## **GILLETTE GENERATORS**

## LIQUID COOLED NAT. GAS ENGINE GENERATOR SET

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



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



s 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.







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



**60 HZ MODEL** 

**SP-6500** 

"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. <u>Critical grade muffler is standard</u>.

<u>GENER</u>	ATOR	RATING	<u>as</u>		LIQUID PROPAN	IE GAS FUEL	NATURAL	GAS FUEL
GENERATOR MODEL	VOL	TAGE	рн нл		PH HZ 130°C RISE STANDBY RATING		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	e, 12 Lead, 480V, Three Phase
HCI534F.07, 4 Po	le, 6 Lead, 600V, Three Phase
Exciter	Brushless, shunt excited
Voltage Regulator	Solid State, HZ/Volts
Voltage Regulation	<sup>1</sup> /2%, No load to full load
FrequencyField	d convertible, 60 HZ to 50 HZ
Frequency Regulation <sup>1</sup> /2%	$(\frac{1}{2}$ 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	e Dip (208-240V)1500 kVA
3 Ø Motor Starting @ 30% Voltage	e 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 Period24 M	Ionths 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, underfrequency 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**

ManufacturerF	Power Solutions Inc. (PSI)
Model and Type Heavy Duty,	31.8LTCAC HO, 4 cycle
AspirationTurbochar	ged & Charge Air Cooled
Cylinder Arrangement	12 Cylinders, Vee
Displacement Cu. In. (Liters)	
Bore & Stroke In. (Cm.)	5.91 x 5.91 (150 x 150)
Compression Ratio	
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 CleanerD	ry, Replaceable Cartridge
Engine Speed	
Piston Speed, ft/min (m./min)	
Max Power, bhp (kwm) Standby/LPG.	
Max Power, bhp (kwm) Standby/NG	
Ltd. Warranty Period12 Months	or 2000 hrs., first to occur

#### FUEL SYSTEM

TypeLPG or	r NAT. GAS, Vapor Withdrawal
Fuel Pressure (kpa), in. H <sub>2</sub> O*	(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	

#### **FUEL CONSUMPTION**

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

## **OIL SYSTEM**

Туре	Full Pressure
Oil Pan Capacity qt. (L)	
Oil Pan Cap. W/ filter qt. (L)	
Oil Filter	

### **ELECTRICAL SYSTEM**

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

Recommended battery to  $-18^{\circ}C$  (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  $-13^{\circ}$  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)	
Ambient Capacity of Radiator °F (°C	)
Engine Jacket Coolant Capacity Gal	(L)23.3 (88.1)
Radiator Coolant Capacity Gal. (L)	
Maximum Restriction of Cooling Air	· Intake
and discharge side of radiator in. H <sub>2</sub> 0	(kpa) 0.5 (.125)
Water Pump Flow gpm (L/min)	
Heat Reject Coolant: Btu/min (kw)	
Low Radiator Coolant Level Shutdow	vnStandard
Note: Coolant temp. shut-down switch setting (water/antifreeze) mix.	at 230°F (110°C) with 50/50

## AIR REQUIREMENTS

65,100 (1843)

## EXHAUST SYSTEM

Exhaust Outlet Size	(2) 6'
Max. Back Pressure, in. hg (KPA)	
Exhaust Flow, at rated kw: cfm (m <sup>3</sup> /min)	4079 (115)
Exhaust Temp., at rated kw: °F (°C)	1183 (639)
Engines are EPA certified for Natural Gas.	× ,

## SOUND LEVELS MEASURED IN dB(A)

	Open	Level 2	
	Set	Encl.	
Level 2, Critical Silencer			
Level 3, Hospital Silencer			

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	Level 2
	Set	Enclosure
Length in (cm)	186 (472)	
Width in (cm)		
Height in (cm)		
3 Ø Net Weight lbs (kg)	15950 (7235)	
3 Ø Ship Weight lbs (kg).	16340 (7412)	

## **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 <u>continuously</u> 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  $\bullet$  (8) configurable outputs  $\bullet$  voltage monitoring  $\bullet$  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

- Engine fail to start
- Engine over speed
- Engine under speedOver & under voltage
- Three auxiliary alarms

Design & specifications subject to

Dimensions shown are approximate. Contact Gillette for certified drawings. DO NOT USE DIMENSIONS FOR INSTALLATION PURPOSES.

without

prior

Battery fail alarm

Also included is tamper-proof engine hour meter

#### **ENGINE:**

change

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.

notice.

#### 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:**

<sup>1</sup>/<sub>2</sub>% 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







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General Engine Data	-										
Туре		V-S	eries		Flywheel housi	ng			SAE	No.0	
Number of cylinders	1	1	2		Flywheel				SAE	No.18	
Aspiration	Charg	ged Cooled	Forced Inc	luction	Dry Weight (Fa	n to Flywhee	el)	lb	kg	7344	3331
Firing Order	1-8-5-	10-3-7-	6-11-2-	9-4-12	Wet Weight (Fa	an to Flywhe	el)	lb	kg	7788	3533
Rotation Viewed from Flywheel	1.	Counter	Clockwise	1.7.1.1	CG From Rear	Face of Bloc	:k	in	mm	37.0	941
Bore	in	mm	5.906	150	CG Above Cra	nk Centerline	3	in	mm	0	0
Stroke	ìn	mm	5.906	150	Oil Specificatio	n		SAE 15	W-40 Low	0 Low Ash Gas engine oil	
Displacement	in <sup>3</sup>	L	1941	31.8	On opechicatio	V.1.	- NO	(.255%	% by wt), A	PI CD/CF o	or higher
Compression Ratio		10.	5:1	C	Engine Oil Cap	acity <sup>8</sup>	WR MIN				
Exhaust Manifold Type	1	Water	Cooled		Min	- 10 <sup>10</sup>		qts	L	95	90
Turbo Exhaust Outlet Pipe Size	in	mm	3.5	89	Max	11		qts	L	129	122
Catalyst Inlet Size	in	mm	5	127	ECU Oil Pressu	ure Warning <sup>6</sup>		psi	kPa	57	393
Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	3.0	10.2	ECU Oil Press	re Shut Dov	/n <sup>6</sup>	psi	kPa	47	324
Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	Oil Pressure at	1000 rpm (lo	dle)				
Maximum Operating pressure to EPR	in-H <sub>2</sub> O	kPa	11.0	2.7	Min	1.		psi	kPa	82	569
Minimum Operating pressure to EPR	in-H <sub>2</sub> O	kPa	7.0	1.7	Max			psi	kPa	74	512
Minimum Gas Supply Pipe Size <sup>5</sup>	in	mm	3	76	Max Allowable	Oil Tempera	ture	°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	141.44				Standard Therr	nostat Range	8		1. C. C.	64. U. T.	12.11
Clean Air Filter	in-H <sub>2</sub> O	kPa	5	1.24	Normal Op	peration Tem	perature <sup>9</sup>	°F	°C	176	80
Dirty Air Filter	in-H <sub>2</sub> O	kPa	15	3.73	Full Open	Temperature	39	°F	°C	198	92
Spark Plug Part Number	1.012.0	Bosch	R6 6857	13 N. X	ECU Coolant Temp Warning		°F	°C	203	95	
Standard Spark Plug Gap <sup>10</sup>	in	mm	0.012	0.3	ECU Coolant T	emp Shutdo	wn	°F	°C	208	98
Spark Plug Coil - Primary Resistance	Ohms		0.59Ω	± 10%	50°C Ambient	Capable <sup>11</sup>				P	ass
Battery Voltage	Vo	olts	2	4	Max External C	oolant Frictio	on Head	psi	kPa	7.25	50
Starter Motor Power	HP	kW	15.7	11.7	CAC Rise Abov	e Ambient Sp	ecified	F	C	15	9
Performance Data 60Hz <sup>3,5</sup>									1.1.1		
Nominal Engine Speed	R	PM	18	00	Water Pump Sp	beed		R	PM	37	05
Mean Piston Speed	ft/min	m/s	1772	9.0	Engine Coolant	Flow	- 2	gal/min	L/min	361	1368
RPM Range (Min-Max) ISO 8528-5 G1	RF	M	1778	- 1823	Cooling Fan Po	wer <sup>11</sup>	- R.O.	HP	kW	62.8	47
Charging Alternator Voltage	Vo	lts	2	8	Cooling Fan Sp	eed	31	R	PM	10	050
Charging Alternator Current	An	nps	5	5	Cooling Fan Ai	Flow <sup>11</sup>	-	SCFM	m <sup>3</sup> /min	65100	1843
NG 60hz	Lo	ad	1	00%	7	<b>i%</b>	5	<b>j0%</b>	- 1	25%	6
Stand-By Power Bating <sup>1,2,3,4</sup> Per ISO 3046	HP	kW	966	720	724	540	483	360		243	181
MEP (@ rated Load on NG)	osi	bar	219	15.1	164	11.3	109	7.5		55	3.8
Evel Consumption <sup>3,4,7</sup>	lb/br	ko/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	1	006	541
Exhaust Mass Flow (entire engine)	lb/hr	ka/hr	6396	2901	4907	2226	3578	162	3 5	226	1010
Exhaust Flow at Turbine Outlet Conditions	ACEM	m <sup>3</sup> /min	4079	115	3126	89	2263	64		390	39
Air Induction System <sup>5</sup>	L'riot m	111 (1116)		1 110	0120		2400				
Combustion Air required (entire engine)	lb/hr	ka/hr	6055	2746	4644	2106	3385	153	6 1 3	104	954
Combustion Air Volume Required (entire engine)	ACEM	m <sup>3</sup> /min	1320	37	1012	29	738	21		458	13
Compressor Outlet Temperature <sup>2</sup>	°E	°C	269	132	252	122	207	97		140	60
Thermal Balance <sup>5</sup>		U.	200	102	LOL	122	201			140	00
Total Fuel	BTI I/min	kW/	123393	2170	95872	1686	69190	121	7 4	3019	756
Mechanical Power	BTU/min	L/M/	40946	720	30700	540	20473	360		0205	181
Heat Rejected to Cooling Water at Rated Load	BTU/min	KIN/	34074	500	26768	471	21370	376		5114	266
Heat Rejection CAC at Rated Power	BTU/min	EW.	4160	72	20700	47	1435	25		475	8
Heat Rejection to Exhaust (LHV/ to 150C)	BTU/min	KVV VIA	27/06	13	10640	346	13115	20		370	130
Engine Radiated Heat	BTUlmin	L/M	16710	204	16095	283	12789	201		765	172
	Brumin	KVV	10/10	294	10005	200	12/00	440		100	114

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

TOTH BITCHARMPOT

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

31.8L

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.

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

All values in the following section are provided for informational purpose only and are non-binding. >1400RPM. See PSI HD Technical Spec. 56300002 - Fuel Specification.

\* Standard Sump Capacity.

± 2 degrees Celsius.

± 0.002" or 0.05mm.

At 0.5 in-H2O of Package Restriction at STP.

