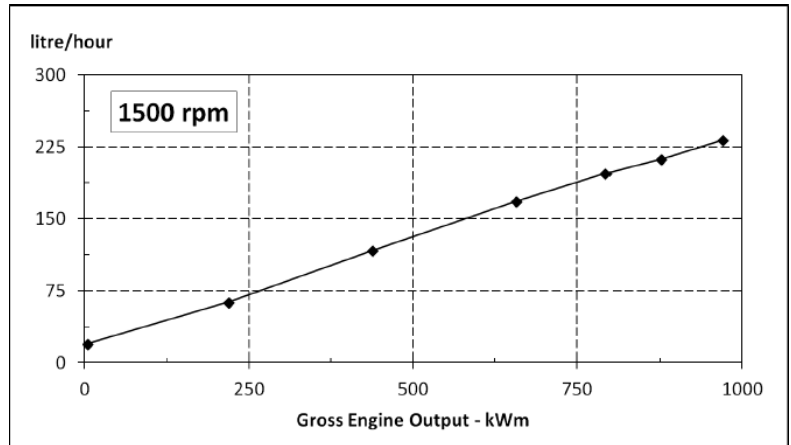
	<b>康明斯公司</b> 印第安纳哥伦布 47202-3005 <b>发动机性能数据单</b>	发动机型号: <b>QSK38-G1</b>	曲线号: <b>FR6786</b>	<b>G-驱</b> <b>QSK</b> <b>1</b>
		发动机关键零件清单: <b>CPL : 3570</b>	日期: <b>2014/10/15</b>	
压缩比: <b>15:1</b>		排量: <b>37.7 L (2301 in³)</b>		
燃油系统: <b>Cummins MCRS</b>		进气方式: <b>涡轮增压, 中冷</b>		
排放认证: <b>U.S. EPA Tier 2</b>				

发动机转速	备用功率		常用功率		持续功率	
rpm	bhp	kWm	bhp	kWm	bhp	kWm
<b>1500</b>	1300	970	1174	876	1061	792

## 发动机性能数据 @ 1500 rpm

输出功率			燃油消耗			
%	bhp	kWm	lb/ hp·h	kg/ kWm·h	US gal/ hour	litre/ hour
<b>备用功率</b>						
100	1300	970	0.335	0.204	61.3	232
<b>常用功率</b>						
100	1174	876	0.339	0.206	56.0	212
75	881	657	0.357	0.217	44.3	168
50	587	438	0.373	0.227	30.8	117
25	294	219	0.404	0.245	16.7	63
<b>持续功率</b>						
100	1061	792	0.348	0.212	52.1	197



单位换算: (litres = US Gal x 3.785) (US Gal = litres x 0.2642)

数据如有更改, 恕不另行通知

以下准则阐明了确保G驱动发动机应用于交流发电机组的正确使用规范。 **备用功率标定:** 适用于在市电停电期间提供应急电源。该标定无超负荷能力, 且该备用功率标定不能与市电并网运行。此标定的发动机应安装在有效电网覆盖区域内。备用功率标定的发动机按平均负荷率为 80% 来使用, 一年不超过200小时。在备用功率点使用时每年不超过25小时。备用功率标定的发动机只能在断电时作为应急电源使用。电网预先通知的断电不属于应急电源使用范畴。 **常用功率标定:** 是可以替代商业电网电力来使用的功率。常用功率必须按下列两种类型之一来使用: **无时限运行常用功率:** 按常用功率标定的发动机, 可有效地变负荷无时限使用。在每250小时的运行周期内, 可变负荷的均值不能超过所标定常用功率的70%。一年内, 100%常用功率的整个运行时间不超过500小时。在12小时运行周期内, 有1小时有效超负荷10%的能力。在一年内, 超负荷10%运行的整个时间不超过25小时。 **限时运行常用功率:** 限时常用功率在不变负荷应用中可以使用有限的小时数。它适用于预先通知的断电情况, 如电网限电。在功率决不会超过常用功率标定的前提下, 每年内可与市电并网运行750小时。但客户应该意识到, 长期高负荷运行将缩短发动机寿命。一年内并网运行超过750小时时, 请按持续功率标定运行。 **持续功率标定:** 可以恒定按100%标定负荷、无时限连续使用的功率。按此标定的发动机无超负荷能力。

