

SCOPE OF SUPPLY

SGT-400 Gas Turbine Generator Set

Power Generation Application - 12.9 MW / 50 Hz / 11 kV

1. GAS TURBINE GENERATOR PACKAGE

1.1 Gas Turbine Engine

Siemens SGT-400 twin-shaft industrial gas turbines, ISO rating 12.9 MW(e), comprising:

- Gas generator assembly
 - Air inlet casing
 - Compressor rotor, 11-stage axial flow
 - Compressor stator with variable guide vanes (VGV)
 - Centre casing
 - Combustion system - Dry Low Emissions (DLE) for gaseous fuels
 - Compressor turbine rotor, 2-stage, air-cooled
 - Compressor turbine stator
- Power turbine assembly
 - Two-stage uncooled variable free power turbine
 - Hot gas interdict
 - Power turbine rotor with interlocking shrouds
 - Power turbine stator
 - Output shaft drive (hot end drive arrangement)
- Exhaust outlet casing
- Engine bearing temperature and vibration instrumentation

1.2 AC Generator

Siemens Electrical Machines AC generator, complete with:

- 11 kV output voltage
- 50 Hz frequency
- 4 poles
- 0.8 power factor
- Cylindrical pole brushless type
- Filter ventilated
- Class F insulation with class F total temperature rise
- Generator bearing temperature instrumentation
- Lubricating oil piping from gas turbine to driven unit
- Manufacturer's works acceptance test data

1.3 Under Base Assemblies

- Fabricated carbon steel underbase for gas turbine, auxiliary gearbox, and auxiliaries
- Multi-point mounting arrangement
- Separate underbase for driven unit (AC generator)
- Integral lubrication oil tank - carbon steel construction

2. AUXILIARY SYSTEMS

2.1 Start System

- Hydraulic motor and pump

- AC electric motor driven starting system

2.2 Gears, Couplings and Guards

- Auxiliary gearbox incorporating drives to start system and lubricating oil pump
- High speed drive coupling - flexible element dry type (turbine to gearbox)
- Low speed drive coupling - flexible element dry type (gearbox to AC generator)
- High speed coupling guard - carbon steel
- Low speed coupling guard - carbon steel
- Gearbox seismic vibration instrumentation

2.3 Lubricating Oil System

Integral mineral oil lubricating system serving gas turbine, gearbox and driven unit, conforming to API 614, comprising:

- Main lubricating oil pump - gas turbine gearbox driven
- Auxiliary lubricating oil pump - AC motor driven
- Emergency lubricating oil pump - DC motor driven
- Lubricating oil system filter - duplex filter arrangement with continuous flow transfer valves
- Filter body - carbon steel with differential pressure indicator
- Temperature, pressure and level transmitters - Smart type, aluminium bodies
- Lubricating oil tank immersion heater
- Lubricating oil system breather with oil mist eliminator
- Lubricating oil breather ducting - austenitic stainless steel
- Lubricating oil system cooler - air blast simplex type, package roof mounted
- Cooler fan - single unit (100% duty), suitable for non-hazardous area
- Lubricating oil cooler piping supply and return - austenitic stainless steel

2.4 Gas Fuel System

- Pilot fuel flow control system with actuator and integrated pressure transmitters
- Main fuel flow control system with actuator and integrated pressure transmitters
- Rapid acting gas shut-off valves (2-off)
- Temperature transmitter - aluminium body
- Gas fuel block and vent valve assembly (off-package)

2.5 Drain System

- Hydrocarbon drains tank integrated into package
- Auto drains module

3. ENCLOSURE AND PACKAGE STRUCTURE

3.1 Acoustic Enclosure

- Painted carbon steel acoustic enclosure fitted over gas turbine, gearbox and auxiliaries
- Doors for personal access and maintenance
- Acoustic performance: 85 dB(A)
- Integral lifting beam for maintenance
- Integral lightning protection

