



# GILLETTE GENERATORS

## LIQUID COOLED DIESEL ENGINE GENERATOR SET

Model	HZ	STANDBY 125°C RISE
		2000 KW
<b>SPMI-2M-60 HERTZ</b>	60	



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 7-05 & 7-10**

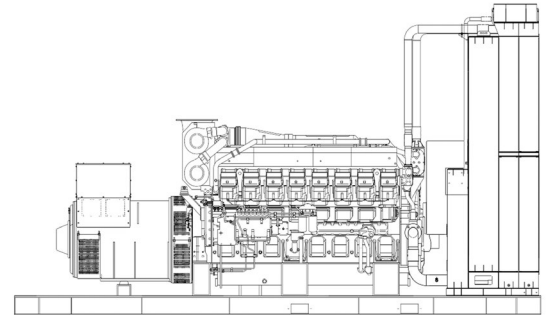
All generator sets meet 180 MPH rating.



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

60 HZ MODEL

## SPMI-2M



### “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.

## GENERATOR RATINGS

GENERATOR MODEL	VOLTAGE		PH	HZ	130°C RISE STANDBY RATING		POWER LEAD CONNECTIONS
	L-N	L-L			KW/KVA	AMP	
SPMI-2M-3-4	277	480	3	60	2000/2500	3010	6 – Lead High Wye
SPMI-2M-3-16	346	600	3	60	2000/2500	2408	6 – Lead High Wye

RATINGS: All three phase gen-sets are 6 lead windings, rated at .8 power factor. 125° 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 130°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 & ENGINEERING DATA FOR MODEL SPMI-2M-60 HZ

## GENERATOR SPECIFICATIONS

Manufacturer..... Stamford AVK Electric Generators  
Model & Type S7L1DG-312, 4 Pole, 6 Lead, 480V, Three Phase  
..... S7L1DG-7, 4 Pole, 6 Lead, 600V, Three Phase  
Exciter..... Brushless, PMG 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% (1/2 cycle, no load to full load)  
Unbalanced Load Capability..... 100% of standby amps  
One Step Load Acceptance..... 100% of nameplate rating  
Total Stator and Load Insulation..... Class H, 180°C  
Temperature Rise..... 125°C R/R, standby rating @ 40°C amb.  
3 Ø Motor Starting @ 30% Voltage Dip (480V)..... 5625 kVA  
3 Ø Motor Starting @ 30% Voltage Dip (600V)..... 5000 kVA  
Bearing..... 1, Pre-lubed and sealed  
Coupling..... Direct flexible disc.  
Total Harmonic Distortion..... Max 3½% (MIL-STD705B)  
Telephone Interference Factor..... Max 50 (NEMA MG1-22)  
Deviation Factor..... Max 5% (MIL-STD 405B)  
Alternator..... Self ventilating and drip-proof  
Ltd. Warranty Period..... 24 Months from start-up date or  
..... 1000 hours use, first to occur.

## GENERATOR FEATURES

- World Renown STAMFORD Generator having UL-1446 certification.
- Full generator protection with **Deep Sea 7420 MKII** controller, having UL-508 certification.
- Automatic voltage regulator with over-excitation, under-frequency compensation, under-speed protection, and EMI filtering. Entire solid-state board is encapsulated for moisture protection.
- Generator power ratings are based on temperature rise, measured by resistance method, as defined in MIL-STD 705C and IEEE STD 115, Method 6.4.4.
- Power ratings will not exceed temperature rise limitation for class H insulation as per NEMA MG1-22.40.
- Insulation resistance to ground, exceeds 1.5 meg-ohm.
- Stator receives 2000 V. hi-potential test on main windings, and rotor windings receive a 1500 V. hi-potential test, as per MIL-STD 705B.
- Full amortisseur windings with UL-1446 certification.
- Complete engine-generator torsional acceptance, confirmed during initial prototype testing.
- Full load testing on all engine-generator sets, before shipping.

## ENGINE SPECIFICATIONS AND APPLICATIONS DATA

### ENGINE

Manufacturer..... MITSUBISHI  
Model and Type..... S16R-Y2PTAW2-1, 4 cycle, liquid Cooled  
Aspiration..... Turbo After Cooler, H2O to Air  
Charged Air Cooled System..... H2O to Air  
Cylinder Arrangement..... 16 Cylinders, 60° V  
Displacement Cu. In. (Liters)..... 3,989 (65.37)  
Bore & Stroke In (Cm)..... 6.69 x 7.09 (17.0 x 18.0)  
Compression Ratio..... 14.0:1  
Main Bearings..... Tin Overlay with Babbit Backing  
Cylinder Head..... Cast Iron with overhead Cam  
Pistons..... Aluminum Alloy with Graphite Coating  
Crankshaft..... Induction Hardened, Heat Treated Forged  
Valves..... 2/ Cylinder, Heat Treated and Hardened Ex. Valves  
Governor..... Electronic, Bosch  
Frequency Regulation..... ± 1/4%  
Air Cleaner..... Dry, Replaceable Cartridge  
Engine Speed..... 1800 rpm  
Max Power, bhp (kwm) Standby..... 2923 (2180)  
Ltd. Warranty Period..... 2 Year or 1000 hrs, first to occur

### FUEL SYSTEM

Type..... Diesel Fuel Oil (ASTM No. 2-D)  
Combustion System..... Direct Injection  
Fuel Injection Pump..... Mitsubishi PS8 Type x2  
Total Fuel Flow gal/hr (L/hr)..... 174 (660)  
Fuel Filter..... Yes  
Maximum Fuel Lift ft. (m)..... 3 (1)

### FUEL CONSUMPTION

GAL/HR (LITER/HR)	STANDBY
100% LOAD	155 (587)
75% LOAD	115 (435)
50% LOAD	79.2 (300)

### OIL SYSTEM

Type..... Full Pressure  
Oil Pan Capacity qt. (L)..... 200 (53)  
Oil Pan Cap. W/ filter qt. (L)..... 230 (60.8)  
Oil Filter..... 6, Replaceable Cartridge Type

### ELECTRICAL SYSTEM

Ignition System..... Electronic  
Eng. Alternator/Starter: 24 VDC, negative ground, 55 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 1400 CCA. Battery tray (max. dim. at  
15"lg x 7"wi). This model has (4) battery trays, (4) hold down  
straps, (2) sets of battery cables, and (1) battery charger.  
Installation of (4) 12VDC starting batteries connected in series  
for 48VDC output is required, with possible higher AMP/HR  
rating, as described above, if the normal environment  
temperature averages -13° F (-25°C) or cooler.

### CERTIFICATIONS

All engines are EPA emissions certified. All emergency  
stationary diesel engines are Tier II compliant.

# APPLICATION & ENGINEERING DATA FOR MODEL SPMI-2M-60 HZ

## COOLING SYSTEM

Type of System ..... Air to Air, Charged Air Cooler  
Coolant Pump .....Pre-lubricated, self-sealing  
Cooling Fan Type (no. of blades) .....Pusher  
Fan Diameter inches (cm)..... 77.16 (196)  
Ambient Capacity of Radiator °F (°C)..... 122 (50)  
Engine Jacket Coolant Capacity gal. (L).....37 (140)  
Radiator Coolant Capacity gal. (L)..... 182 (689)  
Water Pump Capacity gpm (L/min)..... 489 (1,851)  
Heat Reject Coolant: Btu/min ..... 44,374  
Air to Air Heat Reject, BTU/min. ....10,240  
Low Radiator Coolant Level Shutdown.....Standard  
Note: Coolant temp. shut-down switch setting at 217°F (103°C) with  
50/50 (water/antifreeze) mix.

## COOLING AIR REQUIREMENTS

Combustion Air cfm (m<sup>3</sup>/min) ..... 7,274 (206)  
Max Air Intake Restrictions:  
Clean Air Cleaner, mm H<sub>2</sub>O (in.H<sub>2</sub>O) .... 400 (15.7)  
Max. Temp. out of Charger Air Cooler  
@ 77° F (25°C), Amb. Air, kW (Btu/min) ..... 780 (44,374)  
Radiator Cooling Air, SCFM (m<sup>3</sup>/min)..... 86,078 (2,436)

## EXHAUST SYSTEM

Exhaust Outlet Size..... 18"  
Max. Back Pressure in KPA (in. H<sub>2</sub>O)..... 5.9 (23.6)  
Exhaust Flow, at rated KW, CFM (m<sup>3</sup>/min)..... 19,209 (544)  
Exhaust Temp, (Stack) °F (°C) ..... 979 (526)

## SOUND LEVELS MEASURED IN dB(A)

	Open Set
Level 3, Hospital Silencer.....	98

Note: Open sets (no enclosure) have optional silencer system choices due to unknown job-site applications. Level 3 hospital silencer upgrade is available as an option. 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
Length in (cm).....	240 (610)
Width in (cm).....	100 (254)
Height in (cm).....	135 (343)
3 Ø Net Weight lbs (kg).....	37725 (17112)
3 Ø Ship Weight lbs (kg) ....	38025 (17248)

# DEEP SEA 7420MKII DIGITAL MICROPROCESSOR CONTROLLER



### Deep Sea 7420MKII

The “7420MKII” 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 “7420MKII” 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 132 x 64 pixel ratio display • protected solid state outputs • test buttons for: stop/reset • manual mode • auto mode • lamp test • start button • power monitoring (kWh, kVAr, kVAh, kVArh) • IP65 rating (with supplied gasket)

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 Deep Sea website and allows monitoring with direct USB cable, LAN, or by internet via the built in web interface.

### Advanced Features:

PLC editor allow user configurable functions to meet specific application requirements • Data logging to assist with fault finding with 20 parameter data logging and recording on USB drives • Multiple date and time scheduler • Set maintenance periods can be configured to maintain optimum engine performance • Modules can be integrated into building management systems (BMS) using MODBUS • Configurable MODBUS pages with RTU & TCP support • Fully configurable via DSE Configuration Suite PC software • Remote SCADA monitoring via DSE Configuration Suite PC software • Engine exerciser • Automatic load transfer • Multiple configurations

# STANDARD FEATURES FOR MODEL SPMI-2M-60 HZ

## STANDARD FEATURES

### CONTROL PANEL:

Deep Sea 7420 MKII digital microprocessor with logic allows programming in the field. Controller has:

- STOP-MANUAL-AUTO modes and automatic engine shutdowns, signaled by full text LCD indicators:
- Low oil pressure
- High engine temp
- Low Radiator Level
- Three auxiliary alarms
- Battery fail alarm
- Engine fail to start
- Engine over speed
- Engine under speed
- Over & under voltage

Also included is tamper-proof engine hour meter

### ENGINE:

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

### AC GENERATOR SYSTEM:

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

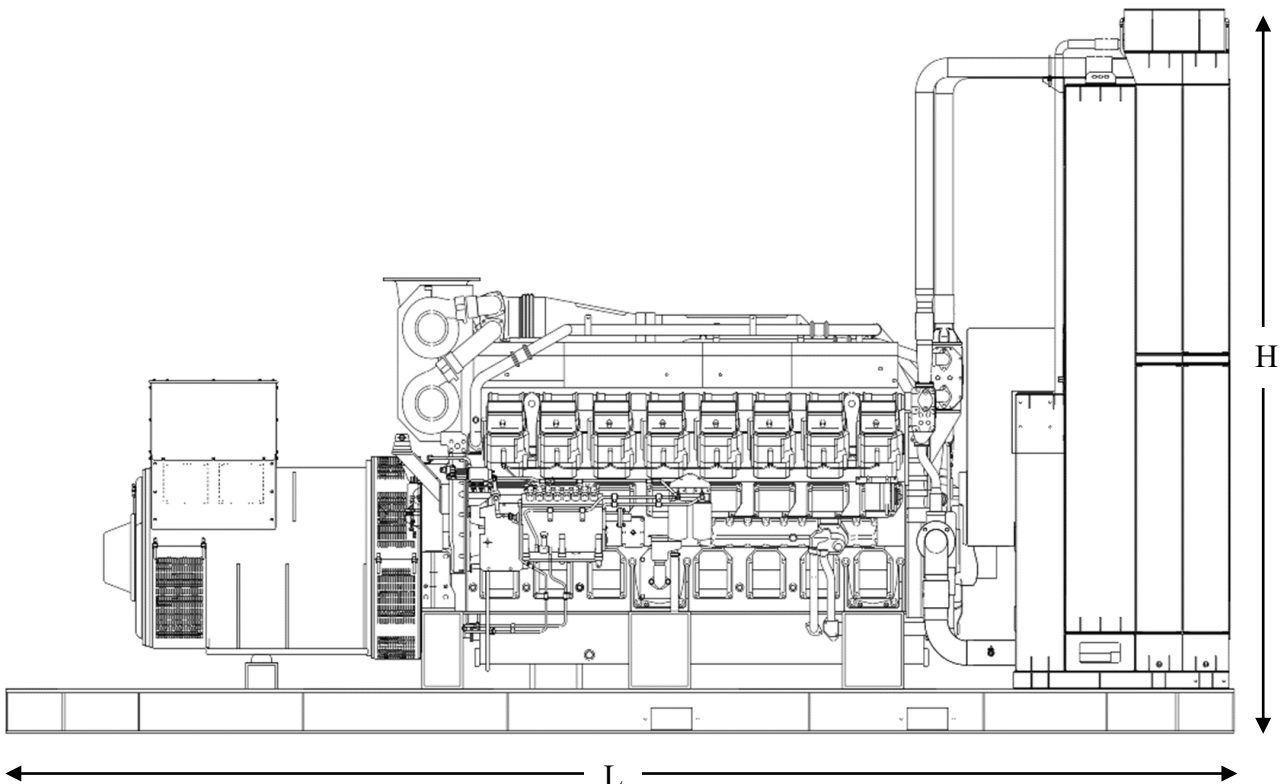
### VOLTAGE REGULATOR:

