


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 in ³	16,12 984
Firing order			1-5-3-6-2-4
Bore		mm in	144 5,67
Stroke		mm in	165 6,50
Compression ratio			16.8:1
Wet weight	Engine only	kg lb	1440 3175
	Power pac	kg lb	1840 4057

Performance

			rpm	1200	1500	1800	1900
IFN Power	405 kW	without fan	kW hp	347 472	405 551	405 551	405 551
		with fan 890 mm	kW hp	See diagram for fan power consumption			
ICFN Power	405 kW	without fan	kW hp	346 471	405 551	405 551	405 551
		with fan 890 mm	kW hp	See diagram for fan power consumption			
Torque at:	IFN Power 405 kW		Nm lbf ft	2761 2036	2578 1902	2149 1585	2036 1501
		ICFN Power 405 kW	Nm lbf ft	2753 2031	2578 1902	2149 1585	2036 1501
Max torque at engine speed	IFN Power	1200 rpm	Nm lbf ft	2761 2036			
Power tolerance			%	±2%			
Mean piston speed			m/s ft/sec	6,6 21,7	8,3 27,1	9,9 32,5	10,5 34,3
Effective mean pressure at:	IFN Power 405 kW		MPa psi	2,15 312	2,01 291	1,67 243	1,59 230
Max combustion pressure at:	IFN Power 405 kW		MPa psi	15,5 2248	16,5 2393	16,3 2364	16,9 2451
Total mass moment of inertia, J (mR ²) (not including flywheel)			kgm ² lbf ft ²	4,1 97,3			
Friction Power			kW hp	26 35	39 53	58 79	65 88

Derating see Technical Diagrams

Engine brake performance (only engines with VCB)

			rpm	1200	1500	1900	2200
Maximum Brake Power:	without fan	kW		85	152	284	345
		hp		116	207	386	469
Maximum Brake Torque:	without fan	Nm		676	968	1427	1498
		lbf ft		499	714	1053	1104
Mean Brake Power: (Dependent on exhaust temperature at activation)	without fan	kW		83	146	273	341
		hp		113	199	371	464
Mean Brake Torque: (Dependent on exhaust temperature at activation)	without fan	Nm		660	929	1372	1480
		lbf ft		487	685	1012	1092
Engine speed range for VCB activation:			rpm	1000-2200			
Minimum engine speed with VCB still active:			rpm	900			
Minimum oil temperature for VCB activation:			°C	55			

Cold start performance

*Cold start limit temperature	without starting aid	°C	-10	
		°F	14	
	with manifold heater 4 kW	°C	-25	
		°F	-13	
	with manifold heater 4 kW and block heater	°C	-30	
		°F	-22	
*Specify oil and fuel quality	Oil: VDS3 10W/30, Fuel: MK1			
Block heater type	Make	Power kW	Engaged hours	Cooling water temp engine block
Self circulating	Volvo 3828864	2	12	1°C 34°F

* See also general section in the sales guide

Lubrication system

Lubricating oil consumption at max rpm at:	IFN Power 405 kW	liter/h	0,025
		US gal/h	0,007
Oil system capacity including filters		liter	48
		US gal	12,68
Oil sump capacity:	Max	liter	42
		US gal	11,10
	Min	liter	32
		US gal	8,45
Oil change intervals/specifications	VDS3	h	600
Engine angularity limits:	front up	°	30
	front down	°	30
	side tilt	°	30
Oil pressure at rated speed		kPa	300-650
		psi	44-94
Oil pressure shut down switch setting		kPa	N/A
		psi	

Lubrication system




Lubrication oil temperature in sump:	max	°C	130
		°F	266
Oil filter micron size		μ	40

Fuel system

	rpm	1200	1500	1800	1900
Fuel to conform to		EN590 ASTM D 975 No 1D and 2D (Max 20 ppm sulphur and 7% FAME)			

Fuel system



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 (measured at fuel inlet connection)	kPa	0
	psi	
System return flow at max. speed	liter/h	25,0
	US gal/h	6,6
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 micron size	μ	5
Governor type/make, standard	Volvo/EMS2.2	
Injection pump type/make	Delphi E3	

Intake and exhaust system		Inlet air temp	rpm	1200	1500	1800	1900
Air consumption at: (+25°C and 100kPa)	IFN Power 405 kW		m³/min cfm	25,1 886	32,0 1130	34,5 1218	35,1 1240
 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 405 kW		kW BTU/min	239 13592	279 15838	298,4 16970	298,6 16981
Exhaust gas temperature after turbine at:	IFN Power 405 kW		°C °F	455 851	425 797	427 801	413 775
 See front page for important information Max allowable back pressure in exhaust line (after turbine) Pipe dimension Ø: 125 mm			kPa psi	19 2,8	26 3,8	30 4,4	31 4,5
 See front page for important information Max allowable temperature drop between turbine and SCR muffler inlet.			°C °F	10 18	10 18	10 18	10 18
SCR muffler pressure drop			kPa psi	16 2,3	22 3,2	24 3,5	25 3,6
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	IFN Power 405 kW		m³/min cfm	58,1 2052	67,6 2387	71 2507	72,1 2546
Exhaust gas smoke	IFN Power 405 kW		*Bosch	0,027	0,025	0,045	0,031

