



## Industrial Applications

# SGT-400 Industrial Gas Turbine

**Power Generation: (ISO) 12.90 MW(e)**

The Siemens SGT-400 industrial gas turbine (formerly known as the Cyclone) is designed for electrical power generation applications and has a nominal simple cycle efficiency of 35%.

Incorporating the proven technology of the SGT-100 and SGT-300 gas turbines, the SGT-400 offers cost effective power for a wide range of duties. These include applications offshore and onshore in power generation and cogeneration. The gas turbine incorporates the latest aerodynamic and combustion technologies. The SGT-400 features a two-stage power turbine and produces a high simple cycle efficiency.

### Industrial Power Generation

Power generation applications benefit from the gas turbine's high simple cycle efficiency. In cogeneration applications the unit's consistent, cost-effective power and steam raising capability - over 27 tonnes an hour at 10 barg pressure - contribute towards achieving overall plant efficiencies of 80% or higher and shorter economic pay-back periods.

The SGT-400 is also available as a trailer mounted transportable power unit which can supply 12.90MW(e) of electrical power wherever it is needed. Full power can be available within hours of arrival at site.



### Power Generation in the Oil and Gas Industry

The compact arrangement, on-site maintainability and inherent reliability of the SGT-400 have made it the gas turbine of choice for the oil and gas industry. The gas turbine is employed on offshore platforms and Floating Production Storage and Off-loading (FPSO) vessels world-wide. Onshore the gas turbine is the ideal power generator for oil field service, refinery application, emergency and standby power generation. Cogeneration in the oil and gas industry provides highly efficient solutions for crude oil and glycol heating as well as steam generation.



## General Specifications

### Axial Compressor

- 11-stage axial flow transonic compressor design
- Variable inlet guide vane and stators
- Pressure ratio: (ISO) 16.7:1
- Airflow: (ISO) 38.9kg/s
- Nominal speed: 14,100rpm

### Combustion

- 6 reverse flow tubular combustion chambers
- Dry Low Emissions (DLE) Combustion System
  - Single high energy ignitor in each chamber
- Steam injection option for power augmentation

### Turbine

- 2-stage overhung compressor turbine
  - Both stages are air-cooled
- 2-stage high efficiency free power turbine
  - 9,500rpm design speed
  - Rotor blades have interlocking shrouds for mechanical integrity
  - Both stators are cast as complete rings
- Anti-clockwise rotation of power turbine (when viewed from the driven unit)

### Fuel System

- Natural gas - Liquid fuel - Dual fuel
- Other fuels capability on request
- Automatic changeover from primary to secondary fuel at any load

### Emissions Control

- Dual fuel Dry Low Emissions (DLE) combustion system as standard
  - Bleed system for part load emissions control
- DLE NO<sub>x</sub> levels of sub10 and 60ppmVd on gas and liquid fuel respectively

### Bearings

- Tilting pad journal and thrust bearings
- Vibration and temperature monitoring

### Gearbox - Power Generation

- Speed reduction gearbox integral with the generator
- Speeds of 1500rpm and 1800rpm to suit 50Hz or 60Hz operation

### Lubrication

- Integral lubricating oil system
- Auxiliary gearbox driven main pump
- AC motor driven auxiliary pump
- DC motor driven emergency pump

### Starting

- Electrically driven hydraulic system

### Compressor Cleaning

- On-line and off-line high pressure cleaning

### Control System

- PLC based with local distributed control and processing capability installed on the underbase

## Principal Features

- *Nominal 35% simple cycle efficiency, cutting fuel costs, particularly in cogeneration applications*
- *Dual fuel Dry Low Emissions (DLE) combustion system, meeting the most stringent legislation*
- *Twin-shaft arrangement for both power generation and mechanical drive, allowing commonality of parts in mixed duty installations*
- *Site maintainability*
- *Alternate rapid core engine exchange option*
- *Compressor cleaning both on and off-line*
- *Compact size with low weight-to-power ratio*
- *Highly competitive cost-to-power ratio with very low installation costs*

## Maintenance and Service

- *Maintenance on or off site*
- *Multiple borescope inspection ports*
- *Vertically and horizontally split intake casing*
- *Horizontally split compressor casing*
- *Combustion chambers, flame tubes and ignitors easily accessible for inspection*
- *Hot section inspection on condition*
  - typically after 24,000 hours
- *General overhaul on condition*
  - gas generator typically after 48,000 hours
  - power turbine typically after 96,000 hours

## Customer Support

Utilising our global support network, customer support managers and a round-the-clock specialist help desk, we are able to provide first class support to our customers. In addition, remote monitoring and trouble-shooting are available on-line via our Electronic Data Exchange Network (EDEN) system. This allows full diagnostic support from our world-wide service centres. Training programmes are designed for both in-house or on-site application. We can supply spare parts and service exchange items from regional distribution centres or electronically via our on-line 'Sparesfinder' service. We are committed to providing OEM retrofits, upgrades and refurbished packages to our customers' specifications. We offer a combination of maintenance contracts, overhauls (using lease or exchange engines) and technical field support with our world-wide pool of over 200 field staff.

