



CUMMINS INC.
Columbus, IN 47201
Marine Performance Curves
marine.cummins.com

Basic Engine Model
QSM11-M-355 CON
Engine Configuration
D353021MX03

Curve Number:
M-20777
CPL Code:
4334
Date:
27-Oct-16

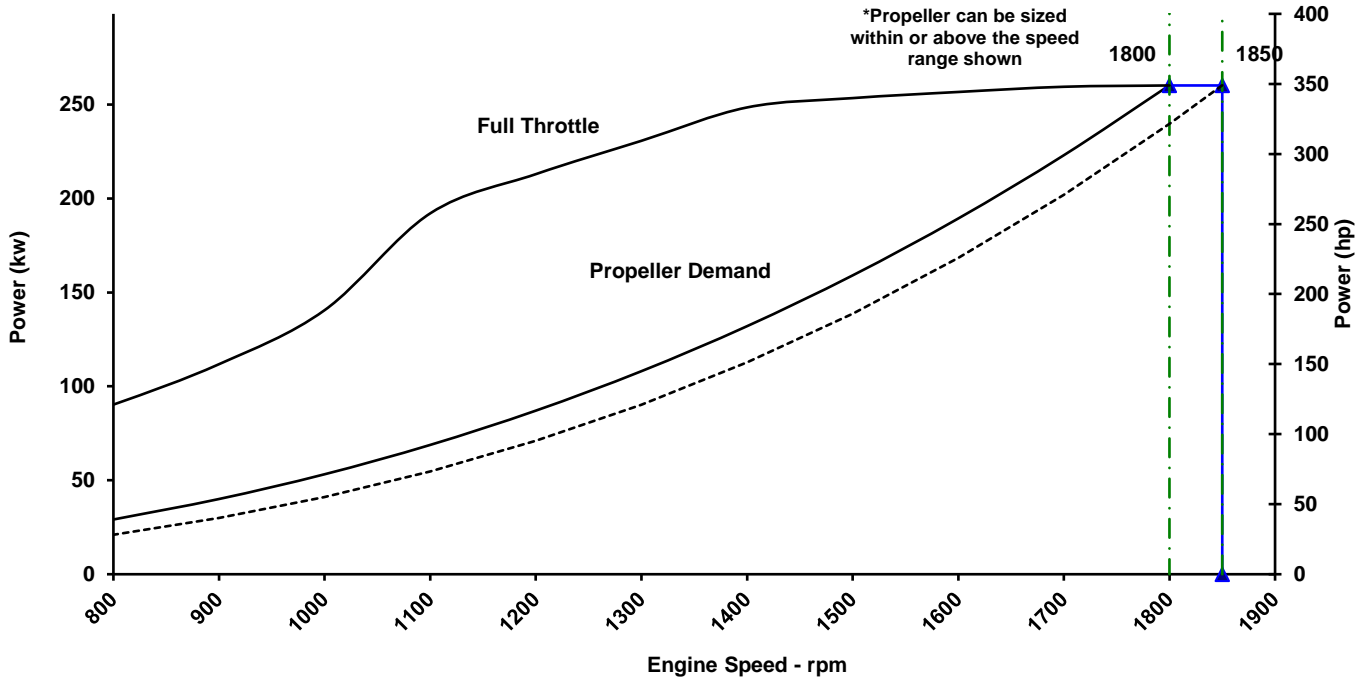
Displacement: **10.8 liter [661 in³]** Rated Power: **260 kw [349 bhp, 355 mhp]**
Bore: **125 mm [4.92 in]** Rated Speed: **1800 rpm**
Stroke: **147 mm [5.79 in]** Rating Type: **Continuous Duty**
Fuel System: **CELECT** Aspiration: **Turbocharged / Sea Water Aftercooled**
Cylinders: **6**

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

EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)

EU Stage IIIa - EC Nonroad Mobile Machinery Directive (2004/26/EC)

IMO Tier II - Tier 2 (Two) NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13



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)		
1850	260	(349)	1343	(990)		
1800	260	(349)	1380	(1018)	67.6	(17.9)
1700	259	(348)	1457	(1075)	55.8	(14.7)
1600	257	(344)	1532	(1130)	46.3	(12.2)
1500	253	(340)	1613	(1190)	38.3	(10.1)
1400	248	(333)	1695	(1250)	31.2	(8.2)
1300	231	(309)	1695	(1250)	25.0	(6.6)
1200	213	(286)	1695	(1250)	19.8	(5.2)
1100	192	(258)	1668	(1230)	15.5	(4.1)

* 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, tolerance on all values is +/-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].

Continuous Rating (CON): Intended for continuous use in applications requiring uninterrupted service at full power. This rating is an ISO 15550 standard power rating.

TECHNICAL DEPT.

CHIEF ENGINEER

Propulsion Marine Engine Performance Data

Curve No. M-20777
 DS : 3075
 CPL : 4334
 DATE: 27-Oct-16

General Engine Data

Engine Model	QSM11-M-355 CON
Rating Type	Continuous Duty
Rated Engine Power	260 [349]
Rated Engine Speed	1800
Rated Power Production Tolerance	5
Rated Engine Torque	1381 [1018]
Peak Engine Torque @ 1200 rpm.....	1695 [1250]
Brake Mean Effective Pressure	1603 [232]
Indicated Mean Effective Pressure.....	1782 [258]
Maximum Allowable Engine Speed	1860
Maximum Torque Capacity from Front of Crank ²	847 [625]
Compression Ratio	15.9:1
Piston Speed	8.8 [1736]
Firing Order	1-5-3-6-2-4
Weight (Dry) - Engine Only - Average	1118 [2464]
Weight (Dry) - Engine With Heat Exchanger System - Average.....	1184 [2610]

Governor Settings

High Speed Governor Break Point.....	1850
Minimum Idle Speed Setting	600
Normal Idle Speed Variation	10
High Idle Speed Range Minimum	1840
Maximum	1860

Noise and Vibration

Average Noise Level - Top (Idle).....	80
(Rated)	95
Average Noise Level - Right Side (Idle).....	80
(Rated)	95
Average Noise Level - Left Side (Idle).....	80
(Rated)	95
Average Noise Level - Front (Idle).....	80
(Rated)	95

Fuel System¹

Avg. Fuel Consumption - ISO 8178 E3 Standard Test Cycle	46.1 [12.2]
Fuel Consumption at Rated Speed	67.6 [17.9]
Approximate Fuel Flow to Pump	219.6 [58.0]
Maximum Allowable Fuel Supply to Pump Temperature	60.0 [140]
Approximate Fuel Flow Return to Tank	152.0 [40.1]
Approximate Fuel Return to Tank Temperature	71.2 [160]
Maximum Heat Rejection to Drain Fuel	2.4 [138]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	1103 [160]

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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COLUMBUS, INDIANA

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Propulsion Marine Engine Performance Data

Curve No. M-20777
 DS : 3075
 CPL : 4334
 DATE: 27-Oct-16

Air System¹

Intake Manifold Pressure	kPa [in Hg]	169 [50]
Intake Air Flow	l/sec [cfm]	399 [845]
Heat Rejection to Ambient	kW [Btu/min]	19 [1094]

Exhaust System¹

Exhaust Gas Flow	l/sec [cfm]	755 [1600]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	385 [724]
Exhaust Gas Temperature (Manifold)	°C [°F]	559 [1038]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	4.90 [3.65]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.31 [0.23]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	0.34 [0.25]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.02 [0.02]

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 without Low Temperature Aftercooling (LTA)

Sea Water Aftercooled Engine (SWAC)

Coolant Flow to Engine Heat Exchanger	l/min [gal/min]	181 [47.9]
Standard Thermostat Operating Range (Start to Open)	°C [°F]	71 [160]
Standard Thermostat Operating Range (Full Open)	°C [°F]	80 [175]
Heat Rejection to Engine Coolant ³	kW [Btu/min]	258 [14700]

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

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CUMMINS INC.
Columbus, IN 47201
Marine Performance Curves
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Basic Engine Model

QSM11-405 HD

Engine Configuration

D353021MX03

Curve Number:

M-20776

CPL Code:

4334

Date:

27-Oct-16

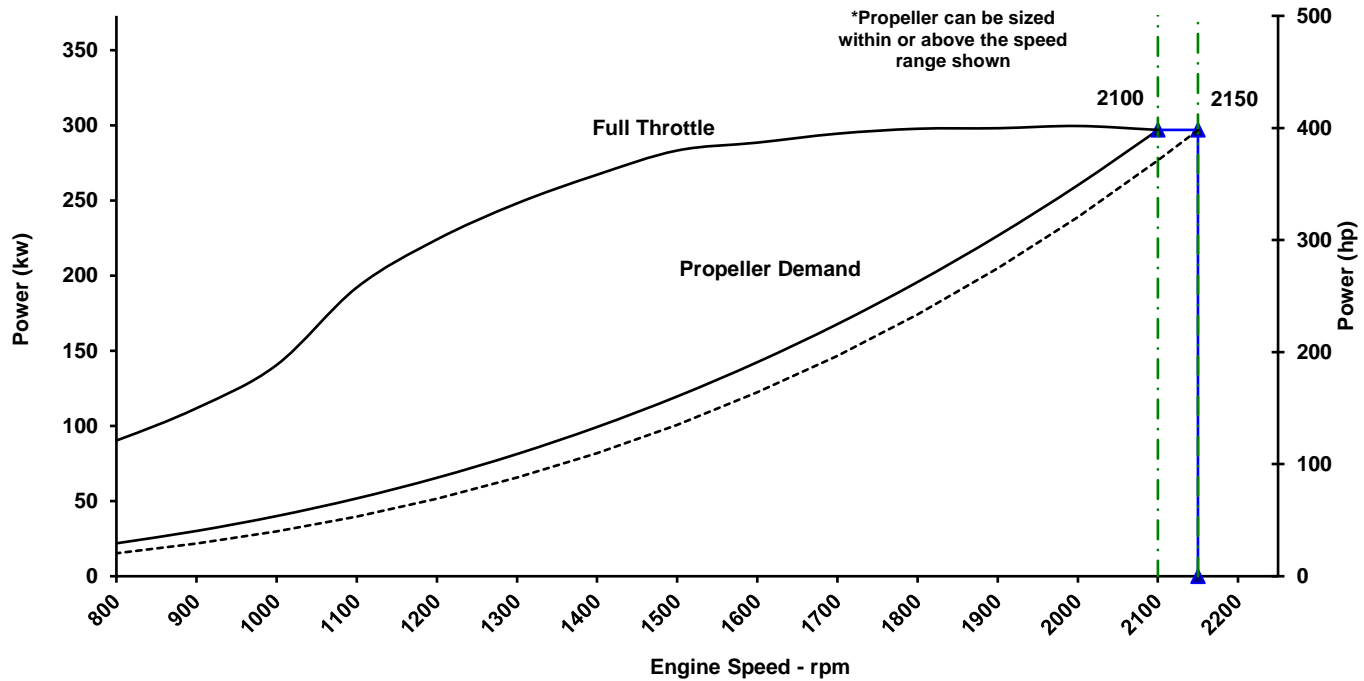
Displacement: **10.8 liter [661 in³]** Rated Power: **297 kw [398 bhp, 405 mhp]**
 Bore: **125 mm [4.92 in]** Rated Speed: **2100 rpm**
 Stroke: **147 mm [5.79 in]** Rating Type: **Heavy Duty**
 Fuel System: **CELECT** Aspiration: **Turbocharged / Sea Water Aftercooled**
 Cylinders: **6**

