DS50 John Deere Stock 190mph Steel L3 Standard Extended Tank

Technical Specification

and

Scope of Supply

mtu 4R0113 DS50
DG04RJ113A3N

I. System Description

Product type	DG04RJ113A3N mtu 4R0113 DS50
Application Group	3D - Emergency Standby power, IFN

Power as per MTU Sales Program

Power per genset (ISO 8528)	50	kWel
Engine speed	1.800	rpm
Intake air temperature	25	°C
Coolant temperature	0	°C
Altitude	100	m

On-site Power

Power per genset (ISO 8528)	50	kWel
Engine speed	1.800	rpm
Intake air temperature	25	°C
Coolant temperature	0	°C
Altitude	100	m

Requirements

Frequency	60 Hz
Generator voltage	208 V
EngineType	4045TF280

II. Selection Criteria for the Scope of Supply

Criteria	*Selection*
Application	Emergency Standby (3D)
Frequency	60 Hz
Generator Voltage	208 V
Phase	3 Phase
Unit Specification	UL2200
IBC Seismic Certification	With IBC 45902-01C 2012 2015
SCAQMD Certification	With SCAQMD
Mobile Flex Certification	Without Mobile Flex
Engine Model	JD4045TF290 (12volts)
Exhaust Emissions (EPA)	EPA Stationary EMERG T3 (40CFR60)
Radiator Design Temperature	50°C
Temp Rise	130°
Power Output	50 kW
Full Load Amps	173
Generator Frame and Wire Qty	361/1601 (12 Wire)
Generator Wire Configuration	Wye
OPU/HSD	Level 3 - Maximum Sound Attenuation
Fuel Tank	With Fuel Tank
Control panel	with control panel
Circuit Breaker Options	Single Circuit Breaker
Breaker Wire Color Scheme	Standard Breaker Wire Color Scheme
Paralleling	No Paralleling Operation
Acceptance testing	Factory acceptance
Country of Operation	USA / Canada
Emission cert. authority	18 US EPA Agency

III. Scope of Supply

1 SYSTEM CONFIGURATION

1.1 System Description

SLU: DG04RJ113A3N
Model: MTU 4R0113 DS50

Application 60Hz Standby

1.2 Cooling System

50 Deg C Cooling System

- Closed loop, liquid cooled, with radiator factory mounted on engine-generator set mounting frame and integral engine-driven coolant pump

1.3 Circuit Breaker

Circuit Breaker Position 1:

200 Amp 600 Volt 3 Pole 100% LSI CB SQ-D JDL36250CU33X

LSI Breaker Trip:

- LSI breakers provide protection from long time overload, short time overload and instantaneous short circuit events. Specific overload current values and time delays vary with breaker type and trip unit.

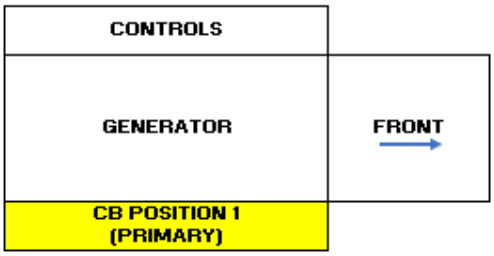
Circuit Breaker #1 Accessories:

Auxillary Contact (OF1)

Circuit Breaker Shunt Trip (MX) (Customer Use)

Circuit Breaker Bell Alarm

Circuit Breaker Mounted Right Side



Top View	**Right Side**	CB Position 1
	Left Side	Controls

* For technical data refer to the circuit breaker enclosure data sheets located on the Business Portal

Standard Breaker Wire Scheme:

- Phase 1 (A) is Black label “L1”
- Phase 2 (B) is Red label “L2”
- Phase 3 (C) is Blue label “L3”
- Neutral is White label “NEU”

1.4 Starting Aids

Battery Rack Only

- Shipped with Battery Rack only (no battery included)

Battery Charger: MicroGenius 10A

- 180W
- 10 Amp
- 12V
- NFPA 110

Battery Charger Mounted & AC/DC Wired

__Note__ - This option will be factory-wired to the distribution panel (if selected)

Coolant Preheater

- -20 Deg F Coolant Preheater (120V 1PH - 1500W)
- Model: TPS151GT10-005
- Qty 1

Coolant Preheater Mounted & AC Wired

1.5 Genset Enclosure

Level 3 Genset Enclosure

- Level 2 enclosure with air exhaust scoop with UL 94 HF-1 compliant, 1.5" thick sound attenuated foam insulation installed where applicable.

Weather Proof Enclosure - Steel

190mph Wind Rated

Sound Attenuation Kit

Sound Attenuation Kit

Exhaust Scoop - Steel

Door Restraints

1.6 Vibration Isolation

SUA63015 Pad Isolators
• ¼ inch thick elastomeric pad in rectangular shape placed under the base frame at each of the pre-drilled isolator mounting holes

2 ENGINE CONFIGURATION

2.1 Engine System

EPA Certification Tier Level: Tier 3

South Coast Air Quality Management District (SCAQMD) Certified Engine

4R 4.5L 4045TF290 Turbo Engine

Note Emission Compliance:
The engines and/or systems, may only be certified to comply with the required country or region specific emission regulations. Where applicable, the engines and/or systems are only certified to those specific emission regulations/standards which are clearly stated in the respective RRPS/MTU defined technical specifications. It is the customer's sole responsibility to ensure that the export/import, installation and use of the engine and/or system complies with the applicable emissions regulations in the country or region where the engine and/or system will be used.

2.2 Exhaust System

Unit-Mounted Silencer 3-1/2"

- Provides 35 - 40dB of sound attenuation
- Silencer Model: CPS-35X-90020047
- Qty 1

2.3 FUEL SYSTEM

24 HR 140 Gallon Sub Base Fuel Tank (with Stub-Up)

Extended Fuel Tank exceeds genset base footprint

2.4 Air Intake System

Air Filter (Standard)

MTU Air Filter

- SUA106417
- Qty 1

3 GENERATOR CONFIGURATION

3.1 Generator Specification

Generator Model Number: 361/1601

3.2 Generator accessories

PMG with DVR 2400

- True RMS Sensing - One or Three Phase Connect. Senses 100 to 600 volts ±10% at 50/60 Hertz. Patented circuitry senses true RMS voltage rather than average for superior load regulation.

Generator Strip Heater

- Strip heater mounted permanently in the generator winding to prevent condensation in the generator.

Note - This option will be factory-wired to the distribution panel (if selected)

4 CONTROL PANEL CONFIGURATION

4.1 Control panel

Circuit Breaker 1 Ground Fault

Circuit Breaker Position 1:

Without Ground Fault

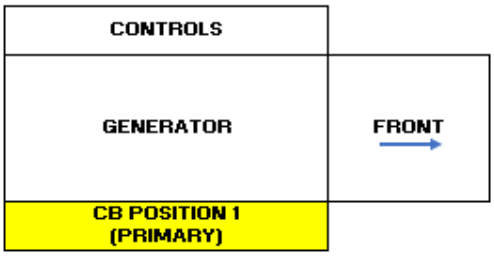
Modbus RTU

- ModBus RTU connects the MGC to Programmable Logic Controllers by means of communication transmission over serial lines (RS485).

MGC- 2000 Series

- MTU Onsite Energy's Digital Genset Controller MGC-2000 series is a highly advanced integrated generator set control system. 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 flexible enough to meet your application's needs. This device provides generator set control, transfer switch control, metering, protection, and programmable logic in a simple, easy-to-use, reliable, rugged, and cost effective package.

Control Panel Mounted LH Side



Top View	**Right Side**	CB Position 1
	Left Side	Controls

* For technical data refer to the circuit breaker enclosure data sheets located on the Business Portal

Remote Emergency Stop

Isochronous Governor

High Fuel Level Pre-Alarm

Critical Low Fuel Level Alarm

No Parallel Operation

5 SERVICES AND AFTER SALES SUPPLY

5.1 Warranty

General Terms and Conditions of Sale, Warranty and After Sales Supply
Our offer is based on the attached General Terms and Conditions of Sale for MTU Products (Rev. V-601-1803 MUS & MOE) and the Warranty will be the attached Standard Two (2) Year / 3,000 Hour Basic Standby (3D), Prime (3B), and Data Center Continuous Power (DCCP) (3F) Limited Warranty (SYS-M-GEN-S-026).

6 MISCELLANEOUS

6.1 Painting

Paint Color: RAL 7001 Grey

6.2 Additional Options

Unit Includes One (1) Convenience Receptacle

Note - This option will be factory-wired to the distribution panel (if selected)

6.3 Documentation

English

1 Flash Drive

7 FUNCTIONAL TESTING

7.1 Acceptance Testing

Standard Commercial Test

8 SHIPPING CONDITIONS

8.1 Shipment

Genset Unit is enclosed in a Shipping Bag

Ship unit with fluids installed

Diesel Generator Set

mtu 4R0113 DS50

50 kWe/60 Hz/Standby (SCAQMD)/208 - 600V
Reference *mtu* 4R0113 DS50 (45 kWe SCAQMD) for Prime Power for Stationary Emergency Rating Technical Data

System ratings

Voltage (L-L)	240V †	240V †	208V †	240V †	380V †	480V †	600V
Phase	1	1	3	3	3	3	3
PF	1	1	0.8	0.8	0.8	0.8	0.8
Hz	60	60	60	60	60	60	60
kW	50	50	50	50	50	50	50
kVA	50	50	62	62	62	62	62
Amps	208	208	173	150	95	75	60
skVA@30% voltage dip	127	130	129	129	112	172	138
Generator model	362CSL1604	361CSL1613	361CSL1601	361CSL1601	361CSL1601	361CSL1601	361PSL1633
Temp rise	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C	130 °C/40 °C
Connection	12 LEAD DOUBLE DELTA	4 LEAD	12 LEAD WYE	12 LEAD DELTA	12 LEAD WYE	12 LEAD WYE	4 LEAD WYE

† UL 2200 offered

Certifications and standards

- Emissions
  - EPA Tier 3 certified
  - South Coast Air Quality Management District (SCAQMD)
- Generator set is designed and manufactured in facilities certified to standards ISO 9001:2008 and ISO 14001:2004
- Seismic certification – optional
  - 2015 IBC certification
- UL 2200 - optional (refer to *System ratings* for availability)
- 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

A Rolls-Royce solution

Standard features*

- Single source supplier
- Global product support
- Two (2) Year/3,000 Hour Basic Limited Warranty
- 4045TF290J diesel engine
  - 4.5 liter displacement
  - Mechanical injection pump
  - 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 shut-off valve
- Full flow oil filter
- Fuel filter with water seperator
- Jacket water pump
- Thermostat
- Blower fan and fan drive
- Radiator - unit mounted
- Electric starting motor - 12V
- Governor - mechanical droop
- Base - formed steel
- SAE flywheel and bell housing
- Charging alternator - 12V
- Battery box 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
- Self-ventilated and drip-proof
- Superior voltage waveform
- Solid state, volts-per-hertz regulator
- ± 1% voltage regulation no load to full load
- 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
- 100% of rated load - one step
- 5% maximum total harmonic distortion

Digital control panel(s)

- Digital metering
- Engine parameters
- Generator protection functions
- Engine protection
- Windows®-based software
- Multilingual capability
- Communications to 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	4045TF290J
Type	4-cycle
Arrangement	4-inline
Displacement: L (in^3)	4.5 (275)
Bore: cm (in)	10.6 (4.19)
Stroke: cm (in)	12.7 (5)
Compression ratio	19:1
Rated rpm	1,800
Engine governor	mechanical droop
Maximum power: kWm (bhp)	55 (74)
Steady state frequency band	± 0.5%
Air cleaner	dry

Liquid capacity

Total oil system: L (gal)	13 (3.4)
Engine jacket water capacity: L (gal)	8.5 (2.3)
System coolant capacity: L (gal)	18.9 (5)

Electrical

Electric volts DC	12
Cold cranking amps under -17.8 °C (0 °F)	925
Batteries: group size	31
Batteries: quantity	1

Fuel system

Fuel supply connection size	3/8” NPT
Fuel return connection size	3/8” NPT
Maximum fuel lift: m (ft)	1.8 (6)
Recommended fuel	diesel #2
Total fuel flow: L/hr (gal/hr)	112.8 (29.8)

Fuel consumption

At 100% of power rating: L/hr (gal/hr)	15.8 (4.2)
At 75% of power rating: L/hr (gal/hr)	12.3 (3.3)
At 50% of power rating: L/hr (gal/hr)	8.1 (2.1)

Cooling - radiator system

Ambient capacity of radiator: °C (°F)	50 (122)
Maximum restriction of cooling air: intake and discharge side of radiator: kPa (in. H20)	0.12 (0.5)
Water pump capacity: L/min (gpm)	144 (38)
Heat rejection to coolant: kW (BTUM)	31 (1,765)
Heat radiated to ambient: kW (BTUM)	6.8 (384)
Fan power: kW (hp)	1.6 (2.2)

Air requirements

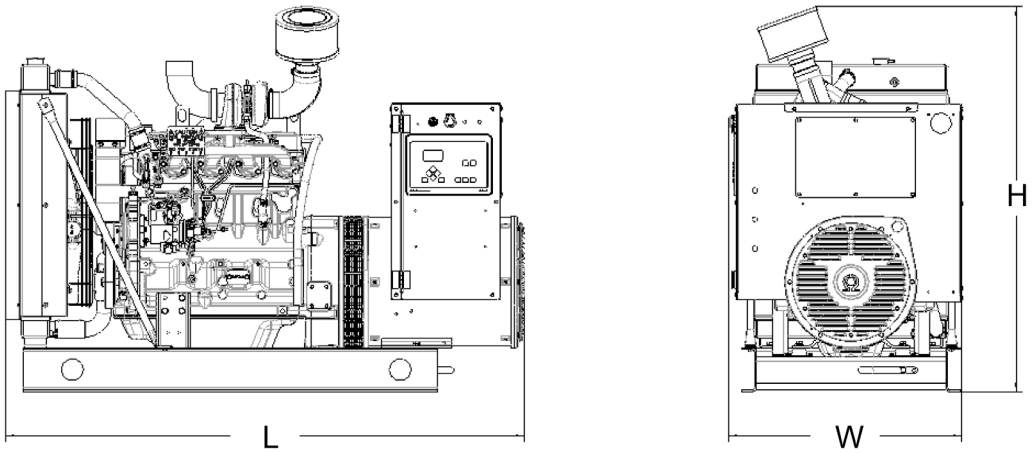
Aspirating: *m^3/min (SCFM)	4.5 (159)
Air flow required for radiator cooled unit: *m^3/min (SCFM)	117 (4,088)
Remote cooled applications; air flow required for dissipation of radiated generator set heat for a maximum of 25 °F rise: *m^3/min (SCFM)	25 (867)

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

Exhaust system

Gas temperature (stack): °C (°F)	537 (999)
Gas volume at stack temperature: m^3/min (CFM)	12.7 (448)
Maximum allowable back pressure at outlet of engine, before piping: kPa (in. H_20)	7.5 (30)
Minimum allowable back pressure: kPa (in. H_20)	N/A

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
Open Power Unit (OPU)	1,781 x 800 x 1,321 mm (70.1 x 31.5 x 52 in)	943 - 1,404 kg (2,078-3,095 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.

Sound data

Unit type	Standby full load
Level 0 (OPU): dB(A)	80.5

Sound data is provided at 7 m (23 ft). Generator set tested in accordance with ISO 8528-10 and with infinite exhaust.

Emissions data

NO_x + NMHC	CO	PM
3.3	N/A	0.12

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. 5-mode emission data per 40 CFR 89 or 40 CFR 1039 (as applicable) is available upon request.

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 3046-1, BS 5514, and AS 2789. Average load factor: ≤ 85%.
- Nominal ratings at standard conditions: 25 °C and 300 meters (77 °F and 1,000 feet).
- Deration factor:
  - Consult your local ***mtu*** Distributor for altitude derations.
  - Consult your local ***mtu*** Distributor for temperature derations.

N/A = Not Available

MAGNAPLUS®

TYPICAL SUBMITTAL DATA

BASE MODEL: 361PSL1601 **Winding:** 1601 **Date:** 02/07/22

Kilowatt ratings at	1800 RPM	60 Hertz		12 Leads	
kW (kVA)	3 Phase	0.8 Power Factor		Dripproof or Open Enclosure	
	CONTINUOUS [1, 2]			STANDBY [1, 2]	
Voltage*	NEMA B / 80 °C	NEMA F / 105 °C	NEMA H / 125 °C	NEMA F / 130 °C	NEMA H / 150 °C
240/480	49 (61)	55 (69)	60 (75)	60 (75)	65 (81)
220/440	48 (60)	53 (66)	58 (73)	58 (73)	61 (76)
208/416	45 (56)	50 (63)	55 (69)	55 (69)	58 (73)
200/400	43 (54)	48 (60)	53 (66)	53 (66)	55 (69)
190/380	41 (51)	45 (56)	50 (63)	50 (63)	52 (65)

① Rise by resistance method, Mil-Std-705, Method 680.1b. ② Machine rated for Max Ambient of 40 °C, Max Altitude 3300 ft

Submittal Data: 208 Volts*, 50 kW, 63 kVA, 0.8 P.F., 1800 RPM, 60 Hz, 3 Phase **Low Wye CONNECTION**

Mil-Std-705B Method	Description	Value	Units	Mil-Std-705C Method	Description	Value	Units
301.1b	Insulation Resistance	>1.5 Meg	Ohms	505.3b	Overspeed	2250	RPM
302.1a	High Potential Test			507.1c	Phase Sequence CCW-ODE	ABC	
	Main Stator	1960	Volts	508.1c	Voltage Balance, L-L or L-N	0.2%	
	Main Rotor	1500	Volts	601.4a	L-L Harmonic Max - Total (Distortion Factor)	3.5%	
	Exciter Stator	1500	Volts				
	Exciter Rotor	1500	Volts	601.4a	L-L Harmonic Max - Single	2.5%	
	PMG Stator	1500	Volts	601.1c	Deviation Factor	7.0%	
401.1a	Stator Resistance, Line to Line Low Wye Connection	0.06600	Ohms	---	TIF (1960 Weightings)	<50	
				---	THF (IEC, BS & NEMA Weightings)	<2%	
	Rotor Resistance	0.81	Ohms	---	Winding Pitch	2/3	
	Exciter Stator	23.5	Ohms				
	Exciter Rotor	0.12	Ohms				
	PMG Stator	2.1	Ohms				
410.1a	No Load Exciter Field Amps at 208 Volts Line to Line	0.63	A DC	**Additional Prototype Mil-Std Methods are Available on Request.**			
420.1a	Short Circuit Ratio	0.541					
421.1a	Xd Synchronous Reactance	2.496	PU	--	Generator Frame	361	
		1.728	Ohms	--	Type	MagnaPlus	
422.1a	X2 Negative Sequence React.	0.225	PU	--	Insulation	Class H	
		0.156	Ohms	--	Coupling - Single Bearing	Flexible	
423.1a	X0 Zero Sequence Reactance	0.053	PU	--	Amortisseur Windings	Full	
		0.037	Ohms	--	Excitation	Ext. Voltage Regulated, Brushless	
425.1a	X'd Transient Reactance	0.178	PU	--	Voltage Regulator	SE350E	
		0.123	Ohms	--	Voltage Regulation	1.00%	
426.1a	X''d Subtransient Reactance	0.147	PU				
		0.101	Ohms				
				--	Cooling Air Volume	700	CFM
				--	Heat rejection rate	326	Btu's/min
427.1a	T'd Transient Short Circuit Time Constant	0.048	Sec	--	Full load current	173.5	Amps
				--	Minimum Input hp required	74.7	HP
428.1a	T''d Subtransient Short Circuit Time Constant	0.008	Sec	--	Full load torque	218	Lb-ft
				--	Efficiency at rated load :	89.7%	
430.1a	T'do Transient Open Circuit Time Constant	0.68	Sec				
432.1a	Ta Short Circuit Time Constant of Armature Winding	0.01	Sec				
				--	Weight	569	lbs

** Voltages refer to wye (star) connection, unless otherwise specified.*

www.marathongenerators.com

RegalRexnord
Not indicative of legal entity.

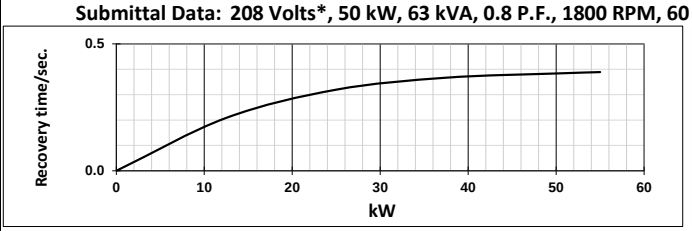
marathon® Generators

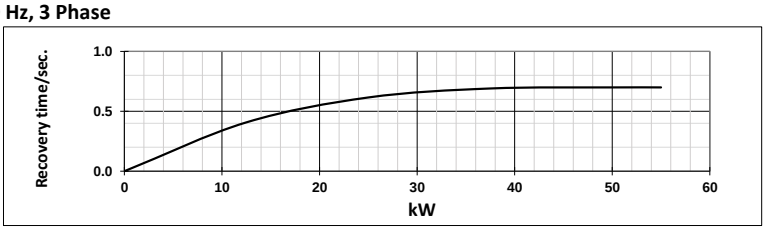
MAGNAPLUS®

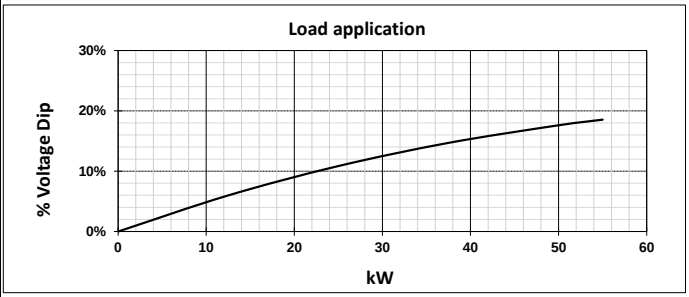
TYPICAL DYNAMIC CHARACTERISTICS

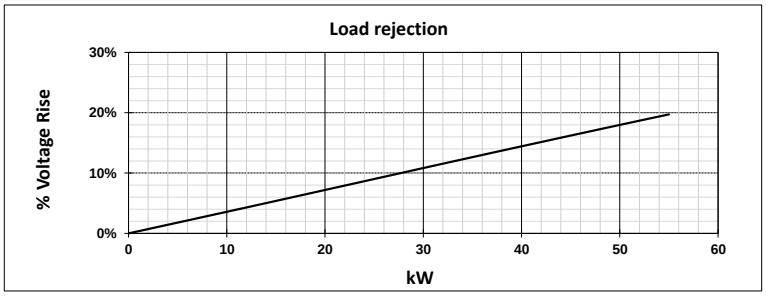
BASE MODEL: 361PSL1601 **Date:** 02/07/22

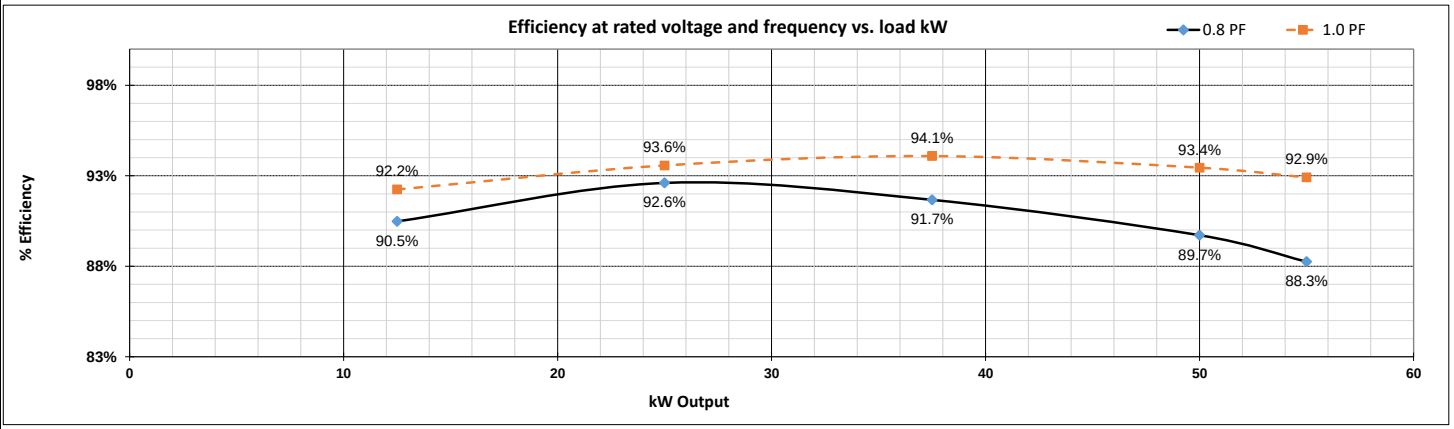
Submittal Data: 208 Volts*, 50 kW, 63 kVA, 0.8 P.F., 1800 RPM, 60 Hz, 3 Phase

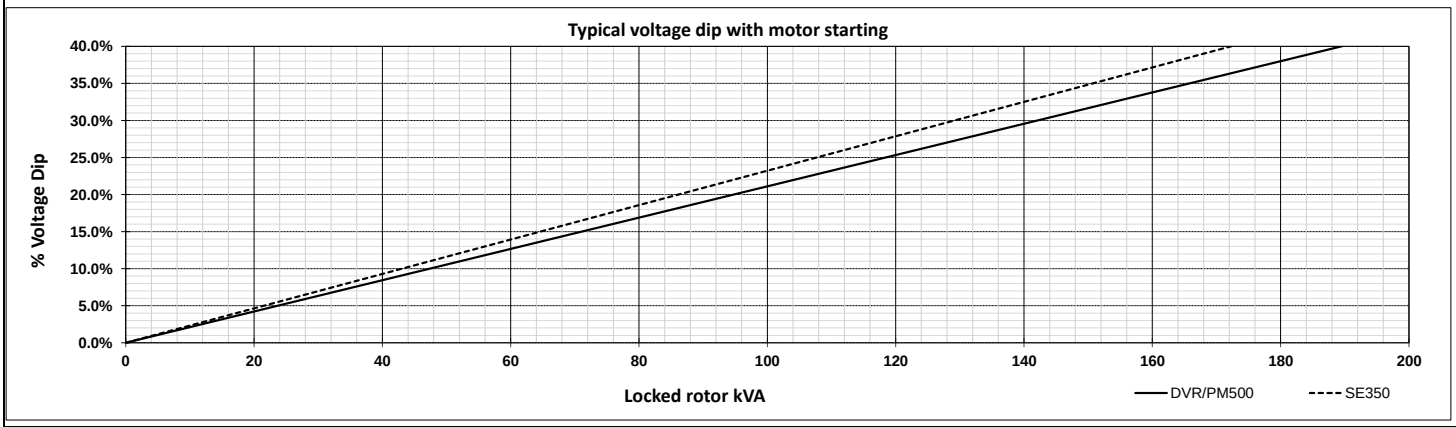












RegalRexnord

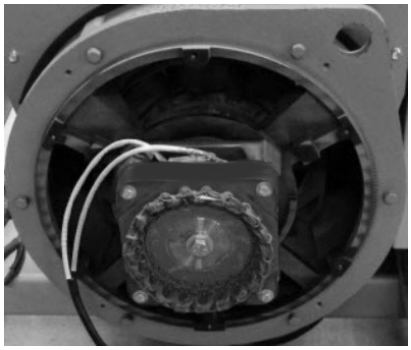
marathon® Generators

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.

