# Engine Performance Data

**Cummins Inc**

Columbus, Indiana 47202-3005
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Power Generation

## QSK38-G4 Tier II

| Configuration | CPL Code | Revision |
|---|---|---|
| **D233042GX03** | **3265** | **27-Jun-2008** |

**FR 6697**

Compression Ratio: **15:1**
Fuel System: **Cummins MCRS**
Emission Certification: **U.S. EPA Tier 2, CARB Tier 2**

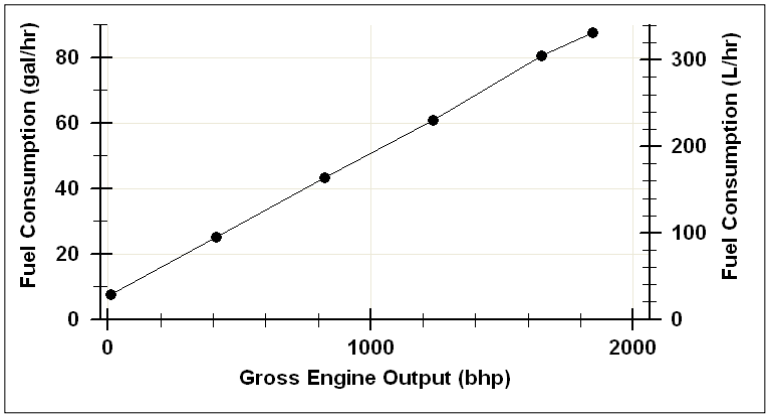
Displacement: **2,313 in3 (37.9 L)**
Aspiration: **Turbocharged and Aftercooled**

## Engine Ratings:

| Engine Speed | Standby Power | | Prime Power | | Continuous Power | |
|---|---|---|---|---|---|---|
| **RPM** | **bhp** | **kWm** | **bhp** | **kWm** | **bhp** | **kWm** |
| 1,800 | 1,845 | 1,376 | 1,650 | 1,230 | 1,400 | 1,044 |

## Engine Fuel Consumption @1,800 RPM

| Output Power | | | Fuel Consumption | | | |
|---|---|---|---|---|---|---|
| **%** | **bhp** | **kWm** | **lb/ bhp-h** | **kg/ kWm-h** | **gal/hr** | **l/hr** |
| **Standby Power** | | | | | | |
| 100 | 1,845 | 1,376 | 0.337 | 0.205 | 87.7 | 332 |
| **Prime Power** | | | | | | |
| 100 | 1,650 | 1,230 | 0.346 | 0.21 | 80.5 | 305 |
| 75 | 1,238 | 923 | 0.349 | 0.212 | 60.8 | 230 |
| 50 | 825 | 615 | 0.372 | 0.226 | 43.3 | 164 |
| 25 | 413 | 308 | 0.422 | 0.257 | 25.1 | 95 |
| **Continuous Power** | | | | | | |
| 100 | 1,400 | 1,044 | 0.334 | 0.203 | 67.8 | 257 |




Rating Type:

Data Subject to Change Without Notice

These guidelines have been formulated to ensure proper application of generator drive engines in A.C. generator set installations. **STANDBY POWER RATING:** Applicable for supplying emergency power for the duration of the utility power outage. No overload capability is available for this rating. Under no condition is an engine allowed to operate in parallel with the public utility at the Standby Power rating. This rating should be applied where reliable utility power is available. A Standby rated engine should be sized for a maximum of an 80% average load factor and 200 hours of operation per year. This includes less than 25 hours per year at the Standby Power rating. Standby ratings should never be applied except in true emergency power outages. Negotiated power outages contracted with a utility company are not considered an emergency. **PRIME POWER RATING:** Applicable for supplying electric power in lieu of commercially purchased power. Prime Power applications must be in the form of one of the following two categories: **UNLIMITED TIME RUNNING PRIME POWER:** Prime Power is available for an unlimited number of hours per year in a variable load application.Variable load should not exceed a 70% average of the Prime Power rating during any operating period of 250 hours. The total operating time at 100% Prime Power shall not exceed 500 hours per year. A 10% overload capability is available for a period of 1 hour within a 12-hour period of operation. Total operating time at the 10% overload power shall not exceed 25 hours per year. **LIMITED TIME RUNNING PRIME POWER:** Limited Time Prime Power is available for a limited number of hours in a non-variable load application. It is intended for use in situations where power outages are contracted, such as in utility power curtailment. Engines may be operated in parallel to the public utility up to 750 hours per year at power levels never to exceed the Prime Power rating. The customer should be aware, however, that the life of any engine will be reduced by this constant high load operation. Any operation exceeding 750 hours per year at the Prime Power rating should use the Continuous Power rating.
**CONTINUOUS POWER RATING:** Applicable for supplying utility power at a constant 100% load for an unlimited number of hours per year. No overload capability is available for this rating.

