RECORD ONLY SUBMITTAL PACKAGE

CSDG - 4552- 4553

Prepared for:

Central States Diesel Generators
2001 S Prairie Ave
Waukesha, WI 53189

THIS SUBMITTAL IS BEING PREPARED FOR RECORD PURPOSES ONLY

3/18/2024 Rev 0

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

SECTION 1
PROJECT INFORMATION

Sales and Service

Bill of Material

Description	Qty
C2000D6E, Diesel Genset, 60Hz, 2000kW C2000D6E, Diesel Genset, 60Hz, 2000kW EPA, Tier 2, NSPS CI Stationary Emergency Emissions Certification Listing - UL 2200 Duty Rating - Standby Power (ESP) Low Voltage 277/480V 3 Phase, Wye, 4 Wire Ambient Temperature (40C/104F) Alternator - 60Hz, Wye, 480V, 125C Rise Control Mounting - Front Facing PowerCommand 3.3 Controller, Paralleling Capable Analog Meters - AC Output AmpSentryTM UL Listed Protective Relay Alarm - Audible, Engine Shutdown LCD Control Display Display, Running Time Signals - Aux, Input/Output Relays - User Configured Circuit Breaker or Entrance Box - Single Manual Circuit Breaker - Right Bottom Entry,Right Side Circuit Breaker - 3000A, 3P, 600/690V, UL/IEC, Right Indication-Ground Fault, Circuit Breaker Box - right Circuit Breaker Lugs - Mechanical, Right Side Battery Charging Alternator Water in Fuel (WIF) sensor Low fuel pressure sensor Shutdown - Low Coolant Level Warning - Low Coolant Level Temperature independent coolant heater (240 VAC) Engine Air Cleaner - Normal Duty Air cleaner restriction indicator (Electronic) Engine Oil Filters, Full Flow with Bypass Oil Sampling Valve Engine Starter - 24 Volt DC Motor Fuel Hoses Genset Warranty - 3 Year Base, 1000 hours Fuel Filters – Engine, Single	**2**
Battery Charger-10Amp, 120/208/240VAC, 12/24V, 50/60Hz	**2**
Vibration Isolators	**16**
Sound Attenuated Enclosure with UL142 subbase fuel tank (3375 gallons) and basic electrical package (distribution panel, receptacle and lighting)	**2**

SECTION 2
GENERATOR SPECIFICATIONS

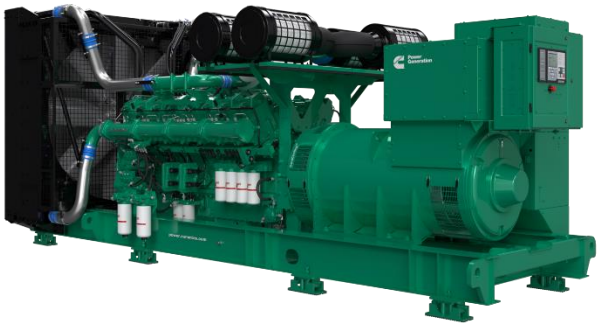
C1750D6E
C2000D6E

DIESEL GENERATOR SET SPECIFICATION SHEET

QSK50 ENGINE, 1750-2000 kWe, 60 Hz, EPA TIER 2 NSPS CERTIFIED (STATIONARY EMERGENCY)

DESCRIPTION

Cummins commercial generator sets are fully integrated power generation systems for stationary standby power and data center applications.
The Centum™ Series meets the demand for efficient and sustainable power with performance, flexibility, and commitment – for the next generation of power.



FEATURES

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

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

ISO 8528-5 G3 Capable: Consult factory for site and configuration specific transient performance information.

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

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

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

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

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

Cooling System: High ambient (40 °C) and enhanced high ambient (50 °C), integral set-mounted radiator systems, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

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 standard three-year warranty and worldwide distributor network.

MODELS

	Emergency Standby Power (ESP) Rating[1] kWe (kVA)	Prime Power (PRP) Rating[1,2] kWe (kVA)	Data Center Continuous (DCC) Rating[1,2] kWe (kVA)	Data Sheet
C1750D6E	1750 (2188)	1600 (2000)	1600 (2000)	NAD-6744
C2000D6E	2000 (2500)	1825 (2281)	1825 (2281)	NAD-6745

[1] All ratings include radiator fan losses.
[2] Prime rating and DCC at standby power rating available subject to Cummins' site-specific assessment; contact your Cummins distributor.

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Centum™ SERIES GENERATORS

GENERATOR SET SPECIFICATIONS

Performance class	Genset models have been tested in accordance with ISO 8528-5. Consult factory for transient performance information
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 1.0%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Electromagnetic compatibility performance	Emissions to EN 61000-6-2:2005 Immunity to EN 61000-6-4:2007+A1:2011 Complies with FCC PART 15 subpart B and ICES-002

ENGINE SPECIFICATIONS

Bore	159 mm (6.26 in.)
Stroke	159 mm (6.26 in.)
Displacement	49.8 liters (3039 in3)
Configuration	Four Cycle; Vee; 16 Cylinder
Battery capacity	1800 amps minimum at ambient temperature of -18 °C (0 °F)
Battery charging alternator	100A
Starting voltage	24 volts, negative ground
Fuel system	Cummins YZ Modular Common Rail System (MCRS)
Fuel filter	Two-stage, spin-on fuel filter and water separator system. Stage 1: remote mounted, 5 µm duplex filter with two priming pumps. Stage 2: engine mounted, 3 µm triple element filter
Air cleaner	Dry replaceable element
Lube oil filter	Four spin-on, combination full flow filter and bypass filters
Standard cooling system	High ambient cooling system

ALTERNATOR SPECIFICATIONS

Design	Brushless, 4-pole, drip proof, revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible disc
Insulation system	Class H
Standard temperature rise	125 ºC standby
Exciter type	Permanent Magnet Generator (PMG)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform total harmonic distortion (THDV)	< 5% no load to full linear load

AVAILABLE VOLTAGES (60 Hz LINE-TO-NEUTRAL / LINE-TO-LINE)[3]

277/480	254/440	220/380	2400/4160	347/600	7976/13800
7620/13200	3810/6600	3640/6300	3985/6900	6350/11000	7200/12470

[3] Additional voltages may be available; contact your Cummins distributor

GENERATOR SET OPTIONS AND ACCESSORIES[4]

Generator Set
- Oil sampling valve
- 10A battery charger
- Set mounted circuit breakers up to 3200 Amps
- Circuit breaker aux and trip contacts
- Anti-vibration mounts
- Battery temperature sensor
- IBC Certification
- HCAI Certification

Engine
- 240V thermo-statically controlled coolant heater
- 120/240V 500W lube oil heaters
- Heavy duty air cleaner
- Remote duplex fuel filter
- Engine oil filters - full flow with bypass
- Automatic oil make up system and monitoring
- Engine toolkit

Control Panel
- Masterless load demand
- Multiple language support
- 120/240V 100W control anti- condensation heater
- Exhaust pyrometer
- Ground fault indication
- Paralleling relay package
- Shutdown alarm relay package
- Mechanical hour meter
- 6x user-configurable relays
- 8 additional I/O relays

Alternator
- 80°C/105°C /125°C/150°C rise
- Stator winding temp sensor 2 RTDs/phase
- Bearing temp sensor RTDs
- 1-hole or 2-hole lug output terminal
- Cable entrance box set mounted top or bottom entry
- 120/240V 510W anti- condensation heater
- Generator Louvres

Exhaust System
- Industrial grade silencer
- Residential grade silencer
- Critical grade silencer

Cooling System
- Enhanced high ambient temperature (50 °C)
- Low coolant level warning
- Coolant heater

Data Center options
- Automatic oil make up system
- Closed crank ventilation system
- Oil sampling valve
- Propylene glycol coolant
- Customized testing

Miscellaneous
- Multilingual manuals
- 3-year extended warranty
- 5-year extended warranty
- 10-year extended warranty
- Witness testing
- Virtual witness test
- Tier 4 compliant aftertreatment kits shipped loose

[4] Some options may not be available on all models; contact your Cummins distributor.
Data Center options are available through RFQ with the Custom Applications Group and could result in additional lead-times. Please consult with the Custom Applications Group to understand feasibility

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Centum™
SERIES GENERATORS

PowerCommand® 3.3

CONTROL SYSTEM DESCRIPTION

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

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

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

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

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

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

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

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

Multi-Language Support

OPERATOR PANEL FEATURES

Operating/Display Functions

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

Paralleling Control Functions

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

Alternator Data

- Line-to-Neutral and Line-to-Line AC volts
- 3-phase AC current
- Frequency
- kW, kVAR, power factor kVA (three-phase and total)

Engine Data

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

OPERATOR PANEL FEATURES (CONT.)

Other Data

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

STANDARD CONTROL FEATURES

Digital Governing

- Integrated digital electronic isochronous governor
- Temperature dynamic governing

Digital Voltage Regulation

- Integrated digital electronic voltage regulator
- 3-phase, 4-wire Line-to-Line sensing
- Configurable torque matching

AmpSentry™ AC Protection

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

Engine Protection

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

Control Functions

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

Options

- Auxiliary output relays (2)

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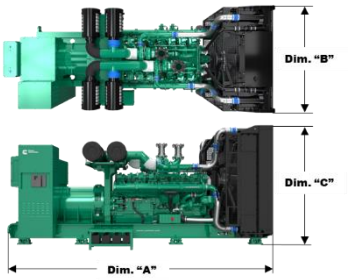
Centum™ SERIES GENERATORS

RATING DEFINITIONS

Emergency Standby Power (ESP)	Prime Power (PRP)	Data Center Continuous (DCC)
Applicable for supplying power to varying electrical loads for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550.	Prime Power for Stationary Emergency ratings apply to installations served by a reliable utility source. Applicable for supplying power to varying electrical loads for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046-1. Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550.	Applicable for supplying power continuously to a constant or varying electrical load for unlimited hours in a data center application. Designed to comply with Uptime Institute® Tier III and IV data center site requirements by being rated to run for unlimited hours of operation when loaded to 'N' demand for the engine generator set.

GENERATOR SET DIMENSIONS AND WEIGHTS[5]



Model Name	Dim. "A" mm (in)	Dim. "B" mm (in)	Dim. "C" mm (in)
C1750D6E C2000D6E	5708 (224.7)	2470 (97.2)	2441 (96.1)

See outline drawings for package weight & dimensions

Model Name	As Shipp	Weight b)
C1750D6E C2000D6E	14135 (31169)	14512 (32001)

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

CODES AND STANDARDS[6]

ISO 9001 ISO 14001 ISO 45001	This product was manufactured in a facility whose quality management system is certified to ISO 9001 and its Health Safety Environmental Management Systems certified to ISO 14001 and ISO 45001.	UL LISTED	UL Listing to UL 2200, "Stationary Engine Generator Assemblies" is available for this genset model. The PowerCommand® control is listed to UL 508 – Category NITW7 for U.S. and Canadian usage.
PTS	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.	UNITED STATES ENVIRONMENTAL PROTECTION AGENCY	Engine certified to Stationary Emergency U.S. EPA New Source Performance Standards (NSPS), 40 CFR 60 subpart IIII Tier 2 exhaust emission levels. U.S. applications must be applied per this EPA regulation.
CSA	All genset models are available as CSA certifiedto CSA C22.2 No. 100.	IBC INTERNATIONAL BUILDING CODE	The generator set package is available certified for seismic application in accordance with International Building Code.

[6] Codes or standards compliance may not be available with all model configurations; contact your Cummins distributor.

Bulletin NAS-6746 PD00001955 Produced in U.S.A. (Rev. 06/24)

Centum SERIES GENERATORS

C2000D6E

DIESEL GENERATOR SET DATA SHEET

MODEL: C2000D6E
FREQUENCY: 60 Hz
FUEL TYPE: DIESEL
RATING: 2000 kWe (2500 kVA) EMERGENCY STANDBY POWER (ESP)[1]
1825 kWe (2281 kVA) DATA CENTER CONTINUOUS (DCC)[1,2]
EMISSIONS CERTIFICATION: EPA NSPS STATIONARY EMERGENCY TIER 2

GENERATOR SET PUBLICATIONS

Exhaust emission data sheet	EDS-3135 / EDS-3136
Exhaust emission compliance statement	EPA-2100 / EPA-2101
Sound data sheet	MSP-4178
Cooling system data sheet	MCP-2257 / MCP-2258
Seismic certificate of compliance	VMA-53914-01C (Revision 1)
Prototype test support data sheet	PTS-785 / PTS-803
Genset outline drawing	A060C089
Genset wiring schematic diagram	A073F079

ENGINE SPECIFICATIONS

		Emergency Standby Power (ESP)	Data Center Continuous (DCC)
Manufacturer		Cummins Inc.	
Model		QSK50 - G24 / G25	
Configuration		Four Cycle; Vee; 16 Cylinder	
Aspiration		Turbocharged and Charge Air Cooled	
Gross engine power output	kWm (bhp)	2204 (2956)	1975 (2648)
Brake mean effective pressure at set rated load	kPa (psi)	2951 (428)	2641 (383)
Bore	mm (in)	159 (6.26)	
Stroke	mm (in)	159 (6.26)	
Displacement	L (in^3)	49.8 (3039)	
Rated speed	rpm	1800	
Piston speed at rated speed	m/s (ft/min)	19.1 (3756)	
Compression ratio		14.2:1	
Lube oil capacity	L (US gal)	121 (32.0)	
Overspeed limit	rpm	2070	
Regenerative power	kWm (hp)	166 (223)	

FUEL CONSUMPTION

Rating	kWe (kVA)	2000 (2500)				1825 (2281)			
Load		25%	50%	75%	100%	25%	50%	75%	100%
Fuel Consumption	US gph	41.5	75	108	139.8	38	68	97	128.0
Fuel Consumption	L/h	157.0	283.9	408.8	529.1	143.8	257.4	367.1	484.5

[1] Generator set ratings include radiator fan losses
[2] DCC at standby power available subject to Cummins' site-specific assessment; contact your Cummins distributor

Centum™ SERIES GENERATORS

FUEL SYSTEM

		Emergency Standby Power (ESP)	Data Center Continuous (DCC)
Maximum fuel flow	L/h (US gph)	958 (253)	
Maximum fuel inlet restriction	kPa (inHg)	40 (11.8)	
Maximum fuel inlet temperature	°C (°F)	70 (158)	
Maximum fuel return temperature	°C (°F)	129 (264)	

AIR SYSTEM

Combustion air flow (at set rated load)	m^3/min (scfm)	159.7 (5639)	156.3 (5521)
Maximum air cleaner restriction (dirty filter)	kPa (inH2O)	3.7 (15)	
Alternator cooling air flow	m^3/min (scfm)	222 (7850)	

EXHAUST SYSTEM

Exhaust flow (at set rated load)	m^3/min (cfm)	436 (15388)	415 (14654)
Exhaust temperature (at set rated load)	°C (°F)	535 (996)	512 (954)
Maximum back pressure	kPa (inH_2O)	6.7 (26.9)	

COOLING SYSTEM (SET MOUNTED) – HIGH AMBIENT

Engine model		QSK50 - G24	
Ambient design (limiting ambient temp.)	°C (°F)	40 (104)	
Fan load	kWm (hp)	89.5 (120)	
Coolant capacity (engine + radiator)	L (US gal)	140 (37)	
Cooling system air flow (at max. restriction)	m^3/min (acfm)	2073 (73210)	
Total heat rejection to radiator	MJ/min (Btu/min)	88 (83282)	80 (76207)
Total heat radiated to room	MJ/min (Btu/min)	7.0 (6675)	5.5 (5237)
Nominal air flow static restriction	kPa (inH_2O)	0.12 (0.5)	
Maximum fuel return line restriction	kPa (in Hg)	34.9 (10.3)	

COOLING SYSTEM (SET MOUNTED) – ENHANCED HIGH AMBIENT

Engine model		QSK50 - G25	
Ambient design (limiting ambient temp.)	°C (°F)	50.0 (122)	
Fan load	kWm (hp)	105.9 (142)	
Coolant capacity (engine + radiator)	L (US gal)	140 (37)	
Cooling system air flow (at max. restriction)	m^3/min (acfm)	2421 (85483)	
Total heat rejection to radiator	MJ/min (Btu/min)	88 (83282)	80 (76207)
Total heat radiated to room	MJ/min (Btu/min)	7.6 (7192)	6.4 (6026)
Nominal air flow static restriction	kPa (inH_2O)	0.12 (0.5)	
Maximum fuel return line restriction	kPa (in Hg)	34.9 (10.3)	

GENERATOR SET WEIGHTS[3]

		As Ship	et)
C2000D6E	kg (lb)		01)

See outline drawings for package weight & dimensions

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

Centum SERIES GENERATORS

GENERATOR SET DERATING FACTORS[4]

Emergency Standby Power (ESP)	**High Ambient Cooling System:** Full engine power available up to 400 m (1312 ft) at ambient temperature up to 40°C (104°F). From 400 m (1312 ft) to 2000 m (6562 ft) derates at 3% per 305 m (1000 ft). For temperature above 40°C engine derates at 10% per 10°C (18°F). **Enhanced High Ambient Cooling System:** Full engine power available at Sea level at ambient temperature up to 50°C (122°F). From 0 m (0 ft) to 2000 m (6562 ft) derates at 3.3% per 305 m (1000 ft). For temperature above 50°C engine derates at 3% per 10°C (18°F).
Data Center Continuous (DCC)	**High Ambient Cooling System:** Full engine power available up to 400 m (1312 ft) at ambient temperature up to 40°C (104°F). From 400 m (1312 ft) to 2000 m (6562 ft) derates at 2.8% per 305 m (1000 ft). For temperature above 40°C engine derates at 9.2% per 10°C (18°F). **Enhanced High Ambient Cooling System:** Full engine power available at Sea level at ambient temperature up to 50°C (122°F). From 0 m (0 ft) to 2000 m (6562 ft) derates at 3.1% per 305 m (1000 ft). For temperature above 50°C engine derates at 2.6% per 10°C (18°F).

[4] Note: Ambient operating temperature is defined as the air temperature measured at the room (or enclosure) inlet, assuming a temperature rise of 3 °C to the turbocharger compressor inlet.

RATING DEFINITIONS

Emergency Standby Power (ESP)	Data Center Continuous (DCC)
Applicable for supplying power to varying electrical loads for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Data shown above represents gross engine performance and capabilities as per ISO 3046-1, obtained and corrected in accordance with ISO 15550.	Applicable for supplying power continuously to a constant or varying electrical load for unlimited hours in a data center application. Designed to comply with Tier III and IV data center site requirements by being rated to run for unlimited hours of operation when loaded to 'N' demand for the engine generator set.

FORMULAS

Calculating Power Factor	Calculating Full Load Current (Three Phase AC Output)	Calculating Full Load Current (Single Phase AC Output)
$\cos\theta = \frac{Active\ (True, Real)\ Power}{Apparent\ Power} = \frac{P_{(kW)}}{\lvert S\rvert_{(kVA)}}$ Power Factor = 0.8 (industry standard)	$I = \frac{\lvert S\rvert_{(kVA)}}{\sqrt{3} \times V} = \frac{1000 \times P_{(kW)}}{\sqrt{3} \times V \times \cos\theta}$	$I = \frac{\lvert S\rvert_{(kVA)}}{V} = \frac{1000 \times P_{(kW)}}{V \times \cos\theta}$

Bulletin NAD-6745 PD00001954 Produced in U.S.A. (Rev. 06/24)

Centum™ SERIES GENERATORS

Specification Sheet

PowerCommand® 3.3 Generator Set Digital Integrated Control System

Bargraph Optional

Introduction

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

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

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

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

Benefits and Features

- 320 x 240 pixels graphical LED backlit LCD
- Multiple languages supported
- AmpSentry™ protection provides industry-leading generator overcurrent protection
- Digital Power Transfer Control (Automatic Mains Failure) provides load transfer operation in open transition, closed transition, or soft (ramping) transfer modes
- Extended Paralleling (Peak Shave/Base Load) regulates the genset real and reactive power output while paralleled to the utility. Power can be regulated at either the genset or utility bus monitoring point
- Digital frequency synchronization and voltage matching
- Isochronous Load Sharing
- Droop kW and kVAr control
- Real time clock for fault and event time stamping
- Exerciser clock and time of day start/stop initiate a test with or without load, or a Base Load or Peak Shave session
- Digital automatic voltage regulation is provided using three phase sensing and full wave FET type regulator, which is compatible with either shunt or PMG excited systems with a standard AUX103 AVR or an option for a more powerful high-current field drive capability AUX106 AVR
- Digital engine speed governing is provided on applicable platforms
- Generator set monitoring (including metering) and protection with PCC3300 measuring voltage, current, kW and kVAr offering a measurement accuracy of 1%
- Utility / AC Bus metering and protection with PCC3300 voltage, current, kW and kVAr offering a measurement accuracy of 1%
- 12 V (DC) and 24 V (DC) battery operation
- RS-485 Modbus® interface for interconnecting to customer equipment
- Warranty and service – Cummins Power Generation offers a comprehensive warranty and worldwide distributor service network
- Global regulatory certification and compliance: PCC3300 is suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., UKCA, and CE standards

PowerCommand® Generator Set Digital Control System PCC 3300

Introduction

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

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

Features

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

Base Control Functions

HMI capability

Options: Local and remote HMI320 options are available

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

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

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

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

Alternator data

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

For Lean Burn Natural Gas Engine applications:

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

Utility/AC bus data

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

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

Engine data

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

Lean Burn Natural Gas (LBNG) application parameters include:

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

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

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

Prime Mover Control

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

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

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

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

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

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

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

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

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

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

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

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

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

Lean Burn Natural Gas application specific parameters

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

Generator Control

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

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

Major features of generator control include:

Digital output voltage regulation - Capable of regulating output voltage to within +/-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.

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

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

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

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

Paralleling Functions

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

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

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

Load govern control– When PowerCommand® receives a signal indicating that the genset is paralleled with an infinite source such as a utility (mains) service, the genset will operate in load govern mode. In this mode the genset will synchronize and close to the bus, ramp to a pre-programmed kW and kVar load level, and then operate at that point. Control is adjustable for kW values from 0-100% of standby rating, and 0.7-1.0 power factor (lagging). Default setting is 80% of standby and 1.0 power factor. The control includes inputs to allow independent control of kW and kVar load level by a remote device while in the load govern mode. The rate of load increase and decrease is also adjustable in the control. In addition, the control can be configured for operation in kW or kVAR load govern droop.

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

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

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

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

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

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

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

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

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

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

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

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

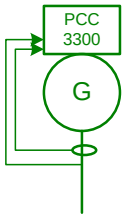
Breaker control – Utility and Genset breaker interfaces include separate relays for opening and closing breaker, as well as inputs for both 'a' and 'b' breaker position contacts and tripped status. Breaker diagnostics include Contact Failure, Fail to Close, Fail to Open, Fail to Disconnect, and Tripped.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

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

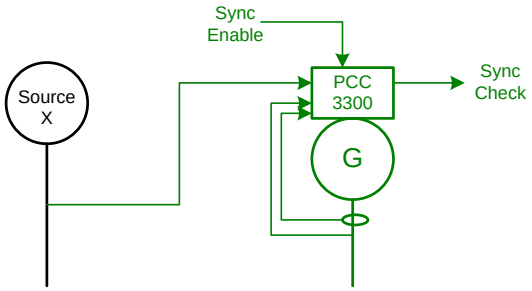
Extended paralleling – In extended paralleling mode (when enabled) the controller will start the genset and parallel to a utility source and then govern the real and reactive power output of the genset based on the desired control point. The control point for the real power (kW) can be configured for either the genset metering point ("Base Load") or the utility metering point ("Peak Shave"). The control point for the reactive power (kVAR or Power Factor) can also be independently configured for either the genset metering point or the utility metering point. This flexibility would allow base kW load from the genset while maintaining the utility power factor at a reasonable value to avoid penalties due to low power factor. The System always operates within genset ratings. The control point can be changed while the system is in operation. Set points can be adjusted via hardwired analog input or adjusted through an operator panel display or service tool.

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

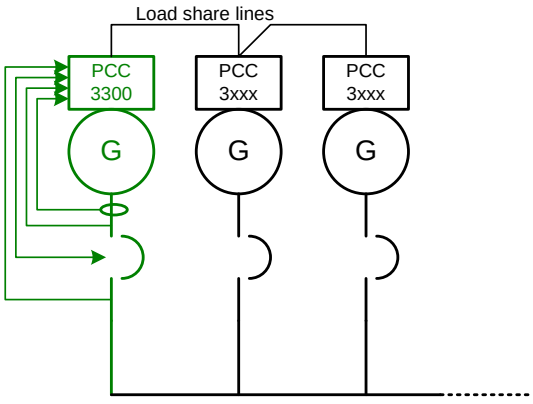
Standalone: Control provides monitoring, protection and control in a non-paralleling application.



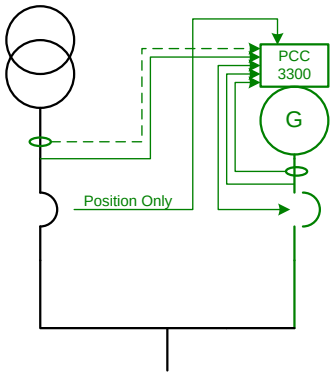
Synchronizer only: control will synchronize the genset to other source when commanded to either via a hardwired or Modbus driven input.



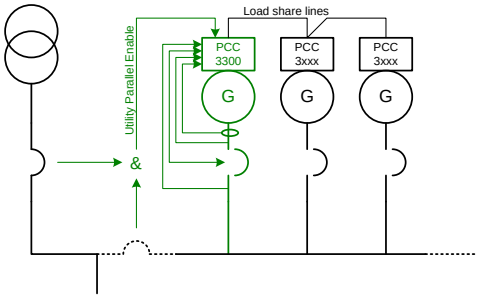
Isolated Bus: allows the genset to perform a dead bus closure or synchronize to the bus and isochronously share kW and kVAR loads with other gensets.



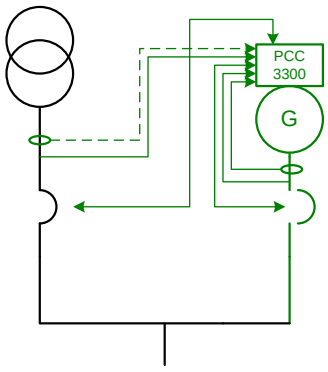
Utility Single: Control monitors one genset and utility. The control will automatically start and provide power to a load if the utility fails. The control will also resynchronize the genset back to the utility and provides extended paralleling capabilities.



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

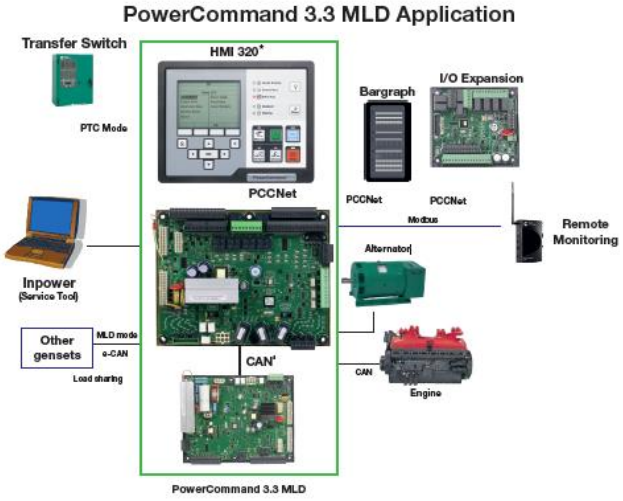


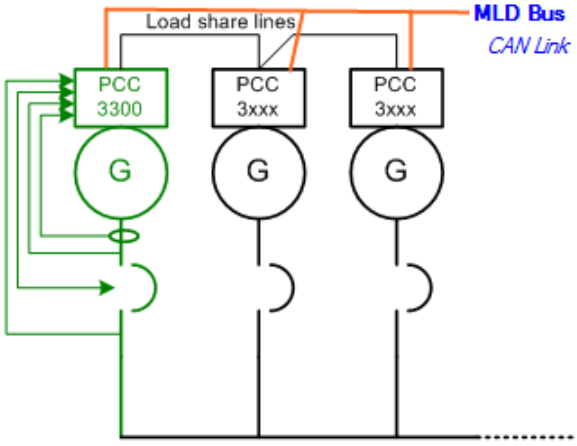
Power Transfer Control: Control operates a single genset/single utility transfer pair in open transition, fast closed transition, or soft closed transition. Extended paralleling functionality also provides base load and peak shave options.



~~Masterless Load Demand (Optional Feature)~~:

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





PCC3300 External Voltage and Frequency Biasing Inputs

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

Protective Functions

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

Battle short mode

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

Derate

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

Configurable alarm and status inputs

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

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

Emergency stop

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

General prime mover protection

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

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

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

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

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

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

For Lean Burn Natural Gas Engine applications:

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

Hydro Mechanical fuel system engine protection:

Overspeed shutdown – Default setting is 115% of nominal

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

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

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

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

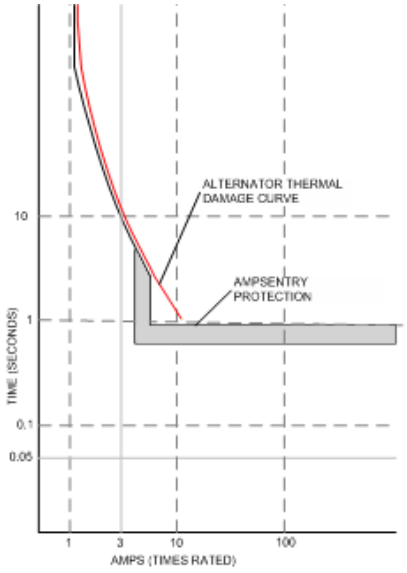
High intake manifold temperature shutdown – Level is preset (configurable with InPower or HMI) to match the capabilities of the engine used. Control includes time delays to prevent nuisance alarms.

Full authority electronic engine protection:

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

Alternator Protection

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



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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Paralleling Protection

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

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

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

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

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

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

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

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

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

Field Control Interface

Input signals to the PowerCommand® control include:

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

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

Input signals for Lean Burn Natural Gas Engine applications:

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

Output signals from the PowerCommand® control include:

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

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

Output Signals for Lean Burn Natural Gas Engine applications:

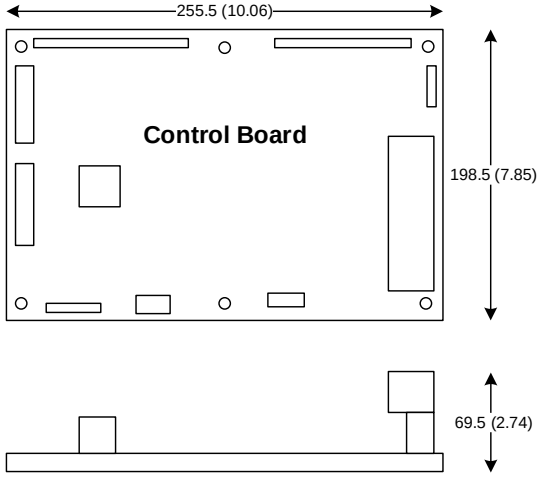
- Start inhibit/enable event
- Emergency stop event
- Ventilator fan run control
- Louvre control
- Radiator fan control
- Alternator heater control
- Engine at idle speed event

Communications connections include:

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

  Note - An RS-232 or USB to RS-485 converter is required for communication between PC and control.
- Networking: This RS-485 communication port allows connection from the control to the other Cummins Power Generation products.

Mechanical Drawing



PowerCommand® Human Machine Interface HMI320

Description

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

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

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

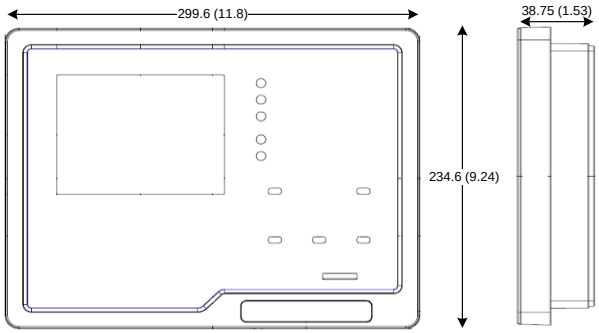
Features:

- LED indicating lamps
  - genset running
  - remote start
  - not in auto
  - shutdown
  - warning
  - auto
  - manual and stop
  - Circuit breaker open (if equipped)
  - Circuit breaker closed (if equipped)
- 320 x 240 pixels graphic LED backlight LCD.
- Four tactile feel membrane switches for LCD defined operation. The functions of these switches are defined dynamically on the LCD.
- Seven tactile feel membrane switches dedicated screen navigation buttons for up, down, left, right, ok, home and cancel.
- Six tactile feel membrane switches dedicated to control for auto, stop, manual, manual start, fault reset and lamp test/panel lamps.
- Two tactile feel membrane switches dedicated to control of circuit breaker (where applicable).
- Allows for complete genset control setup.
- Certifications: Suitable for use on gensets that are designed, manufactured, tested and certified to relevant UL, NFPA, ISO, IEC, Mil Std., UKCA and CE standards.
- Languages supported: English, Spanish, French, German, Italian, Greek, Portuguese, Finnish, Norwegian, Danish, Russian (Cyrillic), Chinese, Hungarian, Japanese, Polish, Korean, Romanian, Brazilian Portuguese, Turkish, Dutch, and Czech

Communications connections include:

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

Mechanical Drawing



HMI

Dimensions: mm (inches)

Software

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

Environment

The control is designed for proper operation without recalibration in ambient temperatures from -40 ºC (-40 ºF) to +70º C (158 ºF), and for storage from -55 ºC (-67 ºF) to +80 ºC (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 (-4 ºF) to +70 ºC (158 ºF), and for storage from -30 ºC (-22 ºF) to +80 ºC (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 genset. The control includes transient voltage surge suppression to provide compliance to referenced standards.

Certifications

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

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

Reference Documents

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

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

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

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

Warranty

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

PCCNet COMPATIBLE

Alternator Data Sheet
Frame Size: S7L1D-G4

Characteristics

	No of Bearings:	**1-bearing**		**2-bearing**	
Weights:	Stator assembly:	3803 lb	1725 kg	3803 lb	1725 kg
	Rotor assembly:	3280 lb	1488 kg	3186 lb	1445 kg
	Complete assembly:	8018 lb	3637 kg	7945 lb	3604 kg
Maximum speed:		2250 rpm			
Excitation current:	Full load:	Wdg 07: 2.8, Wdg 13: 2.8, Wdg 312: 2.9			
	No load:	Wdg 07: 0.67, Wdg 13: 0.75, Wdg 312: 0.67-0.62			
Insulation system:	Class H throughout				

3 Ø Ratings (0.8 power factor)			**60 Hz** (winding no)			
			600 (07)	380 (13)	440 (312)	480 (312)
163° C rise ratings	@ 27° C	kW	2230	2145	2140	2230
		kVA	2787	2681	2675	2787
150° C rise ratings	@ 40° C	kW	2165	2085	2080	2165
		kVA	2706	2606	2600	2706
125° C rise ratings	@ 40° C	kW	2600	2005	2000	2080
		kVA	2080	2506	2500	2600
105° C rise ratings	@ 40° C	kW	1940	1865	1860	1940
		kVA	2425	2331	2325	2425
80° C rise ratings	@ 40° C	kW	1795	1725	1720	1795
		kVA	2244	2156	2150	2244

3 Ø Reactances (Based on full load at 125° C rise rating)	600 (07)	380 (13)	440 (312)	480 (312)
Synchronous	2.82	2.42	2.84	2.48
Transient	0.19	0.19	0.2	0.18
Subtransient	0.14	0.12	0.14	0.12
Negative sequence	0.16	0.17	0.18	0.15
Zero sequence	0.03	0.04	0.04	0.03

3 Ø Motor starting	600 (07)	380 (13)	440 (312)	480 (312)
Maximum kVA (90% sustained voltage)	8361	8043	8361	8361

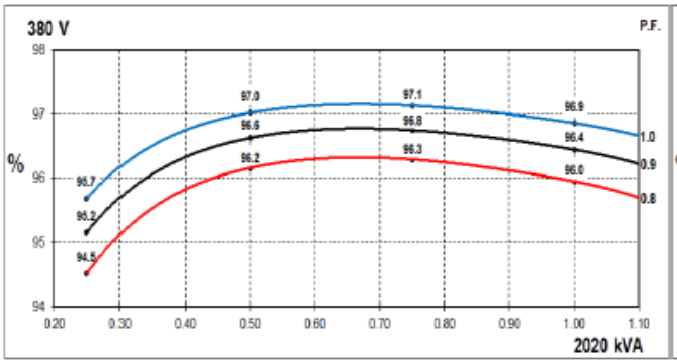
Time constants (sec)	600 (07)	380 (13)	440 (312)	480 (312)
Transient	0.185	0.156	0.150	0.150
Subtransient	0.016	0.015	0.015	0.015
Open circuit	4.29	4.63	4.49	4.49
DC	0.032	0.034	0.0284	0.0284

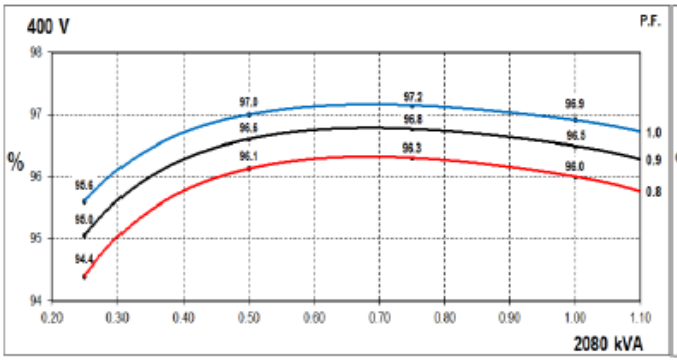
Windings (@22° C)		600 (07)	380 (13)	440 (312)	480 (312)
Stator resistance	(L-L Ohms)	0.0026	0.0010	0.0014	0.0014
Rotor resistance	(Ohms)	2.150	2.150	2.150	2.150
Number of leads		6	6	6	6

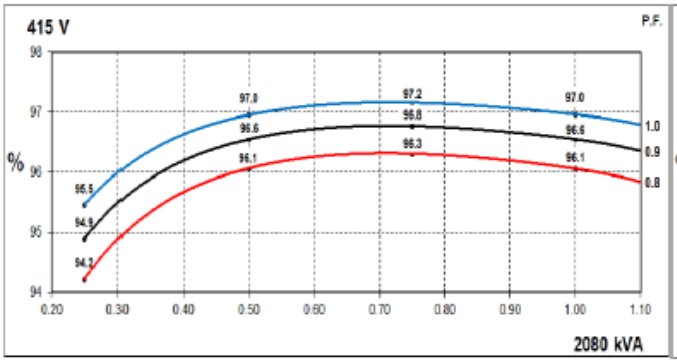
S7L1D-G4 Wdg.312

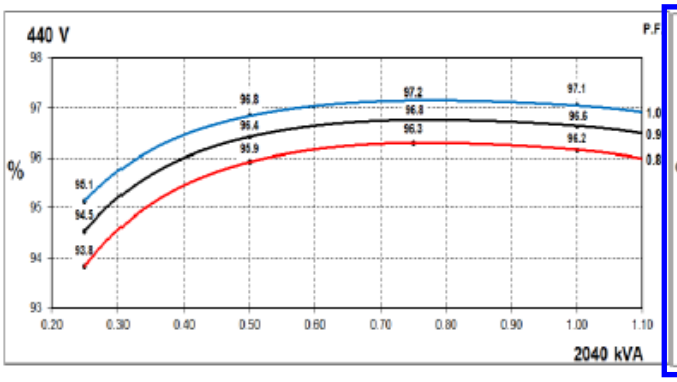
THREE PHASE EFFICIENCY CURVES

50Hz

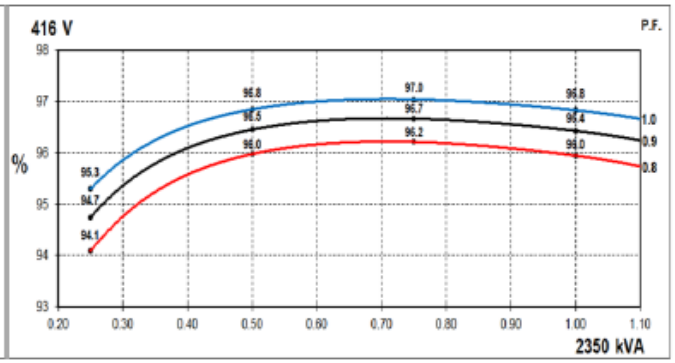


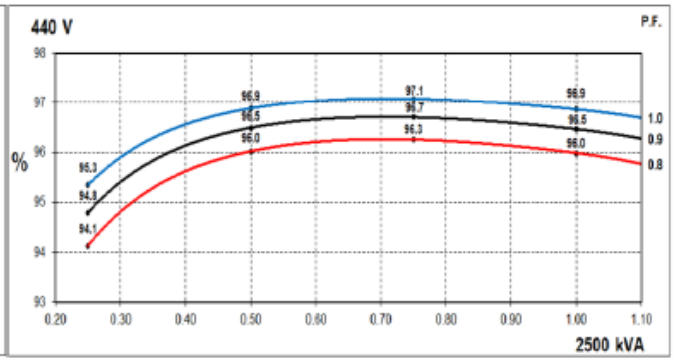


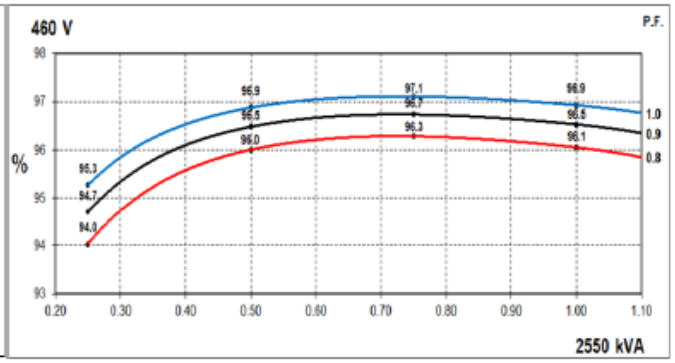


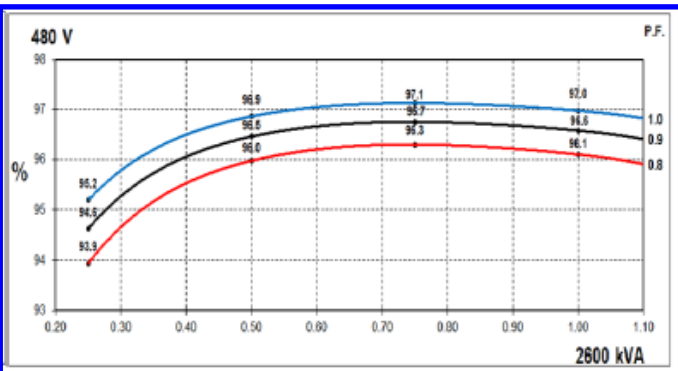


60Hz





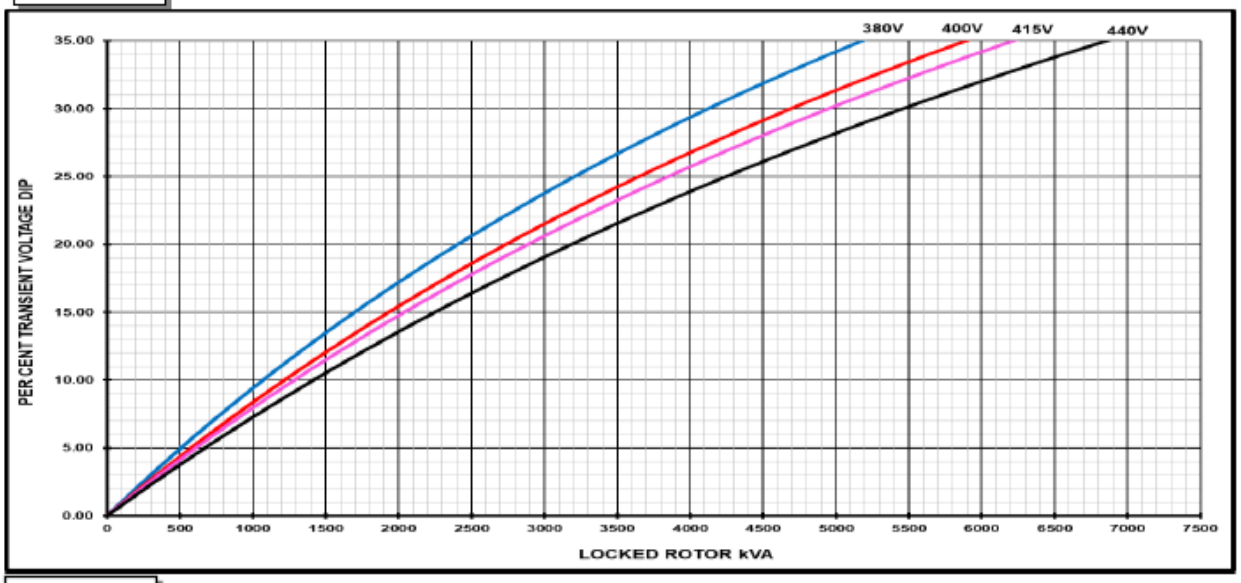




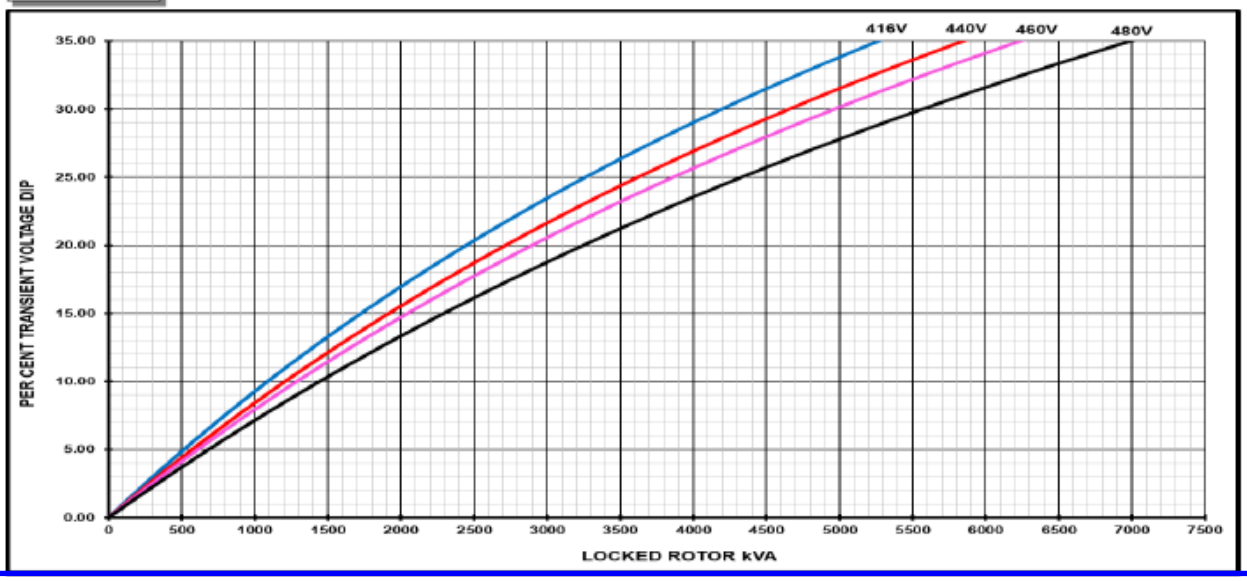
S7L1D-G4 Wdg.312

Locked Rotor Motor Starting Curves - Separately Excited

50Hz



60Hz



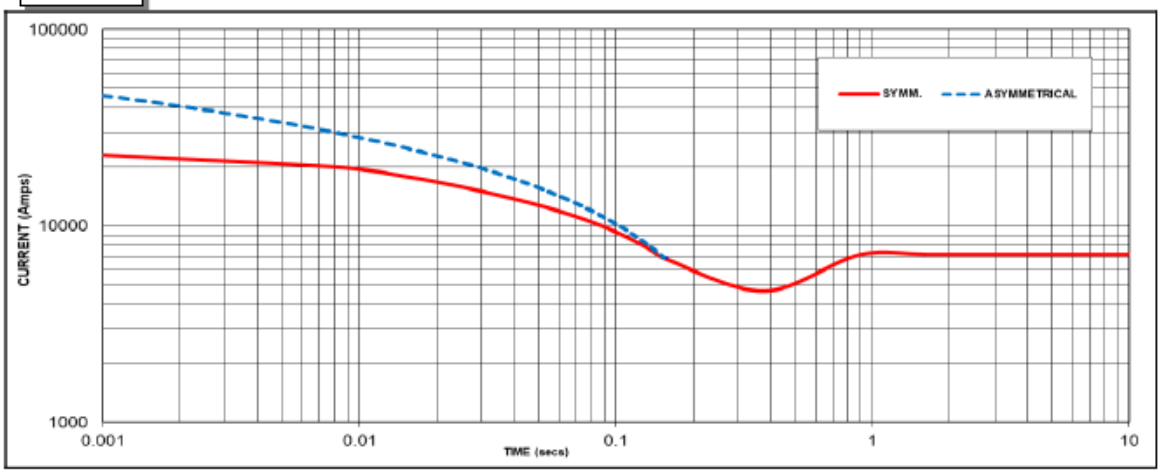
Transient Voltage Dip Scaling Factor	
PF	Factor
< 0.5	1
0.5	0.97
0.6	0.93
0.7	0.9
0.8	0.85
0.9	0.83

