

CPE-EN4600

Solar/Wind/Fuel Cell Training System



FEATURES

- Integrated training system designed to help the user learn basic principles of renewable energy and practice circuit configuration throughout theory verification and simulation
- Supports minimized installation spaces to perform indoor experiments by each group of two persons
- Comprehensive experiments, from the basic to advanced level, on characteristics of solar cells, PV modules, off-grid inverter, grid-tied inverter, AC load and DC load
- Modularized structure with a modular rack for easy attachment and detachment of modules
- Provides PC program for monitoring and data analysis for the voltage, current and temperature values of experimental modules
- Hands-on power control practices covering various power generation system: off-grid, grid-tied, hybrid (option) and smart grid (option)

EXPERIMENTAL CONTENTS

- Basic principles of solar PV power generation
- Solar PV system related practices
- Characteristics of power generation by the solar amount
- Electrical characteristics such as open circuit voltage and short-circuit current
- I-V, P-V characteristics by the incidence angle of solar modules
- I-V, P-V characteristics according to the distance of solar modules
- I-V, P-V characteristics based on the temperature characteristics of solar modules
- I-V, P-V characteristics based on the irradiance of solar modules
- V-I characteristics and load in solar generation according to the solar cell connection in series or parallel
- Characteristics of battery
- Battery charge-discharge practices using a charging controller
- Power conversion through the off-grid inverter
- Off-grid inverter's load / no load
- Power conversion through the grid-tied inverter
- The faraday efficiency and electrolysis's energy efficiency
- Data measurement and control practice using RS-485 serial port
- Voltage / current / temperature measurement using software
- Characteristics of Reverse voltage protection diodes

SPECIFICATIONS

AC Power Source Module (M01)

- Dimension: 150(W) x 309(H) x 120(D)mm
- ELCB(AC220V/60Hz/15A/15mA): 1ea
- AC Inlet (built-in fuse, 5A): 1ea
- AC power lamp: 1ea
- AC 220V I/O connector (3 / 4 pins): 1ea



Diode Module (M02)

- Dimension: 150(W) x 309(H) x 120(D)mm
- Schottky Barrier Diode: 4ea
 - Max. power voltage (Vmp): 40V
 - Max. reverse Voltage (Vmp): 40V
 - Max. current (Io) : 5A



Fuse Module (M03)

- Fuse: 4ea
- Rated voltage: 250V 5A
- Dimension: 150(W) x 309(H) x 120(D)mm



Charging Controller Module (M04)

- Dimension: 150(W) x 309(H) x 120(D)mm
- Charging Controller
 - Normal Voltage : 12V
 - Boost Voltage : 13.5V(25°C), 2hr
 - Equalization Voltage : 14.8V(25°C), 2hr
 - Float Voltage : 13.7V(25°C)
 - Low voltage cut-off function (LVD):
 - 11.4~11.9V (Controlled by the charging status)
 - 11.0V (Controlled by voltage)
 - Load re-connection voltage: 12.8V
 - Temperature compensation: -4mV/Cell*k
 - Maximum input current (solar panel):
 - 5A / 8A / 10A / 15A / 20A
 - Maximum load current (load):
 - 5A / 8A / 10A / 15A / 20A



Battery Module (M05)

- Dimension: 150(W) x 309(H) x 120(D)mm
- Battery (12V, 17AH): 1ea
- Battery I/O terminal (4mm insulation)
 - Solar input: 1 pair
 - Inverter output: 1 pair
- Battery Switch: 1ea
- Battery status indicator: 1ea



Stand-Alone Inverter Module (M06)

- Dimension : 150(W) x 309(H) x 120(D)mm
- Inverter
 - Output(AC): 250W quasi-sine wave
 - Frequency: 60Hz
 - Protection: overheat, short-circuit, overload
 - Warning: Alarm beep and red light at the time of low power and overheat



DC Load Module (M07)

