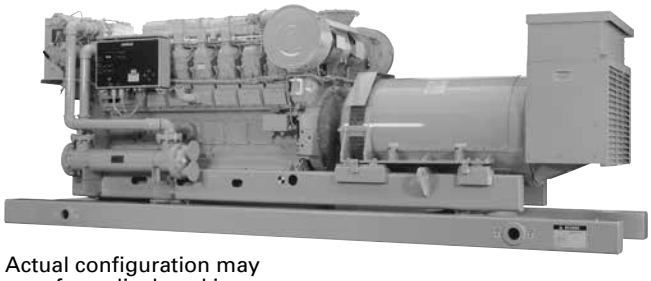
3516B Offshore Generator Set

1648 ekW (2060 kVA)
1717 bkW (2303 bhp)
50 Hz (1500 rpm)



Actual configuration may vary from displayed image

CAT® ENGINE SPECIFICATIONS

V-16, 4-Stroke-Cycle-Diesel

Emissions	EPA Marine Tier 2, IMO Tier II
Bore	170 mm (6.7 in)
Stroke	190 mm (7.5 in)
Displacement	69 L (4233 in^3)
Aspiration	Turbocharged-Aftercooled
Governor and Protection	Electronic ADEM™ A3
Refill Capacity	
Lube Oil System (refill)[2]	405 L (107 U.S. gal)
Module Cooling System[3]	480 L (127 U.S. gal)
Oil Change Interval	1000 hours

FEATURES

Engine Design
- Proven reliability and durability
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Assembled, tested, and validated as a package to minimize package vibration and maximize component life
- Market-leading power density
- Long overhaul life proven in oilfield applications
- Core engine components designed for reconditioning and reuse at overhaul

Ease of Installation
Engine and generator are mounted to an inner base, which mounts to an outer base assembly with vibration isolators; installed with an integral drip tray to provide a single lift installation and to reduce shipyard scope of work complexity

Safety
- E-stop pushbutton on instrument panel
- Air shutoff and explosion relief valves
- Configurable alarm and shutdown features
- Extra alarm switches available for customer-supplied panel

Improved Serviceability
Large inspection openings allow convenient access to core engine internals

Reduction of Owning and Operating Costs
- Long filter change intervals, aligned with service intervals
- Excellent fuel economy — direct injection electronic unit injectors precisely meter fuel

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.

Testing
Every Cat engine is full-load tested to ensure proper engine performance.

Product Support Offered Through Global Cat Dealer Network
More than 2,200 dealer outlets
Caterpillar factory-trained dealer technicians service every aspect of your petroleum engine
Caterpillar parts and labor warranty
Preventive maintenance agreements available for repair-before-failure options
S•O•S℠ program matches your oil and coolant samples against Caterpillar set standards to determine:
- Internal engine component condition
- Presence of unwanted fluids
- Presence of combustion by-products
- Site-specific oil change interval

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

Air Inlet System
Aftercooler core, corrosion resistant coated (air side)
Air cleaner, regular duty, with soot filter
Dual turbochargers, 152 mm (6") OD straight connection
Service indicators

Control System
Caterpillar ADEM A3 electronic engine control, LH
Requires 24V DC 10 amp continuous, 20 amp intermittent, clean electrical power

Cooling System
In order to ensure compliance in use, optional or customer-supplied heat exchangers or radiators must be capable of rejecting enough heat to allow proper operation at worst case site conditions, and also must supply 122°F (50°C) SCAC cooling water to the aftercooler inlet, with an SCAC flow rate of at least 200 GPM with an ambient temperature of 86°F (30°C) and at-site conditions (including altitude considerations).

Engine Configuration for Remote Radiator Cooling:
Outlet controlled thermostat and housing, full open temperature 92°C (198°F)
Jacket water pump, gear driven
Single water outlet connection, includes flange: 143 mm (5.6")
Aftercooler fresh water cooling pump (SCAC), gear driven centrifugal
SCAC pump circuit contains a thermostat to keep the aftercooler coolant from falling below 30°C (85°F)

Exhaust System
Dry, gas-tight exhaust manifolds with thermo-laminated heat shields
Dual turbochargers with thermo-laminated heat shields
Flexible exhaust fitting/weldable exhaust flange

Flywheels and Flywheel Housings
Flywheel, SAE No. 00, 183 teeth
Flywheel housing, SAE No. 00

Fuel System
Fuel filter, LH
Fuel transfer pump
Fuel priming pump, LH (RH is optional)
Electronically controlled unit injectors
Relocated customer connection from fuel return check valve located at top of engine to fuel inlet customer connection point at base of engine. Includes rigid lines on engine as well as two flexible hoses.

