



# GILLETTE GENERATORS

LIQUID COOLED NAT. GAS ENGINE GENERATOR SET

60 HZ MODEL

**SP-2650**

Model	STANDBY 130°C RISE		
	HZ	LPG	N.G.
<b>SP-2650-60 HERTZ</b>	60	170	265



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



**UL2200, UL1446, UL508, UL142, UL498**



**NFPA 110, 99, 70, 37**

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



**NEC 700, 701, 702, 708**



**NEMA ICS10, MG1, ICS6, AB1**



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

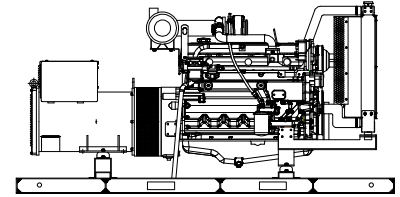


**ASCE 7-05 & 7-10**

All generator sets meet 180 MPH rating.

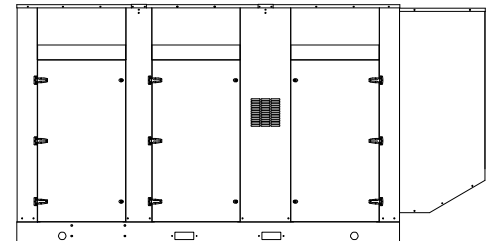


**EPA 40CFR Part 60, 1048, 1054, 1065, 1068**



“OPEN” GEN-SET

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



“LEVEL 2” HOUSED GEN-SET

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

## GENERATOR RATINGS

GENERATOR MODEL	VOLTAGE		PH	HZ	LIQUID PROPANE GAS FUEL		NATURAL GAS FUEL	
	L-N	L-L			130°C RISE STANDBY RATING		130°C RISE STANDBY RATING	
					KW/KVA	AMP	KW/KVA	AMP
<b>SP-2650-3-2</b>	120	208	3	60	170/212	590	265/331	921
<b>SP-2650-3-3</b>	120	240	3	60	170/212	512	265/331	798
<b>SP-2650-3-4</b>	277	480	3	60	170/212	256	265/331	399
<b>SP-2650-3-5</b>	127	220	3	60	170/212	558	265/331	870
<b>SP-2650-3-16</b>	346	600	3	60	170/212	205	265/331	319

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-2650-60 HZ

## GENERATOR SPECIFICATIONS

Manufacturer..... Marathon Electric Generators  
 Model & Type..... 432CSL6210, 4 Pole, 12 Lead, Three Phase  
 ..... 432PSL6246, 4 Pole, 4 Lead, 600V, Three Phase  
 Exciter..... Brushless, shunt excited  
 Voltage Regulator..... Solid State, HZ/Volts  
 Voltage Regulation..... ½%, No load to full load  
 Frequency..... Field convertible, 60 HZ to 50 HZ  
 Frequency Regulation..... ½% (½ cycle, no load to full load)  
 Unbalanced Load Capability..... 100% of standby amps  
 Total Stator and Load Insulation..... Class H, 180°C  
 Temperature Rise..... 130°C R/R, standby rating @ 40°C amb.  
 3 Ø Motor Starting @ 30% Voltage Dip (208-240V)..... 600 kVA  
 3 Ø Motor Starting @ 30% Voltage Dip (480V-600V) .. 800 kVA  
 Bearing..... 1, Pre-lubed and sealed  
 Coupling..... Direct flexible disc  
 Total Harmonic Distortion..... Max 3½% (MIL-STD705B)  
 Telephone Interference Factor..... Max 50 (NEMA MG1-22)  
 Deviation Factor..... Max 5% (MIL-STD 405B)  
 Ltd. Warranty Period..... 24 Months from date of start-up or  
 ..... 1000 hours use, first to occur.

## GENERATOR FEATURES

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

## ENGINE SPECIFICATIONS AND APPLICATIONS DATA

### ENGINE

Manufacturer..... Power Solutions Inc. (PSI)  
 Model and Type..... Heavy Duty, 14.6LTCAC, 4 cycle  
 Aspiration..... Turbocharged & Charge Air Cooled  
 Cylinder Arrangement..... 8 Cylinders, Vee  
 Displacement Cu. In. (Liters)..... 892 (14.6)  
 Bore & Stroke In. (Cm.)..... 5.04 x 5.59 (12.8 x 14.2)  
 Compression Ratio..... 10.5:1  
 Main Bearings & Style..... 10, Precision Half-Shell  
 Cylinder Head..... Cast Iron  
 Pistons..... Cast Aluminum  
 Crankshaft..... Forged Steel  
 Exhaust Valve..... Inconel, A193  
 Governor..... Electronic  
 Frequency Reg. (no load-full load)..... Isochronous  
 Frequency Reg. (steady state)..... ± 1/4%  
 Air Cleaner..... Dry, Replaceable Cartridge  
 Engine Speed..... 1800  
 Piston Speed, ft/min (m./min)..... 1677 (511)  
 Max Power, bhp (kwm) Standby/LPG..... 253 (189)  
 Max Power, bhp (kwm) Standby/NG..... 402 (300)  
 Ltd. Warranty Period..... 12 Months or 2000 hrs., first to occur

### FUEL SYSTEM

Type..... LPG or NAT. GAS, Vapor Withdrawal  
 Fuel Pressure (kpa), in. H<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..... (2) 2" NPTF

### FUEL CONSUMPTION

LP GAS: FT <sup>3</sup> /HR (M <sup>3</sup> /HR)	STANDBY
100% LOAD	926 (26.2)
75% LOAD	789 (22.4)
50% LOAD	532 (15.1)
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	2782 (78.7)
75% LOAD	2168 (61.4)
50% LOAD	1522 (43.1)
NG = 1000 BTU X FT <sup>3</sup> /HR = Total BTU/HR	

### OIL SYSTEM

Type..... Full Pressure  
 Oil Pan Capacity qt. (L)..... 42.3 (40.0)  
 Oil Pan Cap. W/ filter qt. (L)..... 49.7 (47.1)  
 Oil Filter..... 2, Replaceable Spin-On

### ELECTRICAL SYSTEM

Ignition System..... Electronic  
 Eng. Alternator/Starter: 24 VDC, negative ground, 45 amp/hr.  
 Recommended battery to -18°C (0° F): ....(2) 12 VDC, BCI# 31,  
 Max. Dimensions: 14"lg x 6 3/4" wi x 10" hi, with standard  
 round posts. Min output 1000 CCA. Battery tray (max. dim. at  
 15"lg x 7"wi). This model has (2) battery trays, (2) hold down  
 straps, (2) sets of battery cables, and (1) battery charger.  
 Installation of (2) 12VDC starting batteries connected in series  
 for 24VDC output is required, with possible higher AMP/HR  
 rating, as described above, if the normal environment  
 temperature averages -13° F (-25°C) or cooler.

# APPLICATION AND ENGINEERING DATA FOR MODEL SP-2650-60 HZ

## COOLING SYSTEM

Type of System ..... Pressurized, closed recovery  
 Coolant Pump .....Pre-lubricated, self-sealing  
 Cooling Fan Type (no. of blades) ..... Pusher (12)  
 Fan Diameter inches (mm)..... 45" (1143)  
 Ambient Capacity of Radiator °F (°C)..... 125 (51.6)  
 Engine Jacket Coolant Capacity Gal (L).....9.5 (43.2)  
 Radiator Coolant Capacity Gal. (L) .....50.0 (227.3)  
 Maximum Restriction of Cooling Air Intake  
 and discharge side of radiator in. H<sub>2</sub>O (kpa)..... 0.5 (.125)  
 Water Pump Capacity gpm (L/min)..... 180 (680)  
 Heat Reject Coolant: Btu/min (kw) ..... 16,189 (284)  
 Low Radiator Coolant Level Shutdown.....Standard  
 Note: Coolant temp. shut-down switch setting at 230°F (110°C) with 50/50  
 (water/antifreeze) mix.

## AIR REQUIREMENTS

Combustion Air, cfm (kg/hr) .....532 (1064)  
 Radiator Air Flow cfm (m<sup>3</sup>/min).....30,000 (849)  
 Heat Rejected to Ambient:  
     Engine: kw (btu/min).....66.0 (3765)  
     Alternator: kw (btu/min).....23 (1309)

## EXHAUST SYSTEM

Exhaust Outlet Size..... (2) 4"  
 Max. Back Pressure, in. hg (KPA).....3.0 (10.2)  
 Exhaust Flow, at rated kw: cfm (m<sup>3</sup>/min) .....2521 (71.3)  
 Exhaust Temp., at rated kw: °F (°C) .....1382 (750)  
 Engines are EPA certified for Natural Gas.

