



GILLETTE GENERATORS

LIQUID COOLED DIESEL ENGINE GENERATOR SET

60 HZ MODEL
T4D-2000

Model	HZ	STANDBY	PRIME
		130°C RISE	105°C RISE
T4D-2000-60 HERTZ	60	200	200



All generator sets are USA prototype built and thoroughly tested. Production models are USA factory built and 100% load tested.



UL1446, UL508, UL142, UL498



NFPA 110, 99, 70, 37

All generator sets meet NFPA-110 Level 1, when equipped with the necessary accessories and installed per NFPA standards.



NEC 700, 701, 702, 708



NEMA ICS10, MG1, ICS6, AB1



ANSI C62.41, 27, 59, 32, 480, 40Q, 81U, 360-05

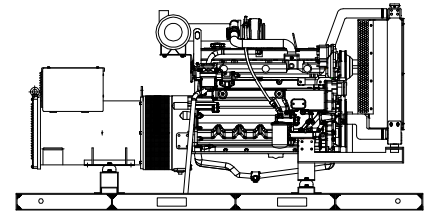


ASCE 7-05 & 7-10

All generator sets meet 180 MPH rating.

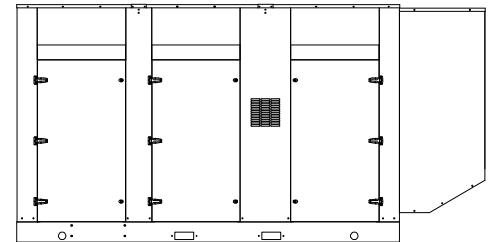


EPA 40CFR Part 60, 89, 1039, 1048, 1054, 1065, 1068



“OPEN” GEN-SET

There is no enclosure, so gen-set must be placed within a weather protected area, uninhabited by humans or animals, with proper ventilation. Silencer not supplied, as installation requirements are not known. However, this item is available as optional equipment.



“LEVEL 2” HOUSED GEN-SET

Full aluminum weather protection and superior sound attenuation for specific low noise applications. Critical grade muffler is standard.

GENERATOR RATINGS

GENERATOR MODEL	VOLTAGE		PH	HZ	130°C RISE STANDBY RATING		105°C RISE PRIME RATING	
	L-N	L-L			KW/KVA	AMP	KW/KVA	AMP
T4D-2000-3-2	120	208	3	60	200/250	694	200/250	694
T4D-2000-3-3	120	240	3	60	200/250	602	200/250	602
T4D-2000-3-4	277	480	3	60	200/250	301	200/250	301
T4D-2000-3-5	127	220	3	60	200/250	656	200/250	656
T4D-2000-3-16	346	600	3	60	200/250	240	200/250	240

RATINGS: All three phase gen-sets are 12 lead windings, rated at .8 power factor. 130° C “STANDBY RATINGS” are strictly for gen-sets that are used for back-up emergency power to a failed normal utility power source. This standby rating allows varying loads, with no overload capability, for the entire duration of utility power outage. 105° C “PRIME RATINGS” are strictly for gen-sets that provide the prime source of electric power, where normal utility power is unavailable or unreliable. A 10% overload is allowed for a total of 1 hour, within every 12 hours of operation, on every PRIME RATED systems. All gen-set power ratings are based on temperature rise measured by resistance method as defined by MIL-STD 705C and IEEE STD 115, METHOD 6.4.4. All generators have class H (180°C) insulation system on both rotor and stator windings. All factory tests and KW/KVA charts shown above are based 130°C (standby), and 105°C (prime) R/R winding temperature, within a maximum 40°C ambient condition. Generators operated at standby power ratings must not exceed the temperature rise limitation for class H insulation system, as specified in NEMA MG1-22.40. Specifications & ratings are subject to change without prior notice.

APPLICATION & ENGINEERING DATA FOR MODEL T4D-2000-60 HZ

GENERATOR SPECIFICATIONS

Manufacturer..... Stamford Generators
Model & Type..... HCI434D-311, 4 Pole, 12 Lead, Three Phase
..... HCI434D-17, 4 Pole, 12 Lead, 600V, Three Phase
Exciter..... Brushless, shunt excited
Voltage Regulator..... Solid State, HZ/Volts
Voltage Regulation..... ½%, No load to full load
Frequency..... 60 HZ
Frequency Regulation..... ± ½% (1/2 cycle, no load to full load)
Unbalanced Load Capability..... 100% of standby amps
One Step Load Acceptance..... 100% of nameplate rating
Total Stator and Load Insulation..... Class H, 180°C
Temperature Rise..... 105°C R/R, prime rating @ 40°C amb.
3 Ø Motor Starting @ 30% Voltage Dip (208-240V)... 1500 kVA
3 Ø Motor Starting @ 30% Voltage Dip (480V-600V) 2300 kVA
Bearing..... 1, Pre-lubed and sealed
Coupling..... Direct flexible disc.
Total Harmonic Distortion..... Max 3½% (MIL-STD705B)
Telephone Interference Factor..... Max 50 (NEMA MG1-22)
Deviation Factor..... Max 5% (MIL-STD 405B)
Alternator..... Self ventilating and drip-proof
Ltd. Warranty Period..... 24 Months from start-up date or
..... 1000 hours use, first to occur.

GENERATOR FEATURES

- World Renown Stamford Electric Generator having UL-1446 certification.
- Full generator protection with **Basler DGC-2020** controller, having UL-508 certification.
- Automatic voltage regulator with over-excitation, under-frequency compensation, under-speed protection, and EMI filtering. Entire solid-state board is encapsulated for moisture protection.
- Generator power ratings are based on temperature rise, measured by resistance method, as defined in MIL-STD 705C and IEEE STD 115, Method 6.4.4.
- Power ratings will not exceed temperature rise limitation for class H insulation as per NEMA MG1-22.40.
- Insulation resistance to ground, exceeds 1.5 meg-ohm.
- Stator receives 2000 V. hi-potential test on main windings, and rotor windings receive a 1500 V. hi-potential test, as per MIL-STD 705B.
- Full amortisseur windings with UL-1446 certification.
- Complete engine-generator torsional acceptance, confirmed during initial prototype testing.
- Full load testing on all engine-generator sets, before shipping.

ENGINE SPECIFICATIONS AND APPLICATIONS DATA

ENGINE

Manufacturer..... VOLVO-PENTA
Model and Type..... TAD1371VE, 4 cycle, liquid Cooled
Aspiration..... Turbo After Cooler, Air to Air
Charged Air Cooled System..... Air to Air
Cylinder Arrangement..... 6 Cylinders, In-Line
Displacement Cu. In. (Liters)..... 780 (12.8)
Bore & Stroke in (Cm)..... 5.16 x 6.22 (13.1 x 15.8)
Compression Ratio..... 17.8:1
Main Bearings..... Tin Overlay with Babbit Backing
Cylinder Head..... Cast Iron with overhead Cam
Pistons..... Aluminum Alloy with Graphite Coating
Crankshaft..... Induction Hardened, Heat Treated Forged
Valves..... Heat Treated and Hardened Exhaust Valve
Governor..... Electronic, EMS 2.2
Frequency Regulation..... ± 1/4%
Air Cleaner..... Dry, Replaceable Cartridge
Engine Speed..... 1800 rpm
Max Power, bhp (kwm) Standby..... 388 (285)
BMEP: psi (MPa) Standby..... 331 (2.3)
Ltd. Warranty Period..... 2 Year or 1000 hrs, first to occur

FUEL SYSTEM

Type..... Diesel Fuel Oil (ASTM No. 2-D)
Combustion System..... Direct Injection
Fuel Injection Pump..... Electronic, Delphi E3
24 VDC Coolant heaters..... Optional Equipment
Fuel Filter..... Yes with Water Separator

FUEL CONSUMPTION

GAL/HR (LITER/HR)	STANDBY	PRIME
100% LOAD	18.7 (70.7)	17.3 (65.3)
75% LOAD	14.3 (54.0)	13.2 (49.8)
50% LOAD	9.71 (36.8)	9.19 (34.8)

DEF Consumption is 6% of fuel consumption

OIL SYSTEM

Type..... Full Pressure
Oil Pan Cap. W/ filter qt. (L)..... 39 (37)
Oil Filter..... 3, Replaceable Cartridge type

ELECTRICAL SYSTEM

Ignition System..... Electronic
Eng. Alternator/Starter: 24 VDC, negative ground, 110 amp/hr.
Recommended battery to -18°C (0° F):(2) 12 VDC, BCI# 31,
Max. Dimensions: 14"lg x 6 3/4" wi x 10" hi, with standard
round posts. Min output 1000 CCA. Battery tray (max. dim. at
15"lg x 7"wi). This model has (2) battery trays, (2) hold down
straps, (2) sets of battery cables, and (1) battery charger.
Installation of (2) 12VDC starting batteries connected in series
for 24VDC output is required, with possible higher AMP/HR
rating, as described above, if the normal environment
temperature averages -13° F (-25°C) or cooler.

CERTIFICATIONS

All engines are EPA emissions certified. All non-emergency
stationary diesel engines are Tier IV Final compliant.

APPLICATION & ENGINEERING DATA FOR MODEL T4D-2000-60 HZ

COOLING SYSTEM

Type of System	Air to Air, Charged Air Cooler
Coolant Pump	Pre-lubricated, self-sealing
Cooling Fan Type	Pusher
Fan Diameter inches (cm).....	35.1 (89)
Fan drive ratio.....	1.04:1
Ambient Capacity of Radiator °F (°C).....	131 (55)
Engine Jacket Coolant Capacity gal. (L).....	4.50 (17)
Radiator Coolant Capacity gal. (L).....	10.2 (39)
Water Pump Capacity gpm (L/min).....	96 (372)
Heat Reject Coolant: Btu/min.....	6,824
Air to Air Heat Reject, BTU/min.	2,843
Heat Radiated to Ambient, BTU/min	2,419
Low Radiator Coolant Level Shutdown.....	Standard
Note: Coolant temp. shut-down switch setting at 228°F (109°C) with 50/50 (water/antifreeze) mix.	

COOLING AIR REQUIREMENTS

Combustion Air cfm (m ³ /min)	745 (21.1)
Max Air Intake Restrictions:	
Clean Air Cleaner, KPA (psi).....	5 (1.5)
Radiator Cooling Air, SCFM (m ³ /min).....	16,725 (480)

EXHAUST SYSTEM

Exhaust Outlet Size.....	6"
Max. Back Pressure in KPA (in. H2O).....	7 (28)
Exhaust Flow, at rated KW, CFM (m ³ /min).....	1564 (44.3)
Exhaust Temp, (Stack) °F (°C)	775 (413)

SOUND LEVELS MEASURED IN dB(A)

	<u>Open</u>	<u>Level 2</u>
	<u>Set</u>	<u>Encl.</u>
Level 2, SCR/Residential Silencer	98.....	83

Note: Open sets (no enclosure) have installed selective catalytic reduction/residential silencer system. Level 2 enclosure has installed selective catalytic reduction/residential silencer. Sound tests are averaged from several test points and taken at 23 ft. (7 m) from source of noise at normal operation.

DERATE GENERATOR FOR ALTITUDE

3% per 1000 ft. (305m) above 3000 ft. (914m) from sea level

DERATE GENERATOR FOR TEMPERATURE

2% per 10°F (5.6°C) above 104°F (40°C)

DIMENSIONS AND WEIGHTS

	<u>Open</u>	<u>Level 2</u>
	<u>Set</u>	<u>Enclosure</u>
Length in (cm).....	132 (335)	162 (412)
Width in (cm).....	52 (132)	52 (132)
Height in (cm).....	65 (165)	80 (203)
Net Weight lbs (kg).....	5777 (2620)	7547 (3424)
Ship Weight lbs (kg)	6052 (2745)	7892 (3580)

BASLER DGC-2020 DIGITAL MICROPROCESSOR CONTROLLER



Basler DGC-2020

The “2020” controller is a highly advanced integrated gen-set control system for single gen-set applications. This controller includes a backlit LCD display which continuously displays the status of the engine and generator at all times.

Basler “DGC-2020” includes: Generator metering (including three phase) • Engine – Generator protections including IEEE-[27] under voltage, [32] power, [40] loss of excitation, [59] over voltage, [81] over and under frequency, Exercise timer • SAE J1939 engine ECU communications • Expansion capabilities for both inputs and outputs with expansion • Remote communications through RS-485 to Basler’s RDP110 remote Display panel • (16) programmable contact inputs • (15) programmable contact outputs- (3) for up to 30AmpDC and (12) for up to 2 Amp DC • Illuminated Text Display • Front panel menu scroll buttons • Front panel operation mode buttons for STOP, RUN and AUTO • Alarm Silence and Lamp Test buttons

This controller includes expansion features including, RS485 (using MODBUS), direct USB connection with PC, expansion optioned using BESTCOMSPPlus for remote annunciation and remote relay interfacing for a distance of up to 3300FT. The controller software is freely downloadable from the internet and allows monitoring with direct USB cable, LAN, or by internet via the built in web interface.



Further expansion is available by adding the optional RDP-110 remote display panel module. This featured device will allow Four programmable LEDs (2) alarms and (2) pre-alarms • (17) alarms and pre-alarms displayed from Basler controller • audible alarm horn • lamp test and alarm silence buttons • RD100 local power supply inputs of either 12vdc or 24vdc • connects through Basler controller through RS-485 communications protocol • conduit box included for (2) mounting configurations- either surface mount or semi-flush mounting.

STANDARD FEATURES FOR MODEL T4D-2000-60 HZ

STANDARD FEATURES

CONTROL PANEL:

- Basler DGC-2020 digital microprocessor with logic allows programming in the field. Controller has:
- STOP-MANUAL-AUTO modes and automatic engine shutdowns, signaled by full text LCD indicators:
 - Low oil pressure
 - High engine temp
 - Low Radiator Level
 - Three auxiliary alarms
 - Battery fail alarm
 - Engine fail to start
 - Engine over speed
 - Engine under speed
 - Over & under voltage

Also included is tamper-proof engine hour meter

ENGINE:

- Fuel filter
- Full flow Oil filter
- Air filter
- Fuel pump
- Oil pump
- Solenoid type starter motor
- Hi-temp radiator
- Jacket water pump
- Thermostat
- Pusher fan and guard
- Exhaust manifold
- Electronic Governor
- 24 VDC battery charging alternator
- Flexible fuel and exhaust connectors
- Vibration isolators
- Open coolant recovery system with 50/50 water to anti-freeze mixture
- flexible oil & radiator hose
- Shut-down sensors for low oil pressure, high coolant temp., low coolant level, high ambient temp.

AC GENERATOR SYSTEM:

- AC generator
- Shunt excited
- Brushless design
- Circuit Breaker installed and wired to gen-set
- Direct connection to engine with flex disc
- Class H, 180°C insulation
- Self ventilated
- Drip proof construction
- UL Certified

VOLTAGE REGULATOR:

- 1% Voltage regulation
- EMI filter
- Under-speed protection
- Over-excitation protection
- total encapsulation

DC ELECTRICAL SYSTEM:

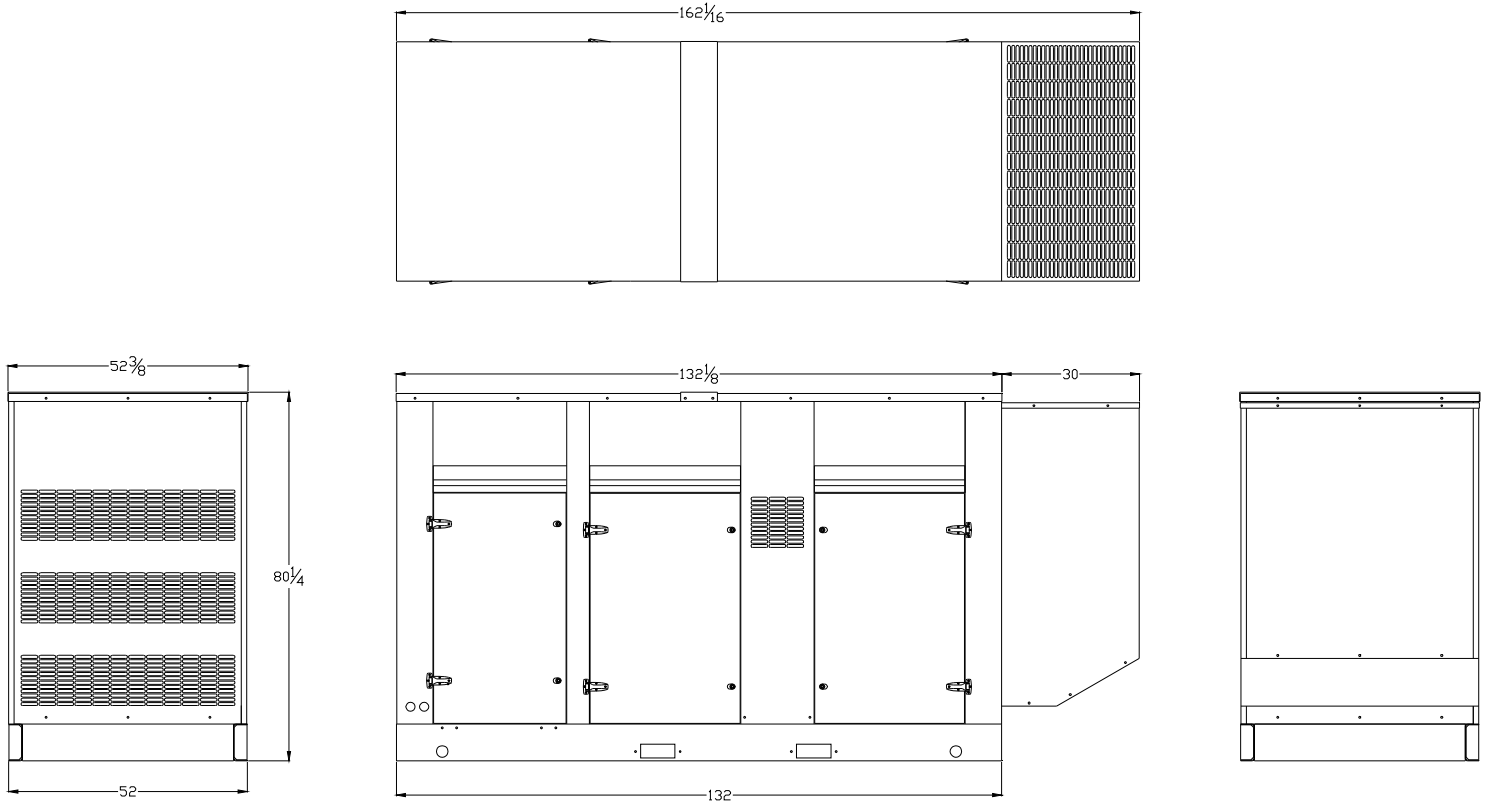
- Battery trays
- Battery cables
- Battery hold down straps
- 3-stage battery charger with float, absorption, & bulk automatic charge stages

WEATHER / SOUNDPROOF ALUMINUM HOUSING:

Corrosion Resistant Protection consisting of:


- (9) Heated and Agitated Wash Stages
- Zinc Phosphate Etching-Coating Stage
- Final Baked on Enamel Powder Coat
- 18/8 Stainless Steel Hardware

Design & specifications subject to change without prior notice. Dimensions shown are approximate. Contact Gillette for certified drawings. DO NOT USE DIMENSIONS FOR INSTALLATION PURPOSES.



