

# Natural gas generator set QSK60 series engine



## > Specification sheet

1160 kW - 1400 kW

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## Power Generation

### Description

This Cummins Power Generation gas generator set is a fully integrated power generation system utilizing state of the art technology that results in optimum performance and efficient use of fuel for continuous duty, CHP and peaking applications.



This generator set is designed in facilities certified to ISO 9001 and manufactured in facilities certified to ISO 9001 or ISO 9002.



The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design.

### Features

**Exhaust emissions** – Lean burn technology provides exhaust emissions levels as low as 350 mg/Nm<sup>3</sup> (0.7 g/hp-hr) NO<sub>x</sub>.

**Cummins® heavy-duty engine** – Rugged 4-cycle lean burn gas combustion engine utilizing full authority electronic engine management and monitoring.

**Permanent magnet generator (PMG)** – Excitation system offers enhanced motor starting and fault clearing short circuit capability.

**Alternator** – Several alternator sizes offer selectable voltage and temperature rise with low reactance 2/3 pitch windings; low waveform distortion with non-linear loads, fault clearing short circuit capability, bearing and stator RTDs, anti-condensation heater, class F or H insulation (see alternator datasheet for details). Mechanically strengthened for use on utility paralleling with unreliable grid.

**Control system** – The PowerCommand 3.3 generator set control is standard equipment and provides total genset system integration including full paralleling capability in grid or load share mode, precise frequency and voltage regulation, alarm and status message display, AmpSentry™ protection, output metering, auto-shutdown at fault detection and a user interface panel installed onto the genset. Optional remote operator panels are also available.

**Cooling system** – The generator set is equipped with the capability to interface with a remote radiator or heat exchanger.

**Warranty and service** – Backed by a comprehensive warranty and worldwide distributor network that can provide all levels of service from replacement parts to performance guarantee programs.

#### 50 Hz

#### 60 Hz

| New Model        | Old Model   | kW   | Configuration       | New Model        | Old Model   | kW   | Configuration       |
|------------------|-------------|------|---------------------|------------------|-------------|------|---------------------|
| <b>C1160 N5C</b> | <b>GQKA</b> | 1160 | 4 pole direct drive | <b>C1400 N6C</b> | <b>GQKA</b> | 1400 | 4 pole direct drive |

\* Genset is capable of operating between 0.8 lagging and 1.0 power factor. All fuel consumption and heat balance data is at 1.0 power factor.

## Generator set specifications

|  |   |
|--|---|
| Governor regulation class                | ISO 8528 Part 1, Class G1 with exceptions - see PTS (Prototype Test Support) Data Sheet |
| Voltage regulation, no load to full load | ± 0.5%  |
| Random voltage variation                 | ± 0.5%  |
| Frequency regulation                     | Isochronous   |
| Random frequency variation               | ± 0.25%   |
| Radio frequency emissions compliance     | IEC 801.2 through IEC 801.5; MIL STD 461C, Part 9                                       |
| Single step load pickup                  | Minimum 50% see PTS data sheet for details  |

## Engine specifications

|                             |  |
|-----------------------------|--|
| Design                      | 4 cycle, V-block, turbocharged low temperature aftercooled |
| Bore                        | 159 mm (6.25 in)   |
| Stroke                      | 190 mm (7.48 in)   |
| Displacement                | 60.3 liters (3685 in <sup>3</sup> )                        |
| Cylinder block              | Cast iron, V16   |
| Battery charging alternator | None   |
| Starting voltage            | 24 volt negative ground                                    |
| Fuel system                 | Lean burn  |
| Ignition system             | Individual coil on plug                                    |
| Air cleaner type            | Dry replaceable element                                    |
| Lube oil filter type(s)     | Full flow and bypass filters                               |
| Breather                    | Breather filter  |

## Alternator specifications

|                                       |  |
|---------------------------------------|--|
| Design                                | Brushless, 4 pole, revolving field                             |
| Stator                                | 2/3 pitch  |
| Rotor                                 | Two bearing  |
| Insulation system                     | Class F and H see ADS (Alternator Data Sheet) for details      |
| Standard temperature rise             | 105 °C (221 °F) Continuous @ 40 °C (104 °F) ambient            |
| Exciter type                          | PMG (Permanent Magnet Generator)                               |
| Phase rotation                        | A (U), B (V), C (W)  |
| Alternator cooling                    | Direct drive centrifugal blower fan                            |
| AC waveform total harmonic distortion | < 5% 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  |