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

### DC ELECTRICAL SYSTEM:

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

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



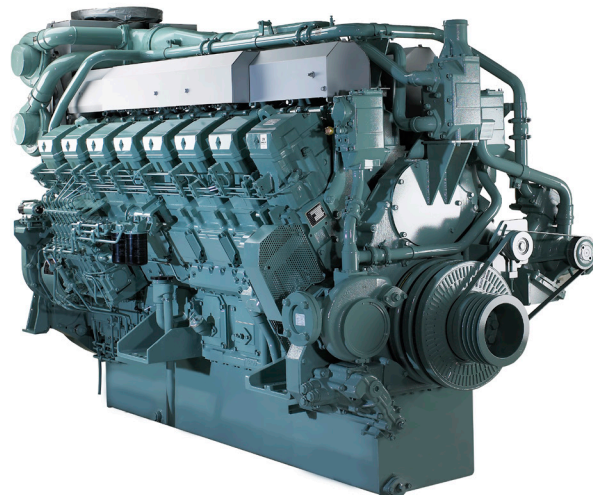
## S16R-Y2PTAW2

INDUSTRIAL ENGINE | CONSTANT SPEED

MAX OUTPUT 2180 kWm

# MITSUBISHI DIESEL ENGINE

POWERFUL AND RELIABLE



### ENGINE DATA

Engine model	S16R-Y2PTAW2
Engine type	4-stroke, diesel
Cylinder configuration	16/60°V
Bore x stroke (mm)	170 x 180
Total displacement (l)	65.37
Dry weight (kg)	6680
Aspiration	turbocharged

Cooling system	water-cooled with separate jacket water and charge-air cooling circuits
Combustion system	direct injection
Fuel injection system	pump-line-nozzle (2x in-line pump)
Electrical system (V)	24
Rotation (ISO 1204)	counter clockwise
Flywheel and housing	SAE 21" / SAE #00

### RATING<sup>1,2</sup>

	Standby		LTP / PRP / DCCP	
	60		60	
Frequency (Hz)	without fan	with fan <sup>7</sup>	without fan	with fan <sup>7</sup>
Output (kWm)	2180	2130	1982	1932
Output (bhp)	2923	2856	2657	2590
Output (kWe) <sup>3</sup>	2071	2024	1883	1835
Output (kVA) <sup>4</sup>	2589	2529	2354	2294
Engine speed (rpm)	1800		1800	
Fuel consumption 100% load (g/kWh) <sup>5</sup>	231	236	228	234
Fuel consumption 75% load (g/kWh) <sup>5</sup>	225	230	224	230
Fuel consumption 50% load (g/kWh) <sup>5</sup>	227	232	229	235
Emission <sup>6</sup>	EPA Tier II - 60 Hz		not regulated	

<sup>1</sup> For rating definitions, please see our website.

<sup>2</sup> All data represents net performance with standard accessories under the condition of 100 kPa barometric pressure, 298 K ambient temperature and 30% relative humidity.

<sup>3</sup> kWe ratings based on 95% alternator efficiency.

<sup>4</sup> kVA ratings based on a power factor of 0.8.

<sup>5</sup> Fuel consumption is based on ISO3046/1 with +5% tolerance at 100% rated power, +10% tolerance at 75% and 50% rated power.

<sup>6</sup> F1, A2 and Y2 series are only emission compliant at the standby rating.

<sup>7</sup> Based on MHIET's recommended/estimated fan loss. These engines are not available in a configuration that includes an engine-mounted fan.



## BENEFITS

The Mitsubishi Diesel Engine range is designed to provide premium levels of performance, durability and reliability with ease of maintenance. Every Mitsubishi Diesel Engine benefits from the following features and advantages:

- Compact configuration to minimize installation footprint.
- Cast iron crankcase with access door per cylinder for easy inspection and maintenance.
- Quenched and tempered steel crankshaft with induction-hardened journals and pins to ensure maximum strength and low bearing wear. The crankshaft can be reground, if required, during a major overhaul.
- Wet-liner cylinder construction to ensure the bore geometry accuracy required to achieve low oil consumption. This type of construction allows easy replacement, if required, during a major overhaul.
- High performance AC8A aluminium-alloy pistons with Ni-Resist iron top ring groove insert ensure low long-term oil consumption with reduced carbon deposits.
- Individual cylinder head assemblies for easy and cost effective servicing.
- Basic consumable parts, such as fuel and oil filters, are positioned to allow easy access during routine maintenance.
- A low number of specialised tools is required to carry out maintenance activities.
- High level of commonality of parts across the Mitsubishi Diesel Engine ranges ensures ease of procurement and simplifies spare part stock control.
- Wide range of engine configurations allows choice of engine to be optimised for the requirements of each individual application.

### Air intake and exhaust systems

The proprietary MHIET\* -designed and -manufactured turbochargers are specifically matched to the characteristics of the engine to provide maximum power output with minimum fuel consumption. Noise-reducing air inlet silencers fitted to turbochargers as standard. Exhaust manifold heat-shield plates available on various models.

#### Option kits available

- Heavy-duty air inlet filter
- Flexible expansion joint (including counter flange)

### Fuel system

Mechanical pump-line-nozzle fuel system offers reliable operation with simplified diagnostics and servicing. Engine-mounted fuel-feed pump allows direct coupling to day-tank system. Standardized spin-on cartridge-type fuel filters allow simplified spare parts management.

### Governing system

Toho Seisakusho SG-4017-BR/XS-400B-03 control system provides 'isochronous' or 'droop' governing with fast load-step response characteristics that can be easily adjusted to the design of each genset installation.

#### Option kits available

- Digital setting unit for load-sharing

### Cooling system

The Two-Pump Two-Circuit system has a low-temperature after-cooling circuit, separate from the high-temperature jacket water circuit, to enable increased charge-air density to give higher power output and improved fuel economy. An engine-mounted pump drives each circuit, simplifying the design and control of the cooling system for the installer.

#### Option kits available

- Various radiator designs for different ambient conditions
- Pre-heater and pump system

### Lubrication system

Gear-driven oil pump and engine-integrated oil cooler ensures optimum performance of the lubrication system and minimum rate of wear in the engine. Easy-access filter bracket includes a bypass filter for added safety. Standardized spin-on cartridge-type oil filters allows simplified spare parts management.

#### Option kits available

- Pre-lubrication pump system
- Manual oil drain pump

### Starter system

24V starter motor system and battery-charging alternator installed as standard. System sized to ensure reliable, fast starting under conditions as low as -10°C. (The use of pre-heating and pre-lubrication starting aids may be necessary under certain conditions).

#### Option kits available

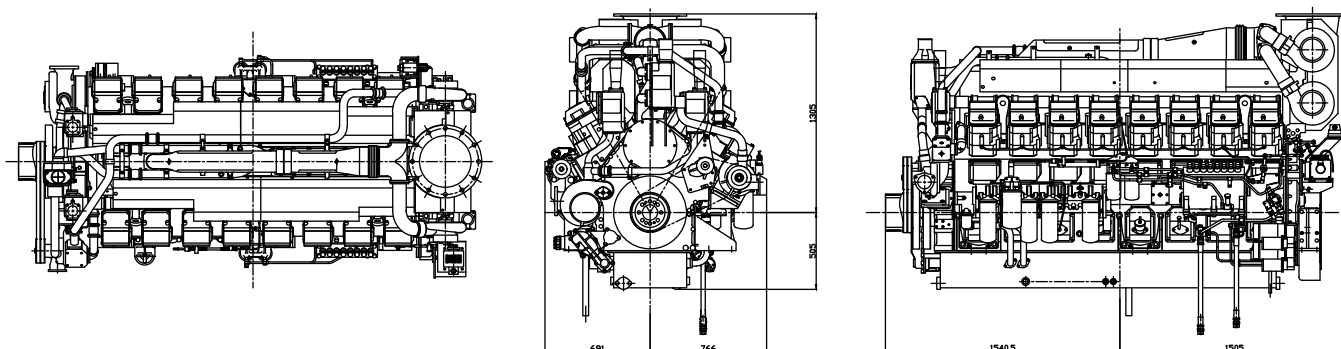
- Air starter
- Redundant starter

### Monitoring system

High coolant temperature, low oil pressure and oil filter status alarm switches fitted as standard.

\*MHIET: Mitsubishi Heavy Industries Engine & Turbocharger, Ltd. Headquarter for Engine & Energy Division.

## DIMENSIONS



### More information

Contact your local dealer for more information regarding Mitsubishi Diesel Engines and optional equipment or, visit [engine-genset.mhi.com](http://engine-genset.mhi.com)

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**MOVE THE WORLD FORWARD** **MITSUBISHI**  
**HEAVY**  
**INDUSTRIES**  
**GROUP**

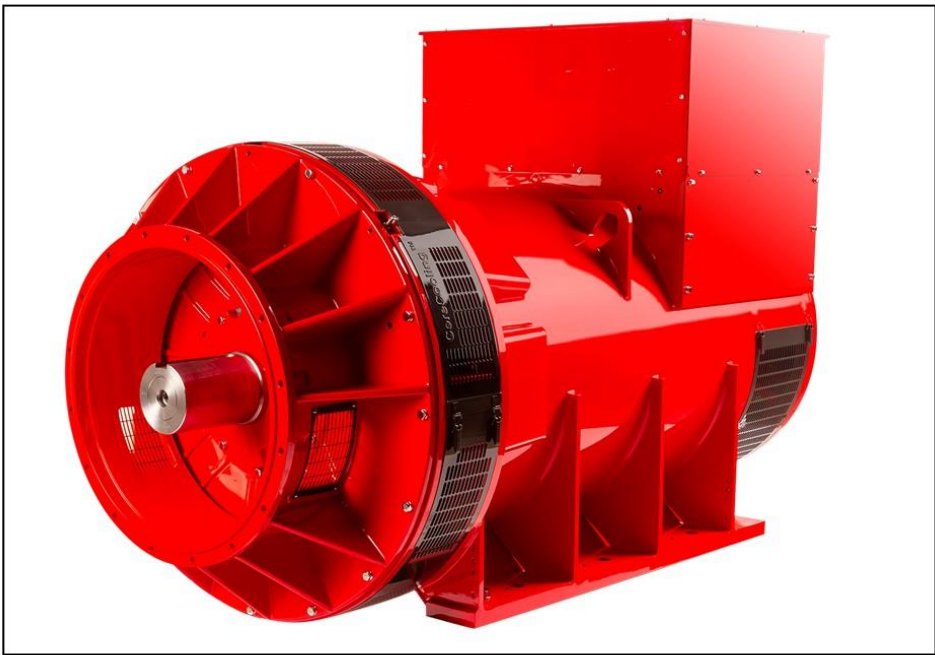
**S7L1D-G4 Wdg.312 - Technical Data Sheet**

**Standards**

STAMFORD industrial alternators meet the requirements of the relevant parts of the IEC 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	MX341	MX322	DECS150		
Voltage Regulation	± 1%	± 0.5%	± 0.25%		with 4% Engine Governing
AVR Power	PMG	PMG	PMG		

No Load Excitation Voltage (V)	15.4 - 14.7
No Load Excitation Current (A)	0.67 - 0.62
Full Load Excitation Voltage (V)	73
Full Load Excitation Current (A)	2.9
Exciter Time Constant (seconds)	0.125

