

G3516C-RM Refurbished Gas Power Module

WEIGHTS AND DIMENSIONS

| Model | Length mm (in) | Width mm (in) | Height mm (in) | Weight with Lube oil and Coolant kg (lb) |
|---------------------|----------------|---------------|----------------|--|
| XQ1475G w/o Chassis | 12192 (480) | 2438 (96) | 2896 (114) | 31,920 (70,372) |
| XQ1475G w/Chassis | 12192 (480) | 2438 (96) | 2896 (114) | 36,003 (79,372) |

FUEL/EMISSIONS STRATEGY

- Meets emissions requirements down to 500 mg/Nm³ NO_x level without after treatment

CAT G3516C ISLAND MODE GAS ENGINE

- Compact, four-stroke-cycle gas engine provides exceptional dependability, fuel economy and power density
- Robust kilowatt based air to fuel ratio control system yields enhanced system performance
- Designed for maximum performance on low pressure pipeline natural gas of 3-7 psi (0.21 kg/cm² - 0.49 kg/cm²) to the container with a methane number range of 55-100 (contact factory for methane numbers <55)
- Island mode feature improves engine's capability to handle electrical loading and unloading
- Complete Engine overhaul

REDUCED ENVIRONMENTAL IMPACT

- 110% spill containment of onboard engine fluids
- Positive crankcase fumes ventilation

COOLING SYSTEM

- Horizontally mounted radiator with vertical discharge
- Sized compatible to rating with energy efficient electric drive fan and core.
- Provides 40C (104F) ambient capability with 500 mg/Nm³ NO_x (1g/hp-hr) at 100% continuous rating before derate
- Variable frequency drive fan controls improve partial load fuel consumption

CAT GENERATOR

- Cat SR4B 826 frame generator designed to match the performance and output characteristics of the Cat gas engine
- Double bearing, wye-connected, static regulated, brushless, permanent magnet excited

CONTINUOUS 1475 kW

50/60 Hz Switchable

| Frequency (Hz) | Voltage (V) | Continuous kW (kVA) |
|----------------|-------------|---------------------|
| 50 Hz | 400/230V | 1475 (1844) |
| 60 Hz | 480/240V | 1475 (1844) |

ON PACKAGE CONTROL PANEL SYSTEM

- Provides auto paralleling using package mounted controls
- EMCP 4.3 offers engine and generator monitoring and protection
- AGC-4 provides paralleling, load sharing, VFD control, and primary generator protection
- Intertie protection provided via utility grade Basler BE1-11i utility multi-function relay (UMR)

DIGITAL VOLTAGE REGULATOR (CAT DVR)

- Three-phase sensing with adjustable volts-per hertz regulation
- Provides precise control and constant voltage in the normal operating range.

SOUND ATTENUATED CONTAINER

- Meets 72 dB(A) at 15 meters or below per SAE J1074 measurement procedure at continuous Rating

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FACTORY INSTALLED STANDARD EQUIPMENT

Engine

Cat G3516C Island Mode Gas Engine (Operates on 31.5 to 47.2 MJ/Nm³ (800 to 1200 btu/ft³) dry pipeline natural gas)
Cat Engine Advisor Panel provides engine diagnostics and full text descriptions
Cat Gas Engine Control Module (Cat GECM) includes electronic speed governor with hydrax actuator and provides transient richening and turbo bypass control
Electronic Ignition System (controlled by ECM)
Individual cylinder Detonation Sensitive Timing (DST)
Engine installed electronic fuel metering valve
Hydraulic actuated throttle plate electronically controlled by ECM
Heavy duty, single element canister type air cleaner with service indicator
Charging Alternator, 60-Amp
Dual 24V electric starting motors
Integral lube oil cooler, lube oil pump, oil filter, filler, and dipstick and oil drain lines routed to engine rail
Prelube Pump, 24VDC continuous type
Jacket Water Heater, 9kW, 400/480V, 50/60 Hz, 3-phase with isolation valves

Generator

Double bearing SR-4B brushless, form wound, permanent magnet excited, three-phase with Cat digital voltage regulator (Cat DVR), space heater, 6-lead design, Class H insulation operating at Class F temperature for extended life, winding temperature detectors and anti-condensation space heaters (120/240V 1.2 kW).
Generator equipped with System 4 insulation protection.

