



# GILLETTE GENERATORS

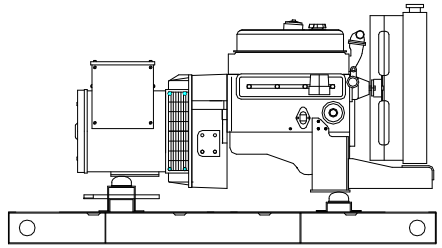
**60 HZ MODEL**  
**SP-250**

**LIQUID COOLED LPG/NG ENGINE GENERATOR SET**

| Model                  | STANDBY<br>120°C RISE |     |      |
|------------------------|-----------------------|-----|------|
|                        | HZ                    | LPG | N.G. |
| <b>SP-250-60 HERTZ</b> | 60                    | 25  | 25   |



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



**“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.



**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**

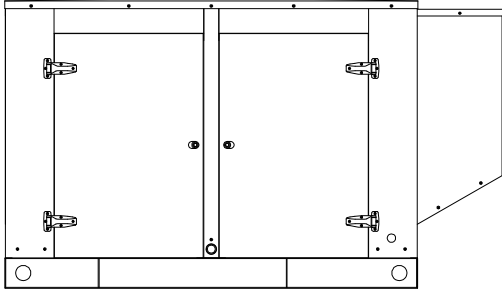


**ASCE 7-05 & 7-10**

All generator sets meet 180 MPH rating.



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



**“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 |    |    | 120°C RISE STANDBY RATING |     | 120°C RISE STANDBY RATING |     |
|                    |         |     |    |    | KW/KVA                    | AMP | KW/KVA                    | AMP |
| <b>SP-250-1-1</b>  | 120     | 240 | 1  | 60 | 25/25                     | 104 | 25/25                     | 104 |
| <b>SP-250-3-2</b>  | 120     | 208 | 3  | 60 | 25/31                     | 87  | 25/31                     | 87  |
| <b>SP-250-3-3</b>  | 120     | 240 | 3  | 60 | 25/31                     | 75  | 25/31                     | 75  |
| <b>SP-250-3-4</b>  | 277     | 480 | 3  | 60 | 25/31                     | 38  | 25/31                     | 38  |
| <b>SP-250-3-5</b>  | 127     | 220 | 3  | 60 | 25/31                     | 82  | 25/31                     | 82  |
| <b>SP-250-3-16</b> | 346     | 600 | 3  | 60 | 25/31                     | 30  | 25/31                     | 30  |

RATINGS: All single phase gen-sets are dedicated 4 lead windings, rated at unity (1.0) power factor. All three phase gen-sets are 12 lead windings, rated at .8 power factor. 120°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 120°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-250-60 HZ

## GENERATOR SPECIFICATIONS

Manufacturer.....Stamford Electric Generators  
 Model & Type.....20L2U1706, 4 Pole, 4 Lead, Single Phase  
 ..... SIL2J1311, 4 Pole, 12 Lead re-connectable, Three Phase  
 ..... P14E17, 4 Pole, 6 Lead, 600V, Three Phase  
 Exciter.....Brushless, shunt excited  
 Voltage Regulator.....Solid State, HZ/Volts  
 Voltage Regulation.....½%, No load to full load  
 Frequency.....Field convertible, 60 HZ to 50 HZ  
 Frequency Regulation.....½% (½ cycle, no load to full load)  
 Unbalanced Load Capability.....100% of standby amps  
 Total Stator and Load Insulation.....Class H, 180°C  
 Temperature Rise.....120°C R/R, standby rating @ 40°C amb.  
 1 Ø Motor Starting @ 30% Voltage Dip (240v).....34 kVA  
 3 Ø Motor Starting @ 30% Voltage Dip (208-240V).....41 kVA  
 3 Ø Motor Starting @ 30% Voltage Dip (480V).....61 kVA  
 3 Ø Motor Starting @ 30% Voltage Dip (600V).....72 kVA  
 Bearing.....1, Pre-lubed and sealed  
 Coupling.....Direct flexible disc.  
 Total Harmonic Distortion.....Max 3½% (MIL-STD705B)  
 Telephone Interference Factor.....Max 50 (NEMA MG1-22)  
 Deviation Factor.....Max 5% (MIL-STD 405B)  
 Ltd. Warranty Period.....24 Months from date of start-up or  
 .....1000 hours use, first to occur.

## GENERATOR FEATURES

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

## ENGINE SPECIFICATIONS AND APPLICATIONS DATA

### ENGINE

Manufacturer.....PSI (Power Solutions International)  
 Model and Type.....2.4L, 4 cycle  
 Aspiration.....Natural  
 Cylinder Arrangement.....4 Cylinders, In-Line  
 Displacement Cu. In. (Liters).....143.5 (2.4)  
 Bore & Stroke In. (Cm.).....3.4 x 3.93 (8.65 x 10.0)  
 Compression Ratio.....9.5:1  
 Main Bearings & Style.....4, Babbitt  
 Cylinder Head.....Cast Iron  
 Pistons.....4, Silicon Aluminum  
 Crankshaft.....Nodular Iron  
 Exhaust Valve.....Forged Steel  
 Governor.....Electronic  
 Frequency Reg. (no load-full load).....Isochronous  
 Frequency Reg. (steady state).....± 1/4%  
 Air Cleaner.....Dry, Replaceable Cartridge  
**Engine Speed.....1800 rpm**  
 Piston Speed, ft/min (m./min).....1080 (329)  
 Max Power, bhp (kwm) Standby/LPG.....46 (34)  
 Max Power, bhp (kwm) Standby/NG.....42 (31)  
 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.....1" NPTF  
 \* Measured at gen-set fuel inlet, downstream of any dry fuel accessories.

### FUEL CONSUMPTION

| LP GAS: FT <sup>3</sup> /HR (M <sup>3</sup> /HR)                                  | STANDBY   |
|---|-----------|
| 100% LOAD   | 173 (4.9) |
| 75% LOAD  | 139 (3.9) |
| 50% LOAD  | 108 (3.0) |
| <b>LPG = 2500 BTU X FT<sup>3</sup> = Total BTU/HR</b>                             |           |
| <b>LPG Conversion: 8.50 FT<sup>3</sup> = 1 LB. : 36.4 FT<sup>3</sup> = 1 GAL.</b> |           |

| NAT. GAS: FT <sup>3</sup> /HR (M <sup>3</sup> /HR)   | STANDBY    |
|--|------------|
| 100% LOAD  | 439 (12.4) |
| 75% LOAD   | 342 (9.6)  |
| 50% LOAD   | 242 (6.8)  |
| <b>NG = 1000 BTU X FT<sup>3</sup> = Total BTU/HR</b> |            |

### OIL SYSTEM

Type.....Full Pressure  
 Oil Pan Capacity qt. (L).....4.5 (4.2)  
 Oil Pan Cap. W/ filter qt. (L).....5 (4.7)  
 Oil Filter.....1, Replaceable Spin-On

### ELECTRICAL SYSTEM

Ignition System.....Electronic  
 Eng. Alternator and Starter:  
     Ground.....Negative  
     Volts DC.....12  
     Max. Amp Output of Alternator.....70  
 Recommended Battery to -18°C (0°F):..12 VDC, Size BCI# 24F  
 Max Dimensions: ..10 3/4" lg X 6 3/4" wi X 9" hi, with standard round posts. Min. output at 600 CCA. Battery tray (max. dim. at 12"lg x 7"wi), hold down straps, battery cables, and battery charger, is furnished. Installation of (1) starting battery is required, with possible higher AMP/HR rating, as described above, if normal environment averages -13°F (-25°C) or cooler.

# APPLICATION AND ENGINEERING DATA FOR MODEL SP-250-60 HZ

## COOLING SYSTEM

Type of System ..... Pressurized, closed recovery  
 Coolant Pump ..... Pre-lubricated, self-sealing  
 Cooling Fan Type (no. of blades) ..... Pusher (6)  
 Fan Diameter inches (cm) ..... 18" (46)  
 Ambient Capacity of Radiator °F (°C)..... 125 (51.6)  
 Engine Jacket Coolant Capacity Gal (L)..... 1.8 (6.8)  
 Radiator Coolant Capacity (including engine)Gal. (L)..5.0 (18.9)  
 Maximum Restriction of Cooling Air Intake  
 and discharge side of radiator in. H<sub>2</sub>O (kpa)..... .5 (.125)  
 Water Pump Capacity gpm (L/min)..... 18.2 (69)..... 15.5 (59)  
 Heat Reject Coolant : Btu/min (kw) ..... 1940 (34)  
 Low Radiator Coolant Level Shutdown.....Standard  
 Note: Coolant temp. shut-down switch setting at 220°F (104°C) with 50/50  
 (water/antifreeze) mix.

## COOLING AIR REQUIREMENTS

Combustion Air, cfm (m<sup>3</sup>/min).....64 (1.8)  
 Radiator Air Flow cfm (m<sup>3</sup>/min).....2500 (72)  
 Heat Rejected to Ambient:  
     Engine: kw (btu/min) ..... 9 (520)  
     Alternator: kw (btu/min).....4.5 (250)

## EXHAUST SYSTEM

Exhaust Outlet Size.....2"  
 Max. Back Pressure in. hg (KPA) .....3.0 (10.2)  
 Exhaust Flow, at rated kw: cfm (m<sup>3</sup>/min) .....248 (7.0)  
 Exhaust Temp., at rated kw: °F (°C) .....1056 (569)  
 Engines are EPA certified for LPG and Natural Gas.

## SOUND LEVELS MEASURED IN dB(A)

|                                  | Open<br>Set | Level 2<br>Encl. |
|----------------------------------|-------------|------------------|
| Level 2, Critical Silencer ..... | 68          | 62               |
| Level 3, Hospital Silencer.....  |             | 58               |

Note: Open sets (no enclosure) have silencer system choices due to unknown job-site applications. Level 2 enclosure has installed critical silencer with upgrade to Level 3 hospital silencer. Sound tests are averaged from several test points and taken at 23 ft. (7 m) from source of noise at normal operation.

## DERATE GENERATOR FOR ALTITUDE

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

## DERATE GENERATOR FOR TEMPERATURE

2% per 10°F (5.6°C) above 104°F (40°C)

## DIMENSIONS AND WEIGHTS

|                               | Open<br>Set | Level 2<br>Enclosure |
|-------------------------------|-------------|----------------------|
| Length in (cm).....           | 68 (173)    | 82 (208)             |
| Width in (cm).....            | 36 (91)     | 36 (92)              |
| Height in (cm).....           | 34 (86)     | 47 (119)             |
| 1 Ø Net Weight lbs (kg).....  | 1050 (476)  | 1460 (662)           |
| 1 Ø Ship Weight lbs (kg)..... | 1130 (512)  | 1600 (725)           |
| 3 Ø Net Weight lbs (kg).....  | 1037 (470)  | 1447 (656)           |
| 3 Ø Ship Weight lbs (kg)..... | 1117 (506)  | 1587 (720)           |

# 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-250-60 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
  - 12 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

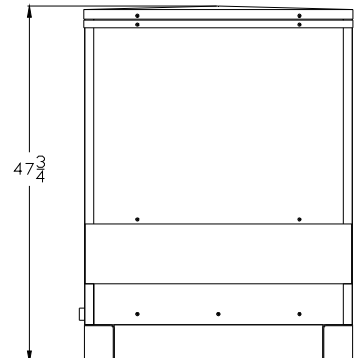
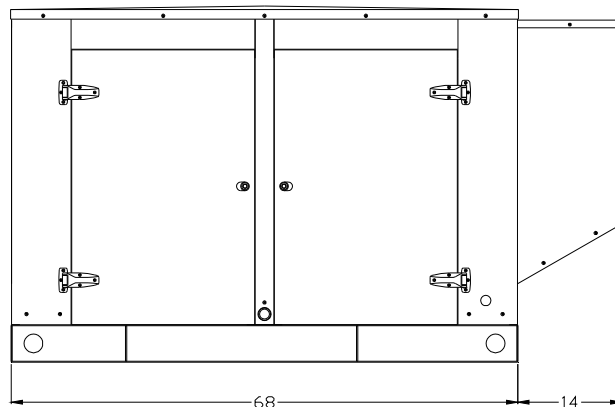
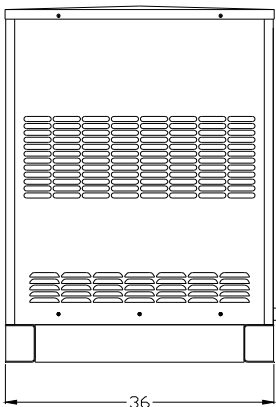
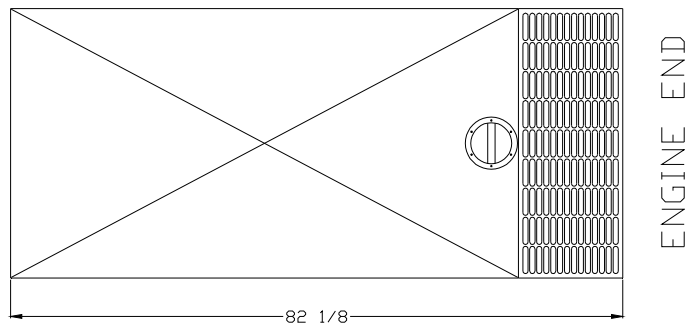
### DC ELECTRICAL SYSTEM:

- 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.





**POWER SOLUTIONS  
INTERNATIONAL**

## 2.4L Naturally Aspirated Stationary

### **EMERGENCY "STANDBY"**



|       |           |
|-------|-----------|
| Date: | 9/30/2016 |
| Rev:  | A         |

| Units |        | 2.4L |      |  |  |
|-------|--------|------|------|--|--|
| Std   | Metric | 1500 | 1800 |  |  |

| General Engine Data   |          |          |                                     |       |             |       |  |
|---|----------|----------|-------------------------------------|-------|-------------|-------|--|
| Type  | N/A      |          | Inline 4 Cylinder                   |       |             |       |  |
| Number of cylinders   | N/A      |          | 4                                   |       |             |       |  |
| Aspiration  | N/A      |          | Naturally Aspirated                 |       |             |       |  |
| Bore  | in       | mm       | 3.4                                 | 86.5  | 3.4         | 86.5  |  |
| Stroke  | in       | mm       | 3.93                                | 100   | 3.93        | 100   |  |
| Displacement  | in^3     | L        | 143.5                               | 2.4   | 143.5       | 2.4   |  |
| Compression Ratio   | N/A      |          | 9.5:1                               |       |             |       |  |
| RPM Range (Min-Max)   | RPM      |          | 1500-1800                           |       |             |       |  |
| Rotation Viewed from Flywheel   | N/A      |          | Counter Clockwise                   |       |             |       |  |
| Firing Order  | N/A      |          | 1-3-4-2                             |       |             |       |  |
| Dry Weight (long Block)   | LBS      |          | 260                                 |       |             |       |  |
| Gross Standby Power Rating <sup>1,2,3</sup> Per ISO 3046 at the Flywheel              |          |          | HP                                  | kWm   | HP          | kWm   |  |
| LP  |          |          | 38.38                               | 28.62 | 46.52       | 34.69 |  |
| Standby Rating Average Load Factor - LP   |          |          | 31.47                               | 23.47 | 38.15       | 28.45 |  |
| NG  |          |          | 34.79                               | 25.95 | 42.81       | 31.92 |  |
| Standby Rating Average Load Factor - NG   |          |          | 28.53                               | 21.28 | 35.10       | 26.17 |  |
| Please ask a PSI sales representative for information regarding prime power operation |          |          |                                     |       |             |       |  |
| Exhaust System  |          |          |                                     |       |             |       |  |
| Type  |          |          | Air Cooled Manifold                 |       |             |       |  |
| Emergency Standby Rating Catalyst Configuration for US Certified Product              |          |          | No Catalyst                         |       | No Catalyst |       |  |
| Maximum allowable Back pressure   | in HG    | kPa      | 3                                   | 10.2  | 3           | 10.2  |  |
| Exhaust Volumetric Flow at Rated Power @ 1350 F                                       | cfm      | m^3/min  | 208.90                              | 5.9   | 248.22      | 7.0   |  |
| Air Induction System  |          |          |                                     |       |             |       |  |
| Maximum allowable Intake Air Restriction with Air Cleaner                             |          |          |                                     |       |             |       |  |
| Clean   | inH2O    | kPa      | 3                                   | 1.49  | 3           | 1.49  |  |
| Dirty   | inH2O    | kPa      | 13                                  | 3.24  | 13          | 3.24  |  |
| Combustion Air required (volume)  | cfm      | m^3/min  | 62.29                               | 18.0  | 74.74       | 21.6  |  |
| Cooling System  |          |          |                                     |       |             |       |  |
| Heat rejected to Cooling water at rated Load  | btu/min  | kcal/sec | 1330                                | 5.59  | 1520        | 6.39  |  |
| Cracking Temperature  | F        | C        | 160                                 | 71    | 160         | 71    |  |
| Full Open Temperature   | F        | C        | 185                                 | 85    | 185         | 85    |  |
| Lubrication System  |          |          |                                     |       |             |       |  |
| Oil Specification   |          |          | SAE 5W-30 API Rating of SM or Newer |       |             |       |  |
| Maximum Allowable Oil Temperature   | F        | C        | 250                                 | 121   | 250         | 121   |  |
| Engine Oil Capacity   |          |          |                                     |       |             |       |  |
| Min   | Qts      | L        | 4.5                                 | 4.25  | 4.5         | 4.25  |  |
| Max   | Qts      | L        | N/A                                 | N/A   | N/A         | N/A   |  |
| Fuel System   |          |          |                                     |       |             |       |  |
| Fuel Consumption @ Rated Load   |          |          |                                     |       |             |       |  |
| NG  | lb/hp-hr | kg/hr    | 0.361                               | N/A   | 0.359       | N/A   |  |
| LP  | lb/hp-hr | kg/hr    | 0.376                               | N/A   | 0.377       | N/A   |  |
| Maximum EPR Rated Pressure  | psi      | kPa      | 1.0                                 | 6.9   | 1.0         | 6.9   |  |
| Recommended Maximum Running pressure to Electronic Pressure Regulator (EPR)           | inH2O    | kPa      | 11.0                                | 2.7   | 11.0        | 2.7   |  |
| Recommended Minimum Running pressure to EPR   | inH2O    | kPa      | 7.0                                 | 1.7   | 7.0         | 1.7   |  |
| Minimum NG Supply Pipe Size <sup>4</sup>  |          |          | 1-1/4" NPT                          |       |             |       |  |
| Minimum LPG Supply Pipe Size <sup>4</sup>   |          |          | 3/4"                                |       |             |       |  |

<sup>1</sup> Standby and overload ratings based on ISO 3046. See PSI technical standard 3630000A for additional duty cycle and engine rating information

<sup>2</sup> All ratings are gross flywheel horsepower corrected to 77°F at an altitude of 328feet with no cooling fan or alternator losses using heating value for NG of 1015 BTU/SCF.

