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 ⚠ onsidered 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 penalities 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^3	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		kW	153	149	149	149
		650 mm		hp	208	203	203	203
Torque at:		ICFN Power 160 kW		Nm	1020	982	884	803
				lbf ft	752	724	652	592
Max torque at engine speed	ICFN 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	12,1	11,9	12	12,2
				psi	1755	1726	1740	1769
Total mass moment of inertia, J (mR^2)				kgm^2	0,421			
(not including flywheel)				$lbft^2$	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	130
		°F	266
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	165			
			US gal/h	43,6			
Fuel supply line max. restriction (Measured at fuel inlet connection)			kPa	10			
			psi	1,5			
Fuel supply line max. pressure, during engine stand still			kPa	20			
(meassured at fuel inlet connection)			psi	2,9			
System return flow at max. speed			liter/h	111,0			
			US gal/h	29,3			
Fuel return line max. restriction (Measured at fuel return connection)			kPa	15			
			psi	2,2			
Max. allowable inlet fuel temp (Measured at fuel inlet connection)			°C	80			
			°F	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	m³/min	13,6	15,7	17,1	18,8
		77°F	cfm	480	554	604	664
⚠ **See front page for important information** Max allowable air intake restriction including piping			kPa	6			
			psi	0,9			
Heat rejection to exhaust at:	ICFN Power 160 kW		kW	132	132	140	156
			BTU/min	7507	7507	7962	8872
Exhaust gas temperature after turbine at:	ICFN Power 160 kW		°C	453	403	393	399
			°F	847	757	739	750
⚠ **See front page for important information** Max allowable back pressure in exhaust line (after turbine)			kPa	9	12	14	15
Pipe dimension Ø: 127 mm			psi	1,3	1,7	2,0	2,2
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	ICFN Power 160 kW		m³/min	33,5	35,0	36,8	40,6
			cfm	1183	1236	1300	1434

Cooling system			rpm	1500	1800	2000	2200
Heat rejection radiation from engine at:		ICFN Power 160 kW	kW	7	5	5,2	5,8
			BTU/min	392	307	296	330
Heat rejection to coolant at:		ICFN Power 160 kW	kW	72	76	80,6	92,4
			BTU/min	4095	4339	4584	5255
Radiator cooling system type				Closed circuit			
Standard radiator core area		ICFN Power 160 kW	m²	0,6			
			foot²	6,46			
Fan diameter	650 mm	ICFN Power 160 kW	mm	650			
			in	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	31,8	35,2	38,3	44,9
		BTU/min	1808	2002	2178	2553
Charge air mass flow	ICFN Power 160 kW	kg/s	0,271	0,312	0,34	0,374
Charge air inlet temp.	ICFN Power 160 kW	°C	158	156	158	169
(Charge air temp after turbo compressor)		°F	316	313	316	336
⚠ **See front page for important information** Max allowable Charge air outlet temp.		°C	41	44	46	50
(Charge air temp after charge air cooler)		°F	106	111	115	122
⚠ **See front page for important information** 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		kPa	169	162	161	166
(After charge air cooler)		psi	24,51	23,50	23,35	24,08
Standard charge air cooler core area		m²	0,5			
		foot²	5,38			

Cooling performance: 0,6 m² radiator and 650mm fan, pull

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 111°C TTT and 40% coolant. Valid at 1 atm.

		ICFN Power 160 kW					
Engine speed	Engine power	Air on temp		Air flow		External restriction	
rpm	kW hp	°C	°F	m^3/s	ft^3/s	Pa	psi
2200	160	76,3	169	9,1	321,4	0	
	218	75,9	169	8,9	314,3	100	0,015
		75,2	167	8,6	303,7	200	0,029
		74,1	165	8,2	289,6	300	0,044

Cooling performance: 0,6 m² radiator and 650mm fan, push

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 111°C TTT and 40% coolant. Valid at 1 atm.

		ICFN Power 160 kW					
Engine speed	Engine power	*Air on temp		Air flow		External restriction	
rpm	kW hp	°C	°F	m^3/s	ft^3/s	Pa	psi
2200	160	75,2	167	5,9	208,4	0	
	218	73,8	165	5,8	204,8	100	0,015
		72,4	162	5,7	201,3	200	0,029
		70,7	159	5,6	197,8	300	0,044

* AOT-temperatures are based upon simulations.

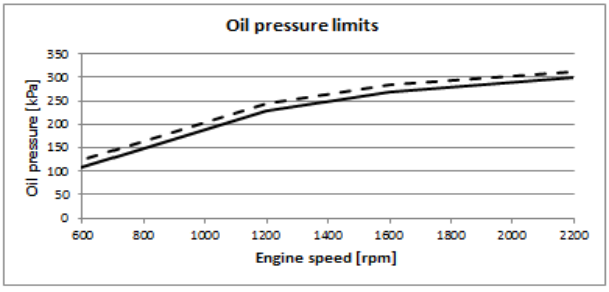
Engine management system

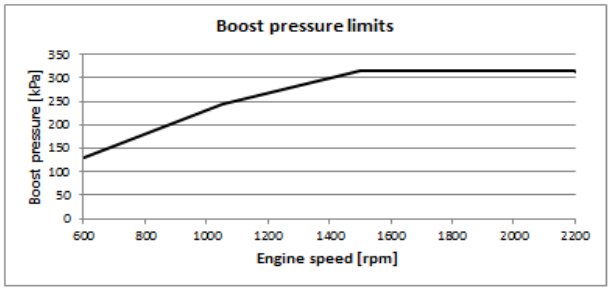
Functionality	Alternatives			Default setting
Governor mode	Droop	Isochronous		Isochronous
Governor droop	10	125	Nm/rpm	
Governor response	Adjustable PI constants			
Idle speed	600	800	rpm	600
Stop function				Replaced by "Ignition of stop engine"
Preheating function	Ignition	Request	Request + temp	If 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			