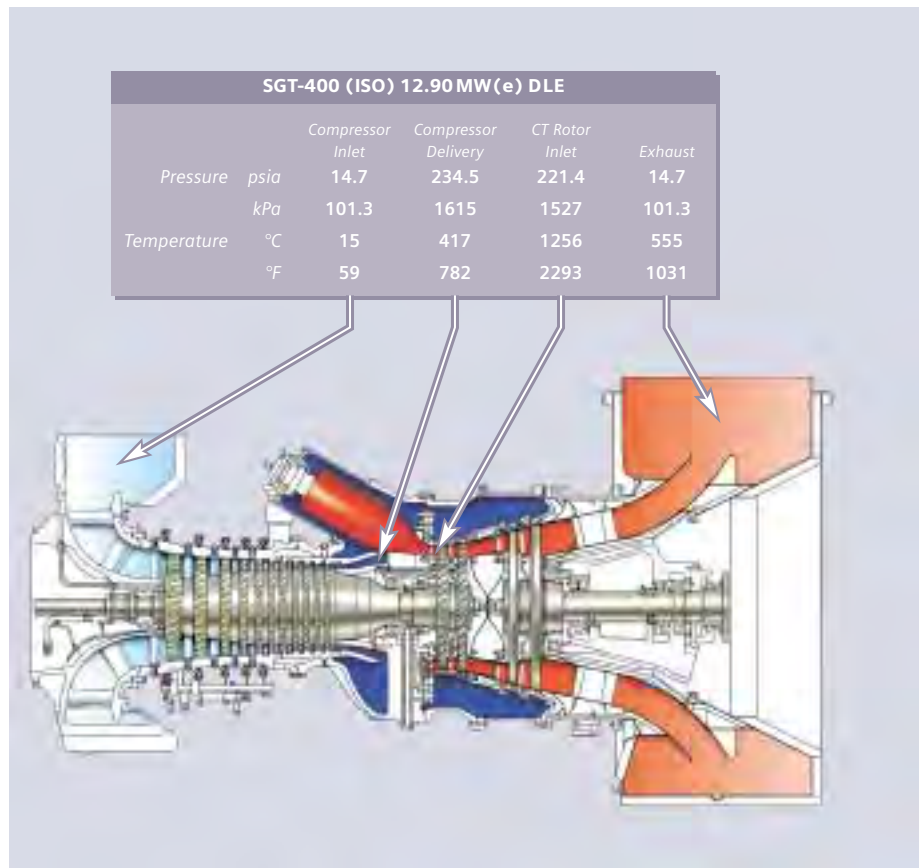


## Package

The SGT-400 is available as a factory assembled packaged power plant for utility and industrial power generation applications. It is easily transported, installed and maintained at site. The package incorporates the gas turbine and all systems mounted on a single underbase. Turbine controls, motor control centre for package motors and variable speed drive for starter motor can also be package mounted. The generator incorporates an integral epicyclic speed reduction gearbox and is mounted on a separate underbase for ease of installation.

