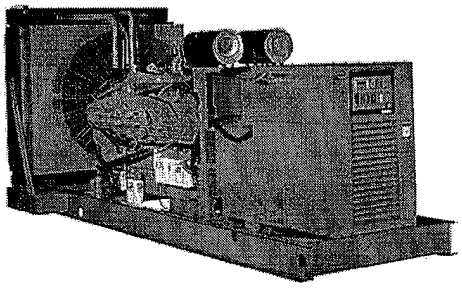
Power Generation

# Diesel Generator Set
# KTA50 Series Engine

**900-1500kW 60Hz**
**1000-1290kW 50Hz**



Optional Features Shown

## Description

This Cummins Power Generation commercial generator set is a fully integrated power generation system, providing optimum performance, reliability and versatility for stationary standby, prime power and continuous duty applications.

This generator set is designed in facilities certified to ISO9001.

This generator set is manufactured in facilities certified to ISO9001 or ISO9002.

The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins Power Generation products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.

All low voltage models are CSA certified to product class 4215-01.

The generator set is available Listed to UL2200, Stationary Engine Generator Assemblies. The PowerCommand control is Listed to UL508 - Category NITW7 for U.S. and Canadian usage. Circuit breaker assemblies are UL489 Listed for 100% continuous operation and also UL869A Listed Service Equipment.

## Features

- **Cummins® Heavy-Duty Engine** - Rugged 4-cycle industrial diesel delivers reliable power, low emissions, and fast response to load changes.
- **Permanent Magnet Generator (PMG)** - Offers enhanced motor starting and fault clearing short circuit capability.
- **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 F or H insulation.
- **Control System** - The PowerCommand™ electronic 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™ protection, output metering, auto-shutdown at fault detection, and NFPA 110 compliance.
- **Cooling System** - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.
- **Structural Steel Skid Base** - Robust skid base supports the engine, alternator, and radiator.
- **Warranty and Service** - Backed by a comprehensive warranty and worldwide distributor network.

| | Standby Rating | | Prime Power Ratings | | Continuous Ratings | | Data Sheets | |
|---|---|---|---|---|---|---|---|---|
| Model | 60 Hz kW (kVA) | 50 Hz kW (kVA) | 60 Hz kW (kVA) | 50 Hz kW (kVA) | 60 Hz kW (kVA) | 50 Hz kW (kVA) | 60 Hz | 50 Hz |
| DFLB | 1100 (1375) | | 900 (1125) | | | | D-3251 | |
| DFLC | 1250 (1563) | 1120 (1400) | 1100 (1375) | 1000 (1250) | | | D-3252 | D-3253 |
| DFLE | 1500 (1875) | 1290 (1613) | 1250 (1563) | 1100 (1375) | | | D-3234 | D-3237 |

Power Generation

## Generator Set Specifications

| | |
|---|---|
| Governor Regulation Class | ISO8528 Part 1 Class G3 |
| Voltage Regulation, No Load to Full Load | ± 0.5% |
| Random Voltage Variation | ± 0.5% |
| Frequency Regulation | Isochronous |
| Random Frequency Variation | ± 0.25% |
| Radio Frequency Emissions Compliance | IEC 801.2 through IEC 801.5; MIL STD 461C, Part 9 |

## Engine Specifications

| | |
|---|---|
| Design | 4 cycle, V-block, turbocharged and low temperature after-cooled |
| Bore | 158.8 mm (6.25 in.) |
| Stroke | 158.8 mm (6.25 in.) |
| Displacement | 50.3 litres (3067 $in^3$) |
| Cylinder Block | Cast iron, 60°V 16 cylinder |
| Battery Capacity | 1800 amps minimum at ambient temperature of 32°F (0°C) |
| Battery Charging Alternator | 55 amps |
| Starting Voltage | 24 volt, negative ground |
| Fuel System | Direct injection: number 2 diesel fuel |
| Fuel Filter | Dual element, 10 micron filtration, spin on fuel filters with water separator |
| Air Cleaner Type | Dry replaceable element |
| Lube Oil Filter Type(s) | Four spin-on, combination full flow and bypass filters |
| Standard Cooling System | 104°F (40° C) ambient radiator |

## Alternator Specifications

| | |
|---|---|
| Design | Brushless, 4 pole, revolving field |
| Stator | 2/3 pitch |
| Rotor | Single bearing, flexible disc |
| Insulation System | Class H |
| Standard Temperature Rise | 150° C Standby |
| Exciter Type | PMG (Permanent Magnet Generator) |
| Phase Rotation | A (U), B (V), C (W) |
| Alternator Cooling | Direct drive centrifugal blower fan |
| AC Waveform Total Harmonic Distortion | < 5% no load to full linear load, <3% for any single harmonic |
| Telephone Influence Factor (TIF) | <50 per NEMA MG1-22.43 |
| Telephone Harmonic Factor (THF) | <3 |

## Available Voltages

| 60 Hz Line – Neutral / Line – Line | | 50 Hz Line – Neutral / Line – Line | |
|---|---|---|---|
| ☐ 220/380 | ☑ 277/480 | ☐ 220/380 | ☐ 254/440 |
| ☐ 255/440 | ☐ 347/600 | ☐ 230/400 | ☐ 1905/3300 |
| | ☐ 2400/4160 | ☐ 240/415 | |

**Note: Consult factory for other voltages.**

## Generator Set Options

**Engine**

- ☑ 208/240/480V Thermostatically controlled coolant heaters for ambients above 4.5°C (40°F)
- ☐ 208/240/480V Thermostatically controlled coolant heaters for ambients below 4.5°C (40°F)
- ☐ Bypass oil filter
- ☐ Dual 120V, 300W lube oil heaters
- ☐ Dual 208/240V, 300W lube oil heaters
- ☐ Dual 480V, 300W lube oil heaters
- ☐ Heavy duty air cleaners with service indicator

**Control Panel**

- ☐ 120/240V, 100 Watt control anti-condensation space heater
- ☑ Paralleling configuration
- ☐ Remote fault signal package
- ☑ Run relay package
- ☐ Exhaust pyrometer
- ☐ Fuel-pressure gauge
- ☑ Ground fault indication

**Alternator**

- ☐ 80°C rise alternator
- ☐ 105°C rise alternator
- ☑ 125°C rise alternator
- ☐ 120/240V, 300 Watt anti-condensation heater

**Exhaust System**

- ☐ Industrial-grade exhaust silencer
- ☐ Residential-grade exhaust silencer
- ☐ Critical-grade exhaust silencer
- ☐ Exhaust packages

**Cooling System**

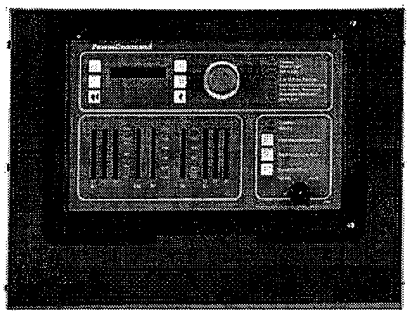
- ☐ Radiator, 50°C ambient
- ☐ Remote radiator cooling
- ☐ Heat exchanger cooing

**Generator Set**

- ☐ AC entrance box
- ☐ Batteries
- ☑ Battery charger
- ☐ Circuit breaker – set mounted
- ☐ Disconnect switch – set mounted
- ☐ Paralleling accessories
- ☐ PowerCommand® Network
- ☐ Remote annunciator panel
- ☐ Spring isolators
- ☐ 2 year warranty
- ☑ 5 year warranty
- ☐ 10 year major components warranty

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

# Control System



## PowerCommand Control with AmpSentry™ Protection

- The PowerCommand Control is an integrated generator set control system providing governing, voltage regulation, engine protection, and operator interface functions.
- PowerCommand Controls include integral AmpSentry protection. AmpSentry provides a full range of alternator protection functions that are matched to the alternator provided.
- Controls provided include Battery monitoring and testing features, and Smart-Starting control system.
- InPower PC-based service tool available for detailed diagnostics.
- Available with Echelon LonWorks™ network interface.
- NEMA 3R enclosure.
- Suitable for operation in ambient temperatures from -40C to +70C, and altitudes to 13,000 feet (5000 meters).
- Prototype tested; UL, CSA, and CE compliant.

### AmpSentry AC Protection

- Overcurrent and short circuit shutdown
- Overcurrent warning
- Single & 3-phase fault regulation
- Over and under voltage shutdown
- Over and under frequency shutdown
- Overload warning with alarm contact
- Reverse power and reverse Var shutdown
- Excitation fault

### Engine Protection

- Overspeed shutdown
- Low oil pressure warning and shutdown
- High coolant temperature warning and shutdown
- High oil temperature warning (optional)
- Low coolant level warning or shutdown
- Low coolant temperature warning
- High and low battery voltage warning
- Weak battery warning
- Dead battery shutdown
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Redundant start disconnect
- Cranking lockout
- Sensor failure indication

### Operator Interface

- OFF/MANUAL/AUTO mode switch
- MANUAL RUN/STOP switch
- Panel lamp test switch
- Emergency Stop switch
- Alpha-numeric display with pushbutton access, for viewing engine and alternator data and providing setup, controls, and adjustments
- LED lamps indicating genset running, not in auto, common warning, common shutdown
- (5) configurable LED lamps
- LED Bargraph AC data display (optional)

### Alternator Data

- Line-to-line and line-to-neutral AC volts
- 3-phase AC current
- Frequency
- Total and individual phase kW and kVA

### Engine Data

- DC voltage
- Lube oil pressure
- Coolant temperature
- Lube oil temperature (optional)

### Other Data

- Genset model data
- Start attempts, starts, running hours
- KW hours (total and since reset)
- Fault history
- Load profile (hours less than 30% and hours more than 90% load)
- System data display (optional with network and other PowerCommand gensets or transfer switches

### Governing

- Integrated digital electronic isochronous governor
- Temperature dynamic governing
- Smart idle speed mode
- Glow plug control (some models)

### Voltage Regulation

- Integrated digital electronic voltage regulator
- 3-phase line to neutral sensing
- PMG (Optional)
- Single and three phase fault regulation
- Configurable torque matching

### Control Functions

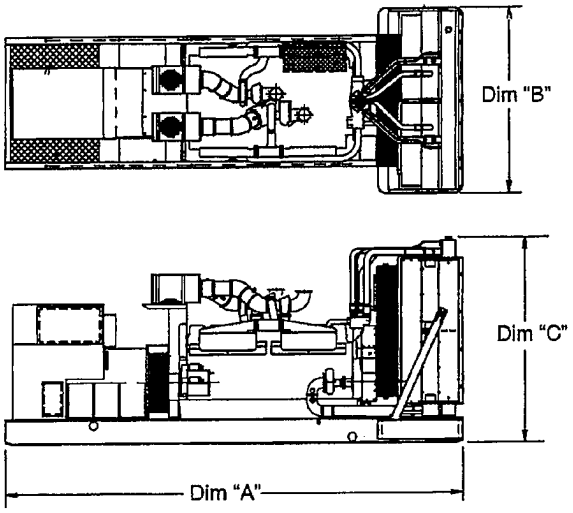
- Data logging on faults
- Fault simulation (requires InPower)
- Time delay start and cooldown
- Cycle cranking
- (4) Configurable customer inputs
- (4) Configurable customer outputs
- (8) Configurable network inputs and (16) outputs (with optional network)

### Options

- [ ] Power Transfer Control
- [ ] Analog AC Meter Display
- [ ] Thermostatically Controlled Space Heater
- [ ] Key-type mode switch
- [ ] Ground fault module
- [ ] Engine oil temperature
- [ ] Auxiliary Relays (3)
- [ ] Echelon LonWorks interface
- [ ] Digital input and output module(s) (loose)
- [ ] Remote annunciator (loose)

## Ratings Definitions

| Standby: | Prime (Unlimited Running Time): | Base Load (Continuous): |
|---|---|---|
| Applicable for supplying emergency power for the duration of normal power interruption. No sustained overload capability is available for this rating. This rating is applicable to installations served by a reliable normal utility source. This rating is only applicable to variable loads with an average load factor of 80 percent of the standby rating for a maximum of 200 hours of operation per year and a maximum of 25 hours per year at 100% of its standby rating. The standby rating is only applicable to emergency and standby applications where the generator set serves as the back up to the normal utility source. No sustained utility parallel operation is permitted with this rating. (Equivalent to Fuel Stop Power in accordance with ISO3046, AS2789, DIN6271 and BS5514). Nominally Rated. | Applicable for supplying power in lieu of commercially purchased power. Prime power is the maximum power available at a variable load for an unlimited number of hours. A 10% overload capability is available for limited time. (Equivalent to Prime Power in accordance with ISO8528 and Overload Power in accordance with ISO3046, AS2789, DIN6271, and BS5514). This rating is not applicable to all generator set models. | Applicable for supplying power continuously to a constant load up to the full output rating for unlimited hours. No sustained overload capability is available for this rating. Consult authorized distributor for rating. (Equivalent to Continuous Power in accordance with ISO8528, ISO3046, AS2789, DIN6271, and BS5514). This rating is not applicable to all generator set models. |




This outline drawing is to provide representative configuration details for Model series only.

