The following items are supplied as standard with every order:

- Automatic type. Shipped loose.

**APG1000**

Turbocharged and Intercooled, Sixteen Cylinder, Lean Combustion Gaseous Fueled Enginator

1000 - 1100 kW

**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 (7.6m) 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.

**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 engine monitoring devices. 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 ESM sensors and logs any faults into non-volatile flash memory.

**Exhaust** - Insulated exhaust system with dry type manifolds. Single exhaust outlet with 125# (254mm) outlet flange. Front mounted.

**Fuel System** - Single natural gas high efficiency variuri carburetor, mounted directly to turbocharger inlet. One low pressure Fisher 66Z regulator mounted and piped. 1-5 psig (7 – 34.5 kPa) fuel inlet pressure required. ESM controlled shipped loose fuel shutoff valve.

**Generator** - Open, drip-proof, direct connected, synchronous, fan cooled, AC revolving field type, 2/3 pitch, single bearing generator with AREP excitation system for 300% short circuit sustain (250% for 50 Hz) and motor starting. TIF and Deviation Factor within NEMA MG–1.32. Voltage: 480/277, 3 phase, 6 wire Wye, 60 Hz, and 400/230, 3 phase, 6 wire Wye, 50 Hz. Temperature rise within NEMA 105° C for continuous duty, within NEMA 130° C for standby duty. Voltage regulation is ±0.5%. All generators are rated at 0.8 power factor, are mounted on the engine flywheel housing, and have multiple steel disc flexible coupling drive.

**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 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.

**Intercooler** - Air-to-water two stage. First stage utilizing jacket water. Second stage is in separate auxiliary water circuit with integral thermostat.

**Lubrication System** - Full pressure, gear type pump, replaceable spin on oil filters, mounted oil cooler, mounted electric driven prelube pump.

**Paint** - Oilfield Orange.

**Pistons** - Aluminum with floating pin, single piece, gallery cooled, Ni-resist insert, two compression and one oil control rings.

**Starting System** - 24V DC starting motor.

**Turbocharger** - Single, high pressure ratio, water cooled and oil lubricated. ESM controlled air/gas bypass, and factory set wastegate. Front mounted.

**Voltage Regulator** - Automatic type. Shipped loose.

**Water Circuit** - Engine mounted pumps and thermostats.

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**Engine Specifications**

- **Engine**
  - **Model:** APG1000
  - **Type:** Turbocharged and Intercooled
  - **Cylinders:** Sixteen Cylinder
  - **Engine Technology:** Miller Cycle Technology
  - **Maximum Power:** 1000 - 1100 kW

- **Power System**
  - **System Capacity:** 68 gal. (258 L)
  - **Auxiliary Water Capacity:** 14 gal. (530 L)

- **Fuel System**
  - **Piston Displacement:** 2924 cu. in. (48L)
  - **Bore & Stroke:** 5.95" x 6.5" (152 x 165 mm)

- **Compression Ratio:** 10:1 / 14:1

- **Weight and Dimensions**
  - **Dry Weight:** 30,200 lb. (13,730 kg)
  - **Overall Dimensions:**
    - **Width:** 14.5 ft. (4.4 m)
    - **Length:** 19 ft. (5.8 m)
    - **Height:** 10 ft. (3.0 m)

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**Documentation**

- The following items are supplied as standard with every order:
  - One Enginator® manual consisting of:
    - Engine operation/service manual.
    - Engine parts book.
    - Generator/voltage regulator instructions.
    - Instructions on major items.

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**APG1000**

**Waukesha Engine**

16V150LTD

Four Cycle

Lean Burn

Cylinders

V 16

**Piston Displacement**

2924 cu. in. (48L)

**Bore & Stroke**

5.95" x 6.5" (152 x 165 mm)

**Compression Ratio**

10:1 / 14:1

---

**Jacket Water System Capacity**

68 gal. (258 L)

**Auxiliary Water Capacity**

14 gal. (530 L)

**Starting System**

24VDC Electric

**Lube Oil System Capacity**

113 gal. (428 L)

**Dry Weight**

30,200 lb. (13,730 kg)

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**Enginator shown with options.**

Model APG1000

Turbocharged and Intercooled, Sixteen Cylinder, Lean Combustion Gaseous Fueled Enginator
## PERFORMANCE DATA: APG1000 GAS ENGINATOR® GENERATING SYSTEM

### HEAT EXCHANGER/ WATER CONNECTION COOLING

Intercooler Water: 130°F (54°C)

<table>
<thead>
<tr>
<th>kW RATING</th>
<th>1500 rpm 50 Hz</th>
<th>1800 rpm 60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 kW</td>
<td>5979 (2436)</td>
<td>5988 (2685)</td>
</tr>
<tr>
<td></td>
<td>1551 (455)</td>
<td>1660 (487)</td>
</tr>
<tr>
<td></td>
<td>530 (155)</td>
<td>583 (171)</td>
</tr>
<tr>
<td></td>
<td>344 (101)</td>
<td>379 (111)</td>
</tr>
<tr>
<td></td>
<td>495 (145)</td>
<td>544 (159)</td>
</tr>
<tr>
<td></td>
<td>373 (109)</td>
<td>373 (109)</td>
</tr>
<tr>
<td></td>
<td>2137 (626)</td>
<td>2476 (726)</td>
</tr>
<tr>
<td></td>
<td>12144 (5609)</td>
<td>13324 (5998)</td>
</tr>
<tr>
<td></td>
<td>740 (393)</td>
<td>756 (402)</td>
</tr>
<tr>
<td></td>
<td>2568 (3947)</td>
<td>2919 (4487)</td>
</tr>
</tbody>
</table>

### Cooling Equipment

<table>
<thead>
<tr>
<th>Equipment</th>
<th>L in (mm)</th>
<th>W in (mm)</th>
<th>H in (mm)</th>
<th>Avg. Wt. lb (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Connection</td>
<td>191 (4851)</td>
<td>85 (2159)</td>
<td>88 (2235)</td>
<td>30200 (13727)</td>
</tr>
<tr>
<td>Heat Exchanger</td>
<td>208 (5283)</td>
<td>85 (2159)</td>
<td>88 (2235)</td>
<td>31200 (14182)</td>
</tr>
</tbody>
</table>

### Emissions

<table>
<thead>
<tr>
<th>Emissions</th>
<th>1500 rpm 50 Hz</th>
<th>1800 rpm 60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx g/bhp-hr (mg/mm³ @ 5% O₂)</td>
<td>1.2 (500)</td>
<td>1.0 (410)</td>
</tr>
<tr>
<td>CO g/bhp-hr (mg/mm³ @ 5% O₂)</td>
<td>1.5 (695)</td>
<td>1.4 (650)</td>
</tr>
<tr>
<td>NMHC g/bhp-hr (mg/mm³ @ 5% O₂)</td>
<td>0.5 (210)</td>
<td>0.65 (270)</td>
</tr>
<tr>
<td>THC g/bhp-hr (mg/mm³ @ 5% O₂)</td>
<td>3.5 (1480)</td>
<td>2.6 (1100)</td>
</tr>
</tbody>
</table>

*No overload.

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**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.**