# STAMFORD

## S7L1D-G4 Wdg.312

Electrical Data								
Insulation System	H							
Stator Winding	Double Layer Concentric							
Winding Pitch	2/3							
Winding Leads	6							
Winding Number	312							
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	33.26							
50 Hz					60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	2.39 m³/sec				2.87 m³/sec			
Voltage Star (V)	380	400	415	440	416	440	460	480
Voltage Parallel Star (V)	-	-	-	-	-	-	-	-
Voltage Delta (V)	-	-	-	-	-	-	-	-
kVA Base Rating (Class H) for Reactance Values (kVA)	2020	2080	2080	2040	2350	2500	2550	2600
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.56	2.38	2.21	1.93	2.98	2.84	2.65	2.48
X'd Dir. Axis Transient	0.18	0.17	0.16	0.14	0.21	0.20	0.19	0.18
X''d Dir. Axis Subtransient	0.13	0.12	0.11	0.09	0.15	0.14	0.13	0.12
Xq Quad. Axis Reactance	1.93	1.79	1.66	1.45	2.24	2.13	1.99	1.86
X''q Quad. Axis Subtransient	0.22	0.20	0.19	0.16	0.25	0.24	0.23	0.21
XL Stator Leakage Reactance	0.08	0.07	0.07	0.06	0.09	0.09	0.08	0.08
X2 Negative Sequence Reactance	0.16	0.15	0.14	0.12	0.19	0.18	0.16	0.15
X0 Zero Sequence Reactance	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.03
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	3.07	2.86	2.65	2.31	3.58	3.40	3.18	2.98
X'd Dir. Axis Transient	0.21	0.19	0.18	0.16	0.24	0.23	0.22	0.20
X''d Dir. Axis Subtransient	0.15	0.14	0.13	0.11	0.17	0.16	0.15	0.14
Xq Quad. Axis Reactance	1.98	1.84	1.71	1.49	2.31	2.20	2.05	1.92
X''q Quad. Axis Subtransient	0.26	0.24	0.23	0.20	0.31	0.29	0.27	0.25
XL Stator Leakage Reactance	0.09	0.08	0.08	0.07	0.10	0.10	0.09	0.09
Xlr Rotor Leakage Reactance	0.20	0.19	0.17	0.15	0.24	0.22	0.21	0.20
X2 Negative Sequence Reactance	0.19	0.18	0.16	0.14	0.22	0.21	0.20	0.18
X0 Zero Sequence Reactance	0.04	0.04	0.03	0.03	0.05	0.04	0.04	0.04



# STAMFORD®

## S7L1D-G4 Wdg.312

Time Constants (Seconds)		
T'd Transient Time Const.	0.15	
T''d Sub-Transient Time Const.	0.0150	
T'do O.C. Field Time Const.	4.49	
Ta Armature Time Const.	0.0284	
T''q Sub-Transient Time Const.	0.0104	
Resistances in Ohms (Ω) at 22°C		
Stator Winding Resistance (Ra), per phase for series connected	0.0007	
Rotor Winding Resistance (Rf)	2.15	
Exciter Stator Winding Resistance	22.3	
Exciter Rotor Winding Resistance per phase	0.065	
PMG Phase Resistance (Rpmg) per phase	1.91	
Positive Sequence Resistance (R1)	0.0009	
Negative Sequence Resistance (R2)	0.0010	
Zero Sequence Resistance (R0)	0.0009	
Saturation Factors	400V	480V
SG1.0	0.283	0.275
SG1.2	1.366	1.201
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 Bearing
SAE Adaptor	SAE 0, 00	SAE 0, 00
Moment of Inertia	45.47 kgm²	44.44 kgm²
Weight Wound Stator	1725kg	1725kg
Weight Wound Rotor	1488kg	1445kg
Weight Complete Alternator	3637kg	3604kg
Shipping weight in a Crate	3689kg	3656kg
Packing Crate Size	220 x 105 x 155 (cm)	220 x 105 x 155 (cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL. 6232
Bearing Non-Drive End	BALL. 6319	BALL. 6319

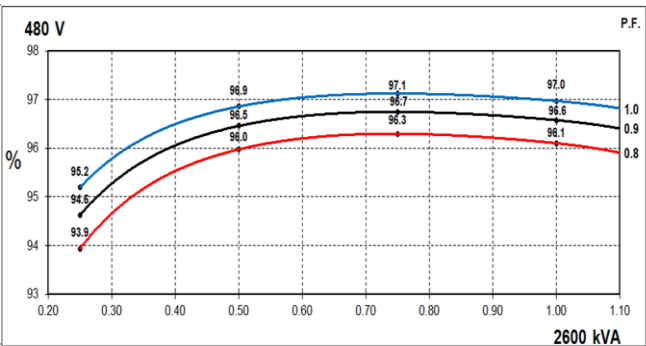
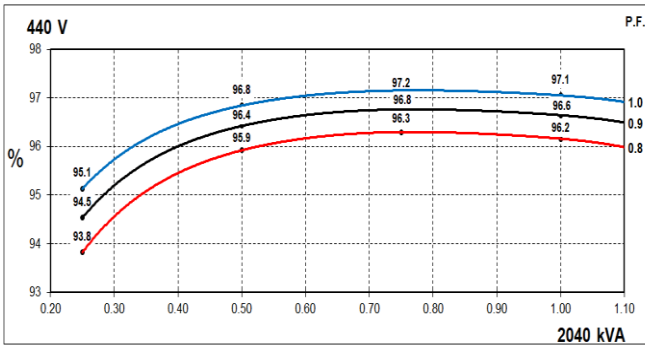
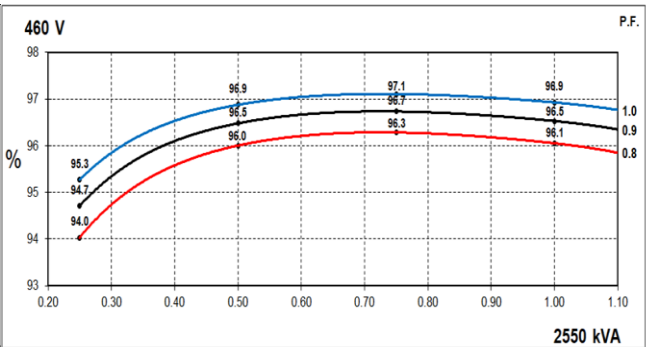
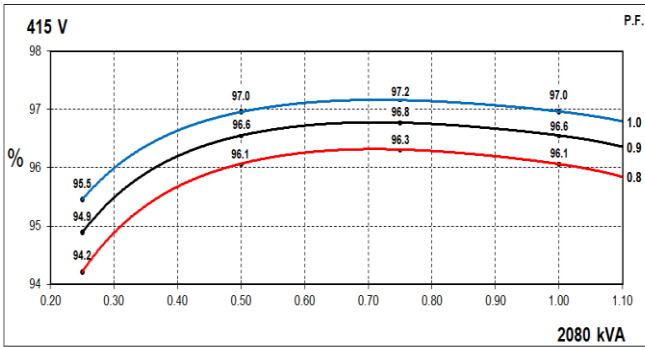
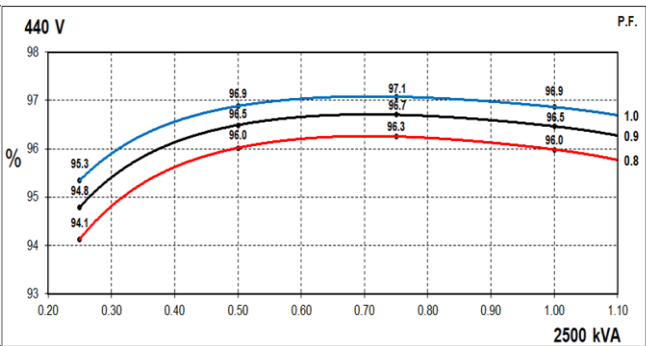
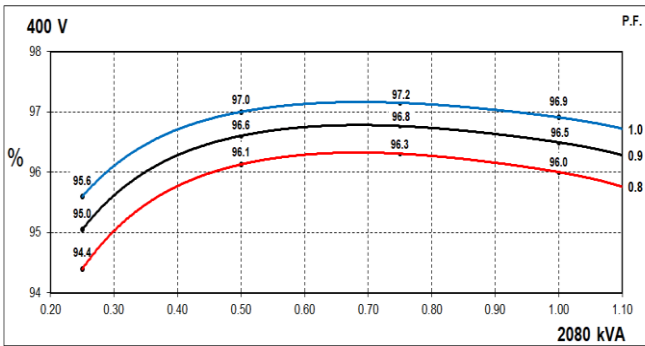
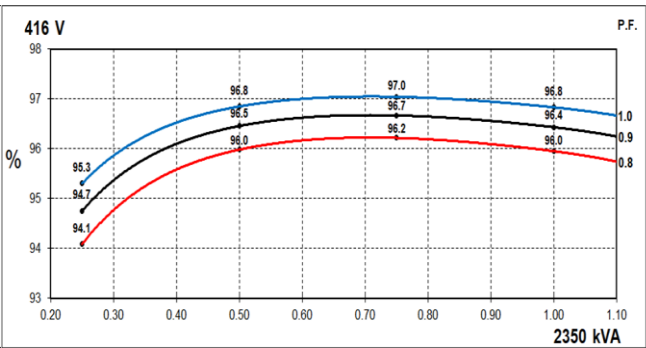
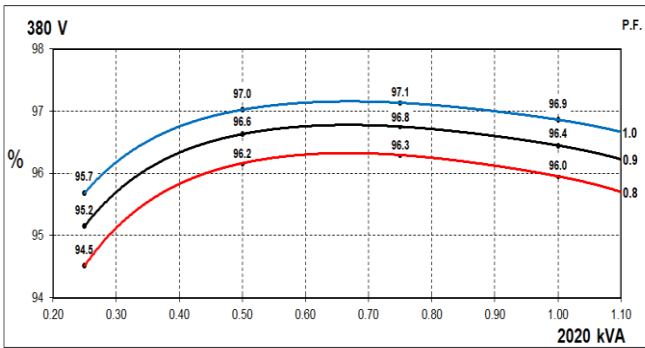
# STAMFORD®

