


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	16,12
		in ³	984
Firing order			1-5-3-6-2-4
Bore		mm	144
		in	5,67
Stroke		mm	165
		in	6,50
Compression ratio			17,0:1
Wet weight	Engine only (Estimated) (excl after treatment comp.)	kg	1395
		lb	3075
	Power pac	kg	1840
		lb	4057

Performance

				rpm	1200	1500	1800	1900
IFN Power	450 kW	without fan		kW	357	446	450	430
				hp	485	607	612	585
		with fan		kW	See diagram for fan power consumption			
		890 mm		hp				
Torque at:		IFN Power		Nm	2840	2840	2386	2161
				lbf ft	2095	2094	1760	1594
Max torque at engine speed		rpm	1260 rpm	Nm	2897			
				lbf ft	2137			
Power tolerance				%	±2			
Mean piston speed				m/s	6,6	8,3	9,9	10,5
				ft/sec	21,7	27,1	32,5	34,3
Effective mean pressure at:		IFN Power		MPa	2,21	2,21	1,86	1,68
				psi	321	321	270	244
Max combustion pressure at:		IFN Power		MPa				
				psi				
Total mass moment of inertia, J (mR ²) (not including flywheel)				kgm ²	1,43			
				lbft ²	33,9			
Friction Power				kW	26	39	55	61
				hp	35	53	75	83

Derating see Technical Diagrams

Engine brake performance (only engines with VCB)

		rpm	1200	1500	1800	1900
Brake power:	without fan	kW hp	N/A	N/A	N/A	N/A
Brake torque:	without fan	Nm lbf ft	N/A	N/A	N/A	N/A
Engine speed range for VCB activation:		rpm	N/A			
Min engine speed with VCB still active:		rpm	N/A			
Min oil temperature for VCB activation:		°C	N/A			

Cold start performance

*Cold start limit temperature	without starting aid	°C	-10	
		°F	14	
	with manifold heater 3.5 kW	°C	-25	
		°F	-13	
with manifold heater 3.5 kW and block heater	°C	-30		
	°F	-22		
*Specify oil and fuel quality	T>-15°C Oil VDS4/VDS3 15W/40 T<-15°C Oil VDS4/VDS3 5W/40			
Heater type	Make	Power kW	Engaged hours (-30°C)	Cooling water temp engine block
Self circulating	Volvo 21578298	2	12	1°C 34°F

* See also general section in the sales guide

Lubrication system

Lubricating oil consumption (average)		Vol%	0,03
Oil system capacity including filters		liter US gal	48 12,68
Oil sump capacity: (both variants)	Max	liter	42
		US gal	11,10
	Min	liter	32
		US gal	8,45
Oil change intervals/specifications	VDS3	h	500*
	VDS4	h	500*
Engine angularity limits: Standard sump / optional aluminium sump	front up	°	11 / 30
	front down	°	11 / 30
	side tilt	°	11 / 30
Oil pressure at rated speed		kPa psi	300 - 650 44 - 94

*** Oil change intervals vary depending on oil grade, sulfur content of the fuel and running conditions. Oil sample analyses is recommended to determine application specific oil change interval.**




Lubrication system

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

Fuel system



System supply flow at max. Speed		liter/h	150
		US gal/h	39,6
Fuel supply line max. restriction (measured at fuel inlet connection)		kPa	10
		psi	1,5
Fuel supply line max. pressure, during engine stand still (measured at fuel inlet connection)		kPa	165
		psi	23,9
Fuel supply line min. pressure, during engine stand still (measured at fuel inlet connection)		kPa	-125
		psi	-18,1
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		°C	60
Prefilter / Water separator micron size		μ	10
Fuel filter filtration efficiency	96%	μ	6
	75%	μ	4
Engine Control System, standard	Volvo/EMS2.3		
Specific UREA consumption in Nonroad Transient Cycle (NRTC)	Vol%	N/A	
Fuel to conform to	Fuel corresponding to EN590 or ASTM D 975 (No 1-D, No 2-D) or JIS KK2204		

Intake and exhaust system

		rpm	1200	1500	1800	1900
Charge air consumption at: (+25°C and 100kPa)	IFN Power	m³/min cfm	21,5 759	28,3 999	32,2 1137	32,6 1151
 See front page for important information						
Max allowable air intake restriction including piping		kPa psi		5 0,7		
Heat rejection to exhaust at:	IFN Power	kW BTU/min	254 14445	347 19734	367 20871	385 21895
Exhaust gas temperature after turbine at:	IFN Power	°C °F	540 1004	559 1038	528 982	546 1015
 See front page for important information						
Max allowable back pressure in exhaust line (after turbine) Pipe dimension Ø: 125 mm		kPa psi	10 1,5	12 1,7	15 2,2	15 2,2
 Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	IFN Power	m³/min cfm	59,3 2094	76,0 2684	80,5 2843	82,9 2928

Cooling system		rpm	1200	1500	1800	1900
Heat rejection radiation from engine at:	IFN Power	kW	10	11	11	11
		BTU/min	569	626	626	626
Heat rejection to coolant at:	IFN Power	kW	152	187	198	215
		BTU/min	8644	10635	11260	12227
Coolant	Yellow Volvo Coolant Solution (VCS)					
Radiator cooling system type	Closed circuit					
Standard radiator core area	IFN Power	m ²	1,42			
		foot ²	15,28			
HD radiator core area		m ²	0,87			
		foot ²	9,36			
Fan diameter	890 mm	IFN Power	mm	890		
			in	35,04		
Fan power consumption	890 mm (Fixed fan)	kW	See diagram for actual fan drive ratio power.			
		hp				
Fan drive ratio	fan Ø890	See diagram for cooling performance				
Coolant capacity:	Engine	liter	24			
		US gal	6,3			
	STD. 1,42m ² radiator with hoses Pusher syst. Core thickness 63mm	liter	37			
		US gal	9,8			
	STD. 1,42m ² radiator with hoses Puller syst. Core thickness 41mm	liter	30			
		US gal	7,9			
	HD 0,87m ² radiator with hoses	liter	32			
		US gal	8,5			
Coolant pump		drive/ratio	belt/1,77:1 cw			
Coolant flow with standard system		l/s	4,7	5,8	7	7,3
		US gal/s	1,2	1,5	1,8	1,9
Minimum coolant flow		l/s	4,3	5,4	6,6	6,9
		US gal/s	1,1	1,4	1,7	1,8
Maximum outer circuit restriction incl. piping		kPa	70,0			
		psi	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	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	1200	1500	1800	1900
Heat rejection to charge air cooler	IFN Power	kW	56	77	87	85
		BTU/min	3185	4379	4948	4834
Charge air mass flow	IFN Power	kg/s	0,42	0,55	0,63	0,63
Charge air inlet temp. (Charge air temp after turbo compressor)	IFN Power	°C	172	186	190	185
		°F	342	367	374	365
 See front page for important information Max allowable Charge air outlet temp. (Charge air temp after charge air cooler at 25°C ambient)		°C	41	49	50	50
		°F	106	120	122	122
 See front page for important information Maximum pressure drop over charge air cooler incl. piping		kPa	12			
		psi	1,74			
Charge air pressure (Relative, after charge air cooler)		kPa	192	218	216	205
		psi	27,85	31,62	31,33	29,73
Standard charge air cooler core area		m ²	0,76			
		foot ²	8,18			

