


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, counterclockwise viewed towards flywheel

Number of cylinders			6
Displacement, total		liters	10,84
		in ³	661
Firing order			1-5-3-6-2-4
Bore		mm	123
		in	4,84
Stroke		mm	152
		in	5,98
Compression ratio			17,0:1
Wet weight	Engine only (Estimated) (excl after treatment comp.)	kg	1072
		lb	2363
	Power pac	kg	1351
		lb	2978

Performance

				rpm	1400	1800	2000	2100
ICFN Power	235 kW	without fan		kW	227	235	235	235
				hp	309	320	320	320
		with fan		kW	219	217	211	207
		890 mm		hp	298	295	287	282
Torque at:		ICFN Power 235 kW		Nm	1548	1247	1122	1069
				lbf ft	1142	919	828	788
Max torque at engine speed		rpm	1260 rpm	Nm	1550			
					lbf ft	1143		
Power tolerance				%	±2			
Mean piston speed				m/s	7,1	9,1	10,1	10,6
				ft/sec	23,3	29,9	33,2	34,9
Effective mean pressure at:			ICFN Power 235 kW	MPa	1,80	1,45	1,30	1,24
				psi	260	210	189	180
Max combustion pressure at:			ICFN Power 235 kW	MPa	15	13	13	12
				psi	2175	1885	1885	1740
Total mass moment of inertia, J (mR ²) (not including flywheel)				kgm ²	1,034			
				lbf ²	24,5			
Friction Power				kW	20	29	36	49
				hp	27	39	49	67

Derating see Technical Diagrams

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Engine brake performance (only engines with VCB)		rpm	1200	1500	1900	2200
Brake power:	without fan	kW	70	120	170	185
		hp	95	163	231	252
Brake torque:	without fan	Nm	557	764	854	803
		lbf ft	411	563	630	592
Engine speed range for VCB activation:		rpm	1000-2200			
Min engine speed with VCB still active:		rpm	900			
Min oil temperature for VCB activation:		°C	55			

Cold start performance

*Cold start limit temperature	without starting aid	°C	-15		
		°F	5		
	with manifold heater 3 kW	°C	-25		
		°F	-13		
	with manifold heater 3 kW and block heater	°C	-35		
		°F	-31		
*Specify oil and fuel quality	T>-15°C Oil VDS3 or VDS4 15W/40 T<-15°C Oil VDS3 or VDS4 5W/40				
Heater type	Make	Power kW	Engaged hours (-30°C)	Cooling water temp engine block	
Self circulating	Volvo	1,2	12	-1°C 30°F	

* See also general section in the sales guide

Lubrication system




Lubricating oil consumption (average)		Vol%	0,05		
Oil system capacity including filters		liter	37		
		US gal	9,77		
Oil pan capacity: (both variants)	Max	liter	32		
		US gal	8,45		
	Min	liter	27		
		US gal	7,00		
Oil change intervals/specifications	VDS3	h	1000		
	VDS4	h	1000		
Engine angularity limits:	front up	°	30		
	front down	°	30		
	side tilt	°	30		
Oil pressure at rated speed		kPa	350 - 600		
		psi	51 - 87		
Lubrication oil temperature in sump:	max	°C	130		
		°F	266		
Oil filter filtration efficiency (in accordance with ISO 4548-12)	99%	μ	38		
	50%	μ	14		

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Fuel system

System supply flow at max. Speed		liter/h	108
		US gal/h	28,5
Fuel supply line max. restriction (measured at fuel inlet connection)		kPa	20
		psi	2,9
Fuel supply line max. pressure, during engine stand still (measured at fuel inlet connection and high tank/low tank positions)		kPa	16,5
		psi	2,4
Fuel supply line min. pressure, during engine stand still (measured at fuel inlet connection and high tank/low tank positions)		kPa	-12,5
		psi	-1,8
System return flow at max. Speed		liter/h	30,0
		US gal/h	7,9
Fuel return line max. restriction (measured at fuel return connection)		kPa	20
		psi	2,9
Max. allowable inlet fuel temp (Measured at fuel inlet connection)		°C	60
		°F	140
Prefilter / Water separator micron size		μ	10
Fuel filter filtration efficiency	75%	μ	4
Governor type/make, standard	Volvo/EMS2.3		
Injection pump type/make			
Specific UREA consumption in Nonroad Transient Cycle (NRTC)	Vol%	5,0	
Fuel to conform to	Fuel equal to or better than EN590:2009 or ASTM D975-09 and Max sulphur 15ppm		



Intake and exhaust system

		rpm	1400	1800	2000	2100
Charge air consumption at: (+25°C and 100kPa)	ICFN Power 235 kW	m³/min cfm	17,2 607	21,1 745	22 777	22,8 805
 See front page for important information						
Max allowable air intake restriction including piping		kPa psi		6 0,9		
Heat rejection to exhaust at:	ICFN Power 235 kW	kW BTU/min	157 8928	193 10976	210 11942	218 12397
Exhaust gas temperature after turbine at:	ICFN Power 235 kW	°C °F	411 772	413 775	430 806	430 806
 See front page for important information						
Max allowable back pressure in exhaust line (after turbine) Pipe dimension Ø: 125 mm		kPa psi	15 2,2	17 2,5	17 2,5	17 2,5
 See front page for important information						
Max allowable temperature drop between turbine and SCR muffler inlet.		Δ°C Δ°F	10 18	10 18	10 18	10 18
SCR muffler pressure drop (at exhaust gas flow and exhaust temp given)		kPa psi	11 1,6	10 1,5	10 1,5	9 1,3
Pre-catalyst pressure drop		kPa psi	N/A	N/A	N/A	N/A
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	ICFN Power 235 kW	m³/min cfm	36,7 1296	44,3 1564	47,3 1670	49,2 1737

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Cooling system		rpm	1400	1800	2000	2100
Heat rejection radiation from engine at:	ICFN Power 235 kW	kW	6	7	7	7
		BTU/min	341	398	398	398
Heat rejection to coolant at:	ICFN Power 235 kW	kW	105	120	132	138
		BTU/min	5971	6824	7507	7848
Coolant		Yellow Volvo Coolant Solution (VCS)				
Radiator cooling system type		Closed circuit				
Standard radiator core area	ICFN Power 235 kW	m ²	0,8			
		foot ²	8,61			
Fan diameter	890mm	mm	890			
		in	35,04			
Fan power consumption	890mm	kW	8,0	18,0	24,0	28,0
		hp	11	24	33	38
Fan drive ratio	fan Ø890	1,01:1 ccw				
Coolant capacity:	engine	liter	17			
		US gal	4,5			
	std. 0,8m ² radiator with hoses	liter	21			
		US gal	5,5			
Coolant pump		drive/ratio	belt/1,41:1 cw			
Coolant flow with standard system		l/s	4,8	6,2	6,8	7,1
		US gal/s	1,3	1,6	1,8	1,9
Minimum coolant flow		l/s	1,9	2,3	2,6	2,5
		US gal/s	0,5	0,6	0,7	0,7
Maximum outer circuit restriction incl. piping		kPa	55,0			
		psi	8,0			
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	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	1400	1800	2000	2100
Heat rejection to charge air cooler	ICFN Power 235 kW	kW	41	50	52	55
		BTU/min	2332	2843	2957	3128
Charge air mass flow	ICFN Power 235 kW	kg/s	0,34	0,42	0,44	0,46
Charge air inlet temp. (Charge air temp after turbo compressor)	ICFN Power 235 kW	°C	161	166	167	169
		°F	322	331	333	336
 See front page for important information Max allowable Charge air outlet temp. (Charge air temp after charge air cooler)		°C	43	48	49	50
		°F	109	118	120	122
 See front page for important information Maximum pressure drop over charge air cooler incl. piping		kPa	12			
		psi	1,74			
Charge air pressure (After charge air cooler)		kPa	180	182	180	175
		psi	26,11	26,40	26,11	25,38
Standard charge air cooler core area		m ²	0,8			
		foot ²	8,61			

Cooling performance: 0,8 m² radiator and 890 fan

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.