如需发电输出数据, 请参见应用工程公告AEB 10.47。  
 上述代表发动机整体性能数据的获得和修正均是基于ISO-3046 标准规定的标准条件: 大气压力100 kPa (29.53 in Hg), 海拔 [110 m (361 ft)], 进气温度25 °C (77 °F), 相对湿度30%, 使用标准2#柴油或符合ASTM D2的柴油。  
 降功率数据是基于 10/15 in H<sub>2</sub>O 的进气阻力和 1.5/2.0 in Hg 的排气背压给定的 @ 1500/ 1800 RPM。  
 燃油消耗数据是基于比重为0.85kg/(7.1 lbs/US gal)的No.2柴油而得到的。功率输出曲线是基于发动机带燃油系统、水泵和机油泵试验时获得的, 而不包括交流发电机、风扇、其它选用设备和被驱动的部件。

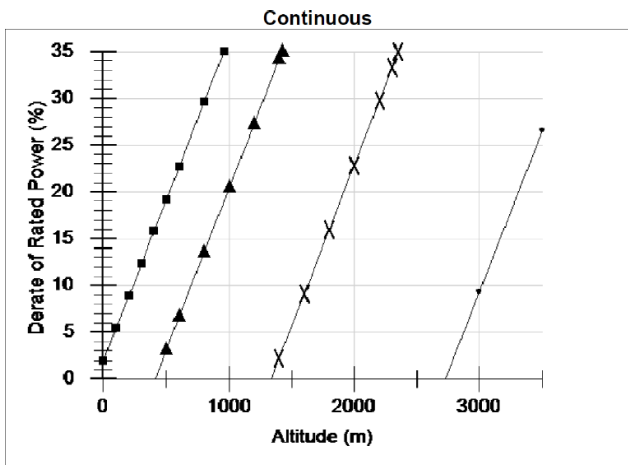
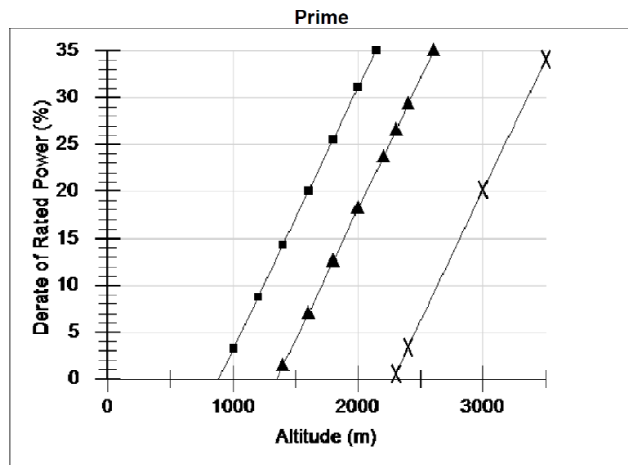
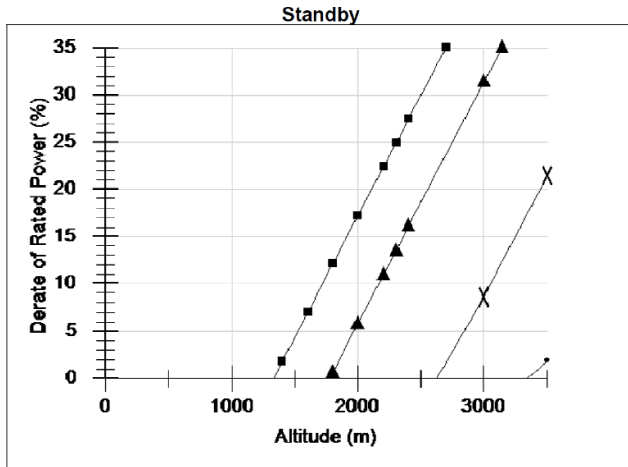
数据状态: **最终版本**

