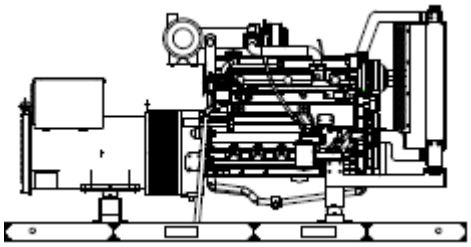
GILLETTE GENERATORS

LIQUID COOLED DIESEL ENGINE GENERATOR SET

60 HZ MODEL

SPVD-7000

Model	HZ	STANDBY 120°C RISE
SPVD-7000-60 HERTZ	60	700



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

UL1446, UL508, UL142, UL498

NFPA 110, 99, 70, 37
All generator sets meet NFPA-110 Level 1, when equipped with the necessary accessories and installed per NFPA standards.

NEC 700, 701, 702, 708

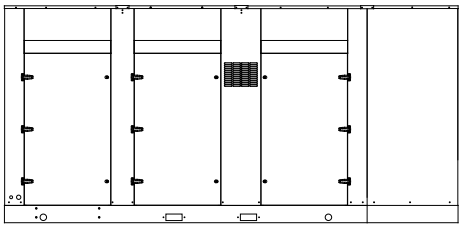
NEMA ICS10, MG1, ICS6, AB1

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

ASCE 7-05 & 7-10
All generator sets meet 180 MPH rating.

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

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



"LEVEL 2" HOUSED GEN-SET
Full aluminum weather protection and superior sound attenuation for specific low noise applications. Critical grade muffler is standard.

GENERATOR RATINGS

GENERATOR MODEL	VOLTAGE		PH	HZ	120°C RISE STANDBY RATING		POWER LEAD CONNECTIONS
	L-N	L-L			KW/KVA	AMP	
SPVD-7000-3-2	120	208	3	60	700/875	2428	12 LEAD LOW WYE
SPVD-7000-3-3	120	240	3	60	700/875	2104	12 LEAD HIGH DELTA
SPVD-7000-3-4	277	480	3	60	700/875	1052	12 LEAD HIGH WYE
SPVD-7000-3-16	346	600	3	60	700/875	841	4 LEAD HIGH WYE

RATINGS: All single phase gen-sets are dedicated 4 lead windings, rated at unity (1.0) power factor. 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 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 & ENGINEERING DATA FOR MODEL SPVD-7000-60 HZ

GENERATOR SPECIFICATIONS

Manufacturer.....Stamford Electric Generators
Model & Type.....S6DC311-014, 4 Pole, 12 Lead, Three Phase
.....S6DC311-014, 4 Pole, 12 Lead, 480V, Three Phase
.....S6DC17-014, 4 Pole, 6 Lead, 600V, Three Phase
Exciter.....Brushless, shunt excited
Voltage Regulator.....Solid State, HZ/Volts
Voltage Regulation .....½%, No load to full load
Frequency.....60 HZ
Frequency Regulation .....± ½% (1/2 cycle, no load to full load)
Unbalanced Load Capability.....100% of standby amps
One Step Load Acceptance..... 100% of nameplate rating
Total Stator and Load Insulation.....Class H, 180°C
Temperature Rise..... 120°C R/R, standby rating @ 40°C amb.
3 Ø Motor Starting @ 30% Voltage Dip (208-240V)....2300kVA
3 Ø Motor Starting @ 30% Voltage Dip (480V -600V) 3100kVA
Bearing..... 1, Pre-lubed and sealed
Coupling.....Direct flexible disc.
Total Harmonic Distortion..... Max 3½% (MIL-STD705B)
Telephone Interference Factor .....Max 50 (NEMA MG1-22)
Deviation Factor..... Max 5% (MIL-STD 405B)
Alternator.....Self ventilating and drip-proof
Ltd. Warranty Period..... 24 Months from start-up date or
.....1000 hours use, first to occur.

GENERATOR FEATURES

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

ENGINE SPECIFICATIONS AND APPLICATIONS DATA

ENGINE

Manufacturer..... VOLVO-PENTA
Model and Type .....TWD1744GE, 4 cycle, liquid Cooled
Aspiration..... Turbo After Cooler, H2O to Air
Charged Air Cooled System .....H2O to Air
Cylinder Arrangement.....6 Cylinders, In-Line
Displacement Cu. In. (Liters).....1053.3 (17.26)
Bore & Stroke in (Cm).....5.87 X6.50 (14.9 x 16.5)
Compression Ratio..... 16.5:1
Main Bearings..... Tin Overlay with Babbit Backing
Cylinder Head .....Cast Iron with overhead Cam
Pistons.....Aluminum Alloy with Graphite Coating
Crankshaft.....Induction Hardened, Heat Treated Forged
Valves ..... Heat Treated and Hardened Exhaust Valve
Governor .....Electronic, EMS 2.2
Frequency Regulation .....± 1/4%
Air Cleaner.....Dry, Replaceable Cartridge
Engine Speed .....1800 rpm
Max Power, bhp (kwm) Standby 1020 (750)
BMEP: psi (MPa) Standby..... .....439.1 (3.03)
Ltd. Warranty Period..... 2 Year or 1000 hrs, first to occur

FUEL SYSTEM

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

FUEL CONSUMPTION

GAL/HR (LITER/HR)	STANDBY
100% LOAD	45.92 (173.82)
75% LOAD	34.26 (129.71)
50% LOAD	23.3 (88.24)

OIL SYSTEM

Type ..... Full Pressure
Oil Pan Capacity qt. (L) 49.66 (47)
Oil Pan Cap. W/ filter qt. (L) 54.94 (52)
Oil Filter.....3, Replaceable Cartridge type

ELECTRICAL SYSTEM

Ignition System .....Electronic
Eng. Alternator/Starter: …24 VDC, negative ground, 80 amp/hr.

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

CERTIFICATIONS

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

APPLICATION & ENGINEERING DATA FOR MODEL SPVD-7000-60 HZ

COOLING SYSTEM

Type of System ..... Air to Air, Charged Air Cooler
Coolant Pump .....Pre-lubricated, self-sealing
Cooling Fan Type .....Pusher
Fan Diameter inches (cm).....38 (97)
Fan drive ratio..... 1.05:1
Ambient Capacity of Radiator °F (°C).....131 (55)
Engine Jacket Coolant Capacity gal. (L).....6.60 (25)
Radiator Coolant Capacity gal. (L) 14.53 (55)
Heat Reject Coolant: Btu/min ....….14,274
Air to Air Heat Reject, BTU/min. .... ….7,677
Heat Radiated to Ambient, BTU/min .... ….1,365
Heat Rejection to CAC, kW (BTU/min)……202 (11488)
Low Radiator Coolant Level Shutdown……..Standard
Note: Coolant temp. shut-down switch setting at 228°F (109°C) with 50/50 (water/antifreeze) mix.

COOLING AIR REQUIREMENTS

Combustion Air cfm (m^3/min) 1,988 (56.3)
Max Air Intake Restrictions:
Clean Air Cleaner, KPA (psi) 5 (1.5)
Radiator Cooling Air, SCFM (m^3/min)…….....31,802 (900)

EXHAUST SYSTEM

Exhaust Outlet Size.....10"
Max. Back Pressure in KPA (in. H2O).....10 (40)
Exhaust Flow, at rated KW, CFM (m3/min)..... 1954 (55.3)
Exhaust Temp, (Stack) °F (ºC) 916 (491)

SOUND LEVELS MEASURED IN dB(A)

	Open Set	Level 2 Encl.
Level 2, Critical Silencer	98	83
Level 3, Hospital Silencer	93	78

Note: Open sets (no enclosure) have optional silencer system choices due to unknown job-site applications. Level 2 enclosure has installed critical silencer with upgrade to Level 3 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)	168 (427)	216 (548)
Width in (cm)	82 (208)	82 (208)
Height in (cm)	92 (234)	100 (254)
3 Ø Net Weight lbs (kg)	11,718 (5315)	14,218 (6449)
3 Ø Ship Weight lbs (kg)	12,118 (5497)	14,618 (6631)

BASLER DGC-2020 DIGITAL MICROPROCESSOR CONTROLLER

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

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

This controller includes expansion features including, RS485 (using MODBUS), direct USB connection with PC, expansion optioned using BESTCOMSPlus 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.

STANDARD FEATURES FOR MODEL SPVD-7000-60 HZ

STANDARD FEATURES

CONTROL PANEL:

Basler DGC-2020 digital microprocessor with logic allows programming in the field. Controller has:

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

Also included is tamper-proof engine hour meter

ENGINE:

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

AC GENERATOR SYSTEM:

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

VOLTAGE REGULATOR:

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

DC ELECTRICAL SYSTEM:

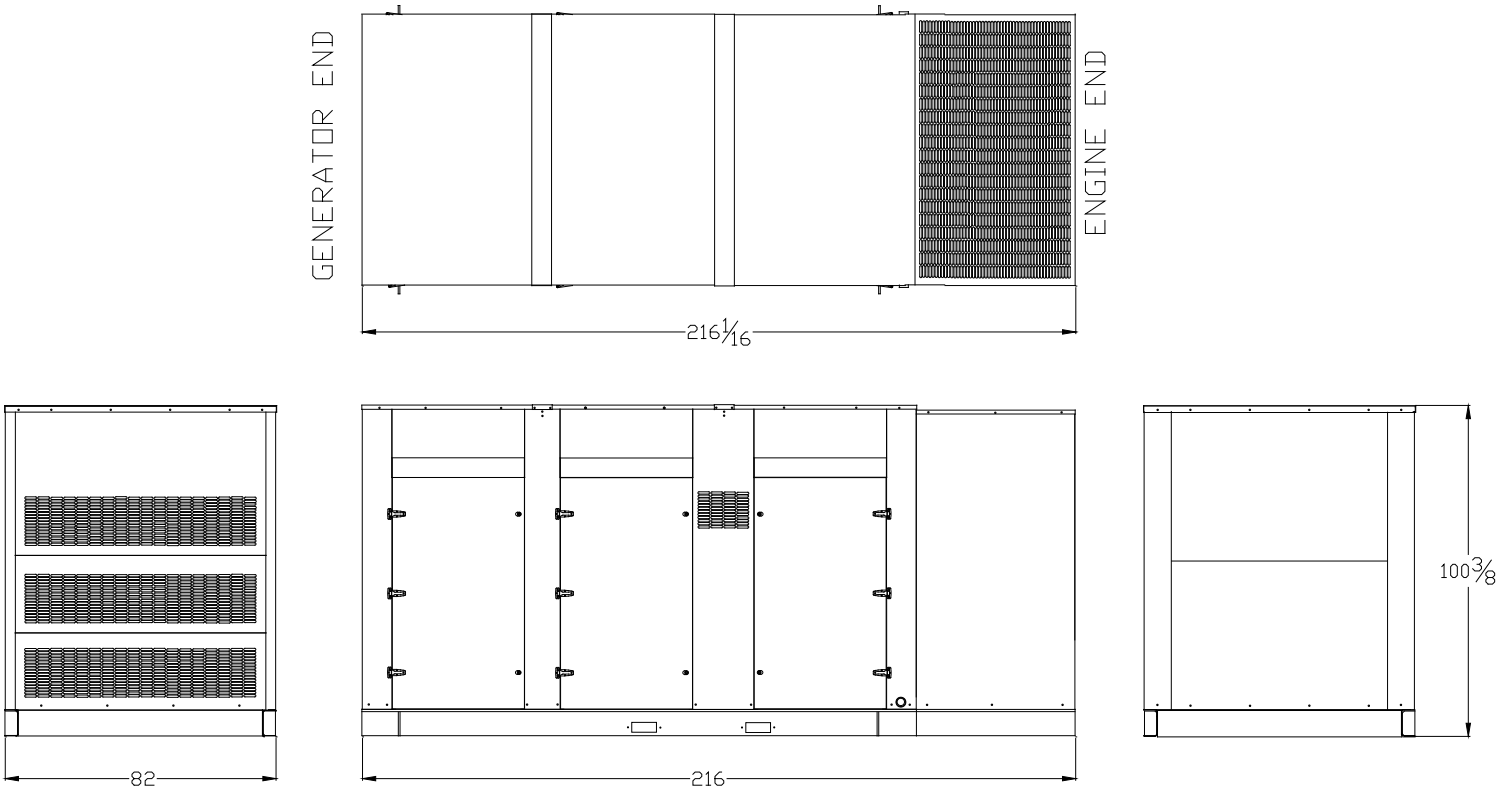
Battery trays • Battery cables • Battery hold down straps • 3-stage battery charger with float, absorption, & bulk automatic charge stages

WEATHER / SOUNDPROOF ALUMINUM HOUSING:

Corrosion Resistant Protection consisting of:

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

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



Gillette Generators, Inc. • 2921 Thorne Dr. •Elkhart, IN • 46514 • Ph: 574-264-9639 • www.gillettegenerators.com

VOLVO PENTA

TWD1744GE

17.26 liter, in-line 6 cylinder

TWD1744GE is a reliable, powerful and compact in-line 6 cylinder diesel engine. It´s designed to power a wide range of stand-by and prime power generator sets.

