General

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

Number of cylinders			6
Displacement, total		litre in^3	12,78 779,7
Firing order			1-5-3-6-2-4
Bore		mm in	131 5,16
Stroke		mm in	158 6,22
Compression ratio			18.5
Dry weight	Engine only, excluding cooling system	kg lb	1500 3307
	Genset, see dimension drawing	kg lb	

Performance			**rpm** **load**	**1500** **25%**	**50%**	**75%**	**100%**	**110%**
Power setting 360 kW		without fan	kW hp	90 122	180 245	270 367	360 490	396 539
		with fan	kW hp	79 107	169 230	259 352	349 475	385 524
Torque at:	Power setting 360 kW		Nm lbft	573 423	1146 845	1719 1268	2292 1690	2521 1859
Mean piston speed			m/s ft/sec			7,9 26,0		
Effective mean pressure at:	Power setting 360 kW		MPa psi	0,6 82	1,1 163	1,7 245	2,3 327	2,5 360
Max combustion pressure at:	Power setting 360 kW		MPa psi	8 1160	10,3 1494	13,6 1973	17,6 2553	19,3 2799
Total mass moment of inertia, J (mR^2) Engine only			kgm^2 $lbft^2$			3,43 81,4		
Degree of irregularity at:	Power setting 360 kW							
Friction Power			kW hp	32 44	32 44	32 44	32 44	32 44
If applicable Derating are described in Technical Diagrams								

Performance			**rpm** **load**	**1800** **25%**	**50%**	**75%**	**100%**	**110%**
Power setting 400 kW		without fan	kW hp	100 136	200 272	300 408	400 544	440 598
		with fan 890 mm	kW hp	81 110	181 246	281 382	381 518	421 573
Torque at:	Power setting 400 kW		Nm lbft	531 391	1061 783	1592 1174	2122 1565	2334 1722
Mean piston speed			m/s ft/sec			9,5 31,2		
Effective mean pressure at:	Power setting 400 kW		MPa psi	0,5 76	1,0 151	1,6 227	2,1 303	2,3 333
Max combustion pressure at:	Power setting 400 kW		MPa psi	8,7 1262	11,5 1668	14,2 2060	17 2466	18,3 2654
Total mass moment of inertia, J (mR^2) Engine only			kgm^2 $lbft^2$			3,43 81,4		
Degree of irregularity at:	Power setting 400 kW							
Friction Power			kW hp	46 62,56	46 62,56	46 62,56	46 62,56	46 62,56
If applicable Derating are described in Technical Diagrams								

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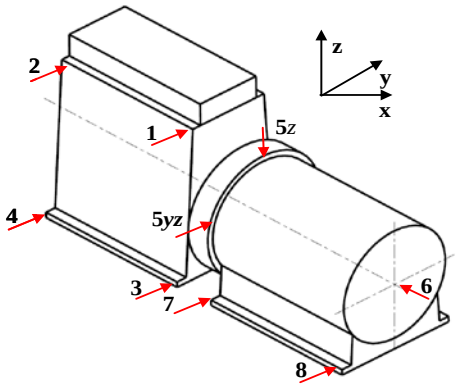
Engine noise emission

Test Standards: ISO 3744-1981 (E) sound power (with intake and without exhaust noise)
Tolerans ± 0.75 dB(A)

		rpm			**1500**		
		load	**25%**	**50%**	**75%**	**100%**	**110%**
Measured sound power Lw	No load	dB(A)	112,8	112,8	112,8	112,8	112,8
	Power setting 360 kW	dB(A)	114,3	113,5	113,5	113,9	113,8
		rpm			**1800**		
Measured sound power Lw	No load	dB(A)	116,8	116,8	116,8	116,8	116,8
	Power setting 400 kW	dB(A)	117,6	117,1	117,2	117,6	117,2

Vibrations (vibration velocity)

Declared vibration levels according to ISO 8528-9



rpm	**1500**		
	RMS Velocity (10 - 1000Hz) Measurement direction		
Measuring position	Axial [x] mm/s	Transverse [y] mm/s	Vertical [z] mm/s
1	10,9	16,8	21,7
2	11,7	16,7	18,2
3	10,6	12,3	15,4
4	10,3	13,1	17
5	11,1	6,5	16,5
6	14,5	18,1	26,8
7	8,1	14,2	22
8	7,7	20,5	17
rpm		**1800**	
1	8,8	18,4	21,4
2	12,2	34,5	20,7
3	9,5	34,4	22,8
4	11,4	27,5	18,8
5	10,9	9,5	19,2
6	16,4	24,3	17,2
7	9,3	22,2	27,5
8	9,1	25,6	24,6

Test conditions for load acceptance data

Warm engine. UFRO according to stamford recommendation (Start at -3Hz) Minimum dip setting	**Generator**	**Modell**	**Type of AVR**
	Stamford	HCM 534C	MX341

Load acceptance performance can vary due to actual alternator inertia, voltage regulator, type of load and local ambient conditions.