Cooling performance: STD cooling package 1,42m² radiator and suction 890mm 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.

Fix fan drive ratio 1:0,97

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	kg/s	lb/s	Pa	psi
1900	450 612	62	143	12,0	26,5	0	
		60	141	11,3	24,9	150	0,022
		59	138	10,6	23,5	300	0,044
		57	135	10,0	21,9	450	0,065

Cooling performance: STD cooling package 1,42m² radiator and suction 890mm electronically controlled visco 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.

Visco fan drive, ratio 1:0,88

Engine speed rpm	Engine power hp	Air on temp		Air flow		External restriction	
		°C	°F	kg/s	lb/s	Pa	psi
1900	450 612	58	136	10,5	23,2	0	
		56	132	9,7	21,5	150	0,022
		53	128	9,0	19,8	300	0,044
		51	123	8,2	18,0	450	0,065

Cooling performance: STD cooling package 1,42 m² radiator and pusher 890mm 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.

Fix fan drive ratio 1:1,13

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1800	450 612	66	150	9,9	349,3	450	0,065
		67	152	10,0	352,8	300	0,044
		68	154	10,5	372,2	150	0,022
		69	155	10,9	384,2	0	

Fix fan drive ratio 1:1,04

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1800	450 612	63	146	9,0	319,2	450	0,065
		64	148	9,3	329,8	300	0,044
		66	150	9,9	348,2	150	0,022
		67	152	10,3	362,3	0	

Fix fan drive ratio 1:0,97

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1800	450 612	61	142	8,0	281,8	450	0,065
		62	144	8,4	294,9	300	0,044
		64	147	8,9	313,2	150	0,022
		65	148	9,3	326,7	0	

Fix fan drive ratio 1:0,88

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1800	450 612	58	137	7,2	253,6	450	0,065
		59	139	7,5	265,2	300	0,044
		61	142	8,0	281,1	150	0,022
		62	143	8,2	290,6	0	

Cooling performance: STD cooling package 1,42m² radiator and pusher 890mm electronically controlled visco 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.

Visco fan drive, pully ratio 1:0,88

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1800	450	57	135	7,0	247,6	450	0,065
	612	59	137	7,4	259,9	300	0,044
		60	141	7,8	275,5	150	0,022
		61	142	8,0	283,9	0	

Cooling performance, HD cooling package with 890mm fan and fan drive ratio 1:0,97

Cooling air flow and external restriction at different radiator air temperatures based on 107°C TTT and 40% antifreeze (radiator and cooling fan, see optional equipment)

Engine speed rpm	External restriction n	PRIME POWER		STANDBY POWER	
		Air mass flow m3/s	Air on temp C°	Air mass flow m3/s	Air on temp C°
1500	0		70		68
	100		67		65
	200		65		62
	300		61		59
	400		59		55
1800	0		74		72
	100		72		70
	200		71		68
	300		70		67
	400		68		65

Engine management system

Functionality	Alternatives		Default setting
Governor mode		Isochronous	
Governor droop		0	
Governor response	Adjustable PI-constants		1
Idle speed		600-900	700
Stop function	Ignition off stop engine		
Preheating function		On/Off	
Lamp test		On/Off	

Engine sensors and switch settings		Warning level (Yellow lamp)		Engine protection (Red lamp)		
Parameter		Unit	Setting range	Default setting	Level	Action. Default/Alternative
Oil temp		°C	125-130	125	130	Soft derate VE / Shut down, Powerpack
Oil pressure	Low idle	kPa	N/A	50	25	Shut down, ON/OFF*
	Rated speed	kPa	N/A	300	275	Shut down, ON/OFF*
Oil level						
Piston cooling pressure >1000 rpm		kPa				
Coolant temp		°C	105-107	105	107	Soft derate VE / Shut down, Powerpack
Coolant level			See cooling system	On		
Fuel feed pressure	1200rpm	kPa		100		
Water in fuel			Alarm When Closed			
Crank case pressure		kPa	N/A	Rapid Pres inc	Rapid Pres inc	Shut down, ON/OFF*
Air filter pressure drop				5		
Altitude, above sea		m				Automatic derating, see section derating
Charge air temp		°C	N/A	80	85	Soft derate VE / Shut down, Powerpack
Charge air pressure		kPa	N/A	Demand value +35kPa	Demand value +40kPa	Soft derate VE / Shut down, Powerpack
Engine speed		rpm	100-120% of rated speed	120% of rated speed	Alarm level	Alarm only

* Off means no shut down, alarm only

Parameter	Warning Yellow lamp	Alarm, Red lamp	Derated 0% to engine protection map	Derated 100% to engine protection map	Forced idle after sec	Forced shut down after 2 sec
Coolant temp	105°C	107°C	107°C	108°C	N/A	Powerpack
Oil temp	125°C	130°C	130°C	132°C	N/A	Powerpack
Low oil pressure	Warning map value	Alarm map value	N/A	N/A	N/A	Alarm map value
High charge air temp	80°C	85°C	85°C	86°C	N/A	Powerpack
High charge air pressure	Warning map value	Alarm map value	Alarm map value	Alarm map value	N/A	Powerpack

