**NITIN CORPORATION**
402, 4th Floor,
Bezzola Commercial Complex,
Sion – Trombay Road,
Chembur,
Mumbai – 400071,
India.

WEB: www.corponit.com

E – MAIL: enquiry@corponit.com
nitincorporation@yahoo.com

PH (M) : +91 -9920404345

*THE FOLLOWING USED BRAND NEW CONDENSING STEAM TURBINE GENERATOR SETS ARE AVAILABLE FOR SALE WITH US WITH IMMEDIATE DELIVERY:*

**5 Nos. 30 MW each, BRAND NEW SIEMENS make Condensing type Steam Turbine Generator Sets, having the following technical specifications:**

# SST-400 Steam Turbine

## Overview

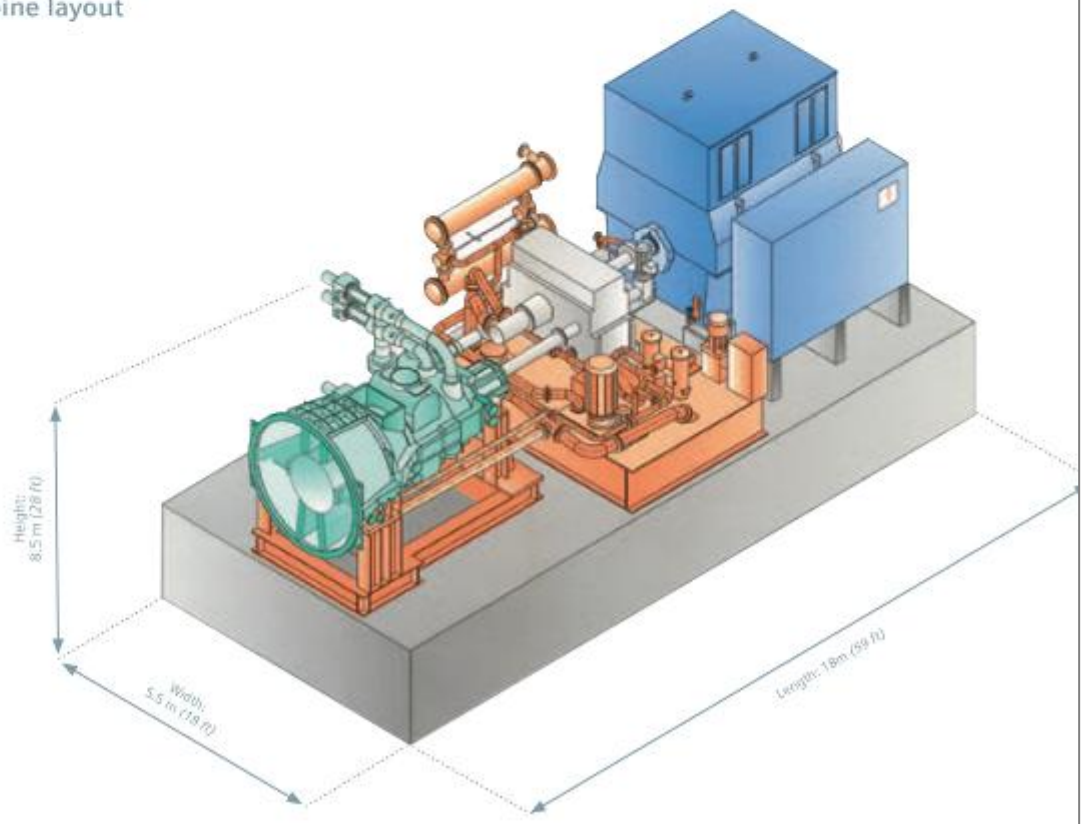
The SST-400 is a single casing steam turbine, providing geared or direct drive to 50 and 60 Hz generators, or to compressors and pumps. The symmetrical casing with horizontal joint flange enable the SST-400 to accept short start-up times and rapid load changes.

The modular package design allows a wide variety of configurations to satisfy the customer's individual needs in the most economical way. The utilization of selected proven components assures high reliability and easy maintenance.

Typical applications of the SST-400 include:

- Industrial power plants, e.g. captive power plants in the chemical industry, sugar industry, textile industry, in pulp and paper mills, steel works, mines
- Cogeneration and district heating plants
- Concentrated Solar Power (CSP) plants
- Geothermal power plants (SST-400 GEO)
- Biomass plants, waste to energy, e.g. waste incinerators, waste heat from chemical processes
- Combined cycle power plant

## Turbine layout



## SST-400 – design features

The SST-400 is available as a back pressure or condensing turbine with internally controlled extraction and possibility of several bleeds. The blading design provides for high efficiency over the whole operation range, giving the customer highly flexible plant operation. The design of the exhaust blades allows large exhaust areas with high thermodynamic efficiency and reliability. With a separate internal casing, the steam turbine can also be used as a single casing reheat turbine.

## Operational flexibility

The turbine has a symmetrical casing with horizontal joint flange, which allows short start-up times and rapid load changes. The design of all supports for labyrinths and blade carriers ensures flexibility for the whole turbine. Internal valve arrangements, controlling the steam flow to the back end of the turbine, are used to maintain constant process steam extraction pressures over a wide flow range.

The rotor of the SST-400 range is made of solid forging and is fitted with resonance-resistant blading. The reduction gears are taken from the existing range of world class gear manufacturers and have proven high reliability and performance.

## Reliability and efficiency from proven technology

The SST-400 single casing turbine can be equipped with upward, downward or axial exhaust to fit with the selected installation. The turbine skid can be combined with standardized gearbox-oil units and generators to a turboset, according to the customer's needs. The turbine skid and gearbox / oil unit are fully assembled in the workshop before being shipped to the site.