数据公差: ± 5%

总工程师:

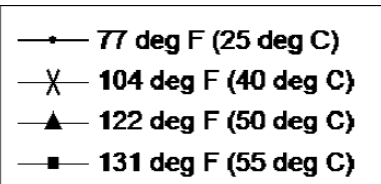


### 1500 rpm 降功率曲线



**在高海拔和高环境温度下的运行:**

对 **备用功率** 在超过上图的环境条件时, 海拔每升高300米 (1000英尺), 再降低功率8%, 大气温度每升高10°C(18°F), 再降低功率23%。  
 对 **常用功率** 在超过上图的环境条件时, 海拔每升高300米 (1000英尺), 再降低功率8%, 大气温度每升高10°C(18°F), 再降低功率26%。  
 对 **持续功率** 在超过上图的环境条件时, 海拔每升高300米 (1000英尺), 再降低功率10%, 大气温度每升高10°C(18°F), 再降低功率32%。



# 康明斯公司

## 发动机数据单

发动机型号: QSK38-G1

特征编号: D233042GX03

数据单: FR6786

日期: 2014/10/15

### 安装图

• 风扇飞轮: 4954124

### CPL号

• 发动机关键零件清单: 3570

## 整机数据

发动机型式 .....	四冲程; V型; 12 缸
进气方式 .....	涡轮增压, 低温中冷
缸径 x 行程 .....	6.25 x 6.25 (159 x 159)
排量 .....	2,301 (37.7)
压缩比 .....	15 : 1
干重 (大约) .....	8,433 (3,825)
湿重 (大约) .....	9,039 (4,100)
旋转部件的转动惯量	
• 带飞轮 FW 6074 .....	246.8 (10.4)
• 带飞轮 FW 6077 .....	493.6 (20.8)
质心至缸体后端面的距离 .....	31.5 (801)
质心在曲轴中心线上方 .....	6.8 (173)
后端轴承最大静载荷 .....	2,000 (907)

## 发动机悬置安装

缸体后端面允许的最大弯矩 .....	4,500 (6,101)
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## 排气系统

允许的最大排气背压@ 备用功率 .....	2 (7)
-----------------------	-------

## 进气系统

最大进气阻力	
• 脏滤芯 .....	25 (6.2)
• 带普通空气滤清器和干净滤芯 .....	15 (3.7)

## 冷却系统

### 水套水回路要求

冷却液容量 — 仅发动机 .....	28 (106)
海平面允许的最小压力盖压力 .....	11 (76)
冷却水的最大静压在发动机曲轴中心线上方 .....	60 (18.3)
顶部水箱允许的最高温度-备用/常用功率 .....	220 / 212 (104 / 100)
节温器温度调节范围 .....	180 - 202 (82 - 94)
发动机外部最大冷却水阻力 - 1500 RPM .....	10 (68.9)

### 中冷器回路要求

冷却液容量 — 中冷器 .....	6 (22.7)
发动机外部最大冷却水阻力 - 1500 RPM .....	10 (68.9)
进入中冷器的最高冷却液温度 @ 77 °F (25 °C) 的环境温度时 .....	120 (49)
进入中冷器的最高冷却液温度 @ 极限环境温度条件下, 备用/常用功率 .....	160 / 150 (71 / 66)
节温器温度调节范围 .....	115 - 135 (46 - 57)

## 润滑系统

机油压力 @ 最小低怠速时 .....	20 (138)
@ 控制转速时 .....	50 - 70 (344.7 - 482.6)
最高机油温度 .....	248 (120)
机油盘 OP 6125 容量: 低 - 高 .....	37 - 44 (140.1 - 166.6)
系统总容量 (包含复合滤清器) .....	45 (170.3)

