

Diesel Generator Set Model DFEK 60 Hz

500 kW, 625 kVA Standby
455 kW, 569 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 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 housings 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 UL2200 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 with warranty, service, parts, and planned maintenance support.

Features

- **UL Listed Generator Set** - The complete generator set assembly is available Listed to UL2200.
- **Fuel Tanks** - Dual wall sub-base fuel tanks and in-skid day tanks are also offered.
- **Low Exhaust Emissions** - Engine certified to U.S. EPA Nonroad Source Emission Standards, CFR 40.
- **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 compliance.
- **Cooling System** - Provides reliable running at the rated power level, at up to 50°C ambient temperature.
- **Integral Vibration Isolation** - Robust skid base supports the engine, alternator, and radiator on isolators, minimizing transmitted vibration.
- **E-Coat Finish** - Dual electro-deposition paint system provides high resistance to scratches, corrosion, or fading.
- **Certifications** - Generator sets are designed, manufactured and tested 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 500-3326 for installation design specifications.

Unit Width, in (mm)	60.0 (1524)
Unit Height, in (mm)	71.3 (1812)
Unit Length, in (mm)	152.1 (3864)
Unit Dry Weight, lb (kg)	9500 (4309)
Unit Wet Weight, lb (kg)	9800 (4445)
Rated Speed, rpm	1800
Voltage Regulation, No Load to Full Load	±0.5%
Random Voltage Variation	±0.25%
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

Cooling	Standby	Prime
Standard Set-Mounted Radiator Cooling (Dwg. 500-3326)		
Set Coolant Capacity, US Gal (L)	15.3 (57.9)	15.3 (57.9)
Total Heat Rejected from Cooling System, BTU/min (MJ/min)	18900.0 (20.0)	13960.0 (14.8)
Heat Radiated to Room, BTU/min (MJ/min)	3845.0 (4.1)	3080.0 (3.3)

Air		
Combustion Air, scfm (m ³ /min)	1470.0 (41.6)	1200.0 (34.0)
Alternator Cooling Air, scfm (m ³ /min)	2190.0 (62.0)	2190.0 (62.0)
Radiator Cooling Air, scfm (m ³ /min)	25000.0 (707.5)	25000.0 (707.5)
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.

Site Derating Factors

Genset may be operated at up to 1000 m (3280 ft) and 40°C (104°F) without power deration. For sustained operation above these conditions up to 2000 m, derate by 2.4% per 305 m (1000 ft), and 4.2% per 11°C (2.1% per 10°F). Above 2000 m, derate 8% total for 2000 m plus 6.4% per 305 m (1000 ft) over 2000 m and 11.9% per 11°C (6% per 10°F) over 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.

Note: Features included with the engine: battery charging alternator, fuel/water separator, shutdown low coolant and bypass oil filtration.

Specifications – Engine

Base Engine	Cummins Model QSX15-G9, Turbo-charged with air-to-air charge air cooling, diesel-fueled
Displacement in³ (L)	912.0 (14.9)
Overspeed Limit, rpm	2150 ±50
Regenerative Power, kW	52.20
Cylinder Block Configuration	Cast iron with replaceable wet liners, In-Line 6 cylinder
Cranking Current	900 amps at ambient temperature of 32°F (0°C)
Battery Charging Alternator	35 amps
Starting Voltage	24-volt, negative ground
Lube Oil Filter Types	Single spin-on combination element with full flow and bypass filtration
Standard Cooling System	122° F (40° C) ambient radiator

Power Output	Standby	Prime							
Gross Engine Power Output, bhp (kWm)	755.0 (563.2)	680.0 (507.3)							
BMEP at Rated Load, psi (kPa)	353.0 (2433.9)	291.0 (2006.4)							
Bore, in. (mm)	5.39 (136.9)	5.39 (136.9)							
Stroke, in. (mm)	6.65 (168.9)	6.65 (168.9)							
Piston Speed, ft/min (m/s)	1995.0 (10.1)	1995.0 (10.1)							
Compression Ratio	17.0:1	17.0:1							
Lube Oil Capacity, qt. (L)	88.0 (83.3)	88.0 (83.3)							
Fuel Flow									
Fuel Flow at Rated Load, US Gal/hr (L/hr)	112.0 (423.9)	112.0 (423.9)							
Maximum Inlet Restriction, in. Hg (mm Hg)	5.0 (127.0)	5.0 (127.0)							
Maximum Return Restriction, in. Hg (mm Hg)	3.0 (77.5)	3.0 (77.5)							
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)	3625.0 (102.6)	2910.0 (82.4)							
Exhaust Temperature, °F (°C)	925.0 (496.1)	875.0 (468.3)							
Max Back Pressure, in. H ₂ O (kPa)	27.0 (6.7)	27.0 (6.7)							
Fuel System	Full Authority Electronic (FAE) Cummins HPI-TP								
Fuel Consumption	Standby		Prime						
60 Hz Ratings, kW (kVA)	500 (625)		455 (569)						
	Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
	US Gal/hr	11.2	18.5	25.4	34.8	9.9	15.9	21.5	27.5
	L/hr	42	70	96	132	37	60	81	104

Alternator

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.

