



GILLETTE GENERATORS

LIQUID COOLED NAT. GAS ENGINE GENERATOR SET

60 HZ MODEL

SP-3000P

Model	STANDBY 120°C RISE		
	HZ	LPG	N.G.
SP-3000P-60 HERTZ	60	165	300



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

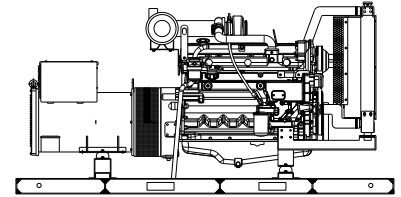


ASCE 7-22

All generator sets meet 200 MPH rating.

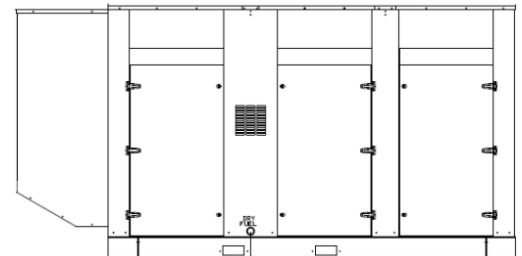


EPA 40CFR Part 60, 1048, 1054, 1065, 1068



“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

					LIQUID PROPANE GAS FUEL		NATURAL GAS FUEL	
GENERATOR MODEL	VOLTAGE		PH	HZ	120°C RISE STANDBY RATING		120°C RISE STANDBY RATING	
	L-N	L-L			KW/KVA	AMP	KW/KVA	AMP
SP-3000P-3-2	120	208	3	60	165/206	582	300/375	1040
SP-3000P-3-3	120	240	3	60	165/206	505	300/375	902
SP-3000P-3-4	277	480	3	60	165/206	251	300/375	451
SP-3000P-3-16	346	600	3	60	165/206	202	300/375	360

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-3000P-60 HZ

GENERATOR SPECIFICATIONS

Manufacturer.....Stamford Electric Generators
Model & Type.....S4L1DE-311, 4 Pole, 12 Lead, Three Phase
.....S4L1D-311, 4 Pole, 12 Lead, 480V, Three Phase
.....S4L1D-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, 13L CAC HO, 4 cycle
Aspiration.....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).....1950 (9.9)
Max Power, bhp (kwm) Standby/LPG.....240 (179)
Max Power, bhp (kwm) Standby/NG.....469 (350)
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	985 (27)
75% LOAD	803 (22)
50% LOAD	511 (14)
LPG = 2500 BTU X FT ³ /HR = Total BTU/HR LPG Conversion: 8.50 FT ³ = 1 LB. : 36.4 FT ³ = 1 GAL.	

NAT. GAS: FT ³ /HR (M ³ /HR)	STANDBY
100% LOAD	3979 (113)
75% LOAD	3111 (88)
50% LOAD	2079 (59)
NG = 1000 BTU X FT ³ /HR = Total BTU/HR	

OIL SYSTEM

Type.....Full Pressure
Oil Pan Capacity qt. (L).....29 (27)
Oil Pan Cap. W/ filter qt. (L).....32 (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-3000P-60 HZ

COOLING SYSTEM

Type of System Pressurized, closed recovery
Coolant Pump Pre-lubricated, self-sealing
Cooling Fan Type (no. of blades) Pusher (12)
Fan Diameter inches (mm) 34" (863.6)
Ambient Capacity of Radiator °F (°C) 140 (60)
Engine Jacket Coolant Capacity Gal (L) 6 (22)
Radiator Coolant Capacity Gal. (L) 16 (62)
Maximum Restriction of Cooling Air Intake
and discharge side of radiator in. H₂O (kpa) 0.5 (.125)
Water Pump Capacity gpm (L/min) 146 (553)
Heat Reject Coolant: Btu/min (kw) 14,627 (257)
Heat Reject CAC: Btu/min (kw) 2730 (48)
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) 661 (1307)
Radiator Air Flow cfm (m³/min) 25639 (726)
Heat Rejected to Ambient:
Engine: kw (btu/min) 70 (3981)

EXHAUST SYSTEM

Exhaust Outlet Size 6"
Max. Back Pressure, in. hg (KPA) 4.4 (15)
Exhaust Flow, at rated kw: cfm (m³/min) 2197 (62)
Exhaust Temp., at rated kw: °F (°C) 1288 (698)
Engines are EPA certified for Natural Gas.

SOUND LEVELS MEASURED IN dB(A)

	Open Set	Level 2 Encl.
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 104°F (40°C)

DIMENSIONS AND WEIGHTS

	Open Set	Level 2 Enclosure
Length in (cm).....	152 (368)	200 (473)
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-3000P-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.

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

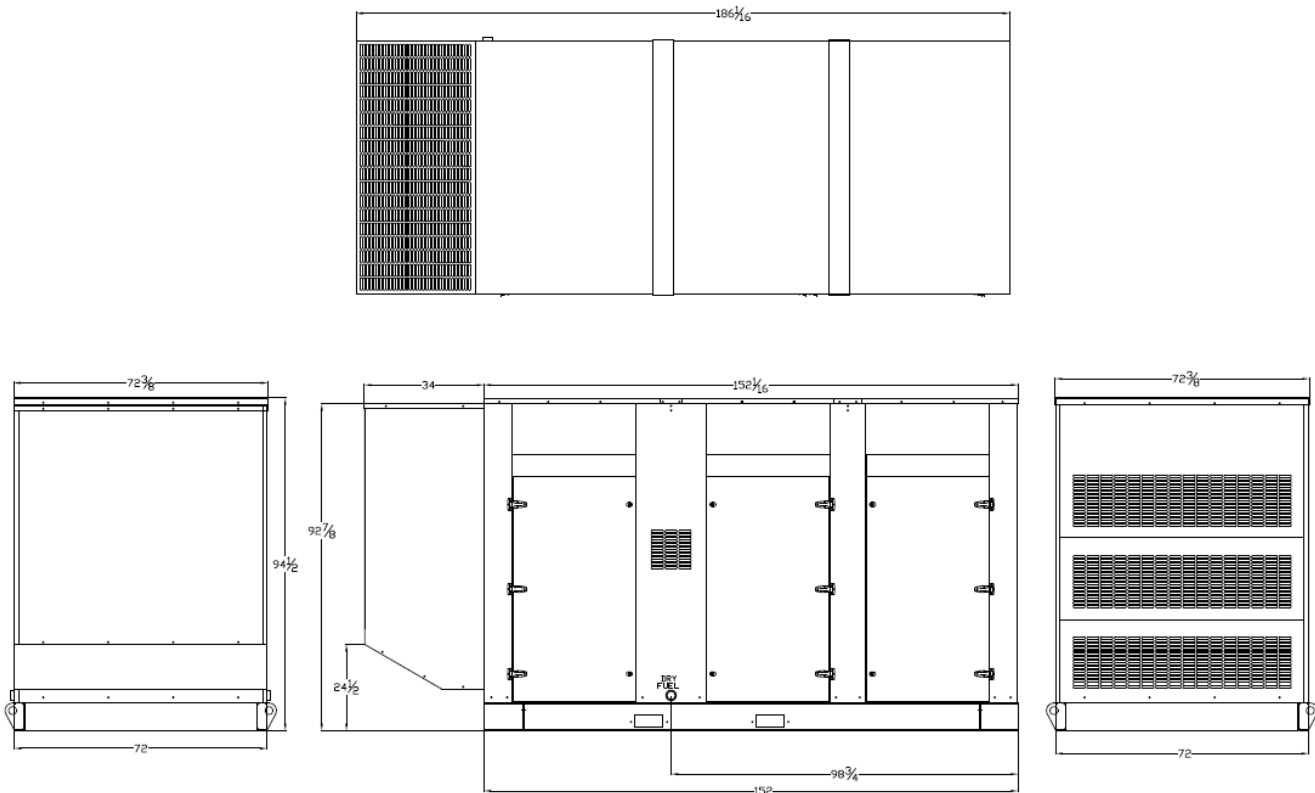
DC ELECTRICAL SYSTEM:

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

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





**POWER SOLUTIONS
INTERNATIONAL**

13LHO

Natural Gas / LPG

56100091
Revision 1
1/24/2023

General Engine Data ⁵														
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	2315	1050	
Firing Order		1 - 5 - 3 - 6 - 2 - 4						Radiator to Flywheel		lb	kg	3219	1460	
Rotation Viewed from Flywheel		Counter Clockwise				Wet Weight		Fan to Flywheel		lb	kg	2425	1100	
Bore		in	mm	5.0	127.0			Radiator to Flywheel		lb	kg	3475	1576	
Stroke		in	mm	6.5	165.1	CoG from Rear Face of Flywheel Housing				in	mm	17.8	451	
Displacement		in ³	L	765.4	12.54	Center of Gravity Above Crank Centerline				in	mm	6.3	161	
Compression Ratio		10.5 : 1				Oil Specification				SAE 15W-40 Low Ash Gas engine oil				
Exhaust Manifold Type		Water Cooled								Ash content 0.25 - 0.5% by weight				
Turbo Exhaust Outlet Pipe Size		in	mm	3.0	77.0	Engine Oil Capacity		Min	qts	L	29	27		
Catalyst Inlet Size (O.D)		in	mm	3.5	89.0			Max	qts	L	32	30		
Catalyst Dp		in-H ₂ O	kPa	29.9	7.5	ECU Oil Pressure Warning ⁶				psi	bar	50	3.5	
Maximum Allowable Exhaust Back Pressure		in-Hg	kPa	4.4	15.0	ECU Oil Pressure Shut Down ⁶				psi	bar	36	2.5	
Maximum Fuel System Pressure ⁸		psi	kPag	0.9	6.2	Oil Pressure Operating Range		Idle	psi	bar	58	4.0		
Maximum Operating pressure to EPR		in-H ₂ O	kPa	10.9	2.7			Rated	psi	bar	75	5.2		
Minimum Operating pressure to EPR		in-H ₂ O	kPa	6.8	1.7	Max Allowable Oil Temperature				°F	°C	235	113	
Minimum Gas Supply Pipe Size ⁵		2-11.5 NPT				Coolant Capacity (Engine only)				gal	L	6	22	
Maximum Pressure Drop Across CAC		psi	kPa	0.7	5.0	Coolant Capacity (Radiator only)				gal	L	16	62	
Maximum Allowable Intake Restriction		Clean Air Filter	in-H ₂ O	kPa	12.1	3.0	Radiator Weight (Dry)				lb	kg	904	410
		Dirty Air Filter	in-H ₂ O	kPa	24.9	6.2	Thermostat Operating		Cracking	°F	°C	169	76	
Spark Plug Part Number		Bosch R66857				Temperature Range ⁹		Full Open	°F	°C	190	88		
Standard Spark Plug Gap ¹⁰		in	mm	0.02	0.45	ECU Coolant Temp Warning				°F	°C	220	104	
Spark Plug Coil - Primary Resistance		Ohms		0.59Ω ± 10%		ECU Coolant Temp Shutdown				°F	°C	230	110	
Battery Voltage		Volts		24		Maximum Radiator Cooling Air Temp				°F	°C	140	60	
Starter Motor Power		HP	kW	7.4	5.5	Max External Coolant Friction Head				psi	kPa	7	50	
						CAC Rise Above Ambient Specified				°F	°C	27	15	
Performance Data 60Hz ^{3,5}														
Nominal Engine Speed		RPM		1800		Total Engine Coolant Flow				gal/min	L/min	146	553	
Mean Piston Speed		ft/min	m/s	1950	9.9	Cooling Fan Power ¹¹				HP	kW	30	22.5	
Steady-State RPM Range - ISO 8528-5 G3		RPM		1791 - 1809		Cooling Fan Speed				RPM		2192		
Charging Alternator Voltage		Volts		28		Cooling Fan Air Flow ¹¹				SCFM	m ³ /min	25639	726	
Charging Alternator Current		Amps		70										
Standby 60Hz Natural Gas		Load		100%		75%		50%		25%				
Power Rating ^{1,2,3,4} Per ISO 3046		HP	kWm	469	350	352	263	235	175	117	88			
Brake Mean Effective Pressure		psi	bar	270	18.6	202	14.0	135	9.3	67	4.7			
Fuel Consumption ^{3,4,7,12}		lb/hr	kg/hr	178	81	139	63	93	42	53	24			
		ft ³ /hr	m ³ /hr	3979	113	3111	88	2079	59	1183	34			
Brake Specific Fuel Consumption		lb/(hp-hr)	g/(kW-hr)	0.379	231	0.396	241	0.397	241	0.451	275			
Turbine Outlet Temperature		°F	°C	1288	698	1269	687	1225	663	1128	609			
Exhaust Flow at Turbine Outlet Conditions (entire engine)		lb/hr	kg/hr	3062	1389	2397	1087	1609	730	915	415			
		ACFM	m ³ /min	2197	62	1702	48	1117	32	604	17			
Air Induction System ⁵														
Combustion Air required (entire engine)		lb/hr	kg/hr	2881	1307	2257	1024	1515	687	861	391			
		ACFM	m ³ /min	661	19	518	15	348	10	198	6			
Compressor Outlet Temperature ²		°F	°C	325	163	255	124	194	90	120	49			
Thermal Balance ⁵														
Total Fuel		BTU/min	kW	58439	1028									
Mechanical Power		BTU/min	kW	19904	350									
Heat Rejected to Cooling Water		BTU/min	kW	14627	257									
Heat Rejected to CAC		BTU/min	kW	2730	48									
Heat Rejection to Exhaust		BTU/min	kW	17265	304									
Engine Radiated Heat		BTU/min	kW	3981	70									

1: Max load and overload ratings based on ISO 3046 gross flywheel power. For additional information on ratings and duty cycles see PSI Power Systems Technical Spec #56100017 - Engine Ratings Guidelines

2: Technical data based on ISO 3046-1 standards of 77°F(25°C), barometric 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 Power Systems Technical Spec. 56100019 - Fuel Standard.

8: Maximum pressure the fuel system components can withstand without being damaged. Operating pressure should fall between the listed minimum and maximum pressures.

9: ± 2 degrees Celsius.

10: ± 0.002" or 0.05mm.

11: At 0.5 in-H₂O of Package Restriction at STP.

