



**1x New Siemens SGT400 12.9 MW 50 / 60Hz (DF) Gas Turbine Mobile Generator Set**

SGT-400 package.
Sewage-sludge drying plant for the City of Athens, on Psytalia island.

### Package

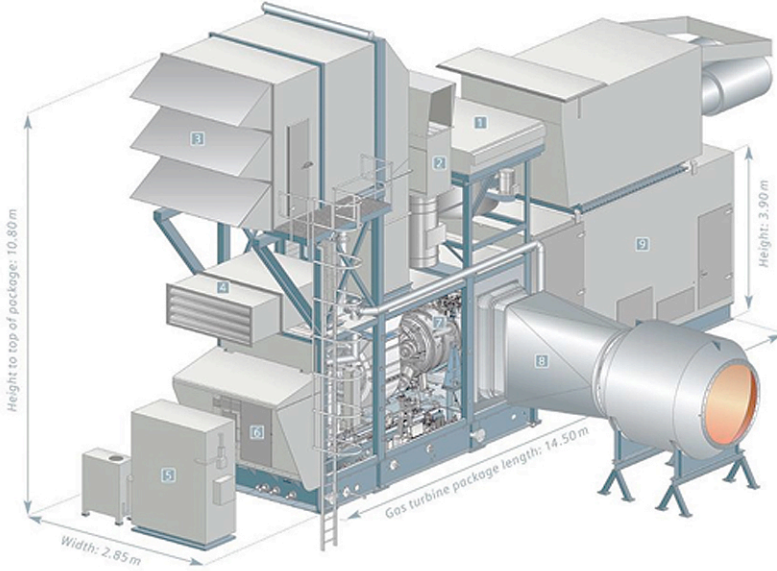
**Key features**

- Short installation time
- Compact package size, high power-to-weight ratio
- Factory testing:
  - Core engine
  - Functional testing of modules as standard
  - Pre-commissioning of package
  - Optional core customer-witness test
  - Optional complete package test
- Minimized customer interfaces

### Customer Support

**Key features**

- Global support network of Authorized Service Centers
- Emergency service – 24/7 specialist helpdesk
- Full field service
- Full diagnostic support, remote monitoring
- OEM modernizations and upgrades
- In-house or on-site training programs
- Range of maintenance and service contracts available



**SGT-400 standard package**

1 Lube oil cooler	4 Enclosure air inlet	7 Core engine
2 Enclosure air outlet	5 Fire and gas system	8 Combustion exhaust
3 Combustion air inlet	6 On-package controls	9 AC generator

**1. Scope of Supply**

Siemens Industrial Turbomachinery Ltd hereinafter “Siemens” offer to design, manufacture, package and despatch the following equipment listed within this scope of supply.

## **1 x SGT400 gas turbine mobile generator package, comprising :**

### **1.1 Driven Unit**

#### **1.1.1 Generator**

- AC Generator, 13.8kV, 3 phase, 4 pole, 50 / 60Hz, 0.8 power factor, salient pole brushless type
- Other ratings may be available on request
- Closed air circuit air cooled ( CACA )
- Class 'F' insulation with class 'B' total temperature rise
- Generator bearing temperature detectors
- Lubricating oil piping from gas turbine to driven unit
- Pfisterer MV connectors

### **1.2 Gas Turbine Package**

#### **1.2.1 Gas Turbine Engine**

- Core Engine – twin shaft design
- Gas Generator
- Air Inlet Casing
- Compressor Rotor
- Compressor Stator with Variable Guide Vanes
- Centre casing
- Dual Fuel 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 Instrumentation
- Engine arranged for hot end drive

#### **1.2.2 Underbase**

- Turbine underbase – fabricated carbon steel construction, arranged for multi-point mounting
- Integral lubricating oil tank – carbon steel
- Generator and gearbox underbase – fabricated carbon steel construction, arranged for multi-point mounting
- Support legs – underbase to ground, fixed on installation to carry all static and dynamic loads