Electrical system

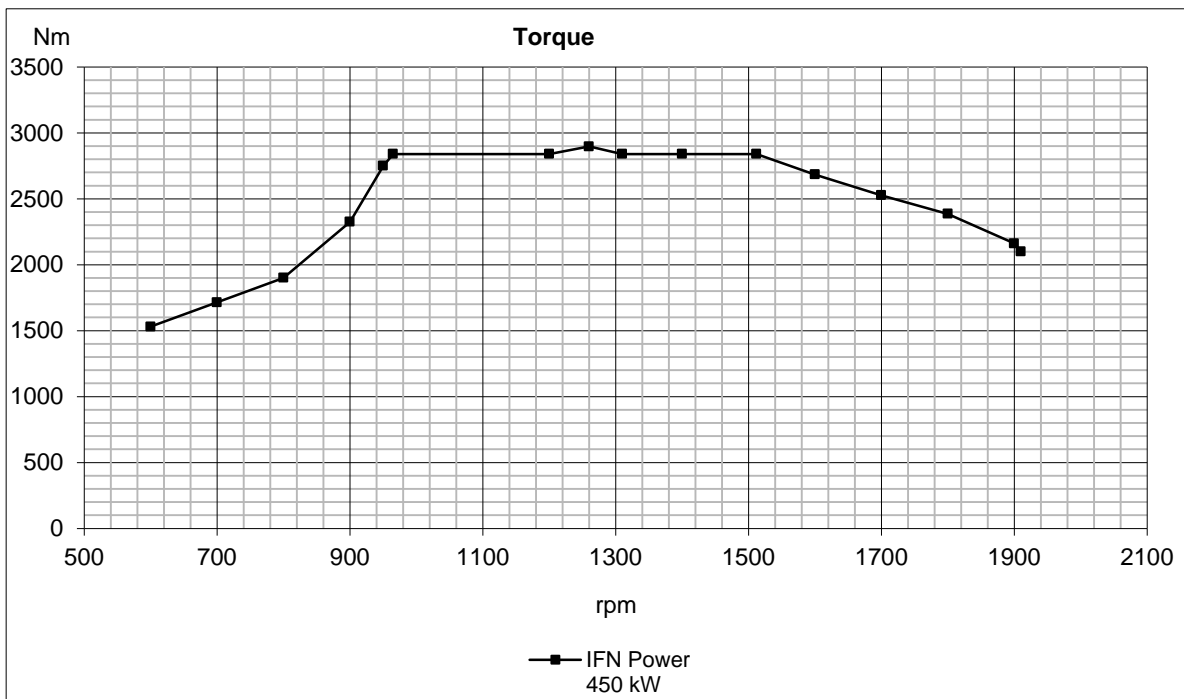
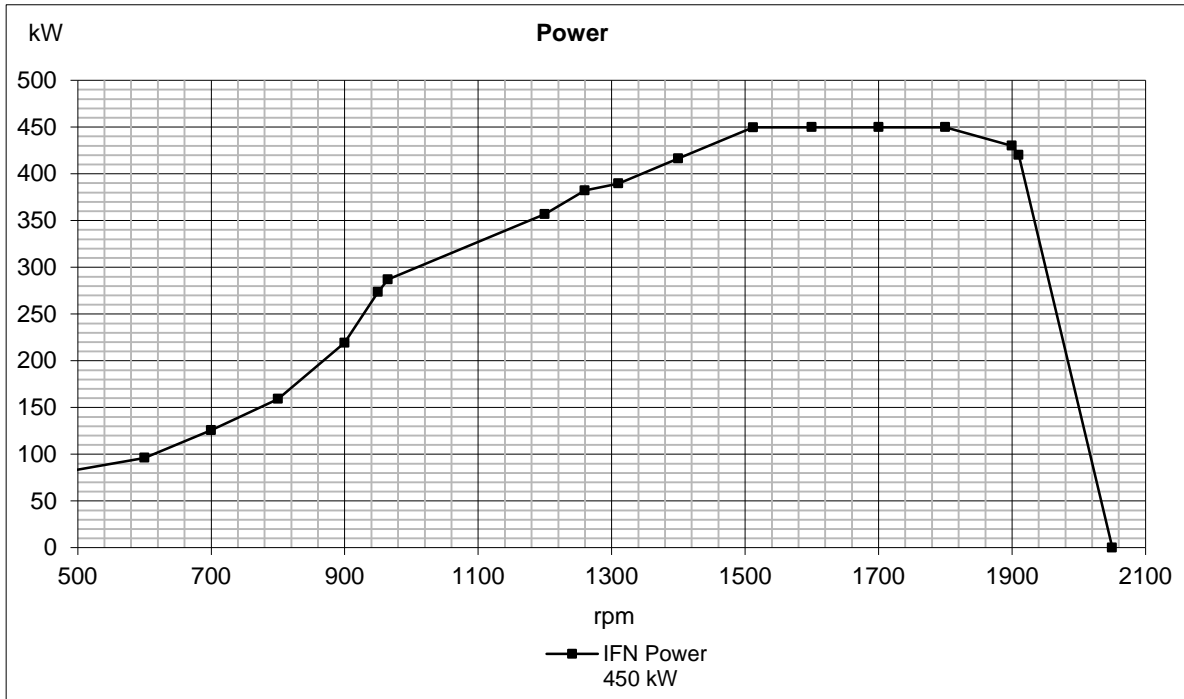
Voltage and type				24V		
Alternator:	make			Bosch		
Alternator:	output	A		110/150		
	tacho output	Hz/alternator rev.		6		
	drive ratio			3,9:1		
Starter motor:	make			Melco		
	type			105P70		
	output	kW	7			
		hp	9,5			
Number of teeth on:	flywheel			153		
	starter motor			12		
Max wiring resistance 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	3.5			
Power relay for the manifold heater		A	1			
Conditions:	Temperature	°C	25	0	-15	
(4 mΩ main circuit resistance@	Battery	Ah / CCA	235 / 1300	145 / 1050	145 / 1050	
Crank speed		rpm	171	118	98	
Crank current		A	290	400	480	
Starter input power during crank		kW	6,2	7,5	7,7	
Battery power during crank		kW	6,5	8,1	8,5	
Min battery @ 0°C		Ah / CCA	140/800			

