



SUBMITTAL PACKAGE

CSDG-C3000D6EB

Prepared For:

CENTRAL SATES DIESEL GENERATORS
2001 S PRAIRIE AVE
WAUKESHA WISCONSIN 53189-7307

PLEASE COMPLETE THIS SECTION

Date: _____

- ☐ Revise with corrections provided
- ☐ Approved and release for production

By (name and company): _____

Requested delivery date: _____

Requested delivery address: _____

Contact person and phone # for deliveries: _____

Date: _____

Opportunity # _____

BMS# _____

Customer PO# _____



Serving Cummins Customers
cummins.com/sales-and-service



DISCLAIMER



Serving Cummins Customers

Cummins power solutions are supported by the largest and best-trained worldwide certified sales/distributor network in the industry. This network will help you select and install the critical power solution to meet the requirements of your specific application. This same network provides experts with advanced technology to make your life easier while providing a seamless support experience.

IMPORTANT: *The critical power solution information and specifications included in this pdf can be used by the site contractor(s) and/or engineer(s) to assist with planning for and accomplishing the overall power solution installation. Please forward this document to the appropriate personnel, as necessary.*

It is the obligation of the electrical contractor and reviewing engineer to determine that the item quantities and accuracy of this submittal is correct as required for the job. Any inaccuracies or deviations must be addressed with Cummins Inc. before release to manufacturing. Any releases of material to manufacturing by the above parties constitute an acceptance of the accuracy of the submittal. Any changes after release will be viewed as a change order, subject to pricing changes. Please take the time to review this package for accuracy to prevent any after-shipment problems that could cause delay in energization.

Cummins certifies that these drawings, material lists, specification and datasheets have been checked prior to submittal and they:

- accurately depict the proposed equipment*
- provide current information to the date of the submittal and*
- present true and accurate equipment information.*

This Approval Drawing Package is submitted as our interpretation of the project requirements and/or the specifications for this job. Please note that issuance of these submittals shall not be deemed or interpreted as performance nor acceptance of your purchase order terms and conditions.

For questions or comments regarding this submittal, please contact the Cummins Project Manager listed on the title page.

TABLE OF CONTENTS



Section 1 - Project Information

Project Bill of Material

Section 2 - Generator Specification Sheets

Generator Specification Sheet

Generator Data Sheet

PowerCommand PC3.3 Specification Sheet

Alternator Data Sheet

Cooling System Data Sheet

Sound Data Sheet

Exhaust Emission Data Sheet

Exhaust Emission Compliance Statement

Prototype Test Summary Report

Section 3 - Generator Accessories

AUX Input/Output Module Specification Sheet Alternator

Heater Specification Sheet

Coolant Heater Specification Sheet

Alternator Windings & Bearing Temp Sensors

Ground Fault Indication Relay Specification Sheet

Battery Charger Specification Sheet

Battery Charger Outline Drawing

Section 4 - Generator Drawings and Interconnects

C3000D6EB Generator Set Outline Drawing

Vibration Isolator Drawing

Vibration Isolator Installation Drawing

Section 5 - Enclosure & Fuel Tank Submittal & Drawings

Tramont Enclosure & Fuel Tank Submittal

Section 6 - Startup & Warranty

Pre Commissioning Inspection Form

L312 Generator Warranty Statement

SECTION 1

Project Information



14 May 2026

Bill of Material

Feature Code	Description	Qty
C3000D6EB	C3000D6EB, Diesel Genset, 60Hz, 3000kW	10
C3000D6EB	C3000D6EB, Diesel Genset, 60Hz, 3000kW	
Install-US-Stat	U.S. EPA, Stationary Emergency Application	
A331-2	Duty Rating - Standby Power (ESP)	
L170-2	Emission Certification, EPA, Tier 2, NSPS CI Stationary Emergency	
L090-2	Listing - UL 2200	
L193-2	NFPA 110 Type 10 Level 1 Capable	
E170-2	Ambient Temperature (40C/104F)	
BE11-2	125C Temperature Rise	
R002-2	Voltage - 277/480, 3 Phase, Wye, 4 Wire	
C127-2	Fuel Water Separator	
C286-2	Fuel Filters - Stage 1 Redundant	
A333-2	Battery Charging Alternator	
A334-2	Engine Starter - 24 Volt DC Motor	
H752-2	Forced Circulation Coolant Heater - 208V	
H729-2	Open Crankcase Breather - Impactor	
H607-2	Engine Oil Filters, Full Flow with Bypass	
H663-2	Priming - Engine Lube Oil, Starting Only	
H734-2	Oil Sampling Valve	
H705-2	Lube Oil Replacement - Continuous/Make Up	
D041-2	Engine Air Cleaner - Normal Duty	
E128-2	Engine Cooling - Radiator, High Ambient Air Temperature, Ship Loose	
DC02-2	Air Cleaner Restriction Indicator - Mechanical	
B801-2	Alternator - 60Hz, 3 Phase, 480 Volt, 125/105/80C - Standby/Prime/Continuous	
A416-2	Alternator Heater, 110/220 (120/240) Volt AC	
B225-2	Stator Winding Temperature Sensors, 2 RTD per Phase	
B244-2	Bearing Temperature Sensor RTDs	
H609-2	Control Mounting - Left Facing	
H704-2	PowerCommand 3.3 Controller, Paralleling Capable	
H244-2	Gauge - Exhaust Gas Temperature	
H606-2	Analog Meters - AC Output	
KA08-2	Alarm - Audible, Engine Shutdown	
H678-2	LCD Control Display	
H720-2	Amp Sentry TM UL Listed Protective Relay	
K020-2	Display, Running Time	
KX24-2	Relays - User Configured	
KS53-2	Signals - Auxiliary, 8 Inputs/8 Outputs	
H536-2	Control Display Language - English	
F258-2	Terminal Housing - Alternator Mounted, Bottom Entry, LV, NEMA 2 - Hole Connectors	
H724-2	Indication - Ground Fault, Terminal Box (or) Circuit Breaker Box - Right	
H389-2	Shutdown - Low Coolant Level	
H527-2	Warning - Low Coolant Level	
L050-2	Literature - English	
L312-2	Genset Warranty - 3 Years Base, 1000 hours	
A358-2	Packing - Standard. This is the standard packing for domestic over-the-road deliveries	
A072A360-FRD	Eng Cooling-High Ambient Air Temp, Ship Loose	



A071Z521-FRD	Standard AVM - 6600 lbs/in Spring Rate - VMC	
A048G602	Battery Charger-10Amp, 120/208/240VAC, 12/24V, 50/60Hz	10
Enclosure	Sound Attenuated Level II Enclosure with basic electrical package	10
Fuel tank	UL 142 Sub-base Fuel tank - 24 hours	10
Parts	Coolant 50/50	10

SECTION 2

Generator Specification Sheets



C3000D6EB

C2750D6E

DIESEL GENERATOR SET SPECIFICATION SHEET

QSK78 SERIES ENGINE, 2500-3000 kWe, 60 Hz, EPA TIER 2 NSPS CERT. (STATIONARY EMERGENCY)

DESCRIPTION

Cummins commercial generator sets are fully integrated power generation systems for stationary standby power and data center applications.

The Centum™ Series meets the demand for efficient and sustainable power with performance, flexibility and commitment – for the next generation of power.

FEATURES

Cummins Heavy-Duty Engine: Rugged, four-cycle industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator: Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads, fault clearing short-circuit capability and class H insulation.

ISO 8528-5: Consult factory for site and configuration specific transient performance information.

Low NOx: Enables compliance with 6 g/bhp-hr NOx site requirements.

HVO Fuel Compatible: Approved for use with paraffinic fuels (EN15940), including Hydrotreated Vegetable Oil (HVO), which has a very low life cycle carbon emission.

Data Center Continuous: Applicable for supplying power continuously to a constant or varying electrical load for unlimited hours in a data center application.

Uptime Compliant: Meets the requirement of a Tier III and IV data center site by being rated to run for unlimited hours of operation when loaded to 'N' demand for the engine generator set.



Permanent Magnet Generator (PMG): Offers enhanced motor starting and fault clearing short circuit capability.

Control System: The PowerCommand® digital control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry™ protective relay, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling System: High ambient and enhanced high ambient, integral, set-mounted radiator systems, designed and tested for rated ambient temperatures, simplify facility design requirements for rejected heat.

Compliance: Capable of meeting NFPA 110 Type 10 for Level 1 Emergency or Standby Power Supply Systems (EPSSs) when installed and operated per Cummins and NFPA guidelines. The genset is UL listed, CSA certified and is available certified for seismic application in accordance with IBC.

Warranty and Service: Backed by a standard three-year warranty and worldwide distributor network.

MODELS

	Emergency Standby Power (ESP) Rating ¹ kWe (kVA)	Prime Power (PRP) Rating ^{1,2} kWe (kVA)	Data Center Continuous (DCC) Rating ^{1,2} kWe (kVA)	Emissions Certification and Compliance	Data Sheet ²
C2750D6E	2750 (3438)	2500 (3125)	2500 (3125)	EPA T2 NSPS (Low NOx) ³	D-6764
C3000D6EB	3000 (3750)	2750 (3438)	2750 (3438)	EPA T2 NSPS	D-6765
	3000 (3750)	2750 (3438)	2750 (3438)	EPA T2 NSPS (Low NOx) ³	D-6766

¹ All ratings include radiator fan losses

² Prime rating and DCC at standby power rating available subject to Cummins' site-specific assessment; contact your Cummins distributor

³ Designed to comply with 6 g/bhp-hr NOx site requirement. Certain conditions apply; refer to emissions data sheet for more information



cummins.com

Bulletin S-6763 PD00002097 Produced in U.S.A. (Rev. 09/24)
©2024 Cummins Inc.

Centum™
SERIES GENERATORS

GENERATOR SET SPECIFICATIONS

Performance class	Genset models have been tested in accordance with ISO 8528-5. Consult factory for transient performance information
Voltage regulation, no load to full load	± 1.0%
Random voltage variation	± 1.0%
Frequency regulation	Isochronous
Random frequency variation	± 0.5%
Electromagnetic compatibility performance	Emissions to EN 61000-6-2:2005 Immunity to EN 61000-6-4:2007+A1:2011 Complies with FCC PART 15 subpart B and ICES-002

ENGINE SPECIFICATIONS

Bore	170 mm (6.69 in)
Stroke	190 mm (7.48 in)
Displacement	77.6 L (4735 in³)
Configuration	Four-cycle; vee; 18-cylinder
Battery capacity	2200 A minimum at ambient temperature of -18 °C (0 °F) to 0 °C (32 °F)
Battery charging alternator	55 A
Starting voltage	24 V, negative ground
Fuel system	Modular Common Rail System (MCRS)
Fuel filter	Two-stage, spin-on fuel filter and water separator system. Stage 1: remote mounted, 5 µm duplex filter with two priming pumps. Stage 2: engine mounted, 3 µm triple element filter
Air cleaner	Four unboxed, dry replaceable elements standard
Lube oil filter	Four spin-on, combination full flow filter and bypass filters
Cooling system	Charge-air cooled and jacket water cooled

ALTERNATOR SPECIFICATIONS

Design	Brushless, 4-pole, drip proof, revolving field
Stator	2/3 pitch
Rotor	Two bearing, flexible coupling
Insulation system	Class H
Standard temperature rise	125°C standby at 40 °C ambient
Exciter type	Permanent Magnet Generator (PMG)
Phase rotation	A (U), B (V), C (W)

AVAILABLE VOLTAGES (60 Hz LINE-TO-NEUTRAL / LINE-TO-LINE)⁴

240 / 416	277 / 480	347 / 600	2400 / 4160
3810 / 6600	7200 / 12470	7620 / 13200	7976 / 13800

⁴ Additional voltages may be available; contact your Cummins distributor

GENERATOR SET OPTIONS AND ACCESSORIES⁵

Engine

- 208 V and 480 V, 3 Phase, 12 kW forced-type coolant heater
- Oil sampling valve
 - Redundant starting
 - Closed crankcase ventilation
- Automatic oil make-up system

Cooling System (ship loose)

- High ambient standard
- Enhanced high ambient

Control Panel

- Masterless load demand
- Multiple language support
- Low coolant level warning and shutdown

Control Panel (cont.)

- Left facing mounting
- Warning high bearing temperature
- Alternator temp. monitoring
- Exhaust gas temp. monitoring
- 6x user-configurable relays
 - 120 / 240 V heater control cabinet
- Mechanical hour meter
- : digital input/output

Alternator

- 80 °C / 105 °C / 125 °C / 150 °C rise
- 120 / 240 V, 300 W anti-condensation heater
 - Top and bottom entrance boxes

Alternator (cont.)

- Temp. sensor - RTDs, 2 / phase
- Temp. sensor - alternator bearing RTD
 - Differential current transformers for various voltages

Generator Set

- Battery
- Floor-mount battery tray, hold-down
- PowerCommand® network
- Remote annunciator panel
- Vibration isolators
- Standby 3yr/1000hr standard, ~~5yr/2500hr~~ **and 10yr/5000hr** warranties
- DCC 3-, 5- and 10-year unlimited hour warranties

⁵ Some options may not be available on all models; contact your Cummins distributor



cummins.com

Bulletin S-6763 PD00002097 Produced in U.S.A. (Rev. 09/24)
©2024 Cummins Inc.

Centum
SERIES GENERATORS

PowerCommand® 3.3

CONTROL SYSTEM DESCRIPTION

The PowerCommand® 3.3 is an integrated, microprocessor-based, generator set control system providing voltage regulation, engine protection, alternator protection, operator interface and isochronous governing. Refer to document S-1570 for more detailed information on the control.

AmpSentry™: Includes integral AmpSentry™ protection, which provides a full range of alternator protection functions that are matched to the alternator provided.

Power Management: Control function provides battery monitoring and testing features and smart starting control system.

Advanced Control Methodology: Three-phase sensing, full wave rectified voltage regulation, with a PWM output for stable operation with all load types.

Communications Interface: Control comes standard with PCCNet and Modbus interface.

Service: InPower™ PC-based service tool available for detailed diagnostics, setup, data logging and fault simulation.

Easily Upgradeable: PowerCommand® controls are designed with common control interfaces.

Reliable Design: The control system is designed for reliable operation in harsh environment.

Multi-Language Support

OPERATOR PANEL FEATURES

Operating/Display Functions

- Displays paralleling breaker status
- Provides direct control of the paralleling breaker
- 320 x 240 pixels graphic LED backlight LCD
- Auto, manual, start, stop, fault reset and lamp test/panel lamp switches
- Alpha-numeric display with pushbuttons
- LED lamps indicating genset running, remote start, not in auto, common shutdown, common warning, manual run mode, auto mode and stop

Paralleling Control Functions

- First Start Sensor™ system selects first genset to close to bus
- Phase lock loop synchronizer with voltage matching
- Sync check relay
- Isochronous kW and kVAR load sharing
- Load govern control for utility paralleling
- Extended paralleling (base load/peak shave) mode
- Digital power transfer control, for use with a breaker pair to provide open transition, closed transition, ramping closed transition, peaking and base load functions

Alternator Data

- Line-to-neutral and line-to-line AC volts
- Three-phase AC current
- Frequency
- kW, kVAR, power factor kVA (three-phase and total)

Engine Data

- DC voltage
- Engine speed
- Lube oil pressure and temperature
- Coolant temperature
- Comprehensive FAE data (where applicable)



OPERATOR PANEL FEATURES (CONT.)

Other Data

- Genset model data
- Start attempts, starts, running hours, kWh
- Load profile (operating hours at %load in 5% increments)
- Fault history
- Data logging and fault simulation (requires InPower™)

STANDARD CONTROL FEATURES

Digital Governing

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital Voltage Regulation

- Integrated digital electronic voltage regulator
- Three-phase, four-wire line-to-line sensing
- Configurable torque matching

AmpSentry™ AC Protection

- AmpSentry™ protective relay
- Over current and short circuit shutdown
- Over current warning
- Single-phase and three-phase fault regulation
- Over and under voltage shutdown
- Over and under frequency shutdown
- Overload warning with alarm contact
- Reverse power and reverse VAR shutdown
- Field overload shutdown

Engine Protection

- Battery voltage monitoring, protection, and testing
- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- Low coolant level warning or shutdown
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Cranking lockout
- Sensor failure indication
- Full authority electronic engine protection

Control Functions

- Time delay start and cool down
- Real time clock for fault and event time stamping
- Exerciser clock and time of day start/stop
- Data logging
- Cycle cranking
- Load shed
- Configurable inputs and outputs (4)
- Remote emergency stop

Options

- Auxiliary output relays (2)



cummins.com

Bulletin S-6763 PD00002097 Produced in U.S.A. (Rev. 09/24)
©2024 Cummins Inc.

Centum™
SERIES GENERATORS

RATING DEFINITIONS

Emergency Standby Power (ESP)

Applicable for supplying power to varying electrical loads for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550.

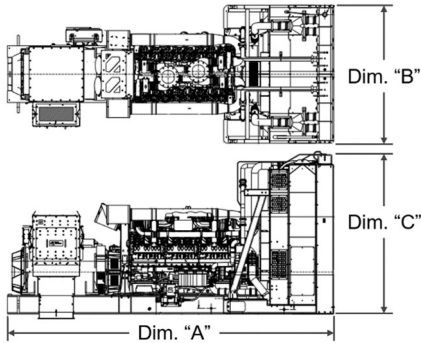
Prime Power (PRP)

Prime Power for Stationary Emergency ratings apply to installations served by a reliable utility source. Applicable for supplying power to varying electrical loads for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046-1. Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550.

Data Center Continuous (DCC)

Applicable for supplying power continuously to a constant or varying electrical load for unlimited hours in a data center application. Designed to comply with Uptime Institute® Tier III and IV data center site requirements by being rated to run for unlimited hours of operation when loaded to 'N' demand for the engine generator set.

GENERATOR SET DIMENSIONS AND WEIGHTS⁶



Model Name	Dim. "A" mm (in)	Dim. "B" mm (in)	Dim. "C" mm (in)
C2750D6E	7328 (288.5)	3064 (120.6)	3614 (142.3)
C3000D6EB			
Model Name	As Shipped Set Weight (No Cooling System) kg (lb)	As Shipped Cooling System Weight (Dry) kg (lb)	Installed Set Weight (Wet) kg (lb)
C2750D6E	21527 (47459)	3532 (7787)	25361 (55911)
C3000D6EB			

⁶ Do not use for installation design. Longest alternator (G-core) used for dimension "A". All weights are approximate and represent a generator set with standard features and heaviest alternator (low voltage G-core). "As Shipped Set Weight (No Cooling System)" includes weight from engine oil. "Installed Set Weight (Wet)" includes weight from engine oil and coolant. See respective model data sheet for specific model outline drawing number that contains weights of other configurations.

CODES AND STANDARDS⁷

ISO 9001 ISO 14001 ISO 45001	This product was manufactured in a facility whose quality management system is certified to ISO 9001 and its Health Safety Environmental Management Systems certified to ISO 14001 and ISO 45001.		This product is listed to UL 2200, Stationary Engine Generator Assemblies.
	The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.		Engine certified to Stationary Emergency U.S. EPA New Source Performance Standards (NSPS), 40 CFR 60 subpart IIII Tier 2 exhaust emission levels. U.S. applications must be applied per this EPA regulation.
	All genset models are available as CSA certified to CSA C22.2 No. 100.		The generator set package is available certified for seismic application in accordance with International Building Code.

⁷ Codes or standards compliance may not be available with all model configurations; contact your Cummins distributor



cummins.com

Bulletin S-6763 PD00002097 Produced in U.S.A. (Rev. 09/24)
©2024 Cummins Inc.

Centum
SERIES GENERATORS

C3000D6EB

DIESEL GENERATOR SET DATA SHEET

MODEL:	C3000D6EB
FREQUENCY:	60 Hz
FUEL TYPE:	DIESEL
RATING:	3000 kW _e (3750 kVA) EMERGENCY STANDBY POWER (ESP) ¹ 2750 kW_e (3438 kVA) DATA CENTER CONTINUOUS (DCC)^{1,2}
EMISSIONS CERTIFICATION:	EPA TIER 2 NSPS (STATIONARY EMERGENCY)

GENERATOR SET PUBLICATIONS

Exhaust emission data sheet	EDS-3187
Exhaust emission compliance statement	EPA-3048
Sound data sheet	MSP-4243
Cooling system data sheet	MCP-2371
Seismic certificate of compliance	OSP-0813 , VMA-50998-01C
Prototype test support data sheet	PTS-868
Alternator data sheet	See "Alternator Data" section for complete list of ADS-###
Genset outline drawing	A073W614
Genset wiring schematic diagram	A067W397

ENGINE SPECIFICATIONS

		Emergency Standby Power (ESP)	Data Center Continuous (DCC)
Manufacturer		Cummins Inc.	
Model		QSK78-G39	
Configuration		Four-cycle; vee; 18-cylinder	
Aspiration		Turbocharged and charge-air cooled	
Gross engine power output	kW _m (bhp)	3312 (4441)	3019 (4049)
Brake mean effective pressure at set rated load	kPa (psi)	2841 (412)	2592 (376)
Bore	mm (in)	170 (6.69)	
Stroke	mm (in)	190 (7.48)	
Displacement	L (in ³)	77.6 (4737)	
Rated speed	rpm	1800	
Piston speed at rated speed	m/s (ft/min)	11.4 (2244)	
Compression ratio		15.3:1	
Lube oil capacity	L (US gal)	405 (107)	
Overspeed limit	rpm	1980	
Regenerative power	kW _m (hp)	256 (343)	

FUEL CONSUMPTION

Rating	kW _e (kVA)	3000 (3750)				2750 (3438)			
Load		25%	50%	75%	100%	25%	50%	75%	100%
Fuel Consumption	US gph	61	111	160	204	56	101	147	186
Fuel Consumption	L/h	229	419	604	773	213	384	557	706

¹ Generator set ratings include radiator fan losses

² DCC at standby power available subject to Cummins' site-specific assessment; contact your Cummins distributor



FUEL SYSTEM

		Emergency Standby Power (ESP)	Data Center Continuous (DCC)
Maximum fuel flow	L/h (US gph)	1080 (285)	
Allowable fuel inlet pressure ³ (single/duplex operating mode)	kPa (inHg)	-27 to +14.5 (-8 to +4.3)	-17 to +14.5 (-5 to +4.3)
Allowable fuel inlet pressure ³ (dual operating mode)	kPa (inHg)	-31 to +14.5 (-9 to +4.3)	-21 to +14.5 (-6 to +4.3)
Maximum fuel return line restriction	kPa (inHg)	34 (10)	
Maximum fuel inlet temperature	°C (°F)	70 (158)	

AIR SYSTEM

Combustion air flow (at set rated load)	m³/min (scfm)	262 (9236)	249 (8800)
Maximum air cleaner restriction (dirty filter)	kPa (inH ₂ O)	6 (25)	
Alternator cooling air flow	m³/min (scfm)	199.8 (7056)	

EXHAUST SYSTEM

Exhaust flow (at set rated load)	m³/min (scfm)	631 (22293)	589 (20793)
Exhaust temperature (at set rated load)	°C (°F)	462 (863)	444 (831)
Maximum back pressure	kPa (inH ₂ O)	6.8 (27.3)	

COOLING SYSTEM (SET MOUNTED) – HIGH AMBIENT

Ambient design (limiting ambient temp.)	°C (°F)	44.3 (111.7)	47.1 (116.8)
Maximum air flow static restriction	kPa (inH ₂ O)	0.25 (1.0)	
Cooling system air flow (at max. restriction)	m³/min (acfm)	2751 (97140)	
Fan load	kWm (hp)	78 (105)	
Coolant capacity (engine + radiator)	L (US gal)	455 (120.2)	

COOLING SYSTEM (SET MOUNTED) – ENHANCED HIGH AMBIENT

Ambient design (limiting ambient temp.)	°C (°F)	50.0 (122.0)	52.9 (127.2)
Maximum air flow static restriction	kPa (inH ₂ O)	0.25 (1.0)	
Cooling system air flow (at max. restriction)	m³/min (acfm)	3294 (116320)	
Fan load	kWm (hp)	112 (150)	
Coolant capacity (engine + radiator)	L (US gal)	455 (120.2)	

COOLING SYSTEM (REMOTE MOUNTED)⁴ – JACKET WATER CIRCUIT

Maximum static head above engine crank centerline	m (ft)	Not applicable	
Maximum friction head external to engine (at set rated speed)	kPa (psi)	Not applicable	
Maximum flow rate (at max. friction head)	L/min (US gal/min)	Not applicable	
Engine jacket water circuit coolant capacity	L (US gal)	Not applicable	
Maximum outlet temperature	°C (°F)	Not applicable	Not applicable
Heat rejected, jacket water coolant circuit	MJ/min (Btu/min)	Not applicable	Not applicable
Heat rejected, fuel circuit	MJ/min (Btu/min)	Not applicable	Not applicable
Total heat radiated to room	MJ/min (Btu/min)	Not applicable	Not applicable

³ Allowable fuel inlet gauge pressure in single/duplex or dual operating condition is measured at the Stage 1 fuel filter head inlet. Value includes filter life allowance, which is smaller for standby applications. This range translates to the available pressure drop for customer fuel supply plumbing restriction and lift or the maximum head pressure at the customer connection. Gauge pressure limit at on-engine fuel inlet connection is -13 inHg (-44 kPa).

⁴ For non-standard remote installations contact your Cummins distributor



COOLING SYSTEM (REMOTE MOUNTED)⁵ – AFTERCOOLER CIRCUIT

		Emergency Standby Power (ESP)	Data Center Continuous (DCC)
Maximum static head above engine crank centerline	m (ft)	Not applicable	
Maximum friction head external to engine (at set rated speed)	kPa (psi)	Not applicable	
Maximum flow rate (at max. friction head)	L/min (US gal/min)	Not applicable	
Engine aftercooler circuit coolant capacity	L (US gal)	Not applicable	
Maximum aftercooler inlet temperature (at limiting ambient temperature)	°C (°F)	Not applicable	Not applicable
Maximum aftercooler inlet temperature (at 25 °C (77 °F) ambient air temperature)	C (°F)	Not applicable	Not applicable
Heat rejected, aftercooler coolant circuit	MJ/min (Btu/min)	Not applicable	Not applicable
Heat rejected, fuel circuit	MJ/min (Btu/min)	Not applicable	Not applicable
Total heat radiated to room	MJ/min (Btu/min)	Not applicable	Not applicable

⁵ For non-standard remote installations contact your Cummins distributor

GENERATOR SET WEIGHTS⁶

		As Shipped Set Weight (No Cooling System)	As Shipped Cooling System Weight (Dry)	Installed Set Weight (Wet)
C2750D6E	kg (lb)	21527 (47459)	3532 (7787)	25361 (55911)

⁶ All weights are approximate and represent a generator set with standard features and heaviest alternator (low voltage G-core). "As Shipped Set Weight (No Cooling System)" includes weight from engine oil. "Installed Set Weight (Wet)" includes weight from engine oil and coolant. See respective model data sheet for specific model outline drawing number that contains weights of other configurations.

GENERATOR SET POWER CAPABILITIES

		Emergency Standby Power (ESP)	Data Center Continuous (DCC)
Max Altitude for full Power Output – High ambient cooling system			
at 25°C Ambient	m (ft)	1849 (6066)	2431 (7975)
at 40°C Ambient	m (ft)	1428 (4686)	2076 (6813)
at 45°C Ambient	m (ft)	1261 (4139)	1818 (5963)
at 50°C Ambient	m (ft)	664 (2178)	1111 (3645)
Max Altitude for Full Power Output - Enhanced High Ambient Cooling System			
at 25°C Ambient	m (ft)	1754 (5754)	2355 (7728)
at 40°C Ambient	m (ft)	1330 (4362)	1999 (6559)
at 45°C Ambient	m (ft)	1161 (3809)	1763 (5783)
at 50°C Ambient	m (ft)	603 (1979)	1057 (3469)

Note:

Ambient operating temperature is defined as the air temperature measured at the engine inlet.

Power and Altitude Capabilities are for reference purposes assuming standard options selected and assume a cooling system with 0.25 kPa (1.0 inH₂O) backpressure and 50% relative humidity. Refer Cummins sizing tool Gensize or your Cummins Distributor for a more detailed assessment.

RATING DEFINITIONS

Emergency Standby Power (ESP):

Applicable for supplying power to varying electrical loads for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550.

Data Center Continuous (DCC)

Applicable for supplying power continuously to a constant or varying electrical load for unlimited hours in a data center application. Designed to comply with Tier III and IV data center site requirements by being rated to run for unlimited hours of operation when loaded to 'N' demand for the engine generator set.



ALTERNATOR DATA⁸ (ESP: 3000 kW_e, DCC: 2750 kW_e)

Voltage	Connection	Winding Number	Ambient Temp. (°C)	Temp. Rise (°C)	Duty Rating ⁹	Model	Max. Surge (kVA) ¹⁰	Alternator Data Sheet	Feature Code
416	Wye; 3-phase	312	40	150	DCC	S9L1D-E4	11520	ADS-682	BE74-2
					ESP	S9L1D-E4	11520	ADS-682	BE81-2
416	Wye; 3-phase	312	40	125	DCC	S9L1D-E4	11520	ADS-682	BE75-2
					ESP	S9L1D-F4	12390	ADS-683	BC39-2
416	Wye; 3-phase	312	40	105	DCC	S9L1D-F4	12390	ADS-683	BE76-2
					ESP	S9L1D-G4	13725	ADS-684	B867-2
416	Wye; 3-phase	312	40	80	DCC	S9L1D-G4	13725	ADS-684	BE77-2
					ESP	N/A	N/A	N/A	N/A
416	Wye; 3-phase	312	50	150	DCC	S9L1D-E4	11520	ADS-682	BE74-2
					ESP	S9L1D-F4	12390	ADS-683	BE81-2
416	Wye; 3-phase	312	50	125	DCC	S9L1D-F4	12390	ADS-683	BE75-2
					ESP	S9L1D-G4	13725	ADS-684	BC39-2
416	Wye; 3-phase	312	50	105	DCC	S9L1D-G4	13725	ADS-684	BE76-2
					ESP	N/A	N/A	N/A	N/A
416	Wye; 3-phase	312	50	80	DCC	N/A	N/A	N/A	N/A
					ESP	N/A	N/A	N/A	N/A
480	Wye; 3-phase	312	40	150	DCC	S9L1D-D4	11745	ADS-681	BD49-2
					ESP	S9L1D-D4	11745	ADS-681	BE80-2
480	Wye; 3-phase	312	40	125	DCC	S9L1D-D4	11745	ADS-681	BD48-2
					ESP	S9L1D-E4	13290	ADS-682	B801-2
480	Wye; 3-phase	312	40	105	DCC	S9L1D-E4	13290	ADS-682	BD47-2
					ESP	S9L1D-E4	13290	ADS-682	B280-2
480	Wye; 3-phase	312	40	80	DCC	S9L1D-F4	14310	ADS-683	BD46-2
					ESP	S9L1D-G4	15825	ADS-684	B601-2
480	Wye; 3-phase	312	50	150	DCC	S9L1D-D4	11745	ADS-681	BD49-2
					ESP	S9L1D-E4	13290	ADS-682	BE80-2
480	Wye; 3-phase	312	50	125	DCC	S9L1D-D4	11745	ADS-681	BD48-2
					ESP	S9L1D-E4	13290	ADS-682	B801-2
480	Wye; 3-phase	312	50	105	DCC	S9L1D-E4	13290	ADS-682	BD47-2
					ESP	S9L1D-F4	14310	ADS-683	B280-2
480	Wye; 3-phase	312	50	80	DCC	S9L1D-G4	15825	ADS-684	BD46-2
					ESP	N/A	N/A	N/A	N/A
600	Wye; 3-phase	607	40	150	DCC	S9L1D-E4	13293	ADS-682	BD57-2
					ESP	S9L1D-E4	13293	ADS-682	BD50-2
600	Wye; 3-phase	607	40	125	DCC	S9L1D-E4	13293	ADS-682	BD56-2
					ESP	S9L1D-E4	13293	ADS-682	B465-2
600	Wye; 3-phase	607	40	105	DCC	S9L1D-E4	13293	ADS-682	BD55-2
					ESP	S9L1D-E4	13293	ADS-682	B839-2
600	Wye; 3-phase	607	40	80	DCC	S9L1D-F4	14343	ADS-683	BD54-2
					ESP	N/A	N/A	N/A	N/A
600	Wye; 3-phase	607	50	150	DCC	S9L1D-E4	13293	ADS-682	BD57-2
					ESP	S9L1D-E4	13293	ADS-682	BD50-2
600	Wye; 3-phase	607	50	125	DCC	S9L1D-E4	13293	ADS-682	BD56-2
					ESP	S9L1D-E4	13293	ADS-682	B465-2
600	Wye; 3-phase	607	50	105	DCC	S9L1D-E4	13293	ADS-682	BD55-2
					ESP	S9L1D-F4	14343	ADS-683	B839-2
600	Wye; 3-phase	607	50	80	DCC	N/A	N/A	N/A	N/A
					ESP	N/A	N/A	N/A	N/A

(Alternator data table is continued on next page)



PowerCommand® 3.3 Generator Set Digital Integrated Control System



Bargraph Optional

Introduction

The PowerCommand® 3.3 control system is a microprocessor-based generator set monitoring, metering, and control system, which is comprised of PowerCommand® Control 3300 and the Human Machine Interface 320. PCC3300 supports multiple operation modes including:

- Standalone,
- Synchronization only,
- Isolated bus paralleling,
- Utility single generator set paralleling,
- Utility multiple generator set paralleling,
- Utility single generator set paralleling with power transfer control (automatic mains failure),
- Isolated bus paralleling with Masterless Load Demand

PowerCommand® Control 3300 is designed to meet the exacting demands of the harsh and diverse environments of today's typical power generation applications for Full Authority Electronic or Hydromechanical engine power generator sets.

Offering enhanced reliability and performance over more conventional generator set controls via the integration of all generator control functions into a single system, PCC3300 is your Power of One generator set control solution.

Benefits and Features

- 320 x 240 pixels graphical LED backlit LCD
- Multiple languages supported
- AmpSentry™ protection provides industry-leading generator overcurrent protection
- Digital Power Transfer Control (Automatic Mains Failure) provides load transfer operation in open transition, closed transition, or soft (ramping) transfer modes

- Extended Paralleling (Peak Shave/Base Load) regulates the genset real and reactive power output while paralleled to the utility. Power can be regulated at either the genset or utility bus monitoring point
- Digital frequency synchronization and voltage matching
- Isochronous Load Sharing
- Droop kW and kVAR control
- Real time clock for fault and event time stamping
- Exerciser clock and time of day start/stop initiate a test with or without load, or a Base Load or Peak Shave session
- Digital automatic voltage regulation is provided using three phase sensing and full wave FET type regulator, which is compatible with either shunt or PMG excited systems with a standard AUX103 AVR or an option for a more powerful high-current field drive capability AUX106 AVR
- Digital engine speed governing is provided on applicable platforms
- Generator set monitoring (including metering) and protection with PCC3300 measuring voltage, current, kW and kVAR offering a measurement accuracy of 1%
- Utility / AC Bus metering and protection with PCC3300 voltage, current, kW and kVAR offering a measurement accuracy of 1%
- 12 V (DC) and 24 V (DC) battery operation
- RS-485 Modbus® interface for interconnecting to customer equipment
- Warranty and service – Cummins Power Generation offers a comprehensive warranty and worldwide distributor service network
- Global regulatory certification and compliance: PCC3300 is suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., UKCA, and CE standards

PowerCommand® Generator Set Digital Control System PCC 3300



Introduction

PCC3300 is an industry-leading digital generator set control suitable for usage on a wide range of diesel and lean burn natural gas generator sets in both standalone as well as paralleling applications.

PowerCommand® is compatible with either shunt or PMG excitation, and is suitable for usage with reconnectable or non-reconnectable generators. Configuration for any frequency, voltage and power connection from 120 V (AC) to 600 V (AC) line-to-line or 601 V (AC) to 45k V (AC) with an external PT is supported. The PCC3300 derives its own power from the generator set starting batteries and functions over a voltage range of 8 V (DC) to 30 V (DC).

