



Cummins Inc.

Columbus, Indiana 47201

Engine Data Sheet

Basic Engine Model:
QSK23-G3 NR1

Engine Critical Parts List:
CPL: 8352

Curve Number:
FR-50011

Date:
19Jul04

G-DRIVE
QSK
1

Displacement : **23.15 litre (1413 in³)**

Bore : **170 mm (6.69 in.)** Stroke : **170 mm (6.69 in.)**

No. of Cylinders : **6**

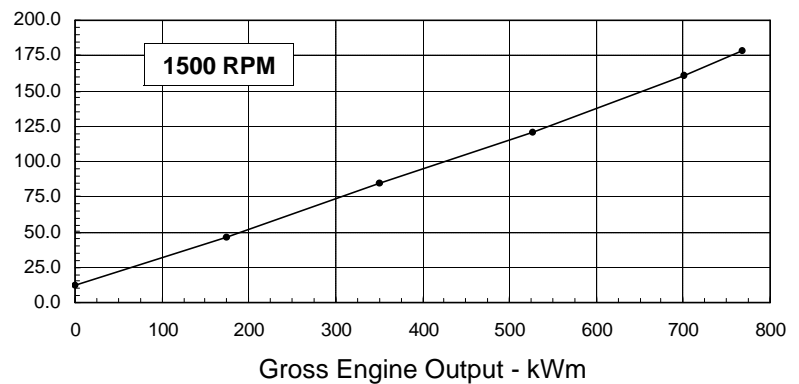
Aspiration : **Turbocharged and Air to Air Aftercooled**

Engine Speed RPM	Standby Power		Prime Power		Continuous Power	
	kWm	BHP	kWm	BHP	kWm	BHP
1500	768	1030	701	940	537	720
1800	895	1200	809	1085	652	875

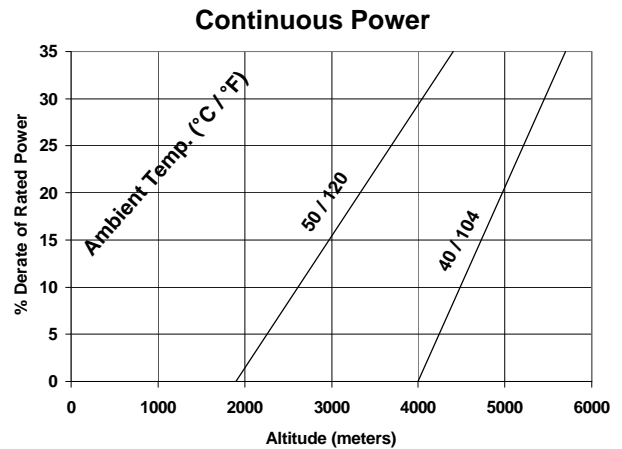
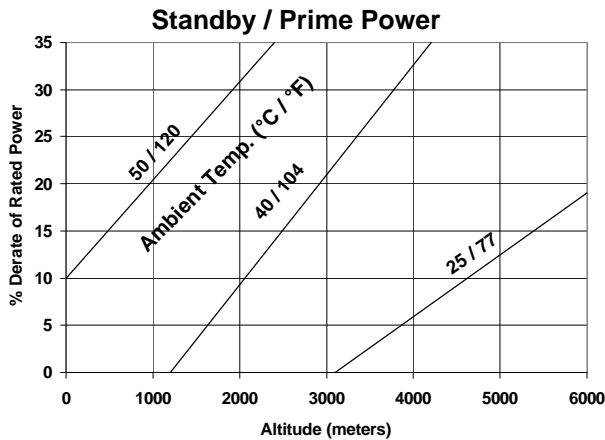
Engine Performance Data @ 1500 RPM

OUTPUT POWER			FUEL CONSUMPTION			
%	kWm	BHP	kg/ kWm-h	lb/ BHP-h	litre/ hour	U.S. Gal/ hour
STANDBY POWER						
100	768	1030	0.197	0.323	178	46.9
PRIME POWER						
100	701	940	0.195	0.321	161	42.5
75	526	705	0.196	0.322	121	32.0
50	351	470	0.206	0.338	85	22.4
25	175	235	0.223	0.370	46	12.2
CONTINUOUS POWER						
100	537	720	0.198	0.326	125	33.1

Litre/hour



Power Derate Curves @ 1500 RPM



Operation At Elevated Temperature And Altitude:

For sustained operation above these conditions, derate by an additional 3.4% per 300 m (1000 ft), and 20% per 10° C (18° F).

