

## CONTINUOUS 400 kW



Frequency (Hz)	Voltage (V)	Continuous kW (kVA)
60	480/277	400 (500)
60	240/139	400 (500)
60	208/120	400 (500)

### FEATURES

#### FUEL/EMISSIONS STRATEGY

- Capable of 0.5g NSPS SI emissions site compliance\*
- Customer's responsibility to complete site-specific emissions demonstrating compliance to US EPA NSPS

#### CAT® CG137-12 TA GAS ENGINE

- Tough and durable with field-proven head design
- Caterpillar supplied air/fuel ratio control and three-way catalyst
- Fuel flexibility enables operation on a wide range of gas quality – from wellhead gas to pipeline quality natural gas
- Engine ratings developed to accept low-quality gas down to Cat MN 30

#### CAT EMCP 4.4 CONTROL PANEL

- Fully featured power metering, protective relaying, and engine/generator control and monitoring
- Simple user friendly interface and navigation
- Automatic set-point adjustment integrated with voltage and frequency changes

#### CAT GENERATOR

- Caterpillar SR4B 593 frame generator designed to match performance and output characteristics of the CAT® gas engine
- 4 pole, permanent magnet excitation, random wound
- Segregated AC/DC, low voltage accessory box provides single point access to accessory connections

#### CAT DIGITAL VOLTAGE REGULATOR (CDVR)

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

#### SOUND ATTENUATED CONTAINER

- 30' ISO high cube container designed to meet CSC but not certified
- Painted standard Cat Power Module white
- Sound attenuated air intake louvers
- Floor insulated with acoustic glass and covered by galvanized steel
- Three lockable personnel doors with panic release
- Two fire extinguishers
- External drain access to standard fluids
- Meets 78 dB(A) at 7 meters per SAE J1074

#### DISTRIBUTION PANEL

- 480/277V 3 phase
- 240/139V, 208/120V 3 phase

#### SIDE CUSTOMER ACCESS

- Separate control panel and distribution panel access doors
- Hinged door over main bus connectors w/safety switch
- Emergency stop on control panel
- Remote start/stop contacts

#### ENVIRONMENTALLY FRIENDLY

- Capable NSPS SI emissions site compliant
- 110% spill containment of onboard engine fluids

#### RENTAL READY FEATURES

- Anti-condensation heater 110-120 VAC
- Coolant heater 110-120 VAC
- UL Listed battery charger
- Full package CSA certification

#### COOLING SYSTEM

- Provides xx C (xxx F) ambient capability with 0.5 g/bhp-hr NOx per NSPS 2010 at 100% continuous rating before derate

## FACTORY INSTALLED STANDARD EQUIPMENT

SYSTEM	STANDARD EQUIPMENT
<b>Engine</b>	CG137-12 TA, V12, 4-stroke-cycle, gas engine
<b>Air Inlet</b>	Single element, canister-type air cleaner with service indicator
<b>Generator</b>	SR4B 593 frame, three-phase, 480V, random wound, 12-lead design, permanent magnet excited, 0.7333 pitch – Class H Coastal insulation protection. Windings impregnated in a triple dip, thermo-setting moisture, oil and acid resisting polyester varnish. Heavy coat of anti-tracking varnish for additional protection. Cat digital voltage regulator (CDVR) with VAR/PF control, RFI suppression, exciter diode monitor 120VAC anti-condensation heater
<b>Charging System</b>	UL/CSA listed 120V, 20 Amp battery charger, shock mounted and enclosed in dust proof housing Charging alternator, 24V-60A
<b>Control Panel</b>	EMCP 4.4 genset mounted controller NEMA 2, IP23 dust proof enclosure, UL508 listed Idle/rated switch Generator Protection features: 32, 32RV, 46, 50/51, 27/59, 81 O/U Metering display: voltage, current, frequency, power factor, kW, WHM, and kVAR Panel illumination lights and Emergency stop switch Manual and automatic paralleling capability Automatic start/stop with cool down timer
<b>Cooling System</b>	Package mounted radiator with vertical air discharge provides xx° C ambient capability Blower fan, fan drive, fan guard and belt guards Externally accessible coolant drain line with internal brass ball control valve piped to base-frame Coolant sight gauge, level switch and shutdown 50/50 coolant antifreeze (NGEC)
<b>Distribution System</b>	Side bus bar access door, external access load connection bus bars Shore power connection via distribution block connections for jacket water heater, battery charger, and generator condensate heaters, one single duplex service receptacle Main circuit breaker 1600A with 24V DC shunt trip wired to load door safety switch Current transformers, hard mounted Two wire remote start/stop terminals and 120 VAC shore power connection for rapid starting
<b>Enclosure</b>	30' ISO high cube container 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 Sound attenuated 78 dB(A) @ 7m Side bus bar access door, external
<b>Exhaust System</b>	Catalyst w/spark arresting muffler Crankcase fumes disposal system
<b>Fuel System</b>	Gas pressure regulator, low pressure fuel system, Energize to Run (ETR) gas shutoff valve, air-fuel-ratio-control controlled by ADEM, Coalescing Filter, Methane detection
<b>Lube System</b>	Pump, integral oil cooler, lube oil, filter, filler and dipstick, and oil sampling valve Oil makeup tank (xxx gal/19 L) Externally accessible oil drain connection
<b>Mounting System</b>	Generator set soft mounted to the heavy duty, genset base Provides integral 110% spill containment system for all engine fluids
<b>Starting System</b>	Single electric starting motor, 24VDC Dual 12V (1400 CCA) maintenance free batteries with disconnect switch, battery rack, and cables UL listed, 120 volt single phase jacket water heater with thermostat and shut off valves, auto disconnect on start-up
<b>General</b>	Factory testing of standard generator set Full manufacturer's warranty ISO 8528 G2 Governing Full package CSA certification
	<b>OPTIONAL EQUIPMENT</b>
<b>Available Options</b>	2-axle, 30' ISO container air ride chassis Cold weather package

