SUBMITTAL PACKAGE

CSDG - DSHAD

☐ Revise with corrections provided

☐ Approved and released for production

By (name and company):

Requested delivery date:

Requested delivery address:

Contact person and phone # for deliveries:

November 02 2023

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.

Sales and Service

TABLE OF CONTENTS

Cummins Sales and Service

Section 1 – Project Information

Sales and Service

Bill of Material

DSHAD	**DSHAD, Commercial Diesel Generator Set, 230kW Standby 60Hz**	2
Install-US-Stat	U.S. EPA, Stationary Emergency Application	
230DSHAD	230DSHAD, Diesel Genset, 60Hz, 230kW	
A331-2	Duty Rating - Standby Power (ESP)	
L169-2	Emission Certification, EPA, Tier 3, NSPS CI Stationary Emergency	
L090-2	Listing - UL 2200	
B184-2	Exciter/Regulator - Permanent Magnet Generator, 3 Phase Sensor	
R002-2	Voltage - 277/480, 3 Phase, Wye, 4 Wire	
B414-2	Alternator - 60Hz, 12 Lead, Upper Broad Range, 125C	
F182-2	Steel Weather Protective Enclosure, with Exhaust System	
F179-2	Skidbase - Housing Ready	
C202-2	Fuel Tank - Sub Base, 336 Gallon, UL142 Compliant	
L163-2	Listing, ULC - S601 - 07	
H703-2	PowerCommand 2.3 Controller	
H536-2	Control Display Language - English	
KU93-2	Circuit Breaker or Entrance Box or Terminal Box - Left Only	
KU07-2	Circuit Breaker - 400A, Left, 3P, 600/690V, SS RMS, 80%, UL/IEC	
0186	Circuit Breaker or Entrance Box or Terminal Box, Right-None	
KB73-2	Bottom Entry, Left	
A366-2	Engine Governor - Electronic, Isochronous	
E125-2	Engine Cooling - Radiator, High Ambient Air Temperature, Ship Fitted	
H389-2	Shutdown - Low Coolant Level	
H036-2	Coolant Heater - 120V, Single Phase	
L028-2	Genset Warranty - 2 Years Base	
A322-2	Packing - Skid, Poly Bag	
F065-2	Battery Rack	
A048G602	**Battery Charger-10Amp, 120/208/240VAC, 12/24V, 50/60Hz**	2

NOTES:

Proposal is for equipment only, offloading, rigging, and installation by others.
Fuel and permits, unless listed above, is not included.
Cummins Standard Start-up and testing is included. Additional tests, such as NETA testing, if required, is by others
Coordination Study not provided.

Sales and Service

Section 2 – Generator Spec Sheets

Specification sheet

Diesel generator set QSL9-G2 series engine

230 kW Standby

Description

Cummins® commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary Standby and Prime Power applications.

Features

Cummins heavy-duty engine - Rugged 4-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 and fault clearing short-circuit capability.

Control system - The PowerCommand® 2.3 electronic control is standard equipment and provides total generator set system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

Enclosures - Optional weather protective and sound attenuated enclosures are available.

Fuel tanks - Dual wall sub-base fuel tanks are also available.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby rating		Prime rating		Continuous rating		Data sheets	
Model	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz	50 Hz
DSHAD	230 (288)		209 (261)				D-3453	

Generator set specifications

Governor regulation class	ISO 8528 Part 1 Class G3
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 0.5%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Radio frequency emissions compliance	Meets requirements of most industrial and commercial applications.

Engine specifications

Bore	114.0 mm (4.49 in)
Stroke	145 mm (5.69 in)
Displacement	8.9 L (543 in^3)
Configuration	Cast iron, in-line 6 cylinder
Battery capacity	1500 amps minimum at ambient temperature of -18 ℃ (0 ℉)
Battery charging alternator	100 amps
Starting voltage	12 volt, negative ground
Fuel system	Direct injection: number 2 diesel fuel, fuel filter, automatic electric fuel shutoff
Fuel filter	Single element, 10 micron filtration, spin-on fuel filter with water separator
Air cleaner type	Dry replaceable element
Lube oil filter type(s)	Spin-on, full flow
Standard cooling system	High ambient radiator

Alternator specifications

Design	Brushless, 4 pole, drip proof revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible discs
Insulation system	Class H
Standard temperature rise	150 ℃ Standby at 40 ℃ ambient
Exciter type	Torque match (shunt)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower
AC waveform Total Harmonic Distortion (THDV)	< 5% no load to full linear load, < 3% for any single harmonic
Telephone Influence Factor (TIF)	< 50 per NEMA MG1-22.43
Telephone Harmonic Factor (THF)	< 3

Available voltages

Three phase reconnectable				**Single phase non-reconnectable**	**Three phase non-reconnectable**	
• 120/208 • 240/416	• 120/240 • 254/440	• 127/220 • 277/480	• 139/240	• 120/241	• 220/380	• 347/600

Note: Consult factory for other voltages.

Generator set options and accessories

Engine

- 120/240 V 1500 W coolant heater
- 120/240 V 150 W lube oil heater
- Heavy duty air cleaner
- Engine oil temperature

Fuel system

- 12 hour sub-base tank (dual wall)
- 24 hour sub-base tank (dual wall)
- 473 L (125 gal) sub-base tank (single wall)

Alternator

- 105 ℃ rise
- 125 ℃ rise
- 120/240 V 100 W anti-condensation heater
- PMG excitation
- Single phase

Exhaust system

- Genset mounted muffler
- Heavy duty exhaust elbow
- Slip on exhaust connection

Generator set

- AC entrance box
- Battery
- Battery charger
- Enclosure: aluminium, steel, weather protective or sound attenuated
- Export box packaging
- UL 2200 Listed
- Main line circuit breaker
- PowerCommand Network Communications module (NCM)
- Remote annunciator panel
- Spring isolators
- 2 year Prime power warranty
- 2 year Standby power warranty
- 5 year Basic power warranty

Note: Some options may not be available on all models - consult factory for availability.

Control system PowerCommand 2.3

The PowerCommand 2.3 control system - An integrated generator set control system providing voltage regulation, engine protection, generator protection, operator interface and isochronous governing (optional).

Control – Provides battery monitoring and testing features and smart-starting control system.

InPower™ – PC-based service tool available for detailed diagnostics.

PCCNet RS485 – Network interface (standard) to devices such as remote annunciator for NFPA 110 applications**.**

Control boards – Potted for environmental protection.

Ambient operation – Suitable for operation in ambient temperatures from -40 ºC to +70 ºC and altitudes to 13,000 feet (5000 meters). Prototype tested - UL, CSA and CE compliant.

AC protection

AC protection

- AmpSentry protective relay
- Over current warning and shutdown
- Over and under voltage shutdown
- Over and under frequency shutdown
- Over excitation (loss of sensing) fault
- Field overload
- Overload warning
- Reverse kW shutdown
- Reverse Var shutdown
- Short circuit protection

Engine protection

- Overspeed shut down
- Low oil pressure warning and shut down
- High coolant temperature warning and shut down
- Low coolant level warning or shut down
- Low coolant temperature warning
- High, low and weak battery voltage warning
- Fail to start (over crank) shut down
- Fail to crank shut down
- Redundant start disconnect
- Cranking lockout
- Sensor failure indication
- Low fuel level warning or shutdown
- Fuel-in-rupture-basin warning or shutdown

Operator/display panel

- Manual off switch
- 128 x 128 Alpha-numeric display with push button access for viewing engine and alternator data and providing setup, controls and adjustments (English or international symbols)
- LED lamps indicating genset running, not in auto, common warning, common shutdown, manual run mode and remote start.

  Suitable for operation in ambient temperatures from -20 ºC to +70 ºC

Alternator data

- Line-to-Neutral AC volts
- Line-to-Line AC volts
- 3-phase AC current
- Frequency
- kVA, kW, power factor

Engine data

- DC voltage
- Lube oil pressure
- Coolant temperature

Control functions

- Time delay start and cool down
- Glow plug control (some models)
- Cycle cranking
- PCCNet interface
- (4) Configurable inputs
- (4) Configurable outputs
- Remote emergency stop
- Battle short mode
- Load shed
- Real time clock with exerciser
- Derate

Digital governing (optional)

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital voltage regulation

- Integrated digital electronic voltage regulator
- 3-phase Line-to-Line sensing
- Configurable torque matching
- Fault current regulation under single or three phase fault conditions

Other data

- Genset model data
- Start attempts, starts, running hours
- Fault history
- RS485 Modbus® interface
- Data logging and fault simulation (requires InPower service tool)
- Total kilowatt hours
- Load Profile

Options

- Auxiliary output relays (2)
- 120/240 V, 100 W anti-condensation heater
- Remote annunciator with (3) configurable inputs and (4) configurable outputs
- PMG alternator excitation
- PowerCommand for Windows® remote monitoring software (direct connect)
- AC output analogue meters
- PowerCommand 2.3 and 3.3 control with AmpSentry protection

For further detail on PC 2.3 see document S-1569.
For further detail on PC 3.3 see document S-1570.

Emergency Standby Power (ESP):

Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-Time Running Power (LTP):

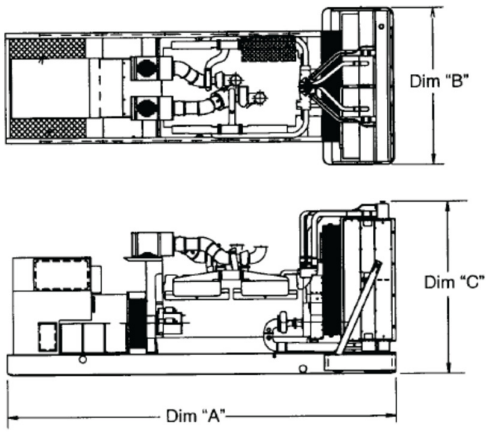
Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.

Prime Power (PRP):

Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base Load (Continuous) Power (COP):

Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.



This outline drawing is for reference only.
See respective model data sheet for specific model outline drawing number.

Do not use for installation design

Model	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)	Set weight* dry kg (lbs)	Set weight* wet kg (lbs)
DSHAD	2667 (105.0)	1016 (40.0)	1372 (54.0)		1469 (3238)

*Weights represent a set with standard features. See outline drawings for weights of other configurations.

Codes and standards

Codes or standards compliance may not be available with all model configurations – consult factory for availability.

	This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.		The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage.
	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.	**U.S. EPA**	Engine certified to Stationary Emergency U.S. EPA New Source Performance Standards,40 CFR 60 subpart IIII Tier 3 exhaust emission levels. U.S. applications must be applied per this EPA regulation.
	All low voltage models are CSA certified to product class 4215-01.	**International Building Code**	The generator set package is available certified for seismic application in accordance with the following International Building Code: IBC2000, IBC2003, IBC2006, IBC2009 and IBC2012.

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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

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S-1587.DOCX (02/22)

Generator Set Data Sheet

Model: DSHAD
Frequency: 60 Hz
Fuel Type: Diesel
kW Rating: 230 Standby
209 Prime
Emissions level: EPA NSPS Stationary Emergency Tier 3

Exhaust emission data sheet:	**EDS-1075**
Exhaust emission compliance sheet:	**EPA-1102**
Sound performance data sheet:	**MSP-1049**
Cooling performance data sheet:	**MCP-165**
Prototype test summary data sheet:	**PTS-162**
Standard set-mounted radiator cooling outline:	**0500-4303**
Optional set-mounted radiator cooling outline:	
Optional heat exchanger cooling outline:	
Optional remote radiator cooling outline:	

Fuel Consumption

	Standby				Prime				Continuous
	kW (kVA)				kW (kVA)				kW (kVA)
Ratings	230 (288)				209 (261)				
Load	**1/4**	**1/2**	**3/4**	**Full**	**1/4**	**1/2**	**3/4**	**Full**	**Full**
US gph	6.2	10.8	14.7	18.2	5.8	10.1	13.8	17.0	
L/hr	23	41	57	69	22	38	52	64	

Engine

	Standby rating	Prime rating	Continuous rating
Engine manufacturer	Cummins Inc.		
Engine model	QSL9-G2 NR3		
Configuration	Cast iron, with replaceable wet cylinder liners, in-line 6 cylinder		
Aspiration	Turbocharged and CAC		
Gross engine power output, kW_m (bhp)	271.5 (364.0)	238.7 (320.0)	
BMEP at set rated load, kPa (psi)	1979 (287)	1816 (263)	
Bore, mm (in.)	114.0 (4.49)		
Stroke, mm (in.)	145 (5.69)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	8.7 (1707.0)		
Compression ratio	17.8:1		
Lube oil capacity, L (qt)	26.5 (28.0)		
Overspeed limit, rpm	2100 ± 50		
Regenerative power, kW	35.00		

Fuel Flow	Standby rating	Prime rating	Continuous rating
Fuel flow at rated load, L/hr (US gph)	162.8 (43.0)		
Maximum inlet restriction, mm Hg (in Hg)	152.4 (6.0)		
Maximum return restriction, mm Hg (in Hg)	254.0 (10.0)		

Air			
Combustion air, m^3/min (scfm)	20.9 (739.0)	20.8 (733.0)	
Maximum air cleaner restriction with clean filter, kPa (in H_2O)	3.7 (15)		
Alternator cooling air, m^3/min (cfm)	41.3 (1460.0)		

Exhaust			
Exhaust flow at set rated load, m^3/min (cfm)	33.3 (1176)	31.0 (1157)	
Exhaust temperature, °C (°F)	600 (1110.0)	572 (1063.0)	
Maximum back pressure, kPa (in H_2O)	10.2 (41.0)		

Standard Set-Mounted Radiator Cooling (Non-Seismic)			
Ambient design, °C (°F)	52 (126)	48 (118)	
Fan load, kW_m (HP)	16.4 (22)		
Coolant capacity (with radiator), L (US gal)	29.5 (7.8)		
Cooling system air flow, m^3/min (scfm)	248 (8769)		
Total heat rejection, MJ/min (Btu/min)	7.8 (7374)	7.6 (7222)	
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)		

Optional Set-Mounted Radiator Cooling	
Ambient design, °C (°F)	
Fan load, kW_m (HP)	
Coolant capacity (with radiator), L (US gal)	
Cooling system air flow, m^3/min (scfm)	
Total heat rejection, MJ/min (Btu/min)	
Maximum cooling air flow static restriction, kPa (in H_2O)	

Optional Heat Exchanger Cooling	Standby rating	Prime rating	Continuous rating
Set coolant capacity, L (US gal)			
Heat rejected, jacket water circuit, MJ/min (Btu/min)			
Heat rejected, aftercooler circuit, MJ/min (Btu/min)			
Heat rejected, fuel circuit, MJ/min (Btu/min)			
Total heat radiated to room, MJ/min (Btu/min)			
Maximum raw water pressure, jacket water circuit, kPa (psi)			
Maximum raw water pressure, aftercooler circuit, kPa (psi)			
Maximum raw water pressure, fuel circuit, kPa (psi)			
Maximum raw water flow, jacket water circuit, L/min (US gal/min)			
Maximum raw water flow, aftercooler circuit, L/min (US gal/min)			
Maximum raw water flow, fuel circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, jacket water circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, aftercooler circuit, L/min (US gal/min)			
Minimum raw water flow at 27 °C (80 °F) inlet temp, fuel circuit, L/min (US gal/min)			
Raw water delta P at min flow, jacket water circuit, kPa (psi)			
Raw water delta P at min flow, aftercooler circuit, kPa (psi)			
Raw water delta P at min flow, fuel circuit, kPa (psi)			
Maximum jacket water outlet temp, °C (°F)			
Maximum aftercooler inlet temp, °C (°F)			
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)			

Optional Remote Radiator Cooling[1]	
Set coolant capacity, L (US gal)	
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)	
Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min)	
Heat rejected, jacket water circuit, MJ/min (Btu/min)	
Heat rejected, aftercooler circuit, MJ/min (Btu/min)	
Heat rejected, fuel circuit, MJ/min (Btu/min)	
Total heat radiated to room, MJ/min (Btu/min)	
Maximum friction head, jacket water circuit, kPa (psi)	
Maximum friction head, aftercooler circuit, kPa (psi)	
Maximum static head, jacket water circuit, m (ft)	
Maximum static head, aftercooler circuit, m (ft)	
Maximum jacket water outlet temp, °C (°F)	
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)	
Maximum aftercooler inlet temp, °C (°F)	
Maximum fuel flow, L/hr (US gph)	
Maximum fuel return line restriction, kPa (in Hg)	

Weights[2]

Unit dry weight kgs (lbs)	
Unit wet weight kgs (lbs)	1561 (3442)

Notes:

[1] For non-standard remote installations contact your local Cummins representative.

[2] Weights represent a set with standard features. See outline drawing for weights of other configurations.

Derating Factors

Standby	Engine power available up to 1100 m (3600 ft) at ambient temperature up to 40 °C (104 °F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters.
Prime	Engine power available up to 850 m (2800 ft) at ambient temperature up to 40 °C (104 °F). Consult your Cummins distributor for temperature and ambient requirements outside these parameters.
Continuous	

Ratings Definitions

Emergency Standby Power (ESP):	**Limited-Time Running Power (LTP):**	**Prime Power (PRP):**	**Base Load (Continuous) Power (COP):**
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited-Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514. No sustained overload capability is available at this rating.