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

EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)

EU Stage IIIa - EC Nonroad Mobile Machinery Directive (2004/26/EC)

IMO Tier II - Tier 2 (Two) NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13



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)		
2150	297	(398)	1319	(973)		
2100	297	(398)	1350	(996)	80.6	(21.3)
2000	300	(402)	1430	(1055)	67.8	(17.9)
1900	298	(400)	1498	(1105)	58.7	(15.5)
1800	298	(399)	1580	(1165)	49.4	(13.1)
1700	294	(395)	1654	(1220)	40.8	(10.8)
1600	289	(387)	1722	(1270)	34.2	(9.0)
1500	283	(380)	1803	(1330)	28.4	(7.5)
1400	267	(358)	1822	(1344)	23.4	(6.2)
1300	248	(333)	1822	(1344)	19.0	(5.0)
1200	224	(300)	1783	(1315)	15.2	(4.0)
1100	192	(258)	1668	(1230)	12.3	(3.3)

* 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 druggers, 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, tolerance on all values is +/-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.

TECHNICAL DEPT.

CHIEF ENGINEER

Propulsion Marine Engine Performance Data

Curve No. M-20776
 DS : 3075
 CPL : 4334
 DATE: 27-Oct-16

General Engine Data

Engine Model	QSM11-405 HD
Rating Type	Heavy Duty
Rated Engine Power	297 [398]
Rated Engine Speed	2100
Rated Power Production Tolerance	±% 5
Rated Engine Torque	1350 [995]
Peak Engine Torque @ 1300 rpm.....	1822 [1344]
Brake Mean Effective Pressure	1567 [227]
Indicated Mean Effective Pressure.....	1781 [258]
Maximum Allowable Engine Speed	2160
Maximum Torque Capacity from Front of Crank ²	847 [625]
Compression Ratio	15.9:1
Piston Speed	10.3 [2026]
Firing Order	1-5-3-6-2-4
Weight (Dry) - Engine Only - Average	1118 [2464]
Weight (Dry) - Engine With Heat Exchanger System - Average.....	1184 [2610]

Governor Settings

High Speed Governor Break Point.....	rpm	2150
Minimum Idle Speed Setting	rpm	600
Normal Idle Speed Variation	±rpm	10
High Idle Speed Range Minimum	rpm	2140
Maximum	rpm	2160

Noise and Vibration

Average Noise Level - Top	(Idle).....	dBA @ 1m	80
	(Rated)	dBA @ 1m	95
Average Noise Level - Right Side	(Idle).....	dBA @ 1m	80
	(Rated)	dBA @ 1m	95
Average Noise Level - Left Side	(Idle).....	dBA @ 1m	80
	(Rated)	dBA @ 1m	95
Average Noise Level - Front	(Idle).....	dBA @ 1m	80
	(Rated)	dBA @ 1m	95

Fuel System¹

Avg. Fuel Consumption - ISO 8178 E3 Standard Test Cycle	l/hr [gal/hr]	54.3 [14.4]
Fuel Consumption at Rated Speed	l/hr [gal/hr]	80.6 [21.3]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	242.3 [64.0]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60.0 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	161.7 [42.7]
Approximate Fuel Return to Tank Temperature	°C [°F]	71.2 [160]
Maximum Heat Rejection to Drain Fuel	kW [Btu/min]	2.6 [147]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	kPa [psi]	1103 [160]

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.

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Propulsion Marine Engine Performance Data

Curve No. M-20776
 DS : 3075
 CPL : 4334
 DATE: 27-Oct-16

Air System¹

Intake Manifold Pressure	kPa [in Hg]	149 [44]
Intake Air Flow	l/sec [cfm]	387 [820]
Heat Rejection to Ambient	kW [Btu/min]	23 [1287]

Exhaust System¹

Exhaust Gas Flow	l/sec [cfm]	897 [1900]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	348 [658]
Exhaust Gas Temperature (Manifold)	°C [°F]	513 [955]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	4.48 [3.34]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.30 [0.22]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	0.44 [0.33]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.03 [0.02]

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 without Low Temperature Aftercooling (LTA)

Sea Water Aftercooled Engine (SWAC)

Coolant Flow to Engine Heat Exchanger	l/min [gal/min]	238 [62.9]
Standard Thermostat Operating Range (Start to Open)	°C [°F]	71 [160]
Standard Thermostat Operating Range (Full Open)	°C [°F]	80 [175]
Heat Rejection to Engine Coolant ³	kW [Btu/min]	311 [17700]

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Basic Engine Model
QSM11-455 MCD
Engine Configuration
D353021MX03

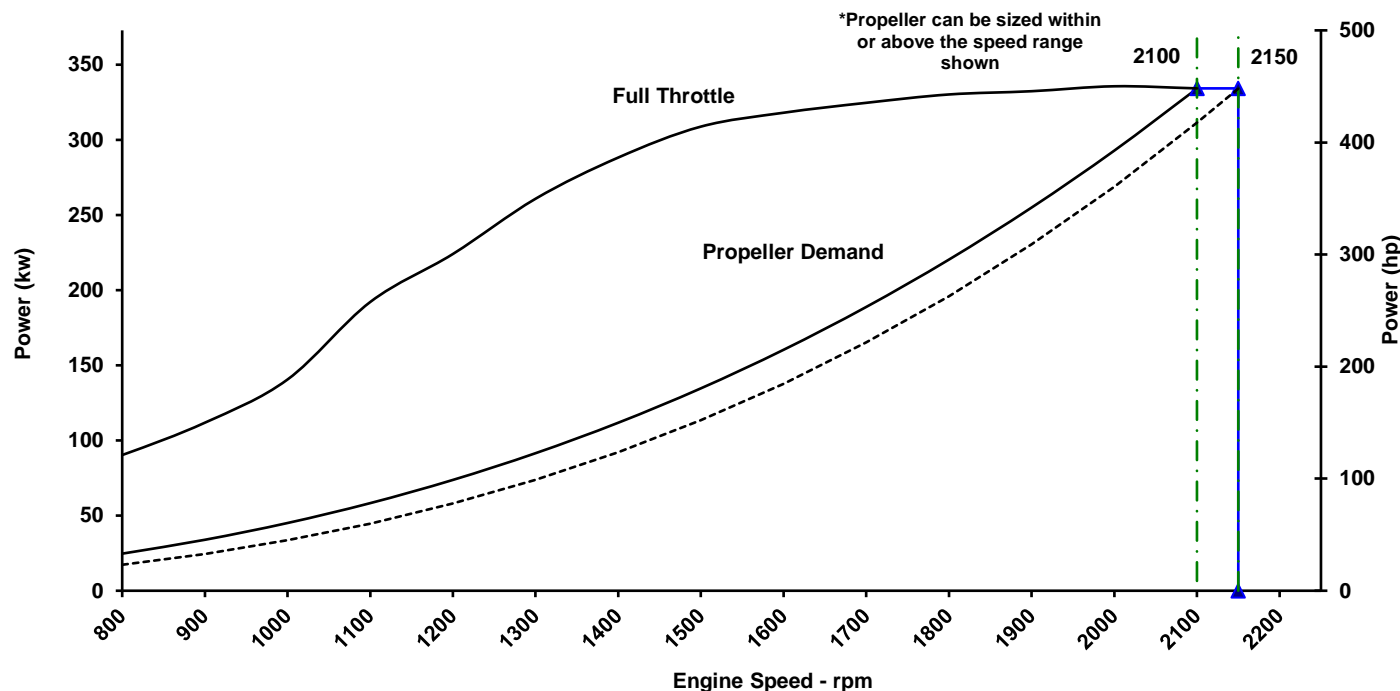
Curve Number:
M 20775

CPL Code:
4334

Date:
5-Nov-18

Displacement: **10.8 liter [661 in³]** Rated Power: **334 kw [448 bhp, 453 mhp]**
 Bore: **125 mm [4.92 in]** Rated Speed: **2100 rpm**
 Stroke: **147 mm [5.79 in]** Rating Type: **Medium Continuous Duty**
 Fuel System: **CELECT** Aspiration: **Turbocharged / Sea Water Aftercooled**
 Cylinders: **6**

CERTIFIED: This diesel engine complies with or is certified to the following agencies requirements:
 EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)
 IMO Tier II (Two) NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13



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)		
2150	334	(448)	1485 (1095)			
2100	334	(448)	1520 (1121)	92.5	(24.4)	
2000	336	(450)	1603 (1182)	77.1	(20.4)	
1900	332	(446)	1670 (1232)	64.6	(17.1)	
1800	330	(443)	1752 (1292)	55.0	(14.5)	
1700	325	(435)	1824 (1345)	45.5	(12.0)	
1600	318	(427)	1898 (1400)	37.8	(10.0)	
1500	309	(414)	1966 (1450)	31.5	(8.3)	
1400	288	(387)	1966 (1450)	25.9	(6.8)	
1300	261	(350)	1916 (1413)	20.6	(5.4)	
1200	224	(300)	1783 (1315)	16.7	(4.4)	
1100	192	(258)	1668 (1230)	13.0	(3.4)	

* 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, tolerance on all values is +/-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].

