

Diesel Generator Set Model DFEC 60 Hz

450 kW, 563 kVA Standby
410 kW, 513 kVA Prime



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 or prime 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 NFPA 110 requirements.

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

Optional weather-protective enclosures and 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 UL 2200 Listed. The PowerCommand control is UL 508 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 engine delivers reliable power, low emissions, and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor-starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads, fault-clearing short-circuit capability, and class H insulation. The alternator electrical insulation system is UL1446 Recognized.

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

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. PowerCommand control is Listed to UL508.

Cooling System - Provides reliable running at the rated power level, at up to 50°C ambient temperature.

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 scratching, corrosion, and fading.

Enclosures - Optional weather-protective 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 worldwide distributor network.

Generator Set

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

Specifications – General

See outline drawing 500-3070 for installation design specifications.

Unit Width, in (mm)	60.0 (1524)
Unit Height, in (mm)	77.6 (1971)
Unit Length, in (mm)	156.0 (3962)
Unit Dry Weight, lb (kg)	11000 (4990)
Unit Wet Weight, lb (kg)	11400 (5171)
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	Prime
Fan Load, HP (kW)	22.6 (16.9)	22.6 (16.9)
Coolant Capacity with radiator, US Gal (L)	24.0 (90.8)	24.0 (90.8)
Coolant Flow Rate, Gal/min (L/min)	196.0 (741.9)	196.0 (741.9)
Heat Rejection To Coolant, Btu/min (MJ/min)	17810.0 (18.9)	16120.0 (17.1)
Heat Radiated To Room, Btu/min (MJ/min)	5620.0 (6.0)	5110.0 (5.4)
Maximum Coolant Friction Head, psi (kPa)	10.0 (68.9)	10.0 (68.9)
Maximum Coolant Static Head, ft (m)	60.0 (18.3)	60.0 (18.3)

Air		
Combustion Air, scfm (m ³ /min)	1370.0 (38.8)	1295.0 (36.6)
Alternator Cooling Air, scfm (m ³ /min)	2780.0 (78.7)	2780.0 (78.7)
Radiator Cooling Air, scfm (m ³ /min)	27200.0 (769.8)	27200.0 (769.8)
Max. Static Restriction, in H ₂ O (Pa)	0.5 (124.5)	0.5 (124.5)

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 5900 ft (1800 m) at ambient temperatures up to 104°F (40°C). Above 5900 ft (1800 m), derate at 4% per 1000 ft (305 m) and 1% per 10°F (2% per 11°C) above 104°F (40°C).

Engine

Cummins heavy duty diesel engines use advanced combustion technology for reliable and stable power, low emissions, 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. Optional coolant heaters are recommended for all emergency standby installations or for any application requiring fast load acceptance after start-up.

Specifications – Engine

Base Engine	Cummins Model KTA19-G3, Turbocharged and Aftercooled, diesel-fueled
Displacement in³ (L)	1150.0 (18.8)
Overspeed Limit, rpm	2100 ±50
Regenerative Power, kW	77.00
Cylinder Block Configuration	Cast iron with replaceable wet cylinder liners, In-line 6 cylinder
Battery Capacity	610 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	Two spin-on, full flow
Standard Cooling System	122°F (50°C) ambient radiator

Power Output	Standby	Prime							
Gross Engine Power Output, bhp (kWm)	685.0 (511.0)	620.0 (462.5)							
BMEP at Rated Load, psi (kPa)	253.0 (1744.4)	231.0 (1592.7)							
Bore, in. (mm)	6.25 (158.8)	6.25 (158.8)							
Stroke, in. (mm)	6.25 (158.8)	6.25 (158.8)							
Piston Speed, ft/min (m/s)	1875.0 (9.5)	1875.0 (9.5)							
Compression Ratio	13.9:1	13.9:1							
Lube Oil Capacity, qt. (L)	48.0 (45.4)	48.0 (45.4)							
Fuel Flow									
Fuel Flow at Rated Load, US Gal/hr (L/hr)	60.0 (227.1)	60.0 (227.1)							
Maximum Inlet Restriction, in. Hg (mm Hg)	4.0 (101.6)	4.0 (101.6)							
Maximum Return Restriction, in. Hg (mm Hg)	6.5 (165.1)	6.5 (165.1)							
Air Cleaner									
Maximum Air Cleaner Restriction, in. H ₂ O (kPa)	25.0 (6.2)	25.0 (6.2)							
Exhaust									
Exhaust Flow at Rated Load, cfm (m ³ /min)	3630.0 (102.7)	3345.0 (94.7)							
Exhaust Temperature, °F (°C)	915.0 (490.6)	880.0 (471.1)							
Max Back Pressure, in. H ₂ O (kPa)	41.0 (10.2)	41.0 (10.2)							
Fuel System	Direct injection, number 2 diesel fuel; fuel filter; automatic electric fuel shutoff								
Fuel Consumption									
60 Hz Ratings, kW (kVA)	Standby 450 (563)				Prime 410 (513)				
	Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
	US Gal/hr	10.8	17.7	24.3	31.0	10.3	16.2	22.6	28.7
	L/hr	41	67	92	117	39	61	86	109

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
- [] 115/200
- [] 120/208
- [] 127/220
- [] 139/240
- [] 120/240
- [] 220/380
- [] 240/416
- [] 254/440
- [] 277/480