See respective model data sheet for specific model outline drawing number.

***Do not use for installation design***

| Model | Dim "A" mm (in.) | Dim "B" mm (in.) | Dim "C" mm (in.) | Dim "D" mm (in.) | Set Weight* dry kg (lbs) | Set Weight* wet kg (lbs) | w/Tank Dry weight kg (lbs) | w/Tank Wet weight kg (lbs) |
|---|---|---|---|---|---|---|---|---|
| DFLB | **5652** (223) | 1894 (75) | 2515 (99) | | 9573 (21105) | 9924 (21877) | | |
| DFLC | **5652** (223) | **2274** (90) | 2383 (94) | | 9719 (21247) | **10053** (22162) | | |
| DFLE | **5652** (223) | **2274** (90) | 2514 (99) | | 10350 (22817) | **10788** (23784) | | |

***Note: Weights represent a set with standard features. See outline drawings for weights of other configurations. Dim "D" available only on models with sub-base fuel tank option.**

**See your distributor for more information.**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**Important:** Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

# Generator Set Data Sheet

**Model:** DFLE
**Frequency:** 60
**Fuel Type:** Diesel

| | |
|---|---|
| Exhaust Emission Data Sheet: | EDS-163 |
| Emission Compliance Sheet: | EPA1CS-1004 |
| Sound Performance Data Sheet: | MSP-159 |
| Cooling Performance Data Sheet: | MCP-125 |
| Prototype Test Summary Data Sheet: | PTS-140 |
| Standard Set-Mounted Radiator Cooling Outline: | 500-4000 |
| Optional Set-Mounted Radiator Cooling Outline: | 500-3997 |
| Optional Heat Exchanger Cooling Outline: | |
| Optional Remote Radiator Cooling Outline: | 500-3995 |

| Fuel Consumption | Standby kW (kVA) | | | | Prime kW (kVA) | | | | Continuous kW (kVA) |
|---|---|---|---|---|---|---|---|---|---|
| Ratings | 1500 (1875) | | | | 1250 (1563) | | | | |
| Load | 1/4 | 1/2 | 3/4 | Full | 1/4 | 1/2 | 3/4 | Full | Full |
| US gph | 32.8 | 55.8 | 79.4 | 103.6 | 29.2 | 47.6 | 68 | 87.3 | |
| L/hr | 124 | 211 | 301 | 392 | 111 | 180 | 257 | 330 | |

| Engine | Standby Rating | Prime Rating | Continuous Rating |
|---|---|---|---|
| Engine Manufacturer | Cummins | | |
| Engine Model | KTA50-G9 | | |
| Configuration | Cast Iron, 60°V 16 cylinder | | |
| Aspiration | Turbocharged and Low Temperature Aftercooled | | |
| Gross Engine Power Output, kWm (bhp) | 1656 (2220) | 1384 (1855) | 1224 (1640) |
| BMEP at Set Rated Load, kPa (psi) | 2221 (318) | 1835 (266) | |
| Bore, mm (in.) | 159 (6.25) | | |
| Stroke, mm (in.) | 159 (6.25) | | |
| Rated Speed, rpm | 1800 | | |
| Piston Speed, m/s (ft/min) | 9.5 (1875) | | |
| Compression Ratio | 13.9:1 | | |
| Lube Oil Capacity, L (qt) | 120 (127) | 204.4 (216) | |
| Overspeed Limit, rpm | 2100 ±50 | | |
| Regenerative Power, kW | 168 | | |
| | | | |
| **Fuel Flow** | | | |
| Maximum Fuel Flow with C180, L/hr (US gph) | 693 (183) | | |
| Maximum Fuel Flow with C174, L/hr (US gph) | 984 (260) | | |
| Maximum Fuel Inlet Restriction w/ clean filter, mm Hg (in. Hg) | 102 (4.0) | | |
| Maximum Return Restriction, mm Hg (in. Hg) | 165 (6.5) | | |
| | | | |
| **Air** | | | |
| Combustion Air, $m^3$/min (scfm) | 124 (4400) | 116 (4100) | |
| Maximum Air Cleaner Restriction, kPa (in. $H_2O$) | 6.2 (25) | | |
| Alternator Cooling Air, $m^3$/min (cfm) | 190 (6720) | | |
| | | | |
| **Exhaust** | | | |
| Exhaust Gas Flow at Set Rated Load, $m^3$/min (cfm) | 301 (10650) | 272 (9600) | |
| Exhaust Gas Temperature, °C (°F) | 516 (960) | 471 (880) | |
| Maximum Exhaust Back Pressure, kPa (in. $H_2O$) | 6.7 (27) | | |

| Standard Set-Mounted Radiator Cooling | Standby Rating | Prime Rating | Continuous Rating |
|---|---|---|---|
| Ambient Design, °C (°F) | | 40 (104) | |
| Fan Load, $KW_m$ (HP) | | 56 (75) | |
| Coolant Capacity (with Radiator), L (US Gal.) | | 379 (100) | |
| Cooling System Air Flow, $m^3$/min (scfm) | | 1613 (57000) | |
| Total Heat Rejection, MJ/min (BTU/min) | 81.7 (77065) | 69.1 (65170) | |
| Maximum Cooling Air Flow Static Restriction, kPa (in. $H_2O$) | | 0.12 (0.5) | |
| | | | |
| **Optional Set-Mounted Radiator Cooling** | | | |
| Ambient Design, °C (°F) | | 50 (122) | |
| Fan Load, kWm (HP) | | 45 (60) | |
| Coolant Capacity (with radiator), L (US Gal.) | | 519 (137) | |
| Cooling System Air Flow, $m^3$/min (scfm) | | 1700 (60150) | |
| Total Heat Rejection, MJ/min (BTU/min) | 79.8 (75335) | 67.0 (63250) | |
| Maximum Cooling Air Flow Static Restriction, kPa (in. $H_2O$) | | 0.12 (0.5) | |
| | | | |
| **Optional Heat Exchanger Cooling** | | | |
| Set Coolant Capacity, L (US Gal.) | | | |
| Heat Rejected, Jacket Water Circuit, MJ/min (BTU/min) | | | |
| Heat Rejected, After-cooler Circuit, MJ/min (BTU/min) | | | |
| Heat Rejected, Fuel Circuit, MJ/min (BTU/min) | | | |
| Total Heat Radiated to Room, MJ/min (BTU/min) | | | |
| Maximum Raw Water Pressure, Jacket Water Circuit, kPa (psi) | | | |
| Maximum Raw Water Pressure, Aftercooler Circuit, kPa (psi) | | | |
| Maximum Raw Water Pressure, Fuel Circuit, kPa (psi) | | | |
| Maximum Raw Water Flow, Jacket Water Circuit, L/min (US Gal/min) | | | |
| Maximum Raw Water Flow, Aftercooler Circuit, L/min (US Gal/min) | | | |
| Maximum Raw Water Flow, Fuel Circuit, L/min (US Gal/min) | | | |
| Minimum Raw Water Flow @ 27°C (80°F) Inlet Temp, Jacket Water Circuit, L/min (US Gal/min) | | | |
| Minimum Raw Water Flow @ 27°C (80°F) Inlet Temp, After-Cooler Circuit, L/min (US Gal/min) | | | |
| Minimum Raw Water Flow @ 27°C (80°F) Inlet Temp, Fuel Circuit, L/min (US Gal/min) | | | |
| Raw Water Delta P @ Min Flow, Jacket Water Circuit, kPa (psi) | | | |
| Raw Water Delta P @ Min Flow, After-cooler Circuit, kPa (psi) | | | |
| Raw Water Delta P @ Min Flow, Fuel Circuit, kPa (psi) | | | |
| Maximum Jacket Water Outlet Temp, °C (°F) | | | |
| Maximum After-Cooler Inlet Temp, °C (°F) | | | |
| Maximum After-Cooler Inlet Temp @ 11°C (77°F) Ambient, °C (°F) | | | |
| | | | |

## Alternator Data

| Voltage | Connection[1] | Temp Rise Degrees C | Duty[2] | Single Phase Factor[3] | Max Surge kVA[4] | Alternator Data Sheet | Feature Code |
|---|---|---|---|---|---|---|---|
| 380 | Wye, 3 Phase | 125 | P | N/A | 5743 | ADS-332 | B596-2 |
| 380 | Wye, 3 Phase | 150/105 | S/P | N/A | 6716 | ADS-333 | B595-2 |
| 380 | Wye, 3 Phase | 80 | P | N/A | 6716 | ADS-333 | B687-2 |
| 380 | Wye, 3 Phase | 105/80 | S/P | N/A | 7361 | ADS-334 | B599-2 |
| 380 | Wye, 3 Phase | 80 | S | N/A | 7695 | ADS-335 | B660-2 |
| 440 | Wye, 3 Phase | 125 | P | N/A | 4602 | ADS-330 | B692-2 |
| 440 | Wye, 3 Phase | 150/125 | S/P | N/A | 5521 | ADS-331 | B691-2 |
| 440 | Wye, 3 Phase | 80 | P | N/A | 5521 | ADS-331 | B689-2 |
| 440 | Wye, 3 Phase | 125/105 | S/P | N/A | 5743 | ADS-332 | B663-2 |
| 440 | Wye, 3 Phase | 80 | S | N/A | 6716 | ADS-333 | B688-2 |
| 480 | Wye, 3 Phase | 105 | P | N/A | 4602 | ADS-330 | B693-2 |
| 480 | Wye, 3 Phase | 125/105 | S/P | N/A | 5521 | ADS-331 | B276-2 |
| 480 | Wye, 3 Phase | 80 | P | N/A | 5521 | ADS-331 | B694-2 |
| 480 | Wye, 3 Phase | 105/80 | S/P | N/A | 5743 | ADS-332 | B600-2 |
| 480 | Wye, 3 Phase | 80 | S | N/A | 6716 | ADS-333 | B601-2 |
| 600 | Wye, 3 Phase | 105 | P | N/A | 4602 | ADS-330 | B581-2 |
| 600 | Wye, 3 Phase | 125/105 | S/P | N/A | 5521 | ADS-331 | B602-2 |
| 600 | Wye, 3 Phase | 80 | P | N/A | 5521 | ADS-331 | B695-2 |
| 600 | Wye, 3 Phase | 105/80 | S/P | N/A | 5743 | ADS-332 | B603-2 |
| 600 | Wye, 3 Phase | 80 | S | N/A | 6716 | ADS-333 | B604-2 |
| 4160 | Wye, 3 Phase | 105 | P | N/A | 6204 | ADS-322 | B312-2 |
| 4160 | Wye, 3 Phase | 125/105 | S/P | N/A | 7005 | ADS-323 | B467-2 |
| 4160 | Wye, 3 Phase | 105/80 | S/P | N/A | 7005 | ADS-323 | B313-2 |
| 4160 | Wye, 3 Phase | 80 | S | N/A | 7926 | ADS-324 | B605-2 |

**Notes:**

1. Limited single phase capability is available from some three phase rated configurations. To obtain single phase rating, multipy the three phase kW rating by the Single Phase Factor[3]. All single phase ratings are at unity power factor.
2. Standby (S), Prime (P) and (C) Continuous ratings.
3. Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.
4. Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

**Formulas for calculating full load currents:**

| Three Phase Output | Single Phase Output |
|---|---|
| $\frac{\text{kWx1000}}{\text{Voltagex1.73x0.8}}$ | $\frac{\text{kWxSinglePhaseFactorx1000}}{\text{Voltage}}$ |

**See your distributor for more information.**

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# Cooling System Data

## DFLE

### 40 Degree C Ambient Radiator Cooling System

| Duty | | Rating (kW) | Max Cooling @ Air Flow Static Restriction, Unhoused (inches water/mm water) | | | | Housed in Free Air, No Air Discharge Restriction | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 /0.0 | 0.25 /6.4 | 0.5 /12.7 | 0.75/19.1 | F182 | F183 | F184 | F172 | F173 |
| | | | Maximum Allowable Ambient Temperature, Degree C | | | | | | | | |
| 60 Hz | Standby | 1500 | 46.1 | 42.2 | 40 | 33.9 | N/A | N/A | N/A | N/A | N/A |
| | Prime | 1250 | 46.1 | 42.2 | 40 | 33.9 | N/A | N/A | N/A | N/A | N/A |
| 50 Hz | Standby | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Prime | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

### 50 Degree C Ambient Radiator Cooling System

| Duty | | Rating (kW) | Max Cooling @ Air Flow Static Restriction, Unhoused (inches water/mm water) | | | | Housed in Free Air, No Air Discharge Restriction | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.0 /0.0 | 0.25 /6.4 | 0.5 /12.7 | 0.75/19.1 | F182 | F183 | F184 | F172 | F173 |
| | | | Maximum Allowable Ambient Temperature, Degree C | | | | | | | | |
| 60 Hz | Standby | 1500 | 52.2 | 51.7 | 50.6 | 48.3 | N/A | N/A | N/A | N/A | N/A |
| | Prime | 1250 | 52.2 | 51.7 | 50.6 | 48.3 | N/A | N/A | N/A | N/A | N/A |
| 50 Hz | Standby | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| | Prime | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

Note:

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.

