GILLETTE GENERATORS

LIQUID COOLED NAT. GAS ENGINE GENERATOR SET

60 HZ MODEL

SP-6500

Model		STANDBY 130°C RISE	
	HZ	LPG	N.G.
SP-6500-60 HERTZ	60	420	650

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.

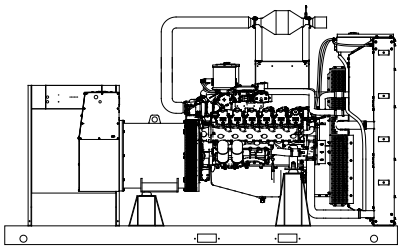
NEC 700, 701, 702, 708

NEMA ICS10, MG1, ICS6, AB1

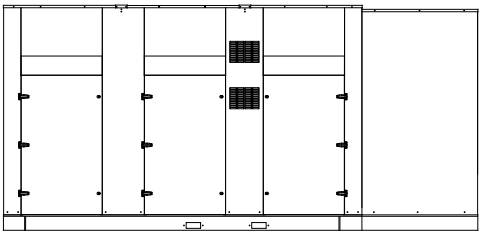
ANSI C62.41, 27, 59, 32, 480, 40Q, 81U, 360-05

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	LIQUID PROPANE GAS FUEL 130°C RISE STANDBY RATING		NATURAL GAS FUEL 130°C RISE STANDBY RATING	
	L-N	L-L			KW/KVA	AMP	KW/KVA	AMP
SP-6500-3-2	120	208	3	60	420/525	1458	650/812	2258
SP-6500-3-3	120	240	3	60	420/525	1264	650/812	1957
SP-6500-3-4	277	480	3	60	420/525	632	650/812	978
SP-6500-3-5	127	220	3	60	420/525	1379	650/812	2135
SP-6500-3-16	346	600	3	60	420/525	505	650/812	783

RATINGS: 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 on 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 AND ENGINEERING DATA FOR MODEL SP-6500-60 HZ

GENERATOR SPECIFICATIONS

Manufacturer.....Stamford Electric Generators
Model & Type..... HCI634G.311, 4 Pole, 12 Lead, Three Phase
..... HCI534F.311, 4 Pole, 12 Lead, 480V, Three Phase
..... HCI534F.07, 4 Pole, 6 Lead, 600V, Three Phase
Exciter.....Brushless, shunt excited
Voltage Regulator.....Solid State, HZ/Volts
Voltage Regulation .....½%, No load to full load
Frequency.....Field convertible, 60 HZ to 50 HZ
Frequency Regulation .....½% (½ cycle, no load to full load)
Unbalanced Load Capability.....100% of standby amps
Total Stator and Load Insulation.....Class H, 180°C
Temperature Rise ..... 130°C R/R, standby rating @ 40°C amb.
3 Ø Motor Starting @ 30% Voltage Dip (208-240V)...1500 kVA
3 Ø Motor Starting @ 30% Voltage Dip (480V-600V)2140 kVA
Bearing..... 1, Pre-lubed and sealed
Coupling.....Direct flexible disc
Total Harmonic Distortion ..... Max 3½% (MIL-STD705B)
Telephone Interference Factor .....Max 50 (NEMA MG1-22)
Deviation Factor..... Max 5% (MIL-STD 405B)
Ltd. Warranty Period.....24 Months from date of start-up or
.....1000 hours use, first to occur.

GENERATOR FEATURES

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

ENGINE SPECIFICATIONS AND APPLICATIONS DATA

ENGINE

Manufacturer.....Power Solutions Inc. (PSI)
Model and Type .....Heavy Duty, 31.8LTCAC HO, 4 cycle
Aspiration.....Turbocharged & Charge Air Cooled
Cylinder Arrangement..... 12 Cylinders, Vee
Displacement Cu. In. (Liters).....1941 (31.8)
Bore & Stroke In. (Cm.).....5.91 x 5.91 (150 x 150)
Compression Ratio..... 10.5:1
Main Bearings & Style..... 14, Precision Half-Shell
Cylinder Head .....Cast Iron
Pistons.....Cast Aluminum
Crankshaft.....Forged Steel
Exhaust Valve .....Inconel, A193
Governor .....Electronic
Frequency Reg. (no load-full load) .....Isochronous
Frequency Reg. (steady state) .....± 1/4%
Air Cleaner.....Dry, Replaceable Cartridge
Engine Speed 1800
Piston Speed, ft/min (m./min)…… .1772 (450)
Max Power, bhp (kwm) Standby/LPG..... .....637 (475)
Max Power, bhp (kwm) Standby/NG..... .....966 (720)
Ltd. Warranty Period.....12 Months or 2000 hrs., first to occur

FUEL SYSTEM

Type .....LPG or NAT. GAS, Vapor Withdrawal
Fuel Pressure (kpa), in. H_2O* .....(1.74-2.74), 7"-11"
Secondary Fuel Regulator..... NG or LPG Vapor System
Auto Fuel Lock-Off Solenoid ..... Standard on all sets
Fuel Supply Inlet Line..... (2) 3" NPTF

FUEL CONSUMPTION

LP GAS: FT^3/HR (M^3/HR)	STANDBY
100% LOAD	2490 (70.5)
75% LOAD	1844 (52.2)
50% LOAD	1309 (37.1)
LPG = 2500 BTU X FT^3/HR = Total BTU/HR LPG Conversion: 8.50 FT^3 = 1 LB. : 36.4 FT^3 = 1 GAL.	

NAT. GAS: FT^3/HR (M^3/HR)	STANDBY
100% LOAD	7259 (205.5)
75% LOAD	5708 (161.5)
50% LOAD	4208 (119.2)
25% LOAD	2757 (78.1)
NG = 1000 BTU X FT^3/HR = Total BTU/HR	

OIL SYSTEM

Type ..... Full Pressure
Oil Pan Capacity qt. (L) 95 (90)
Oil Pan Cap. W/ filter qt. (L) 119 (113)
Oil Filter..... 6, Replaceable Spin-On

ELECTRICAL SYSTEM

Ignition System .....Electronic
Eng. Alternator/Starter: 24 VDC, negative ground, 55 amp/hr.

Recommended battery to -18°C (0° F): ....(2) 12 VDC, BCI# 31, Max. Dimensions: 14"lg x 6 3/4" wi x 10" hi, with standard round posts. Min output 1400 CCA. Battery tray (max. dim. at 15"lg x 7"wi). This model has (2) battery trays, (2) hold down straps, (2) sets of battery cables, and (1) battery charger. Installation of (2) 12VDC starting batteries connected in series for 24VDC output is required, with possible higher AMP/HR rating, as described above, if the normal environment temperature averages -13° F (-25°C) or cooler.

APPLICATION AND ENGINEERING DATA FOR MODEL SP-6500-60 HZ

COOLING SYSTEM

Type of System ..... Pressurized, closed recovery
Coolant Pump .....Pre-lubricated, self-sealing
Cooling Fan Type (no. of blades) ..... Pusher (10)
Fan Diameter inches (mm)..... 68" (1727)
Ambient Capacity of Radiator °F (°C)..... 125 (51.6)
Engine Jacket Coolant Capacity Gal (L)..... 23.3 (88.1)
Radiator Coolant Capacity Gal. (L) 39 (148)
Maximum Restriction of Cooling Air Intake
and discharge side of radiator in. H_20 (kpa)..... 0.5 (.125)
Water Pump Flow gpm (L/min)..... .....436 (1650)
Heat Reject Coolant: Btu/min (kw) 34,074 (599)
Low Radiator Coolant Level Shutdown……...Standard
Note: Coolant temp. shut-down switch setting at 230°F (110°C) with 50/50 (water/antifreeze) mix.

AIR REQUIREMENTS

Combustion Air, cfm (m^3/min) 1396 (40)
Radiator Air Flow cfm (m^3/min)..... .....65,100 (1843)
Heat Rejected to Ambient:
Engine: kw (btu/min)..... .....146 (8310)
Alternator: kw (btu/min)..... .....65 (3696)

EXHAUST SYSTEM

Exhaust Outlet Size..... (2) 6"
Max. Back Pressure, in. hg (KPA)..... 3.0 (10.2)
Exhaust Flow, at rated kw: cfm (m^3/min)..... .....……4079 (115)
Exhaust Temp., at rated kw: °F (ºC) ……..….1183 (639)
Engines are EPA certified for Natural Gas.

SOUND LEVELS MEASURED IN dB(A)

	Open Set	Level 2 Encl.
Level 2, Critical Silencer	97	86
Level 3, Hospital Silencer	92	80

Note: Open sets (no enclosure) has (2) optional silencer system choices due to unknown job-site applications. Level 2 enclosure has installed critical silencer with upgrade to hospital silencer. Sound tests are averaged from several test points and taken at 23 ft. (7 m) from source of noise at normal operation.

DERATE GENERATOR FOR ALTITUDE

3% per 1000 ft.(305m) above 3000 ft. (914m) from sea level

DERATE GENERATOR FOR TEMPERATURE

2% per 10°F(5.6°C) above 104°F (40°C)

DIMENSIONS AND WEIGHTS

	Open Set	Level 2 Enclosure
Length in (cm)	186 (472)	246 (625)
Width in (cm)	92 (234)	92 (234)
Height in (cm)	98 (249)	116 (295)
3 Ø Net Weight lbs (kg)	15950 (7235)	18940 (8591)
3 Ø Ship Weight lbs (kg)	16340 (7412)	19340 (8772)

DEEP SEA 7420 DIGITAL MICROPROCESSOR CONTROLLER

DEEP SEA 7420

The 7420 controller is an auto start mains (utility) failure module for single gen-set applications. This controller includes a backlit LCD display which continuously displays the status of the engine and generator at all times.

The 7420 controller will also monitor speed, frequency, voltage, current, oil pressure, coolant temp., and fuel levels. These modules have been designed to display warning and shut down status. It also includes: (11) configurable inputs • (8) configurable outputs • voltage monitoring • mains (utility) failure detection • (250) event logs • configurable timers • automatic shutdown or warning during fault detection • remote start (on load) • engine preheat • advanced metering capability • hour meter • text LCD displays • protected solid state outputs • test buttons for: stop/reset • manual mode • auto mode • lamp test • start button • power monitoring (kWh, kVAr, kVAh, kVArh) This controller includes expansion features including RS232, RS484 (using MODBUS-RTU/TCP), direct USB connection with PC, expansion optioned using DSENet for remote annunciation and remote relay interfacing for a distance of up to 3300FT. The controller software is freely downloadable from the internet and allows monitoring with direct USB cable, LAN, or by internet via the built in web interface.

LOW LOAD CONDITIONS: Operation of PSI HD engines at low-load conditions should be limited to no more than one (1) hour per twenty-four (24) hour period. If the application requires extended time at light loads, it is recommended that the engine load be increased to at least 70% of mechanical rating for a minimum of two (2) hours per fifty (50) hours of low-load operation. Piston sealing rings rely on adequate cylinder firing pressure and temperature to seal the combustion chamber and prevent excessive engine oil from entering the power cylinder. Under low loads these rings will not seal properly, resulting in oil being burned in the combustion chamber and carbon deposits on pistons and valves. This mechanism is well-documented in reciprocating engines of all fuel types and is often referred to as "wet-stacking."

STANDARD FEATURES FOR MODEL SP-6500-60 HZ

STANDARD FEATURES

CONTROL PANEL:

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

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

Also included is tamper-proof engine hour meter

ENGINE:

Full flow oil filter • Air filter • Oil pump • Solenoid type starter motor • Hi-temp radiator • Jacket water pump • Thermostat • Pusher fan and guard • Exhaust manifold • 24 VDC battery charging alternator • Flexible exhaust connector • "Isochronous" duty, electronic governor • Secondary dry fuel regulator • Dry fuel lock-off solenoid • Vibration isolators • Closed coolant recovery system with 50/50 water to anti-freeze mixture • flexible oil & radiator drain hose.

AC GENERATOR SYSTEM:

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

VOLTAGE REGULATOR:

½% Voltage regulation • EMI filter • Under-speed protection • Over-excitation protection • total encapsulation

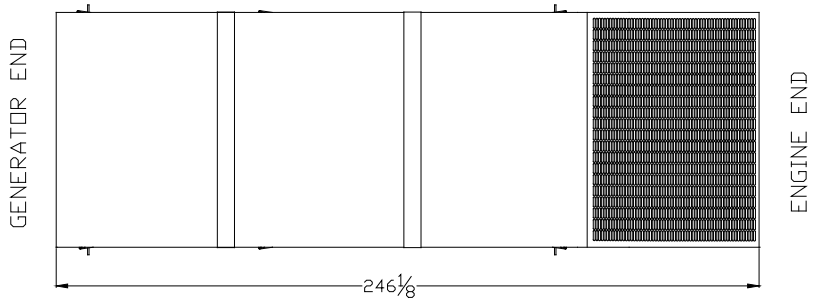
DC ELECTRICAL SYSTEM:

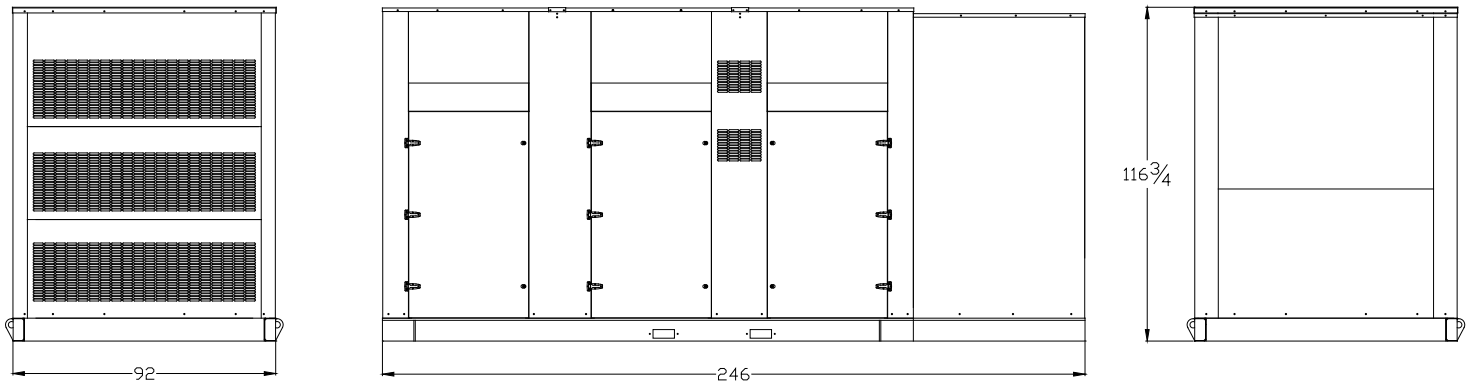
Battery tray • Battery cables • Battery hold down straps • 2-stage battery float charger with maintaining & recharging automatic charge stages

WEATHER/SOUND PROOF ALUMINUM HOUSING CORROSION RESISTANT PROTECTION CONSISTING OF:

- 9 Heated and Agitated Wash Stages
- Zinc Phosphate Etching-coating Stage
- Final Baked On Enamel Powder Coat
- 18/8 Stainless Steel Hardware

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





31.8L PSI HEAVY-DUTY

[Stoic.]
Rev: 1

General Engine Data[5]										
Type	V-Series				Flywheel housing	SAE No.0				
Number of cylinders	12				Flywheel	SAE No.18				
Aspiration	Charged Cooled Forced Induction				Dry Weight (Fan to Flywheel)	lb	kg	7344	3331
Firing Order	1 - 8 - 5 - 10 - 3 - 7 - 6 - 11 - 2 - 9 - 4 - 12				Wet Weight (Fan to Flywheel)	lb	kg	7788	3533
Rotation Viewed from Flywheel	Counter Clockwise				CG From Rear Face of Block	in	mm	37.0	941
Bore	in	mm	5.906	150	CG Above Crank Centerline	in	mm	0	0
Stroke	in	mm	5.906	150	Oil Specification	SAE 15W-40 Low Ash Gas engine oil (.25-.5% by wt), API CD/CF or higher			
Displacement	in^3	L	1941	31.8					
Compression Ratio	10.5 : 1				Engine Oil Capacity[8]				
Exhaust Manifold Type	Water Cooled				Min	qts	L	95	90
Turbo Exhaust Outlet Pipe Size	in	mm	3.5	89	Max	qts	L	129	122
Catalyst Inlet Size	in	mm	5	127	ECU Oil Pressure Warning[6]	psi	kPa	57	393
Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	3.0	10.2	ECU Oil Pressure Shut Down[6]	psi	kPa	47	324
Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	Oil Pressure at 1000 rpm (Idle)				
Maximum Operating pressure to EPR	in-H_2O	kPa	11.0	2.7	Min	psi	kPa	82	569
Minimum Operating pressure to EPR	in-H_2O	kPa	7.0	1.7	Max	psi	kPa	74	512
Minimum Gas Supply Pipe Size[5]	in	mm	3	76	Max Allowable Oil Temperature	°F	°C	250	121
Maximum Pressure Drop Across CAC	psi	kPa	1	6.9	Coolant Capacity (Engine only)	gal	L	23.3	88.1
Max Allowable Intake Restriction					Standard Thermostat Range				
Clean Air Filter	in-H_2O	kPa	5	1.24	Normal Operation Temperature[9]	°F	°C	176	80
Dirty Air Filter	in-H_2O	kPa	15	3.73	Full Open Temperature[9]	°F	°C	198	92
Spark Plug Part Number	Bosch R6 6857				ECU Coolant Temp Warning	°F	°C	203	95
Standard Spark Plug Gap[10]	in	mm	0.012	0.3	ECU Coolant Temp Shutdown	°F	°C	208	98
Spark Plug Coil - Primary Resistance	Ohms		0.59Ω ± 10%		50°C Ambient Capable[11]			Pass	
Battery Voltage	Volts		24		Max External Coolant Friction Head	psi	kPa	7.25	50
Starter Motor Power	HP	kW	15.7	11.7	CAC Rise Above Ambient Specified	F	C	15	9

Performance Data 60Hz[3,5]										
Nominal Engine Speed	RPM		1800		Water Pump Speed	RPM		3705	
Mean Piston Speed	ft/min	m/s	1772	9.0	Engine Coolant Flow	gal/min	L/min	361	1368
RPM Range (Min-Max) ISO 8528-5 G1	RPM		1778 - 1823		Cooling Fan Power[11]	HP	kW	62.8	47
Charging Alternator Voltage	Volts		28		Cooling Fan Speed	RPM		1050	
Charging Alternator Current	Amps		55		Cooling Fan Air Flow[11]	SCFM	m^3/min	65100	1843

NG 60hz	Load		100%		75%		50%		25%	
Stand-By Power Rating[1,2,3,4] Per ISO 3046	HP	kW	966	720	724	540	483	360	243	181
MEP (@ rated Load on NG)	psi	bar	219	15.1	164	11.3	109	7.5	55	3.8
Fuel Consumption[3,4,7]	lb/hr	kg/hr	341	155	263	119	192	87	122	55
BSFC	lb/(hp-hr)	g/(kW-hr)	0.370	225	0.383	233	0.415	253	0.508	309
Turbine Outlet Temperature	°F	°C	1183	639	1111	600	1055	568	1006	541
Exhaust Mass Flow (entire engine)	lb/hr	kg/hr	6396	2901	4907	2226	3578	1623	2226	1010
Exhaust Flow at Turbine Outlet Conditions	ACFM	m^3/min	4079	115	3126	89	2263	64	1390	39
Air Induction System[5]										
Combustion Air required (entire engine)	lb/hr	kg/hr	6055	2746	4644	2106	3385	1536	2104	954
Combustion Air Volume Required (entire engine)	ACFM	m^3/min	1320	37	1012	29	738	21	458	13
Compressor Outlet Temperature[2]	°F	°C	269	132	252	122	207	97	140	60
Thermal Balance[5]										
Total Fuel	BTU/min	kW	123393	2170	95872	1686	69190	1217	43019	756
Mechanical Power	BTU/min	kW	40946	720	30709	540	20473	360	10295	181
Heat Rejected to Cooling Water at Rated Load	BTU/min	kW	34074	599	26768	471	21379	376	15114	266
Heat Rejection CAC at Rated Power	BTU/min	kW	4169	73	2661	47	1435	25	475	8
Heat Rejection to Exhaust (LHV to 150C)	BTU/min	kW	27496	483	19649	346	13115	231	7370	130
Engine Radiated Heat	BTU/min	kW	16710	294	16085	283	12788	225	9765	172

[1] Standby and overload ratings based on ISO 3046 gross flywheel power.

