6BTA

6BTA5.9 F1

FIRE PUMP ENGINE

SPECIFICATIONS

Four Stroke Cycle, Turbocharged-Aftercooled, In-Line, 6 Cylinder Diesel Engine

Bore and Stroke	4.02 x 4.72 in.	(102x120 mm)
Displacement	359 cu. in.	(5.88 L)
Oil System Capacity	15 U.S. qts.	(14.2 L)
Engine Coolant Capacity	21.8 U.S. gal.	(20.7 L)
Dry Weight, With Std. Accessories	1,170 lb.	(530 kg)

INSTALLATION CONSIDERATIONS

Maximum raw water pressure must not exceed 20 PSI (137 kPa). Minimum acceptable raw water flow at 90° F (32° C) raw water temperature and 100° F (38° C) ambient air temperature should be at least 25 G.P.M. (68 L/min.) at the 2100 RPM listed rating.

Ventilation air required for engine combustion is 385 CFM @ 208 and 283 CFM @ 182 hp. This is for engine air combustion only and does not take into consideration additional air required for normal room cooling.

This symbol on the nameplate means the product is Listed by Underwriters' Laboratories, Inc.

This symbol on the nameplate means the product is approved by the Factory Mutual Research Corporation.

This symbol on the nameplate means the product is Listed by Underwriters' Laboratories of Canada.

LISTED AGENCY RATINGS

182 HP @ 1760 RPM
208 HP @ 2100 RPM

All of the above ratings are listed by the following agencies:

Underwriters' Laboratories Inc.

Factory Mutual

Underwriters' Laboratories of Canada

The agency-approved horsepower ratings published are already derated for fire pump service. The ratings show horsepower available for driving the fire pump at standard SAE J1995 conditions of 29.61 in. (752 mm) Hg barometer and 77° F (25° C) inlet air temperature (approximately 300 ft. [91.4 m] above sea level). The only additional deration necessary is for higher ambient temperatures and elevations as follows: 3% for each 1000 ft. (305 m) above 300 ft. (91.4 m) and 1% for each 10° F (5.6° C) above 77° F (25° C) in accordance with National Fire Association Pamphlet No. 20.

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DESIGN FEATURES

Aftercooler: Large capacity aftercooler results in cooler, denser air for more efficient combustion and reduced internal stress for longer life.

Direct Fuel Injection System: With high swirl intake ports for thorough mixing of air and fuel to provide low fuel consumption.

Holset Exhaust Gas Driven Turbocharger: Provides more power, improved fuel economy, altitude compensation, and lower smoke and noise levels.

Compact Size: For ease of installation and easy access for routine maintenance.

Fewer Parts: For less inventory and faster maintenance and repair. Parts simplicity also enables engines to be serviced and repaired with ordinary hand tools.

Cast Iron Skirted Block: With main bearing supports between each cylinder, for maximum strength and rigidity, low weight, and optimum crankshaft support.

Forged Steel, I-beam Cross Section Connecting Rods: With angle split cap-to-rod interface and capscrew attachment for maximum structural strength and ease of service.

Side Mounted Gear Driven Camshaft: For low engine height and minimum maintenance.

Single Piece Cross Flow Cylinder Head: For short length and maximum structural stiffness of the block/head assembly, for fewer head gasket problems.

Two Valves Per Cylinder: With single valve springs, for fewer parts.

Single Belt Fan, Alternator, and Water Pump Drive: With self-tensioning idler for minimum belt maintenance.

STANDARD EQUIPMENT

Air Cleaner: 15 inch (318 mm) diameter dry air cleaner.

Belt and Damper Shield Guard: Protection from alternator, accessory drive, and water pump belts and vibration damper.

Coolant Pump: Belt driven, centrifugal type.

Corrosion Resistor: Mounted, checks rust and corrosion, controls acidity, and removes impurities from coolant.

Electrical Equipment: 12 volt negative ground system, including: a 12 volt starting motor; a 12 volt, 65 alternator; manually operable contactors; and a junction box with enclosed terminal strip.

Engine Support: Pedestal type, front and rear.

Exhaust Manifold: Wet.

Exhaust Outlet: 3 in. (76 mm) diameter, 90° elbow.

Filters: Spin-on, replaceable lubricating oil filter. Single spin-on, replaceable fuel filter.

Flywheel: Machined for stubshaft mounting.

Flywheel Housing: SAE No. 3 with industrial supports.

Governor: Mechanical flyweight, mechanical variable speed type.

Heat Exchanger: Copper nickel tube bundle, mounted.

Instrument Panel: Mounted. Electrical instruments only. Includes amp meter, tachometer, hour meter, water temperature gauge, and lubricating oil pressure gauge.

