



GILLETTE GENERATORS

LIQUID COOLED NAT. GAS ENGINE GENERATOR SET

60 HZ MODEL
SP-2500P

Model	STANDBY 120°C RISE		
	HZ	LPG	N.G.
SP-2500P-60 HERTZ	60	165	250



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



UL2200, 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

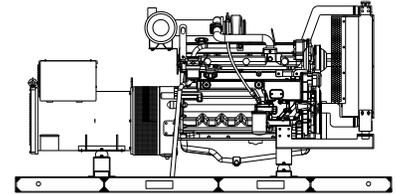


ASCE 7-22

All generator sets meet 200 MPH rating.

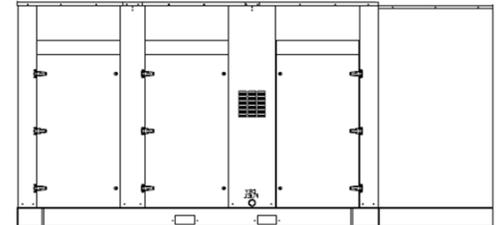


EPA 40CFR Part 60, 1048, 1054, 1065, 1068



“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	LIQUID PROPANE GAS FUEL		NATURAL GAS FUEL	
	L-N	L-L			120°C RISE STANDBY RATING		120°C RISE STANDBY RATING	
					KW/KVA	AMP	KW/KVA	AMP
SP-2500P-3-2	120	208	3	60	165/206	582	250/312.5	867
SP-2500P-3-3	120	240	3	60	165/206	505	250/312.5	751
SP-2500P-3-4	277	480	3	60	165/206	251	250/312.5	375
SP-2500P-3-16	346	600	3	60	165/206	202	250/312.5	300

RATINGS: All three phase gen-sets are 12 lead windings, rated at .8 power factor. 120°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. 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 on 120°C (standby) 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 AND ENGINEERING DATA FOR MODEL SP-2500P-60 HZ

GENERATOR SPECIFICATIONS

Manufacturer.....Stamford Electric Generators
 Model & Type..... S4L1DD-311, 4 Pole, 12 Lead, Three Phase
S4L1SC-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.....Field convertible, 60 HZ to 50 HZ
 Frequency Regulation.....½% (½ cycle, no load to full load)
 Unbalanced Load Capability..... 100% of standby amps
 Total Stator and Load Insulation.....Class H, 180°C
 Temperature Rise..... 120°C R/R, standby rating @ 40°C amb.
 3 Ø Motor Starting @ 30% Voltage Dip (208-240V).....730 kVA
 3 Ø Motor Starting @ 30% Voltage Dip (480V).....990 kVA
 3 Ø Motor Starting @ 30% Voltage Dip (600V).....700 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)
 Ltd. Warranty Period..... 24 Months from date of start-up or
 1000 hours use, first to occur.

GENERATOR FEATURES

- World Renown Stamford Electric Generator having UL-1446 certification on full amortisseur windings.
- Full generator protection with **Deep Sea 7420** 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.
- Complete engine-generator torsional acceptance, confirmed during initial prototype testing.
- Full load testing on all engine-generator sets, before shipping.
- Self ventilating and drip-proof & revolving field design

ENGINE SPECIFICATIONS AND APPLICATIONS DATA

ENGINE

Manufacturer.....Power Solutions Inc. (PSI)
 Model and Type.....Heavy Duty, 13LTCAC, 4 cycle
 Aspiration.....Turbocharged & Charge Air Cooled
 Cylinder Arrangement..... 6 Cylinders, In-Line
 Displacement Cu. In. (Liters).....765 (12.54)
 Bore & Stroke In. (mm)..... 5 x 6.5 (127 x 165)
 Compression Ratio..... 10.5:1
 Main Bearings & Style..... 10, Precision Half-Shell
 Cylinder Head.....Cast Iron
 Pistons..... Cast Aluminum
 Crankshaft..... Forged Steel
 Exhaust Valve.....Inconel, A193
 Governor..... Electronic
 Frequency Reg. (no load-full load)..... Isochronous
 Frequency Reg. (steady state)..... ± 1/4%
 Air Cleaner.....Dry, Replaceable Cartridge
 Engine Speed..... 1800
 Piston Speed, ft/min (m/s)..... 1949 (9.9)
 Max Power, bhp (kwm) Standby/LPG.....243 (181)
 Max Power, bhp (kwm) Standby/NG.....402 (300)
 Ltd. Warranty Period..... 12 Months or 2000 hrs., first to occur

FUEL SYSTEM

Type.....LPG or NAT. GAS, Vapor Withdrawal
 Fuel Pressure (kpa), in. H₂O*.....(2.7 – 3.5), 11”-14”
 Secondary Fuel Regulator..... NG or LPG Vapor System
 Auto Fuel Lock-Off Solenoid..... Standard on all sets
 Fuel Supply Inlet Line.....2” NPTF

FUEL CONSUMPTION

LP GAS: FT ³ /HR (M ³ /HR)	STANDBY
100% LOAD	949 (26)
75% LOAD	766 (21)
50% LOAD	475 (13)
LPG = 2500 BTU X FT³/HR = Total BTU/HR LPG Conversion: 8.50 FT³ = 1 LB. : 36.4 FT³ = 1 GAL.	

NAT. GAS: FT ³ /HR (M ³ /HR)	STANDBY
100% LOAD	3418 (97)
75% LOAD	2710 (77)
50% LOAD	2042 (58)
NG = 1000 BTU X FT³/HR = Total BTU/HR	

OIL SYSTEM

Type..... Full Pressure
 Oil Pan Capacity qt. (L).....28 (26.5)
 Oil Pan Cap. W/ filter qt. (L).....31.7 (30)
 Oil Filter..... 2, Replaceable Spin-On

ELECTRICAL SYSTEM

Ignition System.....Electronic
 Eng. Alternator/Starter: 24 VDC, negative ground, 45 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.

APPLICATION AND ENGINEERING DATA FOR MODEL SP-2500P-60 HZ

COOLING SYSTEM

Type of System Pressurized, closed recovery
 Coolant PumpPre-lubricated, self-sealing
 Cooling Fan Type (no. of blades) Pusher (12)
 Fan Diameter inches (mm)..... 34" (863.6)
 Ambient Capacity of Radiator °F (°C)..... 118 (48)
 Engine Jacket Coolant Capacity Gal (L).....5.8 (22)
 Radiator Coolant Capacity Gal. (L) 14.3 (54)
 Maximum Restriction of Cooling Air Intake
 and discharge side of radiator in. H₂O (kpa)..... 0.5 (.125)
 Water Pump Capacity gpm (L/min)..... 159 (600)
 Heat Reject Coolant: Btu/min (kw) 16,229 (287)
 Heat Reject CAC: Btu/min (kw).....2144 (38)
 Low Radiator Coolant Level Shutdown.....Standard
 Note: Coolant temp. shut-down switch setting at 230°F (110°C) with 50/50
 (water/antifreeze) mix.

AIR REQUIREMENTS

Combustion Air, cfm (kg/hr)575 (1157)
 Radiator Air Flow cfm (m³/min).....26697 (756)
 Heat Rejected to Ambient:
 Engine: kw (btu/min).....43 (2462)

EXHAUST SYSTEM

Exhaust Outlet Size.....5"
 Max. Back Pressure, in. hg (KPA).....3.8 (15)
 Exhaust Flow, at rated kw: cfm (m³/min)1855 (52.5)
 Exhaust Temp., at rated kw: °F (°C)1204 (651)
 Engines are EPA certified for Natural Gas.

SOUND LEVELS MEASURED IN dB(A)

	<u>Open Set</u>	<u>Level 2 Encl.</u>
Level 2, Critical Silencer	93.....	80
Level 3, Hospital Silencer.....		75

Note: Open sets (no enclosure) has (2) optional silencer system choices due to unknown job-site applications. Level 2 enclosure has installed critical silencer with upgrade to hospital 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 104F (40°C)

DIMENSIONS AND WEIGHTS

	<u>Open Set</u>	<u>Level 2 Enclosure</u>
Length in (cm).....	152 (368)	200 (508)
Width in (cm).....	72 (183)	72 (183)
Height in (cm).....	80 (203)	94 (239)
Net Weight lbs (kg).....	8175 (3708) ...	10675 (4842)
Net Weight lbs (kg).....	8525 (3867) ...	11025 (5001)

DEEP SEA 7420 MKII DIGITAL MICROPROCESSOR CONTROLLER



Deep Sea 7420

The “7420” controller is an auto start mains (utility) failure module 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.

The “7420” controller will also monitor speed, frequency, voltage, current, oil pressure, coolant temp., and fuel levels. These modules have been designed to display warning and shut down status. It also includes: (11) configurable inputs • (8) configurable outputs • voltage monitoring • mains (utility) failure detection

- (250) event logs • configurable timers • automatic shutdown or warning during fault detection • remote start (on load) • engine preheat • advanced metering capability • hour meter • text LCD displays • protected solid state outputs • test buttons for: stop/reset • manual mode • auto mode • lamp test • start button • power monitoring (kWh, kVAr, kVAh, kVArh) This controller includes expansion features including RS232, RS484 (using MODBUS-RTU/TCP), direct USB connection with PC, expansion optioned using DSENet 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.

LOW LOAD CONDITIONS: Operation of PSI HD engines at low-load conditions should be limited to no more than one (1) hour per twenty-four (24) hour period. If the application requires extended time at light loads, it is recommended that the engine load be increased to at least 70% of mechanical rating for a minimum of two (2) hours per fifty (50) hours of low-load operation. Piston sealing rings rely on adequate cylinder firing pressure and temperature to seal the combustion chamber and prevent excessive engine oil from entering the power cylinder. Under low loads these rings will not seal properly, resulting in oil being burned in the combustion chamber and carbon deposits on pistons and valves. This mechanism is well-documented in reciprocating engines of all fuel types and is often referred to as “wet-stacking.”

STANDARD FEATURES FOR MODEL SP-2500P-60 HZ

STANDARD FEATURES

CONTROL PANEL:

- Deep Sea 7420 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:

- Full flow oil filter • Air filter • Oil pump • Solenoid type starter motor • Hi-temp radiator • Jacket water pump
- Thermostat • Pusher fan and guard • Exhaust manifold
 - 24 VDC battery charging alternator • Flexible exhaust connector • "Isochronous" duty, electronic governor • Secondary dry fuel regulator • Dry fuel lock-off solenoid • Vibration isolators • Closed coolant recovery system with 50/50 water to anti-freeze mixture • flexible oil & radiator drain hose.

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

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:

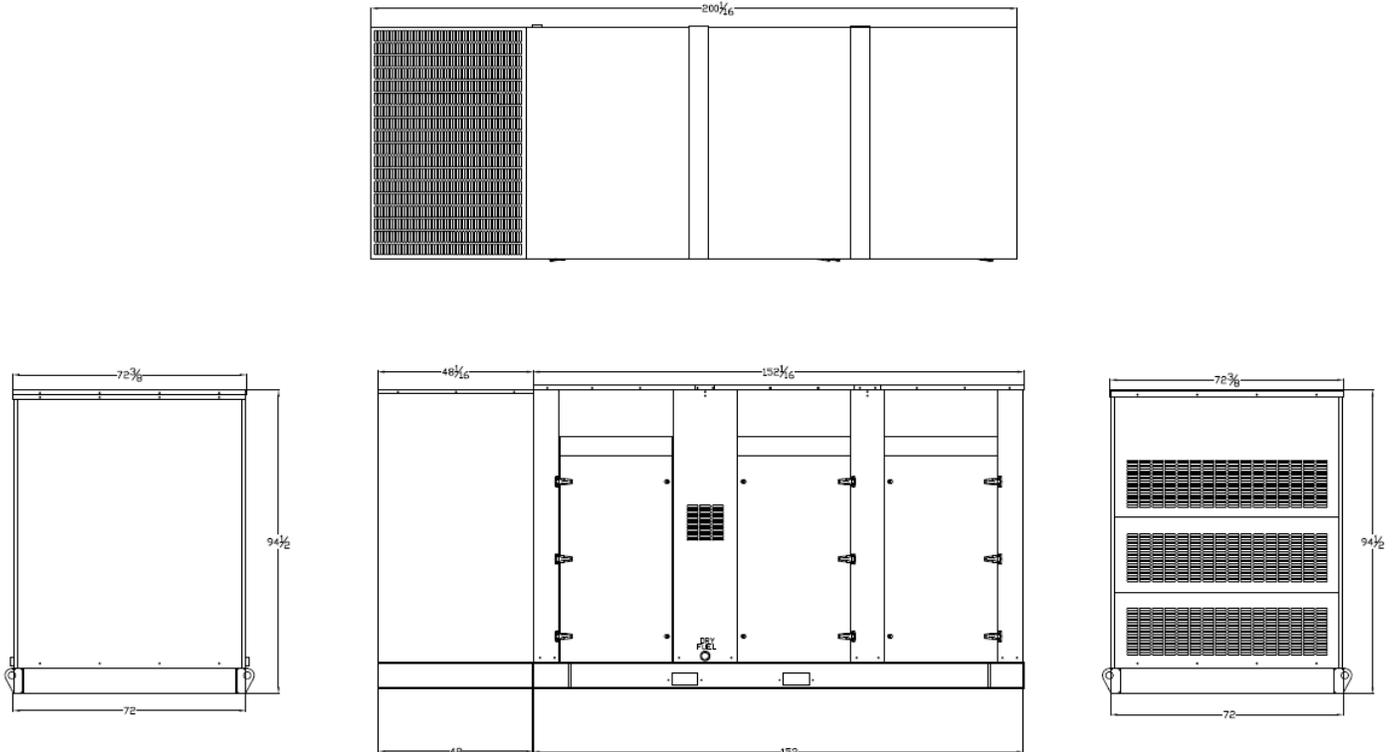
- ½% Voltage regulation • EMI filter • Under-speed protection • Over-excitation protection • total encapsulation

DC ELECTRICAL SYSTEM:

- Battery tray • Battery cables • Battery hold down straps
- 2-stage battery float charger with maintaining & recharging automatic charge stages

