

Specifications

Cylinders: V 18
Piston Displacement: 10019 cu. in. (164.2 L)
Bore & Stroke: 8.7" x 9.4" (220 x 240 mm)
Compression Ratio: 11:1
Jacket Water System Capacity: 139 gal. (526 L)
Lube Oil Capacity: 215 gal. (820 L)
Starting System: Electric Starter
Dry Weight: 80,100 lb. (36333 kg)

Standard Equipment

AFR – Air Fuel Ratio control included with ESM®. Load based control with continuous feedback.

BARRING DEVICE – Manual, mounted.

BASE – Engine, generator are mounted and aligned on a welded steel, wide flange base with lifting outriggers. Standard base designed for solid-mount only. Optional base suitable for vibration isolators.

BEARINGS – Heavy-duty, bi-metal. Sputterlager type, replaceable, precision type.

BREATHER – Open, customer to vent from connection on engine.

CAMSHAFTS – Case hardened individual segments (three per bank) bolted together.

CONNECTING RODS – Forged high tensile steel, fully machined and balanced.

COOLING SYSTEM – Standard three (3) circuits (HT, LT, & Lube Oil) for CHP applications using a separate lube oil cooling circuit. Designed for temperature range: LT 45°C (113°F) or LT 55°C (131°F) and HT 100°C (212°F). External lube oil cooler and thermostat, external radiator (or) cooling tower (or) raw water are customer supplied. Standard engine supplied with raised flanges on all coolant connections for customer connections. Optional skid is available for simple cycle. Simple cycle skid provides equipment for pumping and thermostatic control of both coolant circuits, cooling and thermostatic control of the lube oil, instrumentation, and interconnects to the engine.

AUXILIARY CIRCUIT (LT) – Second stage charge air cooler, 45°C (113°F) or 55°C (131°F) inlet water temperature.

JACKET WATER CIRCUIT (HT) – First stage charge air cooler and engine jacket in series, 100°C (212°F) outlet water temperature. Includes jacket water preheater and circulating pump.

CONTROL SYSTEM – Waukesha Engine System Manager (ESM®) integrates fuel injection, 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. 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 required to the local panel (ECP), auxiliary systems interface, exhaust vent, and for 24V DC power supply. ESM meets Canadian Standard Association Class I, Division 2, Group D, hazardous location requirements. Logic provided for engine preheat, engine prelube, optional valve-proving system, and exhaust venting.

CRANKCASE – Nodular cast iron, fully ribbed, integral with cylinder frame. Hydraulically fastened main bearing caps. Optimal compact and rigid design including large inspection doors.

CRANKSHAFT – Forged high tensile steel, counterweighted and fully dynamically balanced.

CYLINDERS – Removable wet type cylinder liners, centrifugally cast iron with anti polishing ring.

CYLINDER HEADS – Eighteen interchangeable robust design cylinder heads with hydraulically tensioned studs. Grey cast iron. Four valves per head - two intake and two exhaust valve with replaceable intake and exhaust valve seats, stellite-coated seat faces and chrome-plated stems. Water-cooled flame deck and prechamber. Prechamber is heat resistant alloy steel.

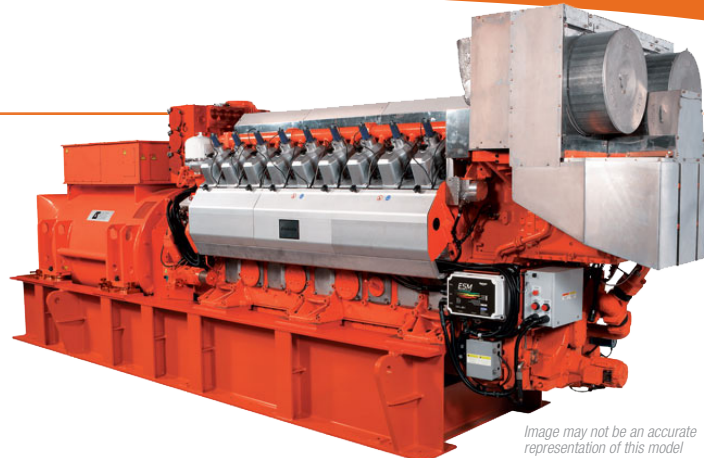


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ELECTRONIC SERVICE PROGRAM (ESP) – Microsoft Windows based program provided on CD-ROM for programming and interface to ESM. Includes E-Help for troubleshooting any ESM faults. Serial harness is provided for connection of a customer supplied laptop to the ECU RS-232 port.