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



General Engine Data ⁵															
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	2315	1050			
Firing Order	1 - 5 - 3 - 6 - 2 - 4					Radiator to Flywheel			lb	kg	3219	1460			
Rotation Viewed from Flywheel	Counter Clockwise				Wet Weight	Fan to Flywheel			lb	kg	2425	1100			
Bore	in	mm	5.0	127.0		Radiator to Flywheel			lb	kg	3475	1576			
Stroke	in	mm	6.5	165.1	CoG from Rear Face of Flywheel Housing				in	mm	17.8	451			
Displacement	in ³	L	765.4	12.54	Center of Gravity Above Crank Centerline				in	mm	6.3	161			
Compression Ratio	10.5 : 1				Oil Specification				SAE 15W-40 Low Ash Gas engine oil Ash content 0.25 - 0.5% by weight						
Exhaust Manifold Type	Water Cooled				Engine Oil Capacity				Min	qts	L	29	27		
Turbo Exhaust Outlet Pipe Size	in	mm	3.0	77.0					Max	qts	L	32	30		
Catalyst Inlet Size (O.D)	in	mm	3.5	89.0	ECU Oil Pressure Warning ⁶				psi	bar	50	3.5			
Catalyst Dp	in-H ₂ O	kPa	29.9	7.5	ECU Oil Pressure Shut Down ⁶				psi	bar	36	2.5			
Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	4.4	15.0	Oil Pressure Operating Range				Idle	psi	bar	58	4.0		
Maximum Fuel System Pressure ⁸	psi	kPag	0.9	6.2					Rated	psi	bar	75	5.2		
Maximum Operating pressure to EPR	in-H ₂ O	kPa	10.9	2.7	Max Allowable Oil Temperature				°F	°C	235	113			
Minimum Operating pressure to EPR	in-H ₂ O	kPa	6.8	1.7	Coolant Capacity (Engine only)				gal	L	6	22			
Minimum Gas Supply Pipe Size ⁵	2-11.5 NPT				Coolant Capacity (Radiator only)				gal	L	16	62			
Maximum Pressure Drop Across CAC	psi	kPa	0.7	5.0	Radiator Weight (Dry)				lb	kg	904	410			
Maximum Allowable Intake Restriction	Clean Air Filter	in-H ₂ O	kPa	12.1	3.0	Thermostat Operating				°F	°C	169	76		
	Dirty Air Filter	in-H ₂ O	kPa	24.9	6.2	Temperature Range ⁹			Cracking	°F	°C	190	88		
Spark Plug Part Number	Bosch R66857				Full Open				°F	°C	220	104			
Standard Spark Plug Gap ¹⁰	in	mm	0.02	0.45	ECU Coolant Temp Warning				°F	°C	230	110			
Spark Plug Coil - Primary Resistance	Ohms			0.59Ω ± 10%				ECU Coolant Temp Shutdown				°F	°C	140	60
Battery Voltage	Volts			24				Maximum Radiator Cooling Air Temp				°F	°C	7	50
Starter Motor Power	HP	kW	7.4	5.5	Max External Coolant Friction Head				psi	kPa	27	15			
					CAC Rise Above Ambient Specified				°F	°C					

Performance Data 60Hz ^{3,5}												
Nominal Engine Speed	RPM		1800		Total Engine Coolant Flow				gal/min	L/min	146	553
Mean Piston Speed	ft/min	m/s	1950	9.9	Cooling Fan Power ¹¹				HP	kW	30	23
Steady-State RPM Range - ISO 8528-5 G3	RPM		1791 - 1809		Cooling Fan Speed				RPM		2192	
Charging Alternator Voltage	Volts		28		Cooling Fan Air Flow ¹¹				SCFM	m³/min	25639	726
Charging Alternator Current	Amps		70									

S4LID-E41 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®

S4LID-E41 Wdg.311

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	13.56							
	50 Hz				60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air	0.8 m³/sec				0.96 m³/sec			
Voltage Star	380	400	415	440	416	440	460	480
kVA Base Rating (Class H) for Reactance Values	350	360	360	350	400	435	440	455
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	3.01	2.79	2.59	2.24	3.47	3.38	3.12	2.97
X'd Dir. Axis Transient	0.20	0.19	0.17	0.15	0.21	0.20	0.19	0.18
X''d Dir. Axis Subtransient	0.14	0.13	0.12	0.11	0.15	0.14	0.13	0.12
Xq Quad. Axis Reactance	2.57	2.39	2.22	1.92	2.92	2.84	2.62	2.49
X''q Quad. Axis Subtransient	0.36	0.33	0.31	0.27	0.41	0.40	0.37	0.35
XL Stator Leakage Reactance	0.07	0.06	0.06	0.05	0.08	0.08	0.08	0.07
X2 Negative Sequence Reactance	0.24	0.23	0.21	0.18	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	3.61	3.35	3.11	2.69	4.17	4.05	3.75	3.56
X'd Dir. Axis Transient	0.23	0.21	0.20	0.17	0.24	0.23	0.21	0.20
X''d Dir. Axis Subtransient	0.17	0.16	0.15	0.13	0.17	0.17	0.15	0.15
Xq Quad. Axis Reactance	2.65	2.46	2.29	1.98	3.00	2.92	2.70	2.57
X''q Quad. Axis Subtransient	0.43	0.40	0.37	0.32	0.49	0.48	0.44	0.42
XL Stator Leakage Reactance	0.08	0.07	0.07	0.06	0.10	0.09	0.09	0.08
Xlr Rotor Leakage Reactance	0.12	0.11	0.10	0.09	0.13	0.13	0.12	0.11
X2 Negative Sequence Reactance	0.29	0.27	0.25	0.22	0.33	0.32	0.30	0.29
X0 Zero Sequence Reactance	0.12	0.11	0.10	0.09	0.11	0.11	0.10	0.10

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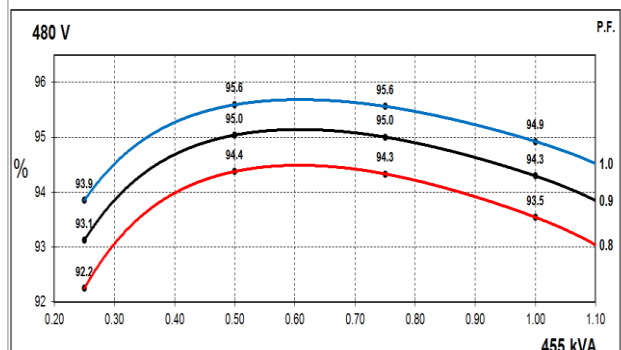
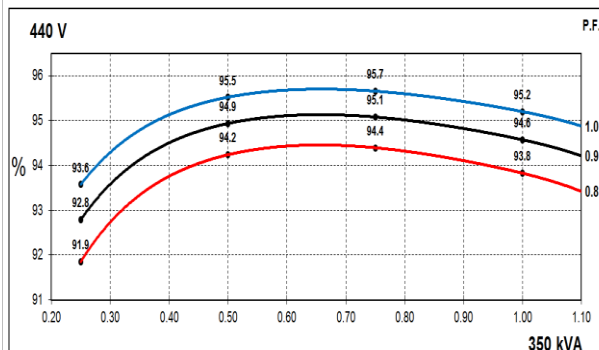
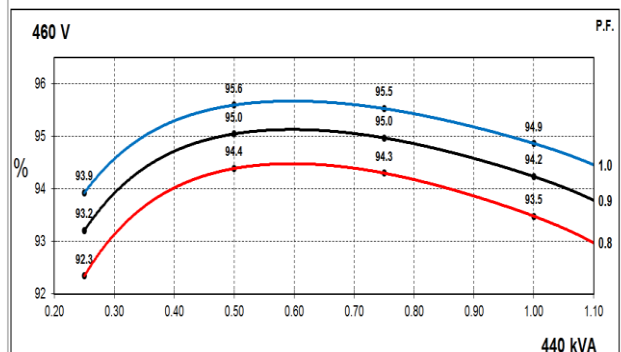
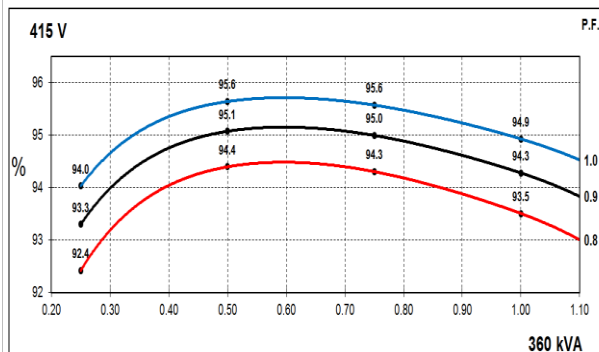
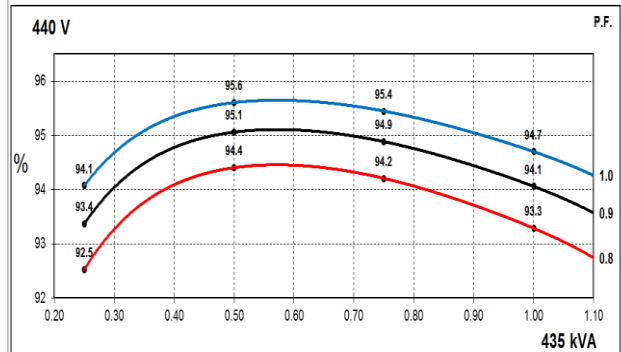
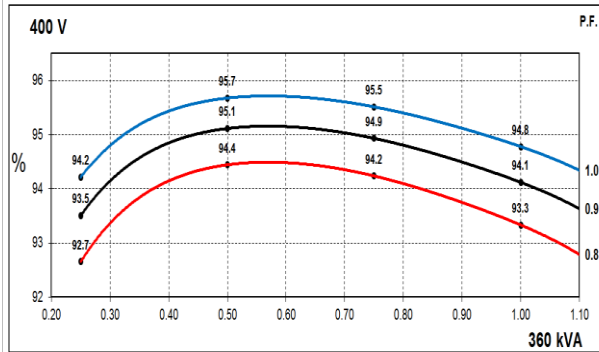
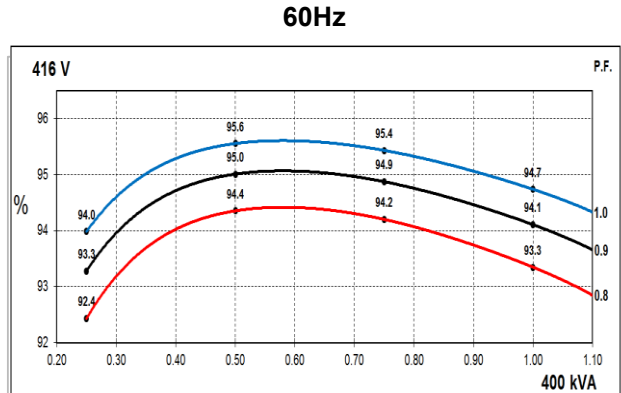
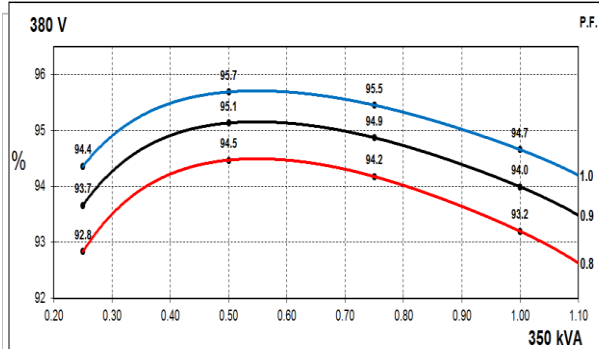
Time Constants (Seconds)		
T'd TRANSIENT TIME CONST.	0.08	
T''d SUB-TRANSTIME CONST.	0.019	
T'do O.C. FIELD TIME CONST.	1.7	
Ta ARMATURE TIME CONST.	0.018	
T''q SUB-TRANSTIME CONST.	0.0079	
Resistances in Ohms (Ω) at 22 ⁰ C		
Stator Winding Resistance (Ra), per phase for series connected	0.009	
Rotor Winding Resistance (Rf)	1.19	
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)	0.01125	
Negative Sequence Resistance (R2)	0.01296	
Zero Sequence Resistance (R0)	0.01125	
Saturation Factors	400V	480V
SG1.0	0.32	0.33
SG1.2	1.3	1.32
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	4.6331kgm ²	N/A
Weight Wound Stator	470kg	N/A
Weight Wound Rotor	400kg	N/A
Weight Complete Alternator	1024kg	N/A
Shipping weight in a Crate	1095kg	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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THREE PHASE EFFICIENCY CURVES

50Hz

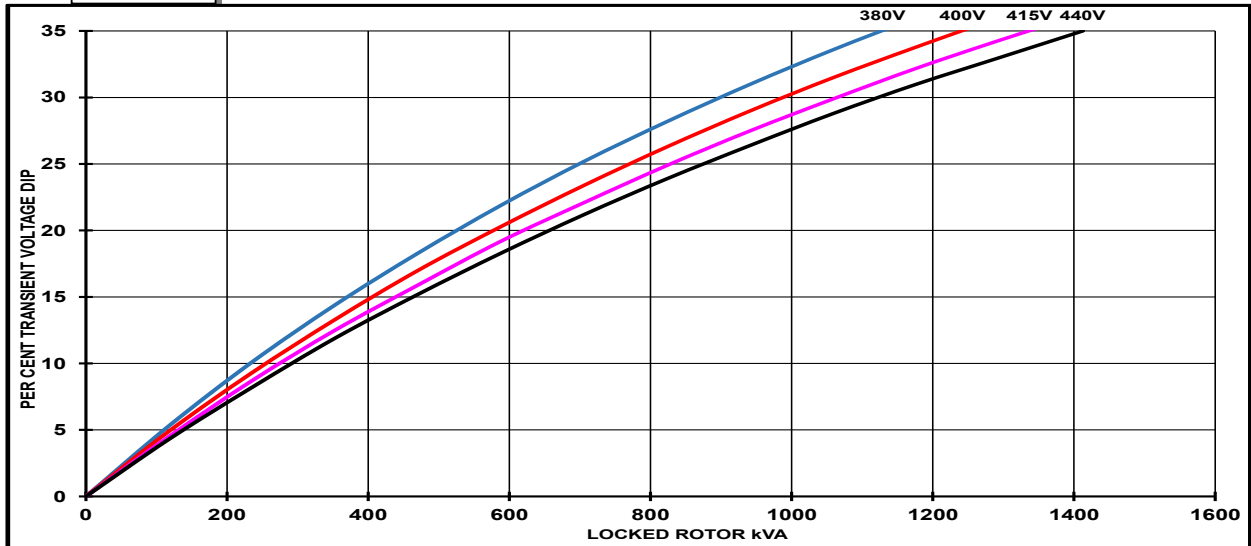


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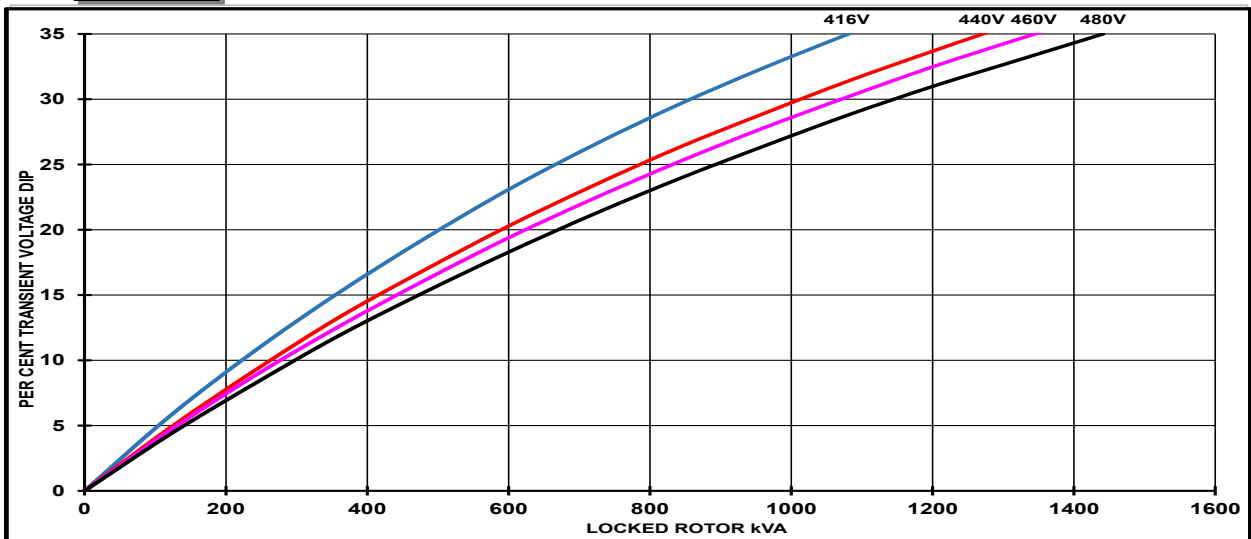
S4LID-E41 Wdg.311

Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



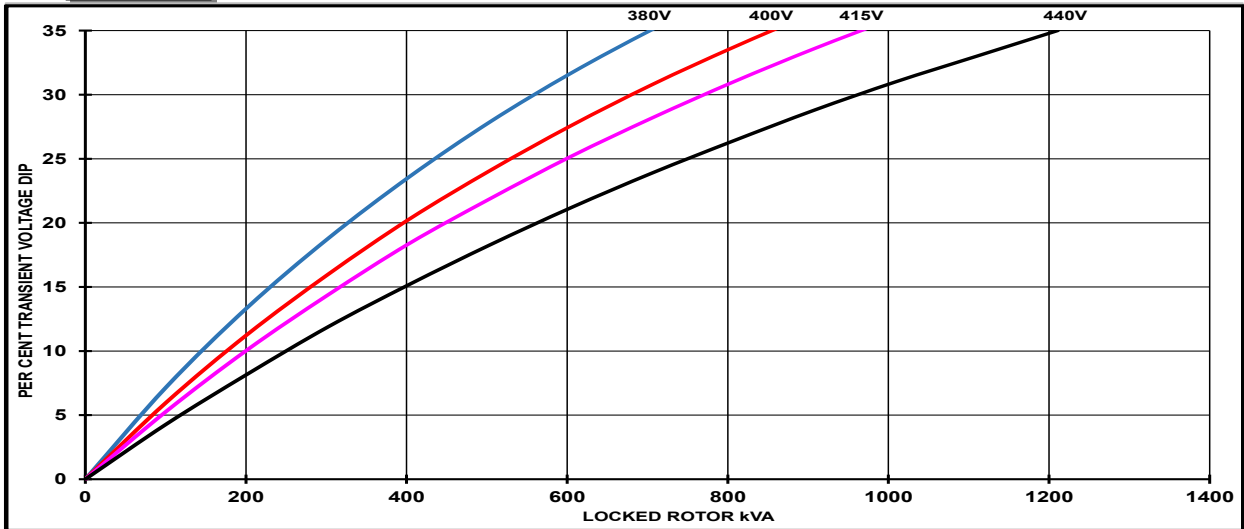
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1	
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

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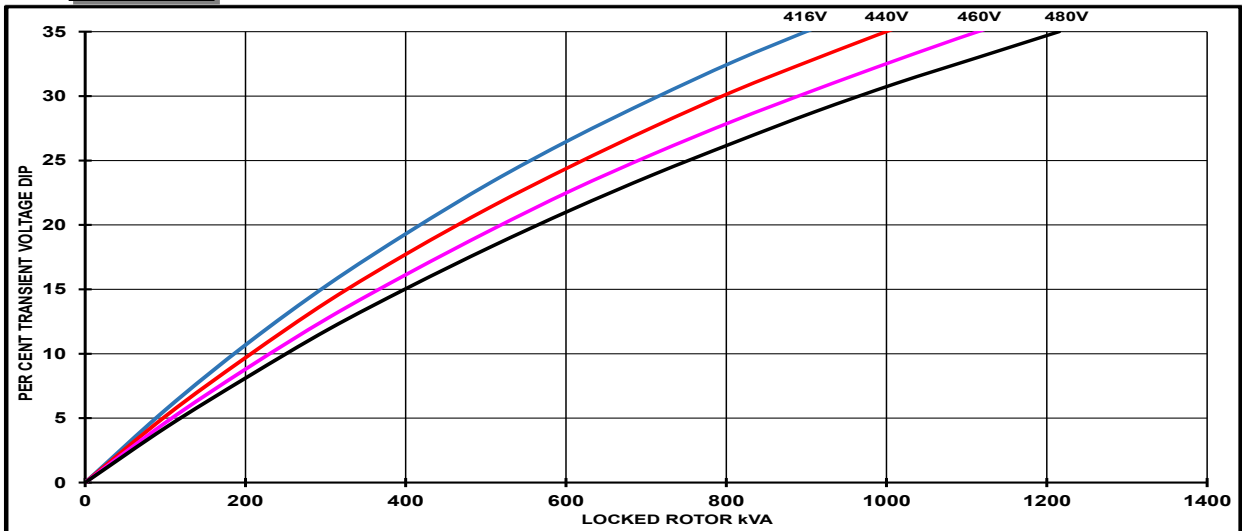
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Locked Rotor Motor Starting Curves - Self Excited

50Hz



60Hz



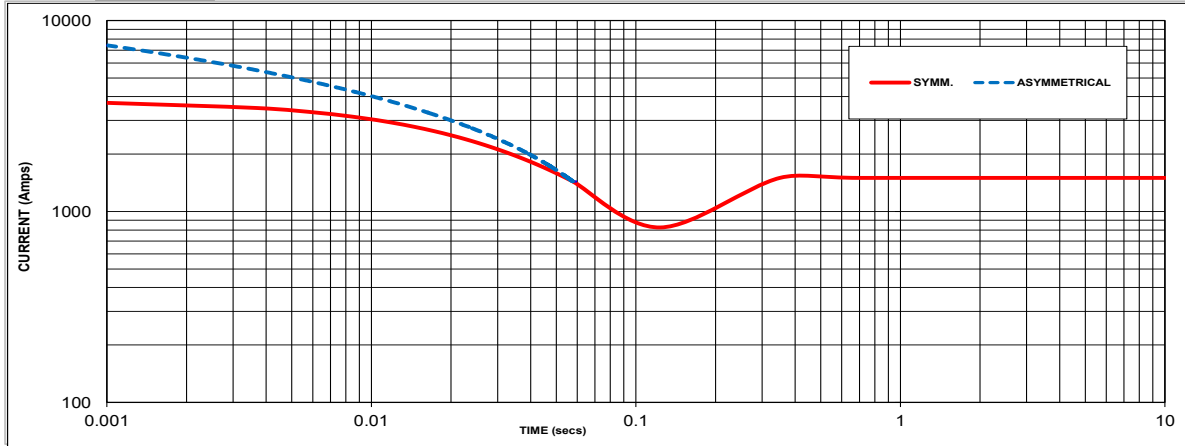
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1	
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

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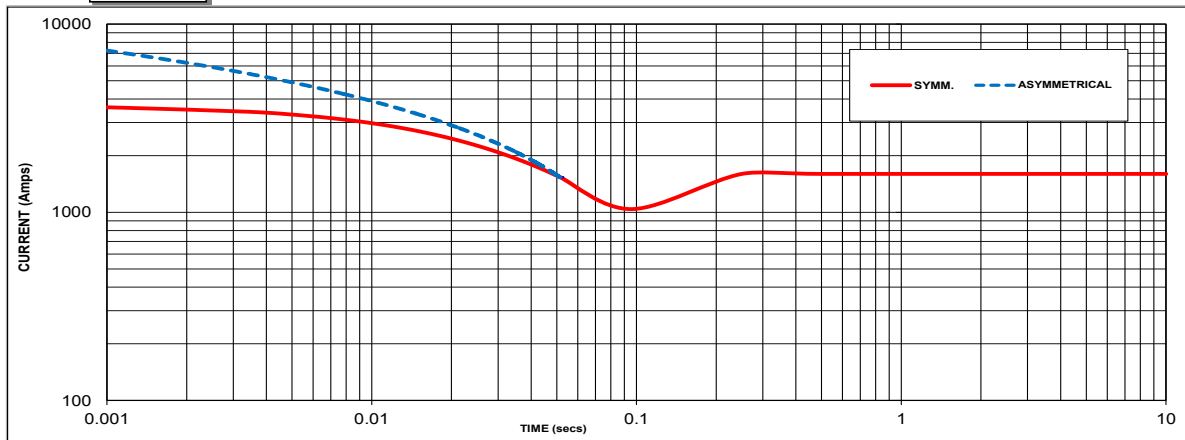
Three-phase Short Circuit Decrement Curve

50Hz



Sustained Short Circuit = 1500 Amps

60Hz



Sustained Short Circuit = 1600 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

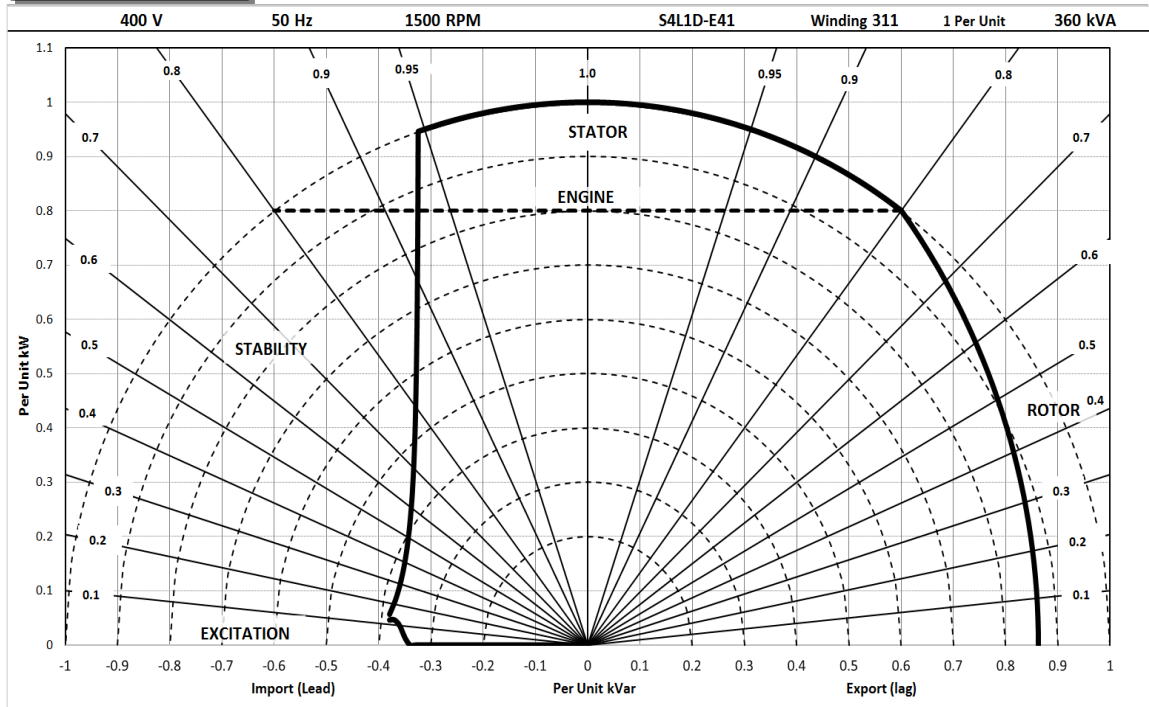
Series Delta = Curve current value X 1.732

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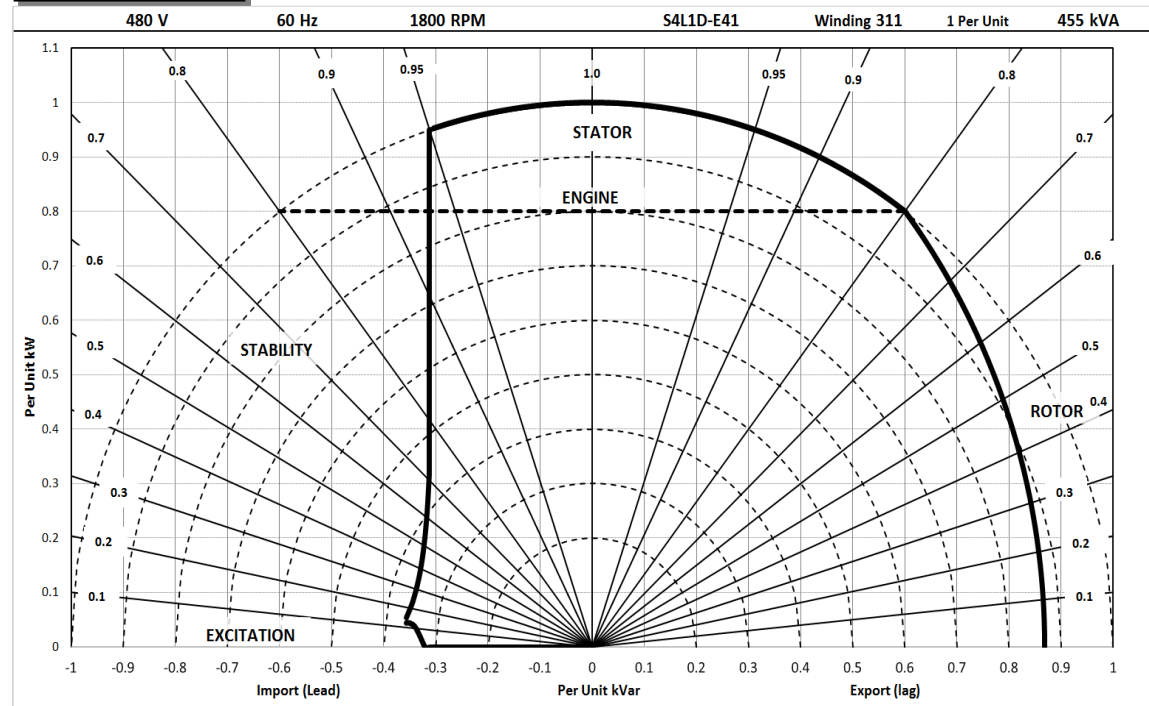
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Typical Alternator Operating Charts

400V/50Hz



480V/60Hz



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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	380	415	400	380	370	385	385	370	350	360	360	350	320	325	325	320
	kW	304	332	320	304	296	308	308	296	280	288	288	280	256	260	260	256
	Efficiency (%)	92.7	92.5	93.0	93.5	92.9	93.0	93.2	93.6	93.2	93.3	93.5	93.8	93.6	93.8	93.9	94.1
	kW Input	328	359	344	325	319	331	331	316	300	309	308	298	274	277	277	272

60 Hz	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	kVA	435	470	475	490	420	460	460	475	400	435	440	455	365	395	400	410
	kW	348	376	380	392	336	368	368	380	320	348	352	364	292	316	320	328
	Efficiency (%)	92.9	92.9	93.1	93.2	93.1	93.0	93.3	93.3	93.4	93.3	93.5	93.5	93.7	93.7	93.9	93.9
	kW Input	374	405	408	421	361	396	395	407	343	373	377	389	312	337	341	349

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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For Applications Support:
applications@cummins.com

For Customer Service:
service-engineers@stamford-avk.com

For General Enquiries:
info@cumminsgeneratortechnologies.com

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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

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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

