SPRING LAKE PARK CITY HALL

MTU DIESEL GENERATOR SUBMITTAL DATA & DRAWINGS

Pride in Service

Provided by:

Interstate Power Systems

12568 Highview Avenue

Lakeville, MN 55044

Premier Service

Engines, Generators & Service

Pride in Service is not just a phrase. We have established a reputation for providing premier service to all the lines we represent, a reputation we are truly proud of.

MTU Onsite Energy

Premier Products

- Engines
  - MTU
  - Detroit
  - New & Repower
- Generators
  - MTU Onsite Energy
  - Atlas Copco
  - Gillette
- Service
  - All Makes & Models
  - Load Banking
  - Flexible Contracts

Premier Value

- Engine Application Specialists
- Systems Integration
- ”Turn Key” Installations
- Technical Support & Training
- 24-Hour Service
- 14 Full-Service Locations

Premier Technicians

- 675 Technicians on Staff
- Factory-trained & Certified Technicians
- Comprehensive Guild Programs

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Power Generation

PERFORMANCE ASSURANCE CERTIFICATION

A Rolls-Royce solution

TESTING PROCEDURES

Prototype

We have been producing superior generator sets for more than six decades. Understanding the importance of reliable, cost-effective products, we have developed industry-leading test procedures to ensure we exceed this criteria. Our testing program confirms that our customers will receive products of the highest quality.

Our Performance Assurance Certification (PAC) certifies that every MTU generator set undergoes rigorous prototype testing including the following:

Prototype Test Procedures

- **Rated Load (NFPA 110)**
  All generator set models will produce the nameplate-rated load within the design tolerance of the generator set.
- **Extended-run Testing**
  All generator set prototypes have been subjected to extended run-time testing.
- **Transient Response Analysis (ISO 8528-5)**
  All new generator set models have undergone transient response analysis per ISO 8528-5.
- **Torsional Analysis**
  All generator set models have undergone torsional stress analysis.
- **Engine Cooling System**
  All generator set models will cool sufficiently within the ambient design conditions per each model.
- **Anticipatory Alarms and Shutdowns**
  The pre-alarms and alarms function appropriately to protect the generator set from any foreseen unnecessary failures.
- **Vibrational Analysis (ISO 8528-9)**
  All new generator set models have undergone vibration analysis to ensure that each engine-generator coupling is balanced and that there is no destructive resonant vibration.
- **Noise Analysis (ISO 8528-10)**
  All generator sets undergo airborne noise analysis using the enveloping surface method.

Prototype Test Standards

MTU generator sets are compliant with many different codes and standards. Our validation philosophy and performance are regularly reviewed to ensure continuity with these codes and standards: *UL2200, CSA, EPA, NFPA 99—Health Care Facilities, NFPA 70—National Electrical Code, NFPA 110—Standard for Emergency and Standby Power Systems, Department of Labor and Industry, NEMA MG 1—Motors and Generators, and MIL-STD-705-c.*

Factory Acceptance

Our factory testing is performed with the same extreme diligence and attention to detail that is given to the prototype testing process. Every MTU generator set receives a complete factory acceptance test that certifies and ensures the system will function in accordance to every specific application.

Test metering has an accuracy of 1.3% or better. This metering is calibrated a minimum of once per year and is directly traceable to the Bureau of Standards.

Factory acceptance testing procedures

- **Insulation Resistance Inspection** (301.1c)*
- **High Potential Test** (302.1b)*
- **Alternator Overspeed** (1 min.)*
- **Engine Inspection**
- **Generator Inspection**
- **Resistances Inspection** (401.1b)
  - Exciter Field Stator
  - Alternator Armatures
- **Mounting and Coupling Inspection**
- **Engine Fuel Oil System Inspection**
- **Engine Lube Oil System Inspection**
- **Engine Cooling System Inspection**
- **DC Charging System Inspection**
- **Circuit Breaker Inspection**
- **Anticipatory Alarms and Shutdowns Inspection** (505.2b, 515.1b, 515.2b)
- **Optional Equipment Inspection** (513.2a)
- **Load Test Inspection**
  - Full Nameplate-Rated Load
  - No-Load Inspection
  - MAX Load @ 1.0 P.F. (640.1d)
  - MAX Load @ 0.8 P.F.
  - Block Loads @ 0–25%, 0–50%, 0–75%, 0–100%
- **Phase Balance and Sequence Inspection** (507.1d, 508.1d, 516.1a)

** Performed by Alternator OEM*

OPTIONAL TESTING

Factory Acceptance

Extended-run factory acceptance testing

In some cases, extended-run testing may be requested. Unless specified otherwise, extended-run testing will be performed in the following manner:

- Full nameplate-rated load
- Standard readings taken every 15 or 30 minutes

Standard readings recorded during load test inspection

- Run Time
- AC Voltage
- AC Amperage
- kVA
- kWe
- Power Factor
- Frequency
- Exciter Field Voltage
- Exciter Field Current
- Lube Oil Pressure
- Engine Coolant Temperature
- Ambient Temperature

Witnessed factory acceptance testing

Witnessed factory tests must be scheduled and approved at least four weeks prior to the generator set's scheduled shipping date. Any requests for witnessed factory testing after this four-week period must be approved by the Regional Sales Manager and are subject to additional fees.

Witnessed extended-run factory acceptance testing

Witnessed extended-run tests must be scheduled and approved at least four weeks prior to the generator set's scheduled ship date. Any requests for witnessed extended-run testing after this four-week period must be approved by the Regional Sales Manager and are subject to additional fees.

Additional factory acceptance testing

Additional testing is available upon request. The following is a list of supplementary tests which can be performed on MTU generator sets. Non-standard testing is subject to additional charges.

Additional testing procedures

- **Start and Stop Test** (MIL-STD-705c 503.1c)
- **Remote Start and Stop Test** (MIL-STD-705c 503.2c)
- **Overspeed Protective Device Test** (MIL-STD-705c 505.2b)
- **Insulation Resistance Test** (MIL-STD-705c 301.1c)*
- **Open Circuit Saturation Curve Test** (MIL-STD-705c 410.1b)
- **Temperature Rise Test** (MIL-STD-705c 680.1c)
- **Frequency Range Adjust Test** (MIL-STD-705c 511.2c)
- **Low Oil Pressure Protective Device Test** (MIL-STD-705c 515.1b)
- **Over-temperature Protective Device Test** (MIL-STD-705c 515.2b)
- **Controls, Direction, and Rotation Test** (MIL-STD-705c 516.1a)
- **Frequency and Voltage Regulation, Stability, and Transient Response** (MIL-STD-705c 608.1b)
- **Voltage and Frequency Regulation** (MIL-STD-705c 614.1b)
- **Voltage Dip and Rise for Rated Load Test** (MIL-STD-705c 619.2c)
- **Regulator Range Test** (511.1d)
- **Maximum Power Test** (MIL-STD-705c 640.1d)
- **Fuel Consumption Test**
- **Vibration and Mechanical Balance Test** (ISO 8528-9)
- **Sound Test** (ISO 8528-10)

** Testing conducted by generator OEM*

Rolls-Royce Group
www.mtu-solutions.com

Subject to change. | Edition 02/20 | ENC 2020-02

ROLLS-ROYCE SOLUTIONS AMERICA INC.

Five (5) Year / 3,000 Hour
Comprehensive Extended Standby Limited Warranty

Rolls-Royce Solutions America Inc. ("RRSA") issues the following express Limited Warranty subject to the following terms, conditions, and limitations:

An original consumer ("Owner") who purchases an RRSA engine generator set ("Product") is entitled to coverage under this Limited Warranty. RRSA warrants to the Owner that the Product is free of defects in material and workmanship and will perform under normal use and service from valid start-up performed by RRSA. Any nonconformity to the foregoing is defined as a Warrantable Defect. This Limited Warranty applies to Product shipped by RRSA after January 1, 2014.

1. Disclaimers

LIMITATION OF WARRANTIES: THIS LIMITED WARRANTY IS GIVEN EXPRESSLY AND IN PLACE OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, FREEDOM FROM INFRINGEMENT OR THIRD PARTY INTELLECTUAL PROPERTY RIGHTS, OR ARISING FROM COURSE OF DEALING, COURSE OF PERFORMANCE OR USAGE OF TRADE. THERE ARE NO UNDERSTANDINGS, AGREEMENTS, REPRESENTATIONS, OR WARRANTIES NOT SPECIFIED HEREIN.

THIS LIMITED WARRANTY, THE OBLIGATIONS OF RRSA AND THE RIGHTS AND REMEDIES OF THE OWNER SET FORTH IN THIS LIMITED WARRANTY ARE EXCLUSIVE AND ARE EXPRESSLY IN LIEU OF, AND THE OWNER HEREBY WAIVES AND RELEASES ALL OTHER OBLIGATIONS, WARRANTIES (INCLUDING WARRANTY AGAINST REDHIBITORY DEFECTS), REPRESENTATIONS OR LIABILITIES, EXPRESS OR IMPLIED, ARISING BY LAW IN CONTRACT, TORT (INCLUDING NEGLIGENCE OR STRICT LIABILITY) OR OTHERWISE, INCLUDING BUT NOT LIMITED TO ANY CLAIMS ARISING OUT OF, CONNECTED WITH OR RESULTING FROM THE PERFORMANCE OF THIS LIMITED WARRANTY OR FROM THE DESIGN, MANUFACTURE, SALE, REPAIR, LEASE OR USE OF THE PRODUCT, ANY COMPONENT THEREOF AND SERVICES DELIVERED OR RENDERED HEREUNDER OR OTHERWISE.

IN NO EVENT, WHETHER AS A RESULT OF BREACH OF CONTRACT OR WARRANTY, ALLEGED NEGLIGENCE, OR OTHERWISE, SHALL RRSA BE SUBJECT TO LIABILITY FOR INCIDENTAL, CONSEQUENTIAL, INDIRECT, SPECIAL OR PUNITIVE DAMAGES OF ANY KIND, INCLUDING WITHOUT LIMITATION, DAMAGE TO THE PRODUCT, OR OTHER PROPERTY, COMMERCIAL LOSSES, LOST PROFITS, LOSS OF USE, INCONVENIENCE, LOSS OF TIME, COST OF CAPITAL, COST OF SUBSTITUTE EQUIPMENT, DOWNTIME, OR CLAIMS OF CUSTOMERS.

RRSA'S AGGREGATE TOTAL LIABILITY RELATING TO THE SYSTEM AND/OR PRODUCT UNDER THIS LIMITED WARRANTY OR UNDER ANY OTHER CLAIM (IN CONTRACT, TORT, OR OTHERWISE) MADE IN CONNECTION WITH THE SALE OR USAGE OF THE SYSTEM AND/OR PRODUCT IS LIMITED TO THE DOLLAR AMOUNT OF THE OWNER'S ORIGINAL PAYMENT MADE FOR THE SYSTEM AND/OR PRODUCT.

2. Limited Warranty Periods

Limited Warranty Period. The Limited Warranty Period for a Warrantable Defect in the Product is sixty (60) months after the first commissioning of the Product. In all cases, the Limited Warranty period will expire not later than seventy-two (72) months from the date of shipment from the RRSA Mankato, MN facility or after 3,000 operation hours, whichever occurs first.

Accessories Coverage Period. The Accessories Coverage Period for a Warrantable Defect in cords, receptacles, cord reels, gas flex pipes, housing lights, space heaters, and associated equipment ("Accessories") is twelve (12) months from the date of shipment from RRSA Mankato, MN facility.

RRSA warranty obligations under this Limited Warranty are contingent upon distributor completing the following:

(a) The RRSA warranty and the *Start-Up Validation and Pre-Inspection Form.* Return both to RRSA within sixty (60) days of the start-up date; and
(b) The engine registration form (when applicable). Return to the manufacturer as stated in the engine registration form instructions.

3. RRSA Responsibilities

If a Warrantable Defect is found during the Limited Warranty Period and/or the Accessories Coverage Period, and provided the Owner has complied with its obligations under Section 4, RRSA will, during normal working hours, through an RRSA authorized distributor, dealer, or service outlet, perform some or all of the following:

(a) Repair or replace, at the sole election of RRSA, the defective part with a new or remanufactured replacement part;
(b) Provide reasonable or customary labor needed to correct the Warrantable Defect;
(c) Provide technician travel time of 400 miles to and from the closest RRSA authorized distributor, dealer, or service outlet to the Product location;
(d) Part removal and re-installation, if necessary and as solely determined by RRSA.

The obligation to repair or replace defective parts by RRSA does not include responsibility for reimbursement of incidental or consequential costs. If RRSA repairs or replaces an Accessory, part, or Product under this Limited Warranty, the repaired or replaced Accessory, part, or Product assumes the unexpired portion of the warranty period remaining from the original Accessory, part, or Product. Repair or replacement of an Accessory, part, or Product will not extend the term of the original Limited Warranty Period or Accessories Coverage Period. Parts or Product replaced shall become the property of RRSA.

Failure of RRSA to enforce any of the terms or conditions stated herein shall not be construed as a waiver of such provision or of any other terms and conditions of this Limited Warranty.

4. Owner Responsibilities

During the Limited Warranty Period and Accessories Coverage Period, the Owner is responsible for, and RRSA will not reimburse for the following:

(a) Battery;
(b) Premium or overtime labor costs;
(c) Labor and material costs for Product removal and reinstallation;
(d) Any special access fees required to gain access to RRSA equipment, without limitation, training or safety policy requirement to gain access;
(e) Transportation costs or travel expenses related to delivery of the Product to the designated distributor, dealer, or service outlet;
(f) Incidental and consequential costs, damages, or administrative expenses of whatever nature;
(g) Non-Product repairs, vehicle damage, “downtime” expenses, cargo damage, fines, lost income, any business costs of any kind, Owner’s travel expenses, and other losses resulting from a Warrantable Defect;
(h) Shipping charges for replacement parts/Products in excess of those which are usual and customary; or
(i) Local taxes, if applicable.

In addition, Owner must:

(a) Operate, use, and maintain the Product in accordance with the applicable Owner’s manual and/or any other manuals specified by RRSA, including without limitation handling, inspection, servicing, or operating instructions;

(b) Promptly notify RRSA or its authorized representative of a Warrantable Defect and make the Product available for repair;
(c) Comply with RRSA or its authorized representative's reasonable directions regarding the timing, sequence, and location of warranty repairs and make the Product available for inspection;
(d) Perform all required maintenance and maintain and provide proof that all required maintenance has been performed;
(e) Use RRSA specified parts, components, and consumables;
(f) Promptly return to RRSA all parts replaced under this Limited Warranty;
(g) Comply with RRSA long term storage guidelines, if applicable, and maintain and provide proof of compliance;
(h) Routinely exercise the Product in accordance with operating instructions;
(i) Install the Product in accordance with the installation guide provided; and
(j) Reimburse RRSA for all costs incurred in providing warranty service where, following examination, the request or claim for warranty coverage proves to be unfounded or excluded, as well as all incidental costs including those incurred investigating the claim.

5. Limitations

RRSA is not responsible, and this Limited Warranty is not available under any circumstances, for any of the following:

(a) Failure of Owner to fulfill its obligations under Section 4;
(b) Failure of Owner to follow RRSA instructions for Product stored by Owner longer than 180 days from date of shipment from the RRSA Mankato, MN facility;
(c) Defects caused by adjustments made by Owner to the fuel system or governor system;
(d) Defects which were obvious or capable of being identified by reasonable inspection and were not reported to RRSA within a reasonable time;
(e) Rental equipment used during warranty work;
(f) Defects caused or potentially caused by service work performed by non-RRSA authorized service providers and/or the use of non-genuine RRSA parts;
(g) Defects resulting from natural wear and tear, external action, negligence, natural disasters, accidents, incorrect use, improper handling or storage, inadequate corrosion-proofing, incorrect assembly or installation, or modification of the Product;
(h) Defects resulting from abuse or neglect, including unauthorized modifications to the Product;
(i) Repair or any use or installation which RRSA, in its sole discretion, determines to be improper;
(j) Defects caused by incorrect maintenance;
(k) Defects resulting from Owner's delay in making the Product available after being notified of a potential problem or Owner's failure to take immediate measures to avoid or mitigate damage;
(l) Damage caused by shipping;
(m) Repair of parts sold by RRSA that are warranted directly to the Owner by the respective part's manufacturer;
(n) Misapplication of the Product;
(o) Diesel engine "wet stacking" due to lightly loaded diesel engines;
(p) Acts of nature or acts of God;
(q) Any failure, other than those resulting from a defect in material or factory workmanship of the Product;
(r) Use of the Product for purposes other than those for which it was intended, including without limitation use of the Product under extraordinary operating conditions not made known to RRSA in writing at the time of the order; or
(s) Material provided by or a design specified by the Owner.

6. Software Warranty. Where software is included in the Product, RRSA warrants to the Owner that 1) the software will be substantially free from material program errors and material defects in material and workmanship, and that 2) it shall function substantially in accordance with RRSA specification at the time of dispatch from the RRSA manufacturing facility. RRSA does not warrant that the software is error-free or free from "bugs" as commonly categorized by the computer

industry. RRSA shall, during the Limited Warranty Period, endeavor to remedy at its cost, in its sole discretion, by repair or replacement of any material program errors or material defects of which Owner has promptly notified RRSA. RRSA, at its option, may elect to provide the most current software at no cost, and in such case RRSA will not cover the cost to install the applicable updated software. RRSA shall have no obligation with respect to any nonconformities resulting from unauthorized modifications to the software or any Owner interfacing.

7. **Emissions Warranty.** The Product may be covered under an emissions warranty specified by the U.S. Environmental Protection Agency and/or the California Air Resources Board. The terms of the warranty, if applicable, may be accessed by following the link: https://www.mtu-solutions.com/eu/en/technical-information/emissions-warranty.html. Any such Emissions Warranty is incorporated herein by reference in its entirety to the extent and with the same force as if fully set forth herein. The Product, if certified, may only be certified to comply with the required country or region-specific emission regulations. Where applicable, the Product is only certified to those specific emission regulations/standards which are clearly stated in the respective RRSA defined technical specifications. IT IS THE OWNER'S SOLE RESPONSIBILITY TO ENSURE THAT THE EXPORT/IMPORT, INSTALLATION, AND USE OF THE PRODUCT(S) COMPLIES WITH THE APPLICABLE EMISSION REGULATIONS IN THE COUNTRY OR REGION WHERE THE PRODUCT(S) WILL BE USED.

8. The Owner is entitled to rectify the defect or to have it rectified by third parties only in urgent cases where operational safety is at risk or in order to prevent disproportionately extensive damage; provided that Owner has informed RRSA and obtained prior written consent from RRSA. In such cases, RRSA shall, in its sole discretion, reimburse the costs incurred by the Owner up to an amount equivalent to the costs RRSA would have incurred had it remedied the defect itself.

9. This Limited Warranty gives the Owner specific legal rights, and the Owner may also have other rights, which vary from state to state. Some states do not allow warranty duration limitations and/or certain exclusions or limitation of incidental or consequential damages. Therefore, the previously expressed exclusion(s) may not apply to Owner. If any one or more of the provisions contained in this Limited Warranty shall be invalid, illegal, or unenforceable in any respect, the validity, legality, or enforceability of the remaining provisions contained therein shall not in any way be affected or impaired thereby.

10. This Limited Warranty is governed by the laws of the State of Michigan without regard to its conflicts of law principles and excluding the United Nations Convention for the International Sale of Goods. Any and all disputes between the parties that may arise pursuant to the sale or use of the Product shall be heard and determined before an appropriate state of federal court located in Oakland County, Michigan. The Owner acknowledges that such court has the jurisdiction to interpret and enforce the provisions herein, and Owner waives any and all objections that it may have as to personal jurisdiction or venue in any of the above courts.

11. In order to obtain performance of an RRSA warranty obligation, the Owner should contact the nearest RRSA authorized distributor, dealer, or service outlet for instructions. To find the location of the nearest RRSA authorized distributor, dealer, or service outlet call +1 248-560-8000 or write to: Rolls-Royce Solutions America Inc. Warranty Department, 39525 MacKenzie Drive, Novi, MI 48377.

CERTIFICATE OF COMPLIANCE

Certificate Number	AU3559
Report Reference	AU3559- 20020610
Issue Date	2019-DECEMBER-02
Issued to:	MTU America Inc 100 Power Dr, Mankato MN 56001-4790
This certificate confirms that representative samples of	ENGINE GENERATORS See addendum Page
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL 2200 Standard for Safety for Stationary Engine Generator Assemblies
Additional Information:	See the UL Online Certifications Directory at https://iq.ulprospector.com for additional information.

This *Certificate of Compliance* does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

CERTIFICATE OF COMPLIANCE

Certificate Number	AU3559
Report Reference	AU3559- 20020610
Issue Date	2019-DECEMBER-02

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

Stationary engine generator assemblies (diesel fueled) for outdoor use and Indoor Use, models as follows:

Model Series 25 – 415, followed by any of the following letters (R,P,J,N,G,D), followed by J, followed by C or S, followed by 6, followed by D, followed by T, followed by 3 or 4. May have additional prefix or suffix letters or numbers.

Model Series D, followed by S or P, may be followed by two or three zeroes, followed by a number ranging from 20-415, followed by D, followed by 6, followed by C or S, followed by one of the following letters (R,P,J,N,G,D), followed by A, W, N, or T, followed by K, followed by 0, followed by 57 or 66, followed by 3 or 4. May have additional prefix or suffix letters or numbers.

Models D, followed by G, followed by 04, 05, or 06, followed by R, followed by J, followed by a three digit number. May be have additional prefix or suffix letters or numbers.