WEATHER/SOUND PROOF 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



13L



ENERGY

[Stoich Turbocharged]
56100046 Rev: 3

General Engine Data ³												
Type	Inline 4-cycle				Flywheel housing			SAE No. 1				
Number of cylinders	6				Flywheel			SAE No. 14				
Aspiration	Charged Cooled Forced Induction				Dry Weight (Fan to Flywheel)		lb	kg	2313	1050		
Firing Order	1 - 5 - 3 - 6 - 2 - 4				Wet Weight (Fan to Flywheel)		lb	kg	2423	1100		
Rotation Viewed from Flywheel	Counter Clockwise				CG From Flywheel Housing Rear Face		in	mm	17.8	451		
Bore	in	mm	5.0	127.0	CG Above Crank Centerline		in	mm	6.4	162		
Stroke	in	mm	6.5	165.1	Max Bending Moment @ Rear of Block		lbf-ft	N-m	8238	11170		
Displacement	in ³	L	764.9	12.54	Moment of Inertia About Roll Axis		lbf-ft ²	kg-m ²	1066	45		
Compression Ratio	9.75 : 1				Oil Specification			SAE 15W-40 Low Ash Gas engine oil (.25-.5% by wt), API CD/CF or higher				
Exhaust Manifold Type	Water Cooled				Engine Oil Capacity ⁸		Min	qts	L	28.0	26.5	
Turbo Exhaust Outlet Pipe Size	in	mm	3.15 - 3.37	80.0 - 85.6	Max		qts	L	31.7	30.0		
Catalyst Inlet Size	in	mm	3.5	90	ECU Low Oil Pressure Warning ⁶		psi	bar	30	2.1		
Catalyst Dp	in-H ₂ O	kPa	29.9	7.45	ECU Low Oil Pressure Shutdown ⁶		psi	bar	25	1.7		
Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	3.8	15	Oil Pressure Operating Range		Idle	psi	bar	19 - 36	1.3 - 2.5	
Maximum Fuel System Pressure	psi	kPag	1.0	6.9	Rated		psi	bar	51 - 80	3.5 - 5.5		
Maximum Operating pressure to EPR	in-H ₂ O	kPa	10.8	2.7	Max Allowable Oil Temperature		°F	°C	221	205		
Minimum Operating pressure to EPR	in-H ₂ O	kPa	6.8	1.7	Coolant Capacity (Engine only)		gal	L	5.8	22		
Minimum Gas Supply Pipe Size ⁵	1-1/4" NPT				Coolant Capacity (Radiator only)		gal	L	14.3	54		
Maximum Pressure Drop Across CAC	psi	kPa	1.7	12.0	Radiator Weight (Dry)		lb	kg	705	320		
Maximum Allowable Intake Restriction	Clean Air Filter	in-H ₂ O	kPa	12.0	3.0	Thermostat Operating		Cracking	°F	°C	169	76
	Dirty Air Filter	in-H ₂ O	kPa	24.9	6.2	Temperature Range ⁹		Full Open	°F	°C	190	88
Spark Plug Part Number	Bosch R66857				ECU Coolant Temp Warning		°F	°C	220	103		
Standard Spark Plug Gap ¹⁰	in	mm	0.020	0.5	ECU Coolant Temp Shutdown		°F	°C	230	110		
Spark Plug Coil - Primary Resistance	Ohms				Max External Coolant Friction Head		psi	kPa	7.3	50		
Battery Voltage	Volts				CAC Rise Above Ambient Specified		°F	°C	37.8	21		
Starter Motor Power	HP	kW	7.4	5.5								

Performance Data 60Hz ^{3,b}				
Nominal Engine Speed	RPM		1800	
Mean Piston Speed	ft/min	m/s	1949	9.9
RPM Range (Min-Max) ISO 8528-5 G1	RPM		1778 - 1823	
Charging Alternator Voltage	Volts		28	
Charging Alternator Current	Amps		70	
Total Engine Coolant Flow	gal/min	L/min	159	600
Cooling Fan Power ¹¹	HP	kW	39	29
Cooling Fan Speed	RPM		2200	
Cooling Fan Air Flow ¹¹	SCFM	m ³ /min	26697	756
Maximum Cooling Air Temp at Radiator	°F	°C	111	44

Performance Data 50Hz ^{3,b}				
Nominal Engine Speed	RPM		1500	
Mean Piston Speed	ft/min	m/s	1624	8
RPM Range (Min-Max) ISO 8528-5 G1	RPM		1477 - 1519	
Charging Alternator Voltage	Volts		28	
Charging Alternator Current	Amps		70	
Total Engine Coolant Flow	gal/min	L/min	90	340
Cooling Fan Power ¹¹	HP	kW	23	17
Cooling Fan Speed	RPM		1830	
Cooling Fan Air Flow ¹¹	SCFM	m ³ /min	22194	629
Maximum Cooling Air Temp at Radiator	°F	°C	118	48

	Standby		NG 60Hz		NG 50Hz		LP 60Hz		LP 50Hz	
	HP	kW	402	300	335	250	243	181	202	151
Power Rating ^{1,2,3,4} Per ISO 3046	HP	kW	402	300	335	250	243	181	202	151
MEP (@ rated Load on NG)	psi	bar	231	16.0	231	16.0	140	9.6	140	9.6
Fuel Consumption ^{3,4,7,12}	lb/hr	kg/hr	153	69	122	56	109	49.4	84	38
	ft ³ /hr	m ³ /hr	3418	97	2734	77	-	-	-	-
	gal/hr	L/hr	-	-	-	-	26	97	20	75
BSFC	lb/(hp-hr)	g/(kW-hr)	0.380	231	0.364	222	0.448	273	0.413	252
Turbine Outlet Temperature	°F	°C	1204	651	1177	636	1260	682	1191	644
Exhaust Flow at Turbine Outlet Conditions (entire engine)	lb/hr	kg/hr	2701	1226	2200	1000	1815	825	1395	634
	ACFM	m ³ /min	1855	52.5	1492	42.3	1285	36.4	953	27.0
Air Induction System⁵										
Combustion Air required (entire engine)	lb/hr	kg/hr	2551	1157	2094	950	1634	741	1257	570
	ACFM	m ³ /min	575	16.3	472	13.4	368	10.4	283	8.0
Compressor Outlet Temperature ²	°F	°C	326	163	279	137	170	112	208	98

Thermal Balance ⁵				
Total Fuel	BTU/min	kW	52570	924
Mechanical Power	BTU/min	kW	17072	300
Heat Rejected to Cooling Water at Rated Load	BTU/min	kW	16299	287
Heat Rejection CAC at Rated Power	BTU/min	kW	2144	38
Heat Rejection to Exhaust (LHV to 150C)	BTU/min	kW	14593	257
Engine Radiated Heat	BTU/min	kW	2462	43

¹ Standby and overload ratings based on ISO 3046 gross flywheel power.

² Technical data based on ISO 3046-1 standards of 77°F(25°C), absolute pressure 14.5Psia(100kPa) and 30% relative humidity.

³ Production tolerances in engines and installed components can account for power variations of ± 5%. Altitude, temperature and excessive exhaust and intake restrictions should be applied to power calculations.

⁴ All fuel and thermal calculations unless otherwise noted are done at ISO 3046 rated load using LHV for NG of 48.17 MJ/kg.

⁵ All values in the following section are provided for informational purpose only and are non-binding.

⁶ >1400RPM.

⁷ See PSI Energy Technical Spec. 56100019 - Fuel Standard.

⁸ Standard Sump Capacity.

⁹ ± 2 degrees Celsius.

¹⁰ ± 0.002" or 0.05mm.

¹¹ At 0.5 in-H₂O of Package Restriction at 50C Ambient Air Temperature.

¹² Volume calculated using density of 0.717 kg/m³ for NG, 0.51 kg/L for LPG

STAMFORD

S4L1D-D41 Wdg.311 - Technical Data Sheet

Standards

Stamford industrial alternators meet the requirements of the relevant parts of the BS EN 60034 and the relevant section of other international standards such as BS5000, VDE 0530, NEMA MG1-32, IEC34, CSA C22.2-100 and As1359. Other standards and certifications can be considered on request.

Quality Assurance

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



Excitation and Voltage Regulators

Excitation System					
AVR Type	AS440	MX341	MX321		
Voltage Regulation	± 1%	± 1%	± 0.5%		with 4% Engine Governing
Excitation Type	Self-Excited	PMG	PMG		

No Load Excitation Voltage (V)	12 - 9
No Load Excitation Current (A)	0.7 - 0.5
Full Load Excitation Voltage (V)	41 - 39
Full Load Excitation Current (A)	2.3 - 2.2
Exciter Time Constant (seconds)	0.105

STAMFORD

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Electrical Data								
Insulation System	Class H							
Stator Winding	Double Layer Lap							
Winding Pitch	Two Thirds							
Winding Leads	12							
Winding Number	311							
Number of Poles	4							
IP Rating	IP23							
RFI 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%							
Short Circuit Ratio	1/Xd							
Steady State X/R Ratio	12.29							
	50 Hz				60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air	0.83 m³/sec				0.99 m³/sec			
Voltage Star	380	400	415	440	416	440	460	480
kVA Base Rating (Class H) for Reactance Values	300	310	310	290	344	370	375	390
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	3.15	2.94	2.73	2.27	3.60	3.46	3.21	3.07
X'd Dir. Axis Transient	0.20	0.19	0.17	0.14	0.22	0.21	0.20	0.19
X''d Dir. Axis Subtransient	0.14	0.13	0.12	0.10	0.15	0.14	0.13	0.12
Xq Quad. Axis Reactance	2.66	2.48	2.30	1.92	3.09	2.97	2.75	2.63
X''q Quad. Axis Subtransient	0.40	0.37	0.34	0.29	0.40	0.39	0.36	0.34
XL Stator Leakage Reactance	0.07	0.06	0.06	0.05	0.09	0.08	0.08	0.07
X2 Negative Sequence Reactance	0.27	0.25	0.23	0.19	0.28	0.27	0.25	0.24
X0 Zero Sequence Reactance	0.10	0.09	0.09	0.07	0.10	0.09	0.09	0.08
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	3.78	3.53	3.28	2.73	4.32	4.16	3.85	3.68
X'd Dir. Axis Transient	0.23	0.21	0.20	0.17	0.25	0.24	0.23	0.22
X''d Dir. Axis Subtransient	0.17	0.16	0.15	0.12	0.17	0.16	0.15	0.15
Xq Quad. Axis Reactance	2.74	2.55	2.37	1.97	3.18	3.06	2.84	2.71
X''q Quad. Axis Subtransient	0.48	0.45	0.41	0.34	0.48	0.46	0.43	0.41
XL Stator Leakage Reactance	0.08	0.07	0.07	0.05	0.10	0.09	0.09	0.08
Xlr Rotor Leakage Reactance	0.12	0.11	0.10	0.09	0.14	0.13	0.12	0.12
X2 Negative Sequence Reactance	0.32	0.30	0.28	0.23	0.34	0.32	0.30	0.29
X0 Zero Sequence Reactance	0.12	0.11	0.10	0.08	0.11	0.11	0.10	0.10

STAMFORD®

S4L1D-D41 Wdg.311

Time Constants (Seconds)		
T'd TRANSIENT TIME CONST.	0.08	
T" d SUB-TRANSTIME CONST.	0.019	
T'do O.C. FIELD TIME CONST.	1.7	
Ta ARMATURE TIME CONST.	0.018	
T" q SUB-TRANSTIME CONST.	0.0077	
Resistances in Ohms (Ω) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	0.0124	
Rotor Winding Resistance (Rf)	1.05	
Exciter Stator Winding Resistance	18	
Exciter Rotor Winding Resistance per phase	0.068	
PMG Phase Resistance (Rpmg) per phase	1.9	
Positive Sequence Resistance (R1)	0.0155	
Negative Sequence Resistance (R2)	0.017856	
Zero Sequence Resistance (R0)	0.0155	
Saturation Factors	400V	480V
SG1.0	0.31	0.31
SG1.2	1.25	1.25
Mechanical Data		
Shaft and Keys	All alternator rotors are dynamically balanced to better than BS6861: Part 1 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.	
	1 Bearing	2 Bearings
SAE Adaptor	SAE 0.5, 1	N/A
Moment of Inertia	4.0771 kgm ²	N/A
Weight Wound Stator	415 kg	N/A
Weight Wound Rotor	361 kg	N/A
Weight Complete Alternator	940 kg	N/A
Shipping weight in a Crate	1010 kg	N/A
Packing Crate Size	155 x 87 x 107(cm)	N/A
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	N/A	N/A
Bearing Non-Drive End	Ball 6314	N/A

