

**XQ-5200 Solar T60  
Gas Turbine-Generator  
5,200 ekW Iso Conditions  
13.8 kV**

## [Index](#)

1. Overview .....	3
2. Equipment .....	4
3. Performance Data .....	4
4. Gas Composition Requirement .....	6
5. Availability .....	6
6. Installation Requirement .....	6
7. Technical Specification .....	7
8. Single Line Diagram .....	11

## 1. Overview

The XQ5200 can operate on both natural gas and liquid fuels such as kerosene or #2 diesel. The mobile power plant is powered by Caterpillar's Solar Taurus 60 gas turbine power generation package. The Taurus 60 enjoys a stellar reputation with over 1100 units in service worldwide.

The XQ5200 is self-contained, sound attenuated, trailerized for easy delivery, and designed for quick connection and convenient servicing. Having the ability to produce 5200kW in a two-trailer arrangement, this package maintains a high power density. The XQ5200 mobile power plant is rated at 5200ekW 60 Hz (ISO) rating at 13 – 13.8 kV. Operating as one of the cleanest sources of power generation, the XQ5200

guarantees Not to Exceed 25 ppm NOx emissions' output while operating on Natural Gas and 96 ppm NOx while operating on #2 diesel. This full utility-grade Mobile Power Plant is capable of running stand-alone or infinitely parallel with the utility. On board the PCR (power control room) trailer, are all of the necessary controls, fire protection system, and associated switchgear. Included is the Beckwith model M-3425 relay package that provides the system protection requirements. Schemes are included for 21, 27, 32, 40, 46,



60FL, 51V, 50/27, 50N, 51N, 59/59N, 81, 87, 81G, 50/51B devices to assure complete protection. The XQ5200 ships as three (3) separate trailers and when completed on site, only two (2) trailers remain. Those being the power plant trailer, which houses the turbine generator and the PCR trailer. Both of these enclosures have been designed for minimal esthetic and sound impact to the area. These sound attenuated enclosures have sound levels of 85 dbA at three feet (3').

The assembled package takes approximately three (3) days to assemble. It has a peak height of twenty-six (26') and requires two-thousand five hundred pounds per square foot (2500psf) soil or deck loading capability.

## 2. Equipment

One (1) XQ-5200, Natural Gas Industrial Turbine, Taurus 60, 5.2 MW ISO Conditions, rated at 13.8 kV, 60 Hz with gearbox, generator, control system, fuel system, lubrication system, start system (require black start in Island Mode), and ancillary equipment included in the package.

## 3. Performance Data

### ISO Conditions

The following ISO conditions have been assumed:

- Sea level
- 15 C Design Air Temperature

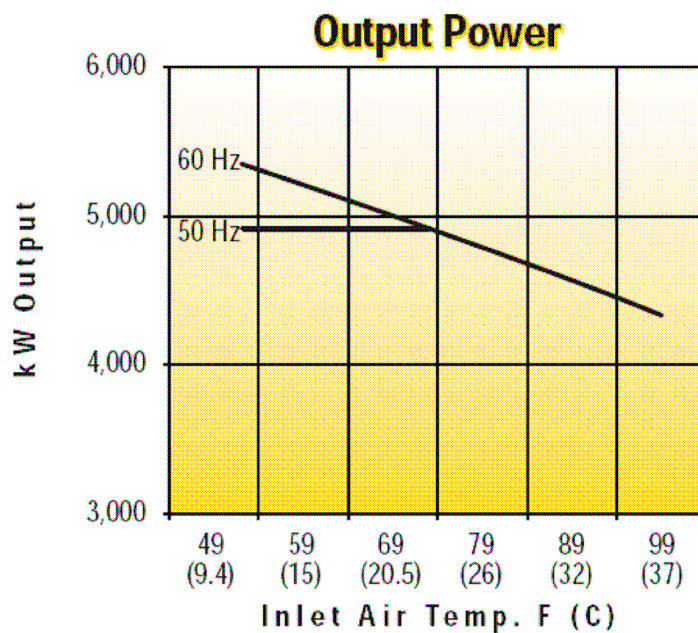
### Estimated Plant Output

At the specified site conditions, the XQ-5200 Gas Turbine is able to perform as follows:

Item	Unit	Per Turbine
ISO Power – Turbine*	kW electric	5,200
Generator Voltage	kV	13.8
Fuel Type		Natural Gas

\* Based on ISO 3046/1.