<sup>3</sup> 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.

<sup>4</sup> The preceding pipe sizes are only suggestions and piping sizes may vary with temperature, pressure, distance from supply and application of local codes. Gas must be available at adequate volume and pressure for engine at the EPR.

**For information not listed in this document, please contact you PSI sales representative**



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**PSI Technical Standard 36300000A- Engine Rating Guidelines**

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**Emergency Standby Power Rating:** Applicable for supplying emergency power for the duration of utility power outage. There is no overload capability for the emergency standby rating. Any use of the generator above the emergency standby rating is prohibited. Any unit operating in parallel with a public utility is not considered emergency standby. Emergency standby engine is applicable to a variable load with a maximum average load factor of 82% and 200 hours of operation per year. Emergency standby rating should only be applied in emergency power outages.

**Prime Power Rating:** Applicable for supplying electrical power in lieu of commercially purchased power or providing guaranteed standby power. The prime power rating is applicable for variable loads with limited number of operating hours per year. The average power output shall not exceed 75% of the prime power rating. The total time at 100% Prime power shall not exceed 500 hours per year. A 110% overload rating is available one hour in every twelve hours with the total hours at 110% not to exceed 25 hours per year. Maximum number of hours per year is 2500.

**Continuous Power Rating:** The continuous power rating is applicable for variable loads with unlimited number of operating hours per year. The power output shall not exceed 75% of the prime power rating. There is no overload capability.

# STAMFORD

S0L2-U1 Winding 06 / 706

## S0L2-U1 - Technical Data Sheet

### Standards

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

### Quality Assurance

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



### Excitation and Voltage Regulators

|                                  |                            |
|----------------------------------|----------------------------|
| Excitation System                |                            |
| <b>AVR Type</b>                  | <b>AVR Power</b>           |
| AS540                            | Self-Excited / Aux winding |
| Voltage Regulation               | ± 1%                       |
| No Load Excitation Voltage (V)   | 12 V                       |
| Full Load Excitation Voltage (V) | 42 V                       |

# STAMFORD®

## S0L2-U1 Winding 06 / 706

| Electrical Data   |   |         |
|---|---|---------|
| Insulation System   | Class H   |         |
| Stator Winding  | Double Layer Concentric                                   |         |
| Winding Pitch   | Two Thirds  |         |
| Winding Leads   | 4   |         |
| Winding Number  | 06 / 706  |         |
| Number of Poles   | 4   |         |
| IP Rating   | IP23  |         |
| RFI Suppression   | EN 61000-6-2 & EN 61000-6-4, refer to factory for others  |         |
| Waveform Distortion   | NO LOAD < 2.5% NON-DISTORTING BALANCED LINEAR LOAD < 5.0% |         |
| Short Circuit Ratio   | 1/Xd  |         |
| Steady State X/R Ratio                                      | 5.2   |         |
| <b>60 Hz</b>  |   |         |
| Telephone Interference                                      | TIF<75  |         |
| Voltage Series/ Voltage Parallel                            | 240/120   | 240/120 |
| Power Factor  | 0.8   | 1.0     |
| kVA Base Rating (Class H)                                   | 24  | 25.9    |
| Saturated Values in Per Unit at Base Ratings and Voltages   |   |         |
| Xd Dir. Axis Synchronous                                    | 1.348   | 1.455   |
| X'd Dir. Axis Transient                                     | 0.130   | 0.140   |
| X''d Dir. Axis Subtransient                                 | 0.117   | 0.126   |
| Xq Quad. Axis Reactance                                     | 0.982   | 1.060   |
| X''q Quad. Axis Subtransient                                | 0.165   | 0.178   |
| XL Stator Leakage Reactance                                 | 0.075   | 0.081   |
| X2 Negative Sequence Reactance                              | 0.234   | 0.253   |
| X0 Zero Sequence Reactance                                  | 0.085   | 0.092   |
| Unsaturated Values in Per Unit at Base Ratings and Voltages |   |         |
| Xd Dir. Axis Synchronous                                    | 1.793   | 1.935   |
| X'd Dir. Axis Transient                                     | 0.150   | 0.161   |
| X''d Dir. Axis Subtransient                                 | 0.137   | 0.148   |
| Xq Quad. Axis Reactance                                     | 1.011   | 1.092   |
| X''q Quad. Axis Subtransient                                | 0.198   | 0.214   |
| XL Stator Leakage Reactance                                 | 0.085   | 0.091   |
| X2 Negative Sequence Reactance                              | 0.281   | 0.303   |
| X0 Zero Sequence Reactance                                  | 0.099   | 0.107   |
| Time Constants (Seconds)                                    |   |         |
| T'd TRANSIENT TIME CONST.                                   | 0.047   |         |
| T''d SUB-TRANSTIME CONST.                                   | 0.002   |         |
| T'do O.C. FIELD TIME CONST.                                 | 0.896   |         |
| Ta ARMATURE TIME CONST.                                     | 0.02  |         |



# STAMFORD

## S0L2-U1 Winding 06 / 706

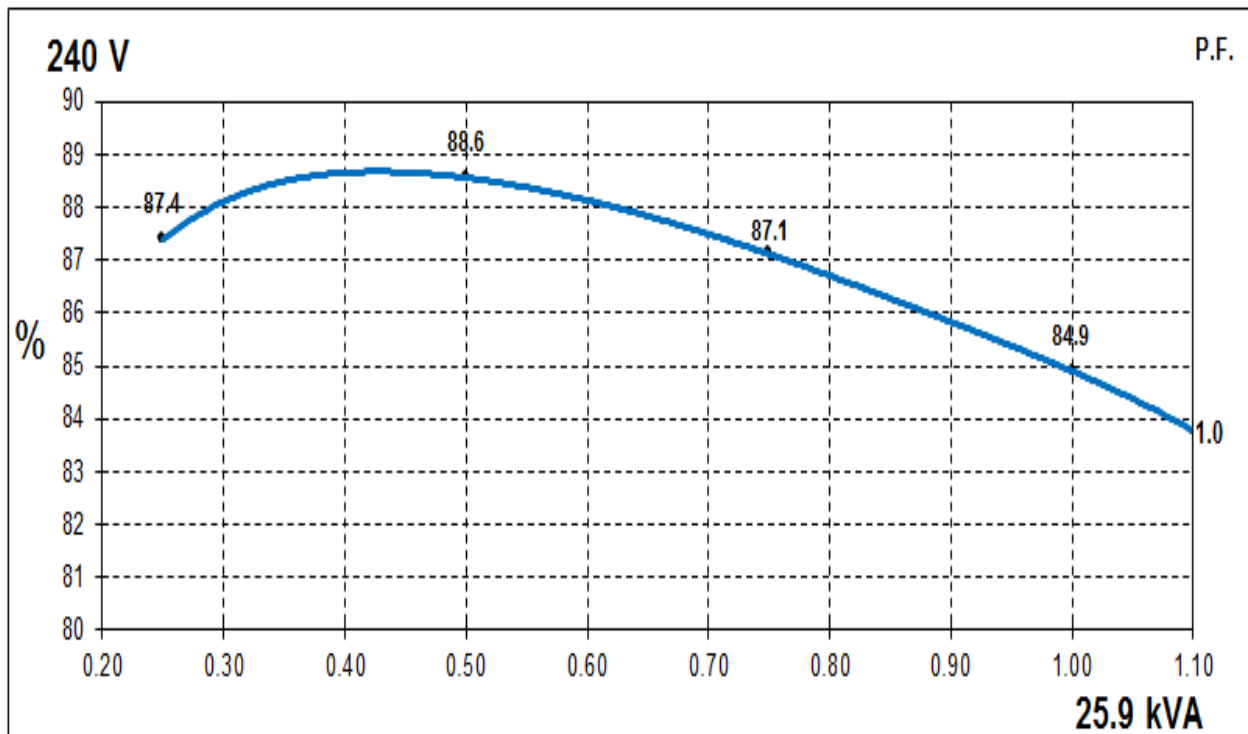
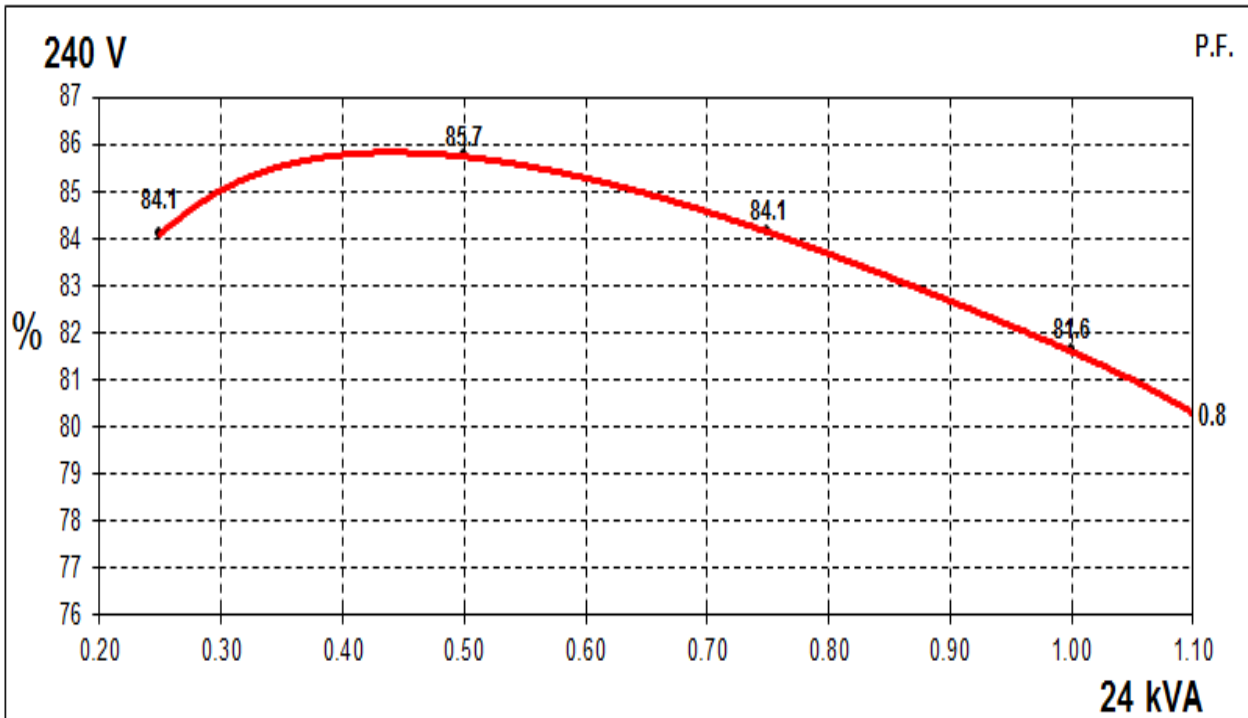
| Resistances in Ohms ( $\Omega$ ) at 22°C       |  |
|--|--|
| Stator Winding Resistance (Ra)                 | 0.083 $\Omega$ per phase series connected  |
| Rotor Winding Resistance (Rf)                  | 0.889 $\Omega$   |
| Exciter Stator Winding Resistance              | 16.126 $\Omega$  |
| Exciter Rotor Winding Resistance               | 0.110 $\Omega$ per phase   |
| Positive Sequence Resistance (R1)              | 0.1037 $\Omega$  |
| Negative Sequence Resistance (R2)              | 0.119 $\Omega$   |
| Zero Sequence Resistance (R0)                  | 0.1037 $\Omega$  |
| Aux Winding Resistance (with winding 706 only) | 2.721 $\Omega$   |
| Mechanical data                                |  |
| Cooling Air                                    | 0.126 m <sup>3</sup> /sec (50Hz)   |
| Shaft and Keys                                 | All alternator rotors are dynamically balanced to better than BS6861: Part 1 Grade 2.5 for minimum vibration in operation. |
| Bearing  | Single Bearing   |
| Weight Complete Alternator                     | 140.4 kg   |
| Weight Wound Stator                            | 59.5kg   |
| Weight Wound Rotor                             | 54.6 kg  |
| Moment of Inertia                              | 0.185 kgm <sup>2</sup>   |
| Shipping weight in a Crate                     | 178 kg   |
| Packing Crate Size                             | 930X590X760 mm   |
| Maximum Over Speed                             | 2250 RPM for two minutes   |
| Bearing Drive End                              | N/A  |
| Bearing Non-Drive End                          | Ball Bearing, 6305-2RS1  |