Cooling system

		rpm	1200	1500	1800	1900
Heat rejection radiation from engine at:	IFN Power 405 kW	kW	7	7	9	9
		BTU/min	398	398	512	512
Heat rejection to coolant at:	IFN Power 405 kW	kW	131	158	180	186
		BTU/min	7450	8985	10236	10578
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		m ²	1,42			
		foot ²	15,28			
HD radiator core area		m ²	0,87			
		foot ²	9,36			
Fan diameter	890 mm	mm	890			
		in	35,04			
Fan power consumption	890 mm	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	liter	37			
	Pusher syst. Core thickness 63mm	US gal	9,8			
	STD.1,42m ² radiator with hoses	liter	30			
	Puller syst. Core thickness 41mm	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			
Coolant flow with standard system		l/s	4,7	5,8	7,0	7,3
		US gal/s	1,2	1,5	1,8	1,9
Minimum coolant flow		l/s	4,2	5,3	6,5	6,8
		US gal/s	1,1	1,4	1,7	1,8
Maximum outer circuit restriction incl. piping		kPa	85,0			
		psi	12,3			
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 405 kW	kW BTU/min	39 2218	72 4095	87 4948	88 5004
Charge air mass flow	IFN Power 405 kW	kg/s	0,4	0,56	0,66	0,67
Charge air inlet temp. (Charge air temp after turbo compressor)	IFN Power 405 kW	°C °F	145 293	180 356	183 361	183 361
 See front page for important information Max allowable Charge air outlet temp. (Charge air temp after charge air cooler)	IFN Power 405 kW	°C °F	39 102	47 117	50 122	50 122
 See front page for important information Maximum pressure drop over charge air cooler incl. Piping (throttle not included)		kPa psi			14 2,03	
Charge air pressure at rated power (After charge air cooler)		kPa psi			169 24,51	
Standard charge air cooler core area		m ² foot ²			1,3 13,99	

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 kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1900	405	57	135	7,3	257,8	320	0,046
		59	138	7,6	268,4	240	0,035
	60	140	7,8	275,5	190	0,028	
	61	142	8,1	286,0	130	0,019	
	62	144	8,3	293,1	85	0,012	
	64	147	8,7	307,2	0		

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 1:0,88

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1900	405	45	113	6	211,9	740	0,107
	551	50	122	6,7	236,6	590	0,086
		55	131	7,6	268,4	400	0,058
		60	140	8,6	303,7	180	0,026
		63	145	9,4	332,0	80	0,012
		65	149	10,1	356,7	0	

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
1900	405	70	158	10,0	353,1	450	0,065
	551	71	159	10,5	371,9	300	0,044
		72	161	11,1	392,3	150	0,022
		73	163	11,7	413,5	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
1900	405	69	155	9,1	321,7	450	0,065
	551	69	157	9,6	338,3	300	0,044
		70	158	10,2	358,4	150	0,022
		71	159	10,7	377,2	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
1900	405	67	152	8,4	297,7	450	0,065
	551	68	154	8,8	312,2	300	0,044
		69	156	9,4	331,3	150	0,022
		70	157	9,8	346,8	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
1900	405	64	148	7,6	269,5	450	0,065
	551	65	149	8,0	281,5	300	0,044
		67	152	8,5	298,8	150	0,022
		67	153	8,8	310,4	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
1900	405	64	147	7,5	263,1	450	0,065
		65	148	7,8	274,4	300	0,044
	551	66	151	8,2	290,6	150	0,022
		67	152	8,5	300,9	0	

Cooling performance: HD cooling package 0,87m² 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 1:0,88

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1900	405	64	147	8,9	315,7	400	0,058
		66	150	9,4	332,9	300	0,044
	551	67	153	10,0	352,7	200	0,029
		69	156	10,6	372,7	100	0,015
		71	159	11,2	397,1	0	

Cooling performance: HD cooling package 0,87m² 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 1:0,88

Engine speed rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	m ³ /s	ft ³ /s	Pa	psi
1900	405	61	142	8,4	295,5	400	0,058
		63	146	8,9	314,5	300	0,044
	551	65	149	9,3	329,8	200	0,029
		67	152	9,8	346,6	100	0,015
		68	154	10,3	364,1	0	

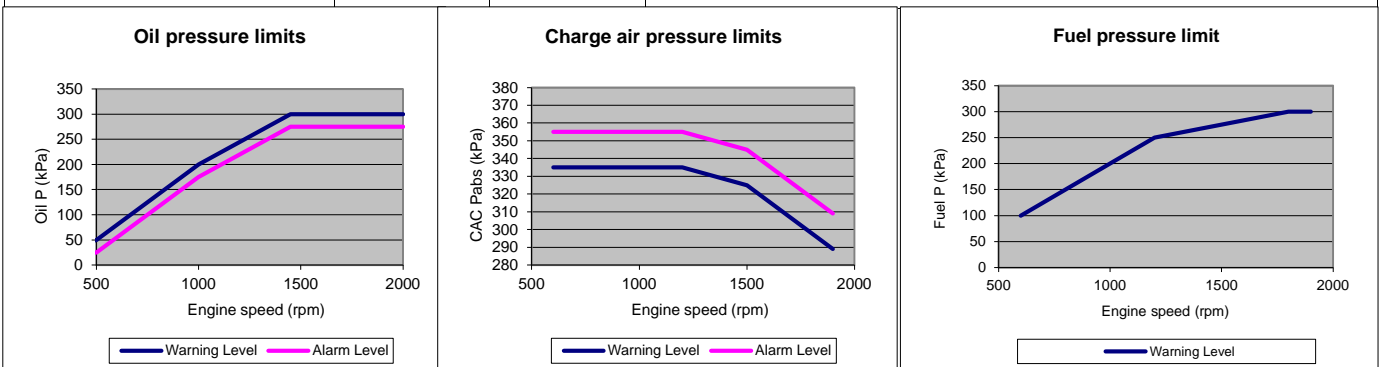
Engine management system

Functionality	Alternatives	Default setting
Governor mode	Isochronus	
Governor droop	0%	
Governor response	Adjustable PI-constants	1
Idle speed	600-900	700
Stop function	Energized to run/Stop	
Preheating function	On/Off	
Lamp test	On/Off	

Parameter	Warning level	Alarm level	Engine protection	
Parameter for Power Pack	Default setting	Level	Action.	Default/Alternative
Oil temp	125°C	Setting +5°C	Shut down.	ON/OFF*
Oil pressure	Low idle	25 kPa	Shut down.	ON/OFF*
	Rated speed	275 kPa	Shut down.	ON/OFF*
Oil level	Min level	-	-	-
Coolant temp	105°C	107°C	Shut down.	ON/OFF*
Coolant level	Low level	-	-	-
Fuel feed pressure	Low idle	100 kPa	-	-
	1200	250 kPa	-	-
Water in fuel	High level	-	-	-
Crank case pressure	Press inc	-	Shut down.	ON/OFF*
Air filter pressure drop	5 kPa	-	-	-
Altitude, above sea	Automatic derating, see section derating			
Charge air temp	80°C	85°C	Shut down.	ON/OFF*
Charge air pressure	Warning map value + 5kPa	Alarm map value + 5kPa	Shut down.	ON/OFF*
Engine speed	120%	-	Shut down.	ON/OFF*
Cat temp protection (exhaust temp)	-	-	Derates the engine in order to not exceed exhaust T>550°C	

* Off: disables the function, i e no shut down.