### Solar T60 Performance Curve



**Requirements for Gaseous Fuels:**

Fuel Volume Ratio (1220/WOBBE Index*)	0.9 to 1.1
Fuel Mass ratio (21550/LHV Btu/lb)	<5
Hydrogen Content	<4% by volume
Carbon Monoxide Content**	<12.5% by volume
Ratio of Flammability Limits  <u>Upper flammability limit</u> *** Lower flammability limit	>2.2 for Saturn >2.8 for Centaur and Mars
Stoichiometric Flame Temperature with Air Temperature Equal to Compressor Discharge Temperature at Design Point	>3600°F (1980°C)
Total Particulates	<30 ppmw x (LHV/21500)
Maximum Particle Size	10 micron
Gas Supply Temperature (at inlet flange of package):	At least 50°F above dew point temp (both natural gas liquids and water) of the fuel at operating pressure (no liquids are allowed in the fuel gas), and shall not be lower than -40°F nor higher than the level specified for the project fuel system.
<p>*WOBBE Index = Lower Heat Value (use ASTM 3588 or DIN 51850 for individual component heating values) in Btu/Scf divided by the square root of the relative density (specific gravity).</p> <p>**If carbon monoxide is present in the fuel gas, precautions must be taken to detect leaks</p> <p>***Flammability limits at 1 atm and 25°C as defined by M.G. Zabetakis, US Bureau of Mines Bulletin 627.</p>	
<p style="text-align: center;"><b>Note:</b></p> <p>If the required fuel temperature is above ambient air temperature, adequate thermal insulation and heat tracing of fuel lines and fuel control system is required to avoid condensation. If condensates form during shutdown or are otherwise introduced, provisions should be made to drain fuel lines just before start up to ensure that gas fuel condensation is completely eliminated.</p>	

#### 4. Gas Composition Requirement

- 4.1. Pipeline Quality Natural Gas is required for working in the Solar T60. Pipeline has shall be processed to remove the heavier hydrocarbons. Methane shall be the major constituent (>90%).

#### 5. Availability

- 5.1. The XQ-5200 herein specified is currently available, can be shipped in three to four weeks. However, this is strictly subject to equipment availability at the time of award and receipt of down payment.

#### 6. Installation Requirement

##### 6.1. Natural Gas Fueled

	English	Metric
Gas Pressure	250 PSIG	<b>172 KPAG</b>
Maximum Gas Demand	1,400 SCFM	<b>39.6 M<sup>3</sup>/MIN</b>

##### 6.2. Foundation

	English	Metric
Gravel Compacted to	2,500 lbs/ft <sup>2</sup>	<b>120 kPA</b>

##### 6.3. Electrical Connections

Load Connection	<b>12.47 kV or 13.8 kV</b>
Black Start (if needed)	<b>480 V, 200 kW</b>

##### 6.4. Estimated Setup Crew and Equipment Requirement for Installation

The customer shall be liable to install the XQ-5200 complete package, being the minimum setup crew and equipment requirement for the installation as follows:

- 6.4.1.1. 15-25 Ton Crane w/operator
- 6.4.1.2. All Terrain fork-lift or shooting boom rated 6,000 Lbs
- 6.4.1.3. Two (2) Laborers five days @ 12 hours per day
- 6.4.1.4. Two (2) Skilled Mechanics four days @ 12 hours per day
- 6.4.1.5. One (1) 13.8 kV high voltage electrician four days @ 12 hours per day
- 6.4.1.6. One (1) Electrician's assistant four days @ 12 hours per day
- 6.4.1.7. One (1) Relay Technician, 4-8 ma-hours/turbine

## 7. Technical Specification

The following outline describes the gas turbine generator set technical specification:

### 7.1. Basic Package

- Taurus 60 PG Generator Set
- 480 Volts / 60 Hz

### 7.2. Gearbox

- 1800 RPM 60 Hz

### 7.3. Generator

- Continuous Duty
- Open Drip Proof (ODP)
- 13,800 Volt, 60 Hz

### 7.4. Start System

- Direct Drive AC Motor

### 7.5. Fuel System

- Dual Fuel (Liquid & Natural Gas), Gas & Liquid Availability by Customer

### 7.6. Lube System

- Main Lube Oil Pump, Engine Driven
- Backup Lube Oil Pump, 120 VDC Motor Driven
- 3 Phase AC Lube Oil Tank Heater
- Lube Oil Mechanical Coalescer
- AC, Air/Oil Cooler, Simplex
- Package Configured for Petroleum Base, Viscosity Grade C46
- Simplex Lube Oil Filter

