

Cummins Inc.

Columbus, Indiana 47201

Engine Data Sheet

Basic Engine Model: QSK23-G3 NR1

CPL: 8352

Engine Critical Parts List:

Curve Number: FR-50011

5May03

G-DRIVE QSK

Displacement : **23.15** litre (**1413** in³) Bore : **170** mm (**6.69** in.) Stroke : **170** mm (**6.69** in.)

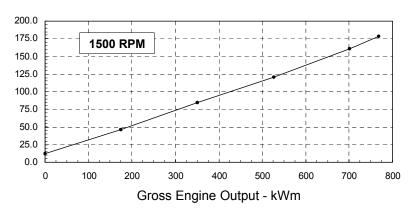
No. of Cylinders: 6 Aspiration: Turbocharged and Air to Air Aftercooled

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

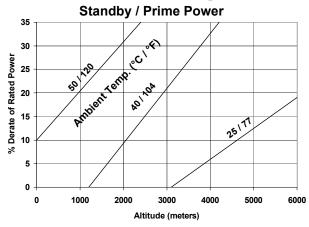
Engine Performance Data @ 1500 RPM

OUTPUT POWER			FUEL CONSUMPTION				
%	kWm	ВНР	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



Continuous Power 35 30 25 30 25 30 25 30 26 30 30 30 30 30 4000 5000 6000 Altitude (meters)

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 rating during any operating period of 250 hours. The total operating time at 100% Prime Power and into exceed 500 hours per year. A 10% overload capability is available or 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 valiable 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 prime. Power as a for 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% l

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:

DK. Trueblood



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Columbus, Indiana 47201

Engine Data Sheet

Basic Engine Model: QSK23-G3 NR1

CPL: 8352

Engine Critical Parts List:

Date: 5May03

Curve Number:

FR-50011

G-DRIVE QSK 2

Displacement : **23.15** litre (**1413** in³) Bore : **170** mm (**6.69** in.) Stroke : **170** mm (**6.69** in.)

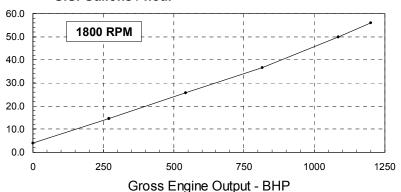
No. of Cylinders: 6 Aspiration: Turbocharged and Air to Air Aftercooled

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

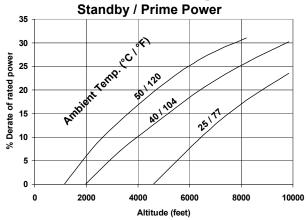
Engine Performance Data @ 1800 RPM

OUTPUT POWER			FUEL CONSUMPTION				
%	kWm	ВНР	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	

U.S. Gallons / hour



Power Derate Curves @ 1800 RPM



Continuous Power 35 30 25 25 25 26 27 20 200 4000 6000 8000 10000 12000 Altitude (feet)

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)

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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:

DK. Inueblood

Cummins Inc. Engine Data Sheet

DATA SHEET: LP-50011 ENGINE MODEL: QSK23-G3 NR1 CONFIGURATION NUMBER: D893001GX03 DATE: 5May03
PERFORMANCE CURVE: FR-50011

• Fan to Flywheel : 3170553

<u>CPL NUMBER</u>
• Engine Critical Parts List : 8352

GENERAL ENGINE DATA		
Type	Inline 6-Cylinder	
Aspiration	_	nd Low Temperatu
Bore x Stroke — mm x mm (in x in)	Aftercooled 170 x 170 (6.69	v 6 60)
Displacement— litre (in ³)	23.15 (1413)	x 0.09)
Compression Ratio	16.0:1	
Dry Weight	10.0.1	
Fan to Flywheel Engine— kg (lb)	2755	(6060)
, ,	2755	(0000)
Wet Weight	2005	(6470)
Fan to Flywheel Engine — kg (lb)	2805	(6170)
Moment of Inertia of Rotating Components	44.0	(070)
• with (SAE 0)	11.6	(270)
Center of Gravity from Front Face of Block	725	(28.5)
Center of Gravity Above Crankshaft Centerline	240	(9.5)
Maximum Static Loading at Rear Main Bearing — kg (lb)	990	(2160)
ENGINE MOUNTING		
Maximum Bending Moment at Rear Face of Block	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	381	(15)
COOLING SYSTEM		
Coolant Capacity — Engine Only — litre (US gal)	46.5	(12.3)
Minimum Pressure Cap	69	(10)
Jacket Water Circuit Requirements		
Maximum Static Head of Coolant Above Engine Crank Centerline	18.3	(60)
Standard Thermostat (Modulating) Range	82 - 95	(180 - 203)
Maximum Top Tank Temperature for Standby . Prime Power	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	145	(21)
@ Governed Speed	345 - 448	(50 - 65)
Maximum Oil Temperature	120	(248)
Oil Capacity with OP TBD Oil Pan : Low - High	66 - 95	(17 - 25)
Total System Capacity (With Combo Filters)	74 - 103	(17 - 23)
Total dysterii dapadity (vvitii dorribo i liters)	14 - 103	(13 - 21)

