GILLETTE GENERATORS

LIQUID COOLED DIESEL ENGINE GENERATOR SET

60 HZ MODEL

SPMI-8000

Model	HZ	STANDBY 130°C RISE
SPMI-8000-60 HERTZ	60	800

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.

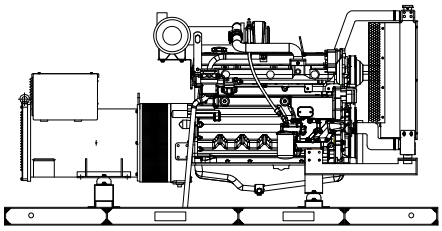
NEC 700, 701, 702, 708

NEMA ICS10, MG1, ICS6, AB1

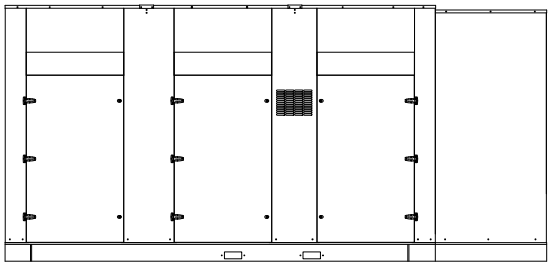
ANSI C62.41, 27, 59, 32, 480, 40Q, 81U, 360-05

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

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



"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	130°C RISE STANDBY RATING		POWER LEAD CONNECTIONS
	L-N	L-L			KW/KVA	AMP	
SPMI-8000-3-2	120	208	3	60	800/1000	2779	12 LEAD LOW WYE
SPMI-8000-3-3	120	240	3	60	800/1000	2408	12 LEAD HIGH DELTA
SPMI-8000-3-4	277	480	3	60	800/1000	1204	12 LEAD HIGH WYE
SPMI-8000-3-5	127	220	3	60	800/1000	2627	12 LEAD LOW WYE
SPMI-8000-3-16	346	600	3	60	800/1000	963	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. 130° C "STANDBY RATINGS" are strictly for gen-sets that are used for back-up emergency power to a failed normal utility power source. This standby rating allows varying loads, with no overload capability, for the entire duration of utility power outage. 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-8000-60 HZ

GENERATOR SPECIFICATIONS

Manufacturer..... Stamford AVK Electric Generators
Model & Type..... HCI634H, 4 Pole, 12 Lead, Three Phase
..... HCI634G.314, 4 Pole, 12 Lead, 480V, Three Phase
..... HCI634G.07, 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 ..... 130°C R/R, standby rating @ 40°C amb.
3 Ø Motor Starting @ 30% Voltage Dip (208-240V)...1800 kVA
3 Ø Motor Starting @ 30% Voltage Dip (480V-600V) 2350 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** 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 ..... S12A2-Y2PTAW-2, 4 cycle, liquid Cooled
Aspiration..... Turbo After Cooler, H2O to Air
Charged Air Cooled System .....H2o to Air
Cylinder Arrangement.....12 Cylinders, V-12
Displacement Cu. In. (Liters).....2,071 (33.9)
Bore & Stroke in (Cm).....5.91 x 6.30 (15 x 16)
Compression Ratio..... 15.3:1
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 1207 (900)
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, Bosch P Type x2
Total Fuel Flow gal/hr (L/hr).....127 (480)
Fuel Filter .....Yes
Maximum Fuel Lift ft. (m).....10 (3)

FUEL CONSUMPTION

GAL/HR (LITER/HR)	STANDBY
100% LOAD	67.4 (255)
75% LOAD	46.1 (175)
50% LOAD	31.3 (119)

OIL SYSTEM

Type ..... Full Pressure
Oil Pan Capacity qt. (L) 105.67 (100)
Oil Pan Cap. W/ filter qt. (L) 126.80 (120)
Oil Filter.....3, Replaceable Cartridge Type

ELECTRICAL SYSTEM

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

Recommended battery to -18°C (0° F): ....(2) 12 VDC, BCI# 31, Max. Dimensions: 14"lg x 6 3/4" wi x 10" hi, with standard round posts. Min output 1400 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 SPMI-8000-60 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 (28)
Fan Diameter inches (cm).....60 (152)
Ambient Capacity of Radiator °F (°C).....122 (50)
Engine Jacket Coolant Capacity gal. (L).....26.4 (100)
Radiator Coolant Capacity gal. (L) 80.0 (303)
Water Pump Capacity gpm (L/min)..... .....291 (1,102)
Heat Reject Coolant: Btu/min..... ..... ….20,418
Air to Air Heat Reject, BTU/min. .... ….7,969
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) 3,107 (87.9)
Max Air Intake Restrictions:
Clean Air Cleaner, KPA (MBAR)..... ..... 2 (20)
Max. Temp. out of Charger Air Cooler
@ 77° F (25°C), Amb. Air °F (°C)..... ..... 180 (82)
Radiator Cooling Air, SCFM (m^3/min)..... .....44,950 (1,272)

EXHAUST SYSTEM

Exhaust Outlet Size.....12"
Max. Back Pressure in KPA (in. H2O).....5.9 (24.1)
Exhaust Flow, at rated KW, CFM (m3/min)..... 8,192 (232)
Exhaust Temp, (Stack) °F (ºC) 883 (473)

SOUND LEVELS MEASURED IN dB(A)

	Open Set	Level 2 Encl.
Level 2, Critical Silencer	99	88
Level 3, Hospital Silencer	94	82

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)	186 (472)	234 (595)
Width in (cm)	82 (208)	82 (208)
Height in (cm)	94 (238)	110 (279)
3 Ø Net Weight lbs (kg)	18950 (8595)	19440 (8817)
3 Ø Ship Weight lbs (kg)	19340 (8772)	21840 (9906)

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-8000-60 HZ

STANDARD FEATURES

CONTROL PANEL:

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

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

Also included is tamper-proof engine hour meter

ENGINE:

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.

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

AC GENERATOR SYSTEM:

AC generator • 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

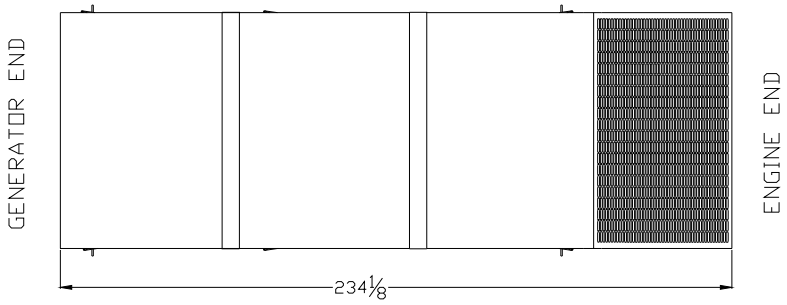
DC ELECTRICAL SYSTEM:

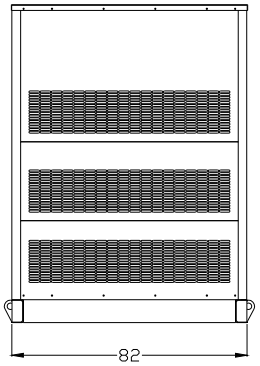
Battery tray • Battery cables • Battery hold down straps • 3-stage battery charger with float, absorption, & bulk automatic charge stages

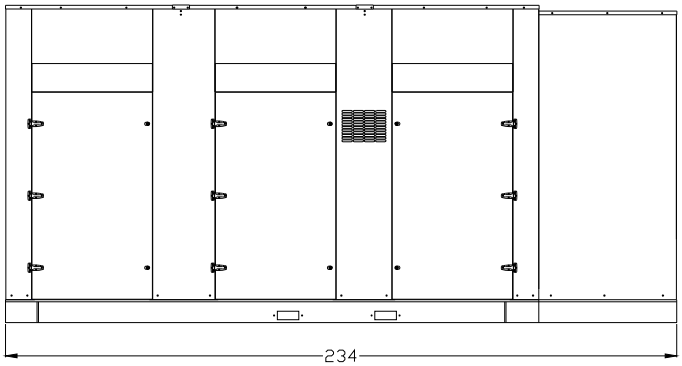
WEATHER / SOUNDPROOF ALUMINUM HOUSING:

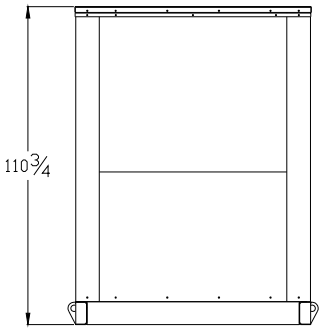
Corrosion Resistant Protection consisting of:

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









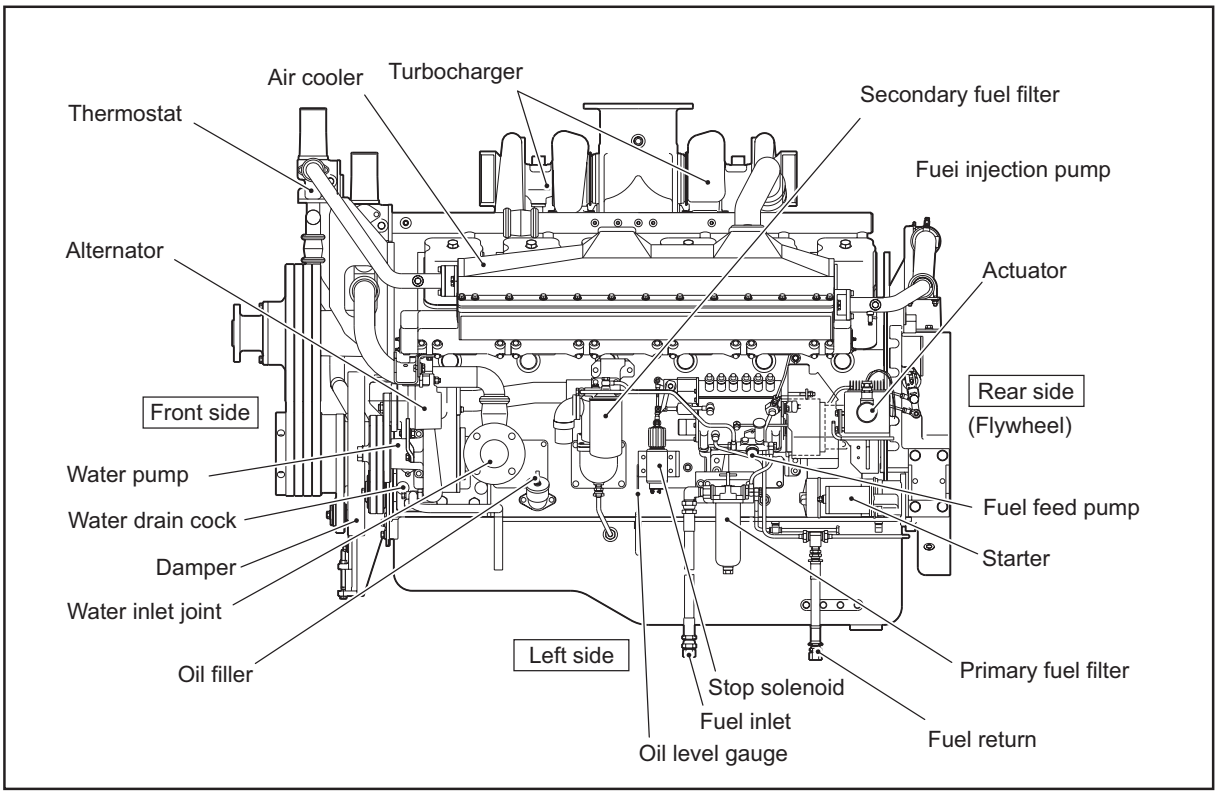
MITSUBISHI DIESEL ENGINE TECHNICAL INFORMATION	ITEM NO.	T0213-0005E (1/4)
	DATE	June, 2012

Specification Sheets of S12A2-Y2PTAW-2 Engine

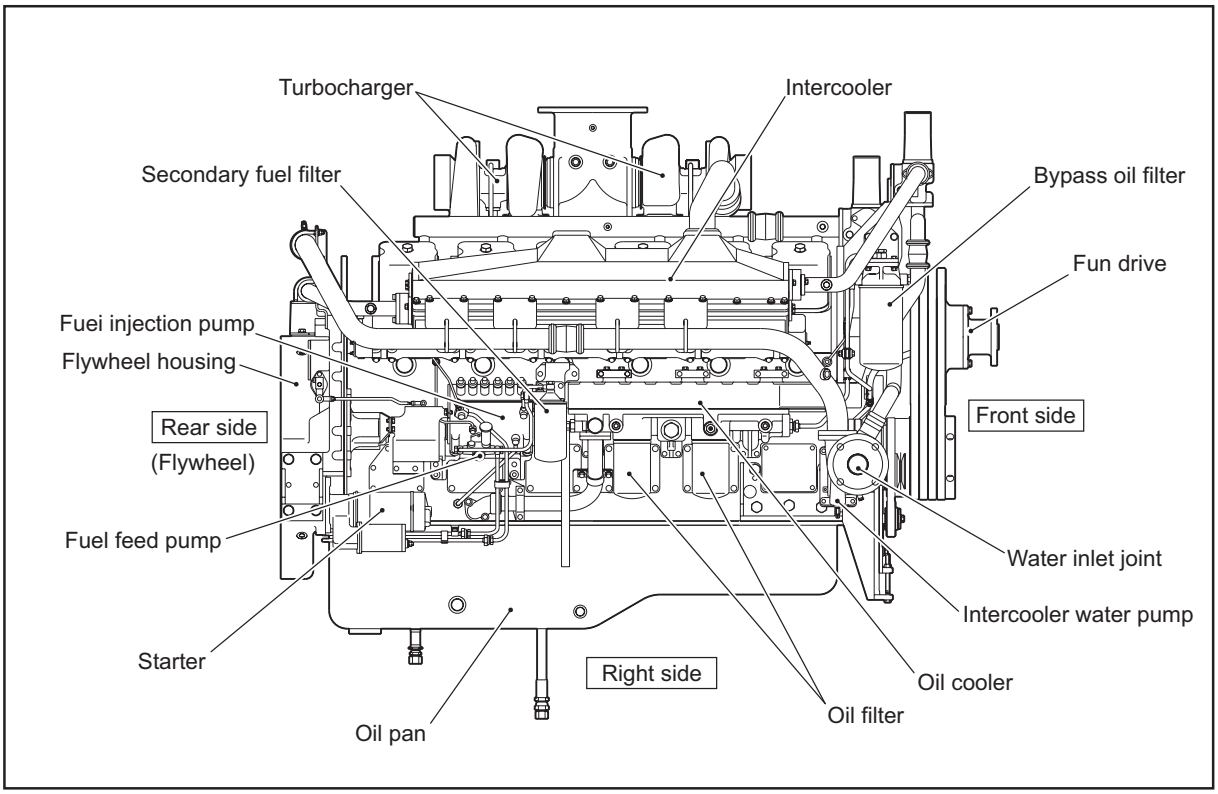
Specification Sheets of S12A2-Y2PTAW-2 Engine are enclosed herein.

Revision	First Edition : June, 2012 (T13-0631-E Dec. '06)	Engine Engineering Department Engine System Designing Section		
		Approved by	Checked by	Drawn by
		T.HASHIGUCHI	K.NAKAMURA	K.N.