#### **1.2.3 Trailers**

- 3 Axle gooseneck trailer for mounting of:
  - Gas turbine package
  - Lube oil cooler
  - Fire extinguishant cabinet
  - Water wash module
- 5 Axle gooseneck trailer for mounting of:
  - Generator
  - Gearbox

#### **1.2.4 Start System**

- Hydraulic Motor and Pump - AC electric motor driven

#### **1.2.5 Gears, Couplings and Guards**

- Main speed reducing gearbox – epicyclic type, output shaft speed 1500 / 1800 rpm
- Acoustic Enclosure – painted carbon steel, fitted over the gearbox
- Doors for personnel access
- Internal lighting
- Natural Ventilation
- Auxiliary gearbox incorporating drives for start system and lubricating oil pump
- Generator and Gearbox, seismic vibration monitoring - Bently Nevada 1701 system
- Drive coupling – high speed - flexible element dry type – Turbine to gearbox
- Drive coupling – low speed - flexible element dry type – Gearbox to generator
- Coupling guard – high speed (brass) – Turbine to gearbox
- Coupling guard – low speed (brass) – Gearbox to driven unit

#### **1.2.6 Lubricating Oil System**

- Gas turbine lubrication system utilises 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 system filter
- Duplex filter arrangement
- Continuous flow transfer valves
- Conforms to API 614
- Filter body carbon steel
- Differential pressure indicator
- Lub oil module transmitters – Siemens standard smart type - aluminium
- Lubricating oil tank immersion heater
- 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
- Lubricating oil cooler piping supply and return – austenitic stainless steel

#### **1.2.7 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 - aluminium
- Gas fuel block and vent valve assembly - off package

#### **1.2.8 Liquid Fuel System**

- Liquid fuel pump, AC motor driven – Zone 2 motor
- High pressure fuel filter
- Fuel flow control valve
- Liquid fuel purge system
- Pressure transmitters – Siemens standard smart type - aluminium

- Block and thermal relief valves – Siemens standard – off package

### **1.2.9 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 – aluminium
- Controls Weather Protection Canopy - Aluminium
- DU Controls Weather Protection Canopy - Aluminium

### **1.2.10 Acoustic Enclosure Ventilation System**

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

### **1.2.11 Gas Detection System**

- Gas Detection equipment, comprising :-
- 2 - Gas Detectors (vent outlet)

### **1.2.12 Fire Protection System**

- Fire Protection equipment, comprising :-
- 3 - IR Flame Detectors
- 2 - Heat Detectors
- Single Sounder
- Status Indicator (end of package)
- Single MAC (Manual Alarm Contact)
- Breakglass Unit

### **1.2.13 Combustion Air Inlet System**

- Combustion air filter – automatic pulse type, self cleaning – horizontal elements - painted carbon steel
- Combustion air filter weather hood
- Combustion air silencer – painted carbon steel
- Combustion air inlet ducting – painted carbon steel
- Integral support for combustion air inlet system

### **1.2.14 Combustion Exhaust System**

- Exhaust diffuser – 304 stainless steel
- Exhaust silencer – 304 stainless steel
- Exhaust stack – 304 stainless steel – vertical orientation
- Thermal insulation and aluminium cladding – personnel protection only

### **1.2.15 Local Equipment Room**

- Container (12.2m Long x 3.0m wide x 3.2m High) of carbon steel construction
- External walls of corrugated carbon steel sheet
- Internal rockwool insulation
- containing the following equipment:
- Motor Control Centre – for package motors

- Fire Suppression and Alarm Panel – including extinguishant bottle
- Battery Cabinet
- Batteries - lead acid type, sized to ensure a safe rundown of the turbine and driven unit in an emergency
- Battery Tripping Unit and Batteries
- Inter Panel Cabling
- Auxiliary Transformer
- Medium Voltage Switchgear
- Neutral Earthing Resistor
- Main Control Room Dual Incomer Distribution Board
- Auxiliary Control Panel
- Power and Lighting Distribution Board and Transformer
- Diesel Generator for LER power distribution
- GPS Enclosure/Junction Box
- Fibre Optic Panel
- LV Connector Junction Boxes
- Elliott Bushings for feeders
- Pfisterer MV connectors for generator incomer and NER