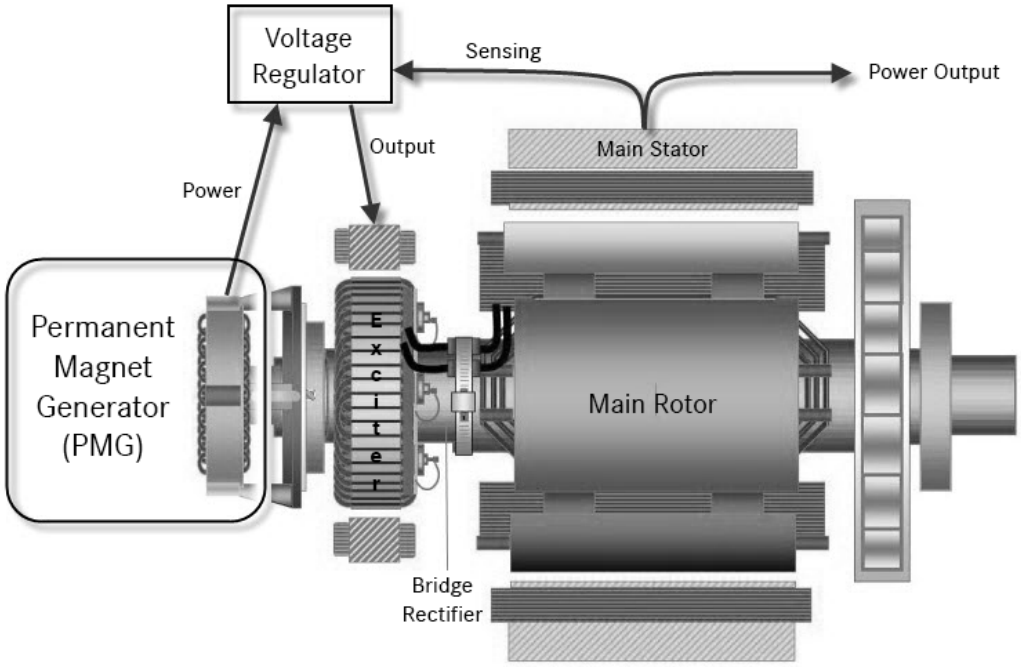
300% short circuit capability

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®

Strip Heater Data Sheet

Marathon Generator

DESCRIPTION

Strip heaters are used when engine generator sets are installed in cold temperature or high humidity climates. The heater maintains the generator windings at a suitable temperature to prevent corrosion due to condensation.

FEATURES

— Rugged, dependable construction
— Minimum maintenance cost
— High-emissivity black oxide finish*

SPECIFICATIONS

— Chrome steel sheath*
— Operational to 648 °C (1,200 °F)*
— Supply voltage: 120 V, 60 Hz. Two heaters may be wired in series for 240 V operation.

Generator Frame	Watts per Element	Elements per Generator	Dimension A**	Dimension B**	Dimension C**
280	42	2	88.9 mm (3.5 in)	328.4 mm (12.93 in)	N/A
360	250	2	304.8 mm (12 in)	279.4 mm (11 in)	431.8 mm (17 in)
430	250	2	304.8 mm (12 in)	279.4 mm (11 in)	266.7 mm (10.5 in)
570	500	2	454 mm (17.9 in)	428.6 mm (16.9 in)	415.9 mm (16.4 in)
740	250	4	454 mm (17.9 in)	428.6 mm (16.9 in)	415.9 mm (16.4 in)
1,000	625	2	152.4 mm (6 in)	1168.4 mm (46 in)	N/A

* 430-740 generator frame models only
** Refer to Dimensional Diagrams below for dimension reference points
N/A = Not Available

CERTIFICATIONS AND STANDARDS

— UL listed
— CSA certified

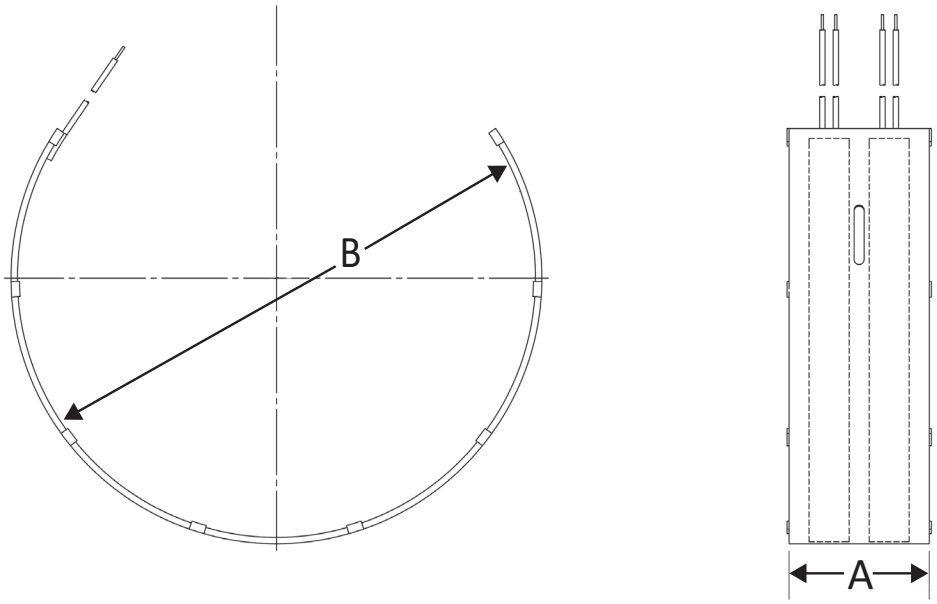


Figure 1: 280 and 1,000 Frame Dimensional Diagram

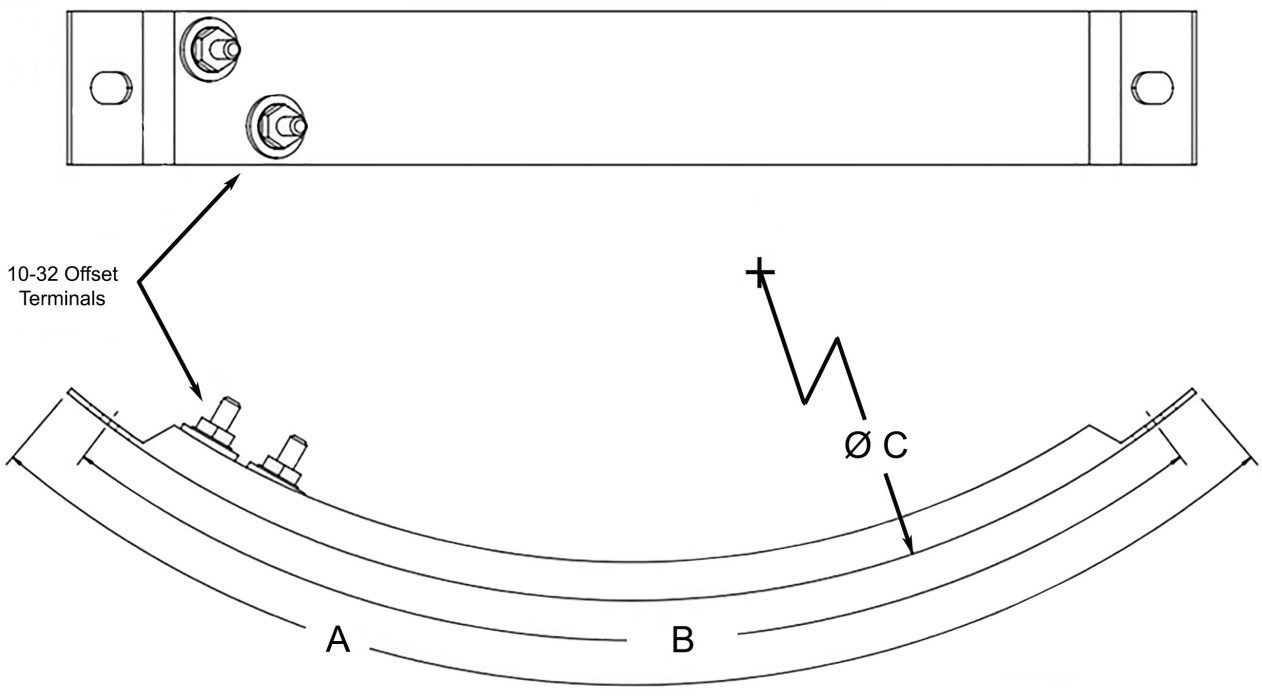


Figure 2: 360 Frame Dimensional Diagram

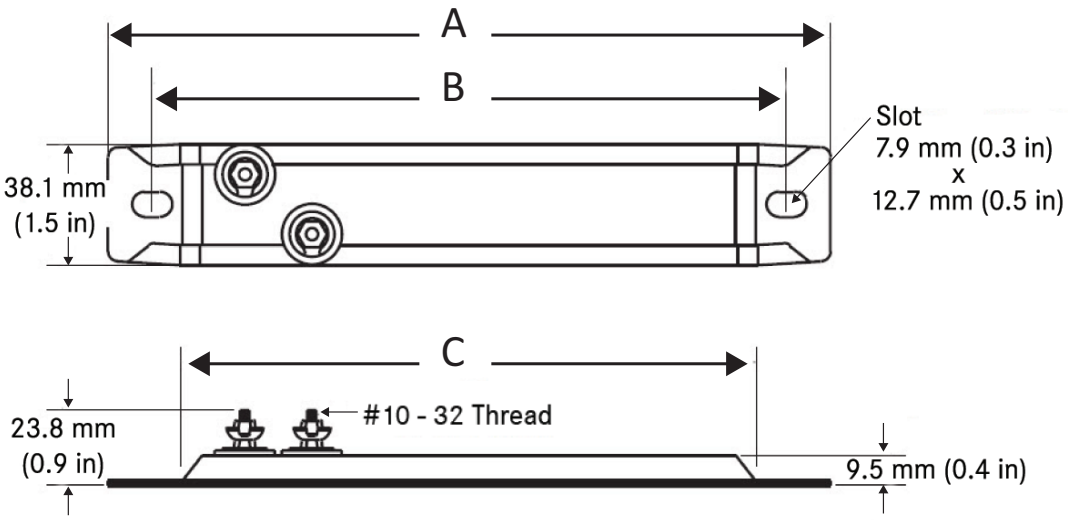
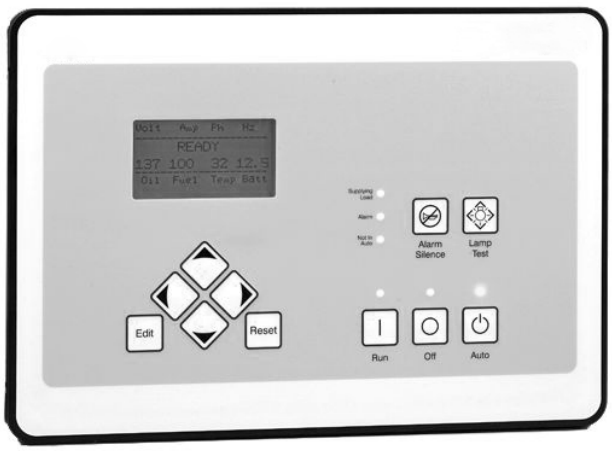


Figure 3: 430, 570, and 740 Frame Dimensional Diagram

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



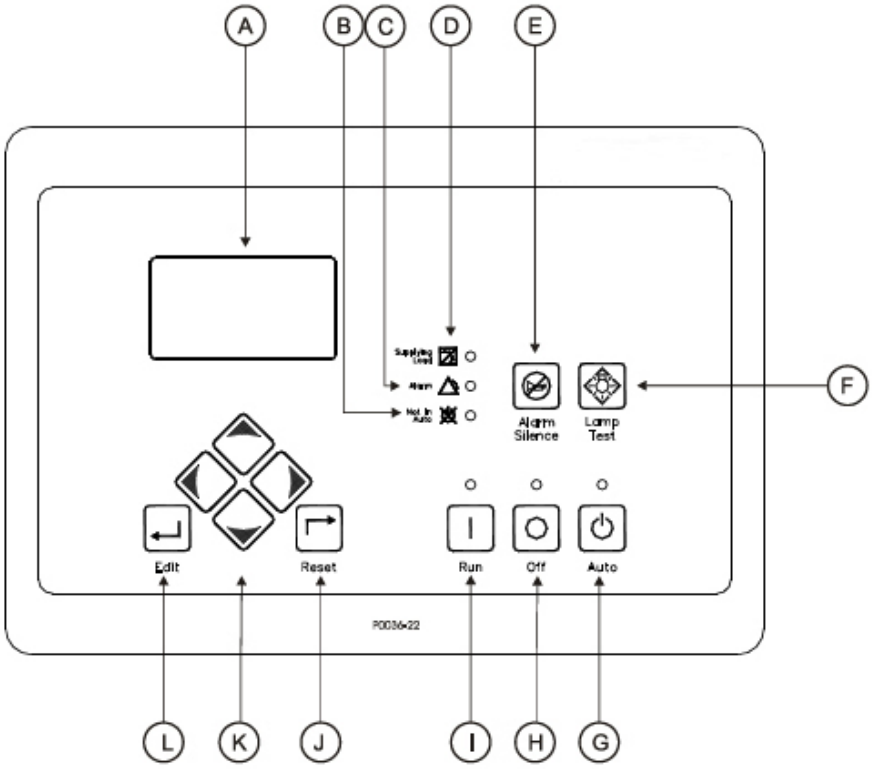
mtu Generator Set Controllers (MGC Series) are highly advanced integrated digital generator set control systems. The MGC-2000 Series is perfectly focused, combining rugged construction and microprocessor technology to offer a product that will hold up to almost any environment and is flexible enough 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.

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.

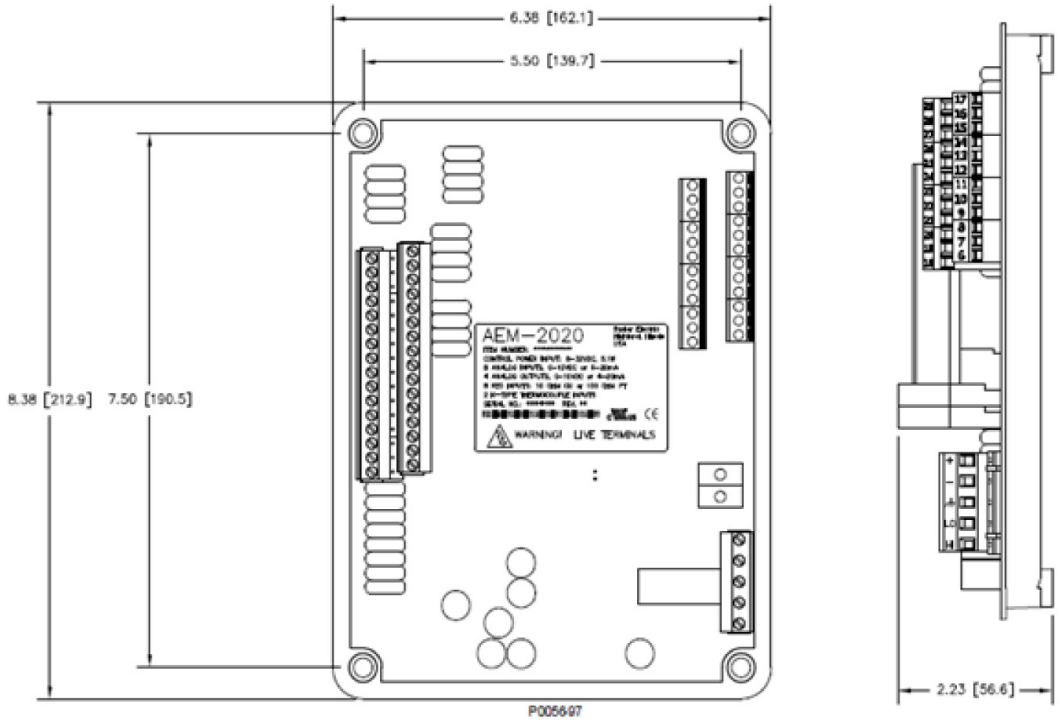
- .

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

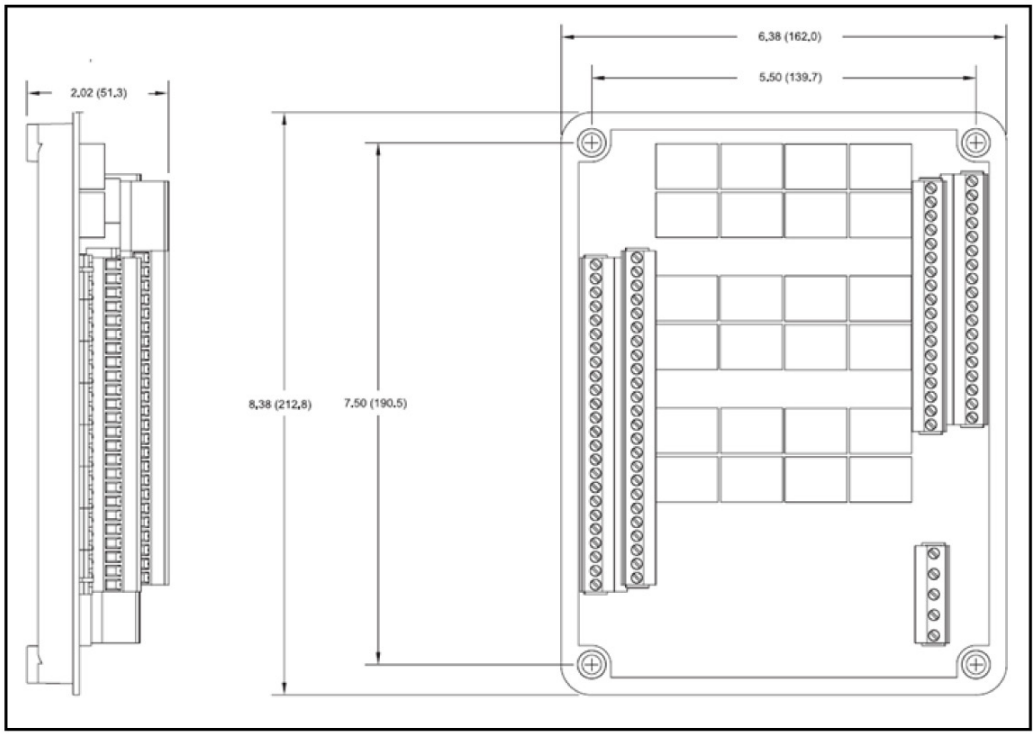
Contact Expansion Module 2020 (CEM-2020)

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	-	-	-

Circuit Breaker Enclosure Data Sheet - Diesel

40-50 KW / 40-44 KVA

DESCRIPTION

This circuit breaker enclosure data sheet is used in conjunction with dimensional drawings to assist with submittal documentation, specification requirements, and installation. This document summarizes the enclosure dimensions and mounting positions for the ***mtu*** 4R0113 DS40, ***mtu*** 4R0113 DS44, and ***mtu*** 4R0113 DS50 circuit breakers, including 280 and 360 frame size enclosures. The dimensional drawings will govern and should be referenced for installation.

280 FRAME ENCLOSURE

- Supplied with all 280 frame alternator applications.
- Right side breakers shown. Left side breakers optional.
- Reference Figure 2 for breaker mounting positions.

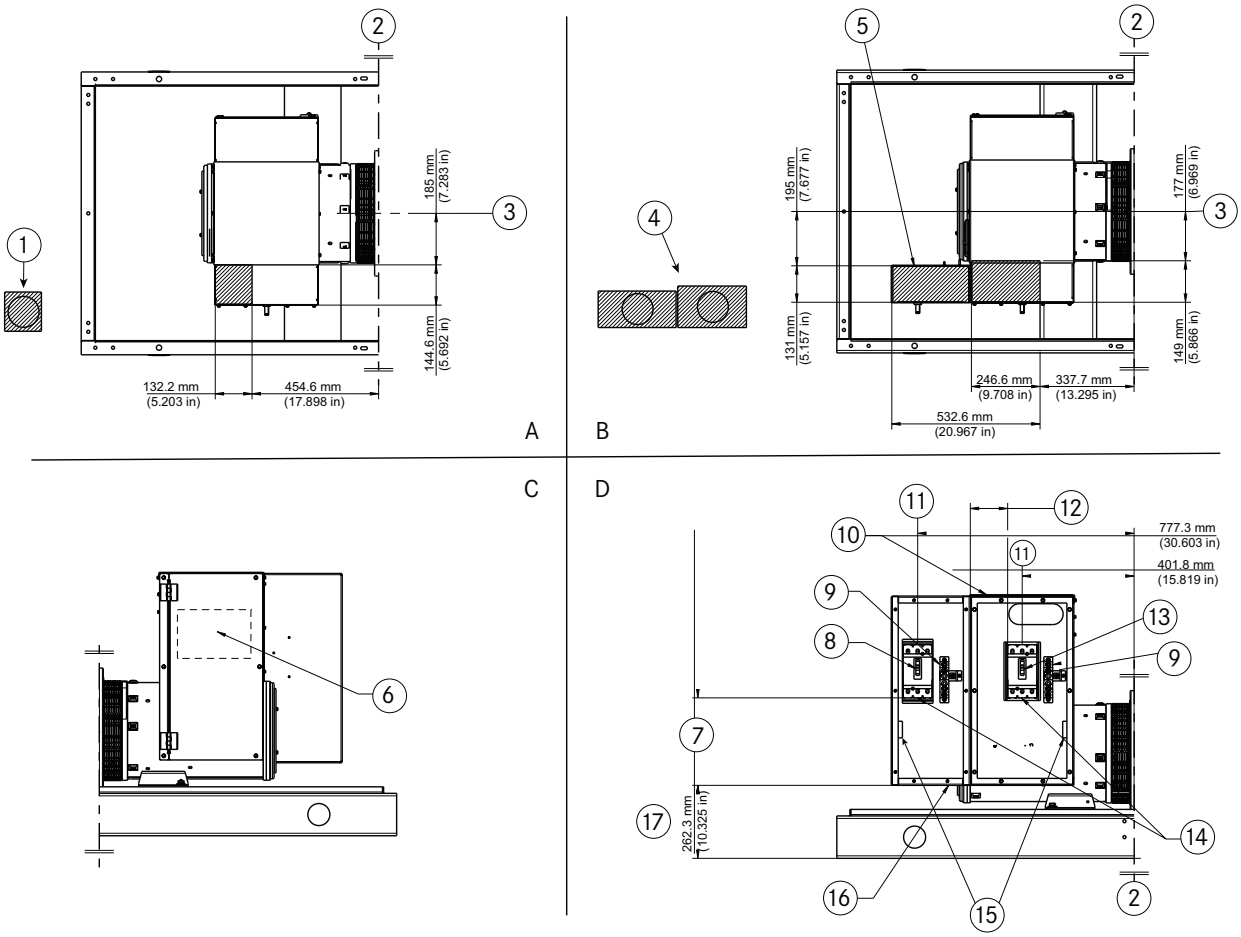


Figure 1: 280 Frame Enclosure

A. Top view, top entry conduit area
B. Top view, bottom entry conduit area
C. Left view, breaker enclosure detail
D. Right view, breaker enclosure detail (enclosure cover not shown)

1. Possible top entry conduit locations
2. Rear face of flywheel housing
3. Generator centerline
4. Possible bottom entry conduit locations
5. Optional secondary breaker enclosure
6. Optional control panel location
7. Dimension A
8. Optional second breaker
9. Neutral ASM (torque to 275 in/lbs)
10. Top entry conduit area
11. Breaker centerline
12. Dimension B
13. Primary breaker
14. Customer connect end (recommended torque on label)
15. Equipment ground terminal (torque to 275 in/lbs)
16. Bottom entry conduit area
17. Add 177.8 mm (7 in) for bases with integrated single wall fuel tank

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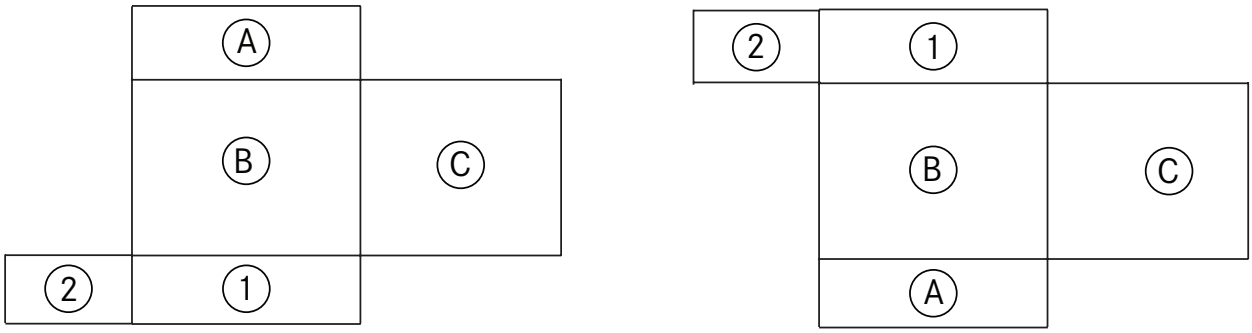
Circuit Breaker Enclosure Data Sheet - Diesel
40-50 kW / 40-44 kVA

Available Circuit Breakers		Enclosure Data				
Breaker Frame	Amperage	Output Wire Range 90 °C Cu (wires per lug)	Wire Bending Space[1] Dimension A mm (in)	Wire Gutter Space[1,2] Dimension B mm (in)	Conduit Quantity	Conduit Size[3] in
H-Frame	20-150	(1) 8-3/0	329 (12.95)	134 (5.27)	1	2.5
J-Frame	175	(1) 4-4/0	314 (12.36)	134 (5.27)	1	2.5
J-Frame	200-250	(1) 3/0-350	314 (12.36)	134 (5.27)	1	3

(1) Meets or exceeds NFPA 70, NEC 312.6(A), and NEC 312.6(B)
(2) Top entry only available for single breaker applications
(3) Based on flexible metal conduit at 40% fill using THHN wire

NOTE: Equipment grounding terminal wire range: 6 AWG - 3/0 AWG.