1. External view



Left side view of the engine



Right side view of the engine

4. Main specification

Table 1-1 Main specification(1 / 3)

Engine type				S12A2-Y2PTAW
Major specifications	Model			Water-cooled, 4-stroke cycle, turbocharged diesel with air-cooled intercooler
	No. of cylinders - arrangement			12-V
	Combustion type			Direct injection
	Valve mechanism			Overhead
	Cylinder bore × stroke			150 × 160 mm [5.906 × 6.2992 in.]
	Displacement			33.93 L [2070.53 cu in.]
	Compression ratio			15.3 : 1
	Fuel			Diesel fuel (ASTM, D975 No.1-D, No.2-D)
	Firing order			1-12-5-8-3-10-6-7-2-11-4-9
	Rotation of direction			Counterclockwise as viewed from flywheel
	Dimensions (without fan)	Length		2104 mm [82.83 in.]
		Width		1556 mm [61.26 in.]
		Height		1542 mm [60.71 in.]
	Weight (Dry)			3380 kg [7452 lb]
Engine main parts	Cylinder liner	Type		Wet type
	No. of piston rings	Compression rings Oil ring		Compression rings: 2 Oil ring (w/expander): 1
	Valve timing	Inlet valve	Open	BTDC 55°
			Close	ABDC 65°
		Exhaust valve	Open	BBDC 65°
			Close	ATDC 55°
	Engine support method			4 - point support
	Starting system			Electric - starter
Inlet and exhaust system	Turbocharger	Type		TD10
		No. of units		2
Lubrication system	Lubricating method			Forced circulation type (oil pump pressure feed type)
	Engine oil	Specification		Class CD or CF oil (API service classification)
		Capacity		Engine total: 120 L [32 U.S.gal.] approx.
	Oil pump	Type		Gear pump
		Delivery capacity		375 L [99 U.S.gal] / min (at engine speed of 1800 min^{-1})
	Relief valve	Type		Main gallery pressure detection type
		Valve opening pressure		0.49 to 0.69 MPa {5.0 to 7.0 kgf/cm²} [71.3 to 99.58 psi]
	Oil cooler	Type		Water-cooled, multi-plate type
	Oil filter	Type		Cartridge paper-element type, filtration rating 20µn
	Bypass oil filter	Type		Cartridge paper-element type, filtration rating 2µn
	Oil filter alarm	Type		Piston valve type, built-in electric contact points
		Injection pressure		0.22 to 0.26 MPa {2.3 to 2.7 kgf/cm²} [32.72 to 38.41 psi] (Contacting pressure: 0.14 to 0.17 MPa {1.5 to 1.8 kgf/cm²} [21.34 to 25.61 psi])
	Oil cooler bypass valve	Valve opening pressure		0.44 ± 0.05 MPa {4.5 ± 0.5 kgf/cm²} [64 ± 7.1 psi]
	Safety valve	Valve opening pressure		1.42 MPa {14.5 kgf/cm²} [206 psi]

Table 1-1 Main specification(2 / 3)

Engine type			S12A2-Y2PTAW
Cooling system	Cooling method		Water-cooled, forced circulation
	Coolant capacity (engine)		Approx. 86 L [23 U.S.gal]
	Water pump	Type	Centrifugal type
		Delivery capacity	1120 L [296 U.S.gal] / min (at engine speed of 1800 min^{-1})
	Water pump belt	Type	Raw edge cog B belt (NR-1)
		Manufacturer	Mitsuboshi Belting, Ltd.
		Outside circumference	1420 mm [56 in.]
	2-way water pump	Type	Centrifugal type
		Delivery capacity	500 L [132 U.S.gal] / min (at engine speed of 1800 min^{-1})
	2-way water pump belt	Type	Raw edge cog C belt (NR-1)
		Manufacturer	Mitsuboshi Belting, Ltd.
		Outside circumference	1660 mm [65 in.]
	Thermostat (water pump)	Type	Wax type
		Temperature at which valve starts opening	71 ± 2°C [160 ± 3.6°F]
	Thermostat (2-way water pump)	Type	Wax type
		Temperature at which valve starts opening	35 ± 2°C [95 ± 3.6°F]
	Fan belt	Type	Low enge cog C belt (NR-1)
		Manufacturer	Mitsuboshi Belting, Ltd.
		Outside circumference	1710 mm [67 in.]
Fuel system	Injection pump	Model (abbreviation)	NP-PE6P / S7S (S7S)
		Manufacturer	Bosch Corporation
		Plunger outside diameter	13 mm [0.51 in.]
		Plunger lead	Clockwise, 40 lead on both sides
		Cam lift	12 mm [0.47 in.]
	Feed pump	Model	NP-FP / KD-P7S
		Manufacturer	Bosch Corporation
		Cam lift	4 mm [0.157 in.]
	Governor and actuator	Control system	(Electric) Woodward PROACT- II
	Injection nozzle	Model	Hole type
		Manufacturer	Bosch Corporation
		No. of spray holes	8
		Spray hole diameter	ø 0.23 mm [0.0091 in.]
		Spray angle	158°
		Valve opening pressure	29.4 MPa {300 kgf/cm^2} [4267 psi]
	Fuel filter		Primary: Wire element type Secondary: Paper element type

Table 1-1 Main specification(3 / 3)

Engine type			S12A2-Y2PTAW
Electrical system	Voltage - polarity		24 V - Negative (-) ground
	Starter	Manufacturer	Nikko Electric Industry Co., Ltd.
		Piston mesh type	Pinion shift
		Output	24 V-7.5 kW
		No. of units	2
	Alternator	Type	3-phase alternating-current generator, built-in IC regulator
		Manufacturer	Mitsubishi Electric Corporation
		Output	24V - 30A
		Rated output generating speed	Hot 5000 min^{-1} or less (at 27V, 30A)
		Regulated voltage	28.5 ± 0.5V
	Magnetic relay (two starters for parallel operation)	Manufacturer	Nikko Electric Industry Co., Ltd
		Nominal voltage	24V
		Rating	30 sec.
		Operating voltage	8 to 24V
		Operating interval (at 24 V)	1 ON - OFF cycle between SS and SW 2.5 to 3.0 sec.
		Allowable temperature	-30 to +80°C [-54 to +144°F]
		Grounding system	2-wire system
	Alternator belt	Type	Low edge cog B belt (NR-1)
		Manufacturer	Mitsuboshi belting, Ltd.
		Outside circumference	830 mm [33 in.]

Certified for US EPA-Tier 2 / Constant Speed
Standard Model [800kWe/60Hz]

S12A2-Y2PTAW-2 SPECIFICATION SHEET

MITSUBISHI DIESEL ENGINES

GENERAL ENGINE DATA

Type	4-Cycle, Water Cooled	
Aspiration	Turbo-Charged, Inter Cooler (Fresh water to Cooler)	
Cylinder Arragement	60°V	
No.of Cylinders	12	
Bore mm(in.)	150	(5.91)
Stroke mm(in.)	160	(6.30)
Displacement liter(in^3)	33.93	(2071)
Compression Ratio	15.3:1	
Dry Weight - Engine only - kg(lb)	3380	(7453)
Wet Weight - Engine only - kg(lb)	3600	(7938)

PERFORMANCE DATA

Steady State Speed Stability Band at any Constant Load		
Electric Governor - %	±0.25 or better	
Maximum Overspeed Capacity - rpm	2400	
Moment of inertia of Rotating Components - kgf·m^2(lbf·ft^2)	37.7	(894.8)
(Includes Std.Flywheel)		
Cyclic Speed Variation with Flywheel at 1800rpm	1/449	

ENGINE MOUNTING

Maximum Bending Moment at Rear Face of Flywheel Housing - kgf·m(lbf·ft)	200	(1447)

AIR INLET SYSTEM

Maximum Intake Air Restriction (Includes piping)		
With Clean Filter Element - mm H_2O (in.H_2O)	400	(15.7)
With Dirty Filter Element - mm H_2O (in.H_2O)	635	(25.0)

EXHAUST SYSTEM

Maximum Allowable Back Pressure - mm H_2O (in.H_2O)	600	(23.6)

LUBRICATION SYSTEM

Oil Pressure at ldle - kgf/cm^2(psi)	2～3	(29～43)
at Rate Speed - kgf/cm^2(psi)	4～6	(57～86)
Maximum Oil Temperature - °C(°F)	110	(230)
Oil Capacity of Standard Pan High - liter (U.S.gal)	100	(26.4)
Low - liter (U.S.gal)	80	(21.1)
Total System Capacity (lncludes Oil Filter) - liter (U.S.gal)	120	(31.7)
Maximum Angle of lnstallation (Std. Pan) Front Down	9.5°	
(Engine Only) Front Up	11°	
Side to Side	22.5°	

COOLING SYSTEM

Coolant Capacity of Jacket (Engine only) - liter (U.S.gal)	86	(22.7)
Coolant Capacity of Air cooler (Engine only) - liter (U.S.gal)	14	(3.7)
Maximum External Friction Head at Engine Outlet - kgf/cm^2(psi)		
(For Jacket and Air Cooler)	0.35	(5.0)
Maximum Static Head of Coolant above Crankshaft Center - m(ft)	10	(32.8)
Standard Thermostat (modulating)Range of Jacket - °C(°F)	65～85	(149～185)
Standard Thermostat (modulating)Range of Air Cooler - °C(°F)	35～50	(95～122)
Maximum Coolant Temperature at Engine Outlet - °C(°F)	98	(208)
Minimum Coolant Expansion Space - % of System Capacity		
(For Jacket and Air Cooler)	10	(0.4)
Maximum Coolant Temperature at Intercooler lnlet, PTAW type - °C(°F)	45	(113)
Maximum Air Restriction on Discharge Side of Radiator and Fan - mm H_2O(in.H_2O)	10	(0.4)

APPLICATION : GENERATOR

June, '12 Printed in Japan

FUEL SYSTEM

Fuel Injector	Bosch P Type × 2	
Maximum Suction Head of Feed Pump - mm Hg (in. Hg)	75	(3.0)
Maximum Static Head of Return & Leak Pipe - mm Hg (in.Hg)	150	(5.9)

STARTING SYSTEM

Battery Charging Alternator - V- Ah	24-25	
Starting Motor Capacity - V - kW	24-6.0 × 2	
Maximum Allowable Resistance of Cranking Circuit - m Ω	1.5	
Recommended Minimum Battery Capacity		
At 5°C (41°F) and above - Ah	300	
Below 5°C (41°F) through - 5°C (23°F)	500	

Certified for US EPA-Tier 2 / Constant Speed
Standard Model [800kWe/60Hz] MITSUBISHI
S12A2-Y2PTAW-2 SPECIFICATION SHEET DIESEL ENGINE

ENGINE RATING

All data represent net performance with standard accessories such as air cleaner, inlet /exhaust manifolds, fuel oil system, L.O. pump, etc. under the condition of 100kPa(29.6inHg) barometric pressure, 77°F(25°C) ambient temperature and 30% relative humidity.

ITEM	UNIT	STAND-BY POWER	PRIME POWER		
		60Hz	60Hz		
Engine Speed	rpm	1800	1800		
No. of Cylinders		12			
Bore	mm (in.)	150 (5.91)			
Stroke	mm (in.)	160 (6.30)			
Displacement	liter ($in.^3$)	33.93 (2071)			
Brake Horse power without Fan	HP (kW)	1207 (900)	1099 (820)		
Brake Mean Effective Pressure without Fan	kgf/cm^2 (psi)	18.0 (256)	16.4 (233)		
Mean Piston Speed	m/s (ft/min)	9.6 (1890)	9.6 (1890)		
Maximum Regenerative Power Absorption Capacity without Fan	HP (kW)	125 (93)	125 (93)		
Intake Air flow	m^3/min (CFM)	88 (3107)	75 (2648)		
Exhaust Gas Flow	m^3/min (CFM)	232 (8192)	200 (7062)		
Coolant Flow	liter/min (U.S. GPM)	1100 (291)	1100 (291)		
Coolant Flow to Intercooler (PTAW only)	liter/min (U.S. GPM)	470 (124)	470 (124)		
Cooling Air Flow (Std. Fan)	m^3/min (CFM)	—	—		
Allowable Fan Loss Horse Power	HP (kW)	51 (38)	51 (38)		
Radiated Heat to Ambient	kcal/hr (BTU/min)	66155 (4375)	56798 (3757)		
Heat Rejection to Coolant	kcal/hr (BTU/min)	308721 (20418)	265058 (17531)		
Heat Rejection to Air Cooler (PTAW Version)	kcal/hr (BTU/min)	242567 (16043)	208260 (13774)		
Heat Rejection to Exhaust	kcal/hr (BTU/min)	813498 (53804)	658220 (43534)		
Noise Level (1 m height & distance) (excludes, Intake,Exhaust & Fan)	dB(A)	TBD	TBD		

The specifications are subject to change without notice.

APPLICATION : GENERATOR

Pub. No. T0213-0005E 4/4

June, '12 Printed in Japan

MITSUBISHI DIESEL ENGINE TECHNICAL INFORMATION	ITEM NO.	T0409-0006E (1/2)
	DATE	March, 2014

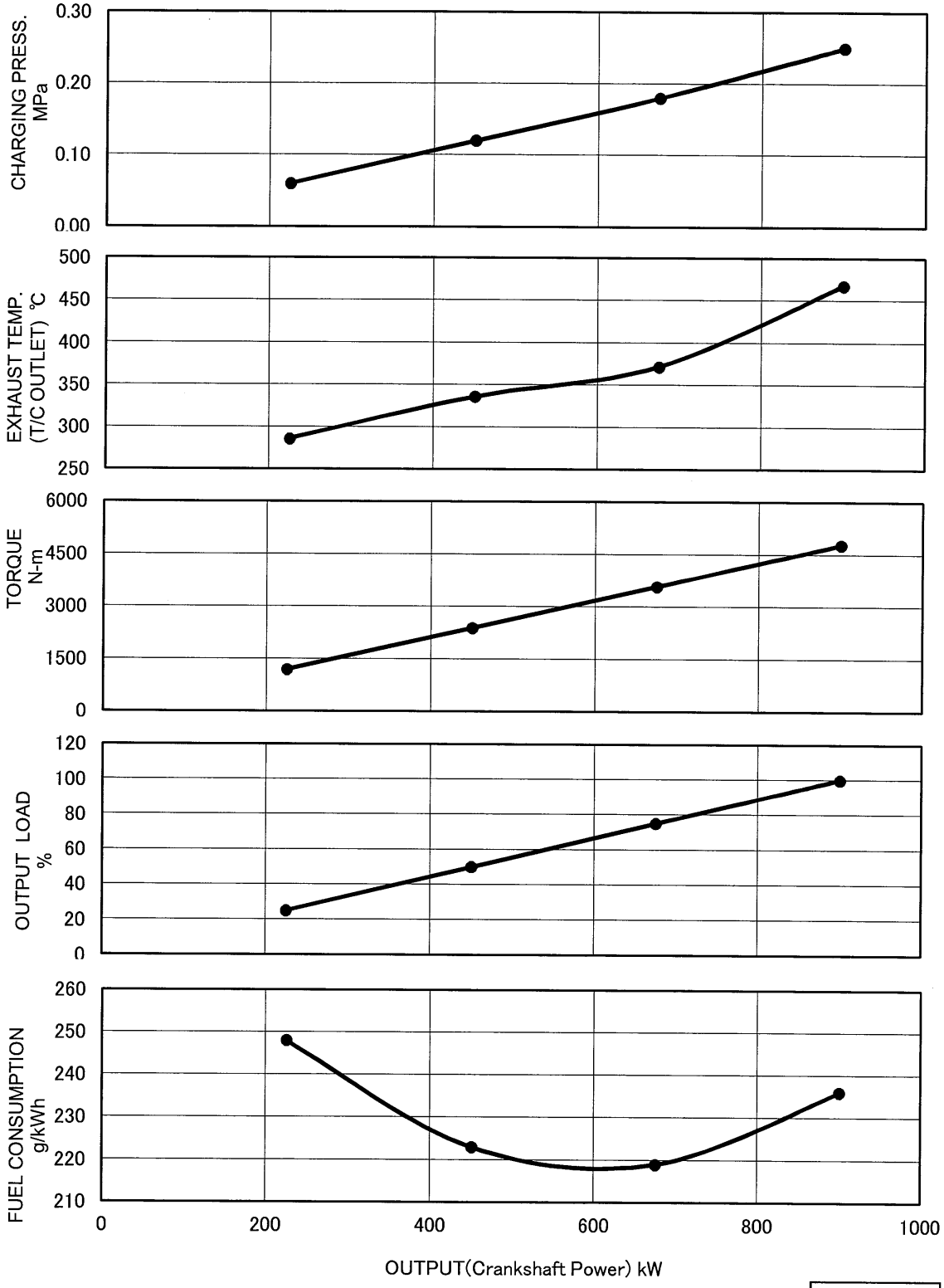
Performance Curves of S12A2-Y2PTAW-2

Performance Curves of S12A2-Y2PTAW-2 Engine are enclosed herein. The data are test bench data and not a guaranteed performance.

Revision				
	First Edition : March, 2014	Engine Engineering Department Hihg Speed Engine Designing		
		Approved by	Checked by	Drawn by
		T.HASHIGUCHI	K.YATO	K.Y

S12A2-Y2PTAW-2(60Hz) PERFORMANCE CURVE

Engine speed: 1800min^{-1}



WITHOUT FAN

MHI CONFIDENTIAL

Fuel Consumption is based on ISO3046/1 with +5% tolerance at rated power.
The specifications are subject to change without notice.

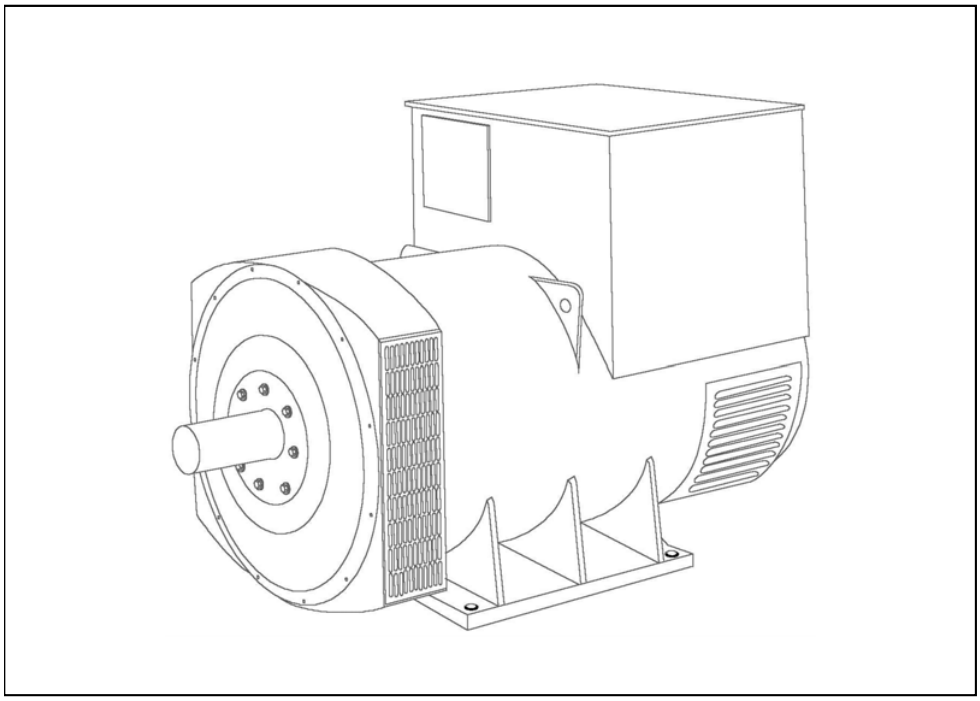
APPLICATION : GENERATOR

Mar.'14 Printed in Japan

STAMFORD®

HCI634H - Winding 311 and 312

Technical Data Sheet



SPECIFICATIONS & OPTIONS
WINDING 311 and 312

STANDARDS

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

VOLTAGE REGULATORS

MX321 AVR - STANDARD

This sophisticated Automatic Voltage Regulator (AVR) is incorporated into the Stamford Permanent Magnet Generator (PMG) system and is fitted as standard to generators of this type.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

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

TERMINALS & TERMINAL BOX

Standard generators feature a main stator with either 6 ends (Winding 312) or 12 ends (Winding 311) brought out to the terminals, which are mounted on the frame at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.

