Specification sheet

Diesel generator set B3.3 series engine

44 kVA - 66 kVA 50 Hz

40 kW - 60 kW 60 Hz

Description

This Cummins® commercial generator set is a fully integrated power generation system, providing optimum performance, reliability, and versatility for stationary Standby and Prime Power duty applications.

Features

Cummins medium-duty engine - Rugged 4-cycle industrial diesel delivers reliable power and fast response to load changes.

Alternator - Low reactance 2/3 pitch windings; low waveform distortion with non-linear loads, fault clearing short-circuits capability, and class H insulation.

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

Control system - The PowerStart® electronic control is standard equipment for 50 Hz products while PowerCommand® is for 60 Hz products. It provides total genset system integration, including auto remote start/stop, precise frequency and voltage regulation, alarm and status message display.

Enclosures - Optional sound attenuated enclosures are available.

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

3-Phase ratings

	Standby rating		Prime rating	
	50 Hz	60 Hz	50 Hz	60 Hz
Model	kVA (kW)	kW (kVA)	kVA (kW)	kW (kVA)
C44 D5e	44 (35)		40 (32)	
C55 D5e	55 (44)		50 (40)	
C66 D5e	66 (53)		60 (48)	
C40 D6e		40 (50)		36 (45)
C50 D6e		50 (63)		45 (57)
C60 D6e		60 (75)		55 (68)
C44 D5L	44 (35)		40 (32)	
C55 D5L	55 (44)		50 (40)	
C66 D5L	66 (53)		60 (48)	

1-Phase Ratings

	Reconnectable Winding,311			
	Standby rating		Prime rating	
	50 Hz	60 Hz	50 Hz	60 Hz
Model	kVA (kW)	kW (kVA)	kVA (kW)	kW (kVA)
C40 D6e		40 (40)		36 (36)
C50 D6e		50 (50)		45 (45)
C60 D6e		58 (58)		53 (53)
C44 D5L	40 (40)		36.5 (36.5)	
C55 D5L	45 (45)		41.5 (41.5)	
C66 D5L	50 (50)		47 (47)	

Generator set specifications

Governor regulation class	ISO8528
Voltage regulation, no load to full load	± 0.63%
Random voltage variation	± 0.50%
Frequency regulation	6% Droop for 50 Hz and Isochronous for 60 Hz
Random frequency variation	± 0.195%
Radio frequency emissions compliance	BS EN61000-6-4/BS EN61000-6-2

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Engine specifications

Design	4 cycle, in-line, turbocharged after-cooled
Bore	95 mm (3.75 in.)
Stroke	115 mm (4.53 in.)
Displacement	3.3 L (199 in^3)
Cylinder block	Cast iron, 4 cylinder
Battery capacity	65 AH
Battery charging alternator	37 Amp
Starting voltage	12 Volt
Fuel system	Direct injection
Fuel filter	Spin on fuel filters with water separator
Air cleaner type	Dry replaceable element with restriction indicator
Lube oil filter type(s)	Spin on full flow filter
Standard cooling system*	131 ºF (55 ºC) ambient radiator

*Open genset at 12.7 mm H_2O restriction

Alternator specifications

Design	Brushless, single bearing, revolving field
Stator	2/3 pitch winding
Rotor	Single bearing, flexible disc coupling
Insulation system	Class H
Standard temperature rise	Standby 50/60 Hz – 163 ºC/27 ºC ambient
Exciter type	Self-excited
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal fan
AC waveform Total Harmonic Distortion (THDV)	No load <2%. Non distorting balanced linear load <5%
Telephone Influence Factor (TIF) for 60 Hz	< 50% per NEMA MG1-22.43
Telephone Harmonic Factor (THF) for 50 Hz	< 2%

Available voltages

50 Hz line – line / line - neutral		1-Phase	60 Hz line – line / line - neutral		1-Phase
• 380/220	• 190/110	• 240	• 380/220	• 190/110	• 240
• 400/230	• 200/115	• 230	• 400/230	• 200/115	• 230
• 416/240	• 208/120	• 220	• 416/240	• 208/120	• 220
			• 440/255	• 220/127	
			• 480/277	• 230/132	
				• 240/139	

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

Generator set options

- Sound attenuated housing
- Engine coolant heater
- Heavy duty air cleaner
- Electronic governing on 50 Hz
- Mains operated battery charger
- Circuit breaker size
- Language literature
- Shunt trip
- 332 litre fuel tank
- Extended warranty
- Alternator heater
- Lower temp rise alt frame