Table 1: 280 Frame Enclosure Data



Top View - Right Side Breaker

Top View - Left Side Breaker

Figure 2: 280 Frame Enclosure Breaker Mounting Positions

A. Controls
B. Outlet box
C. 280 frame alternator

1. Position 1 (Primary)
2. Position 2

360 FRAME ENCLOSURE

- Supplied with all 360 frame alternator applications.
- Right side breakers shown. Left side breakers optional.
- Reference Figure 4 for breaker mounting positions.

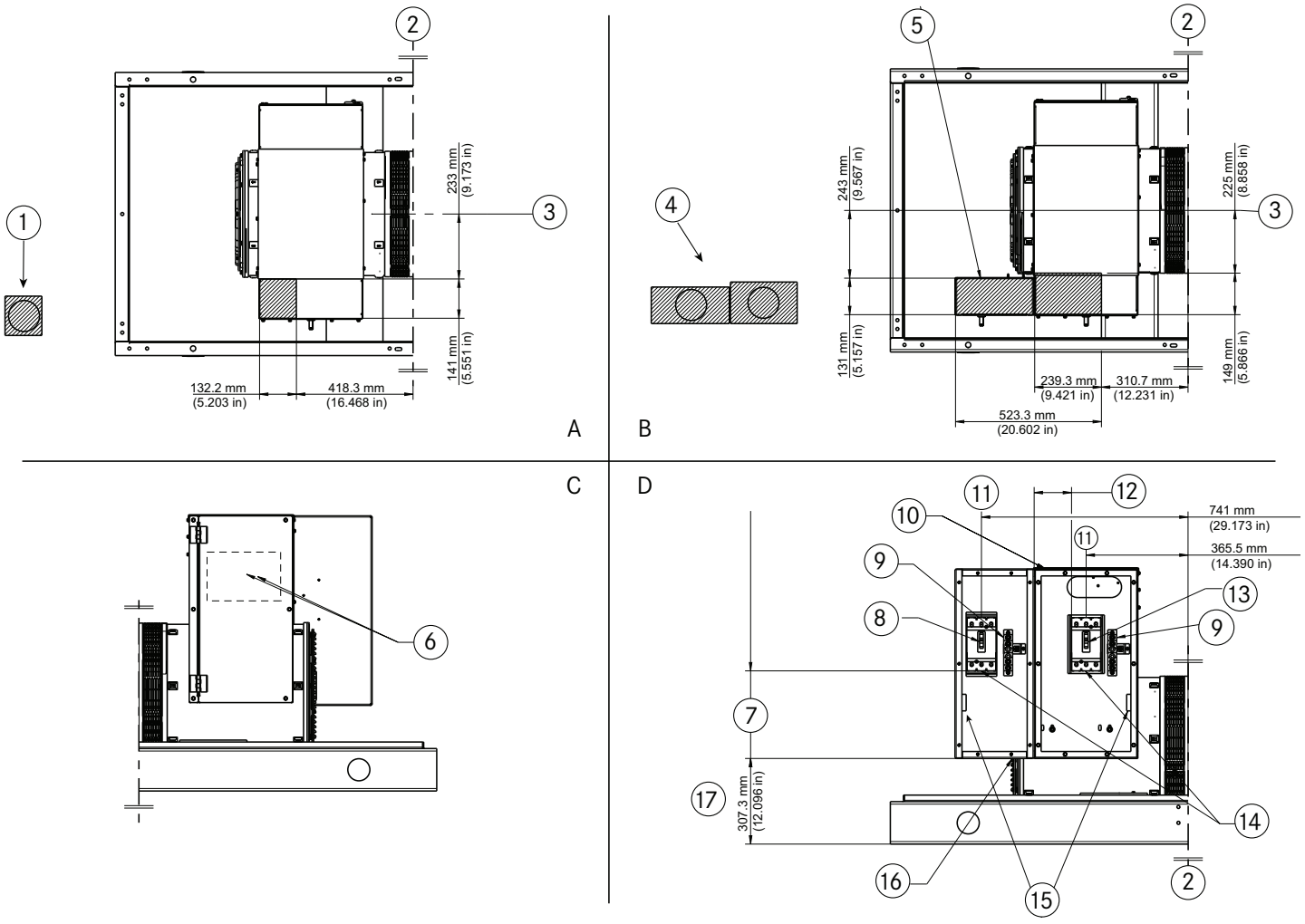


Figure 3: 360 Frame Enclosure

A. Top view, top entry conduit area
B. Top view, bottom entry conduit area
C. Left view, breaker enclosure detail
D. Right view, breaker enclosure detail (enclosure cover not shown)

1. Possible top entry conduit locations
2. Rear face of flywheel housing
3. Generator centerline
4. Possible bottom entry conduit locations
5. Optional secondary breaker enclosure
6. Optional control panel location
7. Dimension A
8. Optional second breaker
9. Neutral ASM (torque to 275 in/lbs)
10. Top entry conduit area
11. Breaker centerline
12. Dimension B
13. Primary breaker
14. Customer connect end (recommended torque on label)
15. Equipment ground terminal (torque to 275 in/lbs)
16. Bottom entry conduit area
17. Add 177.8 mm (7 in) for bases with integrated single wall fuel tank

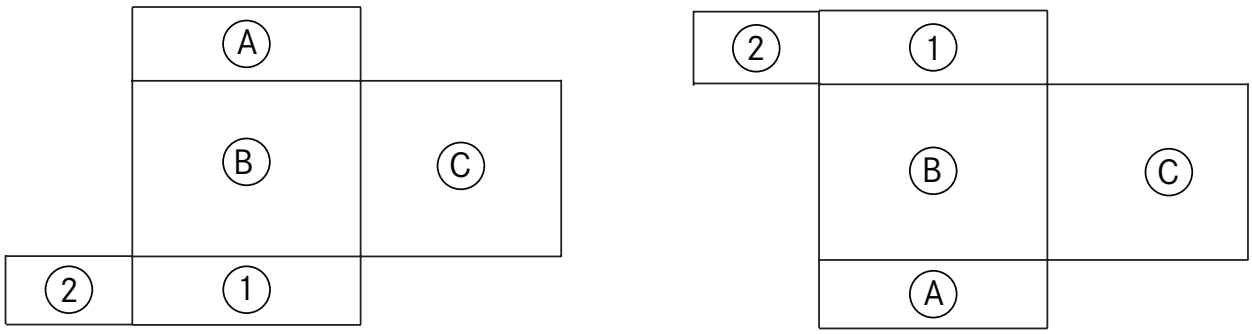
Circuit Breaker Enclosure Data Sheet - Diesel
40-50 kW / 40-44 kVA

Available Circuit Breakers		Enclosure Data				
Breaker Frame	Amperage	Output Wire Range 90 °C Cu (wires per lug)	Wire Bending Space[1] Dimension A mm (in)	Wire Gutter Space[1,2] Dimension B mm (in)	Conduit Quantity	Conduit Size[3] in
H-Frame	20-150	(1) 8-3/0	329 (12.95)	134 (5.27)	1	2.5
J-Frame	175	(1) 4-4/0	314 (12.36)	134 (5.27)	1	2.5
J-Frame	200-250	(1) 3/0-350	314 (12.36)	134 (5.27)	1	3

[1] Meets or exceeds NFPA 70, NEC 312.6(A), and NEC 312.6(B)
[2] Top entry only available for single breaker applications
[3] Based on flexible metal conduit at 40% fill using THHN wire

NOTE: Equipment grounding terminal wire range: 6 AWG - 3/0 AWG .

Table 2: 360 Frame Enclosure Data



Top View - Right Side Breaker

Top View - Left Side Breaker

Figure 4: 360 Frame Enclosure Breaker Mounting Positions

A. Controls
B. Outlet box
C. 360 frame alternator

1. Position 1 (Primary)
2. Position 2

Product data sheet
Characteristics

JDL36250CU33X
PowerPact H Circuit Breaker,Micrologic3.2S,250A,3P,600V,14kA

Main

Product or component type	Circuit breaker
Range of product	PowerPact J
Trip unit technology	Electronic standard Micrologic 3.2 S LSI
Breaking capacity code	D

Complementary

Line Rated Current	250 A
Number of poles	3
Poles description	3P
Breaking capacity	25 kA 240 V AC 18 kA 480 V AC 14 kA 600 V AC
System Voltage	600 V AC
[Ics] rated service short-circuit breaking capacity	100 %
Mounting mode	Unit mount
Electrical connection	Lugs load Lugs line
AWG gauge	AWG 3/0...350 kcmil (aluminium/copper)
Height	7.52 in
Width	4.12 in
Depth	5 in

Environment

Product certifications	CE IEC UL listed CCC

	CSA
Ambient air temperature for operation	104 °F (40 °C)

Ordering and shipping details

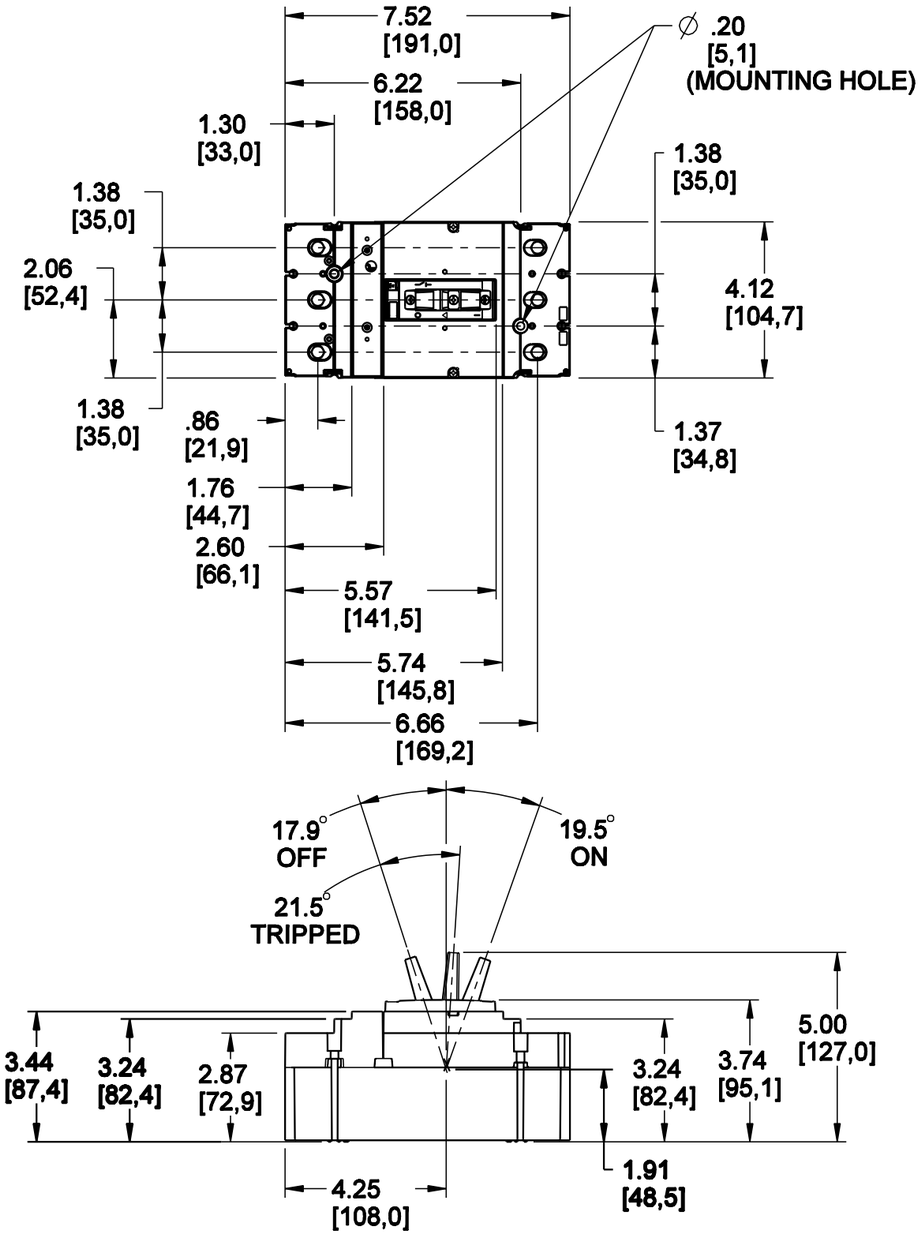
Category	01107 - H/J ELEC TRIP UNIT MOUNT BREAKER/SW
Discount Schedule	DE2
GTIN	00785901952282
Nbr. of units in pkg.	1
Package weight(Lbs)	5
Returnability	Y
Country of origin	US

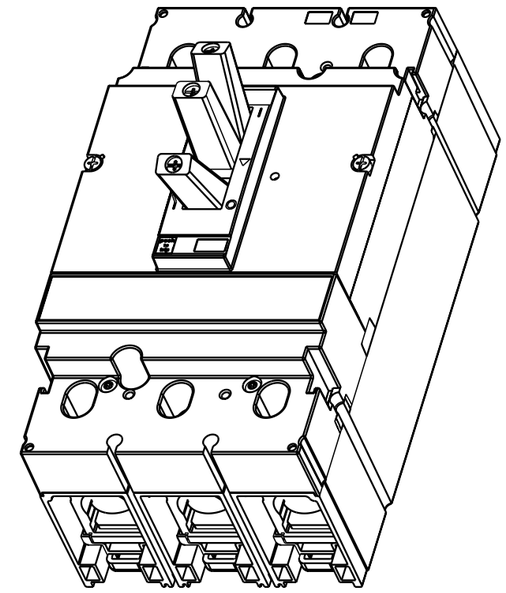
Offer Sustainability

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

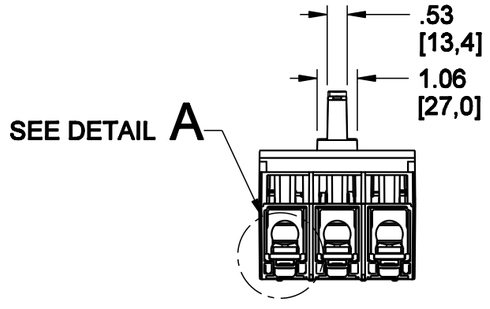
Contractual warranty

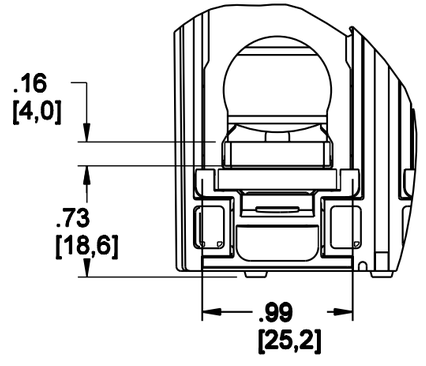
Warranty period	18 months





ISOMETRIC VIEW
SCALE 1:2





DETAIL A
SCALE 1:1

CATALOG NUMBER:			
DESCRIPTION:	J-Frame 150A - 250A 3P Toggle Lug-Lug		
DRAWN BY:	LRG	DATE:	13AUG2003
CHECKED BY:	RLS	DATE:	04MAR2004
DRAWING FILE:	48996-014-01 .DRW		
ECN: J582			

DO NOT SCALE DRAWING
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE
IN / mm

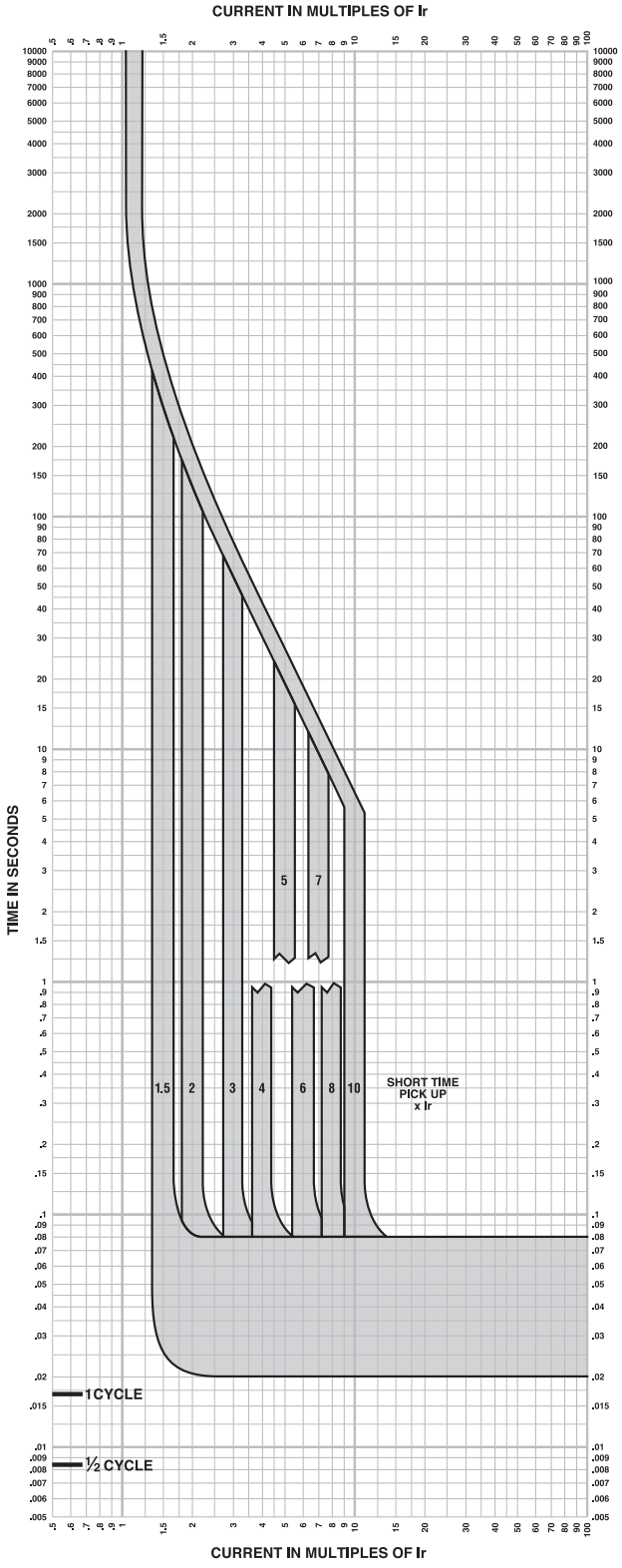
THIRD ANGLE

SQUARE D
Schneider Electric

DRAWING NUMBER 48996-014-01

REVISION 0

Figure 110: Micrologic 3.2S and 3.2S-W Electronic Trip Unit Long Time / Short Time Trip Curve



MICROLOGIC™ ELECTRONIC TRIP UNITS
Micrologic™ 3.2S and 3.2S-W
Long Time/Short Time Trip Curve
250A J-Frame

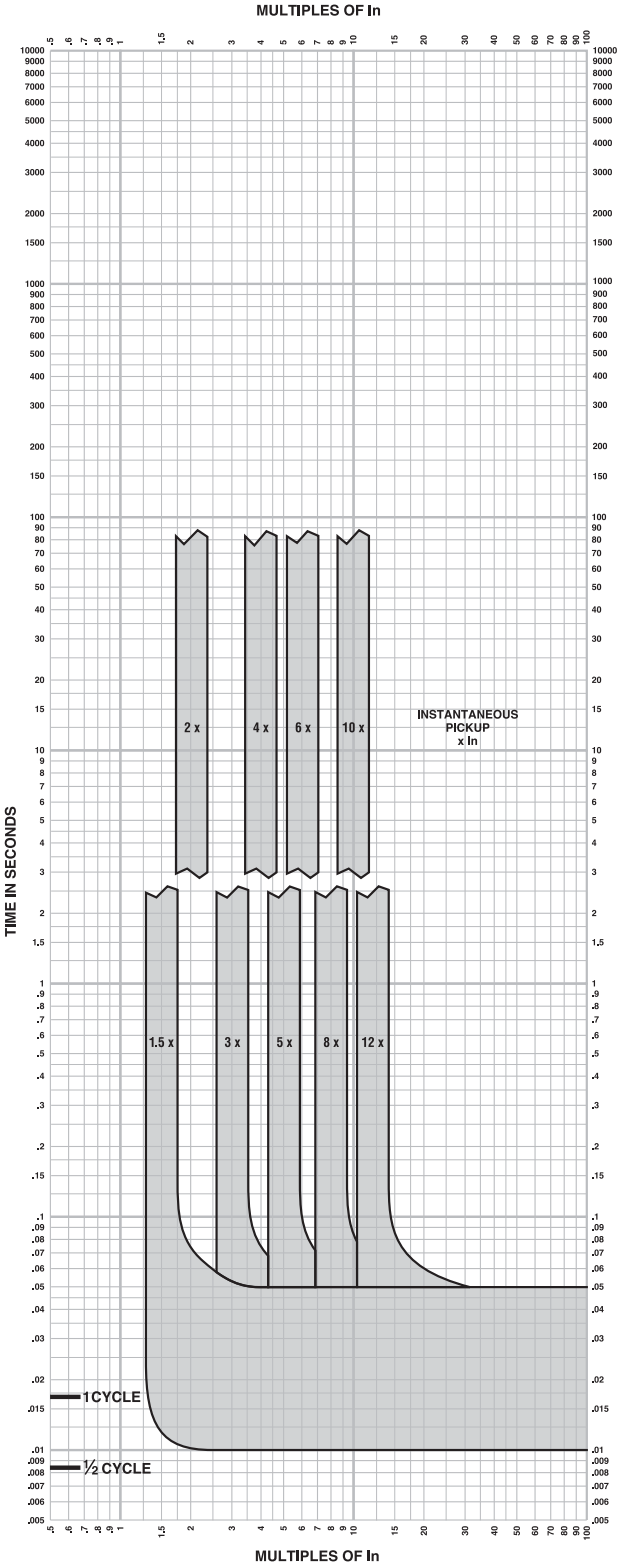
The time-current curve information is to be used for application and coordination purposes only.

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

Figure 111: Micrologic 3.2, 3.2-W, 3.2S, 3.2S-W, 5.2A, 5.2A-W, 5.2E, 5.2E-W, 6.2A, 6.2A-W, 6.2E, and 6.2E-W Electronic Trip Curve Instantaneous Trip Curve



MICROLOGIC™ ELECTRONIC TRIP UNITS
Micrologic™ 3.2, 3.2-W, 3.2S, 3.2S-W, 5.2A, 5.2A-W, 5.2E, 5.2E-W, 6.2A, 6.2A-W, 6.2E, and 6.2E-W
Instantaneous Trip Curve
250A J-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.
   250A J-Frame: In = 250A = Max Ir setting

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

Battery Charger Data Sheet

MicroGenius Battery Charger

BENEFITS AND FEATURES

Designed for mission-critical applications, the MicroGenius® battery charger packs advanced technology charging into a small, lightweight, and rainproof package. MicroGenius® is the only charger that delivers high-performance charging while prolonging useful life of batteries and significantly reducing risk of sudden battery failure. Rigorous worst-case analysis design processes and extensive abuse testing ensure reliable operation in adverse environments.