INSULATION/IMPREGNATION

The insulation system is class 'H'.
All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

QUALITY ASSURANCE

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

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

DE RATES

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

5% when air inlet filters are fitted.
10% when IP44 Filters are fitted.
3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.
3% for every 5 C by which the operational ambient temperature exceeds 40 C.
Note: Requirement for operating in an ambient exceeding 60 C must be referred to the factory.

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

Front cover drawing typical of product range.

HCI634H

STAMFORD

WINDING 311 and 312

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.	
A.V.R.	MX321	
VOLTAGE REGULATION	± 0.5 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)	

INSULATION SYSTEM	CLASS H							
PROTECTION	IP23							
RATED POWER FACTOR	0.8							
STATOR WINDING	DOUBLE LAYER LAP							
WINDING PITCH	TWO THIRDS							
WINDING LEADS	6 (Wdg 312) or 12 (Wdg 311)							
STATOR WDG. RESISTANCE	0.003 Ohms PER PHASE AT 22°C STAR CONNECTED							
ROTOR WDG. RESISTANCE	1.88 Ohms at 22°C							
EXCITER STATOR RESISTANCE	17 Ohms at 22°C							
EXCITER ROTOR RESISTANCE	0.079 Ohms PER PHASE AT 22°C							
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others							
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
MAXIMUM OVERSPEED	2250 Rev/Min							
BEARING DRIVE END	BALL. 6224 (ISO)							
BEARING NON-DRIVE END	BALL. 6317 (ISO)							
	1 BEARING				2 BEARING			
WEIGHT COMP. GENERATOR	2117 kg				2145 kg			
WEIGHT WOUND STATOR	1010 kg				1010 kg			
WEIGHT WOUND ROTOR	866 kg				821 kg			
WR² INERTIA	20.0438 kgm^2				19.4965 kgm^2			
SHIPPING WEIGHTS in a crate	2173kg				2180kg			
PACKING CRATE SIZE	183 x 92 x 140(cm)				183 x 92 x 140(cm)			
	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	1.614 m³/sec 3420 cfm				1.961 m³/sec 4156 cfm			
VOLTAGE STAR	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
VOLTAGE PARALLEL STAR (*)	190/110	200/115	208/120	220/127	208/120	220/127	230/133	240/138
VOLTAGE DELTA	220	230	240	254	240	254	266	277
kVA BASE RATING FOR REACTANCE VALUES	910	940	910	875	1025	1063	1075	1125
Xd DIR. AXIS SYNCHRONOUS	2.99	2.80	2.51	2.15	3.37	3.13	2.89	2.78
X'd DIR. AXIS TRANSIENT	0.25	0.24	0.21	0.18	0.29	0.27	0.25	0.24
X"d DIR. AXIS SUBTRANSIENT	0.18	0.17	0.15	0.13	0.19	0.18	0.17	0.16
Xq QUAD. AXIS REACTANCE	1.77	1.65	1.49	1.27	2.00	1.86	1.72	1.65
X"q QUAD. AXIS SUBTRANSIENT	0.19	0.18	0.16	0.14	0.22	0.20	0.19	0.18
X_L LEAKAGE REACTANCE	0.09	0.09	0.07	0.06	0.10	0.09	0.08	0.08
X_2 NEGATIVE SEQUENCE	0.20	0.19	0.17	0.14	0.23	0.21	0.20	0.19
X_0 ZERO SEQUENCE	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED							
T'd TRANSIENT TIME CONST.	0.185							
T"d SUB-TRANSTIME CONST.	0.025							
T'do O.C. FIELD TIME CONST.	2.44							
Ta ARMATURE TIME CONST.	0.04							
SHORT CIRCUIT RATIO	1/Xd							

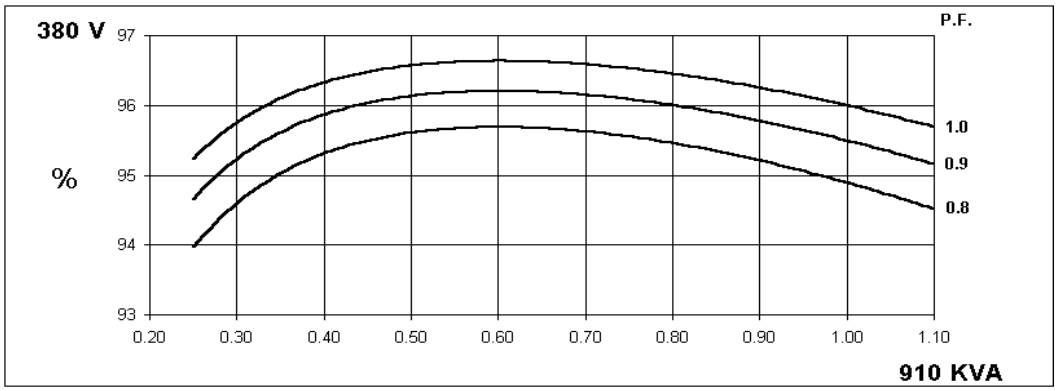
(*) Parallel Star connection only available with Wdg 311

