C280-16 Offshore Generator Set

5500 ekW
5730 bkW (7684 bhp)
60 Hz (900 rpm)

PRELIMINARY

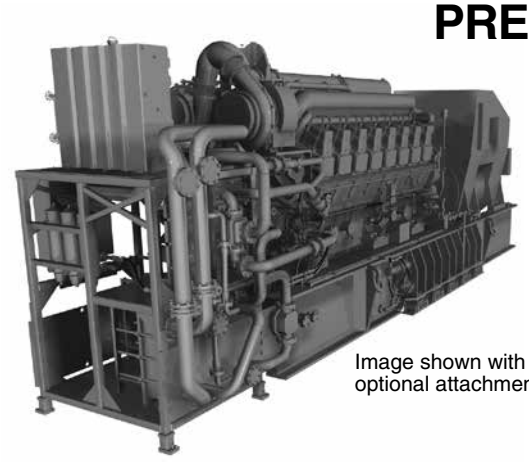

Image shown with optional attachments

CAT® GENERATOR SET SPECIFICATIONS

V-16, 4-Stroke-Cycle-Diesel

Emissions ..... IMO Tier II/EPA Marine Tier 2
Bore ..... 280 mm (11.0 in)
Stroke ..... 300 mm (11.8 in)
Displacement ..... 296 L (18,062 in^3)
Aspiration ..... Turbocharged-Aftercooled
Fuel System ..... EUI
Engine Control ..... Dual ADEM™ A4
Generator Set Control .. Cat® Alarm and Protection System
Refill Capacity
  Cooling System ..... 1245 L (329 U.S. gal)
  Lube Oil System ..... 1677 L (443 U.S. gal)
Oil Change Interval ..... 1000 hours

FEATURES

Product Design

- Cat C280 engines are type approved by the following marine classification societies:
  - American Bureau of Shipping
  - Bureau Veritas
  - China Classification Society
  - Det Norske Veritas
  - Germanisher Lloyd
  - Lloyd's Register of Shipping
- IMO Tier II emissions certification, GL and CCS approved
- Cat alarm and protection system provides redundancy and the latest technology in generator set control, protection, and operator interface; type approved by the following marine classification societies:
  - American Bureau of Shipping
  - Bureau Veritas
  - China Classification Society
  - Det Norske Veritas
  - Germanisher Lloyd
  - Lloyd's Register of Shipping
  - Russian Maritime Register of Shipping
- Optimized to lower specific fuel consumption at 35% load

Simplified Packaging Concept

- Front-mounted turbocharger configuration allows for simplified rig integration
- Engine design can take up to 38°C coolant to the aftercooler, allowing integration with flexible cooling system designs and reducing installation cost
- Single-point AC and DC connection points at distribution panel
- Ready-to-run package, includes most ancillary equipment
- Few shipped-loose parts simplify handling at installation
- Single-lift handling
- Caterpillar warranty covers all factory package components worldwide

Custom Packaging

For any petroleum application, trust Caterpillar to meet your project needs with custom factory generator sets and mechanical packages. Cat engines, generators, controls, radiators, and transmissions can be custom designed and matched in collaboration with our local dealers to create unique solutions. 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 increases application flexibility and reduces installation time.

Testing

- Every unit is full-load tested to ensure proper package performance
- Full range of factory tests and reports are available including performance, torsional-vibration analysis, fuel consumption, engine, and generator special tests

Product Support Offered Through Global Cat Dealer Network

More than 2,200 dealer outlets

Caterpillar factory-trained dealer technicians service every aspect of your Cat 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 and combustion by-products
- Site-specific oil change interval

Over 80 Years of Engine Manufacturing Experience

- C280 engines incorporate over 20 years of proven component reliability and durability from 3600 engines
- Large field population in offshore applications provides proven performance, reliability, durability, and established worldwide product support network

Web Site

Visit www.catoilandgasinfo.com to learn more.

PRELIMINARY

CONFIGURATION

Product Consist
The engine is a turbocharged, aftercooled, four-stroke-cycle-diesel, electronic unit injection engine with a 280 mm (11 in) bore by 300 mm (11.8 in) stroke. SAE standard rotation is counterclockwise as viewed from the rear of engine flywheel.