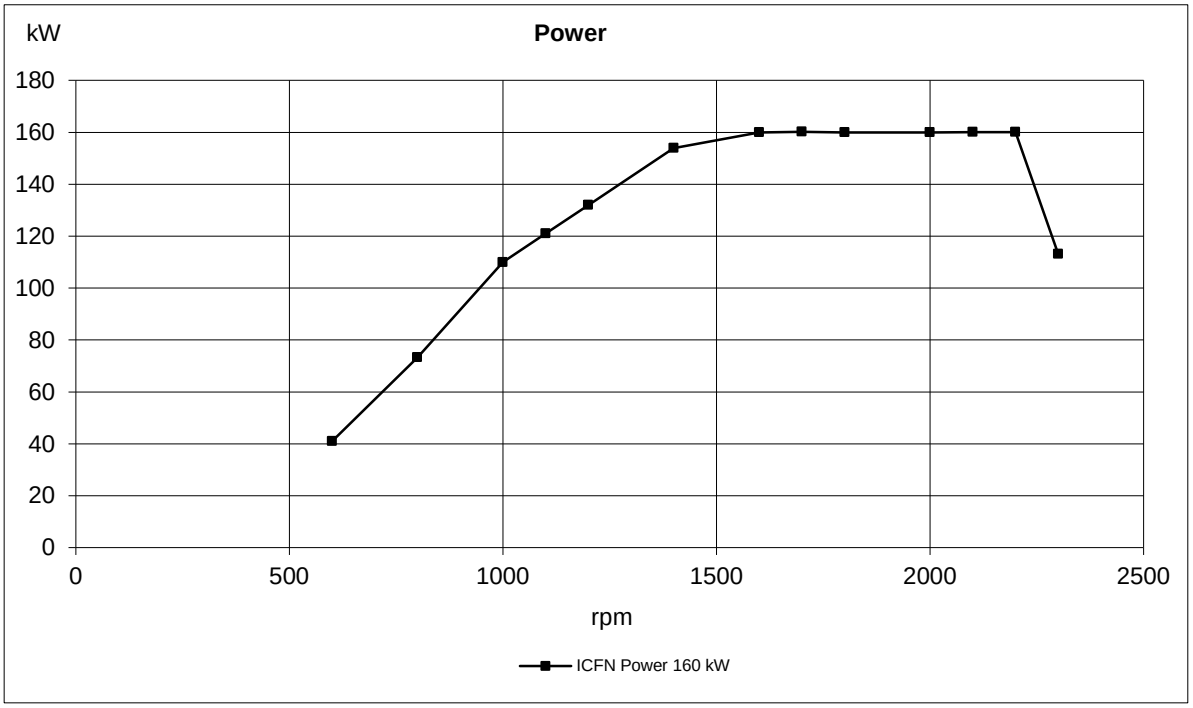
Electrical system

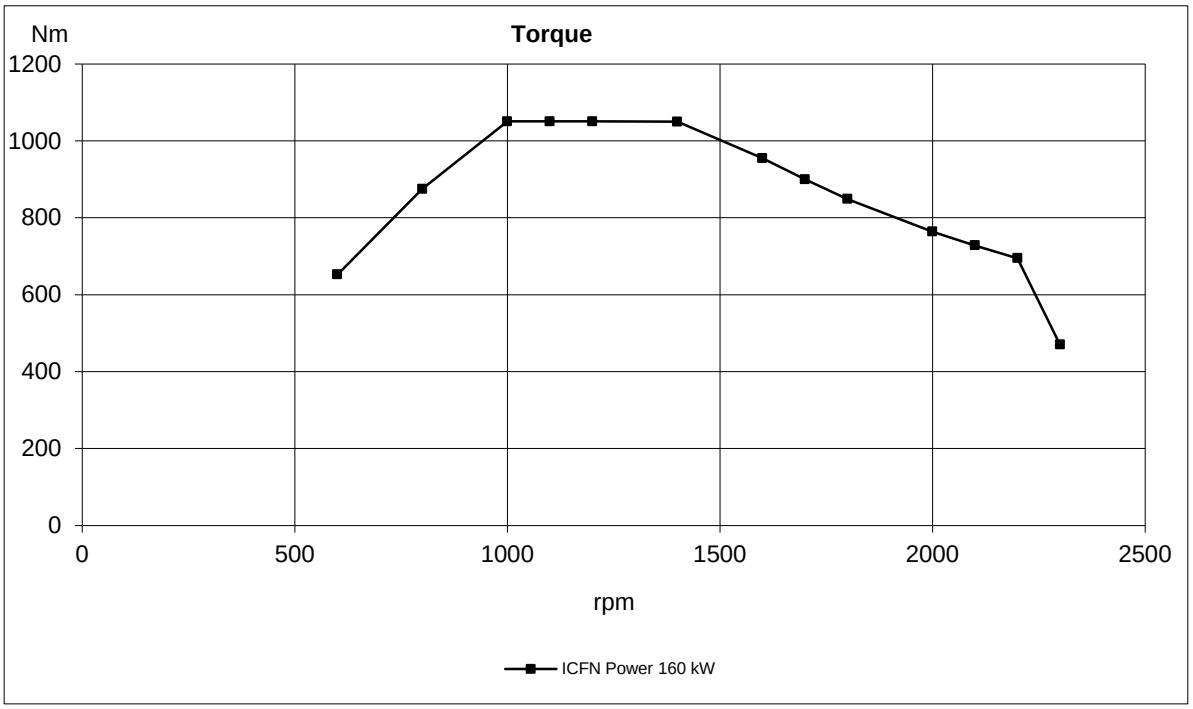
Voltage and type				24V
Alternator:	make			MELCO
	output	A		110/130
	tacho output	Hz/alternator rev.		
	drive ratio			
Starter motor:	make			MELCO
	type			85P50 / 90P55
	output		kW	5 / 5.5
			hp	6.8 / 7.5
Number of teeth on:	flywheel			137
	starter motor			10 / 12 teeth
Inlet manifold heater (at 20 V)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

