



# GILLETTE GENERATORS

## LIQUID COOLED DIESEL ENGINE GENERATOR SET

Model	HZ	STANDBY
		130°C RISE
<b>SPMI-8000-60 HERTZ</b>	60	800

## 60 HZ MODEL SPMI-8000



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**

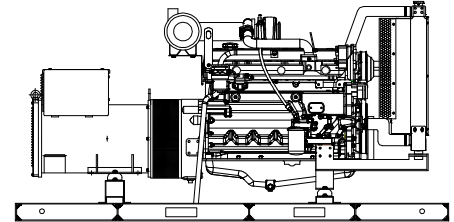


**ASCE 7-05 & 7-10**

All generator sets meet 180 MPH rating.

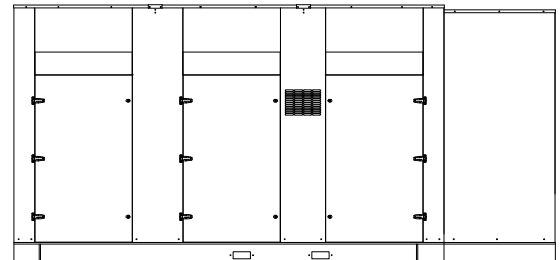


**EPA 40CFR Part 60, 1048, 1054, 1065, 1068**



“OPEN” GEN-SET

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



“LEVEL 2” HOUSED GEN-SET

Full aluminum weather protection and superior sound attenuation for specific low noise applications. Critical grade muffler is standard.

### GENERATOR RATINGS

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

## ENGINE SPECIFICATIONS AND APPLICATIONS DATA

### ENGINE

Manufacturer..... 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 <sup>3</sup> /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 <sup>3</sup> /min).....	44,950 (1,272)

## EXHAUST SYSTEM

Exhaust Outlet Size .....	12"
Max. Back Pressure in KPA (in. H <sub>2</sub> O).....	5.9 (24.1)
Exhaust Flow, at rated KW, CFM (m <sup>3</sup> /min).....	8,192 (232)
Exhaust Temp, (Stack) °F (°C) .....	883 (473)

## SOUND LEVELS MEASURED IN dB(A)

	<u>Open</u>	<u>Level 2</u>
	<u>Set</u>	<u>Encl.</u>
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

	<u>Open</u>	<u>Level 2</u>
	<u>Set</u>	<u>Enclosure</u>
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).....	15950 (7235)	16440 (7457)
3 Ø Ship Weight lbs (kg) .....	16340 (7412)	18840 (8546)

# BASLER DGC-2020 DIGITAL MICROPROCESSOR CONTROLLER

### Basler DGC-2020



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

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

This controller includes expansion features including, RS485 (using MODBUS), direct USB connection with PC, expansion optioned using BESTCOMSPPlus for remote annunciation and remote relay interfacing for a distance of up to 3300FT. The controller software is freely downloadable from the internet and allows monitoring with direct USB cable, LAN, or by internet via the built in web interface.



Further expansion is available by adding the optional RDP-110 remote display panel module. This featured device will allow Four programmable LEDs (2) alarms and (2) pre-alarms • (17) alarms and pre-alarms displayed from Basler controller • audible alarm horn • lamp test and alarm silence buttons • RD100 local power supply inputs of either 12vdc or 24vdc • connects through Basler controller through RS-485 communications protocol • conduit box included for (2) mounting configurations- either surface mount or semi-flush mounting.

# STANDARD FEATURES FOR MODEL SPMI-8000-60 HZ

## STANDARD FEATURES

### CONTROL PANEL:

- Basler DGC-2020 digital microprocessor with logic allows programming in the field. Controller has:
- STOP-MANUAL-AUTO modes and automatic engine shutdowns, signaled by full text LCD indicators:
  - Low oil pressure                      • Engine fail to start
  - High engine temp                      • Engine over speed
  - Low Radiator Level                      • Engine under speed
  - Three auxiliary alarms                      • Over & under voltage
  - Battery fail alarm

Also included is tamper-proof engine hour meter

### ENGINE:

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

### AC GENERATOR SYSTEM:

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

### VOLTAGE REGULATOR:

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

### DC ELECTRICAL SYSTEM:

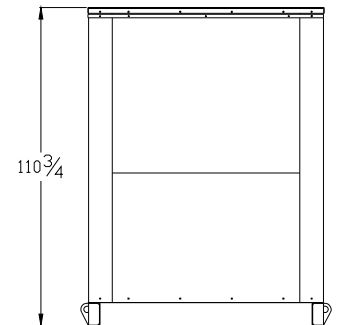
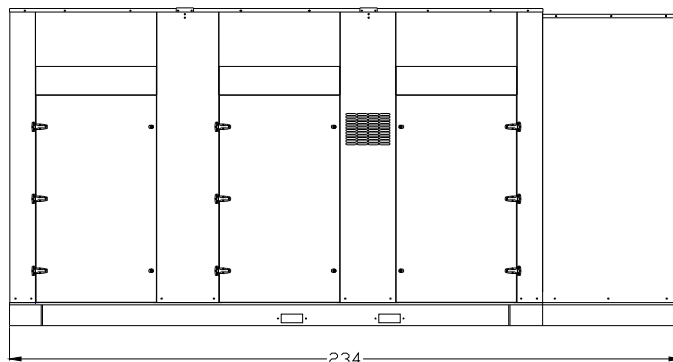
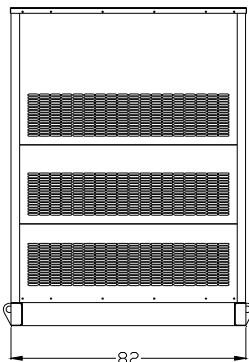
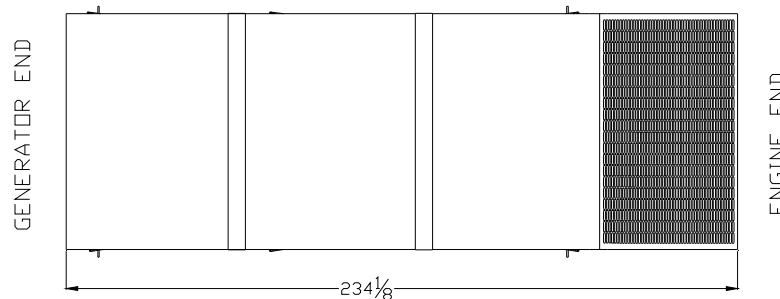
- Battery tray • Battery cables • Battery hold down straps • 3-stage battery charger with float, absorption, & bulk automatic charge stages

### WEATHER / SOUNDPROOF ALUMINUM HOUSING:

Corrosion Resistant Protection consisting of:

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

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





**MITSUBISHI DIESEL ENGINE  
TECHNICAL INFORMATION**

ITEM NO.

T0213-0005E (1/4)

DATE

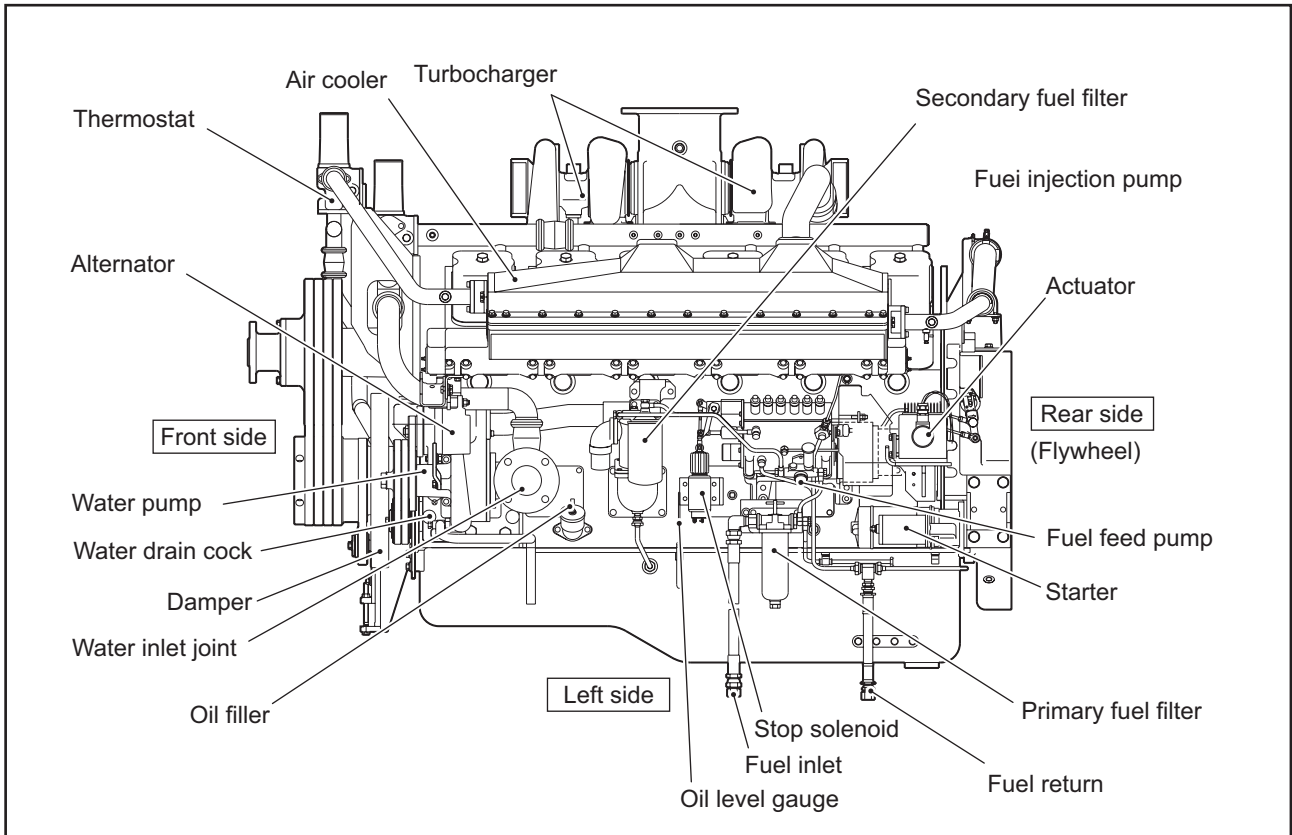
June, 2012

Specification Sheets of S12A2-Y2PTAW-2 Engine

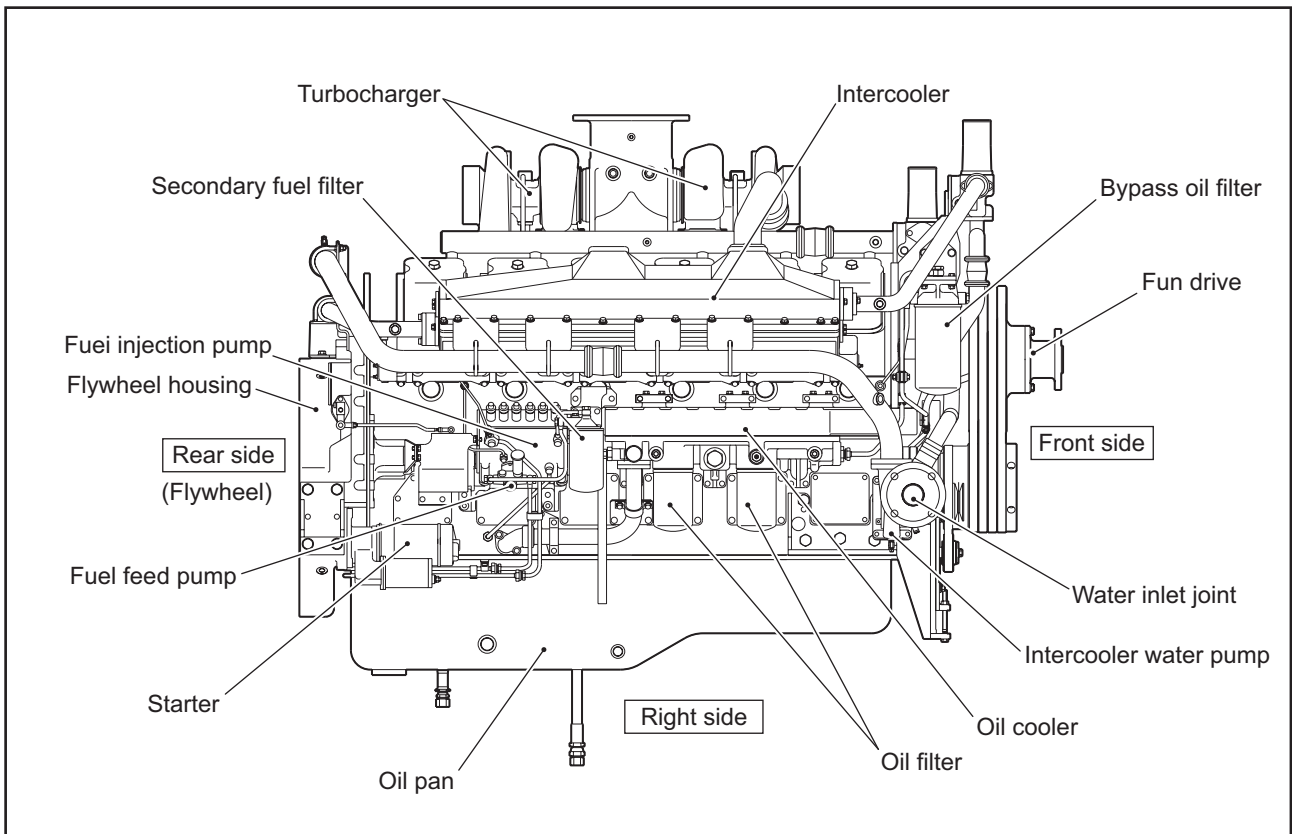
Specification Sheets of S12A2-Y2PTAW-2 Engine are enclosed herein.

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 <sup>-1</sup> )	
	Relief valve	Type	Main gallery pressure detection type	
		Valve opening pressure	0.49 to 0.69 MPa {5.0 to 7.0 kgf/cm <sup>2</sup> } [71.3 to 99.58 psi]	
	Oil cooler	Type	Water-cooled, multi-plate type	
	Oil filter	Type	Cartridge paper-element type, filtration rating 20μm	
	Bypass oil filter	Type	Cartridge paper-element type, filtration rating 2μm	
	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/cm <sup>2</sup> } [32.72 to 38.41 psi] (Contacting pressure: 0.14 to 0.17 MPa {1.5 to 1.8 kgf/cm <sup>2</sup> } [21.34 to 25.61 psi])	
Oil cooler bypass valve	Valve opening pressure	0.44 ± 0.05 MPa {4.5 ± 0.5 kgf/cm <sup>2</sup> } [64 ± 7.1 psi]		
Safety valve	Valve opening pressure	1.42 MPa {14.5 kgf/cm <sup>2</sup> } [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 <sup>-1</sup> )
	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 <sup>-1</sup> )
	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	∅ 0.23 mm [0.0091 in.]
		Spray angle	158°
Valve opening pressure		29.4 MPa {300 kgf/cm <sup>2</sup> } [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 <sup>-1</sup> 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.]	