## 燃油系统

	Cummins MCRS	
燃油系统型式.....		
燃油泵入口处允许的最大供油阻力 (干净/脏滤芯)..... — in Hg (kPa)	5 / 10	(16.9 / 34)
燃油器回油管路允许的最大阻力 (包含摩擦阻力和静压)..... — in Hg (kPa)	10	(34)
最高进油温度..... — °F (°C)	160	(71)
最大供油流量 - 1500 RPM..... — US gph (litre/hr)	159	(602)
最大回油流量 - 1500 RPM..... — US gph (litre/hr)	94	(356)

4

## 电气系统

系统电压..... — volt	24
最小推荐电池容量	
• 冷态 @ 10 °C (50 °F) 及以上..... — CCA	1,800
• 冷态 @ 0 °C 至 10 °C (32 °F 至 50 °F)..... — CCA	1,800
• 冷态 @ -18 °C 至 0 °C (0 °F 至 32 °F)..... — CCA	1,800
起动电路允许的最大电阻..... — ohm	0.002

## 冷起动能力

无辅助冷起动	
最低曲轴转速..... — RPM	150
无辅助冷起动的最低环境温度..... — °F (°C)	10 (-12.2)

## 性能数据

- 所有数据均基于:
- 发动机带燃油系统、水泵、机油泵、空滤器和消声器时试验获得的, 而不包括交流发电机空压机、风扇、其它选用设备和被驱动的部件。
  - 测试时使用符合ASTM D975标准的2#柴油
  - ISO 3046, 第1部分, 标准参考条件:  
大气压力: 100 kPa (29.53 in Hg)      进气温度: 25 °C (77 °F)  
海拔: 110 m (361 ft)                      相对湿度: 30%

任意恒载下的稳态稳定带..... — %	+/-	0.25
估计的典型发电机组自由场声压级		
不包含排气噪声; 在额定工况, 距离 7.5 m (24.6 ft)处; @ 1500 RPM..... — dBA		99.4
在排气管中心线水平面上距离1米处朝上45°方向的排气噪声 @ 1500 RPM..... — dBA		96.3

	备用功率		常用功率	
	60 hz	50 hz	60 hz	50 hz
发动机控制转速..... RPM	N/A	1,500	N/A	1,500
发动机怠速..... RPM	N/A	700 - 900	N/A	700 - 900
发动机输出总功率..... hp (kW)	N/A	1,300 (970)	N/A	1,174 (876)
平均有效压力..... psi (kpa)	N/A	298 (2,057)	N/A	269 (1,858)
活塞平均速度..... ft/min (m/s)	N/A	1,562 (7.9)	N/A	1,562 (7.9)
摩擦损失功率..... hp (kW)	N/A	115 (86)	N/A	115 (86)
在一定的发动机外部阻力的情况下, 发动机冷却水流量:				
• 在4 psi 流动阻力时..... gpm (L/s)	N/A	274 (17)	N/A	274 (17)
• 在最大外部流动阻力时..... gpm (L/s)	N/A	209 (13)	N/A	209 (13)
<b>发动机数据</b>				
进气流量..... cfm (L/s)	N/A	2,897 (1,368)	N/A	2,727 (1,288)
排气温度 - 干式排气管..... °F (°C)	N/A	860 (460)	N/A	853 (457)
排气流量..... cfm (L/s)	N/A	6,818 (3,218)	N/A	6,428 (3,034)
空燃比..... 空气: 燃料	N/A	28.5:1	N/A	29.4:1
散失到环境中的热量..... BTU/min (kW)	N/A	5,314 (94)	N/A	4,853 (86)
散失到水套冷却液中的热量..... BTU/min (kW)	N/A	21,335 (375)	N/A	19,716 (347)
散失到排气中的热量..... BTU/min (kW)	N/A	38,174 (671)	N/A	35,664 (627)
散失到 *燃油中的热量..... BTU/min (kW)	N/A	379 (7)	N/A	379 (7)
<b>2P / 2L</b>				
散失到中冷器冷却液中的热量..... BTU/min (kW)	N/A	12,486 (220)	N/A	10,917 (192)
在一定的发动机外部阻力的情况下, 中冷器冷却水流量:				
• 在2 psi 流动阻力时..... gpm (L/s)	N/A	137 (9)	N/A	137 (9)
• 在最大外部流动阻力时..... gpm (L/s)	N/A	116 (7)	N/A	116 (7)

