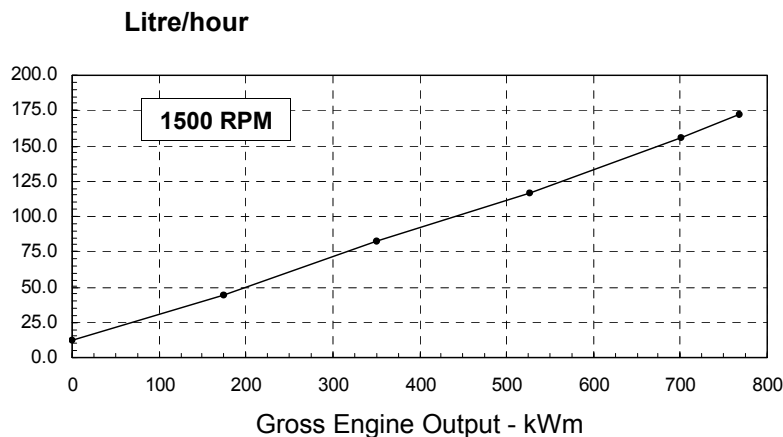


	Cummins Inc. Columbus, Indiana 47201 Engine Data Sheet		Basic Engine Model: QSK23-G4 NR1	Curve Number: FR-50025	<i>G-DRIVE</i> QSK 1
			Engine Critical Parts List: CPL: 8354	Date: 5May03	
Displacement : 23.15 litre (1413 in ³)		Bore : 170 mm (6.69 in.) Stroke : 170 mm (6.69 in.)			
No. of Cylinders : 6		Aspiration : Turbocharged and Air to Air Aftercooled			

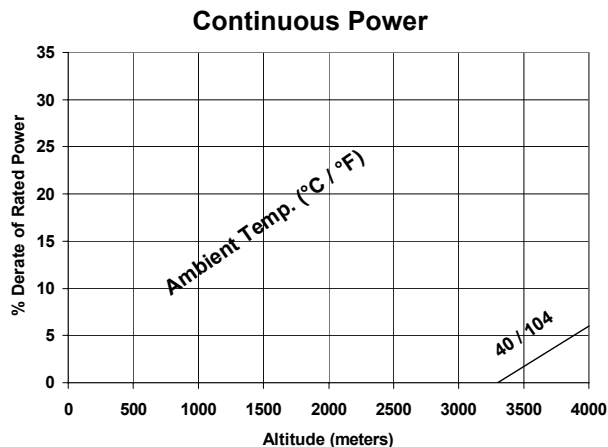
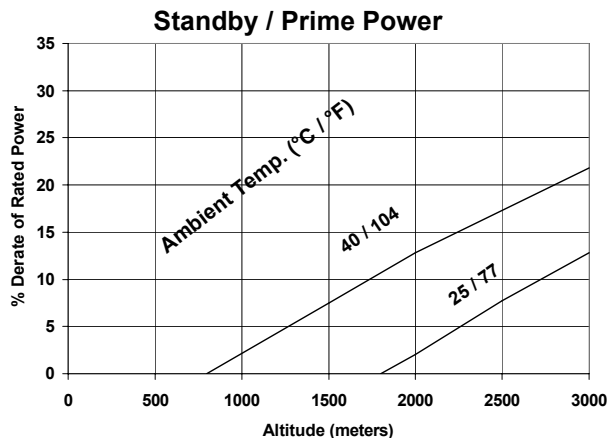
Engine Speed	Standby Power		Prime Power		Continuous Power	
	kWm	BHP	kWm	BHP	kWm	BHP
1500	768	1030	701	940	537	720
1800	809	1085	768	1030	626	840

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	0.190	0.313	172	45.4
PRIME POWER						
100	701	940	0.189	0.311	156	41.2
75	526	705	0.189	0.320	117	30.8
50	351	470	0.196	0.327	82	21.6
25	175	235	0.214	0.348	44	11.5
CONTINUOUS POWER						
100	537	720	0.188	0.310	119	31.4



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:

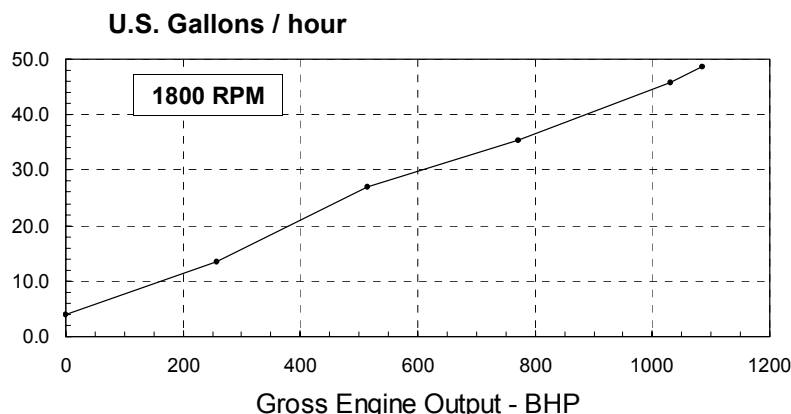
D.K. Trueblood

	Cummins Inc. Columbus, Indiana 47201 Engine Data Sheet		Basic Engine Model: QSK23-G4 NR1	Curve Number: FR-50025	<i>G-DRIVE</i> QSK 2
			Engine Critical Parts List: CPL: 8354	Date: 5May03	
Displacement : 23.15 litre (1413 in ³)		Bore : 170 mm (6.69 in.) Stroke : 170 mm (6.69 in.)			
No. of Cylinders : 6		Aspiration : Turbocharged and Air to Air Aftercooled			

