


**Important**

This Technical Data Sheet and the corresponding Installation Instructions provide important information to ensure the installed engine will operate according to the design specification in the Volvo Penta application for certification.

Requirements marked with  are considered as critical for exhaust emissions compliance according to the design specification in the Volvo Penta application for certification.

Failing to follow and meet these instructions and requirements when installing a certified engine in a piece of nonroad equipment for use in the United States violates U.S. federal law (40 CFR 1068.105(b)), subject to fines or other penalties as described in the Clean Air Act.

**General**

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel

Number of cylinders			6
Displacement, total		liters	7,70
		in <sup>3</sup>	470
Firing order			1-4-2-6-3-5
Bore		mm	110
		in	4,33
Stroke		mm	135
		in	5,31
Compression ratio			17,5:1
Wet weight (Not including after treatment system)	Engine only	kg	707
		lb	1559
	Power pac	kg	917
		lb	2022

**Performance**

				rpm	1500	1800	2000	2200
ICFN Power	160 kW	without fan	kW	160	160	160	160	
			hp	218	218	218	218	
		with fan 650 mm	kW	153	149	149	149	
			hp	208	203	203	203	
Torque at:	ICFN Power 160 kW	Nm	1020	849	764	695		
		lbf ft	752	626	563	513		
Max torque at engine speed	IFN Power	1350 rpm	Nm	1060				
			lbf ft	782				
Power tolerance			%	±5				
Mean piston speed			m/s	6,8	8,1	9,0	9,9	
			ft/sec	22,1	26,6	29,5	32,5	
Effective mean pressure at:	ICFN Power 160 kW		MPa	1,66	1,39	1,25	1,13	
			psi	241	201	181	164	
Max combustion pressure at:	ICFN Power 160 kW		MPa	12,3	11,2	11,2	8	
			psi	1784	1624	1624	1160	
Total mass moment of inertia, J (mR <sup>2</sup> ) (not including flywheel)			kgm <sup>2</sup>	0,421				
			lbft <sup>2</sup>	10,0				
Friction Power			kW	18	25	31	38	
			hp	24	34	42	52	

**Derating see Technical Diagrams**

**Engine brake performance (only engines with engine brake)**

				rpm	1500	1800	2200	2500
Brake power:	without fan		kW	36	53	83	107	
			hp	49	72	113	146	
Brake torque:	without fan		Nm	230	280	360	410	
			lbf ft	170	207	266	302	
Engine speed range for engine brake activation:			rpm	900-2500				
Min engine speed with engine brake still active:			rpm	750				
Min oil temperature for engine brake activation:			°C	N/A				

**Cold start performance**

*Cold start limit temperature	without starting aid	°C	-15	
		°F	5	
	with manifold heater 4 kW	°C	-25	
		°F	-13	
	with manifold heater 4 kW and block heater	°C	-35	
		°F	-31	
*Specify oil quality	Above -15°C; 15W40 Above -25°C; 10W30 Below -25°C; 5W30			
Block heater type	Make	Power kW	Engaged hours	Cooling water temp engine block
	Volvo	1,5		

\* See also general section in the sales guide



**Lubrication system**

Lubricating oil consumption (average)		Vol%	0,05
Oil system capacity including filters		liter	27
		US gal	7,13
Oil sump capacity:	Max	liter	24
		US gal	6,34
	Min	liter	19
		US gal	5,02
Oil change intervals/specifications	VDS3, VDS4.5	h	500
	VDS3 with oil analysis	h	1000
Engine angularity limits:	front up	°	35
	front down	°	35
	side tilt	°	35
Oil pressure at rated speed	kPa	425	
	psi	62	

**Lubrication system**

Lubrication oil temperature in sump:	max	°C	125
		°F	257
Oil filtration efficiency (in accordance with ISO 4548-12)	97%	μ	36
	50%	μ	14

Fuel system		rpm	1500	1800	2000	2200
Fuel to conform to			EU EN590 US D975, 1-D and 2-D (Max 3000ppm sulphur and 7% FAME) For further information, see service bulletin 18-8-8			
System supply flow at max. speed		liter/h US gal/h	165 43,6			
Fuel supply line max. restriction (Measured at fuel inlet connection)		kPa psi	10 1,5			
Fuel supply line max. pressure, during engine stand still (measured at fuel inlet connection)		kPa psi	20 2,9			
System return flow at max. speed		liter/h US gal/h	111,0 29,3			
Fuel return line max. restriction (Measured at fuel return connection)		kPa psi	15 2,2			
Max. allowable inlet fuel temp (Measured at fuel inlet connection)		°C °F	80 176			
Prefilter / Water separator filtration efficiency	99%	μ	30			
Main fuel filter filtration efficiency (in accordance with ISO 19438)	98%	μ	5			
	96%	μ	4			
Governor type/make, standard		Volvo / EMS 2.3				
Injection pump type/make		Denso HP4				

Intake and exhaust system		Inlet air temp	rpm	1500	1800	2000	2200
Charge air consumption at: (+25°C and 100kPa)	ICFN Power 160 kW	25°C	m <sup>3</sup> /min	12,4	14,9	16,4	18,1
		77°F	cfm	438	526	579	639
 <b>See front page for important information</b>							
Max allowable air intake restriction including piping			kPa psi	6 0,9			
Heat rejection to exhaust at:	ICFN Power 160 kW		kW	109	114	121	132
			BTU/min	6199	6483	6881	7507
Exhaust gas temperature after turbine at:	ICFN Power 160 kW		°C	414	371	358	356
			°F	777	700	676	673
 <b>See front page for important information</b>							
Max allowable back pressure in exhaust line (after turbine) Pipe dimension Ø: 127 mm			kPa psi	8 1,2	12 1,7	14 2,0	15 2,2
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	ICFN Power 160 kW		m <sup>3</sup> /min	29,4	31,9	34	37
			cfm	1038	1127	1201	1307

