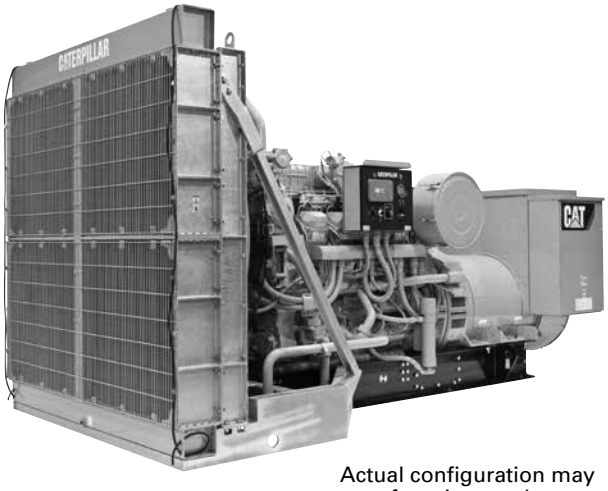
3508B Offshore Emergency Generator Set

910 ekW (1138 kVA)
968 bkW (1298 bhp)
60 Hz (1800 rpm)



Actual configuration may vary from image shown

CAT® ENGINE SPECIFICATIONS

V-8, 4-Stroke-Cycle-Diesel

Emissions ..... IMO Tier I
Bore ..... 170 mm (6.7 in)
Stroke ..... 190 mm (7.5 in)
Displacement ..... 35 L (2116 in^3)
Aspiration ..... Turbocharged-Aftercooled
Governor and Protection ..... Electronic ADEM™ A3
Refill Capacity
  Lube Oil System (refill)[1] ..... 227 L (60 U.S. gal)
  Engine Cooling System ..... 309 L (81.6 U.S. gal)
Oil Change Interval ..... 1000 hours

[1]Standard sump

FEATURES

Engine Design
- Proven reliability and durability in demanding petroleum offshore applications
- Robust diesel strength design prolongs life and lowers owning and operating costs
- Fast pick-up and load acceptance
- Assembled, tested, and validated as a package to minimize package vibration and maximize component life
- Direct injection electronic unit injectors precisely meter fuel and provide excellent fuel economy
- Proven generator selected to meet the demands and harsh conditions found in the offshore environment
- Market-leading power density
- Long overhaul life proven in oilfield applications
- Core engine components designed for reconditioning and reuse at overhaul
- Optional IMO certificate by GL or CCS is available for non-U.S. flag vessels
- DNV, ABS, or GL marine society type approved coupling
- Offshore electric drive ratings include 10% overload capacity to meet most marine society approvals

Ease of Installation

Separate-circuit aftercooler for ease of installation
Offshore package provides single lift handling to reduce the shipyard scope of work complexity

Safety
- ADEM A3 monitoring system provides engine deration, alarm, or shutdown strategies to protect against adverse operating conditions. Selected parameters are customer programmable.
- 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.
- Manufacturing of cast engine blocks, heads, cylinder liners, and flywheel housings
- Machining of critical components
- Complete engine assembly

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
Rigid wiring harness
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 140°F (60°C) SCAC cooling water to the aftercooler inlet, with an SCAC flow rate of at least 130 GPM with an ambient temperature of 86°F (30°C) and at-site conditions (including altitude considerations).

Outlet controlled thermostat and housing, full open temperature 92°C (198°F)
Jacket water pump, gear driven
Single water outlet 127 mm (5 in) hose connection
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
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
Deep sump oil pan
Oil pump, gear-type
Oil pan drain valve, 2" NPT female connection

Mounting System
Rails, engine mounting, engine length, industrial floor-type 254 mm (10 in) C-channel

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

Notes
When used with competitive generator, a TVA is recommended. An alternative vibration damper may be required. The engine is wired for auto/start/stop.

