



CUMMINS INC.
Columbus, IN 47201
Marine Performance Curves

Basic Engine Model
QSK38-M Tier 2

Curve Number:
M-6668

Engine Configuration
D233041MX03

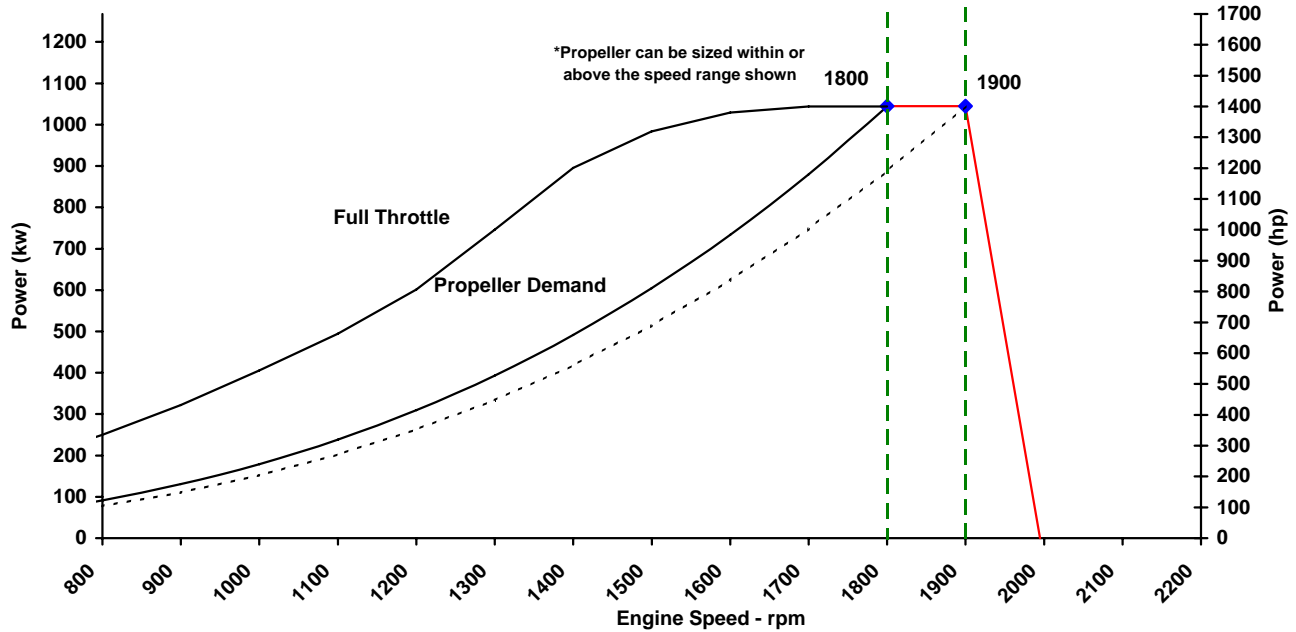
CPL Code:
CPL 0847

Date:
17-Mar-09

Displacement: **38.0 liter** [2300 in³]
Bore: **159 mm** [6.25 in]
Stroke: **159 mm** [6.25 in]
Fuel System: **MCRS**
Cylinders: **12**
Rated Power: **1044 kw** [1400 bhp]
Rated Speed: **1800 rpm**
Rating Type: **Heavy Duty**
Aspiration: **Turbocharged / Low Temperature Aftercooled**

CERTIFIED: This diesel engine complies with or is certified to the following agencies requirements:

IMO - NOx requirements of the International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13
EPA Tier 2 - Model year requirements of the EPA marine regulation (40CFR94)
EU Stage IIIa - EC Nonroad Mobile Machinery Directive (2004/26/EC)



Speed	Full Throttle- Power		Full Throttle- Torque		Fuel Cons.- Prop. Curve 3.0 Exp.	
	rpm	kw (hp)	N-m (ft-lb)	L/hr (gal/hr)		
1900	1044	(1400)	5538	(4085)	266.3	(70.4)
1800	1044	(1400)	5538	(4085)	223.5	(59.0)
1700	1044	(1400)	5864	(4325)	188.4	(49.8)
1600	1030	(1380)	6142	(4530)	160.8	(42.5)
1500	984	(1319)	6261	(4618)	135.0	(35.7)
1400	895	(1200)	6105	(4503)	108.9	(28.8)
1300	746	(1000)	5479	(4041)	87.4	(23.1)
1200	602	(807)	4787	(3531)	68.1	(18.0)
1100	495	(663)	4294	(3167)	51.6	(13.6)
1000	406	(544)	3875	(2858)	38.1	(10.1)
900	322	(431)	3413	(2517)	27.5	(7.3)
800	250	(335)	2980	(2198)	19.4	(5.1)
700	187	(251)	2553	(1883)		

* Cummins Full Throttle Requirements:

- Engine achieves or exceeds rated rpm at full throttle under any steady operating condition
- Engines in variable displacement boats (such as pushboats, tugboats, net dragners, etc.) achieve no less than 100 rpm below rated speed at full throttle during a dead push or bollard pull
- Engine achieves or exceeds rated rpm when accelerating from idle to full throttle

Rated Conditions: Ratings are based upon ISO 15550 reference conditions; air pressure of 100 kPa [29.612 in Hg], air temperature 25deg. C [77 deg. F] and 30% relative humidity. Power is in accordance with IMCI procedure. Member NMMA. Unless otherwise specified, all data is at rated power conditions and can vary ± 5%.

