



Engine Performance Data

Cummins Inc

Columbus, Indiana 47202-3005

http://www.cummins.com

Power Generation

QSL9-G4 NR3

FR92858

Configuration
D563007GX03

CPL Code
2701

Revision
22-Apr-2009

Compression Ratio: **17.8:1**
Fuel System: **Bosch HPCR**
Emission Certification: **U.S. EPA Tier 3, CARB Tier 3, EU Stage IIIA**

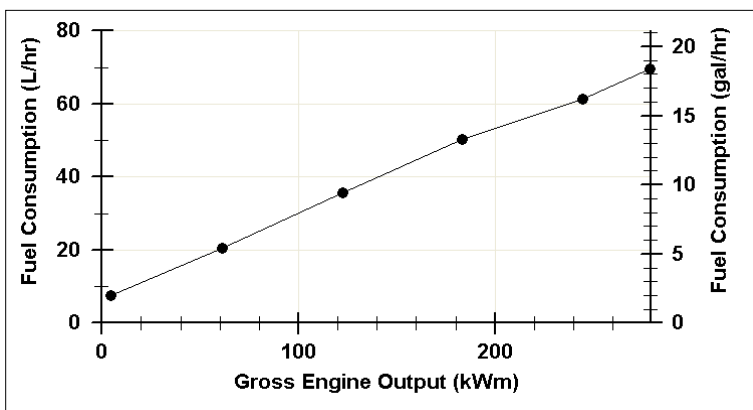
Displacement: **543 in3 (8.9 L)**
Aspiration: **Turbocharged and Charge Air Cooled**

Engine Ratings:

Engine Speed	Standby Power		Prime Power		Continuous Power	
RPM	bhp	kWm	bhp	kWm	bhp	kWm
1,500	374	279	328	245	296	221
1,800	430	321	378	282	342	255

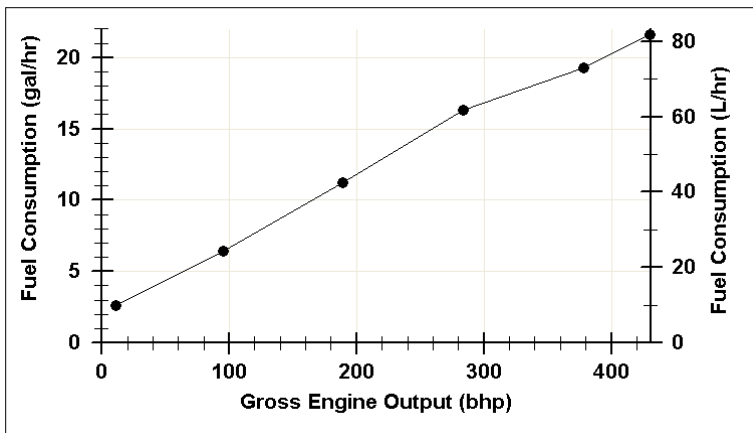
Engine Fuel Consumption @1,500 RPM

Output Power			Fuel Consumption			
%	bhp	kWm	lb/ bhp-h	kg/ kWm-h	gal/hr	l/hr
Standby Power						
100	374	279	0.349	0.212	18.4	70
Prime Power						
100	328	245	0.351	0.214	16.2	61
75	246	183	0.385	0.234	13.3	50
50	164	122	0.406	0.247	9.4	36
25	82	61	0.470	0.286	5.4	20
Continuous Power						
100	296	221	0.366	0.223	15.3	58



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	430	321	0.356	0.217	21.6	82
Prime Power						
100	378	282	0.362	0.220	19.3	73
75	284	212	0.408	0.248	16.3	62
50	189	141	0.423	0.257	11.2	42
25	95	71	0.478	0.291	6.4	24
Continuous Power						
100	342	255	0.373	0.227	18	68



Rating Type:

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 H2O air intake restriction and 2.5 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.

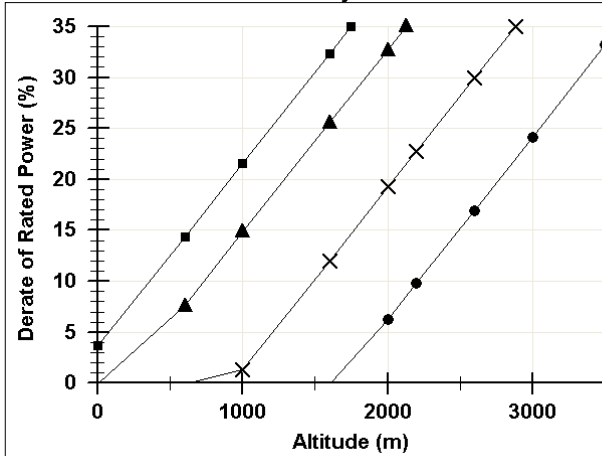
Data Subject to Change Without Notice

Data Status: Beta- (Measured data)