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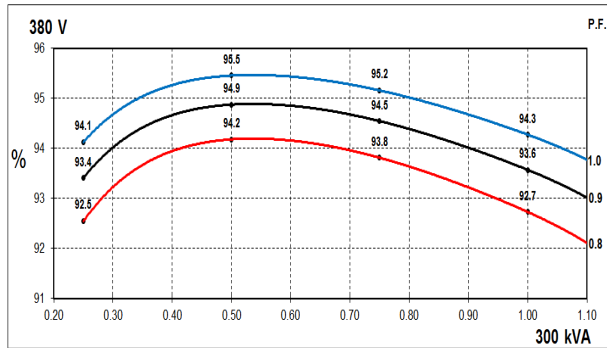
Time Constants (Seconds)		
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T''d SUB-TRANSTIME CONST.	0.019	
T'do O.C. FIELD TIME CONST.	1.7	
Ta ARMATURE TIME CONST.	0.018	
T''q SUB-TRANSTIME CONST.	0.0077	
Resistances in Ohms (Ω) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	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 kgm2	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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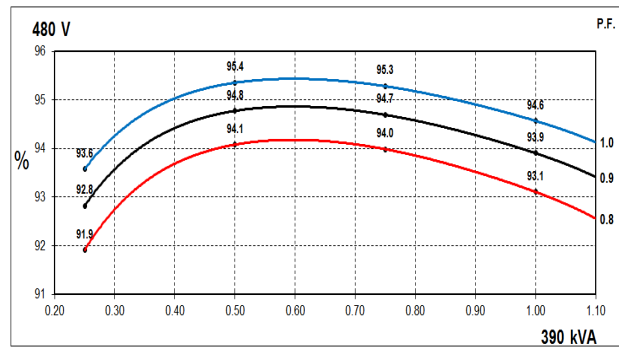
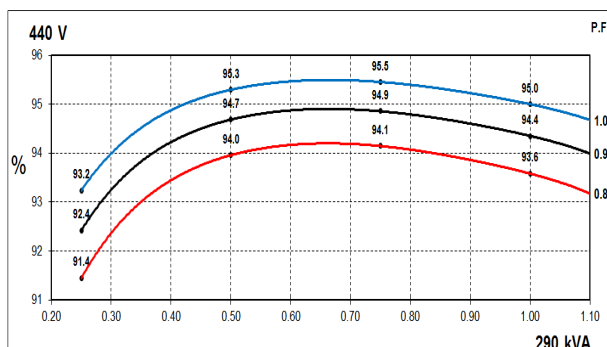
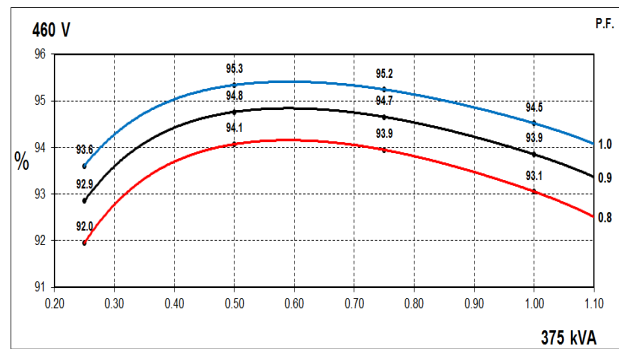
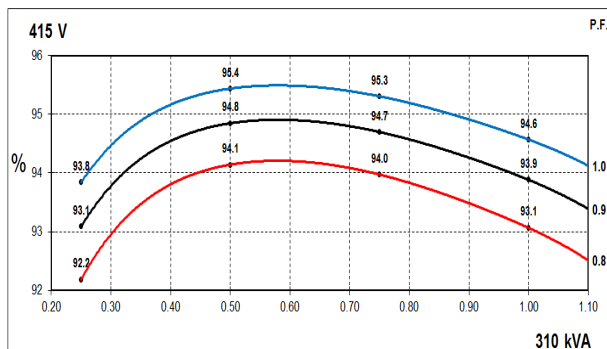
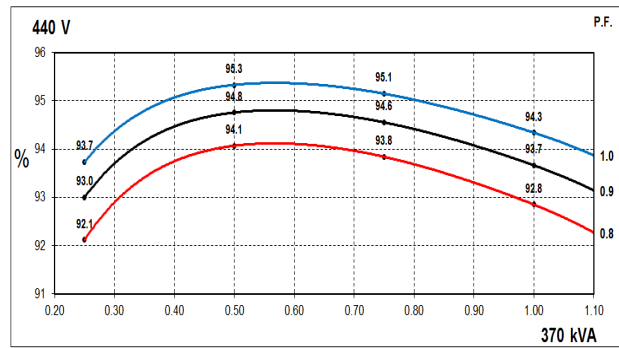
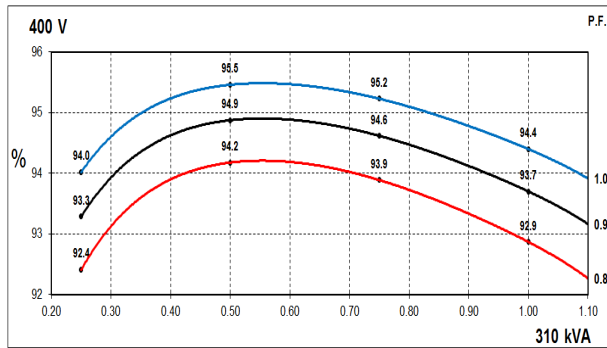
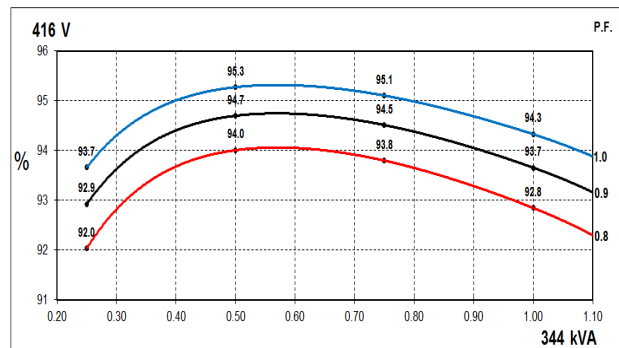
S4L1D-D41 Wdg.311

THREE PHASE EFFICIENCY CURVES

50Hz



60Hz

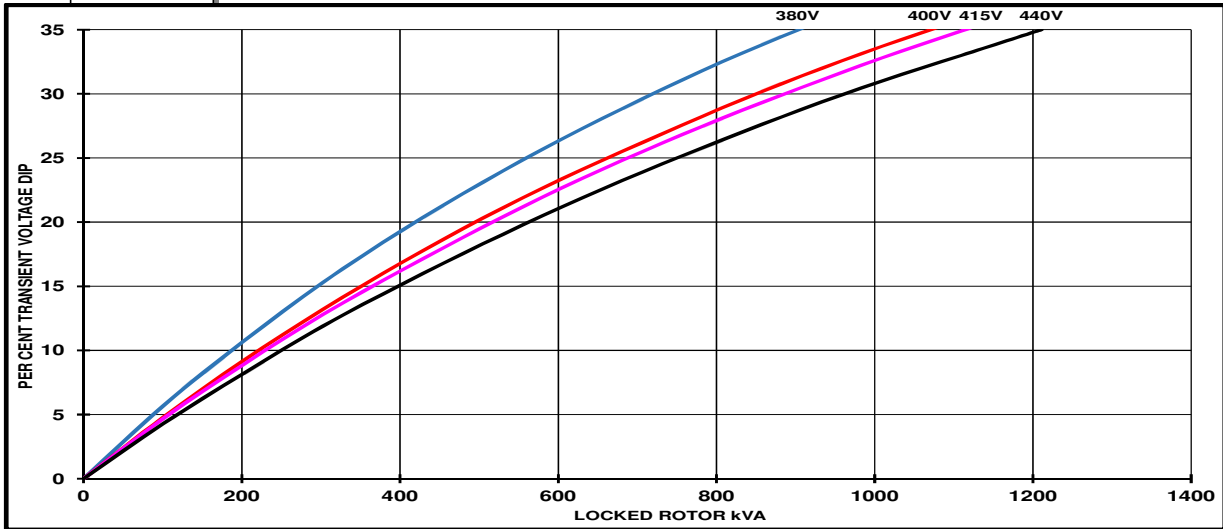


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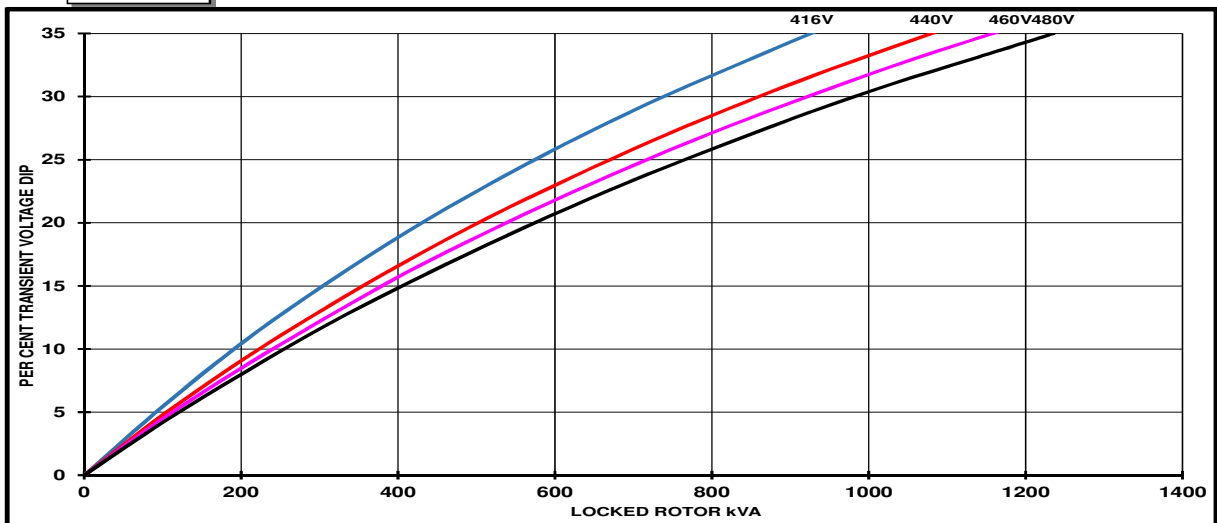
S4L1D-D41 Wdg.311

Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



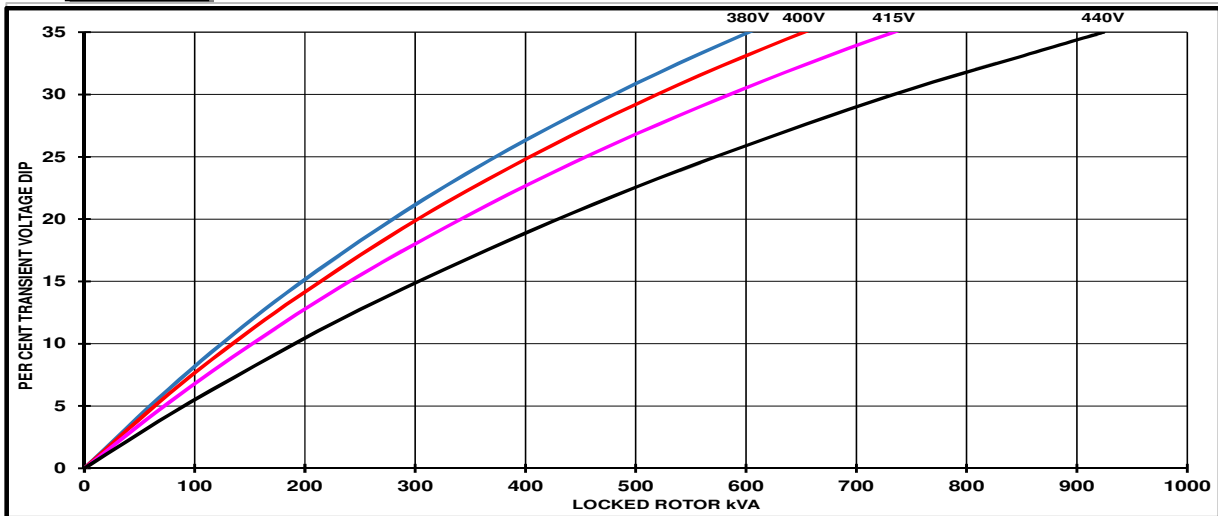
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1	
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

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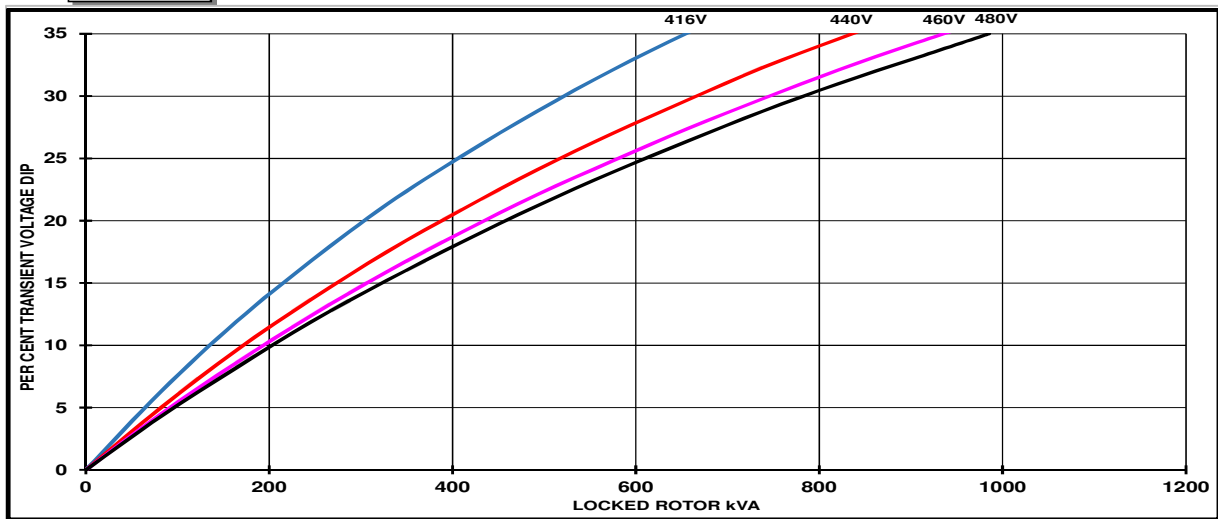
S4L1D-D41 Wdg.311

Locked Rotor Motor Starting Curves - Self Excited

50Hz



60Hz



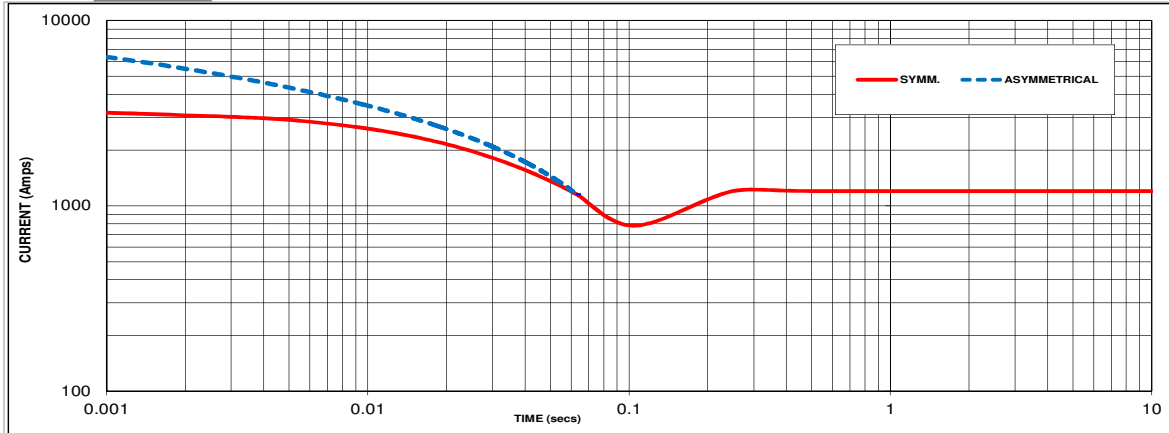
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor
PF	Factor	For voltage rise multiply voltage dip by 1.25
< 0.5	1	
0.5	0.97	
0.6	0.93	
0.7	0.9	
0.8	0.85	
0.9	0.83	

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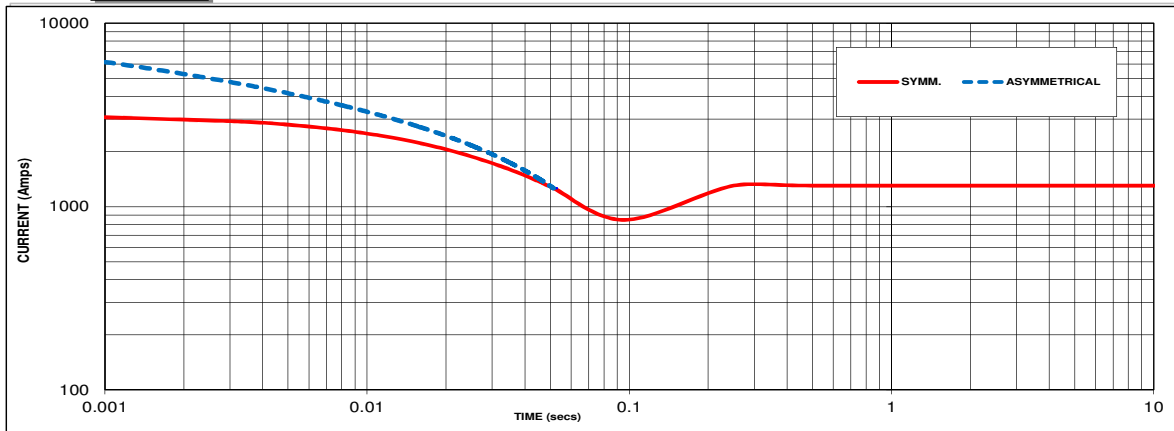
Three-phase Short Circuit Decrement Curve

