

# Technical data TAD1641GE

## 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 <sup>3</sup>	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 <sup>2</sup> )		kgm <sup>2</sup> lbft <sup>2</sup>	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 in technical diagrams.

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  $\pm 0.75$  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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<b>Lubrication system</b>		<b>r/min</b>	<b>1500</b>	<b>1800</b>
Lubricating oil consumption	Prime Power	liter/h US gal/h	0,10 0,026	0,11 0,029
	Standby Power	liter/h US gal/h	0,10 0,026	0,12 0,032
Oil system capacity including filters		liter US gal	48 12,7	
Oil sump capacity:	max	liter US gal	42 11,1	
	min	liter US gal	32 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 psi	300 - 650 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

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

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<b>Fuel system</b>	<b>r/min</b>	<b>1500</b>	<b>1800</b>
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		

<b>Intake and exhaust system</b>		<b>r/min</b>	<b>1500</b>	<b>1800</b>	
Air consumption at:	Prime Power	25°C 77°F	m <sup>3</sup> /min cfm	35,5 1254	44 1554
	Standby Power	25°C 77°F	m <sup>3</sup> /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 <sup>3</sup> /min cfm	85,0 3002	100,6 3553	
	Standby Power	m <sup>3</sup> /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		m <sup>2</sup> foot <sup>2</sup>	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
		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
		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
		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	
		kPa in wc	70 281	
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa in wc	70 281	
		kPa in wc	75 301	
Standard pressure cap setting		kPa in wc	75 301	
Maximum top tank temperature		°C	103	
		°F	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 <sup>2</sup>	1,3	
		foot <sup>2</sup>	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		

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## 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	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	-	-	>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.

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<b>Electrical system</b>		<b>r/min</b>	<b>1500</b>	<b>1800</b>
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	

<b>Power take off</b>		<b>r/min</b>	<b>1500</b>	<b>1800</b>
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