Alternator Data

Three phase table[1]		**125 °C**	**125 °C**	**150 °C**	**150 °C**
Feature code		B414	B246	B268	B419
Alternator data sheet number		213	212	212	212
Voltage ranges		120/208 thru 139/240 240/416 thru 277/480	277/480	120/208 thru 139/240 240/416 thru 277/480	347/600
Surge kW		233	233	233	233
Motor Starting kVA (at 90% sustained voltage)	Shunt	770	212	770	770
	PMG	920	920	920	920

Full load current - amps at Standby rating	120/208	120/240	139/240	220/380	277/480	347/600
	799	629	629	399	346	277

Alternator Data (continued)

Single phase table[1]		**125 °C**
Feature code		B414
Alternator data sheet number		213
Voltage ranges		120/240[2]
Surge kW		233
Motor Starting kVA (at 90% sustained voltage)	Shunt	420
	PMG	500

Full load current - amps at Standby rating	120/240[2] 639

Notes:

[1] Single phase power can be taken from a three phase generator set at up to 2/3 set rated 3-phase kW at 1.0 power factor.

[2] The broad range alternators can supply single phase output up to 2/3 set rated 3-phase kW at 1.0 power factor.

Formulas for Calculating Full Load Currents:

Three phase output

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

Single phase output

$$\frac{\text{kW} \times \text{SinglePhaseFactor} \times 1000}{\text{Voltage}}$$

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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

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PDD-3453.DOCX (02/22)

Specification Sheet

PowerCommand®
2.3 Control System

Control System Description

The PowerCommand control system is a microprocessor-based generator set monitoring, metering and control system designed to meet the demands of today's engine driven generator sets. The integration of all control functions into a single control system provides enhanced reliability and performance, compared to conventional generator set control systems. These control systems have been designed and tested to meet the harsh environment in which gensets are typically applied.

Features

- 320 x 240 pixels graphic LED backlight LCD.
- Multiple language support.
- AmpSentry™ protective relay - true alternator overcurrent protection.
- Real time clock for fault and event time stamping.
- Exerciser clock and time of day start/stop.
- Digital voltage regulation. Three phase full wave FET type regulator compatible with either shunt or PMG systems.
- Generator set monitoring and protection.
- 12 and 24 VDC battery operation.
- Modbus® interface for interconnecting to customer equipment.
- Warranty and service. Backed by a comprehensive warranty and worldwide distributor service network.
- Certifications - suitable for use on generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., CE, UKCA and CSA standards.

PowerCommand Digital Genset Control PCC 2300

Description

The PowerCommand generator set control is suitable for use on a wide range of generator sets in non-paralleling applications. The PowerCommand control is compatible with shunt or PMG excitation style. It is suitable for use with reconnectable or non-reconnectable generators, and it can be configured for any frequency, voltage and power connection from 120-600 VAC Line-to-Line.

Power for this control system is derived from the generator set starting batteries. The control functions over a voltage range from 8 VDC to 30 VDC.

Features

- 12 and 24 VDC battery operation.
- Digital voltage regulation - Three phase full wave FET type regulator compatible with either shunt or PMG systems. Sensing is three phase.
- Full authority engine communications (where applicable) - Provides communication and control with the Engine
- due to thermal 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 overload or electrical faults by inverse time protection
- Common harnessing - with higher feature Cummins controls. Allows for easy field upgrades.
- Generator set monitoring - Monitors status of all critical engine and alternator functions.
- Digital genset metering (AC and DC).
- Genset battery monitoring system to sense and warn against a weak battery condition.
- Configurable for single or three phase AC metering.
- Engine starting - Includes relay drivers for starter, Fuel Shut Off (FSO), glow plug/spark ignition power and switch B+ applications.
- Generator set protection – Protects engine and alternator.
- Real time clock for fault and event time stamping.
- Exerciser clock and time of day start/stop.
- Advanced serviceability - using InPower™, a PC-based software service tool.
- Environmental protection - The control system is designed for reliable operation in harsh environments. The main control board is a fully encapsulated module that is protected from the elements.
- Modbus interface for interconnecting to customer equipment.
- Configurable inputs and outputs - Four discrete inputs and four dry contact relay outputs.
- Warranty and service - Backed by a comprehensive warranty and worldwide distributor service network.
- Certifications - Suitable for use on generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., CE and CSA standards.

Base Control Functions

HMI Capability

Operator adjustments - The HMI includes provisions for many set up and adjustment functions.

Generator set hardware data - Access to the control and software part number, generator set rating in kVA and generator set model number is provided from the HMI or InPower.

Data logs - Includes engine run time, controller on time, number of start attempts, total kWh, 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, 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
- Comprehensive Full Authority Engine (FAE) data (where applicable)

Service adjustments - The HMI includes provisions for adjustment and calibration of generator set control functions. Adjustments are protected by a password. Functions include:

Service adjustments (continued)

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

Engine Control

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

12 VDC/24 VDC battery operations - PowerCommand will operate either on 12 VDC or 24 VDC batteries.

Temperature dependent governing dynamics (with electronic governing) - modifies the engine governing control parameters as a function of engine temperature. This allows the engine to be more responsive when warm and more stable when operating at lower temperature levels.

Isochronous governing - (where applicable) Capable of controlling engine speed within +/-0.25% for any steady state load from no load to full load. Frequency drift will not exceed +/-0.5% for a 33 °C (60 °F) change in ambient temperature over an 8 hour period.

Droop electronic speed governing - Control can be adjusted to droop from 0 to 10% from no load to full load.

Remote start mode - It accepts a ground signal from remote devices to automatically start the generator set and immediately accelerate to rated speed and voltage. The remote start signal will also wake up the control from sleep mode. The control can incorporate a time delay start and stop.

Remote and local emergency stop - The control accepts a ground signal from a local (genset mounted) or remote (facility mounted) emergency stop switch to cause the generator set to immediately shut down. The generator set is prevented from running or cranking with the switch engaged. If in sleep mode, activation of either emergency stop switch will wakeup the control.

Sleep mode - The control includes a configurable low current draw state to minimize starting battery current draw when the genset is not operating. The control can also be configured to go into a low current state while in auto for prime applications or applications without a battery charger.

Engine starting - The control system supports automatic engine starting. Primary and backup start disconnects are achieved by one of two methods: magnetic pickup or main alternator output frequency. The control also supports configurable glow plug control when applicable.

Cycle cranking - Is configurable for the number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging.

Time delay start and stop (cooldown) - Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal and for time delay of 0-600 seconds prior to shut down after signal to stop in normal operation modes. Default for both time delay periods is 0 seconds.

Alternator Control

The control includes an integrated three phase Line-to-Line sensing voltage regulation system that is compatible with shunt or PMG excitation systems. The voltage regulation system is a three phase full wave rectified and has an FET output for good motor starting capability.

Major system features include:

Digital output voltage regulation - Capable of regulating output voltage to within +/-1.0% for any loads between no load and full load. Voltage drift will not exceed +/- 1.5% for a 40 ºC (104 ºF) 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.

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 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.

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, shutdown or status indication and for labeling the input.

Emergency Stop

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

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.

General Engine 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 generator set is signaled to start and indicate a warning if the battery indicates impending failure.

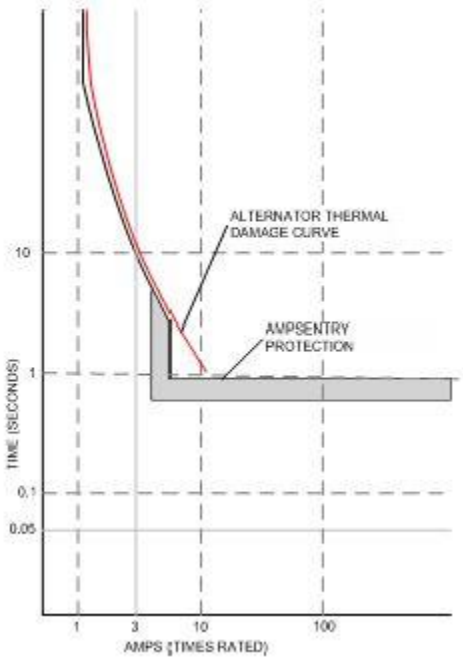
Fail to start (overcrank) shutdown - The control system will indicate a fault if the generator set fails to start by the completion of the engine crack sequence.

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.

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 generator set or in the load. It also provides single and three phase fault current regulation 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 (2 sec for 1-Phase short, 5 sec for 2-Phase short). See document R1053 for a full-size time over current curve.



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 during synchronizing.

Under frequency shutdown (81 u) - Generator set 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 (81 o) - Generator set 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 - Thresholds and time delays are configurable. 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 generator set will occur on loss of voltage sensing inputs to the control.

Field overload shutdown - Monitors field voltage to shutdown generator set 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 - 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.

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
- Battleshort
- Rupture basin
- Start type signal
- 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

Output signals from the PowerCommand control include:

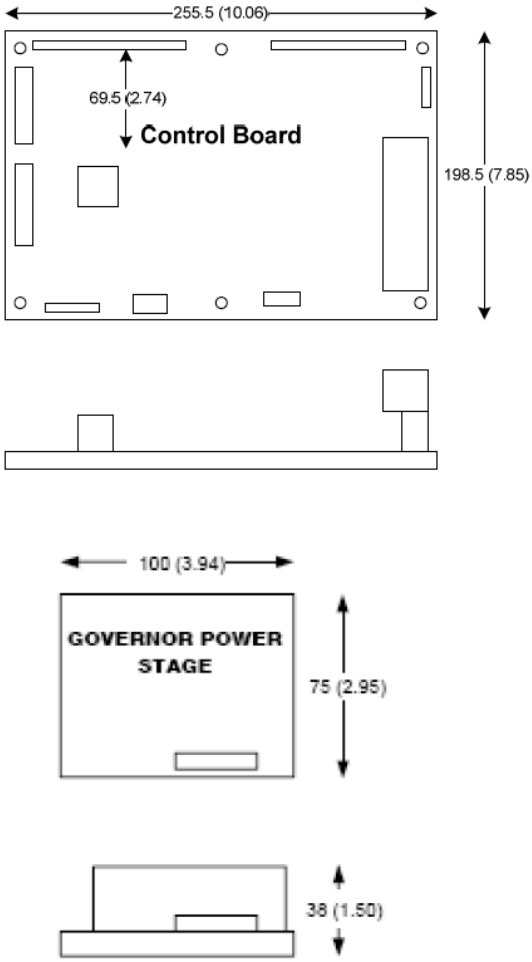
- Load dump signal: Operates when the generator set is in an overload condition.
- Delayed off signal: Time delay based output which will continue to remain active after the control has removed the run command. Adjustment range: 0 – 120 seconds. Default: 0 seconds.
- Configurable relay outputs: Control includes (4) relay output contacts (3 A, 30 VDC). 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 (generator set running) signal: Operates when the generator set has reached 90% of rated speed and voltage and latches until generator set is switched to off or idle mode.

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 products.

Mechanical Drawings



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.

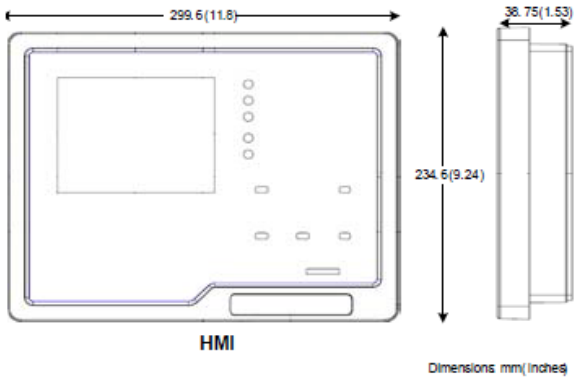
Features

- LED indicating lamps:
  - Genset running
  - Remote start
  - Not in auto
  - Shutdown
  - Warning
  - Auto
  - Manual and stop
- 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 generator sets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., CE and CSA standards.
- LCD languages supported: English, Spanish, French, German, Italian, Greek, Dutch, Portuguese, Finnish, Norwegian, Danish, Russian and Chinese Characters.

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 generator sets 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 ºC to +70º C (-40 ºF to 158 ºF) and for storage from -55 ºC to +80 ºC (-67 ºF to 176 ºF). Control will operate with humidity up to 95%, non-condensing.

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

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 generator set. 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: 1993 compliance, controls and switchgear.
- 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.
- EN50081-1,2 residential/light industrial emissions or industrial emissions.
- EN50082-1,2 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 and 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.

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.

PCCNet COMPATIBLE

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

Our energy working for you.™

PDS-1569 | PD00000157 | (02/22)

2022 EPA Tier 3 Exhaust Emission Compliance Statement 230DSHAD Stationary Emergency

60 Hz Diesel Generator Set

Compliance Information:

The engine used in this generator set complies with Tier 3 emissions limit of U.S. EPA New Source Performance Standards for stationary emergency engines under the provisions of 40 CFR 60 Subpart IIII.

Engine Manufacturer:	Cummins Inc.
EPA Certificate Number:	NCEXL0540AAB-010
Effective Date:	07/02/2021
Date Issued:	07/02/2021
EPA Engine Family (Cummins Emissions Family):	NCEXL0540AAB

Engine Information:

Model:	QSL9-G2 NR3	Bore:	4.5 in. (114 mm)
Engine Nameplate HP:	375	Stroke:	5.7 in. (145 mm)
Type:	4 Cycle, In-line, 6 Cylinder Diesel	Displacement:	543 cu. in. (9 liters)
Aspiration:	Turbocharged and Charge Air Cooled	Compression ratio:	17.8:1
Emission Control Device:		Exhaust stack diameter:	5 in. (127 mm)

Diesel Fuel Emission Limits

D2 Cycle Exhaust Emissions

	Grams per BHP-hr			Grams per kWm-hr		
	NO_X + NMHC	CO	PM	NO_X + NMHC	CO	PM
Test Results	2.8	2.5	0.11	3.8	3.3	0.15
EPA Emissions Limit	3.0	2.6	0.15	4.0	3.5	0.20

Test methods: EPA emissions recorded per 40 CFR Part 60, 89, 1039, 1065 and weighted at load points prescribed in the regulations for constant speed engines.

Diesel fuel specifications: Cetane number: 40-50, Reference: ASTM D975 No. 2-D, 300-500 ppm 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 NOx 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.

High ambient air temperature radiator cooling system

Duty		Rating (kW)	Max cooling @ air flow static restriction, unhoused (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	F182	F172	F173	
			Maximum allowable ambient temperature, degree C								
60 Hz	Standby	230	55	54	52	50	48	49	45	42	N/A
	Prime	210	52	50	48	46	42	45	42	38	N/A
	Continuous		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
50 Hz	Standby		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Prime		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Continuous		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	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
230DSHAD 60 Hz

Sound pressure level @ 7 meters, dB(A)

Configuration		Position (note 1)								8 Position Average
		1	2	3	4	5	6	7	8	
Standard – unhoused (note 3)	Infinite exhaust	88.2	92.2	89.6	90.5	86.2	93.0	91.6	92.5	90.9
F182 – weather w/ exhaust silencer	Mounted muffler	91.8	96.4	94.9	95.7	92.8	97.9	97.0	97.3	95.9
F172 – quiet site II first stage	Mounted muffler	92.1	92.8	83.4	82.9	77.9	82.1	83.7	92.8	89.0
F173 – quiet site II second stage	Mounted muffler	76.7	79.3	77.5	80.5	76.8	77.7	77.9	78.3	78.2

Note:
1. Position 1 faces the engine front at 23 feet (7 m) from surface of the generator set. The positions proceed around the generator set in a counter-clockwise direction in 45° increments.
2. Data based on full rated load with standard radiator fan package.
3. Sound data for generator set with infinite exhaust do not include exhaust noise.
4. Sound pressure levels per ANSI S1.13-1971 as applicable.
5. Reference sound pressure is 20 µPa.
6. Sound pressure levels are subject to instrumentation, measurement, installation and generator set variability.
7. Sound data with remote-cooled set are based on rated loads without fan noise.

Sound power level, dB(A)

Configuration		Octave band center frequency (Hz)								Sound power level
		63	125	250	500	1000	2000	4000	8000	
Standard – unhoused (note 3)	Infinite exhaust	79.0	93.8	107.8	111.5	114.0	111.9	106.5	103.8	117.8
F182 – weather w/ exhaust silencer	Mounted muffler	103.1	109.4	117.1	119.2	117.3	113.9	113.0	109.1	122.7
F172 – quiet site II first stage	Mounted muffler	87.3	94.9	103.8	108.9	111.2	110.1	103.8	96.6	115.1
F173 – quiet site II second stage	Mounted muffler	85.5	92.8	99.0	97.4	98.1	96.7	95.9	91.0	105.1

Note:
1. Sound pressure levels per ANSI S12.34-1988 and SIO 3744 as applicable.
2. Data based on full rated load with standard radiator fan package.
3. Sound data for generator set with infinite exhaust do not include exhaust noise.
4. Reference sound pressure is 1pW-1x10^{-12} W.
5. Sound pressure levels are subject to instrumentation, measurement, installation and generator set variability.
6. Sound data with remote-cooled set are based on rated loads without fan noise.

Exhaust sound pressure level @ 1 meter, dB(A)

Open exhaust (no muffler) @ rated load	Octave band center frequency (Hz)								Sound pressure level
	63	125	250	500	1000	2000	4000	8000	
	85	95	102	105	111	116	116	110	121

Note: Sound pressure level per ISO 6798 Annex A as applicable.