Air Inlet System
Fresh water aftercooler, corrosion resistant coated (air side); air inlet shutoff; crankcase breathers, top-mounted; turbochargers (2), front-mounted, oil lubricated

Control System
Dual Cat ADEM A4 electronic engine control module with electronic unit injector fuel system, rigid wiring harness (10 amp 24V power required to drive electronic engine control modules), direct rack control

Cooling System
Gear-driven jacket water (JW) pump, gear-driven separate-circuit aftercooler/oil cooler (AC/OC) pump, front-mounted water connections: JW and AC/OC, 6" ANSI

Exhaust System
Dry, gas tight exhaust manifold; dual turbocharger, front-mounted; dual wastegate; hard shielding – SOLAS compliant

Fuel System
Distillate fuel (requires viscosity ranging from 1.4 cSt to 20 cSt at 38°C); fuel pump, gear-driven; fuel transfer pump (mounted on left-hand side); duplex fuel filters, rear-engine-mounted; electronically controlled unit injectors

Lube System
Centrifugal oil filters and lines with single shutoff – RH mounted on cylinder block inspection covers, serviceable with the engine running; oil pump, gear-driven; oil filler and dipstick – located in base integrated tank; oil pressure regulating valve; crankcase explosion relief valves; duplex oil filter – accessory module mounted; off engine-mounted oil cooler – DTO quote required for package connections; base integrated tank – DTO required

Instrumentation
Cat Alarm and Protection System
Features:

- 145 mm (5.7") color monitor to display all engine parameters and alarm annunciation, alarms annunciated with a time and date stamp
- Annunciation of all engine shutdowns, alarms, and status points
- Start/prelube control switch and emergency stop button
- Selection of local/remote control of engine
- Customer connections at terminal blocks inside panel
- Equipped for remote communication MODBUS RS485 and MODBUS TCP
- Two configurable relay outputs
- All engine sensors are monitored by the ECU or the Cat alarm and protection system
- The panel can display all engine parameters

Starting System
TDI dual air starting motors, LH rear; shutoff valve; two integrated relay valves with built-in screen #40 mesh and solenoid; air pressure sensor, monitored by Cat alarm and protection system – requires customer wiring; maximum operating (dynamic) pressure: 10 bar (150 psi); maximum static pressure: 14 bar (200 psi); 3-inch ANSI flange customer connection; requires customer-provided 3-inch supply air line from receiver or regulator to air starter and flex connection; if regulator is used, Cv of 40 or greater is required

PRELIMINARY

ATTACHMENTS

Emission Certification
GL and CCS approved IMO certificate — includes statement of compliance or Engine International Air Pollution Prevention (EIAPP) certificate, supplied by the Recognized Organization (RO) where available, and technical file to be kept on board per IMO regulations.

Marine Society Certifications
Societies currently granting approval to C280 engines are: ABS, BV, CCS, DnV, GL, LRS

Marine Society Requirements
Spray shielding to meet SOLAS regulations for flammable fluids

European Certifications
Declaration of Incorporation for EU Machinery Safety Directive and EU Low Voltage Safety Directive

Air Inlet System
90° adapter and straight adapters for air inlet to turbocharger
Air cleaners
Air cleaners with Cat dry paper filter elements (approximately 99.9% efficient at filtering SAE fine dust)
*Soot filter
*Air cleaner support bracket

Cooling System
Jacket Water Thermostat Options:
- 90°C thermostat, direct connection to expansion tank
- 90°C thermostat, for remote mounting
- 90°C thermostat, fully automatic 3-way with manual override
- Customer-provided thermostat

AC/OC Thermostat Options:
- 32°C thermostat, remote mounted
- 32°C thermostat, fully automatic, 3-way with manual override
- Customer-provided thermostat

Expansion Tank Options:
- Remote-mounted expansion tank
- Accessory-module-mounted expansion tank

*Jacket water heaters
*ANSI connection adapters

Exhaust System
Exhaust manifold shields
*Flexible exhaust fittings
*Weld flanges

Fuel System
*Manual fuel priming pump
*Duplex primary fuel strainer

Lube System
Redundant prelube with continuous electric prelube
Intermittent air prelube backup
Electric continuous prelube pump
* Lube oil heater

Protection System
Flywheel and damper guards
*Cylinder pressure relief valve
*Spray shielding
*Oil mist detector

Starting System
Pressure reducing valve

Mounting System
Design-To-Order (DTO) base
*Vertically-restrained vibration isolators and weld plates