## Easy maintenance

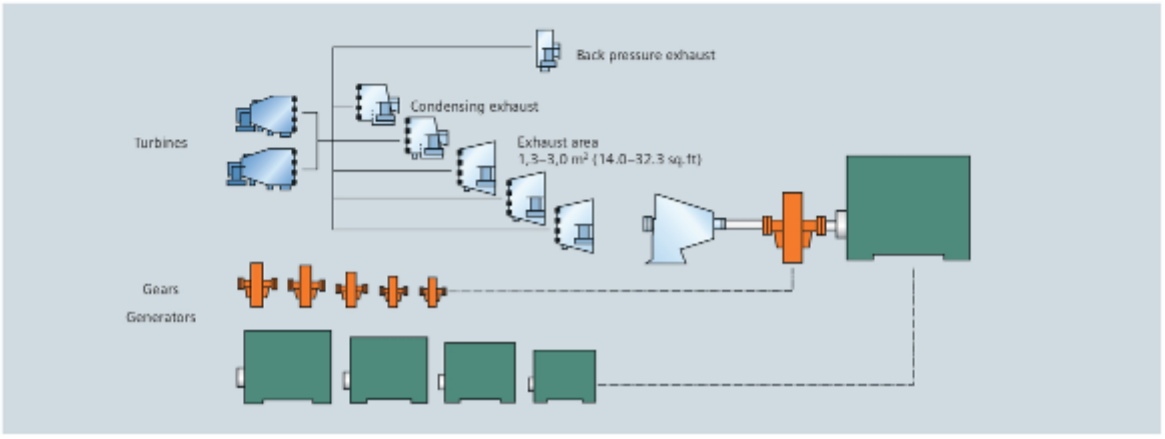
Our proven installation and maintenance concept lowers maintenance cost by enabling easy access to the installed components, the turbine, gearbox, and generator. Several maintenance concepts are available for different modes of operation.

### Design features

- Customized steam path
- Proven
- Modular
- Thermoflexible design

### Customer benefits

- Fast and early layout planning
- Short delivery time
- Compact design minimizes space requirements of installation
- Easy access to mechanical components facilitates maintenance
- Remote control for simple operation
- High reliability/availability
- High efficiency




Modular concept for SST 400 turboset

## SST-400 technical data

- Power output 50 or 60 Hz, up to 65 MW
- Speed range 3000–8000 rpm
- Live steam conditions
  Pressure up to 140 bara / 2030 psia
  Temperature up to 540°C / 1004°F
- Hot reheat conditions
  Pressure up to 30 bara / 435 psia
  Temperature up to 450°C / 842°F
- Bleed up to 60 bara / 870 psia
- Controlled extraction (single or double)
  Pressure up to 45 bara / 653 psia
  Temperature up to 450°C / 842°F
- Exhaust steam conditions
  Back pressure up to 25 bara / 363 psia
  District heating up to 3 bara / 43 psia
  Condensing up to 0.6 bara / 8.7 psia

## SST-400 GEO technical data

- Power output
  50 or 60 Hz, 5–55 MW (condensing)
  50 or 60 Hz, 5–60 MW (non-condensing)
- Speed range 3000–6000 rpm
- Live steam conditions
  Pressure up to 12 bara / 175 psia
  Temperature up to 250°C / 482°F
- Exhaust steam conditions
  Condensing up to 0.4 bara / 5.8 psia
  Non-condensing up to 1.4 bara / 20 psia

All data are approximate and project-related.

## TECHNICAL SPECIFICATION

### TURBINE DETAILS:

| | | |
|---|---|---|
| Make | : | Siemens |
| Year of make | : | 2011 |
| Type | : | SST 400 |
| Power | : | 30 MW |
| Inlet Steam Pressure | : | 128 bar |
| Inlet Steam Temperature | : | 535°C |
| Extraction Pressure | : | 10 bar |
| Cooling Water Temperature | : | 25°C |
| Cooling Water Flow | : | 4130 t/h |
| Speed | : | 5000 RPM |

### GENERATOR DETAILS:

| | | |
|---|---|---|
| Make | : | Siemens |
| Type | : | S6ENS-100A-4P |
| Year of Make | : | 2011 |
| Power | : | 38000 kVA |
| Speed | : | 1500 RPM |
| Voltage | : | 10500 V (-5/+5%) |
| Current | : | 2099 A |
| No of Phases | : | 3 |
| Frequency | : | 50 Hz |
| P.F | : | 0.8 |
| Type of Excitation | : | Self Excitation |
| Connection | : | Star |
| Enclosure | : | IP 54 |
| Type of Cooling | : | Air Cooling |
| Cooling Air Temperature | : | 32 Deg. C |
| Duty | : | Continuous |
| Altitude | : | 1000 M |
| Insulation Class | : | F |