## Available voltages

| 60 Hz Three phase line-neutral/line-line |              |              |              | 50 Hz Three phase line-neutral/line-line |             |              |           |
|--|--------------|--------------|--------------|--|-------------|--------------|-----------|
| • 240/416                                | • 254/440    | • 277/480    | • 347/600    | • 220/380                                | • 230/400   | • 240/415    | • 254/440 |
| • 2400/4160                              | • 7200/12470 | • 7620/13200 | • 7970/13800 | • 1905/3300                              | • 3810/6600 | • 6350/11000 |           |

**Note:** Some voltages may not be available on all models - consult factory for availability.

## Generator set options and accessories

### Engine

- NO<sub>x</sub> 350 mg/Nm<sup>3</sup> (0.9 g/hp-hr)
- NO<sub>x</sub> 500 mg/Nm<sup>3</sup> (1.2 g/hp-hr)
- Natural gas fuel methane index as low as 61 for some models
- High temperature cooling circuit outlet up to 95 °C (203 °F)

### Alternator

- 80 °C (176 °F) temperature rise
- 105 °C (221 °F) temperature rise

### Generator set

- CE Certification

### Control panel

- Remote operator panel with HMI320
- Remote operator panel with HMI420

### Accessories

- Exhaust silencers
- Gas train
- Radiators
- Bladder expansion tank
- Heat exchanger
- Exhaust heat recovery

**Note:** Some options may not be available on all models - consult factory for availability.

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## PowerCommand® 3.3 control system



**PowerCommand control** system is a microprocessor-based genset monitoring, metering and control system designed to meet the demands of today's engine driven gensets. The integration of all control functions into a single control system provides enhanced reliability and performance, compared to conventional genset control systems. These control systems have been designed and tested to meet the harsh environment in which gensets are typically applied. Major features include:

- AmpSentry™ protection providing a full range of alternator protection functions matched to the alternator provided.
- Extended Paralleling (Peak Shave/Base Load) regulates the genset real and reactive power output while paralleled to the utility. Power can be regulated at either the genset or utility bus monitoring point.
- Digital frequency synchronization and voltage matching.
- Isochronous Load Share
- Droop KW and KVAR Control
- Real time clock for fault and event time stamping.
- Real time clock for start/stop to initiate a test with or without load, or a Base Load or Peak Shave session.
- Digital voltage regulation. Three phase full wave FET type regulator.
- Genset/Engine monitoring and protection.
- Utility/AC Bus metering and protection
- Modbus® interface for interconnecting to customer equipment.

### Operator/display panel

- Auto/Manual/Run/Stop mode selectors
- Alpha-numeric display with pushbutton access for viewing engine and alternator data and providing setup, controls and adjustment
- Circuit breaker position indication and manual control
- 320 x 240 pixels graphic LED backlight LCD.
- Multiple language support

### Engine Protection

- Engine vitals - oil temperature and pressure, coolant temperature and levels
- Derate
- Configurable alarm and status inputs
- Emergency stop
- Low and high battery voltage warning
- Weak battery warning

- Dead battery shutdown
- Fail to start (overcrank) shutdown
- Fail to crank shutdown
- Cranking lockout

### Engine Data

- Oil temperature and pressure
- Coolant temperature and pressure, HT and LT
- Intake manifold pressure and temperature
- Exhaust temperature and pressure
- Engine electronics temperature and DC voltage
- Gas inlet and downstream pressures, mass flow rate, and control valve position
- Spark advance and knock level/count, per cylinder
- Lube oil status, priming status
- Oil and engine heater status
- Start system status
- Compressor and compressor bypass status
- Auxiliary power supply status

### AmpSentry™ alternator protection

- Overcurrent and short circuit shutdown
- Single and three phase fault current regulation
- Over and under voltage shutdown
- Over and under frequency shutdown
- Overload warning and load shed alarm output
- Reverse power and Var shutdown
- Excitation fault

### Alternator data

- AC voltage, line-to-line and line-to-neutral
- Three phase AC current
- Frequency
- Total and individual phase power factor, kW and KVA
- Alternator heater status
- Winding and bearing temperatures

### Other data

- Genset hardware data
- Data logs – operational data
- Fault history – up to 32 events
- Start attempts, starts, running hours, kW hours
- Engine data – operational data, monitored status functions, auxiliary system inputs, etc.
- Service adjustments - operational, customer configurable set up, calibration, etc.