Lubricating Oil Cooler: Tubular type, jacket water cooled.

Oil Pan: Steel stamp, rear sump type, 15 U.S. quarts (14.2 litre) capacity. Provision for optional oil heater.

Oil Pressure Switch: Provides signal to activate alarm (not included) for low oil pressure.

Overspeed Switch: Mounted, overspeed shutdown with manual reset, stop crank contacts.

Stubshaft: Mounted on flywheel.

Throttle Control: Hydraulic, with no manual override.

Vibration Damper: Viscous type.

Water Jacket Heater: Mounted beside oil pan, 120/240 volt, 1000 watt.

Water Temperature Switch: Provides signal to activate alarm (not included) for high water temperature.

Cummins has always been a pioneer in product improvement. Thus specifications may change without notice. Illustrations may include optional equipment.

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CUMMINS ENGINE COMPANY, INC.
Engine Data Sheet

Engine Model: **FIREPUMP 6BTA5.9 F1** **Data Sheet:** **DS-9374**
Gross Power BHP (kW): **208 (155) @ 2100** **Date:** **12May97**
Configuration Number: **D403018FX02** **CPL Code:** **1165**

GENERAL ENGINE DATA

Type ..... 4 cycle, Inline, 6 cylinder
Aspiration: ..... Turbocharged, Aftercooled
Bore - in. (mm) & Stroke - in. (mm) ..... 4.02 (102) x 4.72 (120)
Displacement - in.^{3} (litre) 359.0 (5.88)
Compression Ratio 15.5:1
Valves per Cylinder: - Intake 1
- Exhaust 1
Engine Weight & Center of Gravity (With Standard Accessories)
Reference Installation Diagram 3884450
Dry Weight - lb. (kg) 1170 (530)
Wet Weight - lb. (kg) 1230 (561)
C.G. Distance from F.F.O.B. - in. (mm) 18.375 (466.7)
C.G. Distance Above Crankshaft Centerline - in. (mm) 12.52 (318.0)
Maximum Allowable Bending Moment @ Rear Face of Block - lb.-ft. (N•m) 1000 (1350)

AIR INDUCTION SYSTEM

Maximum Allowable Temperature Rise Between Ambient Air and Engine Air Inlet
(Ambients 32°F [0°C] to 100°F [38°C]) - °F (°C) 30 (15)
Maximum Allowable Intake Restriction With a Dirty Air Filter Element
in. H_2O (mm H_2O) 25 (635)
Part Number of Standard Air Filter Element (Dry Type) 3915185

LUBRICATION SYSTEM

Oil Pressure @ Rated Speeds - PSI (kPa) ..... 40 - 60 (276 - 414)
Oil Flow @ Maximum Rated Speeds (Nominal) - U.S. GPM (litre/s) 15.5 (1.0)
Oil Pan Capacity (High - Low) U.S. quarts (litre) ..... 15 - 13 (14.2 - 12.3)
Full Flow Lube Oil Filter Capacity - U.S. gal (litre) 0.25 (0.9)
Part Number of Standard Oil Pan 3915703
Part Number of Standard Oil Filter Element 3908615

COOLING SYSTEM

Heat Exchanger Cooled (Shell & Tube Type)
Part Number of Tube Bundle 3911840
Raw Water Working Pressure Range at Heat Exchanger - PSI (kPa) ..... 60 (414) MAX
Recommended Minimum Water Supply Pipe Size to
Heat Exchanger (Reference Only) - in. (mm) dia 0.75 (19.1)
Recommended Minimum Water Discharge Pipe Size From
Heat Exchanger (Reference Only) - in. (mm) dia 1.0 (30.1)
Coolant Water Capacity (Engine Side) - U.S. gal (litre) 5.5 (20.8)
Standard Thermostat- Type ..... Modulating
- Range - °F (°C) 181-203 (83-95)
Minimum Raw Water Flow with Water
Temperatures to 90°F (32°C) - U.S. GPM (litre/s) 25 (1.6)

A jacket water heater is mandatory on this engine. The recommended heater wattage is 1000 down to 40°F (4°C)

EXHAUST SYSTEM

Maximum Allowable Back Pressure Imposed by Piping &
Silencer - in. Hg (mm Hg) 3 (75)
Exhaust Pipe Size Normally Acceptable - in. (mm) dia 3 (76)

FUEL SYSTEM

Supply Line Size - in. (mm) 0.25 (6)
Drain Line Size - in. (mm) 0.125 (3)
Maximum Fuel Line Length Between Supply Tank & Fuel Pump - ft. m) 40 (12)
Maximum Fuel Height Above CL Crankshaft - in. (mm) 80 (2030)
Part Number of Standard Fuel Filter 3903640
Part Number of Standard Fuel Filter Element 3903640
Maximum Allowable Restriction to Fuel Pump with Dirty Filter - in. Hg (mm Hg) 3.5 (89)
Maximum Allowable Return Line Restriction - in. Hg (mm Hg) 5.0 (127)