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	165
		psi	23,9
Fuel supply line min. pressure, during engine stand still (measured at fuel inlet connection and high tank/low tank positions)		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 (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

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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	80	55,0	Shut down	Shut down.
	Rated speed	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	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

VOLVO PENTA TAD1170VE	Document No	Issue Index
	22294507	05

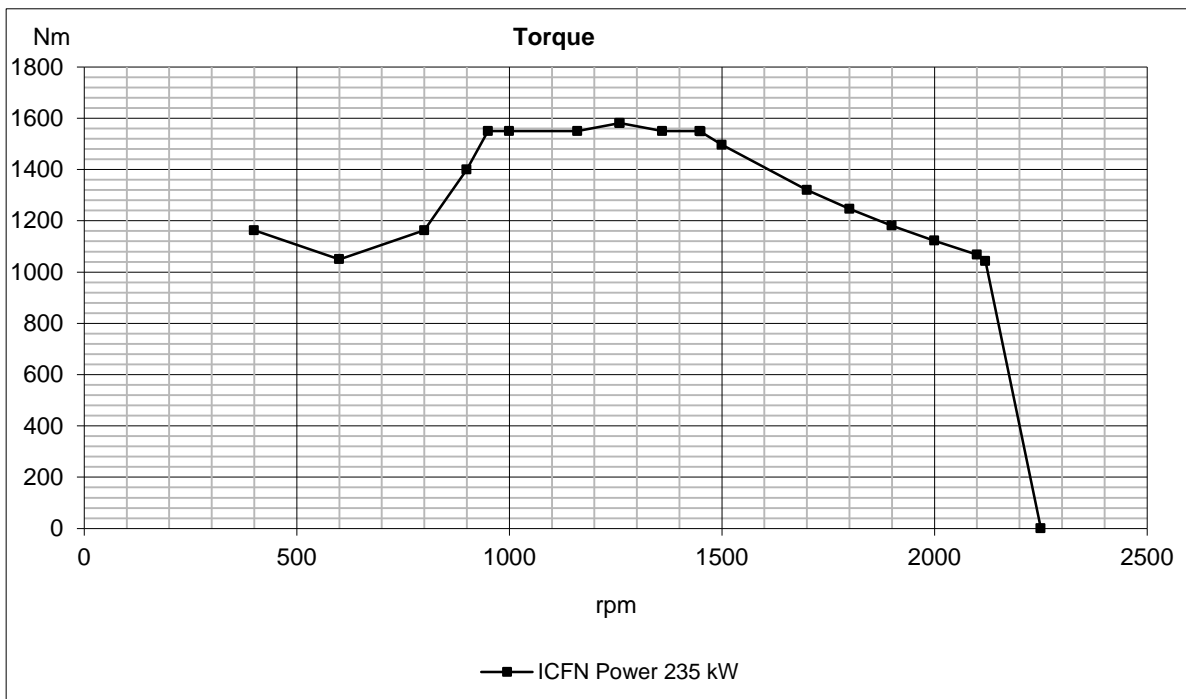
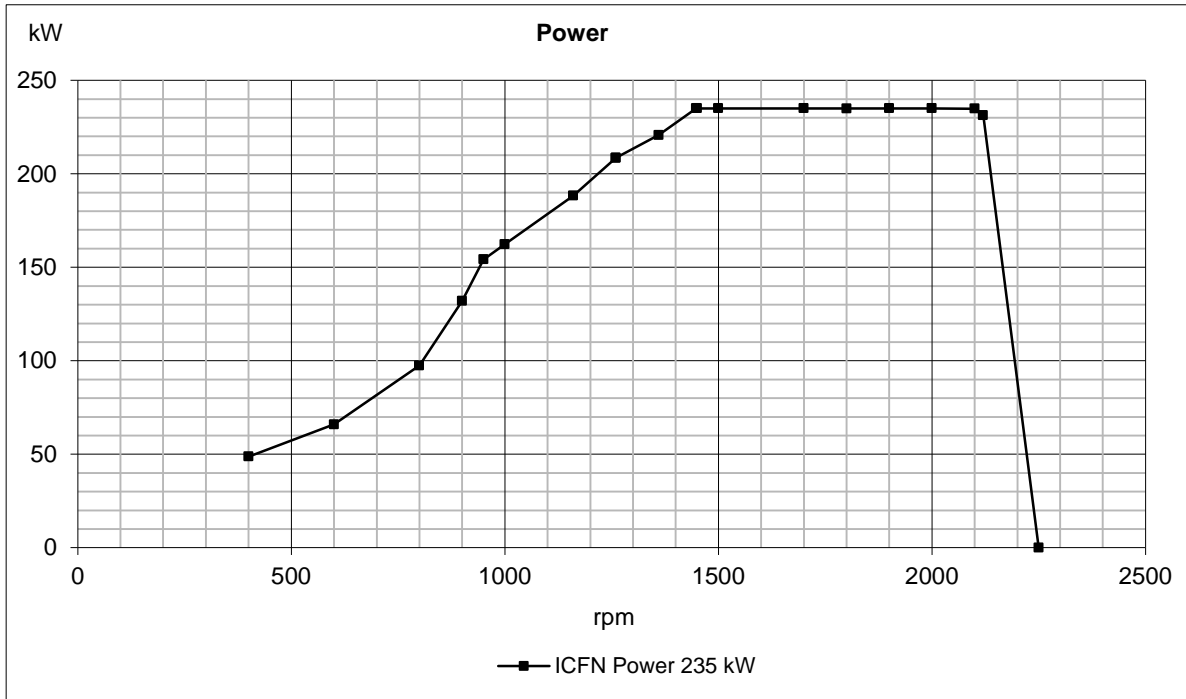
Electrical system

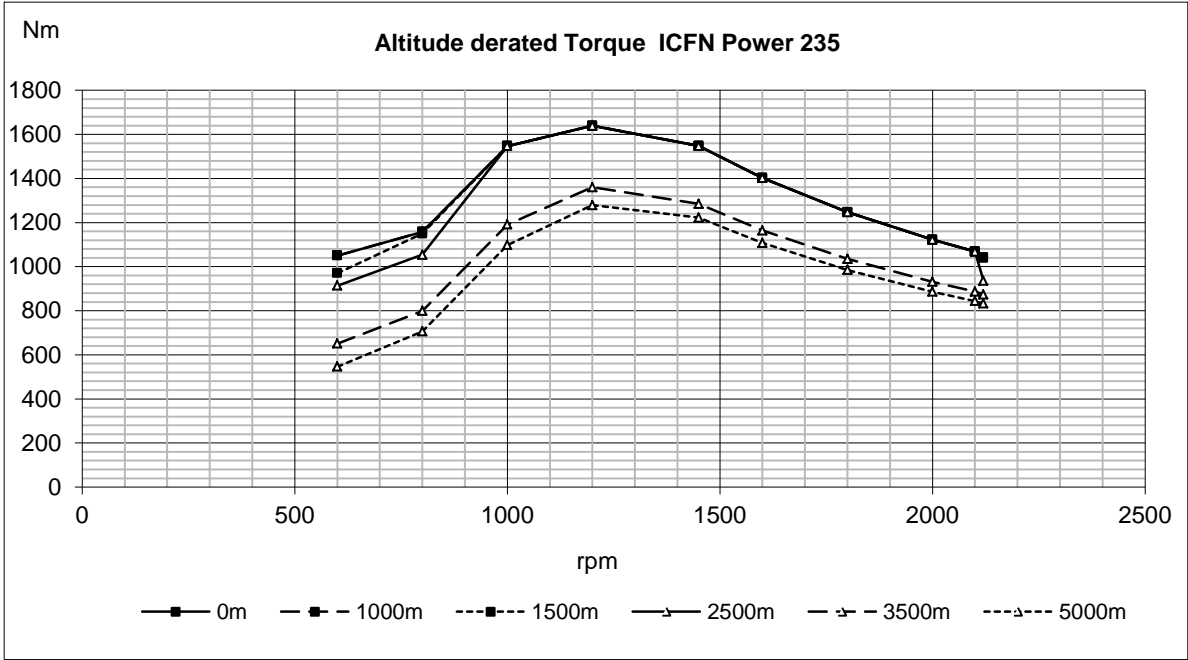
Voltage and type				24V		
Alternator:	output	A		110/150		
	tacho output	Hz/alternator rev.		6		
	drive ratio			5,25		
Starter motor:	type			90P55 / (105P70 ISS för start/stop)		
	output	kW	hp	5,5 / (7,0)		
Number of teeth on:	flywheel			153		
	starter motor			11		
Inlet manifold heater (at 20 V)		kW	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			

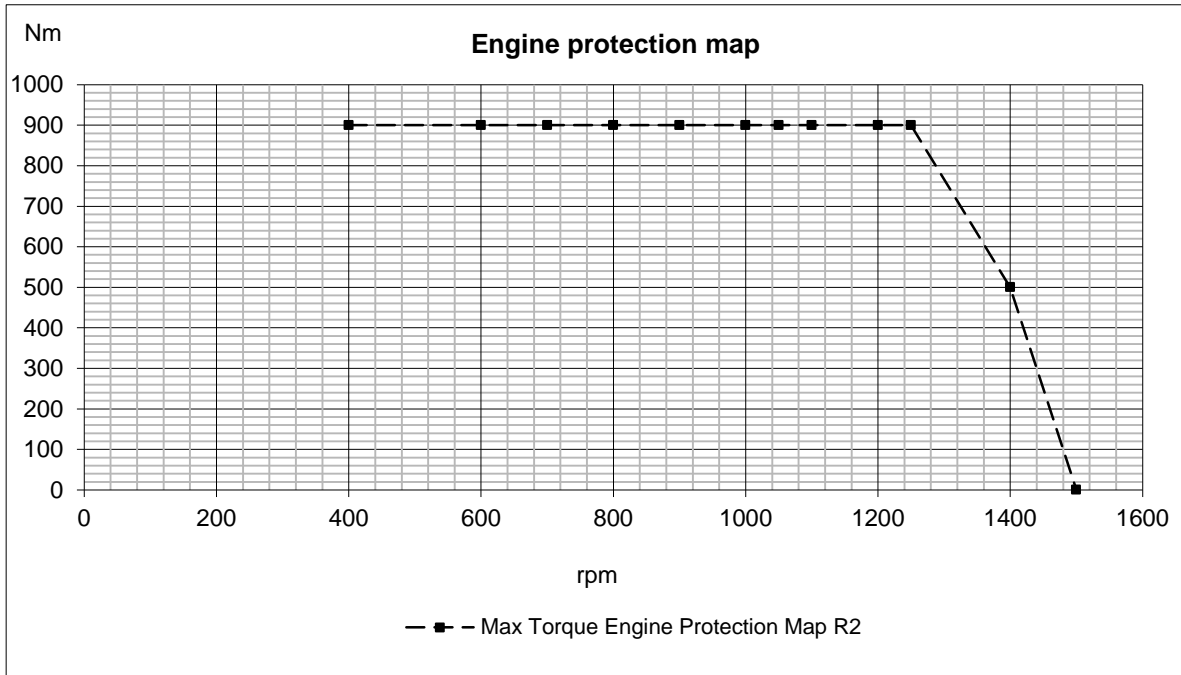
Power take off	rpm	1400	1800	2000	2100	
Front end in line with crank shaft max:*	Nm	1490	1210	1110	1060	
(with a total added mass moment of inertia, J (mR2)≤0,05 kgm²)	lbf ft	1099	892	819	782	
Front end belt pulley load. Direction of load viewed from flywheel side.	max side	kW	13	19	21	22
		hp	18	26	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
Maximum torque on timing gear at rear PTO : *	Nm	650				
	lbf ft	479				
Speed ratio direction of rotation viewed from flywheel side	1,08:1/ ccw					
Timing gear at compressor PTO max:*	Nm	310				
	lbf ft	229				
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				

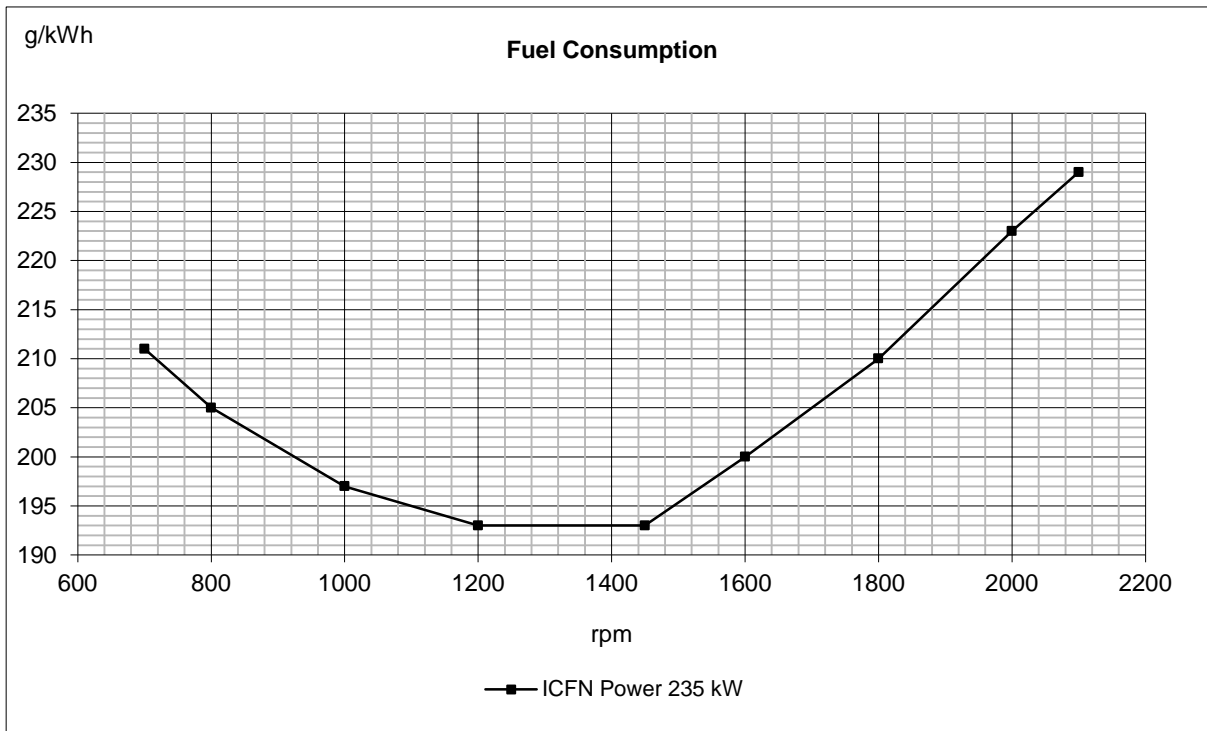
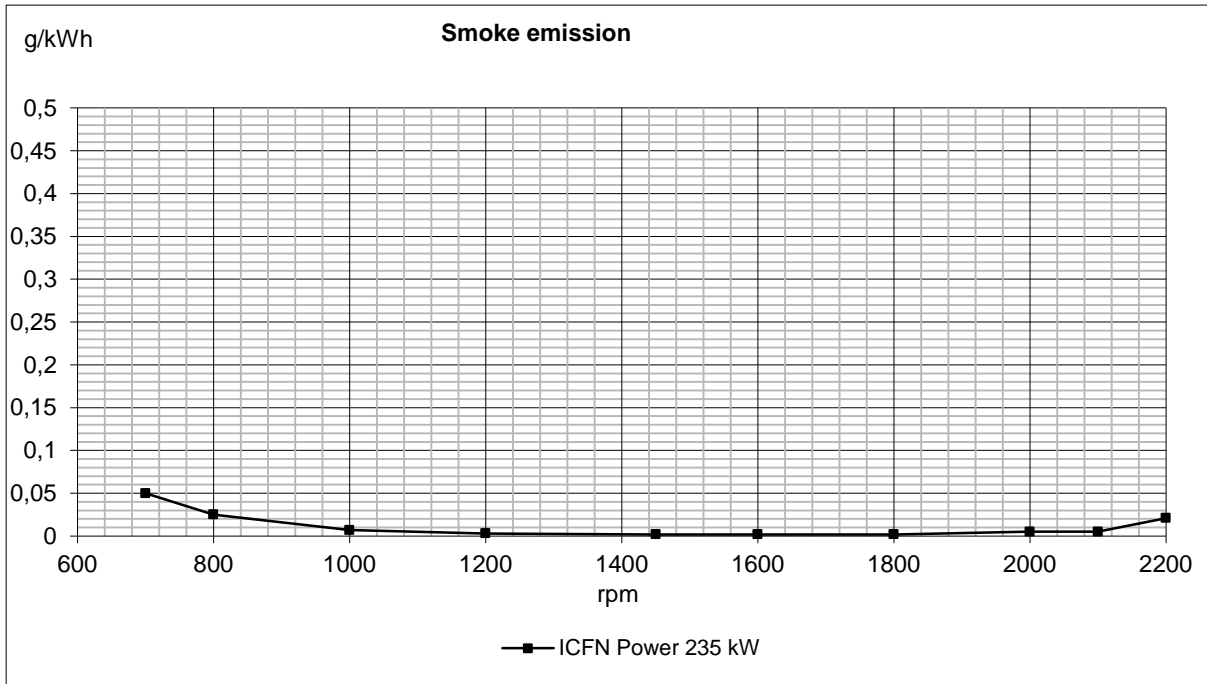
* Maximum allowed torque at individual PTO's.