Engine speed	Engine power	Air on temp		Air flow		External restriction	
						Pa	psi
rpm	kW hp	°C	°F	m ³ /s	ft ³ /s		
2100 (fix 1,01)	235	75	167	8,5	300,2	0	0,000
		73	163	8	282,5	100	0,015
		70	158	7,5	264,9	200	0,029

Engine management system

Functionality	Alternatives			Default setting
Governor mode	Droop	Isochronous		Isochronous
Governor droop	10	127	Nm/rpm	
Governor response	Adjustable PI constants			
Idle speed	600	900	rpm	700
Preheating function	Ignition	Request	Request + temp	If preheat is available, preheat will be active at ignition on if temp low or demanded by driver.
Ignition off stops engine	Yes	No		No

Engine sensors and switch settings		Engine protection action				
Parameter	Unit	Warning setting (Yellow)	Alarm setting	Default	Optional (Module or)	
Oil temp	°C	125	130	Derate	Shut down.	
Oil pressure	Low idle	kPa	80	55,0	Shut down	Shut down.
	Rated speed	kPa	300	275	Shut down	Shut down.
Oil level		Low level	N/A	Fault code only	Fault code only	
Piston cooling pressure >1000 rpm	kPa	Not available on this engine				
Coolant temp	°C	105	107	Derate	Shut down.	
Coolant level		N/A	Low level	Derate	Shut down.	
Fuel feed pressure	Low idle	kPa	See Fuel pressure limits	N/A	Fault code only	Fault code only
	Rated speed			N/A	Fault code only	Fault code only
Water in fuel		Alarm when closed	N/A	Fault code only	Fault code only	
EGR temp	°C	N/A	N/A	N/A	N/A	
Air filter pressure drop	kPa	5	N/A	Fault code only	Fault code only	
Altitude, above sea	m	N/A	N/A	Automatic derating, see section derating	Automatic derating, see section derating	
Crank case pressure		N/A	Alarm at	Shut down	Shut down.	
Charge air temp	°C	120	125	Derate	Shut down.	
Charge air pressure	kPa	See Charge air pressure limits		Derate	Shut down.	
SCR temp	°C	N/A	N/A	Automatic derating	Automatic derating	
Engine overspeed	rpm	2400	N/A	Fault code only	Fault code only	

Derate parameters	Derated 0% to engine protection map	Derated 100% to engine protection map	Forced idle after 5 sec	Forced shut down after 0 sec
Oil temp	130°C	132°C	N/A	N/A
Coolant temp	107°C	108°C	N/A	N/A
Charge air temp	125°C	126°C	N/A	N/A
EGR temp	N/A	N/A	N/A	N/A
Low oil pressure	See Oil pressure limits		N/A	At alarm
Charge air pressure	See Charge air pressure limits		N/A	N/A

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Electrical system

Voltage and type				24V		
Alternator:	output	A		110/150		
	tacho output	Hz/alternator rev.		6		
	drive ratio			5,25		
Starter motor:	type			90P55 / (105P70 ISS för start/stop)		
	output	kW hp		5,5 / (7,0)		
Number of teeth on:	flywheel			153		
	starter motor			11		
Inlet manifold heater (at 20 V)		kW		3		
Power relay for the manifold heater		A		1		
Max wiring resistance main circuit		mΩ		3		
Conditions:		Temperature		°C		
(4 mΩ main circuit resistance@		Battery		Ah / CCA		
				25	0	-15
				140/800	140/800	145 / 1050
Crank speed		rpm		165	150	100
Crank current		A		240	310	370
Starter input power during crank		kW		5	6,1	6,3
Battery power during crank		kW		5,3	6,5	6,8
Min battery @ 0°C		Ah / CCA		140/800		

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Power take off - Front	rpm	1400	1800	2000	2100	
Front end in line with crank shaft max:*	Nm	1490	1210	1110	1060	
(with a total added mass moment of inertia, J (mR2)≤0,05 kgm ²)	lbf ft	1099	892	819	782	
Front end belt pulley load. Direction of load viewed from flywheel side.	max side	kW	13	19	21	22
		hp	18	26	29	30
Pulley diameter 201mm and position 190mm from main bearing 1	max down	kW	13	19	21	22
		hp	18	26	29	30
	max up	kW	38	52	58	61
		hp	52	71	79	83
Power take off - Rear with Flywheel housing Standard						
Continuous torque on timing gear at rear PTO*	Nm			300		
SAE B spline	lbf ft			221		
Continuous torque on timing gear at rear PTO*	Nm			650		
DIN 5462 spline	lbf ft			479		
Speed ratio direction of rotation viewed from flywheel side				1,08:1/ ccw		
Continuous torque on timing gear at compressor PTO*	Nm			300		
SAE B spline	lbf ft			221		
Speed ratio direction of rotation viewed from flywheel side				1,29:1 / ccw		
Max allowed bending moment in flywheel housing	Nm			7000		
	lbf ft			5163		
Max. rear main bearing load	N			3000		
	lbf			674,4		

