EN 01.6 - COMPUTERIZED PHOTOVOLTAIC INSTALLATION DEMONSTRATOR

The EN 01.6 equipment scales a complete photovoltaic solar system. It has been designed with special emphasis on the didactic aspect of it, being able to observe at a glance all the components that a solar photovoltaic installation has and its arrangement. It allows the study of both, isolated photovoltaic solar energy installations and grid connection.

The equipment consists of: 2 photovoltaic panels of 20Wp, 2 batteries, regulator, insulated inverter, grid inverter, solar panel emulator, pyranometer, temperature sensors in panels, various DC and AC loads, and module control and data acquisition.

It has cables ready to connect and disconnect the various elements of the installation in different ways, being able to observe and analyze the operation of the panels connected independently, in series, in parallel, with batteries in series or in parallel, with direct output in Direct current or direct current to AC converter, working in isle or connected to the grid.

It is provided with elements of measurement of the variables necessary to analyze the characteristics of the panels and their behavior. Thus, it has a pyranometer that indicates the intensity of radiation that affects the panels, with voltmeters and ammeters that show us respectively the voltage and the intensity generated.

It also has ammeter and voltmeter in each of the batteries to indicate the state of these and the direction of flow of the current in them, that is to say if they are loading or providing load. It has also a measuring instrument that provides us all the characteristics of the alternating current obtained after the inverter.

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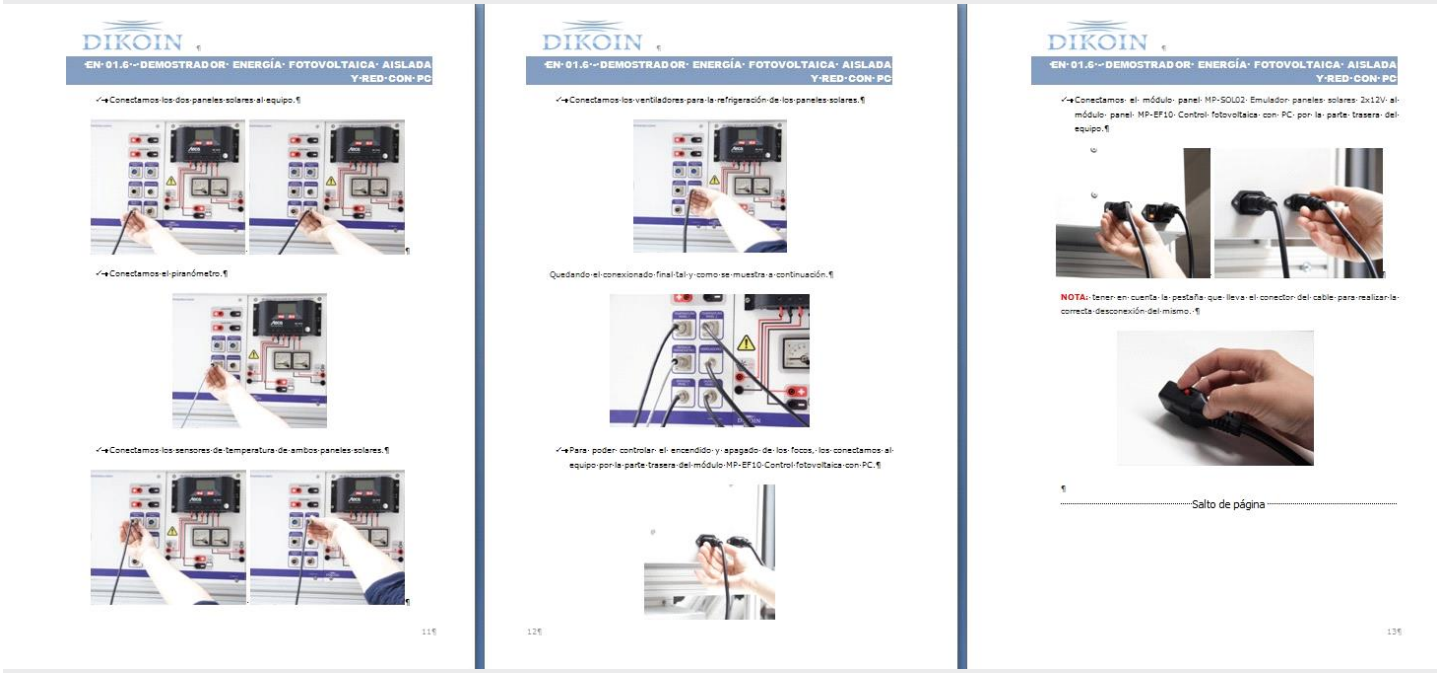

The user manual clearly shows and with a large number of images, the entire process to be followed to operate the equipment.

The practical manual shows and explains all the theoretical foundations, as well as the mathematical formulas used for the realization of all the experimentation.

