

Efficiency: More value to your facility

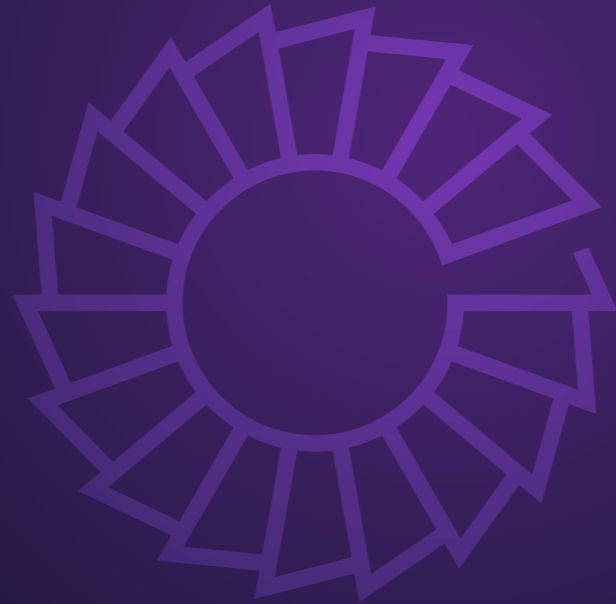
Industrial steam turbines
from 2 to 250 MW



[siemens-energy.com/steamturbines](https://www.siemens-energy.com/steamturbines)



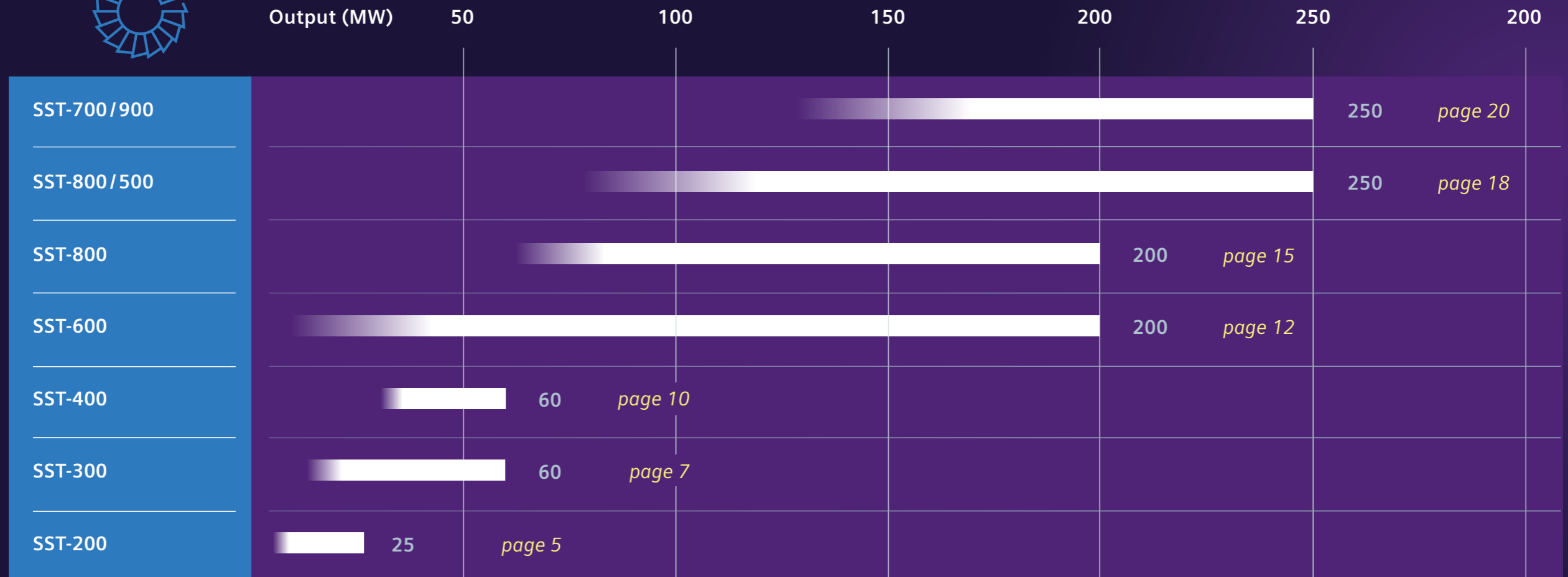
Reliable Steam Turbines



With over a century of experience and continuous development in steam turbine technology, Siemens Energy has stayed at the forefront of development and is a prime partner for your business. With a fleet of more than 60,000 steam turbines world wide, Siemens Energy is a reliable and experienced partner.

Siemens Energy Steam Turbines are an essential piece of turbomachinery to many power plants worldwide. They are applied either as a generator drive or a mechanical drive for pumps and compressors. The modular design concept of all steam turbines ensures high flexibility, availability and a reduction of time-to-market.

Industrial Steam Turbines—overview





Industrial steam turbines from 2 to 250 MW

As a market leader for industrial steam turbines, we offer a comprehensive range of reliable and versatile steam turbines for the power output range from 2 to 250 MW. Our industrial steam turbines are designed for easy constructability, fast start-up and economical operation.

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SST-200 Industrial steam turbine

The ability to combine standardized casing modules enable optimal design flexibility. This allows the turbine series to achieve high performance in combination with an optimal cost position.

Each steam path is customized for optimal fit to the specific thermal cycle requirements providing high efficiency over the entire operating range.

The inlet and exhaust sections are configured to cover different plant configuration needs and are

used in condensing configurations as well as in back pressure applications.

With this flexible approach the SST-200 covers the range of both industrial mechanical drive and industrial power generation applications.

The product design closely follows API 612 requirements.