Power take off - Rear with Flywheel housing Twin PTO

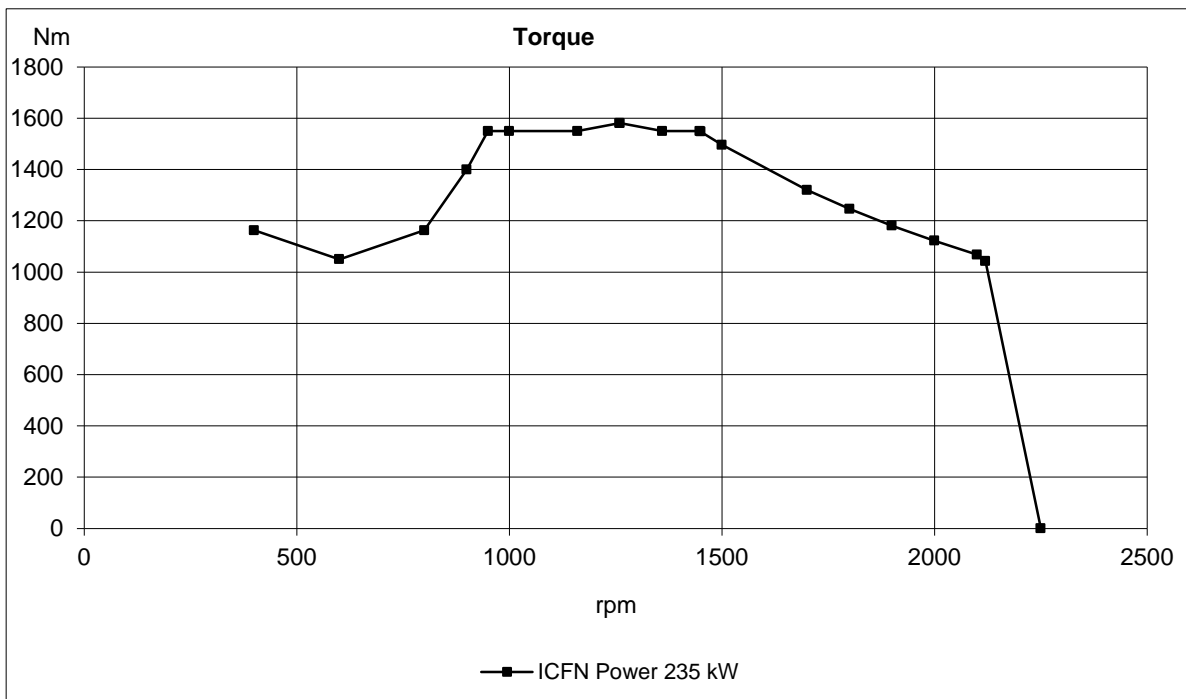
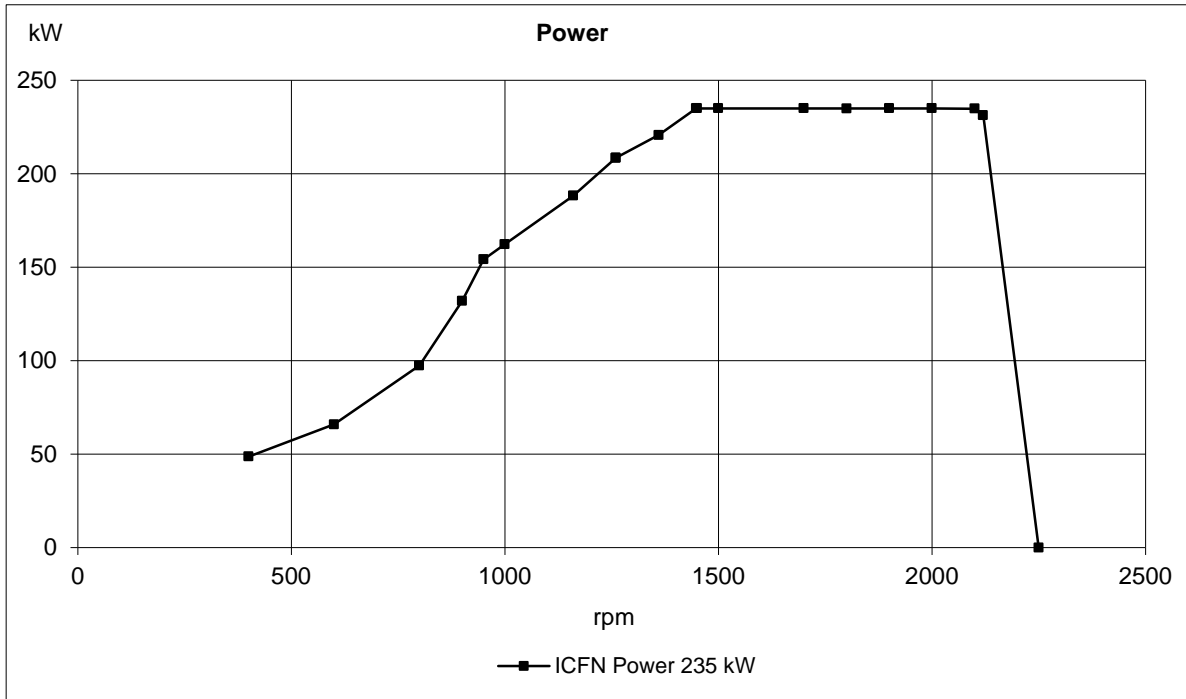
Drive front LHS / RHS		1x11031509, 1" / 1x11031017, 7/8"
Drive rear		2x11031509, 1"
Pump flange		4xSAE B
Gear ratio engine / PTO		1:1,222
Max PTO power output: **	kW / rpm	135 / 2100
Torque used at max PTO power output: *	Nm	616
	lbf ft	454
Continous power output: ***	kW	40,5
Torque used at 1200 rpm with allowed continuous power output	Nm	322
	lbf ft	237
Continuous torque on timing gear at rear PTO*, SAE B spline	Nm	300
	lbf ft	221
Continuous torque on timing gear at rear PTO*, DIN 5462 spline	Nm	650
	lbf ft	479
Speed ratio direction of rotation viewed from flywheel side		1,08:1/ ccw
Continuous torque on timing gear at compressor PTO* SAE B spline	Nm	300
	lbf ft	221
Speed ratio direction of rotation viewed from flywheel side		1,29:1 / ccw
Max allowed bending moment in flywheel housing	Nm	7000
	lbf ft	5163
Max. rear main bearing load	N	3000
	lbf	674,4

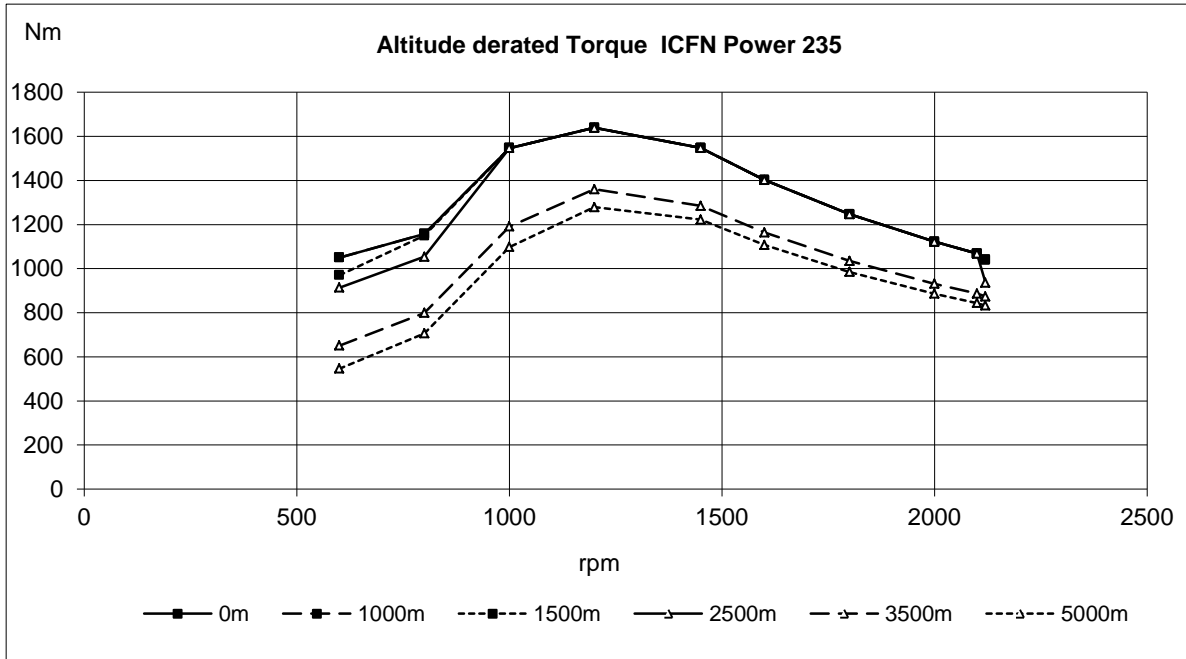
* **Maximum allowed torque at individual PTO's.**