## SPECIFICATIONS

### GENERATOR

Frame Size	593 SR4B
Pitch	0.7333
No. of poles	4
Excitation	PM excited
Constructions	Single bearing, close coupled
Insulation	UL 1446 Class H
Coastal Protection	Yes
Enclosure	Drip proof IP23
Temperature rise	80 deg C
Alignment	Close coupled
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%
Telephone Influence Factor (TIF)	Less than 50
Harmonic Distortion (THD)	Less than 5%

### CAT® CG137-12 TA GAS ENGINE

Number of Cylinders	.V12
Type	4-Stroke-Cycle, Spark Ignited
Bore – mm (in)	137.2 (5.4)
Stroke – mm (in)	152.4 (6.0)
Displacement – L (cu in)	27 (1648)
Compression ratio	8.3:1
Engine Speed (rpm)	1800
Aspiration	Turbocharged Aftercooled
Governor	Electronic ADEM™ A4
Aftercooler Inlet (deg C)	54
Jacket Water Inlet (deg C)	99
Cooling System	Separate Circuit
Fuel	Natural Gas
Minimum Inlet Fuel Pressure (kPa)	10 - 35
Minimum Methane Number	30

## TECHNICAL DATA\*

	Units	DM9292-00
<b>Generator Set Data</b>		
Rated Power (includes fan power)	ekW	400
kVA Rating	kVA	500
Rated Power Factor	pf	0.8
Frequency	Hz	60
<b>Engine Data</b>		
Engine Power	bkW (bhp)	448 (600)
Engine Speed	rpm	1800
Min. Cat Methane Number without derate		45
BSFC @ 100% load	MJ/bkW-hr (Btu/bhp-hr)	10.47 (7405)
BSFC @ 75% load	MJ/bkW-hr (Btu/bhp-hr)	10.98 (7766)
BSFC @ 50% load	MJ/bkW-hr (Btu/bhp-hr)	12.08 (8544)
Air Flow Rate (@ 0°C, 101.3 kPa)	m³/min (ft³/min)	22.7 (800)
Inlet Manifold Pressure @ Rated Power	kPa (psi)	200 (29.0)
Aftercooler Water Temperature	°C (°F)	54 (129)
Jacket Water Temperature	°C (°F)	99 (210)
Exhaust Stack Temperature (engine out)	°C (°F)	543 (1009)
Exhaust Flow Rate (@ stack temperature, 101.3 kPa)	m³/min (ft³/min)	72.9 (2574)
Lube oil system capacity	L (gal)	170 (45)
Engine coolant capacity	L (gal)	55.5 (15)
Radiator coolant capacity (JW)	L (gal)	144 (38)
Radiator coolant capacity (AC)	L (gal)	144 (38)
Oil change interval	Hours	500
<b>Emissions (NTE)</b>		
NOx	g/bkW-hr (g/bhp-hr)	0.67 (0.50)
CO	g/bkW-hr (g/bhp-hr)	2.68 (2.00)
THC	g/bkW-hr (g/bhp-hr)	3.08 (2.30)
NMHC	g/bkW-hr (g/bhp-hr)	0.46 (0.34)
NMNEHC (VOC)	g/bkW-hr (g/bhp-hr)	0.31 (0.23)
HCHO (formaldehyde)	g/bkW-hr (g/bhp-hr)	0.11 (0.08)