**PACKING LIST:**

for one set of SST400 steam turbine and one set of 30MW generator

| No. | Description / Cargo | Dimensions In cms | | | Volume In M3 | Weight In Kgs | |
|---|---|---|---|---|---|---|---|
| | | Length | Width | High | | Net | Gross |
| 1 | Steam Turbine on the base frame | 600 | 350 | 390 | 81.900 | 54,800.000 | 55,000.000 |
| 2 | Base frame with oil system and gearbox | 670 | 365 | 340 | 83.147 | 33,000.000 | 33,200.000 |
| 3 | Turbine - base plates, foundation bolts and fixing elements | 238 | 88 | 67 | 1.403 | 570.000 | 720.000 |
| 4 | Turbine - accessories | 328 | 228 | 207 | 15.480 | 2,350.000 | 2,800.000 |
| 5 | Turbine - piping I. | 360 | 68 | 87 | 2.130 | 390.000 | 490.000 |
| 6 | Turbine - spare parts | 80 | 80 | 90 | 0.576 | 166.000 | 216.000 |
| 7 | Turbine - control oil hydraulic unit | 228 | 128 | 187 | 5.457 | 750.000 | 1,080.000 |
| 8 | Turbine - piping II. | 740 | 133 | 197 | 19.389 | 4,870.000 | 5,800.000 |
| 9 | Turbine - valves I. | 260 | 223 | 127 | 7.363 | 2,879.000 | 3,285.000 |
| 10 | Turbine - valves II. | 380 | 103 | 127 | 4.971 | 410.000 | 752.000 |
| 11 | Turbine - electrical cubicles | 190 | 150 | 251 | 7.154 | 825.000 | 1,909.000 |
| 12 | Turbine - valves III. | 380 | 103 | 127 | 4.971 | 793.000 | 1,135.000 |
| 13 | Turbine - control system | 348 | 118 | 252 | 10.348 | 1,100.000 | 1,420.000 |
| 14 | Generator | 548 | 366 | 407 | 81.631 | 53,900.000 | 58,800.000 |
| 15 | Generator - accessories, assembly parts | 350 | 170 | 186 | 11.067 | 888.000 | 1,705.000 |
| 16 | Generator - anchorage | 140 | 120 | 106 | 1.781 | 434.600 | 717.000 |
| 17 | Pagel -underfull mortar | 80 | 60 | 81 | 0.389 | 100.000 | 183.000 |
| 18 | Generator - high-voltage terminal box | 355 | 242 | 314 | 26.976 | 3,200.000 | 4,631.000 |
| 19 | Generator - Spare Parts | 239 | 126 | 104 | 3.132 | 330.624 | 531.000 |
| 20 | Turbine - Motor | 50 | 50 | 108 | 0.270 | 120.000 | 140.000 |
| 21 | Total | | | | 369.535 | 161,876.224 | 174,514.000 |

Remark:
The above packing list is preliminary and the actual packing list shall prevail.

**SCOPE OF SUPPLY:**

Steam Turbine – radial exhaust- Alternative 1

1 Condensing turbine type SST 400 comprising:

- 1 Emergency stop valve, hydraulic, for the live steam inlet, with built-in steam strainer
- 3 Control valves with servo operator for the live steam inlet
- 5 Bleeds
- Reverse flow protections for bleeds as shown in P&ID (loose supply)
- Radial exhaust
- Control system for speed, power (see chapter 6)
- Turbine protection (see chapter 6)
- Mat-type insulation
- Internal steam pipes with valves for balance piston, sealing steam and leak steam
- Internal pipes for drain system with valves
- Internal oil pipes for the lube and control oil system with valves
- Start-up drains with pneumatic operated shut-off valves
- Operating drains
- Baseframe for the turbine
- Earth terminal
- Boroscope openings in the turbine casing
- Sealing steam pressure control (sealing steam from live steam)
- 1 Connection for air dryer (dehumidifier)
- 1 Sealing steam cooler for the rear labyrinths
- Standard preservation (6 months) as per Siemens - factory standard
- Prime coat and finishing coat of paint as per Siemens - factory standard
- Touch up paint to Site
- Operation manual, 3-fold, English langauge

Steam Turbine – axial exhaust- base offer

1 Condensing turbine type SST 400 comprising:

- 1 Emergency stop valve, hydraulic, for the live steam inlet, with built-in steam strainer
- 3 Control valves with servo operator for the live steam inlet
- 5 Bleeds
- Reverse flow protections for bleeds as shown in P&ID (loose supply)
- Axial exhaust
- Control system for speed, power (see chapter 6)
- Turbine protection (see chapter 6)
- Mat-type insulation
- Internal steam pipes with valves for balance piston, sealing steam and leak steam
- Internal pipes for drain system with valves
- Internal oil pipes for the lube and control oil system with valves
- Start-up drains with pneumatic operated shut-off valves
- Operating drains
- Flash box (optional)
- Baseframe for the turbine

- Earth terminal
- Boroscope openings in the turbine casing
- Sealing steam pressure control (sealing steam from live steam)
- 1 Connection for air dryer (dehumidifier)
- 1 Sealing steam cooler for the rear labyrinths
- Standard preservation (6 months) as per Siemens - factory standard
- Prime coat and finishing coat of paint as per Siemens - factory standard
- Touch up paint to Site
- Operation manual, 3-fold, in English

Gear Unit:

Single helical high-speed parallel-shaft gear with:

- Flanges for coupling guard on pinion and gear shaft
- Hollow shaft between turbine and gear unit
- Coupling guard between turbine and gear unit
- Coupling (quillshaft) between gear unit and generator
- Coupling cover between gear unit and generator
- Built-on barring gear with electric motor, coupling and softstarter
- Built-on main oil pump
- 6 Resistance thermometers wired to terminal box
  ( 1 x for each radial bearing, 1 x for each side of thrust bearing)
- Shaft vibration pick-up wired to terminal box
- Base frame for the gear unit, as oil tank
- on the base frame are arranged: 1 electrical operated full load standby oil pump, 1 electrical operated emergency oil pump, 1 double oil cooler (2 x 100%), 1 double oil filter (2 x 100%), 1 oil vapour extractor, 1 jacking oil pump
- Foundation anchors, -bolts and leveling spindles
- Inspection documents acc. to EN 10204
- Trial run acc. to the Siemens standard test program
- Painting acc. to factory standard
- Preservation acc. to factory standard

Lube Oil Plant:

Design of the oil plant according to the manufacturer's standard
Design of the oil coolers according to DIN

The lube oil plant arranged on the gear package with integrated oil tank comprises following main parts:

- 100% auxiliary oil pump, three-phase a.c. motor driven
- approx. 40 % emergency oil pump, d.c. motor driven
- Jacking oil pump, three-phase a.c. motor driven
- Oil vapor extractor with three-phase a.c. motor
- Oil tank heater (electric immersion heater for Tamb. < 15°C)
- 2 x 100 % oil coolers (tubes made of CuZn28Sn and tube sheets made of CuZn38SnAlF39)
- 2 x 100 % lube oil filters
- Change-over device (oil cooler and oil filter) for switching operations without interruption of the oil supply

- Pressure control for the lube oil
- Oil safety valve

Additional accessories:

- Direct driven main oil pump (at the gear unit)

Control Oil Unit:

The hydraulic supply unit is installed on a separate skid ready for operation and consists of the following main parts:

- 2 x 100% displacement piston type pumps, AC motor driven
- 1 oil tank
- 1 oil accumulator
- 2 x 100% oil filter with change over device
- 1 off-line cooling pump, AC motor driven
- 1 oil cooler (oil/air) with fan
- Interconnecting oil pipes (stainless steel) with valves

Surface Condensing Plant:

Not in Siemens' scope of supply

Optional: Siemens will submit the following documents of the main condenser
Incl. in Siemens scope for engineering support is:

- The thermodynamic design data
  based on customer material specification provided in advanced
- assembly drawing
- Mechanical data sheet including the following.:
- dimensions of tubes
- tube sheet
- shell
- Allocation of tube bundles in tube sheet.

Excluded from Siemens scope is the following:

- any kind of liability and guarantee
- support during manufacturing and installation
- detailed manufacture drawings
- quality control of manufacture

The design / supply of the ejector unit including condensate pumps, ejectors, interand after condenser and control valves and interconnecting piping are not in Siemens scope.

Miscellaneous:

ALTERNATIVE 1:

- Spring elements for the turbine table
- Basic & detail engineering
- Documentation in ENGLISH
- Packing for transportation

- Freight FOB, north German seaport, in accordance with INCOTERMS 2000
- Turbine anchor bolts if required by Siemens

Base offer:

- Basic & detail engineering
- Documentation in ENGLISH
- Packing for transportation
- Freight FOB, north German seaport, in accordance with INCOTERMS 2000
- Turbine anchor bolts if required by Siemens
- List of special tools required for erection

Steam turbine:

- Blow out device for trip valve
- Aligning device (shaft)
- Container for the special tools

Spare Parts:

One set for two years of continuous operation we recommend the following spare parts:

Steam turbine:

- 1 Set of pads for the main bearings of the turbine (radial and axial bearings)
- 1 Set of oil sealing rings for these bearings
- 1 Set of sealing strips with caulking wires for the shaft labyrinths
- 1 Set packings and spindles for control valves

Gear unit:

- 1 Set of bearings for the pinion and the wheel shaft
- 1 Set of shaft sealing rings

Oil units:

- 1 Set gaskets
- 1 pc. Pressure regulation valve cone
- 1 Set lubrication oil filter elements
- 1 Set control oil filter elements

Instrumentation:

- 1 pc. Pick-up for speed
- 1 pc. Pick-up for axial displacement
- 2 pc. Pick-up for shaft vibration
- 2 pc. RTD for bearing temperature – turbine
- 2 pc. RTD for bearing temperature – gear unit
- 1 pc. Pressure switch (valve block)
- 1 pc. Position transducer (steam control valve)
- 2 pc. Instrument 3-way valve
- 1 pc. O-Ring

Generator:
Not included in the offer

Supervision of Erection, commissioning and trial run (separate contract):

The scope of service, based on daily rates, includes the following:

The assignment of personnel (and, if applicable, the tools) for:

- The supervision of the erection (ready for commissioning)
- The preparation of commissioning
- The commissioning
- Training on the job during commissioning
- Classroom training (Option), see separate proposal in Ch. 8
- The trial run (3 days, 10 hours daily with recall standby)
- Performance test acc. to ASME PTC 6.1 under conditions specified in section 8.3

An erection / commissioning coordination meeting shall be held before erection & commissioning activities.

See also chapter 8 “Erection time schedule” and "Specification of technical field assistance".

Performance test acc. ASME PTC 6.1:

The turbine unit will be tested in accordance with ASME PTC 6.1 as described inspection 8.03 “conditions for Performance test. The test shall be carried out within three months after the provisional acceptance of the turbine, but no later than six months after first steam to turbine. During the performance test the plant will be operated under the responsibility of the customer taking due account of the operating instructions. The reports on beginning, course and end of the performance tests as issued by the supplier must be signed by the customer.
Performance test will be carried out by third party (not in Siemens scope)

Siemens scope of supply:
Test supervisor
Precision instruments
Fitting and removal of Siemens’s precision instruments

Performances by others:
Labour, normal operating personnel, helpers etc.
Nozzles for flow measurements
Calibrated measuring transformers (3-phase) for power measurement
Necessary pressure taps outside Siemens delivery limits
Necessary temperature pockets outside Siemens delivery limits

Duration:
Three up to five days for the installation of Siemens-measuring instruments.

Two days each loadpoint for the calibration and testing.

If the test should be delayed due to reasons beyond Siemens control, any additional cost for Siemens personnel and instruments will be charged.

Number of test points:
The performance test will be carried out for one load point.

Tolerances:
The tolerances which are mentioned in the test instructions will be applied.