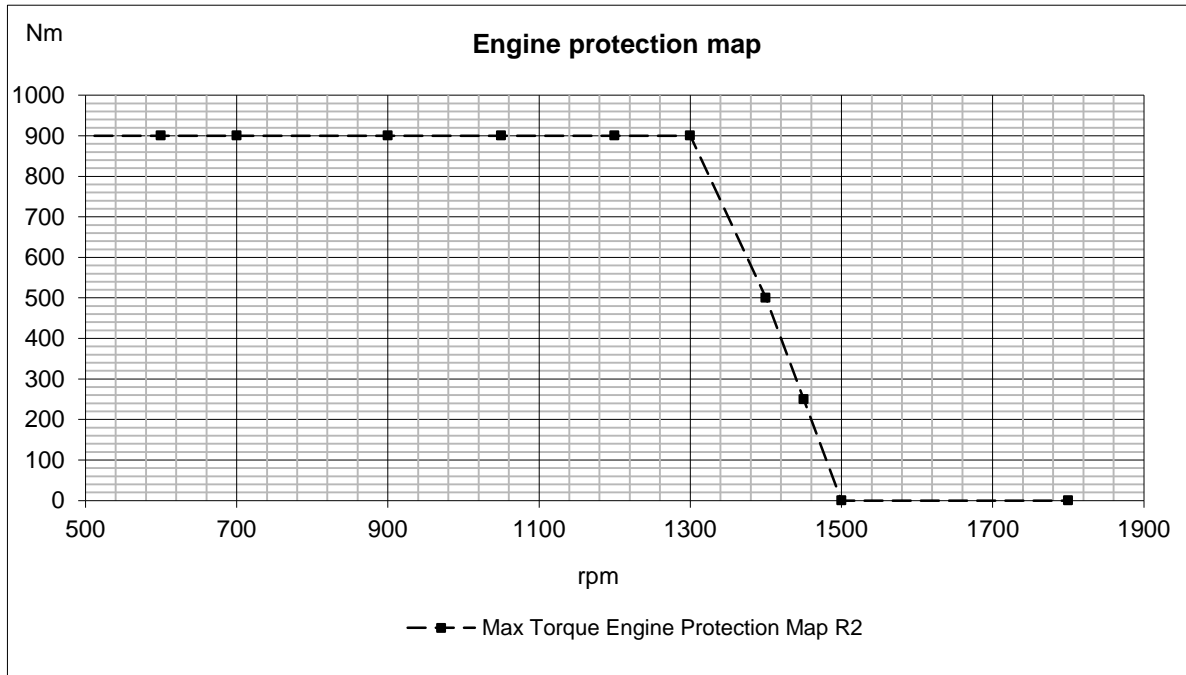
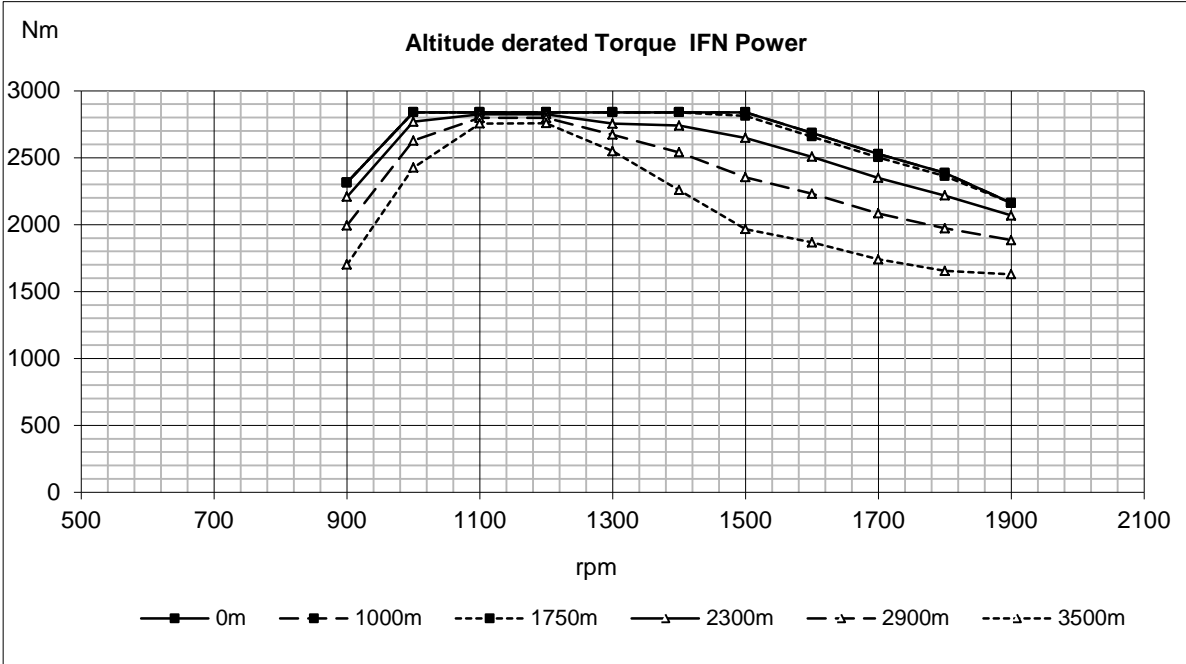
Power take off

