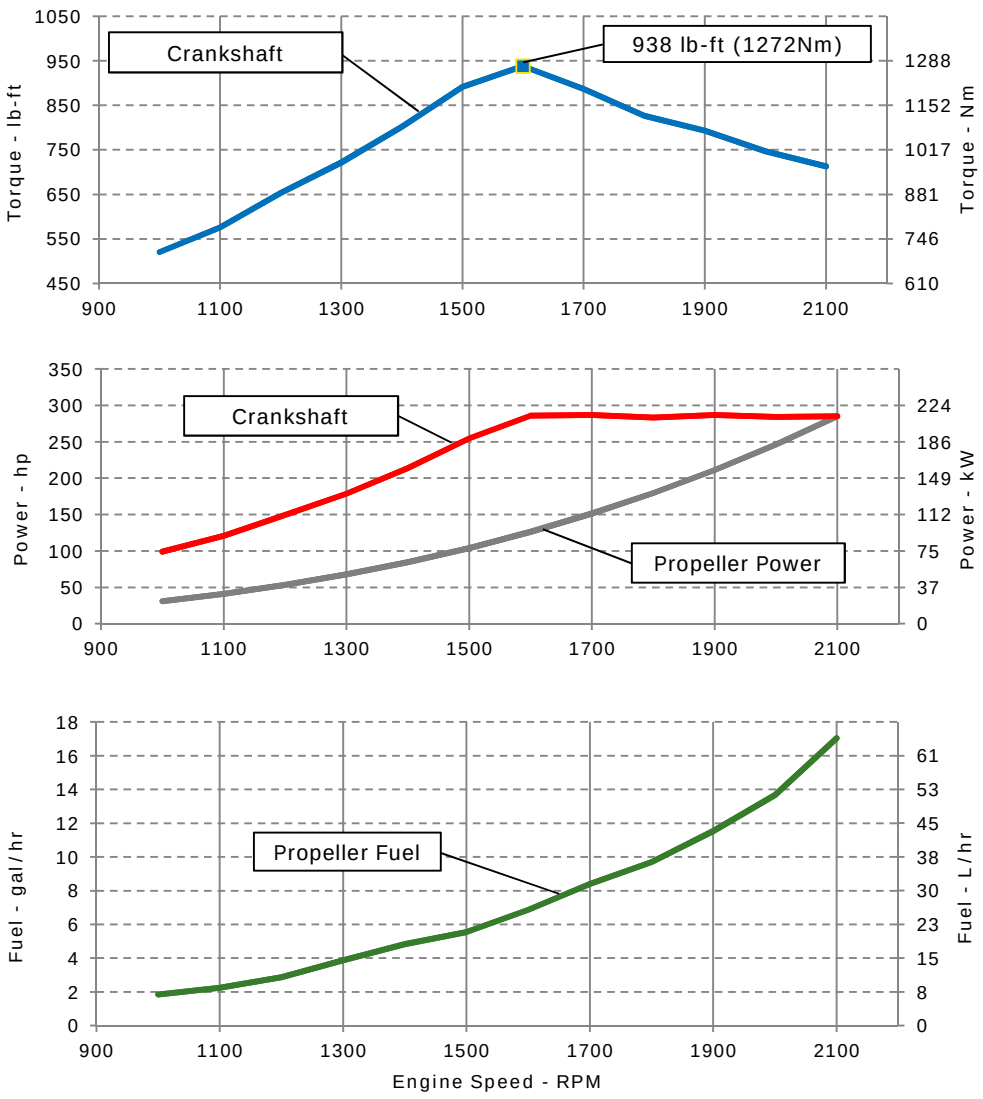
ENGINE PERFORMANCE CURVE

Rating: M1 - 285hp (213kW) @ 2100 RPM
Application: Marine

PowerTech™ 9.0L Engine
Model: 6090AFM85



REFERENCE CONDITIONS

Air Intake Restriction.....12 in.H_2O (3 kPa)
Exhaust Back Pressure..... 30 in.H_2O (7.5 kPa)

Rated speed and power
Gross power guaranteed within ±5% at SAE J1995 and ISO 3046
J1995 and ISO 3046 conditions:
77 °F (25 °C) air inlet temperature
29.31 in.Hg (99 kPa) barometric pressure
104 °F (40 °C) fuel inlet temperature
0.853 fuel specific gravity @ 60 °F (15.5 °C)

Ambient air temperature is defined to be the temperature of ambient air close to operating vessel that is not influenced in any manner by operating characteristics of the vessel (free field temp).

Conversion factors:
Power: kW = hp x 0.746
Fuel: 1 gal = 7.1 lb, 1 L = 0.85 kg
Torque: N·m = lb-ft x 1.356

All values from currently available data. Subject to manufacturing and measurement variations and to change without notice.
Actual performance is subject to application and operation conditions outside of John Deere control.