General
Generator panel
Torsional coupling
Engine barring device options:
- Manual 50:1
- Electric 400V
- Electric 480V

*Accessory module – Front mounted for mounting expansion tank, heat exchanger, instrument panel, annunciator panel, alarm and shutdown contactors, and fuel strainer
*Engine testing — full-load tested, fuel consumption test, rated speed performance test, overload test, minimum power setting, peak firing pressure test, turbo work certificates, crankshaft work certificates, standard and project-specific witness testing
*Spare parts kit
*Engine lifting eyes

Literature
*Project-specific installation drawings
*Electrical schematics and P&ID drawings

*Indicates an optional attachment

PRELIMINARY

DIESEL ENGINE TECHNICAL DATA

C280-16 Engine — 5730 bkW (900 rpm)

Genset	60 Hz		
		CERTIFICATION TARGET:	IMO/EPA MARINE TIER II
ENGINE SPEED (rpm):	900	TURBOCHARGER PART #:	362-8652
COMPRESSION RATIO:	12.6 : 1	FUEL TYPE:	Distillate
AFTERCOOLER WATER (°C):	38	RATED ALTITUDE @ 25°C (m):	200
JACKET WATER INLET (°C):	90	ASSUMED GENERATOR EFFICIENCY (%):	96
IGNITION SYSTEM:	EUI	ASSUMED GENERATOR POWER FACTOR:	0.8
EXHAUST MANIFOLD:	DRY	MEAN PISTON SPEED (m/s):	9
FIRING PRESSURE @ 100% load (kPa)	17300		

RATING		LOAD	110%	100%	75%	50%	25%
ENGINE POWER[2]		**bkW**	**6303**	**5730**	**4298**	**2865**	**1433**
GENERATOR POWER[2]		ekW	6051	5501	4126	2750	1375
BMEP		kPa	2844	2586	1939	1293	646
ENGINE DATA							
FUEL CONSUMPTION[1]	(ISO 3046/1)	g/bkw-hr	193.8	193.5	195.1	209.2	208.1
AIR FLOW (@ 25C, 101.3kPa-a)		Nm3/min	528	489	461	325	161
AIR MASS FLOW		kg/hr	35320	32741	30844	20883	10805
INLET MANIFOLD PRESSURE		kPa-a	415	384	349	237	92
INLET MANIFOLD TEMPERATURE		deg C	45	43	42	40	41
EXHAUST STACK TEMPERATURE		deg C	430	427	371	400	371
EXHAUST GAS FLOW (@ stack temp, 101.3kPa-a)		m3/min	1164	1074	924	683	324
EXHAUST GAS MASS FLOW		kg/hr	36541	33849	31682	21453	11103
ENERGY BALANCE DATA							
FUEL INPUT ENERGY (LHV)[1]	(NOMINAL)	kW	14510	13167	9958	7117	3948
HEAT REJ. TO JACKET WATER[3]	(NOMINAL)	kW	1108	1006	818	637	601
HEAT REJ. TO ATMOSPHERE[4]	(NOMINAL)	kW	290	263	199	142	79
HEAT REJ. TO OIL COOLER[5]	(NOMINAL)	kW	578	555	470	390	301
HEAT REJ. TO EXH (LHV to 25 deg C)[3]	(NOMINAL)	kW	4481	4129	3186	2375	1552
HEAT REJ. TO EXH. (LHV to 177 deg C)[3]	(NOMINAL)	kW	2757	2528	1753	1389	908
HEAT REJ. TO AFTERCOOLER[6,7]	(NOMINAL)	kW	1830	1661	1333	617	121

ALTITUDE DERATION FACTORS

ALTITUDE (METERS ABOVE SEA LEVEL)	AIR TO TURBO (°C) 10	15	20	25	30	35	40	45	50
0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98
250	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.96

AFTERCOOLER HEAT REJECTION FACTORS

ALTITUDE (METERS ABOVE SEA LEVEL)	AIR TO TURBO (°C) 10	15	20	25	30	35	40	45	50
0	1.00	1.00	1.00	1.00	1.03	1.08	1.13	1.18	1.23
250	1.00	1.00	1.00	1.01	1.06	1.12	1.17	1.22	1.27

CONDITIONS AND DEFINITIONS

STANDARD REFERENCE CONDITIONS OF 25°C, 100 KPA, 30% RELATIVE HUMIDITY AND 150M ALTITUDE AT THE STATED AFTERCOOLER WATER TEMPERATURE. CONSULT ALTITUDE CURVES FOR APPLICATIONS ABOVE MAXIMUM RATED ALTITUDE AND/OR TEMPERATURE.
PERFORMANCE AND FUEL CONSUMPTION ARE BASED ON 35 API, 16°C FUEL HAVING A LOWER HEATING VALUE OF 42.780 MJ/KG USED AT 29°C WITH A DENSITY OF 838.9 G/LITER.

