

# Solar Turbines

A Caterpillar Company

## Industry Leader for Gas Turbine Power

Solar Turbines, a subsidiary of Caterpillar Inc., is a leading producer of industrial gas turbines and turbomachinery packages in the 1 to 22 MW (1590 to 30,000 hp) range.

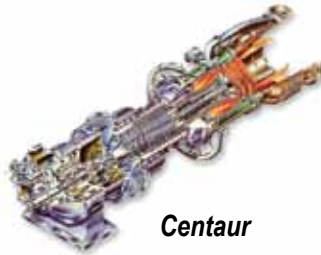
Headquartered in San Diego, California, Solar designs and manufactures its proven line of compressor sets, mechanical-drive packages and generator sets using state-of-the-art operations certified by DNV to conform to the ISO 9001:2008 Quality Systems Standard.

Since Solar entered the industrial gas turbine business in 1960 with the *Saturn*<sup>®</sup> turbine, Solar's fleet has grown to more than 14,200 units worldwide. These units have logged more than 1.8 billion hours in 98 countries in some of the toughest, most challenging arctic, desert, tropical and offshore environments. This unparalleled experience gives testimony to the robust design and wide user acceptance of Solar's products.

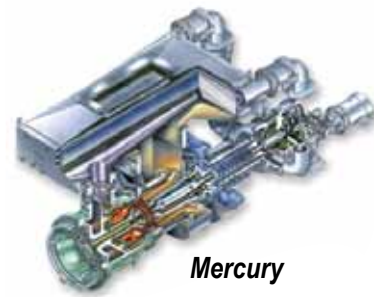
Solar's compact, lightweight and durable gas turbines offer the highest thermal efficiencies in their power classes. Other advantages include ease of transport and installation, long life, high performance, availability and reliability. Units in the *Centaur*<sup>®</sup>, *Mercury*<sup>™</sup>, *Taurus*<sup>™</sup>, *Mars*<sup>®</sup> and *Titan*<sup>™</sup> gas turbine families are available with Solar's pollution prevention *SoLoNOx*<sup>™</sup> dry low emissions combustion system. Customers have installed more than 2500 gas turbines with *SoLoNOx*, and those units have logged more than 117.4 million operating hours. Solar's experience with dry, lean-premixed combustion technology, designed to meet low emissions regulations, is unmatched by any other company in the gas turbine industry.



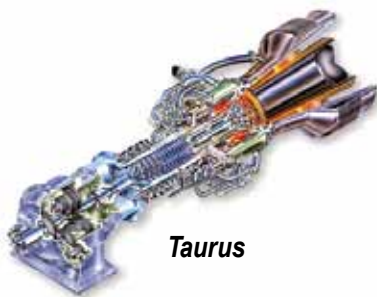
*Saturn*



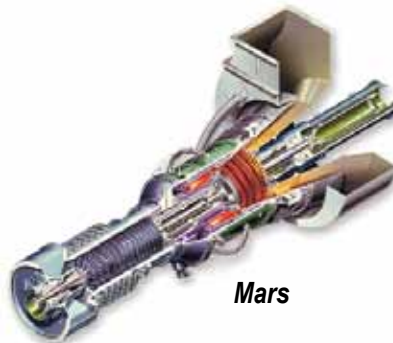
*Centaur*



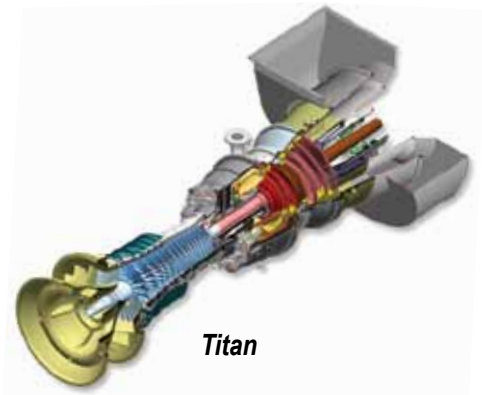
*Mercury*



*Taurus*



*Mars*



*Titan*

# Package Specifications

## COMPRESSOR SETS

Solar manufactures gas turbine-driven compressor sets that are designed for applications in the oil and gas industry, such as transmission, natural gas gathering, storage/withdrawal, gas lift and export sales gas. *Solar*® compressor sets are fully assembled and tested at the factory so they can be installed quickly. Their compact size, light weight, low maintenance requirements and dependability have led to widespread use throughout the world, particularly at remote and offshore facilities.