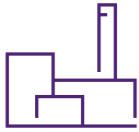
At a glance

- Customized steam path
- Modular design for short delivery time
- Thermoflexible design
- Fast and early layout planning
- Compact design minimizes space requirements of installation

SST-200

Power output	2 up to 25 MW
Speed	up to 14,600 rpm
Live steam parameters	
Inlet pressure	up to 120 bar(a) / 1,740 psi
Inlet temperature	up to 540 °C / 1,004 °F
Exhaust steam parameters	
Water-Cooled Condenser	0.05–0.15 bar (a)
Air-Cooled Condenser	0.15–0.50 bar (a)
Backpressure Turbines	2–20 bar(a)
Uncontrolled extraction	up to 3
Controlled extraction	1
Steam extraction	
Controlled (up to 4)	up to 16 bar / 230 psi up to 350 °C / 560 ° F
Uncontrolled	60 bar / 870 psi

SST-200



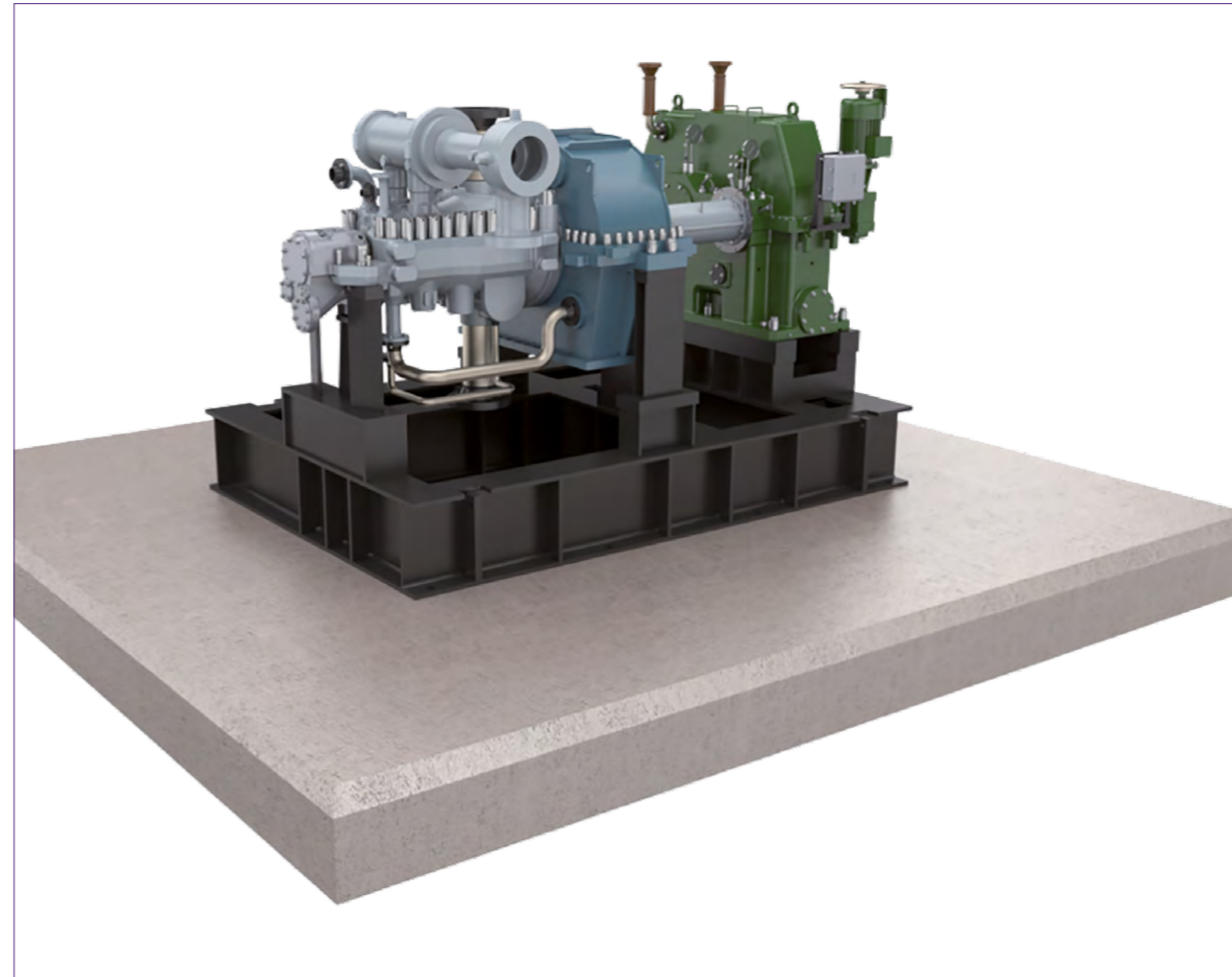
Tamoil, Switzerland

2 turbines producing on average 5 MW each in mechanical drive application



Steam turbine:
2 × SST-200

Power output:
5 MW each
Mechanical drive



Typical applications

- Biomass plants
- Chemical and petrochemical industry
- Cement industry
- Combined cycle power plants and combined heat and power plants
- Concentrated solar power plants
- District heating
- Waste-to-energy plants (waste incineration)
- Pulp and paper mills
- Sugar industry
- Steel works and mines

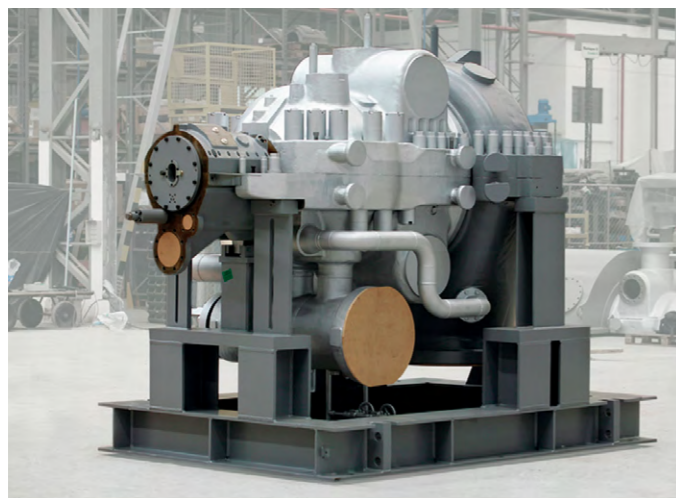
SST-300

Industrial steam turbine

The SST-300 is an optimal solution for a wide range of applications due to the implementation of the best technology combined with over 20 years of experience. In the last decade alone, this turbine has been installed in over 500 industrial and power applications by customers all over the world.

