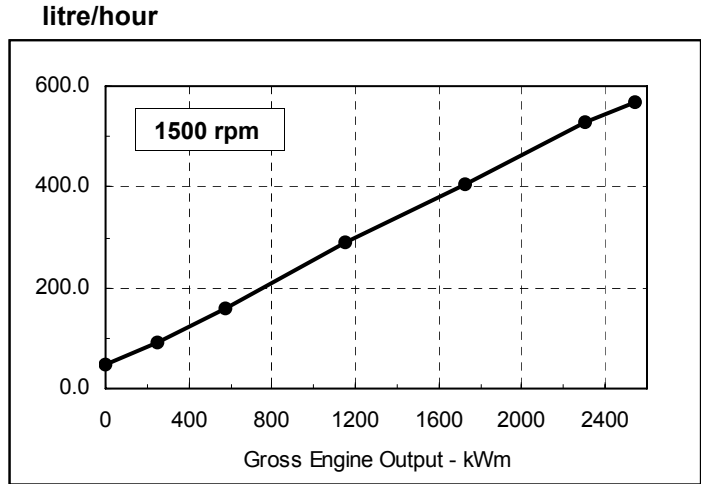
	Cummins Inc. Columbus, Indiana 47202-3005 Engine Data Sheet	Basic Engine Model: QSK78-G9	Curve Number: FR-6676	<i>G-DRIVE</i> QSK 1
		Engine Critical Parts List: CPL: 43194	Date: 4Nov08	
Displacement : 77.6 litre (4735 in³)		Bore : 170 mm (6.69 in.) Stroke : 190 mm (7.48 in.)		
No. of Cylinders : 18		Aspiration : Turbocharged and Low Temperature Aftercooled (2 Pump / 2 Loop)		

Engine Speed rpm	Standby Power		Prime Power		Continuous Power	
	kWm	hp	kWm	hp	kWm	hp
1500	2539	3404	2304	3088	2072	2777


Engine Performance Data @ 1500 rpm

OUTPUT POWER			FUEL CONSUMPTION			
%	kWm	hp	kg/ kWm·h	lb/ hp·h	litre/ hour	US gal/ hour
STANDBY POWER						
100	2539	3404	0.191	0.313	569	150.3
PRIME POWER						
100	2304	3088	0.195	0.321	528	139.4
75	1728	2316	0.200	0.328	406	107.1
50	1152	1544	0.214	0.353	291	76.7
25	576	772	0.234	0.384	158	41.8
CONTINUOUS POWER						
100	2072	2777	0.195	0.321	476	125.7



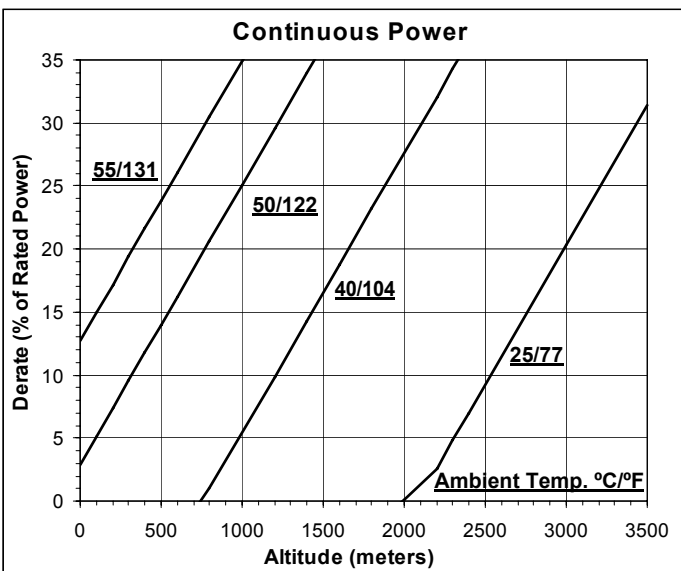
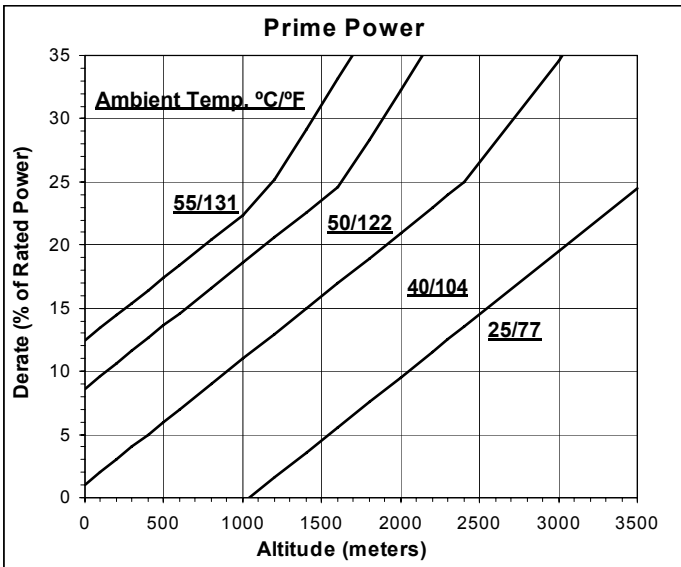
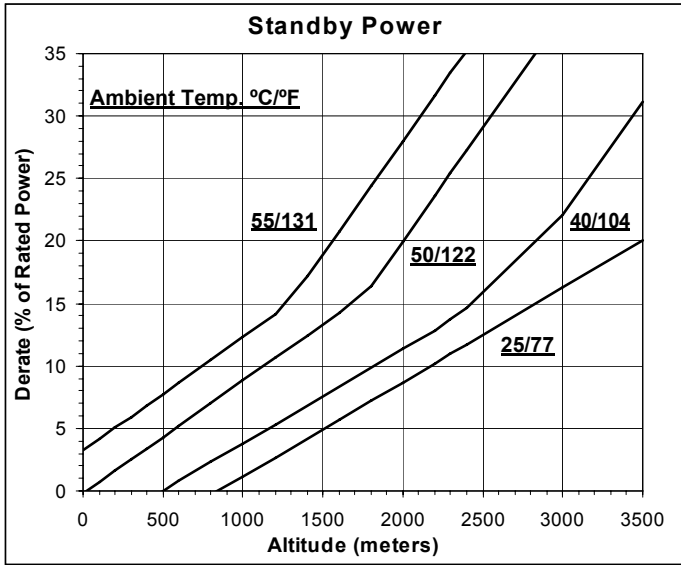
CONVERSIONS:(litres = US Gal x 3.785) (US Gal = litres x 0.2642)