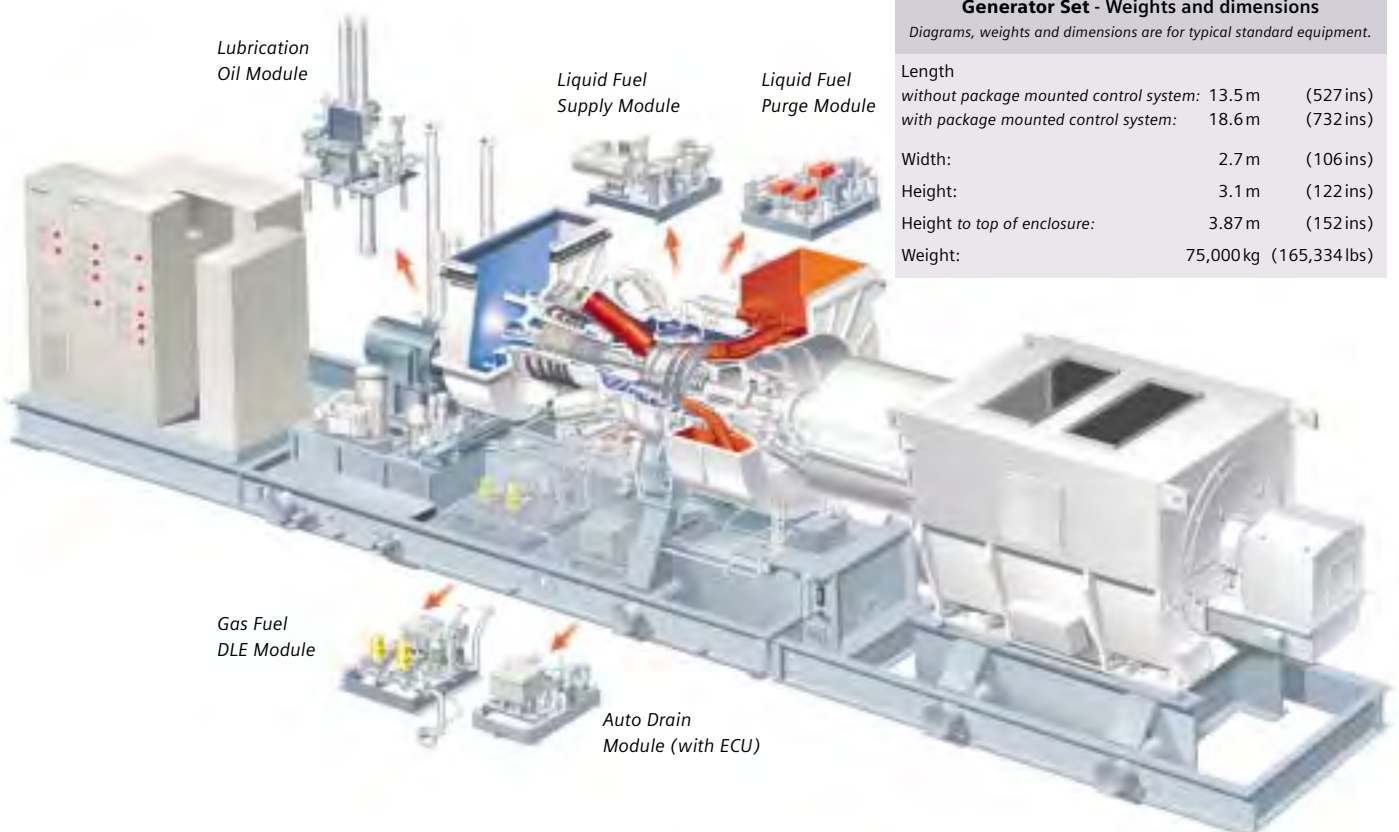
A common modular package design concept is used with the appropriate system pre-assembled and tested in modular form and installed into a standard underbase design. The modules are easily accessible for maintenance. Distributed input/output collection modules are used on the package to reduce the amount of site cabling to any off-skid control equipment.

The package is available for either multi-point or three-point mounting for onshore or offshore use as required. An option for acoustic treatment reduces noise levels to 80dB(A) and is available in carbon steel or stainless steel. Doors and panels are incorporated to provide access for servicing.



