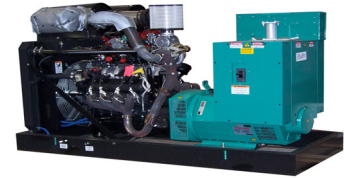


Gaseous Fuel Generator Set

PSI 8.8L Engine Series



Specification Sheet

Model GFPA EPA SI NSPS Certified

NOTE: This engine is EPA SI NSPS certified and must be operated as outlined in the O&M manual.

| Model GFPA Ratings | |
|-----------------------------------|------------------|
| Speed/Frequency | 1800 rpm/60 Hz |
| Rating | Standby |
| Compression Ratio | 10:1 |
| Natural Gas Rating @ 0.8 P.F.* | 150 kW (188 kVa) |
| Propane Rating @ 0.8 P.F. | 140 kW (175 kVa) |

NOTE: 54 °C (130 °F) or lower water temperature to the aftercooler.

* Rating is based on commercial pipeline natural gas.

All gases such as field, digester, and sewage gas will require an analysis of the specified gas and pre-approval from the factory. Consult your Cummins Distributor for details.

Description

The Cummins NPower GF-series commercial Generator Set (GenSet) is a fully integrated power generation system providing optimum performance, reliability, and versatility for stationary standby power applications.

A primary feature of the GF-series GenSet is strong motor-starting capability and fast recovery from transient load changes. The torque-matched system includes a heavy-duty PSI 4-cycle spark-ignited 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 GF-series GenSet accepts 100% of the nameplate standby rating within ten seconds per NFPA 110.

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

Optional GenSet housing and component heaters shield the GenSet from extreme operating conditions.* Environmental concerns are addressed by low exhaust emission engines, sound-attenuated housings, and exhaust silencers. A wide

range of options, accessories, and services are available to allow 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 NPower manufacturing facilities exemplify quality standards, emphasizing our commitment to high quality in the design, manufacture, and support of our products.

GenSets are designed, manufactured, and tested to relevant codes and standards listed below.

Features

PSI Heavy-Duty Engine - Rugged 4-cycle industrial spark-ignited engine delivers reliable power, low emissions, and quick 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 Listed. The alternator is certified to CSA 22.2 and UL 1004 Listed.

Control Systems - The PowerCommand® electronic control is standard equipment and provides total GenSet system integration, including automatic remote starting/stopping, precise voltage regulation, alarm and status message display, output metering, and auto-shutdown at fault detection. The PowerCommand® control is UL508 Listed, as well as NFPA 110 compliant in standalone applications. The controls are certified to CSA C282-M1999 and CSA 22.2 No.14 M91.

Warranty and Service - All Cummins NPower GenSets are backed by a comprehensive one-year warranty program and supported by a worldwide network of over 200 locations to assist with warranty, service, parts, and planned maintenance support.

* Cold weather heaters are recommended when ambient temperatures are below 0 °C (32 °F).

Generator Set

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

| Specifications - General | | |
|--|--|----------|
| Unit Width | 1016 mm (41 in) | Open set |
| Unit Height | 1575 mm (63 in) | Open set |
| Unit Length | 2413 mm (97 in) | Open set |
| Unit Wet Weight * | 1359 to 1453 kg (2990 to 3197 lbs) - Dependent on selected alternator. Open set | |
| Rated Speed | 1800 rpm | |
| Voltage Regulation, No Load to Full Load | ±1% | |
| Random Voltage Variation | ±1% (Three phase only.) | |
| Frequency Regulation | Isochronous | |
| Random Frequency Variation | ±0.5% | |
| Radio Frequency Interference | Optional PMG excitation operates in compliance with BS800 and VDE level G and N. Addition of RFI protection kit allows operation per MIL-STD-461 and VDE level K. | |

* Weight does not include silencer, catalyst, batteries, circuit breakers, or optional equipment.

Rating Definitions

Standby Rating: 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. Usage based on ISO 8528.

Site Derating Factors

See engine data sheet PSI Technical Standard 36300018 for altitude and ambient derate curves.

See GenSet enclosure specification sheet for other applicable derates.

Electrical System Connection

Warning: Backfeed to a utility system can cause electrocution and/or property damage. Do not connect GenSets to any building electrical system except through an approved device or after the building main disconnect is open. Neutral connection must be bonded in accordance with National Electrical Code.

Fuel System

Standard Carburetor – Econtrols E480

Low Pressure Dry Processed Natural Gas – (905 BTU/ft.³ L.H.V.)