# STAMFORD

S0L2-U1 Winding 06 / 706

## Single Phase Efficiency Curves

### 60Hz Curves

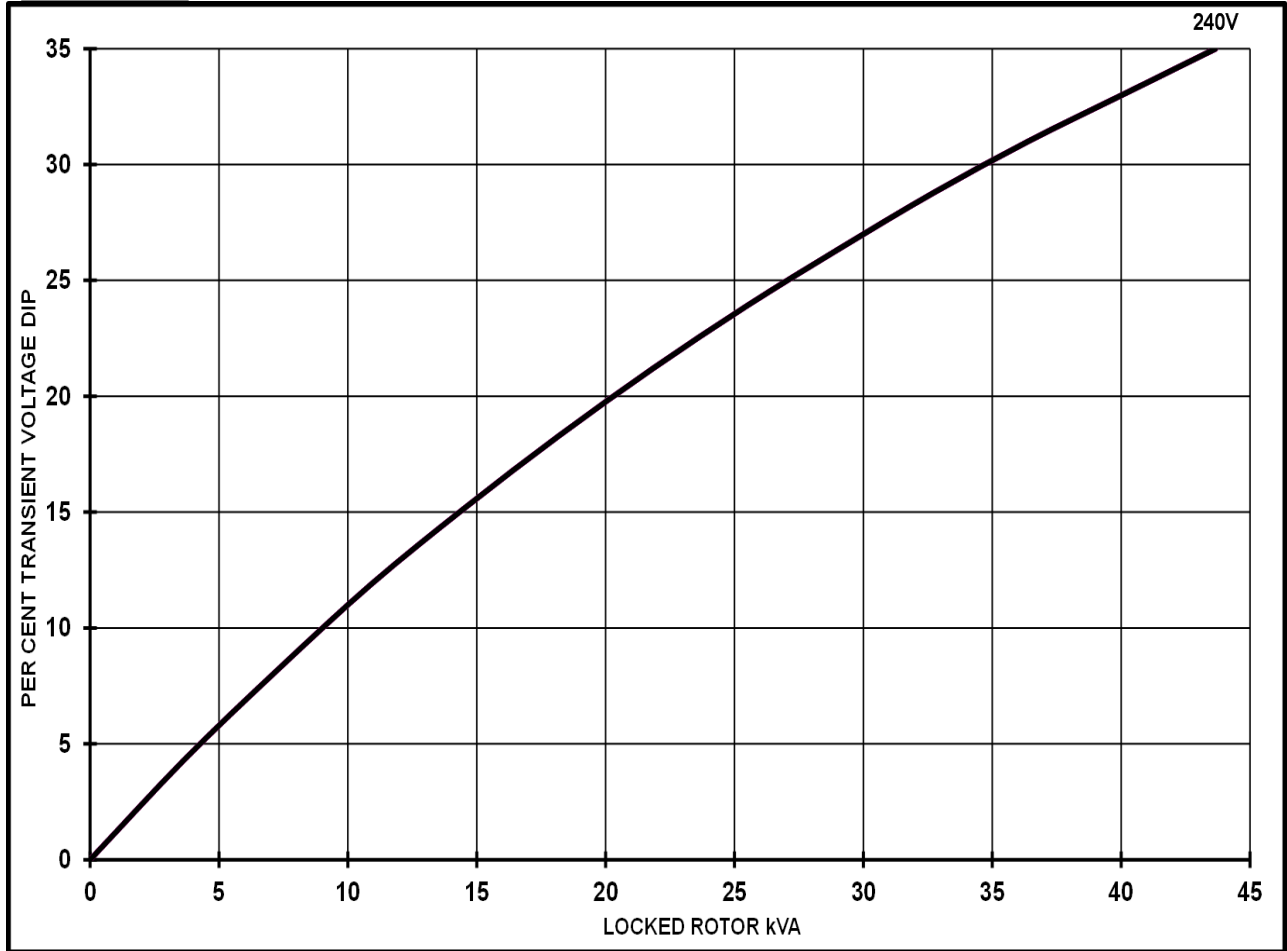


# STAMFORD

S0L2-U1 Winding 06 / 706

## Locked Rotor Motor Starting Curves

**60Hz**



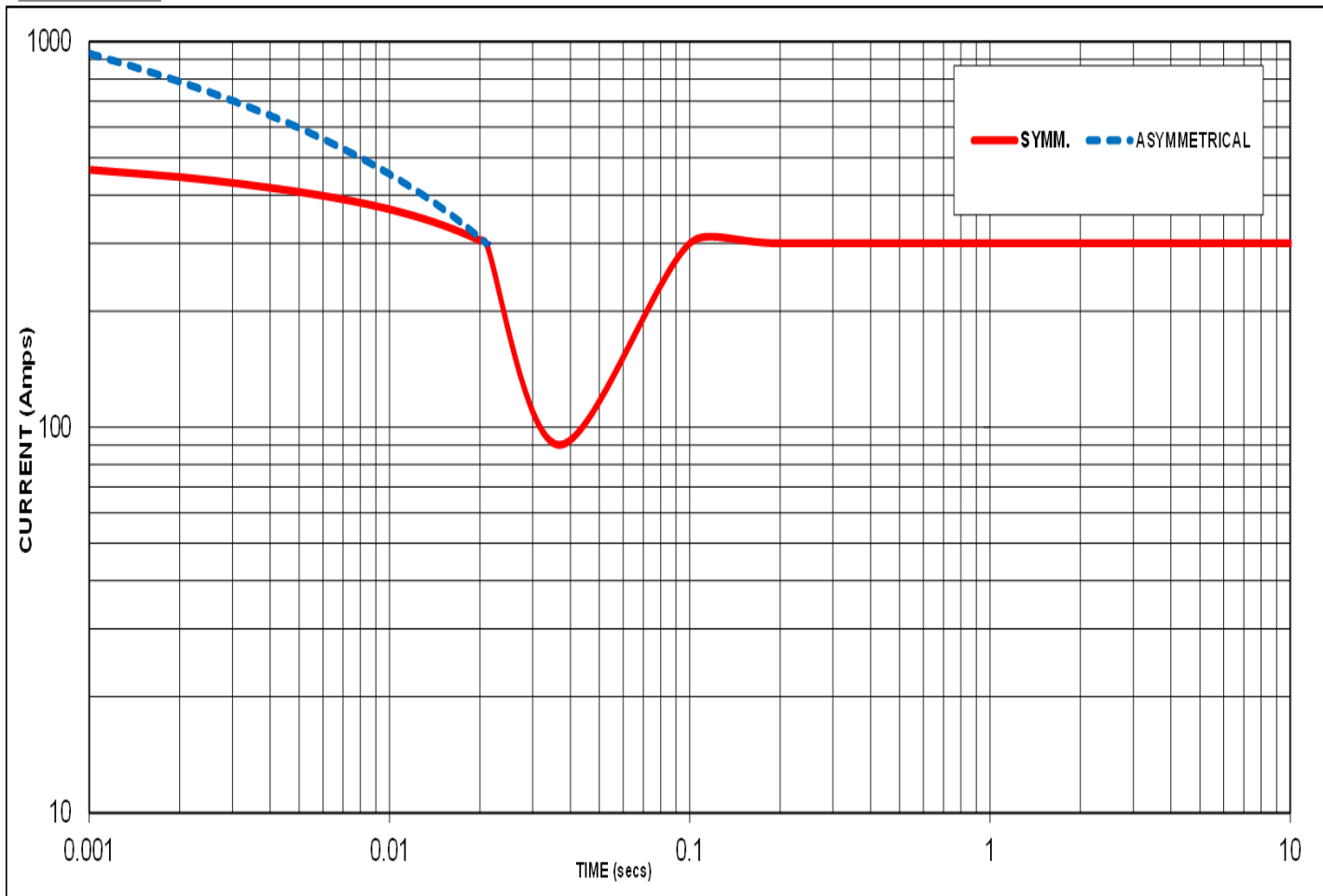
| Transient Voltage Dip Scaling Factor |        | Transient Voltage Rise Scaling Factor         |
|--------------------------------------|--------|---|
| PF                                   | Factor | For voltage rise multiply voltage dip by 1.25 |
| < 0.5                                | 1.00   |   |
| 0.5                                  | 0.97   |   |
| 0.6                                  | 0.93   |   |
| 0.7                                  | 0.90   |   |
| 0.8                                  | 0.85   |   |
| 0.9                                  | 0.83   |   |
| 1.0                                  | 0.80   |   |

# STAMFORD®

S0L2-U1 Winding 706  
Short Circuit Decrement Curve

*Note: Applicable only for Winding 706 ( Auxiliary winding).  
Winding 06 (no Auxiliary winding) will not provide short circuit capability.*

**60Hz**

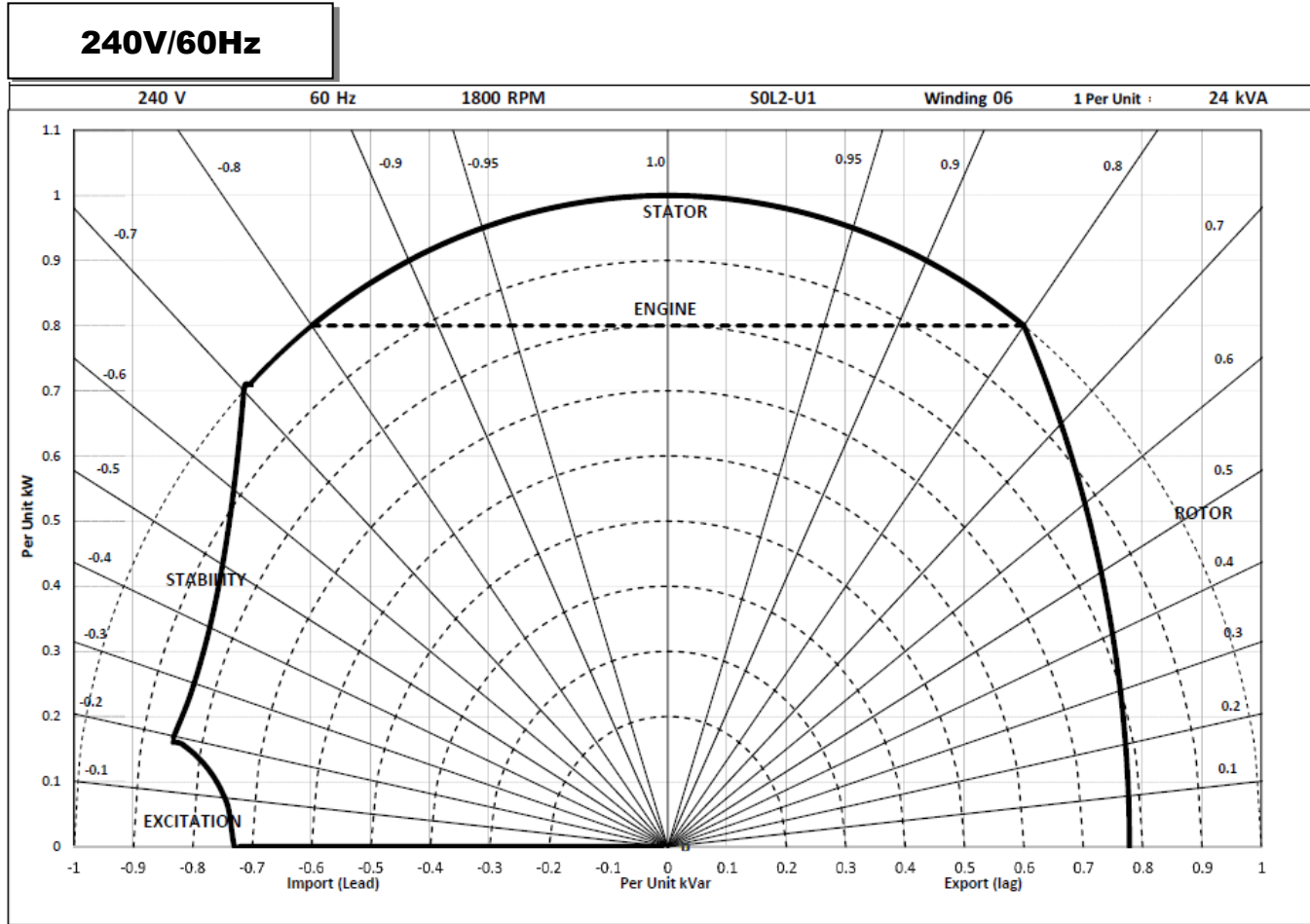


Sustained Short Circuit = 300 Amps

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S0L2-U1 Winding 06 / 706

## Typical Alternator Operating Chart



# STAMFORD®

## S0L2-U1 Winding 06 / 706

### RATINGS AT 0.8/1.0 POWER FACTOR

| Class - Temp Rise      |                | Standby - 163/27°C |      | Standby - 150/40°C |      | Cont. H - 125/40°C |      | Cont. F - 105/40°C |      |
|------------------------|----------------|--------------------|------|--------------------|------|--------------------|------|--------------------|------|
| <b>60</b><br><b>Hz</b> | Series (V)     | 240                | 240  | 240                | 240  | 240                | 240  | 240                | 240  |
|                        | Parallel(V)    | 120                | 120  | 120                | 120  | 120                | 120  | 120                | 120  |
|                        | Power Factor   | 0.8                | 1.0  | 0.8                | 1.0  | 0.8                | 1.0  | 0.8                | 1.0  |
|                        | kVA            | 26.4               | 28.5 | 25.6               | 27.6 | 24.0               | 25.9 | 21.7               | 23.5 |
|                        | kW             | 21.1               | 28.5 | 20.5               | 27.6 | 19.2               | 25.9 | 17.4               | 23.5 |
|                        | Efficiency (%) | 80.3               | 83.8 | 80.7               | 84.2 | 81.6               | 84.9 | 82.6               | 85.8 |
|                        | kW Input       | 26.3               | 34.0 | 25.4               | 32.8 | 23.5               | 30.5 | 21.0               | 27.4 |

#### De-Rates

All values tabulated above are subject to the following reductions:

- 3% for every 500 meters by which the operating altitude exceeds 1000 meters above mean sea level
- 3% for every 5°C by which the operational ambient temperature exceeds 40°C
- For any other operating conditions impacting the cooling circuit please refer to applications

Note: Requirement for operating in an ambient exceeding 60°C and altitude exceeding 4000 meters must be referred to applications.

#### Dimensional and Torsional Drawing

For dimensional and torsional information please refer to the alternator General Arrangement and rotor drawings available on our website (<http://stamford-avk.com/>)

**Note:** Continuous development of our products means that the information contained in our data sheets can change without notice, and specifications should always be confirmed with Cummins Generator Technologies prior to purchase.



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S1L2-J1 Winding 311 / 711

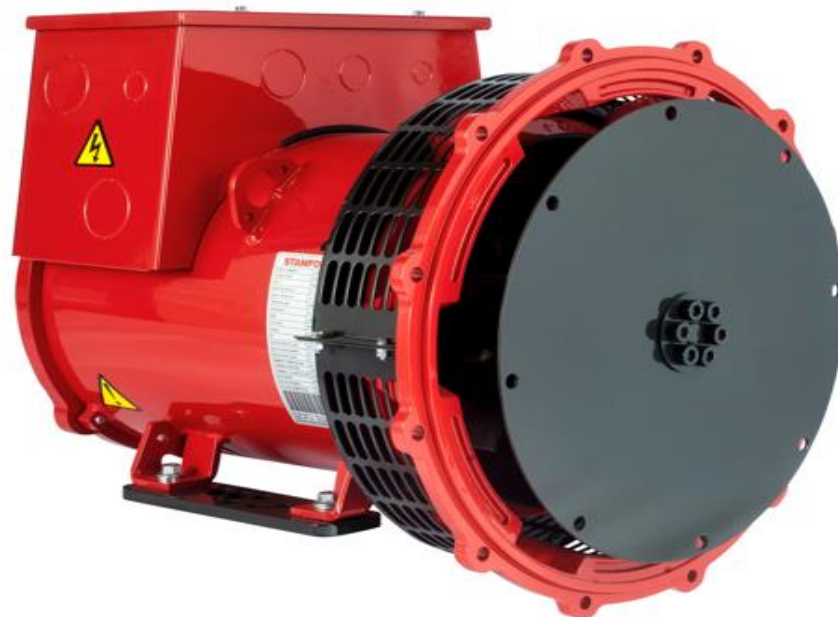
## S1L2-J1 - Technical Data Sheet

### Standards

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

### Quality Assurance

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



### Excitation and Voltage Regulators

|                                  |                            |
|----------------------------------|----------------------------|
| Excitation System                |                            |
| <b>AVR Type</b>                  | <b>AVR Power</b>           |
| AS540                            | Self-Excited / Aux winding |
| Voltage Regulation               | ± 1%                       |
| No Load Excitation Voltage (V)   | 13 V                       |
| Full Load Excitation Voltage (V) | 43 V                       |



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## S1L2-J1 Winding 311 / 711

| Electrical Data   |  |         |         |         |         |         |         |         |
|---|--|---------|---------|---------|---------|---------|---------|---------|
| Insulation System   | Class H  |         |         |         |         |         |         |         |
| Stator Winding  | Double Layer Concentric                                  |         |         |         |         |         |         |         |
| Winding Pitch   | Two Thirds   |         |         |         |         |         |         |         |
| Winding Leads   | 12   |         |         |         |         |         |         |         |
| Winding Number  | 311/711  |         |         |         |         |         |         |         |
| Number of Poles   | 4  |         |         |         |         |         |         |         |
| IP Rating   | IP23   |         |         |         |         |         |         |         |
| RFI Suppression   | EN 61000-6-2 & EN 61000-6-4, refer to factory for others |         |         |         |         |         |         |         |
| Waveform Distortion   | NO LOAD < 2% NON-DISTORTING BALANCED LINEAR LOAD < 5.0%  |         |         |         |         |         |         |         |
| Short Circuit Ratio   | 1/Xd   |         |         |         |         |         |         |         |
| Steady State X/R Ratio                                      | 6.5  |         |         |         |         |         |         |         |
|   | 50 Hz  |         |         |         | 60 Hz   |         |         |         |
| Telephone Interference                                      | THF<2%   |         |         |         | TIF<50  |         |         |         |
| Voltage Series Star   | 380/220  | 400/231 | 415/240 | 440/254 | 416/240 | 440/254 | 460/266 | 480/277 |
| Voltage Parallel Star                                       | 190/110  | 200/115 | 208/120 | 220/127 | 208/120 | 220/127 | 230/133 | 240/138 |
| Voltage Series Delta  | 220/110  | 230/115 | 240/120 | 254/127 | 240/120 | 254/127 | 266/133 | 277/138 |
| kVA Base Rating (Class H)                                   | 32   | 35      | 35      | N/A     | 37      | 39.2    | N/A     | 42      |
| Saturated Values in Per Unit at Base Ratings and Voltages   |  |         |         |         |         |         |         |         |
| Xd Dir. Axis Synchronous                                    | 2.898  | 2.616   | 2.430   |         | 2.557   | 2.421   |         | 2.180   |
| X'd Dir. Axis Transient                                     | 0.167  | 0.151   | 0.140   |         | 0.147   | 0.139   |         | 0.126   |
| X''d Dir. Axis Subtransient                                 | 0.131  | 0.118   | 0.110   |         | 0.116   | 0.110   |         | 0.099   |
| Xq Quad. Axis Reactance                                     | 1.255  | 1.132   | 1.052   |         | 1.107   | 1.048   |         | 0.944   |
| X''q Quad. Axis Subtransient                                | 0.177  | 0.159   | 0.148   |         | 0.156   | 0.147   |         | 0.133   |
| XL Stator Leakage Reactance                                 | 0.085  | 0.076   | 0.071   |         | 0.075   | 0.071   |         | 0.064   |
| X2 Negative Sequence Reactance                              | 0.223  | 0.201   | 0.187   |         | 0.197   | 0.186   |         | 0.168   |
| X0 Zero Sequence Reactance                                  | 0.045  | 0.041   | 0.038   |         | 0.040   | 0.038   |         | 0.034   |
| Unsaturated Values in Per Unit at Base Ratings and Voltages |  |         |         |         |         |         |         |         |
| Xd Dir. Axis Synchronous                                    | 3.188  | 2.877   | 2.673   |         | 2.812   | 2.663   |         | 2.398   |
| X'd Dir. Axis Transient                                     | 0.192  | 0.173   | 0.161   |         | 0.169   | 0.160   |         | 0.144   |
| X''d Dir. Axis Subtransient                                 | 0.153  | 0.139   | 0.129   |         | 0.135   | 0.128   |         | 0.115   |
| Xq Quad. Axis Reactance                                     | 1.292  | 1.166   | 1.084   |         | 1.140   | 1.080   |         | 0.972   |
| X''q Quad. Axis Subtransient                                | 0.212  | 0.191   | 0.178   |         | 0.187   | 0.177   |         | 0.159   |
| XL Stator Leakage Reactance                                 | 0.096  | 0.086   | 0.080   |         | 0.084   | 0.080   |         | 0.072   |
| X2 Negative Sequence Reactance                              | 0.268  | 0.242   | 0.224   |         | 0.236   | 0.224   |         | 0.201   |
| X0 Zero Sequence Reactance                                  | 0.053  | 0.048   | 0.044   |         | 0.047   | 0.044   |         | 0.040   |
| Time Constants (Seconds)                                    |  |         |         |         |         |         |         |         |
| T'd TRANSIENT TIME CONST.                                   | 0.029  |         |         |         |         |         |         |         |
| T''d SUB-TRANSTIME CONST.                                   | 0.013  |         |         |         |         |         |         |         |
| T'do O.C. FIELD TIME CONST.                                 | 0.305  |         |         |         |         |         |         |         |
| Ta ARMATURE TIME CONST.                                     | 0.007  |         |         |         |         |         |         |         |

