

# SGT-500 Industrial Gas Turbine

Power Generation: (ISO) 19.1 MW(e) Base Load

The Siemens SGT-500 industrial gas turbine is a highly dependable gas turbine with excellent fuel flexibility. It combines the reliability and robustness of an industrial design and low emission levels of the latest turbine technology for a wide variety of fuels and applications at low operational costs.

The SGT-500 gas turbine has been serving the industrial power generation segment for over 50 years. Introduced in 1955, the turbine was designed for heavy oil operation under tough conditions. It is used widely in industrial power generation, marine as well as oil and gas applications, whether onshore or offshore, floating or fixed.

Due to its large roomy combustors and low firing temperature, the SGT-500 has the capability to operate on a wide range of fuels. Experience includes gas and heavy fuel oils, naphtha, crude oil, high aromatic and hydrogen-rich gases, as well as gases with high content of hydrogen sulfide.

In addition, the combustor and fuel system have the potential for easy adaptation to additional liquid and gaseous fuels, including the growing flora of environmentally friendly fuels. The SGT-500 can be equipped with several emissions reduction alternatives, including Dry Low Emissions (DLE) combustion.

## Outstanding operational reliability

With world class start-up and operational reliability performance, the SGT-500 is an excellent solution for emergency power applications. Its low firing temperature contributes to an impressive maintenance program. At operation on full load the standard time between major overhauls is 80,000 hours. At 94% load the interval can be extended to 160,000 hours, equal to 18 years of operation.

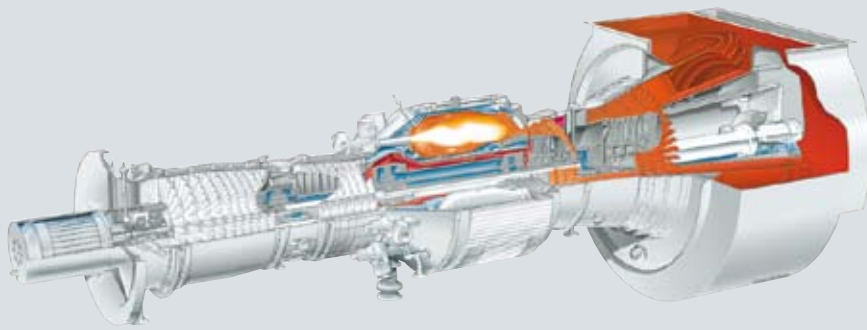


Industrial Gas Turbines

Answers for energy.

**SIEMENS**

# SGT-500 Industrial Gas Turbine



SGT-500 core engine in workshop.

## Technical specifications

### Overview

- Power generation: 19.1 MW(e)
- Electrical efficiency: 33.8%
- Heat rate: 10,664 kJ/kWh (10,107 Btu/kWh)
- Power turbine speed: 3,600 rpm
- Compressor pressure ratio: 13:1
- Exhaust gas flow: 97.9 kg/s (215.9 lb/s)
- Exhaust temperature: 369°C (697°F)
- NO<sub>x</sub> emissions (with DLE corrected to 15% O<sub>2</sub> dry)
  - Natural gas: ≤42 ppmV

### Axial Compressor

- Two multi-stage (10+8 LP/HP) axial flow compressors
- Compressor rotors of bolted design
- Corrosion-coating available

### Combustion

- 7 can-annular combustion chambers
- Conventional combustion system
  - Steam or water injection for emissions control and power augmentation
- Dry Low Emissions (DLE) combustion system option (gas only)

### Turbine

- Two compressor turbines (1+2 HP/LP)
- Free power turbine of axial-flow design
- 3-stage 3,600 rpm turbine

### Fuel System

- Natural gas - Liquid fuel - Dual fuel - Heavy fuel
  - Other fuel capability available on request
- Fuel-changeover capability at any load
- Load-rejection capability
- Fuel-supply pressure requirement: 18.0 bar(a) ±0.5 bar (261±7 psi(a))

### Bearings

- Hydrodynamic radial- and thrust bearings of tilting pad type
- Vibration and temperature monitoring