Running Pressure to Engine180 to 280 mm WC (7 to 11 in. WC)

Minimum Gas Supply Pipe Size @ Engine (NG)37.5 mm (1.25 in.)

Minimum Gas Supply Pipe Size @ Engine (Propane)25.4 mm (1.0 in.)

LP Supply Connection.....3/8" JIC

The preceding pipe sizes are only suggestions and piping may vary with temperature, distance from fuel supply, and application of local codes. Gas must be available at adequate volume and pressure for engine at the regulator.

Low pressure sensor only included on Dual Fuel train options (NFPA 37 compliant).

The GenSet (engine) performance is based on processed natural gas fuel with 905 BTU per standard cubic foot (33.72 kJ/L) lower heating value. Variations in fuel composition and/or supply pressure must be eliminated during steady state operation. Locate the gas regulator as near to the engine as possible. Some systems may need an accumulator or other device(s) for startup or unstable conditions. Contact the fuel supply utility for details.

GenSets must be ordered with dual solenoids in order to comply with NFPA 37, but do not include visual indication (provided by others, if required) on shutoff valves.

Engine

PSI heavy-duty spark-ignited engines use advanced combustion technology for reliable and stable power, low emissions, and fast response to sudden load changes. Electronic governing is standard 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 | | Power Solutions International | | | |
| Displacement | | 8.8 L (537 in ³) | | | |
| Overspeed Limit | | 2100 rpm | | | |
| Regenerative Power | | 11 kW | | | |
| Cylinder Block Configuration | | Cast iron | | | |
| Cranking Current | | 550 amps at ambient temperature of 0 °C (32 °F) | | | |
| Battery Charging Alternator | | 80 amps | | | |
| Battery Type | | Group 31 (x1) | | | |
| Starting Voltage | | 12-volt, negative ground | | | |
| Standard Cooling System | | See derates on Page 2 | | | |
| Lube Oil Filter Types | | Single spin-on canister-combination full flow with bypass | | | |
| Fuel Consumption | | | | | |
| STANDBY LOAD | | 1/4 | 1/2 | 3/4 | Full |
| NG Rating | kW | 35.6 | 75 | 112 | 150 |
| Propane Rating | kW | 35 | 70 | 105 | 140 |
| Natural Gas | CFH | 930 | 1341 | 1630 | 2043 |
| Propane Vapor | CFH | 358 | 516 | 628 | 787 |
| Propane Liquid | GPH | 9.8 | 14.2 | 17.2 | 21.6 |
| Cooling | | | Full Load | | |
| Jacket Water Heat Rejection to Coolant | | | 88.3 kW (5022 BTU/min) | | |
| Charge Air Cooler Heat Rejection | | | 11.3 kW (643 BTU/min) | | |
| Heat Rejection to Room | | | 26 kW (1479 BTU/min) | | |
| Jacket Water Coolant Capacity (w/radiator) | | | 34 L (9 USG) | | |
| Jacket Water Coolant Flow Rate | | | 125 L/min (33 GPM) | | |
| Radiator Fan Load | | | 13 kW (17 hp) | | |
| Air | | | Full Load | | |
| Combustion Air | | | 175 L/sec (371 cfm) | | |
| Maximum Air Cleaner Restriction | | | 203 mm H ₂ O (8 in H ₂ O) | | |
| Alternator Cooling Air | | | 620 L/sec (1314 cfm) | | |
| Radiator Cooling Air | | | 5993 L/sec (12705 cfm) | | |
| Maximum Total External Restriction at Radiator (static) | | | 25.4 mm H ₂ O (1.0 in H ₂ O) | | |
| Exhaust | | | Full Load | | |
| Gas Flow (Full Load) | | | 470 L/sec (996 cfm) | | |
| Maximum Gas Temperature - Dry Stack | | | 677 °C (1251 °F) | | |
| Total System Back Pressure Allowed | | | 76 mm Hg (3 in Hg) | | |
| Catalyst Back Pressure | | | 50.8 mm Hg (2 in Hg) estimate | | |
| Silencer Back Pressure (Factory Enclosed Units Only) | | | 20.6 mm Hg (.81 in Hg) | | |
| Engine | | | Full Load | | |
| Gross Engine Power Output | | | 180 kWm (241 hp) | | |
| BMEP @ Rated Load on NG | | | 1641 kPa (246 psi) | | |
| Piston Speed | | | 6.9 m/sec (1350 ft/min) | | |
| Oil Capacity | | | 9.5 L (2.5 USG) | | |

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 drive train 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 GenSets. The standard excitation system is a self-excited shunt system with the voltage regulator powered directly from the GenSet output.

