196 0,318	198 0,321
	100%	g/kWh lb/hph	200 0,324	204 0,331

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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	25	
	US gal/h	6,6	
System supply flow at rated speed	liter/h	190	210
	US gal/h		
Fuel supply line max restriction	kPa	10,0	
	psi	1,5	
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 / E3		

Intake and exhaust system		r/min	1500	1800
Air consumption at:	Prime Power	m ³ /min	43,65	53,07
		cfm	1541	1874
	Standby Power	m ³ /min	46,96	54,85
		cfm	1658	1937
Air intake restriction, clean filter(s)		kPa	1,5	2
		in wc	6,0	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		%	99,85	
Heat rejection to exhaust at:	Prime Power	kW	415	472
		BTU/min	23601	26842
	Standby Power	kW	463	530
		BTU/min	26330	30141
Exhaust gas temperature after Low Pressure turbine at:	Prime Power	°C	450	422
		°F	842	792
	Standby Power	°C	463	461
		°F	865	862
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	101,6	119,0
		cfm	3586	4201
	Standby Power	m ³ /min	111,8	130,1
		cfm	3949	4593

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Cooling system		r/min	1500	1800
Heat rejection radiation from engine at:	Prime Power	kW	23	26
		BTU/min	1308	1479
	Standby Power	kW	33	33
		BTU/min	1877	1877
Heat rejection to coolant engine radiator at:	Prime Power	kW	208	246
		BTU/min	11829	13990
	Standby Power	kW	226	270
		BTU/min	12852	15355
Heat rejection to coolant CAC radiator at:	Prime Power	kW	116	121
		BTU/min	6597	6881
	Standby Power	kW	125	135
		BTU/min	7109	7677
Coolant	Volvo Penta coolant "ready mix" or Volvo Penta coolant mixed with clean fresh water 40 / 60			
Radiator cooling system type	Closed circuit			
Engine radiator core area	m ²		1,68	
	foot ²		18,08	
CAC radiator core area	m ²		1,68	
	foot ²		18,08	
Fan diameter	mm		965	
	in		37,99	
Fan power consumption	kW		17	30
	hp		23	41
Fan drive ratio	1,04 : 1			
Coolant capacity,	engine	litre	33	
		US gal	8,72	
	Engine radiator and CAC-radiator with hoses	litre	95	
		US gal	25,10	
Coolant pump	drive/ratio	Belt / 1,85 : 1		
Coolant flow engine radiator (at fully opened thermostat)	l/s		4,8	6,0
	US gal/s		1,3	1,6
Coolant flow CAC-radiator (at fully opened thermostat)	l/s		1,5	1,6
	US gal/s		0,4	0,4
Maximum external coolant system restriction, including piping Engine radiator	kPa		34	50
	in wc		137	201
Maximum external coolant system restriction, including piping CAC-radiator	kPa		24	25
	in wc		96	100
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	
	in wc		402	
Minimum static pressure head (expansion tank height + pressure cap setting)	kPa		70	
	in wc		281	
Standard pressure cap setting	kPa		75	
	in wc		301	
Maximum top tank temperature	°C		103	
	°F		217	
Draw down capacity	4% of total cooling system capacity			
Charge air temperature. Inlet manifold, max allowed. (At air inlet temp. 25 degr. C)	°C		50	50
	°F			

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Cooling performance

Cooling air flow and external restriction at different radiator air temperatures based on 103°C TTT and 50% antifreeze (radiator and cooling fan, see optional equipment)

Engine speed rpm	Air on temp °C	PRIME POWER		STANDBY POWER	
		Air flow kg/s	External restriction Pa	Air flow kg/s	External restriction Pa
1500	33			8,0	1000
	39	8,0	1000		
	43			10,0	600
	49	10,0	600		
	50			12,0	200
	54			13,0	0
	55	12,0	200		
1800	58	13,0	0		
	35			10,0	1000
	42	10,0	1000		
	44			12,0	600
	50			14,0	200
	51	12,0	600		
	55			15,0	0
	56	14,0	100		
	58	15,0	0		

Note! Calculated values >0 Pa

Engine management system

Functionality	Alternatives	Default setting
Governor mode	Isochronous/droop	Isochronous
Governor droop	0-8%	4%
Governor response	Adjustable PID-constants (VODIA)	Not adjusted
Dual speed	1500 / 1800	According to customer
Idle speed	600-1200	900
Fine speed adjustment	±120	0
Stop function	Energized to Run / Stop	Energized to stop
Preheating function	On / Off	Off
Lamp test	On / Off	On

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Engine protection		Alarm level		Engine protection		
Parameter	Unit	Setting range	Default setting	Level	Action. Default/Alternative	
Oil temp	°C	120 - 130	125	Setting +5	Shut down. ON/OFF*	
Oil pressure	Low idle	kPa	-	190	160	Shut down. ON/OFF*
	1500 rpm	kPa	-	250	220	Shut down. ON/OFF*
	1800 rpm	kPa	-	300	270	Shut down. ON/OFF*
Oil level		-	Min level	-	-	
Piston cooling pressure >1000 rpm	kPa	-	150	150	Shut down. ON/OFF*	
Coolant temp	°C	95 - 103	98	Setting +5	Shut down. ON/OFF*	
Coolant level		-	On	Low level	Shut down. ON/OFF*	
Fuel feed pressure	Low idle	kPa	-	150	-	-
	>1400 rpm		-	250	-	-
Water in fuel		-	High level	-	-	
Crank case pressure	kPa	-	Increased pressure	Increased pressure	Shut down. ON/OFF*	
Air filter pressure droop	kPa	-	5,0	-	-	
Altitude, above sea	m	-	-	1500	Automatic derating, see section derating	
Charge air temp	°C	-	80	85	Shut down. ON/OFF*	
Charge air pressure	kPa	-	500 (absolute)	510 (absolute)	Shut down. ON/OFF*	
Engine speed	rpm	100 - 120% of rated speed	115% of rated speed	Alarm level	Shut down. OFF/ON*	
Exhaust temp**	°C	-	580	610	Shut down. ON/OFF*	
Low voltage	V	-	25,5	-	-	

* Off means no shut down, alarm only

** Between high pressure turbin and low pressure turbin

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	750	
Cranking current at +20°C		Amp	300	
Crank engine speed at 20°C		rpm	155	
Starter motor battery capacity:	max	Ah	2x225	
	min at +5°C	Ah	-	
Inlet manifold heater (at 20 V)		kW	4,0	
Power relay for the manifold heater		Amp	1	

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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	NA	