Generator
See generator data, page 3

Instrumentation
Graphic Unit (Marine Power Display), LH for analog or digital display of:
- Engine oil pressure
- Engine water temperature
- Fuel pressure
- System DC voltage
- Air inlet restriction
- RH & LH exhaust temperature
- Fuel filter differential
- Oil filter differential
- Service meter
- Engine speed
- Instantaneous fuel consumption
- Total fuel consumed
- Engine control switch (4-position)
- Alarms are prioritized
- Overspeed shutdown notification light
- Emergency stop notification light
- Prelube override
- Shutdown override

Lube System
Crankcase breather, top mounted
Oil cooler
Oil filter and dipstick, LH
1000 hour deep oil pan — not capable of 15° tilt (see options for 15° and 25° tilt pans)
Oil pump, gear-type
Oil pan drain valve, 2" NPT female connection

Protection System
ADEM A3 monitoring system provides engine deration, alarm, or shutdown strategies to protect against adverse operating conditions. Selected parameters are customer-programmable. Status available on engine-mounted instrument panel and can be broadcast through the PL1000 or I/O module. Initially set as follows:
Safety shutoff protection, electrical:
Oil pressure, water temperature, crankcase pressure, aftercooler temperature; includes air inlet shutoff, activated on overspeed or emergency stop; oil pressure and water temperature (non-redundant, uses OP and WT sensors); overspeed (redundant and independent of engine governing system)
Alarms, electrical:
ECU voltage, oil pressure, water temperature (low and high), overspeed, crankcase pressure, aftercooler temperature, low water level (sensor is optional attachment), air inlet restriction, exhaust stack temperature, filter differential pressure (oil and fuel)
Derate, electrical:
High water temperature, crankcase pressure, aftercooler temperature; air inlet restriction; altitude and exhaust temperature
Emergency stop pushbutton, located on instrument panel
Alarm switches (oil pressure and water temperature) for connection to PL1000 — unwired

Starting System
Air starting motor, RH, 620 to 1034 kPa (90 to 150 psi), LH control
Air silencer

General
Paint, Caterpillar yellow, with black rails
Vibration damper and guard
Lifting eyes
Engine and generator, three-point mounted to sub-base
Lift provisions on base
Oil drain extension
Engine length drip pan

ACCESSORY EQUIPMENT

Spark-arresting muffler
Duplex fuel filter
Duplex oil filter
Jacket water heater
Crankcase explosion relief valve
Primary fuel filter
Fuel cooler
Exhaust temperature thermocouples
Additional instrumentation:
- Communications management device
- Remote panel display
- Remote cylinder temperature display
- Oil temperature sensor
- Intake manifold temperature sensors

Direct rack control interface, 0-200 mA DC control
Marine society and IMO certifications
Bypass centrifugal oil filter
Metal particle detector
15° and 25° tilt capability oil sumps
Redundant start with select switch
Single point connection terminal box
Prelube
Air filter — generator
Air separator
Manual voltage control
Oil level regulator
Emergency lube oil connections
Auxiliary drive shafts and pulleys
Air or electric starting motors
Fuel level switch
Vibration isolators
Spray shielding

RIG BASE

For use with Cat or other manufacturers' generators
Built-in three-point mounting system maintains alignment of engine and generator on uneven surfaces
Keeps substructure from flexing to prevent twist at the base and engine-generator misalignment

DIESEL ENGINE TECHNICAL DATA

3516B Engine — 1717 bkW (1500 rpm)

Engine speed	1500 rpm
Compression ratio	14:1
Aftercooler water temperature	45 deg C
Jacket water temperature	99 deg C
Fuel injection system	EUI
Exhaust manifold type	Dry
Rating	Prime
Emissions certification	IMO TIER II/EPA MARINE TIER 2
Fuel type	Diesel
Mean piston speed	9.5 m/s