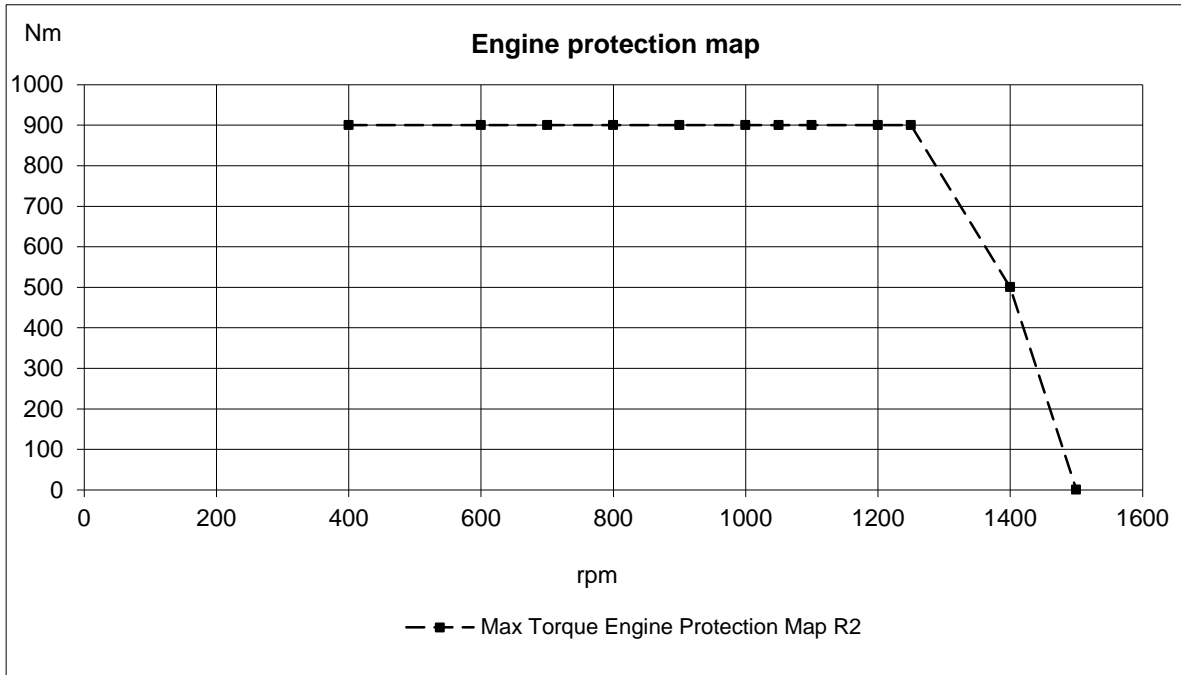
If more than one PTO output is used simultaneously, calculations needs to be performed to determine available maximum. Available torque depends on application inertia.

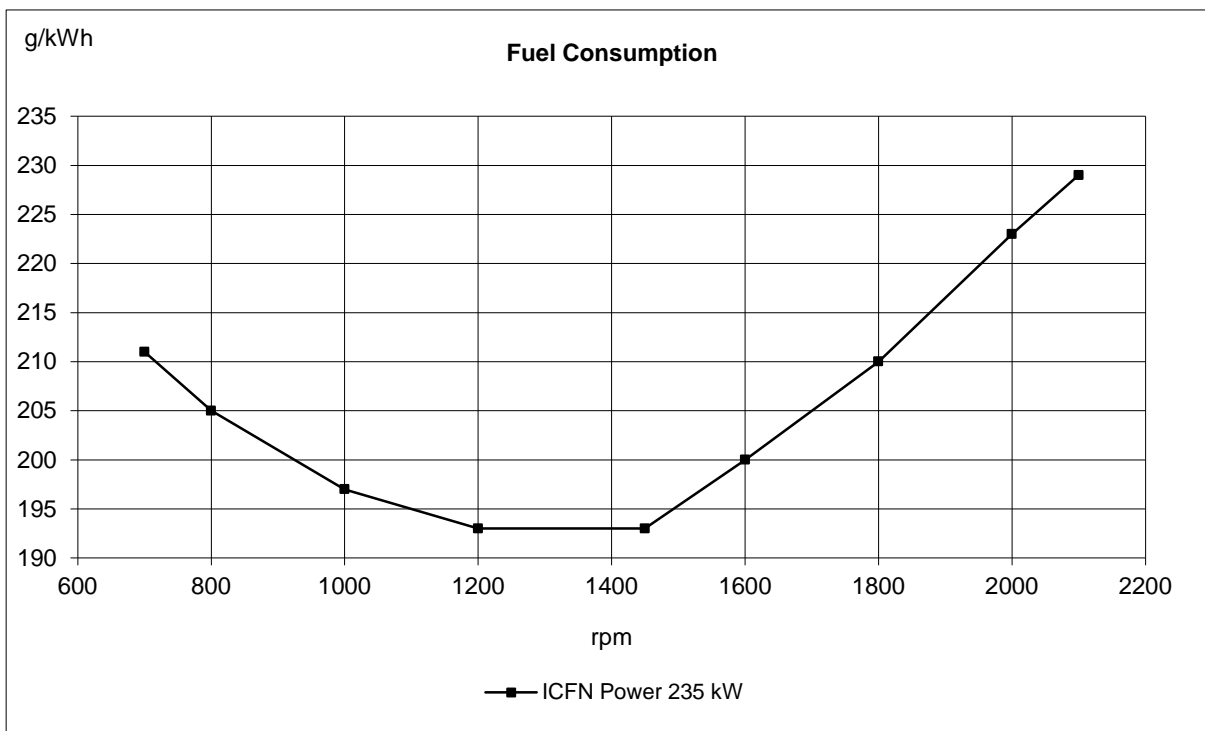
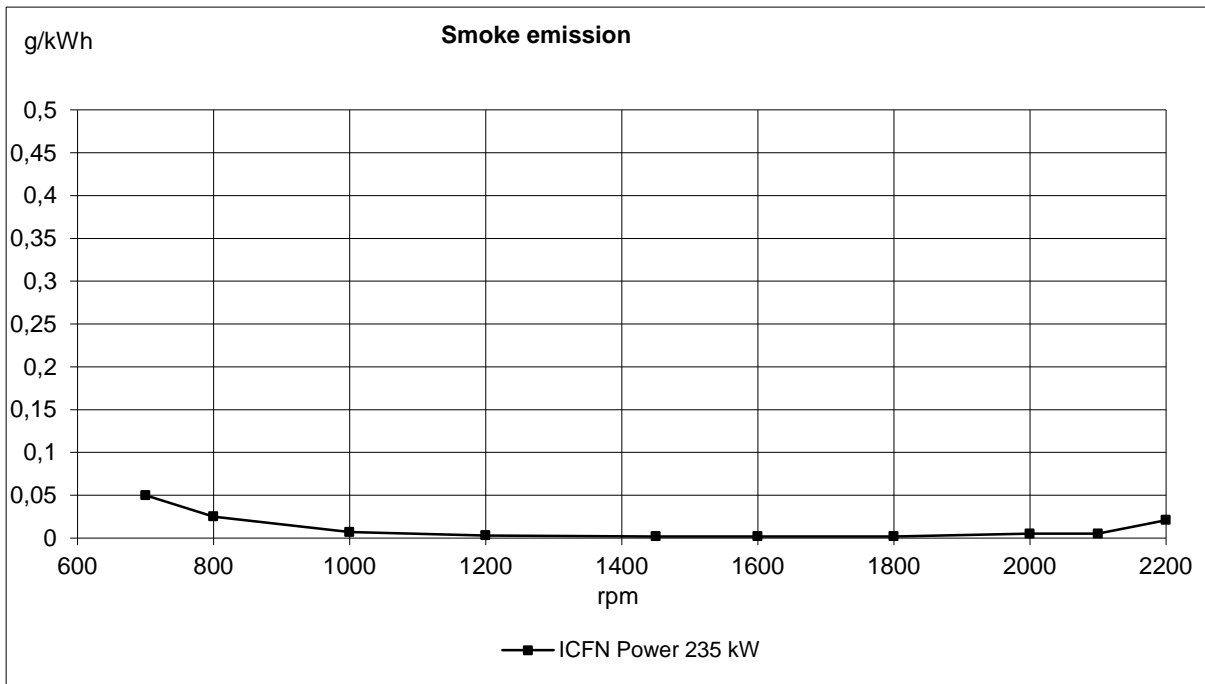
** **During maximum 5 seconds, 10 times/hour.**

*** **Maximum 20,25 kW per LHS PTO's and RHS PTO's. The difference in output load must not exceed 15 kW between LHS PTO's and RHS PTO's.**