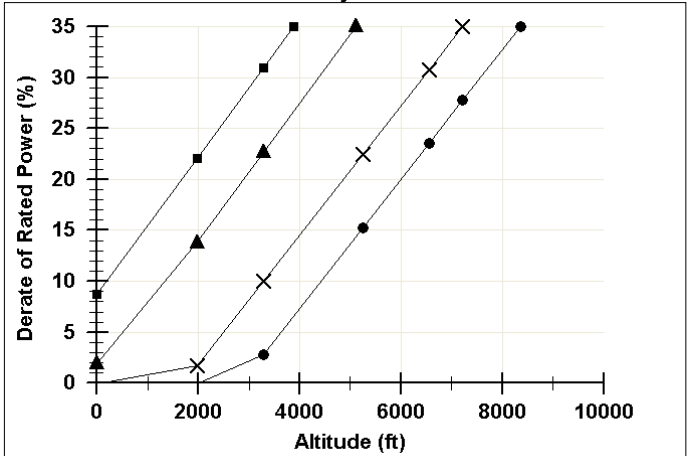
Data Tolerance: +/- 5 %

CHIEF ENGINEER: Cary J Marston

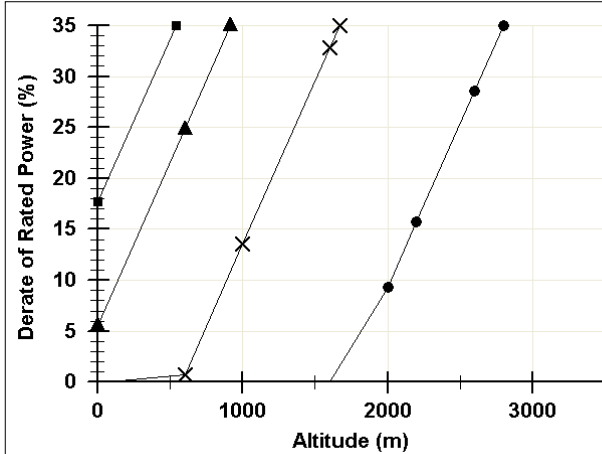
**1,500 RPM Power Derate Curves
Standby Power**



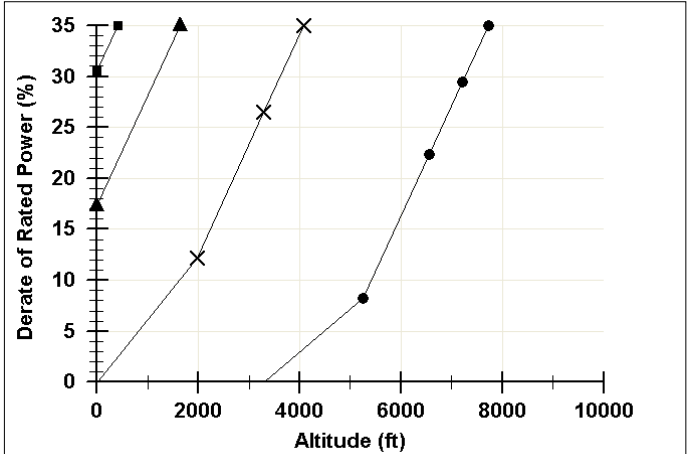
**1,800 RPM Power Derate Curves
Standby Power**