**GENERAL ENGINE DATA**

Type	-----	4-Cycle, Water Cooled	
Aspiration	-----	Turbo-Charged, Inter Cooler (Fresh water to Cooler)	
Cylinder Arrangement	-----	60°V	
No. of Cylinders	-----	12	
Bore mm(in.)	-----	150	(5.91)
Stroke mm(in.)	-----	160	(6.30)
Displacement liter(in <sup>3</sup> )	-----	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 <sup>2</sup> (lbf·ft <sup>2</sup> )	-----	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)
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**AIR INLET SYSTEM**

Maximum Intake Air Restriction (Includes piping)			
With Clean Filter Element - mm H <sub>2</sub> O (in.H <sub>2</sub> O)	-----	400	(15.7)
With Dirty Filter Element - mm H <sub>2</sub> O (in.H <sub>2</sub> O)	-----	635	(25.0)

**EXHAUST SYSTEM**

Maximum Allowable Back Pressure - mm H <sub>2</sub> O (in.H <sub>2</sub> O)	-----	600	(23.6)
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**LUBRICATION SYSTEM**

Oil Pressure at Idle - kgf/cm <sup>2</sup> (psi)	-----	2~3	(29~43)
at Rate Speed - kgf/cm <sup>2</sup> (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 (Includes Oil Filter) - liter (U.S.gal)	-----	120	(31.7)
Maximum Angle of Installation (Std. Pan)			
(Engine Only)			
Front Down	-----	9.5°	
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 <sup>2</sup> (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 Inlet, PTAW type - °C(°F)	---	45	(113)
Maximum Air Restriction on Discharge Side of Radiator and Fan - mm H <sub>2</sub> O(in.H <sub>2</sub> O)	---	10	(0.4)

**APPLICATION : GENERATOR**

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

MITSUBISHI  
DIESEL ENGINES

**S12A2-Y2PTAW-2** SPECIFICATION SHEET

---

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

The specifications are subject to change without notice.

APPLICATION : GENERATOR

Pub. No. T0213-0005E 3/4

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

MITSUBISHI  
DIESEL ENGINE

**S12A2-Y2PTAW-2**

**SPECIFICATION SHEET**

**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. <sup>3</sup> )	33.93 (2071)			
Brake Horse power without Fan	HP (kW)	1207 (900)	1099 (820)		
Brake Mean Effective Pressure without Fan	kgf/cm <sup>2</sup> (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 <sup>3</sup> /min (CFM)	88 (3107)	75 (2648)		
Exhaust Gas Flow	m <sup>3</sup> /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 <sup>3</sup> /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



**MITSUBISHI DIESEL ENGINE  
TECHNICAL INFORMATION**

ITEM NO.

T0409-0006E (1/2)

DATE

March, 2014

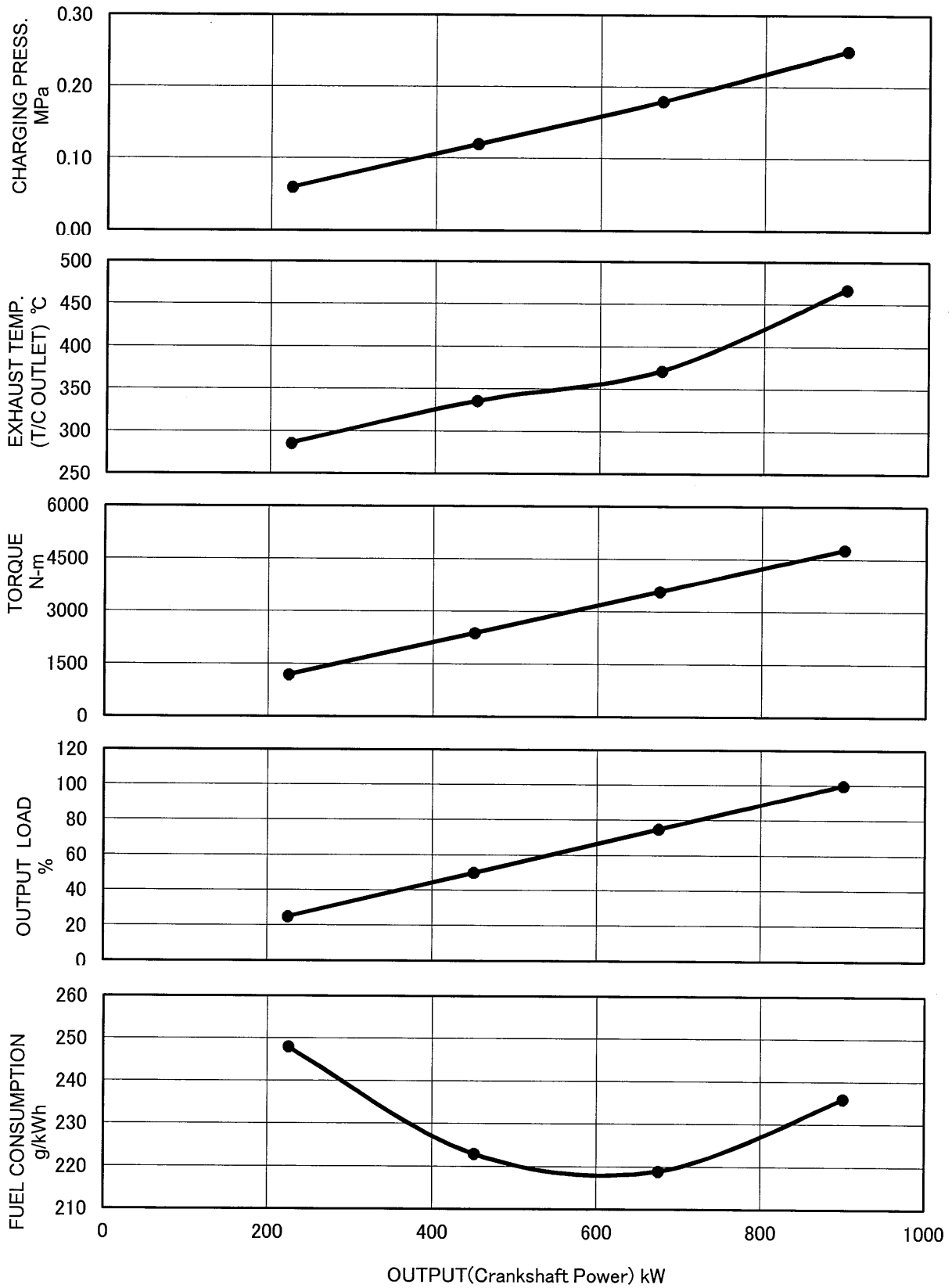
Performance Curves of S12A2-Y2PTAW-2

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

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

Engine speed: 1800min<sup>-1</sup>



WITHOUT FAN

MHI CONFIDENTIAL

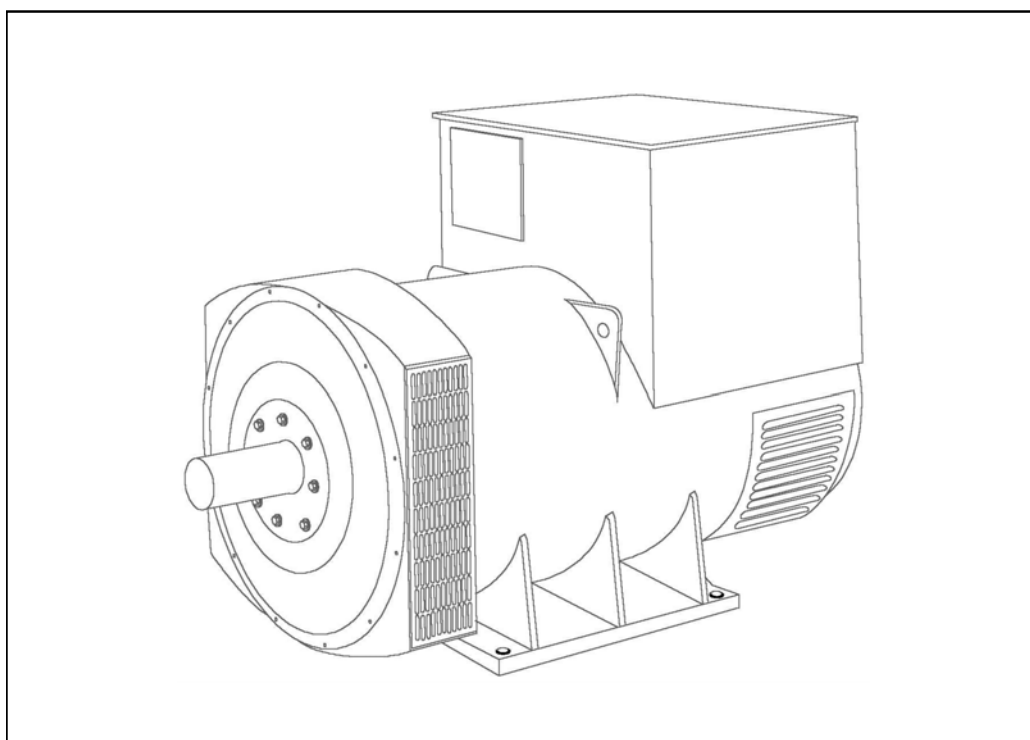
Fuel Consumption is based on ISO3046/1 with +5% tolerance at rated power.  
The specifications are subject to change without notice.

APPLICATION : GENERATOR

# STAMFORD®

**HCI634H** - Winding 311 and 312

Technical Data Sheet



# HCI634H

## SPECIFICATIONS & OPTIONS

### WINDING 311 and 312

**STAMFORD**

#### STANDARDS

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

Other standards and certifications can be considered on request.

#### VOLTAGE REGULATORS

##### 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



## 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			
WR <sup>2</sup> INERTIA	20.0438 kgm <sup>2</sup>				19.4965 kgm <sup>2</sup>			
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 m <sup>3</sup> /sec 3420 cfm				1.961 m <sup>3</sup> /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
X <sub>d</sub> DIR. AXIS SYNCHRONOUS	2.99	2.80	2.51	2.15	3.37	3.13	2.89	2.78
X' <sub>d</sub> DIR. AXIS TRANSIENT	0.25	0.24	0.21	0.18	0.29	0.27	0.25	0.24
X'' <sub>d</sub> DIR. AXIS SUBTRANSIENT	0.18	0.17	0.15	0.13	0.19	0.18	0.17	0.16
X <sub>q</sub> QUAD. AXIS REACTANCE	1.77	1.65	1.49	1.27	2.00	1.86	1.72	1.65
X' <sub>q</sub> QUAD. AXIS SUBTRANSIENT	0.19	0.18	0.16	0.14	0.22	0.20	0.19	0.18
X <sub>L</sub> LEAKAGE REACTANCE	0.09	0.09	0.07	0.06	0.10	0.09	0.08	0.08
X <sub>2</sub> NEGATIVE SEQUENCE	0.20	0.19	0.17	0.14	0.23	0.21	0.20	0.19
X <sub>0</sub> 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' <sub>d</sub> TRANSIENT TIME CONST.	0.185
T'' <sub>d</sub> SUB-TRANSTIME CONST.	0.025
T' <sub>do</sub> O.C. FIELD TIME CONST.	2.44
T <sub>a</sub> ARMATURE TIME CONST.	0.04
SHORT CIRCUIT RATIO	1/X <sub>d</sub>

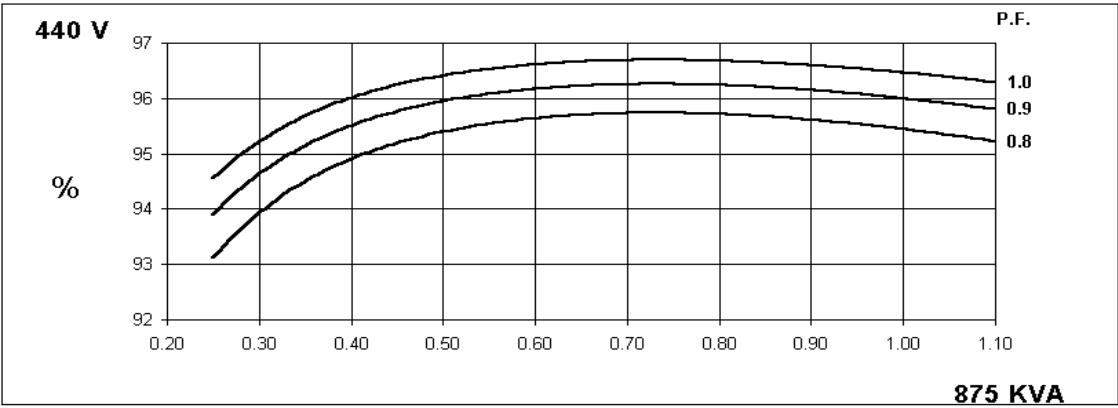
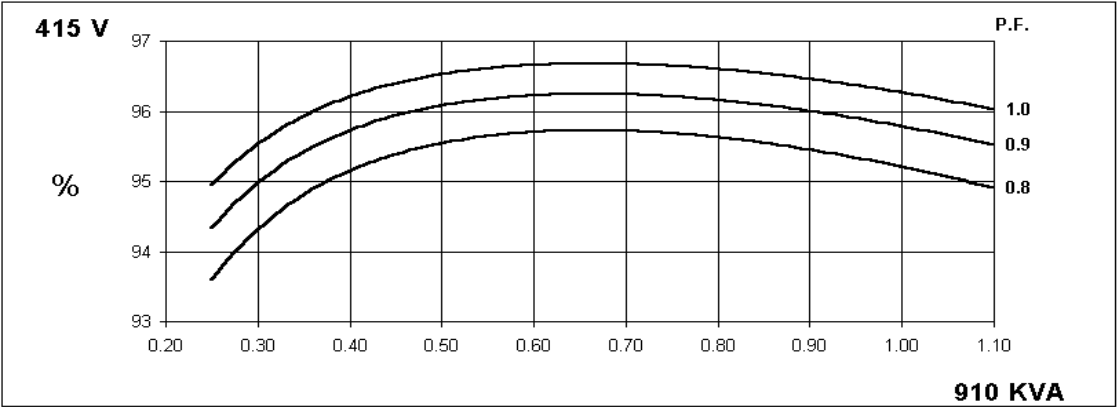
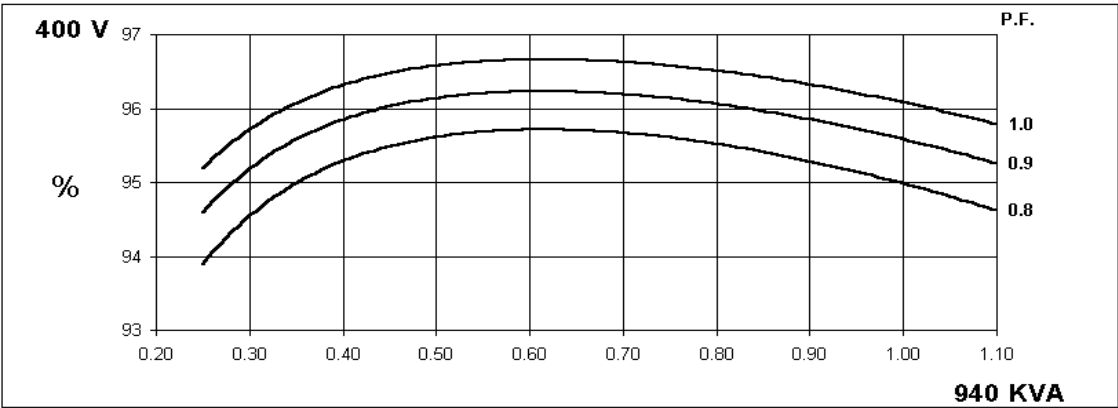
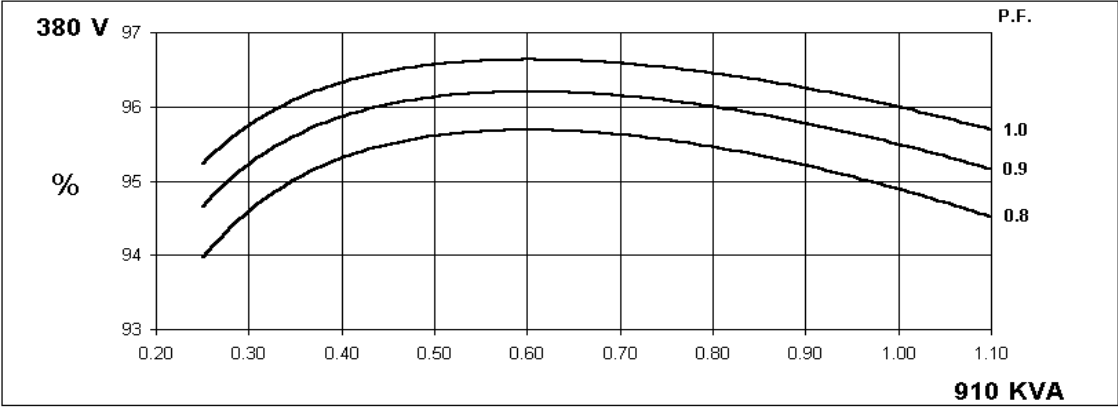
(\*) Parallel Star connection only available with Wdg 311