[2] Technical data based on ISO 3046-1 standards of 77°F(25°C), absolute pressure 14.5Psia(100kPa) and 30% relative humidity.

[3] Production tolerances in engines and installed components can account for power variations of ± 5%. Altitude, temperature and excessive exhaust and intake restrictions should be applied to power calculations.

[4] All fuel and thermal calculations unless otherwise noted are done at ISO 3046 rated load using LHV for NG of 48.17 MJ/kg.

[5] All values in the following section are provided for informational purpose only and are non-binding.

[6] >1400RPM.

[7] See PSI HD Technical Spec. 56300002 - Fuel Specification.

[8] Standard Sump Capacity.

[9] ± 2 degrees Celsius.

[10] ± 0.002" or 0.05mm.

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

31.8L PSI HEAVY-DUTY

[Stoic.]
Rev: 1

General Engine Data[5]					Flywheel housing	SAE No.0			
Type	V-Series				Flywheel	SAE No.18			
Number of cylinders	12				Dry Weight (Fan to Flywheel)	lb	kg	7344	3331
Aspiration	Charged Cooled Forced Induction				Wet Weight (Fan to Flywheel)	lb	kg	7788	3533
Firing Order	1 - 8 - 5 - 10 - 3 - 7 - 6 - 11 - 2 - 9 - 4 - 12				CG From Rear Face of Block	in	mm	37.0	941
Rotation Viewed from Flywheel	Counter Clockwise				CG Above Crank Centerline	in	mm	0	0
Bore	in	mm	5.906	150	Oil Specification	SAE 15W-40 Low Ash Gas engine oil (.25-.5% by wt), API CD/CF or higher			
Stroke	in	mm	5.906	150					
Displacement	in^3	L	1941	31.8					
Compression Ratio	10.5 : 1				Engine Oil Capacity[8]				
Exhaust Manifold Type	Water Cooled				Min	qts	L	95	90
Turbo Exhaust Outlet Pipe Size	in	mm	3.5	89	Max	qts	L	129	122
Catalyst Inlet Size	in	mm	5	127	ECU Oil Pressure Warning[6]	psi	kPa	57	393
Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	3.0	10.2	ECU Oil Pressure Shut Down[6]	psi	kPa	47	324
Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	Oil Pressure at 1000 rpm (Idle)				
Maximum Operating pressure to EPR	in-H_2O	kPa	11.0	2.7	Min	psi	kPa	82	569
Minimum Operating pressure to EPR	in-H_2O	kPa	7.0	1.7	Max	psi	kPa	74	512
Minimum Gas Supply Pipe Size[5]	in	mm	3	76	Max Allowable Oil Temperature	°F	°C	250	121
Maximum Pressure Drop Across CAC	psi	kPa	1	6.9	Coolant Capacity (Engine only)	gal	L	23.3	88.1
Max Allowable Intake Restriction					Standard Thermostat Range				
Clean Air Filter	in-H_2O	kPa	5	1.24	Normal Operation Temperature[9]	°F	°C	176	80
Dirty Air Filter	in-H_2O	kPa	15	3.73	Full Open Temperature[9]	°F	°C	198	92
Spark Plug Part Number	Bosch R6 6857				ECU Coolant Temp Warning	°F	°C	203	95
Standard Spark Plug Gap[10]	in	mm	0.012	0.3	ECU Coolant Temp Shutdown	°F	°C	208	98
Spark Plug Coil - Primary Resistance	Ohms		0.59Ω ± 10%		50°C Ambient Capable[11]			Pass	
Battery Voltage	Volts		24		Max External Coolant Friction Head	psi	kPa	7.25	50
Starter Motor Power	HP	kW	15.7	11.7	CAC Rise Above Ambient Specified	F	C	15	9

Performance Data 50Hz[4,5]					Water Pump Speed	RPM		3088	
Nominal Engine Speed	RPM		1500		Engine Coolant Flow	gal/min	L/min	297	1126
Mean Piston Speed	ft/min	m/s	1476	7.5	Cooling Fan Power[11]	HP	kW	36	27
RPM Range (Min-Max) ISO 8528-5 G1	RPM		1477 - 1519		Cooling Fan Speed	RPM		875	
Charging Alternator Voltage	Volts		28		Cooling Fan Air Flow[11]	SCFM	m^3/min	54200	1535
Charging Alternator Current	Amps		53						

NG 50hz	Load		100%		75%		50%		25%	
Stand-By Power Rating[1,2,3,4] Per ISO 3046	HP	kW	805	600	603	450	402	300	202	151
MEP (@ rated Load on NG)	psi	bar	219	15.1	164	11.3	109	7.5	55	3.8
Fuel Consumption[3,4,7]	lb/hr	kg/hr	290	132	227	103	164	74	101	46
BSFC	lb/(hp-hr)	g/(kW-hr)	0.363	221	0.373	227	0.408	248	0.502	306
Turbine Outlet Temperature	°F	°C	1078	581	1032	556	990	532	915	491
Exhaust Mass Flow (entire engine)	lb/hr	kg/hr	4861	2205	3816	1731	2771	1257	1732	786
Exhaust Flow at Turbine Outlet Conditions	ACFM	m^3/min	3183	90	2477	70	1772	50	1071	30
Air Induction System[5]										
Combustion Air required (entire engine)	lb/hr	kg/hr	4571	2073	3589	1628	2607	1183	1631	740
Combustion Air Volume Required (entire engine)	ACFM	m^3/min	996	28	782	22	568	16	355	10
Compressor Outlet Temperature[2]	°F	°C	254	124	223	106	172	78	124	51
Thermal Balance[5]										
Total Fuel	BTU/min	kW	99707	1753	78048	1372	56389	992	34855	613
Mechanical Power	BTU/min	kW	34121	600	25591	450	17061	300	8580	151
Heat Rejected to Cooling Water at Rated Load	BTU/min	kW	27127	477	23202	408	18642	328	13478	237
Heat Rejection CAC at Rated Power	BTU/min	kW	3151	55	2041	36	902	16	247	4
Heat Rejection to Exhaust (LHV to 150C)	BTU/min	kW	18671	328	13756	242	9269	163	5094	90
Engine Radiated Heat	BTU/min	kW	16637	293	13458	237	10516	185	7456	131

[1] Standby and overload ratings based on ISO 3046 gross flywheel power.

[2] Technical data based on ISO 3046-1 standards of 77°F(25°C), absolute pressure 14.5Psia(100kPa) and 30% relative humidity.

[3] Production tolerances in engines and installed components can account for power variations of ± 5%. Altitude, temperature and excessive exhaust and intake restrictions should be applied to power calculations.

[4] All fuel and thermal calculations unless otherwise noted are done at ISO 3046 rated load using LHV for NG of 48.17 MJ/kg.

[5] All values in the following section are provided for informational purpose only and are non-binding.

[6] >1400RPM.

[7] See PSI HD Technical Spec. 56300002 - Fuel Specification.

[8] Standard Sump Capacity.

[9] ± 2 degrees Celsius.

[10] ± 0.002" or 0.05mm.

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

31.8L PSI HEAVY-DUTY

[Stoic.]
Rev: 1

General Engine Data[5]					Flywheel housing	SAE No.0			
Type	V-Series				Flywheel	SAE No.18			
Number of cylinders	12				Dry Weight (Fan to Flywheel)	lb	kg	7344	3331
Aspiration	Charged Cooled Forced Induction				Wet Weight (Fan to Flywheel)	lb	kg	7788	3533
Firing Order	1 - 8 - 5 - 10 - 3 - 7 - 6 - 11 - 2 - 9 - 4 - 12				CG From Rear Face of Block	in	mm	37.0	941
Rotation Viewed from Flywheel	Counter Clockwise				CG Above Crank Centerline	in	mm	0	0
Bore	in	mm	5.906	150	Oil Specification	SAE 15W-40 Low Ash Gas engine oil (.25-.5% by wt), API CD/CF or higher			
Stroke	in	mm	5.906	150					
Displacement	in^3	L	1941	31.8					
Compression Ratio	10.5 : 1				Engine Oil Capacity[8]				
Exhaust Manifold Type	Water Cooled				Min	qts	L	95	90
Turbo Exhaust Outlet Pipe Size	in	mm	3.5	89	Max	qts	L	129	122
Catalyst Inlet Size	in	mm	5	127	ECU Oil Pressure Warning[6]	psi	kPa	57	393
Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	3.0	10.2	ECU Oil Pressure Shut Down[6]	psi	kPa	47	324
Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	Oil Pressure at 1000 rpm (Idle)				
Maximum Operating pressure to EPR	in-H_2O	kPa	11.0	2.7	Min	psi	kPa	82	569
Minimum Operating pressure to EPR	in-H_2O	kPa	7.0	1.7	Max	psi	kPa	74	512
Minimum Gas Supply Pipe Size[5]	in	mm	3	76	Max Allowable Oil Temperature	°F	°C	250	121
Maximum Pressure Drop Across CAC	psi	kPa	1	6.9	Coolant Capacity (Engine only)	gal	L	23.3	88.1
Max Allowable Intake Restriction					Standard Thermostat Range				
Clean Air Filter	in-H_2O	kPa	5	1.24	Normal Operation Temperature[9]	°F	°C	176	80
Dirty Air Filter	in-H_2O	kPa	15	3.73	Full Open Temperature[9]	°F	°C	198	92
Spark Plug Part Number	Bosch R6 6857				ECU Coolant Temp Warning	°F	°C	203	95
Standard Spark Plug Gap[10]	in	mm	0.012	0.3	ECU Coolant Temp Shutdown	°F	°C	208	98
Spark Plug Coil - Primary Resistance	Ohms		0.59Ω ± 10%		50°C Ambient Capable[11]			Pass	
Battery Voltage	Volts		24		Max External Coolant Friction Head	psi	kPa	7.25	50
Starter Motor Power	HP	kW	15.7	11.7	CAC Rise Above Ambient Specified	F	C	15	9

Performance Data 60Hz[3,5]					Water Pump Speed	RPM		3705	
Nominal Engine Speed	RPM		1800		Engine Coolant Flow	gal/min	L/min	361	1368
Mean Piston Speed	ft/min	m/s	1772	9.0	Cooling Fan Power[11]	HP	kW	62.8	47
RPM Range (Min-Max) ISO 8528-5 G1	RPM		1778 - 1823		Cooling Fan Speed	RPM		1050	
Charging Alternator Voltage	Volts		28		Cooling Fan Air Flow[11]	SCFM	m^3/min	65100	1843

LPG 60hz	Load		100%		75%		50%		25%	
Stand-By Power Rating[1,2,3,4] Per ISO 3046	HP	kW	637	475	478	356	318	238	160	119
MEP (@ rated Load on NG)	psi	bar	144	10.0	108	7.5	72	5.0	36	2.5
Fuel Consumption[3,4,7]	lb/hr	kg/hr	293	133	217	98	154	70	105	48
BSFC	lb/(hp-hr)	g/(kW-hr)	0.458	279	0.454	276	0.485	295	0.629	383
Turbine Outlet Temperature	°F	°C	1208	653	1117	603	1057	569	973	523
Exhaust Mass Flow (entire engine)	lb/hr	kg/hr	4844	2197	3596	1631	2558	1160	1735	787
Exhaust Flow at Turbine Outlet Conditions	ACFM	m^3/min	3439	97	2493	71	1748	49	1123	32
Air Induction System[5]										
Combustion Air required (entire engine)	lb/hr	kg/hr	4551	2064	3379	1533	2404	1090	1630	739
Combustion Air Volume Required (entire engine)	ACFM	m^3/min	992	28	736	21	524	15	355	10
Compressor Outlet Temperature[2]	°F	°C	255	124	220	104	164	73	123	50
Thermal Balance[5]										
Total Fuel	BTU/min	kW	97288	1711	72203	1270	51298	902	34824	612
Mechanical Power	BTU/min	kW	27013	475	20260	356	13506	238	6792	119
Heat Rejected to Cooling Water at Rated Load	BTU/min	kW	30994	545	25757	453	20306	357	14388	253
Heat Rejection CAC at Rated Power	BTU/min	kW	3127	55	1868	33	770	14	240	4
Heat Rejection to Exhaust (LHV to 150C)	BTU/min	kW	22299	392	14605	257	9642	170	5609	99
Engine Radiated Heat	BTU/min	kW	13855	244	9713	171	7073	124	7796	137

1. Standby and overload ratings based on ISO 3046 gross flywheel power.
2. Technical data based on ISO 3046-1 standards of 77°F(25°C), absolute pressure 14.5Psia(100kPa) and 30% relative humidity.
3. Production tolerances in engines and installed components can account for power variations of ± 5%. Altitude, temperature and excessive exhaust and intake restrictions should be applied to power calculations.
4. All fuel and thermal calculations unless otherwise noted are done at ISO 3046 rated load using LHV for LPG 46.38 MJ/kg.
5. All values in the following section are provided for informational purpose only and are non-binding.
6. >1400RPM.
7. See PSI HD Technical Spec. 56300002 - Fuel Specification.
8. Standard Sump Capacity.
9. ± 2 degrees Celsius.
10. ± 0.002" or 0.05mm.
11. At 0.5 in-H2O of Package Restriction at STP.

31.8L PSI HEAVY-DUTY

[Stoic.]
Rev: 1

General Engine Data[5]					Flywheel housing	SAE No.0			
Type	V-Series				Flywheel	SAE No.18			
Number of cylinders	12				Dry Weight (Fan to Flywheel)	lb	kg	7344	3331
Aspiration	Charged Cooled Forced Induction				Wet Weight (Fan to Flywheel)	lb	kg	7788	3533
Firing Order	1 - 8 - 5 - 10 - 3 - 7 - 6 - 11 - 2 - 9 - 4 - 12				CG From Rear Face of Block	in	mm	37.0	941
Rotation Viewed from Flywheel	Counter Clockwise				CG Above Crank Centerline	in	mm	0	0
Bore	in	mm	5.906	150	Oil Specification	SAE 15W-40 Low Ash Gas engine oil (.25-.5% by wt), API CD/CF or higher			
Stroke	in	mm	5.906	150					
Displacement	in^3	L	1941	31.8					
Compression Ratio	10.5 : 1				Engine Oil Capacity[8]				
Exhaust Manifold Type	Water Cooled				Min	qts	L	95	90
Turbo Exhaust Outlet Pipe Size	in	mm	3.5	89	Max	qts	L	129	122
Catalyst Inlet Size	in	mm	5	127	ECU Oil Pressure Warning[6]	psi	kPa	57	393
Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	3.0	10.2	ECU Oil Pressure Shut Down[6]	psi	kPa	47	324
Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	Oil Pressure at 1000 rpm (Idle)				
Maximum Operating pressure to EPR	in-H_2O	kPa	11.0	2.7	Min	psi	kPa	82	569
Minimum Operating pressure to EPR	in-H_2O	kPa	7.0	1.7	Max	psi	kPa	74	512
Minimum Gas Supply Pipe Size[5]	in	mm	3	76	Max Allowable Oil Temperature	°F	°C	250	121
Maximum Pressure Drop Across CAC	psi	kPa	1	6.9	Coolant Capacity (Engine only)	gal	L	23.3	88.1
Max Allowable Intake Restriction					Standard Thermostat Range				
Clean Air Filter	in-H_2O	kPa	5	1.24	Normal Operation Temperature[9]	°F	°C	176	80
Dirty Air Filter	in-H_2O	kPa	15	3.73	Full Open Temperature[9]	°F	°C	198	92
Spark Plug Part Number	Bosch R6 6857				ECU Coolant Temp Warning	°F	°C	203	95
Standard Spark Plug Gap[10]	in	mm	0.012	0.3	ECU Coolant Temp Shutdown	°F	°C	208	98
Spark Plug Coil - Primary Resistance	Ohms		0.59Ω ± 10%		50°C Ambient Capable[11]			Pass	
Battery Voltage	Volts		24		Max External Coolant Friction Head	psi	kPa	7.25	50
Starter Motor Power	HP	kW	15.7	11.7	CAC Rise Above Ambient Specified	F	C	15	9

Performance Data 50Hz[3,5]					Water Pump Speed	RPM		3088	
Nominal Engine Speed	RPM		1500		Engine Coolant Flow	gal/min	L/min	297	1125.6
Mean Piston Speed	ft/min	m/s	1476	7.5	Cooling Fan Power[11]	HP	kW	36.4	27
RPM Range (Min-Max) ISO 8528-5 G1	RPM		1477 - 1519		Cooling Fan Speed	RPM		875	
Charging Alternator Voltage	Volts		28		Cooling Fan Air Flow[11]	SCFM	m^3/min	54200	1535

LPG 50hz	Load		100%		75%		50%		25%	
Stand-By Power Rating[1,2,3,4] Per ISO 3046	HP	kW	543	405	407	304	272	203	137	102
MEP (@ rated Load on NG)	psi	bar	148	10.2	111	7.6	74	5.1	37	2.6
Fuel Consumption[3,4,7]	lb/hr	kg/hr	604	274	571	259	631	286	849	385
BSFC	lb/(hp-hr)	g/(kW-hr)	0.428	260	0.445	271	0.437	266	0.599	364
Turbine Outlet Temperature	°F	°C	1168	631	1077	581	1022	550	947	508
Exhaust Mass Flow (entire engine)	lb/hr	kg/hr	4406	1998	3287	1491	2599	1179	2202	999
Exhaust Flow at Turbine Outlet Conditions	ACFM	m^3/min	2913	82	2017	57	1426	40	943	27
Air Induction System[5]										
Combustion Air required (entire engine)	lb/hr	kg/hr	3802	1725	2716	1232	1969	893	1352	613
Combustion Air Volume Required (entire engine)	ACFM	m^3/min	829	23	592	17	429	12	295	8
Compressor Outlet Temperature[2]	°F	°C	246	119	185	85	144	62	113	45
Thermal Balance[5]										
Total Fuel	BTU/min	kW	81417	1432	58071	1021	42143	741	28738	505
Mechanical Power	BTU/min	kW	23032	405	17274	304	11516	203	5791	102
Heat Rejected to Cooling Water at Rated Load	BTU/min	kW	26302	462	20356	358	16728	294	12536	220
Heat Rejection CAC at Rated Power	BTU/min	kW	2486	44	1115	20	486	9	145	3
Heat Rejection to Exhaust (LHV to 150C)	BTU/min	kW	17788	313	11078	195	7540	133	4416	78
Engine Radiated Heat	BTU/min	kW	11809	208	8248	145	5873	103	5850	103

[1] Standby and overload ratings based on ISO 3046 gross flywheel power.