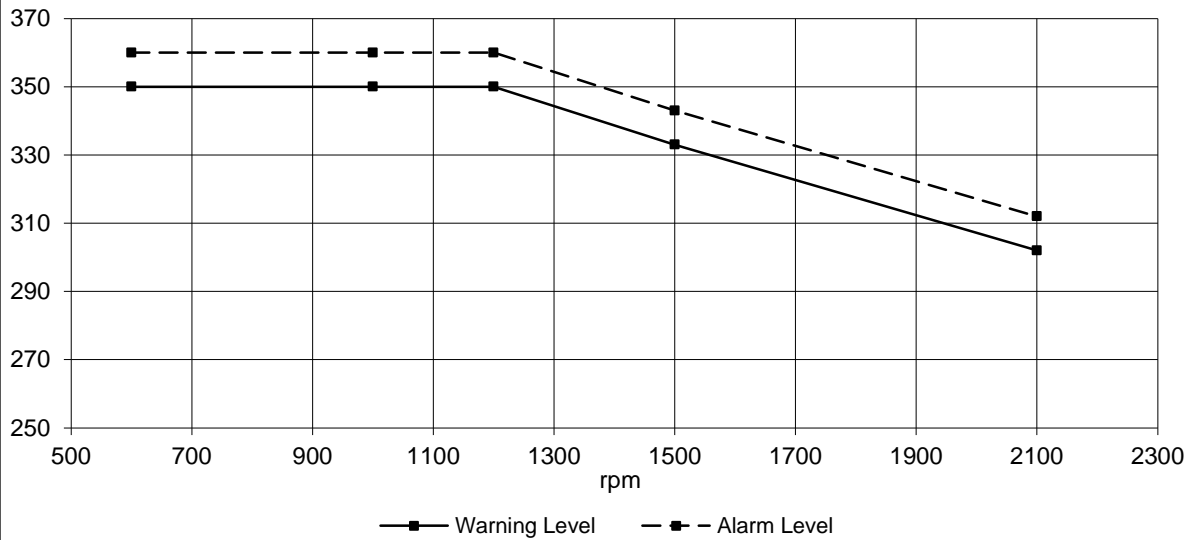




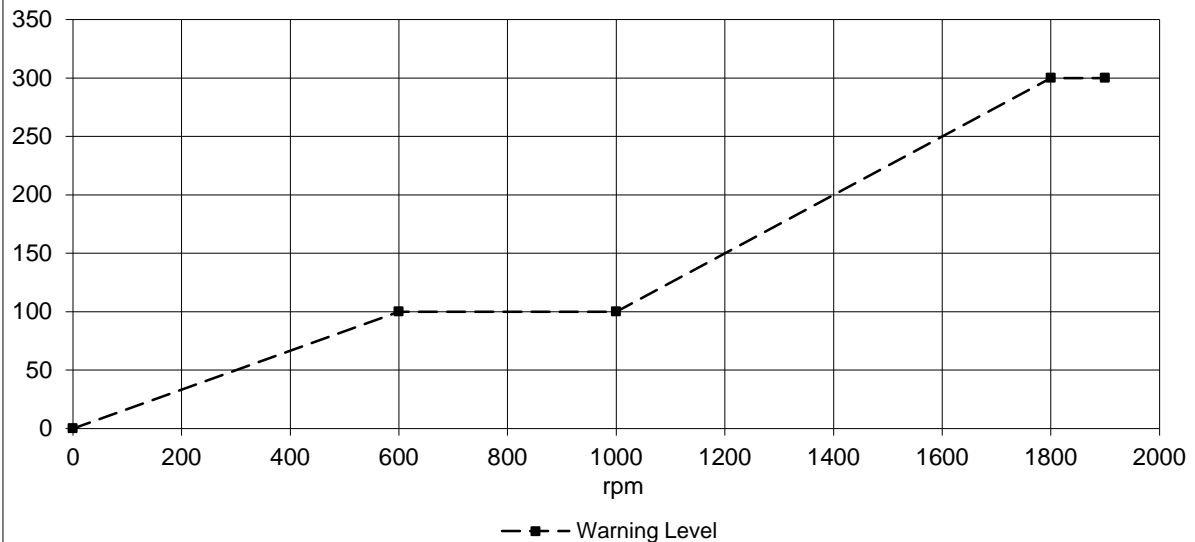


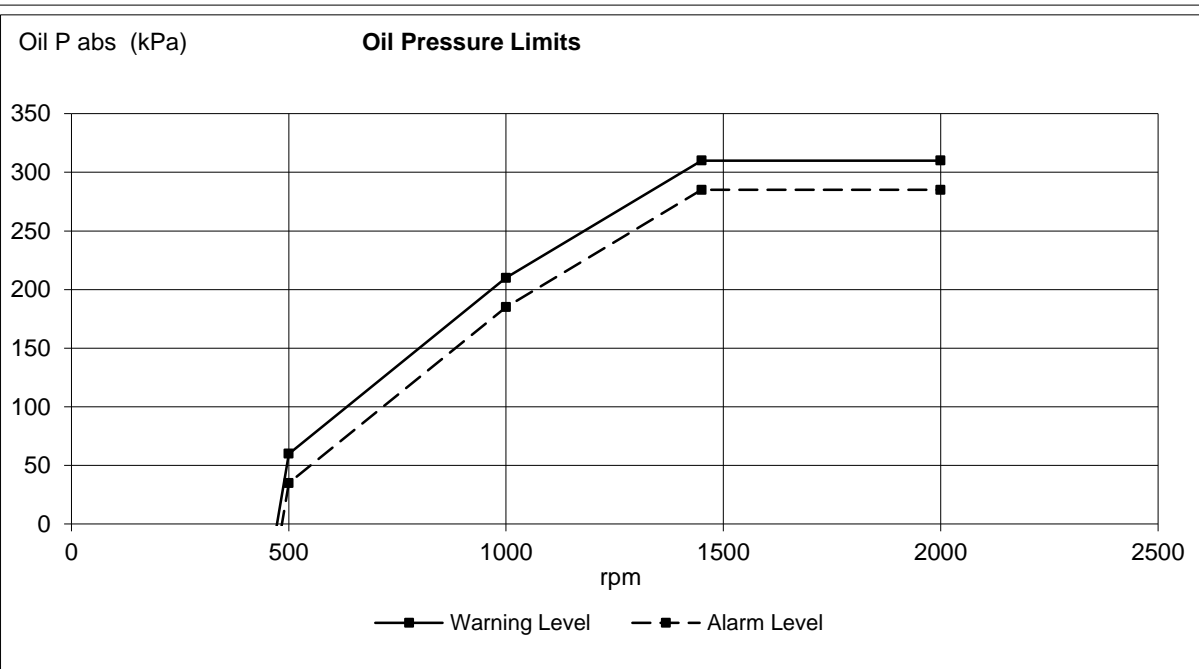


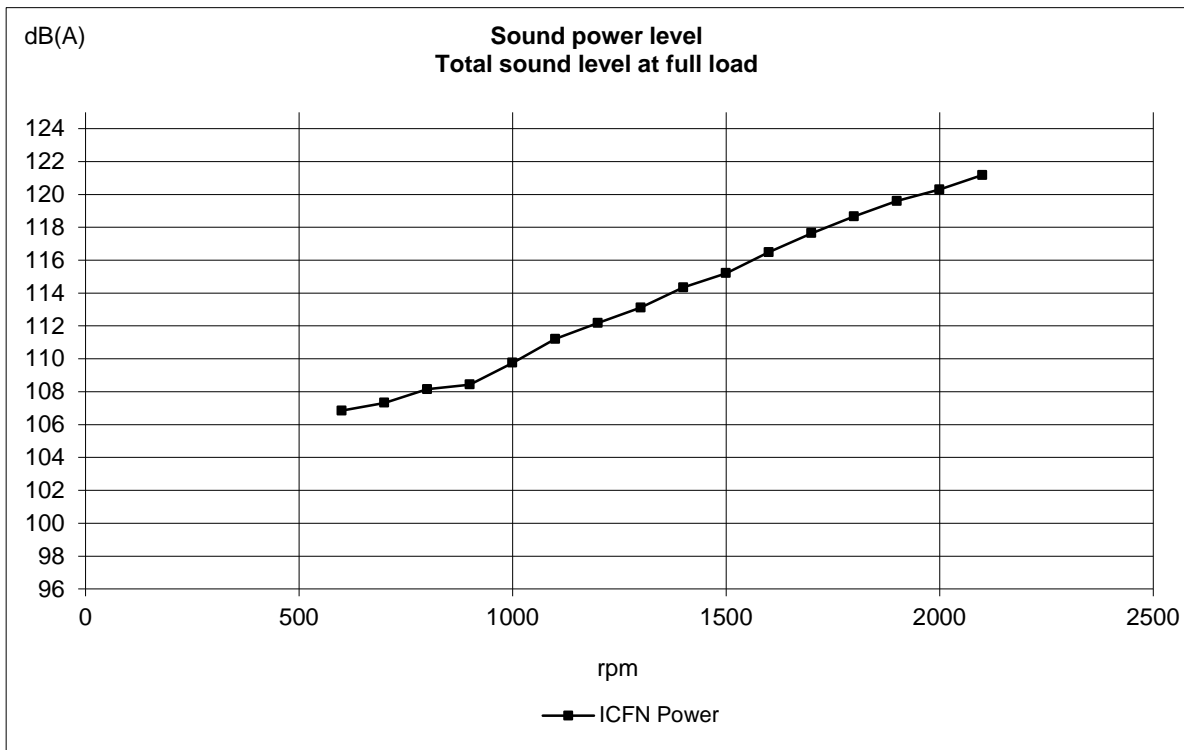
