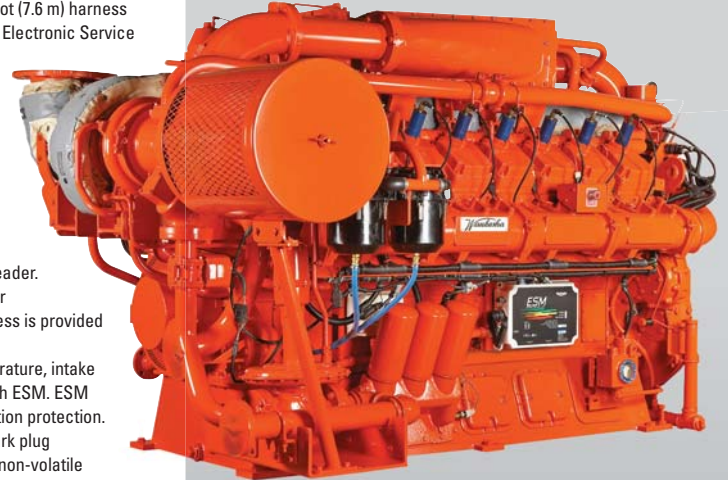


STANDARD EQUIPMENT

- AIR CLEANER** – Single, high efficiency, replaceable element and service indication.
- AFR** – Air Fuel Ratio control. Included with ESM®. Load based control with continuous feedback. Requires kW transducer.
- BARRING DEVICE** – Manual, mounted.
- BEARINGS** – Heavy duty, bi-metal, replaceable, precision type.
- BREATHER** – Closed system, replaceable element, mounted.
- CAMSHAFTS** – Two high alloy steel, outboard mounted, roller follower, utilizing Miller Cycle technology.
- CONNECTING RODS** – Drop forged alloy steel, high angle split, serrated joint, oil jet piston pin lubrication.
- CONTROL SYSTEM** – Waukesha Engine System Manager (ESM®) integrates spark timing control, speed governing, detonation protection, start-stop control, diagnostic tools, fault logging and engine safeties. Engine Control Unit (ECU) is central brain of the control system and main customer interface. Interface with ESM is through 25 foot (7.6 m) harness to local panel, through MODBUS RTU slave connection RS-485 multidrop hardware, and through the Electronic Service Program (ESP). Customer's 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 Standard Association Class 1, Division 2, Group D, hazardous location requirements.
- CRANKCASE** – Alloy cast iron, fully ribbed, integral with cylinder frame. Main bearing caps drilled and tapped for temperature sensors. Does not include sensors.
- CRANKSHAFT** – Forged steel, nine bearings, counterweighted and dynamically balanced.
- CYLINDERS** – Removable wet type cylinder liners, centrifugally cast.
- CYLINDER HEADS** – Sixteen interchangeable, valve-in-head type. Four valves per cylinder. Two hard faced intake valves. Two hard faced exhaust valves. Replaceable intake and exhaust valve seats. Mechanical valve lifters with pivoted roller followers. Rocker arm housing with integrated cooling header.
- 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. Serial harness is provided for connection of a customer supplied laptop to the ECU RS-232 port.
- ENGINE MONITORING DEVICES** – Factory mounted and wired sensors for lube oil pressure and temperature, intake manifold temperature and pressure, overspeed, and jacket water temperature, all accessible through ESM. ESM continuously monitors combustion performance through individual knock sensors to provide detonation protection. Dual magnetic pickups are used for accurate engine speed monitoring. ESM provides predictive spark plug diagnostics as well as advanced diagnostics of engine and all ESM sensors and logs any faults into non-volatile flash memory.
- ENGINE ROTATION** – Counterclockwise when facing flywheel.
- EXHAUST SYSTEM** – Insulated exhaust system with dry type manifolds. Single exhaust outlet with 125# 10" (254mm) outlet flange. Front mounted.
- FLYWHEEL** – Approx. WR2 = 28,710 lb-in2; with ring gear (165 teeth), machined to accept SAE 620D-21, 21" (533 mm) diameter clutch, or SAE J927B-210 flywheel converter.
- FLYWHEEL HOUSING** – SAE #00, cast iron housing. Provision for two magnetic pickups.
- FUEL SYSTEM** – Single natural gas high efficiency venturi carburetor, mounted directly to turbocharger inlet. Single low pressure Fisher 66Z regulator mounted and piped. 0.75-2 psig (5 – 14 kPa) fuel inlet pressure required. 10 foot (3m) harness provided for ESM control of customer supplied fuel shutoff valve.
- GOVERNOR** – Electronic 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 step loads.
- IGNITION SYSTEM** – Ignition Power Module Diagnostics (IPM-D) controlled by ESM, with spark timing optimized for varying 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. Flange mounted coils. Shielded ignition components meet Canadian Standard Association Class 1, Division 2, Group D hazardous location requirements.
- INTERCOOLER** – Air-to-water two stage. First stage utilizing jacket water. Second stage is in separate auxiliary water circuit. Customer supplied thermostat. Second stage designed for 130°F (54°C).
- LEVELING BOLTS**
- LIFTING EYES** – Requires 9.5 ton Working Load Limit (W.L.L.) anchor shackles. For lifting engine only.
- LUBRICATION SYSTEM** – Full pressure, gear type pump, replaceable spin on oil filters. Mounted oil cooler and prelube pump. Customer supplied prelube motor.
- OIL COOLER** – Shell and tube type, with thermostatic temperature controller and pressure regulating valve. Factory mounted.
- OIL PAN** – Base type with removable doors. 113 gallons (428 liters) capacity, including filters and cooler. Industrial base for mounting.
- PAINT** – Oilfield orange.
- PISTONS** – Aluminum with floating pin, single piece, gallery cooled, Ni-resist insert, two compression and one oil control rings.
- SHIPPING SKID** – Steel for domestic truck or rail.
- TURBOCHARGER** – Single, high pressure ratio, water cooled and oil lubricated. ESM controlled air/gas bypass, and factory set wastegate. Front mounted.
- VIBRATION DAMPER** – Single viscous type.
- WATER CIRCULATING SYSTEM** – Customer supplied pumps and jacket water thermostat and auxiliary water thermostat. ANSI flanges.
- Auxiliary circuit** – Second stage intercooler and oil cooler piping in series, 130° (54°) inlet water temperature.
- Jacket water circuit** – First stage intercooler and jacket water in parallel, 210°F (99°C) outlet water temperature.

