ET 852

Steam generator, electrical

Description

- **generation of superheated steam to supply the axial steam turbine ET 851**
- **alternative to the gas-fired steam generator ET 850**
- **steam generation independent of fuel supply and exhaust gas routing**

Steam generators are an essential element in steam power plants, where the generated steam is used to drive a steam turbine. A generator then converts the turbine's mechanical energy into electrical energy.

The ET 852 steam generator and the ET 851 axial steam turbine together form a complete laboratory-scale steam power plant.

The ET 852 unit is electrically operated and is therefore independent of fuel supply and exhaust gas routing.

The main components are a steam boiler with downstream superheater and a condenser. Water is pumped from the feedwater tank into the steam boiler using a level control system. The heater is controlled by a pressure control system in the steam boiler. The generated steam is fed into the superheater. The superheated steam is used to drive the steam turbine ET 851 or, alternatively, is condensed directly via the condenser. A condensate pump feeds the water into a condensate collector. This is emptied into a storage tank with immersion pump, which completes the water circuit to the feedwater tank.

Sensors record the temperature, pressure and flow rate at all relevant points. The measured values can be read on digital displays. At the same time, the measured values can also be transmitted directly to a PC via USB. The data acquisition software is included.

The steam generator is type tested and does not require specific permissions. It includes extensive safety equipment.

The ET 852 electrical steam generator is used as an alternative to the gas-fired steam generator ET 850 to supply steam to the steam turbine ET 851.

Learning objectives/experiments

- specific characteristic values of a steam boiler
- efficiency of a steam generator
- saturation temperature and pressure of the steam
- steam enthalpy
- determination of the heat flux density and the overall heat transfer coefficient

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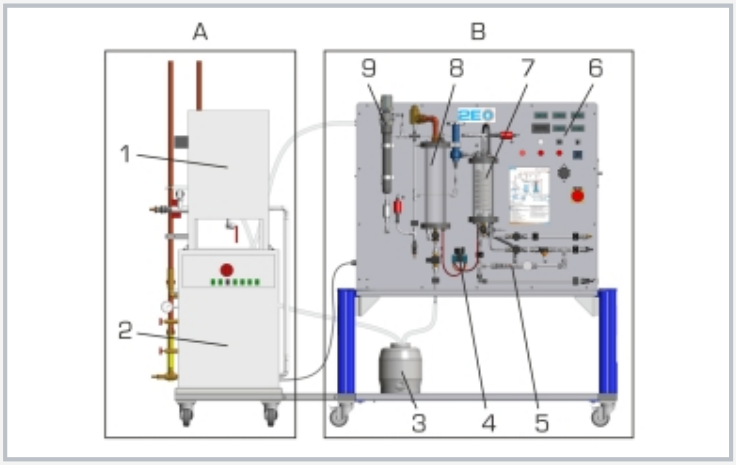
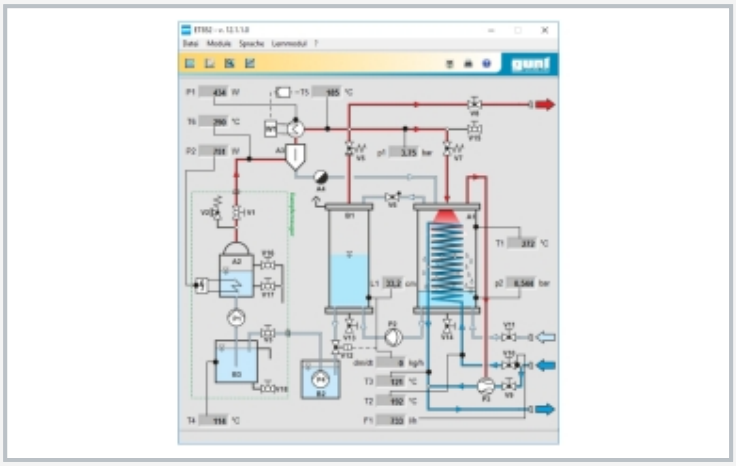
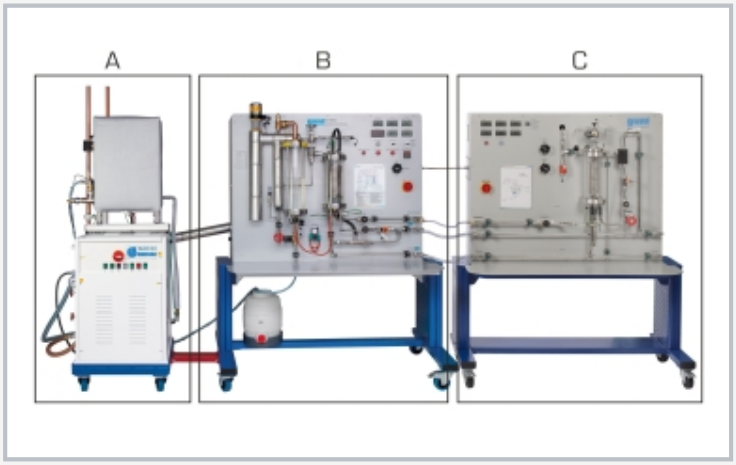


1 feed water tank, 2 steam boiler, 3 storage tank with pump, 4 condensate pump, 5 water jet pump, 6 displays and controls, 7 condenser, 8 condensate collecting tank, 9 superheater;
A steam supply unit, B steam processing



Software screenshot: process schematic



Operation of ET 852 together with ET 851 steam turbine to demonstrate the principle of a steam power plant
A steam supply unit ET 852, B steam processing ET 852, C ET 851 steam turbine

Specification

[1] electrical steam generator with superheater for generation of superheated steam
[2] heater in the steam boiler controlled by a pressure control system
[3] connections for steam supply to the ET 851 steam turbine
[4] condenser as a thick-walled glass cylinder with water-cooled tube coil and water jet pump for air extraction
[5] closed-circuit feed water supply
[6] sensor for temperature, pressure, flow rate, level (feed water)
[7] extensive safety equipment for safe operation
[8] software via USB under Windows 10

Technical data

Steam boiler
- volume: 24L
- max. pressure: 7bar
- heating power: 6kW
- max. steam output: 8,1kg/h

Feed water tank: 45L
Storage tank: 15L

Superheater
- power: 750W
- max. temperature: 250°C

Condensate pump, max. flow rate: 0,6L/min
Submersible pump, max. flow rate: 10L/min

Measuring ranges
- temperature: 6x 0...400°C
- pressure: 0...1,6bar abs. (condenser), 0...16 bar abs. (live steam)
- flow rate: 0...720L/h (cooling water)
- level: 0...60cm (feed water)

Steam supply unit
230V, 60Hz, 3 phases, 400V, 60Hz, 3 phases
400V, 50Hz, 3 phases
Steam processing
230V, 60Hz, 1 phase, 230V, 50Hz, 1 phase
120V, 60Hz, 1 phase, UL/CSA optional
LxWxH: 2540x790x1990mm
Weight: approx. 402kg

Required for operation

water connection: 720L/h, 2bar, drain
PC with Windows recommended

Scope of delivery

1 trainer
1 GUNT software + USB cable
1 set of accessories
1 packing unit of distilled water (20L)
1 set of instructional material

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Required accessories

ET 851	Axial steam turbine

Optional accessories

for Remote Learning

GU 100	Web Access Box
with	
ET 852W	Web Access Software

Other accessories

ET 805.50	Determination of the vapour content