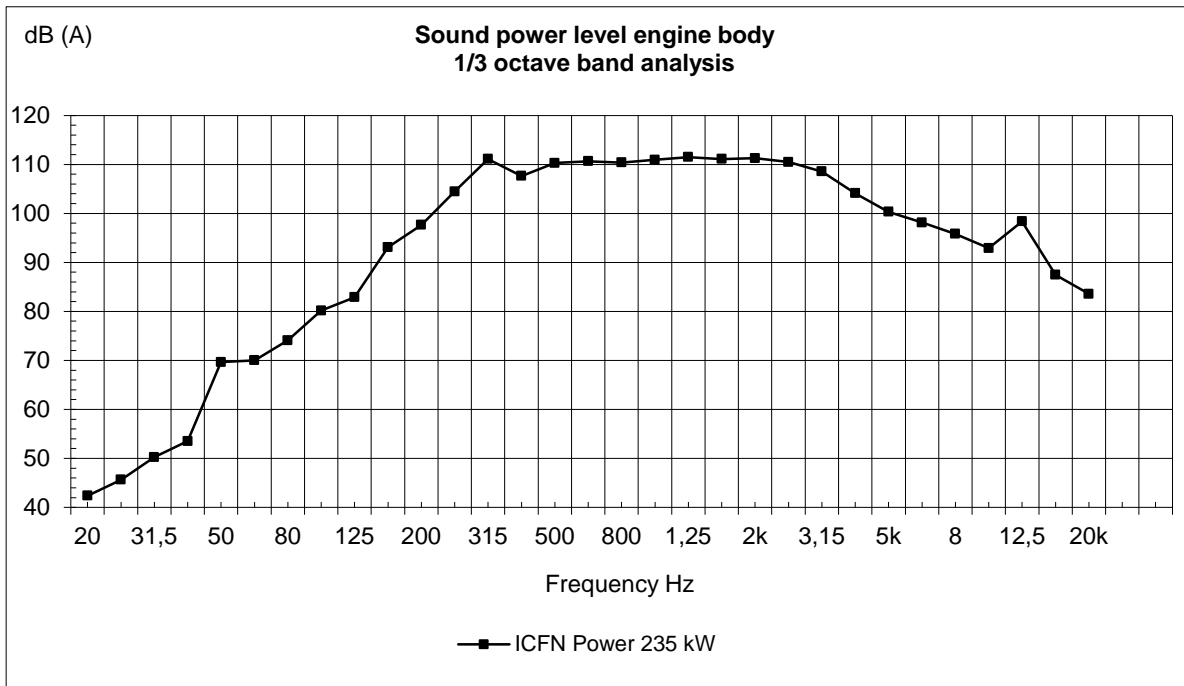
CAC P abs (kPa)

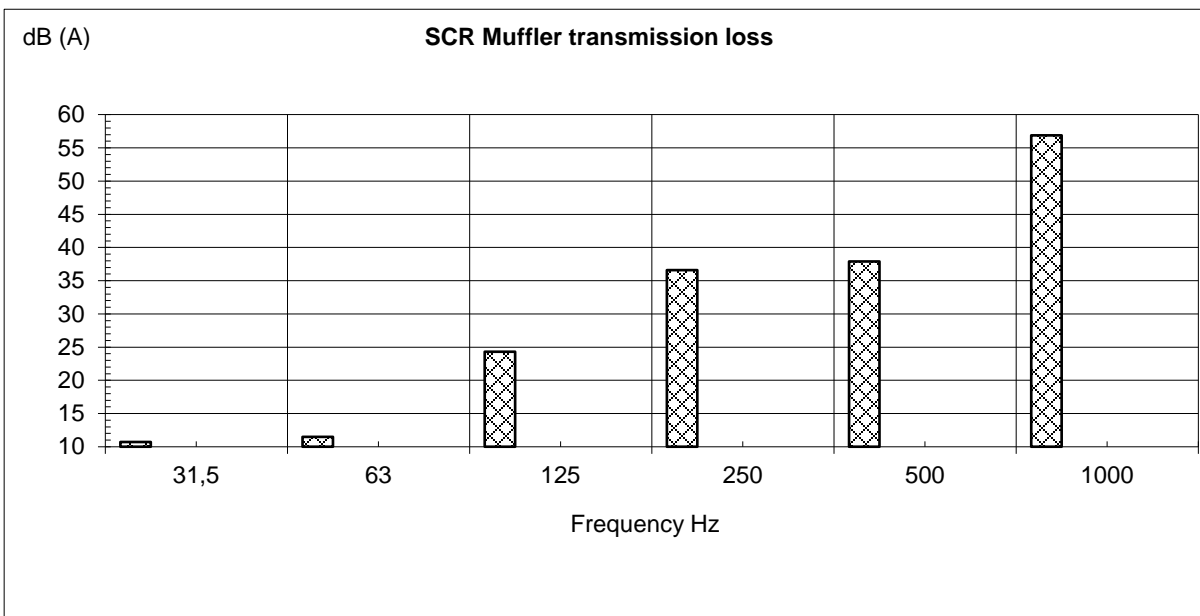
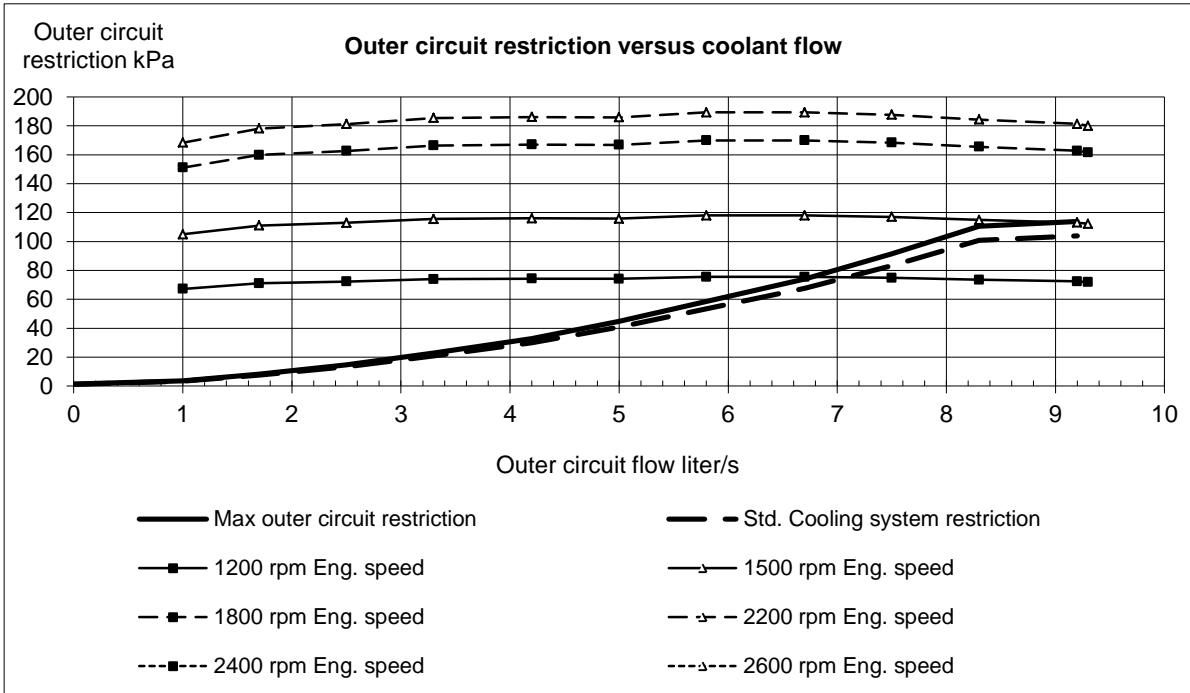
Charge Air Pressure Limits