- Dynamic Boost™ Charge safely recharges batteries faster than competing products
- HELIX™ technology increases battery life and cuts risk of sudden battery failure
- Field-selectable 12/24 volt output
- Hardened switchmode powertrain delivers first-class abuse resistance and state-of-the-art energy efficiency
- Small, lightweight, water-resistant, and rugged
- Standard J-1939 and Modbus communications

SPECIFICATIONS

AC Input	MicroGenius 2	MicroGenius S2	MicroGenius S4
VAC, Hz	90-265 VAC, 47-63 Hz When set for 24-volt output, full 15A output of 450W available above 170 VAC input, 12A output current max between 100 VAC and 170 VAC input.	90-265 VAC, 47-63 Hz When set for 24-volt output, full 30A output available above 170 VAC input, 24A output current max between 100 VAC and 170 VAC input.	90-265 VAC, 47-63 Hz When set for 24-volt output, full output available above 170 VAC input, output power reduced by approximately 20% for operation between 100 VAC and 170 VAC input (e.g. 24A for charger rated 30A).
Protection	Supplementary overcurrent protection fuse, transient protected to EN61000-4-5 level 4		
Power factor and efficiency	PF > 0.95 typical; efficiency to 93%; meets CEC Title 20 Efficiency Regulations; standby AC draw < 3W		

A Rolls-Royce solution

SPECIFICATIONS, continued

DC Output	MicroGenius 2	MicroGenius S2	MicroGenius S4
Volts	12V / 24V nominal		
Amps	**MicroGenius 180:** 10A/6A **MicroGenius 300:** 12A/10A	20A	45A
Charging modes	Multi-stage, including float, boost, and commissioning charge modes		
Current limit	Factory set at 100% of rating. Field adjustable w/optional keypad or from PC.[1]		
Charging characteristic	Constant voltage, current limited; patented Dynamic Boost control		
Line and load regulation	±0.5%		
Output ripple	< 30 mVrms with or without battery. Delivers fast-responding, stable, well-filtered DC without battery.		
Battery temperature compensation	Standard. Optional remote battery temperature probe[2]		
Output protection	Current limit, supplementary overcurrent protection fuse, transient protected		
Dead battery charge	Starts into and recharges zero volt battery without user intervention		
Parallel operation	Two or more chargers operate with all modes synchronized for increased current or fault tolerance[3]		

Adjustment and Controls	MicroGenius 2	MicroGenius S2	MicroGenius S4
Charge mode control	Fully automatic patented Dynamic Boost system. Manual boost and battery commissioning available from keypad.		
Adjustments	12 or 24 volt; battery type program; fine voltage setting, alarm setpoints; alarm relay mapping		
Battery type programs	Flooded lead-acid, Ni-Cd, VRLA, ultracapacitor, lithium[4]		
Field voltage adjustment	Three methods: jumper pins, from front panel keypad (requires that digit 12 of the model number be F), or from PC[1]	Two methods: from front panel keypad or from PC[1]	

Status Display	MicroGenius 2	MicroGenius S2	MicroGenius S4
LEDs	Two multi-color front panel status LEDs		
Metering and status display	Voltmeter accurate to +2%; ammeter to +5%. 20-character display of status and alarm messages.		

Alarms	MicroGenius 2	MicroGenius S2	MicroGenius S4
Alarms	Factory set and field reconfigurable. Standard genset configuration includes summary, AC fail, charger fail, high DC volts, low DC volts, low cranking volts.		
Alarms: Form C contacts	**MicroGenius 180:** N/A **MicroGenius 300:** Two Form C contacts, each rated 30V, 2A resistive, assignable. Standard configuration includes summary, AC fail, charger fail, high DC volts, low DC volts and discharging battery.	Five Form C contacts, each rated 30V, 2A resistive, assignable. Standard configuration includes summary, AC fail, charger fail, high DC volts, low DC volts and discharging battery.	

SPECIFICATIONS, continued

Networking	MicroGenius 2	MicroGenius S2	MicroGenius S4
J-1939 communications	CAN 2.0 extended ID on RJ-45 port		
Modbus communications	Modbus RS-485 on RJ-45 port or Modbus TCP/IP on RJ-45 port.		Uses only Modbus TCP/IP. Do not use Modbus RS-485 for serial port communication.
SENSbus	Proprietary bus for connection of paralleled chargers and SENS accessories		

Environmental	MicroGenius 2	MicroGenius S2	MicroGenius S4
Operating temp[5] (convection cooled)	-40 °C to +70 °C (-40 °F to +158 °F)		
	MicroGenius 180: Meets full specification from -40 °C to +60 °C (-40 °F to +140 °F) **MicroGenius 300:** Meets full specification from -40 °C to +50 °C (-40 °F to +122 °F)	Meets full specification from -40 °C to +40 °C (-40 °F to +104 °F)	
Humidity	5% to 95%, non-condensing		
Ingress protection	IP 22; NEMA 3R; UL Listed "Rainproof"	IP 20; NEMA 1. Optional drip shield for IP 22/NEMA 3R rating.	
Vibration	Swept Sine (EN60068-2-6); 4G, 18-500 Hz, 3 axes. Random: 20-500 Hz, 0.01G2/Hz		
Shock	EN 60068-2-27 (15G)		
Electrical transient	ANSI/IEEE C62.41 and EN 61000-4-12 on power terminals		

Abuse Protection	MicroGenius 2	MicroGenius S2	MicroGenius S4
Reverse polarity	Charger self-protects without fuse clearing. Indication via LED and optional LCD.	Charger self-protects without fuse clearing. Indication via LED and LCD.	Charger self-protects without output protective device clearing. Indication via LED and LCD.
Wrong voltage battery	Charger-battery voltage mismatch shuts down charger. Indication via LED and LCD		
Overvoltage shutdown	Selective: Shutdown only operates if charger causes the overvoltage condition		
Overtemp protection	Gradual output power reduction if heatsink temperature becomes excessive		

Regulatory Compliance	MicroGenius 2	MicroGenius S2	MicroGenius S4
North America	C-UL Listed for US and Canada: UL 1236 categories BBGQ, BBHH, BBJY and QWIR[6], CSA 22.2, No. 107.2. Certified to UL 1236 supplements SB (marine), SC (fire pump) and SE (emergency generator)		
	NFPA-70, NFPA-110[7] **Note:** X00A42500005 meets NFPA-70 only.		
	FCC Part 15, Class B	FCC Part 15, Class A	
	Seismic: Rigid and non-structure wall mount; max SDS of 2.5G. IBC 2000-2015, Calif. BC 2007-2016		
	American Bureau of Shipping, type approved		
European Union (CE)	EMC: 2014/30/EU (EN 61000-6-2 and EN 61000-6-4)		
	LVD: 2014/35/EU (EN 60335-1 and EN 60335-2-29)		
	RoHS 2: 2011/65/EU (EN 50581)		

SPECIFICATIONS, continued

Construction	MicroGenius 2	MicroGenius S2	MicroGenius S4
Housing/Configuration	Die-cast aluminum heatsink base with stainless steel covers and fasteners	Aluminum with powder coated finish	
Connections	AC and DC terminal blocks: 20 to 10 AWG. J-1939 and Modbus-485: RJ-45. Form C alarms: 28 to 16 AWG	AC and DC terminal blocks: 20 to 2 AWG. J-1939 and Modbus: RJ-45. Form C alarms: 28 to 16 AWG	AC and DC terminal blocks: 14 AWG to 2/0. AC and DC breakers, <50A (optional): 14 to 2 AWG. AC and DC breakers, ≥50A (optional): 12 AWG to 2/0. J-1939 and Modbus: RJ-45. Form C alarms: 28 to 16 AWG

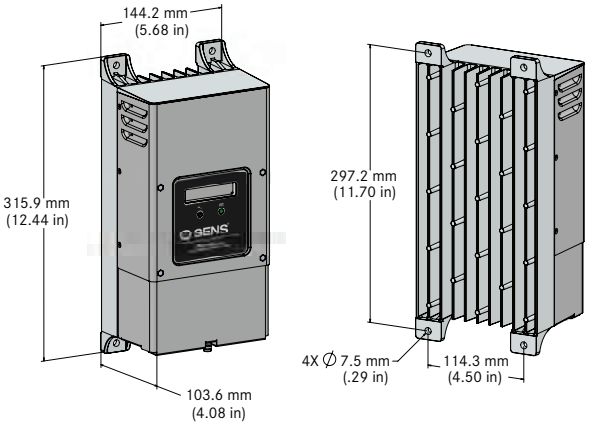
[1] Requires optional computer-to-charger adapter. To order, contact ***mtu*** Parts Department.
[2] Remote battery temp sensor is optional. To order, contact ***mtu*** Parts Department.
[3] Requires standard RJ-45 network cable to connect paralleling bus. To order, contact ***mtu*** Parts Department.
[4] Contact factory to determine compatibility with the battery management system (BMS) of your lithium battery.
[5] At 65 **°C (149 °F)** and above, the LCD display may be unreadable and display life will be reduced.
[6] Except 180 W unit in 24 V configuration, which is not listed to QWIR
[7] All chargers equipped with an alarm/display board meet NFPA-110 requirements. For chargers without an alarm/display board to meet NFPA-110, charger performance and alarm data available on the J-1939 port must be annunciated by the generator set control panel.

MICROGENIUS ORDERING INFORMATION

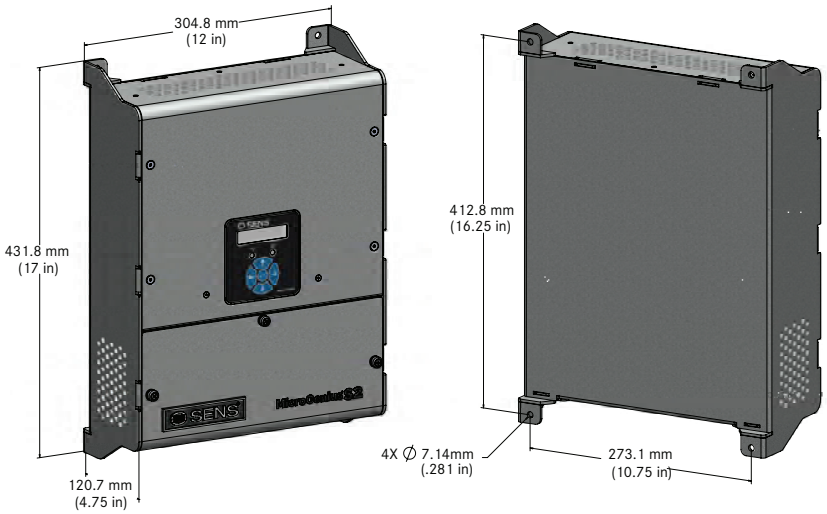
Battery Charger	*mtu* Part #	Output Volts	Output Amps
MicroGenius 2 180*	X00A42500005	12/24 Volts	10/6 Amps
MicroGenius 2 180**	XG3042500013	12 Volts	10 Amps
MicroGenius 2 300**	X54942500005	24 Volts	10 Amps
MicroGenius 2 450**	XG3042500014	24 Volts	15 Amps
MicroGenius S2	X54942500003	12/24 Volts	20 Amps
MicroGenius S4	X54942500002	12/24 Volts	45 Amps

*Meets NFPA-70 only.
Includes ***mtu*-specific programming

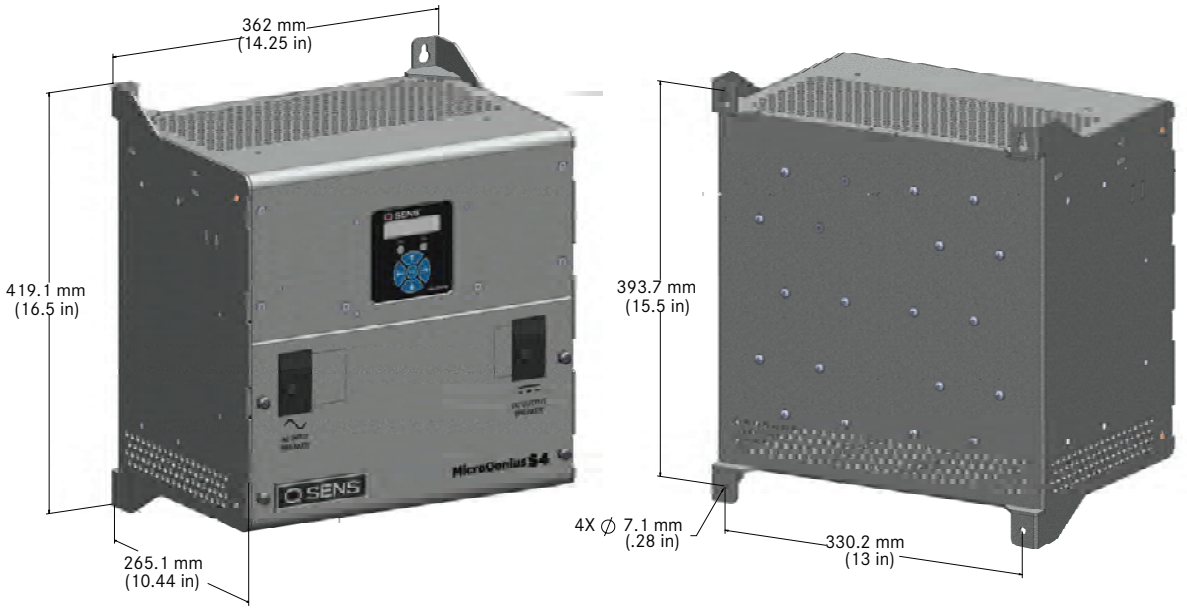
DIAGRAMS AND DIMENSIONS



MicroGenius 2 Dimensions



MicroGenius S2 Dimensions



MicroGenius S4 Dimensions

Subject to change. | WT00038096 | 2021-03

Water Heater Data Sheet

TPS Series

DESCRIPTION

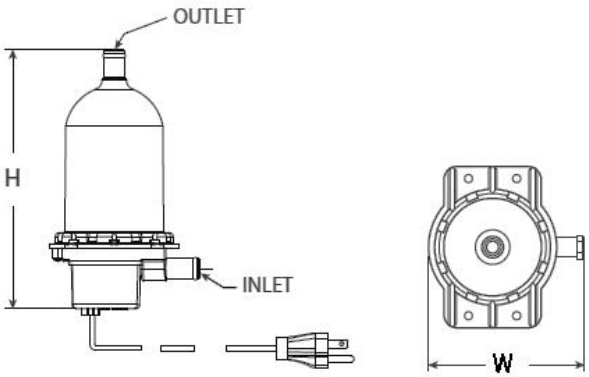
The TPS engine preheater is designed to preheat diesel and gas engines in generator set applications. Simple to install and very lightweight, the TPS engine preheater features a built-in thermostat and heats engines with up to 12 L displacement. Thermosiphon circulation of the coolant delivers heat throughout the entire engine.

CERTIFICATIONS AND STANDARDS

— c-UL-us Listed
— CE Compliant

SPECIFICATIONS

Height:	200 mm (7.9 in)
Width:	117 mm (4.6 in)
Weight:	771 g (1.7 lb)
Heating fluid:	Engine coolant (50% glycol/50% water)
Power:	0.5, 1, 1.5, 1.8, and 2 kW
Voltage range:	120 to 240 V
Tank material:	Polyphenylene sulfide (PPS)
Heating element:	Incoloy 800
Enclosure:	IP41
Fluid capacity:	416 cm^3 (0.11 gal)
Max pressure:	6.2 bar (90 psi)
Inlet / outlet:	15.9 mm (0.625 in)
Thermostat range:	
On	38 °C (100 °F)
Off	49 °C (120 °F)



Model Number	*mtu* Part Number	Watts	Volts	Phase	Hz	Amps
TPS051GT10-000	SUA90366	500	120	1	60	4.2
TPS101GT10-000	SUA52746	1,000	120	1	60	8.4
TPS151GT10-000	SUA52748	1,500	120	1	60	12.5
TPS181GT10-000	SUA52750	1,800	120	1	60	15
TPS202GT10-000	SUA52751	2,000	240	1	60	8.3

Subject to change. | WT00032343 | 2021-04

A Rolls-Royce solution

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

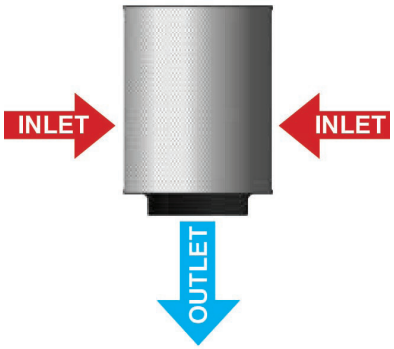
mtu Part #	Airflow @ Inches of Water Restriction (refer to *Airflow Diagrams* below)			Weight	Maximum Temp	
	m^3/min (SCFM) @ 4 in. H_2O	m^3/min (SCFM) @ 6 in. H_2O	m^3/min (SCFM) @ 8 in. H_2O	kg (lb)	Continuous °C (°F)	Intermittent °C (°F)
SUA106417	4.3 (150)	5.1 (180)	6.1 (215)	1 (2.2)	83 (180)	105 (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)

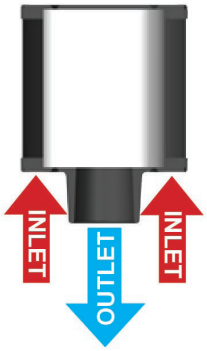
N/A = Not Available

A Rolls-Royce solution

AIRFLOW DIAGRAMS



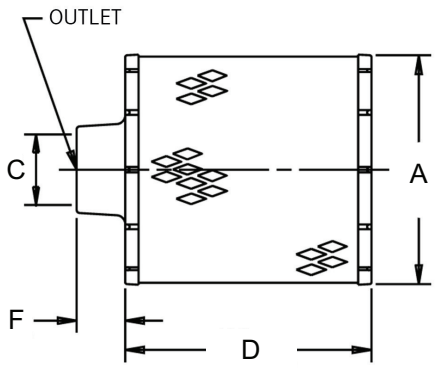
Airflow Diagram: SUA90069, XG3012100019



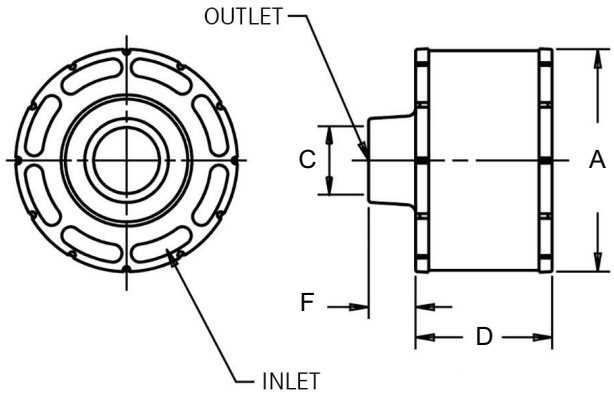
Airflow Diagram: SUA106417, SUA86885, SUA77166, SUA40198

Airflow Diagram: XG2112100001, XG2512100002

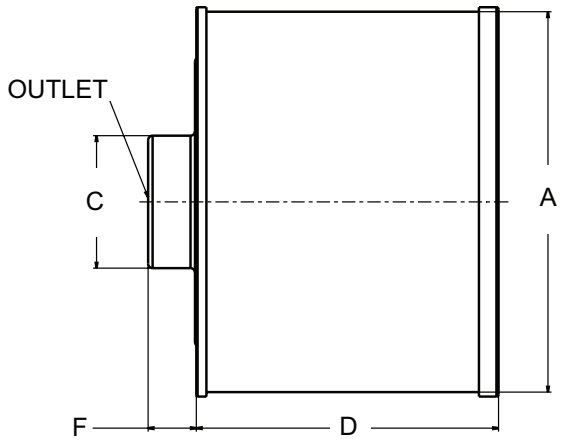
DIMENSION DIAGRAMS



Dimension Diagram: SUA90069, XG3012100019



Dimension Diagram: SUA106417, SUA86885, SUA40198



Dimension Diagram: SUA77166, XG2112100001, XG2512100002

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

December 15, 2021

Brandon Lingle
Senior Certification Engineer
Emissions Compliance, John Deere Power Systems
6725 Cedar Heights Road
Waterloo, IA 50613-8000

Dear Mr. Lingle,

The South Coast Air Quality Management District (South Coast AQMD) has extended Certified Equipment Permits (CEPs) to December 31, 2022 for the stationary emergency internal combustion (IC) engine models listed in the attached table. However, please be reminded that many of these certified diesel-fueled IC engines may not meet Rule 1470 requirements if installed at or near a sensitive receptor or near school grounds and, therefore, may require an aftertreatment system such as a diesel particulate filter in the exhaust stream.

Please note that the South Coast AQMD does not endorse or warrant any specific equipment or manufacturer. Modification of the equipment listed here will void this certification.

If you have additional questions or need further clarification on the CEP program, please feel free to contact CJ Chang at (909) 396-3293, cchang@aqmd.gov; or Susan Tsai at (909) 396-2529, stsai@aqmd.gov.

Sincerely,

David Ono
Senior Air Quality Engineering Manager
Engineering and Permitting

DO:GI:ST:CC

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Certified ICE-Emergency Generators

JOHN DEERE POWER SYSTEMS

Engine Mfr.	Model	Engine Rating	Application No.
Deere	3029HFG03A with Oxidation Catalyst and DPF	74 BHP	572836
Deere	3029HFG89F	62 BHP	572839
Deere	4024HF285B	80 BHP	494710
Deere	4045HF285H	133 BHP	462962
Deere	4045HF285I	158 BHP	462956
Deere	4045HF285J	126 BHP	462966
Deere	4045HF285K	197 BHP	493792
Deere	4045HF485E or 4045HFG85A	197 BHP	462957
Deere	4045TF285E	99 BHP	493796
Deere	4045TF290J	74 BHP	568240
Deere	5030HF285G	96 BHP	494713
Deere	6068HF285K	237 BHP	462955
Deere	6068HF285L	197 BHP	462958
Deere	6068HF485T or 6068HFG85A	315 BHP	451077
Deere	6068HF485U or 6068HFG85B	284 BHP	475411
Deere	6068HFG82E	284 BHP	545149
Deere	6090HF484A	422 BHP	493797
Deere	6090HF484B	385 BHP	493799
Deere	6090HF484C	346 BHP	493800
Deere	6090HF484D	307 BHP	493801
Deere	6090HF485V	422 BHP	449704
Deere	6090HF485W	385 BHP	449705
Deere	6090HF485X	346 BHP	449706
Deere	6090HF485Y	307 BHP	449707
Deere	6090HFG86	463 BHP	536689
Deere	6135HF485S	617 BHP	462959
Deere	6135HF485T	538 BHP	462960
Deere	6135HF485U	463 BHP	462961
Deere	6135HFG75	755 BHP	536684
Deere	6135HFG84A	617 BHP	551055
Deere	6135HFG84B	538 BHP	551041
Deere	6135HFG06A w/ Integrated Aftertreatment	634 BHP	627157
Deere	6090HFG06A w/ Integrated Aftertreatment	463 BHP	627158

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 Copley Drive, Diamond Bar, CA 91765

Application No.
568240

CERTIFIED EQUIPMENT PERMIT (CEP)
(NOT A PERMIT TO CONSTRUCT OR OPERATE)

Granted on December 23, 2014

ID 92796

Legal Owner or Operator:
JOHN DEERE POWER SYSTEMS
P.O. BOX 8000
WATERLOO, IA 50704-8000
ATTN: DAVID A. PIECH

Equipment Location: SAME AS ABOVE

The equipment described below and as shown on the approved plans and specifications are subject to the special condition or conditions listed.

Equipment Description

Internal combustion engine, John Deere Model No. 4045TF290J, 74 bhp (55.2 kwm), 4 cylinders, turbocharged, aftercooled, diesel-fueled, driving an emergency electrical generator.

Manufacturer Condition

1. **This Certified Equipment Permit (CEP) is not a Permit to Construct or Operate.** The person constructing, installing or operating the equipment at each specific site shall obtain all necessary permit(s) to construct and permit(s) to operate and comply with any other District rules and regulations including the requirements of Regulation XIII.

End User Conditions

1. Operation of this equipment shall be conducted in accordance with all data and specifications submitted with the application under which this permit is issued unless otherwise noted below.

2. This equipment shall be properly maintained and kept in good operating condition at all times.

3. A non-resettable totalizing timer shall be installed and maintained to indicate the engine elapsed operating time.

4. This engine shall not operate more than **200** hours in any one year, which includes no more than **50** hours in any one year for maintenance and testing purposes.

5. An engine operating log of engine operations shall be kept and maintained documenting the total time the engine is operated each month and the specific reason for operation such as:
   a. emergency use
   b. maintenance and testing
   c. other (be specific)

   In addition for each time the engine is manually started, the log shall include the date of engine operation, the specific reason for operation, and the totalizing hour meter reading (in hours and tenths of hours) at the beginning and the end of the operation.

ORIGINAL

CERTIFIED EQUIPMENT PERMIT (CEP)
(NOT A PERMIT TO CONSTRUCT OR OPERATE)

6. On or before January 15th of each year, the operator shall record in the engine operating log:
   a. The total hours of engine operation for the previous calendar year, and
   b. The total hours of engine operation for maintenance and testing for the previous calendar year.

7. *Engine operation* log(s) shall be retained on site for a minimum of three calendar years and shall be made available to the Executive Officer or representative upon request.

