طرح نگهداشت و افزایش تولید ۲۷ مخزن

DATA SHEETS FOR DIESEL ENGINE

نگهداشت و افزایش تولید میدان نفتی بینک

V00	NOV. 2024	IFA	Kalaye Pump	M.Fakharian	M.Sadeghian	
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Status:

IFA: Issued for Approval
IFI: Issued for Information
AFC: Approved for Construction

REVISION RECORD SHEET

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1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also, PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

2.0 GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – Supply Of Fire Water Pumps
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR/PURCHASER:	Joint Venture of: Hirgan Energy – Design & Inspection (D&I) Companies
VENDOR:	Kalaye Pump Company
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
TPI:	Third Party Inspector.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

3.0 SCOPE

The scope of this executive instruction includes all projects of Kalay-E-Pump Company and other common productions.

VOLVO PENTA GENSET ENGINE

TAD1341GE

308 kW (419 hp) at 1500 rpm, 335 kW (456 hp) at 1800 rpm, acc. ISO 3046

The TAD1341GE is a powerful, reliable and economical Generating Set Diesel Engine built on the dependable Volvo in-line six concept.

Durability & low noise

Designed for easy, fast and economical installation. Field tested to ensure highest standard of durability and long life. 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 & noise emission

The state of the art, high-tech injection and highly efficient charge air system with low internal losses contributes to excellent combustion and low fuel consumption.
The TAD1341GE is EU Stage 2 emission certified. An electronically controlled viscous fan drive is available giving substantially lower noise and fuel consumption.

Easy service & maintenance

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

Technical description

Engine and block

- Cast iron cylinder block with optimum distribution of forces without the block being unnessarily heavy.
- Wet, replaceable cylinder liners
- Piston cooling for low piston temperature and reduced ring temperature
- Tapered connecting rods for increased piston lifetime
- 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

Features

- Excellent load acceptance
- Highly efficient cooling system
- Dual Speed 1500 / 1800 rpm
- EMS 2
- EU Stage 2 emission certified
- Wide range of optional equipment including visco fan.

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

Fuel system

- Electronic high pressure 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

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 coolant pump with high degree of efficiency
- Electronically controlled viscous fan drive provides lower noise and fuel consumption (optional).

Turbo charger

- Efficient and reliable turbo charger
- Electronically controlled Waste-gate
- 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.
- Possibility to perform a start battery test according to the NCPA requirements via CAN bus signals.
- 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 anolog 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

TAD1341GE

Technical Data

General

Engine designation	TAD1341GE
No. of cylinders and configuration	in-line 6
Method of operation	4-stroke
Bore, mm (in.)	131 (5.16)
Stroke, mm (in.)	158 (6.22)
Displacement, l (in³)	12.78 (780)
Compression ratio	18.1:1
Wet weight, engine only, kg (lb)	1325 (2921)
Wet weight with Gen Pac, kg (lb)	1790 (3946)

Performance	**1500 rpm**	**1800 rpm**
with fan, kW (hp) at:		
Prime Power	271 (369)	287 (390)
Standby Power	298 (405)	317 (431)

Lubrication system	**1500 rpm**	**1800 rpm**
Oil consumption, liter/h (US gal/h) at:		
Prime Power	0.04 (0.011)	0.05 (0.013)
Standby Power	0.04 (0.011)	0.05 (0.013)
Oil system capacity incl filters, liter		36

Fuel system	**1500 rpm**	**1800 rpm**
Specific fuel consumption at:		
Prime Power, g/kWh (lb/hph)		
25 %	230 (0.373)	237 (0.384)
50 %	202 (0.327)	211 (0.342)
75 %	195 (0.316)	202 (0.327)
100 %	191 (0.310)	200 (0.324)
Standby Power, g/kWh (lb/hph)		
25 %	226 (0.366)	242 (0.392)
50 %	200 (0.324)	209 (0.339)
75 %	194 (0.314)	201 (0.326)
100 %	191 (0.310)	200 (0.324)

Intake and exhaust system	**1500 rpm**	**1800 rpm**
Air consumption, m³/min (cfm) at:		
Prime Power	22.7 (802)	26.4 (932)
Standby Power	24.1 (849)	29.0 (1023)
Max allowable air intake restriction, kPa (PSI)		5 (0.7)
Exhaust gas temperature after turbine, °C (°F) at:		
Prime Power	405 (761)	383 (721)
Standby Power	414 (777)	403 (757)
Max allowable back-pressure in exhaust line, kPa (PSI)		10 (1.5)
Exhaust gas flow, m³/min (cfm) at:		
Prime power	49.0 (1732)	58.0 (2047)
Standby Power	52.0 (1839)	62.0 (2190)

Cooling system	**1500 rpm**	**1800 rpm**
Fan power consumption, std ratio, kW (hp)	10 (14)	18 (24)

Cooling performance	**1500 rpm**	**1800 rpm**
Max cooling air flow, m³/s (cfs)	6.8 (240)	8.2 (290)
AOT at max cooling air flow, °C (°F):		
Prime Power	71 (160)	71 (160)
Standby Power	69 (156)	68 (154)

