Diesel Generator Set

Model DFHD 60 Hz
EPA Emissions

1000 kW, 1250 kVA Standby
900 kW, 1125 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 NFPA110 Level 1 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 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 the PowerCommand control is UL508 listed. Circuit breaker assemblies are UL489 Listed for 100% continuous operation and also UL869A Listed Service Equipment.

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 UL2200.
- **Emissions Compliance** - All 60 Hz models comply with EPA emissions requirements for stationary applications. Some 60 Hz models comply with EPA TPEM requirements for mobile applications.
- **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.
- **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.
- **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.

Generator Set

This generator set is equipped with a standard radiator cooling system serving an engine-block cooling circuit and a turbocharger aftercooler. Also available with optional heat exhanger or remote radiator cooling systems. The general specifications in this document provide representative configuration details. Consult the respective outline drawing listed below for each available cooling system. These outline drawings must be used for installation design and construction dimensional information.

General Specifications	
Unit Width, in (mm)	78.7 (2000)
Unit Height, in (mm)	92.6 (2353)
Unit Length, in (mm)	171.7 (4361)
Unit Dry Weight, lb (kg)	16922 (7676)
Unit Wet Weight, lb (kg)	17578 (7973)
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 through IEC 801.5 MIL STD 461C, Part 9

	Standby	**Prime**
50° C Set-Mounted Radiator Cooling (Dwg. 500-3636)		
Fan Load, HP (kW)	56.9 (42.4)	56.9 (42.4)
Set Coolant Capacity, US Gal (L)	53.5 (202.5)	53.5 (202.5)
Total Heat Rejected from Cooling System, BTU/min (MJ/min)	36300.0 (38.5)	31470.0 (33.4)
Heat Radiated to Room, BTU/min (MJ/min)	10330.0 (10.9)	9120.0 (9.7)
Optional Heat Exchanger Cooling (Dwg. 500-3613)		
Set Coolant Capacity, US Gal (L)	70.0 (265.0)	70.0 (265.0)
Heat Rejected, Jacket Water Circuit, BTU/min (MJ/min)	20880.0 (22.1)	19350.0 (20.5)
Heat Rejected, Aftercooler Circuit, BTU/min (MJ/min)	15420.0 (16.3)	12120.0 (12.8)
Heat Radiated to Room, BTU/min (MJ/min)	10330.0 (10.9)	9120.0 (9.7)
Max Raw Water Pressure, Jacket Water Circuit, psi (kPa)	180.0 (1241.1)	180.0 (1241.1)
Max Raw Water Pressure, Aftercooler Circuit, psi (kPa)	150.0 (1034.2)	150.0 (1034.2)
Max Raw Water Flow, Jacket Water Circuit, US Gal/min (L/min)	360.0 (1362.6)	360.0 (1362.6)
Max Raw Water Flow, Aftercooler Circuit, US Gal/min (L/min)	150.0 (567.8)	150.0 (567.8)
Min Raw Water Flow @ 80° F (27° C) Inlet Temp, Jacket Water Circuit, US Gal/min (L/min)	42.0 (159.0)	42.0 (159.0)
Min Raw Water Flow @ 80° F (27° C) Inlet Temp, Aftercooler Circuit, US Gal/min (L/min)	90.0 (340.6)	90.0 (340.6)
Raw Water Delta P@Min Flow, Jacket Water Circuit, psi (Pa)	0.2 (1379.0)	0.2 (1379.0)
Raw Water Delta P@Min Flow, Aftercooler Circuit, psi (Pa)	0.8 (5516.0)	0.8 (5516.0)
Max Jacket Water Outlet Temp,°F (°C)	220.0 (104.4)	212.0 (100.0)
Max Aftercooler Inlet Temp,°F (°C)	150.0 (65.6)	150.0 (65.6)
Optional Remote Radiator Cooling (Dwg. 500-3612)		
Set Coolant Capacity, US Gal (L)	24.2 (91.6)	24.2 (91.6)
Max Flow Rate @ Max Friction Head, Jacket Water Circuit, Gal/min (L/min)	262.0 (991.7)	262.0 (991.7)
Max Flow Rate @ Max Friction Head, Aftercooler Circuit, Gal/min (L/min)	80.0 (302.8)	80.0 (302.8)
Heat Rejected, Jacket Water Circuit, BTU/min (MJ/min)	20880.0 (22.1)	19350.0 (20.5)
Heat Rejected, Aftercooler Circuit, BTU/min (MJ/min)	15420.0 (16.3)	12120.0 (12.8)
Heat Radiated to Room, BTU/min (MJ/min)	10330.0 (10.9)	9120.0 (9.7)
Max Friction Head, Jacket Water Circuit, psi (kPa)	10.0 (68.9)	10.0 (68.9)
Max Friction Head, Aftercooler Circuit, psi (kPa)	7.0 (48.3)	7.0 (48.3)
Max Static Head, Jacket Water Circuit, ft (m)	46.0 (14.0)	46.0 (14.0)
Max Static Head, Aftercooler Circuit, ft (m)	46.0 (14.0)	46.0 (14.0)
Max Jacket Water Outlet Temp,°F (°C)	220.0 (104.4)	212.0 (100.0)
Max Aftercooler Circuit Inlet Temp @ 77° F (11° C),°F (°C)	120.0 (48.9)	120.0 (48.9)
Max Aftercooler Circuit Inlet Temp,°F (°C)	150.0 (65.6)	150.0 (65.6)
Air		
Combustion Air, scfm (m^3/min)	2840.0 (80.4)	2650.0 (75.0)
Alternator Cooling Air, scfm (m^3/min)	6720.0 (190.2)	6720.0 (190.2)
Radiator Cooling Air, scfm (m^3/min)	34000.0 (962.2)	34000.0 (962.2)
Max. Static Restriction, in H_2O (Pa)	0.5 (124.5)	0.5 (124.5)