8. Operation beyond the **50** hours per year allotted for engine maintenance and testing shall be allowed only in the event of a loss of grid power or up to 30 minutes prior to a rotating outage, provided that: (a) the utility distribution company has ordered rotating outages in the control area where the engine is located or has indicated that it expects to issue such an order at a certain time; and (b) the engine is located in a utility service block that is subject to the rotating outage. Engine operation shall be terminated immediately after the utility distribution company advises that a rotating outage is no longer imminent or in effect.

9. This engine shall comply with all applicable requirements of Rules 431.2, 1470 and 1472.

Please notify Rizaldy Calungcagin at (909) 396-2315 (rcalungcagin@aqmd.gov) when SCAQMD information packets are needed or if you have any questions concerning the Certification/Registration Program.

This Certified Equipment Permit is based on the plans, specifications, and data submitted as it pertains to the release of air contaminants and control measures to reduce air contaminants. No approval or opinion concerning safety and other factors in design, construction or operation of the equipment is expressed or implied.

This Certified Equipment Permit will become invalid if this application is canceled. This permit shall expire on December 31, 2015 unless an extension is granted by the Executive Officer.

By 

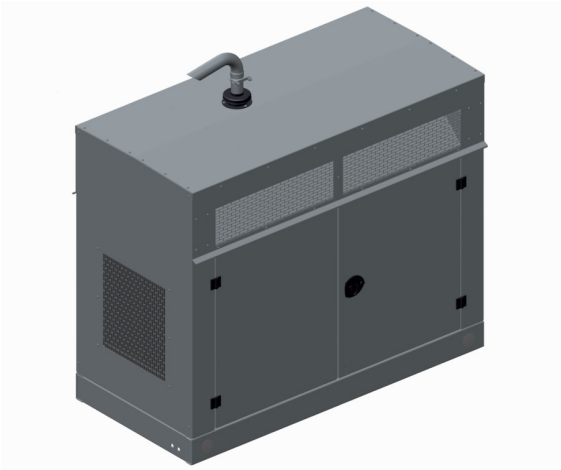
DAVID DE BOER
Program Supervisor

ORIGINAL

Enclosure and Sound Data Sheet - Diesel, Open Field

60 Hz: 30-60 kW Standby / 27-55 kW Prime

50 Hz: 34-55 kVA Standby / 30-50 kVA Prime



Level 1 Enclosure (pictured)*

Level 3 Enclosure (pictured)*

Enclosure Level Identification	
Level 1	Basic weather-protective enclosure constructed of heavy gauge steel or aluminum with fixed stormproof panels designed for 190 mph wind load rating. Skid-mounted enclosure consists of a bolted and welded construction with unit-mounted internal silencer. Hinged, lockable double-door access on both sides of the enclosure.
Level 2	Enhanced weather-protective enclosure constructed of heavy gauge steel or aluminum with fixed stormproof panels designed for 190 mph wind load rating. Skid-mounted enclosure consists of a bolted and welded construction with unit-mounted internal silencer. Hinged, lockable double-door access on both sides of enclosure. UL 94 HF-1 compliant,1.5" thick sound attenuated foam insulation installed inside enclosure walls where applicable.
Level 3	Level 2 enclosure with air exhaust scoop with UL 94 HF-1 compliant, 1.5" thick sound attenuated foam insulation installed where applicable.

CERTIFICATIONS AND STANDARDS

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

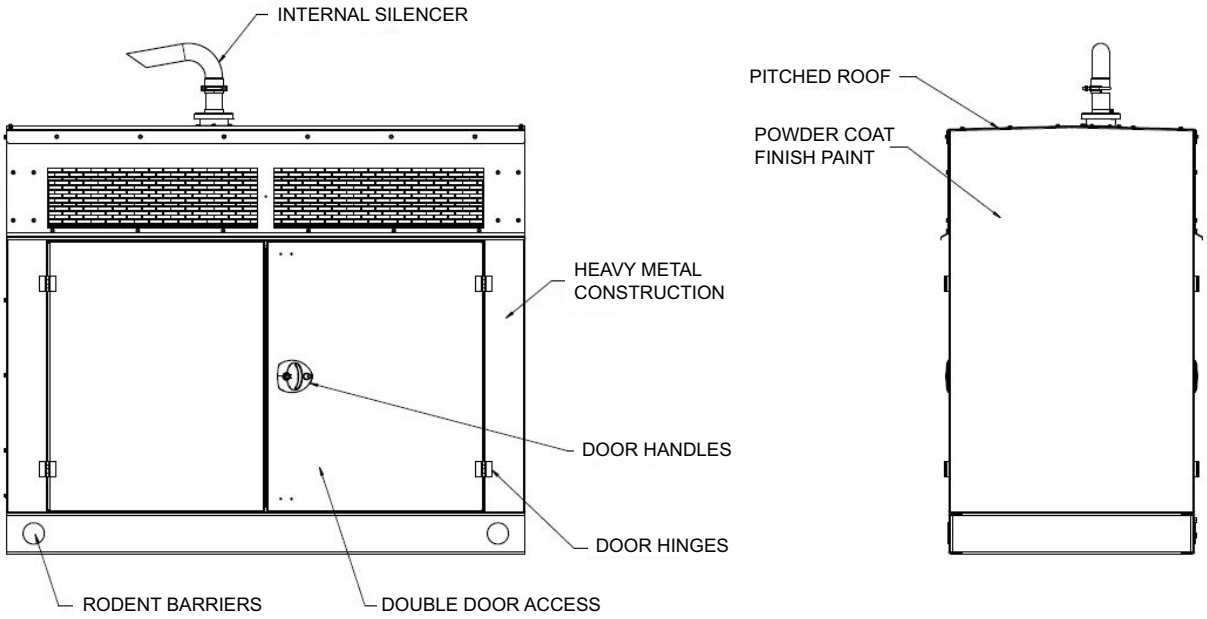
STANDARD FEATURES FOR ALL LEVELS

- 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
- 190 mph wind rating
- Service access
  - Double door access gives ease of service to all components
- Pitched roof
- Rain collar
- 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
  - Internally-insulated space saver design
  - Level 1: Industrial Grade
  - Level 2/3: Hospital Grade

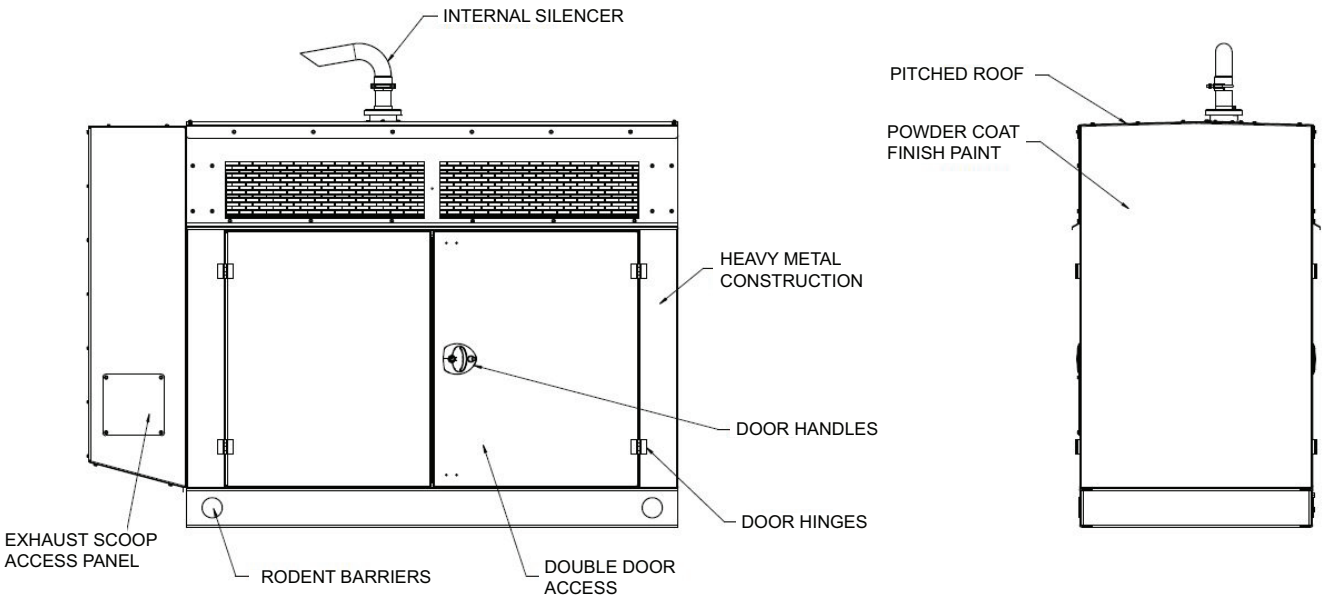
A Rolls-Royce solution

Enclosure and Sound Data Sheet - Diesel, Open Field

60 Hz: 30-60 kW Standby / 27-55 kW Prime
50 Hz: 34-55 kVA Standby / 30-50 kVA Prime



Level 1 Enclosure (pictured)*



Level 3 Enclosure (pictured)*

OPTIONAL FEATURES (LEVEL 2 AND LEVEL 3 ONLY)

- Door restraints
- LED light package
- Gravity exhaust louvers
- Distribution panel
- Enclosure space heater
- Motorized intake louvers
- 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*** 3R0096 DS30	30 kW	101.6	84.1	79.2	72.4	69.6
	mtu 4R0113 DS40	40 kW	105.1	91.6	84.3	77	71
	mtu 4R0113 DS50	50 kW	105.1	91.6	84.6	76.7	71.5
	mtu 4R0113 DS60	60 kW	107	87.6	83.9	77.2	73.4
Application	**Model**	**Power Node**	**Engine Exhaust[1]**	**OPU[2]**	**Level 1**	**Level 2**	**Level 3**
60 Hz Prime	***mtu*** 3R0096 DS30	27 kW	92.1	82.6	79.2	72.4	69.6
	mtu 4R0113 DS40	40 kW	104.3	89.3	84.3	77	71
	mtu 4R0113 DS50	45 kW	104.3	89.3	84.6	76.7	71.5
	mtu 4R0113 DS60	55 kW	103.7	88.4	83.9	77.2	73.4
Application	**Model**	**Power Node**	**Engine Exhaust[1]**	**OPU[2]**	**Level 1**	**Level 2**	**Level 3**
50 Hz Standby	***mtu*** 3R0096 DS34	34 kVA	96.9	78.6	C/F	C/F	C/F
	mtu 4R0113 DS44	44 kVA	93.3	89.3	C/F	C/F	C/F
	mtu 4R0113 DS55	55 kVA	104.5	88.9	C/F	C/F	C/F
Application	**Model**	**Power Node**	**Engine Exhaust[1]**	**OPU[2]**	**Level 1**	**Level 2**	**Level 3**
50 Hz Prime	***mtu*** 3R0096 DS34	30 kVA	92.9	76.8	C/F	C/F	C/F
	mtu 4R0113 DS44	40 kVA	94.7	89.5	C/F	C/F	C/F
	mtu 4R0113 DS55	50 kVA	98.9	87.9	C/F	C/F	C/F

[1] Undampened engine exhaust noise
[2] Measurement with infinite exhaust connection

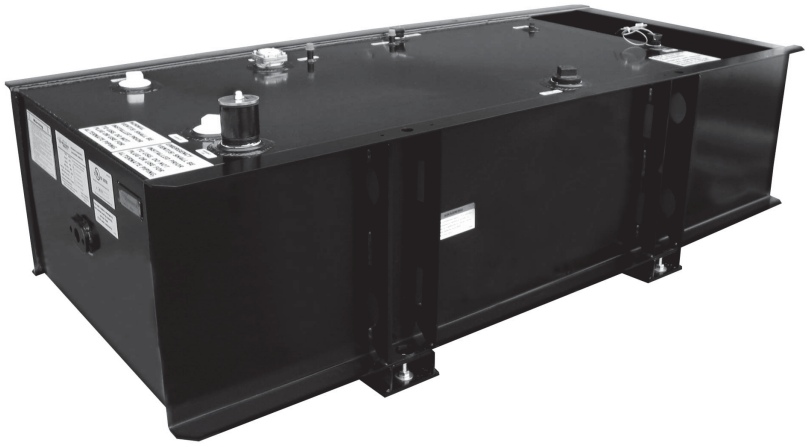
NOTE:
- Measurements include exhaust noise
- Aluminum enclosure sound levels are approximately 2 dB(A) higher than listed sound levels for steel enclosures
- For installation within 50 miles of the coast, aluminum enclosures are recommended to prevent accelerated corrosion
- Sound pressure levels subject 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.

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.

mtu 4R0113 DS50

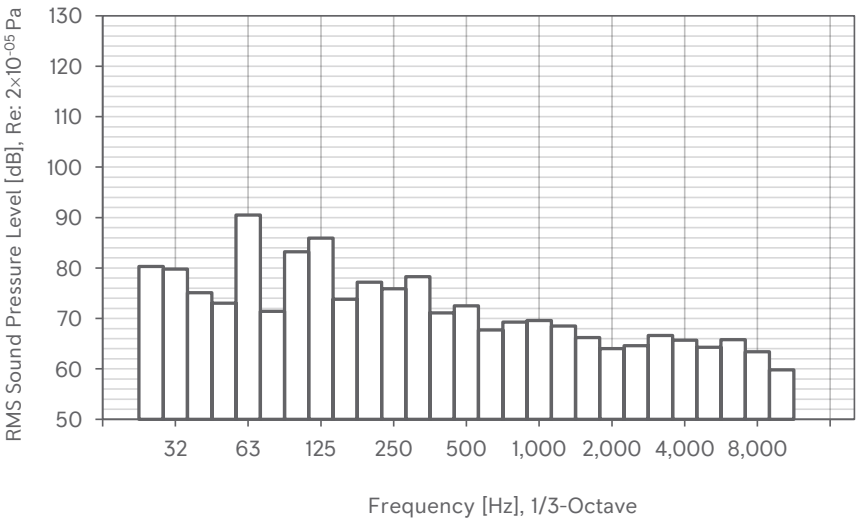
50 kWe/60 Hz/Standby
Free-field Noise Analysis

ENGINE MODEL:	JD4045TF280	ENGINE S/N:	PE4045L240858
GENERATOR MODEL:	361 / 1602	FREQUENCY:	60 Hz
POWER / SPEED:	50 kW / 1800 rpm	TEST CELL:	N/A
ORDER / PROJECT NO.:	P-2127	DATE MEASURED:	01/19/2015
TEST LOAD:	50 kW / 100%	ENCLOSURE:	Level 3
INTAKE AIR OPENING:	Paper filters with housing	RADIATOR:	50°C
MEASURING DISTANCES:	1 meter | 7 meters	EXHAUST NOISE:	Included
MEASURING SURFACE DIMENSIONS:	17.4 | 29.0	OPERATOR:	MA
NO. OF MEASURING POINTS:	12 | 8		
SOUND PROPAGATION:	Free-field		
MEASUREMENT STANDARD:	ISO 8528-10		
TOLERANCE:	+5 dB for single 1/3-octave band; +2 dB(A) for total A-weighted level		

Energy mean sound pressure levels of the airborne noise that is emitted by the generator set.
For project purposes only.

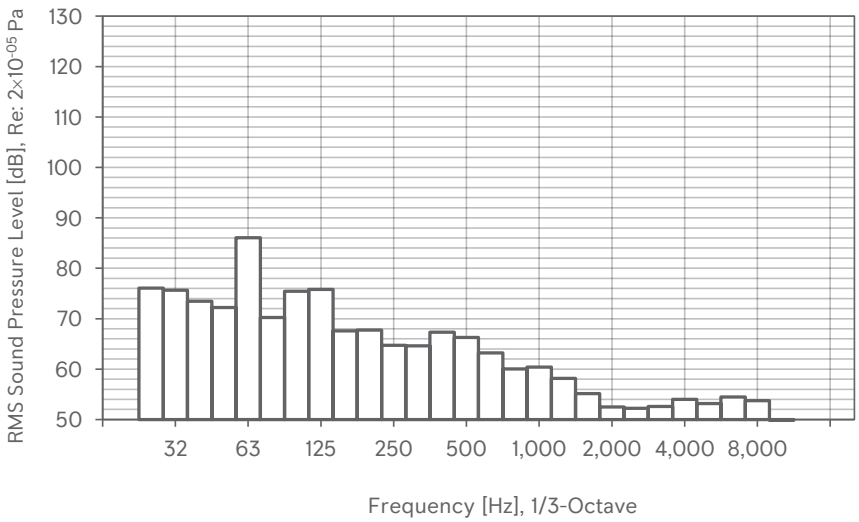
f [Hz]	SPL [dB]	f [Hz]	SPL [dB]
25	80	630	68
32	80	800	69
40	75	1,000	70
50	73	1,250	69
63	91	1,600	66
80	71	2,000	64
100	83	2,500	65
125	86	3,150	67
160	74	4,000	66
200	77	5,000	64
250	76	6,300	66
315	78	8,000	63
400	71	10,000	60
500	73		
		SPL 1m [dB]	**93.5**
		SPL 1m [dBA]	**80.6**

Sound Pressure Level (1 meter)



f [Hz]	SPL [dB]	f [Hz]	SPL [dB]
25	76	630	63
32	76	800	60
40	73	1,000	60
50	72	1,250	58
63	86	1,600	55
80	70	2,000	52
100	75	2,500	52
125	76	3,150	53
160	68	4,000	54
200	68	5,000	53
250	65	6,300	54
315	65	8,000	54
400	67	10,000	50
500	66		
		SPL 7m [dB]	**88.0**
		SPL 7m [dBA]	**71.5**

Sound Pressure Level (7 meter)



Electrical System Data Sheet

Ground Fault Convenience Receptacle

DESCRIPTION

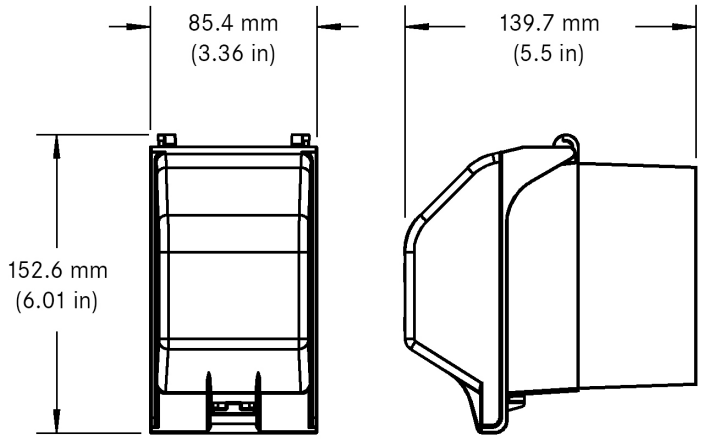
Convenience receptacles provide a 20 Amp Ground Fault Circuit Interrupter (GFCI). Receptacle is mounted in a weatherproof box, including a weatherproof cover, located adjacent to the generator set control panel.

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

Isolator Pad Data Sheet

DESCRIPTION

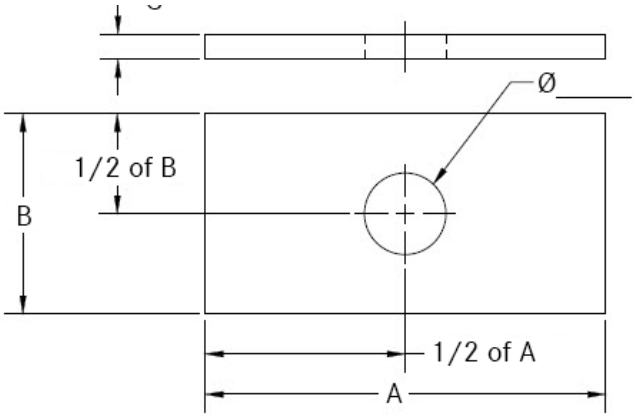
These square-molded, neoprene pads can be used to compensate for inconsistencies in the mounting surface between the generator set base frame and the installation surface, or between the sub-base fuel tank and the installation surface, if applicable. They can be easily cut to any desired shape and can be used in multiple layers to increase deflection.

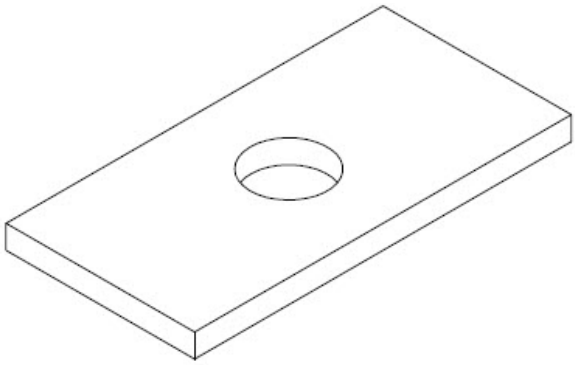
NEOPRENE TYPICAL PHYSICAL PROPERTIES

Hardness:	40A-90A
Tensile Strength:	500
Elongation:	200
Tear Value:	50
Thermal Conductivity (K Factor):	0.30

Heat Resistance @ 100 °C (212 °F) after 70 Hours:

Change in Hardness:	10
Change in Tensile:	-16%
Change in Elongation:	-60%
Compression Set:	50%
Lowest Working Temperature:	-40 °C (-40 °F)
Highest Working Temperature:	90.6 °C (195 °F)





mtu Part Number	Dim. A mm (in)	Dim. B mm (in)	Dim. C mm (in)	Hole Diameter mm (in)	Durometer
SUA46904	101.6 (4)	50.8 (2)	6.35 (0.25)	20.638 (0.813)	50
SUA46905	152.4 (6)	50.8 (2)	6.35 (0.25)	20.638 (0.813)	50
SUA46906	254 (10)	50.8 (2)	6.35 (0.25)	20.638 (0.813)	50
SUA46907	457.2 (18)	63.5 (2.5)	6.35 (0.25)	20.638 (0.813)	50
SUA46908	457.2 (18)	76.2 (3)	6.35 (0.25)	20.638 (0.813)	50
SUA46909	457.2 (18)	457.2 (18)	6.35 (0.25)	Not Required	50
SUA63015	203.2 (8)	76.2 (3)	6.35 (0.25)	20.638 (0.813)	50
SUA77843	101.6 (4)	50.8 (2)	19.05 (0.75)	20.638 (0.813)	60
SUA86147	457.2 (18)	76.2 (3)	6.35 (0.25)	20.638 (0.813)	70
SUA95672	304.8 (12)	50.8 (2)	6.35 (0.25)	20.638 (0.813)	50
SUA102408	457.2 (18)	76.2 (3)	6.35 (0.25)	26 (1.024)	50
X54599100330	381 (15)	76.2 (3)	6.35 (0.25)	22.225 (0.875)	50