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

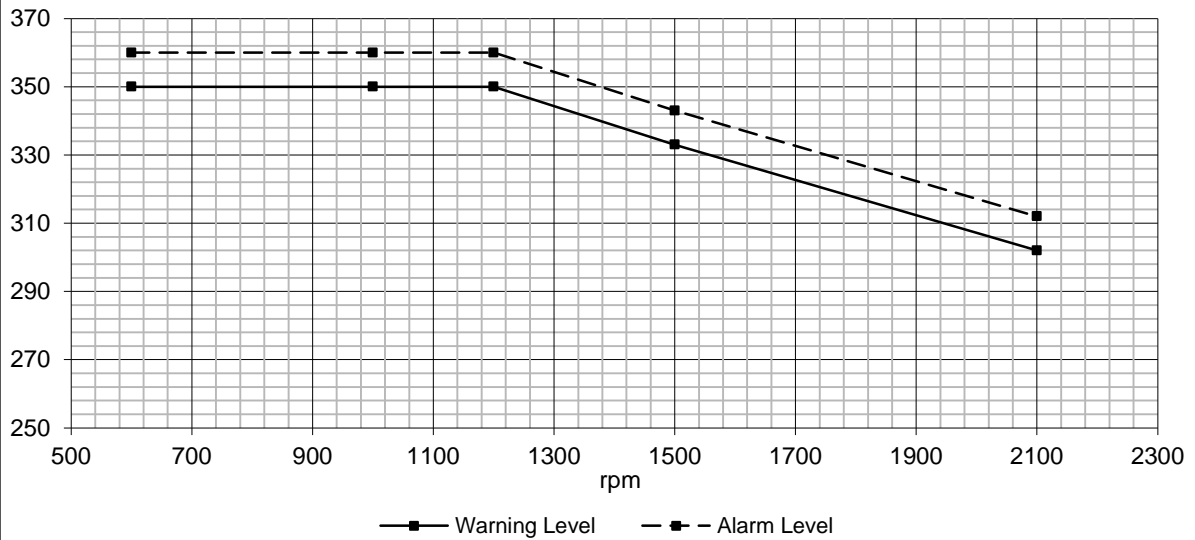




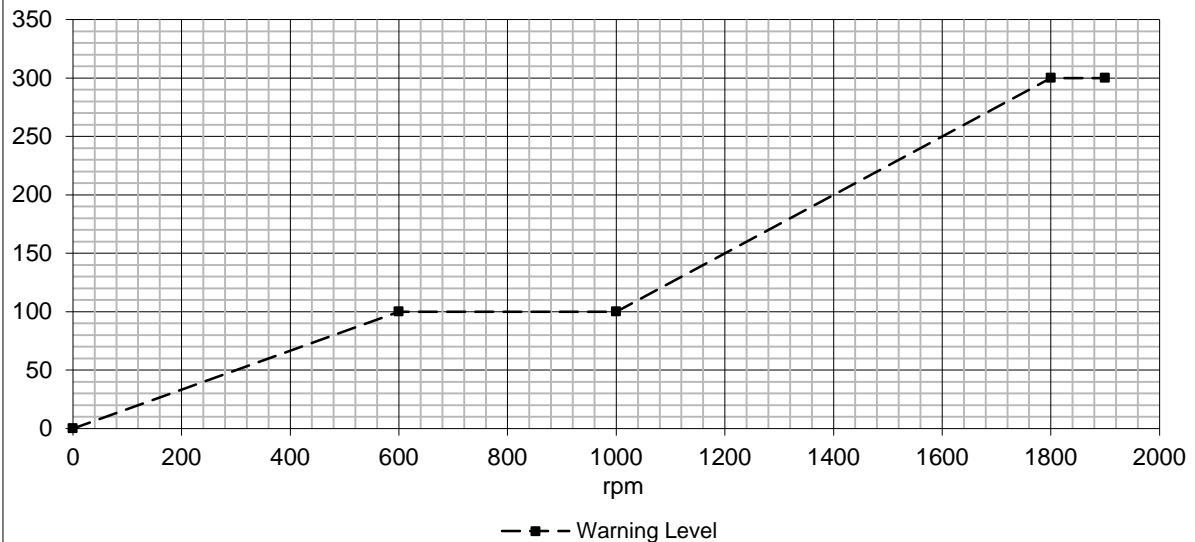


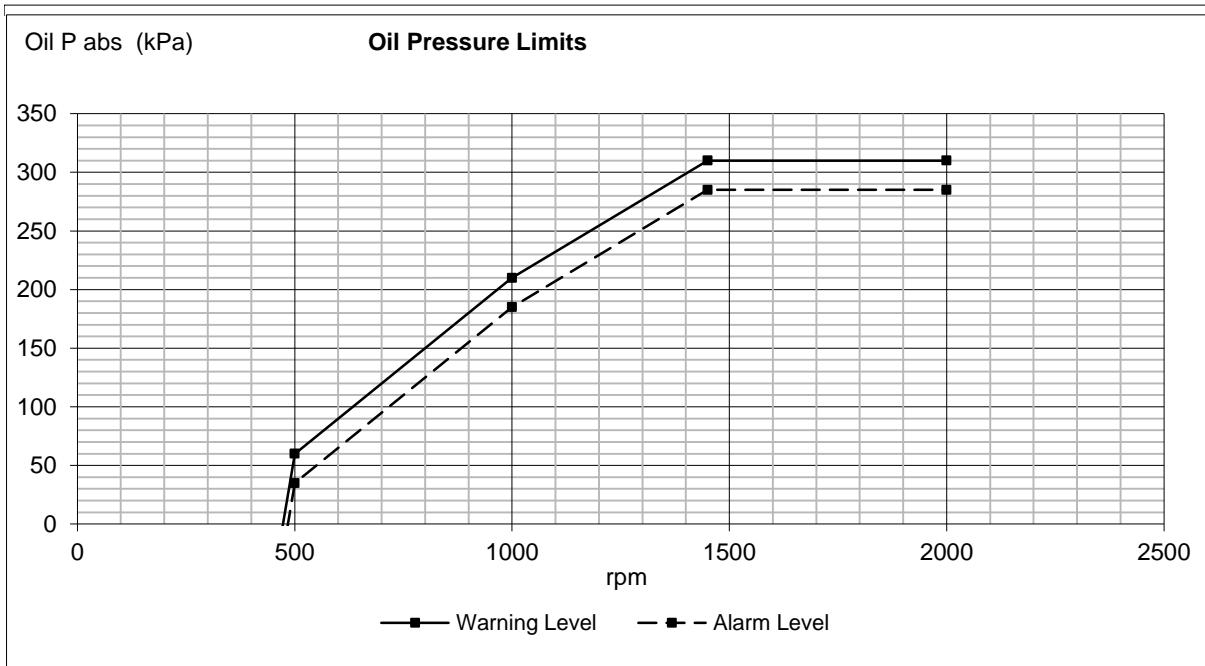


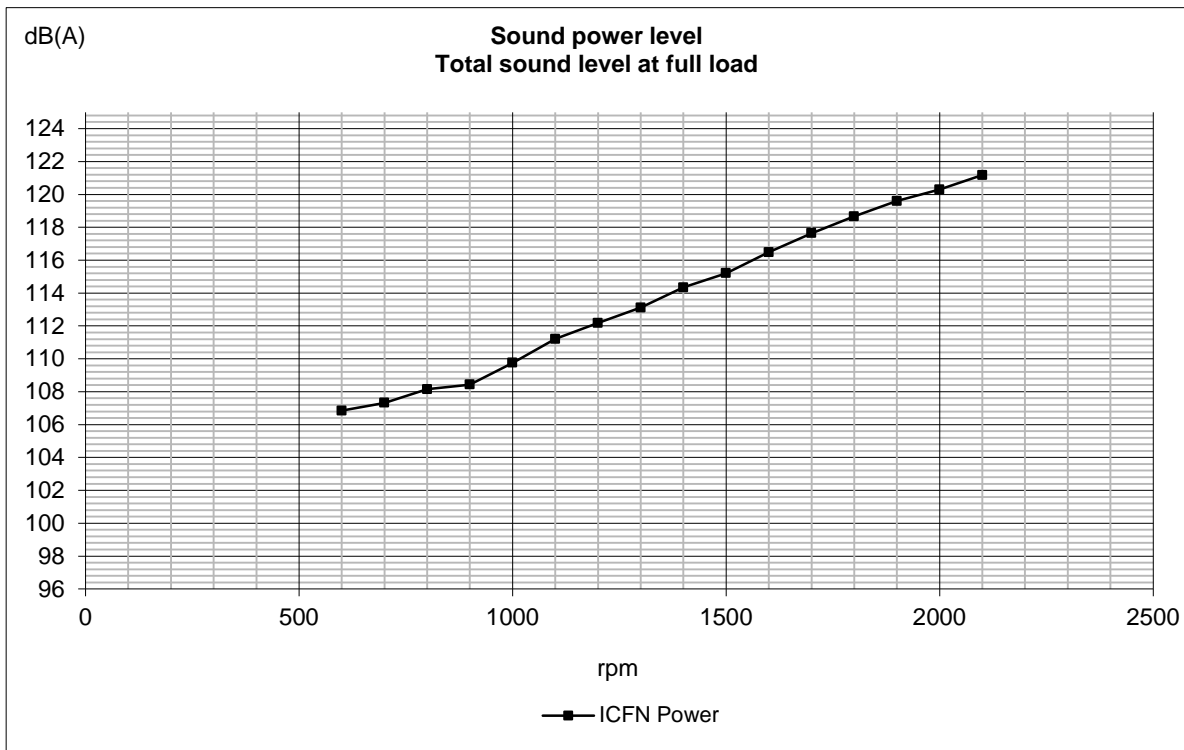
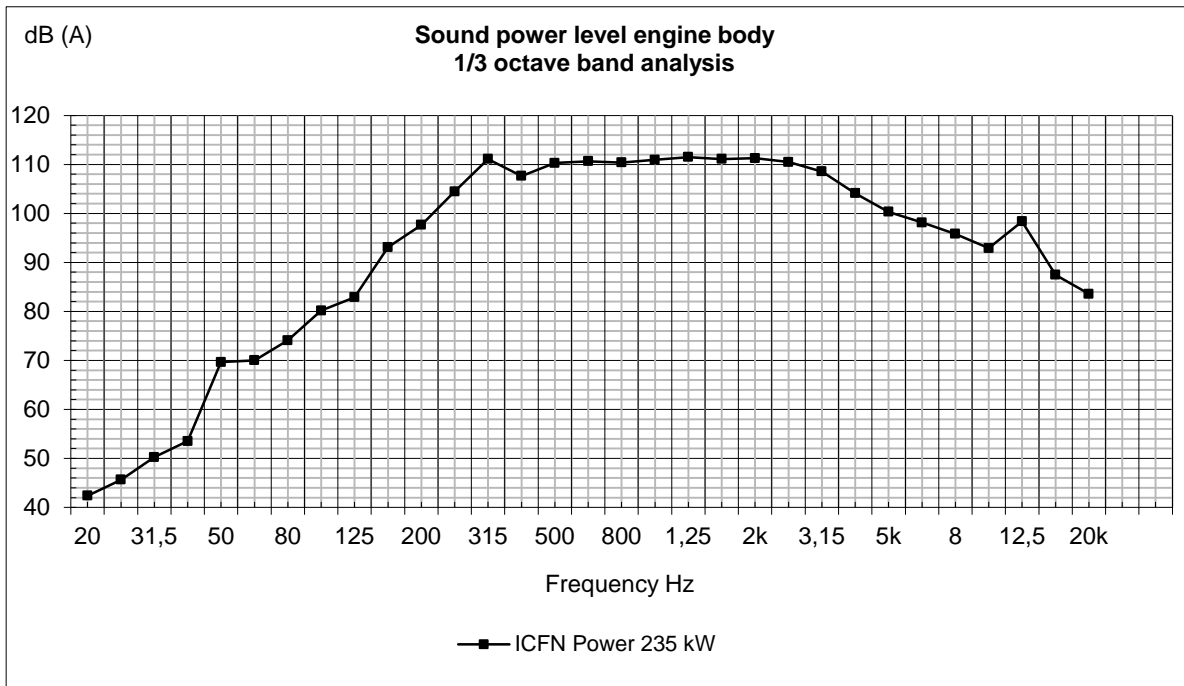
CAC P abs (kPa)

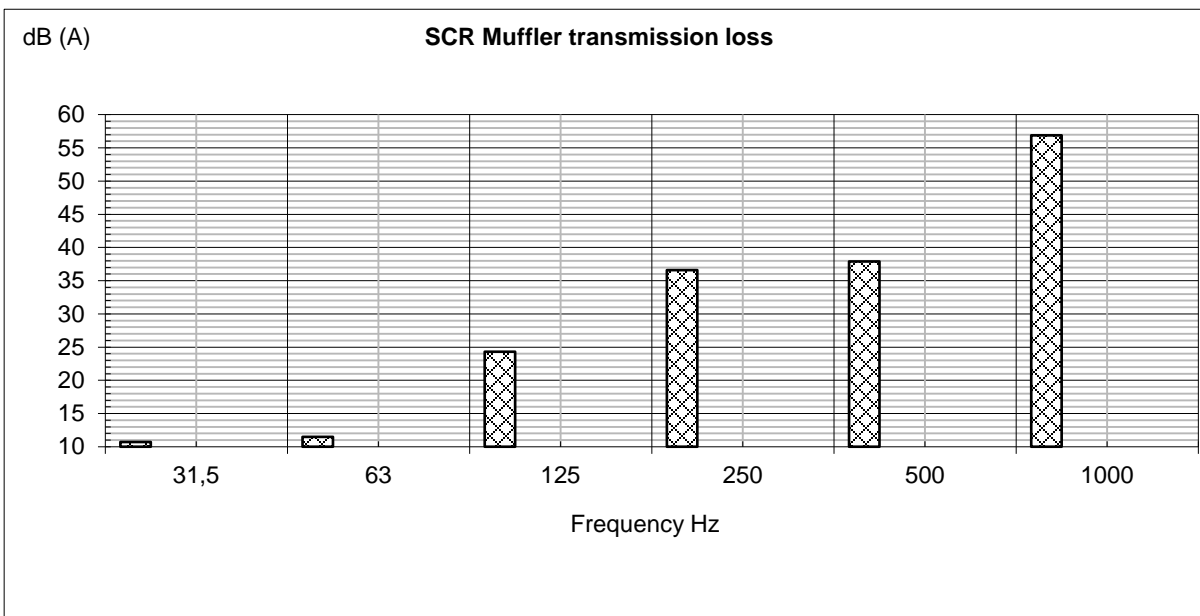
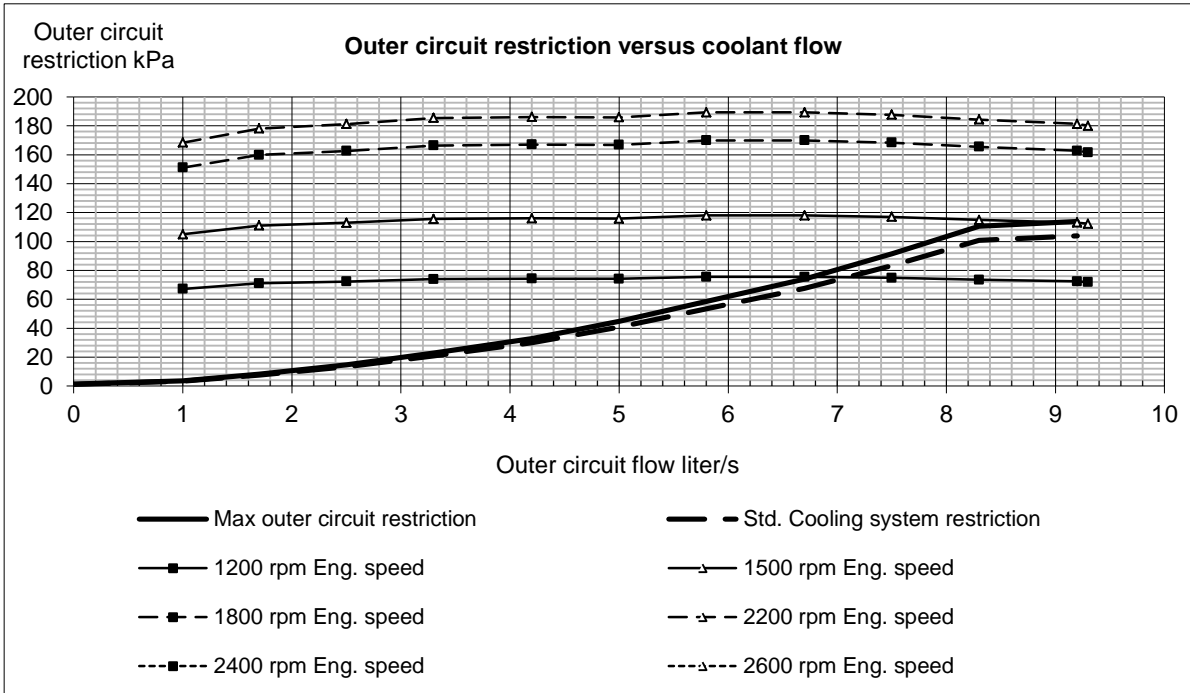
Charge Air Pressure Limits

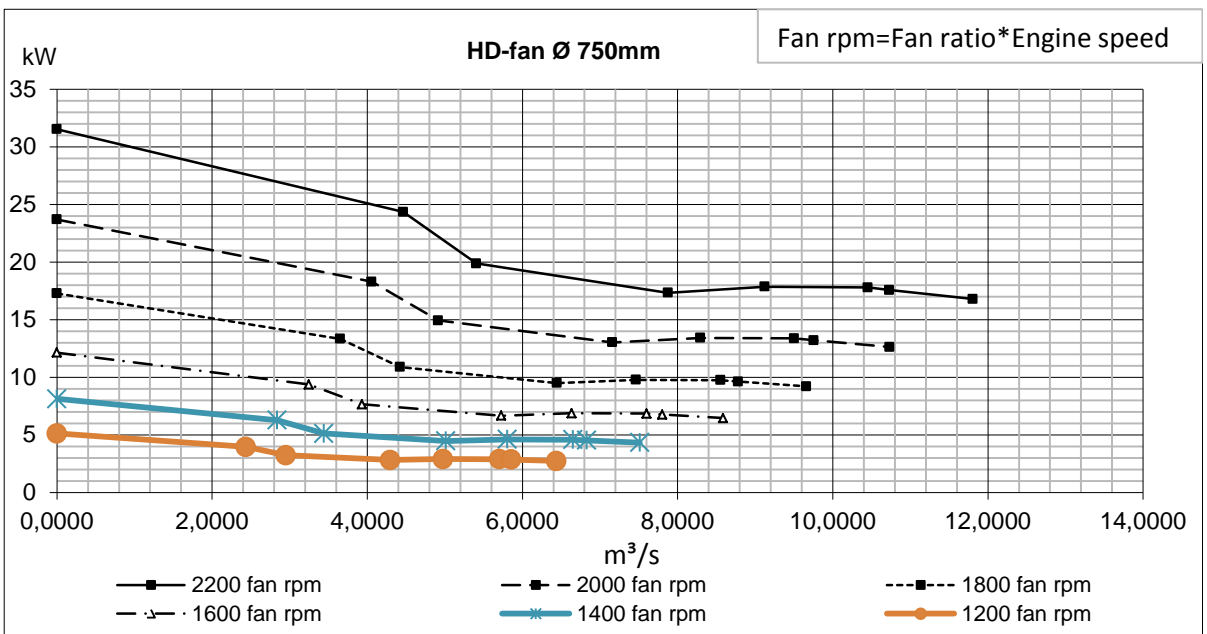
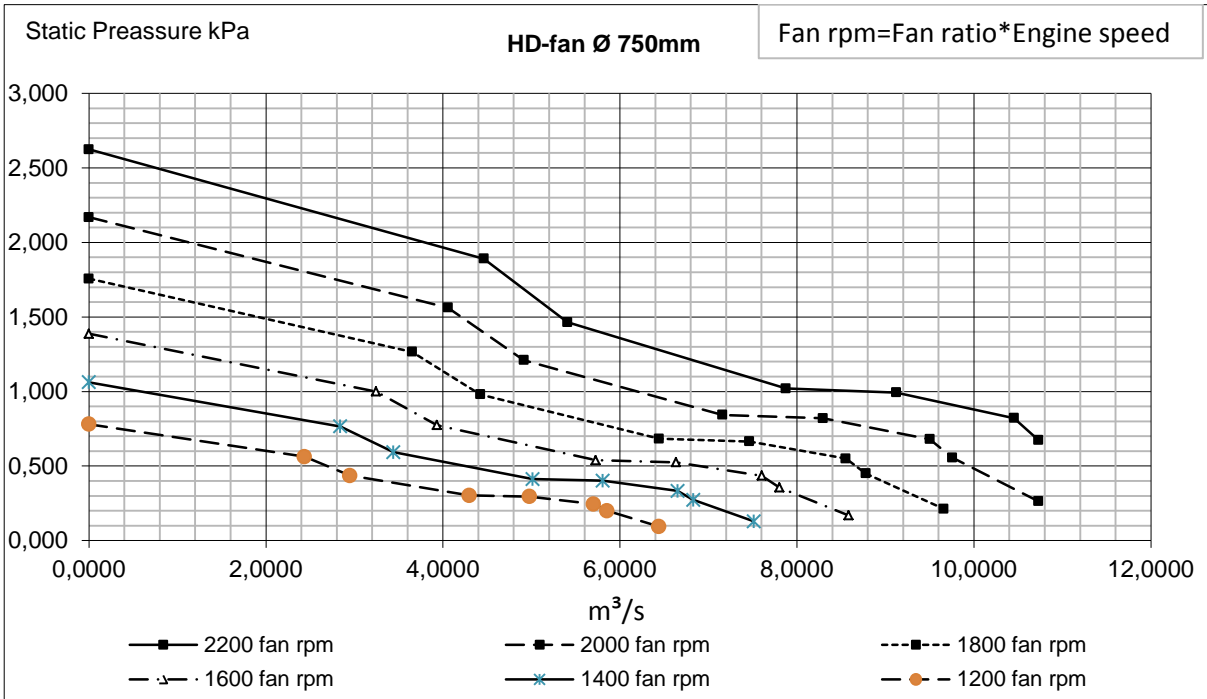
Fuel P (kPa)

