ET 202

Principles of solar thermal energy

Description

- **demonstration model of a solar thermal system**
- **lighting unit for operation in the laboratory**
- **hot water storage tank with electrical auxiliary heater**
- **inclinable flat collector with replaceable absorbers**
- **network capable GUNT software with data acquisition for remote learning**

Solar thermal systems convert solar energy into usable thermal energy. The efficiency achieved is of essential importance here. Effects on the absorption of the radiation and on the subsequent heat transport processes are investigated, e.g. to identify measures for the optimization of operating parameters and efficiency.

ET 202 allows to demonstrate solar thermal heating of domestic water in an illustrative manner. For this purpose, the trainer contains a fully functional model of a solar thermal system. To enable weather-independent laboratory experiments, the system is equipped with its own lighting unit. A lighting unit simulates natural solar radiation. The light is converted into heat in an absorber and transferred to a heat transfer fluid.

A pump conveys the heat transfer fluid through a hot water storage tank. The heat is released to the water by an integrated heat exchanger in the tank.

In experiments different angles of incidence and illuminances are considered. The pre-installed absorber with selective coating can be replaced for a more simple blackened absorber, so as to obtain comparative measurements of collector losses. External heat consumers can be attached to the tank.

The temperatures in the storage tank, at the outlet and inlet of the collector and the ambient air are measured. Additionally the illuminance is measured. The measured values are displayed on the device and can simultaneously be transferred to a PC via USB. Using the PC, the data can be clearly displayed in the software provided and analysed further. The network capable software makes it possible to follow and analyse the experiments at any number of workstations via a LAN/WLAN connection to the local network.

Learning objectives/experiments

- design and operation of a simple solar thermal system
- determining the net power
- energy balance on the solar collector
- influence of illuminance, angle of incidence and flow rate
- determining efficiency curves
- influence of various absorbing surfaces

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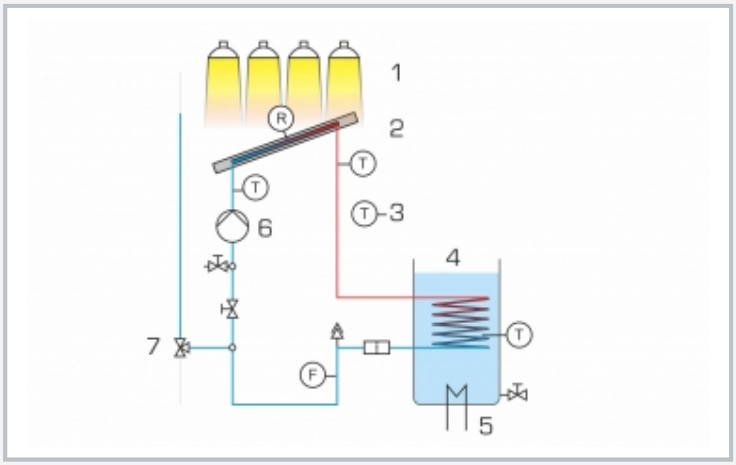
1 lighting unit, 2 control cabinet, 3 illuminance sensor, 4 flat collector with spacing and inclination adjustment, 5 temperature sensor, 6 hot water storage tank, 7 electrical auxiliary heater



Main components: 1 lighting unit, 2 flat collector, 3 temperature sensor ambient air, 4 hot water storage tank, 5 electrical auxiliary heater, 6 pump;
R illuminance, T temperature

Specification

[1] functional demonstration model of a solar thermal system
[2] lighting unit with 16 halogen bulbs
[3] spacing and inclination adjustable collector
[4] 2 replaceable absorbers with different coating
[5] solar circuit with pump and variable flow
[6] hot water storage tank with tube coil as heat exchanger and electrical auxiliary heater
[7] sensors detect temperature and illuminance
[8] remote learning: follow and analyse experiments at any number of workstations with LAN/WLAN connection via network capable GUNT software
[9] GUNT software for data acquisition via USB under Windows 8.1, 10

Technical data

Flat collector
- absorbing surface: 320x330mm
- inclination angle: 0...60°

Lighting unit
- lamp field: 16x 75W

Pump
- adjustable flow: 0...24L/h

Measuring ranges
- temperature: 4x 0...100°C
- flow rate: 0...30L/h
- illuminance: 0...3kW/m^2

230V, 50Hz, 1 phase
230V, 60Hz, 1 phase
230V, 60Hz, 3 phases
UL/CSA optional
LxWxH: 1840x800x1500mm
Weight: approx. 167kg

Required for operation

PC with Windows recommended

Scope of delivery

1 trainer
1 measuring cup
1 absorber
1 GUNT software + USB cable
1 set of instructional material