## SOUND LEVELS MEASURED IN dB(A)

	<u>Open Set</u>	<u>Level 2 Encl.</u>
Level 2, Critical Silencer .....	93.....	80
Level 3, Hospital Silencer.....		75

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 104F (40°C)

## DIMENSIONS AND WEIGHTS

	<u>Open Set</u>	<u>Level 2 Enclosure</u>
Length in (cm).....	152 (368) .....	186 (473)
Width in (cm).....	72 (183) .....	72 (183)
Height in (cm).....	80 (203) .....	94 (239)
3 Ø Net Weight lbs (kg).....	8175 (3708) ...	10675 (4842)
3 Ø Net Weight lbs (kg).....	8525 (3867) ...	11025 (5001)

# DEEP SEA 7420 DIGITAL MICROPROCESSOR CONTROLLER



### Deep Sea 7420

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

The “7420” controller will also monitor speed, frequency, voltage, current, oil pressure, coolant temp., and fuel levels. These modules have been designed to display warning and shut down status. It also includes: (11) configurable inputs • (8) configurable outputs • voltage monitoring • mains (utility) failure detection • (250) event logs • configurable timers • automatic shutdown or warning during fault detection • remote start (on load) • engine preheat • advanced metering capability • hour meter • text LCD displays • protected solid state outputs • test buttons for: stop/reset • manual mode • auto mode • lamp test • start button • power monitoring (kWh, kVAr, kVAh, kVArh)

This controller includes expansion features including RS232, RS484 (using MODBUS-RTU/TCP), direct USB connection with PC, expansion optioned using DSENet for remote annunciation and remote relay interfacing for a distance of up to 3300FT. The controller software is freely downloadable from the internet and allows monitoring with direct USB cable, LAN, or by internet via the built in web interface.



Further expansion is available by adding the optional “WebNet” gateway interface module. This device will allow comprehensive monitoring of the generator via the cloud including identification, location, and status. Some advantages of this module include: reduced site visits and maintenance costs • remote fuel management • fault analysis • asset tracking • automatic system alerts • maximized system up-time.

# STANDARD FEATURES FOR MODEL SP-2650-60 HZ

## STANDARD FEATURES

### CONTROL PANEL:

- Deep Sea 7420 digital microprocessor with logic allows programming in the field. Controller has:
- STOP-MANUAL-AUTO modes and automatic engine shutdowns, signaled by full text LCD indicators:
  - Low oil pressure
  - High engine temp
  - Low Radiator Level
  - Three auxiliary alarms
  - Battery fail alarm
  - Engine fail to start
  - Engine over speed
  - Engine under speed
  - Over & under voltage
- Also included is tamper-proof engine hour meter

### ENGINE:

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

### AC GENERATOR SYSTEM:

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

### VOLTAGE REGULATOR:

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

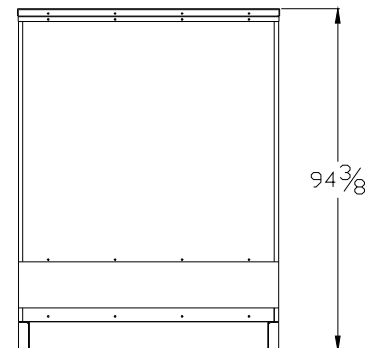
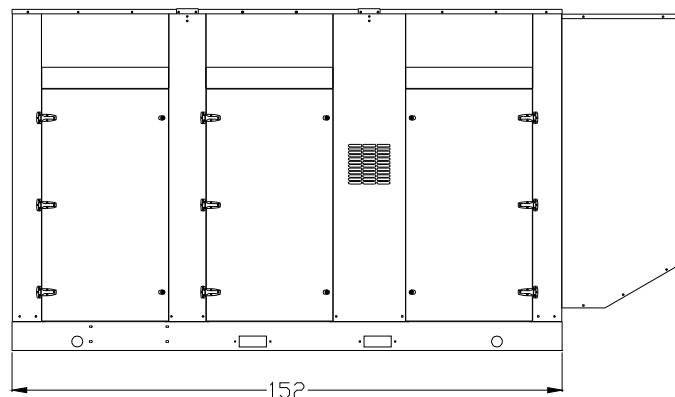
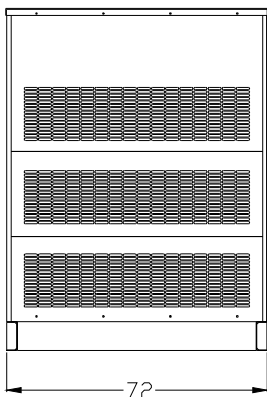
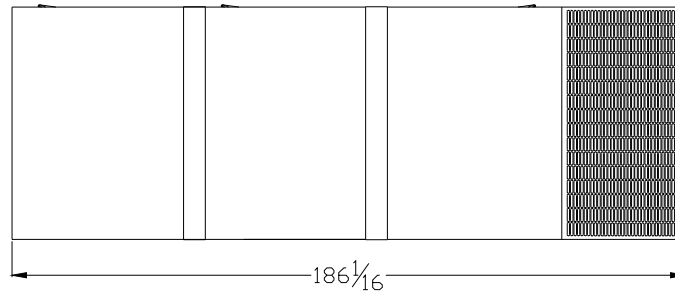
### DC ELECTRICAL SYSTEM:

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

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

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

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







# HEAVY-DUTY

# 14.6L ENGINE

## INDUSTRIAL STATIONARY

## Product Overview

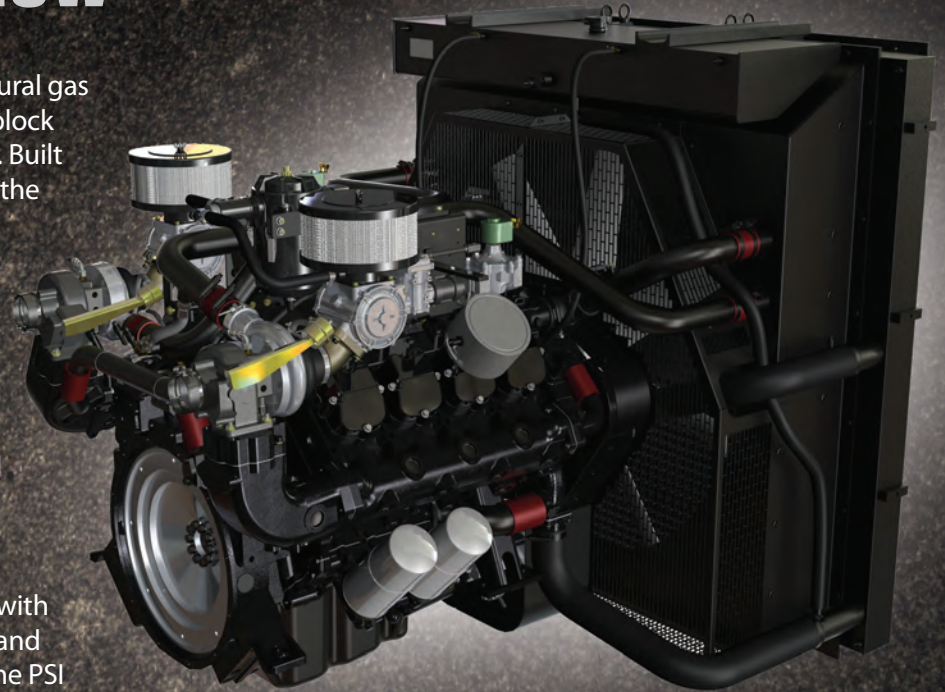
The PSI HD 14.6L is a U.S. EPA-certified natural gas and propane engine developed from the block up to be a reliable and durable power unit. Built upon a proven marine-diesel grade block, the 6-cylinder in-line, turbocharged and after-cooled engine features replaceable wet liners and water-cooled exhaust.

Superior engine performance is provided by an ECU that integrates and coordinates all critical functions including: Governor, Variable Ignition Timing, Air Fuel Ratio Control, Knock Suppression and Engine Protection.

The PSI HD product lineup has six models with displacements of 8.1L, 11.1L, 14.6L, 18.3L and 21.9L. These engines are an extension of the PSI product line, which is based upon blocks from 650cc to 8.8L. All PSI engines feature the same fuel systems and controls, simplifying your application development and support.

### FEATURES

- U.S. EPA-Certified and CARB-Compliant
- Dual Fuel with Automatic Change-Over
- 50C Ambient Cooling Capacity
- 3-Way Catalytic Converter
- Air Filtration
- UL2200-Compliant or Listed Components
- MasterTrak Telematics service (included for 1 year)



**MAXIMUM  
PERFORMANCE  
NO COMPROMISES**

**POWER & PERFORMANCE • EMISSION-CERTIFIED • FUEL-FLEXIBLE**



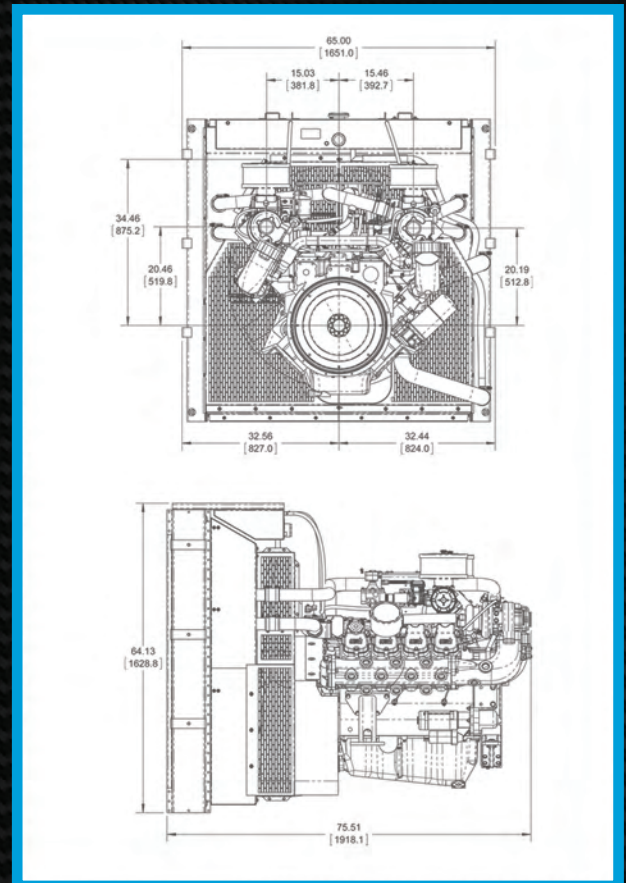


## 14.6 L Industrial Stationary Engine

Displacement	892 cid	14,620 cc
Compression Ratio	10.5:1	
Bore & Stroke	5.04 in x 5.59 in	128 mm x 142 mm
kWe	300@1,800 rpm (Natural Gas)	225@1,500 rpm (Natural Gas)
Emission-Certified	EPA, CARB – Industrial Stationary	
Fuel Types	Natural Gas / Propane	

### GENERAL DATA

- Water-cooled, turbo-charged, air-to-air inter-cooled, stoichiometric, replaceable wet cylinder liners
- Cast iron block & heads, 10.5:1 compression ratio, overhead valve/2V configuration
- Crankshaft gear-driven oil system with cartridge-type filter, belt-driven centrifugal water pump
- Full ECU engine control including: coil-on-plug variable timing ignition, electronic governor and fuel-air ratio control
- Engine protection for oil pressure, coolant level, coolant temperature, fuel pressure, over-speed
- Complete fuel system for single fuel (NG/LP) operation with closed-loop control
- Alternator (45A/24VDC)
- Starter (24VDC)
- CANBUS J1939 interface



Power shown is gross engine power and has been corrected to SAE J1995. Actual installed power levels may vary depending on the application and OEM supplied components.