50  
Hz

HCI634H  
WINDING 311 and 312

**STAMFORD**

**THREE PHASE EFFICIENCY CURVES**

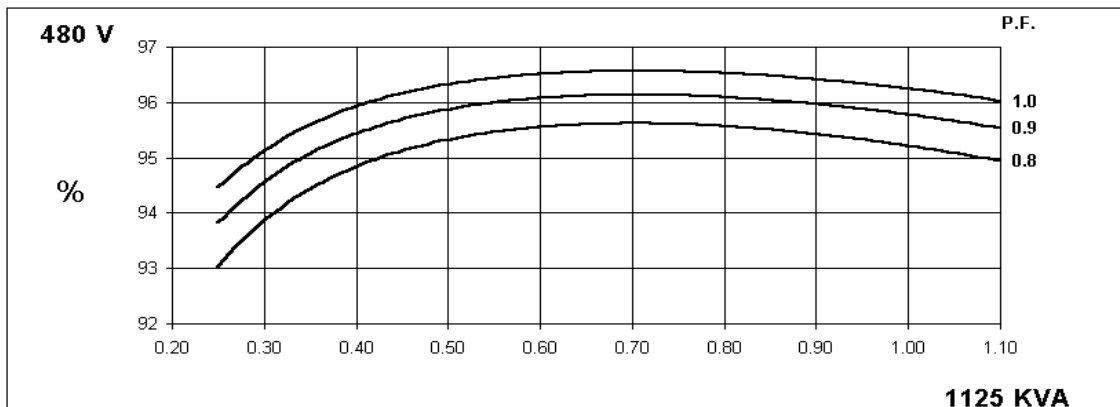
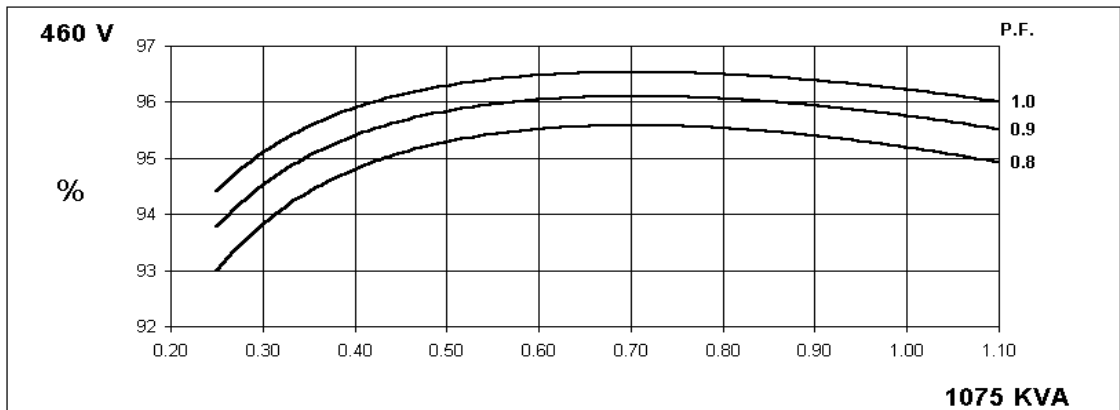
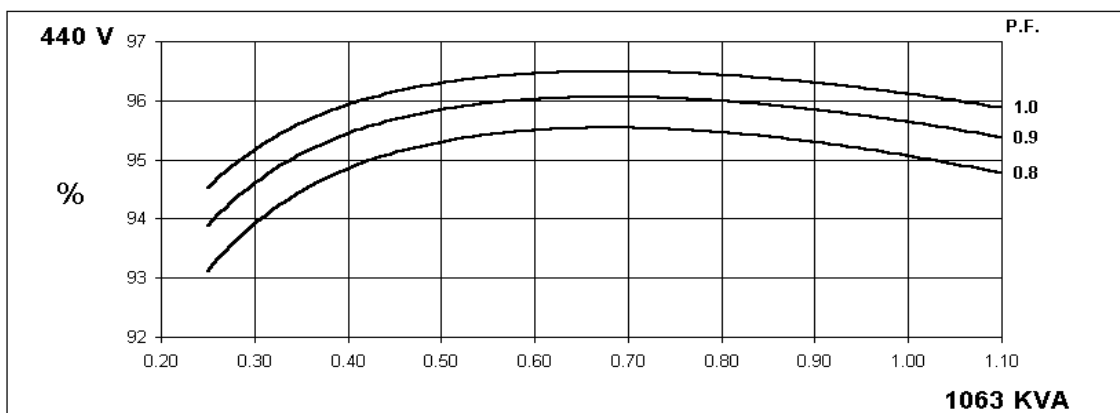
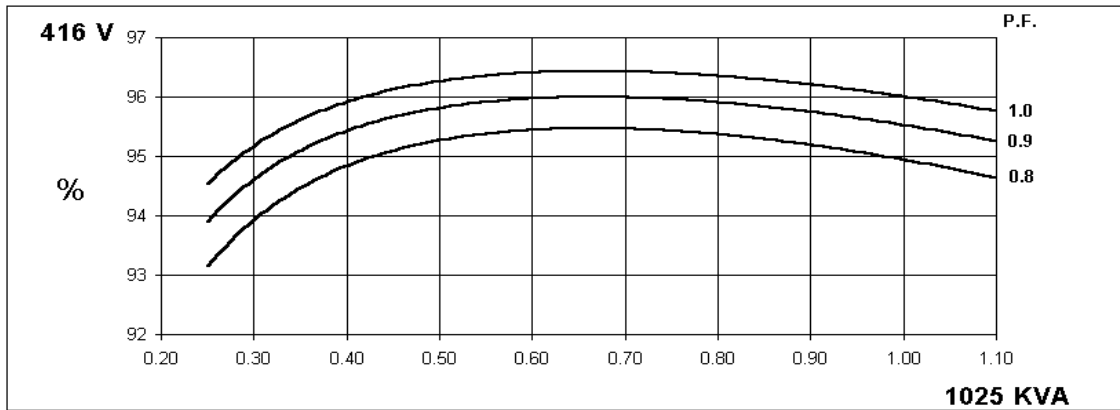


60  
Hz

**STAMFORD**

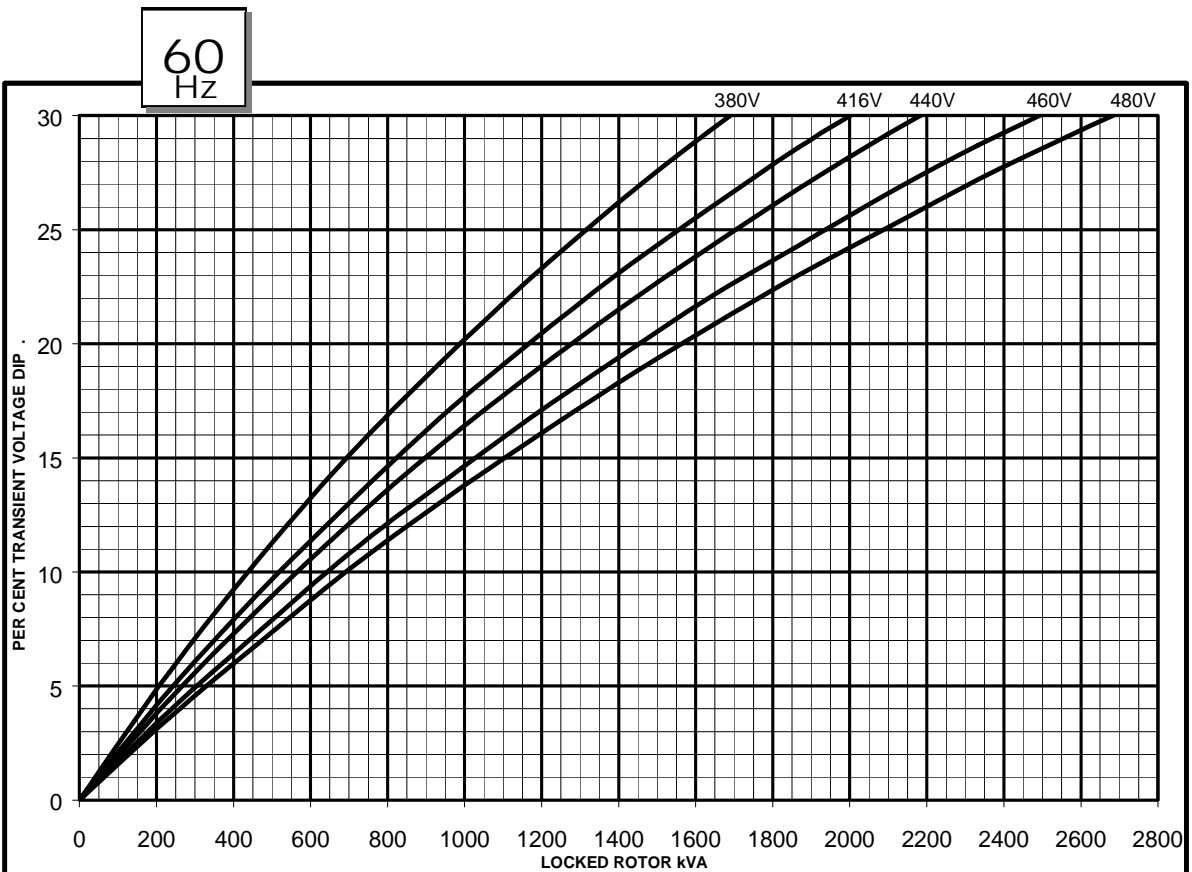
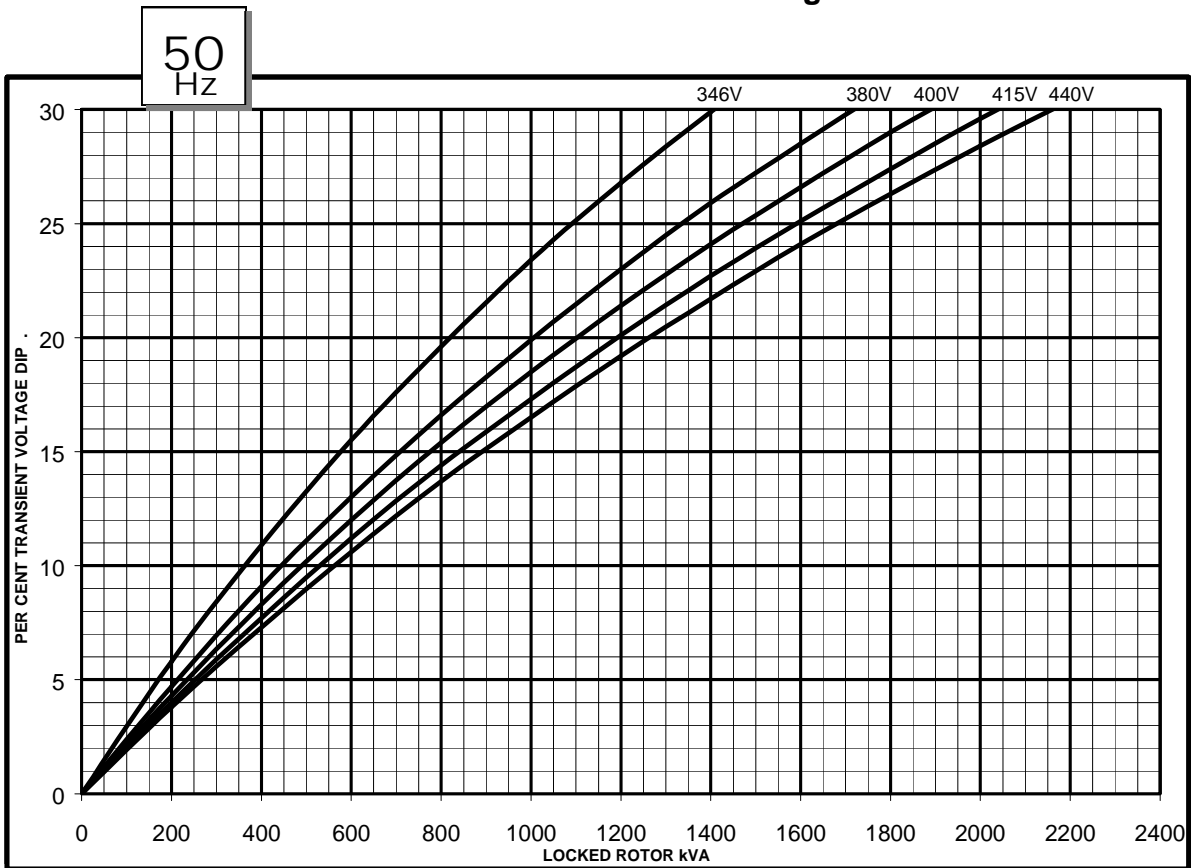
HCI634H  
WINDING 311 and 312