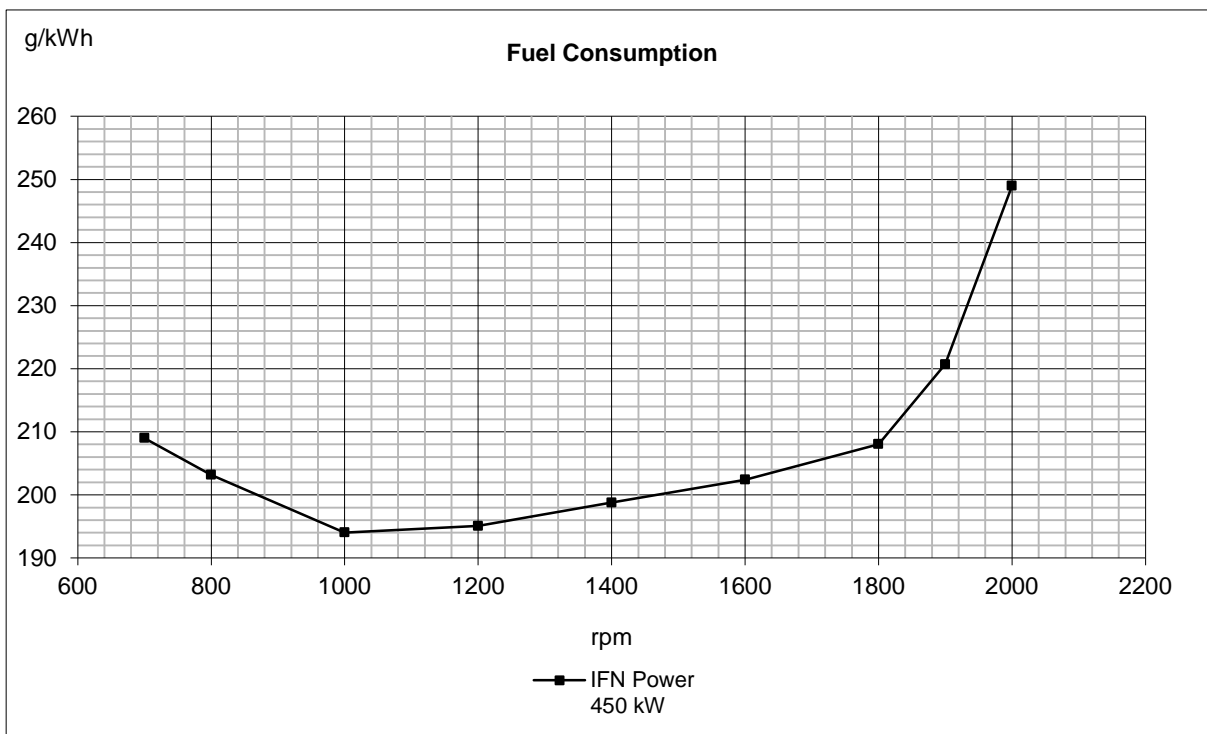
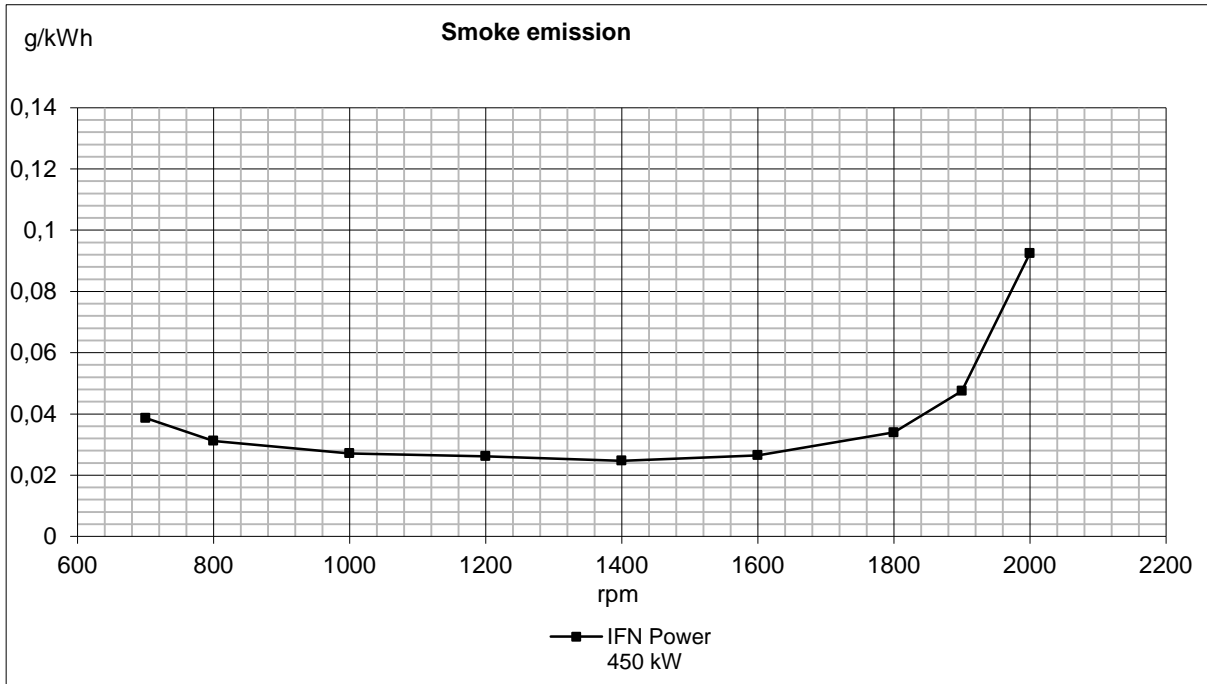
	rpm	1200	1500	1800	1900
Front end in line with crank shaft max:*	Nm	2840	2840	2386	2161
(with a total added mass moment of inertia, J (mR2)≤0,05 kgm²)	lbf ft	2095	2095	1760	1594
Front end belt pulley load. Direction of load viewed from flywheel side:	max left	kW	26	33	40
		hp	35	45	54
	max down	kW	60	75	90
		hp	82	102	122
	max right	kW	26	33	40
		hp	35	45	54
Timing gear at servo pump PTO max:*	Nm	100			
	lbf ft	74			
Speed ratio direction of rotation viewed from flywheel side		1,58:1/ccw			
Timing gear at compressor PTO max:*	Nm	600			
	lbf ft	443			
Speed ratio direction of rotation viewed from flywheel side		1,31:1/ccw			
Max allowed bending moment in flywheel housing	Nm	15000			
	lbf ft	11063			
Max. rear main bearing load	N	5000			
	lbf	1124,0			