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TAD840VE 160kW/2200rpm

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**09****Cooling system**

		rpm	1500	1800	2000	2200
Heat rejection radiation from engine at:	ICFN Power 160 kW	kW	6	4	3,9	4,2
		BTU/min	318	239	222	239
Heat rejection to coolant at:	ICFN Power 160 kW	kW	72	75	79,5	88,7
		BTU/min	4078	4259	4521	5044
Radiator cooling system type			Closed circuit			
Standard radiator core area	ICFN Power 160 kW	m <sup>2</sup>	0,6			
		foot <sup>2</sup>	6,46			
Fan diameter	650 mm	ICFN Power 160 kW	650			
			25,59			
Maximum fan power consumption	650 mm pull	kW	7,2	10,8	10,8	10,8
		hp	10	15	15	15
Fan drive ratio	fan Ø650		1:1.4			
	fan position high		1:1.1			
Coolant capacity:	engine	liter	17			
		US gal	4,5			
	engine + standard radiator, hoses and expansion tank	liter	51			
		US gal	13,5			
Coolant pump		drive/ratio	belt/1,4:1			
Coolant flow with standard system		l/s	5,4	6,5	7,2	8
		US gal/s	1,4	1,7	1,9	2,1
Minimum coolant flow		l/s				6,0
		US gal/s				1,6
Maximum outer circuit restriction incl. piping		kPa	40,0			
		psi	5,8			
Thermostat:	start to open	°C	85			
		°F	185			
	fully open	°C	95			
		°F	203			
Maximum static pressure head (expansion tank height + pressure cap setting)		kPa	110			
		psi	16,0			
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa	85			
		psi	12,3			
Standard pressure cap setting		kPa	100			
		psi	14,5			
Maximum top tank temperature		°C	107			
		°F	225			
Recommended 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		liter	2			
		US gal	0,5			

**Charge air cooler system**

		rpm	1500	1800	2000	2200
Heat rejection to charge air cooler	ICFN Power 160 kW	kW	26	30,7	34,2	39,3
		BTU/min	1479	1746	1945	2235
Charge air mass flow	ICFN Power 160 kW	kg/s	0,248	0,296	0,327	0,36
Charge air inlet temp. (Charge air temp after turbo compressor)	ICFN Power 160 kW	°C	145	147	151	159
		°F	293	297	304	318
 <b>See front page for important information</b> Max allowable Charge air outlet temp. (Charge air temp after charge air cooler)		°C	41	44	47	50
		°F	106	111	117	122
 <b>See front page for important information</b> Maximum pressure drop over charge air cooler incl. piping		kPa	7	9	10	12
		psi	1,0	1,3	1,5	1,7
Charge air pressure (After charge air cooler)		kPa	146	148	150	154
		psi	21,18	21,47	21,76	22,34
Standard charge air cooler core area		m <sup>2</sup>	0,5			
		foot <sup>2</sup>	5,38			

**Cooling performance: 0,6 m<sup>2</sup> radiator and 650mm fan, pull**

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

		ICFN Power 160 kW					
Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m <sup>3</sup> /s	ft <sup>3</sup> /s	Pa	psi
2200	160 218	77,2	171	9,1	321,4	0	
		76,8	170	8,9	314,3	100	0,015
		76,1	169	8,6	303,7	200	0,029
		75,1	167	8,2	289,6	300	0,044

**Cooling performance: 0,6 m<sup>2</sup> radiator and 650mm fan, push**

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

		ICFN Power 160 kW					
Engine speed rpm	Engine power kW hp	* Air on temp		Air flow		External restriction	
		°C	°F	m <sup>3</sup> /s	ft <sup>3</sup> /s	Pa	psi
2200	160 218	76,3	169	5,9	208,4	0	
		75,0	167	5,8	204,8	100	0,015
		73,5	164	5,7	201,3	200	0,029
		72,0	162	5,6	197,8	300	0,044

\* AOT-temperatures are based upon simulations.

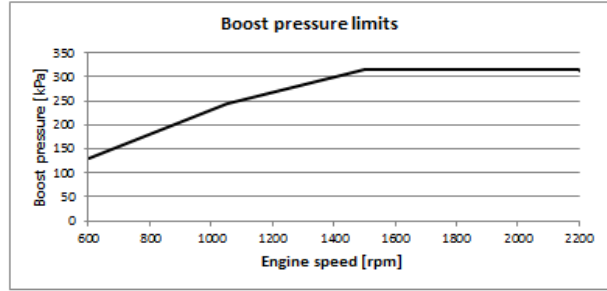
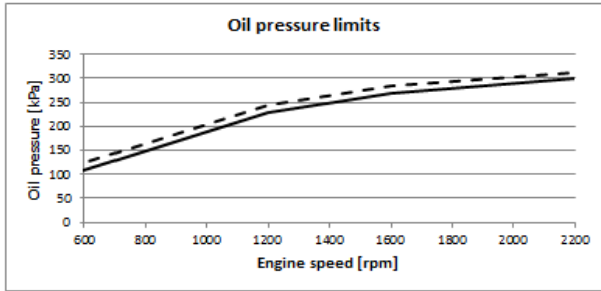
### Engine management system

