PRESENTATION

SGT 400 50Hz/60Hz Gas Turbine Power Islands

BRAND NEW 2022 SIEMENS SGT- 400 NATURAL GAS TURBINE GENSET, HIGH PERFORMANCE UP TO 12.9 MW POWER OUTPUT, 50HZ/60HZ FREQUENCY, AND 11 kV VOLTAGE at 50HZ

- **ZERO HOURS UNIT**

OPTIMAL FUEL FLEXIBILITY, LOW EMISSIONS, AND EXTENDED SERVICE INTERVALS – SUITABLE FOR POWER GENERATION AND MECHANICAL DRIVE APPLICATIONS

OVERVIEW:

1. General Description

The Siemens SGT-400 is a high-performance, robust twin-shaft gas turbine, suitable for both power generation and mechanical drive applications. These gas turbines are brand new, manufactured in 2022, and have never been used before. This turbine is known for its operational and fuel flexibility, low emissions, and overall efficiency. It can burn a wide range of fuel compositions and run efficiently at all loads, including loads as low as 30%. The SGT-400 offers seamless, true dual-fuel capability.

2. Unit Specifications

1. Power Output: 12.9 MW(e)
2. Fuel: Natural gas.
3. Frequency: 50Hz/60Hz
4. Gross Efficiency: 35.00%
5. Heat Rate: 10,294 kJ/kWh (9,756 Btu/kWh)
6. Turbine Speed: 9,500 rpm
7. Pressure Ratio: 16.9:1
8. Exhaust Mass Flow: 40.0 kg/s (88.2 lb/s)
9. Exhaust Temperature: 555 °C (1,031 °F)
10. NO_x Emissions: ≤ 15 ppmvd (NO_x emissions at 15% O_2 on fuel gas with DLE)
11. Voltage: 11 kV at 50 Hz

3. Key Features

1. Extended service intervals of 32,000 hours for the hot gas path, with 64,000 hours before the first major overhaul. This unit has zero hours.
2. Fuel flexibility allows the turbine to burn many fuel types and qualities, including liquid fuels and gases with high inerts. It can burn up to 10 vol% of hydrogen (H_2) when equipped with DLE burners and up to 65 vol% of hydrogen (H_2) when equipped with diffusion burners.
3. Twin-shaft design enables efficient operation across a broader range of power – from 10 to 15 MW.
4. The turbine has intelligent automatic adjustment of fuel split during starting and during operation to compensate for load, ambient, and fuel composition changes, thereby minimizing emissions.

4. Applications

1. Ideal for onshore or offshore oil and gas industry applications due to its compact dimensions, on-site or off-site maintainability, and high reliability. It can be used as a direct drive for compressors or pumps, or for power generation. Suitable for onshore use in oil fields or refinery applications and offshore on platforms and FPSO vessels.
2. It is also ideal for industrial power generation in simple cycle or combined cycle applications and combined heat and power (CHP) uses.

5.Design Details

1. The SGT-400 features a two-bearing gas generator rotor with an 11-stage axial flow transonic compressor and a two-stage, overhung compressor turbine. The SGT-400 free power turbine also has a robust two-stage, overhung design.
2. The rotors are contained in heavy-duty casings that are horizontally and vertically split, so maintenance can be carried out on-site as needed.
3. The compressor uses variable guide vanes for robust operability and optimized performance across a range of operating conditions.
4. The gas turbine is equipped with a DLE combustion system to achieve low NO_x emissions with both gaseous and liquid fuels.