Parameter	Warning level	Alarm level	Engine protection			
Parameter for Mobile	Warning	Alarm	Derated 0% to engine protection map	Derated 100% to engine protection map	Forced idle after sec	Forced shut down after 2 sec
Oil temp	125°C	127°C	127°C	130°C	N/A	N/A
Oil pressure	Warning map value	Alarm map value	N/A	N/A	N/A	Alarm map value
Oil level	Min level	N/A	N/A	N/A	N/A	N/A
Coolant temp	105°C	107°C	107°C	108°C	N/A	N/A
Coolant level	Low level	N/A	N/A	N/A	N/A	N/A
Fuel feed pressure	Warning map value	N/A	N/A	N/A	N/A	N/A
Water in fuel	High level	N/A	N/A	N/A	N/A	N/A
Crank case pressure	N/A	Press incr 5kPa	N/A	N/A	N/A	Press incr 5kPa
Air filter pressure drop	-	5 kPa	N/A	N/A	N/A	N/A
Altitude, above sea	Automatic derating, see section derating					
Charge air temp	80°C	85°C	85°C	86°C	N/A	N/A
Charge air pressure	Warning map	Alarm map value	Alarm map	Alarm map value	N/A	N/A
Engine speed	120%	N/A	N/A	N/A	N/A	N/A
Cat temp protection (exhaust temp)	-	-	Derates the engine in order to not exceed exhaust T>550°C			

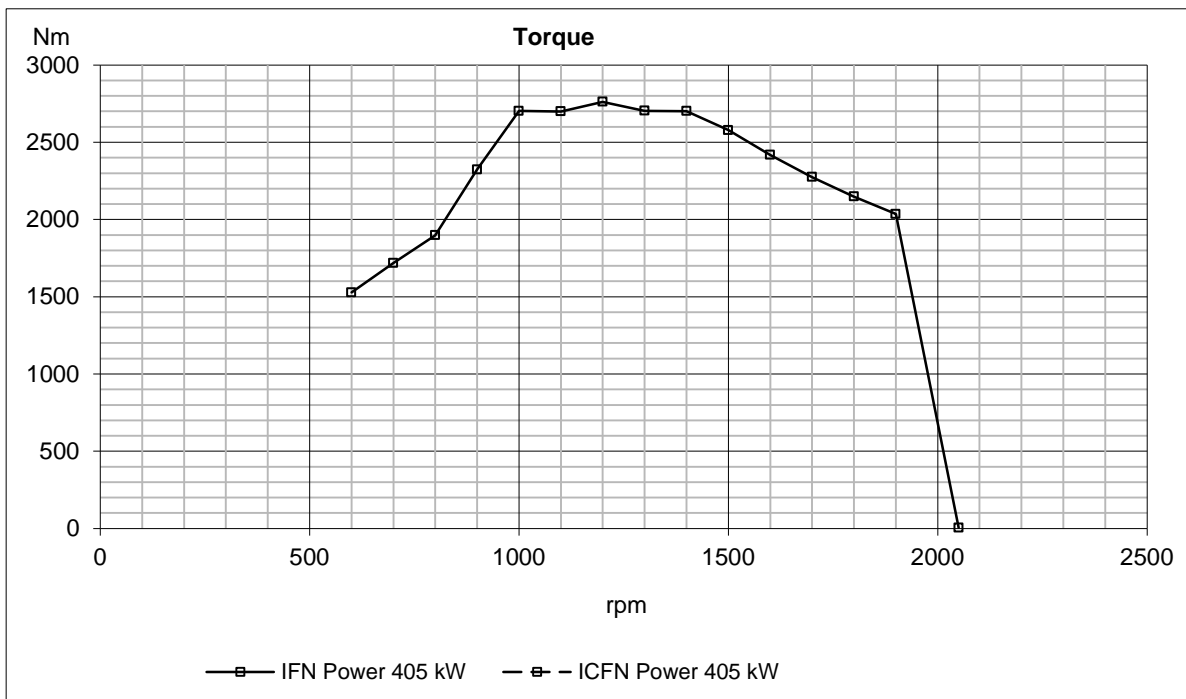
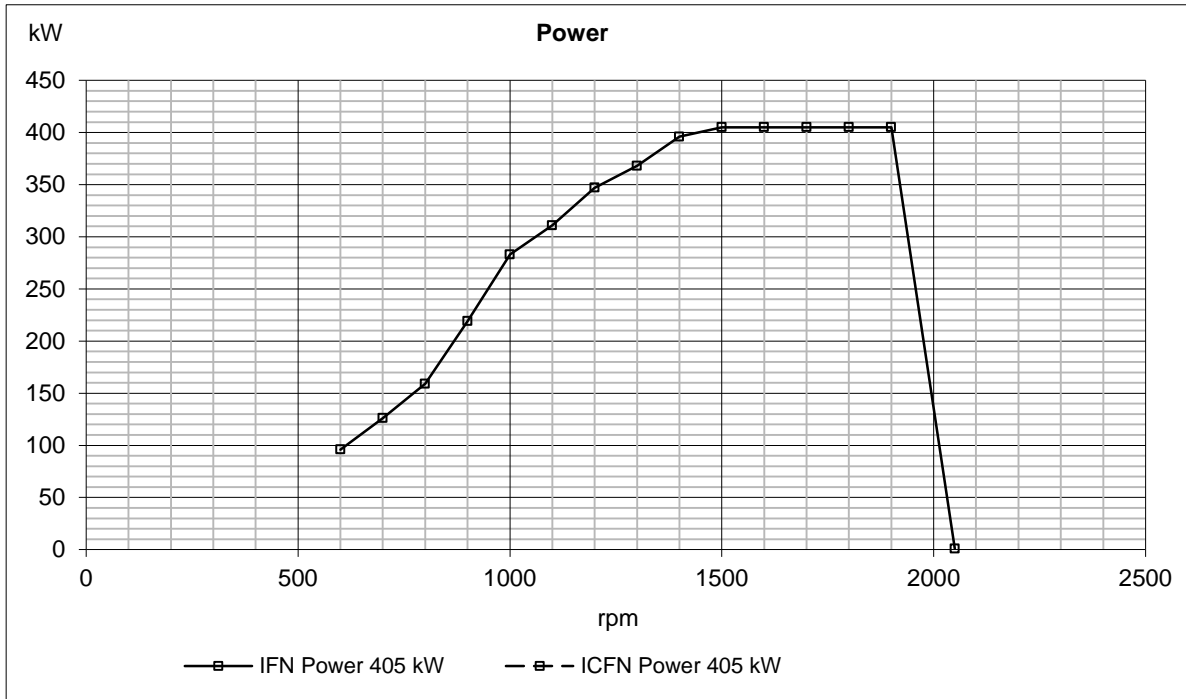