Transient Voltage Rise Scaling Factor
For voltage rise multiply voltage dip by 1.25

S7L1D-G4 Wdg.312

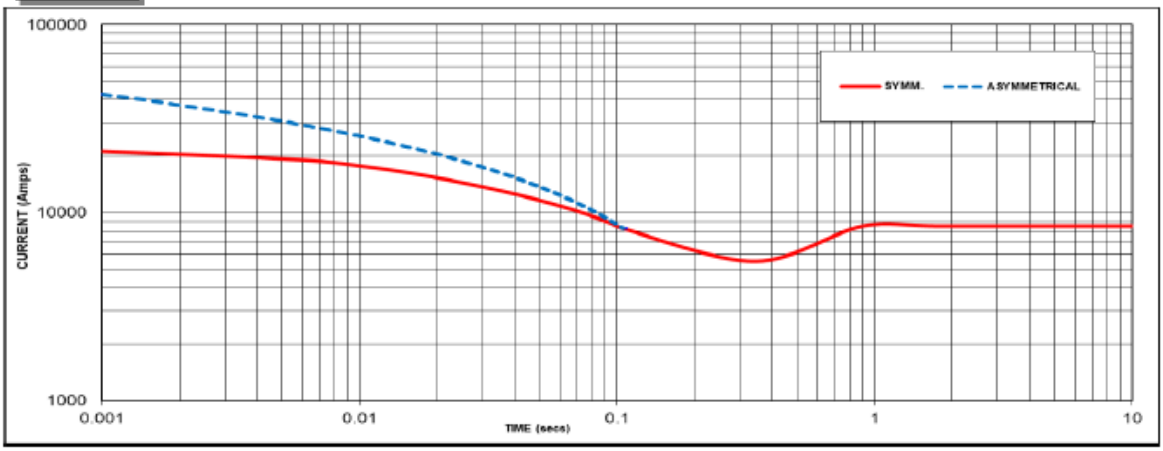
Three-phase Short Circuit Decrement Curve - Separately Excited

50Hz



Sustained Short Circuit = 7182 Amps

60Hz



Sustained Short Circuit = 8495 Amps

Note 1
The following multiplication factors should be used to adjust the values from curve between time 0.001 seconds and the minimum current point in respect of nominal operating voltage :

50Hz		60Hz	
Voltage	Factor	Voltage	Factor
380V	X 1.00	416V	X 1.00
400V	X 1.05	440V	X 1.06
415V	X 1.09	460V	X 1.10
440V	X 1.16	480V	X 1.15

The sustained current value is constant irrespective of voltage level

Note 2
The sustained current values are for MX341 AVR. For MX322 and Digital AVR 1.2 factor to be applied to the sustained short circuit

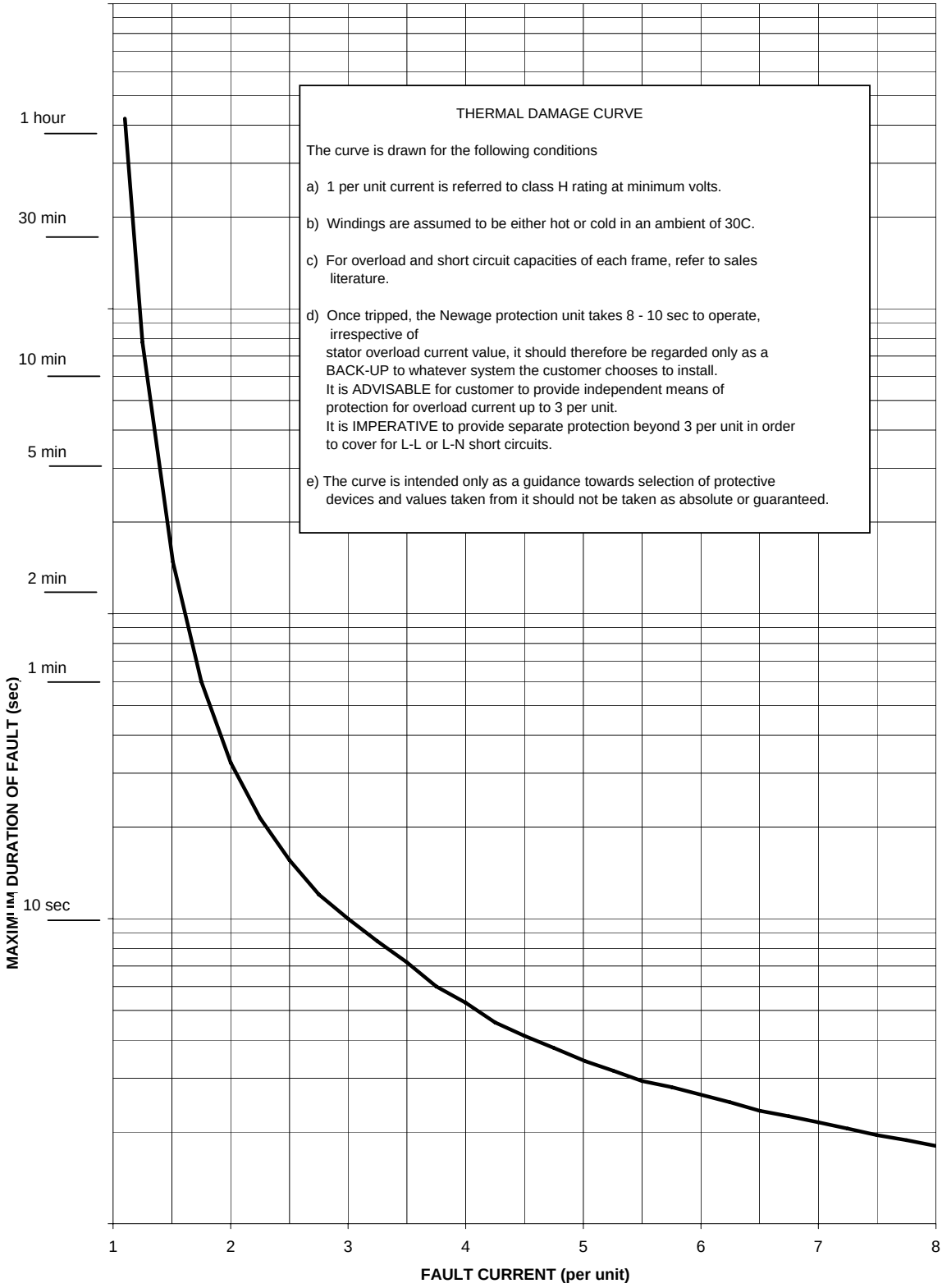
Note 3
The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

	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 4
Curves are drawn for Star connected machines under no-load excitation at rated speeds. For other connection (where applicable) the following multipliers should be applied to current values as shown :
Parallel Star = Curve current value X 2
Series Delta = Curve current value X 1.732

THERMAL DAMAGE CURVE



Data before enclosure/muffler sound attenuation

Sound Data
C2000D6E
QSK50-G24 60Hz Diesel

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

See notes 2, 5 and 7-11 listed below

Configuration	Exhaust	Applied Load	Position (Note 2)								8 Position Average
			1	2	3	4	5	6	7	8	
Standard – Unhoused (40°C Cooling Package)	Infinite Exhaust	0% Standby	89.3	93.4	93.4	95.6	92.9	94.7	94.9	96.2	94.2
		50% Standby	92.5	104.2	100.2	102.6	95.1	97.1	97.1	97.3	99.7
		75% Standby	93.1	104.0	101.3	104.0	95.9	97.2	97.2	97.5	100.3
		100% Standby	92.8	103.3	101.1	104.1	96.6	97.5	97.5	97.6	100.2
		100% Prime	92.9	104.1	101.1	104.1	96.8	97.5	97.5	97.6	100.4

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

See notes 1, 5 and 7-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Pressure Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused (40°C Cooling Package)	Infinite Exhaust	0% Standby	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		50% Standby	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		75% Standby	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		100% Standby	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		100% Prime	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

See notes 1, 5 and 7-15 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Pressure Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused (40°C Cooling Package)	Infinite Exhaust	0% Standby	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		50% Standby	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		75% Standby	N/A	49.0	64.7	83.1	89.5	99.1	94.9	90.6	88.1	93.4	80.2	102.1
		100% Standby	N/A	49.1	65.4	83.4	89.6	98.7	94.8	91.0	89.3	91.5	81.2	101.8
		100% Prime	N/A	49.1	65.3	83.3	89.8	98.7	94.9	91.3	89.8	90.6	81.5	101.8

Sound Data
C2000D6E
KTA50-G24 60Hz Diesel

A-weighted Sound Power Level, dB(A)

See notes 1, 3 and 6-14 listed below

Configuration	Exhaust	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Power Level
			16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard – Unhoused (40°C Cooling Package)	Infinite Exhaust	0% Standby	N/A	71.1	84.7	104.3	111.8	117.4	117.2	114.3	110.6	104.2	93.5	122.2
		50% Standby	N/A	73.8	85.8	105.3	112.4	117.5	117.7	115.9	116.5	123.8	115.3	126.9
		75% Standby	N/A	73.5	86.0	105.5	112.4	117.5	117.8	116.7	119.2	125.5	116.9	128.3
		100% Standby	N/A	72.8	86.4	106.0	112.5	117.7	118.4	117.8	121.2	123.3	118.0	127.9
		100% Prime	N/A	73.1	86.3	105.4	112.3	117.6	118.2	117.4	120.7	124.1	117.9	128.0

Exhaust Sound Power Level, dB(A)

See notes 4 and 6-14 listed below

Configuration	Applied Load	Octave Band Center Frequency (Hz)											Overall Sound Power Level
		16	31.5	63	125	250	500	1000	2000	4000	8000	16000	
Standard - Unhoused (With Tailpipe)	0% Standby	N/A	70.9	87.8	103.3	111.4	108.7	108.8	111.3	109.4	98.6	84.2	117.3
	50% Standby	N/A	78.3	100.4	114.3	119.2	119.3	122.5	127.2	124.8	118.0	106.6	131.0
	75% Standby	N/A	77.8	102.8	116.7	122.5	126.0	129.4	131.9	130.8	125.1	114.5	136.7
	100% Standby	N/A	78.2	103.6	118.5	124.1	127.0	131.0	134.4	134.3	129.1	117.4	139.2
	100% Prime	N/A	77.3	103.3	118.1	123.7	126.8	130.6	133.9	133.6	128.2	116.6	138.7

Global Notes:

1. Sound pressure levels at 1 meter are measured per the requirements of ISO 3744, ISO 8528-10, and European Communities Directive 2000/14/EC as applicable. The microphone measurement locations are 1 meter from a reference parallelepiped just enclosing the generator set (enclosed or unenclosed).
2. Seven-meter measurement location 1 is 7 meters (23 feet) from the generator (alternator) end of the generator set, and the locations proceed counter-clockwise around the generator set at 45° angles at a height of 1.2 meters (48 inches) above the ground surface.
3. Sound Power Levels are calculated according to ISO 3744, ISO 8528-10, and or CE (European Union) requirements.
4. Exhaust Sound Levels are measured and calculated per ISO 6798, Annex A.
5. Reference Sound Pressure Level is 20 µPa.
6. Reference Sound Power Level is 1 pW (10^{-12} Watt).
7. Fan noise is not included for the configuration with remote cooling system. Fan noise is included for the configurations with a specific cooling system.
8. Sound data for the generator set with infinite exhaust do not include the exhaust noise contribution.
9. Published sound levels are measured at CE certified test site and are subject to instrumentation, measurement, installation and manufacturing variability.
10. Unhoused/Open configuration generator sets refers to generator sets with no sound enclosures of any kind.
11. Housed/Enclosed/Closed/Canopy configuration generator sets refer to generator sets that have noise reduction sound enclosures installed over the generator set and usually integrally attached to the skid base/base frame/fuel container base of the generator set.
12. Published sound levels meet the requirements India's Central Pollution Control Board (Ministry of Environment & Forests),vide GSR 371 (E), which states the A-weighted sound level at 1 meter from any diesel generator set up to a power output rating of 1000kVA shall not exceed 75dB(A)
13. For updated noise pollution information for India see website: http://www.envfor.nic.in/legis/legis.html
14. Sound levels must meet India's Ambient Air Noise Quality Standards detailed for Daytime/Night-time operation in Noise Pollution (Regulation and Control) Rules, 2000
15. Operator Location is near genset control panel and is at 1 meter distance from genset control panel and at 1.6 height.

Cooling System Data
C2000D6E
QSK50-G24

High Ambient Air Temperature Radiator Cooling System									
				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	Enclosed
	Fuel Type	Duty	Rating (kW)	Maximum allowable ambient temperature, degree C					
60 Hz	Diesel	Standby	2000	47.6	45.0	41.5	38.6	35.4	N/A
		Prime	1825	N/A	N/A	N/A	N/A	N/A	N/A
		DCC	1825	N/A	N/A	N/A	N/A	N/A	N/A
				Airflow (m^3/s) – Actual @ Fan					
				36.3	35.4	34.6	33.4	32.4	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.

2024 EPA Tier 2 Exhaust Emission Compliance Statement C2000D6E Stationary Emergency

60 Hz Diesel Generator Set

Compliance Information:

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

Engine Manufacturer:	Cummins Inc.
EPA Certificate Number:	RCEXL050.AAD-016
Effective Date:	09/05/2023
Date Issued:	09/05/2023
EPA Engine Family (Cummins Emissions Family):	RCEXL050.AAD

Engine Information:

Model:	QSK50-G24	Bore:	6.26 in. (159 mm)
Engine Nameplate HP:	2956	Stroke:	6.26 in. (159 mm)
Type:	4 cycle, Vee, 16 Cylinder Diesel	Displacement:	3039 cu. in. (50 liters)
Aspiration:	Turbocharged and Charge Air Cooled	Compression Ratio:	14.2:1
Emission Control Device:	Turbocharged and Charge Air Cooled		

Diesel Fuel Emissions Limits

D2 Cycle Exhaust Emissions

	Grams per BHP-hr			Grams per kW_m-hr		
	NO_X + NMHC	CO	PM	NO_X + NMHC	CO	PM
EPA Emissions Limit	4.7	2.6	0.15	6.4	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 Sulfur

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.

Exhaust Emission Data Sheet
C2000D6E
60 Hz Diesel Generator Set

Engine Information:

Model:	Cummins Inc. QSK50-G24	Bore:	6.26 in. (159 mm)
Type:	4 Cycle, Vee, 16-cylinder Diesel	Stroke:	6.26 in. (159 mm)
Aspiration:	Turbocharged and Charge Air Cooled	Displacement:	3039 cu. in. (49.8 liters)
Compression Ratio:	14.2:1		

Performance Data	1/4 Standby	1/2 Standby	3/4 Standby	Full Standby	Full Prime	Full DCC
Engine BHP @ 1800 RPM (60 Hz)	739	1478	2217	2956	2648	2648
Fuel Consumption (US Gal/Hr)	41.5	73.7	112.0	139.8	128.0	128.0
Exhaust Gas Flow (CFM)	6229	9733	13648	15388	15654	14654
Exhaust Gas Temperature (°F)	650	696	894	996	954	954
Air to Fuel Ratio	42:1	36:1	29:1	24:1	26:1	26:1
Exhaust Emission Data						
HC (Total Unburned Hydrocarbons)	0.15	0.07	0.04	0.03	0.03	0.03
NOx (Oxides of Nitrogen as NO_2)	2.8	3.9	3.9	6.7	5.4	5.4
CO (Carbon Monoxide)	1.13	0.33	0.35	0.31	0.31	0.31
PM (Particulate Matter)	0.05	0.05	0.04	0.01	0.02	0.02
SO_2 (Sulfur Dioxide)	0.13	0.11	0.12	0.10	0.11	0.11
Smoke (Bosch)	0.2	0.3	0.2	0.1	0.2	0.2

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

Test Conditions

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

Fuel Specification:	ASTM D975 No. 2-D S15 diesel fuel with 0.0015 Wt.% Sulfur content, 42-48 Cetane Number
Air Inlet Temperature	25 °C (77 °F)
Fuel Inlet Temperature:	40 °C (104 °F)
Barometric Pressure:	100 kPa (29.53 in Hg)
Humidity:	NOx measurement corrected to 10.7 g/kg (75 grains H_2O/lb) of dry air
Intake Restriction:	Set to 18 in of H_2O as measured from compressor inlet
Exhaust Back Pressure:	Set to 1.5 in Hg
Note:	mg/m^3 values are measured dry, corrected to 5% O_2 and normalized to standard temperature and pressure (0°C, 101.325 kPa)

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

Prototype Test Support (PTS)
60 Hz test summary

Generator set models	Representative prototype	
C1750D6E	Model:	C2000D6E
C2000D6E	Engine:	QSK50-G24
	Alternator:	S7L1D-J4

The following summarizes prototype testing conducted on the designated representative prototype of the specified models. This testing is conducted to verify the complete generator set electrical and mechanical design integrity.

Prototype testing is conducted only on generator sets not sold as new equipment.

Maximum surge power: 2032 kW

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

Maximum motor starting: 5600 kVA

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

Alternator temperature rise:

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

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

Torsional analysis and testing:

The generator set on S7L1D-J4 was tested to verify that the design is not subjected to harmful torsional stresses. A spectrum analysis of the transducer output was conducted over the speed range of 1650 to 1950 RPM.

Cooling system: 40°C ambient
0.5 in H2O restriction

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

Durabilty:

The generator set was subjected to 800 hour of endurance testing replicating field duty cycles operating at variable load up to the standby rating based on MIL-STD-705 to verify structural soundness and durability of the design.

Electrical and mechanical strength:

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

Steady state performance:

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

Voltage regulation:	± 0.25%
Random voltage variation:	± 0.36%
Frequency regulation:	Isochronous
Random frequency variation:	± 0.12%

Transient performance:

The generator set was tested with the listed alternator to verify single step loading capability as required by NFPA 110. Voltage and frequency response on load addition or rejection were evaluated. The following results were recorded at 1.0 power factor:

Full load acceptance:

Voltage dip:	52.3%
Recovery time:	4.3 seconds
Frequency dip:	24.2%
Recovery time:	4.7 seconds

Full load rejection:

Voltage rise:	9.3%
Recovery time:	0.8 seconds
Frequency rise:	4.4%
Recovery time:	0.6 seconds

All data based on 1.0 power factor:

Harmonic analysis:

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

	Line to Line		Line to Neutral	
Harmonic	No load	Full load	No load	Full load
3	0.04	0.06	0.07	0.21
5	0.15	2.42	0.14	2.43
7	0.67	0.45	0.67	0.42
9	0.03	0.02	0.03	0.12
11	0.57	0.29	0.57	0.31
13	0.28	0.29	0.27	0.27
15	0.02	0.00	0.02	0.07

SECTION 3
GENERATOR ACCESSORIES

Data Sheet

Circuit Breakers

Description

This data sheet provides circuit breaker manufacturer part numbers and specifications. The circuit breaker box description is the rating of that breaker box installation on a Cummins® generator. Please refer to the website of the circuit breaker manufacturer for breaker specific ratings and technical information.

Applicable Models

Engine	Models			
QSK23-G7	DQCA	DQCB	DQCC	
QST30-G5	DQFAA	DQFAB	DQFAC	DQFAD
QST30-G17	DQFAH			
QSK38-G17	C1250D6E			
QSK38-G18	C1250D6E	C1500D6E		
QSK50-G5	DQGAE	DQGAF		
QSK50-G4	DQGAA	DQGAB		
QSK50-G8	DQGAS			
QSK50-G24	C1750D6E	C2000D6E		
QSK50-G25	C2000D6E			
QSK60-G6	DQKAA	DQKAB	DQKAD	DQKAE
QSK60-G14	DQKAF			
QSK60-G17	DQKAM			

Instructions

1. Locate the circuit breaker feature code or part number and use the charts below to find the corresponding manufacturer circuit breaker catalog number.

2. Use the first letter of the circuit breaker catalog number to determine the "frame" of the breaker. If the first letter is an “N”, use the second letter. Then follow the corresponding website link from the table below to find the breaker catalog number description.

Please refer to the catalog numbering systems page, which is given in the chart, to understand the nomenclature of the catalog number.

Frame	Catalog Name*	Catalog Number Description Pages
P and R	0612CT0101 https://www.se.com/us/en/download/document/0612CT0101/	16-17
L	0611CT1001 https://www.se.com/us/en/download/document/0611CT1001/	8-9
MasterPact NT/NW	https://www.se.com/us/en/faqs/FA231180/	Please refer to PLS007 Rev 25

*The following link may also be used to search specifically by the breaker part number or for the catalog name listed above.

https://www.se.com/us/en/work/support/contacts.jsp

3. Search the catalog by using the first 3 letters of the breaker catalog number and the first 5 numbers to find information such as trip curves, accessories, and dimensional details regarding the circuit breaker.

*If the catalog number starts with “N”, skip the N and begin your search with the second letter.

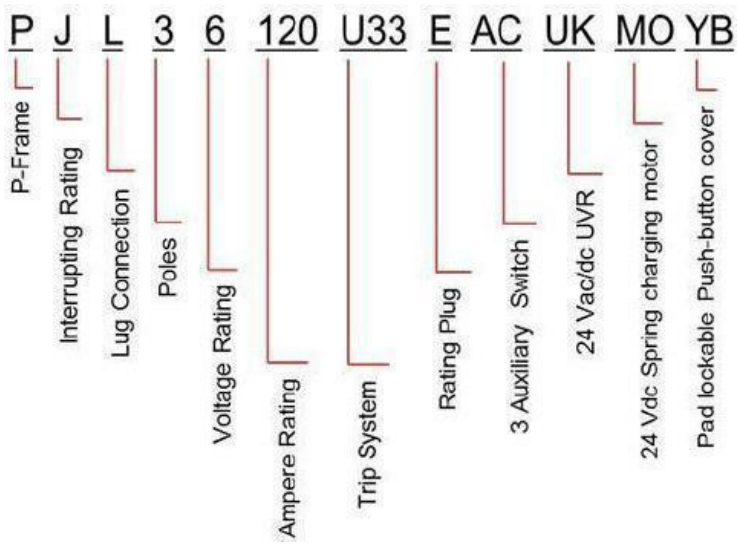
*If the first 3 letters are “PJP,” the search will not work. You will need to start with just “PJ” and use the description pages to obtain the information you are looking for on the “PJP.”

Example

After finding your circuit breaker catalog number to be "PJL36120U33EACUKMOYB," navigate to the P-frame catalog by using the link provided.

Look at pages 16-17 of the pdf catalog to find the nomenclature of the breaker.

Search the P-frame spec sheet using the search "PJL36120.”

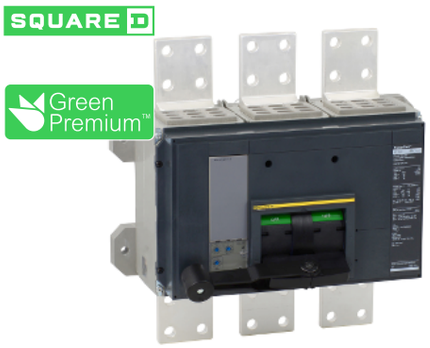


For decoding the ABB breakers, see the decoder sheet, titled "T8 Catalog number explanation"

KP91-2	CB-800A, Left, 3P, UL 600, IEC 415, UL Serv Ent, 100%	0320-2182	QSK50-G4, QSK50-G5,QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18	Schneider Electric	PJP36080U31F	MicroLogic 3.0 LI	F
		A054K405	QST30-G5, QST30-G17, 30L QSK23-G7		PJP36080U33F	MicroLogic 5.0 LSI	
KP92-2	CB-600A, Right,3P, UL 600, IEC 690, UL Serv Ent 100%	A044T468	QSK23-G7, QST30-G5, QST30-G17, 30L, QSK50-G4,QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18	Schneider Electric	NLGL36600U33X-600A	MicroLogic 3.3S LSI	N/A
		A065A765	QSK50-G24, QSK50-G25				
		A065A801	QSK50-G24, QSK50-G25				
KP93-2	CB-600A, Left, 3P, UL 600, IEC 690, UL Serv Ent, 100%	A044T468	QSK23-G7, QST30-G5, QST30-G17, 30L, QSK50-G4,QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18	Schneider Electric	NLGL36600U33X-600A	MicroLogic 3.3S LSI	N/A
		A065A765	QSK50-G24, QSK50-G25				
		A065A801	QSK50-G24, QSK50-G25				
KU62-2	CB-3000A, 3P, 600/690V, UL/IEC, ServEnt, 100%UL, Right	A029B150	QSK38-G17, QSK38-G18, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18, QSK50-G24, QSK50-G25	Schneider Electric	RLF36300U31A	MicroLogic 3.0 LI	A
		A064G469	QSK50-G24, QSK50-G25				
KU68-2	CB-3000A, 3P, 600/690V, UL/IEC, ServEnt, 100%UL, Left	A029B150	QSK38-G17, QSK38-G18, QSK50-G5, QSK50-G7, QSK60-G6, QSK60-G11 QSK60-G14, QSK60-G18	Schneider Electric	RLF36300U31A	MicroLogic 3.0 LI	A
M696-2	Right Side Circuit Breaker - 1000A	A065A771	QSK38-G17, QSK38-G18, QSK50-G24, QSK50-G25	Schneider Electric	PJF36100U33A	MicroLogic 5.0 LSI	A
		A065A803	QSK50-G24, QSK50-G25				
M690-2	Left Side Circuit Breaker - 1000A	A065A771	QSK38-G17, QSK38-G18	Schneider Electric	PJF36100U33A	MicroLogic 5.0 LSI	A

Product data sheet

Specifications



POWERPACT R-FRAME, MOLDED CASE CIRCUIT BREAKER, 600V, 3000A, 3P, 50kA

RLF36300U31A

Main

Range	PowerPact
Product name	PowerPact R
Product or Component Type	Circuit breaker
Device application	Distribution

Complementary

Line Rated Current	3000 A
Number of Poles	3P
Control type	Operating handle
Breaking capacity code	L
Breaking capacity	AIR 125 kA 240 V AC 50/60 Hz UL 489 AIR 100 kA 480 V AC 50/60 Hz UL 489 AIR 50 kA 600 V AC 50/60 Hz UL 489 Icu 125 kA 240 V AC 50/60 Hz IEC 60947-2 Icu 85 kA 380/415 V AC 50/60 Hz IEC 60947-2
[Ue] rated operational voltage	600 V AC 50/60 Hz UL 489
Network Frequency	50/60 Hz
[Ics] rated service breaking capacity	65 kA 240 V AC 50/60 Hz IEC 60947-2 45 kA 380/415 V AC 50/60 Hz IEC 60947-2
[Uimp] rated impulse withstand voltage	8 kV IEC 60947-2
Trip unit technology	Electronic, standard, Micrologic 3.0, LI
[Ui] rated insulation voltage	750 V IEC 60947-2
Trip unit name	Micrologic 3.0
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	Alarm 1 LED yellow)long-time pick up)
Mounting mode	Unit mount busbar)
Mounting Support	Busbar

Electrical connection	Busbar connection line Busbar connection load
Terminal identifier	Please see CB outline drawing for lug and termination details
Tightening torque	548.75 lbf.in (62 N.m) 0.08…0.62 in² (50…400 mm²) (AWG 1/0...750 kcmil) 548.75 lbf.in (62 N.m) 0.08…0.23 in² (50…150 mm²) (2 x AWG 1/0...2 x 300 kcmil)
Number of slots	2 auxiliary switch OF plug-in) 1 alarm switch SD plug-in) 1 voltage release MN or MX plug-in)
Power wire stripping length	1.38 in (35 mm)
Height	16.24 in (412.50 mm)
Width	16.54 in (420.12 mm)
Depth	14.49 in (368.05 mm)
Net Weight	52 lb(US) (23.59 kg)
Quantity per Set	1

Environment

Quality labels	CE
Standards	UL CSA NEMA NMX J-266 IEC 60947-2
Product certifications	UL CSA NOM
IP degree of protection	IP40
Pollution degree	3 IEC 60947-1
Ambient Air Temperature for Operation	-13…158 °F (-25…70 °C)
Ambient Air Temperature for Storage	-58…185 °F (-50…85 °C)
Operating altitude	< 6561.68 ft (2000 m) without derating 13123.36 ft (4000 m) with derating

Ordering and shipping details

Category	01245-RG,H,J,K,L,N UNIT MT BREAKERS
Discount Schedule	DE2
Package weight(Lbs)	75.00 lb(US) (34.019 kg)
Returnability	Yes
Country of origin	US

Offer Sustainability

Sustainable offer status	Green Premium product
California proposition 65	WARNING: This product can expose you to chemicals including: DINP, which is known to the State of California to cause cancer, and DIDP, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov
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.

Micrologic™ 3.0 Electronic Trip Unit

ENGLISH

Instruction Bulletin

48049-207-05
Rev. 01, 07/2012

Retain for future use.

Schneider Electric™

ENGLISH

Section 1—General Information

Introduction

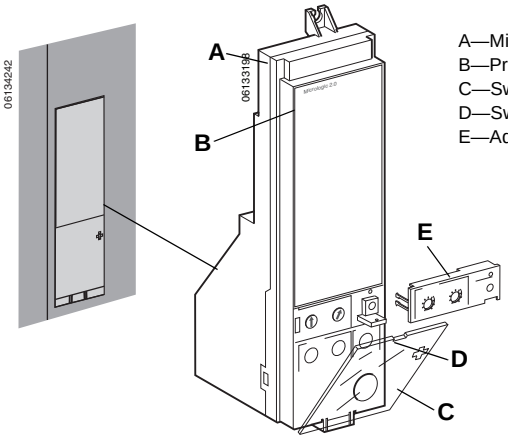
Micrologic™ trip units (A) provide adjustable tripping functions on electronic trip circuit breakers. The product name (B) specifies the level of protection provided by the trip unit.

Micrologic 3.0 Trip Unit

- Type of protection
  - 2—Basic IEC protection (LS0)
  - 3—Basic UL protection (LI)
  - 5—Selective protection (LSI)
- Trip unit series
  - 0—Indicates the first version

Micrologic trip units are field replaceable to allow for upgrading of the trip unit in the field. For complete information on available circuit breaker models, frame sizes, interrupting ratings, sensor plugs, rating plugs and trip units, see the product catalog.

Figure 1: Micrologic Trip Unit



Trip Unit Settings

On the face of the trip unit are adjustable switches to allow changing of trip characteristics. Trip units are shipped with the long-time pickup switch set at 1.0 and all other trip unit adjustments set at their lowest settings.

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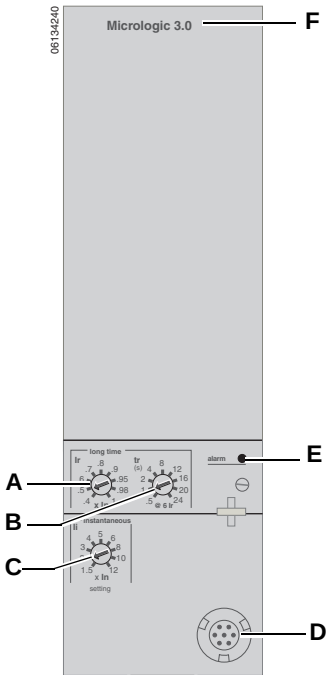
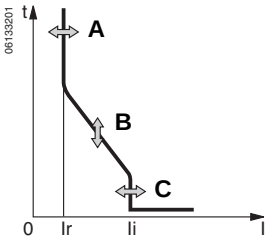
Micrologic 3.0 Trip Unit

The Micrologic 3.0 trip unit provides basic (LI) protection.

A. Long-time pickup (Ir) switch
B. Long-time delay (tr) switch
C. Instantaneous pickup (Ii) switch
D. Test plug receptacle
E. Overload indicator light
F. Trip unit name

Figure 3: Micrologic 3.0 Trip Unit





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Trip Unit Switches

Long-Time Protection

Long-time protection protects equipment against overloads.

- Long-time protection is standard on all trip units.
- The long-time pickup (Ir) (A) sets maximum current level (based on sensor plug rating In) which circuit breaker will carry continuously. If current exceeds this value, circuit breaker will trip after the preset time delay. The long-time pickup (Ir) is adjustable from 0.4–1.0 times the sensor plug rating (In).
- The long-time delay (tr) (B) sets the length of time that the circuit breaker will carry an overcurrent below the short-time or instantaneous pickup current level before tripping. See Table 1 for long-time delay settings.
- The overload indicator light (C) indicates that the Ir long-time pickup threshold has been exceeded.
- Both long-time pickup and long-time delay are on the field-replaceable adjustable rating plug. To change settings to more precisely match the application, various rating plugs are available. For instructions on replacing the rating plug, see Section 4—Adjustable Rating Plug Replacement.
- The In value can be changed by replacing the sensor plug below the trip unit. For further information, see the instructions packed with the sensor plug replacement kit.
- Long-time protection uses true RMS measurement.

Thermal imaging provides continuous temperature rise status of the wiring, both before and after the device trips. This allows the circuit breaker to respond to a series of overload conditions which could cause conductor overheating, but would go undetected if the long-time circuit was cleared every time the load dropped below the pickup setting or after every tripping event.

NOTE: If checking trip times, wait a minimum of 15 minutes after circuit breaker trips before resetting to allow the thermal imaging to reset completely to zero.

Figure 5: Long-Time Protection Switches

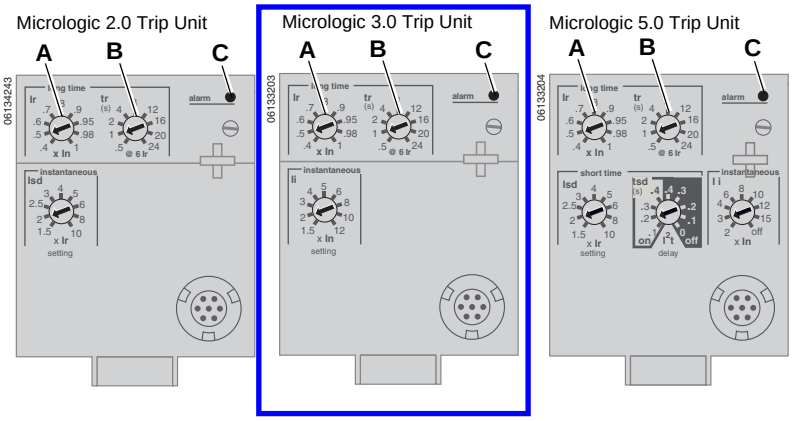

Table 1: Micrologic Trip Unit Long-Time Delay Values

Setting[1]	Long-Time Delay in Seconds[2]								
tr at 1.5 x Ir	12.5	25	50	100	200	300	400	500	600
tr at 6 x Ir	0.5	1	2	4	8	12	16	20	24
tr at 7.2 x Ir	0.34[3]	0.69	1.38	2.7	5.5	8.3	11	13.8	16.6

[1]In = sensor rating. Ir = In x long-time pickup. Trip threshold between 1.05 and 1.20 Ir.
[2]Time-delay accuracy +0/-20%
[3]For Micrologic 5.0 trip units, when tsd is set to 0.4 off or 0.4 on, then tr = 0.5 instead of 0.34.

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Instantaneous Protection

Instantaneous protection protects equipment against short circuits with no intentional time delay.

- Instantaneous protection (Ii) (A) is standard on 3.0 and 5.0 trip units.*
- Instantaneous protection for 2.0 trip units is based on the circuit breaker sensor rating (Ir).
- Instantaneous protection for 3.0 and 5.0 trip units is based on the long-time delay pickup (In).
- Circuit breaker open command is issued as soon as threshold current is exceeded.
- Instantaneous protection for 3.0 and 5.0 trip units use peak current measurement. Instantaneous protection for 2.0 trip units use RMS current measurement.
- When instantaneous protection switch is set to off, the instantaneous protection is disabled.

*Instantaneous protection on 2.0 trip units is achieved by using short-time protection (Isd) with short-time delay factory set to 0 (zero).

Figure 7: Instantaneous Protection Switches

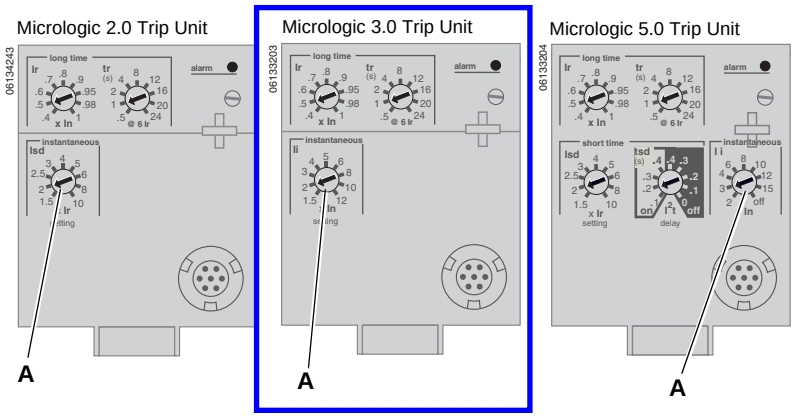


Table 3: Micrologic Instantaneous Values

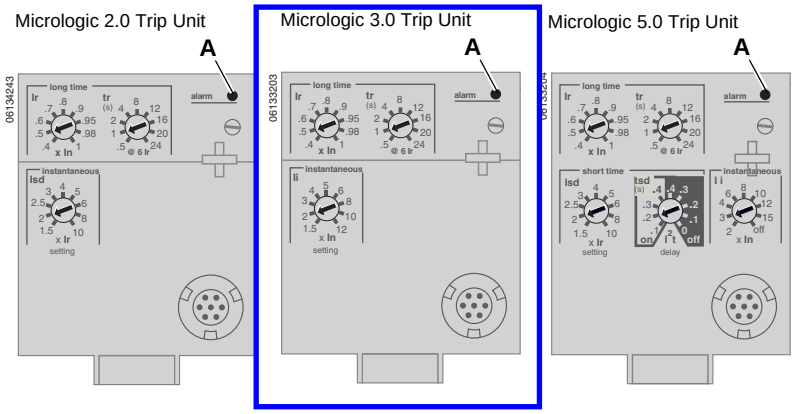
Setting	Interruption Current								
2.0 Isd (= Ir x..)	1.5	2	2.5	3	4	5	6	8	10
3.0 Ii (= In x..)	1.5	2	3	4	5	6	8	10	12
5.0 Ii (= In x..)	2	3	4	6	8	10	12	15	off

Ii = UL and ANSI instantaneous
Isd = IEC instantaneous (short-time with zero delay)
In = sensor rating
Ir = long-time pickup

Overload Indicator Light

The overload indicator light (A) lights when the Ir long-time pickup level has been exceeded.

Figure 8: Overload Indicator Lights



Trip Unit Testing

Trip unit functions can be tested using primary injection testing or secondary injection testing.

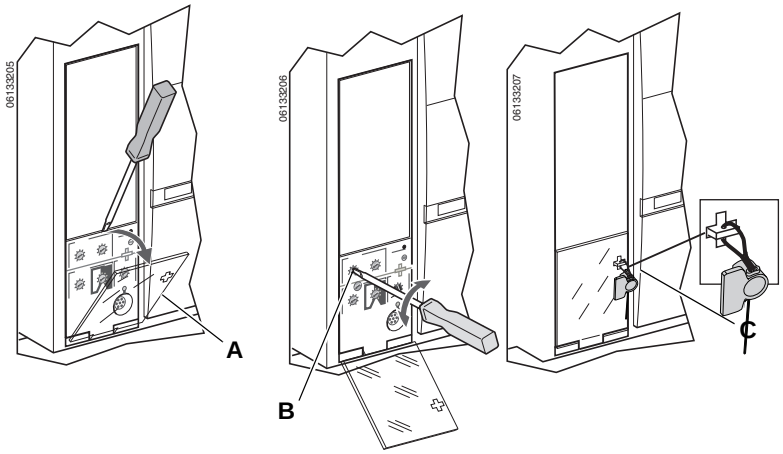
ENGLISH

Section 2—Operation

Switch Adjustment

1. Open switch cover (A).
2. Adjust the appropriate switches (B) to desired values.
3. Replace switch cover. Use wire seal MICROTUSEAL (C), if necessary, to provide tamper evidence.

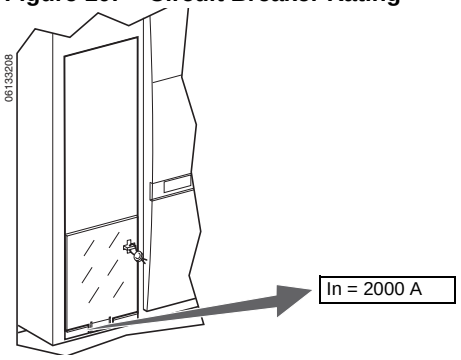
Figure 9: Adjust Switch Settings



Examples

Circuit breaker is rated 2000 A.