**MARATHON ELECTRIC  
SYNCHRONOUS AC GENERATOR  
TYPICAL DYNAMIC CHARACTERISTICS**

Basic Model: **432CSL6210/432PSL6210**

Date: **6/15/17**

kW (kVA)	1800 RPM			60 Hertz			12 Leads		
	3 Phase			0.8 Power Factor			Dripproof or Open Enclosure		
	Class B	Class F			Class H				
Voltage*	80° C ① Continuous	90° C ① Lloyds	95° C ① ABS	105° C ② British Standard	105° C ① Continuous	130° C ① Standby	125° C ② British Standard	125° C ① Continuous	150° C ① Standby
<b>240/480</b>	220 (275)	237 (296)	245 (306)	260 (325)	260 (325)	280 (350)	265 (331)	275 (344)	291 (364)
<b>230/460</b>	220 (275)	237 (296)	245 (306)	260 (325)	260 (325)	282 (353)	265 (331)	277 (346)	292 (365)
<b>220/440</b>	221 (276)	240 (300)	247 (309)	261 (326)	261 (326)	283 (354)	265 (331)	278 (348)	292 (365)
<b>208/416</b>	220 (275)	236 (295)	245 (306)	260 (325)	260 (325)	280 (350)	261 (326)	275 (344)	287 (359)
<b>190/380</b>	213 (266)	230 (288)	233 (291)	245 (306)	245 (306)	265 (331)	250 (313)	260 (325)	275 (344)

① Rise by resistance method, Mil-Std-705, Method 680.1b.

② Rating per BS 5000.

Submittal Data: 240/480 Volts*, 350 kVA, 1800 RPM, 60 Hz, 3 Phase					
Mil-Std-705B			Mil-Std-705B		
Method	Description	Value	Method	Description	Value
301.1b	Insulation Resistance	> 1.5 Meg	505.3b	Overspeed	2250 RPM
302.1a	High Potential Test		507.1c	Phase Sequence CCW-ODE	ABC
	Main Stator	2000 Volts	508.1c	Voltage Balance, L-L or L-N	0.2%
	Main Rotor	1500 Volts	601.4a	L-L Harmonic Maximum - Total (Distortion Factor)	5.0%
	Exciter Stator	1500 Volts	601.4a	L-L Harmonic Maximum - Single	3.0%
	Exciter Rotor	1500 Volts	601.1c	Deviation Factor	5.0%
	PMG Stator	1500 Volts**	---	TIF (1960 Weightings)	<50
401.1a	Stator Resistance, Line to Line		652.1a	Shaft Current	< 0.1 ma
	High Wye Connection	0.0214 Ohms	652.1a	Main Stator Capacitance to Ground	0.019 mfd
	Rotor Resistance	0.841 Ohms			
	Exciter Stator	18.5 Ohms			
	Exciter Rotor	0.116 Ohms			
	PMG Stator	2.1 Ohms**			
410.1a	No Load Exciter Field Amps at 480 Volts Line to Line	0.72 A DC			
420.1a	Short Circuit Ratio	0.508			
421.1a	Xd Synchronous Reactance	2.617 pu			
422.1a	X2 Negative Sequence Reactance	0.187 pu			
423.1a	X0 Zero Sequence Reactance	0.091 pu			
425.1a	X'd Transient Reactance	0.128 pu			
426.1a	X"d Subtransient Reactance	0.104 pu			
--	Xq Quadrature Synchronous Reactance	1.241 pu			
427.1a	T'd Transient Short Circuit Time Constant	0.065 sec.			
428.1a	T"d Subtransient Short Circuit Time Constant	0.013 sec.			
430.1a	T'do Transient Open Circuit Time Constant	1.79 sec.			
432.1a	Ta Short Circuit Time Constant of Armature Winding	0.017 sec.			

**Additional Prototype Mil-Std Methods  
are Available on Request.**

\* Voltage refers to wye (star) connection, unless otherwise specified.

\*\*Not supplied as standard equipment.

\*\*\*DVR®2000E+ voltage regulator supplied with PMG option. DVR®2000E+ voltage regulation 1/4%, 1 or 3 Phase sensing.

www.marathonelectric.com

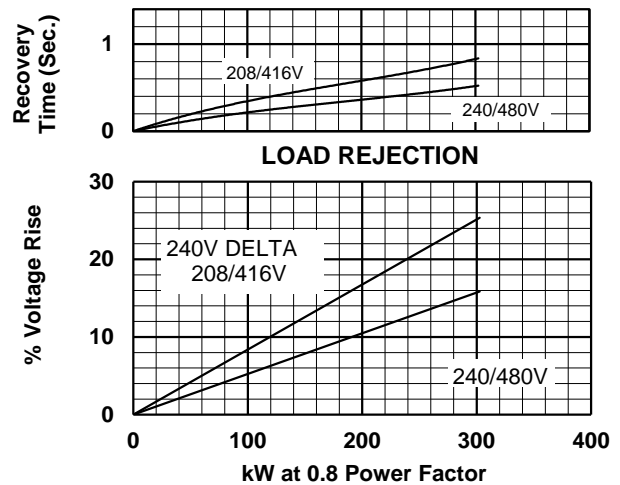
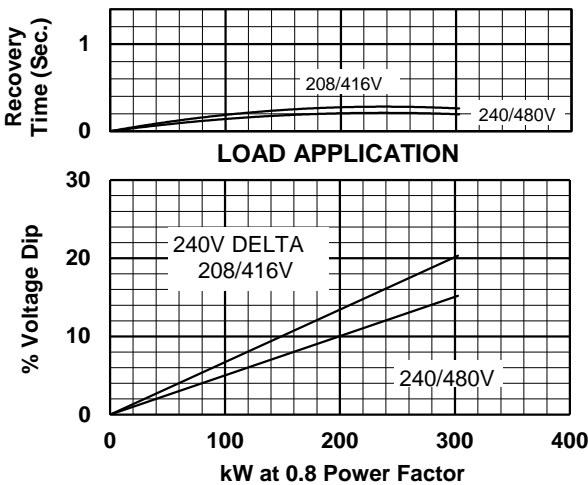


**MARATHON ELECTRIC  
SYNCHRONOUS AC GENERATOR  
TYPICAL DYNAMIC CHARACTERISTICS**

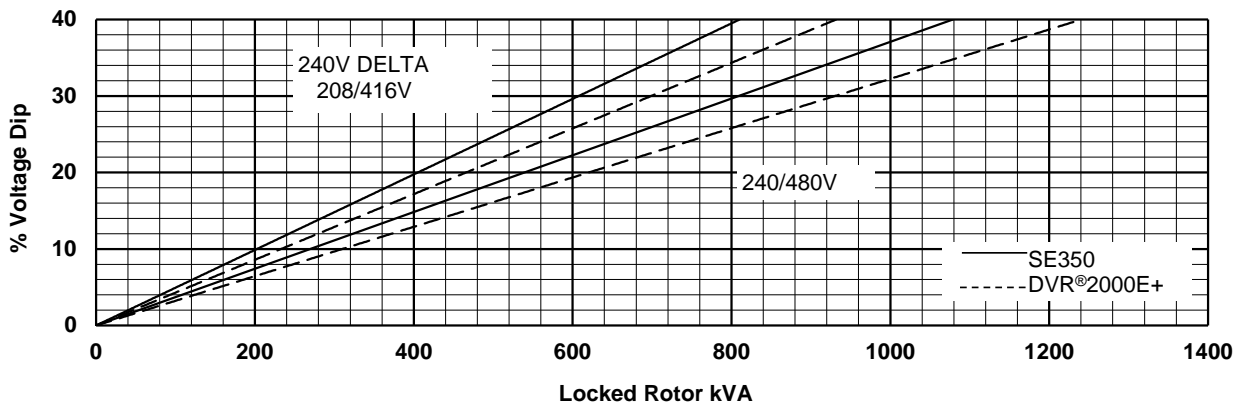
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Date: 6/27/17

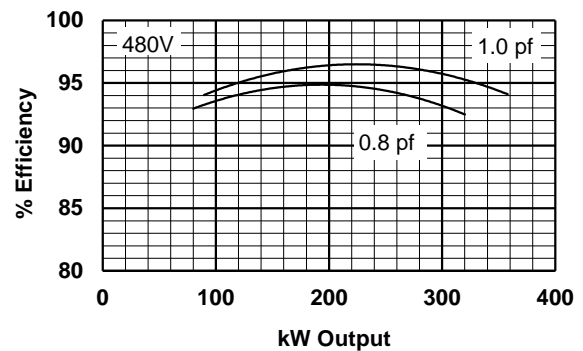
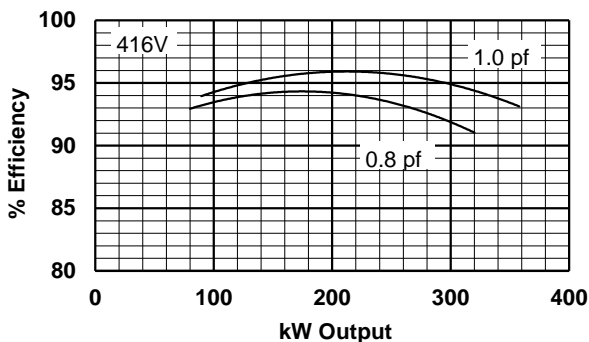
**60 HERTZ**



**TYPICAL MOTOR STARTING CHARACTERISTICS**



**TYPICAL GENERATOR EFFICIENCY**



Voltage refers to wye (star) connection, unless otherwise specified.