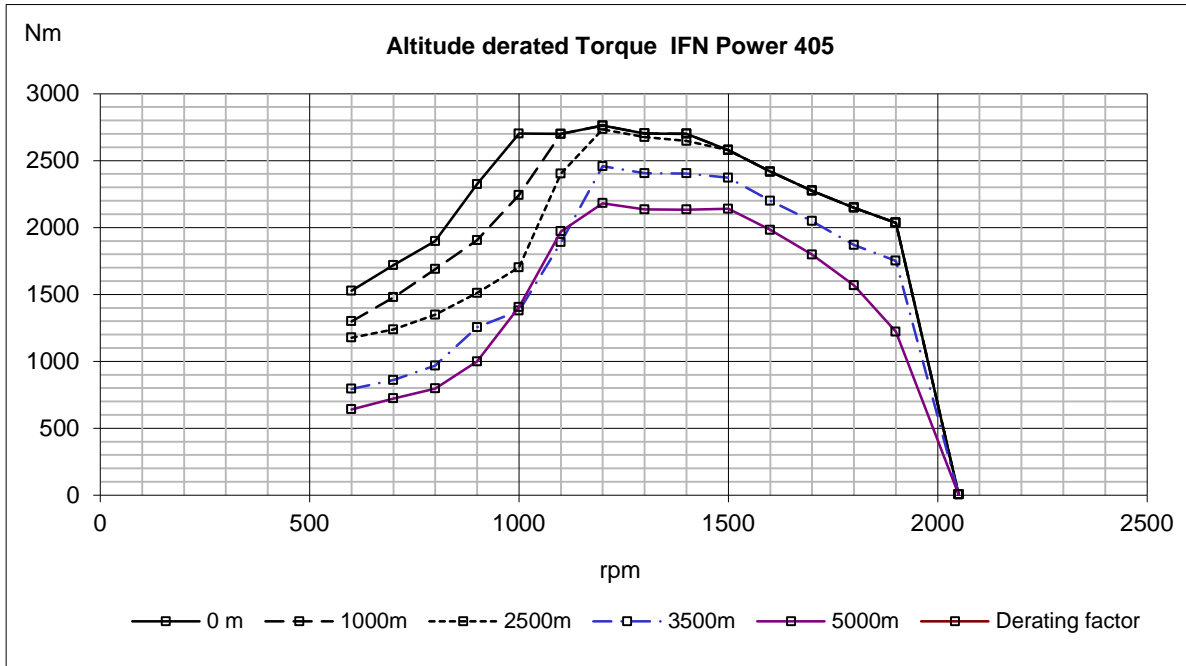
Electrical system

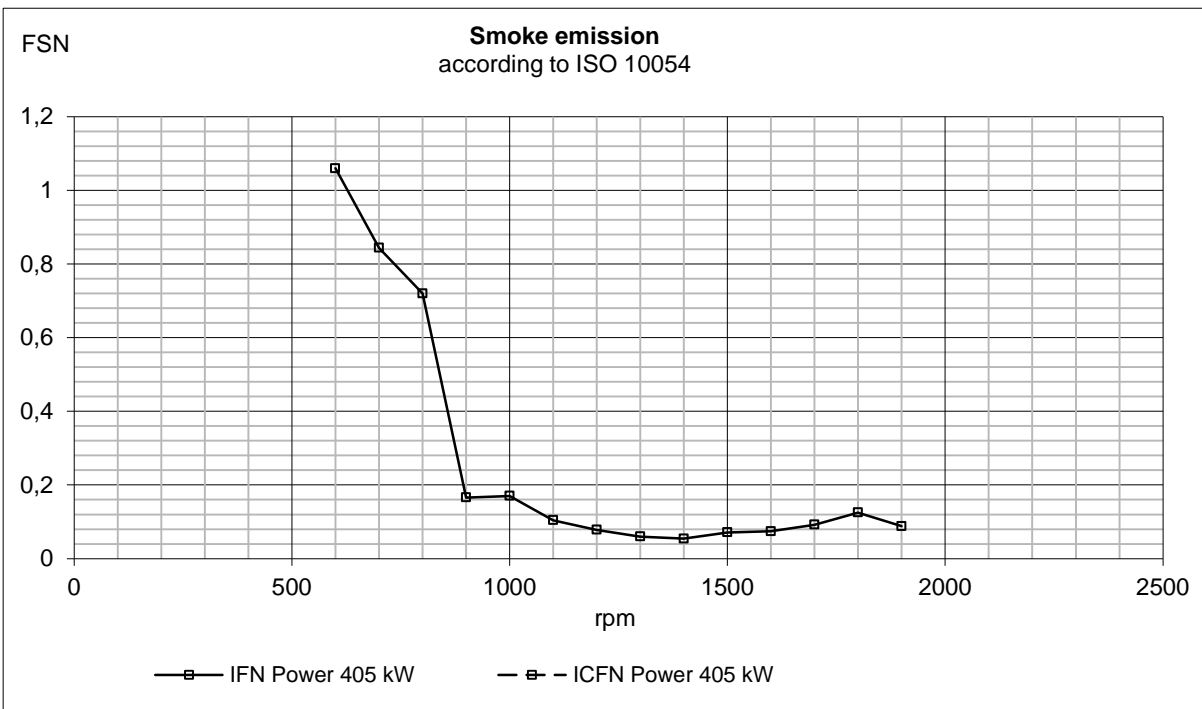
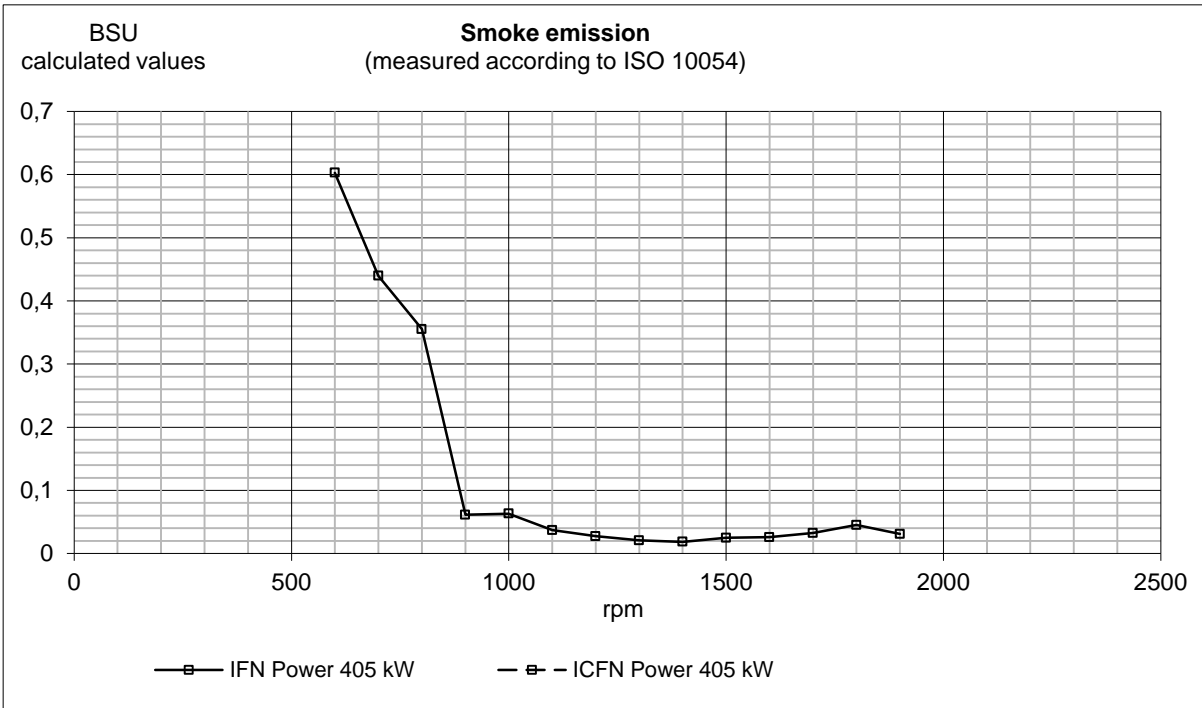
Voltage and type				24 V
Alternator:	make			Bosch
	output	A		80
	tacho output	Hz/alternator rev.		6
	drive ratio			3.9:1
Starter motor:	make			Melco
	type			105P70
	output	kW		7
Number of teeth on:	flywheel	hp		9,5
		starter motor		12
Max wiring resistance main circuit		mΩ		2
Cranking current at +20°C		A		280
Crank engine speed at 20°C		rpm		150
Starter motor battery capacity	max	Ah/A		2*225
	min at +5°C	Ah/A		-
Inlet manifold heater (at 20 V)		kW		4
Power relay for the manifold heater		A		1