This 17 liter diesel engine utilizes dual-stage turbochargers and heavy-duty steel pistons to provide excellent power density.
It features a proven combustion technology with Common Rail injection system, resulting in high fuel efficiency and low exhaust emission levels.

The engine also features a compact and low weight design that is well-balanced, providing smooth operation with low noise. It´s designed for easily accessible service points.

A wide range of options are available, cooling package with the option of fixed or visco controlled fan and air-filter that will suit a variety of installations.

- **High power density and fuel efficiency**
- **Low exhaust emissions**
- **Certified according to US EPA Tier 2 Stationary Emergency**
- **Compact and low weight design**
- **Dual speed 1500/1800 rpm**
- **Suitable for a wide range of applications**
- **Service interval 1000 hours**

	50 Hz / 1500 rpm									60 Hz / 1800 rpm								
	Continuous power			Prime power			Standby power			Continuous power			Prime power			Standby power		
	kWm	kWe	kVA	kWm	kWe	kVA	kWm	kWe	kVA	kWm	kWe	kVA	kWm	kWe	kVA	kWm	kWe	kVA
TWD1744GE	532	500	625	645	606	758	710	667	834	563	529	661	682	641	801	750	705	881

Generator efficiency (typical): 94%

kWm = kiloWatt mechanical, net with fan*; **kWe** = kiloWatt electrical = kWm x Generator eff.; **kVA** = kiloVoltAmpere calculations based on a 0.8 power factor = kWe / 0.8
1 kW = 1 hp x 1.36; **1 hp** = 1 kW x 0.7355
*) According to technical data

TWD1744GE

17.26 liter, in-line 6 cylinder

Technical Data

Configuration and no. of cylinders ..... in-line 6
Displacement, l (in³) 17.26 (1053.3)
Method of operation 4-stroke
Bore, mm (in.) 149 (5.86)
Stroke, mm (in.) 165 (6.5)
Compression ratio 16.5:1
Wet weight, engine only, kg (lb) 1900 (4190)
Wet weight, Genpac (engine, cooling system, air filtration system kg (lb) ... 2200 (4851)

Fuel consumption

Prime Power, g/kWh (lb/hph)

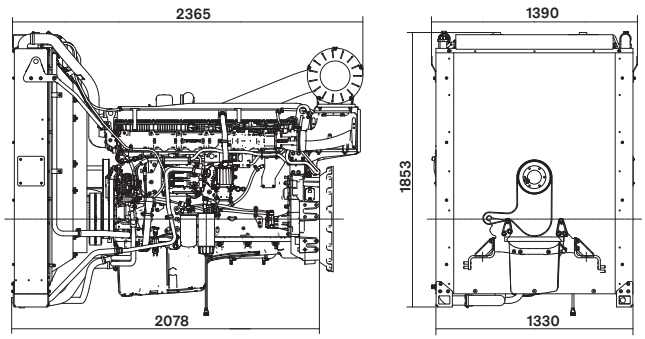
	TWD1744GE	
	1500 rpm	**1800 rpm**
25%	211 (0.343)	225 (0.365)
50%	197 (0.319)	202 (0.328)
75%	194 (0.314)	197 (0.319)
100%	194 (0.314)	196 (0.318)

Standby Power, g/kWh (lb/hph)

	TWD1744GE	
	1500 rpm	**1800 rpm**
25%	208 (0.338)	222 (0.360)
50%	195 (0.317)	200 (0.325)
75%	195 (0.315)	196 (0.318)
100%	194 (0.315)	197 (0.319)

Dimensions

Not for installation. Dimensions in mm.



Technical description

Engine and block
- Wet, replaceable cylinder liners
- Steel pistons for high durability
- Crankshaft induction hardened bearing surfaces and fillets with seven main bearings
- Case hardened and Nitrocarburized transmission gears for heavy duty operation
- Viscous type crankshaft vibration dampers to withstand single bearing alternator torsional vibrations
- Replaceable valve guides and valve seats
- Overhead camshaft and 4 valves per cylinder
- SAE0 alternator interface

Lubrication system
- Full flow oil cooler
- Full flow disposable spin-on oil filter
- Bypass filter with extra high filtration
- Oil quality VDS4.5 10W30
- Engine delivered with oil

Fuel system
- Common Rail injection system
- Improved water separator and water-in-fuel sensor
- Improved fine fuel filtration efficency with fuel pressure sensor
- F3 fuel injection system
- Improved filter capacity

Cooling system
- Efficient cooling with accurate coolant control through a water distribution duct in the cylinder block.
- Dual-circuit
- Belt driven coolant pumps (fixed or visco controlled fan drive) with high degree of efficiency
- Fixed or visco controlled fan drive
- Water-cooled charge air coolers
- Visco as option
- Coolant VCS2

Turbo charger
- Efficient and reliable dual stage turbo chargers
- Dual charge air coolers
- Waste gate system for the high pressure turbo charger

Electrical system
- ECM4, an electronically controlled processing system which optimizes engine performance. It also includes advanced facilities for diagnostics and fault tracing
- The instruments and controls connect to the engine via the CAN SAE J1939 interface
- Sensors for inputs such as: oil pressure, oil temp, boost pressure, boost temp, coolant temp, air filter pressure, water in fuel and fuel pressure.

Rating guidelines
PRIME POWER rating corresponds to ISO Standard Power for continuous operation. It is applicable for supplying electrical power at variable load for an unlimited number of hours instead of commercially purchased power. A10 % overload capability for govering purpose is available for this rating.

STAND-BY POWER rating corresponds to ISO Standard Fuel Stop Power. It is applicable for supplying stand-by electrical power at variable load in areas with well established electrical networks in the event of normal utility power failure. No overload capability is available for this rating.

Power standards
The engine performance corresponds to ISO 3046, BS 5514 and DIN 6271. The technical data applies to an engine without cooling fan and operating on a fuel with calorific value of 42.7 MJ / kg (18360 BTU/lb) and a density of 0.84 kg/liter (7.01 lb/US gal), also where this involves a deviation from the standards. Power output guaranteed within 0 to +2% att rated ambient conditions at delivery. Ratings are based on ISO 8528. Engine speed governing in accordance with ISO 8528-5.

AB Volvo Penta
SE-405 08 Göteborg, Sweden
www.volvopenta.com

STAMFORD

S6L1D-C4 Wdg.311/312 - Technical Data Sheet

Standards

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

Quality Assurance

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

Excitation and Voltage Regulators

Excitation System					
AVR Type	MX341	MX321/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 - 12.9
No Load Excitation Current (A)	0.8 - 0.7
Full Load Excitation Voltage (V)	59
Full Load Excitation Current (A)	2.9
Exciter Time Constant (seconds)	0.17

STAMFORD

S6L1D-C4 Wdg.311/312

Electrical Data								
Insulation System	H							
Stator Winding	Double Layer Concentric							
Winding Pitch	2/3							
Winding Leads	6/12							
Winding Number	311/312							
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	15.40							
	50 Hz				60 Hz			
Telephone Interference	THF<2%				TIF<50			
Cooling Air Flow	1.46 m³/sec				1.76 m³/sec			
Voltage Series Star (V)	380	400	415	440	416	440	460	480
Voltage Parallel Star (V)	190	200	208	220	208	220	230	240
Voltage Delta (V)	220	230	240	254	240	254	266	277
kVA Base Rating (Class H) for Reactance Values (kVA)	800	810	810	800	875	925	963	1000
Saturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	2.62	2.39	2.22	1.95	2.86	2.71	2.58	2.46
X'd Dir. Axis Transient	0.19	0.17	0.16	0.14	0.20	0.19	0.18	0.17
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	2.10	1.92	1.78	1.56	2.30	2.17	2.07	1.97
X"q Quad. Axis Subtransient	0.33	0.30	0.28	0.25	0.36	0.34	0.33	0.31
XL Stator Leakage Reactance	0.08	0.07	0.07	0.06	0.09	0.08	0.08	0.08
X2 Negative Sequence Reactance	0.20	0.18	0.17	0.15	0.22	0.20	0.19	0.19
X0 Zero Sequence Reactance	0.02	0.01	0.01	0.01	0.02	0.02	0.02	0.01
Unsaturated Values in Per Unit at Base Ratings and Voltages								
Xd Dir. Axis Synchronous	3.14	2.87	2.66	2.34	3.44	3.25	3.09	2.95
X'd Dir. Axis Transient	0.21	0.20	0.18	0.16	0.23	0.22	0.21	0.20
X"d Dir. Axis Subtransient	0.18	0.16	0.15	0.13	0.20	0.19	0.18	0.17
Xq Quad. Axis Reactance	2.16	1.97	1.83	1.61	2.36	2.23	2.13	2.03
X"q Quad. Axis Subtransient	0.40	0.36	0.34	0.30	0.44	0.41	0.39	0.38
XL Stator Leakage Reactance	0.09	0.08	0.08	0.07	0.10	0.09	0.09	0.08
Xlr Rotor Leakage Reactance	0.10	0.09	0.09	0.08	0.11	0.10	0.10	0.09
X2 Negative Sequence Reactance	0.24	0.22	0.20	0.18	0.26	0.24	0.23	0.22
X0 Zero Sequence Reactance	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02

* Parallel Star connection only available with 12 leads winding option

STAMFORD

S6L1D-C4 Wdg.311/312

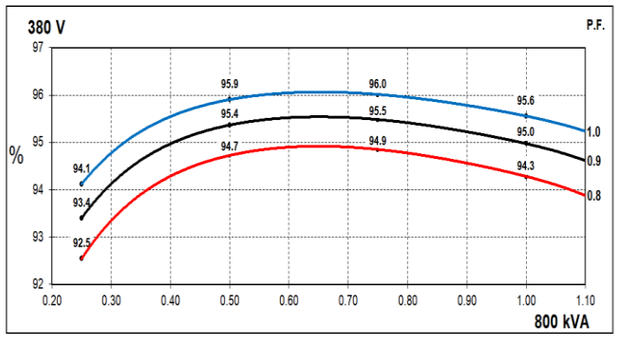
Time Constants (Seconds)		
T'd Transient Time Const.	0.092	
T''d Sub-Transient Time Const.	0.016	
T'do O.C. Field Time Const.	3.340	
Ta Armature Time Const.	0.020	
T''q Sub-Transient Time Const.	0.0095	
Resistances in Ohms (Ω) at 22^{0}C		
Stator Winding Resistance (Ra), per phase for series connected	0.00330	
Rotor Winding Resistance (Rf)	1.63	
Exciter Stator Winding Resistance	18.47	
Exciter Rotor Winding Resistance per phase	0.095	
PMG Phase Resistance (Rpmg) per phase	1.91	
Positive Sequence Resistance (R1)	0.0041	
Negative Sequence Resistance (R2)	0.0048	
Zero Sequence Resistance (R0)	0.0041	
Saturation Factors	400V	480V
SG1.0	0.367	0.359
SG1.2	1.52	1.304
Mechanical Data		
Shaft and Keys	All alternator rotors are dynamically balanced to better than ISO 21940-11 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.	
	1 Bearing	2 Bearing
SAE Adaptor	SAE0,1	SAE0,1
Moment of Inertia	16.455 kgm²	15.93 kgm²
Weight Wound Stator	803kg	803kg
Weight Wound Rotor	721kg	679kg
Weight Complete Alternator	1897kg	1970kg
Shipping weight in a Crate	1940kg	2013kg
Packing Crate Size	160x105x153(cm)	160x105x153(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL 6224
Bearing Non-Drive End	BALL 6317	BALL 6317

