

# ET 203

## Parabolic trough collector with solar tracking



screen mirroring is possible on different end devices

### Description

- mobile parabolic trough collector with motorized two-axis tracking
- astronomical and sensor-based tracking
- plant control using an integrated PLC
- integrated router for operation and control via an end device and for screen mirroring on additional end devices: PC, tablet, smartphone

Parabolic trough collectors consist of parabolically shaped mirror surfaces in which the solar radiation is collected and concentrated in an absorber. A heat transfer fluid flows in the absorber tube and transports the heat to its destination.

With ET 203 the main aspects of solar thermal energy use with a parabolic trough collector can be investigated. For this purpose, solar radiation is focused by a parabolic mirror on an absorber tube. The radiation energy is absorbed and converted into heat. To reduce heat loss, the absorber tube is equipped with a double-walled glass envelope. Through a pipeline in the absorber, the heat is transferred to a heat transfer fluid in the solar circuit. Via a plate heat exchanger the heat is transferred to the hot water circuit and the storage tank.

The parabolic trough collector can be tracked via two geared motors to track the position of the sun. Both control according to calculated astronomical data and sensor-based control are possible. The solar circuit is protected by an expansion tank and a safety valve. The temperatures in the storage tank, at the outlet and inlet of the collector and the flow in the solar circuit are measured.

Operation and control are carried out via the integrated PLC and touch screen. By means of an integrated router, the trainer can alternatively be operated and controlled via an end device. The user interface can also be displayed on additional end devices (screen mirroring). Via the PLC, the measured values can be stored internally. Access to stored measured values is possible from end devices via WLAN with integrated router/ LAN connection to the customer's own network.

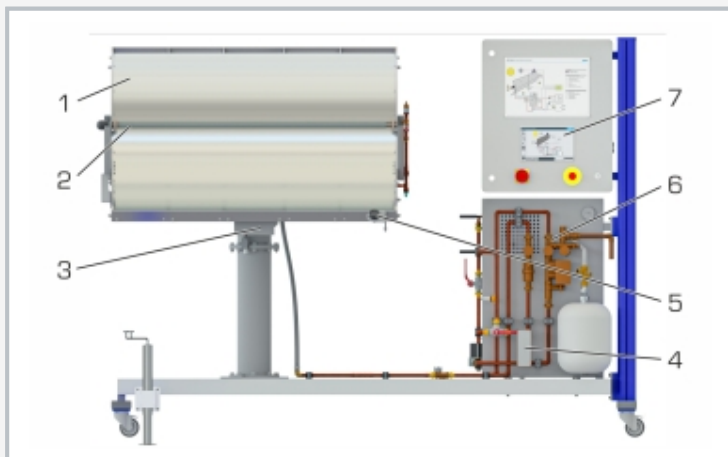
The parabolic trough collector can be pivoted and aligned vertically for experiments with the artificial light source HL 313.01. Rollers and movable supports make it possible to position and operate the test stand at a suitable outdoor location with little effort.

### Learning objectives/experiments

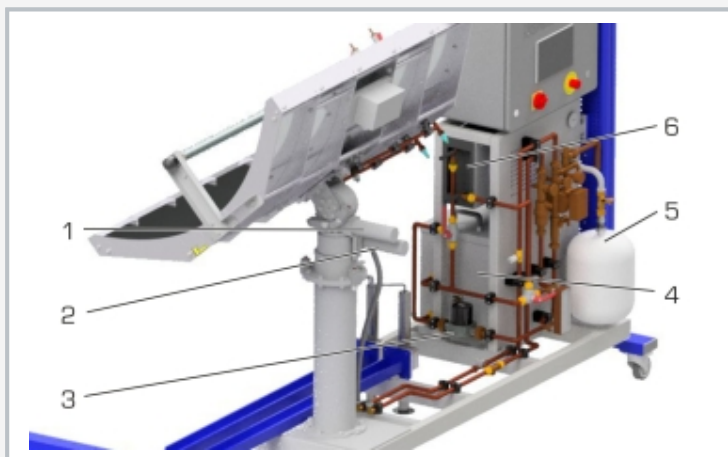
- focusing of solar radiation with a parabolic trough mirror
- optical concentration factor
- DNI: Direct Normal Irradiance
- sensor-based sun tracking
- astronomical sun tracking
- conversion of radiant energy into heat
- losses in thermal solar collectors
- efficiency curves

