Engine Performance Data

Cummins Inc

Columbus, Indiana 47202-3005
http://www.cummins.com

Power Generation

QSK38-G5

FR 6699

Configuration	CPL Code	Revision
D233042GX03	**3267**	**29-May-2009**

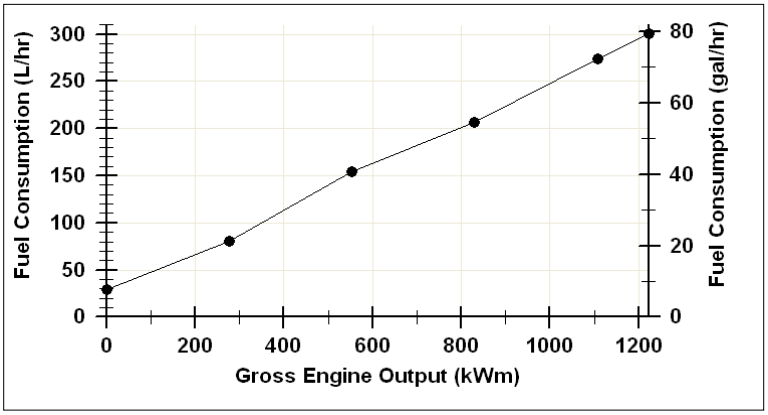
Compression Ratio: **15:1**
Fuel System: **Cummins MCRS**
Emission Certification: **U.S. EPA Tier 2, CARB Tier 2 (without Centinel)**
Displacement: **2,301 in3 (37.7 L)**
Aspiration: **Turbocharged and Aftercooled**

Engine Ratings:

Engine Speed	Standby Power		Prime Power		Continuous Power	
RPM	**bhp**	**kWm**	**bhp**	**kWm**	**bhp**	**kWm**
1,500	1,641	1,224	1,484	1,107	1,250	932
1,800	1,715	1,279	1,425	1,063	1,195	891

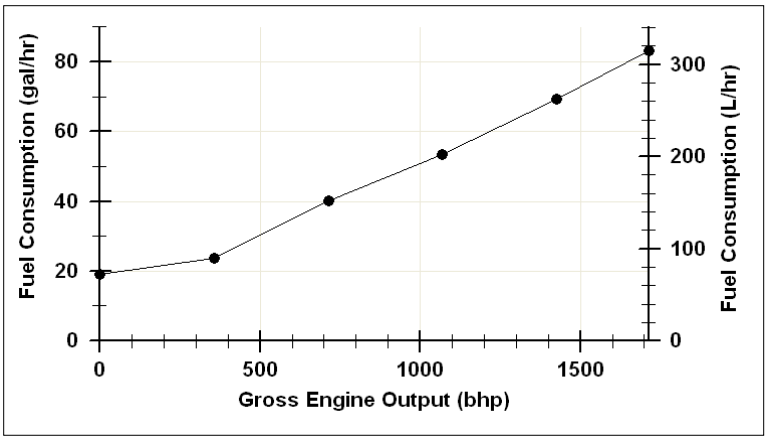
Engine Fuel Consumption @1,500 RPM

Output Power			Fuel Consumption			
%	**bhp**	**kWm**	**lb/ bhp-h**	**kg/ kWm-h**	**gal/hr**	**l/hr**
Standby Power						
100	1,641	1,224	0.343	0.209	79.4	301
Prime Power						
100	1,484	1,107	0.347	0.211	72.5	274
75	1,113	830	0.348	0.212	54.5	206
50	742	553	0.391	0.238	40.8	154
25	371	277	0.407	0.248	21.3	81
Continuous Power						
100	1,250	932	0.345	0.210	60.8	230



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	1,715	1,279	0.345	0.210	83.3	315
Prime Power						
100	1,425	1,063	0.345	0.210	69.3	262
75	1,069	797	0.355	0.216	53.4	202
50	713	532	0.402	0.245	40.3	153
25	356	265	0.473	0.288	23.7	90
Continuous Power						
100	1,195	891	0.351	0.214	59	223



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-(Measured data)