### Lubrication

- Lubricating oil tank integrated into gas turbine skid
- AC-driven auxiliary pump
- DC-driven emergency pump
- AC-driven lube oil pumps with DC backup
- Air- or water-cooled lube oil coolers

### Gearbox

- Parallel-shaft gear of double helical design
- High-speed shaft 3,600 rpm (nominal speed for PG)
- Low-speed shaft 1,500 rpm (50 Hz) or 1,800 rpm (60 Hz)
- 4 radial bearings of sleeve type

### Generator

- 4-pole design
- Rated voltage: 10.5 kV/11.0 kV/13.8 kV
- 50 Hz or 60 Hz
- Protection IP54
- PMG for excitation power supply
- Complies with IEC/EN 60034-1 standard

### Starting

- Start and barring motor connected to the LP rotor via a ratchet coupling

### Control System

- Siemens Simatic control system
- Distributed inputs/outputs

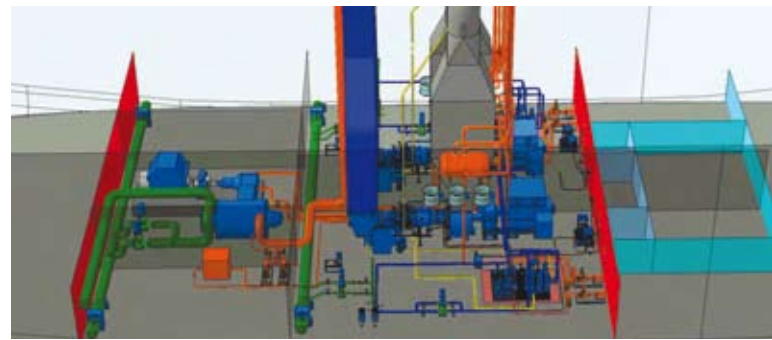
## Gas turbine

### Key features

- Robust design – long engine life
- High availability/reliability
- High part-load efficiency
- Low fuel-gas pressure requirement
- No advanced sealings, resulting in minimal deterioration and maintained efficiency
- Dry Low Emissions (DLE) system option
- Low starting power (<160 kW)
- Fast start capability (~3 minutes)
- Dual-fuel
- Competitive with dual-fuel reciprocating technology
- Marine classified
- No methane slip

### Maintenance

- Extremely low and predictable maintenance costs
- Easy on-site maintenance possible
  - complete modules can be swiftly exchanged
- Direct exchange of gas generator possible
  - Core can be air-freighted
- First overhaul after 40,000 hours (80,000 hours between major overhauls)
- Lease-engine availability for planned overhauls
- Online wash available
- Standardized concepts for time-based and cycle-based maintenance
- Staff training in operation and maintenance
- 24/7 Siemens support
- Remote diagnostics



SGT-500 package in combined cycle configuration.



Four SGT-500 units installed in Egypt to power an LNG plant.