Features

- PCC3300 supports configurable control features via software download using InPower PC-compatible software
- 12 V (DC) and 24 V (DC) battery operation
- Digital automatic voltage regulation is provided using three phase sensing and full wave FET type regulator, which is compatible with either shunt or PMG excited systems with a standard AUX103 AVR or an option for a more powerful high-current field drive capability AUX106 AVR
- Digital engine speed governing on applicable platform is provided, which is capable of providing isochronous frequency regulation
- Full authority J1939 CANBus® prime mover communications and control is provided for platforms with an Engine Control Module (ECM)
- AmpSentry® protection provides industry-leading alternator overcurrent protection:
 - Time-based generator protection applicable to both line-to-line and line-to-neutral, that can detect an unbalanced fault condition and swiftly react appropriately. Balanced faults can also be detected by AmpSentry and appropriate acted upon.
 - Reduces the risk of Arc Flash due to thermal overload or electrical faults by inverse time protection
- Generator set monitoring offers status information for all critical prime mover and generator functions
- AC and DC digital generator set metering is provided. AC measurements are configurable for single or three phase sensing with PCC3300 measuring voltage, current, kW and kVAr offering a measurement accuracy of 1%
- Battery monitoring system continually monitors the battery output and warns of the potential occurrence of a weak battery condition
- Relay drivers for prime mover starter, fuel shutoff (FSO), glow plug/spark ignition power and switched B+ applications are provided
- Integrated generator set protection is offered to protect the prime mover and generator
- Real time clock for fault and event time stamping
- Exerciser clock and time of day start/stop initiate a test with or without load, or a Base Load or Peak Shave session
- Digital Power Transfer Control (Automatic Mains Failure) provides load transfer operation in open transition, closed transition, or soft (ramping) transfer modes
- Extended Paralleling (Peak Shave/Base Load) regulates the genset real and reactive power output while paralleled to the utility. Power can be regulated at either the genset or utility bus monitoring point
- Digital frequency synchronization and voltage matching
- Isochronous Load Sharing
- Droop kW and kVAr Control
- The synchronization check function provides adjustments for phase angle window, voltage window, frequency window and time delay
- Utility / AC Bus metering and protection with PCC3300 voltage, current, kW and kVAr offering a measurement accuracy of 1%
- Advanced serviceability is offered via InPower™, a PC-based software service tool
- PCC3300 is designed for reliable operation in harsh environments with the unit itself being a fully encapsulated module
- RS-485 ModBus interface for interconnecting to customer equipment
- Native on PCC3300: Four discrete inputs, two dry contact relay outputs and two low-side driver outputs are provided and are all configurable.
 - Optional extra PCC3300 input and output capability available via AUX101
- Warranty and service – Cummins Power Generation offers a comprehensive warranty and worldwide distributor service network
- Global regulatory certification and compliance: PCC3300 is suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., UKCA and CE standards

Base Control Functions

HMI capability

Options: Local and remote HMI320 options are available

Operator adjustments: The HMI320 includes provisions for many set up and adjustment functions.

Genset hardware data: Access to the control and software part number, genset rating in kVA and genset model number is provided from the HMI320 or InPower.

Data logs: Information concerning all of the following parameters is periodically logged and available for viewing; engine run time, controller on time, number of start attempts, total kilowatt hours, and load profile. (Control logs data indicating the operating hours at percent of rated kW load, in 5% increments. The data is presented on the operation panel based on total operating hours on the generator.)

Fault history: Provides a record of the most recent fault conditions with control date and time stamp. Up to 32 events are stored in the control non-volatile memory.

Alternator data

- Voltage (single or three phase line-to-line and line-to-neutral)
- Current (single or three phase)
- kW, kVA, Power Factor, kVA (three phase and total)
- Frequency

For Lean Burn Natural Gas Engine applications:

- Alternator heater status
- Alternator winding temperature (per phase) as well as alternator drive end and non-drive end bearing

Utility/AC bus data

- Voltage (three phase line-to-line and line-to-neutral)
- Current (three phase and total)
- kW, kVAR, Power Factor, kVA (three phase and total)
- Frequency

AmpSentry: 3x current regulation for downstream tripping/motor inrush management. Thermal damage curve (3-phase short) or fixed timer (2 sec for 1-Phase Short or 5 sec for 2-Phase short).

Engine data

- Starting battery voltage
- Engine speed
- Engine temperature
- Engine oil pressure
- Engine oil temperature
- Intake manifold temperature
- Coolant temperature
- Comprehensive Full Authority Engine (FAE) data (where applicable)

Lean Burn Natural Gas (LBNG) application parameters include:

- Safety shutoff valve status
- Valve proving status
- Downstream gas pressure
- Gas inlet pressure
- Gas mass flow rate
- Control valve position
- Gas outlet pressure
- Manifold pressure and temperature
- Throttle position
- Compressor outlet pressure
- Turbo speed
- Compressor bypass position
- Cylinder configuration (e.g., drive end and non-drive end configurations)
- Coolant pressure 1 and 2 as well as coolant temperature 1 and 2 for both HT/LT respectively
- Exhaust port temperature (up to 18 cylinders)
- Pre-filter oil pressure
- Exhaust back pressure
- Parent ECM internal temperature and isolated battery voltage
- Speed bias
- Child ECM internal temperature and isolated battery voltage
- Knock level, spark advance, and knock count (for up to 18 cylinders)
- Auxiliary supply disconnect status
- Engine heater status
- Coolant circulating pump status
- Lube oil priming pump status
- Lube oil status
- Oil heater status
- Derate authorization status
- Start system status
- Ventilator fan status
- Ventilation louver status
- Radiator fan status
- DC PSU status
- Start inhibit/enable status and setup

Service adjustments – The HMI320 includes provisions for adjustment and calibration of genset control functions. Adjustments are protected by a password. Functions include:

- Engine speed governor adjustments
- Voltage regulation adjustments
- Cycle cranking
- Configurable fault set up
- Configurable input and output set up
- Meter calibration
- Paralleling setup
- Display language and units of measurement

Prime Mover Control

SAE-J1939 CAN interface to full authority ECMs (where applicable). Provides data transfer between genset and engine controller for control, metering and diagnostics.

12 V (DC) or 24 V (DC) nominal battery voltage is supported by PCC3300 for normal operation.

Temperature dependant prime mover governing dynamics: This function is supported enabling the engine to be responsive when warm and more stable when operating at lower temperature via providing control and modification over electronic governing parameters as a function of engine temperature.

Isochronous governing is provided in order to control prime mover speed within $\pm 0.25\%$ of nominal rated speed for any steady state load from no load to full load. During operation frequency drift should not exceed $\pm 0.5\%$ of nominal frequency given a 33°C (or 60°F) change in ambient temperature within an eight-hour period.

Droop electronic speed is governing capability is natively offered by PCC3300 to permit droop from 0% to 10% between no load to full load.

Remote start capability is built into the PCC3300 as the unit accepts a ground signal from remote devices to automatically command the starting of the generator set as well as the reaching of rated speed, voltage and frequency or otherwise run at idle speed until prime mover temperature is adequate. The presence of a remote start signal shall cause the PCC3300 to leave sleep mode and return to normal power mode. PCC3300 supports an option for delayed start or stop.

Remote Start Integrity: In compliance with NEC2017 Start Signal Integrity standard – NFPA70 Article 700.10(D)(3), the remote start circuit from ATS to PCC3300 is continuously monitored for signal disturbance due to broken, disconnected or shorted wires via a configurable input. Loss of signal integrity results in activation of a remote start signal.

Remote and local emergency stopping capability: PCC3300 accepts ground signal from a locally or remotely mounted emergency stop switch to cause the generator set to immediately shutdown. The generator set is prevented from either running or cranking with the emergency stop switch engaged. If PCC3300 is in sleep mode, then the activation of any emergency stop switch shall return PCC3300 to normal powered state along with the activation of the corresponding shutdown and run-prevention states.

Sleep mode: PowerCommand 3.3 supports a configurable low current draw state, which is designed with consideration to the needs of prime applications or other applications without a battery charger (in order to minimize battery current drain).

Automatic prime mover starting: Any generator set controlled by PCC3300 is capable of automatic starting achieved via either magnetic pickup or main alternator output frequency. PCC3300 additionally supports

configurable glow plug control where applicable.

Prime mover cycle cranking: PCC3300 supports configurable starting cycles and rest periods. Built-in starter protection is incorporated to prevent the operator from specifying a starting sequence that may be damaging.

Configurable time delay functionality: PCC3300 supports time delayed generator set starting and stopping (for cooldown). Permissible time delays are as follows (noting a default setting is 0 seconds):

1. Start delay: 0 seconds to 300 seconds prior to starting after receiving a remote start signal.
2. Stop delay: 0 seconds to 600 seconds prior to shutdown after receiving a signal to stop in normal operation modes.

Lean Burn Natural Gas application specific parameters

PCC3300 supports prime mover inhibiting in order to permit application-specific processes (i.e. Auxiliaries) to be started first.

Generator Control

PCC3300 performs both Genset voltage sensing and Genset voltage regulation as follows:

- Voltage sensing is integrated into PCC3300 via three phase line-to-line sensing that is compatible with shunt or PMG excitation systems
- Automatic voltage regulation is accomplished by using a three phase fully rectified input and has a FET output for good motor starting capability.

Major features of generator control include:

Digital output voltage regulation - Capable of regulating output voltage to within $\pm 1.0\%$ for any loads between no load and full load. Voltage drift will not exceed $\pm 1.5\%$ for a 40 °C (104 °F) change in temperature in an eight-hour period. On engine starting or sudden load acceptance, voltage is controlled to a maximum of 5% overshoot over nominal level.

The automatic voltage regulator feature can be disabled to allow the use of an external voltage regulator.

Droop voltage regulation - Control can be adjusted to droop from 0-10% from no load to full load.

Torque-matched V/Hz overload control - The voltage roll-off set point and rate of decay (i.e. the slope of the V/Hz curve) is adjustable in the control.

Fault current regulation - PowerCommand® will regulate the output current on any phase to a maximum of three times rated current under fault conditions for both single phase and three phase faults. In conjunction with a permanent magnet generator, it will provide three times rated current on all phases for motor starting and short circuit coordination purpose.

Cylinder Cut-off System (CCS): PCC 3300 supports Cylinder Cut-off System which is used to operate the engines on half bank at no load and light load conditions. CCS has the following benefits on engine

performance- improved emission standards, improved fuel efficiency, reduced hydrocarbons, reduced white smoke, reduced wet stacking and higher exhaust temperature at light loads to improve turbocharger operations and catalyst performance.

Step Timing Control (STC): PCC 3300 supports STC functionality which is used to advance the engine timing of a hydro-mechanical engine during start up and light load conditions. During ADVANCED injection timing, it:

- Improves cold weather idling characteristics
- Reduces cold weather white smoke
- Improves light load fuel economy
- Reduces injector carboning

Paralleling Functions

First Start Sensor™ system – PowerCommand® provides a unique control function that positively prevents multiple gensets from simultaneously closing to an isolated bus under black start conditions. The First Start Sensor system is a communication system between the gensets that allows the gensets to work together to determine which genset a system should be the first to close to the bus. The system includes an independent backup function, so that if the primary system is disabled the required functions are still performed.

Synchronizing – Control incorporates a digital synchronizing function to force the genset to match the frequency, phase and voltage of another source such as a utility grid. The synchronizer includes provisions to provide proper operation even with highly distorted bus voltage waveforms. The synchronizer can match other sources over a range of 60-110% of nominal voltage and -24 to +6 hertz. The synchronizer function is configurable for slip frequency synchronizing for applications requiring a known direction of power flow at instant of breaker closure or for applications where phase synchronization performance is otherwise inadequate.

Load sharing control – The genset control includes an integrated load sharing control system for both real (kW) and reactive (kVar) loads when the genset(s) are operating on an isolated bus. The control system determines kW load on the engine and kVar load on the alternator as a percent of genset capacity, and then regulates fuel and excitation systems to maintain system and genset at the same percent of load without impacting voltage or frequency regulation. The control can also be configured for operation in droop mode for kW or kVar load sharing.

Load govern control– When PowerCommand® receives a signal indicating that the genset is paralleled with an infinite source such as a utility (mains) service, the genset will operate in load govern mode. In this mode the genset will synchronize and close to the bus, ramp to a pre-programmed kW and kVar load level, and then operate at that point. Control is adjustable for kW

values from 0-100% of standby rating, and 0.7-1.0 power factor (lagging). Default setting is 80% of standby and 1.0 power factor. The control includes inputs to allow independent control of kW and kVar load level by a remote device while in the load govern mode. The rate of load increase and decrease is also adjustable in the control. In addition, the control can be configured for operation in kW or kVAR load govern droop.

Load demand control – The control system includes the ability to respond to an external signal to initiate load demand operation. On command, the genset will ramp to no load, open its paralleling breaker, cool down, and shut down. On removal of the command, the genset will immediately start, synchronize, connect, and ramp to its share of the total load on the system.

Sync check – The sync check function decides when permissive conditions have been met to allow breaker closure. Adjustable criteria are: phase difference from 0.1-20 deg, frequency difference from 0.001-1.0 Hz, voltage difference from 0.5-10%, and a dwell time from 0.5-5.0 sec. Internally the sync check is used to perform closed transition operations. An external sync check output is also available.

Genset and utility/AC bus source AC metering – The control provides comprehensive three phase AC metering functions for both monitored sources, including: 3-phase voltage (L-L and L-N) and current, frequency, phase rotation, individual phase and totalized values of kW, kVAR, kVA and Power Factor; totalized positive and negative kW-hours, kVAR-hours, and kVA-hours. Three wire or four wire voltage connection with direct sensing of voltages to 600V, and up to 45kV with external transformers. Current sensing is accomplished with either 5 amp or 1 CT secondaries and with up to 10,000 amp primary. Maximum power readings are 32,000kW/kVAR/kVA.

Power transfer control – provides integrated automatic power transfer functions including source availability sensing, genset start/stop and transfer pair monitoring and control. The transfer/retransfer is configurable for open transition, fast closed transition (less than 100msec interconnect time), or soft closed transition (load ramping) sequences of operation. Utility source failure will automatically start genset and transfer load, retransferring when utility source returns. Test will start gensets and transfer load if test with load is enabled. Sensors and timers include:

Under voltage sensor: 3-phase L-N or L-L under voltage sensing adjustable for pickup from 85-100% of nominal. Dropout adjustable from 75-98% of pickup. Dropout delay adjustable from 0.1-30 sec.

Over voltage sensor: 3-phase L-N or L-L over voltage sensing adjustable for pickup from 95-99% of dropout. Dropout adjustable from 105-135% of nominal. Dropout delay adjustable from 0.5-120 sec. Standard configuration is disabled and is configurable to enabled in the field using the HMI or InPower service tools.

Over/Under frequency sensor: Center frequency adjustable from 45-65 Hz. Dropout bandwidth adjustable from 0.3-5% of center frequency beyond pickup bandwidth. Pickup bandwidth adjustable from 0.3-20% of center frequency. Field configurable to enable.

Loss of phase sensor: Detects out of range voltage phase angle relationship. Field configurable to enable.

Phase rotation sensor: Checks for valid phase rotation of source. Field configurable to enable.

Breaker tripped: If the breaker tripped input is active, the associated source will be considered as unavailable.

Timers: Control provides adjustable start delay from 0 - 300sec, stop delay from 0 - 800sec, transfer delay from 0-120sec, retransfer delay from 0-1800sec, programmed transition delay from 0-60sec, and maximum parallel time from 0-1800sec.

Negative Sequence Current Protection: PCC3300 supports this protection natively in order to determine if the generator is at any point was running subject to negative phase sequencing.

Breaker control – Utility and Genset breaker interfaces include separate relays for opening and closing breaker, as well as inputs for both 'a' and 'b' breaker position contacts and tripped status. Breaker diagnostics include Contact Failure, Fail to Close, Fail to Open, Fail to Disconnect, and Tripped. Upon breaker failure, appropriate control action is taken to maintain system integrity.

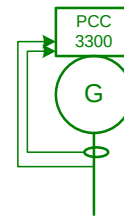
Exerciser clock –The exerciser clock (when enabled) allows the system to be operated at preset times in either test without load, test with load, or extended parallel mode. A Real Time Clock is built in. Up to 12 different programs can be set for day of week, time of day, duration, repeat interval, and mode. For example, a test with load for 1 hour every Tuesday at 2AM can be programmed. Up to 6 different exceptions can also be set up to block a program from running during a specific date and time period.

Extended paralleling – In extended paralleling mode (when enabled) the controller will start the genset and parallel to a utility source and then govern the real and reactive power output of the genset based on the desired control point. The control point for the real power (kW) can be configured for either the genset metering point ("Base Load") or the utility metering point ("Peak Shave"). The control point for the reactive power (kVAR or Power Factor) can also be independently configured for either the genset metering point or the utility metering point. This flexibility would allow base kW load from the genset while maintaining the utility power factor at a reasonable value to avoid

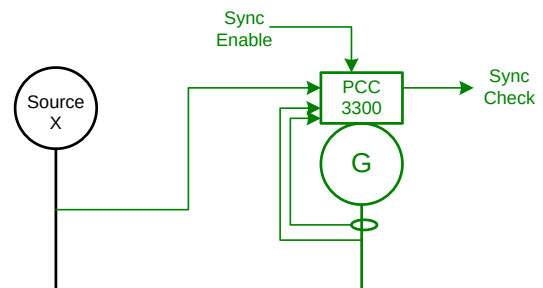
penalties due to low power factor. The System always operates within genset ratings. The control point can be changed while the system is in operation. Set points can be adjusted via hardwired analog input or adjusted through an operator panel display or service tool.

Application types – Controller is configured to operating in one of six possible application types. These topologies are often used in combinations in larger systems, with coordination of the controllers in the system either by external device or by interlocks provided in the control. Topologies that may be selected in the control include:

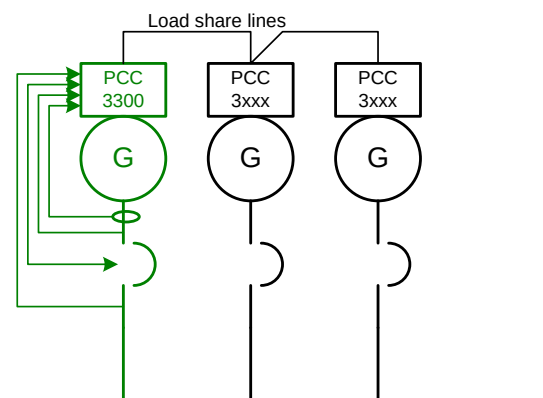
Standalone: Control provides monitoring, protection and control in a non-paralleling application.



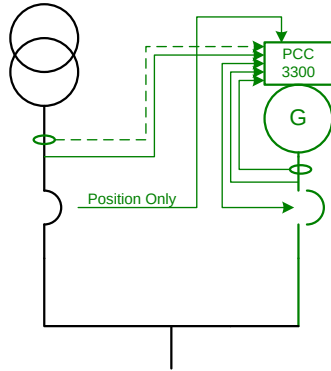
Synchronizer only: control will synchronize the genset to other source when commanded to either via a hardwired or Modbus driven input.



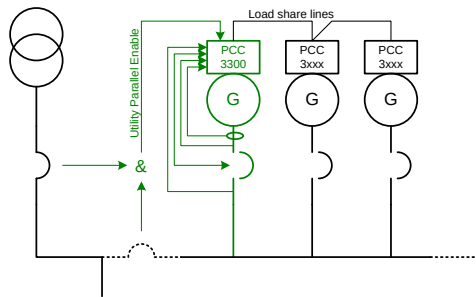
Isolated Bus: allows the genset to perform a dead bus closure or synchronize to the bus and isochronously share kW and kVAR loads with other gensets.



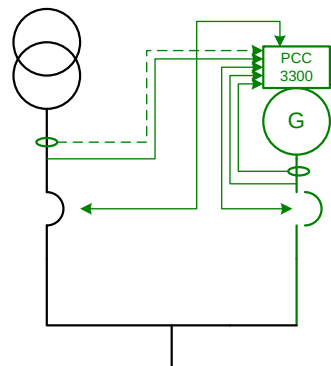
Utility Single: Control monitors one genset and utility. The control will automatically start and provide power to a load if the utility fails. The control will also resynchronize the genset back to the utility and provides extended paralleling capabilities.



Utility Multiple: Supports all functionality of Isolated Bus and provides extended paralleling to the utility. Extended paralleling load set points follow a constant setting; dynamically follow an analog input, Modbus register or HMI.

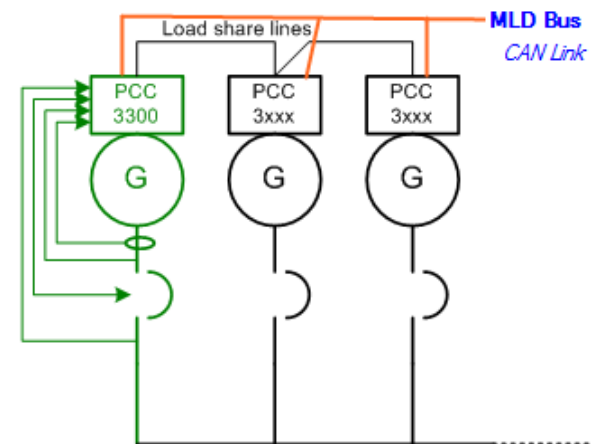
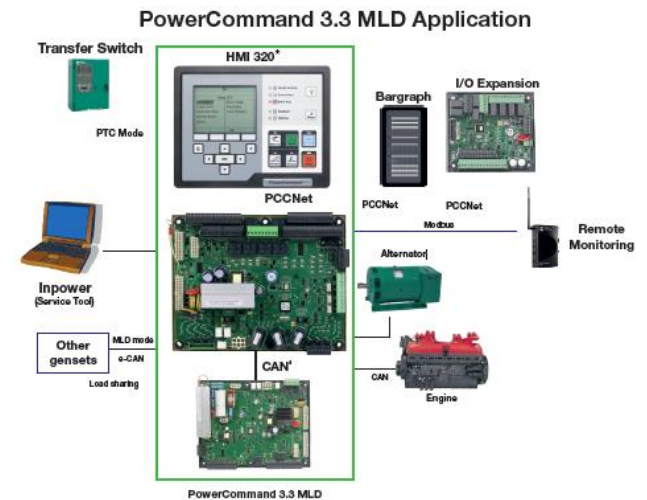


Power Transfer Control: Control operates a single genset/single utility transfer pair in open transition, fast closed transition, or soft closed transition. Extended paralleling functionality also provides base load and peak shave options.



Masterless Load Demand (Optional Feature):

PowerCommand® 3.3 with Masterless Load Demand (MLD) technology enables generator sets to start/stop automatically based on load demand. Masterless Load Demand-capable generators are equipped with an additional s-CAN network connection that allows sharing of information amongst paralleled generator sets. MLD has been designed for hassle-free installation, commissioning and operation. MLD functionality. Integrated on-board system logic provides the MLD topology control without the need for any additional system.



PCC3300 External Voltage and Frequency Biasing Inputs

PCC3300 supports externally driven voltage and frequency biasing capability in order to permit external paralleling (if intending to use this feature please contact your local distributor for further information).

Protective Functions

On operation of a protective function the control will indicate a fault by illuminating the appropriate status LED on the HMI, as well as display the fault code and fault description on the LCD. The nature of the fault and time of occurrence are logged in the control. The service manual and InPower service tool provide service keys and procedures based on the service codes provided. Protective functions include:

Battle short mode

When enabled and the *battle short* switch is active, the control will allow some shutdown faults to be bypassed. If a bypassed shutdown fault occurs, the fault code and description will still be annunciated, but the genset will not shutdown. This will be followed by a *fail to shutdown* fault. Emergency stop shutdowns and others that are critical for proper operation (or are handled by the engine ECM) are not bypassed. Please refer to the Control Application Guide or Manual for list of these faults.

Derate

The Derate function reduces output power of the genset in response to a fault condition. If a Derate command occurs while operating on an isolated bus, the control will issue commands to reduce the load on the genset via contact closures or Modbus. If a Derate command occurs while in utility parallel mode, the control will actively reduce power by lowering the base load kW to the derated target kW.

Configurable alarm and status inputs

The control accepts up to four alarm or status inputs (configurable contact closed to ground or open) to indicate a configurable (customer-specified) condition.

The control is programmable for warning, derate, shutdown, shutdown with cooldown or status indication and for labeling the input.

Emergency stop

Annunciated whenever either emergency stop signal is received from external switch.

General prime mover protection

Low and high battery voltage warning - Indicates status of battery charging system (failure) by continuously monitoring battery voltage.

Weak battery warning - The control system will test the battery each time the genset is signaled to start and indicate a warning if the battery indicates impending failure.

Low coolant level warning – Can be set up to be a warning or shutdown.

Low coolant temperature warning – Indicates that engine temperature may not be high enough for a 10 second start or proper load acceptance.

Fail to start (overcrank) shutdown - The control system will indicate a fault if the genset fails to start by the completion of the engine crank sequence.

Fail to crank shutdown - Control has signaled starter to crank engine but engine does not rotate.

Cranking lockout - The control will not allow the starter to attempt to engage or to crank the engine when the engine is rotating.

Fault simulation –The control in conjunction with InPower software, will accept commands to allow a technician to verify the proper operation of the control and its interface by simulating failure modes or by forcing the control to operate outside of its normal operating ranges. InPower also provides a complete list of faults and settings for the protective functions provided by the controller.

For Lean Burn Natural Gas Engine applications:

Off load running (protection) – This feature protects the engine in the event the genset is being called to go off load for too long.

Hydro Mechanical fuel system engine protection:

Overspeed shutdown – Default setting is 115% of nominal

Low lube oil pressure warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

High lube oil temperature warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

High engine temperature warning/shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

Low coolant temperature warning – Indicates that engine temperature may not be high enough for a 10 second start or proper load acceptance.

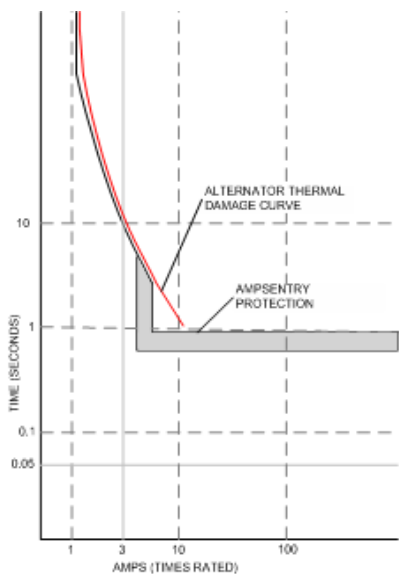
High intake manifold temperature shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

Full authority electronic engine protection:

Engine fault detection is handled inside the engine ECM. Fault information is communicated via the SAE-J1939 data link for annunciation in the HMI.

Alternator Protection

AmpSentry protective relay - A comprehensive monitoring and control system integral to the PowerCommand® Control System that guards the electrical integrity of the alternator and power system by providing protection against a wide array of fault conditions in the genset or in the load. It also provides single and three phase fault current regulation (3x Current) so that downstream protective devices have the maximum current available to quickly clear fault conditions without subjecting the alternator to potentially catastrophic failure conditions. Thermal damage curve (3 phase short) or fixed timer (2sec for 1P short, 5sec for 2P short). See document R1053 for a full-size time over current curve. The control does not include protection required for interconnection to a utility (mains) service.



AmpSentry Maintenance Mode (AMM) - Instantaneous tripping, if AmpSentry Maintenance mode is active (50mS response to turn off AVR excitation/shutdown genset) for arc flash reduction when personnel are near genset.

High AC voltage shutdown (59) - Output voltage on any phase exceeds preset values. Time to trip is inversely proportional to amount above threshold. Values adjustable from 105-125% of nominal voltage, with time delay adjustable from 0.1-10 seconds. Default value is 110% for 10 seconds.

Low AC voltage shutdown (27) - Voltage on any phase has dropped below a preset value. Adjustable over a range of 50-95% of reference voltage, time delay 2-20 seconds. Default value is 85% for 10 seconds. Function tracks reference voltage. Control does not nuisance trip when voltage varies due to the control directing voltage to drop, such as during a V/Hz roll-off or synchronizing.

Under frequency shutdown (81 u) - Genset output frequency cannot be maintained. Settings are adjustable from 2-10 Hz below reference governor set point, for a 5-20 second time delay. Default: 6 Hz, 10 seconds. Under frequency protection is disabled when excitation is switched off, such as when engine is operating in idle speed mode.

Over frequency shutdown/warning (81o) - Genset is operating at a potentially damaging frequency level. Settings are adjustable from 2-10 Hz above nominal governor set point for a 1-20 second time delay. Default: 6 Hz, 20 seconds, disabled.

Overcurrent warning/shutdown (51) - Implementation of the thermal damage curve with instantaneous trip level calculated based on current transformer ratio and application power rating.

Loss of sensing voltage shutdown - Shutdown of genset will occur on loss of voltage sensing inputs to the control.

Field overload shutdown - Monitors field voltage to shutdown genset when a field overload condition occurs.

Over load (kW) warning - Provides a warning indication when engine is operating at a load level over a set point. Adjustment range: 80-140% of application rated kW, 0-120 second delay. Defaults: 105%, 60 seconds.

Reverse power shutdown (32) - Adjustment range: 5-20% of standby kW rating, delay 1-15 seconds. Default: 10%, 3 seconds.

Reverse Var shutdown (40) - Shutdown level is adjustable: 15-50% of rated Var output, delay 10-60 seconds. Default: 20%, 10 seconds.

Short circuit protection - Output current on any phase is more than 175% of rating and approaching the thermal damage point of the alternator. Control includes algorithms to protect alternator from repeated over current conditions over a short period of time.

Negative sequence overcurrent warning (46) - Control protects the generator from damage due to excessive imbalances in the three phase load currents and/or power factors.

Custom overcurrent warning/shutdown (51) - Control provides the ability to have a custom time overcurrent protection curve in addition to the AmpSentry protective relay function.

Ground fault overcurrent (51G) - Control detects a ground fault either by an external ground fault relay via a contact input or the control can measure the ground current from an external current transformer. Associated time delays and thresholds are adjustable via InPower or HMI.

Paralleling Protection

Breaker fail to close Warning: When the control signals a circuit breaker to close, it will monitor the breaker auxiliary contacts and verify that the breaker has closed. If the control does not sense a breaker closure within an adjustable time period after the close signal, the fail to close warning will be initiated.

Breaker fail to open warning: The control system monitors the operation of breakers that have been signaled to open. If the breaker does not open within an adjustable time delay, a Breaker Fail to Open warning is initiated.

Breaker position contact warning: The controller will monitor both 'a' and 'b' position contacts from the breaker. If the contacts disagree as to the breaker position, the breaker position contact warning will be initiated.

Breaker tripped warning: The control accepts inputs to monitor breaker trip / bell alarm contact and will initiate a breaker tripped warning if it should activate.

Fail to disconnect warning: In the controller is unable to open either breaker, a fail to disconnect warning is initiated. Typically, this would be mapped to a configurable output, allowing an external device to trip a breaker.

Fail to synchronize warning: Indicates that the genset could not be brought to synchronization with the bus. Configurable for adjustable time delay of 10 -900 seconds, 120 default.

Phase sequence sensing warning: Verifies that the genset phase sequence matches the bus prior to allowing the paralleling breaker to close.

Maximum parallel time warning (power transfer control mode only): During closed transition load transfers, control independently monitors paralleled time. If time is exceeded, warning is initiated and genset is disconnected.

Bus or genset PT input calibration warning: The control system monitors the sensed voltage from the bus and genset output voltage potential transformers. When the paralleling breaker is closed, it will indicate a warning condition if the read values are different.

Field Control Interface

Input signals to the PowerCommand® control include:

- Coolant level (where applicable)
- Fuel level (where applicable)
- Remote emergency stop
- Remote fault reset
- Remote start
- Rupture basin
- Start type signal
- Battle short
- Load demand stop
- Synchronize enable
- Genset circuit breaker inhibit
- Utility circuit breaker inhibit
- Single mode verify
- Transfer inhibit – prevent transfer to utility (in power transfer control mode)
- Retransfer inhibit – prevent retransfer to genset (in power transfer control mode)
- kW and kVAR load setpoints

Configurable inputs - Control includes (4) input signals from customer discrete devices that are configurable for warning, shutdown or status indication, as well as message displayed

Input signals for Lean Burn Natural Gas Engine applications:

- Gearbox oil pressure/temperature protection
- Fire fault
- Earth fault support as a discrete input via an appropriate secondary detection device
- Differential fault
- DC power supply fault
- Genset Interface Box (GIB) isolator open fault
- Start inhibit/enable (x3)
- Radiator fan trip
- Ventilator fan trip
- Ventilation louvers closed
- Start system trip
- Alternator heater trip
- Alternator heater status
- Alternator winding temperature (PT100 RTDx3)
- Alternator drive end bearing temperature (PT100 RTD)
- Alternator non-drive end bearing temperature (PT100 RTD)

Output signals from the PowerCommand® control include:

- Load dump signal: Operates when the genset is in an overload condition.
- Delayed off signal: Time delay-based output which will continue to remain active after the control has removed the run command. Adjustment range: 0 - 120 seconds. Default: 0 seconds.

- Configurable relay outputs: Control includes (4) relay output contacts (3 A, 30VDC). These outputs can be configured to activate on any control warning or shutdown fault as well as ready to load, not in auto, common alarm, common warning and common shutdown.
- Ready to load (genset running) signal: Operates when the genset has reached 90% of rated speed and voltage and latches until genset is switched to off or idle mode.
- Paralleling circuit breaker relays outputs: Control includes (4) relay output contacts (3.5A, 30 VDC) for opening and closing of the genset and utility breakers.

Output Signals for Lean Burn Natural Gas Engine applications:

- Start inhibit/enable event
- Emergency stop event
- Ventilator fan run control
- Louvre control
- Radiator fan control
- Alternator heater control
- Engine at idle speed event

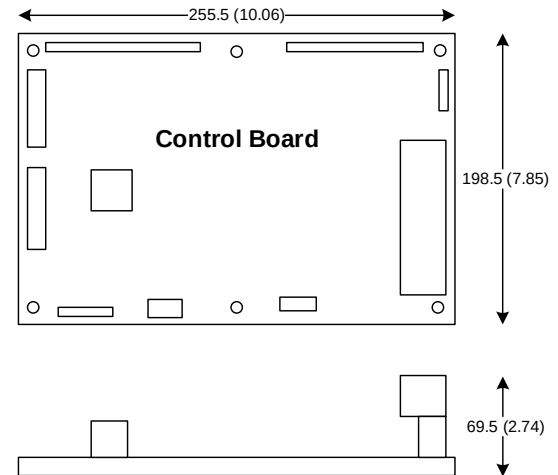
Communications connections include:

- PC tool interface: This RS-485 communication port allows the control to communicate with a personal computer running InPower software.
- Modbus RS-485 port: Allows the control to communicate with external devices such as PLCs using Modbus protocol.

Note - An RS-232 or USB to RS-485 converter is required for communication between PC and control.

- Networking: This RS-485 communication port allows connection from the control to the other Cummins Power Generation products.

Mechanical Drawing



PowerCommand® Human Machine Interface HMI320



Description

This control system includes an intuitive operator interface panel that allows for complete genset control as well as system metering, fault annunciation, configuration and diagnostics. The interface includes five genset status LED lamps with both internationally accepted symbols and English text to comply with customer's needs. The interface also includes an LED backlit LCD display with tactile feel soft-switches for easy operation and screen navigation. It is configurable for units of measurement and has adjustable screen contrast and brightness.

The *run/off/auto* switch function is integrated into the interface panel.

All data on the control can be viewed by scrolling through screens with the navigation keys. The control displays the current active fault and a time-ordered history of the five previous faults.

Features:

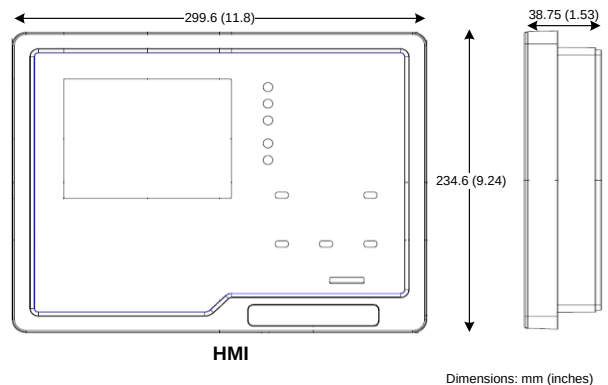
- LED indicating lamps
 - genset running
 - remote start
 - not in auto
 - shutdown
 - warning
 - auto
 - manual and stop
 - Circuit breaker open (if equipped)
 - Circuit breaker closed (if equipped)
- 320 x 240 pixels graphic LED backlight LCD.
- Four tactile feel membrane switches for LCD defined operation. The functions of these switches are defined dynamically on the LCD.
- Seven tactile feel membrane switches dedicated screen navigation buttons for up, down, left, right, ok, home and cancel.