Power Generation

# ALTERNATOR DATA SHEET

# Frame Size P734C

## CHARACTERISTICS

| | | | |
|---|---|---|---|
| **WEIGHTS:** | Stator Assembly: | 3186 lb | 1445 kg |
| | Rotor Assembly: | 2756 lb | 1250 kg |
| | Complete Assembly: | 6654 lb | 3018 kg |
| **MAXIMUM SPEED:** | | 2250 | rpm |
| **EXCITATION CURRENT:** | Full Load | 3.6 | Amps |
| | No Load | 0.5 | Amps |

**INSULATION SYSTEM:** Class H Throughout

| **3 ∅ RATINGS** (0.8 power factor)<br>(Based on specific temperature rise at 40°C ambient temperature) | | **60 Hz Voltage** (winding no) | | | | | |
|---|---|---|---|---|---|---|---|
| | | 220/380 (13) | 240/416 (13) | 220/380 (312) | 240/416 (312) | 254/440 (312) | 277/480 (312) | 347/600 (07) |
| 163°C Rise Ratings | kW | | | 1284 | 1456 | 1556 | 1620 | 1620 |
| | kVA | | | 1605 | 1820 | 1945 | 2025 | 2025 |
| 150°C Rise Ratings | kW | | | 1248 | 1416 | 1512 | 1576 | 1576 |
| | kVA | | | 1560 | 1770 | 1890 | 1970 | 1970 |
| 125°C Rise Ratings | kW | | | 1200 | 1364 | 1452 | 1512 | 1512 |
| | kVA | | | 1500 | 1705 | 1815 | 1890 | 1890 |
| 105°C Rise Ratings | kW | | | 1116 | 1272 | 1352 | 1408 | 1408 |
| | kVA | | | 1395 | 1590 | 1690 | 1760 | 1760 |
| 80°C Rise Ratings | kW | | | 1032 | 1172 | 1252 | 1300 | 1300 |
| | kVA | | | 1290 | 1465 | 1565 | 1625 | 1625 |

| **REACTANCES** (per unit ± 10%)<br>(Based on full load at 125°C Rise Rating) | 220/380 (13) | 240/416 (13) | 220/380 (312) | 240/416 (312) | 254/440 (312) | 277/480 (312) | 347/600 (07) |
|---|---|---|---|---|---|---|---|
| Synchronous | | | 4.06 | 3.86 | 3.67 | 3.21 | 2.96 |
| Transient | | | 0.25 | 0.23 | 0.22 | 0.19 | 0.21 |
| Subtransient | | | 0.18 | 0.17 | 0.16 | 0.14 | 0.14 |
| Negative Sequence | | | 0.26 | 0.25 | 0.23 | 0.20 | 0.16 |
| Zero Sequence | | | 0.03 | 0.03 | 0.03 | 0.03 | 0.02 |

| **MOTOR STARTING** | 220/380 (13) | 240/416 (13) | 220/380 (312) | 240/416 (312) | 254/440 (312) | 277/480 (312) | 347/600 (07) |
|---|---|---|---|---|---|---|---|
| Maximum kVA (90% Sustained Voltage) | | | 5521 | 5521 | 5521 | 5521 | 5521 |

| **TIME CONSTANTS** (Sec) | 220/380 (13) | 240/416 (13) | 220/380 (312) | 240/416 (312) | 254/440 (312) | 277/480 (312) | 347/600 (07) |
|---|---|---|---|---|---|---|---|
| Transient | | | 0.135 | 0.135 | 0.135 | 0.135 | 0.135 |
| Subtransient | | | 0.010 | 0.010 | 0.010 | 0.010 | 0.010 |
| Open Circuit | | | 2.230 | 2.230 | 2.230 | 2.230 | 2.230 |
| DC | | | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 |

| **WINDINGS** (@20°C) | 220/380 (13) | 240/416 (13) | 220/380 (312) | 240/416 (312) | 254/440 (312) | 277/480 (312) | 347/600 (07) |
|---|---|---|---|---|---|---|---|
| Stator Resistance (Line to Line, Ohms) | | | 0.00126 | 0.00126 | 0.00126 | 0.00126 | 0.00400 |
| Rotor Resistance (Ohms) | | | 1.85 | 1.85 | 1.85 | 1.85 | 1.85 |
| Number of Leads | | | 6 | 6 | 6 | 6 | 6 |

Power Generation

# ALTERNATOR DATA SHEET — Frame Size P734C

## CHARACTERISTICS

| | | | |
|---|---|---|---|
| **WEIGHTS:** | Stator Assembly: | 3186 lb | 1445 kg |
| | Rotor Assembly: | 2756 lb | 1250 kg |
| | Complete Assembly: | 6654 lb | 3018 kg |
| **MAXIMUM SPEED:** | | 2250 | |
| **EXCITATION CURRENT:** | Full Load | 3.6 | |
| | No Load | 0.5 | |

**INSULATION SYSTEM:** Class H Throughout

| **3 ∅ RATINGS** (0.8 power factor)<br>(Based on specific temperature rise at 40°C ambient temperature) | | **50 Hz Voltage** (winding no) | | | |
|---|---|---|---|---|---|
| | | 220/380 (312) | 240/400 (312) | 240/415 (312) | 254/440 (312) |
| 163°C Rise Ratings | kW | 1292 | 1328 | 1328 | 1304 |
| | kVA | 1615 | 1660 | 1660 | 1630 |
| 150°C Rise Ratings | kW | 1256 | 1292 | 1292 | 1272 |
| | kVA | 1570 | 1615 | 1615 | 1590 |
| 125°C Rise Ratings | kW | 1204 | 1240 | 1240 | 1216 |
| | kVA | 1505 | 1550 | 1550 | 1520 |
| 105°C Rise Ratings | kW | 1120 | 1156 | 1156 | 1132 |
| | kVA | 1400 | 1445 | 1445 | 1415 |
| 80°C Rise Ratings | kW | 1036 | 1068 | 1068 | 1048 |
| | kVA | 1295 | 1335 | 1335 | 1310 |

| **REACTANCES** (per unit ± 10%)<br>(Based on full load at 125°C Rise Rating) | 220/380 (312) | 240/400 (312) | 240/415 (312) | 254/440 (312) |
|---|---|---|---|---|
| Synchronous | 3.18 | 2.96 | 2.75 | 2.40 |
| Transient | 0.19 | 0.18 | 0.17 | 0.15 |
| Subtransient | 0.14 | 0.13 | 0.12 | 0.11 |
| Negative Sequence | 0.20 | 0.19 | 0.18 | 0.15 |
| Zero Sequence | 0.02 | 0.02 | 0.02 | 0.02 |

| **MOTOR STARTING** | 220/380 (312) | 240/400 (312) | 240/415 (312) | 254/440 (312) |
|---|---|---|---|---|
| Maximum kVA (90% Sustained Voltage) | 3688 | 3688 | 3688 | 3688 |

| **TIME CONSTANTS** (Sec) | 220/380 (312) | 240/400 (312) | 240/415 (312) | 254/440 (312) |
|---|---|---|---|---|
| Transient | 0.135 | 0.135 | 0.135 | 0.135 |
| Subtransient | 0.010 | 0.010 | 0.010 | 0.010 |
| Open Circuit | 2.230 | 2.230 | 2.230 | 2.230 |
| DC | 0.020 | 0.020 | 0.020 | 0.020 |

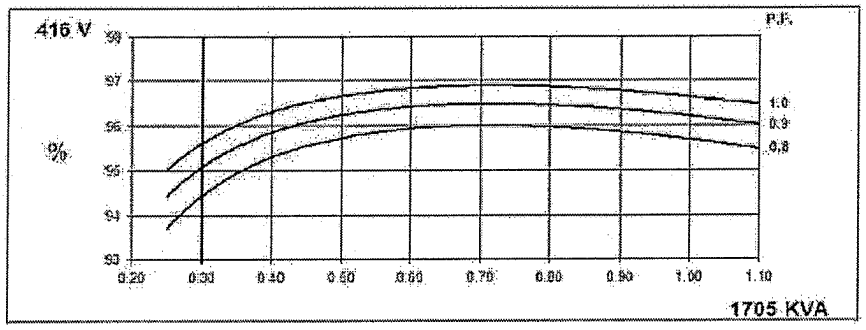
| **WINDINGS** (@20°C) | 220/380 (312) | 240/400 (312) | 240/415 (312) | 254/440 (312) |
|---|---|---|---|---|
| Stator Resistance (Line to Line, Ohms) | 0.00126 | 0.00126 | 0.00126 | 0.00126 |
| Rotor Resistance (Ohms) | 1.85 | 1.85 | 1.85 | 1.85 |
| Number of Leads | 6 | 6 | 6 | 6 |

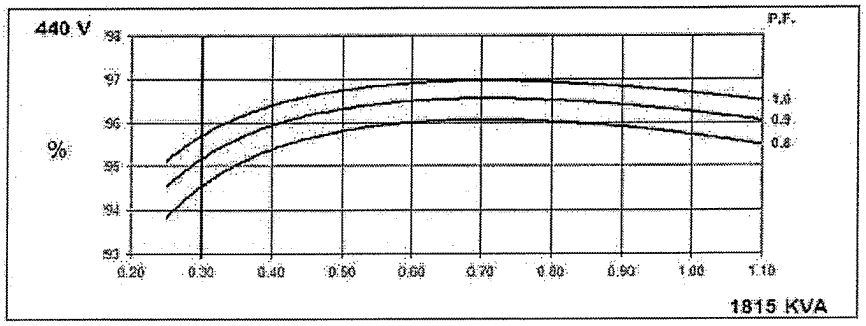
# Alternator Data Sheet Frame Size: P734C