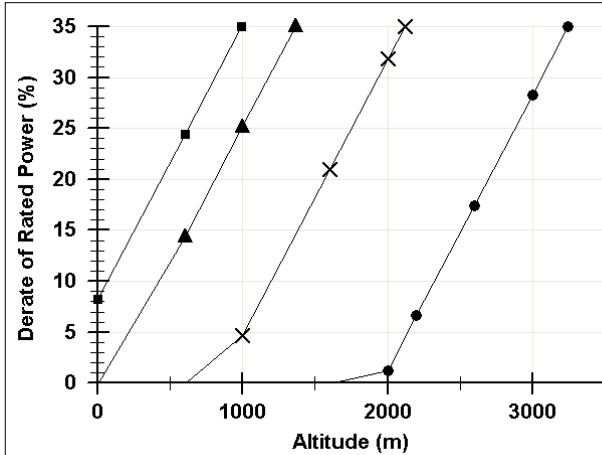
Prime Power



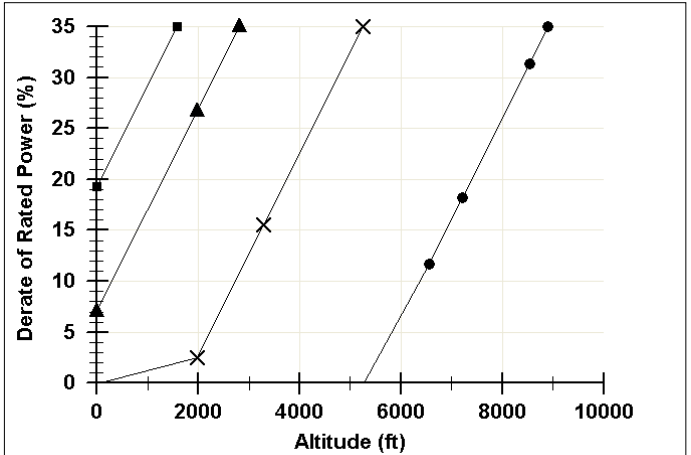
Prime Power



Continuous Power



Continuous Power



Operation at Elevated Temperature and Altitude:

For standby operation above these conditions, derate by an additional 5 % per 984 ft (300 m), and 14 % per 18 delta deg F (10 delta deg C)
For prime operation above these conditions, derate by an additional 10 % per 984 ft (300 m), and 24 % per 18 delta deg F (10 delta deg C)
For continuous operation above these conditions, derate by an additional 11 % per 984 ft (300 m), and 26 % per 18 delta deg F (10 delta deg C)

- 77 deg F (25 deg C)
- × 104 deg F (40 deg C)
- ▲ 122 deg F (50 deg C)
- 131 deg F (55 deg C)

Operation at Elevated Temperature and Altitude:

For standby operation above these conditions, derate by an additional 7 % per 984 ft (300 m), and 17 % per 18 delta deg F (10 delta deg C)
For prime operation above these conditions, derate by an additional 8 % per 984 ft (300 m), and 20 % per 18 delta deg F (10 delta deg C)
For continuous above these conditions, derate by an additional 10 % per 984 ft (300 m), and 24 % per 18 delta deg F (10 delta deg C)

General Engine Data

Installation Diagram Number	4953839	
Type	Four cycle; Inline; 6 Cylinder	
Aspiration	Turbocharged and Charge Air Cooled	
Bore x Stroke	4.49 x 5.69 in	114 x 145 mm
Displacement	543 in3	8.9 L
Compression Ratio	17.8:1	
Approximate engine weight (dry)	1,575 lbm	714 kg
Approximate engine weight (wet)	1,627 lbm	738 kg
Moment of Inertia of Rotating Components		
with FW 9878 Flywheel	16 in-lbf-sec**2	1.8 kg-m**2
with FW 9525 Flywheel	22 in-lbf-sec**2	2.5 kg-m**2
Center of Gravity		
from rear face of block	16.89 in	429 mm
above crankshaft centerline	8.35 in	212 mm
Maximum Static Loading at Rear Main Bearing	100 lbm	45 kg

Engine Mounting

Maximum Bending Moment at Rear Face of Block	1,000 lb-ft	1,356 N-m
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Exhaust System

Maximum back pressure at Standby Power	3 in-Hg	10 kPa
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Air Induction System

Maximum Intake Air Restriction		
with Dirty Filter Element	25 in H2O	6.2 kPa
with Normal Duty Air Cleaner and Clean Filter Element	15 in H2O	3.7 kPa

Cooling System

Coolant Capacity		
Engine	11.6 quarts	11 L
Minimum pressure cap rating at sea level	15 psi	103 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	4 / 5 psi	27.6 / 34.5 kPa
Maximum Coolant Temperature (Max Top Tank Temp) for standby/prime power	230 / 219 deg F	110 / 104 deg C
Thermostat (Modulating) Range	180 - 199 deg F	82 - 93 deg C

Charge Air Cooler Requirements

Maximum Intake Manifold Temperature Differential (Ambient to IMT) (IMTD) - 1,500/1,800 RPM	45 / 45 delta deg F	25 / 25 delta deg C
Maximum allowable pressure drop across charge air cooler and OEM CAC piping (IMPD) - 1,500/1,800 RPM	2.5 / 4 in-Hg	8 / 14 kPa
Maximum Intake Manifold Temperature for Engine Protection	200 deg F	93 deg C