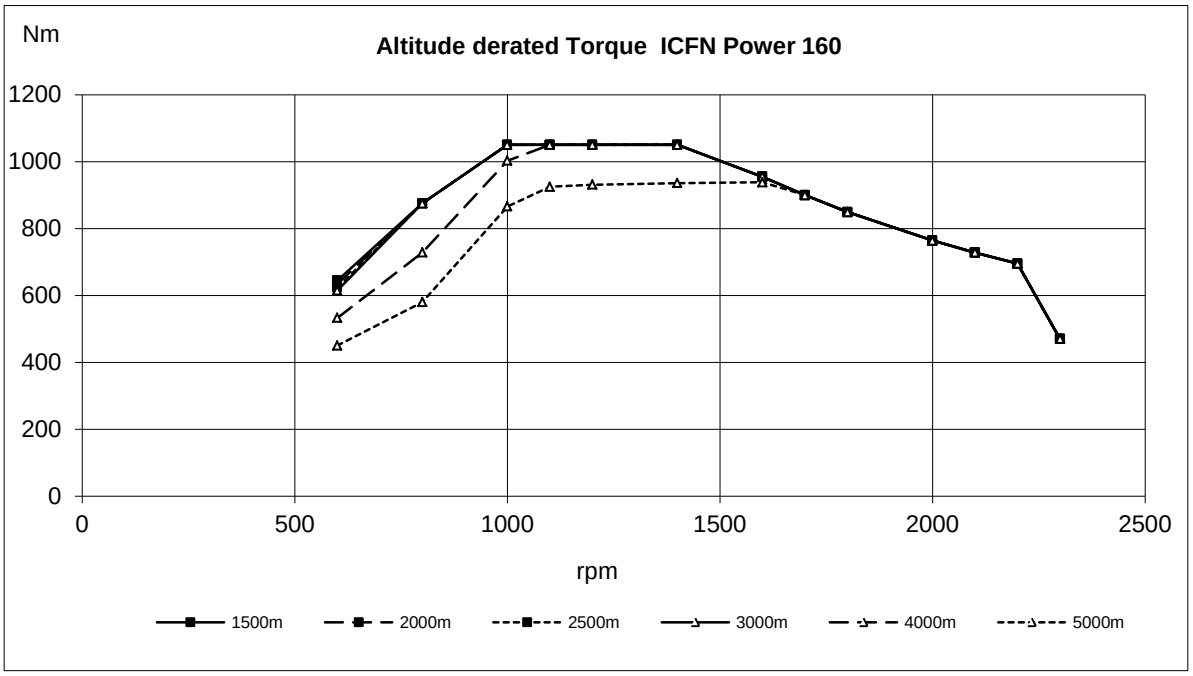
Conditions:	**Temperature**	**°C**		**25**	**0**	**-15**
(5 mΩ main circuit resistance@ 20°C)	**Battery**	**Ah / CCA**		**140/800**	**140/800**	**170/1000**
Crank speed		rpm		185	160	120
Crank current		A		220	300	470
Starter input power during crank		kW		4,91	5,90	6,94
Battery power during crank		kW		5,15	6,31	7,50
Min battery @ 0°C		Ah / CCA		100/700		