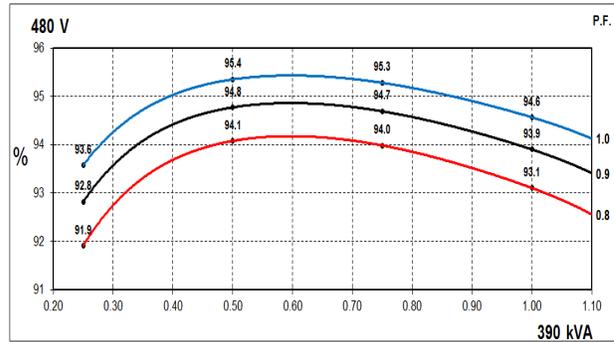
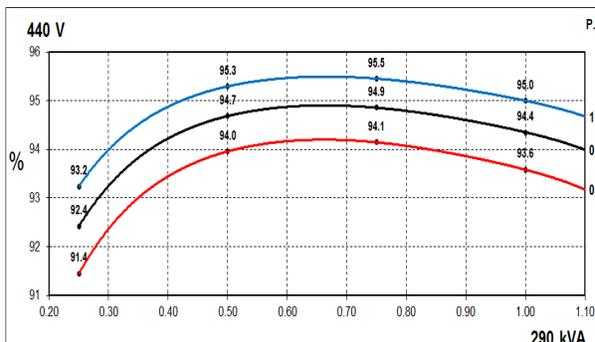
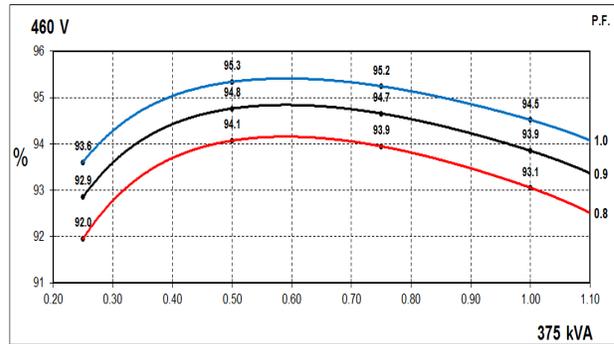
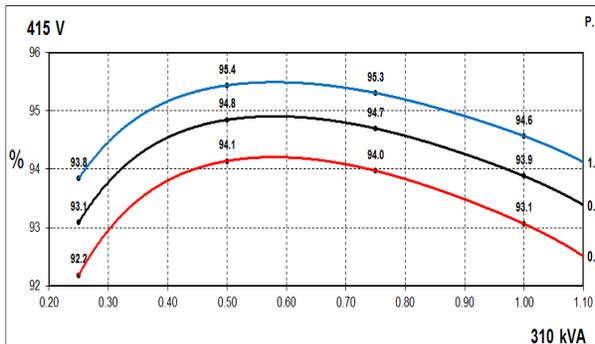
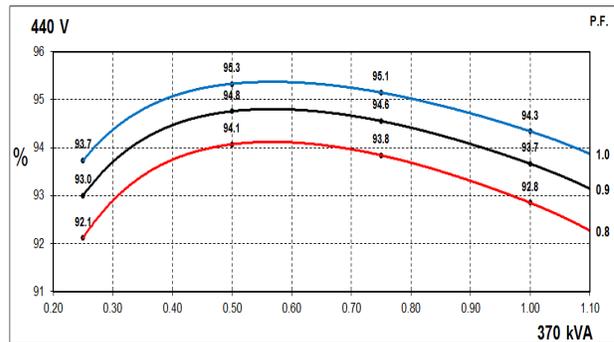
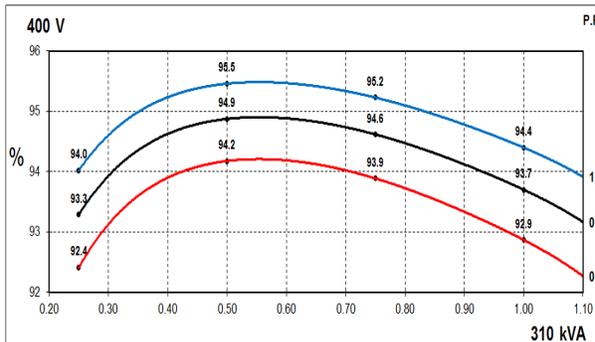
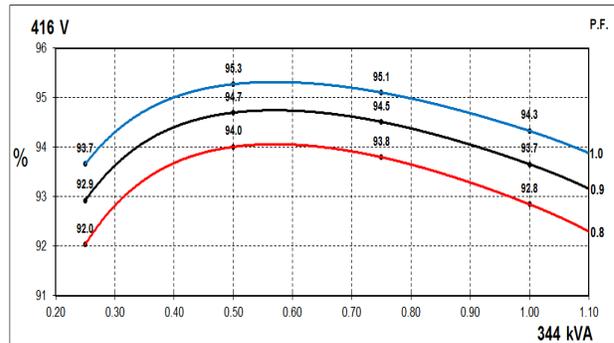
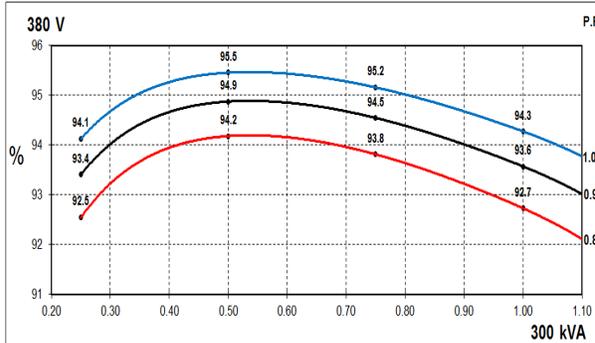
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S4L1D-D41 Wdg.311

THREE PHASE EFFICIENCY CURVES

50Hz

60Hz

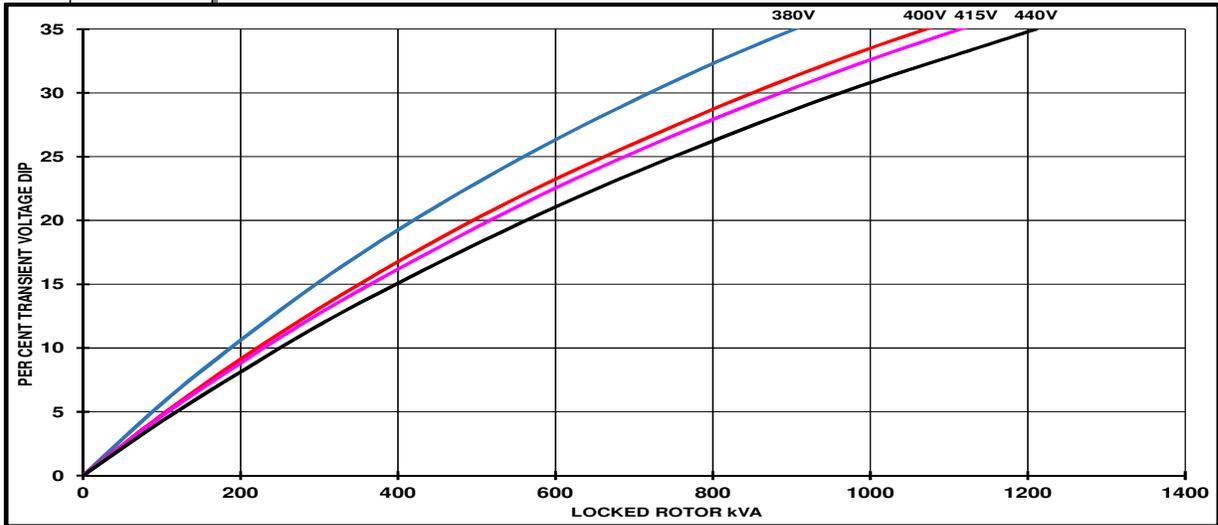


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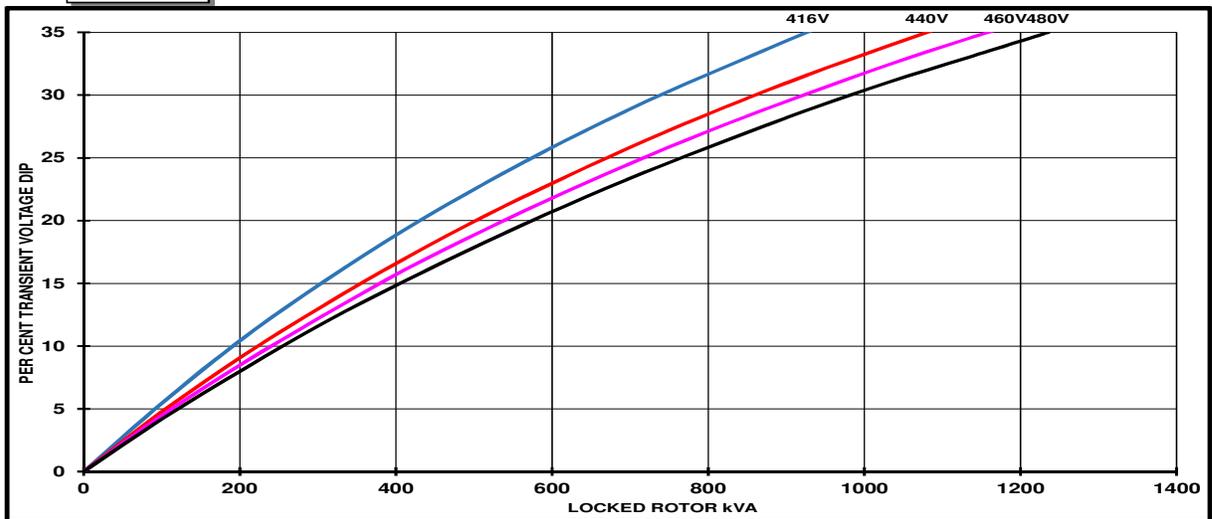
S4L1D-D41 Wdg.311

Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



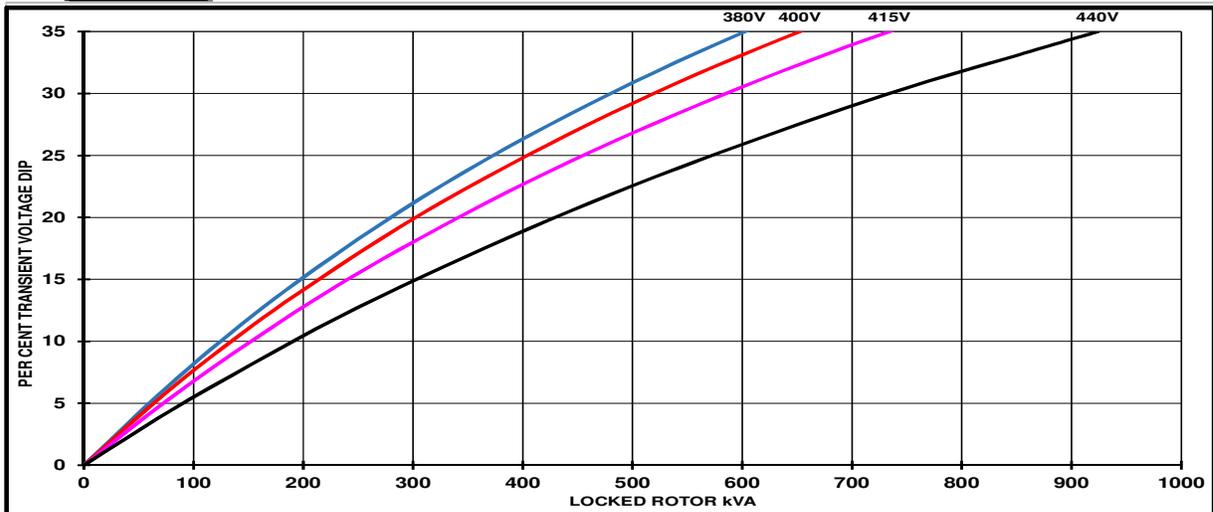
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	
< 0.5	1	For voltage rise multiply voltage dip by 1.25
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

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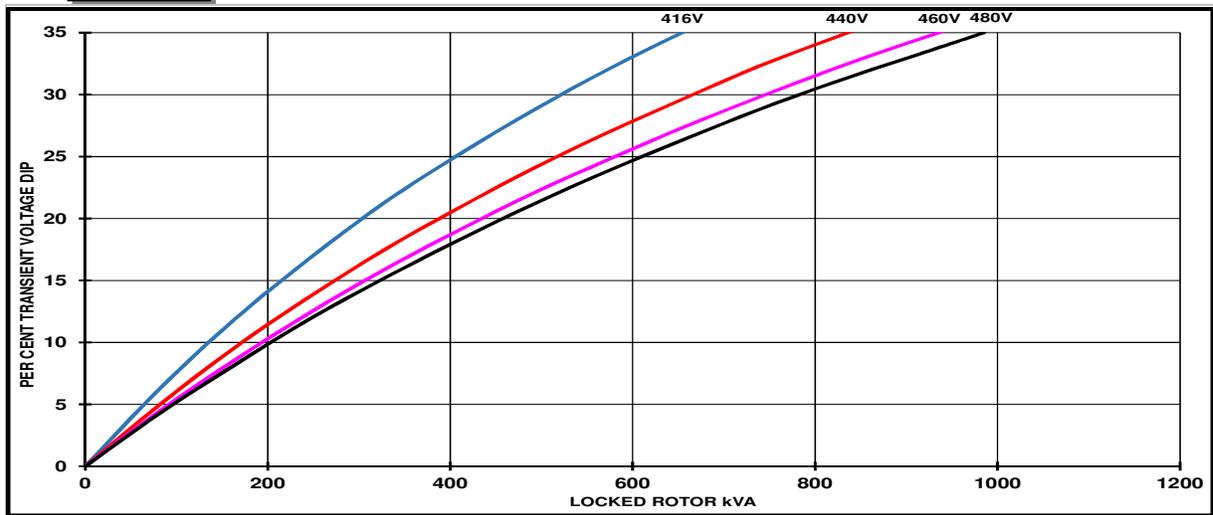
S4L1D-D41 Wdg.311

Locked Rotor Motor Starting Curves - Self Excited

50Hz



60Hz



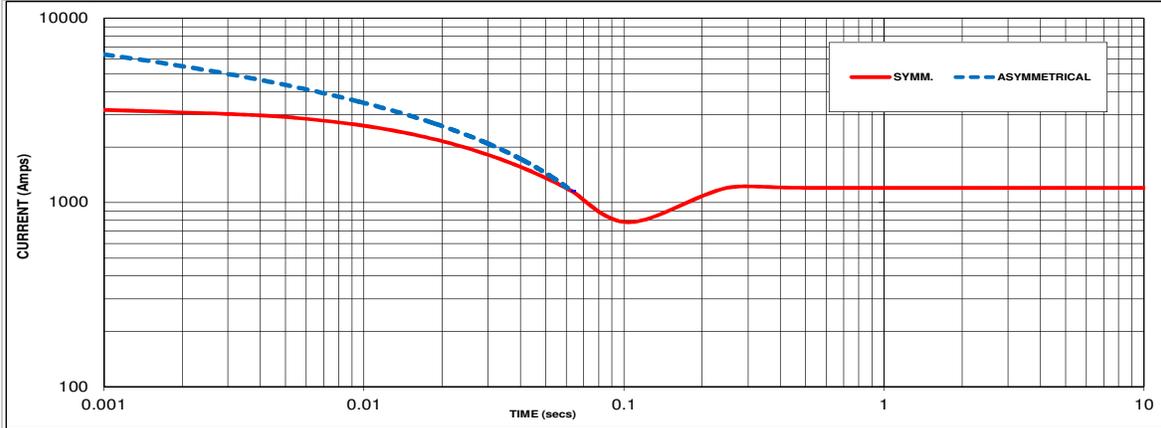
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	
< 0.5	1	For voltage rise multiply voltage dip by 1.25
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