[2] Technical data based on ISO 3046-1 standards of 77°F(25°C), absolute pressure 14.5Psia(100kPa) and 30% relative humidity.

[3] Production tolerances in engines and installed components can account for power variations of ± 5%. Altitude, temperature and excessive exhaust and intake restrictions should be applied to power calculations.

[4] All fuel and thermal calculations unless otherwise noted are done at ISO 3046 rated load using LHV for LPG 46.38 MJ/kg.

[5] All values in the following section are provided for informational purpose only and are non-binding.

[6] >1400RPM.

[7] See PSI HD Technical Spec. 56300002 - Fuel Specification.

[8] Standard Sump Capacity.

[9] ± 2 degrees Celsius.

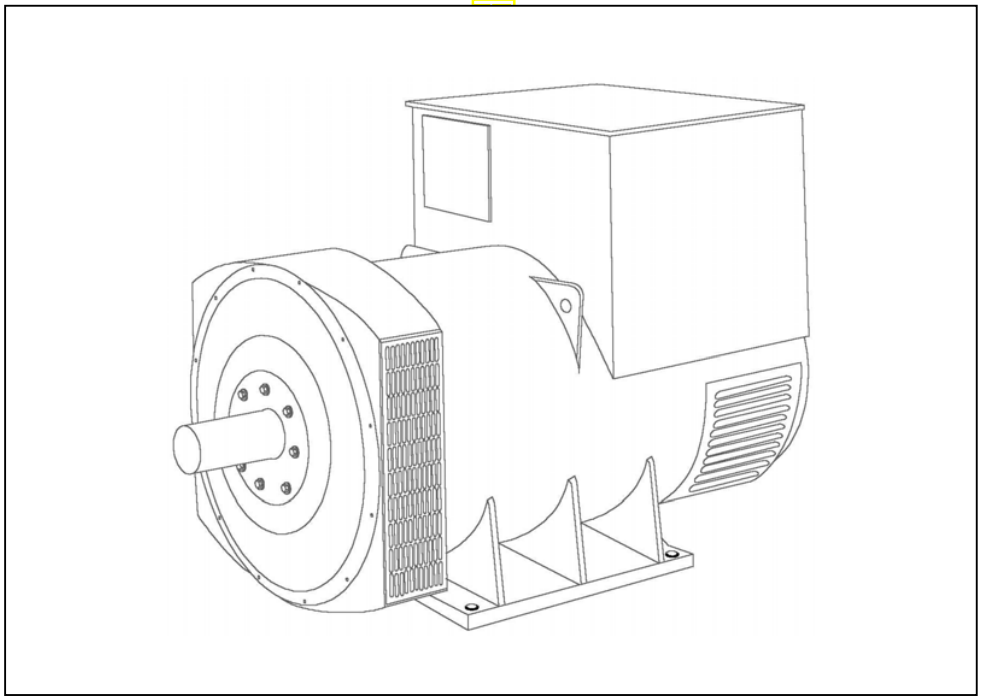
[10] ± 0.002" or 0.05mm.

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

STAMFORD®

HCI634G - 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.

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							

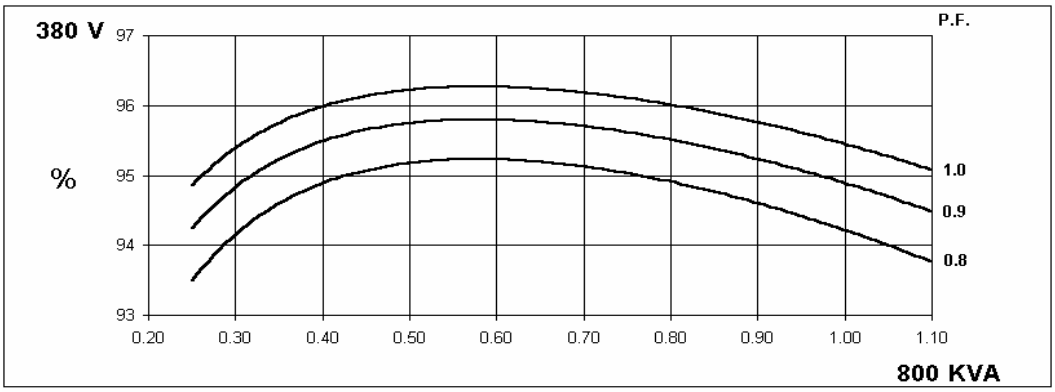
(*) Parallel Star connection only available with Wdg 311