**THREE PHASE EFFICIENCY CURVES**



HCI634H  
WINDING 311 and 312

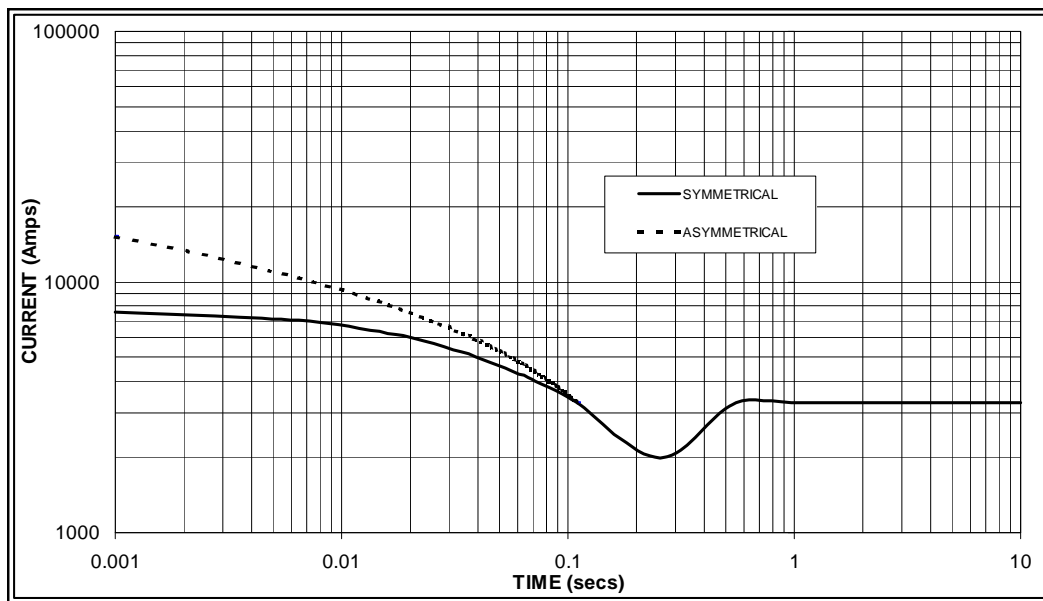
**Locked Rotor Motor Starting Curve**



**HCI634H  
WINDING 311 and 312**

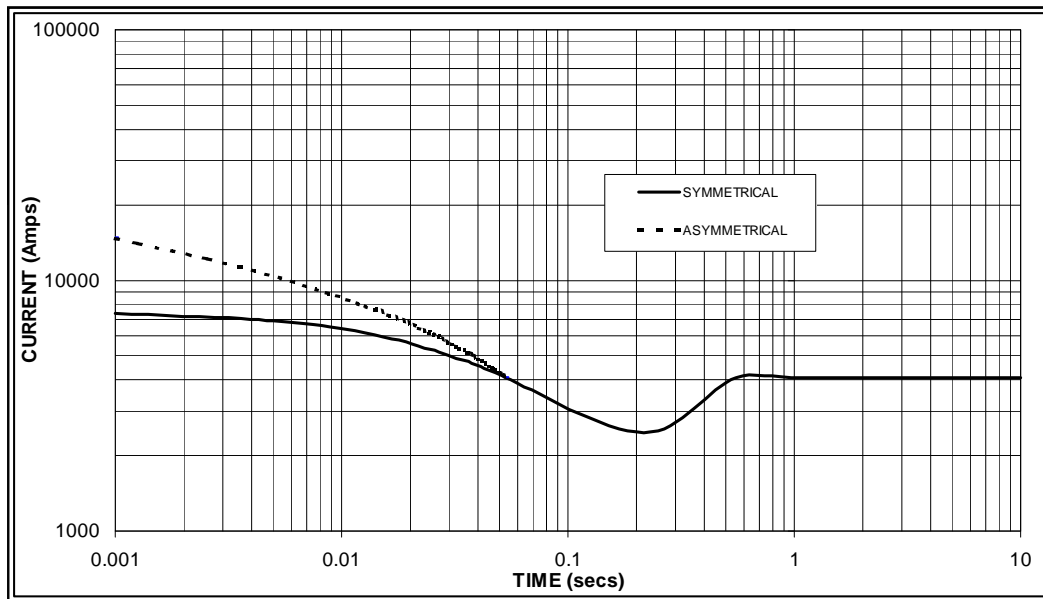
**Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed  
Based on star (wye) connection.**

**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

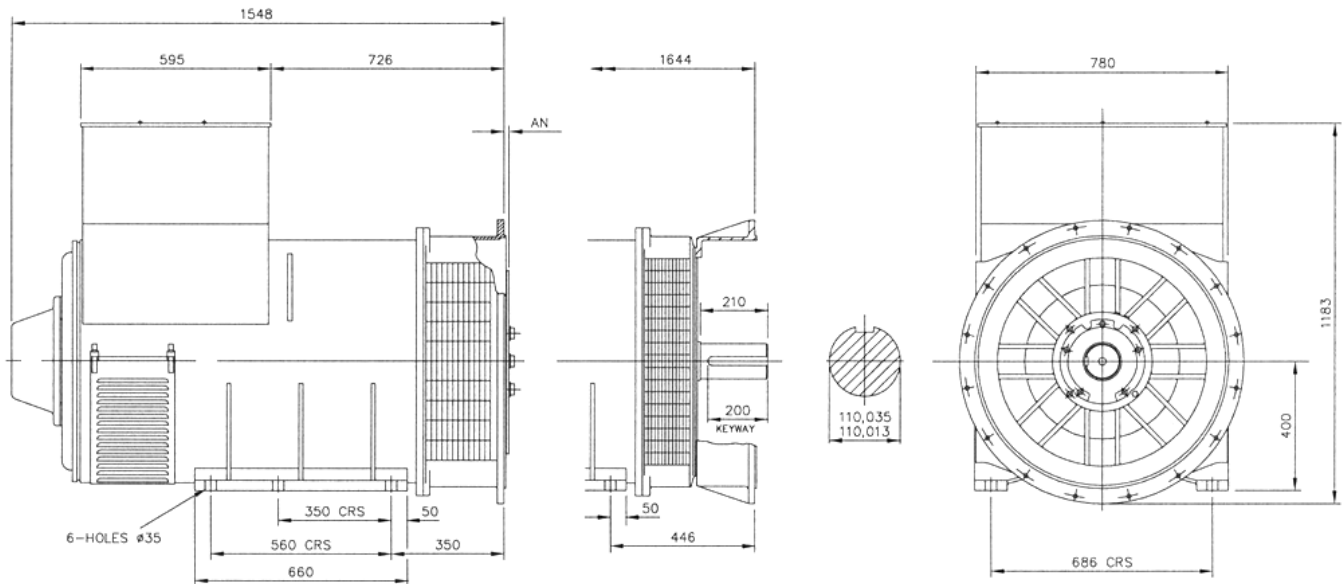
**HCI634H**  
**Winding 311 and 312    0.8 Power Factor**

**RATINGS**

Class - Temp Rise	Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C				
<b>50Hz</b>	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
<b>60Hz</b>	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**



<b>SAE</b>	14	18	21	24
<b>AN</b>	25.4	15.87	0	0

## **STAMFORD**

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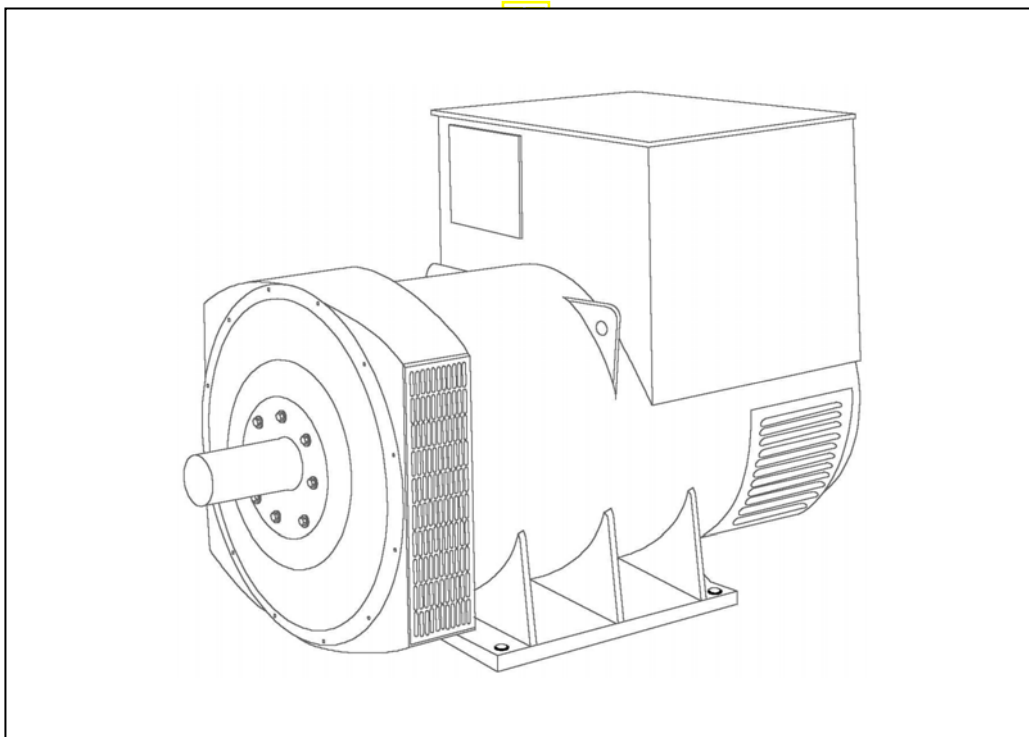
[www.cumminsgeneratortechnologies.com](http://www.cumminsgeneratortechnologies.com)

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# STAMFORD®

**HCI634G** - Winding 311 and 312

Technical  Data Sheet





# HCI634G

## SPECIFICATIONS & OPTIONS

### WINDING 311 and 312

**STAMFORD**

#### STANDARDS

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

#### VOLTAGE REGULATORS

##### 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.*

APPROVED DOCUMENT

**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			
WR <sup>2</sup> INERTIA	18.3482 kgm <sup>2</sup>				17.8009 kgm <sup>2</sup>			
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 m <sup>3</sup> /sec 3420 cfm				1.961 m <sup>3</sup> /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
X <sub>d</sub> DIR. AXIS SYNCHRONOUS	3.14	2.83	2.63	2.34	3.53	3.34	3.18	3.03
X' <sub>d</sub> DIR. AXIS TRANSIENT	0.25	0.23	0.21	0.19	0.28	0.26	0.25	0.24
X'' <sub>d</sub> DIR. AXIS SUBTRANSIENT	0.18	0.16	0.15	0.13	0.21	0.20	0.19	0.18
X <sub>q</sub> QUAD. AXIS REACTANCE	1.88	1.70	1.58	1.40	2.10	1.98	1.89	1.80
X'' <sub>q</sub> QUAD. AXIS SUBTRANSIENT	0.21	0.19	0.18	0.16	0.24	0.23	0.22	0.21
X <sub>L</sub> LEAKAGE REACTANCE	0.10	0.09	0.08	0.07	0.12	0.11	0.10	0.10
X <sub>2</sub> NEGATIVE SEQUENCE	0.22	0.20	0.19	0.17	0.24	0.23	0.22	0.21
X <sub>0</sub> 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' <sub>d</sub> TRANSIENT TIME CONST.	0.185
T'' <sub>d</sub> SUB-TRANSTIME CONST.	0.025
T' <sub>do</sub> O.C. FIELD TIME CONST.	2.35
T <sub>a</sub> ARMATURE TIME CONST.	0.04
SHORT CIRCUIT RATIO	1/X <sub>d</sub>