Site Derating Factors

Engine power available up to 4958 ft (1512 m) at temperatures up to 104°F (40°C) and up to 4433 ft (1350 m) at 122°F (50°C). Above these elevations, derate at 3.4% per 1000 ft (305 m) up to 9843 ft (3000 m). Above 122°F (50°C) and 9843 ft (3000 m), derate an additional 9% per 1000 ft (305 m) and 15% per 18°F (10°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.

General Specifications

Base Engine	Cummins Model QST30-G5 Nonroad 1, Turbocharged and Low Temperature Aftercooled, diesel-fueled
Displacement in^3 (L)	1860.0 (30.5)
Overspeed Limit, rpm	2100 ±50
Regenerative Power, kW	82.00
Cylinder Block Configuration	Cast iron, 50°V 12 cylinder
Battery Capacity	1280 amps minimum at ambient temperature of 32°F (0°C)
Battery Charging Alternator	35 amps
Starting Voltage	24-volt, negative ground
Lube Oil Filter Types	Four spin-on, full flow; two bypass oil filters
Standard Cooling System	122°F (50° C) ambient radiator
Fuel System	Direct injection, number 2 diesel fuel; fuel filter; automatic electric fuel shutoff

Power Output	**Standby**	**Prime**
Gross Engine Power Output, bhp (kWm)	1490.0 (1111.5)	1350.0 (1007.1)
BMEP at Rated Load, psi (kPa)	352.0 (2427.0)	319.0 (2199.4)
Bore, in. (mm)	5.51 (140.0)	5.51 (140.0)
Stroke, in. (mm)	6.50 (165.1)	6.50 (165.1)
Piston Speed, ft/min (m/s)	1949.0 (9.9)	1949.0 (9.9)
Compression Ratio	14.0:1	14.0:1
Lube Oil Capacity, qt. (L)	140.0 (132.5)	140.0 (132.5)

Fuel Flow

Fuel Flow at Rated Load, US Gal/hr (L/hr)	150.0 (567.8)	150.0 (567.8)
Maximum Inlet Restriction, in. Hg (mm Hg)	4.0 (101.6)	4.0 (101.6)
Maximum Return Restriction, in. Hg (mm Hg)	20.0 (508.0)	20.0 (508.0)

Air Cleaner		
Maximum Air Cleaner Restriction, in. H_2O (kPa)	25.0 (6.2)	25.0 (6.2)

Exhaust

Exhaust Flow at Rated Load, cfm (m^3/min)	7775.0 (220.0)	6960.0 (197.0)
Exhaust Temperature,°F (°C)	975.0 (523.9)	920.0 (493.3)
Max Back Pressure, in. H_2O (kPa)	27.0 (6.7)	27.0 (6.7)

Fuel Consumption

Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
US Gal/hr	20.6	35.3	51.1	69.3	19.2	32.3	46.2	61.8
L/hr	78	134	193	262	73	122	175	234

Alternator

A single-bearing alternator is coupled directly to the engine flywheel with flexible discs for drivetrain reliability and durability. No gear reducers or speed changers are used. Two-thirds pitch armature windings minimize output voltage third-order harmonic content.

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.

Several 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.