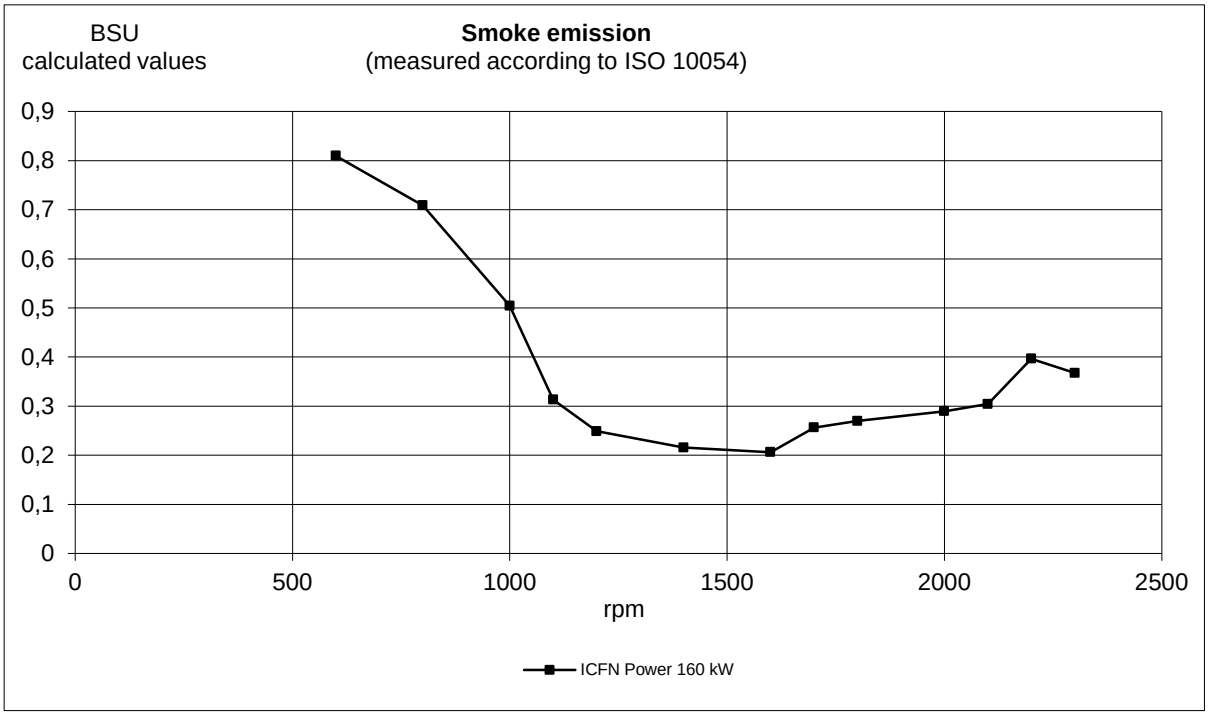
Power take off			**rpm**	**1500**	**1800**	**2000**	**2200**
Front end in line with crank shaft max:*		0.02 kgm^2	Nm	1064,0	743,0	740	833
Flywheel			lbf ft	785	548	546	614
SAE 2, STD 10" & 11,5 ", 1.303 kgm2		0.03 kgm^2	Nm	1030,0	706,0	697	786
			lbf ft	760	521	514	580
		0.04 kgm^2	Nm	996,0	663,0	654	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				

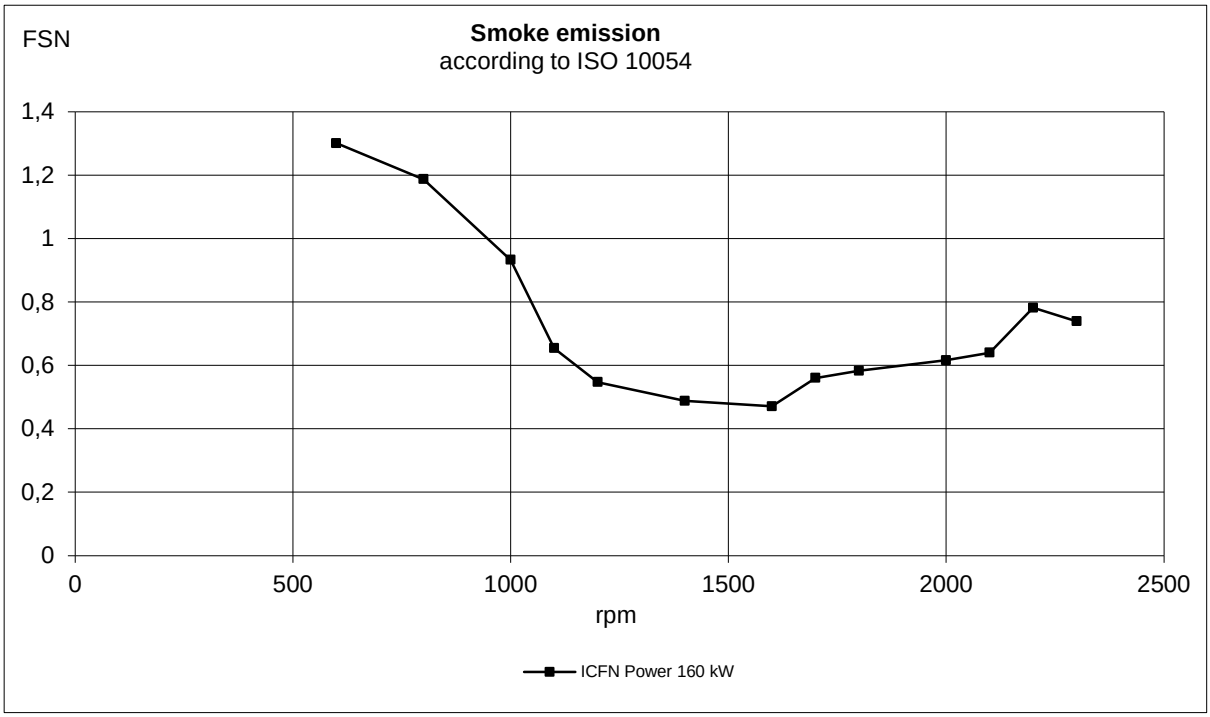
**** Maximum allowed torque at individual PTO´s.***
If more then one PTO output is used simultaniusly, calculations needs to be performed to determine available maximum. Available torque depends on application inertia.

