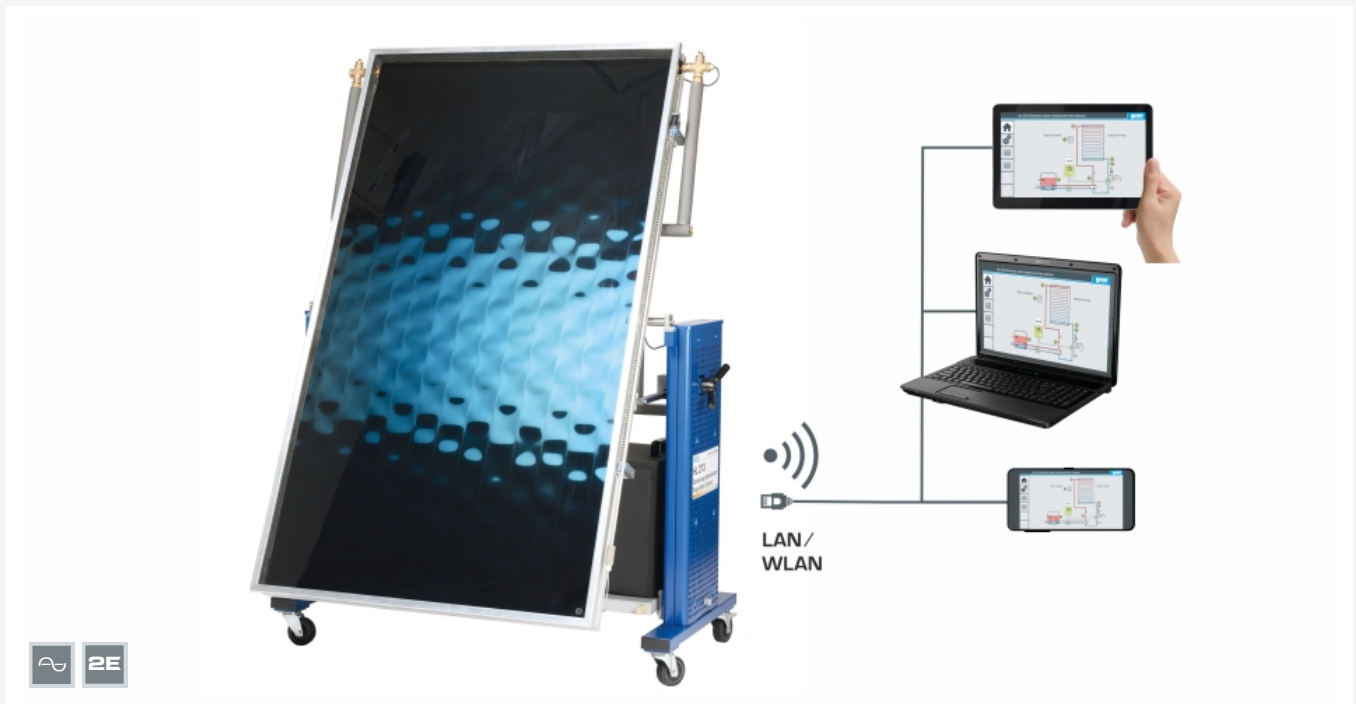


HL 313

Domestic water heating with flat collector



Display of the solar controller's user interface on any number of end devices

Description

- flat collector converts solar energy into heat
- system with heat exchanger and two separate circuits
- solar controller with data logger and integrated router for operation via web browser using an end device and for tracking experiments on numerous end devices: PC, tablet, smartphone

A widespread type of collector, which collects solar energy in a non-concentrating way, is the flat collector. The absorber is a selectively coated metal sheet that conducts heat well. The flat collector is mainly used for hot water preparation and heating support. It represents a balanced compromise between simple, cost-effective construction and efficiency.

HL 313 can be used to demonstrate the principal aspects of solar thermal domestic water heating in a system with components used in real world applications. Radiant energy is converted into heat in a commercially available flat collector and transferred to a heat transfer fluid in the solar circuit. The heat then gets into the hot water circuit via a heat exchanger. A solar controller controls the pumps for the hot water and solar circuits. The solar circuit is protected by

an expansion tank and a safety valve. The trainer has been designed so that it is possible to carry out a complete pre-heating as part of a practical experiment.

The temperatures in the storage tank, at the outlet from and the inlet to the collector are measured, as is the flow in the solar circuit. The measured values are recorded via the integrated data logger. Additionally, as in practice, the temperatures of the inlet and return are displayed on the solar circulation station.

The solar controller is operated via an integrated router. The user interface can be displayed on any number of terminals via a web browser. Different user levels with different functions can be selected. Access to recorded measured values is possible on Windows-based end devices via WLAN with integrated router or LAN connection to the customer's own network. An additional producer software of the solar controller is supplied for this purpose.