NOTES

1) FUEL CONSUMPTION TOLERANCE. ISO 3046/1 IS 0, + 5% OF FULL LOAD DATA.
2) ENGINE POWER TOLERANCE IS ± 3 % OF FULL LOAD DATA.
3) HEAT REJECTION TO JACKET AND EXHAUST TOLERANCE IS ± 10% OF FULL LOAD DATA. (heat rate based on treated water)
4) HEAT REJECTION TO ATMOSPHERE TOLERANCE IS ±50% OF FULL LOAD DATA. (heat rate based on treated water)
5) HEAT REJECTION TO LUBE OIL TOLERANCE IS ± 20% OF FULL LOAD DATA. (heat rate based on treated water)
6) HEAT REJECTION TO AFTERCOOLER TOLERANCE IS ± 5% OF FULL LOAD DATA. (heat rate based on treated water)
7) TOTAL AFTERCOOLER HEAT = AFTERCOOLER HEAT x ACHRF (heat rate based on treated water)

TOTAL DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information to help determine actual engine power for your site. The total deration factor includes deration due to altitude and ambient temperature, and air inlet manifold temperature deration.

AFTERCOOLER HEAT REJECTION FACTORS:

Aftercooler heat rejection is given for standard conditions of 25°C and 150 m altitude. To maintain a constant air inlet manifold temperature, as the air to turbo temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor to adjust for ambient and altitude conditions. Multiply this factor by the standard aftercooler heat rejection.

GENERATOR EFFICIENCY:

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

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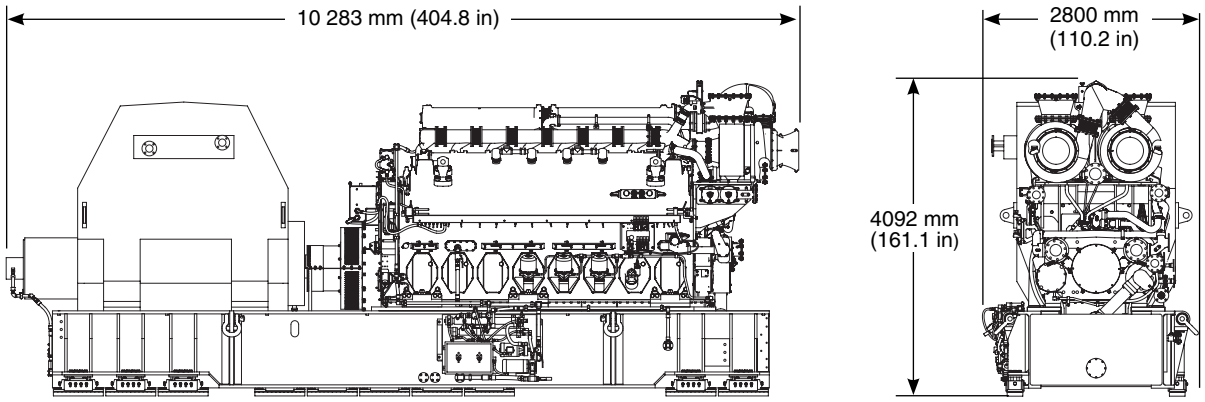
PRELIMINARY

DIMENSIONS



Dimensions and Weight		
Length	10 283 mm	404.8 in
Width	2800 mm	110.2 in
Height	4092 mm	161.1 in
Weight — dry	66 000 kg	145,505 lb

Note: Dimensions are dependent on generator and options. See general dimension drawings for details.

Note: Weight includes engine, generator, base, coupling, water/lube oil heater, generator lubrication module, and piping. 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.

Fuel consumption has a tolerance of +5% and is based on fuel oil of 35° API [16°C (60°F)] gravity having an LHV of 52 780 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 shown with all oil, fuel, and water pumps, engine driven.