

# VOLVO PENTA GENSET ENGINE

# TAD1642GE

565 kW (768 hp) at 1500 rpm, 604 kW (821 hp) at 1800 rpm, acc. ISO 3046

The TAD1642GE is a powerful, reliable and economical Generating Set Diesel Engine built on the dependable in-line six design.

## Durability & low noise

Designed for easiest, fastest and most economical installation. Well-balanced to produce smooth and vibration-free operation with low noise level.

To maintain a controlled working temperature in cylinders and combustion chambers, the engine is equipped with piston cooling. The engine is also fitted with replaceable cylinder liners and valve seats/guides to ensure maximum durability and service life of the engine.

## Low exhaust emission

The state of the art, high-tech injection and charging system with low internal losses contributes to excellent combustion and low fuel consumption.

The TAD1642GE complies with EU Stage 2 exhaust emission regulations.

## Easy service & maintenance

Easily accessible service and maintenance points contribute to the ease of service of the engine.

## Technical description

### Engine and block

- Optimized cast iron cylinder block with optimum distribution of forces without the block being unnecessarily heavy.
- Wet, replaceable cylinder liners
- Piston cooling for low piston temperature and reduced ring temperature
- Tapered connecting rods for reduce risk of piston cracking
- Crankshaft induction hardened bearing surfaces and fillets with seven bearings for moderate load on main and high-end bearings
- Case hardened and Nitrocarburized transmission gears for heavy duty operation
- Keystone top compression rings for long service life
- Viscous type crankshaft vibration dampers to withstand single bearing alternator torsional vibrations
- Replaceable valve guides and valve seats
- Over head camshaft and four valves per cylinder

### Lubrication system

- Full flow oil cooler
- Full flow disposable spin-on oil filter, for extra high filtration
- The lubricating oil level can be measured during operation
- Gear type lubricating oil pump, gear driven by the transmission



## Features

- Maintained performance, air temp 40°C
- Cooling system (55°C)
- Fully electronic with Volvo Penta EMS 2
- Dual frequency switch (between 1500 rpm and 1800 rpm)
- High power density
- Emission compliant
- Low noise levels
- Gen Pac configuration

### Fuel system

- Non-return fuel valve
- Electronic unit injectors
- Fuel prefilter with water separator and water-in-fuel indicator / alarm
- Gear driven low-pressure fuel pump
- Fine fuel filter with manual feed pump and fuel pressure switch
- Fuel shut-off valve, electrically operated

### Cooling system

- Efficient cooling with accurate coolant control through a water distribution duct in the cylinder block. Reliable sleeve thermostat with minimum pressure drop
- Belt driven, maintenance-free coolant pump with high degree of efficiency

### Turbo charger

- Efficient and reliable turbo charger
- Extra oil filter for the turbo charger

### Electrical system

- Engine Management System 2 (EMS 2), an electronically controlled processing system which optimizes engine performance. It also includes advanced facilities for diagnostics and fault tracing
- The instruments and controls connect to the engine via the CAN SAE J1939 interface, either through the Control Interface Unit (CIU) or the Digital Control Unit (DCU). The CIU converts the digital CAN bus signal to an analog signal, making it possible to connect a variety of instruments. The DCU is a control panel with display, engine control, monitoring, alarm, parameter setting and diagnostic functions. The DCU also presents error codes in clear text.
- Sensors for oil pressure, oil temp, boost pressure, boost temp, coolant temp, fuel temp, water in fuel, fuel pressure and two speed sensors.