The flexible configuration of the SST-300 enables it to be used in diverse applications such as waste-to energy, chemical processing, pulp and paper, cement and many more.

All components and auxiliaries including the lube oil system are mounted on a common base frame. The turbine can be configured with either an upward, downward or axial exhaust orientation depending on the layout of the plant. The turbine can also accommodate multiple steam extraction/steam induction points as well. The compact design and simple layout of the turbine significantly reduce the cost and time associated with its construction, inspection and maintenance.



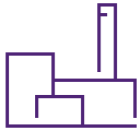
At a glance

- All components and auxiliaries can be mounted on a common base frame or skid
- Short erection time at site due to a “plug and play” system
- Fast, early and flexible layout planning

SST-300

Power output	up to 60 MW
Speed	up to 12,000 rpm
Live steam parameters	
Inlet pressure	140 bar / 2,030 psi
Inlet temperature	540 °C / 1,004 °F
Exhaust steam parameters	
Back pressure	0.05–0.15 bar (a)
Condensing	0.15–0.50 bar (a)
District heating	2–20 bar(a)
Controlled extractions (up to 2)	
	Single or double, adaptive stage, nozzle control, throttle control
Pressure	up to 25 bar / 362 psi
Temperature	400 °C / 752 °F
Uncontrolled extractions (up to 6)	
Pressure	up to 60 bar / 870 psi

SST-300



Waste-to-energy plant, Lincoln/UK

In operation since 2014, the Lincolnshire Waste-to-energy facility provides a safe, sustainable and affordable waste treatment solution to dispose of household waste, with a useful and profitable by-product: electricity. It burns 150.000 t of waste a year



Power output:
25.15 MW

Speed:
5,300 rpm

Live steam pressure:
58 bar / 841 psi

Live steam temperature:
397°C / 746°F

Exhaust steam pressure:
0.07 bar / 1 psi



Typical applications

- Biomass plants
- Chemical and petrochemical industry
- Cement industry
- Combined cycle power plants and combined heat and power plants
- Concentrated solar power plants
- District heating
- Waste-to-energy plants (waste incineration)
- Pulp and paper mills
- Sugar industry
- Steel works and mines

Valve arrangement

Internal valve arrangements (or adaptive stages) control the steam flow and maintain constant process steam extraction pressures over a wide flow range.

Reaction Blading

The rotor is fitted with resonance-proof fully shrouded blading. The last stage is free standing with a damping wire (condensing steam turbine)

