

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: Air 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. Designed for flexible elastic mounting on isolators. May also be solid mounted.

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 application using a separate lube oil cooling circuit. HT and LT controlled by a built-in thermostatic valve. 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. Optional design with two separate cooling circuits – Low temperature (LT) second stage circuit for charge air cooler and lube oil cooler and high temperature (HT) circuit for jacket water, cylinder heads, first stage charge air cooler and exhaust system water. Both HT and LT cooling water are circulated by an engine driven twin 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, gas train, 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, gas train 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 chromium-plated stems. Water-cooled flame deck and prechamber. Prechamber is heat resistant alloy steel.

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, 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 – 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. Includes a pre-packaged gas train (shipped loose) including fuel pressure regulator, coalescing filter, two blocking valves, ventilation system and temperature and pressure gauges and sensors. The gas pressure to be delivered to the gas train is 58-87 psig (4-6 barG).

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.

GOVERNOR – Fuel injected.

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 for rapid starts. Lube oil level controller.

OIL PAN – Base type.

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.

STARTING SYSTEM – Air starting system includes one air starter with silencer, relay valve and strainer. Low air consumption and noise level.

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).

WATER CIRCULATING SYSTEM – Engine driven twin pump fitted on free end of the engine. The LT & HT twin pump feeds water directly into the cooling channels of the engine block.

AUXILIARY CIRCUIT (LT) – Second stage charge air cooler and oil cooler piped in parallel, 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.

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

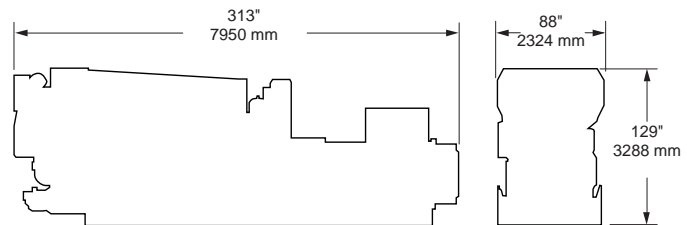
HEAT EXCHANGER/ WATER CONNECTION COOLING Intercooler Water: 113°F (45°C)	CONTINUOUS POWER			
	1500 RPM 50Hz TA Luft NOx	1500 RPM 50Hz 1/2 TA Luft NOx	1200 RPM 60Hz TA Luft NOx	1200 RPM 60Hz 1/2 TA Luft NOx
kWe RATING	3234	3234	2846	2846
Electrical Efficiency	41.7%	40.4%	42.7%	40.3%
Fuel Consumption - BTU/bhp-hr (kW)	5988 (7755)	6167 (8005)	5798 (6665)	6138 (7062)
Engine Heat Balance - Btu/hr*1000 (kW)				
HT (1st Stage Intercooler + Jacket Water)	3474 (1018)	3341 (979)	3047 (893)	3457 (1013)
LT (2nd Stage Intercooler)	882 (259)	986 (289)	832 (244)	939 (275)
Lube Oil	1534 (449)	1466 (430)	1291 (378)	1277 (374)
Radiation	426 (125)	465 (136)	417 (122)	435 (128)
Exhaust Heat (cooled to 120°C (248°F))	6449 (1889)	6983 (2045)	5170 (1514)	4938 (1446)
Exhaust Stack Temperature - °F (°C)	768 (409)	808 (431)	727 (386)	664 (351)
Induction Air - SCFM (Nm³/hr)	10339 (15570)	10330 (15558)	9031 (13600)	10002 (15063)
Exhaust Gas Flow - lb/hr (kg/hr)	46588 (21132)	46628 (21150)	40675 (18450)	45001 (20412)
Emissions - g/bhp-hr (mg/Nm³ @ 5% O₂)				
NOx	1.2 (500)	0.6 (250)	1.2 (500)	0.6 (250)
CO	1.8 (775)	2.4 (1035)	1.7 (735)	3.1 (1335)
NMHC	0.9 (385)	1.3 (555)	0.9 (385)	1.5 (640)

NOTES:

Continuous Power Rating: The highest electrical power output of the engine available for an unlimited number of hours per year, less maintenance.

Rating Standard: The 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 Tcr (clause 10.0) is limited to ± 10° F (5° C).

- 1) No overload available.
- 2) Fuel consumption per ISO 3046/1 +5 %. Includes engine-driven pumps
- 3) For engines with external lube oil cooler, charge air LT is LT total rejection
- 4) Heat balanced per ISO 3046/1 ±2.5%
- 5) Ratings shown require optional high-efficiency generator at 50Hz
- 6) LT water temperature of 55°C available for hot climates



Typical heat balance 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.

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.

Dresser Inc.
Dresser Waukesha
 1101 West St. Paul Avenue
 Waukesha, WI 53188-4999
 T. 262 547 3311
 F. 262 549 2795



Bulletin 2251 0909

© 2009 Dresser, Inc. All rights reserved. Waukesha, APG, ESM, and Enginotor are trademarks/registered trademarks of Dresser, Inc., Dresser Waukesha

www.dresser.com/waukesha