Alternator data sheet

Frame size: UCDI274K

Characteristics

Weights:	Wound stator assembly:	454 kg	1001 lb
	Rotor assembly:	273 kg	602 lb
	Complete alternator:	727 kg	1603 lb
Maximum speed:		2250 rpm	
Excitation current:	Full load:	2 Amps	
	No load:	0.50 Amps	
Insulation system:	Class H throughout		

1 Ø Ratings (1.0 power factor) (Based on specific temperature rise at 40 °C ambient temperature)		**60 Hz** (winding no)			**50 Hz** (winding no)	
		Double delta (311)	4 lead (06)		Double delta (311)	4 lead (05)
		120/240	120/240		110-120/220-240	110-120/220-240
125 °C rise ratings	kW/kVA	175/175	200/200		150/150	N/A
105 °C rise ratings	kW/kVA	160/160	N/A		137/137	N/A

3 Ø Ratings (0.8 power factor) (Based on specified temperature rise at 40 °C ambient temperature)		Upper broad range (311)					Broad range (311)			
		120/208 240/416	127/220 255/440	139/240 277/480			110/190 220/380	115/200 230/400	120/208 240/415	127/220 254/440
150 °C Rise ratings	kW	243	250	265			212	212	212	N/A
	kVA	304	313	331			265	265	265	N/A
125 °C Rise ratings	kW	233	239	250			200	200	200	N/A
	kVA	291	199	313			250	250	250	N/A
105 °C Rise ratings	kW	214	220	229			183	183	183	N/A
	kVA	267	275	286			229	229	229	N/A
80 °C Rise ratings	kW	N/A	N/A	N/A			N/A	N/A	N/A	N/A
	kVA	N/A	N/A	N/A			N/A	N/A	N/A	N/A

3 Ø Reactances (per unit, ±10%) (Based on full load at 105 °C rise rating)									
Synchronous	2.90	2.67	2.34			2.59	2.34	2.17	N/A
Transient	0.14	0.12	0.11			012	0.11	0.10	N/A
Subtransient	0.09	0.08	0.07			0.08	0.07	0.07	N/A
Negative sequence	0.12	0.11	0.10			0.11	0.10	0.09	N/A
Zero sequence	0.02	0.02	0.02			0.02	0.02	0.02	N/A

3 Ø Motor starting		Broad range	LBR*	600	Broad range
Maximum kVA	(Shunt)	770			535
(90% sustained voltage)	(PMG)	920			678

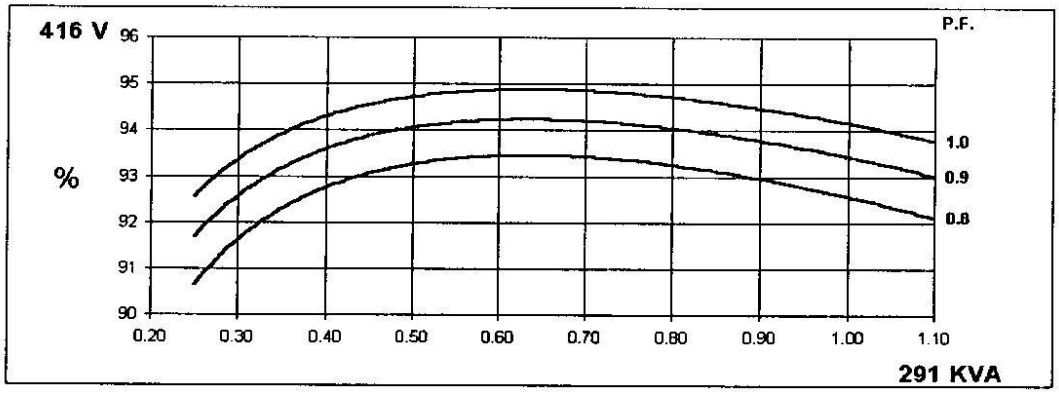
Time constants (Sec)	
Transient	0.049
Subtransient	0.020
Open circuit	1.270
DC	0.018

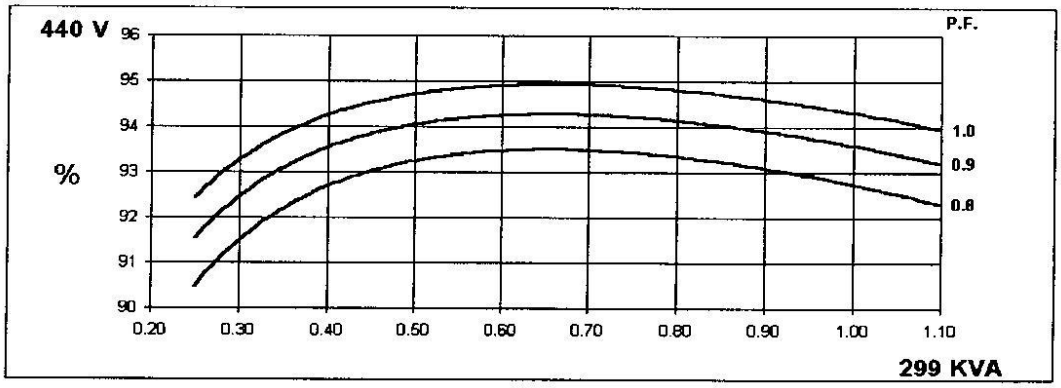
Windings (@ 20° C)		
Stator resistance	(Line to Line, Ohms)	0.0126
Rotor resistance	(Ohms)	2.0800
Number of leads		12

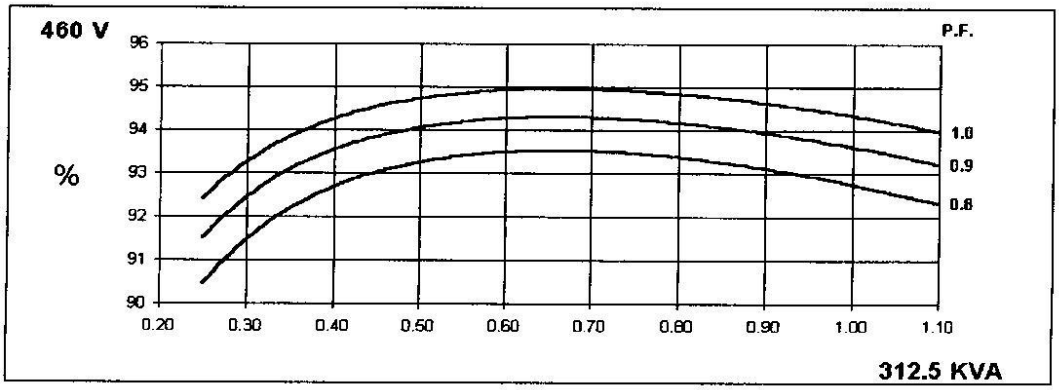
* Lower broad range 110/190 thru 120/208, 220/380 thru 240/416.

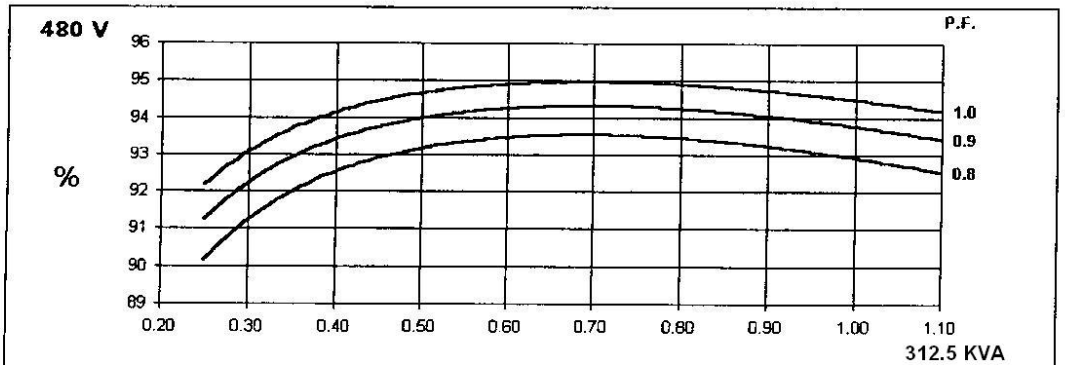
Alternator data sheet Frame size: UCDI274K

Three Phase Efficiency Curves (Winding 311) **60 Hz**







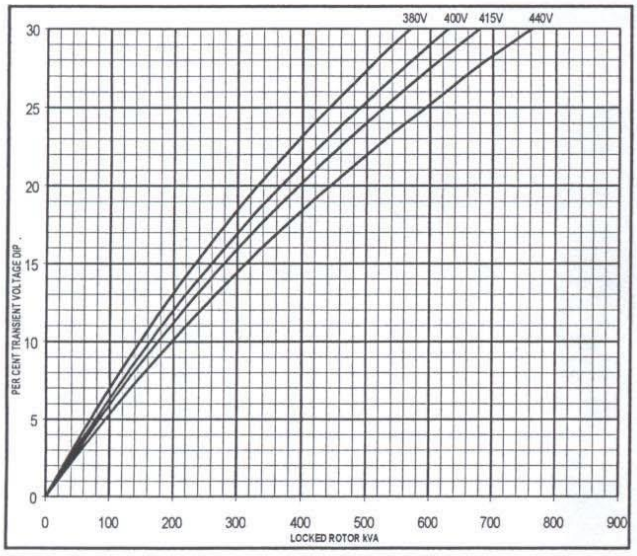


Alternator data sheet Frame size: UCDI274K

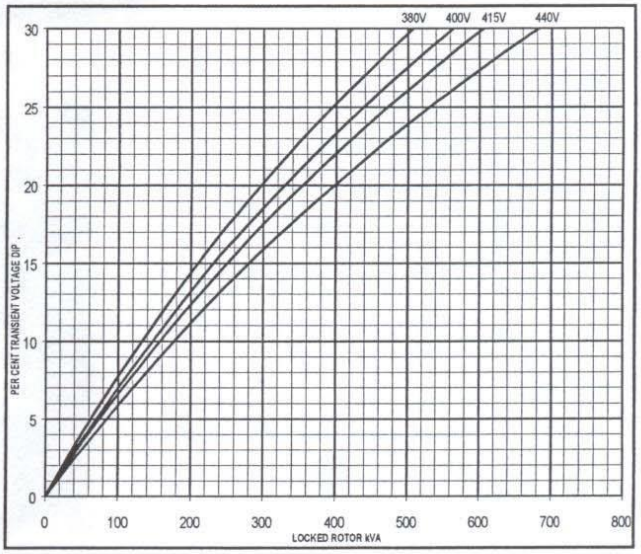
Locked Rotor Motor Starting Curve (Winding 311)

50 Hz

MX

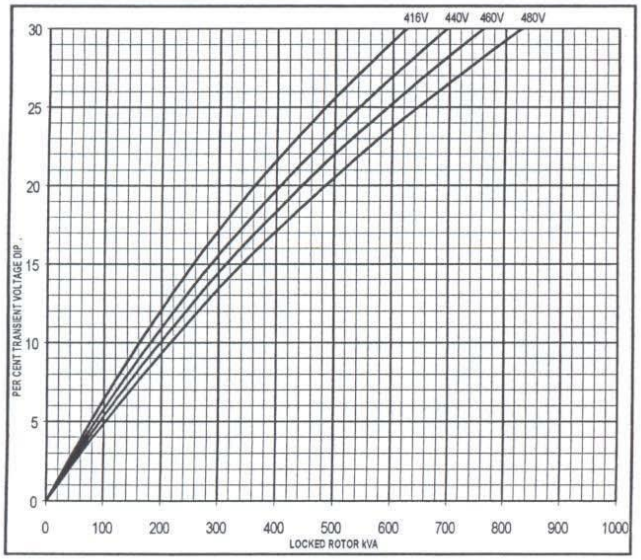


SX

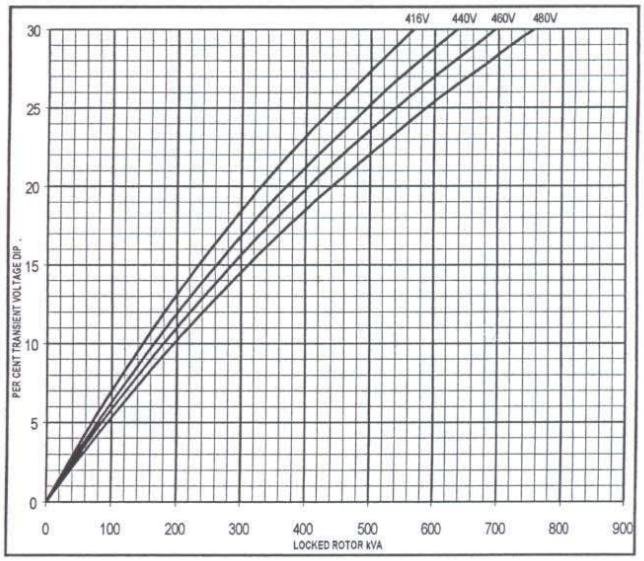


60 Hz

MX

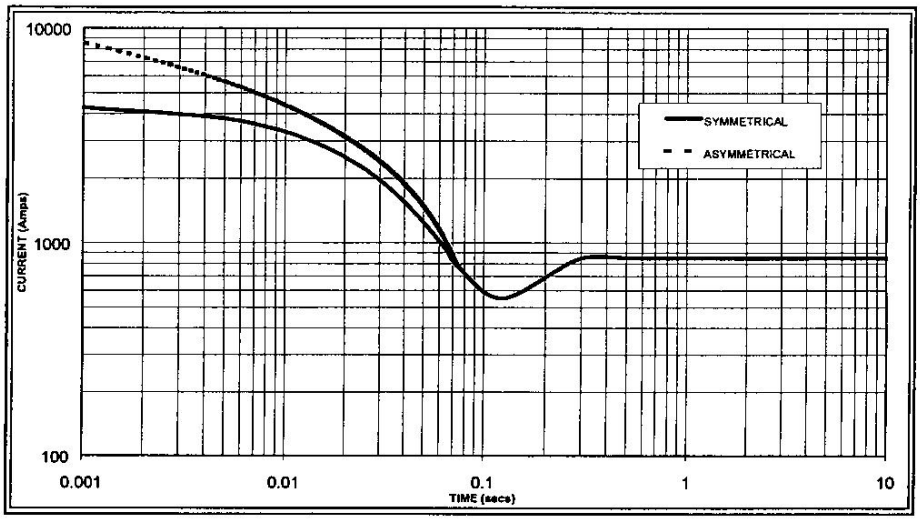


SX



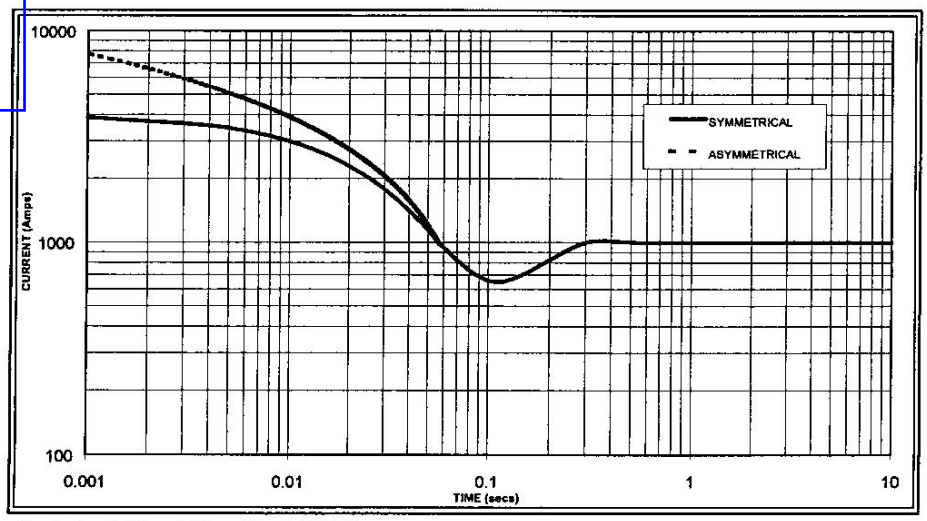
Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed
Based on star (wye) connection.

50 Hz



Sustained Short Circuit = 850 Amps

60 Hz



Sustained Short Circuit = 1,000 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 1.07
415v	X 1.10	460v	X 1.12
440v	X 1.16	480v	X 1.16

The sustained current value is constant irrespective of voltage level

Note 2
The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

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

All other times are unchanged

Note 3
Curves are drawn for Star (Wye) connected machines. For other connection the following multipliers should be applied to current values as shown :
Parallel Star = Curve current value X 2
Series Delta = Curve current value X 1.732

Specification sheet

Enclosures and tanks

35-230 kW gensets

Enclosure features

- 14-gauge, low carbon, hot-rolled ASTM A569 steel construction (panels)
- 12-gauge, low carbon, hot-rolled ASTM A569 steel construction (posts)
- Stainless steel hardware
- Compact footprint
- Zinc phosphate pre-treatment, e-coat primer and super durable powder topcoat paint minimize corrosion and color fade
- Package listed to UL 2200
- Fuel and electrical stub-up area within enclosure perimeter
- Two or three recessed doors per side, depending on generator set dimensions, for service access
- Doors key and padlockable for added security
- Weather protective seals around all doors on sound-attenuated enclosures
- Enclosed exhaust silencer improves safety and protects against rust
- Critical sound level exhaust silencers in sound-attenuated enclosures
- Rain collar and rain cap
- Non-hydroscopic sound-attenuating material
- Easy access lifting points for spreader bars or forklift, depending on model
- Compatible with most under-set fuel tanks
- Enclosure attaches directly to generator set skid base or fuel tank, depending on model
- Designed for ambient temperatures up to 50 ºC (122 ºF)
- Refer to genset model cooling system data sheets for specific capabilities
- Enclosures are designed for outdoor use only

Options

- Two levels of sound attenuation, and weather protective enclosure, steel and aluminum (most models)
- Super durable powder coat painted aluminum construction minimizes corrosion and color fade, panels and posts.1” thick, ASTM B209, 5052 H32
- Aluminum wind rated to 150 mph (per ASCE 7-05 exposure D, category 1 importance factor) (also available on some steel enclosures)
- Window for control viewing
- Kits to up fit existing gensets or to upgrade existing enclosures with additional sound attenuation
- Exterior oil and coolant drains with interior valves for ease of service
- Overhead 2-point lifting brackets (some models)

Enclosure package sound pressure levels @ 7 meters dB(A)

Genset model	Weather protective enclosure steel: F182 aluminum: F216*	Level 1 sound attenuated enclosure steel: F172 aluminum: F231*	Level 2 sound attenuated enclosure steel: F173 aluminum: F217*	Level 3 sound attenuated enclosure steel: F232 aluminum: F233*
Natural gas				
35 GGPA	82	74	63	N/A
40 GGPB	83	74	65	N/A
45/50 GGPC	83	74	65	N/A
60 GGHE	86	77	68	N/A
70/75 GGHF	87	77	69	N/A
85 GGHG	80	76	70	N/A
100 GGHH	80	76	70	N/A
125 GGHJ	86	82	75	N/A
Diesel				
30 DGHCA	76	68	62	N/A
30 DGHCB	76	68	62	N/A
35 DSFAA	87	79	70	N/A
40 DGHCC	76	69	62	N/A
40 DSFAB	87	79	70	N/A
50 DGCA	83	72	66	N/A
50 DSFAC	87	79	70	N/A
60 DGCB	84	73	67	N/A
60 DSFAD	87	79	71	N/A
80 DGCG	84	76	67	N/A
80 DSFAE	87	82	72	N/A
100 DSGAA	87	N/A	72	69
125 DSGAB	88	N/A	73	69
150 DSGAC	88	N/A	73	70
175 DSGAD	89	N/A	74	70
200 DSGAE	89	N/A	74	71
230 DSHAD	96	89	78	N/A

Where two natural gas ratings are shown above, the first is the natural gas rating and the second is the propane rating. Data is a measured average of 8 positions, and is 60 Hz, full load Standby rating, steel enclosures only.