FUEL SYSTEM

Type Injection System	Cummir	ns HPI-PT
Maximum Restriction at Fuel Injection Pump — with Clean Fuel Filter— mm Hg (in Hg) — with Dirty Fuel Filter— mm Hg (in Hg)	120 203	(4.0)
Maximum Allowable Head on Injector Return Line (Consisting of Friction Head and Static Head)	229	(9.0)
Maximum Inlet Temperature — °C (°F)	70	(160)
Maximum Fuel Flow to Injection Pump — litre / hr (US gph)	684	(181)
Maximum Drain Flow — litre / hr (US gph)	662	(175)
ELECTRICAL SYSTEM		
Cranking Motor (Heavy Duty, Positive Engagement) volt		24
Battery Charging System, Negative Ground— ampere		35
Maximum Allowable Resistance of Cranking Circuit	0.0	02
Minimum Recommended Battery Capacity		
• Cold Soak @ 10 °C (50 °F) and Above 0°F CCA	12	.00
• Cold Soak @ 0 °C to 10 °C (32 °F to 50 °F)	12	80
• Cold Soak @ -18 °C to 0 °C (0 °F to 32 °F)	18	000
COLD START CAPABILITY		
Minimum Ambient Temperature for Cold Start with 1500 watt Coolant Heater to Rated Speed	-30	(-22)
Minimum Ambient Temperature for Unaided Cold Start to Idle Speed	0	(32)
Minimum Ambient Temperature for NFPA 110 Cold Start (90° F Minimum Coolant Temperature)	10	(50)
PERFORMANCE DATA		` '
All data is based on:		

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) : 110 m (361 ft) Relative Humidity : 30%

Air Intake Restriction : $381 \text{ mm H}_2\text{O} (15 \text{ in H}_2\text{O})$ Exhaust Restriction: 51 mm Hg (2 in Hg)

+/- 0.25 Estimated Free Field Sound Pressure Level of a Typical Generator Set;

TBD TBD

Governed Engine Speed — rpm Engine Idle Speed — rpm Gross Engine Power Output — kW _m (BHP) Brake Mean Effective Pressure — kPa (psi) Piston Speed — m / s (ft / min) Friction Horsepower — kW _m (HP) Engine Jacket Water Flow at Stated Friction Head External to Engine:
• 3 psi Friction Head litre / s (US gpm)
Maximum Friction Head litre / s (US gpm)
Engine Data
Intake Air Flow — litre / s (cfm)
Exhaust Gas Temperature
Exhaust Gas Flow — litre / s (cfm)
Air-to-Fuel Ratio air : fuel
Radiated Heat to Ambient — kW _m (BTU / min)
Heat Rejection to Jacket Water Coolant — kW _m (BTU / min)
Heat Rejection to Exhaust — kW _m (BTU / min)
Heat Rejection to Fuel*
Charge Air Cooler Heat Rejection
Turbo Compressor Outlet Temperature — °C (°F)

STANDB 60 hz	Y POWER 50 hz	PRIME POWER 60 hz 50 hz		
1800	1500	1800	1500	
750	750	750	750	
895 (1200)	768 (1030)	809 (1085)	701 (940)	
2600 (377)	2675 (388)	2350 (341)	2441 (354)	
10.3 (2010)	8.6 (1675)	10.3 (2010)	8.6 (1675)	
93 (124)	72 (96)	93 (124)	72 (96)	
10.4 (165)	7.6 (120)	10.4 (165)	7.9 (126)	
10.1 (160)	7.6 (120)	10.1 (160)	7.6 (120)	
1132 (2398)	888 (1882)	1094 (2318)	815 (1720)	
514 (957)	543 (1010)	467 (872)	532 (990)	
3056 (6475)	2463 (5218)	2773 (5875)	2259 (4786)	
25.5 : 1	23.8 : 1	27.6 : 1	25.3 : 1	
85 (4862)	71 (4058)	76 (4313)	65 (3682)	
269 (15305)	222 (12636)	235 (13358)	215 (12252)	
656 (37334)	570 (32417)	569 (32392)	507 (28877)	
9.1 (520)	6.8 (387)	9.1 (520)	6.8 (387)	
223 (12673)	146 (8329)	198 (11270)	122 (6944)	
227 (440)	199 (390)	209 (408)	182 (360)	
283 (41)	248 (36)	269 (39)	214 (31)	

^{*} 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: QSK23-G3 NR1

DATA SHEET: DS-50011-LP DATE: 5May03 **CURVE NO.:** FR-50011