## S7L1D-G4 Wdg.312

### THREE PHASE EFFICIENCY CURVES

50Hz

60Hz

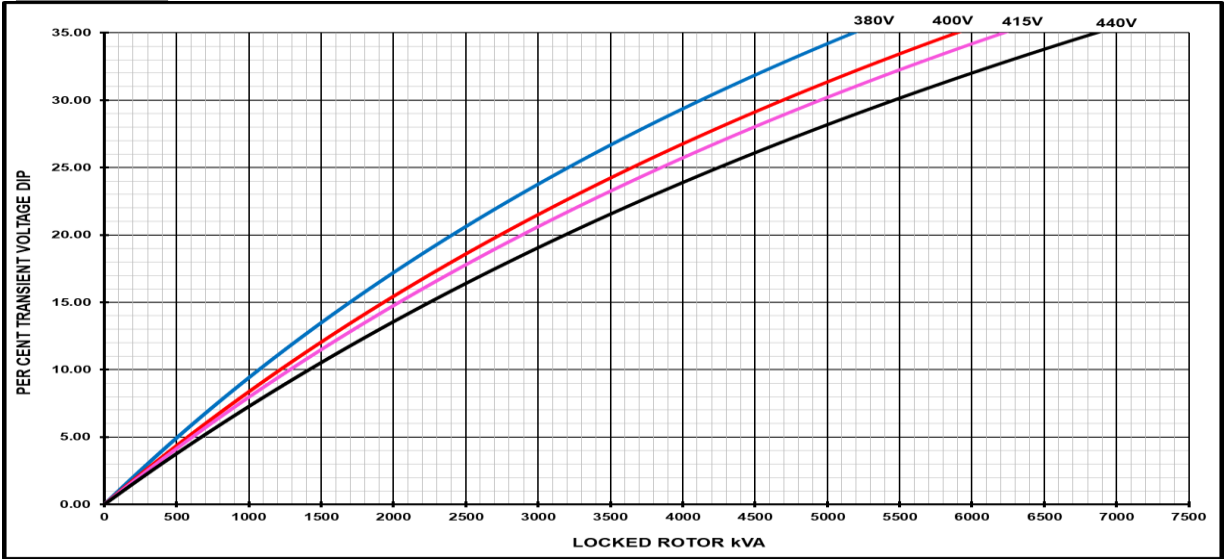


# STAMFORD

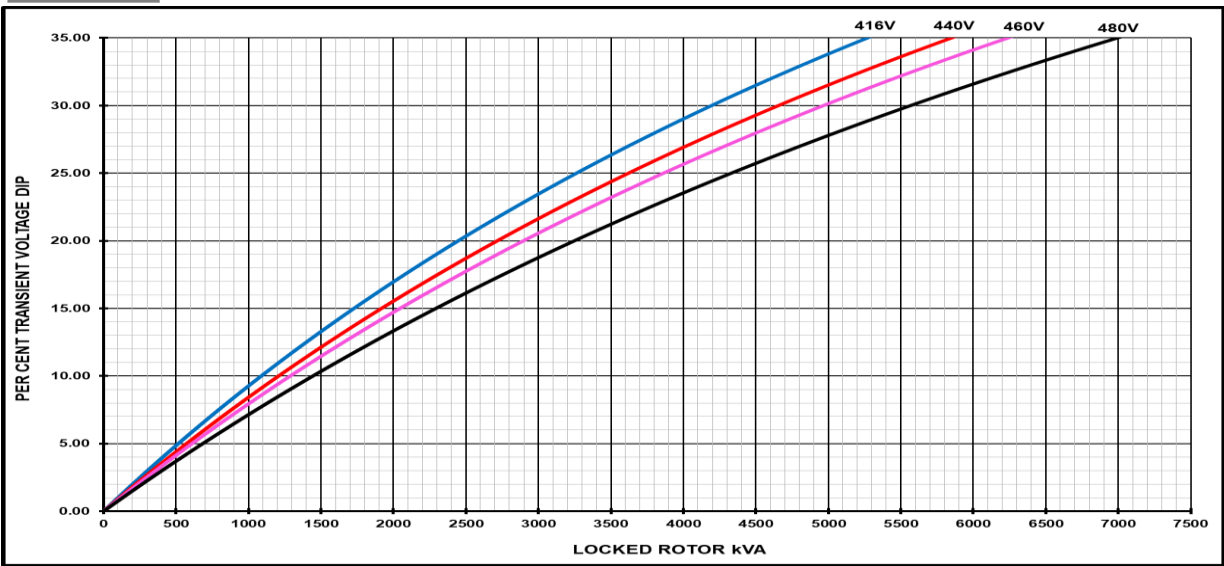
S7L1D-G4 Wdg.312

Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



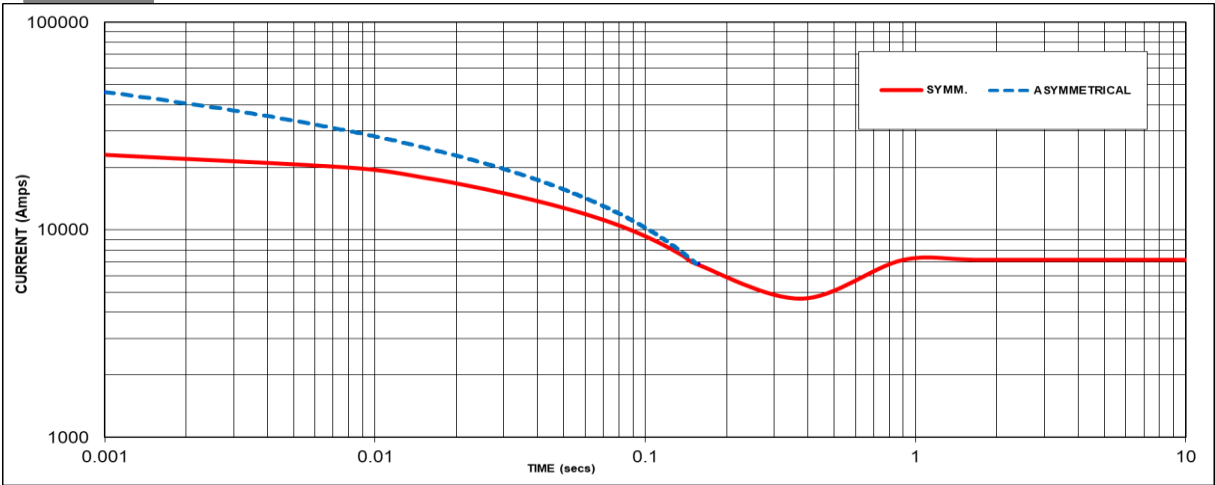
Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor	
PF	Factor	For voltage rise multiply voltage dip by 1.25	
< 0.5	1		
0.5	0.97		
0.6	0.93		
0.7	0.9		
0.8	0.85		
0.9	0.83		

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## S7L1D-G4 Wdg.312

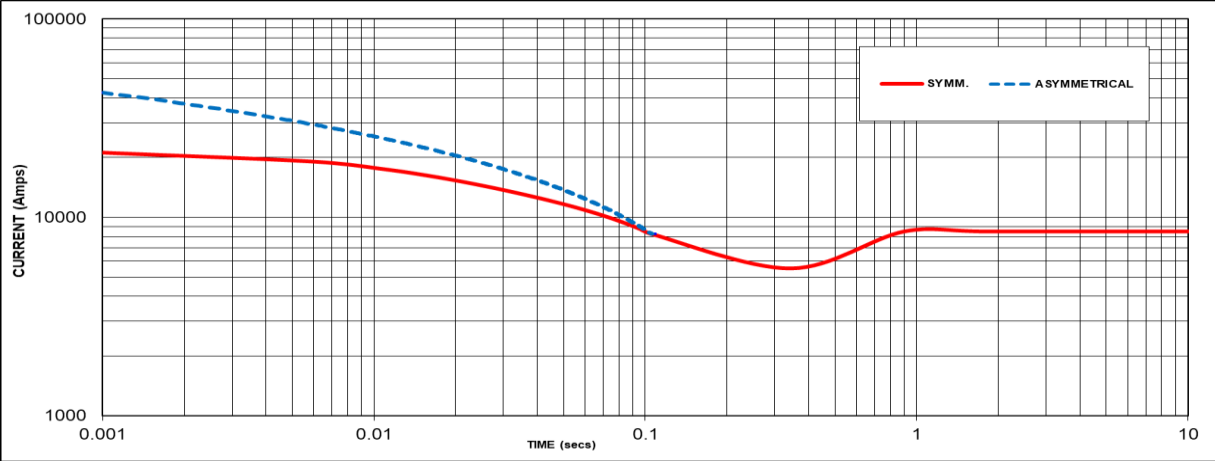
### Three-phase Short Circuit Decrement Curve - Separately Excited

**50Hz**



Sustained Short Circuit = 7182 Amps

**60Hz**



Sustained Short Circuit = 8495 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 sustained current values are for MX341 AVR. For MX322 and Digital AVR 1.2 factor to be applied to the sustained short circuit

**Note 3**

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 4**

Curves are drawn for Star connected machines 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

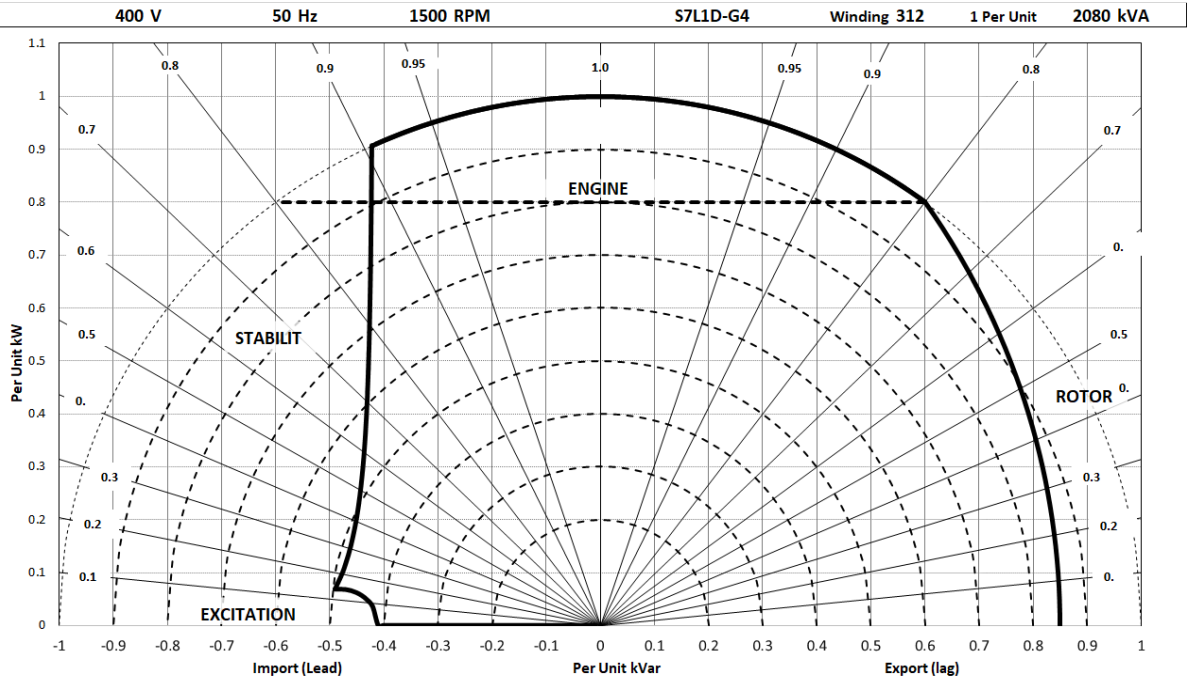
Series Delta = Curve current value X 1.732

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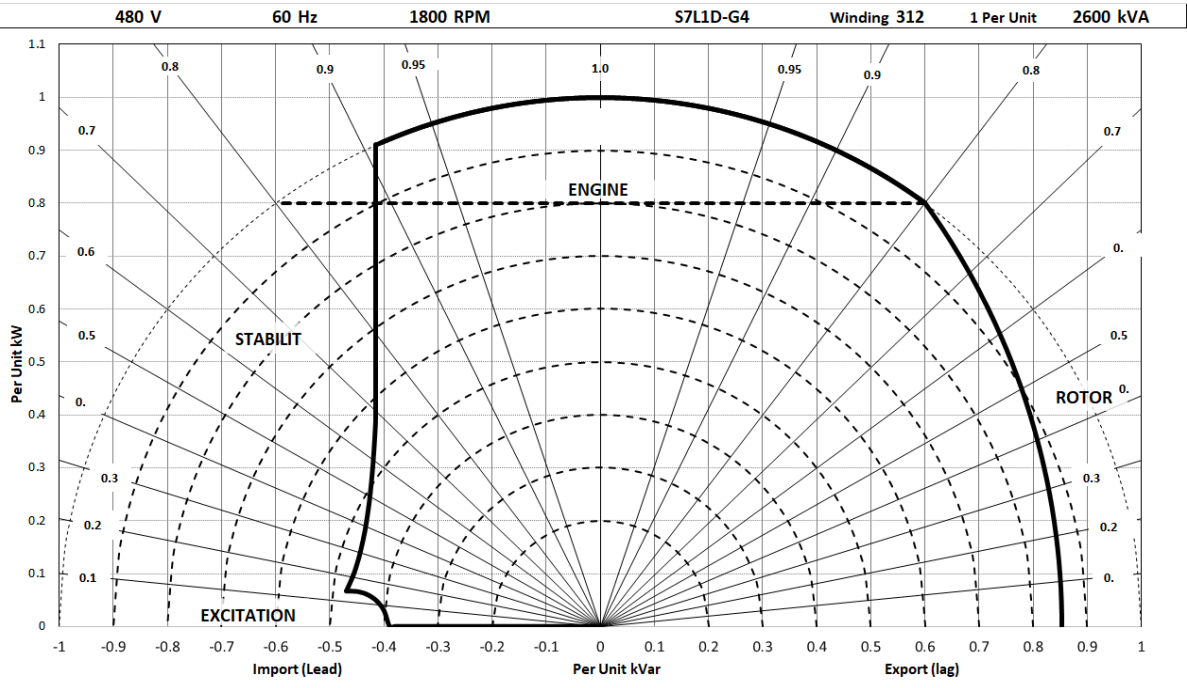
S7L1D-G4 Wdg.312

## Typical Alternator Operating Charts

400V/50Hz



480V/60Hz





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## S7L1D-G4 Wdg.312

### 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			
<b>50</b> Hz	Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	kVA	2165	2250	2250	2185	2105	2170	2170	2125	2020	2080	2080	2040	1880	1935	1935	1900
	kW	1732	1800	1800	1748	1684	1736	1736	1700	1616	1664	1664	1632	1504	1548	1548	1520
	Efficiency (%)	95.8	95.8	95.9	96.1	95.9	95.9	96.0	96.1	96.0	96.0	96.1	96.2	96.1	96.1	96.2	96.2
	kW Input	1808	1878	1877	1820	1757	1810	1809	1769	1684	1733	1732	1697	1565	1610	1610	1579