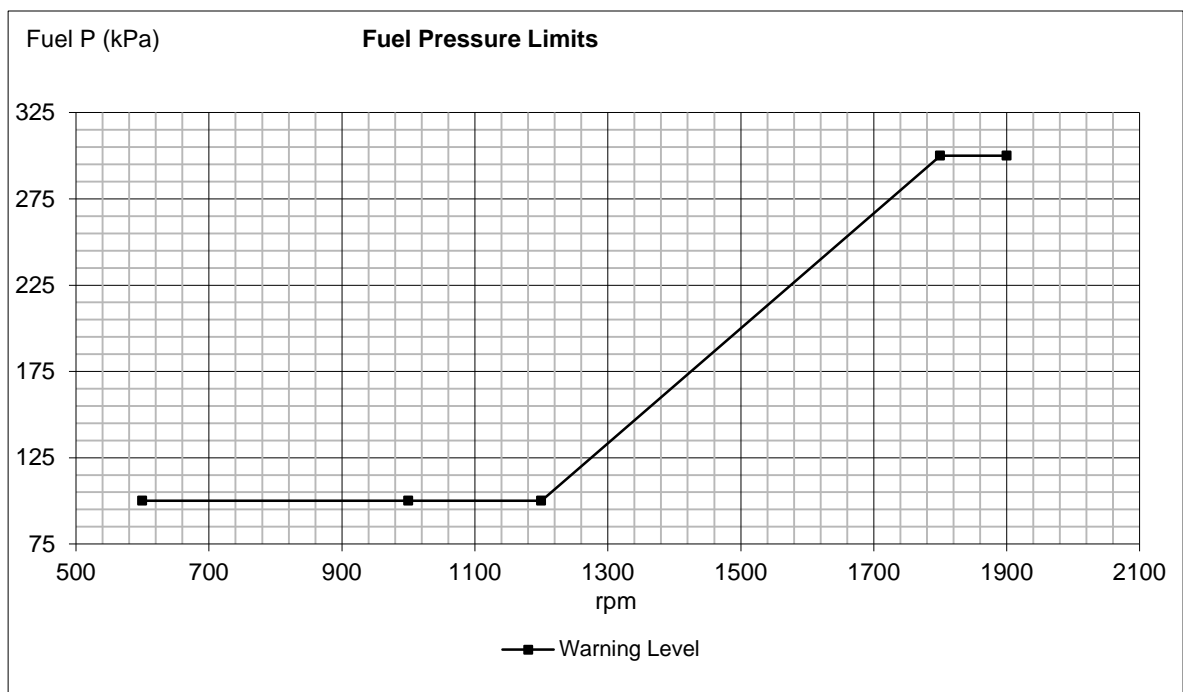
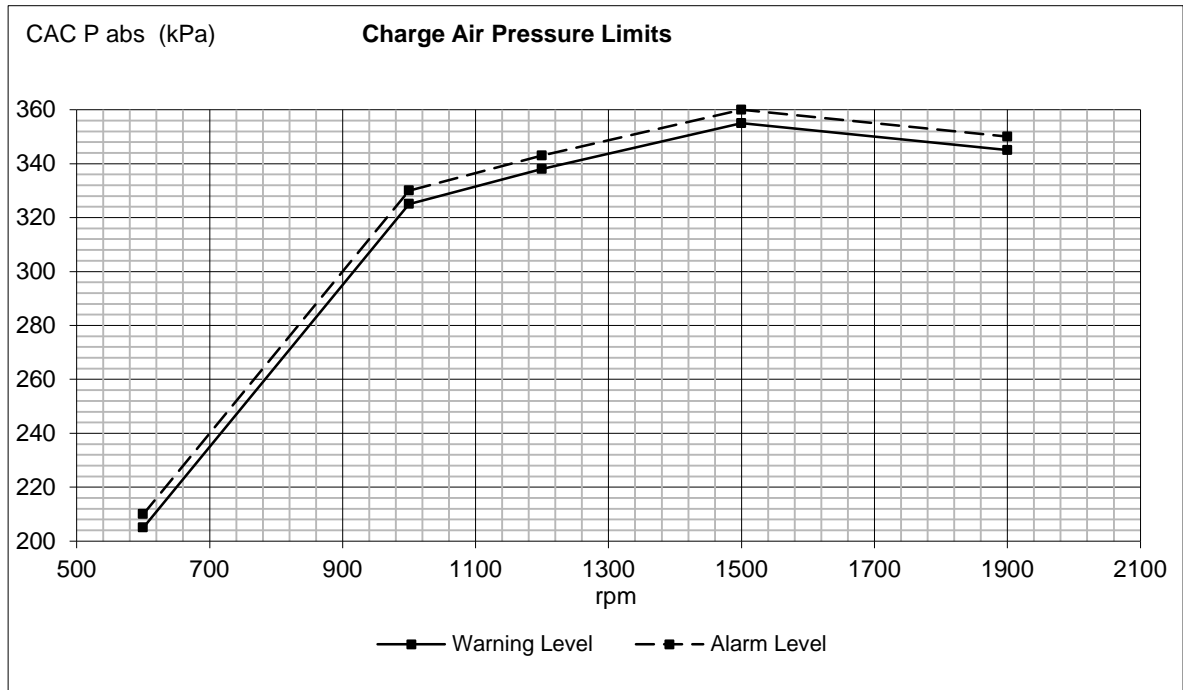
* **Maximum allowed torque at individual PTO's.**