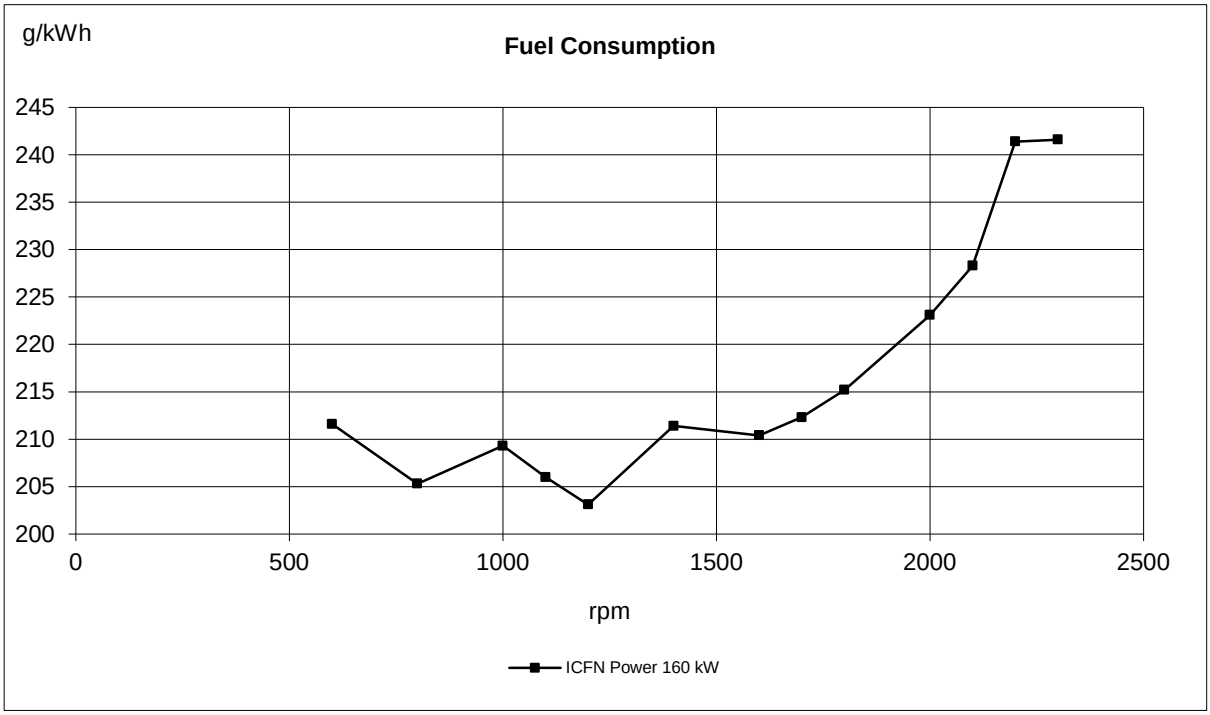

kW
Power
180
160
140
120
100
80
60
40
20
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