**Sound levels on aluminum enclosures are approximately 2 dB(A) higher than steel as measured above.*

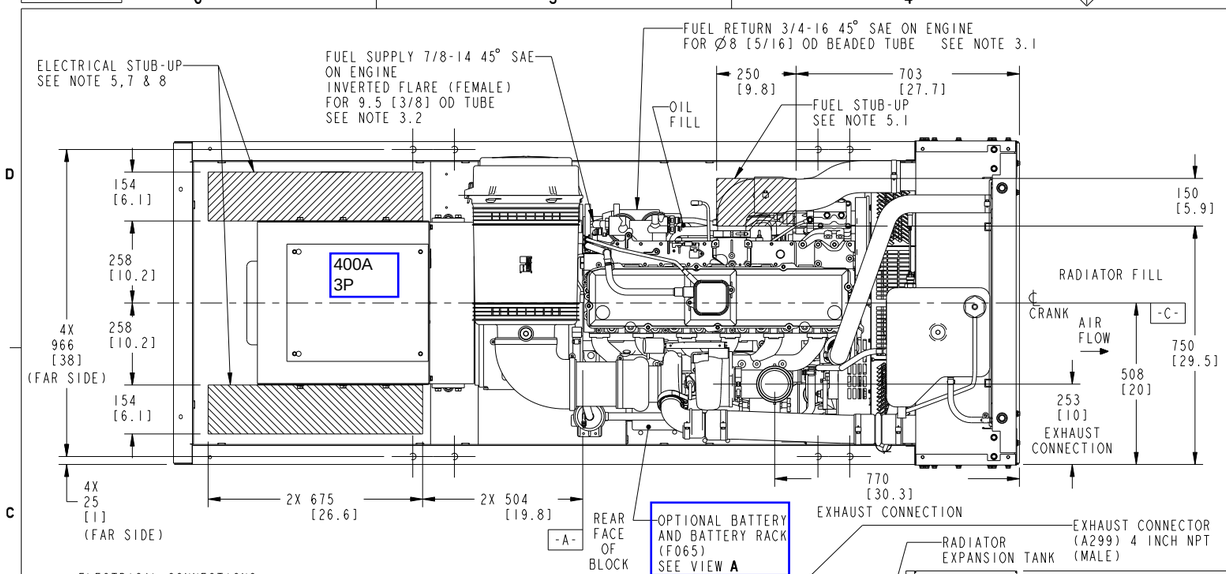
Cummins Sales and Service

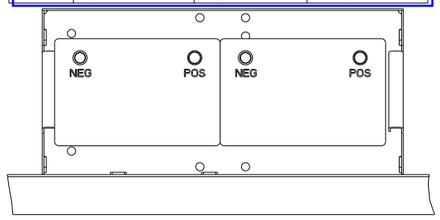
Section 3 – Generator Drawings

Pro/ENGINEER

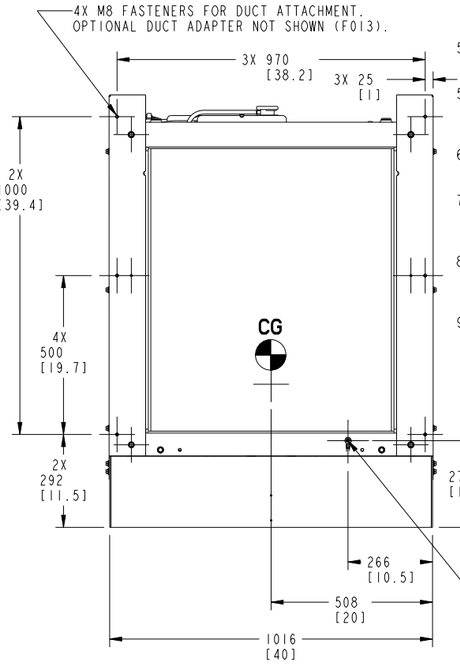
REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-119836	A	1	PRODUCTION_RELEASE	PT	HT	H.TRUONG	14OCT11

TABULATION			
ALT DATA SH #	DIM "A"	DIM "B"	GEN SET WET WEIGHT kg LB
208	2417 [95.2]	1243 [48.9]	1513 [3329]
209	2417 [95.2]	1250 [49.2]	1525 [3355]
210	2467 [97.1]	1257 [49.5]	1536 [3379]
211	2507 [98.7]	1261 [49.7]	1543 [3395]
212	2566 [101.0]	1270 [50.0]	1561 [3434]
213	2586 [101.9]	1281 [50.4]	1582 [3488]





SECTION A-A
SCALE 1/4
SEE NOTE 9



NOTES:

1. DIMENSIONS SHOWN IN [ ] ARE IN INCHES.
2. Ø20.7 [.81] HOLES MARKED BY △ ARE FOR 4 POINT ISOLATION MOUNTING OR SECURING TO MOUNTING SURFACE.
3. GENSET SUPPLIED WITH FLEXIBLE FUEL LINES THAT CAN BE CONNECTED TO ENGINE INTERFACE POINTS.
- 3.1 FUEL RETURN LINE: 960 [38] LONG WITH 3/4-16 45° SAE (MALE) TERMINATION.
- 3.2 FUEL SUPPLY LINE: 1020 [40] LONG WITH 7/8-14 45° SAE (MALE) TERMINATION.
4. Ø25.4 [1.0] HOLES MARKED □ ARE FOR SUB BASE FUEL TANK ATTACHMENT OR SECURING TO MOUNTING SURFACE.
5. REFER TO CIRCUIT BREAKER OUTLINE DRAWING FOR ELECTRICAL STUB-UP AREA FOR SPECIFIC BREAKERS.
- 5.1 REFER TO SUBBASE FUEL TANK OUTLINE DRAWING FOR ELECTRICAL STUB-UP AREA AVAILABLE WITH FUEL TANKS.
6. TABULATED WEIGHT AND CG IS FOR SET WITH NO OPTIONS.
7. FOR ENTRANCE/TERMINAL BOX APPLICATIONS SEE APPLICABLE ENTRANCE/TERMINAL BOX OUTLINE DRAWINGS.
8. FOR CIRCUIT BREAKER BOX APPLICATIONS SEE APPLICABLE CIRCUIT BREAKER BOX OUTLINE DRAWINGS.
9. GENSET REQUIRES TWO BATTERIES. POSITION BATTERIES IN THE ORIENTATION SHOWN. CABLES MUST BE CONNECTED IN PARALLEL TO THE RESPECTIVE BATTERY POST TERMINALS.

HOUSING READY SKID BASE

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS
DIM: X ±1, .X ±0.8, .XX± 0.38
HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0°
SCALE: 1/8

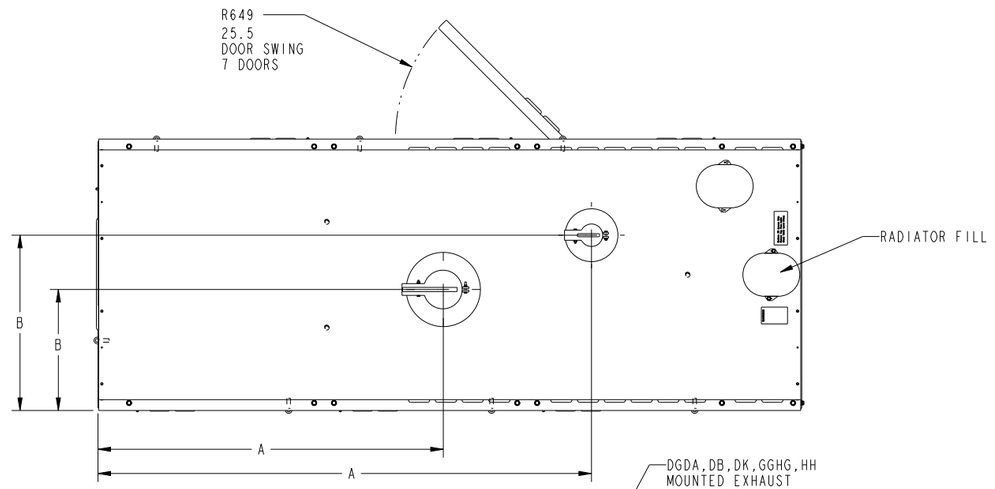
SIM TO 0500-4303
DO NOT SCALE PRINT
- CONFIDENTIAL - PROPERTY OF CUMMINS POWER GENERATION GROUP
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON DSGAD,AE,DSHAD

DRN P.THEVAR
CKD H.TRUONG
APVD H.TRUONG
DATE 14OCT11

SITE CODE PGF

CUMMINS POWER GENERATION
OUTLINE,GENSET (F179)
DWG SIZE D | A040V272 | SHEET 1 of 1 | DWG REV A

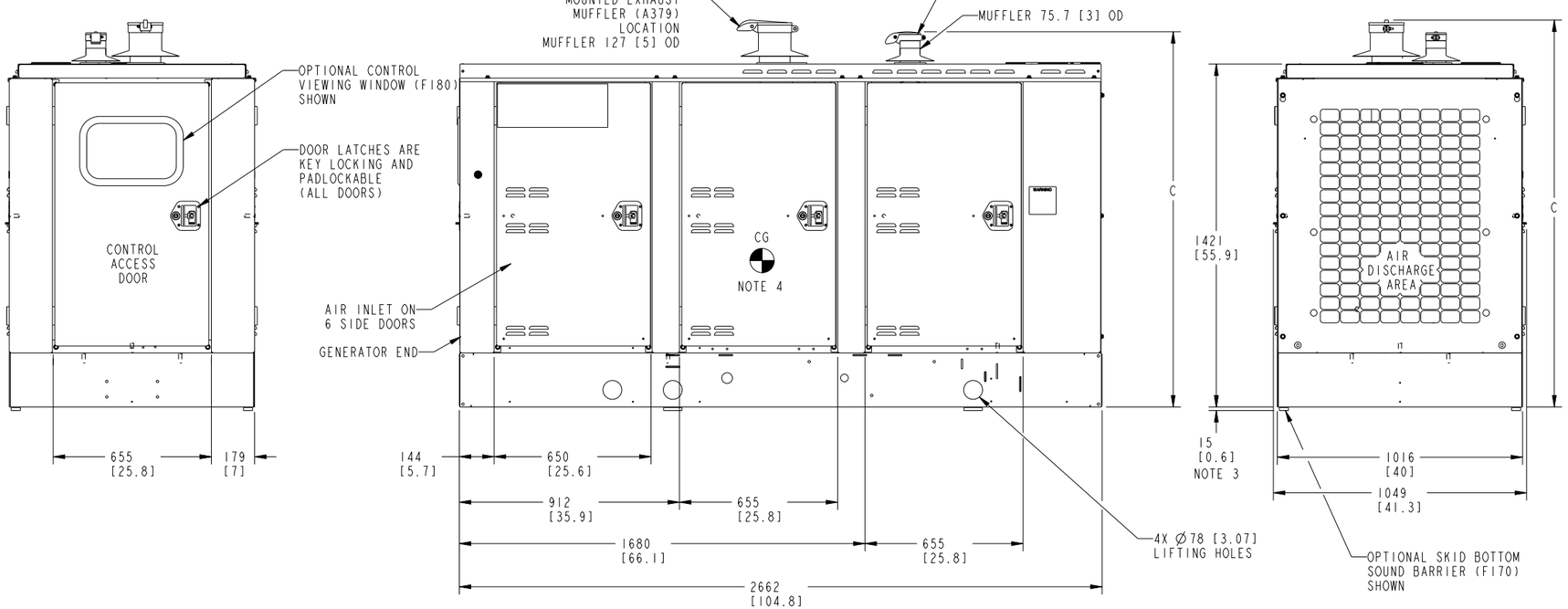
0500_3281



NOTE:

1. DIMENSIONS SHOWN IN [ ] ARE INCHES.
2. HOUSING AND MUFFLER WEIGHT: 204kg (450lbs)
3. HEIGHT INCREASE OF 15 [0.6] WHEN OPTIONAL SKID SOUND BARRIER IS USED.
4. THE CENTER OF GRAVITY (CG) OF THE GENERATOR SET WHEN EQUIPPED WITH THIS HOUSING SHIFTS APPROXIMATELY 16 [.6] FOR DGDA,DB,DK OR 9 [.3] FOR DGEA, FA,FB,FC,FS TOWARD THE GENERATOR END COMPARED TO THE EQUIVALENT NON-HOUSED PRODUCT WITH THE FI79 SKID.
   SEE HOUSING READY SKID BASE OUTLINE DRAWING FOR CG LOCATION OF NON-HOUSED PRODUCT.

TABULATION			
MODEL	DIM A	DIM B	DIM C
DGDA,DB,DK	1867 [73.5]	663 [26.1]	1554 [61.2]
DGEA,FA,FB,FS DSHAA,AB,AC DSHAD	1346 [53]	452 [17.8]	1520 [59.8]
DGFC	1306 [51.4]	452 [17.8]	1520 [59.8]
GGHG,HH	1865 [73.4]	663 [26.1]	1554 [61.2]



WEATHER PROTECTIVE HOUSING

MODEL/PLATFORM: DGDA,DB,EA,FA,FB,FC,FS		THIS PART IS SIMILAR TO: -	
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY			ANG. TOL.: ± 1.0°
DIMENSIONAL TOLERANCES:	X ± 1	.X ± 0.8	.XX ± 0.38
HOLE SIZE 0.09 - 4.99 TOL. +0.15/-0.08	HOLE SIZE 5.00 - 9.99 TOL. +0.20/-0.10	HOLE SIZE 10.00 - 17.49 TOL. +0.25/-0.13	HOLE SIZE 17.50 - 24.99 TOL. +0.30/-0.13

Cummins Inc.

DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: - | SIZE: D | SCALE:1/10

DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009 | THIRD ANGLE PROJECTION

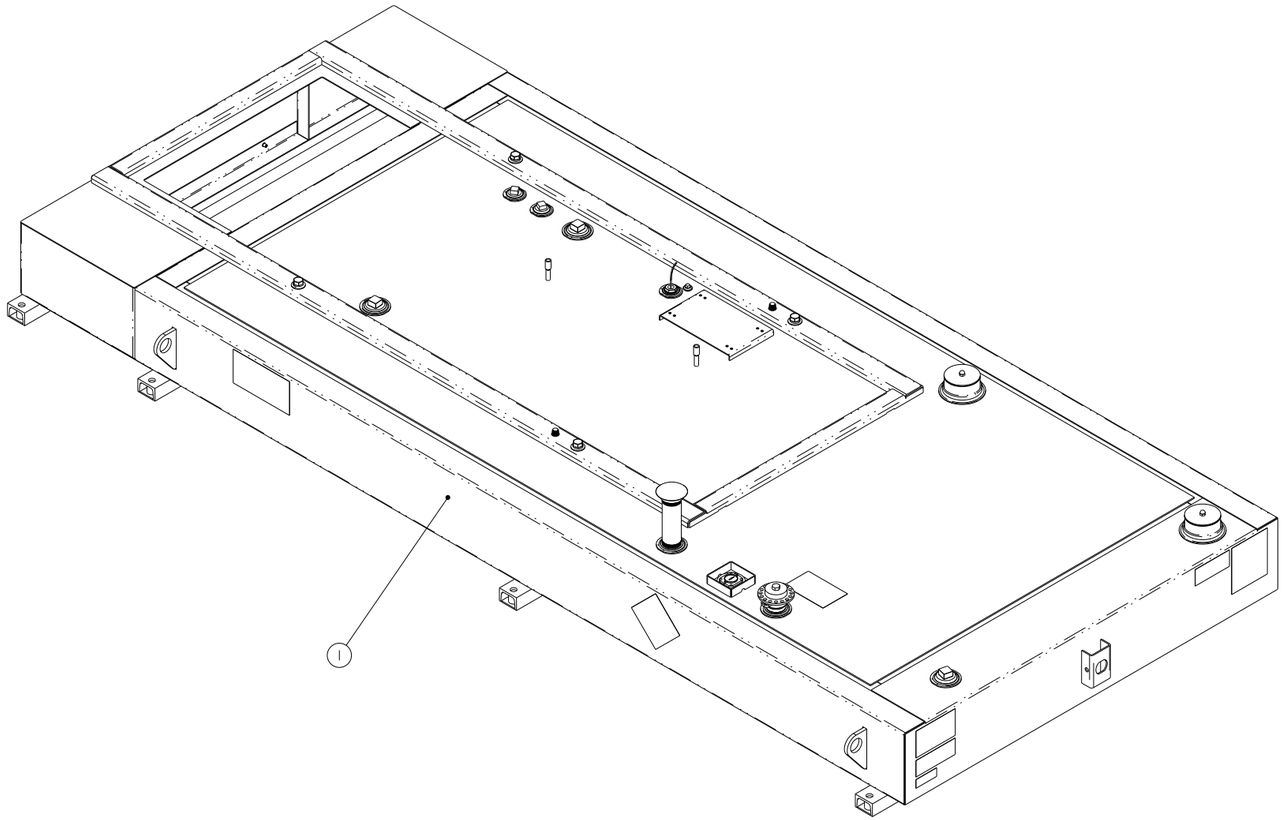
CAD SYSTEM PTC® Creo® Parametric

Document Generated: **24JUN2019 14:20 GMT**

Part Number: **0500-3281** Part Revision: **E**
Part Name: **OUTLINE,ENCLOSURE**
Drawing Category: **Detail** State: **Released**

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-147430	B	1	RMV ALL NOTES	RCR	RSN	R.NERADI	22OCT14
		2	RMV ALL VIEWS AND RELATED DIMS	RCR	RSN	R.NERADI	22OCT14
		3	ADD A051C600 QTY 1	RCR	RSN	R.NERADI	22OCT14
		4	ADD ISO VIEW	RCR	RSN	R.NERADI	22OCT14
		5	CHG FROM PURCHASE TO DESIGN & RMV MEP	RCR	RSN	R.NERADI	22OCT14



-THIS IS A CONTROLLED ITEM-
PER CPG PROCEDURE FRE-1002

TO MAINTAIN COMPLIANCE WITH REQUIREMENTS OF THE CODES, STANDARDS, OR AGENCIES LISTED BELOW

☐ CSA ☐ UL ☐ CE ☐ RVIA ☐ ABYC
☒ IBC ☐ OTHER ____ ☐ OTHER ____

CHANGES, DEVIATIONS, OR SUBSTITUTIONS OF MATERIAL, PROCESS, OR DESIGN OF THIS ITEM MUST BE APPROVED BY THE FOLLOWING CONTROLLED ITEM APPROVER

RESPONSIBLE C/A ROLE STATIONARY GENSET
RESPONSIBLE C/A ROLE
RESPONSIBLE C/A ROLE

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
		10.00-17.49 +0.25/-0.13
.XX	± 0.38	17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 1/8

SIM TO A030Y654
DO NOT SCALE PRINT

- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

DWN G. THOMAS
CKD B. DELANEY
APVD S. ANDERSON
DATE 04OCT12

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994 | FIRST USED ON DG

SITE CODE PGF

CUMMINS POWER GENERATION

TANK, FUEL
317 GAL

DWG SIZE D | A043V646 | SHEET 1 of 1 | DWG REV B

Drawing Name: A043V647 Revision: B
Part Name: A043V646 Revision: B
Sheet 1 of 2

Sales and Service

Section 4 – Generator Accessories

Specification Sheet

Battery Charger

A048G602 10 A 50/60 Hz
A051H785 20 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.

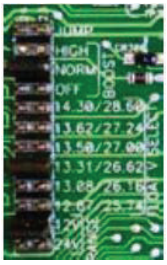
Faults – The charger senses and annunciates the following fault conditions: AC power loss, battery overvoltage, battery under voltage, battery fault conditions and charger failure. Includes an individual 30 volt/2-amp isolated contact for each alarm.

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 or 20 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) 20A: 50 lbs. (22.68 Kg)
Approximate dimensions: height x width x depth-in		10A: 12.50" x 7.66" x 6.50"(318 x 195 x 165 mm) 20A: 13.06" x 13.95" x 6.83"(332 x 354 x1 73 mm)
Ambient temperature operation: At full rated output -		- 4 °F to 104 °F (-20 °C to 40 °C)

Note:

1. Battery charger comes with default settings of 12VDC and 13.50/27.00VDC float voltage and can be changed to the battery manufacture recommendations. Replacement printed circuit board and f uses are identified in the Owner's Manual (10A: A050S537 and 20A: A051X126) which resides in Quick Serve On-Line. Service parts can be purchased through the Memphis Distribution Center. The PC board replacement instruction sheet (10A: A052N073, 20A: A053W929) and service manual (A050D829) is also available.
2. Installation and application must comply with "section 4.5.3 batteries and battery charger" of application guide T-030 (Liquid Cooled Generator Set Application Manual A040S369).

Caution:

1. Higher input voltages (i.e. 480VAC or 600VAC) can be applied if a transformer with a 120VAC-240VAC output is installed. Higher input voltages (i.e. 480VAC or 600VAC) can be applied if a transformer with a 120VAC-240VAC output is installed. For voltages higher than 240 VAC, stepdown transformer must be used. Review the respective Owner/Installation manual A050S537 for 10Amp and A051X126 20A chargers for supplier recommended stepdown transformer requirements.
2. 10Amp battery charger is recommended for genset applications with 1 or 2 factory provided batteries. 20Amp battery charger is recommended for Cummins Genset applications with 3 or 4 factory provided batteries. Please consider the auxiliary DC loads connected to the genset batteries and size this charger as per the T-030 application guide to prevent misapplication issues.
3. Back feed to a utility system can cause electrocution and/or property damage. Do not connect generator sets to any building electrical system except through an approved device or after building main switch is open.
4. For professional use only. Must be installed by a qualified service technician. Improper installation presents hazards of electrical shock and improper operation, resulting in severe personal injury and/or property damage.
5. Use this charger for charging LEAD-ACID or LIQUID ELECTROLYTE NICKEL-CADMIUM batteries only. Do not use this battery charger for charging dry cells, alkaline, lithium, nickel-metal hydride, or sealed nickel-cadmium batteries that are commonly used with home appliances. These batteries may burst and cause injuries to persons and damage to property.
6. Do not parallel these battery chargers with any other charging system.

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

Our energy working for you.™

NAAC-5602-EN (06/21) PDA059Y464

Pro/ENGINEER

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
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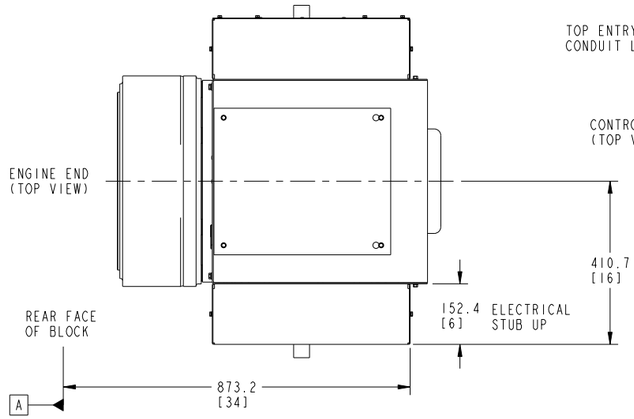
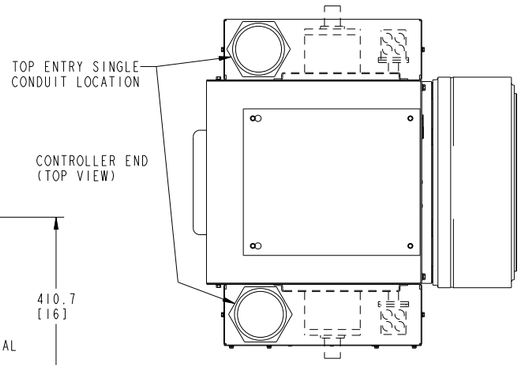
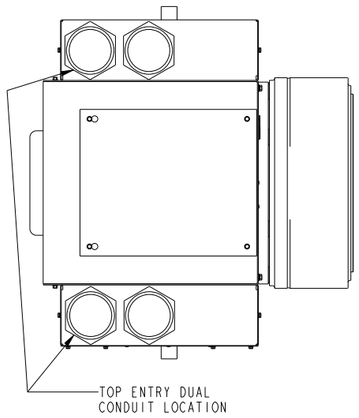
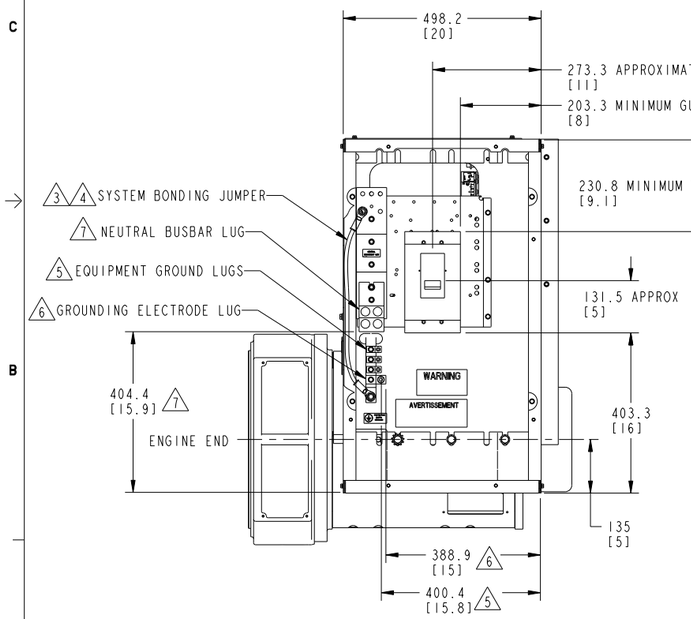
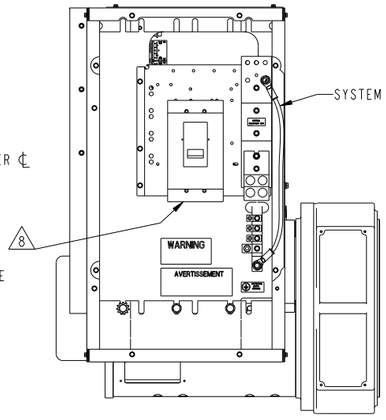




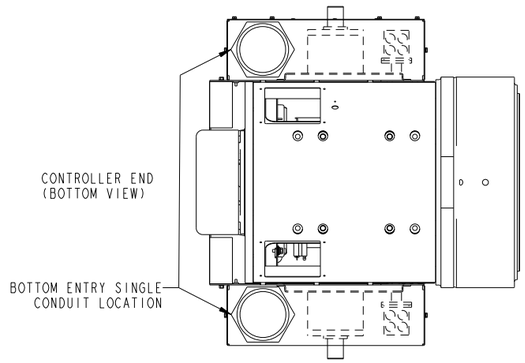


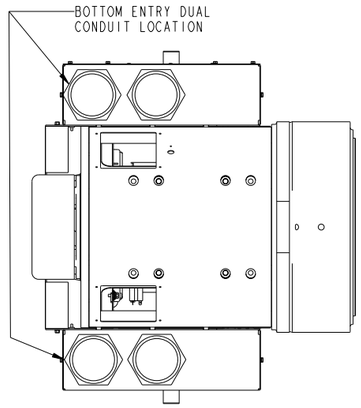


LH CONFIGURATION SHOWN



RH CONFIGURATION SHOWN





NOTES:

1. DIMENSIONS SHOWN IN [ ] ARE IN INCHES.

2. THESE WIRE-CONDUIT COMBINATIONS MEET NEC AND CEC. TO USE OTHER COMBINATIONS, REFER TO APPLICABLE CODES TO ENSURE THAT WIRE AMPACITY. BEND SPACE AND GUTTER SPACE MEET THE REQUIREMENTS.

3. TORQUE TO 47-57 Nm (35-42 FT-LBS) HARDEWARE IS PROVIDED WITH BONDING JUMPER.

4. 2/0 AWG SYSTEM BONDING JUMPER SIZED PER NEC TABLE 250.122 USING COPPER CABLE FOR A MAXIMUM AMPACITY RATING OF 1000 AMPS.

5. EQUIPMENT GROUND LUG IS MECHANICAL TYPE,
   COPPER 1/0-14 AWG
   SCREW 3/8" - 24 UNF-2B, "S" HEX WRENCH
   RECOMMENDED TORQUES:
   1/0-3 AWG - 50 IN-LBS
   4-6 AWG - 45 IN-LBS
   8 AWG - 40 IN-LBS
   10-14 AWG - 35 IN-LBS

6. GROUNDING ELECTRODE LUG IS MECHANICAL TYPE,
   COPPER 300 MCM-6 AWG
   SCREW 5/8"-18 UNF-2B, 5/16" HEX WRENCH
   RECOMMENDED TORQUES:
   300 MCM-1 AWG - 375 IN-LBS
   2-6 AWG - 275 IN-LBS

7. NEUTRAL LUG IS MECHANICAL TYPE,
   COPPER #2-600 MCM
   SCREW 15/16"-16, 3/8" HEX WRENCH
   RECOMMENDED TORQUES:
   600 MCM-4 AWG - 500 IN-LBS

8. CIRCUIT BREAKER LUGS - REFER TO RECOMMENDED TORQUE ON LABEL.

9. MINIMUM WIRE BENDING SPACE AT BREAKER TERMINALS CALCULATED PER NEC TABLE 312.6(B) USING 500 MCM CABLES (2 WIRES PER TERMINAL), MECHANICAL LUGS USED AS TERMINALS.

   NUMBER OF CONDUCTORS PER PHASE CALCULATED PER TABLE 310.16 USING COPPER CABLES RATED AT 75° C ON A MAXIMUM AMBIENT TEMP OF 40° C.

10. MINIMUM WIRE BENDING SPACE AT GROUND TERMINALS CALCULATED PER NEC TABLE 312.6(A) USING [3/0-14] CABLES (1 WIRE PER TERMINAL), MECHANICAL LUGS USED AS TERMINALS.

11. "NS" SHUNT TRIP HAS NO INTERNAL CONTACTS, IT MUST BE USED IN CONJUNCTION WITH AUXILIARY CONTACTS TO ACCEPT CONTINUOUS APPLIED VOLTAGE. IT CAN OPERATE AT 75% OF NOMINAL VOLTAGE.

TYPICAL CONDUIT AND WIRE SIZE BASED ON NEC 2008, ARTICLE 310.15 AT 75C TEMPURATURE RATED CONDUCTOR AT 40C AMBIENT AND ANNEX C (LIQUID TIGHT FLEXIBLE METAL CONDUIT - LFCM) 2

MAX BRKR AMPS	WIRE (COPPER)		CONDUIT	
	QTY	SIZE	QTY	SIZE
300	1	500 MCM	1	4"
350-400	1	600 MCM	1	4"
450	2	300 MCM	2	3 1/2"

UL/IEC LUGS				ACCESSORY SPECIFICATIONS			
LUG	FRAME	MAX AMPS	WIRE RANGE COPPER	ACCESSORY DESCRIPTION	CONTACT RATING	INRUSH CURRENT	CONNECTION TYPE
○	NSJ 600/690V	400A 3-POLE	#2-600 KCMIL	12 VDC SHUNT TRIP	-	10A 11	COMPRESSION TERMINALS #20-16 AWG OR SMALLER TORQUE: 10 LB-IN
○○○		600A 3-POLE	2/0-350 KCMIL	1 EA. FORM C 1 AUX CONTACT + 1 TRIP ALARM	6A AT 690 VAC 2.5A AT 48 VDC, 0.3A AT 250 VDC	-	

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE	
X	±1		0.00- 4.99 +0.15/-0.08
.X	±0.8		5.00- 9.99 +0.20/-0.10
.XX	±0.38		10.00-17.49 +0.25/-0.13
			17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 5/32

SIM TO NONE
DO NOT SCALE PRINT
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DRN G POWERS
CHD H TRUONG
APVD H TRUONG
DATE 23AUG11
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994
FIRST USED ON UC22

CUMMINS POWER GENERATION

OUTLINE,CIRCUIT BREAKER

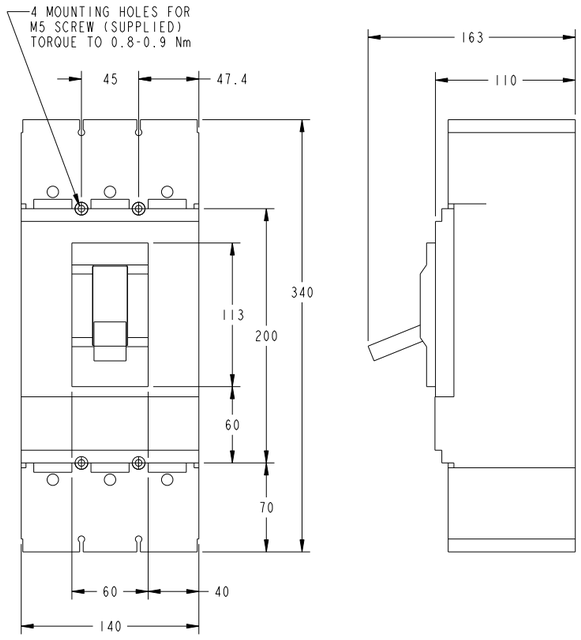
SITE CODE
PGF
SIZE D
A040V302
SHEET 1 OF 1
REV B