<b>60</b> Hz	Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	kVA	2506	2675	2731	2787	2437	2600	2650	2706	2350	2500	2550	2600	2194	2325	2375	2425
	kW	2005	2140	2185	2230	1950	2080	2120	2165	1880	2000	2040	2080	1755	1860	1900	1940
	Efficiency (%)	95.8	95.8	95.9	96.0	95.9	95.9	96.0	96.0	96.0	96.0	96.1	96.1	96.1	96.1	96.2	96.2
	kW Input	2092	2233	2278	2323	2033	2169	2209	2254	1959	2084	2124	2164	1827	1936	1976	2017

#### 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 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.

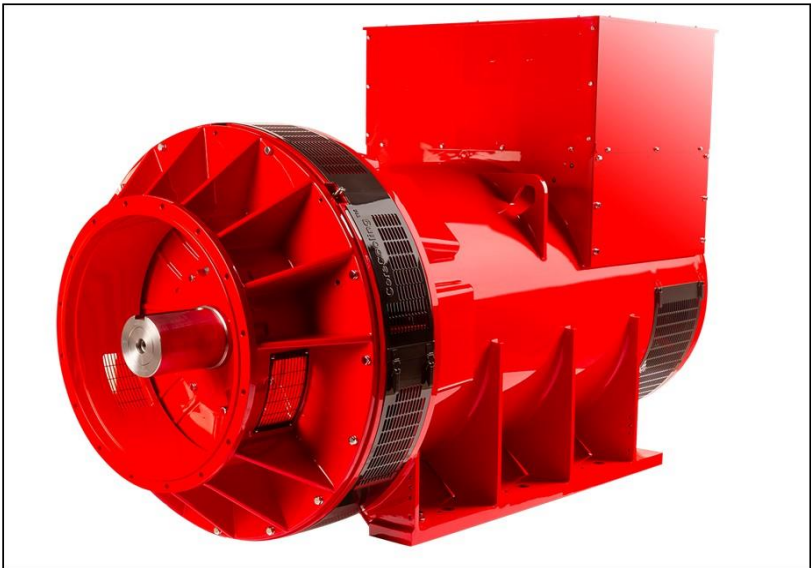
**S7L1D-G4 Wdg.07 - Technical Data Sheet**

**Standards**

STAMFORD industrial alternators meet the requirements of the relevant parts of the IEC 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	MX341	MX322	DECS100	DECS150	
Voltage Regulation	± 1%	± 0.5%	± 0.25%	± 0.25%	with 4% Engine Governing
AVR Power	PMG	PMG	PMG	PMG	

No Load Excitation Voltage (V)	14.6
No Load Excitation Current (A)	0.67
Full Load Excitation Voltage (V)	63
Full Load Excitation Current (A)	2.8
Exciter Time Constant (seconds)	0.125

# STAMFORD

## S7L1D-G4 Wdg.07

Electrical Data	
Insulation System	H
Stator Winding	Double Layer Concentric
Winding Pitch	2/3
Winding Leads	6
Winding Number	07
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	32.02
60 Hz	
Telephone Interference	TIF<50
Cooling Air Flow	2.87 m³/sec
Voltage Star (V)	600
Voltage Parallel Star (V)	-
Voltage Delta (V)	-
kVA Base Rating (Class H) for Reactance Values (kVA)	2600
Saturated Values in Per Unit at Base Ratings and Voltages	
Xd Dir. Axis Synchronous	2.82
X'd Dir. Axis Transient	0.19
X''d Dir. Axis Subtransient	0.14
Xq Quad. Axis Reactance	1.94
X''q Quad. Axis Subtransient	0.22
XL Stator Leakage Reactance	0.08
X2 Negative Sequence Reactance	0.16
X0 Zero Sequence Reactance	0.03
Unsaturated Values in Per Unit at Base Ratings and Voltages	
Xd Dir. Axis Synchronous	3.38
X'd Dir. Axis Transient	0.22
X''d Dir. Axis Subtransient	0.16
Xq Quad. Axis Reactance	2.00
X''q Quad. Axis Subtransient	0.26
XL Stator Leakage Reactance	0.10
Xlr Rotor Leakage Reactance	0.21
X2 Negative Sequence Reactance	0.19
X0 Zero Sequence Reactance	0.04

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## S7L1D-G4 Wdg.07

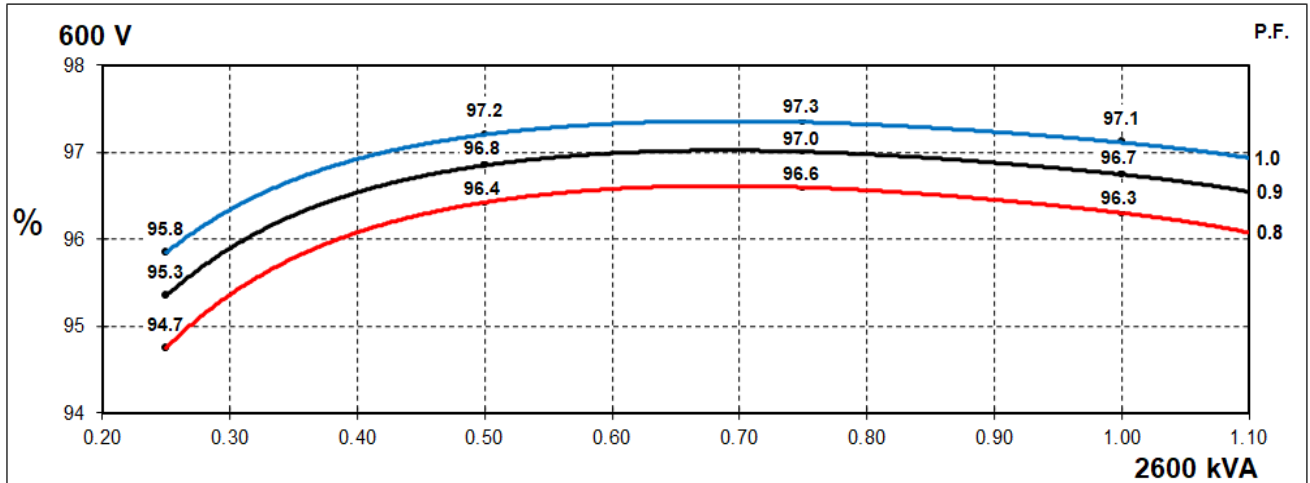
Time Constants (Seconds)		
T'd Transient Time Const.	0.185	
T''d Sub-Transient Time Const.	0.016	
T'do O.C. Field Time Const.	4.290	
Ta Armature Time Const.	0.032	
T''q Sub-Transient Time Const.	0.0106	
Resistances in Ohms (Ω) at 22 <sup>0</sup> C		
Stator Winding Resistance (Ra), per phase for series connected	0.00131	
Rotor Winding Resistance (Rf)	2.15	
Exciter Stator Winding Resistance	22.3	
Exciter Rotor Winding Resistance per phase	0.065	
PMG Phase Resistance (Rpmg) per phase	1.91	
Positive Sequence Resistance (R1)	0.0016	
Negative Sequence Resistance (R2)	0.0019	
Zero Sequence Resistance (R0)	0.0016	
Saturation Factors	600V	
SG1.0	0.173	
SG1.2	1.175	
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 Bearing
SAE Adaptor	SAE0, SAE00	SAE0, SAE00
Moment of Inertia	45.47 kgm²	44.44 kgm²
Weight Wound Stator	1725kg	1725kg
Weight Wound Rotor	1488kg	1445kg
Weight Complete Alternator	3637kg	3604kg
Shipping weight in a Crate	3689kg	3656kg
Packing Crate Size	220 x 105 x 155(cm)	220 x 105 x 155(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL. 6232 C3
Bearing Non-Drive End	BALL. 6319 C3	BALL. 6319 C3

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S7L1D-G4 Wdg.07

## THREE PHASE EFFICIENCY CURVES

60Hz



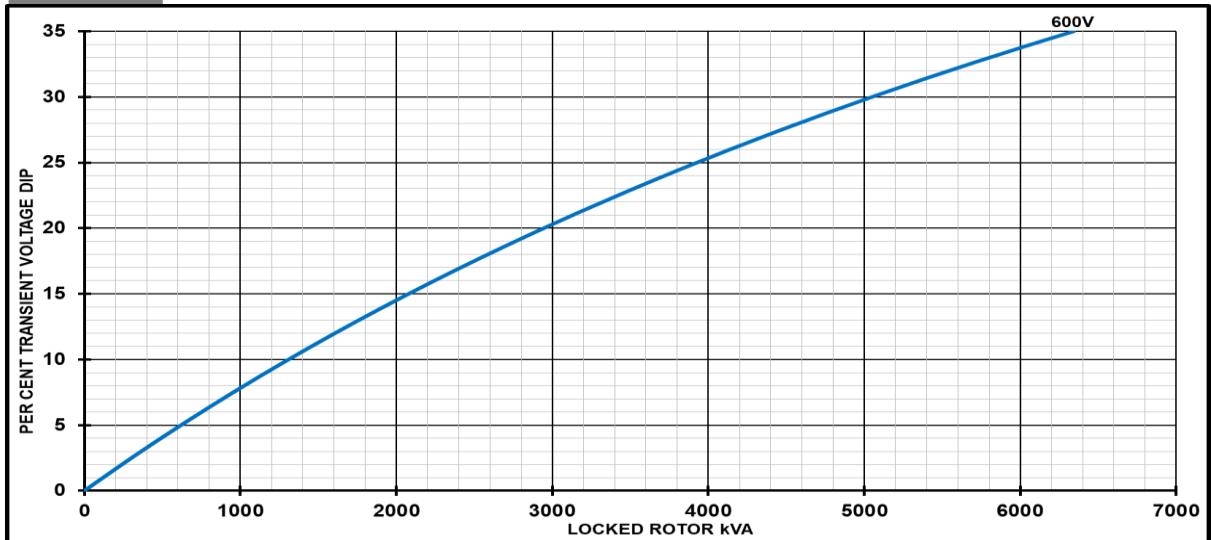


# STAMFORD

S7L1D-G4 Wdg.07

## Locked Rotor Motor Starting Curves - Separately Excited

60Hz



Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor	Lagging PF	Scaling Factor
<= 0.4	1.00	<= 0.4	1.25
0.5	0.95	0.5	1.20
0.6	0.90	0.6	1.15
0.7	0.86	0.7	1.10
0.8	0.83	> 0.7	1.00
0.9	0.75		
0.95	0.70		
1	0.65		

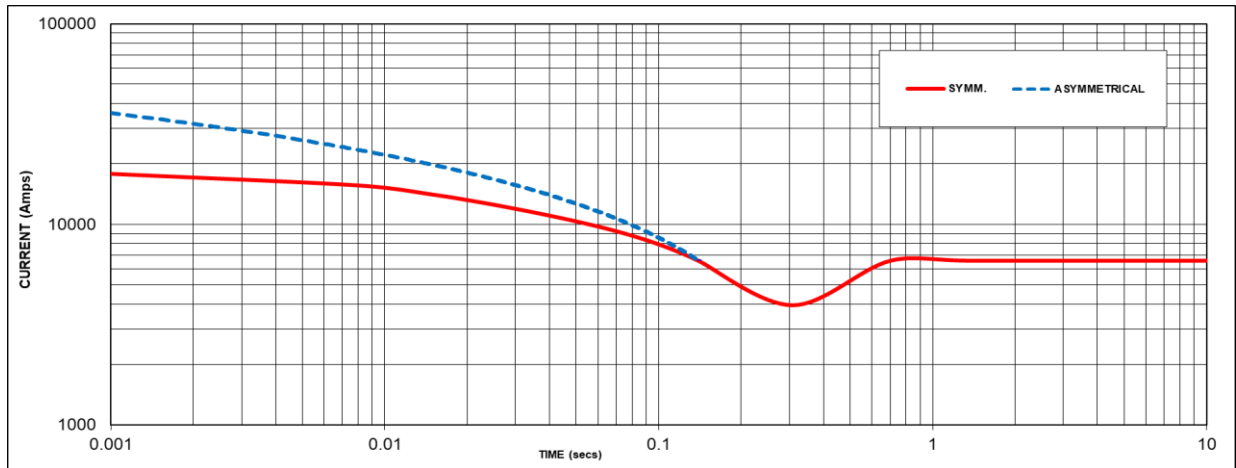
**Note:** To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

# STAMFORD®

## S7L1D-G4 Wdg.07

### Three-phase Short Circuit Decrement Curve - Separately Excited

**60Hz**



Sustained Short Circuit = 6607 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

#### Note 2

The sustained current values are for MX341 AVR. For MX322 and Digital AVR 1.2 factor to be applied to the sustained short circuit