Models 4, 5, or 6, followed by R, followed by a four digit number, followed by D, followed by S, followed by a number ranging from 25 to 415. May have additional prefix or suffix letters or numbers

Bruce Mahrenholz, Director North American Certification Program

UL LLC

Diesel Generator Set

MTU 6R0150 DS300

300 kWe/60 Hz/Standby/208 - 600V
Reference MTU 6R0150 DS300 (275 kWe) for Prime Rating Technical Data

System ratings

Voltage (L-L)	208V	240V	380V	480V	600V
Phase	3	3	3	3	3
PF	0.8	0.8	0.8	0.8	0.8
Hz	60	60	60	60	60
kW	300	300	300	300	300
kVA	375	375	375	375	375
Amps	1,041	902	570	451	361
skVA@30% voltage dip	930	930	640	820	720
Generator model	433CSL6216	433CSL6216	433CSL6216	432CSL6212	432PSL6246
Temp rise	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C
Connection	12 LEAD WYE	12 LEAD DELTA	12 LEAD WYE	12 LEAD WYE	4 LEAD WYE

Certifications and standards

- Emissions
  - EPA Tier 3 certified
- Generator set is designed and manufactured in facilities certified to standards ISO 9001:2008 and ISO 14001:2004
- Seismic certification - optional
  - IBC certification
  - OSHPD Pre-approval
- UL 2200 - optional
- CSA - optional
  - CSA C22.2 No. 100
  - CSA C22.2 No. 14
- Performance Assurance Certification (PAC)
  - Generator set tested to ISO 8528-5 for transient response
  - Verified product design, quality and performance integrity
  - All engine systems are prototype and factory tested
- Power rating
  - Accepts rated load in one step per NFPA 110
  - Permissible average power output during 24 hours of operation is approved up to 85%.

A Rolls-Royce solution

Standard features*

- MTU is a single source supplier
- Global product support
- 2 year standard warranty
- 6090HFG86 diesel engine
  - 9 liter displacement
  - Common rail fuel injection
  - 4-cycle
- Engine-generator resilient mounted
- Complete range of accessories
- Cooling system
  - Integral set-mounted
  - Engine-driven fan
- Generator
  - Brushless, rotating field generator
  - 2/3 pitch windings
  - 300% short circuit capability with optional Permanent Magnet Generator (PMG)
- Digital control panel(s)
  - UL recognized, CSA certified, NFPA 110
  - Complete system metering
  - LCD display

Standard equipment*

Engine

- Air cleaner
- Oil pump
- Oil drain extension and S/O valve
- Full flow oil filter
- Open crankcase ventilation
- Jacket water pump
- Thermostat
- Blower fan and fan drive
- Radiator - unit mounted
- Electric starting motor - 24V
- Governor – electronic isochronous
- Base - formed steel
- SAE flywheel and bell housing
- Charging alternator - 24V
- Battery rack and cables
- Flexible fuel connectors
- Flexible exhaust connection
- EPA certified engine

Generator

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting
- Sustained short circuit current of up to 300% of the rated current for up to 10 seconds
- Self-ventilated and drip-proof
- Superior voltage waveform
- Digital, solid state, volts-per-hertz regulator
- No load to full load regulation
- Brushless alternator with brushless pilot exciter
- 4 pole, rotating field
- 130 °C maximum standby temperature rise
- 1-bearing, sealed
- Flexible coupling
- Full amortisseur windings
- 125% rotor balancing
- 3-phase voltage sensing
- ±1% voltage regulation
- 100% of rated load - one step
- 5% maximum total harmonic distortion

Digital control panel(s)

- Digital metering
- Engine parameters
- Generator protection functions
- Engine protection
- CANBus ECU communications
- Windows®-based software
- Multilingual capability
- Remote communications to RDP-110 remote annunciator
- Programmable input and output contacts
- UL recognized, CSA certified, CE approved
- Event recording
- IP 54 front panel rating with integrated gasket
- NFPA 110 compatible

* Represents standard product only. Consult the factory/MTU Distributor for additional configurations.

Application data

Engine

Manufacturer	John Deere
Model	6090HFG86
Type	4-cycle
Arrangement	6-inline
Displacement: L (in^3)	9 (549)
Bore: cm (in)	11.84 (4.7)
Stroke: cm (in)	13.6 (5.4)
Compression ratio	16:1
Rated rpm	1,800
Engine governor	JDEC
Maximum power: kWm (bhp)	345 (463)
Speed regulation	± 0.25%
Air cleaner	dry

Liquid capacity (Lubrication)

Total oil system: L (gal)	31 (8.19)
Engine jacket water capacity: L (gal)	16 (4.23)
System coolant capacity: L (gal)	53.5 (14.13)

Electrical

Electric volts DC	24
Cold cranking amps under -17.8 °C (0 °F)	950

Fuel system

Fuel supply connection size	-10 JIC 37° female
Fuel return Connection size	-6 JIC 37° female
Maximum fuel Lift: m (ft)	2.4 (7.9)
Recommended fuel	diesel #2
Total fuel flow: L/hr (gal/hr)	239.92 (63.38)

Fuel consumption

At 100% of power rating: L/hr (gal/hr)	83.71 (22.11)
At 75% of power rating: L/hr (gal/hr)	67.34 (17.79)
At 50% of power rating: L/hr (gal/hr)	49.48 (13.07)

Cooling - radiator system

Ambient capacity of radiator: °C (°F)	50 (122)
Maximum restriction of cooling air: Intake and discharge side of radiator: kPa (in. H_20)	0.124 (0.5)
Water pump capacity: L/min (gpm)	294.6 (78)
Heat rejection to coolant: kW (BTUM)	114 (6,489)
Heat rejection to air to air: kW (BTUM)	99.1 (5,641)
Heat radiated to ambient: kW (BTUM)	36.9 (2,099)
Fan power: kW (hp)	13.9 (18.6)

Air requirements

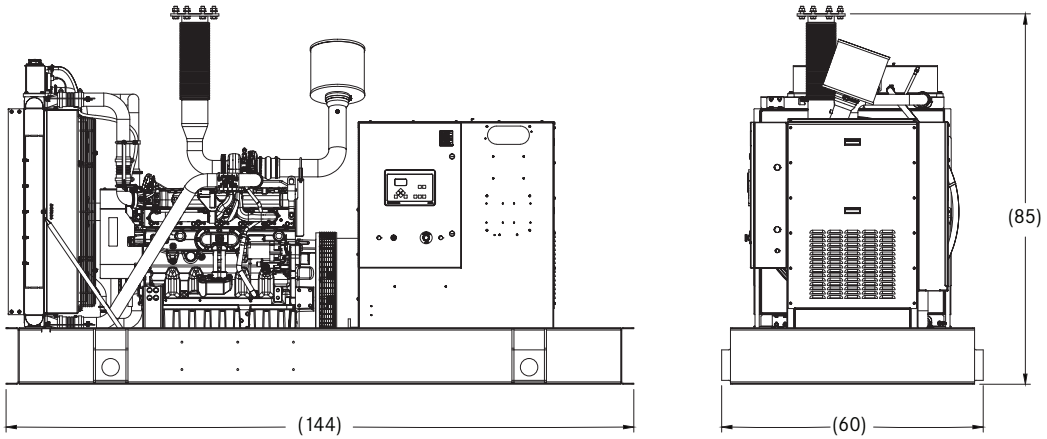
Aspirating: *m^3/min (SCFM)	26.5 (936)
Air flow required for radiator cooled unit: *m^3/min (SCFM)	507.6 (17,926)
Remote cooled applications; air flow required for dissipation of radiated generator set heat for a maximum of 25 °F rise: *m^3/min (SCFM)	134 (4,733)

* Air density = 1.184 kg/m^3 (0.0739 lbm/ft^3)

Exhaust system

Gas temp. (stack): °C (°F)	497 (927)
Gas volume at stack temp: m^3/min (CFM)	63.6 (2,246)
Maximum allowable back pressure at outlet of engine, before piping: kPa (in. H_20)	7.5 (30)

Weights and dimensions



Drawing above for illustration purposes only, based on standard open power 480 volt generator set. Lengths may vary with other voltages. Do not use for installation design. See website for unit specific template drawings.

System	Dimensions (L x W x H)	Weight (dry/less tank)
Open power unit (OPU)	3,658 x 1,524 x 2,159 mm (144 x 60 x 85 in)	3,080 kg (6,790 lb)

Weights and dimensions are based on open power units and are estimates only. Consult the factory for accurate weights and dimensions for your specific generator set.

Emissions data

NO_x + NMHC	CO	PM
4.25	0.25	0.02

All units are in g/hp-hr and shown at 100% load (not comparable to EPA weighted cycle values). Emission levels of the engine may vary with ambient temperature, barometric pressure, humidity, fuel type and quality, installation parameters, measuring instrumentation, etc. The data was obtained in compliance with US EPA regulations. The weighted cycle value (not shown) from each engine is guaranteed to be within the US EPA standards.

Rating definitions and conditions

- Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. No overload capability for this rating. Ratings are in accordance with ISO 8528-1, ISO 3046-1, BS 5514, and AS 2789. Average load factor: ≤ 85%.
- Consult your local MTU Distributor for derating information.

Electronic Governor Data Sheet

JDEC

DESCRIPTION

The electronic control system consists of electronically controlled unit injectors, engine sensors, Engine Control Unit (ECU), and engine wiring harnesses. The ECU is the box that contains the computer and most of the other electronic components needed to operate the system. The ECU's primary job is scheduling an accurately timed pulse to each injector so that a controlled fuel quantity is injected into the cylinder at the correct crank angle.

STANDARD FEATURES

- The JDEC includes a special push button adjustable 2-state throttle feature that allows variable speed operation without a mechanical or potentiometer throttle.
- Up to two potentiometer throttles can be added, if desired.
- The adjustable 2-state throttle feature can be used to easily preset maximum and minimum allowable operating speed when using a potentiometer throttle.
- The auto-cal feature eliminates the need for manual adjustment of analog throttles.
- Built in protection is provided to prevent abuse of the power-bulge feature.
- Automatic engine protection shutdown can be specified for low oil pressure, high coolant temperature, and any desired user selectable input (loss of prime, machine hydraulic temperature, etc.) eliminating the need for a separate magnetic shutdown switch.
- A new RE68155 2-inch digital diagnostic gauge displays diagnostic codes and warnings, engine hours, rpm, oil pressure, coolant temperature, system voltage, and many other engine parameters. It also includes *Warning* and *Stop Engine* lights.
- Additional gauge displays can be driven from the RE68155 diagnostic gauge to provide analog displays of rpm, oil pressure, coolant temperature, system voltage, % load, etc.
- Standard user-selectable 12V backlighting is provided (optional adapter required for 24-Volt units).

SPECIFICATIONS

Governor Operations

The all-speed governor can be set for either normal droop or isochronous operation. Normal droop, the default, gives a drop in engine speed with an increase in load or an increase in engine speed with a decrease in load. The normal percentage droop for your engine will be listed in the owner/operator manual and on the engine performance curve. When isochronous governing is selected, the droop is set to 0%, and there is no change in engine speed with changing loads until the engines torque limit is reached.

Self Diagnostics

The ECU will detect failures within the control system including sensors, actuators and the ECU itself. The ECU monitors the engine fuel, coolant, and oil pressure sensors for out-of-range values or erratic operation.

Engine Diagnostics

The ECU can detect abnormal engine operating conditions or faults in several engine systems. Faults are stored in the ECU for later use by service personnel. Drivers are provided for an amber *Warning* light and a red *Shutdown* light. Amber and red lights are also incorporated into the diagnostic gauge.

Low Oil Pressure Protection

There are two low oil protection features, *Low Oil Pressure Warning* and *Low Oil Pressure Shutdown*. The set points for *Low Oil Pressure Warning* and *Shutdown* are variable based on engine speed. At the *Low Oil Pressure Warning* set point, the ECU turns on the warning lamp and starts a gradual power derate. If the oil pressure goes above the *Low Oil Pressure Warning* set point during that time, power increases gradually until the power is back to full power. The *Warning* lamp will stay on until the power returns to normal even if the fault condition has gone away and the recovery is in process. At *Low Oil Pressure Shutdown* set point the ECU turns on a *Shutdown* lamp and starts a more rapid power derate. If the oil pressure does not go above the *Shutdown* set point within 30 seconds, the engine will shutdown. If oil pressure goes above *Low Oil Pressure Shutdown* set point within 30 seconds, power derate reverts to the *Low Oil Pressure Warning* curve. Shutdown will only occur on systems with the shutdown option enabled.

Coolant Temperature Protection

There are two coolant temperature protection features, *High Coolant Temperature Warning*, and *High Coolant Temperature Shutdown*. If coolant temperature exceeds the maximum allowable level the ECU turns on the *Warning* lamp and starts a gradual power derate. If the coolant temperature goes below the *High Coolant Temperature Warning* set point, power increases gradually until the power is back to full power. The *Warning* lamp will stay on until the power returns to normal even if the fault condition has gone away and the recovery is in process. At *High Coolant Temperature Shutdown* set point, the ECU turns on the shutdown lamp and starts an additional power derate. If the coolant temperature does not go below the *Shutdown* set point within 30 seconds, the engine will shutdown. If coolant temperature goes below *High Coolant Temperature Shutdown* set point within 30 seconds, power derate reverts to *High Coolant Temperature Warning* curve.

Engine Protection

The ECU can detect several types of engine problems and may take actions to minimize engine damage that may result if these problems are not corrected. There are two levels of engine problems, warning and shutdown. Warning faults are engine problems that may lead to engine failures if not corrected. Warning faults include higher than normal fuel temperature, lower than normal oil pressure, higher than normal coolant temperatures, higher than normal change air temperatures, or power derates. Shutdown faults are engine problems that indicate imminent engine failure. Shutdown problems include extremely low oil pressure, extremely high coolant temperatures, and loss of coolant. The *Warning* lamp will be on when a warning fault is detected by the ECU and the *Shutdown Engine* lamp will be on when a shutdown fault is detected.

No Protection

Engine ECUs with “No Protection” do not derate the engine when coolant temperature, oil pressure, or charge-air temperature warning faults are detected and do not shutdown the engine when there is a shutdown fault. The *Warning* lamp turns on when a warning fault is detected by the ECU and the *Shutdown Engine* lamp turns on when a shutdown fault is detected. The engine operator is responsible for reducing engine speed and power when a warning fault exists and for shutting down the engine when a shutdown fault exists. If engine coolant temperature and oil pressure sensors are not installed on engines with “No Protection” ECUs, no fault will be detected and the fault light will not turn on. “No Protection” ECUs cannot warn of a broken or disconnected wire in the coolant temp and oil pressure sensor circuit. The other ECUs can detect this failure.

Shutdown without Derate Protection

The engine shutdown feature is only in ECUs with engine shutdown programmed into the ECU. All engine protection sensors, including coolant temperature and oil pressure, must be installed if engine protection is specified. Otherwise, a fault will be detected and the fault lamp will light. The engine derate schedules will not be active, but the engine will shutdown in 30 seconds if a shutdown fault is detected. The *Warning* lamp lights when a warning fault is detected by the ECU. The *Shutdown Engine* lamp will be on for 30 seconds before shutting down when a shutdown fault is detected. The operator may delay a shutdown for 30 seconds by pushing a *Shutdown Override* button. On an ECU with the shutdown feature, shutting down the engine and turning off the key switch will reset the engine shutdown feature and will allow at least 30 seconds of running after restart. After 30 seconds, the engine will again shutdown unless the shutdown fault condition has cleared. The *Shutdown Override* button resets the shutdown timer to 30 seconds, and may be used repeatedly. However, continuously holding down the *Shutdown Override* button will only reset the 30-second timer once. It must be released and pressed again to reset for another 30 seconds.

Derate Protection with Shutdown

The engine derate and shutdown feature is only in ECUs with engine derate and shutdown protection programmed into the ECU. All engine protection sensors, including coolant temperature and oil pressure, must be installed if engine protection is specified. Otherwise, a fault will be detected, and the fault lamp will light. The engine derate schedules will be active and the engine will shutdown in 30 seconds if a shutdown fault is detected. The *Warning* lamp turns on when a warning fault is detected by the ECU. The *Shutdown Engine* lamp will be on for 30 seconds before shutting down when a shutdown fault is detected. The operator may delay a shutdown for 30 seconds by pushing a *Shutdown Override* button. On an ECU with the shutdown feature, shutting down the engine and turning off the key switch will reset the engine shutdown feature and will allow at least 30 seconds of running after restart. After 30 seconds, the engine will again shutdown unless the shutdown fault condition has cleared. The *Shutdown Override* switch resets the shutdown timer to 30 seconds and may be used repeatedly. However, continuously holding down the *Shutdown Override* switch will only reset the 30-second timer once. It must be released and pressed again to reset for another 30 seconds.

External Derate and Shutdown Inputs

Two additional inputs are provided for external derates and shutdown. These inputs can be used to allow the OEM to trigger a 20% reduction in engine power or an engine shutdown from external switches, such as a loss of prime switch or hydraulic overtemperature switch. These switches are active on all ECUs, even if “No Protection” is specified. If the user does not wish to use this feature, the wires should be left disconnected.

Service Diagnostics

Fault codes generated by the ECU are stored for later retrieval through the diagnostic gauge.

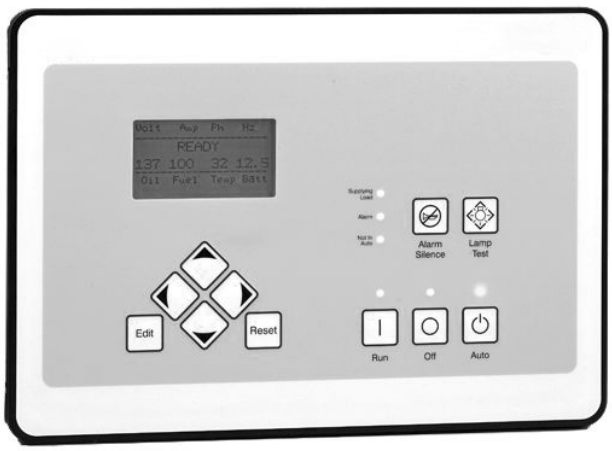
Fuel Temperature Compensation

Fuel temperature compensation provides constant power regardless of fuel temperature.

Digital Generator Set Controller Data Sheet

MGC-2000 Series

The MGC-2000 Series controllers include the following models which are described throughout this document.*
- MGC-2010
- MGC-2020
- MGC-2050



mtu Generator Set Controllers (MGC Series) are highly advanced integrated digital generator set control systems. The MGC-2000 Series is perfectly focused, combining rugged construction and microprocessor technology to offer a product that will hold up to almost any environment and is flexible enough to meet your application's needs. The MGC-2000 Series provides generator set control, transfer switch control, metering, protection, and programmable logic in a simple, easy-to-use, reliable, rugged, and cost effective package.

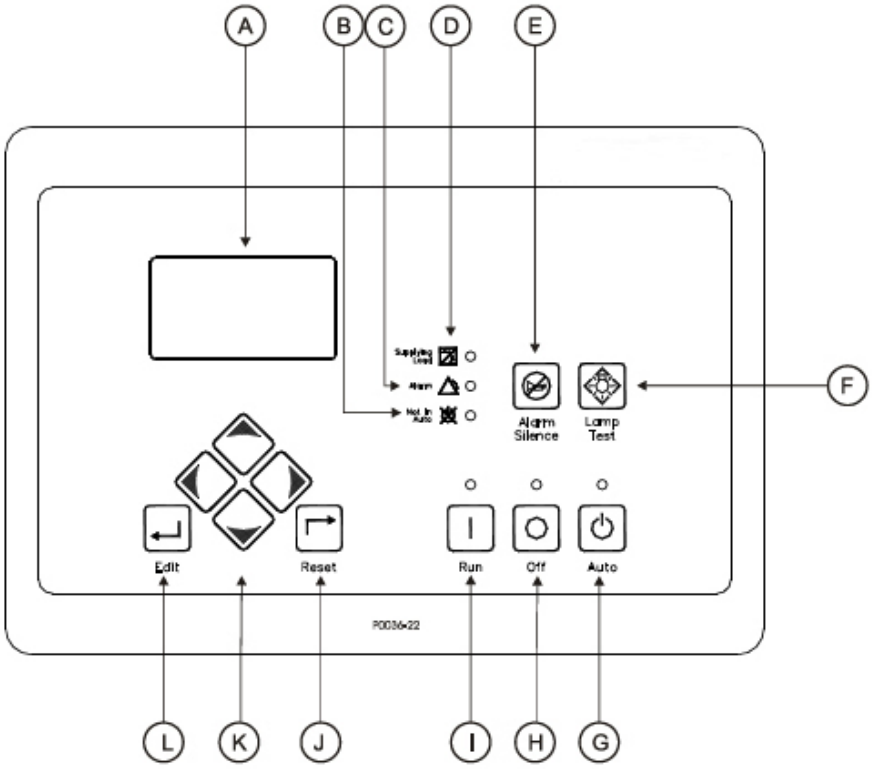
PRODUCT HIGHLIGHTS

- Three-phase generator metering
- Engine metering
- Generator set control
- Engine and generator protection
- Var sharing over Ethernet
- BESTCOMS*Plus*®
  - Windows®-based software for optional remote operation (Software can be downloaded at www.mtu-solutions.com)
  - Programming and setup software
  - Intuitive and powerful
  - Remote control and monitoring
  - Programmable logic
  - USB communications
- Automatic transfer switch compatible
- Exercise timer
- Suitable for use on rental generator sets with high/low line sensing, single or three phase sensing override, and wye/delta/grounded delta
- SAE J1939 Engine Control Unit (ECU) communications
- Automatic generator configuration detection
- Selection of integrating reset of instantaneous reset characteristics for overcurrent protection
- Multilingual capability
- Remote annunciation to RDP-110
- Extremely rugged, fully potted design
- 16 programmable contact inputs, 12 programmable contact outputs
- ModBus™ communications with RS-485 (Refer to *Configuration Options*.)
- UL recognized, CSA certified, CE approved
- Highly Accelerated Life Tests (HALT) tested
- IP 54 front panel rating with integrated gasket
- NFPA-110 compatible
- Microprocessor based
- Complete system metering
- Expandable to meet customer needs

*Please refer to the last page of this data sheet for available MGC-2000 Series configuration options. The MGC Series Controller Comparison Data Sheet is available as a reference for all MGC Series configuration options.