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

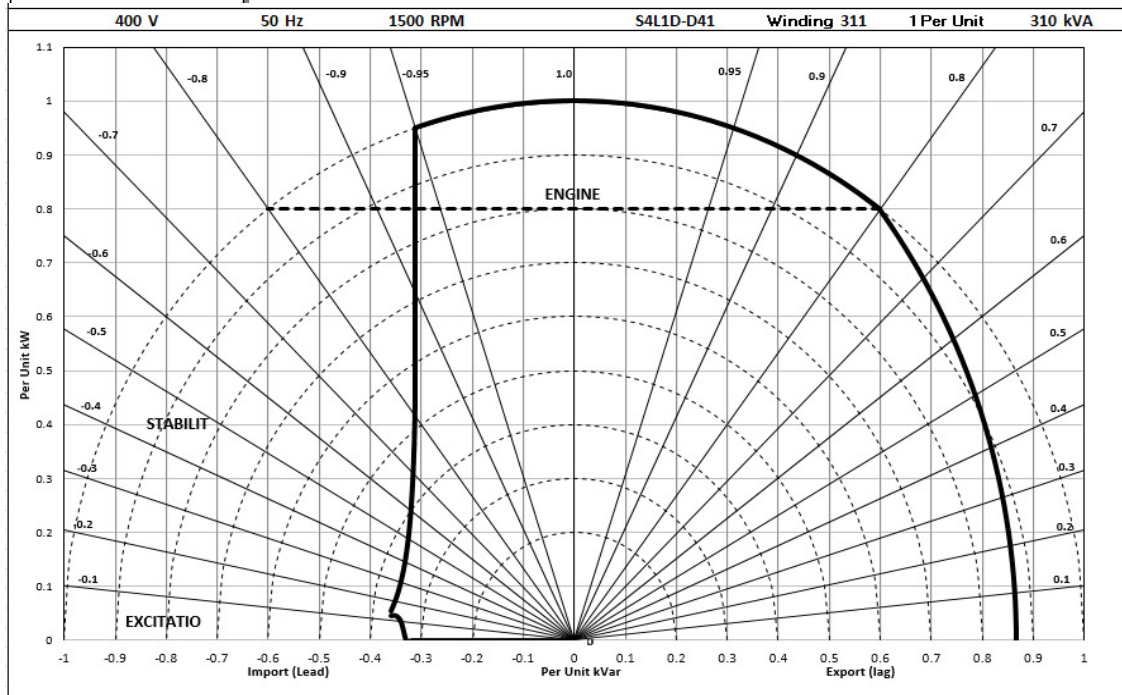
Curves are drawn for Star connected machines under no-load excitation at rated speeds. For other connection the following multipliers should be applied to current values as shown :
 Parallel Star = Curve current value X 2
 Series Delta = Curve current value X 1.732

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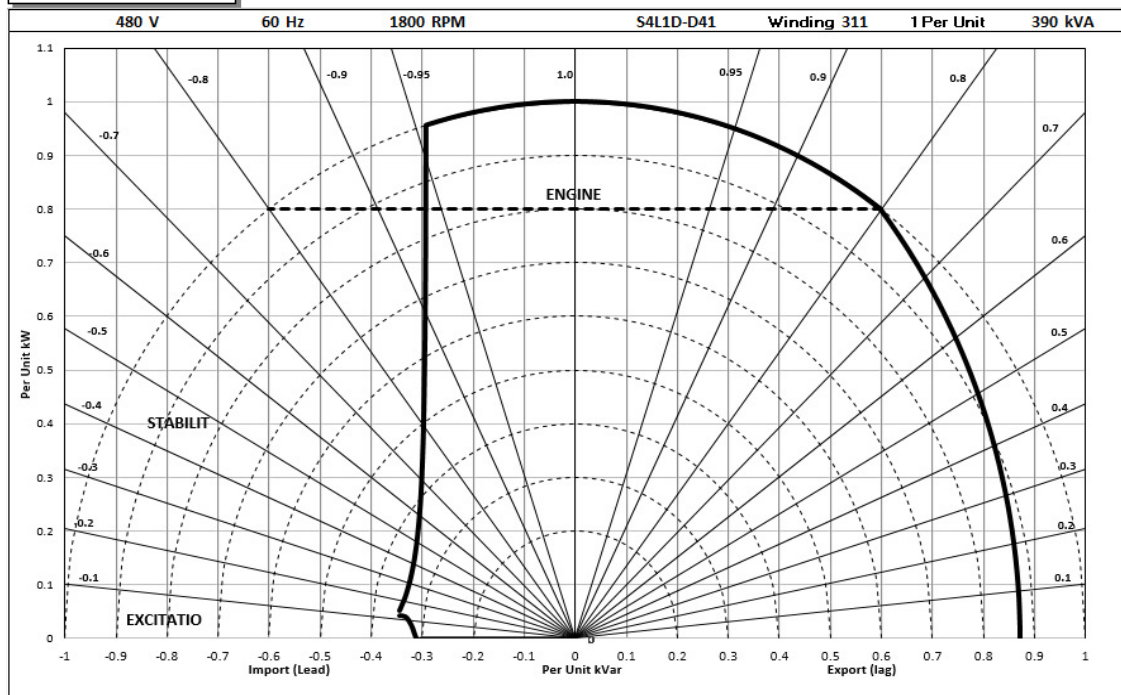
S4L1D-D41 Wdg.311

Typical Alternator Operating Charts

400V/50Hz



480V/60Hz



STAMFORD®

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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Cummins Generator Technologies



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news.stamford-avk.com

For Applications Support:
applications@cummins.com

For Customer Service:
service-engineers@stamford-avk.com

For General Enquiries:
info@cumminsgeneratortechnologies.com

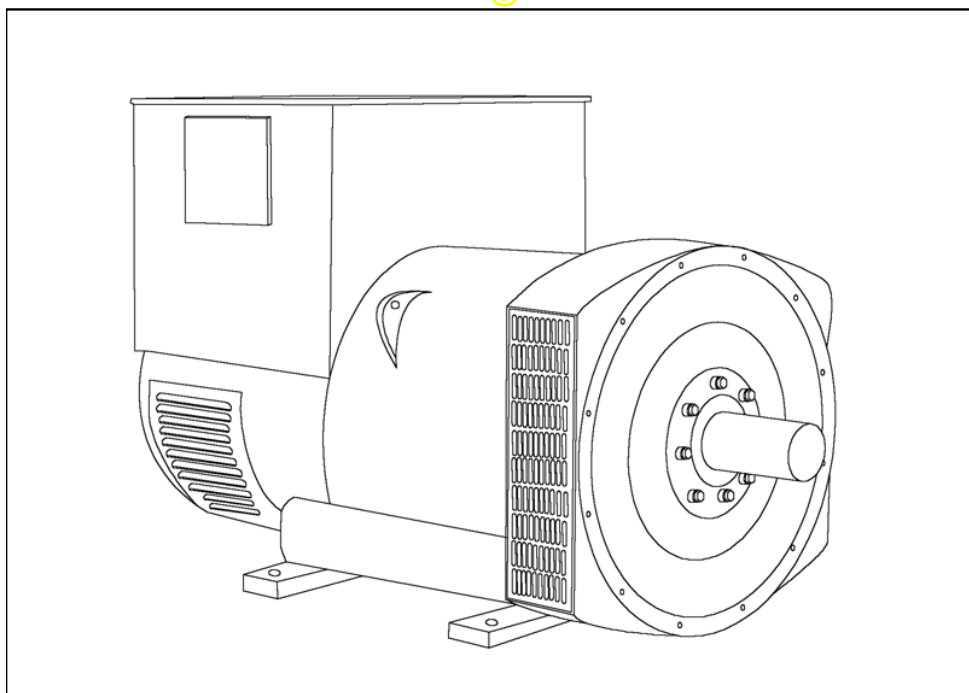
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STAMFORD[®]

HCI434D/444D - Winding 17

Technical  Data Sheet



HCI434D/444D

SPECIFICATIONS & OPTIONS

STAMFORD

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

AS440 AVR - STANDARD

With this self-excited system the main stator provides power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semi-conductors 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. Two bearing generators are balanced with a half key.

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.

HCI434D/444D

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.	AS440		
VOLTAGE REGULATION	± 1.0 %	With 4% ENGINE GOVERNING	
SUSTAINED SHORT CIRCUIT	WILL NOT SUSTAIN A SHORT CIRCUIT		

INSULATION SYSTEM	CLASS H	
PROTECTION	IP23	
RATED POWER FACTOR	0.8	
STATOR WINDING	DOUBLE LAYER LAP	
WINDING PITCH	TWO THIRDS	
WINDING LEADS	12	
STATOR WDG. RESISTANCE	0.02 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED	
ROTOR WDG. RESISTANCE	1.05 Ohms at 22°C	
EXCITER STATOR RESISTANCE	18 Ohms at 22°C	
EXCITER ROTOR RESISTANCE	0.068 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 DRIVE END	BALL. 6317 (ISO)	
BEARING NON-DRIVE END	BALL. 6314 (ISO)	
	1 BEARING	2 BEARING
WEIGHT COMP. GENERATOR	940 kg	950 kg
WEIGHT WOUND STATOR	415 kg	415 kg
WEIGHT WOUND ROTOR	361 kg	338 kg
WR² INERTIA	4.0771 kgm²	3.8783 kgm²
SHIPPING WEIGHTS in a crate	1010 kg	1010 kg
PACKING CRATE SIZE	155 x 87 x 107(cm)	155 x 87 x 107(cm)
TELEPHONE INTERFERENCE	THF<2%	TIF<50
COOLING AIR	0.99 m³/sec 2100 cfm	
VOLTAGE SERIES STAR	600V	
VOLTAGE PARALLEL STAR	300V	
VOLTAGE SERIES DELTA	346V	
kVA BASE RATING FOR REACTANCE VALUES	375	
Xd DIR. AXIS SYNCHRONOUS	2.96	
X'd DIR. AXIS TRANSIENT	0.18	
X''d DIR. AXIS SUBTRANSIENT	0.13	
Xq QUAD. AXIS REACTANCE	2.54	
X''q QUAD. AXIS SUBTRANSIENT	0.34	
XL LEAKAGE REACTANCE	0.07	
X2 NEGATIVE SEQUENCE	0.22	
Xo ZERO SEQUENCE	0.08	
REACTANCES ARE SATURATED		
VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED		
T'd TRANSIENT TIME CONST.	0.08s	
T''d SUB-TRANSTIME CONST.	0.019s	
T'do O.C. FIELD TIME CONST.	1.7s	
Ta ARMATURE TIME CONST.	0.018s	
SHORT CIRCUIT RATIO	1/Xd	

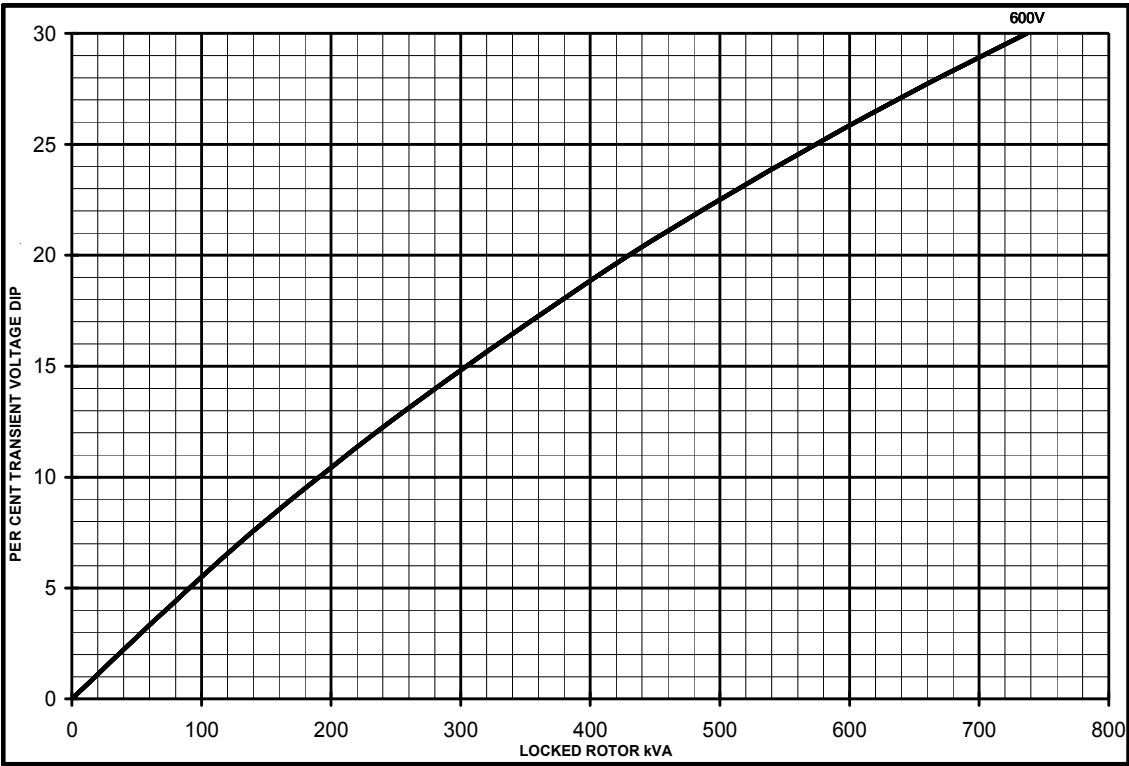
HCI434D/444D

STAMFORD

Winding 17

SX

Locked Rotor Motor Starting Curves



OCU

MX

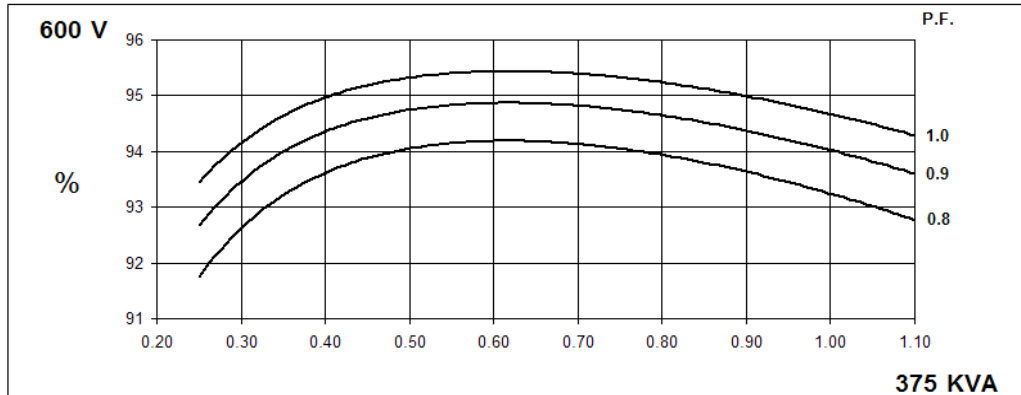


HCI434D/444D

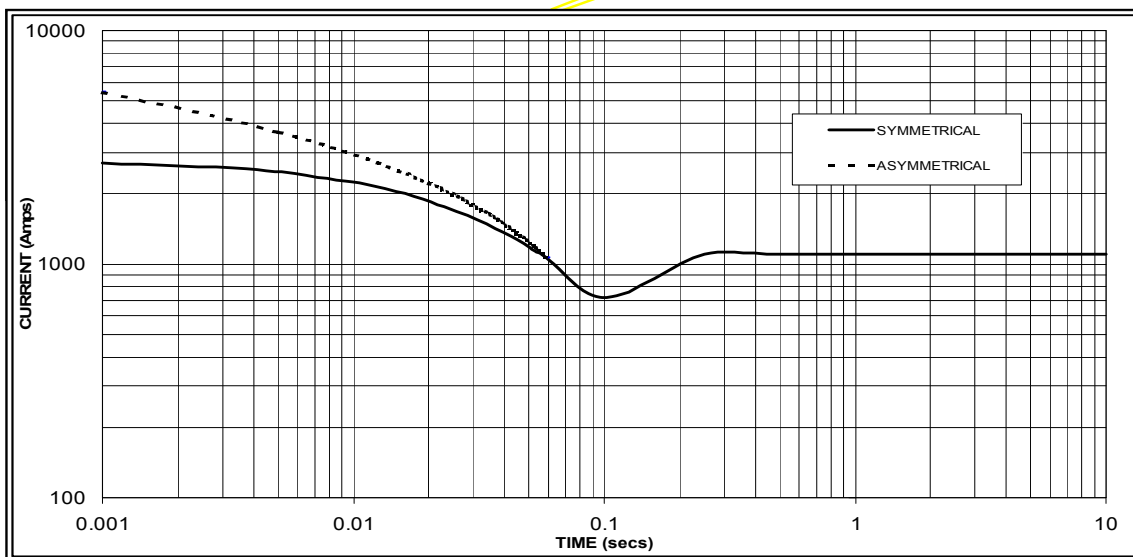
Winding 17

STAMFORD

THREE PHASE EFFICIENCY CURVES



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



Sustained Short Circuit = 1100 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