- Six tactile feel membrane switches dedicated to control for auto, stop, manual, manual start, fault reset and lamp test/panel lamps.
- Two tactile feel membrane switches dedicated to control of circuit breaker (where applicable).
- Allows for complete genset control setup.
- Certifications: Suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., UKCA and CE standards.
- Languages supported: English, Spanish, French, German, Italian, Greek, Portuguese, Finnish, Norwegian, Danish, Russian (Cyrillic), Chinese, Hungarian, Japanese, Polish, Korean, Romanian, Brazilian Portuguese, Turkish, Dutch, and Czech

Communications connections include:

- PC tool interface - This RS-485 communication port allows the HMI to communicate with a personal computer running InPower.
- This RS-485 communication port allows the HMI to communicate with the main control board.

Mechanical Drawing



Software

InPower (beyond 6.5 version) is a PC-based software service tool that is designed to directly communicate to PowerCommand® gensets and transfer switches, to facilitate service and monitoring of these products.

Environment

The control is designed for proper operation without recalibration in ambient temperatures from -40 °C (-40 °F) to +70 °C (158 °F), and for storage from -55 °C (-67 °F) to +80 °C (176 °F). Control will operate with humidity up to 95%, non-condensing.

The HMI is designed for proper operation in ambient temperatures from -20 °C (-4 °F) to +70 °C (158 °F), and for storage from -30 °C (-22 °F) to +80 °C (176 °F).

The control board is fully encapsulated to provide superior resistance to dust and moisture. Display panel has a single membrane surface, which is impervious to effects of dust, moisture, oil and exhaust fumes. This panel uses a sealed membrane to provide long reliable service life in harsh environments.

The control system is specifically designed and tested for resistance to RFI/EMI and to resist effects of vibration to provide a long reliable life when mounted on a genset. The control includes transient voltage surge suppression to provide compliance to referenced standards.

Certifications

PowerCommand® meets or exceeds the requirements of the following codes and standards:

- NFPA 110 for level 1 and 2 systems.
- ISO 8528-4:2005 compliance, controls and switchgear (second edition)
- CE marking: The CE marking is only valid when equipment is used in a fixed installation application. Material compliance declaration is available upon request.
- UKCA marking- The UKCA marking is only valid when equipment is used in a fixed installation application. Material compliance declaration is available upon request.
- EN 61000-6-3,4 residential/light industrial emissions or industrial emissions.
- EN 50082-1,2 residential/light industrial or industrial susceptibility.
- ISO 7637-2, level 2; DC supply surge voltage test.
- Mil Std 202C, Method 101 and ASTM B117: Salt fog test.
- UL 6200 recognized, suitable for use on UL 2200 Listed generator sets.
- CSA C282-M1999 compliance
- CSA 22.2 No. 14 M91 industrial controls.
- PowerCommand® control systems and generator sets are designed and manufactured in ISO 9001 certified facilities.
- ROHS (Restriction of Hazardous substance) complaint both for HMI 320 & PCC3300v2.

Reference Documents

Please refer to the following reference documents available in the PowerSuite library:

- PowerCommand™ 3.3. Application Guide
- T-037: PowerCommand Control Application Manual (ANSI Protective Functions)
- T-040: PowerCommand 3.3 Paralleling Application Guide

Please refer to the following reference documents available on Cummins Quickserve:

- Service Manuals for PC3.3 (non-MLD) and PC3.3 (MLD)
- Modbus Register Mapping

Warranty

All components and subsystems are covered by an express limited one-year warranty. Other optional and extended factory warranties and local distributor maintenance agreements are available.





Alternator Data Sheet

Frame Size: S9L1D-E4

Characteristics													
		No of Bearings:		1-bearing		2-bearing							
Weights:		Stator assembly:		N/A	N/A	7782 lb	3530 kg						
		Rotor assembly:		N/A	N/A	5262 lb	2387 kg						
		Complete assembly:		N/A	N/A	15542 lb	7050 kg						
Maximum speed:		2250 rpm											
Excitation current:		Full load:		Wdg 312: 4; Wdg 607: 3.9, Wdg 613: 3.9									
		No load:		Wdg 312: 1-0.9; Wdg 607: 1.0, Wdg 613: 0.9									
Insulation system:		Class H throughout											
3 Ø Ratings (0.8 power factor)			60 Hz (winding no)										
			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)			
			150° C rise ratings	@ 40° C	kW	3072	3248	3396	3544	3545	3200	3200	3200
					kVA	3840	4060	4245	4430	4431	4000	4000	4000
			125° C rise ratings	@ 40° C	kW	2872	3040	3175	3314	3315	3000	3000	3000
					kVA	3590	3800	3969	4142	4144	3750	3750	3750
			105° C rise ratings	@ 40° C	kW	2680	2840	2968	3097	3100	2760	2760	2760
					kVA	3350	3550	3710	3871	3875	3450	3450	3450
			80° C rise ratings	@ 40° C	kW	2332	2468	2579	2691	2700	2425	2425	2425
					kVA	2915	3085	3224	3364	3375	3031	3031	3031
			Reactances (per unit ± 10%)			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)
			(Based on full load at 125° C rise rating)										
			Synchronous			2.454	2.322	2.219	2.126	1.960	2.090	1.886	1.744
			Transient			0.231	0.219	0.209	0.200	0.173	0.230	0.207	0.191
			Subtransient			0.156	0.148	0.141	0.135	0.120	0.136	0.122	0.113
			Negative sequence			0.218	0.207	0.198	0.189	0.170	0.173	0.156	0.144
Zero sequence			0.089	0.084	0.080	0.077	0.064	0.006	0.005	0.005			
Motor starting			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)			
Maximum kVA (90% sustained voltage)			11520	12180	12735	13290	13293	11250	11250	11250			
Time constants (sec)			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)			
Transient			0.24	0.24	0.24	0.24	0.23	0.363	0.363	0.363			
Subtransient			0.0163	0.0163	0.0163	0.0163	0.0184	0.017	0.017	0.017			
Open circuit			4.16	4.16	4.16	4.16	4.25	3.477	3.477	3.477			
DC			0.034	0.034	0.034	0.034	0.039	0.025	0.025	0.025			
Windings (@22° C)			<u>416</u> (312)	<u>440</u> (312)	<u>460</u> (312)	<u>480</u> (312)	<u>600</u> (607)	<u>380</u> (613)	<u>400</u> (613)	<u>416</u> (613)			
Stator resistance		(L-L Ohms)	0.00066	0.00066	0.00066	0.00066	0.00096	0.0004	0.0004	0.0004			
Rotor resistance		(Ohms)	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56			
Number of leads			6	6	6	6	6	6	6	6			



Alternator Data Sheet

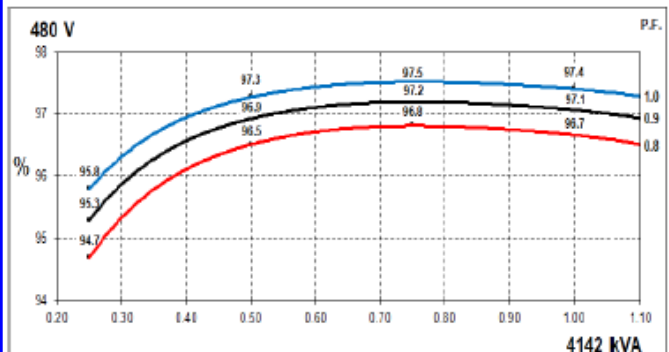
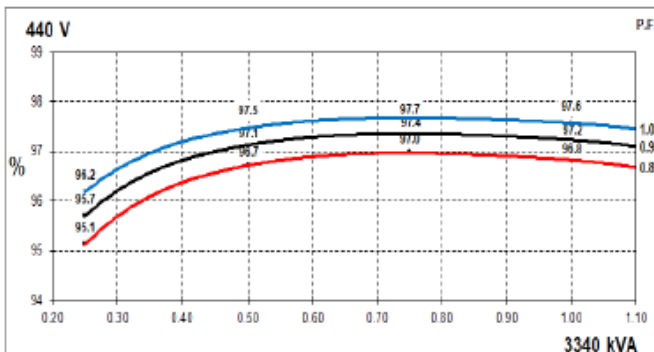
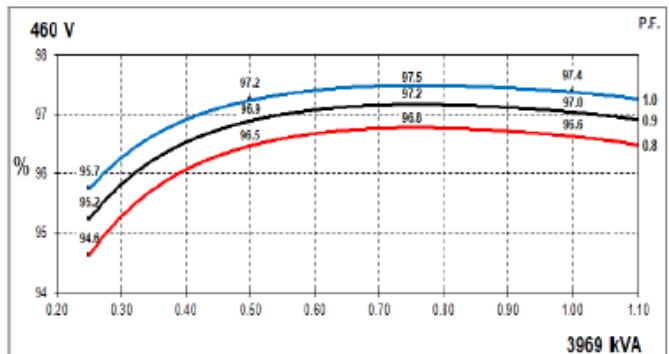
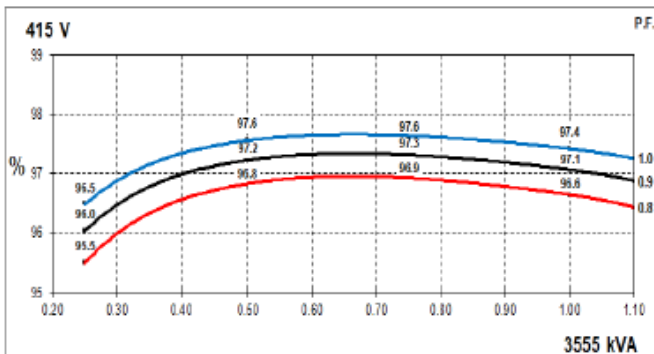
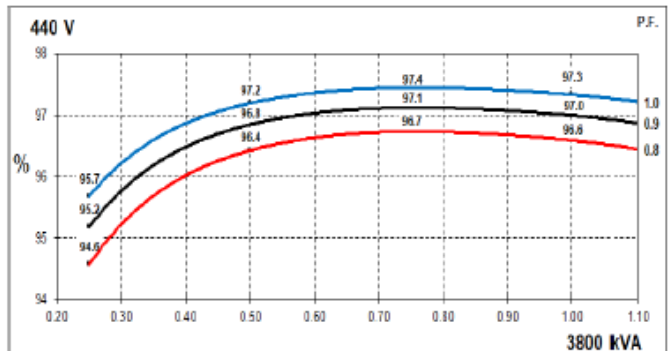
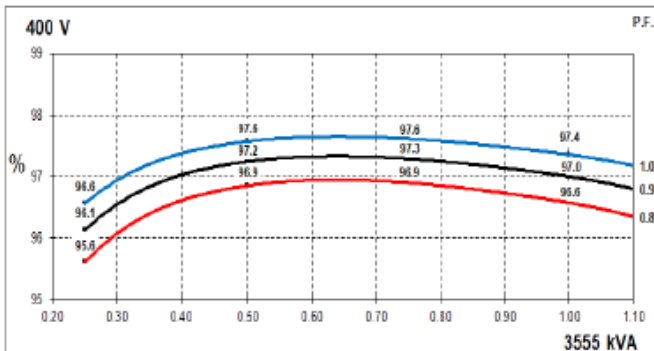
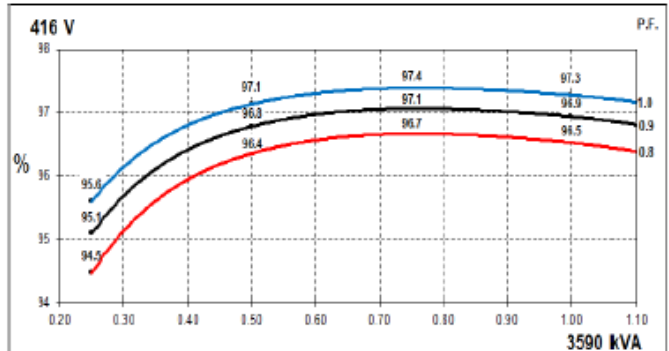
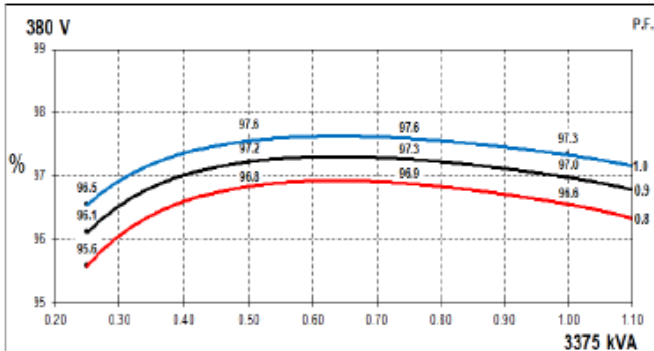
Frame Size: S9L1D-E4

S9L1D-E4 Wdg.312

THREE PHASE EFFICIENCY CURVES

50Hz

60Hz



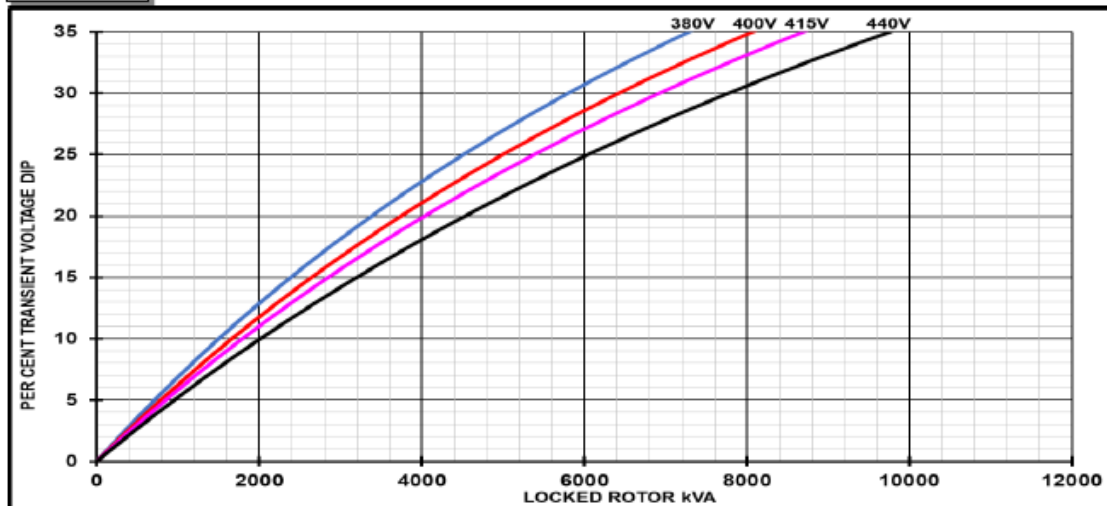


Alternator Data Sheet Frame Size: S9L1D-E4

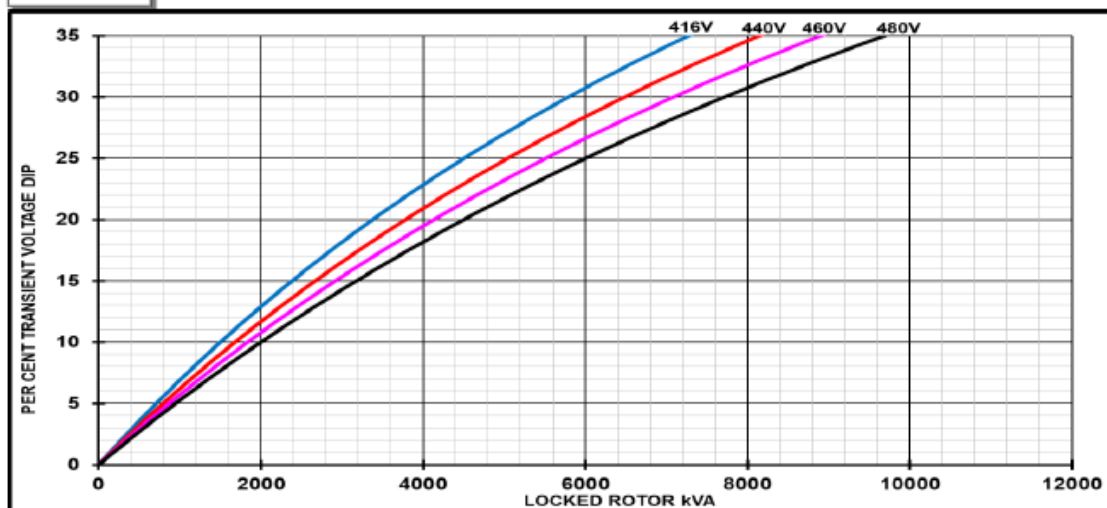
S9L1D-E4 Wdg.312

Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor	Lagging PF	Scaling Factor
<= 0.4	1.00	<= 0.4	1.25
0.5	0.95	0.5	1.20
0.6	0.90	0.6	1.15
0.7	0.86	0.7	1.10
0.8	0.83	> 0.7	1.00
0.9	0.75		
0.95	0.70		
1	0.65		

Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.

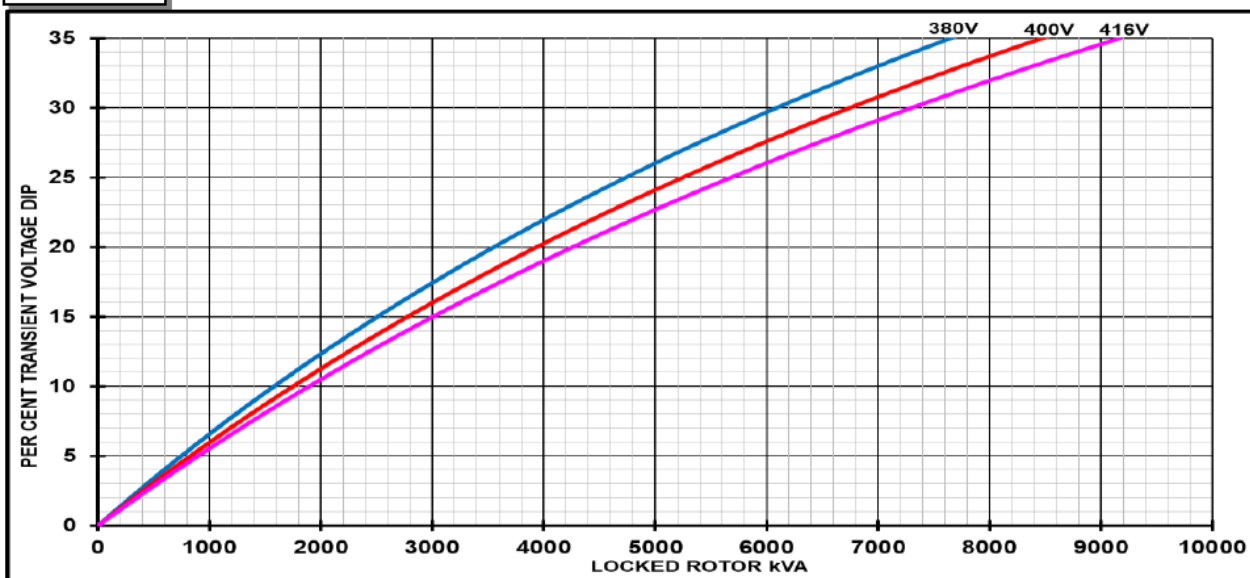


Alternator Data Sheet Frame Size: S9L1D-E4

S9L1D-E4 Wdg.613

Locked Rotor Motor Starting Curves - Separately Excited

60Hz



Transient Voltage Dip Scaling Factor		Transient Voltage Rise Scaling Factor	
Lagging PF	Scaling Factor	Lagging PF	Scaling Factor
<= 0.4	1.00	<= 0.4	1.25
0.5	0.95	0.5	1.20
0.6	0.90	0.6	1.15
0.7	0.86	0.7	1.10
0.8	0.83	> 0.7	1.00
0.9	0.75		
0.95	0.70		
1	0.65		

Note: To determine % Transient Voltage Dip or Voltage Rise at various PF, multiply the % Voltage Dip from the curve directly by the Scaling Factor.



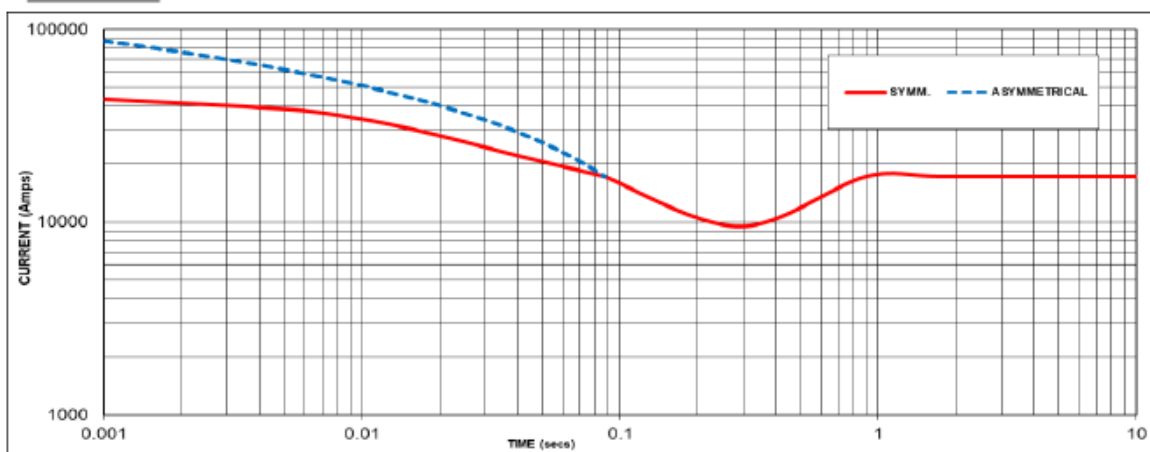
Alternator Data Sheet

Frame Size: S9L1D-E4

S9L1D-E4 Wdg.312

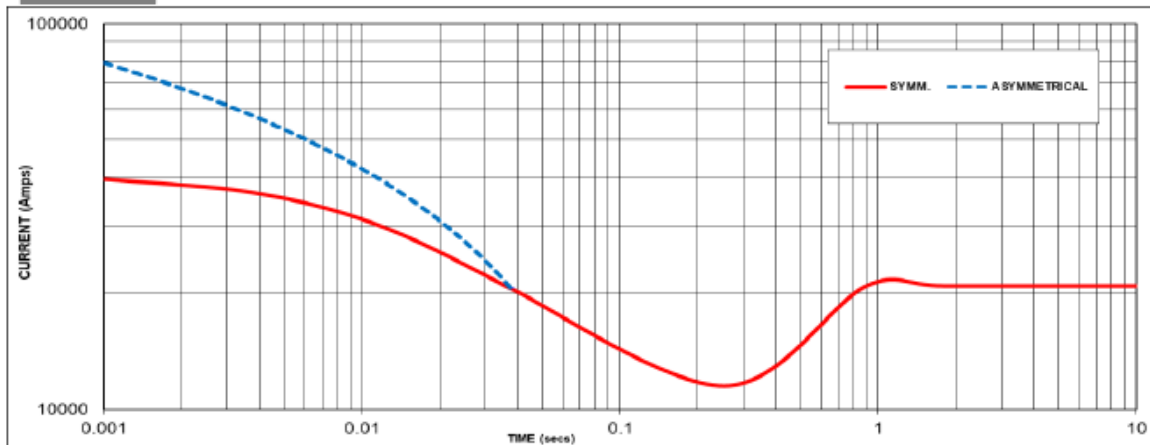
Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz



60Hz

Sustained Short Circuit = 17262 Amps



Sustained Short Circuit = 20954 Amps

Note 1

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

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380V	X 1.00	416V	X 1.00
400V	X 1.05	440V	X 1.06
415V	X 1.09	460V	X 1.11
440V	X 1.16	480V	X 1.15

The sustained current value is constant irrespective of voltage level

Note 2

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

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

Note 3

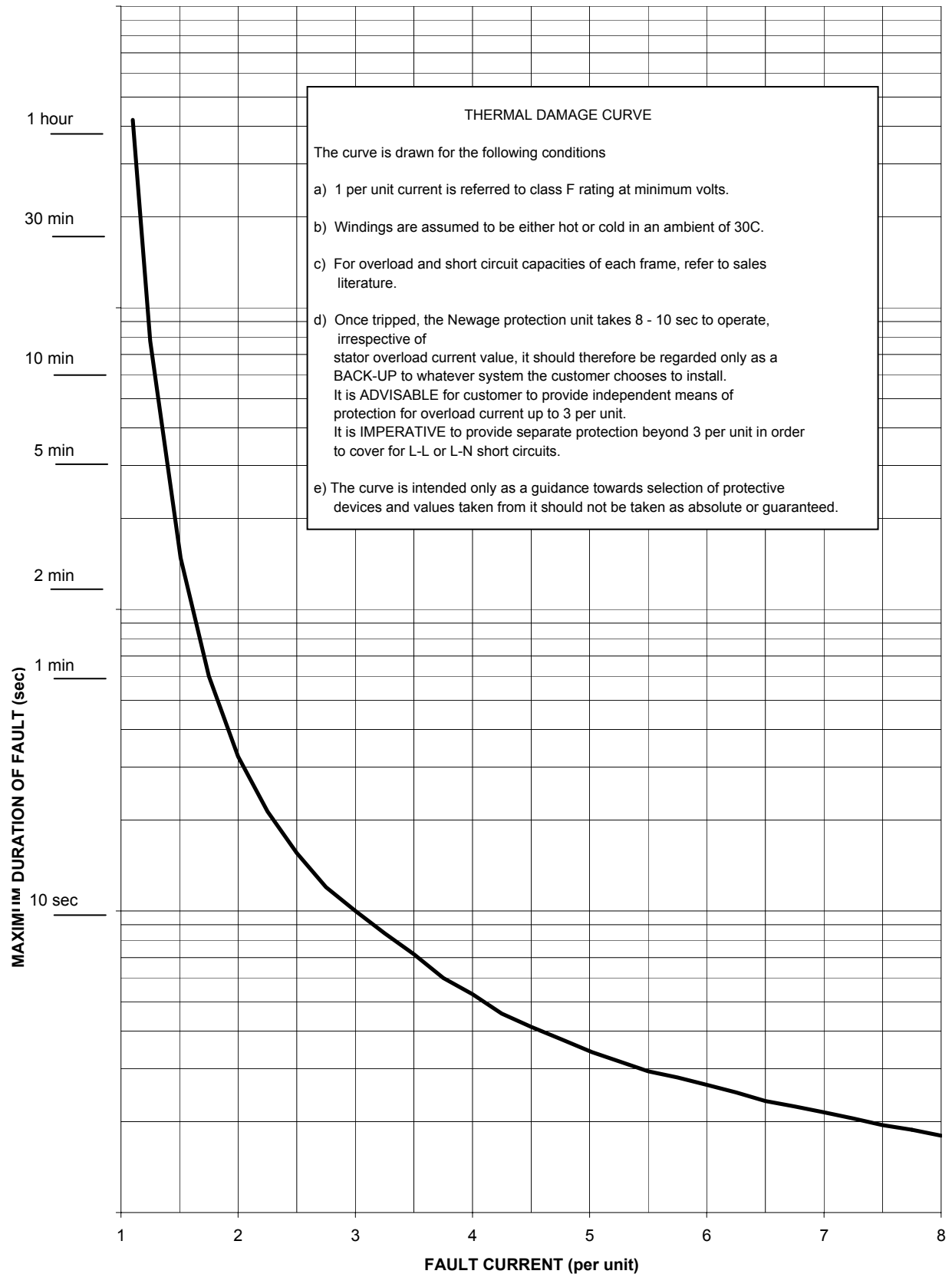
All other times are unchanged

Curves are drawn for Star connections under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :

Parallel Star = Curve current value X 2

Series Delta = Curve current value X 1.732

THERMAL DAMAGE CURVE





Cooling System Data

C3000D6EB

QSK78-G39

High Ambient Air Temperature Radiator Cooling System

	Fuel Type	Duty	Rating (kW)	Max cooling @ air flow static restriction, unhouse (inches water/mm water)					Housed in free air, no air discharge restriction
				0.0/0.0	0.25/6.4	0.5/12.7	0.75/19.1	1.0/25.4	Enclosed
				Maximum allowable ambient temperature, degree C					
60 Hz	Diesel	Standby	3000	56.1	53.1	50.1	47.2	44.3	N/A
		DCC	2750	58.5	56.1	53.7	50.4	47.1	N/A
				Airflow (m ³ /s) – Actual @ Fan					
				52.53	50.82	49.10	47.48	45.86	N/A

Enhanced High Ambient Air Temperature Radiator Cooling System

	Fuel Type	Duty	Rating (kW)	Max cooling @ air flow static restriction, unhouse (inches water/mm water)					Housed in free air, no air discharge restriction
				0.0/0.0	0.25/6.4	0.5/12.7	0.75/19.1	1.0/25.4	Enclosed
				Maximum allowable ambient temperature, degree C					
60 Hz	Diesel	Standby	3000	61.4	59.4	57.3	53.7	50.0	N/A
		DCC	2750	63.5	61.4	59.2	56.1	52.9	N/A
				Airflow (m ³ /s) – Actual @ Fan					
				64.35	61.71	59.06	56.99	54.91	N/A

Notes:

1. Data shown are anticipated cooling performance for typical generator set.
2. Cooling data is based on 1000 ft (305 m) site test location.
3. Generator set power output may need to be reduced at high ambient conditions. Consult generator set data sheet for derate schedules.
4. Cooling performance may be reduced due to several factors including but not limited to: Incorrect installation, improper operation, fouling of the cooling system, and other site installation variables.



Sound Data

C3000D6EB

QSK78-G39 60Hz Diesel

A-weighted Sound Pressure Level @ 7 meters, dB(A)

See notes 2, 5 and 7-11 listed below

Configuration	Exhaust	Applied Load	Position (Note 2)								8 Position Average
			1	2	3	4	5	6	7	8	
Standard – Unhoused (40°C Shipped Loose Cooling System)	Infinite Exhaust	0% Standby	89.3	96.0	92.8	94.3	91.4	94.4	95.5	96.1	94.2
		25% Standby	89.8	96.0	93.2	94.7	91.4	94.3	96.0	96.3	94.5
		50% Standby	90.6	96.7	94.6	95.6	92.0	95.4	96.5	97.0	95.3
		75% Standby	92.0	97.9	96.2	97.1	93.1	96.6	97.8	98.7	96.7
		100% Standby	93.2	99.3	97.7	98.6	94.4	98.4	98.7	100.2	98.1
		25% DCC	89.7	96.2	93.1	94.6	91.5	94.4	96.1	96.3	94.5
		50% DCC	90.4	96.7	94.6	95.5	92.0	95.4	96.3	96.7	95.1
		75% DCC	91.7	97.5	95.7	96.7	92.9	96.4	97.4	98.1	96.3
		100% DCC	92.7	98.7	97.2	98.0	93.9	97.6	98.4	99.4	97.5
Standard – Unhoused (40°C Shipped Loose Cooling System)	No Muffler	0% Standby	91.2	96.0	93.8	95.2	91.9	95.2	96.1	96.3	94.8
		25% Standby	93.8	97.8	95.4	96.4	92.6	96.7	98.0	98.0	96.5
		50% Standby	96.2	99.7	97.7	98.1	93.8	98.7	99.7	99.8	98.4
		75% Standby	99.0	101.8	100.1	100.2	96.0	101.2	101.6	102.7	100.7
		100% Standby	100.7	103.7	102.1	101.6	97.4	103.1	103.5	104.1	102.4
		25% DCC	93.6	97.6	95.4	96.3	92.5	96.5	97.7	97.9	96.3
		50% DCC	95.3	99.3	97.1	97.8	93.5	98.2	99.2	99.2	97.8
		75% DCC	98.3	101.4	99.7	99.7	95.3	100.7	101.3	102.0	100.2
		100% DCC	99.9	102.9	101.3	101.1	97.0	102.4	102.9	103.6	101.8
Standard – Unhoused (50°C Shipped Loose Cooling System)	Infinite Exhaust	0% Standby	90.9	96.5	93.8	95.5	92.8	95.2	96.6	97.1	95.2
		25% Standby	91.1	96.6	94.1	95.5	92.8	95.4	96.8	97.0	95.3
		50% Standby	91.7	97.3	95.3	96.4	93.2	96.3	97.2	97.8	96.0
		75% Standby	92.8	98.3	96.9	97.8	94.2	97.3	98.3	99.1	97.2
		100% Standby	94.1	99.9	98.1	99.3	95.3	98.7	99.6	100.3	98.6
		25% DCC	91.1	96.6	94.1	95.6	92.8	95.3	96.9	97.0	95.3
		50% DCC	91.5	97.1	95.1	96.2	93.1	96.1	97.0	97.3	95.8
		75% DCC	92.6	97.9	96.4	97.4	93.9	97.1	98.0	98.7	96.9
		100% DCC	93.6	99.1	97.7	98.8	94.9	98.3	99.1	99.9	96.1



Sound Data

C3000D6EB

QSK78-G39 60Hz Diesel

Average A-weighted Sound Pressure Level @ 1 meter, dB(A)

See notes 1, 5 and 7-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Pressure Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused (40°C Shipped Loose Cooling System)	Infinite Exhaust	0% Standby	N/A	N/A	67.0	84.0	90.4	95.1	94.5	91.9	87.7	79.8	66.3	99.8
		25% Standby	N/A	N/A	66.9	84.3	90.3	95.4	94.4	92.1	89.3	82.9	74.4	100.0
		50% Standby	N/A	N/A	67.3	84.6	90.8	95.3	95.1	93.4	90.2	90.0	74.1	100.9
		75% Standby	N/A	N/A	68.3	85.6	91.1	95.8	95.9	95.0	92.3	94.4	77.2	102.2
		100% Standby	N/A	N/A	69.4	86.8	91.6	96.7	97.0	96.5	94.3	97.7	78.5	103.9
		25% DCC	N/A	N/A	67.0	84.5	90.4	95.4	94.4	92.0	89.2	82.8	70.8	100.0
		50% DCC	N/A	N/A	67.3	84.7	90.8	95.5	95.0	93.1	90.1	89.1	73.8	100.8
		75% DCC	N/A	N/A	67.8	85.3	91.0	95.6	95.6	94.6	91.6	93.7	76.3	101.9
		100% DCC	N/A	N/A	69.2	86.3	91.3	96.3	96.6	96.0	93.6	96.3	77.9	103.2
Standard – Unhoused (40°C Shipped Loose Cooling System)	No Muffler	0% Standby	N/A	N/A	68.6	86.8	92.0	96.1	95.2	93.1	89.1	80.7	66.9	100.8
		25% Standby	N/A	N/A	70.5	87.7	94.6	99.6	97.6	98.0	94.4	84.9	73.7	104.4
		50% Standby	N/A	N/A	71.7	90.1	97.1	100.9	99.8	103.2	99.0	92.4	75.4	107.7
		75% Standby	N/A	N/A	73.0	92.3	99.6	103.1	102.5	106.3	102.3	97.5	81.1	110.6
		100% Standby	N/A	N/A	74.6	93.9	101.4	105.1	104.2	107.9	105.0	101.3	82.7	112.6
		25% DCC	N/A	N/A	70.4	87.7	94.4	99.3	97.4	97.5	93.9	84.6	70.9	104.0
		50% DCC	N/A	N/A	71.8	89.8	96.4	100.4	99.5	102.5	98.4	91.2	75.0	107.1
		75% DCC	N/A	N/A	72.4	91.7	99.5	102.3	101.9	105.7	101.4	96.3	79.7	109.9
		100% DCC	N/A	N/A	74.2	93.2	100.7	104.4	103.7	107.3	104.0	100.3	81.9	111.9
Standard – Unhoused (50°C Shipped Loose Cooling System)	Infinite Exhaust	0% Standby	N/A	N/A	70.8	87.0	92.0	95.9	95.3	93.1	89.2	81.3	66.9	100.9
		25% Standby	N/A	N/A	70.6	87.1	92.0	96.2	95.1	93.0	90.6	83.5	73.1	101.1
		50% Standby	N/A	N/A	70.7	87.2	92.4	96.1	95.8	94.3	91.2	90.6	74.8	101.9
		75% Standby	N/A	N/A	71.8	87.9	92.5	96.5	96.6	95.7	93.2	95.1	77.6	103.1
		100% Standby	N/A	N/A	72.2	88.6	93.0	97.2	97.6	97.0	95.0	98.5	78.8	104.7
		25% DCC	N/A	N/A	70.6	87.1	91.9	96.1	95.2	93.0	90.4	83.7	72.2	101.1
		50% DCC	N/A	N/A	70.9	87.3	92.3	96.1	95.7	94.8	91.0	89.5	74.1	101.7
		75% DCC	N/A	N/A	71.3	87.5	92.5	96.4	96.3	95.4	92.5	94.4	76.6	102.8
		100% DCC	N/A	N/A	72.1	88.3	92.8	97.0	97.2	96.6	94.4	97.5	78.3	104.1