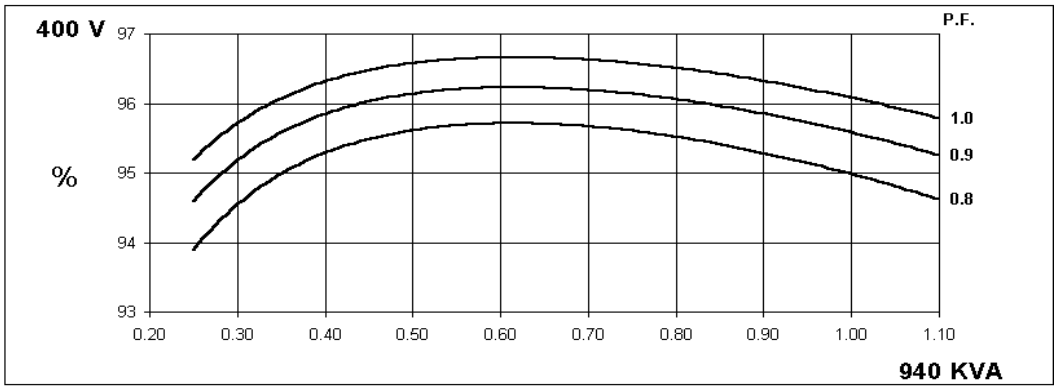
50 Hz

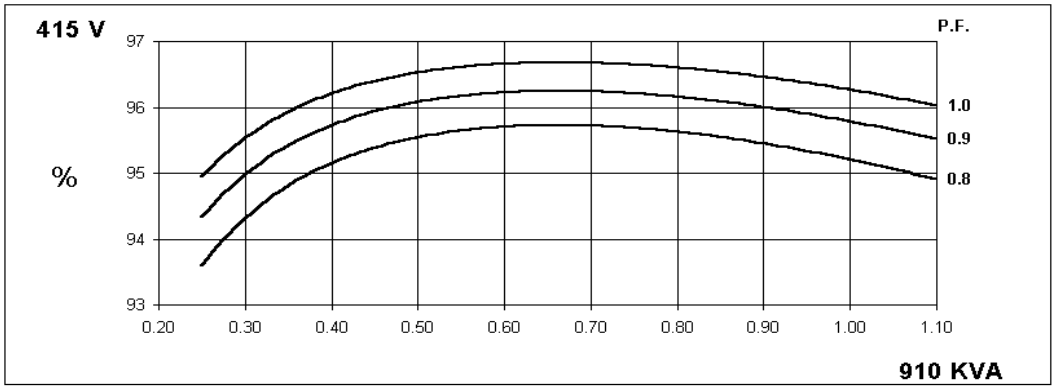
HCI634H

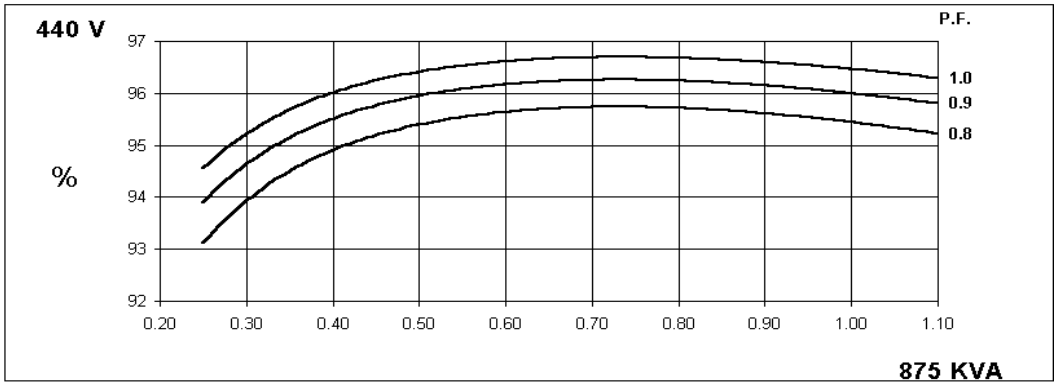
WINDING 311 and 312

THREE PHASE EFFICIENCY CURVES







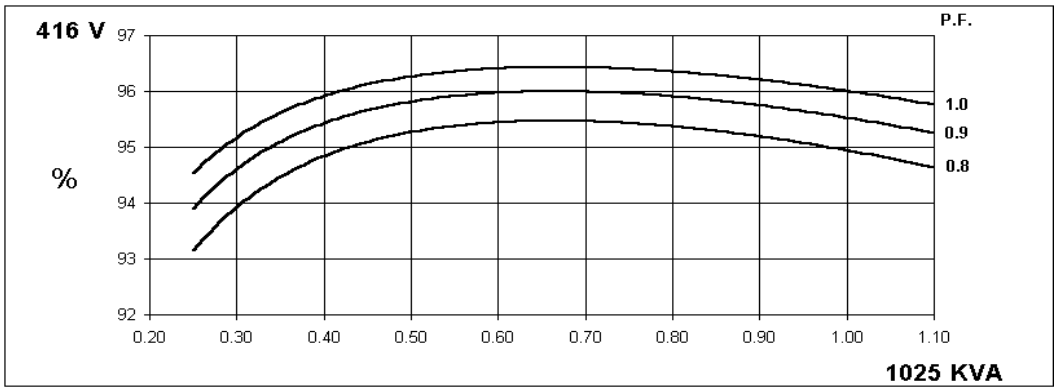


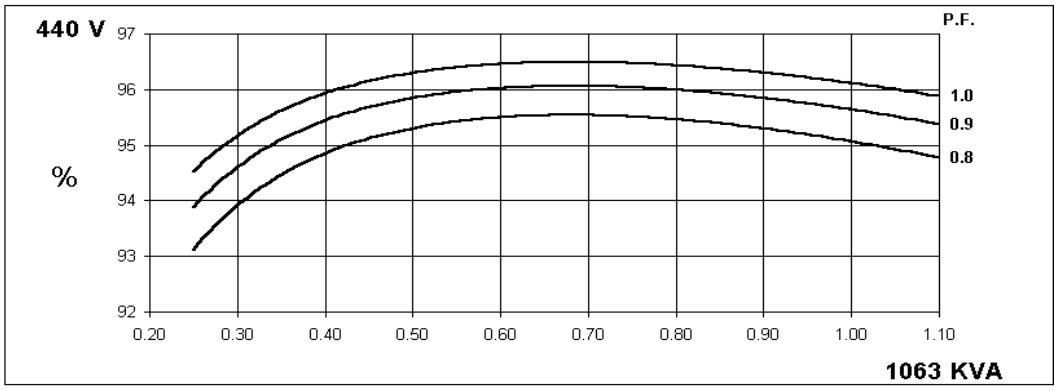
60 Hz

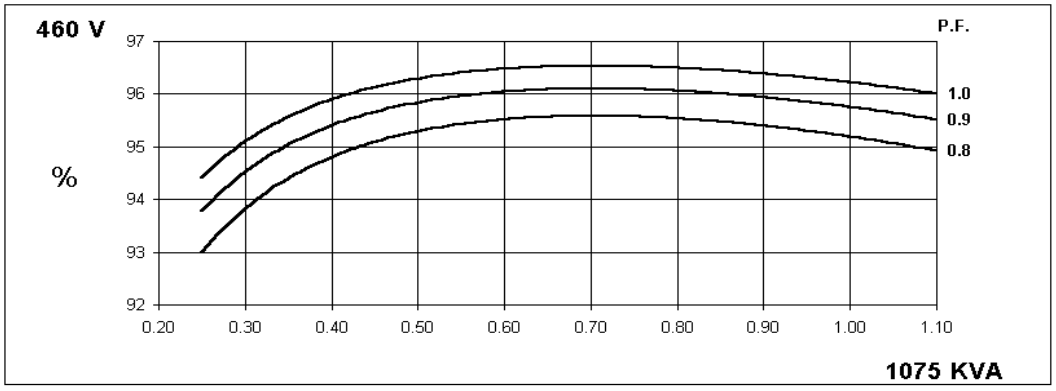
HCI634H

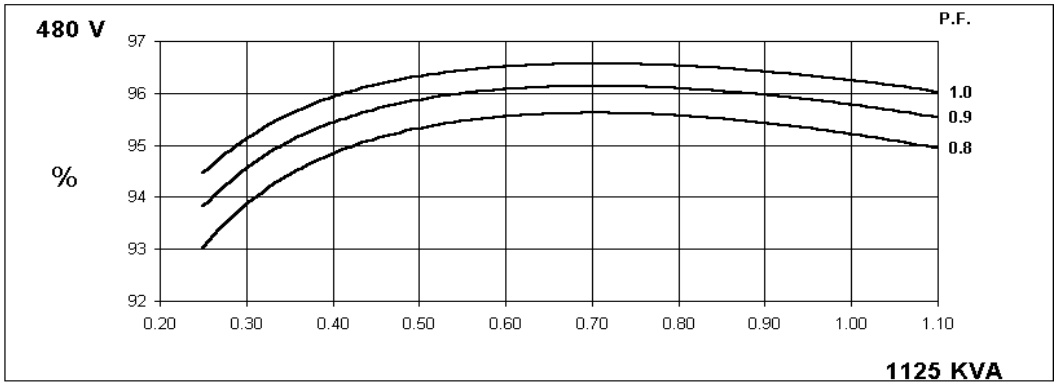
WINDING 311 and 312

THREE PHASE EFFICIENCY CURVES





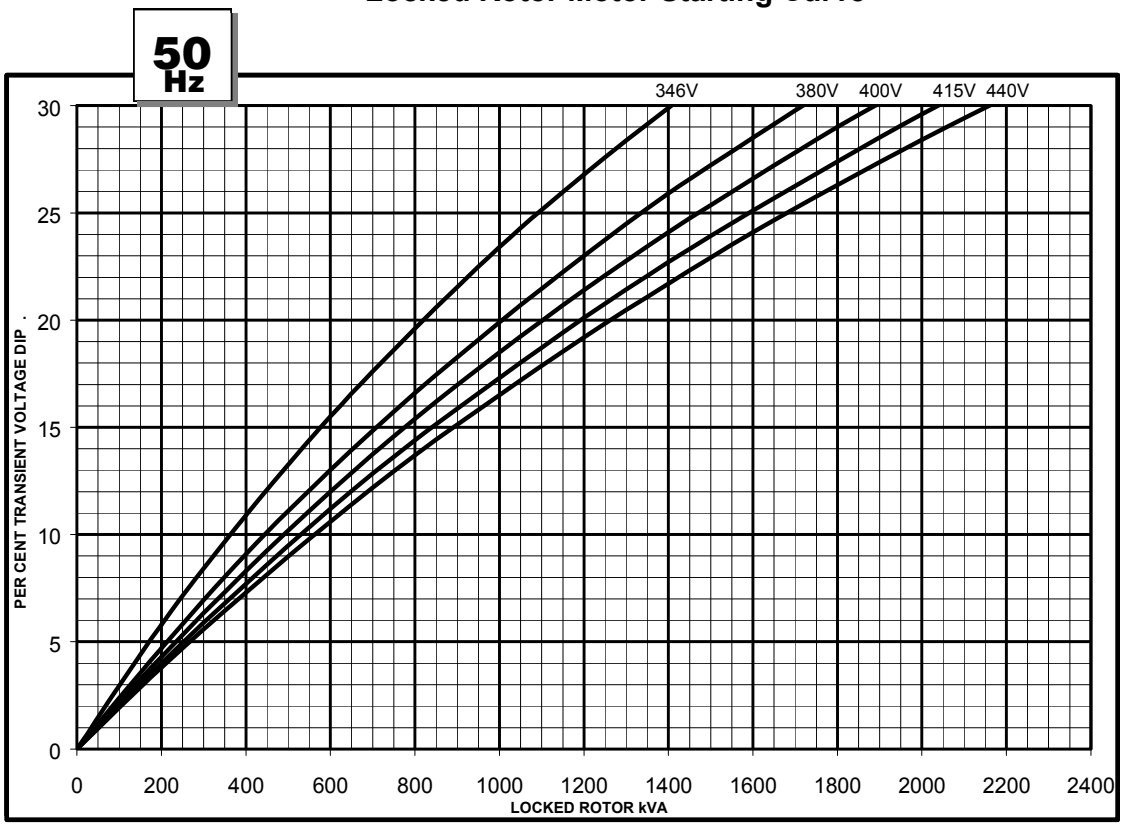


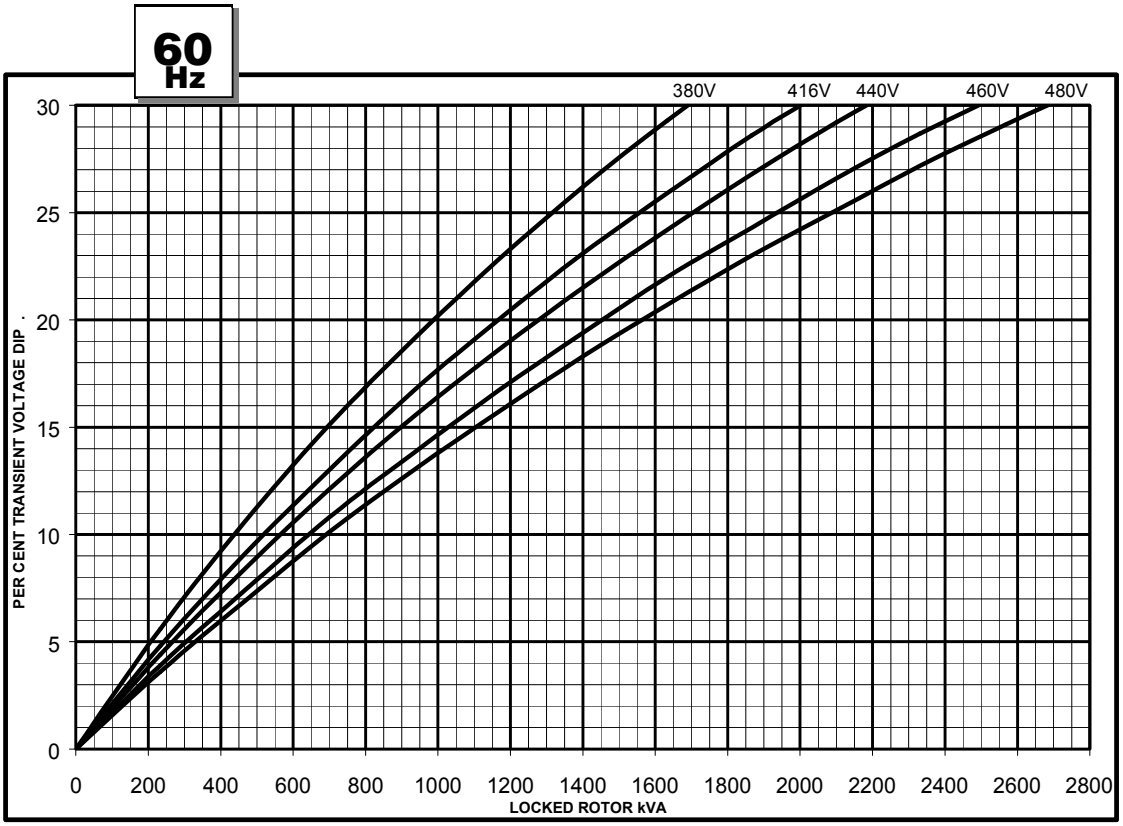


HCI634H

WINDING 311 and 312

Locked Rotor Motor Starting Curve





HCI634H

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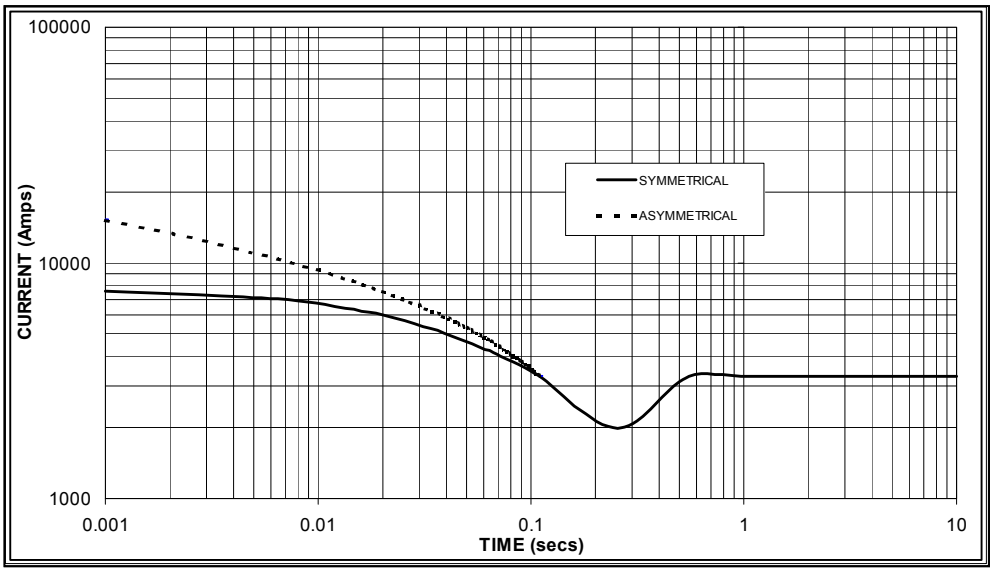
WINDING 311 and 312

Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed

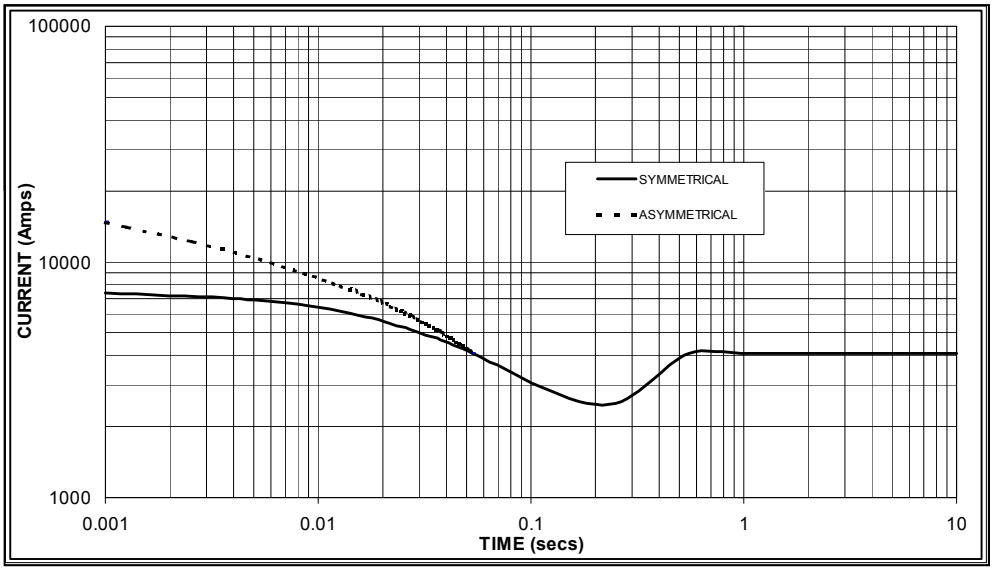
Based on star (wye) connection.

50 Hz



Sustained Short Circuit = 3,300 Amps

60 Hz



Sustained Short Circuit = 4,000 Amps

Note 1

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

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380v	X 1.00	416v	x 1.00
400v	X 1.07	440v	x 1.06
415v	X 1.12	460v	x 1.12
440v	X 1.18	480v	x 1.17

The sustained current value is constant irrespective of voltage level

Note 2

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

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

All other times are unchanged

Note 3

Curves are drawn for Star (Wye) connected machines.
For Delta connection multiply the Curve current value by 1.732

HCI634H

STAMFORD

Winding 311 and 312 0.8 Power Factor

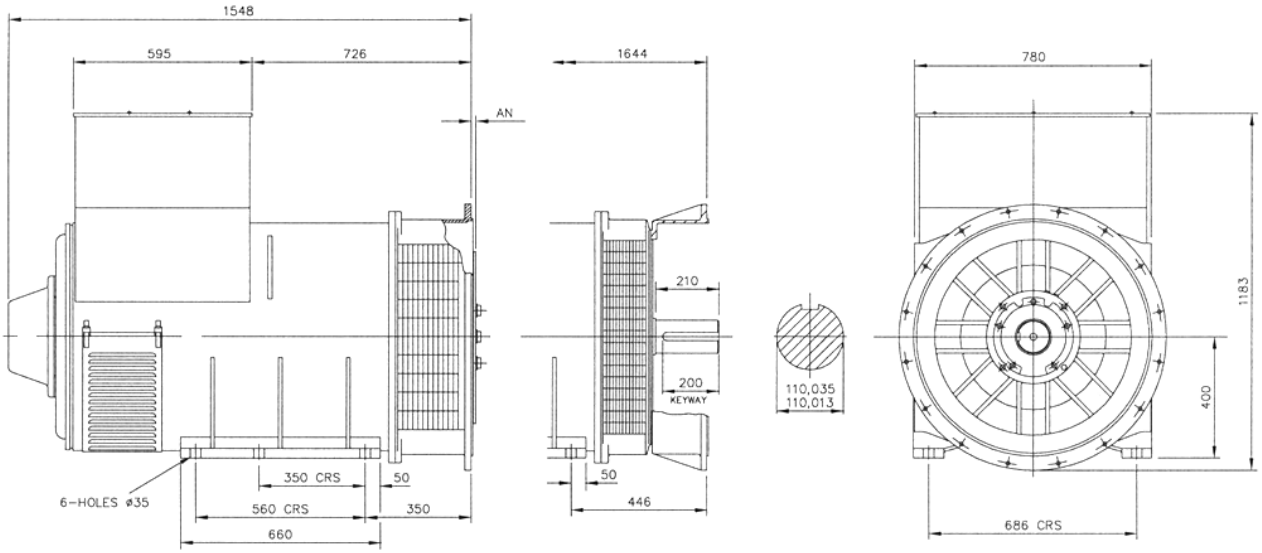
RATINGS

Class - Temp Rise		Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C			
50Hz	Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V) *	180	200	208	220	180	200	208	220	180	200	208	220	180	200	208	220
	Delta (V)	220	230	240	254	220	230	240	254	220	230	240	254	220	230	240	254
	kVA	830	860	830	800	910	940	910	875	960	980	960	920	1000	1010	1000	960
	kW	664	688	664	640	728	752	728	700	768	784	768	736	800	808	800	768
	Efficiency (%)	95.2	95.3	95.4	95.6	94.9	95.0	95.2	95.4	94.7	94.8	95.1	95.3	94.5	94.7	94.9	95.2
	kW Input	697	722	696	669	767	792	765	734	811	827	808	772	847	853	843	807

60Hz	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	913	963	1000	1025	1025	1063	1075	1125	1088	1125	1138	1188	1125	1163	1175	1219
	kW	730	770	800	820	820	850	860	900	870	900	910	950	900	930	940	975
	Efficiency (%)	95.2	95.3	95.3	95.4	94.9	95.1	95.2	95.2	94.8	94.9	95.0	95.1	94.6	94.8	94.9	95.0
	kW Input	767	808	839	860	864	894	903	945	918	948	958	999	951	981	991	1027

* Parallel Star only available with Wdg 311

DIMENSIONS



SAE	14	18	21	24
AN	25.4	15.87	0	0

STAMFORD

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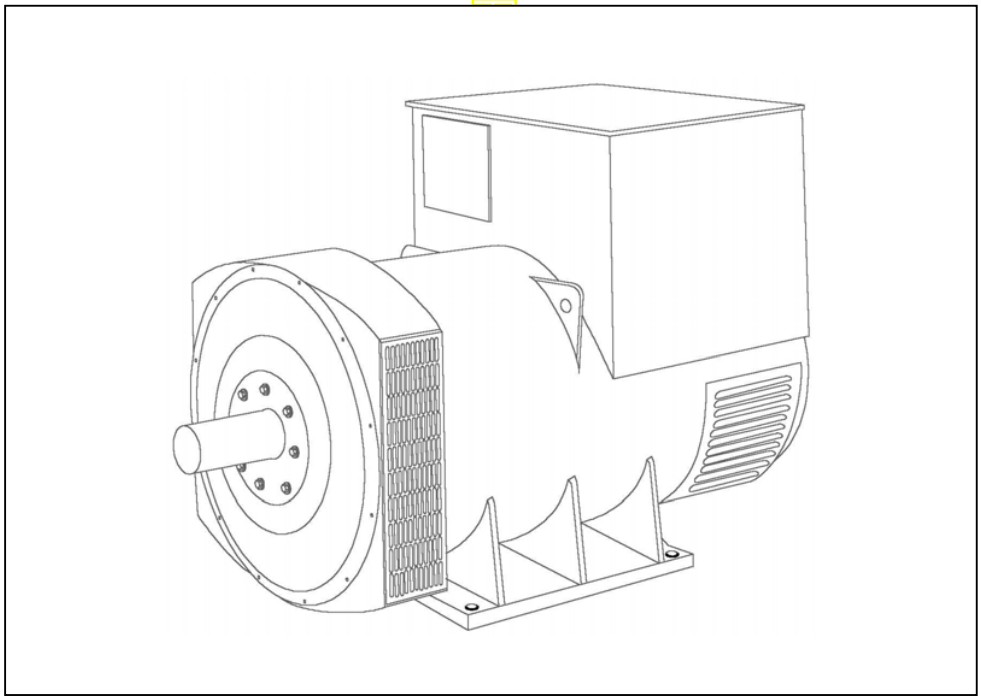
Fax: +44 (0) 1780 484100

www.cumminsgeneratortechnologies.com

STAMFORD®

HCI634G - Winding 311 and 312

Technical Data Sheet



SPECIFICATIONS & OPTIONS
WINDING 311 and 312

STANDARDS

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TERMINALS & TERMINAL BOX

Standard generators feature a main stator with either 6 ends (Winding 312) or 12 ends (Winding 311) brought out to the terminals, which are mounted on the frame at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.

INSULATION/IMPREGNATION

The insulation system is class 'H'.
All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

QUALITY ASSURANCE

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DE RATES

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

5% when air inlet filters are fitted.
10% when IP44 Filters are fitted.
3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.
3% for every 5°C by which the operational ambient temperature exceeds 40°C.
Note: Requirement for operating in an ambient exceeding 60°C must be referred to the factory.

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

Front cover drawing typical of product range.

HCI634G

STAMFORD

WINDING 311 and 312

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.	
A.V.R.	MX321	
VOLTAGE REGULATION	± 0.5 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)	

INSULATION SYSTEM	CLASS H							
PROTECTION	IP23							
RATED POWER FACTOR	0.8							
STATOR WINDING	DOUBLE LAYER LAP							
WINDING PITCH	TWO THIRDS							
WINDING LEADS	6 (Wdg 312) or 12 (Wdg 311)							
STATOR WDG. RESISTANCE	0.003 Ohms PER PHASE AT 22°C STAR CONNECTED							
ROTOR WDG. RESISTANCE	1.75 Ohms at 22°C							
EXCITER STATOR RESISTANCE	17 Ohms at 22°C							
EXCITER ROTOR RESISTANCE	0.079 Ohms PER PHASE AT 22°C							
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others							
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%							
MAXIMUM OVERSPEED	2250 Rev/Min							
BEARING DRIVE END	BALL. 6224 (ISO)							
BEARING NON-DRIVE END	BALL. 6317 (ISO)							
	1 BEARING				2 BEARING			
WEIGHT COMP. GENERATOR	1965 kg				1989 kg			
WEIGHT WOUND STATOR	934 kg				934 kg			
WEIGHT WOUND ROTOR	814 kg				766 kg			
WR² INERTIA	18.3482 kgm^2				17.8009 kgm^2			
SHIPPING WEIGHTS in a crate	2023kg				2029kg			
PACKING CRATE SIZE	183 x 92 x 140(cm)				183 x 92 x 140(cm)			
	50 Hz				60 Hz			
TELEPHONE INTERFERENCE	THF<2%				TIF<50			
COOLING AIR	1.614 m³/sec 3420 cfm				1.961 m³/sec 4156 cfm			
VOLTAGE STAR	380/220	400/231	415/240	440/254	416/240	440/254	460/266	480/277
VOLTAGE PARALLEL STAR (*)	190/110	200/115	208/120	220/127	208/120	220/127	230/133	240/138
VOLTAGE DELTA	220	230	240	254	240	254	266	277
kVA BASE RATING FOR REACTANCE VALUES	800	800	800	800	875	925	963	1000
Xd DIR. AXIS SYNCHRONOUS	3.14	2.83	2.63	2.34	3.53	3.34	3.18	3.03
X'd DIR. AXIS TRANSIENT	0.25	0.23	0.21	0.19	0.28	0.26	0.25	0.24
X"d DIR. AXIS SUBTRANSIENT	0.18	0.16	0.15	0.13	0.21	0.20	0.19	0.18
Xq QUAD. AXIS REACTANCE	1.88	1.70	1.58	1.40	2.10	1.98	1.89	1.80
X"q QUAD. AXIS SUBTRANSIENT	0.21	0.19	0.18	0.16	0.24	0.23	0.22	0.21
X_L LEAKAGE REACTANCE	0.10	0.09	0.08	0.07	0.12	0.11	0.10	0.10
X_2 NEGATIVE SEQUENCE	0.22	0.20	0.19	0.17	0.24	0.23	0.22	0.21
X_0 ZERO SEQUENCE	0.03	0.03	0.03	0.02	0.03	0.03	0.03	0.03
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED							
T'd TRANSIENT TIME CONST.	0.185							
T"d SUB-TRANSTIME CONST.	0.025							
T'do O.C. FIELD TIME CONST.	2.35							
Ta ARMATURE TIME CONST.	0.04							
SHORT CIRCUIT RATIO	1/Xd							

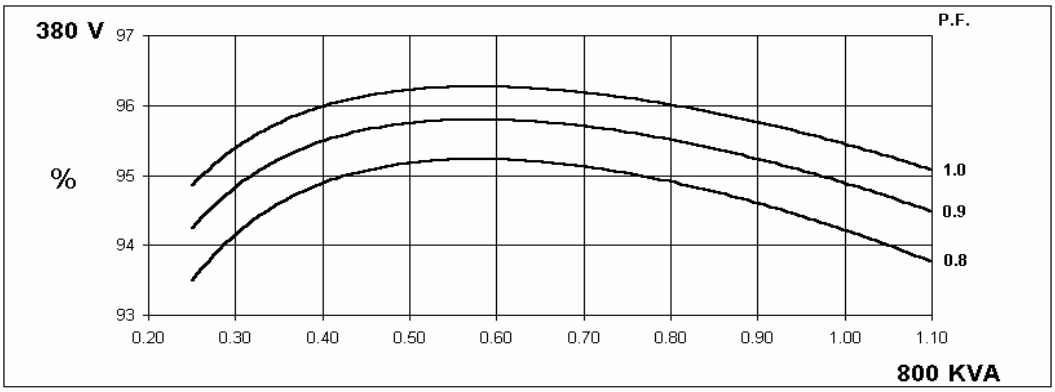
(*) Parallel Star connection only available with Wdg 311