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General Engine Data <sup>®</sup>	-										
Туре		V-S	eries		Flywheel housi	ng		-	SAE	No.0	
Number of cylinders		1	12		Flywheel	A.C			SAE	No.18	100
Aspiration	Char	ged Cooled	Forced Ind	duction	Dry Weight (Fa	n to Flywhee	1)	lb	kg	7344	3331
Firing Order	1-8-5-	10-3-7-	6-11-2	-9-4-12	Wet Weight (Fa	an to Flywhee	el)	lb	kg	7788	3533
Rotation Viewed from Flywheel	1.1.2	Counter	Clockwise		CG From Rear	Face of Bloc	k	in	mm	37.0	941
Bore	in	mm	5.906	150	CG Above Cra	nk Centerline		in	mm	0	0
Stroke	in	mm	5,906	150			-	SAE 15	W-40 Low	-40 Low Ash Gas engine oil	
Displacement	in <sup>3</sup>	L	1941	31.8	Oil Specification	n	~ 10	(.2559	% by wt), A	PI CD/CF	or higher
Compression Ratio		10.	5:1		Engine Oil Cap	acity <sup>8</sup>	- D-	-			
Exhaust Manifold Type		Water	Cooled		Min			ats	L	95	90
Turbo Exhaust Outlet Pipe Size	in	mm	3.5	89	Max	11		ats	L	129	122
Catalyst Inlet Size	in	mm	5	127	FCIL Oil Press	re Warning <sup>6</sup>	(	osi	kPa	57	393
Maximum Allowable Exhaust Back Pressure	in-Ho	kPa	3.0	10.2	ECU Oil Press	ire Shut Dow	(m <sup>6</sup>	DSi	kPa	47	324
Maximum EPB Rated Pressure	nei	kPa	1.0	69	Oil Pressure at	1000 rpm (lo	lle)	1 000	10.14		024
Maximum Operating pressure to EPR	in-H-O	kPa	11.0	27	Min	Todo Ipin (i		nsi	kPa	82	560
Minimum Operating pressure to EPR	in-H-O	kDa	70	17	Max		_	nsi	kPa	74	510
Minimum Cas Supply Bing Size <sup>5</sup>	in	mm	2	76	Max Allowable Oil Temperature		°E	°C	250	121	
Maninum Gas Supply File Size	oei	k Po	1	69	Coolant Canaci	ity /Engine of	alv)	len	1	233	98.1
Max Allowable Intake Restriction	] psi	кга	30	0.5	Standard Thermostat Pange		yai .	-	20.0	00.1	
Close Air Filter	LinHO	1/De	E	1.24	Standard men	nostat Mange	9	9C	-0	176	0
Didy Air Filter	in H O	kPa kDo	15	3.72	Normal Op	Tomporature	g	95	°C	108	00
Coorty All Filter	In-H2O	Reach	10	3.73	FOIL Coolerst T	Temperature		0E	0	202	92
Spark Flug Part Number	lin.	Bosch	0.040	0.2	ECU Coolant T	emp warning	9	PE	0	203	95
Standard Spark Plug Gap	in Ohme	mm	0.012	0.5	ECO Coolant I	emp Shutdov	WIT	- F -	U	200	98
Spark Plug Coll - Primary Resistance	Unms	lle	0.591	1 10%	50°C Ambient C	capable	n Lload	nai	LDe.	7.05	ass
Battery Voltage	V	JILS .	45.7	4	Max External C	Juliant Frictic	in neau	psi	кра	1.20	50
Starter Motor Power	HP	KVV	15.7	-1Pt	CAC Rise Above	e Ambient Sp	ecified	F	G	15	9
Performance Data 50Hz**	-							1	11-		10 m
Nominal Engine Speed	R	PM	15	500	Water Pump Speed		RPM		3088		
Mean Piston Speed	ft/min	m/s	1476	7.5	Engine Coolant	I Flow	15	gal/min	L/min	297	1126
RPM Range (Min-Max) ISO 8528-5 G1	RF	PM	1477	- 1519	Cooling Fan Po	ower	102	HP	kW	36	27
Charging Alternator Voltage	Va	lts		28	Cooling Fan Sp	beed	15	R	PM	8	75
Charging Alternator Current	An	nps		53	Cooling Fan Air	Flow		SCFM	m³/min	54200	1535
NG 50hz	Lo	ad	1	00%	75	<b>j%</b>	5	<b>j0%</b>	-162	25%	6
Stand-By Power Rating <sup>1,2,3,4</sup> 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 <sup>3,4,7</sup>	lb/hr	kg/hr	290	132	227	103	164	74	1.1.1	101	46
BSFC	lb/(hp-hr)	g/(kW-hr)	0.363	221	0.373	227	0.408	248	3 0	.502	306
Turbine Outlet Temperature	°F	°C	1078	581	1032	556	990	532	2	915	491
Exhaust Mass Flow (entire engine)	lb/hr	ka/hr	4861	2205	3816	1731	2771	125	7 1	732	786
Exhaust Flow at Turbine Outlet Conditions	ACFM	m <sup>3</sup> /min	3183	90	2477	70	1772	50		071	30
Air Induction System <sup>5</sup>	. List in	- in inter									
Combustion Air required (entire engine)	lb/hr	ka/hr	4571	2073	3589	1628	2607	118	3 1	631	740
Combustion Air Volume Required (entire engine)	ACEM	m <sup>3</sup> /min	996	28	782	22	568	16		355	10
Compressor Outlet Temperature <sup>2</sup>	°F	°C	254	124	223	106	172	78		124	51
Thermal Balance <sup>5</sup>	1		201		220	1001			-		1.6
Total Fuel	BTI I/min	kW/	99707	1753	78048	1372	56389	992	1 3	1855	613
Mechanical Power	BTU/min	k/M/	34121	600	25501	450	17061	300	) 6	580	151
Heat Rejected to Cooling Water at Rated Load	BTUmin	KIM	27127	477	23031	408	18642	300	1	3478	237
Heat Rejection CAC at Rated Power	BTUlmin	L/M/	3151	55	20202	36	902	16		247	4
Heat Rejection to Exhaust /LHV to 150C)	BTUmin	L/M	18671	329	12756	242	0360	163		094	90
Engine Radiated Heat	BTUmin	L/M	16637	202	13/50	237	10516	186		456	131
milline (registed freat	Diomin	1.44	10007	200	10400	207	10010	100		100	101

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

TOTH BITCHARMPOT

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

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.

.8L .

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

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

>1400RPM.

See PSI HD Technical Spec. 56300002 - Fuel Specification.

Standard Sump Capacity.

± 2 degrees Celsius.

± 0.002" or 0.05mm.