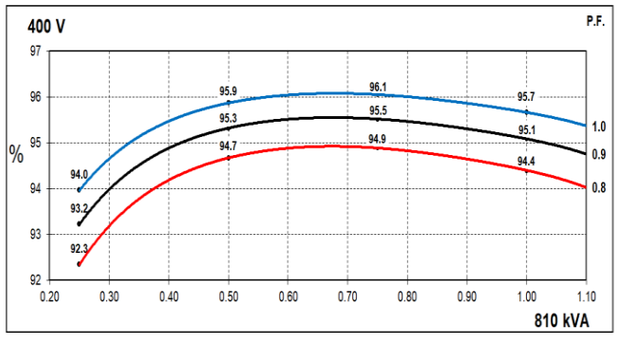
STAMFORD

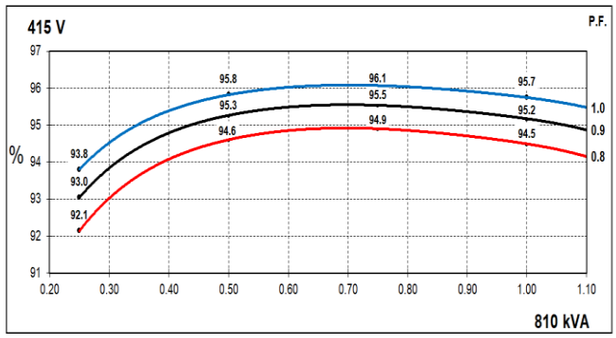
S6L1D-C4 Wdg.311/312

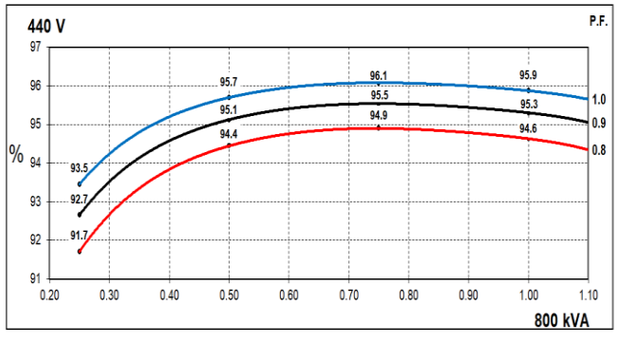
THREE PHASE EFFICIENCY CURVES

50Hz

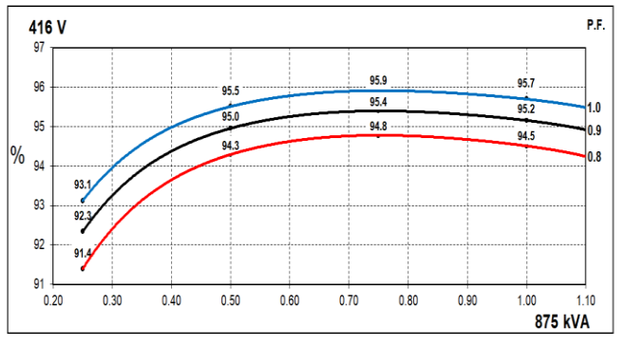


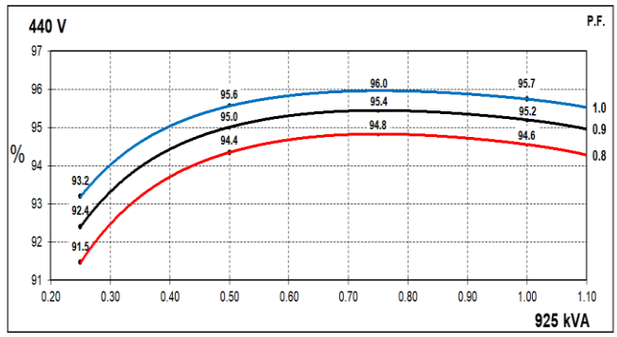


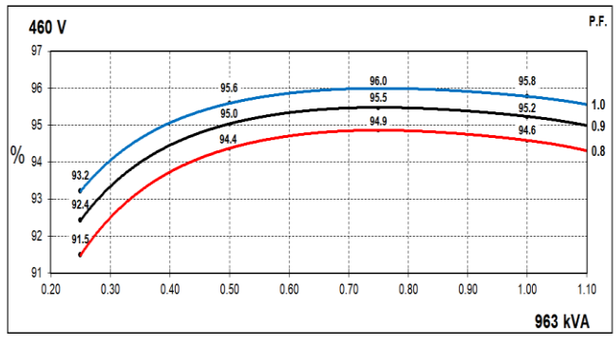


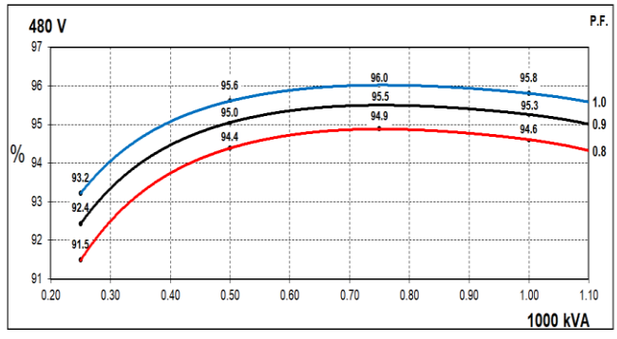


60Hz







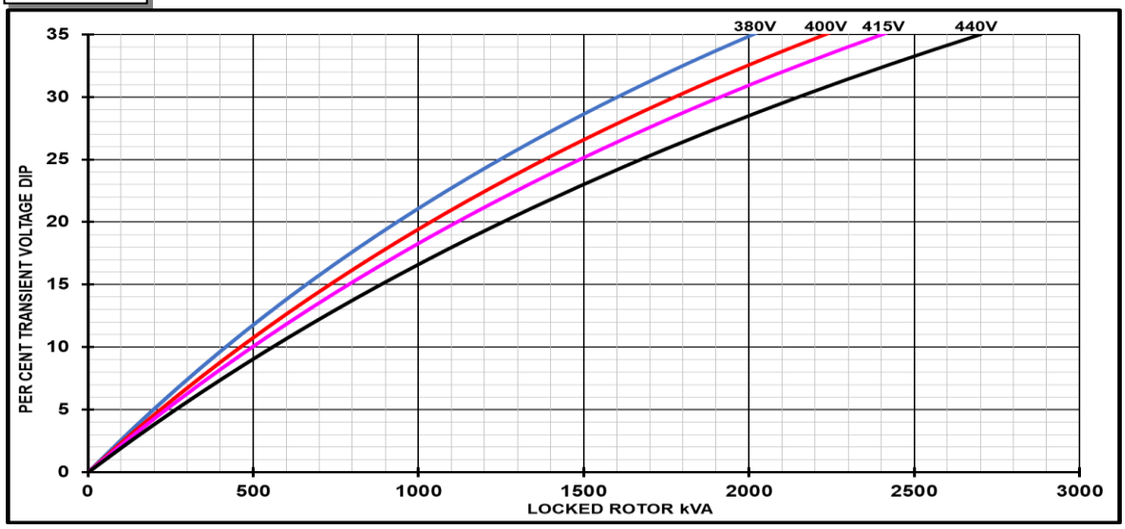


STAMFORD

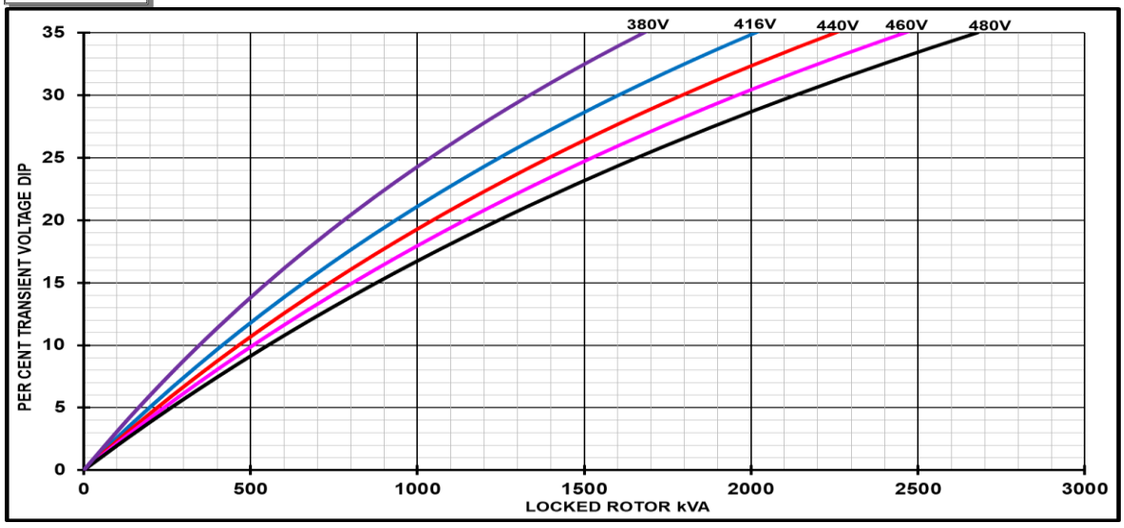
S6L1D-C4 Wdg.311/312

Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



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

Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor
<= 0.4	1.25
0.5	1.20
0.6	1.15
0.7	1.10
> 0.7	1.00

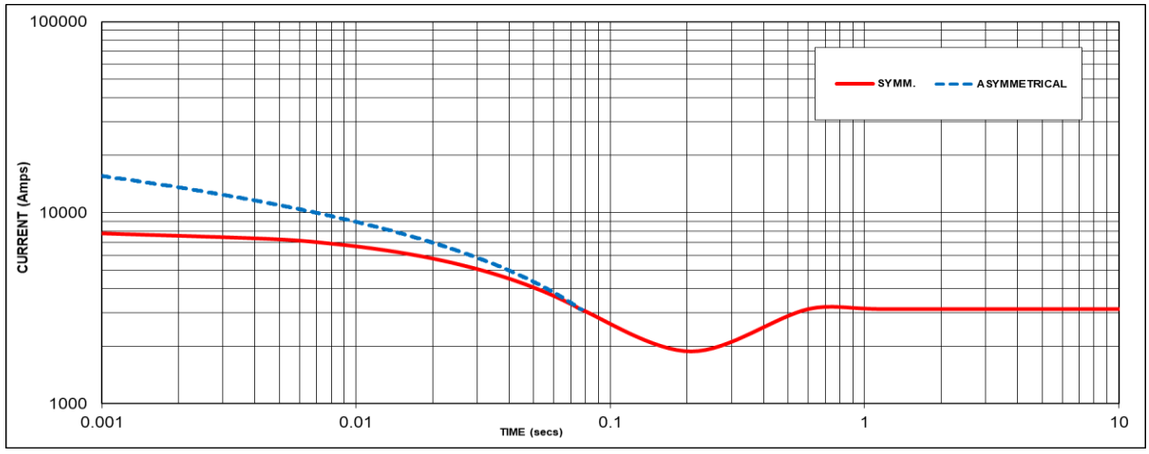
Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

STAMFORD

S6L1D-C4 Wdg.311/312

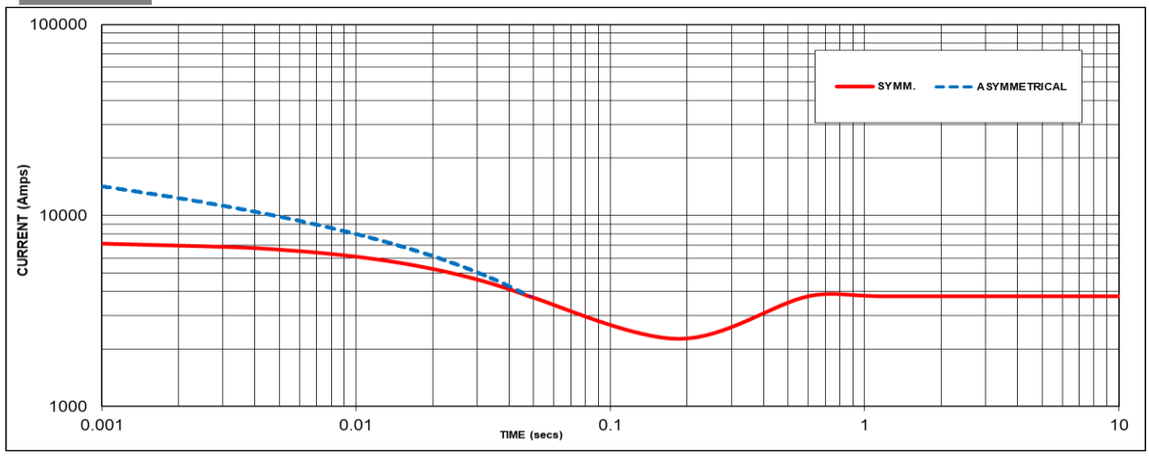
Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz



Sustained Short Circuit = 3125 Amps

60Hz



Sustained Short Circuit = 3781 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	-	440V	-
415V	-	460V	-
440V	-	480V	-