- Industrial grade silencer
- 4P MCCB
- Aux contact
- Earth fault relay
- Dual wall, with secondary containment
- Remote fuel filling
- PS0600
- Permanent Magnet Generator (PMG)

Control system

Generator set control PowerStart 600 – The PowerStart control is a microprocessor-based generator set monitoring and control system. The control provides a simple operator interface to the generator set, auto/ manual and remote start/stop control and shutdown fault indication. The integration of all control functions into a single control provides enhanced reliability and performance compared to conventional generator set control systems. This control has been designed and tested to meet the harsh environment in which gensets are typically applied.

- The PowerStart generator set control is suitable for use on a wide range of generator sets in non-paralleling applications. It is suitable for use with reconnectable or non-reconnectable generators, can be configured for either 50 Hz or 60 Hz and voltage and power connection from 190-600 VAC line-to-line.
- This control includes an intuitive operator interface that allows for complete genset control as well as system metering, fault annunciation, maintenance alarm, over imbalance current, configuration and diagnostics. The interface includes seven generator set status LED lamps with both internationally accepted symbols and English text to comply with customer needs. The interface also includes an LED backlit LCD display with tactile-feel soft-switches for easy operation and screen navigation. The manual/auto/stop 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.
- Power for this control is derived from the generator set starting batteries and functions over a voltage range from 8VDC to 16 VDC.

Major Features

- Integrated 128x64 Pixel monochrome graphic LCD Display
- 12 and 24V battery operation
- Genset monitoring-monitor status of all critical engine and alternator functions
- Digital genset metering (AC and DC)
- Genset battery monitoring system to warn against a weak battery connection
- Configurable for single phase or three phase or split phase AC metering
- Exerciser clock and time of delay start/stop initiate a
- test without load.
- Maintenance due alarm based on engine running time and real time clock
- Auto Main Failure (AMF) Provides load transfer operation in open transition mode
- AMF Test with or without load options
- Utility Voltage monitoring and protection
- Remote start capability in Auto mode
- Advanced service ability using Inpower™ a PC based Software service tool
- Modbus interface for interconnecting to customer
- PLC/BMS
- Configurable Inputs and Outputs
- Environmental protection: The Control is designed for reliable operation in harsh environment
- Warranty and service backed by a comprehensive warranty and worldwide distributor service network
- Certification-suitable for use on generator sets that are designed, manufactured, tested and certified relevant ISO, IEC, UKCA and CE standards.

Base control functions

LCD capability

LED INDICATING LAMPS

- For Genset Running, Remote Start, AMF Test Active, Genset Shutdown, Warning, Load connected to Genset, Load connected to Utility, Manual Mode, Stop Mode and Auto Mode.

LCD display

- 128 x 64 Pixel Monochrome Graphics display

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- Engine starting includes solid state output to operate external relay to start the engine, fuel shut off (FSO) and glow Plug
- Genset Protection: protects engine and alternator
- Real time clock for fault and event stamping
- Fuel level measurement using 4-20mA input sensor

AMF FUNCTIONALITY

- When Auto Mains Failure is enabled and controller is in Auto Mode and if utility goes off then control starts the Genset automatically and transfers load onto Genset. If Utility returns and is healthy then load again gets retransferred onto Utility. AMF provides load transfer operation in Open Transition transfer mode.

FUEL LEVEL FEATURE

- The Control will show the warning fault when the fuel level in the tank goes below the predefined threshold. Control includes time delays to prevent nuisance warning signals.

EXERCISE SCHEDULER

- It is used only when genset is in Auto mode. It is used to start a Scheduler schedule at No Load condition. A trim Exercise Scheduler Enable is available to enable or disable the feature.

MAINTENANCE

- Maintenance due alarm based on Engine Running Time or Real time clock

CONTROL DATA

- Access to the control software part number and software version are provided from the LCD or InPower™.

OPERATION INTERFACE

- Six tactile-feel soft switches for LCD navigation, genset operation and control setup. These switches are indicated by internationally accepted symbols and English text.