A Rolls-Royce solution

DIAGRAM



Front Panel Descriptions

A. Liquid Crystal Display
B. Not in Auto Indicator
C. Alarm Indicator
D. Supplying Load Indicator
E. Alarm Silence Pushbutton
F. Lamp Test Pushbutton
G. Auto Pushbutton and Mode Indicator
H. Off Pushbutton and Mode Indicator
I. Run Pushbutton and Mode Indicator
J. Reset Pushbutton
K. Arrow Pushbuttons
L. Edit Pushbutton

FUNCTIONS

Generator set protection

Generator ANSI codes

- Overvoltage (59)
- Overfrequency (81o)
- Reverse power (32)
- Undervoltage (27)
- Underfrequency (81u)
- Loss of excitation (40q)
- Phase imbalance (47)
- Overcurrent (51) (optional)
- Vector shift (78) (optional)
- Rate of change of frequency (ROCOF) (81R) (Refer to *Configuration Options*.)

All generator set protection features are programmable as alarms, pre-alarms, status, or not used.

Alarms (Shutdowns)

- Low oil pressure
- High coolant temperature
- Low coolant level
- Overspeed
- Overcrank
- Coolant temp sender fail (non-ECU engines)
- Oil pressure sender fail (non-ecu engines)
- Emergency stop
- Critical low fuel level (Refer to *Configuration Options*.)

FUNCTIONS, continued:

Generator Set Protection, continued:

Pre-alarms (Warnings)
- Low oil pressure
- High coolant temperature
- Low coolant temperature
- Battery overvoltage
- Weak battery voltage
- Aem comms failure
- Breaker open failure
- Cem comms failure
- Generator reverse rotation
- Engine kw overload (three levels)
- Loss of sensing
- Checksum failure
- Ecu comms fail
- Low fuel level
- High fuel level
- Active diagnostic trouble codes (DTC)
- Breaker close failure
- Low battery voltage

All alarms and pre-alarms can be enabled or disabled via the BESTCOMS*Plus*® PC software or the front panel. Additional custom alarms and pre-alarms are available upon request.

Generator set metering
- Generator parameters include voltage, current, real power (watts), apparent power (VA), and power factor (PF).
- Engine parameters include oil pressure, coolant temperature, battery voltage, speed, fuel level, engine load, coolant level (from ECU), ECU specific parameters, and run-time statistics.

Engine control
- Cranking control: cycle or continuous (quantity and duration fully programmable)
- Engine cooldown: smart cooldown function saves fuel and engine life
- Successful start counter: counts and records successful engine starts
- Timers:
  - Engine cooldown timer
  - Engine maintenance timer
  - Pre-alarm time delays for weak/low battery voltage
  - Alarm time delay for overspeed
  - Alarm time delay for sender failure
  - Arming time delays after crank disconnect:
    - Low oil pressure
    - High coolant temperature
  - Pre-crank delay
  - Continuous or cycle cranking time delay
  - Programmable logic timers

Event recording
The MGC-2000 Series has an event recorder that provides a record of alarms, pre-alarms, engine starts, engine runtime loaded, engine runtime unloaded, last run date, and many other events that are all date and time stamped to help the user determine the cause and effect of issues related to the generator set. Contains 30 event records each retaining up to 99 occurrences in memory. Time, date, and engine hour detail is available for the most current 30 occurrences within each event record.

Transfer switch control (Mains failure)
The MGC-2000 Series has the ability to detect a mains failure via a single- or three-phase bus input. A mains failure is established when any one of the following conditions are met:

- Any phase of bus voltage falls below the dead bus threshold
- Any phase of bus voltage is unstable due to overvoltage or undervoltage
- Any phase of bus voltage is unstable due to overfrequency or underfrequency

When conditions are met, the MGC-2000 Series will start the generator set and, when ready, will send generator and mains breaker commands to apply power to the load from the generator set. The MGC-2000 Series implements open or closed breaker transitions to and from the mains. When the mains returns and is considered stable, the MGC-2000 Series will transfer the load back to the mains and stop the engine.

ModBus™ RTU
When utilized, the user can send and receive information from the MGC-2000 Series via the RS-485 communications port and ModBus™ RTU protocol. This feature allows the MGC-2000 Series controlled generator set to be fully integrated into the building management system. Please see the *MGC-2000 Series Controller Manual* for the ModBus™ register list.

Programmable logic
The MGC-2000 Series offers a very powerful, yet easy-to-use, programmable logic scheme, BESTlogic™*Plus*, for custom programming of the various inputs, outputs, alarms, and pre-alarms. It allows these elements to be integrated into a complete logic scheme so that the user can meet even the most complex specification. The programmable logic control includes the selection of logic gates and timers, with drag-and-drop technology to make it fast and simple.

FUNCTIONS, continued:

Remote display panel annunciation
The MGC-2000 Series can communicate to a remote display panel, Model RDP-110. This requires only two wires to annunciate all of the alarms and pre-alarms required by NFPA-110 Level I and II. External power is required.

External modem interface
The MGC-2020 and MGC-2050 controllers include an external modem interface permitting an external modem to be connected to the MGC controller via RS-232. A dial-out modem enables remote control, monitoring, and setting of the MGC-2000 Series. When an alarm or pre-alarm condition occurs, the MGC-2000 Series can dial up to four telephone numbers in sequence until an answer is received and the condition is annunciated.

Note: Only an external modem interface is provided. The external modem must be provided by a third party. The external modem is only available on the MGC-2020 and MGC-2050 controller configurations of the MGC-2000 Series.

SAE J1939 communications
SAE J1939 CANBus communications allows the MGC-2000 Series to communicate with the ECU to gather critical engine information like oil pressure, engine coolant temperature, RPM, battery voltage, and much more. By utilizing the ECU, the addition of analog engine senders is no longer required. This can save substantial money for the installer. It also eliminates any errors or discrepancies between the ECU data and the data displayed on the MGC-2000 Series that may be present due to analog sender inaccuracies or incompatibility. An additional benefit is access to the ECU's diagnostic troubleshooting codes (DTCs). The DTCs provide information about the engine's operating conditions and communicates these, via SAE J1939, to the MGC-2000 Series, eliminating the need for hand-held service tools to diagnose simple engine issues.

SPECIFICATIONS

Operating power
- Nominal: 12 or 24 VDC
- Range: 6 to 32 VDC
- Power consumption:
  - Sleep Mode: 5W with all relays non-energized
  - Normal operational mode: 7.9W - run mode, LCD heater off, six relays energized
- Battery ride-through: withstands cranking ride-through down to 0 V for 50 ms, starting at 10 VDC.

Current sensing (5 A CT inputs)
- Continuous rating: 0.1 to 5.0 Aac
- One second rating: 10 Aac
- Burden: 1 VA

Voltage sensing
- Range: 12 to 576 V rms, line-to-line
- Frequency range: 10 to 72 Hz
- Burden: 1 VA
- One second rating: 720 V rms

Input contacts
Contact sensing inputs include one emergency stop input and 16 programmable inputs. The emergency stop input accepts normally closed, dry contacts. The remote emergency stop is limited to 75 ft. standard. Extended runs are available with optional relay. All programmable inputs accept normally open, dry contacts. The factory utilizes up to three of these inputs.

Engine System Inputs
- Fuel Level Sensing Resistance Range: 0 to 250 Ω nominal
- Coolant Temperature Sensing Resistance Range: 10 to 2,750 Ω nominal
- Oil Pressure Sensing Resistance Range: 0 to 250 Ω nominal
- Engine Speed Sensing:
  - Magnetic Pickup or CANBus
    - Magnetic Pickup Voltage Range: 3 to 35 V peak (6 to 70 V peak to peak)
    - Magnetic Pickup Frequency Range: 32 to 10,000 Hz
  - Generator Frequency (alternate or redundant)
    - Voltage Range: 12 to 576 V rms

Output contacts
- (15) total programmable outputs: (3) 30 A @ 28 VDC and (12) 2 A @ 30 VDC
- The factory utilizes the following on each generator set which can be reprogrammed as needed:
  - (3) 30 A @ 28 VDC for pre-start, start, and run
  - (12) 2 A @ 30 VDC for general purpose

SPECIFICATIONS, continued:

Metering

Generator and bus voltage (rms)
- Metering range: 0 to 576 VAC (direct measurement); up to 9,999 VAC (with appropriate voltage transformer)
- Accuracy: ±1% of programmed rated voltage of ±2 VAC (subject to accuracy of voltage transformer when used)

Generator current (rms)
- Generator current is measured at the secondary windings of 5 A CTs.
- Metering range: 0 to 5,000 Aac
- CT primary range: 1 to 5,000 Aac, in primary increments of 1 Aac
- Accuracy: ±1% of programmed rated current or ±2 Aac (subject to accuracy of CTs)

Generator and bus frequency
- Metering range: 10 to 72 Hz
- Accuracy: ±0.25% or 0.05 Hz

Apparent power
- Indicates total kVA and individual line kVA (four-wire, line-to-neutral or three-wire, line-to-line).
- Accuracy: ±3% or the full-scale indication or ±2 kVA

Power factor
- metering range: 0.2 leading to 0.2 lagging
- Accuracy: ±0.02

Real power
- Indicates total kW and individual line kW (four-wire, line-to-neutral or three-wire, line-to-line)
- Accuracy: ±3% of the full-scale indication or ±2 kW

Oil pressure
- Metering range: 0 to 150 psi or 0 to 1,034 kPa
- Accuracy: ±3% of actual indication or ±2 psi or ±12 kPa (subject to accuracy of sender)

Coolant temperature
- Metering range: 0 °C to 204 °C (32 °F to 410 °F)
- Accuracy: ±3% of actual indication or ±2° (subject to accuracy of sender)

Fuel level
- Metering range: 0 to 100%
- Accuracy: ±2% (subject to accuracy of sender)

Battery voltage
- Metering range: 6 to 32 VDC
- Accuracy: ±3% of actual indication or ±0.2 VDC

Engine RPM
- Metering range: 0 to 4,500 rpm
- Accuracy: ±2% of actual indication or ±2 rpm

Engine run time
- Engine run time is retained in non-volatile memory.
- Metering range: 0 to 99,999 h; update interval: 6 min
- Accuracy: ±1% of actual indication or ±12 min

Maintenance timer
- Maintenance timer indicates the time remaining until generator set service is due. Value is retained in non-volatile memory.
- Metering range: 0 to 5,000 h; update interval: 6 min
- Accuracy: ±1% of actual indication or ±12 min

Generator protection functions

Overvoltage (59) and undervoltage (27)
- Pickup range: 70 to 576 VAC
- Activation delay range: 0 to 30 s

Overfrequency (81O) and underfrequency (81U)
- Pickup range: 45 to 66 Hz
- Pickup increment: 0.1 Hz
- Activation delay range: 0 to 30 s

Reverse power (32)
- Pickup range: –50 to 5%
- Pickup increment: 0.1%
- Hysteresis range: 1 to 10%
- Hysteresis increment: 0.1%
- Activation delay range: 0 to 30 s
- Activation delay increment: 0.1 S

Loss of excitation (40Q)
- Pickup range: –150 to 0%
- Pickup increment: 0.1%
- Hysteresis range: 1 to 10%
- Hysteresis increment: 0.1%
- Activation delay range: 0 to 30 s
- Activation delay increment: 0.1 S

SPECIFICATIONS, continued:

Generator protection functions, continued:

Phase imbalance (47)
- Pickup range: 5 to 100 VAC
- Pickup increment: 1 VAC
- Activation Delay Range: 0 To 30 S
- Activation Delay Increment: 0.1 S

ROCOF (81R) (optional)
- Pickup range: 0.2 to 10 Hz/s
- Pickup increment: 0.1 Hz/s
- Activation delay range: 0 to 10,000 ms
- Activation delay increment: 1 ms
- Accuracy: 0.2 Hz/s
-

Overcurrent (51)
- Pickup range: 0.18 to 1.18 Aac (1 A current sensing)
- Time dial range: 0

Vector shift (78) (optional)
- Pickup range: 2 to 90°
- Pickup increment: 1°
- Accuracy: ±1°

Environmental
- Temperature
  - Operating: -40 °C to 70 °C (-40 °F to 158 °F)
  - Storage: -40 °C to 85 °C (-40 °F to 185 °F)
- Humidity: IEC 68-2-38
- Salt fog: ASTM B 17-73, IEC 68-2-11 (tested while operational)
- Ingress protection: IEC IP54 for front panel
- Shock: 15 G in three perpendicular planes
- Vibration: 5 to 29 to 5 Hz at 1.5 G peak for 5 min.
  29 to 52 to 29 Hz at 0.036" DECS-A for 2.5 min.
  52 to 500 to 52 Hz at 5 G peak for 7.5 min.
  - Swept over the above ranges for 12 sweeps in each of three mutually perpendicular planes with each 15 minute sweep

Agency approvals
- UL/CSA approvals: "cURus" approved to UL 6200 and CSA C22.2 No.14
- NFPA compliance: complies with NFPA Standard 110, standard for emergency and standby power
- CE marked: complies with applicable EC directives

ADDITIONAL SPECIFICATIONS

Battery backup for real time clock
The MGC-2000 Series provides a real-time clock with an internal backup battery. The battery will maintain timekeeping for approximately 10 years (depending on conditions) after power is removed from the controller. The clock is used by the event recorder and sequence of events functions to time-stamp events, and the exercise timer is used to start and stop the generator set when the exercise feature is utilized.

Breaker management
The MGC-2000 Series is capable of controlling the generator breaker and the mains breaker. The status of the breakers is determined by using BESTlogic™*Plus* programmable logic to set up the GENBRK and MAINSBRK logic blocks. These logic blocks have outputs that can be configured to energize an output contact and control a breaker, as well as inputs for breaker control and status. The MGC-2000 Series will attempt to close a breaker only after verifying that it can be closed. If the breaker cannot be closed, the close request will be ignored. Only one breaker can be closed at a time. Synchronization is required before closing the breaker to a live bus. Closure to a dead bus can be performed after meeting dead bus threshold and timing requirements set by the user.

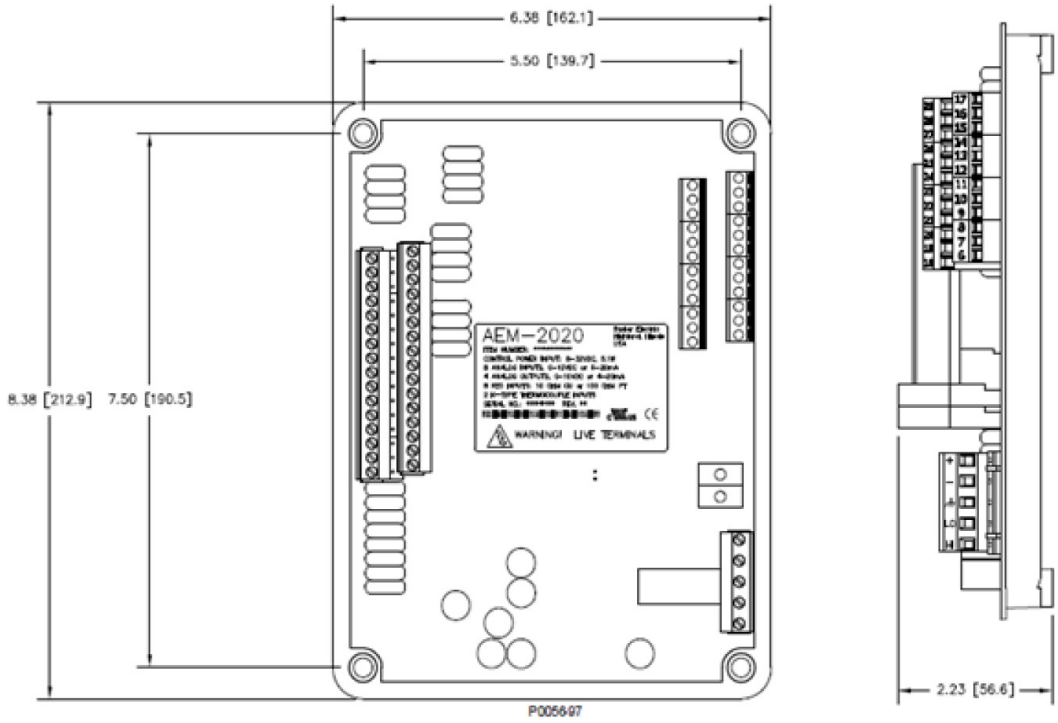
- .

OPTIONAL ACCESSORIES

Analog Extension Module 2020 (AEM–2020)

The optional AEM-2020 is a remote auxiliary device that provides additional MGC-2000 Series analog inputs and outputs. Its features include:

- **Eight analog inputs:** The AEM-2020 provides eight analog inputs that are user-selectable for 4 to 20 mA or 0 to 10 VDC. Each analog input has under/over thresholds that can be configured as status only, alarm, or pre-alarm. When enabled, an out of range alarm alerts the user of an open or damaged analog input wire. The label text of each analog input is customizable
- **Eight Resistance Temperature Detector (RTD) inputs:** The AEM-2020 provides eight user-configurable RTD inputs for monitoring generator set temperature. Each RTD input can be configured as status only, alarm, or pre-alarm to protect against high or low temperature conditions. When enabled, an out-of-range alarm alerts the user of an open or damaged RTD input wire. The label text of each RTD input is customizable.
- **Two thermocouple inputs:** The AEM-2020 provides two thermocouple inputs for monitoring generator set temperature. Each thermocouple input can be configured as status only, alarm, or pre-alarm to protect against high or low temperature conditions. When enabled, an out-of-range alarm alerts the user of an open or damaged thermocouple input wire. The label text of each thermocouple input is customizable.
- **Four analog outputs:** The AEM-2020 provides four analog outputs that are user-selectable for 4 to 20 mA or 0 to 10 VDC. A wide selection of parameters including oil pressure, fuel level, generator voltage, and bus voltage can be configured as analog outputs. Refer to *Section 4, BESTCOMSPlus® Software* of the *MGC-2000 Series Controller Manual,* for a full list of parameter selections.
- **Communications via CANBus:** A Control Area Network (CAN) is a standard interface that enables communication between the AEM-2020 and the MGC-2000 Series.



Input and Output Terminals

OPTIONAL ACCESSORIES, CEM-2020, continued

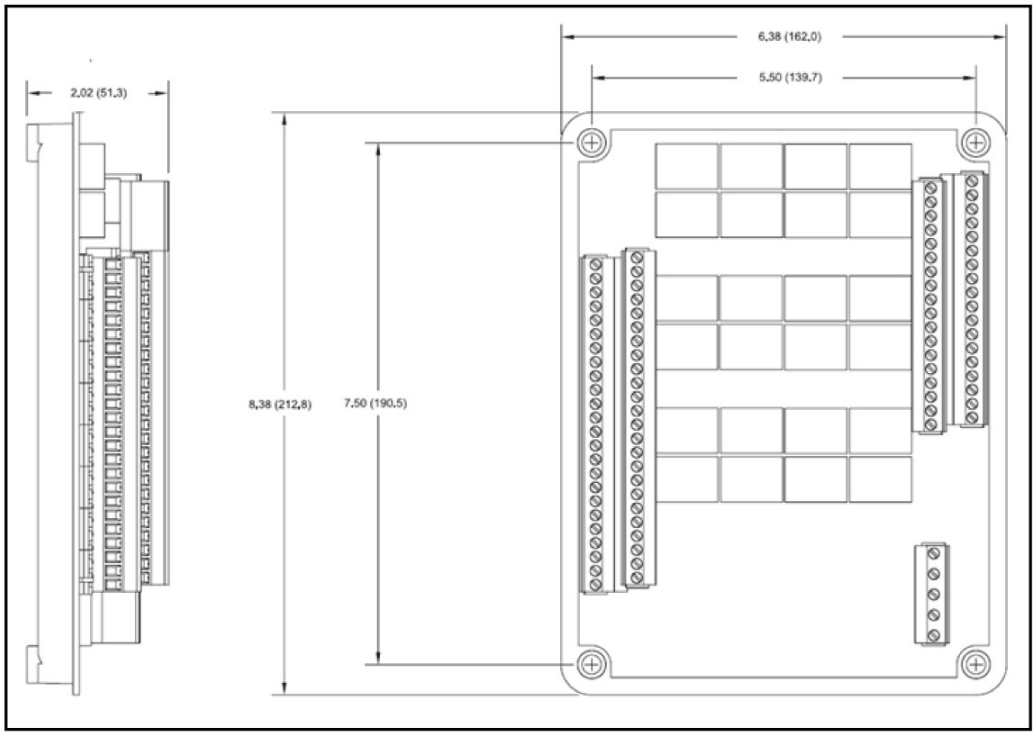
Contact Expansion Module 2020 (CEM-2020)

The CEM-2020 is a remote device that provides additional MGC-2000 Series contact inputs and outputs, giving the user flexibility to use the same model MGC-2000 Series generator set controller for simple or complicated applications that require contact functionality or duplication of contacts for remote annunciation. Its features include:

- **10 Contact Inputs:** The CEM-2020 provides 10 programmable contact inputs with the same functionality as the contact inputs on the MGC-2000 Series.
- **24 Output Contacts:** The CEM-2020 provides 24 Form C programmable output contacts with the same functionality as the output contacts on the MGC-2000 Series. The output ratings of the Form C contacts are:

Output No.	Rating (Cont.)	Additional Information
13–24	1 A @ 30 VDC	This is a gold flash contact for low current circuits.
25–36	4 A @ 30 VDC	

- **Communications via CANBus:** The CEM-2020 communicates to the MGC-2000 Series via SAE J1939 CANBus communications and allows the user to program the functionality of these inputs and outputs in the BESTCOMS*Plus*® software.
- The user can add labels for the inputs and outputs that appear in BESTCOMS*Plus*®, show up on the front panel, and in programmable logic. All the functionality can be assigned to these inputs and outputs as if they were an integrated part of the MGC-2000 Series. The CEM-2020 module has all of the environmental ratings of the MGC-2000 Series, including a model for UL Class1 Div2 applications. The CEM-2020 terminals accept a maximum wire size of 12 AWG, while the chassis ground requires 12 AWG wire. Flexibility is one of the benefits of the MGC-2000 Series, and this add-on module enhances that benefit even further.