At 0.5 in-H2O of Package Restriction at STP

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Type         Type         Fys/Mate         Fys/Mate         Stack         No         Stack         No           Algination         Charget Cocket         Forcet IrSUC         Org         Wall         Train         No         Ng         7744         3331           Ratination         Charget Cocket         Forcet IrSUC         Org         Wall         Train         No         Ng         7744         3331           Ratination         in<         mm         Sole         150         Org         Name         No         Nm         No	General Engine Data <sup>®</sup>	-								-		
Number Optimiders         Image Income Charged Cooler Forced Induction         Dyr Weight (Fran to Fywheel)         Iso kap Z 254   3331           Fring Order,         1.8 - 5. 10 - 3. 7. 6. 11 - 2. 9. 4. 12         Vet Weight (Fran to Fywheel)         Iso kap Z 264   3331           Gordano Waved from Fywheel         Counter Clockwise         CG Fran Raar Race / Bloox         In         Inin         No.         10.0         0           Bisplacement         in         mm         5.068         130         GG Apove Crank Centerine         In         Inin         0         0           Compression Rafo	Туре		V-S	eries		Flywheel housi	ng	_		SAE	No.0	
Aspiration         Charged Cooled         Force of Investment         Dr         No         No         7244         3331           Reader         In         Rm         Count         Clockwate         Corp         No         No         No         9         9         941           Bring Order         In         mm         5.908         150         Corp         Corp Assoc Carack Caratefine         n         mm         37.0         941           Corp Displacement         In         mm         5.908         150         Corp Assoc Carack Caratefine         Corp Assoc Carack         Non Mark         Corp Assoc Carack         Non Mark         Q8         KPa         All         7.80         Stat         Stat        Stat         Stat        <	Number of cylinders	1	1	2	1.1.1.1	Flywheel				SAE	No.18	
Find Order       1.8.5.5.10-3.7-6.11-2.9.4.12       Well Wight (Fin to Fybres)       In       No.       No.       S333         Rotation Views from Fybreteal       Counter Clockwise       CG From Rare are of Block       in       m.       n.	Aspiration	Charg	ged Cooled	Forced Inc	luction	Dry Weight (Fa	n to Flywhee	1)	lb	kg	7344	3331
Roalian Origination Flywheiel         Counter Clockware         Corp Rear Face of Block Centrefine         n	Firing Order	1-8-5-	10-3-7-	6-11-2-	9-4-12	Wet Weight (Fa	an to Flywhee	el)	lb	kg	7788	3533
Børe         in         mm         5.908         150         CS Above Crank Cranktinetine         in         mm         0         0.           Displacement         m²         L         1941         31.8         00         Sect 1944 40.164 ker ker Gasengre of Compression Ratio         28.41 1344 40.164 ker ker Gasengre of Compression Ratio         Engles Of Cogacity*         Engles Of Cogacity*         Kr 1944 40.164 ker ker Gasengre of Cogacity*           Exhaust Maarfold Type         m         mm         5.5         17         Min         v         ts         1.8         12.2         12.2         12.4         12.8         12.4         12.8         12.2         12.2         12.4         12.8         12.2         12.2         12.4	Rotation Viewed from Flywheel	1. 1	Counter (	Clockwise	1.7.1.4	CG From Rear	Face of Bloc	k	in	mm	37.0	941
Stroke         in         mm         5.90         150         OI Specification	Bore	in	mm	5.906	150	CG Above Cra	nk Centerline		in	mm	0	0
Displacement         m²         L         1941         31.8         Obsplacement         (2.5.3% by w), API CODE or hyber           Exhaust Namifod Type         Water Cooles         Engine OL (Gasald)*         the L         195         197           Exhaust Namifod Type         in <mm< td="">         m3.5         198         Mar         qts         L         192         122           Catubet Hole Size         in<mm< td="">         m         m5.5         127         ECU QA Peasure Namifor         qts         L         192         122           Catubet Hole Size         in<mm< td="">         mm         5.5         107         Ass         100         200         Peasure Namifor         pts         L         128         128         126         120</mm<></mm<></mm<>	Stroke	ìn	mm	5.906	150	Oil CaselFeelte			SAE 15	W-40 Low	40 Low Ash Gas engine oil	
Compression Ratio         105:1         Engine Oil Cagacity <sup>4</sup> Unit         Unit <thunit< th="">         Unit         Unit</thunit<>	Displacement	in <sup>3</sup>	L	1941	31.8	Oil Specificatio	n/1	- 1Q	(.2559	% by wt), A	PI CD/CF	or higher
Exhaust Manifold Type         Image: Second se	Compression Ratio		10.	5:1	C I	Engine Oil Cap	acity <sup>8</sup>	10.000	1		1	-
Turbe Exhaus Ouder IPpe Size         in         mm         3.5         6.99         Max         gts         L         129         122         122         122         122         123 </td <td>Exhaust Manifold Type</td> <td>4.1</td> <td>Water</td> <td>Cooled</td> <td></td> <td>Min</td> <td>- Chi</td> <td></td> <td>qts</td> <td>L</td> <td>95</td> <td>90</td>	Exhaust Manifold Type	4.1	Water	Cooled		Min	- Chi		qts	L	95	90
Catabyst Intel Size         in         mm         5         127         ECU QL Pressure Numling*         pail         kPa         303           Maximum Movanum Alowahe Enhans Back Pressure         in-Hg         kPa         1.0         6.0.9         Oil Pressure Stut Dom*         psi         kPa         324           Maximum Derating pressure to EPR         in-HgO         KPa         1.0         -2.6.9         Oil Pressure at 1000 rpm (idle)         psi         kPa         8.2         669           Mainimum Operating pressure to EPR         in-HgO         KPa         7.0         Max         Aloxa Aloxabel Oil Temperature         7.6         C         250         121           Maximum Pressure Drop Across CAC         psi         KPa         1         6.9         Codant Capacity (Engine only)         gal         L         2.33         8.1           Maximum Drop Strate         Tine R         Nm         3         7.6         Max Aloxabel onla Capacity (Engine only)         gal         L         2.33         8.1         121           Maximum Presson Brop Strate         In HyO         KPa         15         3.73         Full Operation Temperature         7.6         7.2         193         92           Stante Maxin Presson Brot Strate         In HyO	Turbo Exhaust Outlet Pipe Size	in	mm	3.5	89	Max	1		qts	L	129	122
Maximum EPR Latel Pressure         In+g         KPa         3.0         10.2         ECU OID Pressure Shut Down*         psi         KPa         4.7         324           Maximum EPR Latel Pressure to EPR         in+tj.O         KPa         1.0         2.7         Max         psi         KPa         47         324           Maximum Gas Supply Pipe Size*         in         mm         3.7         Max         psi         KPa         42.0         1.7         Max         psi         KPa         45.12         Max         psi         KPa         45.12         Max         psi         KPa         45.12         Max         Max         Max         Max         Max         Psi         KPa         4         512         Max         Max         Max         KPa         1         6.9         Colant Capacity (Cigano only)         gal         L         23.3         88.1           MaxAlowabie Interise Restriction         in+HyO         KPa         5         1.4         Normal Operation remperature*         °F         C         108         92         States         States         Normal Operation remperature*         °F         C         108         92         States         Normal Operation remperature*         °F         C         10	Catalyst Inlet Size	in	mm	5	127	ECU Oil Pressu	re Warning <sup>6</sup>		psi	kPa	57	393
Maximum DPR Rated Pressure         pg         iH-pG         kPa         1.0         6.8.9         OIP Pressure at 1000 rpm (idle)           Maximum Operating pressure to EPR         in-H,O         kPa         7.0         1.7         Max         pgi         kPa         7.4         512           Minimum Gas Supply Pipe Size <sup>2</sup> in         mm         3         7.6         Max Allowable Oil Temparature         ~PE         rC         250         121           Maximum Pressure Orop Across CAC         pai         kPa         1         6.9         Coloan Capacity (Engine only)         gai         L         2.3.3         88.1           Max Muxuble Intake Restriction         In-HyO         kPa         1         5.37         Full Open Temparature         ~F         °C         176         80.2           Stand Right Piter         In-HyO         kPa         1         5.37         Full Open Temparature         ~F         °C         176         80.2         83.2           Stant Pite Gart         In-HyO         kPa         1         5.90         Full Open Temparature         ~F         °C         2.0         83.2         84.2         84.2         84.2         84.2         84.2         84.2         84.2         84.2         84.	Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	3.0	10.2	ECU Oil Pressu	re Shut Dow	n <sup>6</sup>	psi	kPa	47	324
Maximum Operating pressure to EPR         In-H <sub>0</sub> KPa         11.0         2.7         Min         psi         KPa         74         55           Minimum Ga Suppy Pipe Size <sup>1</sup> in         mm         3         76         Max Allowable Oil Temperature         psi         KPa         74         512           Maximum Gas Suppy Pipe Size <sup>1</sup> in         mm         3         76         Max Allowable Oil Temperature         psi         KPa         74         512           Max Allowable Intake Restriction         In-H <sub>0</sub> O         KPa         1         6.9         Coolant Caparature <sup>8</sup> 7F         °C         176         80.           Otiry Air Filter         In-H <sub>0</sub> O         KPa         5         1.24         Normal Operating Pressure <sup>8</sup> 7F         °C         176         80.           Standard Spark Pug Oat         Reparature <sup>8</sup> F         C.2         1.7         Additional Standard Thermostal Respiret         F         °C         178         76.         188.         92           Standard Spark Pug Gap <sup>105</sup> in         mm         0.012         2.03         5CU Coolant Temp Shuthown         °F         °C         208         88.           Standedro Prower         HP         KW </td <td>Maximum EPR Rated Pressure</td> <td>psi</td> <td>kPa</td> <td>1.0</td> <td>6.9</td> <td>Oil Pressure at</td> <td>1000 rpm (lo</td> <td>le)</td> <td></td> <td></td> <td></td> <td></td>	Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	Oil Pressure at	1000 rpm (lo	le)				
Minimum Operating pressure to EPR         In-H <sub>2</sub> O         kPa         7.0         1.7         Max Allowable Oil Temparature         psi         kPa         7.4         512           Minimum Gas Supply Pipe Size <sup>5</sup> in         mm         3         7.6         Max Allowable Oil Temparature         7.7         C         25.0         121           Max Microwable Intake Restriction	Maximum Operating pressure to EPR	in-H <sub>2</sub> O	kPa	11.0	2.7	Min			psi	kPa	82	569
Inimum Gas Supply Pipe Size <sup>3</sup> in         mm         3         76         Max Movable OII Temperature         *F         *C         220         121           Maximum Gas Supply Pipe Size <sup>3</sup> in         in         mm         3         76         Maximum Cas Supply Pipe Size <sup>3</sup> gal         L         23.3         88.1           Max Allowable Intake Restriction         in-H <sub>2</sub> O         kPa         5         1.24         Normal Operation Temperature <sup>10</sup> *F         *C         176         80           Dirty Air Filter         in-H <sub>2</sub> O         kPa         5         1.24         Normal Operation Temperature <sup>10</sup> *F         *C         176         80         92           Spark Plug Call - Primary Resistance         Ohms         0.590 ± 10%         50°C chronit Capable <sup>11</sup> Pass         50           Starter Motor Power         HP         KW         15.7         11.7         CAR Rea Abox Ambient Specified         F         *C         130         *           RePM Range (Min-Atax) ISO St828-5 G 1         ffr/min         m/s         1772         9.0         Engine Collant Fine Mow <sup>11</sup> HP         KW         62.2         7.2         50           Starter Motor Power         HP         KW         1772 </td <td>Minimum Operating pressure to EPR</td> <td>in-H<sub>2</sub>O</td> <td>kPa</td> <td>7.0</td> <td>1.7</td> <td>Max</td> <td></td> <td></td> <td>psi</td> <td>kPa</td> <td>74</td> <td>512</td>	Minimum Operating pressure to EPR	in-H <sub>2</sub> O	kPa	7.0	1.7	Max			psi	kPa	74	512
Maximum Prosume Drop Across CAC         psi         KPa         1         6.9         Conditi (Engine only)         gal         L         23.3         88.1           Max Allowable Intake Restriction         Intake Restriction         Istindard Thermostal Range           Dirty Air Filter         Int-H <sub>2</sub> O         KPa         5         1.24         Normal Operatoria         IF         IC         176         80           Spark Pup Gang <sup>10</sup> In         mm         0.012         0.3         ECU Coolant Temp Shutdown         IF         IC         20.3         95           Spark Pup Gang <sup>10</sup> in         mm         0.012         0.3         ECU Coolant Temp Shutdown         IF         IC         20.3         95           Starter Motor Power         HP         KW         15.7         11.7         CAR Rise Above Ambient Specified         F         C         13         9           Performance Date B0H2************************************	Minimum Gas Supply Pipe Size <sup>5</sup>	in	mm	3	76	Max Allowable Oil Temperature		°F	°C	250	121	