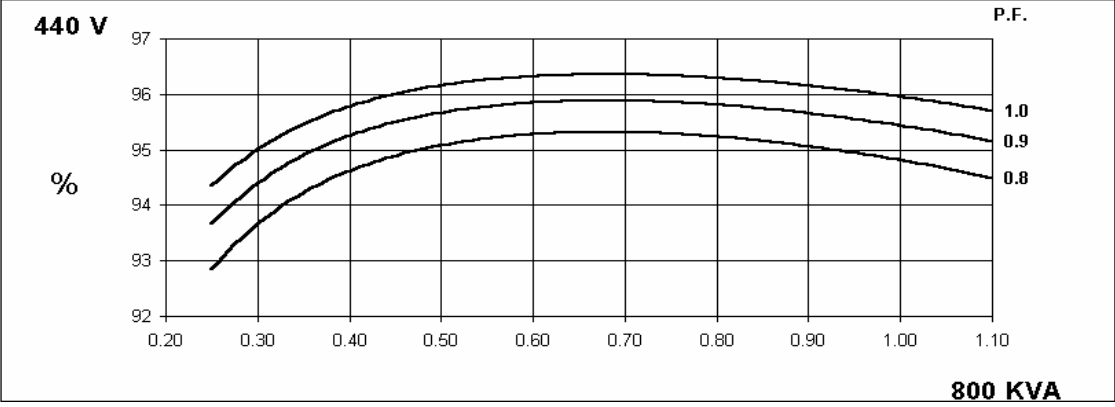
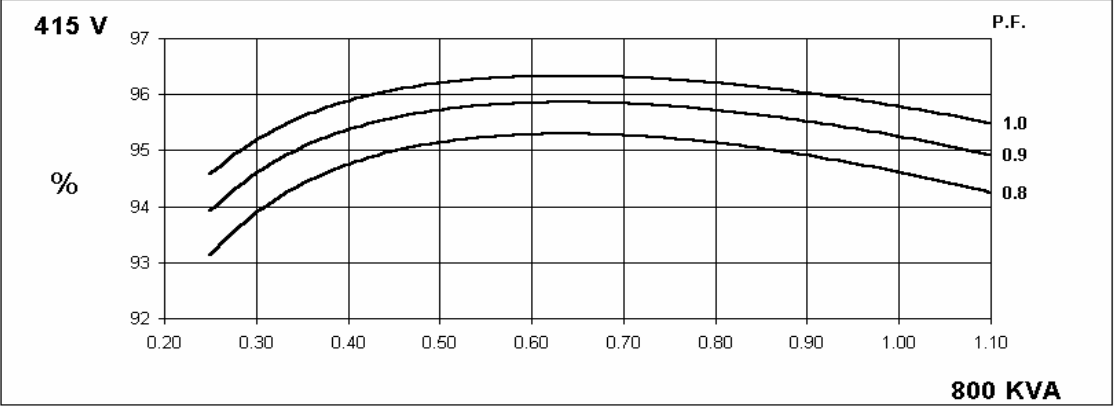
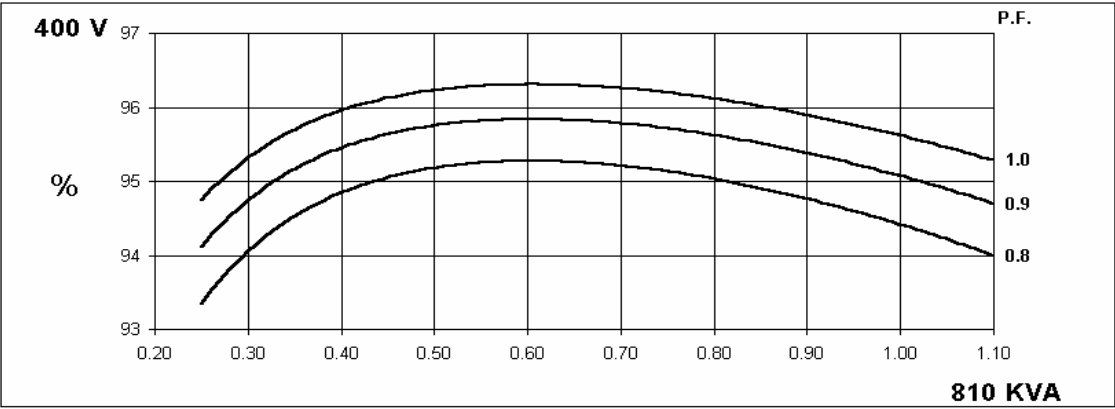
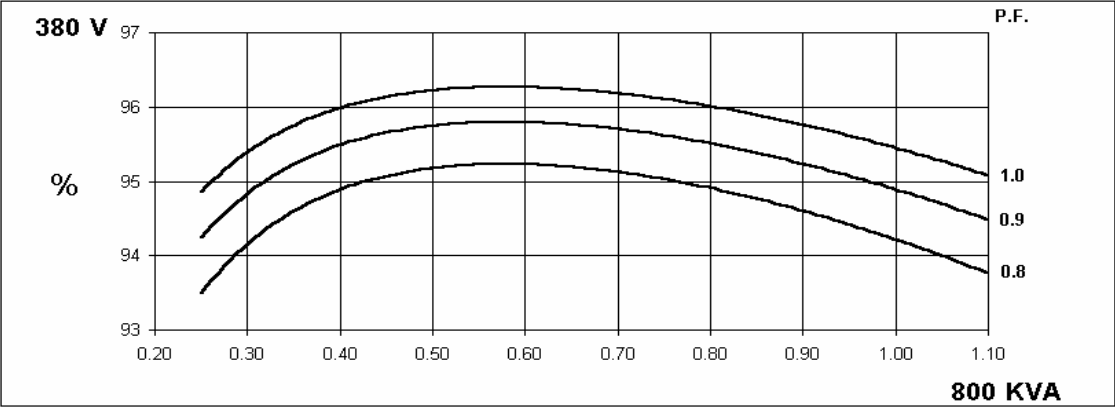
(\*) Parallel Star connection only available with Wdg 311

50  
Hz

HCI634G  
WINDING 311 and 312

STAMFORD

THREE PHASE EFFICIENCY CURVES

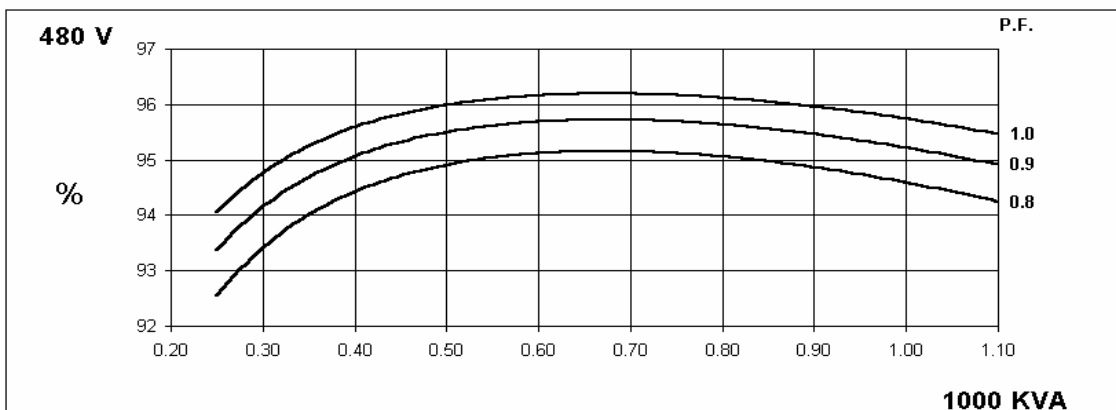
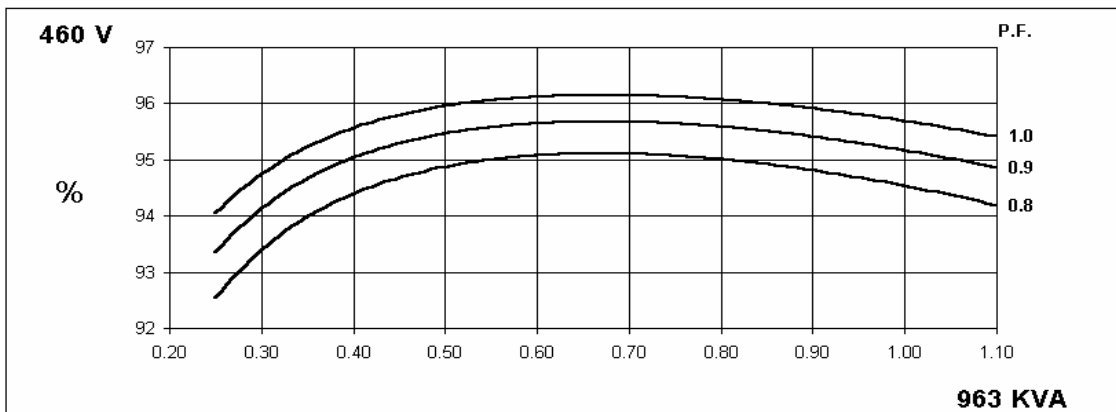
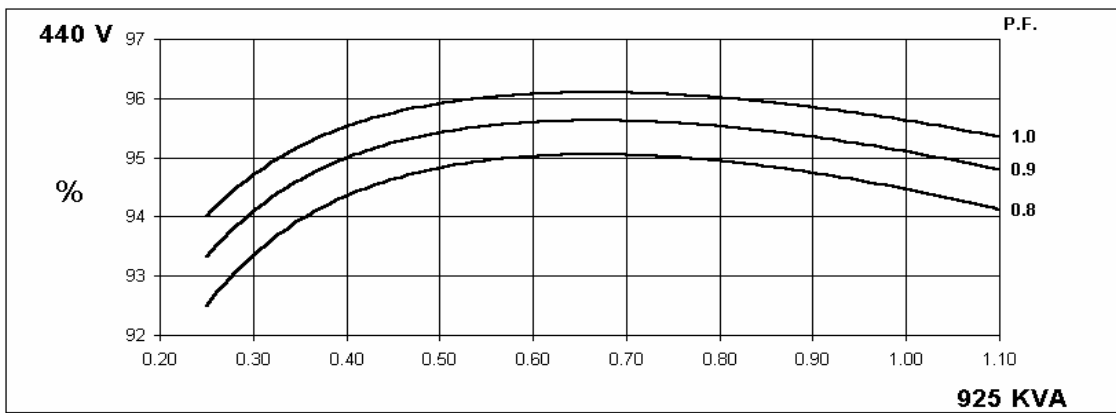
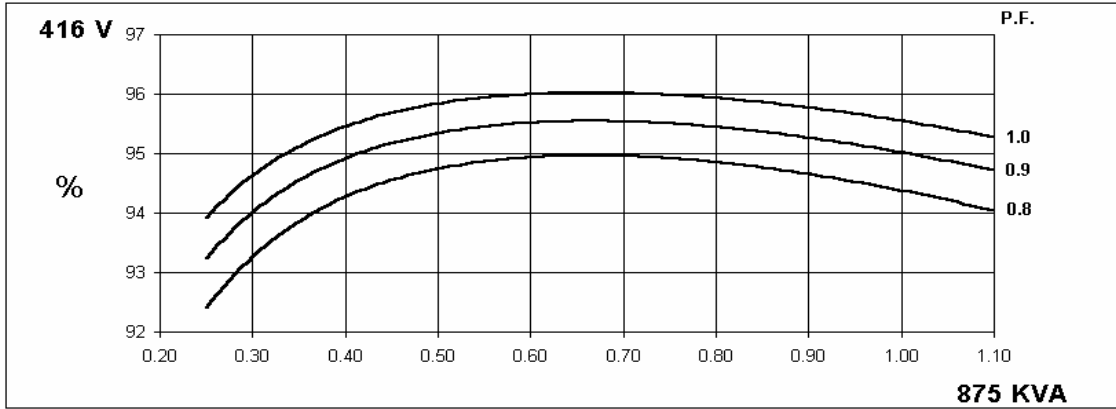


60  
Hz

HCI634G  
WINDING 311 and 312

STAMFORD

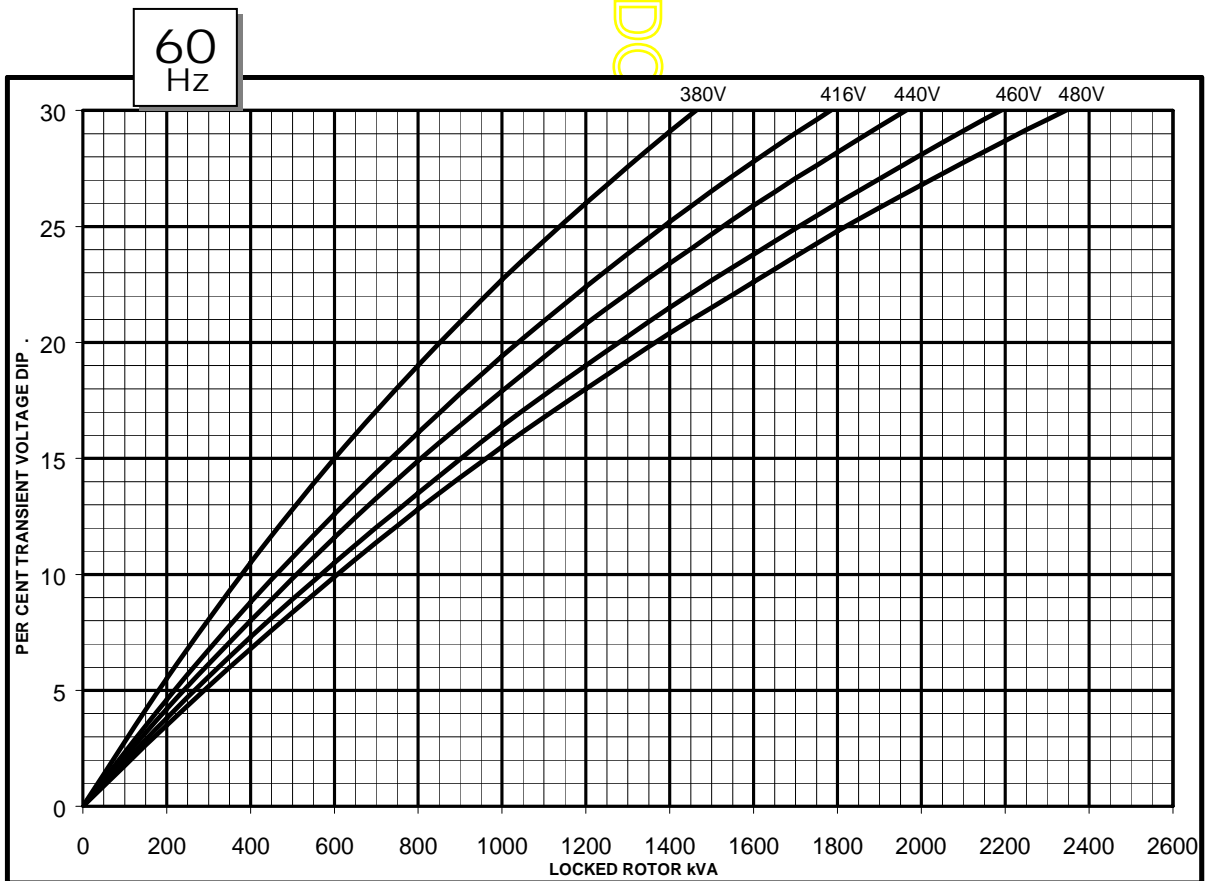
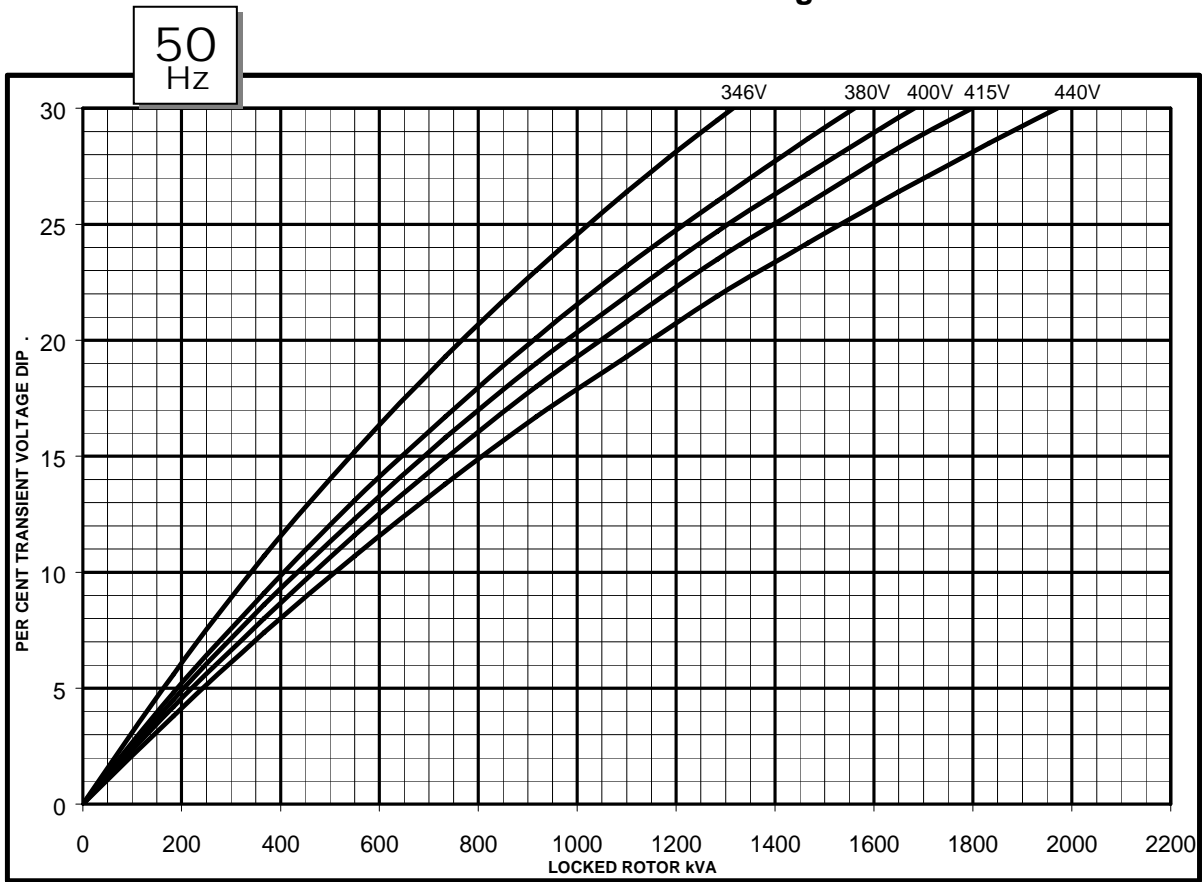
THREE PHASE EFFICIENCY CURVES