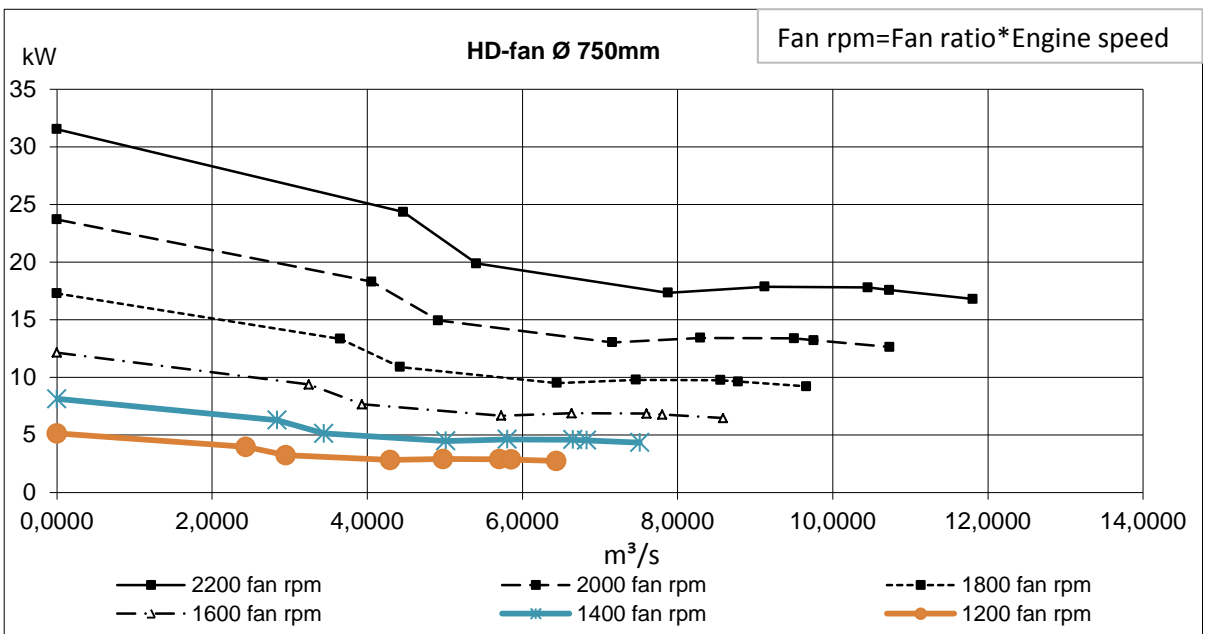
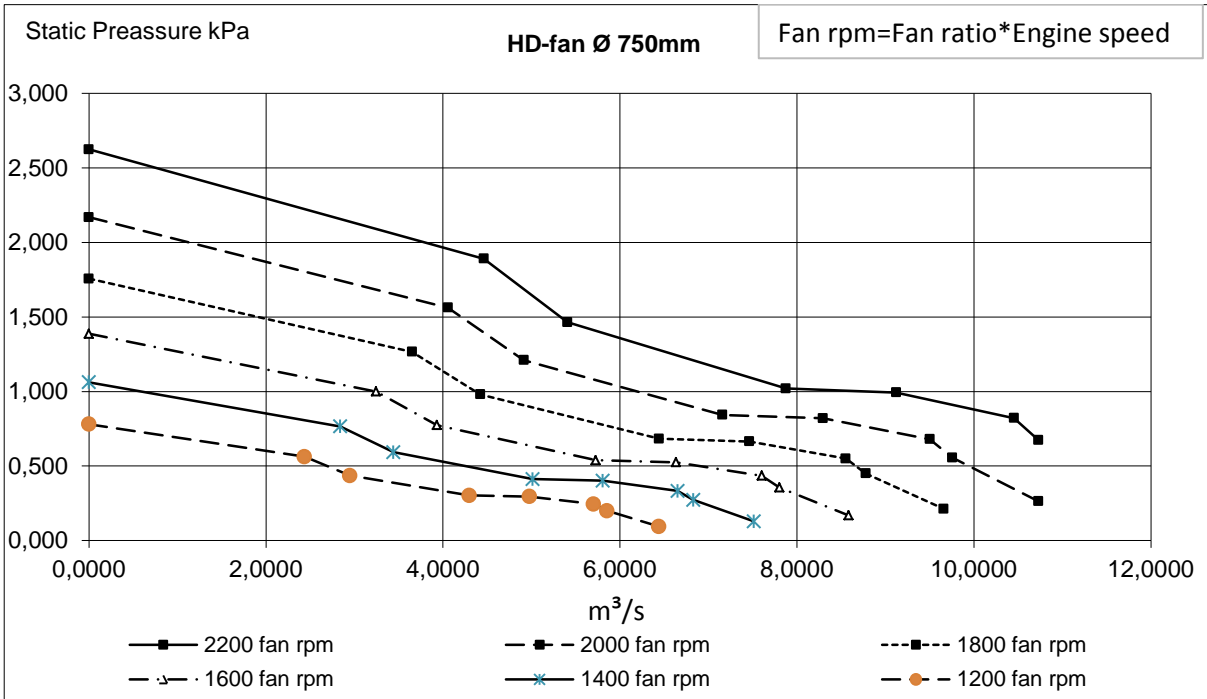
Fuel P (kPa)

