



Waukesha

VHP3604GSI/GSID

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 regulators actuators, exhaust O₂ 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.

BEARINGS – Heavy duty, replaceable, precision type.

BREATHER – Closed system.

CONNECTING RODS – 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 (5.2 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 for 24V DC power supply. Compatible with Woodward load sharing module. ESM meets Canadian Standards Association Class I, Division 2, Group D, hazardous location requirements.

COOLING SYSTEM – Choice of mounted radiator with pusher fan, core guard and duct adaptor, heat exchanger with expansion tanks, or connection for remote radiator cooling. (One shutdown level switch for each circuit included on radiator and heat exchanger units).

CRANKCASE – Integral crankcase and cylinder frame.

CRANKSHAFT – Counterweighted, forged steel, dynamically balanced, with sealed viscous vibration damper.

CYLINDER HEADS – Six interchangeable valve-in-head type. Four valves per cylinder head, with water cooled exhaust valve seat. Roller valve lifters and hydraulic push rods. Flange mounted ignition coils.

CYLINDERS – 9.375" (238 mm) bore x 8.5" (216 mm) stroke; Removable wet type cylinder liners, chrome plated on outer diameter. Number of cylinders – Six.

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 BASE – Engine, generator and radiator or heat exchanger are mounted and aligned on a welded steel, wide flange base, designed for solid mounting on an inertia block, with standard base lifting eyes.

ENGINE MONITORING DEVICES – Factory mounted and wired sensors for lube oil pressure and temperature, intake manifold temperature and pressure, jacket water temperature, and Exhaust O₂ 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.

EXHAUST SYSTEM – Water cooled exhaust manifold with single vertical exhaust at rear. Flexible stainless steel exhaust connection; 8" (203 mm) long with 6" (152 mm) outlet flange.

FUEL SYSTEM (GSI) – One natural gas, 4" (102 mm) updraft carburetors and one mounted Mooney Flowgrid 250, 2 (51 mm) gas regulator, one 2" NPT flexible connection (shipped loose), and one 2" NPT Magnatrol gas solenoid valve (shipped loose). Fuel pressure – 30 PSIG minimum and 50 PSIG maximum.

FUEL SYSTEM (GSID) – One natural gas 4" updraft carburetor, one Fisher 133L gas regulator (shipped loose), one 3.5" 125 lb. flanged flexible connection (shipped loose), and one 3" NPT Magnatrol gas solenoid valve (shipped loose). Fuel pressure – 1 PSIG minimum and 50 PSIG maximum.

GENERATOR – Open, drip-proof, direct connected, fan cooled, 2/3 pitch, A.C. revolving field type, single bearing generator with brushless exciter, short circuit sustain (PMG type maintains 270% of rated generator current for up to 10 seconds on 105°C temperature rise generators; maintains 250% of current on 130°C rise generators) and damper windings. TIF and Deviation Factor within NEMA MG-1.32. Voltage 480/277, 3 phase, 4 wire, Wye 60 Hz and 400/230, 3 phase, 4 wire, Wye 50 Hz. Other voltages are available, consult factory. Insulation material NEMA Class F. Temperature rise within NEMA (105°C) for continuous power duty, within NEMA (130°C) for standby duty. All generators are rated 0.8 Power Factor, are mounted on the engine flywheel housing and have multiple steel disc flexible coupling drive. Includes space heater, 115/230 V, 1 phase.

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.

JUNCTION BOXES – Separate AC and DC junction boxes for engine wiring and external connections.

LUBRICATION – Full pressure, positive displacement pump. Full flow oil filter (shipped loose) and flexible connections (shipped loose). Microspin® bypass filter and flexible connections. 50 or 60 Hz, 230 volt AC, single phase electric motor driven intermittent prelube pump with motor starter (other voltages can be specified).

OIL COOLER – Shell and tube type (mounted).

OIL PAN – Cast alloy iron base type with removable doors.

PAINT – Oilfield Orange.

PISTONS – Aluminum with floating pin. Oil cooled.