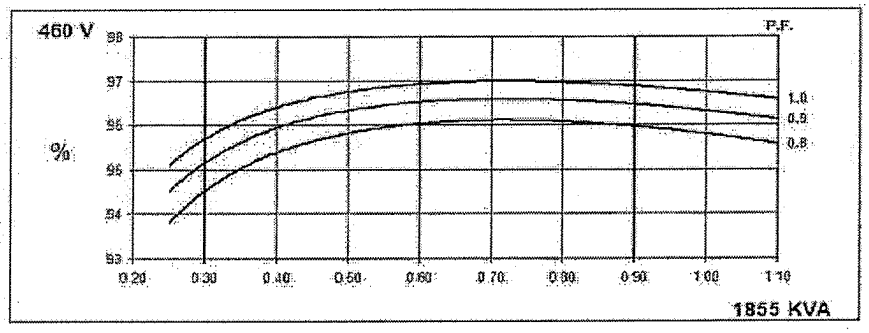
**60 Hz**

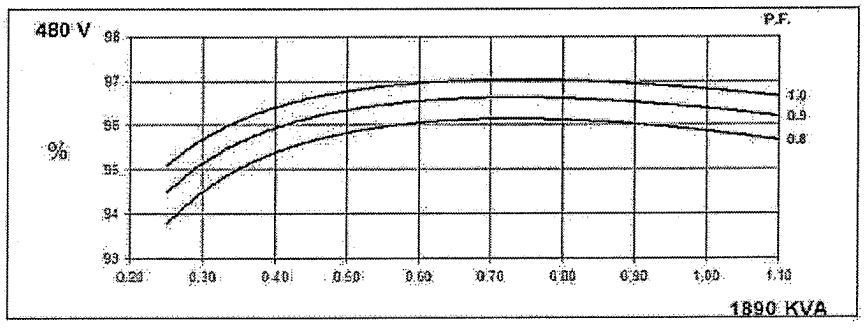
Winding 312

THREE PHASE EFFICIENCY CURVES



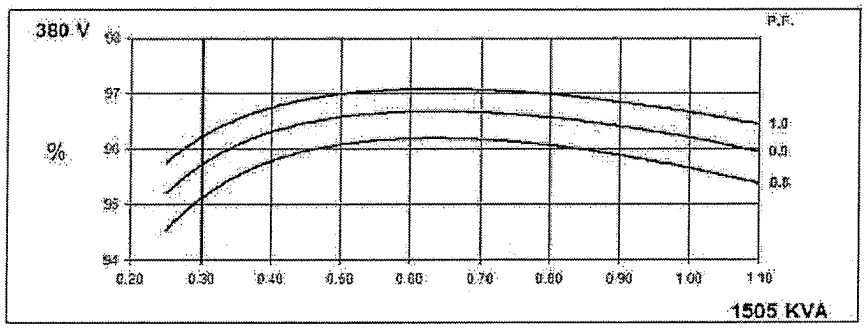



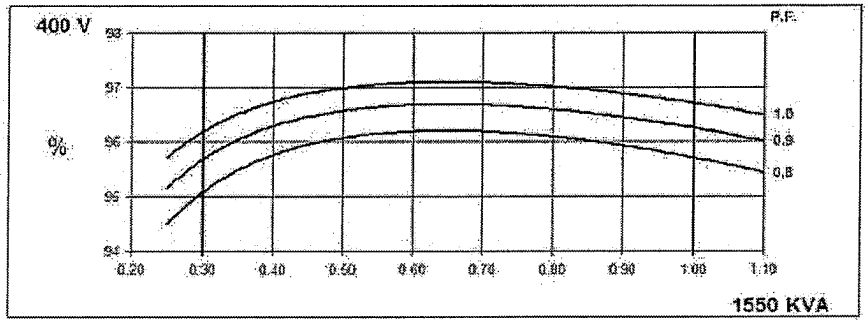
# Alternator Data Sheet Frame Size: P734C