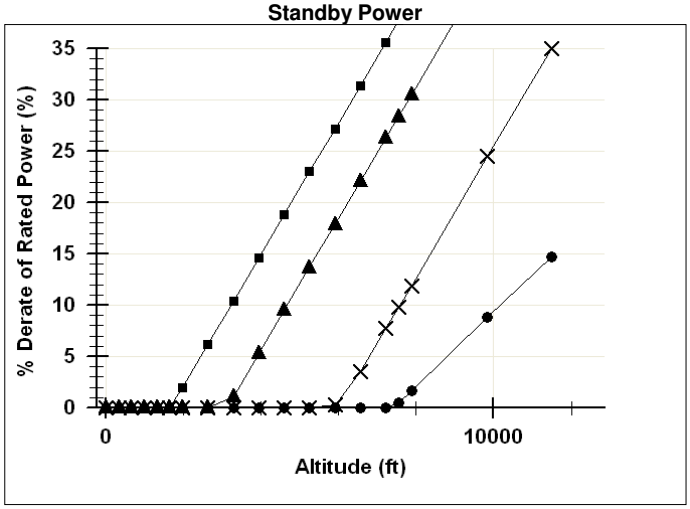
Reference AEB 10.47 for determining Electrical Output.
Data shown above represent gross engine performance capabilities obtained and corrected in accordance with ISO-3046 conditions of 100 kPa (29.53 in Hg) barometric pressure [110 m (361 ft) altitude], 25 °C (77 °F) air inlet temperature, and relative humidity of 30% with No. 2 diesel or a fuel corresponding to ASTM D2. Derates shown are based on 15 in H20 air intake restriction and 2 in Hg exhaust back pressure.

The fuel consumption data is based on No. 2 diesel fuel weight at 0.85 kg/litre (7.1 lbs/U.S. gal). Power output curves are based on the engine operating with fuel system, water pump and lubricating oil pump; not included are battery charging alternator, fan, optional equipment and driven components.