Separately Excited Permanent Magnet Generator (PMG) System - This option 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 option is recommended for use in applications that have large transient loads, sensitive electronic loads (especially UPS applications) or harmonic content, or that require sustained short-circuit current (sustained three-phase short circuit current at approximately three times rated for ten seconds).

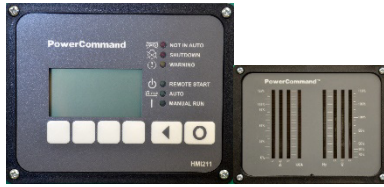
Alternator Sizes - On any given model, various alternator sizes are available to meet individual application needs. Alternator sizes are differentiated by maximum winding temperature rise at the GenSet standby rating when operated in a 40 °C (104 °F) ambient environment. Not all temperature rise selections are available on all models. For other temperatures not listed below, contact your local Cummins distributor. Lower temperature rise is accomplished using larger alternators at lower current density. Lower temperature rise alternators have higher motor-starting kVA and 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. An alternator space heater is recommended to inhibit condensation.

| Specifications - Alternator (based on the Natural Gas rating) | | | | |
|---|--|-------------------------------|--|-----------------------------|
| | 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 or better | |
| | Standard Temperature Rise * | | 125 °C | |
| | Exciter Type | | Shunt or 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 | | |
| | Voltage Ranges @ 60 Hz | Motor Starting Voltage | Maximum kVa (90% Sustained Voltage) | Alternator Datasheet |
| 80 °C Alternator | 120/208 Thru 139/240 240/416 Thru 277/480 | Broad Range | 672 (Shunt) 791 (PMG) | ADS211 |
| | 277/480 | 480 | 672 (Shunt) 791 (PMG) | ADS211 |
| | 347/600 | 600 | 672 (Shunt) 791 (PMG) | ADS211 |
| 105 °C Alternator | 120/208 Thru 139/240 240/416 Thru 277/480 | Broad Range | 563 (Shunt) 663 (PMG) | ADS210 |
| | 277/480 | 480 | 516 (Shunt) 607 (PMG) | ADS209 |
| | 347/600 | 600 | 516 (Shunt) 607 (PMG) | ADS209 |
| 125 °C Alternator | 120/208 Thru 139/240 240/416 Thru 277/480 | Broad Range | 563 (Shunt) 663(PMG) | ADS210 |
| | 277/480 | 480 | 516 (Shunt) 607 (PMG) | ADS209 |
| | 347/600 | 600 | 516 (Shunt) 607 (PMG) | ADS209 |

* For UL1004 ratings, refer to temperature rise at 120 °C or below, and ambient temperature up to 40 °C

| Amp Rating at Full Load Voltage | | | | | | | | | |
|--|----------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Full Load Voltage | 120/240 (1 Ph) | 120/208 | 127/220 | 139/240 | 220/380 | 240/416 | 254/440 | 277/480 | 347/600 |
| Amps | 625 | 520 | 492 | 451 | 284 | 260 | 246 | 226 | 180 |

Control System



HMI 211

(optional)

PowerCommand® Control 1.1

The PowerCommand® Control is an integrated GenSet control system providing voltage regulation, engine protection, operator interface and isochronous governing (optional). The integration of all functions into a single control system provides enhanced reliability and performance compared to conventional GenSet control systems. Prototype tested; UL, CSA, and CE compliant. The PowerCommand® Control system includes:

Environment

- Ambient operating temperature from:
-40 to +70 °C (-40 to 158 °F)
[HMI from -20 to +70 °C (-4 to 158 °F)].
- Operating altitude up to 5000 m (13,000 ft.).

Features

- Control boards potted for environmental protection.
- InPower™ PC-based service tool available for detailed diagnostics.
- Battery monitoring and testing features and smart starting control system.
- Standard PowerCommand® Control Network (PCCNet) interface to devices such as remote annunciator for NFPA 110 applications.

AC Protection

- Field overload.
- Over current warning and shutdown.
- Over and under voltage shutdown.
- Over and under frequency shutdown.
- Over excitation (loss of sensing) fault.
- Integrated digital electronic voltage regulator.

Digital Voltage Regulation

- 2-phase line-to-line sensing.
- Configurable torque matching.
- Integrated digital electronic voltage regulator.