\* 这是散失到燃油的最大热量。

发动机型号: QSK38-G1

数据单: FR6786

日期: 2014/10/15


N.A. - Not Available不可用

N/A - Not Applicable to this Engine不适用

TBD - To Be Determined待定

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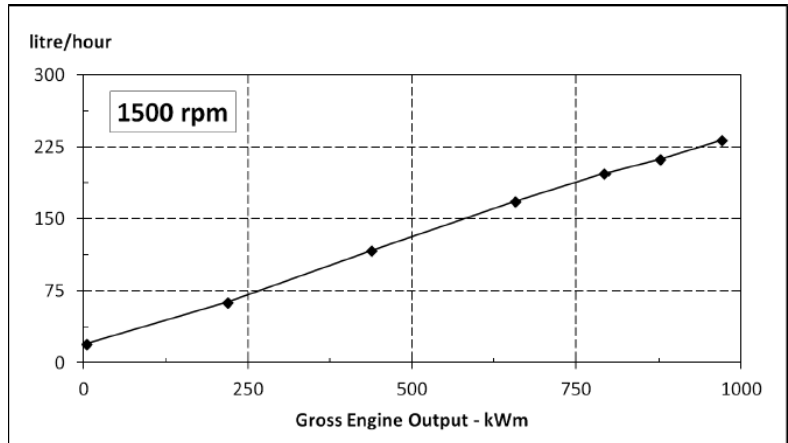
受控版本位于 gce.cummins.com

	<b>Cummins Inc.</b> Columbus, Indiana 47202-3005 <b>ENGINE PERFORMANCE DATASHEET</b>	Basic Engine Model: <b>QSK38-G1</b>	Curve Number: <b>FR6786</b>	<b>G-DRIVE</b> <b>QSK</b> <b>1</b>
		Engine Critical Parts List: <b>CPL : 3570</b>	Date: <b>15 OCT 14</b>	
Compression Ratio : <b>15:1</b>		Displacement : <b>37.7 L (2301 in³)</b>		
Fuel System : <b>Cummins MCRS</b>		Aspiration : <b>Turbocharged and Aftercooled</b>		
Emission Certification : <b>U.S. EPA Tier 2</b>				

Engine Speed	Standby Power		Prime Power		Continuous Power	
rpm	bhp	kWm	bhp	kWm	bhp	kWm
<b>1500</b>	1300	970	1174	876	1061	792


## Engine Performance Data @ 1500 rpm

OUTPUT POWER			FUEL CONSUMPTION			
%	bhp	kWm	lb/ hp-h	kg/ kWm-h	US gal/ hour	litre/ hour
<b>STANDBY POWER</b>						
100	1300	970	0.335	0.204	61.3	232
<b>PRIME POWER</b>						
100	1174	876	0.339	0.206	56.0	212
75	881	657	0.357	0.217	44.3	168
50	587	438	0.373	0.227	30.8	117
25	294	219	0.404	0.245	16.7	63
<b>CONTINUOUS POWER</b>						
100	1061	792	0.348	0.212	52.1	197