Max Allowable Intake Restriction         Standard Thermostat Range         V         Standard Thermostat Range           Clean Air Filter         In-H <sub>2</sub> O         kPa         5         1.24         Normal Operation Temperature <sup>8</sup> "F         "C         176         80           Dirty Air Filter         In-H <sub>2</sub> O         kPa         5         1.24         Normal Operation Temperature <sup>8</sup> "F         "C         176         80           Spark Plug Part Number         Bosch R6 6857         ECU Coolant Temp Warning         "F         "C         203         95           Spark Plug Coil - Primary Resistance         Ohms         0.590 ± 10%         50°C Ambient Capable <sup>11</sup> psi         kPa         7.25         60           Starter Motor Power         HP         KW         17.72         9.0         Engine Coolant Finction Head         psi         kPa         3705           Water Plans Deped         ft/min         m/s         1772         9.0         Engine Coolant Finction Head         psi         kPa         3705           Mean Piston Speed         ft/min         m/s         1772         9.0         Engine Coolant Finction Head         psi         kPa         3705           Charging Alternator Voltage         Volts         228	Maximum Pressure Drop Across CAC	psi	kPa	1	6.9	Coolant Capacity (Engine only)		gal	_ L	23.3	88.1	
Clear Air Filter         In-H <sub>2</sub> O         kPa         5         1.24         Normal Operation Temperature <sup>8</sup> °F         °C         176         80           Dirty Air Filter         in-H <sub>2</sub> O         kPa         15         3.73         Full Open Temperature <sup>8</sup> °F         °C         176         90           Spark Pug Gap <sup>10</sup> in         mm         0.012         0.3         ECU Coolant Temp Shutdown         °F         °C         203         95           Spark Pug Gap <sup>10</sup> in         mm         0.012         0.3         ECU Coolant Temp Shutdown         °F         °C         203         95           Spark Pug Gap <sup>10</sup> in         mm         0.012         0.3         ECU Coolant Temp Shutdown         °F         °C         208         98           Spark Pug Gap <sup>10</sup> in         mm         0.012         0.1         Temperature <sup>11</sup> Vals         50° C Ambient Capable <sup>11</sup> Pass         Fast         50°         Spark Pug Gap         Pass         Fast         50°         Spark         10.0         Fast Pass         70°         50°         50°         Spark         50°         Spark         70°         10°         Vals         28°         Cooling Fast Are Fow <sup>11</sup>	Max Allowable Intake Restriction	1				Standard Therr	nostat Range	1	1.0			
Ditty Air Filter         in-H <sub>2</sub> O         kPa         15         3.73         Fill Open Temperature?         'F         'C         198         92           Spark Plug Part Number         Soch R6 6857         ECU Colant Temp Murning         'F         'C         203         95           Spark Plug Coll - Primary Resistance         Ohms         0.012         0.3         ECU Colant Temp Murning         'F         'C         208         98           Spark Plug Coll - Primary Resistance         Ohms         0.920 ± 10%         Soc A molent Capable <sup>11</sup> -         Pass           Starter Motor Power         HP         kW         15.7         11.7         CAC Rise Above Amblent Specified         F         C         15         9           Performance Data 60Hz <sup>15</sup> HP         kW         15.7         11.7         CAC Rise Above Amblent Specified         F         C         15         9           Performance Data 60Hz <sup>16</sup> HP         kW         15.7         Coling Fan Specified         RPM         1050           Charging Allemator Voltage         Volts         28         Cooling Fan Specif         RPM         1050         143           BPM Range (Min-Max) ISO 8528-5 G1         RPM         1772         0.0         166	Clean Air Filter	in-H <sub>2</sub> O	kPa	5	1.24	Normal Or	peration Tem	oerature <sup>9</sup>	۴F	°C	176	80
Spark Plug Part Number         Bosch R6 6867         ECU Coolant Temp Warning         'F         'C         203         95           Standard Spark Plug Gag <sup>10</sup> in         mm         0.012         0.3         ECU Coolant Temp Shutdwom         'F         'C         203         95           Spark Plug Gag <sup>10</sup> in         mm         0.012         0.3         ECU Coolant Temp Shutdwom         'F         'C         203         95           Spark Plug Call         Press         0.590.4 10%         50°C Amblent Capable <sup>11</sup> Press         Pass           Battery Voltage         Wolts         24         Max External Coolant Friction Head         psi         kPa         7.25         50           Starter Motor Power         HP         kW         15.7         11.7         CA Cite Above Amblent Specified         F         C         15         9           Performance Data 60Hz <sup>10</sup> HP         KW         1772         9.0         Engine Coolant Flow         gat/min         L/min         361         1368           RPM Range (Min-Max) ISO 8528-5 G1         RPM         1778 - 1823         Cooling Fan Speed         RPM         1050         Cooling Fan Speed         RPM         1050         1050         1050         1050	Dirty Air Filter	in-H <sub>2</sub> O	kPa	15	3.73	Full Open	Temperature	9	°F	°C	198	92
Standard Spark Plug Gap <sup>10</sup> in         mm         0.012         0.3         ECU Coolant Temp Shutdown         °F         °C         208         98           Spark Plug Coll - Primary Resistance         Ohms         0.590 ± 10%         50°C Ambient Capable <sup>11</sup> Pai         Pai         7.25         50           Battery Volts         24         Max External Coolant Frotion 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 60H2* <sup>36</sup> Nominal Engine Speed         RPM         1772         9.0         Engine Coolant Flow         gal/min         L/min         361         1368           RPM Range (Min-Max ISO 5828-5 G1         RPM         1776         1823         Cooling Fan Speed         RPM         10050         Cooling Fan Speed         RPM         1050         Cooling Fan Speed         RPM         1050         143           PG 60hz         Load         100%         75%         50%         25%         160         119           MEP (@ ratel Load on NG)         psi         bar         144         10.0         108         7.5 </td <td>Spark Plug Part Number</td> <td></td> <td>Bosch I</td> <td>R6 6857</td> <td></td> <td>ECU Coolant T</td> <td>emp Warning</td> <td>1</td> <td>°F</td> <td>°C</td> <td>203</td> <td>95</td>	Spark Plug Part Number		Bosch I	R6 6857		ECU Coolant T	emp Warning	1	°F	°C	203	95
Spark Plug Coll - Primary Resistance         Ohms         0.59Ω ± 10%         Sp <sup>2</sup> ± 10%         Sp <sup>2</sup> C Ambient Capable <sup>11</sup> Pas           Battery Voltage         Volts         24         Max External Coclant 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 60H2 <sup>10</sup> RPM         1800         Water Pump Speed         RPM         3705           Mean Piston Speed         RPM         1772         9.0         Engine Coclart Flow         getImin         Limin         381         1368           RPM Range (Min-Mar) ISO S528-5 G1         RPM         1778         182         Cocling Fan Speed         RPM         1050           Charging Alternator Voltage         Volts         28         Cocling Fan Air Flow <sup>11</sup> KW         62.8         47           Charging Alternator Current         Amp         507         478         356         318         238         160         119           MEP (@ rated Load on NG)         psi         bar         144         10.00         108         7.5         72         5.0         36	Standard Spark Plug Gap <sup>10</sup>	in	mm	0.012	0.3	ECU Coolant T	emp Shutdov	vn	°F	°C	208	98
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**         CAC Rise Above Ambient Specified         F         C         15         9           Mean Piston Speed         RPM         1800         Water Pump Speed         RPM         3705           Mean Piston Speed         RVmin         m/s         1772         9.0         Engine Coolant Flow         gal/min         Lmin         381         1388           RPM Range (Min-Max) ISO 8528-6 G1         RPM         1776 - 1823         Cooling Fan Speed         RPM         1050           Charging Alternator Voltage         Volts         28         Cooling Fan Air Flow <sup>13</sup> SCFM         m/min         65100         1443           LPG 60hz         Load         100%         75%         50%         25%         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50         50 <td>Spark Plug Coil - Primary Resistance</td> <td>Ohms</td> <td></td> <td>0.59Ω</td> <td>± 10%</td> <td>50°C Ambient (</td> <td>Capable<sup>11</sup></td> <td>-</td> <td></td> <td></td> <td>P</td> <td>ass</td>	Spark Plug Coil - Primary Resistance	Ohms		0.59Ω	± 10%	50°C Ambient (	Capable <sup>11</sup>	-			P	ass
Stater Motor Power         HP         kW         15.7         11.7         CAC Rise Above Ambient Specified         F         C         15         9           Performance Date 60Hz <sup>3,3</sup> Nominal Engine Speed         RPM         1800         Water Pump Speed         RPM         3705           Mean Piston Speed         If/Imin         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 Speed         RPM         1050         R433           Bref G0hz         Load         Load         100%         75%         50%         25%         ScErM         1051         448           SSFC         Ib/nr         kg/nr         433         97         4453         245         0652         9325 </td <td>Battery Voltage</td> <td>Vo</td> <td>olts</td> <td>2</td> <td>4</td> <td>Max External C</td> <td>oolant Frictic</td> <td>n Head</td> <td>psi</td> <td>kPa</td> <td>7.25</td> <td>50</td>	Battery Voltage	Vo	olts	2	4	Max External C	oolant Frictic	n Head	psi	kPa	7.25	50
Performance Data 60Hz <sup>3,3</sup> RPM         1800         Water Pump Spead         RPM         3705           Mean Piston Speed         ft/min         m/s         1772         9.0         Engine Coolant Flow         gat/min         L/min         361         1388           RPM Range (Min-Max) ISO 8528-5 G1         RPM         1778 - 1823         Cooling Fan Power <sup>11</sup> HP         KW         62.8         47           Charging Alternator Voltage         Volts         28         Cooling Fan Speed         RPM         1050           Charging Alternator Current         Amps         55         Cooling Fan Alr Flow <sup>11</sup> SCFM         m <sup>3</sup> min         65100         1843           MEP (@ rated Load on NG)         psi         bar         144         10.0         108         7.5         7.2         5.0         36         2.5           Fuel Consumption <sup>3,4,7</sup> Ib/thr         kg/thr         293         133         217         98         154         70         105         48           BSFC         Ib/(hp-th)         g/g/thr         293         133         217         98         154         70         105         48           BSFC         Ib/(hp-th)         g/g/thr         493         279 </td <td>Starter Motor Power</td> <td>HP</td> <td>kW</td> <td>15.7</td> <td>11.7</td> <td>CAC Rise Above</td> <td>e Ambient Sp</td> <td>ecified</td> <td>F</td> <td>С</td> <td>15</td> <td>9</td>	Starter Motor Power	HP	kW	15.7	11.7	CAC Rise Above	e Ambient Sp	ecified	F	С	15	9
Nominal Engine Speed         RPM         1800         Water Pump Speed         RPM         3705           Mean Piston Speed         ft/min         m/s         1772         9.0         Engine Coolant Flow         gat/min         L/min         361         1368           RPM Range (Min-Max) ISO 8528-5 G1         RPM         1778 - 1823         Cooling Fan Speed         RPM         462.8         47           Charging Alternator Voltage         Volts         28         Cooling Fan Speed         RPM         1000         1050         Ecoling Fan Speed         RPM         1050           Charging Alternator Voltage         Volts         28         Cooling Fan Speed         RPM         1050         1843           LGadt         LGadt         100%         75%         50%         28         160         119           MEP (@ rated Load on NG)         psi         bar         144         10.0         108         7.5         72         5.0         36         2.5           Fuel Consumption <sup>34,7</sup> Ib/hr         kg/hr         293         133         217         98         154         70         105         48           BSFC         Ib/hr         kg/hr         4293         133         217         9	Performance Data 60Hz <sup>3,5</sup>	-								11.1		-
Mean Plston 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 <sup>31</sup> HP         kW         62.8         47           Charging Alternator Voltage         Volts         28         Cooling Fan Speed         RPM         1050           Charging Alternator Current         Amps         55         Cooling Fan Air Flow <sup>11</sup> SCFM         m <sup>3</sup> /min         65100         1843           Stand-By Power Rating <sup>1/23,4</sup> Per ISO 3046         HP         kW         637         475         478         366         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 <sup>34,7</sup> Ib/hr         kg/hr         293         133         217         98         154         70         105         48           BSFC         Ib//(hp-hr)         g(KW-hr)         0.458         276         0.485         295         0.629         383           turbine Outlet Conditions	Nominal Engine Speed	R	PM	18	00	Water Pump Sp	peed	-	R	PM	3	705
RPM Range (Min-Max) ISO 8528-5 G1         RPM         1778 - 1823         Cooling Fan Speed         RPM         1050           Charging Alternator Voltage         Volts         28         Cooling Fan Speed         RPM         1050           Charging Alternator Voltage         Volts         28         Cooling Fan Speed         RPM         1050           Lead         Load         100%         75%         50%         2CFM         m³/min         65100         1843           BS for Charging Alternator Current         Load         100%         75%         50%         2CFM         m³/min         65100         1843           BS for Charging Alternator Current         Load         100%         75%         50%         2C5%         2C5%           Stand-By Power Rating <sup>17,23,4</sup> Per ISO 3046         HP         kW         637         475         478         356         318         238         160         119           BF (id Cansumption <sup>34,7</sup> Ib/hr         kg/hr         293         133         217         98         154         70         105         48           BSFC         Ib/hr         kg/hr         293         133         217         98         154         70         105         233     <	Mean Piston Speed	ft/min	m/s	1772	9.0	Engine Coolant	Flow		gal/min	gal/min L/min		1368