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## S1L2-J1 Winding 311 / 711

| Resistances in Ohms ( $\Omega$ ) at 22 <sup>o</sup> C |  |
|---|--|
| Stator Winding Resistance (Ra)                        | 0.203 $\Omega$ per phase series star connected   |
| Rotor Winding Resistance (Rf)                         | 0.925 $\Omega$   |
| Exciter Stator Winding Resistance                     | 16.44 $\Omega$   |
| Exciter Rotor Winding Resistance                      | 0.207 $\Omega$ per phase   |
| Positive Sequence Resistance (R1)                     | 0.254 $\Omega$   |
| Negative Sequence Resistance (R2)                     | 0.292 $\Omega$   |
| Zero Sequence Resistance (R0)                         | 0.254 $\Omega$   |
| Aux Winding Resistance (with winding 711 only)        | 4.24 $\Omega$  |
| Mechanical data                                       |  |
| Cooling Air   | 0.177 m <sup>3</sup> /sec (50Hz)                      0.212 m <sup>3</sup> /sec (60Hz)                                     |
| Shaft and Keys  | All alternator rotors are dynamically balanced to better than BS6861: Part 1 Grade 2.5 for minimum vibration in operation. |
| Bearing   | Single Bearing   |
| Weight Complete Alternator                            | 168.3 kg   |
| Weight Wound Stator                                   | 69.5 kg  |
| Weight Wound Rotor                                    | 63.2 kg  |
| Moment of Inertia                                     | 0.2793 kgm <sup>2</sup>  |
| Shipping weight in a Crate                            | 216 kg   |
| Packing Crate Size                                    | 1050X570X960 mm  |
| Maximum Over Speed                                    | 2250 RPM for two minutes   |
| Bearing Drive End                                     | N/A  |
| Bearing Non-Drive End                                 | Ball Bearing, 6306-2RS1  |

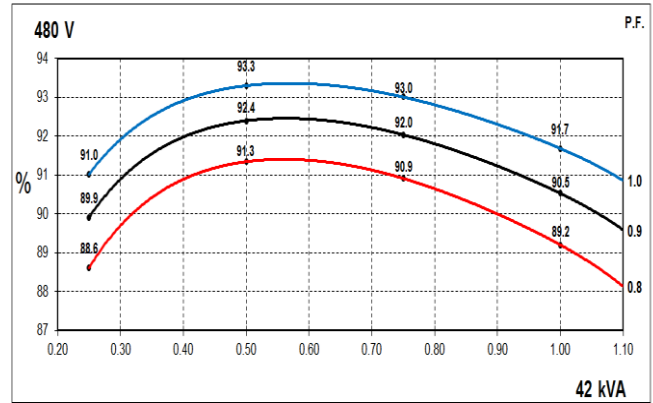
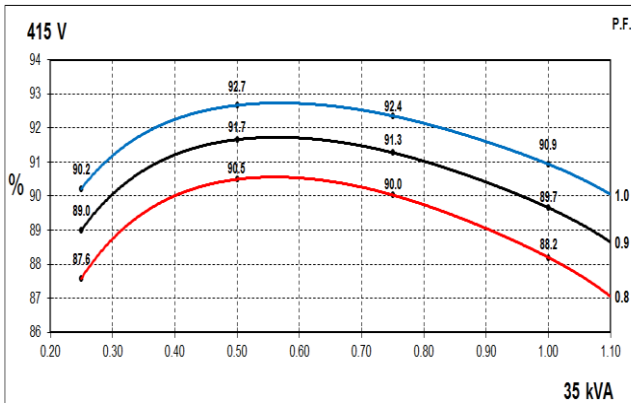
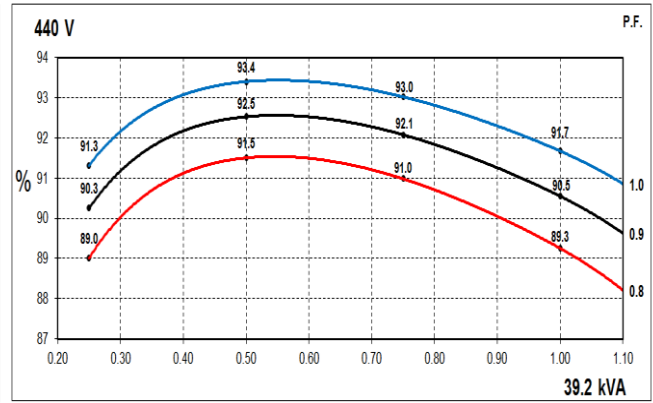
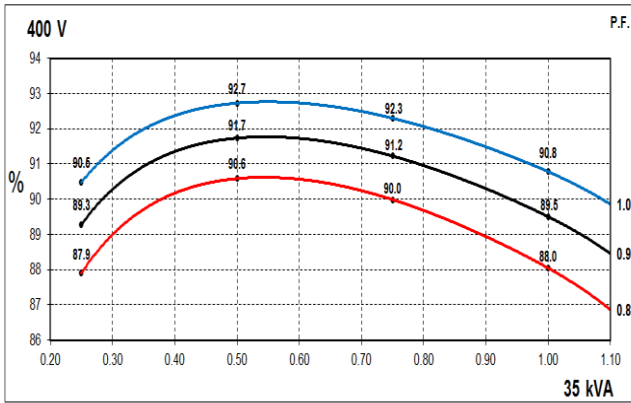
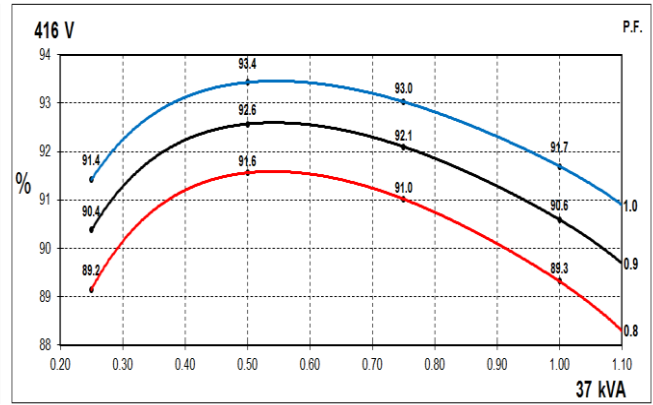
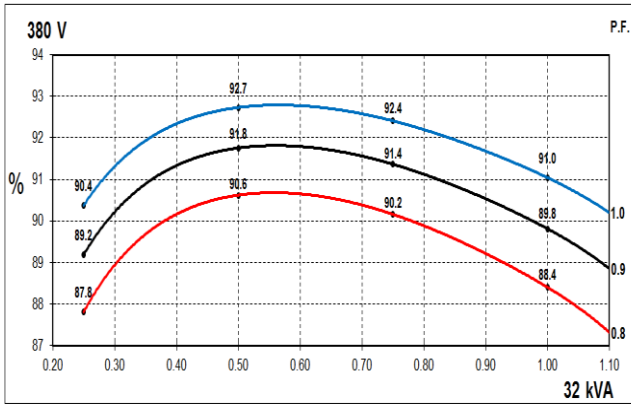
# STAMFORD®

## S1L2-J1 Winding 311 / 711

### Three Phase Efficiency Curves

50Hz Curves

60Hz Curves

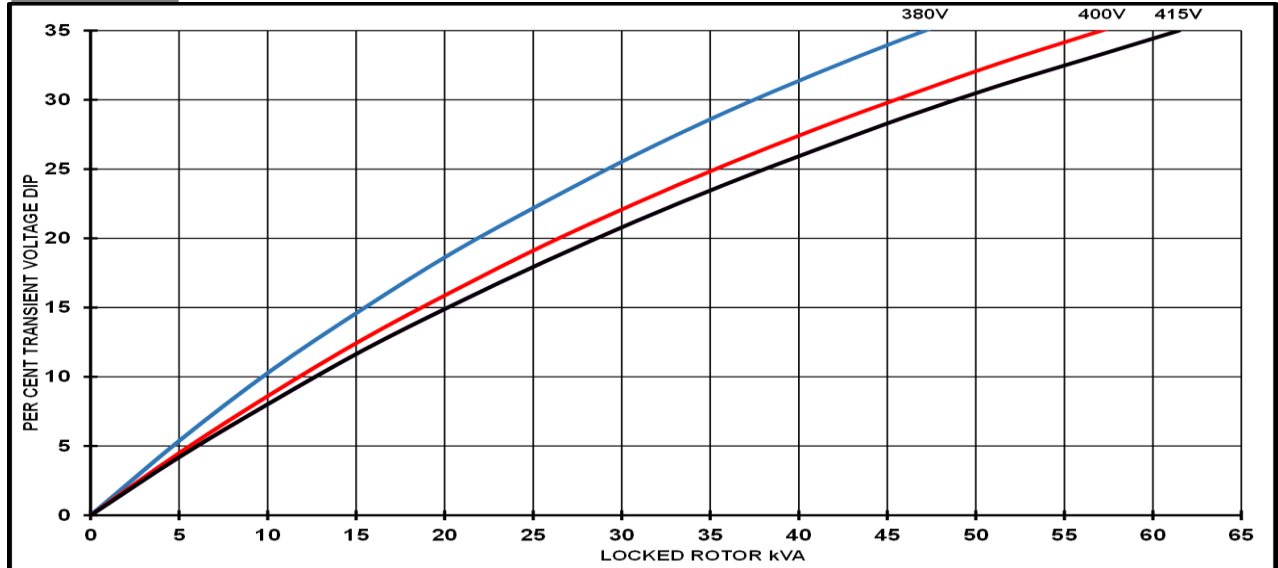


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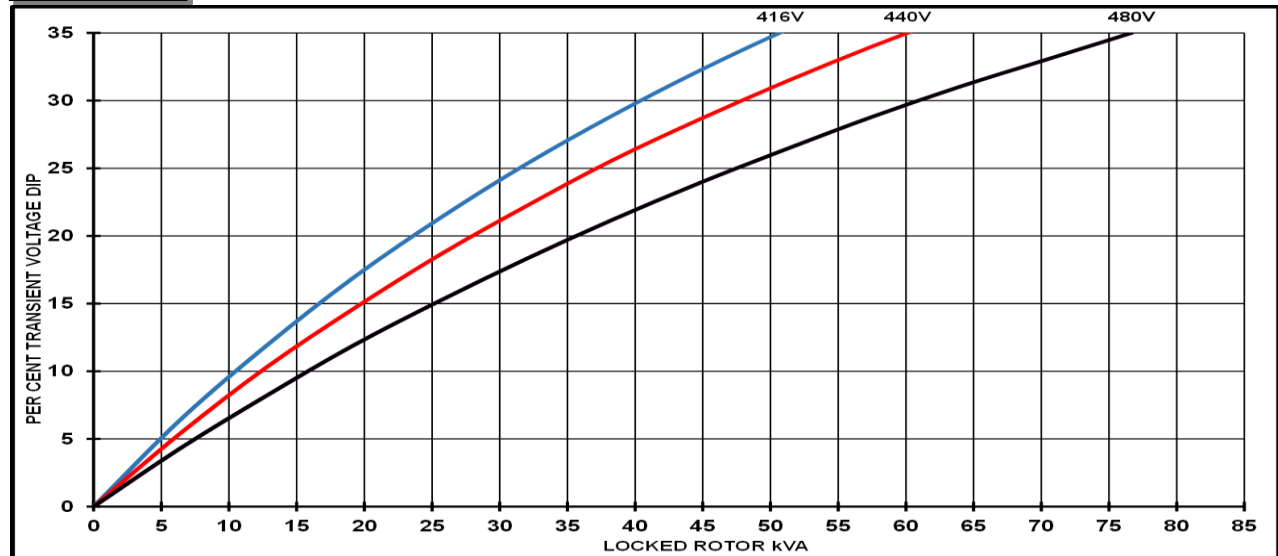
## S1L2-J1 Winding 311 / 711

### Locked Rotor Motor Starting Curves

**50Hz**



**60Hz**



| Transient Voltage Dip Scaling Factor |        | Transient Voltage Rise Scaling Factor         |
|--------------------------------------|--------|---|
| PF                                   | Factor | For voltage rise multiply voltage dip by 1.25 |
| < 0.5                                | 1.00   |   |
| 0.5                                  | 0.97   |   |
| 0.6                                  | 0.93   |   |
| 0.7                                  | 0.90   |   |
| 0.8                                  | 0.85   |   |
| 0.9                                  | 0.83   |   |
| 1.0                                  | 0.80   |   |

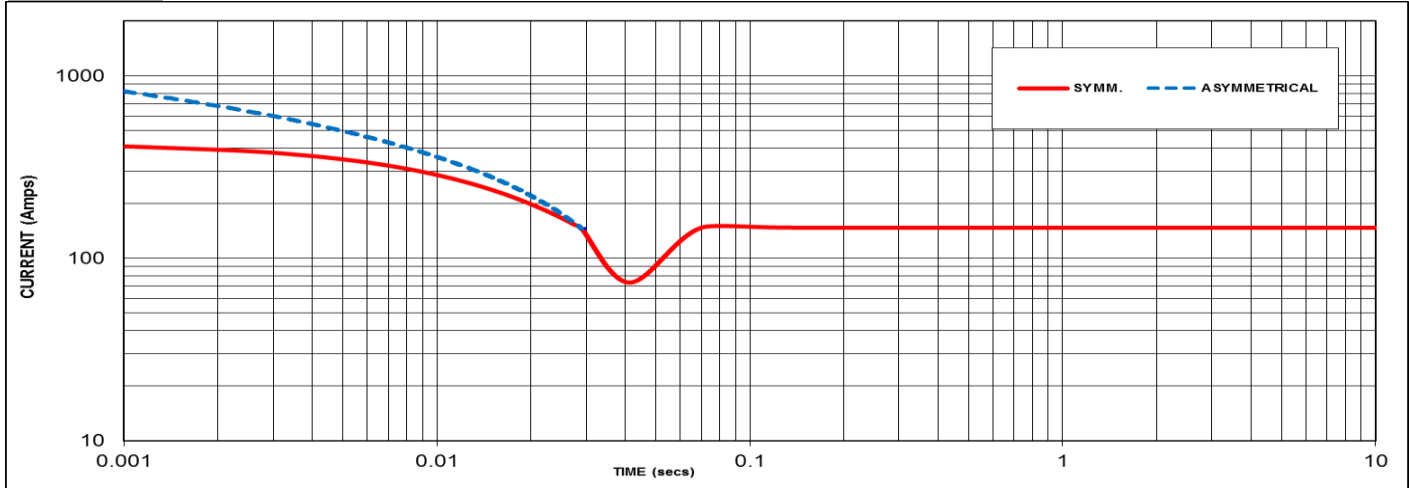
# STAMFORD®

## S1L2-J1 Winding 711

### Three-phase Short Circuit Decrement Curve

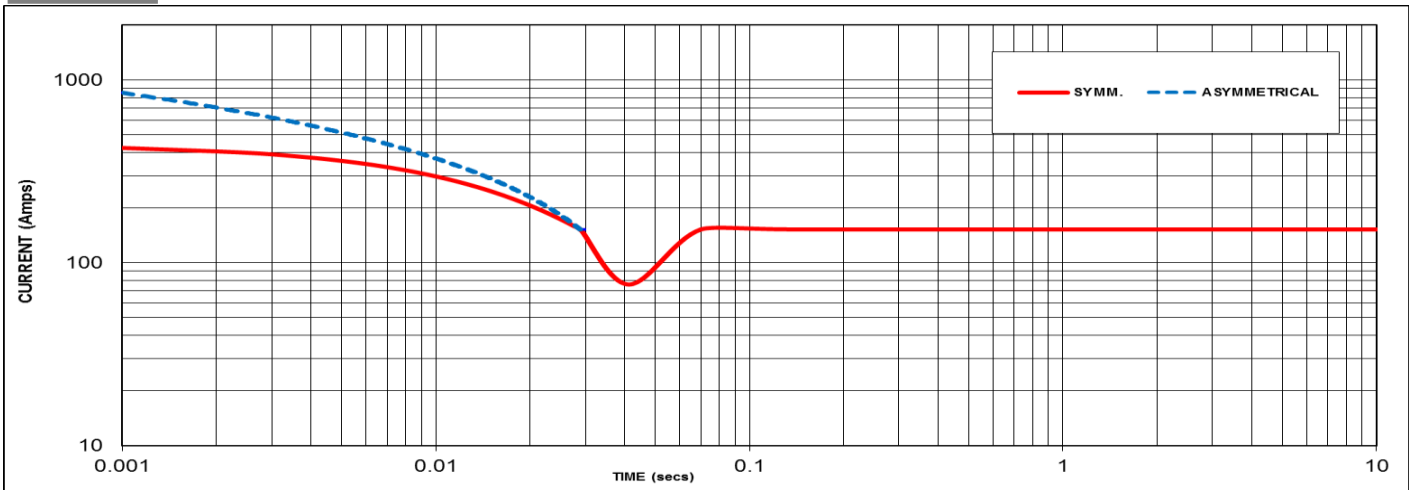
**Note: Applicable only for Winding 711 ( Auxiliary winding).  
Winding 311 (no Auxiliary winding) will not provide short circuit capability.**