ENGINE MONITORING DEVICES – Factory mounted and wired sensors for fuel pressure, lube oil pressure and temperature, intake manifold temperature and pressure, overspeed, jacket water temperature and pressure, auxiliary water temperature and pressure, and cylinder exhaust temperatures, 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 and position 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.

EXHAUST SYSTEM – Insulated removable covers for exhaust manifold and turbochargers. Single DIN 300 outlet flange at each turbocharger. Includes two DIN 300 stainless steel exhaust flex connections (shipped loose).

FUEL SYSTEM – Engine supplied with mounted main and prechamber gas regulator, gas vent valve, and 24V shut-off valve. Gas is supplied through common pipes running along the engine (DIN 80), with individual feed pipes to each main and prechamber fuel injector on each cylinder head. Two common pipes per bank, one for the main and one for the prechamber gas supply. Shipped loose, coalescing filter and inlet flex supplied.

GENERATOR – Open, drip-proof, direct connected, synchronous, fan cooled, AC revolving field type, two-bearing generator with permanent magnet generator excitation system for 270% short circuit sustain and motor starting, cross current compensation, 100 ohm platinum RTD's for the stator windings and both bearings, and 230V single phase, 50-/60 Hz generator space heater. TIF and Deviation Factor within NEMA MG-1.32. Voltage: 4.16kV or 13.8kV, 3 phase, 6 wire Wye, 60 Hz, and 6.3kV or 11kV, 3 phase, 6 wire Wye, 50 Hz. Temperature rise within NEMA 105° C for continuous duty. Voltage regulation is ±0.5%. All generators are mounted to engine via flexible coupling. Optional high-efficiency generators available.

IGNITION SYSTEM – Designed for industrial gas engines to achieve long lifetime and reliability. The ignition system is controlled by ESM which automatically adjusts the ignition timing according to the data received from the engine. Optimizes combustion in every cylinder. The diagnostics feature of ESM can be used to help monitor spark plug life and aid in predictive maintenance.

JUNCTION BOX – Separate AC, I/O junction box for engine wiring and external connections. Includes motor starters and relays to operate the prelube pump, HT preheat circulating pump, HT heaters and generator space heater.

LUBRICATION SYSTEM – Wet oil sump and single lube oil circuit including fiberglass cartridge filters. Centrifugal filter to remove fine particles from lubricating oil. Engine connections provided for customer supplied oil cooler and thermostats for CHP application. Mounted pre-lubrication system with pump. Lube oil level controller.

OIL PAN – Underhung sump.

PAINT – Oilfield Orange.

PISTONS – Composite type with aluminum skirt and a steel crown. Piston gallery cooled via large flow oil jets. The piston skirt and cylinder liner lubricated by piston skirt lubrication through two bores in a groove in the piston skirt.

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STARTING SYSTEM – Three electric starters engine mounted. Option for air starting available, with engine-mounted turbine starter, relay valve, strainer, and silencer.

TURBOCHARGER – Two (2) single stage, oil lubricated, high pressure ratio turbochargers. ESM controlled wastegate. Front mounted.

VOLTAGE REGULATOR – Automatic type with 3-phase sensing (shipped loose).

ENGINE CONTROL PANEL – ECP5000E panel with alarm horn, NEMA 12 enclosure, Human Machine Interface (HMI), programmable Logic Controller (PLC) with engine control logic, AC Power Monitor, protective functions, kilowatt transducer for ESM-AFR, synchronizing check relay, Modbus TCP communication, Supervisory Control and Data Acquisition (SCADA) for historical logging and report generation visible on HMI.