### 7.7. Control System

- On-skid control system

- Turbine and Main Reduction Drive Vibration Monitoring
- Turbine Thrust Bearing Temperature Monitoring
- Historical Trend Display Screen
- Auxiliary Desktop Video Display Unit
- ControlNet Redundant Media Supervisory Interface

#### **7.8. Generator Control and Monitoring**

- Individual Auto Synchronizer
- Motorized Voltage Adjust
- Vibration Monitoring System
- Generator Bearing and Stator Winding Temperature Monitoring
- Kilowatt Control
- KVAR / Power Factor Control

#### **7.9. Accessory Equipment**

- On-Crank/On-Line Turbine Compressor Cleaning System
- 120 Vdc, VRLA Batteries
- Portable Engine Cleaning System

#### **7.10. Miscellaneous**

- Alignment Tool
- Long Term Preservation
- Operation and Maintenance Manuals, English Language

#### **7.11. Test and Quality Assurance**

- Package Static Test
- Observe on Noninterference Basis
- Quality Control Documentation

#### **7.12. Air Inlet System**

- Static type filters
- Silencer

#### **7.13. Exhaust System**

- Exhaust Silencer, Floor Standing
- Exhaust Bellows
- Rain Protection Stack

#### **7.14. Enclosure**

- Enclose Complete Package, Single Turbine Compartment



- Combustible Gas Monitoring System - One Sensor in Enclosure Exhaust
- Inlet Ventilation Silencer - Elbow Type (Single Fan)
- Exhaust Ventilation Silencer - Elbow Type
- Dust Protection - Barrier Type Filters
- Fire Detection and Suppression System - CO2 System
- Fire CO2 Cylinder Cabinet
- Internal Equipment Handling Kit
- Note: Noise 85dBA @ 1m

#### 7.15. Gas Turbine Generator Trailer XQ5200

- Tri-Axle Transport Trailer with Two Axle Pivoting Booster
- Trailer Length 48' + 14'1" Booster (removable at site)
- Width 8'6", 9'0" across trailer axles
- 133" Swing Clearance
- 49" 5th wheel Height (loaded)
- Air Ride Suspension and Air Raise and Lower Kit
- Steel Disc Wheels with 275/70R x 22.5 Tire
- Three Tail Light Package
- Landing Gear (2)
- 6 Additional Landing Gears with Soil Bearing Plates for Leveling/Stabilization at Site
- Overall transport height: 14'2"
- Approximate transport weight: 118,000 lbs (without tractor)



#### 7.16. Power Control Module

- Power Control Room (PCR) mounted on Two Axle Transport Trailer
- Power Control Room HVAC system
- Generator Main Circuit Breaker. Single interface point to power grid
- Auxiliary Transformer Feeder Circuit Breaker
- Bus PTs, Feeder CTs, Metering CTs and PTs
- Beckwith M-3425 Protective Relay Module included
- Neutral Grounding

- Neutral Grounding Transformer
- Lightning Arrestor and Surge Capacitor
- Motor Control Center. Serves Turbine Generator Auxiliary Loads
- 120VDC Turbine Generator Battery System with Charger
- Dedicated 120VDC Switchgear Battery System with Charger
- Start Motor Variable Frequency Drive (VFD)
- DC Backup Lube Oil Pump Contactor
- Interior Lighting. Photocell Controlled Exterior Lighting at Access Doors
- CO2 Bottles
- Emergency Eyewash Station
- Two Axle Transport Trailer
- Trailer Length 46' Overall
- Width 8'6"
- 49" 5th wheel Height (loaded)
- Air Ride Suspension and Air Raise and Lower Kit
- Steel Disc Wheels with 255/70R x 22.5 Tires
- Three Tail Light Package
- Landing Gear
- 4 Additional Landing Gears with Soil Bearing Plates for Leveling/Stabilization at Site
- Overall Transport Height: 14'0"
- Approximate transport weight: 48,000 lbs. (without tractor)