CONVERSIONS:(litres = U.S. Gal x 3.785) (U.S.Gal = litres x 0.2642)

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.


Data Subject to Change Without Notice

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 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.

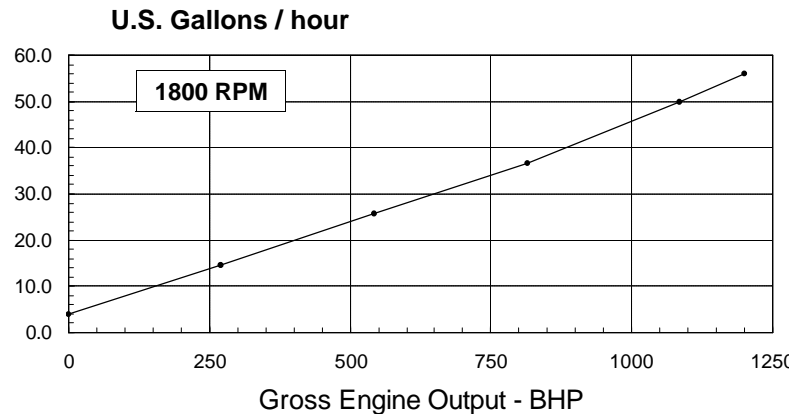
Data Status: Limited Production
Data Tolerance: ± 5%
Chief Engineer: *D.K. Trueblood*

	Cummins Inc. Columbus, Indiana 47201 Engine Data Sheet	Basic Engine Model: QSK23-G3 NR1	Curve Number: FR-50011	G-DRIVE QSK 2
		Engine Critical Parts List: CPL: 8352	Date: 19Jul04	
Displacement : 23.15 litre (1413 in³)		Bore : 170 mm (6.69 in.) Stroke : 170 mm (6.69 in.)		
No. of Cylinders : 6		Aspiration : Turbocharged and Air to Air Aftercooled		

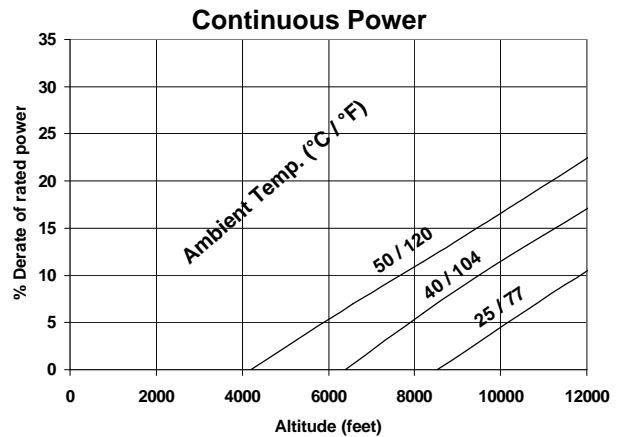
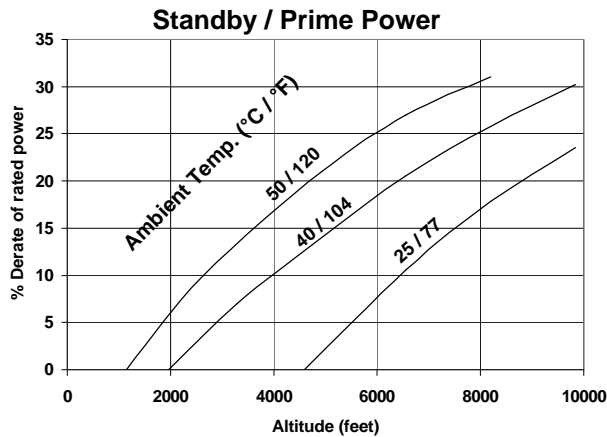
Engine Speed	Standby Power		Prime Power		Continuous Power	
	kWm	BHP	kWm	BHP	kWm	BHP
1500	768	1030	701	940	537	720
1800	895	1200	809	1085	652	875