Containerized Module

40' ISO high cube container
Four (4) sound attenuated air intake louvers and 3 lockable personnel doors with panic release
Interior walls and ceilings insulated with 100 mm of acoustic paneling
Floor of container is undercoated for corrosion protection
Side bus bar access door, external access load connection bus bars
Shore power connection via distribution block connections for jacket water heater, battery charger, generator space heaters, and generator condensate heaters
3" ANSI flange customer fuel connection with cover to prevent vandalism
Energized-to-run (ETR) shutoff valve (double solenoid, low/high pressure switch, CSA/FM approved)
Cat Brand fuel filter, wall mounted and gas pressure regulator
Lube oil level regulator with makeup tank
Sound attenuated 72 dB(A) @ 15 m (50 ft)
Four (4) oversized maintenance-free batteries, battery rack and 20-Amp battery charger and Six (6) DC lights
Critical grade exhaust silencer with vertical discharge and single 2 m (6.5 ft.) stack
Vibration isolators
External drain access to standard fluids
One 4.5 kg (10 lb) carbon dioxide fire extinguisher
Standard Cat rental decals and painted standard Cat power module white
LH and RH engine service panels integrated into container side walls
110% spill containment system for on-board engine fluids

Cooling

Standard cooling provides 40C (104F) ambient capability with 500mg/Nm³ NO_x at 100% Continuous
Horizontally mounted radiator with vertical air discharge
Variable frequency drive (VFD) for optimal partial load fuel consumption

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Generator Controls and Protection

Controls provide auto paralleling AGC-4 controller, CAN-bus, ethernet comm, PWM and analog outputs, legacy analog load sharing; includes PL1000E gas engine Advisor panel for operational/diagnostic information cabinet houses shore power transformer, distribution, protection, and internal/external power selector switch

EMCP 4.3 genset mounted controller

Automatic start/stop with cool down timer

Generator Protection features: 25, 32, 40, 46, 47, 50/51, 27/59, 81 O/U

Reverse compatibility for interface to legacy power modules

3200A IEC/UL rated generator circuit breaker with LSIG trip unit w/ammeter

Multi-mode operation (island, multi-island and utility parallel), load sharing (multi-unit only)

Manual and automatic paralleling capability

Metering display: voltage, current, frequency, power factor, kW, WHM, kVAR, and synchroscope

Basler BE1-11i is IEEE1547-2003 compliant in most applications

SPECIFICATIONS

GENERATOR

| | |
|-----------------------------------|---|
| Frame Size | 826 |
| Pitch | 0.6667 |
| No. of poles | 4 |
| Excitation | Static regulated brushless PM excited |
| Constructions | Double bearing, close coupled |
| Insulation | Class H |
| Enclosure | Drip proof IP22 |
| Temperature rise | 105 deg C |
| Alignment | Pilot shaft |
| Overspeed capability – % of rated | 125% of rated |
| Voltage regulator | 3 phase sensing with Volts-per-Hertz |
| Voltage regulation | Less than ± 0.5% voltage gain |
| | Adjustable to compensate for engine speed droop and line loss |
| Wave form deviation | Less than 3% deviation |
| Telephone Influence Factor (TIF) | Less than 50 |
| Harmonic Distortion (THD) | Less than 5% |

CAT G3516C LOW EMISSIONS GAS ENGINE

| | |
|-----------------------------|--|
| Number of Cylinders | V16 |
| Bore – mm (in) | 170 (6.7) |
| Stroke – mm (in) | 190 (7.5) |
| Displacement – L (cu in) | 69 (4,210) |
| Compression ratio | 11.3:1 |
| Engine Speed (rpm) | 1500/1800 |
| Aspiration | Turbocharged Separate Circuit Aftercooled |
| Aftercooler Inlet (deg C) | 92 |
| Jacket Water Outlet (deg C) | 98 |
| Exhaust Manifold | Dry |
| Fuel system | Cat Low Pressure w/ Air Fuel Ratio Control |
| Governor type | ADEM™ A3 Control System |
| Combustion | Low Emission |
| Fuel | Natural Gas |
| Fuel Pressure Range (PSI) | 3-7 |
| Methane Number | 55-100 |