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

## FUEL USAGE GUIDE

<b>Cat Methane Number</b>	30	35	40	45	50	55	60	65	70	75	80
<b>Set point timing</b>	16	15.5	15.5	15	17	19	20.5	24.5	26.5	28	30
<b>Deration factor</b>	0.90	0.93	0.96	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

## ALTITUDE AND AMBIENT DERATION FACTORS

	10°C	15°C	20°C	25°C	30°C	35°C	40°C	45°C	50°C
<b>0 m</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<b>250 m</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<b>500 m</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<b>750 m</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<b>1000 m</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<b>1250 m</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<b>1500 m</b>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
<b>1750 m</b>	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.83

\*\*Table advises air-fuel ratio control required for maximum rating.

## STANDARD FEATURES

### EMCP 4.4 LOCAL CONTROL PANEL

- Generator mounted EMCP 4.4 provides power metering, protective relaying and engine and generator control and monitoring
- UL508 recognized
- Convenient service access for Caterpillar Service tools (not included)
- Integration with the Cat DVR provides enhanced system monitoring
- Ability to view and reset diagnostics of all controls networked on primary CAN datalink eliminates need for separate service tools for troubleshooting
- True RMS AC metering, 3 phase
- Multiple stored setpoint group selection via switched input eliminates need to reprogram control when switching voltages and frequencies

### EMCP 4.4 ENGINE OPERATOR INTERFACE

- Controls
  - Run/Auto/Stop
  - Speed Adjust
  - Voltage Adjust
  - Emergency Stop
  - Cycle crank
  - Cool-down timer
- Digital indication for
  - RPM - DC Volts
  - Operating hours
  - Coolant Temperature
  - L-L volts, L-N volts, phase amps, Hz
  - ekW, kVA, kVAR, kW-hr, %kW, PF
  - Oil pressure
  - Oil Temperature
- Shutdowns with common indicating light for
  - Low oil pressure
  - High Coolant Temp
  - Failure to Start (Overcrank)
  - Emergency stop
  - Overspeed
  - High Oil Temperature
  - Low Coolant level
- Emergency stop pushbutton
- Display navigation keys including four shortcut keys for
- Engine Parameters, Generator Parameters, Control and main menu

### EMCP 4.4 GENERATOR PROTECTIVE RELAYING

- Generator protective features provided by EMCP 4.4
  - Phase over/under voltage (Device 27/59)
  - Over/Under frequency (Device 81 O/U)
  - Reverse Power (Device 32/32RV)
  - Current Balance (46)
  - Overcurrent (Device 50/51)
  - Bus Phase Sequence

### VOLTAGE REGULATION AND POWER FACTOR CONTROL CIRCUITRY

- Generator mounted automatic voltage regulator, microprocessor based
- Automatic voltage and VAR/power factor control for maintaining constant generator power factor while paralleled with the utility. Voltage and power factor adjustments are performed on the
- Generator Paralleling Control
- Includes RFI suppression, exciter limiter and exciter diode monitoring

### CIRCUIT BREAKER

- 1600A fixed type, 3 poles, genset mounted, electrically operated, insulated case circuit breaker
- Solid state trip unit for overload (time overcurrent) and fault (instantaneous) overcurrent protection
- 65 KA-interrupting capacity at 480 VAC
- Under-voltage release

### CURRENT TRANSFORMERS

- CT's rated 2000:5

### POTENTIAL TRANSFORMERS

- 4:1 ratio with primary and secondary fuse Protection (optional)

### 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 studs for connection to the generator frame ground and field ground cable

### LINK BOARD ASSEMBLY

- 1600A link board for 208/240/400/480 wye operation
- Reconnection via movable link board
- Includes switch to determine the mode of operation

## STANDARD FEATURES (CONT)

### CONTAINER

- 30' ISO high cube container designed to meet CSC but not certified
- Painted standard Cat Power Module white
- Sound attenuated air intake louvers
- Floor insulated with acoustic glass and covered by galvanized steel
- Three lockable personnel doors with panic release
- Two fire extinguishers
- External drain access to standard fluids

### EXHAUST SILENCER

- Internally insulated exhaust silencer with vertical discharge and spark arrestor