Medium Continuous (MCD). Intended for continuous use in variable load applications with a power factor of 40-60%. Full power is limited to six out of every 12 hours of operation. Reduced power operation must be at or below 80% load.

CHIEF ENGINEER

Propulsion Marine Engine Performance Data

Curve No. M 20775
DS : 3075
CPL : 4334
DATE: 5-Nov-18

General Engine Data

Engine Model	QSM11-455 MCD	
Rating Type	Medium Continuous Duty	
Rated Engine Power	kW [hp]	334 [448]
Rated Engine Speed	rpm	2100
Rated Power Production Tolerance	±%	5
Rated Engine Torque	N·m [lb·ft]	1519 [1120]
Peak Engine Torque @ 1400 rpm.....	N·m [lb·ft]	1966 [1450]
Brake Mean Effective Pressure	kPa [psi]	1764 [256]
Indicated Mean Effective Pressure.....	kPa [psi]	1977 [287]
Maximum Allowable Engine Speed	rpm	2160
Maximum Torque Capacity from Front of Crank ²	N·m [lb·ft]	847 [625]
Compression Ratio	FALSE	15.9:1
Piston Speed	m/sec [ft/min]	10.3 [2026]
Firing Order		1-5-3-6-2-4
Weight (Dry) - Engine Only - Average	kg [lb]	1118 [2464]
Weight (Dry) - Engine With Heat Exchanger System - Average.....	kg [lb]	1184 [2610]

Governor Settings

High Speed Governor Break Point.....	rpm	2150
Minimum Idle Speed Setting	rpm	600
Normal Idle Speed Variation	±rpm	10
High Idle Speed Range Minimum	rpm	2140
Maximum	rpm	2160

Noise and Vibration

Average Noise Level - Top	(Idle).....	dBA @ 1m	80
	(Rated).....	dBA @ 1m	95
Average Noise Level - Right Side	(Idle).....	dBA @ 1m	80
	(Rated).....	dBA @ 1m	95
Average Noise Level - Left Side	(Idle).....	dBA @ 1m	80
	(Rated).....	dBA @ 1m	95
Average Noise Level - Front	(Idle).....	dBA @ 1m	80
	(Rated).....	dBA @ 1m	95

Fuel System¹

Avg. Fuel Consumption - ISO 8178 E3 Standard Test Cycle	l/hr [gal/hr]	60.9 [16.1]
Fuel Consumption at Rated Speed	l/hr [gal/hr]	92.5 [24.4]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	242.3 [64.0]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60.0 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	149.8 [39.6]
Approximate Fuel Return to Tank Temperature	°C [°F]	71.2 [160]
Maximum Heat Rejection to Drain Fuel	kW [Btu/min]	2.4 [136]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	kPa [psi]	1103 [160]

TBD= To Be Determined

N/A = Not Applicable

N.A. = Not Available

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

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Propulsion Marine Engine Performance Data

Curve No. M 20775
 DS : 3075
 CPL : 4334
 DATE: 5-Nov-18

Air System¹

Intake Manifold Pressure	kPa [in Hg]	211 [62]
Intake Air Flow	l/sec [cfm]	481 [1020]
Heat Rejection to Ambient	kW [Btu/min]	26 [1481]

Exhaust System¹

Exhaust Gas Flow	l/sec [cfm]	991 [2100]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	434 [813]
Exhaust Gas Temperature (Manifold)	°C [°F]	649 [1200]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	4.40 [3.28]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.25 [0.19]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	0.47 [0.35]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.03 [0.02]

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 without Low Temperature Aftercooling (LTA)

Sea Water Aftercooled Engine (SWAC)

Coolant Flow to Engine Heat Exchanger	l/min [gal/min]	302 [79.8]
Standard Thermostat Operating Range (Start to Open)	°C [°F]	71 [160]
Standard Thermostat Operating Range (Full Open)	°C [°F]	80 [175]
Heat Rejection to Engine Coolant ³	kW [Btu/min]	358 [20400]

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.

CUMMINS INC.

COLUMBUS, INDIANA

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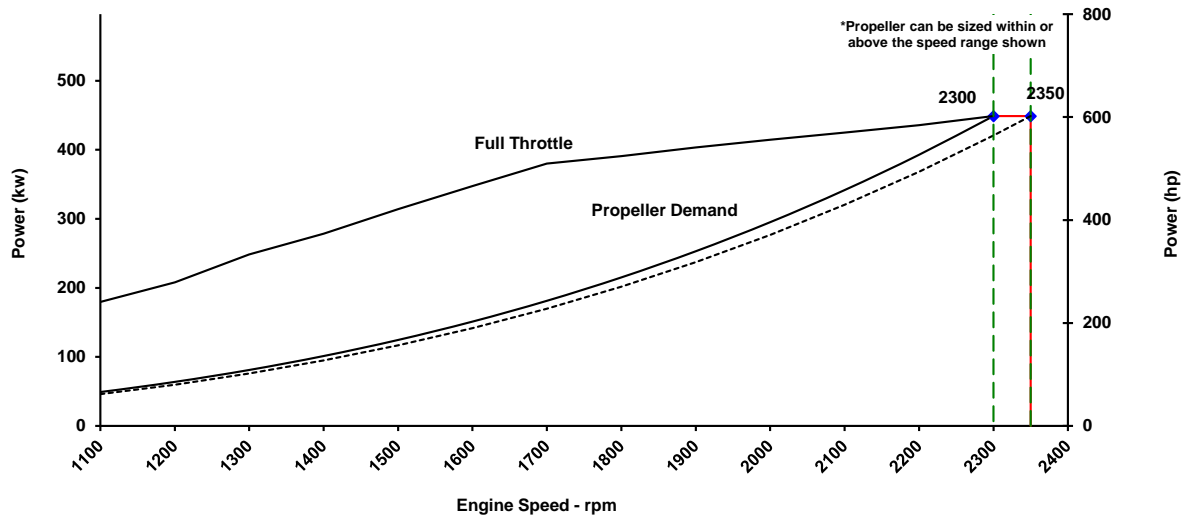
CUMMINS INC.
 Charleston, SC 29405
 Marine Performance Curves
gce.cummins.com

Basic Engine Model QSM11-M	Curve Number: M-21049
Engine Configuration D353013MX03	CPL Code: 5413 Date: 24-Jan-19

Displacement: 10.8 liter [661 in³]	Rated Power: 449 Kw [602 bhp, 610 mhp]
Bore: 125 mm [4.92 in]	Rated Speed: 2300 rpm
Stroke: 147 mm [5.79 in]	Rating Type: High Output
Cylinders: 6	Aspiration: Turbocharged / Sea Water Aftercooled
Fuel System: CELECT	

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

- EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)
- IMO Tier II (Two) NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13
- RCD - meets the requirements of the Recreational Craft Directive 94/25/EC as amended by 2003/44/EC in accordance with ISO 8178-1



Speed rpm	Full Throttle				Propeller Demand					
	Power		Torque		Power		Torque		Fuel Consumption	
	kw	(hp)	N·m	(ft·lb)	kw	(hp)	N·m	(ft·lb)	L/hr	(gal/hr)
2350	449	(602)	1824	(1345)						
2300	449	(602)	1864	(1375)	449	(602.0)	1864	(1,374.7)	112.5	(29.7)
2200	436	(584)	1891	(1395)	393	(526.8)	1705	(1,257.7)	96.7	(25.5)
2100	425	(570)	1932	(1425)	342	(458.2)	1554	(1,146.0)	82.6	(21.8)
2000	415	(556)	1979	(1460)	295	(395.8)	1409	(1,039.4)	71.2	(18.8)
1900	403	(541)	2027	(1495)	253	(339.4)	1272	(938.1)	61.2	(16.2)
1800	391	(524)	2074	(1530)	215	(288.6)	1142	(841.9)	52.2	(13.8)
1700	380	(510)	2135	(1575)	181	(243.1)	1018	(751.0)	45.4	(12.0)
1600	348	(466)	2074	(1530)	151	(202.7)	902	(665.2)	44.6	(11.8)
1500	314	(421)	2000	(1475)	125	(167.0)	793	(584.7)	37.9	(10.0)
1400	278	(373)	1898	(1400)	101	(135.8)	691	(509.3)	31.4	(8.3)
1300	248	(333)	1824	(1345)	81	(108.7)	595	(439.2)	25.7	(6.8)
1200	208	(279)	1654	(1220)	64	(85.5)	507	(374.2)	20.9	(5.5)
1100	180	(241)	1559	(1150)	49	(65.9)	426	(314.4)	16.6	(4.4)
1000	143	(192)	1369	(1010)	37	(49.5)	352	(259.9)	13.2	(3.5)
900	109	(147)	1159	(855)	27	(36.1)	285	(210.5)	10.4	(2.7)
800	80	(107)	956	(705)	19	(25.3)	225	(166.3)	8.0	(2.1)
700	70	(94)	956	(705)	13	(17.0)	173	(127.3)	6.1	(1.6)
600	55	(73)	868	(640)	8	(10.7)	127	(93.5)	4.6	(1.2)

*** Cummins Full Throttle Requirements:**

- Engine achieves or exceeds rated rpm at full throttle under any steady operating condition
- 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. 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].

High Output (HO). Intended for infrequent use in variable load applications with a power factor of 10-30%. Full power is limited to one out of every eight hours of operation. Reduced power operation must be at or below 80% load.

TECHNICAL DATA DEPT.