- Dimension: 380(W) x 309(H) x 120(D)mm
- DC lamp and socket (DC12V/10W): 2ea
- Buzzer (DC12V): 1ea
- Fan (DC12V, protection cover): 1ea
- Variable resistor (50W/10Ω, 50W/50Ω): 1ea
- DC Voltmeter: 1ea
- DC Ampere Meter: 1ea
- DC input terminal (4mm insulation type): 1 set
- Load selector switch: 5ea



AC Load Module (M08)

- Dimension: 380(W) x 309(H) x 120(D)mm
- AC lamp and socket (AC220V): 2ea
- Buzzer (AC220V): 1ea
- AC motor (AC220V, rotary-disc type): 1ea
- AC motor control (phase control) device: 1ea
- Selector switch (AC motor and lamp): 1ea
- AC voltmeter: 1ea
- AC ampere meter: 1ea
- Load selector switch: 5ea



Grid-tied Inverter Module (M09)

- Dimension: 380(W) x 309(H) x 120(D)mm
- Output power: 1,100W at 50°C (1,250W Max)
- Import watt-hour meter: 1ea
- Export watt-hour meter: 1ea
- ELCB(AC220V/60Hz/15A/30mA): 2ea
- DC Circuit Breaker: 1ea



Shunt Module-A(1A, 50mV)(M10)

- Rating: 1A/50mV
- Terminal block
 - INPUT terminal
 - 50mV +. - terminal



Shunt Module-B(5A, 50mV)(M11)

- Rating: 5A/50mV
- Terminal block
 - Input terminal
 - 50mV +. - terminal



PV Meter Module (M12)

- Dimension : 150(W) x 309(H) x 120(D)mm
- DC voltmeter: 1ea
- DC ampere meter: 1ea
- Connector (RS-485): 2ea
- RS-485 connection cable: 1ea



Watt-Hour Meter Module (M13)

- Dimension : 250(W) x 309(H) x 120(D)mm
- Single-phase 2-wire type (1P2W)
- Current: 30(10)A
- Voltage: 220V



Automatic Charger Module (M14)

- Dimension: 150(W) x 309(H) x 120(D)mm
- Indicator: Displays the battery charging status
- Chargeable voltage selection: 13.4V, 14.4V
- Charging current: Rated 10A
- Output short-circuit protection
- High-efficient automatic recharge function
- AC Inlet (built-in fuse): 1ea
- DC output terminal (4mm insulation type): 1 set
- DC voltmeter: 1ea



RS-485 / USB Converter Module (M15)

- Dimension : 150(W) x 309(H) x 120(D)mm
- Connector (RS-485): 2ea
- AC 220V I/O connector (3-pin & 4-pin): 1 set
- AC 220V connection cable (3-pin & 4-pin): 1ea



Data Collector Module (M16)

- Dimension: 380(W) x 309(H) x 120(D)mm
- Connector (USB terminal): 1ea
- Variable resistance (0~200Ω): 1ea
- AC 220V connection cable: 1ea
- Data Collect Display: 1ea
- Load characteristics
 - Motor (DC 12V) : 1ea
 - Lamp-1 (DC 24V): 2ea
- PV & Sensor Input
 - Photovoltaic (4-pin): 1ea
 - Temperature actinometry (8-pin): 1ea



Light & PV Array Module (M17)

- PV Module
 - Maximum output (Max. Power : P_m) : 10W x 2EA
- Halogen lamp
 - Output: 300W
 - Heat resistant glass
 - Dimming control : 0~100%



STANDARD ACCESORIES

- AC power cord: 1ea
- Connection cable (insulation type): 1set
- RS-485 communication cable: 1set
- AC 220V input connector (3 pins and 4 pins): 1set
- AC 220V output connector (3 pins and 4 pins): 1set
- PC Software CD (monitoring program)
- Experimental manual: 1ea

OPTIONS

- Hybrid and smart grid experimental modules (CPE-EN4500)
- Experimental table set