OPERATOR ADJUSTMENTS

- The LCD includes provisions for necessary set up and adjustment functions.
- Data Log includes engine run time and controller on time Fault History.
- Provides a record of the most recent fault Condition with Engine run time stamp, RTC stamp and occurrences
- Up to 5 events are stored in the control non-volatile memory.
- Voltage selection
- Frequency selection
- Genset and Utility AC Meter Calibration

ENGINE CONTROL

- CT ratio, and Genset ratings setup
- Start/Stop time delay setup
- Real time clock setup with daylight saving
- AMF Setup with test mode and transfer/retransfer time delays
- Modbus baud rate, parity setup
- Exercise scheduler repeat interval, Day, time and duration setup
- Maintenance due setup
- LCD brightness and contrast control

Battery operation

- Control will operate on 12V/24V batteries

AUTO START MODE

- Accepts a ground signal from remote devices to automatically start the generator set. The remote start signal will also wake up the control from sleep mode. The control can incorporate a time delay start and stop.

EMERGENCY STOP

- The control annunciates when an emergency stop signal is received and the generator set

ALTERNATOR DATA

- Voltage (single or three phase line-to-line and line-to- neutral)
- Current (single or three phase)
- kVA, kVAR, kW, Power Factor (Three phase and total)
- Frequency
- Totalized positive and negative kWH, kVARH, kVAH

Utility AC data

- Voltage (three/single phase LL and LN) -Frequency

ENGINE DATA

- Starting battery voltage
- Engine running hours
- Engine temperature
- Engine oil pressure

SERVICE ADJUSTMENTS

- The control includes provisions for adjustment and calibration of generator set control functions. Functions include:

Time delay of 0-600 seconds prior to shutdown After signal to stop in normal operation modes. Default for both time delay periods is 0 seconds.

AUTO MAINS FAILURE FUNCTIONS

- AMF primarily means that the genset controller is controlling both the genset breaker and a utility breaker in a transfer pair arrangement. AMF is only for use in a single genset / single utility arrangement. AMF's primary job is to keep loads powered. AMF completely manages the system by automatically starting the genset and transferring load when it detects utility failure. AMF has numerous built-in configurable sensors to determine the availability of the utility and genset sources. Sensors include under voltage, overvoltage, over/under frequency and breaker failure. PS0600 immediately shuts down. The generator set is prevented from running or cranking with the switch engaged E-stop switch.

SLEEP MODE

- The control includes a configurable low current draw state to minimize starting battery current draw when the genset is not operating.

ENGINE STARTING

- The control supports automatic engine starting. Primary and backup start disconnects are achieved by battery charging alternator feedback or main alternator output frequency. The control also supports configurable glow plug control when applicable.

CYCLE CRANKING

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

TIME DELAY START AND STOP (COOLDOWN)

Configurable for time delay of 0-300 seconds prior to starting after receiving a remote start signal and for

- Control provides retransfer time delays including time delay emergency to normal (0-1800 sec) and programmed transition delay (0-600 sec), time delay engine cooldown (0-3600 sec)

PROTECTIVE FUNCTIONS:

On operation of a protective function, the control will indicate a fault by illuminating the appropriate status LED, 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. In Power is used to configure settings.

CONFIGURABLE ALARM INPUT

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control supports only open transition (Break before Make) AMF functionality.

AMF TEST MODE

- AMF supports test mode with or without load options along with test mode duration.

LOAD TRANSFER SWITCH TYPE

- AMF breaker outputs can be continuous (contact pair) or pulsed (GTEC) type based on load transfer switch selection.

UNDERVOLTAGE SENSOR

Three phase LL and LN under voltage sensing for pickup 85-100% and dropout adjustable from 75-98% of nominal and dropout adjustable delay from 0.1-30 sec

Overvoltage sensor
Three phase LL and LN overvoltage sensing for dropout adjustable from 105-135% of nominal and dropout adjustable delay from 0.5-120 sec

Over/under frequency sensor
Underfrequency sensing for pickup 85-100% and dropout adjustable from 70-85% of nominal and dropout adjustable delay from 0.1-15 sec. Over frequency sensing for dropout adjustable from 105-115% of nominal and dropout adjustable delay from 0.1-15 sec

Timers
Control provides transfer time delays including Time delay engine start (0-3600 sec), time delay normal to emergency (0-300 sec) and programmed transition delay (0-600 sec). impending failure.