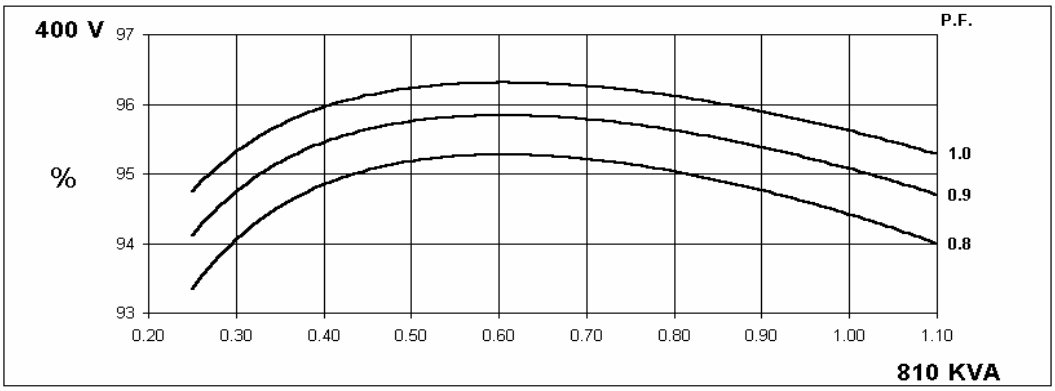
50 Hz

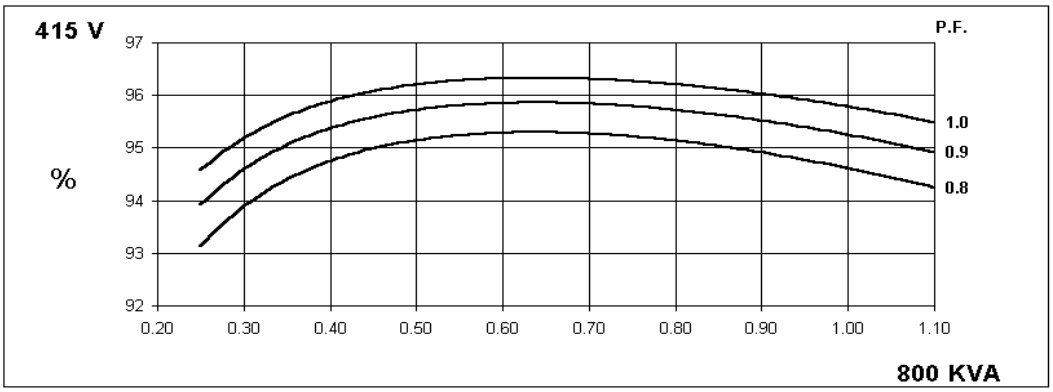
HCI634G

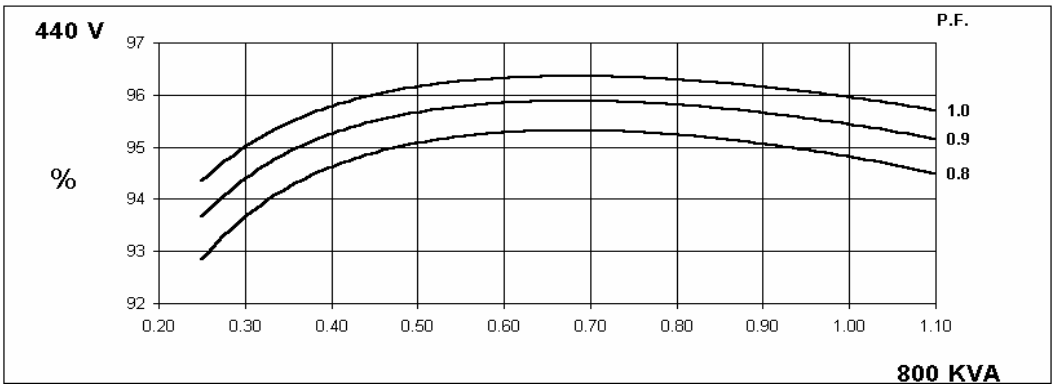
WINDING 311 and 312

THREE PHASE EFFICIENCY CURVES







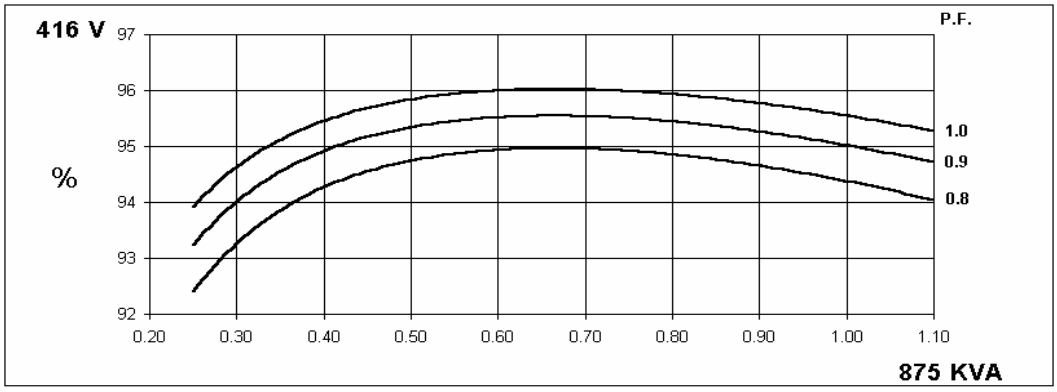


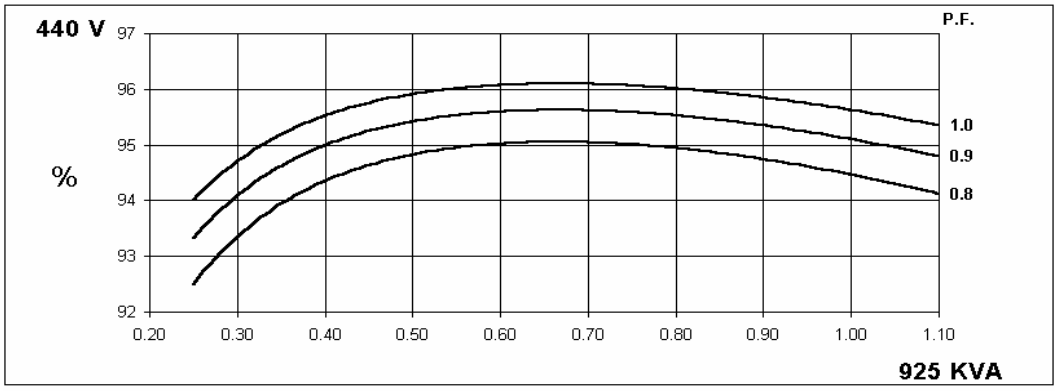
60 Hz

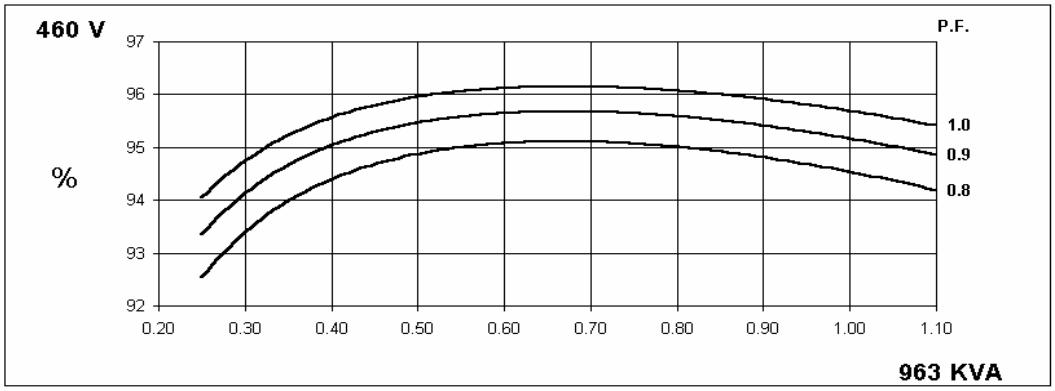
HCI634G

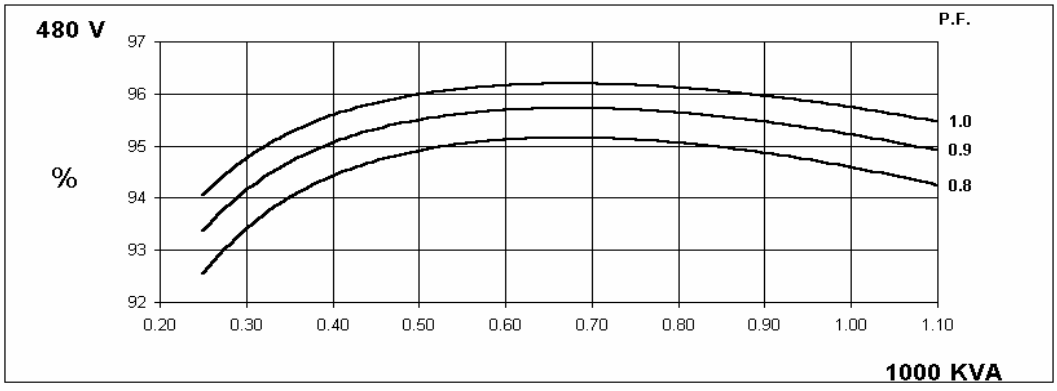
WINDING 311 and 312

THREE PHASE EFFICIENCY CURVES





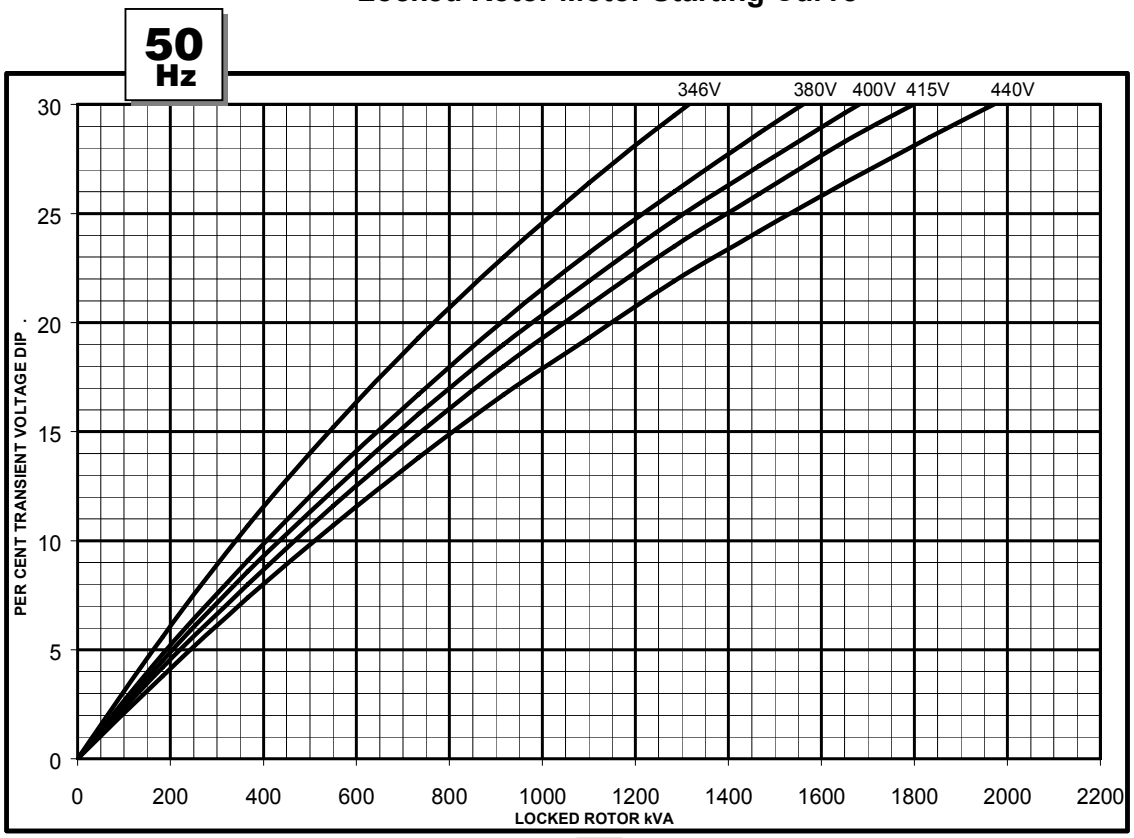


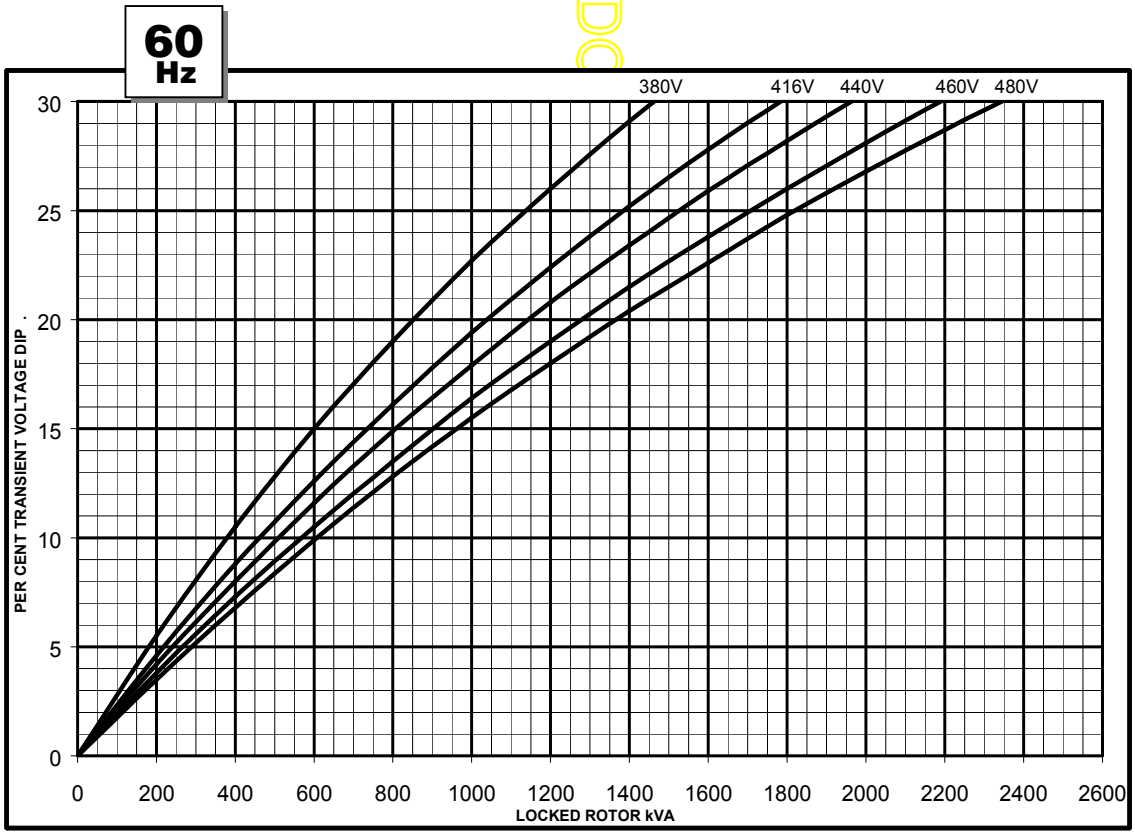


HCI634G

WINDING 311 and 312

Locked Rotor Motor Starting Curve





HCI634G

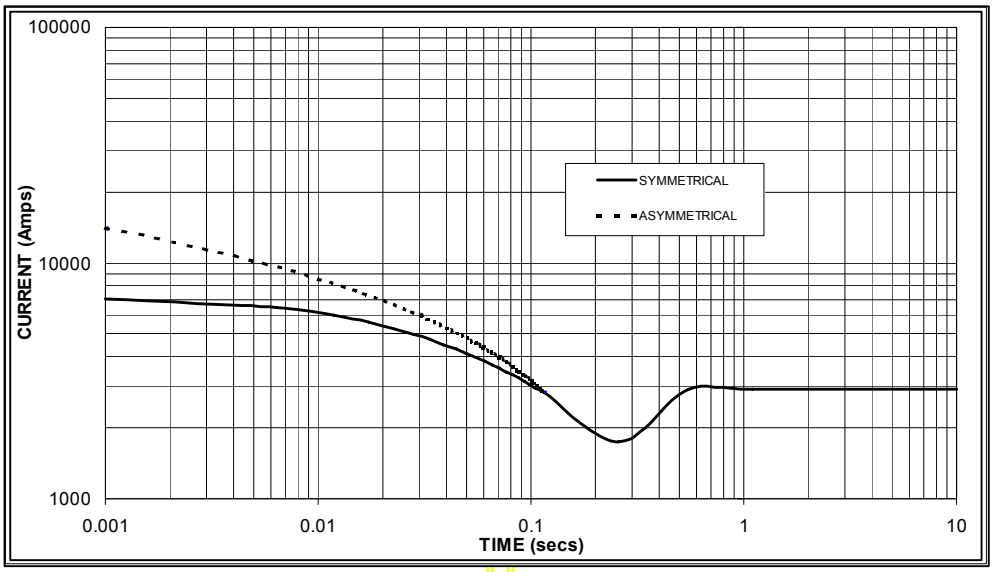
STAMFORD

WINDING 311 and 312

Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed

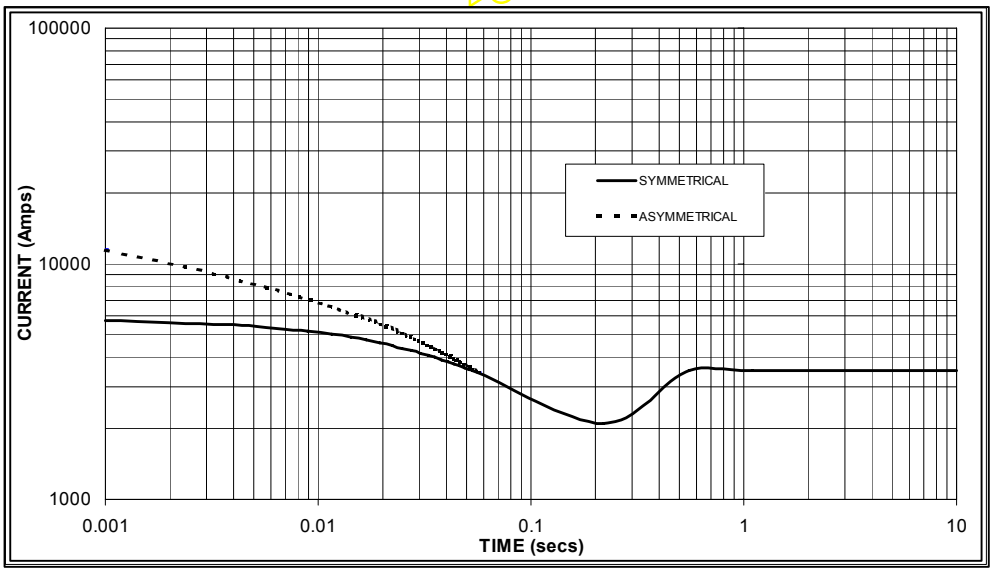
Based on star (wye) connection.

