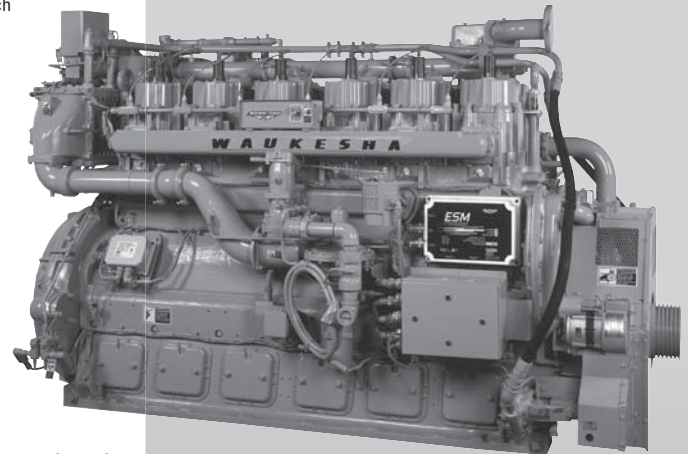


**STANDARD EQUIPMENT**

- AIR CLEANER** - Dry type with rain shield and service indicator.
- AIR FUEL RATIO CONTROL (AFR)** - Integrated ESM - AFR catalyst rich-burn control, main fuel gas regulator actuators, exhaust O<sub>2</sub> sensor(s), and post turbocharger exhaust thermocouple. Factory mounted and tested. AFR maintains emissions through load and speed changes. The ESM - AFR meets Canadian Standards Association Class 1, Division 2, Group D hazardous location requirements. Note: For dual fuel applications, ESM - AFR system will control the primary fuel source only.
- BARRING DEVICE** - Manual.
- BATTERY BOX** - Designed to accommodate two series 31 12 VDC batteries. Includes power disconnect switch and 20 foot (6.1 m) cable for connection to ESM Power Distribution Box.
- BEARINGS** - Heavy duty, replaceable, precision type.
- BREATHER** - Closed system.
- CONNECTING RODS** - Drop forged steel, rifle drilled.
- CONTROL SYSTEM** - Waukesha Engine System Manager (ESM®) integrates spark timing control, speed governing, air/fuel ratio control, detonation protection, start-stop control, diagnostic tools, fault logging and engine safeties. The Engine Control Unit (ECU) is the central brain of the control system and main customer interface. Connection to the ESM is via a 25 foot (7.6 m) harness to a local panel, through MODBUS RTU slave RS-485 connection, and through the Electronic Service Program (ESP). Customer connections are only required to the local panel, fuel valve, and 24V DC power supply. Compatible with Woodward load sharing module. ESM meets Canadian Standards Association Class 1, Division 2, Group D, hazardous location requirements.
- CRANKCASE** - Integral crankcase and cylinder frame. Main bearing caps drilled and tapped for temperature sensors. Does not include sensors.
- CRANKSHAFT** - Forged steel, seven main bearings, counterweighted, and dynamically balanced.
- CYLINDERS** - Removable wet type bainitic cast iron cylinder liners, chrome plated on outer diameter.
- CYLINDER HEADS** - Six interchangeable. Four valves per cylinder, with water cooled exhaust valve seats. Roller valve lifters and hydraulic push rods. Flange mounted ignition coils.
- ELECTRONIC SERVICE PROGRAM (ESP)** - Microsoft® Windows-based program provided on CD-ROM for programming and interface to ESM. Includes E-Help for troubleshooting any ESM faults. A serial cable is provided for connection from a customer-supplied PC to the ECU's RS-232 port.
- ENGINE MONITORING DEVICES** - Factory mounted and wired sensors for lube oil pressure and temperature, intake manifold temperature and pressure, jacket water temperature, and Exhaust O<sub>2</sub> content, all accessible through ESM. ESM continually monitors combustion performance through individual knock sensors to provide detonation protection. Dual magnetic pick-ups are used for accurate engine speed monitoring. ESM provides advanced diagnostics of engine and all ESM sensors and logs any faults into non-volatile flash memory.
- ENGINE ROTATION** - Counterclockwise when facing flywheel.
- EXHAUST OUTLET** - Single vertical at rear. Flexible stainless steel connection with 6" (152 mm) pipe flange.
- FLYWHEEL** - Approx. WR<sup>2</sup> = 155000 lb-in<sup>2</sup>; with ring gear (208 teeth), machined to accept two drive adapters: 31.88" (810 mm) pilot bore, 30.25" (768 mm) bolt circle, (12) 0.75"-10 tapped holes; or 28.88" (734 mm) pilot bore, 27.25" (692 mm) bolt circle, (12) 0.625"-11 tapped holes and (12) 0.75"-10 tapped holes.