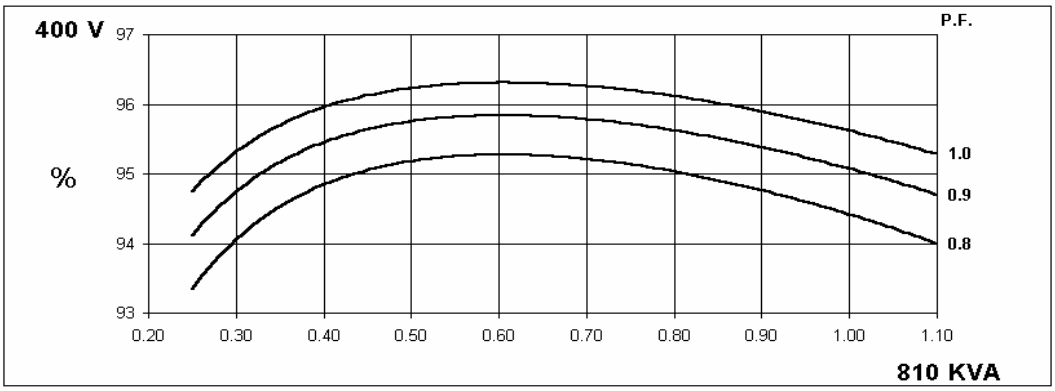
50 Hz

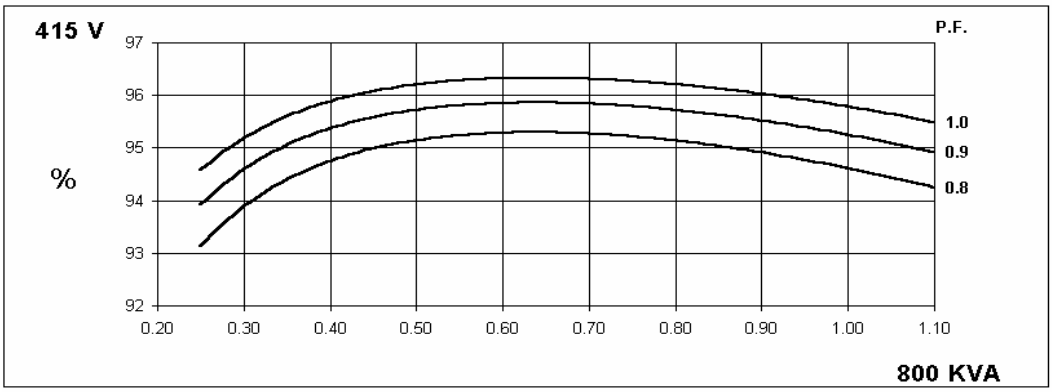
HCI634G

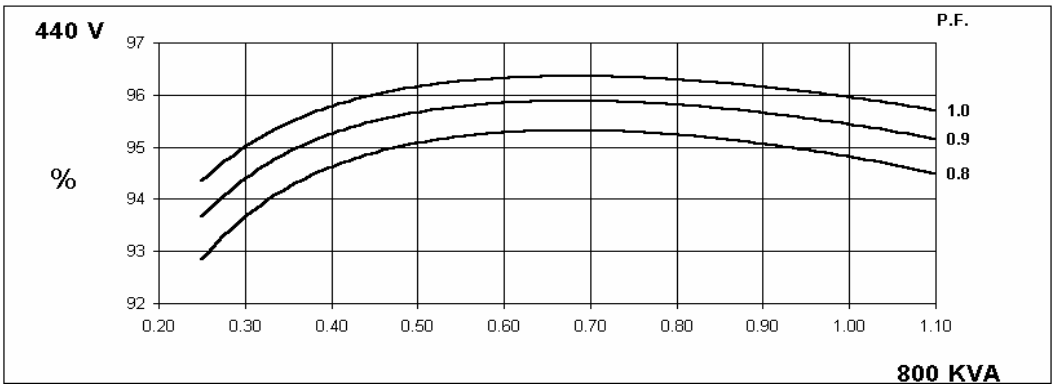
WINDING 311 and 312

THREE PHASE EFFICIENCY CURVES







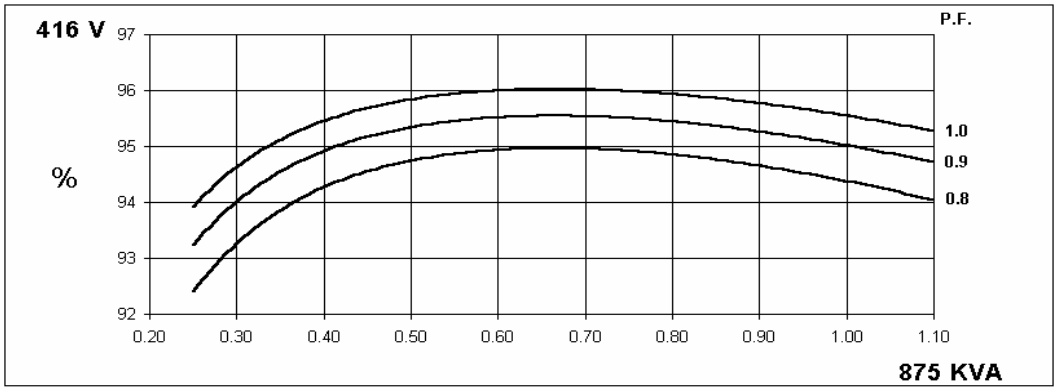


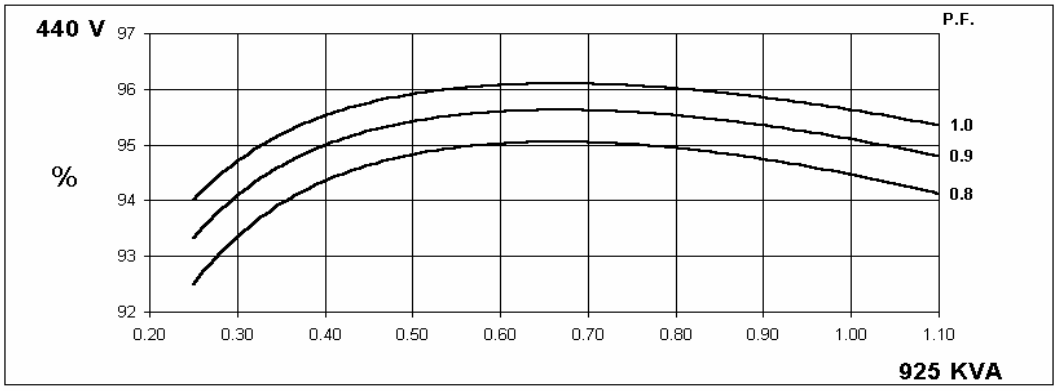
60 Hz

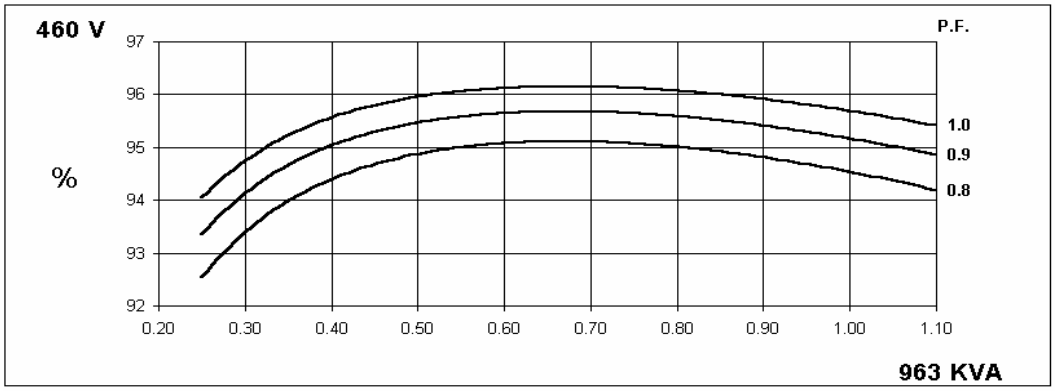
HCI634G

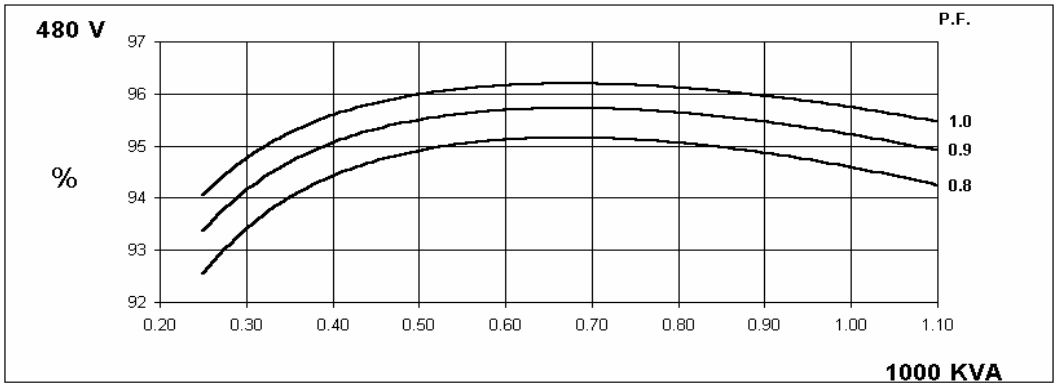
WINDING 311 and 312

THREE PHASE EFFICIENCY CURVES





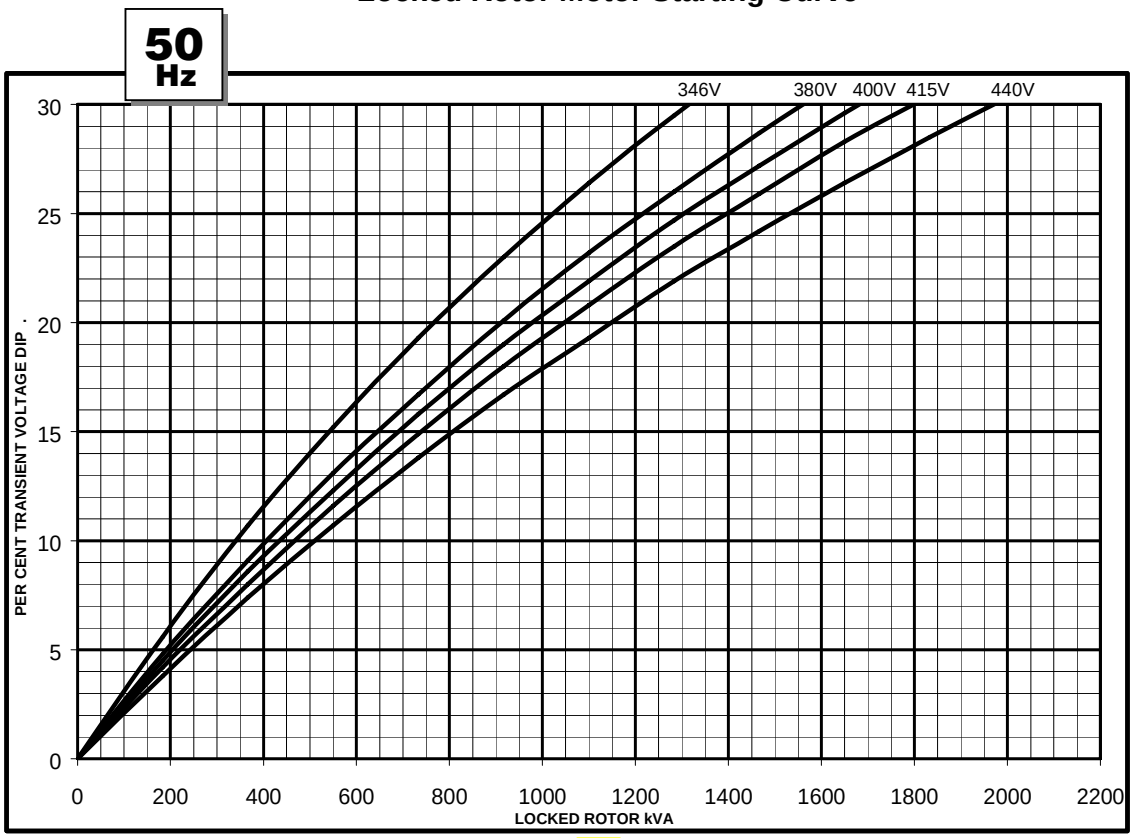


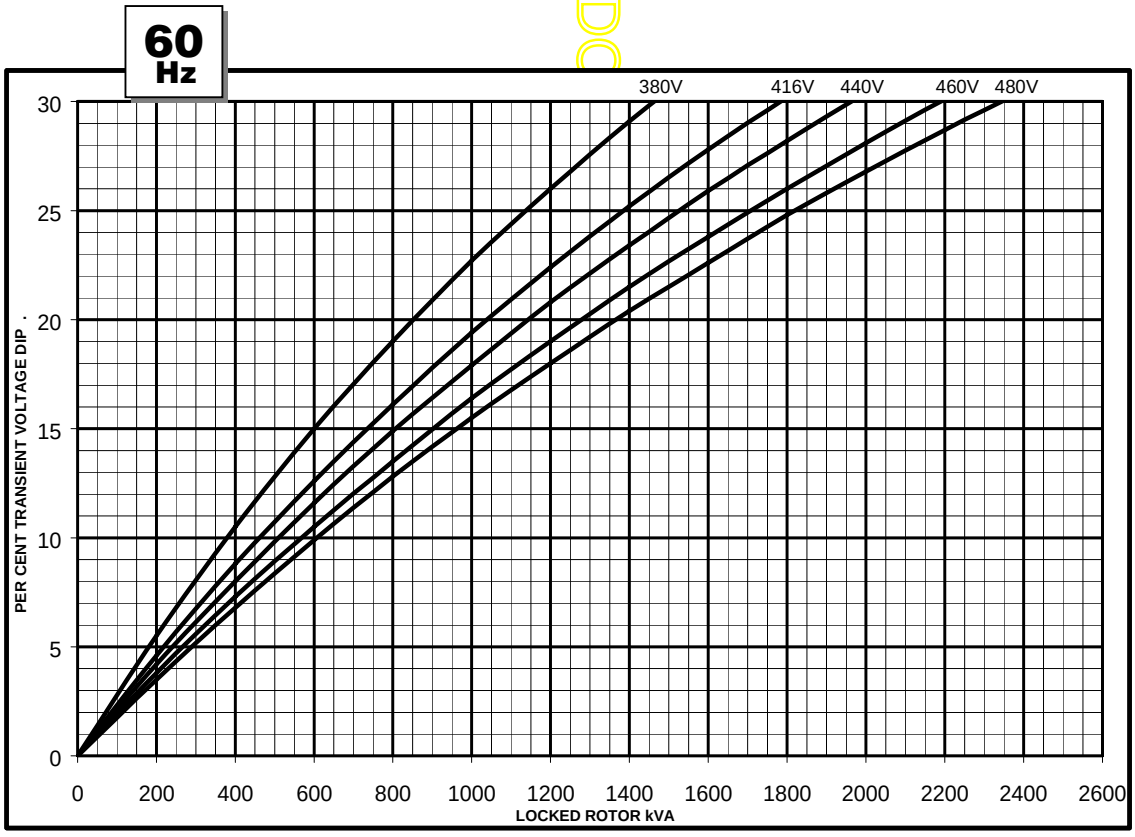


HCI634G

WINDING 311 and 312

Locked Rotor Motor Starting Curve





HCI634G

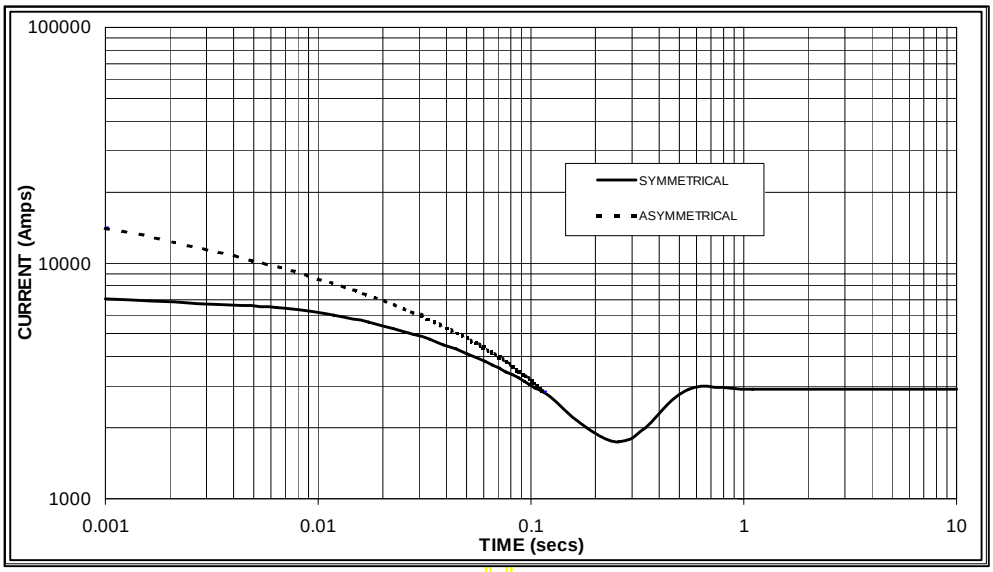
STAMFORD

WINDING 311 and 312

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

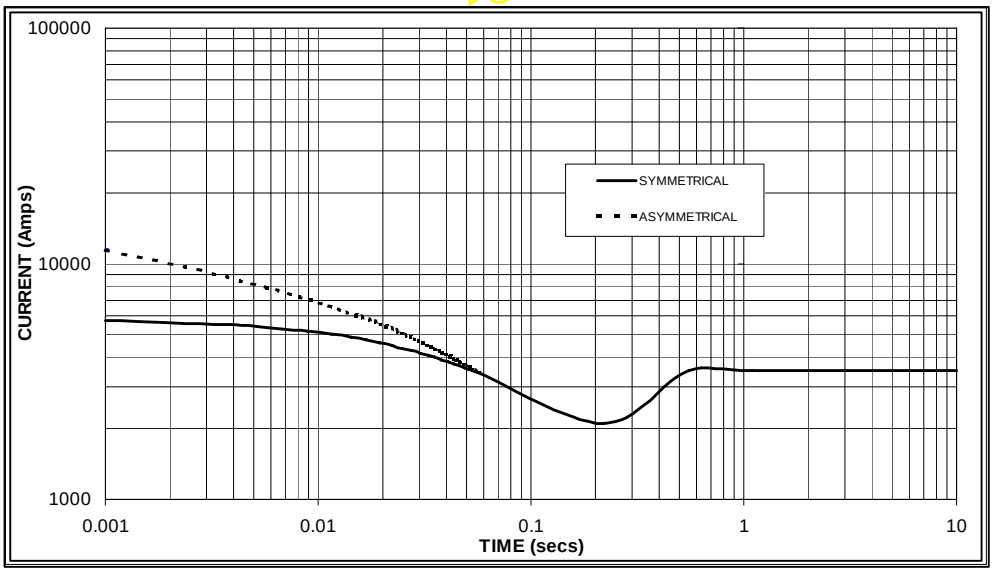
Based on star (wye) connection.

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

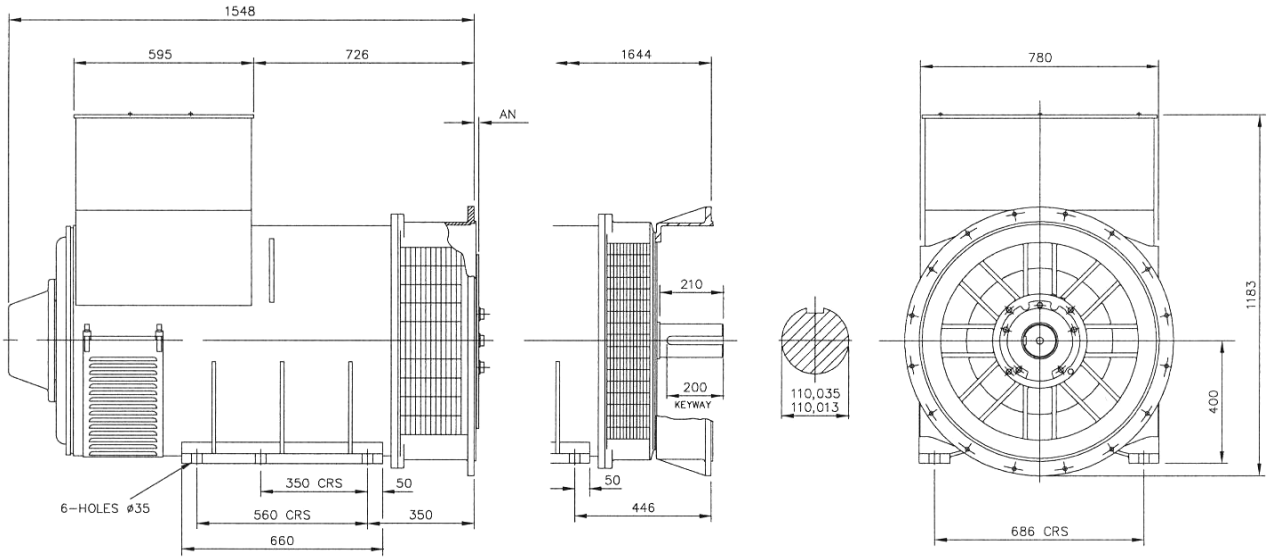
RATINGS

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

STAMFORD

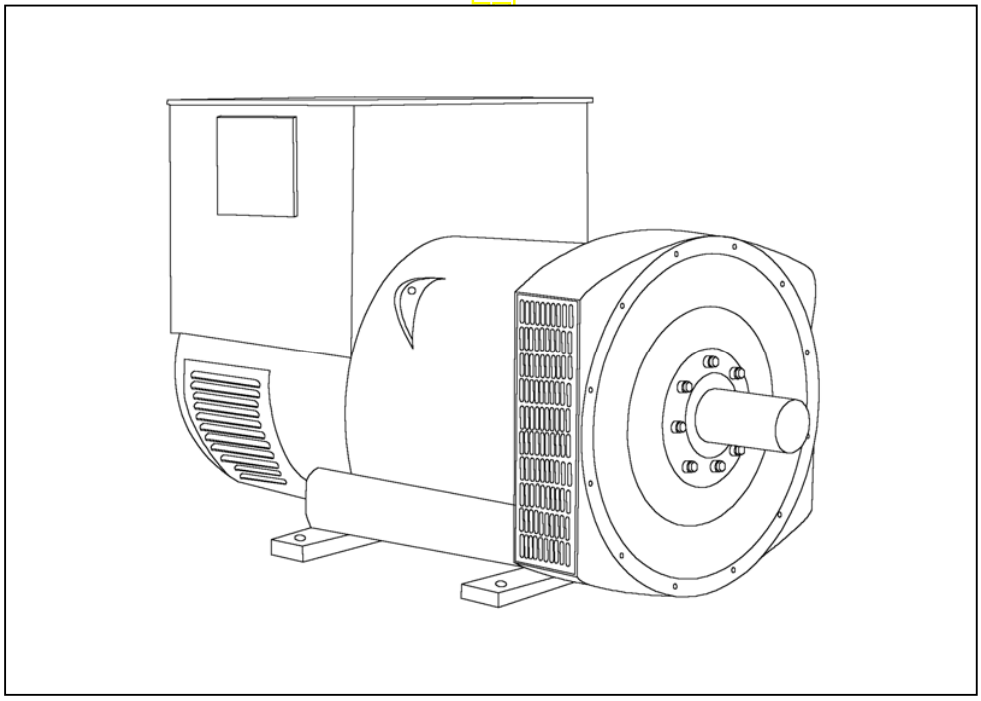
Head Office Address:
Barnack Road, Stamford
Lincolnshire, PE9 2NB
United Kingdom
Tel: +44 (0) 1780 484000
Fax: +44 (0) 1780 484100

www.cumminsgeneratortechnologies.com

STAMFORD®

HCI 534F/544F - Winding 311

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

AS440 AVR - STANDARD
With this self-excited system the main stator provides power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semi-conductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.
The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

MX341 AVR
This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.
If three-phase sensing is required with the PMG system the MX321 AVR must be used.
We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

MX321 AVR
The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

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

TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

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

INSULATION/IMPREGNATION

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

QUALITY ASSURANCE

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

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

DE RATES

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

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

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

Front cover drawing typical of product range.

HCI534F/544F

STAMFORD

WINDING 311

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.		
A.V.R.	MX321	MX341	
VOLTAGE REGULATION	± 0.5 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 7)		

CONTROL SYSTEM	SELF EXCITED	
A.V.R.	AS440	
VOLTAGE REGULATION	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	SERIES 4 CONTROL DOES NOT SUSTAIN A SHORT CIRCUIT CURRENT	

INSULATION SYSTEM	CLASS H						
PROTECTION	IP23						
RATED POWER FACTOR	0.8						
STATOR WINDING	DOUBLE LAYER LAP						
WINDING PITCH	TWO THIRDS						
WINDING LEADS	12						
STATOR WDG. RESISTANCE	0.0037 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED						
ROTOR WDG. RESISTANCE	2.16 Ohms at 22°C						
EXCITER STATOR RESISTANCE	17 Ohms at 22°C						
EXCITER ROTOR RESISTANCE	0.092 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. 6220 (ISO)						
BEARING NON-DRIVE END	BALL. 6314 (ISO)						
	1 BEARING				2 BEARING		
WEIGHT COMP. GENERATOR	1685 kg				1694 kg		
WEIGHT WOUND STATOR	805 kg				805 kg		
WEIGHT WOUND ROTOR	684 kg				655 kg		
WR² INERTIA	10.033 kgm^2				9.7551 kgm^2		
SHIPPING WEIGHTS in a crate	1775 kg				1780kg		
PACKING CRATE SIZE	166 x 87 x 124(cm)				166 x 87 x 124(cm)		
	50 Hz				60 Hz		
TELEPHONE INTERFERENCE	THF<2%				TIF<50		
COOLING AIR	1.035 m³/sec 2202 cfm				1.312 m³/sec 2780 cfm		
VOLTAGE SERIES 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 SERIES DELTA	220/110	230/115	240/120	254/127	240/120	254/127	266/133	277/138
kVA BASE RATING FOR REACTANCE VALUES	670	670	670	650	738	775	800	825
Xd DIR. AXIS SYNCHRONOUS	2.90	2.62	2.43	2.10	3.33	3.13	2.95	2.80
X'd DIR. AXIS TRANSIENT	0.16	0.14	0.13	0.11	0.16	0.15	0.14	0.13
X"d DIR. AXIS SUBTRANSIENT	0.11	0.10	0.09	0.08	0.11	0.10	0.10	0.09
Xq QUAD. AXIS REACTANCE	2.42	2.19	2.03	1.75	2.66	2.50	2.36	2.23
X"q QUAD. AXIS SUBTRANSIENT	0.25	0.23	0.21	0.18	0.31	0.29	0.27	0.26
X_L LEAKAGE REACTANCE	0.05	0.04	0.04	0.03	0.05	0.05	0.04	0.04
X_2 NEGATIVE SEQUENCE	0.18	0.16	0.15	0.13	0.21	0.20	0.19	0.18
X_0 ZERO SEQUENCE	0.08	0.08	0.07	0.06	0.09	0.08	0.08	0.08
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED							
T'd TRANSIENT TIME CONST.	0.08s							
T"d SUB-TRANSTIME CONST.	0.012s							
T'do O.C. FIELD TIME CONST.	2.5s							
Ta ARMATURE TIME CONST.	0.019s							
SHORT CIRCUIT RATIO	1/Xd							