Figure 10: Circuit Breaker Rating

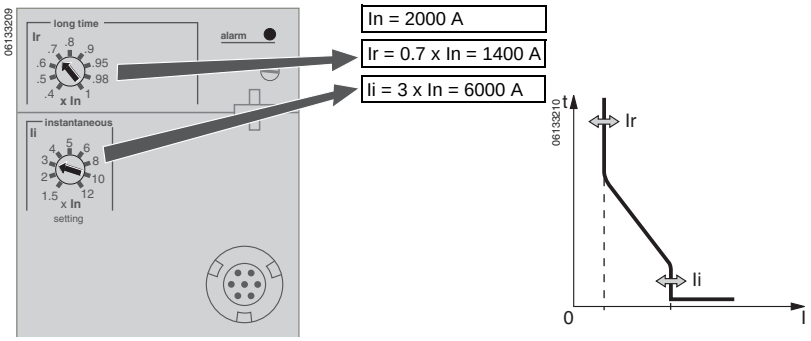


ENGLISH

Micrologic 3.0 Trip Unit

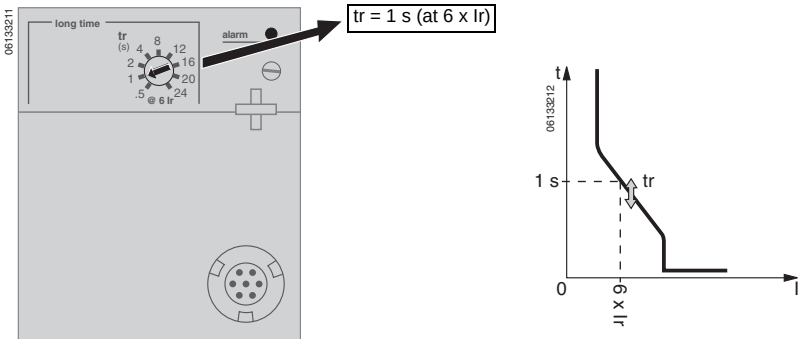
1. Set pickup levels.

Figure 13: Set Pickup Levels



2. Set time delay.

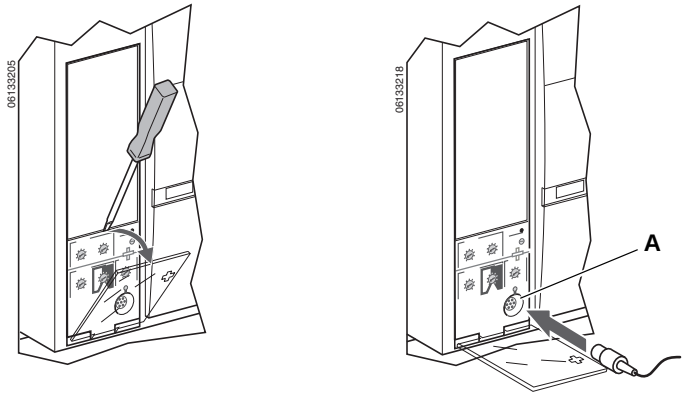
Figure 14: Set Time Delay

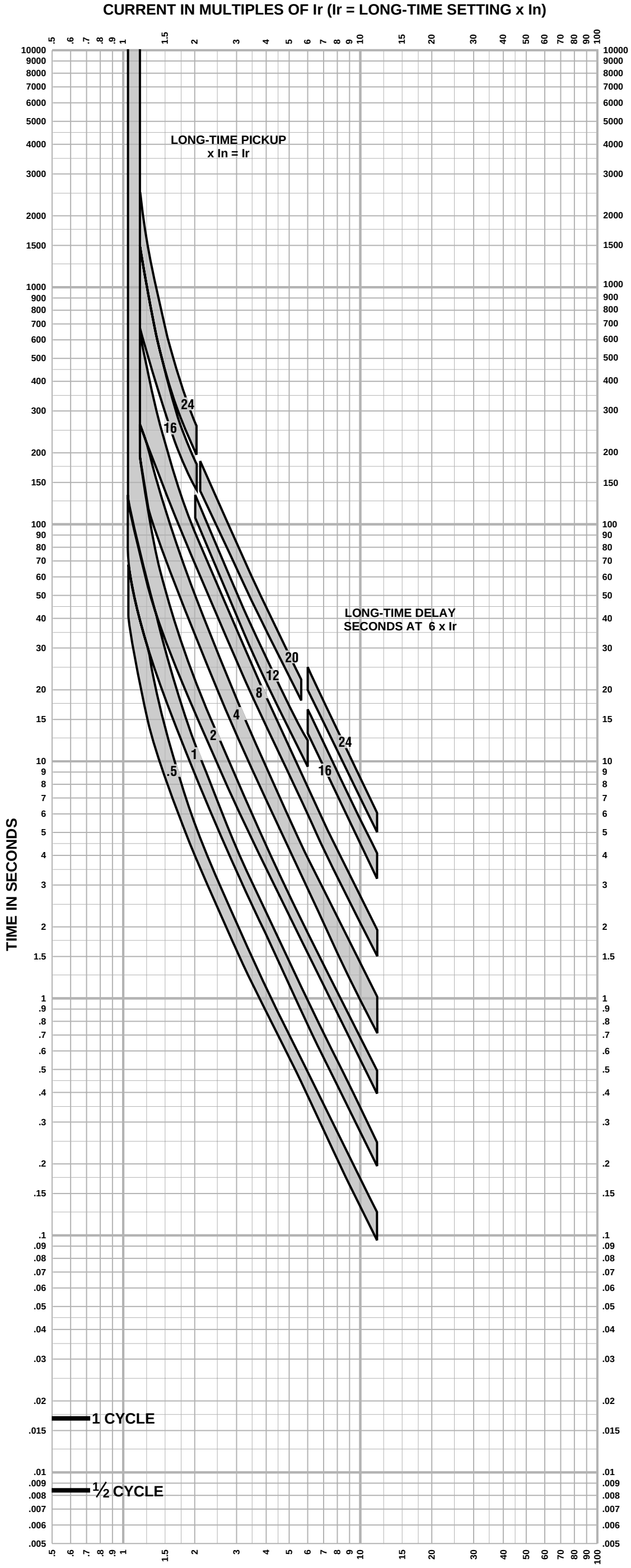


Trip Unit Operation Verification

Use a test kit connected to the trip unit test plug receptacle (A) to verify trip unit is functioning as desired. See instructions shipped with test kit to perform verification tests.

Figure 17: Verify Trip Unit Operation





MICROLOGIC® 3.0 A TRIP UNIT CHARACTERISTIC TRIP CURVE NO. 613-6

Long-time Pickup and Delay

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

Curves apply from -30°C to +60°C ambient temperature.

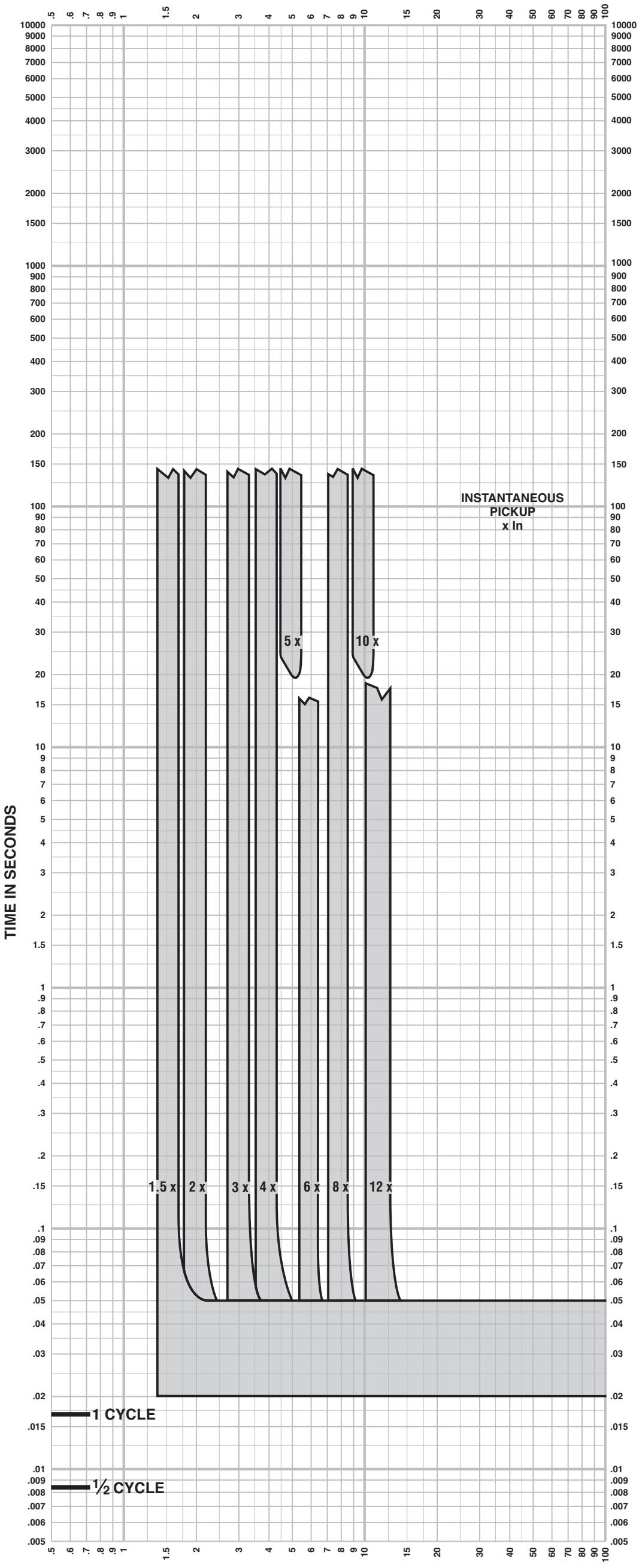
Notes:

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. The end of the curve is determined by the instantaneous setting.
3. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
4. See 613-8 for instantaneous pickup trip curve.

Merlin Gerin
Modicon
Square D
Telemecanique
Federal Pioneer
Federal Pacific
Schneider Electric Brands

Schneider Electric

Curve No. 0613TC0006
December 2000
Drawing No. B48095-613-06



MICROLOGIC® 3.0 A TRIP UNIT CHARACTERISTIC TRIP CURVE NO. 613-8

Instantaneous Pickup
1.5x-12x

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

Curves apply from -30° to +60°C ambient temperature.

Instantaneous override values are given on 613-10.

Notes:

1. The end of the curve is determined by the interrupting rating of the circuit breaker.
2. Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
3. The instantaneous region of the trip curve shows maximum total clearing times. Actual clearing times in this region can vary depending on the circuit breaker mechanism design and other factors. The actual clearing time can be considerably faster than indicated. Contact your local Sales Office for additional information.
4. See 613-6 for long-time pickup and delay trip curves.

a brand of Schneider Electric

Merlin Gerin
Square D
Telemecanique

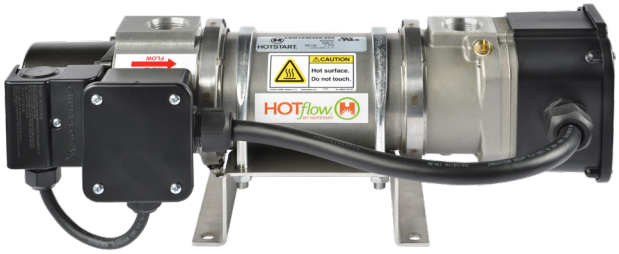
Schneider Electric

Curve No. 0613TC0808
January 2008
Drawing No. 48095-0613-08
(Replaces 0613TC0008)

Hotstart
THERMAL MANAGEMENT

HOTflow® Heating System

CKM



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

INTEGRATED DESIGN

The CKM's mechanically-driven pump is integrated directly into the stainless steel heating tank using a custom designed volute – maximizing coolant flow while minimizing the heater's footprint.

ENERGY EFFICIENT

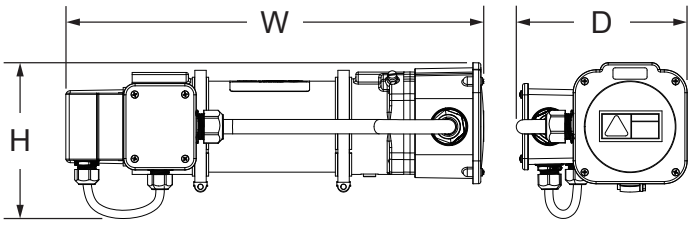
Like all HOTflow® heaters, the CKM is an energy efficient alternative to legacy convection-based heaters for common genset and heavy equipment engine size applications. Pump-driven forced circulation allows for even, consistent heating while lowering overall operating costs.

USER FRIENDLY

With the technician in mind, the CKM is constructed to provide easy access to all major components. A built in bleed screw allows installers to flush air from the heater before operation and an integrated high-limit thermostat can be manually reset without the need for expensive maintenance.

SIMPLE UPGRADE OPTION

Combined with its ability to be installed horizontally or vertically, the CKM's compact configuration makes it an easy drop-in replacement for traditional convection-based systems.



Height (H)	Width (W)	Depth (D)	Weight
6.9"	18.4"	8.5"	13.2 lbs
175 mm	467 mm	216 mm	6.0 kg

System	
Phase	single-phase (1 Ø)
Voltage (60 Hz)	120V | 240V
Voltage (50 Hz)	230V
Terminal Box Ingress	IPX6
Motor Ingress (UL-recognized)	NEMA 2
Motor Ingress (CE-compliant)	IP44
Min./Max. Ambient Temp	-40°F / 104°F (-40°C / 40°C)
Vibration Specification	Meets IEC 60068-2-64
Shock Specification	Meets IEC 60068-2-27
Max Pressure	125 psi (860 kPa)
Certification	UL/C-US recognized models available (E250789) CE-compliant models available

Coolant				
Fluid Type	Water | Coolant mix (50% water/50% glycol)			
Heat Power	3 kW	4 kW	5 kW	6 kW
Temp. Control	Fixed, 100 – 120 °F (38 – 49°C)			
Temp. High Limit	205 °F (96°C)			
Pump Power	70 W (50 Hz) / 97 W (60 Hz)			
Flow	9 gpm @ 10 ft H_2O (34.1 L/min @ 3 m H_2O			
Inlet/Outlet	SAE J1926/1:1 5/16-12 (SAE #16 STOR)			

Ordering Information

CKM

Engine Displacement	Power Supply V	Power Supply Hz	Heating System kW	Heating System Amps	Heating System Model Number
1000–1500 CID 15–23 L	120	60	3	25.0	CKM1030160-000
	230	50	3	13.0	*CKM1030250-000
	240	60	3	13.0	CKM1030260-000
1500–2000 CID 23–30 L	230	50	4	13.0	*CKM1040250-000
	240	60	4	16.7	CKM1040260-000
2000–2500 CID 30–38 L	230	50	5	21.7	*CKM1050250-000
	240	60	5	20.8	CKM1050260-000
2500–3000 CID 38–50 L	230	50	6	26.1	*CKM1060250-000
	240	60	6	25.0	CKM1060260-000

* – CE-compliant
(All other models – UL/C-US recognized)

Optional Inlet/Outlet Adapter Fittings (CKM Models only)			
From	To	Part Number	Part Description
SAE #16 STOR	0.75" hose barb	HB-16STORX3/4HB	#16 STOR to ¾" hose barb adapter. Installs in #16 STOR female inlet or outlet of heater.
SAE #16 STOR	1.0" hose barb	HB-16STORX1HB	#16 STOR to 1" hose barb adapter. Installs in #16 STOR female inlet or outlet of heater.

240VAC is required to power this heater

Specification sheet

Alternator heaters A292 and A293

Alternator heaters

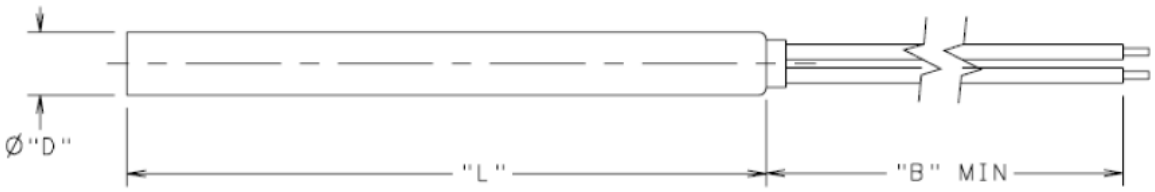
Alternator heaters help prevent corrosive damage of electrical and mechanical components in high humidity environments.

Alternator heater kit	Feature	Corresponding production part	Critical component	Voltage (AC)	Wattage	Instructions
0179-5074-02	A292-2	0179-5074-01	0333-0438-07	120	100	N/A
0300-4434	A292-2	0179-2699-01	0333-0550-01	120	100	000C-0449
0300-4435	A293-2	0179-2699-02	0333-0550-02	240	100	000C-0449
0333-0443	A292-2	0179-2285-09	0333-0438-03 (qty 2)	120	150	000C-0437
0333-0444	A293-2	0179-2285-02	0333-0438-04 (qty 2)	240	150	000C-0437
0333-0445	A292-2	0179-2286-01	0333-0438-07	120	100	000C-0437
0333-0445	A292-2	0179-2667-01	0333-0438-07	120	100	000C-0437
0333-0446	A293-2	0179-2286-02	0333-0438-08	240	100	000C-0437
0333-0446	A293-2	0179-2667-02	0333-0438-08	240	100	000C-0437
0333-0447	A292-2	0179-2285-10	0333-0438-05	120	300	000C-0437
0333-0447	A292-2	0179-2285-03	0333-0438-05	120	300	000C-0437
0333-0448	A416-2	0179-2285-17	0333-0438-17	240	510	000C-0437

Component drawings

Cartridge Heater

Component # 0333-0438-xx



Part #	Ø "D"	Dim "L"	Dim "B"
0333-0438-01	15.8	160	1200
0333-0438-02	15.8	160	1200
0333-0438-03	25.4	160	2200
0333-0438-04	25.4	160	2200
0333-0438-05	25.4	260	2200
0333-0438-06	25.4	260	2200
0333-0438-07	19	134	250
0333-0438-08	19	134	250

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

Specification sheet

PowerCommand® input/output expansion module AUX 101 and ~~AUX 102~~

Description

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

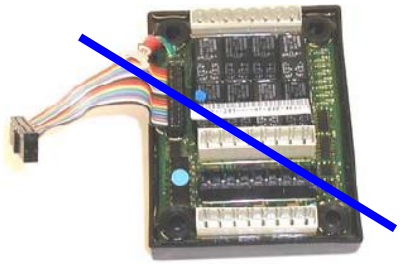
Analog/discrete inputs can be used for system fault expansion and/or generator set metering.

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

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

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

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



AUX 102 - Expansion

Features

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

Specifications

Signal requirements

Network connections: RS485, twisted-pair 78 kbps
Control power: 5-40 VDC
Current

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

Terminations for control power accept wire up to 16 ga.

Environment

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

Relay ratings (AUX 101)

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

Relay ratings (AUX 102)

- 2 A at 125 VAC, 2 A at 30 VDC

Input ratings (AUX 101)

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

Network length

Maximum 1219 m (4000 ft)

Approved wiring

Cat 4 or Cat 5 (stranded)

Configurations

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

Discrete/analog inputs:

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

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

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

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

Inputs are defaulted to disabled

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

Relay outputs

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

AUX 101

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

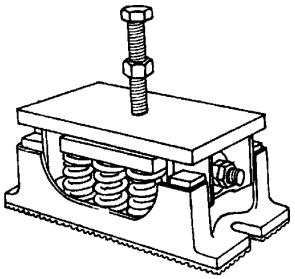
AUX 102

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

Specification Sheet

Vibration Isolators

Non-Seismic



Description

Vibration isolators reduce generator set vibration and noise transmission to the surrounding structure.

The isolation mountings shall consist of malleable cast iron top and bottom housings incorporating one or more steel springs and shall be provided with built-in levelling bolts, elastomer pad, and built-in resilient chocks to control oscillation and withstand lateral forces in all directions.

Isolator/restraint with seismic capabilities that limits motion in all horizontal and vertical directions. The horizontal restraint is incorporated in the casting design with neoprene inserts to reduce the transmission of vibration noise. The vertical restraint is achieved by studs incorporated in the lower housing with nuts and washer above top housing.

How to Specify

The isolation mountings shall consist of malleable cast iron top and bottom housings incorporating one or more steel springs and shall be provided with built-in levelling bolts, elastomer pad, and built-in resilient chocks to control oscillation and withstand lateral forces in all directions. They shall be pre-sized and installed in accordance with the recommendations of the generator set manufacturer. Not recommended in trailer-mounted applications.

Specification sheet

Ground fault indication relay – H550, H666, H667, H668

Code requirements

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

Cummins ground fault indication equipment is designed for use in Emergency/Standby power systems, for indication of ground fault conditions during generator set operation.

Features

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

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

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

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

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

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

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

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

Time delay settings – Adjustable 0-10 seconds.

Circuit board - One-piece molded case fully potted.

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

“Test” - Push-button.

“Reset” - Push-button.

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

Bonding jumper - Sized per NEC requirements.

Construction

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

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

Relay function selection link (auto/hand reset).

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

DC supply burden - 2.5 W.

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

System operation

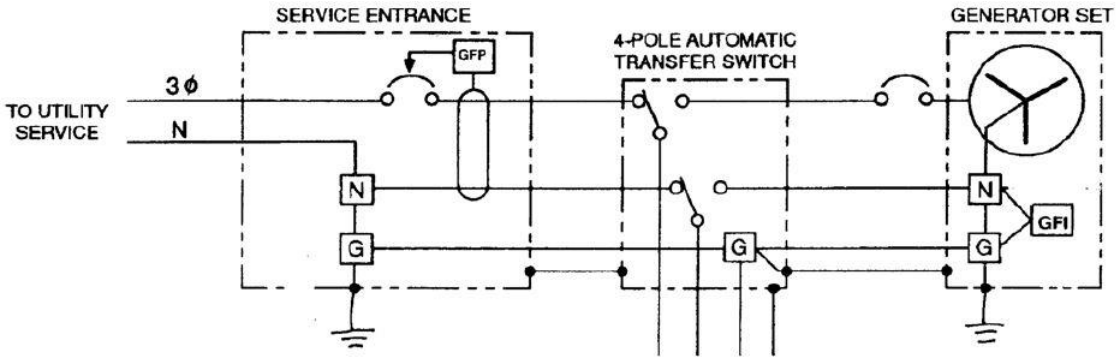
The ground fault relay continuously monitors the voltage across the neutral-to-ground bonding jumper and lights the ground fault alarm lamp on the generator set control when the connection is broken.

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

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

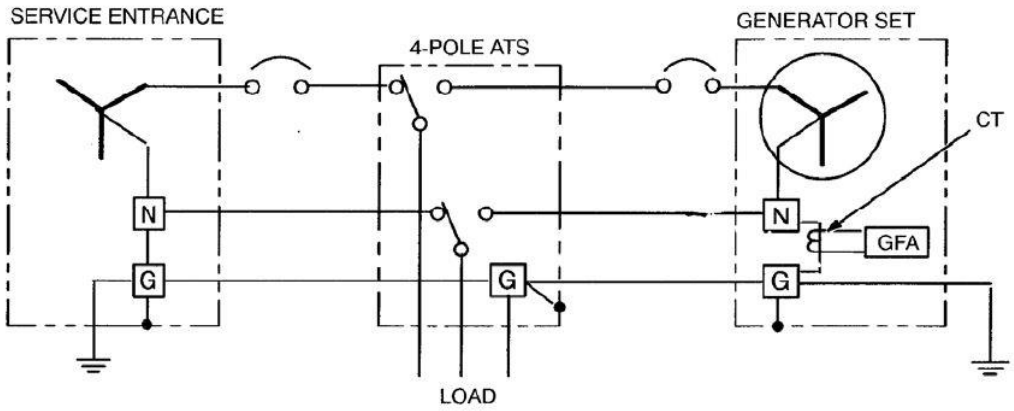
System schematic

Separately derived system connections (local grounding connection).



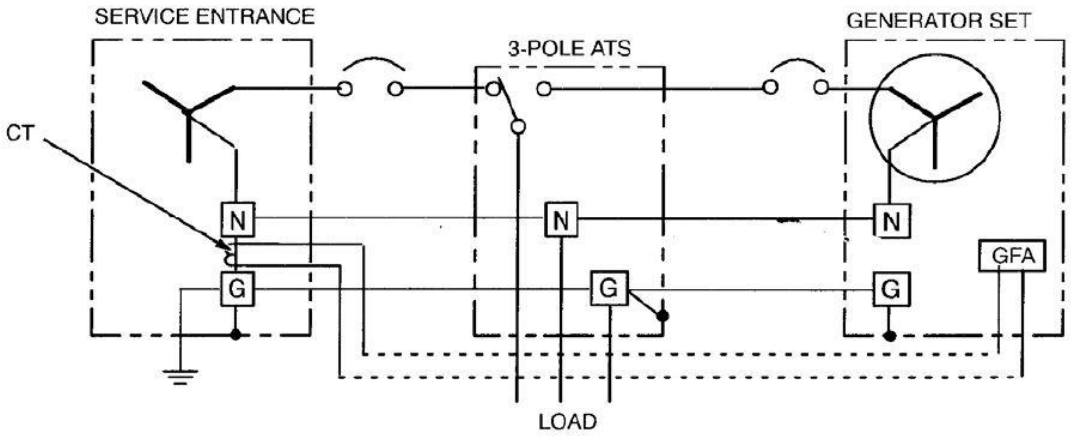
Neutral-to-ground bonding jumper must be sized per code requirements. For non-separately derived systems (3-phase/4-wire systems with 3-pole transfer switch), the ground connection and the neutral-to ground bonding jumper on the generator set are removed, and the 3-pole ATS link is added to the ground fault relay. For non-separately derived systems a label must be applied to the service entrance switchboard, indicating that removal of the equipment-bonding jumper can cause hazardous operating conditions.

0179-3509 – TYPE A



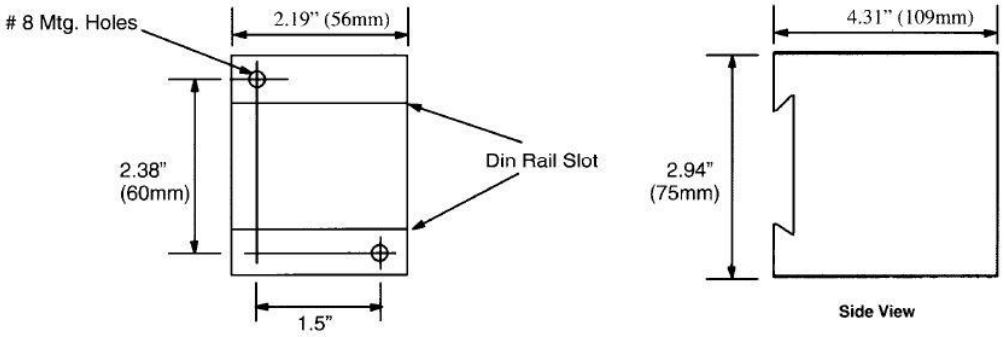
THREE-PHASE, FOUR-WIRE UTILITY, 4-POLE ATS

0179-3509 – TYPE B



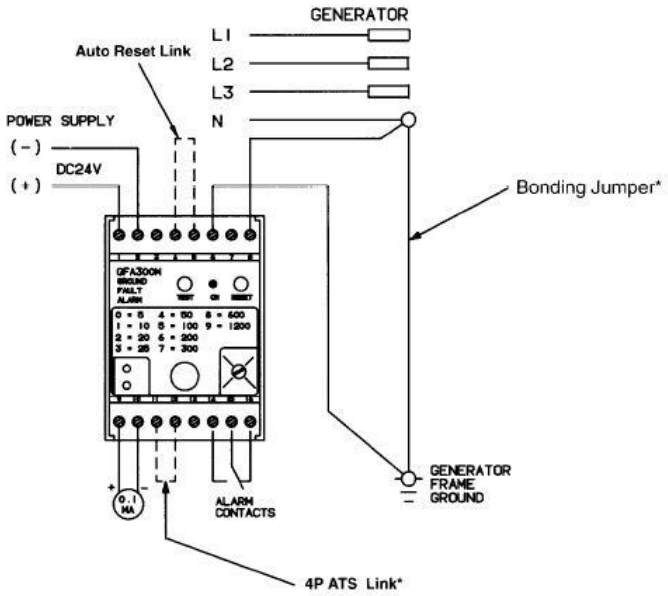
THREE-PHASE, FOUR-WIRE UTILITY, 3-POLE ATS

Outline detail



Weight: 19 oz (540 grams)

Interconnection detail

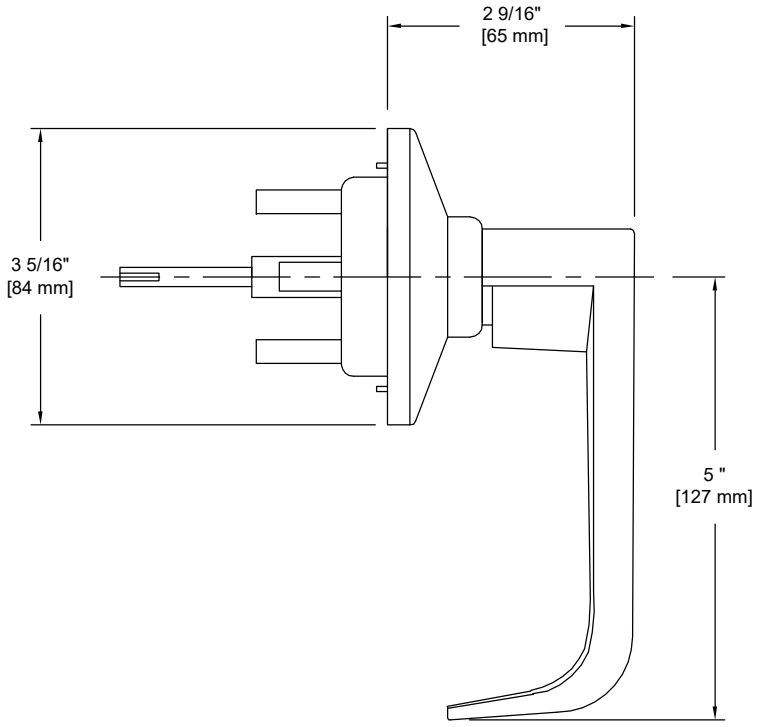


* Required only with separately derived systems. Bonding jumper is included in kit.

PRODUCT DATA SHEET

Product Description: Lever trim, panic exit device, classroom. Non handed. Lever trim cylinder: solid brass 6-pin removable core Schlage "SC 1 Keyway". Lever trim fabricated from die cast zinc, escutcheon fabricated from stainless steel in a US26D satin chrome finish. Cylindrical body fabricated from hardened steel heavy duty tailpiece. Lever is locked and unlocked from the outside and remains unlocked by key. Full length lever handle with 3/8" return. Fits both UL fire rated and UL panic exit devices. ADA compliant. Ships with mounting hardware.

Designed For
161 Cut Out
Door Prep



Door Thickness: Standard Doors 1 3/8" To 1 3/4" With Available Extension Kit Fits Doors 2 1/4" **Cylinder:** Solid brass 6-Pin Removable Core Schlage "SC 1 Keyway"

Overall Size: 5" W X 3 5/16" H X 2 9/16" D

Material: Die Cast Zinc

Finish: US26D Satin Chrome

Cross Reference

Manufacturer	Part Number
CAL-ROYAL	ENT00L

Harney HARDWARE

Description:

Lever Trim, Panic Exit, Classroom Function, FW Clutch, Schlage "SC 1"

Part Number:

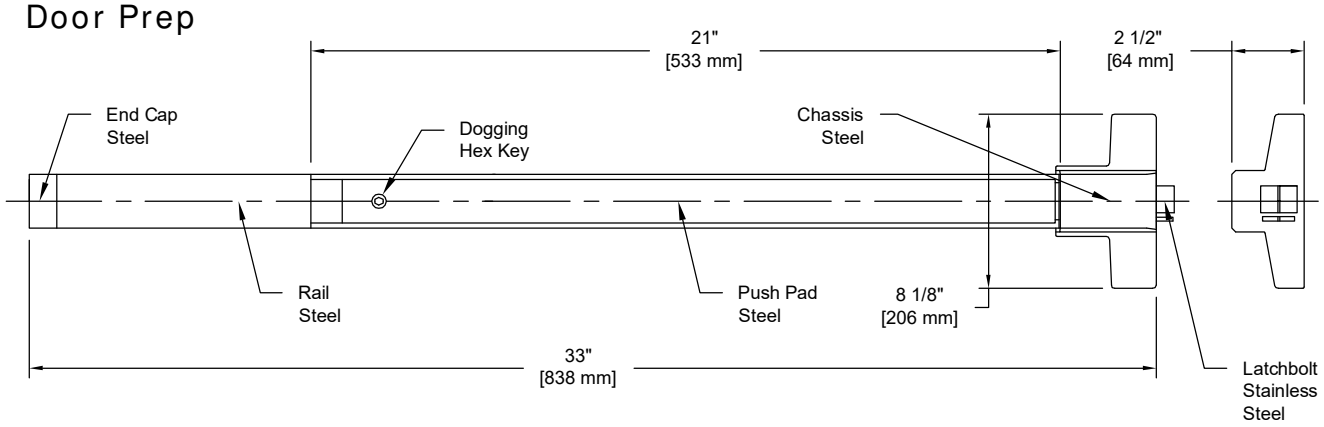
PEL8000CR

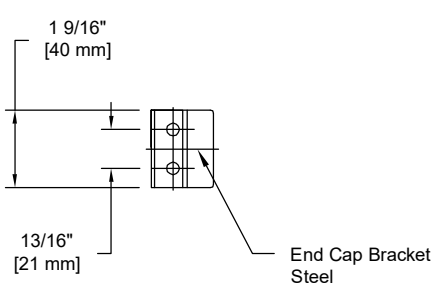
Date	Rev.

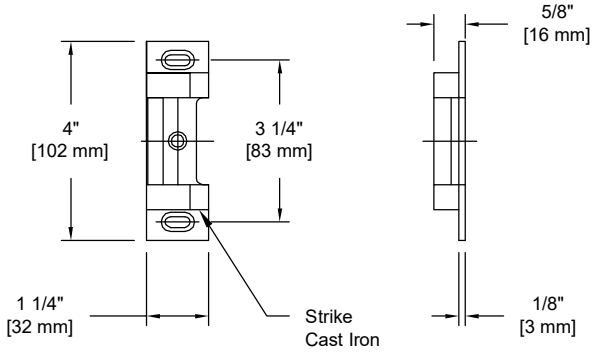
PRODUCT DATA SHEET

Product Description: Panic exit device, for 28" to 42" wide doors. UL panic rated, ANSI A156.3 Grade 1. Non handed. Rail and push pad are fabricated from heavy gauge steel with a powder coated aluminum finish. Trim available in the following functions: classroom, storeroom, passage and dummy. Device and trim for 161 standard cut out. Mounting hardware and 239 strike included. ADA compliant.

Designed For
161 Cut Out
Door Prep







Door Thickness: Standard Doors 1 3/4" to 2 1/4"
Latch Bolt: Stainless Steel 3/4" Throw
Strike: 239 Standard
ANSI/BHMA: Exit Device: A156.3 Grade 1

ANSI 1 | ADA | WITH MOUNTING HARDWARE

Overall Size: 33" W X 8 1/8" H X 2 1/2" D

Material: Steel, Cast Iron, Stainless Steel

Finish: Powder Coated Aluminum

Cross Reference

Manufacturer	Part Number
CAL-ROYAL	2200
CORBIN/RUSSWIN	ED8200
DORMA	8300
VON DUPRIN	22
YALE	2100

Harney HARDWARE

Description:

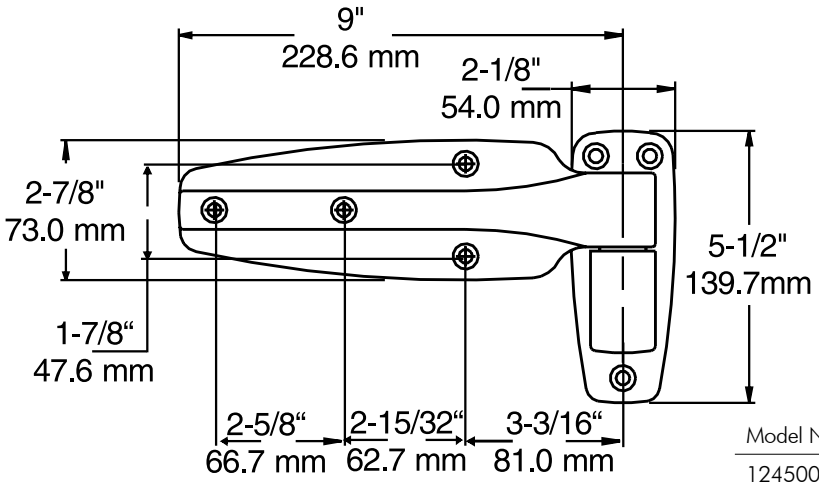
Panic Exit Device, Panic Rated, 32", ANSI Grade 1

Part Number:

PE550036PP

Date	Rev.

1245 REVERSIBLE CAM-RISE HINGE



REVERSE HINGES IN MINUTES

1. Lift strap from flange and remove pin assembly.

2. Pop out cap. Turn strap 180°, reinsert pin assembly in strap.

3. Reposition strap into flange and replace cap.

Model No.	Item	Offset	Finish
1245000004	Hinge	Flush (0.0 mm)	Tuffkote
1245000016	Hinge	1-1/8" (28.6 mm)	Tuffkote
1245000020	Hinge	1-1/4" (31.8 mm)	Tuffkote
1245000024	Hinge	1-3/8" (34.9 mm)	Tuffkote
1245000052	Hinge	1-1/2" (38.1 mm)	Tuffkote
1245000056	Hinge	1-5/8" (41.3 mm)	Tuffkote
1245000060	Hinge	1-3/4" (44.5 mm)	Tuffkote
1245000064	Hinge	1-7/8" (47.6 mm)	Tuffkote
1245000028	Hinge	Flush (0.0 mm)	Polished Chrome
1245000040	Hinge	1-1/8" (28.6 mm)	Polished Chrome
1245000044	Hinge	1-1/4" (31.8 mm)	Polished Chrome
1245000048	Hinge	1-3/8" (34.9 mm)	Polished Chrome
1245000068	Hinge	1-1/2" (38.1 mm)	Polished Chrome
1245000072	Hinge	1-5/8" (41.3 mm)	Polished Chrome
1245000076	Hinge	1-3/4" (44.5 mm)	Polished Chrome
1245000080	Hinge	1-7/8" (47.6 mm)	Polished Chrome
1245000082	Hinge	2" (50.8 mm)	Polished Chrome
1245000088	Hinge	Flush (0.0 mm)	Brushed Chrome
1245000112	Hinge	1-1/8" (28.6 mm)	Brushed Chrome
1245000116	Hinge	1-1/4" (31.8 mm)	Brushed Chrome
1245000120	Hinge	1-3/8" (34.9 mm)	Brushed Chrome
1245000124	Hinge	1-1/2" (38.1 mm)	Brushed Chrome
1245000128	Hinge	1-5/8" (41.3 mm)	Brushed Chrome
1245000132	Hinge	1-3/4" (44.5 mm)	Brushed Chrome
1245000136	Hinge	1-7/8" (47.6 mm)	Brushed Chrome
1245000138	Hinge	2" (50.8 mm)	Brushed Chrome
PACKAGING: 3 pair per carton.			
WEIGHT: Approx. 18 lb. (8.2 kg) per carton.			

AIR CONDITIONING PRODUCTS CO.
SHUTTERS DAMPERS LOUVERS

AUTOMATIC WALL SHUTTER – DOUBLE PANEL
MODEL EAS-DP

Rear flanged vertical mount gravity exhaust shutter uses counter balanced blades to minimize wear load on electric fan motor. Shutter is designed to allow horizontal airflow in one direction and to prevent reverse airflow and provide protection from environmental elements when airflow stops. Countered balanced blades open with airflow and close by gravity when airflow stops. Ideal for direct-drive or belt-driven exhaust fans. Recommended for vertical mount exhaust applications only. Application uses includes commercial, industrial, agricultural and residential. *(Do not use with vane axial or tube axial fans)*.

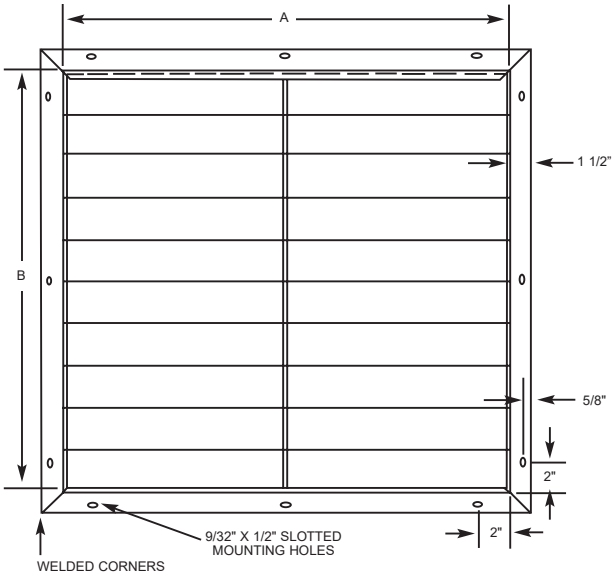
Features:

Frame

- .062 mill finish 6063T5 or T6 extruded aluminum.
- Welded and/or staked corners provide rigidity and durability.
- Integrated weather stripping incorporated into frame for additional strength and weather protection.
- Prepunched oblong mounting holes.
- Easy to motorize (optional motor pack model MTR-556 DP or MTR-885 DP).

Blades

- 26 gauge 3105 mill finish aluminum.
- Galvanized reinforcement strip across top of blade for added strength, counter balancing and efficiency.
- Felt seal on leading edge of blade for tight closure and quiet operation.
- Flanged ends of blades provide additional weather seal protection.
- Center-mounted galvanized steel tie-rod connects blades for uniform opening and closing.
- 304 stainless steel pivot pins, rivets and bushings.
- Opens freely to allow full 90 degree opening and closing.
- Counter balanced blades allow shutter to be mounted vertically to 45 degrees.



FRONT VIEW

Size limitations – Double Panel Only

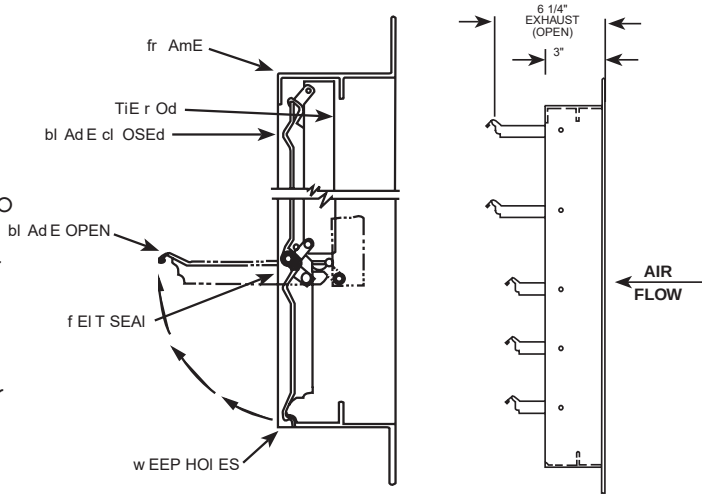
- Minimum panel size 36" W x 36" H (see "A" & "B" dimension)
- Maximum panel size 60" W x 60" H (see "A" & "B" dimension)

Ratings

- Maximum recommended velocity is 2,500 FPM
- Temperature - -40 F to 180 F

Options and Accessories (at additional cost)

- Motor pack (model MTR-556 DP) up to 48" – refer to voltage options
- Motor pack (model MTR-885 DP) over to 48" – refer to voltage options
- Manual pull chain
- Blades - polar white finish
- Custom sizes available in whole inch increments for width and height.
- Face tie rods for additional stability.



SIDE VIEW

AIR CONDITIONING PRODUCTS CO.
SHUTTERS DAMPERS LOUVERS

AUTOMATIC WALL SHUTTER – DOUBLE PANEL
MODEL 556-DP

Rear flanged vertical mount gravity exhaust shutter uses counter balanced blades to minimize wear load on electric fan motor. Shutter is designed to allow horizontal airflow in one direction and to prevent reverse airflow and provide protection from environmental elements when airflow stops. Countered balanced blades open with airflow and close by gravity when airflow stops. Ideal for direct-drive or belt-driven exhaust fans. Recommended for vertical mount exhaust applications only. Application uses includes commercial, industrial, agricultural and residential. *(Do not use with vane axial or tube axial fans)*.

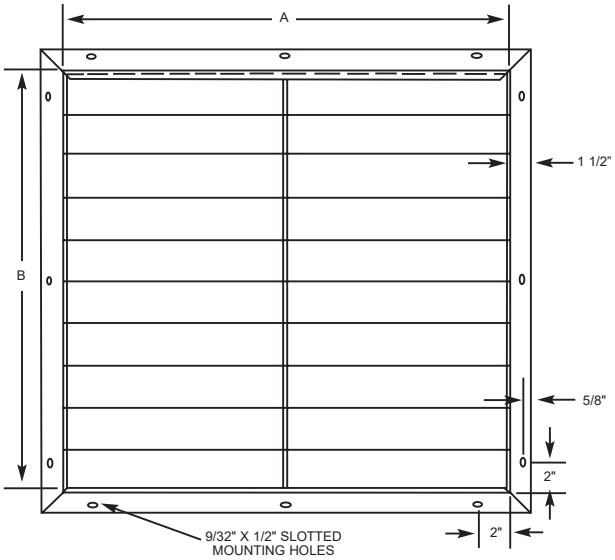
Features:

Frame

- .037 min. gauge galvanized steel.
- Tog-L-Loc and tabbed corners provide rigidity and durability.
- Integrated weather stripping incorporated into frame for additional strength and weather protection.
- Prepunch oblong mounting holes.
- Easy to motorize (optional motor pack model MTR-556 DP or MTR-885 DP).

Blades

- 26 gauge 3105 mill finish aluminum.
- Galvanized reinforcement strip across top of blade for added strength, counter balancing and efficiency.
- Felt seal on leading edge of blade for tight closure and quiet operation.
- Flanged ends of blades provide additional weather seal protection.
- Center-mounted galvanized steel tie-rod connects blades for uniform opening and closing.
- 304 stainless steel pivot pins, rivets and bushings.
- Opens freely to allow full 90 degree opening and closing.
- Counter balanced blades allow shutter to be mounted vertically to 45 degrees.