STAMFORD

S4L1D-D41 Wdg.311

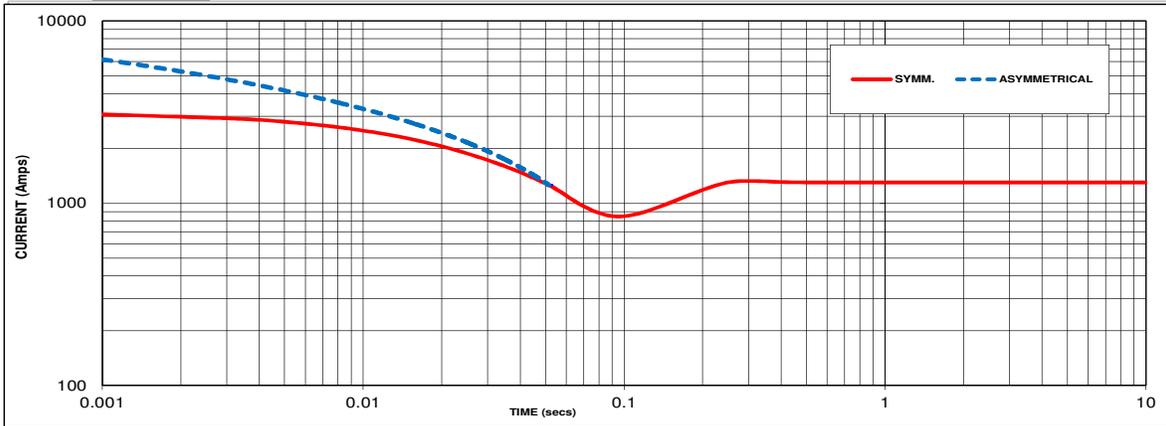
Three-phase Short Circuit Decrement Curve

50Hz



Sustained Short Circuit = 1200 Amps

60Hz



Sustained Short Circuit = 1300 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 1.06
415V	X 1.09	460V	X 1.10
440V	X 1.16	480V	X 1.15

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

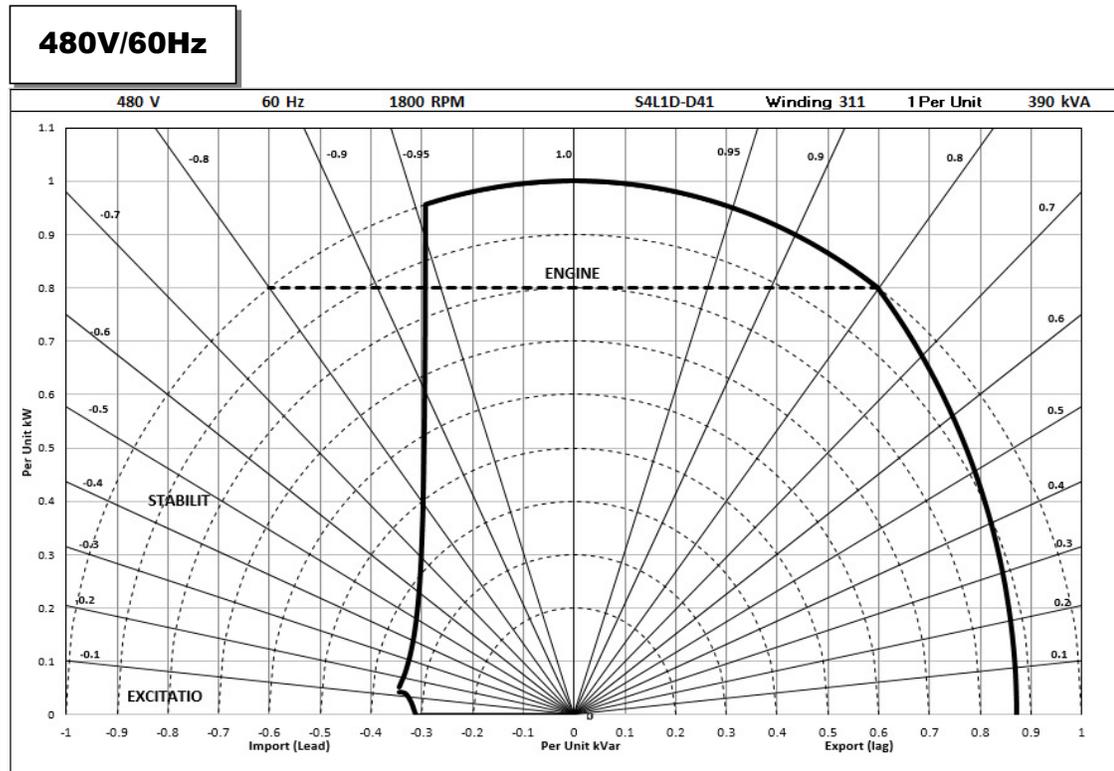
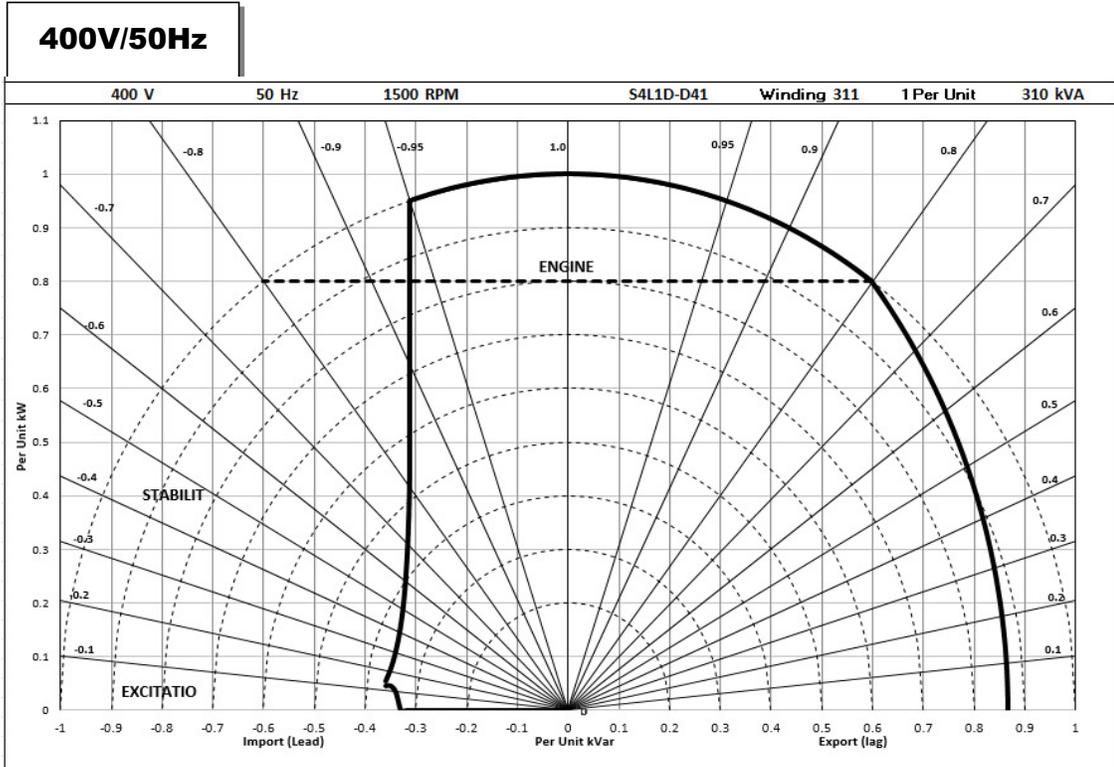
Note 3

Curves are drawn for Star connected machines under no-load excitation at rated speeds. 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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Typical Alternator Operating Charts



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S4L1D-D41 Wdg.311

RATINGS AT 0.8 POWER FACTOR

Class - Temp Rise		Standby - 163/27°C				Standby - 150/40°C				Cont. H - 125/40°C				Cont. F - 105/40°C			
50 Hz	Series Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	kVA	330	340	340	320	320	330	330	310	300	310	310	290	280	285	285	270
	kW	264	272	272	256	256	264	264	248	240	248	248	232	224	228	228	216
	Efficiency (%)	92.1	92.3	92.6	93.2	92.3	92.5	92.7	93.3	92.7	92.9	93.1	93.6	93.1	93.3	93.4	93.8
	kW Input	287	295	294	275	277	285	285	266	259	267	266	248	241	244	244	230

60 Hz	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	kVA	375	410	415	430	365	400	400	415	344	370	375	390	315	340	345	355
	kW	300	328	332	344	292	320	320	332	275	296	300	312	252	272	276	284
	Efficiency (%)	92.4	92.2	92.5	92.6	92.5	92.4	92.7	92.8	92.8	92.9	93.1	93.1	93.2	93.2	93.4	93.5
	kW Input	325	356	359	372	316	346	345	358	296	319	322	335	270	292	295	304

De-Rates

All values tabulated above are subject to the following reductions:

- 5% when air inlet filters are fitted
- 3% for every 500 meters by which the operating altitude exceeds 1000 meters above mean sea level
- 3% for every 5°C by which the operational ambient temperature exceeds 40°C
- For any other operating conditions impacting the cooling circuit please refer to applications

Note: Requirement for operating in an ambient exceeding 60°C and altitude exceeding 4000 meters must be referred to applications.

Dimensional and Torsional Drawing

For dimensional and torsional information please refer to the alternator General Arrangement and rotor drawings available on our website (<http://stamford-avk.com/>)

Note: Continuous development of our products means that the information contained in our data sheets can change without notice, and specifications should always be confirmed with Cummins Generator Technologies prior to purchase.

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S4L1S-C4 Wdg.17 - Technical Data Sheet

Standards

STAMFORD industrial alternators meet the requirements of the relevant parts of the IEC 60034 and the relevant sections of other international standards such as BS5000-3, ISO 8528-3, VDE 0530, NEMA MG1-32, CSA C22.2-100 and AS 60034. Other standards and certifications can be considered on request.

Quality Assurance

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



Excitation and Voltage Regulators

Excitation System					
AVR Type	AS440	MX341	MX321		
Voltage Regulation	± 1%	± 1%	± 0.5%		with 4% Engine Governing
AVR Power	Self-Excited	PMG	PMG		

No Load Excitation Voltage (V)	12 - 9
No Load Excitation Current (A)	0.7 - 0.5
Full Load Excitation Voltage (V)	43-40
Full Load Excitation Current (A)	2.4-2.2
Exciter Time Constant (seconds)	0.105

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S4L1S-C4 Wdg.17

Electrical Data	
Insulation System	H
Stator Winding	Double Layer Lap
Winding Pitch	2/3
Winding Leads	12
Winding Number	17
Number of Poles	4
IP Rating	IP23
RFI 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%
Short Circuit Ratio	1/Xd
Steady State X/R Ratio	12.05
60 Hz	
Telephone Interference	TIF<50
Cooling Air Flow	0.99 m ³ /sec
Voltage Series Star (V)	600
Voltage Parallel Star (V)	300
Voltage Series Delta (V)	346
kVA Base Rating (Class H) for Reactance Values (kVA)	315
Saturated Values in Per Unit at Base Ratings and Voltages	
Xd Dir. Axis Synchronous	2.85
X'd Dir. Axis Transient	0.18
X''d Dir. Axis Subtransient	0.12
Xq Quad. Axis Reactance	2.47
X''q Quad. Axis Subtransient	0.32
XL Stator Leakage Reactance	0.08
X2 Negative Sequence Reactance	0.22
X0 Zero Sequence Reactance	0.07
Unsaturated Values in Per Unit at Base Ratings and Voltages	
Xd Dir. Axis Synchronous	3.42
X'd Dir. Axis Transient	0.21
X''d Dir. Axis Subtransient	0.14
Xq Quad. Axis Reactance	2.54
X''q Quad. Axis Subtransient	0.38
XL Stator Leakage Reactance	0.09
Xlr Rotor Leakage Reactance	0.12
X2 Negative Sequence Reactance	0.26
X0 Zero Sequence Reactance	0.08

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S4L1S-C4 Wdg.17

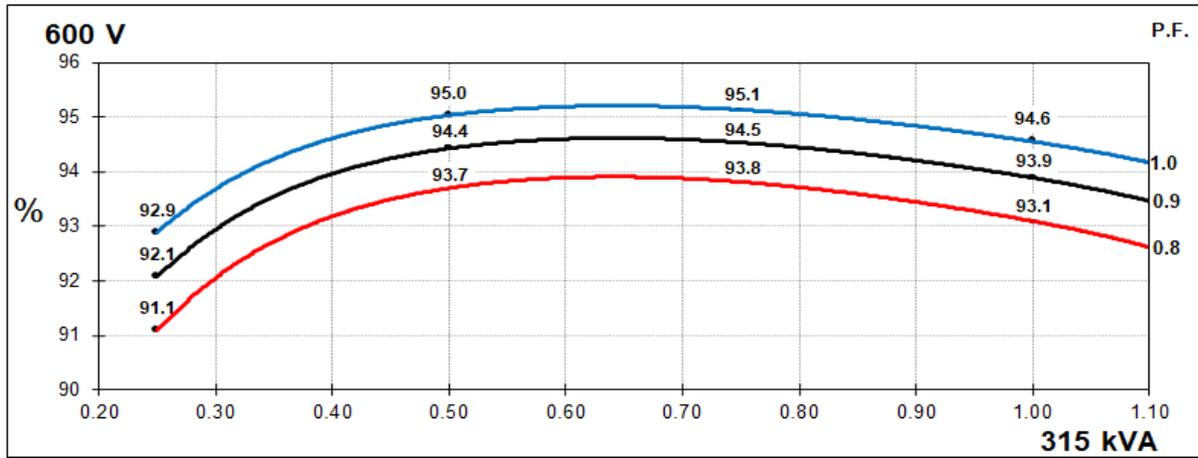
Time Constants (Seconds)		
T'd Transient Time Const.	0.08	
T''d Sub-Transient Time Const.	0.019	
T'do O.C. Field Time Const.	1.7	
Ta Armature Time Const.	0.018	
T''q Sub-Transient Time Const.	0.0304	
Resistances in Ohms (Ω) at 22 ^o C		
Stator Winding Resistance (Ra), per phase for series connected	0.023	
Rotor Winding Resistance (Rf)	0.92	
Exciter Stator Winding Resistance	18	
Exciter Rotor Winding Resistance per phase	0.068	
PMG Phase Resistance (Rpmg) per phase	1.9	
Positive Sequence Resistance (R1)	0.02875	
Negative Sequence Resistance (R2)	0.03312	
Zero Sequence Resistance (R0)	0.02875	
Saturation Factors	600V	
SG1.0	0.28	
SG1.2	1.39	
Mechanical Data		
Shaft and Keys	All alternator rotors are dynamically balanced to better than ISO 21940-11 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.	
	1 Bearing	2 Bearing
SAE Adaptor	SAE 0, 0.5, 1, 2, 3	SAE 0, 0.5, 1, 2
Moment of Inertia	3.5531 kgm ²	3.3543 kgm ²
Weight Wound Stator	370kg	370kg
Weight Wound Rotor	324kg	301kg
Weight Complete Alternator	850kg	885kg
Shipping weight in a Crate	920kg	945kg
Packing Crate Size	155 x 87 x 107(cm)	155 x 87 x 107(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	Ball 6317
Bearing Non-Drive End	Ball 6314	Ball 6314