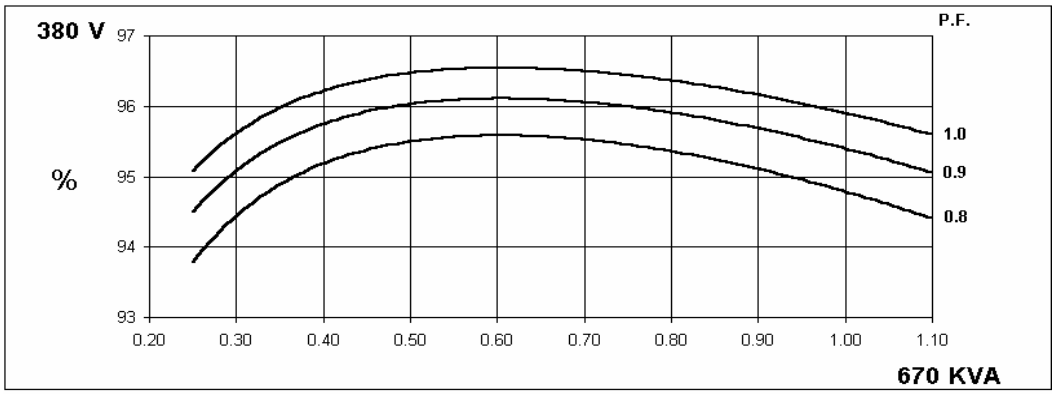
50 Hz

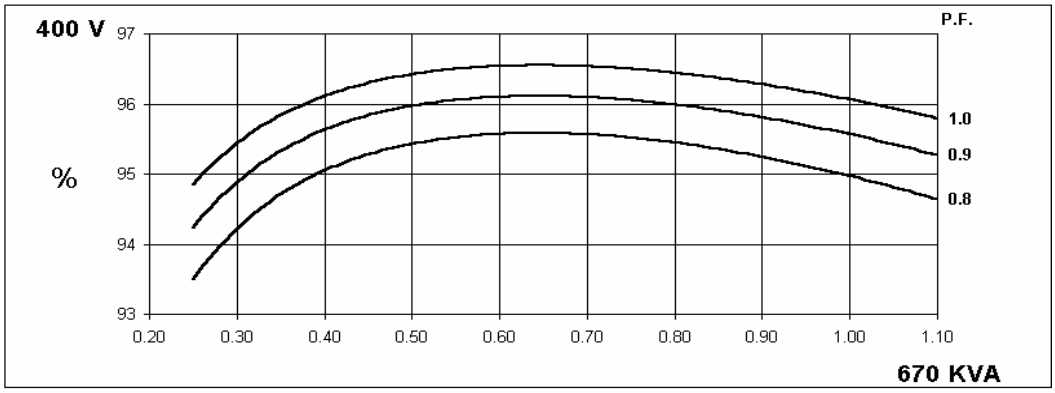
HCI534F/544F

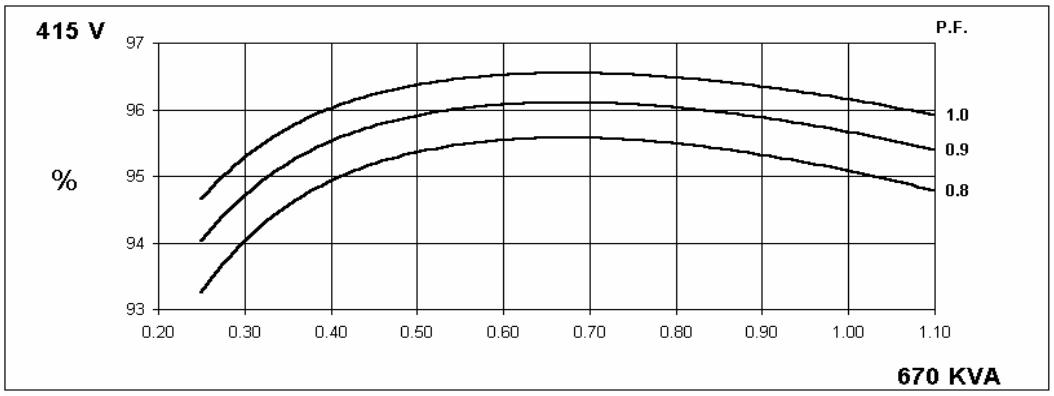
Winding 311

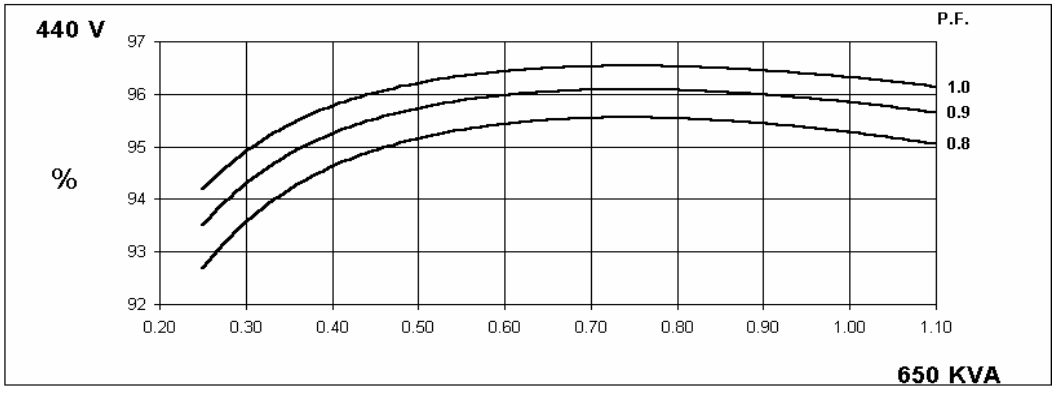
STAMFORD

THREE PHASE EFFICIENCY CURVES









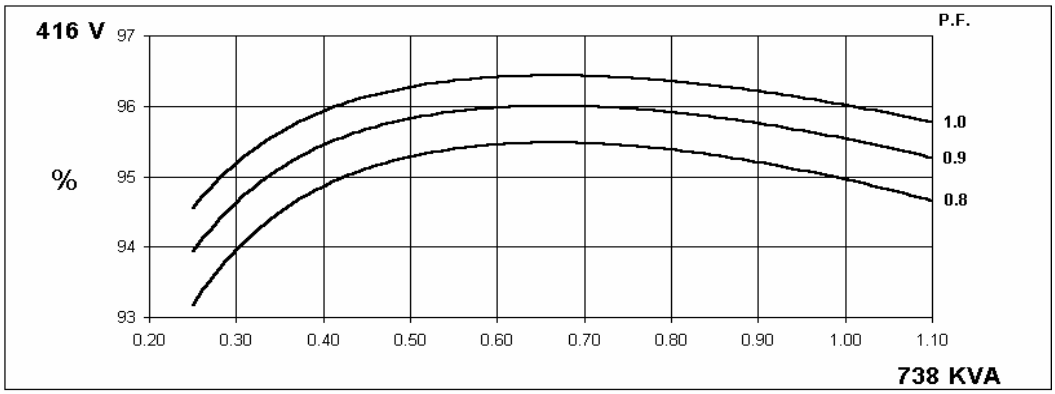
60 Hz

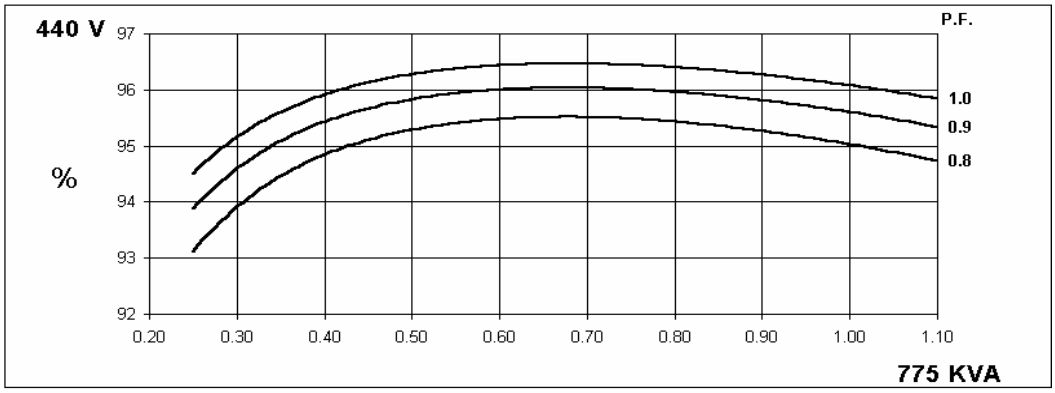
HCI534F/544F

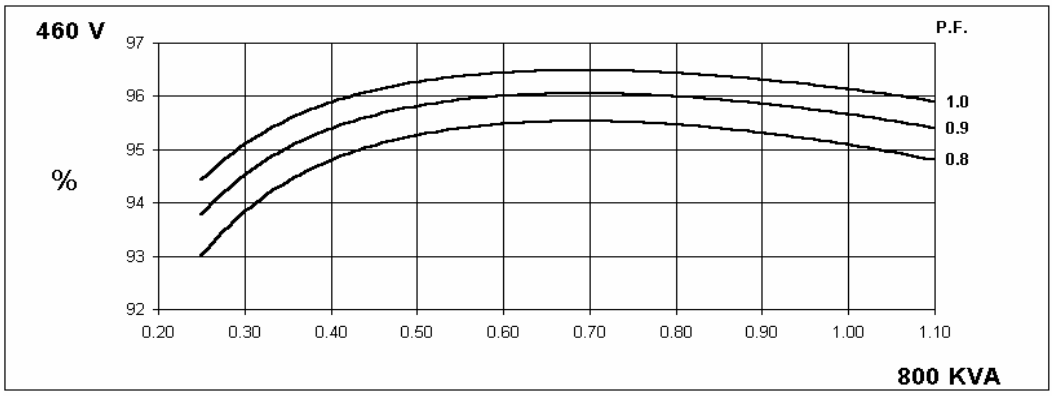
Winding 311

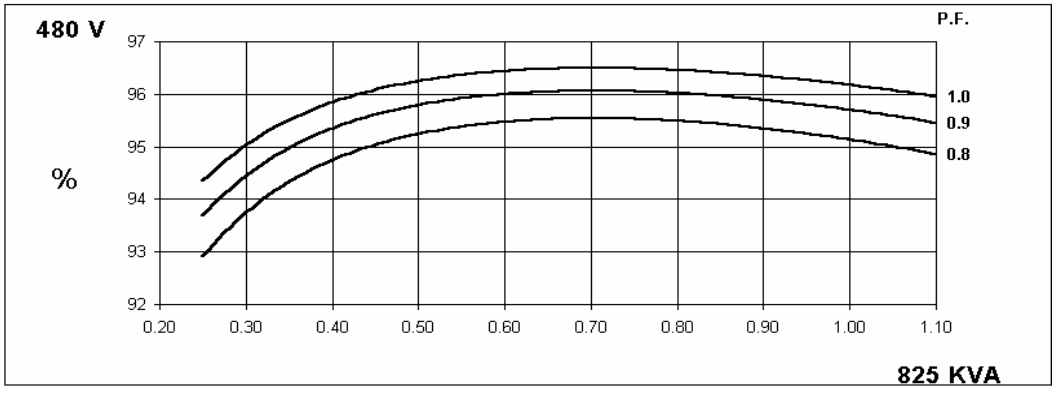
STAMFORD

THREE PHASE EFFICIENCY CURVES









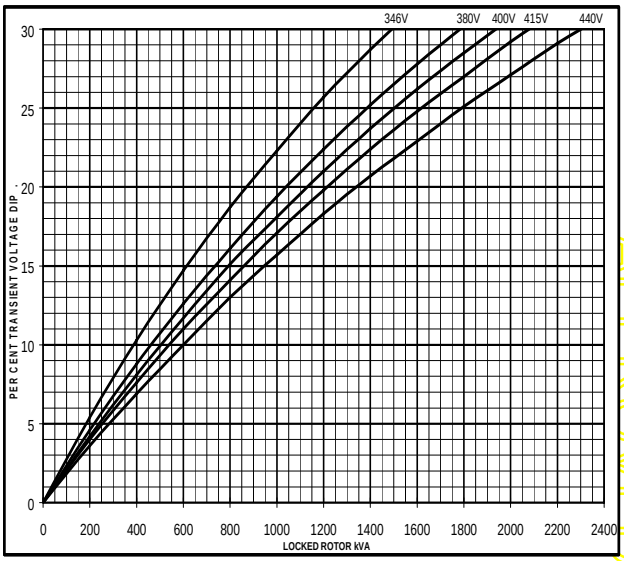
HCI534F/544F

Winding 311

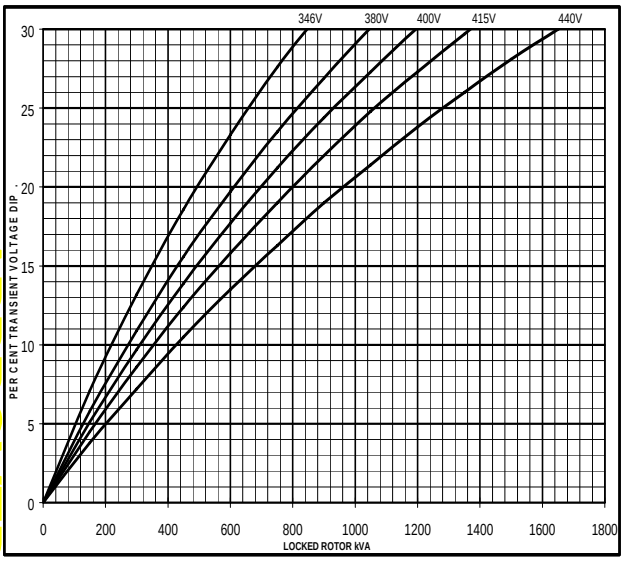
Locked Rotor Motor Starting Curve

50 Hz

MX

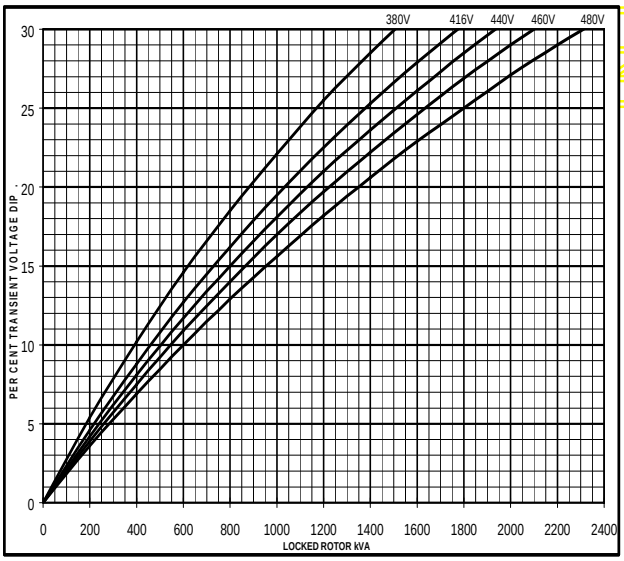


SX

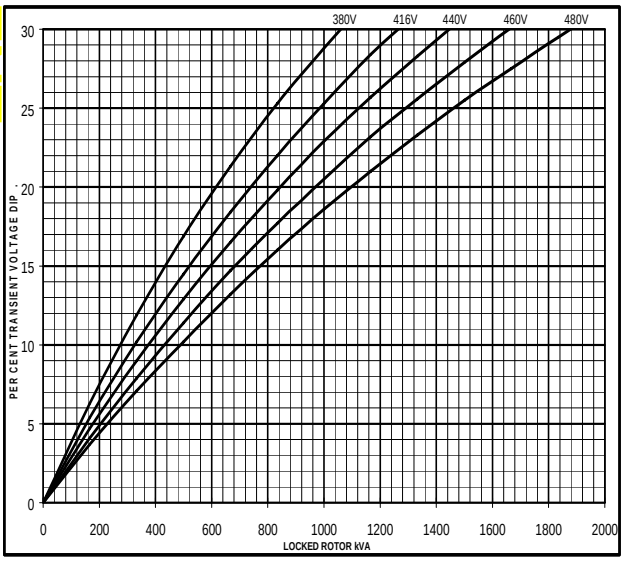


60 Hz

MX

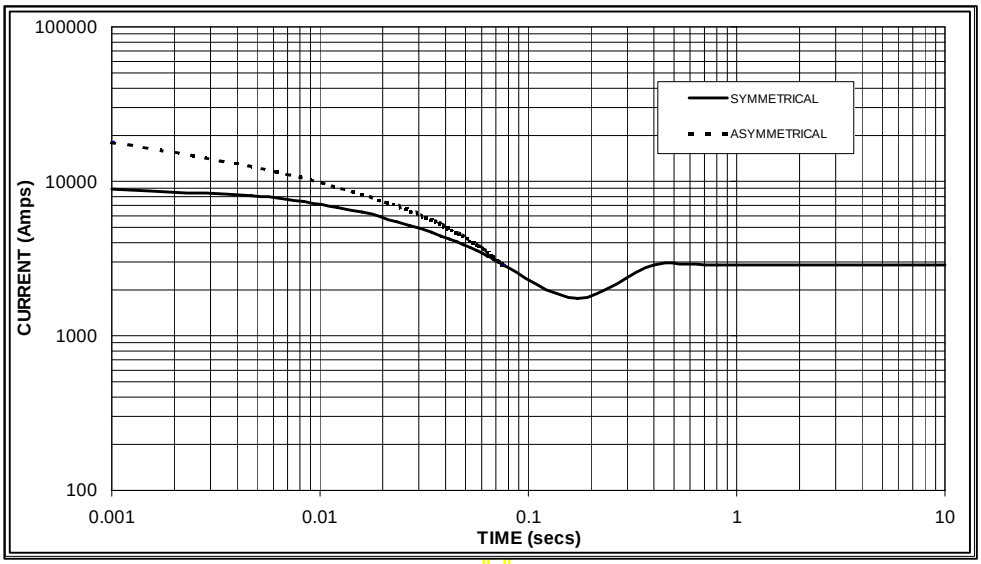


SX



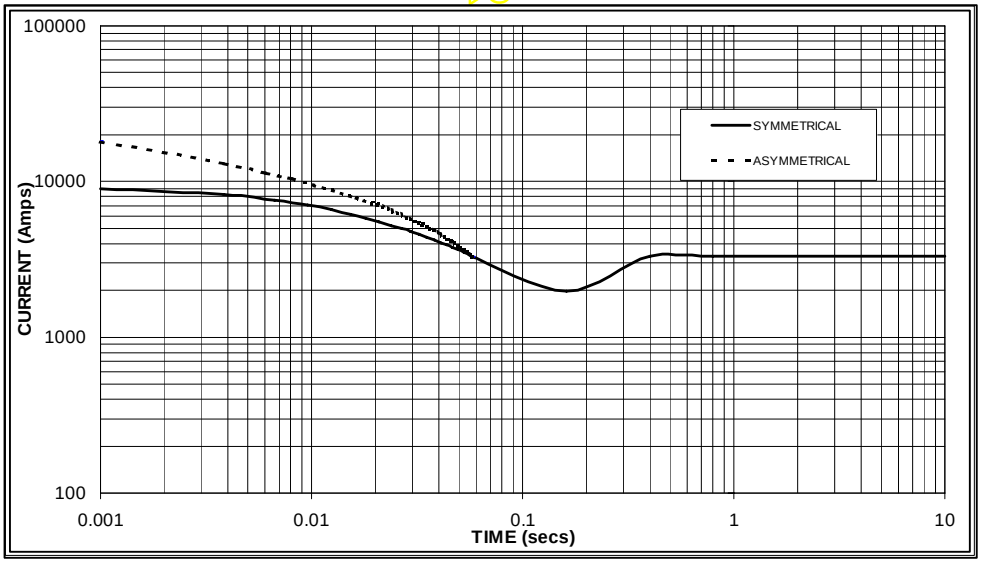
Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed Based on star (wye) connection.

50 Hz



Sustained Short Circuit = 2,900 Amps

60 Hz



Sustained Short Circuit = 3,300 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 1.06	440v	X 1.06
415v	X 1.09	460v	X 1.12
440v	X 1.12	480v	X 1.20

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 other connections the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

Series Delta = Curve current value X 1.732

HCI534F/544F

STAMFORD

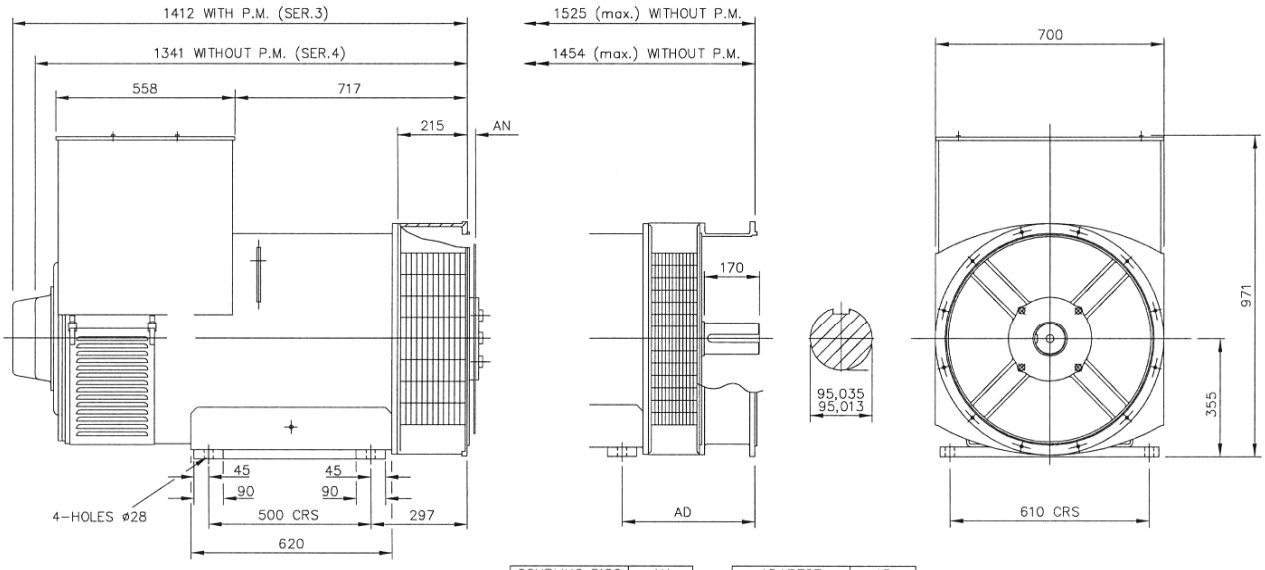
Winding 311 0.8 Power Factor

RATINGS

	Class - Temp Rise	Cont. F - 105/40°C				Cont. H - 125/40°C				Standby - 150/40°C				Standby - 163/27°C			
50 Hz	Series Star (V)	380	400	415	440	380	400	415	440	380	400	415	440	380	400	415	440
	Parallel Star (V)	190	200	208	220	190	200	208	220	190	200	208	220	190	200	208	220
	Series Delta (V)	220	230	240	254	220	230	240	254	220	230	240	254	220	230	240	254
	kVA	620	620	620	600	670	670	670	650	710	710	710	690	738	738	738	715
	kW	496	496	496	480	536	536	536	520	568	568	568	552	590	590	590	572
	Efficiency (%)	95.0	95.2	95.3	95.4	94.8	95.0	95.1	95.3	94.6	94.8	94.9	95.1	94.4	94.6	94.8	95.1
	kW Input	522	521	520	503	565	564	564	546	600	599	599	580	625	624	623	601

60 Hz	Series 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	688	719	731	750	738	775	800	825	781	819	848	875	806	844	878	906
	kW	550	575	585	600	590	620	640	660	625	655	678	700	645	675	702	725
	Efficiency (%)	95.1	95.2	95.3	95.3	95.0	95.0	95.1	95.1	94.8	94.9	94.9	95.0	94.7	94.8	94.8	94.9
	kW Input	579	604	614	630	621	653	673	694	659	690	715	737	681	712	741	764