#### **1.2.16 Package Auxiliaries**

- Turbine compressor cleaning system for on line and off line wash
- Drains Tank on package
- Auxiliary module transmitters Siemens standard smart type – aluminium
- Instrument tagging – Arrow tags - Siemens standard P&ID references
- Package finish to Siemens onshore standard
- Access steps to trailer

#### **1.2.17 Cabling**

- Site plug and socket interconnecting cables between Siemens equipment

### **1.3 Control System**

#### **1.3.1 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
- Emergency stop function – on-package control panel mounted
- Operator display language in English
- Turbine Vibration displacement monitoring - Bently Nevada 1701 system
- Remote cabinet mounted PC, VDU, keyboard and mouse
- Generator Control Panel ( Safe Area ), package mounted, containing :-
- Automatic voltage regulator (Dual Redundant)
- Synchronising facility – automatic & manual with check synchroniser
- Generator metering equipment and electrical protection
- Active / Reactive Load Share Controller

#### **1.3.2 Siemens Turbomachinery Applications – Remote Monitoring System – STA-RMSTM**

- Provision for data collection and remote communication from site allowing access to the following services:
- 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

## **1.4 Testing**

### **1.4.1 Testing Gas Turbine**

- Gas turbine frame and systems test (completed)
- Gas turbine core engine test (completed)
- Emissions test during gas turbine core engine test (completed)
- Site verification test in accordance with Siemens test procedure TSP00174A

### **1.4.2 Driven Unit Test**

- Manufacturer's standard works acceptance test of AC Generator

## **1.5 Installation and Maintenance**

### **1.5.1 Installation and Commissioning**

- Supervision of installation and commissioning is offered on a daily rate basis

## **Siemens Industrial Turbomachinery Ltd**

### **Revision 1**

### **1.5.2 Installation and Maintenance Equipment**

- Roll-off equipment - Gas Turbine power turbine
- Roll-off trolley – Gas Turbine core engine removal (1 off total)
- 'A' Frame Gantry (1 off total)
- Installation Tools (1 off total)
- Holding down fixings
- Selection of paints for site repairs

### **1.6 Drawings and Documentation**

- Standard set of certified information and approval drawings in the English language
- Operator Manual – In English language - CD
- Maintenance Manual – In English language - CD
- Illustrated Parts Catalogue – In English language - CD
- Driven Unit Manual – In English language - CD

## **1.7 Packing and Delivery**

### **1.7.1 Packing**

- Packing and preservation to suit destination and transport method

### **1.7.2 Standard Delivery Terms**

- Delivered Free Carrier (FCA), in accordance with ICC INCOTERMS 2000 edition

## **1.8 Spares**

### **1.8.1 Commissioning Equipment and Tools**

- Commissioning equipment and tools

### **1.8.2 Commissioning Spares**

- Commissioning spares

### **1.8.3 Consumable Spares**

- Consumable spares

## **1.9 Quality Assurance**

- Contract quality assurance programme – English language

## **1.10 Additional Items (Optional)**

### **1.10.1 Black Start Diesel Generator**

- A 4 axle trailer mounted diesel generator package (1 off sized for 2 x SGT400) comprising:
  - Diesel
  - Generator
  - Fuel tank
  - Neutral Grounding Resistor
  - Batteries
  - Distribution Panel
  - Interconnecting cables to LER

### **1.10.2 Instrument Air Compressor**

- A self contained instrument air compressor package comprising:
  - Instrument Air Compressor
  - Controls for local and remote operation
  - Duplex filter
  - Duplex desiccant drier
  - Instrument air receiver
- Interconnecting cables to LER

### **1.10.3 Step Down Transformer**

- A Step Down Transformer
- 18 MVA, 13.8 kV / 6.9 kV,  $2 \pm 2.5\%$  OFLTC
- Other ratings available on request
- Delta / Delta connection
- Block differential protection