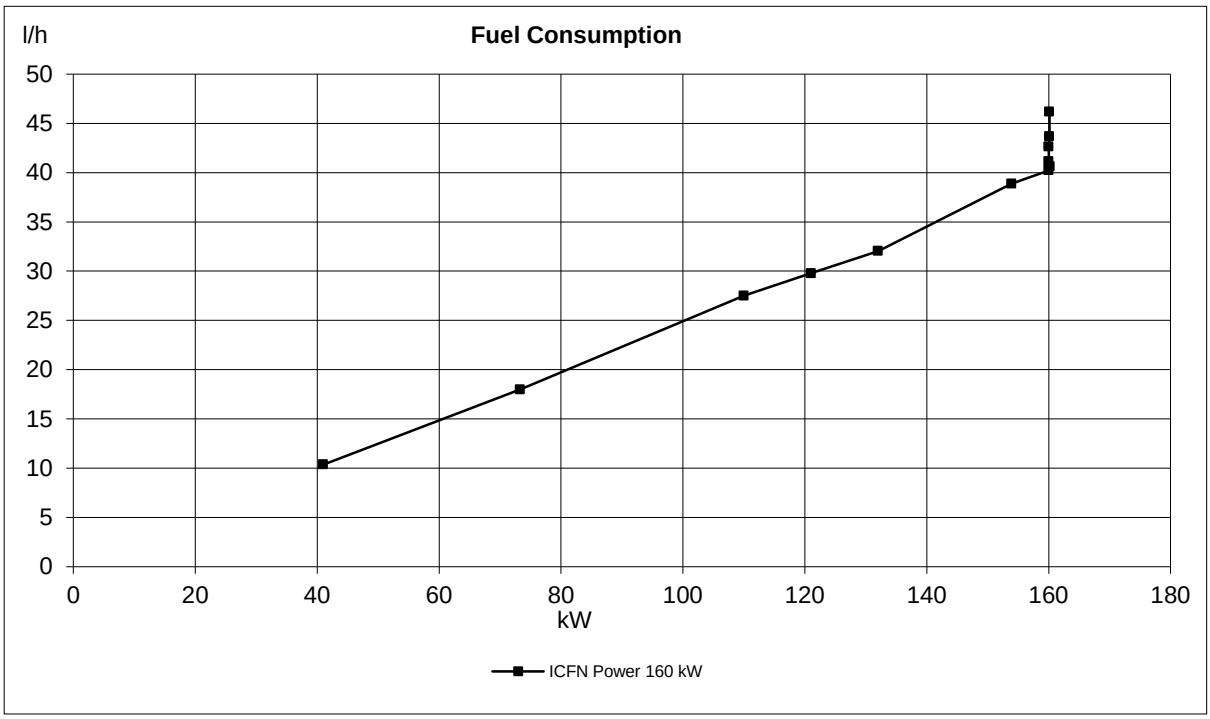

Nm
Torque
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

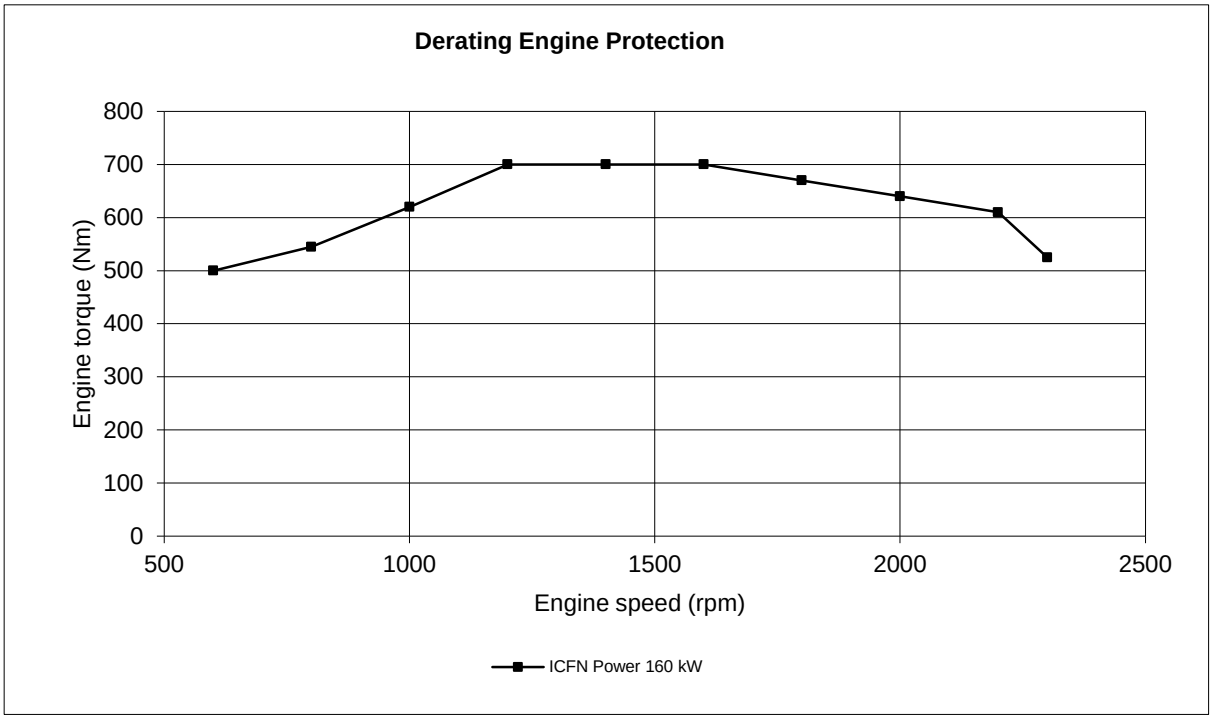

Nm
Altitude derated Torque ICFN Power 160
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
rpm
1500m
2000m
2500m
3000m
4000m
5000m

