G3516B Land Electric-Drive Drilling Module

1300 ekW
1355 bkW
(1818 bhp)
1800 rpm

0.5 g/bhp-hr or 1.0 g/bhp-hr NOx

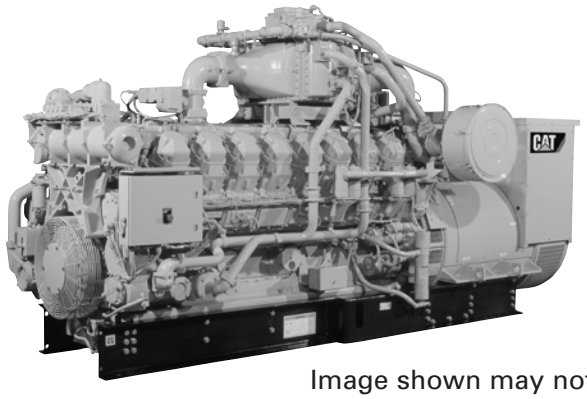


Image shown may not reflect gas drilling module

CAT® MODULE SPECIFICATIONS

V-16, 4-Stroke-Cycle Natural Gas Engine

Bore	170 mm (6.7 in)
Stroke	190 mm (7.5 in)
Displacement	69 L (4210 in^3)
Aspiration	Turbocharged-2 Stage Aftercooled
Digital Engine Management Governor and Protection	Electronic (ADEM™ A3)
Combustion	Low Emission (Lean Burn)
Package Weight, net dry (approx)	12 873 kg (28,380 lb)
Cooling System Capacity	
Jacket Water	205 L (54 U.S. gal)
Aftercooler	16 L (4.5 U.S. gal)
Lube System Refill	423 L (112 U.S. gal)

The entire drilling module is manufactured and assembled by Caterpillar, providing single-source responsibility.

FEATURES

Driving Down Total Cost of Ownership
- Robust design provides prolonged life and lower owning and operating costs
- Designed for maximum performance on low pressure pipeline natural gas
- Natural gas fuel costs are lower than diesel
- Locally sourced fuel comes from either the well field itself or from a nearby gas pipeline
- One electronic control module handles all engine functions: ignition, governing, air fuel ratio control, and engine protection
- Gas engines can be configured to run from many gases directly from the field. Some gas, depending on quality, may need to be treated prior to being injected into the cylinder. Using the locally sourced natural gas reduces fuel transport costs as well as site traffic and dust normally associated with the transportation of diesel fuel to drilling sites.
- Fuel costs contribute a significant portion of the charges incurred over the life of the engine
- Using a gas engine instead of a diesel can greatly lower the overall cost of operation

Committed to Sustainable Development
- Gas engines can be placed in most areas with little or no aftertreatment and reach very low emission levels
- Meets most worldwide emissions requirements down to 0.5 g/bhp-hr NOx level without aftertreatment.

Making Your Investment Work Harder
- Proven reliability and durability
- Rugged engine, generators, radiator, and bases are a result of years of experience in the oilfield
- Assembled, tested, and validated as a package to minimize vibration and maximize component life
- Generator designed to accommodate the rigors of oilfield applications
  - Cat SR4B generator is designed to match performance and output characteristics of Cat engines
  - Two-bearing, anti-friction, close coupled design to provide additional robustness against alignment issues
  - Packaged phase leads to withstand abrasion due to the vibration associated with a reciprocating engine
  - Insulation system provides virtually twice the instantaneous surge withstand capacity by using Mica turn taped magnet wire instead of glass covered magnet wire
- Inner base fastened to outer base by a three-point mounting system
  - Inner base is attached to the outer base at three points by spring-type vibration isolators which isolate the generator set from impact loads associated with moving the generator set and distortions of the outer base resulting from rough handling
  - Three-point mounting system provides protection to the generator set's driveline and alignment
  - Adaptable to customer designs for outer base

Custom Packaging
For any petroleum application, trust Caterpillar to meet your exact needs with a factory custom package. Cat engines, generators, enclosures, controls, radiators, transmissions — anything your project requires — can be custom designed and matched to create a one-of-a kind solution. Custom packages are globally supported and are covered by a one-year warranty after startup.