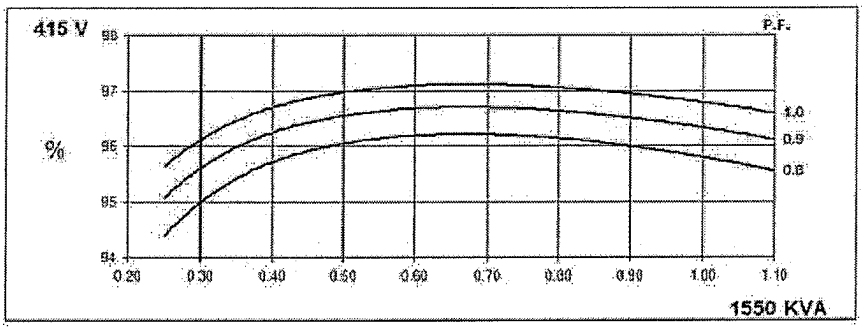
**50 Hz**

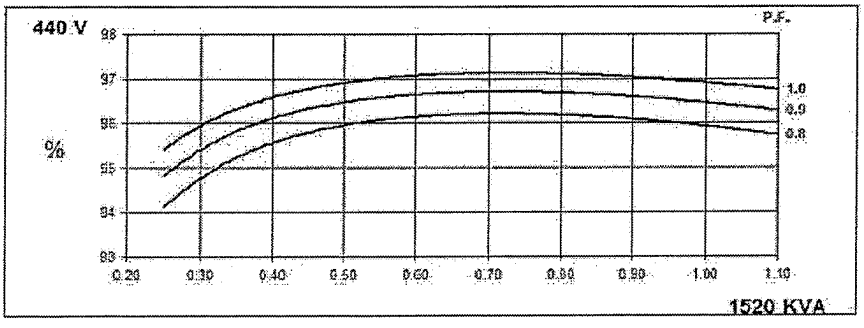
Winding 312

THREE PHASE EFFICIENCY CURVES



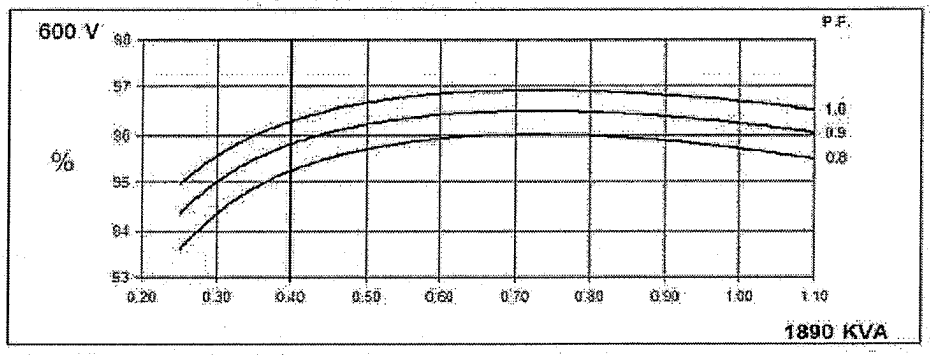



# Alternator Data Sheet Frame Size: P734C

Wdg 7, 60Hz

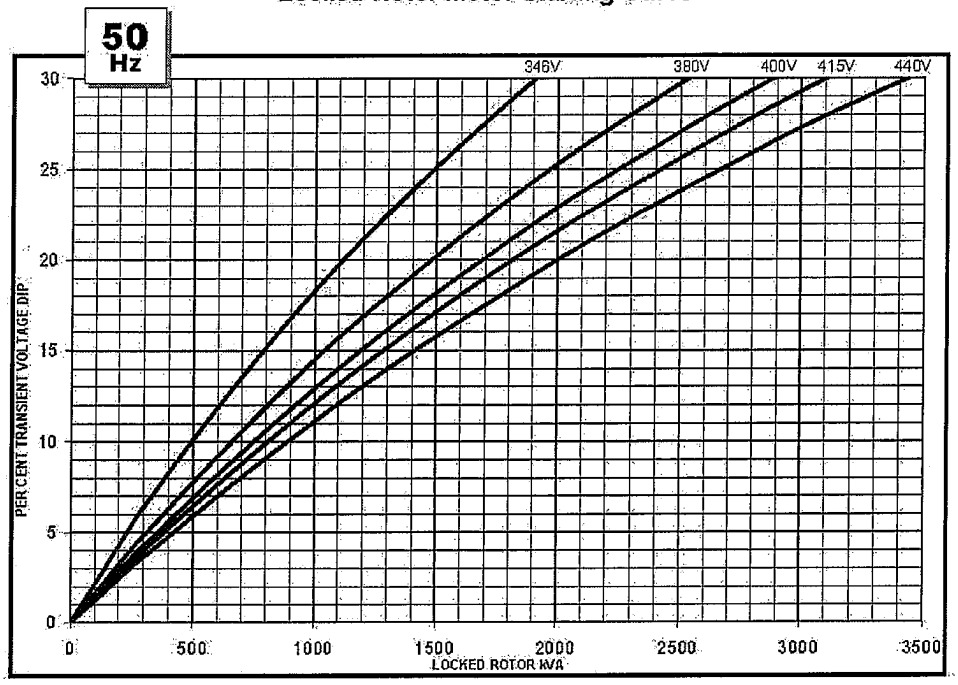
THREE PHASE EFFICIENCY CURVES

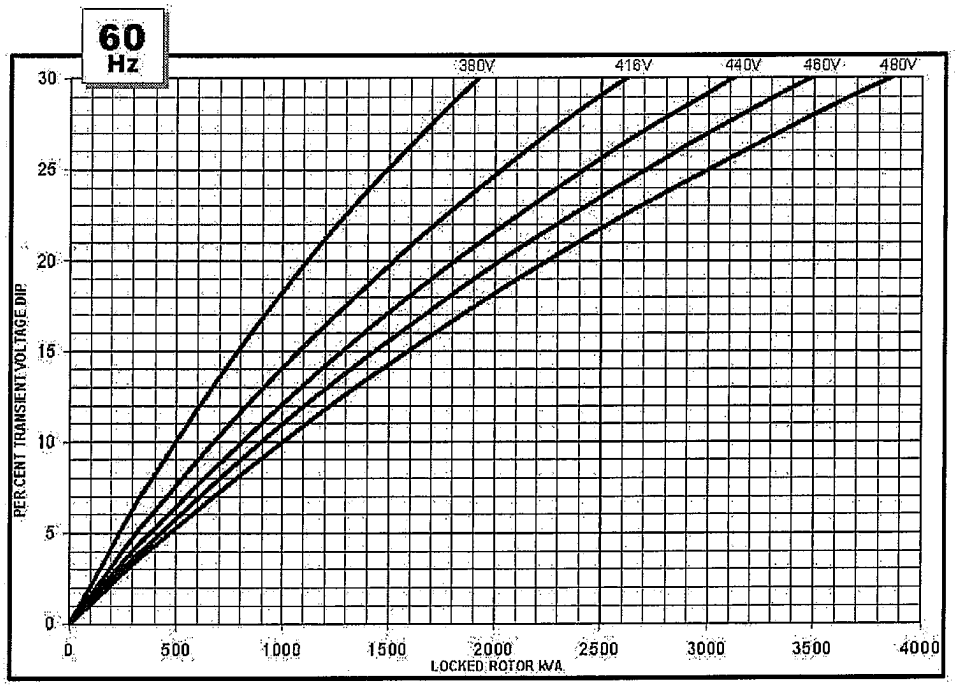


# Alternator Data Sheet Frame Size: P734C

Winding 312

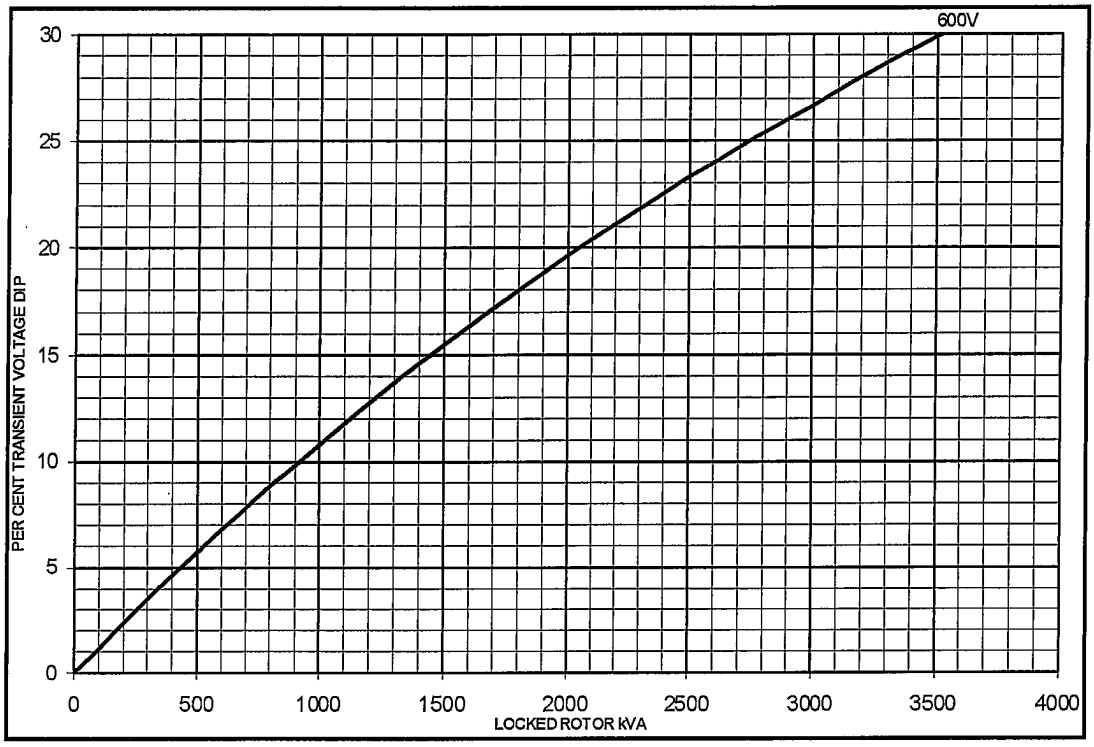
Locked Rotor Motor Starting Curve



## Winding 07
## LOCKED ROTOR MOTOR STARTING CURVE

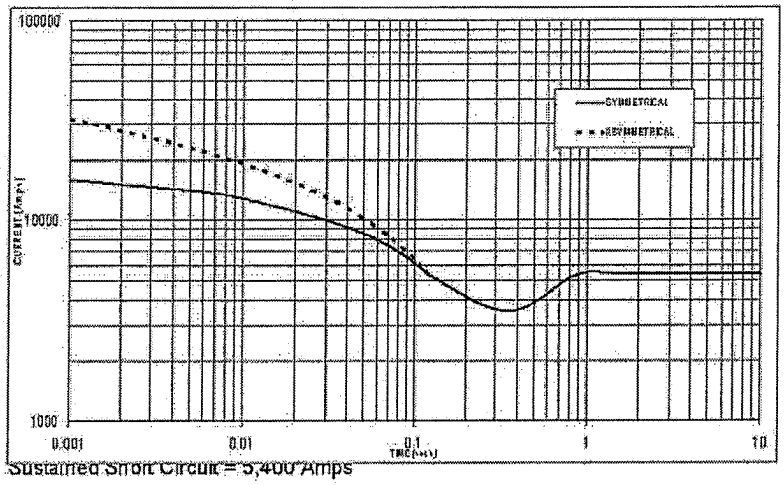
**AVR MX** **60 Hz**



# Alternator Data Sheet Frame Size: P734C

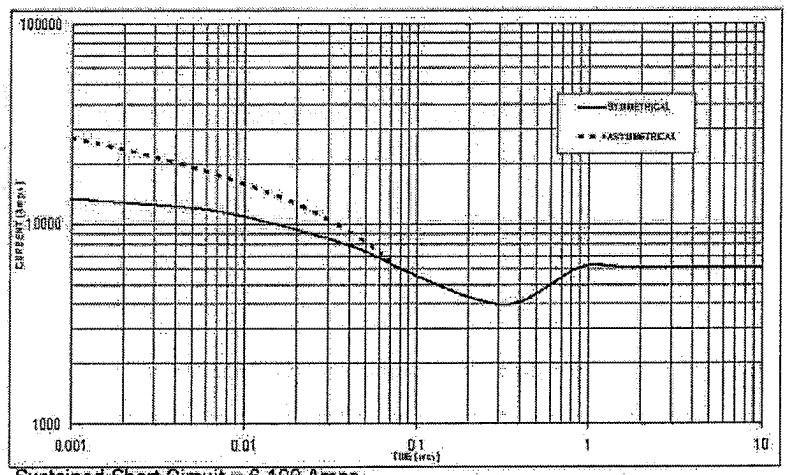
**Three-phase Short Circuit Decrement Curve. No-load Excitation at Rated Speed**
**Based on star (wye) connection.**

**50 Hz**




Sustained Short Circuit = 5,400 Amps

**60 Hz**




Sustained Short Circuit = 6,100 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

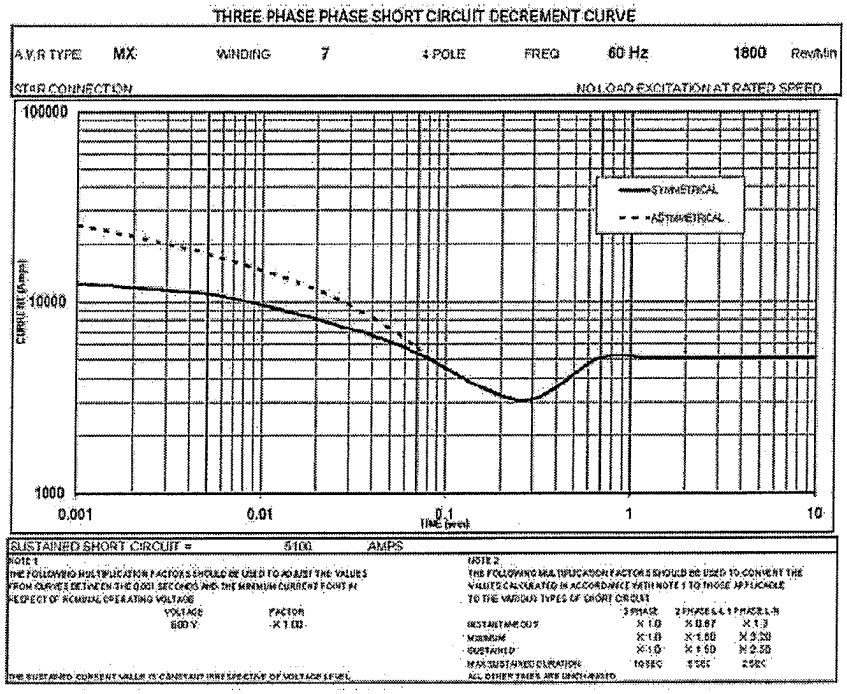
**Note 2**
The following multiplication factor should be used to convert the values calculated in accordance with NOTE 1 to those applicable to the various types of short circuit :

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

All other times are unchanged

**Note 3**
Curves are drawn for Star (Wye) connected machines.

# Alternator Data Sheet Frame Size: P734C



Power Generation

# Exhaust Emission Data Sheet

# 1500DFLE

## 60 Hz Diesel Generator Set

### Engine Information:

| | | | |
|---|---|---|---|
| Model: | Cummins KTA50-G9 | Bore: | 6.25 in. ( 159 mm ) |
| Type: | 4 Cycle, 60° V, 16 Cylinder Diesel | Stroke | 6.25 in. ( 159 mm ) |
| Aspiration: | Turbocharged and Low Temperature Aftercooled | Displacement: | 3067 cu. in. ( 50.2 liters ) |
| | | Compression Ratio: | 14.9:1 |

Emission Control Device: Turbocharged, Low Temperature Aftercooled and Variable Timing

| PERFORMANCE DATA | 1/4 Standby | 1/2 Standby | 3/4 Standby | Full Standby | Full Prime |
|---|---|---|---|---|---|
| BHP @ 1800 RPM ( 60 Hz) | 555 | 1110 | 1655 | 2220 | 1855 |
| Fuel Consumption (gal/Hr) | 31.5 | 55.0 | 79.0 | 103.6 | 87.3 |
| Exhaust Gas Flow (CFM) | 4700 | 6950 | 8950 | 10650 | 9600 |
| Exhaust Gas Temperature ( °F) | 735 | 830 | 865 | 960 | 880 |
| **EXHAUST EMISSION DATA** | | | | | |
| HC ( Total Unburned Hydrocarbons ) | 0.51 | 0.27 | 0.20 | 0.17 | 0.18 |
| NOx ( Oxides of Nitrogen as NO2 ) | 3.30 | 4.50 | 6.40 | 8.50 | 7.30 |
| CO ( Carbon Monoxide ) | 1.20 | 0.90 | 0.80 | 1.30 | 1.00 |
| PM ( Particulate Matter ) | 0.35 | 0.18 | 0.14 | 0.11 | 0.13 |

All values are Grams per HP-Hour

## TEST CONDITIONS

Data was recorded during steady-state rated engine speed ( ± 25 RPM) with full load ( ± 2% ).
Pressures, temperatures, and emission rates were stablized.

| | |
|---|---|
| Fuel Specification: | ASTM D975 No. 2-D diesel fuel with 0.03-0.05% sulfur content (by weight), and 40-48 cetane number. |
| Fuel Temperature: | 99 ± 9 ° F ( at fuel pump inlet) |
| Intake Air Temperature: | 77 ± 9 ° F |
| Barometric Pressure: | 29.6 ± 1 in. Hg |
| Humidity: | NOx measurement corrected to 75 grains H2O/lb dry air |
| Reference Standard: | ISO 8178 |

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

Power Generation

# PROTOTYPE TEST SUPPORT (PTS)
# 60 HZ TEST SUMMARY

| GENERATOR SET MODELS | | REPRESENTATIVE PROTOTYPE | |
|---|---|---|---|
| 1100DFLB | 1250DFLC | Model: | 1500DFLE |
| 1500DFLE | | Alternator: | P734F |
| | | Engine: | KTA50-G9 |
| | | | Nonroad 1 |

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:** **1583 kW**

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

**Torsional Analysis and Testing:**

The generator set 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 1200 to 2000 RPM.

**Cooling System:** 40 °C Ambient
0.50 in. H2O restriction

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

**Durability:**

The generator set was subjected to a minimum 500 hour endurance test operating at variable load up to the standby rating based upon 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 was within the specified maximum limits.

| | |
|---|---|
| Voltage Regulation: | ±0.50% |
| Random Voltage Variation: | ±0.50% |
| Frequency Regulation: | Isochronous |
| Random Frequency Variation: | ±0.25% |

**Transient Performance:**

The generator set was tested with the standard 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:

| | | |
|---|---|---|
| Full Load Acceptance: | | |
| Voltage Dip: | 33.3 | % |
| Recovery Time: | 3.3 | Second |
| Frequency Dip: | 4.1 | % |
| Recovery Time: | 3.8 | Second |
| Full Load Rejection: | | |
| Voltage Rise: | 18.2 | % |
| Recovery Time: | 3.1 | Second |
| Frequency Rise: | 4.2 | % |
| Recovery Time: | 2.6 | Second |

**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 | 0.18 | 0.01 | 0.13 | 0.08 |
| 5 | 0.20 | 2.30 | 0.13 | 2.30 |
| 7 | 0.52 | 1.46 | 0.48 | 0.74 |
| 9 | 0.08 | 0.03 | 0.03 | 0.07 |
| 11 | 0.65 | 0.49 | 0.64 | 0.46 |
| 13 | 0.21 | 0.28 | 0.19 | 0.31 |
| 15 | 0.05 | 0.05 | 0.03 | 0.10 |

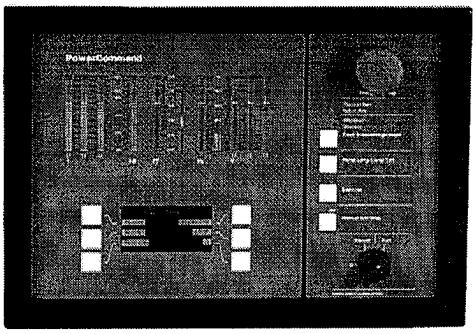
Power Generation

## GenSet Controls

# PowerCommand®

## Digital Generator Set Control

with Paralleling & Power Transfer



*PowerCommand Operator Panel, including graphical display and analog AC metering.*

## Description

The PowerCommand Control (3201) is a microprocessor-based generator set monitoring, metering, and control system. The control provides an operator interface to the genset, digital voltage regulation, digital governing, generator set protective functions, and automatic power transfer functions. The integration of all the functions into a single control system provides enhanced reliability and performance compared to conventional control systems.

PowerCommand generator set controls are suitable for use on generator set ranging in size from roughly 20kW to 4000 kW. They will directly read AC voltages up to 600VAC, and can be configured for any frequency, voltage, and power connection configuration from 120-13,800VAC.

The PowerCommand control is designed for mounting on the generator set. The operator panel may also be remote-mounted from the generator set, and connected via an RS485 network connection.

Control power for PowerCommand is usually derived from the generator set starting batteries. The control functions over a voltage range from 8VDC to 35VDC.

## Features

The control offers a wide range of standard control and digital display features so custom control configurations are not needed to meet application specifications. System reliability is not compromised by use of untested special components.