Three Phase Non-Reconnectable

- [] 277/480
- [] 347/600

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 and BS2757
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		80° C	80° C	105° C	105° C	125° C	125° C	125° C	125° C				
Feature Code		B260	B302	B259	B301	B258	B252	B246	B300				
Alternator Data Sheet Number		308	307	307	306	307	306	305	305				
Voltage Ranges		110/190 Thru 139/240 220/380 Thru 277/480	347/600	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 139/240 139/240 240/416 Thru 277/480	277/480	347/600				
Surge kW		468	470	466	469	466	465	466	464				
Motor Starting kVA (at 90% sustained voltage)	PMG	2429	2208	2208	1896	2208	1896	1749	1749				
Full Load Current - Amps at Standby Rating		<u>120/208</u> 1561	<u>127/220</u> 1476	<u>139/240</u> 1353	<u>220/380</u> 854	<u>240/416</u> 780	<u>254/440</u> 738	<u>277/480</u> 676	<u>347/600</u> 541				

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.

Control System



PowerCommand (2100) Control



PowerCommand (3100) Control

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 (2100 only)
- Suitable for operation in ambient temperatures from -40C to +70C, and altitudes to 13,000 feet (5000 meters)
- Integrated Digital Paralleling Control (3100 only)
- Prototype tested; UL, CSA, and CE compliant

AmpSentry AC Protection	Engine Protection	Operator Interface
<ul style="list-style-type: none"> • Overcurrent and short circuit shutdown • Overcurrent warning • Single & 3-phase fault regulation • Over and under voltage shutdown • Under frequency shutdown • Overload warning with alarm contact • Reverse power and reverse Var • Excitation fault (2100 only) 	<ul style="list-style-type: none"> • Overspeed shutdown • Low oil pressure warning and shutdown • High coolant temperature warning and shutdown • High oil temperature warning • Low coolant level warning or shutdown • Low coolant temperature warning • High and low battery voltage • Weak battery • Fail to start (overcrank) shutdown • Fail to crank shutdown • Redundant start disconnect • Cranking lockout • Sensor failure indication 	<ul style="list-style-type: none"> • OFF/MANUAL/AUTO mode switch (2100) • MANUAL RUN/STOP switch (2100) • RUN/OFF/AUTO switch (3100) • Panel lamp/reset 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 not in auto, common warning, common shutdown • (5) configurable LED lamps (2100 only), plus genset running LED • LED Bargraph AC data display (2100) • Needle-Type AC Meters (3100) • Panel Lighting with switch and timer
Alternator Data	Engine Data	Other Data
<ul style="list-style-type: none"> • Line to Line and Line to Neutral AC volts • 3-phase AC current • Frequency • Total and individual phase kW and kVA 	<ul style="list-style-type: none"> • DC voltage • Lube oil pressure • Coolant temperature • Lube oil temperature 	<ul style="list-style-type: none"> • Genset model data • Start attempts, Starts, running hours • KW hours • Fault history • Load Profile (Hours less than 30% and hours more than 90% load)
Options	Control Functions	
<ul style="list-style-type: none"> <input type="checkbox"/> Key-type mode switch <input type="checkbox"/> Ground fault module <input type="checkbox"/> Exhaust Temperature Monitor <input type="checkbox"/> Echelon LonWorks interface 	<ul style="list-style-type: none"> <input type="checkbox"/> Digital input and output module(s) (loose) <input type="checkbox"/> Remote Annunciator (loose) <input type="checkbox"/> Configurable network inputs (8) and outputs (16). <ul style="list-style-type: none"> • Data logging on faults (2100) • Fault simulation (2100, requires InPower) • Time delay start and cooldown • Cycle cranking • (4) Configurable inputs • (4) Configurable outputs (2100 only) 	

Generator Set Options

Engine

- 208/240/480 V thermostatically controlled coolant heater for ambient above 40°F (4.5°C)
- 208/240/480 V thermostatically controlled coolant heater for ambient below 40°F (4.5°C)
- 120 V 300 W lube oil heater
- 208/240 V 300 W lube oil heater
- 480 V 300 W lube oil heater
- Bypass oil filter
- Fuel/water separator
- Heavy-duty air cleaner with safety element

Cooling System

- Heat exchanger cooling
- Remote radiator cooling

Alternator

- 80°C rise alternator
- 105°C rise alternator
- 120/240 V, 300 W anti-condensation heater

Control Panel

- 120/240 V, 100 W control anti-condensation space heater
- Exhaust pyrometer
- Fuel-pressure gauge (engine mounted)
- Ground fault alarm
- Remote fault signal package
- Run relay package

Exhaust System

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

Generator Set

- AC entrance box
- Batteries
- Battery charger
- Export box packaging
- UL2200 Listed
- Main line circuit breaker
- Paralleling accessories
- Remote annunciator panel
- Sound attenuated enclosure (2 levels) with internal silencers
- Spring isolators
- Weather-protective enclosure with mounted silencer
- 2-year standby warranty
- 2-year prime power warranty
- 5-year basic power warranty
- 5-year comprehensive power warranty
- 10-year major components warranty

Available Products and Services

A wide range of products and services is available to match your power generation system requirements. Cummins Onan products and services include:

Diesel and Spark-Ignited Generator Sets

Transfer Switches

Bypass Switches

Parallel Load Transfer Equipment

Digital Paralleling Switchgear

PowerCommand Network and Software

Distributor Application Support

Planned Maintenance Agreements

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



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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.