Single step load performance at 1500 rpm

Load (%)	Speed diff (%)		Recovery time (s)		Remaining load	Speed diff (%)		Recovery time (s)	
	Nominal	110% power	Nominal	110% power	(%)	Nomi-nal	110% power	Nomi-nal	110% power
0-20	1,9	2,1	1,3	1,1	20-100	16,3	19,8	3,7	7,0
0-40	3,3	3,8	1,1	1,3	40-100	6,1	6,5	2,2	4,8
0-60	8,6	10,8	2,2	2,7	60-100	2,7	3,1	1,2	1,2
0-80	18,3	23,4	3,6	4,1	80-100	1,3	1,4	1,0	1,1
0-100	34,9	61,0	6,4	10,8					
0-57,1	**7,5 (G3)**		1,7		57,1-100	3,2		1,3	
0-52,1		**7,5 (G3)**		1,9	52,1-100		4,0		2,5
0-65,3	**10,5 (G2)**		2,6		65,3-100	2,2		1,1	
0-59,5		**10,5 (G2)**		2,6	59,5-100		3,3		1,3
0-50-100			2,2						
100-0	-4,2	-4,2	1,3	1,4					

Single step load performance at 1800 rpm

Load (%)	Speed diff %		Recovery time (s)		Remaining load	Speed diff (%)		Recovery time (s)	
	Nominal	110% power	Nominal	110% power	(%)	Nomi-nal	110% power	Nomi-nal	110% power
0-20	1,4	1,4	0,7	0,6	20-100	6,6	7,6	1,7	4,4
0-40	2,2	2,5	0,7	0,7	40-100	3,4	3,7	1,0	2,3
0-60	4,6	5,5	1,3	1,4	60-100	1,9	2,2	0,8	0,8
0-80	8,0	9,5	1,3	1,9	80-100	0,9	0,9	0,5	0,4
0-100	13,3	16,5	2,2	5,0					
0-74,7	**7,2 (G3)**		1,4		74,7-100	1,1		0,6	
0-67,9		**7,2 (G3)**		1,5	67,9-100		1,5		0,8
0-89,5	**10,1 (G2)**		2,0		89,5-100	0,4		0,1	
0-81,4		**10,1 (G2)**		1,9	81,4-100		0,8		0,8
0-50-100			1,1						
100-0	-3,1	-3,3	0,8	1,0					

Cold start performance		**rpm**	**1500**	**1800**
Time from start to stay within 0.5% of no load speed at ambient temperature:	20°C	s	4,8	4,6
	5 °C	s	5,7	5,2

Lubrication system			**rpm load**	**1500 25%**	**50%**	**75%**	**100%**	**110%**
Lubricating oil consumption	Power setting 360 kW		liter/h	0,006	0,012	0,018	0,025	0,027
			US gal/h	0,002	0,003	0,005	0,006	0,007
			rpm			**1800**		
	Power setting 400 kW		liter/h	0,007	0,014	0,020	0,027	0,030
			US gal/h	0,002	0,004	0,005	0,007	0,008
Oil system capacity including filters			liter	49				
			US gal	12,9				
Oil sump capacity:		max	liter	44				
			US gal	11,6				
		min	liter	35				
			US gal	9,2				
Oil change intervals/ specifications: (Fuel quality dependent)	VDS-3		h	600				
	VDS-2		h	400				
			h					
			h					
Engine angularity limits, static (ref. classification rules, roll and pitch simultaneously)		front up	°	36				
		front down	°	36				
		side tilt	°	36				

Lubrication system		**rpm**	**1500**	**1800**
Oil pressure at rated speed		kPa	360	450
		psi	52,2	65,3
Lubrication oil temperature in oil sump:	max	°C	110	
		°F	230	
Oil filter micron size		µ	40	

* See also general section in the sales guide

Fuel system		rpm / load	25%	50%	1500 75%	100%	110%
Specific fuel consumption: US EPA Tier 3 (Power setting without fan)	Power setting 360 kW	g/kWh	224	202	196	196	195
		lb/hph	0,364	0,327	0,317	0,317	0,316
Specific fuel consumption: IMO Tier II (Power setting without fan)	Power setting 360 kW	g/kWh	220	197	190	191	192
		lb/hph	0,357	0,319	0,307	0,309	0,312
		rpm			**1800**		
Specific fuel consumption: US EPA Tier 3 (Power setting without fan)	Power setting 400 kW	g/kWh	240	208	205	206	206
		lb/hph	0,390	0,336	0,332	0,334	0,333
Specific fuel consumption: IMO Tier II (Power setting without fan)	Power setting 400 kW	g/kWh	236	203	197	199	200
		lb/hph	0,383	0,330	0,320	0,322	0,325
Fuel to conform to		ASTM-D975-No. 1 and 2-D, JIS KK 2204, EN 590 MDO-DMX and MDO-DMA (ISO8217)					
		rpm			**1500**		
System return flow: US EPA Tier 3	Power setting 360 kW	liter/h	46	45	44	44	44
		US gal/h	12,2	11,9	11,6	11,6	11,6
		rpm			**1800**		
	Power setting 400 kW	liter/h	49	49	48	47	47
		US gal/h	12,9	12,9	12,7	12,4	12,4
		rpm			**1500**		
System supply flow: US EPA Tier 3	Power setting 360 kW	liter/h	70	88	107	128	136
		US gal/h	18,5	23,4	28,3	33,9	36,0
System supply flow: IMO Tier II	Power setting 360 kW	liter/h	70	87	105	126	135
		US gal/h	18,4	23,1	27,8	33,4	35,7
		rpm			**1800**		
System supply flow: US EPA Tier 3	Power setting 400 kW	liter/h	78	99	121	146	155
		US gal/h	20,6	26,1	32,1	38,5	41,0
System supply flow: IMO Tier II	Power setting 400 kW	liter/h	77	98	119	142	153
		US gal/h	20,4	25,8	31,4	37,5	40,3
		rpm			**1500**		
Normal fuel pressure (after filter)	Power setting 360 kW	kPa	528	516	500	487	484
		psi	76,6	74,8	72,5	70,6	70,2
		rpm			**1800**		
	Power setting 400 kW	kPa	574	560	542	525	520
		psi	83,3	81,2	78,6	76,1	75,4