**MARATHON ELECTRIC  
SYNCHRONOUS AC GENERATOR  
TYPICAL DYNAMIC CHARACTERISTICS**

Base Model: 432PSL6246

Date: 1/19/2015

Kilowatt ratings at		1800 RPM		60 Hertz			12 Leads			
kW (kVA)		3 Phase			0.8 Power Factor			Dripproof or Open Enclosure		
Voltage*	Class B		Class F				Class H			
	80° C ①	90° C ①	95° C ①	105° C ②	105° C ①	130° C ①	125° C ②	125° C ①	150° C ①	
	Continuous	Lloyds	ABS	British Standard	Continuous	Standby	British Standard	Continuous	Standby	
<b>600</b>	230 (288)	250 (313)	260 (325)	275 (344)	275 (344)	300 (375)	282 (353)	300 (375)	310 (388)	

① Rise by resistance method, Mil-Std-705, Method 680.1b.

② Rating per BS 5000.

**Submittal Data: 600 Volts\*, 375 kVA, 1800 RPM, 60 Hz, 3 Phase**

Mil-Std-705B			Mil-Std-705B		
Method	Description	Value	Method	Description	Value
301.1b	Insulation Resistance	> 1.5 Meg	505.3b	Overspeed	2250 RPM
302.1a	High Potential Test		507.1c	Phase Sequence CCW-ODE	ABC
	Main Stator	2000 Volts	508.1c	Voltage Balance, L-L or L-N	0.2%
	Main Rotor	1500 Volts	601.4a	L-L Harmonic Maximum - Total	5.0%
	Exciter Stator	1500 Volts		(Distortion Factor)	
	Exciter Rotor	1500 Volts	601.4a	L-L Harmonic Maximum - Single	3.0%
	PMG Stator	1500 Volts**	601.1c	Deviation Factor	5.0%
401.1a	Stator Resistance, Line to Line		---	TIF (1960 Weightings)	<50
	High Wye Connection	0.023 Ohms	625.1c	Mechanical Strength (High Wye	
	Rotor Resistance	0.866 Ohms		Connection, Sustained 3 Phase	
	Exciter Stator	18.5 Ohms		Short Circuit Current) <sup>(3)</sup>	< 300%
	Exciter Rotor	0.116 Ohms	652.1a	Shaft Current	< 0.1 ma
	PMG Stator	2.1 Ohms**	652.1a	Main Stator Capacitance to	
410.1a	No Load Exciter Field Amps			Ground	0.021 mfd
	at 600 Volts Line to Line	0.65 A DC			
420.1a	Short Circuit Ratio	0.39			
421.1a	Xd Synchronous Reactance	2.836 pu			
422.1a	X2 Negative Sequence				
	Reactance	0.205 pu	--	Generator Frame	432
423.1a	X0 Zero Sequence Reactance	0.037 pu	--	Type	Ext. Voltage Regulated, Brushless
425.1a	X'd Transient Reactance	0.157 pu	--	Insulation	Class H
426.1a	X''d Subtransient Reactance	0.137 pu	--	Coupling - Single Bearing	Flexible
--	Xq Quadrature Synchronous		--	Amortisseur Windings	Full
	Reactance	1.434 sec.	--	Exciter	Rotating
427.1a	T'd Transient Short Circuit		--	Voltage Regulator	SE350***
	Time Constant	0.062 sec.	--	Voltage Regulation	1%***
428.1a	T''d Subtransient Short Circuit		--	Sensing	1 Phase***
	Time Constant	0.013 sec.			
430.1a	T'do Transient Open Circuit		--	Cooling Air Volume	1020 CFM
	Time Constant	1.84 sec.	--	Heat Rejection Rate	1165 BTU / min
432.1a	Ta Short Circuit Time		--	Full Load Current	361 AMPS
	Constant of Armature Winding	1.84 sec.	--	Minimum Input Hp Required	429.6 HP
			--	Efficiency at Rated Load	93.6 %
			--	Full Load Torque	1253 Lb-ft

**Additional Prototype Mil-Std Methods  
are Available on Request.**

<sup>(3)</sup> Excitation support system or PMG required to sustain short circuit currents.

\* Voltage refers to wye (star) connection, unless otherwise specified.

\*\*Not supplied as standard equipment.

\*\*\*DVR<sup>®</sup>2000E+ voltage regulator supplied with PMG option. DVR<sup>®</sup>2000E+ voltage regulation 1/4%, 1 or 3 Phase sensing.

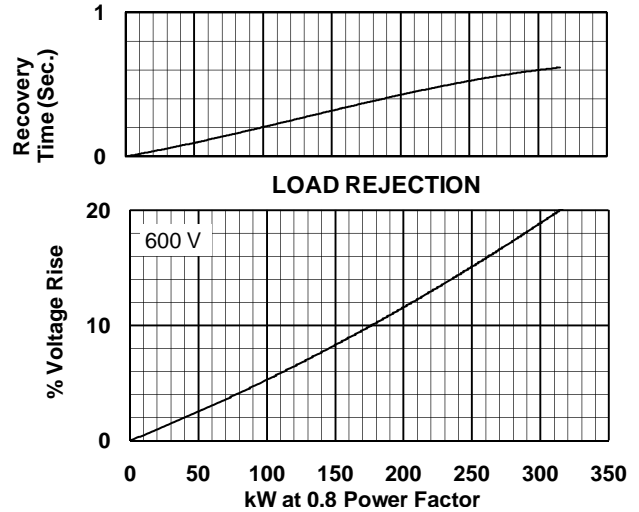
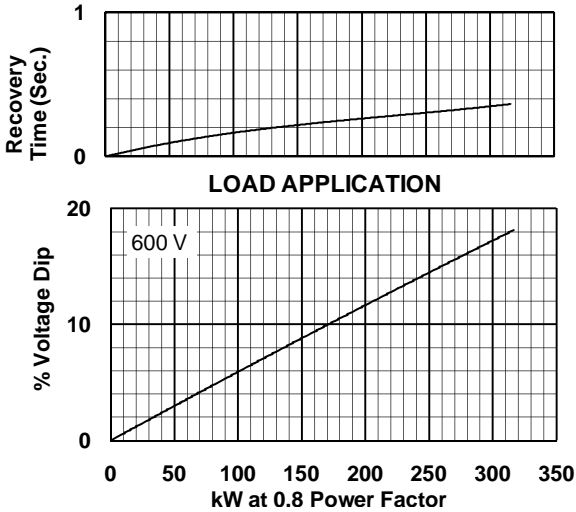