Sound Data

C3000D6EB

QSK78-G39 60Hz Diesel

A-weighted Sound Pressure Level @ Operator Location, dB(A)

See notes 1, 5 and 7-15 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Pressure Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused (40°C Shipped Loose Cooling System)	Infinite Exhaust	0% Standby	N/A	N/A	69.2	84.6	90.8	99.7	99.2	94.7	90.4	83.3	69.1	103.7
		25% Standby	N/A	N/A	69.2	86.0	91.1	99.9	99.4	94.8	92.6	87.0	79.6	104.1
		50% Standby	N/A	N/A	69.0	87.2	91.6	100.1	99.6	95.9	93.3	93.2	79.5	104.7
		75% Standby	N/A	N/A	69.2	88.6	92.1	100.4	100.2	96.9	94.4	98.8	82.2	105.9
		100% Standby	N/A	N/A	70.4	89.9	93.5	101.3	101.4	98.0	95.9	104.9	81.9	108.5
		25% DCC	N/A	N/A	69.5	85.9	91.0	99.6	99.3	94.8	92.5	86.9	75.7	103.9
		50% DCC	N/A	N/A	69.2	87.2	91.8	100.5	99.7	95.6	93.1	90.8	80.0	104.7
		75% DCC	N/A	N/A	69.4	88.1	91.9	100.4	100.2	96.7	93.9	96.5	81.3	105.5
		100% DCC	N/A	N/A	70.2	89.5	92.9	101.0	101.1	97.7	95.5	102.7	82.0	107.5
Standard – Unhoused (40°C Shipped Loose Cooling System)	No Muffler	0% Standby	N/A	N/A	69.9	87.6	92.0	99.9	99.0	95.2	91.1	83.8	69.5	103.9
		25% Standby	N/A	N/A	71.5	88.8	94.6	100.4	99.1	95.7	94.3	87.7	78.2	104.7
		50% Standby	N/A	N/A	72.2	91.3	96.0	101.6	99.9	97.6	94.8	95.6	80.4	106.2
		75% Standby	N/A	N/A	72.9	92.5	98.1	102.3	100.7	99.6	96.5	101.2	83.4	108.1
		100% Standby	N/A	N/A	74.5	94.8	100.5	104.0	101.8	100.8	98.2	102.0	82.5	109.5
		25% DCC	N/A	N/A	71.4	88.7	94.3	100.3	99.1	95.7	93.7	87.2	75.4	104.6
		50% DCC	N/A	N/A	72.4	91.1	95.8	101.8	99.8	97.2	94.6	93.1	78.9	106.0
		75% DCC	N/A	N/A	72.5	91.6	97.5	101.9	100.5	99.2	95.8	97.1	81.4	107.1
		100% DCC	N/A	N/A	73.9	94.1	99.5	103.4	101.6	100.4	97.6	105.6	82.6	110.1
Standard – Unhoused (50°C Shipped Loose Cooling System)	Infinite Exhaust	0% Standby	N/A	N/A	71.4	87.7	92.2	102.8	100.9	95.5	91.3	84.4	69.4	105.9
		25% Standby	N/A	N/A	71.6	88.7	92.4	102.5	100.7	95.3	94.2	87.2	78.4	105.9
		50% Standby	N/A	N/A	71.4	89.3	93.0	102.7	100.9	96.2	93.6	94.5	81.9	106.4
		75% Standby	N/A	N/A	71.6	90.2	93.6	102.7	101.5	97.2	94.9	100.6	82.6	107.5
		100% Standby	N/A	N/A	72.0	90.9	94.7	103.3	102.4	98.5	96.3	103.4	81.8	108.8
		25% DCC	N/A	N/A	71.6	88.8	92.4	102.4	100.7	95.4	92.7	87.3	76.2	105.7
		50% DCC	N/A	N/A	71.4	89.4	93.2	102.7	101.0	96.1	93.6	94.4	80.5	106.4
		75% DCC	N/A	N/A	71.4	89.7	93.1	102.5	101.2	96.9	94.4	96.9	80.9	106.7
		100% DCC	N/A	N/A	71.8	90.6	94.3	103.3	102.2	98.1	95.9	105.2	82.4	109.3



Sound Data

C3000D6EB

QSK78-G39 60Hz Diesel

A-weighted Sound Power Level, dB(A)

See notes 1, 3 and 6-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Power Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused (40°C Shipped Loose Cooling System)	Infinite Exhaust	0% Standby	N/A	N/A	89.6	106.6	113.0	117.7	117.1	114.5	110.3	102.4	88.9	122.5
		25% Standby	N/A	N/A	89.5	106.9	112.9	118.0	117.0	114.7	112.0	105.5	97.0	122.7
		50% Standby	N/A	N/A	89.9	107.2	113.4	117.9	117.7	116.0	112.8	112.6	96.7	123.5
		75% Standby	N/A	N/A	91.0	108.2	113.7	118.4	118.5	117.6	114.9	117.0	99.8	124.9
		100% Standby	N/A	N/A	92.0	109.4	114.2	119.3	119.6	119.1	116.9	120.4	101.1	126.5
		25% DCC	N/A	N/A	89.6	107.1	113.0	118.0	117.0	114.6	111.8	105.4	93.4	122.7
		50% DCC	N/A	N/A	89.9	107.4	113.4	118.1	117.6	115.7	112.7	111.7	96.4	123.5
		75% DCC	N/A	N/A	90.4	107.9	113.7	118.2	118.2	117.2	114.2	116.3	98.9	124.6
		100% DCC	N/A	N/A	91.8	108.9	113.9	118.9	119.2	118.6	116.2	118.9	100.6	125.9
Standard – Unhoused (40°C Shipped Loose Cooling System)	No Muffler	0% Standby	N/A	N/A	91.2	109.5	114.6	118.7	117.8	115.7	111.7	103.3	89.5	123.5
		25% Standby	N/A	N/A	93.1	110.3	117.2	122.2	120.2	120.7	117.0	107.5	96.4	127.0
		50% Standby	N/A	N/A	94.3	112.7	119.7	123.5	122.5	125.8	121.6	115.0	98.0	130.3
		75% Standby	N/A	N/A	95.6	114.9	122.2	125.8	125.2	128.9	124.9	120.1	103.8	133.2
		100% Standby	N/A	N/A	97.2	116.5	124.0	127.7	126.9	130.5	127.6	123.9	105.4	135.2
		25% DCC	N/A	N/A	93.0	110.3	117.0	121.9	120.0	120.1	116.5	107.2	93.5	126.7
		50% DCC	N/A	N/A	94.4	112.5	119.0	123.1	122.1	125.1	121.0	113.8	97.6	129.7
		75% DCC	N/A	N/A	95.0	114.3	122.1	125.0	124.5	128.3	124.0	118.9	102.3	132.5
		100% DCC	N/A	N/A	96.8	115.8	123.3	127.0	126.3	129.9	126.6	122.9	104.5	134.5
Standard – Unhoused (50°C Shipped Loose Cooling System)	Infinite Exhaust	0% Standby	N/A	N/A	93.4	109.6	114.6	118.5	118.0	115.7	111.9	103.9	89.5	123.5
		25% Standby	N/A	N/A	93.2	109.7	114.6	118.8	117.7	115.7	113.2	106.1	95.7	123.7
		50% Standby	N/A	N/A	93.3	109.8	115.0	118.7	118.4	116.9	113.8	113.2	97.4	124.5
		75% Standby	N/A	N/A	94.4	110.5	115.1	119.1	119.2	118.3	115.8	117.7	100.2	125.7
		100% Standby	N/A	N/A	94.8	111.3	115.6	119.9	120.2	119.7	117.6	121.1	101.4	127.2
		25% DCC	N/A	N/A	93.2	109.7	114.6	118.7	117.8	115.6	113.0	106.3	94.8	123.7
		50% DCC	N/A	N/A	93.5	109.9	114.9	118.7	118.3	116.6	113.6	112.1	96.7	124.3
		75% DCC	N/A	N/A	93.9	110.1	115.1	119.0	118.9	118.0	115.1	117.0	99.2	125.4
		100% DCC	N/A	N/A	94.7	110.9	115.4	119.6	119.9	119.2	117.0	120.1	100.9	126.7



Sound Data

C3000D6EB

QSK78-G39 60Hz Diesel

Exhaust Sound Power Level, dB(A)

See notes 4 and 6-14 listed below

Configuration	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Power Level
		16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard - Unhoused (40°C Shipped Loose Cooling System, No Muffler)	0% Standby	N/A	N/A	84.7	104.5	107.7	110.3	106.9	105.8	102.9	92.6	77.9	114.8
	25% Standby	N/A	N/A	89.3	105.6	114.2	118.0	114.5	116.4	112.1	99.0	88.0	122.6
	50% Standby	N/A	N/A	91.2	109.6	117.7	120.0	118.1	122.4	118.1	107.6	89.0	126.8
	75% Standby	N/A	N/A	92.8	112.2	120.6	122.8	121.4	125.4	121.9	113.4	99.8	129.9
	100% Standby	N/A	N/A	95.0	113.8	122.3	124.8	123.3	126.8	124.9	118.6	102.5	132.0
	25% DCC	N/A	N/A	88.9	105.3	113.8	117.6	114.0	115.6	111.4	98.2	76.6	122.1
	50% DCC	N/A	N/A	91.5	109.0	116.6	119.3	117.5	121.8	117.3	107.0	87.8	126.1
	75% DCC	N/A	N/A	92.3	111.6	120.6	121.9	120.7	125.0	120.7	111.6	97.5	129.3
	100% DCC	N/A	N/A	94.5	113.1	121.7	124.1	122.7	126.5	123.8	117.0	101.4	131.3

Global Notes:

1. Sound pressure levels at 1 meter are measured per the requirements of ISO 3744, ISO 8528-10, and European Communities Directive 2000/14/EC as applicable. The microphone measurement locations are 1 meter from a reference parallelepiped just enclosing the generator set (enclosed or unenclosed).
2. Seven-meter measurement location 1 is 7 meters (23 feet) from the generator (alternator) end of the generator set, and the locations proceed counter-clockwise around the generator set at 45° angles at a height of 1.2 meters (48 inches) above the ground surface.
3. Sound Power Levels are calculated according to ISO 3744, ISO 8528-10, and or CE (European Union) requirements.
4. Exhaust Sound Levels are measured and calculated per ISO 6798, Annex A.
5. Reference Sound Pressure Level is 20 µPa.
6. Reference Sound Power Level is 1 pW (10⁻¹² Watt).
7. Sound data for remote-cooled generator sets are based on rated loads without cooling fan noise.
8. Sound data for the generator set with infinite exhaust do not include the exhaust noise contribution.
9. Published sound levels are measured at CE certified test site and are subject to instrumentation, measurement, installation and manufacturing variability.
10. Unhoused/Open configuration generator sets refers to generator sets with no sound enclosures of any kind.
11. Housed/Enclosed/Closed/Canopy configuration generator sets refer to generator sets that have noise reduction sound enclosures installed over the generator set and usually integrally attached to the skid base/base frame/fuel container base of the generator set.
12. Published sound levels meet the requirements India's Central Pollution Control Board (Ministry of Environment & Forests), vide GSR 371 (E), which states the A-weighted sound level at 1 meter from any diesel generator set up to a power output rating of 1000kVA shall not exceed 75dB(A)
13. For updated noise pollution information for India see website: <http://www.envfor.nic.in/legis/legis.html>
14. Sound levels must meet India's Ambient Air Noise Quality Standards detailed for Daytime/Night-time operation in Noise Pollution (Regulation and Control) Rules, 2000
15. Operator Location is near genset control panel and is at 1 meter distance from genset control panel and at 1.6 meter height.



Exhaust Emission Data Sheet

C3000D6EB

60 Hz Diesel Generator Set

Engine Information:

Model:	Cummins Inc. QSK78-G39	Bore:	6.69 in. (170 mm)
Type:	4 Cycle, V, 18 Cylinder Diesel	Stroke:	7.48 in. (190mm)
Aspiration:	Turbocharged and Charge Air Cooled	Displacement:	4737 cu. in. (77.6 liters)
Compression Ratio:	15.3:1		

	<u>1/4</u>	<u>1/2</u>	<u>3/4</u>	<u>Full</u>
<u>Performance Data</u>	<u>Standby</u>	<u>Standby</u>	<u>Standby</u>	<u>Standby</u>
Engine BHP @ 1800 RPM (60 Hz)	1110	2221	3331	4441
Fuel Consumption (US Gal/Hr)	61	111	160	204
Exhaust Gas Flow (CFM)	8424	14252	18987	22293
Exhaust Gas Temperature (°F)	762	816	807	863

Exhaust Emission Data

HC (Total Unburned Hydrocarbons)	0.22	0.10	0.08	0.07
NOx (Oxides of Nitrogen as NO ₂)	3.81	3.75	4.15	6.12
CO (Carbon Monoxide)	0.54	0.19	0.09	0.06
PM (Particulate Matter)	0.06	0.02	0.01	0.01
SO ₂ (Sulfur Dioxide)	0.005	0.005	0.005	0.005
Smoke (FSN)	0.71	0.30	0.16	0.08

(All values are cited: g/HP-hr)

Test Conditions

Steady-state emissions recorded per ISO8178-1 during operation at rated engine speed (+/-2%) and stated constant load (+/-2%) with engine temperatures, pressures and emission rates stabilized.

Fuel Specification:	ASTM D975 No. 2-D S15 diesel fuel with 0.0015 Wt.% Sulfur content, 42-48 Cetane Number
Air Inlet Temperature	25 °C (77 °F)
Fuel Inlet Temperature:	40 °C (104 °F)
Barometric Pressure:	100 kPa (29.53 in Hg)
Humidity:	NOx measurement corrected to 10.7 g/kg (75 grains H ₂ O/lb) of dry air
Intake Restriction:	Set to 18 in of H ₂ O as measured from compressor inlet
Exhaust Back Pressure:	Set to 1.5 in Hg

Note: mg/m³ values are measured dry, corrected to 5% O₂ and normalized to standard temperature and pressure (0°C, 101.325 kPa)

The NOx, HC, CO and PM emission data tabulated here are representative of test data taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.



2026 EPA Tier 2 Exhaust Emission Compliance Statement C3000D6EB Stationary Emergency 60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set complies with Tier 2 emissions limit of U.S. EPA New Source Performance Standards for stationary emergency engines under the provisions of 40 CFR 60 Subpart IIII when tested per ISO8178 D2.

Engine Manufacturer: Cummins, Inc.
EPA Certificate Number: TCEXL95.0AAA-029
Effective Date: 10/09/2025
Date Issued: 10/09/2025
EPA Engine Family (Cummins Emissions Family): TCEXL95.0AAA

Engine Information:

Model:	QSK78-G39	Bore:	6.69 in. (170 mm)
Engine Nameplate HP:	4441	Stroke:	7.48 in. (190mm)
Type:	4 Cycle, V, 18 Cylinder Diesel	Displacement:	4737 cu. in. (77.6 liters)
Aspiration:	Turbocharged and Charge Air Cooled	Compression ratio:	15.3:1
Emission Control Device:	Turbocharged and Charge Air Cooled	Exhaust stack diameter:	12 in. (305 mm)

Diesel Fuel Emission Limits

D2 Cycle Exhaust Emissions

	Grams per BHP-hr			Grams per kWm-hr		
	<u>NO_x + NMHC</u>	<u>CO</u>	<u>PM</u>	<u>NO_x + NMHC</u>	<u>CO</u>	<u>PM</u>
EPA Emissions Limit	4.8	2.6	0.15	6.4	3.5	0.20

Test methods: EPA emissions recorded per 40CFR89 (ref ISO8178-1) and weighted at load points prescribed in the Subpart E, Appendix A for constant speed engines.

Diesel fuel specifications: 40-48 Cetane number, Reference: ASTM D975 No. 2-D, 0.0015 Max Wt % Sulphur

Reference conditions: Air Inlet Temperature: 25 °C (77 °F), Fuel Inlet Temperature: 40 °C (104 °F). Barometric Pressure: 100 kPa (29.53 in Hg), Humidity: 10.7 g/kg (75 grains H₂O/lb) of dry air; required for NO_x correction, Restrictions: Intake Restriction set to a maximum allowable limit for clean filter; Exhaust Back Pressure set to a maximum allowable limit.

Tests conducted using alternate test methods, instrumentation, fuel or reference conditions can yield different results. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.



Prototype Test Support (PTS) 60 Hz test summary



Generator set models

C3000D6EB (-G39)
C3000D6EB (-G38)
C2750D6E (-G38)

Representative prototype

Model: C3000D6EB
Engine: QSK78-G39
Alternator: S9L1D-G4

The following summarizes prototype testing conducted on the designated representative prototype of the specified models. This testing is conducted to verify the complete generator set electrical and mechanical design integrity. Prototype testing is conducted only on generator sets not sold as new equipment.

Maximum surge power: 3203 kW

The generator set was evaluated to determine the stated maximum surge power.

Maximum motor starting: N/A

The generator set was tested to simulate motor starting by applying the specified kVA load at low lagging power factor (0.4 or lower). With this load applied, the generator set recovered to a minimum of 90% rated voltage

Alternator temperature rise:

The highest rated temperature rise (150°C) test result are reported as follows to verify that worst case temperature rises do not exceed allowable NEMA MG1 limits for class H insulation. Tests were conducted per IEEE 115, rise by resistance and embedded detector, with rated voltages. Only the highest temperatures are reported.

Location	Maximum Rise (°C)
Alternator Stator:	150
Alternator Rotor:	150
Exciter Stator:	150
Exciter Rotor:	150

Torsional analysis and testing:

The generator set on S9L1D-G4 was tested to verify that the design is not subjected to harmful torsional stresses. A spectrum analysis of the transducer output was conducted over the speed range of 1650 to 1950 RPM.

Cooling system: 50 °C ambient
1.0 in H₂O restriction

The cooling system was tested to determine ambient temperature and static restriction capabilities. The test was performed at full rated load elevated ambient temperature under static restriction conditions.

Durability:

The generator set was subjected to a minimum 24 hour endurance test operating at variable load to verify structural soundness and durability of the design.

Electrical and mechanical strength:

The generator set was tested to several single phase and three phase faults to verify that the generator can safely withstand the forces associated with short circuit conditions. The generator set was capable of producing full rated output at the conclusion of the testing.

Steady state performance:

The generator set was tested to verify steady state operating performance. It was within the specified maximum limits.

Voltage regulation:	± 1.0%
Random voltage variation:	± 1.0%
Frequency regulation:	Isochronous
Random frequency variation:	± 0.5%

Transient performance:

The generator set was tested with the listed alternator to verify single step loading capability as required by NFPA 110. Voltage and frequency response on load addition or rejection were evaluated. The following results were recorded at 0.8 power factor:

Full load acceptance:

Voltage dip:	50.5%
Recovery time:	7.6 seconds
Frequency dip:	13.7%
Recovery time:	7.7 seconds

Full load rejection:

Voltage rise:	17.1%
Recovery time:	2.0 seconds
Frequency rise:	5.0%
Recovery time:	1.2 seconds

All data based on 0.8 power factor:

Harmonic analysis:

(per MIL-STD-705B, Method 601.4)

Harmonic	<u>Line to Line</u>		<u>Line to Neutral</u>	
	<u>No load</u>	<u>Full load</u>	<u>No load</u>	<u>Full load</u>
3	0.02	N/A	0.05	N/A
5	1.19	N/A	1.19	N/A
7	0.74	N/A	0.75	N/A
9	0.01	N/A	0.01	N/A
11	0.02	N/A	0.02	N/A
13	0.04	N/A	0.04	N/A
15	0.00	N/A	0.01	N/A

SECTION 3

Generator Accessories



PowerCommand® input/output expansion module

AUX 101

~~AUX 102~~



Description

The PowerCommand AUX 101 input/output module and the AUX 102 input/output expansion module provide up to sixteen (16) relay output and up to twelve (12) discrete/analog inputs for auxiliary control and monitoring of the power system.

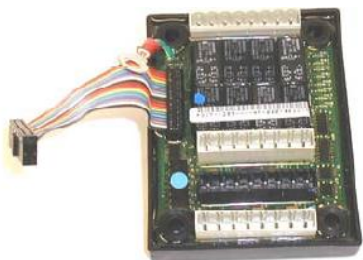
Analog/discrete inputs can be used for system fault expansion and/or generator set metering.

Relay outputs can be used for controlling equipment such as motors, louvers, lamps, fans and pumps. The relays may be configured individually from the genset control operator interface or using InPower™ software.

The AUX 101 and AUX 102 modules are compatible with genset controls supporting a PCCNet network and require a twisted pair connection. This includes the PCC 1301 control.

AUX 101 - Contains eight (8) Form-C relay output sets and eight (8) discrete/analog inputs.

AUX 102 - Easily connects to the AUX 101 to provide an additional eight (8) Form-C relay outputs and (4) additional discrete inputs.



AUX 102 - Expansion

Features

- Up to sixteen (16) configurable Form-C relays provide easy control of system equipment such as lamps, louvers, motors and pumps. LED status of each relay.
- Up to twelve (12) configurable discrete inputs for monitoring equipment status and faults. Equipment status and faults will be annunciated.
- Up to eight (8) analog inputs. Analog inputs can be assigned one of seven preprogrammed functions:
 - Oil temperature
 - Exhaust temperature
 - Fuel level
 - Ambient temperature
 - Alternator RTD
 - Speed bias (for manual paralleling only)
 - Voltage bias (for manual paralleling only)
- Two 5 VDC voltage sources for use with active senders.
- Four programmable current sources for use with resistive senders.
- Two status LEDs:
 - DS1 (green) indicates the AUX 101 is connected to the network and operating normally
 - DS2 (red) indicates the AUX 101 has lost its connection or is not connected to the network
- Device number indicator. Seven segment LED used to uniquely define more than one AUX 101 on the same network.
- May be connected at any point in the PCCNet network.
- Plug-and-play networking - No binding required.
- Pluggable terminal blocks allow easy one-time wiring.
- Less wiring makes installation and system upgrades quick and easy
- PowerCommand controls are supported by a worldwide network of independent distributors who provide parts, service and warranty support.
- UL Listed and labeled; CSA certified; CE and UKCA compliant.

Specifications

Signal requirements

Network connections: RS485, twisted-pair 78 kbps

Control power: 5-40 VDC

Current

- 200 mA typical at 12 V, no active relay
- 100 mA typical at 24 V, no active relay
- 800 mA at 12 V, all relays active

Terminations for control power accept wire up to 16 ga.

Environment

The AUX 101 and AUX 102 are designed for proper operation in ambient temperatures from -40 °C to +60 °C (-40 °F to +140 °F) and for storage from -40 °C to +80 °C (-40 °F to +176 °F). Modules will operate with humidity up to 95%, non-condensing

Relay ratings (AUX 101)

- Normally closed: 3 A at 250 VAC or 30 VDC
- Normally open: 5 A at 250 VAC or 30 VDC

~~Relay ratings (AUX 102)~~

- ~~• 2 A at 125 VAC, 2 A at 30 VDC~~

Input ratings (AUX 101)

- Active low inputs
- Maximum voltage 24 VDC (inputs 1 - 6)
- Maximum voltage 40 VDC (inputs 7 - 8)

Network length

Maximum 1219 m (4000 ft)

Approved wiring

Cat 4 or Cat 5 (stranded)

Configurations

All configurations are stored in the main genset control and are modified from the generator set control HMI or using InPower PC software.

Discrete/analog inputs:

Each AUX 101 input can be configured as discrete or analog. AUX 102 inputs are discrete only. Discrete inputs have the following configuration options:

- Active high or active low
- Event, warning or shutdown
- Programmable text (displayed on genset HMI and InPower software)

Analog inputs have a set of predefined functions and can only be configured on certain module inputs. Below is a list of functions and possible module inputs:

- Input 1 - Voltage bias (-3 to +3 VDC)*
- Input 2 - Speed bias (0 to +5 VDC)*
- Inputs 3 – 6
 - Oil temperature
 - Exhaust temperature
 - Ambient air temperature
 - Fuel level
 - Alternator temperature

Inputs are defaulted to disabled

* Please note that speed and voltage bias interfaces are for manual paralleling only and must not be used with automatic paralleling controls.

Relay outputs

Outputs can be configured to energize on occurrence of any event or fault code supported by the genset control. The relay outputs default to the following:

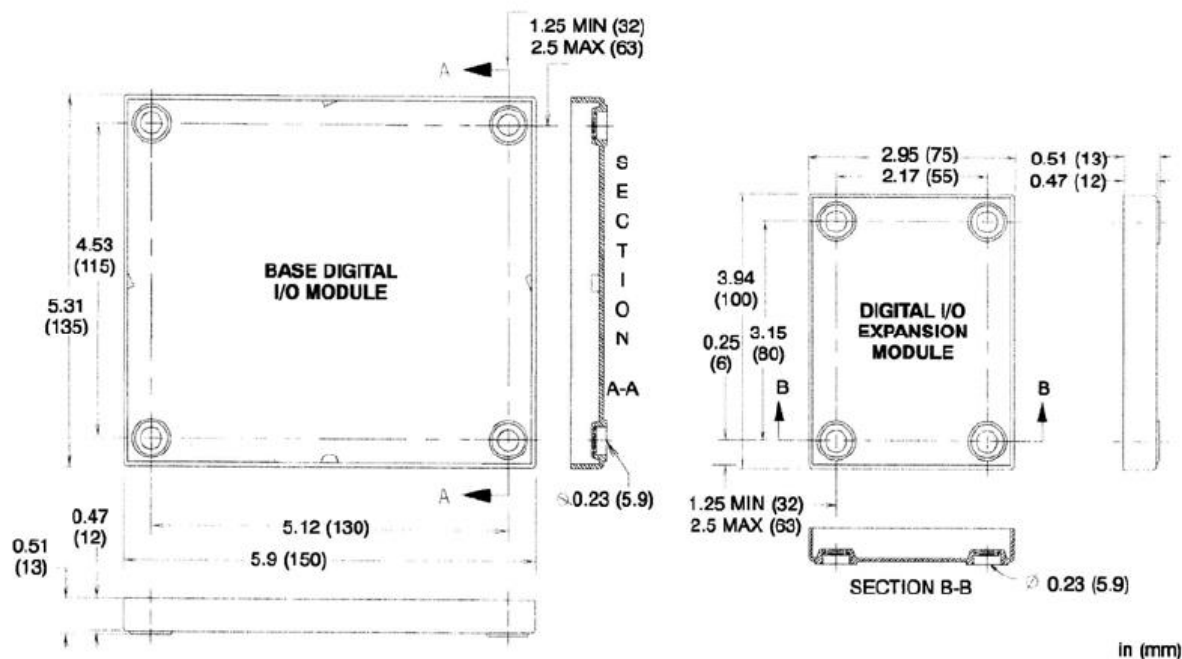
AUX 101

- 1 - Low oil pressure
- 2 - High engine temperature
- 3 - Charger AC failure
- 4 - Battery (low, weak, high)
- 5 - Engine overspeed
- 6 - Fail-to-start
- 7 - Not-in-auto
- 8 - Generator set running

~~AUX 102~~

- ~~9 - Pre-low oil pressure~~
- ~~10 - Pre-high engine temperature~~
- ~~11 - Low coolant level*~~
- ~~12 - Low fuel level*~~
- ~~13 - Low coolant temperature~~
- ~~14 - Common alarm~~
- ~~15 - Not defined~~
- ~~16 - Not defined~~

Dimensions



Ordering information

Part number	Description
0541-1291	AUX 101 Digital Input/output Module - Base – PCC 1301
0184-0263	AUX 101 Digital Input/output Module - Base – PCC 1301 on DN and GN model generator sets
0630-3142	AUX 102 Digital Input/output Module wiring diagram - Instruction sheet C693
0541-0772	AUX 102 Digital Input/output Module - Expansion

PCCNet logo

Look for this logo on spec sheets of PCCNet compatible devices.



For more information contact your local Cummins distributor
or visit power.cummins.com

Our energy working for you.™





AGN 227 – Anti-Condensation Heaters

DESCRIPTION

The type of anti-condensation heater used in an AvK or STAMFORD alternator is dependent on the alternator model and size. The anti-condensation heater could be a Cartridge, Flexible Pad or Circular Ring type. All of these anti-condensation heater types are designed to combat moderate humidity levels over periods of alternator inactivity. They are not to be used when the alternator is in use.

Anti-condensation heaters reduce the moisture level in the air immediately around the alternator when the alternator is stationary. They also maintain the atmosphere inside the alternator above the dew point during long periods of inactivity, such as when the alternator is used in a standby application.

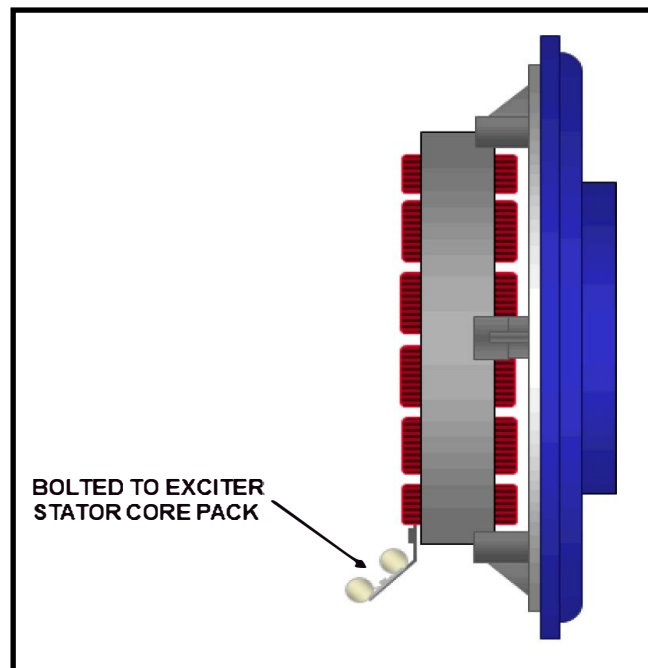
If a situation exists where humidity levels are known to be high, the accepted way of dealing with this situation is to install space heaters around the Generating Set, in the canopy or room, combined with motorised ventilation louvres to shut out the damp atmosphere.

The design criteria for anti-condensation heaters used on AvK and STAMFORD alternators was to support an insulation system by maintaining sufficient residual temperature within an alternator that has just completed an operation (run) to stop condensation forming or being

absorbed during the inactive period. The actual heater wattage is a compromise of design requirement and the space available within the non-drive end (NDE) area of the alternator.

Anti-condensation heaters are NOT adequate for drying out an alternator.

A separate power supply is required for the anti-condensation heaters. Customers usually arrange a power supply connection that automatically switches on when the Generating Set is shut down. The anti-condensation heaters can operate at various voltages. The heater wattage and number of anti-condensation heaters also vary depending on the alternator frame size.



S9 Alternators

The S9 alternators have two circular ring tubular heaters, which can be connected either in series or in parallel. There are specific ranges for the heater output power depending on the voltage applied to the heaters. Heaters are mandatory and therefore fitted as standard on Medium and High Voltage S9 alternators (S9M1D/S9H1D).

When connected in parallel, the voltage operating range across the two heaters is 100 to 138V, resulting in output power of 1062W to 2022W.

When connected in series, the voltage operating range across the two heaters is 200V to 277V, resulting in output power of 1058W to 2029W.

The output power range corresponds to the minimum and maximum supply voltages. So for example, if 200V was applied across the two heaters, the power output would be 1058W, and if 277V was applied across the two heaters, the power output would be 2029W.

Any operating voltage between 200V and 277V requires a calculation to determine the output power. For example, heaters operating at 220V: $(220^2 / 200^2) \times 1058W = 1280W$.

The supply voltage range of the heaters is specified by the customer during the alternator order placement. The heaters will then be connected based on customer's specification (in series or in parallel) and the wiring diagram will reflect the voltage and output power range of the heaters. Instead of having a separate heater connection diagram, the heater connection is included in the complete Wiring Diagram for a S9 alternator.

HOTflow[®] Heating System CSM



CSM Style B shown
with flange pump.



CSM Style A shown
with union pump.



Hotstart's CSM HOTflow[®] heating system is a coolant preheater, developed to maintain optimal temperatures for diesel and gas engines in stationary land power, marine, construction equipment, and truck applications



HEAVY DUTY HEATING

The CSM features the most powerful pump (10 gpm flow) and most powerful heating element options (up to 12 kW) in the HOTflow lineup. The CSM's heating power in an energy efficient system is ideal for replacing costly convection-based heaters in large-engine installations up to 100 L displacement.



CONTROLS & AUTOMATION OPERATION

The CSM's control box allows for easy power connections and enables automatic heater operation, eliminating the need for additional customer-supplied control components.



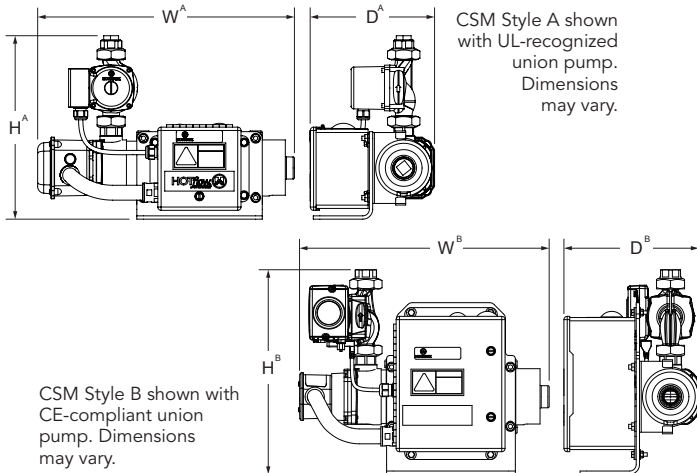
MULTIPLE CONFIGURATIONS

The CSM lineup is equipped to meet a wide array of conditions, including power source requirements and agency certifications. Whatever your power or heating needs, there's a CSM to meet your specific heating system application.



SINGLE HEATER SOLUTION

The CSM's power and pump-driven forced circulation provides superior heat distribution, making the CSM a viable option to replace paired or multiple convection-based heaters – improving heating performance while reducing maintenance costs.



Style A			
Height* (H ^A)	Width (W ^A)	Depth (D ^A)	Weight
15.0"	19.4"	9.5"	37 lbs
383 mm	493 mm	242 mm	16.8 kg

Style B			
Height* (H ^B)	Width (W ^B)	Depth (D ^B)	Weight
17.0"	19.4"	9.5"	54 lbs
434 mm	493 mm	242 mm	24.5 kg

* Height values are stated for flange connection pump. If union pump is installed, the model's height will decrease by approximately 1.5" (38 mm).