CEM-2020 Overall Dimensions

CONFIGURATION OPTIONS

Generator protection	MGC-2010	MGC-2020	MGC-2050
Standard			
Phase Imbalance (47)		✓	✓
Overcurrent (50)			
Overvoltage (59)	✓	✓	✓
Undervoltage (27)	✓	✓	✓
Underfrequency (81U)	✓	✓	✓
Overfrequency (81O)	✓	✓	✓
Reverse Power (32)	✓	✓	✓
Loss of Excitation (40Q)	✓	✓	✓
Enhanced			
Overcurrent (51)		✓	✓
Vector Shift (78)		✓	✓
Rate of Change of Frequency (81R)		✓	✓
Ground Fault			

Inputs	MGC-2010	MGC-2020	MGC-2050
Controller			
Digital	16	16	16
Analog (Dedicated)	3	3	3
Analog	-	-	-
CEM			
Digital	10	10	10
AEM			
Analog	8	8	8
TC	2	2	2
RTD	8	8	8

Outputs	MGC-2010	MGC-2020	MGC-2050
Controller			
Digital Form A, 30 Amp	3	3	3
Digital Form A, 5 Amp	-	-	-
Digital Form A, 2 Amp	12	12	12
Analog	-	-	-
CEM			
Digital Form C, 4 Amp	12	12	12
Digital Form C, 1 Amp	12	12	12
AEM			
Analog	4	4	4
External to Controllers / (CEM)			
Digital Form C, 10 Amp (Interposing Relay)	10	10	10

Communication	MGC-2010	MGC-2020	MGC-2050
ModBus RTU (RS-485)	✓	✓	✓
ModBus TCP-IP			
RDP-110	✓	✓	✓
CANBus	✓	✓	✓
Modem Interface (RS-232)		✓	✓
Ethernet			

Metering	MGC-2010	MGC-2020	MGC-2050
Bus 1 Voltage			
Single Phase	✓	✓	✓
Three Phase	✓	✓	✓
Bus 2 Voltage			
Single Phase			
Three Phase			
Current Transformers			
Generator	3	3	3
Auxiliary	-	-	-

Remote Display Panel Data Sheet

RDP-110C Annunciator

DESCRIPTION

The RDP-110C is a remote annunciation device used in conjunction with digital generator set controllers to provide remote annunciation of the emergency standby generator system. This panel allows for two programmable alarms, two programmable pre-alarms, and is compatible with NFPA 110. The digital generator set controller detects an alarm or pre-alarm condition and communicates via RS-485 to the RDP-110C. The RDP-110C is available with a universal configuration that can be surface- or semi-flush-mounted.

Image for illustration purposes only.
Refer to dimensional drawings on page 3.

HIGHLIGHTS

- Annunciation of eight alarms and seven pre-alarms as detected by the digital generator set controller
- Four programmable LEDs via BESTlogic™ *Plus*
- RS-485 communications reduces the number of interconnection wires to four
- Interconnect distance up to 1,219 m (4,000 ft)
- UL Listed
- CSA Certified

STANDARD FEATURES

- Eight LED alarms
  - Low coolant level
  - Low oil pressure
  - Engine overspeed
  - Fuel leak*
  - High coolant temperature
  - Engine overcrank
  - Emergency stop activated
  - Sender failure*
- Seven LED Pre-Alarms
  - High coolant temperature
  - Low oil pressure
  - Battery overvoltage*
  - Battery charger failure*
  - Low coolant temperature
  - Low fuel level
  - Weak battery
- Three LED operating conditions
  - Switch not in auto
  - EPS supplying load
  - Display panel on
- Audible alarm horn rated at 90 dB (from a distance of two feet)
- Lamp test and alarm silence
- Power supply inputs for 12 VDC or 24 VDC
- Surface- or semi-flush-mounted
- Conduit box included
- Designed for use in harsh environments
- Interconnect distance up to 1,219 m (4,000 ft)
- UL Listed
- CSA Certified

* Pre-configured, but can be reprogrammed and relabeled to match the function of the indicator.

SPECIFICATIONS

Ordering Information

mtu part number: X00A30900392

Power Input

— DC voltage: 8 to 32 VDC (2W)

Environmental and Physical

— Operating temperature: -40 °C to 70 °C (-40 °F to 158 °F)
— Storage temperature: -40 °C to 85 °C (-40 °F to 185 °F)
— Salt fog: qualified to ASTM 117B-1989
— Vibration: The device withstands 2 g in each of the three mutually perpendicular planes, swept over the range of 10 to 500 Hz for a total of six sweeps, 15 minutes each sweep, without structural damage or degradation of performance.
— Shock: 15 g
— Weight: 1.04 kg (2.3 lb)

Agency Approvals

— NFPA 110 Level 1 compliant
— UL Listed to UL 6200, file E97035
— CSA Certified to CSA C22.2 No. 14, file LR 23131

Connections

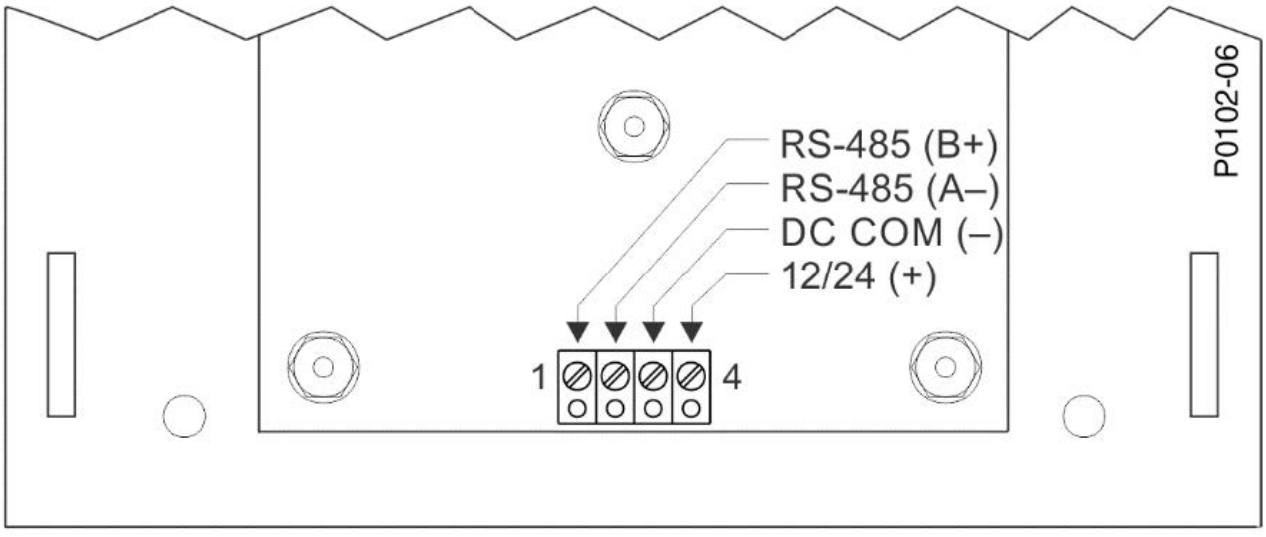


Figure 1: RDP-110C Circuit Board Connections

DIMENSIONS

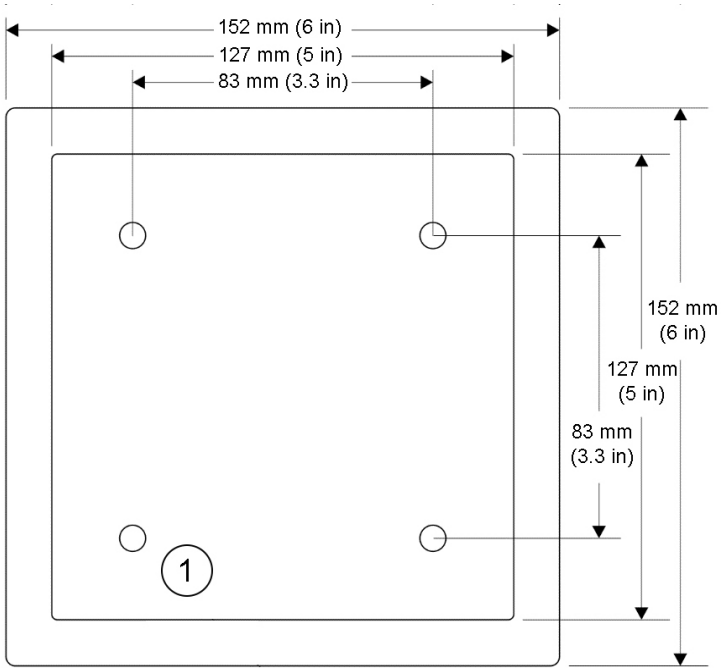


Figure 2: RDP-110C Mounting Dimensions (Rear Panel)

1. Mounting hole diameter (4 places, on rear wall of enclosure) is 7 mm (0.281 in).

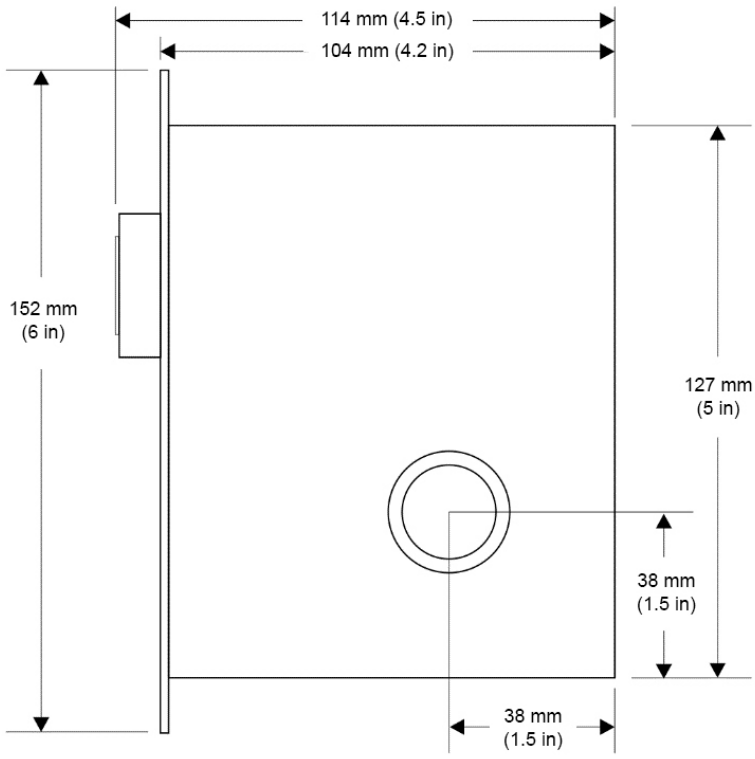


Figure 3: RDP-110C Mounting Dimensions and Knockout Locations (Left Side)

PANEL DISPLAY

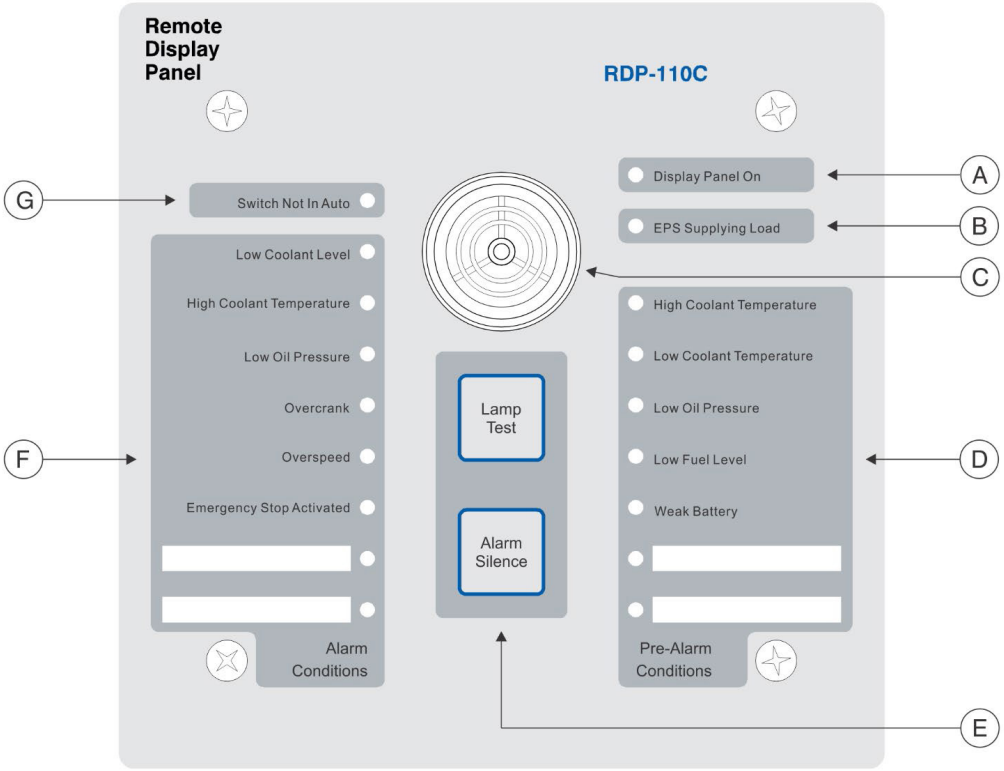


Figure 4: RDP-110C Front Panel Controls and Indicators

A. Green LED lights when power is applied to the RDP-110C.
B. Green LED lights when the generator set is supplying more than 2% of rated load.
C. The horn sounds when an alarm or pre-alarm exists or the connected digital generator set controller is not operating in Auto mode.
D. Amber Pre-Alarm LEDs light when the corresponding pre-alarm setting is exceeded.
E. RDP-110C controls consist of two pushbuttons. The Alarm Silence pushbutton silences the horn. The Lamp Test pushbutton can be used to verify operation of all RDP-110C LEDs and the horn.
F. Red Alarm LEDs light when the corresponding alarm setting is exceeded.
G. Red LED lights when the digital generator set controller is not operating in Auto mode.

Subject to change. | WT000050380 | 2021-03

Remote Emergency Stop Pushbutton Data Sheet

DESCRIPTION

The remote emergency stop pushbutton provides an added level of safety for generator set shutdown. This sturdy, self-latching mushroom button is assembled in a rugged, handy box.

When the button is in its normal state (released and indicator is green), the contacts are closed. Pressing the button opens the contact, which de-energizes the downstream relay coils.

This action communicates with the generator set controller and/or the ECU to initiate an emergency shutdown. Once actuated, the pushbutton must be manually released (twist-to-release) before the generator set controller alarm can be cleared.

FEATURES

- Heavy-duty steel enclosure
- Self-monitoring contact block opens circuit if detached from the actuator
- 45 mm (1.77 in) mushroom button with mechanical indicator
- Pre-assembled

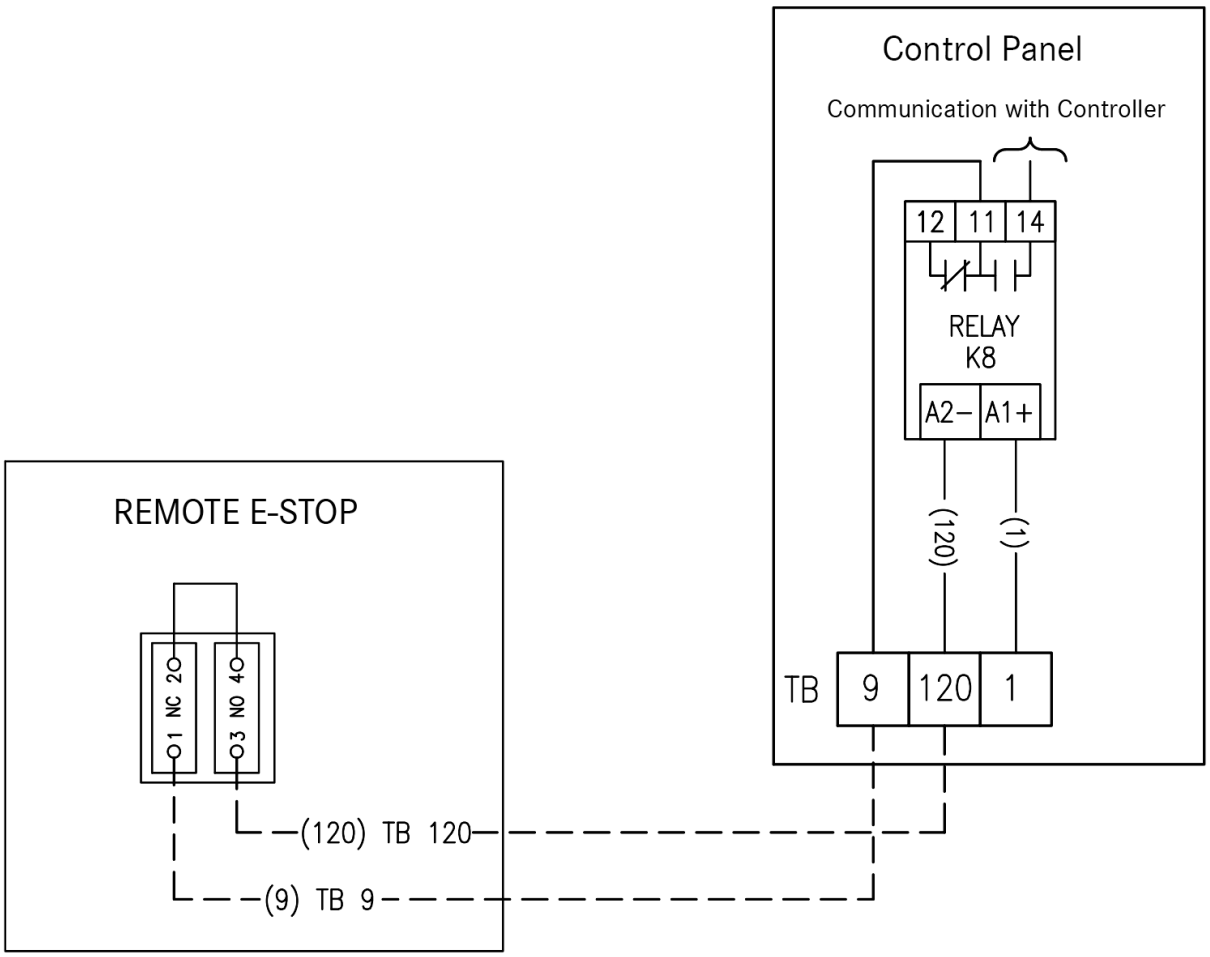
SPECIFICATIONS

- ***mtu*** Part #: SUASA150340
- Enclosure Dimensions:
  - Length: 152.4 mm (6 in)
  - Width: 152.4 mm (6 in)
  - Height: 101.6 mm (4 in)
- Pushbutton Actuator Dimensions:
  - Diameter (Ø): 45 mm (1.77 in)
  - Length: 48 mm (1.89 in)
- Weight: 1.36 kg (3 lbs)
- Enclosure Type: Surface-mount, Type 1 (IP 20 equivalent)
- Contact Configuration:1 N.C. (Normally Closed)
- Terminal Type: Screw clamp
- Wire Range: 4-20 AWG stranded, 14-18 AWG solid
- Approvals:
  - Switch: UL Listed, CSA Certified, CE Marking, IEC 60947-5-1
  - Enclosure: UL Listed, CSA Certified
- Electrical Ratings for ***mtu*** generator set:
  - 12 VDC or 24 VDC
  - 1 Amp

CERTIFICATIONS AND STANDARDS

- Switch: UL Listed, CSA Certified, CE Marking, IEC 60947-5-1
- Enclosure: UL Listed, CSA Certified

DIAGRAM



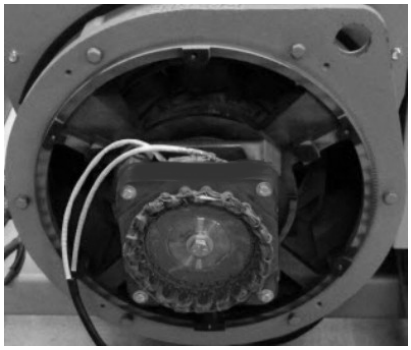
Electrical Schematic

Generator System Data Sheet

Permanent Magnet Generator (PMG)

DESCRIPTION

A permanent magnet generator (PMG) is standard on 450 kW and larger units and is available as an optional accessory on most units smaller than 450 kW. The PMG is an improved method of supplying power to the voltage regulator and adds distinct advantages over the alternative shunt type power supply.



FEATURES

Improved transient response

When a generator is subject to a large step load, the generator's terminal voltage experiences a sudden voltage dip. With a shunt style regulator, reduced voltage means the regulator's ability to increase excitation is reduced and voltage recovery will take longer. Power from a PMG is only dependent on the speed of rotation so voltage regulator power, and therefore excitation power, is not compromised during a load step.

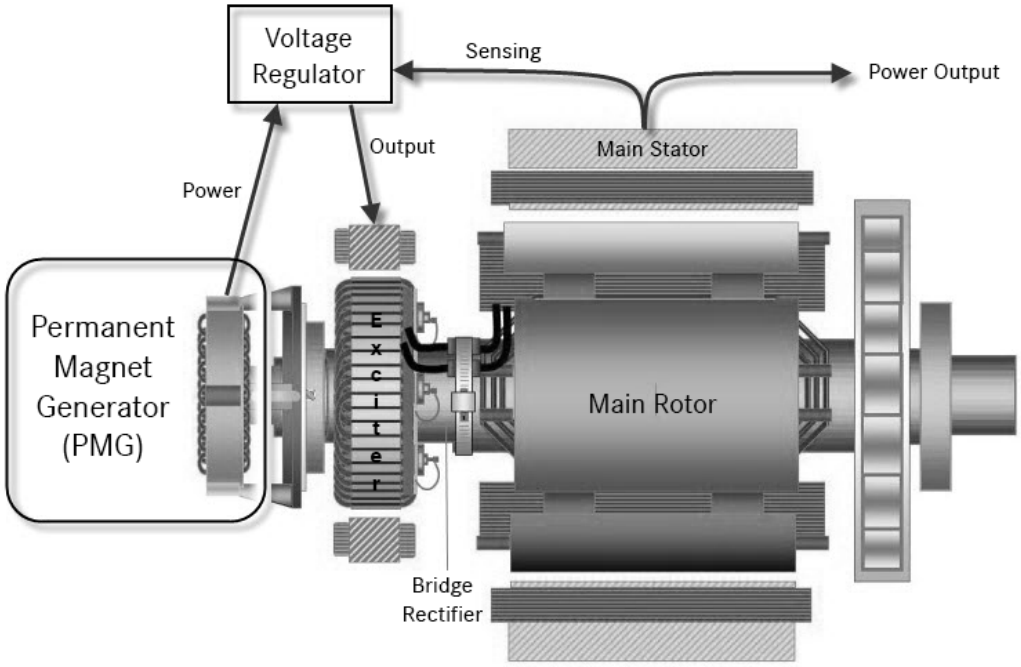
300% short circuit capability

The PMG enables the generator to provide up to 300% short circuit current for 10 seconds. This is important when a fault occurs to ensure current continues to flow long enough for downstream breakers to trip and clear the fault. When a fault occurs with a shunt type regulator, the sudden drop in voltage indicates the regulator has no power to increase excitation to keep current flowing. Without current flow, the downstream breakers may not trip.