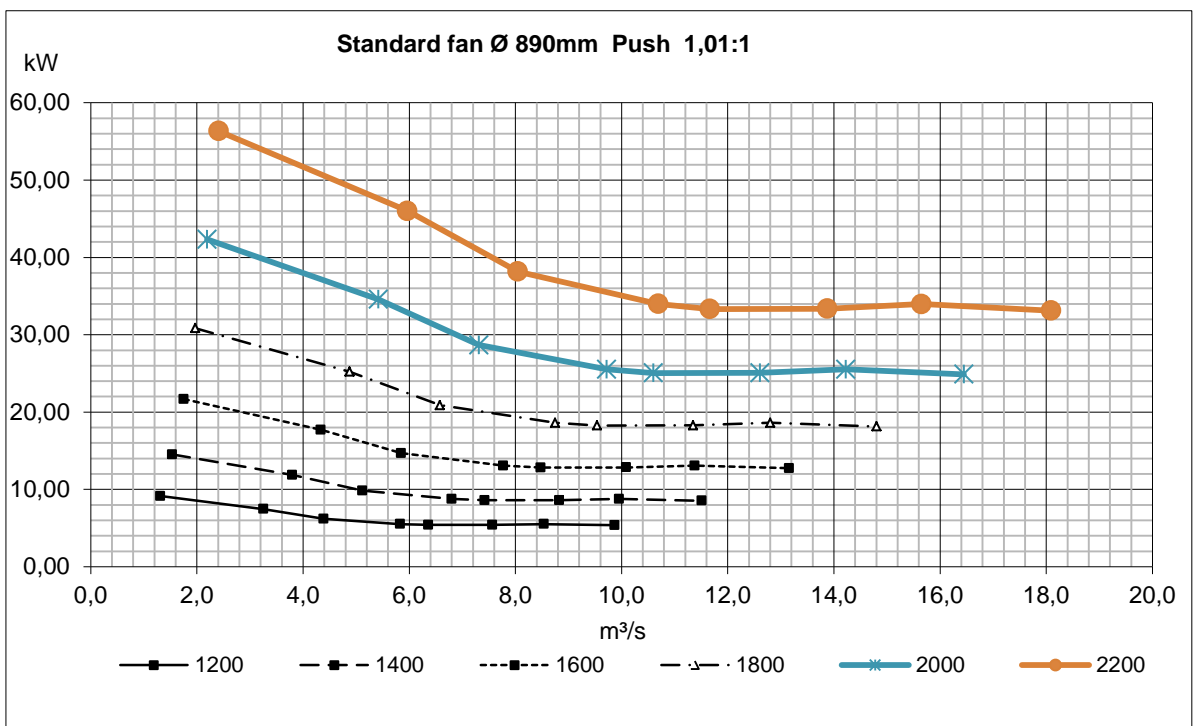
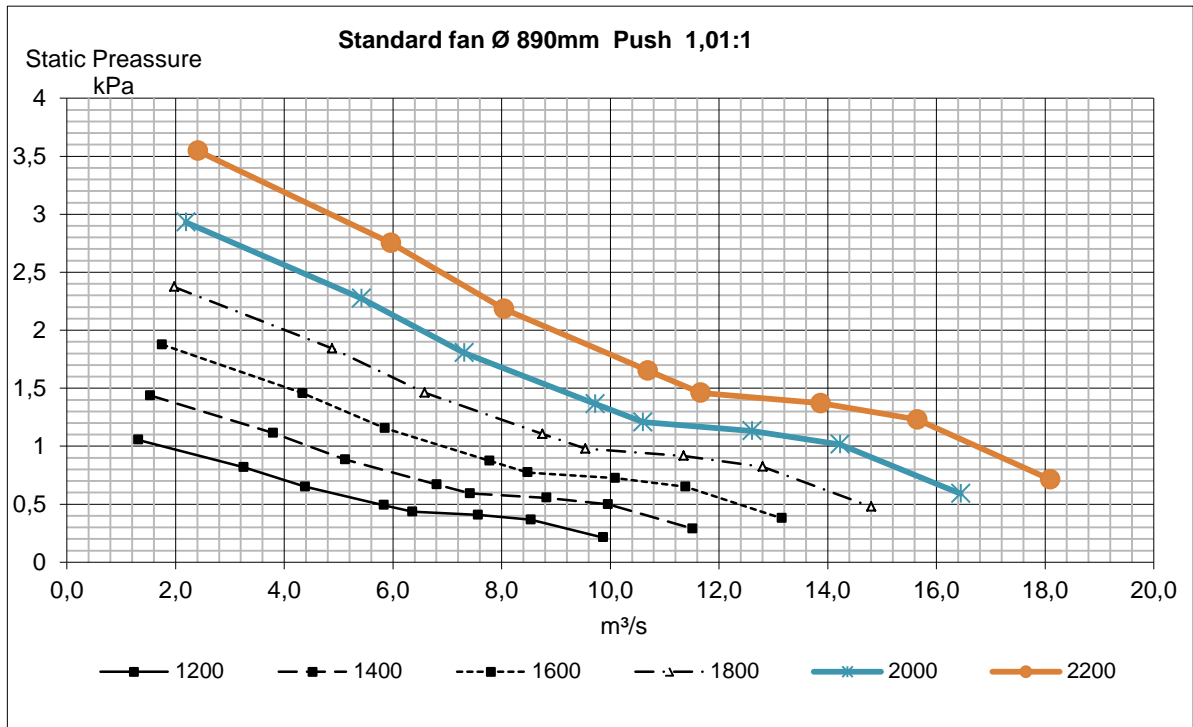
Fuel Pressure Limits



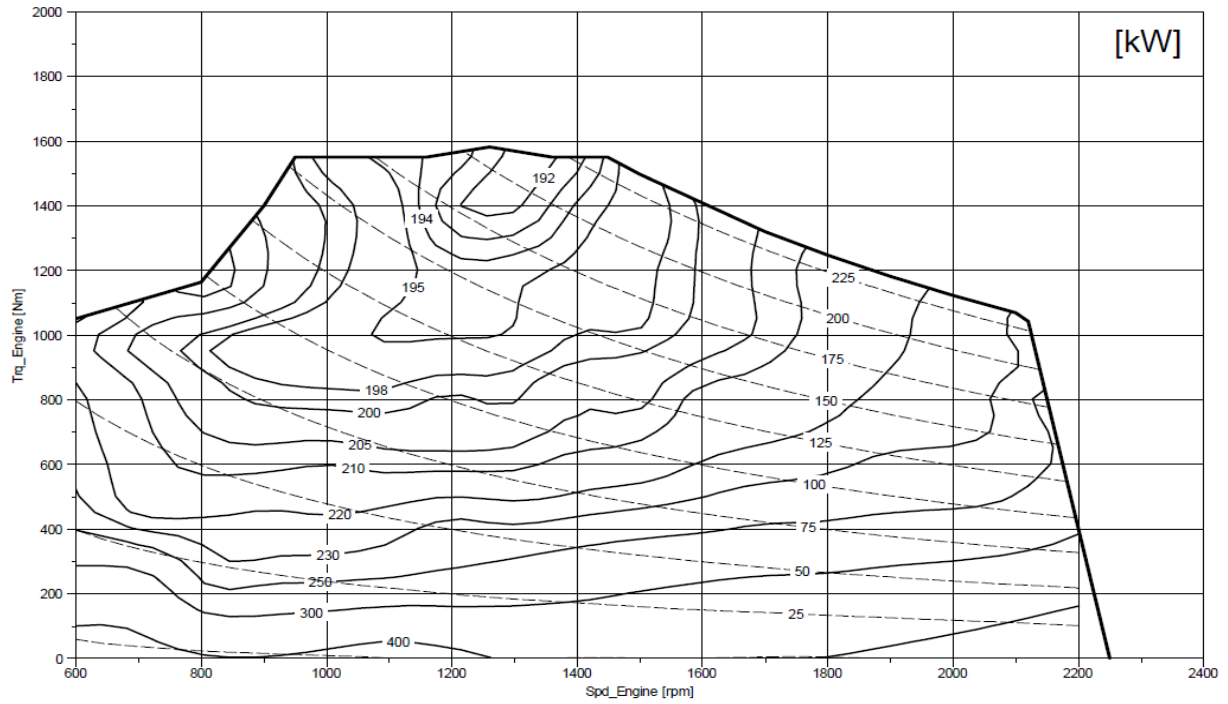




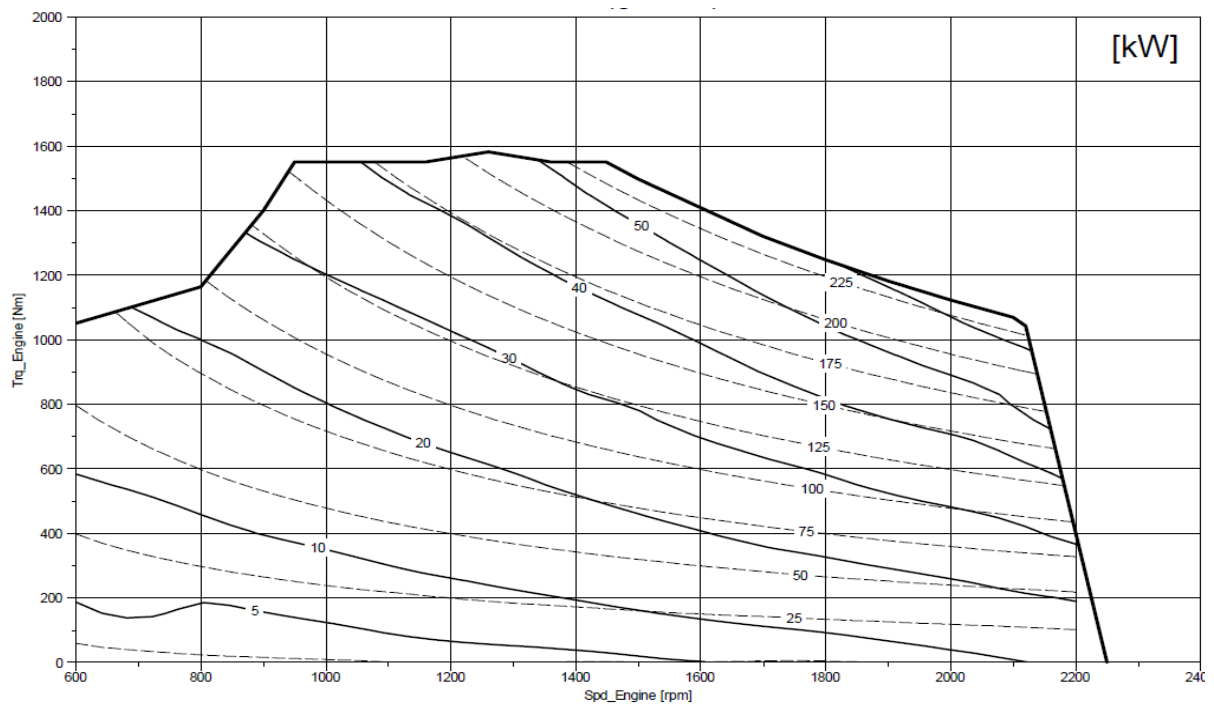




BSFC [g/kWh]



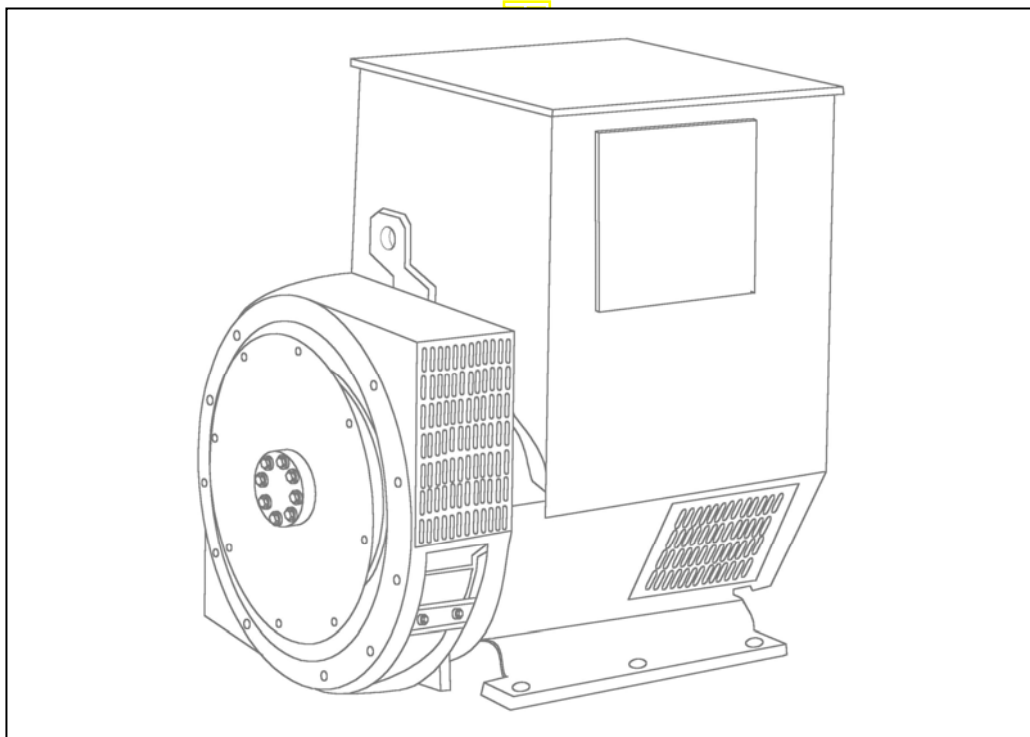
Fuel consumption [l/h]



STAMFORD®

UCDI274J - Winding 311

Technical  Data Sheet



SPECIFICATIONS & OPTIONS

STANDARDS

Stamford industrial generators meet the requirements of BS EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100, AS1359.

Other standards and certifications can be considered on request.

VOLTAGE REGULATORS

SX460 AVR - STANDARD

With this self excited control system the main stator supplies power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.

The exciter rotor output is fed to the main rotor through a three phase full wave bridge rectifier. This rectifier is protected by a surge suppressor against surges caused, for example, by short circuit.

AS440 AVR

With this self-excited system the main stator provides power via the AVR to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.

The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.

The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

MX341 AVR

This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.

The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.

An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.

If three-phase sensing is required with the PMG system the MX321 AVR must be used.

We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.

Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

All generator stators are wound to 2/3 pitch. This eliminates triplen (3rd, 9th, 15th ...) harmonics on the voltage waveform and is found to be the optimum design for trouble-free supply of non-linear loads. The 2/3 pitch design avoids excessive neutral currents sometimes seen with higher winding pitches, when in parallel with the mains. A fully connected damper winding reduces oscillations during paralleling. This winding, with the 2/3 pitch and carefully selected pole and tooth designs, ensures very low waveform distortion.

TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation.

INSULATION/IMPREGNATION

The insulation system is class 'H'.

All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

QUALITY ASSURANCE

Generators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.

The stated voltage regulation may not be maintained in the presence of certain radio transmitted signals. Any change in performance will fall within the limits of Criteria 'B' of EN 61000-6-2:2001. At no time will the steady-state voltage regulation exceed 2%.

DE RATES

All values tabulated on page 8 are subject to the following reductions

5% when air inlet filters are fitted.

3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.

3% for every 5°C by which the operational ambient temperature exceeds 40°C.

Note: Requirement for operating in an ambient exceeding 60°C must be referred to the factory.

NB Continuous development of our products entitles us to change specification details without notice, therefore they must not be regarded as binding.

Front cover drawing typical of product range.

APPROVED DOCUMENT

WINDING 311

CONTROL SYSTEM SER.3	SEPARATELY EXCITED BY P.M.G.							
A.V.R.	MX321	MX341						
VOLTAGE REGULATION	± 0.5 %	± 1.0 %	With 4% ENGINE GOVERNING					
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)							
CONTROL SYSTEM SER.4	SELF EXCITED							
A.V.R.	SX460	AS440						
VOLTAGE REGULATION	± 1.0 %	± 1.0 %	With 4% ENGINE GOVERNING					
SUSTAINED SHORT CIRCUIT	SERIES 4 CONTROL DOES NOT SUSTAIN A SHORT CIRCUIT CURRENT							
INSULATION SYSTEM	CLASS H							
PROTECTION	IP23							
RATED POWER FACTOR	0.8							
STATOR WINDING	DOUBLE LAYER CONCENTRIC							
WINDING PITCH	TWO THIRDS							
WINDING LEADS	12							
STATOR WDG. RESISTANCE	0.0126 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED							
ROTOR WDG. RESISTANCE	2.08 Ohms at 22°C							
EXCITER STATOR RESISTANCE	20 Ohms at 22°C							
EXCITER ROTOR RESISTANCE	0.091 Ohms PER PHASE AT 22°C							
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4, VDE 0875G, VDE 0875N. refer to factory for others							
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
MAXIMUM OVERSPEED	2250 Rev/Min							
BEARING NON-DRIVE END	BALL. 6310-2RS (ISO)							
WEIGHT COMP. GENERATOR	727 kg							
WEIGHT WOUND STATOR	304 kg							
WEIGHT WOUND ROTOR	271.9 kg							
WR ² INERTIA	2.3744 kgm ²							
SHIPPING WEIGHTS in a crate	740 kg							
PACKING CRATE SIZE	123 x 67 x 103 (cm)							
	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	0.58 m ³ /sec 1230 cfm				0.69 m ³ /sec 1463 cfm			
VOLTAGE SERIES STAR	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
VOLTAGE PARALLEL STAR	190/110	200/115	208/120	220/127	208/120	220/127	230/133	240/138
VOLTAGE SERIES DELTA	220/110	230/115	240/120	254/127	240/120	254/127	266/133	277/138
KVA BASE RATING FOR REACTANCE VALUES	230	230	230	N/A	269	281	294	300
X _d DIR. AXIS SYNCHRONOUS	1.939	1.750	1.626	-	2.651	2.475	2.370	2.221
X' _d DIR. AXIS TRANSIENT	0.103	0.093	0.086	-	0.164	0.153	0.147	0.137
X'' _d DIR. AXIS SUBTRANSIENT	0.070	0.064	0.059	-	0.096	0.090	0.086	0.080
X _q QUAD. AXIS REACTANCE	0.886	0.800	0.743	-	1.206	1.126	1.078	1.010
X'' _q QUAD. AXIS SUBTRANSIENT	0.163	0.147	0.137	-	0.138	0.129	0.123	0.116
X _L LEAKAGE REACTANCE	0.062	0.056	0.052	-	0.081	0.076	0.072	0.068
X ₂ NEGATIVE SEQUENCE	0.117	0.105	0.098	-	0.117	0.109	0.105	0.098
X ₀ ZERO SEQUENCE	0.044	0.040	0.037	-	0.048	0.045	0.043	0.040
REACTANCES ARE SATURATED		VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED						
T' _d TRANSIENT TIME CONST.	0.045 s							
T'' _d SUB-TRANSTIME CONST.	0.015 s							
T' _{do} O.C. FIELD TIME CONST.	1.27 s							
T _a ARMATURE TIME CONST.	0.03 s							
SHORT CIRCUIT RATIO	1/X _d							