- FLYWHEEL HOUSING** - No. 00 SAE.
- FUEL SYSTEM** - One natural gas, 4" (102 mm) updraft carburetors and one mounted Mooney Flowgrid 250, 2" (51 mm) gas regulator, 30-60 psi (207-414 kPa) fuel inlet pressure required. 10 foot (3 m) harness provided for ESM control of customer supplied fuel shutoff valve.
- GOVERNOR** - Electric throttle actuator controlled by ESM with throttle position feedback. Governor tuning is performed using ESP. ESM includes option of a load-coming feature to improve engine response to predictable step loads.
- IGNITION SYSTEM** - Ignition Power Module Diagnostics (IPM-D) - controlled by ESM, with spark timing optimized for varying speed-load conditions. Dual voltage energy levels automatically controlled by ESM to maximize spark plug life and improve starting. The diagnostics feature of ESM can be used to help monitor spark plug life via predictive maintenance. Shielded ignition components that meet Canadian Standard Association Class 1, Division 2, Group D hazardous location requirements.
- INTERCOOLER** - Air-to-water.
- LEVELING BOLTS**
- LIFTING EYES** - Requires 9.5 ton Working Load Limit (W.L.L. anchor shackles.
- LUBRICATION** - Full pressure, gear type pump. Full flow lube oil filter, 20 gallon (76 litres) capacity, with replaceable depth-type elements and flexible connections, shipped loose. MICROSPIN® bypass filter, engine mounted. Lube oil strainer, mounted. Air/gas motor driven pre-lube pump, requires final piping.
- MANIFOLD** - Exhaust, water cooled.
- OIL COOLER** - Shell and tube type with thermostatic temperature controller and pressure regulating valve. Mounted on left hand side.
- OIL PAN** - Base type. 72 gallon (273 L) capacity including filter and cooler.
- PAINT** - Oilfield orange primer.
- PISTONS** - Aluminum with floating pin. Oil cooled. 8:1 compression ratio.
- SHIPPING SKID** - For domestic truck or rail.
- TURBOCHARGER** - (1) with water-cooled bearing housing and adjustable wastegate.
- VIBRATION DAMPER** - Viscous type.
- WATER CIRCULATING SYSTEM, AUXILIARY CIRCUIT** - Belt driven water circulating high capacity pump for intercooler and lube oil cooler. See S6543-19 performance curve for use with standard 10 diameter crankshaft pulley.
- WATER CIRCULATING SYSTEM, ENGINE JACKET** - Belt driven water circulating pump. Cluster type thermostatic temperature regulating valve, full flow bypass type with 165° - 170°F (74° - 77°C) start to open thermostats. ANSI 4" (102 mm) 125 psi flange connections on inlet and outlet.

**VHP® Series Four® Gas Engine**

560 - 840 BHP (418 - 626 kWb)



Engine shown with options.

**Model F3524GSI with ESM®**

Turbocharged and Intercooled Six Cylinder, Four-Cycle Gas Fueled Engine

**SPECIFICATIONS**

Cylinders	Lube Oil Capacity
Inline 6	72 gal. (273 L)
Piston	Starting System
Displacement	125 - 150 psi air/ gas
3520 cu. in. (58 L)	24 V electric
Bore & Stroke	Dry Weight
9.375" x 8.5" (238 x 216 mm)	15,000 lb. (6800 kg)
Compression Ratio	
8:1	
Jacket Water System Capacity	
48.5 gal. (184 L)	



## POWER RATINGS: F3524GSI VHP® SERIES FOUR® GAS ENGINES

Brake Horsepower (kWb Output)						
Model	I.C. Water Inlet Temp. °F (°C) (Tcra)	C.R.	800 rpm	900 rpm	1000 rpm	1200 rpm
F3524GSI	130° (54°)	8:1	560 (418)	630 (470)	700 (522)	840 (627)

**Rating Standard:** All models: Ratings are based on ISO 3046/1-1995 with mechanical efficiency of 90% and auxiliary water temperature Tcra (clause 10.1) as specified above limited to ± 10° F (± 5° C). Ratings are also valid for SAE J1349, BS5514, DIN6271 and AP17B-11C standard atmospheric conditions.