Full Throttle curve represents power at the crankshaft for mature gross engine performance corrected in accordance with ISO 15550. Propeller Curve represents approximate power demand from a typical propeller. 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 deg. API gravity at 16 deg C [60 deg. F] having LHV of 42,780 kJ/kg [18390 Btu/lb] and weighing 838.9 g/liter [7.001 lb/U.S. gal].

Heavy Duty (HD): Intended for continuous use in variable load applications where full power is limited to eight (8) hours out of every ten (10) hours of operation. Also, reduced power operations must be at or below 200 rpm of the maximum rated rpm. This is an ISO 15550 fuel stop power rating and is for applications that operate 5,000 hours per year or less.

CHIEF ENGINEER

Propulsion Marine Engine Performance Data

Curve No. M-6668
DS : D23-MX-1
CPL : CPL 0847
DATE: 17-Mar-09

General Engine Data

Engine Model	QS38-M Tier 2
Rating Type	Heavy Duty
Rated Engine Power	1044 [1400]
Rated Engine Speed	1800
Rated Power Production Tolerance	-3/+5
Rated Engine Torque	5538 [4085]
Peak Engine Torque @ 1500 rpm.....	6275 [4628]
Brake Mean Effective Pressure	1847 [268]
Indicated Mean Effective Pressure.....	2109 [306]
Maximum Allowable Engine Speed	2400
Maximum Torque Capacity from Front of Crank ²	3164 [2334]
Compression Ratio	15:1
Piston Speed	9.5 [1875]
Firing Order	2-11-10-3-6-7-12-1-4-9-8-5
Weight (Dry) - Engine Only - Average	5205 [11475]
Weight (Dry) - Engine With Heat Exchanger System - Average.....	5450 [12015]
Weight Tolerance (Dry) Engine Only	3xStd Dev (±%) 8.5

Governor Settings

Default Droop Value.....	Refer to MAB 2.04.00-03/23/2006 for Droop explanation	5%
Minimum Droop Allowed.....		0%
Maximum Droop Allowed.....		16%
High Speed Governor Break Point.....		1900
Minimum Idle Speed Setting		650
Normal Idle Speed Variation		±rpm 10
High Idle Speed Range Minimum		1900
High Idle Speed Range Maximum		1995

Noise and Vibration

Average Noise Level - Top	(Idle)..	dBa @ 1m	TBD
	(Rated)	dBa @ 1m	TBD
Average Noise Level - Right Side	(Idle)..	dBa @ 1m	TBD
	(Rated)	dBa @ 1m	TBD
Average Noise Level - Left Side	(Idle)..	dBa @ 1m	TBD
	(Rated)	dBa @ 1m	TBD
Average Noise Level - Front	(Idle)..	dBa @ 1m	TBD
	(Rated)	dBa @ 1m	TBD

Fuel System¹

Avg. Fuel Consumption - ISO 8178 E3 Standard Test Cycle	l/hr [gal/hr]	188.0 [49.7]
Fuel Consumption at Rated Speed	l/hr [gal/hr]	266.8 [70.5]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	579.2 [153.0]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60.0 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	312.4 [82.5]
Approximate Fuel Return to Tank Temperature	°C [°F]	53.9 [129]
Maximum Heat Rejection to Drain Fuel	kW [Btu/min]	2.2 [126]

TBD= To Be Determined

N/A = Not Applicable

N.A. = Not Available

¹ Unless otherwise specified, all data is at rated power conditions and can vary ± 5%.

² No rear loads can be applied when the FPTO is fully loaded. Max PTO torque is contingent on torsional analysis results for the specific drive system. Consult Installation Direction Booklet for Limitations.

³ Heat rejection to coolant 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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Propulsion Marine Engine Performance Data

Curve No. M-6668
DS : D23-MX-1
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Air System¹

Intake Manifold Pressure	kPa [in Hg]	227 [67]
Intake Air Flow	l/sec [cfm]	1555 [3295]
Heat Rejection to Ambient	kW [Btu/min]	39 [2229]

Exhaust System¹

Exhaust Gas Flow	l/sec [cfm]	3213 [6,807]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	365 [689]
Exhaust Gas Temperature (Manifold)	°C [°F]	570 [1,058]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	6.57 [4.90]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.14 [0.10]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	1.19 [0.89]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.15 [0.11]

Cooling System¹

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

Engines with Low Temperature Aftercooling (LTA)

Two Loop LTA (For both 1 & 2 pump systems)

Main Engine Circuit

Coolant Flow to Main Cooler (with blocked open thermostat).....	l/min [gal/min]	1128 [298]
Standard Thermostat Operating Range	Start to open.....°C [°F]	82 [180]
	Full open.....°C [°F]	95 [202]
Heat Rejection to Engine Coolant ³	kW [Btu/min]	544 [30947]

Aftercooler (LTA) Circuit

Coolant Flow to LTA Cooler (with blocked open thermostat).....	l/min [gal/min]	598 [158]
LTA Thermostat Operating Range	Start to open.....°C [°F]	46 [115]
	Full open.....°C [°F]	57 [135]
Heat Rejection to Engine Coolant ³	kW [Btu/min]	255 [14529]
Maximum Coolant Inlet Temperature from LTA Cooler.....	°C [°F]	49 [120]

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- ³ Heat rejection to coolant 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.
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