Fuel system

Fuel supply line max restriction	kPa	30
	psi	4,4
Fuel supply max pressure head (day tank, from CL)	m	2
	feet	6,6
Fuel supply line max suction head (from CL)	kPa	4
	psi	11,8
Fuel return line max restriction	kPa	20
	psi	2,9
Maximum allowable inlet fuel temp	°C	50
	°F	122

Fuel system

Prefilter / Water separator micron size	µ	
Fuel filter micron size	µ	2

Intake system		rpm load	1500 25%	50%	75%	100%	110%
Air consumption at: (+25°C and 100kPa)	Power setting 360 kW	m^3/min	-	-	-	25	26
		cfm				883	918
		rpm			**1800**		
	Power setting 400 kW	m^3/min	-	-	-	28	29
		cfm				996	1006
Max allowable air intake restriction including piping		kPa	3				
		psi	0,4				
Air filter type			Paper Cartridge				
Air filter cleaning efficiency		%	98,5				

Exhaust system		rpm load	1500 25%	50%	75%	100%	110%
Heat rejection to exhaust at:	Power setting 360 kW	kW	-	-	-	215	243
		BTU/min				12227	13819
		rpm			**1800**		
	Power setting 400 kW	kW	-	-	-	257	292
		BTU/min				14615	16606
		rpm			**1500**		
Exhaust gas temperature after turbine at:	Power setting 360 kW	°C	-	-	-	410	430
		°F				770	806
		rpm			**1800**		
	Power setting 400 kW	°C	-	-	-	433	480
		°F				811	896
Max allowable back pressure in exhaust line		kPa	10				
		psi	1,5				

Exhaust system		rpm load	1500 25%	50%	75%	100%	110%
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	Power setting 360 kW	m^3/min	-	-	-	57	61
		cfm				2013	2154
		rpm			**1800**		
	Power setting 400 kW	m^3/min	-	-	-	65	70
		cfm				2295	2486

Cooling system		rpm load	1500 25%	50%	75%	100%	110%
Heat rejection radiation from engine to sorrounding at:	Power setting 360 kW	kW	3,5	4,0	4,5	5,0	5,2
		BTU/min	199	227	256	284	296
		rpm			**1800**		
	Power setting 400 kW	kW	3,8	4,3	4,8	5,3	5,5
		BTU/min	216	245	273	301	313

Cooling system

		rpm			**1500**		
Heat rejection to coolant at:	Power setting 360 kW	kW	-	-	-	170	186
		BTU/min				9668	10578
		rpm			**1800**		
	Power setting 400 kW	kW	-	-	-	200	219
		BTU/min				11374	12454

Coolant (40% coolant / 60% water)	See Operators Manual
Radiator cooling system type	Closed circuit

		rpm	**1500**
Standard radiator core area	Power setting 360 kW	m²	0,8
		foot²	8,61
		rpm	**1800**
	Power setting 400 kW	m²	0,8
		foot²	8,61
		rpm	**1500**
Fan diameter	Power setting 360 kW	mm	890
		in	35,0
		rpm	**1800**
	Power setting 400 kW	mm	890
		in	35,0

		rpm	**1500**
Fan power consumption			fan Ø 890
		kW	11
		hp	15
		rpm	**1800**
			fan Ø 890
		kW	19
		hp	26

Cooling system

			rpm	**1500**	
Fan drive ratio	fan ø 890			0,99	
			rpm	**1800**	
	fan ø 890			0,99	
Coolant capacity:	engine		liter US gal	20 5,28	
			rpm	**1500**	
	std radiator with hoses			Power setting 360 kW	Power setting 360 kW
			liter US gal	24 6,34	
			rpm	**1800**	
				Power setting 400 kW	Power setting 400 kW
			liter US gal	24 6,34	
Coolant pump		drive/ratio		Belt / 1,43:1	

		rpm	**1500**	**1800**
Coolant flow with standard system		l/s US gal/s	5,25 1,39	6,24 1,65
Nominal coolant pressure with standard system		kPa psi		
Maximum external coolant system restriction, including piping		kPa psi		
Thermostat	start to open	°C °F	82 180	
	fully open	°C °F	92 198	
Maximum static pressure head (expansion tank height + pressure cap setting)		kPa psi	100 14,5	
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa psi		
Standard pressure cap setting		kPa psi	75 10,9	
Maximum temperature entering engine		°C °F	98 208	