Functionality	Alternatives			Default setting
Governor mode	Droop	Isochronous		Isochronous
Governor droop	10	125	Nm/rpm	
Governor response	Adjustable PI constants			
Idle speed	600	800	rpm	600
Stop function				Replaced by "Ignition of stop engine"
Preheating function	Ignition	Request	Request + temp	If preheat is available, preheat will be active at ignition on if temp low or demanded by driver.
Lamp test				No lamp test, not used any longer
Ignition of stop engine	Yes	No		No

Engine sensors and switch settings		Alarm level		Engine protection	
Parameter	Unit	Setting range	Default setting	Level	Action. Default/Alternative
Oil temp	°C		125	125	Derate
Oil pressure	Low idle	kPa	100,0	100	Shut down
	Rated speed	kPa	300	300	Shut down
Coolant temp	°C		107	107	Derate
Coolant level			On	Low level	Derate
Water in fuel		On if closed circuit			
Air filter pressure drop			5kPa		
Altitude, above sea	m				Automatic derating, see section derating
Charge air temp	°C		80	80	Derate
Charge air pressure	kPa		See map		Derate
Engine speed	rpm				Shut down. ON/OFF*

\* Off means no shut down, alarm only

Parameter	Warning	Alarm	Derated 0% to engine protection map	Derated 100% to engine protection map	Forced idle after 0 sec	Forced shut down after 0 sec
Coolant temp	103°C	107°C	107°C	110°C		
Oil temp	122°C	125°C	125°C	130°C		
Low oil pressure	Warning map value	Alarm map value		Alarm map value		
High charge air temp	77°C	80°C	80°C	100°C		
High charge air pressure		Alarm map value	Alarm map value			



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**09****Electrical system**

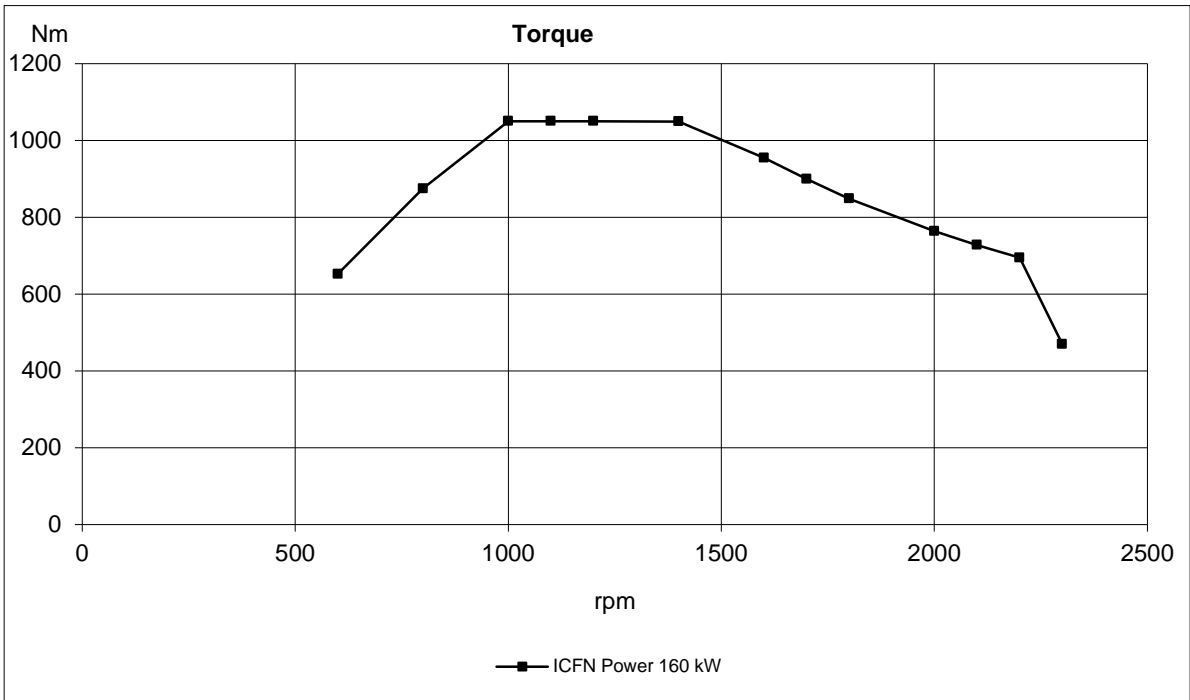
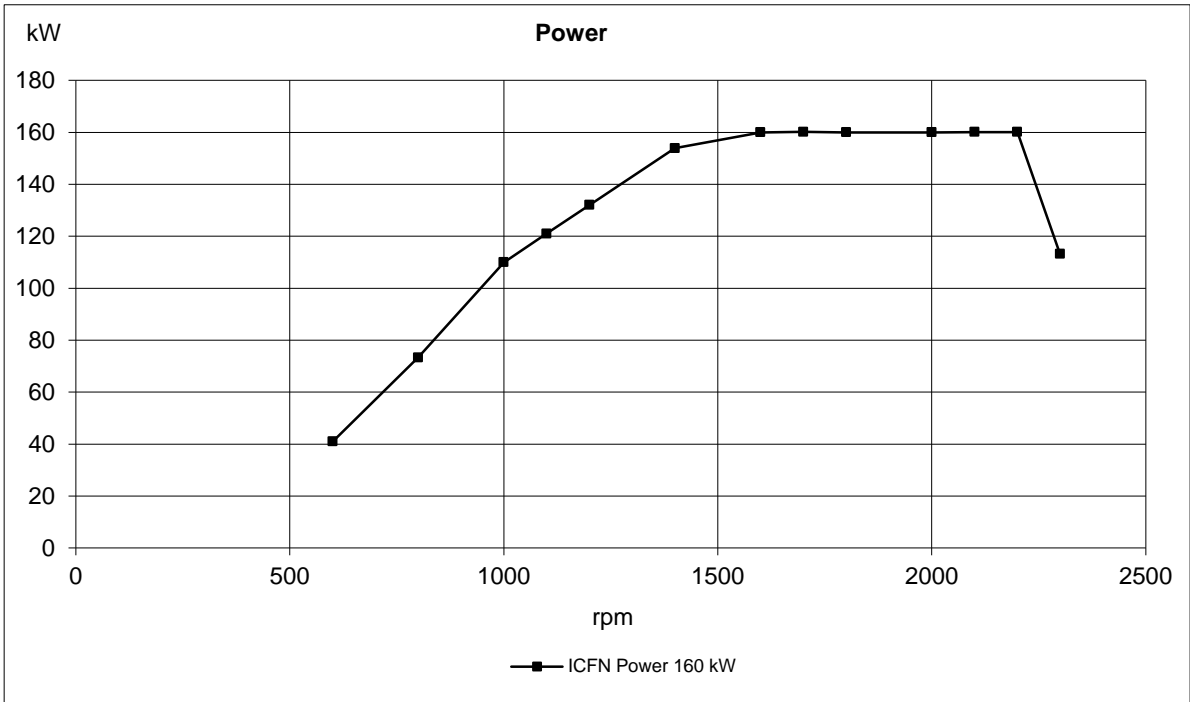
Voltage and type			24V
Alternator:	make		MELCO
	output	A	110/130
	tacho output	Hz/alternator rev.	
	drive ratio		
Starter motor:	make		MELCO
	type		85P50 / 90P55
	output	kW	5 / 5.5
		hp	6.8 / 7.5
Number of teeth on:	flywheel		137
	starter motor		10 / 12 teeth
Inlet manifold heater (at 20 V)		kW	4
Power relay for the manifold heater		A	200