# ET 203

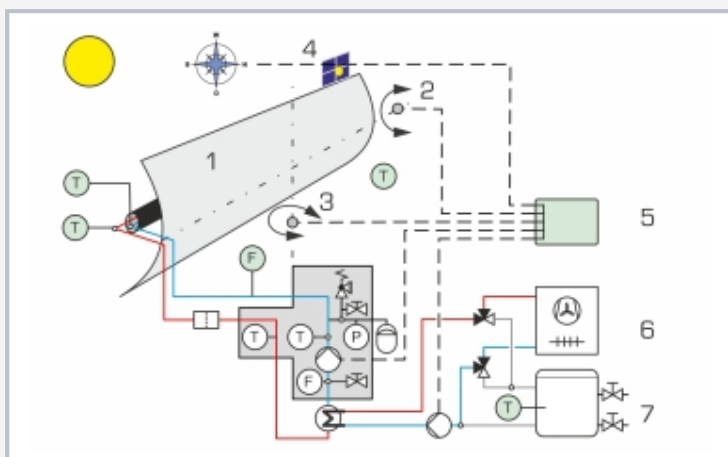
## Parabolic trough collector with solar tracking



1 parabolic mirror, 2 absorber, 3 tracking, 4 heat exchanger, 5 direction and position sensor, 6 solar circuit, 7 PLC with touch screen



1 elevation drive, 2 azimuth drive, 3 pump secondary circuit, 4 storage tank, 5 expansion tank, 6 cooler



1 parabolic trough collector, 2 elevation drive, 3 azimuth drive, 4 direction and position sensor, 5 PLC, 6 cooler, 7 storage; green: sensors for PLC

### Specification

- [1] thermal solar collector with parabolic trough mirror and selectively absorbing absorber tube
- [2] two-axis sun tracking with gear motors
- [3] plant control with PLC, operation via touch screen
- [4] integrated router for operation and control via an end device and for screen mirroring: mirroring of the user interface on up to 5 end devices
- [5] integrated sun sensor (Direct Normal Irradiance)
- [6] integrated magnetometer and accelerometer for astronomical alignment
- [7] connection of the absorber pipe by solar circuit with pump, plate heat exchanger, expansion vessel and safety valve
- [8] hot water circuit with buffer tank, pump and connectable air heat exchanger
- [9] sensors for temperature, illuminance and flow
- [10] pivoted suspension enables vertical alignment of the collector
- [11] operation with solar radiation or with artificial light source HL 313.01
- [12] data acquisition via PLC on internal memory, access to stored measured values via WLAN/LAN with integrated router/LAN connection to customer's own network or direct LAN connection without customer network

### Technical data

PLC: Eaton XV-303

Collector

- parabolic mirror
  - ▶ trough length: 1,4m
  - ▶ aperture width: 1,1m
  - ▶ mirror surface: 1,5m<sup>2</sup>
  - ▶ focal length: 0,3m
- absorber
  - ▶ selectively coated absorber tubes with U-tube line for heat transfer fluid
  - ▶ double-walled glass shell to reduce heat loss
- solar circuit station
  - ▶ solar pump: adjustable

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: 2610x940x2000mm

Weight: approx. 350kg

### Required for operation

PC with Windows recommended

### Scope of delivery

- 1 trainer
- 1 set of instructional material

## **ET 203**

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Optional accessories

HL 313.01

Artificial light source