Standard equipment

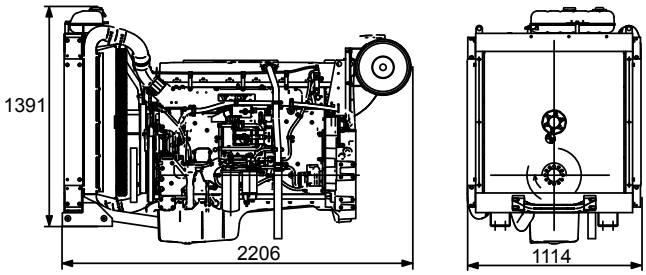
	Engine	Gen Pac
Engine		
Automatic belt tensioner	•	•
Lift eyelets	•	•
Flywheel		
Flywheel housing with conn. acc. to SAE 1	•	•
Flywheel for 14” flex. plate and flexible coupling	•	•
Engine suspension		
Fixed front suspension	•	•
Lubrication system		
Oil dipstick	•	•
Full-flow oil filter of spin-on type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

1) must be ordered, se order specification
2) Available later
– optional equipment or not applicable
• included in standard specification

For our wide range of optional equipment, please see Order specification.

Dimensions TAD1341GE

Not for installation



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% att 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 govering purpose is available for this rating.
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

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 in^3	12,78 779,7
Firing order			1-5-3-6-2-4
Bore		mm in	131 5,16
Stroke		mm in	158 6,22
Compression ratio			18,1:1
Wet weight	Engine only	kg lb	1325 2921
	Engine incl. cooling system, air filtration system, and frame	kg lb	1790 3946

Performance			**rpm**	**1500**	**1800**
Prime Power		without fan	kW hp	281 382	305 415
		with fan	kW hp	275 374	294 400
Standby Power		without fan	kW hp	308 419	335 456
		with fan	kW hp	302 411	324 441
Torque at:	Prime Power		Nm lbft	1789 1319	1618 1193
	Standby Power		Nm lbft	1961 1446	1777 1311
Mean piston speed			m/s ft/sec	7,9 26,0	9,5 31,2
Effective mean pressure at:	Prime Power		MPa psi	1,8 255	1,6 231
Effective mean pressure at:	Standby Power		MPa psi	1,9 280	1,7 254
Max combustion pressure at:	Prime Power		MPa psi	15,9 2306	16,2 2350
Max combustion pressure at:	Standby Power		MPa psi	17 2466	16,7 2422
Total mass moment of inertia, J (mR^2)			kgm^2 $lbft^2$	3,43 81,4	
Friction Power			kW hp	30 40,8	44 59,84
Derating see Technical Diagrams					

Engine noise emission

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

Tolerance ± 0.75 dB(A)		**rpm**	**1500**	**1800**
Measured sound power Lw	No load	dB(A)	112,8	115,2
	Prime Power	dB(A)	117,4	118,6
	Standby Power	dB(A)	117,9	119,1
Calculated sound pressure Lp at 1 m	No load	dB(A)	95,8	98,1
	Prime Power	dB(A)	100,3	101,6
	Standby Power	dB(A)	100,8	102,1

Unsilenced exhaust noise

Data calculated as sound pressure Lp.

Assumed microphone distance 1 m	**rpm**	**1500**	**1800**
Prime Power	dB(A)	113	117
Standby Power	dB(A)	114	117

Test conditions for load acceptance data

Warm engine.	**Generator**	**Model**	**Type of AVR**
	Stamford	HCI 444 F1	SX 440

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

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	1,2	1,3	0,9	1,0	20-100	8,5	10,3	1,9	2,4
0-40	2,4	2,6	1,5	1,5	40-100	4,1	5,1	2,0	3,1
0-60	3,9	4,6	1,4	1,0	60-100	2,3	2,6	1,5	1,1
0-80	7,6	11,2	2,0	2,0	80-100	1,2	1,2	1,0	1,1
0-77	7,0		2,0		78-100	1,3		1,1	
0-86	10,0		2,0		87-100	0,8		0,9	
0-70		7,0		2,5	70-100		1,8		1,4
0-78		10,0		1,9	78-100		1,3		1,2
100-0	5,5	6,0	2,0	2,2					

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	1,1	1,3	1,0	1,2	20-100	4,5	5,0	1,1	2,5
0-40	2,2	2,5	1,4	1,4	40-100	2,8	3,5	1,5	1,7
0-60	3,4	3,8	1,5	1,6	60-100	1,7	1,9	1,5	1,7
0-80	4,7	5,6	1,4	1,3	80-100	0,9	0,9	1,2	1,4
0-85		6,0		1,1	85-100		1,0		1,4
0-100	7,0	10,0	1,5	2,2					
100-0	5,7	5,9	2,6	2,6					

Cold start performance			rpm	1500	1800
Time from start to stay within 0.5% of no load speed at ambient temperature:	°C	20	s	4,8	4,6
		5	s	5,7	5,2
		-15*	s	6,6	6,0

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

Block heater type	Make	Power kW	Engaged hours	Cooling water temp engine block
	Volvo	2	12	10°C 50°F