**MARATHON ELECTRIC  
SYNCHRONOUS AC GENERATOR  
TYPICAL DYNAMIC CHARACTERISTICS**

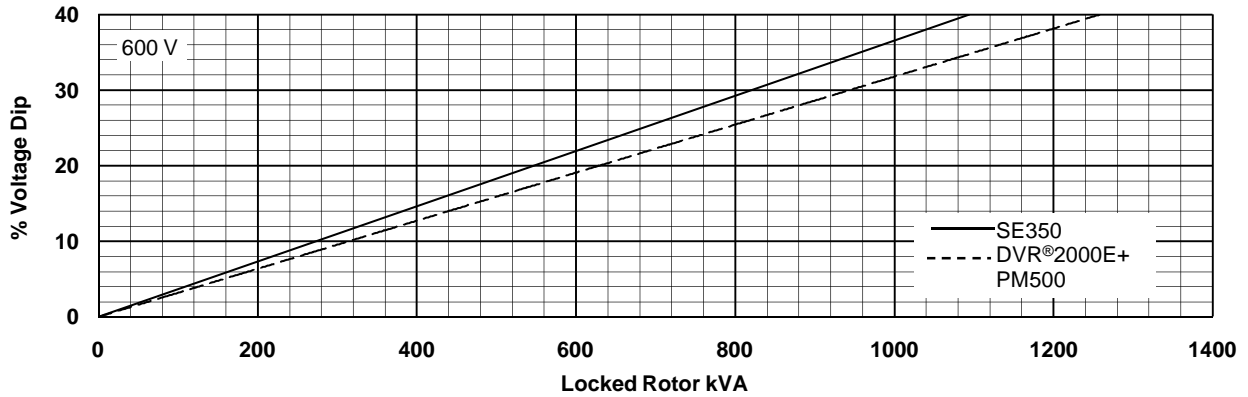
Base Model: 432PSL6246

Date: 1/19/2015

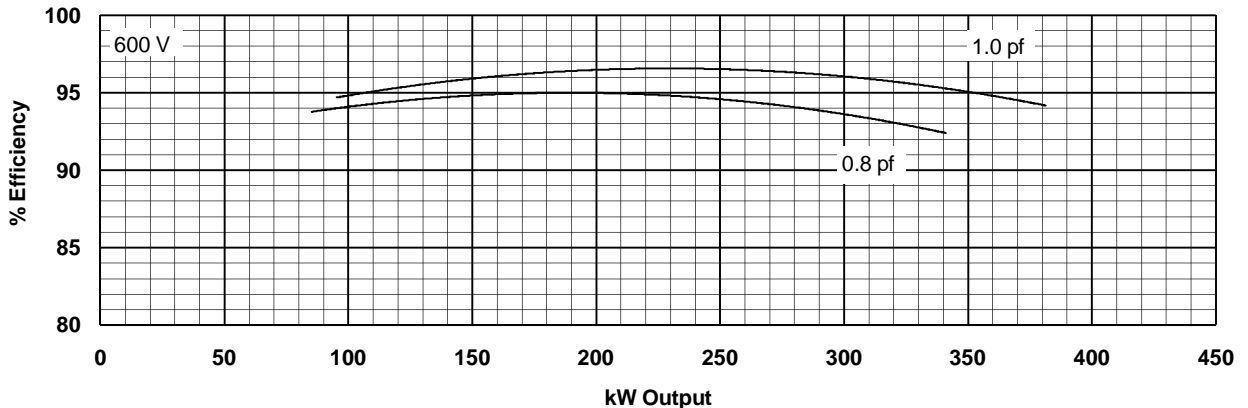
**60 HERTZ**



**TYPICAL MOTOR STARTING CHARACTERISTICS**



**TYPICAL GENERATOR EFFICIENCY**



Voltage refers to wye (star) connection, unless otherwise specified.

# DSE7410/20

## AUTO START & AUTO MAINS FAILURE MODULES

### FEATURES



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

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

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

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

### ENVIRONMENTAL TESTING STANDARDS

#### ELECTRO-MAGNETIC COMPATIBILITY

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

#### ELECTRICAL SAFETY

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

#### TEMPERATURE

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

#### VIBRATION

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

#### HUMIDITY

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

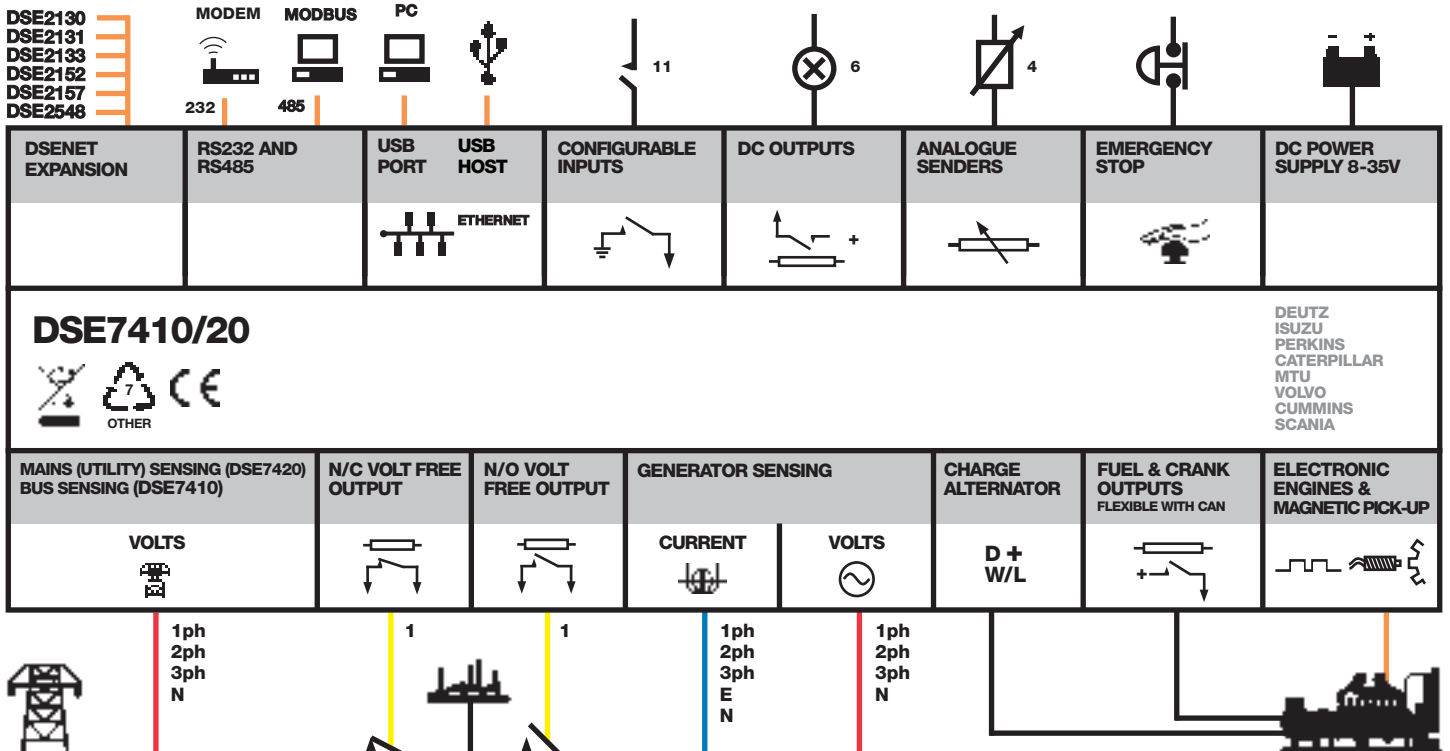
#### SHOCK

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

#### DEGREES OF PROTECTION PROVIDED BY ENCLOSURES

BS EN 60529  
IP65 - Front of module when installed into the control panel with the supplied sealing gasket.

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





# DSE7410/20

## AUTO START & AUTO MAINS FAILURE MODULES

### FEATURES



### DSE7420

### DSE7410



### KEY FEATURES

- Configurable inputs (11)
- Configurable outputs (8)
- Voltage measurement
- Mains (utility) failure detection
- Dedicated load test button
- kW overload alarms
- Comprehensive electrical protection
- RS232, RS485 & Ethernet remote communications
- Modbus RTU/TCP
- PLC functionality
- Multi event exercise timer
- Back-lit LCD 4-line text display
- Multiple display languages
- Automatic start/Manual start
- Audible alarm
- Fixed and flexible LED indicators
- Event log (250)
- Engine protection
- Fault condition notification to a designated PC
- Front panel mounting
- Protected front panel programming
- Configurable alarms and timers
- Configurable start and stop timers

- Five key menu navigation
- Front panel editing with PIN protection
- 3 configurable maintenance alarms
- CAN and magnetic pick-up/Alt. sensing
- Fuel usage monitor and low fuel alarms
- Charge alternator failure alarm
- Manual speed control (on compatible CAN engines)
- Manual fuel pump control
- "Protections disabled" feature
- Reverse power protection
- Power monitoring (kW h, kV Ar, kV A h, kV Ar h)
- Load switching (load shedding and dummy load outputs)
- Automatic load transfer (DSE7420)
- Unbalanced load protection
- Independent earth fault trip
- Fully configurable via DSE Configuration Suite PC software
- Configurable display languages
- Remote SCADA monitoring via DSE Configuration Suite PC software

- Advanced SMS messaging (additional external modem required)
- Start & stop capability via SMS messaging
- Additional display screens to help with modem diagnostics
- DSENet® expansion
- Integral PLC editor

### KEY BENEFITS

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

### RELATED MATERIALS

#### TITLE

DSE7410 Installation Instructions  
**DSE7420** Installation Instructions  
 DSE74xx Quick Start Guide  
 DSE74xx Operator Manual  
 DSE74xx PC Configuration Suite Manual

#### PART NO'S

053-085  
 053-088  
 057-162  
 057-161  
 057-160

### SPECIFICATION

#### DC SUPPLY

**CONTINUOUS VOLTAGE RATING**  
 8 V to 35 V Continuous

#### CRANKING DROPOUTS

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

#### MAXIMUM OPERATING CURRENT

260 mA at 12 V, 130 mA at 24 V

#### MAXIMUM STANDBY CURRENT

120 mA at 12 V, 65 mA at 24 V

#### CHARGE FAIL/EXCITATION RANGE

0 V to 35 V

#### OUTPUTS

##### OUTPUT A (FUEL)

15 A DC at supply voltage

##### OUTPUT B (START)

15 A DC at supply voltage

##### OUTPUTS C & D

8 A AC at 250 V AC (Volt free)

##### AUXILIARY OUTPUTS E,F,G,H,I & J

2 A DC at supply voltage

#### GENERATOR

##### VOLTAGE RANGE

15 V to 333 V AC (L-N)

##### FREQUENCY RANGE

3.5 Hz to 75 Hz

#### MAINS (UTILITY) (DSE7420)

##### VOLTAGE RANGE

15 V to 333 V AC (L-N)

##### FREQUENCY RANGE

3.5 Hz to 75 Hz

#### BUS (DSE7410)

##### VOLTAGE RANGE

15 V to 333 V AC (L-N)

##### FREQUENCY RANGE

3.5 Hz to 75 Hz

#### MAGNETIC PICK UP

##### VOLTAGE RANGE

+/- 0.5 V to 70 V

##### FREQUENCY RANGE

10,000 Hz (max)