## Package

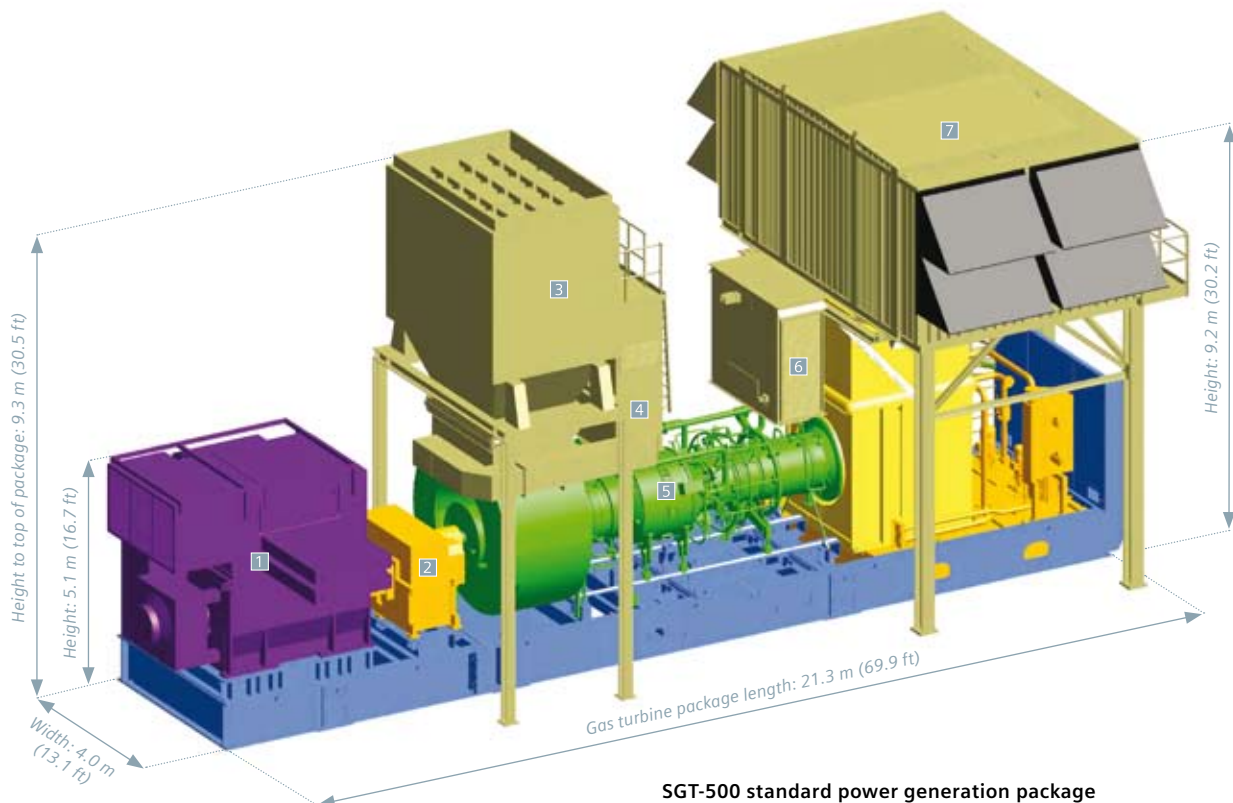
### Key features

- Compact layout
- State-of-the-art control system fulfills all requirements for control and safety
- Can easily communicate with other control systems
- DNV, LR and ABS certified packages
- Marine package with auxiliary drive system on lightweight frame
- FPSO package (Floating Production, Storage and Offloading) option
- ATEX package option

## Cogeneration and combined cycle

The SGT-500 is easily adapted to any cogeneration or combined-cycle plant layout. It has very low environmental impact in both configurations. Thanks to high air flow, the SGT-500 has excellent steam-raising capability which yields high total efficiency in cogeneration.

In combined cycle, the SGT-500 has high total efficiency independent of the fuel used. When using HFO (heavy fuel oil) the SGT-500 offers outstanding emission performance and less than half the maintenance cost compared to competing technologies.

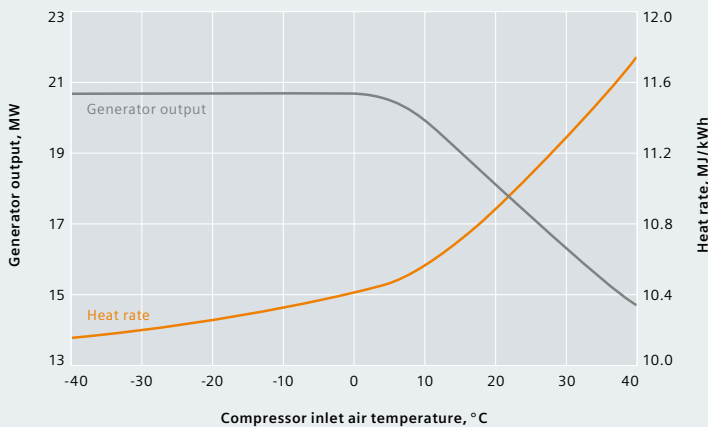


### SGT-500 standard power generation package

- |                        |                        |
|------------------------|------------------------|
| 1 AC generator         | 5 Core engine          |
| 2 Speed reduction gear | 6 Enclosure air inlet  |
| 3 Combustion exhaust   | 7 Combustion air inlet |
| 4 Enclosure air outlet |                        |