The sustained current value is constant irrespective of voltage level

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

Note 2
The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

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

All other times are unchanged

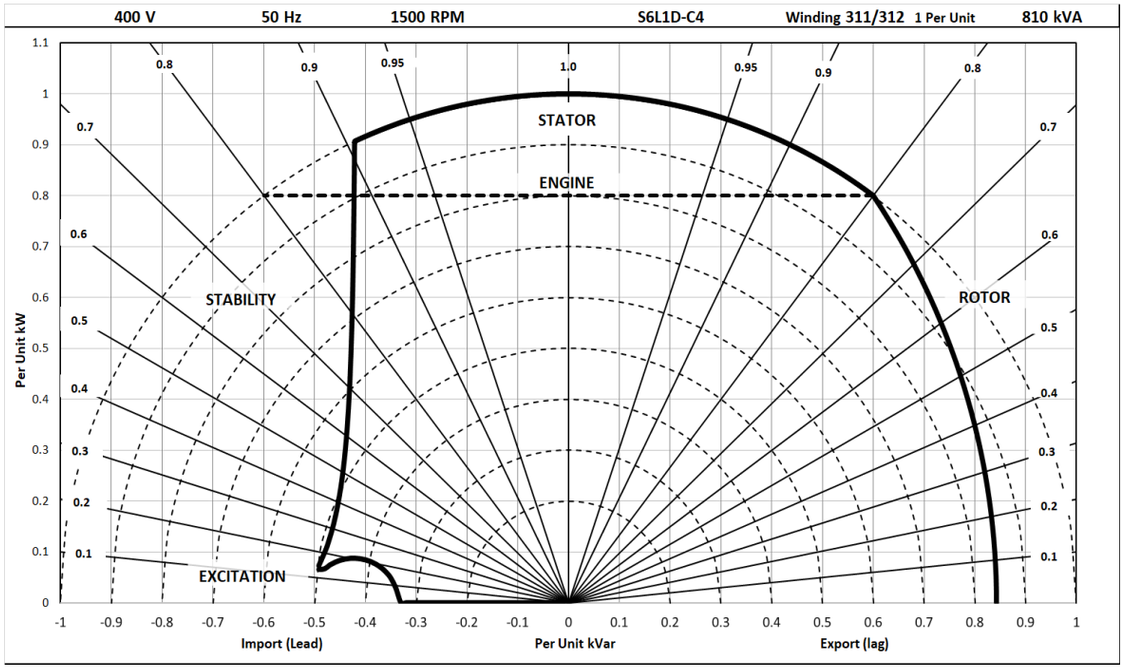
Note 3
Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :
Parallel Star = Curve current value X 2
Series Delta = Curve current value X 1.732

STAMFORD

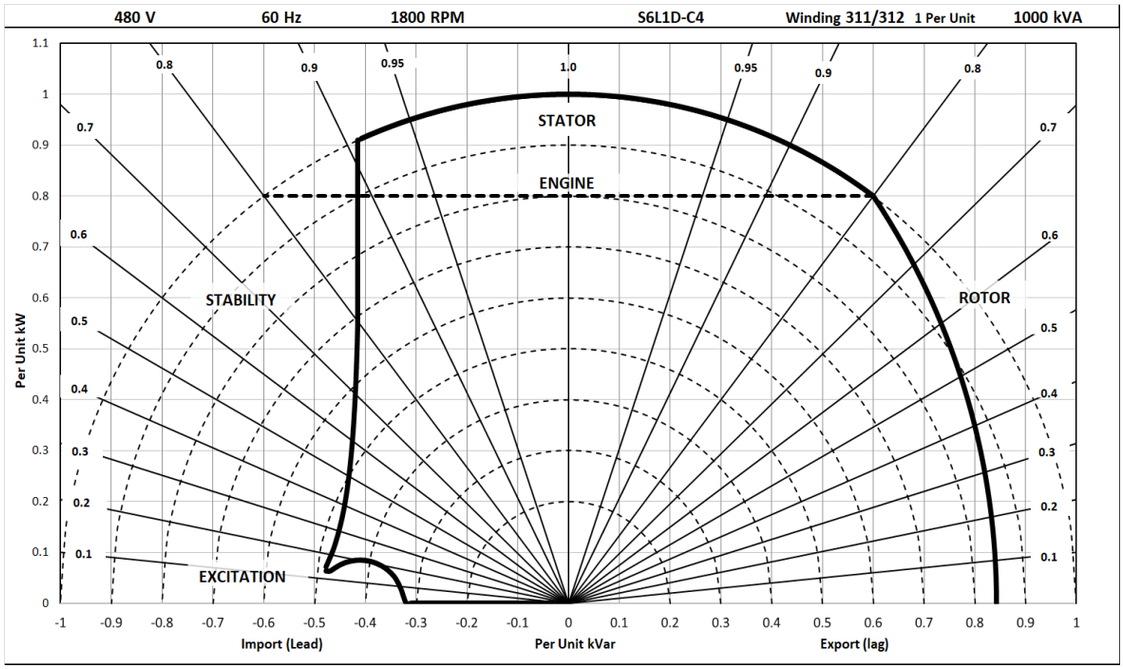
S6L1D-C4 Wdg.311/312

Typical Alternator Operating Charts

400V/50Hz



480V/60Hz



STAMFORD

S6L1D-C4 Wdg.311/312

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			
50 Hz	Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V)	190	200	208	220	190	200	208	220	190	200	208	220	190	200	208	220
	Delta (V)	220	230	240	254	220	230	240	254	220	230	240	254	220	230	240	254
	kVA	850	860	850	850	825	835	835	825	800	810	810	800	750	760	760	750
	kW	680	688	680	680	660	668	668	660	640	648	648	640	600	608	608	600
	Efficiency (%)	94.1	94.2	94.3	94.5	94.2	94.3	94.4	94.6	94.3	94.4	94.5	94.6	94.5	94.6	94.6	94.8
	kW Input	723	730	721	720	701	708	708	698	679	686	686	676	635	643	642	633

60 Hz	Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
	Parallel Star (V)	208	220	230	240	208	220	230	240	208	220	230	240	208	220	230	240
	Delta (V)	240	254	266	277	240	254	266	277	240	254	266	277	240	254	266	277
	kVA	950	1000	1044	1088	913	969	1006	1044	875	925	963	1000	815	845	890	915
	kW	760	800	835	870	730	775	805	835	700	740	770	800	652	676	712	732
	Efficiency (%)	94.3	94.4	94.4	94.4	94.4	94.4	94.5	94.5	94.5	94.6	94.6	94.6	94.6	94.7	94.7	94.8
	kW Input	806	848	885	922	774	821	852	884	741	783	814	846	689	714	752	772

*** Parallel Star connection only available with 12 leads winding option**

De-rates

All values tabulated above are subject to the following reductions:

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

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

Dimensional and Torsional Drawing

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

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

S6L1D-C4 Wdg.7 - Technical Data Sheet

Standards

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

Quality Assurance

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

Excitation and Voltage Regulators

Excitation System					
AVR Type	MX321/MX322	MX341			
Voltage Regulation	± 0.5%	± 1%			with 4% Engine Governing
AVR Power	PMG	PMG			

No Load Excitation Voltage (V)	19.98
No Load Excitation Current (A)	0.92
Full Load Excitation Voltage (V)	61
Full Load Excitation Current (A)	2.9
Exciter Time Constant (seconds)	0.17

STAMFORD

S6L1D-C4 Wdg.7

Electrical Data	
Insulation System	H
Stator Winding	Double Layer Concentric
Winding Pitch	2/3
Winding Leads	6
Winding Number	7
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	19.99
60 Hz	
Telephone Interference	TIF<50
Cooling Air Flow	1.76 m³/sec
Voltage Star (V)	600
Voltage Parallel Star (V)	-
Voltage Delta (V)	346
kVA Base Rating (Class H) for Reactance Values (kVA)	1000
Saturated Values in Per Unit at Base Ratings and Voltages	
Xd Dir. Axis Synchronous	1.789
X'd Dir. Axis Transient	0.167
X"d Dir. Axis Subtransient	0.140
Xq Quad. Axis Reactance	1.807
X"q Quad. Axis Subtransient	0.289
XL Stator Leakage Reactance	0.071
X2 Negative Sequence Reactance	0.056
X0 Zero Sequence Reactance	0.011
Unsaturated Values in Per Unit at Base Ratings and Voltages	
Xd Dir. Axis Synchronous	2.147
X'd Dir. Axis Transient	0.192
X"d Dir. Axis Subtransient	0.164
Xq Quad. Axis Reactance	1.861
X"q Quad. Axis Subtransient	0.347
XL Stator Leakage Reactance	0.080
Xlr Rotor Leakage Reactance	0.085
X2 Negative Sequence Reactance	0.067
X0 Zero Sequence Reactance	0.013

STAMFORD

S6L1D-C4 Wdg.7

Time Constants (Seconds)	
T'd Transient Time Const.	0.089
T''d Sub-Transient Time Const.	0.022
T'do O.C. Field Time Const.	3.321
Ta Armature Time Const.	0.026
T''q Sub-Transient Time Const.	0.0095

Resistances in Ohms (Ω) at 22^{0}C	
Stator Winding Resistance (Ra), per phase for series connected	0.0044
Rotor Winding Resistance (Rf)	1.63
Exciter Stator Winding Resistance	18.47
Exciter Rotor Winding Resistance per phase	0.095
PMG Phase Resistance (Rpmg) per phase	1.91
Positive Sequence Resistance (R1)	0.0055
Negative Sequence Resistance (R2)	0.0063
Zero Sequence Resistance (R0)	0.0055

Saturation Factors	600V
SG1.0	0.76
SG1.2	2.762

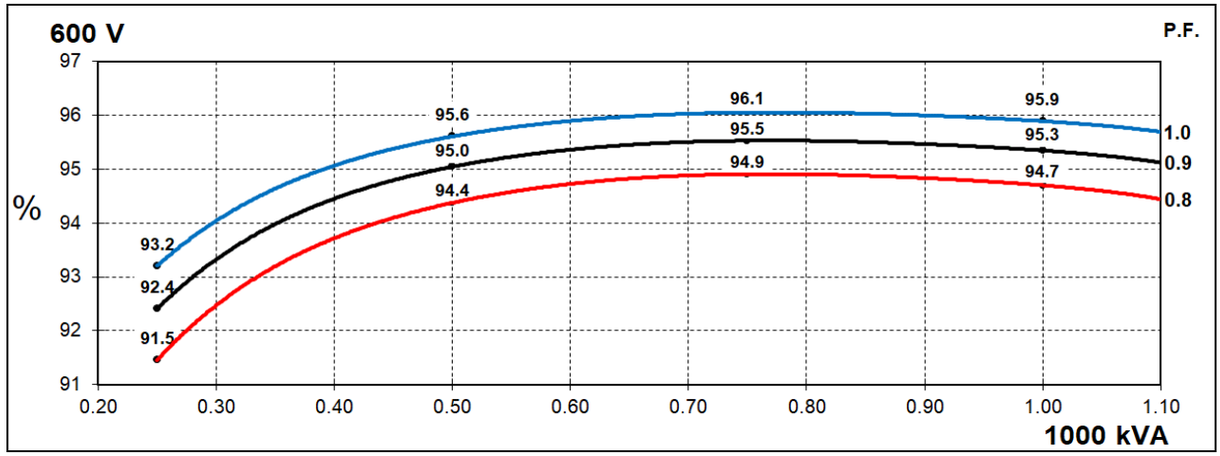
Mechanical Data		
Shaft and Keys	All alternator rotors are dynamically balanced to better than ISO 21940-11 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.	
	1 Bearing	2 Bearing
SAE Adaptor	SAE0,1	SAE0,1
Moment of Inertia	16.455 kgm²	15.93 kgm²
Weight Wound Stator	803kg	803kg
Weight Wound Rotor	721kg	679kg
Weight Complete Alternator	1897kg	1970kg
Shipping weight in a Crate	1940kg	2013kg
Packing Crate Size	160x105x153(cm)	160x105x153(cm)
Maximum Over Speed	2250 RPM for two minutes	
Bearing Drive End	-	BALL 6224
Bearing Non-Drive End	BALL 6317	BALL 6317

STAMFORD

S6L1D-C4 Wdg.7

THREE PHASE EFFICIENCY CURVES

60Hz

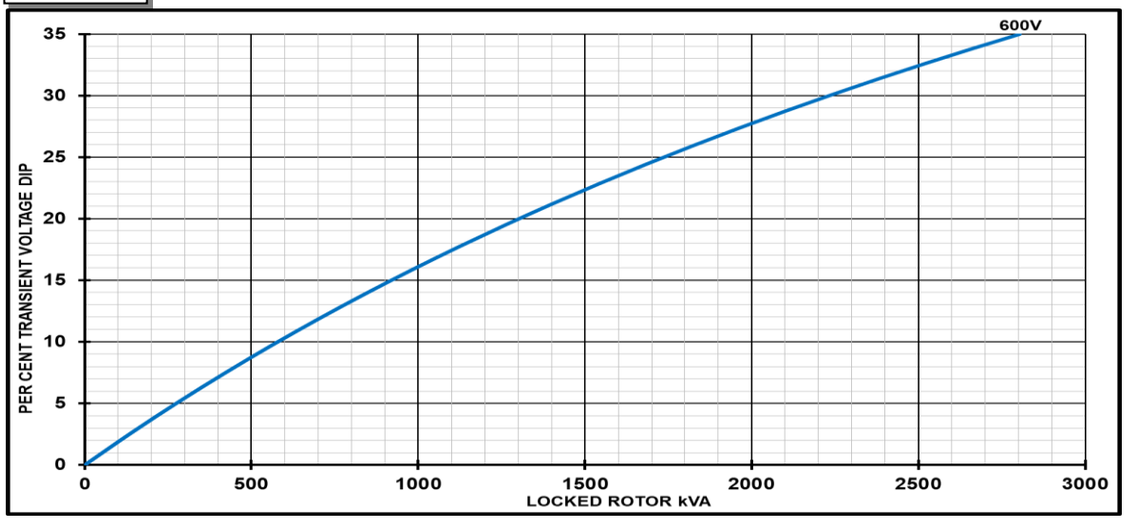


STAMFORD

S6L1D-C4 Wdg.7

Locked Rotor Motor Starting Curves - Separately Excited

60Hz



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

Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor
<= 0.4	1.25
0.5	1.20
0.6	1.15
0.7	1.10
> 0.7	1.00

