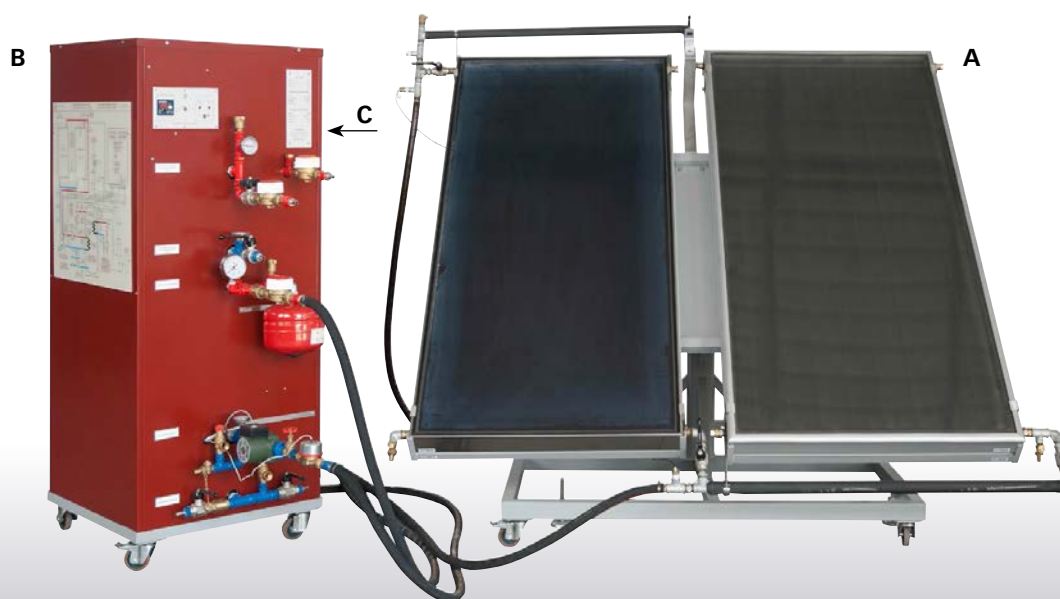


# COMPUTERIZED FLAT PLATE COLLECTOR TRAINER

## Mod. TBS/EV



## INTRODUCTION

Energy saving and environmental pollution reduction are crucial global issues. Using renewable energies as alternative sources to fossil fuels can address both issues, with great benefits especially in countries where traditional energy sources are scarce.

Considering the above, this system enables experimental investigation on the conversion of sunlight into thermal energy for domestic hot water production by means of two flat plate solar collectors. The equipment is manufactured using real components available on the market.

*A video demonstration is available on Elettronica Veneta YouTube channel*



Scan code to watch



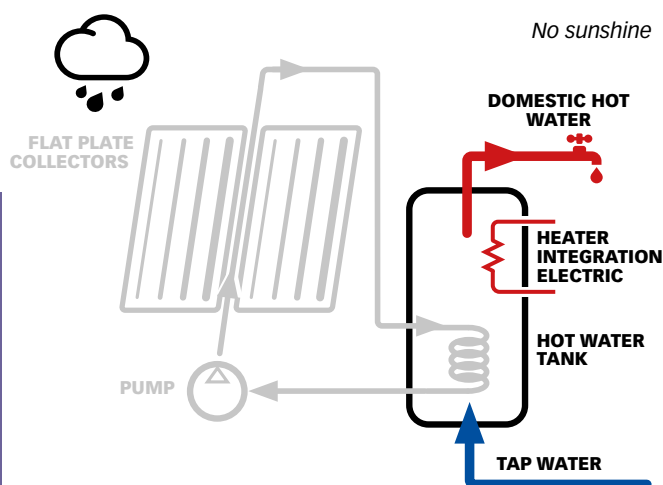
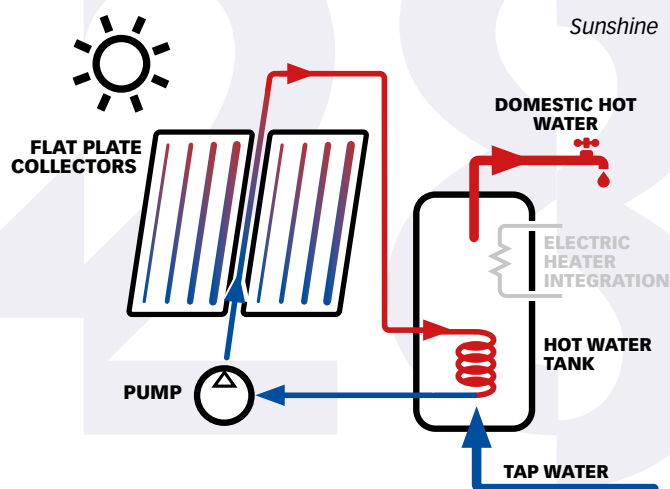
## DESCRIPTION

**The system consists of:**

- A)** Flat plate solar collectors array mounted on castors
- B)** Water storage tank with circulation unit and instrumentation
- C)** PC data acquisition

**Relevant features:**

- The solar collectors array is equipped with shut-off valves that control the operation of one collector or both
- The collectors array can be used outdoors and indoors. In case of indoor use, the lighting device SS-1/EV is required (**optional item** - refer to the end of this data sheet)
- The solar collectors array is mounted on castors; the frame can be tilted to compare system performance under different inclination and orientation
- The hot water stored in the tank is used as domestic hot water
- In case of prolonged absence of sun, the equipment allows to heat the water in the storage tank electrically.