HCI434D/444D

STAMFORD

Winding 17 / 0.8 Power Factor

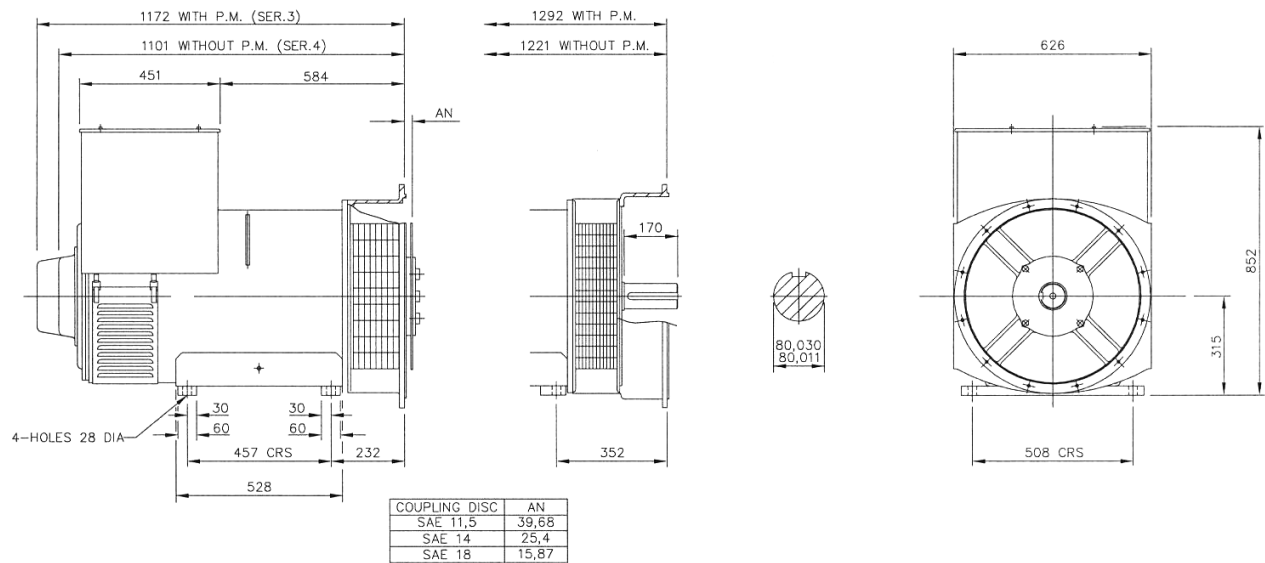
60Hz

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	345	375	400	415
kW	276	300	320	332
Efficiency (%)	93.6	93.2	92.9	92.7
kW Input	295	322	344	358

APPROVED

DIMENSIONS



APPROVED DOCUMENT

STAMFORD

Head Office Address:
Barnack Road, Stamford
Lincolnshire, PE9 2NB
United Kingdom
Tel: +44 (0) 1780 484000
Fax: +44 (0) 1780 484100

www.cumminsgeneratortechnologies.com

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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

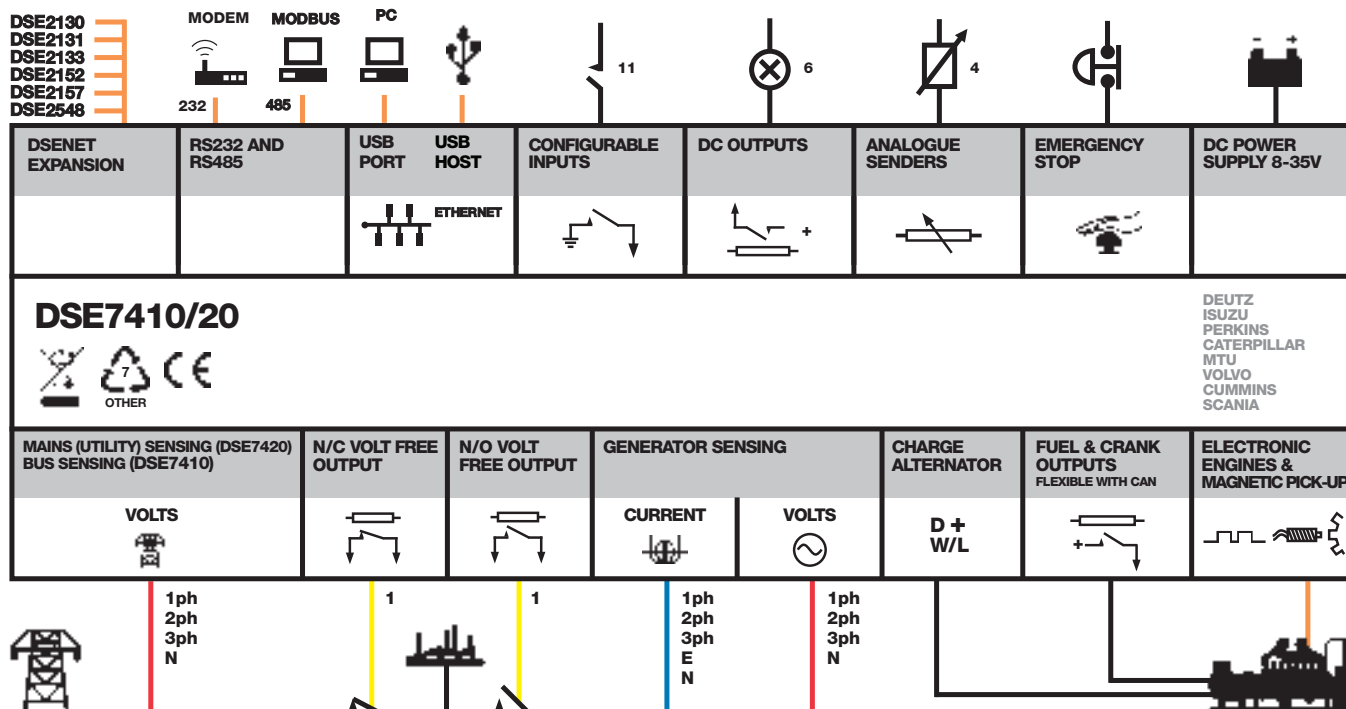
SHOCK

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
TELEPHONE +44 (0) 1723 890099 **FACSIMILE** +44 (0) 1723 893303
EMAIL sales@deepseapl.com **WEBSITE** www.deepseapl.com

DEEP SEA ELECTRONICS INC USA

3230 Williams Avenue, Rockford, IL 61101-2668 USA
TELEPHONE +1 (815) 316 8706 **FACSIMILE** +1 (815) 316 8708
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)*

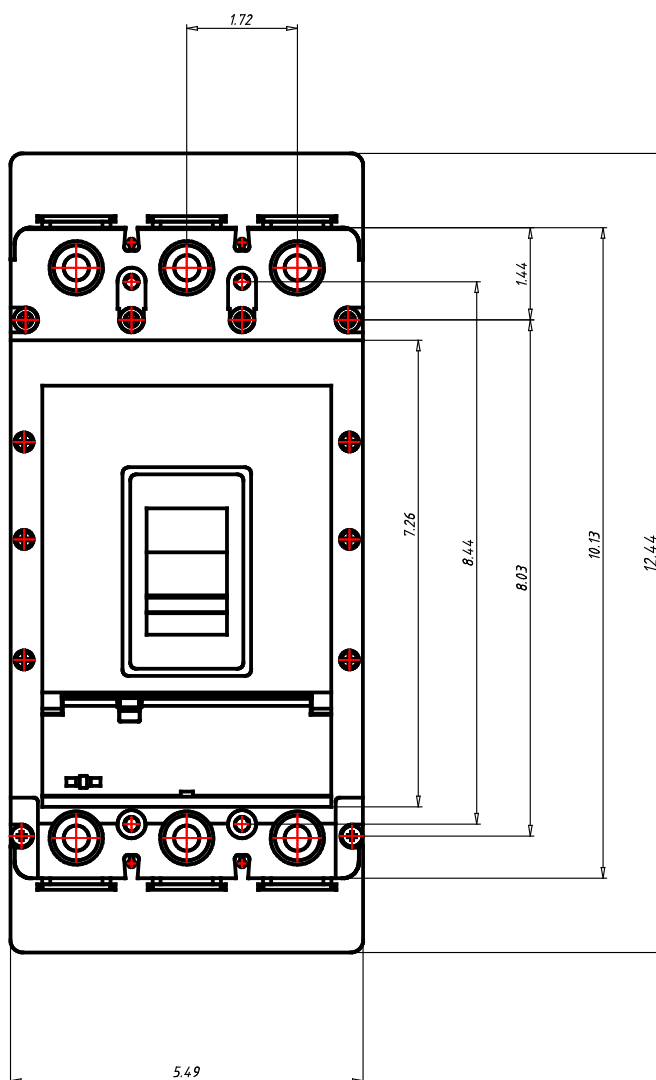
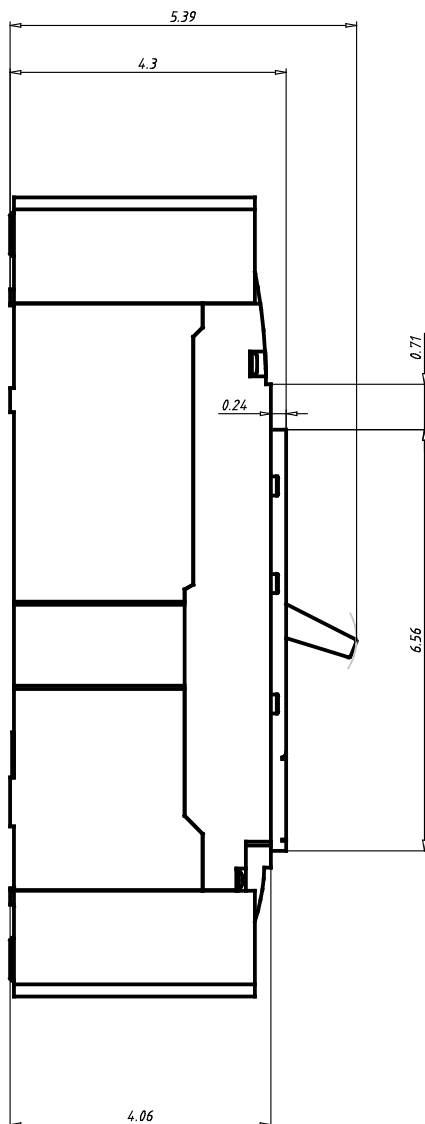
Eaton's Power Defense™ molded case circuit breakers, a globally rated platform designed to help keep your power system safe with latest protection technology. Engineered for the future: IoT and Industry 4.0 features such as built-in communications, advanced energy metering, and algorithms that signal 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: PDG33G0400B2NJNNNNN

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: PDG33G0600B2NJNNNNNN



Datasheet creation date: 02/12/2019

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

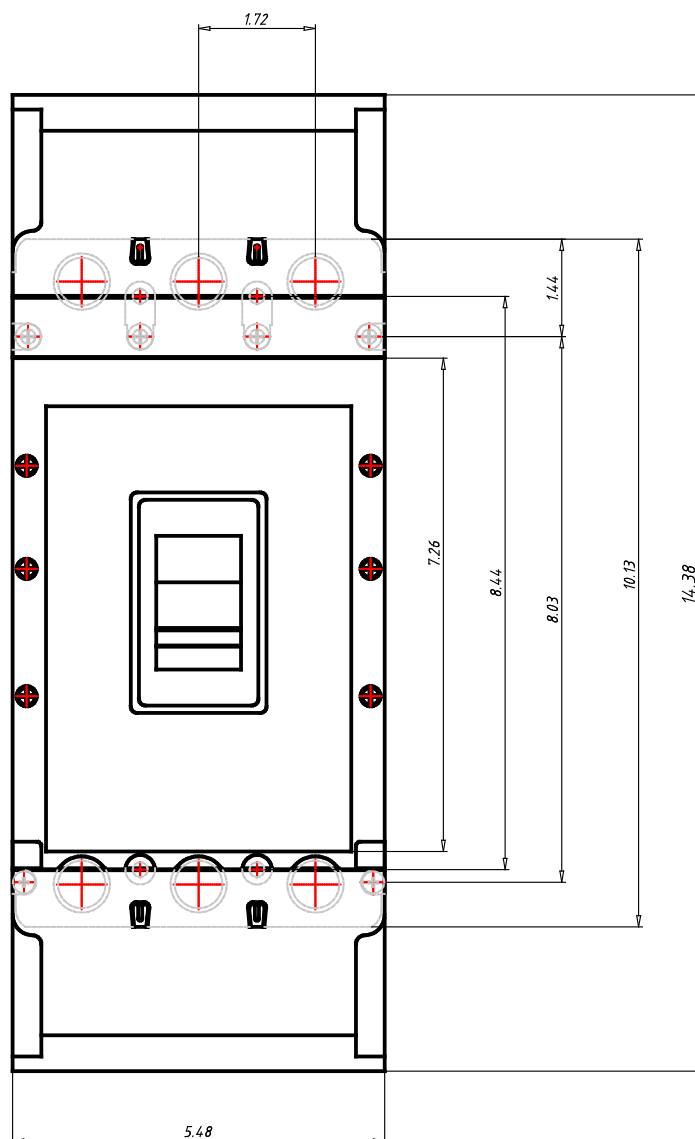
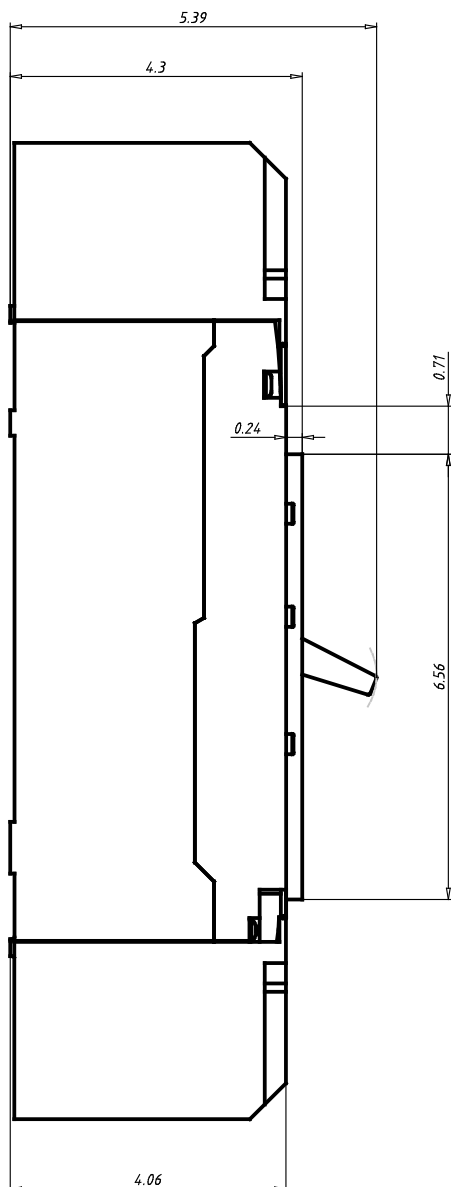
Eaton's Power Defense™ molded case circuit breakers, a globally rated platform designed to help keep your power system safe with latest protection technology. Engineered for the future: IoT and Industry 4.0 features such as built-in communications, advanced energy metering, and algorithms that signal 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	PDG33G0600B2NJNNNNNN
Frame Size	Frame 3
Poles	3 Pole
Voltage	480V AC
Interruption or Breaking Capacity (Icu/Ics)	35kA
Continuous Current Rating (In)	600A
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) 2 - 500
Line Terminal Type	Aluminum
Load Type Description	Option 1 - Standard Terminal
Load Conductor Options	(2) 2 - 500
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: PDG33G0600B2NJNNNNN