Exclusions from our Scope of Supply and Services:
Steam Turbo set

The following components and services are not included in our scope of supply:

- Live steam pipe up to the live-steam emergency-stop valve
- Condenser and Condensing system components
- Spacer / Interconnecting piece Turbine – main condenser
- Condensate sampeling / analysing system
- Tube cleaning system of main condenser
- Bleed steam pipes from turbine nozzle to the bleed non-return flap valve and
- from there to the bleed steam system
- Cooling water pipes with isolating valves to and from the connecting nozzles
- of the corresponding equipment
- Safety valves in the steam, bleed, and water pipes
- Electric cables, switches, contactors and fuses
- Foundations, earthworks, soil preparation
- Spring elements (not required in case of base offer)
- Dehumidifier
- Grouting of baseframe with non shrinking material
- Masonry
- Heating and lighting of the machine house
- Compressed air, water and power supply on site
- Shop test run
- Manufacturing drawings
- Guarantee measurements
- Machine house crane
- Steel structures, platforms, pedestals
- Auxiliary systems, such as cooling water circuit etc.
- HP and LP bypass stations
- Lightning protection and earthing system
- Fire fighting equipment
- First oil filling
- Calculation of the foundation
- Noise hood or Hood for outdoor installation
- Generator and accessories (only one generator is included for Turbine 1)
- Pressure reducing or by pass station
- Interconnecting oil piping between oil system and Generator
- Vent steam condenser

General remark:
All systems connected to the turbine have to be self-protected in acc. with

DGRL 9723EG

Limits of Supply:

Steam
Inlet connection of the turbine live-steam emergency-trip valve
Outlet flanges of the turbine bleeds
Inlet and outlet flanges of the bleed non-return flap valves
Outlet connection on turbine exhaust
Inlet flanges of the sealing steam pressure control valves

Cooling Water
Inlet and outlet flanges of the oil coolers
Inlet and outlet flanges of the generator (only in case generator is in Siemens scope of supply)

Drains
Outlet flange of the falsh box

Electric Current
Connecting terminals of the electric motors
Connecting terminals of the solenoid valves
Connecting terminals for terminal strip (group terminal)
Connecting terminals inside the cubicles

Oil
Filling connection on turbine oil tank
Inlet / Outlet flange on oil reservoir to the generator (both lubricating oil & lifting oil)

Air (Compressed Air and Instrument Air)
Connection at the control equipment

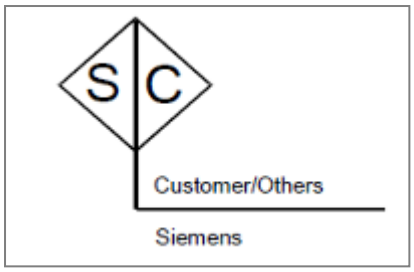
General remark:
In general the piping interface to customer shall be according to Siemens standard i.e. welding or Flanges. In case of Flanges it shall be according to ANSI. Counter flanges, bolts and interconnecting piececs will be supplied by Kaidi.

Siemens will submit during detailed engineering a detailed list, including detailed flange, bolts, nuts, gaskets…etc information, of all customer's connections.

For further details please refer to attached P & I Diagrams in Chaper 7

Limits of Supply

To define the limits of supply the following symbol is used in the P&I diagrams:
(See chapter 7)




Standards, Regulations and Guidelines:

The applicable standards, regulations and guidelines valid at the time of tender submission form the basis for planning and supply of the equipment, except for deviations that are specified in the list of deviations and clarifications.

Unless otherwise agreed, we use the power system designation system KKS, last edition. In respect of numbering, a more detailed system incorporating suitable producer-related groups of numbers is employed in addition.

Basic Standards

Unless other basic standards have been agreed upon with the customer, the quotation of SIEMENS is based on European standards and international standards (EN, DIN, IEC etc.) and the following standards, as far as the equipment covered therein is part of the scope of supply:

Main Components:

- Turbine with pressure casing and pressure oil system acc. to DIN 4312.
- Gear units acc. to AGMA 421.06
- Generator acc. to European IEC-Standards
- Condenser: mechanical strength acc. to AD-regulations, bases on VGB-R455P, thermal rating acc. to HEI.

Pipes and Connections:

- Internal design of steam and condensate pipes acc. to DIN 2413.
- Oil pipes made of stainless steel, seam welded
- Flanged connections in the oil system PN16 acc. to DIN EN 1092-1, contact surface acc. to Form B.
- Flanged connections in the steam area acc. to DIN EN 1092-1

Plant Control and Instrumentation:

- Vibration severity acc. to ISO 10816, shaft vibrations acc. to ISO 7919. Probes acc. to DIN 43 760.

Protection

- Earthing acc. to VDE 0100 and 0141, identification acc. to DIN 40 011.

Inspection and Testing:

- Examinations and tests according to the E&T Plan of SIEMENS. Certificates acc. to EN 10 204-2.2 and 3.1.
- The thermal acceptance tests of steam turbines are performed acc. to DIN 1943. (VDI-Steam Turbine Code)
- Examination and acceptance of pipes and connections acc. to DIN EN 1127.
- Non destructive tests acc. to DIN EN 1559
- Qualification testing of welders acc. to DIN-EN 287.

Welding:

- Welding procedure acc. to DIN EN 15614.

Noise:

- Sound measurement acc. to EN ISO 4871.

Insulation:

- The insulation thickness is determined in accordance with our factory standard based on DIN 18 421 and VDI 2065. Material certificate acc. to VDI 2055.

Painting / Preservation:

- De-rusting in accordance with the Swedish standard SA 2,5, similar as DIN 55928.
- Prime coat of paint acc. to manufacturer‘s standard.
- Final painting acc. to manufacturer‘s standard.
- Preservation for non-painted surfaces acc. to manufacturer‘s standard in accordance with VGB-R 116 H.

Electrical Systems:

- Electric motors: Rating classes acc. to IEC 34. Standard motors acc. to IEC 72 and DIN 42 677.
- Cables for voltages up to 60 V acc. to VDE 0815.