HCI634G  
WINDING 311 and 312

STAMFORD

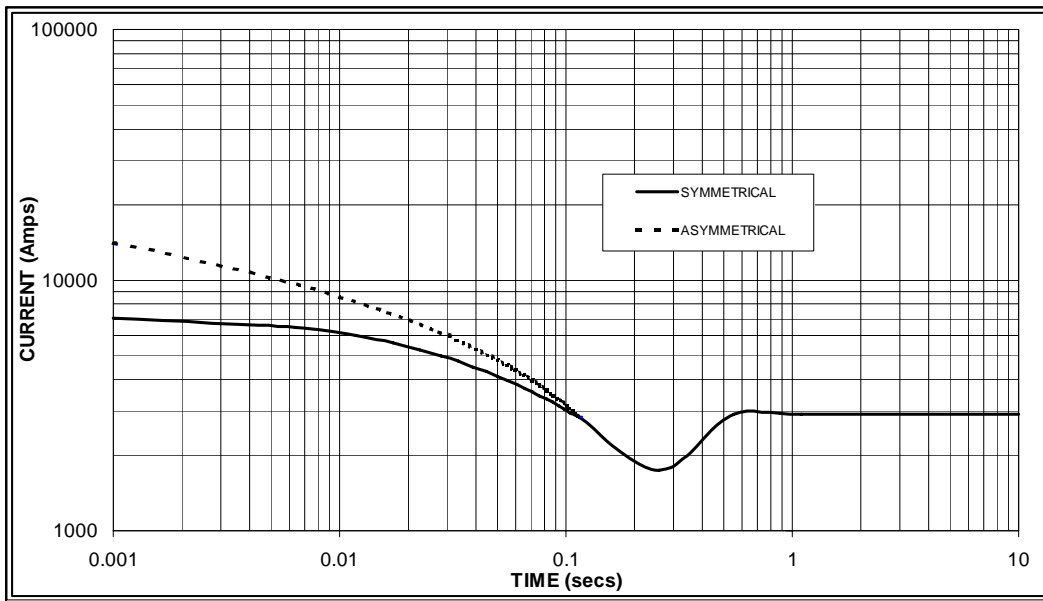
Locked Rotor Motor Starting Curve



**WINDING 311 and 312**

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

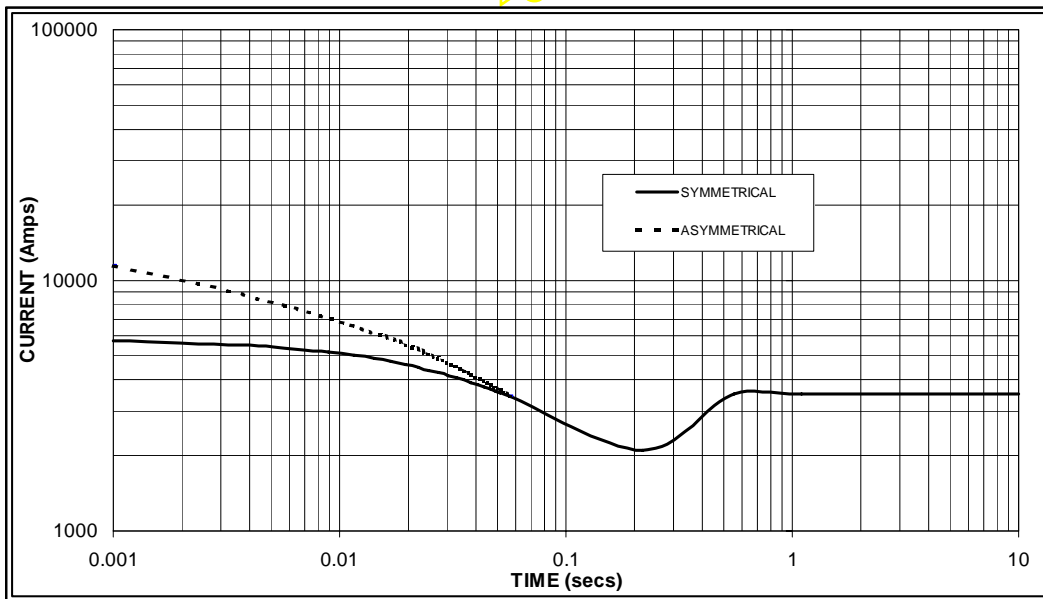
**50  
Hz**



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**

**Winding 311 and 312 0.8 Power Factor**

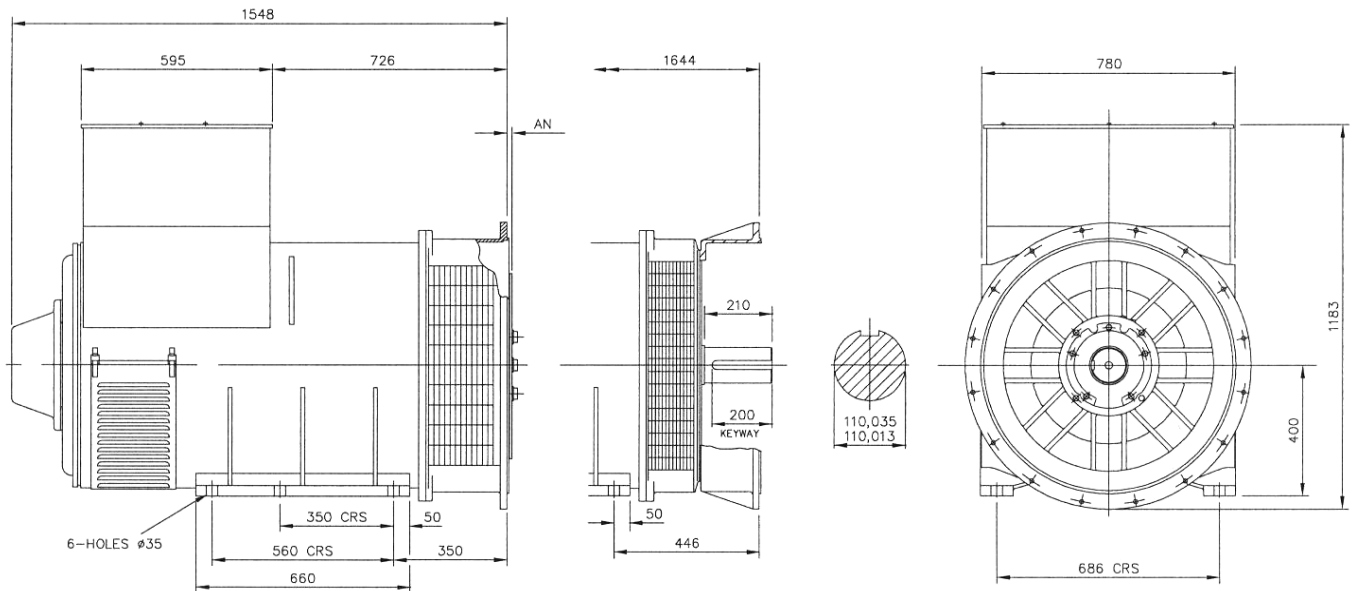
**RATINGS**

Class - Temp Rise	Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C				
<b>50Hz</b>	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

<b>60Hz</b>	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**



<b>SAE</b>	14	18	21	24
<b>AN</b>	25.4	15.87	0	0

APPROVED DOCUMENT

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[www.cumminsgeneratortechnologies.com](http://www.cumminsgeneratortechnologies.com)

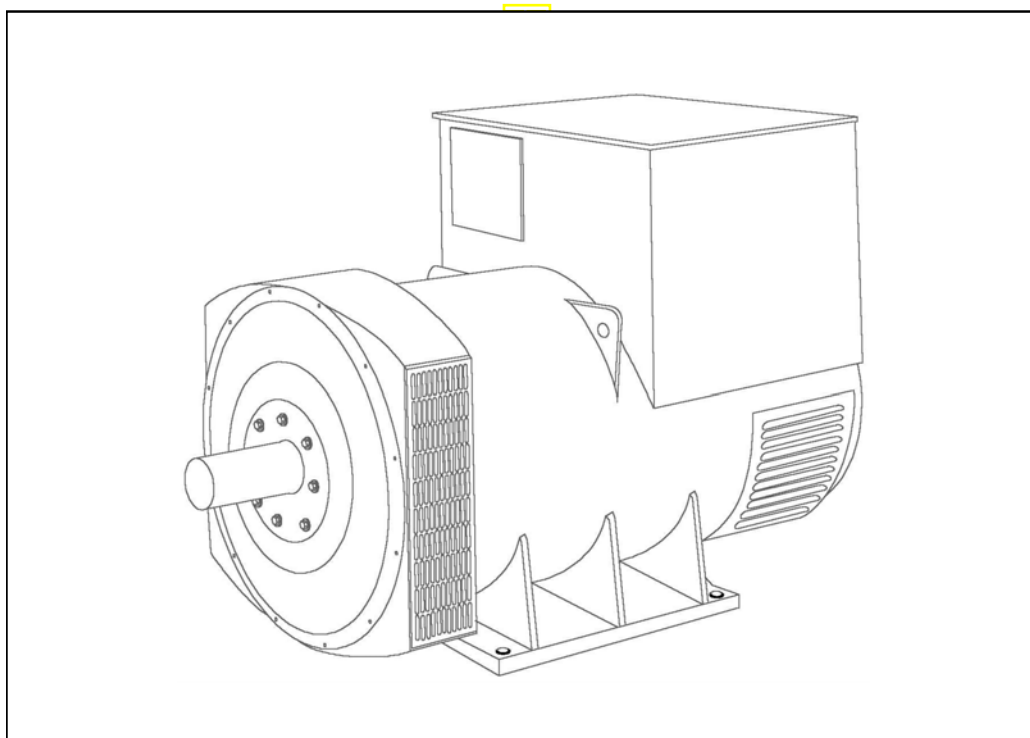
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# STAMFORD®

**HCI634G** - Winding 07

Technical  Data Sheet



# HCI634G

## SPECIFICATIONS & OPTIONS

**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.*

APPROVED DOCUMENT

# HCI634G



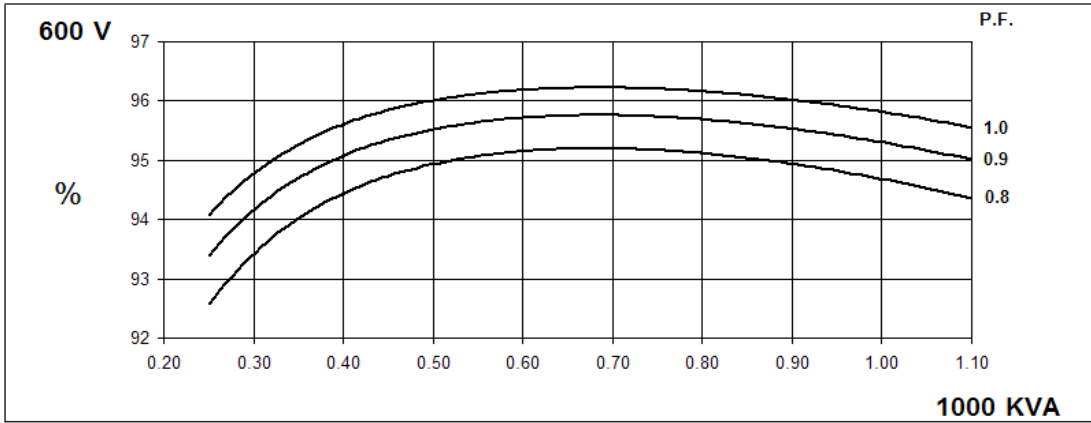
## WINDING 07

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
WR <sup>2</sup> INERTIA	18.3482 kgm <sup>2</sup>	17.8009 kgm <sup>2</sup>
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 m <sup>3</sup> /sec 4156 cfm	
VOLTAGE STAR	600V	
VOLTAGE DELTA	346V	
kVA BASE RATING FOR REACTANCE VALUES	1000	
X <sub>d</sub> DIR. AXIS SYNCHRONOUS	2.96	
X' <sub>d</sub> DIR. AXIS TRANSIENT	0.22	
X'' <sub>d</sub> DIR. AXIS SUBTRANSIENT	0.16	
X <sub>q</sub> QUAD. AXIS REACTANCE	1.74	
X'' <sub>q</sub> QUAD. AXIS SUBTRANSIENT	0.19	
X <sub>L</sub> LEAKAGE REACTANCE	0.08	
X <sub>2</sub> NEGATIVE SEQUENCE	0.20	
X <sub>0</sub> ZERO SEQUENCE	0.03	
REACTANCES ARE SATURATED      VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED		
T' <sub>d</sub> TRANSIENT TIME CONST.	0.185s	
T'' <sub>d</sub> SUB-TRANSTIME CONST.	0.025s	
T' <sub>do</sub> O.C. FIELD TIME CONST.	2.35s	
T <sub>a</sub> ARMATURE TIME CONST.	0.04s	
SHORT CIRCUIT RATIO	1/X <sub>d</sub>	