**VOLVO  
PENTA**

# TAD1642GE

## Technical Data

### General

Engine designation .....	TAD1642GE	
No. of cylinders and configuration.....	in-line 6	
Method of operation .....	4-stroke	
Bore, mm (in.).....	144 (5.67)	
Stroke, mm (in.).....	165 (6.50)	
Displacement, l (in <sup>3</sup> ).....	16.12 (983.7)	
Compression ratio.....	16.5:1	
Dry weight, kg (lb).....	1480 (3263)	
Dry weight with Gen Pac, kg (lb).....	1910 (4211)	
Wet weight, kg (lb).....	1550 (3417)	
Wet weight with Gen Pac, kg (lb).....	2020 (4453)	

Performance	1500 rpm	1800 rpm
with fan, kW (hp) at:		
Prime Power	503 (684)	532 (724)
Max Standby Power	554 (753)	585 (796)

Lubrication system	1500 rpm	1800 rpm
Oil consumption, liter/h (US gal/h) at:		
Prime Power	0.10 (0.026)	0.11 (0.029)
Max Standby Power	0.11 (0.029)	0.12 (0.032)
Oil system capacity incl filters, liter .....	48	

Fuel system	1500 rpm	1800 rpm
Specific fuel consumption at:		
Prime Power, g/kWh (lb/hph)		
25 %	213 (0.345)	227 (0.368)
50 %	195 (0.316)	204 (0.331)
75 %	195 (0.316)	202 (0.327)
100 %	198 (0.321)	209 (0.339)
Max Standby Power, g/kWh (lb/hph)		
25 %	210 (0.340)	220 (0.357)
50 %	196 (0.318)	203 (0.329)
75 %	296 (0.318)	204 (0.331)
100 %	200 (0.324)	212 (0.344)

Intake and exhaust system	1500 rpm	1800 rpm
Air consumption, m <sup>3</sup> /min (cfm) at:		
Prime Power	39.0 (1377)	45.4 (1603)
Max Standby Power	41.2 (1455)	46.6 (1646)
Max allowable air intake restriction, kPa (psi)	5 (0.7)	5 (0.7)
Heat rejection to exhaust, kW (BTU/min) at:		
Prime Power	379 (21553)	439 (24965)
Max Standby Power	427 (24283)	500 (28435)
Exhaust gas temperature after turbine, °C (°F) at:		
Prime Power	456 (853)	468 (874)
Max Standby Power	482 (900)	512 (954)
Max allowable back-pressure in exhaust line, Prime Power kPa (psi)	8 (1.2)	8 (1.2)
Max allowable back-pressure in exhaust line, Standby Power kPa (psi)	10 (1.5)	10 (1.5)
Exhaust gas flow, m <sup>3</sup> /min (cfm) at:		
Prime power	94.4 (3334)	108.9 (3846)
Max Standby Power	102.5 (3620)	117.6 (4153)

Cooling system	1500 rpm	1800 rpm
Heat rejection radiation from engine, kW (BTU/min) at:		
Prime Power	18 (1024)	20 (1137)
Max Standby Power	20 (1137)	24 (1365)
Heat rejection to coolant kW (BTU/min) at:		
Prime Power	187 (10635)	218 (12397)
Max Standby Power	218 (12397)	248 (14104)
Fan power consumption, kW (hp)	11 (15)	19 (26)

Note! Not all models, standard equipment and accessories are available in all countries. All specifications are subject to change without notice. The engine illustrated may not be entirely identical to production standard engines.

### Power Standards

The engine performance corresponds to ISO 3046, BS 5514 and DIN 6271. The technical data applies to an engine without cooling fan and operating on a fuel with calorific value of 42.7 MJ/kg (18360 BTU/lb) and a density of 0.84 kg/liter (7.01 lb/US gal), also where this involves a deviation from the standards. Power output guaranteed within 0 to +2% at rated ambient conditions at delivery. Ratings are based on ISO 8528. Engine speed governing in accordance with ISO 3046/IV, class A1 and ISO 8528-5 class G3

### Exhaust emissions

The engine complies with EU stage 2 emission legislation according to the Non Road Directive EU 97/68/EEC. The engine also complies with TA-luft -50% exhaust emission regulations.

### Rating Guidelines

PRIME POWER rating corresponds to ISO Standard Power for continuous operation. It is applicable for supplying electrical power at variable load for an unlimited number of hours instead of commercially purchased power. A10 % overload capability for governing purpose is available for this rating. MAXIMUM STANDBY POWER rating corresponds to ISO Standard Fuel Stop Power. It is applicable for supplying standby electrical power at variable load in areas with well established electrical networks in the event of normal utility power failure. No overload capability is available for this rating. 1 hp = 1 kW x 1.36

### Information

For more technical data and information, please look in the Generating Set Engines Sales Guide.

