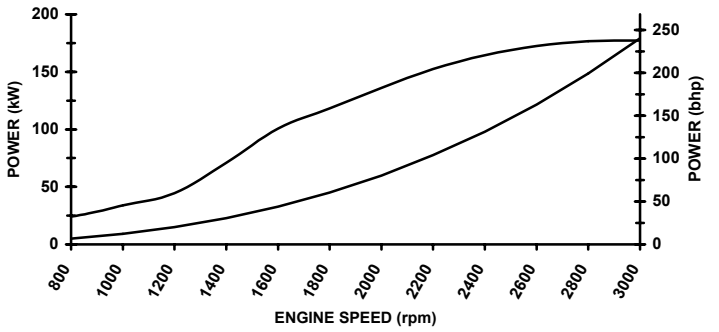
CUMMINS MERCRUISER DIESEL Charleston, SC 29405 Marine Performance Curves	Basic Engine Model: **4B-250**	Curve Number: **M-90231**	
	Engine Configuration: **D383015MX02**	CPL Code: **2197**	Date: **17-Aug-04**

Displacement: **3.9 liter [239 in^3]**
Bore: **102 mm [4.02 in]**
Stroke: **120 mm [4.72 in]**
Fuel System: **Inline Bosch P7100**
Cylinders: **4**

kW [bhp, mhp] @ rpm
Advertised Power: **179 [240, 250] @ 3000**

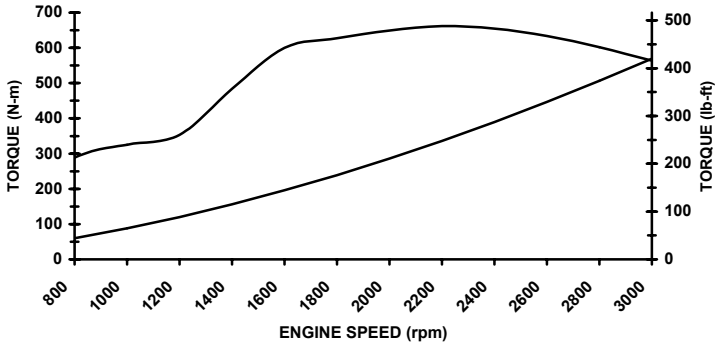
Aspiration: **Turbocharged / Sea Water Aftercooled**
Rating Type: **High Output**

CERTIFIED: This marine diesel engine conforms with the NOx requirements of the International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13 as applicable.



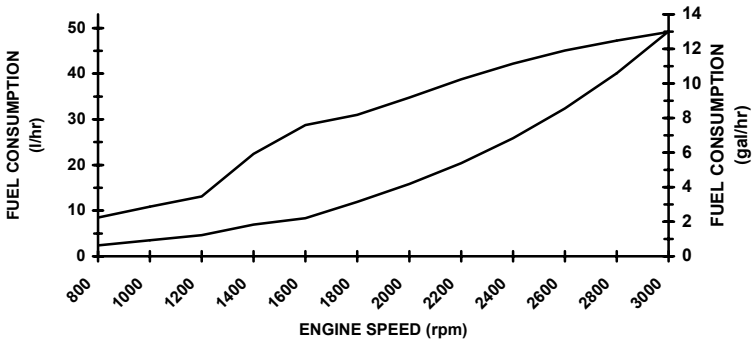
RATED POWER OUTPUT CURVE

rpm	kW	bhp
3000	179	240
2800	177	237
2600	173	231
2400	165	221
2200	153	204
2000	136	182
1800	118	158
1600	101	135
1400	71	95
1200	44	60
1000	34	46
800	24	32



FULL LOAD TORQUE CURVE

rpm	N-m	lb-ft
3000	570	420
2800	602	444
2600	633	467
2400	654	483
2200	662	488
2000	650	479
1800	627	462
1600	600	443
1400	484	357
1200	353	261
1000	325	240
800	289	213



FUEL CONSUMPTION - PROP CURVE

rpm	l/hr	gal/hr
3000	49.3	13.0
2800	40.1	10.6
2600	32.4	8.6
2400	25.8	6.8
2200	20.4	5.4
2000	15.8	4.2
1800	12.0	3.2
1600	8.3	2.2
1400	6.9	1.8
1200	4.7	1.2
1000	3.5	0.9
800	2.4	0.6

Rated Conditions: Ratings are based upon ISO 8665 and SAE J1228 reference conditions; air pressure of 100 kPa [29.612 in Hg], air temperature 25 ^{0}C [77^{0}F], and 30% relative humidy. Power is in accordance with IMCI procedure. Member NMMA.