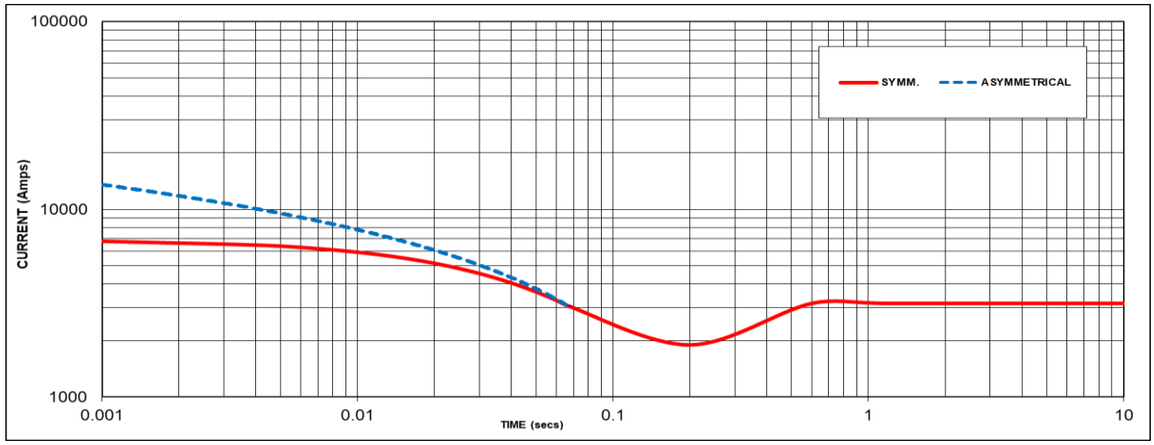
Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

STAMFORD

S6L1D-C4 Wdg.7

Three-phase Short Circuit Decrement Curve - Separately Excited

60Hz



Sustained Short Circuit = 3151 Amps

Note 1
The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
-	-	600V	X 1.00
-	-	-	-
-	-	-	-
-	-	-	-

The sustained current value is constant irrespective of voltage level

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

Note 2
The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

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

All other times are unchanged

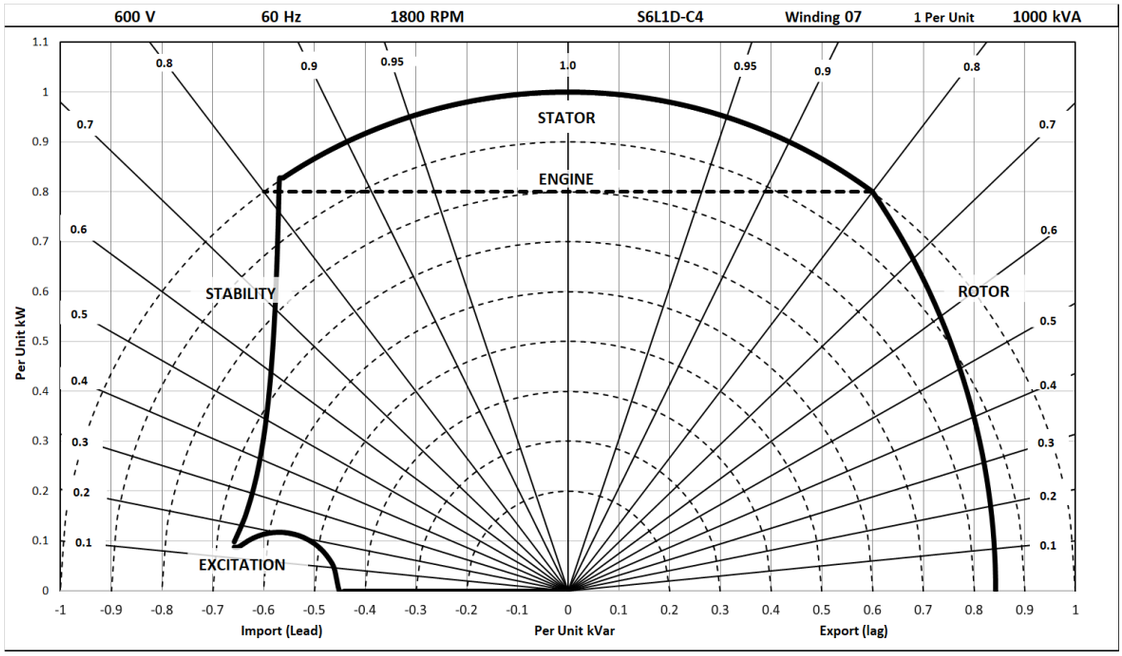
Note 3
Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :
Parallel Star = Curve current value X 2
Series Delta = Curve current value X 1.732

STAMFORD

S6L1D-C4 Wdg.7

Typical Alternator Operating Charts

600V/60Hz



STAMFORD®

S6L1D-C4 Wdg.7

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	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

60 Hz	Star (V)	600	600	600	600
	Parallel Star (V)	N/A	N/A	N/A	N/A
	Delta (V)	346	346	346	346
	kVA	1088	1046	1000	913
	kW	870	837	800	730
	Efficiency (%)	94.5	94.6	94.7	94.8
	kW Input	921	885	845	770

De-rates

All values tabulated above are subject to the following reductions:

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

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

Dimensional and Torsional Drawing

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

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

DGC-2020 Digital Genset Controller

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

Features

- Generator metering (includes three-phase mains)
- Engine and generator protection: 27, 32R, 40Q, 59, 81O/U
- Optional enhanced generator protection: 47, 51, 78, and 81ROCOF
- Load sharing and generator sequencing (via LSM-2020 Load Share Module)
- Var sharing over Ethernet (via LSM-2020)
- BESTCOMS*Plus*® Software
  - Programming and setup
  - Intuitive and powerful
  - Remote control and monitoring
  - Programmable logic
  - USB communications
- Automatic transfer switch control
- Automatic synchronizer (optional)
- Exercise timer
- SAE J1939 engine ECU communications
- Automatic generator configuration detection
- Expandable functionality via add-on modules
  - LSM-2020 Load Share Module
  - CEM-2020 Contact Expansion Module
  - AEM-2020 Analog Expansion Module
- Multilingual capability
- Remote communications to Basler's RDP-110 (remote display panel)
- Sixteen programmable contact inputs
- Up to 15 contact outputs: 3 contacts rated for 30 Adc and up to 12 programmable contacts rated for 2 Adc

Visit www.basler.com for additional information.

Benefits

- Provides integrated engine-genset control, protection, and metering in a single package.
- The Offline Simulator, provided in BESTlogic™*Plus*, helps test and troubleshoot logic without the need for expensive hardware.
- Flexible programmable logic and programmable I/O make it easy to expand the DGC-2020's inputs and outputs with the CEM-2020 (Contact Expansion Module) and the AEM-2020 (Analog Expansion Module). This saves time and money by eliminating unnecessary external PLCs and control relaying.

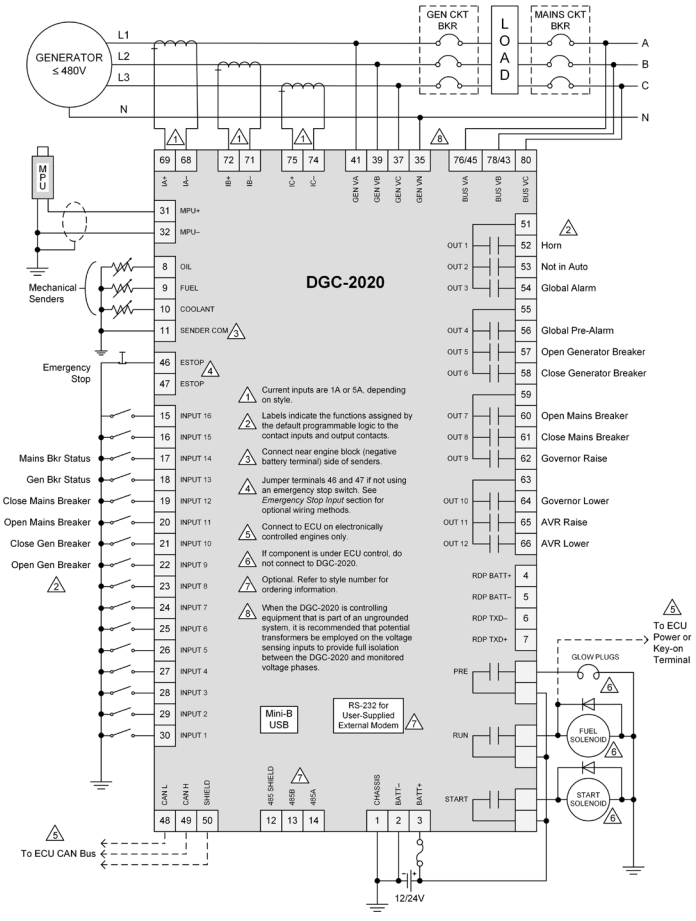


Figure 1 - DGC-2020 Connection Diagram for a Typical Application

Specifications

Power Supply

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

Power Consumption

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

Current Sensing

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

Voltage Sensing

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

Contact Sensing

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

Engine Speed Sensing

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

Resistive Senders

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

Output Contacts

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

Protection

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

Agency Approvals

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

Communication

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

Environmental

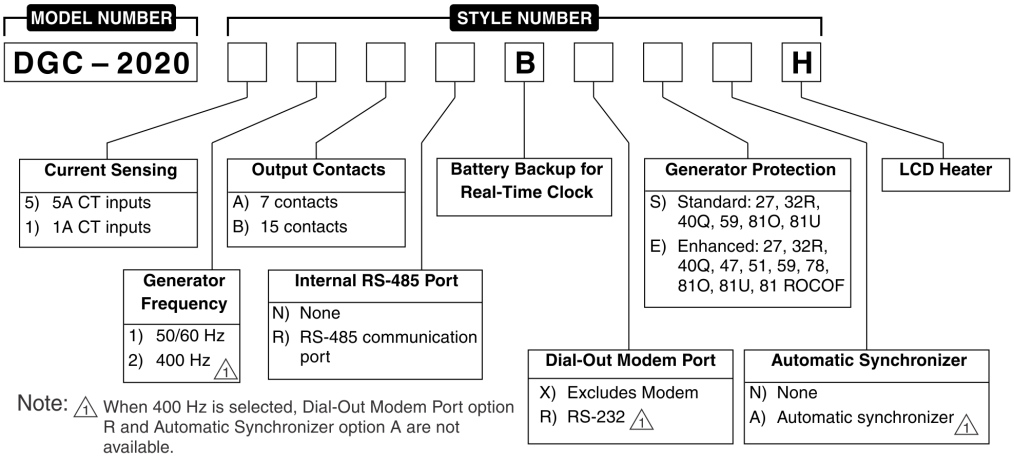
Operating Temp:	-40°C to 70°C (-40°F to 158°F)
Storage Temp:	-40°C to 85°C (-40°F to 185°F)
Humidity:	IEC 68-2-38
Salt Fog:	ASTM B 17-73, IEC 68-2-11
Ingress Protection:	IEC IP54 for front panel
Shock:	15 G in three perpendicular planes
Vibration:	
5 to 29 Hz:	1.5 G peak
29 to 52 Hz:	0.036″ (0.914 mm)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

Physical

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

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

Style Chart



Note: 1 When 400 Hz is selected, Dial-Out Modem Port option R and Automatic Synchronizer option A are not available.