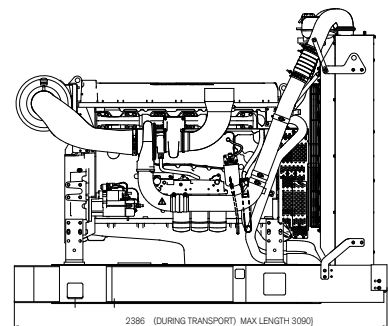
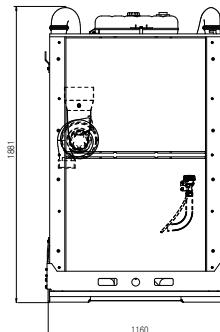
## Standard equipment

	Engine	Gen Pac
<b>Engine</b>		
Automatic belt tensioner	•	•
Lift eyelets	•	•
<b>Flywheel</b>		
Flywheel housing with conn. acc. to SAE 1	•	•
Flywheel for 14" flex. plate and flexible coupling	•	•
Vibration dampers	•	•
<b>Engine suspension</b>		
Fixed front suspension	•	•
<b>Lubrication system</b>		
Oil dipstick	•	•
Full-flow oil filter of spin-on type	•	•
By-pass oil filter of spin-on type	•	•
Oil cooler, side mounted	•	•
Low noise oil sump	•	•
<b>Fuel system</b>		
Fuel filters of disposable type	•	•
Electronic unit injectors	•	•
Pre-filter with water separator	•	•
<b>Intake and exhaust system</b>		
Air filter with replaceable paper insert	•	•
Air restriction indicator	•	•
Air cooled exhaust manifold	•	•
Connecting flange for exhaust pipe	•	•
Exhaust flange with v-clamp	•	•
Turbo charger, low right side	•	•
<b>Cooling system</b>		
Radiator incl intercooler	-	•
Gear driven coolant pump	•	•
Fan hub	•	•
Pusher fan	-	•
Fan guard	-	•
Belt guard	-	•
<b>Control system</b>		
Engine Management System (EMS) with CAN-bus interface SAE J1939	•	•
CIU, Control Interface Unit	-	-
<b>Alternator</b>		
Alternator 80A / 24 V	•	•
<b>Starting system</b>		
Starter motor, 7.0kW, 24 V	•	•
Connection facility for extra starter motor	•	•
<b>Instruments and senders</b>		
Temp.- and oil pressure for automatic stop/alarm 103°C	•	•
<b>Other equipment</b>		
Expandable base frame	-	•
<b>Engine Packing</b>		
Plastic warpping	•	•

• included in base engine or standard option, see order specification  
- optional equipment or not applicable

## Dimensions TAD1642GE

Not for installation



# VOLVO PENTA

**AB Volvo Penta**  
SE-405 08 Göteborg, Sweden  
www.volvopenta.com

**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 <sup>3</sup>	983.9
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
Wet weight	Engine only	kg	1550
		lb	3417
	Engine incl. cooling system and air filtration system	kg	1751
		lb	3860
	Engine incl. cooling system, air filtration system, and frame	kg	2020
		lb	4453

**Performance**

			<b>rpm</b>	<b>1500</b>	<b>1800</b>
Standby Power	without fan	kW		565	604
		hp		768	821
	with fan	kW		554	585
		hp		753	796
Prime Power	without fan	kW		514	551
		hp		699	749
	with fan	kW		503	532
		hp		684	724
Torque at:	Standby Power	Nm		3597	3204
		lbft		2653	2363
	Prime Power	Nm		3272	2923
		lbft		2413	2156
Mean piston speed		m/s		8.3	9.9
		ft/sec		27.1	32.6
Effective mean pressure at:	Standby Power	MPa		2.8	2.5
		psi		407	362
Effective mean pressure at:	Prime Power	MPa		2.6	2.3
		psi		370	330
Max combustion pressure at:	Standby Power	MPa		18.8	18.9
		psi		2727	2741
Max combustion pressure at:	Prime Power	MPa		17.7	18
		psi		2567	2611
Total mass moment of inertia, J (mR <sup>2</sup> )		kgm <sup>2</sup>		4.20	
		lbft <sup>2</sup>		99.7	
Friction Power		kW		36	53
		hp		48.96	72.08
<b>Derating see Technical Diagrams</b>					