Lubrication system			rpm	1500	1800
Lubricating oil consumption	Prime Power		litre/h US gal/h	0,04 0,011	0,05 0,013
	Standby Power		litre/h US gal/h	0,04 0,011	0,05 0,013
Oil system capacity including filters			litre US gal	36 9,5	
Oil sump capacity:		max	litre US gal	30 7,9	
		min	litre US gal	19 5,0	
Oil change intervals/specifications:	VSD3		h	600	
	VSD2		h	400	
			h	200	
Engine angularity limits:		front up	°	11	
		front down	°	11	
		side tilt	°	11	
Oil pressure at rated speed			kPa psi	370 - 520 54 - 75	
Lubrication oil temperature in oil sump:		max	°C °F	130 266	
Oil filter micron size			µ	40	

* See also general section in the sales guide

Fuel system		rpm	1500	1800
Prime Power Specific fuel consumption at:	25%	g/kWh lb/hph	230 0,373	237 0,384
	50%	g/kWh lb/hph	202 0,327	211 0,342
	75%	g/kWh lb/hph	195 0,316	202 0,327
	100%	g/kWh lb/hph	191 0,310	200 0,324
Standby Power Specific fuel consumption at:	25%	g/kWh lb/hph	226 0,366	242 0,392
	50%	g/kWh lb/hph	200 0,324	209 0,339
	75%	g/kWh lb/hph	194 0,314	201 0,326
	100%	g/kWh lb/hph	191 0,310	200 0,324

Fuel system	rpm	1500	1800
Fuel to conform to	ASTM-D975-No1 and 2D JIS KK 2204, EN 590		
System supply flow at:	litre/h	90,0	100,0
	US gal/h	23,8	26,4
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	20,0	20,0
	psi	2,9	2,9
System return flow	litre/h	18,0	18,0
	US gal/h	4,8	4,8
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	50	50
	°F	122	122
Prefilter / Water separator micron size	µ	10	
Fuel filter micron size	µ	5	
Governor type/make, standard	Volvo / EMS 2.2		
Injection pump type/make	Delphi E3		

Intake and exhaust system			rpm	1500	1800
Air consumption at: (+25°C and 100kPa)	Prime Power		m^3/min	22,7	26,4
			cfm	802	932
	Standby Power		m^3/min	24,1	29
			cfm	851	1024
Max allowable air intake restriction including piping			kPa	5	5
			psi	0,7	0,7
Air filter restriction clean Volvo Penta filter			kPa	0,7	0,9
			psi	0,1	0,1
Heat rejection to exhaust at:		Prime Power	kW	187	213
			BTU/min	10635	12113
		Standby Power	kW	203	235
			BTU/min	11544	13364
Exhaust gas temperature after turbine at:		Prime Power	°C	405	383
			°F	761	721
		Standby Power	°C	414	403
			°F	777	757
Max allowable back pressure in exhaust line		Prime Power	kPa	9	9
			psi	1,3	1,3
		Standby Power	kPa	10	10
			psi	1,5	1,5
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)		Prime Power	m^3/min	49,0	58,0
			cfm	1730	2048
		Standby Power	m^3/min	52,0	62,0
			cfm	1836	2190

Cooling system			rpm	1500	1800
Heat rejection radiation from engine at:	Prime Power		kW	8	22
			BTU/min	455	1251
	Standby Power		kW	10	22
			BTU/min	569	1251
Heat rejection to coolant at:	Prime Power		kW	124	138
			BTU/min	7052	7848
	Standby Power		kW	133	148
			BTU/min	7564	8417
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			m²	0,8	
			foot²	8,61	
Fan diameter			mm	890	
			in	35,04	
Fan power consumption			kW	6	11
			hp	8	15
Fan power consumption - Ratio 0,84:1			kW	6	11
			hp	8	15
Fan drive ratio				0,84 : 1	
Coolant capacity,	engine		litre	20	
			US gal	5,28	
	std radiator and hoses		litre	24	
			US gal	6,34	
Coolant pump			drive/ratio	Belt / 1,43 :1	
Coolant flow with standard system			l/s	5	5,5
			US gal/s	1,32	1,45
Minimum coolant flow			l/s	4,0	4,5
			US gal/s	1,06	1,19
Maximum outer circuit restriction, including piping			kPa	45	70
			psi	6,5	10,2
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	70	
			psi	10,2	
Maximum top tank temperature			°C	107	
			°F	225	
Draw down capacity. The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still are functioning			litre	1,8	
			US gal	0,48	

Charge air cooler system		rpm	1500	1800
Heat rejection to charge air cooler	Prime Power	kW	52	71
		BTU/min	2957	4038
	Standby Power	kW	59	80
		BTU/min	3355	4550
Charge air mass flow	Prime Power	kg/s	0,43	0,53
	Standby Power	kg/s	0,46	0,55
Charge air inlet temp. (Charge air temp after turbo compressor)	Prime Power	°C	165	184
		°F	329	363
	Standby Power	°C	176	197
		°F	349	387
Charge air outlet temp. (Charge air temp after intercooler)	Prime Power	°C	44	44
		°F	111	111
	Standby Power	°C	45	45
		°F	113	113
Maximum pressure drop over charge air cooler incl. piping		kPa	8	
		psi	1,16	
Charge air pressure (After charge air cooler)		kPa	203	
		psi	29,44	
Standard charge air cooler core area		m²	0,89	
		foot²	9,58	