*Titan 250 Compressor Set , C85 Compressor - Tennessee, USA*

## CENTRIFUGAL COMPRESSORS

Solar manufactures a broad range of rugged centrifugal compressors designed specifically to match the operating speeds of *Solar* turbines. These units incorporate many API 617 features,

providing high reliability and availability. They include modularized components for maximum simplicity, interchangeability, operational flexibility and field restaging.

## Compressor Set/Mechanical Drive Specifications

Gas Turbine Model	Nominal Output		Thermal Efficiency %	Length		Width		Height		Weight	
	kW	hp		m	ft-in.	m	ft-in.	m	ft-in.	kg	lb
Saturn 20	1185	1590	24.5	4.7	15' 4"	1.9	6' 1"	2.0	6' 8"	6805	15,000
Centaur 40	3500	4700	27.9	6.0	19' 9"	2.5	8' 1"	2.7	8' 11"	14 970	33,000
Centaur 50	4570	6130	29.9	6.0	19' 9"	2.5	8' 1"	2.7	8' 11"	16 330	36,000
Taurus 60	5740	7700	31.9	6.0	19' 9"	2.5	8' 1"	2.7	8' 11"	15 420	34,000
Taurus 70	8140	10,915	34.8	7.7	25' 3"	2.7	8' 8"	3.3	10' 9"	24 950	54,000
Mars 90	9860	13,220	33.1	9.1	29' 11"	2.8	9' 2"	3.4	11' 0"	33 565	74,000
Mars 100	11 860	15,900	34.4	9.1	29' 11"	2.8	9' 2"	3.4	11' 0"	33 565	74,000
Titan 130	15 290	20,500	35.7	9.8	32' 0"	3.1	10' 2"	3.2	10' 4"	38 555	85,000
Titan 250	22 370	30,000	40.0	10.3	33' 9"	3.7	12' 0"	3.6	11' 11"	49 900	110,000

## Gas Compressor Specifications

Compressor Model	Number of Stages	Pressure Rating*		Maximum Flow		Minimum Flow		Maximum Total Head		
		kPag	psig	m <sup>3</sup> /min	ft <sup>3</sup> /min	m <sup>3</sup> /min	ft <sup>3</sup> /min	kJ/kg <sub>m</sub>	ft-lb <sub>f</sub> /lb <sub>m</sub>	
<b>Production Compressors</b>										
C16	1-10	24 130	3500	62	2200	4	200	209	70,000	
C33	1-12	18 620	2700	269	9500	23	800	257	86,000	
C40	1-6	17 235	2500	269	9500	28	1000	239	80,000	
C41	1-10	25 855	3750	510	18,000	42	1500	269	90,000	
C50	1-5	10 340	1500	566	20,000	57	2000	239	80,000	
C51	1-10	20 685	3000	708	25,000	57	2000	269	90,000	
C51 Dual Compartment	1-10	20 685	3000	623	22,000	57	2000	269	90,000	
C61	1-10	20 685	3000	991	35,000	79	2800	269	90,000	
<b>Pipeline Compressors</b>										
C40	1-2	11 030	1600	311	11,000	42	1500	108	36,000	
C45	1-3	15 515	2250	453	16,000	80	2800	162	54,000	
C65	1-2	15 515	2250	453	16,000	80	2800	162	54,000	
C85	1-2	11 030	1600	1275	45,000	283	10,000	108	36,000	

*At ISO conditions: 15°C (59°F), sea level, 60% relative humidity, zero inlet or exhaust duct losses. Natural gas fuel. Single-body compressor skid. Driver package only.*

\* MAWP (Maximum Allowable Working Pressure)

## Package Specifications

The gas compressors are designed to have from 1 to 12 stages to handle flows from 4 to 1275 m<sup>3</sup>/min (200 to 45,000 ft<sup>3</sup>/min) and maximum allowable working pressures to 25 855 kPa (3750 psi). Dual compartment models allow for intercooling and side streams. They may be driven, either directly or through a gearbox, by *Solar* gas turbines or by electric motors. With two or three compressors mounted in tandem, the package can provide up to 40:1 pressure ratios.