Engine Data

- DC voltage battery charge.
- Adjustable lube oil pressure.
- Adjustable engine idle speed.
- 12/24 VDC battery configuration.

Alternator Data

- 60 Hz frequency.
- Three Phase AC current.
- AC: Single or three-phase line-to-line or line-to-neutral.
- Digital output voltage regulation within +/-1.0% any loads between no load to full. Drift = no more than +/-1.5% for 40 °C (104 °F) temperature change in 8 hours.

Control Functions

- Cycle cranking.
- PCCNet interface.
- Configurable inputs (2).
- Configurable outputs (2).
- Remote emergency stop.
- Time delay start and cooldown.

Engine Protection.

- Cranking lockout.
- Overspeed shutdown .
- Fail to start (overcrank) shutdown.
- Fail to crank shutdown Sensor failure indication.
- Redundant start disconnect.
- Low fuel level warning or shutdown.
- Low oil pressure warning and shutdown.
- High coolant temperature warning and shutdown.
- Low coolant level warning or shutdown.
- Low coolant temperature warning.
- High, low, and weak battery voltage warning.

Operator/Display Panel

- Manual off switch.
- Bargraph display (optional).
- LED lamps indicating GenSet running, not in auto, common warning, common shutdown, manual run mode, and remote start.
- Alphanumeric display with pushbutton access for viewing engine and alternator data and providing setup, controls and adjustments (English or international symbols).

Other Display Data

- Fault history.
- GenSet model data.
- RS485 Modbus® interface.
- Start attempts, starts, running hours.
- Data logging and fault simulation (requires InPower™ service tool).

Control Options

- Remote operator panel.
- PMG alternator excitation.
- AC output analog meters (bargraph).
- Color-coded graphical display of: kVa, Frequency, 3-phase current, and 3-phase AC voltage
- Auxiliary output relays (2).
- Modbus® to BACnet™ Module.
- ComAp IntelliGen^{NTC} parallel controller.
- 120/240 V, 100 W anti-condensation heater.
- Remote annunciator with configurable inputs (3) and configurable outputs (4).
- Auxiliary, configurable signal inputs (8) and configurable relay outputs (8).
- PowerCommand® 2.2 control with AmpSentry™ protection.

Generator Set Options

Engine

- 120/240 V, 1500 W coolant heaters
- 120/240 V, 2000 W coolant heaters
- 120 V, 250 W lube oil heater

Fuel System

- Flexible fuel connector
- Fuel strainer

Alternator (see Page Four for available options)

Exhaust System

- GenSet mounted muffler (enclosure models only)
- Catalyst Removal (export option)

Generator Set

- Battery
- Battery charger
- Main line circuit breaker
- PowerCommand® Network Communication Module (NCM)
- Modbus® to BACnet™ Module
- Weather protective enclosure (F001) with silencer
- Level I enclosure w/silencer
- Level II enclosure w/silencer
- Audible Alarm
- Remote Drains
- Oil Maintainer
- Remote annunciator panel
- Spring isolators
- Two-year standby warranty
- Five-year basic power warranty

Available Products and Services

A wide range of Cummins products and services is available to match your power Generation System requirements. Contact your local Cummins Distributor for more information at www.cumminsnpower.com.

- Diesel and Spark-Ignited Generator Sets
- Transfer Switches
- Bypass Switches
- Digital Paralleling Switchgear
- PowerCommand® Network and Software
- Distributor Application Support

Warranty

All Cummins GenSets are backed by a comprehensive one-year warranty program and supported by a worldwide network of over 200 locations to assist with warranty, service, parts, and planned maintenance support. Contact your local Cummins Distributor/Dealer for more information at www.cumminsnpower.com.

Certifications



CSA Group tests products under a formal process to ensure that they meet the safety and/or performance requirements of applicable standards. This GenSet is certified to: CSA 22.2 No. 100 Motors and Generators; CSA 22.2 No. 0.4-044 Bonding of Electrical Equipment; CSA 22.2 No. 14 Industrial Control Equipment; and CSA 22.2 No. 0 General Requirements - Canadian Electrical Code, Part II.



The Prototype Test Support (PTS) program verifies the performance integrity of the GenSet design. Products bearing the PTS symbol have been subjected to demanding tests in accordance with NFPA 110 to verify the design integrity and performance under both normal and abnormal operating conditions. These conditions include: short circuit, endurance, temperature rise, torsional vibration, and transient response, as well as full load pickup.

Manufactured By



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