Power Generation

Diesel Generator Set
Model DFGE 60 Hz

750 kW, 938 kVA Standby

Description

The Cummins Power Generation DF-series commercial generator set is a fully integrated power generation system providing optimum performance, reliability, and versatility for stationary standby power applications.

A primary feature of the DF GenSet is strong motor-starting capability and fast recovery from transient load changes. The torque-matched system includes a heavy-duty Cummins 4-cycle diesel engine, an AC alternator with high motor-starting kVA capacity, and an electronic voltage regulator with three-phase sensing for precise regulation under steady-state or transient loads. The DF GenSet accepts 100% of the nameplate standby rating in one step, in compliance with NFPA110 requirements.

The standard PowerCommand® digital electronic control is an integrated system that combines engine and alternator controls for high reliability and optimum GenSet performance.

Standard coolant heaters improve starting in extreme operating conditions. A wide range of options, accessories, and services are available, allowing configuration to your specific power generation needs.

Every production unit is factory tested at rated load and power factor. This testing includes demonstration of rated power and single-step rated load pickup. Cummins Power Generation manufacturing facilities are registered to ISO9001 quality standards emphasizing our commitment to high quality in the design, manufacture, and support of our products. The generator set is CSA certified and is available as UL2200 Listed. The PowerCommand control is UL508 Listed.

All Cummins Power Generation systems are backed by a comprehensive warranty program and supported by a worldwide network of 170 distributors and service branches to assist you with warranty, service, parts, and planned maintenance support.

Features

UL Listed Generator Set - The complete generator set assembly is available Listed to UL 2200.

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 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 Level 1 compliance. PowerCommand control is listed to UL508.

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.

E-coat Finish - Dual electro-deposition paint system provides high resistance to scratches, corrosion, or fading.

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

Certifications - Generator sets are designed, manufactured, tested, and certified to relevant UL, NFPA, ISO, IEC, and CSA standards.

Warranty and Service - Backed by a comprehensive warranty and world wide distributor network.

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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. Contact your distributor/dealer for more information.

Certifications

ISO9001 - This generator set was designed and manufactured in facilities certified to ISO9001.

CSA - This generator set is CSA certified to product class 4215-01.

PTS - The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Products bearing the PTS symbol have been subjected to demanding tests in accordance to NFPA 110 Level 1 to verify the design integrity and performance under both normal and abnormal operating conditions including short circuit, endurance, temperature rise, torsional vibration, and transient response, including full load pickup.

UL - The generator set is available Listed to UL 2200, Stationary Engine Generator Assemblies. The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage.

See your distributor for more information

Power Generation

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Cummins and PowerCommand are registered trademarks of Cummins Inc.
AmpSentry is a trademark of Cummins Inc.
LonWorks is a registered trademark of Echelon

Important: Backfeed 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.

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.
- Standard PCCNet interface. 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
- PCCNet Interface
- (4) Configurable customer inputs
- (4) Configurable customer outputs
- (8) Configurable network inputs and (16) outputs (with optional network)

Options

- [ ] 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)

Specifications – Alternator

Design	Brushless, 4 pole, drip proof revolving field
Stator	2/3 pitch
Rotor	Direct coupled by flexible disc
Insulation System	Class H per NEMA MG1-1.65
Standard Temperature Rise	125°C @ Standby
Exciter Type	Permanent Magnet Generator (PMG)
Phase Rotation	A (U), B (V), C (W)
Alternator Cooling	Direct drive centrifugal blower
AC Waveform Total Harmonic Distortion	<5% total 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

Three Phase Table[1]		**105° C**	**105° C**	**125° C**	**125° C**	**125° C**	**125° C**	**125° C**	**125° C**				
Feature Code		B259	B301	B258	B252	B282	B246	B276	B300				
Alternator Data Sheet Number		311	310	310	310	310	309	309	309				
Voltage Ranges		110/190 Thru 139/240 220/380 Thru 277/480	347/600	110/190 Thru 139/240 220/380 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	220/380 Thru 277/480	277/480	277/480	347/600				
Surge kW		771	777	768	773	768	770	770	770				
Motor Starting kVA (at 90% sustained voltage)	PMG	3866	3313	3313	3313	3313	2944	2944	2944				

Full Load Current - Amps at Standby Rating	120/208	127/220	139/240	220/380	240/416	254/440	277/480	347/600
	2602	2460	2255	1424	1301	1230	1128	902

Notes:

1. Single Phase Capability: Single phase power can be taken from a three phase generator set at up to 40% of the generator set nameplate kW rating at unity power factor.

