Cummins	**CUMMINS ENGINE COMPANY, INC** Columbus, Indiana 47201 **ENGINE PERFORMANCE CURVE**	Basic Engine Model: **4BTA3.9-G1**	Curve Number: **FR-90234**	Page No.
		Engine Critical Parts List: **CPL: 2246**	Date: **19Aug04**	

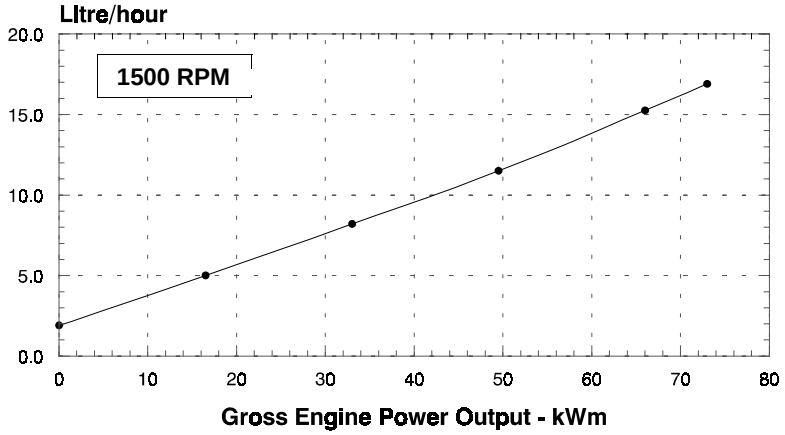
Displacement : **3.9** litre (**239.3** in^3)	Bore : **102** mm (**4.02** in.) Stroke : **120** mm (**4.72** in.)
No. of Cylinders : **4**	Aspiration : **Turbocharged and Jacket Water Aftercooled**

•• PRELIMINARY ••

Engine Speed	Standby Power		Prime Power		Continuous Power	
RPM	kWm	BHP	kWm	BHP	kWm	BHP
1500	73	98	66	89	60	81

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	73	98	0.200	0.330	17	4.6
PRIME POWER						
100	66	89	0.200	0.330	15	4.1
75	49.5	66.8	0.203	0.334	12	3.1
50	33	44.5	0.214	0.352	8.3	2.2
25	16.5	22.3	0.254	0.419	4.9	1.3
CONTINUOUS POWER						
100	60	81	0.197	0.328	14	3.7



Engine Performance Data @ 1800 RPM

Not Available at 1800 RPM
For 1800 RPM (see 4BTA3.9-G2)

Not Available at 1800 RPM
For 1800 RPM (see 4BTA3.9-G2)

CONVERSIONS: (Litres = U.S. Gal x 3.785) (kWm = BHP x 0.746) (U.S. Gal = Litres x 0.2642) (BHP = Engine kWm x 1.34)

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.

See reverse side for application rating guidelines.

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.

TECHNICAL DATA DEPT. **CERTIFIED WITHIN 5%** **CHIEF ENGINEER**

• • PRELIMINARY• •

POWER RATING APPLICATION GUIDELINES FOR GENERATOR DRIVE ENGINES

These guidelines have been formulated to ensure proper application of generator drive engines in A.C. generator set installations. Generator drive engines are not designed for and shall not be used in variable speed D.C. generator set applications.

STANDBY POWER RATING is 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.

CONTINUOUS POWER RATING is 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.

PRIME POWER RATING is 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

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.

Reference Standards:

BS-5514 and DIN-6271 standards are based on ISO-3046.

Operation At Elevated Temperature And Altitude:

The engine may be operated at:

1500 RPM up to 5,000 ft (1525 m) and 104 ^{o}F (40 ^{o}C) without power deration.

For sustained operation above these conditions, derate by 4% per 1,000 ft (300 m), and 1% per 10 ^{o}F (2% per 11 ^{o}C).

•• PRELIMINARY ••

Cummins Engine Company, Inc.

Engine Data Sheet

ENGINE MODEL : **4BTA3.9-G1** **CONFIGURATION NUMBER :** D383030DX02

DATA SHEET : DS-90234
DATE : 19Aug04
PERFORMANCE CURVE : FR-90234

INSTALLATION DIAGRAM
• Fan to Flywheel : 3170245

CPL NUMBER
• Engine Critical Parts List : 2246

GENERAL ENGINE DATA

Type	4-Cycle; In-line; 4-Cylinder Diesel	
Aspiration	Turbocharged / Jacket Water Aftercooled	
Bore x Stroke — in x in (mm x mm)	4.02 x 4.72 (102 x 120)	
Displacement — in^3 (liter)	239.3 (3.92)	
Compression Ratio	16.5 : 1	
Dry Weight		
Fan to Flywheel Engine — lb (kg)	770	(350)
Heat Exchanger Cooled Engine — lb (kg)		N/A
Wet Weight		
Fan to Flywheel Engine — lb (kg)	810	(370)
Heat Exchanger Cooled Engine — lb (kg)		N/A
Moment of Inertia of Rotating Components		
• with FW 9134 Flywheel — $lb_m \cdot ft^2$ ($kg \cdot m^2$)	31.6	(1.33)
• with FW 9017 Flywheel — $lb_m \cdot ft^2$ ($kg \cdot m^2$)	23.5	(0.99)
Center of Gravity from Rear Face of Flywheel Housing — in (mm)	14.7	(373)
Center of Gravity Above Crankshaft Centerline — in (mm)	6.4	(163)
Maximum Static Loading at Rear Main Bearing — lb (kg)	N.A.	N.A.