Charging Alternator Voltage         Volts         28         Cooling Fan Speed         RPM         1050           Charging Alternator Current         Amps         55         Cooling Fan Air Flow <sup>11</sup> SCFM         m <sup>3</sup> /min         65100         1843           LPG 60hz         Load         100%         75%         50%         25%         25%           Stand-By Power Rating <sup>11/2,34</sup> 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 <sup>34,7</sup> Ib/hr         kg/hr         233         133         217         98         154         70         105         48           SPC         Ib/hr         kg/hr         233         133         217         98         154         70         105         48           SPC         Ib/hp-hr/         g/(kW-hr)         0.458         279         0.454         276         0.485         295         0.629         383           Turbine Outlet Conditions         ACFM         m <sup>3</sup> /min </td <td>RPM Range (Min-Max) ISO 8528-5 G1</td> <td>RF</td> <td>PM</td> <td>1778</td> <td>- 1823</td> <td>Cooling Fan Po</td> <td>wer<sup>11</sup></td> <td>1.25</td> <td>HP</td> <td>kW</td> <td>62.8</td> <td>47</td>	RPM Range (Min-Max) ISO 8528-5 G1	RF	PM	1778	- 1823	Cooling Fan Po	wer <sup>11</sup>	1.25	HP	kW	62.8	47
Charging Alternator Current         Amps         55         Cooling Fan Air Flow <sup>11</sup> SCFM         m³/min         65100         1843           LPG 60hz         Load         100%         75%         50%         225%           Stand-By Power Rating <sup>12,3,4</sup> 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 <sup>3,4,7</sup> Ib/hr         kg/hr         293         133         217         98         154         70         105         48           BSFC         Ib/(hp-hr)         g/g/kr         493         133         217         98         154         70         105         48           BSFC         Ib/(hp-hr)         g/g/kr         4844         2197         3596         1631         2558         1160         1735         787           Exhaust Nass Flow (entire engine)         Ib/hr         kg/hr         4844         2197         3596         1631         2558         1160         1735         787 <tr< td=""><td>Charging Alternator Voltage</td><td>Vo</td><td>lts</td><td>2</td><td>8</td><td>Cooling Fan Sp</td><td>beed</td><td>10.00</td><td>R</td><td>PM</td><td>1</td><td>050</td></tr<>	Charging Alternator Voltage	Vo	lts	2	8	Cooling Fan Sp	beed	10.00	R	PM	1	050
LPG 60hz         Load         100%         75%         50%         25%           Stand-By Power Rating <sup>12,3,4</sup> Per ISO 3046         HP         kW         637         475         478         356         318         238         160         119           MEP (@ rated Load on NG)         psi         bar         1144         10.0         108         7.5         72         5.0         36         2.5           Fuel Consumption <sup>3,4,7</sup> Ib/hr         kg/hr         293         133         217         98         154         70         105         48           BSFC         Ib/(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 How at Turbine Outlet Conditions         ACFM         m³/min         3439         97         2493         71         1748         49         1123         32           Air Induction System <sup>2</sup> °F         °C         255         124         206         104         1630         739	Charging Alternator Current	An	nps	5	5	Cooling Fan Air	Flow <sup>11</sup>		SCFM	m <sup>3</sup> /min	65100	1843
LPG 6URZ         LOAD         IUU%         /75%         DU%         Z3%           Stand-By Power Rating <sup>12,3,4</sup> 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 <sup>3,4,7</sup> 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           Exhaust Mass Flow (entire engine)         jb/hr         kg/hr         4844         2197         3596         1631         2558         1160         1735         787           Exhaust Flow at Turbine Outlet Conditions         ACFM         m³/min         3439         97         2493         71         1748         49         1123         32           Combustion Air required (entire engine)         ACFM         m³/min         992         28         736         21         52	IDO OOL-			41	0.00/		•0/		00/	1	050	1
Stand-By Power Rating <sup>12,3,4</sup> 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 <sup>34,7</sup> 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         m³/min         3439         97         2493         71         1748         49         1123         32           Combustion Air required (entire engine)         lb/hr	LPG GUNZ	LO	ao	1.00	<b>JU%</b>	k = k	0%		00%	- 1 · · ·	20	/0
MEP (@ rated Load on NG)         psi         bar         144         10.0         108         7.5         72         5.0         36         2.5           Fuel Consumption <sup>3,4,7</sup> Ib/hr         kg/hr         293         133         217         98         154         70         105         48           BSFC         Ib/(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)         Jb/hr         kg/hr         4844         2197         3596         1631         2558         1160         1735         787           Exhaust Mass Flow (entire engine)         ACFM         m³/min         3439         97         2493         71         1748         49         1123         32           Air Induction System <sup>5</sup> 0         m³/min         992         28         736         21         524         15         355         10           Combustion Air equired (entire engine)         ACFM <t< td=""><td>Stand-By Power Rating<sup>1,2,3,4</sup> Per ISO 3046</td><td>HP</td><td>kW</td><td>637</td><td>475</td><td>478</td><td>356</td><td>318</td><td>238</td><td>3</td><td>160</td><td>119</td></t<>	Stand-By Power Rating <sup>1,2,3,4</sup> Per ISO 3046	HP	kW	637	475	478	356	318	238	3	160	119
Fuel Consumption <sup>34,7</sup> Ib/hr         kg/hr         293         133         217         98         154         70         105         48           BSFC         Ib/(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)         Ib/hr         kg/hr         4844         2197         3596         1631         2558         1160         1735         787           Exhaust Flow at Turbine Outlet Conditions         ACFM         m³/min         3439         97         2493         71         1748         49         1123         32           Air Induction System <sup>5</sup> Combustion Air required (entire engine)         MCFM         m³/min         992         28         736         21         524         15         355         10           Combustion Air Volume Required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10 <tr< td=""><td>MEP (@ rated Load on NG)</td><td>psi</td><td>bar</td><td>144</td><td>10.0</td><td>108</td><td>7.5</td><td>72</td><td>5.0</td><td></td><td>36</td><td>2,5</td></tr<>	MEP (@ rated Load on NG)	psi	bar	144	10.0	108	7.5	72	5.0		36	2,5
BSFC         Ib/(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)         Ib/hr         kg/hr         4844         2197         3596         1631         2558         1160         1735         787           Exhaust Flow at Turbine Outlet Conditions         ACFM         m³/min         3439         97         2493         71         1748         49         1123         32           Air Induction System <sup>3</sup> 739         2493         71         1748         49         1630         739           Combustion Air required (entire engine)         Ib/hr         kg/hr         4551         2064         3379         1533         2404         1090         1630         739           Combustion Air required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10           Compressor Outlet Temperature <sup>2</sup> °F         <	Fuel Consumption <sup>3,4,7</sup>	lb/hr	kg/hr	293	133	217	98	154	70	1 = 1 - 1	105	48
Turbine Outlet Temperature         °F         °C         1208         653         1117         603         1057         569         973         523           Exhaust Mass Flow (entire engine)         Ib/hr         kg/hr         4844         2197         3596         1631         2558         1160         1735         787           Exhaust Flow at Turbine Outlet Conditions         ACFM         m³/min         3439         97         2493         71         1748         49         1123         32           Air Induction System³            555         1249         3379         1533         2404         1090         1630         739           Combustion Air volume Required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10           Compustion Air Volume Required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10           Compustion Air Volume Required (entire engine)         ACFM         m³/min         992         288         736         21         524         15         355         10	BSFC	lb/(hp-hr)	g/(kW-hr)	0.458	279	0.454	276	0.485	295	5 0	.629	383
Exhaust Mass Flow (entire engine)         Ib/hr         kg/hr         4844         2197         3596         1631         2558         1160         1735         787           Exhaust Flow at Turbine Outlet Conditions         ACFM         m³/min         3439         97         2493         71         1748         49         1123         32           Air Induction System <sup>5</sup> Combustion Air required (entire engine)         Ib/hr         kg/hr         4551         2064         3379         1533         2404         1090         1630         739           Combustion Air required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10           Compressor Outlet Temperature <sup>2</sup> °F         °C         255         124         220         104         164         73         123         50           Thermal Balance <sup>5</sup> Total Fuel         BTU/min         kW         97288         1711         7203         1270         51298         902         34824         612           Mechanical Power         BTU/min         kW         27013         475         20260         356         13506         238         6792         119	Turbine Outlet Temperature	°F	°C	1208	653	1117	603	1057	569		973	523
Exhaust Flow at Turbine Outlet Conditions         ACFM         m³/min         3439         97         2493         71         1748         49         1123         32           Air Induction System <sup>5</sup> Combustion Air required (entire engine)         Ib/hr         kg/hr         4551         2064         3379         1533         2404         1090         1630         739           Combustion Air required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10           Compressor Outlet Temperature <sup>2</sup> °F         °C         255         124         220         104         164         73         123         50           Thermal Balance <sup>5</sup> °F         °C         255         124         220         104         164         73         123         50           Thermal Balance <sup>5</sup> °C         255         124         220         104         164         73         123         50           Total Fuel         BTU/min         kW         97288         1711         72203         1270         51298         902         34824         612           Mecha	Exhaust Mass Flow (entire engine)	lb/hr	kg/hr	4844	2197	3596	1631	2558	116	0 1	735	787
Air Induction System <sup>5</sup> Combustion Air required (entire engine)         Ib/hr         kg/hr         4551         2064         3379         1533         2404         1090         1630         739           Combustion Air required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10           Compressor Outlet Temperature <sup>2</sup> °F         °C         255         124         220         104         164         73         123         50           Compressor Outlet Temperature <sup>2</sup> °F         °C         255         124         220         104         164         73         123         50           Thermal Balance <sup>5</sup> Trans         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	Exhaust Flow at Turbine Outlet Conditions	ACFM	m <sup>3</sup> /min	3439	97	2493	71	1748	49		123	32
Combustion Air required (entire engine)         Ib/hr         kg/hr         4551         2064         3379         1533         2404         1090         1630         739           Combustion Air Volume Required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10           Compressor Outlet Temperature <sup>2</sup> °F         °C         255         124         220         104         164         73         123         50           Thermal Balance <sup>5</sup> 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           <	Air Induction System <sup>5</sup>			-								
Combustion Air Volume Required (entire engine)         ACFM         m³/min         992         28         736         21         524         15         355         10           Compressor Outlet Temperature <sup>2</sup> °F         °C         255         124         220         104         164         73         123         50           Thermal Balance <sup>5</sup> 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	Combustion Air required (entire engine)	lb/hr	kg/hr	4551	2064	3379	1533	2404	109	0 1	630	739
Compressor Outlet Temperature <sup>2</sup> °F         °C         255         124         220         104         164         73         123         50           Thermal Balance <sup>5</sup> 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	Combustion Air Volume Required (entire engine)	ACFM	m <sup>3</sup> /min	992	28	736	21	524	15		355	10
Thermal Balance <sup>5</sup> 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	Compressor Outlet Temperature <sup>2</sup>	°F	°C	255	124	220	104	164	73		123	50
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	Thermal Balance <sup>5</sup>							-	-	-		L.KI
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	Total Fuel	BTU/min	kW	97288	1711	72203	1270	51298	902	2 3	4824	612
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	Mechanical Power	BTU/min	kW	27013	475	20260	356	13506	238	3 E	792	119
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	Heat Rejected to Cooling Water at Rated Load	BTU/min	kW	30994	545	25757	453	20306	357	1.	4388	253
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	Heat Rejection CAC at Rated Power	BTU/min	kW	3127	55	1868	33	770	14		240	4
Engine Radiated Heat BTU/min kW 13855 244 9713 171 7073 124 7796 137	Heat Rejection to Exhaust (LHV to 150C)	BTU/min	kW	22299	392	14605	257	9642	170	) 5	609	99
	Engine Radiated Heat	BTU/min	kW	13855	244	9713	171	7073	124	1 7	796	137