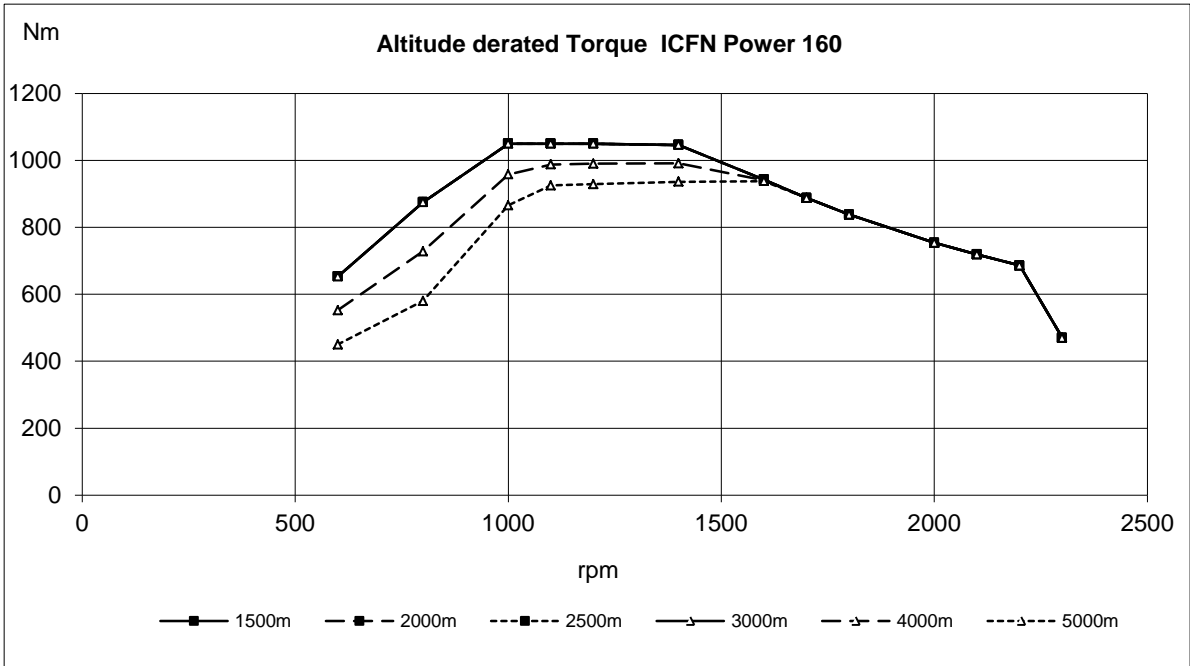
Conditions: (5 mΩ main circuit resistance@)	Temperature	°C	25	0	-15
	Battery	Ah / CCA	140/800	140/800	170/1000
Crank speed		rpm	185	160	120
Crank current		A	220	300	470
Starter input power during crank		kW	4,91	5,90	6,94
Battery power during crank		kW	5,15	6,31	7,50
Min battery @ 0°C		Ah / CCA	100/700		