ENGINE MOUNTING

Maximum Bending Moment at Rear Face of Block — lb • ft (N • m)	1000	(1356)

EXHAUST SYSTEM

Maximum Back Pressure — in Hg (mm Hg)	3	(76)

AIR INDUCTION SYSTEM

Maximum Intake Air Restriction		
• with Dirty Filter Element — in H_2O (mm H_2O)	25	(635)
• with Normal Duty Air Cleaner and Clean Filter Element — in H_2O (mm H_2O)	10	(254)
• with Heavy Duty Air Cleaner and Clean Filter Element — in H_2O (mm H_2O)	15	(381)

COOLING SYSTEM

Coolant Capacity — Engine Only — US gal (liter)	2.1	(7.9)
— with HX —— Heat Exchanger — US gal (liter)		N/A
Maximum Coolant Friction Head External to Engine — 1800 rpm — psi (kPa)	5	(35)
— 1500 rpm — psi (kPa)	4	(28)
Maximum Static Head of Coolant Above Engine Crank Centerline — ft (m)	46	(14)
Standard Thermostat (Modulating) Range — °F (°C)	180 - 203	(82 - 95)
Minimum Pressure Cap — psi (kPa)	10	(69)
Maximum Top Tank Temperature for Standby / Prime Power — °F (°C)	220 / 212	(104 / 100)
Minimum Raw Water Flow @ 90°F to HX —— Heat Exchanger — US gpm (liter / min)		N/A
Maximum Raw Water Inlet Pressure at HX —— Heat Exchanger — psi (kPa)		N/A

LUBRICATION SYSTEM

Oil Pressure @ Idle Speed — psi (kPa)	30	(207)
@ Governed Speed — psi (kPa)	50	(345)
Maximum Oil Temperature — °F (°C)	250	(121)
Oil Capacity with OP 9017 Oil Pan : High - Low — US gal (liter)	2.5 - 2.25	(9.5 - 8.5)
Total System Capacity (with Full-Flow Filter) — US gal (liter)	2.88	(10.9)
Angularity of OP 9017 Oil Pan — Front Down		40°
— Front Up		40°
— Side to Side		40°

FUEL SYSTEM

Type Injection System	Stanadyne DB4 Direct Injection	
Maximum Inlet Restriction at Lift Pump — in Hg (mm Hg)	4	(102)
Maximum Allowable Head on Injector Return Line (Consisting of Friction Head and Static Head) — in Hg (mm Hg)	10	(254)
Total Drain Flow (Constant for All Loads) — US gph (liter / hr)	8	(30)

ELECTRICAL SYSTEM

Cranking Motor (Heavy Duty, Positive Engagement) — volt	12	24
Battery Charging System, Negative Ground — ampere	63	40
Maximum Allowable Resistance of Cranking Circuit — ohm	0.00075	0.002
Minimum Recommended Battery Capacity		
• Cold Soak @ 10 °F (-12 °C) and Above — 0°F CCA	625	312

COLD START CAPABILITY

Minimum Ambient Temperature for Aided (with Coolant Heater) Cold Start within 10 seconds — °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.
- Air Intake Restriction : 254mm H_2O (10 in H_2O).
- Exhaust Restriction : 51 mm Hg (2 in Hg)
- ISO 3046, Part 1, Standard Reference Conditions of:
  - Barometric Pressure : 100 kPa (29.53 in Hg)
  - Altitude : 110 m (361 ft)
  - Air Temperature : 25 °C (77 °F)
  - Relative Humidity : 30%

Steady State Stability Band at any Constant Load — %	+/- 0.50
Estimated Free Field Sound Pressure Level	
Excludes Exhaust Noise; at Rated Load and 7.5 m (24.6 ft); 1800 rpm / 1500 rpm — dBA	N.A.
Exhaust Noise at 1 m Horizontally from Centerline of Exhaust Pipe Outlet Upwards at 45° — dBA	N.A.

	STANDBY		PRIME POWER	
	60 hz	*50 hz*	*60 hz*	*50 hz*
Governed Engine Speed — rpm		1500		1500
Engine Idle Speed — rpm		950 - 1150		950 - 1150
Gross Engine Power Output — BHP (kW_m)		98 (73)		89 (66)
Brake Mean Effective Pressure — psi (kPa)		217 (1493)		196 (1352)
Piston Speed — ft / min (m / s)		1180 (6.0)		1180 (6.0)
Friction Horsepower — HP (kW_m)		11 (8.2)		11 (8.2)
Engine Water Flow at Stated Friction Head External to Engine:				
• 1 psi Friction Head — US gpm (liter / s)		35 (2.2)		35 (2.2)
• Maximum Friction Head — US gpm (liter / s)		26 (1.6)		26 (1.6)
Engine Data with Dry Type Exhaust Manifold				
Intake Air Flow — cfm (liter / s)		152 (70.8)		148 (68.9)
Exhaust Gas Temperature — °F (°C)		940 (505)		890 (475)
Exhaust Gas Flow — cfm (liter / s)		377 (178)		352 (166)
Air to Fuel Ratio — air : fuel		20 : 1		22 : 1
Radiated Heat to Ambient — BTU / min (kW_m)		775 (13.6)		715 (12.6)
Heat Rejection to Coolant — BTU / min (kW_m)		2175 (38.2)		1980 (34.8)
Heat Rejection to Exhaust — BTU / min (kW_m)		2835 (49.8)		2588 (45.5)
	For 60 hz, see 4BTA3.9-G2 Data Sheet DS-90235		**For 60 hz, see 4BTA3.9-G2 Data Sheet DS-90235**	

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

•• **PRELIMINARY** ••

ENGINE MODEL : **4BTA3.9-G1**
DATA SHEET : DS-90234
DATE : 19Aug04
CURVE NO. : FR-90234