Technical drawings



Molded Case Circuit Breakers
Power Defense™ UL Global Series
Part Number: PDG33G0600B2NJNNNNNN



Datasheet creation date: 02/12/2019

General Technical Data

Frame Rating (In)	600A
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 / N / 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	250 - 600A
100% UL489 Rated	Yes
Instantaneous/Short Circuit Range	2 - 10 In
Magnetic/Instantaneous Override	7200A
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: PDG53K1200E3RNNNNNNN



Datasheet creation date: 19/08/2019

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

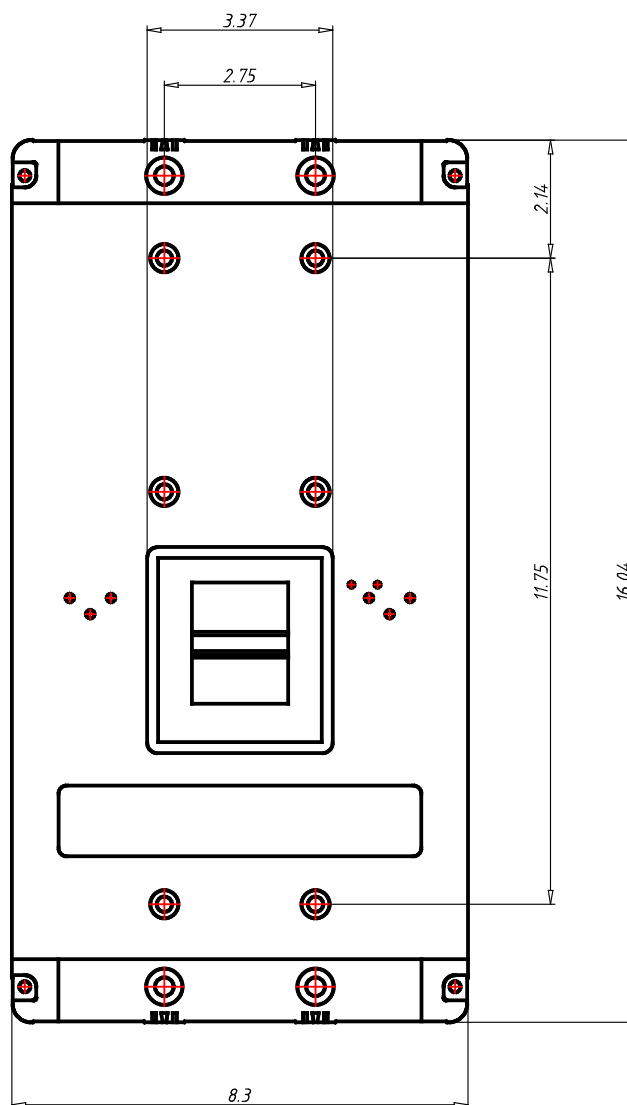
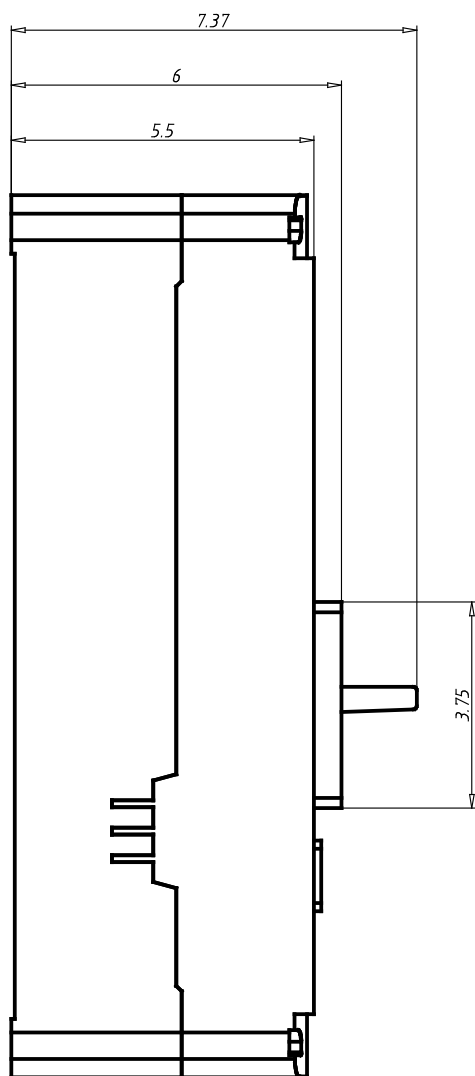
Eaton's Power Defense™ molded case circuit breakers, a globally rated platform designed to help keep your power system safe with latest protection technology. Engineered for the future: IoT and Industry 4.0 features such as built-in communications, advanced energy metering, and algorithms that signal 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	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: PDG53K1200E3RNNNNNNN

Technical drawings



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

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 (cont.)

- New 4-color package design



minnkotamotors.com

minn KOTA

ON-BOARD MARINE BATTERY CHARGER

DIGITALLY CONTROLLED 2X FASTER CHARGING PROTECTS BATTERIES

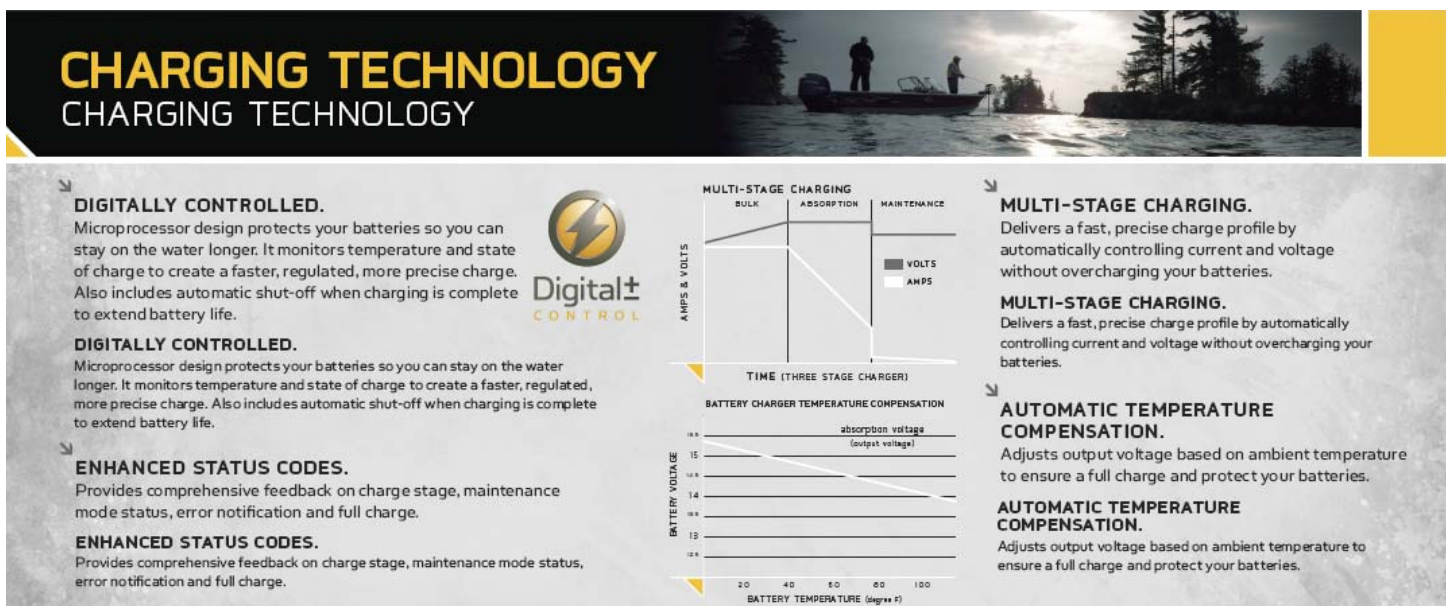
Digital[±] CONTROL

MK210D

10 AMPS

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

MADE IN THE USA FC



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
BULK ABSORPTION MAINTENANCE
AMPS & VOLTS
TIME (THREE STAGE CHARGER)
BATTERY CHARGER TEMPERATURE COMPENSATION
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

Digital Linear Chargers

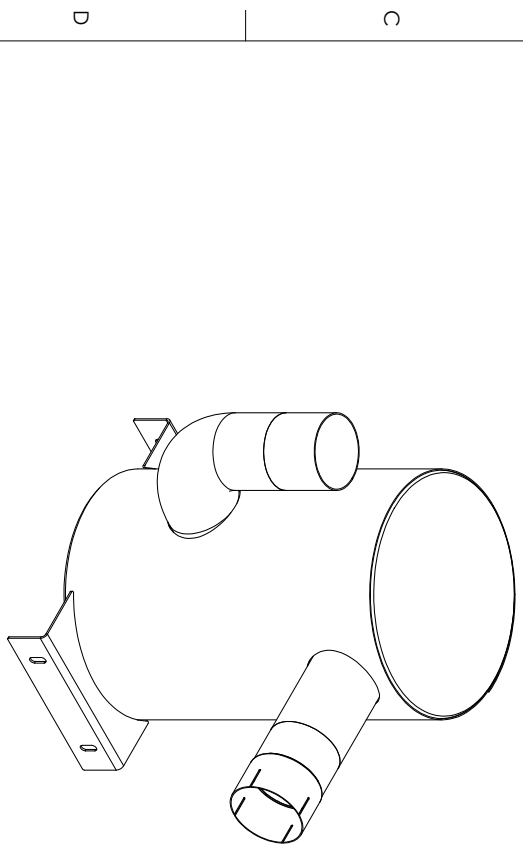
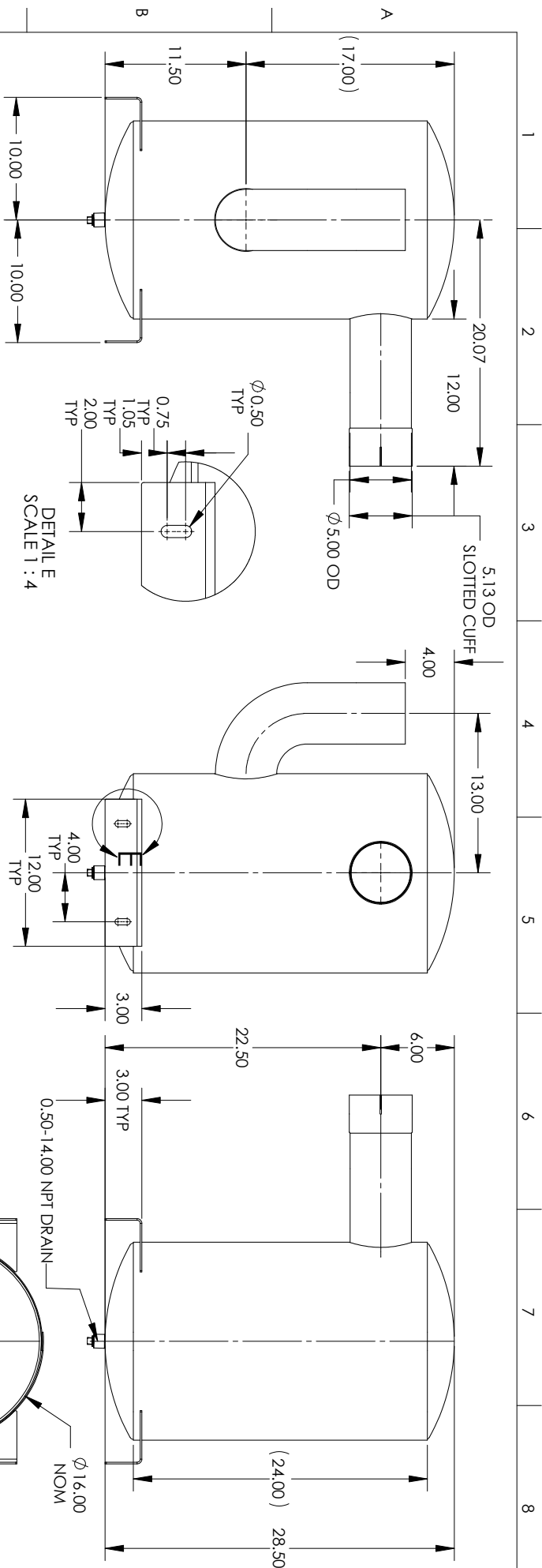
Specifications

- 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)



ENGINE INFORMATION		SILENCER INFORMATION		DRAWING		DESCRIPTION		REVISIONS	
ENGINE MAKE	MTU	RESONATOR FREQUENCY	CB	CHECKED BY	CB	DATE	08/23/2017	DESCRIPTION	500-008546
ENGINE MODEL	6R1600	RESONATOR ALPHA	CB	ENGINEERING	CB	DATE	09/15/2017	SILENCE CRIT CS S-E	500-008546
DRY WEIGHT	641	SILENCER KM	CB	MANUFACTURING	CB	DATE	09/15/2017	CONSTRUCTION MATERIAL	CS
EXHAUST FLOW	25-42	SILENCER TL	CB	WEIGHT (LBS)	78	FINISH	3 OF 3	HIGH TEMP BLACK PAINT	CS
EXHAUST TEMPERATURE	806	TOLERANCES TO BE ADHERED TO	CB	WEIGHT (LBS)	78	FINISH	3 OF 3	HIGH TEMP BLACK PAINT	CS
MAX BACK PRESSURE	60.2	THIRD ANGLE PROJECTION	CB	WEIGHT (LBS)	78	FINISH	3 OF 3	HIGH TEMP BLACK PAINT	CS
RAW SOUND PRESSURE	---	THIRD ANGLE PROJECTION	CB	WEIGHT (LBS)	78	FINISH	3 OF 3	HIGH TEMP BLACK PAINT	CS
CUSTOMER		CUSTOMER P/N		REV.		BY		DATE	
---		---		01		CB		09/15/2017	
EXTENDED OVERALL LENGTH		ECO		REV.		BY		DATE	
---		---		01		CB		09/15/2017	