Notes:

M1: The M1 rating is for marine propulsion applications that may operate up to 24 hours per day at uninterrupted full power and have load factors greater than 65 percent.

Possible applications: Line hauls tugs and towboats, fish and shrimp trawlers/draggers, and displacement hull fishing boats.

Designed/Calibrated to meet:	Certified by:
• EPA Commercial Marine Tier 3 • IMO MARPOL Annex VI Compliant • NRMM (97/68/EC), as amended Ref: Engine Emission Label	Preliminary

Performance Curve: 6090AFM85_A

All values at rated speed, power, and standard conditions, per SAE J1995 unless otherwise noted.

Engine Installation Criteria

General Data

Model	6090AFM85			
Number of Cylinders	6			
Bore	118	mm	4.65	in
Stroke	136	mm	5.35	in
Displacement	9.0	L	549	in^3
Compression Ratio	16.3:1			
Valves per Cylinder, Intake/Exhaust	2/2			
Combustion System	Direct injection			
Firing Order	1-5-3-6-2-4			
Engine Type	In line, 4 Cycle			
Aspiration	Turbocharged and Aftercooled			
Aftercooling System	Engine coolant			
Engine Crankcase Vent System	Closed			

Cooling System*

Engine Coolant Heat Rejection**	238	kW	13547	BTU/min
Max. Pressure Drop Across Keel Cooler	40	kPa	5.8	psi
Coolant Flow	315	L/min	83	gal/min
Seawater Flow (heat exchanged)	401	L/min	106	gal/min
Thermostat Start to Open	71	°C	178	°F
Thermostat Fully Open	84	°C	203	°F
Engine Coolant Capacity, HE	30	L	7.9	gal
Engine Coolant Capacity, KC	26	L	6.9	gal
Min. Coolant Fill Rate	12	L/min	3.2	gal/min
Min. Pressure Cap	110.3	kPa	16	psi
Min. Pump Inlet Pressure	30	kPa	4.4	psi
Max. External Coolant Restriction	40	kPa	5.8	psi
Normal Operation Max Top Tank Temperature	100	°C	212	°F
≤ 5% of Total Operating Time Top Tank Temperature	100-110	°C	212-230	°F
Absolute Max Top Tank Temperature	110	°C	230	°F
Recommended Fuel Cooler	13	kW	743	BTU/min
Engine Radiated Heat	32	kW	1842	BTU/min

* The cooling system should be capable of typical at ambient up to the maximum conditions in which the vessel will operate.

Typical operation is defined as the average load sustainable in the vessel over 10 min.

** Reference 32 ˚C Sea Water Temperature

Physical Data

Length to rear face of block	1293	mm	50.9	in
Length maximum	1714	mm	67.5	in
Width maximum	938	mm	36.9	in
Height, crank centerline to top	665	mm	26.2	in
Height, crank centerline to bottom	319	mm	319	in
Weight, with oil, no coolant (includes engine, flywheel housing, flywheel, and electronics)	1055	kg	2325	lb
Center of Gravity Location, X-axis From Rear Face of Block	408	mm	16.1	in
Center of Gravity Location, Y-axis Right of Crankshaft	38	mm	1.5	in
Center of Gravity Location, Z-axis Above Crankshaft	200	mm	7.9	in
Max. Allowable Static Bending Moment At Rear Face of Flywheel Housing with 5-G Load	814	Nm	600	lb-ft
Thrust Bearing Load Limit, Forward Continuous	8.6	kN	1933	lbf
Thrust Bearing Load Limit, Forward Intermittent	13	kN	2923	lbf
Thrust Bearing Load Limit, Rearward Continuous	4	kN	899	lbf
Thrust Bearing Load Limit, Rearward Intermittent	6	kN	1349	lbf

Electrical System

Min. Recommended Battery Capacity, 12V @32 °F (0 °C)	1100	amps
Min. Recommended Battery Capacity, 24V @32 °F (0 °C)	750	amps
Starter Rolling Current, 12V @32 °F (0 °C)	920	amps
Starter Rolling Current, 24V @32 °F (0 °C)	600	amps
Min. Voltage at ECU during Cranking, 12V	6	volts
Min. Voltage at ECU during Cranking, 24V	10	volts
Max. Allowable Start Circuit Resistance, 12V	0.0012	ohms
Max. Allowable Start Circuit Resistance, 24V	0.002	ohms
Recommended Starter Cable, 12V 100"	#00	
Recommended Starter Cable, 24V 100"	#2	
Recommended Starter Cable, 12V 200"	#0000 or 2#00	
Recommended Starter Cable, 24V 200"	#0	
Electrical Component Maximum Temperature Limit	125 °C	257 °F

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Engine Installation Criteria