Cooling performance

Cooling air flow and external restriction at different radiator air temperatures based on 107°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^3/s	External restriction Pa	Air flow m^3/s	External restriction Pa
1500	55			4,4	315
	60	4,7	233	5,0	140
	63	5,1	115	5,5	0
	66	5,5	0		
1800	58			5,7	365
	60			6,4	132
	62			6,9	0
	64	5,6	425		
	66	6,9	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 %	0,0
Governor response	Adjustable PID-constants (VODIA)	Standard
Dual speed	YES	1500 or 1800
Idle speed	600-1200	900
Fine speed adjustment	± 120	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

			Alarm level		Engine protection	
Parameter		**Unit**	**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	-30,0	Shut down.
	1500 rpm	kPa	-	250,0	-30,0	Shut down.
	1800 rpm	kPa	-	300,0	-30,0	Shut down.
Oil level			-	Min level	-	-
Piston cooling pressure >1000 rpm		kPa	-	150	150,0	Shut down.
Coolant temp		°C	95 - 103	102	Setting +5	Shut down.
Coolant level			See cooling system	On	Low level	
Fuel feed pressure	Low idle	kPa	-	100	-	-
	>1400 rpm		-	200	-	-
Water in fuel			-	High level	-	-
Crank case pressure		kPa	-	Increased pressure	Increased pressure	Shut down.
Air filter pressure droop		kPa	-	5	-	-
		0,0	Alarm level		Engine protection	
Altitude, above sea		m	-	-	-	Automatic derating, see section derating
Charge air temp		°C	-	80	85	Shut down.
Charge air pressure	1500 rpm	kPa	-	360	370	Shut down.
	1800 rpm	kPa	-	350	360	Shut down.
Engine speed		rpm	100 - 120% of rated speed	120% of rated speed	Alarm level	Shut down.

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

Electrical system

Voltage and type		24V / insulated from earth	
Alternator:	make/output	A	Bosch 80 A
	tacho output	Hz/alt. Rev	6
	drive ratio		5,3:1
Starter motor		make	Melco
		type	105P70
		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	180
Crank engine speed at 20°C		rpm	155
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		**0**	**0**	**0**
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	-	-
Timing gear at compressor PTO max:		lbft	118	
Speed ratio direction of rotation viewed from flywheel side		0,91:1/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	4000 899,2	

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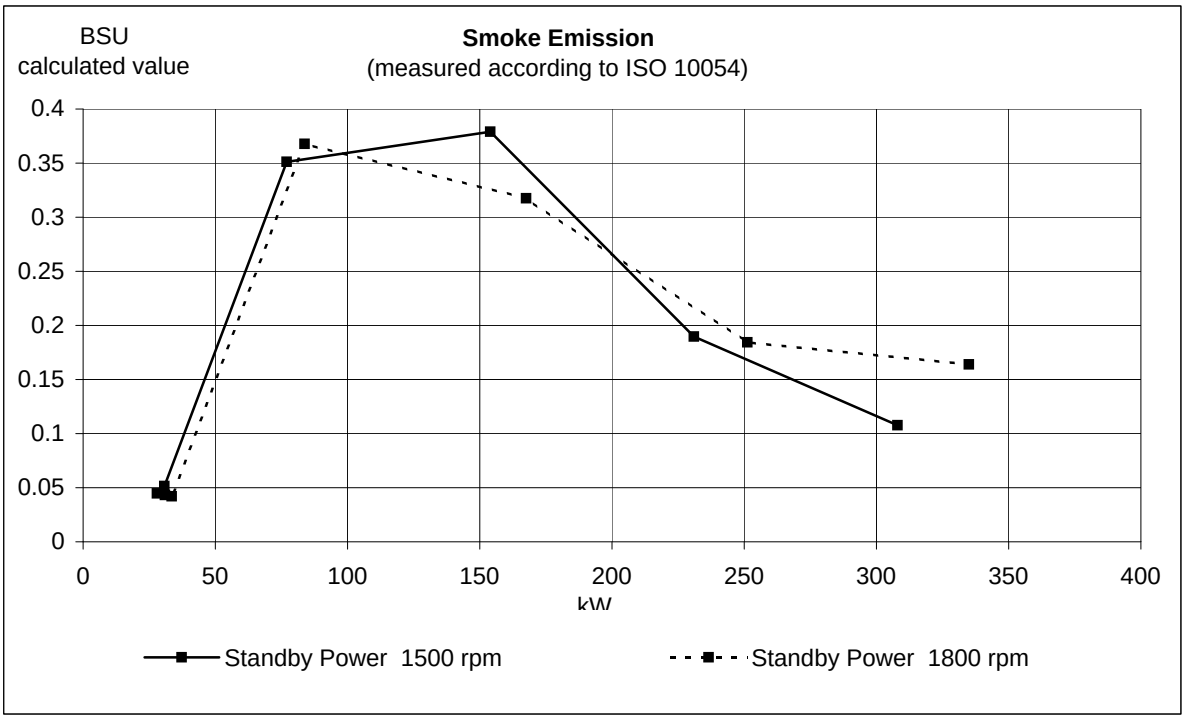