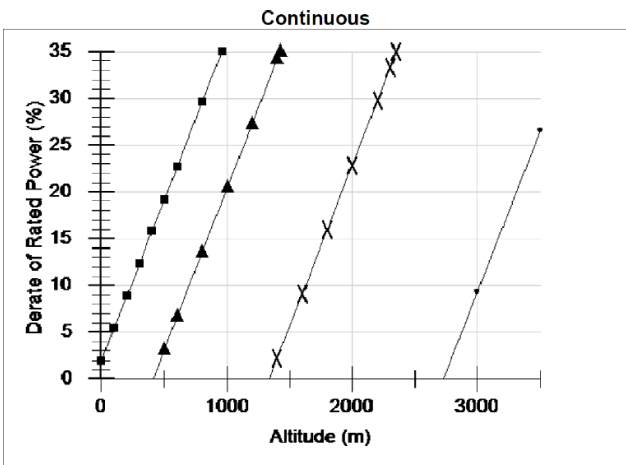
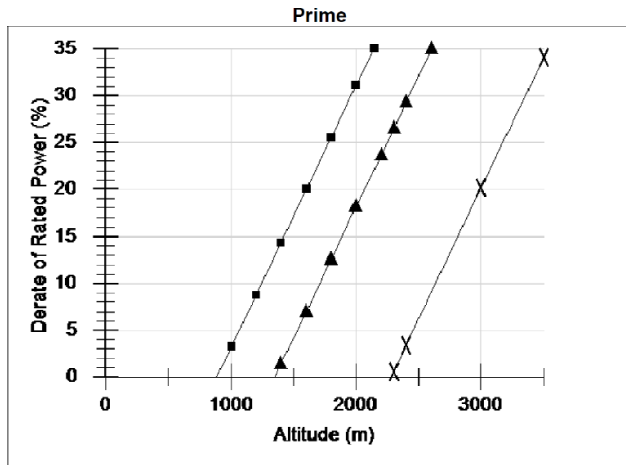
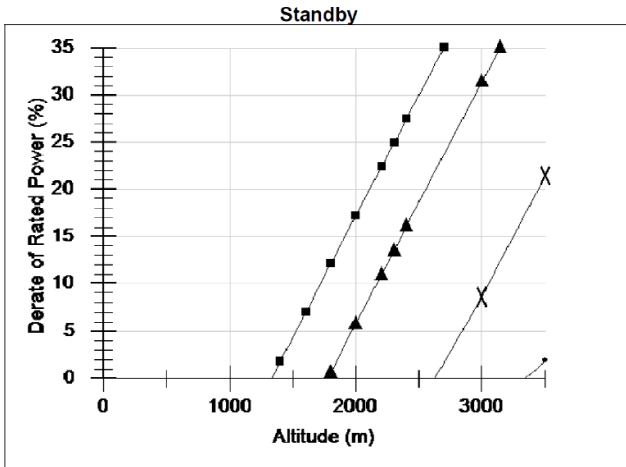


### CONVERSIONS:(litres = US Gal x 3.785) (US Gal = litres x 0.2642)

Data Subject to Change Without Notice

<p>These guidelines have been formulated to ensure proper application of generator drive engines in A.C. generator set installations. <b>STANDBY POWER RATING:</b> 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. <b>PRIME POWER RATING:</b> 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: <b>UNLIMITED TIME RUNNING PRIME POWER:</b> 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. <b>LIMITED TIME RUNNING PRIME POWER:</b> 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. <b>CONTINUOUS POWER RATING:</b> 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.</p>	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 10/15 in H <sub>2</sub> O air intake restriction and 1.5/2.0 in Hg exhaust back pressure @ 1500/1800 RPM.
	The fuel consumption data is based on No. 2 diesel fuel weight at 0.85 kg/litre (7.1 lbs/US 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.
	<b>Data Status: Final</b> <b>Data Tolerance: ± 5%</b> <b>Chief Engineer:</b> 

### 1500 rpm Derate Curves



**Operation at Elevated Temperature and Altitude:**

For **Standby** operation above these conditions, derate by an additional 8% per 1000 ft (300 m), and 23% per 18 delta deg F (10 delta deg C)

