3516B
Offshore
Generator Set

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

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 in³)
Aspiration ............... Turbocharged-Aftercooled
Governor and Protection .... Electronic ADEM™ A3
Refill Capacity
- Lube Oil System (refill)² ......... 405 L (107 U.S. gal)
- Module Cooling System³ .......... 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

### 3516B OFFSHORE GENERATOR SET
1648 ekW 50 Hz

#### 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)**

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

<table>
<thead>
<tr>
<th>RATING</th>
<th>NOTES</th>
<th>UNITS</th>
<th>100% LOAD</th>
<th>75% LOAD</th>
<th>50% LOAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGINE POWER</td>
<td>1</td>
<td>kW</td>
<td>1660</td>
<td>1241</td>
<td>828</td>
</tr>
<tr>
<td>BMEP kPa</td>
<td>6</td>
<td>kPa</td>
<td>1924</td>
<td>1441</td>
<td>958</td>
</tr>
</tbody>
</table>

**ENGINE DATA**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUEL CONSUMPTION (NOMINAL)</td>
<td>6</td>
</tr>
<tr>
<td>AIR FLOW RATE (@25°C, 101.3 kPa)</td>
<td>3.9</td>
</tr>
<tr>
<td>INLET MANIFOLD PRESSURE</td>
<td>3</td>
</tr>
<tr>
<td>INLET MANIFOLD TEMPERATURE</td>
<td>2°C</td>
</tr>
<tr>
<td>EXHAUST STACK TEMPERATURE</td>
<td>3°C</td>
</tr>
<tr>
<td>EXHAUST GAS FLOW RATE (@stack temp, 101.3 kPa)</td>
<td>5.9 m³/min</td>
</tr>
<tr>
<td>EXHAUST GAS MASS FLOW RATE</td>
<td>5.9 kg/hr</td>
</tr>
</tbody>
</table>

**ENERGY BALANCE DATA**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUEL INPUT ENERGY (LHV) (NOMINAL)</td>
<td>kW</td>
</tr>
<tr>
<td>HEAT REJ. TO JACKET WATER (NOMINAL)</td>
<td>kW</td>
</tr>
<tr>
<td>HEAT REJ. TO ATMOSPHERE (NOMINAL)</td>
<td>kW</td>
</tr>
<tr>
<td>HEAT REJ. TO OIL COOLER (NOMINAL)</td>
<td>kW</td>
</tr>
<tr>
<td>HEAT REJ. TO EXH. (LHV to 25°C) (NOMINAL)</td>
<td>kW</td>
</tr>
<tr>
<td>HEAT REJ. TO EXH. (LHV TO 177°C) (NOMINAL)</td>
<td>kW</td>
</tr>
<tr>
<td>HEAT REJ. TO AFTERCOOLER</td>
<td>kW</td>
</tr>
</tbody>
</table>

**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
- **Current — L.N.**: 1162.5 A
- **Frequency**: 50 Hz
- **Speed**: 1500 rpm

**Exciter Armature Data (at full load, 0.7 pf)**
- **Voltage**: 35.45 V
- **Current**: 7.67 A

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

<table>
<thead>
<tr>
<th>Load PU</th>
<th>Kilowatts</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25</td>
<td>387.5</td>
<td>94%</td>
</tr>
<tr>
<td>0.50</td>
<td>775</td>
<td>96.1%</td>
</tr>
<tr>
<td>0.75</td>
<td>1162.5</td>
<td>96.6%</td>
</tr>
<tr>
<td>1.00</td>
<td>1550</td>
<td>96.6%</td>
</tr>
<tr>
<td>1.10</td>
<td>1705</td>
<td>96.5%</td>
</tr>
</tbody>
</table>

**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

**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**

<table>
<thead>
<tr>
<th>Reactances</th>
<th>Per Unit</th>
<th>Ohms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subtransient — Direct Axis</td>
<td>X&quot;D</td>
<td>0.1655</td>
</tr>
<tr>
<td>Subtransient — Quadrature Axis</td>
<td>X&quot;Q</td>
<td>0.1562</td>
</tr>
<tr>
<td>Transient — Saturated</td>
<td>X'D</td>
<td>0.2528</td>
</tr>
<tr>
<td>Synchronous — Direct Axis</td>
<td>XD</td>
<td>3.3688</td>
</tr>
<tr>
<td>Synchronous — Quadrature Axis</td>
<td>XQ</td>
<td>1.6017</td>
</tr>
<tr>
<td>Negative Sequence</td>
<td>X2</td>
<td>0.1605</td>
</tr>
<tr>
<td>Zero Sequence</td>
<td>X0</td>
<td>0.0424</td>
</tr>
</tbody>
</table>

*Other generators are available.
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.

Materials and specifications are subject to change without notice. The International System of Units (SI) is used in this publication. CAT, CATERPILLAR, their respective logos, ADEM, S-O-S, “Caterpillar Yellow” and the “Power Edge” trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.