STARTING EQUIPMENT – Two 24V DC electric starting motors.

TURBOCHARGER – Water cooled bearing housing with adjustable wastegate.

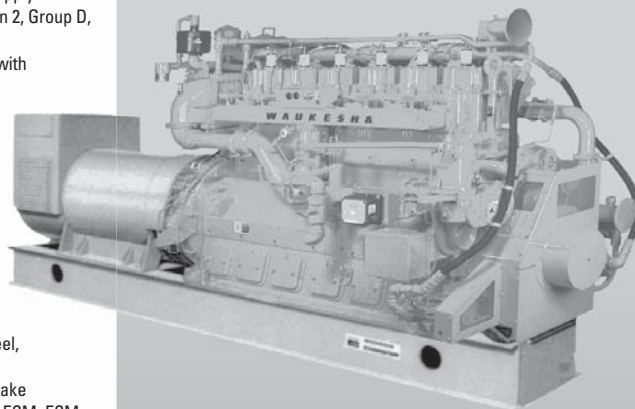
VOLTAGE REGULATOR (shipped loose) – SCR static automatic type providing 1% regulation from no load to full load, three phase sensing and automatic subsynchronous speed protection. Includes voltage adjustment rheostat (shipped loose).

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 pump, 175 – 180° F (79 – 82°C) thermostatic temperature regulation full flow bypass. Single 4" ANSI flange connections for inlet and outlet on water connect units.

VHP® Series Four® Gas Enginator® Generating System Featuring ESM® Technology

500 - 600 kW



Enginator shown with options, less Extender Series features.

Model VHP3604GSI/GSID

Turbocharged and Intercooled
Gas Fueled Enginator

SPECIFICATIONS

| | |
|--------------------------|---------------------------|
| Waukesha Engine | Jacket Water |
| F3524GSI | Capacity |
| Four Cycle | 48.5 gal. |
| Overhead Valve | (184 L) |
| Cylinders | Starting System |
| Inline 6 | 24V Electric |
| Piston | Fuel LHV |
| Displacement | 900 Btu/ft ³ |
| 3520 cu. in. | (33.5 J/cm ³) |
| (58 L) | Lube Oil Capacity |
| Bore & Stroke | 66 gal. |
| 9.375" x 8.5" | (250 L) |
| (238 x 216 mm) | |
| Compression Ratio | |
| 8:1 | |