DIMENSIONS



COUPLING DISC	AN
SAE 14	25,4
SAE 18	15,87
SAE 21	0

ADAPTOR	AD
SAE 00	410
SAE 0	410
SAE 1/2	390
SAE 1	390

APPROVED DOCUMENT

STAMFORD

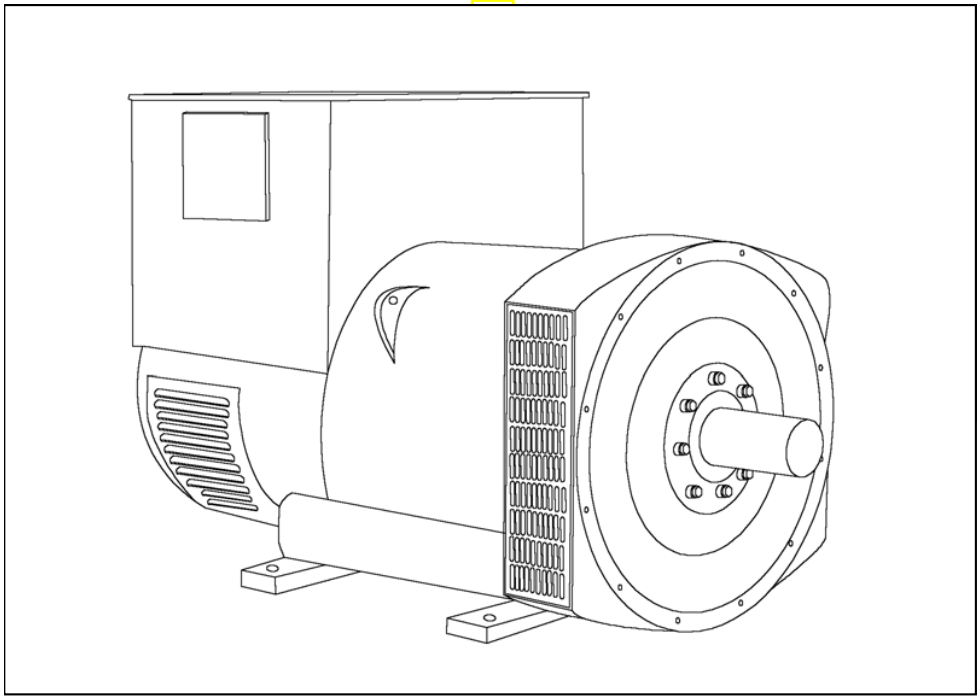
Head Office Address:
Barnack Road, Stamford
Lincolnshire, PE9 2NB
United Kingdom
Tel: +44 (0) 1780 484000
Fax: +44 (0) 1780 484100

www.cumminsgeneratortechnologies.com

STAMFORD®

HCI534F/544F - Winding 17

Technical Data Sheet



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

AS440 AVR - STANDARD

With this self-excited system the main stator provides power via the Automatic Voltage Regulator (AVR) to the exciter stator. The high efficiency semi-conductors of the AVR ensure positive build-up from initial low levels of residual voltage.
The exciter rotor output is fed to the main rotor through a three-phase full-wave bridge rectifier. The rectifier is protected by a surge suppressor against surges caused, for example, by short circuit or out-of-phase paralleling.
The AS440 will support a range of electronic accessories, including a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

MX341 AVR

This sophisticated AVR is incorporated into the Stamford Permanent Magnet Generator (PMG) control system.
The PMG provides power via the AVR to the main exciter, giving a source of constant excitation power independent of generator output. The main exciter output is then fed to the main rotor, through a full wave bridge, protected by a surge suppressor. The AVR has in-built protection against sustained over-excitation, caused by internal or external faults. This de-excites the machine after a minimum of 5 seconds.
An engine relief load acceptance feature can enable full load to be applied to the generator in a single step.
If three-phase sensing is required with the PMG system the MX321 AVR must be used.
We recommend three-phase sensing for applications with greatly unbalanced or highly non-linear loads.

MX321 AVR

The most sophisticated of all our AVRs combines all the features of the MX341 with, additionally, three-phase rms sensing, for improved regulation and performance.
Over voltage protection is built-in and short circuit current level adjustments is an optional facility.

WINDINGS & ELECTRICAL PERFORMANCE

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

TERMINALS & TERMINAL BOX

Standard generators are 3-phase reconnectable with 12 ends brought out to the terminals, which are mounted on a cover at the non-drive end of the generator. A sheet steel terminal box contains the AVR and provides ample space for the customers' wiring and gland arrangements. It has removable panels for easy access.

SHAFT & KEYS

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

INSULATION/IMPREGNATION

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

QUALITY ASSURANCE

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

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

DE RATES

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

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

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

Front cover drawing typical of product range.

HCI534F/544F

STAMFORD

WINDING 17

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.		
A.V.R.	MX321	MX341	
VOLTAGE REGULATION	± 0.5 %	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRCUIT DECREMENT CURVES (page 5)		

CONTROL SYSTEM	SELF EXCITED	
A.V.R.	AS440	
VOLTAGE REGULATION	± 1.0 %	With 4% ENGINE GOVERNING
SUSTAINED SHORT CIRCUIT	WILL NOT SUSTAIN A SHORT CIRCUIT	

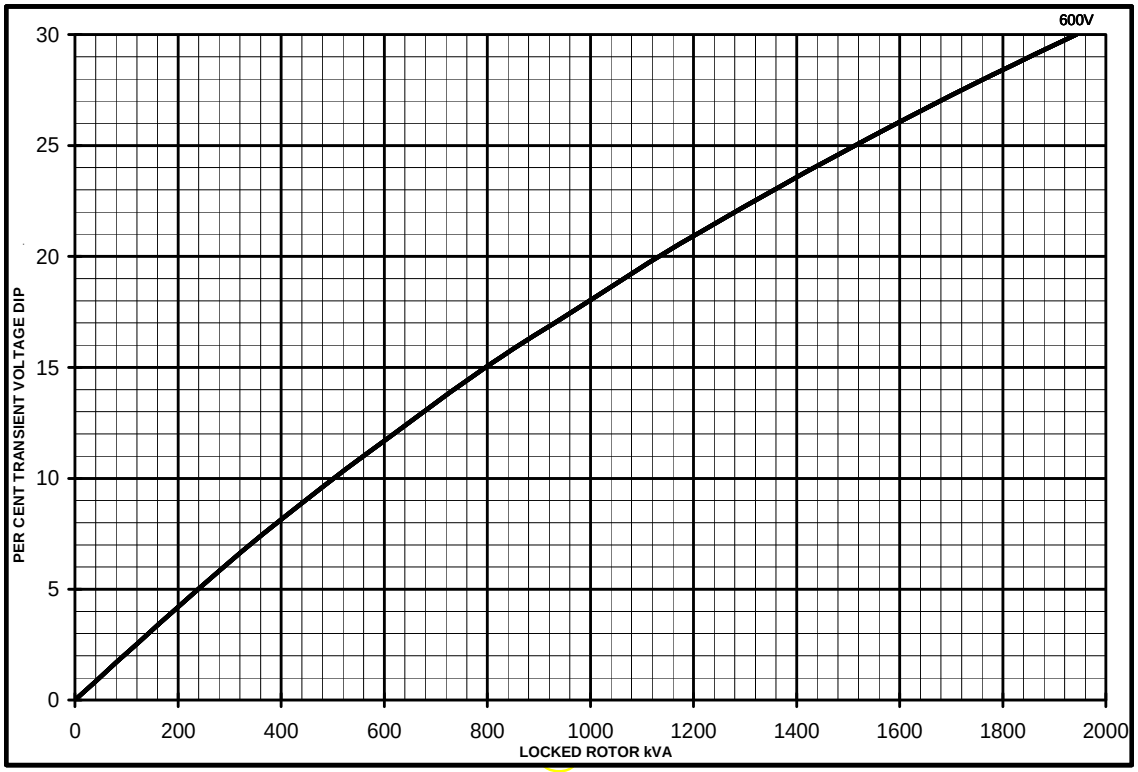
INSULATION SYSTEM	CLASS H	
PROTECTION	IP23	
RATED POWER FACTOR	0.8	
STATOR WINDING	DOUBLE LAYER LAP	
WINDING PITCH	TWO THIRDS	
WINDING LEADS	12	
STATOR WDG. RESISTANCE	0.0049 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED	
ROTOR WDG. RESISTANCE	2.16 Ohms at 22°C	
EXCITER STATOR RESISTANCE	17 Ohms at 22°C	
EXCITER ROTOR RESISTANCE	0.092 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. 6220 (ISO)	
BEARING NON-DRIVE END	BALL. 6314 (ISO)	
	1 BEARING	2 BEARING
WEIGHT COMP. GENERATOR	1685 kg	1694 kg
WEIGHT WOUND STATOR	805 kg	805 kg
WEIGHT WOUND ROTOR	684 kg	655 kg
WR² INERTIA	10.033 kgm^2	9.7551 kgm^2
SHIPPING WEIGHTS in a crate	1775 kg	1780 kg
PACKING CRATE SIZE	166 x 87 x 124 (cm)	166 x 87 x 124 (cm)
TELEPHONE INTERFERENCE	THF<2%	TIF<50
COOLING AIR	1.035 m³/sec 2202 cfm	
VOLTAGE SERIES STAR	600V	
VOLTAGE PARALLEL STAR	300V	
VOLTAGE SERIES DELTA	346V	
kVA BASE RATING FOR REACTANCE VALUES	825	
Xd DIR. AXIS SYNCHRONOUS	2.44	
X'd DIR. AXIS TRANSIENT	0.11	
X"d DIR. AXIS SUBTRANSIENT	0.09	
Xq QUAD. AXIS REACTANCE	1.95	
X"q QUAD. AXIS SUBTRANSIENT	0.23	
X_L LEAKAGE REACTANCE	0.04	
X_2 NEGATIVE SEQUENCE	0.16	
X_0 ZERO SEQUENCE	0.07	
REACTANCES ARE SATURATED	VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED	
T'd TRANSIENT TIME CONST.	0.08 s	
T"d SUB-TRANSTIME CONST.	0.012 s	
T'do O.C. FIELD TIME CONST.	2.5 s	
Ta ARMATURE TIME CONST.	0.019 s	
SHORT CIRCUIT RATIO	1/Xd	

HCI534F/544F

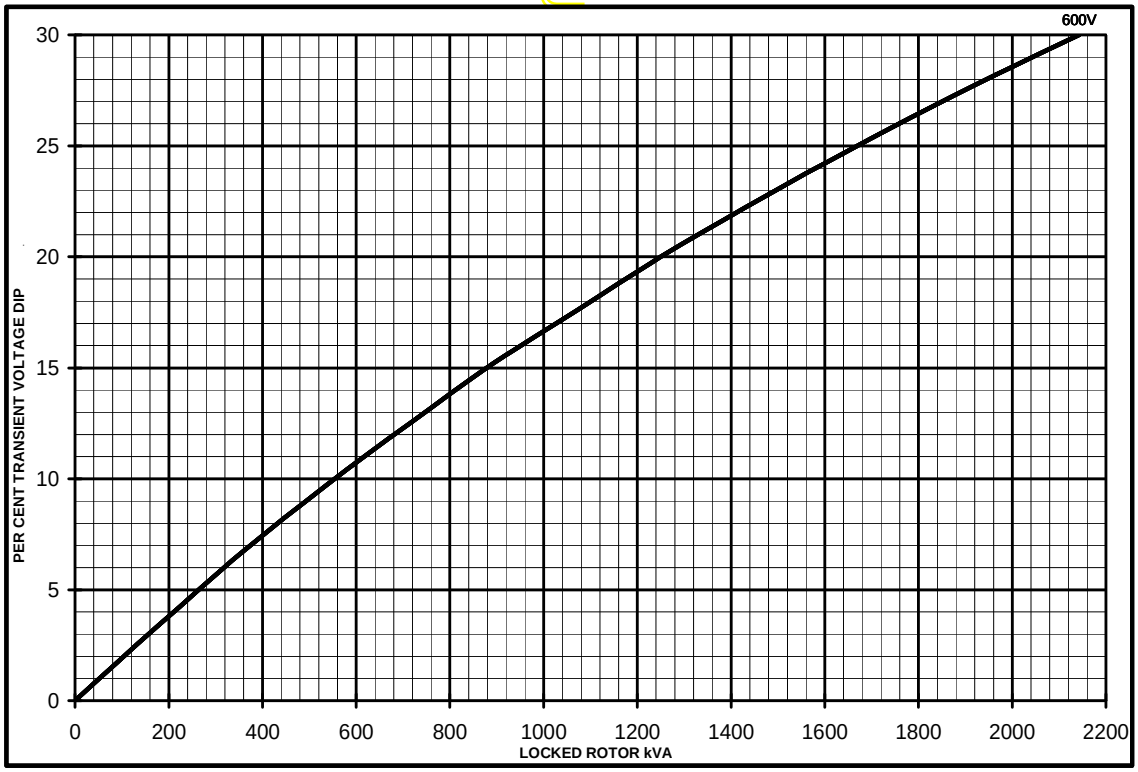
Winding 17

SX

Locked Rotor Motor Starting Curves

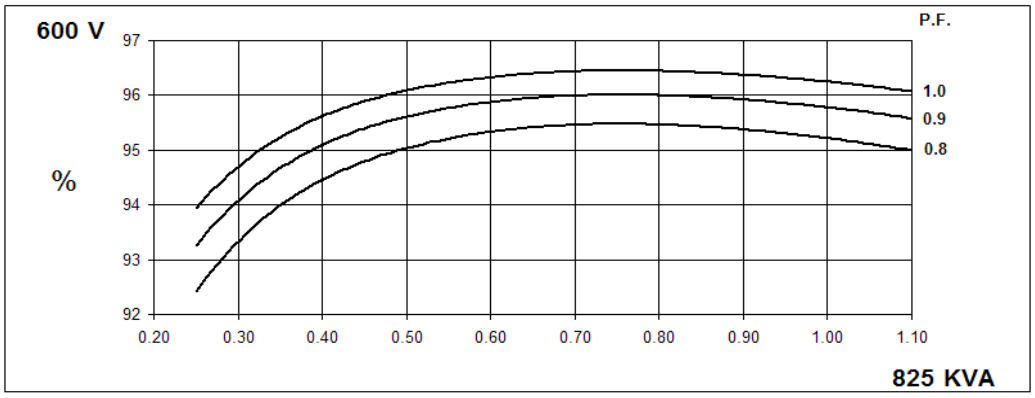


MX

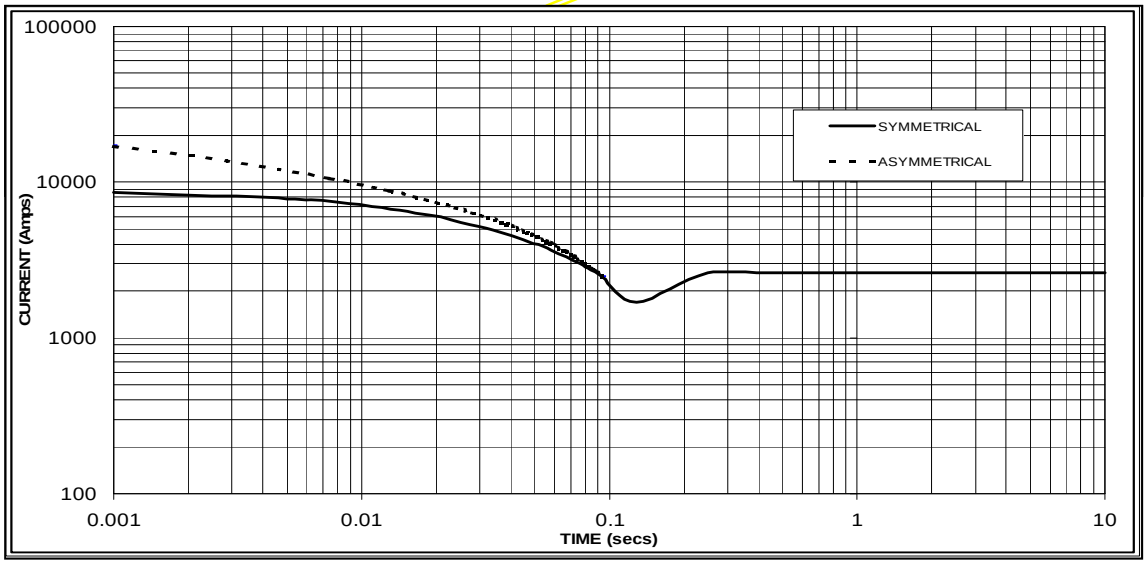


STAMFORD

THREE PHASE EFFICIENCY CURVES



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



Sustained Short Circuit = 2600 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

HCI534F/544F

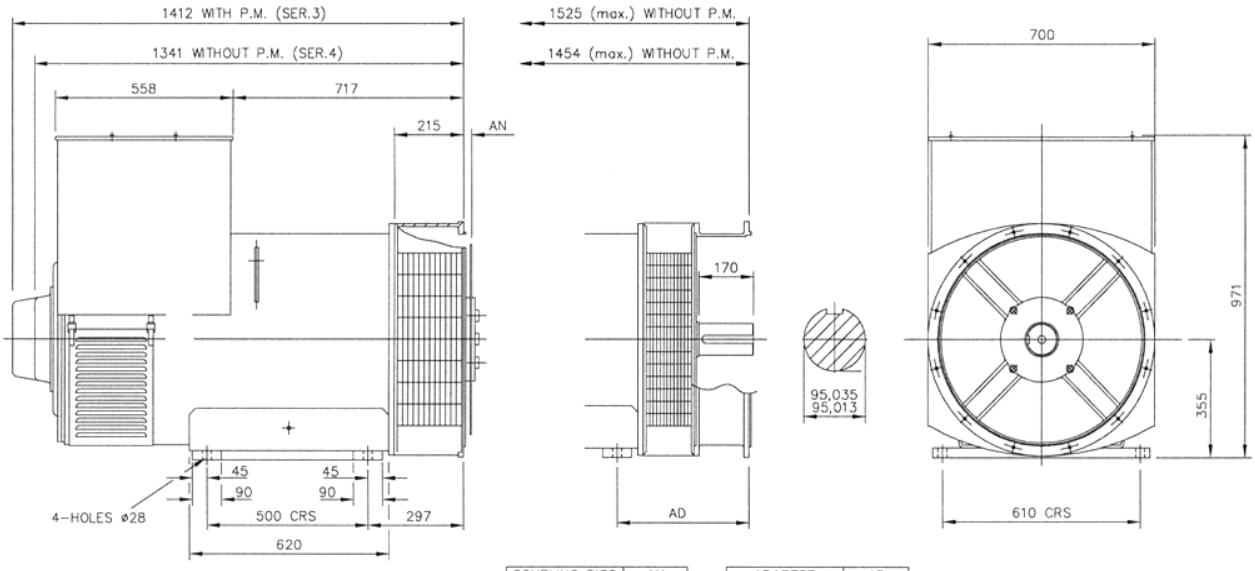
Winding 17 / 0.8 Power Factor

60Hz

RATINGS

Class - Temp Rise	Cont. F - 105/40°C	Cont. H - 125/40°C	Standby - 150/40°C	Standby - 163/27°C
Series Star (V)	600	600	600	600
Parallel Star (V)	300	300	300	300
Series Delta (V)	346	346	346	346
kVA	750	825	875	906
kW	600	660	700	725
Efficiency (%)	95.4	95.2	95.1	95.0
kW Input	629	692	734	760

DIMENSIONS



COUPLING DISC	AN
SAE 14	25,4
SAE 18	15,87
SAE 21	0

ADAPTOR	AD
SAE 00	410
SAE 0	410
SAE 1/2	390
SAE 1	390

APPROVED DOCUMENT

STAMFORD

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

www.cumminsgeneratortechnologies.com

DSEGenset

DSE

DSE7410/20

AUTO START & AUTO MAINS FAILURE MODULES

FEATURES

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

A sophisticated module monitoring an extensive number of engine parameters, the DSE74xx will annunciate warnings, shutdown and engine status information on the back-lit LCD screen, illuminated LED, remote PC, audible alarm and via SMS text alerts. The module includes RS232, RS485 & Ethernet ports as well as dedicated terminals for system expansion.