Exhaust

Equipped with upward, downward or axial exhaust orientation

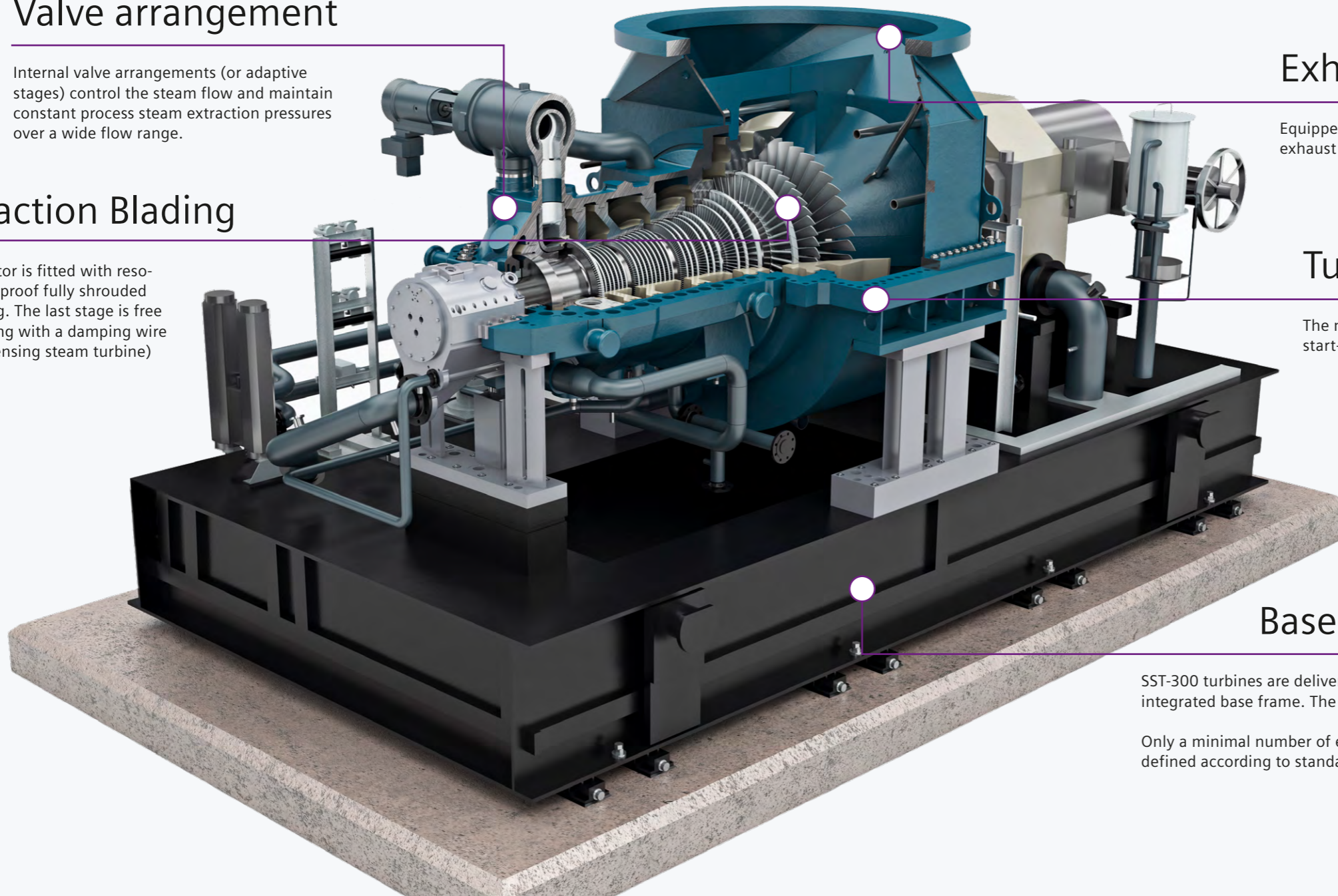
Turbine Casing

The nearly symmetrical casing allows short start-up times and quick load changes.

Base frame

SST-300 turbines are delivered as packaged units with simple or integrated base frame. The oil tank is inside the base frame.

Only a minimal number of external connections, which are clearly defined according to standards, ensure fast and easy installation.



SST-400

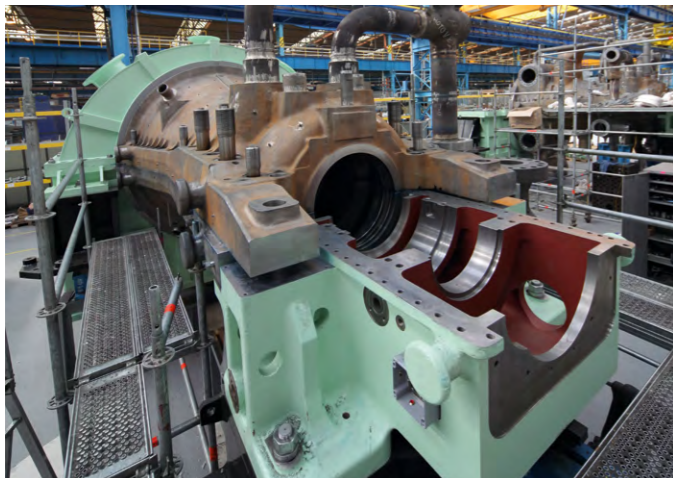
Industrial steam turbine

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 enables the SST-400 to achieve 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.

The SST-400 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. Our proven installation and maintenance concept lowers maintenance cost by enabling easy access to the installed components, the turbine, gearbox, and generator.



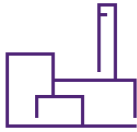
At a glance

- Fast and early layout planning
- Short delivery time
- Compact design minimizes space requirements of installation
- Easy access to mechanical components facilitates maintenance

SST-400

Power output	up to 60 MW
Speed	up to 8,000 rpm
Live steam parameters	
Inlet pressure	up to 140 bar / 2,030 psi
Inlet temperature	up to 540°C / 1,004°F
Exhaust steam parameters	
Back pressure	up to 25 bar / 363 psi
Condensing	up to 0.3 bar / 4.4 psi
Steam extraction	
Controlled (up to 4):	up to 45 bar / 653 psi
Uncontrolled	up to 60 bar / 870 psi

SST-400



Waste-to-energy plant, Mallorca / Spain

Tourism drives the local development and welfare of the Mediterranean island. The significant number of island guests causes the population to vary between about 1 million in winter and 6 million in summer. This poses a challenging task for the proper disposal of daily waste. The EfW-plant in Palma de Mallorca has a capacity of about 430,000t per year. Mallorca reached zero landfill waste