System	
Phase	single phase (1 Ø) three-phase (3 Ø)
Voltage (60 Hz)	120V 208V 240V 440V 480V 575V
Voltage (50 Hz)	230V 400V
Control Box Ingress	NEMA 4/IP66
Motor Ingress	NEMA 2 (UL-listed)/IP44 (CE-compliant)
Min./Max. Ambient Temp.	-4 – 104°F (-20 – 40°C)
Certification	UL/C-US listed models available (E250789) CE-compliant models available

Coolant	
Fluid Type	Water Coolant mix (50% water/50% glycol)
Heat Power	3 kW 6 kW 9 kW 10.5 kW 12 kW
Temp. Control	Fixed, 100–120°F (38–49°C)
Pump Power	97 W (60 Hz) 70 W (50 Hz)
Flow	10 gpm @ 10 ft WC (37.9 L/min @ 3 m WC)
Max. Pressure	125 psi (860 kPa)
Pressure Loss	0.2 psi (1.5 kPa)
Inlet/Outlet	1" NPT

Ordering Information

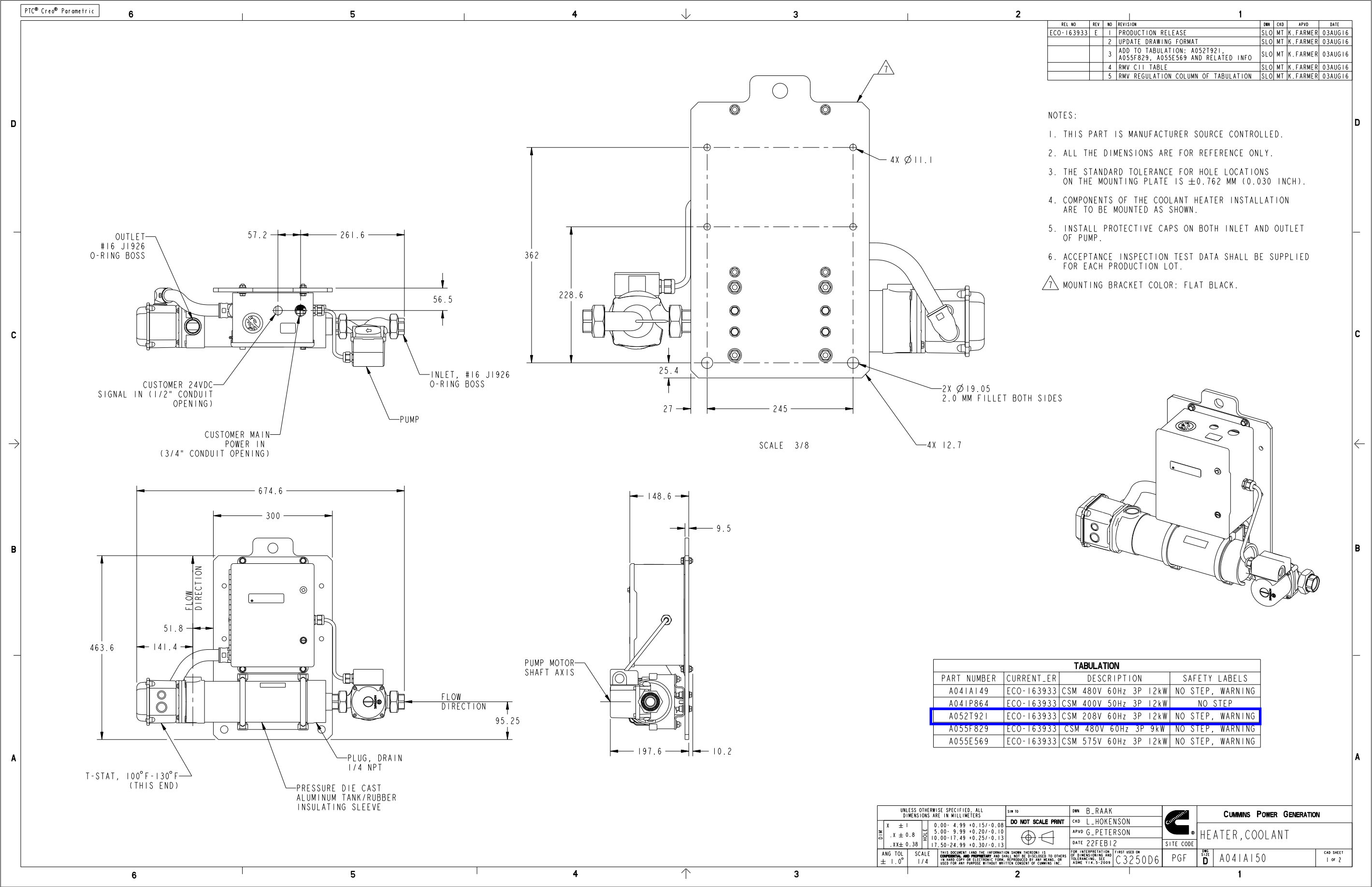
CSM

Engine Displacement	Power Supply			Heating System			
	V	Ø	Hz	kW	Amps	Style	Model Number
1000–1500 CID 15–25 L	120	1	60	3	26.3	A	CSM10301-000
	208	1	60	3	15.1	A	CSM10308-000
	208	3	60	3	8.7	B	CSM30308-000
	230	1	50	3	13.7	A	**CSM1030J-5A0
	240	1	60	3	13.1	A	CSM10302-000
	400	3	50	3	4.9	B	**CSM3030A-5A0
	480	1	60	3	3.8	B	CSM10304-000
	480	3	60	3	4.4	B	CSM30304-000
1500–3000 CID 25–50 L	208	1	60	6	29.6	A	CSM10608-000
	208	3	60	6	17.1	B	CSM30608-000
	230	1	50	6	26.7	A	**CSM1060J-5A0
	240	1	60	6	25.6	A	CSM10602-000
	400	3	50	6	8.9	B	**CSM3060A-5A0
	440	3	60	6	8.1	B	**CSM3060F-5A1
	480	1	60	6	12.8	B	CSM10604-000
	480	3	60	6	7.4	B	CSM30604-000
3000–4500 CID 50–75 L	575	3	60	6	6.2	B	CSM30605-000
	208	1	60	9	44.0	A	CSM10908-000
	208	3	60	9	25.4	B	CSM30908-000
	230	1	50	9	39.8	A	**CSM1090J-5A0
	240	1	60	9	38.1	A	CSM10902-000
	400	3	50	9	13.2	B	**CSM3090A-5A0
	440	3	60	9	12.2	B	**CSM3090F-5A1
	480	1	60	9	19.1	B	CSM10904-000
4500–6000 CID 75–100 L	480	3	60	9	11.0	B	CSM30904-000
	575	3	60	9	9.2	B	CSM30905-000
	208	1	60	10.5	51.2	B	CSM11058-000
	208	3	60	12	33.7	B	CSM31208-000
	230	1	50	12	52.8	B	**CSM1120J-5A0
	240	1	60	12	50.6	B	CSM11202-000
	400	3	50	12	17.5	B	**CSM3120A-5A0
	440	3	60	12	15.9	B	**CSM3120F-5A2
	480	1	60	12	25.3	B	CSM11204-000
	480	3	60	12	14.6	B	CSM31204-000
	575	3	60	12	12.2	B	CSM31205-000

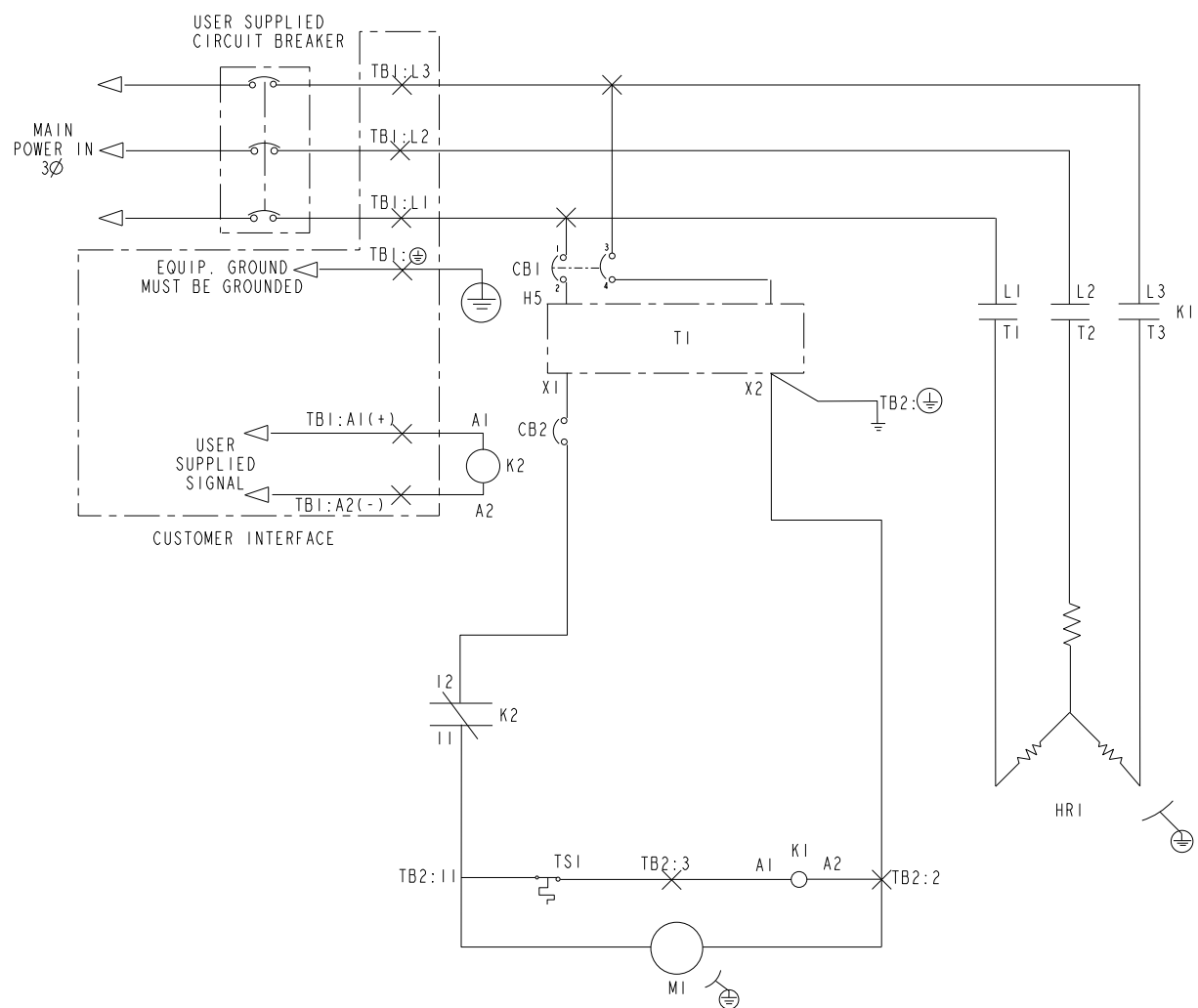
** – CE-compliant/union pump configuration

Other voltages available. Consult the factory.

Options shown represent typical tested or certified configurations. Additional options or configurations may be available. For assistance with your heating system application, contact HOTSTART at 509.536.8660 or sales@hotstart.com.



REL NO	REV	NO	REVISION	DWN	CKD	APVD	DATE
ECO-163933	E	1	PRODUCTION RELEASE	SLO	MT	K. FARMER	03AUG16
		2	UPDATE DRAWING FORMAT	SLO	MT	K. FARMER	03AUG16



ELECTRICAL WIRING SCHEMATIC

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS		SIZE TO	DRAWN BY B. RAAK		CUMMINS POWER GENERATION	
DO NOT SCALE PRINT		CKD L. HOKENSEN	APVD G. PETERSON		HEATER, COOLANT	
DIM. X ± 1 X ± 0.8 .XX ± 0.38	HOLE AND TOL SCALE ± 1.0° 1/4		DATE 22FEB12		SITE CODE	CAD SHEET 2 of 2
			FIRST USED ON C3250D6			
THIS DOCUMENT AND THE INFORMATION SHOWN THEREON IS THE PROPERTY OF CUMMINS INC. AND SHALL NOT BE DISCLOSED TO OTHERS WITHOUT THE EXPRESS WRITTEN CONSENT OF CUMMINS INC.		FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE THE ASME Y14.5-2009		SIZE D	A041A150	

Application Guidance Notes: Technical Information from Cummins Generator Technologies

AGN 027 - Winding and Bearing Temperature Sensors

INTRODUCTION

There are three cost effective ways of detecting winding temperatures:

- Thermostats - Bi-metallic switches pre-set to a fixed temperature.
- Thermistors - Temperature sensitive resistor with pre-set operating knee point.
- RTD (Resistance Temperature Detector) - Resistive element with a linear resistance change, proportional to the temperature change.

BASIC CONSIDERATIONS

Ideally, for detecting winding temperatures, the temperature sensor should be embedded within the windings in such a way that true winding temperatures are detected. This means the detecting element must be constructed of a suitable shape for inclusion within the winding slot and be robust enough to cope with the stator winding impregnation process.

It is also most important that the temperature sensor is small enough to be embedded within the winding slot, without affecting the amount of copper winding wire space available to such an extent that the winding section has to be reduced resulting in a reduction of the alternator's normal output rating.

Thermostats

Some Thermostat units are manufactured within a tubular body, which is susceptible to being misshaped during the stator winding process, often resulting in a change to the operating temperature of the bi-metallic element.

It is considered prudent to have an isolated, low voltage, low current, on-inductive circuit connected to any temperature detecting element to minimise the risk any interaction or interference between the stator winding load circuit and the temperature detecting circuit.

This is achieved in an ideal way with either the Thermistor or RTD systems, but less well achieved with a Thermostat scheme.

There is always a considerable risk with Thermostats, where often, a typical single phase supply is used to energise a control relay, that the combination of the relatively high voltage system, in conjunction with the inductive nature of the relay coil, cause the thermostat contacts to be damaged by 'arcing' upon first operation.

There is also the **safety aspect** with the Thermostat system where a non-isolated, high voltage supply is used, with the risk of this supply being present within the alternator windings and terminal box during fault finding, or maintenance, which requires the control system to be switched on.

For these reasons, Thermostats are not offered as an option on STAMFORD and AvK Alternators.

STAMFORD AND AvK SCHEMES

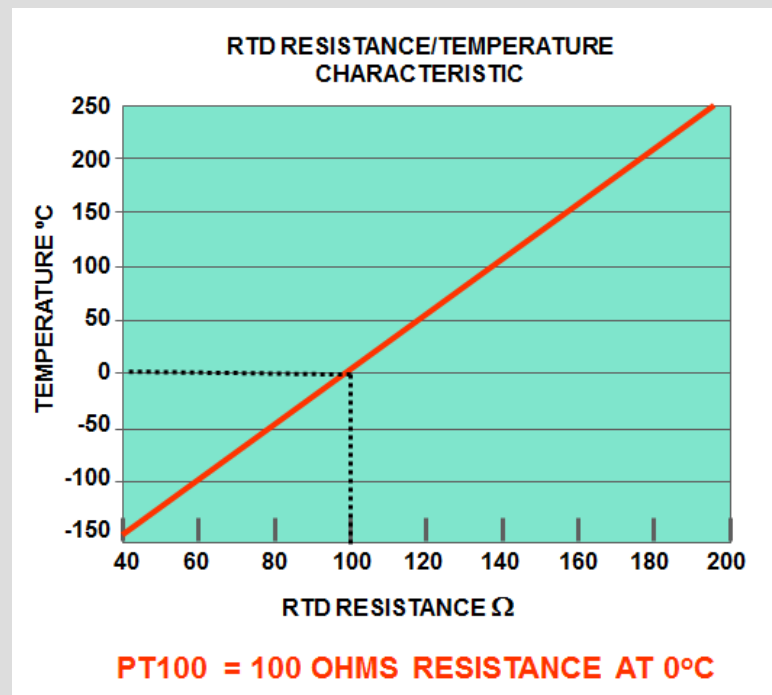
RTDs and Thermistors are offered as winding temperature detectors on STAMFORD and AvK Alternators. RTDs or Thermistors could be fitted, not both. Thermistors may be used for detecting winding temperatures only. RTDs may be used for detecting winding temperatures or bearing temperatures.

Resistance Temperature Detector (RTD)

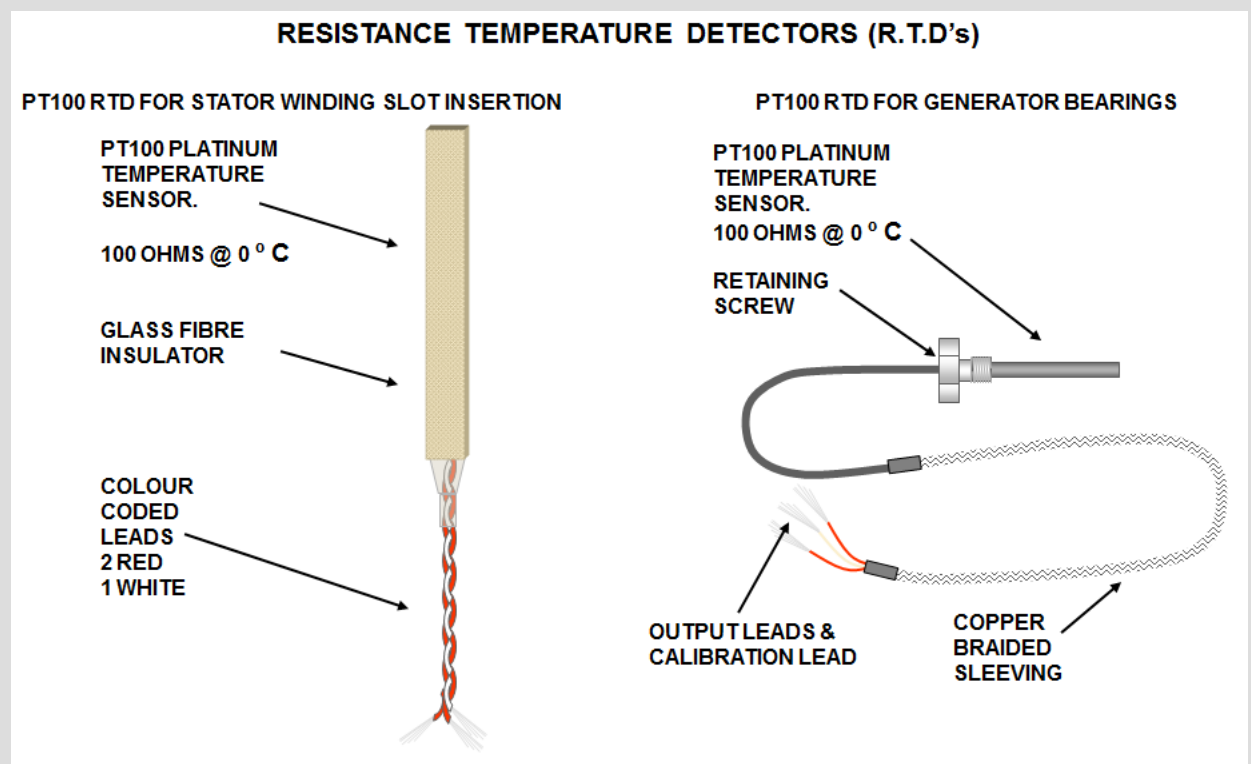
The RTD system employs PT 100 solid state devices, equi-spaced around the stator windings. They are installed as sets of three, one per phase, in the winding slots during manufacture. It is possible to install more than one set on larger alternators.

The RTDs are connected to a programmable modular control unit, which is often a function of the Generating Set control unit and is not supplied by Cummins Generator Technologies. These modular units are available offering many features including display of actual operating temperature and programmable alarm and shutdown temperatures.

An RTD has a linear increase in resistance directly proportional to the detected temperature. The description PT100 refers to a Positive Temperature coefficient, based on the device having a resistance of 100Ω at 0°C, with a linear increase of some 0.385Ω for every 1°C increase.

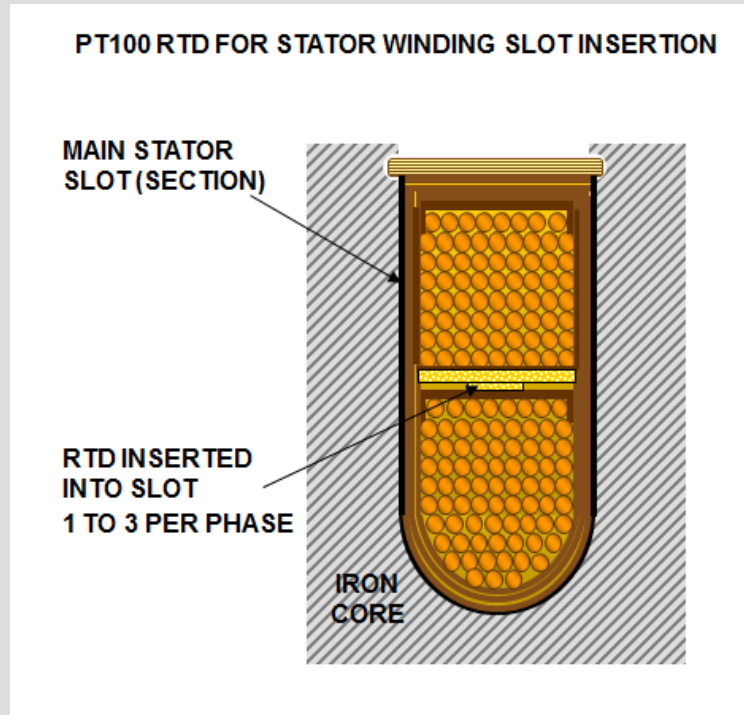


RTDs may be used for detecting temperatures in the stator winding, and they may also be used to detect temperatures in the alternator's bearings. Bearing RTDs are also type PT 100 devices, but of a different design to those used in stator windings.



Winding RTDs

Winding RTDs are embedded within the stator winding assembly in groups of three, equi-spaced such that each one is detecting the temperature of a different phase winding.



An alternators' winding temperature will be directly related to the kVA and power factor of the load, and so assuming an ambient of typically 30degC, an alternator will have 'roughly' the following component temperatures.

Winding Temperatures

[Class H temperature rise rating of 125degC] + [allowance for local hotspot of 15degC] + [local ambient temperature, assumed to be 30degC]. The maximum expected running temperature = $125 + 15 + 30 = 170\text{degC}$.

To provide warning of the maximum expected temperature, we suggest RTDs used for ALARM be set at 170degC. For SHUTDOWN, we suggest they should be set at $170 + 20 = 190\text{degC}$.

For marine alternators with Class H temperature rise ratings, to provide warning of the maximum expected temperature, we suggest RTDs used for ALARM be set at 165degC. For SHUTDOWN, we suggest they should be set at 185degC.

[Class F temperature rise rating of 105degC] + [allowance for local hotspot of 10degC] + [local ambient temperature, assumed to be 30degC]. The maximum expected running temperature = $105 + 10 + 30 = 145\text{degC}$.

To provide warning of the maximum expected temperature, we suggest RTDs used for ALARM be set at 145degC. For SHUTDOWN, we suggest they should be set at $145 + 20 = 165\text{degC}$.

There is no change in suggested settings for marine alternators with Class F temperature rise ratings.

[Class B temperature rise rating of 80degC] + [allowance for local hotspot of 10degC] + [local ambient temperature, assumed to be 30degC] = The maximum expected running temperature = $80 + 10 + 30 = 120\text{degC}$.

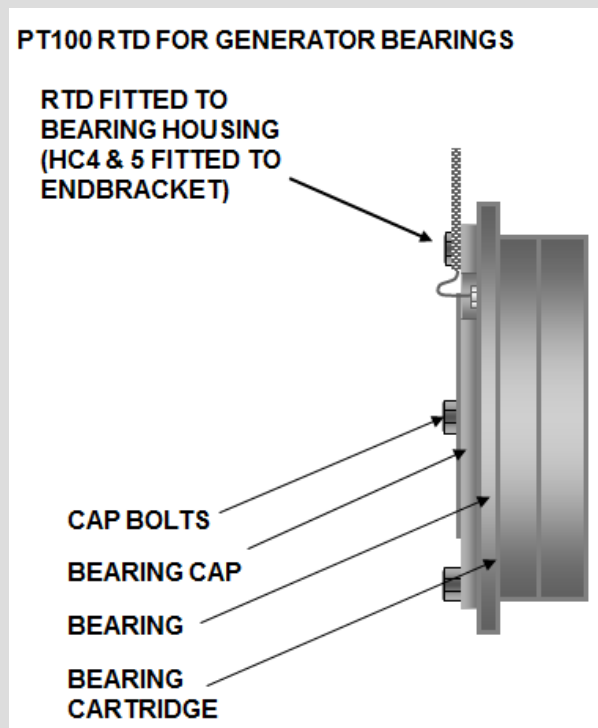
To provide warning of the maximum expected temperature, we suggest RTDs used for ALARM be set at 120degC. For SHUTDOWN, we suggest they should be set at $120 + 20 = 140\text{degC}$.

There is no change in suggested settings for marine alternators with Class B temperature rise ratings.

All commissioning engineers should establish the real running temperatures under site load conditions and then programme the temperature sensing module for ALARM and SHUTDOWN temperatures based on real measured and witnessed running temperatures during commissioning trials and signed-off parameters, including the recorded thermal levels of all thermally monitored components, fluids and gasses.

Bearing RTDs

Bearing RTDs are normally fitted to the bearing cartridge, however; they are fitted to the end bracket on S4 and S5 alternators.



The temperature of a bearing is never a product of the bearing friction and generated heat, rather a temperature associated with the stator and rotor assemblies and the conducted heat from these two hot assemblies through the frame and end brackets into the bearing housing. In fact, a Drive End (DE) bearing's temperature is often governed by conducted heat from the engine components through the flywheel housing/alternator adaptor/ DE bracket assembly.

Typically, when operating at the base continuous rating, the outside surface of the alternator frame can be as much as 35 to 40degC above the ambient temperature. The bearing housing temperature will be about the same as the frame temperature.

Bearing Temperatures:

To detect overheating of bearings, control signals should be set according to the following table.

Bearings	Alarm temperature (°C)	Shutdown temperature (°C)
Drive end bearing	45 + maximum ambient	50 + maximum ambient
Non-drive end bearing	40 + maximum ambient	45 + maximum ambient

Note 1. Quite often the DE bearing RTD will indicate 100degC if the Generating Set is stopped too quickly after a long full-rated load run. Usually this is because the Generating Set housing/canopy/container is not ventilated - doors opened, or forced vent system - for a short period of time after a hot Generating Set has been shut down. A prolonged 'cool-down' period will always be beneficial for component temperature equalisation, but often not acceptable to engine manufacturer.

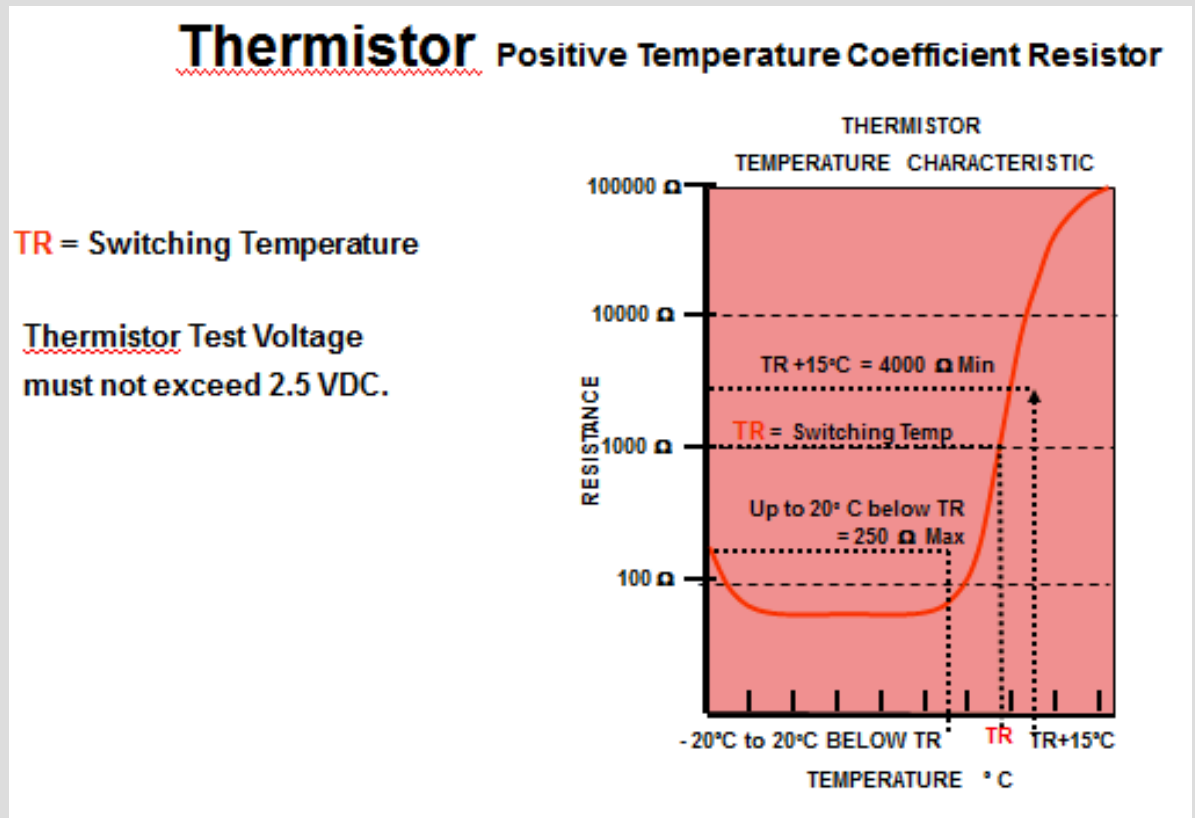
Note 2. A hot shutdown in a 'non-additionally' ventilated Generating Set housing promotes a micro-climate of very high humidity [RH%] and this 'attacks' winding insulation systems.

Thermistors

Three thermistors embedded within a stator winding - series connected - offer a low-cost temperature detection system, which when used in conjunction with a control module, provide a basic protection scheme for the prevention of overheating a stator winding. Thermistors are positive temperature coefficient resistors - low resistance when detecting low temperatures and high resistance (open circuit) when above the tripping temperature. No adjustment is possible.

The resistance of the thermistor will increase very rapidly (equal to contacts opening) when the switching temperature is reached. The resistance of the thermistor will then decrease (equal to contacts closing) when the temperature reduces below the switching temperature. By connecting the thermistors in series, a 24V dc circuit is created that will detect excessively high temperatures in the stator core pack.

Thermistors are offered as sets of three, equi-spaced around the stator windings, one per phase and each set connected to their individual modular Thermistor Control Unit, which incorporates a volt free change-over contact, for inclusion into the Generating Set control scheme. The Thermistor Control Unit is simply a switching device that provides a 'Go NoGo' signal to the Generating Set control system.



Typically, two of the above described thermistor schemes are incorporated, a system which operates at just above expected normal rated operating conditions and this scheme activates a control system function for triggering an ALARM.

A second scheme comprised of a second control module connected to three series connected thermistors with a trigger temperature of some 10°C to 20°C above the ALARM system devices which activate a controlled SHUTDOWN.

The Thermistor Control Unit is supplied loose for the Generating Set manufacturer to decide where it is to be installed - usually in or adjacent to the Generating Set controller. Installation in the alternator terminal box is not advised because of the radial heat effect from the alternator.

Thermistors with various operating temperatures are available to offer individual systems enabling different temperatures to be detected for either alarm or shut down situations, for either Class 'F' or 'H' temperature rise operating temperatures. Customers should be advised of the following switching temperature. The operational effectiveness will depend on the rate of temperature rise, the delay in sensing and the switching effectiveness of the control device.

- Class F Alarm 145°C Class H Alarm 165°C
- Class F Trip 165°C Class H Trip 190°C

Thermistors on STAMFORD Alternators

The actual thermistor values being used to achieve the above switching temperatures are summarised below and these values have been chosen based on experience gained from a series of tests with the objective of considering the whole STAMFORD product range and so a wide variation in product types.

	<u>S4, HC5 (S5), S6, P7 (S7) fitted at NDE</u>			<u>UC (S2/S3) fitted at DE</u>		
Class F Alarm	070-59112	Blue/black	155°C	070-59105	White/green	170°C
Class F Trip	070-59105	White/green	170°C	070-59113	White/red	180°C
Class H Alarm	070-59105	White/green	170°C	070-59113	White/red	180°C
Class H Trip	070-59113	White/red	180°C	070-59104	Grey/brown	190°C

Ground fault indication relay - H724



> Specification sheet

Our energy working for you.™



Code requirements

NFPA 70, the U.S. National Electrical Code (NEC) requires that services of 1000 amps and larger in capacity which operate at more than 150 volts from line-to-neutral must be provided with ground fault equipment. Generator sets rated at 1000 amps and larger which serve as emergency power must be provided with ground fault indication equipment. Health care facilities that utilize ground fault protection equipment must be provided with a coordinated multi-level ground fault system.

Cummins Power Generation ground fault indication equipment is designed for use in emergency/standby power systems, for indication of ground fault conditions during generator set operation.

Features

Suitable for indicating a ground fault condition on a generator set which is either locally or remotely grounded.

Supply voltage - Operates on 24 VDC (nominal) control power - fully functional at voltages from 18-30 VDC.

Direct connection - Suitable for direct connection to generator sets operating at voltages up to 600 VAC (line to line).

Ground fault current settings - 100-1200 A, in 10 discrete settings: 100, 150, 200, 250, 300, 450, 600, 750, 800, 1200 A.

Monitoring - Provides continuous monitoring of neutral-to-ground with LED indication for open connection.

Factory mounted controls - Available factory-mounted and interconnected to Cummins Power Generation Detector™ series PowerCommand® controls.

Link reconnection - For use with either 3-pole (solid neutral) or 4-pole (switched neutral) transfer switches.

Indicating lamps - For Relay on (green), ground fault current over setting (red), loss of ground connection (red).

Time delay settings – Adjustable 0-10 seconds.

Circuit board - One-piece molded case fully potted.

Contacts - One set of form C output, 8A at 250 VAC, 8A at 30 VDC.

“Test” - Push-button.

“Reset” - Push-button.

Percent full scale metering output - 0-1 mA full scale.

Bonding jumper - Sized per NEC requirements.

Construction

The relay is provided in a non-conducting phenolic case, with provisions for panel mounting or mounting to a standard DIN rail (panel mounting is recommended for mounting on a generator set). Relay components are fully potted with epoxy resin for vibration resistance and durability.

The relay includes an integral terminal block assembly, which accepts wires up to 12-gauge.

Relay function selection link (auto/hand reset).

Environmental range - Operating -10 °C to +60 °C, storage -20 °C to 70 °C.

DC supply burden – 2.5 W.

Transfer switch type selection link - (3-pole or 4-pole).

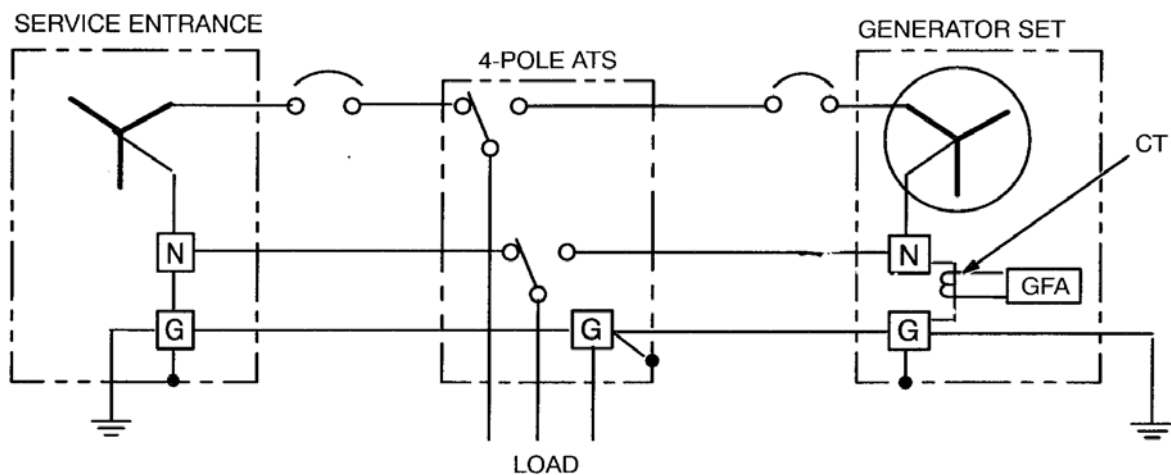
System operation

The ground fault relay continuously monitors the voltage across the neutral-to-ground bonding jumper and lights the ground fault alarm lamp on the generator set control when the connection is broken.

When the generator set is running, the relay continuously monitors the neutral-to-ground generator set connection and lights the ground fault alarm lamp on the generator set control when a ground fault condition is sensed.

Alarm condition can be cleared by pushing the reset switch on the generator set control panel. Actual ground fault current level can be monitored with a 0-1 mA meter, directly from the relay. A push button test switch is provided to simulate ground fault conditions and operate the relay and indication circuitry. Addition of the auto-reset link activates automatic reset of the relay after the ground fault condition has cleared.