6. Packaging

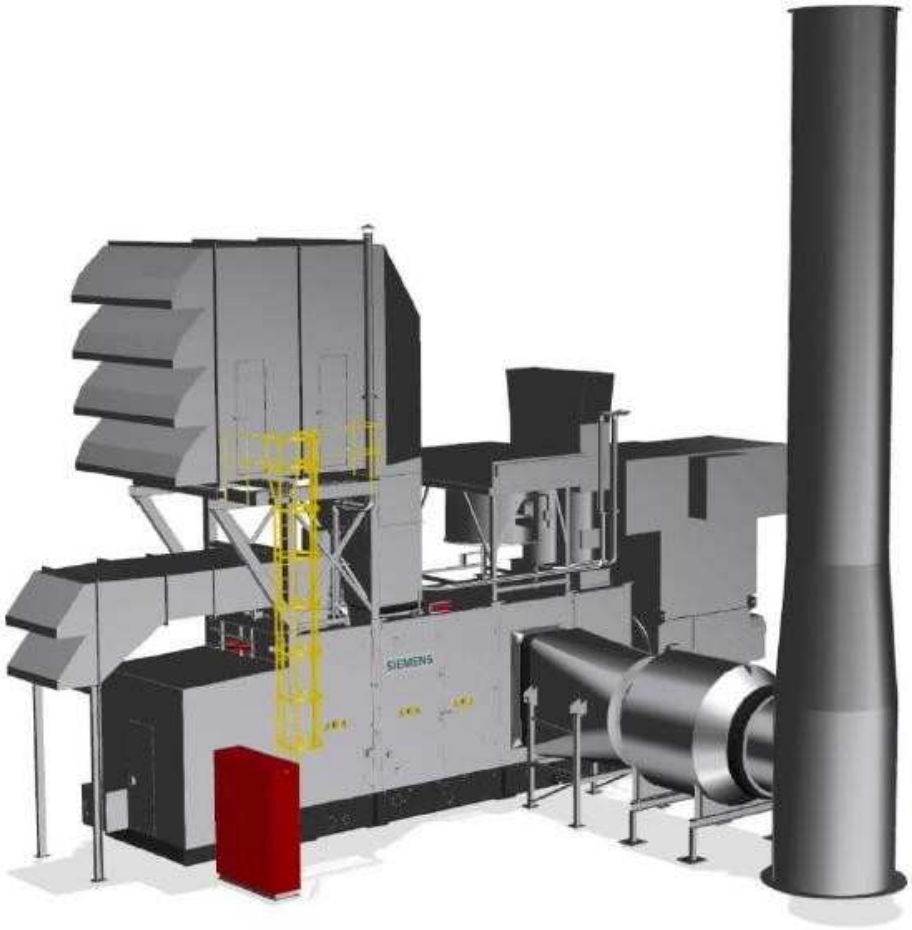
1. The SGT-400 gas turbine packages for both power generation and mechanical drive applications are compact and designed to be easily transported, installed, and maintained. They are equipped with factory-tested modules and offer a high power-to-weight ratio.
2. These packages consist of the gas turbine, gearbox (if necessary), driven unit, and all factory-tested fluid modules, mounted on an under - base.
3. The fluid system modules, which are shop-tested and certified, are common for all SGT-400 gas turbine packages and come fully wired into the control systems. These modules include an auto drains module, a gas fuel module, a lube oil module, and an optional liquid fuel module.

7. Power Generation Package

1. The SGT-400 package for power generation is suited for simple cycle, combined cycle, and cogeneration. Its high steam-raising capability, compact arrangement, robustness, and reliability, and ease of maintenance make it an ideal choice for many applications.

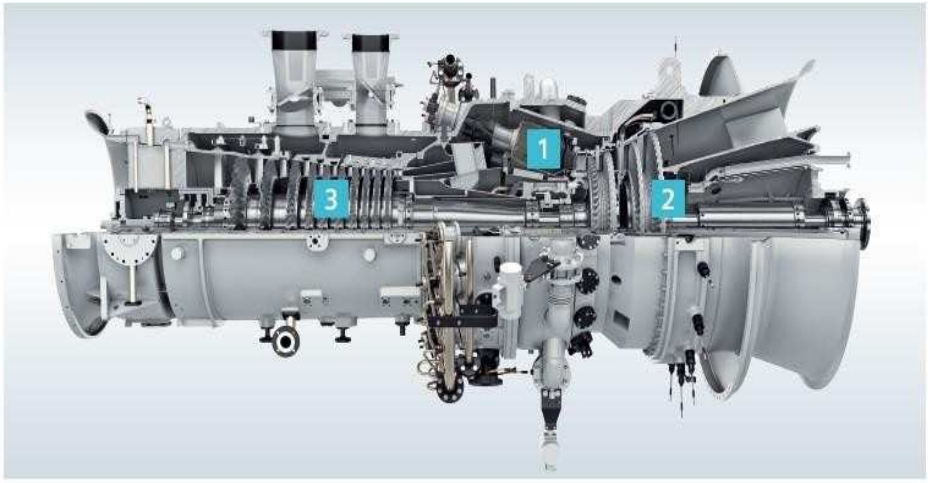
8. Mechanical Drive Package

1. The mechanical drive package is very compact, providing a small footprint and a high power-to-weight ratio.



13 MW 2022 New Siemens SGT-400 Gas Turbine Genset

ADDITIONAL NOTES



Easy to maintain, reliable, and robust twin-shaft designed core engine, consisting of gas generator plus a free spinning power turbine

1 **DLE combustion system**
Well-proven and reliable dry low emissions (DLE) combustor with low emissions.

2 **Power turbine**
Two-stage uncooled free power turbine offers nominal shaft speed up to 7,700 rpm. For mechanical drive, it may operate at 50 to 105 percent of the nominal speed. The blades use inter-locking shrouds for extra robustness.