Resistant to the effects of harmonics

A PMG is also beneficial in applications with harmonic producing loads. When rectifier-type loads are present and cause voltage wave form notching, the disrupted voltage wave form can affect voltage regulator operation on shunt powered regulators. Unlike a shunt regulator, the PMG supplies the regulator with a power source which is isolated from the electrical system.

Permanent Magnet Generator (PMG) Data Sheet



Generator Equipped with PMG

EXCITATION SYSTEM COMPARISON CHART

	AREP	Permanent Magnet Generator (PMG)
Motor starting capability	High	High
Short circuit current capability	300% at 60 Hz	300% at 60 Hz
Susceptibility to non-linear loads	Minimum	Minimum
Number of components	Minimum	Maximum
Retrofitability	No	Yes
Generator length	Minimum	Maximum
Stator design	Special	Standard with PM attachment
Voltage buildup	Uses residual magnetism and permanent magnet inserts on some frames	Positive from permanent magnets

Subject to change. | WT00037948 | 2020-07

marathon®
Generators

DVR® 2400
DIGITAL VOLTAGE REGULATOR

NEW FEATURES
- USB 2.0 access through front panel
- Euro style connector for low voltage connections
- Event Logging
- PMG voltage metering
- Polarity configuration for external inputs
- Configurable cut-in and cut-out frequencies
- Retain/reset configuration of remote adjust

FOUR DIGIT HMI DISPLAY
From intial setup to monitoring regulator status, this display provides innovative, fast and easy setup.

REGULATION MODES
Single and Three phase (AVR), Manual Field Current Regulation (FCR), Reactive Power Regulation (VAR) and Power Factor Regulation (PF). All modes compatible with control by external devices.

GENERATOR SOFT START
Controlled increase to rated voltage limits overshoot during voltage build-up in AVR modes.

TRUE RMS VOLTAGE SENSING - SINGLE OR THREE PHASE
Directly sense 100 to 600 Volts at 50/60 Hz. Circuitry senses true RMS voltage for superior regulation.

SINGLE PHASE POWER METERING

FRAME SIZE SPECIFIC PID SELECTION
Simply select the appropriate frame size and your gains are set.

ROBUST GENERATOR PROTECTION FEATURES
9 different Alarm and Shutdown protection features, many are customizable for your application including:
- Field Over & Under Excitation
- Instantaneous Field Over Current
- Generator Over & Under Voltage
- Generator Voltage Imbalance
- Generator Loss of Sensing

REGAL®

DVR®2400 DIGITAL VOLTAGE REGULATOR

SPECIFICATIONS

Voltage Regulation - 0.25% over load range at rated power factor and constant generator frequency.

Output Power - 100 Vdc, 4.0 Adc continuous rating and 190 Vdc, 7.5 Adc forcing capability for one minute.

Exciter Field DC Resistance - 18 to 25Ω Range

Remote Voltage Adjustment - ±30% of nominal via analog input, ±15% via external contacts.

Input Power - 180 to 240 Vac, 250 to 300 Hz PMG power supply

Regulator Sensing - 100 to 600 Vac, 50/60 Hz, 1-phase/3phase

Operating Temperature - From -40˚C to +70˚C (-40˚F to + 158˚F)

Storage Temperature - From -40˚ C to +85˚C (-40˚F to +185˚F)

Ingress Protection - IP52 (front side mounted in conduit box along with swing cover); IP10 (rear side with protective cover)

Shock - 20G in 3 perpendicular planes

Vibration - 2.5G at 5 to 26 Hz; 0.050" double amplitude (27 to 52 Hz); 7G at 53 to 500 Hz

Weight - 3.5 lb. (1361 g)

Humidity Testing - Per MIL-STD-705B, Method 711-D

Salt Fog Testing - Per MIL-STD-810E

EMI Compatibility

Immunity

Meets EN 61000-6-2: 2005 Electromagnetic compatibility (EMC) -Part 6-2: Generic standards- immunity for industrial environments.

Emission

- Meets EN 61000-6-4: 2007 Electromagnetic compatibility (EMC) - Part 6-4: Generic Standards - emmission standard for industrial environments

EMI Compatibility Tests

Immunity

- Electrostatic Discharge (ESD): IEC 61000-4-2
- Radiated RF: IEC 61000-4-3
- Electrical Fast Transient (EFT) /Burst: IEC 61000-4-4
- Conducted RF: IEC 61000-4-6
- Power Frequency and Magnetic Field: IEC 61000-4-8

Emission

- Radiated RF: EN 61000-6-4: 2007, 30 MHz to 1000 MHz

marathon® Generators

Regal Beloit America, Inc.
100 East Randolph Street
Wausau, WI 54402-8003
PH: 715-675-3359

www.marathonelectric.com

REGAL®

Product data sheet
Characteristics

LDL36600U33X
PowerPact L Circuit Breaker,Micrologic3.3S,600A,3P,600V,14kA

Main

Product or component type	Circuit breaker
Range of product	PowerPact L
Trip unit technology	Electronic standard Micrologic 3.3 S LSI
Breaking capacity code	D

Complementary

Protection technology	Current limiter
Line Rated Current	600 A
Poles description	3P
Breaking capacity	18 kA at 480 V AC 25 kA at 240 V AC 14 kA at 600 V AC
System Voltage	600 V AC
[Ics] rated service short-circuit breaking capacity	80 %
Mounting mode	Unit mount
Electrical connection	Lugs load Lugs line
AWG gauge	AWG 2/0...500 kcmil (aluminium/copper) 2
Terminal identifier	AL600LS52K3
Height	11.3 in
Width	5.5 in
Depth	6.61 in

Environment

Product certifications	NMX CE

	CCC UL listed CSA

Ordering and shipping details

Category	01116 - L ELEC TRIP UNIT MOUNT BREAKER/SW
Discount Schedule	DE2
GTIN	00785901765868
Nbr. of units in pkg.	1
Package weight(Lbs)	15
Returnability	Y
Country of origin	US

Offer Sustainability

Sustainable offer status	Green Premium product
RoHS (date code: YYWW)	Compliant - since 1132 - Schneider Electric declaration of conformity Schneider Electric declaration of conformity
REACh	Reference not containing SVHC above the threshold Reference not containing SVHC above the threshold
Product environmental profile	Available
Product end of life instructions	Available

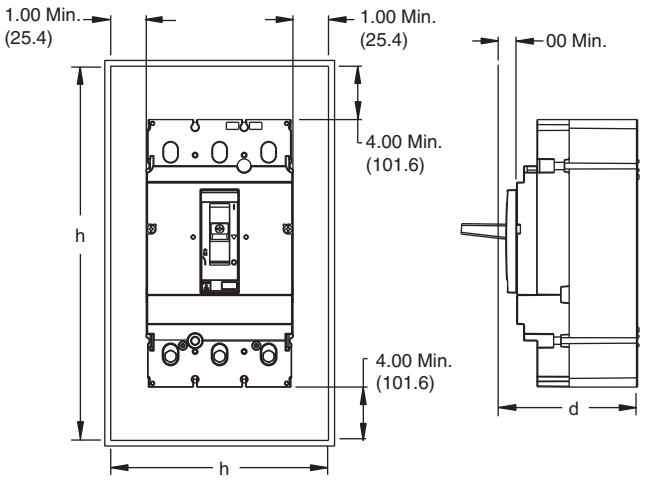
Contractual warranty

Warranty period	18 months

Circuit Breaker Enclosures and Enclosure Accessories

- Square D™ brand circuit breaker enclosures are UL Listed/CSA Certified and are suitable for use as service entrance equipment, except as footnoted.
- The short circuit rating of an enclosed circuit breaker is equal to the rating of the circuit breaker installed, except as footnoted.
- Circuit breakers are ordered and shipped separately for field installation.

Table 113: Minimum Enclosure Dimensions



Circuit Breaker	Amperage	Enclosure Dimensions (h x w x d)	
		Standard (80%)	100% Rated
HD/HG /HJ/HL	15–150 A	15.6 x 6.12 x 3.49 in. (396 x 155 x 89 mm)	15.6 x 6.12 x 3.49 in. (396 x 155 x 89 mm)
HR		18.13 x 8.63 x 4.13 in. (461 x 219 x 105 mm)	62 x 22.5 x 14 in. (1575 x 572 x 356 mm)
JD/JG/ JJ/JL[1]	150–250 A	18.72 x 6.12 x 3.49 in. (476 x 155 x 89 mm)	18.72 x 6.12 x 3.49 in. (476 x 155 x 89 mm)
JR		28.5 x 12.38 x 5.38 in. (724 x 314 x 137 mm)	62 x 22.5 x 14 in. (1575 x 572 x 356 mm)
LD/LG/ LJ/LL	250–600 A	35.48 x 12.00 x 4.45 in. 901 x 305 x 113 mm)	35.48 x 12.00 x 4.45 in. (901 x 305 x 113 mm)
LR		40.5 x 13.75 x 4.33 in. (1030 x 350 x 110 mm)	40.5 x 13.75 x 4.33 in. (1030 x 350 x 110 mm)

1 Minimum enclosure insulation required if circuit breaker side < 4.13 in. (105 mm) from metal.

Table 114: Circuit Breaker Enclosure Catalog Numbers

Circuit Breaker			Enclosure Cat. No.				
Cat. No. Prefix	Rating	Poles	NEMA 1 Flush	NEMA 1 Surface	NEMA 3R[1]	NEMA 4, 4X, 5, 3, 3R Stainless Steel	NEMA 12/3R, 5 (Without Knockouts)[2]
HDL,HGL,HJL,HLL	15–150 A	2, 3	J250F	J250S	J250R	J250DS	J250AWK
JDL,JGL,JJL,JLL	150–250 A	2, 3					
HDL	15–100 A	3	—	HD100S[3, 4, 5]	—	—	—
JDL	150–250 A	3	—	JD250S[3, 5, 6]	—	—	—

1 Enclosures with NRB or RB suffix have provisions for 3/4 in. through 2-1/2 in. bolt-on hubs in top endwall. Enclosures with R suffix have blank endwalls and require field cut opening.

2 Suitable for rainproof NEMA 3R application by removing drain screw from bottom endwall.

3 Copper wire only.

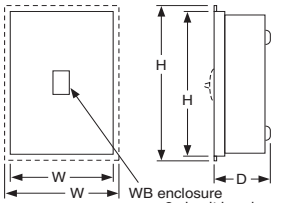
4 Maximum short circuit current rating is 25 kA, 240 Vac.

5 Order service ground kit PKOGTA2 if required.

6 Maximum short circuit current rating is 18 kA, 480 Vac.

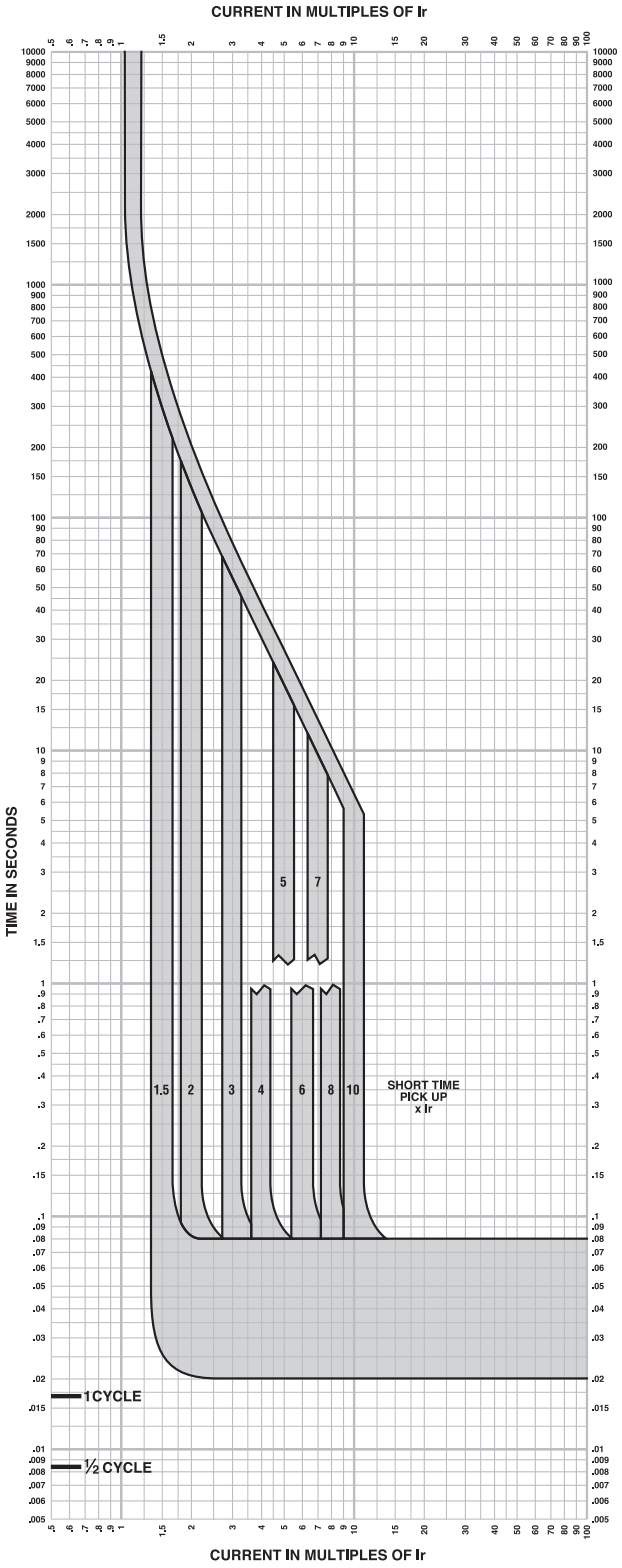
Table 115: Dimensions

Cat. No.	Approximate Dimension						
	Series	H		W		D	
HD100S	A01	17.00 in.	431.8 mm	7.90 in.	200.7 mm	4.75 in.	120.7 mm
J250F	A01	32.40 in.	823 mm	15.40 in.	391 mm	6.00 in.	152 mm
J250S	A01	31.36 in.	797 mm	14.36 in.	365 mm	6.00 in.	152 mm
J250R	A01	31.05 in.	789 mm	14.47 in.	368 mm	6.28 in.	160 mm
J250DS	A01	32.26 in.	819 mm	9.72 in.	247 mm	7.94 in.	202 mm
J250AWK	A01	32.26 in.	819 mm	9.72 in.	247 mm	7.94 in.	202 mm



NEMA Type 1

Figure 125: Micrologic 3.3S and 3.3S-W Electronic Trip Unit Long Time/Short Time Trip Curve



MICROLOGIC™ ELECTRONIC TRIP UNITS
Micrologic™ 3.3S and 3.3S-W
Long Time/Short Time Trip Curve
600A L-Frame

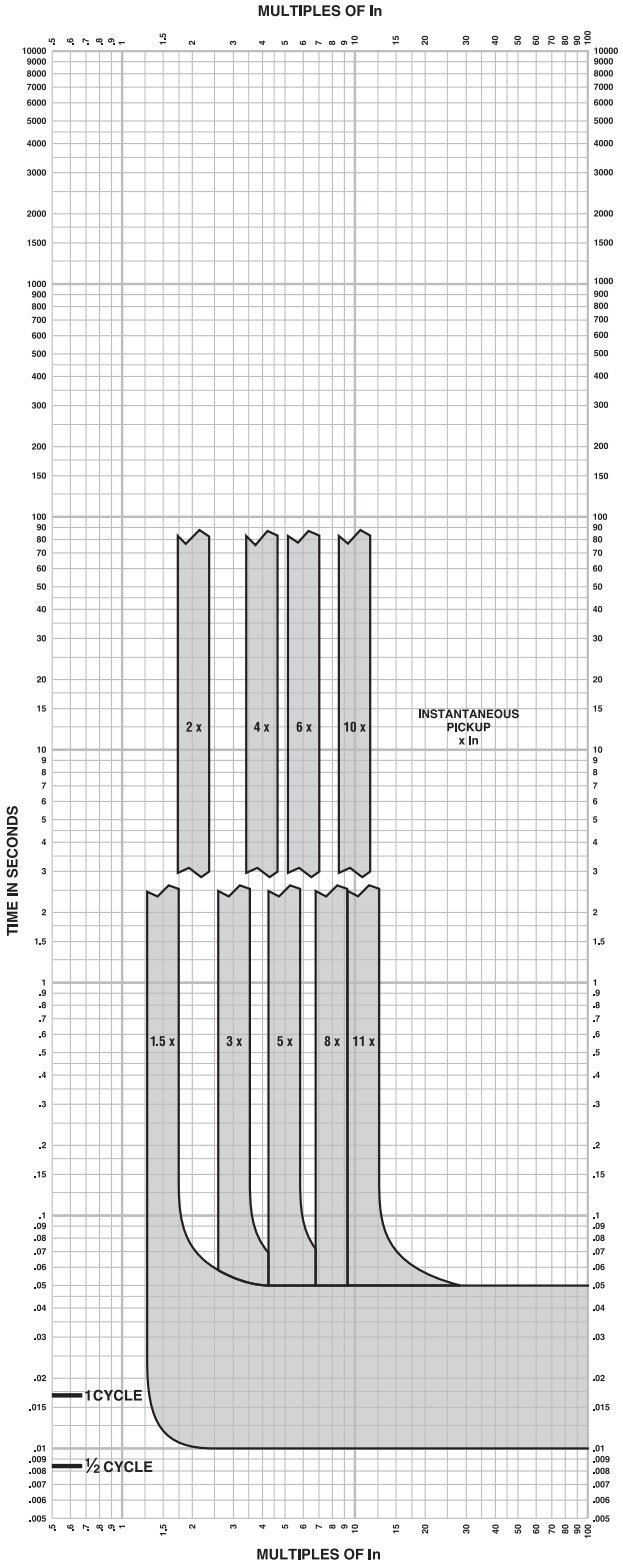
The time-current curve information is to be used for application and coordination purposes only.

Notes:

1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.

Curves apply from -35ºC to +70ºC (-31ºF to +158ºF) ambient temperature.

Figure 126: Micrologic 3.3, 3.3-W, 3.3S, 3.3S-W, 5.3A, 5.3A-W, 5.3E, 5.3E-W, 6.3A, 6.3A-W, 6.3E, and 6.3E-W Electronic Trip Unit Instantaneous Trip Curve



MICROLOGIC™ ELECTRONIC TRIP UNITS
Micrologic™ 3.3, 3.3-W, 3.3S, 3.3S-W, 5.3A, 5.3A-W, 5.3E, 5.3E-W, 6.3A, 6.3A-W, 6.3E, and 6.3E-W
Instantaneous Trip Curve
600A L-Frame

The time-current curve information is to be used for application and coordination purposes only.

Notes:

1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
3. In = Maximum dial setting of Ir.
   600A L-Frame: In = 600A = Max Ir setting

Curves apply from -35°C to +70°C (-31°F to +158°F) ambient temperature.

Electrical System Data Sheet

Ground Fault Convenience Receptacle

DESCRIPTION

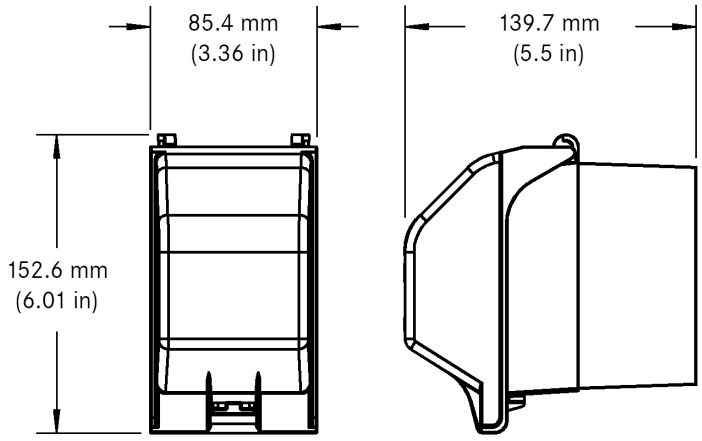
Convenience receptacles provide a 20 Amp Ground Fault Circuit Interrupter (GFCI). Receptacle is mounted in a weatherproof box, including a weatherproof cover, located adjacent to the generator set control panel.

FEATURES

- Limits improper access to energized contacts
- Patented tamper-resistant protection
- Patented self-test diagnostics
- Power indication
- Ground fault indicator
- Open circuit condition eliminates false assumption of protection at face
- Durable, polyester face with V-0 flammability rating
- Vertical latching receptacle cover prevents accidental equipment disconnects
- Box and cover die cast aluminum construction and industrial design provide a rugged and protective enclosure for receptacle

CERTIFICATIONS AND STANDARDS

- Receptacle: c-UL-us Listed
- Box and Cover: UL Listed and CSA Certified



Convenience Receptacle Box and Cover Dimensional Diagram

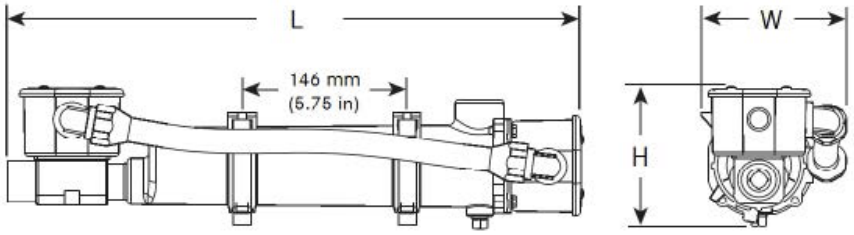
Subject to change. | WT00038239 | 2021-10

Water Heater Data Sheet

CB, CL, and WL Series

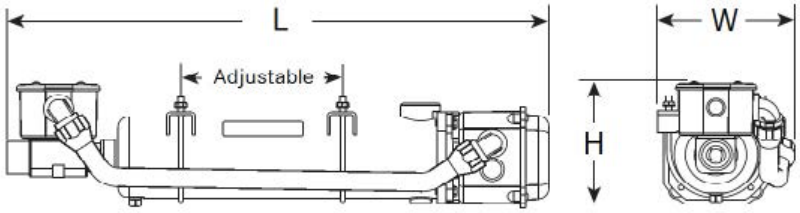
The CB, CL, and WL tank-style engine heaters are designed to preheat diesel and gas engines in generator set applications. With easy start-up regardless of ambient temperature, they feature a built-in thermostat and heat engines from 6L to 25L displacement. Thermosiphon circulation of the coolant delivers heat throughout the entire engine for optimum performance.