Full Range of Attachments
Large variety of factory-installed engine attachments reduces packaging time

Over 80 years of engine manufacturing experience

Ownership of these manufacturing processes enables Caterpillar to produce high quality, dependable products.
- Cast engine blocks, heads, cylinder liners, and flywheel housings
- Machine critical components
- Assemble complete engine

Web Site
For all your petroleum power requirements, visit www.catoilandgasinfo.com.

STANDARD EQUIPMENT

G3516B MODULE
Air Inlet System
Modular air cleaner, single element service indicator

Control System
Cat ADEM A3 digital engine management system
Air/fuel ratio control
Start/stop logic; gas purge cycle, stage shutdown
Transient richening and turbo bypass control

Cooling System
Engine-driven water pumps and thermostatic valves for jacket water and auxiliary circuits
Cat flanged connections

Exhaust System
Dry exhaust manifolds
Cat flanged outlet connection

Fuel System
Air/fuel ratio control, electronic fuel metering valve
24V gas shutoff valve, energized-to-run

Ignition System
Electronic ignition system, individual cylinder timing and detonation control

Lubrication System
Lubricating oil and filter
Integral oil cooler
Gear-type lube oil pump
Oil drain valve
Pre-lubrication pump

Protection System
Detonation-sensitive timing
High jacket water temperature
High oil temperature
Low oil pressure
Failure to start (overcrank)
Overspeed
Emergency stop

Starting/Charging System
60 amp charging alternator
Dual 24V starting motors
Batteries with rack, cables, and disconnect switch

MODULE MOUNTING SYSTEM
Cat Land Rig Inner Base
Engine and generator are mounted to a fabricated structural steel base ready for integration into master package skid
Built-in three-point mounting between inner and outer base maintains engine-generator alignment on uneven surfaces and during rig moves

GENERATOR
Features:
– Close-coupled mounting, independent two-bearing design
– Grease lubricated ball bearings with exciter end insulated
– Two 100 ohm RTDs installed in bearing housing for temperature monitoring (1 per bearing)
– 100% solid epoxy vacuum pressure impregnated windings with red epoxy overspray, including rotor and stator iron
– Formed stator coils with mica insulation, fully wrapped with Armor Tape
– Six 100 ohm RTDs embedded in stator windings for temperature monitoring (2 per phase)
– Commercial space heater, single-phase 250V or less
– Stand-off terminal connectors, mounted in outlet box
– Oversized auxiliary terminal box

Cat Digital Voltage Regulator (DVR)
Microprocessor-based control with three standard control modes for automatic voltage, power factor, or reactive power factor regulation; programmable stability settings and dual slope volts/hertz regulation

Features:
– Generator paralleling with reactive droop compensation and reactive differential compensation
– Line drop compensation
– Generator protection functions, including overvoltage, undervoltage, loss of excitation, instantaneous field overcurrent, over-excitation, loss of sensing, diode fault monitor

CONTROL PANEL
Cat EMCPII+
24VDC panel for integrated generator control and package monitoring

Features:
– NEMA 1, IP22 enclosure
– Electrically dead front
– Lockable hinged door
– Generator instruments meet ANSI C-39-1
– Single-point customer connection
– Segregated AC/DC connections and wiring (EC compliant)