Flow Diagram

## Modular Package - Generator Set

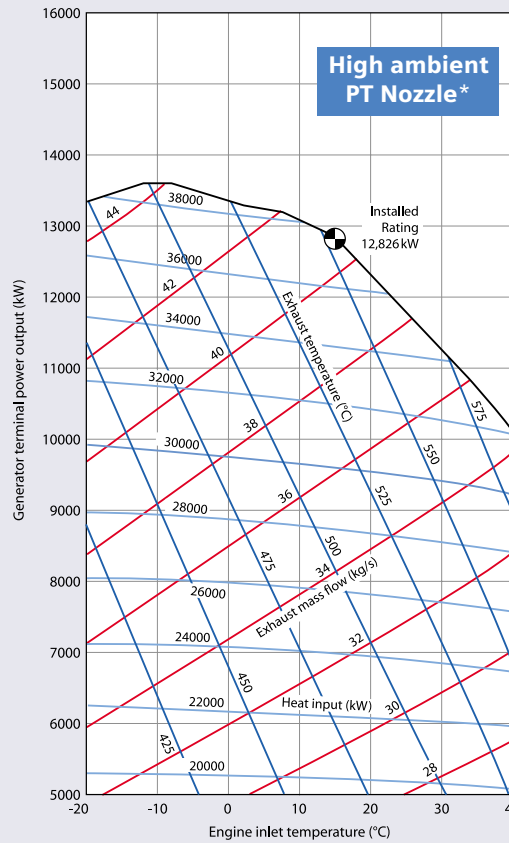
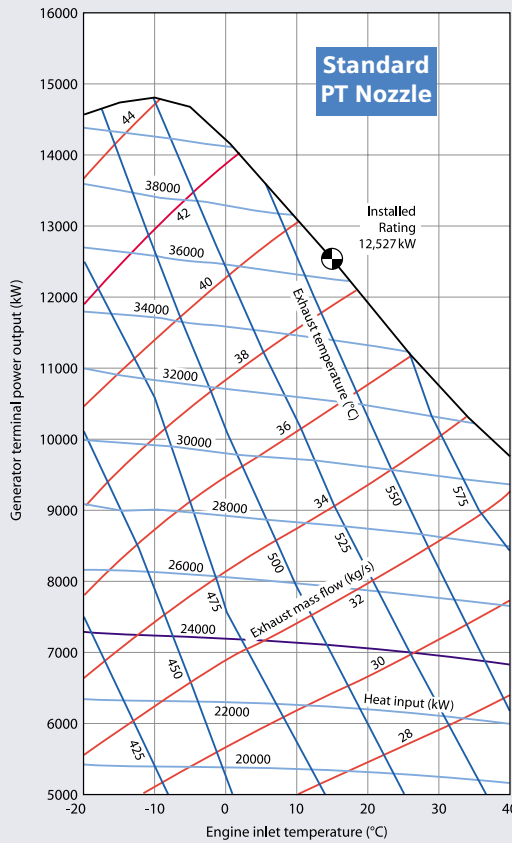




# SGT-400 Performance, Power Generation (ISO) 12.90MW(e)\*

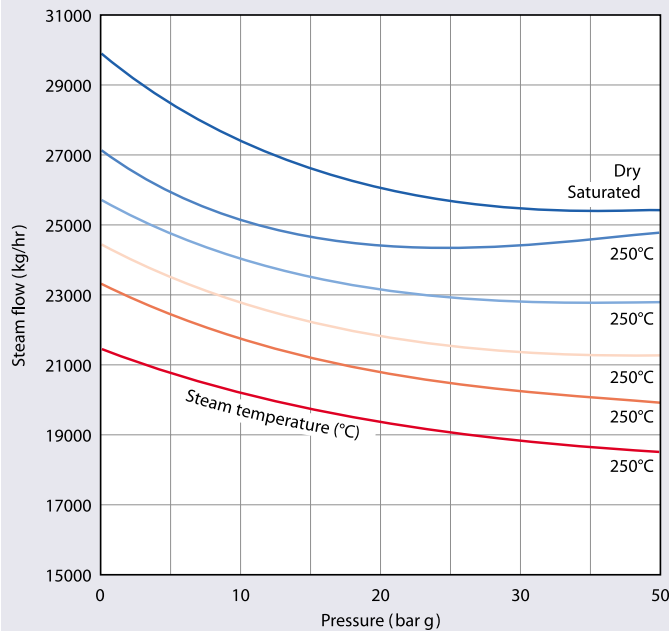
\* A high ambient temperature (30°C) rating is available to provide higher power at elevated site temperatures using an alternative power turbine nozzle configuration.

## Nominal performance - Power and specific heat input vs speed



Altitude:	Sea level	Natural gas fuel only.	
Ambient pressure:	101.3 kPa	Gearbox efficiency:	99.0%
Inlet ducting Loss:	1.0 kPa	Generator efficiency:	97.2%
Exhaust ducting Loss:	2.0 kPa	Relative Humidity:	60%
(assumes waste heat recovery)		No CO turndown bleed in operation.	

## Unfired heat recovery steam generation



Exhaust gas mass flow:	39.5 kg/sec
Mean specific heat:	0.26 kcal/kg/°C
Gas temperature leaving boiler:	120°C
Assumed feed water temperature:	100°C
Exhaust gas temperature:	573°C

Published by and copyright 2005:  
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Order No. A96001-S90-A208-X-4A00  
Printed in England  
4251 698 R BR 01054.

Subject to change without prior notice.  
Printed on paper treated with chlorine-free bleach.

The information in this document contains general descriptions of the technical options available which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.