#### Note 3

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 4

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

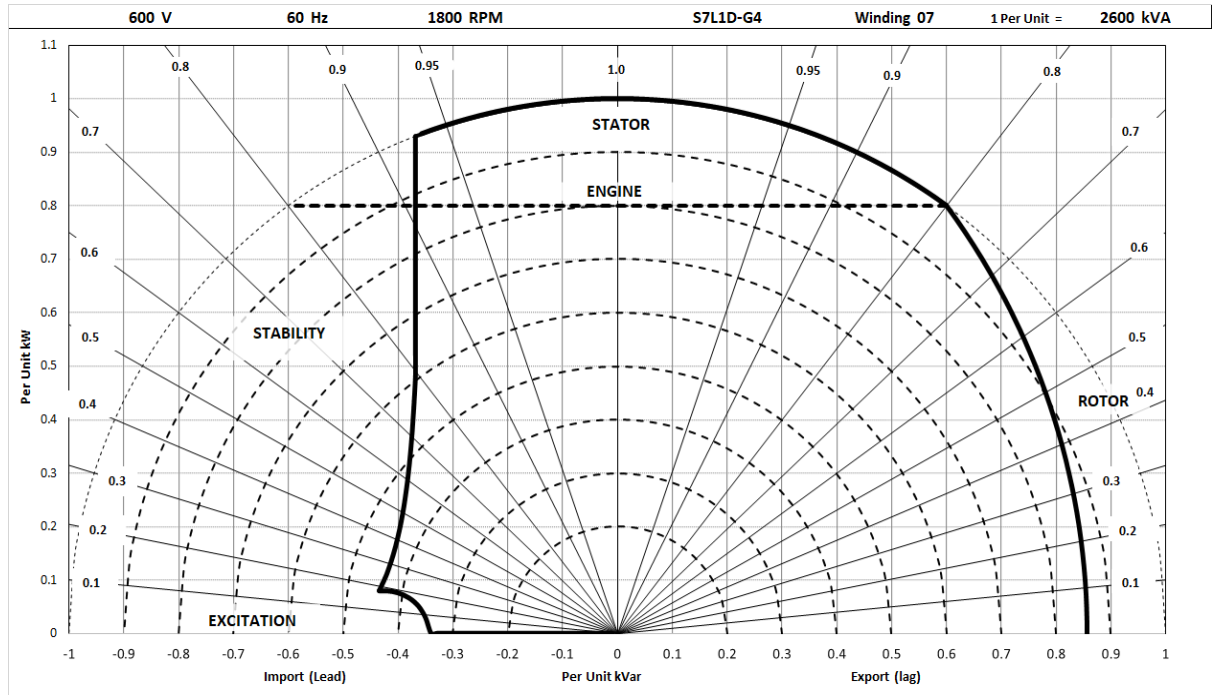
Series Delta = Curve current value X 1.732

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## S7L1D-G4 Wdg.07

### Typical Alternator Operating Charts

**600V/60Hz**



# STAMFORD®

## S7L1D-G4 Wdg.07

### 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
<b>50</b> Hz	Star (V)	N/A	N/A	N/A	N/A
	Parallel Star (V)	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A
	kVA	N/A	N/A	N/A	N/A
	kW	N/A	N/A	N/A	N/A
	Efficiency (%)	N/A	N/A	N/A	N/A
	kW Input	N/A	N/A	N/A	N/A

<b>60</b> Hz	Star (V)	600	600	600	600
	Parallel Star (V)	N/A	N/A	N/A	N/A
	Delta (V)	N/A	N/A	N/A	N/A
	kVA	2787	2706	2600	2425
	kW	2230	2165	2080	1940
	Efficiency (%)	96.2	96.2	96.3	96.4
	kW Input	2319	2250	2160	2012

#### 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 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 MKII

## AUTO START & AUTO MAINS FAILURE CONTROL MODULES

DSE7420 MKII

DSE7410 MKII



### KEY FEATURES

- 4-Line back-lit LCD text display
- Multiple Display Languages
- Five key menu navigation
- LCD alarm indication
- Heated display option available
- Customisable power-up text and images
- DSENet expansion compatibility
- Data logging facility upto 20 parameters
- Internal PLC editor
- Protections disable feature
- Fully configurable via PC using USB, RS232, RS485 and ethernet communication
- Front panel configuration with multi-level PIN protection
- Power save mode
- 3 phase generator sensing and protection
- 3 phase mains (utility) sensing and protection (DSE7420 MKII only)
- Automatic load transfer control (DSE7420 MKII only)
- Generator current and power monitoring (kW, kvar, kVA, pf)
- Mains current and power monitoring (kW, kvar, kVA, pf) (DSE7420 MKII only)
- kW and kvar overload and reverse power alarms
- Over current protection
- Unbalanced load protection
- Independent earth fault protection
- Breaker control via fascia buttons
- Fuel and start outputs configurable when using CAN
- 6 configurable DC outputs

- 2 configurable volt-free relay outputs
- 6 configurable analogue/digital inputs
- Support for 0 V to 10 V & 4 mA to 20 mA sensors
- Support for 3 kΩ resistive sensors
- 8 configurable digital inputs
- Configurable 5 stage dummy load and load shedding outputs
- CAN, MPU and alternator frequency speed sensing in one variant
- Real time clock
- Manual and automatic fuel pump control
- Engine pre-heat and post-heat functions
- Engine run-time scheduler
- Engine idle control for starting & stopping
- Fuel usage monitor and low fuel level alarms
- Simultaneous use of RS232, RS485 & ethernet communication ports
- True dual mutual standby using RS232 or RS485 for accurate hours balancing.
- MODBUS RTU & TCP support with configurable MODBUS pages.
- SNMP GET, SET and TRAP support built in.
- Advanced SMS messaging (additional external modem required)
- Start & stop capability via SMS messaging
- 3 configurable maintenance alarms

- Compatible with a wide range of CAN engines, including tier 4 engine support
- J1939-75 support & CAN alarm ignore function
- Uses DSE Configuration Suite PC Software for simplified configuration
- Licence-free PC software
- IP65 rating (with supplied gasket) offers increased resistance to water ingress
- Modules can be integrated into building management systems (BMS) using MODBUS RTU & TCP
- Configurable CAN parameters to read and display CAN information from external CAN devices.

### KEY BENEFITS

- Automatically transfers between mains (utility) and generator (DSE7420 MKII only) for convenience.
- Hours counter provides accurate information for monitoring and maintenance periods
- User-friendly set-up and button layout for ease of use
- Multiple parameters are monitored & displayed simultaneously for full visibility
- The module can be configured to suit a wide range of applications for user flexibility
- PLC editor allows user configurable functions to meet user specific application requirements.

### RELATED MATERIALS

#### TITLE

DSE7410 MKII & DSE7420 MKII Installation Instructions  
DSE7410 MKII & DSE7420 MKII Operator Manual  
DSE7410 MKII & DSE7420 MKII Configuration Suite PC Manual

#### 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

#### PART NO.

053-191  
057-263  
057-262

#### 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

### SPECIFICATIONS

#### DC SUPPLY

##### CONTINUOUS VOLTAGE RATING

8 V to 35 V Continuous  
5 V for up to 1 minute

#### CRANKING DROPOUTS

Able to survive 0 V for 100 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. LEDs and backlight will not be maintained during cranking.

#### MAXIMUM OPERATING CURRENT

510 mA at 12 V, 240 mA at 24 V

#### MAXIMUM STANDBY CURRENT

330 mA at 12 V, 160 mA at 24 V

#### CHARGE FAIL/EXCITATION RANGE

0 V to 35 V

#### GENERATOR & MAINS (UTILITY)

##### VOLTAGE RANGE

15 V to 415 V AC (Ph to N)  
26 V to 719 V AC (Ph to Ph)

##### FREQUENCY RANGE

3.5 Hz to 75 Hz

##### MAGNETIC PICKUP

##### VOLTAGE RANGE

+/- 0.5 V to 70 V

##### FREQUENCY RANGE

10,000 Hz (max)

#### INPUTS

##### DIGITAL INPUTS A TO H

Negative switching

##### ANALOGUE INPUTS A, B, E & F

Configurable as:  
Negative switching digital input  
0 V to 10 V sensor  
4 mA to 20 mA sensor  
Resistive sensor

##### ANALOGUE INPUTS C & D

Configurable as:  
Negative switching digital input  
Resistive sensor

#### OUTPUTS

##### OUTPUT A & B (FUEL & 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

#### DIMENSIONS

##### OVERALL

245 mm x 184 mm x 51 mm  
9.6" x 7.2" x 2.0"

##### PANEL CUT-OUT

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  
-40 °F to +185 °F

##### OPERATING TEMPERATURE RANGE

##### NON-HEATED DISPLAY VARIANT

-30°C to +70 °C  
-22 °F to +158 °F

##### HEATED DISPLAY VARIANT

-40 °C to +70 °C  
-40 °F to +158 °F



# DSE7410/20 MKII

## AUTO START & AUTO MAINS FAILURE CONTROL MODULES

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

Monitoring an extensive number of engine parameters, the modules will display warnings, shutdown and engine status information on the back-lit LCD screen, illuminated LEDs, remote PC and via SMS text alerts (with external modem).

The DSE7420 MKII will also monitor the mains (utility) supply. The modules include USB, RS232, RS485 and Ethernet ports as well as dedicated DSENet® terminals for system expansion.

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

The extensive list of features includes enhanced event and performance monitoring, remote communications & PLC functionality.

Dual mutual standby is now available on both the DSE7410 MKII & DSE7420 MKII using RS232 or RS485 communications. This provides for a simpler and more convenient installation with more advanced features such as true hours balancing.

The modules also feature SNMP functionality for connection to SNMP systems.

The modules can be easily configured using the DSE Configuration Suite PC 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 at +/-7.5 mm,  
8 Hz to 500 Hz at 2 gn

#### HUMIDITY

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

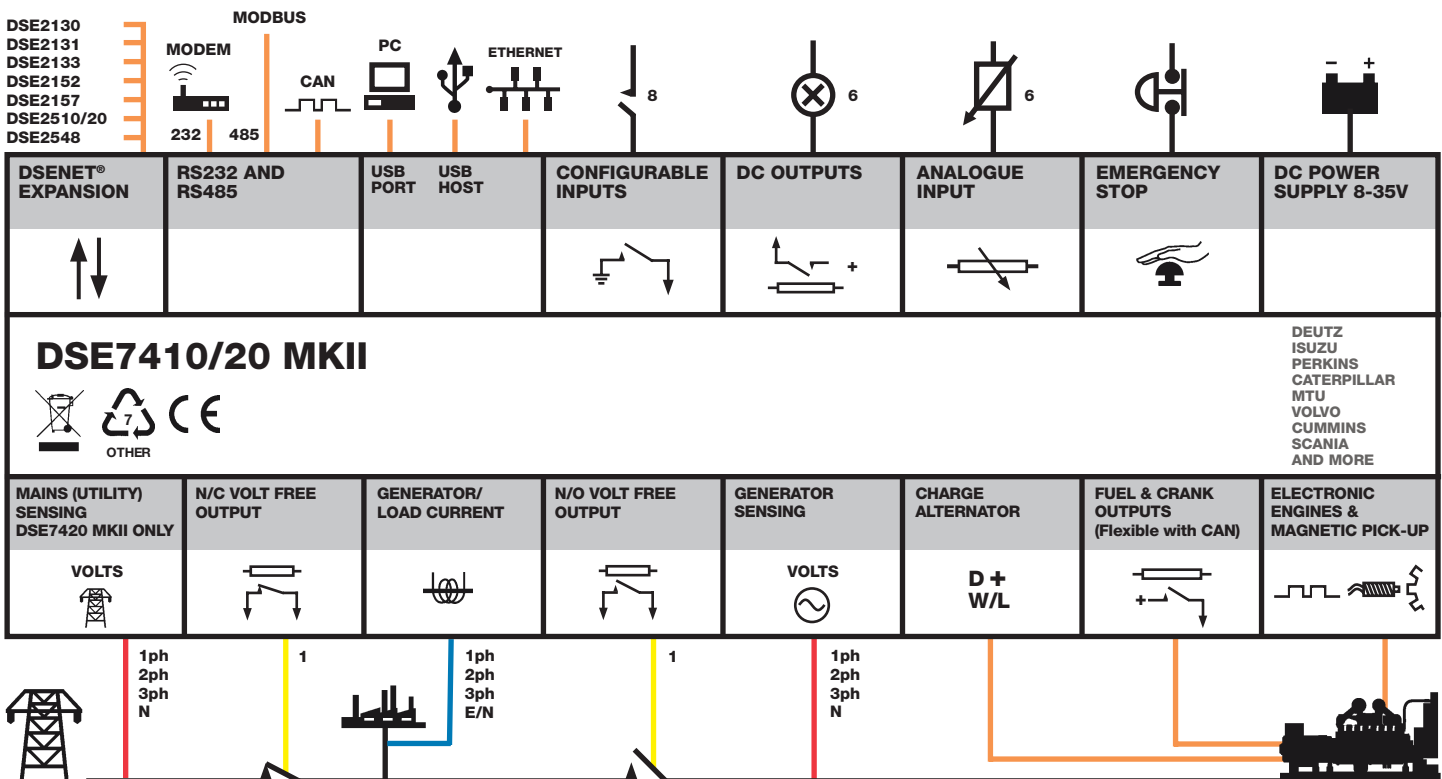
#### SHOCK

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



PRODUCT-DETAILS

# E4.2S-A 3200 Ekip Dip LSIG 4p FVR

## E4.2S-A 3200 Ekip Dip LSIG 4p FVR



General Information	
Extended Product Type	E4.2S-A 3200 Ekip Dip LSIG 4p FVR
Product ID	1SDA078240R1
EAN	8015644846633
Catalog Description	E4.2S-A 3200 Ekip Dip LSIG 4p FVR
Long Description	C.BREAKER SACE EMAX2 E4.2S-A 3200 UL FIXED FOUR-POLE WITH TERMINALS REAR VERTICAL AND SOLID-STATE RELEASE IN AC EKIP/DIP-LSIG R 3200 FITTED WITH: 4 AUXILIARY CONTACT AND C.BREAKER IN POSITION OPEN-CLOSED