General Specifications

Design	Brushless 4-pole, drip-proof, revolving field
Stator	2/3 pitch
Rotor	Direct coupled by flexible disc
Insulation System	Class H (LV), Class F (MV) per NEMA MG1-1.65
Standard Temperature Rise	125°C @ Standby; 105°C @ Prime (LV)
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
Telephone Influence Factor (TIF)	<3% for any single harmonic
Telephone Harmonic Factor (THF)	<50 per NEMA MG1-22.43

Three Phase Table[1]		80° C	80° C	105° C	105° C	125° C	125° C	125° C	125° C	105° C
Feature Code		B284	B604	B283	B301	B252	B282	B288	B276	B300
Alternator Data Sheet Number		331	330	330	312	312	330	312	311	311
Voltage Ranges		220/380 Thru 277/480	347/600	220/380 Thru 277/480	347/600	120/208 Thru 139/240 240/416 Thru 277/480	220/380 Thru 277/480	240/416 Thru 277/480	277/480	347/600
Surge kW		1024	1004	1018	1024	1019	1018	1019	1018	1021
Motor Starting kVA (at 90% sustained voltage)	PMG	5521	4602	4602	4234	4234	4602	4234	3866	3866

Full Load Current - Amps at Standby Rating	120/208	127/220	120/240	139/240	220/380	230/400	240/416	255/440	277/480	347/600
	3470	3280	3007	3007	1899	1804	1735	1640	1504	1202

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.

Available Output Voltages

Three Phase

[ ] 120/208
[ ] 127/220
[ ] 120/240
[ ] 139/240
[ ] 220/380
[ ] 230/400
[ ] 240/416
[ ] 255/440
[ ] 277/480
[ ] 347/600

Control System

Optional Features Shown

PowerCommand Control with AmpSentry Protection

- AmpSentry Protection guards the electrical integrity of the alternator and power system from the effects of overcurrent, over/under voltage, under frequency and overload conditions.
- Control components are designed to withstand the vibration levels typical in generator sets. Integrated automatic voltage regulator and engine speed governor

Standard Control Description

- Analog % of current meter (amps)
- Analog AC frequency meter
- Analog AC voltage meter
- Analog % of load meter (kW)
- Cycle cranking control
- Digital display panel
- Emergency stop switch
- Idle mode control
- Menu switch
- Panel backlighting
- Remote starting, 24 V, 2 wire
- Reset switch
- Run-Off-Auto switch
- Sealed front panel, gasketed door
- Self diagnostics
- Separate customer interconnection box
- Voltmeter/Ammeter phase selector switch

Standard Protection Functions

Warnings

- High coolant temperature
- High DC voltage
- Low coolant temperature
- Low DC voltage
- Low fuel-day tank
- Low oil pressure
- Overcurrent
- Oil pressure sender fault
- Overload load shed contacts
- Temperature sender fault
- Up to four customer fault inputs
- Weak battery

Shutdowns

- Emergency stop
- Fail to crank
- High AC voltage
- High coolant temperature
- Low coolant level (option for alarm only)
- Low AC voltage
- Low oil pressure
- Magnetic pickup failure
- Overcrank
- Overcurrent
- Overspeed
- Short circuit
- Underfrequency

Standard Performance Data

AC Alternator

- Current by phase
- Kilowatts
- Kilowatt hours
- Power factor
- Voltage line to line
- Voltage line to neutral

Engine Data

- Battery voltage
- Coolant temperature
- Engine running hours
- Engine starts counter
- Oil pressure
- Oil temperature
- RPM

Generator Set Options

Engine

[ ] Dual 208/240/480 V thermostatically controlled coolant heaters for ambients above 40° F (4.5° C)
[ ] Dual 208/240/480 V thermostatically controlled coolant heaters for ambients below 40° F (4.5° C)
[ ] Fuel/water separator
[ ] Heavy-duty air cleaner w/service indicator

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
[ ] Broad range, reconnectible
[ ] Extended range

Control Panel

[ ] 120/240 V, 100 W control anti-condensation space heater
[ ] Exhaust pyrometer
[ ] Ground fault indication
[ ] Paralleling configuration
[ ] Paralleling upgrade configuration
[ ] Remote fault signal package
[ ] Run relay package

Exhaust System

[ ] Critical grade exhaust silencer
[ ] Exhaust pipe packages
[ ] Industrial grade exhaust silencer
[ ] Residential grade exhaust silencer

Generator Set

[ ] AC entrance box
[ ] Batteries
[ ] Battery charger
[ ] Battery rack and hold down
[ ] Export box packaging
[ ] Main line circuit breaker
[ ] PowerCommand Network
[ ] Remote annunciator panel
[ ] Spring isolators
[ ] 2-year warranty
[ ] 5-year 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. Circuit breaker assemblies are UL489 Listed for 100% continuous operation and also UL869A Listed Service Equipment.

Ratings 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.

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.