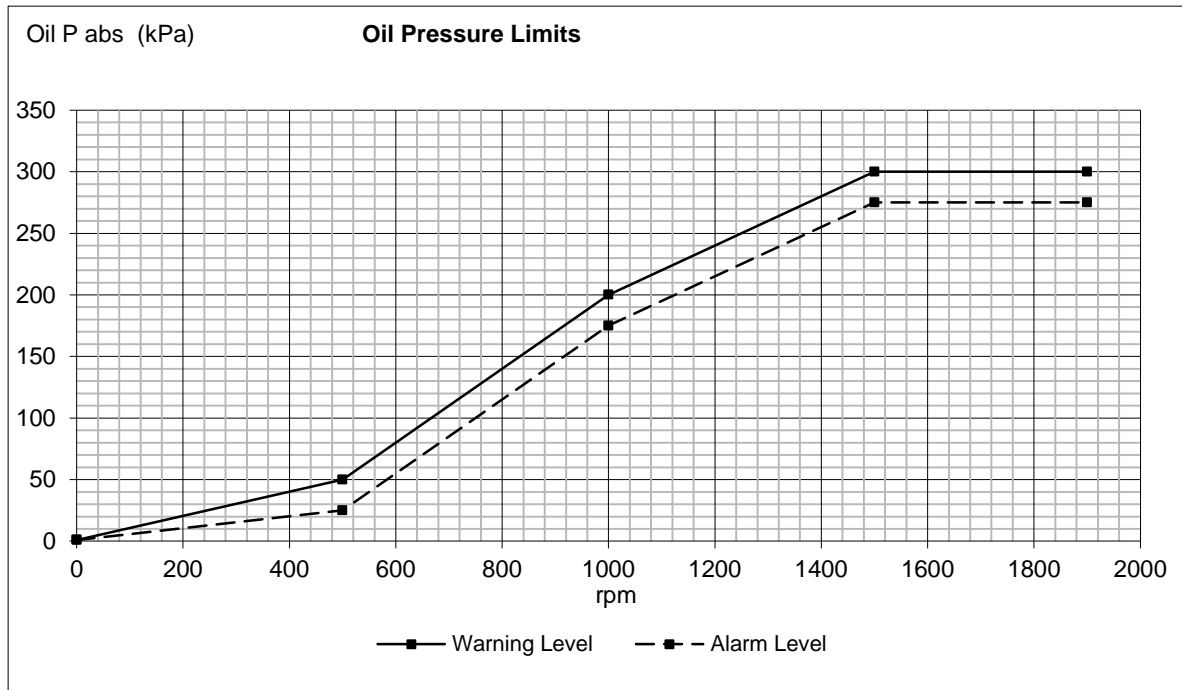
If more than one PTO output is used simultaneously, calculations needs to be performed to determine available maximum. Available torque depends on application inertia.

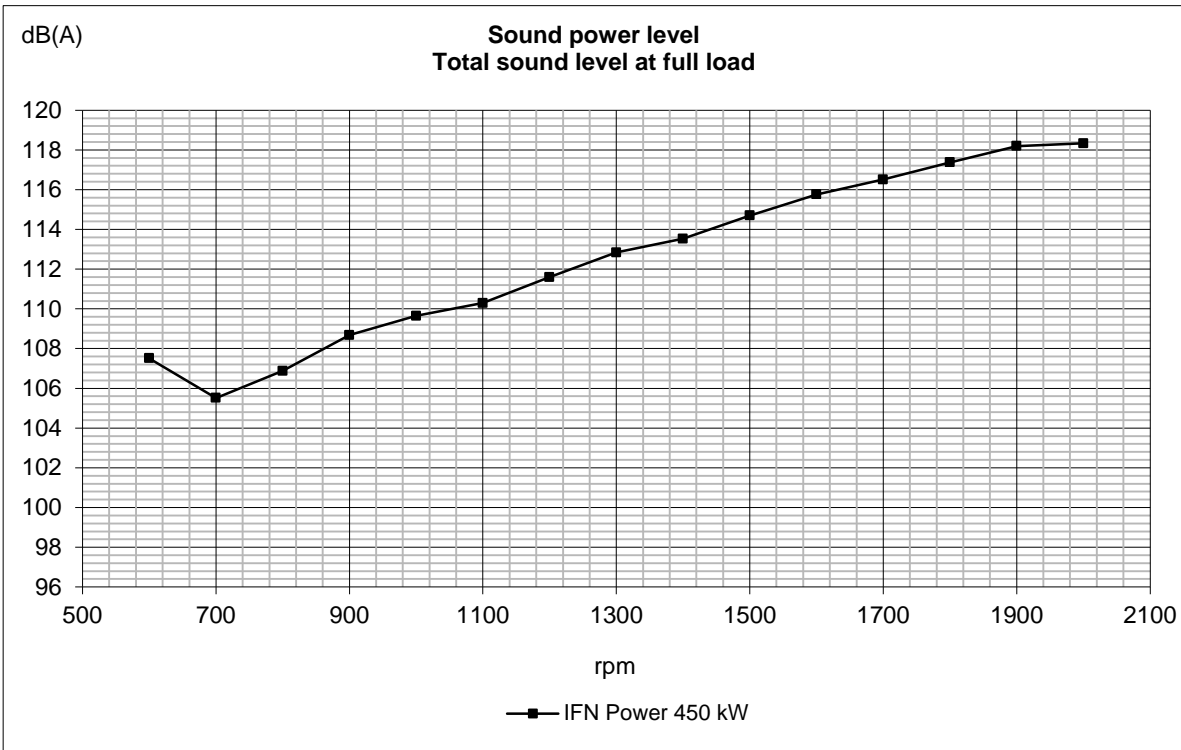
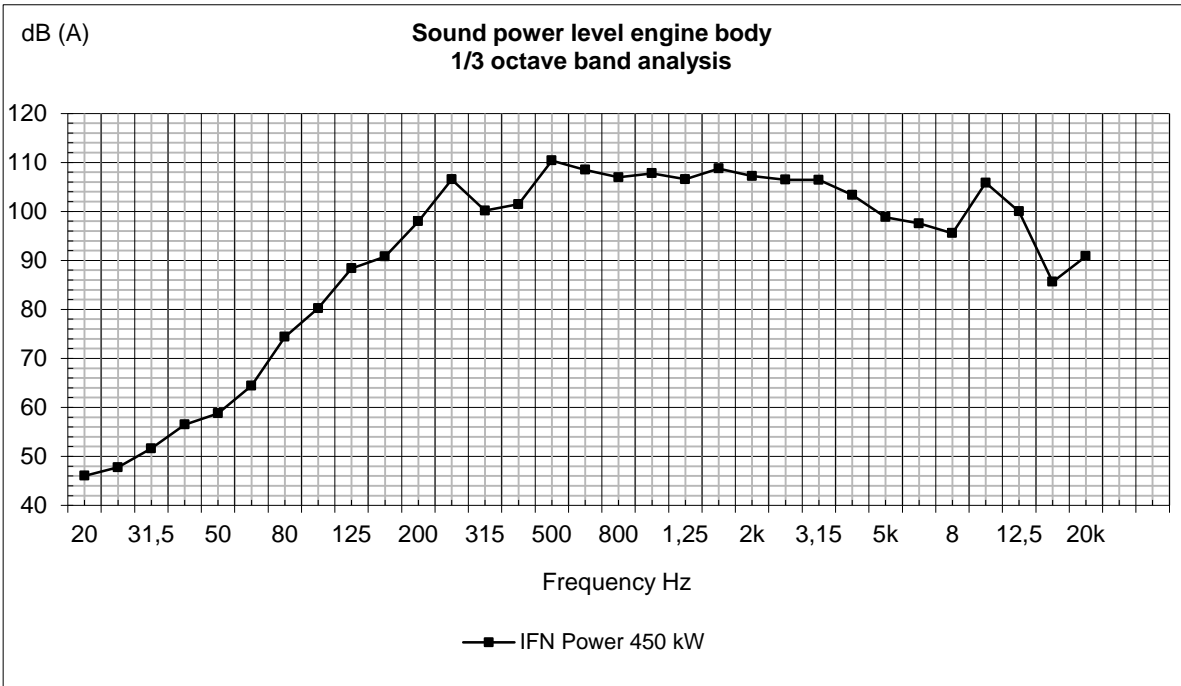