Engine Performance Data @ 1800 RPM

OUTPUT POWER			FUEL CONSUMPTION			
%	kWm	BHP	kg/ kWm-h	lb/ BHP-h	litre/ hour	U.S. Gal/ hour
STANDBY POWER						
100	895	1200	0.201	0.332	212	56.1
PRIME POWER						
100	809	1085	0.199	0.326	189	49.8
75	607	814	0.195	0.320	139	36.7
50	405	543	0.204	0.336	97	25.7
25	202	271	0.236	0.385	56	14.7
CONTINUOUS POWER						
100	653	875	0.194	0.320	149	39.4



Power Derate Curves @ 1800 RPM




Operation At Elevated Temperature And Altitude:

For sustained operation above these conditions, derate by an additional 5.0% per 300 m (1000 ft), and 7% per 10° C (18° F).

CONVERSIONS: (litres = U.S. Gal x 3.785) (U.S. 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>	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 H ₂ O 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: Limited Production Data Tolerance: ± 5% Chief Engineer: 

Cummins Inc.
Engine Data Sheet

ENGINE MODEL : QSK23-G3 NR1 CONFIGURATION NUMBER : D893001GX03

DATA SHEET : LP-50011

DATE : 19Jul04

PERFORMANCE CURVE : FR-50011

INSTALLATION DIAGRAM

• Fan to Flywheel : 3170553

CPL NUMBER

• Engine Critical Parts List : 8352

GENERAL ENGINE DATA

Type	Inline 6-Cylinder Diesel
Aspiration	Turbocharged and Low Temperature Aftercooled
Bore x Stroke	170 x 170 (6.69 x 6.69)
Displacement.....	23.15 (1413)
Compression Ratio.....	16.0:1
Dry Weight	
Fan to Flywheel Engine.....	— kg (lb) 2755 (6060)
Wet Weight	
Fan to Flywheel Engine.....	— kg (lb) 2805 (6170)
Moment of Inertia of Rotating Components	
• with (SAE 0).....	— kg • m ² (lb _m • ft ²) 11.6 (270)
Center of Gravity from Front Face of Block	— mm (in) 725 (28.5)
Center of Gravity Above Crankshaft Centerline.....	— mm (in) 240 (9.5)
Maximum Static Loading at Rear Main Bearing.....	— kg (lb) 990 (2160)

ENGINE MOUNTINGMaximum Bending Moment at Rear Face of Block — N • m (lb • ft) 3205 (2340) |**EXHAUST SYSTEM**Maximum Back Pressure..... — mm Hg (in Hg) 76.2 (3) |**AIR INDUCTION SYSTEM**

Maximum Intake Air Restriction:

• with Dirty Filter Element.....	— mm H ₂ O (in H ₂ O) 635 (25)
• with Clean Filter Element.....	— mm H ₂ O (in H ₂ O) 381 (15)

COOLING SYSTEM

Coolant Capacity — Engine Only	— litre (US gal) 46.5 (12.3)
Minimum Pressure Cap	— kPa (psi) 69 (10)

Jacket Water Circuit Requirements

Maximum Static Head of Coolant Above Engine Crank Centerline.....	— m (ft) 18.3 (60)
Standard Thermostat (Modulating) Range	— °C (°F) 76.5-90 (170 - 194)
Maximum Top Tank Temperature for Standby . Prime Power	— °C (°F) 104 - 100 (220 - 212)
Maximum Coolant Friction Head External to the Engine - 1800 RPM.....	— kPa (psi) 48 (7)
-1500 RPM.....	— kPa (psi) 34 (5)