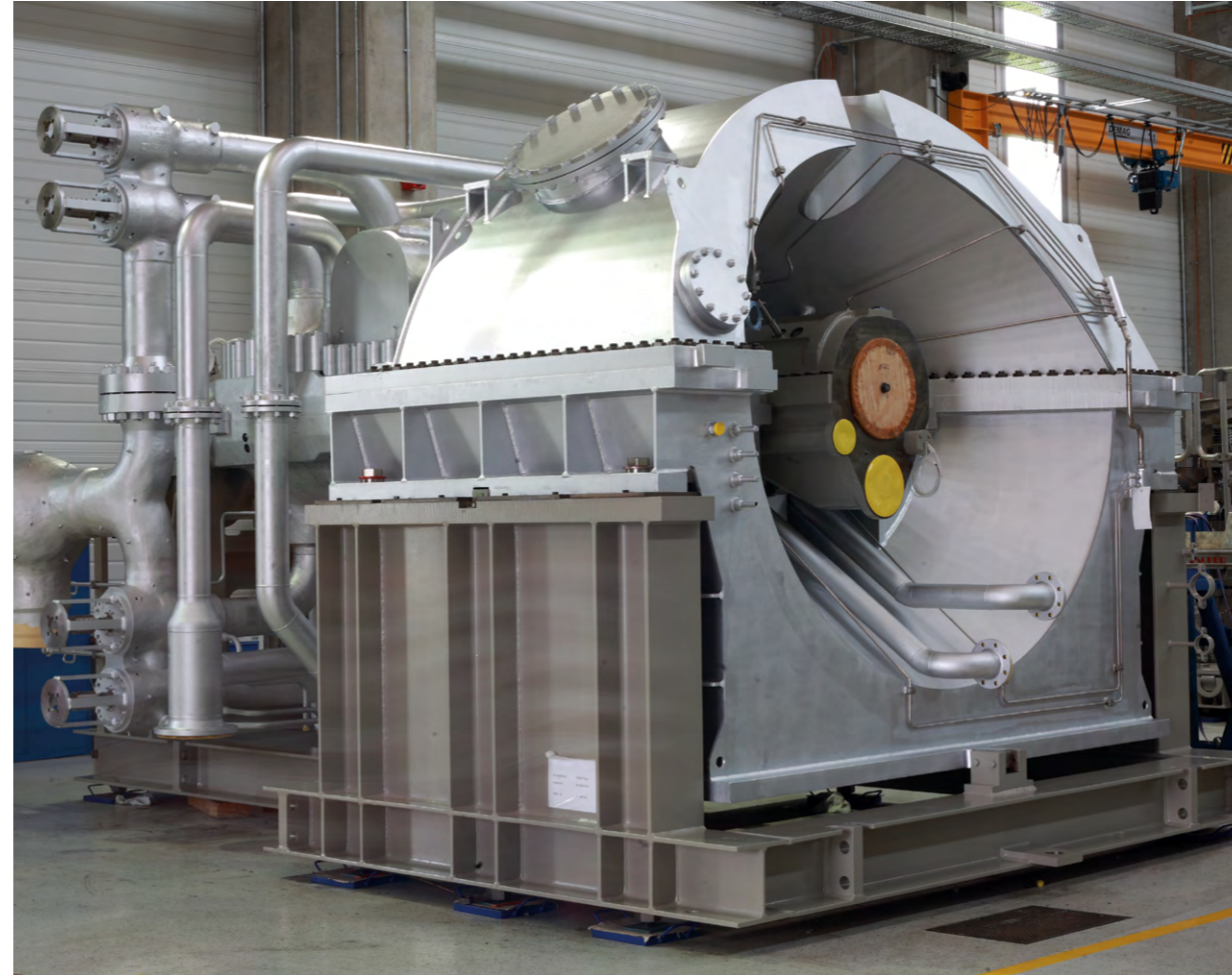


Power output:
38 MW (steam turbine)

Speed:
4,500 rpm

Inlet temperature:
397°C / 746°F

Inlet pressure:
50 bar / 725 psi



Typical applications

- Power generation industrial power plants
- Biomass & waste
- District heating
- Combined cycle power plants
- Mechanical drive
- Waste heat recovery

SST-600

Flexible condensing or back-pressure steam turbine

Generator drive in various packages

We deliver a standard steam turbine generator set including the SST-600 (with or without gearbox), a generator, oil system, piping and instrumentation and the control system. The standard package can be extended to include a condenser, condensing plant or pre-heating system.

The SST-600 with its reliable and flexible design is available with axial or radial exhaust.



Mechanical drive

The SST-600 is also an efficient and economic mechanical drive. Since the 1970s, hundreds of projects have been successfully implemented all over the world using the SST-600 to directly drive everything from the smallest boiler feedwater pump just as reliably as the largest compressor even in the most complex processes. The SST-600 complies with regulations including the API standard.



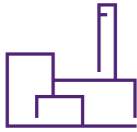
At a glance

- Soft reheat up to 400°C
- Outstanding efficiency
- Fast start-up times
- Highest reliability
- Economic installation and operation
- Flexibility for complex, industrial processes

SST-600

Power output	up to 200 MW
Speed	3,000 to 18,000 rpm
Live steam parameters	
Inlet pressure	up to 165 bar / up to 2,393
Inlet temperature	up to 565 °C / 1,050 °F
Exhaust steam parameters	
Back pressure	up to 80 bar / 1,160 psi
Condensing	up to 1.0 bar / 15 psi
District heating	up to 3.0 bar / 43 psi
Controlled extractions (up to 2)	
Pressure, ext. valve	up to 72 bar / 1,044 psi
Pressure, int. valve	up to 45 bar / 798 psi
Temperature	up to 480 °C / 895 °F

SST-600



Biomass district heating plant, Västergötland / Sweden

The district heating plant operated by Mölndal Energie supplies 91Mwth thermal power and 23 MWe electricity.

It has been in operation since 2009 and uses wood as fuel. Delivery of the complete turboset (SST-600 and generator).



Power output:
25 MW

Live steam temperature:
519 °C / 966 °F

Live steam pressure:
122 bar / 1,769.5 psi

Exhaust steam pressure:
0.5 bar / 7.3 psi

Speed:
5,000 rpm



Typical applications

- Chemical and petrochemical industry
- Pulp and paper mills
- Steel works
- Mines
- Power plants
- Seawater desalination plants
- Biomass and Waste-to-energy plants (waste incineration)

Blades

The improved cylindrical high pressure blades and tapered intermediate pressure blades allow longer airfoils and contribute to the overall high efficiency.

Exhaust section

A wide range of exhaust sizes and types is available for back-pressure and condensing applications.

Sealing

The improved sealing system allows more sealing strips per blade row at both moving and stationary blades.