3 **Compressor**
10-stage axial flow transonic compressor with three balancing planes accessible from the outside.

SGT-400 Gas Turbine Generator Set, with integral Local Equipment Room

- Units to be supplied are unused, with zero running hours, never installed
- These units have been stored indoors since manufacture

Gas Turbine Package:

- Original year of assembly 2022
- SGT-400 Gas Turbine Core Engine
- Original assembly location Europe
- Never installed
- The engines have been re-tested during 2022/23 to verify operation and performance

AC Generator:

- Original assembly location Siemens Electrical Machines
- Original year of assembly 2022
- Package and Core engine serial numbers will be confirmed upon placement of order

Scope of Supply (Siemens)

Driven Unit

Generator

- AC Generator, TBA kV, 3 phase, 4 pole, 50Hz/60Hz, 0.8 power factor, salient pole brushless type
- Filter ventilated
- Class ‘F’ insulation with class ‘B’ total temperature rise
- Generator enclosure rating – IP54
- Generator bearing temperature instrumentation
- Generator bearing proximity X-Y vibration probes Lubricating oil piping – gas turbine to driven unit

Gas Turbine Package

Gas Turbine Engine

- Core Engine – twin shaft design – nominal rating 12.9 MWe
- Gas Generator
- Air Inlet Casing
- Compressor Rotor
- Compressor Stator with Variable Guide Vanes
- Centre casing
- Combustion System – Dry Low Emissions (DLE)
- Compressor Turbine Rotor
- Compressor Turbine Stator
- Power Turbine
- Hot Gas Interduct
- Power Turbine Rotor
- Power Turbine Stator
- Output Shaft Drive
- Exhaust Outlet Casing
- Engine Bearing Temperature Instrumentation
- Engine Vibration Detector
- Engine arranged for hot end drive

Underbase

- Underbase – fabricated carbon steel construction, arranged for multi-point mounting
- Mounting assemblies for the gas turbine core, auxiliary gearbox, auxiliaries, main gearbox, anddriven unit (separate underbase)
- Integral lubricating oil tank – carbon steel

Start System

- Hydraulic Motor and Pump - AC electric motor driven

Gears, Couplings and Guards

- Main speed reducing gearbox – epicyclical type, output shaft speed 1500 rpm
- Auxiliary gearbox incorporating drives for start system and lubricating oil pump
- Driven unit coupling, flexible element dry type
- Coupling guard – carbon steel

Lubricating Oil System

- Gas turbine lubrication system utilizes mineral oil
- Lubricating Oil System serving the turbine, gearbox and driven unit
- Lubricating Oil Pump Main – Turbine gearbox driven
- Lubricating Oil Pump Auxiliary – AC motor driven
- Lubricating Oil Pump Emergency – DC motor driven
- Lubricating Oil Filter - Duplex - carbon steel body non-ASME
- Lub oil module transmitters – Siemens standard smart type – aluminum
- Lubricating Oil tank immersion heaters
- Lubricating oil system breather
- Lubricating oil breather oil mist eliminator
- Lubricating oil breather ducting – austenitic stainless steel
- Lubricating oil system cooler
- Airblast Simplex Lubricating Oil Cooler – non API
- Cooler Fan – single 100% duty
- Suitable for a non-hazardous area
- Package roof mounted

Gas Fuel System

- Pilot fuel flow control system with actuator
- Main fuel flow control system with actuator
- Rapid-acting gas shut-off valves (2-off)
- Pressure transmitters - Siemens standard smart type – aluminum
- Gas fuel system trace heating and insulation (if required)
- Gas fuel system thermocouple
- Gas fuel block and vent valve assembly - off package

Acoustic Enclosure

- Acoustic Enclosure – painted carbon steel, fitted over gas turbine and auxiliaries
- Doors for personnel access and maintenance
- Integral lifting beam for maintenance
- Internal lighting
- Acoustic system transmitters - Siemens standard smart type – aluminum
- Controls Weather Protection Canopy – Aluminum

Acoustic Enclosure Ventilation System

- Ventilation air inlet grille
- Ventilation inlet and outlet dampers – galvanized carbon steel – instrument air operated
- Ventilation fan – single – AC electric motor driven – Zone 2
- Ventilation air system – negative pressure
- Ventilation air silencer – galvanized carbon steel
- Ventilation air inlet and outlet ducting – galvanized carbon steel
- Integral support for turbine enclosure ventilation system