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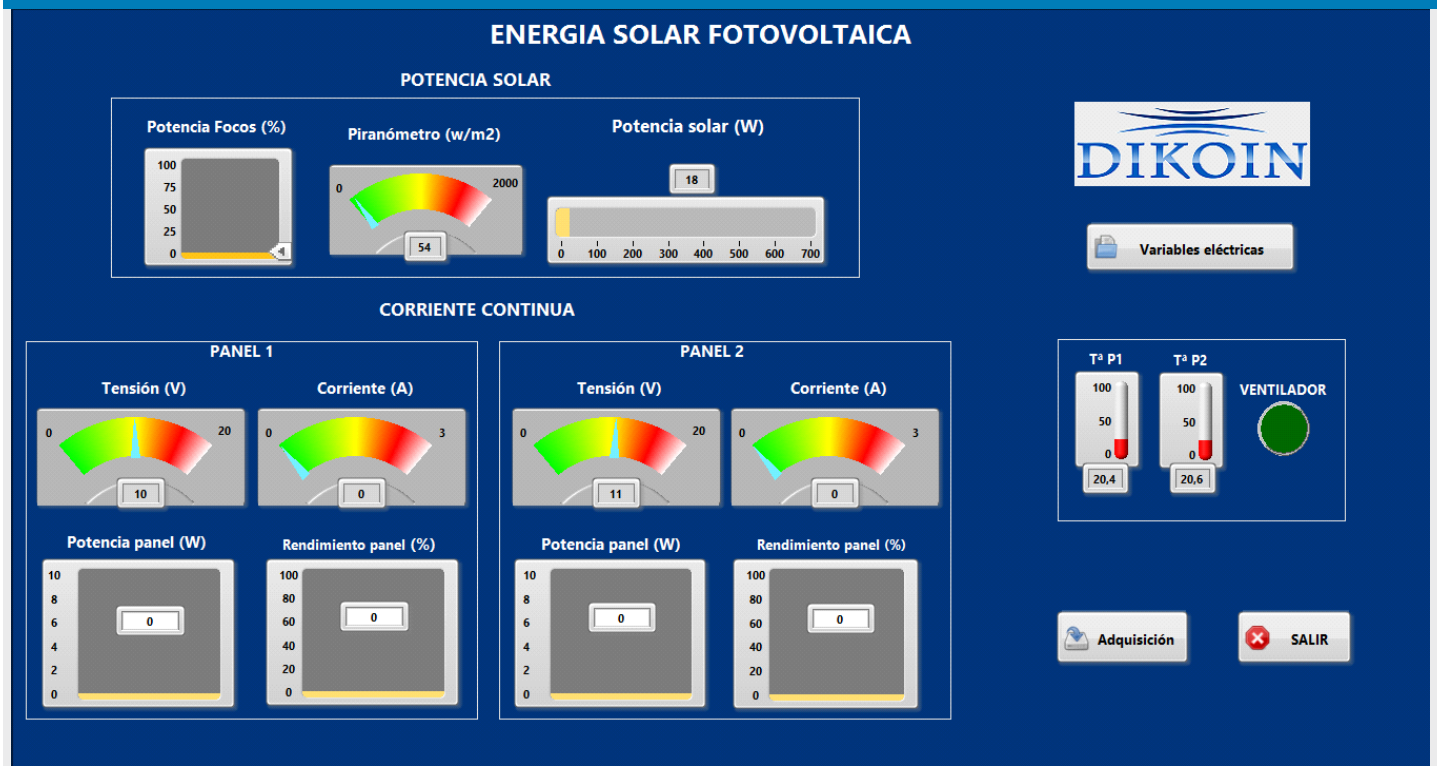

The equipment includes a PC with the equipment management software. In which, the parameters of all control points of the equipment are shown, and the data collection is allowed in automatic or manual mode.

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LEARNING OBJECTIVES

A wide range of practices and experiences can be realized with this equipment, here are some of them:

- Study of the operation of a solar photovoltaic installation.
  - Isolated panels.
  - Panels connected to batteries.
  - Operating with different types of continuous loads.
  - Conversion of direct current to alternating current.
  - Operating with different types of alternating loads.
  - Operation in isle and network connection.
  - Rendimientos de la instalación.
  - Efficiency of the investors.
  - Representation through energy balance.

- Determinación de las características de los paneles solares.
  - Intensity curve - voltage at different temperatures.
  - Intensity of short circuit.
  - Voltage in open circuit.
  - Power curve – Voltage at different temperatures.
  - Power curve – Load resistance.
  - Maximum power generated.
  - Form factor.
  - Efficiency.

- Influence of the angle of inclination and the intensity of radiation in the generated energy.

- Determination of the characteristics of the panels connected in series or in parallel.

- Determination of the characteristics of the panels connected in parallel.

- Study of the behavior of solar panels in various operating conditions.
  - Isolated panels.
  - In parallel with different loads.
  - In series with different loads.
  - Panels connected to batteries in series.
  - In parallel with different loads.
  - In series with different loads.
  - Panels connected to batteries in parallel.
  - In parallel with different loads.
  - In series with different loads.

- Study assisted in PC.

TECHNICAL DATA

- Panels: 2 photovoltaic panels of 20Wp.

- Control of temperature in the solar panels, to control the efficiency as a function of temperature.

- Cooling system of photovoltaic panels using fans.

- Regulation of the intensity of the lights, which simulate the sun.

- Battery charge controller: Regulator with 12 or 24V CC operation, and maximum current =10A. Maximum input voltage= 45V.

- Batteries: 2 Batteries of 12V 10Ah.

- Investorss:
  - Sinusoidal inverter operating on Island 200 VA power, with 230V / 50Hz output.
  - Inverter for network connection 230V / 50Hz.

- Solar panel emulator module for connection to inverter for network connection, with solar intensity regulation.

- Pyranometer for the measurement of solar intensity.

- Rheostat for analysis of voltage-current graph in solar panels and comparison with specifications. It allows in series or parallel connection.

- Data acquisition card.

- The equipment is supplied with a complete workbook with its resolute version.

- Computer integrated in the equipment with teaching software.

REQUIREMENTS

- *Power supply: 230V/50Hz.*

* Other electrical inputs available.

Note: The picture shown may not correspond exactly to the supplied equipment.

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