0179-3509 – TYPE A



THREE-PHASE, FOUR-WIRE UTILITY, 4-POLE ATS

H724-2 = The generator set is equipped with a current transformer and ground fault indication relay for use with a 4-pole, separately derived transfer switch and set mounted circuit breaker. The CT is mounted in the circuit breaker box mounted on the right side of the genset as viewed from the generator end. The genset neutral and ground are bonded.

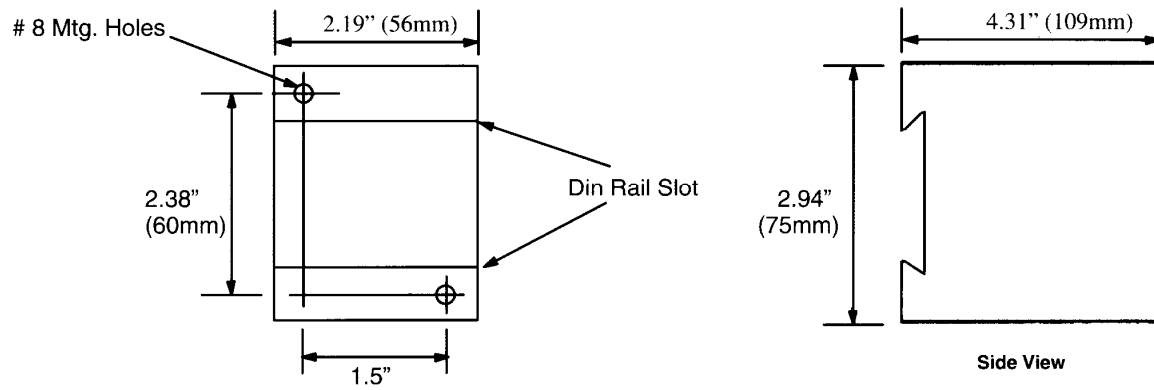
Our energy working for you.™

www.cumminspower.com

©2009 Cummins Power Generation Inc. All rights reserved. Cummins Power Generation and Cummins are registered trademarks of Cummins Inc. "Our energy working for you.", PowerCommand and Detector are trademarks of Cummins Power Generation. Specifications are subject to change without notice.
AC-160e (9/09) Page 2 of 8

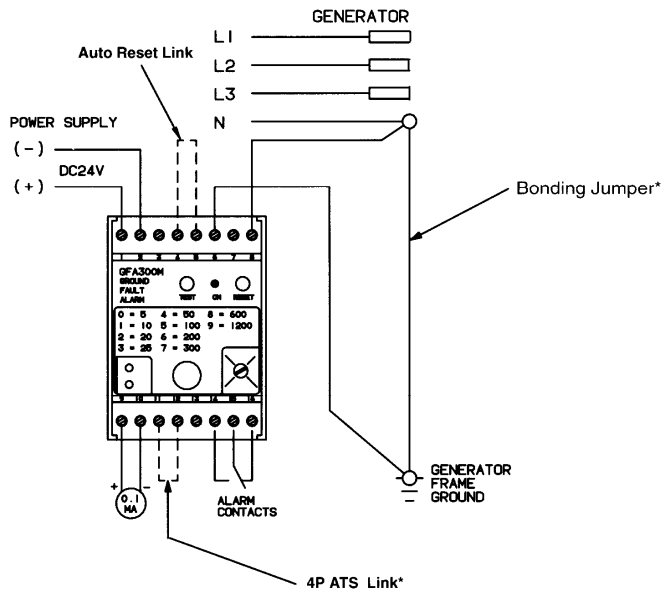


Outline detail



Weight: 19 oz (540 grams)

Interconnection detail



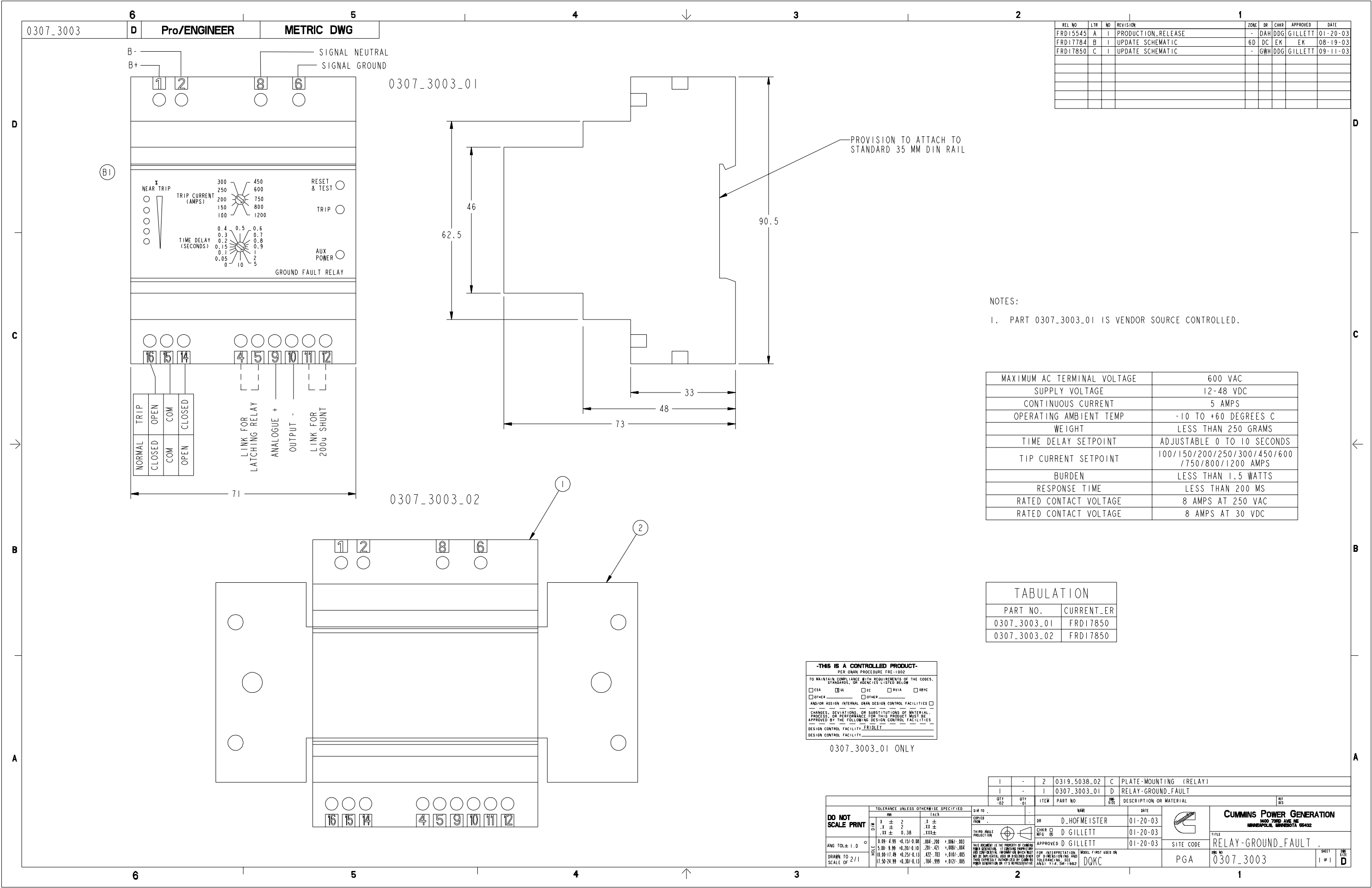
* Required only with separately derived systems. Bonding jumper is included in kit.

Our energy working for you.™

www.cumminspower.com

©2009 Cummins Power Generation Inc. All rights reserved. Cummins Power Generation and Cummins are registered trademarks of Cummins Inc. "Our energy working for you.", PowerCommand and Detector are trademarks of Cummins Power Generation. Specifications are subject to change without notice.
AC-160e (9/09) Page 4 of 8





REL NO	LTR	NO	REVISION	ZONE	DR	CHKR	APPROVED	DATE
FRD15545	A	1	PRODUCTION RELEASE	-	DAH	DDG	GILLETT	01-20-03
FRD17784	B	1	UPDATE SCHEMATIC	6D	DC	EK	EK	08-19-03
FRD17850	C	1	UPDATE SCHEMATIC	-	GWH	DDG	GILLETT	09-11-03

NOTES:
1. PART 0307_3003_01 IS VENDOR SOURCE CONTROLLED.

MAXIMUM AC TERMINAL VOLTAGE	600 VAC
SUPPLY VOLTAGE	12-48 VDC
CONTINUOUS CURRENT	5 AMPS
OPERATING AMBIENT TEMP	-10 TO +60 DEGREES C
WEIGHT	LESS THAN 250 GRAMS
TIME DELAY SETPOINT	ADJUSTABLE 0 TO 10 SECONDS
TIP CURRENT SETPOINT	100/150/200/250/300/450/600 /750/800/1200 AMPS
BURDEN	LESS THAN 1.5 WATTS
RESPONSE TIME	LESS THAN 200 MS
RATED CONTACT VOLTAGE	8 AMPS AT 250 VAC
RATED CONTACT VOLTAGE	8 AMPS AT 30 VDC

TABULATION	
PART NO.	CURRENT-ER
0307_3003_01	FRD17850
0307_3003_02	FRD17850

-THIS IS A CONTROLLED PRODUCT-
PER ONAN PROCEDURE FRE-1002
TO MAINTAIN COMPLIANCE WITH REQUIREMENTS OF THE CODES, STANDARDS, OR AGENCIES LISTED BELOW:
☐ CSA ☒ UL ☐ EC ☐ RVIA ☐ AISC
☐ OTHER ☐ OTHER
AND/OR ASSIGN INTERNAL ONAN DESIGN CONTROL FACILITIES ☐
CHANGES, DEVIATIONS, OR SUBSTITUTIONS OF MATERIAL, PROCESS, OR PERFORMANCE FOR THIS PRODUCT MUST BE APPROVED BY THE FOLLOWING DESIGN CONTROL FACILITIES:
DESIGN CONTROL FACILITY: FRIDLEY
DESIGN CONTROL FACILITY: _____

0307_3003_01 ONLY

1		-	2	0319_5038_02	C	PLATE-MOUNTING (RELAY)			
1		-	1	0307_3003_01	D	RELAY-GROUND_FAULT			
QTY '02		QTY '01	ITEM	PART NO	ONE SIZE	DESCRIPTION OR MATERIAL		REF DIS	
DO NOT SCALE PRINT		TOLERANCE UNLESS OTHERWISE SPECIFIED			SIS TO	NAME		DATE	
DIM		mm inch			COPIED FROM		D.HOFMEISTER		01-20-03
X ± .005		X ± .005			3RD ANGLE PROJECTION		D GILLET		01-20-03
Y ± .005		Y ± .005					APPROVED D GILLET		01-20-03
Z ± .005		Z ± .005					SITE CODE		RELAY-GROUND_FAULT
ANG TOL ± 1.0		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008			0.004-0.008 0.151-0.008	
SCALE OF 2/1		0.004-0.008 0.151-0.008			0.				



Battery Charger

A048G602 10 A 50/60 Hz



Description

Cummins® fully automatic battery chargers are constant voltage/constant current chargers incorporating a 4-stage charging algorithm. Designed for use in applications where battery life and reliability are important; these chargers, complete with built-in equalize charge capability, are ideal for stationary or portable starting battery charging service.

To achieve optimum battery life, a 4-stage charging cycle is implemented. The four charging stages are constant current, high-rate taper charge, finishing charge, and maintaining charge. During the constant current cycle, the charger operates at maximum possible output in the fast charge mode. During the high-rate taper charge cycle the charger stays at fast charge voltage level until battery current acceptance falls to a portion of the chargers rated output. During the finishing charge cycle the charger operates at the float voltage and completes the battery charge. During the maintaining charge cycle the charger supplies only a few milliamps required by the battery to stay at peak capability.

An optional temperature sensor (A043D534) may be used to adjust charging voltage based on temperature of the battery. Use of a battery temperature sensor helps to increase battery life by preventing over or under charging. The battery temperature sensor also protects the battery from overheating. Temperature compensation sensor is required for all applications when battery charger and battery are located in different temperature or battery heater is being used.

Battery chargers are field-configurable for charging either 12 or 24 VDC battery systems at 50/60 Hz operation. Simple jumper selectors enable selection of output voltage and battery type.

Features

Protection – Surge protected to IEEE and EN standards. All models include single pole cartridge type fuses mounted on the printed circuit board to protect against input or output overcurrent.

Easy Installation – Clearly marked terminal blocks and panel knockouts provide convenient connections of input and output leads.

User Display – Output voltage and current, fault information and status are indicated on the front panel. Includes precision ammeter and voltmeter.

Monitoring – Status LED indicators are provided to show the condition of the charger. LED's on the right side of the monitor indicate operational functions for Temperature Compensation active (Green), AC on (Green), Float (Green) or Boost (Amber) mode, as well as Battery Fault (Red). LED's on the left side of the monitor illuminate (in Red) when Charger fail, High or Low VDC or AC fail occur.

Adjustable Float Voltage – Float voltage can be set, using easy to understand jumpers, for optimum battery performance and life.

Construction – NEMA-1 (IP20) corrosion resistant aluminium enclosure designed for wall mounting.

Faults – The charger senses and annunciates the following fault conditions: AC power loss, battery overvoltage, battery under voltage, battery fault conditions and charger failure. Includes an individual 30 volt/2-amp isolated contact for each alarm.

Vibration Resistant Design – complies with UL991 class B vibration resistance requirements.

Listed – C-UL listed to UL 1236 CSA standard 22.2 No 107.2-M89. Suited for flooded and AGM lead acid and NiCd batteries in generator set installations.

Warranty – 5 year CPG warranty.



Status and Fault LED



Field Selectable Jumper

Specifications

Performance and Physical Characteristics

Output:	Nominal voltage	12VDC* or 24VDC
	Float voltage – 12VDC batteries	12.87, 13.08, 13.31, 13.50*, 13.62, 14.30
	Float voltage – 24VDC batteries	25.74, 26.16, 26.62, 27.00*, 27.24, 28.60
	Equalize-voltage	6.5% above float voltage sensing
	Output voltage regulation	±0.5% (1/2%) line and load regulation
	Maximum output current	10 amps nominal
	Equalize charging	Battery interactive auto-boost
Input:	Voltage AC	120, 208, 240 ±10%
	Frequency	60/50 Hz +5%
Approximate net weight:		10A: 25 lbs. (11.36 Kg)
Approximate dimensions: height x width x depth-in		10A: 12.50" x 7.66" x 6.50"(318 x 195 x 165 mm)
Ambient temperature operation: At full rated output -		- 4 °F to 104 °F (-20 °C to 40 °C)

NRG Battery Charger Benefits and Features



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

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

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

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

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

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

EnerGenius reliability technology built into every charger includes:

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

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

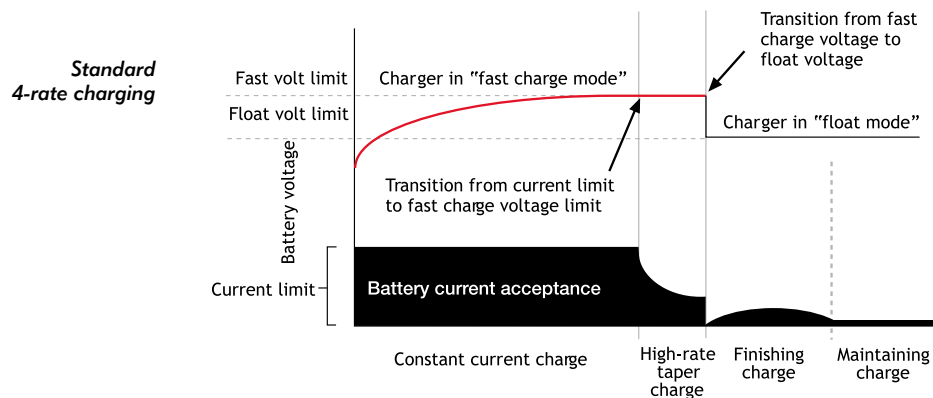
NRG Specifications

AC Input

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

Charger Output

Nominal voltage ratings	12 or 24 volt nominal
Optional voltage rating	12/24 volt, field selectable
Battery settings	Six discrete battery voltage programs
	- Low or high S.G. flooded
	- Low or high S.G. VRLA
	- Nickel cadmium 9, 10, 18, 19 or 20 cells
Regulation	$\pm 0.5\%$ (1/2%) line and load regulation
Current	10 amps nominal
Electronic current limit	105% rated output typical – no crank disconnect required
Charge characteristic	Constant voltage, current limited, 4-rate automatic equalization
Temperature compensation	Enable or disable anytime, remote sensor optional
Output protection	Current limit, 1-pole fuse, transient suppression



User Interface, Indication and Alarms

Digital meter	Automatic meter alternately displays output volts, amps ⁴
Accuracy	$\pm 2\%$ volts, $\pm 5\%$ amps
Alarms	LED and Form C contact(s) per table:



Front panel status display

Alarm System Functions

	Alarm code "1" ¹	Alarm code "C" ² (meets requirements of NFPA 110)
AC good	LED	LED
Float mode	LED	LED
Fast charge	LED	LED
Temp comp active	LED	LED
AC fail	LED ²	LED and Form C contact
Low battery volts		LED and Form C contact
High battery volts		LED and Form C contact
Charger fail	LED ²	LED and Form C contact
Battery fault ³	LED ²	LED and Form C contact

1. Alarms "1" available only on 10A charger
2. Form C contact provides summary alarm of these conditions. BBHH chargers include this alarm configuration. Contacts rated 2A @ 30 VDC or .5A @ 125 VAC resistive.
3. Battery fault alarm indicates these fault conditions:
 - Battery disconnected - Battery polarity reversed - Mismatched charger battery voltage - Open or high resistance charger to battery connection
 - Open battery cell or excessive internal resistance
4. Three-position jumper allows user to select from three display settings: alternating volts / amps (normal), constant volts, or constant amps

Controls

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

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



Simple field adjustments

Environmental

Operating temperature
Over temperature protection
Humidity
Vibration (10A unit)
Transient immunity
Seismic Certification

-20C to +60C, meets full specification to +45C
Gradual current reduction to maintain safe power device temperature
5% to 95%, non-condensing
UL 991 Class B (2G sinusoidal)
ANSI/IEEE C62.41, Cat. B, EN50082-2 heavy industrial, EN 61000-6-2
IBC 2000, 2003, 2006 Maximum S_{ds} of 2.28 g

Agency Standards

Safety

Agency marking

EMC

NFPA standards
Optional agency compliance

C-UL listed to UL 1236 (required for UL 2200 gensets), CSA standard 22.2 no. 107.2-M89
CE: 50/60 Hz units DOC to EN 60335
60 Hz: C-UL-US listed
50/60 Hz: C-UL-US listed plus CE marked
Emissions: FCC Part 15, Class B; EN 50081-2
Immunity: EN 61000-6-2
NFPA 70, NFPA 110. (NFPA 110 requires Alarms "C")
Units with Alarms "1" configuration available with additional compliance to UL category BBHH and NFPA 20

Construction

Housing/configuration

Packaging
Dimensions
Printed circuit card
Cooling
Protection degree
Damage prevention
Electrical connections

Material: Non-corroding aluminum. Configuration options:
• Fully enclosed: C-UL listed enclosure
• Open frame: C-UL recognized
Open-frame and Slimline configurations only available in bulk OEM quantities and packaging
See Drawings and Dimensions page for details
Surface mount technology, conformal coated
Natural convection
Listed housing: NEMA-1 (IP20). Optional IP21 drip shield. Optional NEMA 3R enclosure
Fully recessed display and controls
Compression terminal blocks

Warranty

Standard warranty

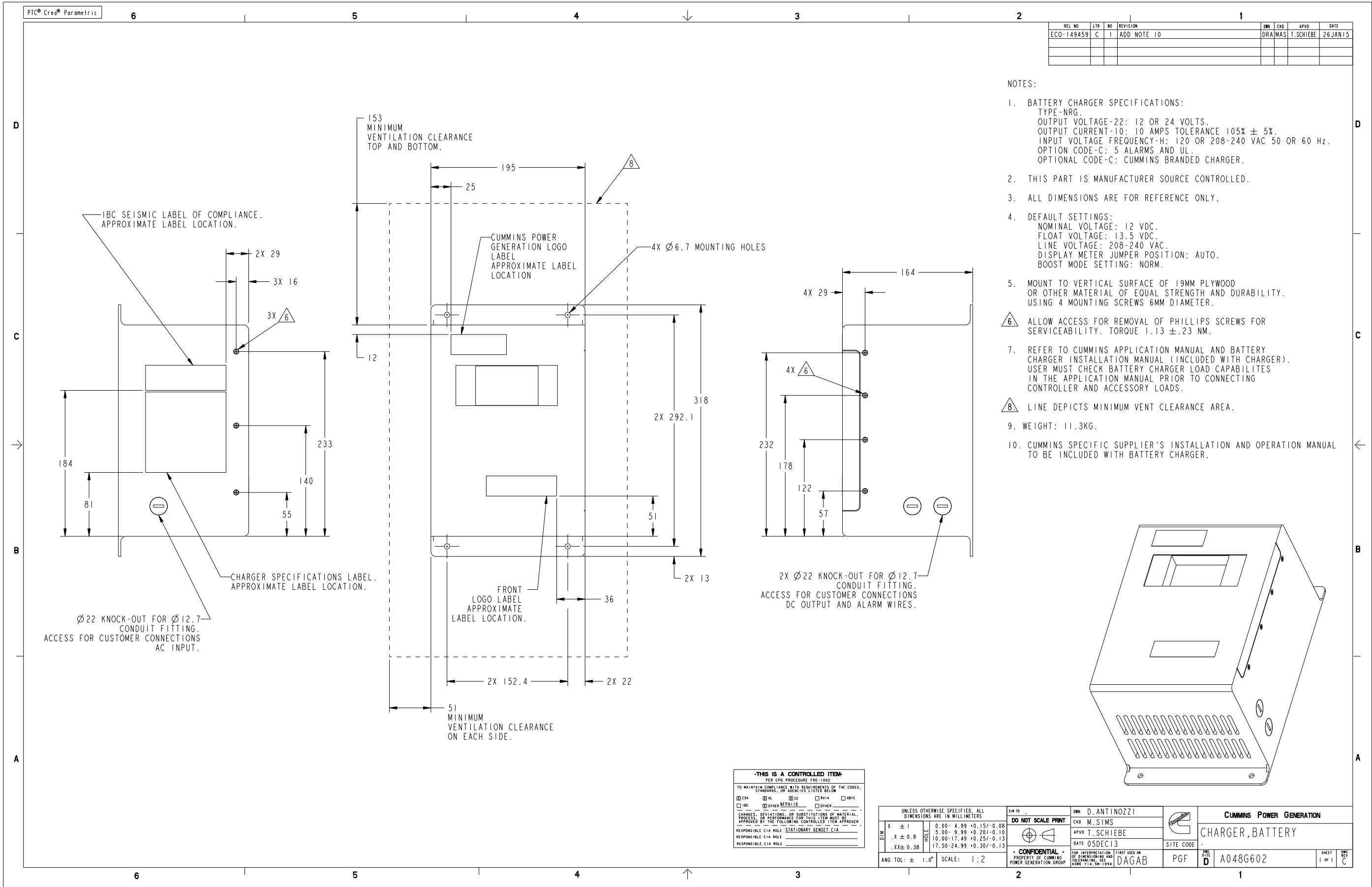
Optional warranty

Three year parts and labor warranty (10 years magnetics and power semiconductors) from date of shipment
If specified at time of order, warranty coverage can be increased to reimburse customer's documented field service costs up to the original charger price or increased to 5 or 10 years with field service cost reimbursement. Contact the factory for full details

Optional features

Input
Remote temp comp sensor
Drip shield meets s/b (IP21)
NEMA 3R housing
UL BBHH listing
Field service warranty

Input frequency, 50/60 Hz
Recommended where battery and charger are in different locations
Protects from dripping water
Enables outdoor installation (remote temp sensor recommended)
Available in 10A units with Alarms "1"
Reimbursement of customer field service expenses up to charger price for 3, 5, or 10 years



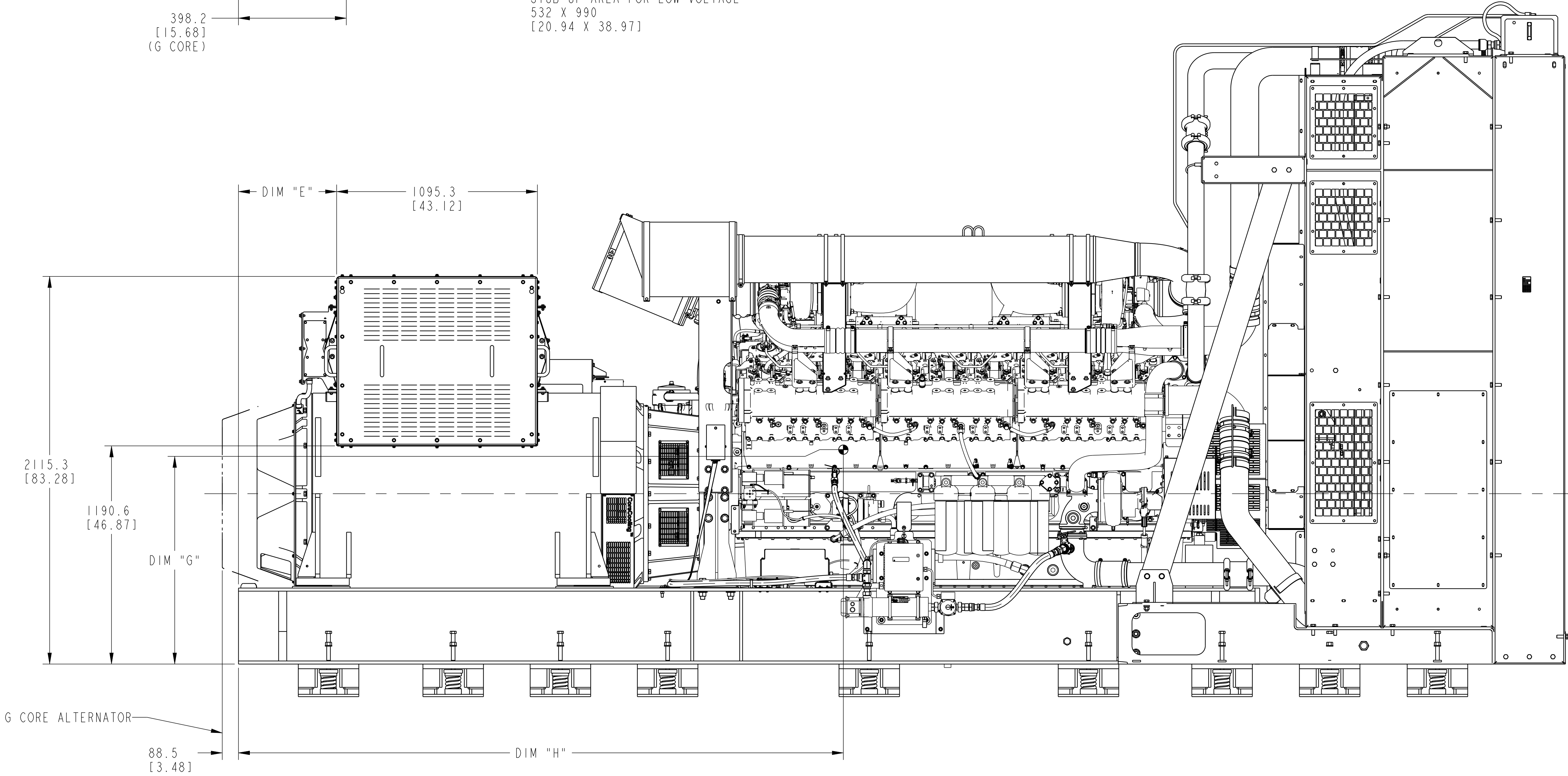
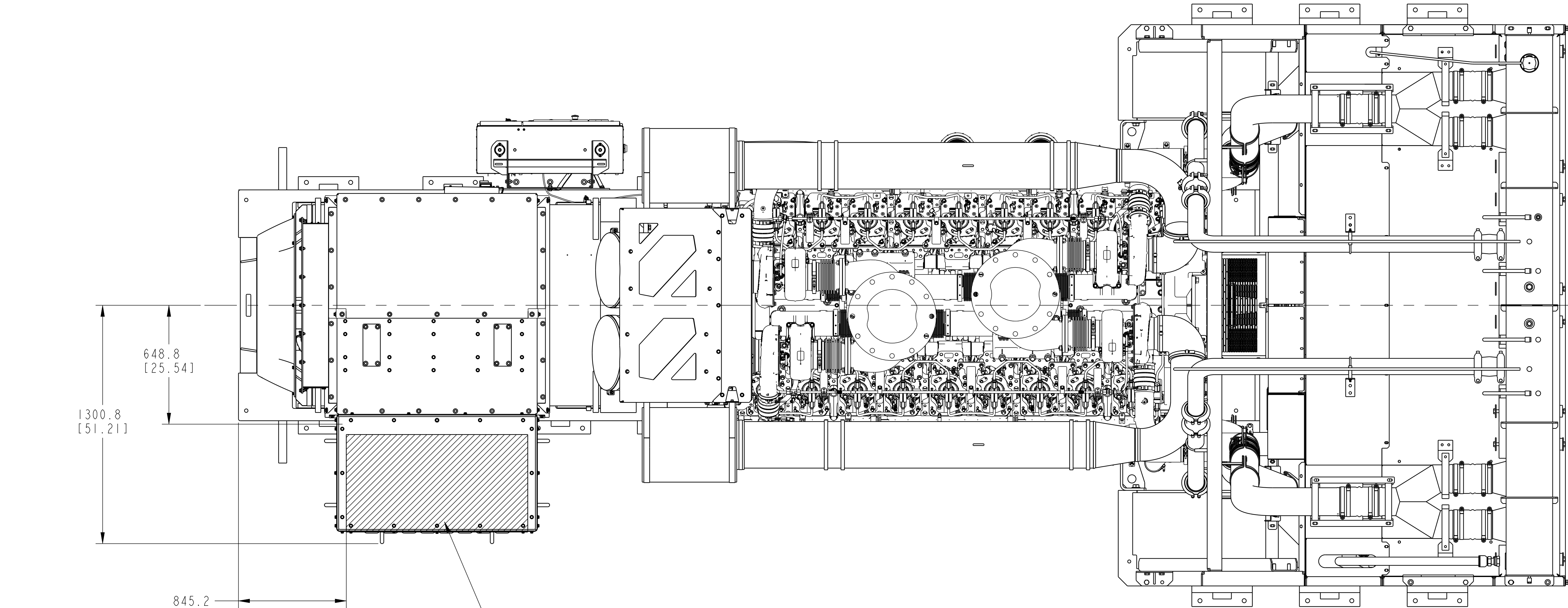
SECTION 4

Generator Set Drawings



LOW VOLTAGE
E-CORE ALTERNATOR SHOWN

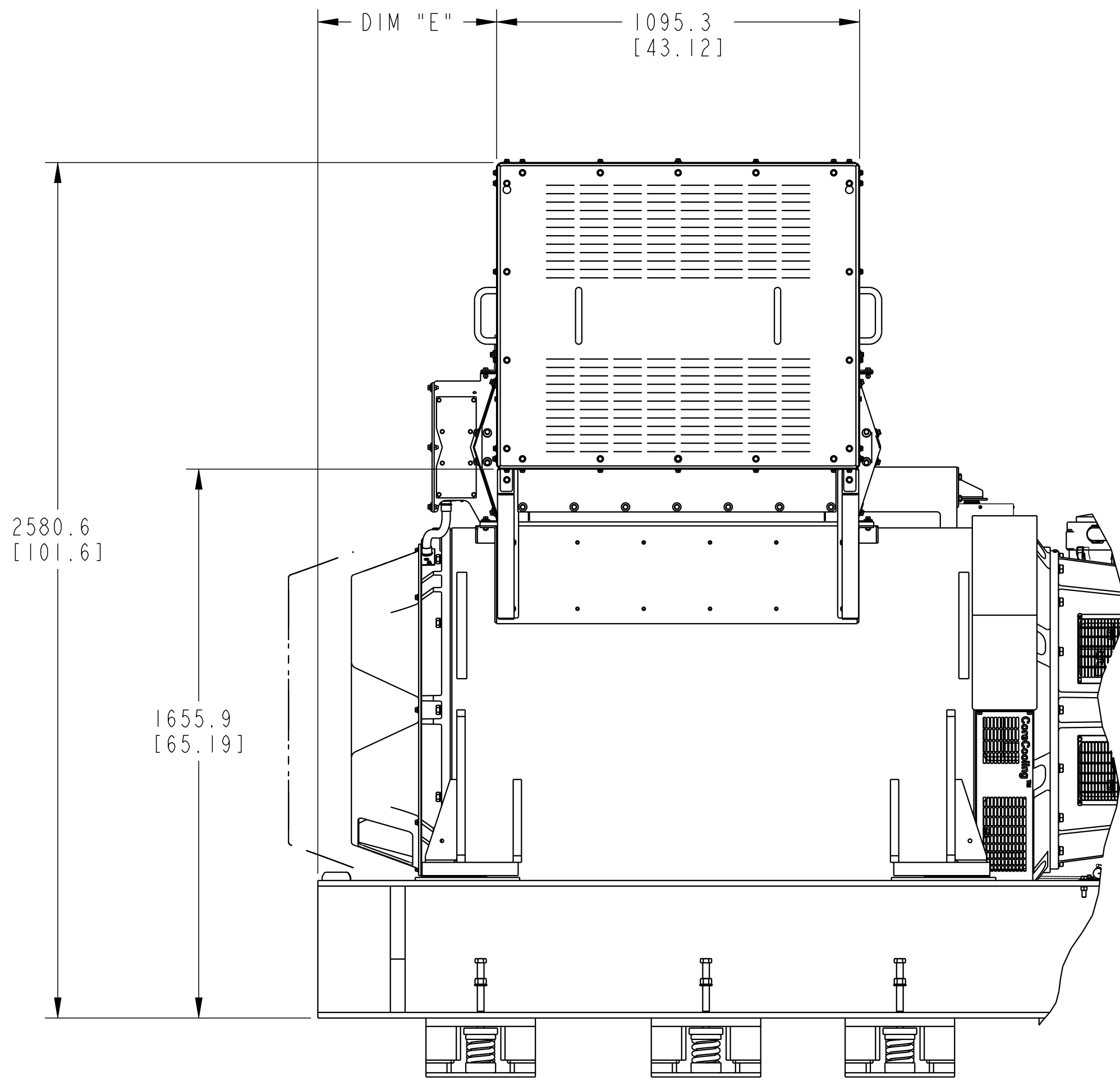
TABULATION									
GENERATOR DESIGNATION	DIM "E"	AS SHIPPED - WITHOUT COOLING SYSTEM				INSTALLED - WITH COOLING SYSTEM			
		GENSET WEIGHT		DIM "G" CENTER OF GRAVITY	DIM "H" CENTER OF GRAVITY	GENSET WEIGHT		DIM "G" CENTER OF GRAVITY	DIM "H" CENTER OF GRAVITY
		KGS	LBS			KGS	LBS		
S9LID-B42	702.6 [27.20]	10227	43200	1081 [42.54]	2001 [78.31]	23061	50734	1151 [45.31]	3560 [140.6]
S9LID-E42	535.5 [21.08]	20377	44829	1072 [42.20]	2859 [112.6]	24211	53264	1141 [44.92]	3423 [134.8]
S9LID-F42	535.5 [21.08]	20377	45269	1071 [42.17]	2832 [111.5]	24411	53704	1139 [44.84]	3395 [133.7]
S9LID-G42	345.5 [13.60]	21527	47359	1066 [41.97]	2734 [107.6]	25361	55794	1132 [44.57]	3291 [129.6]