APG™ Series Gas Engine

1392 - 1531 BHP
(1038 - 1142 kWb)



Engine shown with options

Model 16V150LTD

Turbocharged and Intercooled, Sixteen Cylinder, Lean Combustion, Four-Cycle Gas Fueled Engine

SPECIFICATIONS

| | | | |
|-------------------------------------|---------------------|---------------------------------|-----------------------------|
| Cylinders | V16 | Lube Oil System Capacity | 120 gal. (454 L) |
| Piston | | Starting System | 125 - 150 psi |
| Displacement | 2924 cu. in. (48 L) | Bore & Stroke | 5.98" x 6.5" (152 x 165 mm) |
| Bore & Stroke | | Dry Weight | 17,000 lb. (7730 kg) |
| Jacket Water System Capacity | 42 gal. (159 L) | | |
| Auxiliary Water Capacity | 8 gal. (30 L) | | |



PERFORMANCE DATA: 16V150LTD GAS ENGINE

| HEAT EXCHANGER/ WATER CONNECTION COOLING Intercooler Water: 130°F (54°C) | CONTINUOUS POWER | | | |
|---|---------------------------------|-------------------------------------|------------------------------|--------------------------------|
| | 1500 RPM 50Hz TA Luft NOx | 1500 RPM 50Hz 1/2 TA Luft NOx | 1800 RPM 60Hz 1 gm NOx | 1800 RPM 60Hz 0.6 gm NOx |
| Bhp (kWb) RATING | 1392 (1038) | 1392 (1038) | 1531 (1142) | 1531 (1142) |
| Mechanical Efficiency | 43.1% | 41.9% | 42.5% | 41.7% |
| Fuel Consumption - BTU/bhp-hr (kW) | 5903 (2414) | 6070 (2483) | 5985 (2683) | 6102 (2735) |
| Engine Heat Balance - Btu/hr*1000 (kW) | | | | |
| Jacket Water | 1542 (452) | 1596 (468) | 1729 (507) | 1767 (518) |
| Auxiliary Water (Inc IC Stage 2 & OC) | 781 (229) | 758 (222) | 770 (226) | 768 (225) |
| Radiation | 274 (80) | 297 (87) | 305 (89) | 312 (91) |
| Exhaust Heat (cooled to 120°C) | 1593 (467) | 1771 (519) | 1945 (570) | 2047 (600) |
| Exhaust Stack Temperature - °F (°C) | 742 (395) | 787 (420) | 792 (422) | 804 (429) |
| Induction Air - SCFM (nm ³ /hr) | 2675 (4112) | 2716 (4174) | 2961 (4551) | 3047 (4684) |
| Exhaust Gas Flow - lb/hr (kg/hr) | 12015 (5450) | 12196 (5532) | 13297 (6031) | 13684 (6207) |
| Emissions - g/bhp-hr (mg/nm³ @ 5% O₂) | | | | |
| NOx | 1.2 (500) | 0.6 (250) | 1.0 (400) | 0.6 (240) |
| CO | 1.4 (570) | 1.56 (630) | 1.48 (600) | 1.61 (650) |
| NMHC | 0.17 (70) | 0.17 (70) | 0.15 (60) | 0.17 (70) |

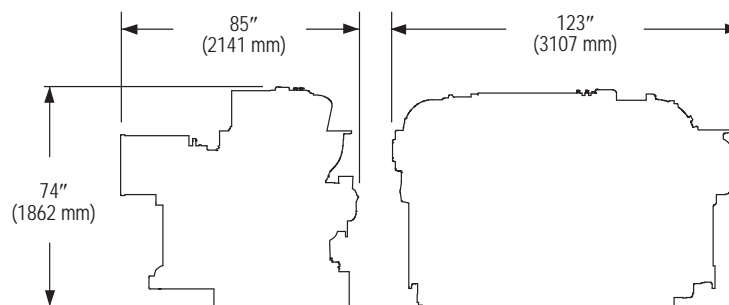
NOTES:

- Fuel consumption and exhaust emissions are based on ISO 3046/1-1995 standard reference conditions and commercial quality natural gas of 900 Btu/ft³ (35.38 MJ/m³ [25, V(0; 101.325)]) saturated lower heat value, Waukesha Knock Index (WKI*) value of 94 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% O₂ (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 consumptions based on ISO 3046/1-1995 with a +5% tolerance for commercial quality natural gas having a 900 Btu/ft³ saturated low heating value.
- Heat data based on fuel consumption +3%

Rating Standard: All models: Ratings are based on ISO 3046/1-1995 with mechanical efficiency of 90% and auxiliary water temperature T_{cr} (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.

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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