#### DIMENSIONS

##### OVERALL

240 mm x 172 mm x 57 mm  
 9.4" x 6.8" x 2.2"

##### PANEL CUTOUT

220 mm x 160 mm  
 8.7" x 6.3"

##### MAXIMUM PANEL THICKNESS

8 mm  
 0.3"

##### STORAGE TEMPERATURE RANGE

-40 °C to +85 °C

### DEEP SEA ELECTRONICS PLC UK

Highfield House, Hunmanby Industrial Estate, Hunmanby YO14 0PH  
**TELEPHONE** +44 (0) 1723 890099 **FACSIMILE** +44 (0) 1723 893303  
**EMAIL** sales@deepseapl.com **WEBSITE** www.deepseapl.com

### DEEP SEA ELECTRONICS INC USA

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

# Tmax-Molded Case Circuit Breakers

T5 400A and 600A Frame

AC Circuit Breakers and Switches

DC Circuit Breakers and Switches (400A Only)

3 and 4 Pole

Motor Circuit Protectors

Higher Performances in Less Space

Field Installable Accessories and Trip Units



**Dimensions** 3P Fixed Version 8.07H x 5.51W x 4.07D

## Compliance with Standards

UL 489

CSA C22.2 No.5.1

IEC 60947-2

Standards

EC directive:

- "Low Voltage Directives" (LVD) no. 73/23 EEC

- "Electromagnetic Compatibility Directive" (EMC) no.89/336 EEC

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

## Interrupting ratings (RMS sym. kAmps)

T5

Continuous Current Rating

400-600A

Number of Poles

3-4

		N	S	H	L	V
AC						
240V		65	100	150	200	200
480V		25	35	65	100	150
600V		18	25	35	65	100
DC* ( 400 A only )						
500V	2 poles in series	25	35	50	65	100
600V	3 poles in series	16	25	35	50	65

\*Thermo Magnetic Trip Only



## Company Quality Systems and Environmental Systems

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

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

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

### Mounting

Fixed  
Plug-in  
Drawout

### Connections

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

### Trip Unit

TMA thermo magnetic trip units, with adjustable thermal threshold ( $I_1 = 0.7 \dots 1 \times I_n$ ) and adjustable magnetic threshold ( $I_3 = 5 \dots 10 \times I_n$ ).

PR221DS, PR222DS/P and PR222DS/PD-A electronic trip unit

<b>Weight (lbs)</b>	8.55
---------------------	------

### Auxiliary Devices for Indication and Control

- Auxiliary contacts - AUX
- Undervoltage release - UVR
- Shunt trip - SOR
- Terminal covers
- Front for lever operating mechanism - FLD
- Direct rotary handle - RHD
- Stored energy motor operator - MOE
- Key lock - KLF
- Early auxiliary contact - AUE
- Transmitted rotary handle - RHE
- Front terminal for copper cable - FC Cu
- Front extended terminal - EF
- Front terminal for copper-aluminum - FC CuAl
- Front extended spread terminal - ES
- Distribution lugs
- Rear orientated terminal - R
- Phase separators
- Residual current release (IEC Only)



#### ABB Inc.

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



# Tmax-Molded Case Circuit Breakers

T6 800A Frame

**AC Circuit Breakers and Switches**

**DC Circuit Breakers and Switches**

**3 and 4 Pole**

**Motor Circuit Protectors**

**Higher Performances in Less Space**

**Field Installable Accessories and Trip Units**



**Dimensions** 3P Fixed Version 10.55H x 8.26W x 4.07D

**Weight** 20.9 (lbs)

## Compliance with Standards

UL 489

CSA C22.2 No.5.1

IEC 60947-2

Standards

EC directive:

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

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

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

## Interrupting ratings (RMS sym. kAmps)

		T6			
Continuous Current Rating		800			
Number of Poles		3-4			
		N	S	H	L
AC					
240V		65	100	200	200
480V		35	50	65	100
600V		20	25	35	42
DC*					
500V	2 poles in series	35	35	50	65
600V	3 poles in series	20	20	35	50

\*Thermal Magnetic Trip Only



## Company Quality Systems and Environmental Systems

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

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### Mounting

Fixed  
Drawout

### Connections

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

### Trip Unit

TMA thermal magnetic trip units, with adjustable thermal threshold ( $I_1 = 0.7 \dots 1 \times I_n$ ) and adjustable magnetic threshold ( $I_3 = 5 \dots 10 \times I_n$ ).

PR221DS, PR222DS/P, and PR222DS/PD-A electronic trip unit

## Auxiliary Devices for Indication and Control

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



### ABB Inc.

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

# Tmax-Molded Case Circuit Breakers

T7 1200A Frame

## AC Circuit Breakers and Switches

3 and 4 Pole

Motor Circuit Protectors

Higher Performances in Less Space

Field Installable Accessories and Trip Units



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

**Weight** 21.4 (lbs)

## Compliance with Standards

UL 489

CSA C22.2 No.5.1

IEC 60947-2

Standards

EC directive:

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

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

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

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





## Company Quality Systems and Environmental Systems

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### Mounting

Fixed  
Drawout

### Connections

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

### Trip Unit

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

## Auxiliary Devices for Indication and Control

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



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# Digital Linear Chargers

## Specifications

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



### DIGITAL LINEAR ON-BOARD CHARGERS

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

# Digital Linear Chargers

## Specifications (cont.)

- New 4-color package design

minnkotamotors.com

**MINN-KOTA**

**ON-BOARD MARINE BATTERY CHARGER**

DIGITALLY CONTROLLED 2X FASTER CHARGING PROTECTS BATTERIES

**Digital CONTROL**

**MK210D**

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

UL LISTED FC 10 AMPS

## CHARGING TECHNOLOGY

CHARGING TECHNOLOGY

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

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

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

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

**Digital CONTROL**

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

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

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

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

**MULTI-STAGE CHARGING**

AMPS & VOLTS

BULK ABSORPTION MAINTENANCE

TIME (THREE STAGE CHARGER)

■ VOLTS  
■ AMPS

**BATTERY CHARGER TEMPERATURE COMPENSATION**

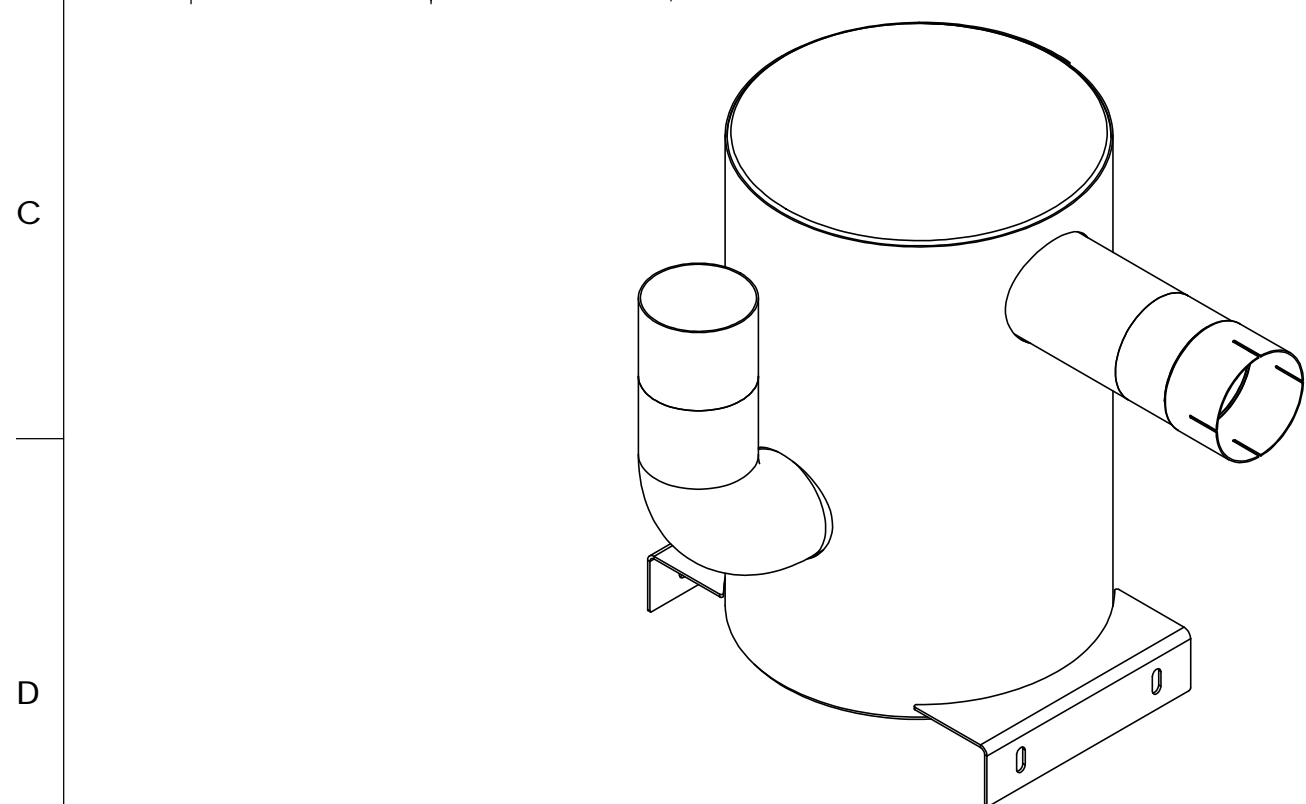
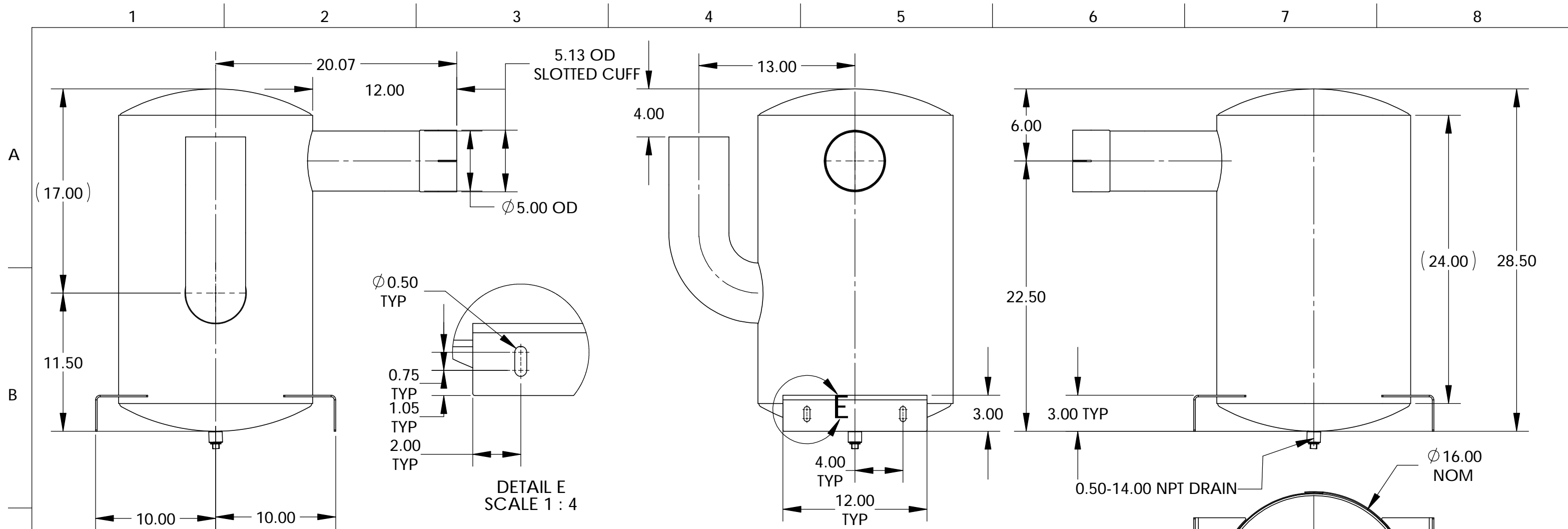
absorption voltage (output voltage)