ABB EcoSolutions	
ABB EcoSolutions	Yes

Circular Value	
Circular Design	Design for Closing Resource Loops - Standard EN45555 - 79.3 %
Principles Recyclability Rate	
Conflict Minerals Reporting Template (CMRT)	9AKK108467A5658
End of Life Instructions	9AKK108468A2363

Group Waste to Landfill Target	UL 2799 Zero Waste To Landfill Validation available
Toxic Substances Control Act - TSCA	9AKK108467A8326

Eco Transparency

Environmental Product Declaration - EPD	9AKK108468A1907
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Environmental

Environmental Information	9AKK108467A6707
REACH Declaration	9AKK108466A1425
RoHS Information	9AKK108466A1424
RoHS Status	Following EU Directive 2011/65/EU and Amendment 2015/863 July 22, 2019

Ordering

Order Code US and Canada	ZCSHUNBC000A000000XX
EAN	8015644846633
Minimum Order Quantity	1 piece
Customs Tariff Number	85362090

Dimensions

Product Net Width	510 mm
Product Net Height	371 mm
Product Net Depth / Length	270 mm
Product Net Weight	60 kg

Container Information

Package Level 1 Units	box 1 piece
Package Level 1 Width	515 mm
Package Level 1 Height	610 mm
Package Level 1 Depth / Length	785 mm
Package Level 1 Gross Weight	81 kg
Package Level 1 EAN	8015644846633

Additional Information

Current Type	AC
Electrical Durability	Ue =< 508 V 7000 cycle Ue = 508 ... 635 V 7000 cycle 20 cycles per hour
Mechanical Durability	20000 cycle 60 cycles per hour

Neutral Pole Current ([% I <sub>n</sub> ])	100 %
Number of Poles	4
Power Loss	at Rated Operating Conditions per Pole 445 W
Product Main Type	SACE Emax 2
Product Name	Air Circuit Breaker
Product Type	Air Circuit Breaker
Rated Current (I <sub>n</sub> )	3200 A
Rated Voltage (U <sub>r</sub> )	600 V
Rated Insulation Voltage (U <sub>i</sub> )	AC 635 V
Rated Operational Voltage	600 V AC
Release	Ekip Dip LSIG
Release Type	EL
Short-Circuit Performance Level	S
Standards	UL
Sub-type	E4.2
Terminal Connection Type	Rear flat Vertical
Version	F

Technical UL/CSA

Interrupting Rating acc. to UL1066	(254 V) 65 kA (508 V) 65 kA (635 V) 65 kA
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Certificates and Declarations

Data Sheet, Technical Information	1SXU200040C0201
Declaration of Conformity - CE	9AKK106713A5545
Instructions and Manuals	1SDH001000R0002

Classifications

ETIM 7	EC000228 - Power circuit-breaker for trafo/generator/installation protection
ETIM 8	EC000228 - Power circuit-breaker for trafo/generator/installation protection
ETIM 9	EC000228 - Power circuit-breaker for trafo/generator/installation protection
IDEA Granular Category Code (IGCC)	4926 >> Air circuit breakers
UNSPSC	39121615
WEEE Category	4. Large Equipment (Any External Dimension More Than 50 cm)
eClass	V11.1 : 27370409

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## Categories

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Low Voltage Products and Systems → Circuit Breakers → Air Circuit Breakers → Emax 2





**Molded Case Circuit Breakers**  
**Power Defense™ UL Global Series**  
**Part Number: PDG63M2500E3RNNNNNNN**



Datasheet creation date: 02/12/2019

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

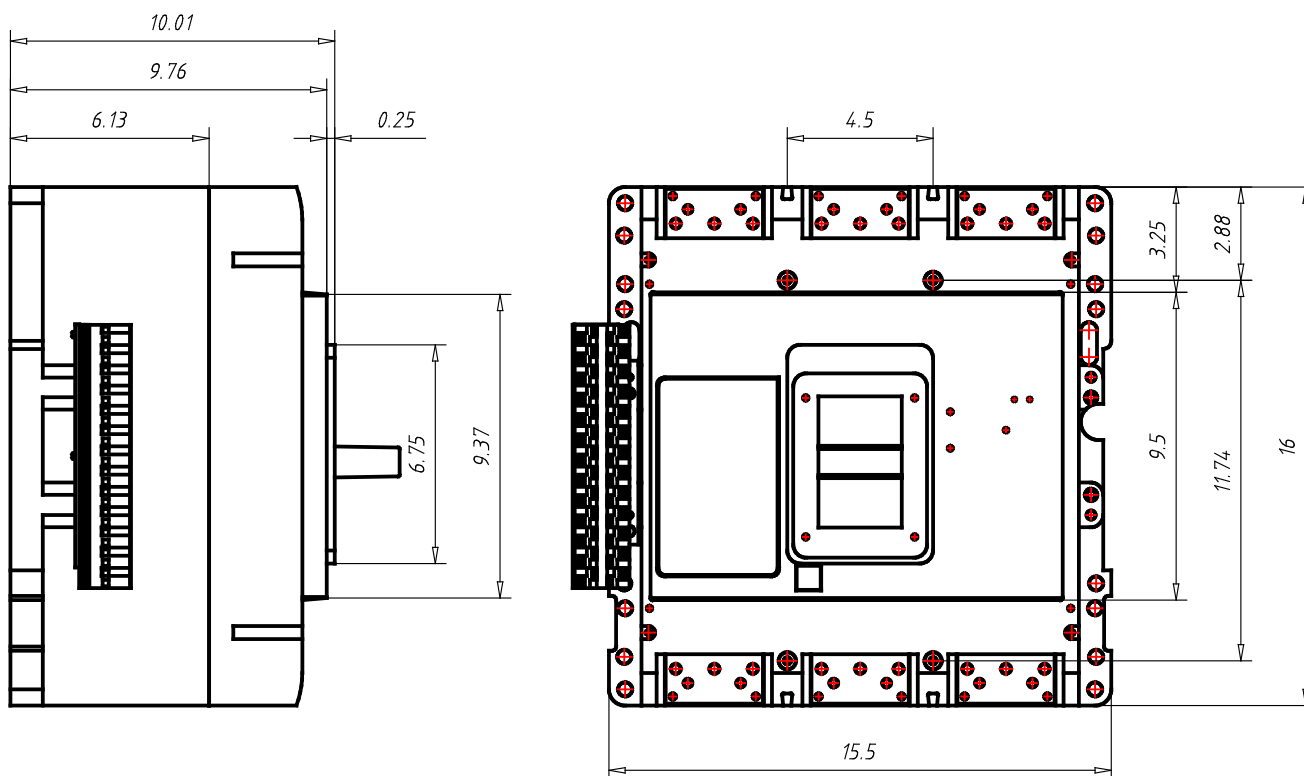
Eaton's Power Defense™ molded case circuit breakers, a globally rated platform designed to help keep your power system safe with latest protection technology. Engineered for the future: IoT and Industry 4.0 features such as built-in communications, advanced energy metering, and algorithms that signal 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	PDG63M2500E3RNNNNNNN
Frame Size	Frame 6
Poles	3 Pole
Voltage	480V AC
Interruption or Breaking Capacity (Icu/Ics)	65kA
Continuous Current Rating (In)	2500A
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	None
Line Terminal Type	N/A
Load Type Description	None
Load Conductor Options	None
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: PDG63M2500E3RNNNNNN**

**Technical drawings**



**Molded Case Circuit Breakers**  
**Power Defense™ UL Global Series**  
**Part Number: PDG63M2500E3RNNNNNNN**

**General Technical Data**

Frame Rating (In)	2500A
Reference Standard	UL489, CSA 22.2, IEC 60947-2 & GB
Number of poles	3
Neutral rating	-
Interruption Rating Designator	M / N / P
UL Interruption Rating to UL 489 (240Vac)	125 / 150 / 200kA
UL Interruption Rating to UL 489 (480Vac)	65 / 85 / 100kA
UL Interruption Rating to UL 489 (600Vac)	35 / 50 / 65kA
UL Interruption Rating to UL 489 (125/250Vdc)	
UL Current Limiting	-
Rated breaking capacity to IEC 60947-2 (220-240 Vac Icu)	135 / 150 / 200kA
Rated breaking capacity to IEC 60947-2 (220-240 Vac Ics)	100 / 100 / 100kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Icu)	70 / 70 / 100kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Ics)	50 / 50 / 50kA
Rated breaking capacity to IEC 60947-2 (440 Vac Icu)	50 / 70 / 100kA
Rated breaking capacity to IEC 60947-2 (440 Vac Ics)	40 / 50 / 50kA
Rated breaking capacity to IEC 60947-2 (525 Vac Icu)	30 / 35 / 40kA
Rated breaking capacity to IEC 60947-2 (525 Vac Ics)	25 / 25 / 25kA
Rated breaking capacity to IEC 60947-2 (690 Vac Icu)	15 / 20 / 35kA
Rated breaking capacity to IEC 60947-2 (690 Vac Ics)	7.5 / 13 / 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	Fixed
100% UL489 Rated	Yes
Instantaneous/Short Circuit Range	Adjustable
Magnetic/Instantaneous Override	17500A
Dimensions H x W x D (inches)	16 x 15.5 x 9.75
Pole to pole distance inches	4,5
Approx Weight lbs	135
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

# NRG

## Intelligent Engine Start Battery Charger



### The Smart Choice for Mission-Critical Engine Starting

- Fast, accurate, mission-critical charging – gives best starting reliability
- 4-rate, temperature-compensated output – offers longest battery life
- Replace nearly any charger – without planning ahead
- Industry-first battery-fault alarm – helps dispatch service early
- Lasting reliability – field MTBF > 1 million hours with industry-best warranty
- IBC seismic certification – meets latest building codes, no installation delays
- Optional OSHPD pre-approval – already approved for California hospital projects



# NRG Battery Charger Benefits and Features



**Failure to start due to battery problems is the leading cause of inoperable engine generator sets.**

SENS NRG battery charger maximizes starting system reliability while slashing genset servicing costs:

**One NRG replaces almost any charger without extra site visits.** Installers can select or change at any time 120, 208 or 240 volts AC input, 12 or 24-volt battery and output settings optimized for nearly any lead-acid or nickel cadmium battery.

**Easy to understand user interface provides state-of-the-art system status** – including digital metering, NFPA 110 alarms and a battery fault alarm that can send service personnel to the site before failure to start.

**Batteries charged by NRG give higher performance and last longer.** In uncontrolled environments precision charging by SENS increases battery life and watering intervals 400% or more.

**NRG meets all relevant industry standards** – including UL, NFPA 110 and CE. Seismic Certification per International Building Code (IBC) 2000, 2003, 2006. All units are C-UL listed. 50/60 Hz units add CE marking to UL agency marks.