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. 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.</p>	<p>Reference AEB 10.47 for determining Electrical Output.</p> <p>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 in Hg exhaust back pressure.</p> <p>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.</p>
<p>Data Status: --Preliminary--</p>	
<p>Data Tolerance: ± 5%</p>	
<p>Chief Engineer:</p> <div style="text-align: right;">  </div>	

1500 rpm Derate Curves

QSK78-G9



Operation At Elevated Temperature And Altitude:

For **Standby Operation** above these conditions, derate by an additional 5% per 300 m (1000 ft), and 16% per 10° C (18° F).

For **Prime Operation** above these conditions, derate by an additional 6% per 300 m (1000 ft), and 18% per 10° C (18° F).

For **Continuous Operation** above these conditions, derate by an additional 7% per 300 m (1000 ft), and 20% per 10° C (18° F).

Cummins Inc.

Engine Data Sheet

ENGINE MODEL : QSK78-G9

CONFIGURATION NUMBER : D773002GX03

DATA SHEET : DS-6676

DATE : 4Nov08

PERFORMANCE CURVE : FR-6676

INSTALLATION DIAGRAM

• Fan to Flywheel: 4953857

CPL NUMBER

• Engine Critical Parts List: 43194

GENERAL ENGINE DATA

Type	4-Cycle; 60° Vee; 18-Cylinder Diesel	
Aspiration	Turbocharged and Low Temperature Aftercooled (2 Pump / 2 Loop)	
Bore x Stroke	— in x in (mm x mm)	6.69 x 7.48 (170 x 190)
Displacement	— in ³ (litre)	4735 (77.6)
Compression Ratio		15.5 : 1
Dry Weight (Approximate), Fan to Flywheel Engine	— lb (kg)	20327 (9220)
Wet Weight (Approximate), Fan to Flywheel Engine	— lb (kg)	21627 (9810)
Moment of Inertia of Rotating Components • with FW 6057 Flywheel (SAE 00)	— lb _m • ft ² (kg • m ²)	775.5 (32.7)
Center of Gravity from Rear Face of Block	— in (mm)	48.3 (1227)
Center of Gravity Above Crankshaft Centerline	— in (mm)	12.0 (304)
Maximum Static Loading at Rear Main Bearing	— lb (kg)	TBD (TBD)

ENGINE MOUNTING

Maximum Bending Moment at Rear Face of Block	— lb • ft (N • m)	7634 (10350)
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EXHAUST SYSTEM

Maximum Back Pressure	— in Hg (kPa)	2 (6.8)
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AIR INDUCTION SYSTEM

Maximum Intake Air Restriction • with Dirty Filter Element	— in H ₂ O (kPa)	25 (6.2)
• with Clean Filter Element	— in H ₂ O (kPa)	15 (3.7)

COOLING SYSTEM (Separate Circuit Aftercooling Required)

Coolant Capacity — Engine	— US gal (litre)	44 (166.6)
— Aftercoolers	— US gal (litre)	15 (56.8)
Minimum Pressure Cap (for Cooling Systems with less than 2m [6 ft.] Static Head)	— psi (kPa)	11 (76)
Maximum Static Head of Coolant Above Engine Crank Centerline	— ft (m)	60 (18.3)

Jacket Water Circuit Requirements:

Maximum Coolant Friction Head External to Engine — 1500 rpm	— psi (kPa)	7 (48)
Maximum Top Tank Temperature for Standby / Prime Power	— °F (°C)	220 / 212 (104 / 100)
Thermostat (Modulating) Range	— °F (°C)	180 - 200 (82 - 93)

Aftercooler Circuit Requirements:

Maximum Coolant Friction Head External to Engine — 1500 rpm	— psi (kPa)	5 (35)
Maximum Inlet Water Temperature to Aftercoolers @ 25 °C (77 °F)	— °F (°C)	120 (49)
Maximum Inlet Water Temperature to Aftercoolers	— °F (°C)	150 (65)
Thermostat (Modulating) Range	— °F (°C)	115 - 135 (46 - 57)

LUBRICATION SYSTEM

Oil Pressure @ Idle Speed	— psi (kPa)	30 (207)
@ Governed Speed	— psi (kPa)	60 - 70 (414 - 483)
Maximum Oil Temperature	— °F (°C)	250 (121)
Oil Capacity with OP 6085 Oil Pan : Low - High	— US gal (litre)	100 - 109 (378 - 413)
Total System Capacity (Including Filter)	— US gal (litre)	123 (466)

FUEL SYSTEM

Type Injection System	Cummins HPI-PT
Maximum Restriction at Lift Pump(clean/dirty filter)..... — in Hg (kPa)	5/9 (16.9/30.5)
Typical Restriction for Engine Fuel Filter Head and Clean Fuel Filter..... — in Hg (mm Hg)	TBD (TBD)
Maximum Allowable Head on Injector Return Line (Consisting of Friction Head and Static Head) — in Hg (kPa)	10 (33.9)
Maximum Fuel Flow to Injector Pump	590 (2225)
Maximum Return Fuel Flow	555 (2100)
Maximum Fuel Inlet Temperature	160 (70)

ELECTRICAL SYSTEM

Cranking Motor (Heavy Duty, Positive Engagement)	— volt	24
Maximum Allowable Resistance of Cranking Circuit	— ohm	.002
Minimum Recommended Battery Capacity		
• Cold Soak @ 0 °F to 32 °F (-18 °C to 0 °C)	— 0°F CCA	2200

COLD START CAPABILITY

Minimum Ambient Temperature for NFPA 110 Cold Start (90 degree °F Coolant Temperature)	— °F (°C)	50 (10)
Minimum Ambient Temperature for Unaided Cold Start	— °F (°C)	10 (-12)

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); @1800 rpm	— dBA		TBD (est.)
Exhaust Noise at 1 m Horizontal from Centerline of Exhaust Pipe Outlet Upwards at 45 °	— dBA		TBD (est.)

Governed Engine Speed	— rpm	
Engine Idle Speed	— rpm	
Gross Engine Power Output	— hp (kW)	
Brake Mean Effective Pressure	— psi (kPa)	
Piston Speed	— ft/min (m/s)	
Friction Horsepower	— hp (kW)	
Engine Jacket Water Flow at Stated Friction Head External to Engine:		
• 4 psi Friction Head	— US gpm (litre/s)	
• Maximum Friction Head	— US gpm (litre/s)	

	STANDBY POWER		PRIME POWER	
	60 hz	50 hz	60 hz	50 hz
		1500		1500
		700 - 900		700 - 900
		3404 (2539)		3088 (2304)
		380 (2617)		344 (2375)
		1870 (9.5)		1870 (9.5)
		253 (189)		253 (189)
		592 (37.3)		592 (37.3)
		572 (36.1)		572 (36.1)
		6820 (3219)		6578 (3105)
		799 (427)		790 (422)
		15272 (7208)		14670 (6924)
		27.4:1		28.5:1
		13008 (229)		12082 (213)
		50335 (885)		47306 (832)
		80685 (1418)		76855 (1351)
		2500 (44)		2500 (44)
		34311 (603)		32181 (566)
		227 (14.3)		227 (14.3)
		218 (13.8)		218 (13.8)

Engine Data

Intake Air Flow	— cfm (litre/s)	
Exhaust Gas Temperature	— °F (°C)	
Exhaust Gas Flow	— cfm (litre/s)	
Air to Fuel Ratio	— air : fuel	
Radiated Heat to Ambient	— BTU/min (kW)	
Heat Rejection to Engine Jacket Radiator	— BTU/min (kW)	
Heat Rejection to Exhaust	— BTU/min (kW)	
Heat Rejection to Fuel*	— BTU/min (kW)	

Engine Aftercooler Data

Heat Rejection to Coolant	— BTU/min (kW)	
Aftercooler Water Flow at Stated Friction Head External to Engine:		
• 2.5 psi Friction Head	— US gpm (litre/s)	
• Maximum Friction Head	— US gpm (litre/s)	

* This is the maximum heat rejection to fuel, which is at low load.

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

ENGINE MODEL : QSK78-G9
DATA SHEET : DS-6676
DATE : 4Nov08
CURVE NO. : FR-6676