Gas Detection System

- Gas Detection equipment, comprising:
- Gas Detectors - vent outlet x 2

Fire Protection System

- Fire Protection equipment, comprising:- Flame Detectors IR x 3
- Heat Detectors x 2
- Sounder / Beacon Unit
- Status Indicator
- Manual Alarm Contact

Fire Extinguishing

- Twin shot CO2 fire protection system
- Cylinders housed in an open rack
- Extinguishing system distribution pipework and nozzles
- Piping - cabinet to package

Combustion Air Inlet System

- Combustion air filter – static pad type - galvanized carbon steel
- Combustion air filter weather hood
- Combustion air silencer – galvanized & painted carbon steel
- Combustion air inlet ducting – galvanized & painted carbon steel
- Integral support for combustion air inlet system

Combustion Exhaust System

- Exhaust diffuser only – ferritic stainless steel – horizontal orientation
- Thermal insulation and aluminum cladding – personnel protection only

Package Electrical Systems

- Motor Control Centre – off-package, for Siemens supplied package motors
- Batteries – *(Not included in this Budgetary Tender)*

Package Auxiliaries

- Turbine compressor cleaning system for hot and cold wash - off-package reservoir
- Auxiliary Module Drains Tank
- Transmitters – Auxiliary Module – Siemens standard smart type - aluminum

- Instrument tagging – Arrow tags - Siemens standard P&ID references Package finish to Siemensonshore standard

Control System

Package Control System Hardware

- Unit Control System – simplex, incorporating a Siemens SIMATIC PLC platform
- Control and monitoring of the package systems
- Control system located on-package
- Climate control incorporated
- Operator display language – English language
- Turbine Vibration displacement monitoring - Bently Nevada 1701 system
- Remote PC, VDU, keyboard and mouse
- Generator Control Panel (Safe Area), package mounted, containing :-
- Automatic voltage regulator
- Synchronizing facility – automatic & manual with check synchronizer
- Generator metering equipment and electrical protection

Siemens Turbomachinery Applications – Remote Monitoring System – STA-RMSTM

- Provision for data collection and remote communication from site allowing access to the followingservices:
- Connection via broadband internet connection (customer supply)
- Automatic recording of data values within the Control System
- Analysis of events
- Analysis of downtime
- Predictive trending
- Anomaly detection
- Software updates
- Accelerated troubleshooting support
- Customer notification reports
- Access to historic data
- Fleet and unit performance overview
- Driven unit monitoring

Testing

Testing Gas Turbine

- Gas turbine frame and systems test
- Gas turbine core engine test– Siemens standard

Driven Unit Test

- Manufacturer’s standard works acceptance test of AC Generator

Installation and Maintenance

Installation and Commissioning

- Supervision of installation and commissioning is offered on a day rates basis

Installation and Maintenance Equipment

- Roll-off equipment - Gas Turbine power turbine
- Roll-off trolley – Gas Turbine core engine removal

- Installation Tools
- Holding down fixings – GT and driven unit package
- Holding down fixings – off-package equipment Selection of paints for site repairs

Drawings and Documentation

- Standard set of certified information and approval drawings in the English language
- Operator Manual - English language – CD version
- Maintenance Manual – English language – CD version Driven Unit Manual - English language –CD Version

Packing and Delivery

Packing

- Packing and preservation to suit destination and transport method

Delivery Terms

- Delivered, FCA, Siemens manufacturing facility, in accordance with ICC INCOTERMS 2010 Edition

Training

- *(Not included in this Budgetary Tender)*

Spares

Commissioning Equipment and Tools

- Commissioning Equipment and Tools

Commissioning Spares

- Commissioning Spares

Quality Assurance

- Contract quality assurance programs – English language

Exclusions

- All items not specifically listed in this Tender

Not contractual; for illustration only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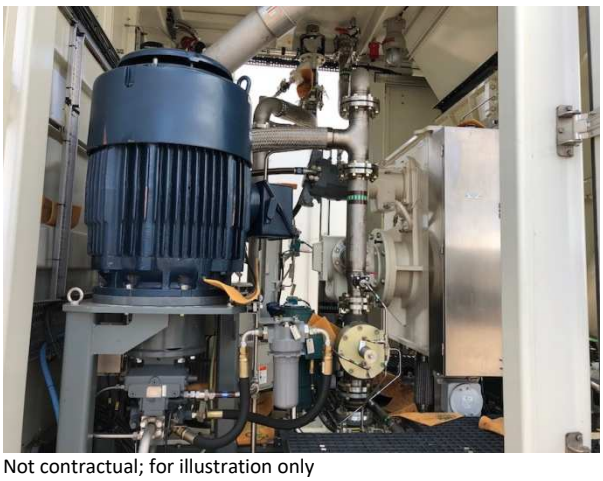
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