For **Prime** operation above these conditions, derate by an additional 8% per 1000 ft (300 m), and 26% per 18 delta deg F (10 delta deg C)

For **Continuous** operation above these conditions, derate by an additional 10% per 1000 ft (300 m), and 32% per 18 delta deg F (10 delta deg C)



# Cummins Inc.

## Engine Data Sheet

ENGINE MODEL : QSK38-G1

CONFIGURATION NUMBER : D233042GX03

DATA SHEET: FR6786

DATE: 15 OCT 14

**INSTALLATION DIAGRAM**

- Fan to Flywheel: 4954124

**CPL NUMBER**

- Engine Critical Parts List: 3570

**GENERAL ENGINE DATA**

Type .....	Four Cycle; Vee; 12 Cylinder
Aspiration .....	Turbocharged and Low Temp Aftercooled
Bore x Stroke .....	6.25 x 6.25 (159 x 159)
Displacement .....	2,301 (37.7)
Compression Ratio .....	15 : 1
Dry Weight (Approximate) .....	8,433 (3,825)
Wet Weight (Approximate) .....	9,039 (4,100)
Moment of Inertia of Rotating Components	
• with FW 6074 Flywheel .....	246.8 (10.4)
• with FW 6077 Flywheel .....	493.6 (20.8)
Center of Gravity from Rear Face of Block .....	31.5 (801)
Center of Gravity Above Crankshaft Centerline .....	6.8 (173)
Maximum Static Loading at Rear Main Bearing .....	2,000 (907)

**ENGINE MOUNTING**

Maximum Bending Moment at Rear Face of Block .....	4,500 (6,101)
--	---------------

**EXHAUST SYSTEM**

Maximum Back Pressure at Standby Power .....	2 (7)
--	-------

**AIR INDUCTION SYSTEM**

Maximum Intake Air Restriction	
• with Dirty Filter Element .....	25 (6.2)
• with Normal Duty Air Cleaner and Clean Filter Element .....	15 (3.7)

**COOLING SYSTEM****Jacket Water Circuit Requirement**

Coolant Capacity — Engine .....	28 (106)
Minimum Pressure Cap Rating at Sea Level .....	11 (76)
Maximum Static Head of Coolant Above Crankshaft Centerline .....	60 (18.3)
Maximum Coolant Temperature (Max Top Tank Temp) for Standby/Prime Power .....	220 / 212 (104 / 100)
Thermostat (Modulating) Range .....	180 - 202 (82 - 94)
Maximum coolant friction head external to engine - 1500 RPM .....	10 (68.9)

**Aftercooler Circuit Requirements**

Coolant Capacity — Aftercooler .....	6 (22.7)
Maximum Coolant Friction Head External to Engine - 1500 RPM .....	10 (68.9)
Maximum Coolant Temperature into Aftercooler @ 77 °F (25 °C) Ambient .....	120 (49)
Maximum Coolant Temperature into Aftercooler @	
Limiting Ambient Conditions for Standby/Prime power .....	160 / 150 (71 / 66)
Thermostat (Modulating) Range .....	115 - 135 (46 - 57)

**LUBRICATION SYSTEM**

Oil Pressure @ Minimum Idle Speed .....	20 (138)
@ Governed Speed .....	50 - 70 (344.7 - 482.6)
Maximum Oil Temperature .....	248 (120)
Oil Capacity with OP 6125 Oil Pan : Low - High .....	37 - 44 (140.1 - 166.6)
Total System Capacity (with Combo Filter) .....	45 (170.3)

**FUEL SYSTEM**

Type Injection System.....	Cummins MCRS	<b>4</b>
Maximum Fuel Supply Restriction at Fuel Pump Inlet (clean/dirty filter) .....	5 / 10	(16.9 / 34)
Maximum Allowable Head on Injector Return Line (Consisting of Friction Head and Static Head) .....	10	(34)
Maximum Fuel Inlet Temperature .....	160	(71)
Maximum Supply Fuel Flow - 1500 RPM.....	159	(602)
Maximum Return Fuel Flow - 1500 RPM.....	94	(356)