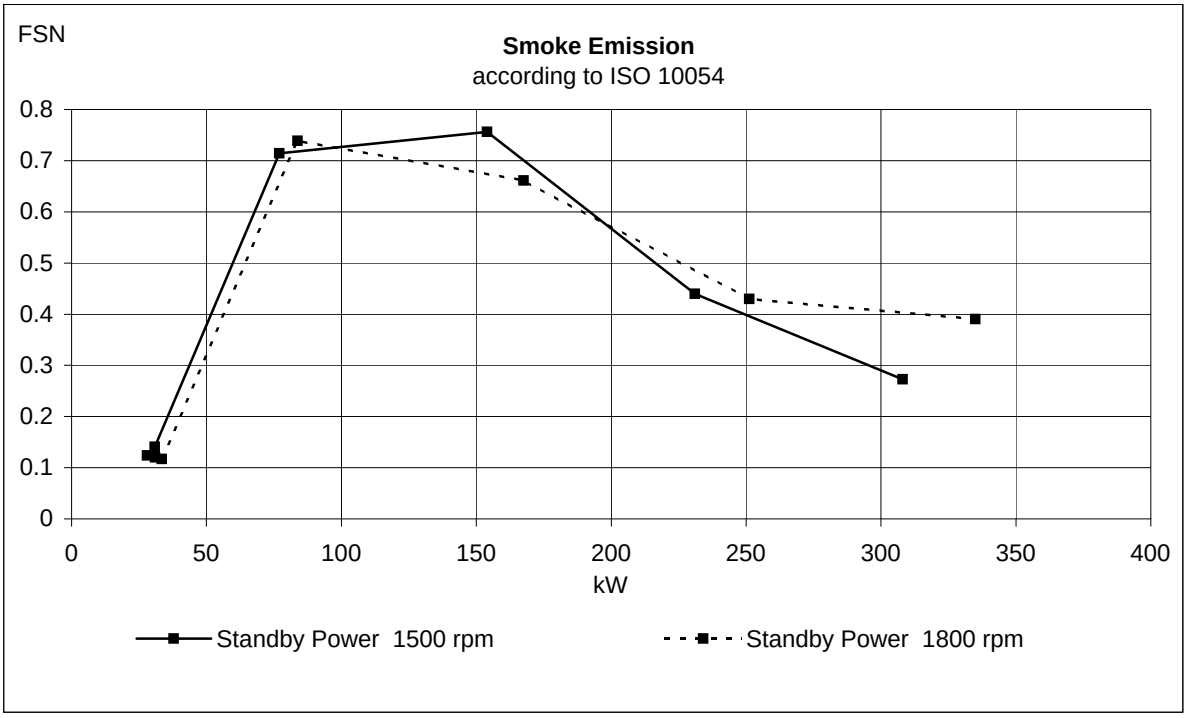

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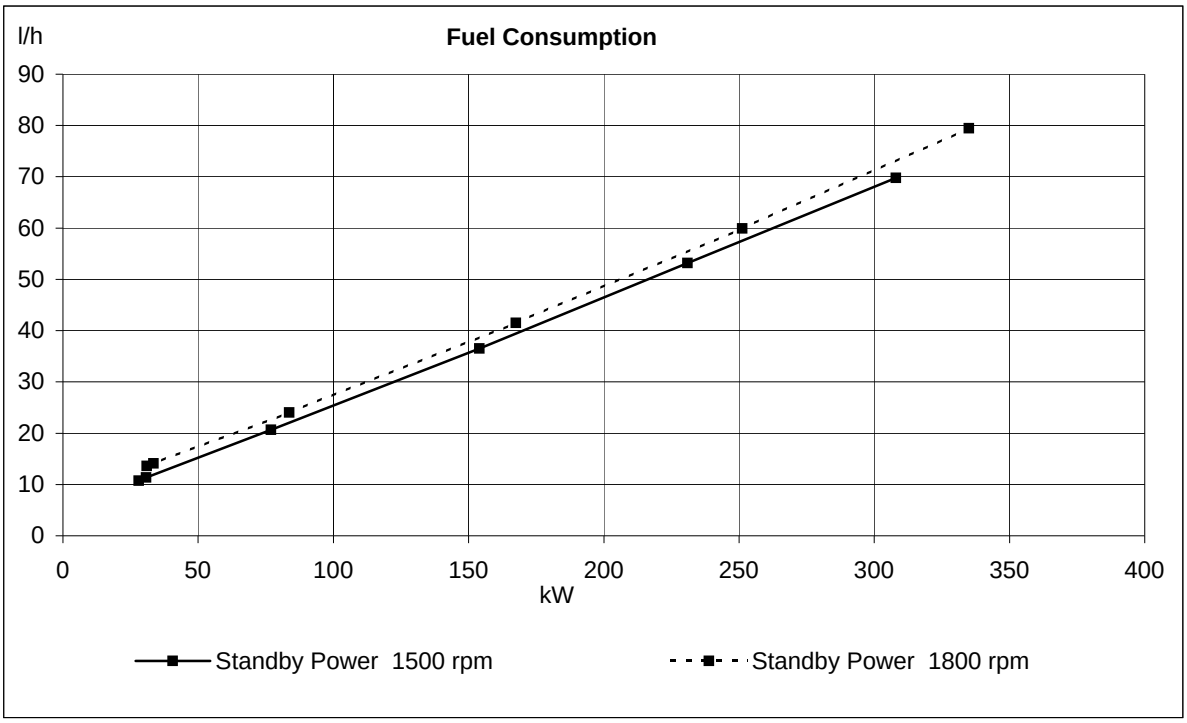