*Gas Compressor Assembly - California, USA*



*Titan 130 Generator Sets - Missouri, USA*

### **MECHANICAL-DRIVE PACKAGES**

Solar manufactures mechanical-drive packages that are completely factory packaged and tested to drive a variety of centrifugal and reciprocating compressors for air, process and refrigeration applications. They also drive pumps for waterflooding and transportation of crude oil and other liquid products. To facilitate the driver/driven equipment interface, Solar offers single-source responsibility for a complete package when Solar supplies the driven equipment. Solar can provide the packaging expertise required when the driven equipment is supplied by other manufacturers.



*Mars 100 Mechanical-Drive Packages - Songkhla, Thailand*

# Solar® Turbines

A Caterpillar Company

## Industry Leader for Gas Turbine Power

### GENERATOR SETS

Solar manufactures gas turbine-driven generator sets for combined heat and power, base-load electricity, dispersed power, combined-cycle, peak shaving, district heating/cooling, mobile, and standby power applications for a wide variety of facilities, including colleges and universities, hospitals, industrial/processing facilities, and distributed power plants.

For overall system thermal efficiencies of 70% or more, these units can be applied in combined heat and power or combined-cycle configurations where the heat from the turbine exhaust is used to produce steam, pre-heated combustion air or hot air for drying or heating processes.



Titan 130 Generator Set - Ontario, Canada

### Generator Set Specifications

Gas Turbine Model	Nominal Output kWe*	Thermal Efficiency %	Standard Voltages	Length		Width		Height		Weight	
				m	ft-in.	m	ft-in.	m	ft-in.	kg	lb
Saturn 20	1210	24.3	240-4160	6.7	21' 11"	2.4	8' 0"	2.7	8' 11"	10 530	23,215
Centaur 40	3515	27.9	3300-13 800	9.8	32' 3"	2.6	8' 6"	3.2	10' 5"	31 620	69,710
Centaur 50	4600	29.3	3300-13 800	9.8	32' 3"	2.6	8' 6"	3.2	10' 5"	38 945	85,860
Mercury 50	4600	38.5	3300-13 800	11.2	36' 6"	3.2	10' 5"	3.7	12' 3"	45 660	100,700
Taurus 60	5670	30.4	3300-13 800	9.8	32' 3"	2.6	8' 6"	3.2	10' 5"	39 055	87,160
Taurus 65	6300	32.9	6900-13 800	9.8	32' 3"	2.6	8' 6"	3.3	10' 9"	39 620	87,160
Taurus 70	7965	34.0	6900-13 800	11.9	39' 0"	2.9	9' 7"	3.7	12' 1"	62 935	138,775
Mars 90	9450	31.7	6900-13 800	14.2	46' 6"	2.8	9' 2"	3.8	12' 6"	86 182	190,000
Mars 100	11 350	32.9	6900-13 800	14.2	46' 6"	2.8	9' 2"	3.8	12' 6"	86 182	190,000
Titan 130	15 000	35.2	6900-13 800	14.0	46' 0"	3.2	10' 11"	3.3	10' 9"	86 850	191,456
Titan 250	21 745	38.9	11 000-13 800	18.1	59' 7"	3.4	11' 1"	3.6	11' 11"	129 636	285,800

At ISO conditions: 15°C (59°F), sea level, 60% relative humidity, zero inlet or exhaust duct losses. Natural gas fuel. Continuous duty.

\*Measured at the generator terminals.

### SOLUTION PROVIDER

Solar offers complete solutions from engineering specifications to machinery management for your 1 to 60 MW project power needs. Our products are marketed and serviced from 48 locations around the world. We are dedicated to providing quality products and prompt, comprehensive customer support such as field service, overhaul, refurbishment, certified parts and technical training.

Solar's Customer Services team is unrivaled in its dedication to support Solar packages around the world. Our experienced technicians and strategically located facilities are ready to respond to any needs our customers may have to ensure their equipment is operating as efficiently and effectively as possible.

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