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S4L1S-C4 Wdg.17

THREE PHASE EFFICIENCY CURVES

60Hz

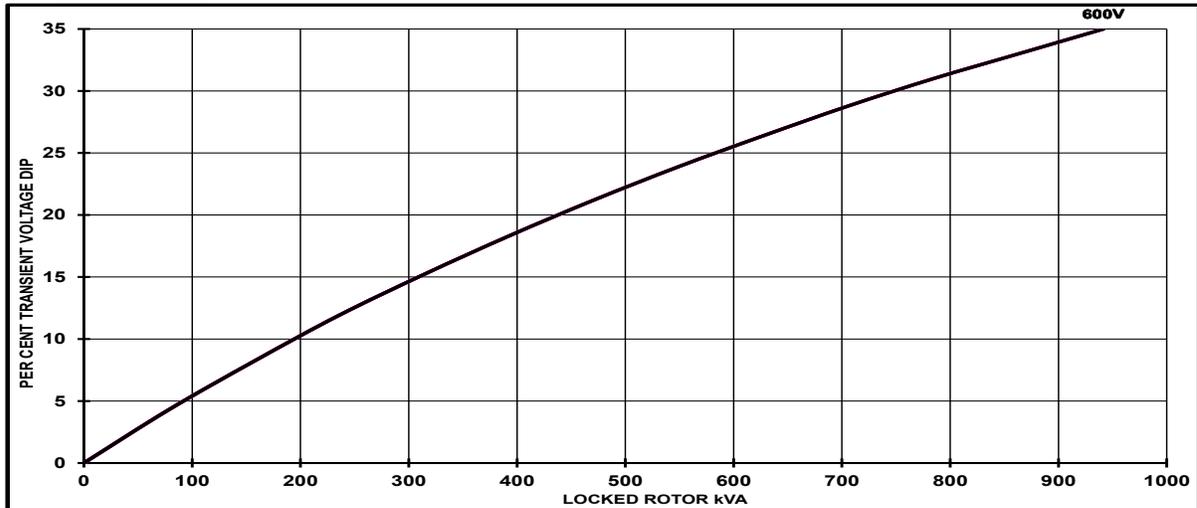


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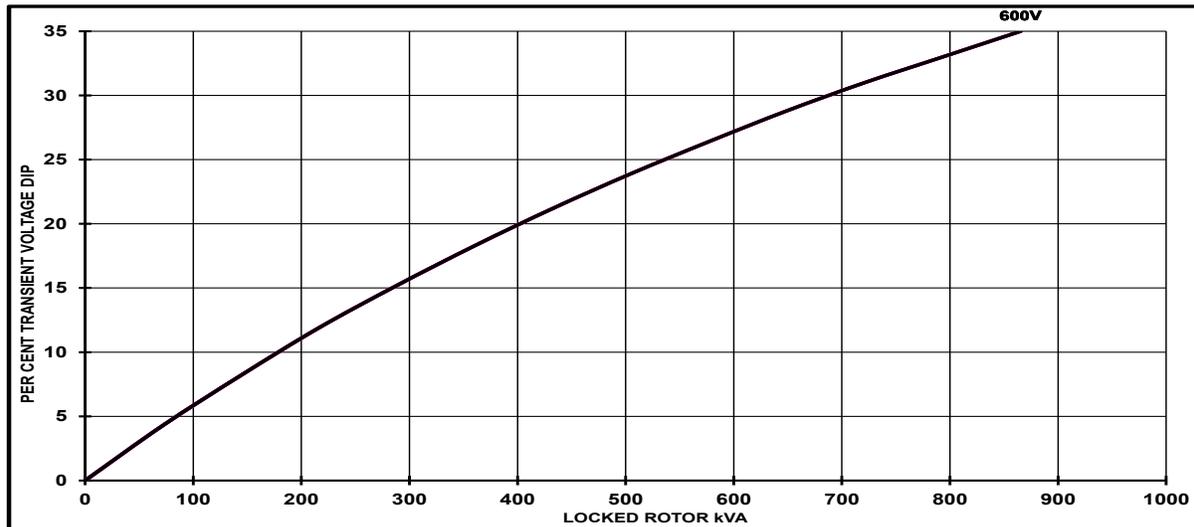
S4L1S-C4 Wdg.17

Locked Rotor Motor Starting Curves - Separately Excited

60Hz



Locked Rotor Motor Starting Curves - Self Excited



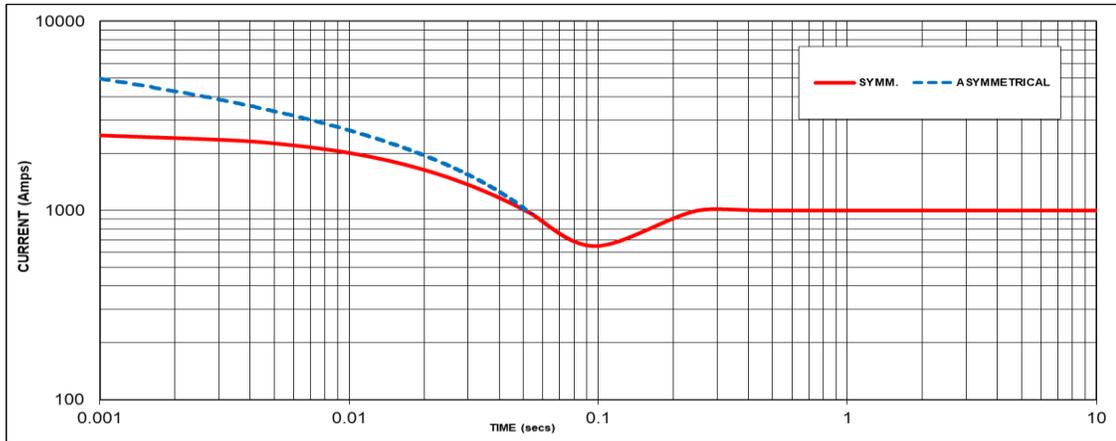
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
Lagging PF	Scaling Factor	For voltage rise multiply voltage dip by 1.25
≤ 0.4	1	
0.5	0.95	
0.6	0.9	
0.7	0.86	
0.8	0.83	
0.9	0.75	

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S4L1S-C4 Wdg.17

Three-phase Short Circuit Decrement Curve - Separately Excited

60Hz



Sustained Short Circuit = 1000 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
-	-	600V	X 1.00
-	-	-	-
-	-	-	-
-	-	-	-

The sustained current value is constant irrespective of voltage level

If MX322 or digital AVR is used, the sustained short-circuit current value is to be multiplied by a factor of 1.1.

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.

Note 3

All other times are unchanged

Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

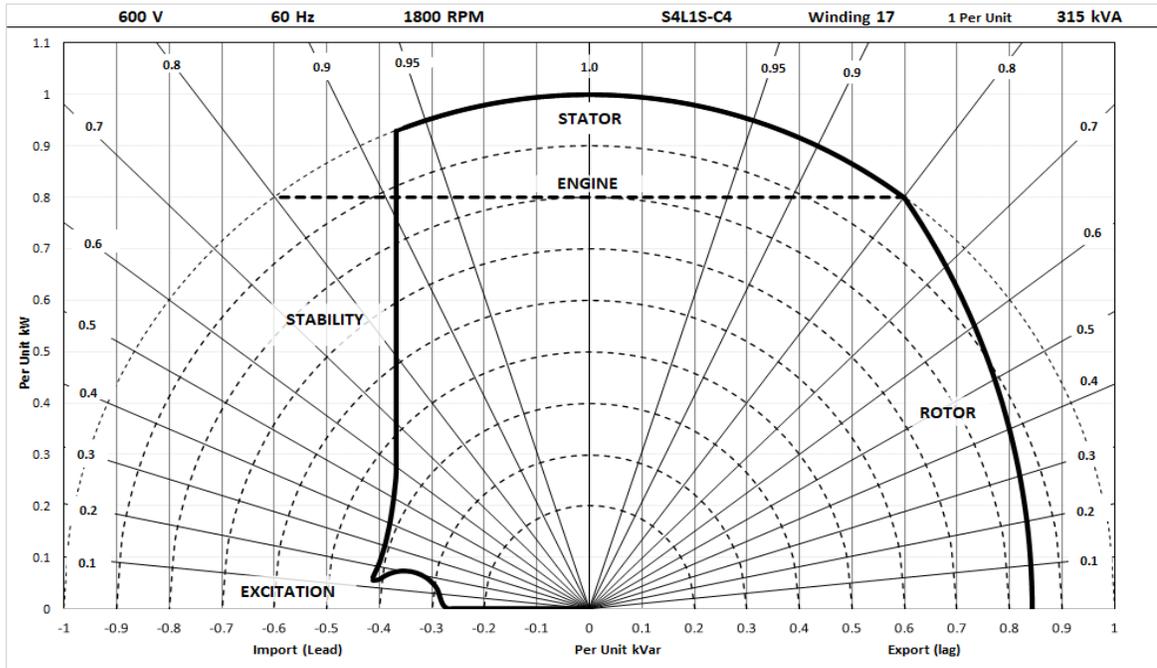
Series Delta = Curve current value X 1.732

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S4L1S-C4 Wdg.17

Typical Alternator Operating Charts

600V/60Hz



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S4L1S-C4 Wdg.17

RATINGS AT 0.8 POWER FACTOR

Class - Temp Rise	Standby - 163/27°C	Standby - 150/40°C	Cont. H - 125/40°C	Cont. F - 105/40°C
50 Hz	Series Star (V)	N/A	N/A	N/A
	Parallel Star (V)	N/A	N/A	N/A
	Series Delta (V)	N/A	N/A	N/A
	kVA	N/A	N/A	N/A
	kW	N/A	N/A	N/A
	Efficiency (%)	N/A	N/A	N/A
	kW Input	N/A	N/A	N/A

60 Hz	Series Star (V)	600	600	600	600
	Parallel Star (V)	300	300	300	300
	Series Delta (V)	346	346	346	346
	kVA	345	335	315	290
	kW	276	268	252	232
	Efficiency (%)	92.7	92.8	93.1	93.4
	kW Input	298	289	271	248

De-rates

All values tabulated above are subject to the following reductions:

- 5% when air inlet filters are fitted
- 3% for every 500 meters by which the operating altitude exceeds 1000 meters above mean sea level
- 3% for every 5°C by which the operational ambient temperature exceeds 40°C @ Class H temperature rise (please refer to applications for ambient temperature de-rates at other temperature rise classes)
- For marine alternators, 3% for every 5°C by which the operational ambient temperature exceeds 50°C
- For any other operating conditions impacting the cooling circuit please refer to applications

Note: Requirement for operating in an ambient exceeding 60°C and altitude exceeding 4000 meters (for <690V) or 1500 meters (for >690V) must be referred to applications.

Dimensional and Torsional Drawing

For dimensional and torsional information please refer to the alternator General Arrangement and rotor drawings available on our website (<http://stamford-avk.com/>)

Note: Continuous development of our products means that the information contained in our data sheets can change without notice, and specifications should always be confirmed with Cummins Generator Technologies prior to purchase.

DSE7410/20

AUTO START & AUTO MAINS FAILURE MODULES

FEATURES



The DSE7410 is an Auto Start Control Module and the **DSE7420** is an Auto Mains (Utility) Failure Control Module suitable for a wide variety of single, diesel or gas, gen-set applications.

A sophisticated module monitoring an extensive number of engine parameters, the DSE74xx will announce warnings, shutdown and engine status information on the back-lit LCD screen, illuminated LED, remote PC, audible alarm and via SMS text alerts. The module includes RS232, RS485 & Ethernet ports as well as dedicated terminals for system expansion.

The DSE7400 Series modules are compatible with electronic (CAN) and non-electronic (magnetic pick-up/alternator sensing) engines and offer a comprehensive number of flexible inputs, outputs and extensive engine protections so the system can be easily adapted to meet the most demanding industry paralleling requirements.

The modules can be easily configured using the DSE Configuration Suite Software. Selected front panel editing is also available.