CHIEF ENGINEER

Propulsion Marine Engine Performance Data

Curve No. M-21049
DS: DS-3021
CPL: 5413
DATE: 24-Jan-19

General Engine Data

Engine Model	QSM11-M
Rating Type	High Output
Rated Engine Power	449 [602]
Rated Engine Speed	2300
Rated Power Production Tolerance	±% 5
Rated Engine Torque	1864 [1375]
Peak Engine Torque @ 1500 rpm.....	2135 [1575]
Brake Mean Effective Pressure	2164 [314]
Indicated Mean Effective Pressure.....	2398 [348]
Maximum Allowable Engine Speed	2360

Maximum Continuous Torque Capacity from Front of Crank Specifications

Maximum Torque Capacity from Front of Crank ²	N·m [lb·ft] 0 [0]
Compression Ratio	16.3:1
Piston Speed	m/sec [ft/min] 11.3 [2219]
Firing Order	1-5-3-6-2-4
Weight (Dry) - Engine With Heat Exchanger System - Average.....	kg [lb] 1188 [2620]

Governor Settings

Default Droop Value.....	Refer to MAB 2.04.00-03/23/2006 for Droop explanation	0%
High Speed Governor Break Point.....	rpm	2350
Minimum Idle Speed Setting	rpm	600
Normal Idle Speed Variation	±rpm	10
High Idle Speed Range Minimum	rpm	2350
Maximum	rpm	2370

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]	75.8 [20.0]
Avg. Fuel Consumption - ISO 8178 E5 Standard Test Cycle	l/hr [gal/hr]	38.5 [10.2]
Fuel Consumption at Rated Speed	l/hr [gal/hr]	112.5 [29.7]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	280.1 [74.0]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60.0 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	159.0 [42.0]
Approximate Fuel Return to Tank Temperature	°C [°F]	93.4 [200]
Maximum Heat Rejection to Drain Fuel	kW [Btu/min]	4.3 [247]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	kPa [psi]	1151 [167]

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.

CUMMINS INC.
COLUMBUS, INDIANA

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<http://qce.cummins.com>

Propulsion Marine Engine Performance Data

Curve No. M-21049
DS: DS-3021
CPL: 5413
DATE: 24-Jan-19

Air System¹

Intake Manifold Pressure	kPa [in Hg]	245 [72]
Intake Air Flow	l/sec [cfm]	678 [1436]
Heat Rejection to Ambient	kW [Btu/min]	35 [1996]

Exhaust System¹

Exhaust Gas Flow	l/sec [cfm]	1549 [3,283]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	496 [924]
Exhaust Gas Temperature (Manifold)	°C [°F]	661 [1,220]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	4.19 [3.13]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.20 [0.15]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	0.52 [0.39]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.08 [0.06]
CO ₂ (Carbon dioxide)	g/kw-hr [g/hp-hr]	620.00 [462.33]

Emissions (in accordance with ISO 8178 Cycle E5)

NOx (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	4.51 [3.36]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.20 [0.15]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	0.58 [0.43]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.08 [0.06]
CO ₂ (Carbon dioxide)	g/kw-hr [g/hp-hr]	626.00 [466.81]

Cooling System¹

Sea Water Pump Specifications	MAB 0.08.17-07/16/2001	
Pressure Cap Rating	kPa [psi]	103 [15]
Max. Coolant Outlet Pressure from the Engine.....	kPa [psi]	414 [60]

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.

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<http://gce.cummins.com>



CUMMINS INC.
 Charleston, SC 29405
 Marine Performance Curves
gce.cummins.com

Basic Engine Model

QSM11-M

Curve Number:

M-21050

Engine Configuration

D353013MX03

CPL Code:

5413

Date:

24-Jan-19

Displacement: **10.8 liter [661 in³]**
 Bore: **125 mm [4.92 in]**
 Stroke: **147 mm [5.79 in]**
 Cylinders: **6**
 Fuel System: **CELECT**

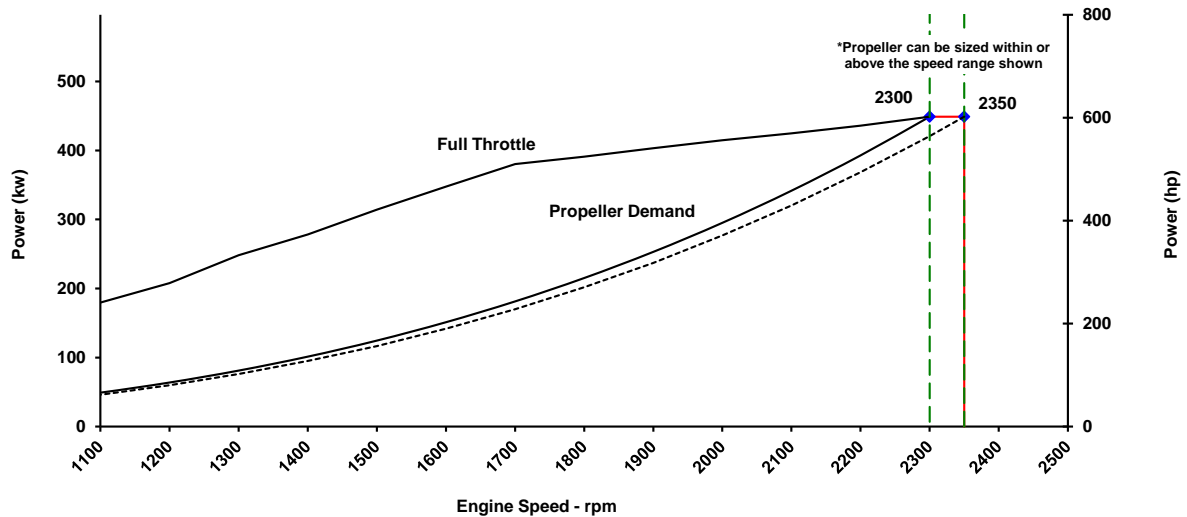
Rated Power: **449 kw [602 bhp, 610 mhp]**
 Rated Speed: **2300 rpm**
 Rating Type: **Intermittent Duty**
 Aspiration: **Turbocharged / Sea Water Aftercooled**

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

EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)

EU Stage IIIa - EC Nonroad Mobile Machinery Directive (2004/26/EC)

IMO Tier II (Two) NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13



Speed rpm	Full Throttle				Propeller Demand					
	Power		Torque		Power		Torque		Fuel Consumption	
	kw	(hp)	N-m	(ft-lb)	kw	(hp)	N-m	(ft-lb)	L/hr	(gal/hr)
2350	449	(602)	1824	(1345)						
2300	449	(602)	1864	(1375)	449	(602.0)	1864	(1,374.7)	112.5	(29.7)
2200	436	(584)	1891	(1395)	393	(526.8)	1705	(1,257.7)	96.7	(25.5)
2100	425	(570)	1932	(1425)	342	(458.2)	1554	(1,146.0)	82.6	(21.8)
2000	415	(556)	1979	(1460)	295	(395.8)	1409	(1,039.4)	71.2	(18.8)
1900	403	(541)	2027	(1495)	253	(339.4)	1272	(938.1)	61.2	(16.2)
1800	391	(524)	2074	(1530)	215	(288.6)	1142	(841.9)	52.2	(13.8)
1700	380	(510)	2135	(1575)	181	(243.1)	1018	(751.0)	45.4	(12.0)
1600	348	(466)	2074	(1530)	151	(202.7)	902	(665.2)	44.6	(11.8)
1500	314	(421)	2000	(1475)	125	(167.0)	793	(584.7)	37.9	(10.0)
1400	278	(373)	1898	(1400)	101	(135.8)	691	(509.3)	31.4	(8.3)
1300	248	(333)	1824	(1345)	81	(108.7)	595	(439.2)	25.7	(6.8)
1200	208	(279)	1654	(1220)	64	(85.5)	507	(374.2)	20.9	(5.5)
1100	180	(241)	1559	(1150)	49	(65.9)	426	(314.4)	16.6	(4.4)
1000	143	(192)	1369	(1010)	37	(49.5)	352	(259.9)	13.2	(3.5)
900	109	(147)	1159	(855)	27	(36.1)	285	(210.5)	10.4	(2.7)
800	80	(107)	956	(705)	19	(25.3)	225	(166.3)	8.0	(2.1)
700	70	(94)	956	(705)	13	(17.0)	173	(127.3)	6.1	(1.6)
600	55	(73)	868	(640)	8	(10.7)	127	(93.5)	4.6	(1.2)

*** 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 druggers, 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. 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].

Intermittent (INT). Intended for intermittent use in variable load applications with a power factor of 20-40%. Full power is limited to two out of every eight hours of operation. Reduced power operations must be at or below 80% load.

Propulsion Marine Engine Performance Data

Curve No. M-21050
DS: DS3021
CPL: 5413
DATE: 24-Jan-19

General Engine Data

Engine Model	QSM11-M
Rating Type	Intermittent Duty
Rated Engine Power	449 [602]
Rated Engine Speed	2300
Rated Power Production Tolerance	±% 5
Rated Engine Torque	1864 [1375]
Peak Engine Torque @ 1700 rpm.....	2135 [1575]
Brake Mean Effective Pressure	2164 [314]
Indicated Mean Effective Pressure.....	2398 [348]
Maximum Allowable Engine Speed	2360

Maximum Continuous Torque Capacity from Front of Crank Specifications

Maximum Torque Capacity from Front of Crank ²	N·m [lb·ft] 0 [0]
Compression Ratio	16.3:1
Piston Speed	m/sec [ft/min] 11.3 [2219]
Firing Order	1-5-3-6-2-4
Weight (Dry) - Engine With Heat Exchanger System - Average.....	kg [lb] 1188 [2620]

Governor Settings

Default Droop Value.....	Refer to MAB 2.04.00-03/23/2006 for Droop explanation	0%
High Speed Governor Break Point.....	rpm	2350
Minimum Idle Speed Setting	rpm	600
Normal Idle Speed Variation	±rpm	10
High Idle Speed Range Minimum	rpm	2350
Maximum	rpm	2370

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]	75.8 [20.0]
Fuel Consumption at Rated Speed	l/hr [gal/hr]	112.5 [29.7]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	280.1 [74.0]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60.0 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	159.0 [42.0]
Approximate Fuel Return to Tank Temperature	°C [°F]	93.4 [200]
Maximum Heat Rejection to Drain Fuel	kW [Btu/min]	4.3 [247]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	kPa [psi]	1151 [167]

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.