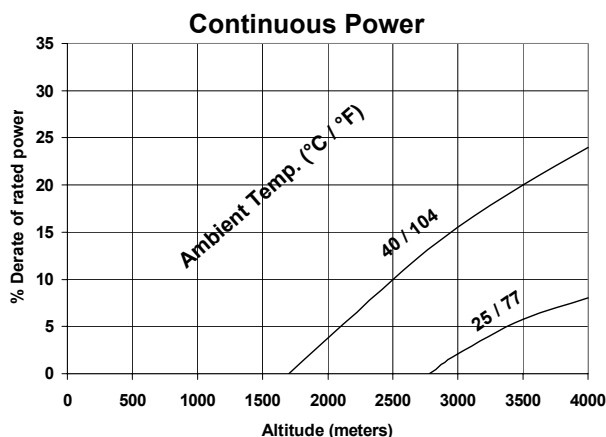
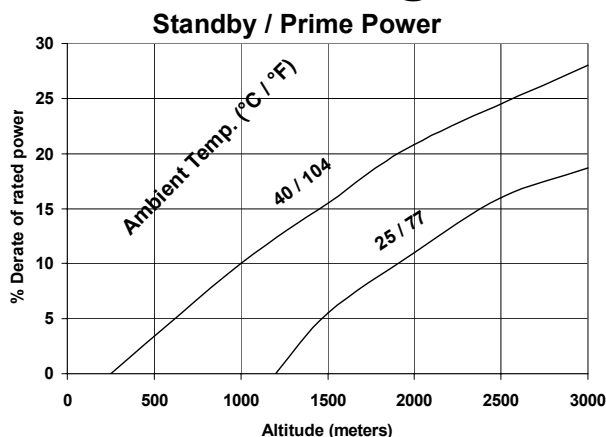
Engine Speed	Standby Power		Prime Power		Continuous Power	
	kWm	BHP	kWm	BHP	kWm	BHP
1500	768	1030	701	940	537	720
1800	809	1085	768	1030	626	840

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	809	1085	0.193	0.319	184	48.7
PRIME POWER						
100	768	1030	0.191	0.316	173	45.8
75	576	772	0.98	0.325	134	35.3
50	384	515	0.228	0.335	103	27.1
25	182	257	0.238	0.376	51	13.6
CONTINUOUS POWER						
100	626	720	0.194	0.319	143	37.8



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)

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

4 - 103 (19 - 27)

FUEL SYSTEM

Type Injection System	Cummins HPI-PT
Maximum Restriction at Fuel Injection Pump — with Clean Fuel Filter	120 (4.0)
— with Dirty Fuel Filter	203 (8.0)
Maximum Allowable Head on Injector Return Line (Consisting of Friction Head and Static Head)	229 (9.0)
Maximum Inlet Temperature	70 (160)
Maximum Fuel Flow to Injection Pump	684 (181)
Maximum Drain Flow	662 (175)

ELECTRICAL SYSTEM

Cranking Motor (Heavy Duty, Positive Engagement)	24
Battery Charging System, Negative Ground	35
Maximum Allowable Resistance of Cranking Circuit	0.002
Minimum Recommended Battery Capacity	
• Cold Soak @ 10 °C (50 °F) and Above	1200
• Cold Soak @ 0 °C to 10 °C (32 °F to 50 °F)	1280
• Cold Soak @ -18 °C to 0 °C (0 °F to 32 °F)	1800

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:
- 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 H ₂ O (15 in H ₂ O)	Exhaust Restriction : 51 mm Hg (2 in Hg)

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 TBD

Exhaust Noise at 1 m Horizontally from Centerline of Exhaust Pipe Outlet Upwards at 45°..... — dBA 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	— °C (°F)
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*	— kW _m (BTU / min)
Charge Air Cooler Heat Rejection	— kW _m (BTU / min)
Turbo Compressor Outlet Temperature	— °C (°F)
Turbo Compressor Outlet Pressure	— kPa (psi)

STANDBY POWER		PRIME POWER	
60 hz	50 hz	60 hz	50 hz
1800	1500	1800	1500
750	750	750	750
809 (1085)	768 (1030)	769 (1030)	701 (940)
2324 (337)	2648 (384)	2213 (321)	2420 (351)
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)
1130 (2395)	1043 (2122)	1070 (2268)	912 (1932)
429 (804)	498 (929)	412 (773)	479 (894)
2672 (5661)	2398 (5081)	2536 (5373)	2220 (4703)
29 : 1	26 : 1	29 : 1	27 : 1
73 (4151)	68 (3893)	66 (3757)	62 (3540)
231 (13124)	226 (12858)	211 (12003)	216 (12286)
505 (28726)	484 (27532)	454 (25821)	445 (25350)
9.1 (520)	6.8 (387)	9.1 (520)	6.8 (387)
198 (11300)	159 (9048)	181 (10308)	124 (7071)
226 (438)	228 (442)	212 (413)	208 (407)
284 (41)	297 (43)	264 (39)	255 (37)

* 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-G4 NR1

DATA SHEET : DS-50025-LP

DATE : 5May03

CURVE NO. : FR-50025