Miscellaneous:

- Turbine oil acc. to ISO, viscosity VG 46.
- Material strength design of the heat exchangers acc. to AD-Code of Practice, DIN materials acc. to VGB-R455P table 3.
- Deviations and tolerances for tube bundles and heat exchangers acc. to DIN 28008.
- Design of steam ejectors and vacuum pumps acc. to VGB-R 126 L.
- Bolts acc. to DIN 933, nuts acc. to DIN 934. Bolted joints on pressure casings acc. to DIN 938/939. Admissible stresses in the bolts acc. to DIN ISO 898 / DIN 17240, in the nuts acc. to DIN 267.
- Denominations acc. to DIN 19 227 in accordance with SI basic units acc. to DIN 1301.
- Symbols on P&I D`s acc. to ISO 10628.
- Blowing out of steam piping in accordance with Siemens factory standard 1CWN002896.

Technical Requirements:

Oil Specification

For the common lube and control oil system for turbine, gearing (if applicable) and driven unit, mineral oil must be used in accordance with DIN Standard 51515 (May 1978) and have the following properties:

| Designation | Requirement | | Test Method |
|---|---|---|---|
| Lube oil type | TD 46 | | |
| ISO viscosity class | ISO VG 46 | | DIN 51519 |
| Hitherto existing code number (correlation) | 25 | | |
| Kinematic viscosity at 40°C | min. 41.4<br>max. 50.6 | mm2/ s (cSt)<br>mm2/ s (cSt) | DIN 51550<br>in connection with<br>DIN 51561 or<br>DIN 51562 |
| Mean dynamic viscosity at 40°C | $41.4 \times 10^{-3}$ | Pa s | |
| Viscosity index not less than | 95 | | |
| Density at 15°C not more than | 0.90 | kg/l | DIN 51757 |
| Flash point (Cleveland) not less than | 185 | °C | DIN 51376 |
| Pourpoint equal to or less than | -6 | °C | DIN 51597 |
| Neutralisation number not more than | 0.1 *) | mgKOH/g | DIN 51558<br>Part 1 |
| Max. saponification number | 0.15 *) | mgKOG/g | DIN 51559 |
| Max. ash content (oxide ash) not more than | 0.01 *) | % by weight | |
| Water content g/100g | below the limit of quantifiable detectability | | DIN 51582 |
| Content of foreign solids g/100g | below the limit of quantifiable detectability | | DIN 51592 |
| Demulsification number | max. 300 | sec. | DIN 51589<br>Part 1 |
| De-airability (air release property) at 50°C | max. 5 | min | DIN 51581 |
| Corrosion influence on copper, corrosion degree | max. 2-100 A3 | | DIN 51759<br>(3h at 100°C) |
| Corrosion protection property against steel | 0 - A (free of corrosion) | | DIN 51585 |
| Ageing behaviour Increase of neutralisation number after 1000 h | max.2.0 | mg KOH / g oil | DIN 51587 |
| Spec. loadability (gear unit) | 6 - 7<br>Damage power stage **)<br>FZG Normal test<br>IP 166/65 | | DIN 51354<br>(A/8, 3/90)<br>ASTM D 1976 |

As additives are used, these values are higher and are to be stated by the supplier. Oils with additive materials contain deterioration and corrosion protection as well as additive which prevent foaming.

NOTE:

1. EP additives increase the specific load ability (mechanical limiting load)
- with EP additives (FZG >7): turbo sets with gear units
- without EP additives(FZG <7): turbo sets without gear units

Refer to the lube oil specification of the gear manufacturer in this regard.

2. Not included in DIN 51515.

Steam purity requirements:
Guidelines for the inlet steam condensate

Kindly refer to the attachment, 02_Appendix_2.3_Steam_Purity_Requirement.pdf, for the recommended steam quality.

Monitoring
We strongly recommend the continuous monitoring of the water/steam cycle by constantly recording the electric conductivity (at 25 °C) at a local sampling point downstream of the strongly acidic cation exchanger, and the determination of the silica content. The monitoring equipment should be installed on the inlet steam and condensate sides.

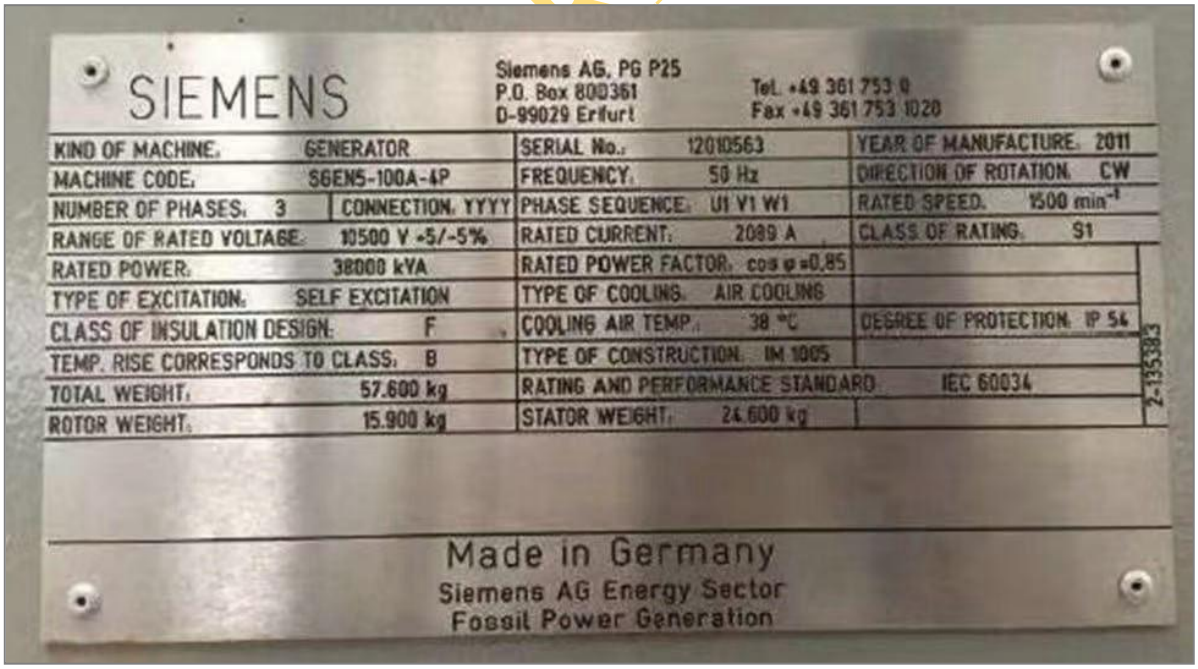
General Comments on Technical Inquiry Specifications:
Our supplies and services shall be designed in accordance with those standards, guidelines and specifications applicable within Germany and Europe. The customer's piping interface will be ANSI flange connections. In addition, Siemens has developed internal guidelines and specifications for implementation, based on its many years of experience with steam turbine generation plants. This ensures a high degree of safety and availability.