**ISO Standard Power/Continuous Power Rating:** The highest load and speed which can be applied 24 hours a day, seven days a week, 365 days per year except for normal maintenance. It is permissible to operate the engine at up to 10% overload, or maximum load indicated by the intermittent rating, whichever is lower, for two hours in each 24 hour period.

All natural gas engine ratings are based on a fuel of 900 Btu/ft<sup>3</sup> (35.3 MJ/nm<sup>3</sup>) SLHV, with a 91 WKI®.

For conditions or fuels other than standard, contact the Dresser Waukesha Application Engineering Department.

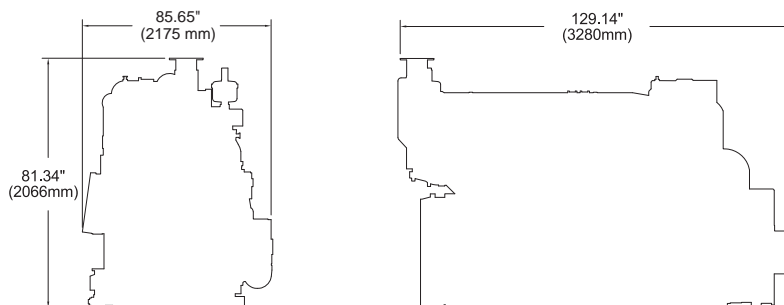
## PERFORMANCE: F3524GSI VHP® SERIES FOUR® GAS ENGINES

English 130° F I.C. Water Temperature			Metric 54° C I.C. Water Temperature		
RPM	1200	1000	RPM	1200	1000
Power (Bhp)	840	700	Power (kWb)	627	522
BSFC (Btu/bhp-hr)	7895	7605	BSFC (kJ/kW-hr)	11170	10760
NOx (grams/bhp-hr)	15.7	15.6	NOx (g/nm <sup>3</sup> )	5.8	5.8
CO (grams/bhp-hr)	12.9	12.3	CO (g/nm <sup>3</sup> )	4.8	4.6
NMHC (grams/bhp-hr)	0.12	0.13	NMHC (g/nm <sup>3</sup> )	0.05	0.05

### NOTES:

- Fuel consumption and exhaust emissions are based on ISO 3046/1-1995 standard reference conditions and commercial quality natural gas of 900 Btu/ft<sup>3</sup> (35.38 MJ/m<sup>3</sup> [25, V(0; 101.325)]) saturated lower heat value, Waukesha Knock Index™ of 91 and 93% methane content by volume. ISO 3046/1-1995 standard reference conditions are 77°F (25°C) ambient temperature, 29.54 inches Hg (100 kPa) barometric pressure, 30% relative humidity (1kPa/0.3 inches Hg water vapor pressure).
- S.I. exhaust emissions are corrected to 5% O<sub>2</sub> (0°C and 101.325 kPa).
- Data will vary due to variations in site conditions. For conditions and/or fuels other than standard, consult the Dresser Waukesha Application Engineering Department.
- Fuel consumption based on ISO 3046/1-1995 with a +5% tolerance for commercial quality natural gas having a 900 Btu/ft<sup>3</sup> saturated low heat valve

Consult your local Waukesha Distributor for system application assistance. The manufacturer reserves the right to change or modify without notice, the design or equipment specifications as herein set forth without incurring any obligation either with respect to equipment previously sold or in the process of construction except where otherwise specifically guaranteed by the manufacturer.



Bulletin 7039 1008

Dresser Waukesha  
1101 West St. Paul Avenue · Waukesha, WI 53188-4999  
Phone: (262) 547-3311 · Fax: (262) 549-2795

©2008 Dresser Inc. Waukesha, VHP, Series Four, ESM, Microspin, and WKI are trademarks/registered trademarks of Dresser Waukesha, Dresser, Inc.



# Waukesha

www.dresser.com