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Alternator

Several alternators are available for application flexibility based on the required motor-starting kVA and other requirements. Larger alternator sizes have lower temperature rise for longer life of the alternator insulation system. In addition, larger alternator sizes can provide a cost-effective use of engine power in across-the-line motor-starting applications and can be used to minimize voltage waveform distortion caused by non-linear loads.

Single-bearing alternators couple directly to the engine flywheel with flexible discs for drivetrain reliability and durability. No gear reducers or speed changers are used. Two-thirds pitch windings eliminate third-order harmonic content of the AC voltage waveform and provide the standardization desired for paralleling of generator sets. The standard excitation system is a PMG excited system.

Alternator Application Notes

Separately Excited Permanent Magnet Generator (PMG) System - This standard system uses an integral PMG to supply power to the voltage regulator. A PMG system generally has better motor-starting performance, lower voltage dip upon load application, and better immunity from problems with harmonics in the main alternator output induced by non-linear loads. This system provides improved performance over self-excited regulators in applications that have large transient loads, sensitive electronic loads (especially UPS applications), harmonic content, or that require sustained short-circuit current (sustained 3-phase short circuit current at approximately 3 times rated for 10 seconds).

Alternator Sizes - On any given model, various alternator sizes are available to meet individual application needs. Alternator sizes are differentiated by maximum winding temperature rise, at the generator set standby or prime rating, when operated in a 40°C ambient environment. Available temperature rises range from 80°C to 150°C. Not all temperature rise selections are available on all models. Lower temperature rise is accomplished using larger alternators at lower current density. Lower temperature rise alternators have higher motor-starting kVA, lower voltage dip upon load application, and they are generally recommended to limit voltage distortion and heating due to harmonics induced by non-linear loads.

Alternator Space Heater - is recommended to inhibit condensation.

Available Output Voltages

Three Phase Reconnectable

[ ] 110/190
[ ] 120/208
[ ] 127/220
[ ] 139/240
[ ] 220/380
[ ] 240/416
[ ] 254/440
[ ] 277/480

Three Phase Non-Reconnectable

[ ] 277/480
[ ] 347/600

Engine

Cummins heavy duty diesel engines use advanced combustion technology for reliable and stable power and fast response to sudden load changes.

Electronic governing provides precise speed regulation, especially useful for applications requiring constant (isochronous) frequency regulation such as Uninterruptible Power Supply (UPS) systems, non-linear loads, or sensitive electronic loads. Coolant heaters are standard and recommended for all emergency standby installations or for any application requiring fast load acceptance after start-up.

Specifications – Engine

Base Engine	Cummins, Inc Model VTA28-G7, Turbocharged and Aftercooled, diesel-fueled
Displacement in^3 (L)	1710.0 (28.0)
Overspeed Limit, rpm	2100 ±50
Regenerative Power, kW	105.00
Cylinder Block Configuration	Cast iron with replaceable wet cylinder liners, 40°V 12 cylinder
Battery Capacity	660 amps minimum at ambient temperature of 32°F (0°C)
Battery Charging Alternator	55 amps
Starting Voltage	24-volt, negative ground
Lube Oil Filter Types	Three spin-on, full flow
Standard Cooling System	113°F (45°C) ambient radiator