HCI634G  
Winding 07

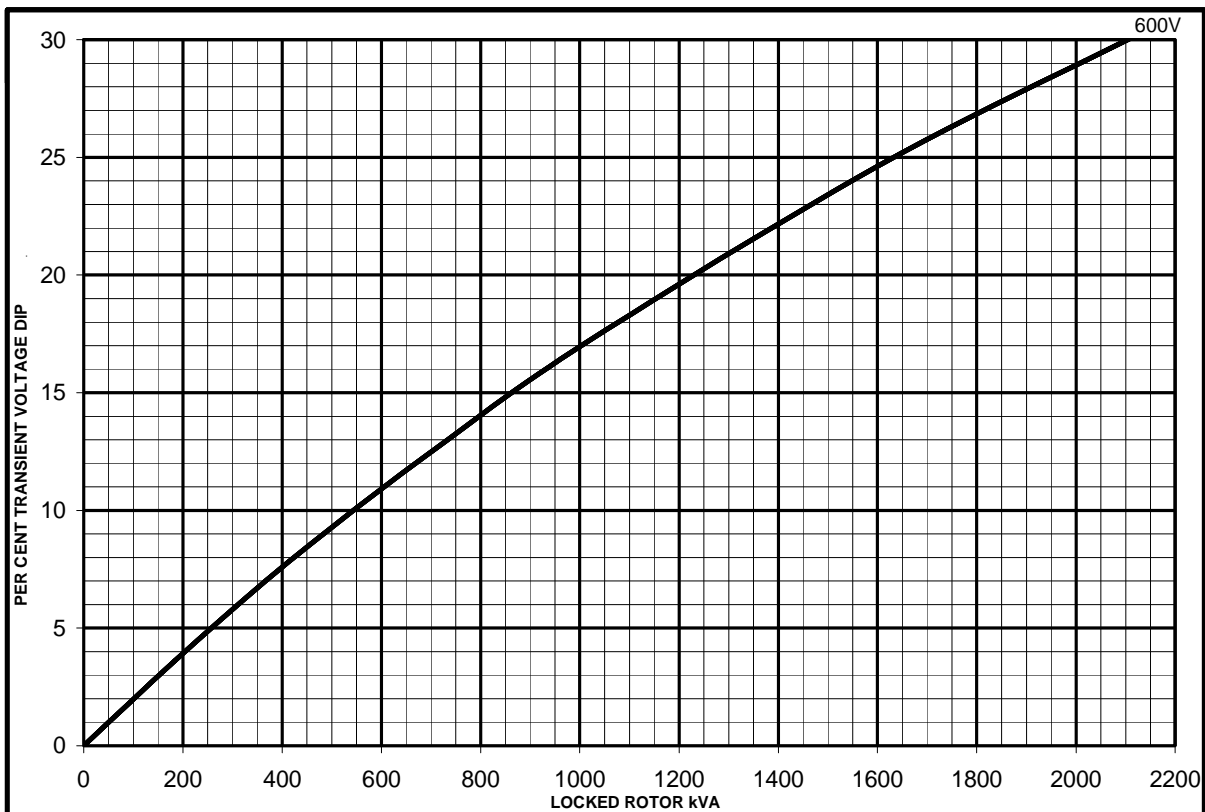
**STAMFORD**

**THREE PHASE EFFICIENCY CURVES**

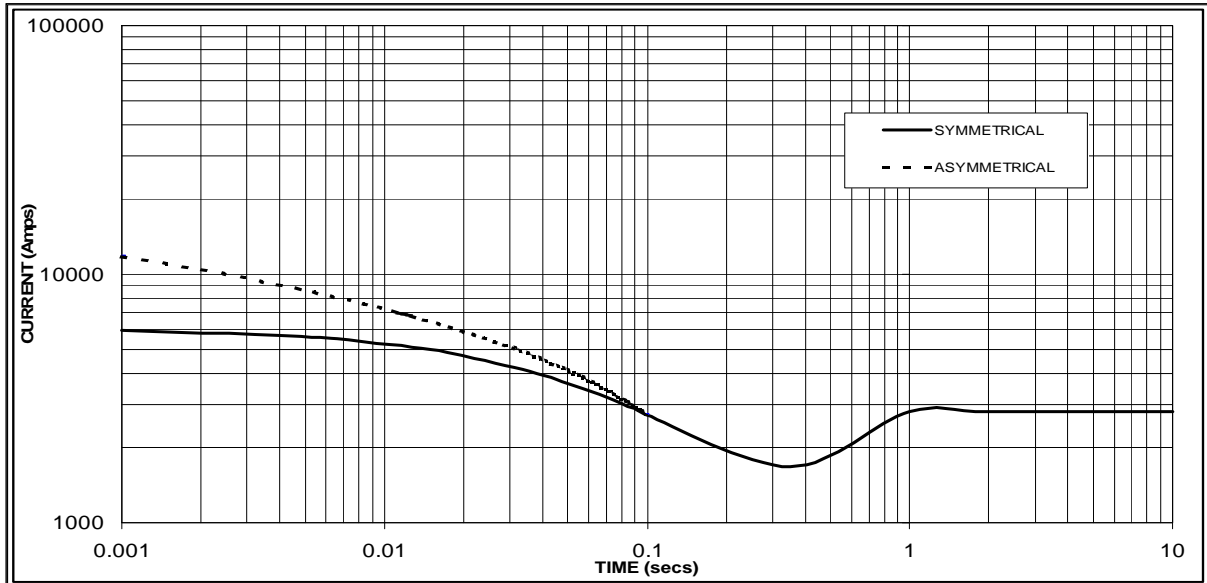


PROVID

**Locked Rotor Motor Starting Curve**



**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**

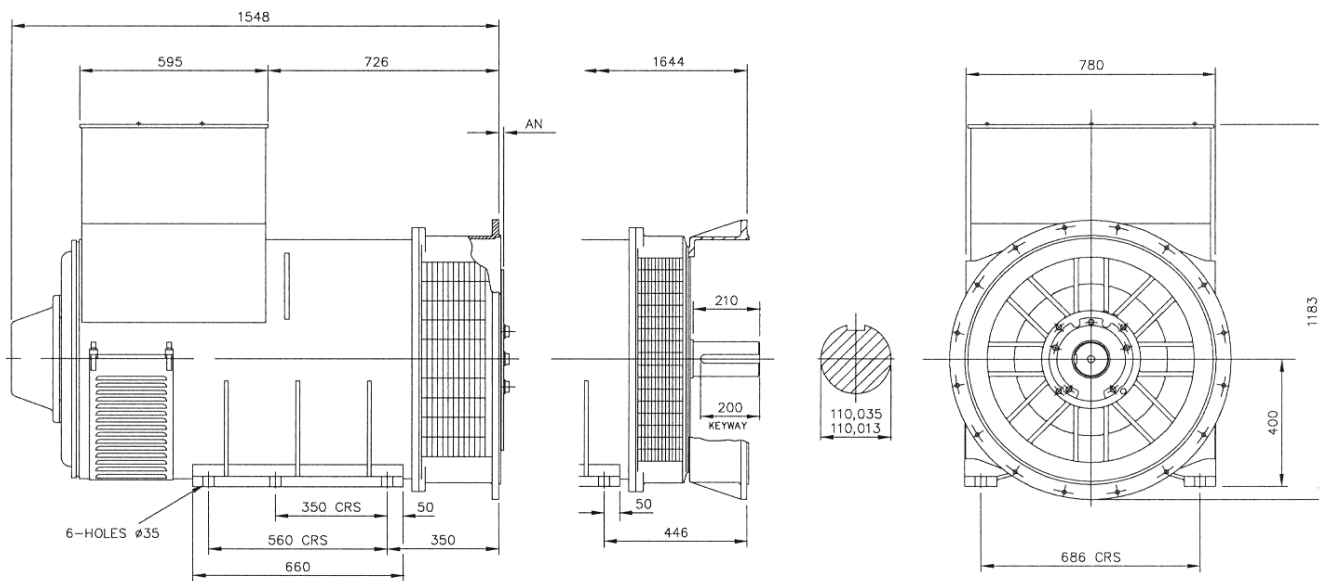
**Winding 07 / 0.8 Power Factor**

**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

**APPROVED**  
**DIMENSIONS**



<b>SAE</b>	14	18	21	24
<b>AN</b>	25.4	15.87	0	0

APPROVED DOCUMENT

**STAMFORD**

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

**FEATURES**

- Generator metering (includes three-phase mains)
- Engine and generator protection: 27, 32R, 40Q, 59, 810/U
- Optional enhanced generator protection: 47, 51, 78, and 81ROCOF
- Load sharing and generator sequencing (via LSM-200 Load Share Module)
- Var sharing over Ethernet (via LSM-200)
- BESTCOMSP<sup>Plus</sup>® Software
  - Programming and setup
  - Intuitive and powerful
  - Remote control and monitoring
  - Programmable logic
  - USB communications
- Automatic transfer switch control
- Automatic synchronizer (optional)
- Exercise timer
- SAE J1939 engine ECU communications
- Automatic generator configuration detection
- Expandable functionality via add-on modules
  - [LSM-200 Load Share Module](#)
  - [CEM-200 Contact Expansion Module](#)
  - [AEM-200 Analog Expansion Module](#)
- Multilingual capability
- Remote communications to Basler's RDP-110 (remote display panel)
- Sixteen programmable contact inputs
- Up to 15 contact outputs: 3 contacts rated for 30 Adc and up to 12 programmable contacts rated for 2 Adc

**BENEFITS**

- Provides integrated engine-genset control, protection, and metering in a single package.
- The Offline Simulator, provided in BESTlogic™ Plus, helps test and troubleshoot logic without the need for expensive hardware.
- Flexible programmable logic and programmable I/O make it easy to expand the DGC-200's inputs and outputs with the CEM-200 (Contact Expansion Module) and the AEM-200 (Analog Expansion Module). This saves time and money by eliminating unnecessary external PLCs and control relaying.

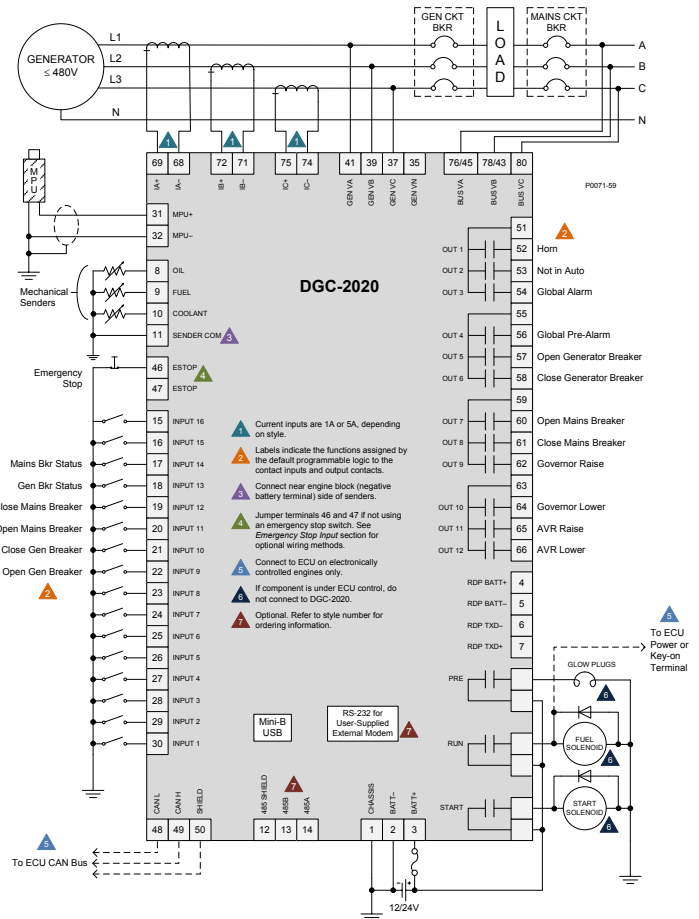


Figure 1 - DGC-200 Connection Diagram for a Typical Application

Visit [WWW.BASLER.COM](http://www.basler.com)  
FOR ADDITIONAL INFORMATION.



## SPECIFICATIONS

### Power Supply

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

### Power Consumption

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

### Current Sensing

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

### Voltage Sensing

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

### Contact Sensing

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

### Engine Speed Sensing

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

### Resistive Senders

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

### Output Contacts

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

### Protection

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

### Agency Approvals

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

### Communication

USB Port:	USB 2.0, Mini-B jack
RS-485 (optional):	9600 baud, 8 data bits, no parity
RDP-110 (optional):	4,000 ft (1,219 m) max wire length, 20 AWG (0.52 mm <sup>2</sup> ) min wire size
Modem (optional):	DB-9 connector (male)
CAN bus:	250 kb/s communication rate, 1.5 to 3 Vdc differential bus

### Environmental

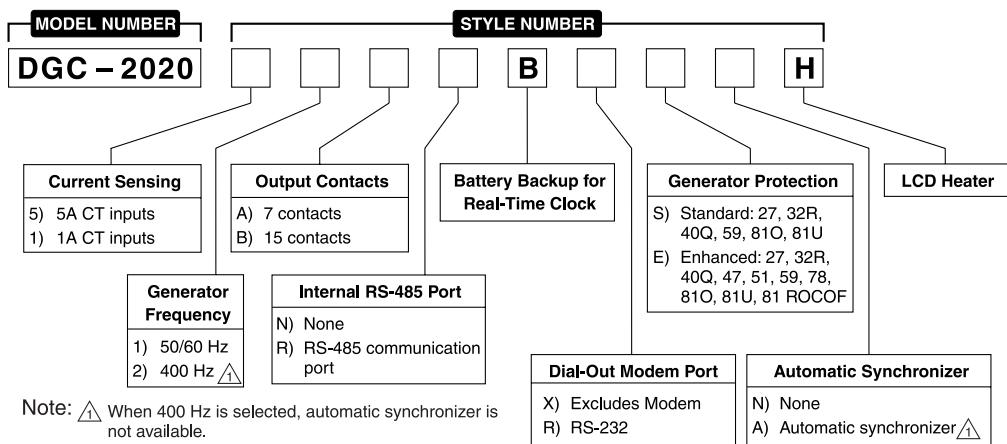
Operating Temp:	-40°C to 70°C (-40°F to 158°F)
Storage Temp:	-40°C to 85°C (-40°F to 185°F)
Humidity:	IEC 68-2-38
Salt Fog:	ASTM B 17-73, IEC 68-2-11
Ingress Protection:	IEC IP54 for front panel
Shock:	15 G in three perpendicular planes
Vibration:	
5 to 29 Hz:	1.5 G peak
29 to 52 Hz:	0.036" (0.914 mm)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

### Physical

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

For complete specifications, download the instruction manual at [www.basler.com](http://www.basler.com).