Intermediate section

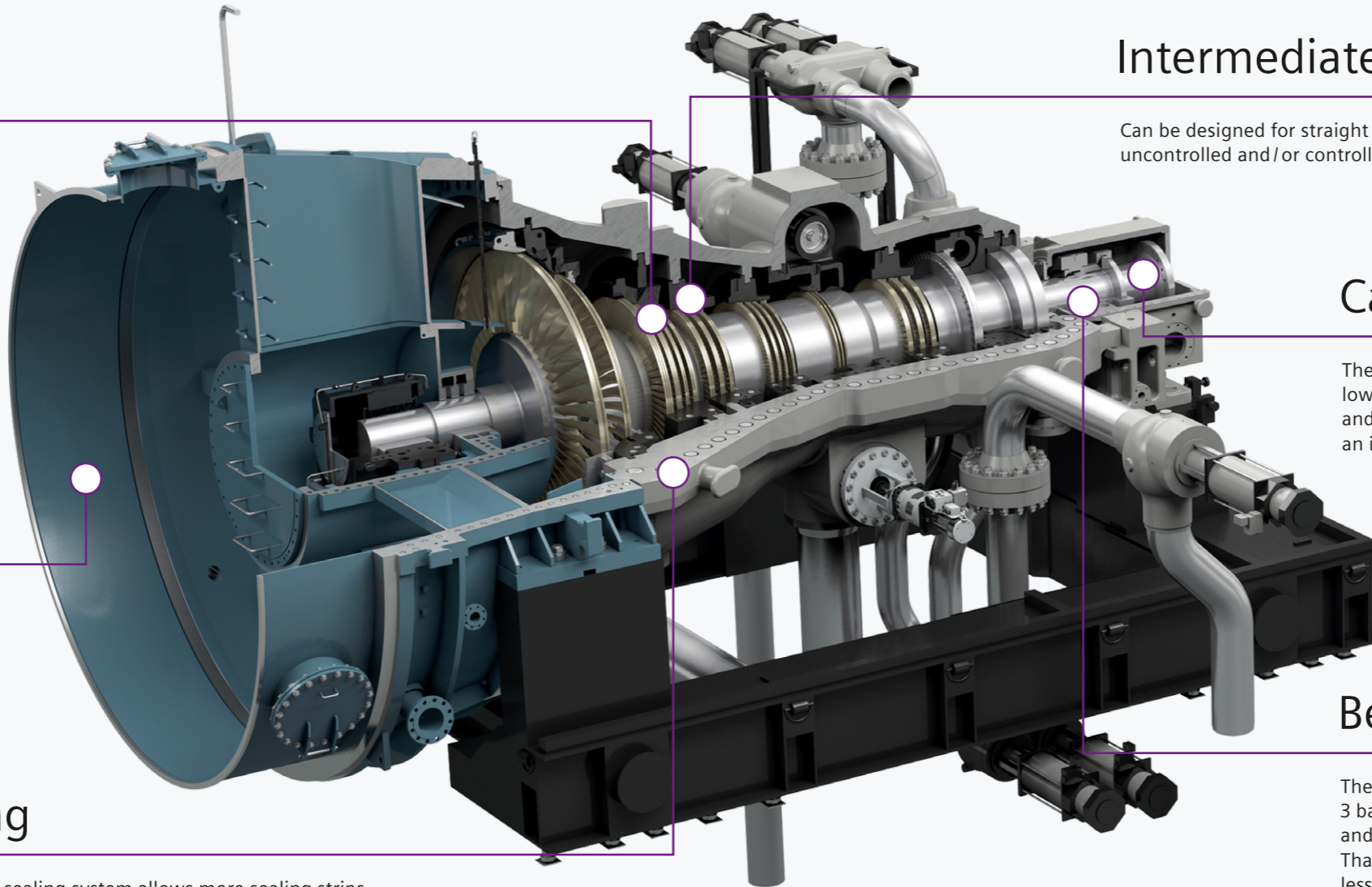
Can be designed for straight flow, or equipped with uncontrolled and/or controlled extractions.

Casing

The symmetrical design of the upper and lower halves avoids material concentrations and ensures improved thermal behavior and an improved start up time.

Bearing

The possibility of applying up to 3 balancing pistons minimizes thrust and allows smaller axial bearings. Thanks to improved journal bearings less oil and a smaller oil tank are needed.



SST-800

Steam turbine with center steam admission

Generator drive in various packages

The SST-800 is a single casing steam turbine with center steam admission and reverse steam flow inner casing, designed for a direct coupled generator or mechanical drive. The power output with dual casing solution is up to 250 MW.

The highly customized turbine provides for an outstanding efficiency, fast start-up times and high reliability and availability. It supports all requirements for economical installation and operation in combination with highest flexibility for complex industrial processes. A double or even multicasing solution can also be provided.



The SST-800 steam turbine can be used for both condensing and back-pressure applications. It is built up from pre-designed modules combined into a single unit for optimum matching of the required parameters. Turbine auxiliary systems are also designed as pre-engineered modules covering the complete range of turbine sizes.

The SST-800 turbine is equipped with impulse control stage and reaction blading fixed in blade carriers. Furthermore the turbine is offered with throttle controlled inlets. The turbine can be arranged on a foundation or as a package (including oil system and on a base frame). The SST-800 steam turbine design is in accordance with DIN or API standards.



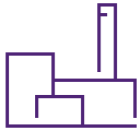
At a glance

- Single casing with or without reheat
- Outstanding efficiency
- Fast start-up times
- Highest reliability
- Economic installation and operation
- Flexibility for complex, industrial processes

SST-800

Power output	up to 200 MW
Speed	3,000 to 3,600 rpm
Live steam parameters	
Inlet pressure	up to 165 bar / up to 2,393 psi
Inlet temperature	up to 565 °C / up to 1,050 ° F
Exhaust conditions	
Back pressure	up to 72 bar / 1,044 psi
Controlled extractions (up to 2)	
Pressure, ext. valve	up to 72 bar / 1,044 psi
Uncontrolled extractions (up to 7)	
	various pressure levels

SST-800



Steam Turbines for Pulp & Paper Industry SST-800, Klabin/Brazil

Two SST-800 steam turbines are supplying electricity and process steam to a pulp factory in Brazil. The SST-800 has a capacity of 190 megawatts (MW), making it among the largest steam turbines in use in the pulp and paper industry worldwide.