CUMMINS INC.
 COLUMBUS, INDIANA

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<http://qce.cummins.com>

Propulsion Marine Engine Performance Data

Curve No. M-21050
DS: DS3021
CPL: 5413
DATE: 24-Jan-19

Air System¹

Intake Manifold Pressure .....	.....kPa [in Hg]	245 [72]
Intake Air Flow .....	.....l/sec [cfm]	678 [1436]
Heat Rejection to Ambient .....	.....kW [Btu/min]	35 [1996]

intermittent (P.T.), intended for intermittent

Exhaust System¹

Exhaust Gas Flow .....	.....l/sec [cfm]	1549 [3,283]
Exhaust Gas Temperature (Turbine Out) .....	.....°C [°F]	496 [924]
Exhaust Gas Temperature (Manifold) .....	.....°C [°F]	661 [1,220]

Emissions (in accordance with ISO 8178 Cycle E3)

NO _x (Oxides of Nitrogen) .....	.....g/kw-hr [g/hp-hr]	4.19 [3.13]
HC (Hydrocarbons) .....	.....g/kw-hr [g/hp-hr]	0.20 [0.15]
CO (Carbon Monoxide) .....	.....g/kw-hr [g/hp-hr]	0.52 [0.39]
PM (Particulate Matter) .....	.....g/kw-hr [g/hp-hr]	0.08 [0.06]
CO ₂ (Carbon dioxide) .....	.....g/kw-hr [g/hp-hr]	620.00 [462.33]

Cooling System¹

Sea Water Pump Specifications .....	.....MAB 0.08.17-07/16/2001	
Pressure Cap Rating .....	.....kPa [psi]	103 [15]
Max. Coolant Outlet Pressure from the Engine .....	.....kPa [psi]	414 [60]
Max. Pressure Drop Across Any External Cooling System Circuit .....	.....kPa [psi]	34 [5]

Engines without Low Temperature Aftercooling (LTA)

Sea Water Aftercooled Engine (SWAC)

Coolant Flow to Engine Heat Exchanger .....	.....l/min [gal/min]	N/A [N.A.]
Standard Thermostat Operating Range (Start to Open) .....	.....°C [°F]	71 [160]
Standard Thermostat Operating Range (Full Open) .....	.....°C [°F]	80 [175]
Heat Rejection to Engine Coolant ³ .....	.....kW [Btu/min]	139 [7915]

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.

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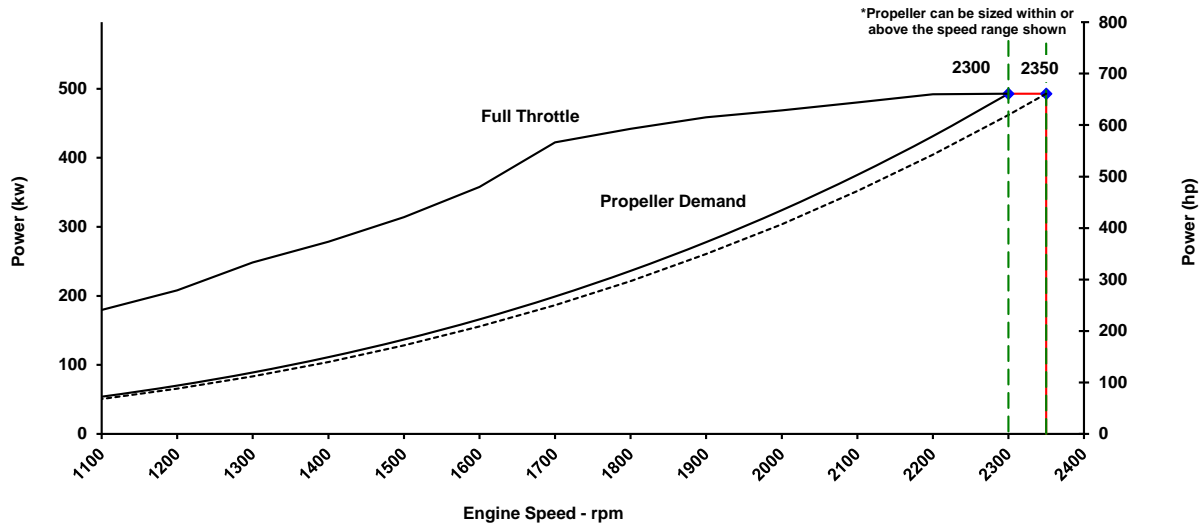


CUMMINS INC.
 Charleston, SC 29405
 Marine Performance Curves
marine.cummins.com

Basic Engine Model QSM11-M	Curve Number: M-21047
Engine Configuration D353013MX03	CPL Code: 5413
	Date: 24-Jan-19

Displacement: 10.8 liter [661 in³]	Rated Power: 493 Kw [661 bhp, 670 mhp]
Bore: 125 mm [4.92 in]	Rated Speed: 2300 rpm
Stroke: 147 mm [5.79 in]	Rating Type: High Output
Cylinders: 6	Aspiration: Turbocharged / Sea Water Aftercooled
Fuel System: CELECT	

CERTIFIED: This diesel engine complies with or is certified to the following agencies requirements:
 EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)
 IMO Tier II (Two) NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13
 RCD - meets the requirements of the Recreational Craft Directive 94/25/EC as amended by 2003/44/EC in accordance with ISO 8178-1



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)
2350	493	(661)	2003	(1477)						
2300	493	(661)	2046	(1509)	493	(661.0)	2046	(1,509.4)	128.1	(33.9)
2200	492	(660)	2135	(1575)	431	(578.5)	1872	(1,381.0)	107.2	(28.3)
2100	480	(644)	2183	(1610)	375	(503.1)	1706	(1,258.3)	91.0	(24.0)
2000	469	(629)	2238	(1650)	324	(434.6)	1547	(1,141.3)	77.7	(20.5)
1900	459	(615)	2305	(1700)	278	(372.6)	1397	(1,030.0)	66.6	(17.6)
1800	442	(593)	2346	(1730)	236	(316.8)	1253	(924.5)	56.9	(15.0)
1700	422	(566)	2373	(1750)	199	(266.9)	1118	(824.6)	48.4	(12.8)
1600	358	(480)	2135	(1575)	166	(222.5)	990	(730.4)	41.1	(10.9)
1500	314	(421)	2000	(1475)	137	(183.4)	870	(642.0)	34.3	(9.1)
1400	278	(373)	1898	(1400)	111	(149.1)	758	(559.2)	28.0	(7.4)
1300	248	(333)	1824	(1345)	89	(119.4)	654	(482.2)	22.6	(6.0)
1200	208	(279)	1654	(1220)	70	(93.9)	557	(410.9)	18.1	(4.8)
1100	180	(241)	1559	(1150)	54	(72.3)	468	(345.2)	14.3	(3.8)
1000	143	(192)	1369	(1010)	41	(54.3)	387	(285.3)	11.1	(2.9)
900	109	(147)	1159	(855)	30	(39.6)	313	(231.1)	8.6	(2.3)
800	80	(107)	956	(705)	21	(27.8)	248	(182.6)	6.6	(1.7)
700	70	(94)	956	(705)	14	(18.6)	190	(139.8)	4.9	(1.3)
600	55	(73)	868	(640)	9	(11.7)	139	(102.7)	3.5	(0.9)

*** Cummins Full Throttle Requirements:**

- Engine achieves or exceeds rated rpm at full throttle under any steady operating condition
- 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. 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].

High Output (HO). Intended for infrequent use in variable load applications with a power factor of 10-30 %. Full power is limited to one out of every eight hours of operation. Reduced power operation must be at or below 80% load.

CHIEF ENGINEER

Propulsion Marine Engine Performance Data

Curve No. M-21047
 DS: DS3021
 CPL: 5413
 DATE: 24-Jan-19

General Engine Data

Engine Model	QSM11-M
Rating Type	High Output
Rated Engine Power	493 [661]
Rated Engine Speed	2300
Rated Power Production Tolerance	±% 5
Rated Engine Torque	2046 [1509]
Peak Engine Torque @ 1500 rpm.....	2373 [1750]
Brake Mean Effective Pressure	2376 [345]
Indicated Mean Effective Pressure.....	2610 [379]
Maximum Allowable Engine Speed	2360

Maximum Continuous Torque Capacity from Front of Crank Specifications

Maximum Torque Capacity from Front of Crank ²	N·m [lb·ft]	0 [0]
Compression Ratio		16.3:1
Piston Speed	m/sec [ft/min]	11.3 [2219]
Firing Order		1-5-3-6-2-4
Weight (Dry) - Engine With Heat Exchanger System - Average.....	kg [lb]	1188 [2620]

Governor Settings

Default Droop Value.....	Refer to MAB 2.04.00-03/23/2006 for Droop explanation	0%
High Speed Governor Break Point.....	rpm	2350
Minimum Idle Speed Setting	rpm	600
Normal Idle Speed Variation	±rpm	10
High Idle Speed Range Minimum	rpm	2350
Maximum	rpm	2370

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]	83.9 [22.2]
Avg. Fuel Consumption - ISO 8178 E5 Standard Test Cycle	l/hr [gal/hr]	42.5 [11.2]
Fuel Consumption at Rated Speed	l/hr [gal/hr]	128.1 [33.9]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	280.1 [74.0]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60.0 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	159.0 [42.0]
Approximate Fuel Return to Tank Temperature	°C [°F]	93.4 [200]
Maximum Heat Rejection to Drain Fuel	kW [Btu/min]	4.3 [247]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	kPa [psi]	1151 [167]

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.

