

S2E 50-250

STEAM TO ENERGY Transformer

Micro Steam Turbine & Generator Module

Wet Steam Turbine Operation

PLUG and PRODUCE System

This is an ecologically designed steam micro-turbine module for the utilization of the energy of the working medium, e.g. steam, to be transferred to electric energy. It has a solid steel frame which enables easy transportation, installation and maintenance without the need of using special tools. The module contains all components for direct connection to the existing distribution system. Connections of the equipment to the mains in accordance with agreed requirements of the customer are also provided.

STEAM INLET AND OUTLET /CONDENSATE REMOVAL/

Flanged endings in accordance with the standard DIN 2576 for connecting of inlet and outlet piping of an existing steam distribution system are part of the valve block – in its upper part. In the lower part, there is a flanged ending in accordance with the standard DIN 2576 for condensate removal. Sizes of individual flanged endings are given by the size and operational parameters of the equipment.

Sealing systems of flanged connections are from renowned companies / A.W. Chesterton, etc./

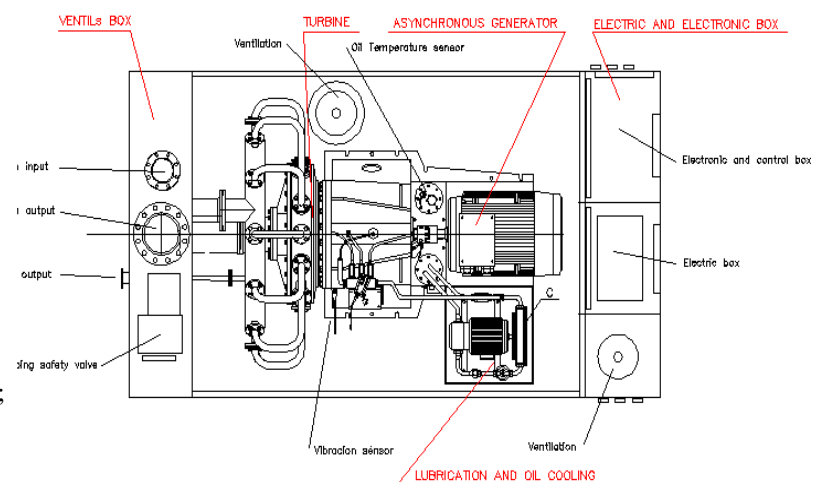
VALVE BLOCK

The valve block contains the distribution piping, groups of valves, regulating and controlling components on the steam input and output systems, as well as on the condensate removal system to provide reliable and safe operation of the equipment and easy maintenance. All components are delivered from internationally recognized manufacturers /LANDIS&GYR, TYCO/ with high standard of operational life, reliability and quality service.

The rapid-reaction safety valve produced by the company TYCO, which in the case of need provides prompt shut-down of the turbine without damaging of the existing system and the turbine itself, is an integral part of the valve block.

TURBINE

New concept of the turbine with original design. Blades of the turbine wheel are replaced by "bristles".



ASYNCHRONOUS / SYNCHRONOUS GENERATOR

The asynchronous generator manufactured by the company SIEMENS is used as standard for S2E 50-250 module. Size of the generator is given by operational parameters, definition of the output, size of the turbine and type of S2E 50-250 module.

ELECTRIC AND ELECTRONIC MODULE

This part of S2E 50-250 module secures complete regulation and control of the equipment and stable and safe connection to the existing network of the user or mains in accordance with the requirements. The whole block is on the basis of components from the company RITTEL with the control system from the company SIEMENS. Operation of S2E 50-250 module and control of its main operational parameters is carried out by touch screen on the front part of the electric and electronic module.

LUBRICATING AGGREGATE AND OIL COOLING

S2E 50-250 module has an autonomous circuit for cooling and lubricating of required components with reliable oil temperature sensor, and it utilizes oils with outstanding technical parameters of renowned manufacturers.

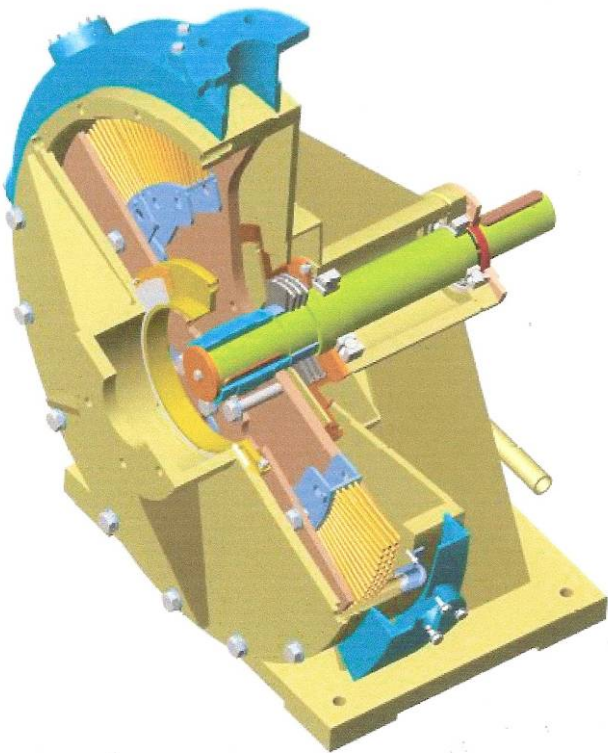
VIBRATION SENSOR

In order to secure high level of safety and preventive diagnostics of S2E 50-250 module, the equipment is outfitted with sensitive vibration sensor of high quality. Actual values of vibrations are part of on-line information on information and control display of S2E 50-250 module.