Power output:
190 MW

Speed:
3,600 rpm

Inlet steam pressure:
100 bar/1,450 psi

Inlet steam temperature:
498°C/928°F



Typical applications

- Combined cycle power plants (CCPP)
- Combined heat and power plants (CHP)
- Oil & Gas industries
- Industrial power plants (e. g. captive power plants in chemical and petrochemical industries, manufacturing industries, paper mills, mines, metal and cement plants, waste heat recovery)
- District heating plants
- Biomass plants and waste-to-energy plants (WtE)
- Concentrated solar power plants (CSP)

SST-800

Exhaust section

Axial or downward connection for condensing, upward or downward connection for back pressure is provided

Center steam admission

The reverse flow adjusts the thrust and relieves the bearings of large steam turbines

Bearings

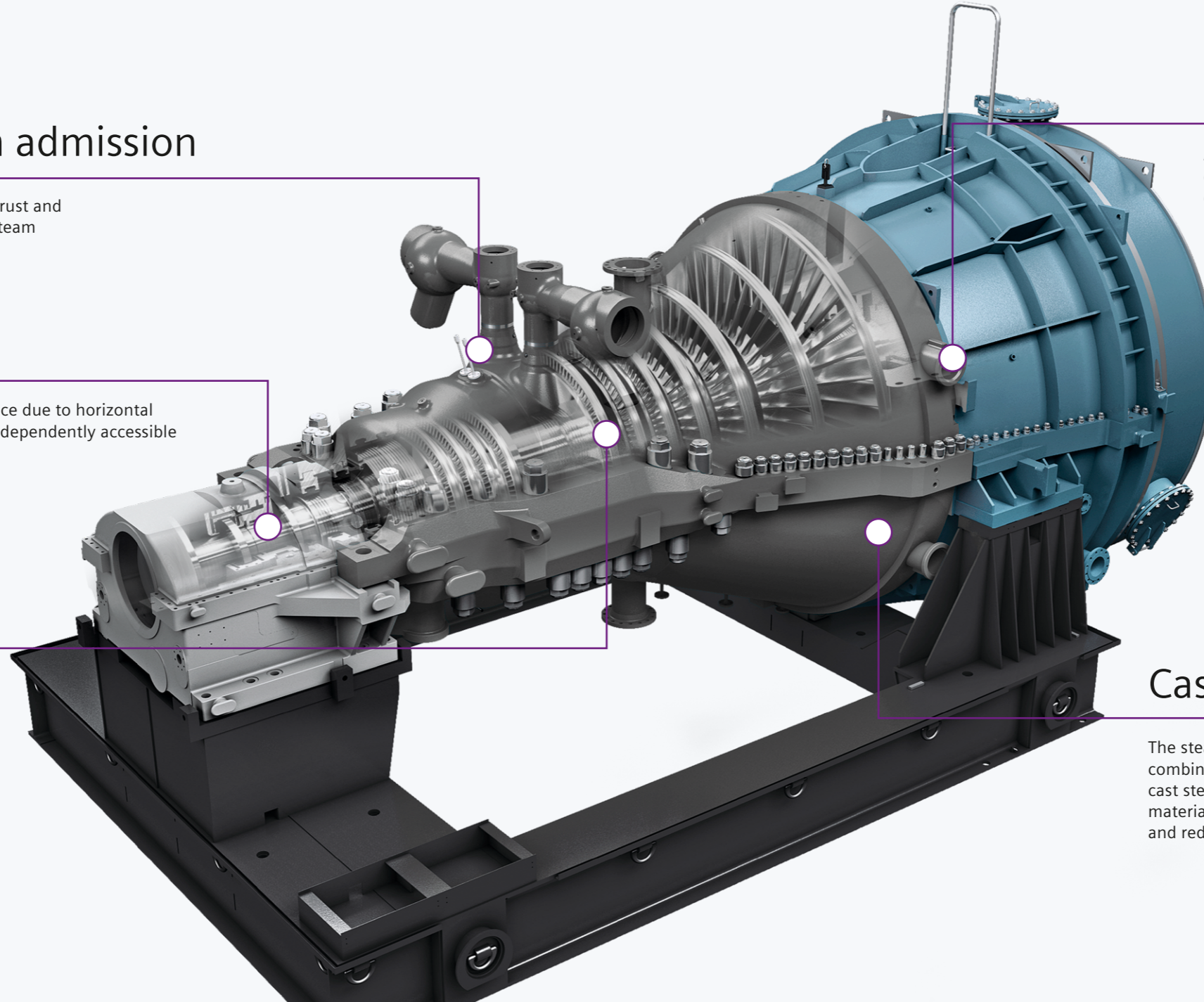
Simplified maintenance due to horizontal casing split and /or independently accessible bearings

Steam path

Highly customized section with up to 2 internally or externally controlled extractions and up to 7 uncontrolled extractions.

Casing

The steam turbine casing is based on a combined housing concept featuring a cast steel and welded design. The material mix ensures high availability and reduced delivery times.



SST-800/500

Double exhaust flow steam turbine in a single or multi-casing solution

The SST-500 is a single casing, double exhaust flow steam turbine, which can be used as an entire drive or as the low-pressure module of a multiple-casing turboset, directly driven or geared. This turbine, with its capacity to operate over a wide range of speed and power, is ideal for large steam volume flows.

Steam flows into the turbine via two tangential inlets to equalize thermal loading and blade

stress. Emergency stop valves and control valves are installed in the steam inlet pipes. The steam flows tangentially into the inner casing and then axially to both exhausts. The customized design of the steam path allows exact adjustment to surpass general physical limitations of the last stage blades. Double-end drive is available, if required, e.g. for booster pump drive.