Power Output	**Standby**	
Gross Engine Power Output, bhp (kWm)	1135.0 (846.7)	
BMEP at Rated Load, psi (kPa)	292.0 (2013.3)	
Bore, in. (mm)	5.50 (139.7)	
Stroke, in. (mm)	6.00 (152.4)	
Piston Speed, ft/min (m/s)	1800.0 (9.1)	
Compression Ratio	13.1:1	
Lube Oil Capacity, qt. (L)	87.7 (83.0)	
Fuel Flow		
Fuel Flow at Rated Load, US Gal/hr (L/hr)	137.0 (518.5)	
Maximum Inlet Restriction, in. Hg (mm Hg)	4.0 (101.6)	
Maximum Return Restriction, in. Hg (mm Hg)	6.5 (165.1)	
Air Cleaner		
Maximum Air Cleaner Restriction, in. H_2O (kPa)	25.0 (6.2)	
Exhaust		
Exhaust Flow at Rated Load, cfm (m^3/min)	5985.0 (169.4)	
Exhaust Temperature, °F (°C)	1000.0 (537.8)	
Max Back Pressure, in. H_2O (kPa)	41.0 (10.2)	

Fuel System	Direct injection, number 2 diesel fuel; fuel filter; automatic electric fuel shutoff.

Fuel Consumption		**Standby**							
60 Hz Ratings, kW (kVA)		**750 (938)**							
	Load	1/4	1/2	3/4	Full				
	US Gal/hr	16.1	28.2	41.6	58.5				
	L/hr	61	107	157	221				

Generator Set

The general specifications provide representative configuration details. Consult the outline drawing for installation design.

Specifications – General

See outline drawing 500-3559 for installation design specifications.

Unit Width, in (mm)	72.1 (1831)
Unit Height, in (mm)	88.2 (2240)
Unit Length, in (mm)	169.5 (4305)
Unit Dry Weight, lb (kg)	13600 (6169)
Unit Wet Weight, lb (kg)	14160 (6423)
Rated Speed, rpm	1800
Voltage Regulation, No Load to Full Load	±0.5%
Random Voltage Variation	±0.5%
Frequency Regulation	Isochronous
Random Frequency Variation	±0.25%
Radio Frequency Interference	IEC 801.2, Level 4 Electrostatic Discharge IEC 801.3, Level 3 Radiated Susceptibility IEC 801.4, Level 4 Electrical Fast Transients IEC 801.5, Level 5 Voltage Surge Immunity MIL STD 461C, Part 9 Radiated Emissions (EMI)

Cooling	**Standby**	
Fan Load, HP (kW)	45.0 (33.6)	
Coolant Capacity with radiator, US Gal (L)	44.0 (166.5)	
Coolant Flow Rate, Gal/min (L/min)	236.0 (893.3)	
Heat Rejection To Coolant, Btu/min (MJ/min)	33440.0 (35.4)	
Heat Radiated To Room, Btu/min (MJ/min)	7559.0 (8.0)	
Maximum Coolant Friction Head, psi (kPa)	10.0 (68.9)	
Maximum Coolant Static Head, ft (m)	60.0 (18.3)	

Air		
Combustion Air, scfm (m^3/min)	2250.0 (63.7)	
Alternator Cooling Air, scfm (m^3/min)	4156.0 (117.6)	
Radiator Cooling Air, scfm (m^3/min)	44000.0 (1245.2)	
Max. Static Restriction, in H_2O (Pa)	0.50 (124.50)	

Rating Definitions

Standby Rating based on: Applicable for supplying emergency power for the duration of normal power interruption. No sustained overload capability is available for this rating. (Equivalent to Fuel Stop Power in accordance with ISO3046, AS2789, DIN6271 and BS5514). Nominally rated.

Prime (Unlimited Running Time) Rating based on: 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.

Base Load (Continuous) Rating based on: 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.

Site Derating Factors

Rated power available up to 2200 ft (671 m) at ambient temperatures up to 104°F (40°C). Above 2200 ft (671 m), derate at 4% per 1000 ft (305 m) and 2% per 10°F (4% per 11°C) above 104°F (40°C).

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