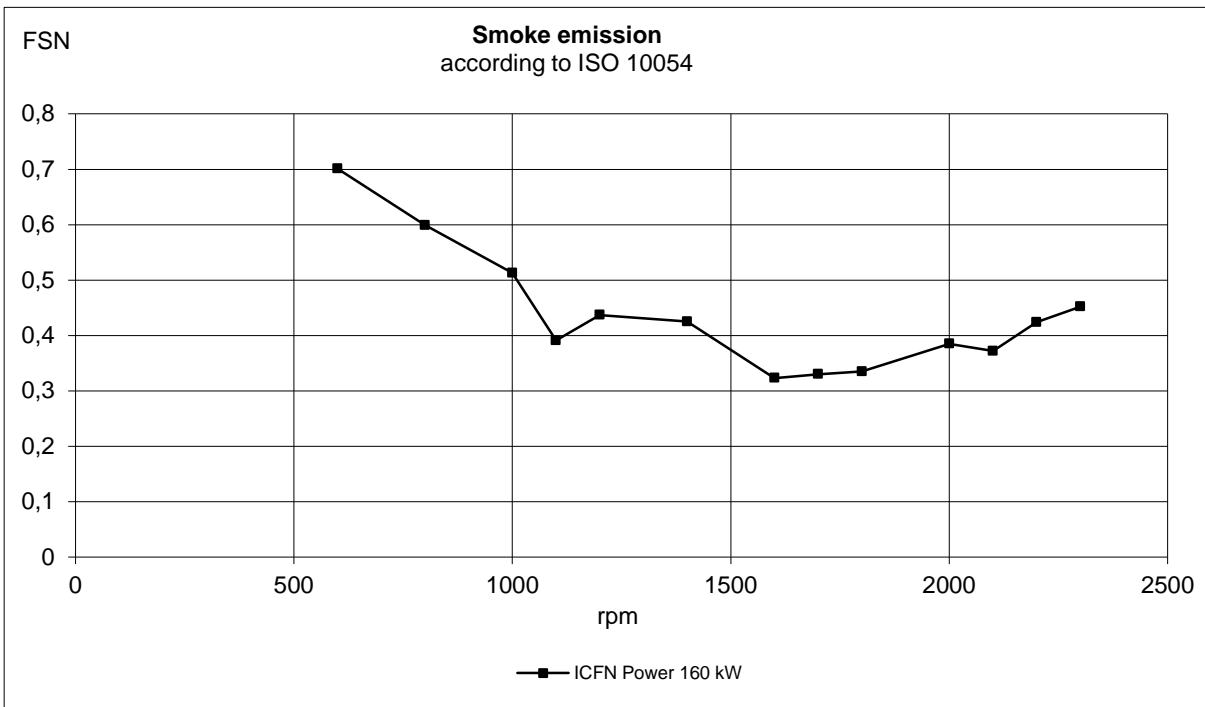
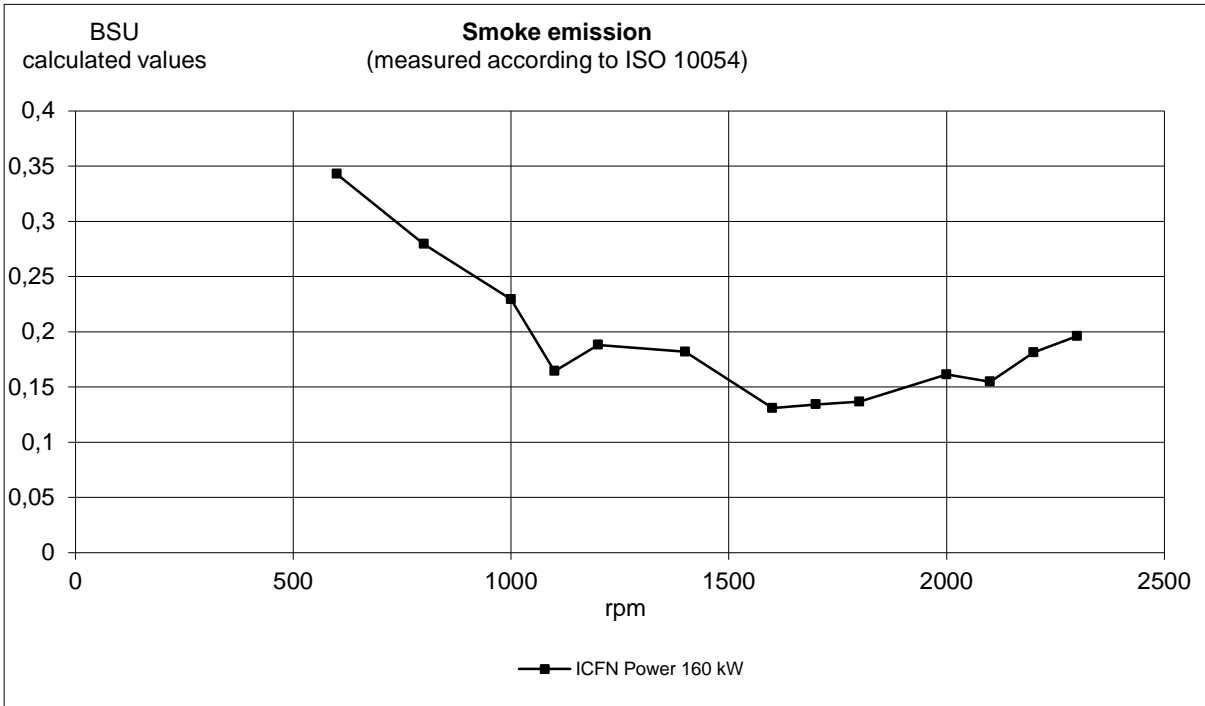
Power take off		rpm	1500	1800	2000	2200
Front end in line with crank shaft max:*	0.02 kgm <sup>2</sup>	Nm	1064,0	743,0	740	833
		lbf ft	785	548	546	614
	0.03 kgm <sup>2</sup>	Nm	1030,0	706,0	697	786
		lbf ft	760	521	514	580
	0.04 kgm <sup>2</sup>	Nm	996,0	663,0	654	729
		lbf ft	735	489	482	538
Front end belt pulley load.	Max up (above or equal to horizontal line)	kW	12,5	16	18,8	19,6
		hp	17,0	21,8	25,6	26,7
	Max down (below horizontal line)	kW	26,6	34,2	38	41,8
		hp	36,2	46,5	51,7	56,8
Maximum power on Rear PTO on top of flywheel housing (REPTO):*		kW	75			
		hp	102			
Speed ratio direction of rotation viewed from flywheel side			1:1 Counter clockwise			
Maximum torque on PTO at compressor position:*		Nm	200			
		lbf ft	148			
Speed ratio direction of rotation viewed from flywheel side			1.026:1 Counter clockwise			
Timing gear at hydraulic pump PTO max:*		Nm	80			
		lbf ft	59			
Speed ratio direction of rotation viewed from flywheel side			1.3:1 Clockwise			
Max allowed bending moment in flywheel housing SAE2		Nm	4600			
		lbf ft	3393			
Max. rear main bearing load		N				
		lbf				