A Permanent Magnet Generator (PMG) excitation system limits voltage dip during transient load application, sustains 3-phase short circuit current at approximately three times rated for up to 10 seconds, and is resistant to harmful effects of harmonics generated by non-linear loads. The alternator delivers excellent performance in applications containing large motors or sensitive electronics.

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 high 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 Application Notes

Alternator Space Heater - is recommended to inhibit condensation.

Available Output Voltages

Three Phase

- [] 110/190
- [] 110/220
- [] 115/200
- [] 115/230
- [] 120/208
- [] 127/220
- [] 139/240
- [] 220/380
- [] 230/400
- [] 240/416
- [] 255/440
- [] 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		105° C	105° C	125° C	125° C	125° C	125° C	125° C	150° C	150° C	150° C	150° C	
Feature Code		B262	B301	B258	B252	B414	B246	B300	B426	B413	B424	B419	
Alternator Data Sheet Number		308	307	308	307	308	306	306	307	307	305	306	
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	120/208 Thru 139/240 240/416 Thru 277/480	277/480	347/600	110/190 Thru 139/240 220/380 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	277/480	347/600	
Surge kW		514	517	514	514	516	515	515	512	514	512	515	
Motor Starting kVA (at 90% sustained voltage)	PMG	2429	2208	2429	2208	2429	1896	1896	2208	2208	1749	1896	
Full Load Current - Amps at Standby Rating		<u>110/190</u> 1901	<u>120/208</u> 1737	<u>110/220</u> 1642	<u>115/230</u> 1571	<u>139/240</u> 1505	<u>220/380</u> 951	<u>230/400</u> 903	<u>240/416</u> 868	<u>255/440</u> 821	<u>277/480</u> 753	<u>347/600</u> 602	

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



Optional Features Shown

PowerCommand® II Digital Generator Set Control	
<ul style="list-style-type: none"> • 	
Operator Panel Features	
<ul style="list-style-type: none"> • Emergency stop switch • Indicating lamps for remote start, Not In Auto, common shutdown, and common warning • Fault reset switch • Panel lamp/lamp test switch • Exercise switch and indicating lamp • Manual run/stop switch • Off/Manual/Auto mode select switch • Graphical display panel with pushbutton switches capable of displaying up to 9 lines of data approximately 26 characters wide, as well as graphical characters 	
Standard Features	Optional Features
<ul style="list-style-type: none"> • Isochronous governing • 3-phase sensing voltage regulation with single and three phase fault current regulation • AC output protection including over/under voltage, over/under frequency, overcurrent, short circuit, and overload (kW) • Engine control and monitoring system with displays for oil pressure, oil temperature, engine coolant temperature, engine speed, battery voltage and other values • Generator set protection system including AC output protection alarms, engine pressure, temperature warning, shutdown functions, low coolant temperature, low coolant level, low fuel level, failure to crank, failure to start and overspeed • Operator adjustments for time delay, start/stop, engine speed, and overspeed • Technician setup menu • Status and data display functions including engine operating hours, kW hour productions, AC metering functions and fault history 	<ul style="list-style-type: none"> • Alternator temperature alarms • Audible alarm module • Automatic mains failure control • Control anti-condensation heater • Digital paralleling controls • Echelon LonWorks interface • Generator running relay contacts • Key-type mode control switch
<ul style="list-style-type: none"> • Analog AC metering panel for simultaneous monitoring of 3-phase AC voltage and current, kW, power factor, and frequency. Voltage, current and kW are scaled in % of nominal values. All values are color-coded to indicate normal, warning and abnormal operating conditions with a single membrane panel. 	

Generator Set Options

Engine

- 208/240/480 V, 4990 total W max. coolant heaters
- 208/240/480 V, 6420 total W max. coolant heaters
- 120 V 300 W lube oil heater
- Heavy-duty air cleaner with safety element

Cooling System

- 125°F (50°C) ambient radiator

Fuel System

- 41 Gal (155 L) In-skid day tank (single wall)
- 55 Gal (208 L) In-skid day tank (dual wall)
- 425 Gal (1595 L) Sub-base tank
- 850 Gal (3191 L) Sub-base tank

Alternator

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

Control Panel

- 120/240 V, 150 W control anti-condensation space heater
- Ground fault alarm
- Paralleling configuration
- 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
- Spring isolators
- Weather-protective housing with mounted silencer
- 2 year prime power warranty
- 2 year standby warranty
- 5 year basic 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 Power Generation 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 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 UL2200, Stationary Engine Generator Assemblies. The PowerCommand control is Listed to UL508 - 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.