# SGT-500 Performance

## Nominal generator output and heat rate



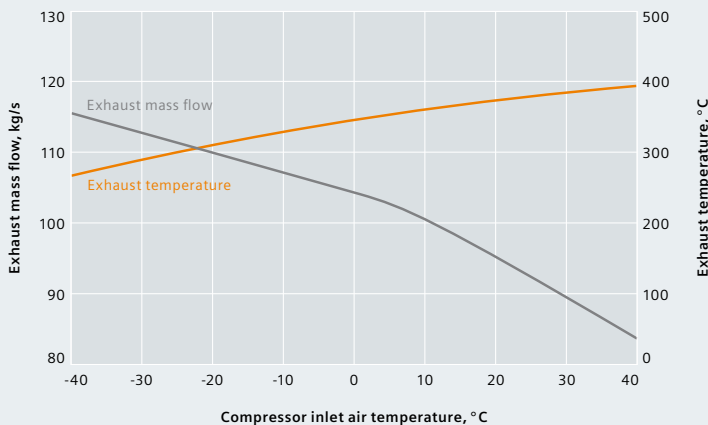
### Conditions/assumptions:

Fuel: Natural Gas LHV, 46,798 kJ/kg (20,118 Btu/lb)  
 Altitude: Sea level  
 Ambient pressure: 1,013 bar (a) (14.7 psi (a))  
 Relative humidity: 60 %  
 Inlet pressure loss: 5 mbar (2" H<sub>2</sub>O)  
 Outlet pressure loss: 5 mbar (2" H<sub>2</sub>O)  
 Fuel temperature: 5°C (41°F)

### Diagram conversion factors:

To convert	To	Multiply by
°C	°F	(°C x 9/5) + 32
MJ/kWh	Btu	949

## Nominal exhaust mass flow and temperature



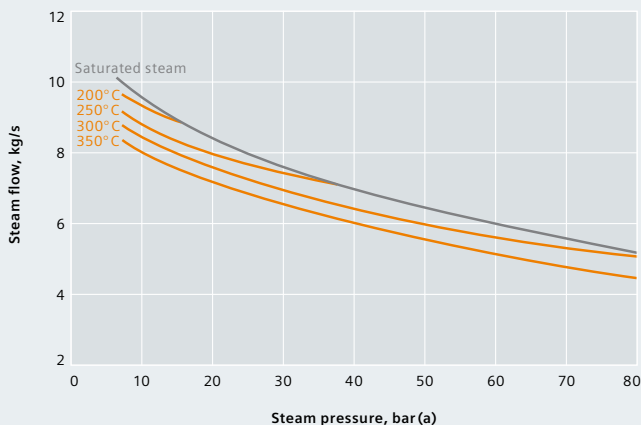
### Conditions/assumptions:

Fuel: Natural Gas LHV, 46,798 kJ/kg (20,118 Btu/lb)  
 Altitude: Sea level  
 Ambient pressure: 1,013 bar (a) (14.7 psi (a))  
 Relative humidity: 60 %  
 Inlet pressure loss: 5 mbar (2" H<sub>2</sub>O)  
 Outlet pressure loss: 5 mbar (2" H<sub>2</sub>O)  
 Fuel temperature: 5°C (41°F)

### Diagram conversion factors:

To convert	To	Multiply by
°C	°F	(°C x 9/5) + 32

## Supplementary-fired heat-recovery steam generation



### Conditions/assumptions:

Fuel: Natural Gas LHV, 46,798 kJ/kg (20,118 Btu/lb)  
 Altitude: Sea level  
 Ambient pressure: 1,013 bar (a) (14.7 psi (a))  
 Ambient temperature: 15°C (59°F)  
 Relative humidity: 60 %  
 Boiler pinch point: 8 K (14 F)  
 Boiler approach point: 5 K (9 F)  
 Inlet pressure loss: 5 mbar (2" H<sub>2</sub>O)  
 Outlet pressure loss: 25 mbar (10" H<sub>2</sub>O)

### Diagram conversion factors:

To convert	To	Multiply by
°C	°F	(°C x 9/5) + 32
kg/s	lb/s	2.2046
bar	psi	14.5

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