50 Hz



Sustained Short Circuit = 2,900 Amps

60 Hz



Sustained Short Circuit = 3,500 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 1.07	440v	x 1.06
415v	X 1.12	460v	x 1.12
440v	X 1.18	480v	x 1.17

The sustained current value is constant irrespective of voltage level

Note 2

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

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

All other times are unchanged

Note 3

Curves are drawn for Star (Wye) connected machines. For Delta connection multiply the Curve current value by 1.732

HCI634G

STAMFORD

Winding 311 and 312 0.8 Power Factor

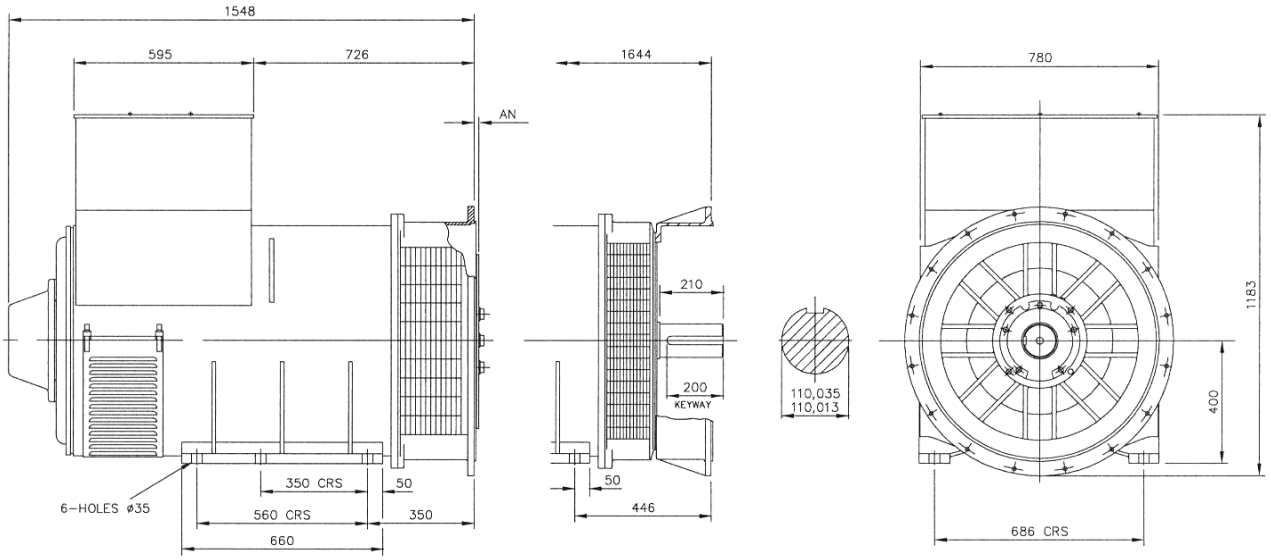
RATINGS

Class - Temp Rise		Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C			
50Hz	Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V) *	180	200	208	220	180	200	208	220	180	200	208	220	180	200	208	220
	Delta (V)	220	230	240	254	220	230	240	254	220	230	240	254	220	230	240	254
	kVA	750	760	750	750	800	810	800	800	825	830	825	820	850	860	850	850
	kW	600	608	600	600	640	648	640	640	660	664	660	656	680	688	680	680
	Efficiency (%)	94.5	94.6	94.8	95.0	94.2	94.4	94.6	94.8	94.1	94.3	94.5	94.7	93.9	94.2	94.4	94.6
	kW Input	635	643	633	632	679	686	677	675	702	704	698	693	724	730	720	719

60Hz	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	813	844	888	913	875	925	963	1000	913	969	1008	1046	950	1000	1044	1088
	kW	650	675	710	730	700	740	770	800	730	775	806	837	760	800	835	870
	Efficiency (%)	94.6	94.7	94.8	94.8	94.4	94.5	94.5	94.6	94.2	94.3	94.4	94.4	94.1	94.2	94.3	94.3
	kW Input	688	713	749	770	742	783	815	846	775	822	854	886	808	849	886	923

* Parallel Star only available with Wdg 311

DIMENSIONS



SAE	14	18	21	24
AN	25.4	15.87	0	0

APPROVED DOCUMENT

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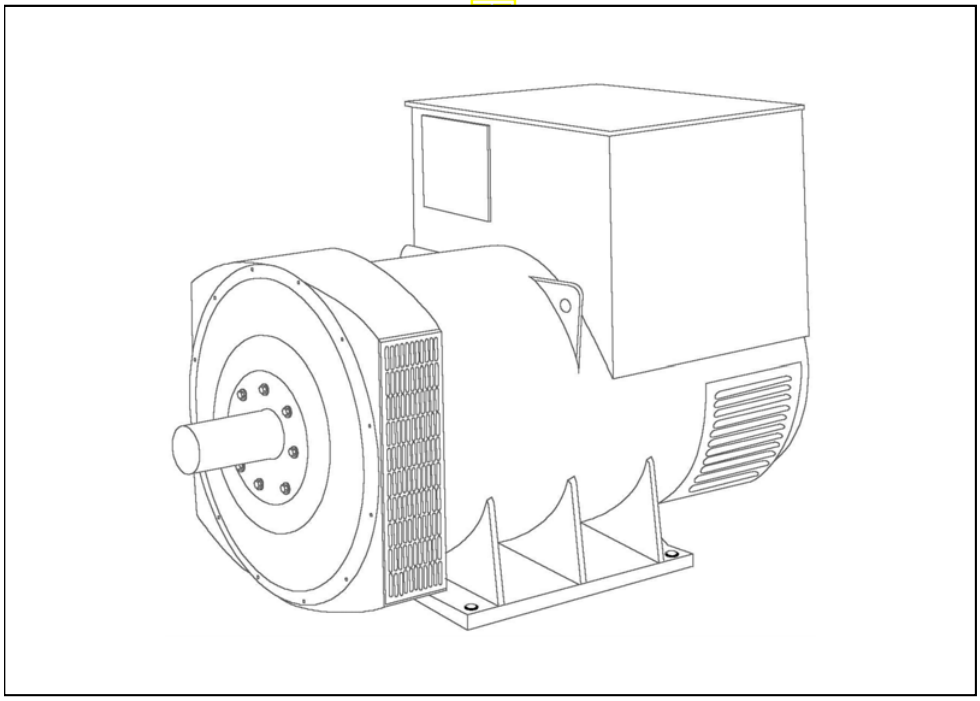
STAMFORD®

HCI634G - Winding 07

Technical Data Sheet



STANDARDS

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

VOLTAGE REGULATORS

MX321 AVR - STANDARD

This sophisticated Automatic Voltage Regulator (AVR) is incorporated into the Stamford Permanent Magnet Generator (PMG) system and is fitted as standard to generators of this type.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

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

TERMINALS & TERMINAL BOX

Standard generators feature a main stator with 6 ends brought out to the terminals, which are mounted on the frame at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

All generator rotors are dynamically balanced to better than BS6861:Part 1 Grade 2.5 for minimum vibration in operation. Two bearing generators are balanced with a half key.

INSULATION/IMPREGNATION

The insulation system is class 'H'.
All wound components are impregnated with materials and processes designed specifically to provide the high build required for static windings and the high mechanical strength required for rotating components.

QUALITY ASSURANCE

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

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

DE RATES

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

5% when air inlet filters are fitted.
10% when IP44 filters are fitted.
3% for every 500 metres by which the operating altitude exceeds 1000 metres above mean sea level.
3% for every 5 C by which the operational ambient temperature exceeds 40 C.
Note: Requirement for operating in an ambient exceeding 60 C must be referred to the factory.

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

Front cover drawing typical of product range.

HCI634G

STAMFORD

WINDING 07

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

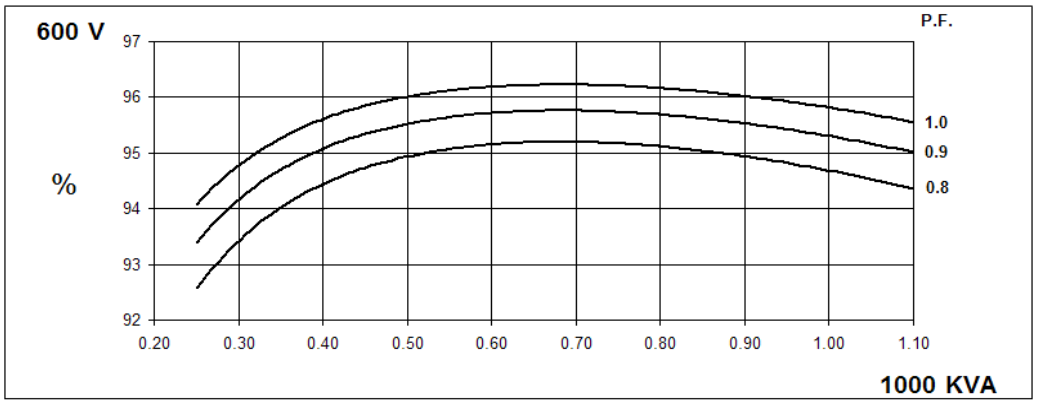
INSULATION SYSTEM	CLASS H	
PROTECTION	IP23	
RATED POWER FACTOR	0.8	
STATOR WINDING	DOUBLE LAYER LAP	
WINDING PITCH	TWO THIRDS	
WINDING LEADS	6	
STATOR WDG. RESISTANCE	0.0055 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED	
ROTOR WDG. RESISTANCE	1.75 Ohms at 22°C	
EXCITER STATOR RESISTANCE	17 Ohms at 22°C	
EXCITER ROTOR RESISTANCE	0.079 Ohms PER PHASE AT 22°C	
R.F.I. SUPPRESSION	BS EN 61000-6-2 & BS EN 61000-6-4,VDE 0875G, VDE 0875N. refer to factory for others	
WAVEFORM DISTORTION	NO LOAD < 1.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%	
MAXIMUM OVERSPEED	2250 Rev/Min	
BEARING DRIVE END	BALL. 6224 (ISO)	
BEARING NON-DRIVE END	BALL. 6317 (ISO)	
	1 BEARING	2 BEARING
WEIGHT COMP. GENERATOR	1965 kg	1989 kg
WEIGHT WOUND STATOR	934 kg	934 kg
WEIGHT WOUND ROTOR	814 kg	766 kg
WR² INERTIA	18.3482 kgm^2	17.8009 kgm^2
SHIPPING WEIGHTS in a crate	2023 kg	2029 kg
PACKING CRATE SIZE	183 x 92 x 140(cm)	183 x 92 x 140(cm)
TELEPHONE INTERFERENCE	THF<2%	TIF<50
COOLING AIR	1.961 m³/sec 4156 cfm	
VOLTAGE STAR	600V	
VOLTAGE DELTA	346V	
kVA BASE RATING FOR REACTANCE VALUES	1000	
Xd DIR. AXIS SYNCHRONOUS	2.96	
X'd DIR. AXIS TRANSIENT	0.22	
X"d DIR. AXIS SUBTRANSIENT	0.16	
Xq QUAD. AXIS REACTANCE	1.74	
X"q QUAD. AXIS SUBTRANSIENT	0.19	
X_L LEAKAGE REACTANCE	0.08	
X_2 NEGATIVE SEQUENCE	0.20	
X_0 ZERO SEQUENCE	0.03	
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED	
T'd TRANSIENT TIME CONST.	0.185s	
T"d SUB-TRANSTIME CONST.	0.025s	
T'do O.C. FIELD TIME CONST.	2.35s	
Ta ARMATURE TIME CONST.	0.04s	
SHORT CIRCUIT RATIO	1/Xd	

HCI634G

STAMFORD

Winding 07

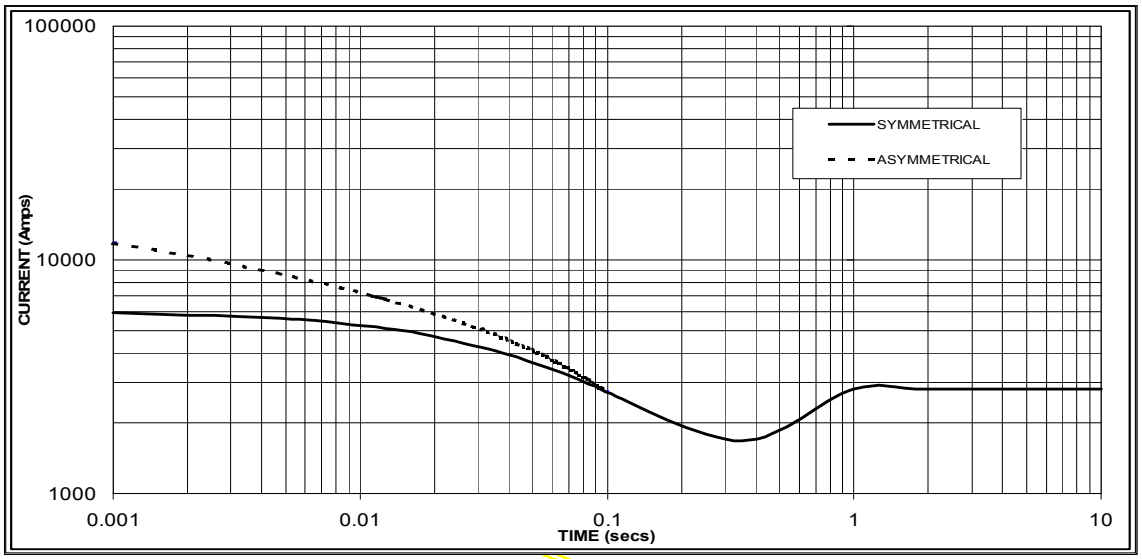
THREE PHASE EFFICIENCY CURVES



Locked Rotor Motor Starting Curve

STAMFORD

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



Sustained Short Circuit = 2800 Amps

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

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

All other times are unchanged

HCI634G

STAMFORD

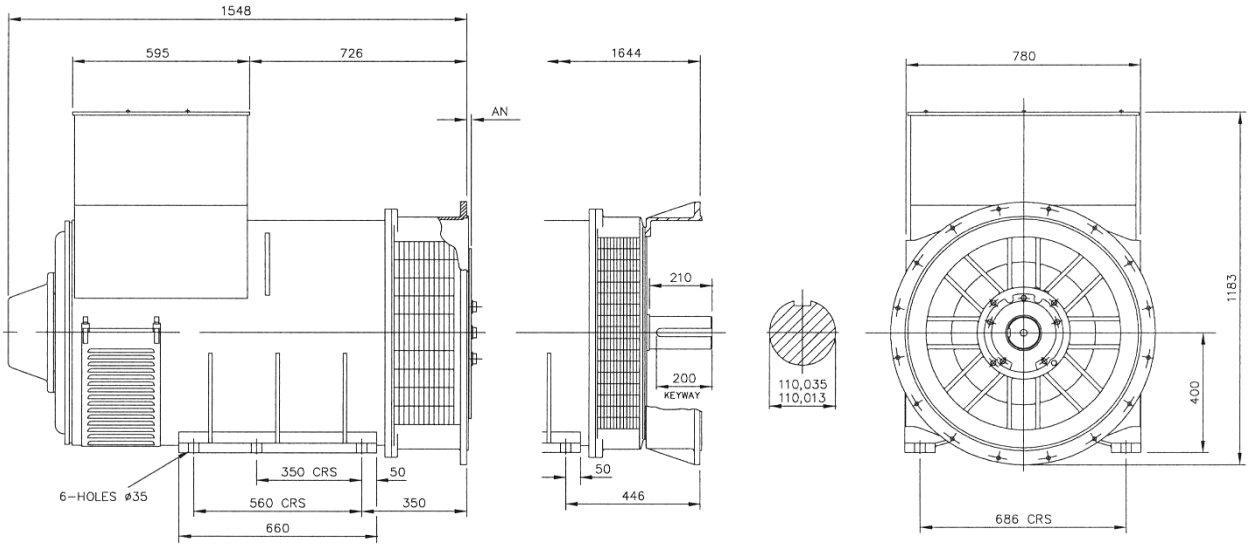
Winding 07 / 0.8 Power Factor

60Hz

RATINGS

Class - Temp Rise	Cont. F - 105/40°C	Cont. H - 125/40°C	Standby - 150/40°C	Standby - 163/27°C
Star (V)	600	600	600	600
Delta (V)	346	346	346	346
kVA	913	1000	1046	1088
kW	730	800	837	870
Efficiency (%)	94.9	94.7	94.5	94.4
kW Input	769	845	886	922