The DSE7400 Series modules are compatible with electronic (CAN) and non-electronic (magnetic pick-up/alternator sensing) engines and offer a comprehensive number of flexible inputs, outputs and extensive engine protections so the system can be easily adapted to meet the most demanding industry paralleling requirements.

The modules can be easily configured using the DSE Configuration Suite Software. Selected front panel editing is also available.

ENVIRONMENTAL TESTING STANDARDS

ELECTRO-MAGNETIC COMPATIBILITY
BS EN 61000-6-2
EMC Generic Immunity Standard for the Industrial Environment
BS EN 61000-6-4
EMC Generic Emission Standard for the Industrial Environment

ELECTRICAL SAFETY
BS EN 60950
Safety of Information Technology Equipment, including Electrical Business Equipment

TEMPERATURE
BS EN 60068-2-1
Ab/Ae Cold Test -30 °C
BS EN 60068-2-2
Bb/Be Dry Heat +70 °C

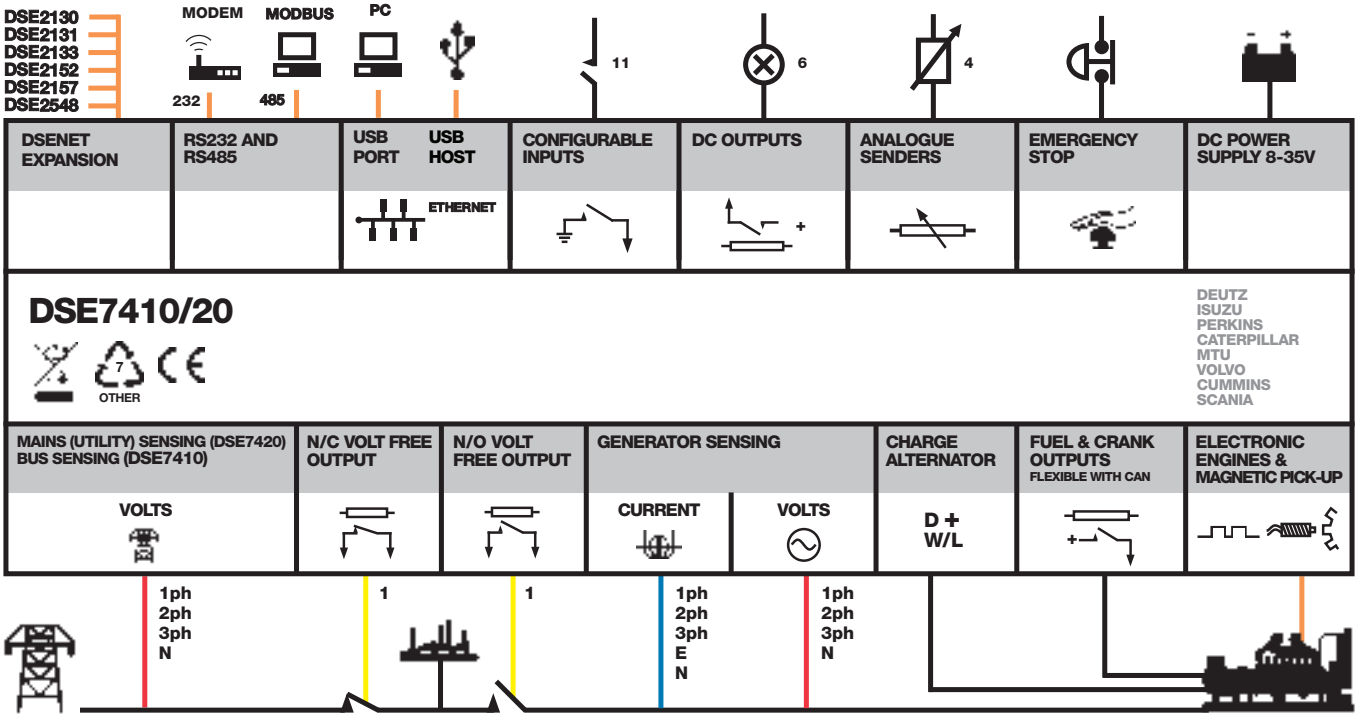
VIBRATION
BS EN 60068-2-6
Ten sweeps in each of three major axes
5 Hz to 8 Hz @ +/-7.5 mm,
8 Hz to 500 Hz @ 2 gn

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

SHOCK
BS EN 60068-2-27
Three shocks in each of three major axes
15 gn in 11 mS

DEGREES OF PROTECTION PROVIDED BY ENCLOSURES
BS EN 60529
IP65 - Front of module when installed into the control panel with the supplied sealing gasket.

COMPREHENSIVE FEATURE LIST TO SUIT A WIDE VARIETY OF GEN-SET APPLICATIONS



ISSUE 1

DSEGenset

DSE

DSE7410/20

AUTO START & AUTO MAINS FAILURE MODULES

FEATURES

DSE7420

DSE7410

KEY FEATURES

- Configurable inputs (11)
- Configurable outputs (8)
- Voltage measurement
- Mains (utility) failure detection
- Dedicated load test button
- kW overload alarms
- Comprehensive electrical protection
- RS232, RS485 & Ethernet remote communications
- Modbus RTU/TCP
- PLC functionality
- Multi event exercise timer
- Back-lit LCD 4-line text display
- Multiple display languages
- Automatic start/Manual start
- Audible alarm
- Fixed and flexible LED indicators
- Event log (250)
- Engine protection
- Fault condition notification to a designated PC
- Front panel mounting
- Protected front panel programming
- Configurable alarms and timers
- Configurable start and stop timers
- Five key menu navigation
- Front panel editing with PIN protection
- 3 configurable maintenance alarms
- CAN and magnetic pick-up/Alt. sensing
- Fuel usage monitor and low fuel alarms
- Charge alternator failure alarm
- Manual speed control (on compatible CAN engines)
- Manual fuel pump control
- “Protections disabled” feature
- Reverse power protection
- Power monitoring (kW h, kV Ar, kV A h, kV Ar h)
- Load switching (load shedding and dummy load outputs)
- Automatic load transfer (DSE7420)
- Unbalanced load protection
- Independent earth fault trip
- Fully configurable via DSE Configuration Suite PC software
- Configurable display languages
- Remote SCADA monitoring via DSE Configuration Suite PC software
- Advanced SMS messaging (additional external modem required)
- Start & stop capability via SMS messaging
- Additional display screens to help with modem diagnostics
- DSENet® expansion
- Integral PLC editor

KEY BENEFITS

- RS232, RS485 & Ethernet can be used at the same time
- DSENet® connection for system expansion
- PLC functionality
- Five step dummy load support
- Five step load shedding support
- High number of inputs and outputs
- Worldwide language support
- Direct USB connection to PC
- Ethernet monitoring
- USB host
- Data logging & trending

RELATED MATERIALS

TITLE	PART NO’S
DSE7410 Installation Instructions	053-085
DSE7420 Installation Instructions	053-088
DSE74xx Quick Start Guide	057-162
DSE74xx Operator Manual	057-161
DSE74xx PC Configuration Suite Manual	057-160

SPECIFICATION

DC SUPPLY

CONTINUOUS VOLTAGE RATING
8 V to 35 V Continuous

CRANKING DROPOUTS
Able to survive 0 V for 50 mS, providing supply was at least 10 V before dropout and supply recovers to 5 V. This is achieved without the need for internal batteries

MAXIMUM OPERATING CURRENT
260 mA at 12 V, 130 mA at 24 V

MAXIMUM STANDBY CURRENT
120 mA at 12 V, 65 mA at 24 V

CHARGE FAIL/EXCITATION RANGE
0 V to 35 V

OUTPUTS

OUTPUT A (FUEL)
15 A DC at supply voltage

OUTPUT B (START)
15 A DC at supply voltage

OUTPUTS C & D
8 A AC at 250 V AC (Volt free)

AUXILIARY OUTPUTS E,F,G,H,I & J
2 A DC at supply voltage

GENERATOR

VOLTAGE RANGE
15 V to 333 V AC (L-N)

FREQUENCY RANGE
3.5 Hz to 75 Hz

MAINS (UTILITY) (DSE7420)

VOLTAGE RANGE
15 V to 333 V AC (L-N)

FREQUENCY RANGE
3.5 Hz to 75 Hz

BUS (DSE7410)

VOLTAGE RANGE
15 V to 333 V AC (L-N)

FREQUENCY RANGE
3.5 Hz to 75 Hz

MAGNETIC PICK UP

VOLTAGE RANGE
+/- 0.5 V to 70 V

FREQUENCY RANGE
10,000 Hz (max)

DIMENSIONS

OVERALL
240 mm x 172 mm x 57 mm
9.4” x 6.8” x 2.2”

PANEL CUTOUT
220 mm x 160 mm
8.7” x 6.3”

MAXIMUM PANEL THICKNESS
8 mm
0.3”

STORAGE TEMPERATURE RANGE
-40 °C to +85 °C

DEEP SEA ELECTRONICS PLC UK
Highfield House, Hunmanby Industrial Estate, Hunmanby YO14 0PH
TELEPHONE +44 (0) 1723 890099 **FACSIMILE** +44 (0) 1723 893303
EMAIL sales@deepseaplc.com **WEBSITE** www.deepseaplc.com

DEEP SEA ELECTRONICS INC USA
3230 Williams Avenue, Rockford, IL 61101-2668 USA
TELEPHONE +1 (815) 316 8706 **FACSIMILE** +1 (815) 316 8708
EMAIL sales@deepseausa.com **WEBSITE** www.deepseausa.com

Registered in England & Wales No.01319649
VAT No.316923457

055-108/01/12 (1)

Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG43G0800B2NJNNNNNN

Datasheet creation date: 20/11/2019

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	PDG43G0800B2NJNNNNNN
Frame Size	Frame 4
Poles	3 Pole
Voltage	240V AC
Interruption or Breaking Capacity (Icu/Ics)	55kA
Continuous Current Rating (In)	800A
Trip Unit Type	PXR10
Trip Unit Options 1	LSI
Trip Unit Options 2	None
Indicating Accessories	None
Indicating Accessories Terminal	None
Tripping Accessories	None
Tripping Accessory Terminal	None
Tripping Accessory Voltage	None
Line Type Description	Option 1 - Standard Terminal
Line Conductor Options	(3) 3/0 - 400
Line Terminal Type	Aluminum
Load Type Description	Option 1 - Standard Terminal
Load Conductor Options	(3) 3/0 - 400
Load Terminal Type	Aluminum
Special Options - Type of Modification	None
Details	None
Additional Description	None

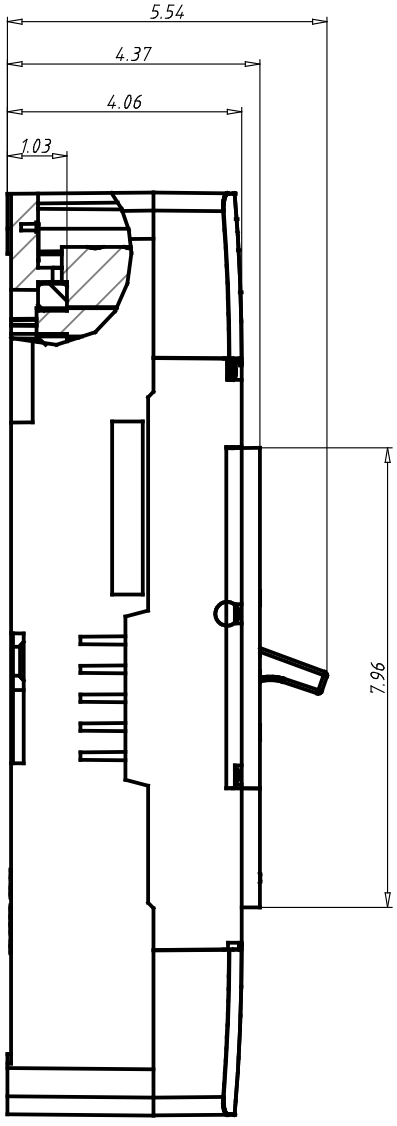
Molded Case Circuit Breakers

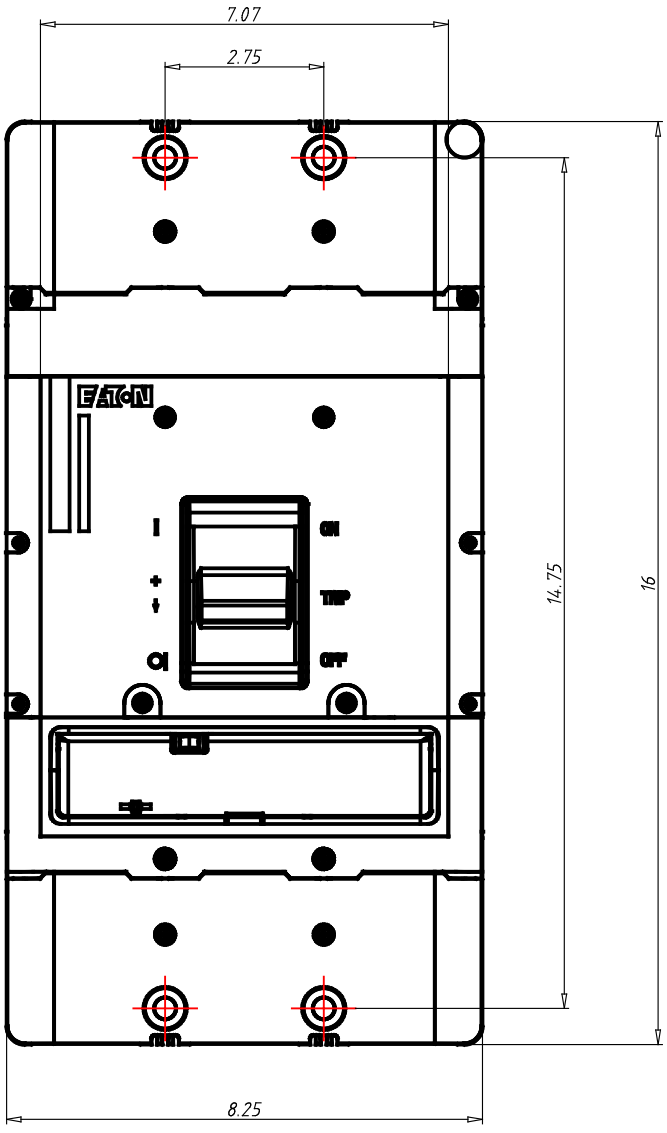
Power Defense ™ UL Global Series

Part Number: PDG43G0800B2NJNNNNNN

Datasheet creation date: 20/11/2019

Technical drawings





Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG43G0800B2NJNNNNNN

Datasheet creation date: 20/11/2019

General Technical Data

Frame Rating (In)	800A
Reference Standard	UL489, CSA 22.2, IEC 60947-2 & GB
Number of poles	3
Neutral rating	-
Interruption Rating Designator	G / K / M
UL Interruption Rating to UL 489 (240Vac)	65 / 85 / 100kA
UL Interruption Rating to UL 489 (480Vac)	35 / 50 / 65(a)kA
UL Interruption Rating to UL 489 (600Vac)	18 / 25 / 35kA
UL Interruption Rating to UL 489 (125/250Vdc)	
UL Current Limiting	-
Rated breaking capacity to IEC 60947-2 (220-240 Vac Icu)	55 / 85 / 100 / 100kA
Rated breaking capacity to IEC 60947-2 (220-240 Vac Ics)	55 / 85 / 100 / 100kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Icu)	36 / 50 / 70 / 70kA
Rated breaking capacity to IEC 60947-2 (380-415 Vac Ics)	36 / 50 / 53 / 70kA
Rated breaking capacity to IEC 60947-2 (440 Vac Icu)	30 / 35 / 50 / 65kA
Rated breaking capacity to IEC 60947-2 (440 Vac Ics)	22.5 / 35 / 40 / 50kA
Rated breaking capacity to IEC 60947-2 (525 Vac Icu)	20 / 25 / 30 / 35kA
Rated breaking capacity to IEC 60947-2 (525 Vac Ics)	16.5 / 20 / 25 / 25kA
Rated breaking capacity to IEC 60947-2 (690 Vac Icu)	8 / 10 / 15 / 20kA
Rated breaking capacity to IEC 60947-2 (690 Vac Ics)	4 / 5 /7. 5 / 10kA
Rated breaking capacity to IEC 60947-2 (125V DC Icu)	
Rated breaking capacity to IEC 60947-2 (250V DC 2P in series Ics)	22 / 22 / 25kA
Frequency	50/60Hz
Trip Unit Type	PXR10
Continuous Current Range	320 - 800A
100% UL489 Rated	Yes
Instantaneous/Short Circuit Range	2 - 8 In
Magnetic/Instantaneous Override	6800A
Dimensions H x W x D (inches)	16 x 8.25 x 4.38
Pole to pole distance inches	2,75
Approx Weight lbs	29,98
RoHS Compliance	Yes
UL File Number	E7819
Ambient Temp Calibration	
Derating at 50C	
Derating at 60C	
Derating at 70C	