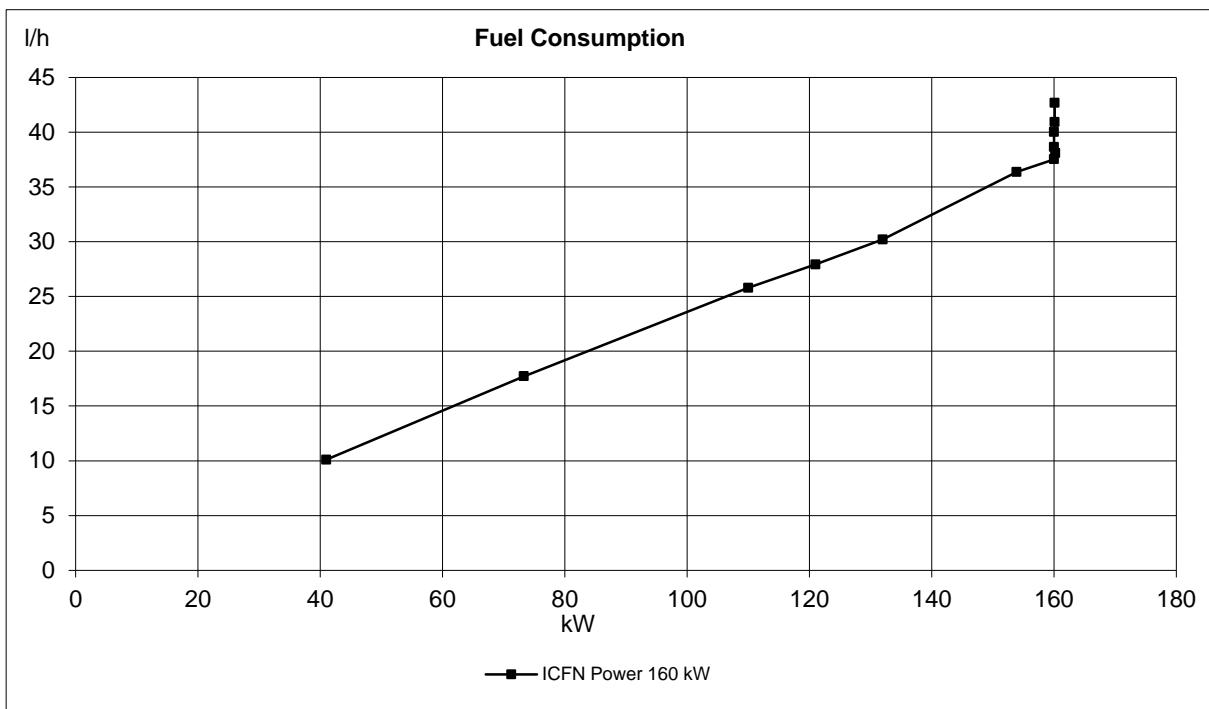
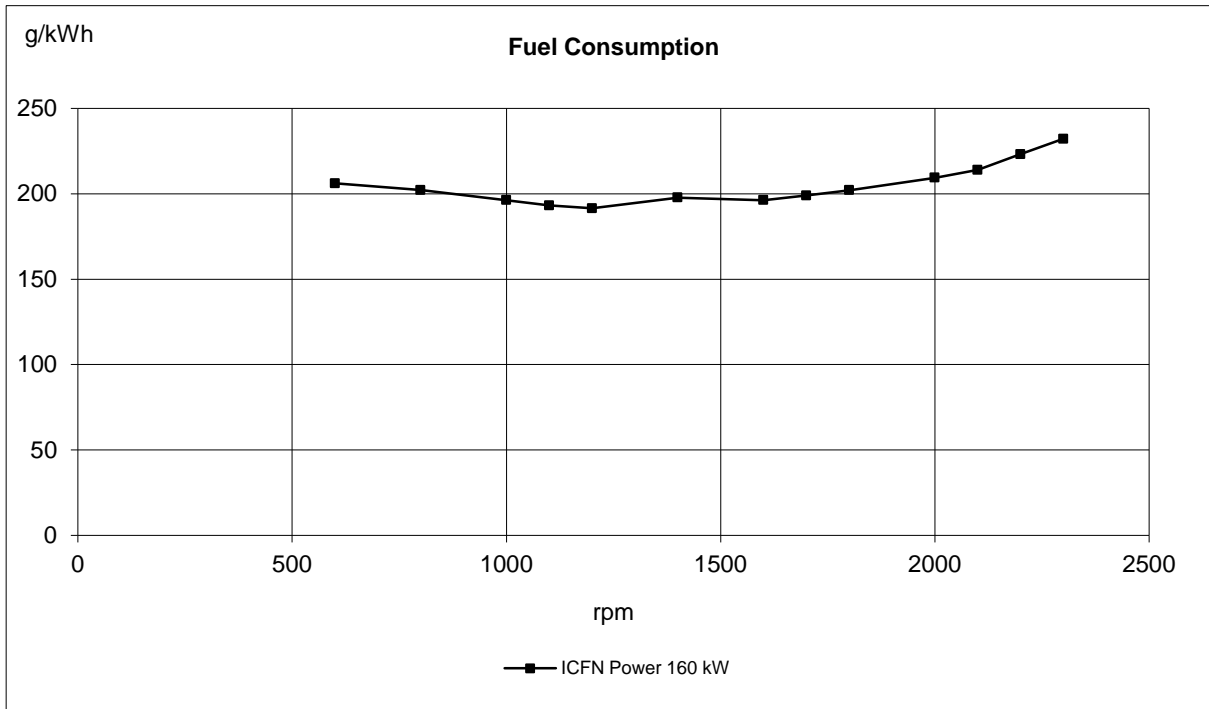
\* Maximum allowed torque at individual PTO's.