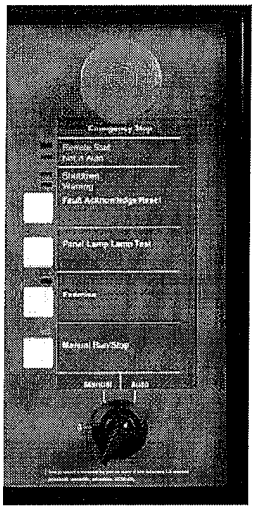
### *Major Control Features Include:*

- **Digital Full Authority Electronic Engine Controls** for Cummins HPI-PT fuel system, including engine monitoring and protection, and governing. These functions are integrated with voltage regulation, and paralleling functions for optimum system performance.
- **Digital Voltage Regulation**
- **AmpSentry™ Protection** for true alternator overcurrent protection.
- **Digital Power Transfer Controls,** including operation in open transition, closed transition, or soft (ramping) transfer modes.
- **Analog and Digital AC Output Metering**.
- **Battery Monitoring System** to sense and warn against a weak battery condition.
- **Digital Alarm and Status Message Display**
- **Generator set Monitoring**: Displays status of all critical engine and alternator generator set functions.
- **Smart Starting Control System**: Integrated fuel ramping to limit black smoke and frequency overshoot, in addition to optimized cold weather starting.
- **Advanced Serviceability** using InPower, a PC-based software service tool.
- **PowerCommand Network** (optional).
- **Warranty.** PowerCommand Controls are supported by a worldwide network of independent distributors who provide parts, certified service and warranty support.

## Operator Panel

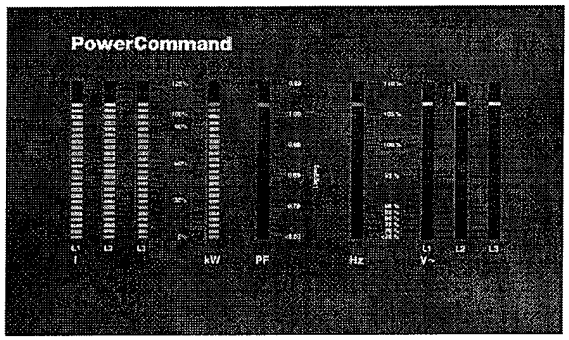
The operator panel provides the user with a complete package of easy to view and use information. It includes an enhanced graphical operator panel that allows the user to view up to 9 lines of information, as well as graphical displays of system data. Connections to the operator panel are sealed locking plug interfaces, for reliable, vibration-resistant interconnection to the generator set wiring harness.

### *Control Switches and Functions*



- **OFF/MANUAL/AUTO Mode Control Switch -** The NOT IN AUTO lamp will flash when the control is in the MANUAL or OFF mode. In the AUTO mode, the generator set can be started using the exercise push-button, or with a start signal from a remote device, such as automatic transfer switches.
- **MANUAL RUN/STOP Control Switch And Indicating LED -** When the mode control switch is in the MANUAL position and the MANUAL RUN /STOP switch is pressed, the Generator set will start, bypassing all time delay start. (Time delay idle can also be bypassed with another control action.) If the generator set is running in the MANUAL mode, pressing the RUN/STOP switch will cause the generator set to shut down. An LED (light emitting diode) lamp adjacent to the switch will light to indicate the generator set is in manual mode.
- **EXERCISE Control Switch And Indicating LED -** When the mode control switch is in the AUTO mode the EXERCISE control switch is used to complete a pre-programmed exercise sequence. All exercise functions are disabled when an emergency start command is received by the control. An LED lamp adjacent to the switch will light to indicate the generator set is in exercise mode.
- **PANEL LAMP/LAMP TEST Control Switch**
- **FAULT ACKNOWLEDGE/RESET Switch –** The control includes a fault acknowledge function to allow the operator to reset the fault condition. If the fault condition is not corrected, the fault will reappear, but will not be logged as a separate event. Multiple faults can be logged and displayed at one time.
- **EMERGENCY STOP Control Switch**
- **Operator Adjustments -** The control includes provisions for many set up and adjustment functions via raise/lower switches on the operator panel. Functions that can be adjusted by the operator include:
  - Time delay start (0-300 seconds)
  - Time delay stop (0-600 seconds)
  - Alternator voltage (plus or minus 5%)
  - Alternator frequency (plus or minus 3 hertz).

  The operator panel can be configured to require an access code prior to adjusting these values. A second access code is used to protect the control from unauthorized service level adjustments. Voltage and frequency adjustments are disabled during operation in parallel with a system bus to prevent inadvertent misadjustment of the paralleling load sharing functions.

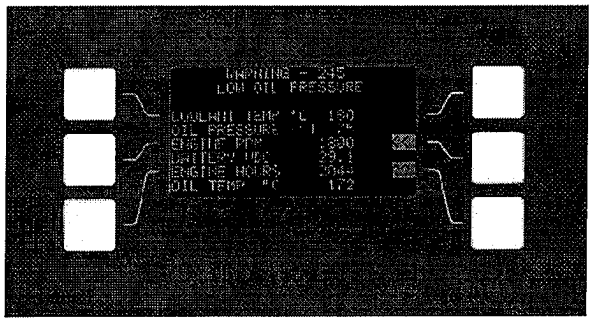



*PowerCommand Analog AC Metering Display*

### *Analog AC Metering Panel*

The PowerCommand control is equipped with an analog AC metering panel that simultaneously displays 3-phase line to line AC volts and current, kW, power factor, and frequency.

The meter panel is composed of a series of LED's configured in bar graphs for each function. The LED's are color coded, with green indicating normal range values, amber for warning levels, and red for shutdown conditions. Scales for each function are in % of nominal rated values. Resolution is 1% for values close to nominal, and increases at increasing values from nominal.




## *Graphical Display Panel*

The PowerCommand control is provided with a graphical display capable of displaying up to 9 lines of data with approximately 27 characters per line. The graphical display is accompanied by a set of six tactile feel membrane switches that are used by the operator to navigate through control menus, and to make control adjustments. Display is configurable for multiple languages. It is configurable for units of measurement. The display incorporates three levels of operation and adjustability. All data on the control can be viewed by scrolling through screens with the navigation keys. The top three lines of the display are allocated to mode and status messages that continuously display the operating mode of the control system, as well as any faults or warning conditions that may be present on the controller. If more than one fault or warning message is present the messages will scroll to allow the operator to view all active messages in the system.

- **Generator Set Hardware Data** - Generator set rating in kVA, complete Generator set model number and serial number, engine model and serial number, and alternator model and serial number. The control also displays the part number of the control and the software version present in the control.
- **Data Logs** - Number of start attempts and number of start attempts since reset. Number of times generator set has run, and number of times since reset. Duration of generator set running time, and duration of running time since last reset. Generator set kWh produced, and kWh produced since last reset.
- **Adjustment History** - Provides a record of adjustment and setting changes made on the control, and identifies whether adjustment was made via the operator panel or with a service tool. If a service tool is used, the control provides a record of the serial number of the tool used. This information is read with InPower.
- **Fault History** - Provides a record of the most recent fault conditions with time stamp, along with the number of times each fault has occurred. At least 20 events are stored in the control memory.
- **Load Profile Data** - Provides data indicating the operating hours at percent of load, in 10% increments. The data is presented based on total operating hours on the generator set, and also on the loads on the generator set since reset.
- **Generator Set Output Voltage** - all phases, line to line and line to neutral, accuracy 1%.
- **Generator Set Output Current** - all phases, accuracy 1%.
- **Generator Set Output Frequency**
- **Generator Set Power Output** - PowerCommand displays generator set kW and kVA output (average and individual phase, and direction of flow), and power factor with leading/lagging indication. Accuracy 5%.
- **Generator Set kWh Power Output** - Displays total kilowatt-hours produced by the generator set, and total produced since last reset, with time stamp of time of last reset.
- **Digital Synchroscope** - Panel displays bus voltage and frequency, generator set bus voltage and frequency, the phase angle displacement, and provides a signal when the generator is ready to close to the bus. A breaker control switch is included on this panel for convenient operation of the equipment without switching between viewing screens.
- **Basic Engine Data** - Engine Starting Battery Voltage, Engine Lube Oil Pressure, Engine Coolant Temperature
- **Engine Service Data** - Engine Coolant Pressure Engine Fuel Rail Temperature and Pressure, Engine Fuel Input And Output Temperature, Intake Manifold Temperature And Pressure, Ambient Air Pressure, Crankcase Blowby Flow, Aftercooler Inlet Coolant Temperature
- **Engine Fuel Consumption** - The fuel consumed by the engine is determined by algorithms based on parameters monitored by the fuel system. Accuracy is $\pm$ 5% for load levels over 30% of standby rating. Data provided includes overall average fuel consumed, consumption since reset. This information is read with InPower.
- **Engine Exhaust Temperature (optional)**
- **Utility (Mains) Source Data** – Displays line to line and line to neutral voltage of utility (mains) source, frequency, and estimated amps, kW, and kVA supplied by utility (mains) source.
- **System Status Information** – Provides graphical system status display showing availability of sources and positions of each contactor.
- **System Control** – Allows operator to view status of system, and manually control operation of the system. Provides manual adjustment capability for time delay start, stop, transfer, and retransfer, as well as time delays for program transition (when used) and power transfer overlap time.

# Internal Control Functions

## *General Functions*

**Emergency Start Mode** - PowerCommand accepts a ground signal from remote devices or a network signal to automatically start the generator set and immediately accelerate to rated speed and voltage.

PowerCommand includes a Smart Starting™ system, that is designed to quickly start the engine, minimize black smoke, and minimize voltage and frequency overshoot and oscillations on starting. The control system does this by careful simultaneous control of the engine fuel system and alternator excitation system.

**Non-Emergency Start Mode** - The control is provided with a separate remote start input or a network signal to start the generator set via the programmable idle control. Using the non-emergency mode, the generator set takes longer to start, but there is less wear on the engine. In this start mode, the generator set will start, operate at idle speed for a predefined time period or until the engine reaches operating temperature (whichever is time is shorter), and then ramp to rated speed and voltage. Time delay is adjustable from 0-300 seconds, and default is 10 seconds. The control also monitors and records the source of start signals, when that information is available. The control automatically exits idle mode if an emergency remote start signal is received at the control.

**Screen-Saver Mode** - PowerCommand can be programmed to automatically switch off the operator panel displays to reduce battery voltage drain when the control is not being used and the generator set is not running. Depressing any button on the operator panel, new fault conditions or receipt of a remote signal at the control will "wake up" the control.

**Data Logging** - The control maintains a record of manual control operations, warning and shutdown conditions, and other events. It uses the control "ON" time as the time stamp means when a real time clock is not included with the control. The control also stores critical engine and alternator data before and after a fault occurs, for use by InPower and the technician in evaluating the root causes for the fault condition.

**Fault Simulation Mode** - PowerCommand, in conjunction with InPower software, will accept commands to allow a technician to verify the proper operation of all protective functions of the control, 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 of the specific generator set it is communicating with.

**Built In Test** - The control system automatically tests itself, and all the sensors, actuators and harnesses in the control system on a startup signal. The test can also be initiated from InPower, and can be accomplished either local to the generator set or remotely.

**Synchronizer** - PowerCommand incorporates a digital synchronizing function to force the generator set to match the phase relationship and voltage of the generator set output with the utility grid. The synchronizer includes provisions to provide proper operation even with highly distorted bus voltage waveforms. The synchronizer operates over a range of 60-110% of nominal voltage and frequency, and includes adjustments for phase angle window (5-20 degrees) and time delay (0.5-5 seconds).

**Load Govern Mode** - When PowerCommand receives a signal indicating that the generator set is paralleled with an infinite source, such as a utility (mains) service, the generator set will operate in load govern mode. In this mode, the generator set will synchronize and close to the bus, and 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 (leading). Default setting is 80% of standby and 1.0 power factor. The control includes inputs to allow independent control of kW and kVar load sharing level by a remote device while in the load govern mode. The rate of load increase and decrease is also adjustable in the control.

## *Engine Control*

- **Engine Starting** - The control operates a factory-supplied fuel valve that enables engine starting.
- **Cycle Cranking** - Configurable for number of starting cycles (1 to 7) and duration of crank and rest periods. Control includes starter protection algorithms to prevent the operator from specifying a starting sequence that might be damaging. Default setting is for (3) start cycles composed of 15 seconds of cranking, and 15 seconds of rest.
- **Programmable Idle Speed Control** - In this mode the generator set would start and run to idle speed. It would operate at that speed for a programmed time period, then ramp to rated speed. When the control gets a signal to stop, it will ramp to idle, operate for the programmed period at idle, and then shut down. During idle mode engine protective functions are adjusted for the lower engine speed, and alternator function is disabled.
- **Time Delay Start And Stop (cooldown)** - Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal, and for time delay of 0-600 seconds prior to ramp to idle or shut down after signal to stop in normal operation modes. The generator set control will monitor the load during operation of the generator set, and if the total load on the set is less than 10% of rated, it will reduce the operation time for the time delay stop to prevent extended operation of the engine at very light load levels. Default for both time delay periods is 0 seconds.