RATING	NOTES	UNITS	100% LOAD	75% LOAD	50% LOAD
ENGINE POWER	1	kW	1660	1241	828
BMEP kPa		kPa	1924	1441	958

ENGINE DATA					
FUEL CONSUMPTION (NOMINAL)	6	L/hr	412	309	210
AIR FLOW RATE (@25°C, 101.3 kPa)	3,9	m^3/min	145	115	81
INLET MANIFOLD PRESSURE	3	kPa	220	144	70
INLET MANIFOLD TEMPERATURE		°C	59	55	51
EXHAUST STACK TEMPERATURE	2	°C	491	479	479
EXHAUST GAS FLOW RATE (@stack temp, 101.3 kPa)	5,9	m^3/min	135	106	74
EXHAUST GAS MASS FLOW RATE	5,9	kg/hr	10300	8102	5639

ENERGY BALANCE DATA					
FUEL INPUT ENERGY (LHV) (NOMINAL)		kW	4107	3080	2094
HEAT REJ. TO JACKET WATER (NOMINAL)	7	kW	600	483	361
HEAT REJ. TO ATMOSPHERE (NOMINAL)	7	kW	104	99	94
HEAT REJ. TO OIL COOLER (NOMINAL)	7	kW	219	164	112
HEAT REJ. TO EXH. (LHV to 25°C) (NOMINAL)	8	kW	1676	1274	884
HEAT REJ. TO EXH. (LHV TO 177°C) (NOMINAL)	8	kW	957	721	501
HEAT REJ. TO AFTERCOOLER	7	kW	336	185	63

GENERATOR EFFICIENCY

Generator power determined with an assumed generator efficiency of 96% [generator power = engine power * 0.96]. If the actual generator efficiency is less than 96% [and greater than 94.5%], the generator power [ekW] listed in the electrical data can still be achieved. The BSFC values must be increased by a factor.
The factor is a percentage = 96% - actual generator efficiency

NOTES

1 Power tolerance is +/- 5%
2 Exhaust stack temperature tolerance is +/- 8%
3 Inlet airflow rate tolerance is +/- 5%
4 Intake manifold pressure tolerance is +/- 10%
5 Exhaust flow rate tolerance is +/- 6%
6 Fuel rate tolerance is +/- 5%
7 Heat rejection tolerance is +/- 5%
8 Exhaust heat rejection tolerance is +/- 10%
9 Wet exhaust mass flow rate

GENERATOR TECHNICAL DATA

Generator*

Specifications

Poles 4
Excitation ..... PMG
Pitch 0.7333
Connection ..... SERIES STAR
Max. Overspeed ..... 180% of synchronous
Number of Bearings 2
Number of Leads 6
Wires per Lead 8

Ratings

Power ..... 1550 ekW
kVA 2214
pf 0.7
Voltage — L.L. ..... 600 V
Voltage — L.N. ..... 346 V
Current — L.L. ..... 2130 A
Frequency ..... 50 Hz
Speed ..... 1500 rpm

Exciter Armature Data (at full load, 0.7 pf)

Voltage ..... 35.45 V
Current ..... 7.67 A

Temperature and Insulation Data

Ambient Temperature ..... 50°C
Temperature Rise ..... 90°C
Insulation Class ..... H
Insulation Resistance (as shipped) .... 100 Megaohms (at 40°C)

Resistances

Stator (at 25°C) ..... 0.0021 ohms
Field (at 25°C) ..... 1.179 ohms
Short Circuit Ratio 0.34

Fault Currents

Instantaneous 3-∅ symmetrical fault current ..... 12,808 amps
Instantaneous L-N symmetrical fault current ..... 17,224 amps
Instantaneous L-L symmetrical fault current ..... 11,246 amps

Efficiency and Heat Dissipation (per NEMA and IEC at 95°C)

Load PU	Kilowatts	Efficiency
0.25	387.5	94%
0.50	775	96.1%
0.75	1162.5	96.6%
1.00	1550	96.6%
1.10	1705	96.5%

Time Constants

OC Transient – Direct Axis T′DO	6.687 sec.
SC Transient – Direct Axis T′D	0.5016 sec.
OC Subtransient – Direct Axis T″DO	0.0147 sec.
SC Subtransient – Direct Axis T″D	0.0122 sec.
OC Subtransient – Quadrature Axis T″QO	0.0116 sec.
SC Subtransient – Quadrature Axis T″Q	0.0099 sec.
Exciter Time Constant	0.2225 sec.
Armature SC TA	0.0693 sec.