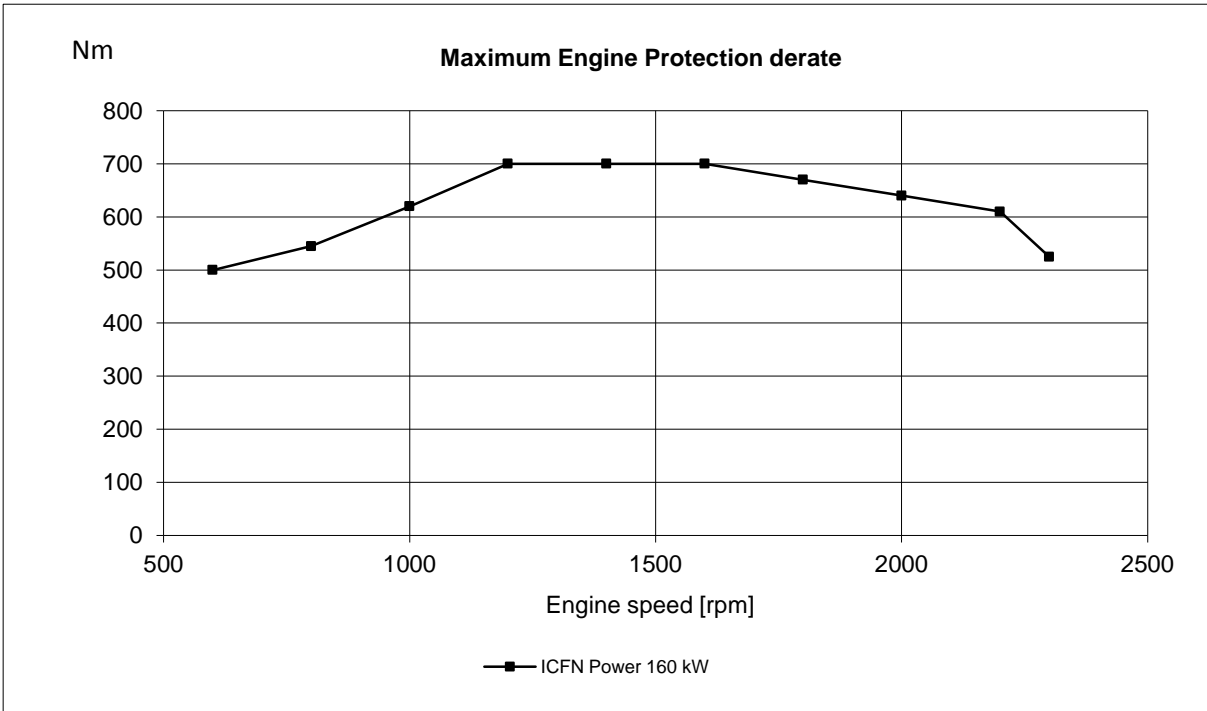
If more than one PTO output is used simultaneously, calculations needs to be performed to determine available maximum. Available torque depends on application inertia.

