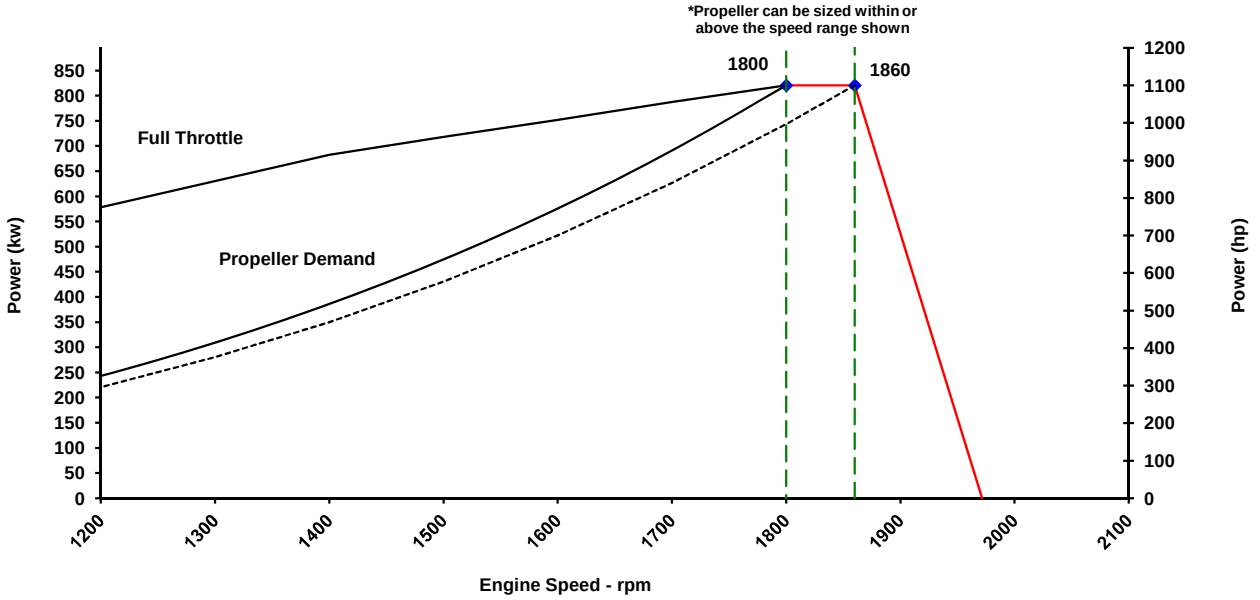
CCEC	CHONGQING CUMMINS ENGINE CO.,Ltd. CHONGQING, P.R.CHINA, 400031 Marine Performance Curves	Basic Engine Model **K38-M**	Curve Number: **M-691**	
		Engine Configuration **D233034MX02**	CPL Code: **CQ613**	Date: **4-Nov-11**

Displacement:	**37.9 liter**	**[2312 in³]**	
Bore:	**159 mm**	**[6.26 in]**	
Stroke:	**159 mm**	**[6.26 in]**	
Cylinders:	**12**		
Fuel System:	**PT (V.S/AFC)**		
Rated Power:	**821 kw**	**[1100 bhp]**	
Rated Speed:	**1800 rpm**		
Rating Type:	**Heavy Duty**		
Aspiration:	**Turbocharged / LTA**		

CERTIFIED: This diesel engine complies with or is certified to the following agencies requirements:
IMO Tier I NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13



Speed	Full Throttle				Propeller Demand					
	Power		Torque		Power		Torque		Fuel Consumption	
rpm	kw	(hp)	N·m	(ft-lb)	kw	(hp)	N·m	(ft-lb)	L/hr	(gal/hr)
1860	820	(1100)	4212	(3210)						
1800	820	(1100)	4352	(3210)	820	(1,100.0)	4352	(3210)	209.7	(55.4)
1700	787	(1056)	4422	(3262)	691	(926.7)	3882	(2863)	178.7	(47.2)
1600	752	(1008)	4487	(3309)	576	(772.6)	3438	(2536)	154.8	(40.9)
1500	718	(963)	4572	(3372)	475	(636.6)	3022	(2229)	128.7	(34)
1400	682	(915)	4654	(3433)	386	(517.6)	2633	(1942)	109.8	(29)
1300	630	(845)	4630	(3415)	309	(414.4)	2270	(1674)	85.9	(22.7)
1200	578	(775)	4598	(3391)	243	(325.9)	1933	(1426)	66.6	(17.6)
1100					187	(251.0)	1626	(1199)		
1000					141	(188.6)	1344	(991)		
900					103	(137.5)	1087	(802)		
800					72	(96.6)	860	(634)		

*** 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 draggers, 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 humidy. Member NMMA. Unless otherwise specified, tolerance on all values is +/-5%. Values from engine control modules and displayed on instrument panels are not absolute. Tolerance varies, but is generally less than +/-5% when operating within 30% of rated power.

