

POWER MODULE



PRIME 2000 kVA CONTINUOUS 1750 kVA

Frequency (Hz)	Voltage (V)	Prime ekW (kVA)	Continuous ekW (kVA)
50	400/240	1600 (2000)	1400 (1750)

FEATURES

SINGLE SOURCE SUPPLIER

- Generator set manufactured in ISO 9001:2000 compliant facility
- Package factory designed and production tested
- Generator set and components meet or exceed the following specifications: AS1359, AS2789, BS4999, DIN6271, DIN6280, EGSA101P, JEM1359, IEC 34/1, ISO3046/1, ISO8528, NEMA MG1-22

WORLDWIDE PRODUCT SUPPORT

- Cat® dealers provide extensive post sale support including maintenance and repair agreements
- Supported 100% by your Cat dealer with warranty on parts and labor

RELIABLE, FUEL EFFICIENT DIESEL ENGINE

- The compact, four-stroke-cycle Cat 3516B turbocharged-aftercooled diesel engine combines durability while providing dependability and economy
- Stainless steel engine aftercooler core to extend component, oil, and overall engine life when using gaseous fuels with elevated H₂S levels
- Fuel system operates on a variety of gaseous fuels
- Integral gas train, gas filter, and isolation valve
- Includes methane detection system and related safeties

CAT GENERATOR

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

REDUCED ENVIRONMENTAL IMPACT

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

SOUND ATTENUATED CONTAINER

- Provides 9-high stack CSC rated enclosure for ease of transportation and protection
- Meets 75 dB(A) at 15 meters or below per SAE J1074 measurement procedure at prime rating

DYNAMIC GAS BLENDING (DGB) SYSTEM

- Requires gas inlet pressure range of 5-35 psi (34-241 kPa)
- Achieves up to 70% substitution, depending on gas quality, while maintaining diesel performance and safe engine operation
- Closed loop control system enables maximum substitution over the widest load range in the industry
- Maintains traditional diesel generator set power and transient response performance
- DGB system, when enabled, can automatically activate when gas supply is detected
- Accepts a wide range of gas quality and automatically adjusts to fuel quality changes, eliminating the need for field calibration
- Leverages current hardware from G3516 product line while minimizing changes to core diesel engine
- Fully integrated diesel and gas controls into single engine control unit with single point operation for generator set and DGB system

CAT COOLING SYSTEM

- Horizontally mounted radiator with vertical discharge with high efficiency fan
- Provides 43C (110F) ambient capability
- Variable frequency drive fan controls improve partial load fuel consumption

ON-PACKAGE PARALLELING CONTROL SYSTEM

- Provides auto paralleling using package mounted controls
- EMCP 4.3 offers engine and generator monitoring and protection, including DGB enable and substitution level set points
- AGC-4 provides paralleling, load sharing, VFD control, and primary generator protection

DIGITAL VOLTAGE REGULATOR (Cat DVR)

- 3 phase sensing and adjustable V/Hz regulation
- Provides precise control, excellent block loading, and constant voltage in the normal operating range

FACTORY INSTALLED STANDARD EQUIPMENT

SYSTEM	STANDARD EQUIPMENT
Engine	Cat 3516B heavy duty flex fuel engine Heavy duty, single element canister type air cleaner with service indicator Fuel filters – primary and duplex secondary with integral water separator and change-over valve Spin on, full flow oil filters with water cooled oil cooler. Requires API CF-4 lube oil Stainless Steel Aftercooler core Jacket water heater, 9kW, 400V, 50 Hz, 3-phase w/isolation valves Fuel cooler and priming pump Electronic ADEM™ A4 controls Integrated Sensor Module (ISM) for combustion sensing and exhaust gas sensing Dual 24V electric starting motors
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, 9-High stack CSC certified 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 insulated with acoustic glass and covered with galvanized steel Side bus bar access door, external access load connection bus bars Shore power connection via distribution block connections for jacket water heater, battery charger, space heaters, and generator condensate heaters Six (6) DC lights 1,250 gal fuel tank, UL listed, double wall, >13 hr runtime @ Continuous rating Solenoid diesel fuel fill control valve Lube oil level regulator with makeup tank Sound attenuated 75 dB(A) @ 15 m (50 ft) Four (4) oversized maintenance-free batteries, battery rack and 20-Amp battery charger Critical grade exhaust silencer with dual 2 m (6.5 ft.) exhaust stacks for increased site power density Vibration isolators, stainless steel fastening hardware and hinges External drain access to standard fluids One 4.5 kg (10lb) carbon dioxide fire extinguisher Standard Cat rental decals and painted standard Cat power module white 110% spill containment system for on-board engine fluids Methane Leak Detection
Gaseous Fuel System	Low pressure regulator Electronically actuated fuel control valve Gaseous fuel heater Electronically controlled gas shut-off valve Gas induction nozzles 1 micron gas fuel filter with dP sensors and isolation ball valve with 1" BSP drain plug for fluid build-up CSA certified gas electronic components
Cooling	Standard cooling provides 43C (110F) ambient capability at 100% Prime Horizontally mounted radiator with vertical air discharge Variable frequency fan drive (VFD) for optimal partial load fuel consumption
Generator Controls and Protection	Controls provide auto paralleling AGC-4 controller, voltage and frequency adjust, base load / PF / load sharing / synchronizer, auto start / stop control & generator CB control, SCADA Interface (Ethernet), fuel level indications & alarms, fuel tank fuel transfer control EMCP 4.3 genset mounted controller Automatic start/stop with cool down timer Generator Protection features: 25, 32, 40, 50/51, 27/59, 81 O/U Reverse compatibility for interface to legacy power modules 3000A 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
Quality	Factory testing of standard generator set and complete power module UL, NEMA, ISO and IEEE standards O&M manuals