- Acoustic system transmitters - Siemens standard Smart type, aluminium bodies
- Excluded: ground level enclosure access platforms and steps

4. SAFETY SYSTEMS

4.1 Fire and Gas Detection

- Fire protection system comprising:
 - 3 x I.R. multi-spectrum flame detectors
 - 2 x heat detectors
 - Single sounder/beacon (end of package)
 - 1 x beacon (inside package)
 - Status indicator (end of package)
 - 1 x MAC (Manual Alarm Contact)
- 1 x I.R. point gas detector (vent outlet)

4.2 Fire Extinguishing

- CO2 fire protection system in accordance with NFPA 12
- Cylinders housed in weatherproof cabinet
- Extinguisher system distribution pipework and nozzles
- Piping from cabinet to package

5. AIR INTAKE AND EXHAUST SYSTEMS

5.1 Combustion Air Inlet System

- Combustion air filter - simple static element, painted carbon steel
- Mist eliminator
- EPA filter stage
- Combustion air silencer - painted carbon steel
- Combustion air inlet ducting - painted carbon steel
- Integral support for combustion air inlet system
- Maintenance access platform and ladder for combustion air filter

5.2 Combustion Exhaust System

- Exhaust diffuser - ferritic stainless steel, horizontal orientation
- Thermal insulation and aluminium cladding for personnel protection

6. ELECTRICAL AND CONTROL SYSTEMS

6.1 Integral Local Equipment Room (LER)

Local Equipment Room designed to provide environmental protection for control panels and operators, fully equipped with:

- 400 V AC package motors and heaters supply
- 230 V 50 Hz distribution board
- Internal and external lighting
- Industrial 230 V 50 Hz outlet
- Air conditioning/heat pump unit capable of maintaining control room at 20 deg C in all ambient conditions
- Baseplate designed to support control panel shelter, attaching to SGT-400 package driver unit baseplate for single point lift
- Single control panel cubicle with support frame

- Batteries - VRLA type, sized for safe run-down of turbine and driven unit in emergency case

6.2 Package Control System Hardware

Control system mounted within integral LER comprising:

- Unit Control System section - simplex, incorporating Siemens SIMATIC PLC platform
- Control and monitoring of all package systems
- Standard start-stop and load control functions (on-package control panel)
- HMI PC panel with operator display language - English
- Machinery vibration monitoring
- Ethernet TCP/IP communications data link to DCS
- Generator Control Panel section containing:
 - Automatic voltage regulator
 - Synchronizing facility - automatic and manual with check synchronizer
 - Generator metering equipment and electrical protection

6.3 SIEMENS Remote Monitoring System (STA-RMS)

- STA-RMS remote monitoring system for improved engine support
- Siemens common Remote Service Platform with secure VPN communication
- Primary functions:
 - Automatic transfer of engine operation data to Remote Diagnostic Centre
 - Routine monitoring, predictive trending, anomaly detection
 - Improved downtime prediction and scheduling
 - Access to historic data
 - Fleet and unit performance reports
 - Remote access to HMI for Siemens support personnel
 - Software updates and faster troubleshooting

7. DOCUMENTATION AND DRAWINGS

- Standard set of information and approval drawings in English language
- Operator manual - English language (CD format)
- Maintenance manual - English language (CD format)
- Driven unit manual - English language (CD format)

8. TESTING AND COMMISSIONING

8.1 Factory Testing

- Gas turbine core engine test - Siemens standard, already completed, test data available
- AC generator manufacturer's works acceptance test data - pre-tested

9. PACKING AND DELIVERY

- Packing and preservation to suit destination and transport method
- Delivery terms: FOB Netherlands (ICC INCOTERMS 2020 edition)

Notes:

- Package finish according to Siemens onshore standard
- Instrument tagging - Siemens standard P&ID references
- Auxiliary module pressure and level transmitters - Smart type, aluminium bodies