**Operating principle:**

When sun is shining the solar rays strike the flat plate collector highly absorbent surface heating the water there contained. After reaching a temperature slightly higher than that of the water contained in the storage tank hydraulically connected to the collectors, the circulation pump switches on and transfers heat from the collectors to the tank.

In case of prolonged absence of sunshine, an electric heater can meet the domestic hot water demands.

**TRAINING PROGRAM**

- Physical principles whereby solar energy heats water exploiting flat plate collectors
- Sizing of collector surface, storage tank, primary circuit
- Flat plate collector energy balance and efficiency
- Efficiency line
- Filling and maintenance operations
- Experimental assessment of flat plate collector instantaneous efficiency and system efficiency
- Plant parameters optimization
- Domestic hot water daily production assessment
- Study of energy flows and related measurement devices

**TECHNICAL SPECIFICATIONS****Flat plate solar collectors array mounted on castors:**

- Steel frame with adjustable inclination
- Flat plate collectors:
  - 1 solar collector, surface area 2 m<sup>2</sup>, copper absorber plate, rockwool insulation
  - 1 high efficiency solar collector with thin specially flattened and shaped copper pipes, surface area 1,8 m<sup>2</sup>, ceramic fiber insulation
- Air venting valve
- Shut-off valves

**Water storage tank with circulation unit and instrumentation**

- Tank for domestic hot water storage mounted on castors:
  - capacity: 200 liters
  - 2 coil heat exchangers
  - dial thermometer, range: 0 ÷ 120°C
  - wells for temperature measurements
  - 1,5 kW built-in electrical resistance with immersion thermostat for thermal power integration
  - thermal insulation: polyurethane, thickness 6 cm
- Circulation unit including:
  - variable speed pump, maximum head: 50 kPa, maximum flow rate: 3,5 m<sup>3</sup>/h
  - safety valve
  - check valve
  - gate valve
  - automatic air venting valve
  - fill/drain cock
  - dial pressure gauge, range: 0 ÷ 6 bar
  - dial flow and return thermometers, range: 0 ÷ 120°C
  - mechanical water counter
- Water feeding line including:
  - shut-off ball valve
  - check valve
  - safety valve
- Expansion vessel
- Domestic hot water line including mechanical water counter
- Comprehensive colored diagram of the system
- Thermomagnetic differential switch

**Flexible pipes**

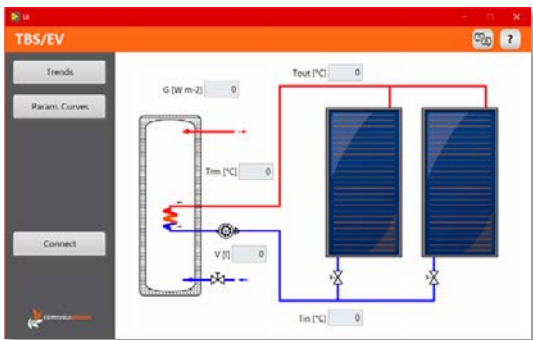
- 10 + 10 meter length 120°C black pipe for connection of the collector array to the tank
- 6 meter length reinforced pipe for connection of water feeding line and hot water line (if present)

**Probes and sensors**

- Freely configurable digital controller for the management, monitoring and control of systems with HVAC applications
- PC communication interface module with USB port
- Collector outlet temperature sensor
  - Range: -30 ÷ +180°C
- Collector inlet temperature sensor
  - Range: -30 ÷ +130°C
- Storage tank temperature sensor
  - Range: -30 ÷ +130°C
- Environment temperature sensor
  - Range: -35 ÷ +90°C
- Universal mechanical meter with pulse output for water count
  - Rated flow rate: 1,5 m<sup>3</sup>/h
- Solar radiation sensor
  - Range: 0 ÷ 2000 W/m<sup>2</sup>

**PC data acquisition**

- The trainer is supplied with a specific software for monitoring the system parameters.
- Parameters displayed:
  - solar collectors inlet and outlet temperature
  - environment temperature
  - solar radiation incident on the collectors plane
  - quantity of water drawn by the pump



- The software enables to:
  - Visualize and modify the digital controller configuration parameters
  - Visualize the trend of the solar radiation incident on the collectors, quantity of water drawn by the pump and all process temperatures



- Save the exercises data for future analysis and for calculating the instantaneous and average collectors efficiency

**Power supply:** 230 Vac 50 Hz single-phase - 1500 VA  
(Other voltage and frequency on request)

**Dimensions**

- Storage tank: 70 x 70 x 150 cm
- 1 Solar collector: 100 x 200 x 10 cm
- Solar collectors array: 230 x 150 x 150 cm
- Net weight:** 300 kg

**REQUIRED**

**PERSONAL COMPUTER**  
- NOT INCLUDED -



**UTILITIES (PROVIDED BY THE CUSTOMER)**

- **Water supply:** min pressure 1 bar - max pressure 2,5 bar

**SUPPLIED WITH**

**THEORETICAL-EXPERIMENTAL HANDBOOK**



**OPTIONAL (REF. ACCESS. AND INSTRUMENTS)**

**INDOOR LIGHTING DEVICE**  
**Mod. SS-1/EV**

To operate the solar collectors array indoor