## *Engine Governing*

- **Isochronous Governing** - Controls engine speed within plus or minus 0.25% for any steady state load from no load to full load. Frequency drift will not exceed plus or minus 0.5% for a 60F (33C) change in ambient temperature over an 8 hour period.
- **Droop Governing** - Control can be adjusted to droop from 0 to 10% from no load to full load, using InPower.
- **Temperature Dynamics** - Modifies the engine fuel system control parameters as a function of engine temperature. Allows engine to be more responsive when warm, and more stable when operating at lower temperature levels.
- **Isochronous Load Sharing Control** – see *General Functions*.
- **Droop Load Sharing Control**– see *General Functions*.
- **Idle Mode** - Engine governing can be regulated at an idle speed for a programmed period on start or stop of the engine. When the engine is operating at idle speed, the alternator excitation is automatically switched off.

## *Alternator Control*

- **Digital Output Voltage Regulation** - PowerCommand will regulate output voltage to within 0.5% for any loads between no load and full load. Voltage drift will not exceed plus or minus 0.5% for a 60F (33C) change in temperature in an 8 hour period. On engine starting, or sudden load acceptance, voltage is controlled to a maximum of 5% overshoot over nominal level.
- **Torque-Matched Volts/Hz Overload Control** - The voltage roll-off set point and rate of decay (i.e., the slope of the volts/hertz curve) is adjustable in the control. This function is automatically disabled when the control is in a synchronizing mode.
- **Fault Current Regulation** - PowerCommand will regulate the output current on any phase to a maximum of 3 times rated current under fault conditions for both single phase and three phase faults. In conjunction with a permanent magnet generator, it will provide 3 times rated current on all phases for motor starting and short circuit coordination purposes.
- **Isochronous (kVar) Load Sharing Control** – see *General Functions*.
- **Droop (kVar) Load Sharing Control** – see *General Functions*.

## *Protective Functions*

On a warning condition the control will indicate a fault by lighting the warning LED on the control panel, and displaying the fault name and code on the operator display panel. 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.

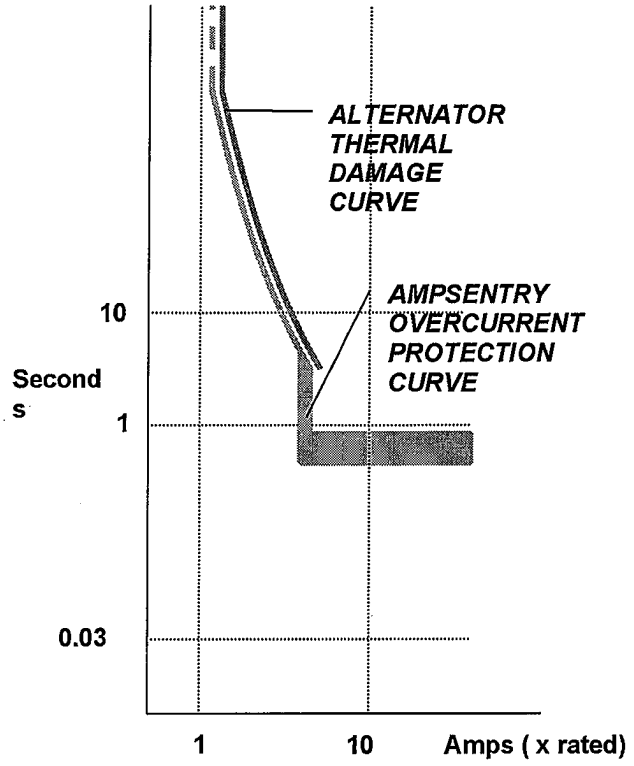
On a shutdown condition, the control will light the shutdown LED on the control panel, display the fault name and code, and initiate shut down and lock out the generator set. The shutdown sequence of the generator set includes programmable cooldown at idle for fault conditions that do not endanger the engine. The control maintains a data log of all fault conditions as they occur, and time stamps them with the controller run time and engine operating hours data. Adjustments to most set points are made using the InPower™ service tool.

The control system includes a "fault bypass" mode that forces the system to function regardless of the status of protective functions. In this mode the only protective functions that are operational are Overspeed, loss of both speed sensors, or moving the control switch to the off position, or pressing the EMERGENCY STOP switch. The control maintains a record of the time that the mode is enabled, and all warning or shutdown conditions that have occurred while in the "fault bypass" mode.

Many protective functions within the control system are configurable for warning, shutdown, or both (2 levels). Exceptions to this include functions such as overspeed conditions, and loss of speed sensing. In addition, some warning functions can incorporate control functions as a consequence of a fault.
PowerCommand provides the following system protective functions:

- **Ground Fault Warning (option- 600VAC class generator sets)** - Ground (Earth) fault sensing is adjustable over a range of 100-1200 amps, with time delays of 0-1 second. May be configured for shutdown rather than alarm.
- **Configurable Alarm And Status Inputs** - PowerCommand will accept up to four alarm or status inputs (contact closed to ground) to indicate customer-specified conditions. The control is programmable for warning, shutdown or status indication, and for labeling the input (up to 24 characters). Four additional faults can be input to the control via the network.
- **Breaker Fail To Close And Breaker Auxiliary Contact Warning Or Shutdown** - When the paralleling control signals a circuit breaker to close, it will monitor the breaker auxiliary contacts and verify that the breaker has connected the generator set to the system bus. If the control does not sense a breaker closure within 1 second of the close signal, the control will monitor the phase relationship between the generator set and the bus. If this indicates that the generator set is not closed to the bus, the Breaker Fail to Close alarm will be indicated, the breaker will be opened, and the generator set shut down. If the phase relationship monitor indicates that the generator set is in parallel with the bus, the Breaker Auxiliary Contact Failure will be indicated, and the generator set will continue to run in normal operation mode.

- **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 1 second of initiation of signal, a Breaker Fail to Open warning is initiated. The control will logically allow the generator set to continue to run if shutdown of the generator set with the breaker closed will cause potential damage or operating problems.
- **Bus Or Generator Set PT Input Calibration Error** - The control system monitors the sensed voltage from the bus and generator set output voltage potential transformers, and will indicate a warning condition when they read different values when the paralleling breaker is closed.
- **Emergency Stop** - Annunciated whenever the local or remote emergency stop signal is received. Alarm panel distinguishes between local or remote operation.




## *AmpSentry™*

AmpSentry is a comprehensive monitoring and control system integral to the PowerCommand control that guards the electrical integrity of the alternator and power system by providing protection against a wide array of fault conditions in the generator set or in the load. It also provides single and 3-phase fault current regulation, so that downstream protective devices have the maximum current available to quickly clear fault conditions, without subjecting the alternator to potentially catastrophic failure conditions. Functions included:

- **Over Current Warning** - Output current on any phase at more than 110% of rating for more than 60 seconds.
- **Over Current Shutdown (51)** - Output current on any phase is more than 110%, less than 175% of rating, and approaching thermal damage point of alternator. Control includes algorithms to protect alternator from repeated over current conditions over a short period of time.
- **Short Circuit Shutdown (51V)** -Output current on any phase is more than 110%, more than 175% of rating, and approaching thermal damage point of alternator. Control includes algorithms to protect alternator from repeated over current conditions over a short period of time.
- **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 0.25-10 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 2-10 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 voltage roll-off during synchronizing.
- **Under Frequency Shutdown (81u)** - Generator set output frequency cannot be maintained. Settings are adjustable from 0-10 hertz below nominal governor set point, for a 0-20 second time delay. Default: 6Hz, 10 seconds. Under frequency protection is disabled when excitation is switched off (such as when engine is operating in idle speed mode or the synchronizer is enabled).
- **Over Frequency Shutdown/Warning (81o)** - Generator set is operating at a potentially damaging frequency level. Defaults: Disabled.
- **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 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. Defaults: 10%, 3 seconds.
- **Sync Check (25)** - Verifies that the generator set is operating in synchronism with the system bus prior to allowing the paralleling breaker to close. Includes dead bus sensing capability.
- **Fail To Synchronize Warning Or Shutdown** - Indicates that the generator set could not be brought to synchronization with the system bus. Configurable for warning or shutdown, and adjustable for time delay of 10-120 seconds. Default is 120 seconds.
- **Phase Sequence Sensing Shutdown** - Verifies that the generator set phase sequence matches the bus prior to allowing the paralleling breaker to close. The generator set will shutdown if the generator set and bus phase sequence does not match.
- **Reverse Var Shutdown** - Shutdown level is adjustable: 15-50% of rated Var output, delay 10-60 seconds. Defaults: 20%, 10 seconds.

- **High Alternator Temperature (Option)**

### *Engine Protection*

- **Overspeed Shutdown -** Default setting is 115% of nominal.
- **Low Lube Oil Pressure Shutdown -** Level is preset to match the capabilities of each engine. Control includes time delays to prevent nuisance shutdown signals.
- **Low Lube Oil Pressure Warning -** Level is preset to match the capabilities of each engine. Control includes time delays to prevent nuisance shutdown signals.
- **High Coolant Temperature Shutdown**
- **High Coolant Temperature Warning**
- **Low Coolant Pressure Warning/Shutdown**
- **Low Coolant Level Warning/Shutdown**
- **Low Coolant Temperature Warning.** Indicates that engine temperature may not be high enough for a 10 second start or proper load pickup.
- **Low and High Battery Voltage Warning -** Indicates battery charging system failure by continuously monitoring battery voltage and indicating a problem when voltage is outside a preset acceptance band.
- **Discharged Battery Protection.** When DC voltage is below a preset threshold the control will shut down to avoid completely discharging the battery.
- **Weak Battery Warning -** The control system will test the battery bank each time the generator set is signaled to start, and indicate a warning if the generator set battery indicates impending failure.
- **Fail to Start (Overcrank) Shutdown**
- **Fail to Crank Shutdown -** Control has signaled starter to crank engine but engine does not rotate.
- **Redundant Starter Disconnect**
- **Redundant Speed Sensors -** Loss of one sensor results in a Mag Pickup sensor warning. Loss of both sensors results in Mag Pickup Failure.
- **Low Fuel-Day Tank and Low Fuel-Main Tank warning.**
- **Cranking Lockout.** The control will not allow the starter to attempt to engage or to crank the engine when the engine is rotating.
- **Sensor Failure Indication.** All analog sensors are provided with sensor failure logic to indicate if the sensor or interconnecting wiring has failed. Separate indication is provided for fail high or low.
- **High Crankcase Blowby Level Warning**
- **High Fuel Temperature Warning**
- **High Intake Manifold Temperature/Pressure**
- **Aftercooler Cooler Inlet Over Temperature**

## Power Transfer Control

The Power Transfer Control feature allows PowerCommand to provide integrated automatic power transfer functions including source availability sensing and transfer device monitoring and control. The control is configurable for open transition, fast (100 mS) transfer, or soft (ramping) sequences of operation. Standard functions include:

- 3-phase (line to neutral) close differential under voltage sensing for utility (mains) service. Sensing for pickup in an adjustable range from 85-100% of nominal, with default at 95% of dropout setting. Dropout is configurable 75-98% of pickup, with default at 85%.
- 3-phase over voltage sensing for normal utility service adjustable for pickup at 95-105% of dropout, and dropout configurable for 105-135% of nominal. Time delay is adjustable in a range of 0.5-120 seconds. Default is disabled, and is enabled using InPower.
- Under frequency sensing for normal utility service. Adjustment range is 80-95% of nominal. Default is disabled, and is enabled using InPower.
- Configurable sequence of operation with or without adjustable program-transition capability. Adjustment range is 0-60 seconds.
- Remote Exercise feature. Accepts a remote signal to initiate with or without load testing; or testing can be initiated by the operator. Test sequence may include a programmed idle period prior to acceleration to rated voltage and frequency and after cooldown. Test may be configured to be performed with load or without load.
- Time delays: time delay start and stop as described in this document; time delay transfer adjustable in a range of 0-120 seconds, and retransfer in a range of 0-1800 seconds; all in 1-second increments.
- Fail to disconnect timer. The control includes a fail to disconnect timer that is adjustable in a range of 0.1 to 120 seconds.