**EnerGenius reliability technology built into every charger includes:**

- All-electronic operation with generous component de-rating
- Disconnected/reversed/incorrect voltage battery alarm and protection
- Protection of connected equipment against load dump transients
- Widest temperature rating, and overtemperature protection
- Superior lightning and voltage transient protection
- Demonstrated field MTBF > 1 million hours
- Standard 3-year warranty (10 years magnetics and power semiconductors) and available 10-year extended warranty

**Earn the best return on your charger investment – choose SENS NRG**

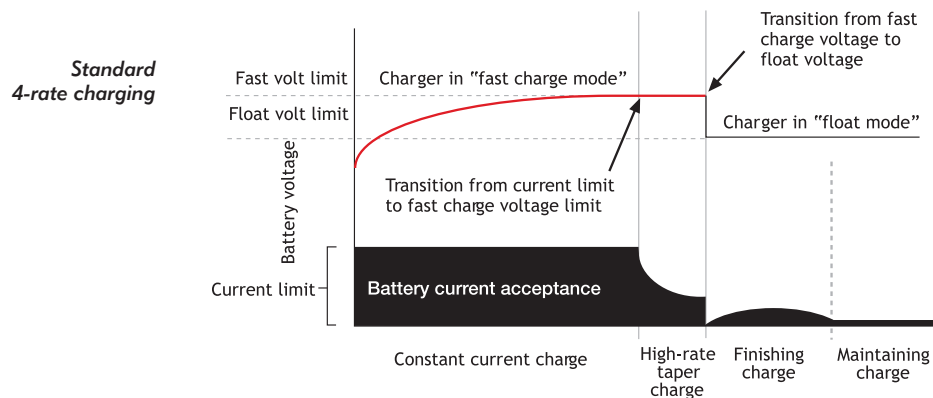
# NRG Specifications

## AC Input

Voltage	110-120/208-240 VAC, $\pm 10\%$ , single phase, field selectable
Input current	10A charger: 6.6/3.3 amps maximum 20A charger: 12.6/6.3 amps maximum
Frequency	60 Hz $\pm 5\%$ standard; 50/60 Hz $\pm 5\%$ optional
Input protection	1-pole fuse, soft-start, transient suppression

## Charger Output

Nominal voltage ratings	12 or 24 volt nominal
Optional voltage rating	12/24 volt, field selectable
Battery settings	Six discrete battery voltage programs - Low or high S.G. flooded - Low or high S.G. VRLA - Nickel cadmium 9, 10, 18, 19 or 20 cells
Regulation	$\pm 0.5\%$ (1/2%) line and load regulation
Current	10 or 20 amps nominal
Electronic current limit	105% rated output typical – no crank disconnect required
Charge characteristic	Constant voltage, current limited, 4-rate automatic equalization
Temperature compensation	Enable or disable anytime, remote sensor optional
Output protection	Current limit, 1-pole fuse, transient suppression



## User Interface, Indication and Alarms

Digital meter	Automatic meter alternately displays output volts, amps <sup>1</sup>
Accuracy	$\pm 2\%$ volts, $\pm 5\%$ amps
Alarms	LED and Form C contact(s) per table:



Front panel status display

## Alarm System Functions

Alarm code "C" (meets requirements of NFPA 110)	
AC good	LED
Float mode	LED
Fast charge	LED
Temp comp active	LED
AC fail	LED and Form C contact <sup>2</sup>
Low battery volts	LED and Form C contact <sup>2</sup>
High battery volts	LED and Form C contact <sup>2</sup>
Charger fail	LED and Form C contact <sup>2</sup>
Battery fault <sup>3</sup>	LED and Form C contact <sup>2</sup>

- Three-position jumper allows user to select from three display settings: alternating volts / amps (normal), constant volts, or constant amps
- Contacts rated 2A @ 30 VDC resistive
- Battery fault alarm indicates these fault conditions:
  - Battery disconnected - Battery polarity reversed - Mismatched charger battery voltage - Open or high resistance charger to battery connection
  - Open battery cell or excessive internal resistance



## Controls

AC input voltage select  
Optional 12/24-volt output select  
Battery program select  
Meter display select  
Fast charger enable/disable  
Temp compensation enable  
Remote temp comp enable

Field-selectable switch  
Field-selectable two-position jumper  
Field-selectable six-position jumper  
Field-selectable three-position jumper  
Field-selectable two-position jumper  
Standard. Can be disabled or re-enabled in the field  
Connect optional remote sensor to temp comp port



*Simple field adjustments*

## Environmental

Operating temperature  
Over temperature protection  
Humidity  
Vibration (10A unit)  
Transient immunity  
Seismic Certification

-20C to +60C, meets full specification to +45C  
Gradual current reduction to maintain safe power device temperature  
5% to 95%, non-condensing  
UL 991 Class B (2G sinusoidal)  
ANSI/IEEE C62.41, Cat. B, EN50082-2 heavy industrial, EN 61000-6-2  
IBC 2000, 2003, 2006, 2009 Maximum S<sub>ds</sub> of 2.28 g, Optional OSHPD pre-approval

## Agency Standards

Safety  
  
Agency marking  
  
EMC  
  
NFPA standards  
Optional agency compliance

C-UL listed to UL 1236 (required for UL 2200 gensets), UL Category BBGQ,  
CSA standard 22.2 no. 107.2-M89  
CE: 50/60 Hz units DOC to EN 60335  
60 Hz: C-UL-US listed  
50/60 Hz: C-UL-US listed plus CE marked  
Emissions: FCC Part 15, Class B; EN 50081-2  
Immunity: EN 61000-6-2  
NFPA 70, NFPA 110. (NFPA 110 requires Alarms "C")  
OSHPD pre-approval

## Construction

Housing/configuration  
Dimensions  
Printed circuit card  
Cooling  
Protection degree  
Damage prevention  
Electrical connections

Material: Non-corroding aluminum. C-UL listed enclosure.  
See Drawings and Dimensions page for details  
Surface mount technology, conformal coated  
Natural convection  
Listed housing: NEMA-1 (IP20). Optional IP21 drip shield. Optional NEMA 3R enclosure  
Fully recessed display and controls  
Compression terminal blocks

## Warranty

Standard warranty  
  
Optional warranty

Three year parts and labor warranty (10 years magnetics and power semiconductors) from date of shipment  
If specified at time of order, warranty coverage for the standard warranty period can be upgraded to reimburse customer's documented field service costs up to the original charger price.  
Alternatively, standard parts and labor warranty coverage can be increased to 5 or 10 years. Contact the factory for full details

## Optional features

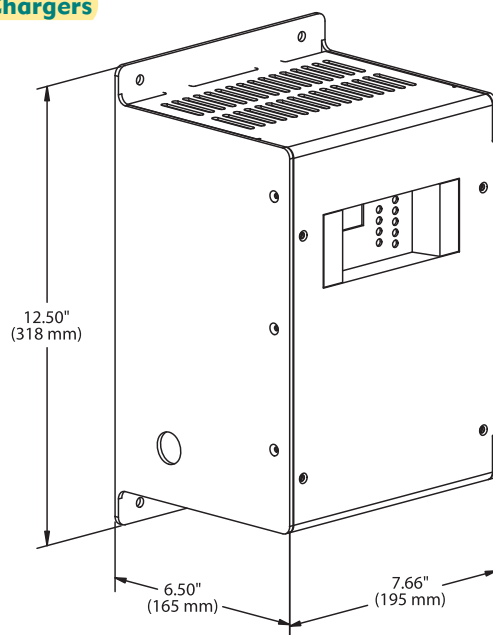
Input  
Remote temp comp sensor  
Drip shield meets s/b (IP21)  
NEMA 3R housing

Input frequency, 50/60 Hz  
Recommended where battery and charger are in different locations  
Protects from dripping water  
Enables outdoor installation (remote temp sensor recommended)

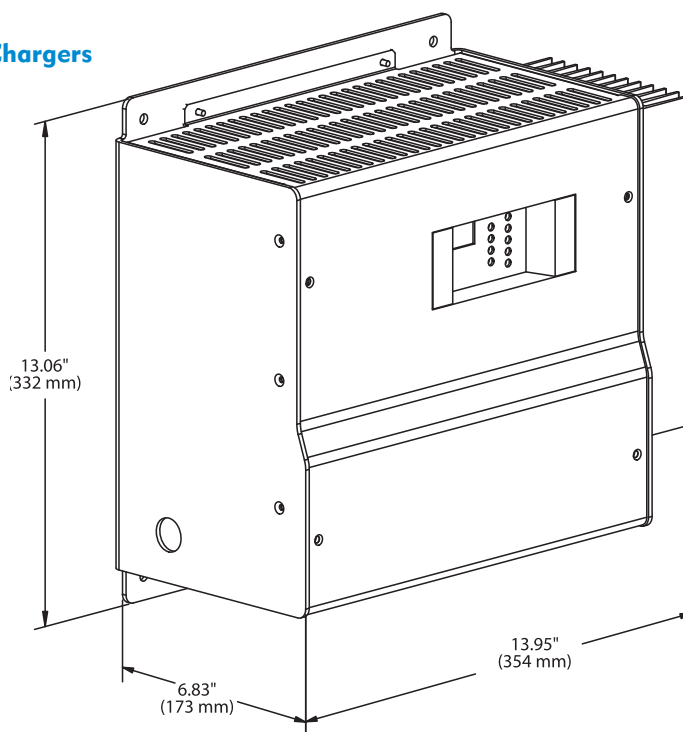


# Drawings and Dimensions

## 10A Chargers



## 20A Chargers



**Housing Dimensions Table**

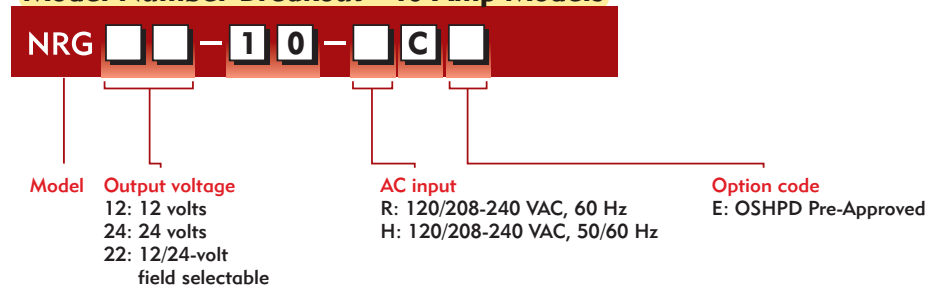
Amps	Width	Depth	Height
10	7.66" (195 mm)	6.50" (165 mm)	12.50" (318 mm)
20	13.95" (354 mm)	6.83" (173 mm)	13.06" (332 mm)

## NRG Ordering Information

Output volts	Output amps	Model	NFPA 110 Alarms	Lbs/Kg	Shipping Lbs/Kg
12	10	NRG12-10-RC	Yes	23 / 10.4	25 / 11.4
24	10	NRG24-10-RC	Yes	23 / 10.4	25 / 11.4
12/24	10	NRG22-10-RC	Yes	23 / 10.4	25 / 11.4
12	20	NRG12-20-RC	Yes	39 / 17.7	43 / 19.5
24	20	NRG24-20-RC	Yes	42 / 19.1	46 / 20.9
12/24	20	NRG22-20-RC	Yes	42 / 19.1	46 / 20.9

All models offer field-selectable input 120/208-240 volts. 60 Hz input is standard with C-UL listing. Optional 50/60 Hz input includes C-UL listing and adds CE mark.

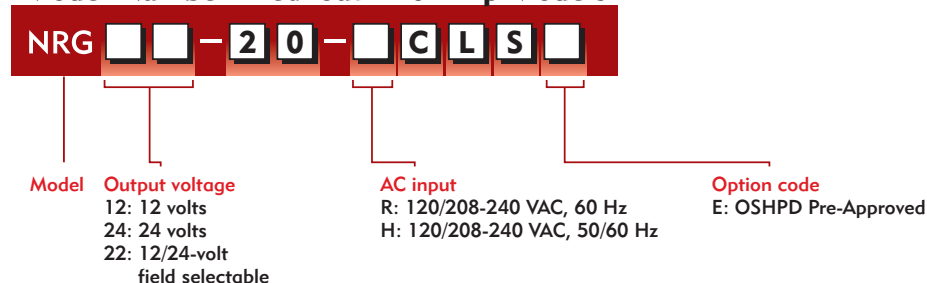
### Model Number Breakout - 10 Amp Models



All NRG models are C-UL Listed to UL1236

All NRG models provide LEDs and Form C contacts to meet NFPA 110

### Model Number Breakout - 20 Amp Models



## The Smart Choice for Mission-Critical Engine Starting

### Additional Information

Contact SENS or your local sales representative for additional specification, engineering and installation information. Check the SENS web site for latest available data. Specification is subject to change without notice.



### Contact Information

For information and service on any SENS product, please contact us at:  
Sales 1.866.736.7872 • 303.678.7500 • Fax 303.678.7504  
www.sens-usa.com • info@sens-usa.com  
1840 Industrial Circle, Longmont, CO 80501 USA