**Engine noise emission**

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

Tolerance  $\pm 0.75$  dB(A)

		rpm	1500	1800
Measured sound power Lw	No load	dB(A)	114	117
	Standby Power	dB(A)	116	119
	Prime Power	dB(A)	116	118
Calculated sound pressure Lp at 1 m	No load	dB(A)	102	105
	Standby Power	dB(A)	104	107
	Prime Power	dB(A)	104	106

**Unsilenced exhaust noise**

Data calculated as sound pressure Lp.

Assumed microphone distance 1 m

	rpm	1500	1800
Standby Power	dB(A)	115	120
Prime Power	dB(A)	115	120

**Test conditions for load acceptance data**

Warm engine.	<b>Generator</b>	<b>Model</b>	<b>Type of AVR</b>
	Stamford	HCI 544 E1	SX 440
AVR Settings	UFRO : Std-setting 47Hz / 57Hz / 400 V		

Load acceptance performance can vary due to actual alternator inertia, voltage regulator, type of load and local ambient conditions. Please note that load step 0-100% is based on calculation.

**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	3.2	3.5	1.8	1.8	20-100	26.8	32.5	6.3	8.4
0-38		7.0		2.4	38-100		13.3		6.4
0-40	6.8	7.8	2.3	2.5	40-100	11.2	11.7	5.0	6.1
0-41	7.0		2.3		41-100	10.7		4.5	
0-48		10.0		3.9	48-100		9.5		4.0
0-53	10.0		3.2		53-100	8.0		4.1	
0-60	13.5	17.3	3.6	4.4	60-100	6.6	7.4	4.0	3.8
0-80	26.7	32.6	5.8	6.8	80-100	3.2	3.2	1.1	3.5
0-100*	42.5	52.5	8.3	9.7					
100-0	9.6	10.4	1.6	1.7					

**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	2.2	2.4	1.8	2.0	20-100	9.9	11.4	3.0	3.6
0-40	4.6	5.1	2.0	2.0	40-100	6.3	7.3	2.3	3.0
0-52		7.0		2.0	52-100		6.2		2.7
0-57	7.0		2.0		57-100	4.5		2.1	
0-60	7.7	8.5	2.1	2.2	60-100	4.1	4.8	2.0	2.4
0-67		10.0		2.8	67-100		4.0		2.3
0-73	10.0		2.6		73-100	2.5		2.0	
0-80	11.7	15.2	2.8	3.6	80-100	1.9	2.2	1.9	2.0
0-100*	19.4	22.9	3.9	5.6					
100-0	6.8	7.4	0.9	1.7					

**Cold start performance**

		rpm	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
		-30**	s		

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

\*\* With manifold heater 4 kW engaged, lubrication oil 5W/30 and block heater, Fuel MK-1.

Block heater type	Make	Power kW	Engaged hours	Cooling water temp engine block
	Volvo	2	12	17°C 63°F

**Lubrication system**

		rpm	1500	1800
Lubricating oil consumption	Standby Power	litre/h	0.11	0.12
		US gal/h	0.029	0.032
	Prime Power	litre/h	0.10	0.11
		US gal/h	0.026	0.029
Oil system capacity including filters		litre	48	
		US gal	12.7	
Oil sump capacity:	max	litre	42	
		US gal	11.1	
	min	litre	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		μ	40.000	