**50Hz**



Sustained Short Circuit = 147 Amps

**60Hz**



Sustained Short Circuit = 152 Amps

**Note 1**

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

| 50Hz    |        | 60Hz    |        |
|---------|--------|---------|--------|
| Voltage | Factor | Voltage | Factor |
| 380V    | N/A    | 416V    | X 1.00 |
| 400V    | X 1.00 | 440V    | X 1.06 |
| 415v    | X 1.04 | 460V    | N/A    |
| 440V    | N/A    | 480V    | X 1.15 |

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**

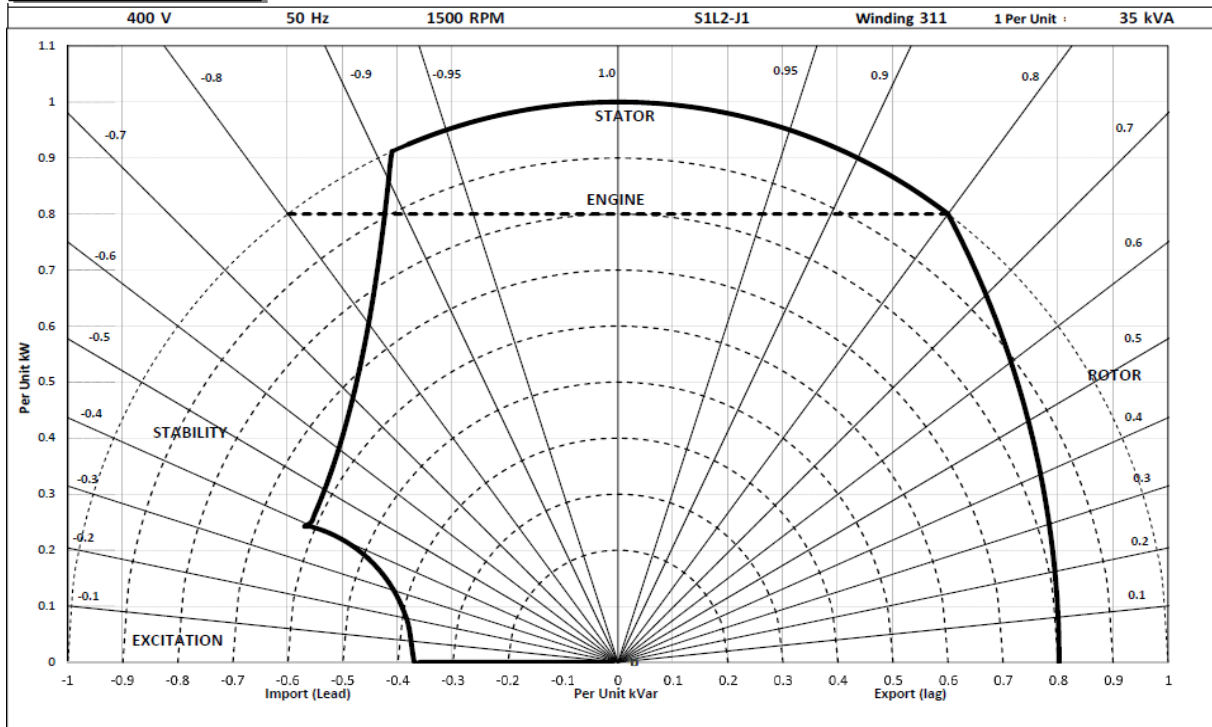
Curves are drawn for Star connected machines under no-load excitation at rated speeds. For other connection the following multipliers should be applied to current values as shown :  
Parallel Star = Curve current value X 2  
Series Delta = Curve current value X 1.732

# STAMFORD

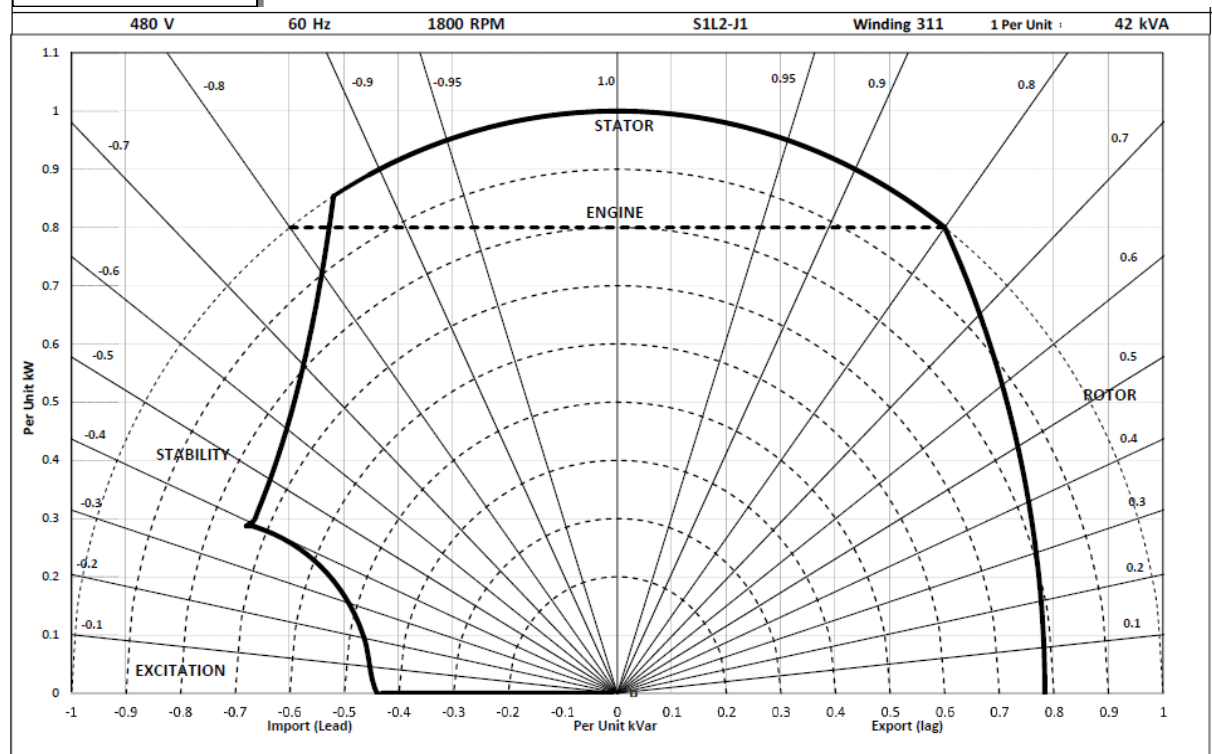
S1L2-J1 Winding 311/711

## Typical Alternator Operating Charts

**400V/50Hz**



**480V/60Hz**



# STAMFORD®

## S1L2-J1 Winding 311 / 711

### RATINGS AT 0.8 POWER FACTOR

| Class - Temp Rise |                   | Standby - 163/27°C |      |      |     | Standby - 150/40°C |      |      |     | Cont. H - 125/40°C |      |      |     | Cont. F - 105/40°C |      |      |     |
|-------------------|-------------------|--------------------|------|------|-----|--------------------|------|------|-----|--------------------|------|------|-----|--------------------|------|------|-----|
| <b>50<br/>Hz</b>  | Series Star (V)   | 380                | 400  | 415  | 440 | 380                | 400  | 415  | 440 | 380                | 400  | 415  | 440 | 380                | 400  | 415  | 440 |
|                   | Parallel Star (V) | 190                | 200  | 208  | 220 | 190                | 200  | 208  | 220 | 190                | 200  | 208  | 220 | 190                | 200  | 208  | 220 |
|                   | Series Delta (V)  | 220                | 230  | 240  | 254 | 220                | 230  | 240  | 254 | 220                | 230  | 240  | 254 | 220                | 230  | 240  | 254 |
|                   | kVA               | 35.3               | 38.5 | 38.5 | N/A | 34.3               | 37.5 | 37.5 | N/A | 32.0               | 35.0 | 35.0 | N/A | 29.2               | 31.9 | 31.9 | N/A |
|                   | kW                | 28.2               | 30.8 | 30.8 | N/A | 27.4               | 30.0 | 30.0 | N/A | 25.6               | 28.0 | 28.0 | N/A | 23.4               | 25.5 | 25.5 | N/A |
|                   | Efficiency (%)    | 87.3               | 86.9 | 87.1 | N/A | 87.6               | 87.2 | 87.4 | N/A | 88.4               | 88.1 | 88.2 | N/A | 89.1               | 88.8 | 89.0 | N/A |
|                   | kW Input          | 32.4               | 35.5 | 35.4 | N/A | 31.3               | 34.4 | 34.3 | N/A | 29.0               | 31.8 | 31.7 | N/A | 26.2               | 28.7 | 28.7 | N/A |

|                  |                   |      |      |     |      |      |      |     |      |      |      |     |      |      |      |     |      |
|------------------|-------------------|------|------|-----|------|------|------|-----|------|------|------|-----|------|------|------|-----|------|
| <b>60<br/>Hz</b> | Series Star (V)   | 416  | 440  | 460 | 480  | 416  | 440  | 460 | 480  | 416  | 440  | 460 | 480  | 416  | 440  | 460 | 480  |
|                  | Parallel Star (V) | 208  | 220  | 230 | 240  | 208  | 220  | 230 | 240  | 208  | 220  | 230 | 240  | 208  | 220  | 230 | 240  |
|                  | Delta (V)         | 240  | 254  | 266 | 277  | 240  | 254  | 266 | 277  | 240  | 254  | 266 | 277  | 240  | 254  | 266 | 277  |
|                  | kVA               | 40.7 | 43.1 | N/A | 46.2 | 39.5 | 41.9 | N/A | 45.0 | 37.0 | 39.2 | N/A | 42.0 | 33.6 | 35.7 | N/A | 38.2 |
|                  | kW                | 32.6 | 34.5 | N/A | 37.0 | 31.6 | 33.5 | N/A | 36.0 | 29.6 | 31.4 | N/A | 33.6 | 26.9 | 28.6 | N/A | 30.6 |
|                  | Efficiency (%)    | 88.3 | 88.2 | N/A | 88.1 | 88.6 | 88.5 | N/A | 88.4 | 89.3 | 89.3 | N/A | 89.2 | 90.0 | 90.0 | N/A | 89.9 |
|                  | kW Input          | 36.9 | 39.1 | N/A | 41.9 | 35.7 | 37.9 | N/A | 40.7 | 33.1 | 35.1 | N/A | 37.7 | 29.9 | 31.7 | N/A | 34.0 |

#### De-Rates

All values tabulated above are subject to the following reductions:

- 3% for every 500 meters by which the operating altitude exceeds 1000 meters above mean sea level
- 3% for every 5°C by which the operational ambient temperature exceeds 40°C
- For any other operating conditions impacting the cooling circuit please refer to applications

Note: Requirement for operating in an ambient exceeding 60°C and altitude exceeding 4000 meters must be referred to applications.

#### Dimensional and Torsional Drawing

For dimensional and torsional information please refer to the alternator General Arrangement and rotor drawings available on our website (<http://stamford-avk.com/>)

**Note:** Continuous development of our products means that the information contained in our data sheets can change without notice, and specifications should always be confirmed with Cummins Generator Technologies prior to purchase.



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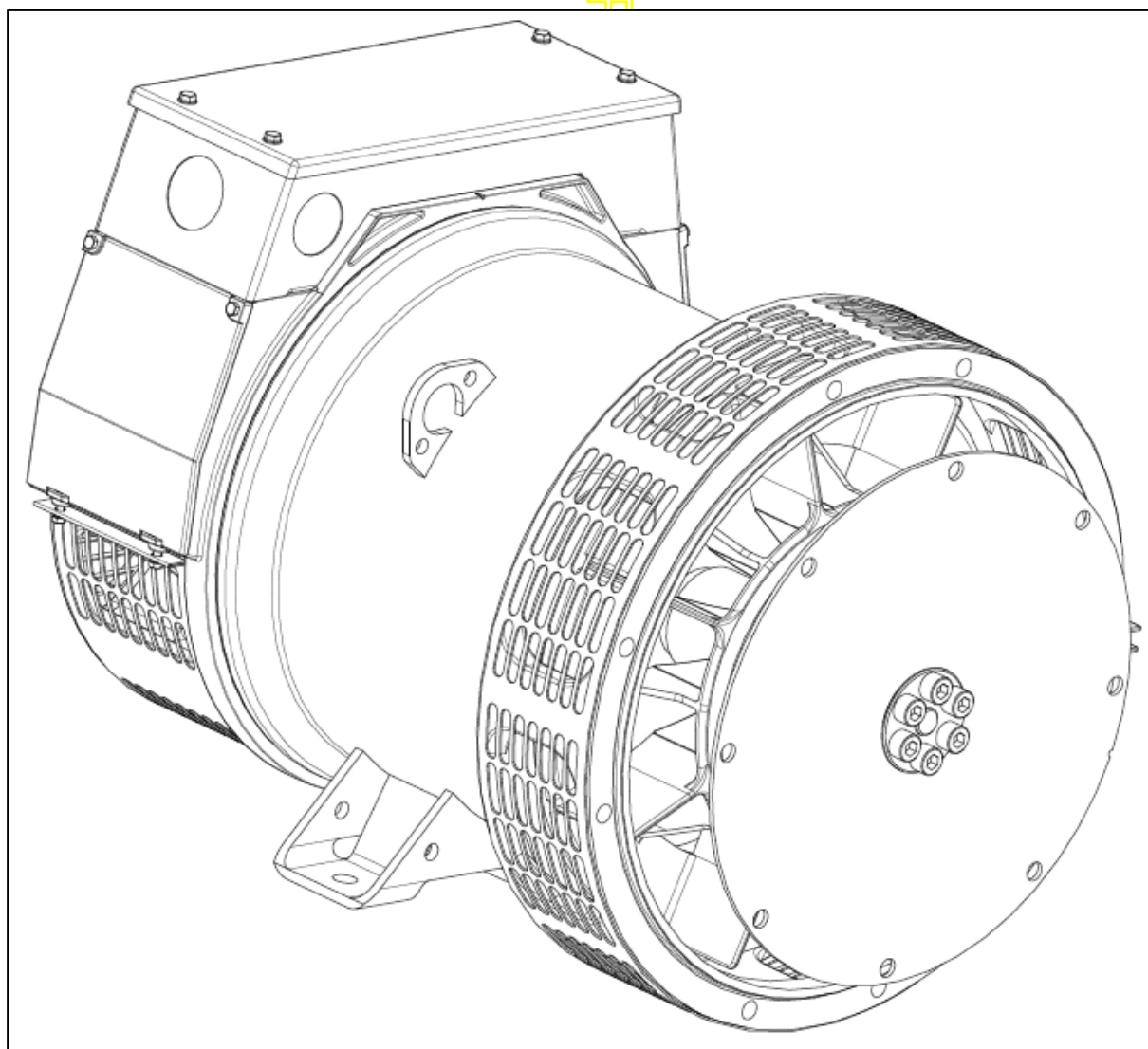




# STAMFORD®

**PI144E - Winding 17**

Technical Data Sheet



APPROVED DOCUMENT

**PI144E  
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 REGULATOR**

**AS480 AVR fitted as STANDARD**

With this self-excited system the main stator provides power via the 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 AS480 will support limited accessories, RFI suppression remote voltage trimmer and for the P1 range only a 'droop' Current Transformer (CT) to permit parallel operation with other ac generators.