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

TOTE BITCH AMPOT

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

31.8L

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.

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

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

>1400RPM.

See PSI HD Technical Spec. 56300002 - Fuel Specification.

Standard Sump Capacity.

± 2 degrees Celsius.

± 0.002" or 0.05mm.

At 0.5 in-H2O of Package Restriction at STP,

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General Engine Data <sup>®</sup>	-					_					
Туре		V-Se	eries		Flywheel housi	ng			SAE	No.0	
Number of cylinders		1	2		Flywheel				SAE	No.18	1
Aspiration	Charg	ed Cooled	Forced Inc	luction	Dry Weight (Fa	n to Flywhee	1)	lb	kg	7344	3331
Firing Order	1-8-5-	10-3-7-	6-11-2-	9-4-12	Wet Weight (Fa	an to Flywhee	el)	lb	kg	7788	3533
Rotation Viewed from Flywheel	1.100	Counter (	Clockwise		CG From Rear	Face of Bloc	k	in	mm	37.0	941
Bore	in	mm	5.906	150	CG Above Cra	nk Centerline		in	mm	0	0
Stroke	ìn	mm	5.906	150	010 00 00			SAE 15	W-40 Low	10 Low Ash Gas engine oil	
Displacement	in <sup>3</sup>	L	1941	31.8	Oil Specificatio	n -	- 10·	(.255%	% by wt), A	PI CD/CF	or higher
Compression Ratio		10.5	5:1		Engine Oil Cap	acity <sup>8</sup>	10.0			1.1.1.1	
Exhaust Manifold Type	1	Water	Cooled		Min	- CM		qts	L	95	90
Turbo Exhaust Outlet Pipe Size	in	mm	3.5	89	Max	11		qts	L	129	122
Catalyst Inlet Size	in	mm	5	127	ECU Oil Pressu	re Warning <sup>6</sup>	-	psi	kPa	57	393
Maximum Allowable Exhaust Back Pressure	in-Hg	kPa	3.0	10.2	ECU Oil Press	re Shut Dow	m <sup>6</sup>	psi	kPa	47	324
Maximum EPR Rated Pressure	psi	kPa	1.0	6.9	Oil Pressure at	1000 rpm (lo	lle)				
Maximum Operating pressure to EPR	in-H <sub>2</sub> O	kPa	11.0	2.7	Min			psi	kPa	82	569
Minimum Operating pressure to EPR	in-H <sub>2</sub> O	kPa	7.0	1.7	Max			psi	kPa	74	512
Minimum Gas Supply Pipe Size <sup>5</sup>	in	mm	3	76	Max Allowable	Oil Tempera	ure	°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	1.10				Standard Therr	nostat Range	3	1	_		-
Clean Air Filter	in-H <sub>2</sub> O	kPa	5	1.24	Normal Or	peration Tem	perature <sup>9</sup>	°F	°C	176	80
Dirty Air Filter	in-H <sub>2</sub> O	kPa	15	3.73	Full Open	Temperature	9	°F	°C	198	92
Spark Plug Part Number		Bosch F	R6 6857	1 1 1 A	ECU Coolant T	emp Warning	9	°F	°C	203	95
Standard Spark Plug Gap <sup>10</sup>	in	mm	0.012	0.3	ECU Coolant T	emp Shutdov	vn	°F	°C	208	98
Spark Plug Coil - Primary Resistance	Ohms		0.59Ω	± 10%	50°C Ambient	Capable <sup>11</sup>				P	ass
Battery Voltage	Vo	olts	2	4	Max External C	oolant Frictio	n Head	psi	kPa	7.25	50
Starter Motor Power	HP	kW	15.7	11.7	CAC Rise Abov	e Ambient Sp	ecified	F	C	15	9
Performance Data 50Hz <sup>3,5</sup>									11.1		1
Nominal Engine Speed	R	M	15	00	Water Pump S	peed		R	PM	3	088
Mean Piston Speed	ft/min	m/s	1476	7.5	Engine Coolan	Flow		gal/min	gal/min L/min		1125.6
RPM Range (Min-Max) ISO 8528-5 G1	RF	M	1477	- 1519	Cooling Fan Po	wer <sup>11</sup>	1.0.1	HP	kW	36.4	27
Charging Alternator Voltage	Vo	lts	2	8	Cooling Fan So	eed	1000	R	PM	8	75
Charging Alternator Current	An	nps	5	3	Cooling Fan Ai	Flow <sup>11</sup>	-	SCFM	m <sup>3</sup> /min	54200	1535
LPG 50hz	Lo	ad	1	10%	75	1%	5	50%		25	10
1224		77		1070	10.0		070	1 000			100
Stand-By Power Rating 23,4 Per ISO 3046	HP	kW	543	405	407	304	2/2	203	5	13/	102
MEP (@ rated Load on NG)	psi	bar	148	10.2	111	7.6	14	5.1		37	2,6
Fuel Consumption <sup>3,4,7</sup>	lb/hr	kg/hr	604	274	571	259	631	286	5 1	349	385
BSFC	lb/(hp-hr)	g/(kW-hr)	0.428	260	0.445	2/1	0.437	266	0	.599	364
Turbine Outlet Temperature	۴	°C	1168	631	1077	581	1022	550	)	947	508
Exhaust Mass Flow (entire engine)	lb/hr	kg/hr	4406	1998	3287	1491	2599	117	9 2	202	999
Exhaust Flow at Turbine Outlet Conditions	ACFM	m³/min	2913	82	2017	57	1426	40		943	27
Air Induction System				-							
Combustion Air required (entire engine)	lb/hr	kg/hr	3802	1725	2716	1232	1969	893	5 1	352	613
Combustion Air Volume Required (entire engine)	ACFM	m³/min	829	23	592	17	429	12		295	8
Compressor Outlet Temperature*	۴F	°C	246	119	185	85	144	62		113	45
Thermal Balance	Lanutra		04.117	1		4004	10110	1		700	FOF
I otal Fuel	BTU/min	kW	81417	1432	58071	1021	42143	741	2	5/38	505
Mechanical Power	BTU/min	kW	23032	405	17274	304	11516	203	5	791	102
Heat Rejected to Cooling Water at Rated Load	BTU/min	kW	26302	462	20356	358	16728	294		2536	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	4	416	78
Engine Radiated Heat	BTU/min	ĸW	11809	208	8248	145	5873	103	5 5	850	103

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

TOTH BITCHARMPOT

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

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.

31.8L 🗠

All fuel and thermal calculations unless otherwise noted are done at ISO 3046 rated load using LHV for LPG 46,38 MJ/kg.

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

>1400RPM.

See PSI HD Technical Spec. 56300002 - Fuel Specification.

Standard Sump Capacity.

± 2 degrees Celsius.

± 0.002" or 0.05mm.

At 0.5 in-H2O of Package Restriction at STP

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## HCI634G - Winding 311 and 312 Technica Data Sheet



## **HCI634G**



## 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



## WINDING 311 and 312

CONTROL SYSTEM	SEPARATE	SEPARATELY EXCITED BY P.M.G.										
A.V.R.	MX321											
VOLTAGE REGULATION	± 0.5 %	With 4% EN	GINE GOVEI	RNING								
SUSTAINED SHORT CIRCUIT	REFER TO	SHORT CIR	CUIT DECRE	MENT CUR	/ES (page 7)							
INSULATION SYSTEM				CLAS	SS H							
PROTECTION				IP2	23							
RATED POWER FACTOR				0.	8							
		DOUBLE LAYER LAP										
			0(									
STATOR WDG. RESISTANCE		0.0	03 Ohms PEI	R PHASE AT	22°C STAR	CONNECTE	:D					
ROTOR WDG. RESISTANCE				1.75 Ohms	s at 22°C							
EXCITER STATOR RESISTANCE				17 Ohms	at 22°C							
EXCITER ROTOR RESISTANCE			0.079	Ohms PER	PHASE AT 2	2°C						
R.F.I. SUPPRESSION	BS EN	61000-6-2 &	BS EN 6100	0-6-4,VDE 0	875G, VDE 0	875N. refer t	o factory for	others				
WAVEFORM DISTORTION		NO LOAD <	1.5% NON-	DISTORTING	BALANCE	D LINEAR LO	AD < 5.0%					
MAXIMUM OVERSPEED		2250 Rev/Min										
BEARING DRIVE END		BALL. 6224 (ISO)										
BEARING NON-DRIVE END		BALL. 6317 (ISO)										
		1 BEAR <mark>ING</mark> 2 BEARING										
WEIGHT COMP. GENERATOR		1965 kg										
WEIGHT WOUND STATOR		934	1 kg			934	kg					
WEIGHT WOUND ROTOR		814 kg 766 kg										
WR <sup>2</sup> INERTIA	18.3482 kgm <sup>2</sup> 17.8009 kgm <sup>2</sup>											
SHIPPING WEIGHTS in a crate		202	:3kg )			2029	9kg					
PACKING CRATE SIZE		183 x 92 x	x 140(cm)			183 x 92 x	140(cm)					
		50	Hz			60	Hz					
		THF	<2%			TIF∢	:50					
		1.614 m³/se	c -3420 cfm			1.961 m <sup>3</sup> /sec	c 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				
	0.10	0.09	0.08	0.07	0.12	0.11	0.10	0.10				
	0.22	0.20	0.19	0.17	0.24	0.23	0.22	0.21				
		VA			85	VULIAG						
T"d SUB-TRANSTIME CONST.				0.0	25							
T'do O.C. FIELD TIME CONST.				2.3	35							
Ta ARMATURE TIME CONST.				0.0	)4							
SHORT CIRCUIT RATIO				1/>	(d							

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



### WINDING 311 and 312

50

Hz

HCI634G

## THREE PHASE EFFICIENCY CURVES











## HCI634G WINDING 311 and 312

## THREE PHASE EFFICIENCY CURVES











HCI634G

WINDING 311 and 312

Locked Rotor Motor Starting Curve



## MFORD



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 :

50	Hz	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	440v X 1.18		x 1.17					
The sustained surrent value is constant important.								

The sustained current value is constant irrespective of voltage level

#### Note 2

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

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

All other times are unchanged

#### Note 3

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

## HCI634G



Winding 311 and 312 0.8 Power Factor

## RATINGS

Class - Temp Rise	C	ont. F -	105/40	°C	Co	ont. H -	125/40	°C	St	andby -	150/40	°C	St	andby -	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
									1							
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	78 <mark>3</mark>	815	846	775	822	854	886	808	849	886	923

\* Parallel Star only available with Wdg 311









SAE	14	18	21	24
AN	25.4	15.87	0	0





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## HCI 534F/544F - Winding 311

Technical Data Sheet



## HCI534F/544F 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 threephase 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  $5^{\circ}$ C by which the operational ambient temperature exceeds  $40^{\circ}$ 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