FRONT VIEW

Size limitations – Double Panel Only

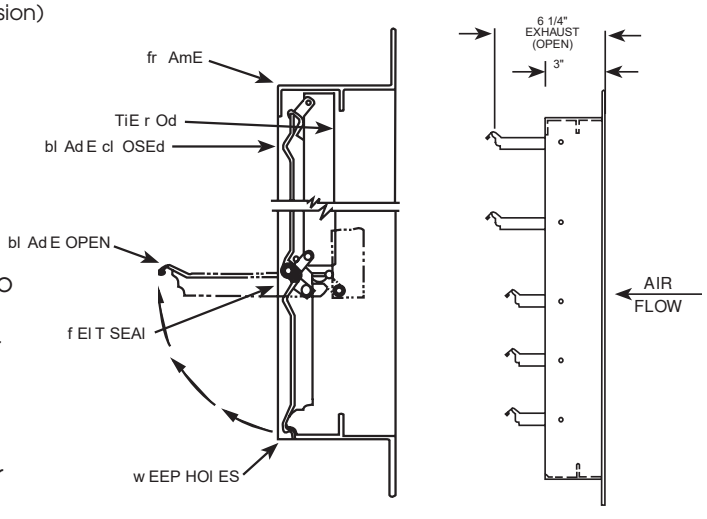
- Minimum panel size 36" W x 36" H (see "A" & "B" dimension)
- Maximum panel size 60" W x 60" H (see "A" & "B" dimension)

Ratings

- Maximum recommended velocity is 2,500 FPM
- Temperature - -40 F to 180 F

Options and Accessories (at additional cost)

- Motor pack (model MTR-556 DP) up to 48" – refer to voltage options
- Motor pack (model MTR-885 DP) over to 48" – refer to voltage options
- Manual pull chain
- Blades - polar white finish
- Custom sizes available in whole inch increments for width and height.
- Face tie rods for additional stability.



SIDE VIEW

Note: Above dimensions + or - normal tolerance of .0625"

XF80MAx High Efficiency Crossflow Cellular Drift Eliminator

Tuned venturi section increases the velocity of the exit airflow to scrub out smaller droplets

Brentwood Industries' XF80MAx is a high efficiency drift eliminator specially designed for crossflow tower applications. The XF80MAx incorporates an upward flow path and a steep water drainage angle to maximize the drift removal for crossflow applications, even when installed in a fully vertical orientation. When this is combined with the engineered venturi section, which increases the air velocity to help remove smaller droplets, the results show drift loss rates as low as 0.0005% of the circulating water flow, per CTI STD-140.

With the XF80MAx's fully nesting design, proper use of Dri-Seals, installation per Brentwood's installation guidelines, any crossflow cooling tower accurately designed can achieve the same result. In retrofit projects, older cooling towers will also see vast improvement in drift emissions.

Made from rigid, UV-protected PVC that meets CTI STD-136, XF80MAx is offered in 13 mil (0.33mm) sheet thickness for up to 96" (2438mm) spans without retainers. Alternate materials are available for high-temperature applications.

Please contact a Brentwood Sales Representative for technical data, pricing, and lead times for your project. Refer to Brentwood drawings for pack dimensional details and tolerances.

Specification

Drift eliminators shall be of the cellular type, Brentwood XF80MAx. The modules shall be made from rigid PVC that meets CTI STD-136 with UV-protection, have a flame spread rating of 20 or less per ASTM E-84, be assembled without adhesives or solvents, and utilize a nesting design to prevent drift bypass between modules. The air passageways shall cause the air to make at least three directional changes in direction and shall incorporate a tuned venturi section to scrub out small droplets.

When installed in the standard 10° from vertical orientation, the modules shall be able to be supported on 96" (2438mm) centers with minimal deflection.

The drift eliminator modules shall measure 5.25" (133mm) D x up to 24.375" (619mm) W x up to 144" (3658mm) L.

The installation shall be in accordance with manufacturer's recommendations and guidelines. See Application Note, "XF80MAx Crossflow Drift Eliminator – Installation Guidelines to Maximize Performance in Crossflow Towers" for Brentwood's installation recommendations.

Protective & Marine Coatings

ACROLON™ 218 HS
ACRYLIC POLYURETHANE

PART A	B65-600	GLOSS SERIES
PART A	B65-650	SEMI-GLOSS SERIES
PART B	B65V600	HARDENER

Revised: Sept. 29, 2015

PRODUCT INFORMATION

5.22

PRODUCT DESCRIPTION

ACROLON 218 HS is a polyester modified, aliphatic, acrylic polyurethane formulated specifically for in-shop applications. Also suitable for industrial applications. A fast drying, urethane that provides color and gloss retention for exterior exposure.

- Can be used directly over organic zinc rich primers (epoxy zinc primer and moisture cure urethane zinc primer)
- Color and gloss retention for exterior exposure
- Fast dry
- Outstanding application properties

PRODUCT CHARACTERISTICS

Finish:	Gloss or Semi-Gloss
Color:	Wide range of colors available
Volume Solids:	65% ± 2%, mixed, may vary by color
Weight Solids:	78% ± 2%, mixed, may vary by color
VOC (EPA Method 24):	Unreduced: <300 g/L; 2.5 lb/gal
mixed	Reduced 10% with R7K15: <340 g/L; 2.8 lb/gal
mixed	Reduced 9% with MEK, R6K10: <340 g/L; 2.8 lb/gal
Mix Ratio:	6:1 by volume, 1 gallon or 5 gallon mixes premeasured components

Recommended Spreading Rate per coat:

	Minimum	Maximum
Wet mils (microns)	**4.5** (112.5)	**9.0** (225)
Dry mils (microns)	**3.0** (75)	**6.0** (150)
~Coverage sq ft/gal (m^2/L)	**175** (4.3)	**346** (8.5)
Theoretical coverage **sq ft/gal** (m^2/L) @ 1 mil / 25 microns dft	**1040** (25.5)	

NOTE: Brush or roll application may require multiple coats to achieve maximum film thickness and uniformity of appearance.

Drying Schedule @ 6.0 mils wet (150 microns):

	@ 35°F/1.7°C	@ 77°F/25°C *50% RH*	@ 120°F/49°C
To touch:	4 hours	30 minutes	20 minutes
To handle:	18 hours	6 hours	4 hours
To recoat:			
minimum:	18 hours	8 hours	6 hours
maximum:	3 months	3 months	3 months
To cure:	14 days	7 days	5 days
Pot Life: (reduced 5% with Reducer R7K15)	4 hours	2 hours	45 minutes
Sweat-in-Time:		None	

If maximum recoat time is exceeded, abrade surface before recoating. Drying time is temperature, humidity, and film thickness dependent.
Paint temperature must be at least 40°F (4.5°C) minimum.

Shelf Life:	Part A* - 36 months, unopened Part B - 24 months, unopened Store indoors at 40°F (4.5°C) to 100°F (38°C).
*Aluminum (Part A, Rex # B65SW655) has a shelf life of 24 months.	
Flash Point:	55°F (13°C), Seta, mixed
Reducer/Clean Up:	
Spray:	Reducer R7K15, MEK R6K10, or R7K111
Brush / Roll:	Reducer #132, R7K132 or R7K111

RECOMMENDED USES

Specifically formulated for in-shop applications.
For use over prepared metal and masonry surfaces in industrial environments such as:

- Structural steel
- Rail cars and locomotives
- Conveyors
- Bridges
- Tank exteriors
- Pipelines
- Ships
- Wind Towers - onshore and offshore
- Offshore platforms - exploration and production
- Suitable for use in USDA inspected facilities
- Conforms to AWWA D102 Outside Coating Systems #4 (OCS-4), #5 (OCS-5) & #6 (OCS-6)
- Acceptable for use in high performance architectural applications
- Acceptable for use over and/or under Loxon S1 and Loxon H1 Caulking
- A component of INFINITANK
- Over FIRETEX® hydrocarbon systems
- Suitable for use in the Mining & Minerals Industry

PERFORMANCE CHARACTERISTICS

Substrate*: Steel

Surface Preparation*: SSPC-SP10/NACE 2

System Tested*:
1 ct. Macropoxy 646 @ 6.0 mils (150 microns) dft
1 ct. Acrolon 218 HS Gloss @ 4.0 mils (100 microns) dft
*unless otherwise noted below

Test Name	Test Method	Results
Abrasion Resistance[1]	ASTM D4060, CS17 wheel, 1000 cycles, 1 kg load	43 mg loss
Adhesion[3]	ASTM D4541	1976 psi
Corrosion Weathering[3]	ASTM D5894, 27 cycles, 9072 hours	Rating 10 per ASTM D610, for rusting; Rating 10 per ASTM D714, for blistering
Direct Impact Resistance[1]	ASTM D2794	50 in. lb.
Dry Heat Resistance[1]	ASTM D2485, Method A	200°F (93°C)
Flexibility[1]	ASTM D522, 180° bend, 1/8" mandrel	Passes
Humidity Resistance[2]	ASTM D4585, 100°F (38°C), 1500 hours	Rating 10 per ASTM D610, for rusting; Rating 10 per ASTM D714, for blistering
Pencil Hardness	ASTM D3363	3H
Salt Fog Resistance[3]	ASTM B117, 15,000 hours	Rating 10 per ASTM D610, for rusting; Rating 10 per ASTM D714, for blistering

Meets the requirements of SSPC Paint No. 36, Level 3 for white and light colors. Dark colors may require a clear coat.

Complies with ISO 12944-5 C5I and C5M requirements.

Footnotes:
[1] *Finish coat only tested*
[2] *Primer — Zinc-Clad II Plus*
Intermediate — Macropoxy 646
Finish — Acrolon 218 HS
[3] *Primer — Zinc-Clad III HS*

Protective & Marine Coatings

ACROLON™ 218 HS
ACRYLIC POLYURETHANE

PART A	B65-600	GLOSS SERIES
PART A	B65-650	SEMI-GLOSS SERIES
PART B	B65V600	HARDENER

Revised: Sept. 29, 2015

PRODUCT INFORMATION

5.22

RECOMMENDED SYSTEMS

		Dry Film Thickness / ct. Mils	(Microns)
Steel:			
1 ct.	Macropoxy 646	5.0-10.0	(125-250)
1-2 cts.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)
Steel:			
1 ct.	Zinc Clad II Plus	3.0-5.0	(75-125)
1 ct.	Macropoxy 646	5.0-10.0	(125-250)
1-2 cts.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)
Steel:			
1 ct.	Zinc Clad IV	3.0-5.0	(75-125)
1-2 cts.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)
Steel:			
1 ct.	Corothane I-GalvaPac Zinc Primer	3.0-4.0	(75-100)
1-2 cts.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)
Steel:			
1 ct.	Epoxy Mastic Aluminum II	6.0	(150)
1-2 cts.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)
Steel:			
1 ct.	Recoatable Epoxy Primer	4.0-6.0	(100-150)
1-2 cts.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)
Concrete/Masonry:			
1 ct.	Kem Cati-Coat HS Epoxy Filler/Sealer	10.0-20.0	(250-500)
1-2 cts.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)
Aluminum/Galvanizing:			
1 ct.	DTM Wash Primer	0.7-1.3	(18-32)
1-2 cts.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)
ISO 12944 C5M System:			
1 ct.	Zinc Clad III HS	3.0-5.0	(75-125)
1 ct.	Tower Guard Epoxy	5.0-11.5	(125-287.5)
1 ct.	Acrolon 218 HS Polyurethane	3.0-6.0	(75-150)

FIRETEX ONLY:

Finish Coat for FIRETEX Hydrocarbon Systems:

1 ct. Acrolon 218 HS Polyurethane*

*Consult FIRETEX PFP Specialist for recommended dft range

The systems listed above are representative of the product's use, other systems may be appropriate.

DISCLAIMER

The information and recommendations set forth in this Product Data Sheet are based upon tests conducted by or on behalf of The Sherwin-Williams Company. Such information and recommendations set forth herein are subject to change and pertain to the product offered at the time of publication. Consult your Sherwin-Williams representative to obtain the most recent Product Data Information and Application Bulletin.

SURFACE PREPARATION

Surface must be clean, dry, and in sound condition. Remove all oil, dust, grease, dirt, loose rust, and other foreign material to ensure adequate adhesion.

Refer to product Application Bulletin for detailed surface preparation information.

Minimum recommended surface preparation:

* Iron & Steel:	SSPC-SP6/NACE 3, 1-2 mil (25-50 micron) profile
* Galvanizing:	SSPC-SP1
* Concrete & Masonry:	SSPC-SP13/NACE 6, or ICRI No. 310.2R, CSP 1-3

* Primer required

Surface Preparation Standards

	Condition of Surface	ISO 8501-1 BS7079:A1	Swedish Std. SIS055900	SSPC	NACE
White Metal		Sa 3	Sa 3	SP 5	1
Near White Metal		Sa 2.5	Sa 2.5	SP 10	2
Commercial Blast		Sa 2	Sa 2	SP 6	3
Brush-Off Blast		Sa 1	Sa 1	SP 7	4
Hand Tool Cleaning	Rusted	C St 2	C St 2	SP 2	-
	Pitted & Rusted	D St 2	D St 2	SP 2	-
Power Tool Cleaning	Rusted	C St 3	C St 3	SP 3	-
	Pitted & Rusted	D St 3	D St 3	SP 3	-

TINTING

Tint Part A with Maxitoner Colorants.
- Extra white tints at 100% tint strength
- Ultradeep base tints at 150% tint strength

Five minutes minimum mixing on a mechanical shaker is required for complete mixing of color.

APPLICATION CONDITIONS

Temperature:	35°F (1.7°C) minimum, 120°F (49°C) maximum (air and surface) 40°F (4.5°C) minimum, 120°F (49°C) maximum (material) At least 5°F (2.8°C) above dew point
Relative humidity:	85% maximum

Refer to product Application Bulletin for detailed application information.

ORDERING INFORMATION

Packaging:	1 gallon (3.78L) mix:	5 gallon (18.9L) mix:
Part A:	.86 gal (3.25L)	4.29 gal (16.2L)
Part B:	.14 gal (0.53L)	0.71 gal (2.7L)
(premeasured components)		

Weight: 11.2 ± 0.2 lb/gal ; 1.3 Kg/L mixed, may vary with color

SAFETY PRECAUTIONS

Refer to the MSDS sheet before use.

Published technical data and instructions are subject to change without notice. Contact your Sherwin-Williams representative for additional technical data and instructions.

WARRANTY

The Sherwin-Williams Company warrants our products to be free of manufacturing defects in accord with applicable Sherwin-Williams quality control procedures. Liability for products proven defective, if any, is limited to replacement of the defective product or the refund of the purchase price paid for the defective product as determined by Sherwin-Williams. NO OTHER WARRANTY OR GUARANTEE OF ANY KIND IS MADE BY SHERWIN-WILLIAMS, EXPRESSED OR IMPLIED, STATUTORY, BY OPERATION OF LAW OR OTHERWISE, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Weatherproof Boxes, Covers, Lampholders and Lighting Fixtures

NEC/CEC:
Listed for Ordinary Locations

Applications

- Use in branch circuit wiring for wet, damp or dry locations.
- May be used as a junction box or a device box for switches, receptacles, GFCIs, etc.
- Lampholders are for use in exterior and interior applications to provide safety and security for driveways, doorways and walkways.
- Lighting fixtures are for use in areas where moisture ingress is a concern such as construction sites, tunnels, bridges and subways.

Features

- Rugged continuous and seamless diecast construction prevents entry of dirt, dust and moisture.
- Polyester powder coating is applied for uniform cosmetic coating and weatherproof durability.
- Mounting can be achieved with mounting lugs (provided) or by using the integral mounting knockouts.
- Smooth, accurately tapped hubs prevent wire abrasion.
- Clear UL marking and volumetric marking cast into each box and extension ring facilitate electrical inspection.
- Continuous box and cover compression ensure complete sealing at gasket interface to prevent moisture entry.
- Lockable covers and covers with integral devices are offered.
- Closure plugs (2), mounting lugs (2) and green ground screw provided with each box.
- Mounting hardware and gasket provided with each cover.
- Locking swivel knuckle on lampholders permits positive lamp positioning and accurate directional aiming.
- Lampholders are supplied with all hardware including locknuts, porcelain sockets and internal gaskets for reliability and weather protection.
- Photocells and lampholders are supplied with long leads (4" from the end of the knuckle) to facilitate wiring.
- Lighting fixtures are factory assembled and fully gasketed to ensure fast and easy installation.
- Complete installation instructions are provided with each item.
- In-Use covers include patented inserts and comply with NEC requirements.
- Lighting fixtures are individually boxed, labeled and bar coded for ease of handling and identification.

Standard Materials

- Boxes, extensions, covers, lamp-holders, lighting fixtures, and closure plugs: diecast aluminum
- In-use covers: polycarbonate or diecast aluminum
- Lugs: stamped aluminum (one- and two-gang boxes), integrally cast (round boxes)
- Cover screws: plated steel
- Gaskets: closed cell foam (covers), fiber (lampholders), closed cell foam or fiber (lighting fixtures)
- Glass: annealed glass
- Sockets: porcelain (lampholders and lighting fixtures)

NEC/CEC Certifications and Compliances

- UL Standard: 514A, 514D, 1598 as applicable
- UL Listed: E2527, E53330
- CSA Standard: C22.2 No. 18.1, C22.2 No. 250.0 as applicable
- cUL Listed: E2527
- NEMA: FB-1, OS-1

Most of the boxes, covers and lampholders are individually shrink wrapped, labeled and bar coded for ease of handling and identification.

Sturdy corrugated boxes with easy lift–off top with shrink wrapping facilitate merchandising.

Weatherproof Boxes, Covers, Lampholders and Lighting Fixtures

One-Gang Weatherproof Outlet Boxes and Extensions

Closure plugs, ground screw and mounting lugs included.

NEC/CEC:
Listed for Ordinary Locations

	Depth (Inches)	Wiring Cubic Inch Capacity	Hub Size (Inches)	No. Of Hubs	Catalog Number
	2	18.3	1/2	4	**WSL150** ①
	2	18.3	3/4	4	**WSL175**
	2	18.3	1/2	3	**WSM150** ①
	2	18.3	3/4	3	**WSM175**
	2	18.3	1	3	**WSM110**
	2	18.3	1/2	5	**WSP150**
	2	18.3	3/4	5	**WSP175**
	2	18.3	1/2	5	**WSX150**
	2	18.3	3/4	5	**WSX175**
	2	18.3	1	5	**WSX110**
	2-5/8	25.5	1/2	3	**WDM150**
	2-5/8	25.5	3/4	3	**WDM175**
	2-5/8	25.5	1	3	**WDM110**

Catalog number shown represents gray color.

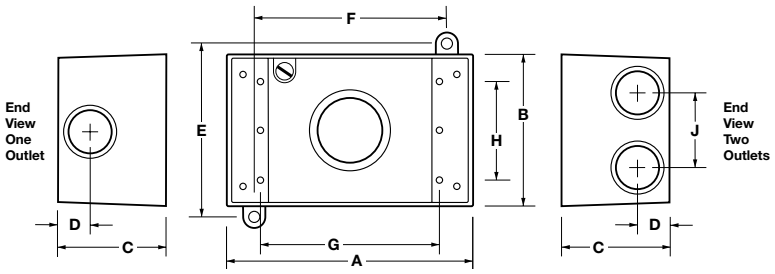
Weatherproof Boxes, Covers, Lampholders and Lighting Fixtures

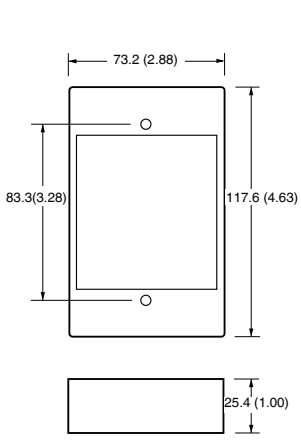
One-Gang Box and Extension Dimensions

Closure plugs, ground screw and mounting lugs included.

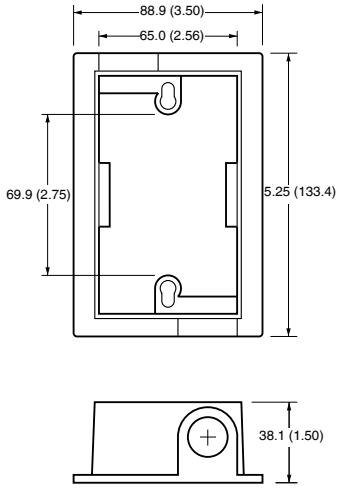
NEC/CEC:
Listed for Ordinary Locations

Dimensions in Millimeters (Inches)





Extension E1



Flanged Extension Adapter: WEFX50, WEFX75

Extensions and Extension Adapters are used to provide additional capacity needed for NEC box fill requirements. Adapters allow installer to add "takeoffs" to new boxes and/or devices.

A	B	C	D	E	F	G	H	J	Catalog Number
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	36.5 (1.43)	**WSL150**
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	36.5 (1.43)	**WSL175**
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WSM150**
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WSM175**
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WSM110**
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	36.5 (1.43)	**WSP150**
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	36.5 (1.43)	**WSP175**
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WSX150**
115.8 (4.56)	71.4 (2.81)	50.8 (2.00)	17.5 (0.68)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WSX175**
114.8 (4.52)	70.4 (2.77)	50.8 (2.00)	17.5 (0.68)	86.4 (3.40)	100.1 (3.94)	82.6 (3.25)	47.8 (1.88)	–	**WSX110**
115.8 (4.56)	71.4 (2.81)	66.8 (2.63)	19.1 (0.75)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WDM150**
115.8 (4.56)	71.4 (2.81)	66.8 (2.63)	19.1 (0.75)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WDM175**
115.8 (4.56)	71.4 (2.81)	66.8 (2.63)	19.1 (0.75)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WDM110**
115.8 (4.56)	71.4 (2.81)	66.8 (2.63)	19.1 (0.75)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WDX150**
115.8 (4.56)	71.4 (2.81)	66.8 (2.63)	19.1 (0.75)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WDX175**
115.8 (4.56)	71.4 (2.81)	66.8 (2.63)	19.1 (0.75)	77.7 (3.06)	88.9 (3.50)	82.6 (3.25)	47.8 (1.88)	–	**WDX110**

Weatherproof Boxes, Covers, Lampholders and Lighting Fixtures

Two-Gang Weatherproof Outlet Boxes and Extensions

Closure plugs, ground screw and mounting lugs included.

NEC/CEC:
Listed for Ordinary Locations

	Depth (Inches)	Wiring Cubic Inch Capacity	Hub Size (Inches)	No. of Hubs	Catalog Number
	2.2	30.2	1/2	7	**WSK250**
	2.2	30.2	3/4	7	**WSK275**
	2.2	30.2	1/2	4	**WSL250**
	2.2	30.2	3/4	4	**WSL275**
	2.2	30.2	1/2	3	**WSM250**
	2.2	30.2	3/4	3	**WSM275**
	2.2	30.2	1	3	**WSM210**
	2.2	30.2	1/2	5	**WSP250**
	2.2	30.2	3/4	5	**WSP275**
	2.2	30.2	1/2	6	**WSR250**
	2.2	30.2	3/4	6	**WSR275**

Weatherproof Boxes, Covers, Lampholders and Lighting Fixtures

Two-Gang Weatherproof Outlet Boxes and Extensions

Closure plugs, ground screw and mounting lugs included.

NEC/CEC:
Listed for Ordinary Locations

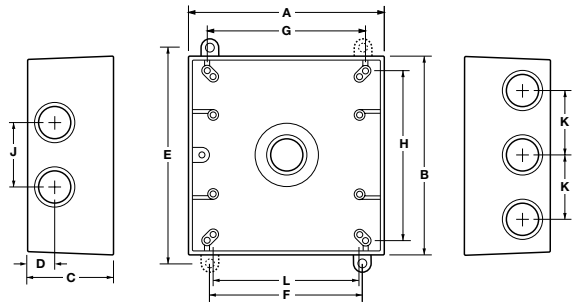
	Depth (Inches)	Wiring Cubic Inch Capacity	HubSize (Inches)	No. Of Hubs	Catalog Number
	2.2	30.2	1/2	7	**WST250**
	2.2	30.2	3/4	7	**WST275**
	2.2	30.2	1/2	5	**WSX250**
	2.2	30.2	3/4	5	**WSX275**
	2.2	30.2	1	5	**WSX210**
	2.78	36	1/2	7	**WDK250**
	2.78	36	3/4	7	**WDK275**
	2.78	36	1	7	**WDK210**
	2.78	36	1/2	5	**WDP250**
	2.78	36	3/4	5	**WDP275**
	2.78	36	1	5	**WDP210**
	1	16	—	—	**WE2**

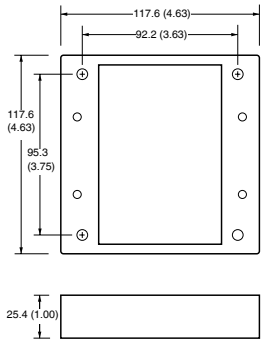
Weatherproof Boxes, Covers, Lampholders and Lighting Fixtures

Two-Gang Box and Extension Dimensions

NEC/CEC:
Listed for Ordinary Locations

Dimensions in Millimeters (Inches)





Extension WE2 – Dimensions in Millimeters (Inches) Extensions and Extension Adapters are used to provide additional capacity needed for NEC box fill requirements. Adapters allow installer to add "take–offs" to new boxes and/or devices.

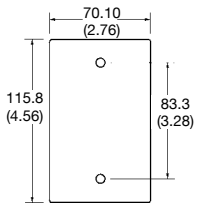
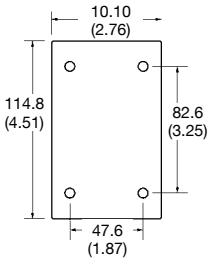
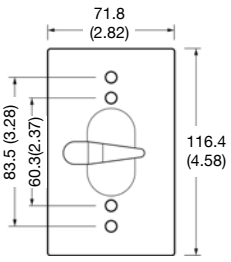
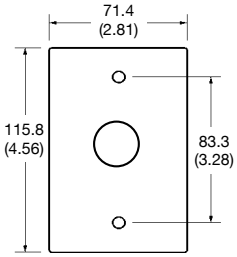
A	B	C	D	E	F	G	H	J	K	L	Catalog Number
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	–	82.6 (3.25)	**WSK250**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	–	82.6 (3.25)	**WSK275**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WSL250**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WSL275**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	–	82.6 (3.25)	**WSM250**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	–	82.6 (3.25)	**WSM275**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	–	82.6 (3.25)	**WSM210**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WSP250**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WSP275**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WSR250**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WSR275**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	38.1 (1.50)	82.6 (3.25)	**WST250**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	38.1 (1.50)	82.6 (3.25)	**WST275**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	–	82.6 (3.25)	**WSX250**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	–	82.6 (3.25)	**WSX275**
115.0 (4.52)	115.0 (4.52)	54.5 (2.14)	16.0 (0.63)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	–	–	82.6 (3.25)	**WSX210**
115.0 (4.52)	115.0 (4.52)	67.8 (2.66)	21.7 (0.85)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WDK250**
115.0 (4.52)	115.0 (4.52)	67.8 (2.66)	21.7 (0.85)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WDK275**
115.0 (4.52)	115.0 (4.52)	67.8 (2.66)	21.7 (0.85)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WDK210**
115.0 (4.52)	115.0 (4.52)	67.8 (2.66)	21.7 (0.85)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WDP250**
115.0 (4.52)	115.0 (4.52)	67.8 (2.66)	21.7 (0.85)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WDP275**
115.0 (4.52)	115.0 (4.52)	67.8 (2.66)	21.7 (0.85)	123.6 (4.86)	98.2 (3.86)	93.7 (3.69)	96.1 (3.78)	38.1 (1.50)	–	82.6 (3.25)	**WDP210**

Weatherproof Boxes, Covers, Lampholders and Lighting Fixtures

One-Gang Weatherproof Covers

Gasket and mounting hardware included.

NEC/CEC:
Listed for Ordinary Locations

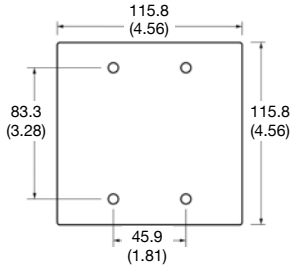
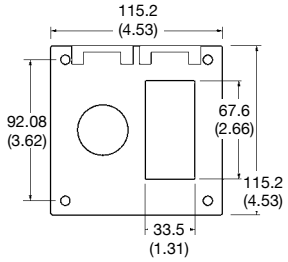
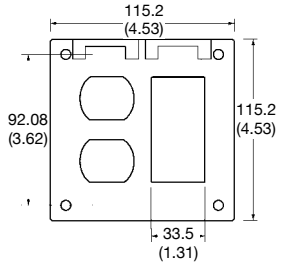
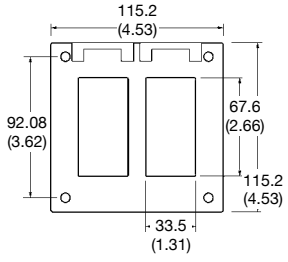
	Description	Orientation	For use with devices	Color	Catalog Number	Dimensions in Millimeters (Inches)
	Blank Cover, 2-screws (stamped aluminum)	Universal	—	Gray	**WCB1**	
	Blank Cover, 4-screws (stamped aluminum)	Universal	—	Gray	**WCB14**	
	Toggle Switch Cover	Vertical	Switch (10A - 20A)	Gray	**WCT1**	
	Toggle Switch Cover w/ switch	Vertical	Switch (15A, 1-pole)	Gray	**WCT115**	
	Toggle Switch Cover w/ switch	Vertical	Switch (15A, 3 Way)	Gray	**WCT113**	
	Cover with Photocell (stamped aluminum)	Universal	Photocell (120A, 300W)	Gray	**WCE1**	

Weatherproof Boxes, Covers, Lampholders and Lighting Fixtures

Two-Gang Weatherproof Covers

Gasket and mounting hardware included.

NEC/CEC:
Listed for Ordinary Locations

	Description	Orientation	For use with devices	Color	Catalog Number	Dimensions in Millimeters (Inches)
	Blank Cover (stamped aluminum)	Universal	—	Gray	**WCB24**	
	Self Closing Cover	Vertical	Single Recept and GFCI	Gray	**WVSG2**	
	Self Closing Cover	Vertical	Duplex Recept and GFCI	Gray	**WVDG2**	
	Self Closing Cover	Vertical	2 GFCI	Gray	**WVGG2**	

Form 85™ Unilets™ Conduit Outlet Bodies, Covers and Gaskets

For use with Rigid Steel, Rigid Aluminum, IMC, and EMT Conduit.

NEC/CEC — Suitable for use in the following Hazardous Locations:
Class I, Division 2 per NEC 501.10(B)(4)

Applications

- Serve as pulling fittings.
- Make bends in conduit system.
- Provide openings for splicing.
- Connect and change direction of conduit runs.
- Allow connections for branch runs.
- Permit access to conductors for maintenance.

Features

- Roomy interiors: more wiring space.
- Smooth, rounded integral bushings in hubs protect conductor insulation.
- Accurately tapped, tapered threads for tight, rigid joints and excellent ground continuity.
- Form 85 copperfree aluminum Unilets™ are lightweight, self-oxidizing, self-renewing and offer a high corrosion resistance.
- Lightweight aluminum facilitates shipping, handling and installing.
- Sizes with flat-back design ideal where fitting is mounted flat against surface.
- 1/2" to 3" blank covers are domed for extra wiring space.

Standard Materials

- Bodies: copperfree (max. 4/10 of 1%) aluminum
  — 1/2” thru 2”: pressure cast
  — 2-1/2” thru 4”: sand cast
- Blank covers: malleable iron, steel or copperfree (max. 4/10 of 1%) aluminum
- Cover screws: stainless steel
- Gaskets: neoprene or composition fiber

Standard Finishes

- Aluminum bodies: epoxy powder coat
- Stamped aluminum covers: natural finish
- Cast aluminum covers: epoxy powder coat

Options

- PVC coating available on all threaded bodies and select covers. Add suffix **-PVC** to catalog number.

NEC/CEC Certifications and Compliances

- UL Standards: 514A, 514B
- UL Listed: E2527
- CSA Standard: C22.2 No. 18.3
- CSA Certified: 065183
- NEMA Standard: FB-1

Related Products

- For explosionproof conduit outlet bodies and boxes, see *Enclosures and Junction Boxes in Protection and Control of Electrical Apparatus and Circuits Catalog.*

Conduit Body with Stamped Aluminum Cover. 2” Type C shown.

Typical Form 85 Conduit Bodies with Setscrews. For use with Electrical Metallic Tubing (EMT).

Form 85™ Unilets™ Conduit Outlet Bodies, Covers and Gaskets

Threaded Type for use with Rigid Metal Conduit and IMC; Setscrew Type for use with Electrical Metallic Tubing (EMT).

NEC/CEC — Suitable for use in the following Hazardous Locations:
Class I, Division 2 per NEC 501.10(B)(4)

Appleton™ Form 85™ Conduit Bodies: Threaded/SetScrew Type ①

		C			E	
Hub Size (Inches)	**Max. Wire Fill**	**Threaded Type**	**Setscrew Type**	**Max. Wire Fill**	**Threaded Type**	**Setscrew Type**
						
1/2	②	**C-50A**	**C-50TA**	②	**E-50A**	**E-50TA**
3/4	(3) # 6	**C-75A**	**C-75TA**	(3) # 6	**E-75A**	—
1	(3) # 4	**C-100A**	**C-100TA**	(3) #6	**E-100A**	—
1-1/4	(3) # 2	**C-125A**	**C-125TA**	—	—	—
1-1/2	(3) # 1/0	**C-150A**	**C-150TA**	—	—	—
2	(3) # 3/0	**C-200A**	—	—	—	—
2-1/2	(3) 300	**C-250A**	—	—	—	—
3	(3) 300	**C-300A**	—	—	—	—
3-1/2	(3) 350	**C-350A**	—	—	—	—
4	(3) 350	**C-400A**	—	—	—	—

		LR			T	
Hub Size (Inches)	**Max. Wire Fill**	**Threaded Type**	**Setscrew Type**	**Max. Wire Fill**	**Threaded Type**	**Setscrew Type**
						
1/2	②	**LR-50A**	**LR-50TA**	②	**T-50A**	**T-50TA**
3/4	(3) # 6	**LR-75A**	**LR-75TA**	(3) # 6	**T-75A**	**T-75TA**
1	(3) # 4	**LR-100A**	**LR-100TA**	(3) # 4	**T-100A**	**T-100TA**
1-1/4	(3) # 2	**LR-125A**	**LR-125TA**	(3) # 2	**T-125A**	—
1-1/2	(3) # 1	**LR-150A**	**LR-150TA**	(3) # 1	**T-150A**	—
2	(3) # 2/0	**LR-200A**	**LR-200TA**	(3) # 2/0	**T-200A**	—
2-1/2	(3) 300	**LR-250A**	—	(3) 300	**T-250A**	—
3	(3) 350	**LR-300A**	—	(3) 300	**T-300A**	—
3-1/2	(3) 350	**LR-350A**	—	(3) 350	**T-350A**	—
4	(3) 350	**LR-400A**	—	(3) 350	**T-400A**	—

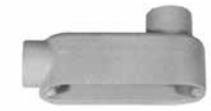
① Refer to following page for Wiring Capacity Table.
② All 1/2" Max Wire Fill Calculations per the NEC - Annex C - Table C8.

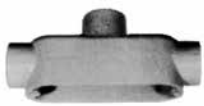
Form 85™ Unilets™ Conduit Outlet Bodies, Covers and Gaskets

Threaded Type for use with Rigid Metal Conduit and IMC; Setscrew Type for use with Electrical Metallic Tubing (EMT).

NEC/CEC — Suitable for use in the following Hazardous Locations:
Class I, Division 2 per NEC 501.10(B)(4)

Form 85™ Conduit Bodies: Threaded/SetScrew Type ①

		LB			LL	
Hub Size (Inches)	**Max. Wire Fill**	**Threaded Type**	**Setscrew Type**	**Max. Wire Fill**	**Threaded Type**	**Setscrew Type**
						
1/2	②	**LB-50A**	**LB-50TA**	②	**LL-50A**	**LL-50TA**
3/4	(3) # 6	**LB-75A**	**LB-75TA**	(3) # 6	**LL-75A**	**LL-75TA**
1	(3) # 4	**LB-100A**	**LB-100TA**	(3) # 4	**LL-100A**	**LL-100TA**
1-1/4	(3) # 2	**LB-125A**	**LB-125TA**	(3) # 2	**LL-125A**	**LL-125TA**
1-1/2	(3) # 1/0	**LB-150A**	**LB-150TA**	(3) # 1	**LL-150A**	**LL-150TA**
2	(3) # 4/0	**LB-200A**	**LB-200TA**	(3) # 2/0	**LL-200A**	**LL-200TA**
2-1/2	(3) 300	**LB-250A**	—	(3) 300	**LL-250A**	—
3	(3) 400	**LB-300A**	—	(3) 350	**LL-300A**	—
3-1/2	(3) 500	**LB-350A**	—	(3) 350	**LL-350A**	—
4	(3) 500	**LB-400A**	—	(3) 350	**LL-400A**	—

		TB	
Hub Size (Inches)	**Max. Wire Fill**	**Threaded Type**	**Setscrew Type**
			
1/2	②	**TB-50A**	—
3/4	(3) # 6	**TB-75A**	—
1	(3) # 6	**TB-100A**	—
1-1/4	(3) # 6	**TB-125A**	—
1-1/2	(3) # 4	**TB-150A**	—
2	(3) # 1/0	**TB-200A**	—
2-1/2	—	—	—
3	—	—	—
3-1/2	—	—	—
4	—	—	—

Back Style for Form 85 Unilet Conduit Body Sizes (Inches)

Unilet Body	Flat Back	Round Back
C, LB, LL, LR, T	1/2 – 2	2-1/2 – 4
TB	1-1/4, 1-1/2	1/2, 3/4, 1, 2
E	1/2 – 1	–

① Refer to following page for Wiring Capacity Table.
② All 1/2" Max Wire Fill Calculations per the NEC - Annex C - Table C8.

Form 85™ Unilets™ Conduit Outlet Bodies, Covers and Gaskets

For Rigid Conduit & IMC.

NEC/CEC — Suitable for use in the following Hazardous Locations:
Class I, Division 2 per NEC 501.10(B)(4)

Applications

- To provide access to conductors for pulling, splicing, maintenance and future changes/ upgrades.
- Allows connection of straight conduit runs, branch conduit runs and 90° bends.

Features

- Tapered threaded hubs (NPT).
- Packaged complete with cover and gasket under one Catalog Number.
- Ready to use.

Standard Materials

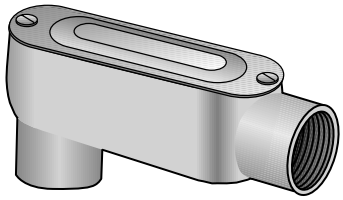
- Conduit Body: copperfree (max. 4/10 of 1%) aluminum
- Cover: **Type BS** copperfree (max. 4/10 of 1%) aluminum
- Gasket: **Type SGN** Neoprene

Standard Finishes

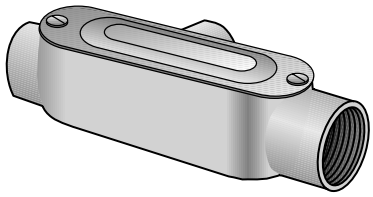
- Conduit Body - epoxy powder coat enamel

NEC/CEC Certifications and Compliances

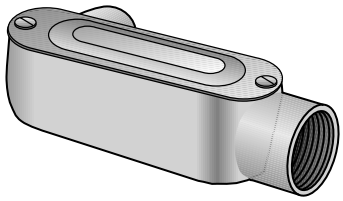
- UL Standards: 514A
- UL Listed: E-18095
- CSA Standard: C22.2 No. 18
- CSA Certified: LR-9795
- NEMA Standard: FB-1, FB-2.10



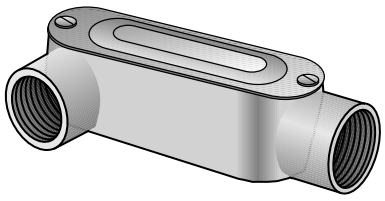
Type LB–ACGA



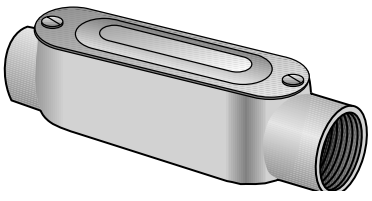
Type T–ACGA



Type LL–ACGA



Type LR–ACGA



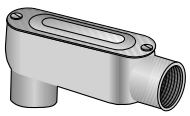
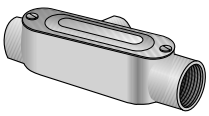
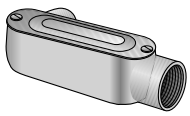
Type C–ACGA

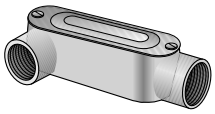
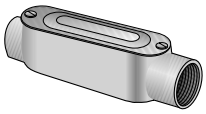
Form 85™ Unilets™ Conduit Outlet Bodies, Covers and Gaskets

For Rigid Conduit & IMC.

NEC/CEC — Suitable for use in the following Hazardous Locations:
Class I, Division 2 per NEC 501.10(B)(4)

Form 85™: Complete with Cover

Hub Size (Inches)	Max. Wire Fill	LB–ACGA	Max. Wire Fill	T–ACGA	Max. Wire Fill	LL–ACGA
						
1/2	①	**LB-50ACGA**	①	**T-50ACGA**	①	**LL-50ACGA**
3/4	(3) # 6	**LB-75ACGA**	(3) # 6	**T-75ACGA**	(3) # 6	**LL-75ACGA**
1	(3) # 4	**LB-100ACGA**	(3) # 4	**T-100ACGA**	(3) # 4	**LL-100ACGA**
1-1/4	(3) # 2	**LB-125ACGA**	(3) # 2	**T-125ACGA**	(3) # 2	**LL-125ACGA**
1-1/2	(3) # 1/0	**LB-150ACGA**	(3) # 1	**T-150ACGA**	(3) # 1	**LL-150ACGA**
2	(3) # 4/0	**LB-200ACGA**	(3) # 2/0	**T-200ACGA**	(3) # 2/0	**LL-200ACGA**

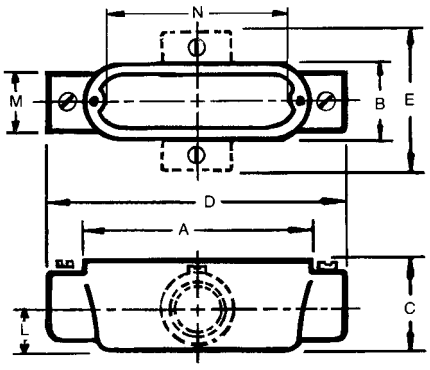
Hub Size (Inches)	Max. Wire Fill	LR–ACGA	Max. Wire Fill	C–ACGA
				
1/2	①	**LR-50ACGA**	①	**C-50ACGA**
3/4	(3) # 6	**LR-75ACGA**	(3) # 6	**C-75ACGA**
1	(3) # 4	**LR-100ACGA**	(3) # 4	**C-100ACGA**
1-1/4	(3) # 2	**LR-125ACGA**	(3) # 2	**C-125ACGA**
1-1/2	(3) # 1	**LR-150ACGA**	(3) # 1/0	**C-150ACGA**
2	(3) # 2/0	**LR-200ACGA**	(3) # 3/0	**C-200ACGA**

Form 85™ Unilets™ Conduit Outlet Bodies, Covers and Gaskets

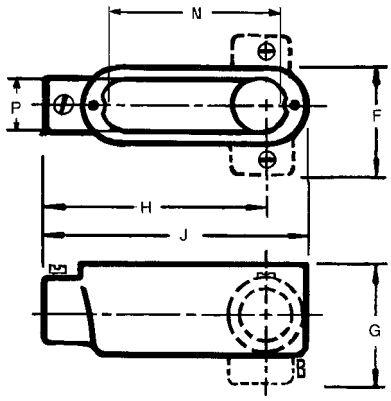
Threaded Type for use with Rigid Metal Conduit and IMC; Setscrew Type for use with Electrical Metallic Tubing (EMT).