Subject to change. | WT00038043 | 2021-10

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

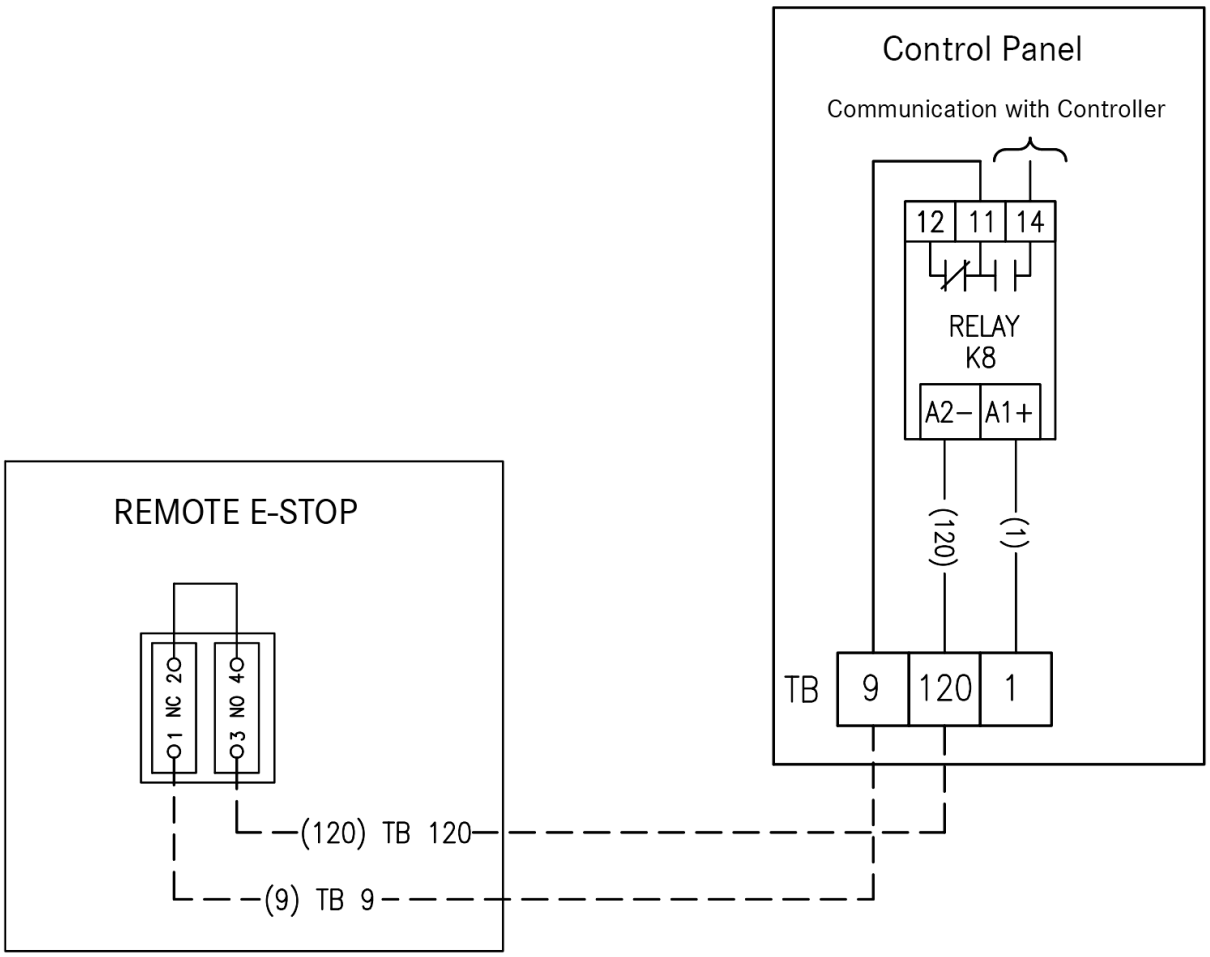
SPECIFICATIONS

- ***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

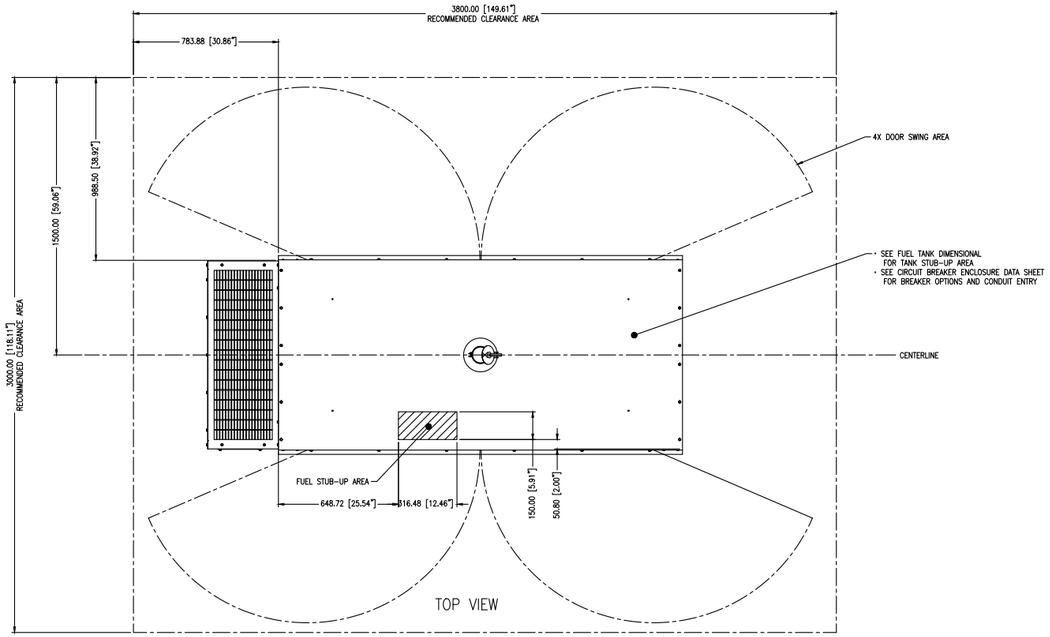
CERTIFICATIONS AND STANDARDS

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

DIAGRAM



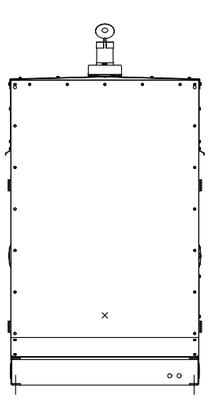
Electrical Schematic



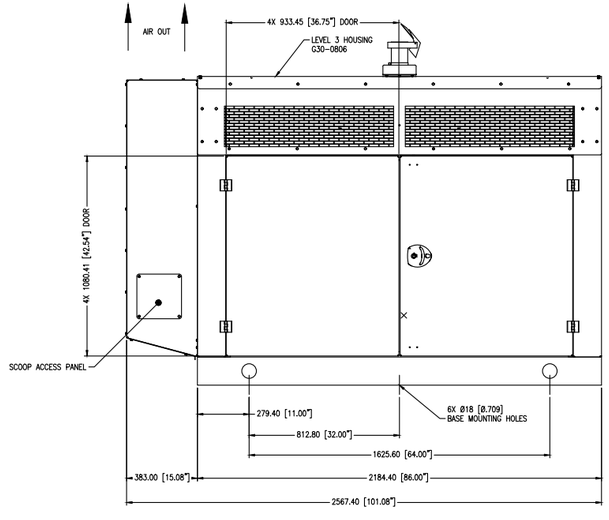
DRAWING OPTIONS 40-50 kW JD4054TF		
Group	Drawing Code	Description
Housing Options, Exterior	G30-0805	Level 2 Housing
	G30-0806	Level 3 Housing w/ Exhaust Scoop
	G30-0807	Air Exhaust Gravity Louver
	G30-0810	Level 1 Housing
Housing Options, Interior	G30-0904	Air Intake Motorized Louver
	G30-0905	Interior Housing Light
	G30-0906	Heater

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

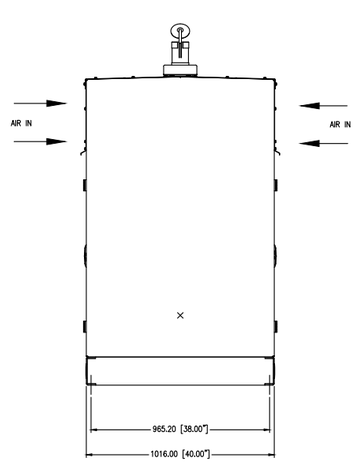
Note: Some options may not be referenced. Only options which visibly change the drawing are selectable.



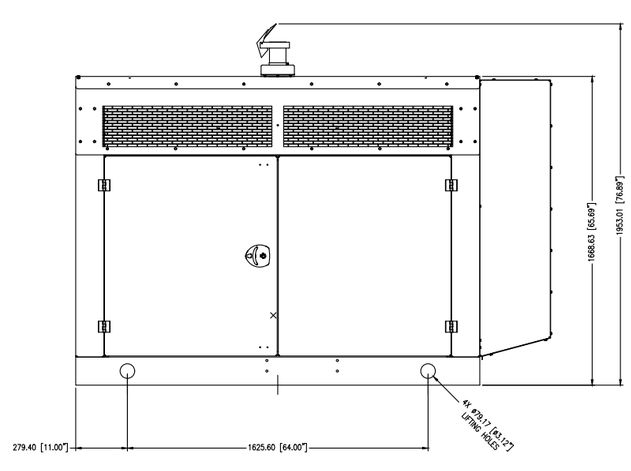
FRONT VIEW



LEFT VIEW



REAR VIEW



RIGHT VIEW

REVISION	DATE	DESCRIPTION
C	2021-05-28	ADDED DOOR SWING DIMENSIONS AND CHANGED FONT STYLE IN APPLICABLE MODELS
B	2020-04-07	UPDATED TITLE BLOCK
A	2018-12-27	CHANGED WEIGHT TO BE CUMULATIVE GENSET W/ HOUSING

A Rolls-Royce solution

APPLICABLE MODELS:
mtu 4R0113 DS44
mtu 4R0113 DS40
mtu 4R0113 DS55
mtu 4R0113 DS50

THIRD ANGLE PROJECTION

DRAWN TO SCALE
DIMENSIONS: MM [INCH]

DATE CREATED: 2015-09-28

DIMENSIONAL LAYOUT

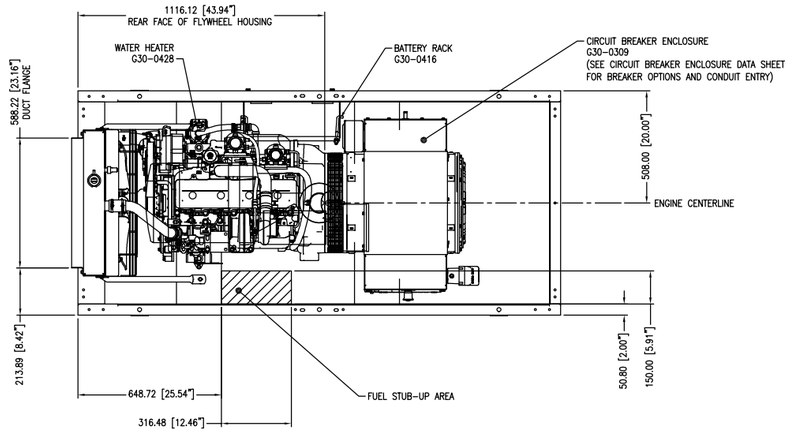
DESCRIPTION: 40-50 kW Genset, Housing

ENGINE: John Deere, JD4045TF

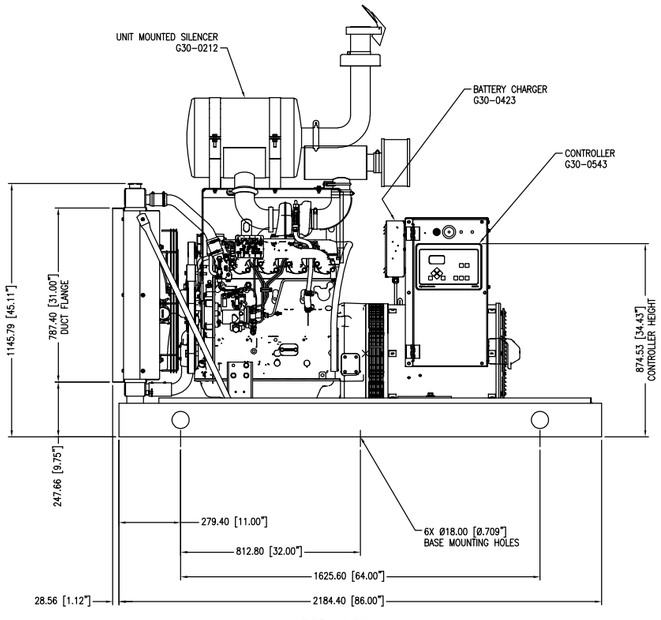
WEIGHT (MIN-MAX): 1067-1403 KG 2352-3954 LB

DRAWING NUMBER: XZG3000100101

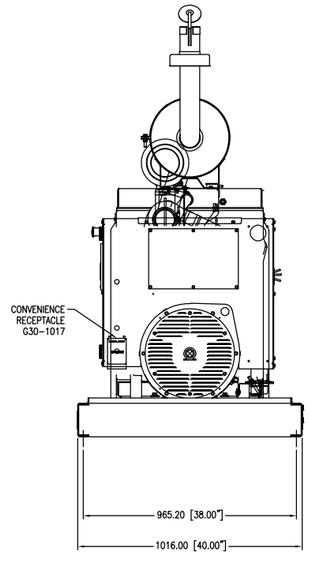
SHEET: 1 of 1



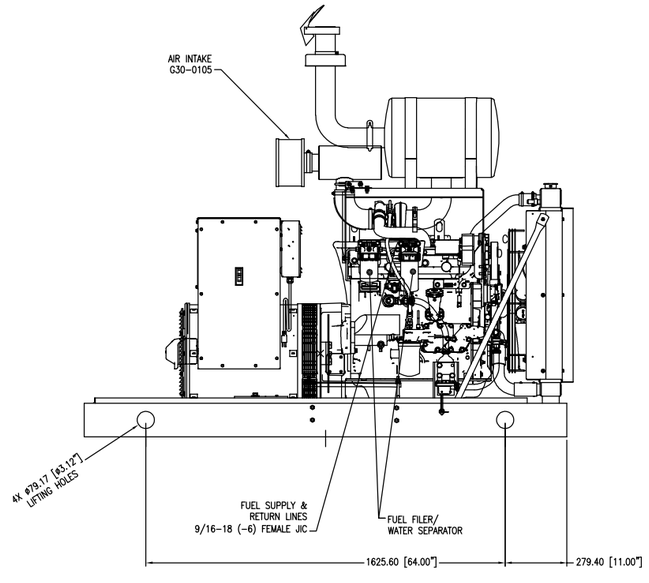
TOP VIEW



LEFT VIEW



REAR VIEW



RIGHT VIEW

REVISION	DATE	DESCRIPTION
A	2020-04-07	UPDATED TITLE BLOCK

A Rolls-Royce solution

APPLICABLE MODELS:

- MTU 4R0113 DS44
- MTU 4R0113 DS40
- MTU 4R0113 DS55
- MTU 4R0113 DS50

THIRD ANGLE PROJECTION

DRAWN TO SCALE
DIMENSIONS: MM [INCH]

DATE CREATED: 2015-09-25

DIMENSIONAL LAYOUT

DESCRIPTION: 40-50 kW Genset, Housed Base

ENGINE: John Deere, JD4045TF

WEIGHT (MIN-MAX): 997-1291 KG 2198-2845 LB

DRAWING NUMBER: XZG3000100099

SHEET: 1 of 2

DRAWING CODE CONFIGURATION 40–50 kW JD4045TF		
GENERATOR FRAME	BREAKER SIDE	LOCATION
285	RIGHT	1
	LEFT	2
361	RIGHT	3
	LEFT	4
362	RIGHT	5
	LEFT	6

Step 1: Reference the Drawing Code Configuration table and determine your location number.

Step 2: Reference the Drawing Options tables and within the Layer Properties turn on/off the Drawing Codes that may or may not apply to your location number.

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

DRAWING OPTIONS 40–50 kW JD4045TF			LOCATION					
GROUP	DRAWING CODE	DESCRIPTION	1	2	3	4	5	6
Standard Unit	G30–0005	JD4045TF Standard Unit w/ Housed Base	X	X	X	X	X	X
Intake Air	G30–0103	Intake for OPU, L1 & L2 Housing	X	X	X	X	X	X
	G30–0104	Intake w/ Restriction Indicator for OPU, L1 & L2 Housing	X	X	X	X	X	X
	G30–0105	Intake for L3 Housing	X	X	X	X	X	X
	G30–0106	Intake w/ Restriction Indicator for L3 Housing	X	X	X	X	X	X
Exhaust Air	G30–0208	Exhaust Flex Pipe	X	X	X	X	X	X
	G30–0211	Unit Mounted Silencer, OPU	X	X	X	X	X	X
	G30–0212	Unit Mounted Silencer, Level 2 & 3 Housing	X	X	X	X	X	X
	G30–0216	Unit Mounted Silencer, Level 1 Housing	X	X	X	X	X	X
Outlet Box & Breaker Enclosure	G30–0303	285 Frame Gen, Right Side Single Breaker	X					
	G30–0304	285 Frame Gen, Left Side Single Breaker		X				
	G30–0307	285 Frame Gen, Right Side Dual Breaker	X					
	G30–0308	285 Frame Gen, Left Side Dual Breaker		X				
	G30–0309	361 Frame Gen, Right Side Single Breaker			X			
	G30–0310	361 Frame Gen, Left Side Single Breaker				X		
	G30–0311	362 Frame Gen, Right Side Single Breaker					X	
	G30–0312	362 Frame Gen, Left Side Single Breaker						X
	G30–0313	361 Frame Gen, Right Side Dual Breaker			X			
	G30–0314	361 Frame Gen, Left Side Dual Breaker				X		
	G30–0315	362 Frame Gen, Right Side Dual Breaker					X	
	G30–0316	362 Frame Gen, Left Side Dual Breaker						X
Starting Aids	G30–0407	Battery Charger, Guest, 6 amp	X					
	G30–0408	Battery Charger, Guest, 6 amp		X				
	G30–0411	Battery Charger, Micro–Genius, 6 or 10 amp NFPA	X					
	G30–0412	Battery Charger, Micro–Genius, 6 or 10 amp NFPA		X				
	G30–0416	Battery Rack, Housed Base	X	X	X	X	X	X
	G30–0418	Battery, Housed Base	X	X	X	X	X	X
	G30–0419	Battery Charger, Guest, 6 amp			X			
	G30–0420	Battery Charger, Guest, 6 amp				X		
	G30–0421	Battery Charger, Guest, 6 amp					X	
	G30–0422	Battery Charger, Guest, 6 amp						X
	G30–0423	Battery Charger, Micro–Genius, 6 or 10 amp NFPA			X			
	G30–0424	Battery Charger, Micro–Genius, 6 or 10 amp NFPA				X		
	G30–0425	Battery Charger, Micro–Genius, 6 or 10 amp NFPA					X	
	G30–0426	Battery Charger, Micro–Genius, 6 or 10 amp NFPA						X
	G30–0427	Water Heater w/o Shut–Off Valves	X	X	X	X	X	X
	G30–0428	Water Heater with Shut–Off Valves	X	X	X	X	X	X

DRAWING OPTIONS 40–50 kW JD4045TF			LOCATION					
GROUP	DRAWING CODE	DESCRIPTION	1	2	3	4	5	6
Controls	G30–0502	MGC–1500 Controller, Left Side Facing	X					
	G30–0504	MGC–1500 Controller, Right Side Facing		X				
	G30–0507	MGC–1500 Controller, Rear Facing	X					
	G30–0508	MGC–1500 Controller, Rear Facing		X				
	G30–0510	MGC–2000 Controller, Left Side Facing	X					
	G30–0512	MGC–2000 Controller, Right Side Facing		X				
	G30–0515	MGC–2000 Controller, Rear Facing	X					
	G30–0516	MGC–2000 Controller, Rear Facing		X				
	G30–0518	MGC–3000 Controller, Left Side Facing	X					
	G30–0520	MGC–3000 Controller, Right Side Facing		X				
	G30–0523	MGC–3000 Controller, Rear Facing	X					
	G30–0524	MGC–3000 Controller, Rear Facing		X				
	G30–0528	Analog Meters, Left Side Facing	X					
	G30–0530	Analog Meters, Right Side Facing		X				
	G30–0532	Analog Meters, Rear Facing	X	X				
	G30–0534	Voltage Regulator (PMG Kit)	X	X				
	G30–0535	MGC–1500 Controller, Left Side Facing			X			
	G30–0536	MGC–1500 Controller, Left Side Facing					X	
	G30–0537	MGC–1500 Controller, Right Side Facing				X		
	G30–0538	MGC–1500 Controller, Right Side Facing						X
	G30–0539	MGC–1500 Controller, Rear Facing			X			
	G30–0540	MGC–1500 Controller, Rear Facing				X		
	G30–0541	MGC–1500 Controller, Rear Facing					X	
	G30–0542	MGC–1500 Controller, Rear Facing						X
	G30–0543	MGC–2000 Controller, Left Side Facing			X			
	G30–0544	MGC–2000 Controller, Left Side Facing					X	
	G30–0545	MGC–2000 Controller, Right Side Facing				X		
	G30–0546	MGC–2000 Controller, Right Side Facing						X
	G30–0547	MGC–2000 Controller, Rear Facing			X			
	G30–0548	MGC–2000 Controller, Rear Facing				X		
	G30–0549	MGC–2000 Controller, Rear Facing					X	
	G30–0550	MGC–2000 Controller, Rear Facing						X
	G30–0551	MGC–3000 Controller, Left Side Facing			X			
	G30–0552	MGC–3000 Controller, Left Side Facing					X	
	G30–0553	MGC–3000 Controller, Right Side Facing				X		
	G30–0554	MGC–3000 Controller, Right Side Facing						X
	G30–0555	MGC–3000 Controller, Rear Facing			X			
	G30–0556	MGC–3000 Controller, Rear Facing				X		
	G30–0557	MGC–3000 Controller, Rear Facing					X	
	G30–0558	MGC–3000 Controller, Rear Facing						X
	G30–0561	Analog Meters, Left Side Facing			X			
	G30–0562	Analog Meters, Left Side Facing					X	
	G30–0563	Analog Meters, Right Side Facing				X		
	G30–0564	Analog Meters, Right Side Facing						X
	G30–0565	Analog Meters, Rear Facing			X	X		
	G30–0566	Analog Meters, Rear Facing					X	X
	G30–0567	Voltage Regulator (PMG Kit)			X	X		
	G30–0568	Voltage Regulator (PMG Kit)					X	X
Vibration Isolation	G30–0606	Non–Seismic Springs, Housed Base	X	X	X	X	X	X
	G30–0608	Seismic Springs, Housed Base	X	X	X	X	X	X
Additional Options	G30–1005	Distribution Panel HSD	X					
	G30–1006	Distribution Panel HSD		X				
	G30–1009	Convenience Receptacle	X					
	G30–1010	Convenience Receptacle		X				
	G30–1011	Crankcase Vent	X	X	X	X	X	X
	G30–1013	Distribution Panel HSD			X			
	G30–1014	Distribution Panel HSD				X		
	G30–1015	Distribution Panel HSD					X	
	G30–1016	Distribution Panel HSD						X
	G30–1017	Convenience Receptacle			X			
	G30–1018	Convenience Receptacle				X		
	G30–1019	Convenience Receptacle					X	
	G30–1020	Convenience Receptacle						X

REVISION	DATE	DESCRIPTION
A	2020–04–07	UPDATED TITLE BLOCK

A Rolls-Royce solution

APPLICABLE MODELS:

MTU 4R0113 DS44
MTU 4R0113 DS40
MTU 4R0113 DS55
MTU 4R0113 DS50

THIRD ANGLE PROJECTION

DRAWN TO SCALE
DIMENSIONS: MM [INCH]

DATE CREATED: 2015–09–25

DIMENSIONAL LAYOUT

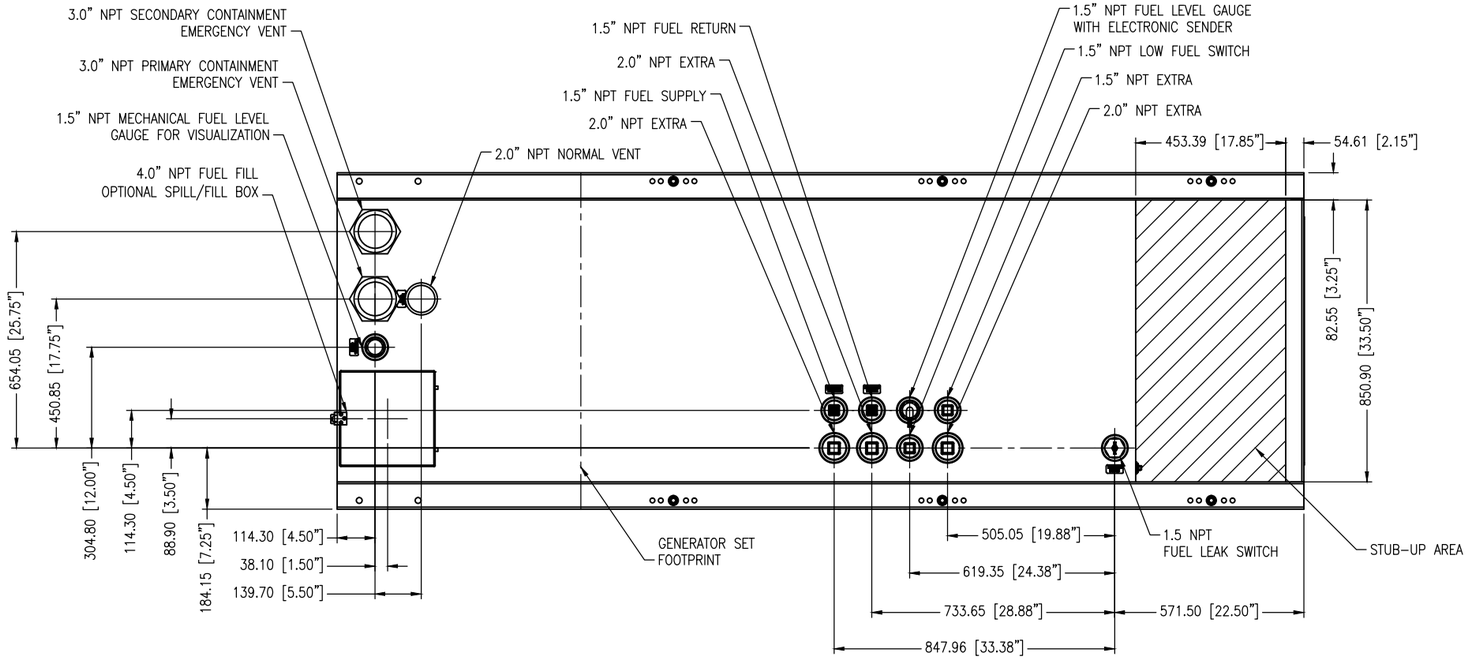
DESCRIPTION: 40–50 kW Genset, Housed Base