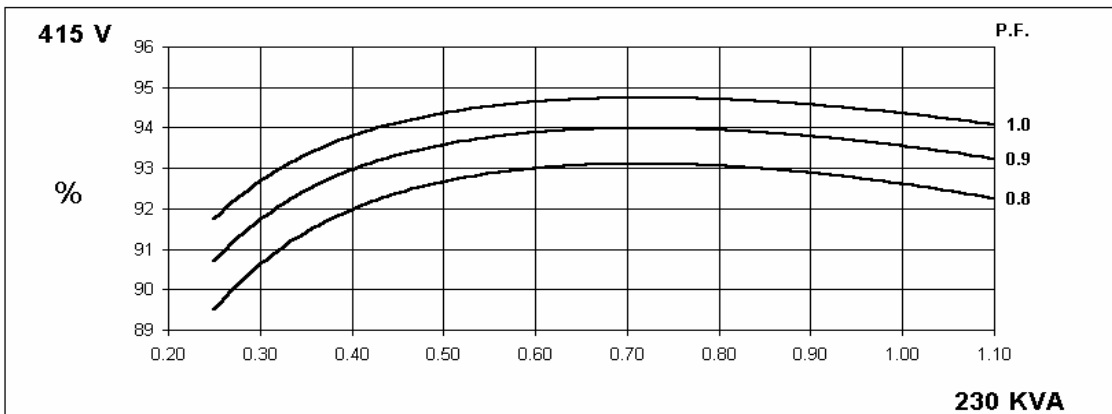
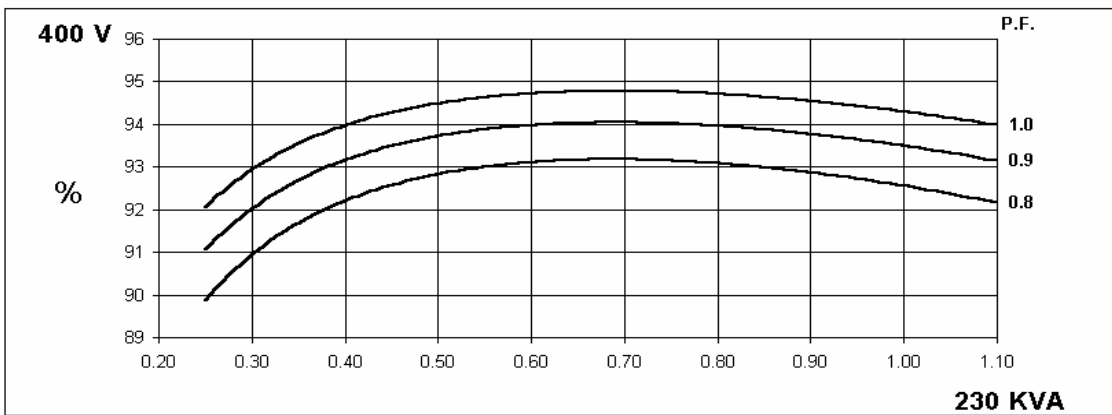
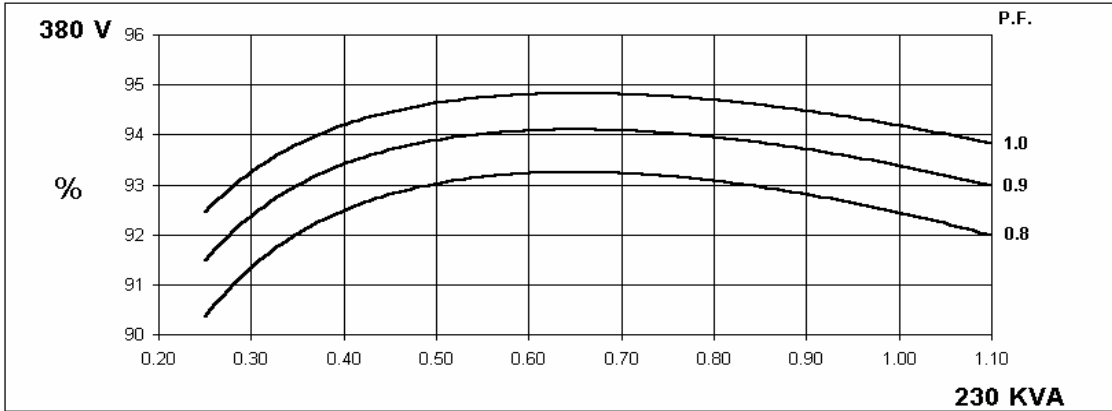
50
Hz

UCDI274J

Winding 311

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THREE PHASE EFFICIENCY CURVES

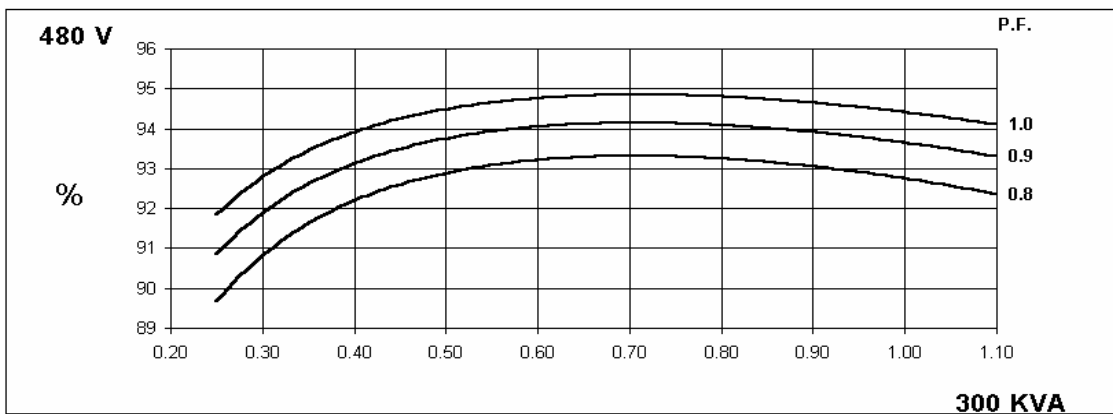
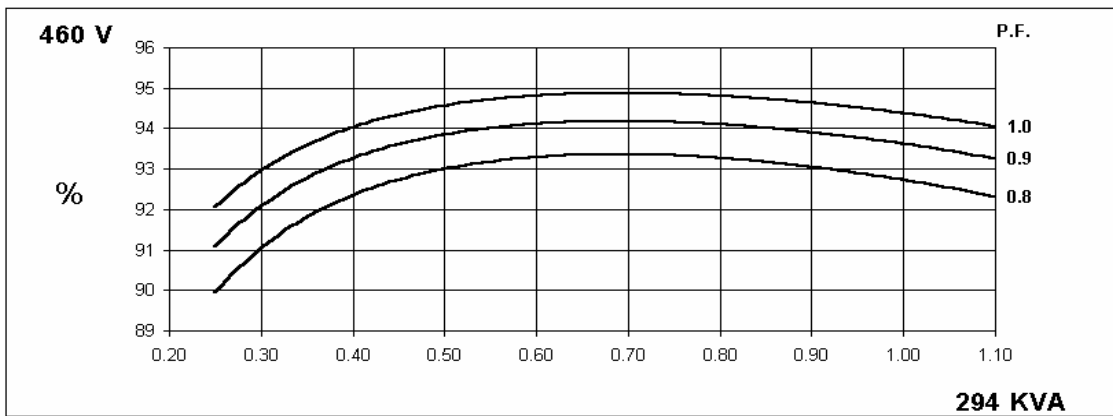
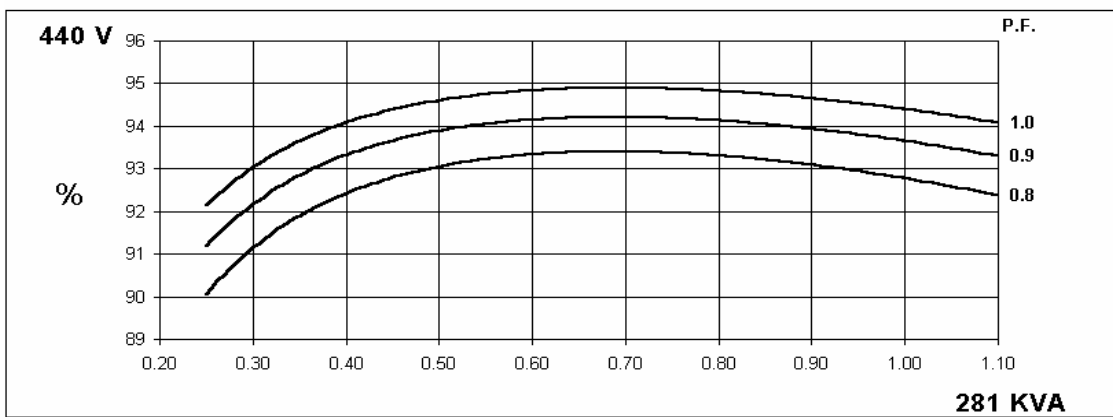
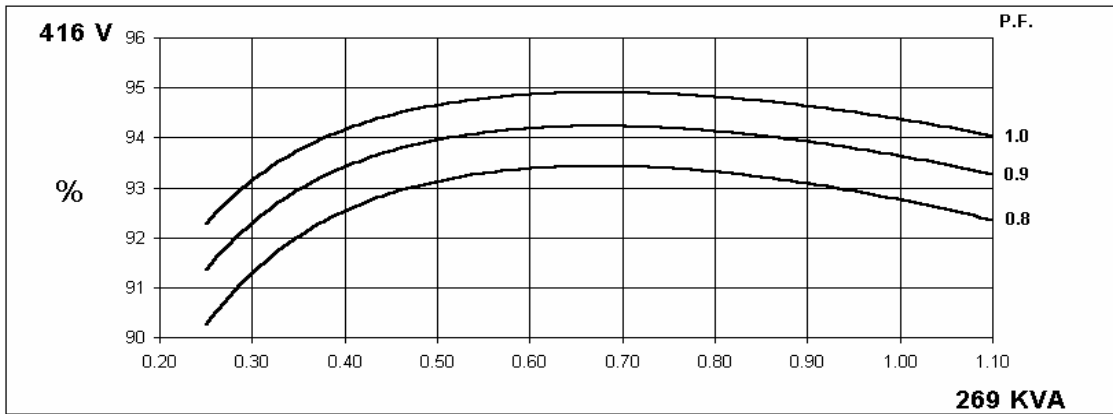


60
Hz

UCDI274J
Winding 311

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THREE PHASE EFFICIENCY CURVES

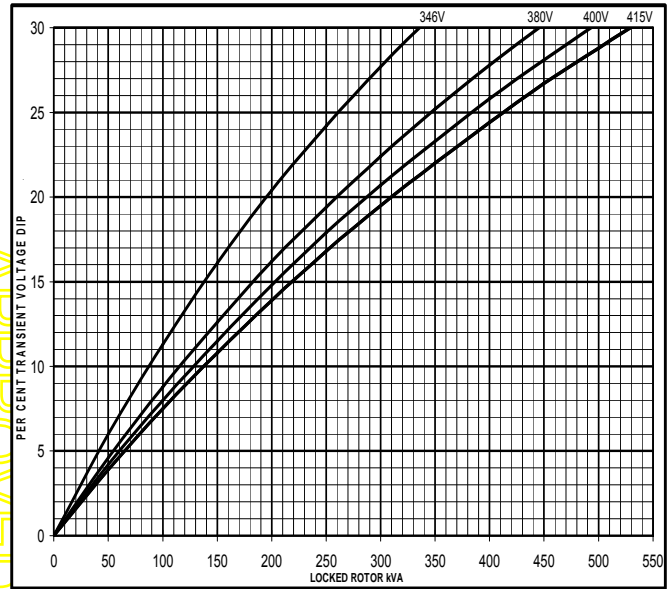
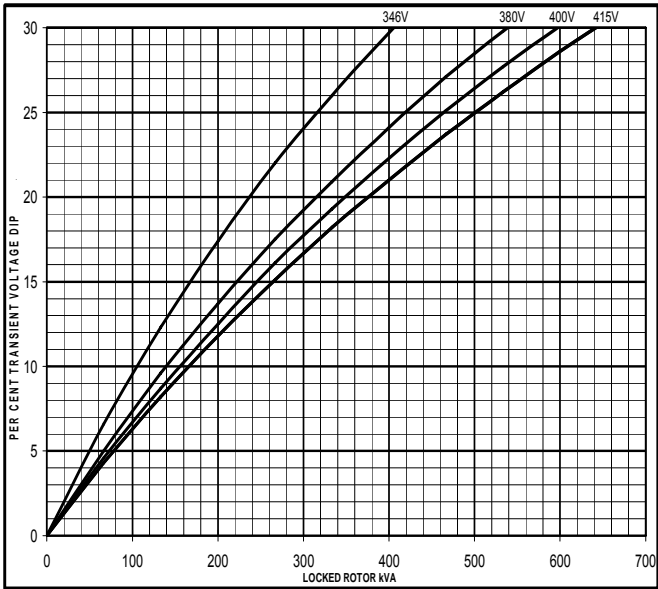


Locked Rotor Motor Starting Curve

50 Hz

MX

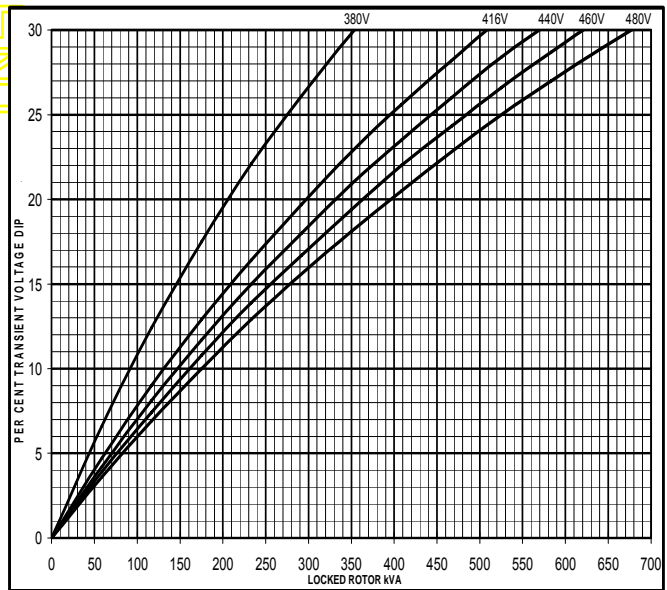
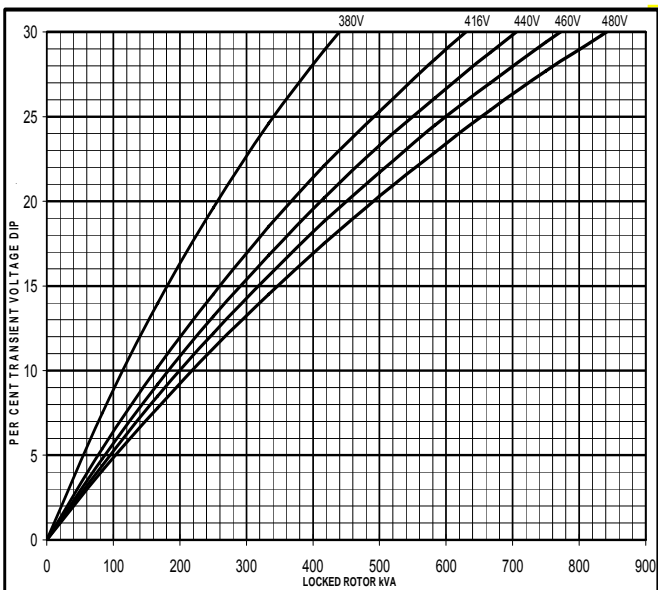
SX



60 Hz

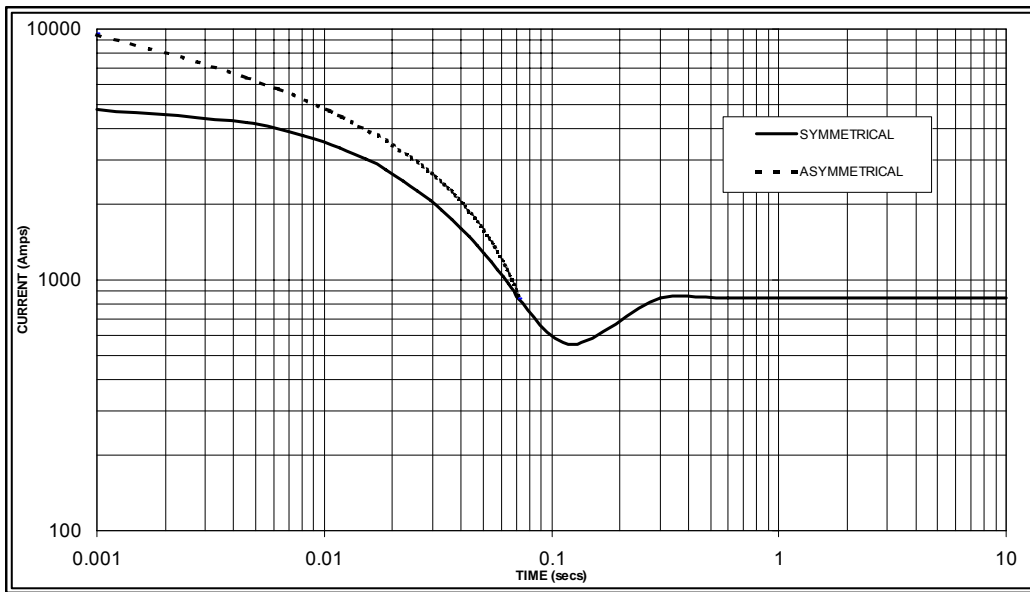
MX

SX



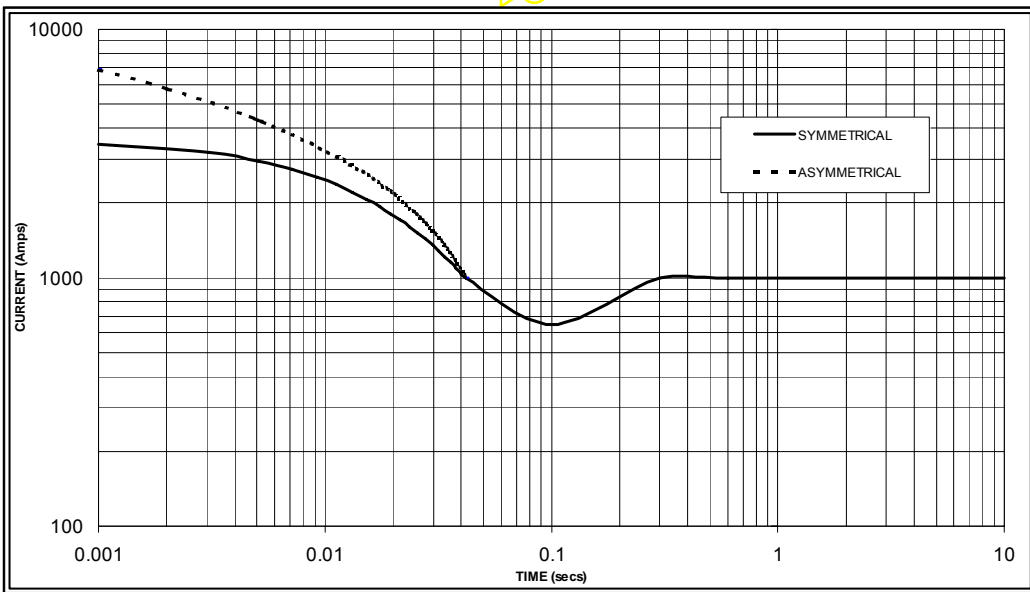
**Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed
Based on star (wye) connection.**

50
Hz



Sustained Short Circuit = 850 Amps

60
Hz



Sustained Short Circuit = 1,000 Amps

Note 1

The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380v	X 1.00	416v	X 1.00
400v	X 1.05	440v	X 1.07
415v	X 1.10	460v	X 1.12
		480v	X 1.16

The sustained current value is constant irrespective of voltage level

Note 2

The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

	3-phase	2-phase L-L	1-phase L-N
Instantaneous	x 1.00	x 0.87	x 1.30
Minimum	x 1.00	x 1.80	x 3.20
Sustained	x 1.00	x 1.50	x 2.50
Max. sustained duration	10 sec.	5 sec.	2 sec.