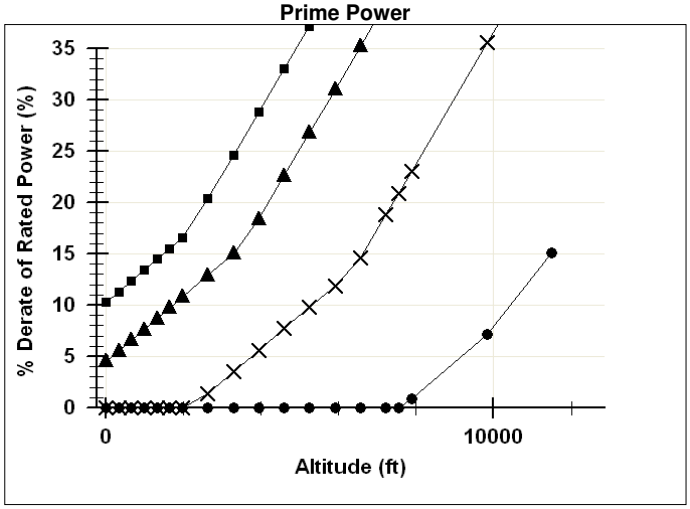
Data Status:Final

Data Tolerance: +/- 5 %
**CHIEF ENGINEER: Cary J Marston**

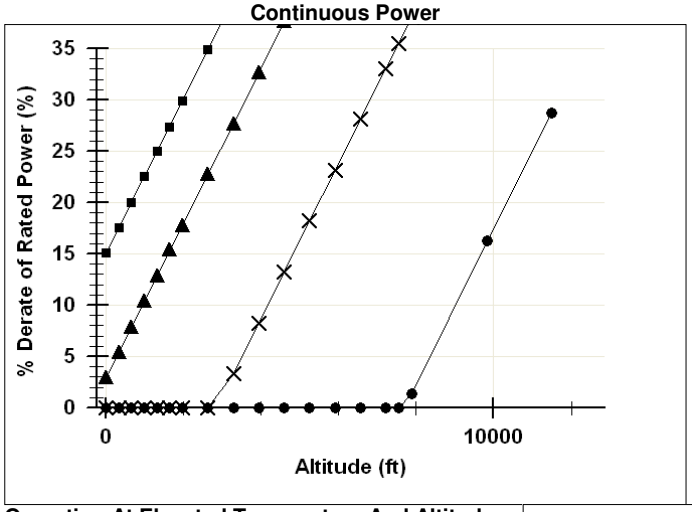
**1,800 RPM Power Derate Curves**
**Standby Power**



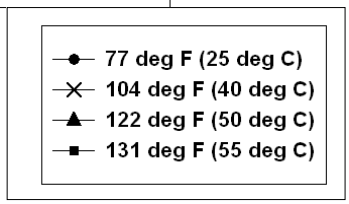

**Prime Power**




**Continuous Power**




**Operation At Elevated Temperature And Altitude:**



## General Engine Data

| | | | | |
|---|---|---|---|---|
| Type | | | Four cycle; Vee; 12 Cylinder | |
| Aspiration | | | Turbocharged and Aftercooled | |
| Bore x Stroke | 6.26 x 6.26 | in | 159 x 159 | mm |
| Displacement | 2,313 | in3 | 37.9 | L |
| Compression Ratio | | | 15:1 | |
| Moment of Inertia of Rotating Components | | | | |
| with FW6077 Flywheel | 184 | in-lbf-sec**2 | 20.8 | kg-m**2 |
| Center of Gravity | | | | |
| from front face of block | 41.7 | in | | |
| above crankshaft centerline | 6.8 | in | 173 | mm |

## Engine Mounting

| | | | | |
|---|---|---|---|---|
| Maximum Bending Moment at Rear Face of Block | 4,500 | lb-ft | 6,101 | N-m |

## Exhaust System

| | | | | |
|---|---|---|---|---|
| Maximum back pressure at Standby Power | 2 | in-Hg | 7 | kPa |

## Air Induction System

| | | | | |
|---|---|---|---|---|
| Maximum Intake Air Restriction | | | | |
| with Dirty Filter Element | 25 | in H2O | 6 | kPa |
| with Normal Duty Air Cleaner and Clean Filter Element | 15 | in H2O | 4 | kPa |

## Cooling System

| | | | | |
|---|---|---|---|---|
| Coolant Capacity | | | | |
| Engine | 112 | quarts | 106 | L |
| Aftercoolers | 24 | quarts | 22.7 | L |
| Minimum pressure cap rating at sea level | 11 | psi | 76 | kPa |
| Maximum static head of coolant above crankshaft centerline | 60 | ft | 18.3 | m |
| **Jacket Water Circuit Requirements** | | | | |
| Maximum Coolant Friction Head External to Engine - 1,500/1,800 RPM | 10 / 10 | psi | 68.9 / 68.9 | kPa |
| Thermostat (Modulating) Range | 180 - 202 | deg F | 82 - 94 | deg C |
| **Aftercooler Circuit Requirements** | | | | |
| Maximum Coolant Friction Head External to Engine - 1,500/1,800 RPM | 10 / 10 | psi | 68.9 / 68.9 | kPa |
| Maximum coolant temperature into the aftercooler @ 25C (77F) ambient | 120 | deg F | 49 | deg C |
| Maximum coolant temperature into aftercooler @ Limiting Ambient conditions | 302 | deg F | 150 | deg C |
| Thermostat (Modulating) Range | 115 - 135 | deg F | 46 - 57 | deg C |

## Lubrication System

| | | | | |
|---|---|---|---|---|
| Oil Pressure | | | | |
| @ Minimum low idle | 20 | psi | 138 | kPa |
| @ Governed speed | 50 - 70 | psi | 344.7 - 482.6 | kPa |
| Maximum Oil Temperature | 248 | deg F | 120 | deg C |
| Oil Capacity with OP Oil Pan: Low-High | 37 - 44 | gal | 140.1 - 166.6 | L |
| Total System Capacity (with Combo Filter) | 45 | gal | 170.3 | L |