The AVR is can be fitted to either side of the generator in its own housing in the non-drive end bracket.

**Excitation Boost System (EBS) (OPTIONAL)**

The EBS is a single, self-contained unit, attached to the non-drive end of the generator.

The EBS unit consists of the Excitation Boost Controller (EBC) and an Excitation Boost Generator (EBG). Under fault conditions, or when the generator is subjected to a large impact load such as a motor starting, the generator voltage will drop. The EBC senses the drop in voltage and engages the output power of the EBG. This additional power feeds the generator's excitation system, supporting the load until breaker discrimination can remove the fault or enable the generator to pick up a motor and drive the voltage recovery.

**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 at the non-drive end of the generator. Dedicated single phase generators are also available. A sheet steel terminal box contains provides ample space for the customers' wiring and gland arrangements. Alternative terminal boxes are available for customers who want to fit additional components in the terminal box.

**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.

5% For reverse rotation  
(Standard rotation CW when viewed from DE)

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

*Front cover drawing typical of product range.*

APPROVED DOCUMENT

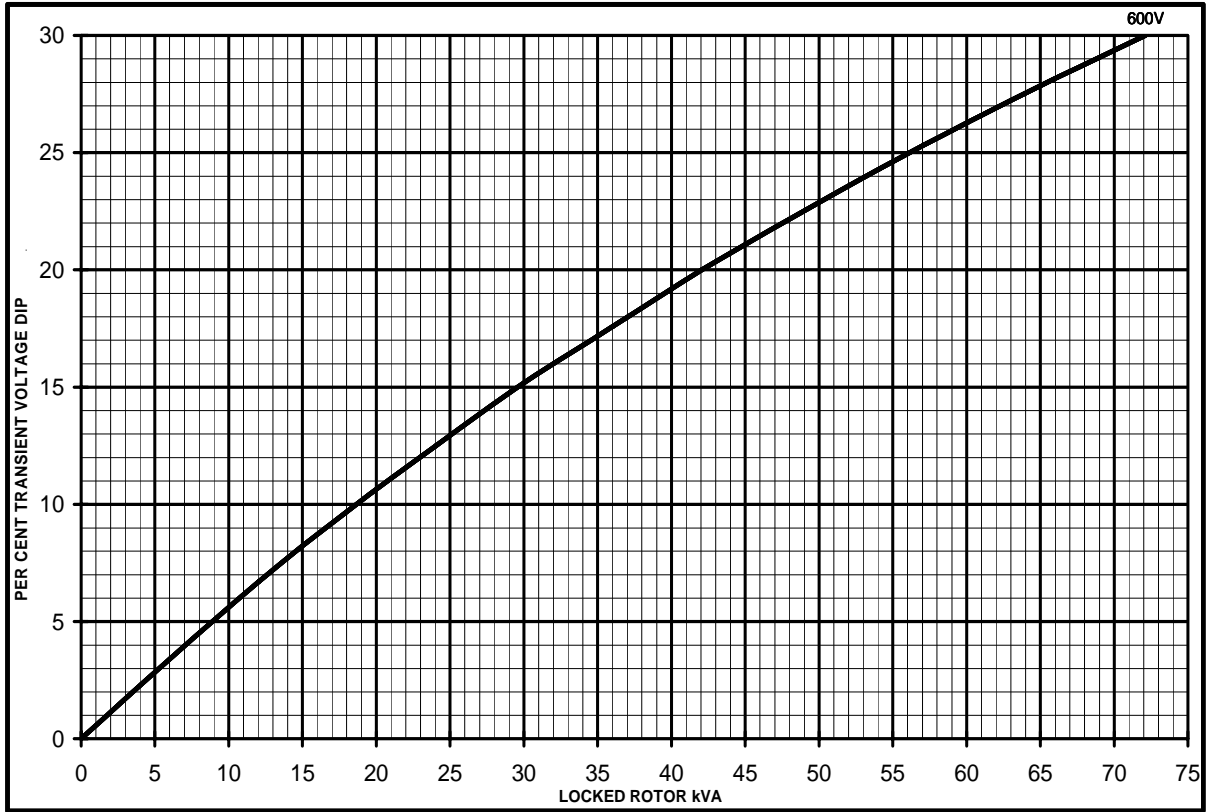
PI144E  
WINDING 17

|  |  |   |                         |
|--|--|---|-------------------------|
| CONTROL SYSTEM                           | STANDARD AS480 AVR (SELF EXCITED)  |   |                         |
| VOLTAGE REGULATION                       | ± 1.0 %  |   |                         |
| SUSTAINED SHORT CIRCUIT                  | SELF EXCITED MACHINES DO NOT SUSTAIN A SHORT CIRCUIT CURRENT                         |   |                         |
| CONTROL SYSTEM                           | AS480 AVR WITH OPTIONAL EXCITATION BOOST SYSTEM (EBS)                                |   |                         |
| SUSTAINED SHORT CIRCUIT                  | REFER TO SHORT CIRCUIT DECREMENT CURVE (page 5)                                      |   |                         |
| INSULATION SYSTEM                        | CLASS H  |   |                         |
| PROTECTION                               | IP23   |   |                         |
| RATED POWER FACTOR                       | 0.8  |   |                         |
| STATOR WINDING                           | DOUBLE LAYER CONCENTRIC  |   |                         |
| WINDING PITCH                            | TWO THIRDS   |   |                         |
| WINDING LEADS                            | 12   |   |                         |
| STATOR WDG. RESISTANCE                   | 0.454 Ohms PER PHASE AT 22°C SERIES STAR CONNECTED                                   |   |                         |
| ROTOR WDG. RESISTANCE                    | 0.67 Ohms at 22°C  |   |                         |
| EXCITER STATOR RESISTANCE                | 19.4 Ohms at 22°C  |   |                         |
| EXCITER ROTOR RESISTANCE                 | 0.215 Ohms PER PHASE AT 22°C   |   |                         |
| EBS STATOR RESISTANCE                    | 12.9 Ohms at 22°C  |   |                         |
| R.F.I. SUPPRESSION                       | BS EN 61000-6-2 & BS EN 61000-6-4, VDE 0875G, VDE 0875N. refer to factory for others |   |                         |
| WAVEFORM DISTORTION                      | NO LOAD < 1.5% NON-DISTORTING LINEAR LOAD < 5.0%                                     |   |                         |
| MAXIMUM OVERSPEED                        | 2250 Rev/Min   |   |                         |
| BEARING DRIVE END                        | BALL. 6309-2RS (ISO)   |   |                         |
| BEARING NON-DRIVE END                    | BALL. 6306-2RS (ISO)   |   |                         |
|  | 1 BEARING  |   | 2 BEARING               |
|  | WITH EBS   | WITHOUT EBS   | WITH EBS                |
|  |  |   | WITHOUT EBS             |
| WEIGHT COMP. GENERATOR                   | 135 kg   | 133.3 kg  | 138 kg                  |
| WEIGHT WOUND STATOR                      | 55 kg  | 55 kg   | 55 kg                   |
| WEIGHT WOUND ROTOR                       | 47.24 kg   | 45.54 kg  | 48.24 kg                |
| WR <sup>2</sup> INERTIA                  | 0.1771 kgm <sup>2</sup>  | 0.1754 kgm <sup>2</sup>                             | 0.1772 kgm <sup>2</sup> |
| SHIPPING WEIGHTS in a crate              | 152 kg   | 150.3 kg  | 161 kg                  |
|  |  |   | 159.3 kg                |
| PACKING CRATE SIZE                       | 71 x 51 x 67 (cm)  |   | 71 x 51 x 67 (cm)       |
| TELEPHONE INTERFERENCE                   | THF<2%   |   | TIF<50                  |
| COOLING AIR                              | 0.122 m <sup>3</sup> /sec 251 cfm  |   |                         |
| VOLTAGE SERIES STAR                      | 600  |   |                         |
| kVA BASE RATING FOR REACTANCE VALUES     | 31.3   |   |                         |
| X <sub>d</sub> DIR. AXIS SYNCHRONOUS     | 1.8  |   |                         |
| X' <sub>d</sub> DIR. AXIS TRANSIENT      | 0.16   |   |                         |
| X'' <sub>d</sub> DIR. AXIS SUBTRANSIENT  | 0.12   |   |                         |
| X <sub>q</sub> QUAD. AXIS REACTANCE      | 0.84   |   |                         |
| X'' <sub>q</sub> QUAD. AXIS SUBTRANSIENT | 0.19   |   |                         |
| X <sub>L</sub> LEAKAGE REACTANCE         | 0.07   |   |                         |
| X <sub>2</sub> NEGATIVE SEQUENCE         | 0.15   |   |                         |
| X <sub>0</sub> ZERO SEQUENCE             | 0.08   |   |                         |
| REACTANCES ARE SATURATED                 |  | VALUES ARE PER UNIT AT RATING AND VOLTAGE INDICATED |                         |
| T <sub>d</sub> TRANSIENT TIME CONST.     | 0.02 s   |   |                         |
| T'' <sub>d</sub> SUB-TRANSTIME CONST.    | 0.005 s  |   |                         |
| T <sub>do</sub> O.C. FIELD TIME CONST.   | 0.45 s   |   |                         |
| T <sub>a</sub> ARMATURE TIME CONST.      | 0.007 s  |   |                         |
| SHORT CIRCUIT RATIO                      | 1/X <sub>d</sub>   |   |                         |

APPROVED DOCUMENT

PI144E  
Winding 17  
Locked Rotor Motor Starting Curves

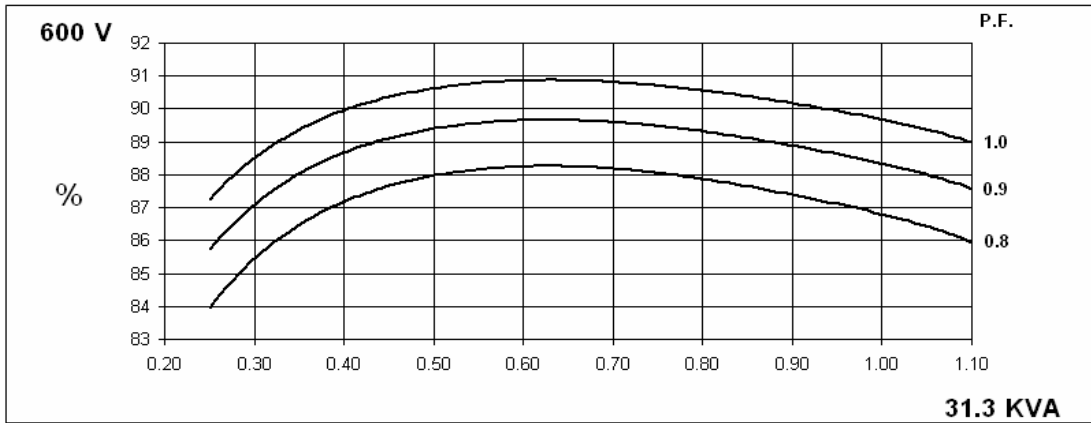
**AS480 AVR Without EBS**



**AS480 AVR With EBS**

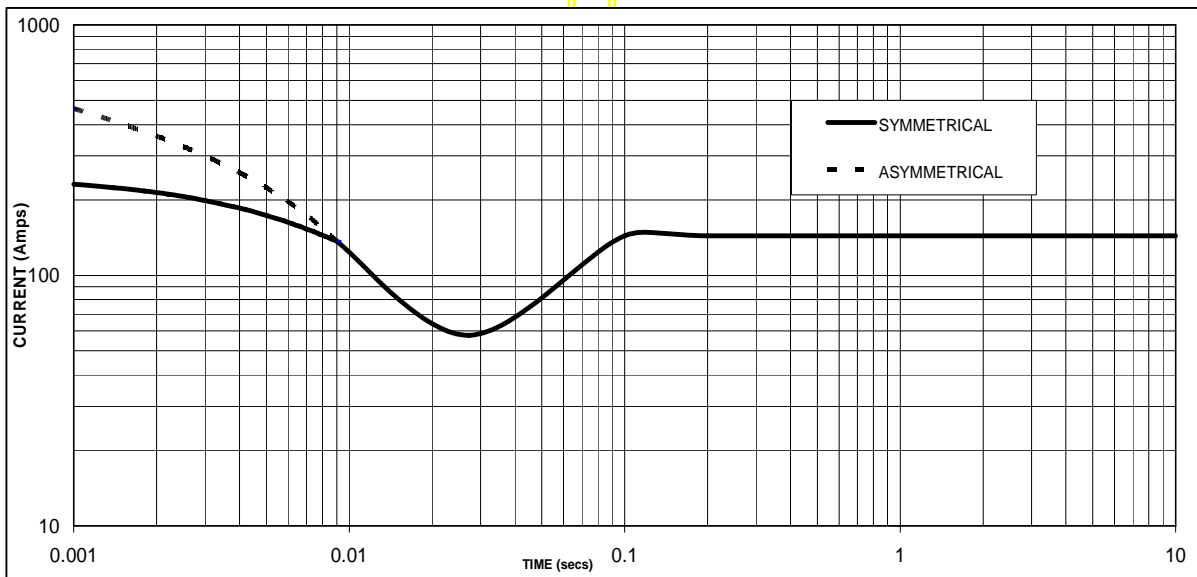


**THREE PHASE EFFICIENCY CURVES**



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

**WITH EBS FITTED**



Sustained Short Circuit = 144 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

**PI144E**  
**Winding 17 / 0.8 Power Factor**

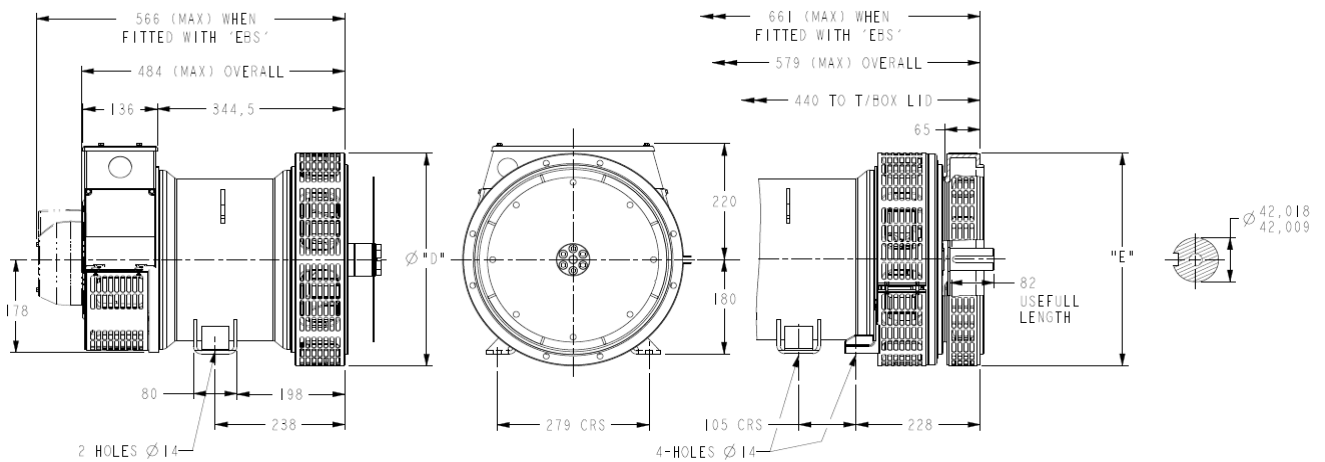
**60Hz**

**RATINGS**

| Class - Temp Rise     | Cont. F - 105/40°C | Cont. H - 125/40°C | Standby - 150/40°C | Standby - 163/27°C |
|-----------------------|--------------------|--------------------|--------------------|--------------------|
| Series Star (V)       | 600                | 600                | 600                | 600                |
| Parallel StarStar (V) | 300                | 300                | 300                | 300                |
| Series Delta (V)      | 346                | 346                | 346                | 346                |
| kVA                   | 28.2               | 31.3               | 32.9               | 34.1               |
| kW                    | 22.6               | 25.0               | 26.3               | 27.3               |
| Efficiency (%)        | 87.4               | 86.8               | 86.4               | 86.1               |
| kW Input              | 25.9               | 28.8               | 30.4               | 31.7               |

APPROXIMATE

**DIMENSIONS**



| COUPLING DISC |      |
|---------------|------|
| SAE           | "AN" |
| 6.5           | 30.2 |
| 7.5           | 30.2 |
| 8             | 62   |
| 10            | 53.8 |
| 11.5          | 39.6 |

| 1-BRG ADAPTOR |     |
|---------------|-----|
| SAE           | "D" |
| 5             | 361 |
| 4             | 405 |
| 3             | 451 |
| 2             | 489 |