## STYLE CHART



## RELATED PRODUCTS

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

## ACCESSORIES

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



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Singapore 179098  
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# Tmax-Molded Case Circuit Breakers

T7 1200A Frame

## AC Circuit Breakers and Switches

3 and 4 Pole

Motor Circuit Protectors

Higher Performances in Less Space

Field Installable Accessories and Trip Units



**Dimensions** 3P Fixed Version 10.55H x 8.26W x 6.06D

**Weight** 21.4 (lbs)

## Compliance with Standards

UL 489

CSA C22.2 No.5.1

IEC 60947-2

Standards

EC directive:

– “Low Voltage Directives” (LVD) no. 73/23 EEC

– “Electromagnetic Compatibility Directive” (EMC) no.89/336 EEC

The ABB Quality System complies with the international ISO 9001 - 2000 Standard (model for quality assurance in design, development, construction, and installation and service) and with the equivalent European EN ISO 9001 and Italian UNI EN ISO 9001 Standards

Interrupting ratings (RMS sym. kAmps)		T7		
Continuous Current Rating		1200		
Number of Poles		3-4		
		S	H	L
AC				
	240V	65	100	150
	480V	50	65	100
	600V	25	50	65



## Company Quality Systems and Environmental Systems

The new Tmax series has a hologram on the front, obtained using special anti-imitation techniques, which guarantees the quality and that the circuit breaker is an original ABB product.

Attention to protection of the environment and to health and safety in the work place is another priority commitment for ABB and, as confirmation of this, the company environmental management system has been certified by RINA in 1997, in conformity with the international ISO 14001 Standard. This certification has been integrated in 1999 with the Management System for Health and Safety in the workplace, according to OHSAS 18001 (British Standards), obtaining one of the first certification of integrated management System, QES (Quality, Environment,

Safety) issued by RINA. ABB - the first industry in the electro-mechanical section in Italy to obtain this recognition - thanks to a revision of the production process with an eye to ecology has been able to reduce the consumption of raw materials and waste from processing by 20%. ABB's commitment to safeguarding the environment is also shown in a concrete way by the Life Cycle Assessments of its products carried out directly by the ABB Research and Development in collaboration with the ABB Research Center. Selection of materials, processes and packing materials is made optimizing the true environmental impact of the product, also foreseeing the possibility of its being recycled.

### Mounting

Fixed  
Drawout

### Connections

Busbar connection or compression lugs  
Pressure-type terminals for bare cables  
Rear connections

### Trip Unit

PR231/P, PR232/P, PR331DS, and PR332DS/P electronic trip unit

## Auxiliary Devices for Indication and Control

- Auxiliary contacts - AUX
- Undervoltage release - UVR
- Shunt trip - SOR
- Terminal covers
- Padlock provision - PLL
- Direct rotary handle - RHD
- Key lock - KLF
- Early auxiliary contact - AUE
- Transmitted rotary handle - RHE
- Front extended terminal - EF
- Front terminal for copper-aluminum - FC CuAl
- Front extended spread terminal - ES
- Rear orientated terminal - R
- Phase separators
- Residual current relay (IEC Only)



### ABB Inc.

1206 Hatton Road  
Wichita Falls, TX 76302  
For more information and  
the location of your local  
field office please go to  
[www.abb-control.com](http://www.abb-control.com)

Annex to the  
technical catalog



## Tmax T8

Low voltage molded case  
circuit breaker up to 3000 A

UL 489 and CSA C22.2 Standard

1SDC210026D0201 – 2008 Edition



**ABB**

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## Main characteristics

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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

			<b>Tmax T8</b>
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.

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

# Digital Linear Chargers

## Specifications (cont.)

- New 4-color package design

minnkotamotors.com

**MINN-KOTA**

**ON-BOARD MARINE BATTERY CHARGER**

DIGITALLY CONTROLLED 2X FASTER CHARGING PROTECTS BATTERIES

**Digital CONTROL**

**MK210D**

<b>MK 210D</b>
2 CHARGING BANKS
5 AMPS PER BANK
10 AMPS TOTAL OUTPUT

UL LISTED FC 10AMPS

## CHARGING TECHNOLOGY

CHARGING TECHNOLOGY

**DIGITALLY CONTROLLED.**  
Microprocessor design protects your batteries so you can stay on the water longer. It monitors temperature and state of charge to create a faster, regulated, more precise charge. Also includes automatic shut-off when charging is complete to extend battery life.

**DIGITALLY CONTROLLED.**  
Microprocessor design protects your batteries so you can stay on the water longer. It monitors temperature and state of charge to create a faster, regulated, more precise charge. Also includes automatic shut-off when charging is complete to extend battery life.

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

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

**Digital CONTROL**

**MULTI-STAGE CHARGING**

AMPS & VOLTS

BULK ABSORPTION MAINTENANCE

TIME (THREE STAGE CHARGER)

■ VOLTS  
■ AMPS

**BATTERY CHARGER TEMPERATURE COMPENSATION**

BATTERY VOLTAGE

absorption voltage (output voltage)

BATTERY TEMPERATURE (degrees F)

**MULTI-STAGE CHARGING.**  
Delivers a fast, precise charge profile by automatically controlling current and voltage without overcharging your batteries.

**MULTI-STAGE CHARGING.**  
Delivers a fast, precise charge profile by automatically controlling current and voltage without overcharging your batteries.

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

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

2010

**MINN-KOTA**

**HUMMINBIRD**

**CANNON**

# Digital Linear Chargers

## Specifications

- Waterproof, shock-and vibration-resistant aluminum construction
- Saltwater tested and fully corrosion-resistant
- Short circuit, reverse polarity, and ignition protected
- For use with 12V/6 cell batteries that are flooded/wet cell, maintenance free or starved electrolyte (AGM) only
- FCC compliant
- UL listed to marine standard 1236
- 3 year warranty
- Replaces all existing current on-board chargers (excluding portables)
- No Price Increase
- Availability: November 2010



### DIGITAL LINEAR ON-BOARD CHARGERS

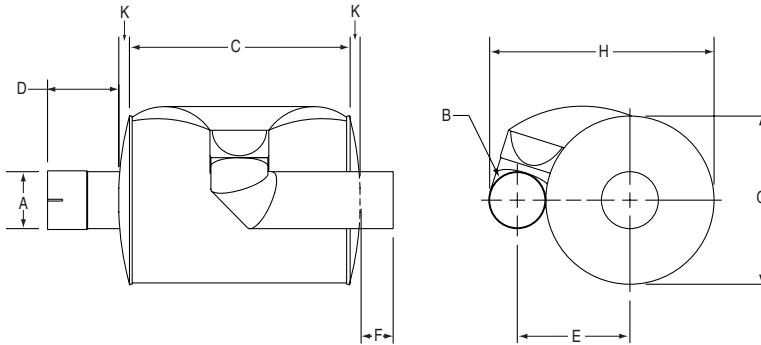
PRODUCT CODE	PRODUCT DESCRIPTION
1821065	MK 106D (1 bank x 6 amps)
1821105	MK-110D (1 bank x 10 amps)
1822105	MK-210D (2 bank x 5 amps)
1823155	MK-315D (3 bank x 5 amps)
1822205	MK-220D (2 bank x 10 amps)
1823305	MK-330D (3 bank x 10 amps)
1824405	MK-440D (4 bank x 10 amps)
1822305	MK-230D (2 bank x 15 amps)
1823455	MK-345D (3 bank x 15 amps)
1824605	MK-460D (4 bank x 15 amps)





# TXS Critical Grade - TR Model

Typical Insertion Loss 28-33 dbA\*



### 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

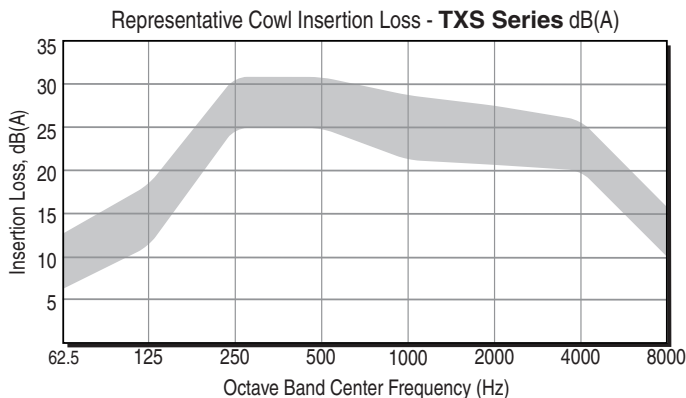
### Options

- 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

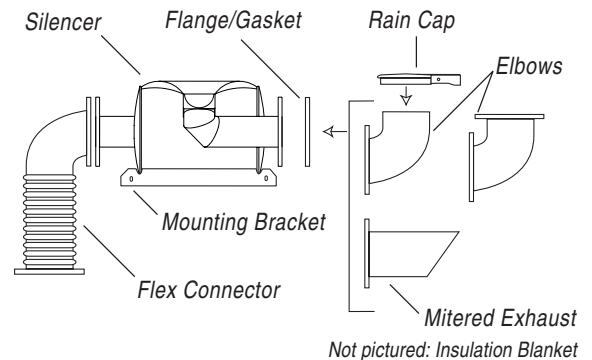
\*Actual insertion loss value may vary by application.  
All measurements in inches unless otherwise noted.

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
<b>TXS120TR</b>	<b>TXS120TRS000</b>	<b>12.00</b>	<b>12.00</b>	<b>36.08</b>	<b>5.75</b>	<b>26.00</b>	<b>3.71</b>	<b>40.00</b>	<b>52.00</b>	<b>2.25</b>	<b>532 lbs</b>

TXS-TR



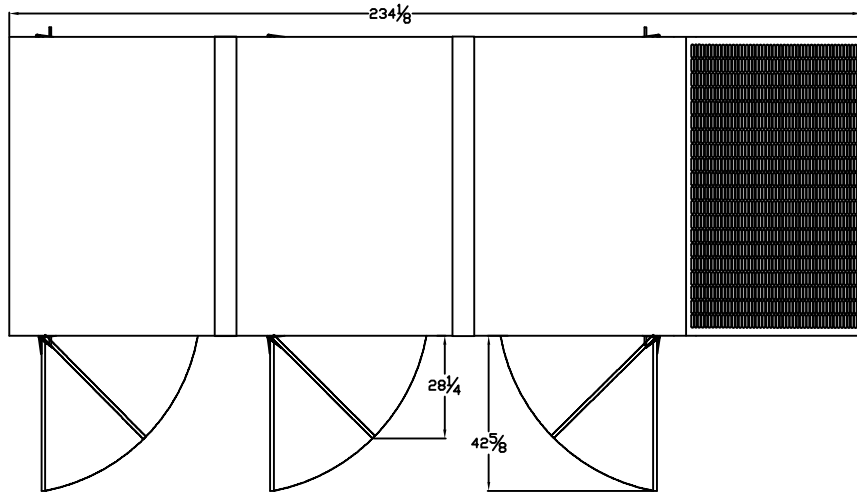
### Engine Exhaust Silencer & Accessories



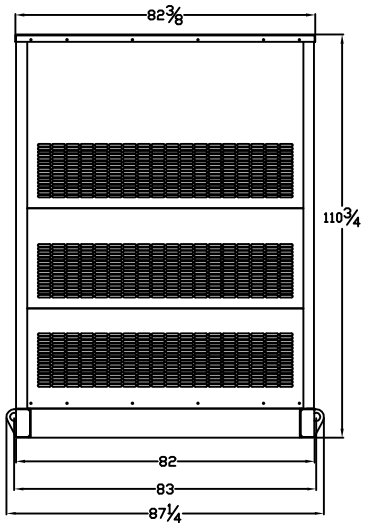
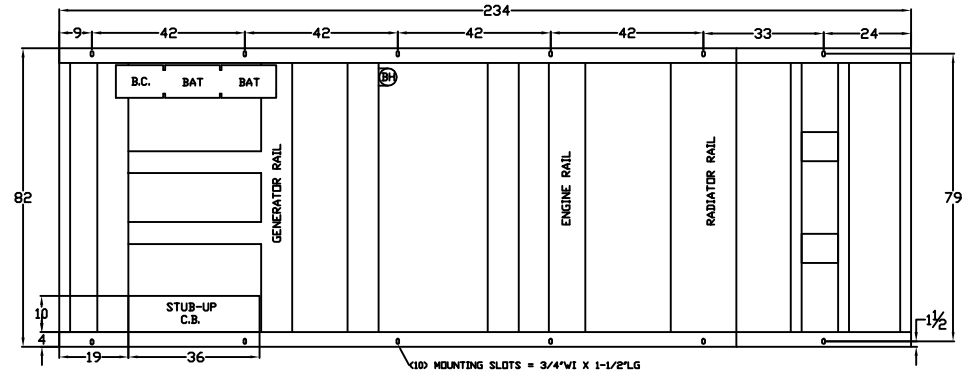
# LEVEL 2 & 3 ENCLOSURE OUTLINE DIMENSIONS FOR SPMI-7000 THRU SPMI-8000

TOP VIEW

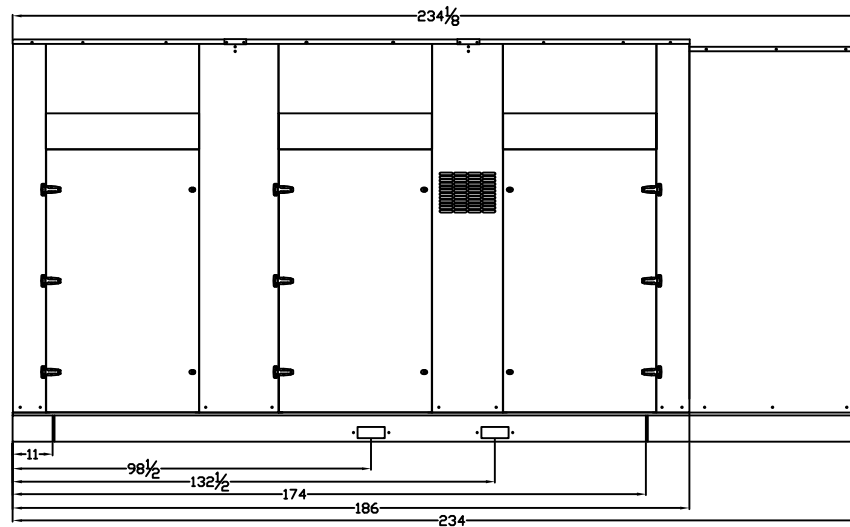
(GEN-SET HAS (6) DOORS, (3) SHOWN OPEN ARE TYPICAL FOR BOTH SIDES)



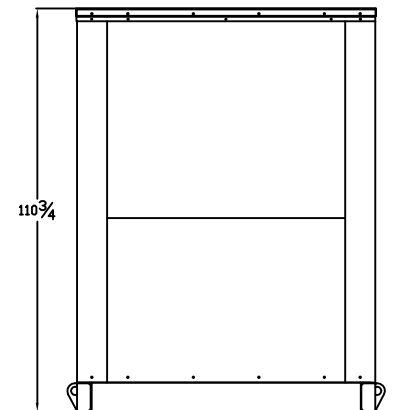
FRAME VIEW



GENERATOR END VIEW



SIDE VIEW



RADIATOR END VIEW