## Control Interface

Input signals to the PowerCommand control include:

- **Remote Start signal.** May be connected via either discrete signal or Lon network, or both for premium reliability. Discrete signal is normally open contact to ground, or normally closed contact that opens to indicate start signal. Separate signal inputs available for emergency start and non-emergency start.
- **Remote Emergency Stop**
- **Configurable Customer Inputs.** Control includes provisions for (4) input signals from customer discrete devices.
- **Low Main or Daytank Fuel Level warning.**
- **Remote Alarm Reset.**
- **Load Demand Stop.**
- **Utility Parallel (Load Govern) Mode command.**

Output signals from the control include:

- **Generator Set Running signal.** Fused normally open contact rated 5A @ 30VDC/180VAC, closes to indicate generator set is running.
- **Generator Set Common Shutdown signal.** Self-protected relay driver.
- **Load Shed signal.** Self-protected relay driver. Operation is configurable for under frequency or over kW load, or both. Adjustment range is 80-140% of

standby rating, with time delay of 0-120 seconds. Default settings are: overload: 105%, 60 sec; under frequency: 3 Hz below governor reference for 3 seconds.

- **Ready to Load signal.** Self-protected relay driver. Operates when the generators sets has reached 90% of rated speed and voltage and latches until generator set is switched to off or idle mode.
- **Modem Control signal.** Self-protected relay driver.
- **Paralleling Breaker Interface.** Fused normally open relay contact (5A, 30Vdc/180Vac) for parallel breaker close signal, and normally open contact for parallel breaker open signal.

Control power for auxiliary devices is available from the controller.

Network connections include:

- **Serial Interface.** This communication port is to allow the control to communicate with a personal computer running InPower service and maintenance software.
- **Echelon LonWorks Interface (Option).** PowerCommand generator sets incorporating this option are LonMark™ compliant.

## Certifications

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

- **NFPA110** for level 1 systems.
- **UL508** Listed, Category NIWT7 for US and Canada.
- **CSA C282**-M1999 Compliance
- **CSA 22**.2 No. 14 M91 Industrial Controls.
- **ISO 8528-4: 1993 Compliance,** Controls and Switchgear
- **NFPA99**: Standard for Health Care Facilities
- **CE Marking**
- **EN 50081-1** Residential, commercial, light industrial
- **EN 50081-2** Industrial
- **EN 50082-1** Residential, commercial, light industrial
- **EN 50082-2** Industrial
- **ISO 7637, pulses #2b, 4;** DC supply surge voltage test.
- **Mil Std 202C, Method 101** Salt Fog test
- **ANSI C62.41** Surge Withstand
- **Mil Std 461**
- **IEC 801.2, 3, 4, 5**
- **IEEE 587**

PowerCommand control systems and generator sets are designed and manufactured in ISO9001 certified facilities.

## Environment

The control is designed for proper operation without recalibration in ambient temperatures from –40C to +70C, and for storage from –40C to +80C. Control will operate with humidity up to 95%, non-condensing. The controls are unrestricted with respect to altitude limitations.

The operator control panel is a NEMA 3R/IP53 enclosure. The operator control panel has a single membrane surface, which is impervious to the effects of dust, moisture, oil, and exhaust fumes. The panel uses sealed membrane or oil-tight switches to provide long reliable service life in harsh environments.

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

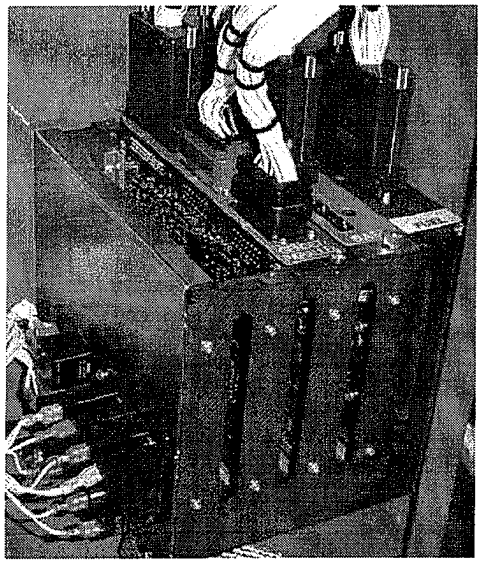
## Software

### *InPower*

InPower is a PC-based software service tool that is designed to directly communicate to PowerCommand generator sets and transfer switches to facilitate service and monitoring of these products.

### *PowerCommand for Windows*

PowerCommand for Windows is a software tool that is used to remotely monitor and control generator sets, transfer switches, and other on-site power system devices.



## Options and Accessories

- ❑ **Key-type Mode Select Switch.**
- ❑ **Ground Fault Alarm Module.**
- ❑ **Utility Protective Relaying.** Gensets can be provided with power switching mechanisms and utility grade protective relaying to meet local grid protection requirements.
- ❑ **Isolated Bus Paralleling.** Provides all automatic and manual paralleling functions for systems that operate isolated from the utility service.
- ❑ **Full Function Paralleling.** Provides all paralleling functions, including automatic and manual operation, protection, and other features described in this document.
- ❑ **Open Transition Power Transfer Control.** Control will operate two circuit breakers to provide power transfer between a normal source and a generator in a "break before make" sequence.
- ❑ **Fast Closed Transition Power Transfer Control.** Control will operate two circuit breakers to provide power transfer between a normal source and generator in a "make before break" sequence between live sources, and "break before make" from a failed source. Overlap between sources is 100mS or less.
- ❑ **Closed Transition (Ramping) Power Transfer Control.** Control will operate two circuit breakers to provide power transfer between a normal source and generator in a "make before break" sequence between live sources, and "break before make" from a failed source. Overlap time between sources is configurable, and control ramps load from source to source to minimize disturbances on transfer.
- ❑ **Exhaust Temperature Monitoring**
- ❑ **Alternator Temperature Monitoring**
- ❑ **Digital Remote Annunciator**
- ❑ **Digital Output Relay Module**
- ❑ **ILSI (Isochronous Load Sharing Interface).** Allows PowerCommand to share real load with other load sharing systems that incorporate analog load sharing lines.

## Warranty

PowerCommand control systems are a part of complete power systems provided by Cummins Onan, and are covered by a one-year limited warranty as a standard feature.

Extended warranty options are available for coverage up to 10 years.

## See your distributor for more information

Power Generation

**Cummins Power Generation**
**1400 73rd Avenue N.E.**
**Minneapolis, MN 55432**
**763.574.5000**
**Fax: 763.574.5298**



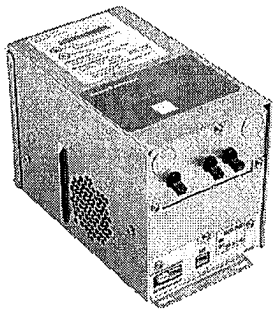
Warning: Backfeed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

 *Specifications Subject to Change* S-1444d (9/05)

Power Generation

# Four-Stage Battery Charger

## 15 Amp @ 12 Volt
## 12 Amp @ 24 Volt



## Description

**Applications -** Cummins Power Generation fully automatic battery chargers – using switched mode power electronics – are constant voltage/constant current chargers incorporating a 4-stage charging algorithm. Designed for use in applications where battery life and reliability is important; these chargers, complete with built-in equalize charge capability, are ideal for stationary or portable starting battery charging service

**Four-Stage Charging** – To achieve optimum battery life, a 4-stage charging cycle is implemented. The four charging stages are trickle, bulk, absorption, and float. The trickle stage safely charges overly discharged batteries. It protects a damaged or shorted battery from excessive current. During bulk charge a constant current is applied to quickly restore the maximum battery charge level in the shortest amount of time. The absorption stage applies a constant voltage to the battery to bring the battery to 100% capacity. The float stage tailors the constant voltage output to maintain the battery at full capacity while serving DC operated loads.

**Temperature Compensation** – An optional temperature sensor may be used to adjust charging rate based on internal battery temperature in the absorption and float stages. Use of a battery temperature sensor helps to increase battery life by preventing over or under charging of the battery. The battery temperature sensor also protects the battery from overheating. Temperature compensation is recommended in all applications, but is particularly valuable for generator sets in outdoor applications.

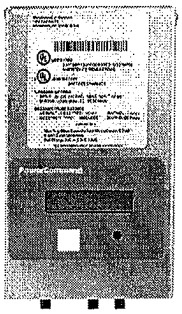
**Operating Voltages –** Battery chargers are field-configurable for charging either 12 or 24 volt battery systems and for operation at 50 or 60 hertz. Output voltage and battery type selection is done through the alphanumeric display.

## Features

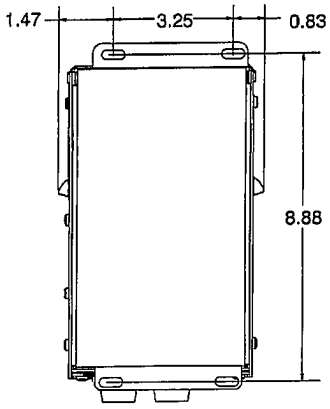
- **Protection** – All models include a 20 amp DC output breaker. Resettable breakers are used for input voltages 240 VAC and lower. For over 240 VAC branch circuit rated fuses are used.
- **Easy installation** – Clearly marked terminal blocks and panel knockouts provide convenient connections of input and output leads.
- **User Display** – Output voltage and current, fault information, and configuration options are indicated on the alphanumeric display.
- **Monitoring** – An LED indicates the condition of the charger. Green indicates normal charging operation, amber indicates equalizing, and red indicates a fault condition.
- **Faults** – The charger senses and annunciates the following fault conditions: Input Overvoltage, Input Undervoltage, AC Power Loss, Battery Overvoltage, Battery Undervoltage, Charger Circuitry Over Temperature, Battery Over Temperature, Unrecoverable Battery, Overload/Overcurrent
- **Output Relay** – Output contacts are closed in a fault condition. 30 Volt 2 Amp contacts.
- **Temperature Compensation** – An optional external sensor is available for temperature compensated battery charging.
- **Corrosion Resistant Aluminum Enclosure**
- **Vibration Resistant Design –** complies with UL991 vibration resistance requirements.
- **RFI/EMI and Voltage Surge Resistant**
- **UL1236 (BBHH) Listing –** for use with lead acid batteries in generator set installations. Also suitable for use with gel, AGM, and NiCad batteries.

## Specifications

| Performance and Physical Characteristics | | |
|---|---|---|
| **Output:** | Nominal Voltage | 12 or 24 Volt DC |
| | Float Voltage | 13.5 or 27.0 Volts |
| | Equalize-Voltage | 15.5 or 31.0 Volts |
| | Output Voltage Regulation | ±1% |
| | Maximum Output Current | 15 Amp @ 12 VDC or<br>12 Amp @ 24 VDC |
| | Equalize Charger Time | 0-12 hrs. |
| **Input:** | Voltage AC | 120, 208, 240, 277, 380, 416, 480, 600 |
| | Frequency | 50 or 60 Hz |
| **Approximate Net Weights:** | | 11.6 lbs (5.3 Kg) |
| **Approximate Dimensions:**<br>Height x Width x Depth – inches (mm) | | 9.75 x 5.56 x 6.14<br>(248 x 141 x 156) |
| **Ambient Temperature Operation:** | | -22° F to 122° F (-30° C to 50° C) |



| Input Volts | Genset Kit Part Number | ATS Kit Part Number |
|---|---|---|
| 120/208/240 | 0300-5878-01 | 0300-5878-13 |
| 277 | 0300-5878-02 | 0300-5878-14 |
| 380 | 0300-5878-03 | 0300-5878-15 |
| 416 | 0300-5878-04 | 0300-5878-16 |
| 480 | 0300-5878-05 | 0300-5878-17 |
| 600 | 0300-5878-06 | 0300-5878-18 |
| Temperature Sensor Kit | 0541-0918-00 | 0541-0918-00 |




Mounting Dimensions – inches
Bottom View

## Enclosure

The NEMA 1, corrosion resistant, aluminum enclosure is designed for wall mounting. When wall mounted, louvers protect cooling holes in the sides of the enclosure. Use ¼ inch (6.35 mm) diameter bolts for mounting.

## RFI/EMI and Voltage Surge Compliance

Charger complies with the requirements of EN61000-4-5 for voltage surge resistance, EN50082-2 (Heavy Industrial) for Immunity, EN61000-4-2 for ESD, EN61000-4-3 for radiated immunity, ANSI/IEEE C62.41 Category B & EN 61000-4-4 for electrically fast transient, EN61000-4-6 for conducted, and FCC Part 15 Class A for emissions.

## See your distributor for more information

**Power Generation**

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***WARNING** 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.*

***WARNING** 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.*

 Specifications subject to change without notice 