Rated Curves (upper) represents rated power at the crankshaft for mature gross engine performance capabilities obtained and corrected in accordance with ISO 3046. Propeller Curve (lower) is based on a typical fixed propeller demand curve using a 2.7 exponent. Propeller Shaft Power is approximately 3% less than rated crankshaft power after typical reverse/reduction gear losses and may vary depending on the type of gear or propulsion system used.

Fuel Consumption is based on fuel of 35 $^{\circ}$ API gravity at 16°C [60°F) having LHV of 42,780 kj/kg [18390 Btu/lb] and weighing 838.9 g/liter [7.001 lb/U.s. gal].

High Output Rating: Intended for use in variable load applications where full power is limited to one (1) hour out of every eight (8) hours of operation. Also, reduced power must be at or below 200 rpm of the maximum rated rpm. This power rating is for pleasure/non-revenue generating applications that operate 300 hours per year or less.

CHIEF ENGINEER

Marine Engine Performance Data

Curve No. M-90231
DS-4959
CPL: 2197
DATE: 17Aug04

General Engine Data

Engine Model		4B-250
Rating Type		High Output
Rated Engine Power	kW [bhp]	179 [240]
Rated Engine Speed	rpm	3000
Rated HP Production Tolerance	%	± 5
Rated Engine Torque	N•m [ft•lb]	570 [420]
Peak Engine Torque @ 2200 rpm	N•m [ft•lb]	662 [488]
Brake Mean Effective Pressure	kPa [psi]	1828 [265]
Indicated Mean Effective Pressure	kPa [psi]	N.A.
Minimum Idle Speed Setting	rpm	650
Normal Idle Speed Variation	rpm	± 25
High Idle Speed Range Minimum	rpm	3100
Maximum	rpm	3400
Maximum Allowable Engine Speed	rpm	N/A
Maximum Torque Capacity from Front of Crank[2]	N•m [ft•lb]	N/A
Compression Ratio		15.3:1
Piston Speed	m/sec [ft/min]	12.0 [2360]
Firing Order		1-3-4-2
Weight (Dry) Engine With Heat Exchanger System - Average	kg [lb]	454 [1001]

Exhaust System[1]

Exhaust Gas Flow	l/sec [cfm]	N.A.
Exhaust Gas Temperature (Turbine Out)	°C [°F]	482 [900]
Exhaust Gas Temperature (Manifold)	°C [°F]	N.A.

Fuel System[1]

Fuel Consumption @ Rated Speed	l/hr [gal/hr]	49.3 [13.0]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	269 [71]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	N.A.
Approximate Fuel Return to Tank Temperature	°C [°F]	N.A.]
Maximum Heat Rejection to Drain Fuel[5]	kW [Btu/min]	N.A.
Fuel Transfer Pump Pressure Range	kPa [psi]	152 [22]

Air System1

Intake Manifold Pressure	kPa [in Hg]	196 [58]
Intake Air Flow	l/sec [cfm]	227 [480]
Heat Rejection to Ambient	kW [Btu/min]	39 [2200]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen)	g/kw·hr [g/hp·hr]	8.27 [6.17]
HC (Hydrocarbons)	g/kw·hr [g/hp·hr]	0..07 [0.05]
CO (Carbon Monoxide)	g/kw·hr [g/hp·hr]	0.94 [0.70]
PM (Particulate Matter)	g/kw·hr [g/hp·hr]	0.19 [0.14]

Cooling System[1]

Sea Water Pump Specifications	MAB 0.08.17-07/16/2001	
Pressure Cap Rating (With Heat Exchanger Option)	kPa [psi]	103 [15]

Engines with Standard Aftercooling

Coolant Flow to Engine Heat Exchanger/Keel Cooler	l/min [gal/min]	161 [43]
Standard Thermostat Operating Range Start to Open	°C [°F]	83 [181]
Full Open	°C [°F]	95 [203]
Heat Rejection to Engine Coolant[3]	kW [Btu/min]	112 [6400]

TBD = To Be Decided **N/A = Not Applicable** **N.A. = Not Available**

[1]All Data at Rated Conditions
[2]Consult Installation Direction Booklet for Limitations
[3]Heat rejection values are based on 50% water/ 50% ethylene glycol mix and do NOT include fouling factors. If sourcing your own cooler, a service fouling factor should be applied according to the cooler manufacturer's recommendation.
[4]Consult option notes for flow specifications of optional Cummins seawater pumps, if applicable.
[5]May not be at rated load and speed. Maximum heat rejection may occur at other than rated conditions.

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