PERFORMANCE DATA: VHP3604GSI GAS ENGINATOR® GENERATING SYSTEM

| HEAT EXCHANGER COOLING Heat Exchanger Water Supply: 93°F (34°C) I.C. Water: 130°F (54°C) | | CONTINUOUS POWER* | |
|--|--|-------------------|-------------------|
| kW Rating | | 1200 rpm 60 Hz | 1000 rpm 50 Hz |
| kW Rating | | 600 | 540*** |
| Fuel Consumption x 1000 Btu/h (kW) | | 6762 (1982) | 5876 (1722) |
| Jacket Water x 1000 Btu/h (kW) | | 2041 (598) | 1772 (519) |
| Lube Oil x 1000 Btu/h (kW) | | 297 (87) | 248 (73) |
| Intercooler x 1000 Btu/h (kW) | | 119 (35) | 80 (23) |
| Heat Radiated x 1000 Btu/h (kW) | | 382 (112) | 345 (101) |
| Exhaust Energy** x 1000 Btu/h (kW) | | 1906 (559) | 1579 (463) |
| Exhaust Flow lb/h (kg/h) | | 5753 (2610) | 4999 (2268) |
| Exhaust Temperature °F (°C) | | 1196 (647) | 1144 (618) |
| Induction Air Flow scfm (nm ³ /hr) | | 1281 (2060) | 1113 (1790) |
| WATER CONNECTION COOLING I.C. Water: 130°F (54°C) | | CONTINUOUS POWER* | |
| kW Rating | | 1200 rpm 60 Hz | 1000 rpm 50 Hz |
| kW Rating | | 600 | 540*** |
| Fuel Consumption x 1000 Btu/h (kW) | | 6762 (1982) | 5876 (1722) |
| Jacket Water x 1000 Btu/h (kW) | | 2041 (598) | 1772 (519) |
| Lube Oil x 1000 Btu/h (kW) | | 297 (87) | 248 (73) |
| Intercooler x 1000 Btu/h (kW) | | 119 (35) | 80 (23) |
| Heat Radiated x 1000 Btu/h (kW) | | 382 (112) | 345 (101) |
| Exhaust Energy** x 1000 Btu/h (kW) | | 1906 (559) | 1579 (463) |
| Exhaust Flow lb/h (kg/h) | | 5753 (2610) | 4999 (2268) |
| Exhaust Temperature °F (°C) | | 1196 (647) | 1144 (618) |
| Induction Air Flow scfm (nm ³ /hr) | | 1281 (2060) | 1113 (1790) |
| RADIATOR CONNECTION COOLING I.C. Water: 130°F (54°C) | | CONTINUOUS POWER* | |
| kW Rating | | 1200 rpm 60 Hz | 1000 rpm 50 Hz |
| kW Rating | | 560 | 500*** |
| Fuel Consumption x 1000 Btu/h (kW) | | 6762 (1982) | 5876 (1722) |
| Jacket Water x 1000 Btu/h (kW) | | 2041 (598) | 1772 (519) |
| Lube Oil x 1000 Btu/h (kW) | | 297 (87) | 248 (73) |
| Intercooler x 1000 Btu/h (kW) | | 119 (35) | 80 (23) |
| Heat Radiated x 1000 Btu/h (kW) | | 382 (112) | 345 (101) |
| Exhaust Energy** x 1000 Btu/h (kW) | | 1906 (559) | 1579 (463) |
| Exhaust Flow lb/h (kg/h) | | 5753 (2610) | 4999 (2268) |
| Exhaust Temperature °F (°C) | | 1196 (647) | 1144 (618) |
| Induction Air Flow scfm (nm ³ /hr) | | 1281 (2060) | 1113 (1790) |
| Radiator Air Flow scfm (nm ³ /hr) | | 57000 (91600) | 54000 (86800) |

Typical heat balance data is shown. Consult factory for guaranteed data.

***Continuous Power Rating:** The highest electrical power output of the Enginator available for an unlimited number of hours per year, less maintenance. It is permissible to operate the 60 Hz Enginator units with up to 10% overload for two hours in each 24 hour period. NO overload is allowed for the 50 Hz units.

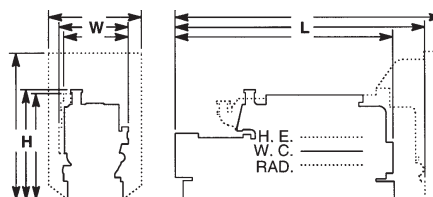
Rating Standard: The Waukesha Enginator power rating descriptions are in accordance to ISO 8528, DIN6271 and BS5514. It is also valid for ISO 3046/1-1995 with an engine mechanical efficiency of 90% and T_{cr}a (clause 10.0) is limited to ±10° F (5° C).

**Heat rejection based on cooling exhaust gas to 85° F (29° C).

*** No overload allowed.

All natural gas engine ratings are based on a fuel of 900 Btu/ft³ (35.3 MJ/nm³) SLHV, with a 91 WKI®. For conditions or fuels other than standard, consult Dresser Waukesha Application Engineering Department.

| Cooling Equipment | L in (mm) | W in (mm) | H in (mm) | Avg. Wt. lb (kg) |
|-------------------|------------|-----------|------------|------------------|
| Heat Exchanger | 205 (5180) | 68 (1730) | 106 (2690) | 24750 (11225) |
| Water Connection | 188 (4780) | 66 (1680) | 106 (2690) | 23750 (10775) |
| Radiator | 217 (5510) | 85 (2160) | 124 (3150) | 27500 (12475) |



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.

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