

# HL 314

## Domestic water heating with tube collector



### Learning objectives/experiments

- familiarisation with the functions of the evacuated tube 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

### Description

- conversion of solar energy into heat
- trainer with real-world components
- pivotable evacuated tube collector
- system with heat exchanger and two separate circuits
- solar controller with data logger and USB interface

The HL 314 trainer 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 absorbed and converted into heat in a commercially available evacuated tube collector. Heatpipes located inside the absorbers enable heat transfer to a heat transfer fluid in the solar circuit.

Subsequently another heat exchanger feeds the heat into the hot water circuit and into the storage tank.

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.

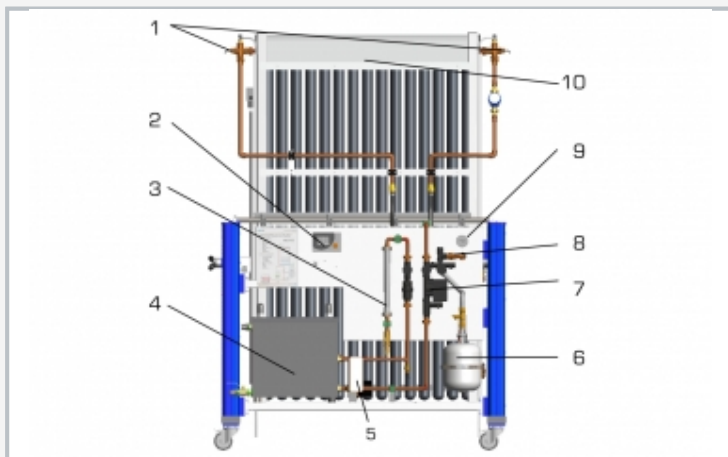
The trainer has been designed so that it is possible to carry out a complete pre-heating as part of a practical experiment.

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. Additionally, as in practice, the temperatures of the inlet and return are displayed on the solar circulation station.

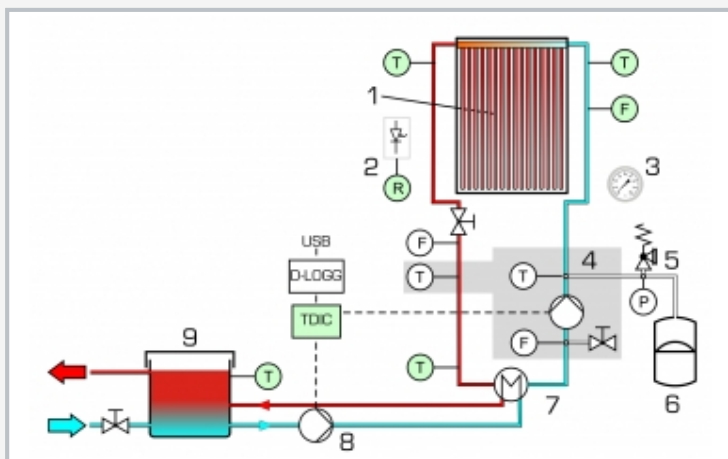
In order to ensure there is sufficient illumination, the system should be operated with solar radiation or the optionally available HL 313.01 Artificial light source.

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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 USB interface  
 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

### Specification

- [1] trainer for investigating the function and operating behaviour of a solar thermal collector
- [2] evacuated tube collector with selectively absorbing coating
- [3] connection of absorbers by heatpipes
- [4] adjustable collector inclination angle
- [5] solar circuit with collector, pump, expansion vessel and safety valve
- [6] hot water circuit with buffer tank, pump and plate heat exchanger
- [7] 4 bimetallic thermometers
- [8] solar controller with temperature, flow rate and illuminance sensors
- [9] data logger with USB interface
- [10] operation with solar radiation or HL 313.01 Artificial light source

### Technical data

#### Solar circuit

- collector
  - ▶ total surface: 2,5m<sup>2</sup>
  - ▶ absorbing surface: 1,4m<sup>2</sup>
  - ▶ number of tubes: 15
  - ▶ rated throughput: 58L/h
- Solar station
  - ▶ solar pump: adjustable
  - ▶ safety valve: 6bar

#### Hot water circuit

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

#### Measuring ranges

- flow rate: 20...320L/h
- temperature: 4x 0...160°C
- pressure: 0...6bar

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

### Scope of delivery

- 1 trainer
- 1 set of instructional material

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Optional accessories

065.31301

HL 313.01

Artificial light source