NEC/CEC — Suitable for use in the following Hazardous Locations:
Class I, Division 2 per NEC 501.10(B)(4)

Dimensions in Millimeters (Inches)



Types C, T, X



Types E, LB, LL, LR

Hub Size (Inches)	Dimensions In Millimeters (Inches)												
	A	B	C	D	E	F	G	H	J	L	M	N	P
Pressure Cast													
1/2	100.1 (3.94)	33.3 (1.31)	35.1 (1.38)	120.7 (4.75)	65.0 (2.56)	50.8 (2.00)	52.3 (2.06)	88.9 (3.50)	109.5 (4.31)	16.0 (0.63)	28.7 (1.13)	79.8 (3.14)	26.7 (1.05)
3/4	117.6 (4.63)	39.6 (1.56)	41.4 (1.63)	143.0 (5.63)	76.2 (3.00)	57.2 (2.25)	62.0 (2.44)	104.9 (4.13)	130.3 (5.13)	19.1 (0.75)	35.1 (1.38)	96.0 (3.78)	32.3 (1.27)
1	136.7 (5.38)	46.0 (1.81)	47.8 (1.88)	169.9 (6.69)	88.9 (3.50)	66.8 (2.63)	71.4 (2.81)	124.0 (4.88)	152.4 (6.00)	23.9 (0.94)	42.9 (1.69)	114.3 (4.50)	38.6 (1.52)
1-1/4	182.6 (7.19)	63.5 (2.50)	69.9 (2.75)	217.4 (8.56)	—	88.9 (3.50)	98.6 (3.88)	166.6 (6.56)	200.2 (7.88)	26.9 (1.06)	54.1 (2.13)	152.4 (6.00)	57.2 (2.25)
1-1/2	182.6 (7.19)	63.5 (2.50)	69.9 (2.75)	217.4 (8.56)	—	88.9 (3.50)	96.8 (3.81)	163.6 (6.44)	200.2 (7.88)	30.2 (1.19)	60.5 (2.38)	152.4 (6.00)	57.2 (2.25)
2	241.3 (9.50)	79.5 (3.13)	87.4 (3.44)	274.6 (10.81)	—	106.4 (4.19)	115.8 (4.56)	211.1 (8.31)	258.8 (10.19)	38.1 (1.50)	74.7 (2.94)	204.7 (8.06)	69.9 (2.75)
Sand Cast													
2-1/2	311.2 (12.25)	109.5 (4.31)	98.6 (3.88)	384.3 (15.13)	—	146.1 (5.75)	133.4 (5.25)	301.8 (11.88)	347.7 (13.69)	46.0 (1.81)	85.9 (3.38)	270.0 (10.63)	93.7 (3.69)
3	311.2 (12.25)	109.5 (4.31)	117.6 (4.63)	384.3 (15.13)	—	146.1 (5.75)	152.4 (6.00)	293.6 (11.56)	347.7 (13.69)	55.6 (2.19)	104.9 (4.13)	270.0 (10.63)	93.7 (3.69)
3-1/2	378.0 (14.88)	139.7 (5.50)	131.8 (5.19)	460.5 (18.13)	—	181.1 (7.13)	173.0 (6.81)	355.6 (14.00)	419.1 (16.50)	63.5 (2.50)	120.7 (4.75)	333.5 (13.13)	124.0 (4.88)
4	378.0 (14.88)	139.7 (5.50)	141.2 (5.56)	460.5 (18.13)	—	181.1 (7.13)	182.6 (7.19)	349.3 (13.75)	419.1 (16.50)	69.9 (2.75)	130.3 (5.13)	333.5 (13.13)	124.0 (4.88)

Aluminum Liquidtight ST™ Series Connectors with Plain Throat

For Liquidtight Flexible Metal Conduit

NEC/CEC — Suitable for use in the following Hazardous Locations:
Class I, Division 2 per NEC 501.10(B)(4)
Class I, Zone 2 per NEC 505.15(C)(2)
Class II, Division 1 per NEC 502.10(A)(2)(2)
Class II, Division 2 per NEC 502.10(B)(2)

NEC/CEC — Suitable for use in the following Hazardous Locations:
Class III, Division 1 per NEC 503.10(A)(3)(2)
Class III, Division 2 per NEC 503.10(B)
Intrinsically Safe per NEC 504.20

Applications

- Provides a dependable connection for liquidtight flexible metal conduit.

Features

- Lightweight aluminum construction facilitates installation.
- Seals out oil, water, dust, dirt and fumes.
- High corrosion resistance.
- Unique long ferrule with more pronounced threads provides over four times UL pull-out requirements.
- Ferrule provides maximum surface contact for better sealing and a continuous, permanent, positive metal-to-metal ground.
- Liquidtight/raintight/oiltight/concretetight.
- Suitable for wet locations.
- Full, machined tapered threads (NPT).
- Compact design with small turning radius.

Standard Materials

- Copperfree (4/10 of 1% of copper or less) aluminum

NEC/CEC Certifications and Compliances

- UL Standard: 514B
- UL Listed: E-14814
- CSA Standard: C22.2 No. 18.3
- CSA Certified: 065178
- NEMA: FB-1

Straight

Trade Size (Inches)	STD Pipe Thread Size	Dimensions in Millimeters (Inches) A	B	C	Weight per 100 kg (lb)	Catalog Number
3/8 flex, 1/2 hub	1/2" - 14"	36.6 (1.44)	16.0 (0.63)	28.7 (1.13)	101.40 (4.80)	**ST-38AL**
1/2	1/2" - 14"	36.6 (1.44)	16.0 (0.63)	31.8 (1.25)	2.04 (4.50)	**ST-50AL**
3/4	3/4" - 14"	38.1 (1.50)	16.0 (0.63)	38.1 (1.50)	3.00 (6.60)	**ST-75AL**
1	1" - 11-1/2"	41.4 (1.63)	19.1 (0.75)	45.9 (1.81)	4.63 (10.20)	**ST-100AL**
1-1/4	1-1/4" - 11-1/2"	50.8 (2.00)	16.0 (0.63)	58.7 (2.31)	11.43 (25.20)	**ST-125AL**
1-1/2	1-1/2" - 11-1/2"	57.2 (2.25)	16.0 (0.63)	66.8 (2.63)	16.33 (36.00)	**ST-150AL**
2	2" - 11-1/2"	63.5 (2.50)	17.5 (0.69)	81.0 (3.19)	22.45 (49.50)	**ST-200AL**
2-1/2	2-1/2" - 8"	85.9 (3.38)	26.9 (1.06)	100.1 (3.94)	47.63 (105.00)	**ST-250AL**
3	3" - 8"	93.7 (3.69)	30.2 (1.19)	111.3 (4.38)	61.23 (135.00)	**ST-300AL**
4	4" - 8"	101.6 (4.00)	31.8 (1.25)	139.7 (5.50)	90.34 (199.20)	**ST-400AL**

90°

Trade Size (Inches)	Dimensions in Millimeters (Inches) B	C	E	F	Weight per 100 kg (lb)	Catalog Number
3/8 flex, 1/2 hub	16.0 (0.63)	28.7 (1.13)	38.1 (1.50)	31.8 (1.25)	3.08 (6.80)	**ST-9038AL**
1/2	16.0 (0.63)	31.8 (1.25)	38.1 (1.50)	31.8 (1.25)	3.13 (6.90)	**ST-9050AL**
3/4	16.0 (0.63)	38.1 (1.50)	39.6 (1.56)	36.6 (1.44)	5.31 (11.70)	**ST-9075AL**
1	19.1 (0.75)	45.9 (1.81)	47.8 (1.88)	35.1 (1.38)	8.44 (18.60)	**ST-90100AL**
1-1/4	16.0 (0.63)	58.7 (2.31)	60.5 (2.38)	45.9 (1.81)	5.51 (34.20)	**ST-90125AL**
1-1/2	16.0 (0.63)	66.8 (2.63)	81.0 (3.19)	61.9 (2.44)	6.54 (58.50)	**ST-90150AL**
2	17.5 (0.69)	81.0 (3.19)	90.4 (3.56)	66.8 (2.63)	9.46 (87.00)	**ST-90200AL**

Technical Data Sheet

Type LTAE - aluminum, CE Certified Liquid-tight flexible metallic conduit

Aluminum, CE compliant Liquid-tight Flexible Metallic Conduits provide excellent performance in corrosive environments and installations where lightweight wireway is required

Liquidtight Systems™

Features & Benefits:

- Designed to meet UL 360 ID/OD dimension requirements
- Full compliance to IEC 61386-1, -23 requirements, CE Certified
- Trade sizes from 3/8 to 6" (12mm to 155mm)
- Coordinated performance with Series 5200AL Fittings
- NEMA & IP ingress protection ratings aligned with industrial enclosures
- Smooth extruded jackets provide best performance with fittings

Applications:

- Aluminum liquid-tight flexible metallic conduit for use in corrosive environments
- Applications with light weight requirements, 40-50% lighter that typical steel construction
- Used extensively in applications where flexibility is necessary for motion, vibration and bending
- The inherant sunlight resistance of PVC enables this product to be used in outdoor applications
- Liquid-tight applications against water, oils, cutting fluids, mild acids
- For use in electrical circuits up to 1,000 V

Construction / Material / Finish:

- Aluminum Core
- PVC (Polyvinyl Chloride) extruded smooth jacket
- Flame retardent and sunlight UV resistant
- Ink jet printed ratings and technical information
- Full range of trade sizes from 3/8 to 6" (12 to 155mm)
  3/8 to 1-1/4", square lock design
  1-1/2" to 6", fully interlocked design
- Colors: Machine tool gray standard, black optional

Environment ratings:

Working Temperature:

- Gen:
  Dry: -20 to +80°C (-4 to +176°F)
  Oil: -20 to +70°C (-4 to +158°F)
  Wet: -20 to +60°C (-4 to +140°F)
- IEC/CE:
  Gen: -15 to +60°C (+5 to +140°F)

Chemical resistance guide:

- See publication GM7636

Certifications / Standards:

IEC CE RoHS COMPLIANT WEEE WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT

Conforms to:

- IEC 61386-1, -23, Conduit Systems for Cable Management
  EU Doc: EC-012-16-162
- RoHS (Restriction of Hazardous Substance Directive)
- WEEE (Waste Electrical & Electronic Equipment Directive)

Standards requirements:

Designed to UL 360 and CSA C22.2 No. 56 standard requirements including:

- ID and OD Dimensions

Meets all IEC 61386-1, -23 standard requirements including:

- Compression strength - Code 2 Light; 320 N/50mm
- Impact strength - Code 3 Medium; 2 Joules
- Tensile strength - Code 3 Medium; 500 N/2 min.

Ingress protection:

- Provides "Ingress Integrity" between enclosures, fittings, conduits & seals when using LTAE Conduits and Series 5200AL Liquidtight Fittings
- Covers all trade sizes from 3/8" to 4" (12 .. 103mm)

System ingress ratings:

- Products tested and comply with UL 50/50E and CSA C22.2 No. 94
  Type Rating requirements
  Indoor: Type 4, 12, 13
  Outdoor: Type 3, 3R, 4
- NEMA 250: Type 3, 3R, 4, 12, 13

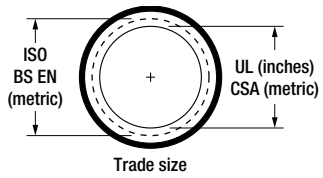
IEC system ingress rating:

- IP ingress protection per IEC 60529 requirements
- IEC ingress rating: IP66, IP67

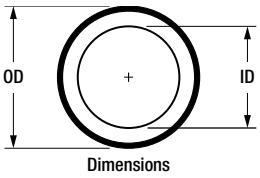
Type LTAE - aluminum, CE Certified
Product selection and dimensions

Product selection

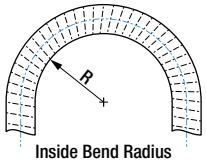
Trade size			Coil length										
UL	CSA	ISO BS EN	Carton			Standard reel			Bulk reel			Weight	
Inches	mm	mm	Part No./GID	Feet	Meter	Part No./GID	Feet	Meter	Part No./GID	Feet	Meter	lbs/ft	kg/m
3/8	12	16	LTAES01G-C	100	30	LTAES01G-K	500	150	LTAES01G-L	1,000	300	0.11	0.16
			7TAA012LB0R0000			7TAA012LB0R0012			7TAA012LB0R0019				
1/2	16	20	LTAES02G-C	100	30	LTAES02G-K	500	150	LTAES02G-L	1,000	300	0.15	0.22
			7TAA012LB0R0001			7TAA012LB0R0013			7TAA012LB0R0020				
3/4	21	25	LTAES03G-C	100	30	LTAES03G-K	500	150	LTAES03G-L	1,000	300	0.20	0.30
			7TAA012LB0R0002			7TAA012LB0R0014			7TAA012LB0R0021				
1	27	32	LTAES04G-C	100	30	LTAES04G-J	400	120	—	—	—	0.29	0.43
			7TAA012LB0R0003			7TAA012LB0R0015							
1-1/4	35	40	LTAES05G-B	50	15	LTAES05G-E	200	60	—	—	—	0.40	0.60
			7TAA012LB0R0004			7TAA012LB0R0016							
1-1/2	41	50	LTAES06G-B	50	15	LTAES06G-D	150	45	—	—	—	0.56	0.83
			7TAA012LB0R0005			7TAA012LB0R0017							
2	53	63	LTAES07G-B	50	15	LTAES07G-C	100	30	—	—	—	0.73	1.09
			7TAA012LB0R0006			7TAA012LB0R0018							
2-1/2	63	70	LTAES08G-A	25	8	—	—	—	—	—	—	1.04	1.55
			7TAA012LB0R0007			—							
3	78	80	LTAES09G-A	25	8	—	—	—	—	—	—	1.44	2.14
			7TAA012LB0R0008			—							
4	103	100	LTAES11G-A	25	8	—	—	—	—	—	—	1.92	2.86
			7TAA012LB0R0009			—							
5	129	—	LTAES12G-A	25	8	—	—	—	—	—	—	2.52	3.75
			7TAA012LB0R0010			—							
6	155	—	LTAES13G-A	25	8	—	—	—	—	—	—	3.16	4.70
			7TAA012LB0R0011										



Trade size



Dimensions



Inside Bend Radius

Dimensions

	Trade size			Minimum inside bend radius				Inches				Millimeters			
	UL	CSA	ISO BS EN	Static		Dynamic		Inside (ID)		Outside (OD)		Inside (ID)		Outside (OD)	
Part number	Inches	mm	mm	Inches	mm	Inches	mm	Min	Max	Min	Max	Min	Max	Min	Max
LTAES01G-*	3/8	12	16	2.0	51	—	—	0.484	0.504	0.690	0.710	12.3	12.8	17.5	18.0
LTAES02G-*	1/2	16	20	2.5	64	—	—	0.622	0.642	0.820	0.840	15.8	16.3	20.8	21.3
LTAES03G-*	3/4	21	25	3.0	76	—	—	0.820	0.840	1.030	1.050	20.8	21.3	26.2	26.7
LTAES04G-*	1	27	32	4.0	102	—	—	1.041	1.066	1.290	1.315	26.4	27.1	32.8	33.4
LTAES05G-*	1-1/4	35	40	4.5	114	—	—	1.380	1.410	1.630	1.660	35.1	35.8	41.4	42.2
LTAES06G-*	1-1/2	41	50	5.5	140	—	—	1.575	1.600	1.865	1.900	40.0	40.6	47.4	48.3
LTAES07G-*	2	53	63	7.0	178	—	—	2.020	2.045	2.340	2.375	51.3	51.9	59.4	60.3
LTAES08G-*	2-1/2	63	70	9.5	241	—	—	2.480	2.505	2.840	2.875	63.0	63.6	72.1	73.0
LTAES09G-*	3	78	80	11.5	292	—	—	3.070	3.100	3.460	3.500	78.0	78.7	87.9	88.8
LTAES11G-*	4	103	100	14.0	356	—	—	4.000	4.040	4.460	4.500	101.6	102.6	113.3	114.3
LTAES12G-*	5	129	—	20.0	508	—	—	4.975	5.035	5.505	5.565	126.4	127.9	139.8	141.4
LTAES13G-*	6	155	—	22.5	572	—	—	6.015	6.075	6.565	6.625	152.8	154.3	166.8	168.3

Note: Product must be installed in accordance with applicable national and local electrical codes.

Threadless Compression and Set–Screw Couplings and Connectors

For RMC and IMC

NEC/CEC — Listed fittings are suitable for use in the following Hazardous Locations:
Class I, Division 2 per NEC 501.10(B)(1)(1)
Class I, Division 2 per NEC 501.10(B)(4)

Application

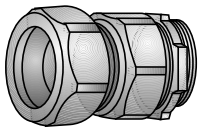
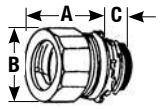
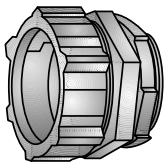
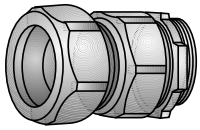
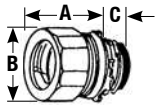
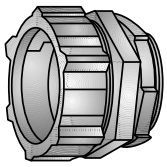
- Compression couplings are used to join lengths of rigid metal conduit.
- Compression connectors are used to secure and terminate rigid metal conduit to enclosures.
- Set-screw couplings are used to join lengths of rigid metal conduit and IMC.
- Set-screw connectors are used to secure and terminate rigid metal conduit and IMC to enclosures.

NEC/CEC Certifications and Compliances

- UL Standard: 514B
- UL Listed: E-11853
- CSA Standard: C22.2 No. 18.3
- CSA Certified: 065178
- NEMA: FB-1

Standard Materials

- Malleable iron/zinc electroplate

	Trade Size (Inches)	Dimensions in Millimeters (Inches) A	B	C	Appleton™ Catalog Number	O–Z/Gedney™ Catalog Number	
Compression Connectors - Concretetight							
	1/2	19.1 (0.75)	35.1 (1.38)	11.2 (0.44)	**NTC-50**	**31-050**	
	3/4	22.4 (0.88)	39.6 (1.56)	11.2 (0.44)	**NTC-75**	**31-075**	
	1	30.2 (1.19)	49.3 (1.94)	14.2 (0.56)	**NTC-100**	**31-100**	
	1-1/4	35.1 (1.38)	58.7 (2.31)	16.0 (0.63)	**NTC-125**	**31-125**	
	1-1/2	35.1 (1.38)	66.8 (2.63)	16.0 (0.63)	**NTC-150**	**31-150**	
	2	38.1 (1.50)	84.1 (3.31)	17.5 (0.69)	**NTC-200**	**31-200**	
	2 - 1/2	54.1 (2.13)	102.4 (4.03)	25.4 (1.0)	**NTC-250** ①	**31-250**①	
	3	62.0 (2.44)	122.2 (4.81)	25.4 (1.0)	**NTC-300** ①	**31-300**①	
	3 - 1/2	66.8 (2.63)	139.7 (5.50)	30.2 (1.19)	**NTC-350** ①	**31-350**①	
	4	65.0 (2.56)	155.7 (6.13)	31.8 (1.25)	**NTC-400** ①	**31-400**①	
	5	55.63 (2.19)	187.45 (7.38)	28.7 (1.13)	—	**31-500**①	
	6	60.45 (2.38)	217.42 (8.56)	35.05 (1.38)	—	**31-600**①	
Compression Connectors — Insulated — Concretetight							
	1/2	19.1 (0.75)	35.1 (1.38)	11.2 (0.44)	**RNTC-50**	**31-050T**	
	3/4	22.4 (0.88)	39.6 (1.56)	11.2 (0.44)	**RNTC-75**	**31-075T**	
	1	30.2 (1.19)	49.3 (1.94)	14.2 (0.56)	**RNTC-100**	**31-100T**	
	1-1/4	35.1 (1.38)	58.7 (2.31)	16.0 (0.63)	**RNTC-125**	**31-125T**	
	1-1/2	35.1 (1.38)	66.8 (2.63)	16.0 (0.63)	**RNTC-150**	**31-150T**	
	2	38.1 (1.50)	84.1 (3.31)	17.5 (0.69)	**RNTC-200**	**31-200T**	
	2-1/2	54.1 (2.13)	102.36 (4.03)	25.4 (1.0)	—	**31-250T** ①	
	3	61.98 (2.44)	122.17 (4.81)	25.4 (1.0)	—	**31-300T** ①	
	3-1/2	66.8 (2.63)	139.7 (5.5)	30.23 (1.19)	—	**31-350T** ①	
	4	65.02 (2.56)	155.7 (6.13)	31.75 (1.25)	—	**31-400T** ①	
	5	55.63 (2.19)	187.45 (7.38)	28.7 (1.13)	—	**31-500T** ①	
	6	60.45 (2.38)	217.42 (8.56)	35.05 (1.38)	—	**31-600T** ①	

Rigid/intermediate grade conduit fittings

Insulating & throat bushings

THROAT BUSHINGS – MALLEABLE IRON

Threaded 105°C rated plastic throat liner

UL File No. E-19189

Insulated

Cat. #	Size	Unit qty.	Wt. lbs. per 100
1031	1/2"	100	3
1032	3/4"	100	4
1033	1"	50	7
1034	1 1/4"	50	15
1035	1 1/2"	10	19
1036	2"	20	22
1037	2 1/2"	10	44
1038	3"	10	54
1039	3 1/2"	5	72
1040	4"	5	95
1041	5"	1	100
1042	6"	1	127

Threadless 105°C rated plastic throat liner

UL File No. E-19189

Cat. #	Size	Unit qty.	Wt. lbs. per 100
S1031	1/2"	100	3
S1032	3/4"	100	4
S1033	1"	50	7
S1034	1 1/4"	50	15
S1035	1 1/2"	10	19
S1036	2"	20	22
S1037	2 1/2"	10	44
S1038	3"	10	54
S1039	3 1/2"	5	72
S1040	4"	5	95
S1041	5"	1	100
S1042	6"	1	127

INSULATED THROAT BUSHINGS – MALLEABLE IRON

Features:

- Plastic liner will not chip, crack, swell or shrink; it resists corrosion, chemicals and temperature extremes

Standard materials:

- Body – malleable iron
- Insuliner – ULTEM1000 rated at 150°C

Standard finish:

- Body – zinc plated

Threaded 150°C rated

UL File No. E-19189

Cat. #	Size	Unit qty.	Wt. lbs. per 100
H1031	1/2"	100	6
H1032	3/4"	100	8
H1033	1"	50	11
H1034	1 1/4"	50	14
H1035	1 1/2"	10	17
H1036	2"	20	24
H1037	2 1/2"	10	51
H1038	3"	10	62
H1039	3 1/2"	5	85
H1040	4"	5	104
H1041	5"	1	130
H1042	6"	1	167

INSULATED THROAT BUSHINGS

Threadless 150°C rated set screw type

UL File No. E-19189

Cat. #	Size	Unit qty.	Wt. lbs. per 100
HS1031	1/2"	100	6
HS1032	3/4"	100	7
HS1033	1"	50	10
HS1034	1 1/4"	50	13
HS1035	1 1/2"	10	15
HS1036	2"	20	21
HS1037	2 1/2"	10	42
HS1038	3"	10	51
HS1039	3 1/2"	5	65
HS1040	4"	5	80
HS1041	5"	1	100
HS1042	6"	1	128

Insulated bushings

INSULATED THROAT BUSHINGS – ZINC DIE CAST

Features:

- Threaded

150°C rated – zinc die cast

UL File No. E-19189

Cat. #	Size	Unit qty.	Wt. lbs. per 100
H1031DC	½"	100	2
H1032DC	¾"	100	3
H1033DC	1"	50	5
H1034DC	1¼"	50	7
H1035DC	1½"	20	9
H1036DC	2"	10	11
H1037DC	2½"	10	27
H1038DC	3"	5	33
H1039DC	3½"	5	39
H1040DC	4"	2	46

NON-INSULATED THROAT BUSHINGS – MALLEABLE IRON

Features:

- Used with locknut to terminate threaded rigid conduit or IMC to enclosure
- Threaded

Cat. #	Size	Unit qty.	Wt. lbs. per 100
1031NI	½"	100	3
1032NI	¾"	100	4
1033NI	1"	50	7
1034NI	1¼"	50	15
1035NI	1½"	10	19
1036NI	2"	20	22
1037NI	2½"	10	44
1038NI	3"	10	54
1039NI	3½"	5	72
1040NI	4"	5	95
1041NI	5"	1	152
1042NI	6"	1	185

NON-INSULATED THROAT BUSHINGS – ZINC DIE CAST

Features:

- Used with locknut to terminate threaded rigid conduit or IMC to enclosure
- Threaded

Cat. #	Size	Unit qty.	Wt. lbs. per 100
1031DC	½"	100	2
1032DC	¾"	100	3
1033DC	1"	50	5
1034DC	1¼"	50	7
1035DC	1½"	20	9
1036DC	2"	10	10
1037DC	2½"	10	26
1038DC	3"	5	32
1039DC	3½"	5	37
1040DC	4"	2	43

INSULATING BUSHINGS

Features:

- Threaded

Standard material:

- Plastic

UL File No. E-19189

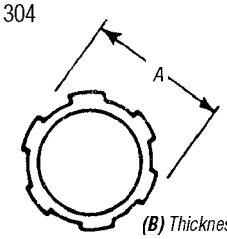
Cat. # Rated 105°C	Cat. # Rated 150°C	Size	Unit qty.	Wt. lbs. per 100
931	**H 931**	½"	50	1
932	**H 932**	¾"	50	1
933	**H 933**	1"	50	2
934	**H 934**	1¼"	50	3
935	**H 935**	1½"	25	3
936	**H 936**	2"	25	4
937	**H 937**	2½"	10	8
938	**H 938**	3"	10	10
939	**H 939**	3½"	5	11
940	**H 940**	4"	5	11
941		5"	5	40
942		6"	5	42

Bushings, Nipples, Locknuts and Plugs

Available in your choice of steel/malleable iron, aluminum or stainless steel.

Locknuts

- Steel from ¼" to 2", malleable iron from 2½" to 6"
- Aluminum 3003 from ½" to 6" or Type 304 stainless steel from ½" to 2"



CAT. NO.				DIMENSIONS (IN.)	
STL./M.I.	ALUM.	ST. STL.	SIZE (IN.)	A	B
139*	—	—	¼	¾	9/64
140*	—	—	⅜	15/16	9/64
141**	141AL	141-SST	½	1 1/64	5/32
142**	142AL	142-SST	¾	1⅜	3/16
143	143AL	143-SST	1	1 11/16	13/64
144	144AL	144-SST	1¼	2 5/32	13/64
145	145AL	145-SST	1½	2½	13/64
146	146AL	146-SST	2	3	7/32
147	147AL	—	2½	3 3/16	13/32
148	148AL	—	3	4 3/16	13/32
149	149AL	—	3½	4 13/16	15/32
150	150AL	—	4	5 5/16	15/32
151	151AL	—	4½	5 15/16	17/32
152	152AL	—	5	6½	17/32
153	153AL	—	6	7¾	19/32

**Hex shape*

***Case hardened locknuts*

Aluminum locknuts comply with federal standard of copper-free aluminum; less than .5% copper.

Available with DURA-PLATE® Finish.

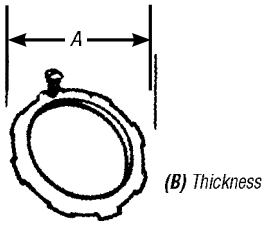
UL File E-23018

CSA File No. 2884

Ensures positive bonding of conduit to box and prevents loosening due to vibration!

Bonding Locknuts

- Steel or malleable iron (steel through 2")
- Can be used anywhere an ordinary locknut is installed
- Also can be used for Service Entrance applications in conformance with code
- T&B rigid conduit and EMT (thinwall) fittings comply with Federal Specification A-A-50553



CAT. NO.	SIZE (IN.)	DIMENSIONS (IN.) A	DIMENSIONS (IN.) B
106†	½	1⅜	.125
107†	¾	1⅜	.140
108	1	1 15/16	.170
109	1¼	2 5/32	.170
110	1½	2½	.170
111	2	3	.187
112†	2½	3 13/32	.375
113†	3	4 13/16	.375
114†	3½	4 29/32	.438
115†	4	5 7/32	.438

† Not CSA certified.

Available with DURA-PLATE® Finish.

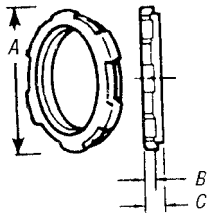
UL File No. E-3060

CSA File No. 638

Provides positive seal against water and oil.

Sealing Locknuts

- For use with rigid and intermediate metal conduits or fittings
- Provides watertight or raintight seal at all enclosures



Molded Santoprene Seal
Color: Blue

CAT. NO.	SIZE (IN.)	DIMENSIONS (IN.) A	DIMENSIONS (IN.) B	DIMENSIONS (IN.) C
141SL	½	1.140	⅛	¼
142SL	¾	1.420	5/32	9/32
143SL	1	1.770	11/64	9/32
144SL	1¼	2.281	11/64	5/16
145SL	1½	2.598	11/64	9/32
146SL	2	3.175	3/16	1/64

UL File No. E-23018

CSA File No. 2884

CS320-2W

Switches and Motor Controls

Color: White

UPC Code: 07847781584

Country of Origin: United States - **Eligible for ARRA funded projects*

made in USA

May include one or more globally sourced components.

RECOVERY.GOV

Brand Features

Leviton's Commercial Specification Grade switches are designed to offer outstanding reliability and top performance in commercial settings. Ideal applications include municipal facilities, government buildings, malls, department stores, hospital and health care facilities, office buildings, schools, colleges, universities, houses of worship and cultural institutions. Leviton offers a large selection of 15 and 20 Amp Commercial switches, available in a wide variety of colors, wiring options and other features.

Item Description

20 Amp, 120/277 Volt, Toggle 3-Way AC Quiet Switch, Commercial Spec Grade, Grounding, Side Wire - WHITE

Technical Information

AC Horsepower Ratings

HP Rating: 1HP-120V 2HP-240V

Electrical Specifications

Amperage: 20 Amp

Voltage: 120/277 VAC

Max. Amperage: 16 Amp

Dielectric Voltage: Withstands 1500V for 1 minute

Temperature Rise: Maximum 30 degrees C rise

Environmental Specifications

Flammability: Rated V-2 per UL94

Operating Temperature: -40ºC to 65ºC

Material Specifications

Body Material: Thermoplastic

Base Material: PBT

Strap Material: Steel

Actuator Material: Polycarbonate

Toggle: Polycarbonate

Cover Material: Nylon

Contacts: Silver-Cadmium .031 Thick

Terminal Screws: Steel 8-32

Color: White

Mechanical Specifications

Terminal ID: Brass-Hot, Green-Ground, Silver-Neutral

Terminal Accom.: 14-12 AWG

Termination: Side

Product ID: Stamped on Strap

Torque Range: 12-14 inch pounds

Product Features

Voltage: 120/277 Volt

HP Rating: 1HP-120V 2HP-240V-277V

Actuator Material: Thermoplastic

Color: White

Warranty: 10 Year Limited

Standards and Certifications

NEMA: WD-1 & WD-6

ANSI: C-73

UL Fed Spec WS896E: File #E7458

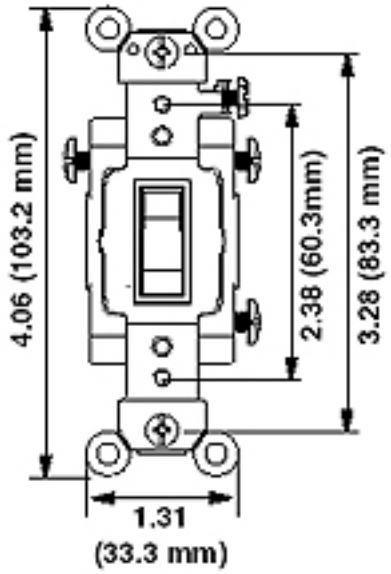
UL Standard: UL 20

CSA C22.2 No. 111: File #152105

NOM: 057

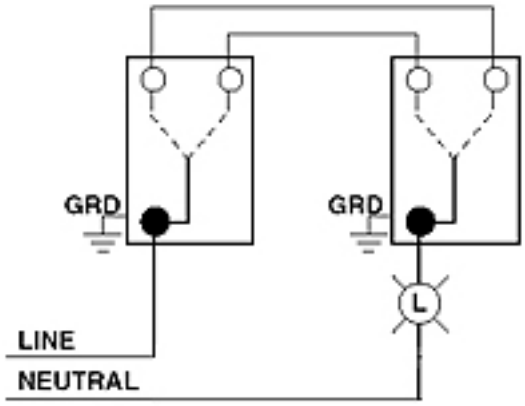
Warranty: 10-Year Limited

Dimensional Diagram



Wiring Diagram

3-Way to 3-Way



SPECIFICATION SUBMITTAL

JOB NAME:	CATALOG NUMBERS:	
JOB NUMBER:		

N7899-W

Ground Fault Circuit Interrupters (GFCIs)

Color: White

UPC Code: 07847753049

Country of Origin: Please Contact Customer Service

NEMA: 5-20R

Brand Features

Slim is in. New SmartlockPro Slim GFCIs Install Easily Industry-leading quality, professional grade lockout action, and the slimmest profile on the market make SmartlockPro Slim GFCIs the smartest choice in ground fault circuit interrupter protection. Faster and easier to install in any wallbox because depth is reduced, the slim GFCIs flush mount to the wall with minimal protrusion for a sleek, finished look. Enhanced features include external back wiring for positive indication the wire is properly seated, exceptional resistance to wire pullout and the ability to withstand high torque.

Item Description

20 Amp, 125 Volt Receptacle/Outlet, 20 Amp Feed-Through, SmartLock Pro Slim GFCI, monochromatic, back and side wired, wallplate/faceplate and self grounding clip included - White

Technical Information

AC Horsepower Ratings

At Rated Voltage: 1 HP

Electrical Specifications

Dielectric Voltage: Withstands 1250VAC per UL 943 and CSA-C22.2 No. 144.1-06

Short Circuit Current Rating: 10KA

Temperature Rise: Max 30C after 100 cycles OL at 150 percent rated current

Environmental Specifications

Flammability: Rated V-2 per UL94

Operating Temperature: -35C to +66C

Material Specifications

Face Material: Thermoplastic

Body Material: Polycarbonate

Line Contacts: Brass Triple Wipe .031 Thick

Terminal Screws: Plated Steel

Grounding Screw: Plated Steel

Yoke: Zinc-Plated Steel

Clamps: Brass

Notes: w/ Wallplate

Mechanical Specifications

Terminal ID: Brass-Hot, Green-Ground, Silver-Neutral

Terminal Accom.: 14-10 AWG

Product ID: Ratings are permanently marked on device

Product Features

Feature: SmartlockPro® Slim

Amperage: 20 Amp

Voltage: 125 Volt

NEMA: 5-20R

Pole: 2

Standards and Certifications

NEMA: WD-6

ANSI: C-73

UL498: Yes

CSA C22.2 No. 42: Yes

NOM: 057

MIL-SPEC: A-A-55459-SB

UL 943: File E48380

Fed Spec WC-596: Yes

CSA-C22.2 No. 144.1-06: File LR-57811

Wire: 3

Trip Level: Class A, 5mA plus or minus 1mA

Termination: Back & Side

Face Material: Thermoplastic

Body Material: Polycarbonate

Grounding: Self-Grounding

Color: White

Strap Material: Galvanized Steel

Standards and Certifications: UL/CSA

Fed Spec WC-596: Yes

Warranty: 2-Year Limited

Notes: w/ Wallplate

Grade: Residential

Features and Benefits

- Reduced depth of SmartlockPro® Slim GFCI makes it easier to install in any electrical box, even shallow ones.
- Terminals allow for easy wiring options – back and side wire capable.
- External back wire clamps provide visual indication of proper wire seating.
- Withstands high torque and resists wire pullout.
- Standard brass self-grounding clip.
- Automatically test the GFCI every time the RESET button is pushed in. The GFCI will not reset if the GFCI circuit is not functioning properly.
- By blocking reset of the GFCI if protection has been compromised, SmartlockPro® Slim GFCI reduces the possibility of end-users incorrectly assuming that a reset GFCI outlet is providing ground fault protection when it actually is not.
- A line-load reversal diagnostic feature is provided which prevents the GFCI from being reset and stops power from being fed to the GFCI receptacle face or through to downstream devices. A green LED indicator on the GFCI's face also illuminates to alert the installer to the line-load wiring reversal.
- Trip threshold meets or exceeds UL requirements for tripping time.
- Improved immunity to high-frequency noise reduces nuisance tripping.
- Advanced electronics design provides superior resistance to electrical surges and over-voltages.
- Compatible with all Decora devices and wallplates; available in select Decora colors.
- UL Fed Spec WC-596 rated.

SPECIFICATION SUBMITTAL

JOB NAME:	CATALOG NUMBERS:	
JOB NUMBER:		

LITHONIA LIGHTING®

Catalog Number	
Notes	
Type	

LED Vapor Tight

XVML

FEATURES & SPECIFICATIONS

INTENDED USE — Ideal for damp/wet locations such as outdoor venues, canopies and locker rooms. **Certain airborne contaminants can diminish the integrity of acrylic and/or polycarbonate.** Click here for Acrylic and Polycarbonate Environmental Compatibility table for suitable uses.

CONSTRUCTION — Light gray, fully gasketed, polycarbonate housing with ten polycarbonate captive latches provides a watertight seal. The high-impact resistant housing and extruded silicone rubber gasket protects the internal components from the environment, including moisture and dirt. 3/8" wet location fitting provided on the 3500LM fixture and 1/2" wet location fitting provided on the 5000LM fixture on one end for use with liquid tight conduit. The housing dimensions vary based on the lumen package selected. See DIMENSIONS drawings on page 2 for details. Polycarbonate latches (included) deter tampering, by accommodating #6-32x3/8" tamper resistant fasteners (not provided). Grade 301 stainless steel latches (available separately) deter tampering, by accommodating #8-32x1/2" tamper resistant fasteners (not provided).

OPTICS — UV-stabilized, high-impact, frosted polycarbonate lens for uniform light output and high-impact resistance.

ELECTRICAL — High-efficiency LEDs. 0-10V dimming standard for a dimming range of 100% to 10%. 3kV Ring, 2kV Combo level of surge protection is standard. Suitable for 50/60 Hz.

INSTALLATION — Mounting hardware for surface mounting to ceiling or wall (horizontally or vertically) included. Mounting hardware kit also includes hooks for suspended mount (chain not included). Optional 45° corner angle bracket mount and junction mount kit also available. Maximum of 15 units or 6A for through wiring connection or daisy chain type installation. Tool-less access for installation.

LISTINGS — UL/C-UL listed to US and Canadian Safety Standards. For use in wet locations under covered ceilings. For use in ambient temperatures from -4°F (-20°C) to 104°F (40°C). IP65 and IP66 rated when ceiling, suspended, wall or corner mounted. Junction Box mount rated IP65. This unit meets FCC Non-Consumer Class A (277v) and Consumer Class B (120V) limits.

DesignLights Consortium® (DLC) qualified product. Not all versions of this product may be DLC qualified. Please check the DLC Qualified Products List at www.designlights.org/QPL to confirm which versions are qualified.

WARRANTY — 5-year limited warranty. Complete warranty terms located at: www.acuitybrands.com/CustomerResources/Terms_and_conditions.aspx

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

ORDERING INFORMATION

Catalog number	Lumens	Voltage	Color temperature	Standard carton quantity
XVML L48 3500LM MVOLT 40K 80CRI	3500LM	MVOLT (120-277)	4000K, 80CRI	1
XVML L48 3500LM MVOLT 50K 80CRI	3500LM	MVOLT (120-277)	5000K, 80CRI	1
XVML L48 5000LM MVOLT 40K 80CRI	5000LM	MVOLT (120-277)	4000K, 80CRI	1
XVML L48 5000LM MVOLT 50K 80CRI	5000LM	MVOLT (120-277)	5000K, 80CRI	1

Accessories: *Order as separate catalog number.*

XVML LATCH STSL	Stainless steel latch kit (Set of 10)[1]
XVMLJSB	Junction box mount[2]
XVMLANGBKT45	Angle mount bracket[3]

Notes

1 To deter tampering, stainless steel latches can accommodate #8-32x1/2" tamper resistant fasteners (not provided). Kit includes 10 latches.

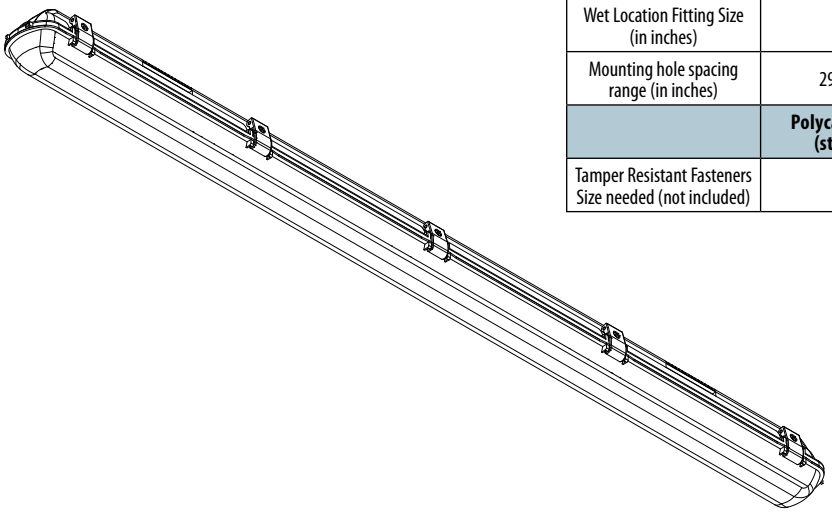
2 IP65 rated. Not compatible with angle mount bracket. Required to be used in center of fixture with supplied brackets for additional mounting support.

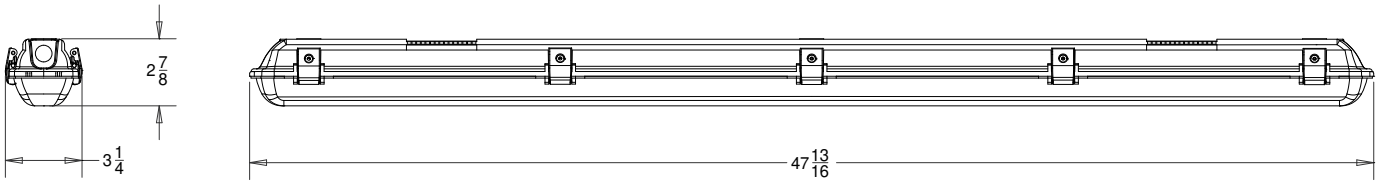
3 For use with applications where ceiling meets wall at a 90° angle. See drawing on page 3 for more information.

DIMENSIONS

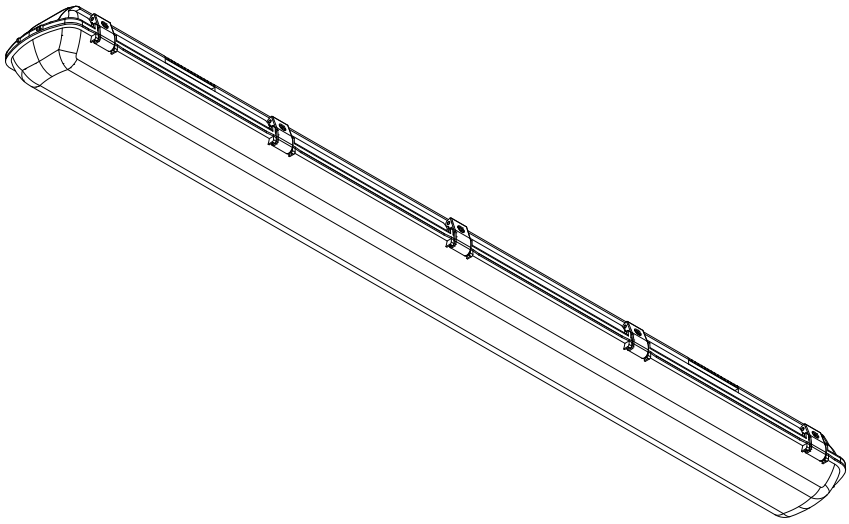
All dimensions are in inches
unless otherwise indicated.

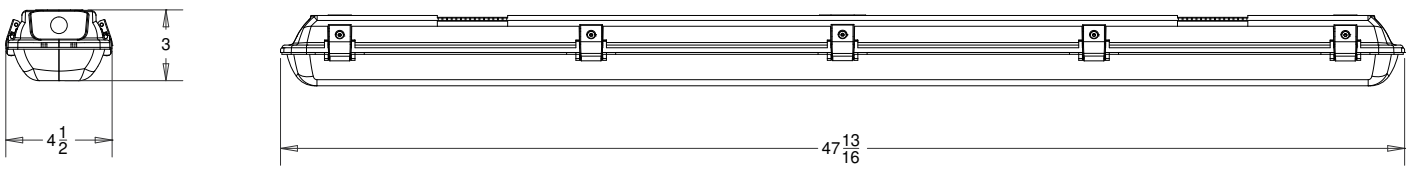
WEIGHT AND PALLET QUANTITY		
	3500LM	**5000LM**
Dimensions (in inches)	47 13/16" x 3 ¼" x 2 7/8"	47 13/16" x 4 1/2" x 3"
Weight	4.4 lbs (2.0 kgs)	6.1 lbs (2.8 kgs)
Pallet Quantity	144	99
Wet Location Fitting Size (in inches)	3/8"	1/2"
Mounting hole spacing range (in inches)	29-5/8"- 33-1/4"	29-5/8"- 33-1/4"
	Polycarbonate latches (standard latch)	**Stainless Steel (optional accessory)**
Tamper Resistant Fasteners Size needed (not included)	#6 - 32x3/8	#8 - 32x1/2





XVML L48 3500LM



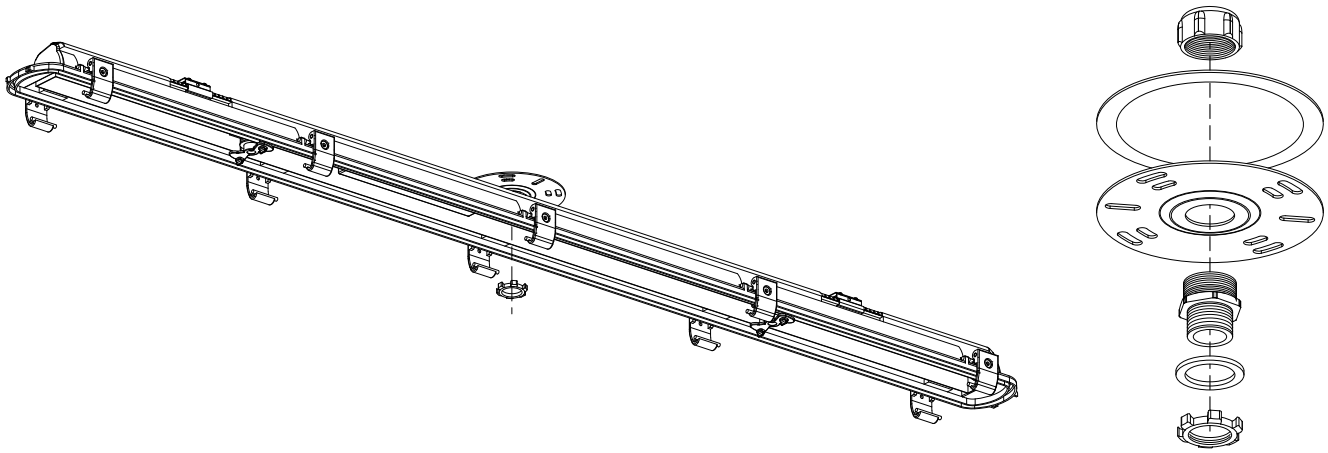


XVML L48 5000LM

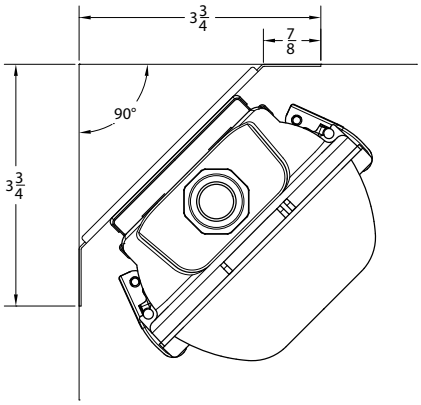
DIMENSIONS

All dimensions are in inches
unless otherwise indicated.