BERGARI SOLUTIONS

DESCRIPTION

SILENCE CRIT CS S-E

500-008546

CONSTRUCTION MATERIAL

CS

FINISH

3 OF 3

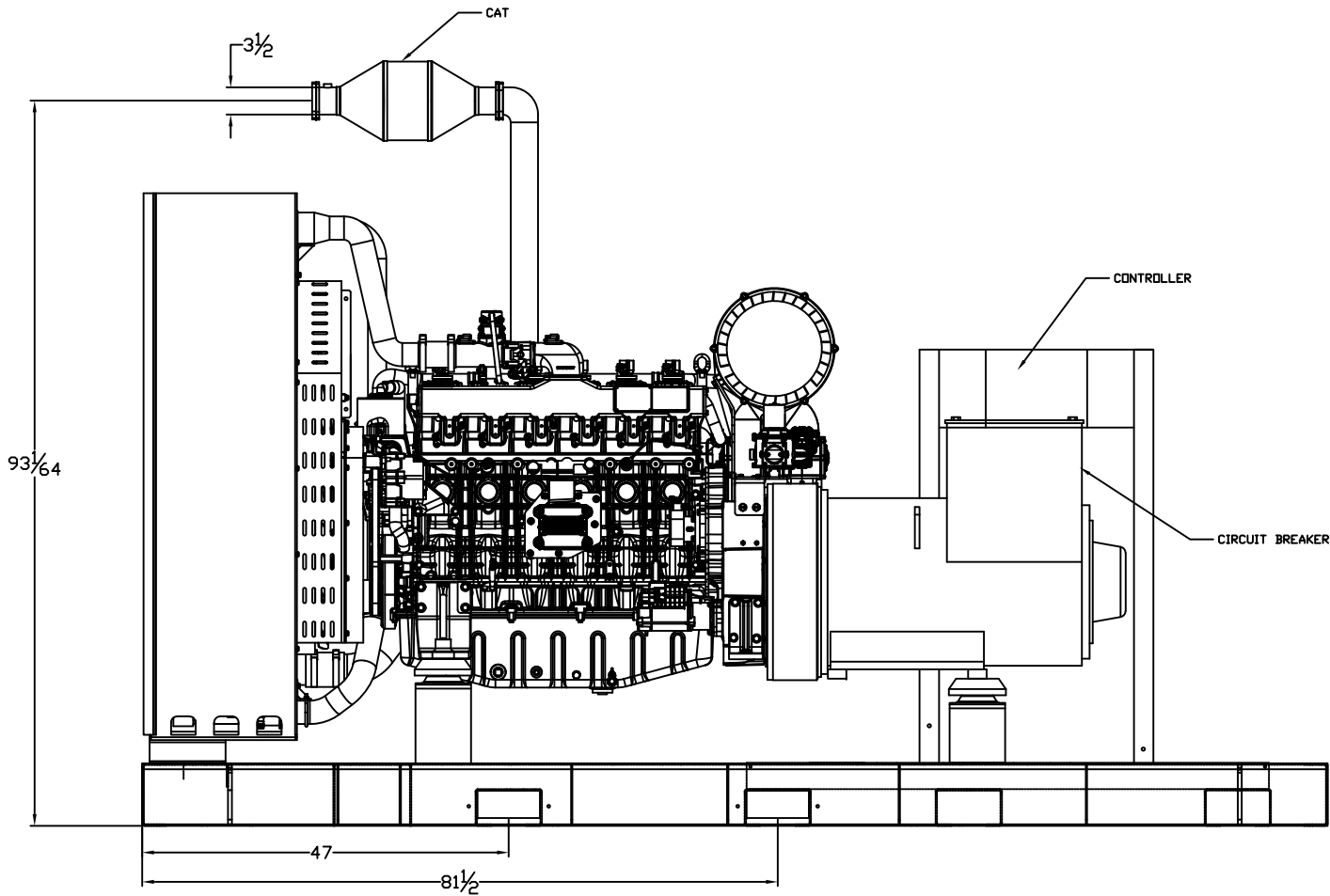
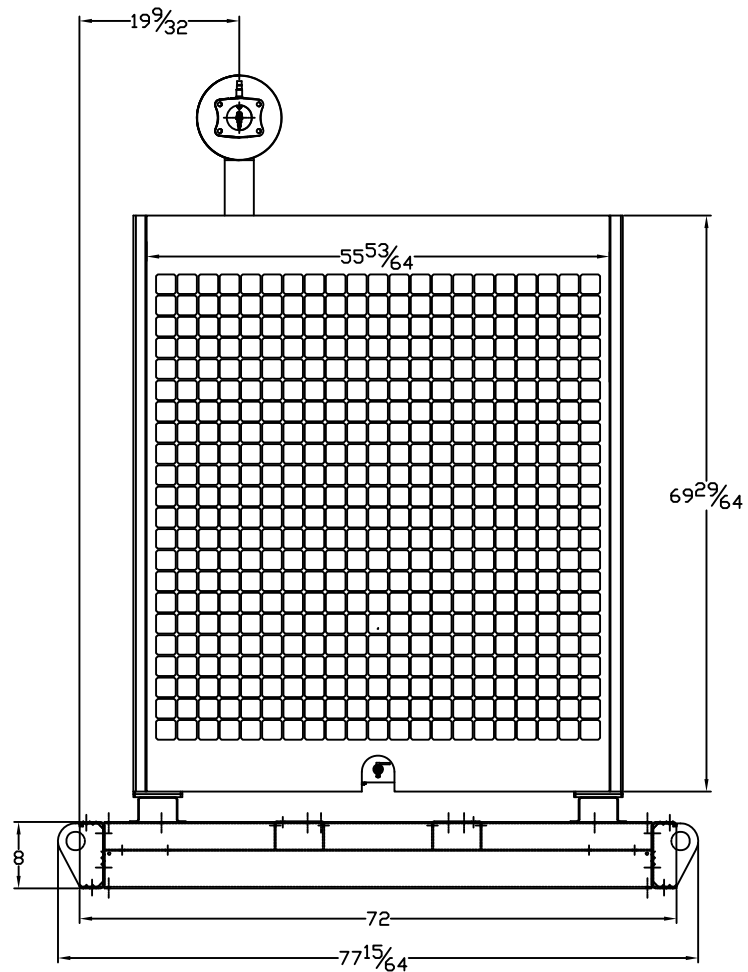
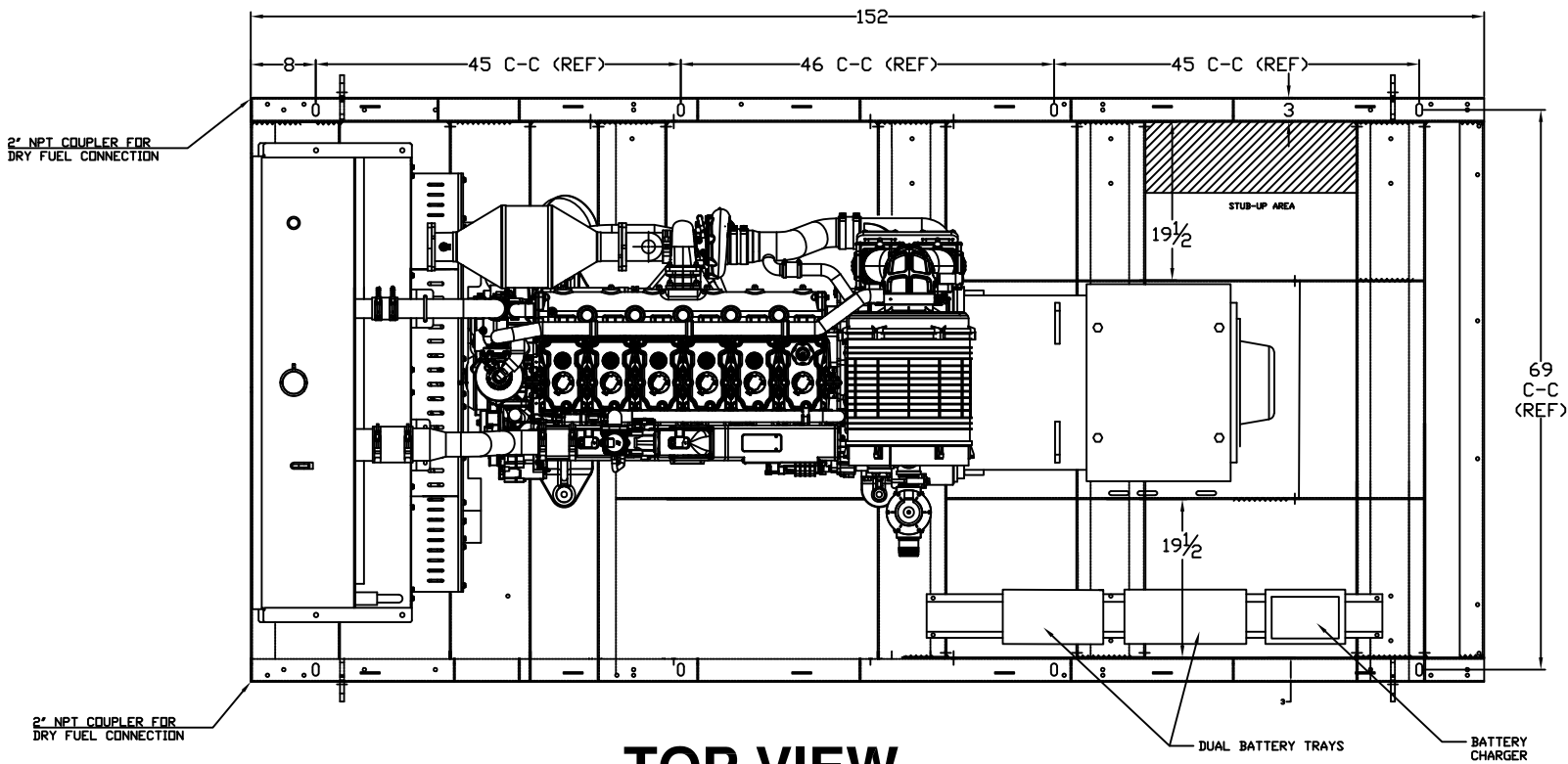
HIGH TEMP BLACK PAINT

CS

REV.

01

OPEN DIMENSIONAL OVERVIEW FOR SP-3000P GENERATOR



THE INFORMATION HEREIN, IS THE SOLE PROPERTY OF GILLETTE GENERATORS, INC. & IS TO BE HELD IN STRICT CONFIDENTIALITY BY ALL WHO RECEIVES THIS INFORMATION. TRANSMITTAL TO OTHERS, OR USE BY OTHERS, IS STRICTLY PROHIBITED.

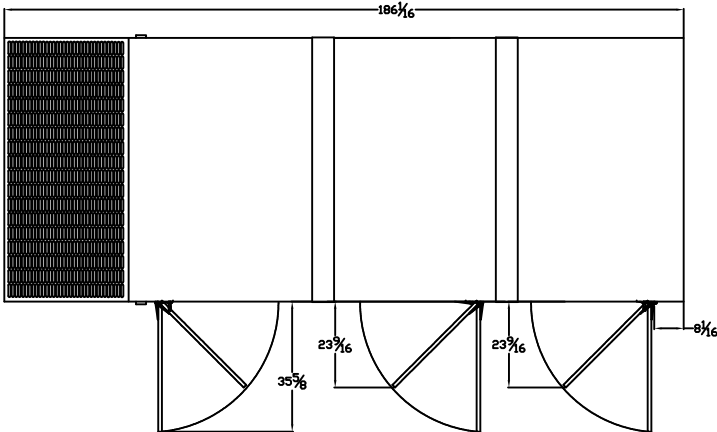
TOLERANCES

DECIMALS	FRACTIONS	ANGLES
± .031	± 1/32	± 1/2°
UNLESS OTHERWISE SPECIFIED		
REMOVE ALL BURRS & BREAK ALL SHARP EDGES		
ALL ANGLES 90° UNLESS OTHERWISE SPECIFIED		
TIGHT CLOSED CORNERS, WITH NO GAPS		

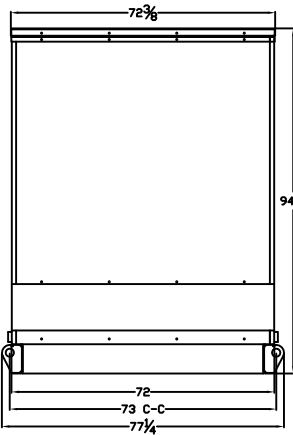
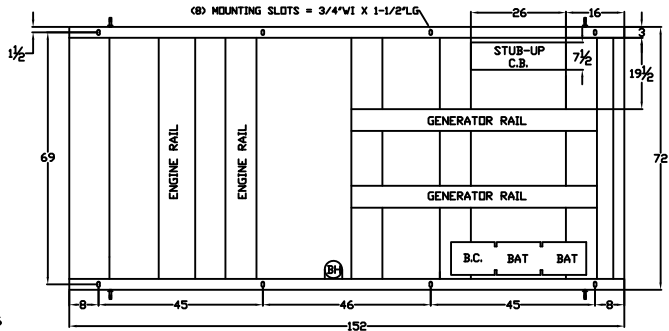
LEVEL 2 ENCLOSURE OUTLINE DIMENSIONS
FOR SP-2500P AND SP-3000P

TOP VIEW

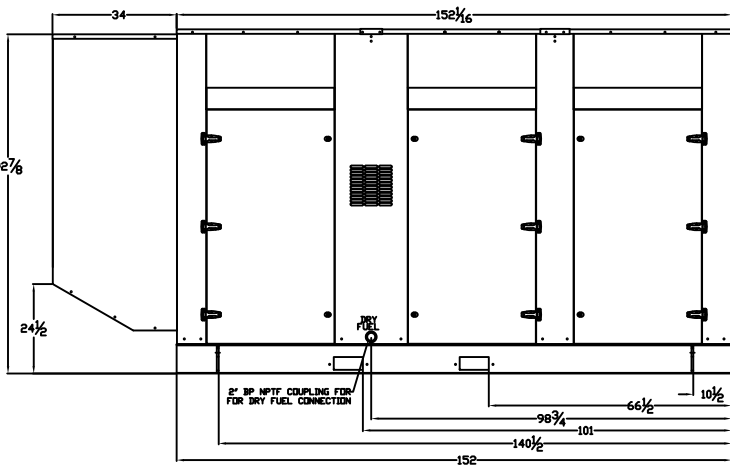
(GEN-SET HAS (6) DOORS, (3) SHOWN OPEN ARE TYPICAL FOR BOTH SIDES)



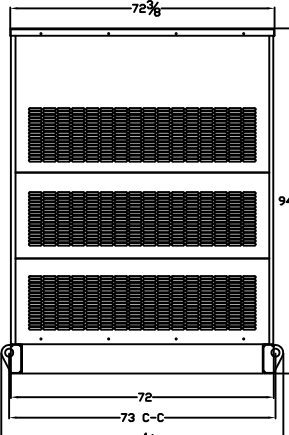
FRAME VIEW



RADIATOR END VIEW



SIDE VIEW



GENERATOR END VIEW

REVISION LEVEL	DATE	DESCRIPTION



GILLETTE GENERATORS, INC. 2921 THORNE DR., ELKHART, IN 46514 (574) 264-9639

DESCRIPTION: LEVEL 2 ENCLOSURE DIMENSIONS FOR SP-2500P & SP-3000P

DATE: 07-15-2026	PT. NO: SP-2500P/3000P	SCALE: 1:1	CAD_NO.: CAD#
DR.BY: PD	ENG. DB	PG.NO. 1 OF 1	DRAWING NO.: SP-2500P/3000P