TECHNICAL DATA*

| Generator Set Technical Data | Units | 50 Hz Continuous* | | 60 Hz Continuous* | |
|--|--|-------------------|---------------|-------------------|---------------|
| Power Rating | ekW | 1475 | | | |
| Lubrication System Lube Oil Refill Volume with filter change for standard sump | L (gal) | 416 (110) | | | |
| Fuel System | | Max VFD (50kW) | Min VFD (3kW) | Max VFD (50kW) | Min VFD (3kW) |
| Fuel Consumption (ISO 3046/1) | | | | | |
| 100% load | MJ/ekW-hr | 9.62 | 9.35 | 10.34 | 10.05 |
| 75% load | MJ/ekW-hr | 9.92 | 9.57 | 10.74 | 10.39 |
| 50% load | MJ/ekW-hr | 10.59 | 9.97 | 11.86 | 11.14 |
| Altitude Capability | | | | | |
| At 25° C (77°) ambient, above sea level | m (ft) | 1500 (4921) | | | |
| Cooling System | | | | | |
| Package ambient capability | ° C (° F) | 40 (104) | | 40 (104) | |
| Jacket water temperature (maximum outlet) | ° C (° F) | 99 (210) | | 99 (210) | |
| System coolant capacity | L (gal) | 770 (203) | | 770 (203) | |
| System required airflow | m ³ /min (ft ³ /min) | 2.604 (91,959) | | | |
| Exhaust System | | | | | |
| Combustion air inlet flow rate | m ³ /min (ft ³ /min) | 116 (4,097) | | 111 (3,920) | |
| Exhaust stack gas temperature | ° C (° F) | 467 (877) | | 492 (918) | |
| Exhaust gas flow rate | Nm ³ /min | 113 | | 118 | |
| Sound Performance | | | | | |
| Noise rating @ 15 m (per SAE J1074) | dB(a) | 72 | | | |
| Emissions at 100% Load | | | | | |
| No _x (as NO ₂)(corr. 5% O ₂) | mg/Nm ³ (dry) | 500 | | 453 | |
| CO (corr. 5% O ₂) | mg/Nm ³ (dry) | 906 | | 937 | |
| THC (corr. 5% O ₂) | mg/Nm ³ (dry) | 2584 | | 1521 | |
| NMHC (corr. To 5% O ₂) | mg/Nm ³ (dry) | 388 | | 228 | |
| Exhaust O ₂ | % (dry) | 9.9 | | 9.3 | |

* Materials and specifications are subject to change without notice. Reference SRR GR-3600-167-02 For Max VFD Power and SRR GR-3600-167-02 for Min VFD Power Data at 50 Hz. Reference SRR GR-3600-136-00 For Max VFD Power and SRR GR-3600-137-00 for Min VFD Power Data at 60 Hz. 60 Hz emissions data pending factory testing results.

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STANDARD FEATURES

EMCP 4.3 LOCAL CONTROL PANEL

- Generator mounted EMCP 4.3 provides power metering, protective relaying and engine and generator control and monitoring.
- Convenient service access for Cat service tools (not included).
- Integration with the Cat DVR provides enhanced system monitoring.
- Ability to view and reset diagnostics of all controls networked on J1939 datalink eliminates need for separate service tools for troubleshooting.
- Real-time clock allows for date and timestamping of diagnostics and events.
- True RMS AC metering, 3 phase: L-L volts, L-N volts, Phase, Amps, Hz, ekW, kVA, kVAR, kWhr, % kW, PF

EMCP 4.3 ENGINE OPERATOR INTERFACE

- Graphical display with positive image, transreflective LCD, adjustable white backlight/contrast.
- Digital indication for
 - RPM - DC Volts
 - Operating hours - Oil pressure
 - Coolant Temperature - Oil Temperature
- Two LED status indicators (1 red, 1 amber)
- Engine cool-down timer
- Engine cycle crank
- Three engine control keys and status indicators (Run/Auto/Stop).
- Lamp test and Alarm acknowledgement keys
- Warnings/shutdowns with indicating text for:
 - Low oil pressure - Overspeed
 - High Oil Temperature - Overcrank
 - Emergency stop - AGC-4
- Emergency stop pushbutton
- Display navigation keys including two shortcut keys for Engine Parameters or Generator Parameters

AGC-4/EMCP 4.3 PROTECTIVE RELAYING

- Generator protective features
- 25 sync-check (AGC-4)
- 32 rev. power (EMCP 4.3 and AGC-4)
- 40 loss of excitation (Cat DVR and AGC-4 impedance based)

- 50/51 Inst. and time overcurrent (GCB trip unit and AGC-4)
- 47 Negative Voltage Sequence (AGC-4)
- 46 Negative Sequence Current (AGC-4)
- 27/59 phase under/over voltage (EMCP 4.3 and AGC-4)
- 81O/U under/over frequency (EMCP 4.3 and AGC-4)
- Package mounted AGC-4 controls provides auto paralleling, CAN-bus, Ethernet communications, PWM and Analog outputs, and legacy analog load sharing (real and reactive)
- AGC-4 main display/ AOP secondary display