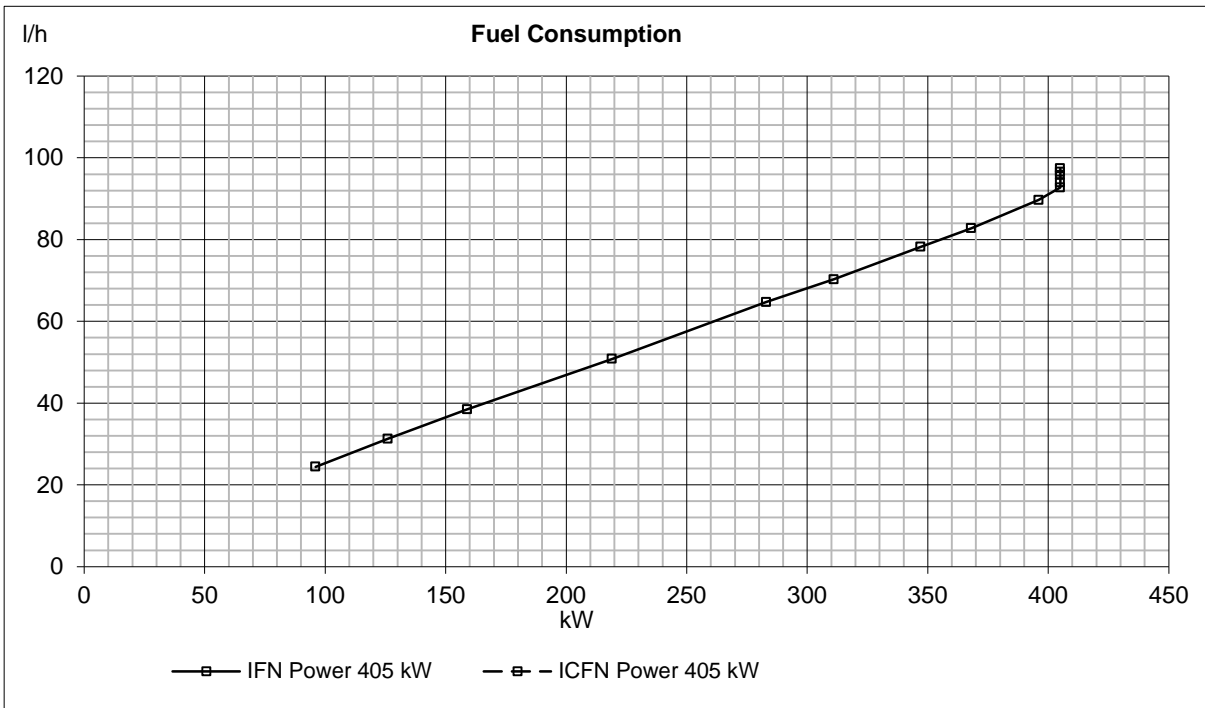
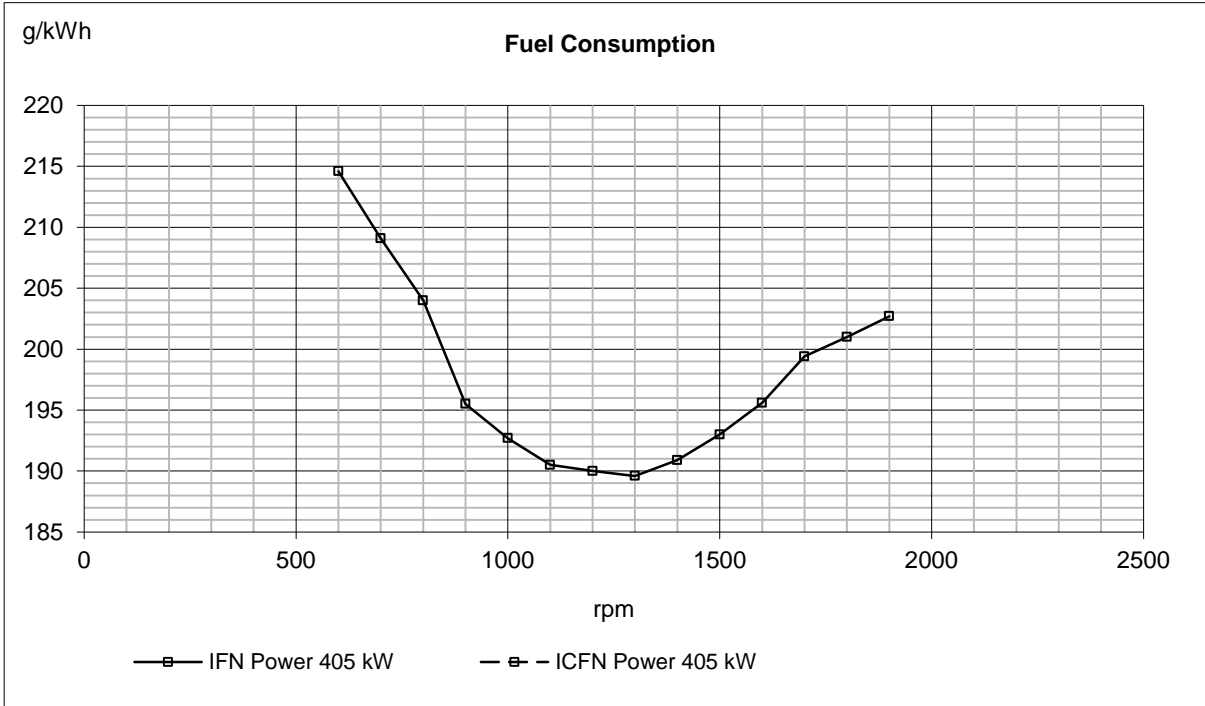
Power take off