Air-to-Air Core Requirements

Maximum Temp. Rise Between Engine Air Intake and Intake Manifold —1500 / 1800 rpm..	— °C (°F) 33 (60)
Maximum Air Press. Drop from Turbo Air Outlet to Intake Manifold — 1500 / 1800 rpm	— mm Hg (in Hg) 102 (4)

LUBRICATION SYSTEM

Oil Pressure @ Idle Speed.....	— kPa (psi) 145 (21)
@ Governed Speed	— kPa (psi) 345 - 448 (50 - 65)
Maximum Oil Temperature.....	— °C (°F) 120 (248)
Oil Capacity with OP TBD Oil Pan : Low - High.....	— litre (US gal) 66 - 95 (17 - 25)
Total System Capacity (With Combo Filters).....	— litre (US gal) 74 - 103 (19 - 27)

FUEL SYSTEM

Table with 3 columns: Parameter, Unit, and Cummins HPI-PT value. Parameters include Type Injection System, Maximum Restriction at Fuel Injection Pump, Maximum Allowable Head on Injector Return Line, Maximum Inlet Temperature, Maximum Fuel Flow to Injection Pump, and Maximum Drain Flow.

ELECTRICAL SYSTEM

Table with 3 columns: Parameter, Unit, and Value. Parameters include Cranking Motor (Heavy Duty, Positive Engagement), Battery Charging System, Maximum Allowable Resistance of Cranking Circuit, and Minimum Recommended Battery Capacity with cold soak conditions.

COLD START CAPABILITY

Table with 3 columns: Parameter, Unit, and Value. Parameters include Minimum Ambient Temperature for Cold Start with 1500 watt Coolant Heater, Minimum Ambient Temperature for Unaided Cold Start, and Minimum Ambient Temperature for NFPA 110 Cold Start.

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%
Air Intake Restriction : 381 mm H2O (15 in H2O) Exhaust Restriction : 51 mm Hg (2 in Hg)

Table with 3 columns: Parameter, Unit, and Value. Parameters include Steady State Stability Band at any Constant Load, Estimated Free Field Sound Pressure Level of a Typical Generator Set, and Exhaust Noise at 1 m Horizontally from Centerline of Exhaust Pipe Outlet.

Governed Engine Speed — rpm
Engine Idle Speed..... — rpm
Gross Engine Power Output..... — kWm (BHP)
Brake Mean Effective Pressure..... — kPa (psi)
Piston Speed..... — m / s (ft / min)
Friction Horsepower..... — kWm (HP)
Engine Jacket Water Flow at Stated Friction Head External to Engine:

Large performance table with columns for STANDBY POWER (60 hz, 50 hz) and PRIME POWER (60 hz, 50 hz). Rows include various parameters like Intake Air Flow, Exhaust Gas Temperature, Air-to-Fuel Ratio, Radiated Heat to Ambient, Heat Rejection to Jacket Water Coolant, Heat Rejection to Exhaust, Heat Rejection to Fuel, Charge Air Cooler Heat Rejection, Turbo Compressor Outlet Temperature, and Turbo Compressor Outlet Pressure.

Engine Data

Intake Air Flow..... — litre / s (cfm)
Exhaust Gas Temperature — °C (°F)
Exhaust Gas Flow..... — litre / s (cfm)
Air-to-Fuel Ratio — air : fuel
Radiated Heat to Ambient — kWm (BTU / min)
Heat Rejection to Jacket Water Coolant..... — kWm (BTU / min)
Heat Rejection to Exhaust..... — kWm (BTU / min)
Heat Rejection to Fuel*..... — kWm (BTU / min)
Charge Air Cooler Heat Rejection..... — kWm (BTU / min)
Turbo Compressor Outlet Temperature — °C (°F)
Turbo Compressor Outlet Pressure..... — kPa (psi)

* 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