Drawing Name: A040V303 Revision: B
Part Name: A040V302 Revision: B
Sheet 1 of 2

PTC® Creo® Parametric

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-148659	D	1	A045U091 - UPDATE MEP (SEE ECO)	WGM	DJR	K.KISHORE	01JAN15

3 POLE



NOTES:

1. THIS PART IS MANUFACTURER SOURCE CONTROLLED.

2. PART SPECIFICATIONS:
   RMS ELECTRONIC TRIP
   TRIP UNIT: MICROLOGIC 3.3S UNIT

   LUGS INCLUDED ON ALL POLES
   UP TO 400A: 1 CABLE 2 AWG-600 KCMIL CU
   401-630A: 1 TO 2 CABLES 2/0 AWG TO 350 KCMIL CU

   EACH CB INCLUDES MOUNTING HARDWARE:
   M5 X 85 SCREWS, NUTS & LOCKWASHERS

   AGENCIES: 3-POLE: UL LISTED
   IEC
   4-POLE: IEC ONLY

TABULATION

PART NO.	CURRENT ECO	RATING (AMP)	POLE	VOLTS (UL/IEC)	DESCRIPTION	NOTES
A046P197	ECO-135274	600	3	600/690	LEFT HAND	
A046U528	ECO-135274	500	3	600/690	LEFT HAND	
A046U529	ECO-135274	450	3	600/690	LEFT HAND	
A046U530	ECO-135274	400	3	600/690	LEFT HAND	
A046U532	ECO-135274	350	3	600/690	LEFT HAND	
A046U534	ECO-135274	300	3	600/690	LEFT HAND	
A046U545	ECO-135274	630	4	690 (IEC ONLY)	LEFT HAND	
A046U546	ECO-135274	500	4	690 (IEC ONLY)	LEFT HAND	
A046U547	ECO-135274	400	4	690 (IEC ONLY)	LEFT HAND	
A046U552	ECO-135274	320	4	690 (IEC ONLY)	LEFT HAND	
A046U557	ECO-135274	250	3	600/690	LEFT HAND	
A046U558	ECO-135274	150	3	600/690	LEFT HAND	
A044T468	ECO-136325	600	3	600/690	RIGHT HAND	SEE NOTE 1
A045U081	ECO-136325	500	3	600/690	RIGHT HAND	SEE NOTE 1
A045U082	ECO-136325	450	3	600/690	RIGHT HAND	SEE NOTE 1
A045U083	ECO-136325	400	3	600/690	RIGHT HAND	SEE NOTE 1
A045U084	ECO-136325	350	3	600/690	RIGHT HAND	SEE NOTE 1
A045U085	ECO-136325	300	3	600/690	RIGHT HAND	SEE NOTE 1
A045U086	ECO-136325	630	4	690 (IEC ONLY)	RIGHT HAND	SEE NOTE 1
A045U087	ECO-136325	500	4	690 (IEC ONLY)	RIGHT HAND	SEE NOTE 1
A045U089	ECO-136325	400	4	690 (IEC ONLY)	RIGHT HAND	SEE NOTE 1
A045U090	ECO-136325	320	4	690 (IEC ONLY)	RIGHT HAND	SEE NOTE 1
A045U091	ECO-148659	250	3	600/690	RIGHT HAND	SEE NOTE 1
A045Z306	ECO-136325	150	3	600/690	RIGHT HAND	SEE NOTE 1
A045U164	ECO-130453	600	3	600/690	ACCESSORIES	
A045U165	ECO-130453	500	3	600/690	ACCESSORIES	
A045U168	ECO-130453	450	3	600/690	ACCESSORIES	
A045U169	ECO-130453	400	3	600/690	ACCESSORIES	
A045U170	ECO-130453	350	3	600/690	ACCESSORIES	
A045U171	ECO-130453	300	3	600/690	ACCESSORIES	
A045U172	ECO-130453	630	4	690 (IEC ONLY)	ACCESSORIES	
A045U173	ECO-130453	500	4	690 (IEC ONLY)	ACCESSORIES	
A045U175	ECO-130453	400	4	690 (IEC ONLY)	ACCESSORIES	
A045U176	ECO-130453	320	4	690 (IEC ONLY)	ACCESSORIES	
A045U177	ECO-130453	250	3	600/690	ACCESSORIES	
A045Z308	ECO-130453	150	3	600/690	ACCESSORIES	

-THIS IS A CONTROLLED ITEM-
PER CPG PROCEDURE FRE-1002

TO MAINTAIN COMPLIANCE WITH REQUIREMENTS OF THE CODES, STANDARDS, OR AGENCIES LISTED BELOW

☐ CSA ☐ UL ☐ CE ☐ RINA ☐ ABYC
☐ IBC ☐ OTHER _____ ☐ OTHER _____

CHANGES, DEVIATIONS, OR SUBSTITUTIONS OF MATERIAL, PROCESS, OR PERFORMANCE FOR THIS ITEM MUST BE APPROVED BY THE FOLLOWING CONTROLLED ITEM APPROVER

RESPONSIBLE C/A ROLE STATIONARY GENSET C/A
RESPONSIBLE C/A ROLE _____
RESPONSIBLE C/A ROLE _____

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM: X ± 1; .X ± 0.8; .XX± 0.38
HOLE: 0.00- 4.99 +0.15/-0.08; 5.00- 9.99 +0.20/-0.10; 10.00-17.49 +0.25/-0.13; 17.50-24.99 +0.30/-0.13
ANG TOL: ± 1.0°

SCALE: 1/2

SIM TO
DO NOT SCALE PRINT

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PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN S. CANFIELD
CHD M. SIMS
APVD V. GUPTA
DATE 29NOV12

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON
GENERAL

SITE CODE
PGF

CUMMINS POWER GENERATION

BREAKER,CIRCUIT

SIZE D | A044T469 | SHEET 1 of 1 | REV D

Drawing Name: A044T469 Revision: D
Part Name: A046P197 Revision: A
Sheet 1 of 2

Product data sheet

Specifications

Circuit breaker, PowerPact L, unit mount, Micrologic 3.3S, 400A, 3 pole, 18kA, 600VAC,

LGL36400U33X

Main

Range	PowerPact
Product name	PowerPact L
Device short name	L-Frame
Product or component type	Circuit breaker
Device application	Distribution

Complementary

[In] rated current	400 A
Number of Poles	3P
Control type	Toggle
Breaking capacity code	G
Breaking capacity	65 kA 240 V AC 50/60 Hz UL 489 35 kA 480 V AC 50/60 Hz UL 489 18 kA 600 V AC 50/60 Hz UL 489 20 kA 250 V DC UL 489 20 kA 500 V DC UL 489
[Ue] rated operational voltage	600 V AC 50/60 Hz IEC 60947-3
Network frequency	50/60 Hz
[Ics] rated service breaking capacity	65 kA 220/240 V AC 50/60 Hz IEC 60947-2 35 kA 380/440/415 V AC 50/60 Hz IEC 60947-2 18 kA 500/525 V AC 50/60 Hz IEC 60947-2 20 kA 250 V DC IEC 60947-2 20 kA 500 V DC IEC 60947-2
[Uimp] rated impulse withstand voltage	8 kV IEC 60947-2
Trip unit technology	Electronic, standard, Micrologic 3.3 S, LSI
[Ui] rated insulation voltage	750 V IEC 60947-2
Trip unit name	Micrologic 3.3 S
Protection technology	Current limiter
Suitability for isolation	Yes IEC 60947-2
Utilisation category	Category A
AWG gauge	Please see CB outline drawing for lug and termination details
Local signalling	Ready 1 LED green) Alarm 1 LED 90 % Ir orange)

	Alarm LED 105 % Ir red) Switched off (OFF) 1 trip indicator green)
Mounting mode	Unit mount lug)
Mounting support	Lug
Electrical connection	Lugs line Lugs load
Terminal identifier	Please see CB outline drawing for lug and termination details
Long time pick-up adjustment range	0.25...1 x In
Tightening torque	442.54 lbf.in (50 N.m) 0.11…0.37 in² (70…240 mm²) AWG 2/0...500 kcmil)
Number of slots	2 auxiliary switch OF plug-in) 1 alarm switch SD plug-in) 1 overcurrent trip switch SDE plug-in) 1 voltage release MN or MX plug-in)
Power wire stripping length	1.22 in (31 mm) 2.40 in (61 mm)
Color	Black
Height	13.39 in (340 mm)
Width	5.51 in (140 mm)
Depth	4.33 in (110 mm)
Net weight	13.67 lb(US) (6.2 kg)
Communication interface	Modbus Ethernet

Environment

Standards	UL CSA NEMA NOM-003-SCFI-2000 IEC 60947-2
Product certifications	UL CSA NOM
IP degree of protection	Front cover IP40
Pollution degree	3 IEC 60947-1
Ambient air temperature for operation	28…158 °F (-2…70 °C)
Ambient air temperature for storage	-58…185 °F (-50…85 °C)
Operating altitude	< 2000 m without derating 5000 m with derating

Packing Units

Unit Type of Package 1	PCE
Number of Units in Package 1	1
Package 1 Weight	15.00 lb(US) (6.804 kg)
Package 1 Height	8.75 in (22.225 cm)
Package 1 width	10.75 in (27.305 cm)
Package 1 Length	19.50 in (49.53 cm)

Offer Sustainability

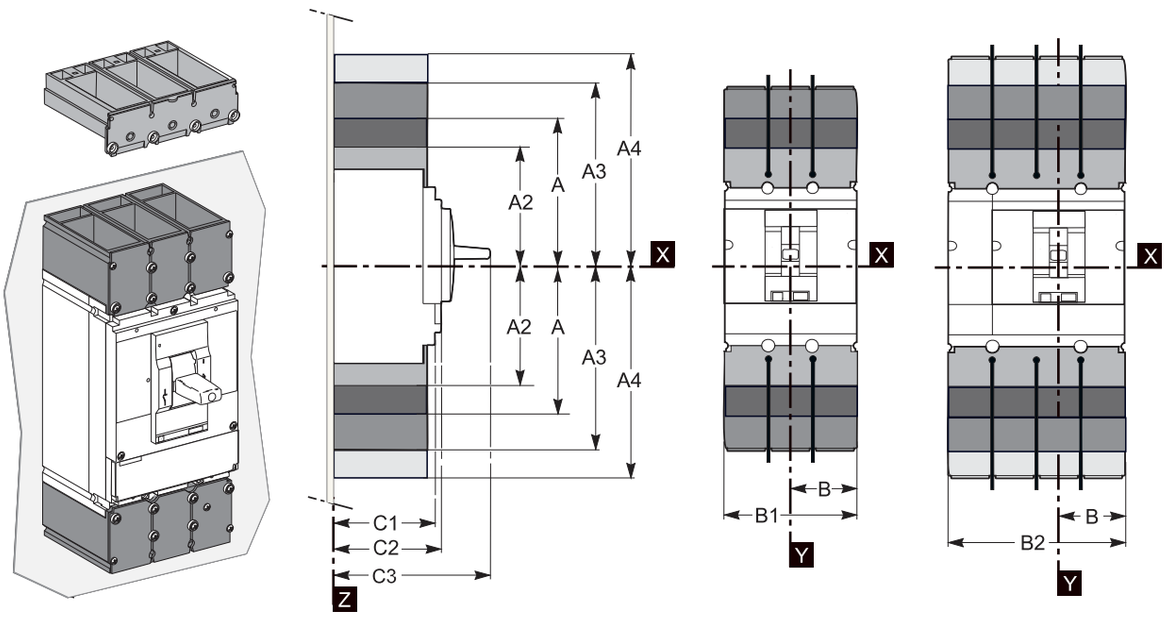
Sustainable offer status	Green Premium product
REACh Regulation	REACh Declaration

EU RoHS Directive	Compliant EU RoHS Declaration
Mercury free	Yes
RoHS exemption information	Yes
China RoHS Regulation	China RoHS declaration Product out of China RoHS scope. Substance declaration for your information
Environmental Disclosure	Product Environmental Profile
Circularity Profile	End of Life Information
PVC free	Yes

Product data sheet LGL36400U33X

Technical Illustration

Dimensions



A2 = Short Lug Pack
AL400L61K3
CU400L61K3
AL600LF52K3
CU600LF5283

A = Medium Lug Pack
AL400L61K4
CU400L61K4
AL600LS52K3
AL600LS52K4
CU600LS52K3
CU600LS52K4

A3 = Long Lug Pack
Compression Lug Kits

A4 = 500 Vdc Lug Pack

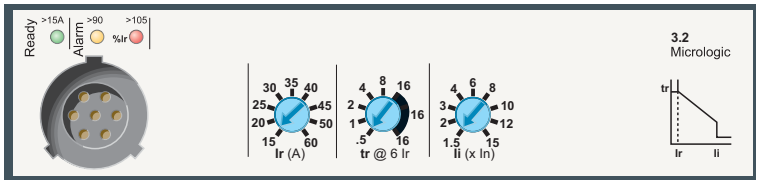
L-Frame

	A	A2	A3	A4	B	B1	B2	C1	C2	C3
inch	6.69	5.65	7.87	9.53	2.76	5.51	7.28	3.76	4.33	6.61
mm	170	143.5	200	242	70	140	185	105	110	168

All dimensions are approximate.
Also see CAD, technical drawings, and technical documentation.

Micrologic™ 3 Trip Units

Micrologic 3 trip units can be used on PowerPact H-, J-, and L-Frame circuit breakers with performance levels D/G/J/L.



They provide:

- standard protection of distribution cables
- indication of:
  - — overloads (using LEDs)
  - — overload tripping (using the SDx relay module).

Circuit breakers equipped with Micrologic 3 trip units can be used to protect distribution systems supplied by transformers.

Protection

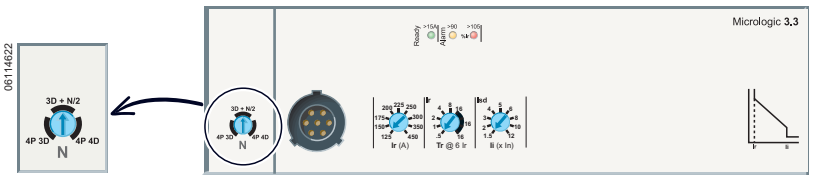
Settings are made using the adjustment rotary switches.

Overloads: Long time protection (I_r)

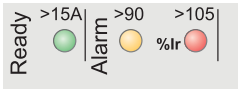
Inverse time protection against overloads with an adjustable current pick-up Ir set using a rotary switch and an adjustable time delay t_r.

Neutral protection

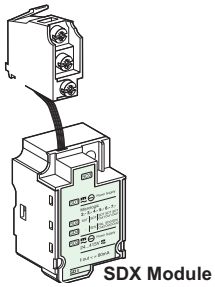
- On 3-pole L-frame circuit breakers, neutral protection is not possible.
- On four-pole L-frame circuit breakers, neutral protection may be set using a three-position switch:
  - — switch position 4P 3D: neutral unprotected
  - — switch position 4P 3D + N/2: neutral protection at half the value of the phase pick-up, (0.5 x Ir)
  - — switch position 4P 4D: neutral fully protected at I_r



Indicators



Front Indicators



SDX Module

Front indicators

- The green “Ready” LED blinks slowly when the electronic trip unit is ready to provide protection. It indicates the trip unit is operating correctly.
- Orange overload pre-alarm LED: steady on when I > 90% I_r
- Red overload LED: steady on when I > 105% I_r

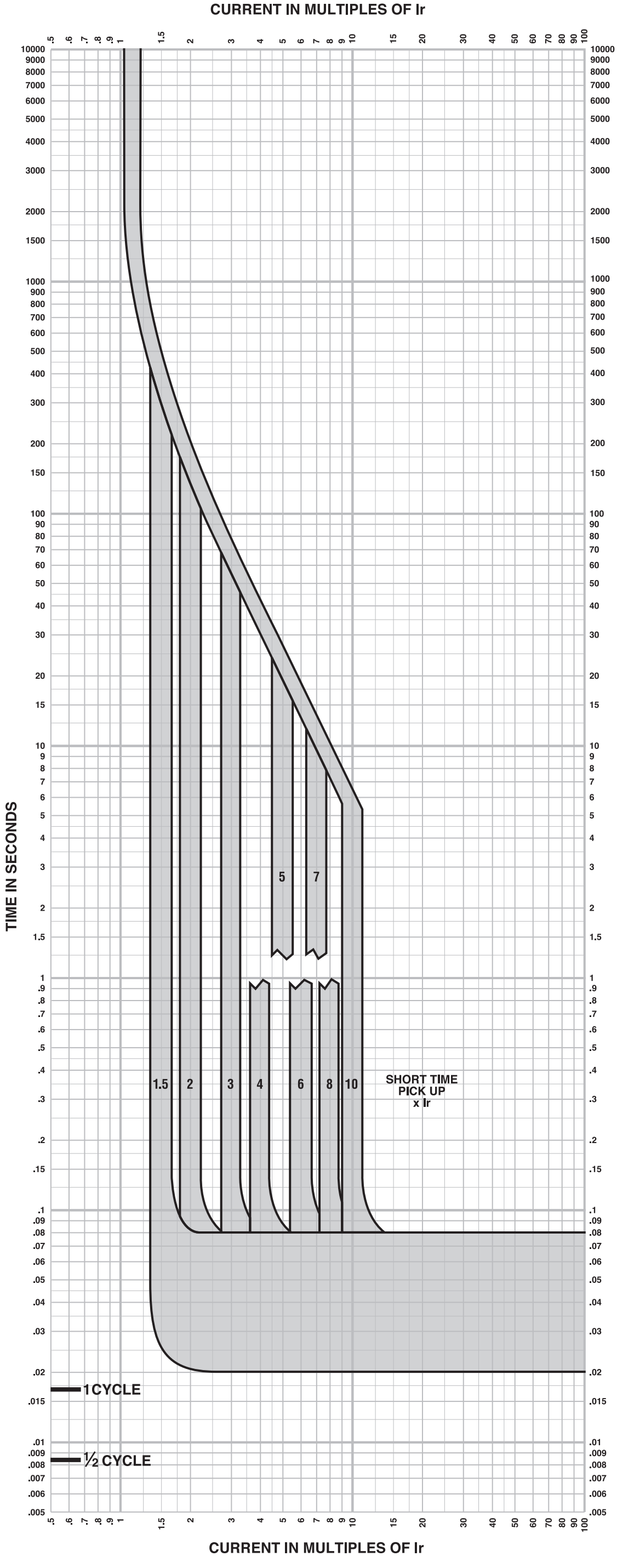
Remote indicators

An overload trip signal can be remotely checked by installing an SDx relay module inside the circuit breaker. This module receives the signal from the Micrologic electronic trip unit through an optical link and makes it available on the terminal block. The signal is cleared when the circuit breaker is reclosed. See page 94.