CUMMINS INC.
 COLUMBUS, INDIANA

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<http://marine.cummins.com>

Propulsion Marine Engine Performance Data

Curve No. M-21047
 DS: DS3021
 CPL: 5413
 DATE: 24-Jan-19

Air System¹

Intake Manifold Pressure	kPa [in Hg]	284 [84]
Intake Air Flow	l/sec [cfm]	668 [1416]
Heat Rejection to Ambient	kW [Btu/min]	38 [2189]

Exhaust System¹

Exhaust Gas Flow	l/sec [cfm]	1665 [3,528]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	514 [957]
Exhaust Gas Temperature (Manifold)	°C [°F]	688 [1,270]

Emissions (in accordance with ISO 8178 Cycle E3)

NO _x (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	3.95 [2.95]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.20 [0.15]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	0.61 [0.45]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.09 [0.07]
CO ₂ (Carbon dioxide)	g/kw-hr [g/hp-hr]	629.00 [469.05]

Emissions (in accordance with ISO 8178 Cycle E5)

NO _x (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	4.31 [3.21]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.20 [0.15]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	0.63 [0.47]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.09 [0.06]
CO ₂ (Carbon dioxide)	g/kw-hr [g/hp-hr]	629.00 [469.05]

Cooling System¹

Sea Water Pump Specifications	MAB 0.08.17-07/16/2001	
Pressure Cap Rating	kPa [psi]	103 [15]
Max. Coolant Outlet Pressure from the Engine	kPa [psi]	414 [60]

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.

CUMMINS INC.

COLUMBUS, INDIANA

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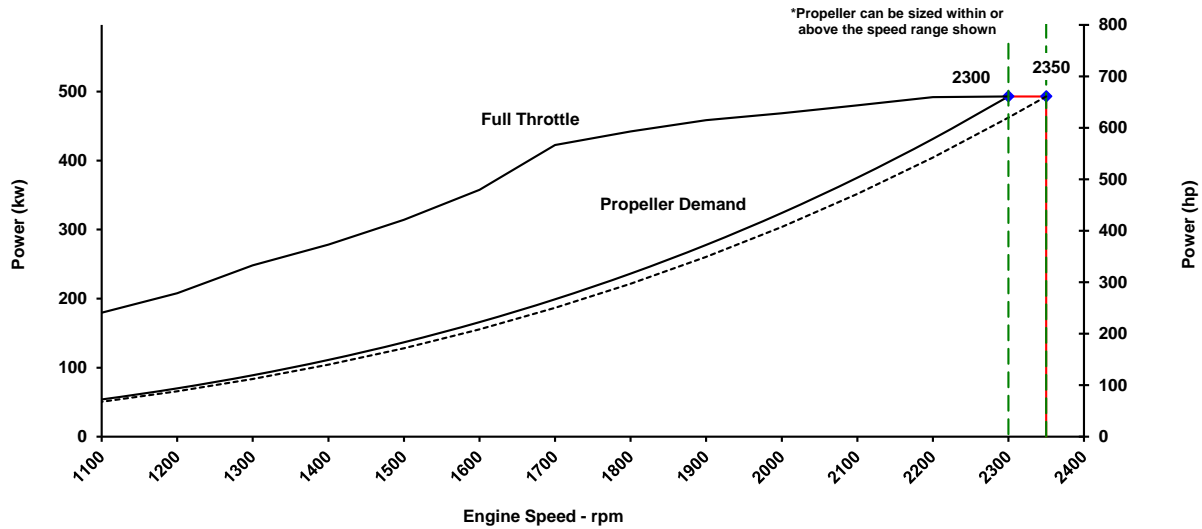


CUMMINS INC.
 Charleston, SC 29405
 Marine Performance Curves
marine.cummins.com

Basic Engine Model QSM11-M	Curve Number: M-21048
Engine Configuration D353013MX03	CPL Code: 5413 Date: 24-Jan-19

Displacement: 10.8 liter [661 in³]	Rated Power: 493 Kw [661 bhp, 670 mhp]
Bore: 125 mm [4.92 in]	Rated Speed: 2300 rpm
Stroke: 147 mm [5.79 in]	Rating Type: Light Duty Commercial
Cylinders: 6	Aspiration: Turbocharged / Sea Water Aftercooled
Fuel System: CELECT	

CERTIFIED: This diesel engine complies with or is certified to the following agencies requirements:
 EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)
 IMO Tier II (Two) 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)		
2350	493	(661)	2003	(1477)	493	(661.0)	2046	(1,509.4)	128.1	(33.9)
2300	493	(661)	2046	(1509)	431	(578.5)	1872	(1,381.0)	107.2	(28.3)
2200	492	(660)	2135	(1575)	431	(578.5)	1872	(1,381.0)	107.2	(28.3)
2100	480	(644)	2183	(1610)	375	(503.1)	1706	(1,258.3)	91.0	(24.0)
2000	469	(629)	2238	(1650)	324	(434.6)	1547	(1,141.3)	77.7	(20.5)
1900	459	(615)	2305	(1700)	278	(372.6)	1397	(1,030.0)	66.6	(17.6)
1800	442	(593)	2346	(1730)	236	(316.8)	1253	(924.5)	56.9	(15.0)
1700	422	(566)	2373	(1750)	199	(266.9)	1118	(824.6)	48.4	(12.8)
1600	358	(480)	2135	(1575)	166	(222.5)	990	(730.4)	41.1	(10.9)
1500	314	(421)	2000	(1475)	137	(183.4)	870	(642.0)	34.3	(9.1)
1400	278	(373)	1898	(1400)	111	(149.1)	758	(559.2)	28.0	(7.4)
1300	248	(333)	1824	(1345)	89	(119.4)	654	(482.2)	22.6	(6.0)
1200	208	(279)	1654	(1220)	70	(93.9)	557	(410.9)	18.1	(4.8)
1100	180	(241)	1559	(1150)	54	(72.3)	468	(345.2)	14.3	(3.8)
1000	143	(192)	1369	(1010)	41	(54.3)	387	(285.3)	11.1	(2.9)
900	109	(147)	1159	(855)	30	(39.6)	313	(231.1)	8.6	(2.3)
800	80	(107)	956	(705)	21	(27.8)	248	(182.6)	6.6	(1.7)
700	70	(94)	956	(705)	14	(18.6)	190	(139.8)	4.9	(1.3)
600	55	(73)	868	(640)	9	(11.7)	139	(102.7)	3.5	(0.9)

*** Cummins Full Throttle Requirements:**

- Engine achieves or exceeds rated rpm at full throttle under any steady operating condition
- 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. 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].

Light Duty Commercial (LD). Intended for intermittent use in variable load applications with a power factor of 10-30%. Full power is limited to one hour out of every eight hours of operation. Reduced power operation must be at or below 80% load.

CHIEF ENGINEER

Propulsion Marine Engine Performance Data

Curve No. M-21048
DS: DS3021
CPL: 5413
DATE: 24-Jan-19

General Engine Data

Engine Model	QSM11-M	
Rating Type	Light Duty Commercial	
Rated Engine Power	493 [661]	kW [hp]
Rated Engine Speed	2300	rpm
Rated Power Production Tolerance	5	±%
Rated Engine Torque	2046 [1509]	N·m [lb·ft]
Peak Engine Torque @ 1500 rpm.....	2373 [1750]	N·m [lb·ft]
Brake Mean Effective Pressure	2376 [345]	kPa [psi]
Indicated Mean Effective Pressure.....	2610 [379]	kPa [psi]
Maximum Allowable Engine Speed	2360	rpm

Maximum Continuous Torque Capacity from Front of Crank Specifications

Maximum Torque Capacity from Front of Crank ²	0 [0]	N·m [lb·ft]
Compression Ratio	16.3:1	
Piston Speed	11.3 [2219]	m/sec [ft/min]
Firing Order	1-5-3-6-2-4	
Weight (Dry) - Engine With Heat Exchanger System - Average.....	1188 [2620]	kg [lb]

Governor Settings

Default Droop Value.....	Refer to MAB 2.04.00-03/23/2006 for Droop explanation	0%
High Speed Governor Break Point.....	2350	rpm
Minimum Idle Speed Setting	600	rpm
Normal Idle Speed Variation	10	±rpm
High Idle Speed Range Minimum	2350	rpm
Maximum	2370	rpm

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	83.9 [22.2]	l/hr [gal/hr]
Fuel Consumption at Rated Speed	128.1 [33.9]	l/hr [gal/hr]
Approximate Fuel Flow to Pump	280.1 [74.0]	l/hr [gal/hr]
Maximum Allowable Fuel Supply to Pump Temperature	60.0 [140]	°C [°F]
Approximate Fuel Flow Return to Tank	159.0 [42.0]	l/hr [gal/hr]
Approximate Fuel Return to Tank Temperature	93.4 [200]	°C [°F]
Maximum Heat Rejection to Drain Fuel	4.3 [247]	kW [Btu/min]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	1151 [167]	kPa [psi]

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.

CUMMINS INC.
 COLUMBUS, INDIANA

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<http://marine.cummins.com>

Propulsion Marine Engine Performance Data

Curve No. M-21048
DS: DS3021
CPL: 5413
DATE: 24-Jan-19

Air System¹

Intake Manifold Pressure	kPa [in Hg]	284 [84]
Intake Air Flow	l/sec [cfm]	668 [1416]
Heat Rejection to Ambient	kW [Btu/min]	38 [2189]

Exhaust System¹

Exhaust Gas Flow	l/sec [cfm]	1665 [3,528]
Exhaust Gas Temperature (Turbine Out)	°C [°F]	514 [957]
Exhaust Gas Temperature (Manifold)	°C [°F]	688 [1,270]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen)	g/kw-hr [g/hp-hr]	3.95 [2.95]
HC (Hydrocarbons)	g/kw-hr [g/hp-hr]	0.20 [0.15]
CO (Carbon Monoxide)	g/kw-hr [g/hp-hr]	0.61 [0.45]
PM (Particulate Matter)	g/kw-hr [g/hp-hr]	0.09 [0.07]
CO ₂ (Carbon dioxide)	g/kw-hr [g/hp-hr]	629.00 [469.05]

Cooling System¹

Sea Water Pump Specifications	MAB 0.08.17-07/16/2001	
Pressure Cap Rating	kPa [psi]	103 [15]
Max. Coolant Outlet Pressure from the Engine	kPa [psi]	414 [60]

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.