DIMENSIONS



SAE	14	18	21	24
AN	25.4	15.87	0	0

APPROVED DOCUMENT

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www.cumminsgeneratortechnologies.com

DSEGenset®

DSE7410/20 MKII

AUTO START & AUTO MAINS FAILURE CONTROL MODULES

DSE**7420 MKII**

DSE**7410 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	PART NO.
DSE7410 MKII & DSE7420 MKII Installation Instructions	053-191
DSE7410 MKII & DSE7420 MKII Operator Manual	057-263
DSE7410 MKII & DSE7420 MKII Configuration Suite PC Manual	057-262

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

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

DSEGenset®

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

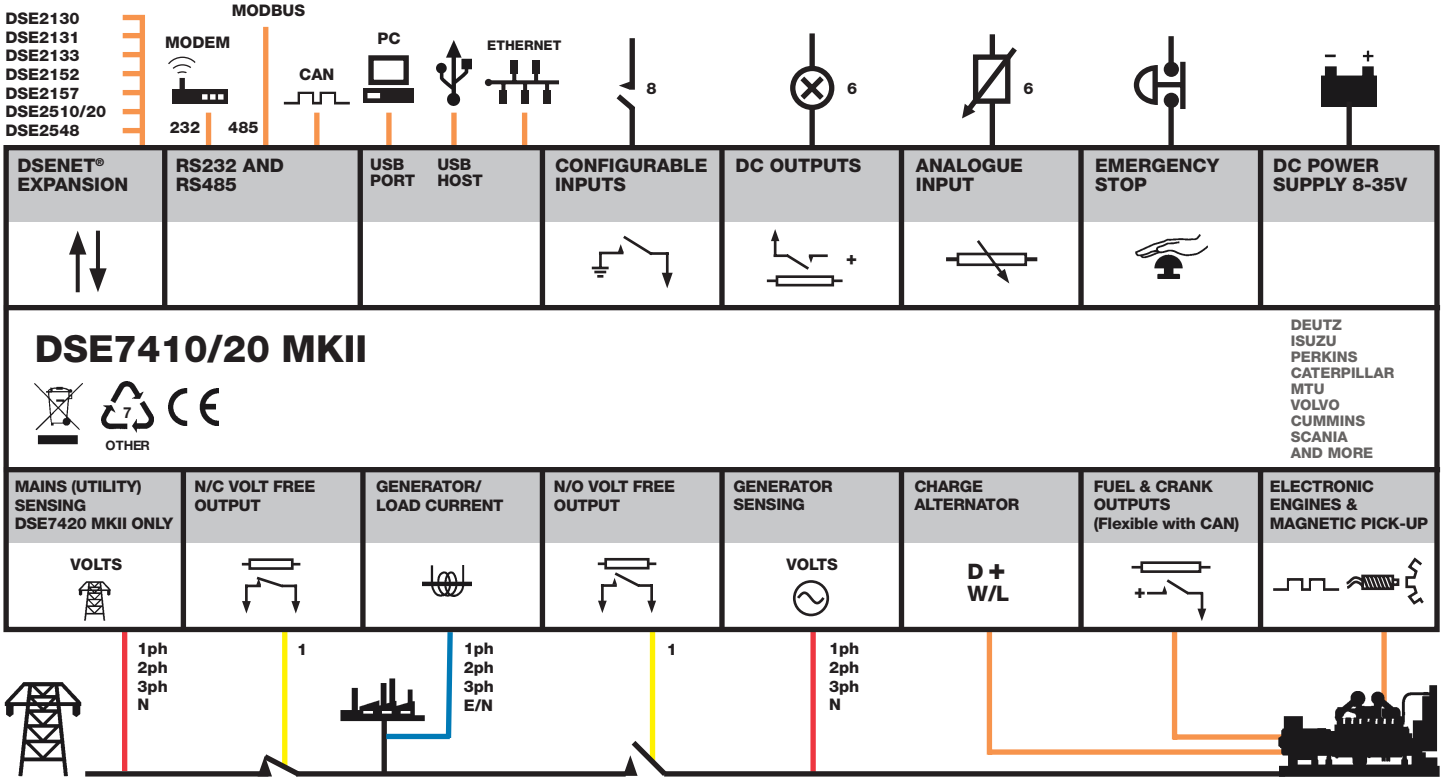
VIBRATION
BS EN 60068-2-6
Ten sweeps in each of three major axes
5 Hz to 8 Hz at +/-7.5 mm,
8 Hz to 500 Hz at 2 gn

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



LISTED

ISSUE 1

Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG53K1200E3RNNNNNNN

Powering Business Worldwide

Datasheet creation date: 19/08/2019

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

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

Tech Data for Configured Product

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

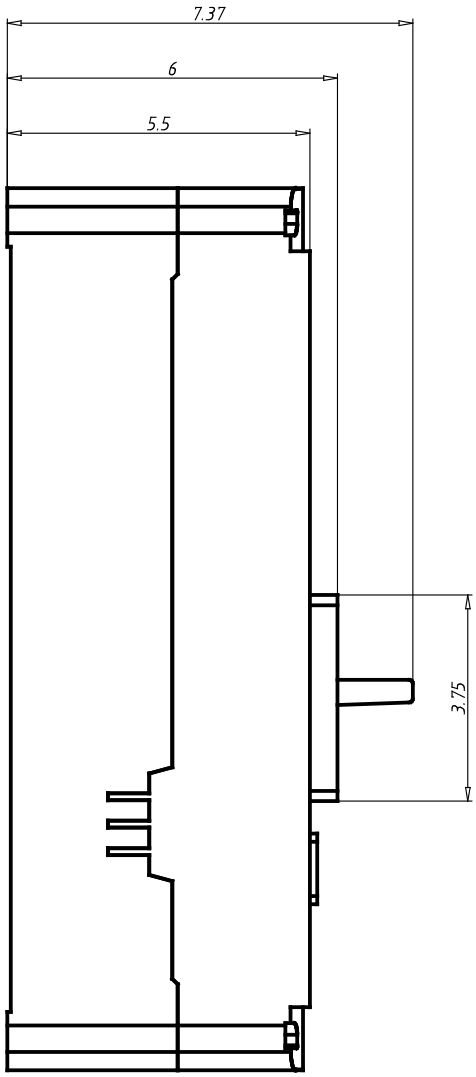
Molded Case Circuit Breakers

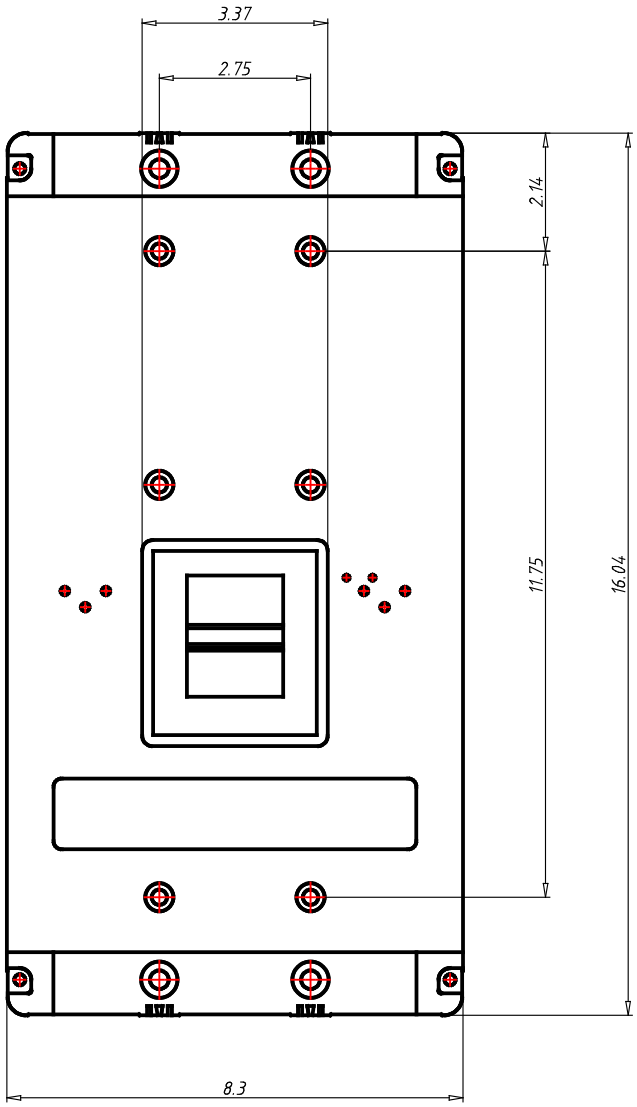
Power Defense ™ UL Global Series

Part Number: PDG53K1200E3RNNNNNNN

Datasheet creation date: 19/08/2019

Technical drawings





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

Powering Business Worldwide

Datasheet creation date: 19/08/2019

General Technical Data

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

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

Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG63M1600E3RNNNNNNN

Powering Business Worldwide

Datasheet creation date: 26/08/2019

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

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

Tech Data for Configured Product

Power Defense Catalog Number	PDG63M1600E3RNNNNNNN
Frame Size	Frame 6
Poles	3 Pole
Voltage	480V AC
Interruption or Breaking Capacity (Icu/Ics)	65kA
Continuous Current Rating (In)	1600A
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

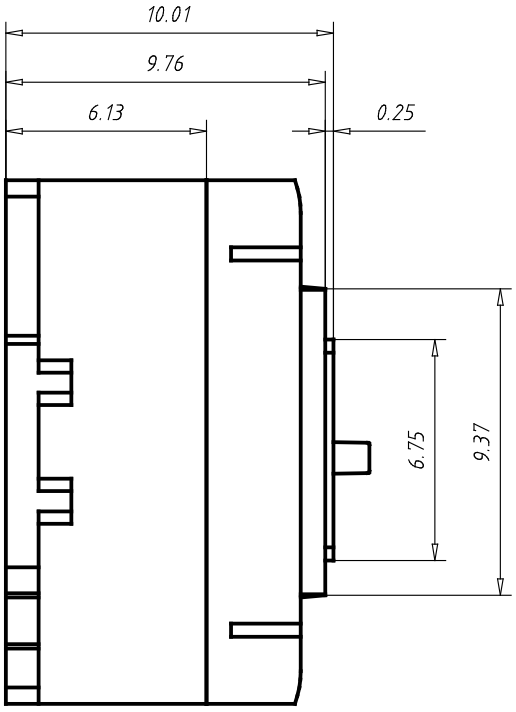
Molded Case Circuit Breakers

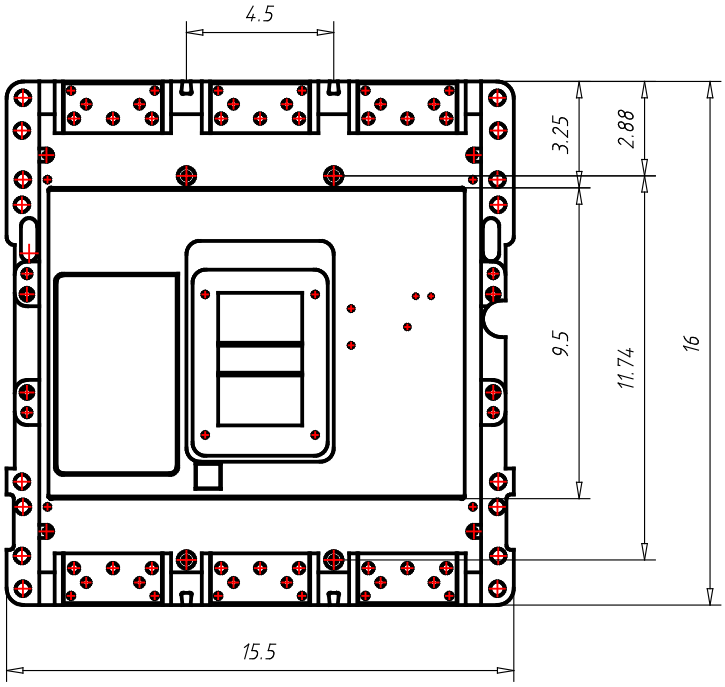
Power Defense ™ UL Global Series

Part Number: PDG63M1600E3RNNNNNNN

Datasheet creation date: 26/08/2019

Technical drawings





Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG63M1600E3RNNNNNNN

Powering Business Worldwide

Datasheet creation date: 26/08/2019

General Technical Data

Frame Rating (In)	1600A
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: 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

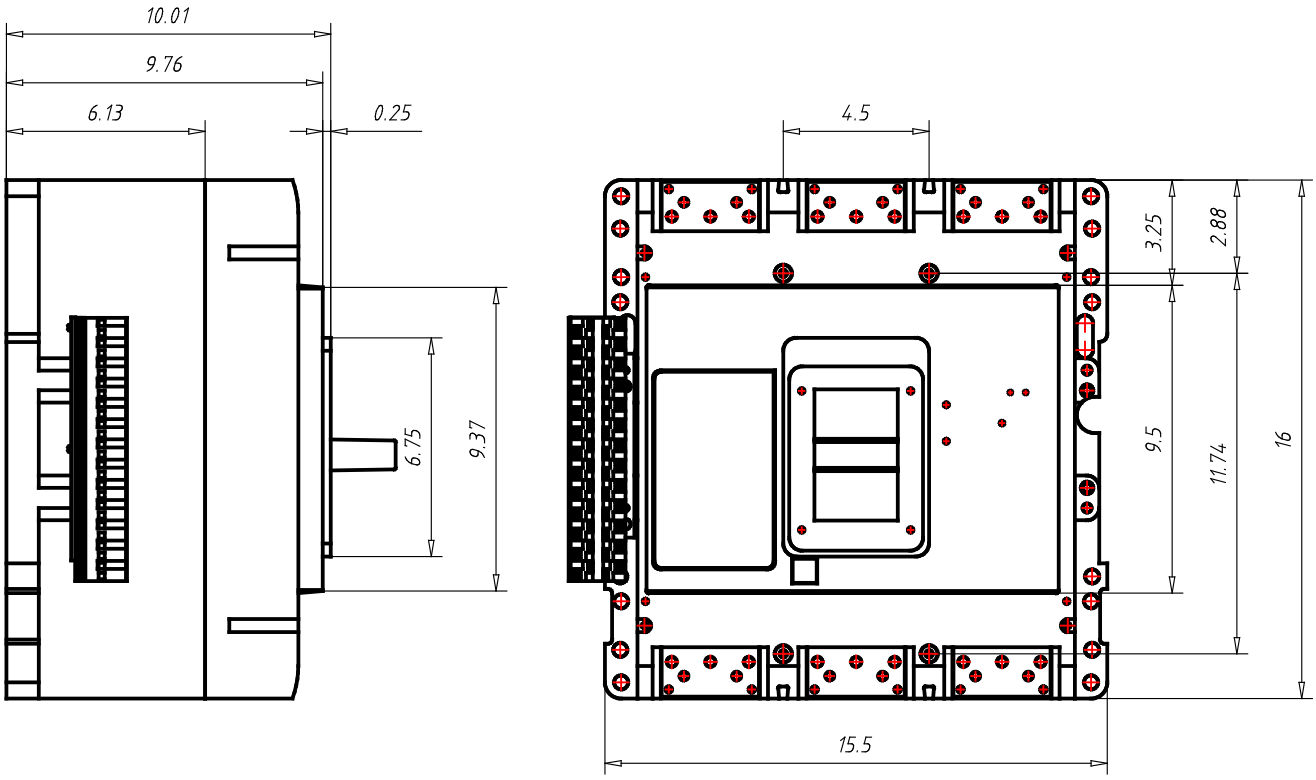
Molded Case Circuit Breakers

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

Main characteristics

The Tmax family, conforming to the UL 489 and CSA C22.2 No. 5.1 Standards, is enriched with the Tmax T8 size, which allows 3000 A to be reached. Also available in the 1600 A, 2000 A and 2500 A frames, Tmax T8 is equipped with the same electronic trip units as Tmax T7, thereby guaranteeing extremely high performances able to satisfy all installation requirements. Adequately sized for the performances offered (W=16.8 / D=11.2 / H=15.0 in). Tmax T8 is able to interrupt the following short-circuit currents: 125 kA@480 V and 100 kA@600 V.

Main characteristics

General characteristics

The Tmax T8 size has both circuit breakers and molded case switches (MCS). The following tables show the main characteristics of these ranges.

Circuit breakers for power distribution

				Tmax T8
Frame size			[A]	1600/2000/2500/3000
Number of poles			[No]	3/4
Rated voltage		(AC) 50-60 Hz	[V]	600
		(DC)	[V]	–
Test voltage (1 min) 50-60 Hz			[V]	3000
Interrupting ratings			[kA rms]	V
	240 V AC		[kA rms]	125
	480 V AC		[kA rms]	125
	600 V AC		[kA rms]	100
Trip units	Electronic	PR232/P-T8		■
		PR331/P		■
		PR332/P		■
Dimensions fixed version (3p)		H	[in-mm]	15.0 - 382
		W	[in-mm]	16.8 - 427
		D	[in-mm]	11.2 - 282
Mechanical life			[operations]	15000
Weight (fixed 3p)		1600/2000/2500 A	[lbs]	161
		3000 A	[lbs]	236

Molded case switches (MCS)

The Tmax T8 MCS are derived from the corresponding circuit breakers, of which they keep the overall dimensions, the versions, the fixing systems and the possibility of mounting accessories unchanged. This version only differs from the circuit breakers in the absence of the protection trip units. All molded case switches comply with the UL 489 and CSA C22.2 Standards and are self-protected.