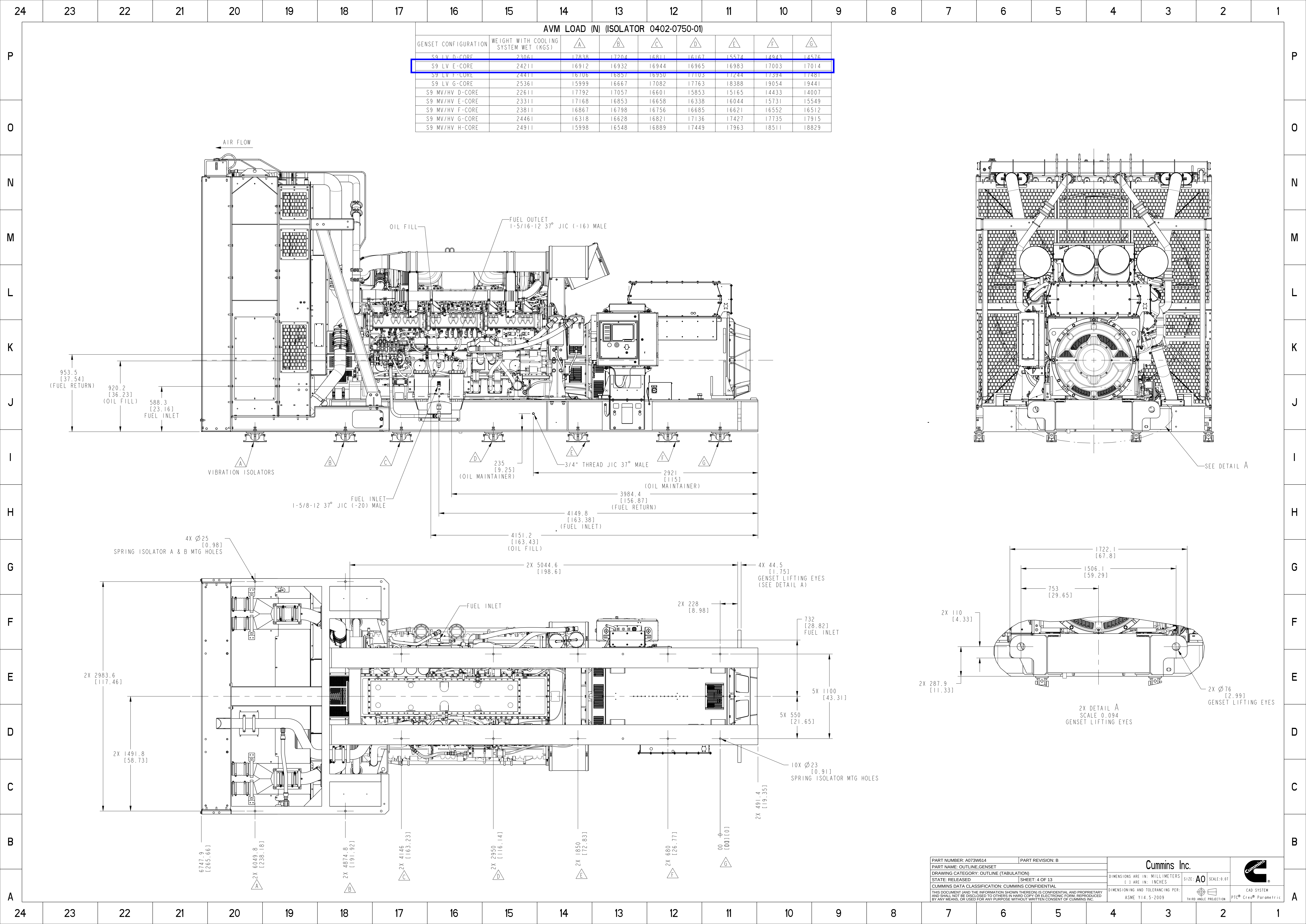
BOTTOM ELECTRICAL ENTRY

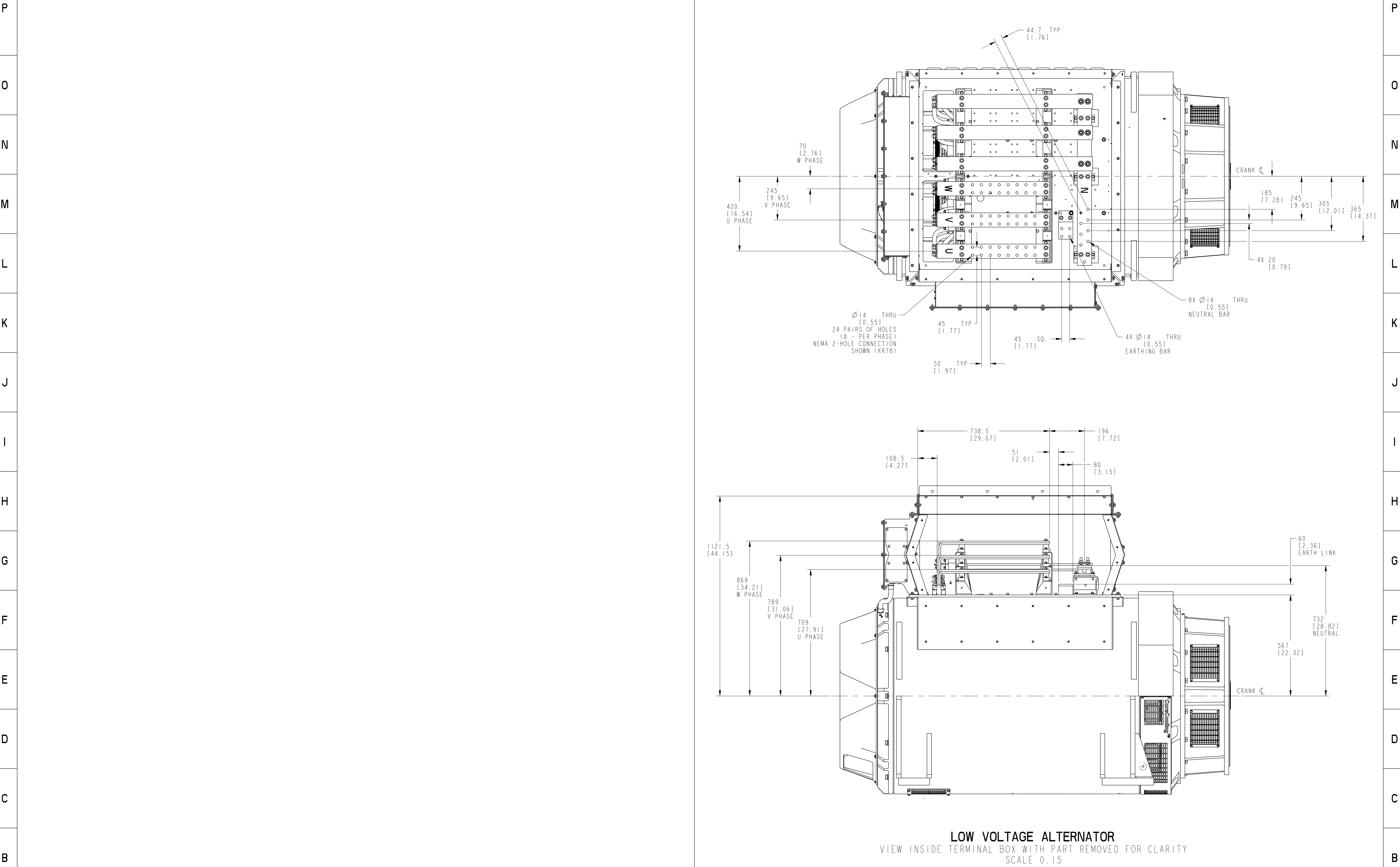
CRANK CL

AIR FLOW →

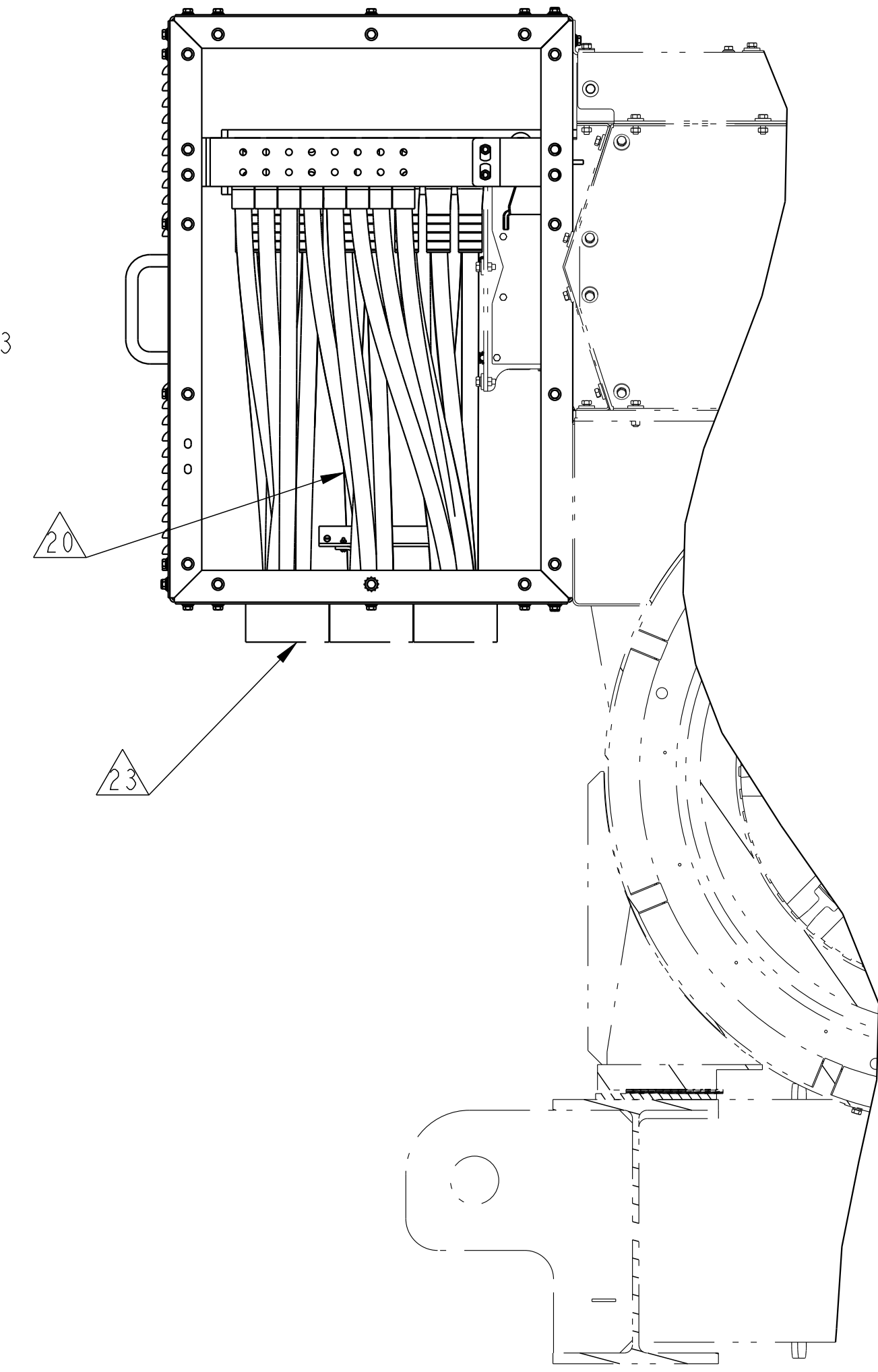
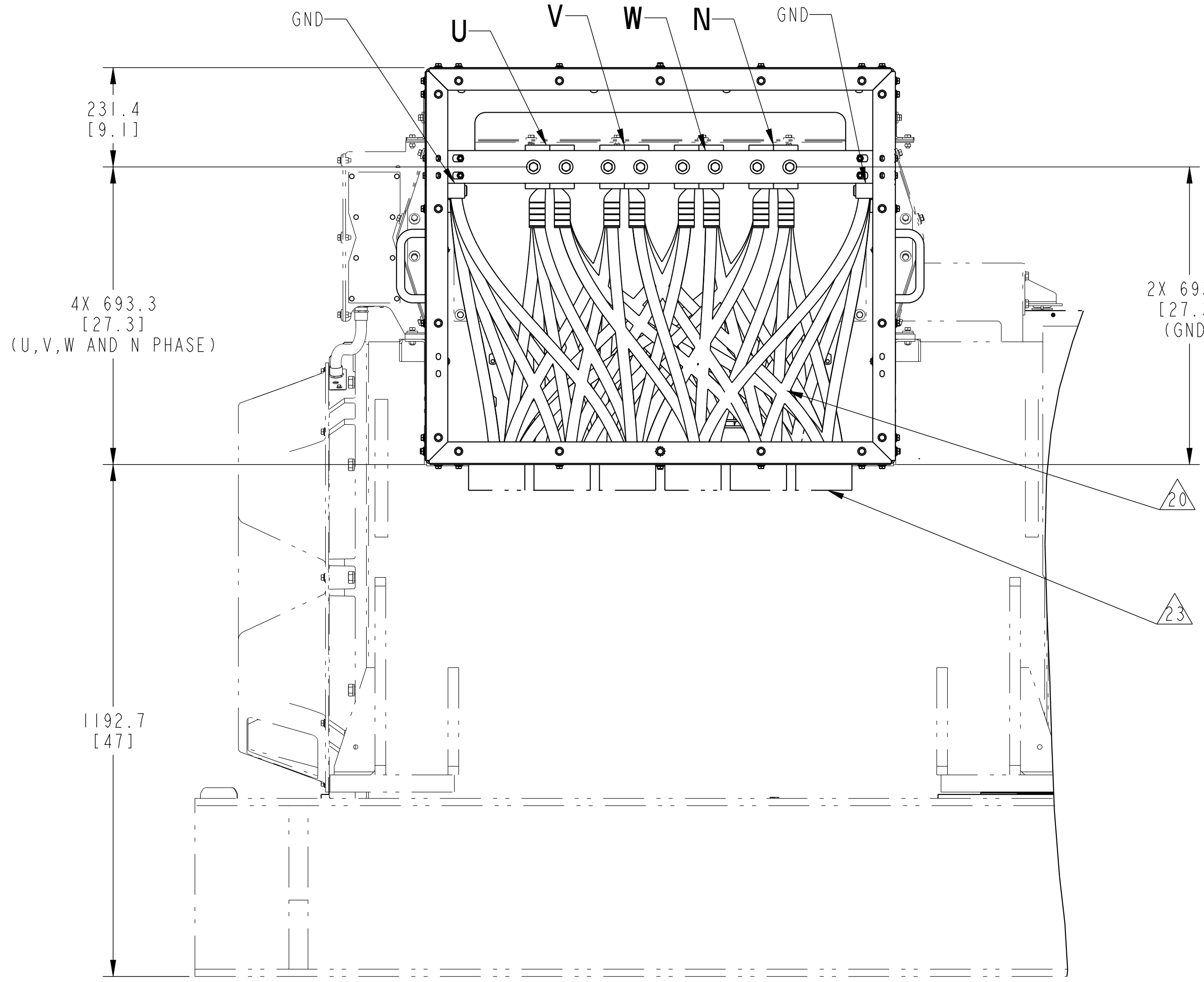
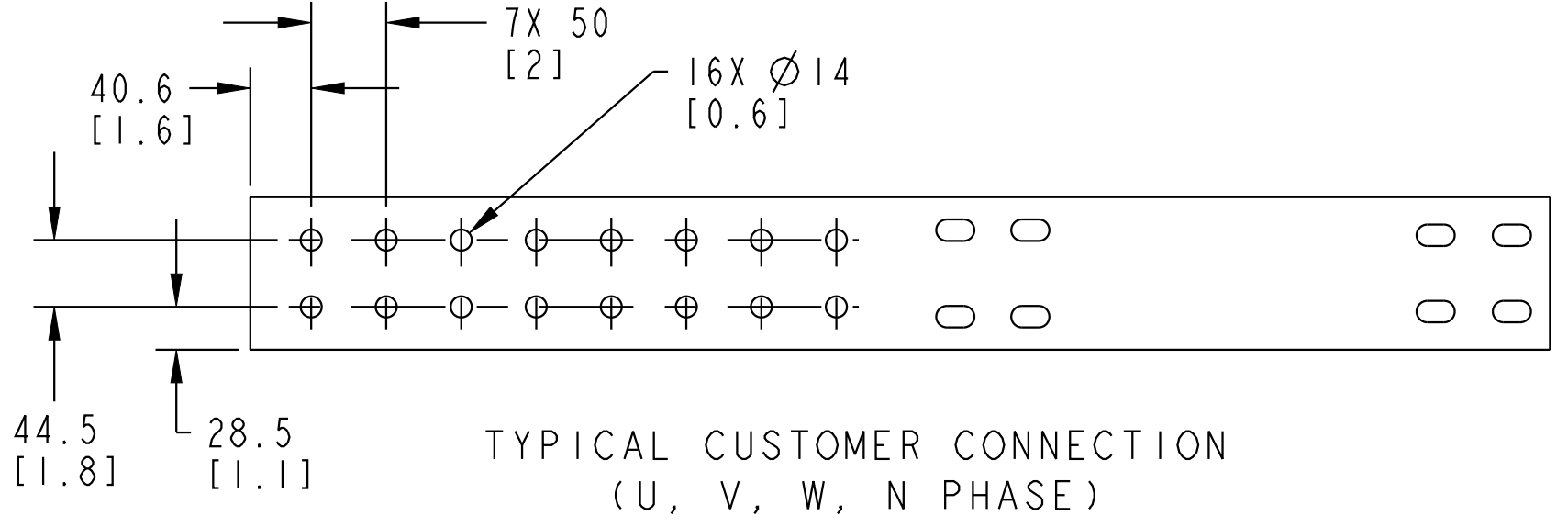
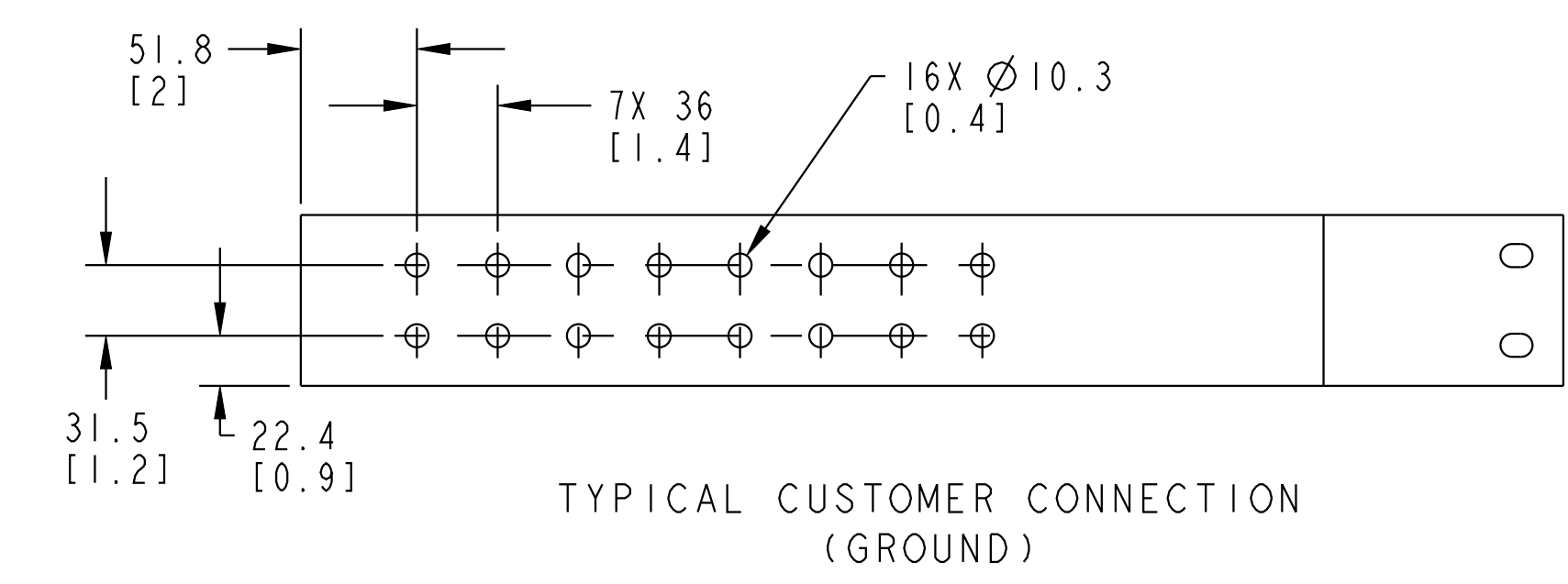
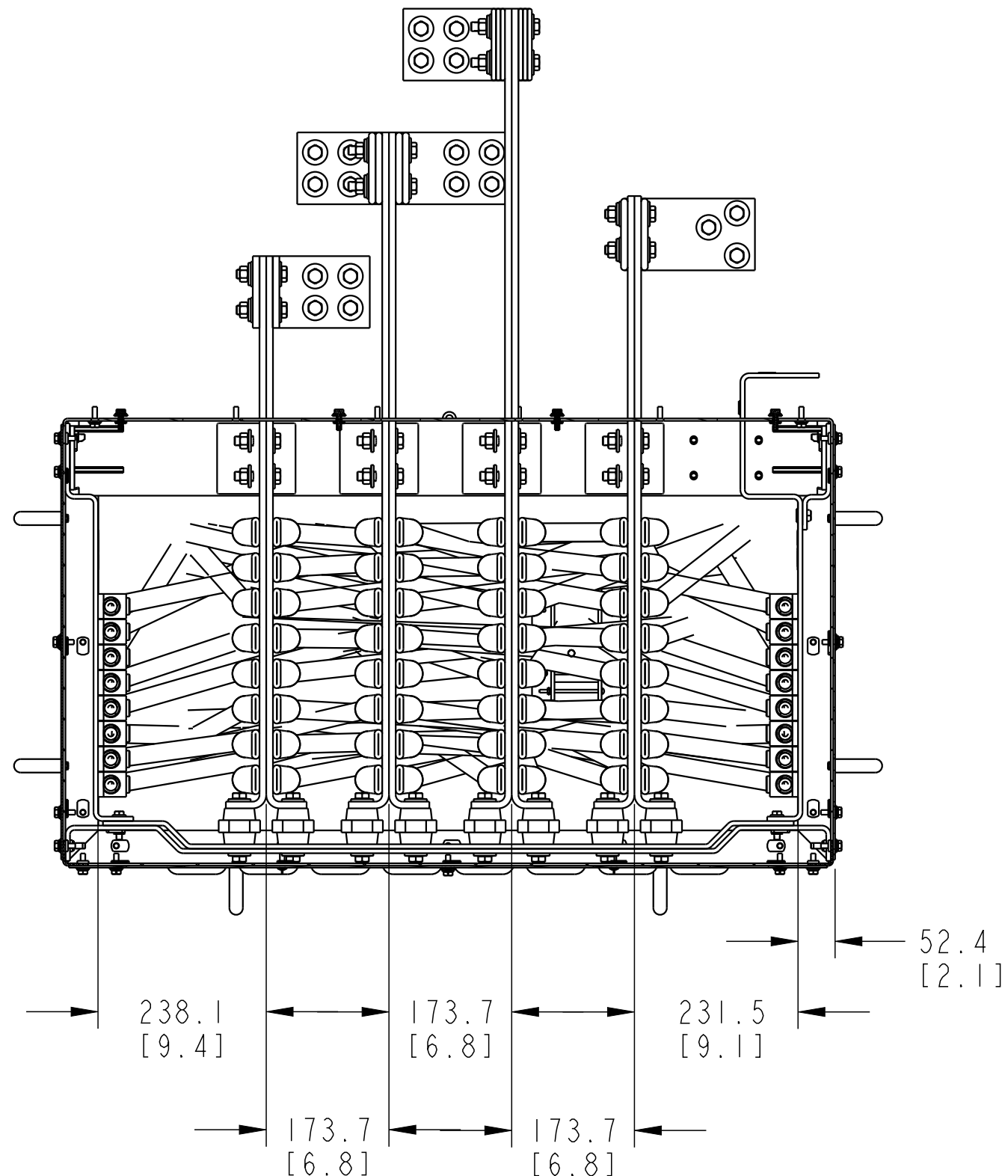