All other times are unchanged

Note 3

Curves are drawn for Star (Wye) connected machines. For other connection the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

Series Delta = Curve current value X 1.732

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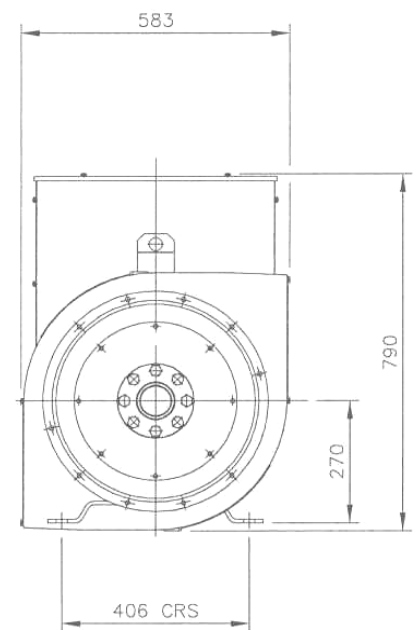
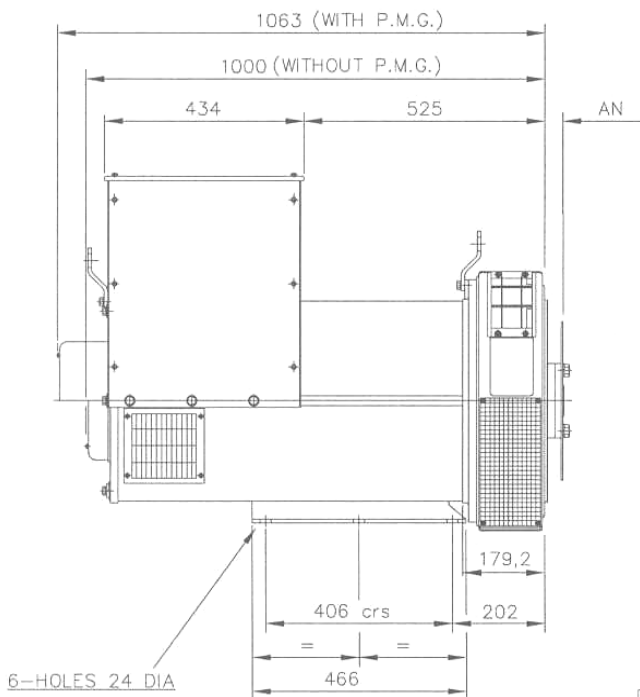
Winding 311 / 0.8 Power Factor

RATINGS

Class - Temp Rise	Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C				
50 Hz	Series Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V)	190	200	208	220	190	200	208	220	190	200	208	220	190	200	208	220
	Series Delta (V)	220	230	240	254	220	230	240	254	220	230	240	254	220	230	240	254
kVA	210	210	210	N/A	230	230	230	N/A	250	250	250	N/A	260	260	260	N/A	
kW	168	168	168	N/A	184	184	184	N/A	200	200	200	N/A	208	208	208	N/A	
Efficiency (%)	92.8	92.8	92.9	N/A	92.4	92.6	92.6	N/A	92.1	92.2	92.3	N/A	91.8	92.0	92.1	N/A	
kW Input	181.0	181.0	180.8	N/A	199.1	198.7	198.7	N/A	217.2	216.9	216.7	N/A	226.6	226.1	225.8	N/A	

60 Hz	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	208	220	230	240	208	220	230	240	208	220	230	240	208	220	230	240
	Series Delta (V)	240	254	266	277	240	254	266	277	240	254	266	277	240	254	266	277
kVA	250	264	275	275	269	281	294	300	288	300	313	319	294	306	319	325	
kW	200.0	211.2	220.0	220.0	215.2	224.8	235.2	240.0	230.4	240.0	250.4	255.2	235.2	244.8	255.2	260.0	
Efficiency (%)	93.0	93.0	93.0	93.0	92.8	92.8	92.7	92.8	92.5	92.5	92.5	92.5	92.4	92.4	92.4	92.4	
kW Input	215.1	227.1	236.6	236.6	231.9	242.2	253.7	258.6	249.1	259.5	270.7	275.9	254.5	264.9	276.2	281.4	

DIMENSIONS



COUPLING DISC	AN
SAE 11,5	39,68
SAE14	25,4

APPROVED DOCUMENT

STAMFORD

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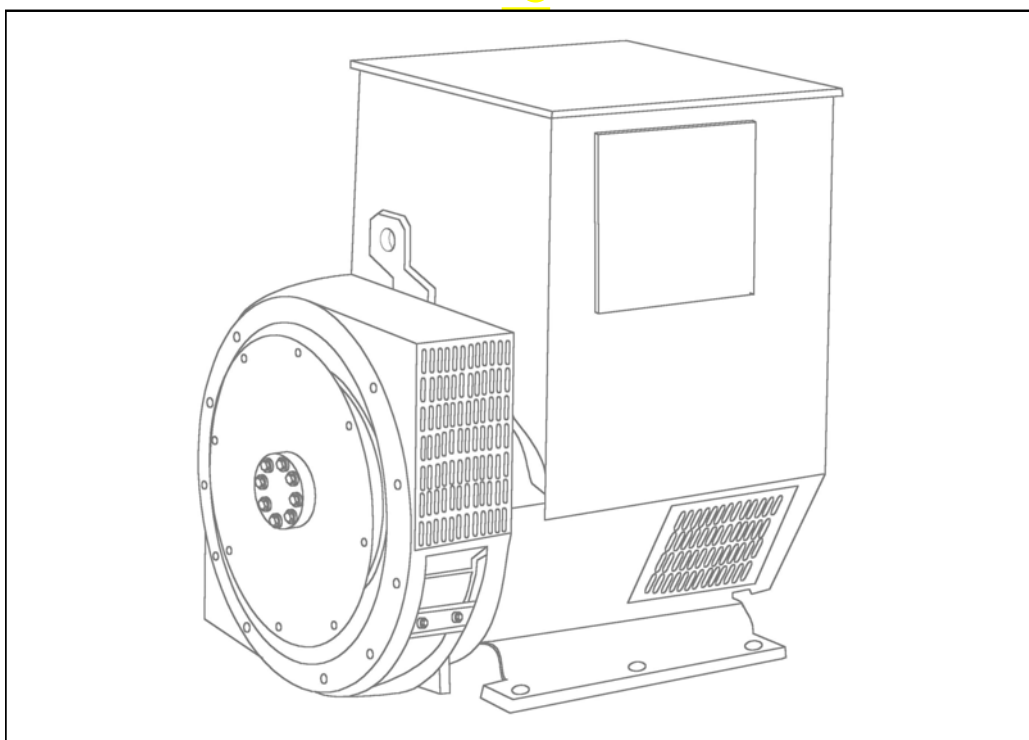
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STAMFORD[®]

UCDI274J - Winding 17

Technical  Data Sheet



SPECIFICATIONS & OPTIONS

STANDARDS

Stamford industrial generators meet the requirements of BS EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100, AS1359.

Other standards and certifications can be considered on request.

VOLTAGE REGULATORS**SX460 AVR - STANDARD**

With this self excited control system the main stator supplies power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.

The exciter rotor output is fed to the main rotor through a three phase full wave bridge rectifier. This rectifier is protected by a surge suppressor against surges caused, for example, by short circuit.

AS440 AVR

With this self-excited system the main stator provides power via the AVR to the exciter stator. The high efficiency semiconductors of the AVR ensure positive build-up from initial low levels of residual voltage.

The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.

The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

MX341 AVR

This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.

The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.

An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.

If three-phase sensing is required with the PMG system the MX321 AVR must be used.

We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.

Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

All generator stators are wound to 2/3 pitch. This eliminates triplen (3rd, 9th, 15th ...) harmonics on the voltage waveform and is found to be the optimum design for trouble-free supply of non-linear loads. The 2/3 pitch design avoids excessive neutral currents sometimes seen with higher winding pitches, when in parallel with the mains. A fully connected damper winding reduces oscillations during paralleling. This winding, with the 2/3 pitch and carefully selected pole and tooth designs, ensures very low waveform distortion.

TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation.

INSULATION/IMPREGNATION

The insulation system is class 'H'.

All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

QUALITY ASSURANCE

Generators are manufactured using production procedures having a quality assurance level to BS EN ISO 9001.

The stated voltage regulation may not be maintained in the presence of certain radio transmitted signals. Any change in performance will fall within the limits of Criteria 'B' of EN 61000-6-2:2001. At no time will the steady-state voltage regulation exceed 2%.

DE RATES

All values tabulated on page 6 are subject to the following reductions

5% when air inlet filters are fitted.

3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.

3% for every 5 C by which the operational ambient temperature exceeds 40 C.

Note: Requirement for operating in an ambient exceeding 60 C must be referred to the factory.

NB Continuous development of our products entitles us to change specification details without notice, therefore they must not be regarded as binding.

Front cover drawing typical of product range.

APPROVED DOCUMENT

UCDI274J

STAMFORD**WINDING 17**

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.		
A.V.R.	MX321	MX341	
VOLTAGE REGULATION	± 0.5 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 5)		

CONTROL SYSTEM	SELF EXCITED		
A.V.R.	SX460	AS440	
VOLTAGE REGULATION	± 1.5 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	SERIES 4 CONTROL DOES NOT SUSTAIN A SHORT CIRCUIT CURRENT		

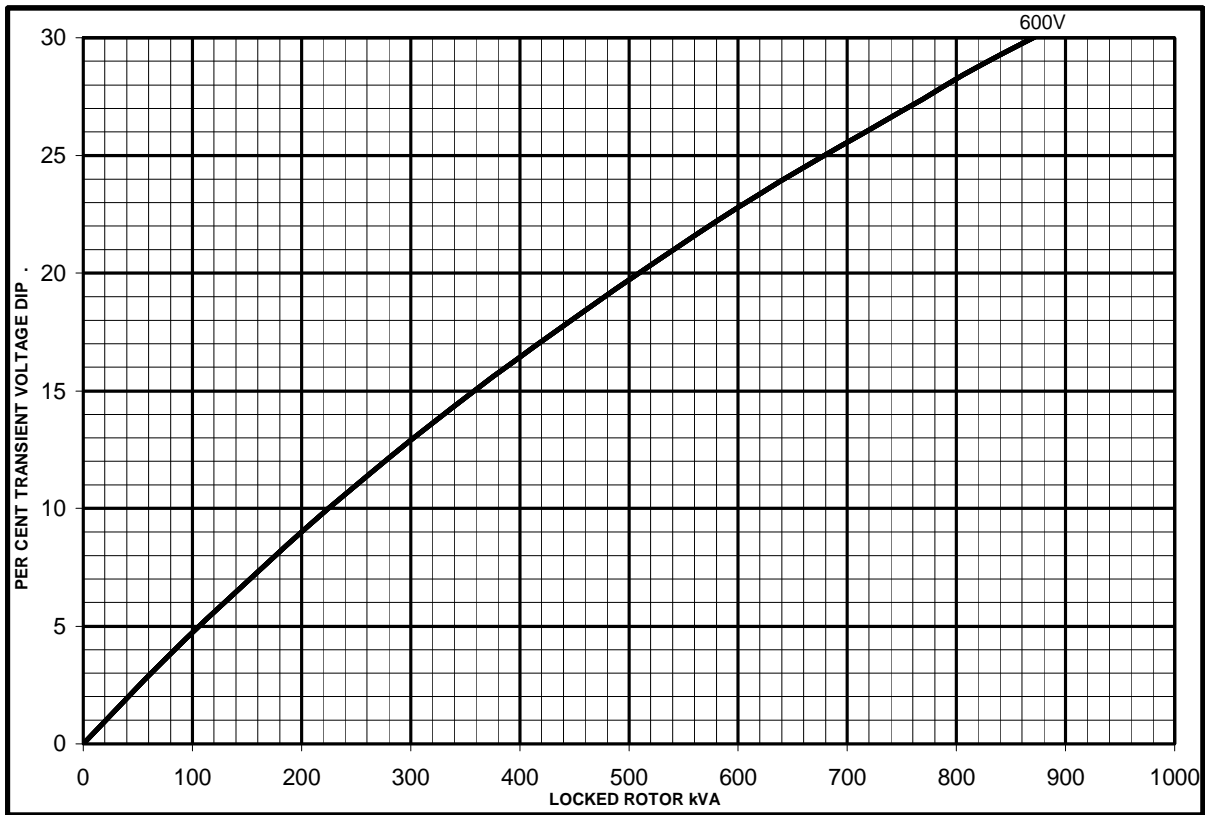
INSULATION SYSTEM	CLASS H		
PROTECTION	IP23		
RATED POWER FACTOR	0.8		
STATOR WINDING	DOUBLE LAYER CONCENTRIC		
WINDING PITCH	TWO THIRDS		
WINDING LEADS	12		
STATOR WDG. RESISTANCE	0.017 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED		
ROTOR WDG. RESISTANCE	2.08 Ohms at 22°C		
EXCITER STATOR RESISTANCE	20 Ohms at 22°C		
EXCITER ROTOR RESISTANCE	0.091 Ohms PER PHASE AT 22°C		
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4, VDE 0875G, VDE 0875N. refer to factory for others		
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%		
MAXIMUM OVERSPEED	2250 Rev/Min		
BEARING NON-DRIVE END	BALL. 6310-2RS (ISO)		
	1 BEARING		
WEIGHT COMP. GENERATOR	727 kg		
WEIGHT WOUND STATOR	304 kg		
WEIGHT WOUND ROTOR	271.9 kg		
WR ² INERTIA	2.3744 kgm ²		
SHIPPING WEIGHTS in a crate	740 kg		
PACKING CRATE SIZE	123 x 67 x 103(cm)		
TELEPHONE INTERFERENCE	THF<2%		TIF<50
COOLING AIR	0.69 m ³ /sec 1463 cfm		
VOLTAGE SERIES STAR	600V		
VOLTAGE PARALLEL STAR	300V		
VOLTAGE SERIES DELTA	346V		
KVA BASE RATING FOR REACTANCE VALUES	305		
X _d DIR. AXIS SYNCHRONOUS	2.01		
X' _d DIR. AXIS TRANSIENT	0.12		
X'' _d DIR. AXIS SUBTRANSIENT	0.07		
X _q QUAD. AXIS REACTANCE	0.92		
X'' _q QUAD. AXIS SUBTRANSIENT	0.11		
X _L LEAKAGE REACTANCE	0.06		
X ₂ NEGATIVE SEQUENCE	0.09		
X ₀ ZERO SEQUENCE	0.04		
REACTANCES ARE SATURATED		VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED	
T' _d TRANSIENT TIME CONST.	0.045s		
T'' _d SUB-TRANSTIME CONST.	0.015s		
T' _{do} O.C. FIELD TIME CONST.	1.27s		
T _a ARMATURE TIME CONST.	0.03s		
SHORT CIRCUIT RATIO	1/X _d		

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Winding 17

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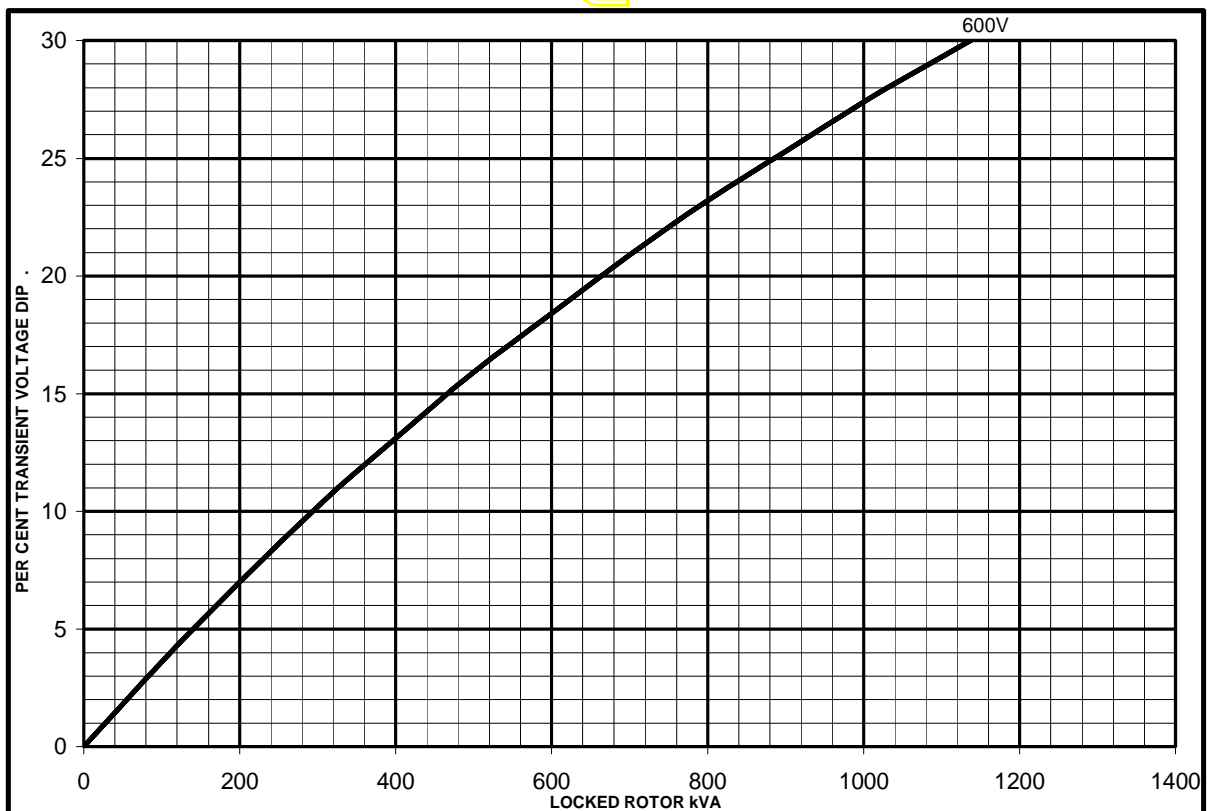
SX

Locked Rotor Motor Starting Curves



OCU

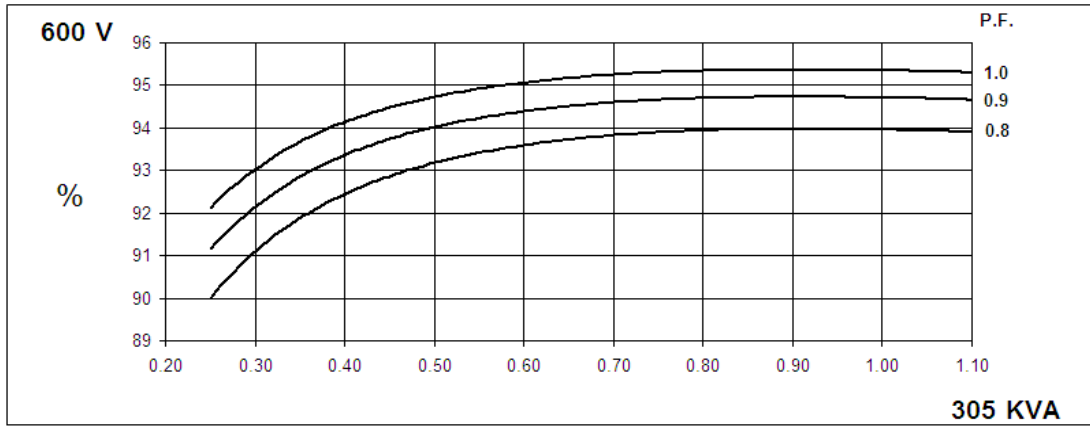
MX



UCDI274J
Winding 17

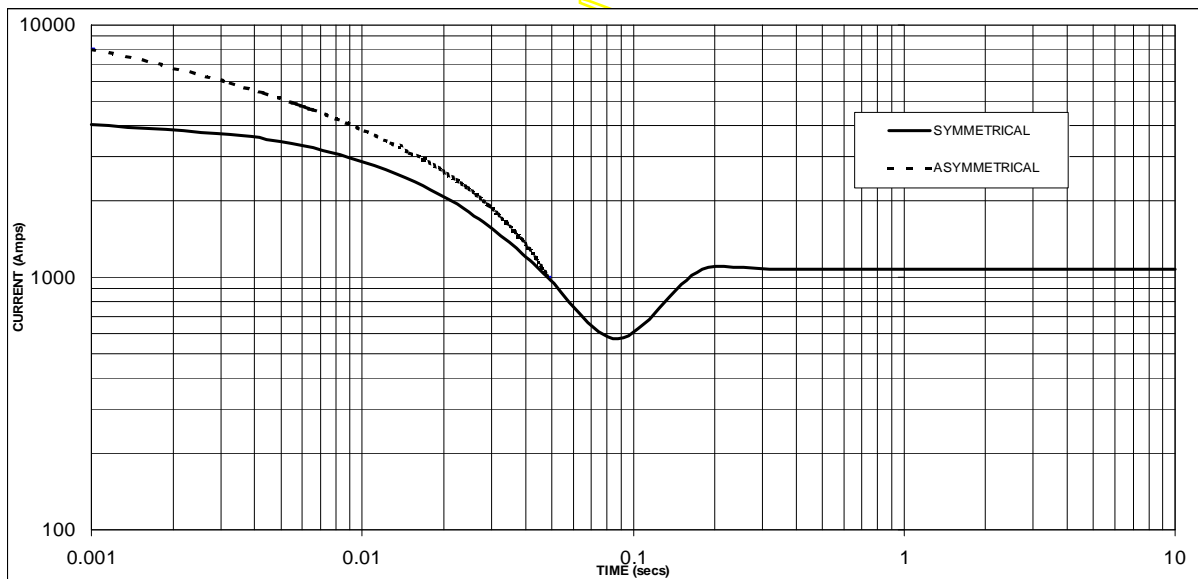
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THREE PHASE EFFICIENCY CURVES



PPRO

Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed Based on star (wye) connection.