Charge air cooler system		**rpm** **load**	**1500** **25%**	**50%**	**1500** **75%**	**100%**	**110%**
Cooling power	Power setting 360 kW	kW BTU/min	-	-	-	78 4436	89 5061
		rpm			**1800**		
	Power setting 400 kW	kW BTU/min	-	-	-	97 5516	99 5630
		rpm			**1500**		
Charge air mass flow	Power setting 360 kW	kg/s	-	-	-	0,493	0,521
		rpm			**1800**		
	Power setting 400 kW	kg/s	-	-	-	0,553	0,558

Charge air cooler system		rpm			**1500**		
Charge air inlet temp. (Charge air temp after turbo compressor) (Approx 30°C air temp before compressor)	Power setting 360 kW	°C °F	-	-	-	207 405	221 430
		rpm			**1800**		
	Power setting 400 kW	°C °F	-	-	-	229 444	233 451
		rpm			**1500**		
Charge air outlet temp. (Charge air temp after charge air cooler) (46°C ambient air temp before cooler at 1800rpm) (42°C ambient air temp before cooler at 1500rpm)	Power setting 360 kW	°C °F	-	-	-	51 124	53 127
		rpm			**1800**		
	Power setting 400 kW	°C °F	-	-	-	56 133	58 136

Maximum pressure drop over charge air cooler, incl. piping		kPa psi	10 1,45
		rpm	**1500**
Charge air pressure	Power setting 360 kW	kPa psi	273 39,60
		rpm	**1800**
	Power setting 400 kW	kPa psi	257,00 37,27
		rpm	**1500**
Standard charge air cooler core area	Power setting 360 kW	m² foot²	0,8 8,61
		rpm	**1800**
	Power setting 400 kW	m² foot²	0,8

Cooling performance

Cooling air flow and external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm. (radiator and cooling fan, see optional equipment)

Engine speed rpm	Air on temp °C	Nominal POWER		110% POWER	
		Air flow m^3/s	External restriction Pa	Air flow m^3/s	External restriction
1500	49,4	5,0	500		
	43,1			5,0	500
	53,8	5,6	300		
	47,9			5,6	300
	57,3	6,3	100		
	51,8			6,3	100
	58,8	6,6	0		
	53,6			6,6	0
1800	50,1	6,6	500		
	45,9			6,5	500
	53,7	7,2	300		
	49,2			7,1	300
	56,4	7,7	100		
	52,2			7,7	100
	57,7	8,0	0		
	53,5			8,0	0