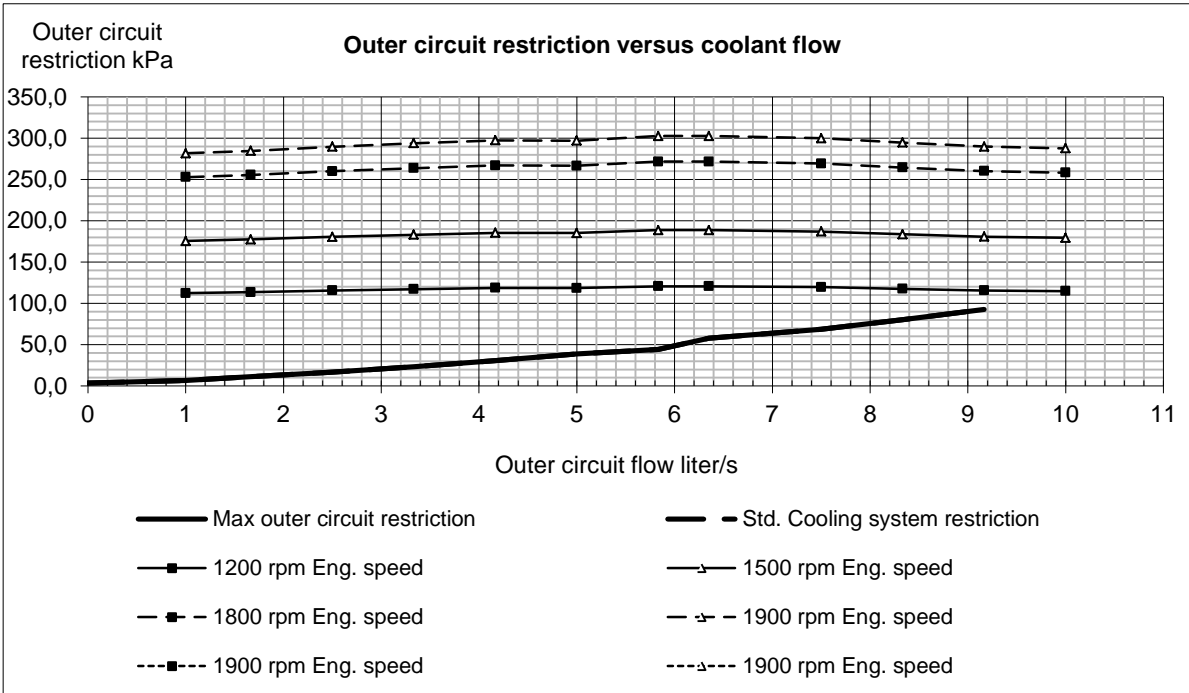




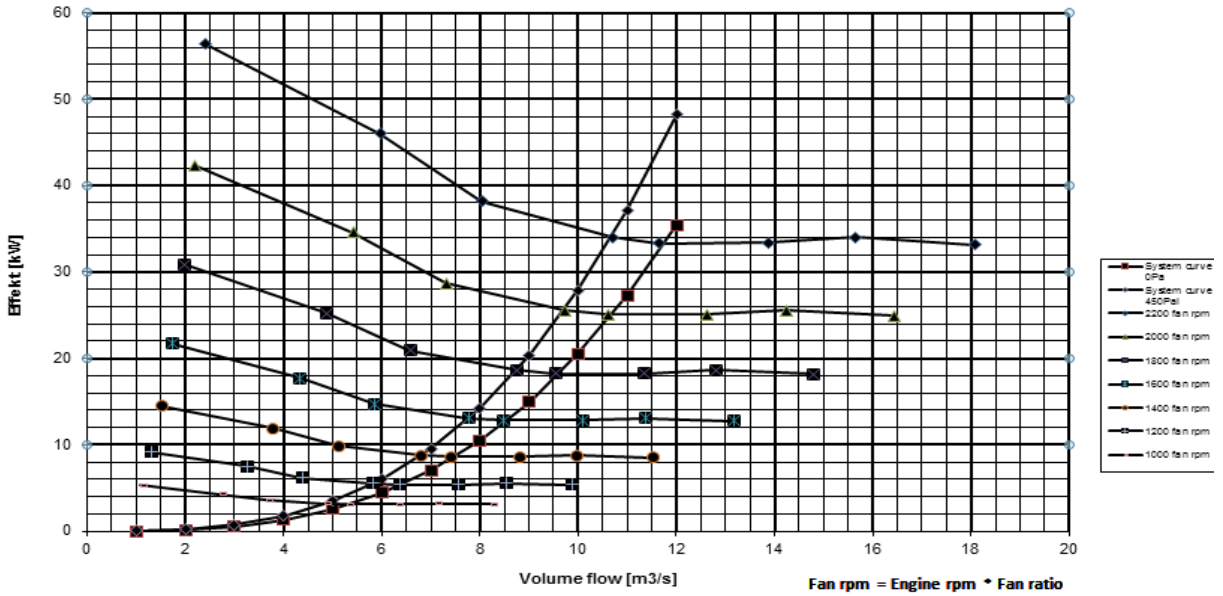








Fan power 890mm Pusher fan



Fan power 890mm Puller fan