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-691**
DS :	**4983**
CPL :	**CQ613**
DATE:	**4-Nov-11**

General Engine Data		
Engine Model	K38-M	
Rating Type	Heavy Duty	
Rated Engine Power ...kW [hp]	821	[1100]
Rated Engine Speed ...rpm	1800	
Rated Power Production Tolerance ...±%	3	
Rated Engine Torque ...N·m [lb·ft]	4352	[3210]
Peak Engine Torque @ 1400 rpm ...N·m [lb·ft]	4654	[3433]
Brake Mean Effective Pressure ...kPa [psi]	1443	[209]
Indicated Mean Effective Pressure ...kPa [psi]		[N.A.]
Maximum Allowable Engine Speed ...rpm	2375	
Maximum Continuous Torque Capacity from Front of Crank Specifications		
Maximum Torque Capacity from Front of Crank[2] ...N·m [lb·ft]	4341	[3202]
Compression Ratio	14.5:1	
Piston Speed ...m/sec [ft/min]	9.5	[1878]
Firing Order	1R-6L-5R-2L-3R-4L-6R-1L-2R-5L-4R-3L	
Weight (Dry) - Engine Only - Average ...kg [lb]	4218	[9300]
Weight (Dry) - Engine With Heat Exchanger System - Average ...kg [lb]	4538	[10005]
Weight Tolerance (Dry) Engine Only ...3xStd Dev(±%)	3.8	
Governor Settings		
Default Droop Value ...Refer to MAB 2.04.00-03/23/2006 for Droop explanation	6%	
Maximum Droop Allowed	16%	
High Speed Governor Break Point ...rpm	1860	
Minimum Idle Speed Setting ...rpm	575	
Normal Idle Speed Variation ...±rpm	25	
High Idle Speed Range Minimum ...rpm	1860	
Maximum ...rpm	1972	

Noise and Vibration			
Average Noise Level - Top	(Idle) ...dBA @ 1m	N.A.	
	(Rated) ...dBA @ 1m	N.A.	
Average Noise Level - Right Side	(Idle) ...dBA @ 1m	N.A.	
	(Rated) ...dBA @ 1m	N.A.	
Average Noise Level - Left Side	(Idle) ...dBA @ 1m	N.A.	
	(Rated) ...dBA @ 1m	N.A.	
Average Noise Level - Front	(Idle) ...dBA @ 1m	N.A.	
	(Rated) ...dBA @ 1m	N.A.	

Fuel System[1]		
Avg. Fuel Consumption - ISO 8178 E3 Standard Test Cycle ...l/hr [gal/hr]	145.6	[38.5]
Fuel Consumption at Rated Speed ...l/hr [gal/hr]	209.8	[55.4]
Approximate Fuel Flow to Pump ...l/hr [gal/hr]	419.7	[110.9]
Maximum Allowable Fuel Supply to Pump Temperature ...°C [°F]	60.0	[140]
Approximate Fuel Flow Return to Tank ...l/hr [gal/hr]	209.8	[55.4]
Approximate Fuel Return to Tank Temperature ...°C [°F]	71.2	[160]
Maximum Heat Rejection to Drain Fuel ...kW [Btu/min]	2.3	[131]
Fuel Pressure - Pump Out/Rail ..Mechanical Gauge ...kPa [psi]	1276	[185]
INSITE Reading ...kPa [psi]	N.A.	

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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CHONGQING, P.R.CHINA, 400031

Propulsion Marine Engine Performance Data

Curve No.	**M-691**
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Air System[1]		
Intake Manifold Pressure	kPa [in Hg]	183 [54]
Intake Air Flow	l/sec [cfm]	1272 [2695]
Heat Rejection to Ambient	kW [Btu/min]	78 [4440]
Exhaust System[1]		
Exhaust Gas Flow	l/sec [cfm]	2978 [6,311]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	444 [830]
Exhaust Gas Temperature (Manifold)	°C [°F]	N.A.
Emissions (in accordance with ISO 8178 Cycle E3)		
NOx (Oxides of Nitrogen)	g/kw·hr [g/hp·hr]	6.49 [4.84]
HC (Hydrocarbons)	g/kw·hr [g/hp·hr]	N.A.
CO (Carbon Monoxide)	g/kw·hr [g/hp·hr]	N.A.
Emissions (in accordance with ISO 8178 Cycle E2)		
NOx (Oxides of Nitrogen)	g/kw·hr [g/hp·hr]	N.A.
HC (Hydrocarbons)	g/kw·hr [g/hp·hr]	N.A.
CO (Carbon Monoxide)	g/kw·hr [g/hp·hr]	N.A.
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]
Max. Pressure Drop Across Any External Cooling System Circuit	kPa [psi]	34 [5]
Engines with Low Temperature Aftercooling (LTA)		
Main Engine Circuit		
Coolant Flow to Main Cooler (with blocked open thermostat)	l/min [gal/min]	1117 [295]
Standard Thermostat Operating Range — Start to open	°C [°F]	82 [180]
Standard Thermostat Operating Range — Full open	°C [°F]	95 [202]
Heat Rejection to Engine Coolant[3]	kW [Btu/min]	365 [20800]
Aftercooler (LTA) Circuit		
Coolant Flow to LTA Cooler (with blocked open thermostat)	l/min [gal/min]	288 [76]
LTA Thermostat Operating Range — Start to open	°C [°F]	66 [150]
LTA Thermostat Operating Range — Full open	°C [°F]	80 [175]
Heat Rejection to Engine Coolant[3]	kW [Btu/min]	140 [7970]
Maximum Coolant Inlet Temperature from LTA Cooler	°C [°F]	63 [145]

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4 **Consult option notes for flow specifications of optional Cummins seawater pumps, if applicable.**
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