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

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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 dessicant 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 ± 2.5% OFLTC
  • Other ratings available on request
  • Delta / Delta connection
  • Block differential protection