Note! Calculated values >0 Pa

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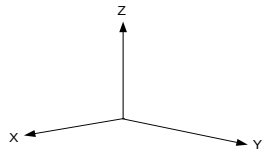
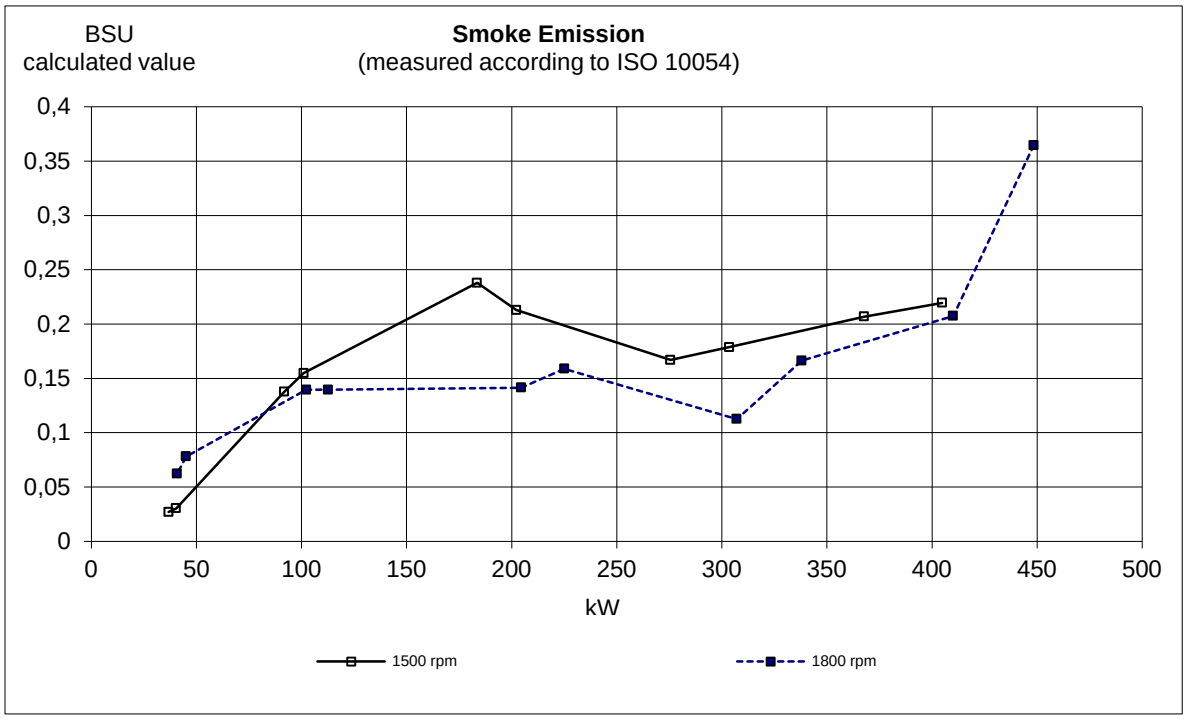
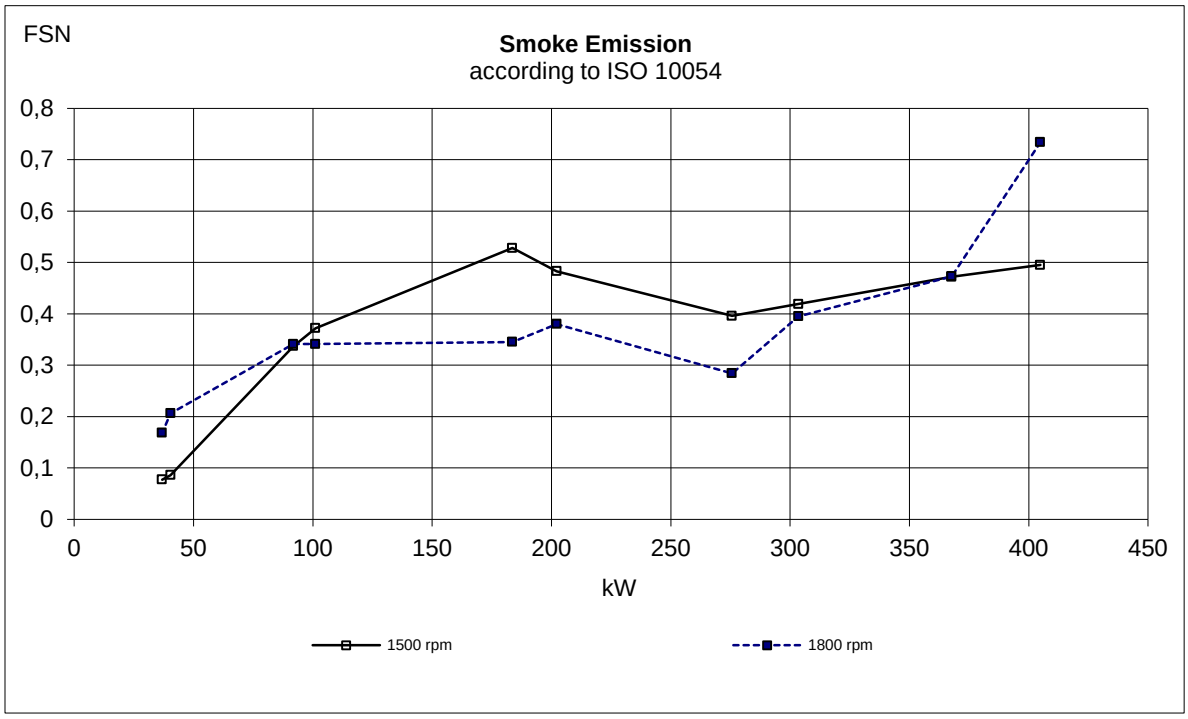
Engine management system

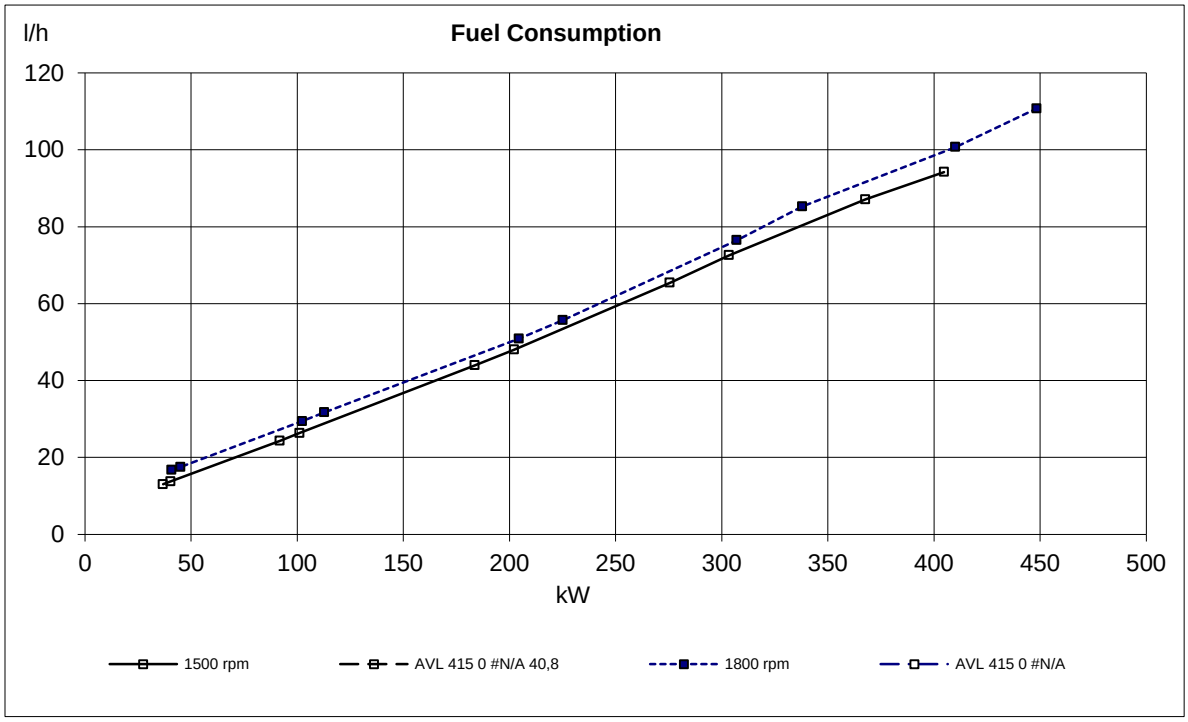
Functionality	Alternatives	Default setting
Governor mode	Isochronus / Droop	Droop
Governor droop	0 / 0.1-5%	4%
Governor response	Adjustable PID (service tool)	0/0/0
Dual speed	YES	1500 or 1800 rpm
Idle speed	600-1200	900
Fine speed adjustment	± 90	0
Stop function	Normaly Closed / Normaly Opend	Depends on order