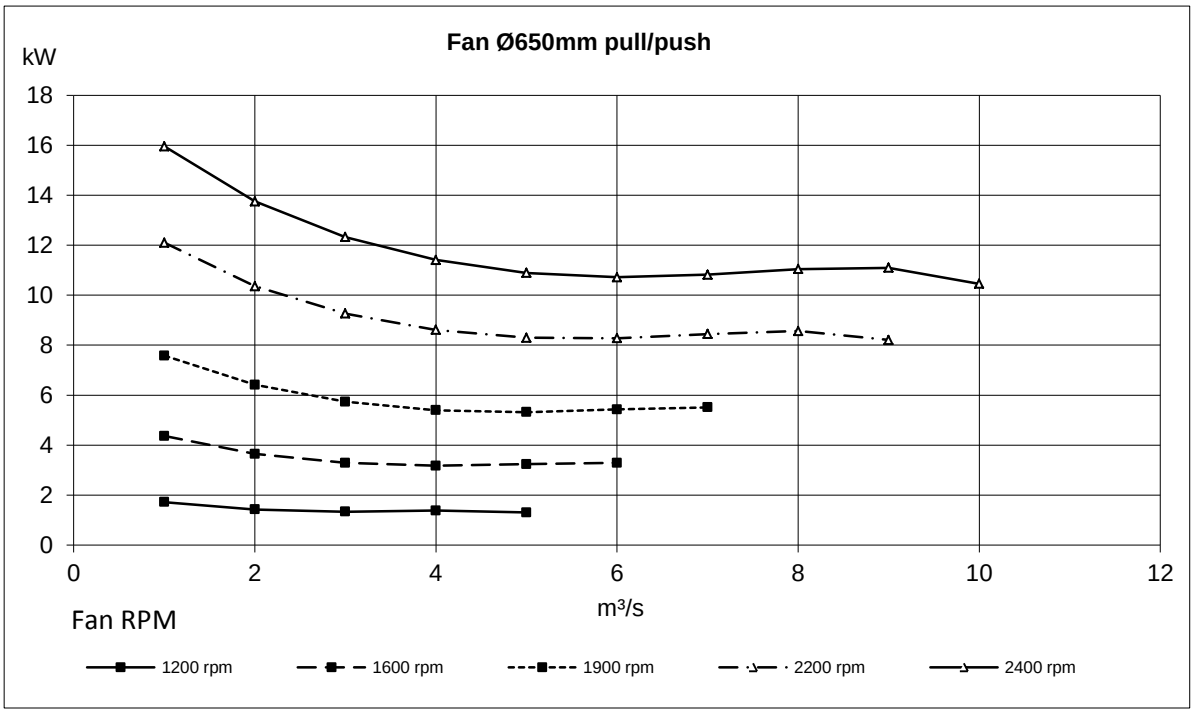

BSU
calculated values
Smoke emission
(measured according to ISO 10054)
0,9
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW


FSN
Smoke emission
according to ISO 10054
1,4
1,2
1
0,8
0,6
0,4
0,2
0
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW

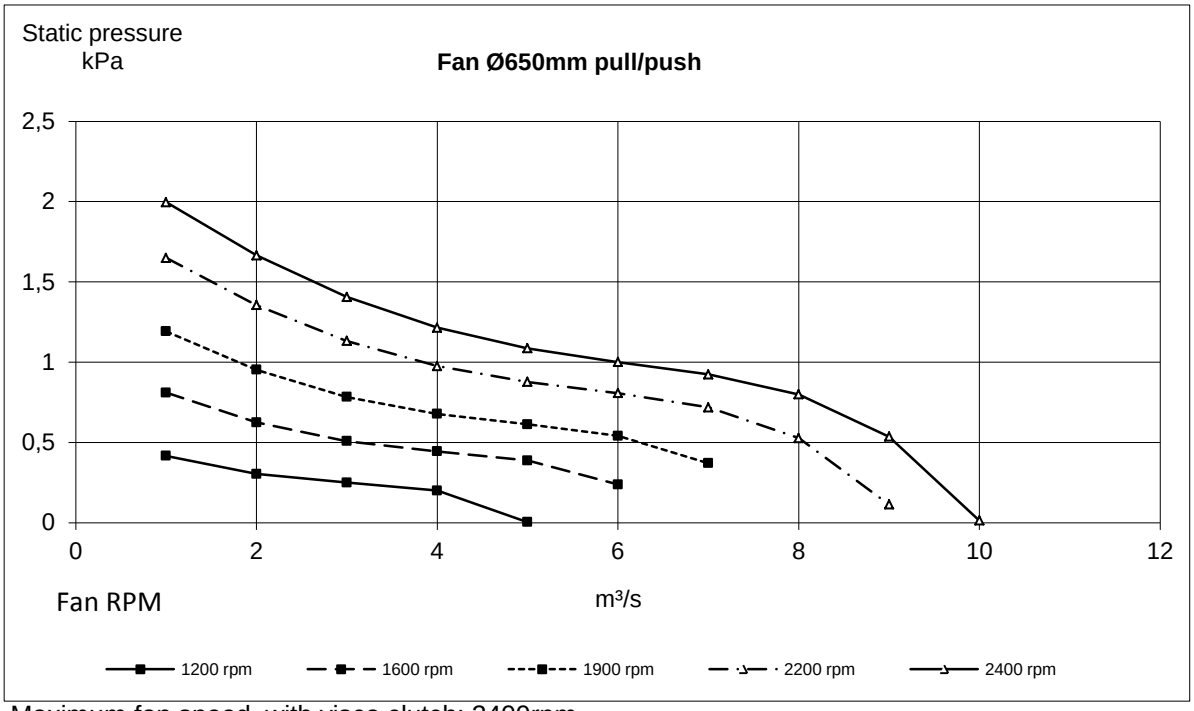

g/kWh
Fuel Consumption
245
240
235
230
225
220
215
210
205
200
0
500
1000
1500
2000
2500
rpm
ICFN Power 160 kW


l/h
Fuel Consumption
50
45
40
35
30
25
20
15
10
5
0
0
20
40
60
80
100
120
140
160
180
kW
ICFN Power 160 kW