ENVIRONMENTAL TESTING STANDARDS

ELECTRO-MAGNETIC COMPATIBILITY

BS EN 61000-6-2
EMC Generic Immunity Standard for the Industrial Environment
BS EN 61000-6-4
EMC Generic Emission Standard for the Industrial Environment

ELECTRICAL SAFETY

BS EN 60950
Safety of Information Technology Equipment, including Electrical Business Equipment

TEMPERATURE

BS EN 60068-2-1
Ab/Ae Cold Test -30 °C
BS EN 60068-2-2
Bb/Be Dry Heat +70 °C

VIBRATION

BS EN 60068-2-6
Ten sweeps in each of three major axes
5 Hz to 8 Hz @ +/-7.5 mm,
8 Hz to 500 Hz @ 2 gn

HUMIDITY

BS EN 60068-2-30
Db Damp Heat Cyclic 20/55 °C @ 95% RH 48 Hours
BS EN 60068-2-78
Cab Damp Heat Static 40 °C @ 93% RH 48 Hours

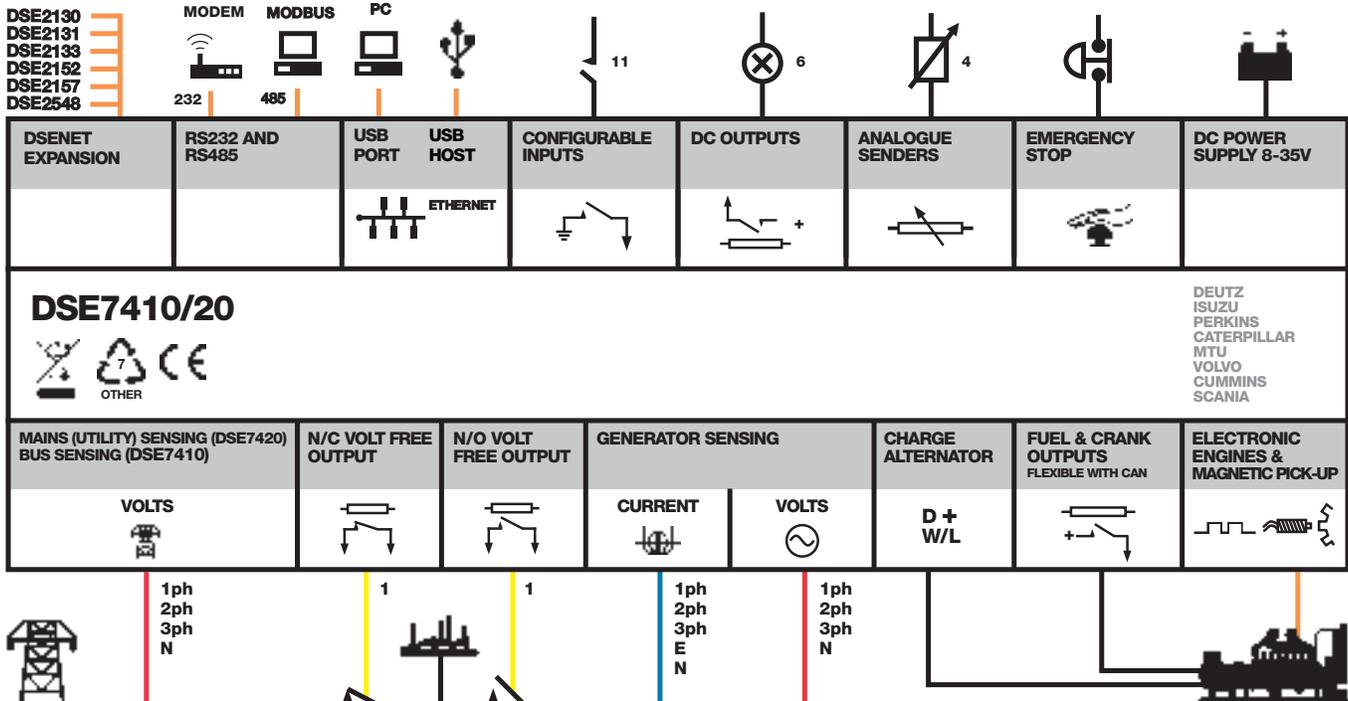
SHOCK

BS EN 60068-2-27
Three shocks in each of three major axes
15 gn in 11 ms

DEGREES OF PROTECTION PROVIDED BY ENCLOSURES

BS EN 60529
IP65 - Front of module when installed into the control panel with the supplied sealing gasket.

COMPREHENSIVE FEATURE LIST TO SUIT A WIDE VARIETY OF GEN-SET APPLICATIONS



DSE7410/20

AUTO START & AUTO MAINS FAILURE MODULES

FEATURES



DSE7420

DSE7410



KEY FEATURES

- Configurable inputs (11)
- Configurable outputs (8)
- Voltage measurement
- Mains (utility) failure detection
- Dedicated load test button
- kW overload alarms
- Comprehensive electrical protection
- RS232, RS485 & Ethernet remote communications
- Modbus RTU/TCP
- PLC functionality
- Multi event exercise timer
- Back-lit LCD 4-line text display
- Multiple display languages
- Automatic start/Manual start
- Audible alarm
- Fixed and flexible LED indicators
- Event log (250)
- Engine protection
- Fault condition notification to a designated PC
- Front panel mounting
- Protected front panel programming
- Configurable alarms and timers
- Configurable start and stop timers

- Five key menu navigation
- Front panel editing with PIN protection
- 3 configurable maintenance alarms
- CAN and magnetic pick-up/Alt. sensing
- Fuel usage monitor and low fuel alarms
- Charge alternator failure alarm
- Manual speed control (on compatible CAN engines)
- Manual fuel pump control
- "Protections disabled" feature
- Reverse power protection
- Power monitoring (kW h, kV Ar, kV A h, kV Ar h)
- Load switching (load shedding and dummy load outputs)
- Automatic load transfer (DSE7420)
- Unbalanced load protection
- Independent earth fault trip
- Fully configurable via DSE Configuration Suite PC software
- Configurable display languages
- Remote SCADA monitoring via DSE Configuration Suite PC software

- Advanced SMS messaging (additional external modem required)
- Start & stop capability via SMS messaging
- Additional display screens to help with modem diagnostics
- DSENet® expansion
- Integral PLC editor

KEY BENEFITS

- RS232, RS485 & Ethernet can be used at the same time
- DSENet® connection for system expansion
- PLC functionality
- Five step dummy load support
- Five step load shedding support
- High number of inputs and outputs
- Worldwide language support
- Direct USB connection to PC
- Ethernet monitoring
- USB host
- Data logging & trending

RELATED MATERIALS

TITLE

DSE7410 Installation Instructions
DSE7420 Installation Instructions
 DSE74xx Quick Start Guide
 DSE74xx Operator Manual
 DSE74xx PC Configuration Suite Manual

PART NO'S

053-085
 053-088
 057-162
 057-161
 057-160

SPECIFICATION

DC SUPPLY
CONTINUOUS VOLTAGE RATING
 8 V to 35 V Continuous

CRANKING DROPOUTS
 Able to survive 0 V for 50 ms, providing supply was at least 10 V before dropout and supply recovers to 5 V. This is achieved without the need for internal batteries

MAXIMUM OPERATING CURRENT
 260 mA at 12 V, 130 mA at 24 V

MAXIMUM STANDBY CURRENT
 120 mA at 12 V, 65 mA at 24 V

CHARGE FAIL/EXCITATION RANGE
 0 V to 35 V

OUTPUTS
OUTPUT A (FUEL)
 15 A DC at supply voltage

OUTPUT B (START)
 15 A DC at supply voltage

OUTPUTS C & D
 8 A AC at 250 V AC (Volt free)

AUXILIARY OUTPUTS E, F, G, H, I & J
 2 A DC at supply voltage

GENERATOR
VOLTAGE RANGE
 15 V to 333 V AC (L-N)

FREQUENCY RANGE
 3.5 Hz to 75 Hz

MAINS (UTILITY) (DSE7420)
VOLTAGE RANGE
 15 V to 333 V AC (L-N)

FREQUENCY RANGE
 3.5 Hz to 75 Hz

BUS (DSE7410)
VOLTAGE RANGE
 15 V to 333 V AC (L-N)

FREQUENCY RANGE
 3.5 Hz to 75 Hz

MAGNETIC PICK UP
VOLTAGE RANGE
 +/- 0.5 V to 70 V

FREQUENCY RANGE
 10,000 Hz (max)

DIMENSIONS
OVERALL
 240 mm x 172 mm x 57 mm
 9.4" x 6.8" x 2.2"

PANEL CUTOUT
 220 mm x 160 mm
 8.7" x 6.3"

MAXIMUM PANEL THICKNESS
 8 mm
 0.3"

STORAGE TEMPERATURE RANGE
 -40°C to +85°C

DEEP SEA ELECTRONICS PLC UK

Highfield House, Hunmanby Industrial Estate, Hunmanby YO14 0PH
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DEEP SEA ELECTRONICS INC USA

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EMAIL sales@deepseausa.com **WEBSITE** www.deepseausa.com

Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG33G0400B2NJNNNNNN



Datasheet creation date: 02/12/2019

PRODUCT VIEW *(Use Mouse to Rotate and Zoom)*

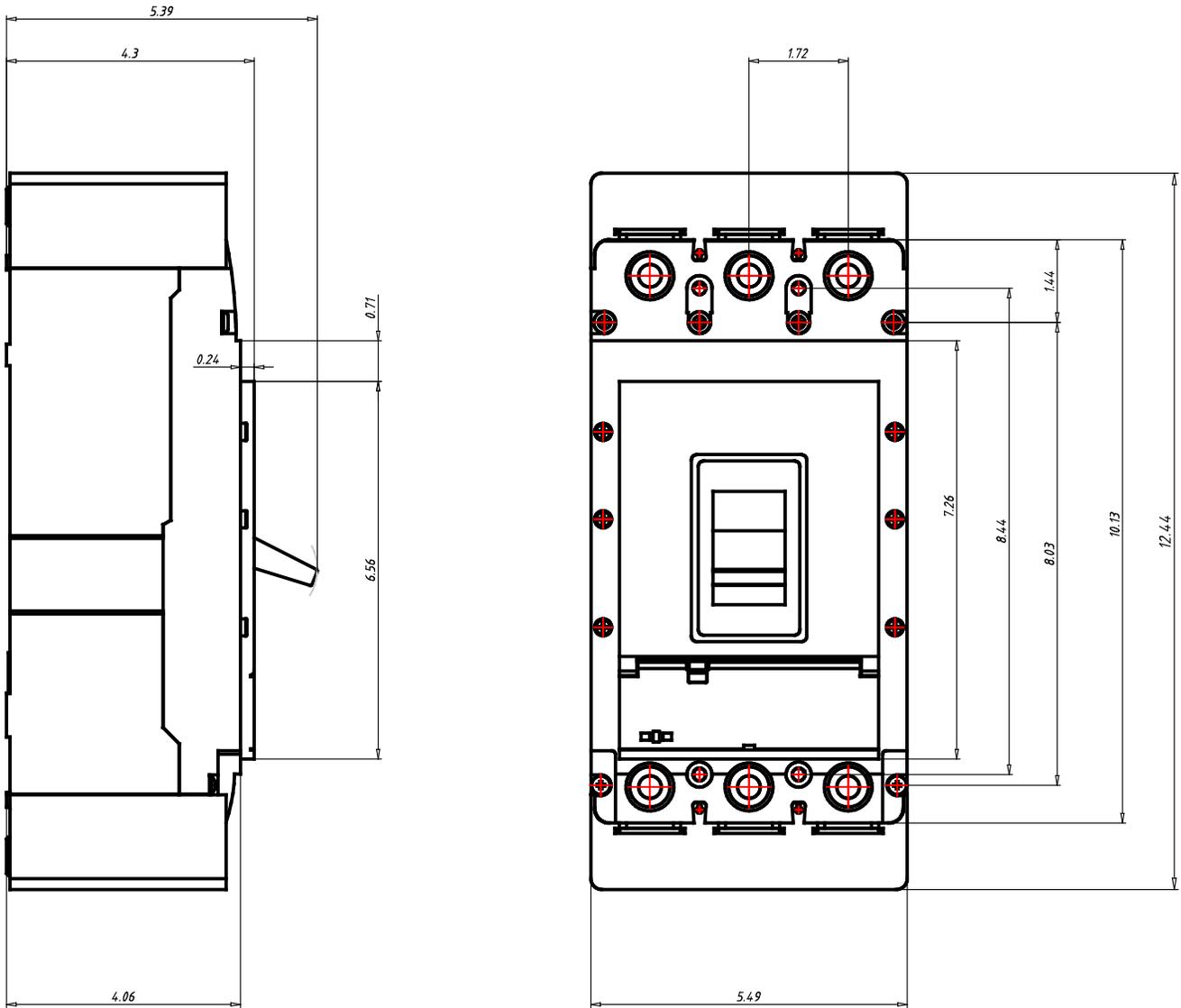
Eaton's Power Defense™ molded case circuit breakers, a globally rated platform designed to help keep your power system safe with latest protection technology. Engineered for the future: IoT and Industry 4.0 features such as built-in communications, advanced energy metering, and algorithms that signal breaker maintenance; zone selective interlock technology that clears faults quickly and locally; ArcFlash reduction options that help protect your people, and not to mention Eaton's best-in-class support and service.

Tech Data for Configured Product

Power Defense Catalog Number	PDG33G0400B2NJNNNNNN
Frame Size	Frame 3
Poles	3 Pole
Voltage	480V AC
Interruption or Breaking Capacity (Icu/Ics)	35kA
Continuous Current Rating (In)	400A
Trip Unit Type	PXR10
Trip Unit Options 1	LSI
Trip Unit Options 2	None
Indicating Accessories	None
Indicating Accessories Terminal	None
Tripping Accessories	None
Tripping Accessory Terminal	None
Tripping Accessory Voltage	None
Line Type Description	Option 1 - Standard Terminal
Line Conductor Options	(2) 3/0 - 250
Line Terminal Type	Aluminum
Load Type Description	Option 1 - Standard Terminal
Load Conductor Options	(2) 3/0 - 250
Load Terminal Type	Aluminum
Special Options - Type of Modification	None
Details	None
Additional Description	None

Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG33G0400B2NJNNNNNN

Technical drawings



Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG33G0400B2NJNNNNNN



Datasheet creation date: 02/12/2019

General Technical Data

Frame Rating (In)	400A
Reference Standard	UL489, CSA 22.2, IEC 60947-2 & GB
Number of poles	3
Neutral rating	-
Interruption Rating Designator	F / G / K / M / N / P
UL Interruption Rating to UL 489 (240Vac)	35 / 65 / 85 / 100 / 150 / 200kA
UL Interruption Rating to UL 489 (480Vac)	25 / 35 / 50 / 65(a) / 85 / 100kA
UL Interruption Rating to UL 489 (600Vac)	14 / 18 / 25 / 35 / 50 / 65kA
UL Interruption Rating to UL 489 (125/250Vdc)	
UL Current Limiting	N / N / N / Y / Y / Y
Rated breaking capacity to IEC 60947-2 (220-240 Vac Icu)	35 / 55 / 85 / 100 / 150 / 200kA
Rated breaking capacity to IEC 60947-2 (220-240 Vac Ics)	35 / 55 / 85 / 100 / 100 / 150kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Icu)	25 / 36 / 50 / 70 / 70 / 100kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Ics)	25 / 36 / 50 / 53 / 70 / 70kA
Rated breaking capacity to IEC 60947-2 (440 Vac Icu)	25 / 30 / 35 / 50 / 70 / 100kA
Rated breaking capacity to IEC 60947-2 (440 Vac Ics)	20 / 22.5 / 35 / 40 / 50 / 50kA
Rated breaking capacity to IEC 60947-2 (525 Vac Icu)	18 / 20 / 25 / 30 / 35 / 40kA
Rated breaking capacity to IEC 60947-2 (525 Vac Ics)	5 / 7.5 / 10 / 15 / 25 / 25kA
Rated breaking capacity to IEC 60947-2 (690 Vac Icu)	- / 8 / 10 / 15 / 20 / 20kA
Rated breaking capacity to IEC 60947-2 (690 Vac Ics)	- / 4 / 5 / 7.5 / 10 / 10kA
Rated breaking capacity to IEC 60947-2 (125V DC Icu)	
Rated breaking capacity to IEC 60947-2 (250V DC 2P in series Ics)	10 / 10 / 10 / 22 / 22 / 22kA
Frequency	50/60Hz
Trip Unit Type	PXR10
Continuous Current Range	160 - 400A
100% UL489 Rated	Yes
Instantaneous/Short Circuit Range	2 - 10 In
Magnetic/Instantaneous Override	4400A
Dimensions H x W x D (inches)	10.125 x 5.47 x 4.297
Pole to pole distance inches	1,719
Approx Weight lbs	16
RoHS Compliance	Yes
UL File Number	E7819
Ambient Temp Calibration	
Derating at 50C	
Derating at 60C	
Derating at 70C	