CB Model with Thermostat



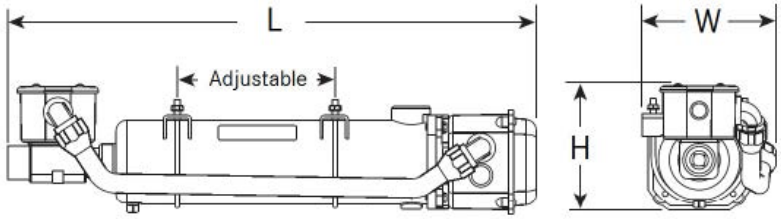
CB Model

CL Model with Thermostat



CL Model

WL Model with Thermostat



WL Model

CERTIFICATIONS AND STANDARDS

- CB and CL Models: c-UL-us Listed, CSA Certified, and CE Compliant
- WL Model: CE Compliant

SPECIFICATIONS

	CB Model	CL Model	WL Model
Height:	132 mm (5.2 in)	147 mm (5.8 in)	147 mm (5.8 in)
Length:	510 mm (20.1 in)	597 mm (23.5 in)	597 mm (23.5 in)
Width:	129 mm (5.1 in)	158 mm (6.2 in)	158 mm (6.2 in)
Weight:	3 kg (6.9 lb)	4.5 kg (10 lb)	4.5 kg (10 lb)

A Rolls-Royce solution

SPECIFICATIONS, continued

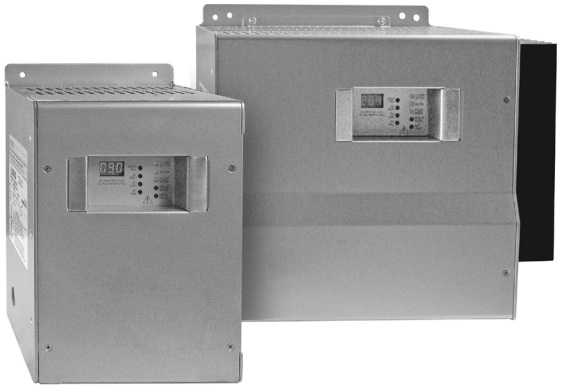
- Heating Fluid: Engine coolant (50% glycol/50% water)
- Power: 1.5, 2, 2.5, 3, 4, and 5 kW
- Rated Voltage: 120V – 575V
- Phase: 1 and 3
- Enclosure: IP44
- Fluid Capacity:
  - CL and WL Models: 2 L (0.5 gal)
  - CB Models: 1.2 L (0.3 gal)
- Max Pressure: 8.61 bar (125 psi)
- Inlet / Outlet: 1" NPT Male / 1" NPT Female
- Thermostat Range:
  - On: 38 °C (100 °F)
  - Off: 49 °C (120 °F)

Model Number	*mtu* Part Number	Watts	Volts	Phase	Hz	Amps
CB115410-200	SUA98952	1,500	480	1	60	3.1
CB120210-200	SUA98996	2,000	240	1	60	8.3
CB120410-200	SUA98953	2,000	480	1	60	4.2
CB120810-200	SUA98404	2,000	208	1	60	9.6
CB125210-200	SUA96723	2,500	240	1	60	10.4
CB125410-200	SUA90334	2,500	480	1	60	5.2
CB125810-200	SUA96727	2,500	208	1	60	12
CL130410-200	SUA97791	3,000	480	1	60	6.3
CL140210-200	SUA99109	4,000	240	1	60	16.7
CL140410-200	SUA52741	4,000	480	1	60	8.3
CL140810-200	SUA99110	4,000	208	1	60	19.2
CL150210-200	SUA98913	5,000	240	1	60	20.8
CL150212-200	SUA82416	5000	240	1	60	20.8
CL150412-200	SUA83334	5000	480	1	60	10.4
CL150810-200	SUA96725	5,000	208	1	60	24
WL325410-200	SUA96568	2,500	480	3	60	3
WL325810-200	SUA97254	2,500	208	3	60	6.9
WL340410-200	SUA96787	4,000	480	3	60	4.8
WL340810-200	SUA99286	4,000	208	3	60	11.1
WL350410-200	SUA98951	5,000	480	3	60	6
WL350810-200	SUA92800	5,000	208	3	60	13.9

Battery Charger Data Sheet

NRG Intelligent Engine Start Battery Charger

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



BENEFITS AND FEATURES

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

The NRG battery charger maximizes starting system reliability while slashing generator set servicing costs:
- One NRG replaces almost any charger without extra site visits. Installers can select or change at any time 120, 208, or 240 volts AC input, 12 or 24-volt battery and output settings optimized for nearly any lead-acid or nickel cadmium battery.
- Easy-to-understand user interface provides state-of-the-art system status including digital metering, NFPA 110 alarms, and a battery fault alarm that can send service personnel to the site before failure to start.
- Batteries charged by NRG give higher performance and last longer. In uncontrolled environments, precision charging increases battery life and watering intervals 400% or more.
- NRG meets all relevant industry standards – including UL, NFPA 110, and CE. Seismic Certification per International Building Code (IBC) 2000, 2003, 2006. All units are C-UL listed. 50/60 Hz units add CE marking to UL agency marks.

EnerGenius reliability technology built into every charger includes:
- All-electronic operation with generous component de-rating
- Disconnected/reversed/incorrect voltage battery alarm and protection
- Protection of connected equipment against load dump transients
- Widest temperature rating and overtemperature protection
- Superior lightning and voltage transient protection
- Demonstrated field MTBF > 1 million hours

SPECIFICATIONS

AC Input

- Voltage: 110-120/208-240 VAC, ±10%, single phase, field selectable
- Input current:
  - 10A charger: 6.6/3.3 amps maximum
  - 20A charger: 12.6/6.3 amps maximum
- Frequency: 60 Hz ±5% standard; 50/60 Hz ±5% optional
- Input protection: 1-pole fuse, soft-start, transient suppression

Charger Output

- Nominal voltage rating: 12/24 volt, field selectable
- Battery settings: six discrete battery voltage programs
  - Low or high S.G. flooded
  - Low or high S.G. VRLA
  - Nickel cadmium 9, 10, 18, 19 or 20 cells
- Regulation: ±0.5% line and load regulation
- Current: 10 or 20 amps nominal
- Electronic current limit: 105% rated output typical—no crank disconnect required
- Charge characteristic: constant voltage, current limited, 4-rate automatic equalization
- Temperature compensation: Enable or disable anytime, remote sensor optional
- Output protection: Current limit, 1-pole fuse, transient suppression

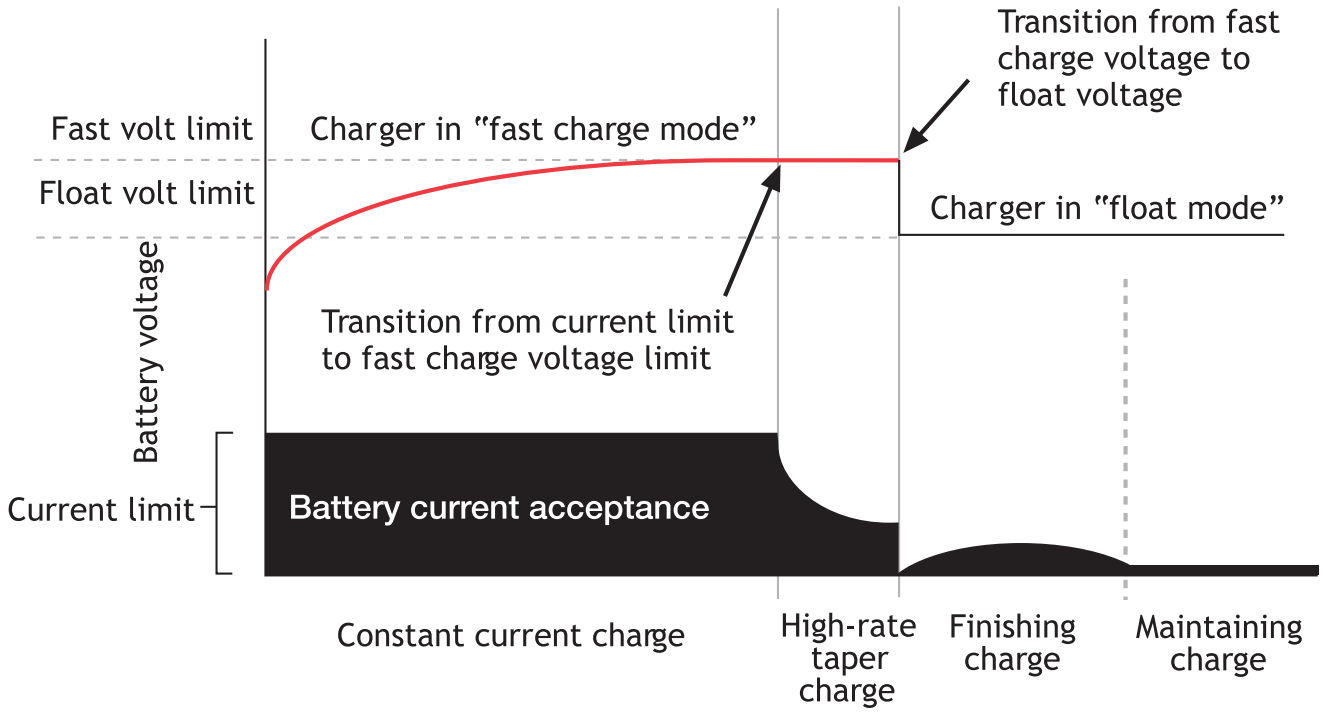


Figure 1: Standard Four (4) Rate Charging

SPECIFICATIONS, continued:

User Interface, Indication and Alarms

— Digital meter: automatic meter alternately displays output volts, amps[1]
— Accuracy: ±2% volts, ±5% amp
— Alarms: LED and Form C contact(s) per table:

	Alarm Code "C" (meets requirements of NFPA 110)
AC good	LED
Float mode	LED
Fast charge	LED
Temp comp active	LED
AC fail	LED and Form C contact[2]
Low battery volts	LED and Form C contact[2]
High battery volts	LED and Form C contact[2]
Charger fail	LED and Form C contact[2]
Battery Fault	LED and Form C contact[2]

Front panel status display

[1] Three-position jumper allows user to select from three display settings: alternating volts / amps (normal), constant volts, or constant amps
[2] Contacts rated 2A at 30 VDC resistive

Table 1: Alarm Code "C", LED and Form C contacts

Controls

— AC input voltage select: field-selectable switch
— 12/24-volt output select: field-selectable two-position jumper
— Battery program select: field-selectable six-position jumper
— Meter display select: field-selectable three-position jumper
— Fast charger enable/disable: field-selectable two-position jumper
— Temp compensation enable: standard, can be disabled or re-enabled in the field
— Remote temp comp enable: connect optional remote sensor to temp comp port

Simple field adjustments

Environmental

— Operating temperature: -20 °C to 60 °C, meets full specification to 45 °C
— Over temperature protection: gradual current reduction to maintain safe power device temperature
— Humidity: 5% to 95%, non-condensing
— Vibration (10A unit): UL 991 Class B (2G sinusoidal)
— Transient immunity: ANSI/IEEE C62.41, Cat. B, EN50082-2 heavy industrial, EN 61000-6-2
— Seismic certification:
  - IBC 2000, 2003, 2006, 2009
  - Maximum S_{ds} of 2.28 g
  - Optional OSHPD pre-approval

NRG Intelligent Engine Start Battery Charger Data Sheet

Agency Standards

- Safety
  - C-UL Listed to UL 1236 (required for UL 2200 gensets),
  - UL Category BBGQ, CSA standard 22.2 no. 107.2-M89
  - CE: 50/60 Hz units DOC to EN 60335
- Agency marking
  - 60 Hz: c-UL-us listed
  - 50/60 Hz: c-UL-us listed plus CE marked
- EMC
  - Emissions: FCC Part 15, Class B; EN 50081-2
  - Immunity: EN 61000-6-2
- NFPA standards
  - NFPA 70
  - NFPA 110. (NFPA 110 requires alarms “C”)
- Optional agency compliance
  - OSHPD pre-approval

Construction

- Material: non-corroding aluminum enclosure
- Dimensions: see Diagrams and Dimensions section of this document
- Printed circuit card: Surface mount technology, conformal coated
- Cooling: natural convection
- Protection degree
  - Listed housing: NEMA-1 (IP20)
  - Optional IP21 drip shield
  - Optional NEMA 3R enclosure
- Damage prevention: fully recessed display and controls
- Electrical connections: compression terminal blocks

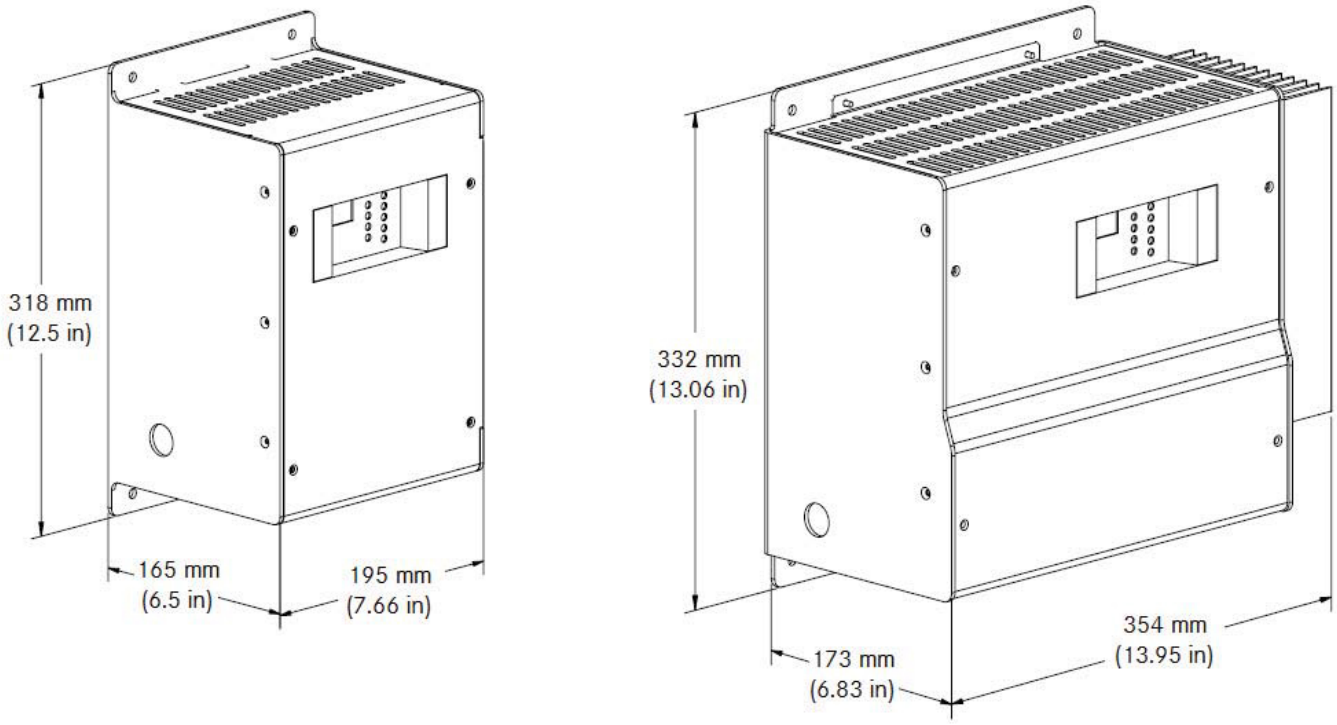
Warranty

Standard warranty: standard warranty terms apply

Optional Features

- Input: input frequency, 50/60 Hz
- Remote temp comp sensor: recommended where battery and charger are in different locations
- Drip shield meets s/b (IP21): protects from dripping water
- NEMA 3R housing: enables outdoor installation (remote temp sensor recommended)

DIAGRAMS AND DIMENSIONS



10A Chargers

20A Chargers

Figure 2: Charger Dimensions

NRG Ordering Information						
Output Volts	Output Amps	Frequency	Model	Available Configurations	NFPA 110 Alarms	Weight kg (lbs)
12/24	10	60 Hz	SUA83187	Enclosed	Yes	10.4 (23)
12/24	20	60 Hz	SUA90170	Enclosed	Yes	19.1 (42)
12/24	10	50/60 Hz	SUA89983	Enclosed	Yes	10.4 (23)
12/24	20	50/60 Hz	SUA94705	Enclosed	Yes	19.1 (42)
24	20	60 Hz	SUA87576	Enclosed	Yes	19.1 (42)
24	20	50/60 Hz	SUA89971	Enclosed	Yes	19.1 (42)

All models offer field-selectable input 120/208-240 volts.

ISO 9000 · c UL us LISTED · CE · SEISMIC IBC 2006 CERTIFIED · EMC IEC 61000-6-2 IMMUNITY · oshpd PRE-APPROVED

Subject to change. 2021-03

Starting System Data Sheet

Commercial Battery

Extra ruggedness and resistance to vibration, heat, chemicals, and physical abuse are built into every commercial battery provided with an ***mtu*** generator set. The battery design features the latest in power storage technology for lead-acid batteries, as well as incorporates proven designs developed with the most experience in the business.

PRODUCT FEATURES

- **Case Design:** Tough, high-impact reinforced polypropylene case is heat sealed under extreme pressure to withstand heavy commercial service usage. This helps to prevent electrolyte leakage, improves reliability, and reduces breakage.
- **Internal Design:** Full-frame power path grids avoid sharp wires protruding through separators and directs the power straight to the lug for low resistance and higher cranking amps.
- **Terminals:** Standard terminals are solidly built preventing porosity, corrosion, black post, and harmful acid leaks.
- **Power Density:** Extra heavy-duty batteries deliver more cranking amps per pound.
- **Maintenance:** The battery uses pure de-mineralized electrolytes for reduced water loss, reduced gassing, longer battery life, and low maintenance.
- **Reliability:** Narrow ribs reduce separator corrosion to protect against shorts while deep-pocket envelopes dramatically improve reliability and extend service life.
- **Quality:** Over 250 quality control checks, combined with computer-aided design technology, provide a tough, durable battery in each commercial battery provided with an ***mtu*** generator set.

						Overall Dimension			
BCI Group Size	Terminal Type	*mtu* Part Number	Volt	Cranking Performance CCA (Cold Cranking Amps) -18° C / 0° F	Reserve Capacity	Length mm (in)	Width mm (in)	Height mm (in)	Weight (Wet) kg (lbs)
24	Post	SUA102538	12	650	115	273 (10.75)	171 (6.75)	229 (9)	18.1 (40)
Qty 2 31	Post	SUA120299	12	950	175	330 (13)	171 (6.75)	241 (9.5)	25.7 (56.5)
4D	Post	SUA102493	12	1,050	290	527 (20.75)	216 (8.5)	258 (10.125)	45.2 (99.5)
8D	Post	SUA102492	12	1,400	430	527 (20.75)	279 (11)	254 (10)	59.3 (130.5)

Air Filter Data Sheet

DESCRIPTION

Air filters offer engine protection and minimal downtime during normal maintenance. The air filters on ***mtu*** generator sets are easy to install, durable, and reliable.