Accessories: *Order as separate catalog number.*



XVMLJSB



XVMLANGBKT45

OPERATIONAL DATA

XVML L48 3500LM MVOLT (80CRI)				
	Lumens	Wattage	LPW	Comparable Light Source
40K	3,558	33	106.6	2 - 32T8 lamps
50K	3,642		110.4	

XVML L48 5000LM MVOLT (80CRI)				
	Lumens	Wattage	LPW	Comparable Light Source
40K	5,365	49	109.6	3-32T8 Lamps, 2-54T5HO lamps
50K	5,534		112.9	

PHOTOMETRICS

See www.lithonia.com.

Circuit Sized THHN/THWN

Vinylon® PVC/Nylon

- **Solid wires: 90°C Dry or Wet**
- **Stranded wires: 90°C Dry, 75°C Wet**
- **600 volts**
- **Gasoline and oil resistant**

APPLICATIONS

600-volt building wire for use in commercial and industrial applications as specified in the NEC®, including machine-tool and appliance wiring. Marked VW-1. Wires with solid conductors are rated THWN-2.

CONDUCTORS

Solid conductors: Uncoated copper per ASTM-B3.
Stranded conductors: Uncoated copper per ASTM-B3, ASTM-B787

INSULATION

Color-coded, heat-and moisture-resistant PVC (polyvinyl chloride)

JACKET

Nylon (polyamide), clear

INDUSTRY STANDARDS*

UL 83: File No. E15119
UL 1063 (MTW): File No. E85964
AWM: File No. E11829
Canada Standard C22.2 No. 75 and CSA Bulletin No. 1451
ASTM Standards: B3, B8, B787
WC70/ICEA S-95-658
Federal Specification A-A-59544
NFPA-70: National Electrical Code®

Cerro Wire LLC self certifies that these products, in stranded constructions, satisfy the product safety requirements identified by the European Low Voltage Directive 2006/95/EC.

SURFACE PRINT

Stranded: CERRO VINYLON-A 1☒ AWG (2.08mm²) (UL) THHN or THWN or MTW or AWM GR2 VW-1 600V - C(UL) TWN75 or T90 NYLON

Solid: CERRO VINYLON-A 1☒ AWG (2.08mm²) (UL) THHN or THWN-2 or AWM GR2 VW-1 600V - C(UL) TWN75 or T90 NYLON

UL LISTED

MADE IN THE USA ©

Circuit Sized THHN/THWN

Vinylon® PVC/Nylon

Product Code	Conductors		Covering		Approx. O.D. Inches	Allowable Ampacities*			Approx. Net. Wt. Lbs./M Ft.
	AWG Size	No. of Strands	PVC Ins. Mils.	Nylon Jkt. Mils.		60°C **	75°C ***	90°C ****	
112-14xxx	14	Solid	15	4	0.104	15	15	15	15
112-16xxx	12	Solid	15	4	0.120	20	20	20	23
112-18xxx	10	Solid	20	4	0.151	30	30	30	37
112-34xxx	14	19	15	4	0.110	15	15	15	16
112-36xxx	12	19	15	4	0.130	20	20	20	24
112-38xxx	10	19	20	4	0.165	30	30	30	39

* Per Table 310.15 (B) (16) NEC®

** For termination to equipment for circuits rated 100 amperes or less or marked for size 14 through 1 AWG conductors. Also for MTW used in wet locations or exposed to oil or coolant.

*** For termination to equipment for circuits rated over 100 amperes or marked for conductors larger than 1 AWG and for THWN in wet locations.
Also for THWN-2 exposed to oil or coolant and MTW in dry locations.

**** For THHN used in dry locations and THWN-2 used in wet or dry locations. For ampacity derating purposes.

Colors available (Product Code 7th and 8th Digits)

AWG Size	Black 01	White 02	Red 03	Blue 04	Green 05	Orange 06	Yellow 07	Brown 08	Purple 09	Grey 10	Pink 11
14 Solid	X	X	X	X	X	X	X	X	X	X	X
12 Solid	X	X	X	X	X	X	X	X	X	X	X
10 Solid	X	X	X	X	X	X	X	X	X	X	X
14 Strand	X	X	X	X	X	X	X	X	X	X	X
12 Strand	X	X	X	X	X	X	X	X	X	X	X
10 Strand	X	X	X	X	X	X	X	X	X	X	X

Packages Available (Product Code 9th Digit)

Package Code	J	M
Size	500' (SPOOL)	2,500' (REEL)
12 S[illegible]	X	X
10 S[illegible]	X	X

NQ Circuit Breaker Panelboards

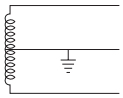
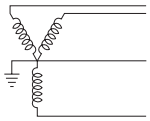
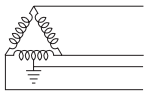
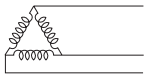
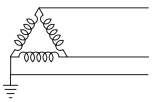
Catalog
1640CT0801
2008
Class 1640

CONTENTS

SQUARE D
by Schneider Electric

Standards and Ratings

NQ circuit breaker panelboards meet US and Canadian standards, and are marked cULus. NQ circuit breaker panelboards accept QO® and QOB branch circuit breakers.

Voltage	System	System Diagram
120/240 Vac	1ϕ3W	
208Y/120 Vac	3ϕ4W	
240/120 Vac	3ϕ4W Delta	
240 Vac	3ϕ3W Delta	
240 Vac	3ϕ3W Grd. Bϕ Delta	

Standards

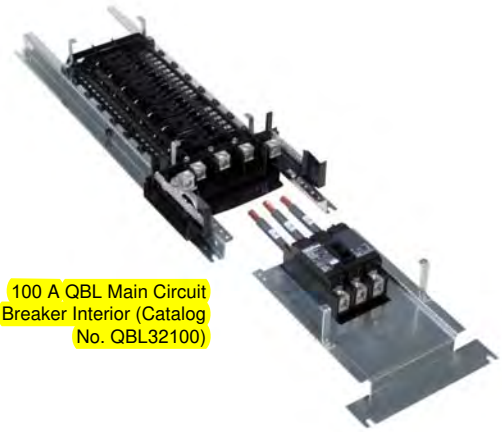
NQ circuit breaker panelboards are designed, manufactured, and tested to comply with the following standards:

- UL 67—Standard for Panelboards
- UL 50—Enclosures for Electrical Equipment
- CSA C22.2, No. 29-M1989—Panelboards and Enclosed Panelboards
- CSA C22.2, No. 94-M91—Special Purpose Enclosures
- NEMA PB 1—Panelboards
- NFPA 70—National Electrical Code® (NEC®)
- Federal Specification W-P-115C Type I Class 1—Circuit Breaker Panelboards
- 2003 IBC, NFPA 5000, ASCE/SE17 Seismic Qualification

Ratings

- Main Circuit Breaker 100–600 A

Interiors



100 A QBL Main Circuit Breaker Interior (Catalog No. QBL32100)

Deadfront Installed

Main Circuit Breaker Interiors

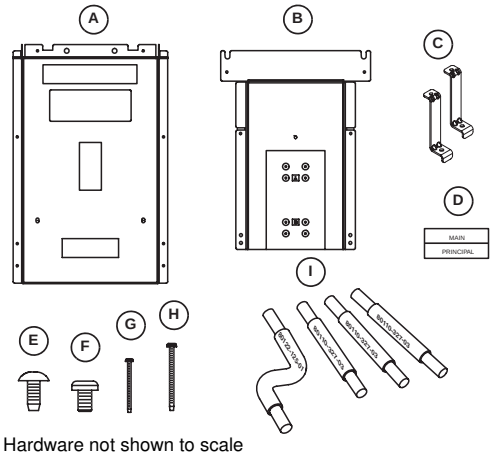
- Will accept plug-on or bolt-on branch circuit breakers.
- Merchandised main circuit breaker interiors are suitable for use as service entrance (US only).
- Service entrance barriers are required and available in Canada (factory-assembled only).
- Top- or bottom-feed.
- 10k AIR branch circuit breakers (fully-rated).
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated

100 A QOB Interior

- 100 A main circuit breaker interiors use a standard main lug interior and an appropriate QOB main circuit breaker in a branch space; vertical main breaker main breaker interiors are also available.
- 100 A main circuit breaker interior consists of:
  - — Standard main lug interior.
  - — Main circuit breaker adaptor kit (NQMB2Q, NQMB2HJ or NQMB2KI).
  - — Appropriate QBL, QDL, QGL, QJL, HDL, HGL, HJL, HLL, JDL, JGL, JJL, JLL, or KIL circuit breaker.
- 100 A main circuit breaker interiors are factory-assembled only.
- 400 A main circuit breaker interiors consist of:
  - — Standard main lug interior
  - — Main circuit breaker adapter kit (Catalog No. NQMB4LA)
  - — Appropriate LAL or LHL circuit breaker
- 600 A main circuit breaker interiors (factory-assembled only) consist of:
  - — Appropriate LCL or LIL circuit breaker

225 A QBL Interior

Main Circuit Breaker Adapter Kits
(Order Circuit Breaker Separately)



Hardware not shown to scale

NQMB2Q
Kit Contents

A. Main circuit breaker deadfront cover (1)
B. Main circuit breaker mounting pan (1)
C. Deadfront support brackets (2)
D. "Main" circuit breaker label (1)
E. 10-32 x 7/16-inch tapping screws (2)
F. 10-32 x 5/16-inch tapping screws (6)
G. 8-32 x 2 ¼-inch tapping screws (2)
H. 8-32 x 3 ¼-inch tapping screws (2)
I. Main lug wires (4)

Table 1: Main Circuit Breaker Adapter Kits

Catalog No.	Ampere Rating	Main Circuit Breaker
NQMB2Q	100–225 A	QBL, QDL, QGL, QJL
NQMB2HJ	100–225 A	HDL, HGL, HJL, HLL, JDL, JGL, JJL, JLL
NQMB2KI	110–225 A	KIL
NQMB4LA	125–400 A	LAL, LHL

Main circuit breakers are not included in the adapter kits, order separately.

Table 2: Main Circuit Breakers

Max. Amperes	Circuit Breaker Type
100 A	QOB[1], QOB-VH[a], or FIL
150 A	HDL, HGL, HJL, or HLL
225 A	QBL, QDL, QGL, QJL, JDL, JGL, JJL, JLL, or KIL
250 A[2]	JDL, JGL, JJL, JLL, or KIL
400 A	LAL or LHL
	LC/LI/LX/LXI/LE[b]
600 A	LC/LI/LX/LXI/LE[b]

1 Backfed main circuit breaker

2 Factory assembled only

Table 3: Additional Main Circuit Breaker Information

Ampere Rating	Circuit Breaker Type	Circuit Breaker Catalog Section Class
100	QOB	730
	FIL	820
150	HDL, HGL, HJL, HLL	611
225/250	QBL, QDL, QGL, QJL	734
	JDL, JGL, JJL, JLL	611
	KIL	825
400	LAL, LHL	660

Field-Installable Circuit Breaker Accessories

Field-installable shunt trip, alarm switch, and auxiliary contacts are available for LAL 400 A main circuit breaker interiors. Refer to the Square D Digest for additional information.

Branch Circuit Breakers (Bolt-on)

Table 8: Branch Circuit Breakers (Plug-on or Bolt-on) [1]

10 k AIR	22 k AIR	65 k AIR	10 k AIR (240 Vac)	42 k AIR
QO, QOB	QO-VH, QOB-VH	QH, QHB	QO-H, QOB-H	QOH
1-Pole 10–70 A	1-Pole 15–30 A	1-Pole 15–30 A	2-Pole 15–100 A	2-Pole 35–125 A
2-Pole 10–125 A	2-Pole 15–150 A	2-Pole 15–30 A		
3-Pole 10–100 A	3-Pole 15–150 A	3-Pole 15–30 A		

[1] Series ratings are also available. Canada: See the Series Rating Guide (data bulletin #S1600PD0302EP) USA: See Switchboard/Panelboard Short-Circuit Current Ratings (data bulletin #2700DB9901), or the Digest

QOB Branch Circuit Breakers

QO Branch Circuit Breakers

Table 9: Branch Circuit Breaker Interrupting Data

Circuit Breaker Catalog Prefix	Max. Vac Rating	Number of Poles	Ampere Rating	Interrupting Rating—RMS Symmetrical Amperes		
				Vac		
				120	120/240	240
QO, QOB	120/240	1	10-70	—	10k	—
	120/240	2	10-125	—	10k	—
	240	3	10-100	—	—	10k
QO-H, QOB-H	240	2	15–125	—	—	10k
QO-VH	120/240	1	15–30	—	22k	—
	120/240	2	15–125	—	22k	—
	240	3	15–100	—	—	22k
QOB-VH	120/240	1	15–30	—	22k	—
	120/240	2	15–150	—	22k	—
	240	3	15–150	—	—	22k
QOH-QOHB	120/240	2	35–125	—	42k	—
QH QHB	120/240	1	15–30	—	65k	—
	120/240	2	15–30	—	65k	—
	240	3	15–30	—	—	65k

Table 10: Additional Branch Circuit Breaker Information

Circuit Breaker Type	Circuit Breaker Catalog Class
QO, QOB	730
QO-AFCI	760
QO-GFI, QOB-GFI	910

Product Data Sheet

9001KYK117

Control Station (Type KY) 10A, 1 Operator(s), 1 N.O./1 N.C., TO STOP - BREAK GLASS

Technical Characteristics

Catalog Reference Number	9001CT0001
Contact Configuration	1 N.O./1 N.C.
Enclosure Material	Die Cast Zinc (Painted Red)
Operators	(1) 9001K15
Markings	TO STOP - BREAK GLASS
Size	30mm
Terminal Type	Screw Clamp
Enclosure Rating	NEMA 3/4/13
Maximum Voltage Rating	300V
Mounting Type	Surface
Type	KY
Includes	Contact Block: KA1; Legend Plate KN799RP
Number of Operators	1
Enclosure Type	Water tight, Dust tight and Oil tight (Indoor/Outdoor)
Approvals	UL Listed File: E42259 CCN NKCR - CSA Certified File: LR25490 Class 3211 03 - CE Marked
Ampere Rating	10A

Shipping and Ordering

Category	21426 - Push Buttons, 30 mm, Metal, Round, Type K
Discount Schedule	CS1
GTIN	00785901039846
Package Quantity	1
Weight	3.25 lbs.
Availability Code	Stock Item: This item is normally stocked in our distribution facility.
Returnability	Y
Country of Origin	MX

Secondary Containment Sub Base Fuel Tank Specifications

General use requirements

- For use in conjunction with diesel powered generator set
- For use in above ground applications only
- Tank is not designed for use as a pressure vessel
- Tank must be vented atmospherically through a minimum of a 2”NPT atmospheric vent pipe

Built in accordance with

- Underwriters Laboratories Standard UL-142
- Flammable and Combustible Liquids Code; NFPA 30
- NFPA 37 Standard for Installation and use of Stationary combustible Engine and Gas Turbines
- NFPA 110 Standard for Emergency and Standby Power Systems

Construction

- Rectangular secondary containment fuel tank with dual wall construction
- Includes reinforced steel box channel for generator support with load rating of 5,000 lbs. per gen-set mounting hole
- Tank is factory pressure tested from 3 psi to verify weld integrity
- Tank is pressure washed with an iron phosphate solution. Interior is coated with a solvent-based film rust preventative providing inter-operational protection.

Venting

- Normal venting sized per American Petroleum Institute Standard No. 2000 Venting Atmospheric and Low Pressure Storage Tanks not less than 2" nominal inside diameter
- Emergency vent sized to accommodate the total capacity of both normal and emergency vents
- Spring-press operated emergency pressure relief vent cap is furnished for the primary and secondary portion of the tank

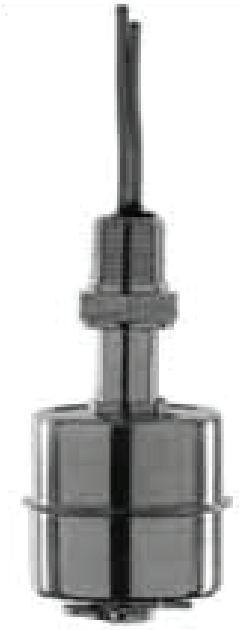
Standard fittings

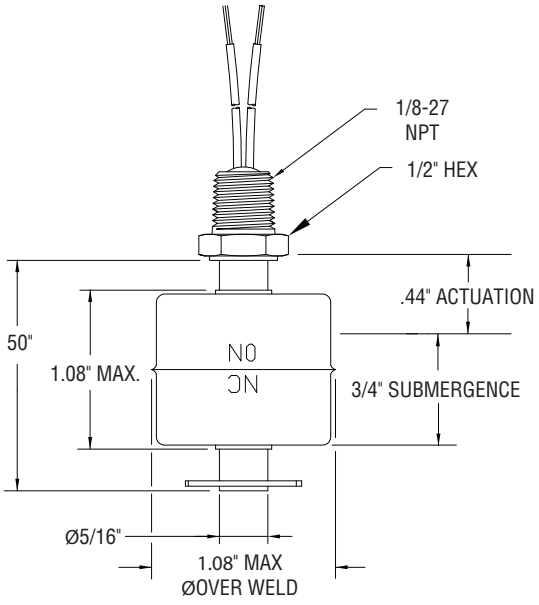
- 2" NPT fuel fill
- 2" NPT for normal vent
- 2" - 8" NPT for emergency vent
- Appropriately sized engine supply and return dip tubes
- Fitting for Fuel level gauge
- Fitting for low level switch option
- Fitting for leak detection switch
- Additional fittings available as needed

Leak Switches

Leak switches come in two configurations. For interstitial space leak detection, the probe will be mounted from the top of the tank. It will be identical to the multi-level probe described above except with only one float at the bottom. These are usually mounted within two inches of the bottom of the tank.

In other configuration a leak switch which is mounted in the base pan area of a pump set or filtration set to detect an oil spill. These are usually directly wired to controllers mounted on the pump set.





Our Fuel Oil Pump Set products are only a part of our complete family of equipment that makes up a typical fuel oil system. Please contact us for your complete system needs.

DATA SHEET

Stainless Steel Continuous
Float Level Sensors

C4651 Series

The C4651 Series monitor liquid levels in small tanks or vessels. These sensors are ideal for water-based fluids or industrial liquid level applications and provide accurate tank level readout and control. The analog continuous level output can be combined with PLC's or digital panel meters or other devices to provide up-to-the-minute level readout and fluid level control.

Applications

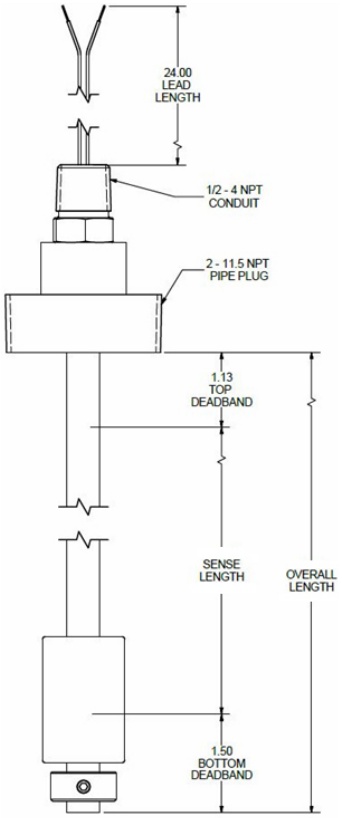
- Small tanks with general fluids
- Ideal for waters, waste and industrial applications

Specifications

- Max. temperature: -40- 221°F /-40- 105°C, non-freezing liquids
- Resolution: 1/4"

Custom Configurations

Contact us directly
for custom solutions.
Email: info@madisonco.com



Part Numbers	Sensing Length	Float Material	Stem Material	Mounting	Float Diameter	Minimum Media SG	Input Voltage	Output
C4651-12802	16"	Polypropylene	316 Stainless Steel	1-1/2" NPT	1.5" OD	0.96	12-30V DC	4-20 mA
C4651-12803	21.13"	316 Stainless Steel		2" NPT	2.13" OD	0.69		
C4651-12804	29.38"	Buna-N		2" NPT	1.25" OD	0.56		

.

Electrical Considerations

When using Madison level switches, it is important to consider the application's electrical parameters. Our level switches utilize reed switch technology, which are glass encapsulated, magnetically actuated switches. Madison generally provides electrical ratings for resistive loads; however, where the maximum current of the load permits, the switches are capable of controlling devices such as motors, solenoids or coils that produce capacitive or inductive electrical loads. Where possible, Madison recommends the use of general-purpose/isolation relays or controllers to protect the switch.

Protection Techniques and Common Failure Modes

Reed Switch protection is the most successful method of increasing the performance and life of your level sensor. Since every application varies, it is important to understand your protection options. The life of the reed switch is typically 1 million cycles, within rated load conditions. The table below is a guide to suggested protection techniques and common failure modes associated with each load type.

Load	Load Example	Protection	Diagram	Common Failure Modes	Failure Mode Description
Resistive (DC)	Indicator Lamp, Heaters	Current Limiting Resistor	A	In-rush Current (Switching)	In-rush current exceeds rating and welds switch closed
				Over-Current (Carry)	Carry-current exceeds rating and switch welds or burns open like a fuse
Inductive & Capacitative (DC)	Relay Coil, Solenoids, Motor	Reversing Diode	B	Over-Voltage (Arcing)	Voltage arcing during switching welds contacts closed
Inductive & Capacitive (AC or DC)		Resistor & Capacitor Network	C		
Resistive, Inductive & Capacitive (AC or DC)	Indicator Lamp, Heaters, Relay Coil, Solenoids, Motor	Varistor or MOV	D	Over-Voltage (Arcing)	Transients voltage spikes exceed breakdown voltage and weld switch closed

Capacitive Load

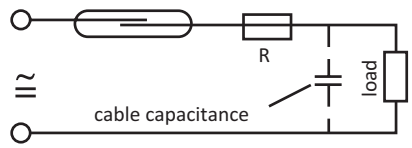


Diagram A: Current Limiting Resistor

Inductive Load

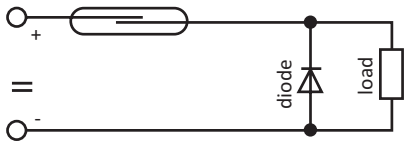


Diagram B: Reversing Diode

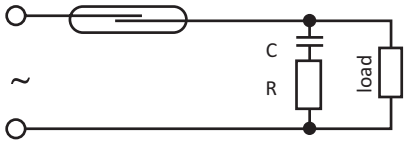


Diagram C: RC Network

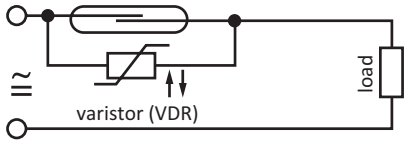


Diagram D: Varistor or MOV

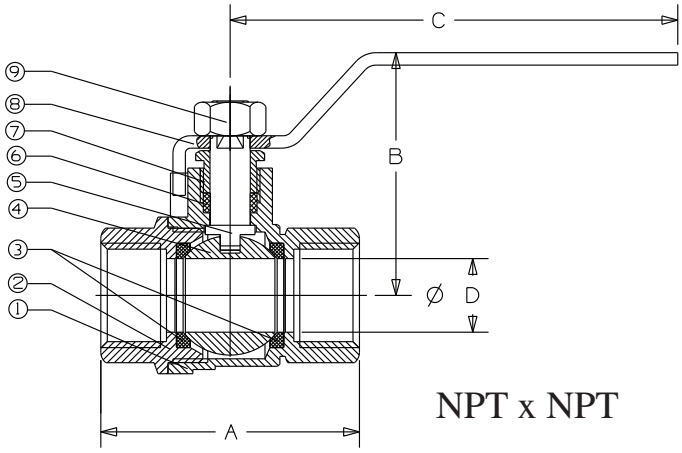
For DC circuits: Insert a 1N4004 diode across the load (i.e.: relay coil) with the cathode end (marked with circular line) connected toward the positive side. This way the diode conducts only when the field collapses. General rule is to use a diode with a voltage rating at least three times the circuit voltage. A 1N4004 has a rating of 1 amp continuous, 30 amp surge, 400V max. Refer to diagram B.

For typical 120V AC circuits: Insert a 50 to 100 ohm, 1/2 watt Resistor in series with a .1 micro farad 400 to 600 volt capacitor across the switch. The capacitor is a high impedance to 60 hertz, but is essentially a short circuit to high frequencies of generated voltages. Alternately, a varistor V130LA10A by itself across the switch will also work for 120V AC. Refer to diagram D.

Isolation Valves

- 1/4" Brass Ball Valve (threaded)
- PTFE Ball Seat
- Chrome Plated Brass Ball
- Brass Stem
- Fluorocarbon O-ring
- PTFE Stem Packing
- Brass Packing Nut / Steel Handle

Threaded



NPT x NPT

Our Fuel Oil Pump Set products are only a part of our complete family of equipment that makes up a typical fuel oil system. Please contact us for your complete system needs.

Model 518 Series 7½ Gallon AST Spill Container

SPECIFICATION SHEET

Application

Tank top spill containers are designed to contain small spills that occur at the fill point on aboveground storage tanks.

Features and Details

- 7½ gallon (28.39 liters) capacity
- Hinged cover lockable with a padlock
- Space saving offset design
- **518** has female threaded offset connection
- **518CC** has female threaded centered connection
- **518M** has male threaded offset connection

Materials of Construction

- Body... 12 gauge spun steel, powder coated white
- Cover... 14 gauge steel, powder coated white
- Drain valve... brass
- Drain o-ring... Viton®

Code Compliance

- Florida DEP EQ 345, meets the new and revised requirements for CAN-ULC-S663-11 (effective September 25, 2015)

Item Number	A	B	C	D	E	F	G	H	I	J
518---0100 AC	7½	F	O	4″	Y	N	15⅞″	$19^{19}/_{64}$″	26.0	$15^{3}/_{32}$″
518CC-0100 AC	7½	F	C	4″	Y	N	15⅞″	$19^{19}/_{64}$″	26.0	$15^{3}/_{32}$″
518M--0100 AC	7½	M	O	4″	Y	N	$17^{13}/_{64}$″	$19^{19}/_{64}$″	26.0	$15^{3}/_{32}$″
518M--0200 AC	7½	M	O	2″	Y	N	$16^{13}/_{32}$″	$19^{19}/_{64}$″	20.0	$15^{3}/_{32}$″

SPECIFICATION OPTIONS:

A—Capacity: Gallons
B—Mounting connection: Male (M), Female (F)
C—Mounting location: Center (C)
D—Size: NPT threads
E—Drain: Yes/No
F—Screen: Yes/No
G—Height: (inches)
H—Width: (inches)
I—Shipping weight: (lbs)
J—Body diameter (inches)

Model 9095AA 2” Overfill Prevention Valve

SPECIFICATION SHEET

Application

The 9095AA 2” series overfill prevention valve is designed to prevent overfilling storage tanks by providing a positive shut-off during a pressurized fill.

Features

- Installs directly onto a 4” riser or top mounted spill container
- Minimum shut-off height is 2” from the tank top
- 2.35” of float height adjustment
- Drop tube adaptor accepts 2” drop fill tubes (Morrison 419)
- Full flow to shut-off point, cushioned closure eliminates shock
- Integral pressure relief
- Integral anti-siphon function
- Optional test mechanism

Materials of Construction

- Direct fill adaptor...passivated aluminum
- Remote adaptor...ductile iron, powder coated
- Shaft, linkage and hardware...stainless steel
- Lower pipe nipple...e-coated steel
- Drop tube adaptor...passivated aluminum
- Body...passivated aluminum

RECENTLY TESTED AND APPROVED FOR FLUIDS WITH VISCOSITIES UP TO 3000 centistokes

ULC LISTED

9095AA0200 (2”)

Operational Criteria

- Minimum 5 PSI flow requirements
- Maximum operating pressure is 100 PSI
- Maximum viscosity of 3000 centistokes (See examples on next page)
- A tight fill connection is required for the valve to operate
- The estimated flow rate is 230 GPM at 10 PSI pressure drop (See flow curve)

NOTE
For use on clean liquids only.

NOTE
9095A models have been replaced with 9095AA models.

Code Compliance

ULC-S661-10 listed, NFPA 30, 30A, UFC, IFC, PEI /RP200, PEI/RP 600, Florida DEP EQ-851, and California EVR models available

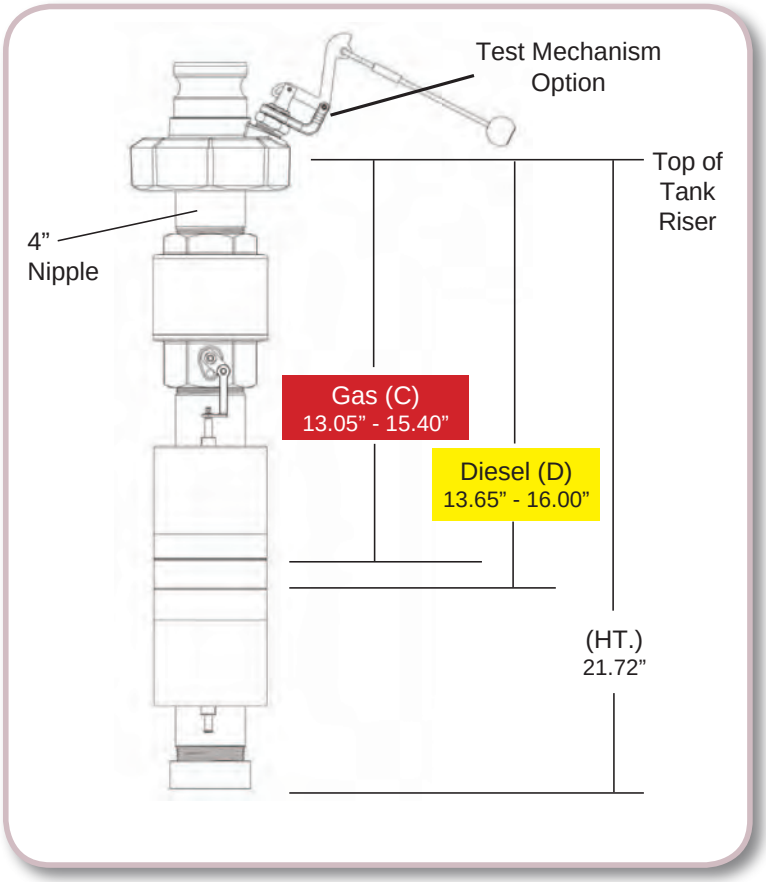
Item Number	Size	Description	Tank Opening	Weight (lbs)
9095AA0200 AV	2”	Valve with 2” male quick disconnect x 4” female threads	4”	14.10
9095AA4000 AV	2”	Valve with 3” male quick disconnect x 4” female threads	4”	16.80
9095AA3200AVEVR	2”	Valve with 2” female threads x 4” female threads	4”	14.10
9095AA4200AVEVR*	2”	Valve with 3” female threads x 4” female threads	4”	21.25
9095AA5200AVEVR	2”	Valve with 2” dry disconnect x 4” female threads	4”	21.25
9095AA9200AVEVR	2”	Valve less adaptor	4”	14.10
9095ATM0100 AM	2" & 3"	Mechanical test mechanism kit for 9095AA Series *(except 9095AA4000 AV)*		.50
9095ATM1000 AK	2” & 3”	Mechanical test mechanism kit for 9095X Series and 9095AA4000AVEVR		
9095A-KIT91 AV	2”	Includes 9095AA0200 AV, 2” x 6’ 419 drop tube, and 305C cap		
9095ATKIT91 AV	2”	Same as 9095A-KIT91 AV, with test mechanism		

EVR

*No mechanical test mechanism available for 9095AA4200 AVEVR.

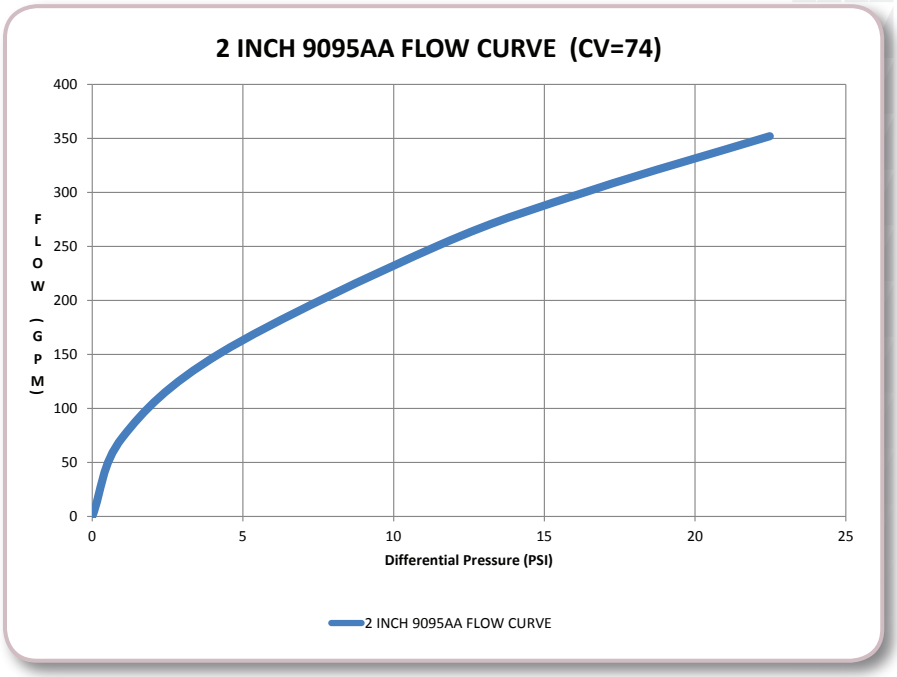
Diagram and flow curve on next page.

MORRISON BROS. CO.



Examples of Oil & Minimum Temperature for Use with 9095AA

Oil Type	Temp (ºF)	CentiStokes (cSt)
15W-40	28	2720
10W-40	25	2800
10W-60	28	2850
5W-40	25	2750
0W-30	15	2900
SAE 30	28	2950



570 E. 7th Street, P.O. Box 238 | Dubuque, IA 52004-0238
t. 563.583.5701 | 800.553.4840 | f. 563.583.5028
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SECTION 4
GENERATOR DRAWINGS AND INTERCONNECTS

1. ENCLOSURE PACKAGE
   a.) CUMMINS C2000D6E GENERATOR SET 2000KW 480VAC
   b.) REMOVABLE DROPOVER ENCLOSURE
   c.) GENERATOR/ENCLOSURE MOUNTING BASE ON TOP OF UL142 BASE TANK
   d.) MINIMUM WIND LOAD OF 125MPH
   e.) DESIGN ROOF LOAD 70PSF, FLOOR LOAD 200PSF

2. ENCLOSURE CONSTRUCTION
   a.) WALLS MINIMUM 12GA ALUMINUM
   b.) ROOF MINIMUM $\frac{1}{8}$" ALUMINUM
   c.) FRAMING/MOUNTING ANGLE FORMED A572 STEEL
   d.) INTERIOR LINER 20GA ALUMINUM PERFORATED SHEET
   e.) INSULATION MATERIAL MINERAL WOOL MINIMUM 6LBS DENSITY 2 HOUR FIRE RATING
   f.) DOORS ALUMINUM CONSTRUCTION, SOUND ATTENUATED, W/ S.S. UL LISTED PANIC HARDWARE
   g.) INTAKE FIXED ALUMINUM CONSTRUCTION
   h.) INTAKE DUCT SILENCERS ALUMINUM CONSTRUCTION
   i.) RADIATOR DISCHARGE GRAVITY DAMPER ALUMINUM CONSTRUCTION
   j.) INSULATED RADIATOR DISCHARGE PLENUM ALUMINUM CONSTRUCTION

3. DESIGN CONDITIONS
   a.) ENGINE AIRFLOW
      RADIATOR - 73,210 CFM
      COMBUSTION - 5,639 CFM
      EXHAUST - 15,388 CFM
   b.) DESIGN PRESSURE DROP NOT TO EXCEED 0.5" H2O
   c.) SOUND LEVEL NOT TO EXCEED 85dBA@7M
   d.) GEN-SET WEIGHT 28,000LBS
   e.) FUEL TANK DRY WEIGHT 18,650LBS
   f.) ENCLOSURE/BASE WEIGHT 19,750LBS

4. PAINTING
   a.) EXTERIOR ALUMINUM SURFACES
      MECHANICAL CLEANING TO SSPC-SP3
      SOLVENT WASH TO SSPC-SP1
      ONE COAT OF MACROPOXY 646 3-5 MILS
      ONE COAT OF ACROLON ULTRA 2-3 MILS
   b.) ALL CARBON STEEL SURFACES
      NEAR WHITE BLAST PER SSPC-SP10
      ONE COAT OF ZINC CLAD III 2-3 MILS
      ONE COAT OF MACROPOXY 646 3-5 MILS
      ONE COAT OF ACROLON ULTRA 2-3 MILS
   c.) CUSTOMER CUSTOM MATCH. TBD

*CUSTOMER TO VERIFY ALL NOTES AND DIMENSIONS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:
FRACTIONS ±1/32 DECIMALS X.XX ±0.03 X.XXX ±0.010 ANGLES ±.5°
MATERIAL
FINISH
DO NOT SCALE DRAWING

APPROVALS	DATE
DFTG	2-11-25
CHKR	
ENG MGR	
MATL	-
COMPL	
PERF	-
MFG	-
COG ENG	-

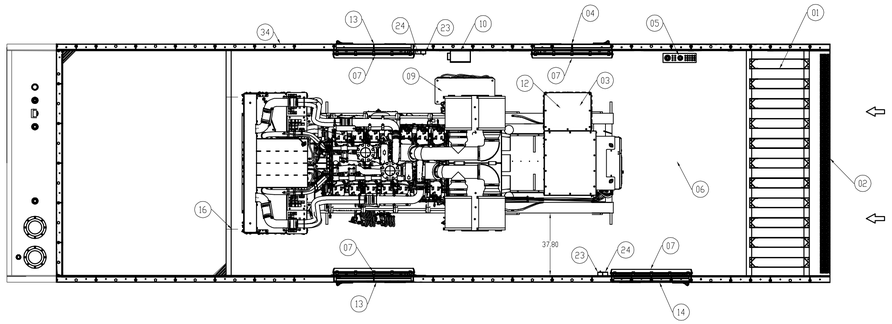
PRECISION POWER SOURCE
6718 W PLANK RD
PEORIA, IL 61604

TITLE: CUMMINS C2000D6E 2000KW GENERATOR SET PACKAGE WITH UL142 BASE TANK GENERAL NOTES DRAWING

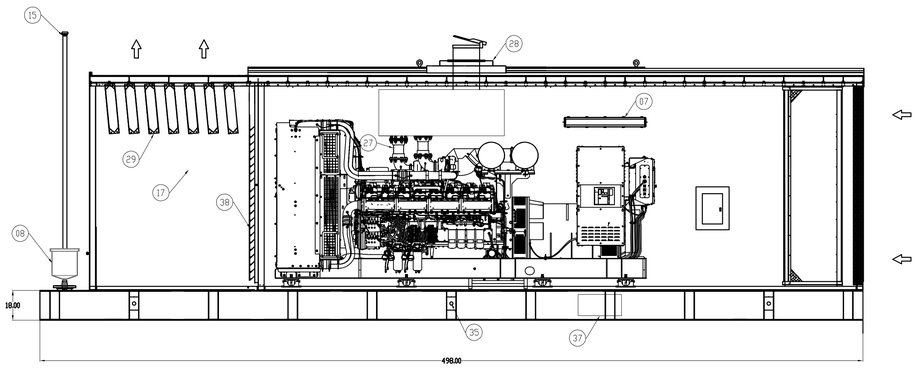
SIZE D | FSCM NO. | SCALE 0027

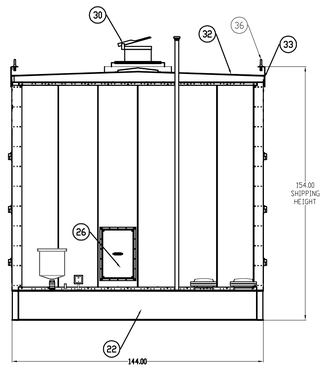
DWG NO. CUMMINS-2000KW-3375GAL-GA | REV 00

SHEET 1 OF 4

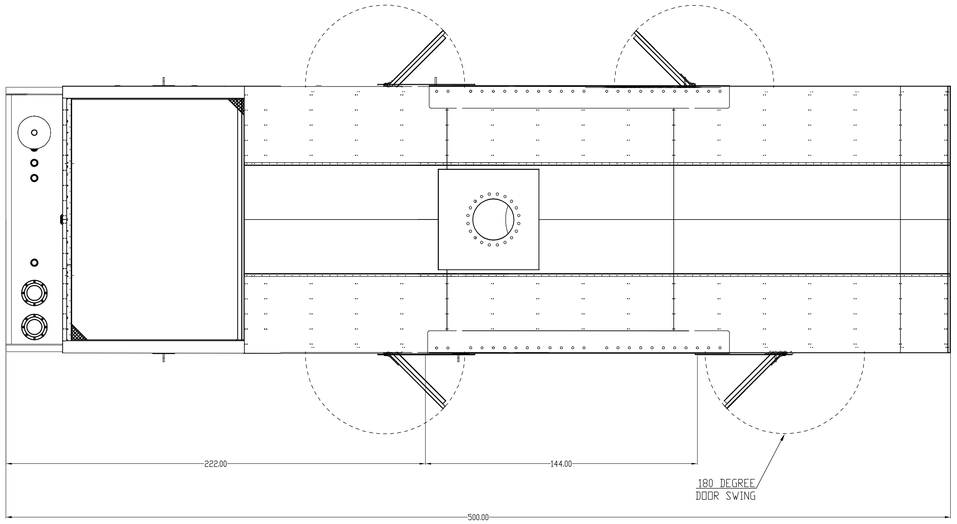


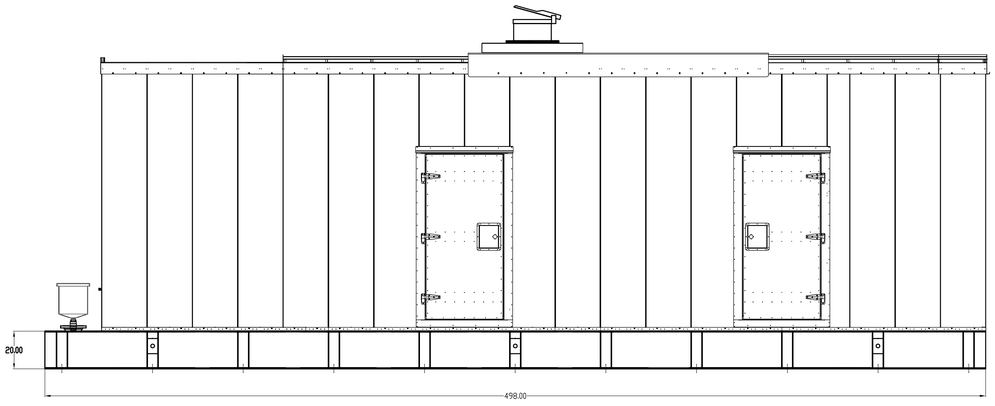
BILL OF MATERIALS		
LTR	QTY	DESCRIPTION
01	11	INTAKE DUCT SILENCERS 36" DEPTH
02	1	ACCUPAC XF80MAX INTAKE WATER SEPARATOR/FILTER SYSTEM
03	1	MAIN BREAKER(CUSTOMER SUPPLIED), MOUNTED TO GENERATOR
04	1	MAIN BREAKER DOOR, 36"X84",W/UL LISTED S.S. PANIC HARDWARE, KEYED ALIKE
05	1	100A 240/120VAC 1 PH PANEL BOARD
06	1	ANTISLIP FLOOR IN PERSONNEL ACCESS AREAS
07	4	48" LED INTERIOR VAPORTITE FIXTURES WIRED TO 3/4 WAY SWITCHES
08	1	5 GAL FUEL FILL/SPILL WITH OPV AND OPW TANK LEVEL ALARM PANEL
09	4	ENGINE STARTING BATTERIES(CUSTOMER SUPPLIED) MOUNTED IN RACKS
10	1	ENGINE STARTING BATTERY CHARGER(CUSTOMER SUPPLIED) MOUNTED ON WALL BY PPS
12	1	MAIN POWER CABLE STUBUP THROUGH TOP OF FUEL TANK FOR CUSTOMER CABLE
13	2	ENGINE MAINTENANCE PERSONNEL ACCESS DOOR, 36"X84",W/UL LISTED S.S. PANIC HARDWARE, KEYED ALIKE
14	1	CONTROL PANEL/ DISTRIBUTION PANEL ACCESS DOOR, 36"X84",W/UL LISTED S.S. PANIC HARDWARE, KEYED ALIKE
15	1	FUEL TANK NORMAL VENT PORT EXTENDED ABOVE ENCLOSURE ROOF
16	1	RADIATOR DISCHARGE TRANSITION WITH BELTING
17	1	RADIATOR DISCHARGE HOOD, VERTICAL DISCHARGE W/BIRDSCREEN
22	1	3375 USEABLE GALLON UL142 DOUBLE WALL BASE TANK 110% RUPTURE
23	2	3 WAY INTERIOR LIGHT SWITCH WITH S.S. COVER
24	2	20A GFCI RECEPTACLE WITH S.S COVER
26	1	DISCHARGE PLENUM ACCESS HATCH
27	2	ENGINE EXHAUST FLEX WITH GASKETS AND HARDWARE
28	2	ENGINE EXHAUST OUTLET S.S. RAIN CAP
29	3	ENGINE RADIATOR EXHAUST DUCT SILENCERS 36"
30	1	ENGINE EXHAUST DISCHARGE WEATHER CAP
32	1	ALUMINUM SEAM WELDED, DOUBLE PITCHED ROOF, MINIMUM 2" PITCH
33	2	ENCLOSURE LIFTING BRACKET, BOLTED TO ENCLOSURE
34	2	1" ENGINE DRAIN CONNECTIONS THROUGH WALL, W/BRAIDED HOSE
35	6	FUEL TANK LIFTING EYES, FOR TANK LIFTING ONLY
36	4	ENCLOSURE ASSEMBLY LIFTING EYELETS
37	1	CABLE PASSTHROUGH ACCESS PORT WITH COVER PLATE
38	1	RADIATOR EXHAUST OUTLET GRAVITY DAMPER/ALUMINUM