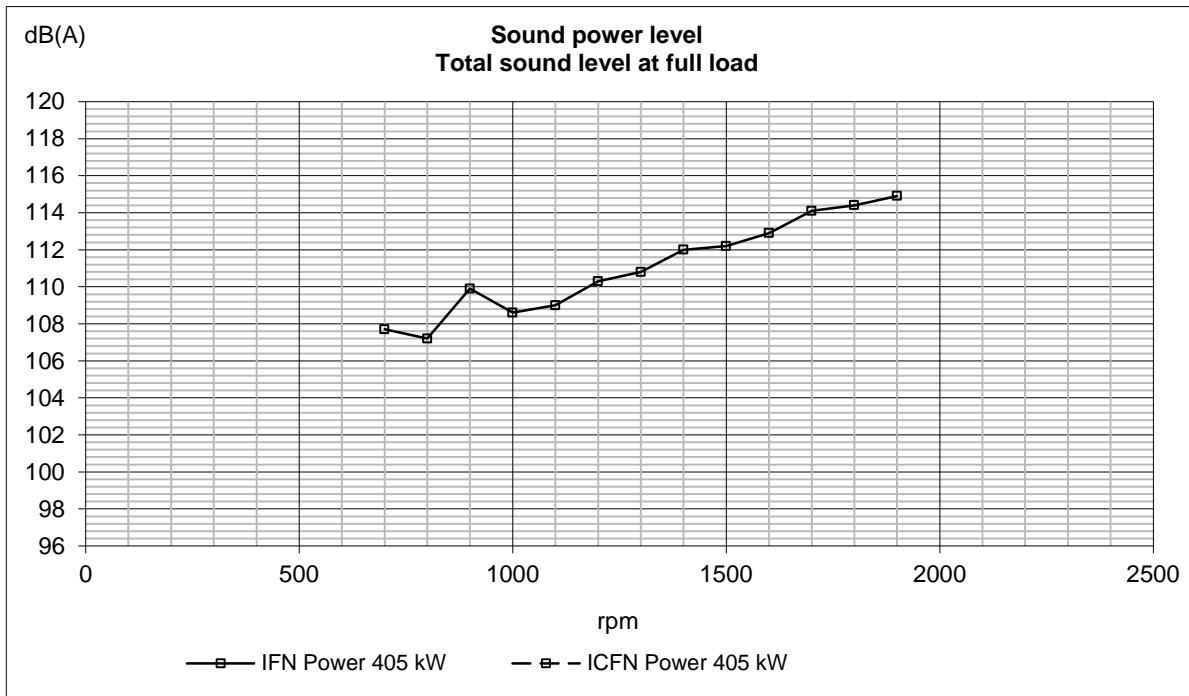
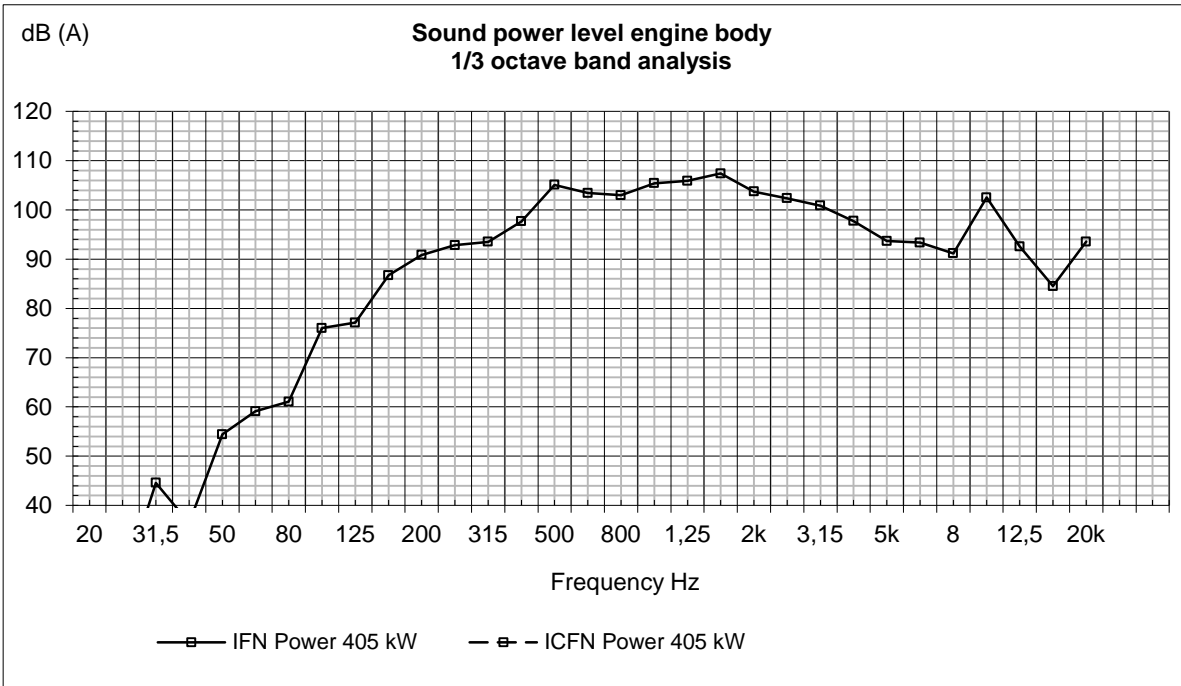
		rpm	1200	1500	1800	1900
Front end in line with crank shaft max:		Nm lbf ft	TBD			
Front end belt pulley load. Direction of load viewed from flywheel side:	max left	kW	26	33	40	
		hp	35	45	54	
	max down	kW	60	75	90	
		hp	82	102	122	
	max right	kW	26	33	40	
		hp	35	45	54	
Timing gear at compressor PTO max:		Nm lbf ft	600 443			
Speed ratio direction of rotation viewed from flywheel side			1.31:1/anti clockwise			
Max allowed bending moment in flywheel housing		Nm lbf ft	15000 11063			
Max. rear main bearing load		N lbf	5000 1124,0			