Related Products

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

Accessories

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

ISO 9001-2008
Highland, IL USA Suzhou, China
Taylor, TX USA Basler Plastics, LLC

Basler Electric®
12570 Route 143, Highland, Illinois 62249-1074 USA
Tel +1 618.654.2341 Fax +1 618.654.2351
email:info@basler.com www.basler.com

No. 59 Heshun Road Loufeng District (N),
Suzhou Industrial Park, 215122, Suzhou, P.R.China
Tel +86.512.8227.2888 Fax +86.512.8227.2887
e-mail: chinainfo@basler.com

111 North Bridge Road #15-06 Peninsula Plaza
Singapore 179098
Tel +65 68.44.6445 Fax +65 68.44.8902
e-mail: singaporeinfo@basler.com

Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG63M2500E3RNNNNNNN

Powering Business Worldwide

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-inclass 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

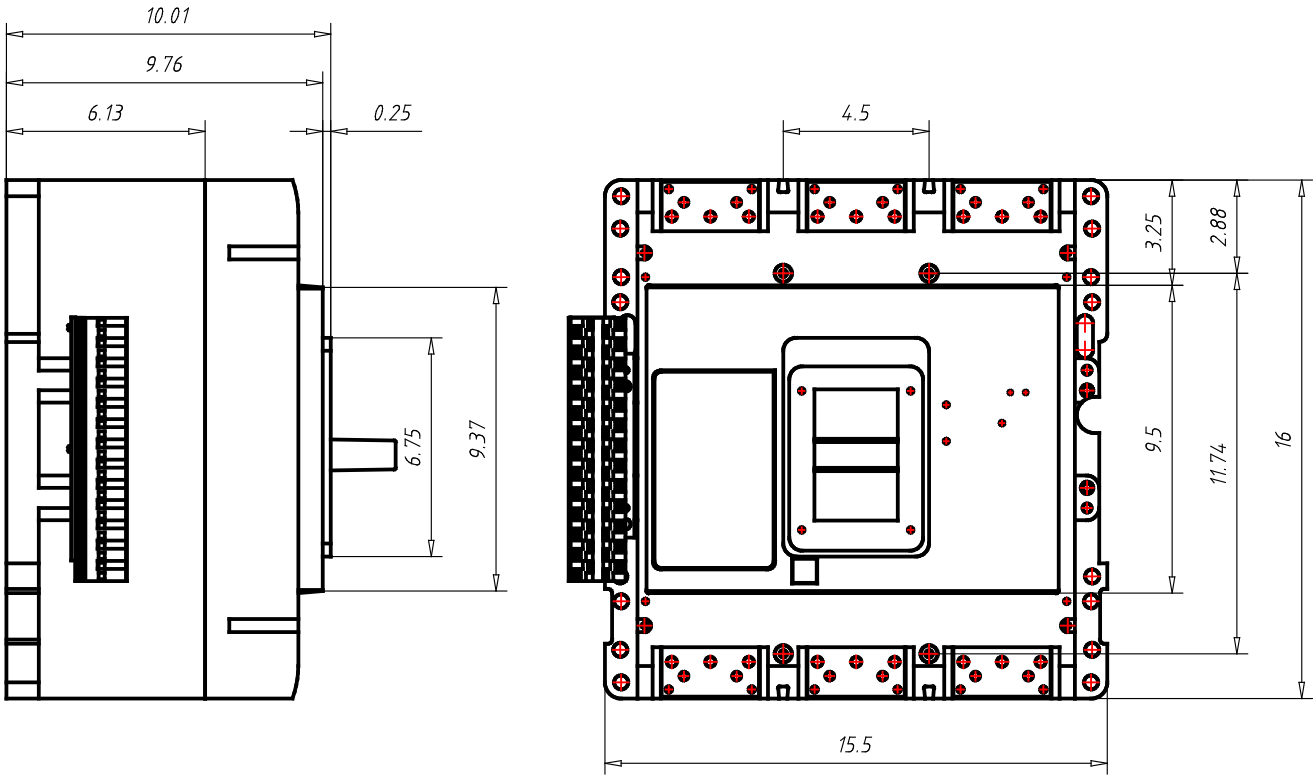
Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG63M2500E3RNNNNNNN

Datasheet creation date: 02/12/2019

Technical drawings



Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG63M2500E3RNNNNNNN

Powering Business Worldwide

Datasheet creation date: 02/12/2019

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

Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDF53K1200E3RNNNNNNN

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-inclass support and service.

Tech Data for Configured Product

Power Defense Catalog Number	PDF53K1200E3RNNNNNNN
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

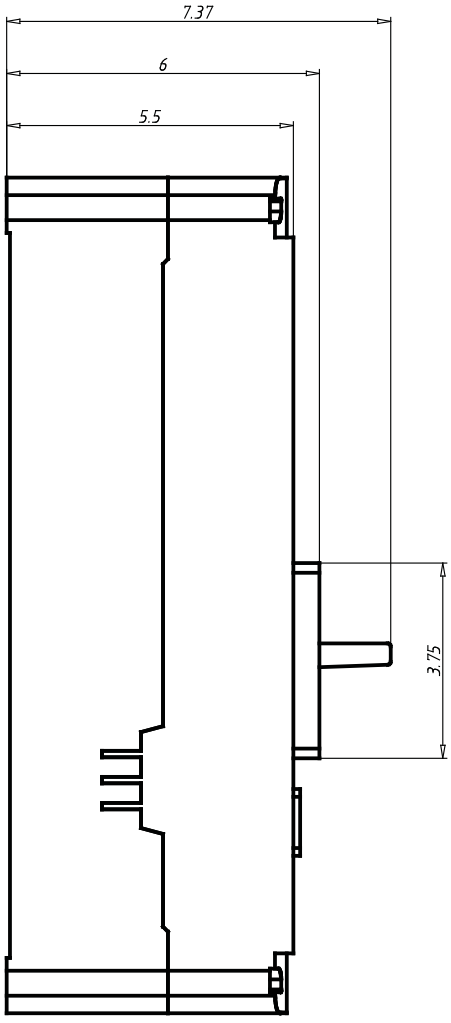
Molded Case Circuit Breakers

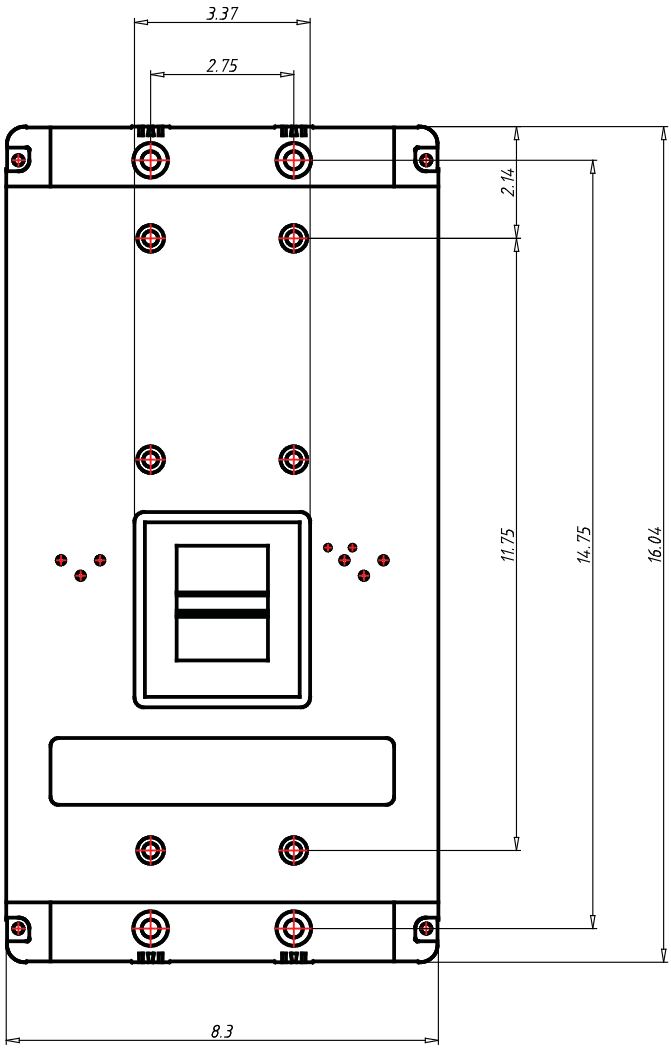
Power Defense ™ UL Global Series

Part Number: PDF53K1200E3RNNNNNNN

Datasheet creation date: 02/12/2019

Technical drawings





Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDF53K1200E3RNNNNNNN

Datasheet creation date: 02/12/2019

General Technical Data

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

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

NRG

Intelligent Engine Start Battery Charger

The Smart Choice for Mission-Critical Engine Starting

- **Fast, accurate, mission-critical charging** – gives best starting reliability
- **Replace nearly any charger** – without planning ahead
- **Industry-first battery-fault alarm** - helps dispatch service early
- **1 million hour observed MTBF** – means longest charger life
- **Smart design** – stops load dump and other damaging transients

ISO 9000 c UL us LISTED CE

SENS®
Our energy means business®

www.sens-usa.com • info@sens-usa.com • Toll-free 866.736.7872 • 303.678.7500

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. All units are either C-UL listed or C-UL recognized. 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 and available reimbursement of customer field service costs

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

NRG Specifications

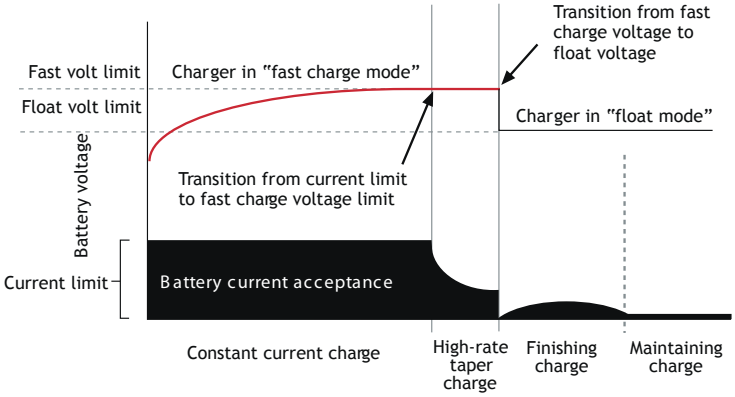
AC Input

Voltage	110-120/208-240 VAC, ±10%, single phase, switch selectable
Input current	10A charger: 6.6/3.3 amps maximum 20A charger: 12.6/6.3 amps maximum
Frequency	60 Hz ±5% standard; 50/60 Hz ±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	±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

Standard 4-rate charging



User Interface, Indication and Alarms

Digital meter	Switch-selectable meter for output volts, amps
Accuracy	±2% volts, ±5% amps
Alarms	LED and Form C contact(s) per table:

Front panel status display

Alarm System Functions

	Alarm code "1"[1]	Alarm code "C" (meets requirements of NFPA 110)
AC good	LED	LED
Float mode	LED	LED
Fast charge	LED	LED
Temp comp active	LED	LED
AC fail	LED[2]	LED and Form C contact
Low battery volts		LED and Form C contact
High battery volts		LED and Form C contact
Charger fail	LED[2]	LED and Form C contact
Battery fault[3]	LED[2]	LED and Form C contact

1. Alarms "1" available only on 10A charger
2. Form C contact provides summary alarm of these conditions. BBHH chargers include this alarm configuration. Contacts rated 2A @ 26 VDC resistive
3. 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	Field-selectable switch
Optional 12/24-volt output select	Field-selectable two-position jumper
Battery program select	Field-selectable six-position jumper
Fast charger enable/disable	Field-selectable two-position jumper
Temp compensation enable	Standard. Can be disabled or re-enabled in the field
Remote temp comp enable	Connect optional remote sensor to temp comp port

Simple field adjustments

Environmental

Operating temperature	-20C to +60C, meets full specification to +45C
Over temperature protection	Gradual current reduction to maintain safe power device temperature
Humidity	5% to 95%, non-condensing
Vibration (10A unit)	UL 991 Class B (2G sinusoidal)
Transient immunity	ANSI/IEEE C62.41, Cat. B, EN50082-2 heavy industrial

Agency Standards

Safety	C-UL listed to UL 1236 (required for UL 2200 gensets), CSA standard 22.2 no. 107.2-M89 CE: 50/60 Hz units DOC to EN 60335
Agency marking	60 Hz: C-UL-US listed 50/60 Hz: C-UL-US listed plus CE marked
EMI	FCC Part 15 Class B; EN 50081-2
NFPA standards	NFPA 70, NFPA 110. (NFPA 110 requires Alarms "C")
Optional agency compliance	Units with Alarms "1" configuration available with additional compliance to UL category BBHH and NFPA 20

Construction

Housing/configuration	Material: Heavy clear anodized aluminum. Configuration options: • Fully enclosed: C-UL listed enclosure • Open frame: C-UL recognized • Slimline: C-UL recognized open frame construction with remote isolation transformer
Packaging	Open-frame and Slimline configurations only available in bulk OEM quantities and packaging
Dimensions	See Drawings and Dimensions page for details
Printed circuit card	Surface mount technology, conformal coated
Cooling	Natural convection
Protection degree	Listed housing: NEMA-1 (IP20). Optional NEMA 3R enclosure
Damage prevention	Fully recessed display and controls
Electrical connections	Compression terminal blocks

Warranty

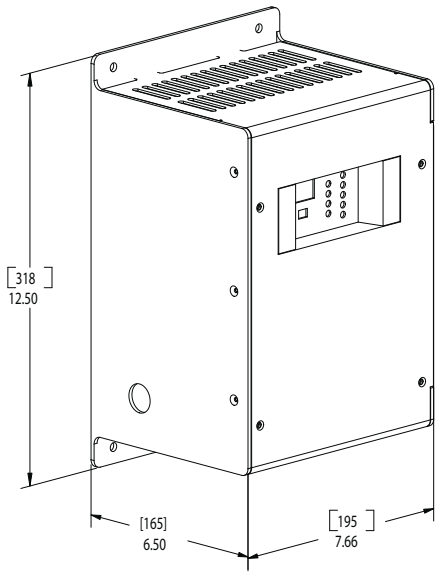
Standard warranty	Three year parts and labor warranty from date of shipment
Optional warranty	If specified at time of order, warranty coverage is increased to reimburse customer's documented field service costs up to the original charger price. Contact the factory for full details

