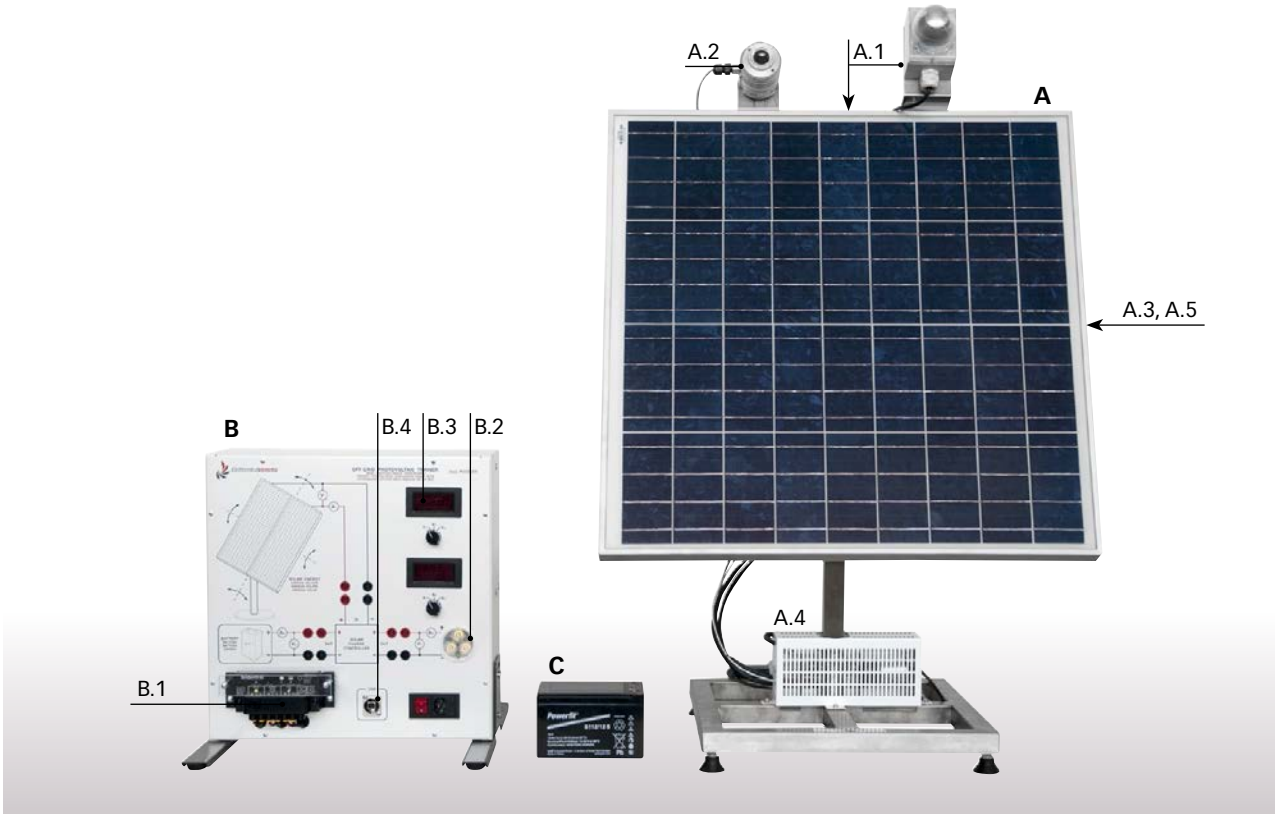
COMPUTERIZED SOLAR TRACKING SYSTEM

Mod. S-TRACK/EV



INTRODUCTION

Energy saving is an issue of fundamental importance at global level. The use of a solar tracking system applied to a photovoltaic array allows to face this issue, with clear benefits, if compared to a fixed installation.

In this context, the proposed system, which uses real components available on the market, allows the study and experimentation of the operation of a two-axis solar tracking system applied to a silicon cell photovoltaic panel.

DESCRIPTION

System configuration: stand-alone (isolated from the grid)

The system consists of:

A) Table top silicon cell photovoltaic (PV) panel including:
- **A.1)** Solar tracker
- **A.2)** Solar radiation sensor
- **A.3)** Temperature sensor
- **A.4)** Direction sensor
- **A.5)** Inclination sensor

B) Table top control panel including:
- **B.1)** Charge controller
- **B.2)** Electric load
- **B.3)** Electric instrumentation for detecting the energy flows in the different branches of the circuit
- **B.4)** Data acquisition board with USB interface for PC connection

C) Buffer battery

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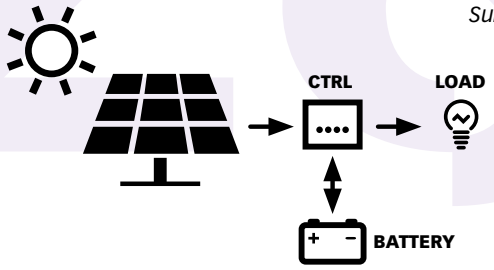
Relevant features:

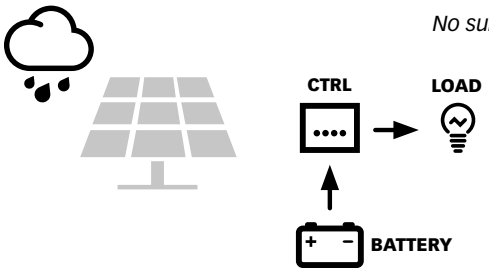
- The PV panel can be used both outdoors and indoors. In case of indoor use, the lighting device *SS-2/EV* is required (**optional item** - refer to the end of this data sheet)
- The PV panel can be disconnected from the system to draw the characteristic curve. The portable rheostat *PRH-1* is required (**optional item** - refer to the end of this data sheet)
- The PV panel can track the sun along one or two axes, to allow the comparison of the performance between a fixed installation (such as the one on the roof of a house) and an installation with tracking device

Operating principle:

Sunshine



No sunshine



- With sunshine and loads, the energy produced by the system partially charges the battery and partially powers the loads
- When the consumption is higher than the power available from the sun, the power surplus is given by the battery
- With sunshine and no load connected, all the energy produced by the system charges the battery
- In case there is no sunshine, all the energy consumed by the user (loads) is taken from the battery

TRAINING PROGRAM

- Components of a stand-alone solar system for electricity production
- Operation of a one / two axis solar tracker
- Effect of panel inclination and orientation variation on the electric power output
- Effect of solar radiation on the panel output voltage
- Effect of applied load variation on the electric power produced by the panel
- Effects of shading on a real solar installation
- Photovoltaic panel energy conversion efficiency
- Battery charging system management
- Connection to portable rheostat *PRH-1* (**optional item** – refer to the end of this data sheet) for photovoltaic panel characteristic curve construction

TECHNICAL SPECIFICATIONS

Silicon cell photovoltaic (PV) panel

- Table top stainless steel frame
- 60 W photovoltaic panel
- Solar tracker:
  - Automatic/manual two axes tracking: RIGHT/LEFT and UP/DOWN for maximum insolation
  - Solar sensors assembly
  - Actuators with DC motors
- Solar radiation sensor for measuring and transmitting the global solar radiation incident on the PV panel to the control panel
- Temperature sensor for measuring and transmitting the PV panel temperature to the control panel
- Direction sensor for measuring and transmitting the angle that the tracker rotates from its reference point (Geographical South) to the control panel
- Inclination sensor for measuring and transmitting the angle that the tracker rotates from its reference point (horizontal plane) to the control panel

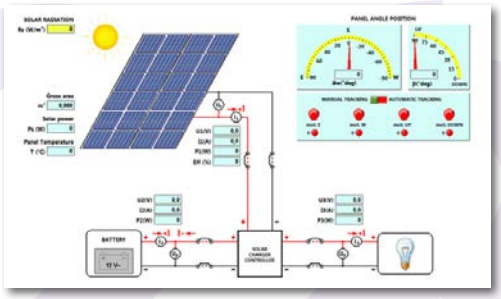
Table top control panel

- Metal structure with complete color synoptic diagram
- Charge controller:
  - rated voltage: 12 Vdc
  - max. power input from solar panel: 6,5 A
  - max. switch off current at LOAD-output: 6 A
- Electric load: 12 Vdc lamp
- Instrumentation:
  - Digital voltmeter
  - Digital ammeter

Buffer battery

- Rated voltage: 12 Vdc
- Capacity: 12 Ah

PC data acquisition



- The unit is supplied with data acquisition board with USB interface for connection to PC.
- The unit is supplied with a dedicated software package (LabView environment) for monitoring the different parameters of the system.
- The visualized parameters are:
  - All DC parameters
  - Global solar radiation incident on the PV panel
  - PV panel temperature
  - PV panel deviation angle on respect to the South
  - PV panel inclination angle on respect to the horizontal plane
- The software allows to:
  - Calculate solar energy conversion efficiency
  - Visualize the trend of the solar radiation incident on the PV panel and the energy flows to and from buffer battery and PV panel
  - Save the exercises data for future analysis or project work

Power supply:	230 Vac 50 Hz single-phase - 50 VA (Other voltage and frequency on request)	
Dimensions:	Control panel:	40 x 40 x 12 cm
	Solar panel:	70 x 70 x 100 cm
Tot weight:	35 kg	

REQUIRED

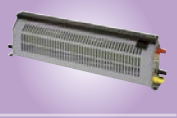
PERSONAL COMPUTER
- NOT INCLUDED -

SUPPLIED WITH

THEORETICAL-EXPERIMENTAL HANDBOOK

OPTIONAL (REF. ACCESS. AND INSTRUMENTS)

PORTABLE RHEOSTAT Mod. PRH-1
To draw the PV panel characteristic curve



INDOOR LIGHTING DEVICE Mod. SS-2/EV
To operate the photovoltaic panel indoor

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