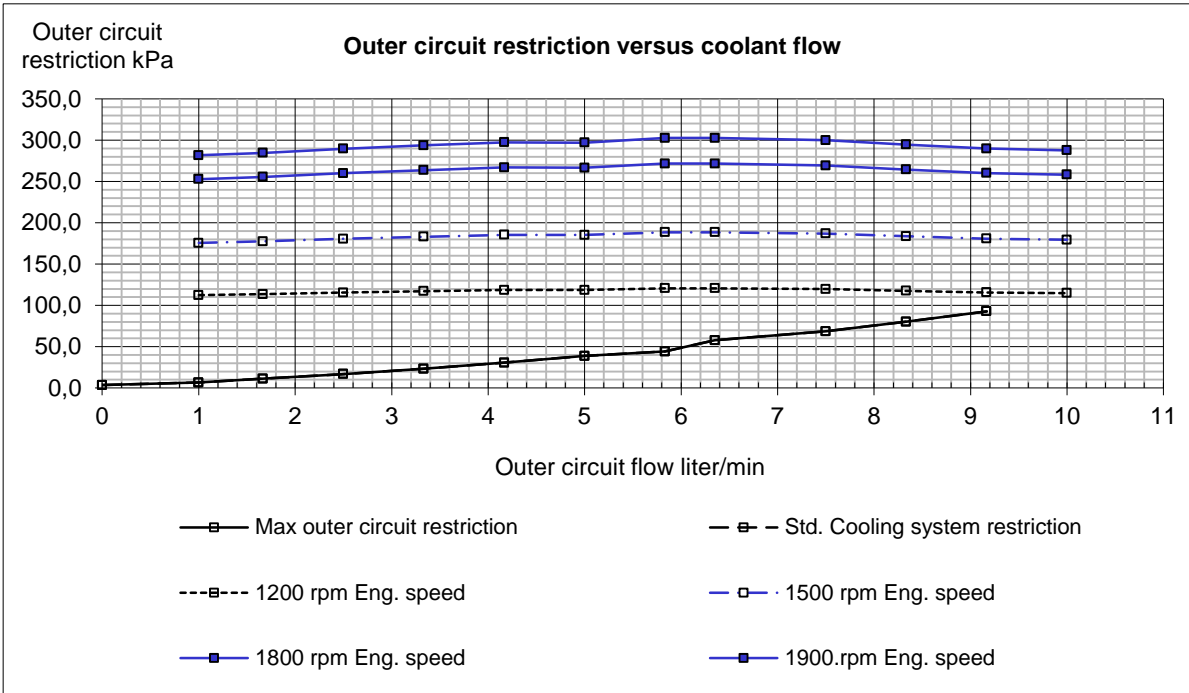


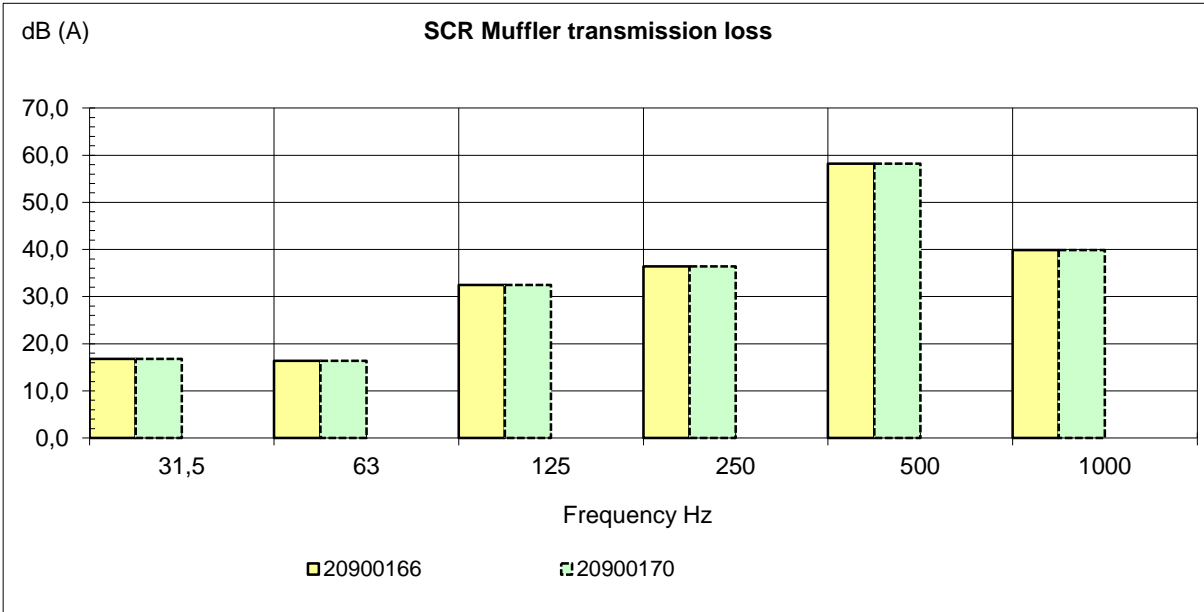




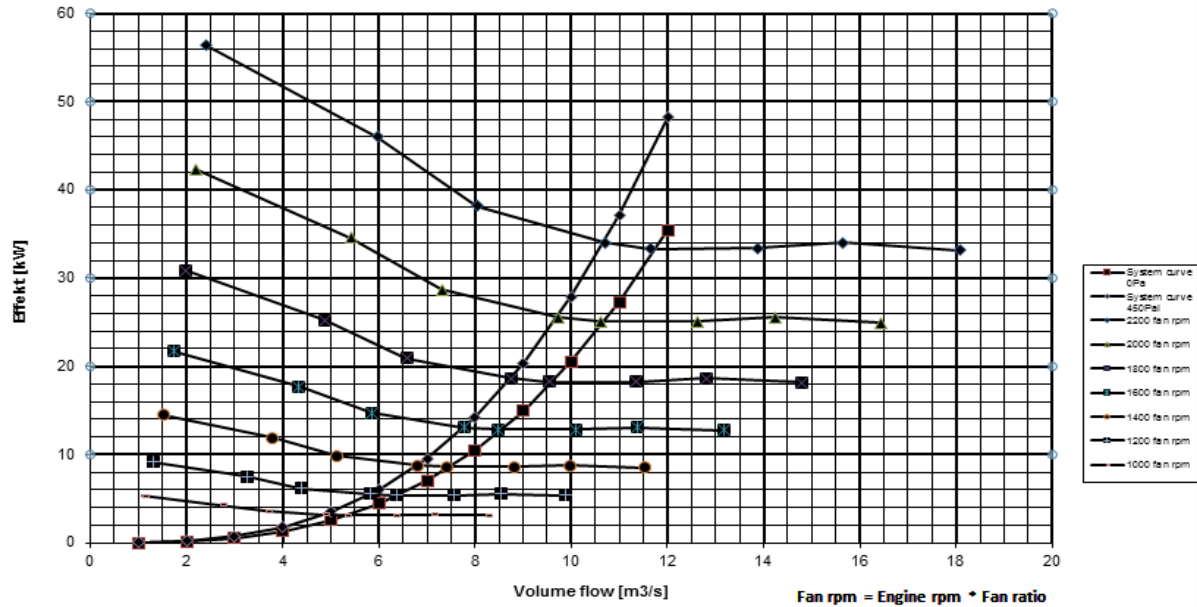








Fan power 890mm Pusher fan



Fan power 890mm Puller fan