List of Major Suppliers for Equipment for Turbo groups
Siemens cooperates with approved suppliers and procures equipment and materials world wide at competitive price levels. It is not possible therefore to name single subcontractors for the various items of the power plant.

The sub suppliers are approved by Siemens. Siemens may also consider other equivalent approved suppliers and reserves the right to select an equivalent supplier.

Kindly refer to 02_Appendix_2.2_Siemens_Subsuppliers_List.pdf for the list of sub-suppliers.

**PHOTOS:**


SIEMENS
Siemens AG, PG P25
P.O. Box 800361
D-99029 Erfurt
Tel. +49 361 753 0
Fax +49 361 753 1020
KIND OF MACHINE: GENERATOR
SERIAL No.: 12010563
YEAR OF MANUFACTURE: 2011
MACHINE CODE: SGEN5-100A-4P
FREQUENCY: 50 Hz
DIRECTION OF ROTATION: CW
NUMBER OF PHASES: 3
CONNECTION: YYYY
PHASE SEQUENCE: U1 V1 W1
RATED SPEED: 1500 min-1
RANGE OF RATED VOLTAGE: 10500 V +5/-5%
RATED CURRENT: 2089 A
CLASS OF RATING: S1
RATED POWER: 38000 kVA
RATED POWER FACTOR: cos φ =0,85
TYPE OF EXCITATION: SELF EXCITATION
TYPE OF COOLING: AIR COOLING
CLASS OF INSULATION DESIGN: F
COOLING AIR TEMP.: 38 °C
DEGREE OF PROTECTION: IP 54
TEMP. RISE CORRESPONDS TO CLASS: B
TYPE OF CONSTRUCTION: IM 1005
TOTAL WEIGHT: 57.600 kg
RATING AND PERFORMANCE STANDARD: IEC 60034
ROTOR WEIGHT: 15.900 kg
STATOR WEIGHT: 24.600 kg
2-135383
Made in Germany
Siemens AG Energy Sector
Fossil Power Generation