1. 480Vac corresponds to 277Vac for 1P
2. 600Vac corresponds to 347Vac for 1P

Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG43G0800B2NJNNNNNN



Datasheet creation date: 20/11/2019

PRODUCT VIEW *(Use Mouse to Rotate and Zoom)*

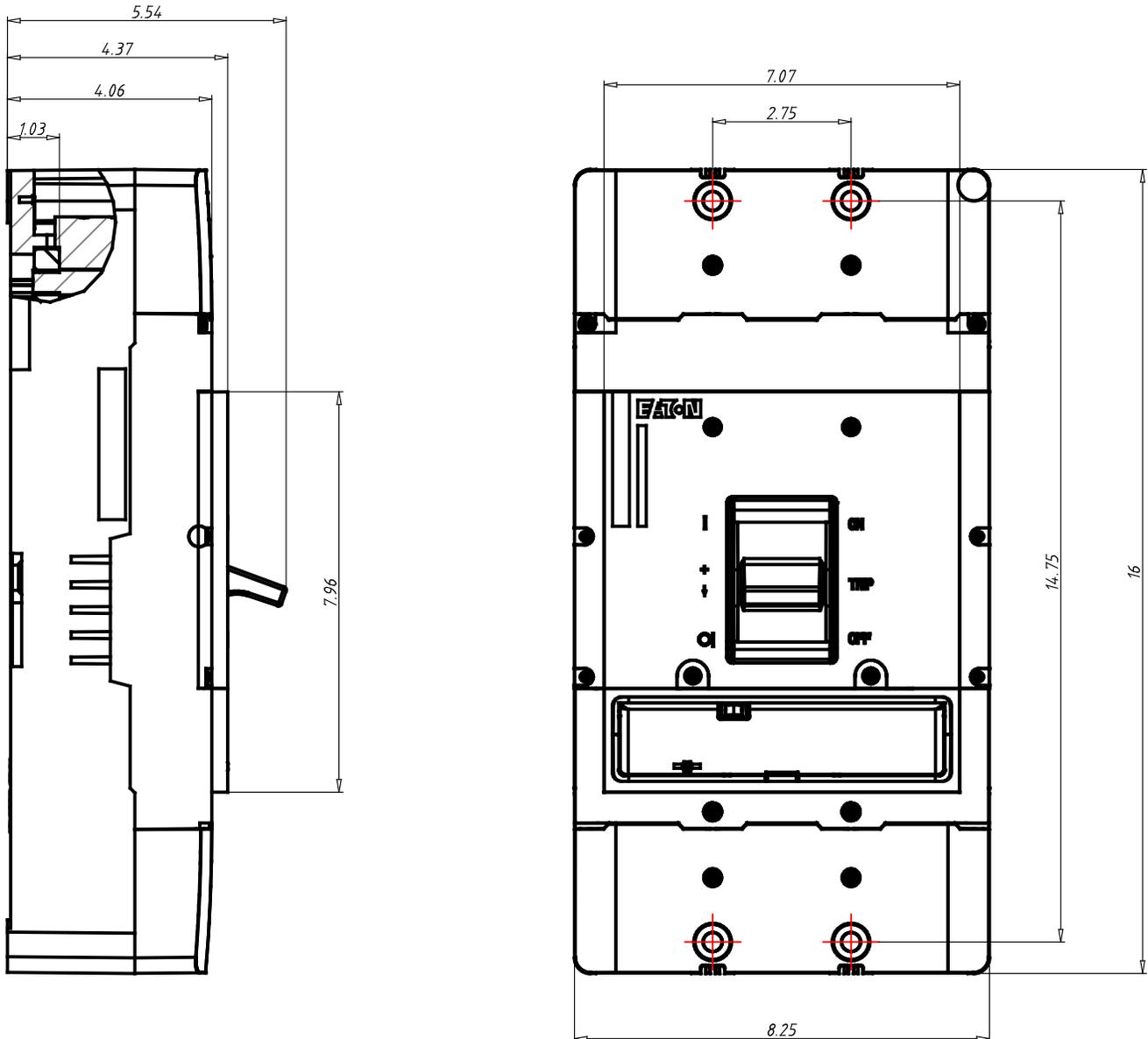
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Tech Data for Configured Product

Power Defense Catalog Number	PDG43G0800B2NJNNNNNN
Frame Size	Frame 4
Poles	3 Pole
Voltage	240V AC
Interruption or Breaking Capacity (Icu/Ics)	55kA
Continuous Current Rating (In)	800A
Trip Unit Type	PXR10
Trip Unit Options 1	LSI
Trip Unit Options 2	None
Indicating Accessories	None
Indicating Accessories Terminal	None
Tripping Accessories	None
Tripping Accessory Terminal	None
Tripping Accessory Voltage	None
Line Type Description	Option 1 - Standard Terminal
Line Conductor Options	(3) 3/0 - 400
Line Terminal Type	Aluminum
Load Type Description	Option 1 - Standard Terminal
Load Conductor Options	(3) 3/0 - 400
Load Terminal Type	Aluminum
Special Options - Type of Modification	None
Details	None
Additional Description	None

Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG43G0800B2NJNNNNNN

Technical drawings



Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG43G0800B2NJNNNNNN



Datasheet creation date: 20/11/2019

General Technical Data

Frame Rating (In)	800A
Reference Standard	UL489, CSA 22.2, IEC 60947-2 & GB
Number of poles	3
Neutral rating	-
Interruption Rating Designator	G / K / M
UL Interruption Rating to UL 489 (240Vac)	65 / 85 / 100kA
UL Interruption Rating to UL 489 (480Vac)	35 / 50 / 65(a)kA
UL Interruption Rating to UL 489 (600Vac)	18 / 25 / 35kA
UL Interruption Rating to UL 489 (125/250Vdc)	
UL Current Limiting	-
Rated breaking capacity to IEC 60947-2 (220-240 Vac Icu)	55 / 85 / 100 / 100kA
Rated breaking capacity to IEC 60947-2 (220-240 Vac Ics)	55 / 85 / 100 / 100kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Icu)	36 / 50 / 70 / 70kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Ics)	36 / 50 / 53 / 70kA
Rated breaking capacity to IEC 60947-2 (440 Vac Icu)	30 / 35 / 50 / 65kA
Rated breaking capacity to IEC 60947-2 (440 Vac Ics)	22.5 / 35 / 40 / 50kA
Rated breaking capacity to IEC 60947-2 (525 Vac Icu)	20 / 25 / 30 / 35kA
Rated breaking capacity to IEC 60947-2 (525 Vac Ics)	16.5 / 20 / 25 / 25kA
Rated breaking capacity to IEC 60947-2 (690 Vac Icu)	8 / 10 / 15 / 20kA
Rated breaking capacity to IEC 60947-2 (690 Vac Ics)	4 / 5 / 7.5 / 10kA
Rated breaking capacity to IEC 60947-2 (125V DC Icu)	
Rated breaking capacity to IEC 60947-2 (250V DC 2P in series Ics)	22 / 22 / 25kA
Frequency	50/60Hz
Trip Unit Type	PXR10
Continuous Current Range	320 - 800A
100% UL489 Rated	Yes
Instantaneous/Short Circuit Range	2 - 8 In
Magnetic/Instantaneous Override	6800A
Dimensions H x W x D (inches)	16 x 8.25 x 4.38
Pole to pole distance inches	2,75
Approx Weight lbs	29,98
RoHS Compliance	Yes
UL File Number	E7819
Ambient Temp Calibration	
Derating at 50C	
Derating at 60C	
Derating at 70C	

1. 480Vac corresponds to 277Vac for 1P
2. 600Vac corresponds to 347Vac for 1P

Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG53K1200E3RNNNNNNN



Datasheet creation date: 19/08/2019

PRODUCT VIEW *(Use Mouse to Rotate and Zoom)*

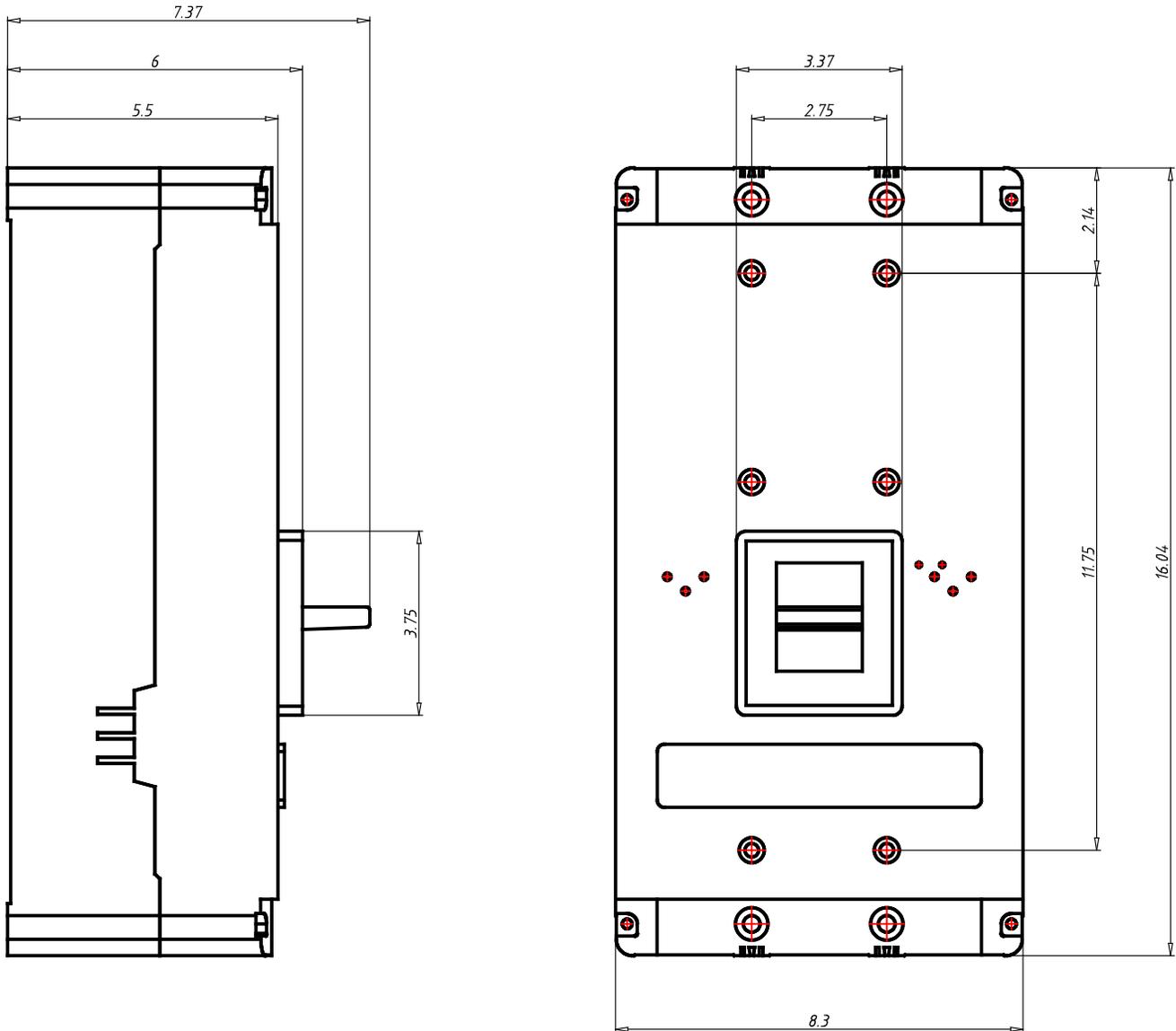
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Tech Data for Configured Product

Power Defense Catalog Number	PDG53K1200E3RNNNNNNN
Frame Size	Frame 5
Poles	3 Pole
Voltage	480V AC
Interruption or Breaking Capacity (Icu/Ics)	50kA
Continuous Current Rating (In)	1200A
Trip Unit Type	PXR20
Trip Unit Options 1	LSIG
Trip Unit Options 2	Relays
Indicating Accessories	None
Indicating Accessories Terminal	None
Tripping Accessories	None
Tripping Accessory Terminal	None
Tripping Accessory Voltage	None
Line Type Description	None
Line Conductor Options	N/A
Line Terminal Type	N/A
Load Type Description	None
Load Conductor Options	N/A
Load Terminal Type	N/A
Special Options - Type of Modification	None
Details	None
Additional Description	None

Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG53K1200E3RNNNNNN

Technical drawings



Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG53K1200E3RNNNNNNN



Datasheet creation date: 19/08/2019

General Technical Data

Frame Rating (In)	1200A
Reference Standard	UL489, CSA 22.2, IEC 60947-2 & GB
Number of poles	3
Neutral rating	-
Interruption Rating Designator	K / M / N / P / T
UL Interruption Rating to UL 489 (240Vac)	85 / 100 / 150 / 200 / 200kA
UL Interruption Rating to UL 489 (480Vac)	50 / 65 / 85 / 100 / 150kA
UL Interruption Rating to UL 489 (600Vac)	25 / 35 / 50 / 65 / 65kA
UL Interruption Rating to UL 489 (125/250Vdc)	
UL Current Limiting	-
Rated breaking capacity to IEC 60947-2 (220-240 Vac Icu)	85 / 100 / 150 / 200kA
Rated breaking capacity to IEC 60947-2 (220-240 Vac Ics)	85 / 100 / 100 / 150kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Icu)	50 / 70 / 70 / 100kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Ics)	50 / 50 / 50 / 50kA
Rated breaking capacity to IEC 60947-2 (440 Vac Icu)	35 / 50 / 70 / 100kA
Rated breaking capacity to IEC 60947-2 (440 Vac Ics)	35 / 40 / 50 / 50kA
Rated breaking capacity to IEC 60947-2 (525 Vac Icu)	25 / 30 / 35 / 40kA
Rated breaking capacity to IEC 60947-2 (525 Vac Ics)	20 / 25 / 25 / 25kA
Rated breaking capacity to IEC 60947-2 (690 Vac Icu)	10 / 15 / 20 / 35kA
Rated breaking capacity to IEC 60947-2 (690 Vac Ics)	5 / 7.5 / 10 / 18kA
Rated breaking capacity to IEC 60947-2 (125V DC Icu)	
Rated breaking capacity to IEC 60947-2 (250V DC 2P in series Ics)	25
Frequency	50/60Hz
Trip Unit Type	PXR20
Continuous Current Range	500 - 1200A
100% UL489 Rated	Yes
Instantaneous/Short Circuit Range	2 - 10 In
Magnetic/Instantaneous Override	14400A
Dimensions H x W x D (inches)	16 x 8.25 x 5.5
Pole to pole distance inches	2,75
Approx Weight lbs	45
RoHS Compliance	Yes
UL File Number	E7819
Ambient Temp Calibration	
Derating at 50C	
Derating at 60C	
Derating at 70C	

1. 480Vac corresponds to 277Vac for 1P
2. 600Vac corresponds to 347Vac for 1P

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.