Emergency Generator Sets Include the Following:
Engine and generator length mounting rails, 13" C-channel
Engine and generator mounting groups
DNV, ABS, or GL marine society type approved coupling
DNV requires a serial number specific certificate available through DTO
Follow ordering procedure found in LEKM5389 to order coupling certificate
Other society approvals available through DTO

ACCESSORY EQUIPMENT

Marine society and IMO Certifications (Germanischer Lloyd, China Classification Society)
Battery charger
Charging alternator
Local speed throttle control
Direct rack control interface, 0-200 mA DC control
Coolant level sensor
Inlet/Outlet and emergency water connections
Engine-mounted plate-type hear exchanger
Air separator
Spark-arresting muffler
Duplex fuel filter
Fuel level switch
Air filter — generator
Manual voltage control

Additional instrumentation:
- Communications management device
- Remote panel display
- Remote cylinder temperature display

Exhaust temperature thermocouples
Bypass centrifugal oil filter
Duplex oil filter
Sump pump
Vibration isolators
Auxiliary drive shafts and pulleys
Spray shielding
Particle detector
Intake manifold temperature sensors
Oil temperature sensor
Air or electric starting motor
Redundant start with select switch

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

3508B Engine — 968 bkW (1800 rpm)

Engine speed	1800 rpm
Compression ratio	14:1
Aftercooler water temperature	60 deg C
Fuel injection system	EUI
Exhaust manifold type	Dry
Rating	Prime
Emissions certification	IMO Tier I
Fuel type	Diesel
Mean piston speed	11.4 m/s

RATING	NOTES	UNITS	100% LOAD	75% LOAD	50% LOAD
ENGINE POWER	1	kW	958	715	477
BMEP kPa		kPa	1851	1382	922

ENGINE DATA					
FUEL CONSUMPTION (NOMINAL)	6	L/hr	234	179	125
AIR FLOW RATE (@25°C, 101.3 kPa)	3,9	m^3/min	85	72	55
INLET MANIFOLD PRESSURE	3	kPa	254	196	124
INLET MANIFOLD TEMPERATURE		°C	72	68	63
EXHAUST STACK TEMPERATURE	2	°C	386	353	336
EXHAUST GAS FLOW RATE (@stack temp, 101.3 kPa)	5,9	m^3/min	194	156	116
EXHAUST GAS MASS FLOW RATE	5,9	kg/hr	6149	–	–

ENERGY BALANCE DATA					
FUEL INPUT ENERGY (LHV) (NOMINAL)		kW	2335	1784	1247
HEAT REJ. TO JACKET WATER (NOMINAL)	7	kW	422	351	275
HEAT REJ. TO ATMOSPHERE (NOMINAL)	7	kW	96	82	72
HEAT REJ. TO OIL COOLER (NOMINAL)	7	kW	117	89	62
HEAT REJ. TO EXH. (LHV to 25°C) (NOMINAL)	8	kW	791	605	433
HEAT REJ. TO EXH. (LHV TO 177°C) (NOMINAL)	8	kW	366	260	179
HEAT REJ. TO AFTERCOOLER	7	kW	220	146	71

The corrected performance values shown for Caterpillar engines will approximate the values obtained when the observed performance data is corrected to SAE J1995, ISO3046-2 & 8665, & 2288 & 9249 & 1585, EEC 80/1269 and DIN70020 standard reference conditions

Reference atmospheric inlet air: 99 KPA (29.31 in hg) and 25°C (77°F)
Reference fuel: #2 distillate diesel with a 35° API gravity; A 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/Liter (7.001 Lbs/Gal).

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 +/- 3%
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 (60 sec.) ..... 150% of synchronous
Number of Bearings 2
Number of Leads 6
Wires per Lead 4

Ratings

Power ..... 910 ekW
kVA 1138
pf 0.8
Voltage — L.L. ..... 480 V
Voltage — L.N. ..... 277 V
Current — L.L. ..... 1368 A
Frequency ..... 60 Hz
Speed ..... 1800 rpm

Exciter Armature Data (at full load, 0.7 pf)

Voltage ..... 23.56 V
Current ..... 5.1 A

Temperature and Insulation Data

Ambient Temperature ..... 40°C
Temperature Rise ..... 80°C
Insulation Class ..... H
Insulation Resistance (as shipped) .... 100 Megaohms (at 40°C)

Resistances

Stator (at 25°C) ..... 0.0033 ohms
Field (at 25°C) ..... 1.55 ohms
Short Circuit Ratio 0.49

Fault Currents

Instantaneous 3-∅ symmetrical fault current ..... 11,784 amps
Instantaneous L-N symmetrical fault current ..... 11,325 amps
Instantaneous L-L symmetrical fault current ..... 7958 amps