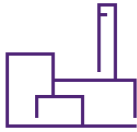


At a glance

- Double-casing reheat or non-reheat solution
- Customized steam path
- Short delivery time due to extensive pre-design
- Easy access to mechanical components facilitates maintenance

	SST-500	SST-800/500
Power output	up to 100 MW	up to 250 MW
Speed	up to 15,000 rpm	3,000 to 3,600 rpm
Live steam parameters		
Inlet pressure	up to 30 bar / 435 psi	up to 165 bar / 2,393 psi
Inlet temperature	up to 400°C / 750°F	up to 565°C / 1,050°F
Exhaust steam parameters		
District Heating	up to 1.5 bar / 21.75 psi	
Condensing	up to 0.5 bar / 7.25 psi	
Steam extraction		
Uncontrolled (up to 2)	various pressure levels	various pressure levels

SST-800/500



Solarthermal power plant, Morocco

Three dual-casing steam turbines put into service at the Noor project site – the most ambitious solar power project in the world. The steam turbine generator set employed in Noor II (a solar tower plant) is a SST- 500/800.



Customer:
Masen, Ouarzazate Solar Power Station

Power output:
200 MW

Inlet temperature:
380°C / 716°F

Inlet pressure:
105 bar(a) / 1,522 psi



SST-800/500 Double-casing reheat solution

Typical applications

- Solarthermal power plants
- Combined cycle plants
- Pump drive (e. g. feedwater pump for large boilers)
- Generator drive
- Compressor drive
- Chemical industry
- Steel works
- Waste to energy, e. g. waste incinerators
- Waste heat from chemical processes

SST-700/900

Industrial steam turbine

Economical dual casing steam turbine for reheat applications

The SST-700/900 is a standard turbine solution with short delivery time due to its fixed pre-engineered design. Predefined modules enable a short manufacturing period, cost-efficient material supply and a fast ex-works delivery. The straight flow turbine solution with power output of up to 250 MW consists of a geared

high-pressure steam turbine (backpressure), an intermediate/low-pressure steam turbine (condensing), both driving a generator installed in between.

The dual casing reheat turbine configuration with inner casing is a competitive and optimized product for combined cycle power plants and concentrated solar power plants.

At a glance

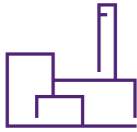
- Fast load changes
- Short start up times
- Highest with reheat efficiency
- Increased life cycle
- Low level arrangement
- Reheat application

SST-700/900

Power output	up to 250 MW
Speed	3,000 to 3,600 rpm
Live steam parameters	
Inlet pressure	up to 180 bar / up to 2,611 psi
Inlet temperature	up to 585 °C / up to 1,085 °F
Exhaust steam parameters	
Back pressure	0.3 bar / 4.4 psi
Steam extraction	
Controlled	72 bar / 1,044 psi
Uncontrolled	up to 7 uncontrolled extractions possible



SST-700/900



Parabolic trough technology in Morocco

On February 4, 2016, the King of Morocco, Mohammed VI, inaugurated the Noor I unit of Ouarzazate Solar Power Station. This is the first of four phased Noor projects at Ouarzazate site which are expected to provide a total electrical generating capacity of 580 megawatts, making it the largest complex of its kind in the world. Delivery of three turbine-generator sets for the power station.



Steam turbine:
SST-700/900

Power output:
160 MW

Inlet steam temperature:
380°C/716°F

Inlet steam pressure:
168 bar(a)/2,437 psi

Exhaust pressure:
0.06 bar(a)/0.87 psi



Steam turbine SST-900 for the CSP-plant NOOR III, Morocco

Typical applications

- Combined cycle power plants
- Concentrated solarthermal power plants
- Biomass-fired power plants

Performance data overview

Steam turbine type	SST-700/900	SST-800	SST-600	SST-500	SST-400	SST-300	SST-200
Output SPP MW	≤250	≤200	≤200	≤100	≤60	≤45	≤20
Frequency HZ	50/60	50/60	50/60	50/60	50/60	50/60	50/60
Inlet pressure bar/psi	180/2,611	165/2,393	165/2,393	30/435	140/2,030	140/2,030	120/1,740
Inlet temperature °C/°F	585/1,085	565/1,050	565/1,050	400/750	540/1,004	540/1,004	540/1,004
Reheat temperature °C/°F	565/1,050	565/1,050					
Rotational Speed rpm	3,000–3,600	3,000–3,600	3,000–18,000	15,000	3,000–8,000	12,000	14,600
Controlled extraction bar/psi	72/1,044	72/1,044	72/1,044 (up to 2)	none	45/653 (up to 4)	25/363 (up to 2)	1
Controlled extraction temperature °C/°F			480/895		450/842	400/752	350/562
Uncontrolled extraction bar/psi	up to 7	up to 7	85/1,233 (up to 6)	up to 2	60/870	60/870	up to 3
Exhaust Pressure (back) bar/psi		72/1,044	80/1,160		25/365	16/232	20/290
Exhaust Pressure (cond.) bar/psi	0.3/4.4	0.3/4.4	1.0/15	0.5/7.25	0.3/4.4	0.3/4.4	≥0.50/7.3
Exhaust Pressure (distr.) bar/psi		3/43	3/43	1.5/21.75		3.0/43.0	
Last stage blade length cm/inches	79.8 to 114.6/31.4 to 45.1	79.8 to 114.6/31.4 to 45.1	79.8 to 114.6/31.4 to 45.1				
Last stage blade length cm/inches	76.2 to 95.4/30 to 37.6	76.2 to 95.4/30 to 37.6	76.2 to 95.4/30 to 37.6				

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Siemens Energy Inc.
Gas and Power
15375 Memorial Drive
Houston, TX 77079
United States

For more information, please contact

Phone +49/(0)180/524 70 00

Fax +49/(0)180/524 24 71

(Charges depending on provider)

E-mail: support@siemens-energy.com

www.siemens-energy.com/steamturbines

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