### Paralleling data, functions and protection

- Genset and Utility/AC Bus Source AC Metering
- First Start Sensor™ System
- Active Digital phase lock loop synchronizer
- Sync check
- Isochronous kW and kVAR load share controls
- kW import/export and kVAR/PF control for extended utility (mains) paralleling
- Multiple Genset Load Demand control
- Power Transfer Control
- Breaker Control and status monitoring/warning
- Inputs for remote kW and kVAR control

For further detail on PowerCommand™ 3.3 see document S-1570

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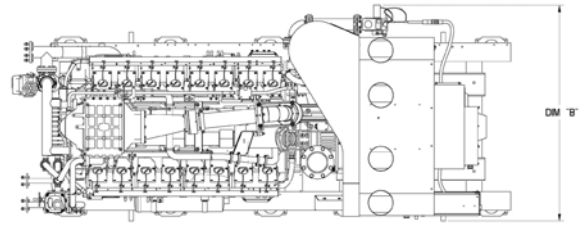
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## Base load (continuous) definitions

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 ISO 8528, ISO 3046, AS2789, DIN 6271, and BS 5514). This rating is not applicable to all generator set models.



## Generator set data sheets

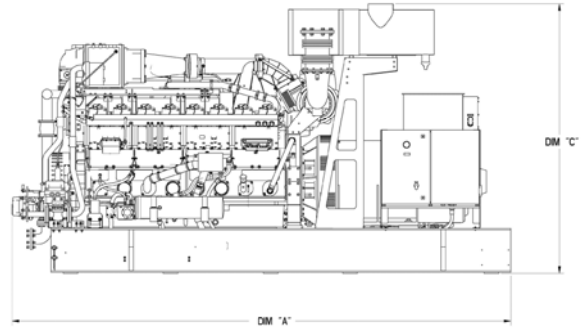
### 60 Hz

| Model     | Data sheet | MN* | Emissions g/hp-hr | LT (°C) | HT (°C) |
|-----------|------------|-----|-------------------|---------|---------|
| C1400 N6C | D-3246     | 75  | 0.7               | 50      | 90      |
| C1400 N6C | D-3247     | 78  | 1.0               | 50      | 90      |

### 50 Hz

| Model     | Data sheet | MN* | Emissions mg/Nm <sup>3</sup> | LT (°C) | HT (°C) |
|-----------|------------|-----|------------------------------|---------|---------|
| C1160 N5C | D-3239     | 69  | 500                          | 50      | 90      |
| C1160 N5C | D-3240     | 78  | 500                          | 50      | 95      |
| C1160 N5C | D-3241     | 67  | 350                          | 40      | 95      |
| C1160 N5C | D-3242     | 73  | 500                          | 50      | 95      |
| C1160 N5C | D-3243     | 61  | 500                          | 40      | 90      |
| C1160 N5C | D-3244     | 83  | 500                          | 50      | 95      |
| C1160 N5C | D-3245     | 75  | 350                          | 50      | 95      |

\* MN = Methane



This outline drawing is to provide representative configuration details for Model series only.

See respective model data sheet for specific model outline drawing number.

***Do not use for installation design***

## Dimensions and weights

| Model            | Dim "A"<br>mm (in) | Dim "B"<br>mm (in) | Dim "C"<br>mm (in) | Weight* wet<br>kg (lbs) |
|------------------|--------------------|--------------------|--------------------|-------------------------|
| <b>C995 N5C</b>  | 5756 (226.6)       | 2130 (83.9)        | 2480 (97.6)        | 12877 (28388)           |
| <b>C1160 N5C</b> | 5756 (226.6)       | 2130 (83.9)        | 2480 (97.6)        | 12877 (28388)           |
| <b>C1400 N6C</b> | 5756 (226.6)       | 2130 (83.9)        | 2480 (97.6)        | 12877 (28388)           |

\* Weights represent a set with standard features. See outline drawings for weights of other configurations.

**Warning:** Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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