X Q 2 0 0 0 W/ DGB I P P



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
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 5% deviation
Telephone Influence Factor (TIF)	Less than 50
Harmonic Distortion (THD)	Less than 5%

CAT 3516B FLEX-FUEL ENGINE

3516B, 4-Stroke diesel	
Bore – mm (in)	170 (6.7)
Stroke – mm (in)	190 (7.5)
Displacement – L (cu in)	69 (4,210)
Compression ratio	15:1
Aspiration	TA
Fuel system	EUI
Governor type	Cat ADEM A4 Control System
Emissions	Non-Certified

TECHNICAL DATA*

*Materials and specifications are subject to change without notice
 **Data represented is at standard conditions

Generator Set Technical Data	Units	50 Hz	
		Prime	Continuous
Power Rating	kW (kVA)	1600 (2000)	1400 (1750)
Lubricating System Total oil pan capacity	L (US gal)	401.3 (106)	
Fuel System Generator set diesel fuel consumption**			
100% Load	L/hr (gal/hr)	397.1 (104.9)	348.3 (92.0)
75% Load	L/hr (gal/hr)	300.9 (79.5)	266.9 (70.5)
50% Load	L/hr (gal/hr)	211.6 (55.9)	190.4 (50.3)
Fuel Tank Capacity	L (gal)	4,731 1,250	
Max Rated Running Time	hours	>11	>13
Cooling System Radiator Capacity	L (U.S. gal)	770 (203)	
Air Requirements			
Combustion air flow	m ³ /min (cfm)	122 (4,320)	111 (3,918)
Maximum air cleaner restriction	kPa (in H ₂ O)	6.2 (24.9)	
Exhaust System			
Exhaust Flow	m ³ /min (cfm)	321 (11,341)	286 (10,097)
Package Noise Rating @ 15m (50 ft.)	dBA	77	77

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 time-stamping of diagnostics and events.
- Customer communication through Modbus TCP
- 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, transfective LCD, adjustable white backlight/contrast.
- Digital indication for
 - RPM
 - DC Volts
 - Operating hours
 - Oil pressure
 - Coolant Temperature
 - Oil Temperature
 - Gas Pressure
 - Gas Substitution %
 - Gas Shutoff Valve status
 - DGB Activation
- 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

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
- 110% spill containment system for on-board engine fluids

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

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 3000:5 with secondaries wired to shorting terminal strips.

CIRCUIT BREAKER

- 3000A fixed type, 3 poles, genset mounted, electrically operated, insulated UL489 CB.
- 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, 100 KA-interrupting capacity at 480 VAC.
- Undervoltage Release 24vdc
- Optional External Ground fault sensing/trip (requires additional ground CT)

INTERNAL LIGHTING

- Six (6) internal 24VDC LED lights with timers located at the control area 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
- Emergency Stop pushbutton located on the container exterior at each personnel door(3)

EXHAUST SILENCER

- Critical grade, internally mounted, dual cylindrical exhaust silencers
- 2 m high vertical discharging exhaust stack located in radiator discharge area

FUEL TANK

- UL Listed 1250 gallon double walled tank
- Fuel solenoid valve system
- Triple fuel/water separators

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 control 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 set-point)
 - Power Factor control (programmable set-point)

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.

AC DISTRIBUTION

- 3 phase, 400VAC, 50 Hz, 50 amp input which can be derived from either the Power Module main output bus (Internal) or customer supplied shore power (External) via selector switch.
- Onboard 50 Hz Transformer for the Power Module AC auxiliaries provides 240/120 VAC for all module accessories except Jacket water heater (400V). Includes controls to de-energize jacket water heaters and generator space heater when the engine is running

LUBE OIL MAKE-UP SYSTEM

- Includes oil pan-mounted oil level regulator and 114 L (30 gal) oil tank for maintaining oil pan levels in extended run applications. Oil tank can be remotely filled without shutting down the engine.

TRAILER (optional)

- Three axle with Anti-lock brake system
- Goodyear G314 295/75R225 Load Range G

RATING DEFINITIONS & CONDITIONS

Prime – Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand of 100% of prime rated kW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year. Prime power in accordance with ISO8258. Fuel stop power in accordance with ISO3046.