TECHNICAL DATA

G3516B Land Electric-Drive Drilling Module — 1800 rpm/60 Hz/600V

Model ..... Cat SR4B Generator, 4 pole, 1800 rpm
Electrical Rating ..... 1300 ekW, 0.7 pf, 1857 kVA 600V, 60 Hz, 3-phase
Connection ..... 6-wire, wye
Temperature Rise .... 80°C/40°C ambient by resistance
Duty ..... Continuous
Insulation ..... Class H
Bearing Design ..... 2 bearing closed-coupled
Excitation ..... SE and PM available
Pitch 0.6667
Number of poles 4
Number of leads 6
IP rating ..... Drip proof IP22
Alignment ..... Pilot shaft
Overspeed capability 125%
Wave form ..... Less than 5% deviation
Paralleling kit droop transformer ..... Standard
Voltage regulator .... 3-phase sensing with adjustable 1:1 or 2:1 Volts/Hz, UL 508A Listed
TIF ..... Less than 50
THD ..... Less than 3%

Consult your Cat dealer for optional generator offerings.

		DM5645-01 1.0 g NOx Setting	DM5643-02 0.5 g NOx Setting
SCAC Temperature	°C (°F)	54 (130)	54 (130)
Package Performance			
Power Rating @ 0.8 pf	ekW (kVA)	1300 (1625)	1300 (1625)
Fuel Consumption*			
Without fan (nominal value) @ 100% Load	MJ/bkW-hr (Btu/bhp-hr)	10 (7065)	10.27 (7261)
Altitude Capability			
Site Rated Power			
@ 610 m/38°C (2000 ft/100°F)	ekW (kVA)	1287 (xxxx)	1261 (xxxx)
@ 1220 m/38°C (4000 ft/100°F)	ekW (kVA)	1196 (xxxx)	1170 (xxxx)
@ 1830 m/38°C (6000 ft/100°F)	ekW (kVA)	1105 (xxxx)	1079 (xxxx)
Cooling System			
Jacket Water Temperature (maximum outlet)	°C (°F)	92 (198)	92 (198)
Aftercooler Water Temperature (maximum inlet)	°C (°F)	54 (130)	54 (130)
Air Inlet/Exhaust System*			
Combustion Air Inlet Flow Rate	m^3/min (scfm)	4.51 (3926)	4.73 (4121)
Exhaust Gas Stack Temperature	°C (°F)	530 (986)	523 (974)
Exhaust Gas Flow Rate (@ stack temp, 14.5 psia)	m^3/min (cfm)	4.83 (11,469)	5.03 (11,844)
Emissions (NTE)*			
NOx	g/bkW-hr (g/bhp-hr)	xxx (1.0)	xxx (0.5)
CO	g/bkW-hr (g/bhp-hr)	xxx (2.6)	xxx (2.5)
HC	g/bkW-hr (g/bhp-hr)	xxx (4.4)	xxx (5.4)
NMHC	g/bkW-hr (g/bhp-hr)	xxx (0.66)	xxx (0.82)
Exhaust O_2 (dry)	g/bkW-hr (g/bhp-hr)	xxx (9.2)	xxx (9.2)
Heat Balance*			
LHV Fuel Input	bkW (Btu/min)	3765 (214,100)	3869 (220,033)
Heat Rejection to JW Circuit (JW+OC+AC1)	bkW (Btu/min)	967 (55,012)	1033 (58,735)
Heat Rejection to AC Circuit (AC2) (AC2)	bkW (Btu/min)	181 (10,277)	212 (12,049)
Heat Rejection to Exhaust	bkW (Btu/min)	1389 (79,019)	1427 (81,125)
Heat Rejection to Atmosphere	bkW (Btu/min)	136 (7762)	130 (7365)