CIRCUIT BREAKER

- 3200A IEC/UL rated, fixed type, 3 poles, genset mounted, electrically operated.
- Solid state trip unit for overload (time overcurrent) and fault (instantaneous) overcurrent protection. LSIG is standard.
- Includes DC shunt trip coil activated on any monitored engine or electrical fault and DC undervoltage release trip coil (UVR), 65 KA interrupting capacity at 480 VAC.

BUS BARS

- Three phase, plus full rated neutral, bus bars are tin-plated copper with NEMA standard hole pattern for connection of customer load cables and generator cables.
- Bus bars are sized for full load capacity of the generator set at 0.8 power factor.
- Includes ground bus, tin-plated copper, for connection to the generator frame ground and field ground cable.

CONTAINER

- 40' ISO high cube container, CSC 9-High Stack Certified
- Painted standard Cat Power Module White per Caterpillar Specifications
- Standard air intake louvers
- Three (3) lockable personnel doors with panic release
- Fire extinguisher

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- LH and RH engine service panels integrated into container side walls
- 110% spill containment system for on-board engine fluids

INTERNAL LIGHTING

- Six (6) compact LED type internal DC lights with timers located at each personnel door
- One (1) duplex service receptacle

BATTERY CHARGER AND BATTERIES

- 24 VDC/20A battery charger with float/equalize modes and charging ammeter
- Four oversized maintenance free batteries

EMERGENCY STOP PUSHBUTTON

- Single emergency stop pushbuttons (ESP) located on rear face of generator set controls area

EXHAUST SILENCER

- Critical grade, internally mounted rectangular exhaust silencers with vertical discharge
- 2 m high vertical discharging exhaust stack with rain cap located in radiator discharge area (optional to mount rain cap only)

TRAILER

- Three axle with Anti-lock brake system
- Ladders, handrails, internal storage provisions

VOLTAGE REGULATION AND POWER FACTOR CONTROL CIRCUITRY

- Generator mounted automatic voltage regulator, microprocessor based
- Manual raise/lower voltage adjust capability and VAR/power factor control circuitry, all via AGC-4, for maintaining constant generator power factor while paralleled with utility
- Includes RFI suppression, exciter limiter and exciter diode monitoring

CURRENT TRANSFORMERS

- CT's rated 3500:5 with secondary wired to shorting terminal strip protection

AC DISTRIBUTION

- 50/60 Hz Transformer distributes utility voltage or customer supplied line voltage, which is selectable via onboard switch, for the Power Module AC auxiliaries .

- Provides 240/120 VAC for all module accessories except Jacket water heater (400/480V). Includes controls to de-energize jacket water heaters and generator space heater when the engine is running

MODES OF OPERATION

- Provides for single unit stand-alone operation, island mode paralleling and load sharing with other power modules, and single unit-to-utility mode paralleling for base load control (with open transition between paralleling modes)
- Island mode paralleling features:
 - AGC-4 allows single unit to connect to a dead bus
 - Auto synchronization (voltage & phase matching)
 - Load sharing (kW) analog signal (like units & legacy compatible)
 - Load sharing (kVAR) analog signal (like units only)
- Utility mode paralleling features:
 - Auto synchronization (voltage & phase matching)
 - Base-load control (selectable: programmable set-point or potentiometer adjust)
 - Soft load/unload (programmable, shared setpoint)
 - Power Factor control (programmable setpoint)

UTILITY MULTI-FUNCTIONAL RELAY

- Intertie protection provided via utility grade Basler BE1-11i
- Provides the following protections:
 - 25 (sync-check, utility mode)
 - 27 (under voltage, 2 stage)
 - 32 (rev. power)
 - 40Z (loss of excitation, impedance based)
 - 47 (neg. sequence over voltage)
 - 51 (phase, time over current)
 - 51N (neutral, over current)
 - 59 (over voltage, 2 stage)
 - 81U (under frequency, 2 stage)
 - 81O (over frequency)
 - 60FL (fuse loss, 'major alarm' LED - no trip)
 - Modbus interface via 485 serial connection
 - Real or Reactive Load High Demand, 'minor alarm' LED - no trip, requires site-specific setpoint values programmed.