Optional features

Input	Input frequency, 50/60 Hz
Remote temp comp sensor	Recommended where battery and charger are in different locations
Drip shield	Protects from dripping water
NEMA 3R housing	Enables outdoor installation (remote temp sensor recommended)
UL BBHH listing	Available in 10A units with Alarms "1"
Field service warranty	Reimbursement of customer field service expenses up to charger price

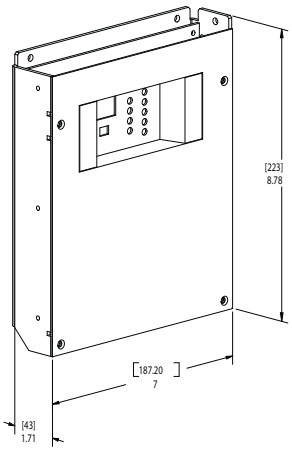
Drawings and Dimensions

10A Chargers
Enclosed and Open Frame Configurations

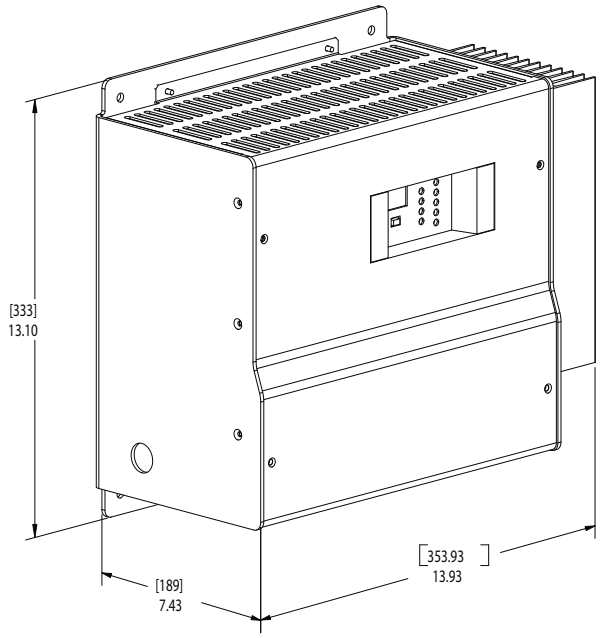


Open-frame configuration omits front cover

10A Chargers
Slimline Open Frame Configuration



Slimline can be mounted either flat or edgewise



Open-frame configuration omits front cover

20A Chargers
Enclosed and Open Frame Configurations

Housing Dimensions Table

Amps	Configuration	Width	Depth	Height
10	Enclosed	7.66" (195 mm)	6.50" (165 mm)	12.50" (318 mm)
10	Open-frame	7.66" (195 mm)	6.50" (165 mm)	12.50" (318 mm)
10	Slimline – flat mount	7.00" (187 mm)	1.71" (43 mm)	8.78" (223 mm)
10	Slimline – edge mount	1.71" (43 mm)	7.00" (187 mm)	8.78" (223 mm)
20	Enclosed	13.93" (354 mm)	7.43" (189 mm)	13.10" (333 mm)
20	Open-frame	13.93" (354 mm)	7.43" (189 mm)	13.10" (333 mm)

NRG Ordering Information

Output volts	Output amps	Model	Available configurations	NFPA 110 Alarms	Lbs/Kg
12	10	NRG12-10-R1	Enclosed, Open-frame, Slimline	No	19 / 8.7
12	10	NRG12-10-RC	Enclosed, Slimline	Yes	19 / 8.7
24	10	NRG24-10-R1	Enclosed, Open-frame, Slimline	No	24 / 10.9
24	10	NRG24-10-RC	Enclosed, Slimline	Yes	24 / 10.9
12/24	10	NRG22-10-R1	Enclosed, Open-frame, Slimline	No	24 / 10.9
12/24	10	NRG22-10-RC	Enclosed, Slimline	Yes	24 / 10.9
12	20	NRG12-20-RC	Enclosed, Open-frame	Yes	39 / 17.7
24	20	NRG24-20-RC	Enclosed, Open-frame	Yes	42 / 19.1
12/24	20	NRG22-20-RC	Enclosed, Open-frame	Yes	42 / 19.1

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

Model

Output voltage
12: 12 volts
24: 24 volts
22: 12/24-volt field selectable

Output current
10: 10 amps
20: 20 amps

AC input
R: 120/208-240 VAC, 60 Hz
H: 120/208-240 VAC, 50/60 Hz

Alarm system code
1: LED and single Form C contact
C: LEDs and Form C contacts to meet NFPA 110

Housing/Agency
L: Enclosed: C-UL listed
R: Open-frame: C-UL recognized
S: Slimline open-frame: C-UL recognized (10A only)

UL category code
S: UL category BBGQ (standard)
H: UL category BBHH (Alarms "1" only)

The Smart Choice for Mission-Critical Engine Starting

Additional Information

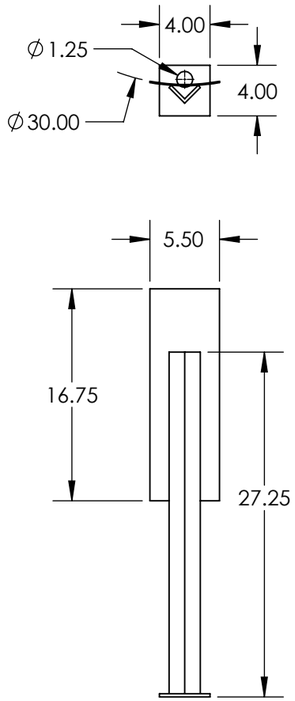
Contact SENS or your local sales representative for additional specification, engineering and installation information

ISO 9000 c UL US LISTED CE

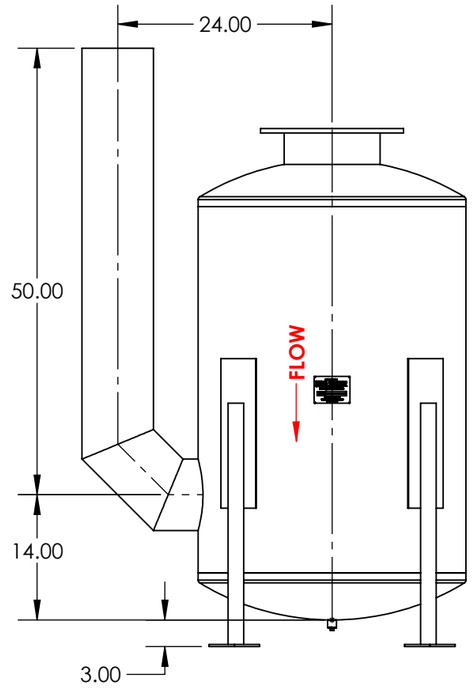
Contact Information

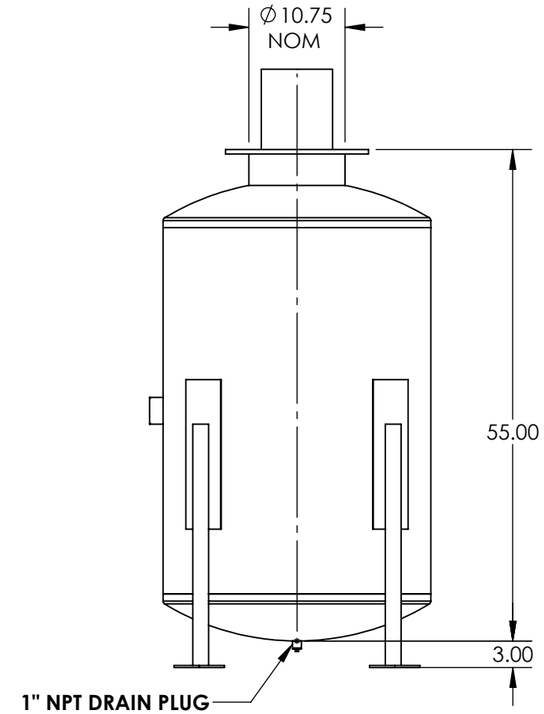
For information and service on any SENS product, please contact us at:
Sales 1.866.736.7872 • 303.678.7500 • Fax 303.678.7504
www.sens-usa.com • info@sens-usa.com
1840 Industrial Circle, Longmont, CO 80501 USA

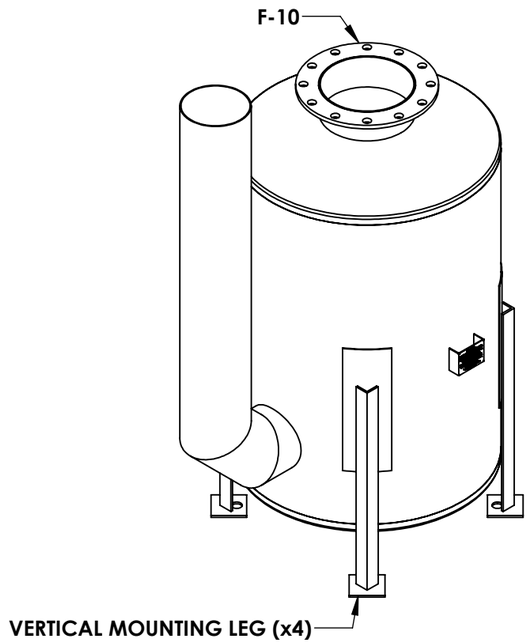
SENS®
STORED ENERGY SYSTEMS
Our energy means business®

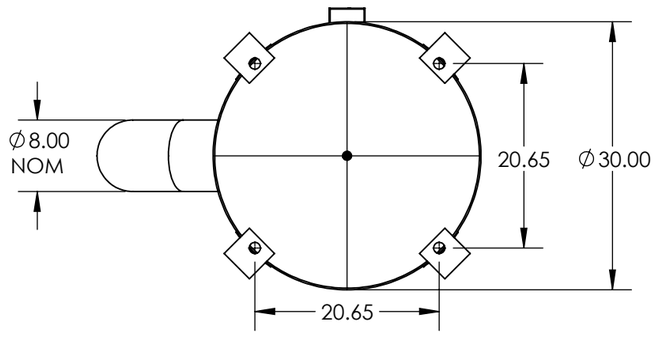


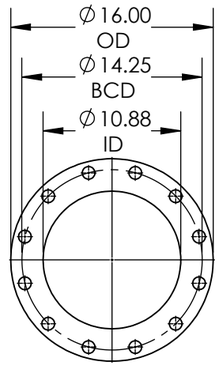
DETAIL VERTICAL MOUNTING LEG











DETAIL F-10
10" ANSI 150# FLANGE
0.50" THK

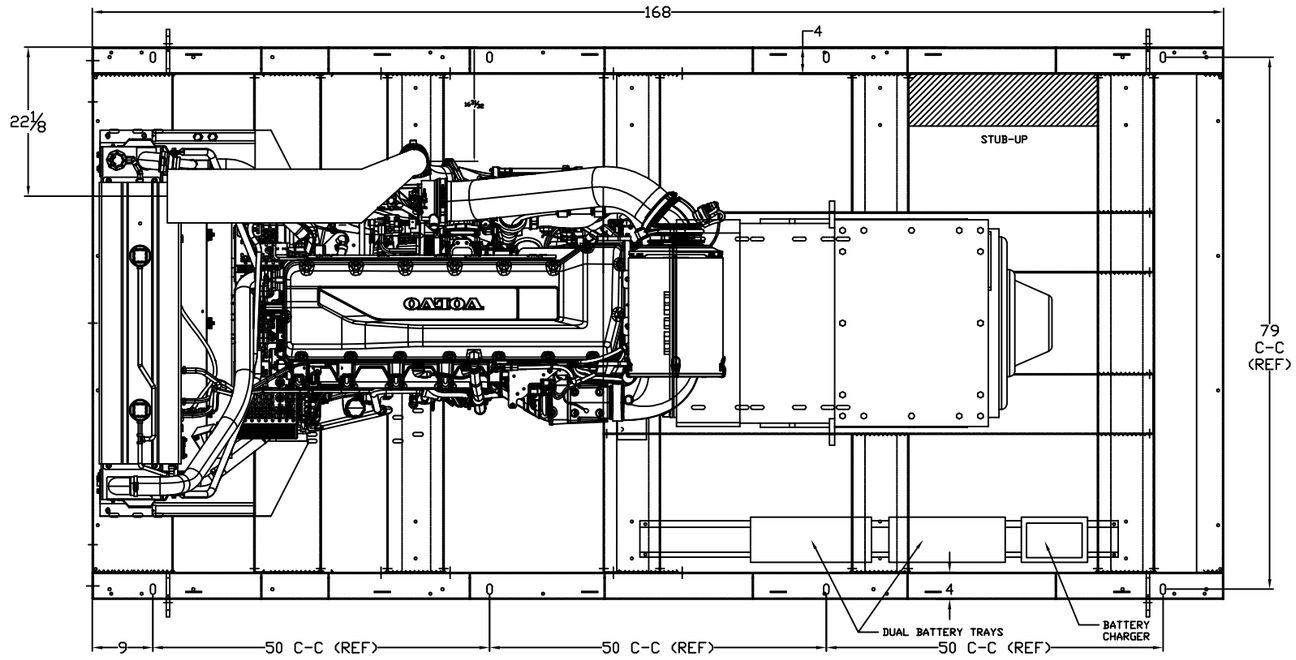
SILENCER DETAIL

SILENCER GRADE: CRITICAL GRADE
ATTENUATION: 30-35 dBA
SILENCER SHELL: STANDARD SHELL (NO INSULATION)
SILENCER TUBES: STANDARD TUBES (NO INSULATION)