FEATURES

- Designed to withstand severe intake pulsation and high humidity
- Sturdy, self-supporting, one-piece construction
- Lightweight and compact

SPECIFICATIONS

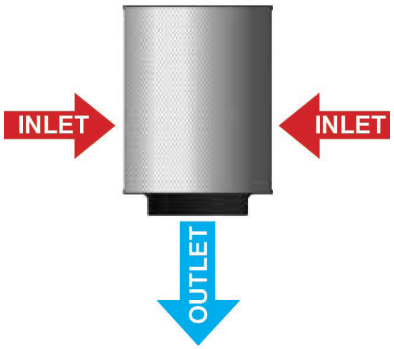
mtu Part #	Airflow @ Inches of Water Restriction (refer to *Airflow Diagrams* below)			Weight	Maximum Temp	
	m^3/min (SCFM) @ 4 in. H_2O	m^3/min (SCFM) @ 6 in. H_2O	m^3/min (SCFM) @ 8 in. H_2O	kg (lb)	Continuous °C (°F)	Intermittent °C (°F)
SUA106417	4.3 (150)	5.1 (180)	6.1 (215)	1 (2.2)	83 (180)	105 (220)
SUA90069	43.9 (1,550)	52 (1,836)	60 (2,118)	3.6 (8)	83 (180)	105 (220)
SUA86885	13.7 (485)	17.6 (620)	21.5 (760)	2.6 (5.8)	83 (180)	105 (220)
SUA77166	3.8 (135)	4.6 (163)	5.3 (190)	1.3 (2.9)	N/A	N/A
SUA40198	3.1 (112)	4.1 (145)	4.8 (170)	0.64 (1.4)	83 (180)	105 (220)
XG3012100019	23.5 (830)	31.43 (1,110)	36.67 (1,295)	1.45 (3.2)	83 (180)	105 (220)
XG2112100001 XG2512100002	9.63 (340)	13.03 (460)	15.85 (560)	1.59 (3.5)	N/A	N/A

mtu Part #	Dimensions (refer to *Dimension Diagrams* on next page)				Minimum Removal Clearance
	Body Length (D) mm (in)	Body Diameter (A) mm (in)	Outlet Length (F) mm (in)	Outlet Diameter (C) mm (in)	mm (in)
SUA106417	127 (5)	216 (8.5)	35 (1.38)	76 (3)	38.1 (1.5)
SUA90069	400 (15.75)	318 (12.5)	48 (1.89)	198 (7.8)	38.1 (1.5)
SUA86885	279 (11)	318 (12.5)	35 (1.38)	127 (5)	38.1 (1.5)
SUA77166	172 (6.75)	216 (8.5)	27 (1.08)	75 (2.96)	38.1 (1.5)
SUA40198	102 (4)	216 (8.5)	35 (1.38)	64 (2.5)	38.1 (1.5)
XG3012100019	381 (15)	318 (12.5)	35 (1.38)	152 (6)	38.1 (1.5)
XG2112100001 XG2512100002	267 (10.5)	267 (10.5)	35 (1.38)	102 (4)	38.1 (1.5)

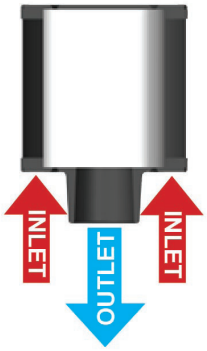
N/A = Not Available

A Rolls-Royce solution

AIRFLOW DIAGRAMS



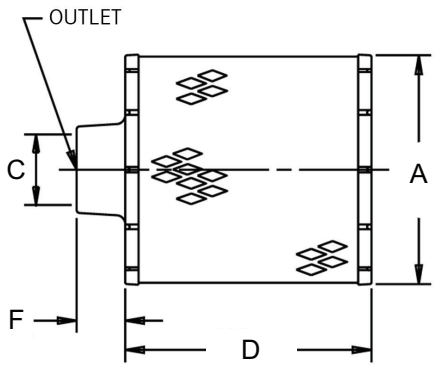
Airflow Diagram: SUA90069, XG3012100019



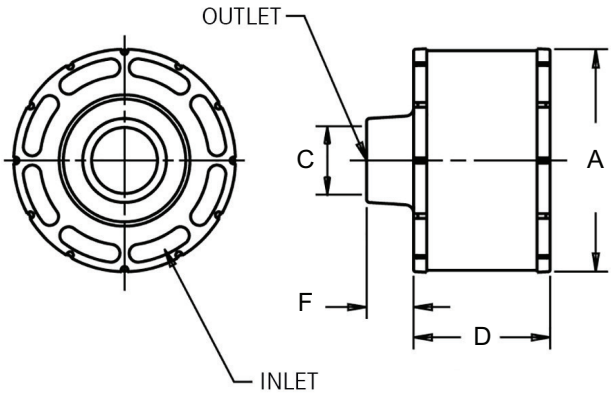
Airflow Diagram: SUA106417, SUA86885, SUA77166, SUA40198

Airflow Diagram: XG2112100001, XG2512100002

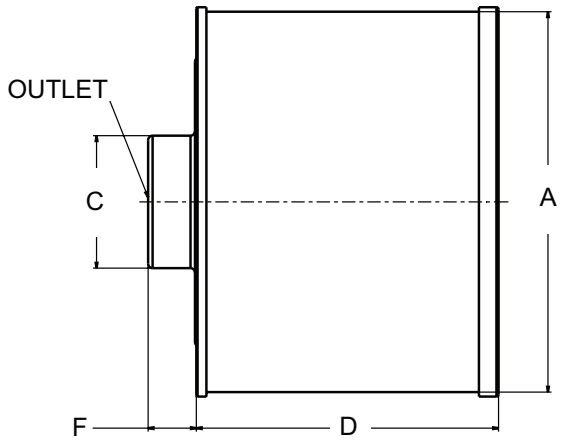
DIMENSION DIAGRAMS



Dimension Diagram: SUA90069, XG3012100019



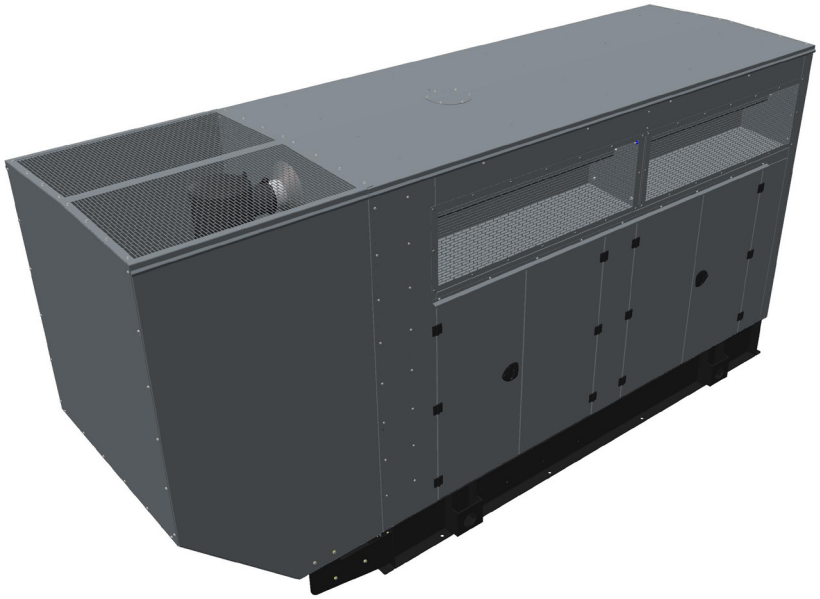
Dimension Diagram: SUA106417, SUA86885, SUA40198



Dimension Diagram: SUA77166, XG2112100001, XG2512100002

Enclosure and Sound Data Sheet - Diesel, Open Field

60 Hz: 230-400 kW Standby / 210-250 kW Prime



Level 3 Enclosure (pictured)*

Enclosure Level Identification	
Level 1	Skid-mounted weather-protective enclosure constructed of heavy gauge steel or aluminum with fixed stormproof panels designed for 130 mph wind load rating. Enclosure consists of a bolted and welded construction with unit-mounted internal silencer. Hinged, lockable double-door access on both sides of the enclosure with single rear door access.
Level 2	Level 1 enclosure with air exhaust scoop. UL 94 HF-1 compliant, 1.5" thick sound attenuated foam insulation installed inside enclosure ceiling and walls.
Level 3	Level 2 enclosure with an additional silencer mounted in the exhaust scoop. UL 94 HF-1 compliant, 1.5" thick sound attenuated foam insulation installed in scoop and inside enclosure ceiling and walls.

CERTIFICATIONS AND STANDARDS

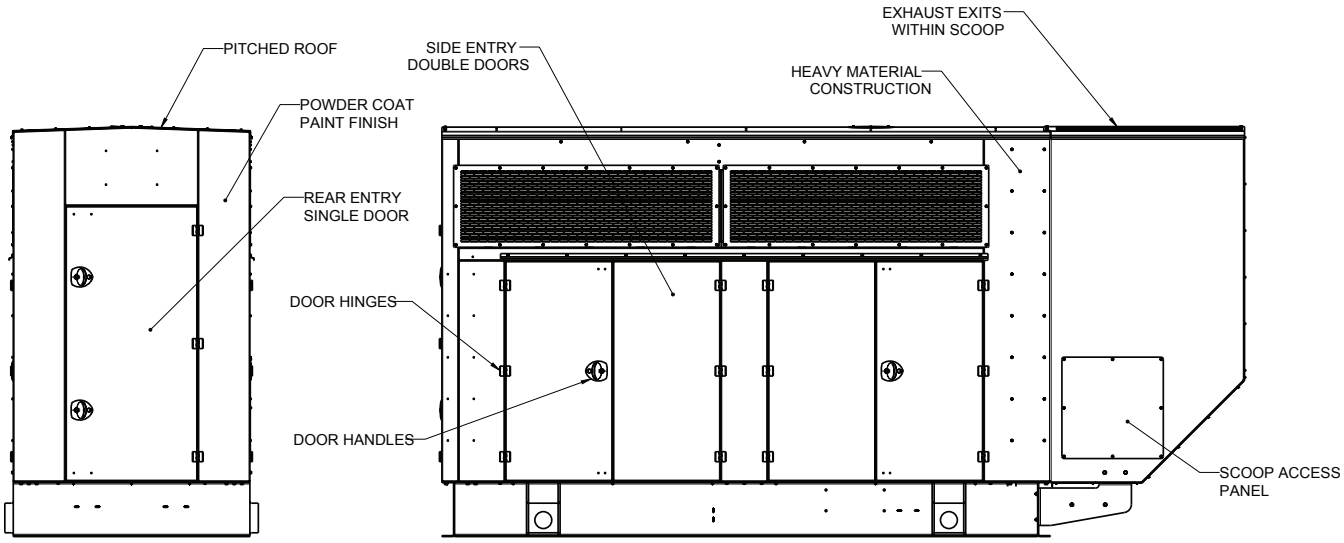
- UL 2200
- CSA C22.2 No. 100
- CSA C22.2 No. 14

A Rolls-Royce solution

Enclosure and Sound Data Sheet - Diesel, Open Field
230-400 kW Standby / 210-250 kW Prime

STANDARD FEATURES FOR ALL LEVELS

- Heavy material construction
  - Steel enclosure: 1.9 mm (0.075 in) - 14 gauge or greater thickness
  - Aluminum enclosure: 2.3 mm (0.09 in) or greater thickness
- 130 mph wind rating
- Service access
  - Double door access gives ease of service to all components
- Pitched roof
- Rain shroud
- Rain cap (Level 1 and Level 3 only)
- Rodent barriers
- Exhaust scoop access panel and drain
- Hardware
  - Powder coated hinges with stainless steel pins
  - Key-lockable and pad-lockable powder coated door handles
- Powder coat finish paint: RAL 7001 Silver Grey standard
  - Custom colors available upon request
- Internal silencer
  - Insulated muffler wrap
  - Stainless steel flexible exhaust connections (where applicable)



Level 3 Enclosure (pictured)*

OPTIONAL FEATURES

- Door restraints
- LED light package
- Motorized / gravity louvers (where available)
- Enclosure space heater
- 190 mph wind rating
- For other custom options, please consult factory

ENGINE EXHAUST SOUND RATINGS dB(A) AT 1 METER
OPU SOUND RATINGS dB(A) AT 1 METER
ENCLOSURE SOUND RATINGS dB(A) AT 7 METERS

			1 Meter		7 Meters		
Application	Model	Power Node	Engine Exhaust[1]	OPU[2]	Level 1	Level 2	Level 3
60 Hz Standby	*mtu* 6R0150 DS230	230 kW	C/F	99	88.5	80.5	74.1
	mtu 6R0150 DS250	250 kW	C/F	99	88.6	80.1	74.6
	mtu 6R0150 DS275	275 kW	C/F	98.9	88.3	80.6	74.3
	mtu 6R0150 DS300	300 kW	113.1	100.6	90.3	81.9	75.1
	mtu 6R0225 DS350 [3]	275 kW	C/F	103.3	89.5	80.9	75.6
	mtu 6R0225 DS350 [3]	300 kW	C/F	103.1	90.1	81.1	76.2
	mtu 6R0225 DS350	350 kW	C/F	103.9	89.9	81.6	76.5
	mtu 6R0225DS400	400 kW	112.4	104	91	82.1	75.5
60 Hz Prime	*mtu* 6R0150 DS230	210 kW	C/F	98.4	88	79.7	73.9
	mtu 6R0150 DS250	230 kW	C/F	98.9	88.5	80.5	74.1
	mtu 6R0150 DS250	250 kW	C/F	98.9	88.6	80.1	74.6

[1] Undampened engine exhaust noise
[2] Measurement with infinite exhaust connection
[3] Single-phase units only

NOTE:
- Measurement includes exhaust noise.
- Aluminum enclosure sound levels are approximately 2 dB(A) higher than listed sound levels for steel enclosures.
- For installation within 50 miles of the coast, aluminum enclosures are recommended to prevent accelerated corrosion.
- Sound pressure levels subject to environment, instrumentation, measurement, installation, and generator set variability.
- Generator set is tested on level ground without spring isolators installed.
- Sound power levels per ISO 8528-10 and ANSI S1.13-2005
- Sound data measured with:
  - Full-rated load
  - Standard radiator package

C/F = Consult Factory

* Note: Visual appearance may differ between power nodes.

ENCLOSURES
Color Options Data Sheet

PRODUCT HIGHLIGHTS

MTU Onsite Energy is proud to offer textured powder coat paint on enclosures in the 20-1,250 kW power range. On Series 4000 1,250-3,250 kW units, a smooth polyurethane liquid topcoat is applied over a TGIC polyester powder coat primer. Validation consisted of a 1,000-hour cyclic ultraviolet (UV) and salt spray degradation test which simulates several years of real-life weathering. This paint provides enhanced corrosion resistance as well as edge coverage. The super durable compound promotes stellar resistance to UV degradation such as fading or chalking. This coating is certified to meet UL 2200 corrosion protection requirements for outdoor electrical enclosures.

STANDARD COLOR*

MTU Onsite Energy uses the following paint color as the standard for our generator sets:

20-3,250 kW

RAL 7001 Silver Grey
(P20519ASC)

CUSTOM COLORS*

MTU Onsite Energy also offers custom color options for your MTU Onsite Energy generator set or enclosure. Custom colors will be applied as either a smooth or textured powder coat finish, or as a liquid topcoat over a powder coat primer. Additional charges apply. Please contact your MTU Onsite Energy Account Manager for further details.

RAL 9003 Signal White
(P90895WRC)

RAL 1013 Pearl White
(P90566WRC)

Khaki/Tan
(P20523TSC)

RAL 1019 Grey Beige
(P90572YRC)

RAL 7006 Beige Grey
(P90802ARC)

ANSI 70 Gloss Grey
(P70129APC)

RAL 7023 Concrete Grey
(P90813ARC)

RAL 8000 Green Brown
(P90874DRC)

RAL 6003 Olive Green
(P90726GRC)

RAL 6001 Emerald Green
(P90724GRC)

RAL 7016 Anthracite Grey
(P90810ARC)

RAL 5012 Gloss Light Blue
(P90711BRC)

RAL 5023 Distant Blue
(P90721BRC)

RAL 5005 Signal Blue
(P90664BRC)

RAL 5002 Ultramarine Blue
(P20517BSC)

RAL 5013 Cobalt Blue
(P90712BRC)

RAL 3009 Oxide Red
(P90636RRC)

RAL 9005 Jet Black
(P90897KRC)

* Colors shown are produced as close as modern printing techniques permit and are only approximate representation of the actual colors.

Diesel Fuel System Data Sheet

Sub-Base Tank

DESCRIPTION

The sub-base fuel tanks used with ***mtu*** generator sets are manufactured and listed per UL142 and ULC-S601 standards for steel above-ground tanks. These certifications ensure that our tanks meet the structural and mechanical integrity requirements for mounting generator sets directly on top, providing our customers with a safe and efficient fuel storage system. These tanks are suitable for above-ground storage of non-corrosive, stable, flammable, or combustible liquids that have a specific gravity not exceeding that of water. They are intended for installation and use in accordance with the codes referenced in the *Certifications and Standards* section. The secondary containment construction consists of a steel tank within a closed steel containment dike that is capable of being monitored for leakage.

STANDARD FEATURES

- Normal vent
- Emergency vent
- Manual fill
- Cam lockable fill cap
- Basin drain (plugged)
- Removable supply and return dip tubes
- Leak detection
- Black paint finish
- Secondary containment
- Electrical stub-up area: Provides space for generator set electrical connections and internal wiring capabilities
- Baffles: Separate cold engine supply fuel from hot returning fuel (additional baffling as required for structural integrity)
- Fuel level gauge: A direct-reading fuel level gauge with electric sender

OPTIONAL FEATURES

- Fuel fill drop tube
- Level alarm
- High fuel pre-alarm and low fuel level shutdown
- Five-gallon spill/fill containment box with lockable hatch
- Optional selectable accessories to meet regional codes/ jurisdictions
- IBC certification 2012, 2015, and 2018

CERTIFICATIONS AND STANDARDS

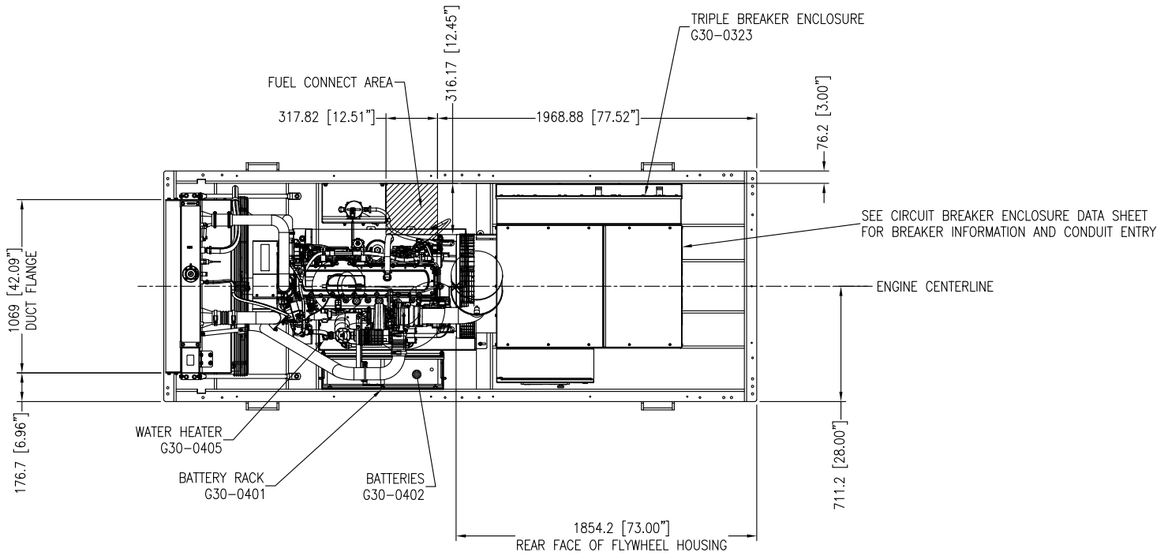
United States	Canada
UL 142	ULC-S601

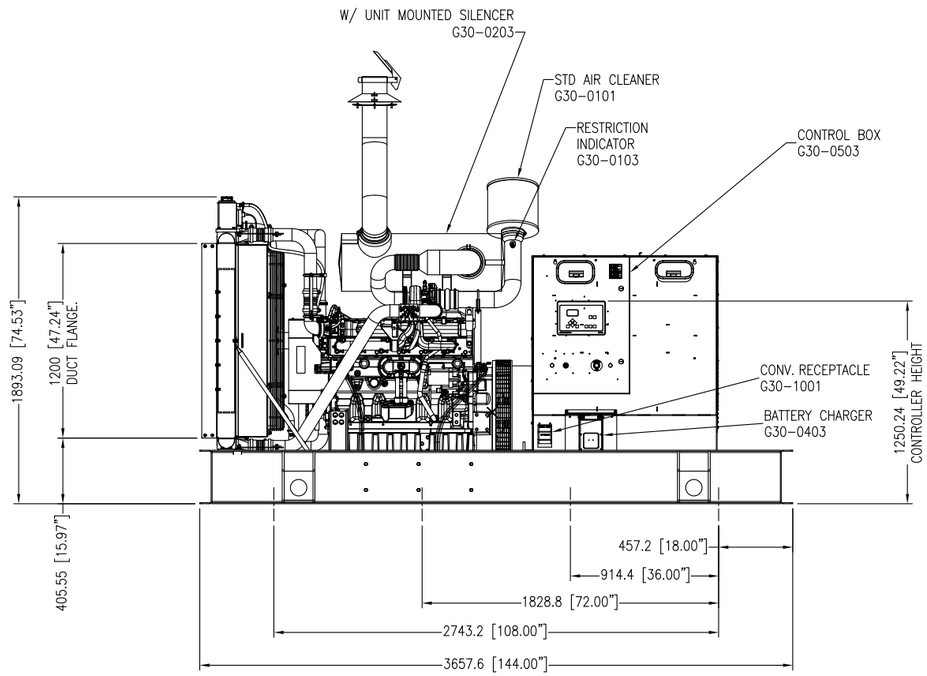
In addition, this equipment is compatible with the following certifications when properly installed in accordance with all applicable codes, standards, regulations, and laws pertaining to the installation and application of the product. Reference the prevailing codes for installation requirements.

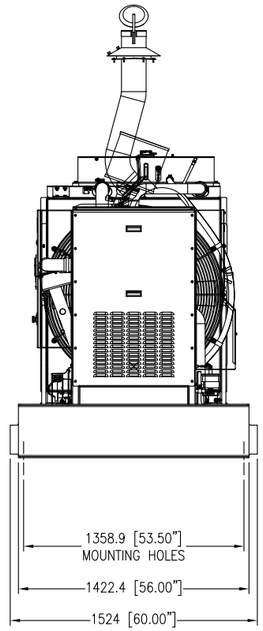
United States	Canada
NFPA 30	Part 4: National Fire Code of Canada
NFPA 37	CSA B139
NFPA 110	CSA C282
International Fire Code	CCME PN 1326

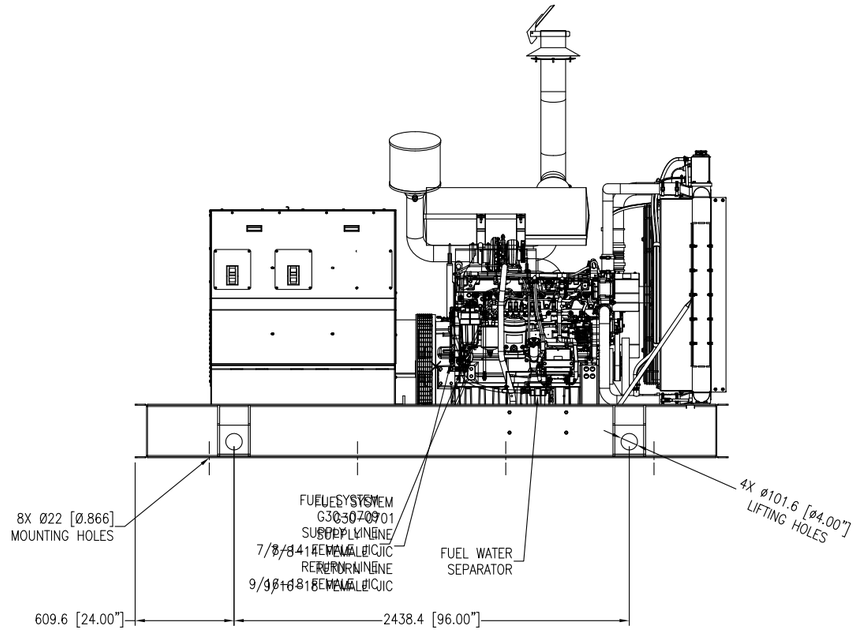
SUGGESTED REGIONAL CODE REQUIREMENTS

Pre-engineered accessories can be added to sub-base fuel tanks on 30-1,250 kW generator sets to meet regional codes/ jurisdictions. Reference the table on page 3 for available options.