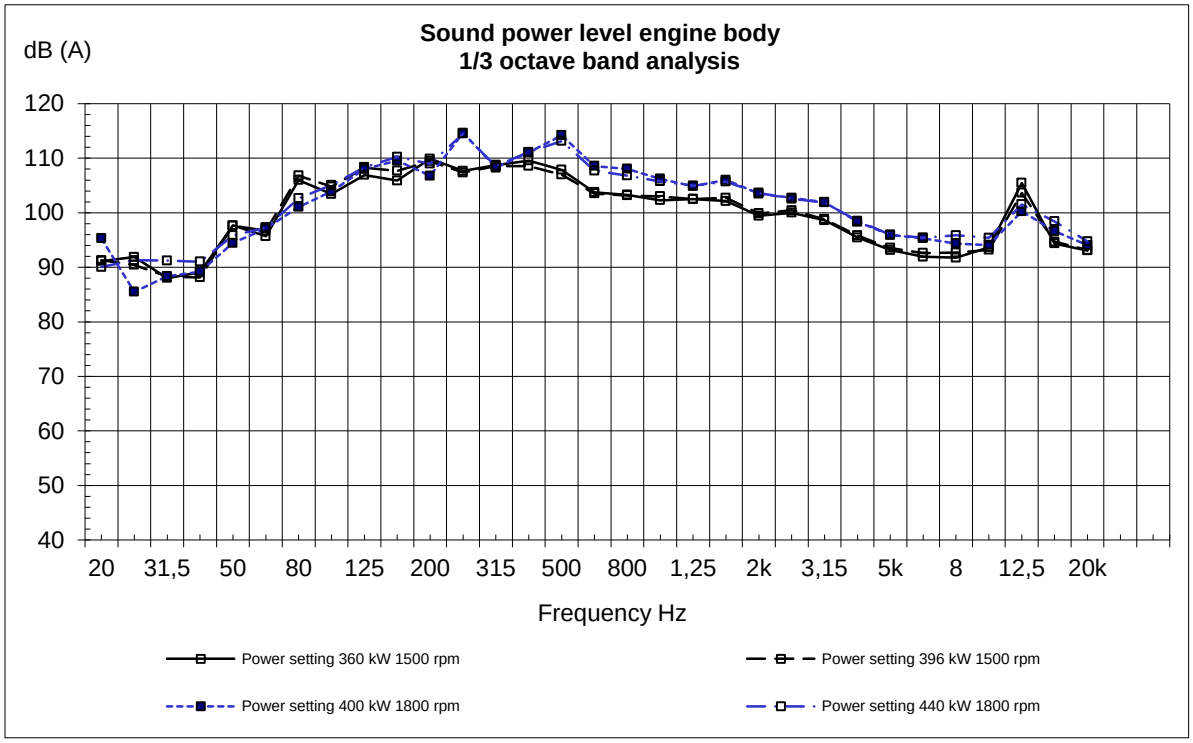
Electrical system		**rpm**	**1500 and 1800**
Voltage and type		24V / insulated from earth	
Alternator:	make/output	Amp	Bosch /110A
	tacho output	Hz/alt. Rev	6
	drive ratio		3,7:1
Starter motor		make	Melco
		type	105P70
		kW	7,0
Starter motor solenoid,	pull current	Amp	280
	hold current	Amp	-
Number of teeth on:	flywheel		153
	starter motor		12
Inrush current at +20°C \ +5°C		Amp	1020 \ 1560
Cranking current at +20°C \ +5°C		Amp	400 \ 530
Crank engine speed at 20°C \ +5°C		rpm	150 \ 130
Starter motor battery capacity:	max	Ah	2x225
	min at +5°C	Ah	2x180