S2E STEAM MICROTURBINE: ULTIMATE SOLUTION FOR DEMANDING STEAM CONDITIONS

The revolutionary concept of the turbine with original and patented design is based on the substitution of turbine blades with a system of "bristles". The material of bristles, their cross-section, shape and density are precisely defined and they are the result of long-term research and extensive tests with various technical parameters. The multiple tangential input of working medium on the turbine bristles is optimized by the system of nozzles of a proprietary concept that enables optimal conversion of kinetic energy of steam to the force with efficiency of 95%. According to the measurements, it is an aerodynamic conversion of kinetic energy with minimum losses by friction and whirling of the working medium. The kinetic energy of the steam is absorbed in the inlet into the turbine circuit so that for example, at outlet velocity of 800m/sec of the steam from the nozzles, its energy is completely absorbed at 80mm of the length of perimeter of the turbine wheel.

The outlet of the steam is an Archimedean spiral from the center of the turbine, the condensate removal is solved by separate sub-circuit in the bottom of the turbine. The turbine wheel is hold by high-quality bearings from renowned manufacturers with own lubricating and cooling aggregate that is an inseparable part of each equipment. Strong emphasis was given on balancing the turbine wheel. Though no vibrations have been found during the tests and operation of individual equipments except the declared parameters, a vibration sensor with on-line output to display of S2E50-250 module is part of each equipment.



The standard solutions of turbine wheel blades are very sensitive to production accuracy and technological discipline, and they often enable utilization only in the areas of limited technical and operational parameters – using only in the area of dry steam of the Mollier Enthalpy-entropy diagram. Besides turbines usually operate at a high revolutions, their operation and maintenance is costly and complicated.

Substitution of turbine blades of standard steam turbines by a system of "bristles" provides the turbine and the operator with new possibilities with unique technical parameters:

- in addition to standard operational parameters, it can also operate unlike the blade turbines in the mode of so-called wet steam,
- turbine can be operated also during frequent and quick changes of operational parameters,
- turbine can be operated in horizontal or vertical positions,
- turbine regulation is possible from zero to maximum at unchanged efficiency rate,
- turbine operates at low operational revolutions / 3000 rev/min /
- rise time from the "cold status" to maximum is up to 10 min.

WARRANTY AND SERVICE INTERVAL

Warranty period for S2E 50-250 module is 24 months.

Local suppliers in cooperation with manufacturers provide warranty and extended services in accordance with the contract terms.

Designed operational life of the equipment is of min. 100 000 working hours.

Service interval for changing bearings of the turbine and the generator is after 25 000 hours of operation (approx. 3 years) with a shut-down period of 8 hours.

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APPLICATION POSSIBILITIES

ROTATING REDUCER

The use of S2E 50-250 module as a rotating reducer is one of its basic application possibilities. It is a substitution of one reducing valve or system of reducing valves in existing systems, e.g. steam system that have reduced the operational parameters of the steam from the supplier to the user according to his requirements. Reduction by system of valves is always associated with loss of great part of the energy and its conversion to heat. Connecting of rotating reducer – S2E 50-250 module into the system enables utilization of this energy for production of electric energy that can be used for self-consumption, supplying to the grid, or combination of both options.

PRODUCTION OF ELECTRIC ENERGY FROM WASTE HEAT

This application exploits the energy from the waste heat of the technological process. Installing of S2E 50-250 into this sub-circuit enables to use the waste energy of steam, for effective production of electric energy. Produced electric energy can be used for self-consumption or supplied to the mains, but combination of both options is also possible.

PRODUCTION OF ELECTRIC ENERGY IN EXISTING OR NEW CIRCUIT

It is possible to integrate S2E 50-250 module directly into the main circuit of the distribution system of steam, or create a parallel sub-circuit just for this application and production of electric energy.

To define informative output by operational parameters, it is possible to use the Mollier Enthalpy-entropy Diagram for water-steam, as per instructions. To define optimal size and type of S2E 50-250 module and output, it is necessary to fill in the questionnaire with technical parameters.