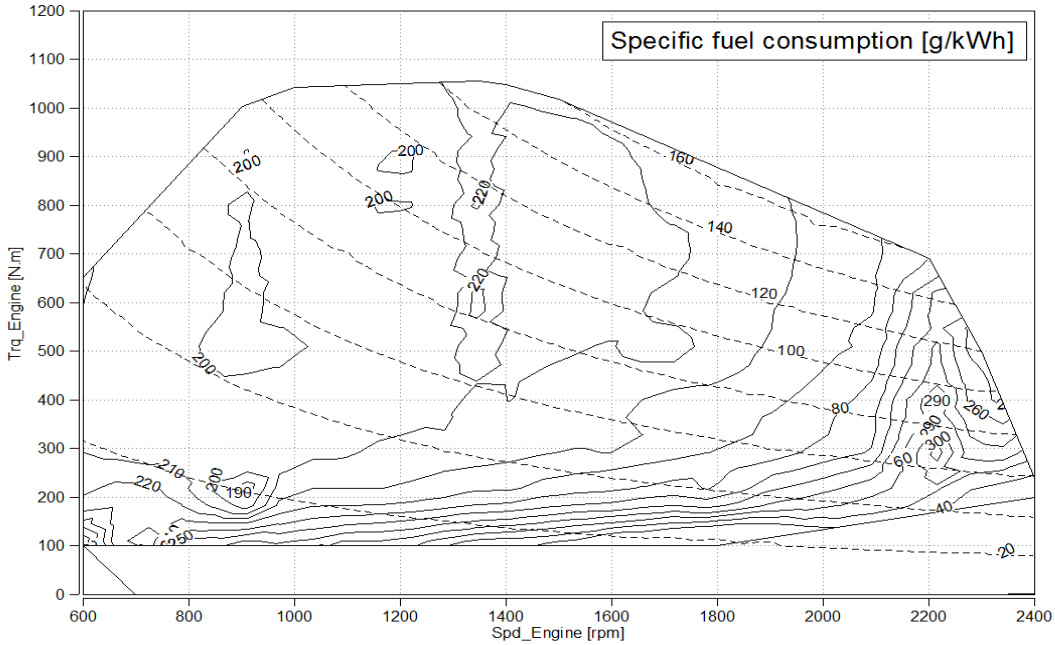

Derating Engine Protection
800
700
600
500
400
300
200
100
0
Engine torque (Nm)
500
1000
1500
2000
2500
Engine speed (rpm)
ICFN Power 160 kW

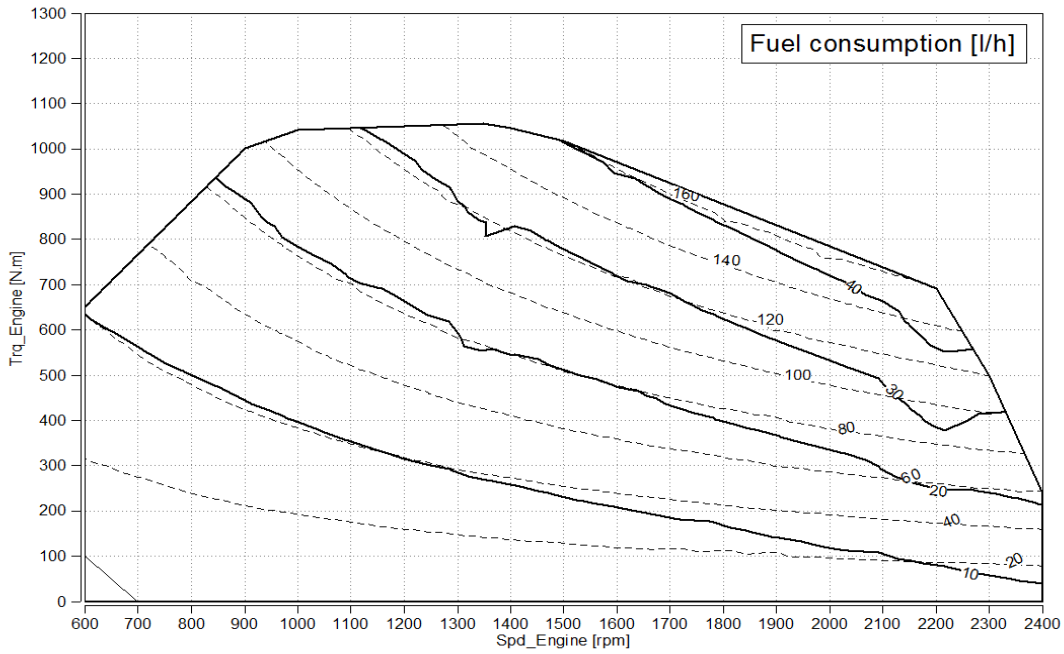


Maximum fan speed with visco clutch: 2400rpm



Maximum fan speed with visco clutch: 2400rpm


Specific fuel consumption [g/kWh]
Trq_Engine [N.m]
Spd_Engine [rpm]


Fuel consumption [l/h]
Trq_Engine [N.m]
Spd_Engine [rpm]