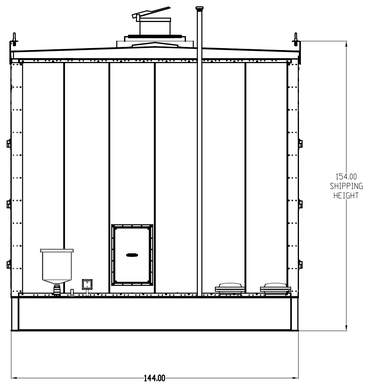




UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ±1/32 DECIMALS ±.XX 0.03 ±.XXX 0.010 ANGLES ±5°	APPROVALS	DATE	PPS PRECISION POWER SOURCE 6718 W PLANK RD PEORIA, IL 61604
	IFTG	2-3-25	
	CHKR		
	ENG MGR		TITLE CUMMINS C2000DE6 2000KW GENERATOR SET PACKAGE WITH UL142 BASE TANK GENERAL ARRANGEMENT DRAWING
MATERIAL	MATL –	–	
	COMPL –	–	
FINISH	PERF –	–	SIZE D / FSCM NO. / DWG NO. CUMMINS-2000KW-3375GAL-GA / REV 00
	MFG –	–	
DO NOT SCALE DRAWING	COG ENG –	–	SCALE 0.027 / SHEET 2 OF 4



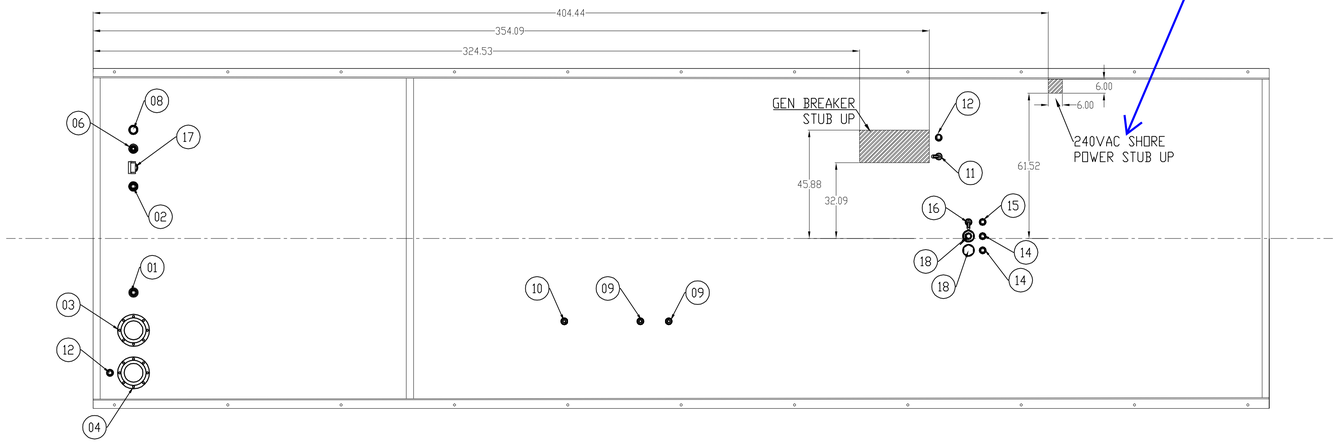


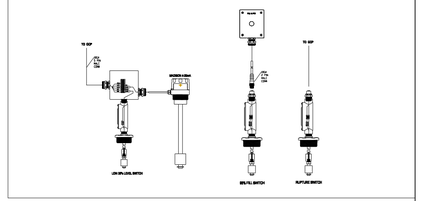


UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:	APPRIVALS	DATE	PPS PRECISION POWER SOURCE EST. 2007 — 6718 W PLANK RD, PEORIA, IL 61604
	DFTG	3-12-25	
FRACTIONS ±1/32 DECIMALS X.XX ±.03 X.XXX ±.010 ANGLES ±.5°	CHKR		TITLE: CUMMINS C2000D6E 2000KW GENERATOR SET PACKAGE WITH UL142 BASE TANK GENERAL ARRANGEMENT DRAWING
	ENG MGR		
MATERIAL	MATL –	–	
	COMPL –	–	
FINISH	PERF –	–	SIZE D — FSCM NO. — DWG NO. CUMMINS-2000KW-3375GAL-GA — REV 00
	MFG –	–	
DO NOT SCALE DRAWING	CDG ENG –	–	SCALE 0.027 — SHEET 3 OF 4

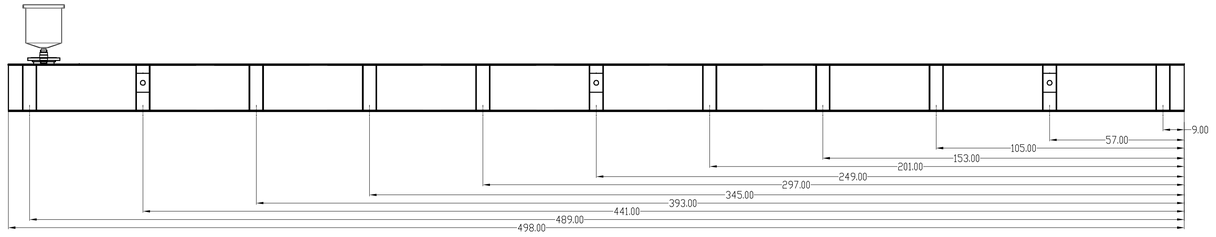
TOTAL GALLONS	USEABLE GALLONS
3600	3375

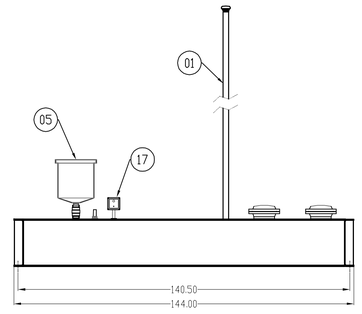
BILL OF MATERIALS			
LTR	QTY	SIZE	DESCRIPTION
01	1	2"NPT	NORMAL TANK VENT, PRIMARY TANK, EXTENDED ABOVE ENCLOSURE
02	1	2"NPT	SPARE, PRIMARY TANK
03	1	8"FL	EMERGENCY VENT, PRIMARY TANK, W/PRESSURE RELIEF CAP
04	1	8"FL	EMERGENCY VENT, SECONDARY TANK, W/PRESSURE RELIEF CAP
05	1	NA	7.5 GALLON FILL/SPILL CONTAINMENT WITH DRAIN
06	1	2"NPT	MECHANICAL LEVEL GAUGE, DIRECT SIGHT
07	1	2"NPT	DRAIN-FILL/SPILL CONTAINMENT WITH VALVE
08	1	2"NPT	FUEL FILL W/OPV SET AT 90%, 2" CAMLOCK
09	2	2"NPT	ENGINE FUEL SUPPLY W/DIP TUBE, S.S. BRAIDED HOSE TO ENGINE
10	1	2"NPT	ENGINE FUEL RETURN , S.S. BRAIDED HOSE TO ENGINE
11	1	2"NPT	LEAK DETECTION SWITCH, N.O. CONTACT, WIRED TO GCP
12	2	2"NPT	SPARE, SECONDARY TANK
14	2	2"NPT	SPARE, PRIMARY TANK
15	1	2"NPT	MADISON LEVEL SENSOR 4-20mA OUTPUT WIRED TO GCP
16	1	2"NPT	LOW LEVEL SWITCH, N.C. CONTACT, 35% FUEL LEVEL, WIRED TO GCP
17	1	2"NPT	HIGH LEVEL SWITCH, N.O. CONTACT, 95% FUEL LEVEL, WIRED TO TANK ALARM PANEL
18	2	4"NPT	SPARE, PRIMARY TANK





NOTES:
UL142 110% BASIN TANK CONSTRUCTION
TESTED TO 3PSI
UL142 DOUBLE WALL DESIGN - UL LABEL INSTALLED
TANK MATERIAL 1/4" STEEL PLATE MINIMUM
WELDING PER AWS D1.1
NFPA 30/ NFPA 37
BLASTED TO SSPC-SP 10 NEAR WHITE BLAST
PRIMED 1 CT ZINC CLAD 2 2.0-4.0 MILS
PRIMED 1 CT MACROPOXY 646 5.0-10.0 MILS
FINISHED 1 CT ACROLON ULTRA 3.0-6.0 MILS





UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32 DECIMALS X.XX 0.03 X.XXX 0.010 ANGLES ±.5°
MATERIAL
FINISH
DO NOT SCALE DRAWING

APPROVALS		DATE
DFTG		3-15-25
CHKR		
ENG MGR		
MATL	-	-
COMPL	-	-
PERF	-	-
MFG	-	-
CDG ENG	-	-

PRECISION POWER SOURCE EST. 2007

6718 W PLANK RD
PEORIA, IL 61604

TITLE: CUMMINS C2000D6E 2000KW GENERATOR SET PACKAGE WITH UL142 BASE TANK DRAWING

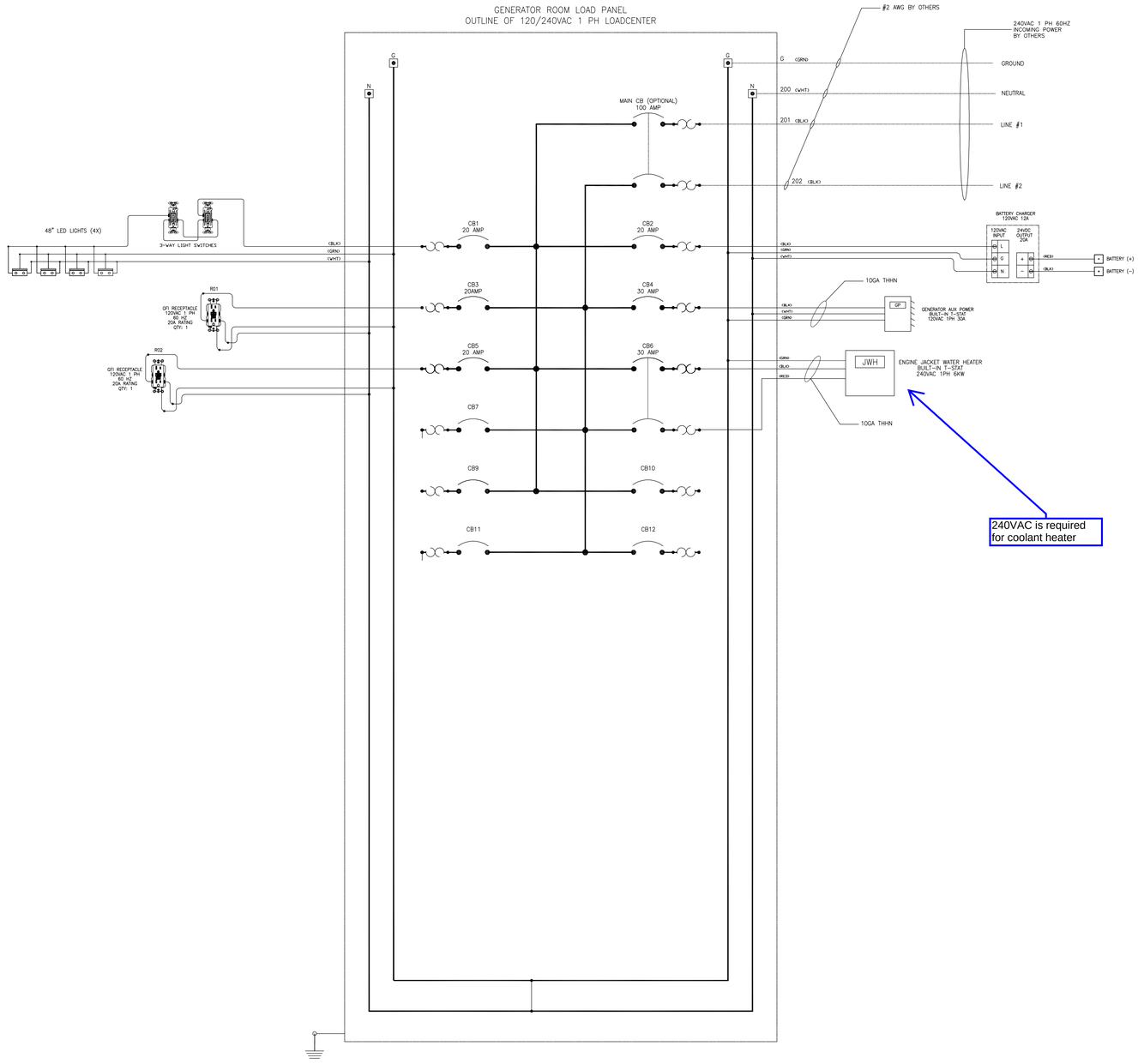
SIZE D | FSCM NO. | DWG NO. CUMMINS-2000KW-3375GAL-GA | REV 00

SCALE 0.027 | SHEET 4 OF 4

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

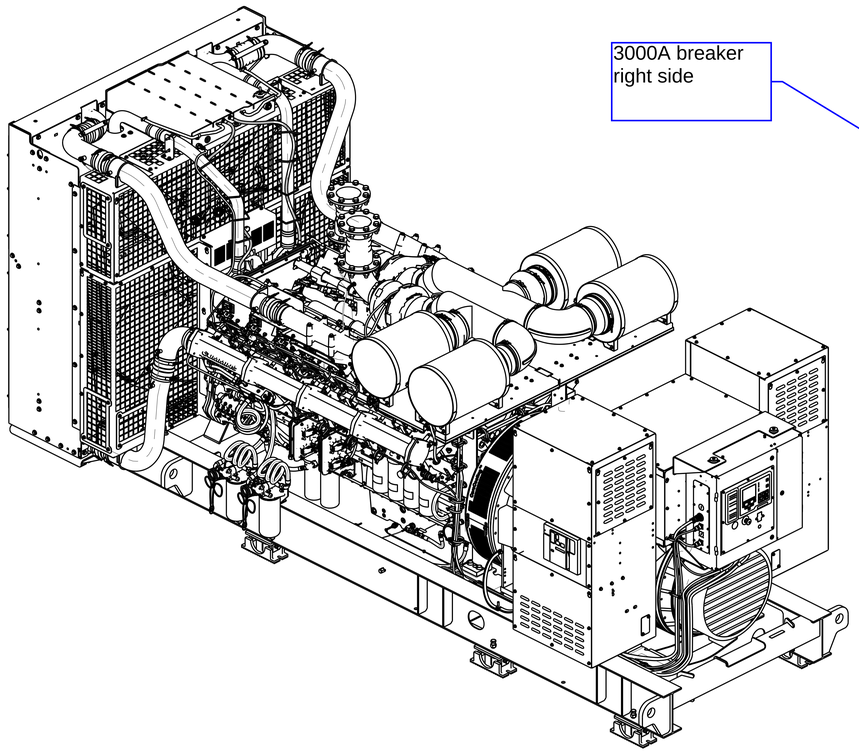
NOTE:

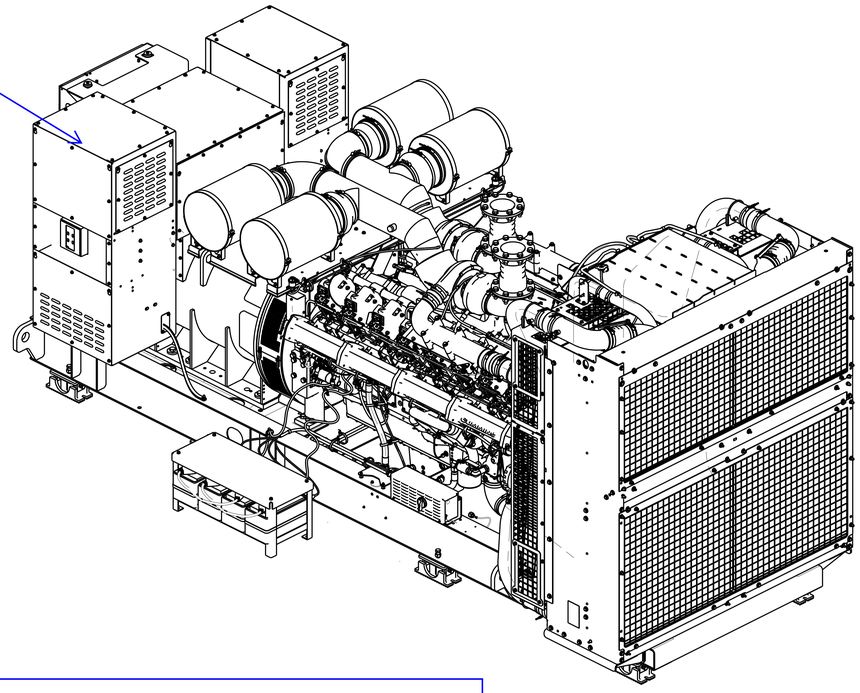
WIRE SIZE IS MINIMUM 12GA UL-1015 OR THHN UNLESS OTHERWISE NOTED.



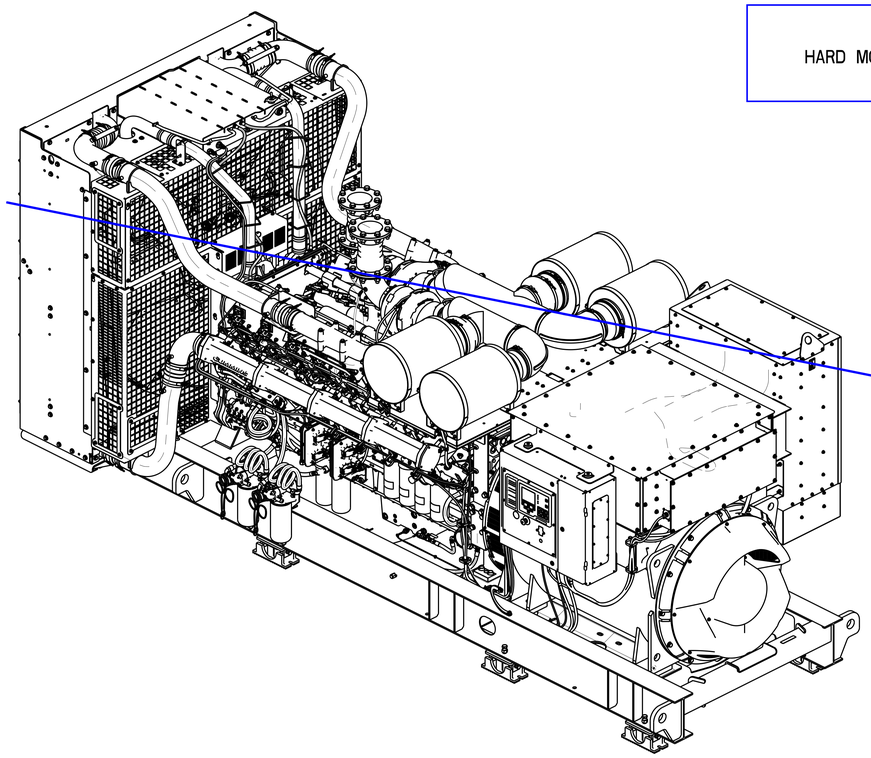
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE:	APPROVALS	DATE	PRECISION POWER SOURCE
FRACTIONS ±1/32 DECIMALS X.XX .03 X.XXX .010 ANGLES ±.5°	DFTG VY	3/17/25	6718 W PLANK RD PEORIA, IL 61604
	CHKR		
	ENG MGR		TITLE CUMMINS C2000D6E 2000KW GENERATOR SET PACKAGE INTERIOR ELECTRIAL DRAWING
MATERIAL	MATL –	–	
	COMPL –	–	
FINISH	PERF –	–	SIZE D / FSCM NO. / DWG NO. CUMMINS-2000KW-3375GAL-EL / REV 00
	MFG –	–	
DO NOT SCALE DRAWING	COG ENG –	–	SCALE 0.010 / SHEET 1 OF 1

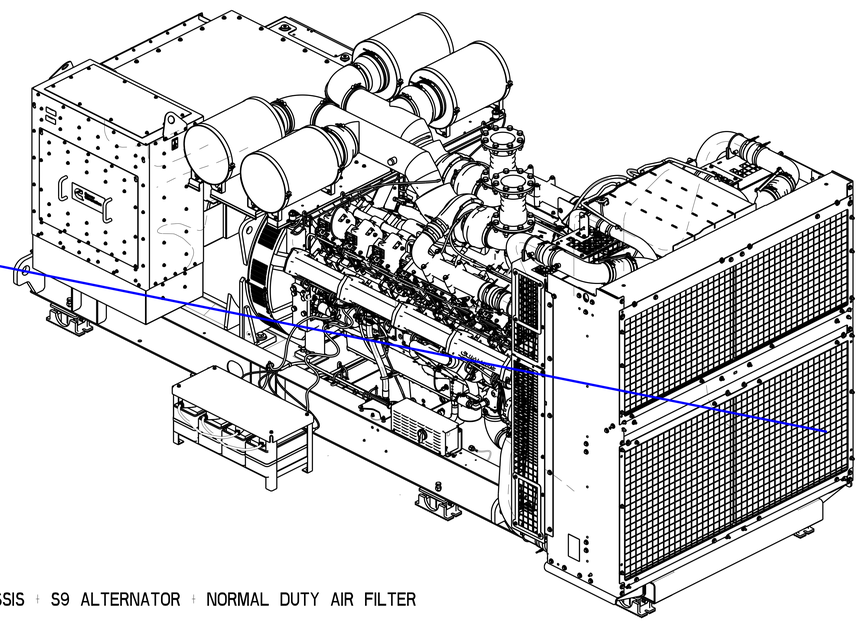
3000A breaker
right side





HARD MOUNTED CHASSIS + S7 ALTERNATOR + NORMAL DUTY AIR FILTER





HARD MOUNTED CHASSIS + S9 ALTERNATOR + NORMAL DUTY AIR FILTER

GENSET MODEL CONFIGURATION TABLE

GENSET MODEL	ENGINE	INSTALLATION FAN (COOLING SYSTEM)	ALTERNATOR	AIR CLEANER	CB
C1750D6E & C2000D6E	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S7-C	NORMAL DUTY HEAVY DUTY	2 CB 1 CB ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S7-D	NORMAL DUTY HEAVY DUTY	2 CB 1 CB ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S7-E	NORMAL DUTY HEAVY DUTY	2 CB 1 CB ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S7-F	NORMAL DUTY HEAVY DUTY	2 CB 1 CB ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S7-G	NORMAL DUTY HEAVY DUTY	2 CB 1 CB ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S7-H	NORMAL DUTY HEAVY DUTY	2 CB 1 CB ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S7-J	NORMAL DUTY HEAVY DUTY	2 CB 1 CB ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S9-B	NORMAL DUTY HEAVY DUTY	ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S9-C	NORMAL DUTY HEAVY DUTY	ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	
	QSK50-G24	A073W661 INSTALLATION, FAN (STD FAN)	S9-D	NORMAL DUTY HEAVY DUTY	ENTRANCE BOX ONLY (NO CB)
	QSK50-G25	A073W321 INSTALLATION, FAN (HIGH SPEED FAN)		NORMAL DUTY HEAVY DUTY	

OTHER AVAILABLE OPTIONS	
1	COOLANT HEATER
2	OIL DRAIN VALVE
3	OIL HEATER
4	ALTERNATOR HEATER
6	BATTERY HEATER
7	OIL MAKE UP
8	OIL SAMPLING VALVE
9	FUEL IN AND DRAIN HOSES
10	EXHAUST BELLOWS
11	MUFFLER
12	REDUNDANT STARTER/BATTERY SYSTEM
13	AIR RESTRICTION INDICATORS
14	SEISMIC-ANTI-VIBRATION ISOLATORS
15	BATTERY CHARGER

LAST DATUM LETTER USED: -		LAST REFERENCE LETTER USED: E	
MODEL/PLATFORM: QSK50		THIS PART IS SIMILAR TO: -	
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY			ANG. TOL.: ± 1.0°
SURFACE FINISH PER: -		SURFACE FINISH: -	
WALL THICKNESS: -	DRAFT ANGLES: -	EDGE RADII: -	FILLET RADII: -
DIMENSIONAL TOLERANCES:	X ± 3	.X ± 1	.XX ± 0.5
HOLE SIZE 0.00-4.99 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

PART NUMBER: A060C089	PART REVISION: D
PART NAME: OUTLINE,GENSET	
DRAWING CATEGORY: DETAIL	
STATE: RELEASED	SHEET: 2 OF 10
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	

Cummins Inc.

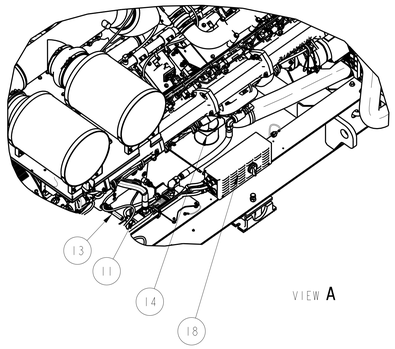
DIMENSIONS ARE IN: MILLIMETERS
[ ] ARE IN: INCHES

SIZE: A0 SCALE: 1/16

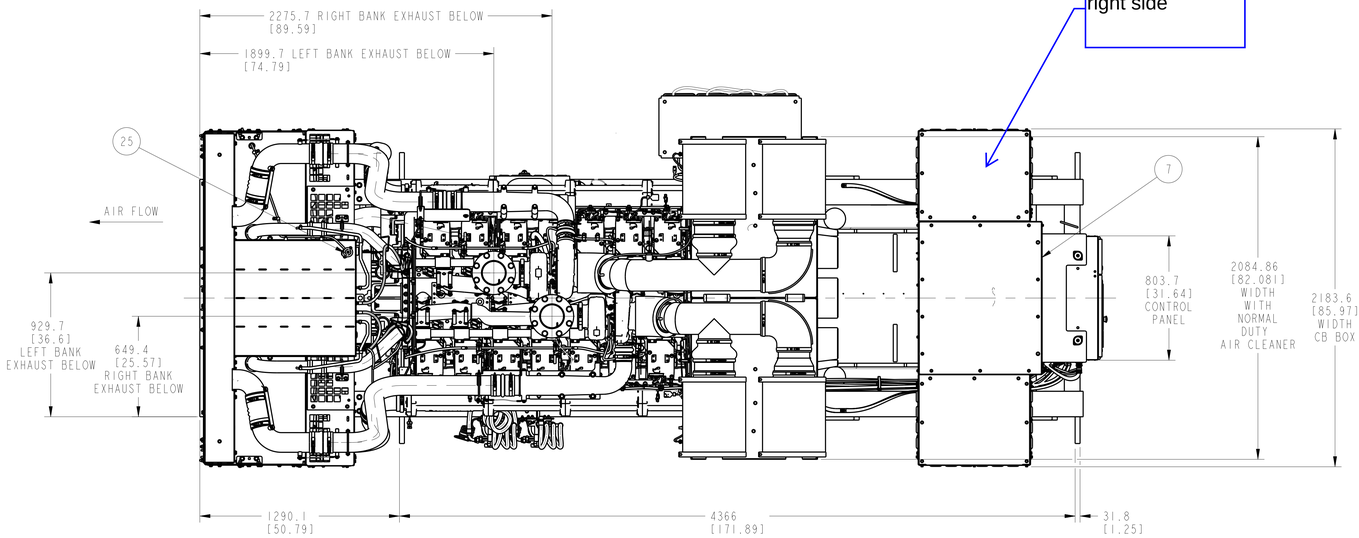
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009

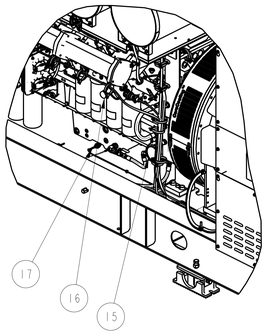
THIRD ANGLE PROJECTION

CAD SYSTEM
PTC® Creo® Parametric

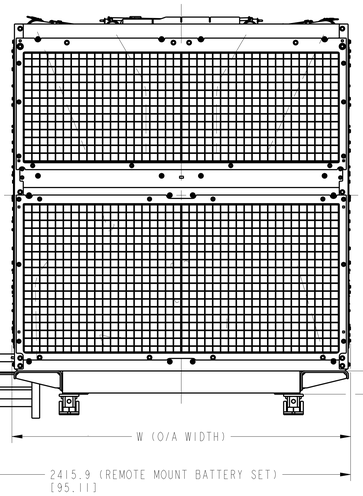


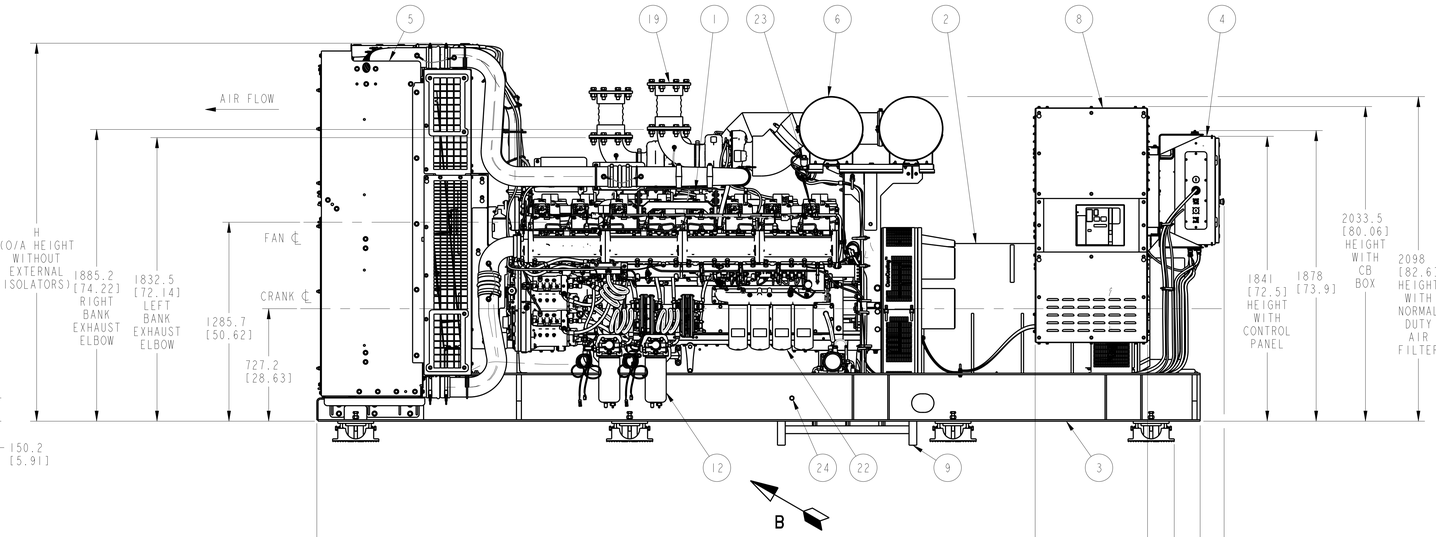
VIEW A

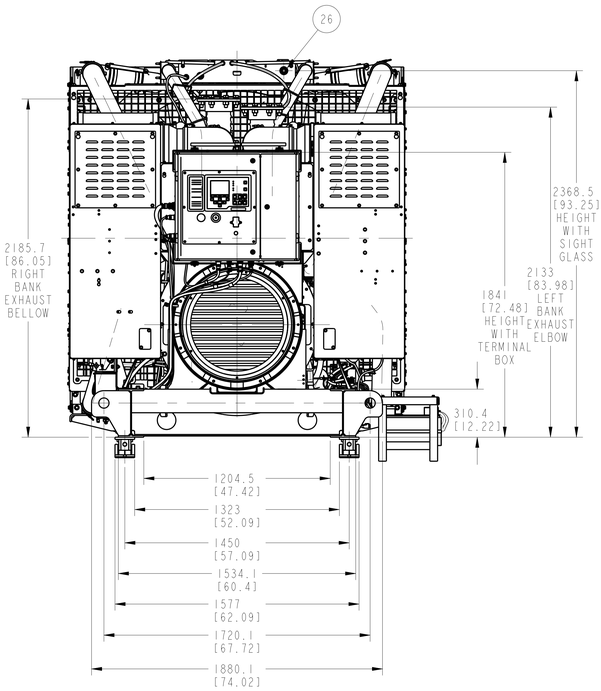


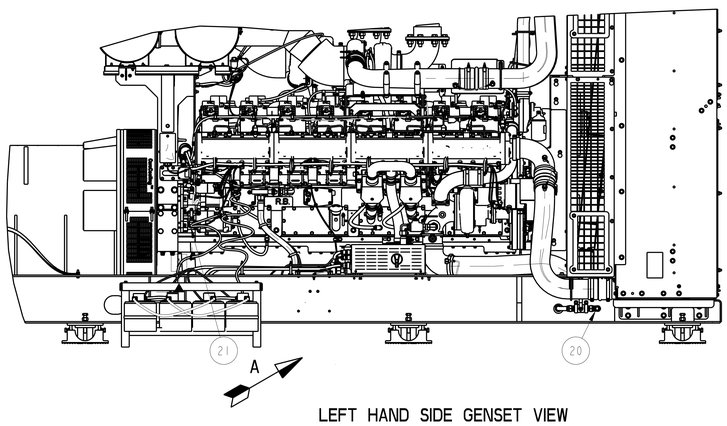


VIEW B









LEFT HAND SIDE GENSET VIEW

ALTERNATOR	J	K	L (UP TO CONTROL PANEL)
S7 C CORE	4356	4356	5578
S7 D CORE	4476	4476	5698
S7 E CORE	4476	4476	5698
S7 F CORE	4476	4476	5698
S7 G CORE	4556	4556	5778
S7 H CORE	4677	4677	5898
S7 J CORE	4642	4642	5863

QTY	FIND NO.	DESCRIPTION
1	27	CRANK CASE VENTILATION
1	26	COOLANT LEVEL GAUGE
1	25	RADIATOR FILL POINT
1	24	LUBE OIL FILL POINT
1	23	AIR RESTRICTION INDICATOR
4	22	LUBE OIL FILTER
2	21	STARTER MOTOR

QTY	FIND NO.	DESCRIPTION
1	20	COOLANT DRAIN
2	19	EXHAUST BELLOWS
1	18	HEATER CONTROL BOX
1	17	OIL HEATER
1	16	OIL SAMPLING VALVE
1	15	ENGINE LUBE OIL LEVEL MAINTAINER
1	14	OIL DRIP CAN
1	13	OIL DRAIN VALVE
2	12	FUEL WATER SEPERATOR
1	11	COOLANT HEATER
4	10	REDUNDANT STARTER BATTERY/TRAY OPTION (REMOTE MOUNT)
4	9	STANDARD STARTER BATTERY/TRAY OPTION (REMOTE MOUNT)
1	8	CIRCUIT BREAKER BOX
1	7	TERMINAL BOX
4	6	AIR FILTER
1	5	COOLING SYSTEM
1	4	CONTROL PANEL
1	3	CHASSIS-HARD MOUNT
1	2	ALTERNATOR-S7J
1	1	ENGINE QSK50-G24/G25

LAST DATUM LETTER USED: -		LAST REFERENCE LETTER USED: E	
MODEL/PLATFORM: QSK50		THIS PART IS SIMILAR TO: -	
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY		ANG. TOL.: ± 1.0°	
SURFACE FINISH PER: -		SURFACE FINISH: -	
WALL THICKNESS: -	DRAFT ANGLES: -	EDGE RADII: -	FILLET RADII: -
DIMENSIONAL TOLERANCES:	X ± 3	.X ± 1	.XX ± 0.5
HOLE SIZE 0.00-4.99 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

PART NUMBER: A060C089 | PART REVISION: D
PART NAME: OUTLINE,GENSET
DRAWING CATEGORY: DETAIL
STATE: RELEASED | SHEET: 3 OF 10

Cummins Inc.

DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES | SIZE: A0 | SCALE: 1/16

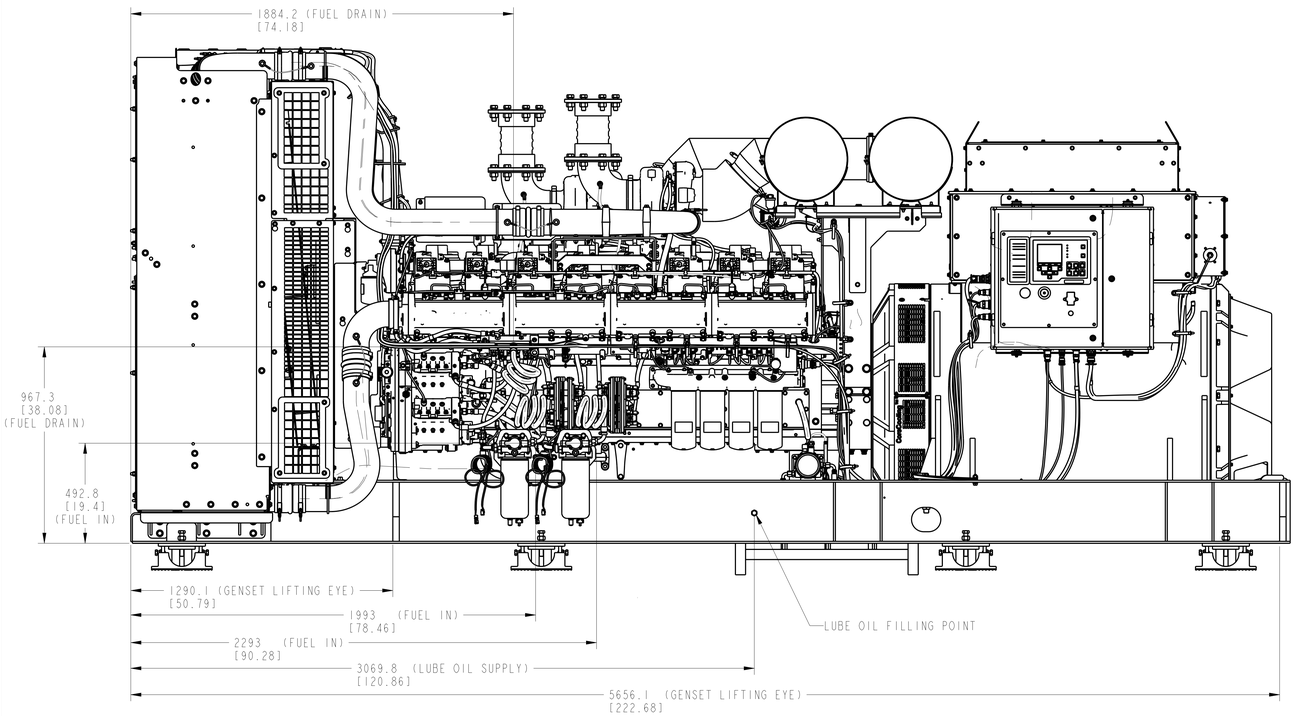
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009 | THIRD ANGLE PROJECTION

CAD SYSTEM PTC® Creo® Parametric

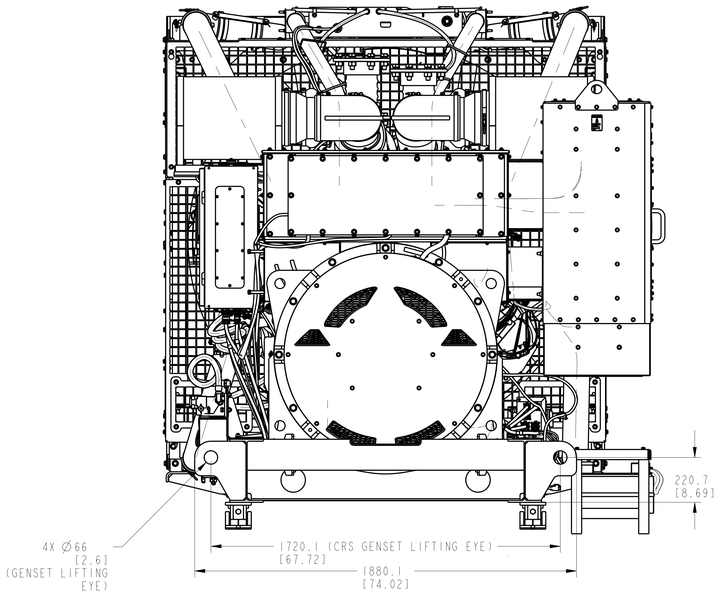
FUEL SUPPLY, LIFTING LUG, OIL MAINTAINER AND S7, S9 NON-SEISMIC ISOLATOR INSTALLATION DETAIL

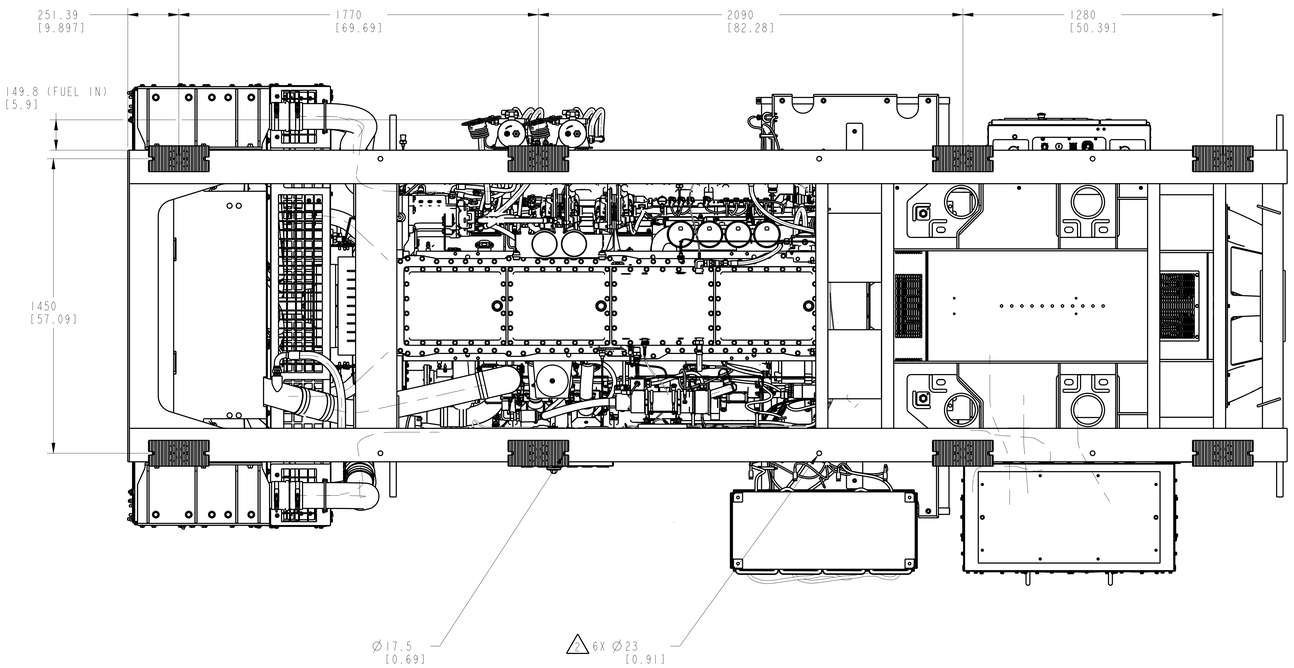
NOTES:

1. REFER TO GENSET INSTALLATION DRAWING A065D207-INSTALLATION, GENSET SEISMIC ISOLATOR AND A065D206-INSTALLATION, GENSET NON SEISMIC INSTALLATION DETAILS



SCALE 3/32





SCALE 3/32

FUEL SYSTEM CONNECTOR DETAILS			
DESCRIPTION	ON FILTER	HOSE	
		FILTER SIDE	CUSTOMER SIDE
FUEL IN	1-1/16-12 UN JIC SWIVEL 37° FLARE	1-1/16-12 90° ELBOW JIC SWIVEL 37°	3/4 NPTF MALE PIPE

FUEL SYSTEM CONNECTOR DETAILS			
DESCRIPTION	ON ENGINE	HOSE	
		ENGINE SIDE	CUSTOMER SIDE
FUEL DRAIN	1-1/16-12 UN-2A 37° FLARE	1-1/16-12 STRAIGHT JIC SWIVEL FEMALE 37° FLARE	3/4 NPTF MALE PIPE

OIL MAINTAINER SYSTEM CONNECTOR DETAILS	
LUBE OIL SUPPLY	3/4"(THREAD) JIC 37°(SAE J514)

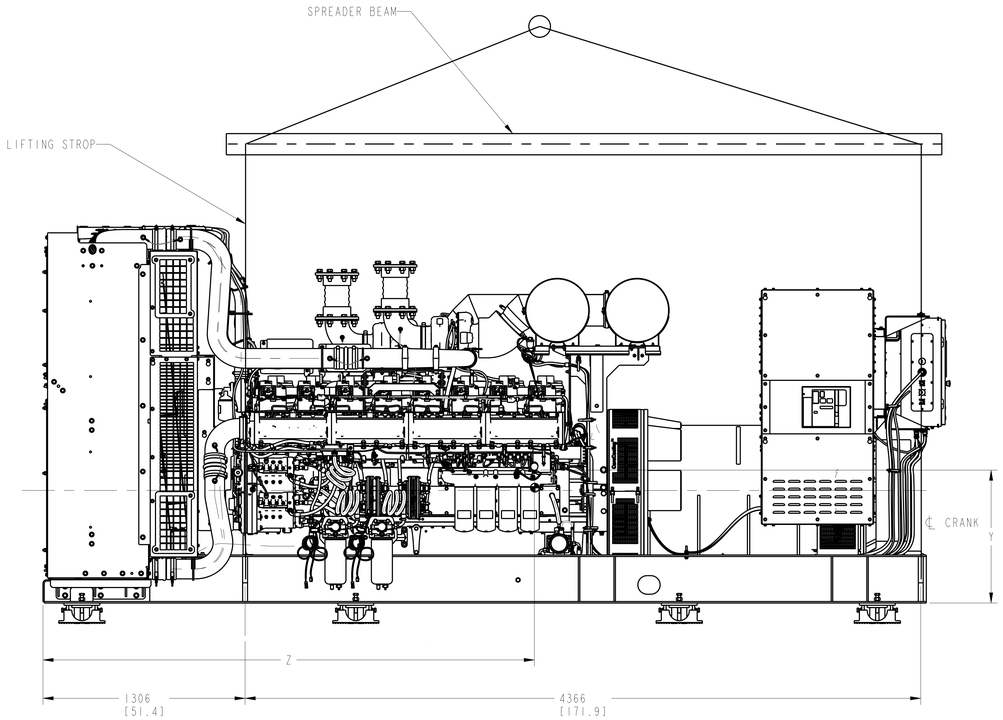
LAST DATUM LETTER USED: -		LAST REFERENCE LETTER USED: E	
MODEL/PLATFORM: QSK50		THIS PART IS SIMILAR TO: -	
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY		ANG. TOL.: ± 1.0°	
SURFACE FINISH PER:		SURFACE FINISH:	
WALL THICKNESS: -	DRAFT ANGLES: -	EDGE RADII: -	FILLET RADII: -
DIMENSIONAL TOLERANCES:	X ± 3	X ± 1	XX ± 0.5
HOLE SIZE 0.00-4.99 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

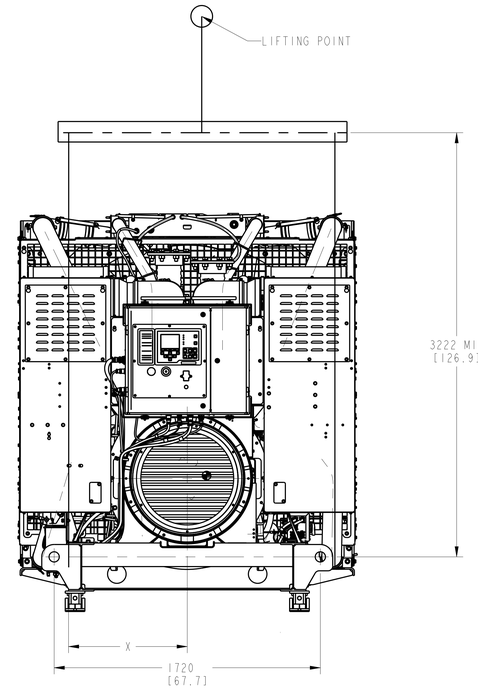
PART NUMBER: A060C089	PART REVISION: D
PART NAME: OUTLINE,GENSET	
DRAWING CATEGORY: DETAIL	
STATE: RELEASED	SHEET: 5 OF 10
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	

Cummins Inc.