### SHORE POWER

- Two shore power connections for jacket water heaters and fuel transfer pump
- One for generator space heater and battery charger

### INTERNAL LIGHTING

- Three internal DC lights with one timer installed at the container door
- One single duplex service receptacle connected to shore and generator power with automatic switchover

### BATTERY CHARGER AND BATTERIES

- 24 VDC/20A battery charger with float/equalize modes and charging ammeter
- Two oversized maintenance free batteries
- Solar power battery maintainer

### AC DISTRIBUTION

- Provides 120 VAC for all module accessories
- Includes controls to de-energize jacket water heaters and generator space heater when the engine is running

### FUEL SYSTEM

- Gas pressure regulator – requires 10.3-34.5 kPa (1.5-5 psi) gas
- Natural gas carburetor
- Air-fuel ratio controlled by ADEM
- \*1 micron gas filter
- Low pressure fuel system
- Energize to Run (ETR) gas shutoff valve
- Coalescing Filter
- Methane detection

### LUBE SYSTEM

- Crankcase breather, top-mounted
- Oil filter, spin-on, left-hand service
- Dipstick, left-hand service
- Oil pump – gear-driven
- Oil cooler
- Lube oil makeup tank

### COOLING SYSTEM

- High ambient radiator design for gas fuel applications
- Stacked aftercooler and jacket water cores
- Metal top and bottom tanks
- Coolant drain
- Fan and belt pulley guard
- Coolant level sensor

## OPTIONAL FEATURES

### COLD WEATHER PACKAGE

- Temperature controlled clutch fan
- Battery heaters
- Fumes disposal heat wrap
- Dual JWH
- Vertical discharge louver
- Control panel heater
- Oil pan heater
- Snow intake louvers
- DC lights

### TRAILER

- Two axle with Anti-lock brake system
- 295/75R225 Load Range G Tires
- Air suspension chassis

## 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:
  - Lead unit select control allows single unit to connect to a dead bus or HWDBA Hard Wired Dead Bus Arbitration to allow first unit up to voltage and speed to be first 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 (programmable set-point or potentiometer adjust)
  - Soft load/unload (programmable, shared set-point)
  - Power Factor control (programmable set-point)

## SINGLE UNIT STAND-ALONE AND MULTIUNIT ISLAND OPERATION

1. Utility Standby Mode (Normal)
  - a. The utility is providing power for the plant loads.
  - b. The PM Generator breaker is open.
  - c. The PM is in automatic standby mode to respond to a utility failure.
2. Emergency Mode (Emergency)
  - a. Utility Failure
    - 1) The customer protective relaying senses a utility abnormal condition.
    - 2) A run request is sent to the PM Generator plant.
    - 3) The first PM generator to reach rated to voltage and frequency is closed to the bus.
    - 4) In Multi-Unit Island Mode, the remaining PM Generators are paralleled to the bus as they reach rated voltage and frequency. This function is performed via the lead unit select jumper and interconnect wiring connected between the Power Modules.

5) Plant load is transferred to the Power Modules, which share load equally via load share lines.

## SINGLE UNIT BASE LOAD OPERATION

1. Utility Mode (Normal)
  - a. The utility is providing power for the plant loads.
  - b. The PM is in auto mode and the generator breaker is open.
  - c. The PM is interconnected to the utility breaker aux contact, lead unit jumper is not installed and load share lines are not connected
  - d. The Paralleling controls automatically detect utility parallel mode when the utility aux contact is closed.
2. Base Load Mode
  - a) Unit receives remote run request and starts
  - b) Unit reaches rated voltage and frequency.
  - c) UMR performs sync-check to permit generator breaker to close.
  - d) Unit ramps to Base-Load setpoint at programmed ramp time.
  - e) Unit continues to run until remote run request is removed

## RATING DEFINITIONS AND CONDITIONS

**Continuous** — Output available without varying load for an unlimited time. Continuous power is in accordance with ISO8528, AS2789, and BS5514. Fuel stop power is in accordance with ISO03036. Natural gas ratings have been established on natural gas with net calorific Low Heat Value (LHV) of approximately 35.6 MJ/Nm<sup>3</sup> (905 Btu/cu ft) and 80 Methane Number (MN). For values in excess of altitude, ambient temperature, inlet/exhaust restriction, or different from the conditions listed, contact your local Caterpillar dealer.

## WEIGHTS AND DIMENSIONS

Model	Length mm (in)	Width mm (in)	Height mm (in)	Weight with Lube oil and Coolant kg (lb)
XQ400G				TBD