**ELECTRICAL SYSTEM**

System Voltage.....	— volt	24
Minimum Recommended Battery Capacity		
• Cold Soak @ 10 °C (50 °F) and above .....	— CCA	1,800
• Cold Soak @ 0 °C to 10 °C (32 °F to 50°F) .....	— CCA	1,800
• Cold Soak @ -18 °C to 0 °C(0 °F to 32°F) .....	— CCA	1,800
Maximum Starting Circuit Resistance .....	— ohm	0.002

**COLD START CAPABILITY**

Unaided Cold Start		
Minimum Cranking Speed .....	— RPM	150
Minimum Ambient Temperature for Unaided Cold Start.....	— °F (°C)	10 (-12.2)

**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); @ 1500 RPM .....	— dBA		99.4
Exhaust Noise at 1 m Horizontal from Centerline of Exhaust Pipe Outlet Upwards at 45° @ 1500 RPM.....	— dBA		96.3

	STANDBY POWER		PRIME POWER		
	60 hz	50 hz	60 hz	50 hz	
Governed Engine Speed .....	RPM	N/A	1,500	N/A	1,500
Engine Idle Speed.....	RPM	N/A	700 - 900	N/A	700 - 900
Gross Engine Power Output .....	hp (kW)	N/A	1,300 (970)	N/A	1,174 (876)
Brake Mean Effective Pressure .....	psi (kpa)	N/A	298 (2,057)	N/A	269 (1,858)
Piston Speed .....	ft/min (m/s)	N/A	1,562 (7.9)	N/A	1,562 (7.9)
Friction Horsepower .....	hp (kW)	N/A	115 (86)	N/A	115 (86)
Engine Water Flow at Stated Friction Head External to Engine:					
• 4 psi Friction Head.....	gpm (L/s)	N/A	274 (17)	N/A	274 (17)
• Maximum Friction Head .....	gpm (L/s)	N/A	209 (13)	N/A	209 (13)
<b>Engine Data</b>					
Intake Air Flow .....	cfm (L/s)	N/A	2,897 (1,368)	N/A	2,727 (1,288)
Exhaust Gas Temperature - Dry Stack .....	°F (°C)	N/A	860 (460)	N/A	853 (457)
Exhaust Gas Flow .....	cfm (L/s)	N/A	6,818 (3,218)	N/A	6,428 (3,034)
Air to Fuel Ratio .....	air : fuel	N/A	28.5:1	N/A	29.4:1
Radiated Heat to Ambient .....	BTU/min (kW)	N/A	5,314 (94)	N/A	4,853 (86)
Heat Rejection to Jacket Coolant .....	BTU/min (kW)	N/A	21,335 (375)	N/A	19,716 (347)
Heat Rejection to Exhaust .....	BTU/min (kW)	N/A	38,174 (671)	N/A	35,664 (627)
Heat Rejected to *Fuel .....	BTU/min (kW)	N/A	379 (7)	N/A	379 (7)
<b>2P / 2L</b>					
Heat Rejection to Aftercooler Coolant .....	BTU/min (kW)	N/A	12,486 (220)	N/A	10,917 (192)
Aftercooler Water Flow at Stated Friction Head External to Engine:					
• 2 psi Friction Head.....	gpm (L/s)	N/A	137 (9)	N/A	137 (9)
• Maximum Friction Head .....	gpm (L/s)	N/A	116 (7)	N/A	116 (7)

\* This is the maximum heat rejection to fuel.

**ENGINE MODEL : QSK38-G1**  
**DATA SHEET : FR6786**  
**DATE : 15 OCT 14**

**N.A.** - Not Available  
**N/A** - Not Applicable to this Engine  
**TBD** - To Be Determined