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

Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG53K1200E3RNNNNNNN

Datasheet creation date: 19/08/2019

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

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

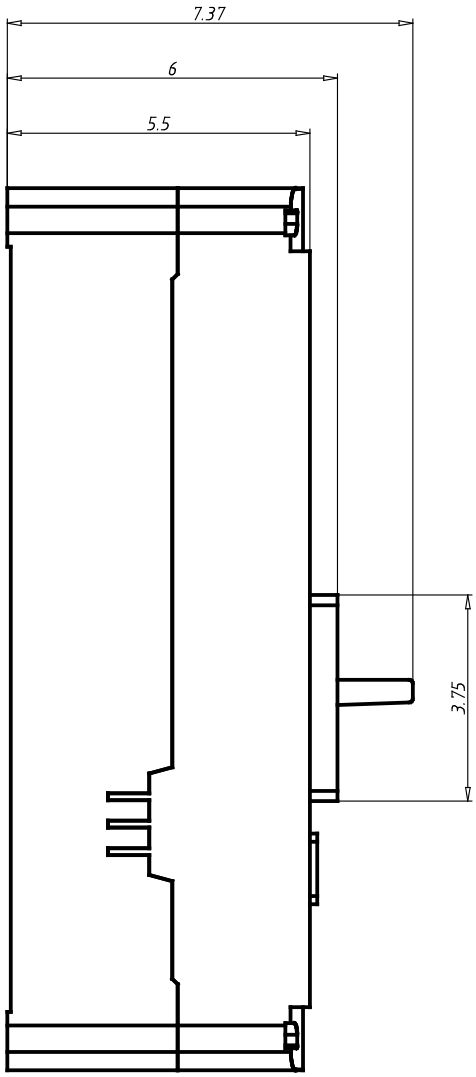
Molded Case Circuit Breakers

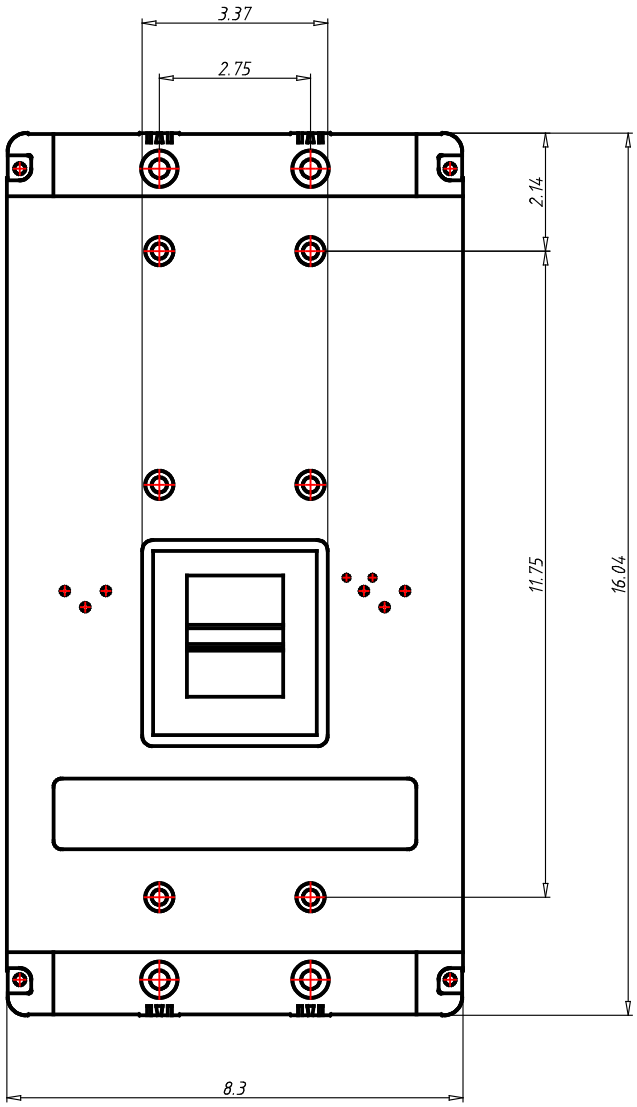
Power Defense ™ UL Global Series

Part Number: PDG53K1200E3RNNNNNNN

Datasheet creation date: 19/08/2019

Technical drawings





Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG53K1200E3RNNNNNNN

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: PDG63M2000E3RNNNNNNN

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	PDG63M2000E3RNNNNNNN
Frame Size	Frame 6
Poles	3 Pole
Voltage	480V AC
Interruption or Breaking Capacity (Icu/Ics)	65kA
Continuous Current Rating (In)	2000A
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

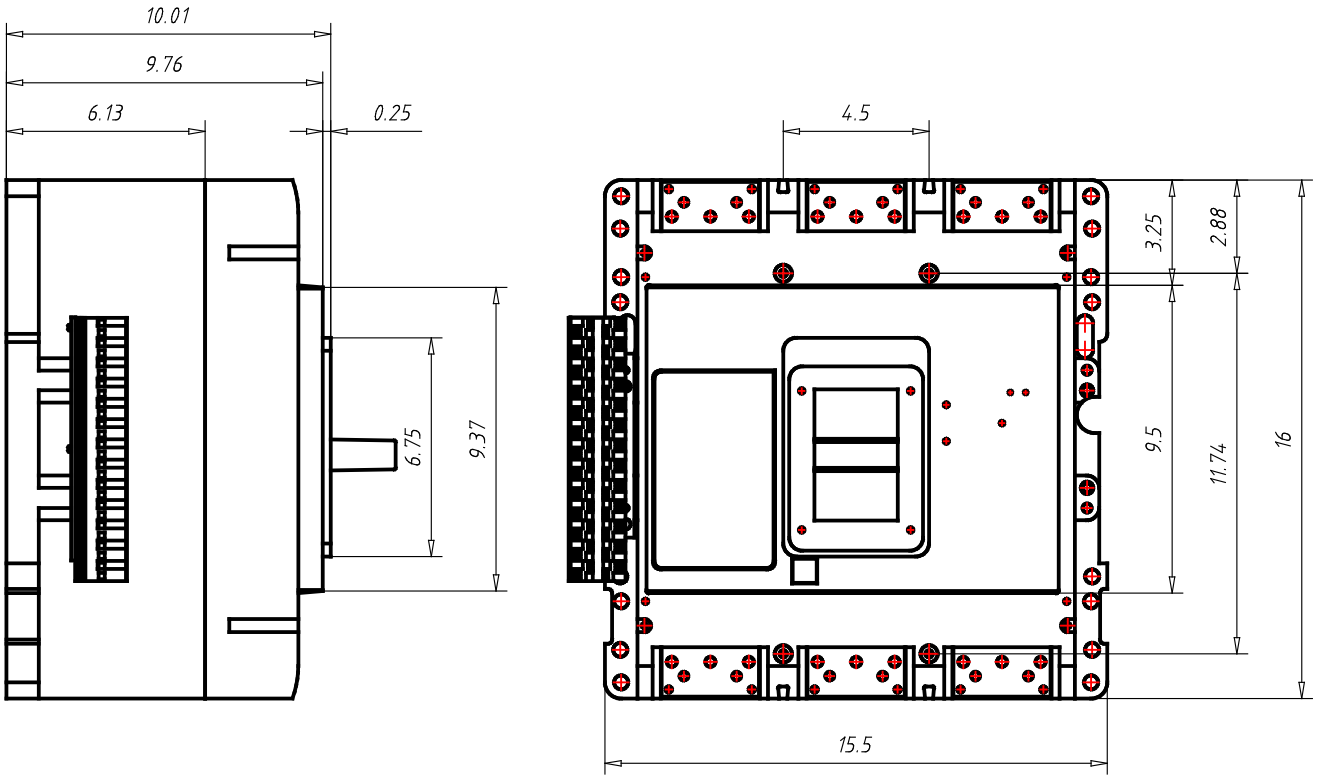
Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG63M2000E3RNNNNNNN

Datasheet creation date: 02/12/2019

Technical drawings



Molded Case Circuit Breakers

Power Defense ™ UL Global Series

Part Number: PDG63M2000E3RNNNNNNN

Datasheet creation date: 02/12/2019

General Technical Data

Frame Rating (In)	2000A
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

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

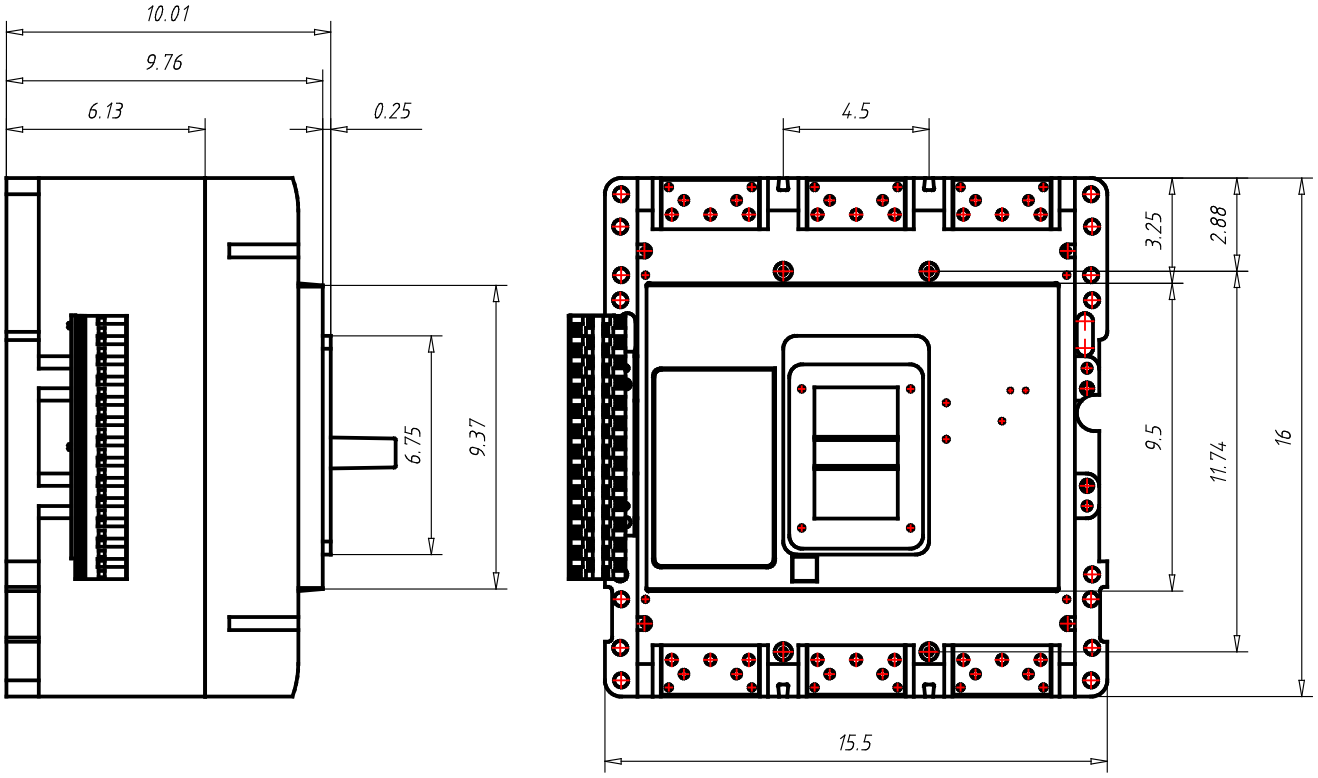
Molded Case Circuit Breakers

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

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)

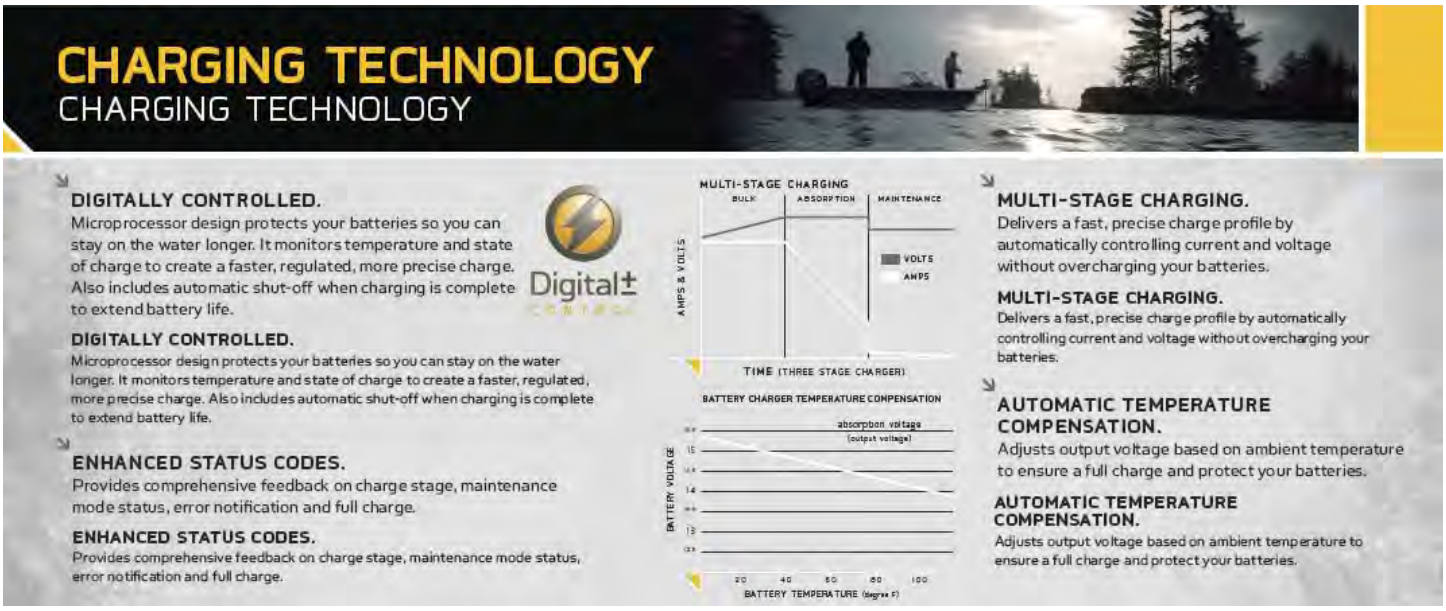
The Tmax T8 MCS are derived from the corresponding circuit breakers, of which they keep the overall dimensions, the versions, the fixing systems and the possibility of mounting accessories unchanged. This version only differs from the circuit breakers in the absence of the protection trip units. All 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]	–

Digital Linear Chargers

Specifications (cont.)

- New 4-color package design

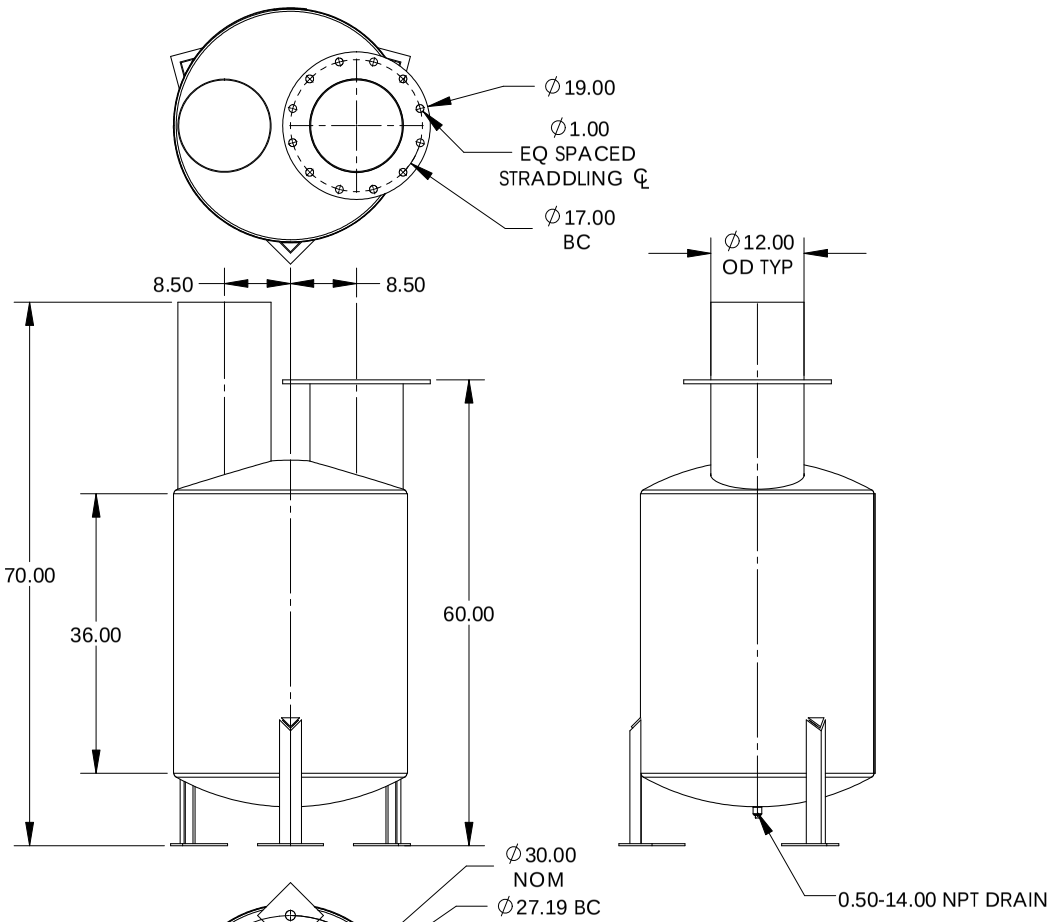


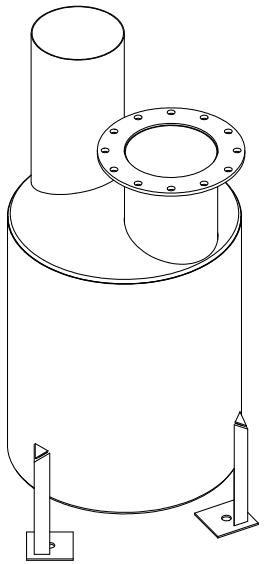
Digital Linear Chargers

Specifications

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

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





ENGINE INFORMATION	SILENCER INFORMATION	DRAWN BY	DATE
ENGINE MAKE: MITSUBISHI	RESONATOR FREQUENCY: ---	CB	08/15/2017
ENGINE MODEL: S12A2-Y2PTAW-2	RESONATOR ALPHA: ---	CHECKED BY: CB	DATE: 08/15/2017
DISPLACEMENT: 2071	SILENCER Km: ---	ENGINEERING: CB	DATE:
EXHAUST FLOW: 8192	SILENCER IL: ---	MANUFACTURING: CB	DATE:
EXHAUST TEMPERATURE: 883	TOLERANCES DO NOT APPLY TO GAGE THICKNESS OR COMMERCIAL FEATURES	TOLERANCES UNLESS OTHERWISE SPECIFIED: .X = ±0.25, .XX = ±0.125, .XXX = ±0.0625, .XXXX = ±0.03125, ALL ANGLES ±1°	WEIGHT (LBS): 356
MAX BACK PRESSURE: 24	THIRD ANGLE PROJECTION		SHEET: 3 OF 3
RAW SOUND PRESSURE: ---			

BERGARI SOLUTIONS
member of the mandelgroup

DESCRIPTION: SIL: COMP CRIT CS E-E 12.00-12.00 Ø30.00 70.00 OAL F---
CONSTRUCTION MATERIAL: CS
FINISH: HIGH TEMP BLACK PAINT
PART NUMBER: 500-008480
REV: 01
SCALE (DO NOT SCALE): 1:12
SHEET SIZE: B

REV.	BY	DATE	DESCRIPTION	ECO
01	CB	08/15/2017	RELEASED FOR CUSTOMER APPROVAL	---

CUSTOMER: ---
CUSTOMER P/N: ---