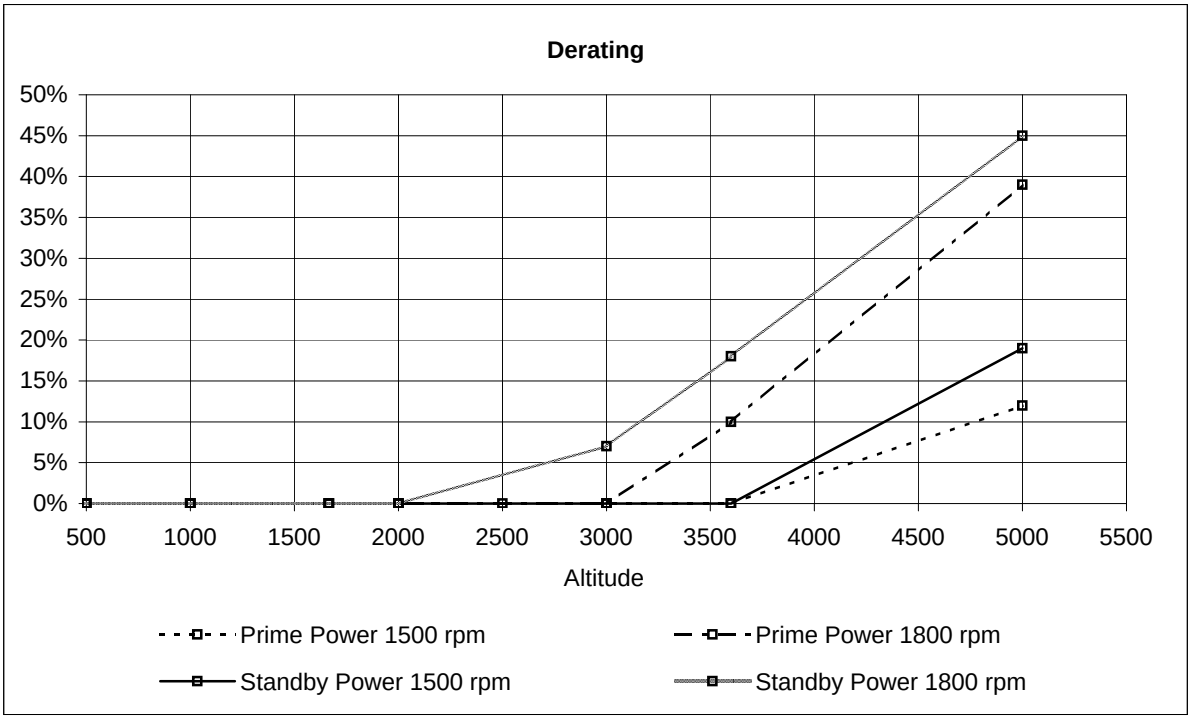

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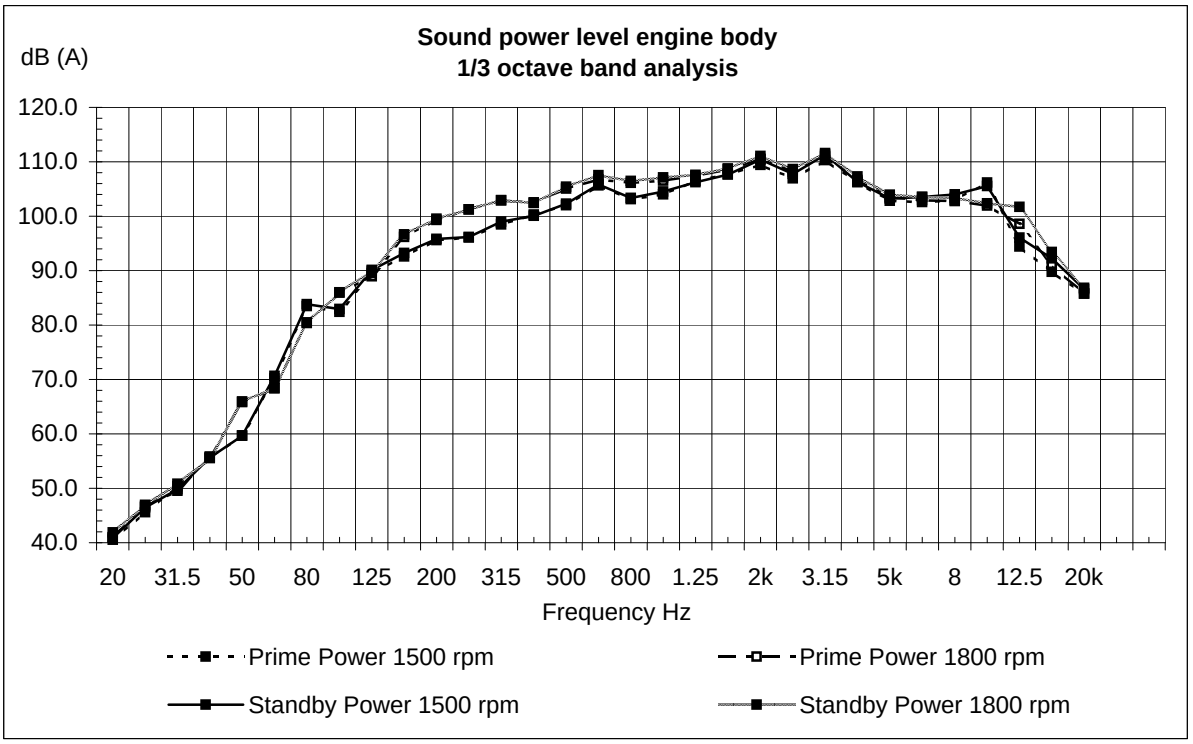

