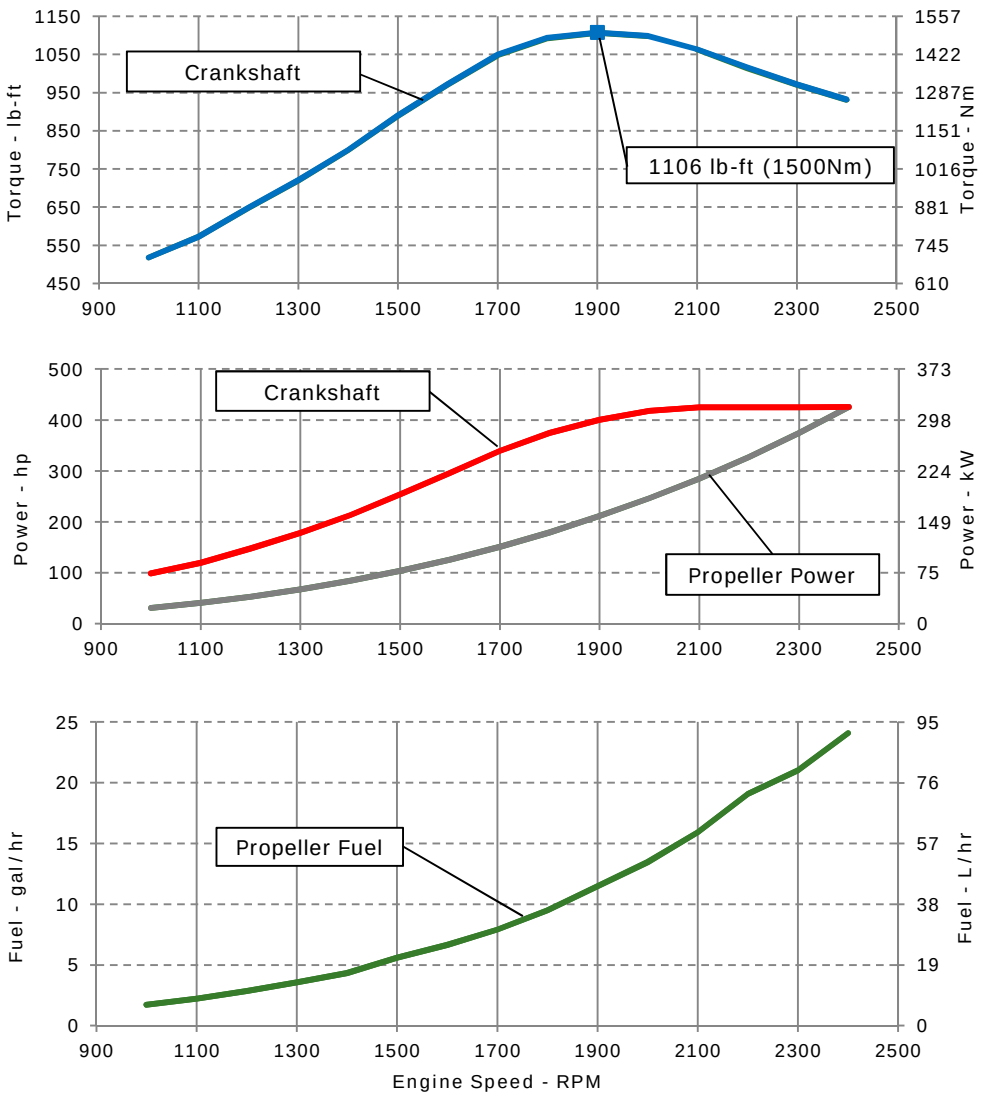
ENGINE PERFORMANCE CURVE

JOHN DEERE

Rating: M4 - 425hp (317kW) @ 2400 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:

M4: The M4 rating is for marine propulsion applications that typically operate between 1,000-3,000 hours per year and have load factors below 40 percent. This rating is for applications that use full power no more than 1 hour out of each 12 hours of operation. The remaining time of operation is at or below cruising speed.

Possible applications: Inshore crew boats, charter fishing boats, pilot boats, dive boats, and planning hull commercial 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	Adam Paull 9-Mar-14

Performance Curve: 6090AFM85_D

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**	337	kW	19182	BTU/min
Max. Pressure Drop Across Keel Cooler	40	kPa	5.8	psi
Coolant Flow	358	L/min	95	gal/min
Seawater Flow (heat exchanged)	416	L/min	110	gal/min
Thermostat Start to Open	71	°C	155	°F
Thermostat Fully Open	84	°C	182	°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	11	kW	630	BTU/min
Engine Radiated Heat	46	kW	2606	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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Fuel System

ECU Description			L14	
Fuel Injection Pump			Denso HP4	
Governor Type			Electronic	
Volumetric Fuel Consumption	91.2	L/hr	24.1	gal/hr
Mass Fuel Consumption	77.5	kg/hr	171	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	300	kPa	44	psi
Oil Pressure at Low Idle (650rpm)**	141	kPa	20	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 1932 option

Air Intake System

Engine Air Flow	28.4	m^3/min	1003	ft^3/min
Intake Manifold Pressure	251	kPa	36.4	psi
Manifold Air Temperature	100	°C	212	°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	0.175	m^2	271	in^2

Performance Data

Rated Power	317	kW	425	hp
Rated Speed		2400	RPM	
Peak Torque Speed		1900	RPM	
Low Idle Speed		650	RPM	
Rated Torque	1262	Nm	931	ft-lb
Peak Torque	1500	Nm	1106	ft-lb
BMEP, Rated	1762	kPa	256	psi
Rated Pferdestärke (metric hp)		431	ps	
Front Drive Capacity, Intermittent	955	Nm	704	lb-ft
Front Drive Capacity, Continuous	955	Nm	704	lb-ft

Exhaust System

Exhaust Flow	64.3	m^3/min	2271	ft^3/min
Exhaust Flow @ gas STP	27.1	m^3/min	957	ft^3/min
Exhaust Temperature	436	°C	817	°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	127	mm	5.0	in
Min. Exhaust Pipe Diameter, Wet	139.7	mm	5.5	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
2400	317	425	1262	931	317	425	91	24	244
2300	317	425	1316	970	279	374	80	21	242
2200	317	425	1376	1015	244	328	72	19	251
2100	317	425	1441	1063	213	285	60	16	241
2000	312	418	1489	1098	184	246	51	13	236
1900	298	400	1500	1106	157	211	43	11	235
1800	279	374	1481	1093	134	179	36	9	228
1700	253	339	1421	1048	113	151	30	8	226
1600	221	296	1317	972	94	126	25	7	228
1500	189	254	1206	890	77	104	21	6	232
1400	159	213	1083	799	63	84	16	4	221
1300	133	178	976	720	50	68	14	4	228
1200	110	148	879	648	40	53	11	3	232
1100	89	120	776	572	31	41	8	2	235
1000	73	99	702	518	23	31	7	2	242

* Theoretical 3.0 exponent propeller curve , measured at flywheel

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