REVISION	DATE	DESCRIPTION
A	2020-04-01	UPDATED TITLE BLOCK

APPLICABLE MODELS:

MTU 6R0150 DS230
MTU 6R0150 DS250
MTU 6R0150 DS275
MTU 6R0150 DS300

THIRD ANGLE PROJECTION

DRAWN TO SCALE
DIMENSIONS: MM [INCH]

DATE CREATED: 2018-08-17

DIMENSIONAL LAYOUT

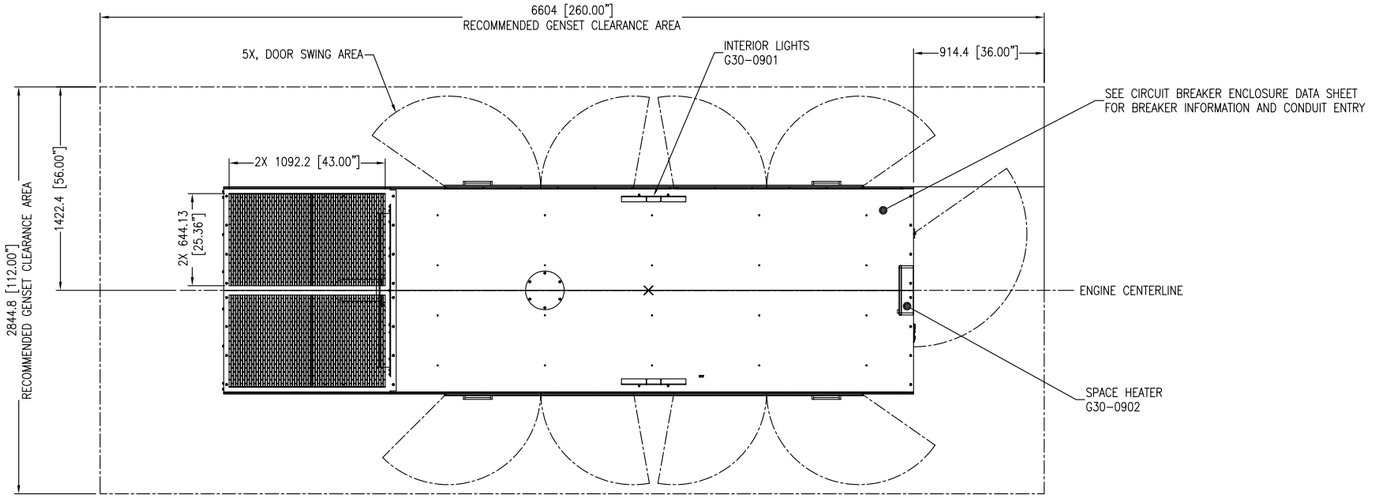
DESCRIPTION: 230-300 kW Genset

ENGINE: John Deere, JD6090

WEIGHT (MIN-MAX): 2750-3555 KG 6063-7838 LB

DRAWING NUMBER: XZG3000100130

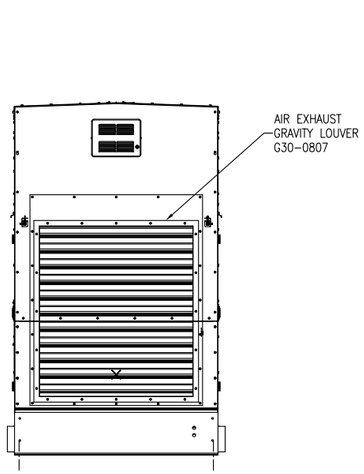
SHEET: 1 of 2

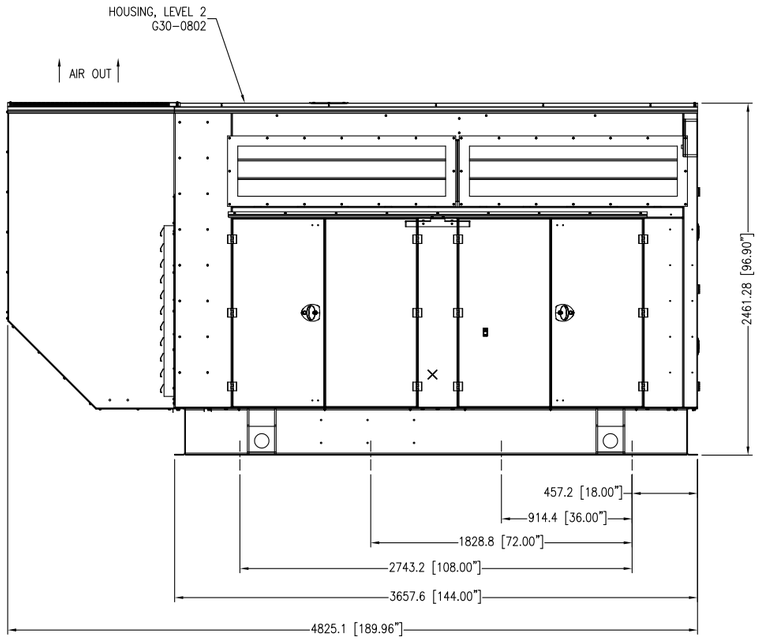


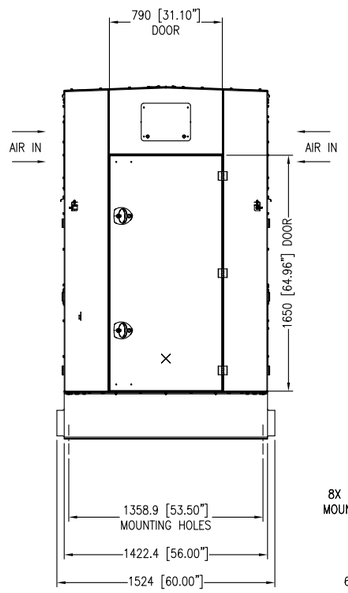
DRAWING OPTIONS			SELECTED OPTIONS
GROUP	DRAWING CODE	DESCRIPTION	
HOUSING OPTIONS, EXTERIOR	G30-0801	HOUSING, LEVEL 1	
	G30-0802	HOUSING, LEVEL 2	
	G30-0803	HOUSING, LEVEL 3	
	G30-0804	AIR INTAKE SCREENS (W/O MOTORIZED LOUVERS)	
	G30-0805	AIR INTAKE MOTORIZED LOUVERS	
	G30-0806	AIR EXHAUST SCREEN (W/O GRAVITY LOUVER)	
	G30-0807	AIR EXHAUST GRAVITY LOUVER	
HOUSING OPTIONS, INTERIOR	G30-0901	INTERIOR HOUSING LIGHTS	
	G30-0902	SPACE HEATER	

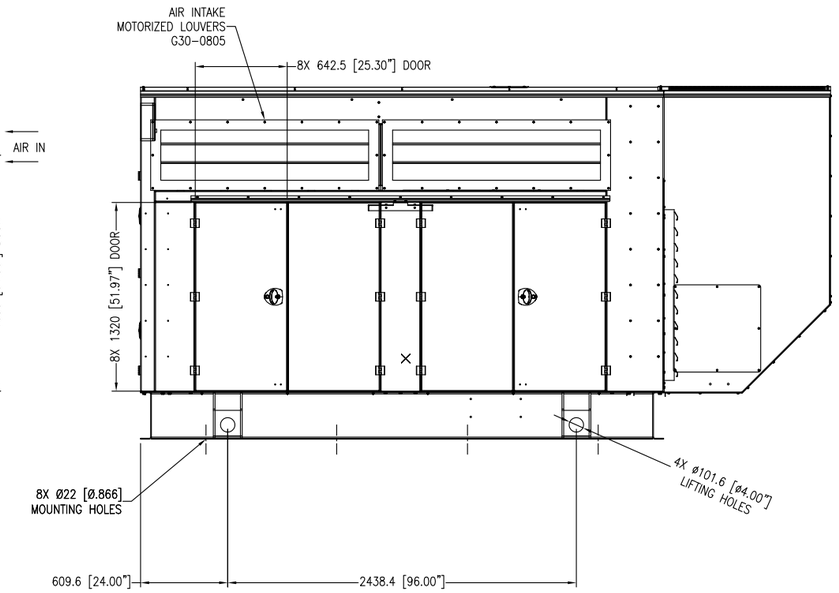
Reference the Drawing Options table and within the Layer Properties turn on/off the Drawing Codes that may or may not apply to your configuration.

Note: Some options may not be referenced. Only options which visibly change the drawing are selectable.









REVISION	DATE	DESCRIPTION
B	2020-04-01	UPDATED TITLE BLOCK
A	2018-11-02	ADDED SCREEN & DOOR DIMENSIONS

A Rolls-Royce solution

APPLICABLE MODELS:

MTU 6R0150 DS230
MTU 6R0150 DS250
MTU 6R0150 DS275
MTU 6R0150 DS300

THIRD ANGLE PROJECTION

DRAWN TO SCALE
DIMENSIONS: MM [INCH]

DIMENSIONAL LAYOUT

DESCRIPTION: 230-300 kW Genset Housed

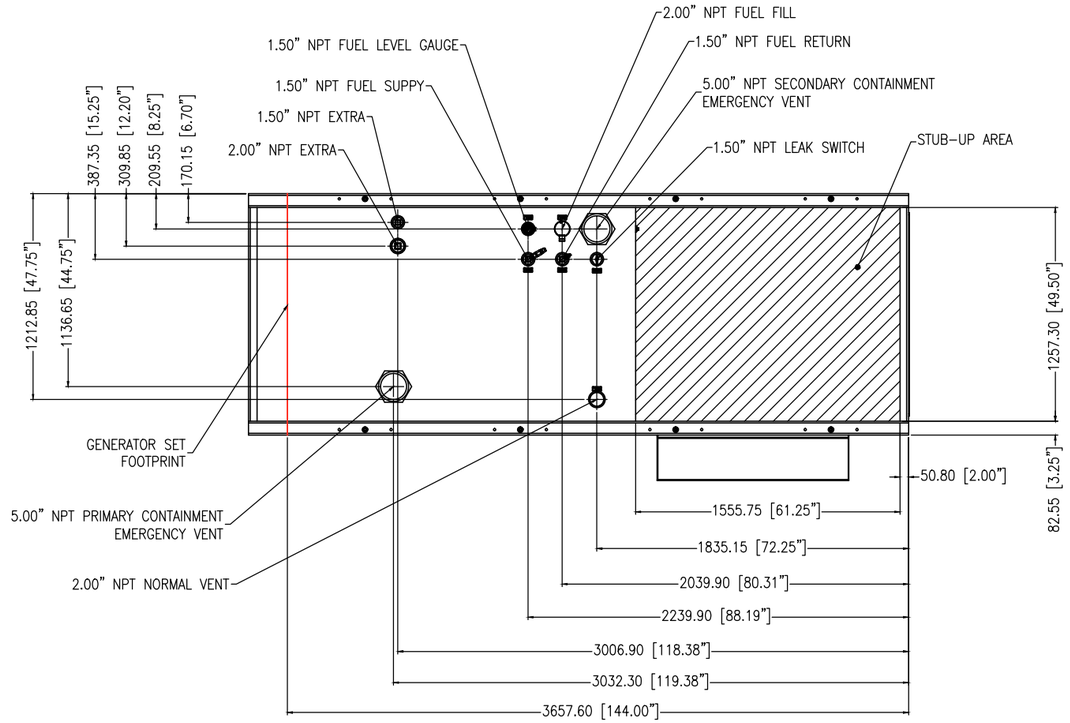
ENGINE: John Deere, JD6090

WEIGHT (MIN-MAX): 3317-5187 KG 7312-11434 LB

DATE CREATED: 2018-08-17

DRAWING NUMBER: XZG3000100131

SHEET: 1 of 1



REVISION	DATE	DESCRIPTION

APPLICABLE MODELS:

- MTU 6R0150 DS230
- MTU 6R0150 DS250
- MTU 6R0150 DS275
- MTU 6R0150 DS300

THIRD ANGLE PROJECTION

DRAWN TO SCALE
DIMENSIONS: MM [INCH]

DIMENSIONAL LAYOUT

DESCRIPTION: 230-300 kW, 24hr, 530gal, Non-Code Ready

ENGINE: John Deere, JD6090

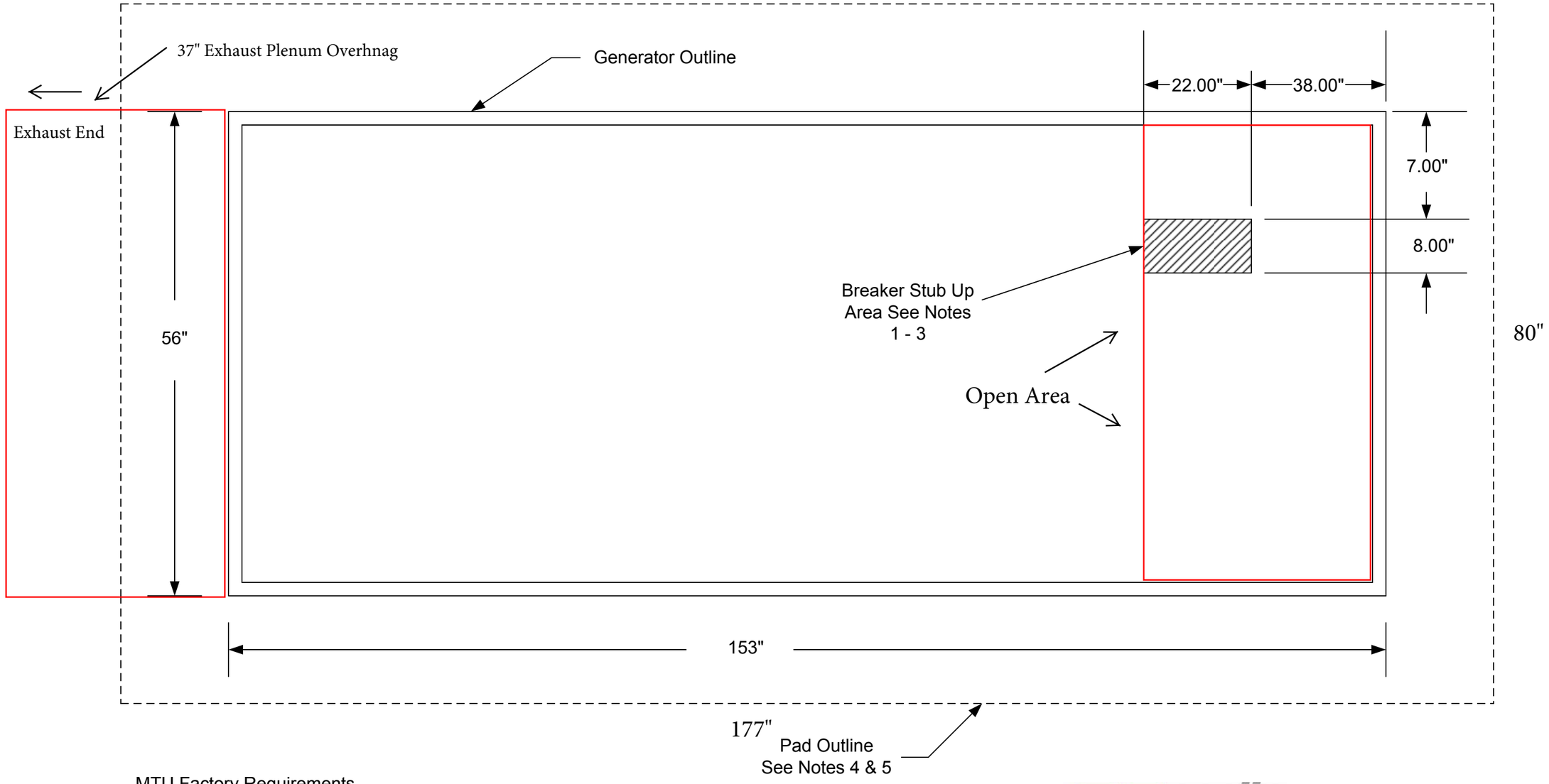
WEIGHT: 1076 KG 2372 LB

DATE CREATED: 2018-12-19

DRAWING NUMBER: XZG3000100143

SHEET: 3 of 12

MTU D300 W LEVEL 3 ENCLOSURE AND 24 HOUR TANK



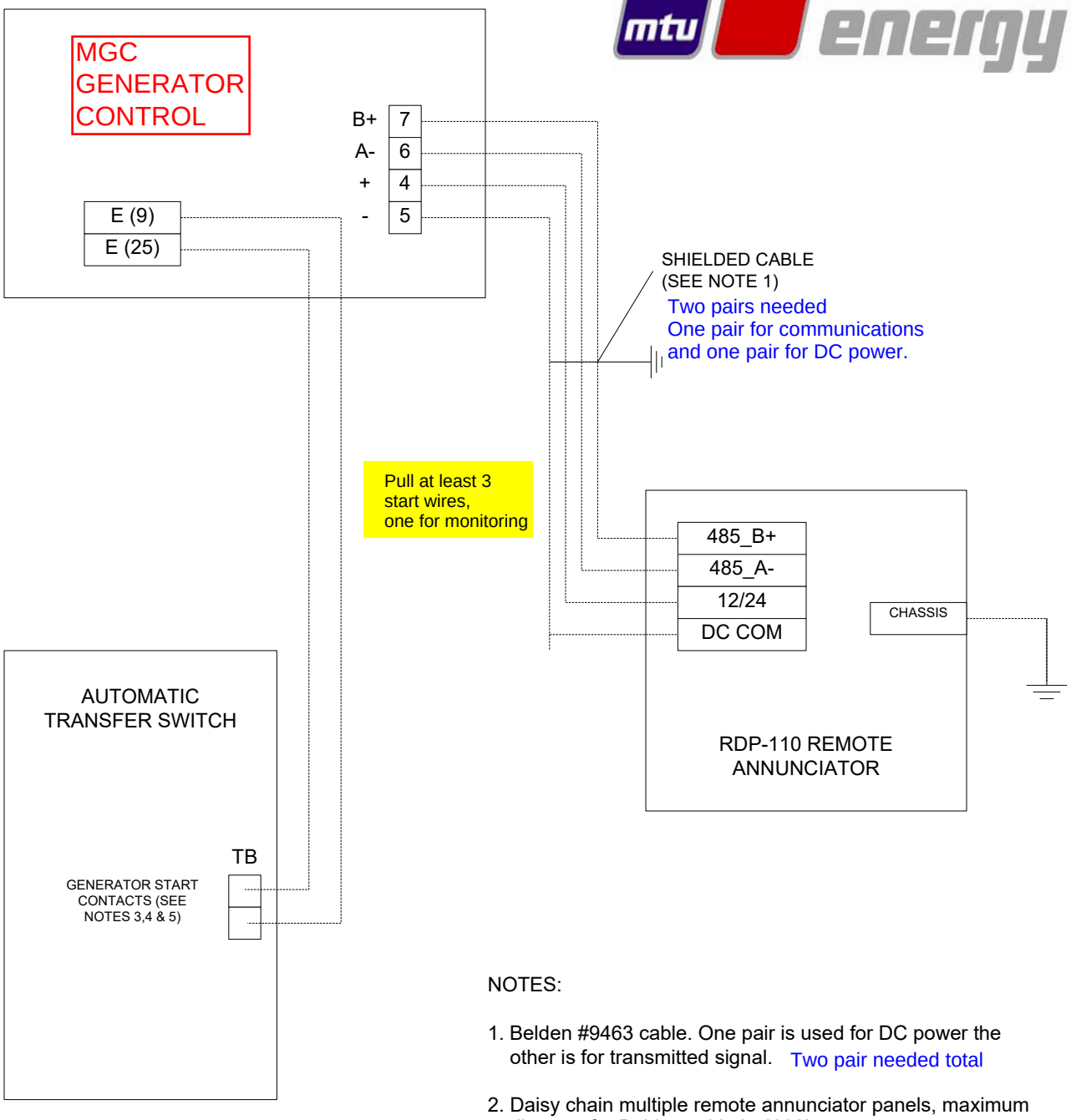
MTU Factory Requirements

1. All conduits should come up in the shaded area.
2. AC Power and Control MUST be run in separate conduits.
3. Power for Charger and Heater should also be stubbed into this area.
4. Gen Enclosure outline shown – pad can be ANY size larger.
5. Concrete should be minimum 8" thick, 4,000# compressive strength with rebar reinforcement on 12" centers.

TOP VIEW SHOWN

Drawing is NOT to scale

Drawn by	INTERSTATE PowerSystems
JNB	Project:: CERENITY CARE PAD DRAWING



NOTES:

1. Belden #9463 cable. One pair is used for DC power the other is for transmitted signal. Two pair needed total

2. Daisy chain multiple remote annunciator panels, maximum distance for Belden cable is 4000'.

3. For multiple transfer switches, daisy chain the contact for generator start.

4. ATS control Interconnect wiring. Three stranded copper wires required:
   0- 700 Feet -20 Gauge
   700- 1125 Feet – 18 Gauge

5. For contact landing locations in transfer switch refer to the wiring drawing included with the transfer switch.

BASIC INTERCONNECT DRAWING FOR MGC CONTROL WITH TRANSFER SWITCH