Performance Data: APG3000 Gas Enginotor® Generating System

HEAT EXCHANGER/ WATER CONNECTION COOLING Intercooler Water: 130°F (54°C)		Continuous Power			
		1500 RPM 50Hz		1200 RPM 60Hz	
		TA Luft NOx	1/2 TA Luft NOx	TA Luft NOx	1/2 TA Luft NOx
kWe Rating		3234		2849	
Electrical Efficiency (%)		41.7	40.5	42.8	40.4
BSFC (LHV) kJ/kW-hr (Btu/bhp-hr)		8323 (5884)	8571 (6059)	8059 (5697)	8535 (6034)
Fuel Consumption - kW (Btu/bhp-hr)		7631 (26037)	7859 (26811)	6550 (22344)	6937 (23665)
Emissions	NOx mg/nm ³ @ 5% O ₂ (g/bhp-hr)	496 (1.00)	240 (0.50)	513 (1.00)	241 (0.50)
	CO mg/nm ³ @ 5% O ₂ (g/bhp-hr)	853 (1.70)	1135 (2.40)	856 (1.70)	1458 (3.00)
	THC mg/nm ³ @ 5% O ₂ (g/bhp-hr)	2896 (5.80)	3962 (8.20)	2999 (5.90)	4790 (9.90)
	NMHC mg/nm ³ @ 5% O ₂ (g/bhp-hr)	209 (0.42)	266 (0.55)	216 (0.42)	312 (0.65)
Heat Balance	1st Stage Intercooler and Jacket Water kW (Btu/hr x 1000)	1018 (3473)	979 (3340)	893 (3046)	1019 (3476)
	2nd Stage Intercooler 2 kW (Btu/hr x 1000)	258 (882)	289 (986)	244 (832)	275 (939)
	Heat to Lube Oil kW (Btu/hr x 1000)	450 (1534)	430 (1466)	378 (1291)	378 (1290)
	Heat to Radiation kW (Btu/hr x 1000)	125 (425)	136 (462)	122 (417)	127 (434)
	Total Exhaust Heat kW (Btu/hr x 1000)	2804 (9567)	3058 (10434)	2264 (7726)	2506 (8551)
Intake/ Exhaust System	Induction Air Flow Nm ³ /hr (scfm)	16794 (10926)	16629 (10819)	14550 (9467)	16293 (10600)
	Exhaust Flow kg/hr (lb/hr)	21383 (47141)	21198 (46731)	18522 (40833)	20708 (45652)
Exhaust Temperature °C (°F)		409 (768)	431 (808)	386 (727)	351 (664)

Typical heat data is shown, however no guarantee is expressed or implied. Consult your Dresser Waukesha Application Engineering Department for system application assistance.

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 the Dresser Waukesha Application Engineering Department.

Data based on standard conditions of 77°F (25°C) ambient temperature, 29.53 inches Hg (100kPa) barometric pressure, 30% relative humidity (0.3 inches HG / 1 kPa water vapor pressure).

Data shown with high efficiency generator.

Fuel consumption based on ISO3046/1-1995 with a tolerance of +5% for commercial quality natural gas having a 900 BTU/ft³ (35.3 MJ/nm³) SLHV.

Heat data based on fuel consumption +2.5%.

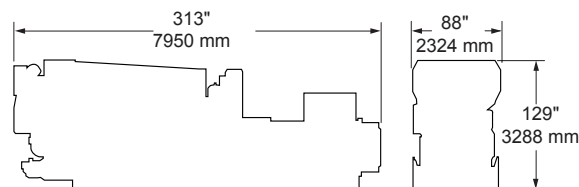
Heat rejection based on cooling exhaust temperature to 77°F (25°C).

Rating Standard: Ratings are based on ISO 3046/1-1995 with an engine mechanical efficiency of 90% and auxiliary water temperature T_{cr} as specified limited to ±10°F (±5°C). Ratings also valid for SAE J1349, DIN 627, BS 5514 and AP17B-11C standard atmospheric conditions.

ISO Standard Power/Continuous Power Rating: The highest load and speed which can be applied 24 hours per day, seven days per week, 365 days per year except for normal maintenance.

No overload available.

Consult your local Waukesha representative 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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