SIEMENS
SIEMENS
SIEMENS


SIEMENS
SIEMENS


SIEMENS


SIEMENS


SIEMENS


SIEMENS

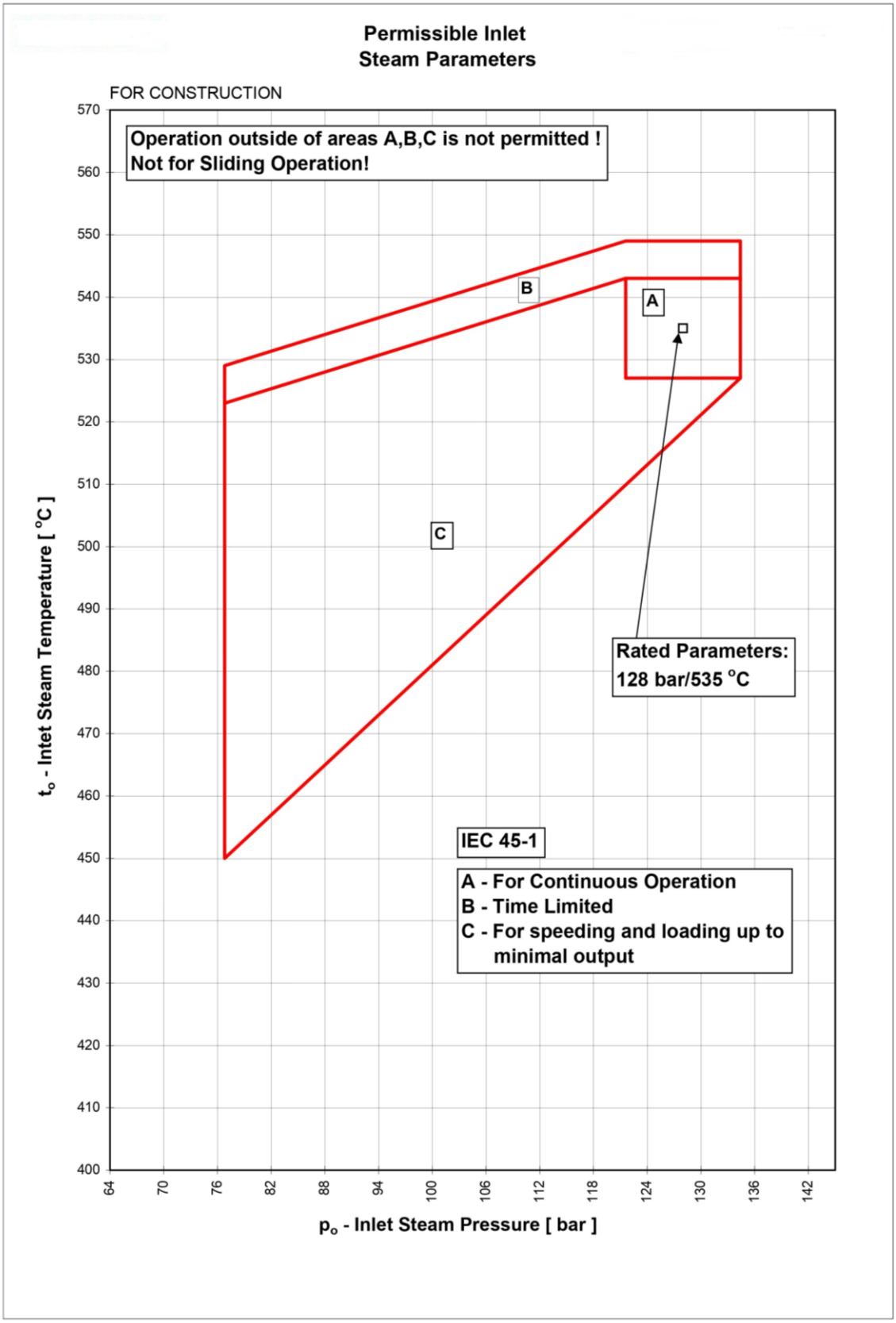

SIEMENS

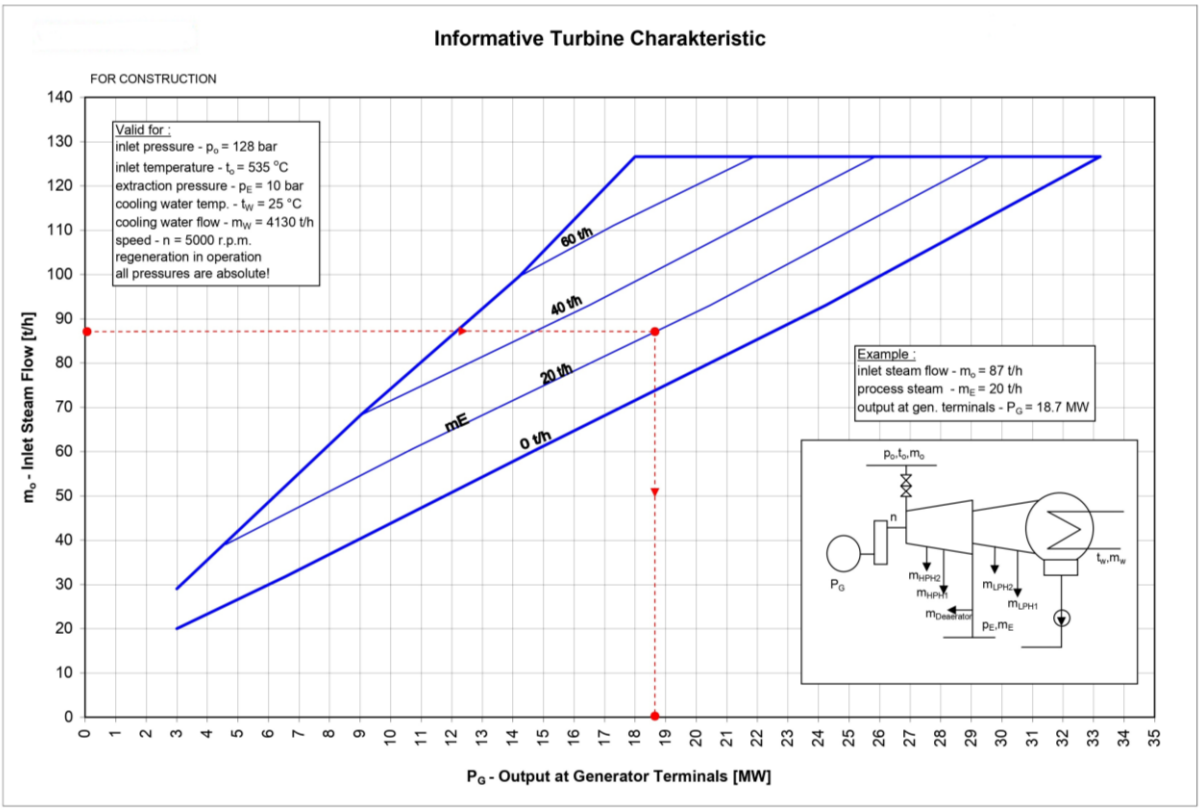

SIEMENS
SIEMENS
SIEMENS


SIEMENS
SIEMENS


SIEMENS
SIEMENS
SIEMENS

**DRAWINGS:**


Permissible Inlet
Steam Parameters
FOR CONSTRUCTION
Operation outside of areas A,B,C is not permitted !
Not for Sliding Operation!
B
A
C
Rated Parameters:
128 bar/535 °C
IEC 45-1
A - For Continuous Operation
B - Time Limited
C - For speeding and loading up to minimal output
$t_o$ - Intet Steam Temperature [ °C ]
$p_o$ - Inlet Steam Pressure [ bar ]
570
560
550
540
530
520
510
500
490
480
470
460
450
440
430
420
410
400
64
70
76
82
88
94
100
106
112
118
124
130
136
142


Informative Turbine Charakteristic
FOR CONSTRUCTION
Valid for :
inlet pressure - $p_o$ = 128 bar
inlet temperature - $t_o$ = 535 °C
extraction pressure - $p_E$ = 10 bar
cooling water temp. - $t_W$ = 25 °C
cooling water flow - $m_W$ = 4130 t/h
speed - n = 5000 r.p.m.
regeneration in operation
all pressures are absolute!
60 t/h
40 t/h
20 t/h
mE
0 t/h
Example :
inlet steam flow - $m_o$ = 87 t/h
process steam - $m_E$ = 20 t/h
output at gen. terminals - $P_G$ = 18.7 MW
$m_o$ - Inlet Steam Flow [t/h]
$P_G$ - Output at Generator Terminals [MW]