\* See also general section in the sales guide

<b>Fuel system</b>		<b>rpm</b>	<b>1500</b>	<b>1800</b>
<b>Standby Power</b>				
Specific fuel consumption at:	25%	g/kWh lb/hph	210 0.340	220 0.357
	50%	g/kWh lb/hph	196 0.318	203 0.329
	75%	g/kWh lb/hph	196 0.318	204 0.331
	100%	g/kWh lb/hph	200 0.324	212 0.344
<b>Prime Power</b>				
Specific fuel consumption at:	25%	g/kWh lb/hph	213 0.345	227 0.368
	50%	g/kWh lb/hph	195 0.316	204 0.331
	75%	g/kWh lb/hph	195 0.316	202 0.327
	100%	g/kWh lb/hph	198 0.321	209 0.339

<b>Fuel system</b>		<b>rpm</b>	<b>1500</b>	<b>1800</b>
Fuel to conform to		ASTM-D975-No1 and 2D JIS KK 2204, EN 590		
System supply flow at:	litre/h	180.0	200.0	
	US gal/h	47.6	52.8	
Fuel supply line max restriction (Measured at fuel inlet connection)	kPa	30.0	30.0	
	psi	4.4	4.4	
Fuel supply line max pressure, engine stopped	kPa	0.0	0.0	
	psi			
System return flow	litre/h	25.0	25.0	
	US gal/h	6.6	6.6	
Fuel return line max restriction (Measured at fuel return connection)	kPa	20.0	20.0	
	psi	2.9	2.9	
Maximum allowable inlet fuel temp (Measured at fuel inlet connection)	°C	60	60	
	°F	140	140	
Prefilter / Water separator micron size	μ	10.000		
Fuel filter micron size	μ	5.000		
Governor type/make, standard	Volvo / EMS 2			
Injection pump type/make	Delphi E1			

**Intake and exhaust system**

		<b>rpm</b>	<b>1500</b>	<b>1800</b>
Air consumption at: (+25°C and 100kPa)	Standby Power	m <sup>3</sup> /min cfm	41.2 1455	46.6 1646
	Prime Power	m <sup>3</sup> /min cfm	39 1377	45.4 1603
Max allowable air intake restriction including piping		kPa psi	5 0.7	5 0.7
Air filter restriction clean Volvo Penta filter		kPa psi	1.5 0.2	2.0 0.3
Heat rejection to exhaust at:	Standby Power	kW BTU/min	427 24283	500 28435
	Prime Power	kW BTU/min	379 21553	439 24965
Exhaust gas temperature after turbine at:	Standby Power	°C °F	482 900	512 954
	Prime Power	°C °F	456 853	468 874
Max allowable back pressure in exhaust line	Standby Power	kPa psi	10 1.5	10 1.5
	Prime Power	kPa psi	8 1.2	8 1.2
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	Standby Power	m <sup>3</sup> /min cfm	102.5 3620	117.6 4153
	Prime Power	m <sup>3</sup> /min cfm	94.4 3334	108.9 3846

**Cooling system**

		<b>rpm</b>	<b>1500</b>	<b>1800</b>
Heat rejection radiation from engine at:	Standby Power	kW	20	24
		BTU/min	1137	1365
	Prime Power	kW	18	20
		BTU/min	1024	1137
Heat rejection to coolant at:	Standby Power	kW	218	248
		BTU/min	12397	14104
	Prime Power	kW	187	218
		BTU/min	10635	12397
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			m <sup>2</sup>	1.32
			foot <sup>2</sup>	14.21
Fan diameter			mm	890
			in	35.04
Fan power consumption			kW	11
			hp	15
				19
				26
Fan drive ratio	1.04:1			
Coolant capacity,	engine	litre	33	
		US gal	8.72	
	engine with std radiator and hoses	litre	60	
		US gal	15.85	
Coolant pump	drive/ratio	Belt / 1.85:1		
Coolant flow with standard system			l/s	6.4
			US gal/s	1.69
Minimum coolant flow			l/s	6.4
			US gal/s	1.69
Maximum outer circuit restriction, including piping			kPa	40
			psi	5.8
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	75
			psi	10.9
Maximum top tank temperature			°C	103
			°F	217
Draw down capacity. The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still is functioning			litre	1.8
			US gal	0.48