CUMMINS INC.
 COLUMBUS, INDIANA

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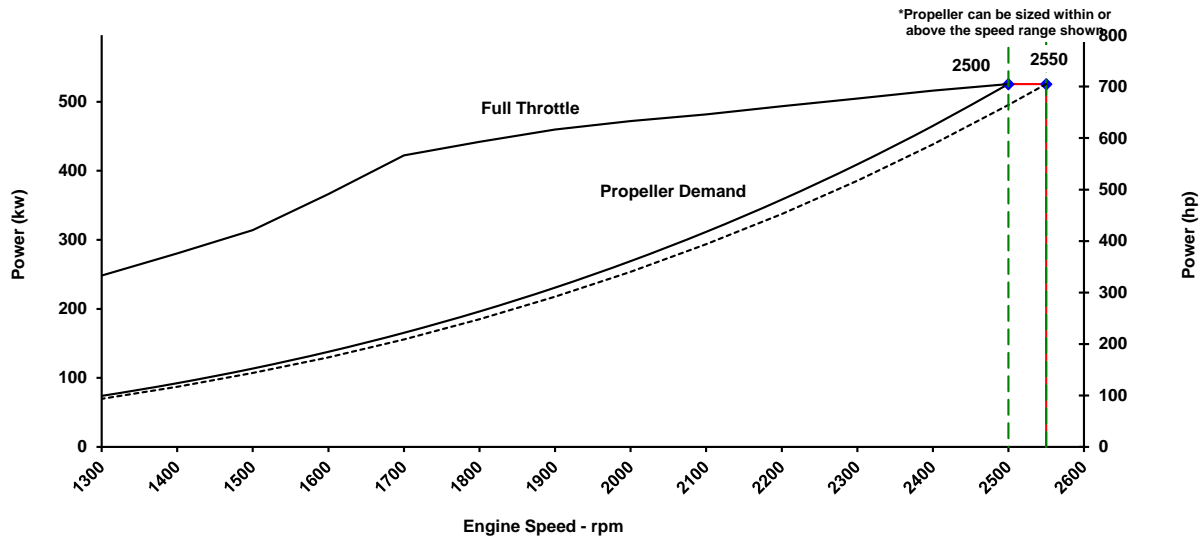


CUMMINS INC.
 Charleston, SC 29405
 Marine Performance Curves
marine.cummins.com

Basic Engine Model QSM11-M	Curve Number: M-21045
Engine Configuration D353013MX03	CPL Code: 5413 Date: 24-Jan-19

Displacement: 10.8 liter [661 in³]	Rated Power: 526 Kw [705 bhp, 715 mhp]
Bore: 125 mm [4.92 in]	Rated Speed: 2500 rpm
Stroke: 147 mm [5.79 in]	Rating Type: High Output
Cylinders: 6	Aspiration: Turbocharged / Sea Water Aftercooled
Fuel System: CELECT	

CERTIFIED: This diesel engine complies with or is certified to the following agencies requirements:
 EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)
 IMO Tier II (Two) NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13
 RCD - meets the requirements of the Recreational Craft Directive 94/25/EC as amended by 2003/44/EC in accordance with ISO 8178-1



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)	
2550	526	(705)	1969	(1452)					
2500	526	(705)	2008	(1481)	526	(705.0)	2008	(1,481.1)	139.2 (36.8)
2400	516	(692)	2054	(1515)	465	(623.7)	1851	(1,364.9)	119.8 (31.6)
2300	505	(677)	2095	(1545)	409	(549.0)	1700	(1,253.6)	102.9 (27.2)
2200	494	(662)	2142	(1580)	358	(480.4)	1555	(1,146.9)	87.6 (23.1)
2100	482	(646)	2190	(1615)	312	(417.9)	1417	(1,045.0)	75.6 (20.0)
2000	472	(633)	2255	(1663)	269	(361.0)	1285	(947.9)	65.4 (17.3)
1900	460	(617)	2312	(1705)	231	(309.5)	1160	(855.5)	56.0 (14.8)
1800	442	(593)	2346	(1730)	196	(263.1)	1041	(767.8)	47.8 (12.6)
1700	422	(566)	2373	(1750)	165	(221.7)	929	(684.8)	41.1 (10.9)
1600	366	(491)	2186	(1613)	138	(184.8)	822	(606.6)	34.8 (9.2)
1500	314	(421)	2000	(1475)	114	(152.3)	723	(533.2)	28.7 (7.6)
1400	280	(376)	1912	(1410)	92	(123.8)	630	(464.5)	23.6 (6.2)
1300	248	(333)	1824	(1345)	74	(99.1)	543	(400.5)	19.2 (5.1)
1200	213	(285)	1691	(1248)	58	(78.0)	463	(341.2)	15.3 (4.0)
1100	180	(241)	1559	(1150)	45	(60.1)	389	(286.7)	12.2 (3.2)
1000	142	(191)	1359	(1003)	34	(45.1)	321	(237.0)	9.5 (2.5)
900	109	(147)	1159	(855)	25	(32.9)	260	(191.9)	7.4 (2.0)
800	89	(119)	1058	(780)	17	(23.1)	206	(151.7)	5.6 (1.5)
700	70	(94)	956	(705)	12	(15.5)	157	(116.1)	4.3 (1.1)
600	0	(0)	0	(0)	7	(9.7)	116	(85.3)	2.5 (0.7)

*** Cummins Full Throttle Requirements:**

- Engine achieves or exceeds rated rpm at full throttle under any steady operating condition
- 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. 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].

High Output (HO). Intended for infrequent use in variable load applications with a power factor of 10-30 %. Full power is limited to one out of every eight hours of operation. Reduced power operation must be at or below 80% load.

Propulsion Marine Engine Performance Data

Curve No. M-21045
 DS: DS3021
 CPL: 5413
 DATE: 24-Jan-19

General Engine Data

Engine Model	QSM11-M
Rating Type	High Output
Rated Engine Power	526 [705]
Rated Engine Speed	2500
Rated Power Production Tolerance	±5
Rated Engine Torque	2008 [1481]
Peak Engine Torque @ 1500 rpm.....	2373 [1750]
Brake Mean Effective Pressure	2331 [338]
Indicated Mean Effective Pressure.....	2600 [377]
Maximum Allowable Engine Speed	2560

Maximum Continuous Torque Capacity from Front of Crank Specifications

Maximum Torque Capacity from Front of Crank ²	0 [0]
Compression Ratio	16.3:1
Piston Speed	12.3 [2411]
Firing Order	1-5-3-6-2-4
Weight (Dry) - Engine With Heat Exchanger System - Average.....	1188 [2620]

Governor Settings

Default Droop Value.....	Refer to MAB 2.04.00-03/23/2006 for Droop explanation	0%
High Speed Governor Break Point.....	rpm	2550
Minimum Idle Speed Setting	rpm	600
Normal Idle Speed Variation	±rpm	10
High Idle Speed Range Minimum	rpm	2550
Maximum	rpm	2570

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]	92.1 [24.3]
Avg. Fuel Consumption - ISO 8178 E5 Standard Test Cycle	l/hr [gal/hr]	46.9 [12.4]
Fuel Consumption at Rated Speed	l/hr [gal/hr]	139.2 [36.8]
Approximate Fuel Flow to Pump	l/hr [gal/hr]	302.8 [80.0]
Maximum Allowable Fuel Supply to Pump Temperature	°C [°F]	60.0 [140]
Approximate Fuel Flow Return to Tank	l/hr [gal/hr]	159.0 [42.0]
Approximate Fuel Return to Tank Temperature	°C [°F]	93.4 [200]
Maximum Heat Rejection to Drain Fuel	kW [Btu/min]	4.3 [247]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	kPa [psi]	1151 [167]

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.

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 COLUMBUS, INDIANA

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<http://marine.cummins.com>

Propulsion Marine Engine Performance Data

Curve No. M-21045
 DS: DS3021
 CPL: 5413
 DATE: 24-Jan-19

Air System¹

Intake Manifold Pressure	kPa [in Hg]	295 [87]
Intake Air Flow	l/sec [cfm]	723 [1533]
Heat Rejection to Ambient	kW [Btu/min]	43 [2446]

Exhaust System¹

Exhaust Gas Flow	l/sec [cfm]	1871 [3,964]
Exhaust Gas Temperature (Turbine Out)	°C [°F] ^Δ	544 [1,010]
Exhaust Gas Temperature (Manifold)	°C [°F]	732 [1,349]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen)	g/kw·hr [g/hp·hr]	3.88 [2.89]
HC (Hydrocarbons)	g/kw·hr [g/hp·hr]	0.20 [0.15]
CO (Carbon Monoxide)	g/kw·hr [g/hp·hr]	0.71 [0.53]
PM (Particulate Matter)	g/kw·hr [g/hp·hr]	0.11 [0.08]
CO ₂ (Carbon dioxide)	g/kw·hr [g/hp·hr]	644.00 [480.23]

Emissions (in accordance with ISO 8178 Cycle E5)

NOx (Oxides of Nitrogen)	g/kw·hr [g/hp·hr]	4.21 [3.14]
HC (Hydrocarbons)	g/kw·hr [g/hp·hr]	0.20 [0.15]
CO (Carbon Monoxide)	g/kw·hr [g/hp·hr]	0.68 [0.51]
PM (Particulate Matter)	g/kw·hr [g/hp·hr]	0.10 [0.07]
CO ₂ (Carbon dioxide)	g/kw·hr [g/hp·hr]	643.00 [479.49]

Cooling System¹

Sea Water Pump Specifications	MAB 0.08.17-07/16/2001	
Pressure Cap Rating	kPa [psi]	103 [15]
Max. Coolant Outlet Pressure from the Engine.....	kPa [psi]	414 [60]