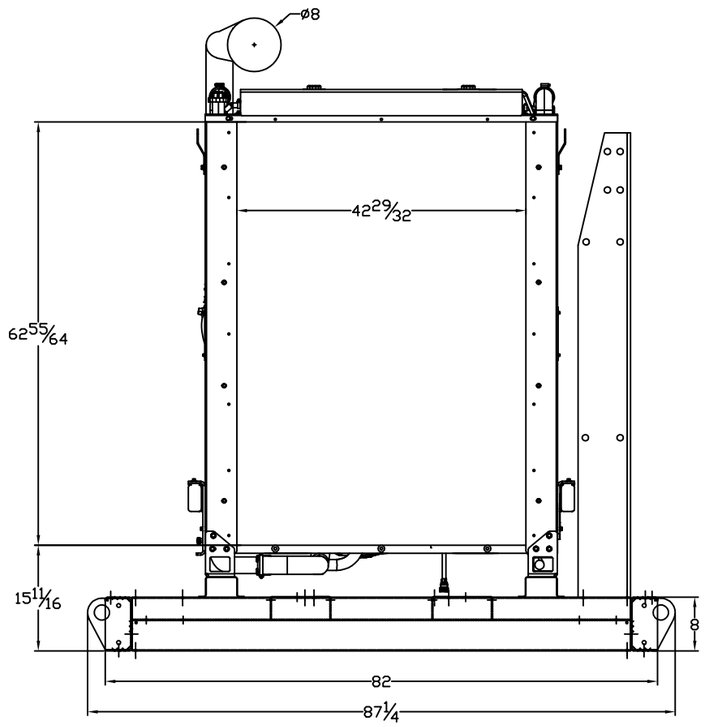
NOTES:
- ALL DIMENSIONS ARE IN INCHES
- DRAWING REQUIRES APPROVAL BEFORE PRODUCTION
- THIS IS NOT A FINAL PRODUCTION DRAWING, SOME DIMENSIONS MAY BE SUBJECT TO CHANGE

MATERIAL: CARBON STEEL CONSTRUCTION	PAINT: HIGH HEAT BLACK	APPROX. WEIGHT (LBS): 600
UNLESS OTHERWISE NOTED 1. REMOVE ALL BURRS AND SHARP EDGES 2. DIMENSIONS ARE IN INCHES TOLERANCES 0.XX ± 1/8" 0.XXX ± 1/16"	E. I. WILLIAMS INDUSTRIES INC. Building Sound Solutions EIW SILENCERS	CONTACT # 905-428-0950 INFO@EIWILLIAMS.COM WWW.EIWILLIAMS.COM
TITLE: CYLINDRICAL SILENCER	DRAWING #: QUOTE #23371	DATE: 2023-09-26
MODEL #: GE5S-10-SP	DRAWN BY: AJ	REV: 00 / SHEET: 1 OF 1

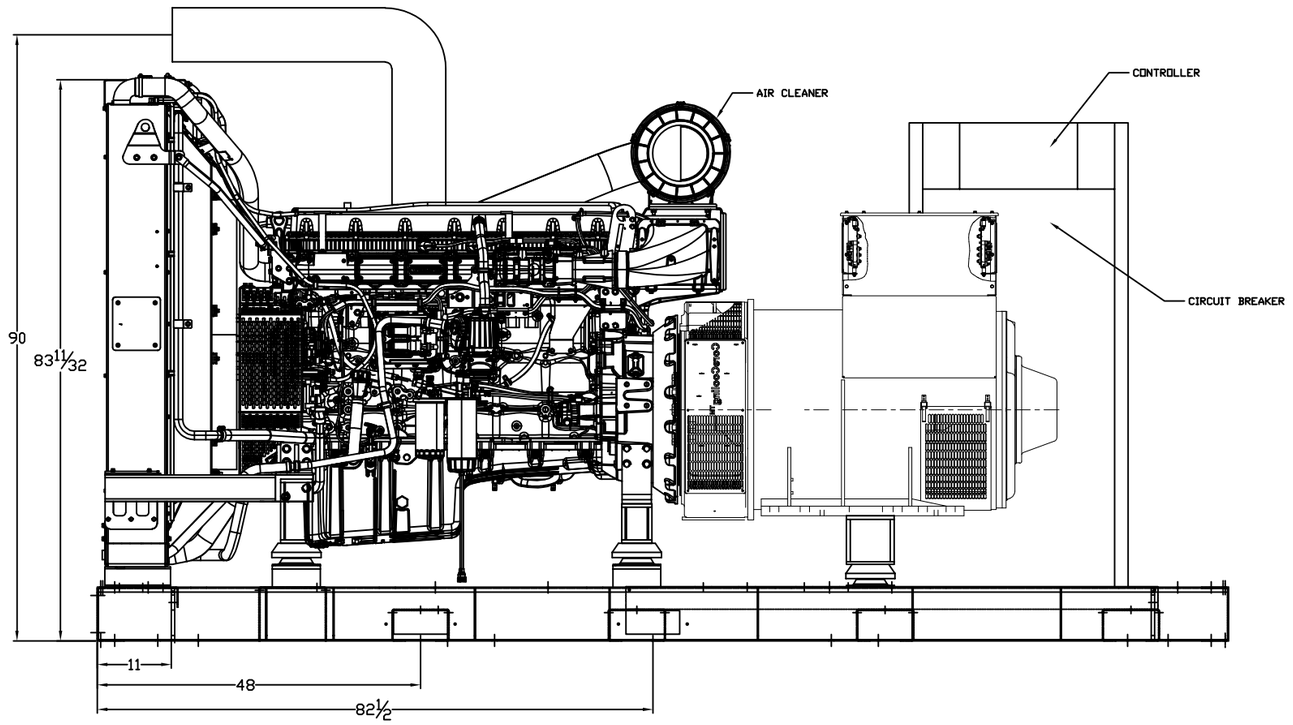
OPEN DIMENSIONAL OVERVIEW FOR SPVD-7000 GENERATOR



TOP VIEW



RADIATOR VIEW

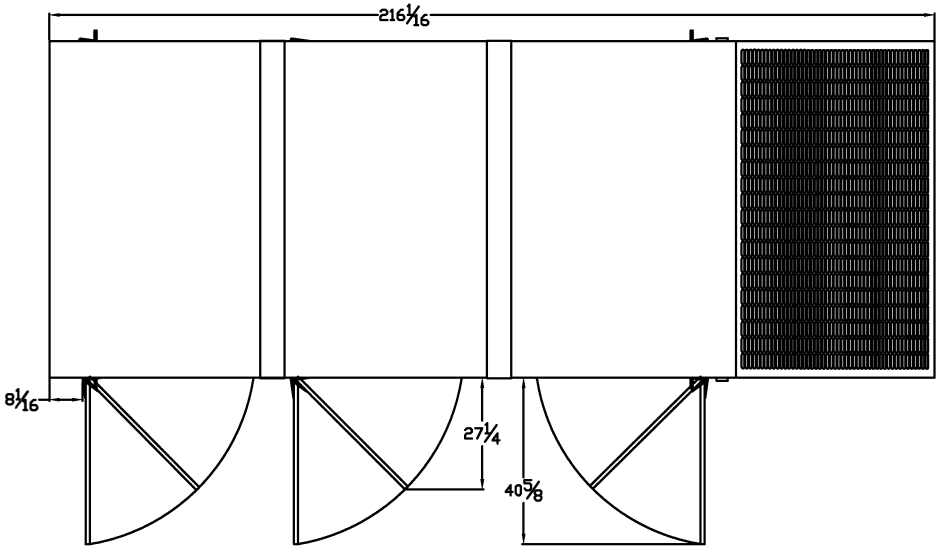


SIDE VIEW

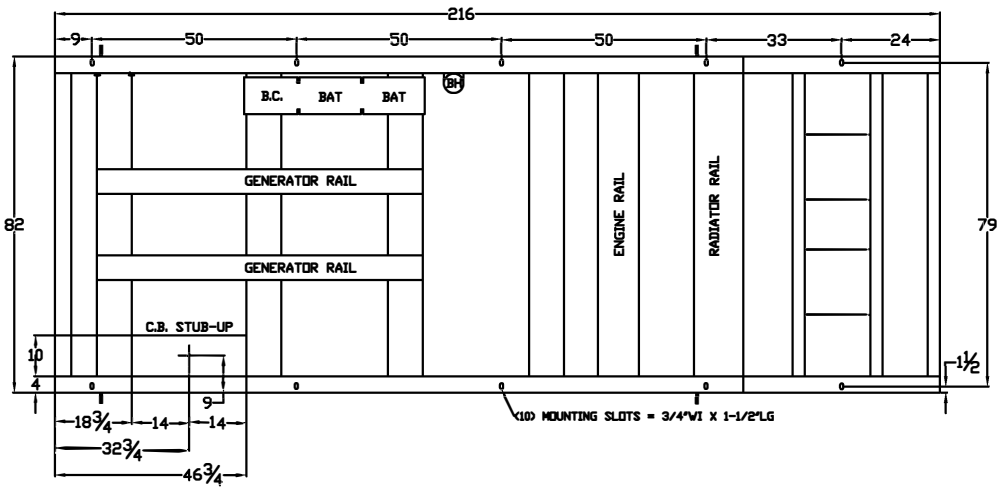
LEVEL 2 & 3 ENCLOSURE OUTLINE DIMENSIONS
FOR SPVD-7000

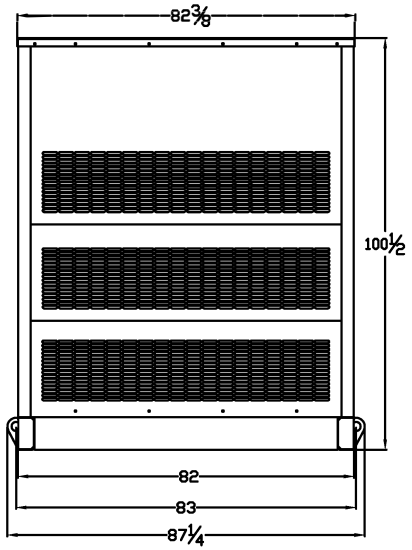
TOP VIEW

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

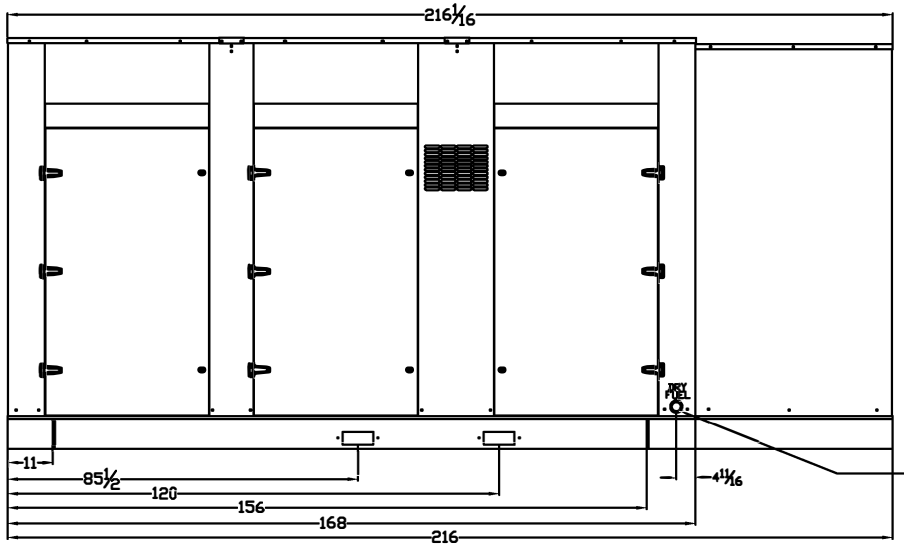


FRAME VIEW

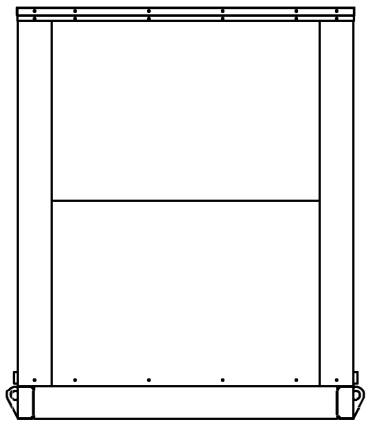




GENERATOR END VIEW



SIDE VIEW



RADIATOR END VIEW

SP-4000-SP-5000-L2-L3-GENERATOR-SET-HINGES-OVERVIEW-20230130