Fuel System

ECU Description			L14	
Fuel Injection Pump			Denso HP4	
Governor Type			Electronic	
Volumetric Fuel Consumption	64.5	L/hr	17.0	gal/hr
Mass Fuel Consumption	54.8	kg/hr	121	lb/hr
Total Fuel Volumetric Flow	240	L/hr	63.4	gal/hr
Total Fuel Mass Flow	204	kg/hr	450	lb/hr
Max. Fuel Inlet Restriction*	20	kPa	80	in.H2O
Max. Fuel Inlet Pressure	20	kPa	80	in.H2O
Max Fuel Return Pressure	20	kPa	80	in.H2O
Max. Fuel Height Above Transfer Pump	2.4	m	7.9	ft
Max. Leak-off Return Height	2.4	m	7.9	ft
Max. Fuel Inlet Height Above Fuel Tank Supply	2.4	m	7.9	ft
Normal Operation Fuel Temperature	40	°C	104	°F
Max. Fuel Inlet Temperature	100	°C	212	°F
Min. Recommended Fuel Line Inside Diameter	8.34	mm	0.33	in
Min. Recommended Fuel Line Size			6 (-) AN	
Primary Fuel Filter			10 mic	
Secondary Fuel Filter			2 mic	

Lubrication System

Oil Pressure at Rated Speed	274	kPa	40	psi
Oil Pressure at Low Idle (650rpm)**	115	kPa	17	psi
Max. Crankcase Pressure	2	kPa	8	in.H2O
Maximum Installed Angle, Front Down			0 deg	
Maximum Installed Angle, Front Up			12 deg	
Engine Angularity Limits Any Direction, Continuous***			20 deg	
Engine Angularity Limits Any Direction, Intermittent***			30 deg	

* With clean filters

** With John Deere Plus-50 II™ 15w-40, not applicable with break in oil.

*** With 19BP option

Air Intake System

Engine Air Flow	20.8	m^3/min	735	ft^3/min
Intake Manifold Pressure	176.4	kPa	25.6	psi
Manifold Air Temperature	88.3	°C	191	°F
Maximum Manifold Air Temperature	130	°C	266	°F
Max. Allowable Temperature Rise, Ambient Air to Engine Inlet	17	°C	30	°F
Max. Air Intake Restriction, Clean Air Cleaner	3	kPa	12	in.H_2O
Max. Air Intake Restriction, Dirty Air Cleaner	6.25	kPa	25	in.H_2O
Min. Ventilation Area	0.128	m^2	198	in^2

Performance Data

Rated Power	213	kW	286	hp
Rated Speed		2100	RPM	
Peak Torque Speed		1600	RPM	
Low Idle Speed		650	RPM	
Rated Torque	969	Nm	714	ft-lb
Peak Torque	1272	Nm	938	ft-lb
BMEP, Rated	1352	kPa	196	psi
Rated Pferdestärke (metric hp)		290	ps	
Front Drive Capacity, Intermittent	955	Nm	704	lb-ft
Front Drive Capacity, Continuous	955	Nm	704	lb-ft

Exhaust System

Exhaust Flow	48	m^3/min	1677	ft^3/min
Exhaust Flow @ gas STP	19.6	m^3/min	692	ft^3/min
Exhaust Temperature	446	°C	835	°F
Max. Allowable Exhaust Restriction	7.5	kPa	30	in.H_2O
Max. Shear on Turbocharger Exhaust Outlet	11	kg	24.3	lb
Max. Bending Moment on Turbocharger Exhaust Outlet	7	Nm	15.4	lb-ft
Min. Exhaust Pipe Diameter, Dry	114.3	mm	4.5	in
Min. Exhaust Pipe Diameter, Wet	127	mm	5.0	in

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Engine Performance Data Table

Engine Speed	Crank Power		Crank Torque		* Prop Power		* Prop Fuel		* Prop BSFC
RPM	kW	hp	Nm	lb-ft	kW	hp	L/hr	gal/hr	g/kW-hr
2100	213	285	967	713	213	285	64.5	17.0	258
2000	212	284	1013	747	184	246	51.7	13.7	239
1900	214	287	1074	792	158	211	43.6	11.5	235
1800	211	283	1121	827	134	180	36.7	9.7	233
1700	214	287	1202	887	113	151	31.7	8.4	239
1600	213	286	1272	938	94	126	26.0	6.9	235
1500	190	255	1208	891	78	104	21.0	5.5	230
1400	159	214	1087	802	63	84	18.3	4.8	247
1300	133	179	978	721	50	68	14.7	3.9	247
1200	111	149	886	653	40	53	10.9	2.9	233
1100	90	121	781	576	31	41	8.5	2.2	237
1000	74	99	705	520	23	31	7.0	1.8	259

* Theoretical 3.0 exponent propeller curve , measured at flywheel

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