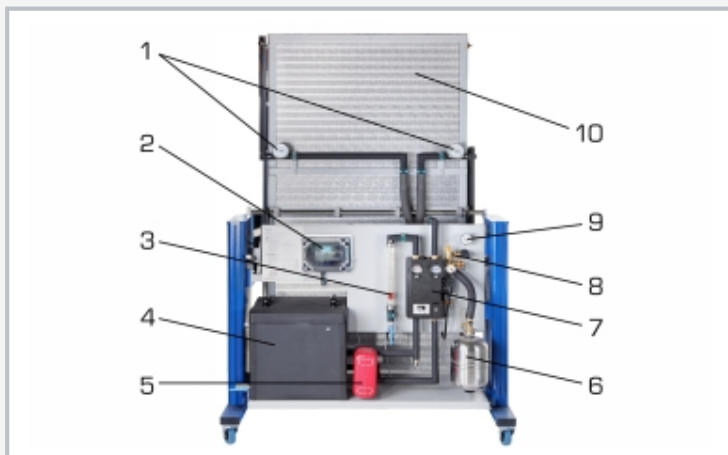
In order to ensure there is sufficient illumination, the system should be operated with solar radiation or the optionally available HL 313.01 Artificial light source.

Learning objectives/experiments

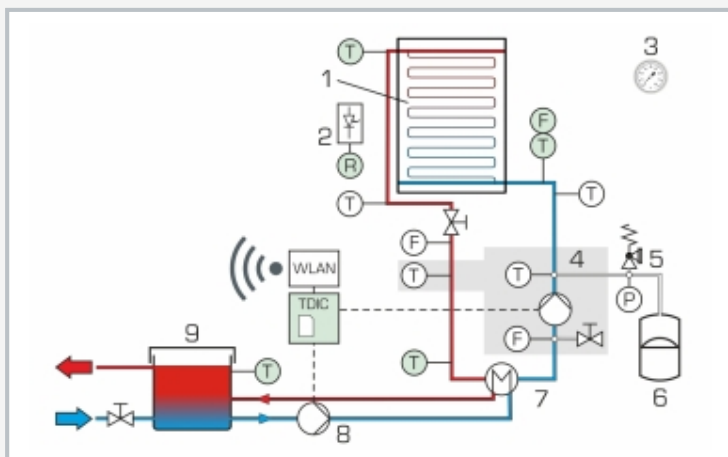
- familiarisation with the functions of the flat collector and the solar circuit
- determining the net power
- relationship between flow and net power
- determining the collector efficiency
- relationship between temperature difference (collector/environment) and collector efficiency

HL 313

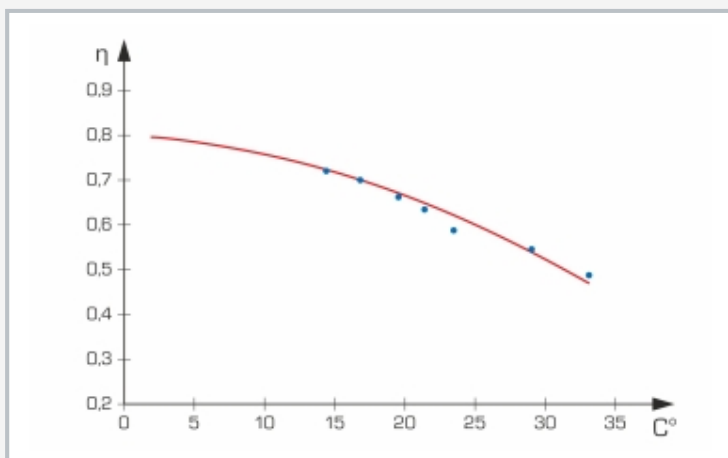
Domestic water heating with flat collector



1 inlet and return thermometer, 2 solar controller, 3 flow meter, 4 buffer tank, 5 heat exchanger, 6 expansion vessel, 7 solar circuit pump, 8 pressure relief valve, 9 ambient air thermometer, 10 collector



TDIC solar controller with data logger and SD memory card
 1 collector, 2 illuminance sensor, 3 ambient air thermometer, 4 solar circulation station with solar circuit pump, 5 safety valve, 6 expansion tank, 7 heat exchanger, 8 hot water circuit pump, 9 buffer tank
 F flow rate, T temperature, P pressure, R illuminance, green sensor for TDIC



Efficiency as a function of the temperature difference

Specification

- [1] investigating the function and operating behaviour of a flat collector
- [2] solar thermal flat collector with selectively absorbing coating
- [3] adjustable collector inclination angle
- [4] solar circuit with collector, pump, expansion vessel and safety valve
- [5] hot water circuit with buffer tank, pump and plate heat exchanger
- [6] 4 bimetallic thermometers
- [7] solar controller with temperature, flow rate and illuminance sensors
- [8] data logger with SD memory card
- [9] integrated router for operation and control via web browser using an end device and for tracking experiments on any number of end devices
- [10] experiment evaluation on Windows-based end devices possible, with additional producer software of the solar controller
- [11] operation with solar radiation or HL 313.01 Artificial light source

Technical data

Solar circuit

- collector
 - ▶ absorbing surface: 2,3m²
 - ▶ rated throughput: 20...200L/h
 - ▶ operating pressure: 1...3bar
- safety valve: 6bar

Hot water circuit

- plate heat exchanger: 3kW, 10 plates
- buffer tank 70L

Measuring ranges

- flow rate: 20...300L/h
- temperature: 4x 0...120°C

230V, 50Hz, 1 phase
 230V, 60Hz, 1 phase
 120V, 60Hz, 1 phase
 UL/CSA optional
 LxWxH: 1660x800x2300mm
 Weight: approx. 240kg

Required for operation

PC with Windows recommended

Scope of delivery

- 1 trainer
- 1 producer software for solar controller
- 1 set of instructional material

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Domestic water heating with flat collector

Optional accessories

HL 313.01	Artificial light source
ET 352	Vapour jet compressor in refrigeration
ET 352.01	Solar heat for refrigeration