- **Cranking lockout** - The control will not allow the starter to attempt to engage or to crank the engine when the engine is running.
- **Fail to start shutdown** - The control will indicate a fault if the generator set fails to start by the completion of the engine crack sequence.
- The control accepts maximum three alarm inputs (contact closed to ground) to cause a shutdown or warning response from the control.

EMERGENCY STOP

- Annunciate whenever an emergency stop signal is received from external switch.

ENGINE PROTECTION

- **Low lube oil pressure warning/shutdown** - Level is pre-set to match the capabilities of the engine used. Control includes time delays to prevent nuisance shutdown signals.
- **High coolant temperature warning/shutdown** - Level is pre-set to match the capabilities of the engine used. Control includes time delays to prevent nuisance shutdown signals.
- **Low coolant temperature warning** - Indicates that engine temperature may not be high enough for 1 min. and start or proper load acceptance.
- **Sensor failure indication** - Logic is provided on the base control to detect analog sensor or interconnecting wiring failures.

General engine protection:
Low Fuel Level Warning - Indicates that engine fuel level reached the Low Fuel Level Warning Threshold (30% by default).

Charging Alternator Failure Warning - Indicates that engine charging alternator voltage reached the low/high charging alternator threshold when charging alternator enable trim is enabled.

- **Low and high battery voltage warning** - Indicates status of battery charging system (failure) by continuously monitoring battery voltage.
- **Weak battery warning** - The control will test the battery each time the generator set is signaled to start and indicate a warning if the battery indicates

High Current warning/shutdown (51)

- Implementation of the thermal damage curve with instantaneous trip level

ALTERNATOR PROTECTION

Battleshort Mode

- When enabled and Battle short switch is active, the control will allow non-critical shutdown faults to be bypassed. If a bypass shutdown fault occurs, the fault code and description will still be enunciated, but the genset will not shutdown. This will be followed by a fail to shutdown fault. Emergency stop critical shutdown faults are not bypassed.

Please refer to control service and operator manual for list of critical faults

High AC voltage shutdown (59)

- Output voltage on any phase exceeds pre-set values. Values adjustable from 105-125% of nominal voltage, with time delay adjustable from 1-10 seconds. Default value is 110% for 5 seconds.

Low AC voltage shutdown (27)

- Voltage on any phase has dropped below a preset value. Adjustable over a range of 50-95% of voltage, time delay 2-20 seconds. Default value is 90% for 5 seconds.

Under frequency shutdown (81 u)

- Generator set output frequency cannot be maintained. Settings are adjustable from 2-10 Hz below nominal governor set point, for a 500-2000 half cycles delay. Default: 5 Hz, 1000 half cycles.

Over frequency shutdown/warning (81 o)

- Generator set is operating at a potentially damaging frequency level. Settings are adjustable from 2-10 Hz above nominal governor set point for 100-2000 half cycles delay. Default: 5 Hz, 1000 half cycles.

Loss of sensing voltage shutdown

calculated based on current transformer ratio and application power rating.

Auto Mains Failure Protections:

- Breaker/ATS Switch fail to close warning - when the control signals a ATS switch to close, it will monitor the ATS switch feedback contacts and verifies that switch is closed. If the control does not sense ATS switch closure within an adjustable time period of ter the close signal, the fail to close warning will be initiated.
- Breaker/ATS Switch fail to open warning - when the control signals a ATS switch to open, it will monitor the ATS switch feedback contacts and verifies that switch is opened. If the control does not sense ATS switch opened within an adjustable time period after the open signal, the fail to open warning will be initiated.

ENVIRONMENT

The control is designed for proper operation without recalibration in ambient temperatures from -15 °C (5 °F) to +70° C (158 °F), and for storage from -20 °C (-4 °F) to +80 °C (176 °F). Control will operate with humidity up to 95%, non-condensing.
The control board is conformal coated to provide resistance to dust and moisture. The 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 is specifically designed and tested for resistance to RFI/EMI and to resist effects of vibration to provide a long reliable life when mounted on a generator set. The control includes transient voltage surge suppression to provide compliance to referenced standards.

- Configurable customer inputs:

Control includes (1 Control includes 3 input signals which can be configured for diagnostic inputs. Out of which 1st input can also be configured as
Battle short input. 2nd and 3rd inputs gets configured to Utility CB status and Genset CB status when Auto mains failure is enabled.)

Output signals from the control include:

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- Shutdown of generator set will occur on loss of voltage sensing inputs to the control.