8-HOLES SPACED AS I2  
 8-HOLES SPACED AS I2

| 2-BRG ADAPTOR |     |
|---------------|-----|
| SAE           | "E" |
| 5             | 359 |
| 4             | 406 |
| 3             | 455 |
| 2             | 493 |

APPROVED DOCUMENT

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# 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

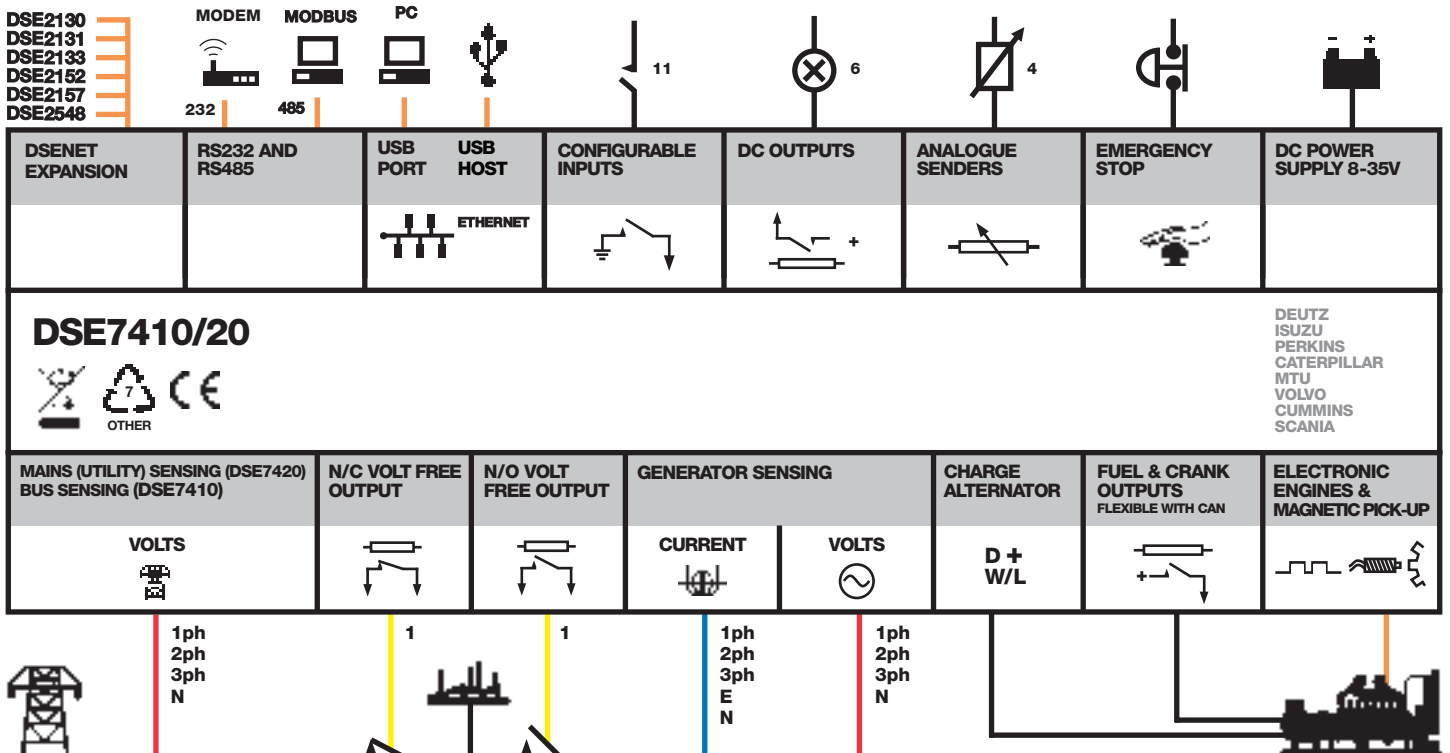
#### SHOCK

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

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**TELEPHONE** +44 (0) 1723 890099 **FACSIMILE** +44 (0) 1723 893303  
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**TELEPHONE** +1 (815) 316 8706 **FACSIMILE** +1 (815) 316 8708  
**EMAIL** sales@deepseausa.com **WEBSITE** www.deepseausa.com

# GUEST® Genset Chargers



**G**uest chargers are proven performers in genset applications. For specific application information, or if you are developing a new product, be sure to consult with the Guest applications engineering team to ensure the correct charger is specified.

## Genset Chargers

| MODEL                                   | TOTAL AMPS | OUT-PUTS | AMPS PER OUTPUT | BATTERY SYSTEM | INPUT VOLTAGE        | AC  | DC   | DIMENSIONS         | WT. (LBS) | AGENCY LISTING    |
|---|------------|----------|-----------------|----------------|----------------------|---|--|--------------------|-----------|-------------------|
| 2602A-12                                | 2          | 1        | 2               | 12V            | 100 - 130<br>50/60Hz | 6' w/<br>Connect-<br>Charge plug                | 4' w/ ring<br>terminals                      | 2.9" x 5.1" x 1.5" | 2         | UL                |
| 2602A-12-B (bulk)                       |            |          |                 |                |                      |   |  |                    |           |                   |
| 2605A-1-24RT-01<br>(bulk pack only) (1) | 5          | 1        | 5               | 24V            | 100 - 130<br>50/60Hz | 6' SJT 18-3<br>w/ Connect-<br>Charge plug       | 6' SJT 18-3<br>w/ ring<br>terminals          | 7.4" x 6.3" x 2.4" | 4.5       | UL                |
| 2608A-B-01<br>(bulk pack only) (1)      | 6          | 1        | 6               | 12V            | 100 - 130<br>50/60Hz | 6' cable w/<br>molded plug<br>rated -40 to 105C | 4' w/ ring<br>terminals<br>rated -40 to 105C | 3.5" x 6.4" x 2.3" | 4         | UL                |
| 2610A                                   | 10         | 2        | 5/5             | 12V+12V        | 100 - 130<br>50/60Hz | Studs   | Studs  | 5.5" x 7.8" x 2.4" | 5.6       | -                 |
| 2610A-B (bulk)                          |            |          |                 |                |                      |   |  |                    |           | UL<br>(bulk only) |

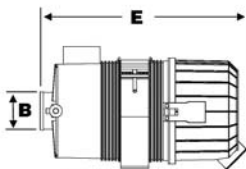
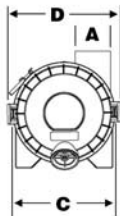
(1) 2-stage charging



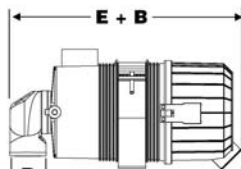
Individual agency listings as shown in product chart.

# Plastic Magna Seal Air Cleaners

**Internal or External Evacuator Valve**  
**High Strength Polymer**  
**Working Temp -40c to +80c (-40F to 176F)**  
**Design Compatibility with other Manufacturers**  
**Industry Standard elements**  
**Can be Mounted Vertical or Horizontal**



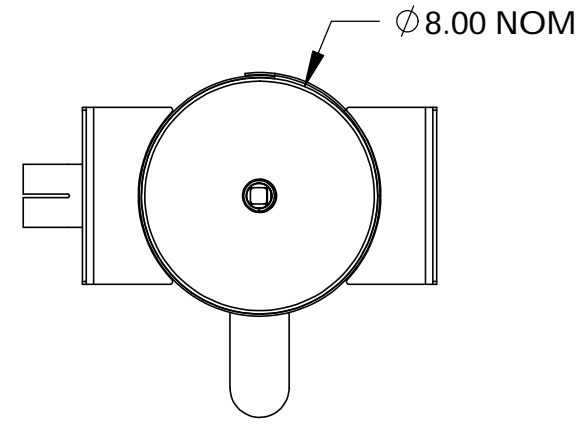
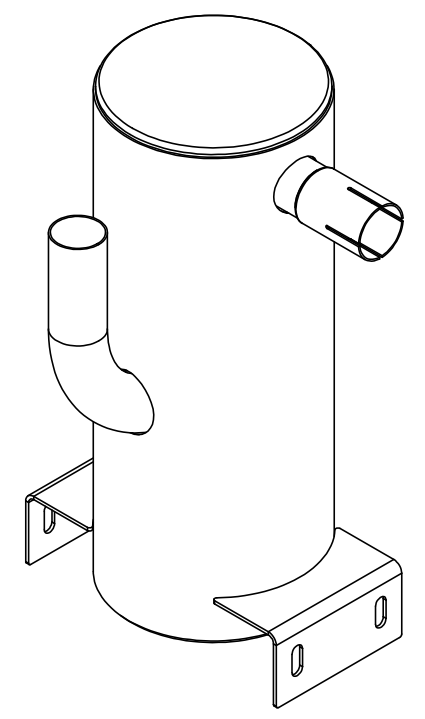
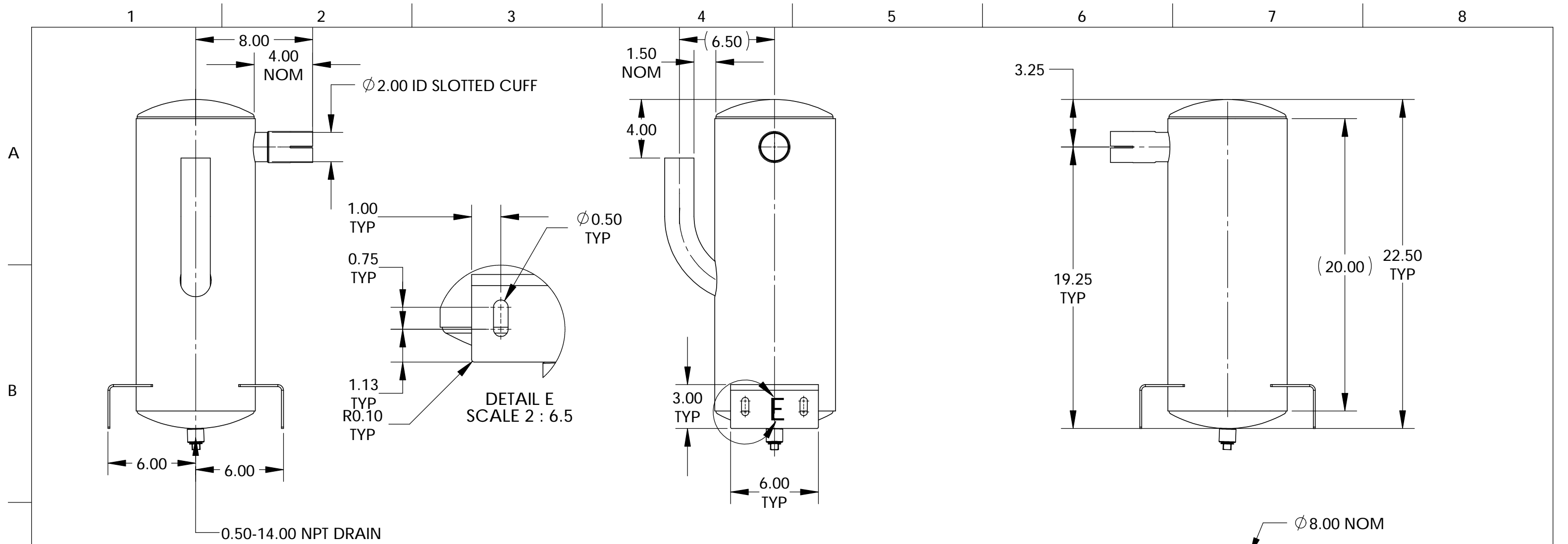
**Type 1  
Straight Outlet**