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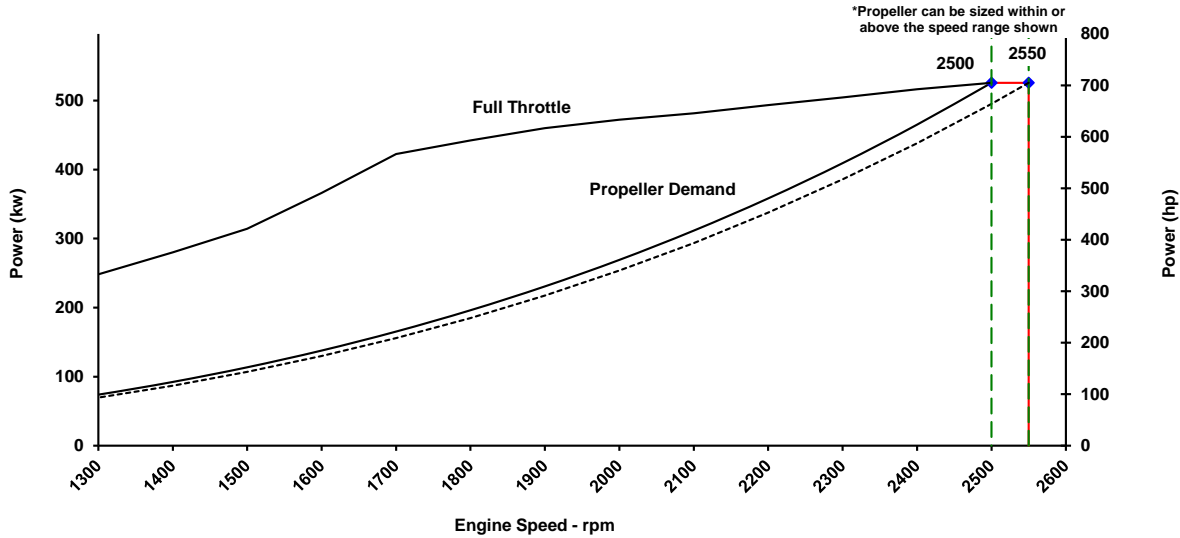
CUMMINS INC.
 Charleston, SC 29405
 Marine Performance Curves
marine.cummins.com

Basic Engine Model QSM11-M	Curve Number: M-21046
Engine Configuration D353013MX03	CPL Code: 5413 Date: 24-Jan-19

Displacement: **10.8 liter [661 in³]**
 Bore: **125 mm [4.92 in]**
 Stroke: **147 mm [5.79 in]**
 Cylinders: **6**
 Fuel System: **CELECT**

Rated Power: **526 Kw [705 bhp, 715 mhp]**
 Rated Speed: **2500 rpm**
 Rating Type: **Light Duty Commercial**
 Aspiration: **Turbocharged / Sea Water Aftercooled**

CERTIFIED: This diesel engine complies with or is certified to the following agencies requirements:
 EPA Tier 3 - Model year requirements of the EPA marine regulation (40CFR1042)
 IMO Tier II (Two) NOx requirements of International Maritime Organization (IMO), MARPOL 73/78 Annex VI, Regulation 13



Speed rpm	Full Throttle				Propeller Demand					
	Power		Torque		Power		Torque		Fuel Consumption	
	kw	(hp)	N-m	(ft-lb)	kw	(hp)	N-m	(ft-lb)	L/hr	(gal/hr)
2550	526	(705)	1969	(1452)						
2500	526	(705)	2008	(1481)	526	(705.0)	2008	(1,481.1)	139.2	(36.8)
2400	516	(692)	2054	(1515)	465	(623.7)	1851	(1,364.9)	119.8	(31.6)
2300	505	(677)	2095	(1545)	409	(549.0)	1700	(1,253.6)	102.9	(27.2)
2200	494	(662)	2142	(1580)	358	(480.4)	1555	(1,146.9)	87.6	(23.1)
2100	482	(646)	2190	(1615)	312	(417.9)	1417	(1,045.0)	75.6	(20.0)
2000	472	(633)	2255	(1663)	269	(361.0)	1285	(947.9)	65.4	(17.3)
1900	460	(617)	2312	(1705)	231	(309.5)	1160	(855.5)	56.0	(14.8)
1800	442	(593)	2346	(1730)	196	(263.1)	1041	(767.8)	47.8	(12.6)
1700	422	(566)	2373	(1750)	165	(221.7)	929	(684.8)	41.1	(10.9)
1600	366	(491)	2186	(1613)	138	(184.8)	822	(606.6)	34.8	(9.2)
1500	314	(421)	2000	(1475)	114	(152.3)	723	(533.2)	28.7	(7.6)
1400	280	(376)	1912	(1410)	92	(123.8)	630	(464.5)	23.6	(6.2)
1300	248	(333)	1824	(1345)	74	(99.1)	543	(400.5)	19.2	(5.1)
1200	213	(285)	1691	(1248)	58	(78.0)	463	(341.2)	15.3	(4.0)
1100	180	(241)	1559	(1150)	45	(60.1)	389	(286.7)	12.2	(3.2)
1000	142	(191)	1359	(1003)	34	(45.1)	321	(237.0)	9.5	(2.5)
900	109	(147)	1159	(855)	25	(32.9)	260	(191.9)	7.4	(2.0)
800	89	(119)	1058	(780)	17	(23.1)	206	(151.7)	5.6	(1.5)
700	70	(94)	956	(705)	12	(15.5)	157	(116.1)	4.3	(1.1)
600	0	(0)	0	(0)	7	(9.7)	116	(85.3)	2.5	(0.7)

*** Cummins Full Throttle Requirements:**

- Engine achieves or exceeds rated rpm at full throttle under any steady operating condition
- 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. 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].

Light Duty Commercial (LD). Intended for intermittent use in variable load applications with a power factor of 10-30%. Full power is limited to one hour out of every eight hours of operation. Reduced power operation must be at or below 80% load.

Propulsion Marine Engine Performance Data

Curve No. **M-21046**
 DS: **DS3021**
 CPL: **5413**
 DATE: **24-Jan-19**

General Engine Data

Engine Model	QSM11-M
Rating Type	Light Duty Commercial
Rated Engine Power	526 [705]
Rated Engine Speed	2500
Rated Power Production Tolerance	5
Rated Engine Torque	2008 [1481]
Peak Engine Torque @ 1500 rpm.....	2373 [1750]
Brake Mean Effective Pressure	2331 [338]
Indicated Mean Effective Pressure.....	2600 [377]
Maximum Allowable Engine Speed	2560

Maximum Continuous Torque Capacity from Front of Crank Specifications

Maximum Torque Capacity from Front of Crank ²	0 [0]
Compression Ratio	16.3:1
Piston Speed	12.3 [2411]
Firing Order	1-5-3-6-2-4
Weight (Dry) - Engine With Heat Exchanger System - Average.....	1188 [2620]

Governor Settings

Default Droop Value.....	Refer to MAB 2.04.00-03/23/2006 for Droop explanation	0%
High Speed Governor Break Point.....	rpm	2550
Minimum Idle Speed Setting	rpm	600
Normal Idle Speed Variation	±rpm	10
High Idle Speed Range Minimum	rpm	2550
Maximum	rpm	2570

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	92.6 [24.5]
Fuel Consumption at Rated Speed	139.2 [36.8]
Approximate Fuel Flow to Pump	302.8 [80.0]
Maximum Allowable Fuel Supply to Pump Temperature	60.0 [140]
Approximate Fuel Flow Return to Tank	159.0 [42.0]
Approximate Fuel Return to Tank Temperature	93.4 [200]
Maximum Heat Rejection to Drain Fuel	4.3 [247]
Fuel Pressure - Pump Out/Rail . Mechanical Gauge	1151 [167]

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Curve No. M-21046
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Intake Manifold PressurekPa [in Hg]	295 [87]
Intake Air Flowl/sec [cfm]	723 [1533]
Heat Rejection to Ambient .....	.....kW [Btu/min]	43 [2446]

Exhaust System¹

Exhaust Gas Flow .....	.....l/sec [cfm]	1871 [3,964]
Exhaust Gas Temperature (Turbine Out) .....	.....°C [°F]	544 [1,010]
Exhaust Gas Temperature (Manifold) .....	.....°C [°F]	732 [1,349]

Emissions (in accordance with ISO 8178 Cycle E3)

NOx (Oxides of Nitrogen) .....	.....g/kw-hr [g/hp-hr]	3.88 [2.89]
HC (Hydrocarbons) .....	.....g/kw-hr [g/hp-hr]	0.20 [0.15]
CO (Carbon Monoxide) .....	.....g/kw-hr [g/hp-hr]	0.71 [0.53]
PM (Particulate Matter) .....	.....g/kw-hr [g/hp-hr]	0.11 [0.08]
CO ₂ (Carbon dioxide) .....	.....g/kw-hr [g/hp-hr]	644.00 [480.23]
CH ₄ (Methane) .....	.....g/kw-hr [g/hp-hr]	0.00 [0.00]

Emissions (in accordance with ISO 8178 Cycle E2)

NOx (Oxides of Nitrogen) .....	.....g/kw-hr [g/hp-hr]	0.00 [0.00]
HC (Hydrocarbons) .....	.....g/kw-hr [g/hp-hr]	0.00 [0.00]
CO (Carbon Monoxide) .....	.....g/kw-hr [g/hp-hr]	0.00 [0.00]

Cooling System¹

Sea Water Pump Specifications .....	.....MAB 0.08.17-07/16/2001	
Pressure Cap Rating .....	.....kPa [psi]	103 [15]
Max. Coolant Outlet Pressure from the Engine.....	.....kPa [psi]	0 [0]
Max. Pressure Drop Across Any External Cooling System Circuit .....	.....kPa [psi]	0 [0]

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]	0 [0]	
Standard Thermostat Operating Range	Start to open.....	.....°C [°F]	-18 [0]
	Full open.....	.....°C [°F]	-18 [0]
Heat Rejection to Engine Coolant ³ .....	.....kW [Btu/min]	0 [0]	

Aftercooler (LTA) Circuit

Coolant Flow to LTA Cooler (with blocked open thermostat).....	.....l/min [gal/min]	0 [0]
LTA Thermostat Operating Range	Start to open.....°C [°F]	-18 [0]
	Full open.....°C [°F]	-18 [0]
Heat Rejection to Engine Coolant ³kW [Btu/min]	0 [0]	
Maximum Coolant Inlet Temperature from LTA Cooler.....°C [°F]	N.A.	

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