Lubrication System

Oil Pressure		
@ Minimum low idle	30 psi	207 kPa
@ Governed speed	48 - 72 psi	330.9 - 496.4 kPa
Maximum Oil Temperature	250 deg F	121 deg C
Oil Capacity with OP 9451 Oil Pan: Low-High	5.3 - 6.3 gal	20.1 - 23.8 L
Total System Capacity (with Combo Filter)	7 gal	26.5 L

Fuel System

Type Injection System	Bosch HPCR	
Maximum fuel supply restriction at fuel pump inlet		
with clean fuel filter element(s) at maximum fuel flow	6 in-Hg	20.3 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	35.1 gal/hr	133 L/hr
Maximum return fuel flow	14.4 gal/hr	55 L/hr

Electrical System

System voltage	24 V	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)		
cold soak at -18 to 0 deg C (0 to 32 deg F)	1,500 CCA	750 CCA
Maximum starting circuit resistance	0.001 Ohm	0.002 Ohm

Cold start capability

Unaided Cold Start		
Minimum cranking speed		150 RPM
Minimum ambient temperature for unaided cold start	10 deg F	-12.2 deg C
Breakaway torque at minimum unaided cold start temperature:	162 lb-ft	220 N-m
Aided Cold Start		
Cold starting aids available		Intake Manifold Heater
Min Amb Temp for NFPA 110 Cold Start (90 deg F min coolant temp)	32 deg F	0 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 °C (77 °F)
Altitude:	110 m (361 ft)	Relative Humidity:	30%

Steady State Stability Band at any constant load (+/-)	0.25 %
Estimated Free Field Sound Pressure Level of a Typical Generator Set;	
Excludes Exhaust Noise; at Rated Load and 7.5 m (24.6 ft);	
1,500/1,800 RPM	0 / 118.8 dBA
Exhaust Noise at Rated 1 m Horizontally From Centerline of Exhaust Pipe Outlet	
Upwards at 45%; 1,500/1,800 RPM	0 / 119.5 dBA

		Standby Power		Prime Power	
		1,800	1,500	1,800	1,500
Governed Engine Speed	RPM				
Engine Idle Speed	RPM	700 - 900	700 - 900	700 - 900	700 - 900
Gross Engine Power Output	hp (kW)	430 (321)	374 (279)	378 (282)	328 (245)
Brake Mean Effective Pressure	psi (kPa)	350 (2,413)	366 (2,523)	308 (2,124)	321 (2,213)
Piston Speed	ft/min (m/s)	1,707 (8.7)	1,422 (7.2)	1,707 (8.7)	1,422 (7.2)
Friction Horsepower	hp (kW)	35 (26)	25 (19)	35 (26)	25 (19)
Engine Jacket Water Flow at Stated Friction Head external to Engine					
- 2.5 psi-2.5 psi Friction Head	gpm (L/min)	67 (254)	56 (212)	65 (246)	55 (208)
- Maximum Friction Head	gpm (L/min)	60 (227)	47 (178)	60 (227)	47 (178)
<u>Engine Data</u>					
Intake Air Flow	ft ³ /min (L/s)	865 (408)	720 (340)	865 (408)	687 (324)
Exhaust Gas Temp - Dry Stack	deg F (deg C)	1,014 (546)	996 (536)	952 (511)	939 (504)
Exhaust Gas Flow	ft ³ /min (L/s)	2,191 (1,034)	1,832 (865)	2,115 (998)	1,694 (799)
Air to Fuel ratio		23.9:1	23.2:1	26.7:1	25.1:1
Heat Rejection to Ambient	BTU/min (kW)	1,881 (33)	1,605 (28)	1,686 (30)	1,420 (25)
Heat Rejection to Jacket Coolant	BTU/min (kW)	7,198 (127)	6,243 (110)	6,341 (112)	5,531 (97)
Heat Rejection to Exhaust	BTU/min (kW)	15,080 (265)	12,655 (223)	13,648 (240)	11,207 (197)
Heat Rejection to Fuel*	BTU/min (kW)	50 (0.9)	29 (0.5)	30 (0.5)	32 (0.6)
<u>ATA CAC</u>					
Heat Rejection to Aftercooler	BTU/min (kW)	4,596 (81)	3,730 (66)	4,377 (77)	3,375 (59)
Charge Air Flow	lb/min (kg/min)	61 (28)	51 (23)	61 (28)	48 (22)
Turbocharger Compressor Outlet	in-Hg (kPa)	81 (275)	79 (266)	78 (262)	72 (244)
Turbocharger Compressor Outlet	deg F (deg C)	428 (220)	422 (217)	410 (210)	398 (203)

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

End of Report