**Type 2  
90° Outlet**

Air Cleaner Assembly

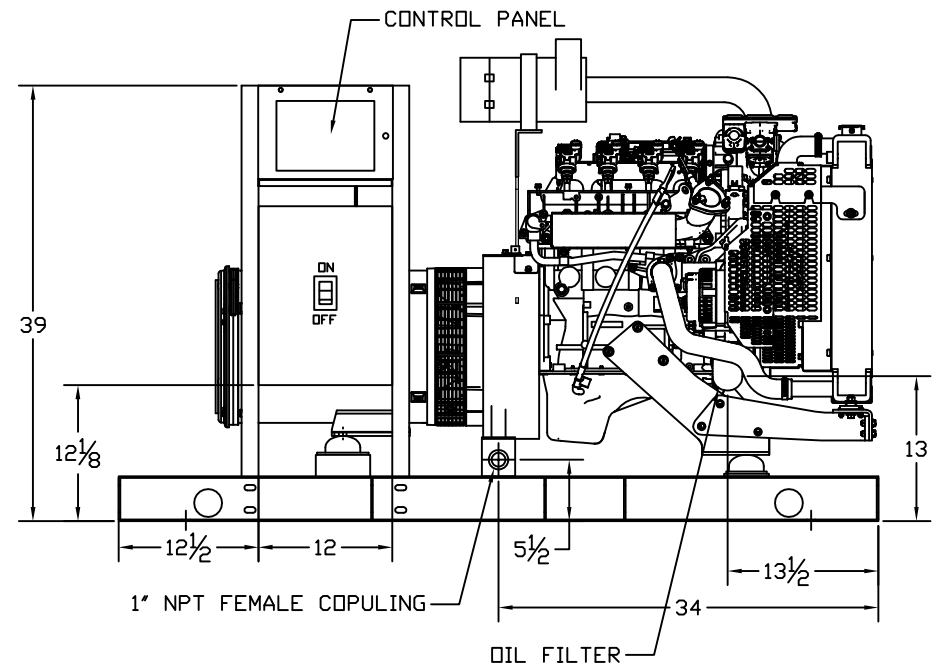
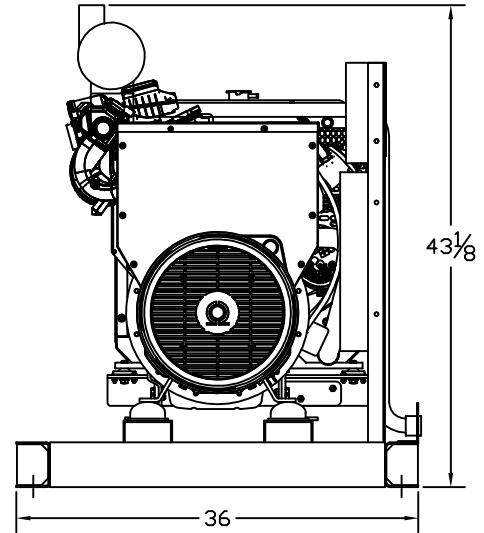
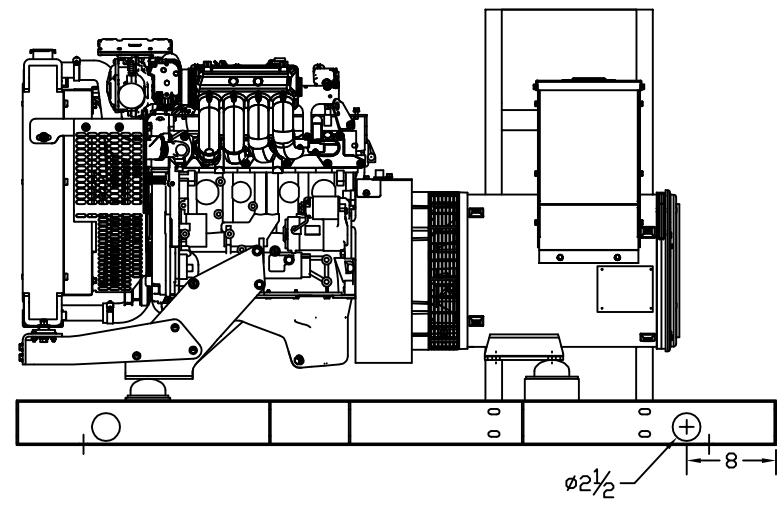
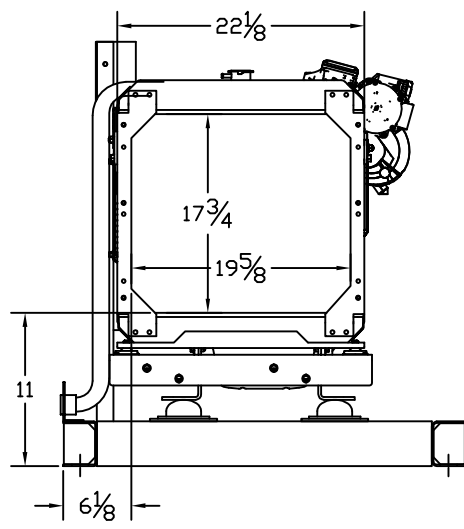
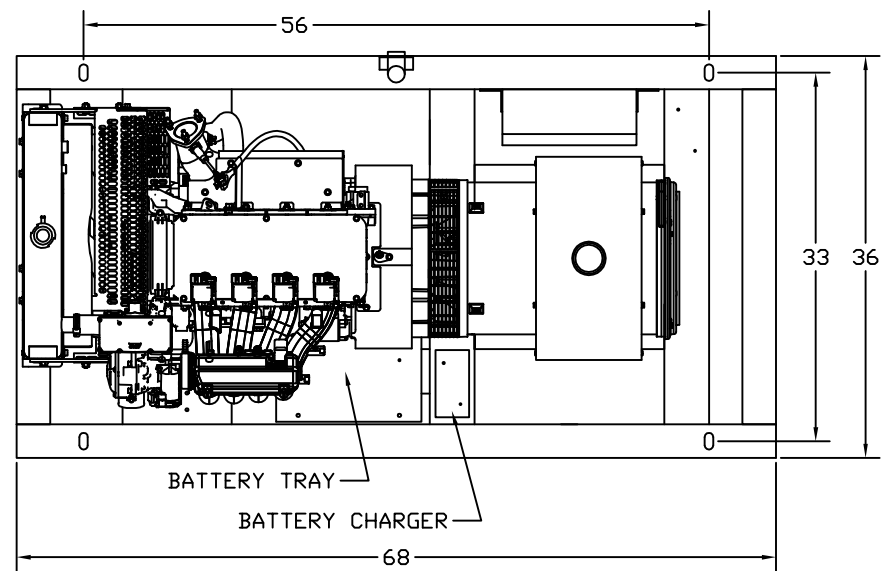
| Model Number  | Part Number | Type | Initial Restriction |            |            |            |             |             | A             |             | B              |              | C     |     | D     |     | E     |     |
|---------------|-------------|------|---------------------|------------|------------|------------|-------------|-------------|---------------|-------------|----------------|--------------|-------|-----|-------|-----|-------|-----|
|               |             |      | 6" H2O CFM          | 6" H2O M3m | 8" H2O CFM | 8" H2O M3m | 10" H2O CFM | 10" H2O M3m | OD Inlet inch | OD Inlet mm | OD Outlet inch | OD Outlet mm | inch  | mm  | inch  | mm  | inch  | mm  |
| 2s-FW-E1      | 68110       | 1    | 75                  | 2.1        | 90         | 2.5        | 105         | 3.0         | 2.00          | 51          | 1.75           | 45           | 4.8   | 122 | 6.14  | 156 | 8.98  | 228 |
| 2s-FW-E2      | 68111       | 1    | 65                  | 1.8        | 75         | 2.1        | 85          | 2.4         | 2.00          | 51          | 1.75           | 45           | 4.80  | 122 | 6.14  | 156 | 8.98  | 228 |
| 2s-FW-E1-90   | 68103       | 2    | 63                  | 1.7        | 73         | 2.0        | 82          | 2.3         | 2.00          | 51          | 1.75           | 45           | 4.80  | 122 | 6.14  | 156 | 10.43 | 265 |
| 2s-FW-E2-90   | 68107       | 2    | 53                  | 1.5        | 63         | 1.8        | 71          | 2.0         | 2.00          | 51          | 1.75           | 45           | 4.80  | 122 | 6.14  | 156 | 10.43 | 265 |
| 2-FW-E1       | 68120       | 1    | 100                 | 2.8        | 115        | 3.3        | 130         | 3.7         | 2.00          | 51          | 2.00           | 51           | 5.75  | 146 | 7.09  | 180 | 13.39 | 340 |
| 2-FW-E2       | 68130       | 1    | 90                  | 2.5        | 105        | 3.0        | 115         | 3.3         | 2.00          | 51          | 2.00           | 51           | 5.75  | 146 | 7.09  | 180 | 13.39 | 340 |
| 2-FW-E1-90    | 68116       | 2    | 88                  | 2.4        | 102        | 2.9        | 113         | 3.2         | 2.00          | 51          | 2.00           | 51           | 5.75  | 146 | 7.09  | 180 | 14.96 | 380 |
| 2-FW-E2-90    | 68127       | 2    | 77                  | 2.2        | 92         | 2.6        | 103         | 2.9         | 2.00          | 51          | 2.00           | 51           | 5.75  | 146 | 7.09  | 180 | 14.96 | 380 |
| 2.5-FW-E1     | 68132       | 1    | 150                 | 4.2        | 175        | 5.0        | 195         | 5.5         | 2.50          | 63.5        | 2.50           | 63.5         | 6.89  | 175 | 8.15  | 207 | 14.13 | 359 |
| 2.5-FW-E2     | 68133       | 1    | 145                 | 4.1        | 165        | 4.7        | 185         | 5.2         | 2.50          | 63.5        | 2.50           | 63.5         | 6.89  | 175 | 8.15  | 207 | 14.13 | 359 |
| 2.5-FW-E1-90  | 68131       | 2    | 134                 | 3.8        | 156        | 4.4        | 175         | 5.0         | 2.50          | 63.5        | 2.50           | 63.5         | 6.89  | 175 | 8.15  | 207 | 16.22 | 412 |
| 2.5-FW-E2-90  | 68134       | 2    | 127                 | 3.6        | 148        | 4.2        | 168         | 4.7         | 2.50          | 63.5        | 2.50           | 63.5         | 6.89  | 175 | 8.15  | 207 | 16.22 | 412 |
| 3-FW-E1       | 68140       | 1    | 160                 | 4.5        | 190        | 5.4        | 210         | 5.9         | 3.00          | 76          | 3.00           | 76           | 7.24  | 184 | 8.58  | 218 | 14.57 | 370 |
| 3-FW-E2       | 68150       | 1    | 150                 | 4.2        | 170        | 4.8        | 190         | 5.4         | 3.00          | 76          | 3.00           | 76           | 7.24  | 184 | 8.58  | 218 | 14.57 | 370 |
| 3-FW-E1-90    | 68140-2     | 2    | 154                 | 4.4        | 181        | 5.1        | 196         | 5.6         | 3.00          | 76          | 3.00           | 76           | 7.24  | 184 | 8.58  | 218 | 17.80 | 452 |
| 3-FW-E2-90    | 68150-2     | 2    | 138                 | 4.0        | 162        | 4.6        | 182         | 5.2         | 3.00          | 76          | 3.00           | 76           | 7.24  | 184 | 8.58  | 218 | 17.80 | 452 |
| 3.75-FW-E1    | 68160       | 1    | 250                 | 7.1        | 290        | 5.4        | 325         | 9.2         | 3.75          | 95          | 3.50           | 89           | 8.35  | 212 | 9.72  | 247 | 15.63 | 397 |
| 3.75-FW-E2    | 68170       | 1    | 225                 | 6.4        | 260        | 7.4        | 280         | 7.9         | 3.75          | 95          | 3.50           | 89           | 8.35  | 212 | 9.72  | 247 | 15.63 | 397 |
| 3.75-FW-E1-90 | 68157       | 2    | 212                 | 6.0        | 250        | 7.1        | 277         | 7.8         | 3.75          | 95          | 3.50           | 89           | 8.35  | 212 | 9.72  | 247 | 18.5  | 470 |
| 3.75-FW-E2-90 | 68167       | 2    | 188                 | 5.3        | 220        | 6.2        | 250         | 7.1         | 3.75          | 95          | 3.50           | 89           | 8.35  | 212 | 9.72  | 247 | 18.5  | 470 |
| 4.5-FW-E1     | 68175       | 1    | 375                 | 10.6       | 425        | 12.0       | 475         | 13.5        | 4.50          | 114         | 4.00           | 102          | 10.60 | 268 | 11.9  | 302 | 19.13 | 486 |
| 4.5-FW-E2     | 68175-1     | 1    | 325                 | 9.2        | 375        | 10.6       | 425         | 12.0        | 4.50          | 114         | 4.00           | 102          | 10.60 | 268 | 11.9  | 302 | 19.13 | 486 |
| 6-FW-E1       | 68178       | 1    | 600                 | 17.0       | 685        | 19.4       | 770         | 21.8        | 6.00          | 152         | 5.00           | 127          | 12.20 | 309 | 13.54 | 344 | 22.00 | 560 |
| 6-FW-E2       | 68179       | 1    | 500                 | 14.2       | 565        | 16.0       | 630         | 17.8        | 6.00          | 152         | 5.00           | 127          | 12.20 | 309 | 13.54 | 344 | 22.00 | 560 |
| 7-FW-E1       | 68182       | 1    | 800                 | 22.7       | 910        | 25.8       | 1060        | 30.0        | 7.00          | 178         | 6.00           | 152          | 15.50 | 394 | 16.80 | 427 | 21.50 | 545 |
| 7-FW-E2       | 68185       | 1    | 710                 | 20.1       | 830        | 23.5       | 960         | 27.2        | 7.00          | 178         | 6.00           | 152          | 15.50 | 394 | 16.80 | 427 | 21.50 | 545 |



|                             |  |  |                                |  |
|-----------------------------|--|--|--------------------------------|--|
| ENGINE INFORMATION          | SILENCER INFORMATION   | DRAWN BY   | DATE                           |                           |
| ENGINE MAKE<br>JOHN DEERE   | RESONATOR FREQUENCY<br>---                                       | CHECKED BY<br>CB   | 10/20/2017                     |  |
| ENGINE MODEL<br>3029TFG89   | RESONATOR ALPHA<br>---   | ENGINEERING<br>HKO   | 10/23/2017                     | DESCRIPTION<br>SIL: COMP CRIT CS S-E<br>2.00-2.00 Ø8.00<br>22.50 OAL F:4.00 ---<br>CONSTRUCTION MATERIAL<br>CS |
| DISPLACEMENT<br>177         | SILENCER Km<br>---   | MANUFACTURING<br>HKO   | 01/05/2018                     |  |
| EXHAUST FLOW<br>293         | SILENCER IL<br>---   | TOLERANCES UNLESS OTHERWISE SPECIFIED<br>.X = ±0.25 ALL ANGLES<br>.XX = ±0.125 ±1°<br>.XXX = ±0.0625<br>.XXXX = ±0.03125 | DATE<br>01/05/2018             | WEIGHT (LBS)<br>25   |
| EXHAUST TEMPERATURE<br>1076 | TOLERANCES DO NOT APPLY TO GAGE THICKNESS OR COMMERCIAL FEATURES | THIRD ANGLE PROJECTION   | SHEET<br>3 OF 3                | FINISH<br>HIGH TEMP BLACK PAINT  |
| CUSTOMER<br>---             | CUSTOMER P7/N<br>---   | MAX BACK PRESSURE<br>30  | PART NUMBER<br>500-008806      |  |
| REV.<br>A                   | BY<br>HKO  | DATE<br>01/05/2018   | DESCRIPTION<br>INITIAL RELEASE | ECO<br>---   |
|                             |  | RAW SOUND PRESSURE<br>---  |                                | SCALE (DO NOT SCALE)<br>1:6.5  |
|                             |  |  |                                | SHEET SIZE<br>B  |

| REV. | BY  | DATE       | DESCRIPTION     | ECO |
|------|-----|------------|-----------------|-----|
| A    | HKO | 01/05/2018 | INITIAL RELEASE | --- |

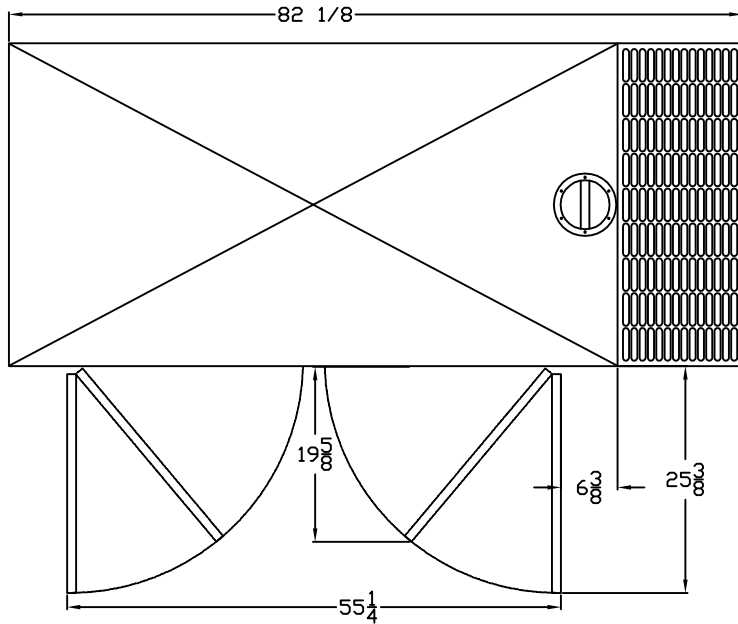
# OUTLINE DIMENSIONS FOR SP-250 OPEN GEN-SET



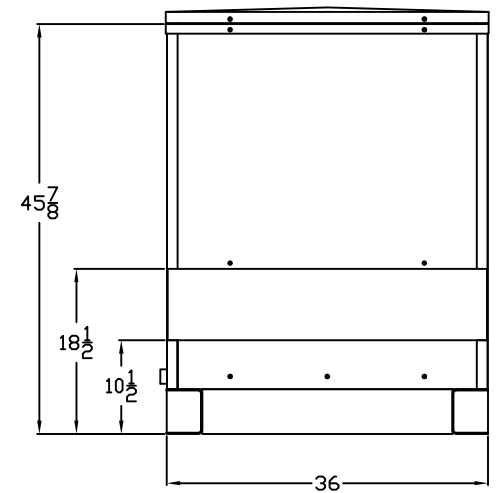
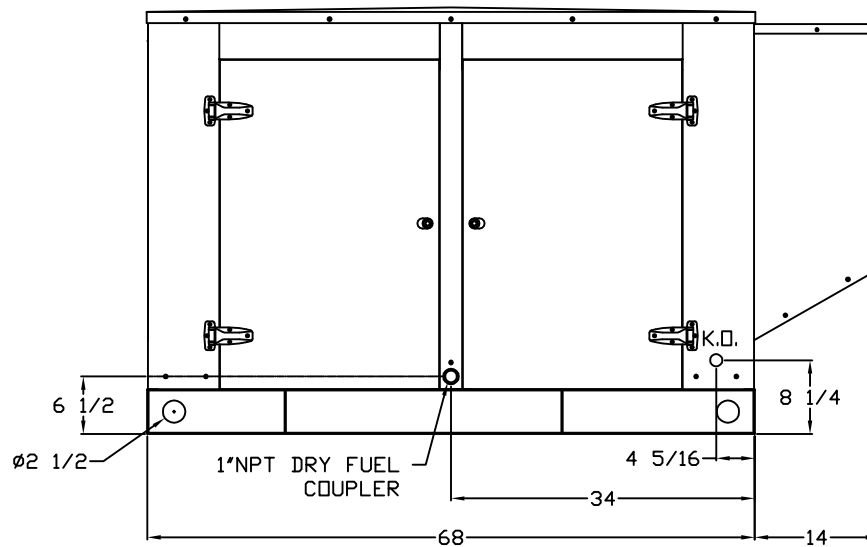
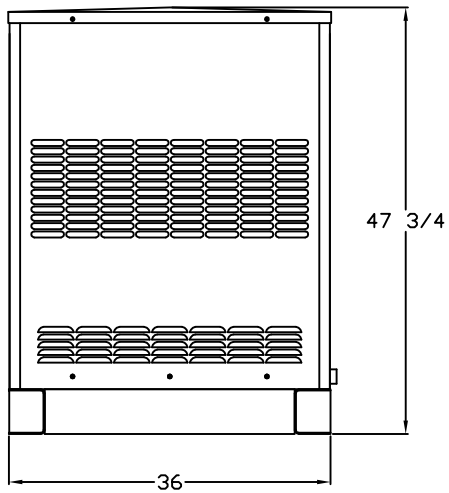
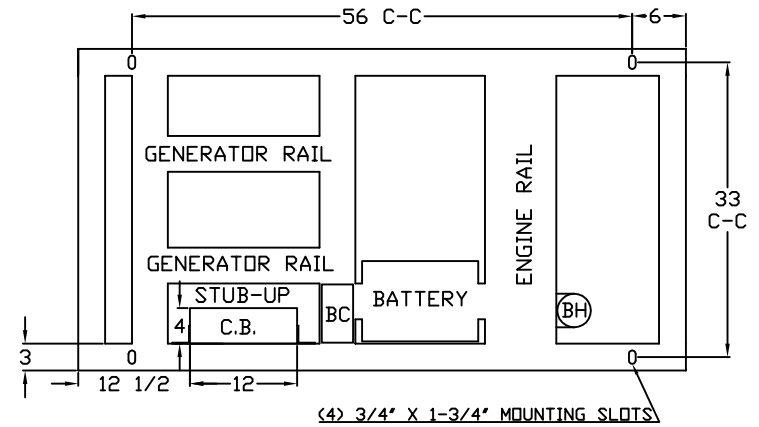
# OUTLINE DIMENSIONS FOR 20 THRU 30 KW LEVEL 2 ENCLOSURE (HINGED DOORS)

## TOP VIEW

(GEN-SET HAS (4) DOORS, (2) SHOWN OPEN ARE TYPICAL FOR BOTH SIDES)



## FRAME VIEW



## GENERATOR END VIEW

## SIDE VIEW

## RADIATOR END VIEW