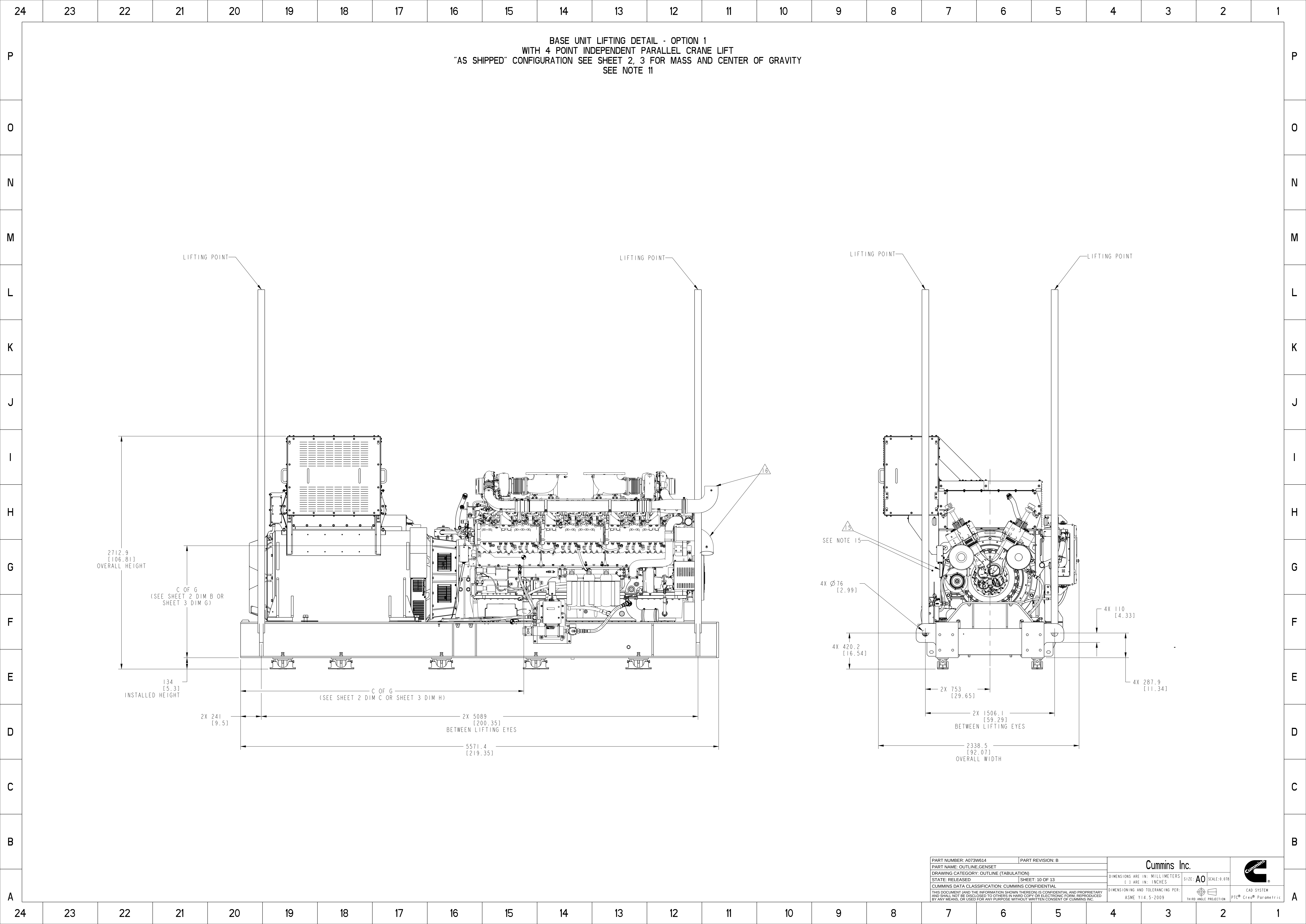
TOP ELECTRICAL ENTRY

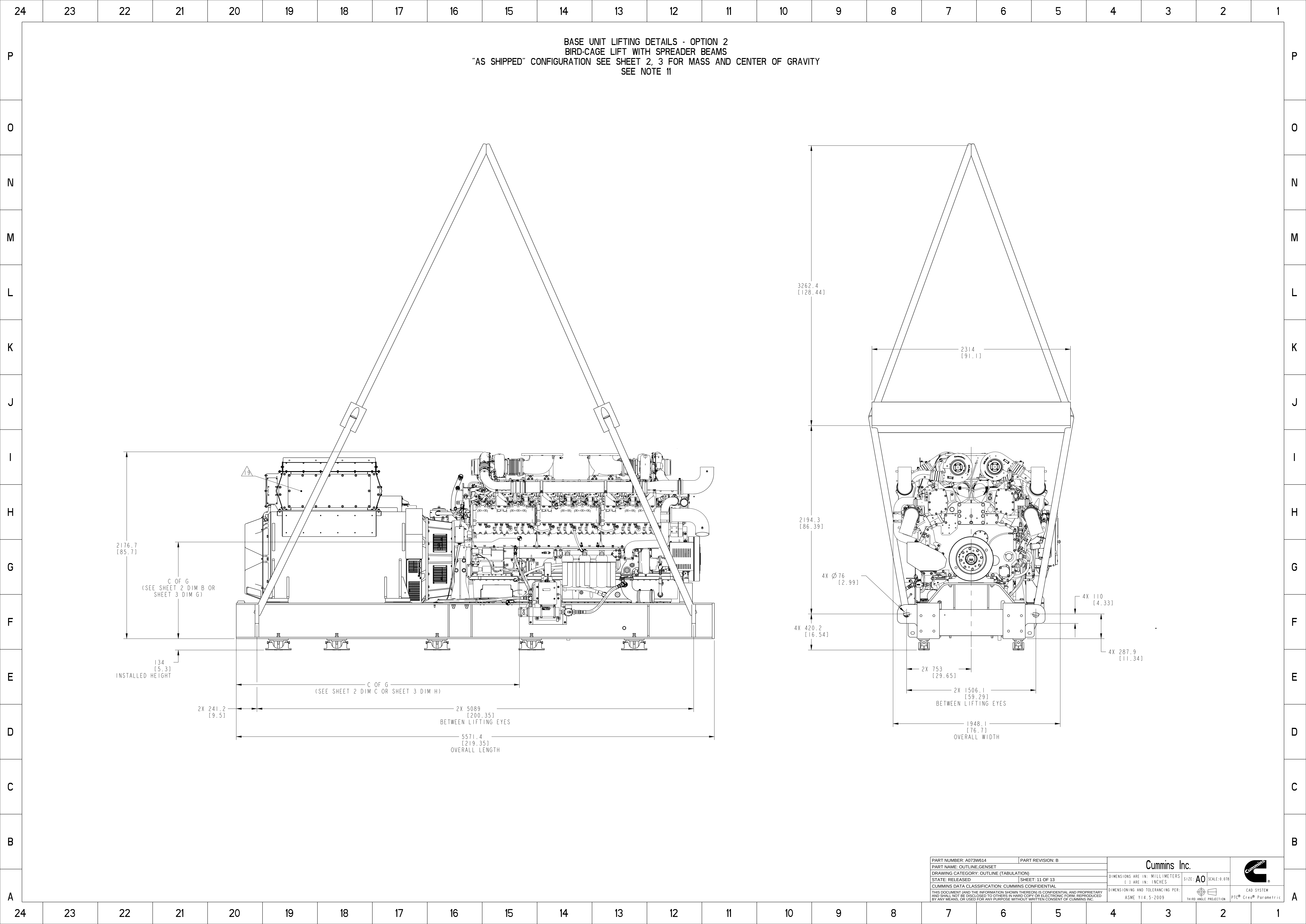


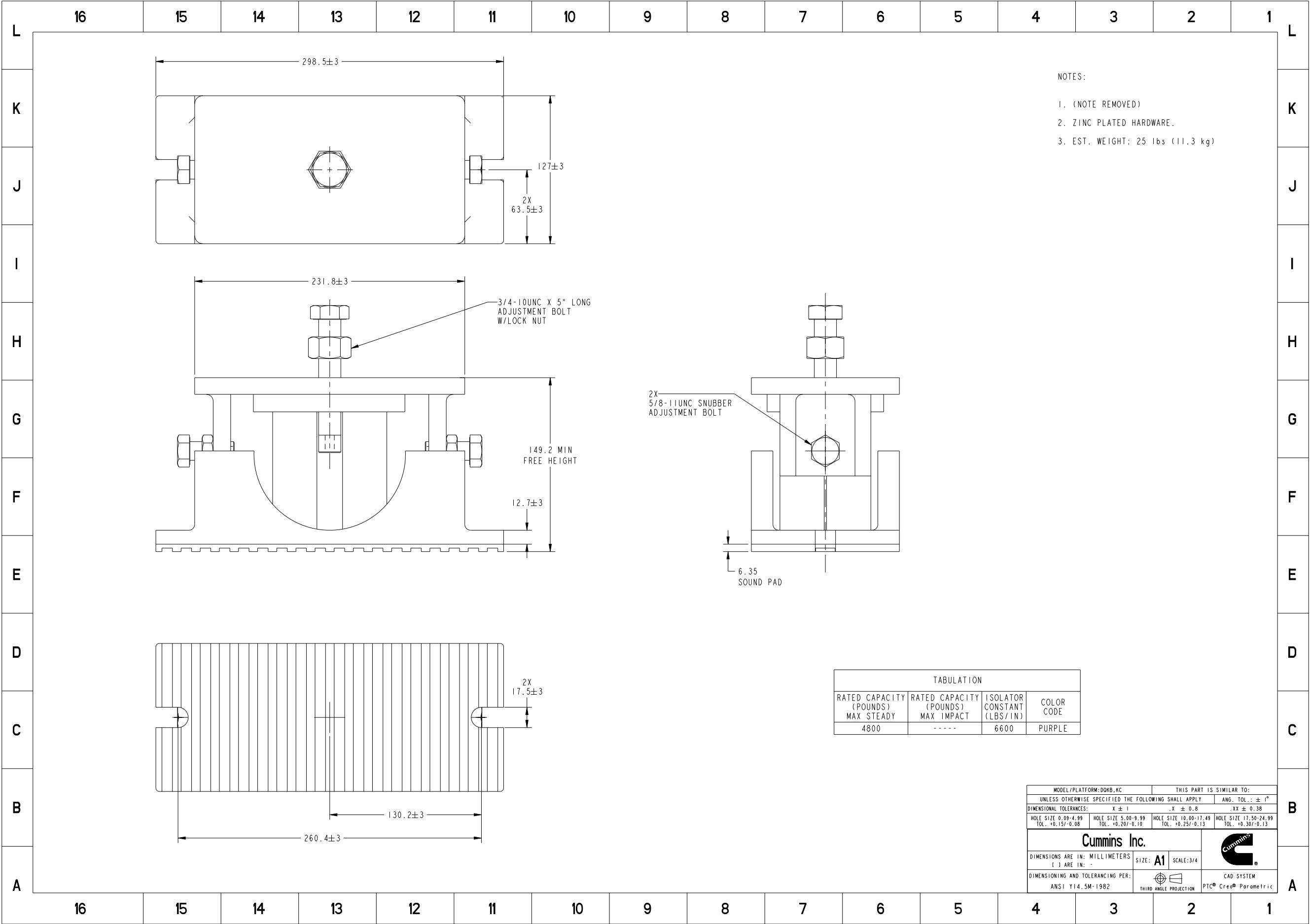


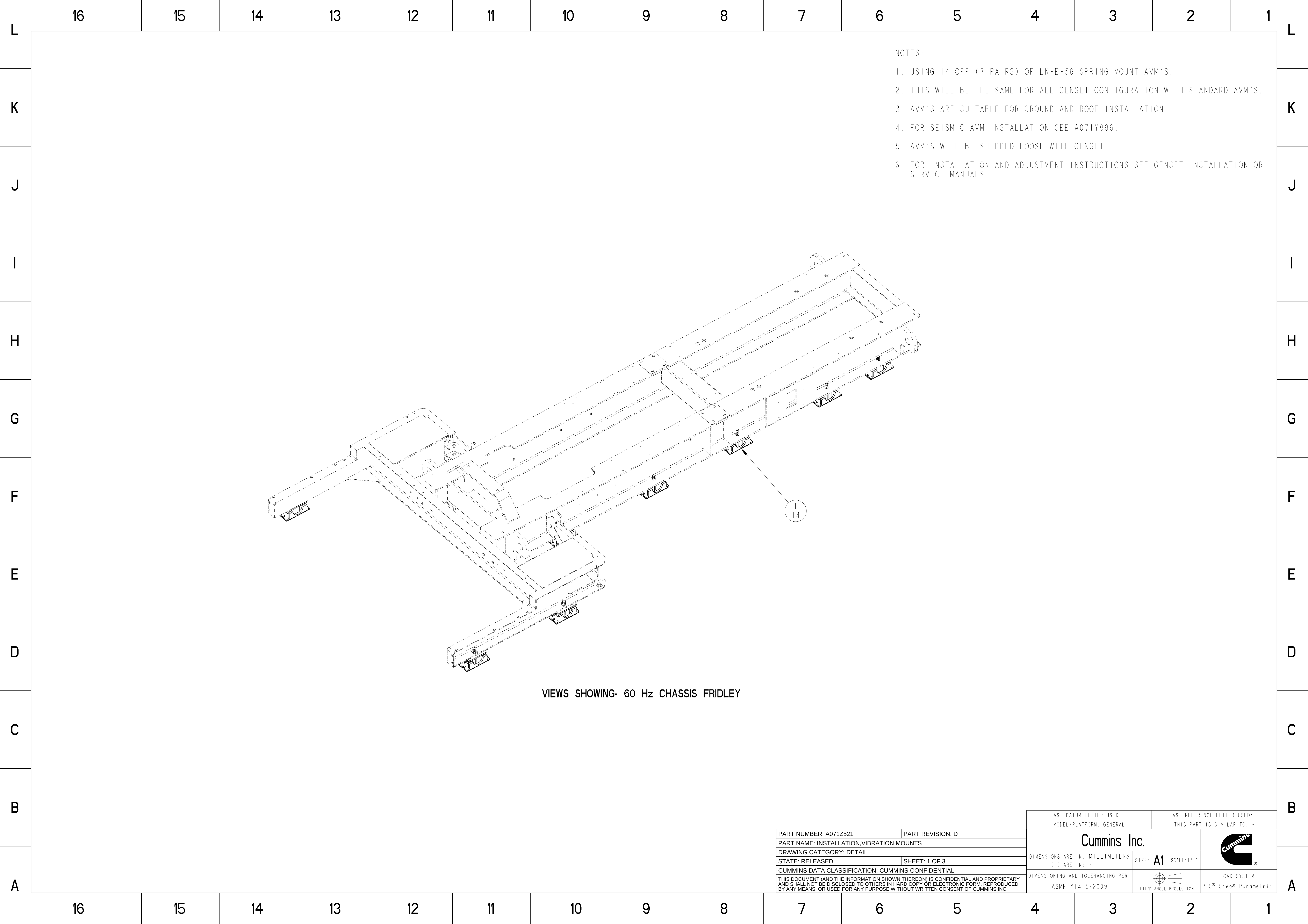
LV BOTTOM ENTRY ALTERNATOR TERMINAL (ENTRANCE) BOX DETAILS







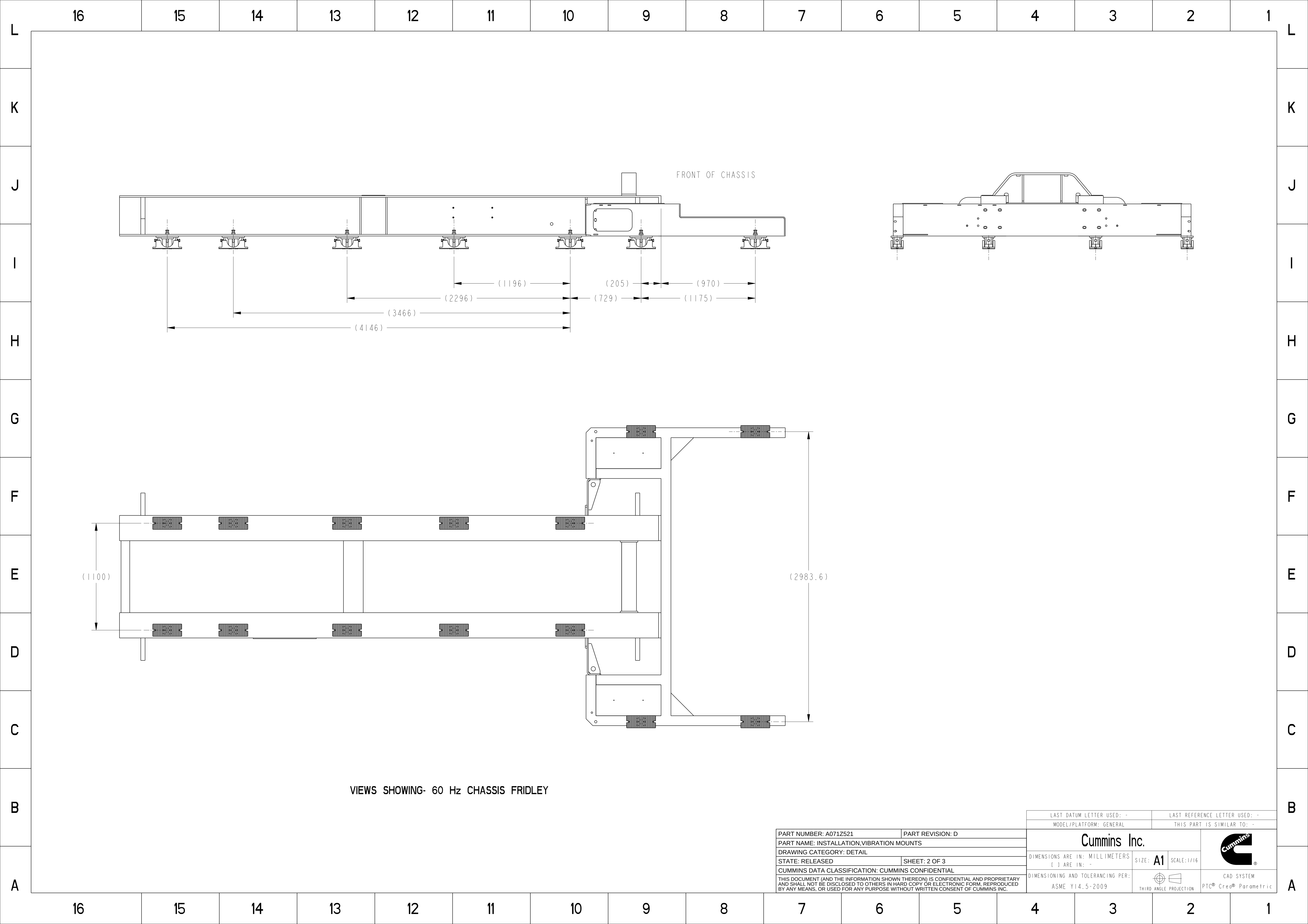




- NOTES:
- 1. USING 14 OFF (7 PAIRS) OF LK-E-56 SPRING MOUNT AVM'S.
 - 2. THIS WILL BE THE SAME FOR ALL GENSET CONFIGURATION WITH STANDARD AVM'S.
 - 3. AVM'S ARE SUITABLE FOR GROUND AND ROOF INSTALLATION.
 - 4. FOR SEISMIC AVM INSTALLATION SEE A071Y896.
 - 5. AVM'S WILL BE SHIPPED LOOSE WITH GENSET.
 - 6. FOR INSTALLATION AND ADJUSTMENT INSTRUCTIONS SEE GENSET INSTALLATION OR SERVICE MANUALS.

VIEWS SHOWING- 60 Hz CHASSIS FRIDLEY

		LAST DATUM LETTER USED: -		LAST REFERENCE LETTER USED: -	
		MODEL/PLATFORM: GENERAL		THIS PART IS SIMILAR TO: -	
PART NUMBER: A071Z521		PART REVISION: D		Cummins Inc. 	
PART NAME: INSTALLATION.VIBRATION MOUNTS					
DRAWING CATEGORY: DETAIL		DIMENSIONS ARE IN: MILLIMETERS [] ARE IN: -		SIZE: A1 SCALE:1/16	
STATE: RELEASED					
SHEET: 1 OF 3		DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009		 THIRD ANGLE PROJECTION	
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL					
THIS DOCUMENT (AND THE INFORMATION SHOWN THEREON) IS CONFIDENTIAL AND PROPRIETARY AND SHALL NOT BE DISCLOSED TO OTHERS IN HARD COPY OR ELECTRONIC FORM, REPRODUCED BY ANY MEANS, OR USED FOR ANY PURPOSE WITHOUT WRITTEN CONSENT OF CUMMINS INC.				CAD SYSTEM PTC® Creo® Parametric	



SECTION 5

Enclosure & Fuel Tank Submittal



CUSTOMER APPROVAL

Name:

Date:

Tank Paint Color: BLACK (Unless Otherwise Specified)

Encl Paint Color: Customer to Specify

Important: By signing this drawing you are approving all pages AS IS. If changes are required, a new revision will be required.

Genset Model

C3000D6EB

Rad ° C

50

Genset Drawing#

A073W614

Rev

B

Alternator/Frame Size

S9LV-E4/ADS-682

Air Filter Style

Std. Duty

Silencer

External Silencer

Isolator

(14) 0402-0750-01

Quote #

SS26-0324A1, SS26-0325A1

Customer Ref.

-

Nominal shipping dimensions are marked with "H", "W" and "L".

PACKAGE WEIGHT (Approximate)

Sub base (S8005521) Weight (Dry)

9,900 lbs

Lift base (L8000361) Weight

3,900 lbs

Enclosure (E8000864) Weight

21,000 lbs

Silencer Weight

2,900 lbs

Genset Weight (Wet)

55,911 lbs

Miscellaneous

Unknown

Total approximate weight to be determined at design phase.

Top View

Electrical stub up

(8x) 37" Door swing

Radiator End

Access Panel

255.5 Ref.

162.0 "H"

150.0

12.0

31.0

144.0 "W"

155.0 Ref.

Generator End

External silencer, shipped loose for field installation by others

114.0

326.0 Genset end

330.0 Lift base / Enclosure / Tank

108.0

552.0 "L"

Side View

Radiator access panel, right side only

00

05/26/26

Start (P8002279)

XX

S. Rev

Date

Description

Name

Change Block

TRAMONT

TRAMONT MANUFACTURING LLC
326 E. KEEFE AVE.
MILWAUKEE, WISCONSIN 53212

Angle = +/- 1.5°
.X = +/- .250 in.
.XX = +/- .125 in.
.XXX = +/- .062 in.

DRAWN BY:

XX

CHK'D:

APPROVED:

SCALE:

NTS

DATE:

05/21/26

DATE:

THIS DESIGN IS THE CONFIDENTIAL PROPERTY OF TRAMONT MFG. FOR USE BY TRAMONT MFG. CUSTOMERS FOR SUBMITTAL PURPOSES ONLY. IN LINE WITH CONTINUOUS PRODUCT DEVELOPMENT, WE RESERVE THE RIGHT TO CHANGE THE SPECIFICATIONS WITHOUT NOTICE

DESCRIPTION:

SAE 75dBA@23', Lift Base, UTSX-4900

FOR:

Submittal, Main View

SHEET

1of5

DRAWING NO.:

P8002459

S:\ENG\DRAWINGS\IP\80024XX\IP8002459\SALES\IP8002459.DWG

CUSTOMER APPROVAL

Name:

Date:

Tank Paint Color: BLACK (Unless Otherwise Specified)

Encl Paint Color: Customer to Specify

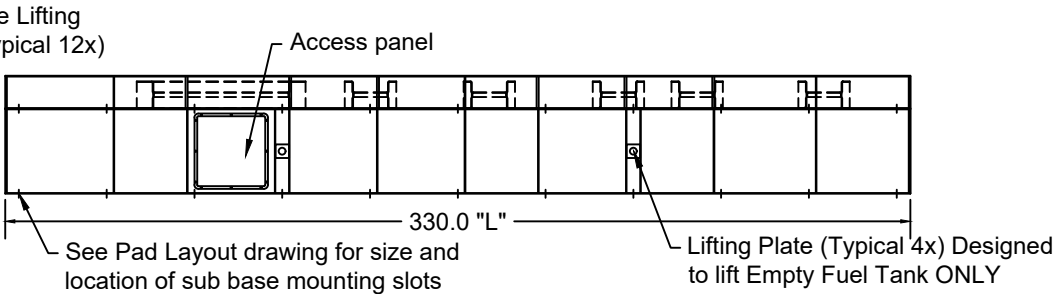
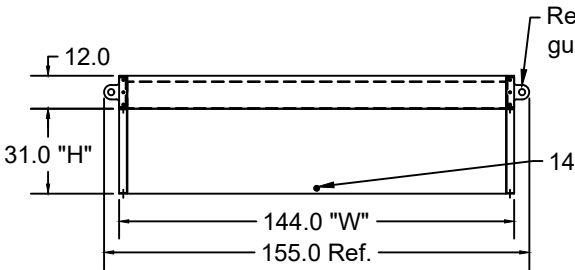
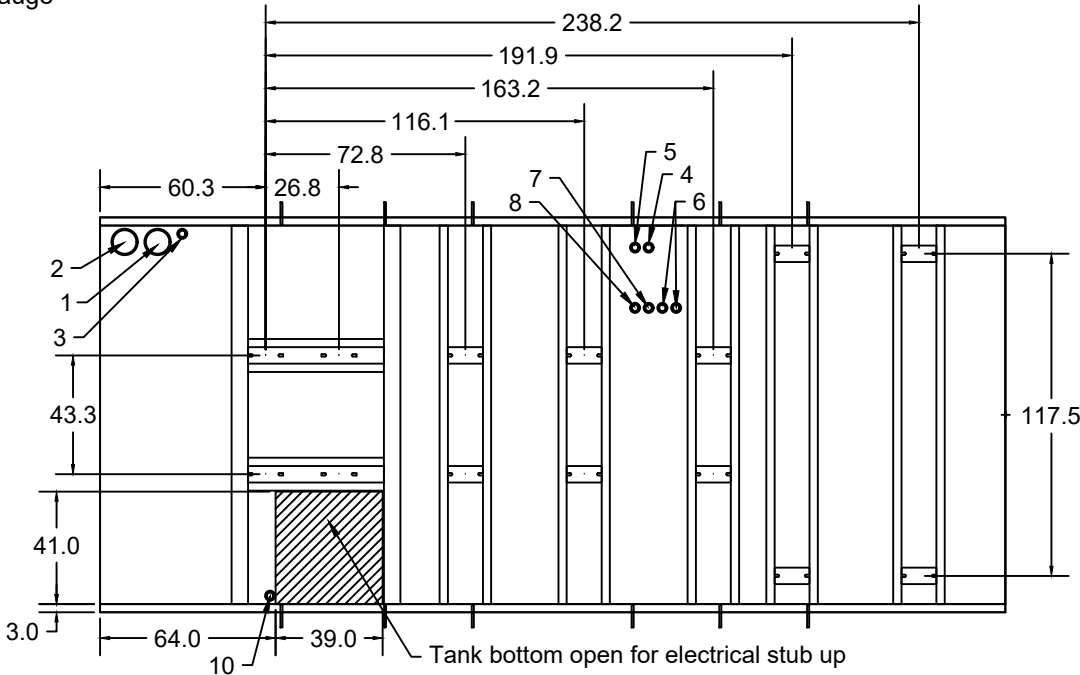
Important: By signing this drawing you are approving all pages AS IS. If changes are required, a new revision will be required.

Genset Model	C3000D6EB	Rad ° C	50
Genset Drawing#	A073W614	Rev	B
Alternator/Frame Size	S9LV-E4/ADS-682		
Air Filter Style	Std. Duty		
Silencer	External Silencer		
Isolator	(14) 0402-0750-01		
Quote #	SS26-0324A1, SS26-0325A1		
Customer Ref.	-		

Nominal shipping dimensions are marked with "H", "W" and "L".

- Double wall secondary containment
- Fittings:
- 1. 8" NPT, Emergency tank vent
 - 2. 8" NPT, Rupture basin emergency vent
 - 3. 2" NPT, Normal tank vent
 - 4. 2" NPT, Manual fill with riser
 - 5. 2" NPT, Direct reading gauge

- 6. (2) 2" NPT, Engine supply, 1" NPT full length dip tube
- 7. 2" NPT, Engine return, 1" NPT full length dip tube
- 8. 2" NPT, Dual level switch 50% and 90%
- 10. 2" NPT, Rupture basin switch
- 14. 1/2" NPT, Basin drain, plugged



00

05/26/26

Start (P8002279)

XX

S. Rev

Date

Description

Name

Change Block

TRAMONT

TRAMONT MANUFACTURING LLC
326 E. KEEFE AVE.
MILWAUKEE, WISCONSIN 53212

Angle = +/- 1.5°
.X = +/- .250 in.
.XX = +/- .125 in.
.XXX = +/- .062 in.

DRAWN BY: XX

CHK'D:

APPROVED:

SCALE: NTS

DATE: 05/21/26

DATE:

DATE:

THIS DESIGN IS THE CONFIDENTIAL PROPERTY OF TRAMONT MFG. FOR USE BY TRAMONT MFG. CUSTOMERS FOR SUBMITTAL PURPOSES ONLY. IN LINE WITH CONTINUOUS PRODUCT DEVELOPMENT, WE RESERVE THE RIGHT TO CHANGE THE SPECIFICATIONS WITHOUT NOTICE

DESCRIPTION:

4900 Gallon Sub base Series 1000

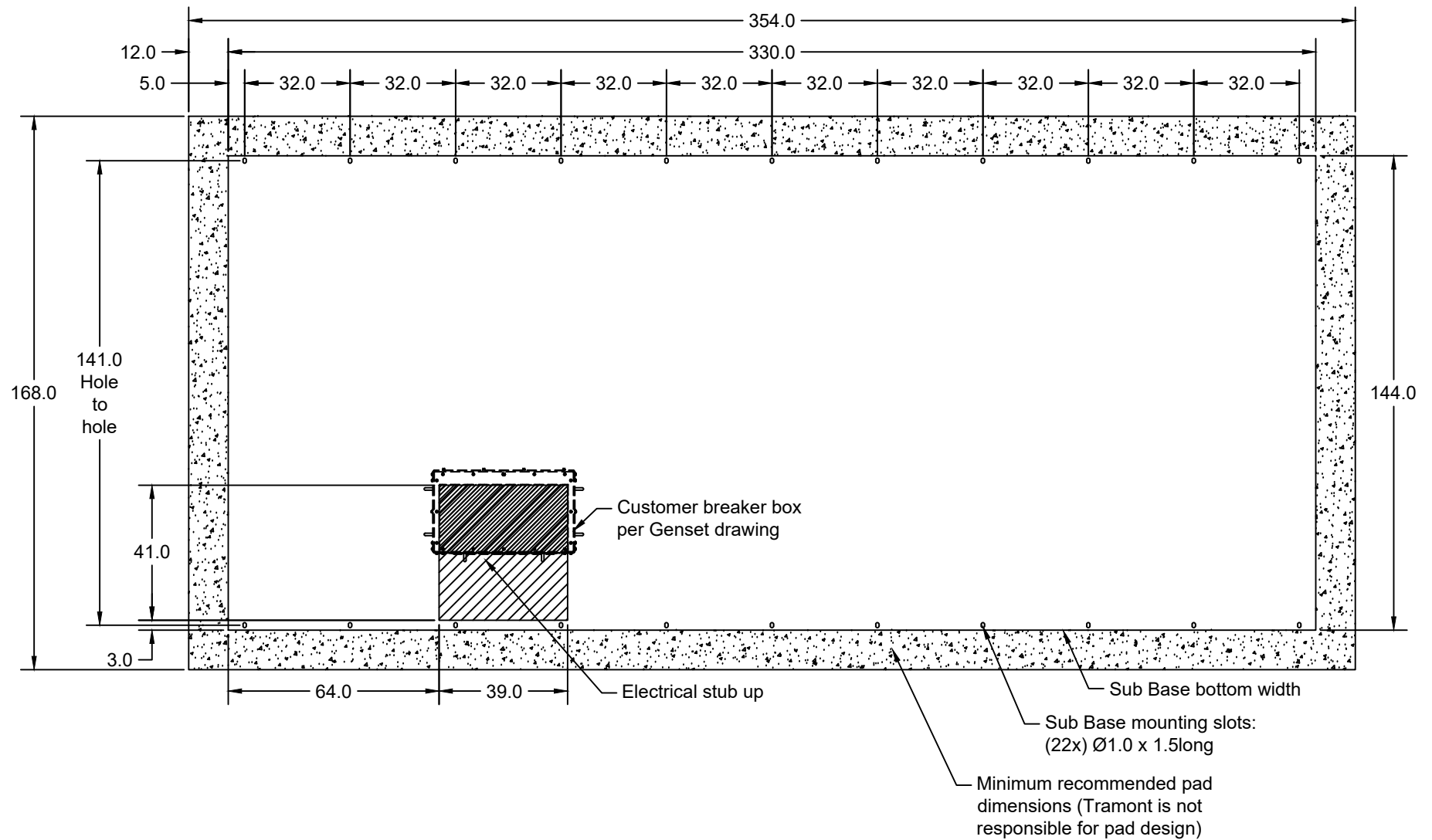
FOR:

SHEET 2of5

DRAWING NO.: P8002459

Submittal, Subbase

S:\ENG\DRAWINGS\IP\80024XX\IP8002459\SALES\IP8002459.DWG



00	05/26/26	Start (P8002279)	XX
S. Rev	Date	Description	Name
Change Block			



TRAMONT MANUFACTURING LLC
326 E. KEEFE AVE.
MILWAUKEE, WISCONSIN 53212

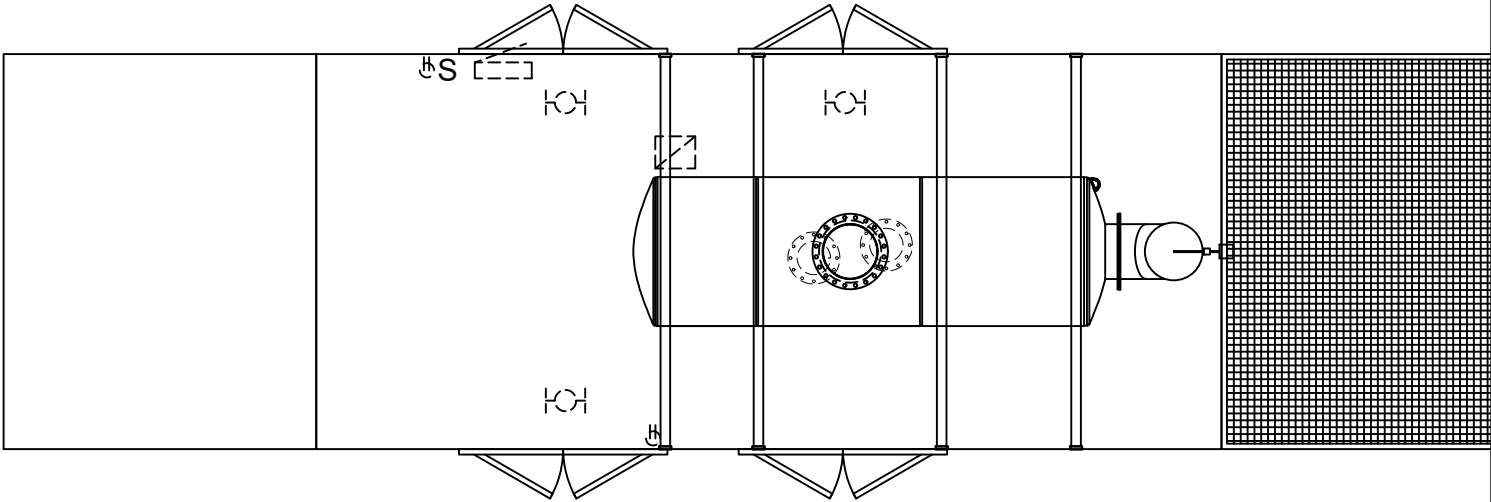
THIS DESIGN IS THE CONFIDENTIAL PROPERTY OF TRAMONT MFG. FOR USE BY TRAMONT MFG. CUSTOMERS FOR SUBMITTAL PURPOSES ONLY. IN LINE WITH CONTINUOUS PRODUCT DEVELOPMENT, WE RESERVE THE RIGHT TO CHANGE THE SPECIFICATIONS WITHOUT NOTICE

Angle = +/- 1.5°
.X = +/- .250 in.
.XX = +/- .125 in.
.XXX = +/- .062 in.

DRAWN BY:	XX	DATE:	05/21/26
CHK'D:		DATE:	
APPROVED:		DATE:	
SCALE:	NTS		

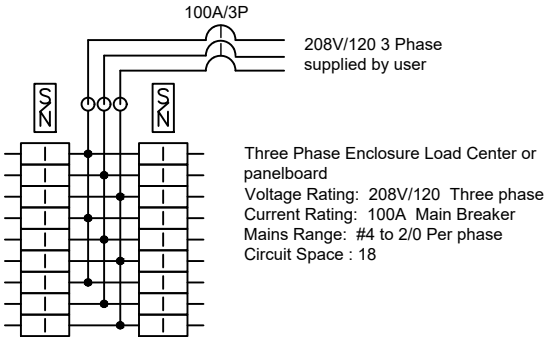
DESCRIPTION:	SAE 75dBA@23', Lift Base, UTSX-4900		
FOR:	Submittal, Pad Layout		
SHEET	3 of 5	DRAWING NO.:	P8002459

Symbols	
	Lighting and Appliance Panel 208/120V or 120/240V
	Switch control
	Battery Chager
	Receptacle
	Indoor Ceiling Mount Fixture



Symbols, Locate Options at assembly time

XXX Conduit/Cable Schedule				
Designation	Size	Type	Conduit	Circuit Breaker
101	2or3#14,GND	THHN/XHHW	1/2"	15A
102	2or3#12,GND	THHN/XHHW	1/2"	20A
103	2or3#10,GND	THHN/XHHW	3/4"	30A
104	2or3#8,GND	THHN/XHHW	3/4"	40A
105	2or3#6,GND	THHN/XHHW	1"	60A
106	2#4, GND	THHN/XHHW	1"	70A
107	3#4, GND	THHN/XHHW	1 1/4"	70A

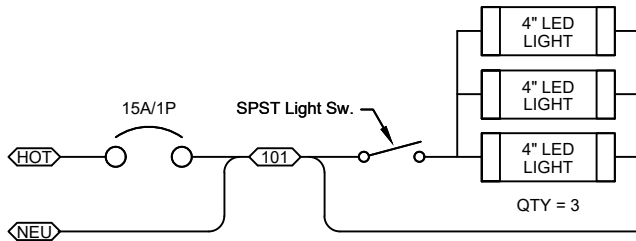


2

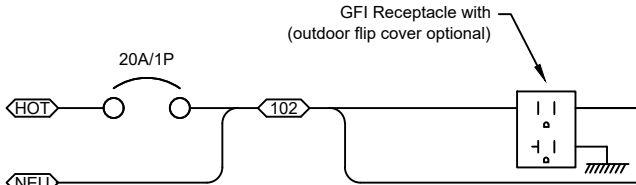
Three Phase Enclosure Load Center or panelboard
 Load Center Notes:
 1. Notify Tramont Mfg. for available supply voltages, other than indicated. Transformers for load center service may be added.

00	05/26/26	Start (P8002279)	XX
S. Rev	Date	Description	Name
Change Block			

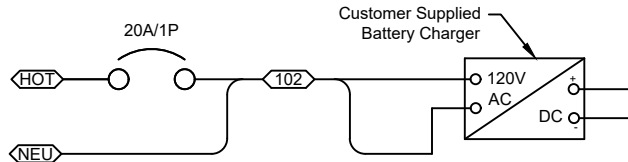
TRAMONT TRAMONT MANUFACTURING LLC 326 E. KEEFE AVE. MILWAUKEE, WISCONSIN 53212		THIS DESIGN IS THE CONFIDENTIAL PROPERTY OF TRAMONT MFG. FOR USE BY TRAMONT MFG. CUSTOMERS FOR SUBMITTAL PURPOSES ONLY. IN LINE WITH CONTINUOUS PRODUCT DEVELOPMENT, WE RESERVE THE RIGHT TO CHANGE THE SPECIFICATIONS WITHOUT NOTICE	
Angle = +/- 1.5° .X = +/- .250 in. .XX = +/- .125 in. .XXX = +/- .062 in.		DESCRIPTION: SAE 75dBA@23', Lift Base, UTSX-4900	
DRAWN BY: XX CHK'D: APPROVED: SCALE: NTS		DATE: 05/21/26 DATE: DATE: DATE:	FOR: Submittal, Electrical
		SHEET 4of5	DRAWING NO.: P8002459



A Enclosure Interior Switched Fluorescent Lighting Detail (AC)

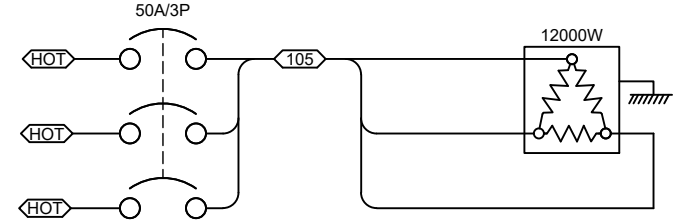


B Enclosure Interior Receptacle (X2)



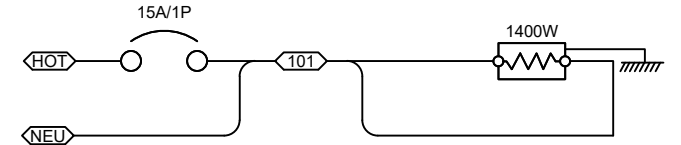
F Battery Charger mounting and feeder

- Notes:
1. For customer supplied battery charger, notify Tramont for input voltages other than 208V/120. Adder for buck/boost transformer may apply for voltages other than 208V/120.



E Jacket Water Heater 208VAC

- Notes:
1. JWH Feeder and breaker size to be confirmed and determined after generator is received by Tramont.



D Alternator Heater 120VAC

- Notes:
1. AH Feeder and breaker size to be confirmed and determined after generator is received by Tramont.

00	05/26/26	Start (P8002279)	XX
S. Rev	Date	Description	Name
Change Block			



TRAMONT MANUFACTURING LLC
326 E. KEEFE AVE.
MILWAUKEE, WISCONSIN 53212

Angle = +/- 1.5°
.X = +/- .250 in.
.XX = +/- .125 in.
.XXX = +/- .062 in.

DRAWN BY:	DATE:
XX	05/21/26
CHK'D:	DATE:
APPROVED:	DATE:
SCALE:	NTS

THIS DESIGN IS THE CONFIDENTIAL PROPERTY OF TRAMONT MFG. FOR USE BY TRAMONT MFG. CUSTOMERS FOR SUBMITTAL PURPOSES ONLY. IN LINE WITH CONTINUOUS PRODUCT DEVELOPMENT, WE RESERVE THE RIGHT TO CHANGE THE SPECIFICATIONS WITHOUT NOTICE

DESCRIPTION:
SAE 75dBA@23', Lift Base, UTSX-4900

FOR:	SHEET	DRAWING NO.:
Submittal, Electrical	5of5	P8002459

SECTION 6

Warranty





Warranty Statement

CENTUM™ Series Generator Set

Limited Warranty

CENTUM™ Series Generator Set

This limited warranty applies to all Cummins Inc. branded CENTUM™ Series generator sets and associated accessories (hereinafter referred to as "Product").

This warranty covers any failures of the Product, under normal use and service, which result from a defect in material or factory workmanship.

Warranty Period:

The warranty start date[†] is the date of initial start up, first rental, demonstration or 18 months after factory ship date, whichever is sooner. See table for details.

Continuous Power (COP) is defined as being the maximum power which the generating set is capable of delivering continuously whilst supplying a constant electrical load when operated for an unlimited number of hours per year. No overload capability is available for this rating.

Prime Power (PRP) is defined as being the maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year. The permissible average power output over 24 hours of operation shall not exceed 70% of the PRP. For applications requiring permissible average output higher than stated, a COP rating should be used.

Limited-Time Running Power (LTP) is defined as the maximum power available, under the agreed operating conditions, for which the generating set is capable of delivering for up to 500 hours of operation per year.

Emergency Standby Power (ESP) is defined as the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 3 years or 1,000 hours, whichever occurs first. The permissible average power output over 24 hours of operation shall not exceed 70% of the ESP.

Environmental Protection Agency – Stationary Emergency (EPA-SE) is defined as being the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generator set is capable of delivering in the event of a utility power outage or under test conditions and used in strict accordance with the EPA NSPS for stationary engines, 40 CFR part 60, subparts IIII and JJJJ, where a reliable utility must be present. The permissible average power output over 24 hours of operation shall not exceed 70% of the EPA-SE.

Data Center Continuous (DCC) is defined as the maximum power which the generator is capable of delivering continuously to a constant or varying electrical load for unlimited hours in a data center application.

**Base Warranty Coverage Duration
(Whichever occurs first)**

Rating	Months	Max. Hours
COP	12	Unlimited
PRP	12	Unlimited
LTP	12	500 hrs
ESP	36	1000 hrs
EPA-SE	24	Unlimited
DCC	24	Unlimited

[†] Warranty start date for designated rental and oil and gas model Products is determined to be date of receipt of Product by the end customer.

Cummins Inc. Responsibilities:

In the event of a failure of the Product during the warranty period due to defects in material or workmanship, Cummins Inc. will only be responsible for the following costs:

- All parts and labor required to repair the Product.
- Reasonable travel expenses to and from the Product site location.
- Maintenance items that are contaminated or damaged by a warrantable failure.

Owner Responsibilities:

The owner will be responsible for the following:

- Notifying Cummins Inc., its distributors or dealers within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Inc.'s published policies and guidelines.
- Providing evidence for date of commissioning.

- Providing sufficient access to and reasonable ability to remove the Product from the installation in the event of a warrantable failure.
- Incremental costs and expenses associated with Product removal and reinstallation resulting from non-standard installations.
- Costs associated with rental of generating sets used to replace the Product being repaired.
- Costs associated with labor overtime and premium shipping requested by the owner.
- All downtime expenses, fines, all applicable taxes, and other losses resulting from a warrantable failure.

Limitations:

This limited warranty does not cover Product failures resulting from:

- Inappropriate use relative to designated power rating.
- Inappropriate use relative to application guidelines.
- Inappropriate use of an EPA-SE application generator set relative to EPA's standards.
- Normal wear and tear.
- Improper and/or unauthorized installation.
- Negligence, accidents or misuse.
- Lack of maintenance or unauthorized repair.
- Noncompliance with any Cummins Inc. published guideline or policy.
- Use of improper or contaminated fuels, coolants or lubricants.
- Improper storage before and after commissioning.
- Owner's delay in making Product available after notification of potential Product problem.
- Replacement parts and accessories not authorized by Cummins Inc.
- Use of Battle Short Mode.
- Owner or operator abuse or neglect such as: operation without adequate coolant or lubricants; overfueling; overspeeding; lack of maintenance to lubricating, cooling or air intake systems; late servicing and maintenance; improper storage, starting, warm-up, run-in or shutdown practices, or for progressive damage resulting from a defective shutdown or warning device.
- Damage to parts, fixtures, housings, attachments and accessory items that are not part of the generating set.

This limited warranty does not cover costs resulting from:

- Difficulty in gaining access to the Product.
- Damage to customer property.

A "Data center" is defined as a dedicated facility that house computers and associated equipment for data storage and data handling.

Reliable utility is defined as utility power without routine or regularly scheduled black-outs.

Please contact your local Cummins Inc. Distributor for clarification concerning these limitations.

CUMMINS INC. RIGHT TO FAILED COMPONENTS:

Failed components claimed under warranty remain the property of Cummins Inc. Cummins Inc. has the right to reclaim any failed component that has been replaced under warranty.

Extended Warranty:

Cummins Inc. offers several levels of Extended Warranty Coverage. Please contact your local Cummins Inc. Distributor for details.

power.cummins.com

THE WARRANTIES SET FORTH HEREIN ARE THE SOLE WARRANTIES MADE BY CUMMINS INC. IN REGARD TO THE PRODUCT. CUMMINS INC. MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, OR OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT IS CUMMINS INC. LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited warranty shall be enforced to the maximum extent permitted by applicable law. In the United States, some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state or jurisdiction to jurisdiction.

Product Model Number: _____
 Product Serial Number: _____
 Date in Service: _____

power.cummins.com

Copyright © 2025 Cummins Inc. All rights reserved.

Cummins, the "C" logo, Centum, PowerCommand, AmpSentry, and InPower are trademarks of Cummins Inc. Other company, product, or service names may be trademarks or service marks of others. Specifications are subject to change without notice.