Sustained Short Circuit = 1075 Amps

Note

The following multiplication factor should be used to convert the values from curve for the various types of short circuit :

	3-phase	2-phase L-L	1-phase L-N
Instantaneous	x 1.00	x 0.87	x 1.30
Minimum	x 1.00	x 1.80	x 3.20
Sustained	x 1.00	x 1.50	x 2.50
Max. sustained duration	10 sec.	5 sec.	2 sec.

All other times are unchanged

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Winding 17 / 0.8 Power Factor

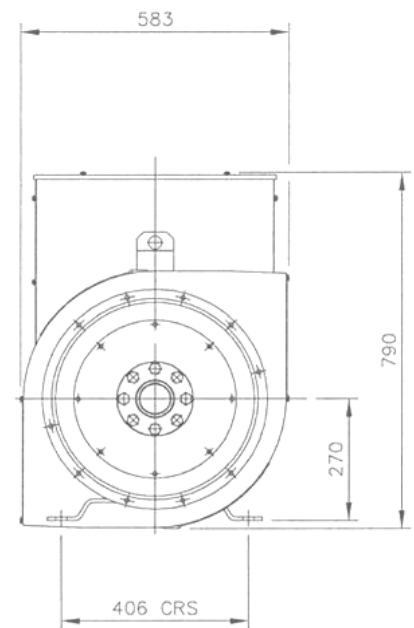
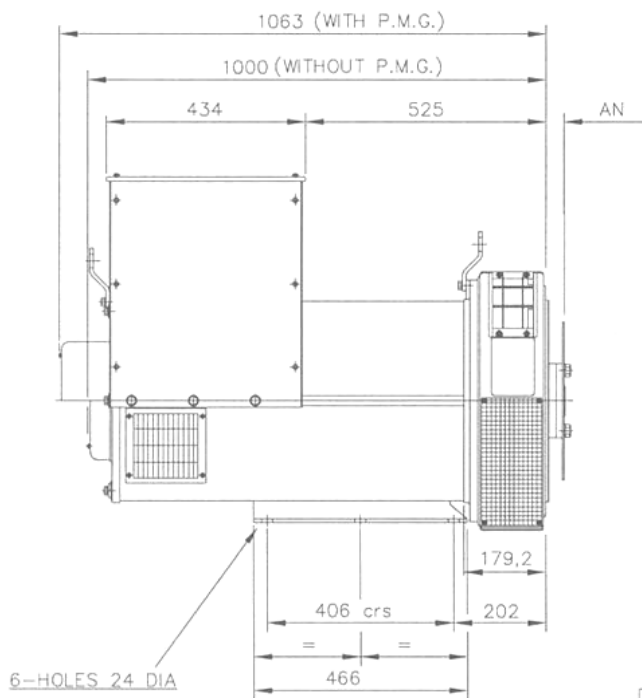
60Hz

RATINGS

Class - Temp Rise	Cont. F - 105/40°C	Cont. H - 125/40°C	Standby - 150/40°C	Standby - 163/27°C
Series Star (V)	600	600	600	600
Parallel Star (V)	300	300	300	300
Series Delta (V)	346	346	346	346
kVA	281.0	305.0	328.0	334.0
kW	224.8	244.0	262.4	267.2
Efficiency (%)	94.0	94.0	93.9	93.9
kW Input	239.2	259.7	279.4	284.6

APPROVED

DIMENSIONS



COUPLING DISC	AN
SAE 11,5	39,68
SAE14	25,4

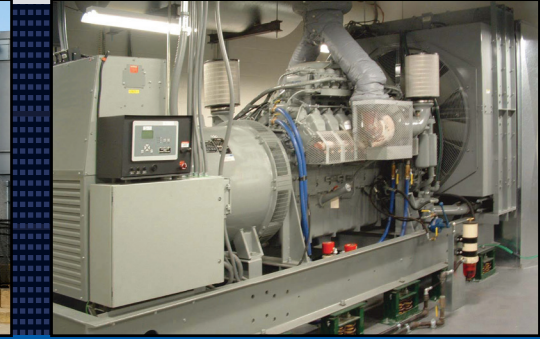
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STAMFORD

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A highly advanced integrated genset control system, this device provides genset control, transfer switch control, metering, protection, and programmable logic in a simple, easy-to-use, reliable, rugged, and cost effective package.

FEATURES

- Generator metering (includes three-phase mains)
- Engine and generator protection: 27, 32R, 40Q, 59, 810/U
- Optional enhanced generator protection: 47, 51, 78, and 81ROCOF
- Load sharing and generator sequencing (via LSM-200 Load Share Module)
- Var sharing over Ethernet (via LSM-200)
- BESTCOMSP^{Plus}® Software
 - Programming and setup
 - Intuitive and powerful
 - Remote control and monitoring
 - Programmable logic
 - USB communications
- Automatic transfer switch control
- Automatic synchronizer (optional)
- Exercise timer
- SAE J1939 engine ECU communications
- Automatic generator configuration detection
- Expandable functionality via add-on modules
 - [LSM-200 Load Share Module](#)
 - [CEM-200 Contact Expansion Module](#)
 - [AEM-200 Analog Expansion Module](#)
- Multilingual capability
- Remote communications to Basler's RDP-110 (remote display panel)
- Sixteen programmable contact inputs
- Up to 15 contact outputs: 3 contacts rated for 30 Adc and up to 12 programmable contacts rated for 2 Adc

BENEFITS

- Provides integrated engine-genset control, protection, and metering in a single package.
- The Offline Simulator, provided in BESTlogic™*Plus*, helps test and troubleshoot logic without the need for expensive hardware.
- Flexible programmable logic and programmable I/O make it easy to expand the DGC-200's inputs and outputs with the CEM-200 (Contact Expansion Module) and the AEM-200 (Analog Expansion Module). This saves time and money by eliminating unnecessary external PLCs and control relaying.

Visit www.basler.com FOR ADDITIONAL INFORMATION.

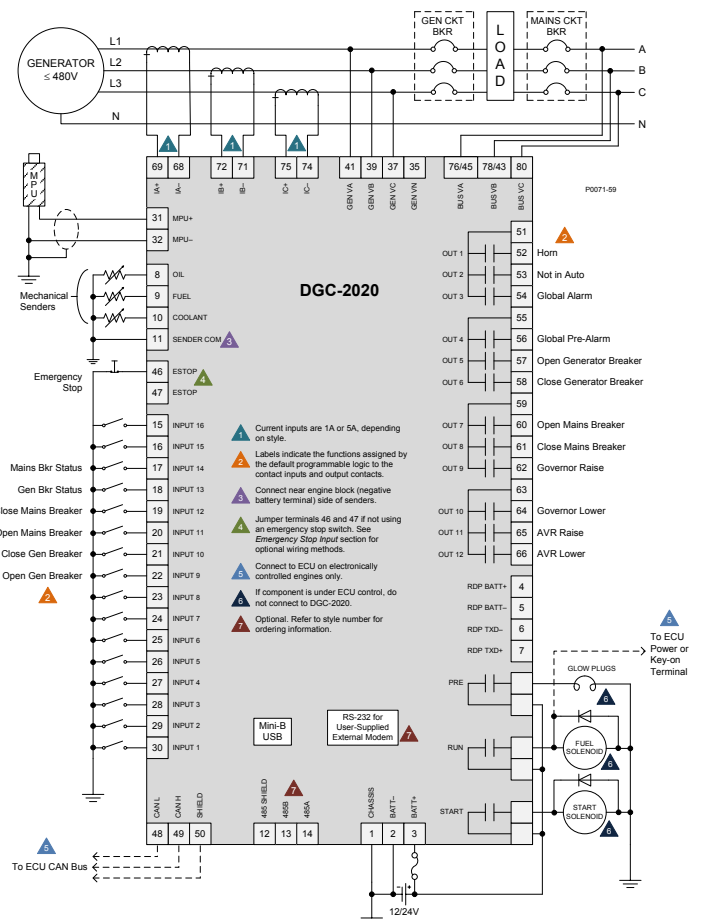


Figure 1 - DGC-200 Connection Diagram for a Typical Application

SPECIFICATIONS

Power Supply

Nominal: 12 or 24 Vdc
 Range: 6 to 32 Vdc
 Battery Ride Through: Starting at 10 Vdc, withstands cranking ride-through down to 0 V for 50 ms

Power Consumption

Sleep Mode: 5 W
 Normal Operational Mode: 7.9 W
 Maximum: 14.2 W

Current Sensing

1 A Sensing: 0.02 to 1.0 Aac, continuous
 2 Aac for 1 second
 5 A Sensing: 0.1 to 5.0 Aac, continuous
 10 Aac for 1 second
 Burden: 1 VA

Voltage Sensing

Range: 12 to 576 Vrms L-L
 Frequency Range: 10 to 72 Hz for 50/60 Hz style,
 10 to 480 Hz for 400 Hz style
 Burden: 1 VA
 One-second Rating: 720 Vrms

Contact Sensing

Contact Inputs (16): Accepts normally open (N.O.), Dry Contacts, programmable
 Emergency Stop: Normally closed (N.C.), Dry Contact

Engine Speed Sensing

Magnetic Pickup:
 Voltage Range: 6 to 70 Vpp
 Frequency Range: 32 to 10,000 Hz
 Generator Frequency:
 Generator Voltage Range: 12 to 576 Vrms
 Via ECU over J1939

Resistive Senders

Fuel Level Sender: 0 to 250 Ω nominal
 Coolant Temp Sender: 10 to 2,750 Ω nominal
 Oil Pressure Sender: 0 to 250 Ω nominal

Output Contacts

Fuel Solenoid, Engine Crank,
 Pre-Start Relays Rating: 30 Adc at 28 Vdc-make, break, and carry
 Programmable Relays: Up to 12
 Rating: 2 Adc at 28 Vdc-make, break, and carry

Protection

Generator: 27, 32R, 40Q, 59, 810/U (standard)
 47, 51, 78, 81 ROCOF (optional)
 Engine: Oil pressure, coolant temperature, overcrank, ECU-specific elements, and diagnostic reporting.

Agency Approvals

CSA certified, NFPA compliant, CE compliant,
 UL recognized (Hazardous Location certification available upon request), EAC certified

Communication

USB Port: USB 2.0, Mini-B jack
 RS-485 (optional): 9600 baud, 8 data bits, no parity
 RDP-110 (optional): 4,000 ft (1,219 m) max wire length, 20 AWG (0.52 mm²) min wire size
 Modem (optional): DB-9 connector (male)
 CAN bus: 250 kb/s communication rate, 1.5 to 3 Vdc differential bus

Environmental

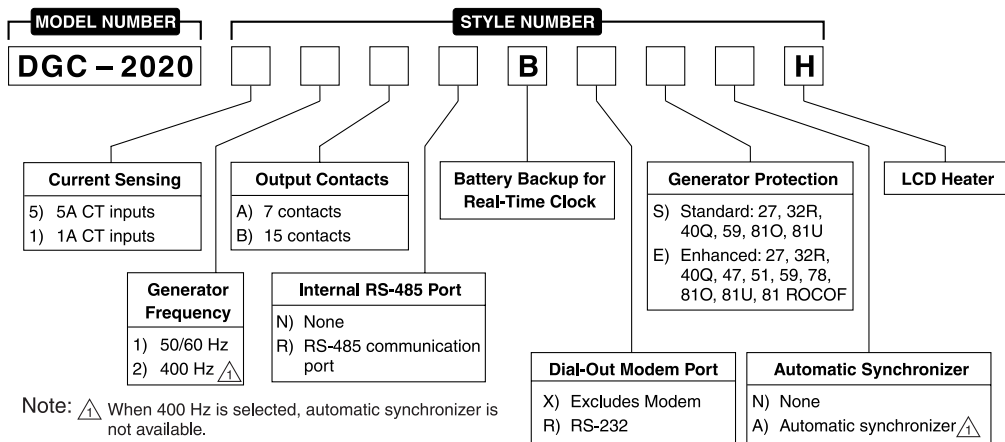
Operating Temp: -40°C to 70°C (-40°F to 158°F)
 Storage Temp: -40°C to 85°C (-40°F to 185°F)
 Humidity: IEC 68-2-38
 Salt Fog: ASTM B 17-73, IEC 68-2-11
 Ingress Protection: IEC IP54 for front panel
 Shock: 15 G in three perpendicular planes
 Vibration:
 5 to 29 Hz: 1.5 G peak
 29 to 52 Hz: 0.036" (0.914 mm) double amplitude
 52 to 500 Hz: 5 G peak

Physical

Weight: 4.4 lb (2 kg)
 Dimensions (WxHxD): 11.77 x 8.27 x 2.69 inches (299 x 210 x 69 mm)

For complete specifications, download the instruction manual at www.basler.com.

STYLE CHART



RELATED PRODUCTS

- [BE1-11g Generator Protection System](#)
 - A complete generator protection system.
- [DECS-250 Digital Excitation Control System](#)
 - Total control in a compact package provides precise voltage, var and power factor regulation, exceptional system response, and generator protection.

ACCESSORIES

- [AEM-2020 Analog Expansion Module](#)
 - Easily increases the functionality by seamlessly adding analog inputs and outputs.
- [CEM-2020, CEM-2020H Contact Expansion Module](#)
 - Each module adds 10 inputs and up to 24 outputs that are easily programmed through BESTCOMSPUs[®] for easy integration into the system.
- [LSM-2020 Load Share Module](#)
 - The simple-to-use LSM-2020 easily adds paralleling capabilities with little effort and expense.
- [RDP-110 Remote Display Panel](#)
 - Provides remote alarm and pre-alarm indication and annunciation of system status, easily meeting the annunciation requirements of NFPA-110 applications.



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 Singapore 179098
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 e-mail: singaporeinfo@basler.com

Tmax-Molded Case Circuit Breakers

T4 250A Frame

AC Circuit Breakers and Switches

DC Circuit Breakers and Switches

3 and 4 Pole

Motor Circuit Protectors

Higher Performances in Less Space

Field Installable Accessories and Trip Units



Dimensions 3P Fixed Version 8.07H x 4.13W x 4.07D

Compliance with Standards

UL 489

CSA C22.2 No.5.1

IEC 60947-2

Standards

EC directive:

- "Low Voltage Directives" (LVD) no. 73/23 EEC

- "Electromagnetic Compatibility Directive" (EMC) no.89/336 EEC

The ABB Quality System complies with the international ISO 9001 - 2000 Standard (model for quality assurance in design, development, construction, and installation and service) and with the equivalent European EN ISO 9001 and Italian UNI EN ISO 9001 Standards

Interrupting ratings (RMS sym. kAmps)

T4

Continuous Current Rating

250A

Number of Poles

3-4

		N	S	H	L	V
AC						
240V		65	100	150	200	200
480V		25	35	65	100	150
600V		18	25	35	65	100
DC*						
500V	2 poles in series	25	35	50	65	100
600V	3 poles in series	16	25	35	50	65

*Thermo Magnetic Trip Only



Company Quality Systems and Environmental Systems

The new Tmax series has a hologram on the front, obtained using special anti-imitation techniques, which guarantees the quality and that the circuit breaker is an original ABB product.

Attention to protection of the environment and to health and safety in the work place is another priority commitment for ABB and, as confirmation of this, the company environmental management system has been certified by RINA in 1997, in conformity with the international ISO 14001 Standard. This certification has been integrated in 1999 with the Management System for Health and Safety in the workplace, according to OHSAS 18001 (British Standards), obtaining one of the first certification of integrated management System, QES (Quality, Environment,

Safety) issued by RINA. ABB - the first industry in the electro-mechanical section in Italy to obtain this recognition - thanks to a revision of the production process with an eye to ecology has been able to reduce the consumption of raw materials and waste from processing by 20%. ABB's commitment to safeguarding the environment is also shown in a concrete way by the Life Cycle Assessments of its products carried out directly by the ABB Research and Development in collaboration with the ABB Research Center. Selection of materials, processes and packing materials is made optimizing the true environmental impact of the product, also foreseeing the possibility of its being recycled.

Mounting

Fixed
Plug-in
Drawout

Connections

Busbar connection or compression lugs
Pressure-type terminals for bare cables
Rear connections

Trip Unit

TMF thermo magnetic trip units, with fixed thermal and magnetic threshold ($I_3 = 10 \times I_n$);

TMD (up to 50 A) thermo magnetic trip units with adjustable thermal threshold ($I_1 = 0.7 \dots 1 \times I_n$) and fixed magnetic threshold ($I_3 = 10 \times I_n$).

TMA thermo magnetic trip units, with adjustable thermal threshold ($I_1 = 0.7 \dots 1 \times I_n$) and adjustable magnetic threshold ($I_3 = 5 \dots 10 \times I_n$).

PR221DS, PR222DS/P and PR222DS/PD-A electronic trip unit

Weight (lbs)	6.18
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Auxiliary Devices for Indication and Control

- Auxiliary contacts - AUX
- Undervoltage release - UVR
- Shunt trip - SOR
- Terminal covers
- Front for lever operating mechanism - FLD
- Direct rotary handle - RHD
- Stored energy motor operator - MOE
- Key lock - KLF
- Early auxiliary contact - AUE
- Transmitted rotary handle - RHE
- Front terminal for copper cable - FC Cu
- Front extended terminal - EF
- Front terminal for copper-aluminum - FC CuAl
- Front extended spread terminal - ES
- Distribution lugs
- Rear orientated terminal - R
- Phase separators
- Residual current release (IEC Only)



ABB Inc.