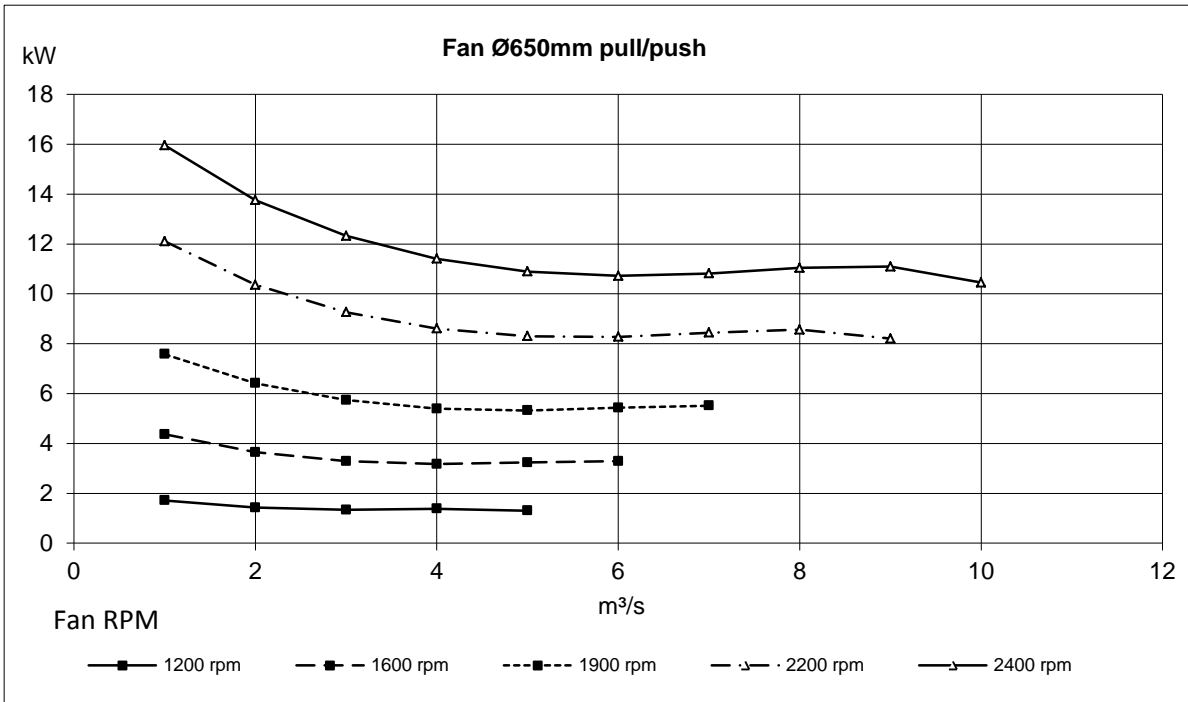




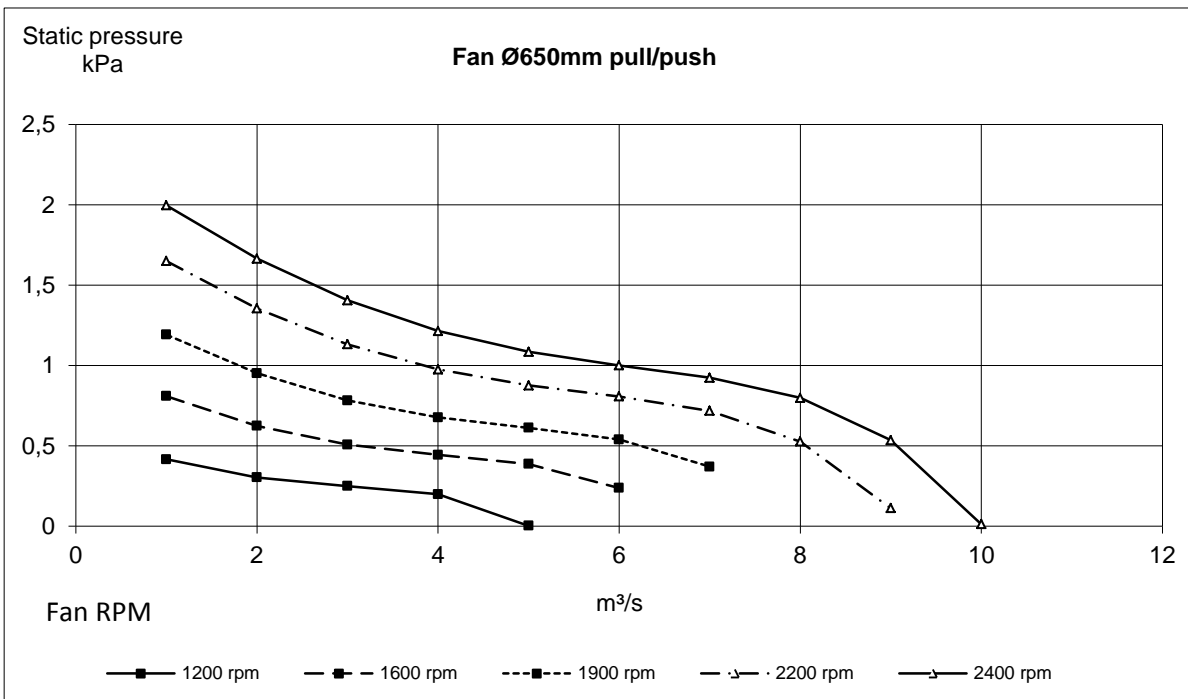








Maximum fan speed with visco clutch: 2400rpm



Maximum fan speed with visco clutch: 2400rpm