Current Imbalance Warning Fault

- Issues warning when current imbalance is observed per phase when genset is in running state.
- Configured to AMF specific outputs (Utility/ Genset CB Open/ Close driver) when Auto mains failure is enabled.

Communications connections include:

Control provides one RS-485 port which can be used either for PCTool interface or Modbus master interface based on protocol selection from LCD or Inpower™.

- Modbus RS485 port: Allows the control to communicate with external devices such as PLCs using Modbus protocol.

- PC tool interface: This RS-485 communication port allows the control to communicate with a personal computer running InPower™ software.
- Note — An RS-485 or USB to RS-232 converter is required for communication between control and PC.

SOFTWARE

InPower (beyond 11.5.2.0 version) is a PC-based software service tool that is designed to directly communicate to Power Start generator sets and transfer switches, to facilitate service and monitoring of these products.

CERTIFICATIONS

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

FIELD CONTROL INTERFACE

Control includes 6 configurable outputs which can be configured to Diagnostic Output, Glow Plug, Ready to load, L series governor.
Configurable output 3, Configurable output 4, Configurable output 5 and Configurable output 6 get

- 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 50081-1,2 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.
- Power Start control and generator sets are designed and manufactured in ISO 9001 certified facilities.

WARRANTY

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

PowerStart 600 control operator /display panel

Rating definitions

Standby:

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

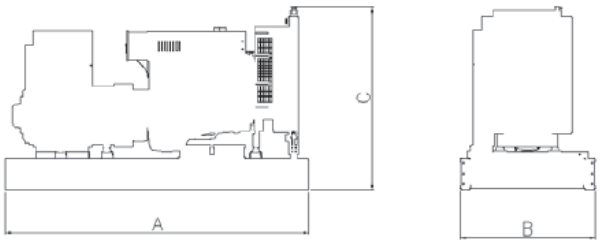
Prime (Unlimited Running Time):

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, and DIN6271). This rating is not applicable to all generator set models.

Base Load (Continuous):

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, and DIN6271). This rating is not applicable to all generator set models.

OPEN



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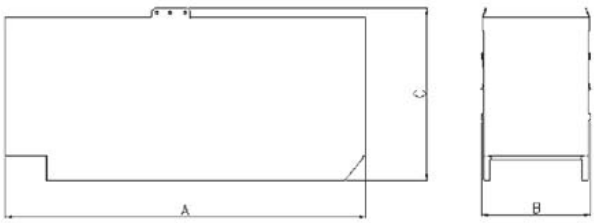

This outline drawing is to provide representative configuration details for Model series only.

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

Do not use for installation design

Model	Open				Enclosed			
	Length "A" mm	Width "B" mm	Height "C" mm	Dry Wt.* kg	Length "A" mm	Width "B" mm	Height "C" mm	Dry Wt.* kg
C44 D5e	2050	967	1510	922	2270	975	1920	1236
					2276**	973**	1793**	1202**
C55 D5e	2050	967	1510	922	2270	975	1920	1236
					2276**	973**	1793**	1230**
C66 D5e	2050	967	1510	1019	2270	975	1920	1423
					2276**	973**	1793**	1300**
C40 D6e	2050	967	1510	922	2270	975	1920	1326
					2276**	973**	1793**	1202**
C50 D6e	2050	967	1510	949	2270	975	1920	1353
					2276**	973**	1793**	1230**
C60 D6e	2050	967	1510	1019	2270	975	1920	1423
					2276**	973**	1793**	1300**
C44 D5L	2050	967	1510	922	2270	975	1920	1236
					2276**	973**	1793**	1202**
C55 D5L	2050	967	1510	922	2270	975	1920	1236
					2276**	973**	1793**	1230**
C66 D5L	2050	967	1510	1019	2270	975	1920	1423
					2276**	973**	1793**	1300**

*Note: Weights represent a set with standard features. See outline drawings for weights of other configurations.
**Note: Weights and dimensions are for Chassis lifting arrangement option.

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Codes and standards

	This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.		The CE marking is only valid when equipment is used in a fixed installation application. Material compliance declaration is available upon request.
2000/14/EC	All enclosed products are designed to meet or exceed EU noise legislation 2000/14/EC step 2006.		The UKCA marking is only valid when equipment is used in a fixed installation application. Material compliance declaration is available upon request.
ISO 8528	This generator set has been designed to comply with ISO 8528 standards.		