Data Tolerance: +/- 5 %

CHIEF ENGINEER: Cary J Marston

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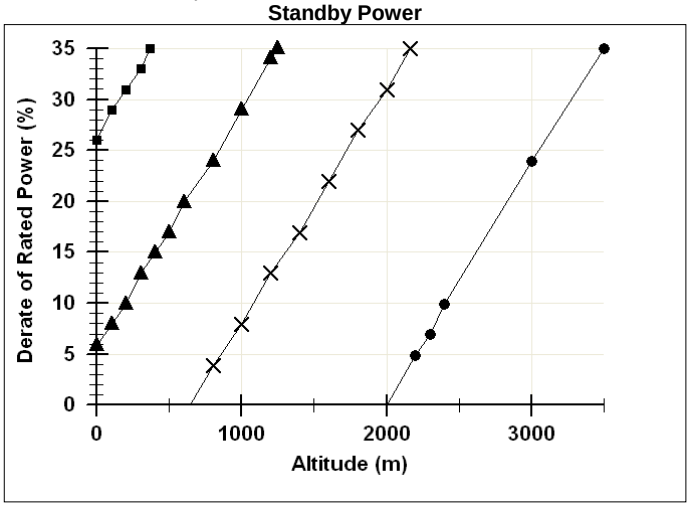
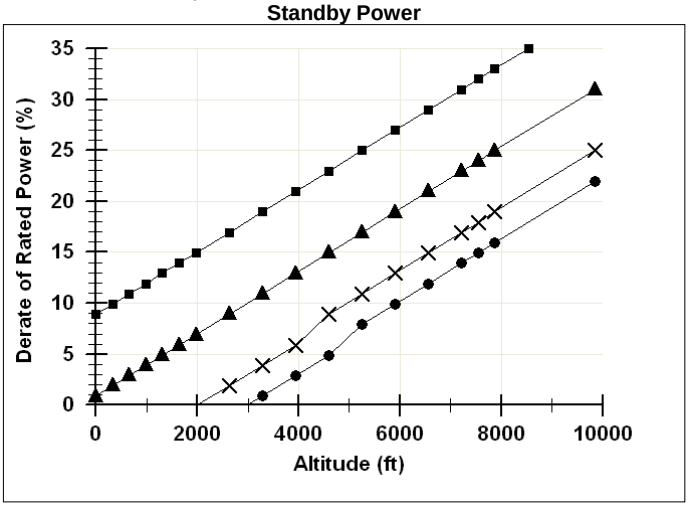
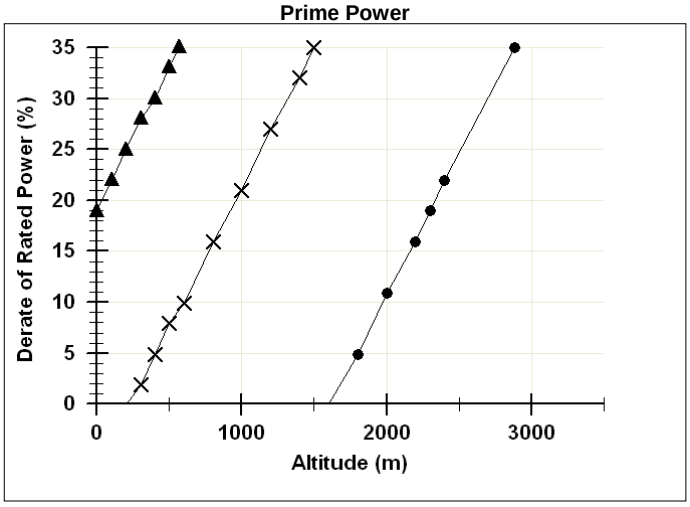
1,500 RPM Power Derate Curves
Standby Power