Continuous – Output available without varying load for an unlimited time. Average power output is 70 – 100% of the continuous power Rating. Typical peak demand is 100% of continuous rated kW for 100% of the operating hours. Continuous power is in accordance with ISO8528. Fuel stop power is in accordance with ISO3036.

Diesel Fuel – Reference fuel is #2 distillate diesel with a 35 degree API gravity, lower heating value is 42,780 kJ/kg (18,390 Btu/lb) when used at 29°C (84.2°F), where the density is 838.9 g/L (7.001 lb/gal).

Gaseous Fuel – Reference natural gas has a lower heating value of 33.74 kJ/L (905 BTU/cu. ft.). Low energy ratings are based on 18.64 kW/L (500 BTU/cu. ft.) lower heating value gas. High energy gas ratings are based on 87.56 kJ/L (2350 BTU/cu. ft.) lower heating value gas.

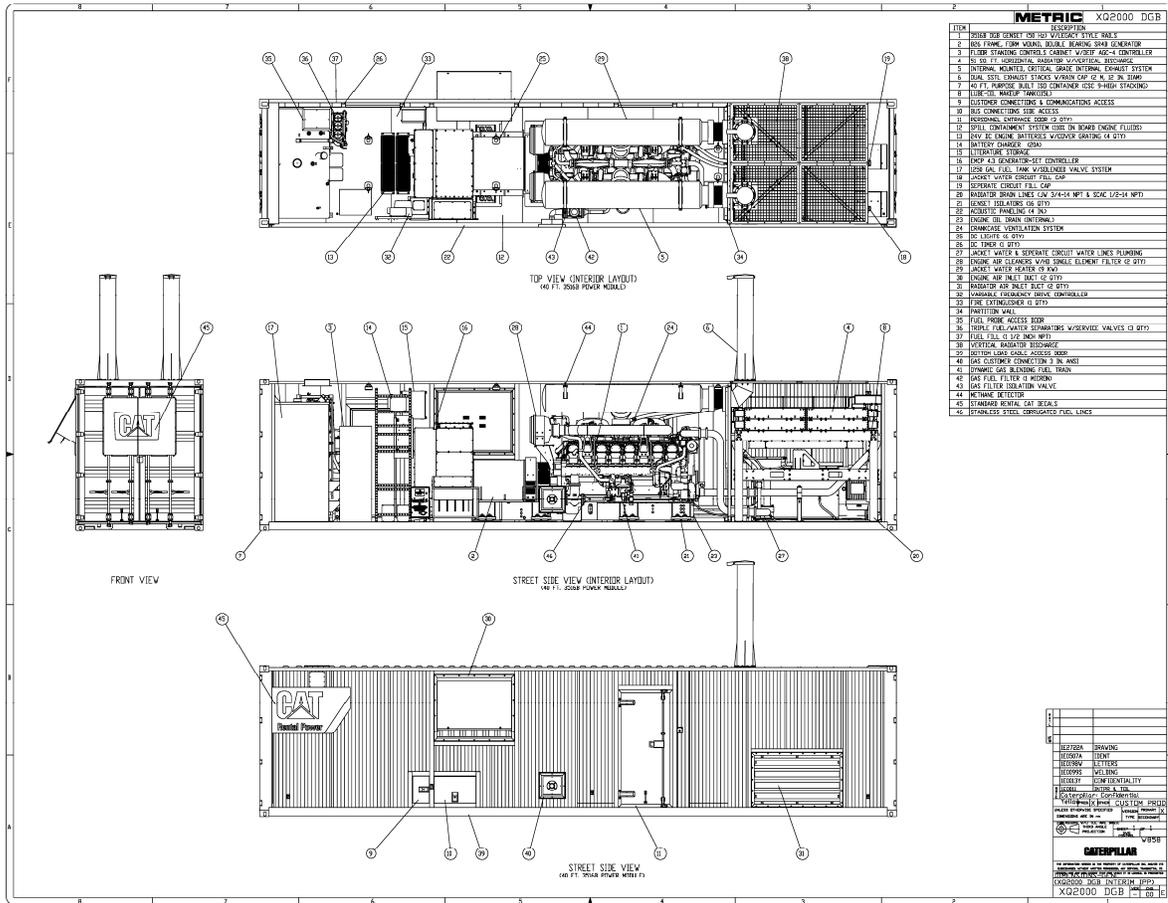
WEIGHTS AND DIMENSIONS

Model	Length in (mm)	Width in (mm)	Height in (mm)	Weight with Lube oil and Coolant lb (kg)	Weight with fuel, lube oil and coolant (kg)
XQ2000 DGB w/o chassis	480 (12,192)	97.5 (2,438)	114 (2,896)	64,000 (29,021)	73,000 (33,106)
XQ2000 DGB w/ chassis	480 (12,192)	97.5 (2,438)	168 (4,267)	74,000 (33,638)	83,000 (37,641)
Center of gravity	x = +4,913 +/- 300 mm (from rear of container); y = +788 mm +/- 300 mm (from container floor); z = 0 +/- 150 mm (centerline)				

XQ2000 W/DGB IPP



EQUIPMENT LAYOUT



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