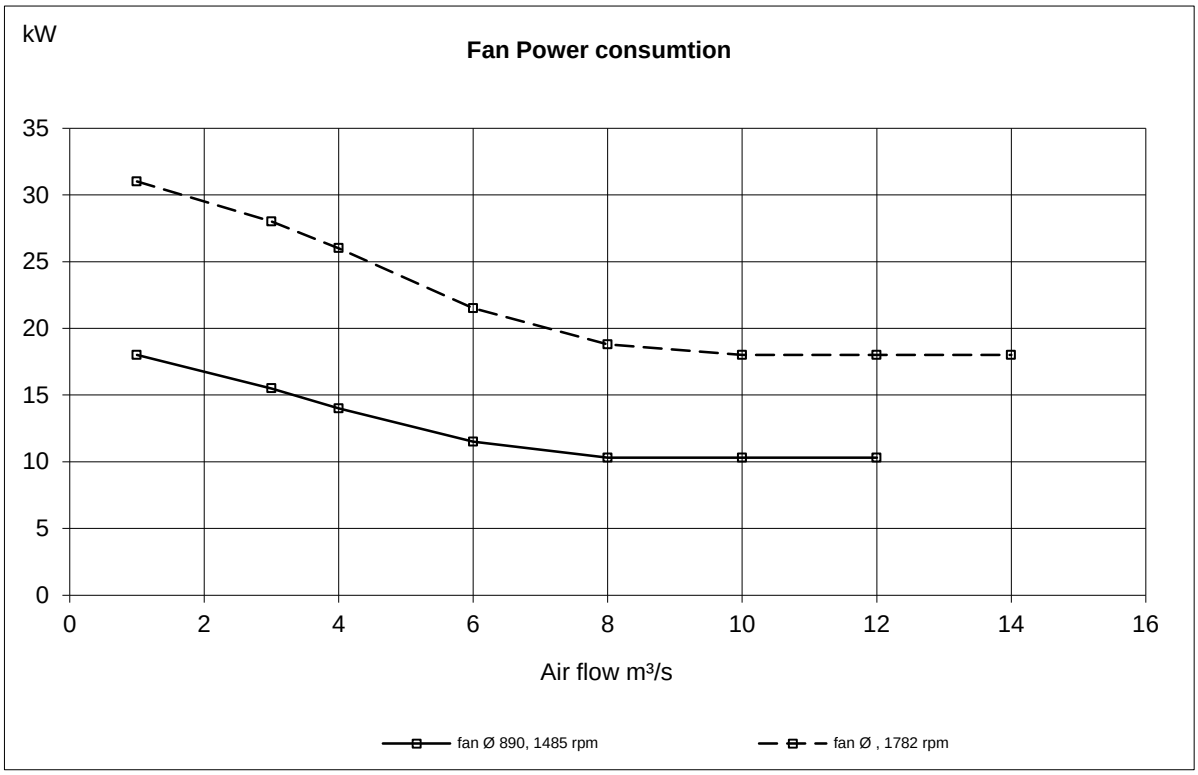
Max. g-force			
	x	m/s²	2
	y	m/s²	2
	z	m/s²	6

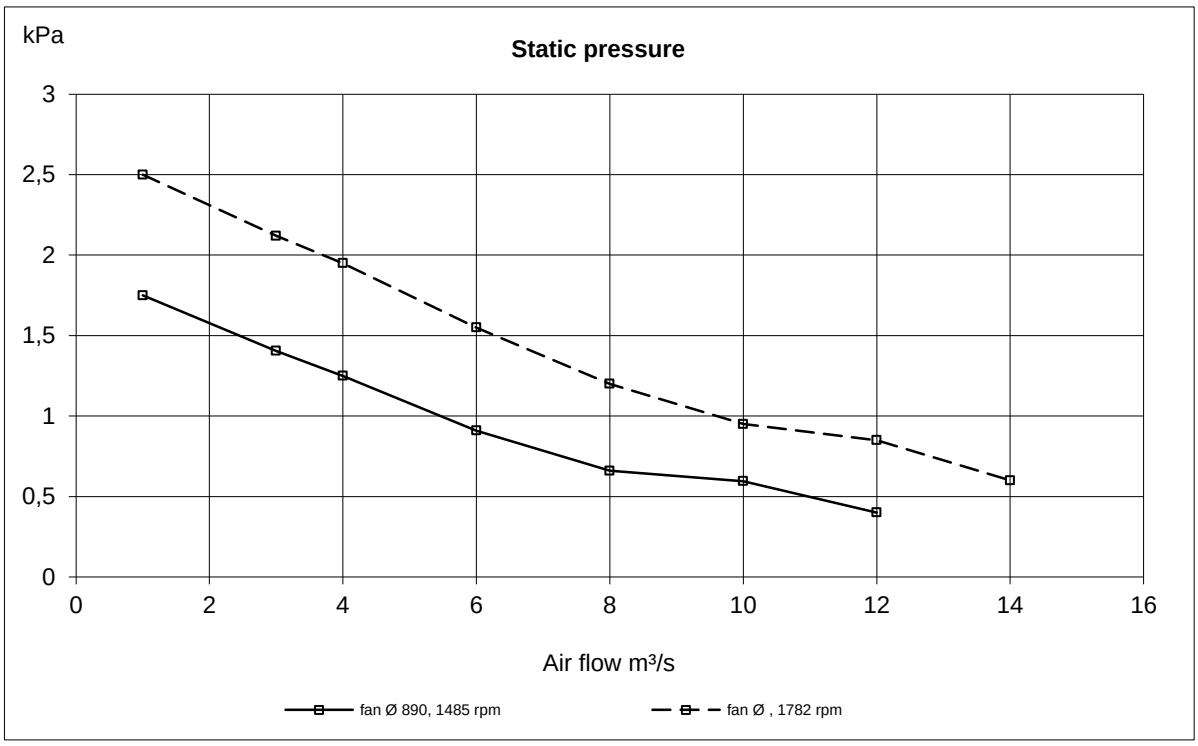

BSU
calculated value
Smoke Emission
(measured according to ISO 10054)
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
0
50
100
150
200
250
300
350
400
450
500
kW
1500 rpm
1800 rpm