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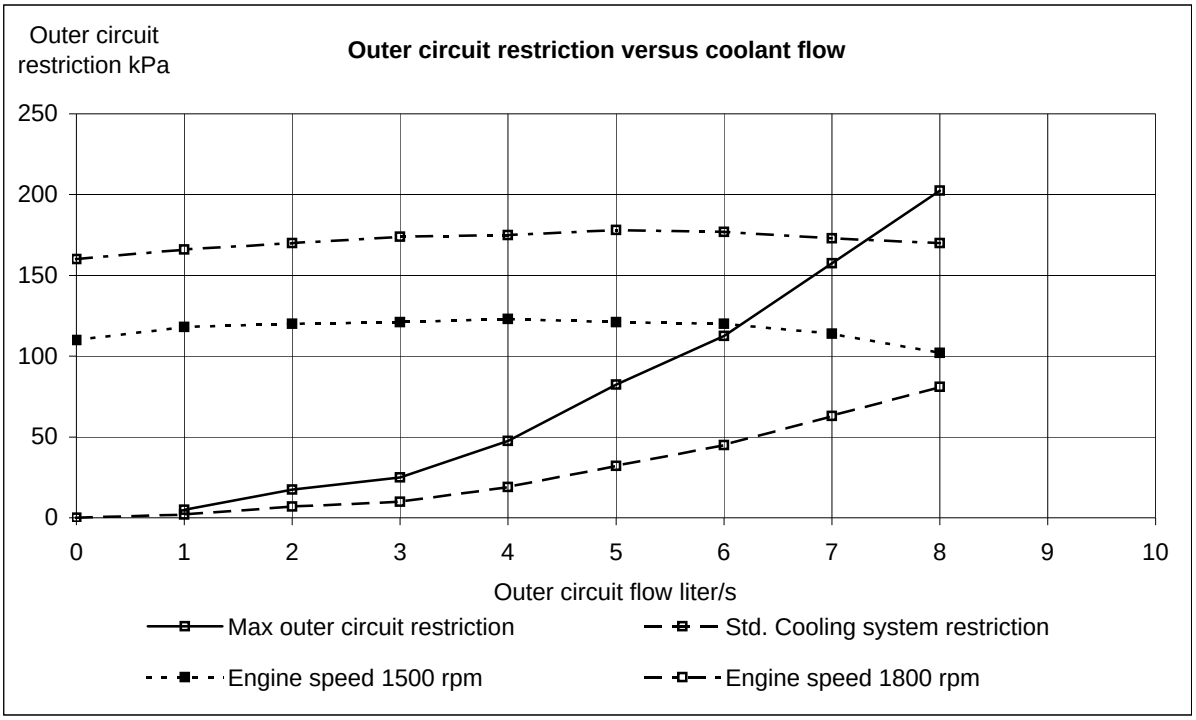