INDUSTRIES

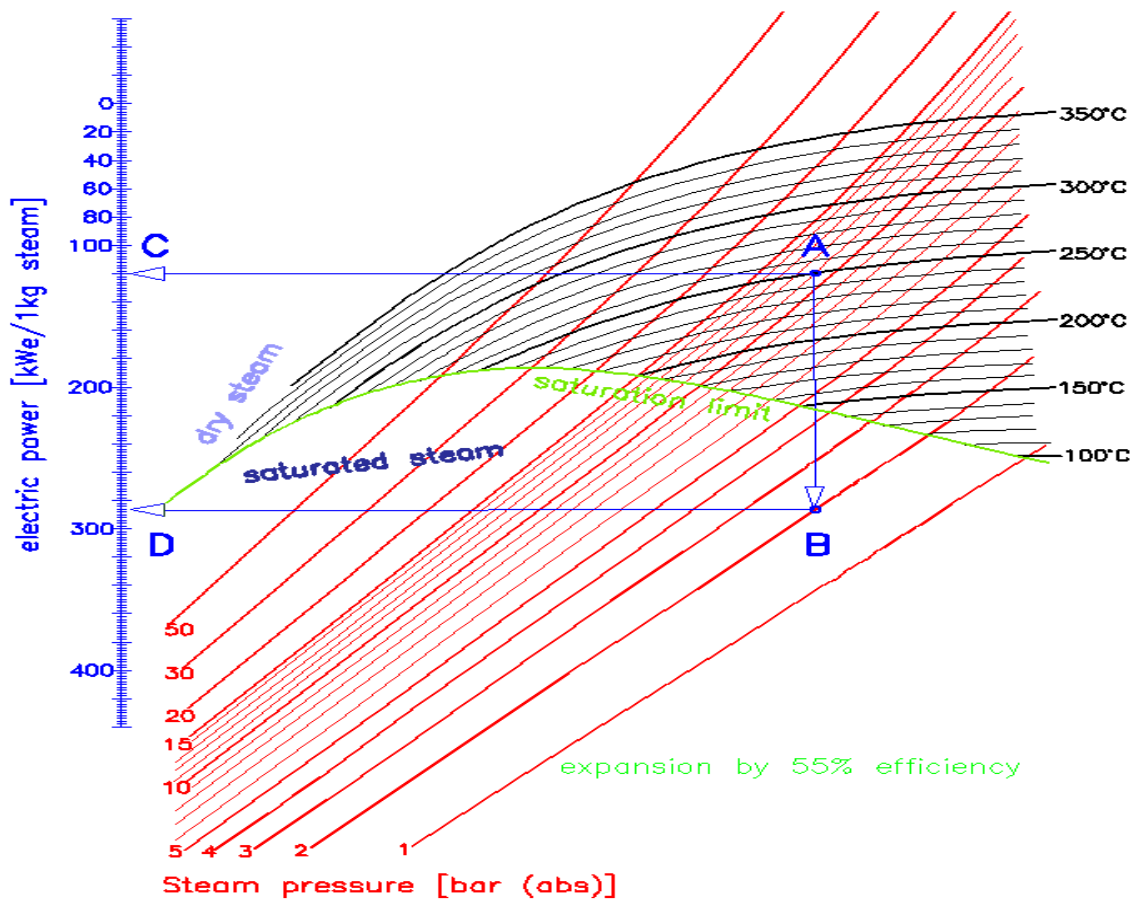
All industries that utilize steam as a technological medium or for heating, for instance:

- Central steam production in various industrial branches
- Steam production for heating of apartments, houses, housing estates
- Wood-processing industry
- Food industry
- Pulp and paper-mills
- Chemical industry
- Rubber industry
- Petrochemical industry
- Heavy engineering industry
- Metallurgy and Steel industry
- Tannery
- Textile industry
- Pharmaceutical industry
- Health service, etc.

S2E Module – Method of calculation of optimal output type

THE MOLLIER ENTHALPY-ENTROPY DIAGRAM

The Mollier Enthalpy-entropy Diagram for Water-Steam belongs to the basic diagrams that show thermodynamic processes of operation devices. At the same time, its below supplemented version enables to calculate the turbine output in kW and choose the specific module of S2E 50-250 series. In order to define optimal size and type of S2E 50-250 module, it is necessary to fill in a questionnaire (available on request) with technical parameters of the available steam. .



Dimension range of S2E 50-250 module

S2E 50-250		INLET	OUTLET
Type	Output	Connect.	Connect.
S2E 50	55 kW	DN 40	DN 150
S2E 100	100 kW	DN 65	DN 150
S2E 150	150 kW	DN 100	DN 250
S2E 200	200 kW	DN 150	DN 250

Calculation of the turbine capacity

1. point „A“ = intersection of the curved lines :
 - incoming steam pressure +1 bar
 - incoming steam temperature
2. point „B“ = intersection of the vertical line from point A with
 the curved line of outgoing steam pressure +1 bar
3. point „C“ = intersection of the horizontal line from the point A
 and the Y-axis = Power P1 / kWe /
4. point „D“ = intersection of the horizontal line from the point B
 and the Y - axis = Power P2 / kWe /
5. TURBINE Power = (P2 - P1) x Steam flow volume (kg/second)
 kWe