			Tmax T8V-D
Rating		[A]	2000/2500/3000
Poles		[No]	3/4
Magnetic override		[A]	40000
Rated voltage	AC (50-60 Hz)	[V]	600
	DC	[V]	–

NRG

Intelligent Engine Start Battery Charger

CONSULTING - SPECIFYING engineer 2009 PRODUCT OF THE YEAR Gold

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

ISO 9000 · c UL us LISTED · CE · IEC 61000-6-2 · IBC 2006 · oshpd PRE-APPROVED

SENS®
STORED ENERGY SYSTEMS

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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

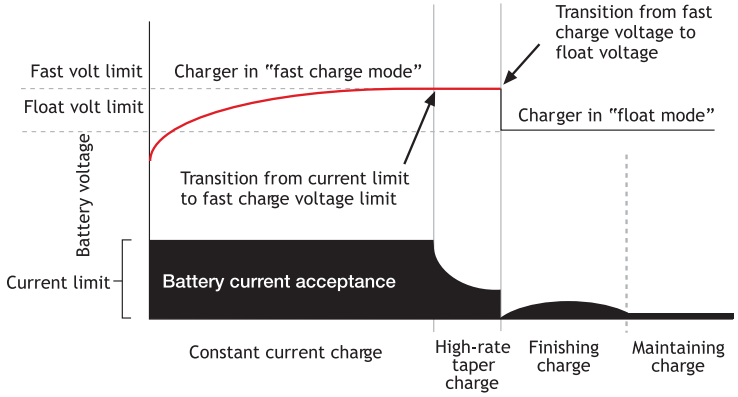
AC Input

Voltage	110-120/208-240 VAC, ±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 ±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	Automatic meter alternately displays output volts, amps[1]
Accuracy	±2% volts, ±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[2]
Low battery volts	LED and Form C contact[2]
High battery volts	LED and Form C contact[2]
Charger fail	LED and Form C contact[2]
Battery fault[3]	LED and Form C contact[2]

1. Three-position jumper allows user to select from three display settings: alternating volts / amps (normal), constant volts, or constant amps
2. Contacts rated 2A @ 30 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
Meter display select	Field-selectable three-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, EN 61000-6-2
Seismic Certification	IBC 2000, 2003, 2006, 2009 Maximum S_{ds} of 2.28 g, Optional OSHPD pre-approval

Agency Standards

Safety	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
Agency marking	60 Hz: C-UL-US listed 50/60 Hz: C-UL-US listed plus CE marked
EMC	Emissions: FCC Part 15, Class B; EN 50081-2 Immunity: EN 61000-6-2
NFPA standards	NFPA 70, NFPA 110. (NFPA 110 requires Alarms "C")
Optional agency compliance	OSHPD pre-approval

Construction

Housing/configuration	Material: Non-corroding aluminum. C-UL listed enclosure.
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 IP21 drip shield. Optional NEMA 3R enclosure
Damage prevention	Fully recessed display and controls
Electrical connections	Compression terminal blocks

Warranty

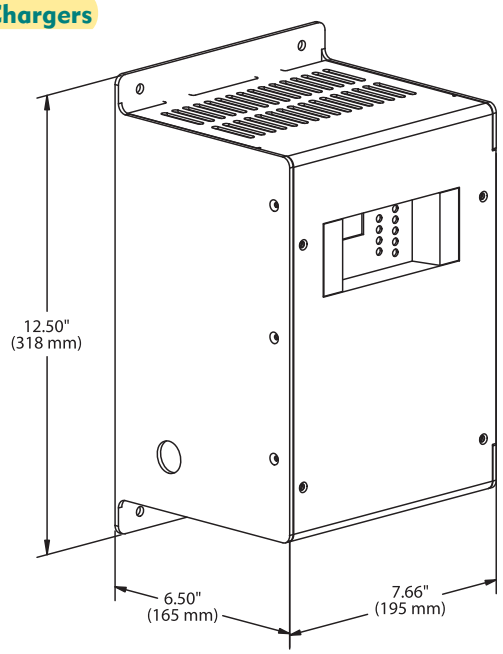
Standard warranty	Three year parts and labor warranty (10 years magnetics and power semiconductors) from date of shipment
Optional warranty	If specified at time of order, warranty coverage for the standard warranty period can be upgraded to reimburse customer's documented field service costs up to the 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

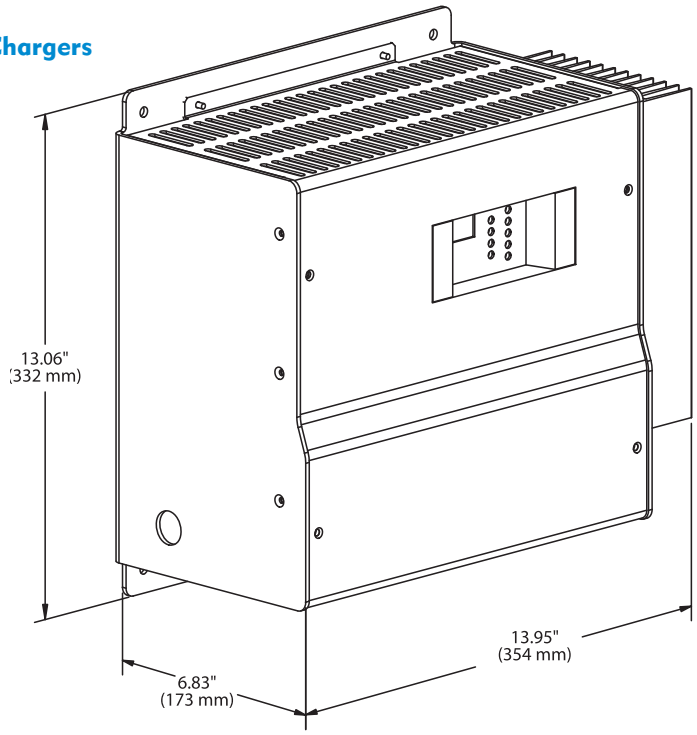
Input	Input frequency, 50/60 Hz
Remote temp comp sensor	Recommended where battery and charger are in different locations
Drip shield meets s/b (IP21)	Protects from dripping water
NEMA 3R housing	Enables outdoor installation (remote temp sensor recommended)

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

NRG □□ – 1 0 – □ C □

- **Model**
- **Output voltage**
  - 12: 12 volts
  - 24: 24 volts
  - 22: 12/24-volt field selectable
- **AC input**
  - R: 120/208-240 VAC, 60 Hz
  - H: 120/208-240 VAC, 50/60 Hz
- **Option code**
  - E: OSHPD Pre-Approved

Model Number Breakout - 20 Amp Models

NRG □□ – 2 0 – □ C L S □

- **Model**
- **Output voltage**
  - 12: 12 volts
  - 24: 24 volts
  - 22: 12/24-volt field selectable
- **AC input**
  - R: 120/208-240 VAC, 60 Hz
  - H: 120/208-240 VAC, 50/60 Hz
- **Option code**
  - E: OSHPD Pre-Approved

All NRG models are C-UL Listed to UL1236

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

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.

ISO 9000 · c UL us LISTED · CE · IBC 2006 · oshpd PRE-APPROVED · engineer 2009 PRODUCT OF THE YEAR Gold

Contact Information

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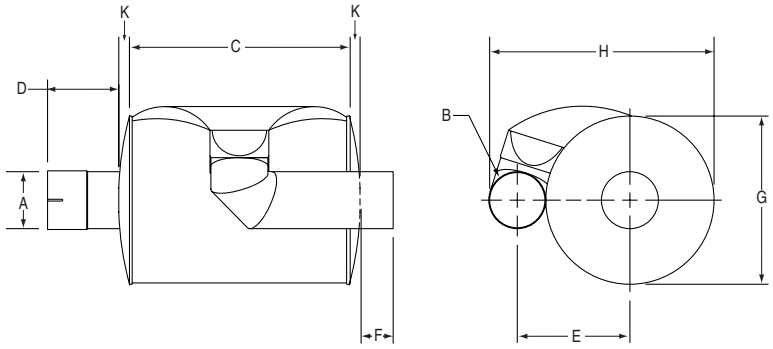
www.sens-usa.com • info@sens-usa.com
1840 Industrial Circle, Longmont, CO 80501 USA

SENS®
STORED ENERGY SYSTEMS

TXS Critical Grade - TR Model

*Typical Insertion Loss 28-33 dbA**



*Actual insertion loss value may vary by application.

All measurements in inches unless otherwise noted.

Features

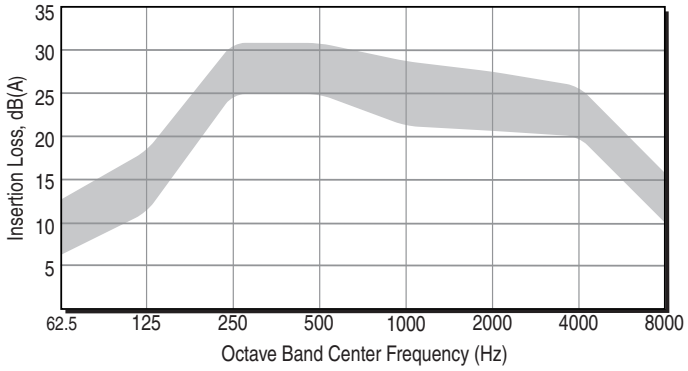
- Compact Spiral Chamber Design
- Premium Silencing
- Low Back Pressure
- Low Weight
- Aluminized Steel Construction
  Maximum Temp: 1200 °F (650 °C)
- Standard High-Temperature Finish
- All MIG Welded Construction
- Steel Wool and Mesh Liner
- Slip-fit Connections Standard

Options

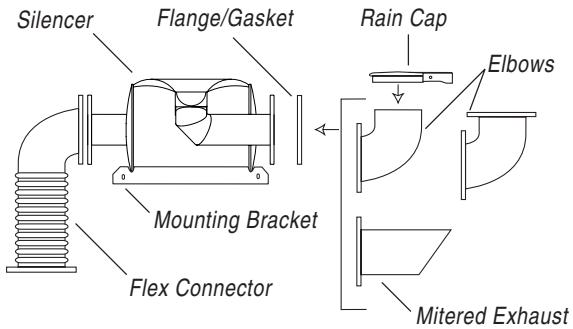
- Factory Customization Available
- 316L Stainless Steel Construction
- Reverse Flow
- Inlet/Outlet Configurations
- 125/150# A.N.S.I. Flange Connections
- Male/Female N.P.T. Connections
- Exterior Finishes
- Complete line of Accessories and Mounting Brackets

COWL Model No.	COWL Part No.	Inlet A dia. (I.D.)	Outlet B dia. (O.D.)	C	D	E	F	G	H	K	Approximate Weight
TXS15TR	**TXS15TRS000**	1.50	1.50	5.24	2.50	5.19	2.07	8.81	10.38	0.50	14 lbs
TXS20TR	**TXS20TRS000**	2.00	2.00	7.24	3.50	5.41	2.07	8.81	10.81	0.50	19 lbs
TXS25TR	**TXS25TRS000**	2.50	2.50	8.24	3.25	7.16	1.82	11.81	14.31	0.75	32 lbs
TXS30TR	**TXS30TRS000**	3.00	3.00	9.24	5.00	9.53	2.07	16.06	19.06	1.00	52 lbs
TXS35TR	**TXS35TRS000**	3.50	3.50	11.49	5.00	9.78	2.07	16.06	19.56	1.00	63 lbs
TXS40TR	**TXS40TRS000**	4.00	4.00	15.49	5.00	10.03	2.07	16.06	20.06	1.00	77 lbs
TXS45TR	**TXS45TRS000**	4.50	4.50	12.49	4.55	11.94	1.46	19.38	23.88	1.45	81 lbs
TXS50TR	**TXS50TRS000**	5.00	5.00	16.49	4.55	12.19	2.12	19.38	24.38	1.45	98 lbs
TXS60TR	**TXS60TRS000**	6.00	6.00	22.49	4.55	12.69	2.05	19.38	25.38	1.45	137 lbs
TXS70TR	**TXS70TRS000**	8.00	8.00	15.41	6.55	17.25	3.97	26.50	34.50	1.45	147 lbs
TXS80TR	**TXS80TRS000**	8.00	8.00	24.33	6.55	17.25	3.97	26.50	34.50	1.45	227 lbs
TXS100TR	**TXS100TRS000**	10.00	10.00	30.08	6.25	22.00	2.62	34.00	44.00	1.75	375 lbs
TXS120TR	**TXS120TRS000**	12.00	12.00	36.08	5.75	26.00	3.71	40.00	52.00	2.25	532 lbs

Representative Cowl Insertion Loss - **TXS Series** dB(A)



Engine Exhaust Silencer & Accessories



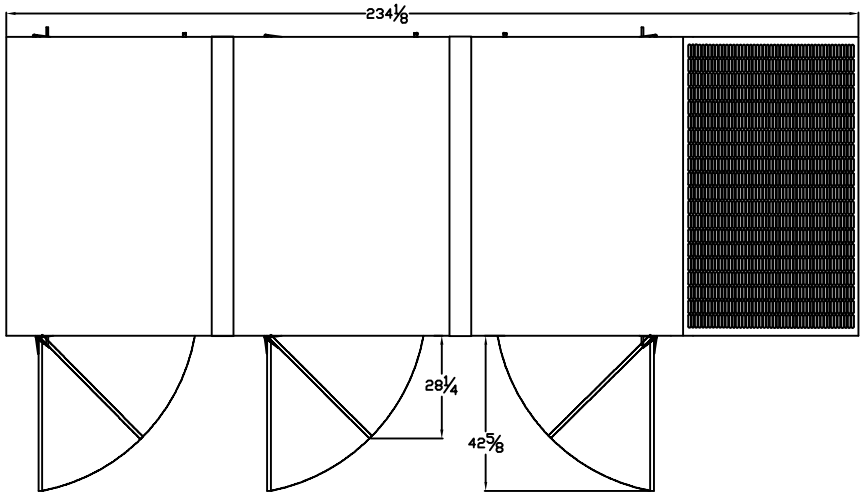
Not pictured: Insulation Blanket

TXS-TR

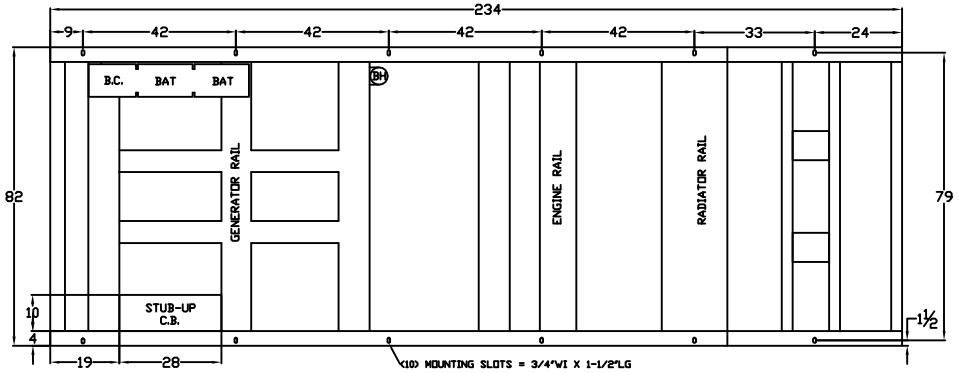
LEVEL 2 & 3 ENCLOSURE OUTLINE DIMENSIONS
FOR SPMI-8000

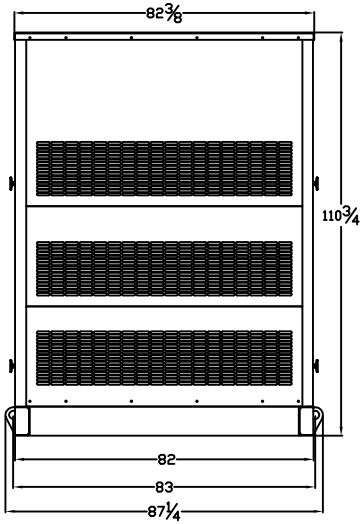
TOP VIEW

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

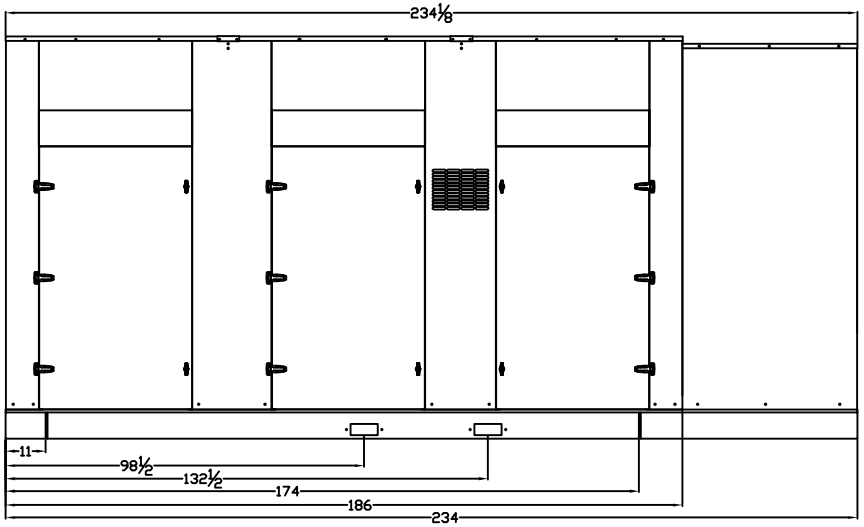


FRAME VIEW

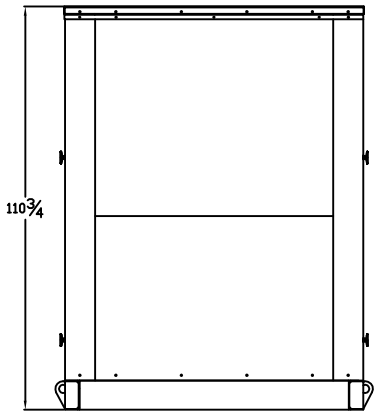




GENERATOR END VIEW



SIDE VIEW



RADIATOR END VIEW

SPMI-8000-L2-L3-GENERATOR-SET-HINGES-OVERVIEW-20200212