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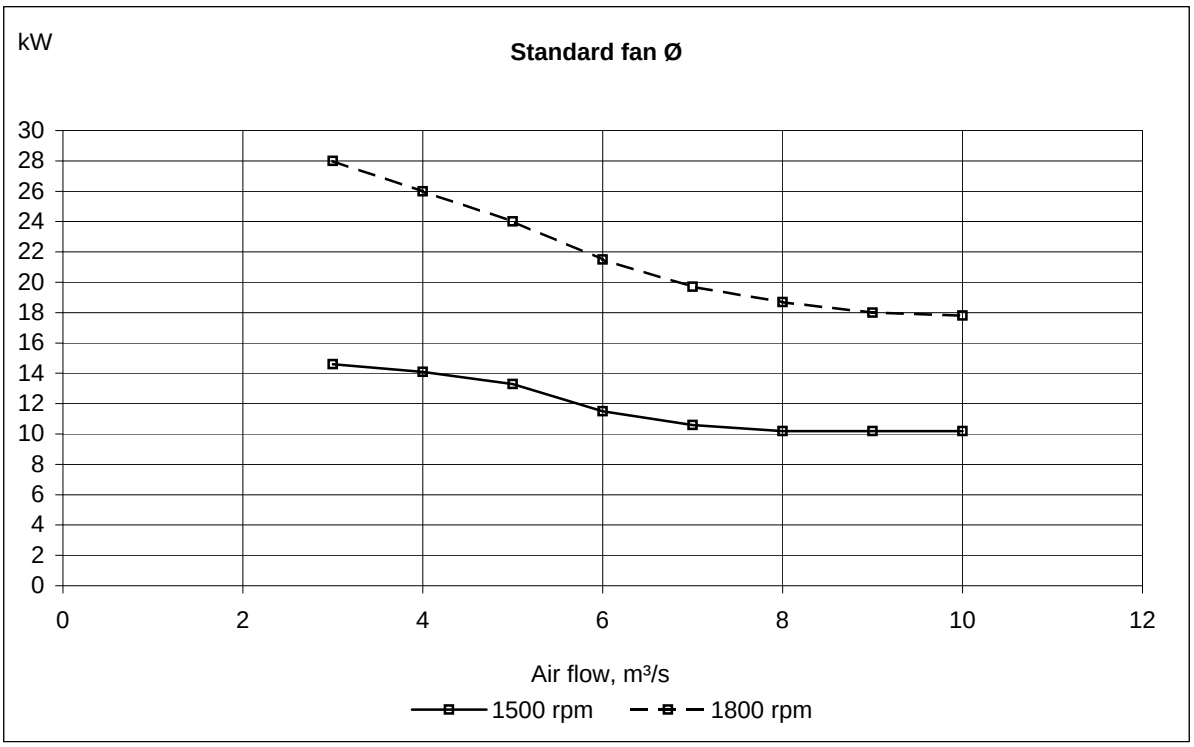

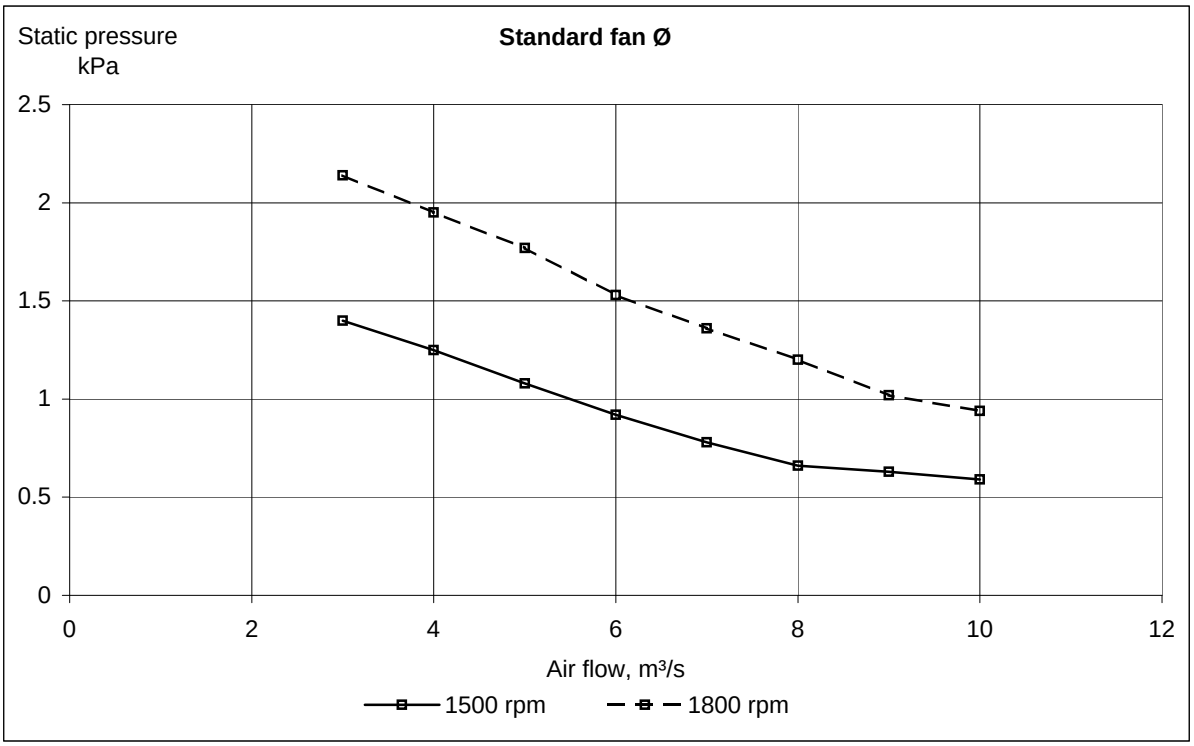

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