1206 Hatton Road
Wichita Falls, TX 76302
For more information and
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field office please go to
www.abb-control.com

Tmax-Molded Case Circuit Breakers

T5 400A and 600A Frame

AC Circuit Breakers and Switches

DC Circuit Breakers and Switches (400A Only)

3 and 4 Pole

Motor Circuit Protectors

Higher Performances in Less Space

Field Installable Accessories and Trip Units



Dimensions 3P Fixed Version 8.07H x 5.51W x 4.07D

Compliance with Standards

UL 489

CSA C22.2 No.5.1

IEC 60947-2

Standards

EC directive:

- "Low Voltage Directives" (LVD) no. 73/23 EEC

- "Electromagnetic Compatibility Directive" (EMC) no.89/336 EEC

The ABB Quality System complies with the international ISO 9001 - 2000 Standard (model for quality assurance in design, development, construction, and installation and service) and with the equivalent European EN ISO 9001 and Italian UNI EN ISO 9001 Standards

Interrupting ratings (RMS sym. kAmps)

T5

Continuous Current Rating

400-600A

Number of Poles

3-4

		N	S	H	L	V
AC						
240V		65	100	150	200	200
480V		25	35	65	100	150
600V		18	25	35	65	100
DC* (400 A only)						
500V	2 poles in series	25	35	50	65	100
600V	3 poles in series	16	25	35	50	65

*Thermo Magnetic Trip Only



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Mounting

Fixed
Plug-in
Drawout

Connections

Busbar connection or compression lugs
Pressure-type terminals for bare cables
Rear connections

Trip Unit

TMA thermo magnetic trip units, with adjustable thermal threshold ($I_1 = 0.7 \dots 1 \times I_n$) and adjustable magnetic threshold ($I_3 = 5 \dots 10 \times I_n$).

PR221DS, PR222DS/P and PR222DS/PD-A electronic trip unit

Weight (lbs)	8.55
---------------------	------

Auxiliary Devices for Indication and Control

- Auxiliary contacts - AUX
- Undervoltage release - UVR
- Shunt trip - SOR
- Terminal covers
- Front for lever operating mechanism - FLD
- Direct rotary handle - RHD
- Stored energy motor operator - MOE
- Key lock - KLF
- Early auxiliary contact - AUE
- Transmitted rotary handle - RHE
- Front terminal for copper cable - FC Cu
- Front extended terminal - EF
- Front terminal for copper-aluminum - FC CuAl
- Front extended spread terminal - ES
- Distribution lugs
- Rear orientated terminal - R
- Phase separators
- Residual current release (IEC Only)



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Tmax-Molded Case Circuit Breakers

T6 800A Frame

AC Circuit Breakers and Switches

DC Circuit Breakers and Switches

3 and 4 Pole

Motor Circuit Protectors

Higher Performances in Less Space

Field Installable Accessories and Trip Units



Dimensions 3P Fixed Version 10.55H x 8.26W x 4.07D

Weight 20.9 (lbs)

Compliance with Standards

UL 489

CSA C22.2 No.5.1

IEC 60947-2

Standards

EC directive:

– “Low Voltage Directives” (LVD) no. 73/23 EEC

– “Electromagnetic Compatibility Directive” (EMC) no.89/336 EEC

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Interrupting ratings (RMS sym. kAmps)

		T6			
Continuous Current Rating		800			
Number of Poles		3-4			
		N	S	H	L
AC					
240V		65	100	200	200
480V		35	50	65	100
600V		20	25	35	42
DC*					
500V	2 poles in series	35	35	50	65
600V	3 poles in series	20	20	35	50

*Thermal Magnetic Trip Only



Company Quality Systems and Environmental Systems

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Mounting

Fixed
Drawout

Connections

Busbar connection or compression lugs
Pressure-type terminals for bare cables
Rear connections

Trip Unit

TMA thermal magnetic trip units, with adjustable thermal threshold ($I_1 = 0.7 \dots 1 \times I_n$) and adjustable magnetic threshold ($I_3 = 5 \dots 10 \times I_n$).

PR221DS, PR222DS/P, and PR222DS/PD-A electronic trip unit

Auxiliary Devices for Indication and Control

- Auxiliary contacts - AUX
- Undervoltage release - UVR
- Shunt trip - SOR
- Terminal covers
- Front for lever operating mechanism - FLD
- Direct rotary handle - RHD
- Stored energy motor operator - MOE
- Key lock - KLF
- Early auxiliary contact - AUE
- Transmitted rotary handle - RHE
- Front extended terminal - EF
- Front terminal for copper-aluminum - FC CuAl
- Front extended spread terminal - ES
- Rear orientated terminal - R
- Phase separators
- Residual current relay (IEC Only)



ABB Inc.

1206 Hatton Road
Wichita Falls, TX 76302
For more information and
the location of your local
field office please go to
www.abb-control.com

Digital Linear Chargers

Specifications

- Waterproof, shock-and vibration-resistant aluminum construction
- Saltwater tested and fully corrosion-resistant
- Short circuit, reverse polarity, and ignition protected
- For use with 12V/6 cell batteries that are flooded/wet cell, maintenance free or starved electrolyte (AGM) only
- FCC compliant
- UL listed to marine standard 1236
- 3 year warranty
- Replaces all existing current on-board chargers (excluding portables)
- No Price Increase
- Availability: November 2010



DIGITAL LINEAR ON-BOARD CHARGERS

PRODUCT CODE	PRODUCT DESCRIPTION
1821065	MK 106D (1 bank x 6 amps)
1821105	MK-110D (1 bank x 10 amps)
1822105	MK-210D (2 bank x 5 amps)
1823155	MK-315D (3 bank x 5 amps)
1822205	MK-220D (2 bank x 10 amps)
1823305	MK-330D (3 bank x 10 amps)
1824405	MK-440D (4 bank x 10 amps)
1822305	MK-230D (2 bank x 15 amps)
1823455	MK-345D (3 bank x 15 amps)
1824605	MK-460D (4 bank x 15 amps)

Digital Linear Chargers

Specifications (cont.)

- New 4-color package design

minnkotamotors.com

MINN-KOTA

ON-BOARD MARINE BATTERY CHARGER

DIGITALLY CONTROLLED 2X FASTER CHARGING PROTECTS BATTERIES

Digital CONTROL

MK210D

MK 210D
2 CHARGING BANKS
5 AMPS PER BANK
10 AMPS TOTAL OUTPUT

UL LISTED FC 10AMPS

CHARGING TECHNOLOGY

CHARGING TECHNOLOGY

DIGITALLY CONTROLLED.
Microprocessor design protects your batteries so you can stay on the water longer. It monitors temperature and state of charge to create a faster, regulated, more precise charge. Also includes automatic shut-off when charging is complete to extend battery life.

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ENHANCED STATUS CODES.
Provides comprehensive feedback on charge stage, maintenance mode status, error notification and full charge.

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Provides comprehensive feedback on charge stage, maintenance mode status, error notification and full charge.

Digital CONTROL

MULTI-STAGE CHARGING

AMPS & VOLTS

TIME (THREE STAGE CHARGER)

BULK ABSORPTION MAINTENANCE

absorption voltage (output voltage)

BATTERY VOLTAGE

BATTERY TEMPERATURE (degrees F)

MULTI-STAGE CHARGING.
Delivers a fast, precise charge profile by automatically controlling current and voltage without overcharging your batteries.

MULTI-STAGE CHARGING.
Delivers a fast, precise charge profile by automatically controlling current and voltage without overcharging your batteries.

AUTOMATIC TEMPERATURE COMPENSATION.
Adjusts output voltage based on ambient temperature to ensure a full charge and protect your batteries.

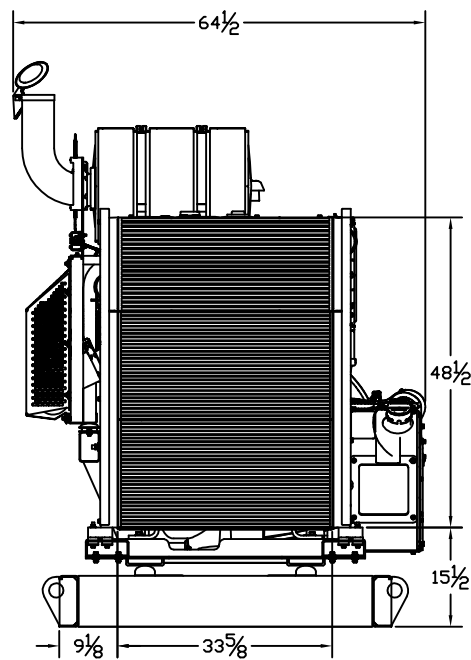
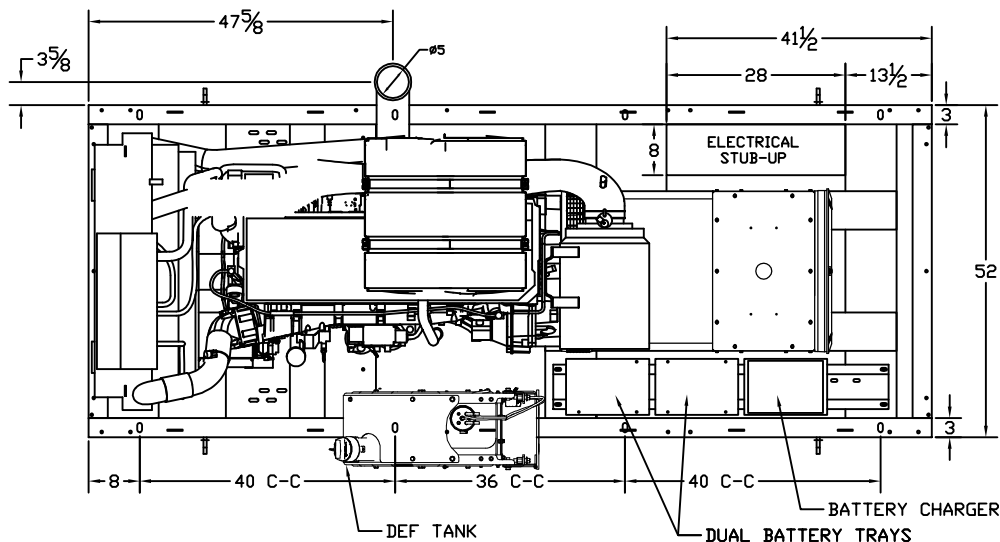
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2010

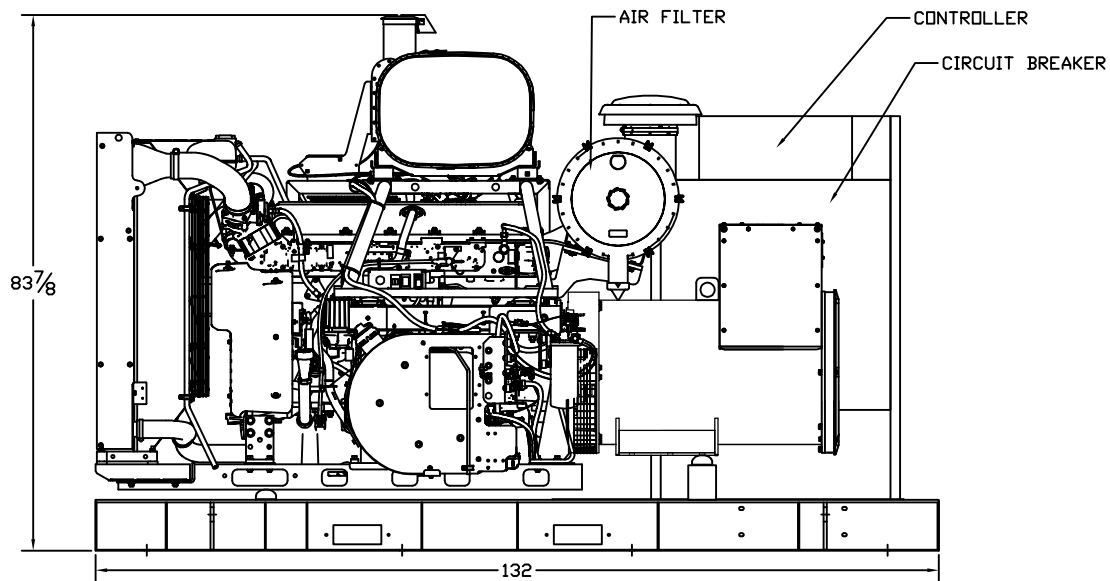


OUTLINE DIMENSIONS FOR T4D-2000 OPEN

TOP VIEW



RADIATOR END VIEW

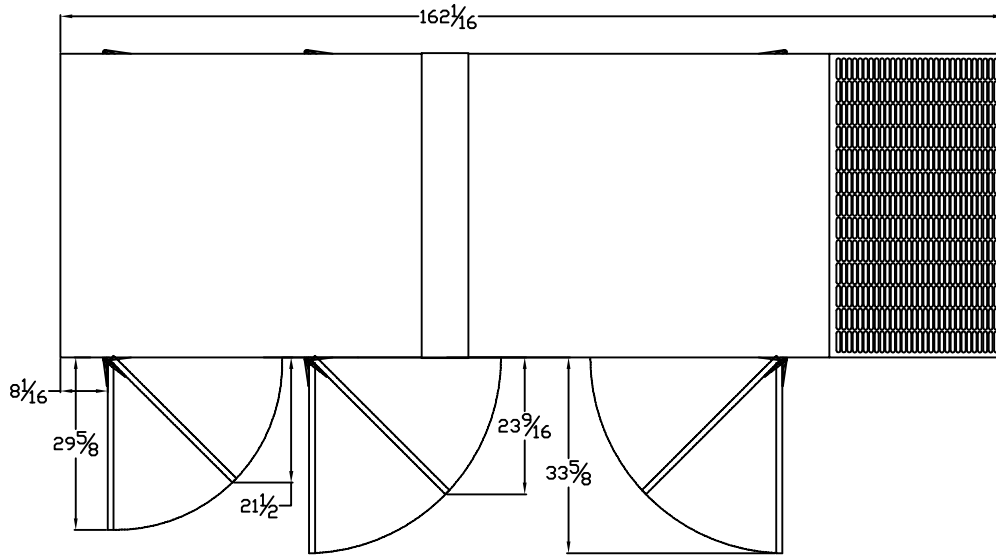


RIGHT SIDE VIEW

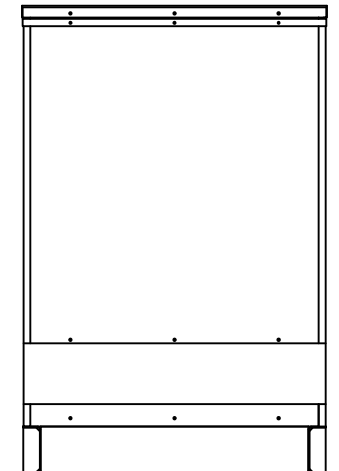
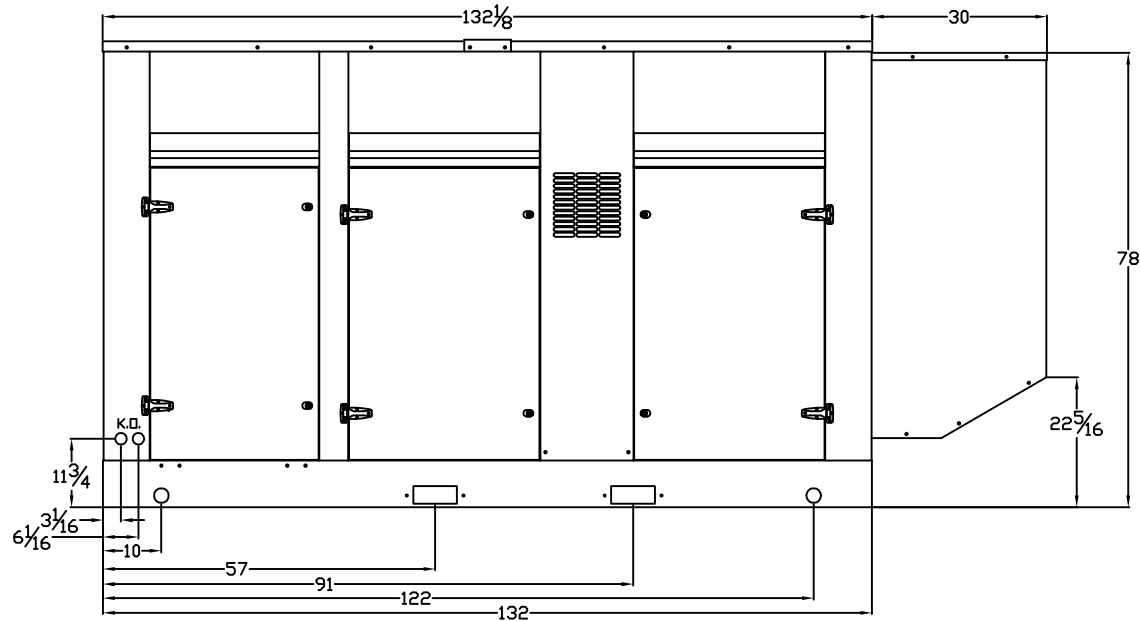
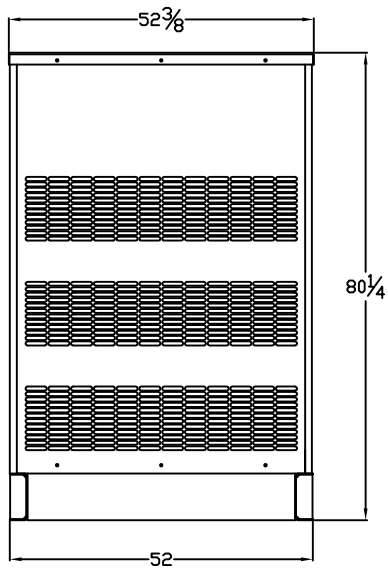
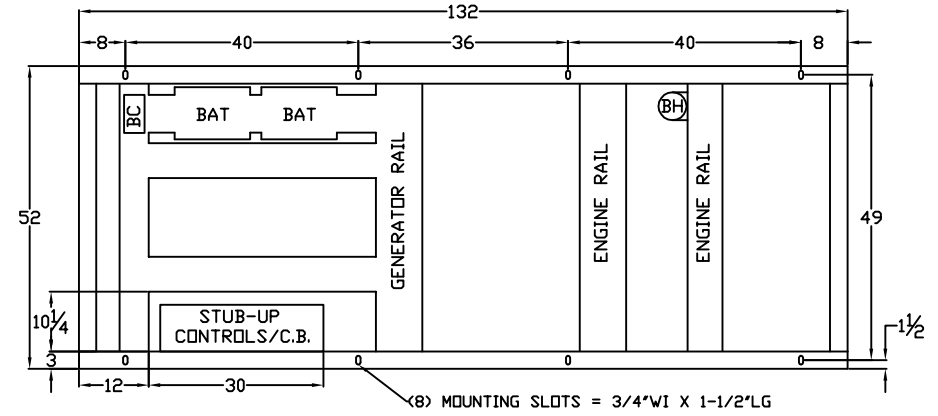
OUTLINE DIMENSIONS FOR T4D 100 - 200 KW LEVEL 2 ENCLOSURE (HINGED DOORS)

TOP VIEW

<GEN-SET HAS (6) DOORS, (3) SHOWN OPEN ARE TYPICAL FOR BOTH SIDES>



FRAME VIEW



GENERATOR END VIEW

SIDE VIEW

RADIATOR END VIEW