ELECTRICAL SYSTEM

Battery Voltage 12
Battery Cable Size (Maximum Cable Length Not to Exceed 10 ft. (3.0 m) AWG) 00
Wiring for Automatic Starting (Negative Ground) ..... Standard
Alternator (Standard) 12 Volt, Internally Regulated - Ampere 53
Manually Operable Contactors ..... Standard
Minimum Recommended Battery Capacity
70°F (21°C) Minimum Temperature - CCA 450
32°F (0°C) Minimum Temperature - CCA 640
Reference Wiring Diagram Number 3884450

PERFORMANCE DATA

All data is based on the engine operating with fuel system, water pump, lubricating oil pump, air cleaner, and alternator; not included are compressor, fan, optional equipment and driven components. Data is based on operation at SAE standard J1995 conditions of 300 ft. (91 m) altitude (29.61 in. [752mm] Hg dry barometer), 77° F (25° C) intake air temperature, using No. 2 diesel or a fuel corresponding to ASTM D2.

All data is subject to change without notice.

Altitude Above Which Output Should be Limited - ft. (m) 300 (91)
Correction Factor per 1000 ft. (300 m) above Altitude Limit 3%
Temperature Above Which Output Should be Limited -°F (°C) 77 (25)
Correction Factor per 10°F (11°C) Above Temperature Limit 1% (2%)

FM Approved and UL Listed Ratings For: 6BTA5.9F1

Listed/ Approved Ratings BHP (kW)	Engine Speed RPM	Ventilation Air Required for Combustion CFM (litre/s)	Heat Rejection to Coolant BTU/min (kW)	Heat Rejection to Ambient Air* BTU/min (kW)	Exhaust Gas Flow CFM (litre/s)	Exhaust Gas Temp. °F (°C)	Fuel Consumption Gal/h (litre/h)
208 (155)	2100	385 (181)	7280 (128)	955 (27)	953 (449)	815 (435)	10.4 (39.4)
182 (136)	1760	283 (133)	6279 (110)	715 (20)	745 (351)	890 (476)	9.2 (35)

* - Does not include exhaust piping.

Cummins Engine Company, Inc.

Exhaust Emissions Data Sheet

Data Sheet: DS-9374
Date: 12May97

Engine

Model:	6BTA5.9-F1	**Application:**	Firepump
Type:	4 cycle, In-Line, 6 Cylinder Diesel	**Config. Number:**	D403018FX02
Aspiration:	Turbocharged and Aftercooled	**Bore:**	4.02 in. (102 mm)
Compression Ratio:	15.5:1	**Stroke:**	4.72 in. (120 mm)
Emissions Control Device:	Turbo, Aftercooling	**Displacement:**	359 cu. in. (5.9 liters)

Performance Data	2100 RPM	1760 RPM
BHP	208	182
Fuel Consumption (gallons/hour)	10.4	9.0
Air to Fuel Ratio	23.0	19.1
Exhaust Gas Flow (CFM)	953	745
Exhaust Gas Temperature (^{o}F)	815	890

Exhaust Emissions Data

(All values are grams/hp-hour)

Component		2100 RPM	1760 RPM
HC	(Total Unburned Hydrocarbons)	1.13	0.77
NOx	(Oxides of Nitrogen as NO_2)	4.58	4.94
CO	(Carbon Monoxide)	2.60	1.31
PM	(Particulate Matter)	0.25	0.25
SO_2	(Sulfur Dioxide)	0.62	0.63
CO_2	(Carbon Dioxide)	510	520
N_2	(Nitrogen)	2800	2400
O_2	(Oxygen)	320	180
H_2O	(Water Vapor)	190	190

Test Conditions

Data was recorded during steady-state rated engine speed ($\pm$ 25 RPM) with full load ($\pm$ 2%). Pressures, temperatures, and emission rates were stabilized.

Fuel Specification:	ASTM D975 No. 2-D diesel fuel with 0.2% sulfur content (by weight) and 42-50 cetane number.
Fuel Temperature:	99°F $\pm 9^{o}$ (at fuel pump inlet)
Intake Air Temperature:	77°F $\pm 9^{o}$
Barometric Pressure:	29.6 in. Hg $\pm$ 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H_2O/lb. dry air

The HC, NOx, and CO emissions data tabulated here were taken from a single engine under the test conditions shown above. Data for the other components are estimates. This data is subject to instrumentation, measurement, and engine-to-engine variability. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may result in elevated emission levels.

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