BATTERY VOLTAGE

BATTERY TEMPERATURE (degrees F)

2010



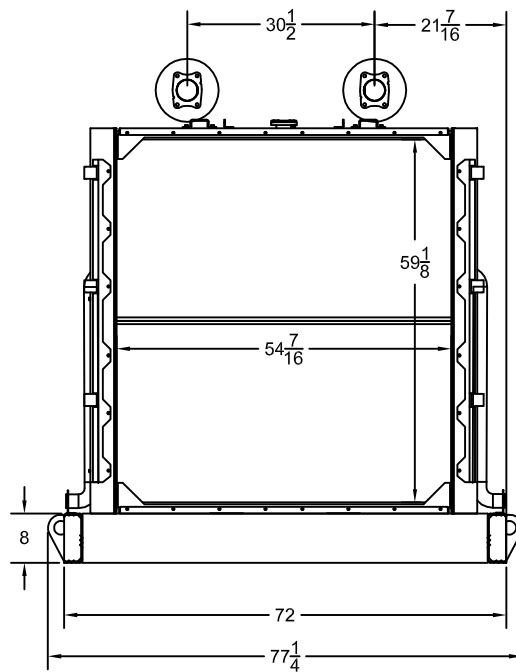
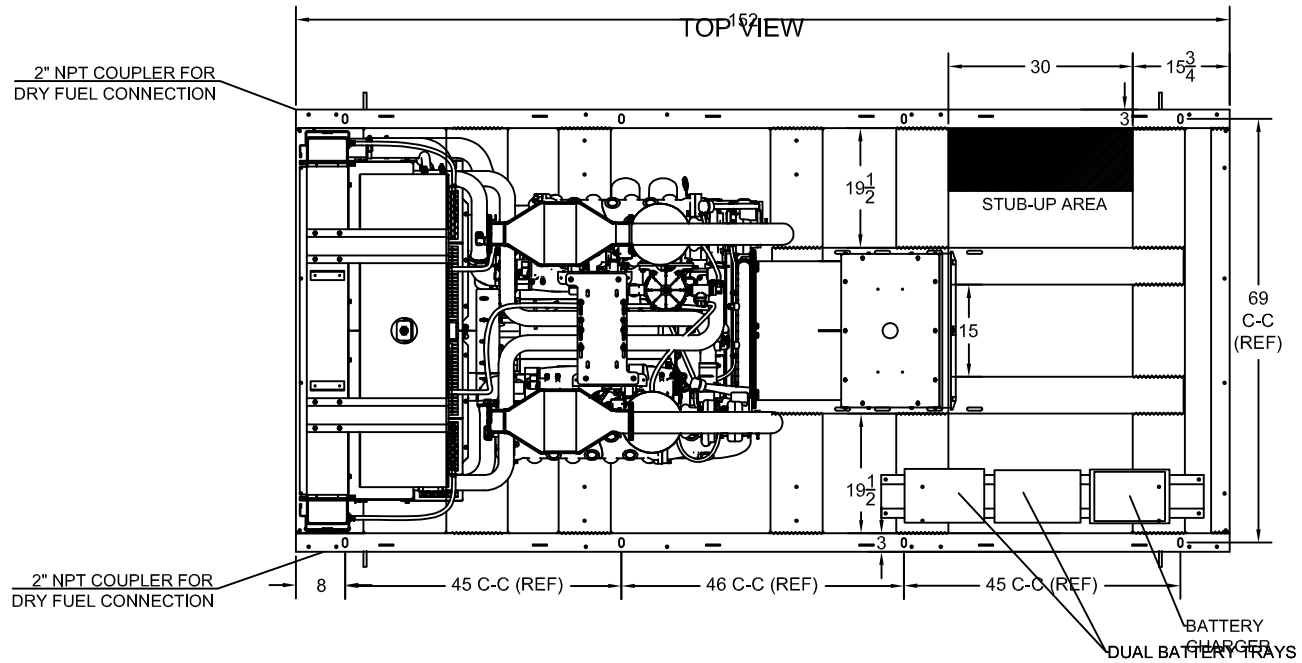


ENGINE INFORMATION	SILENCER INFORMATION	DRAWN BY	DATE	
ENGINE MAKE MTU	RESONATOR FREQUENCY ---	CB	08/23/2017	
ENGINE MODEL 6R1600	RESONATOR ALPHA ---	CHECKED BY CB	DATE 09/15/2017	member of the mandengroup DESCRIPTION SIL: COMP CRIT CS S-E 5.00-5.00 Ø16.00 28.50 OAL F:6.00 --- CONSTRUCTION MATERIAL CS
DISPLACEMENT 641	SILENCER Km ---	ENGINEERING CB	DATE 09/15/2017	
EXHAUST FLOW 2542	SILENCER IL ---	MANUFACTURING CB	WEIGHT (LBS) 78	FINISH HIGH TEMP BLACK PAINT PART NUMBER 500-008546 SCALE (DO NOT SCALE) SHEET SIZE 1:8 B
EXHAUST TEMPERATURE 806	TOLERANCES DO NOT APPLY TO GAGE THICKNESS OR COMMERCIAL FEATURES	TOLERANCES UNLESS OTHERWISE SPECIFIED X = ±0.25 ALL ANGLES .XX = ±0.125 ±1° .XXX = ±0.0625 .XXXX = ±0.03125	SHEET 3 OF 3	
MAX BACK PRESSURE 60.2	THIRD ANGLE PROJECTION	This drawing and the information contained is confidential and the property of Bergari Solutions, LLC. None of this information is to be copied or shared in any form without the express permission from Bergari Solutions, LLC.		REV 01
CUSTOMER ---	CUSTOMER P7/N ---	RAW SOUND PRESSURE ---		