## WINDING 311

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.								
A.V.R.	MX321	MX341							
VOLTAGE REGULATION	± 0.5 %	± 1.0 %	With 4% EN	GINE GOVE	RNING				
SUSTAINED SHORT CIRCUIT	REFER TO	SHORT CIR	CUIT DECRE	MENT CUR	/ES (page 7)				
CONTROL SYSTEM	SELF EXCIT	ED							
A.V.R.	AS440								
VOLTAGE REGULATION	± 1.0 %	With 4% EN	GINE GOVE	RNING					
SUSTAINED SHORT CIRCUIT	SERIES 4 C	ONTROL DO	DES NOT SU	STAIN A SH	ORT CIRCUI	T CURRENT			
INSULATION SYSTEM				CLAS	SS H				
PROTECTION				IP2	23				
RATED POWER FACTOR				0.	8				
STATOR WINDING				DOUBLE L	AYER LAP				
				TWO T	HIRDS				
				1:	2				
		0 0037 (	Thms PER PI	HASE AT 22		STAR CONN	ECTED		
		0.0007 0		2 16 Ohm	at 22°C		LOTED		
				17 Ohme	at 22°C				
R.F.I. SUPPRESSION	BS EN								
		NO LOAD <	1.5% NON-		3 BALANCEL	D LINEAR LC	0AD < 5.0%		
MAXIMUM OVERSPEED				2250 R	ev/Min				
BEARING DRIVE END				BALL. 62	20 (ISO)				
BEARING NON-DRIVE END			$\bigcirc$	BALL. 63	14 (ISO)				
		1685 kg 1604 kg							
WEIGHT WOUND STATOR	1694 kg								
WEIGHT WOUND BOTOR		684	4 kg			655	ka		
WR <sup>2</sup> INERTIA		10.03	3 kgm <sup>2</sup>			9.7551	kgm <sup>2</sup>		
SHIPPING WEIGHTS in a crate		177	′5 <mark>kg</mark>			1780	Okg		
PACKING CRATE SIZE		166 x 87	x 124(cm)			166 x 87 x	(124(cm)		
		50	Hz			60	Hz		
		THF	<sup>-</sup> <2%			TIF<	<50		
COOLING AIR	200/220	1.035 m³/se	ec 2202 cfm	440/054	44.0/0.40	1.312 m³/sec	2780 cfm	400/077	
	380/220	200/115	415/240 208/120	440/254 220/127	208/120	440/204 220/127	400/200 230/133	480/277	
VOLTAGE SERIES DELTA	220/110	230/115	240/120	254/127	240/120	254/127	266/133	277/138	
<b>kVA BASE RATING FOR REACTANCE</b>	670	670	670	650	738	775	800	825	
	2 90	2.62	2/3	2 10	3 33	3 13	2.95	2.80	
	0.16	0.14	0.13	0.11	0.16	0.15	0.14	0.13	
X"d DIR AXIS SUBTRANSIENT	0.10	0.14	0.09	0.08	0.10	0.10	0.14	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	
XL LEAKAGE REACTANCE	0.05 0.04 0.04 0.03 0.05 0.05 0.04 0.04								
X2 NEGATIVE SEQUENCE	0.18	0.16	0.15	0.13	0.21	0.20	0.19	0.18	
X0ZERO SEQUENCE	0.08	0.08	0.07	0.06	0.09	0.08	0.08	0.08	
REACTANCES ARE SATURAT	ED	V	ALUES ARE	PER UNIT A	T RATING AI	ND VOLTAGI	E INDICATEI	C	
				0.0	8s				
				0.01	125 55				
Ta ARMATURE TIME CONST.				0.01	19s				
SHORT CIRCUIT RATIO	1/Xd								



## 50 Hz

HCI534F/544F

Winding 311

## THREE PHASE EFFICIENCY CURVES











## HCI534F/544F

Winding 311

## THREE PHASE EFFICIENCY CURVES









## Winding 311

## Locked Rotor Motor Starting Curve



## HCI534F/544F

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



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 :

50	Hz	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 sustains	The sustained surrent value is constant importantial								

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



Winding 311 0.8 Power Factor

#### RATINGS

	Class - Temp Rise	Cont. F - 105/40°C			°C	Cont. H - 125/40°C			Standby - 150/40°C			Standby - 163/27°C					
50	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
п	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
							<u> </u>	_									
60	Series Star (V)	416	440	460	480	416	440	460	480	416	440	460	480	416	440	460	480
Hz	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. <mark>0</mark>	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	9 <sub>673</sub>	694	659	690	715	737	681	712	741	764

## DIMENSIONS

AD

170





COUPLING DISC	AN	ADAPTOR	AD
SAE 14	25,4	SAE 00	410
SAE 18	15,87	SAE O	410
SAE 21	0	SAE 1/2	390
		SAE 1	390

95,035 95,013





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## HCI534F/544F - Winding 17

Technical Data Sheet



## HCI534F/544F 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 permitparallel 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



## WINDING 17

CONTROL SYSTEM	SEPARATELY EXCITED BY P.M.G.						
A.V.R.	MX321 MX341						
VOLTAGE REGULATION	± 0.5 % ± 1.0 %	With 4% ENGINE GOVER	NING				
SUSTAINED SHORT CIRCUIT	REFER TO SHORT CIRC		ES (page 5)				
CONTROL SYSTEM	SELE EXCITED						
A V R	AS440						
	+ 1.0 % With 4% EN						
SUSTAINED SHORT CIRCUIT	WILL NOT SUSTAIN AS						
INSULATION SYSTEM		CLAS	S H				
PROTECTION		IP2	23				
RATED POWER FACTOR		0.3	8				
STATOR WINDING		DOUBLE L	AYER LAP				
WINDING PITCH		TWO TI	HIRDS				
WINDING LEADS		12	2				
STATOR WDG. RESISTANCE	0.0049	Ohms PER PHASE AT 22	C SERIES STAR CONNECTED				
ROTOR WDG. RESISTANCE		2.16 Ohms	s 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 0	875G, VDE 0875N. refer to factory for others				
WAVEFORM DISTORTION	NO LOAD	< 1.5% NON-DISTORTING	BALANCED LINEAR LOAD < 5.0%				
MAXIMUM OVERSPEED		2250 R	ev/Min				
		BALL 62	20 (ISO)				
		BALL 63					
			14 (15(1))				
BEARING NON-DRIVE END	1 RE		2 BEARING				
WEIGHT COMP. GENERATOR	1 BE	ARING 35 kg	2 BEARING 1694 kg				
WEIGHT COMP. GENERATOR	1 BE 168 80	ARING 35 kg 5 kg	2 BEARING 1694 kg 805 kg				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR	1 BE 168 80 68	ARING 35 kg 5 kg 4 kg	2 BEARING 1694 kg 805 kg 655 kg				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA	1 BE 168 80 68 10.03	ARING 35 kg 5 kg 4 kg 13 kgm <sup>2</sup>	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup>				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate	1 BE 168 80 68 10.03 177	25 kg 4 kg 13 kgm <sup>2</sup> 75 kg	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE	1 BE 168 80 68 10.03 177 166 x 87	4 kg 4 kg 5 kg 4 kg 75 kg x 124 (cm)	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm)				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE	1 BE 168 80 68 10.03 177 166 x 87 THI	ARING 35 kg 4 kg 13 kgm <sup>2</sup> 75 kg x 124 (cm) =<2%	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR	1 BE 168 80 68 10.03 177 166 x 87 THF	ARING 35 kg 4 kg 33 kgm <sup>2</sup> 75 kg x 124 (cm) =<2% 1.035 m <sup>3</sup> /sec	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 c 2202 cfm				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR	1 BE 168 80 68 10.03 177 166 x 87 THF	ARING 35 kg 5 kg 4 kg 33 kgm <sup>3</sup> 75 kg x 124 (cm) =<2% 1.035 m <sup>3</sup> /sec 600	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2202 cfm VV				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR	1 BE 166 80 68 10.03 177 166 x 87 THF	ARING 35 kg 5 kg 4 kg 13 kgm <sup>2</sup> 75 kg x 124 (cm) =<2% 1.035 m <sup>3</sup> /sec 600 300	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2202 cfm V				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA	1 BE 168 80 68 10.03 177 166 x 87 THF	ARING 35 kg 5 kg 4 kg 13 kgm <sup>2</sup> 75 kg x 124 (cm) =<2% 1.035 m <sup>3</sup> /sea 600 300 346	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 c 2202 cfm V V				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA kVA BASE RATING FOR REACTANCE VALUES	1 BE 168 80 68 10.03 177 166 x 87 TH	ARING 35 kg 5 kg 4 kg 33 kgm <sup>3</sup> 75 kg x 124 (cm) = <2% 1.035 m <sup>3</sup> /sec 346 346 82	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 c 2202 cfm VV 5				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA KVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS	1 BE 168 80 68 10.03 177 166 x 87 THF	ARING 35 kg 5 kg 4 kg 33 kgm <sup>2</sup> 75 kg x 124 (cm) = 22% 1.035 m <sup>3</sup> /sec 600 300 346 82 2.4	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2202 cfm V V 5 4				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA kVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS TRANSIENT	1 BE 168 80 68 10.03 177 166 x 87 THF	ARING 35 kg 5 kg 4 kg 33 kgm <sup>2</sup> 75 kg 1.035 m <sup>3</sup> /sec 600 300 346 82 2.4 0.1	2 BEARING         1694 kg         805 kg         655 kg         9.7551 kgm²         1780 kg         166 x 87 x 124 (cm)         TIF<50				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE SERIES STAR VOLTAGE SERIES DELTA KVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SUBTRANSIENT X"d DIR. AXIS SUBTRANSIENT	1 BE. 168 80 68 10.03 177 166 x 87 THI	ARING 35 kg 5 kg 4 kg 13 kgm <sup>2</sup> 75 kg 1.035 m <sup>3</sup> /sec 600 300 346 82 2.4 0.1 0.0	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2 2202 cfm V V 5 4 1 9				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WR2 INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA kVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SUBTRANSIENT X'' DIR. AXIS SUBTRANSIENT X'' QUAD. AXIS REACTANCE	1 BE 166 80 68 10.03 177 166 x 87 THI	ARING 35 kg 5 kg 4 kg 33 kgm <sup>3</sup> 75 kg 1.035 m <sup>3</sup> /sec 1.035 m <sup>3</sup> /sec 346 346 346 346 1.035 m <sup>3</sup> /sec 1.035 m <sup>3</sup> /sec	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2 2202 cfm V V 5 4 1 9 5 5				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA kVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SUBTRANSIENT X" QUAD. AXIS REACTANCE X" QUAD. AXIS SUBTRANSIENT	1 BE 168 80 68 10.03 177 166 x 87 THF	ARING 35 kg 5 kg 4 kg 33 kgm <sup>3</sup> 75 kg 1.035 m <sup>3</sup> /sec 1.035 m <sup>3</sup> /sec 2.4 0.1 0.0 0.0	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2202 cfm V V 5 4 1 9 5 3				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA kVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SUBTRANSIENT X"d DIR. AXIS SUBTRANSIENT X"q QUAD. AXIS SUBTRANSIENT XL LEAKAGE REACTANCE	1 BE 168 80 68 10.03 177 166 x 87 THF	ARING 35 kg 5 kg 4 kg 33 kgm <sup>3</sup> 75 kg 1.035 m <sup>3</sup> /sec 600 300 346 82 2.4 0.1 0.2 0.2 0.0	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2202 cfm V V 5 4 1 9 5 3 4 4				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA kVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SUBTRANSIENT X''q QUAD. AXIS REACTANCE X''q QUAD. AXIS SUBTRANSIENT XL LEAKAGE REACTANCE X2 NEGATIVE SEQUENCE	1 BE 168 80 68 10.03 177 166 x 87 THF	ARING 35 kg 5 kg 4 kg 33 kgm <sup>2</sup> 75 kg 1.035 m <sup>3</sup> /sec 600 300 346 82 2.4 0.1 0.2 0.2 0.1	2 BEARING         1694 kg         805 kg         655 kg         9.7551 kgm²         1780 kg         166 x 87 x 124 (cm)         TIF<50				
BEARING NON-DRIVE END WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA kVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SUBTRANSIENT X"d DIR. AXIS REACTANCE X"q QUAD. AXIS REACTANCE X <sup>2</sup> QUAD. AXIS SUBTRANSIENT XL LEAKAGE REACTANCE X2 NEGATIVE SEQUENCE X0 ZERO SEQUENCE	1 BE 166 80 68 10.03 177 166 x 87 THI 	ARING 35 kg 5 kg 4 kg 13 kgm <sup>2</sup> 75 kg 1.035 m <sup>3</sup> /sec 600 300 346 82 2.4 0.1 0.0 0.1 0.2 0.1 0.1 0.0	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2202 cfm V V 5 4 1 9 5 3 4 6 7				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE PARALLEL STAR VOLTAGE SERIES DELTA kVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SUBTRANSIENT X"d DIR. AXIS SUBTRANSIENT X"q QUAD. AXIS REACTANCE X"q QUAD. AXIS SUBTRANSIENT XL LEAKAGE REACTANCE X2 NEGATIVE SEQUENCE X0 ZERO SEQUENCE REACTANCES ARE SATURAT	ED	ARING 35 kg 5 kg 4 kg 33 kgm <sup>3</sup> 75 kg 1.035 m <sup>3</sup> /sec 1.035 m <sup>3</sup> /sec 2.4 0.1 0.0 0.1 0.2 0.2 0.1 0.2 0.1 0.2 0.1 0.2 0.1 0.2 0.2 0.1 0.2 0.2 0.2 0.1 0.2 0.2 0.2 0.2 0.2 0.2 0.2 0.2	2 BEARING 1694 kg 805 kg 655 kg 9.7551 kgm <sup>2</sup> 1780 kg 166 x 87 x 124 (cm) TIF<50 2202 cfm V V V 5 4 1 1 9 5 5 4 4 1 6 7 T RATING AND VOLTAGE INDICATED				
WEIGHT COMP. GENERATOR WEIGHT WOUND STATOR WEIGHT WOUND STATOR WEIGHT WOUND ROTOR WR <sup>2</sup> INERTIA SHIPPING WEIGHTS in a crate PACKING CRATE SIZE TELEPHONE INTERFERENCE COOLING AIR VOLTAGE SERIES STAR VOLTAGE SERIES DELTA KVA BASE RATING FOR REACTANCE VALUES Xd DIR. AXIS SYNCHRONOUS X'd DIR. AXIS SUBTRANSIENT X"d DIR. AXIS SUBTRANSIENT X"q QUAD. AXIS REACTANCE X"q QUAD. AXIS SUBTRANSIENT XL LEAKAGE REACTANCE X2 NEGATIVE SEQUENCE X0 ZERO SEQUENCE REACTANCES ARE SATURAT T'd TRANSIENT TIME CONST.	ED	ARING 35 kg 5 kg 4 (g 33 kgm <sup>3</sup> 75 kg 1.035 m <sup>3</sup> /sec 1.035 m <sup>3</sup> /sec 22% 1.035 m <sup>3</sup> /sec 0.00 300 346 82 2.4 0.1 0.2 0.1 0.2 0.1 0.2 0.1 0.2 0.2 0.1 0.2 0.2 0.2 0.0 0.2 0.2	2 BEARING         1694 kg         805 kg         655 kg         9.7551 kgm²         1780 kg         166 x 87 x 124 (cm)         TIF<50				
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HCI534F/544F