Table 50: Micrologic™ 3 Trip Unit

Ratings	I_n at 104°F (40°C)[1]		60 A	100 A	150 A	250 A	400 A	600 A			
Circuit Breaker	H-frame		X	X	X						
	J-frame					X					
	L-frame					X	X	X			
Micrologic 3.2 / 3.3 trip units											
L Long-time protection											
Pick-Up (A) Tripping between 1.05 and 1.20 Ir	**I_r**		**Value depending on sensor rating (I_n) and setting on rotary switch**								
	I_n =60 A	I_r =	15	20	25	30	35	40	45	50	60
	I_n = 100 A	I_r =	35	40	45	50	60	70	80	90	100
	I_n = 150 A	I_r =	50	60	70	80	90	100	110	125	150
	I_n = 250 A	I_r =	70	80	100	125	150	175	200	225	250
	I_n = 400 A	I_r =	125	150	175	200	225	250	300	350	400
	I_n = 600 A	I_r =	200	225	250	300	350	400	450	500	600
Time Delay (s) Accuracy 0 to -20%	t_r		0.5	1	2	4	8	16			
		1.5 x I_r	15	25	50	100	200	400			
		6 x I_r	0.5	1	2	4	8	16			
		7.2 x I_r	0.35	0.7	1.4	2.8	5.5	11			
Thermal memory			20 minutes before and after tripping								
I Instantaneous											
Pick-up (A) accuracy ± 15%	I_i x	60 A	1.5	2	3	4	6	8	10	12	15
		100 A	1.5	2	3	4	6	8	10	12	15
		150 A	1.5	2	3	4	6	8	10	12	15
		250 A	1.5	2	3	4	5	6	8	10	12
		400 A	1.5	2	3	4	5	6	8	10	12
		600 A	1.5	2	3	4	5	6	8	10	11
	Non-tripping time Maximum break time		10 ms 50 ms for I > 1.5 Ii								
Micrologic 3.2S / 3.3S trip units											
L Long-time protection											
Pick-Up (A) Tripping between 1.05 and 1.20 Ir	**I_r**		**Value depending on sensor rating (I_n) and setting on rotary switch**								
	I_n =60 A	I_r =	15	20	25	30	35	40	45	50	60
	I_n = 100 A	I_r =	35	40	45	50	60	70	80	90	100
	I_n = 150 A	I_r =	50	60	70	80	90	100	110	125	150
	I_n = 250 A	I_r =	70	80	100	125	150	175	200	225	250
	I_n = 400 A	I_r =	125	150	175	200	225	250	300	350	400
	I_n = 600 A	I_r =	200	225	250	300	350	400	450	500	600
Time Delay (s) Accuracy 0 to -20%	t_r		non-adjustable								
		1.5 x I_r	400								
		6 x I_r	16								
		7.2 x I_r	11								
Thermal memory			20 minutes before and after tripping								
S Short-time protection											
Pick-up (A) accuracy ± 10%	I_{sd} - I_r x...		1.5	2	3	4	5	6	7	8	10
Time delay (ms)	t_{sd}		non-adjustable								
	Non-tripping time Maximum break time		20 80								
I Instantaneous											
Pick-up (A) accuracy ± 15%	I_i x I_n		1.5	2	3	4	6	8	10	12	15
	Non-tripping time Maximum break time		10 ms 50 ms for I > 1.5 Ii								

1 If the trip units are used in high-temperature environments, the Micrologic trip unit setting must take into account the thermal limitations of the circuit breaker. See the temperature derating information on page 126.



MICROLOGIC™ ELECTRONIC TRIP UNITS

Micrologic™ 3.3S Long Time/ Short Time Trip Curve 250A, 400A L-Frame

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

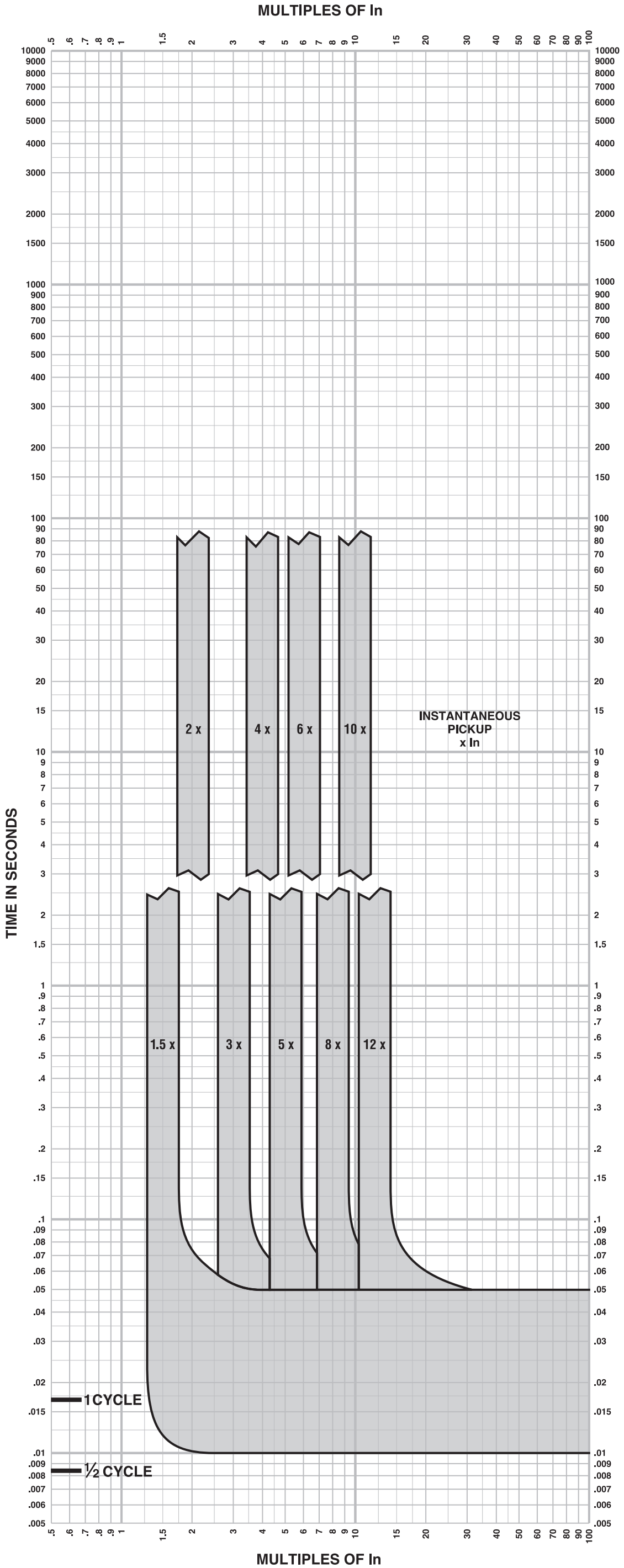
Notes:

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

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

Schneider Electric

Drawing No. S1A8147100
March 2011



MICROLOGIC™ ELECTRONIC TRIP UNITS
Micrologic™ 3.3/3.3S/5.3A or E/6.3A or E
Instantaneous Trip Curve
400A L-Frame

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

Notes:

1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
3. In = Maximum dial setting of Ir.
   400A L-Frame: In = 400A = Max Ir setting

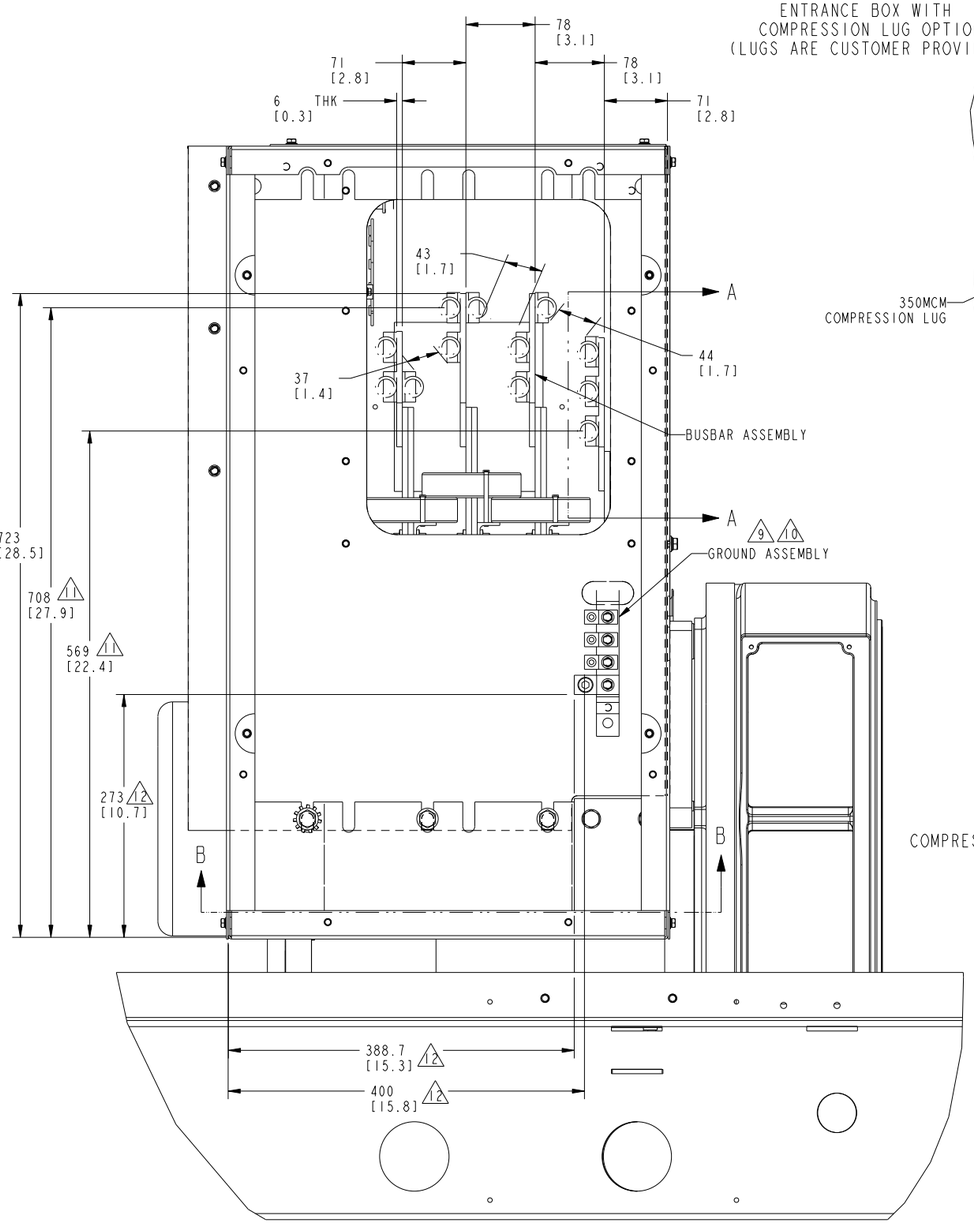
Curves apply from -35°C to +70°C (-31°F to +158°F) ambient temperature.

Schneider Electric

Drawing No. S1A8164100
March 2011

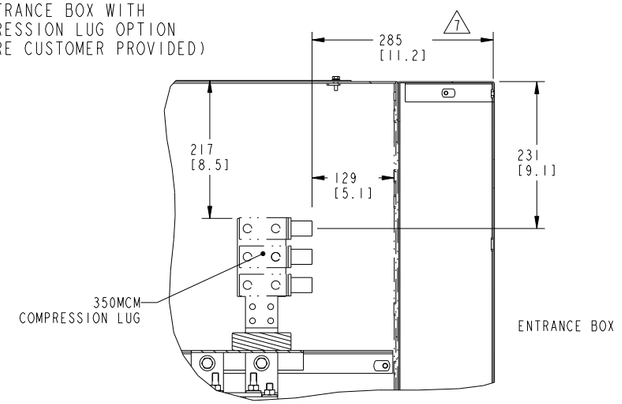
Pro/ENGINEER

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-125328	C	1	UPDATE GRAPHICS TO SHOW SHEET METAL CHG	GWP	HT	H.TRUONG	27APR12

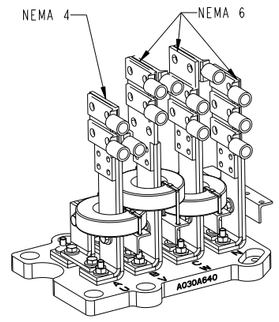


DSHAD TERMINAL BOX
(RIGHT HAND BOTTOM ENTRY CONFIGURATION SHOWN)

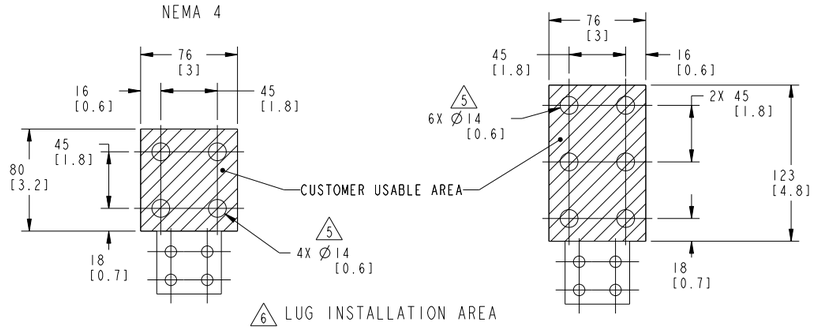
ENTRANCE BOX WITH
COMPRESSION LUG OPTION
(LUGS ARE CUSTOMER PROVIDED)



SECTION A-A
SCALE 1/4



3D VIEW
COMPRESSION LUGS INSTALLATION SHOWN



6 LUG INSTALLATION AREA

NOTES:

1 THE DIMENSIONS ARE FOR REFERENCE ONLY.

2 THE DIMENSIONS SHOWN IN [ ] ARE INCHES.

3 MAXIMUM CAPACITY OF COPPER CABLES IS 600MCM,QTY=3 PER PHASE.

4 USE COMPRESSION TYPE LUG ONLY.

5 LUGS, CUSTOMER CONNECTION CABLE AND HARDWARE ARE PROVIDED BY CUSTOMER. USE STANDARD HARDWARE AND TORQUE TO INSTALL COMPRESSION LUGS TO BUSBAR.

6 NEMA 4 & NEMA 6 HOLE PATTERN (USE DIMENSIONS TO SELECT LUGS).

7 DIMENSIONS TO INSIDE OF ENTRANCE BOX.

8 THESE WIRE-CONDUIT COMBINATIONS MEET NEC AND CEC. TO USE OTHER COMBINATIONS, REFER TO APPLICABLE CODES TO ENSURE THAT WIRE AMPACITY. BEND SPACE AND GUTTER SPACE MEET THE REQUIREMENTS.

9 EQUIPMENT GROUND LUG IS MECHANICAL TYPE,
COPPER 1/0-14 AWG
SCREW 3/8" - 24 UNF-2B, "S" HEX WRENCH
RECOMMENDED TORQUES:
1/0-3 AWG - 50 IN-LBS
4-6 AWG - 45 IN-LBS
8 AWG - 40 IN-LBS
10-14 AWG - 35 IN-LBS

10 GROUNDING ELECTRODE LUG IS MECHANICAL TYPE,
COPPER 300 MCM-6 AWG
SCREW 5/8"-18 UNF-2B, 5/16" HEX WRENCH
RECOMMENDED TORQUES:
300 MCM-1 AWG - 375 IN-LBS
2-6 AWG - 275 IN-LBS

11 MINIMUM WIRE BENDING SPACE AT TERMINALS CALCULATED PER NEC TABLE 312.6(B) USING 500 MCM CABLES (2 WIRES PER TERMINAL), MECHANICAL LUGS USED AS TERMINALS.

NUMBER OF CONDUCTORS PER PHASE CALCULATED PER TABLE 310.16 USING COPPER CABLES RATED AT 75° C ON A MAXIMUM AMBIENT TEMP OF 40° C.