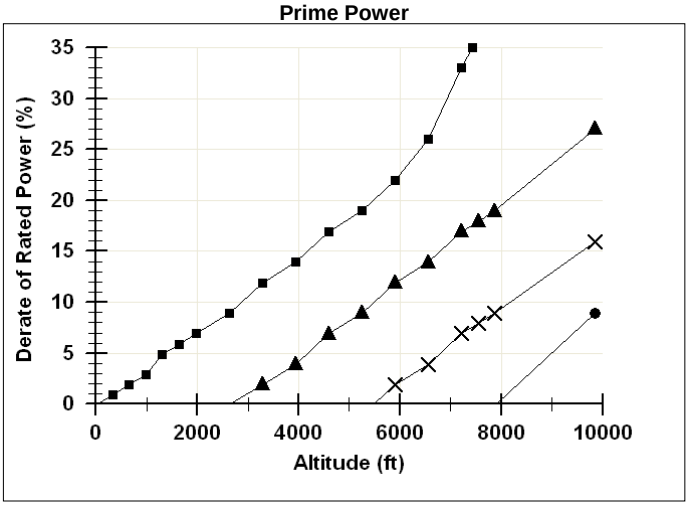
1,800 RPM Power Derate Curves
Standby Power



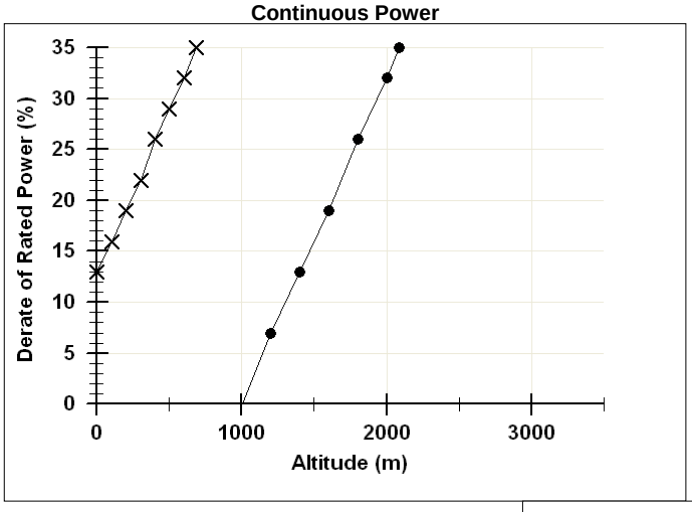
Prime Power



Prime Power



Continuous Power



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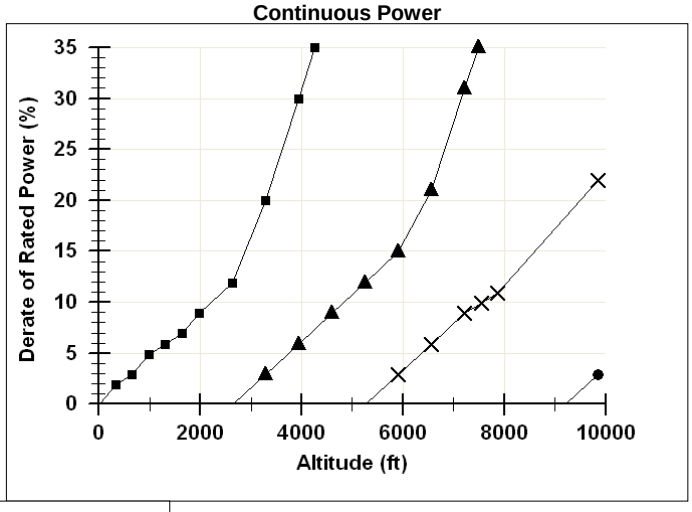

Operation at Elevated Temperature and Altitude:
For standby operation above these conditions, derate by an additional 7 % per 984 ft (300 m), and 21 % per 18 delta deg F (10 delta deg C)
For prime operation above these conditions, derate by an additional 8 % per 984 ft (300 m), and 25 % per 18 delta deg F (10 delta deg C)
For continuous operation above these conditions, derate by an additional 9 % per 984 ft (300 m), and 30 % 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)
- 140 deg F (60 deg C)

Operation at Elevated Temperature and Altitude:
For standby operation above these conditions, derate by an additional 3 % per 984 ft (300 m), and 8 % 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 13 % per 18 delta deg F (10 delta deg C)
For continuous above these conditions, derate by an additional 15 % per 984 ft (300 m), and 49 % per 18 delta deg F (10 delta deg C)