## Fuel System

| | | | | |
|---|---|---|---|---|
| Type Injection System | | | Cummins MCRS | |
| Maximum fuel supply restriction at fuel pump inlet | | | | |
| with clean fuel filter element(s) at maximum fuel flow | 5 | in-Hg | 16.9 | kPa |
| with dirty fuel filter element(s) at maximum fuel flow | 10 | in-Hg | 34 | kPa |
| Maximum fuel inlet temperature | 160 | deg F | 71 | deg C |
| Maximum supply fuel flow | 1,397 | lb/hr | 634 | kg/hr |
| Maximum return fuel flow | 705 | lb/hr | 320 | kg/hr |

## Electrical System

| | | |
|---|---|---|
| System voltage | 24 | V |
| Minimum Recommended Battery Capacity | | |
| cold soak at 10 deg C (50 deg F) and above | | |
| cold soak at 0 to 10 deg C (32 to 50 deg F) | 1,800 | CCA |
| cold soak at -18 to 0 deg C (0 to 32 deg F) | 1,800 | CCA |
| Maximum starting circuit resistance | 0.002 | Ohm |

## Cold start capability

Unaided Cold Start

| | | |
|---|---|---|
| Minimum cranking speed | | 150 RPM |
| Minimum ambient temperature for unaided cold start | 45 deg F | 7.2 deg C |

## Performance Data

All data is based on:

- Engine operating with fuel system, water pump, lubricating oil pump, air cleaner and exhaust silencer; not included are battery charging alternator, fan, and optional driven components.
- Engine operating with fuel corresponding to grade No. 2-D per ASTM D975.
- ISO 3046, Part 1, Standard Reference Conditions of:

| | | | |
|---|---|---|---|
| Barometric Pressure : | 100 kPa (29.53 in Hg) | Air Temperature: | 25 ℃ (77 ℉) |
| Altitude: | 110 m (361 ft) | Relative Humidity: | 30% |

| | | Standby Power | | Prime Power | |
|---|---|---|---|---|---|
| Governed Engine Speed | RPM | 1,800 | 1,500 | 1,800 | 1,500 |
| Engine Idle Speed | RPM | 700 - 900 | | 700 - 900 | |
| Gross Engine Power Output | hp (kW) | 1,845 (1,376) | | 1,650 (1,230) | |
| Brake Mean Effective Pressure | psi (kPa) | 351 (2,420) | | 314 (2,165) | |
| Piston Speed | ft/min (m/s) | | | | |
| Friction Horsepower | hp (kW) | | | | |
| Engine Jacket Water Flow at Stated Friction Head external to Engine | | | | | |
| - 2.5 psi Friction Head | gpm (L/min) | 336 (1,272) | | 336 (1,272) | |
| - Maximum Friction Head | gpm (L/min) | 284 (1,075) | | 284 (1,075) | |
| Engine Data | | | | | |
| Intake Air Flow | ft3/min (L/s) | 4,038 (1,906) | | 3,879 (1,831) | |
| Intake Manifold Pressure | in-Hg (kPa) | 86 (290) | | 80 (270) | |
| Exhaust Gas Temp - Dry Stack | deg F (deg C) | 886 (474) | | 873 (467) | |
| Exhaust Gas Flow | ft3/min (L/s) | 9,683 (4,570) | | 9,255 (4,368) | |
| Air to Fuel ratio | | 27.8:1 | | 29.1:1 | |
| Heat Rejection to Ambient | BTU/min (kW) | 7,590 (133) | | 6,975 (123) | |
| Heat Rejection to Jacket Coolant | BTU/min (kW) | 26,484 (466) | | 24,956 (439) | |
| Heat Rejection to Exhaust | BTU/min (kW) | 57,246 (1,007) | | 53,986 (949) | |
| Heat Rejection to Fuel* | BTU/min (kW) | | | | |
| 2P2L | | | | | |
| Heat Rejection to Aftercooler Coolant | BTU/min (kW) | 20,190 (355) | | 18,428 (324) | |
| Aftercooler Water Flow at Stated Friction Head external to Engine | | | | | |
| - 2.5 psi Friction Head | gpm (L/min) | 168 (636) | | 168 (636) | |
| - Maximum Friction Head | gpm (L/min) | 150 (568) | | 150 (568) | |
| Aftercooler Air Flow | ft3/min (L/s) | 4,038 (1,906) | | 3,879 (1,831) | |

*This is the maxiumum heat rejection, not specified to the load listed.

**End of Report**