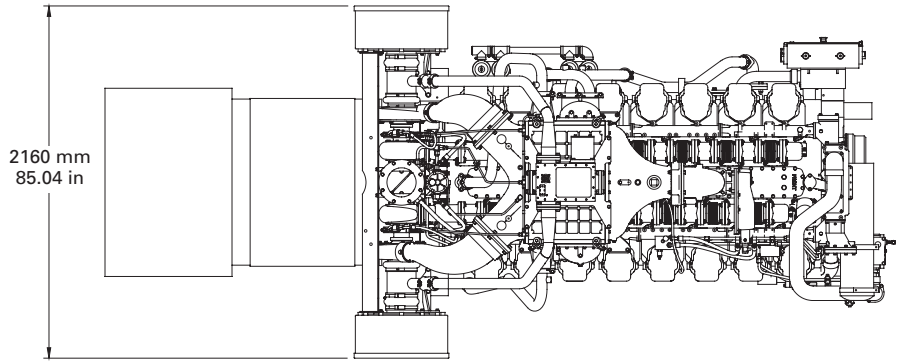
*@ 1300 ekW

Note: Data shown above are nominal values taken directly from Caterpillar published data sheets. Information on tolerances and other detail may be found in the applicable technical data sheets for each rating. Contact your Cat dealer for assistance.

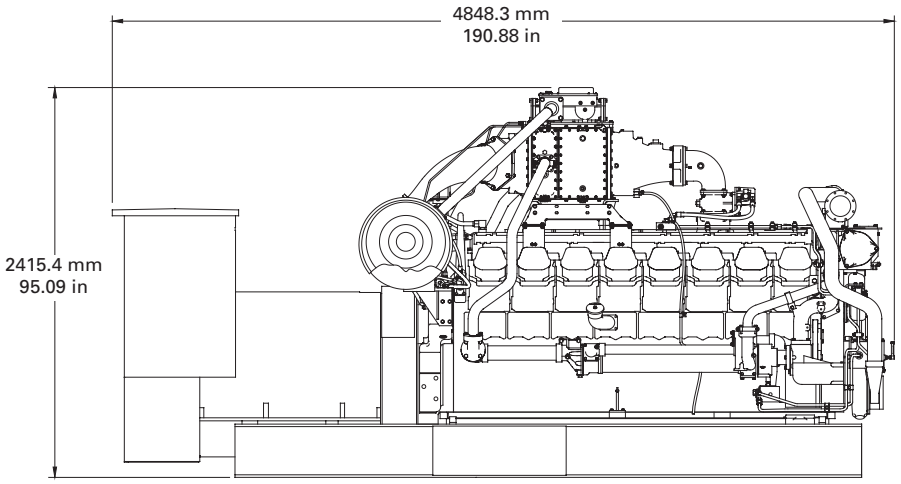
G3516B LAND ELECTRIC-DRIVE DRILLING MODULE

1300 ekW/1355 bkW (1818 bhp)

CONTINUOUS POWER LAND ELECTRIC-DRIVE DRILLING MODULE — TOP VIEW



CONTINUOUS POWER LAND ELECTRIC-DRIVE DRILLING MODULE — SIDE VIEW



DIMENSIONS		
Length	mm (in)	4848.3 (190.88)
Width	mm (in)	2160 (85.04)
Height	mm (in)	2415.4 (95.09)
Shipping Weight	kg (lb)	12 873 (28,380)

Note: General configuration not to be used for installation. Dimensions are in mm (inches). Weights and dimensions will vary depending on base frame selected.

RATING DEFINITIONS AND CONDITIONS

Engine performance is obtained in accordance with SAE J1995, ISO3046/1, BS5514/1, and DIN6271/1 standards.

Transient response data is acquired from an engine/generator combination at normal operating temperature and in accordance with ISO3046/1 standard ambient conditions. Also in accordance with SAE J1995, BS5514/1, and DIN6271/1 standard reference conditions.

Conditions: Power for gas engines is based on fuel having an LHV of 33.74 kJ/L (905 Btu/cu ft) at 101 kPa (29.91 in Hg) and 15°C (59°F). Fuel rate is based on a cubic meter at 100 kPa (29.61 in Hg) and 15.6°C (60.1°F). Air flow is based on a cubic foot at 100 kPa (29.61 in Hg) and 25°C (77°F). Exhaust flow is based on a cubic foot at 100 kPa (29.61 in Hg) and stack temperature.

See the Gas Drilling A&I Guide LEBW0005 for more information.