General Engine Data

Type			Four cycle; Vee; 12 Cylinder	
Aspiration			Turbocharged and Aftercooled	
Bore x Stroke	6.25 x 6.25	in	159 x 159	mm
Displacement	2,301	in3	37.7	L
Compression Ratio			15:1	
Approximate engine weight (wet)	9,039	lbm	4,100	kg
Moment of Inertia of Rotating Components				
with FW6074 Flywheel	93	in-lbf-sec**2	10.4	kg-m**2
with FW6077 Flywheel	184	in-lbf-sec**2	20.8	kg-m**2
Center of Gravity				
from rear face of block	31.54	in	801	mm
above crankshaft centerline	6.8	in	173	mm
Maximum Static Loading at Rear Main Bearing	2,000	lbm	907	kg

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	6.2	kPa
with Normal Duty Air Cleaner and Clean Filter Element	15	in H2O	3.7	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
Maximum Coolant Temperature (Max Top Tank Temp) for standby/prime power	220 / 212	deg F	104 / 100	deg C
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 for standby/prime power	170 / 160	deg F	77 / 71	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	185	gal/hr	700	L/hr
Maximum return fuel flow	99	gal/hr	375	L/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) 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 °C (77 °F)
Altitude:	110 m (361 ft)	Relative Humidity:	30%

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	99.6 / 102.2 dBa
Exhaust Noise at Rated 1 m Horizontally From Centerline of Exhaust Pipe Outlet Upwards at 45%; 1,500/1,800 RPM	96.9 / 95.6 dBa

		Standby Power		Prime Power	
Governed Engine Speed	RPM	1,800	1,500	1,800	1,500
Engine Idle Speed	RPM	700 - 900	700 - 900	700 - 900	700 - 900
Gross Engine Power Output	hp (kW)	1,716 (1,280)	1,641 (1,224)	1,425 (1,063)	1,484 (1,107)
Brake Mean Effective Pressure	psi (kPa)	327 (2,255)	375 (2,586)	272 (1,875)	339 (2,337)
Piston Speed	ft/min (m/s)	1,870 (9.5)	1,555 (7.9)	1,870 (9.5)	1,555 (7.9)
Friction Horsepower	hp (kW)	163 (122)	115 (86)	163 (122)	115 (86)
Engine Jacket Water Flow at Stated Friction Head external to Engine					
- 2.5 psi-2.5 psi Friction Head	gpm (L/min)	336 (1,272)	274 (1,037)	336 (1,272)	274 (1,037)
- Maximum Friction Head	gpm (L/min)	284 (1,075)	209 (791)	284 (1,075)	209 (791)
Engine Data					
Intake Air Flow	ft3/min (L/s)	4,321 (2,039)	3,380 (1,595)	3,894 (1,838)	3,229 (1,524)
Exhaust Gas Temp - Dry Stack	deg F (deg C)	748 (398)	907 (486)	708 (376)	901 (483)
Exhaust Gas Flow	ft3/min (L/s)	9,307 (4,392)	8,289 (3,912)	8,202 (3,871)	7,926 (3,741)
Air to Fuel ratio		31.6:1	26:1	33.9:1	27:1
Heat Rejection to Ambient	BTU/min (kW)	7,150 (126)	6,810 (120)	6,020 (106)	6,265 (110)
Heat Rejection to Jacket Coolant	BTU/min (kW)	25,783 (453)	25,381 (446)	21,804 (383)	23,893 (420)
Heat Rejection to Exhaust	BTU/min (kW)	48,545 (854)	50,119 (881)	42,445 (746)	46,851 (824)
Heat Rejection to Fuel*	BTU/min (kW)	414 (7.3)	379 (6.7)	414 (7.3)	379 (6.7)
2P2L					
Heat Rejection to Aftercooler Coolant	BTU/min (kW)	24,467 (430)	18,186 (320)	19,509 (343)	16,461 (289)
Aftercooler Water Flow at Stated Friction Head external to Engine					
- 2.5 psi-2.5 psi Friction Head	gpm (L/min)	168 (636)	137 (519)	168 (636)	137 (519)
- Maximum Friction Head	gpm (L/min)	150 (568)	116 (439)	150 (568)	116 (439)

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

End of Report