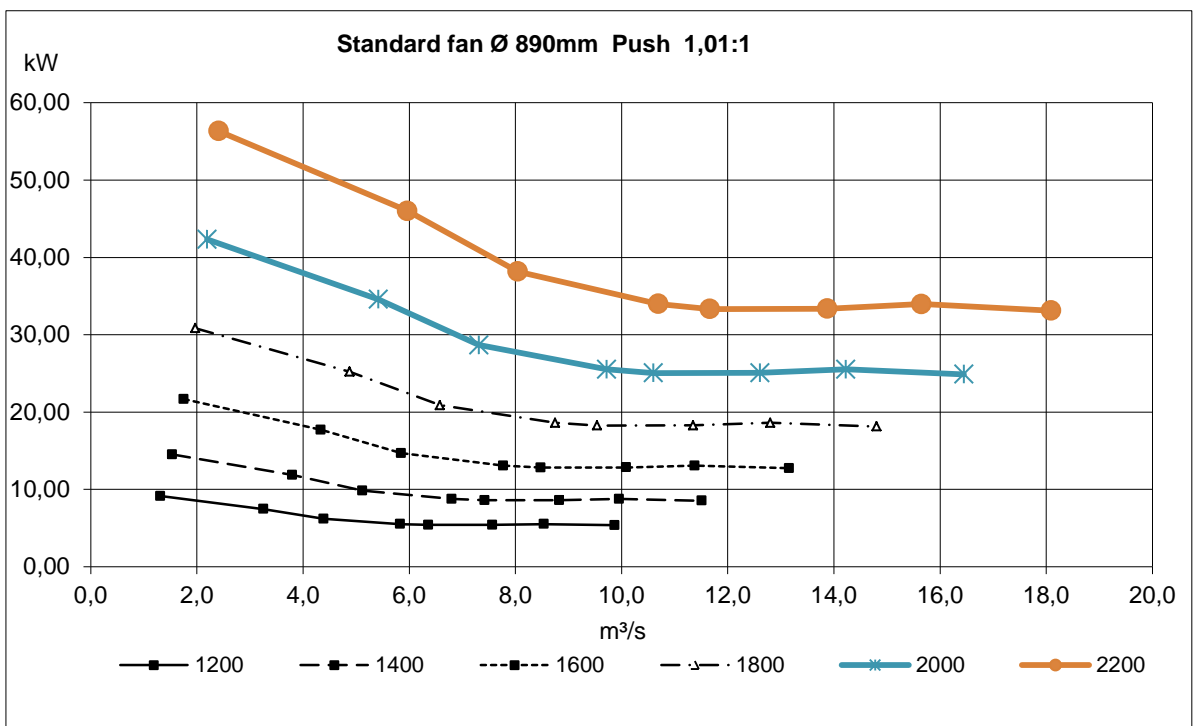
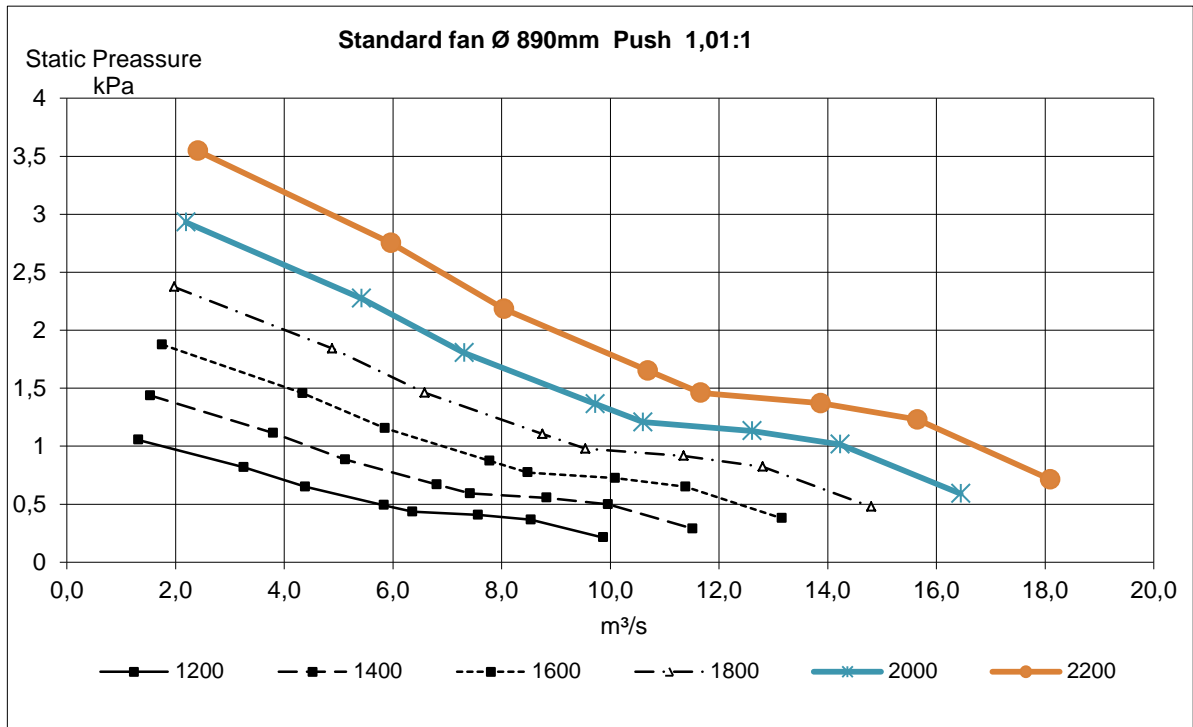
Fuel Pressure Limits



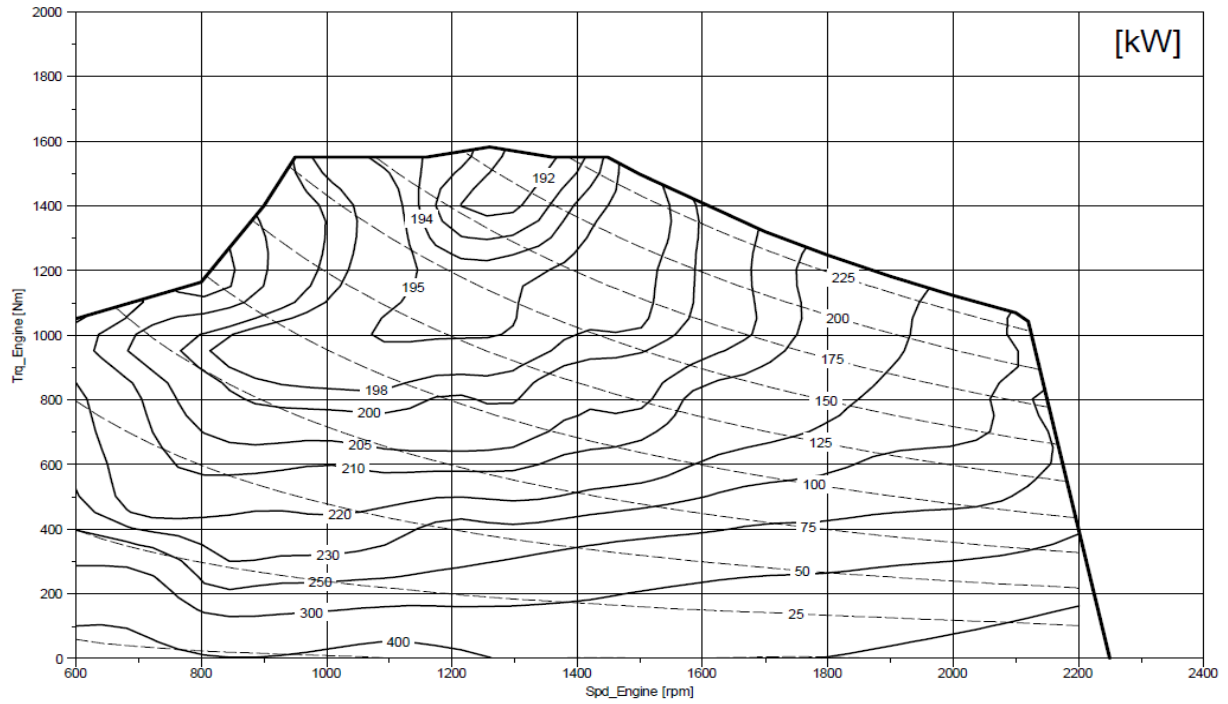








BSFC [g/kWh]



Fuel consumption [l/h]