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UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X ±1		0.00- 4.99 +0.15/-0.08
.X ± 0.8		5.00- 9.99 +0.20/-0.10
.XX± 0.38		10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 7/20

SIM TO NONE
DO NOT SCALE PRINT
- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN N.KASIBHOTLA
CKD H.TRUONG
APVD H.TRUONG
DATE 11APR11
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING SEE ASME Y14.5M-1994
FIRST USED ON UC27

SITE CODE PGF

CUMMINS POWER GENERATION

OUTLINE,ENTRANCE BOX

DWG SIZE D | A035A848 | SHEET 1 OF 2 | DWG REV C

Drawing Name: A035A849 Revision: C
Part Name: A035A848 Revision: C
Sheet 1 of 3

Pro/ENGINEER

REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
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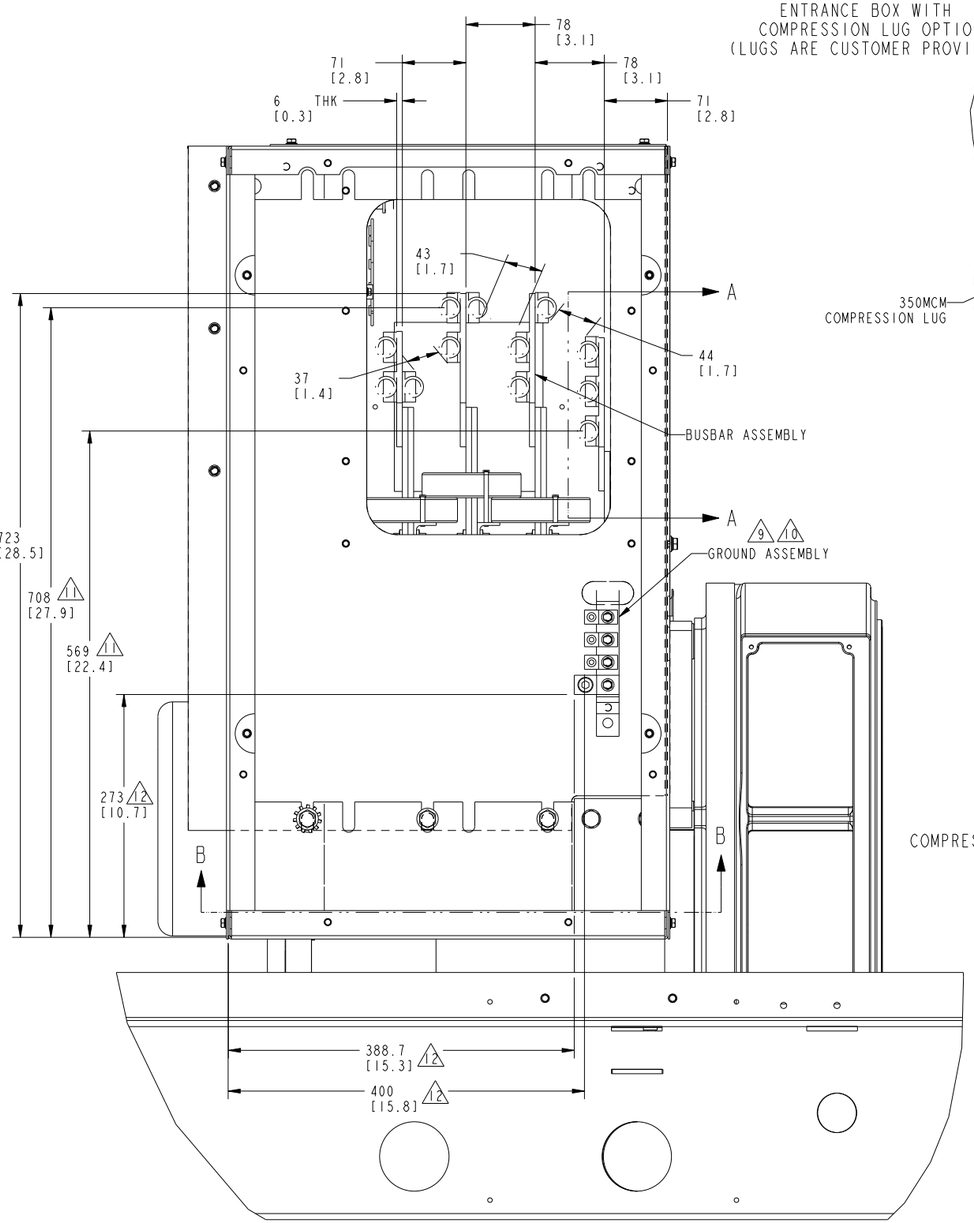
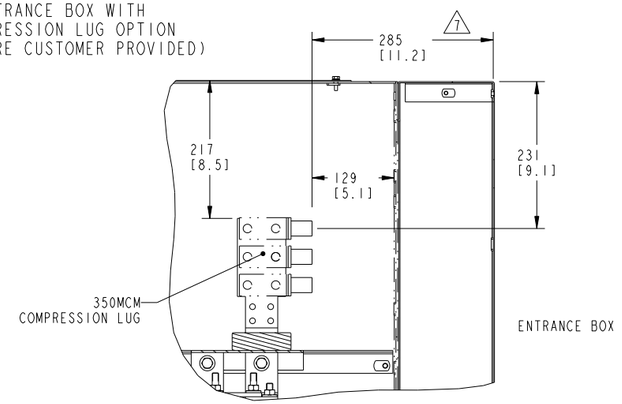
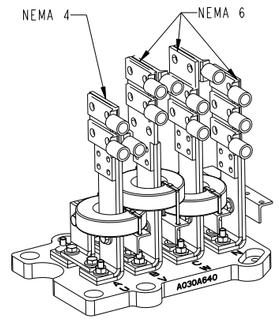


DSHAD TERMINAL BOX
(RIGHT HAND BOTTOM ENTRY CONFIGURATION SHOWN)

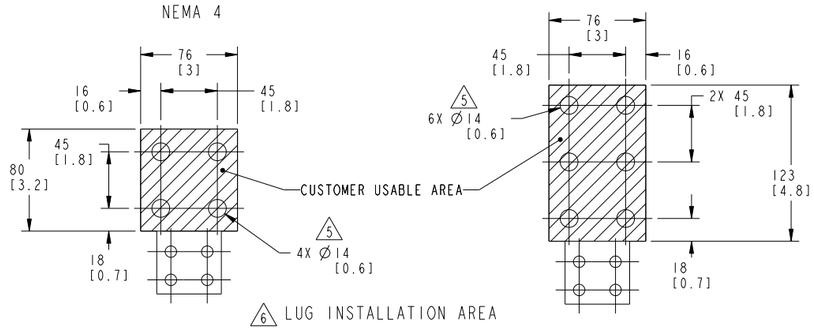
ENTRANCE BOX WITH
COMPRESSION LUG OPTION
(LUGS ARE CUSTOMER PROVIDED)



SECTION A-A
SCALE 1/4



3D VIEW
COMPRESSION LUGS INSTALLATION SHOWN



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.X ± 0.8		5.00- 9.99 +0.20/-0.10
.XX± 0.38		10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0° SCALE: 7/20

SIM TO NONE
DO NOT SCALE PRINT
- CONFIDENTIAL -
PROPERTY OF CUMMINS POWER GENERATION GROUP

DRN N.KASIBHOTLA
CKD H.TRUONG
APVD H.TRUONG
DATE 11APR11
FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING SEE ASME Y14.5M-1994
FIRST USED ON UC27

SITE CODE PGF

CUMMINS POWER GENERATION

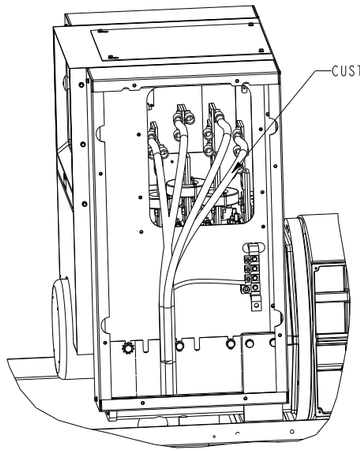
OUTLINE,ENTRANCE BOX

DWG SIZE D | A035A848 | SHEET 1 OF 2 | DWG REV C

Drawing Name: A035A849 Revision: C
Part Name: A035A848 Revision: C
Sheet 1 of 3

Pro/ENGINEER

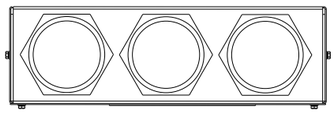
REL NO	LTR	NO	REVISION	DRN	CKD	APVD	DATE
ECO-125328	C	1	UPDATE GRAPHICS TO SHOW SHEET METAL CHG	GWP	HT	H_TRUONG	27APR12



ONE CONDUIT WIRED FOR REFERENCE ONLY

TYPICAL CONDUIT AND WIRE SIZE BASED ON NEC 2008, ARTICLE 310.15 AT 75C TEMPURATURE RATED CONDUCTOR AT 40C AMBIENT AND ANNEX C (LIQUID TIGHT FLEXIBLE METAL CONDUIT - LFCM)

MODEL NAME	WIRE (COPPER)		CONDUIT	
	QTY	SIZE	QTY	SIZE
DSHAD	3	350 MCM	3	3 1/2"
DSFAD	1	250 MCM	1	3"
DSFAE	1	400 MCM	1	3 1/2"
GGHE	1	250 MCM	1	3"
GGHF	1	350 MCM	1	3 1/2"
GGHG	1	500 MCM	1	4"
GGHH	1	3/0	1	2 1/2"



SECTION B-B
SEE SHEET 1, ZONE B5
SCALE 1/4

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS

DIM		HOLE
X	± 1	0.00- 4.99 +0.15/-0.08
.X	± 0.8	5.00- 9.99 +0.20/-0.10
.XX	± 0.38	10.00-17.49 +0.25/-0.13
		17.50-24.99 +0.30/-0.13

ANG TOL: ± 1.0°

SCALE: 7/20

SIM TO NONE

DO NOT SCALE PRINT

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FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ASME Y14.5M-1994

FIRST USED ON UC27

SITE CODE PGF

CUMMINS POWER GENERATION

OUTLINE, ENTRANCE BOX

DWG SIZE D | A035A848 | SHEET 2 OF 2 | DWG REV C

Drawing Name: A035A849 Revision: C
Part Name: A035A848 Revision: C
Sheet 2 of 3

Sales and Service

Section 5 – Startup & Warranty

Cummins Sales and Service

Customer / Contractor Pre Commissioning Inspection Form

The intent of this form is for the contractor to prepare for equipment to be commissioned by a certified Cummins Field Service Power Generation Technician. Filling out this form is required and will minimize delays due to equipment failing to meet requirements. Completing this checklist in its entirety should minimize the need for additional billing beyond the previously provided commissioning quote.

The items listed are the responsibility of the contractor and not Cummins Sales and Service.

Project Name/End User: _____

Contractor: _____

Address: _____ **Contact:** _____

Business Phone: _____ **Cell Phone:**_____

Email: _____

ON SITE INFORMATION

On-Site Contact Information: _____

Address: _____

Time Requested Onsite: _____

Sub location of Generator (ie. Roof, basement, floor): _____

Does the facility have the following: Loading Dock ☐ Elevator ☐

Access (from truck and load bank parking to generator in feet): _____

Parking: Is parking available on-site for service truck: Yes ☐ No ☐

Permits: Have all necessary air quality and local permits been secured: Yes ☐ No ☐ N/A ☐

Fuel Tank Testing: Is fuel tank testing required: Yes ☐ No ☐

If yes when is the inspector scheduled for: _____

Sales and Service

ON SITE INFORMATION CONTINUED

YES	NA	NO
☐	☐	☐
☐	☐	☐
☐	☐	☐

Is the facility occupied and is customer aware there will be power outages after generator is started?

Will there be any site safety training needed for technician prior to beginning? On site contact for training: _____

Will customer representative be on site for operator training?

On site contact for operator training: _____

MECHANICAL LOCATION AND PLACEMENT OF THE GENERATOR SET

YES	NA	NO
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐

Generator is properly secured to pad or vibration isolators

Generator Enclosure and/or Room is free of all debris

No airflow obstructions to the engine or generator are present for cooling combustion (See Cummins T-030 or Installation manual of generator set)

Room is designed for adequate inlet and outlet airflow

GASEOUS FUEL Natural Gas/LP Vapor/LP Liquid

YES	NA	NO
☐	☐	☐
☐	☐	☐
☐	☐	☐
☐	☐	☐

Natural gas and/or LPG fuel supply is connected.

Fuel piping is the appropriate size based on full-load CFH/BTU requirement. Pipe size after service regulator: _____

Service regulator(s), (if supplied), fuel strainer(s), flexible fuel line(s) and manual shut off are installed

Fuel pressure after service regulator is:_____inches of H2O

I have read and fully understand the fuel requirements for this equipment, I am verifying that the piping and fuel supply meets or exceeds those requirements. I also understand failure to meet the requirements will result in additional charges.

_____ _____

Contractor "requestor" Signature ***Date***

Sales and Service

DIESEL FUELED GENERATORS

YES	NA	NO	
☐	☐	☐	Flexible fuel connections, (supply and return) are connected to generator and piping.
☐	☐	☐	Day tank installed, wired and plumbed (lines free of obstruction) to genset and main fuel tank if applicable. Only black iron pipe for fuel lines, never use copper or galvanized pipe.
☐	☐	☐	All tanks filled with enough fuel to perform startup and testing.
☐	☐	☐	A return line from engine to day tank and day tank to main tank should be in place

EXHAUST SYSTEM

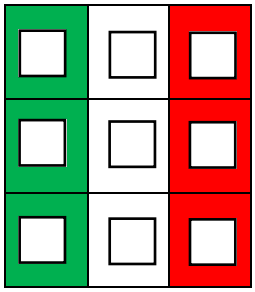
YES	NA	NO	
☐	☐	☐	Exhaust wrapped or isolated to prevent accidental activation of fire protection devices and sprinklers.
☐	☐	☐	Exhaust flex-pipe is installed at engine exhaust outlet (The silencer and flex-pipe are supplied with the generator set).
☐	☐	☐	Silencer is installed with appropriate supports (no weight should be placed on the exhaust outlet of the genset).
☐	☐	☐	Exhaust system has proper expansion joints and wall thimbles (Thimbles are required for wall or roof penetration).

GENERATOR ELECTRICAL CONNECTIONS

YES	NA	NO	
☐	☐	☐	Load conductors connected to breakers
☐	☐	☐	Flexible connections used on all conduit connections to the generator set output box
☐	☐	☐	Remote start interconnection **stranded** wiring is installed between the generator set and the automatic transfer switch(s) and annunciator.
☐	☐	☐	AC Power conductors in dedicated conduit separate from any DC control or network wiring
☐	☐	☐	Ground fault connected/functioning on generator, if supplied
☐	☐	☐	AC power wired to the coolant heaters (Do NOT energize)
☐	☐	☐	Check for AC oil pan heater, control heater or generator winding heater (Needing AC wiring)
☐	☐	☐	Generator is grounded in compliance with local codes
☐	☐	☐	If applicable, louver motors are operational and connected to generator controls

GENERATOR ELECTRICAL CONNECTIONS CONTINUED

YES NA NO



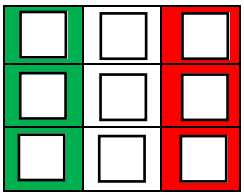
Annunciator mounted in a location where someone can observe a fault of the remote generator system
Where is annunciator located? _____

Are there additional ancillary devices/equipment that need to be integrated into the system? If yes, please define_____

Battery charger mounted (free of vibration, weather, accessible for an operator to observe easily) and connected to the appropriate AC and DC wiring to operate the charger.

TRANSFER SWITCH ELECTRICAL CONNECTIONS

YES NA NO



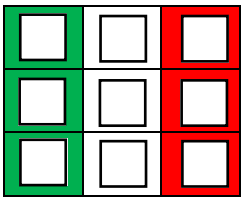
Conductors connected for Utility, Load and Emergency

Remote start interconnection **stranded** wiring is installed between the generator set and the automatic transfer switch(s).

Four Pole Transfer Switch: Is generator neutral grounded? ☐

DAY OF STARTUP

YES NA NO



Training of facility personnel will be done on the same day as start up. Additional trips for operational training will be an additional charge.

Can transfer switch be tested at time of generator startup? (There will be a power interruption) ***Note: After hours testing could result in additional charges.***

If the associated switchgear and/or ATS(s) are not provided by Cummins, will the manufacturer's representative be on site?

Exercise with or without load? ☐

If known, Transfer Time delay set recommendations Generator Set to exercise Day:_____ Time:_____

_____ _____

Contractor "requestor" Signature ***Printed Name***

Date: _____

Please complete this form and return to schedule start up, if not returned within 5 business days prior to scheduled startup it may be delayed. I understand that the start-up date may have to be rescheduled at my expense if the above items have not been completed properly.

Warranty Statement

Global Commercial Warranty Statement

Generator Set

English
Original Instructions

7-2017

A028U870 (Issue 5)

Our energy working for you.™

Power Generation

Limited Warranty

Commercial Generating Set

This limited warranty applies to all Cummins Power Generation® branded commercial generating 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 500 hours of operation per year. 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	24	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 Power Generation® Responsibilities:

In the event of a failure of the Product during the warranty period due to defects in material or workmanship, Cummins Power Generation® 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 Power Generation® distributor or dealer within 30 days of the discovery of failure.
- Installing, operating, commissioning and maintaining the Product in accordance with Cummins Power Generation®'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 Power Generation® 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 Power Generation®.
- 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 Power Generation® Distributor for clarification concerning these limitations.

CUMMINS POWER GENERATION® RIGHT TO FAILED COMPONENTS:

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

Extended Warranty:

Cummins Power Generation® offers several levels of Extended Warranty Coverage. Please contact your local Cummins Power Generation ® Distributor for details.
www.power.cummins.com

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

IN NO EVENT IS CUMMINS POWER GENERATION® LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

This limited warranty shall be enforced to the maximum extent permitted by applicable law. This limited warranty gives the owner specific rights that may vary from state to state or from jurisdiction to jurisdiction.

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