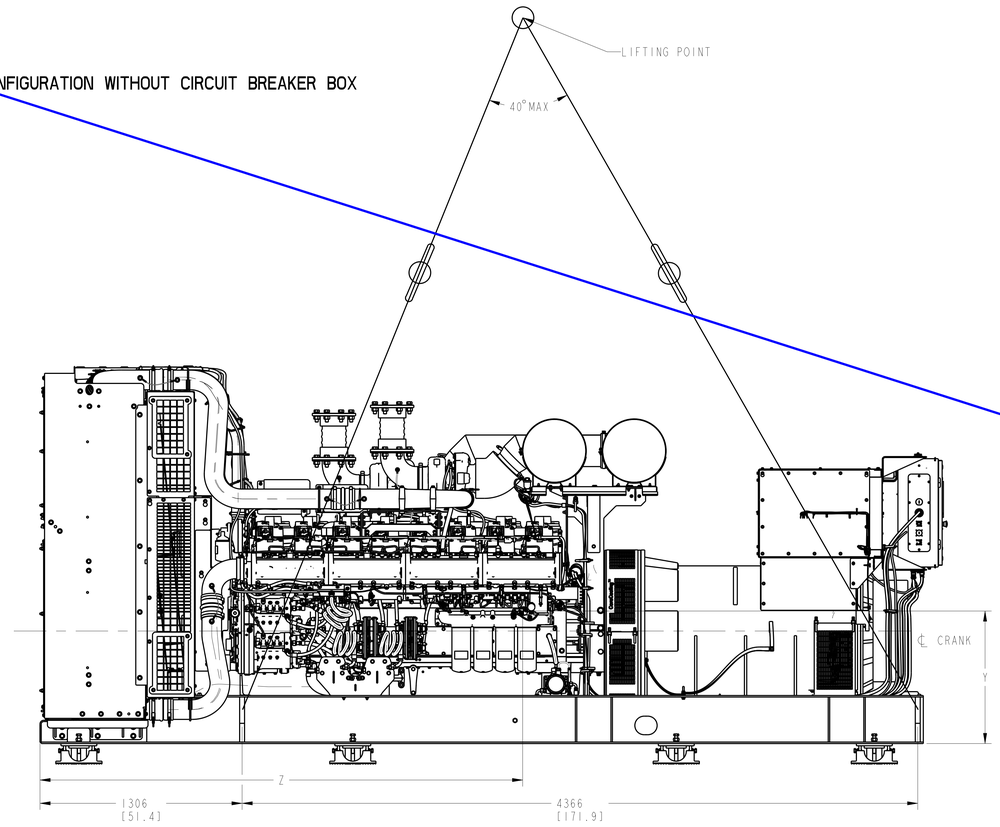
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE: A0	SCALE: 1/16	
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION		CAD SYSTEM PTC® Creo® Parametric

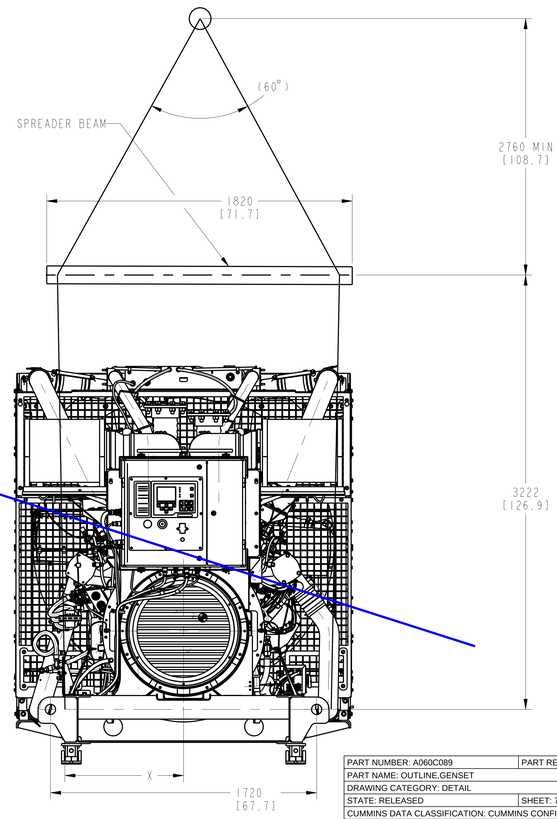
PARALLEL LIFT:
S7 ALTERNATOR CONFIGURATION WITH CIRCUIT BREAKER BOX





SINGLE POINT LIFT:
S7 ALTERNATOR CONFIGURATION WITHOUT CIRCUIT BREAKER BOX





LAST DATUM LETTER USED: -	LAST REFERENCE LETTER USED: E
MODEL/PLATFORM: QSK50	THIS PART IS SIMILAR TO: -
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY	ANG. TOL.: ± 1.0°
SURFACE FINISH PER: -	SURFACE FINISH: -
WALL THICKNESS: - / DRAFT ANGLES: -	EDGE RADII: - / FILLET RADII: -
DIMENSIONAL TOLERANCES:	X ± .1 / XX ± 0.5
HOLE SIZE 0.00-4.99 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	

PART NUMBER: A060C089	PART REVISION: D
PART NAME: OUTLINE,GENSET	
DRAWING CATEGORY: DETAIL	
STATE: RELEASED	SHEET: 7 OF 10
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	

Cummins Inc.

DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES	SIZE A0 / SCALE: 1/16
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009	THIRD ANGLE PROJECTION
	CAD SYSTEM PTC® Creo® Parametric

REFER SHEET 3 FOR DRAWING VIEW AND SHEET 7 FOR COFG

ENGINE	ALTERNATOR	AIR CLEANER	CB OPTION	GENSET WET WEIGHT(KG)	GENSET WET WEIGHT(LBS)	GENSET DRY WEIGHT(KG)	GENSET DRY WEIGHT(LBS)	OVERALL DIMENSIONS MM (INCH)			COFG MM (INCH)		
								LENGTH	WIDTH (WITHOUT REMOTE MOUNT BATTERY)	HEIGHT (WITTHOUT EXTERNAL ISOLATORS)	X	Y	Z
QSK50-G24/G25	S7-C	NORMAL DUTY/ HEAVY DUTY	2 CB	12070	26609	11693	25778	5708 (224.7)	2187 (86.1)	2443 (96.2)	760 (29.9)	897 (35.3)	2865 (112.8)
			LHS CB (VIEW FROM NDE OF ALTERNATOR)	11779	25972	11111	24499				779 (30.6)	887 (34.9)	2817 (110.9)
			RHS CB (VIEW FROM NDE OF ALTERNATOR)	11889	26212	11512	25383				748 (29.4)	891 (35)	2835 (111.6)
			NO CB	11598	25573	11221	24742				767 (30.2)	881 (34.7)	2786 (109.7)
	S7-D	NORMAL DUTY/ HEAVY DUTY	2 CB	12226	26953	11849	26122	5708 (224.7)	2187 (86.1)	2443 (96.2)	760 (29.9)	895 (35.2)	2900 (114.2)
			LHS CB (VIEW FROM NDE OF ALTERNATOR)	11935	26316	11558	25485				779 (30.7)	885 (34.8)	2850 (112.2)
			RHS CB (VIEW FROM NDE OF ALTERNATOR)	12045	26559	11668	25727				748 (29.4)	889 (35)	2869 (112.9)
			NO CB	11754	25917	11377	25086				767	878	2818
	S7-E	NORMAL DUTY/ HEAVY DUTY	2 CB	12510	27579	12133	26748	5708 (224.7)	2187 (86.1)	2443 (96.2)	760 (29.9)	891 (35)	2944 (115.9)
			LHS CB (VIEW FROM NDE OF ALTERNATOR)	12219	26942	11842	26111				779 (30.7)	881 (34.7)	2897 (114)
			RHS CB (VIEW FROM NDE OF ALTERNATOR)	12329	27185	11952	26354				749 (29.5)	885 (34.9)	2915 (114.7)
			NO CB	12038	26543	11661	25712				767 (30.2)	875 (34.4)	2867 (112.9)
	S7-F	NORMAL DUTY/ HEAVY DUTY	2 CB	12510	27579	12133	26748	5708 (224.7)	2187 (86.1)	2443 (96.2)	760 (29.9)	891 (35)	2944 (115.9)
			LHS CB (VIEW FROM NDE OF ALTERNATOR)	12219	26942	11842	26111				779 (30.7)	881 (34.7)	2897 (114)
			RHS CB (VIEW FROM NDE OF ALTERNATOR)	12329	27185	11952	26354				749 (29.5)	885 (34.9)	2915 (114.7)
			NO CB	12038	26543	11661	25712				767 (30.2)	875 (34.4)	2867 (112.9)
	S7-G	NORMAL DUTY/ HEAVY DUTY	2 CB	12817	28256	12440	27425	5778 (227.4)	2187 (86.1)	2443 (96.2)	760 (29.9)	886 (34.9)	2995 (117.9)
			LHS CB (VIEW FROM NDE OF ALTERNATOR)	12526	27619	12149	26788				778 (30.6)	876 (34.5)	2948 (116)
			RHS CB (VIEW FROM NDE OF ALTERNATOR)	12636	27862	12259	27031				749 (29.5)	881 (34.7)	2966 (116.8)
			NO CB	12345	27220	11968	26389				767 (30.2)	870 (34.3)	2918 (114.9)
	S7-H	NORMAL DUTY/ HEAVY DUTY	2 CB	13261	29235	12884	28404	5898 (232.2)	2187 (86.1)	2443 (96.2)	761 (29.9)	881 (34.7)	3070 (120.9)
			LHS CB (VIEW FROM NDE OF ALTERNATOR)	12970	28598	12593	27767				778 (30.6)	871 (34.3)	3024 (119)
			RHS CB (VIEW FROM NDE OF ALTERNATOR)	13080	28841	12703	28010				750 (29.5)	875 (34.4)	3042 (119.7)
			NO CB	12789	28199	12412	27368				767 (30.2)	865 (34)	2995 (117.9)
	S7-J	NORMAL DUTY/ HEAVY DUTY	2 CB	13662	30119	13285	29288	5863 (230.8)	2187 (86.1)	2443 (96.2)	761 (30)	877 (34.5)	3100 (122)
			LHS CB (VIEW FROM NDE OF ALTERNATOR)	13371	29483	12994	28651				778 (30.6)	868 (34.2)	3058 (120.4)
			RHS CB (VIEW FROM NDE OF ALTERNATOR)	13481	29725	13104	28894				750 (29.5)	872 (34.3)	3074 (121)
			NO CB	13190	29083	12813	28252				767 (30.2)	862 (33.9)	3030 (119.3)

REFER SHEET 4 FOR DRAWING VIEW AND SHEET 6 FOR COFG

ENGINE	ALTERNATOR	AIR CLEANER	CB OPTION	GENSET WET WEIGHT(KG)	GENSET WET WEIGHT(LBS)	GENSET DRY WEIGHT(KG)	GENSET DRY WEIGHT(LBS)	OVERALL DIMENSIONS MM (INCH)			COFG MM (INCH)		
								LENGTH	WIDTH (WITHOUT REMOTE MOUNT BATTERY)	HEIGHT (WITHOUT EXTERNAL ISOLATORS)	X	Y	Z
QSK50-G24/G25	S9-B	NORMAL DUTY/ HEAVY DUTY	NO CB NO ENTRANCE BOX	13717	30245	13340	29414	5708 (224.7)	2189 (86.2)	2443 (96.1)	764 (30)	866 (34)	3098 (121.9)
			ENTRANCE BOX ONLY	14013	30898	13636	30067	5708 (224.7)	2470 (97.2)	2443 (96.1)	785 (30.9)	873 (34.4)	3131 (123.2)
	S9-C	NORMAL DUTY/ HEAVY DUTY	NO CB NO ENTRANCE BOX	13917	30686	13540	29855	5708 (224.7)	2189 (86.2)	2443 (96.1)	764 (30)	864 (34)	3124 (123)
			ENTRANCE BOX ONLY	14213	31339	13836	30508	5708 (224.7)	2470 (97.2)	2443 (96.1)	785 (30.9)	871 (34.3)	3156 (124.2)
	S9-D	NORMAL DUTY/ HEAVY DUTY	NO CB NO ENTRANCE BOX	14217	31348	13840	30517	5708 (224.7)	2189 (86.2)	2443 (96.1)	764 (30)	862 (34)	3161 (124.5)
			ENTRANCE BOX ONLY	14513	32001	14136	31169	5708 (224.7)	2470 (97.2)	2443 (96.1)	785 (30.9)	868 (34.2)	3192 (125.7)

LAST DATUM LETTER USED: -	LAST REFERENCE LETTER USED: E
MODEL/PLATFORM: QSK50	THIS PART IS SIMILAR TO: -
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY	ANG. TOL.: ± 1.0°
SURFACE FINISH PER: -	SURFACE FINISH:
WALL THICKNESS: - / DRAFT ANGLES: -	EDGE RADII: - / FILLET RADII: -
DIMENSIONAL TOLERANCES:	X ± 3 / XX ± 1 / XXX ± 0.5
HOLE SIZE 0.00-4.99 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

PART NUMBER: A060C089	PART REVISION: D
PART NAME: OUTLINE,GENSET	
DRAWING CATEGORY: DETAIL	
STATE: RELEASED	SHEET: 8 OF 10
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	

Cummins Inc.

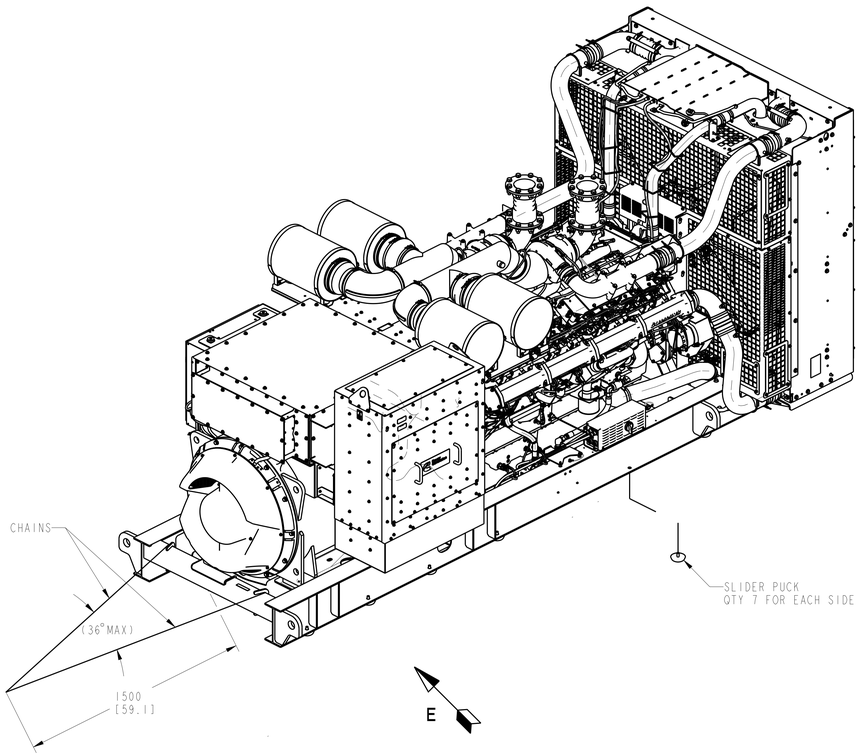
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES | SIZE: A0 | SCALE: 1/16

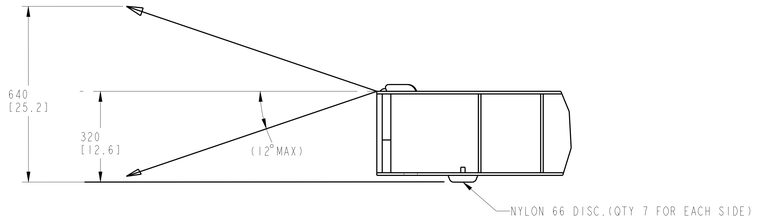
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009 | THIRD ANGLE PROJECTION

CAD SYSTEM PTC® Creo® Parametric

NOTES:

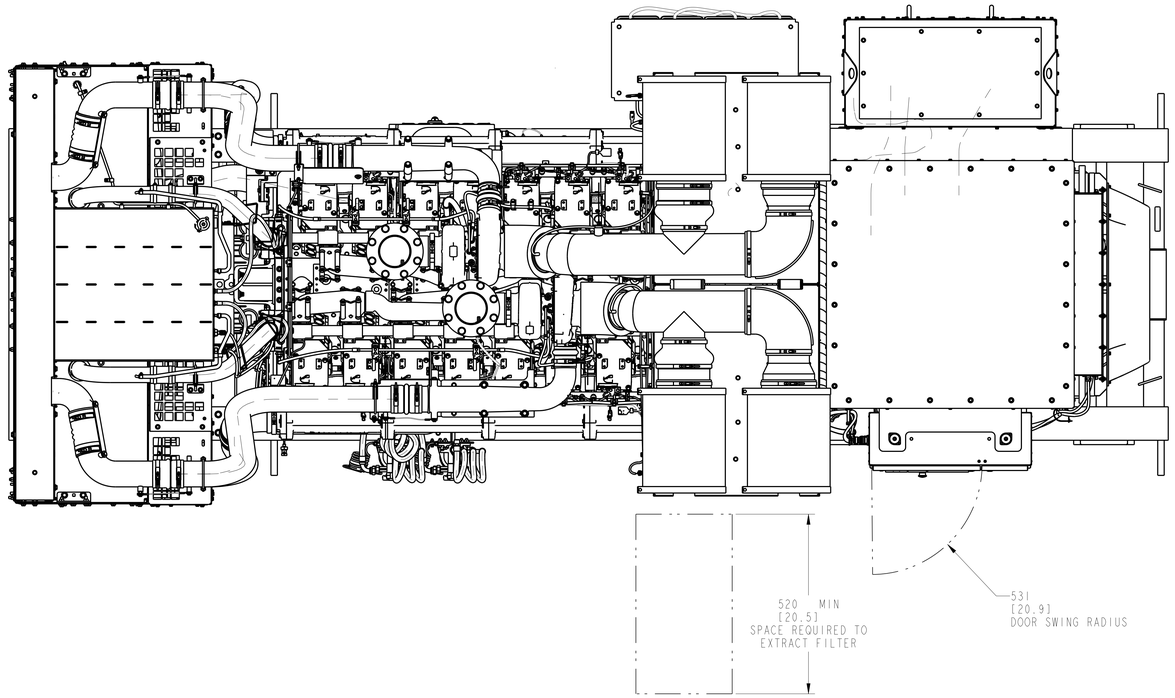
3. GENSET DRAGGING CHAIN ATTACHMENT FEATURE.THIS FEATURE CAN BE USED TO ASSIST IN THE EXTRACTION OF THE GENSET FROM AN ISO SHIPPING CONTAINER.FRICTION REDUCING SLIDER PUCKS MUST BE PRESENT AND INTACT BETWEEN THE CHASSIS AND CONTAINER FLOOR BEFORE AND DURING DRAGGING. MAXIMUM DRAGGING DISTANCE MUST NOT EXCEED THE LENGTH OF THE CONTAINER PLUS 1 METER.CONTAINER MUST BE ON LEVEL GROUND.GROUND SURFACE TO CONSIST OF SMOOTH CONCRETE, STEEL OR WOOD.WINCHING OPERATION TO BE DONE SMOOTHLY AT LOW SPEED.ADHERE TO CHAIN ANGLE LIMITS SHOWN IN THIS DRAWING.





VIEW E
SCALE 1/8

3 VIEW TO SHOW DRAGGING DETAILS FOR THE REMOVAL OF THE GENSET FROM AN ISO CONTAINER.



FOR ALL CONFIGURATIONS WITH CONTROL PANEL AND NORMAL DUTY AIR FILTER
TOP VIEW - S9 ALTERNATOR VIEW SHOWN FOR REFERENCE
SCALE 3/32

LAST DATUM LETTER USED: -	LAST REFERENCE LETTER USED: E
MODEL/PLATFORM: QSK50	THIS PART IS SIMILAR TO: -
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY	ANG. TOL.: ± 1.0°
SURFACE FINISH PER: -	SURFACE FINISH: -
WALL THICKNESS: - / DRAFT ANGLES: -	EDGE RADII: - / FILLET RADII: -
DIMENSIONAL TOLERANCES: X ± 3	.X ± 1 / .XX ± 0.5
HOLE SIZE 0.00-4.99 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

PART NUMBER: A060C089	PART REVISION: D
PART NAME: OUTLINE,GENSET	
DRAWING CATEGORY: DETAIL	
STATE: RELEASED	SHEET: 9 OF 10
CUMMINS DATA CLASSIFICATION: CUMMINS CONFIDENTIAL	

Cummins Inc.

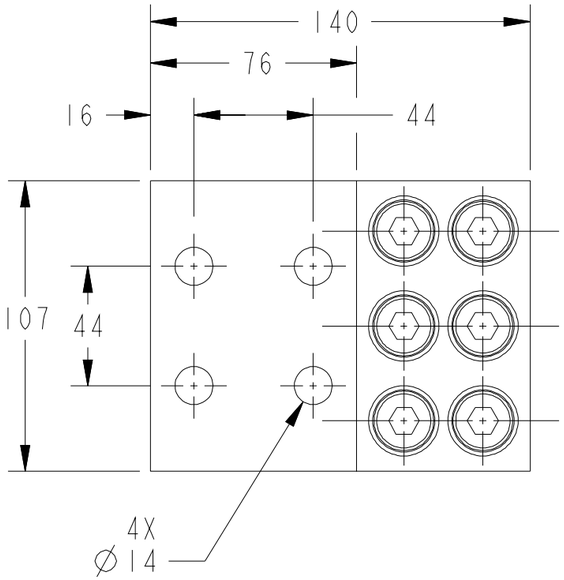
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: INCHES | SIZE A0 | SCALE: 1/16

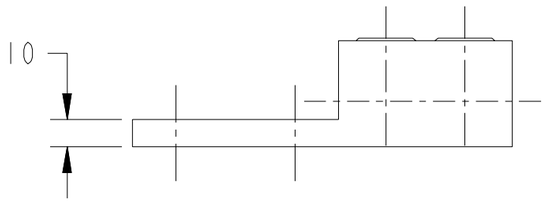
DIMENSIONING AND TOLERANCING PER: ASME Y14.5-2009 | THIRD ANGLE PROJECTION

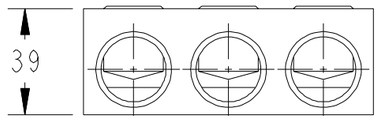
CAD SYSTEM PTC® Creo® Parametric

0332_3949	B	Pro/ENGINEER	METRIC DWG

REL NO	LTR	NO	REVISION	ZONE	DR	CHKR	APPROVED	DATE
FRD16141	A	1	PRODUCTION_RELEASE	-	DC	EC	EC	03-24-03







NOTES:

1. THIS PART IS VENDOR SOURCE CONTROLLED. SEE APPROVED PRODUCT VENDOR LIST.
2. TYPE L3D4-600 ELECTRO TIN PLATED.
3. WIRE SIZE #2 TO 600 MCM.
4. MATERIAL 6061-T6 ALUMINUM.
5. CSA / UL 90°C RATING 486B LISTED.

USE FOR INTERNAL CONTROL ONLY

THIS DOCUMENT IS CONTROLLED TO MAINTAIN COMPLIANCE WITH CODES AND STANDARDS:

[X] UL [X] CSA [ ] US TESTING [ ] OTHER _____

AND/OR TO RETAIN DESIGN RESPONSIBILITY. [ ]

ANY CHANGES OR DEVIATIONS TO THIS DOCUMENT MUST BE APPROVED BY THE COORDINATOR LISTED.

FACILITY _____ DATE _____

SIGNATURE _____

FACILITY _____ DATE _____

SIGNATURE _____

DO NOT SCALE PRINT

ANG TOL ± 1.0 °

DRAWN TO SCALE OF 1/2

	mm	Inch
DIM	X ± 1 .X ± 0.8 .XX± 0.38	.X ± .XX ± .XXX±
HOLE	0.09- 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	.004-.200 +.006/-.003 .201-.421 +.008/-.004 .422-.703 +.010/-.005 .704-.999 +.012/-.005

TOLERANCE UNLESS OTHERWISE SPECIFIED

SIM TO .

COPIED FROM .

THIRD ANGLE PROJECTION

ITEM	PART NO	DWG SIZE	DESCRIPTION OR MATERIAL	REF DES

	NAME	DATE
DR	D_CRANE	03-24-03
CHKR [X] MFG [ ]	E_CZECHOWSKI	03-24-03
APPROVED	E_CZECHOWSKI	03-24-03

FOR INTERPRETATION OF DIMENSIONING AND TOLERANCING, SEE ANSI Y14.5M-1982

MODEL FIRST USED ON: HC6/HC7 CB

SITE CODE: PGA

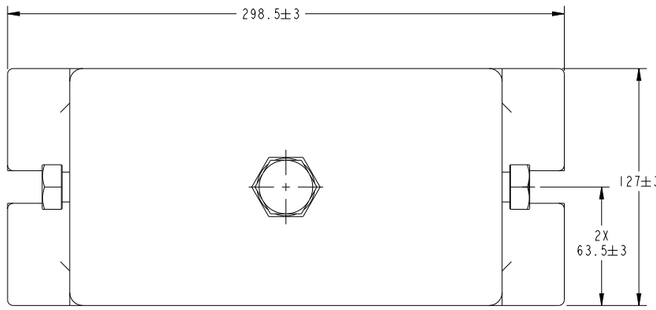
CUMMINS POWER GENERATION
1400 73RD AVE NE
MINNEAPOLIS, MINNESOTA 55432

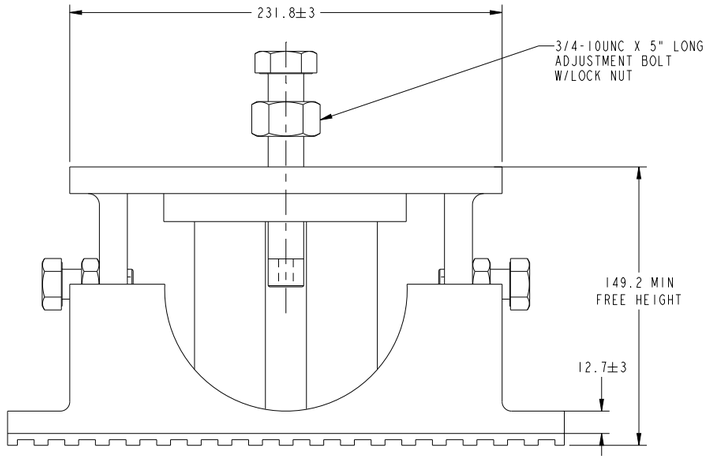
TITLE: LUG-CABLE (SOLDERLESS)

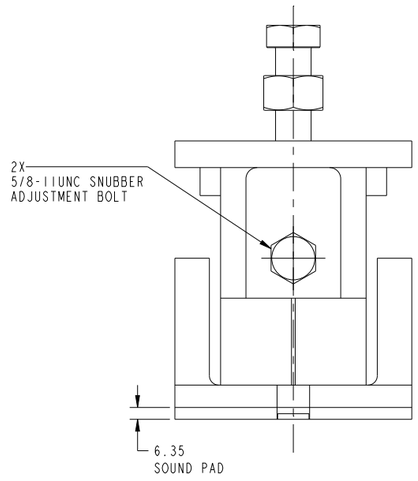
DWG NO: 0332_3949

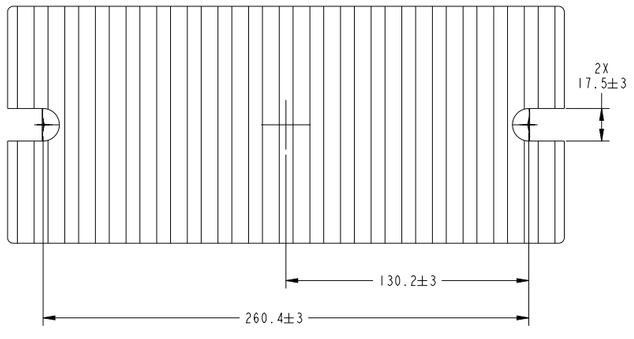
SHEET: 1 OF 1

DWG SIZE: B









NOTES:

1. (NOTE REMOVED)
2. ZINC PLATED HARDWARE.
3. EST. WEIGHT: 25 lbs (11.3 kg)

TABULATION			
RATED CAPACITY (POUNDS) MAX STEADY	RATED CAPACITY (POUNDS) MAX IMPACT	ISOLATOR CONSTANT (LBS/IN)	COLOR CODE
4800	-----	6600	PURPLE

MODEL/PLATFORM: DQKB, KC			THIS PART IS SIMILAR TO:
UNLESS OTHERWISE SPECIFIED THE FOLLOWING SHALL APPLY			ANG. TOL.: ± 1°
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.

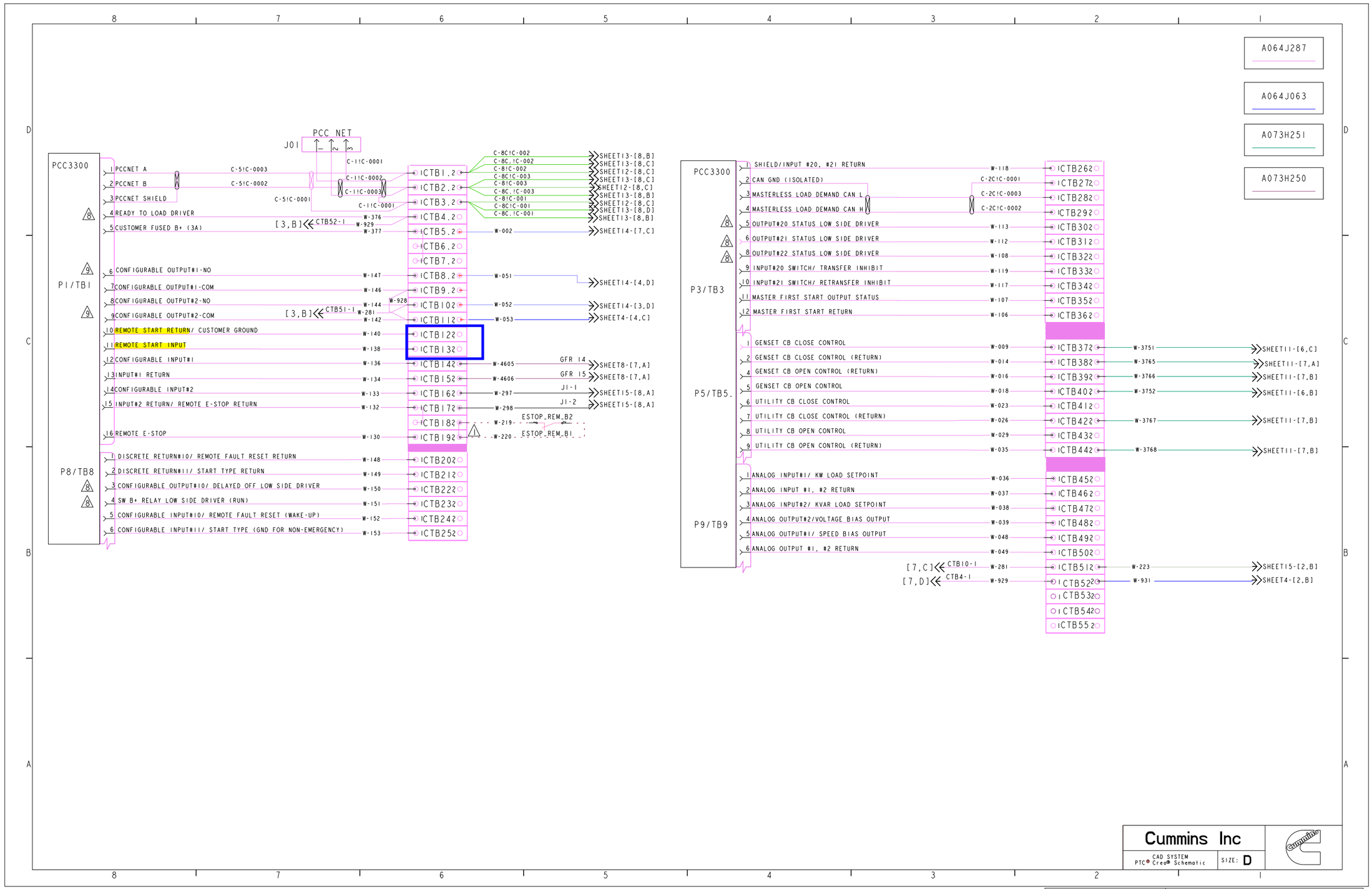
DIMENSIONS ARE IN: MILLIMETERS [ ] ARE IN: - | SIZE: A1 | SCALE: 3/4

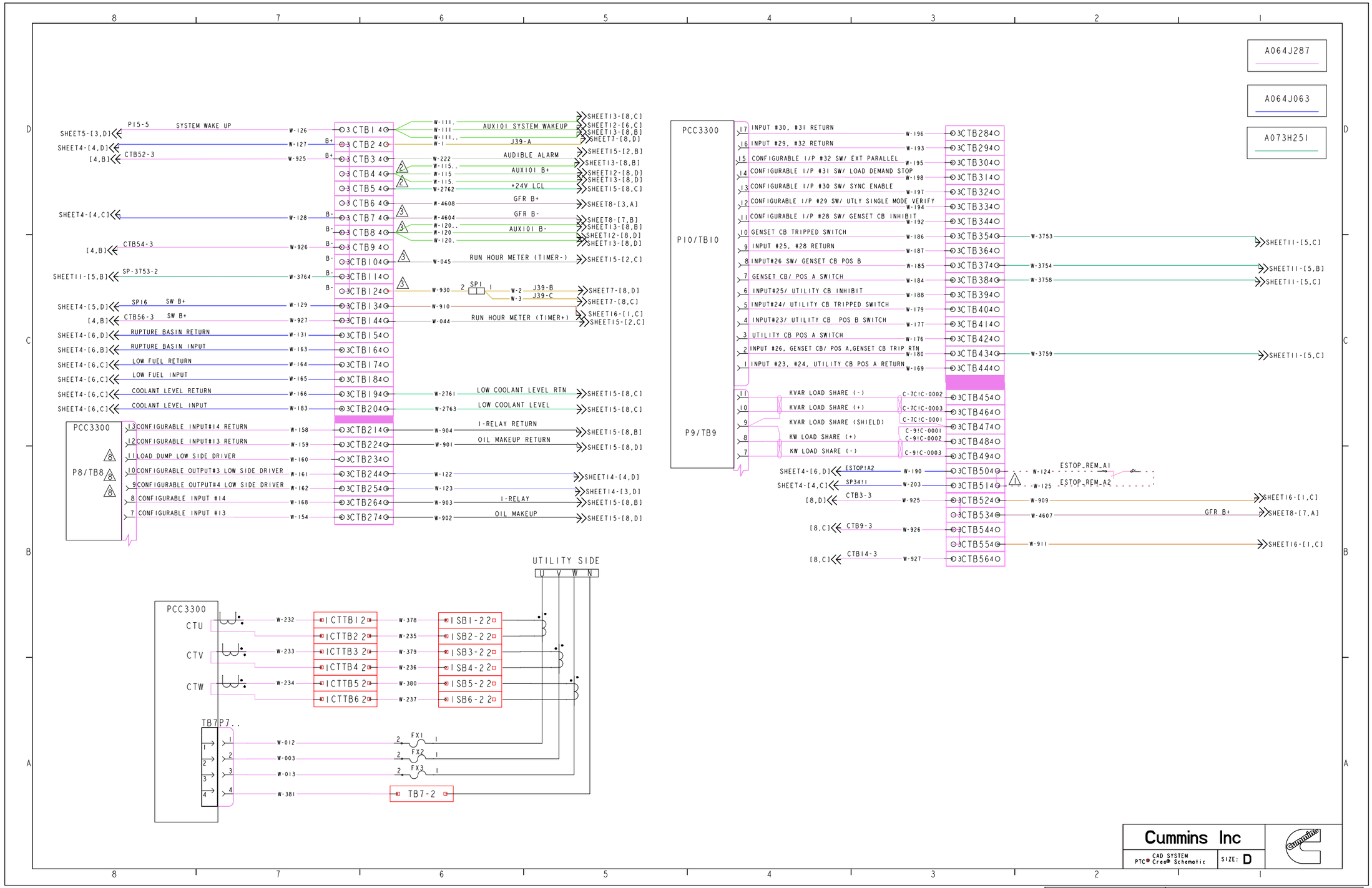
DIMENSIONING AND TOLERANCING PER: ANSI Y14.5M-1982 | THIRD ANGLE PROJECTION | CAD SYSTEM: PTC® Creo® Parametric

Part Number: **0402-0750-01** Part Revision: **C**

Part Name: **ISOLATOR,VIBRATION**

Drawing Category: **Detail** State: **Released**

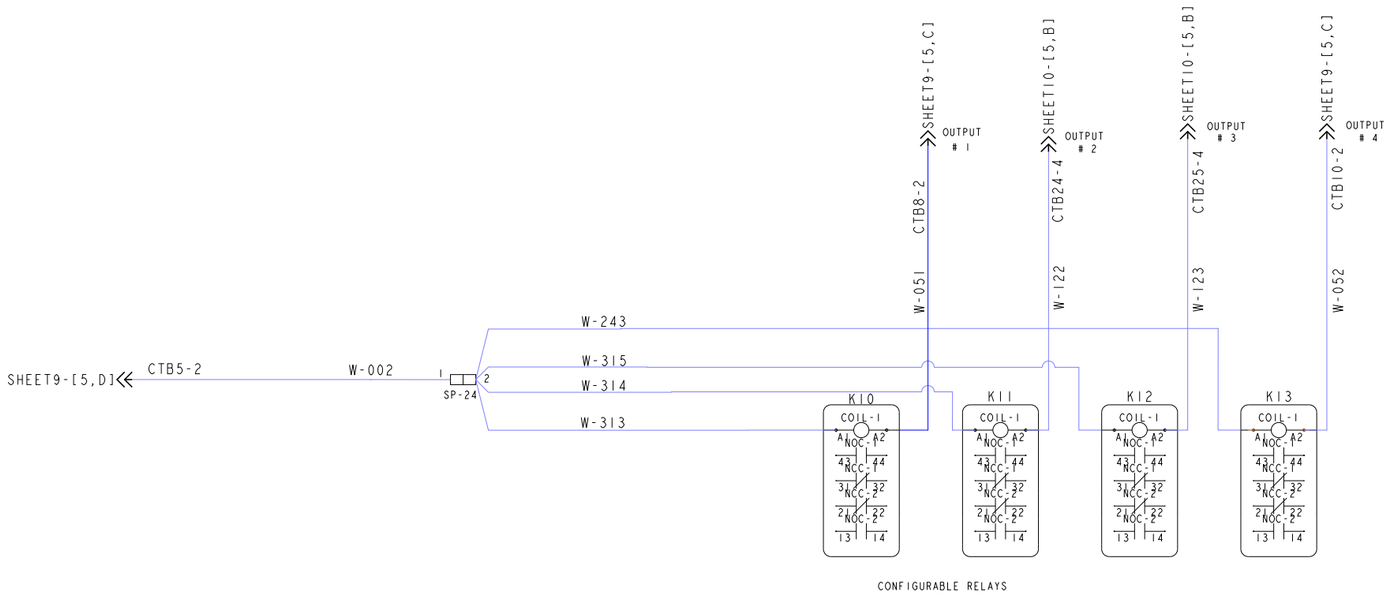




Part Number	A073F079
Part Noun Name	DIAGRAM,WIRING SCHEMATIC

A064J284

OPTIONAL CUSTOMER COFIGURABLE RELAY



Cummins Inc

CAD SYSTEM PTC® Creo® Schematic | SIZE: D

Part Number	A073F079
Part Noun Name	DIAGRAM,WIRING SCHEMATIC

SECTION 5
WARRANTY

Warranty Statement

CENTUM™ Series Generator Set

C1250D6E, C1500D6E, C1750D6E,
C2000D6E, C2750D6E, C3000D6EB

English
Original Instructions

4-2024

A072R157 (Issue 2)

Limited Warranty

CENTUM™ Series Generator Set

This limited warranty applies to all Cummins Inc. branded CENTUM™ Series generator sets including C1250D6E, C1500D6E, C1750D6E, C2000D6E, C2750D6E, and C3000D6EB and associated accessories (hereinafter referred to as "Product").

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

Warranty Period:

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

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

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

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

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

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

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

Base Warranty Coverage Duration (Whichever occurs first)

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

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

Cummins Inc. Responsibilities:

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

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

Owner Responsibilities:

The owner will be responsible for the following:

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

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

Limitations:

This limited warranty does not cover Product failures resulting from:

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

This limited warranty does not cover costs resulting from:

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

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

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

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

CUMMINS INC. RIGHT TO FAILED COMPONENTS:

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

Extended Warranty:

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

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

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

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

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