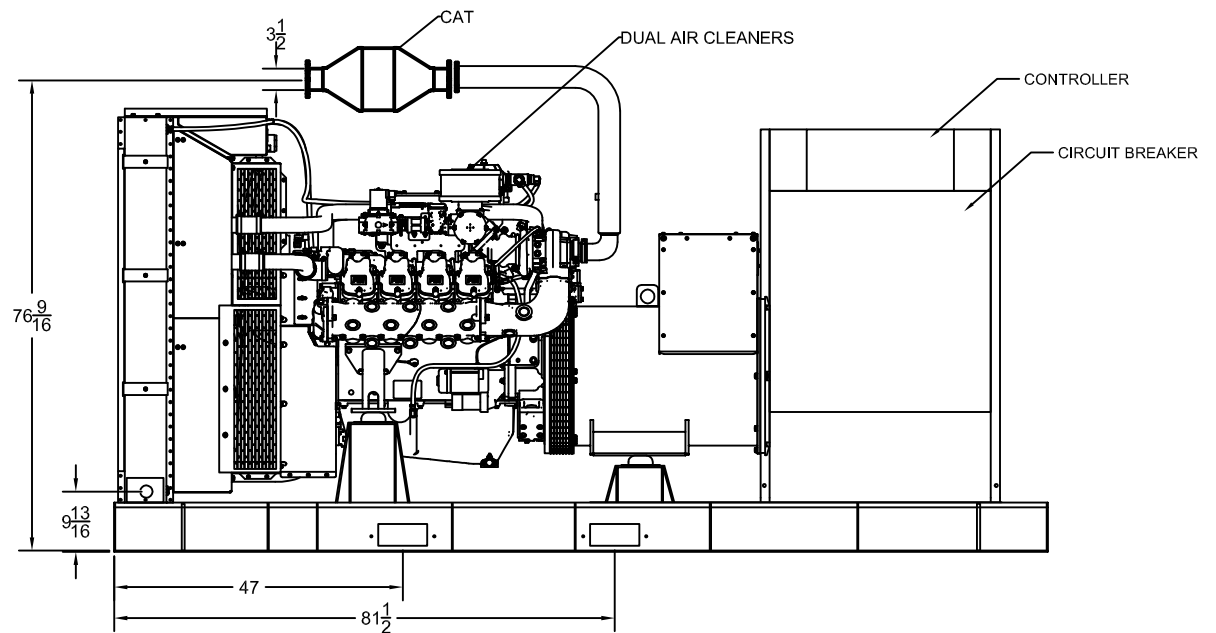
REV.	BY	DATE	DESCRIPTION	ECO
01	CB	09/15/2017	EXTENDED OVERALL LENGTH	---



# SP-2650 OPEN DIMENSIONAL OVERVIEW



RADIATOR VIEW

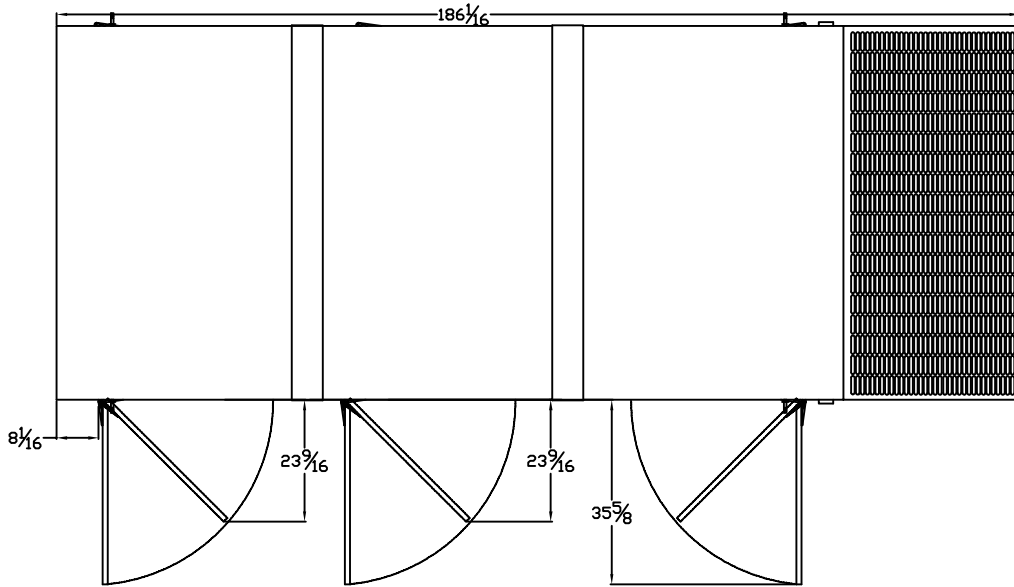


SIDE VIEW

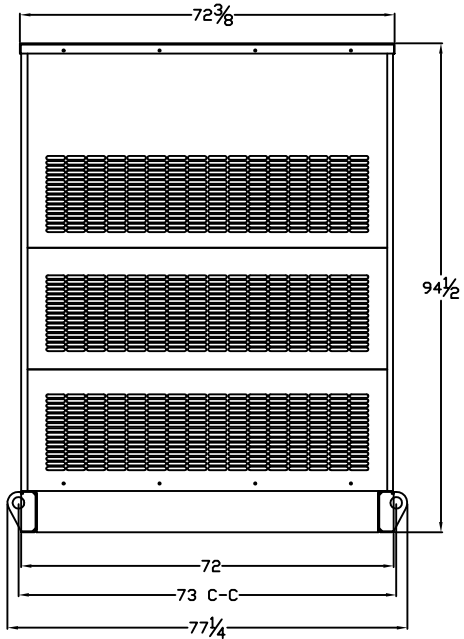
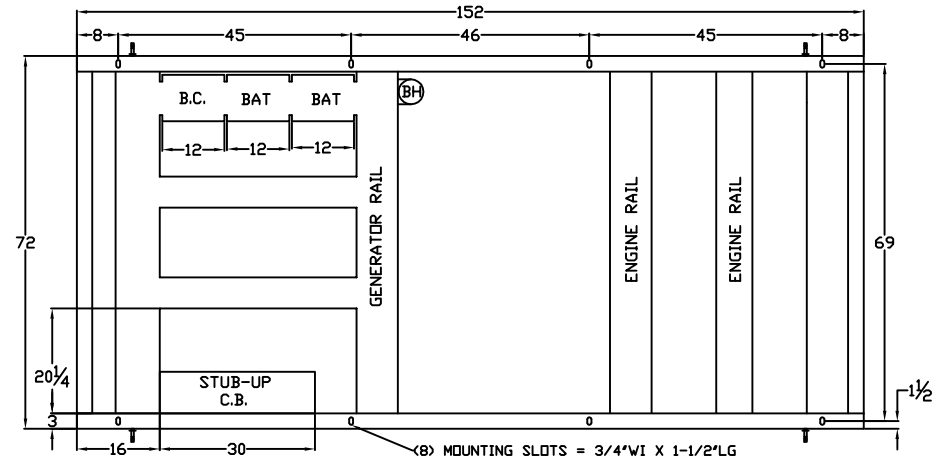
# LEVEL 2 ENCLOSURE OUTLINE DIMENSIONS FOR SP-2000, THRU SP-3000 & SPMD-3500 THRU SPMD-5000

## TOP VIEW

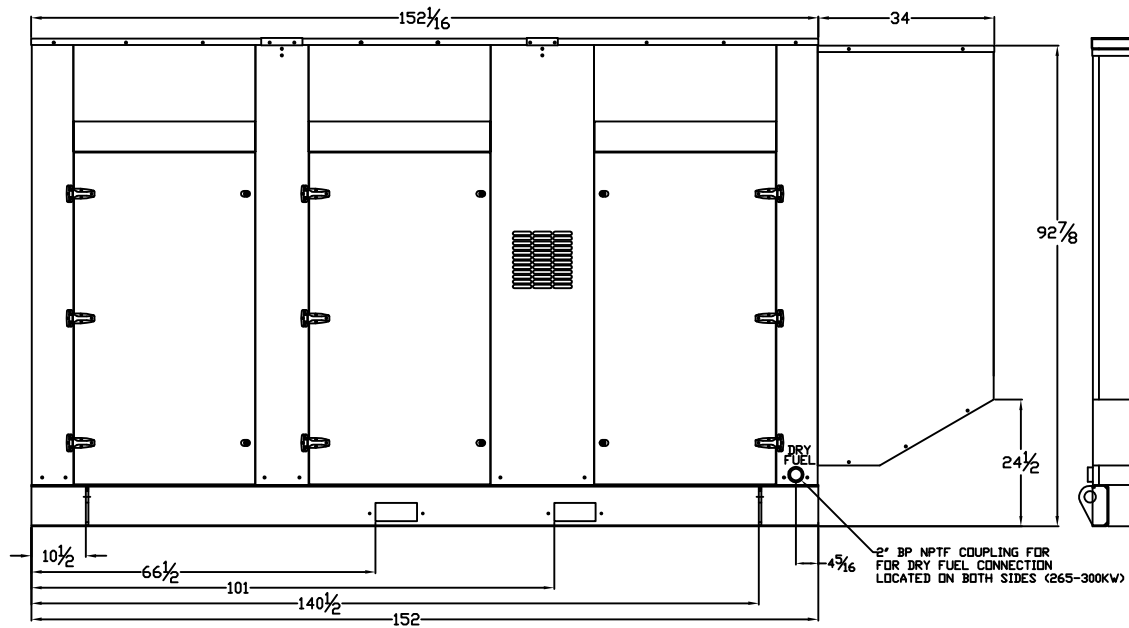
(GEN-SET HAS (6) DOORS, (3) SHOWN OPEN ARE TYPICAL FOR BOTH SIDES)



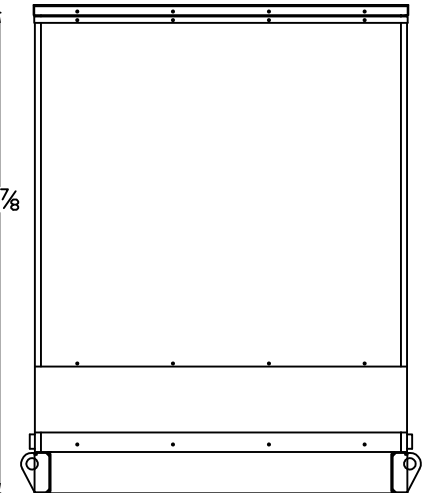
## FRAME VIEW



## GENERATOR END VIEW



## SIDE VIEW



## RADIATOR END VIEW