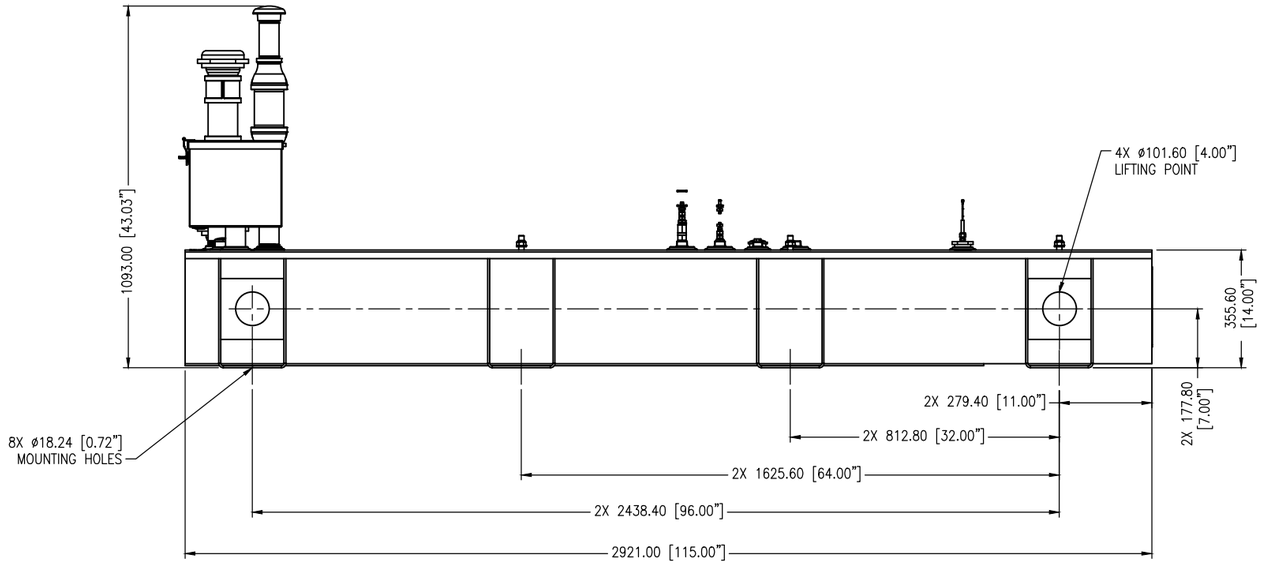
ENGINE: John Deere, JD4045TF

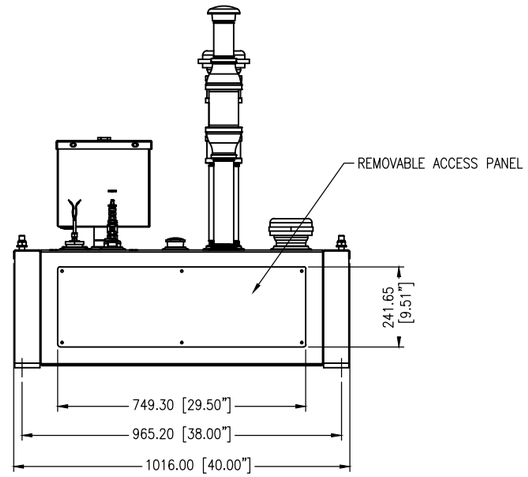
WEIGHT (MIN–MAX): 997–1291 KG 2198–2845 LB

DRAWING NUMBER: XZG3000100099

SHEET: 2 of 2







REVISION	DATE	DESCRIPTION
A	2020-04-07	UPDATED TITLE BLOCK

A Rolls-Royce solution

APPLICABLE MODELS:

MTU 4R0113 DS40
MTU 4R0113 DS44
MTU 4R0113 DS50
MTU 4R0113 DS55
MTU 4R0113 DS60

THIRD ANGLE PROJECTION

DRAWN TO SCALE
DIMENSIONS: MM [INCH]

DATE CREATED: 2018-02-08

DIMENSIONAL LAYOUT

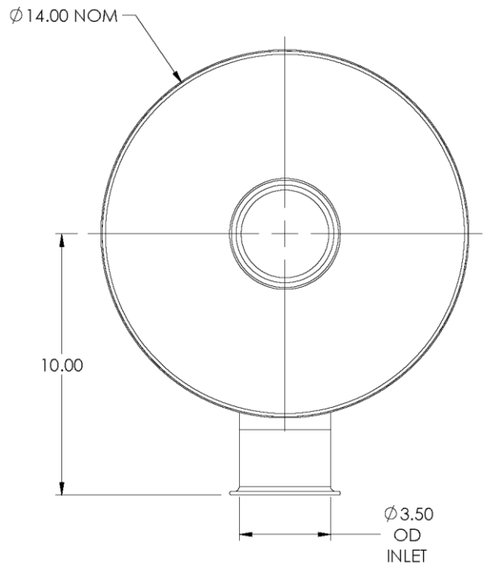
DESCRIPTION: 40-60 kW 24 Hr 140 Gal IBC Extended Tank

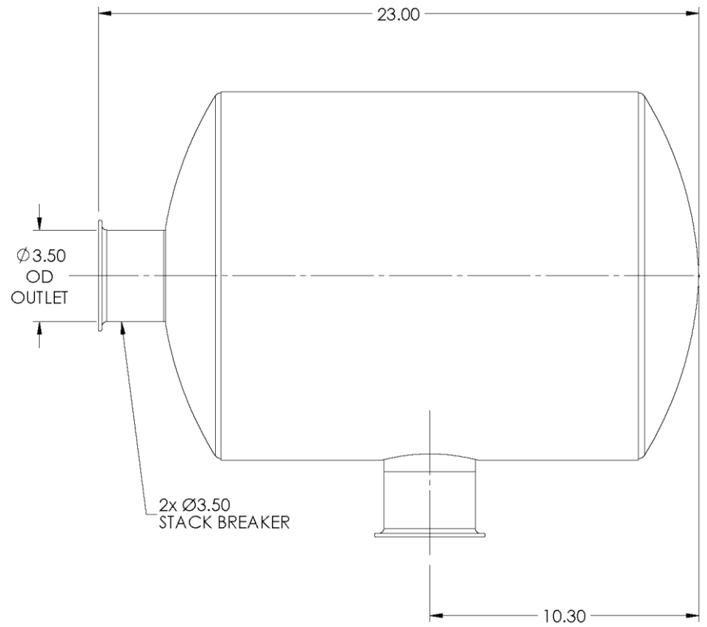
ENGINE: JD4045TF/HF

WEIGHT (MIN-MAX): 445 KG [979 LB]

DRAWING NUMBER: XZG3000100129

SHEET: 8 of 10





ENGINE SPECIFIC INFORMATION		
ENGINE:	JOHN DEERE 4045HF280	JOHN DEERE 4045TF280
DISPLACEMENT (IN³):	275	275
FLOW (CFM):	510	680
TEMP (°F):	1015	1075
ENGINE MAX BP LIMIT (WC):	30IN	30IN

REV	DATE	BY	COMMENTS
1	6/14/2013	JVC	RELEASED FOR CUSTOMER APPROVAL
2	6/25/2013	JVC	REVISED F; DIM WAS 9.50, AND FULLY INSULATED INTERNALS

CUSTOMER SEE PURCHASE ORDER | FINISH HIGH TEMP BLACK PAINT | WEIGHT 41.33

GAS FLOW

FULLY INSULATED
CARBON STEEL CONSTRUCTION

EM PRODUCTS™ | PHILLIPS & TEMRO industries | owl

THIRD ANGLE PROJECTION | DRAWN BY: JVC | DRAWN DATE: 6/14/2013 | DESCRIPTION: E-S CS SB35-SB35 Ø14.00 23.00 OAL F: 10.30

DIMENSIONS ARE IN INCHES DO NOT SCALE DRAWING | CHECKED BY: --- | CHECKED DATE: --- | ENG CHECK BY: --- | ENG CHECK DATE: --- | SIZE B | SHEET 3 OF 3 | MFG CHECK BY: --- | MFG CHECK DATE: --- | SAP NUMBER DWG NO | SAP QTY SEE PO

UNLESS OTHERWISE SPECIFIED DIMENSION TOLERANCE ARE: ANGLES MACH: ±1° BEND: ±3° | INCHES .00 ±.13 .000 ±.06 | MILLIMETERS .00 ±2 0.0 ±1 | P.R. - | REFERENCE: --- | MATERIAL SEE BOM | SCALE 1:4 | DRAWING/PART NUMBER CPJS-35X-90020047 | REV. 2

MANUFACTURER: PHILLIPS & TEMRO

MANUFACTURER PART NUMBER: CPJS-35X-90020047

WEIGHT: 41.33 LB

Buchst. Rev.Ltr.	Kommt vor Frequency	Änderung/Revision	Auftrags-Nr. Rev.Not.No.	Datum Date	Name	Gepr. Check
----	--------	----------		--	Hayden	---

T-348-0108

Oberflächenangaben nach MTN5033 Surface Specification per MTN5033	Allgemeine Fertigungsvorschriften nach MMN 332 Production Specification per MMN 332	-- --	Masse/Mass kg 18.75 / Format/Size A3

Verwendbar für Typ Applicable to Model	WORD	Datum Date	Name
Projekt-/Auftrags-Nr. Project/Order No.	Bearb. Drawn	13-06-20	Hayden
Ref.-Nr./Ref.No. Emissions_ID	Gepr. Checked	13-06-20	Bonner
Bei Fremdteil/Kaufteil dürfen alle techn. Änderungen am Lieferumfang nur nach unserer vorherigen Genehmigung vorgenommen werden. Techn. modifications to third party or purchased parts require our prior permission.	Norm Stndr.	13-06-20	Carsten
	Abt. Dept. OANS		Carsten

Benennung/Title

GERAEUSCHDAEMPFER

SILENCER

3.5" V-CLAMP

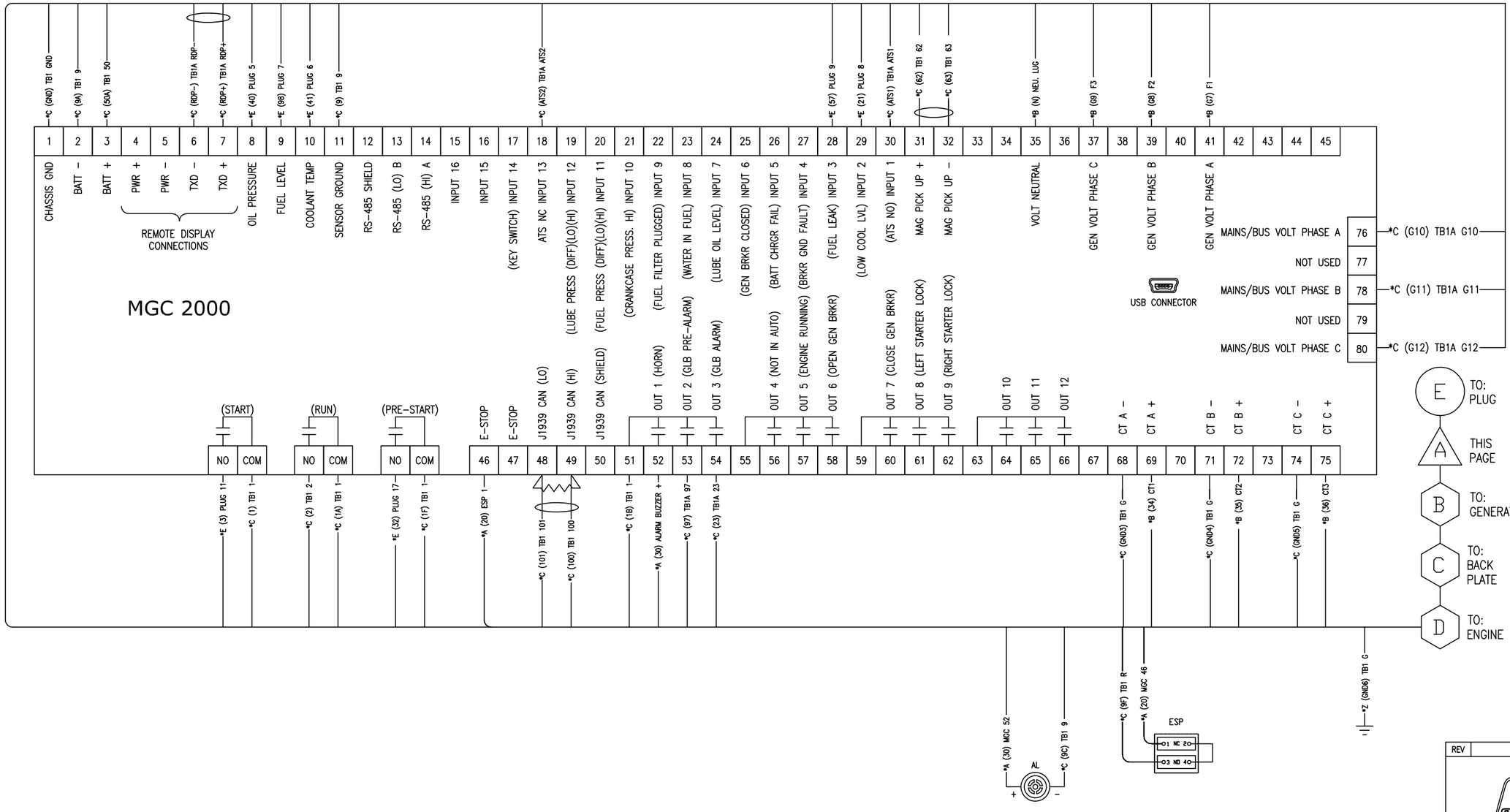
mtu onsite energy

MTU Friedrichshafen GmbH

Zeichnungs-Nr./Drawing No.

SUA105163

Blatt/Sheet 1 von/of 1



NOTES:

1. WIRE NUMBERS ARE IN PARENTHESIS.
2. SHORT DASHED LINES (- - - - - -) INDICATE CUSTOMER CONNECTION OR OPTIONAL EQUIPMENT.

LEGEND

AL	ALARM BUZZER
AEM	ANALOG EXPANSION MODULE
ATS	AUTOMATIC TRANSFER SWITCH
BOS	BATTLE OVERRIDE SW
BPS	BACK PLATE STUD
CEM	CONTACT EXPANSION MODULE
DGS	DOOR GROUND STUD
ESP	EMERGENCY STOP BUTTON
FLGS	FUEL LEVEL GAUGE SENDER
FLS	FUEL LEAK SWITCH
GGS	GENERATOR GROUND STUD
GSA	GOVERNOR SPEED ADJUST
K1	ENGINE RUN RELAY
K10	ENGINE RUN RELAY
K2	ENGINE FAIL RELAY
K3	MINOR ALARM RELAY
K6	LOUVER MOTOR RELAY
K8	REMOTE EMERGENCY STOP RELAY
LWL	LOW WATER LEVEL PROBE
MGC	MTU GENERATOR CONTROLLER
MEC	MODBUS/ETHERNET CONVERTER
R1	120 OHM ⅛ 1% RESISTOR
TB1	TERMINAL BLOCK 1 (PANEL BACK)
TB1A	TERMINAL BLOCK (PANEL BACK)
VAR	VOLTAGE ADJUST RHEOSTAT
VAT	VOLTAGE ADJUST TOGGLE

*X (X) XXX X	
*X	DESTINATION
(X)	WIRE NUMBER
XXX	DESTINATION
X	DESTINATION TERMINAL

REV	REVISION DESCRIPTION	DATE	BY

SPECIAL NOTE

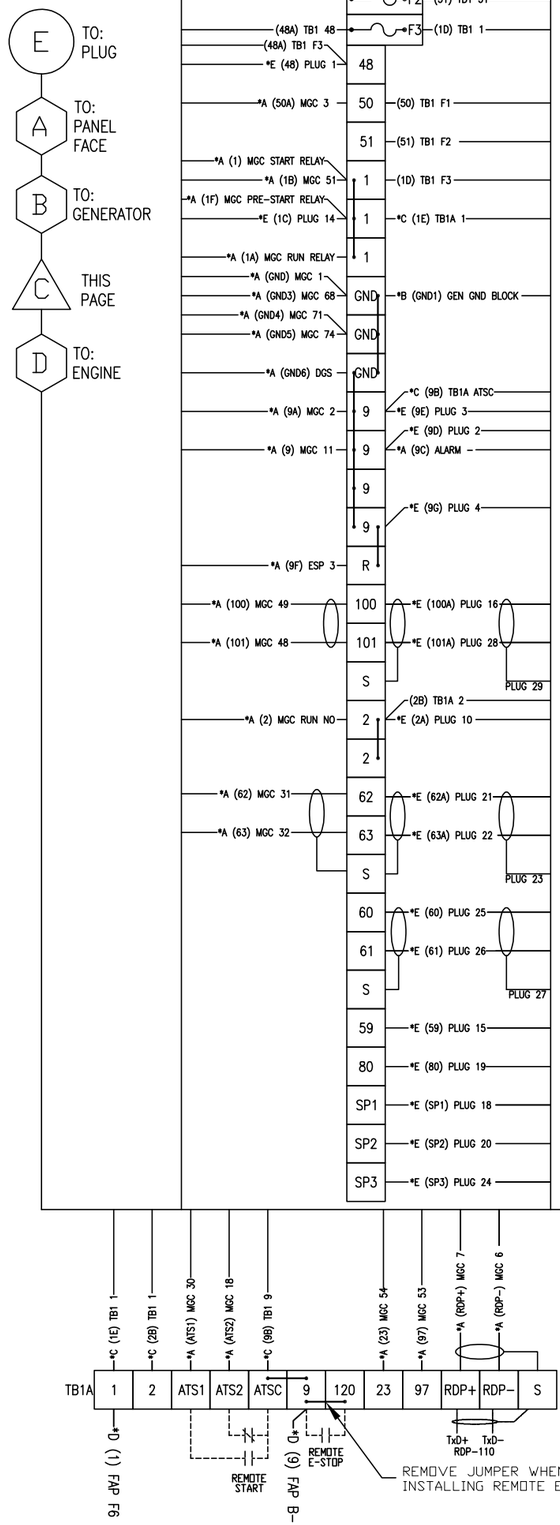
TO MINIMIZE ANY ELECTRICAL NOISE BEING INTRODUCED INTO THE ENGINE CONTROLLER, CONTROL WIRING AND AC POWER LINES NEED TO BE RUN IN SEPARATE CONDUITS.

ENGINE: JD 4045 T3	
GENERATOR: 12 WIRE	
REGULATOR: DVR2400	
CONTROL PANEL: MGC 2020	
VOLTAGE: 208VAC 3Ø	
GOVERNOR: JDEC	

FRONT PANEL

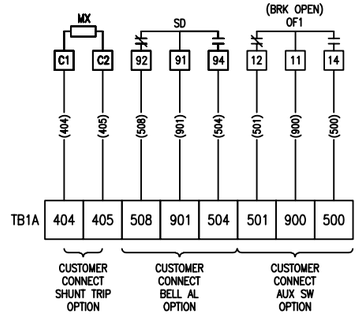
DATE: 6-14-2022	DRAWING SIZE: B-SIZE
DRAWN BY: kjb	SHEET:

809-Q-1336693



BREAKER OPTIONS

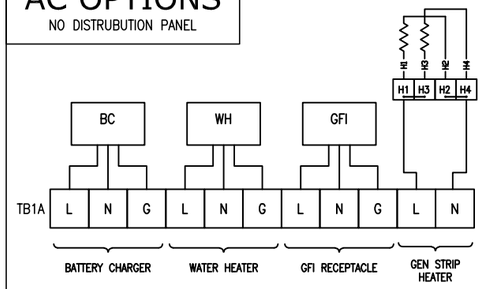
MX = SHUNT TRIP
SD = BELL ALARM
OF1 = AUX SWITCH



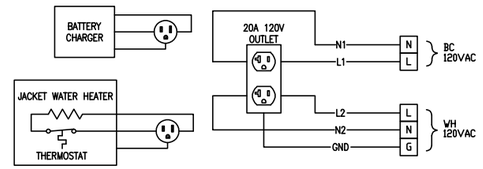
1ST BREAKER

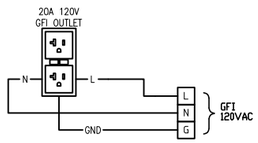
AC OPTIONS

NO DISTRUBUTION PANEL

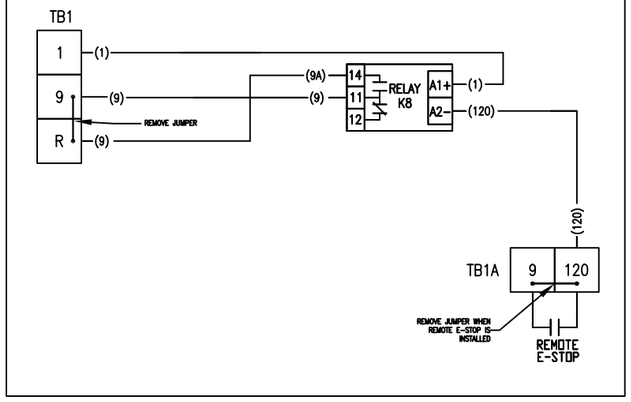


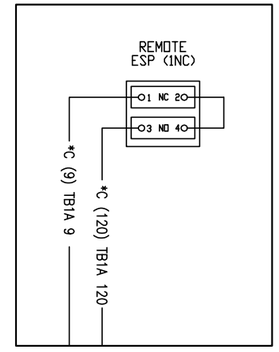
RECEPTACLES



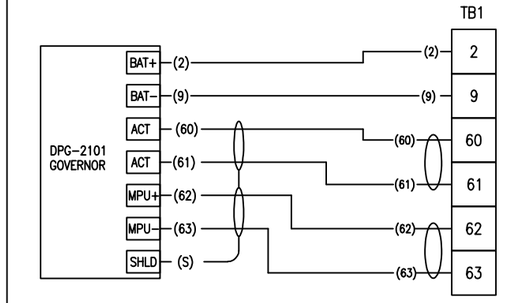


REMOTE E-STOP OPTION





ISOCHRONOUS GOVENOR OPTION



NOTES:

1. WIRE NUMBERS ARE IN PARENTHESIS.
2. SHORT DASHED LINES (------) INDICATE CUSTOMER CONNECTION OR OPTIONAL EQUIPMENT.

LEGEND:

AEM	ANALOG EXPANSION MODULE
BOS	BATTLE OVERRIDE SW
BPS	BACK PLATE STUD
CEM	CONTACT EXPANSION MODULE
MGC	MTU GENERATOR CONTROLLER
DGS	DOOR GROUND STUD
F1	PANEL FUSE ATO 5A
F2	PANEL FUSE ATO 10A
F3	PANEL FUSE ATO 15A
K1	ENGINE RUN RELAY
K10	SPARE RELAY
K2	ENGINE FAIL RELAY
K3	MINOR ALARM RELAY
K6	LOUVER MOTOR RELAY
MEC	MODBUS/ETHERNET CONVERTER
R1	RESISTOR 120 OHM ½ W
TB1	TERMINAL BLOCK 1
TB1A	TERMINAL BLOCK 1A

*X	(X)	XXX	X
*X	DESTINATION		
(X)	WIRE NUMBER		
XXX	DESTINATION		
X	DESTINATION TERMINAL		

REV	REVISION DESCRIPTION	DATE	BY

SPECIAL NOTE

TO MINIMIZE ANY ELECTRICAL NOISE BEING INTRODUCED INTO THE ENGINE CONTROLLER, CONTROL WIRING AND AC POWER LINES NEED TO BE RUN IN SEPARATE CONDUITS.