FSN
Smoke Emission
according to ISO 10054
0,8
0,7
0,6
0,5
0,4
0,3
0,2
0,1
0
0
50
100
150
200
250
300
350
400
450
kW
1500 rpm
1800 rpm


Fuel Consumption
l/h
120
100
80
60
40
20
0
0
50
100
150
200
250
300
350
400
450
500
kW
1500 rpm
AVL 415 0 #N/A 40,8
1800 rpm
AVL 415 0 #N/A


Sound power level engine body
1/3 octave band analysis
dB (A)
120
110
100
90
80
70
60
50
40
20
31,5
50
80
125
200
315
500
800
1,25
2k
3,15
5k
8
12,5
20k
Frequency Hz
Power setting 360 kW 1500 rpm
Power setting 396 kW 1500 rpm
Power setting 400 kW 1800 rpm
Power setting 440 kW 1800 rpm


kW
Fan Power consumtion
35
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
16
Air flow m³/s
fan Ø 890, 1485 rpm
fan Ø , 1782 rpm


kPa
Static pressure
3
2,5
2
1,5
1
0,5
0
0
2
4
6
8
10
12
14
16
Air flow m³/s
fan Ø 890, 1485 rpm
fan Ø , 1782 rpm

Performance	Power (kW)	Rpm
Power setting	360	1500
Power setting	360	1500
Power setting	400	1800
Power setting	400	1800

Sensors Control and Monitoring System							Switches Engine Shutdown System	
Sensors	**Signal**	**Unit**	**Range**	**Initial Delay / Warning Delay**	**Warning Level**	**Derating Level**	**Shutdown Initial Delay / Shutdown Delay**	**Shutdown Level (Tolerance)**
Coolant level switch	Digital		ON/OFF	7,5 sec from start / 7,5 sec	Low(OFF / Open contact)	NA	NA	NA
Coolant temperature	50-0 kΩ	°C	- 40 - 140 ±1.5°C	30 sec from start / 2 sec	98° C	NA	NA	NA
Coolant temperature (SDU)	Digital	°C	ON/OFF	NA	NA	NA	1 sec. from start / 1 sec	105 (±2°C) SDU Ch. S1 (NA for EME. Valid for AUX and HBR modes)*
Engine speed cam	Frequency	rpm		Instant	Lost signal	NA	NA	NA
Engine speed crank	Frequency	rpm		Instant	Lost signal	NA	NA	NA
Eng. overspeed SDU 1500 rpm+15%	Frequency	rpm / Hz	153 puls./rev.	Instant	Lost signal	NA	Instant	1725 rpm / 4399 Hz (-1 to 0%)
Eng. overspeed SDU 1800 rpm+15%	Frequency	rpm / Hz	153 puls./rev.	Instant	Lost signal	NA	Instant	2070 rpm / 5279 Hz (-1 to 0%)
Exhaust gas temperature	PT200	°C	- 40 - 750 ± 2.5%	30 sec from start / 22 sec	575° C	NA	NA	NA
Crankcase pressure	0,5-4,5 V	kPa	0-15 kPa	20 sec from start / Instant	Rapid Pressure Increase	NA	NA	NA
Oil temperature	50-0 kΩ	°C	-40 - 140 °C	30 sec from start / 22 sec	130° C	NA	NA	NA

NA = Not applicable *
Emergency genset modes= EME
Auxiliary genset modes= AUX
Combined genset modes= EME, HBR

Sensors Alarm	Signal	Unit	Range	Initial Delay / Delay	Warning Level / Derating Level / Shutdown Level rpm Map (relative pressure)				Notes
Charge air pressure	0,5-4,5 V	kPa	50 - 600 ± 4 kPa				**1500 rpm**	**1800 rpm**	
Warning Level		kPa		30 sec from start / 2 sec			319	269	
Charge air Temperature	50 - 0 kΩ	°C	-40 - 130°C ±4%				**1500 rpm**	**1800 rpm**	
Warning Level		°C		90 sec from start / 22 sec			80° C	80° C	
Coolant pressure	0,5-4,5 V	kPa	0-300 kPa ±3%				**1500 rpm**	**1800 rpm**	
Warning Level		kPa		30 sec from start / 4 sec			50	70	
Fuel pressure	0,5-4,5 V	kPa	0-700 kPa ±1,5%				**1500 rpm**	**1800 rpm**	
Warning Level		kPa		30 sec from start / 30 sec			270	270	
Oil pressure	0,5-4,5 V	kPa	0-700 kPa ±1,5%				**1500 rpm**	**1800 rpm**	
Warning Level		kPa		30 sec from start / 3 sec			265	265	
Shutdown Level (SDU)	Digital	kPa	ON/OFF	11 s ±20% from start / 1 s			120 ±20	120 ±20	Shutdown Unit Activated S2,S3: 510 rpm ±2% 1300 Hz ±2% 153 pulses / revolution (NA for EME. Valid for AUX and HBR modes)*