Reactances

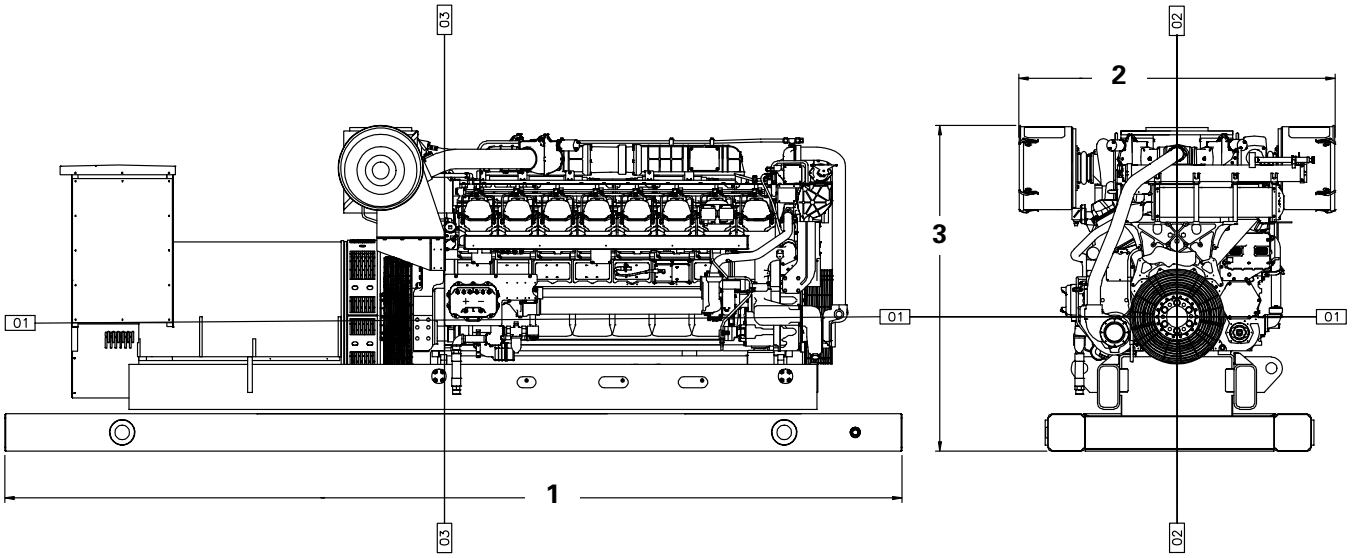
Reactances		Per Unit	Ohms
Subtransient — Direct Axis	X″D	0.1655	0.0269
Subtransient — Quadrature Axis	X″Q	0.1562	0.0254
Transient — Saturated	X′D	0.2528	0.0411
Synchronous — Direct Axis	XD	3.3688	0.5477
Synchronous — Quadrature Axis	XQ	1.6017	0.2604
Negative Sequence	X2	0.1605	0.0261
Zero Sequence	X0	0.0424	0.0069

*Other generators are available.

3516B OFFSHORE GENERATOR SET

1648 ekW 50 Hz

DIMENSIONS



Dimensions and Weight		
(1) Length	6095 mm	240 in
(2) Width	2147 mm	85 in
(3) Height	2214 mm	87 in
Weight – dry	17 500 kg	38,581 lb

Note: Dimensions are dependent on generator and options selected. See general installation drawings for detail.

Note: Weight includes engine, generator, base, coupling, and all auxiliary components. Weight may vary depending upon individual configuration.

RATING DEFINITIONS AND CONDITIONS

Rating Definition — Maximum Continuous Rating (MCR) following reference conditions according to the International Association of Classification Societies (IACS) for main and auxiliary engines. An overload of 10% is permitted for one hour within 12 hours of operation.

Conditions are based on SAE J1995 standard conditions of 100 kPa (29.61 in Hg) and 25°C (77°F). These ratings also apply at ISO3046/1, DIN6271, and BS5514 standard conditions of 100 kPa (29.61 in Hg), 27°C (81°F), and 60% relative humidity. Ratings are valid for air cleaner inlet temperatures up to and including 60°C (140°F).

Fuel Consumption — 5% tolerance and based on fuel oil of 35° API [16°C (60°F)] gravity having an LHV of 62 780 kJ/kg (18,390 Btu/lb) when used at 29°C (85°F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal). Fuel consumption is shown with all engine-driven oil, fuel, and water pumps.