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

Load PU	Kilowatts	Efficiency
0.25	227.5	91.6%
0.50	455	94.6%
0.75	682.5	95.7%
1.00	910	95.9%
1.10	1001	96%

Time Constants

OC Transient – Direct Axis T′DO	4.152 sec.
SC Transient – Direct Axis T′D	0.29 sec.
OC Subtransient – Direct Axis T″DO	0.0063 sec.
SC Subtransient – Direct Axis T″D	0.0054 sec.
OC Subtransient – Quadrature Axis T″QO	0.0121 sec.
SC Subtransient – Quadrature Axis T″Q	0.0104 sec.
Exciter Time Constant	0.2225 sec.
Armature SC TA	0.0547 sec.

Reactances

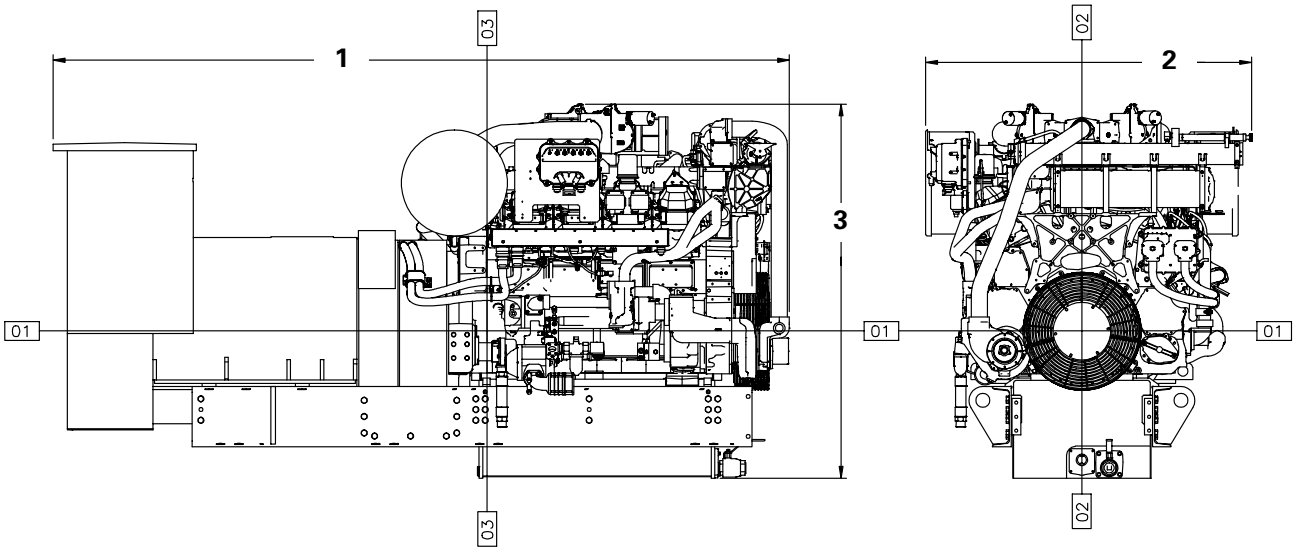
Reactances		Per Unit	Ohms
Subtransient — Direct Axis	X″D	0.115	0.0233
Subtransient — Quadrature Axis	X″Q	0.2449	0.0496
Transient — Saturated	X′D	0.1708	0.0346
Synchronous — Direct Axis	XD	2.4424	0.4947
Synchronous — Quadrature Axis	XQ	1.1226	0.2454
Negative Sequence	X2	0.1797	0.0364
Zero Sequence	X0	0.0642	0.013

*Other generators are available.

3508B OFFSHORE EMERGENCY GENERATOR SET

910 ekW 60 Hz

DIMENSIONS



Dimensions and Weight		
(1) Length	4031 mm	159 in
(2) Width	1784 mm	70 in
(3) Height	2048 mm	81 in
Weight – dry	12,475 kg	27,503 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 — Prime rating with 10% overload for MCS certification. Output available with varying load for an unlimited time. Prime power in accordance with ISO8528. Typical load factor 60-70%. No limit in hours/year.

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.