ENGINE: JD 4045 T3	
GENERATOR: 12 WIRE	
REGULATOR: DVR2400	
CONTROL PANEL: MGC 2020	
VOLTAGE: 208VAC 3ø	
GOVERNOR: JDEC	

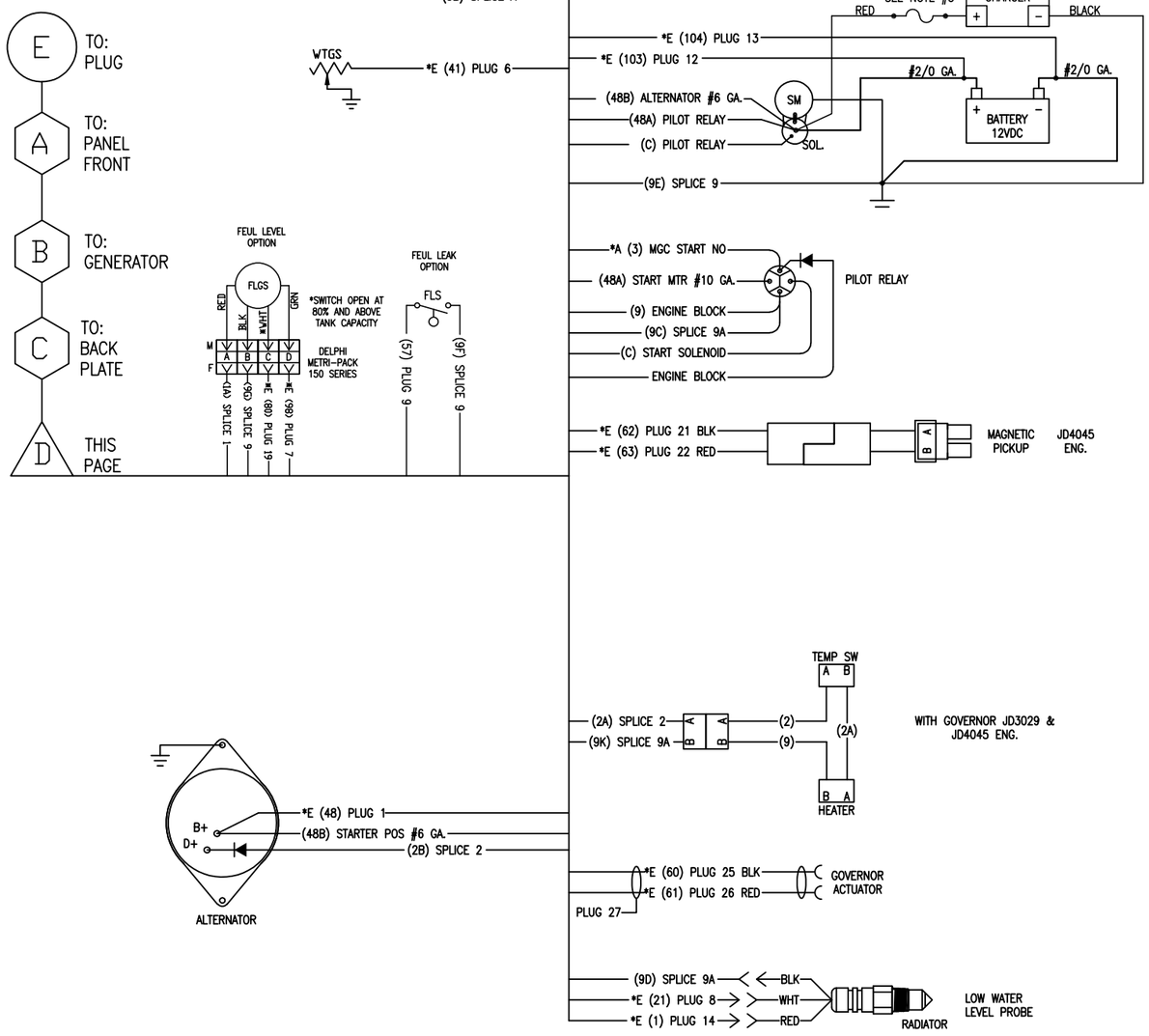
BACK PANEL

DATE: 6-14-2022	DRAWING SIZE: B-SIZE
DRAWN BY: kjb	SHEET:

809-Q-1336693

MGC 2000

PANEL SIDE PLUG		ENGINE SIDE PLUG	
*C (48) TB1 48	1	1	(48) ALTERNATOR
*C (9D) TB1 9	2	2	(9) SPLICE
*C (9E) TB1 9	3	3	(9A) SPLICE
*C (9G) TB1 9	4	4	(9M) SPLICE
*A (40) MGC 8	5	5	(40) OPGS
*A (41) MGC 10	6	6	(41) WTGS
*A (98) MGC 9	7	7	(98) FLGS
*A (21) MGC 29	8	8	(21) LWL
*A (57) MGC 28	9	9	(57) FLS
*C (2A) TB1 2	10	10	(2) ALTERNATOR
*A (3) MGC RELAY	11	11	(3) PILOT RELAY
*C (103) TB1 FUSE	12	12	(103) BATT +
	13	13	(104) BATT –
*C (1C) TB1 1	14	14	(1) LWL
*A (59) TB1 59	15	15	(59) SLS
*C (100A) TB1 100	16	16	
*A (32) MGC PRE-START RELAY	17	17	(32) FUEL PUMP A
*C (SP1) TB1 SP1	18	18	
*C (80) TB1 80	19	19	(80) FUEL LEVEL GAUGE
*C (SP2) TB1 SP2	20	20	
*C (62A) TB1 62	21	21	(62) MPU
*C (63A) TB1 63	22	22	(63) MPU
*C (S) TB1 S	23	23	(S) MPU
*C (SP3) TB1 SP3	24	24	
*C (60) TB1 60	25	25	(60) GOV ACTUATOR
*C (61) TB1 61	26	26	(61) GOV ACTUATOR
*C (S) TB1 S	27	27	(S) GOV ACTUATOR
*C (101A) TB1 101	28	28	
*C (S) TB1 S	29	29	

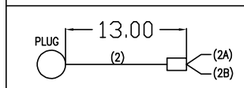


LEGEND

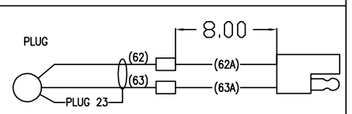
BC	BATTERY CHARGER
BPS	BACK PLATE STUD
MGC	MTU GENERATOR CONTROLLER
DGS	DOOR GROUND STUD
FLGS	FUEL LEVEL GAUGE SENDER
FLS	FUEL LEAK SWITCH
GGS	GENERATOR GROUND STUD
LWL	LOW WATER LEVEL PROBE
TB1	TERMINAL BLOCK 1 (PANEL BACK)
TB1A	TERMINAL BLOCK 1A (PANEL BACK)
TB3	TERMINAL BLOCK 3 (GEN OUTLET BOX)
TB6	DC LIGHT HANDY BOX
SM	STARTER MOTOR
SMS	START MOTOR SOLENOID

NOTES:
1. WIRE NUMBERS ARE IN PARENTHESIS.
2. SHORT DASHED LINES (------) INDICATE CUSTOMER CONNECTION OR OPTIONAL EQUIPMENT.
3. BATTERY CHARGER FUSE ONLY WHEN REQUIRED OR SUPPLIED BY CHARGER MANUFACTURER.
4. FUEL LEVEL GUAGE SENDER REQUIREMENTS
   33 OHMS = FULL
   240 OHMS = EMPTY
5. BATTERY CHARGER FUSE ONLY WHEN SUPPLIED OR REQUIRED BY CHARGER MANUFACTURER.

SPLICE 2

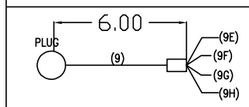


SPLICE 62,63

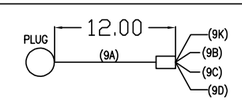


*X (X) XXX X	
*X	DESTINATION
(X)	WIRE NUMBER
XXX	DESTINATION
X	DESTINATION TERMINAL

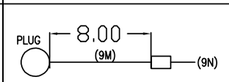
SPLICE 9



SPLICE 9A



SPLICE 9M



REV	REVISION DESCRIPTION	DATE	BY

SPECIAL NOTE

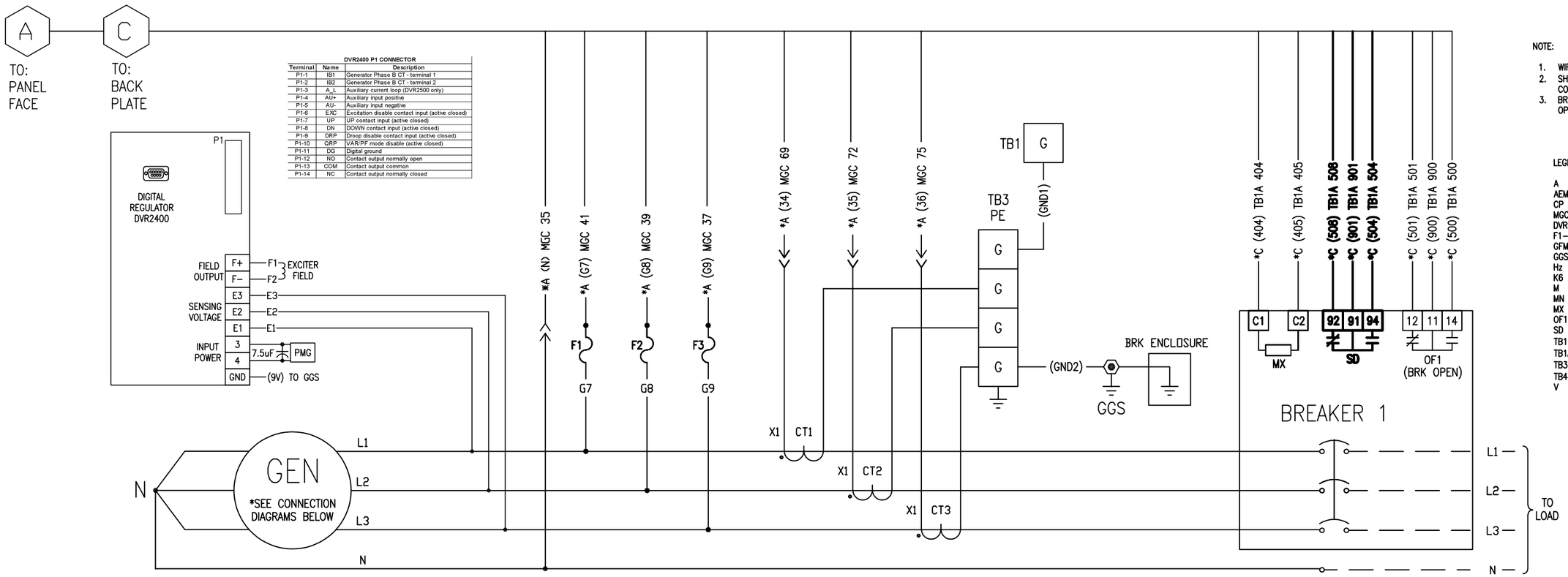
TO MINIMIZE ANY ELECTRICAL NOISE BEING INTRODUCED INTO THE ENGINE CONTROLLER, CONTROL WIRING AND AC POWER LINES NEED TO BE RUN IN SEPARATE CONDUITS.

ENGINE: JD 4045 T3	
GENERATOR: 12 WIRE	
REGULATOR: DVR2400	
CONTROL PANEL: MGC 2020	
VOLTAGE: 208VAC 3ø	
GOVERNOR: JDEC	

ENGINE

DATE: 6-14-2022	DRAWING SIZE: B-SIZE
DRAWN BY: kjb	SHEET:

809-Q-1336693



DVR2400 P1 CONNECTOR

Terminal	Name	Description
P1-1	IB1	Generator Phase B CT - terminal 1
P1-2	IB2	Generator Phase B CT - terminal 2
P1-3	A_L	Auxiliary current loop (DVR2500 only)
P1-4	AU+	Auxiliary input positive
P1-5	AU-	Auxiliary input negative
P1-6	EXC	Excitation disable contact input (active closed)
P1-7	UP	UP contact input (active closed)
P1-8	DN	DOWN contact input (active closed)
P1-9	DRP	Droop disable contact input (active closed)
P1-10	QRP	VAR/PF mode disable (active closed)
P1-11	DG	Digital ground
P1-12	NO	Contact output normally open
P1-13	COM	Contact output common
P1-14	NC	Contact output normally closed

NOTE:

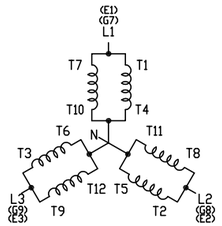
1. WIRE NUMBERS ARE IN PARENTHESIS
2. SHORT DASHED LINES (------) INDICATE CUSTOMER CONNECTION
3. BREAKER ACCESSORIES ARE SHOWN IN THE TRIPPED OR OPEN POSITION

LEGEND

A	AMMETER
AEM	ANALOG EXPANSION MODULE
CP	CONTROL PANEL
MGC	MTU GENERATOR CONTROLLER
DVR	DIGITAL VOLTAGE REGULATOR
F1-3	KTK-10 OR JX-10 10A
GFM	GROUND FAULT MONITOR
GGS	GENERATOR GROUND STUD
Hz	FREQUENCY METER
K6	LOUVER MOTOR RELAY
M	LOUVER MOTOR
MN	UNDERVOLTAGE TRIP
MX	SHUNT TRIP
OF1	AUXILIARY SWITCH 1
SD	ALARM SWITCH
TB1	TERMINAL BLOCK 1 (PANEL BACK)
TB1A	TERMINAL BLOCK 1A (PANEL BACK)
TB3	TERMINAL BLOCK 3 (GEN OUTLET BOX)
TB4	TERMINAL BLOCK 4 (HANDY BOX)
V	VOLTMETER

LOW WYE 3ø

HZ	L-L	L-LO
60	190	110
	208	120
	220	127
	230	133
50	190	110
	200	115
	208	120
	220	127



REV	REVISION DESCRIPTION	DATE	BY

SPECIAL NOTE	ENGINE: JD 4045 T3
TO MINIMIZE ANY ELECTRICAL NOISE BEING INTRODUCED INTO THE ENGINE CONTROLLER, CONTROL WIRING AND AC POWER LINES NEED TO BE RUN IN SEPARATE CONDUITS.	GENERATOR: 12 WIRE
	REGULATOR: DVR2400
	CONTROL PANEL: MGC 2020
	VOLTAGE: 208VAC 3ø
	GOVERNOR: JDEC

GENERATOR/BREAKER

DATE: 6-14-2022	DRAWING SIZE: B-SIZE
DRAWN BY: kjb	SHEET:

809-Q-1336693

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
2022 MODEL YEAR
CERTIFICATE OF CONFORMITY
WITH THE CLEAN AIR ACT

OFFICE OF TRANSPORTATION AND AIR QUALITY
ANN ARBOR, MICHIGAN 48105

Certificate Issued To: **Deere & Company**
(U.S. Manufacturer or Importer)

Certificate Number: **NJDXL04.5214-006**

Effective Date: 08/09/2021

Expiration Date: 12/31/2022

Byron J. Bunker, Division Director
Compliance Division

Issue Date: 08/09/2021

Revision Date: N/A

Model Year: 2022
Manufacturer Type: Original Engine Manufacturer
Engine Family: NJDXL04.5214

Mobile/Stationary Indicator: Stationary
Emissions Power Category: 37<=kW<56
Fuel Type: Diesel
After Treatment Devices: No After Treatment Devices Installed
Non-after Treatment Devices: Engine Design Modification, Non-standard Non-After Treatment Device Installed

Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Part 60, and subject to the terms and conditions prescribed in those provisions, this certificate of conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in the documentation required by 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 60.

It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or rendered void *ab initio* for other reasons specified in 40 CFR Part 60.

This certificate does not cover engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

The actual engine power may lie outside the limits of the Emissions Power Category shown above. See the certificate application for details.

JOHN DEERE EMISSION TEST DATA 4045TF290 55kW@1800rpm*

ENGINE SPEED - RPM	1800	1800	1800	1800	1800
EXH ELBOW - C	538	478	369	264	201
OBSV TORQUE - Nm	291.8	219.1	145.9	72.7	29.2
OBSV BRAKE POWER - kW	55	41.3	27.5	13.7	5.5
CBM CO2 - kg/h	41.7	32.3	20.9	12.4	8.2
CBM CO2 - g/kWh	757.1	784.7	761.9	909.1	1480
CBM HC - g/h	7.3	9.3	6.5	6.3	6.5
CBM HC - g/kWh	0.14	0.22	0.23	0.46	1.15
CBM NOX - g/h	237.9	158.3	118.6	70.3	51.6
CBM NOX - g/kWh	4.33	3.83	4.31	5.13	9.38
CBM NOX+HC - g/h	245.2	167.6	135.8	81.8	64.9
CBM NOX+HC - g/kWh	4.47	4.05	4.54	5.59	10.53
PM MFM TOTAL - g/h	9.2	6.3	4.2	3.2	2.98
PM MFM TOTAL - g/kWh	0.167	0.153	0.153	0.234	0.542

* The emission data listed is measured from a laboratory test engine according to the test procedures of 40 CFR 89 or 40 CFR 1039, as applicable. The test engine is intended to represent nominal production hardware, and we do not guarantee that every production engine will have identical test results. The family parent data represents multiple ratings and this data may have been collected at a different engine speed and load. Emission results may vary due to engine manufacturing tolerances, engine operating conditions, fuels used, or other conditions beyond our control.

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

VMC GROUP
THE POWER OF TOGETHER™

A Rolls-Royce solution

CERTIFICATE OF COMPLIANCE
SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Certification No.

VMA-45902-01C (Revision 5)

Expiration Date: 11/30/2023

Certification Parameters:

The nonstructural products (mechanical and/or electrical components) listed on this certificate are CERTIFIED[1] FOR SEISMIC APPLICATIONS in accordance with the following building code[2] releases.

IBC 2021, 2018, 2015, 2012, 2009, 2006

The following model designations, options, and accessories are included in this certification. Reference report number VMA-45902-01 as issued by The VMC Group for a complete list of certified models, included accessories/options, and certified installation methods.

Rolls-Royce Solutions America Inc.; Diesel Engine Generator Sets
Rating; 30-60kW

The above referenced equipment is **APPROVED** for seismic application when properly installed[3], used as intended, and contains a Seismic Certification Label referencing this Certificate of Compliance[4]. As limited by the tabulated values, below grade, grade, and roof-level installations, installations in essential facilities, for life safety applications, and/or of equipment containing hazardous contents are permitted and included in this certification with an Equipment Importance Factor assigned as I_p=1.5. The equipment is qualified by successful seismic shake table testing at the nationally recognized University of California Berkeley Pacific Earthquake Engineering Research Center and Dynamic Certification Laboratories under the witness of the ISO Accredited Product Certification Agency, the VMC Group.

Certified Seismic Design Levels			
Certified **IBC**	**Importance $I_p \leq 1.5$** Soil Classes A-E Risk Categories I-IV Design Categories A-F	z/h ≤ 1.0	z/h = 0.0
		$S_{DS} \leq 2.000$ g	$S_{DS} \leq 2.500$ g

Certified Seismic Installation Methods	
Rigid Mounting From Unit Base To Rigid Structure	External Isolation Mounting From Unit Base To Rigid Structure

HEADQUARTERS
113 Main Street
Bloomingdale, NJ 07403
Phone: 973.838.1780
Toll Free: 800.569.8423
Fax: 973.492.8430

CALIFORNIA
180 Promenade Circle
Suite 300
Sacramento, CA 95834
Phone: 916.634.7771

TEXAS
11930 Brittmoore Park Drive
Houston, TX 77041
Phone: 713.466.0003
Fax: 713.466.1355

thevmcgroup.com

VMC GROUP
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A Rolls-Royce solution

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Certified Product Table:

Model	Max Rating (kW)/ (kVA)	Configuration	Tank Capacity (gal)	EPA Rating	Max Length (in)	Max Width (in)	Max Height (in)	Max Weight (lbs)
mtu 3R0096_DS30: DP00027D5S-A DS00030D5S-A DP00030D6S-A DS00030D6S-A	30 / 30	Open/ Enclosed	40 - 210	Tier 4	115	44	102	5,000
			Off Tank		92	36	70	2,200
DG03RJ096V1M000(15,18,19,20,21)	30		210				104	4,700
DG03RJ096V1M00016			110				90	3,700
DG03RJ096V1M000(17,23)		Open	210		80		94	3,100
mtu 4R0113 DS40: DP00040D6S-A DS00040D6S-A	40	Open/ Enclosed	70-370	Tier 3	128	48	108	7,300
			Off Tank		102	43	74	3,000
mtu 4R0113 DS50: DP00040D5S-A DS00044D5S-A DP00050D6S-A DS00050D6S-A	50 / 44		70-370		128	48	108	7,300
			Off Tank		102	43	74	3,000
DG04RJ113V3M000(16,17,20,24)	50		210			40	101	5,400
DG04RJ113V3M000(18,22)		Open			92	37	96	4,500
mtu 4R0113 DS60: DP00050D5S-A DS00055D5S-A DP00060D6S-A DS00060D6S-A	60 / 55	Open/ Enclosed	70-370		128	48	108	7,500
			Off Tank		102	43	74	3,200

Note: See Certification Report for Max. Dimensions of Open Models

Group	Type	S_{DS} (z/h=0)	S_{DS} (z/h=1)	A_{Flex-H}	A_{Rig-H}	A_{Flex-V}	A_{Rig-V}	F_p/W_p
Seismic	AC156	2.5	2.0	3.2	2.4	1.68	0.675	4.5

This certification includes the open generator set and the enclosed generator set when installed with or without the sub-base tank. This certification also includes the sub-base tank as a stand-alone accessory. The generator set and included options shall be a catalogue design and factory supplied. The generator set and applicable options shall be installed and attached to the building structure per the manufacturer supplied seismic installation instructions. For a list of certified configurations and options please directly contact the manufacturer. This certification excludes all non-factory supplied accessories, including but not limited to mufflers, isolation/restraint devices, remote control panels, remote radiators, pumps and other electrical/mechanical components.

IBC CERTIFIED
VMC GROUP

VMA-45902-01C (Revision 5)
Issue Date: Thursday, October 23, 2014
Revision Date: Friday, March 4, 2022
Expiration Date: Thursday, November 30, 2023

CERTIFICATE OF COMPLIANCE

SEISMIC DESIGN OF NONSTRUCTURAL COMPONENTS AND SYSTEMS

Notes & Comments:

1. All equipment listed herein successfully passed the seismic acceptance criteria for shake testing non-structural components and systems as set forth in the ICC AC-156. The Test Response Spectrum (TRS) enveloped the Required Response Spectrum (RRS) for all units tested. The tested units were representative sample(s) of a contingent of models and all remained captive and structurally sound after the seismic shake simulation. The units also remained functionally operational after the simulation testing as functional testing was completed by the equipment manufacturer before and after the seismic simulations. Although a seismic qualified unit inherently contains some wind resisting capacity, that capacity is undetermined and is excluded from this certification. Snow/Ice loads have been neglected and thus limit the unit to be installed both indoors (covered by an independent protective structure) and out of doors (exposed to accumulating snow/ice) for ground snow loads no greater than 30 psf for all applications.

2. The following building codes are addressed under this certification:
   IBC 2021 referencing ASCE7-16 and ICC-ES AC-156
   IBC 2018 referencing ASCE7-16 and ICC-ES AC-156
   IBC 2015 referencing ASCE7-10 and ICC-ES AC-156
   IBC 2012 referencing ASCE7-10 and ICC-ES AC-156
   IBC 2009 referencing ASCE7-05 and ICC-ES AC-156
   IBC 2006 referencing ASCE7-05 and ICC-ES AC-156

3. Refer to the manufacturer supplied installation drawings for anchor requirements and mounting considerations for seismic applications. Required anchor locations, size, style, and load capacities (tension and shear) may be specified on the installation drawings or specified by a 3rd party. Mounting requirement details such as anchor brand, type, embedment depth, edge spacing, anchor-to-anchor spacing, concrete strength, special inspection, wall design, and attachment to non-building structures must be outlined and approved by the Engineer of Record for the project or building. Structural walls, structural floors, and housekeeping pads must also be seismically designed and approved by the project or building Structural Engineer of Record to withstand the seismic anchor loads as defined on the installation drawings. The installing contractor is responsible for ensuring the proper installation of all anchors and mounting hardware.

4. For this certificate and certification to remain valid, this certificate must correspond to the "Seismic Certification Label" found affixed to the unit by the factory. The label ensures the manufacturer built the unit in conformance to the IBC seismic design criteria set forth by the Certified Seismic Qualification Agency, the VMC Group, and meets the seismic design levels claimed by this certificate.

5. Mechanical, Electrical, and Plumbing connections to the equipment must be flexibly attached as to not transfer load through the connection. The structural integrity of any conduit, cable trays, piping, ductwork and/or flexible connections is the responsibility of others. This certification does not guarantee the equipment will remain compliant to NEMA, IP, UL, or CSA standards after a seismic event.

6. This certificate applies to units manufactured at:
   100 Power Drive, Mankato, MN 56001, USA

7. This certification follows the VMC Group's ISO-17065 Scheme.

John P. Giuliano, PE
President, VMC Group

VMA-45902-01C (Revision 5)
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Prototype Test Summary (PTS)

A Rolls-Royce solution

Prototype testing is administered to validate the electrical and mechanical design integrity of the generator set. The results indicated below summarize testing performed on the prototype of the specified generator set model. This form of testing is only conducted on standard factory prototype generator sets. *Results may vary.*

GENERATOR SET MODEL(S):	***mtu*** 4R0113 DS50 ***mtu*** 4R0113 DS40

Rep. Prototype Model:	***mtu*** 4R0113 DS50	**Test Date:**	11/11/2013
kW:	48	**kVA:**	60
Voltage:	240	**Hz:**	60

ENGINE/GENERATOR

Engine Manufacturer:	John Deere	**Engine Model:**	4045TF280
Engine Fuel:	Diesel		
Generator Manufacturer:	Marathon	**Generator Model:**	361CSL1602
Voltage Regulator Model:	MAVC63-4D	**PMG Equipped:**	☐ Yes ☒ No

OPTIONS

Enclosure Level:	Level 3	**Silencer:**	Hospital
Air Filtration:	Standard		

TEST SUMMARY

TEST	TEST RESULT
Transient Performance *Certifies that the engine generator-set model has undergone transient response analysis per ISO 8528-5*	**NFPA-110 One Step:** ☒ 100% ☐ Other. Specify: ____ % **Full Load Acceptance:** Voltage Dip: 20 % Recovery Time: 1.27 seconds Frequency Dip: 1.8 % Recovery Time: 1.52 seconds
Steady State Performance *Certifies that voltage deviation and harmonics are within acceptance tolerance range per ISO-8528-5 at full load*	**Frequency Regulation:** 0.16 +/- % Regulation Overall 60.19 Maximum Hz 60 Minimum Hz **Voltage Regulation:** 0.2 +/- % Regulation Overall 240.48 Maximum AC Volts 239.52 Minimum AC Volts
Torsional Analysis *Certifies that the generator set has undergone torsional stress analysis and is not subjected to torsional stresses that could be harmful to the unit*	☒ Complete
Cooling System *Certifies that all generator set models will cool sufficiently within the ambient design conditions per each model at referenced enclosure level*	50 °C (122 °F) Maximum Ambient Temperature 117 m^3/min (4,088 SCFM) Radiator Air Flow
Sound Data *Certifies that sound data is within the acceptable tolerance range per ISO 8528-10 at referenced enclosure level*	64.7 dBA @ 7 m (23 ft) at full rated load *The sound value is representative of the specified prototype at the time of testing and is subject to alteration due to technological advances. Please contact your **mtu** representative for the most recent enclosure and sound data.*
Vibrational Analysis *Certifies that new generator set models have undergone vibration analysis to ensure that each generator coupling is balanced and there is no destructive resonant vibration per ISO 8528-9*	☒ Complete

Subject to change. 2021-10

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*

Subject to change. | Edition 02/22

Rolls-Royce Group
www.mtu-solutions.com

ROLLS-ROYCE SOLUTIONS AMERICA INC.

Two (2) Year / 3,000 Hour Basic Limited Warranty
Standby (3D) / Prime (3B) / Data Center Continuous Power (3F)

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 twenty-four (24) months after the first commissioning of the Product. In all cases, the Limited Warranty period will expire not later than thirty-six (36) 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.

Enclosure Data Sheet

Color Options

PRODUCT HIGHLIGHTS

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*

The following paint color is the standard for generator sets:

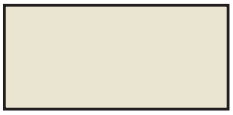
20-3,250 kW

RAL 7001 Silver Grey (P20519ASC)

CUSTOM COLORS*

Custom color options are also available for generator sets and enclosures. 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*** 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.