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.

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

ENHANCED STATUS CODES.
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.

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

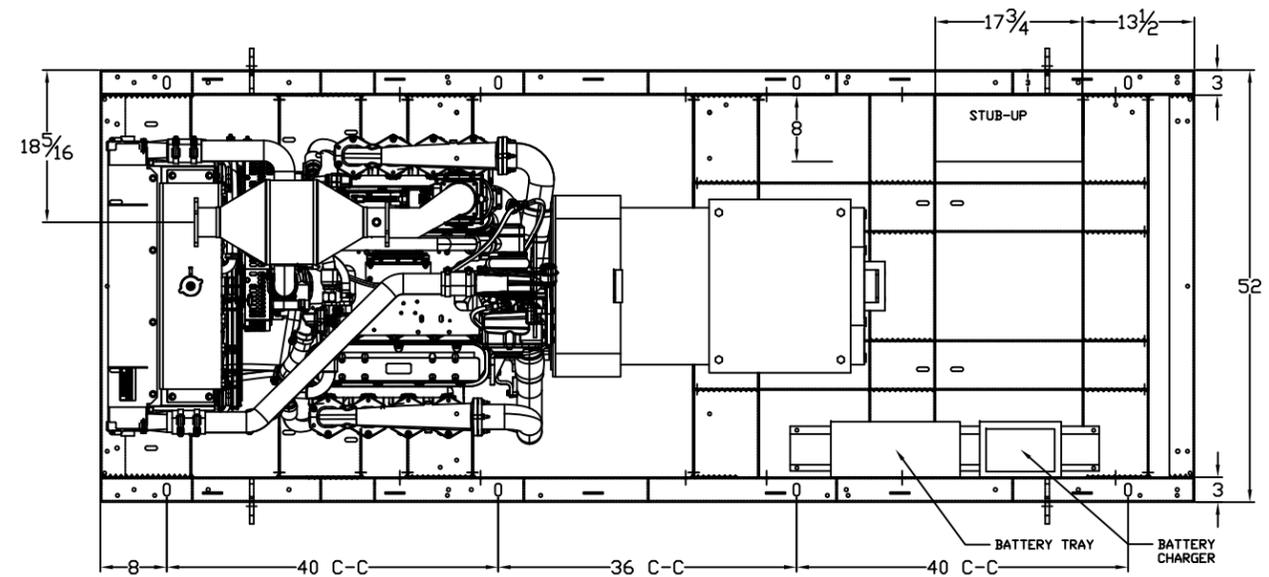
2010

MINN-KOTA

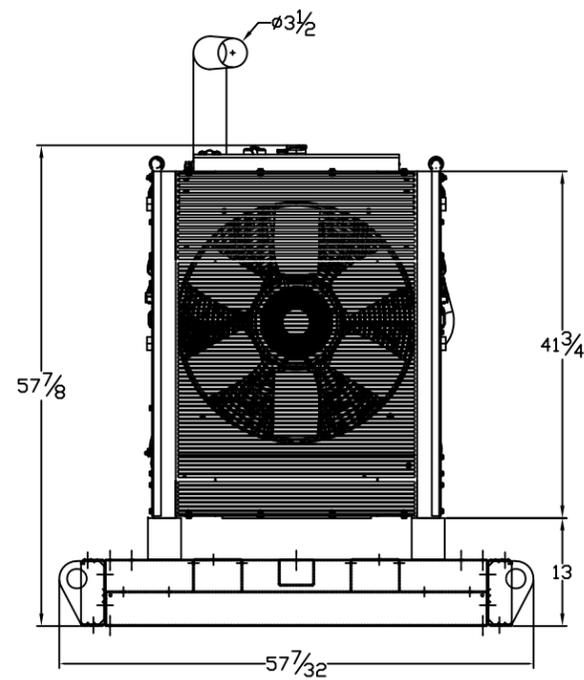
HUMMINBIRD

CANNON

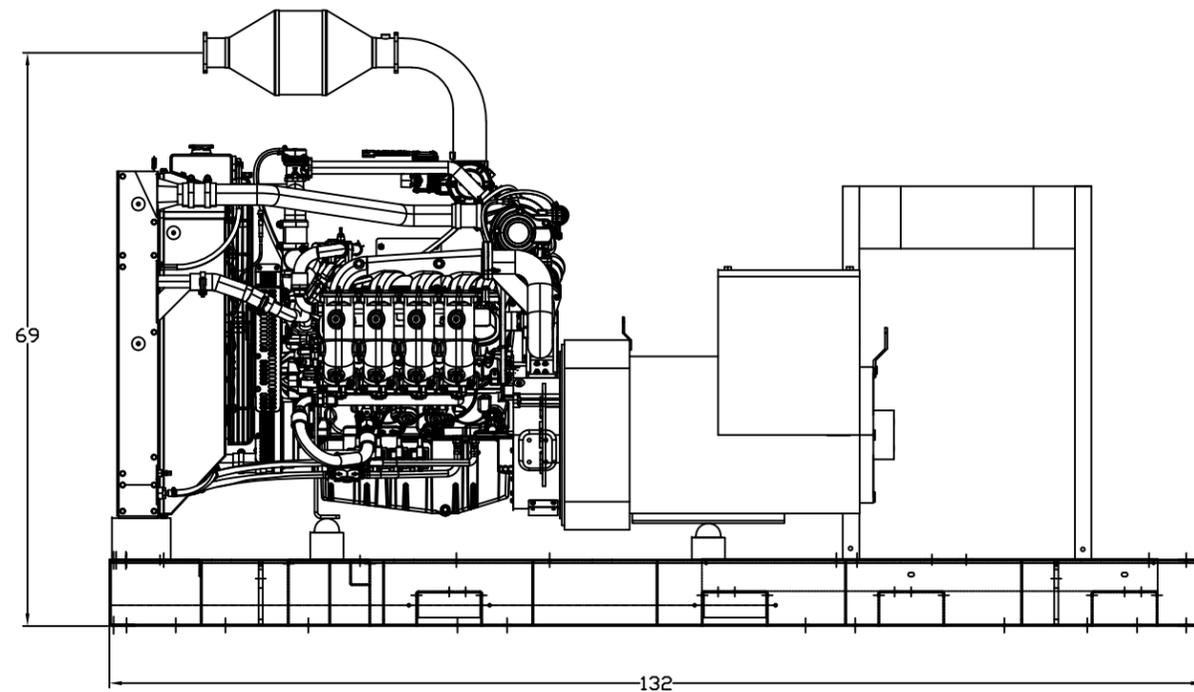
OPEN DIMENSIONAL OVERVIEW FOR SP-2000P GENERATOR



TOP VIEW



RADIATOR VIEW

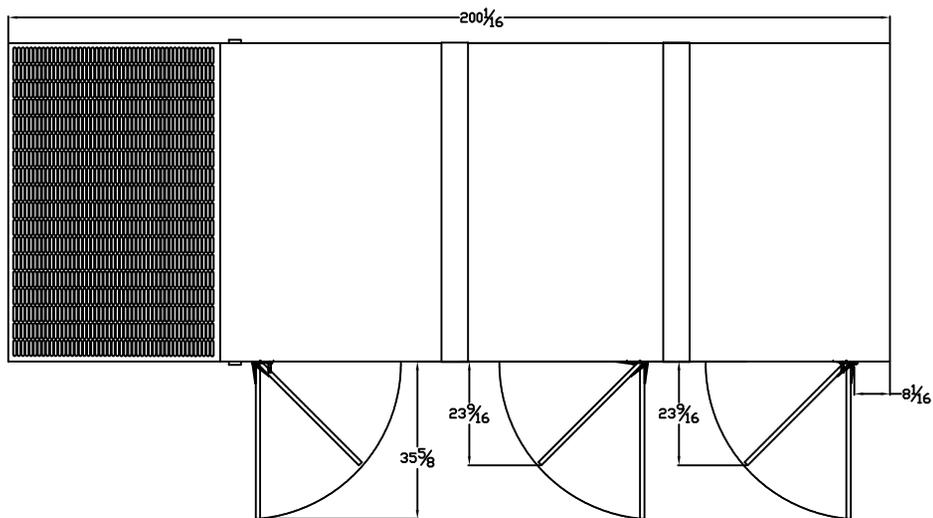


SIDE VIEW

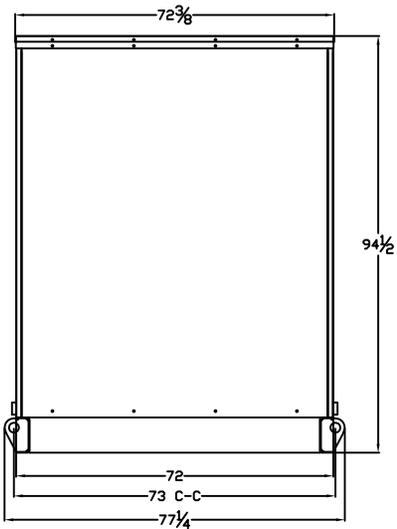
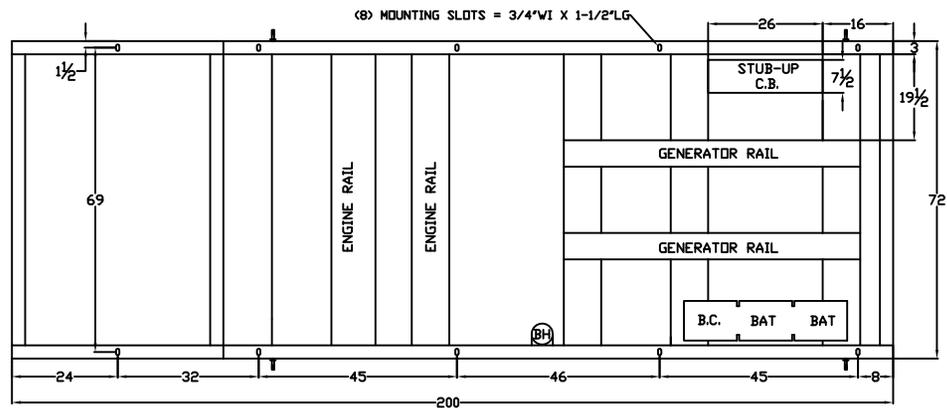
LEVEL 2 & 3 ENCLOSURE OUTLINE DIMENSIONS WITH CRITICAL OR HOSPITAL GRADE SILENCER FOR SP-2500P AND SP-3000P

TOP VIEW

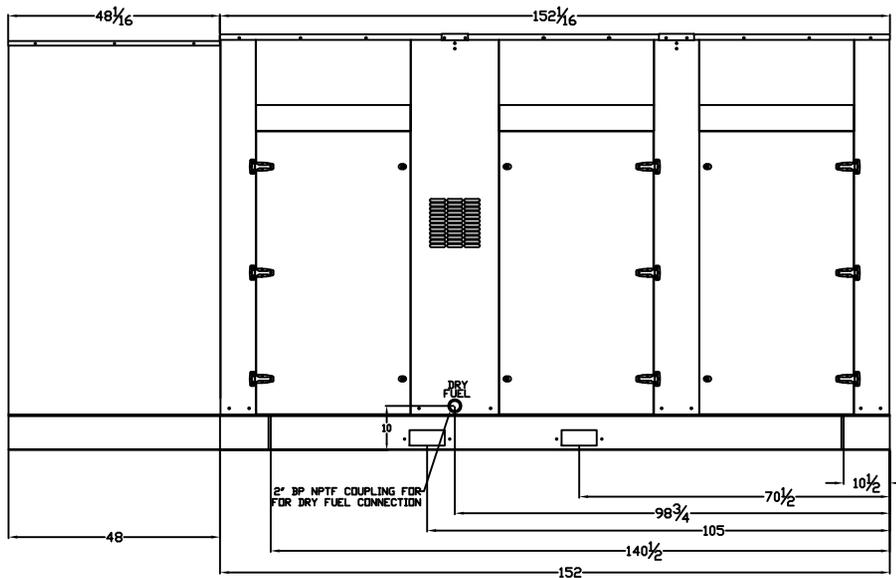
(GEN-SET HAS (6) DOORS, (3) SHOWN OPEN ARE TYPICAL FOR BOTH SIDES)



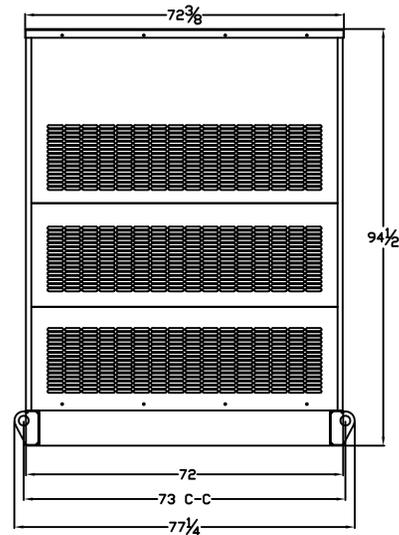
FRAME VIEW



RADIATOR END VIEW



SIDE VIEW



GENERATOR END VIEW