**Charge air cooler system**

		<b>rpm</b>	<b>1500</b>	<b>1800</b>
Heat rejection to charge air cooler	Standby Power	kW	131	159
		BTU/min	7450	9042
	Prime Power	kW	112	145
		BTU/min	6369	8246
Charge air mass flow	Standby Power	kg/s	0.83	0.92
	Prime Power	kg/s	0.78	0.9
Charge air inlet temp. (Charge air temp after turbo compressor)	Standby Power	°C	226	243
		°F	439	469
	Prime Power	°C	206	228
		°F	403	442
Charge air outlet temp. (Charge air temp after intercooler)	Standby Power	°C	45	45
		°F	113	113
	Prime Power	°C	43	43
		°F	109	109
Maximum pressure drop over charge air cooler incl. piping		kPa	19	
		psi	2.76	
Charge air pressure (After charge air cooler)		kPa	268	
		psi	38.87	
Standard charge air cooler core area		m <sup>2</sup>	1.3	
		foot <sup>2</sup>	13.99	

**Cooling performance**

Cooling air flow and external restriction at different radiator air temperatures based on 103°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 <sup>3</sup> /s	External restriction Pa	Air flow m <sup>3</sup> /s	External restriction Pa
1500	40	5.9	835	6.5	736
	45	6.5	748	7.2	683
	50	7.4	697	8.2	616
	55	8.4	600	9.4	250
	57			10.0	0
	60	9.9	76		
	63	10.0	0		
1800	40	6.8	1313	7.6	1154
	45	7.6	1182	8.5	1055
	50	8.6	1078	9.7	956
	55	9.8	963	11.1	494
	58			12.3	0
	60	11.5	324		
	61	12.3	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 %	4.0
Governor response	Adjustable PID-constants (VODIA)	Standard
Dual speed	1500 / 1800 rpm	According to customer
Idle speed	600-1200 rpm	900 rpm
Fine speed adjustment	± 120 rpm	0.0
Stop function	Energized to Run / Stop	Energized to Stop
Preheating function	On / Off	On
Lamp test	On / Off	On

**Engine sensor and switch settings**

Parameter	Unit	Alarm level		Engine protection	
		Setting range	Default setting	Level	Action. Default/Alternative
Oil temp	°C	120 - 130	125	Setting +5	Shut down.
Oil pressure	Low idle	kPa	-	190.0	Shut down
	1500 rpm	kPa	-	250.0	Shut down
	1800 rpm	kPa	-	300.0	Shut down
Oil level		-	Min level	-	-
Piston cooling pressure >1000 rpm	kPa	-	150	150.0	Shut down
Coolant temp	°C	95 - 101	98	Setting +5	Shut down.
Coolant level		-	On	Low level	Shut down.
Fuel feed pressure	Low idle	kPa	-	150	-
	>1400 rpm		-	300	-
Water in fuel		-	High level	-	-
Crank case pressure	kPa	-	-	-	Shut down
Air filter pressure droop	kPa	-	5	-	-
	0.0	Alarm level		Engine protection	
Altitude, above sea	m	-	-	>1500	Automatic derating, see section derating
Charge air temp	°C	-	80	85.0	
Charge air pressure	kPa	-	290	300.0	
Engine speed	rpm	100 - 120% of rated speed	120%	Alarm level	Shut down.
Low voltage	V	-	25.5	-	-

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

**Electrical system**

Voltage and type		24 V / insulated from earth	
Alternator:	make/output	A	Bosch / 80
	tacho output	Hz/alt. Rev	6
	drive ratio		3.9 : 1
Starter motor	make	Melco	
	type	105 P70	
	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	280
Crank engine speed at 20°C		rpm	150
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		1,31:1/clockwise		
Timing gear at servo pump PTO max:		Nm lbft	100 74	
Speed ratio direction of rotation viewed from flywheel side		1,58:1/clockwise		
Timing gear at hydraulic pump PTO max:		Nm lbft	-	
Speed ratio direction of rotation viewed from flywheel side				
Max allowed bending moment in flywheel housing		Nm lbft	15000 11063	
Max. rear main bearing load		N lbf	5000 1124.0	