HCI534F/544F Winding 17

## THREE PHASE EFFICIENCY CURVES







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

## STAMFORD

## HCI534F/544F

## Winding 17 / 0.8 Power Factor

## **60**Hz

### RATINGS









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## DSE7410/20 AUTO START & AUTO MAINS FAILURE MODULES



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 pickup/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 maior 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**

DSE2130 DSE2131 DSE2133 DSE2152 DSE2152 DSE2157 DSE2548	MODEM MOI		_ ■ ∲		] ,,		⊗ ∘		Ŕ	4	đ		i	
DSENET EXPANSION	RS232 AND RS485	USE	B USB RT HOST		URABLE	DC O	UTPUTS	AS	NALOGUE ENDERS	:	EMERGE STOP	NCY	DC POWER SUPPLY 8-35	v
		4	ETHERNET	Ę	`~ <b>↓</b>	t -c	<u>`</u> †		-+	-	44	2		
DSE7410	0/20 C€												DEUTZ ISUZU PERKINS CATERPILLAR MTU VOLVO CUMMINS SCANIA	
MAINS (UTILITY) SEN BUS SENSING (DSE	ISING (DSE7420) 7410)	N/C VOLT OUTPUT	FREE N/O V FREE	olt Dutput	GENERA	TOR SEM	ISING		CHARGE ALTERN	E ATOR	FUEL & C OUTPUTS FLEXIBLE WI	CRANK S ITH CAN	ELECTRONIC ENGINES & MAGNETIC PICI	K-UP
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ISSUE 1





## DSE7410/20 **AUTO START & AUTO MAINS FAILURE MODULES**

DSE7420

2

MARY MAN PLACE



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**

T

- RS232, RS485 & Ethernet can be used at the same time
- DSENet<sup>®</sup> 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

PART NO'S

053-085 053-088

057-162

057-161

057-160

- Data logging & trending
- 8 mm 0.3" STORAGE TEMPERATURE RANGE -40 °C to +85 °C

**RELATED MATERIALS** TITLE DSE7410 Installation Instructions SE7420 Installation Instructions DSE74xx Quick Start Guide DSE74xx Operator Manual DSE74xx PC Configuration Suite Manual

#### DEEP SEA ELECTRONICS PLC UK

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Deep Sea Electronics Plc maintains a policy of continuous development and reserves the right to change the details shown on this data sheet without prior notice. The contents are intended for guidance only.

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## SPECIFICATION

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

Part Number: PDG43G0800B2NJNNNNN



PRODUCT VIEW (Use Mouse to Rotate and Zoom)

Eaton's Power Defense<sup>™</sup> 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	PDG43G0800B2NJNNNNN
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: PDG43G0800B2NJNNNNN



**Technical drawings** 





## **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 ln
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 Ibs	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

Part Number: PDG53K1200E3RNNNNNN



PRODUCT VIEW (Use Mouse to Rotate and Zoom)

Eaton's Power Defense<sup>™</sup> 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	PDG53K1200E3RNNNNNN
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: PDG53K1200E3RNNNNNN



Datasheet creation date: 19/08/2019

## **Technical drawings**







## **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 ln
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 Ibs	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



PRODUCT VIEW (Use Mouse to Rotate and Zoom)

Eaton's Power Defense<sup>™</sup> 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	PDG63M2000E3RNNNNNN
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



Datasheet creation date: 02/12/2019

## **Technical drawings**





## **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 Ibs	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



PRODUCT VIEW (Use Mouse to Rotate and Zoom)

Eaton's Power Defense<sup>™</sup> 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	PDG63M2500E3RNNNNNN
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



Datasheet creation date: 02/12/2019

## **Technical drawings**





## **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 Ibs	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)		Н	[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)	[M]	600	
	DC	[M]	—	
	DC	[V]		

4

## NRG Intelligent Engine Start Battery Charger



## The Smart Choice for Mission-Critical Engine Starting

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





## **NRG Battery Charger Benefits and Features**



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

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

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

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

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

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

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

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

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

## **NRG Specifications**

AC Input Voltage Input current

Frequency Input protection

#### **Charger Output**

Nominal voltage ratings Optional voltage rating Battery settings

Regulation Current Electronic current limit Charge characteristic Temperature compensation Output protection 110-120/208-240 VAC,  $\pm$ 10%, single phase, field selectable 10A charger: 6.6/3.3 amps maximum 20A charger: 12.6/6.3 amps maximum 60 Hz  $\pm$ 5% standard; 50/60 Hz  $\pm$ 5% optional 1-pole fuse, soft-start, transient suppression

12 or 24 volt nominal
12/24 volt, field selectable
Six discrete battery voltage programs
Low or high S.G. flooded
Low or high S.G. VRLA
Nickel cadmium 9, 10, 18, 19 or 20 cells
±0.5% (1/2%) line and load regulation
10 or 20 amps nominal
105% rated output typical – no crank disconnect required
Constant voltage, current limited, 4-rate automatic equalization
Enable or disable anytime, remote sensor optional
Current limit, 1-pole fuse, transient suppression



#### User Interface, Indication and Alarms Digital meter Automo

Automatic meter alternately displays output volts, amps<sup>1</sup>

Accuracy Alarms



Front panel status display

 $\pm 2\%$  volts,  $\pm 5\%$  amps

LED and Form C contact(s) per table:

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

Alarm System Functions

1. Three-position jumper allows user to select from three display settings:

- alternating volts / amps (normal), constant volts, or constant amps
- 2. Contacts rated 2A @ 30 VDC resistive
- 3. Battery fault alarm indicates these fault conditions:

- Battery disconnected - Battery polarity reversed - Mismatched charger battery voltage - Open or high resistance charger to battery connection

- Open battery cell or excessive internal resistance

#### Controls

NEMA 3R housing

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

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



Simple field adjustments

Environmental Operating temperature Over temperature protection Humidity Vibration (10A unit) Transient immunity Seismic Certification	-20C to +60C, meets full specification to +45C Gradual current reduction to maintain safe power device temperature 5% to 95%, non-condensing UL 991 Class B (2G sinusoidal) ANSI/IEEE C62.41, Cat. B, EN50082-2 heavy industrial, EN 61000-6-2 IBC 2000, 2003, 2006, 2009 Maximum S <sub>ds</sub> of 2.28 g, Optional OSHPD pre-approval
Agency Standards Safety Agency marking EMC NFPA standards Optional agency compliance	C-UL listed to UL 1236 (required for UL 2200 gensets), UL Category BBGQ, CSA standard 22.2 no. 107.2-M89 CE: 50/60 Hz units DOC to EN 60335 60 Hz: C-UL-US listed 50/60 Hz: C-UL-US listed plus CE marked Emissions: FCC Part 15, Class B; EN 50081-2 Immunity: EN 61000-6-2 NFPA 70, NFPA 110. (NFPA 110 requires Alarms "C") OSHPD pre-approval
Construction Housing/configuration Dimensions Printed circuit card Cooling Protection degree Damage prevention Electrical connections	Material: Non-corroding aluminum. C-UL listed enclosure. See Drawings and Dimensions page for details Surface mount technology, conformal coated Natural convection Listed housing: NEMA-1 (IP20). Optional IP21 drip shield. Optional NEMA 3R enclosure Fully recessed display and controls Compression terminal blocks
Warranty Standard warranty Optional warranty	Three year parts and labor warranty (10 years magnetics and power semiconductors) from date of shipment If specified at time of order, warranty coverage for the standard warranty period can be upgraded to reimburse customer's documented field service costs up to the original charger price. Alternatively, standard parts and labor warranty coverage can be increased to 5 or 10 years. Contact the factory for full details
Optional features Input Remote temp comp sensor Drip shield meets s/b (IP21)	Input frequency, 50/60 Hz Recommended where battery and charger are in different locations Protects from dripping water

Enables outdoor installation (remote temp sensor recommended)

## **Drawings and Dimensions**



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

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

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



## The Smart Choice for Mission-Critical Engine Starting

#### **Additional Information**

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



#### **Contact Information**

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







