

## GES-100

### Solar Cell Trainer



\* Notebook is excluded

The GES-100 Solar Cell Trainer is an easy and self-contained trainer designed for learning the basic configuration and characteristics of a solar cell.

Through the use of different irradiations for various load units, students study the photoelectric effect of solar cells and plot the current-voltage curve as well as charging/discharging curves.

#### ► Features

- Self-contained solar cell trainer
- Adjustable solar irradiation and azimuth for sunlight simulation
- Equipped with DAQ is advantageous to acquire and save the experimental data

#### ► Specifications

##### ► Solar Cell Base (GES-18001)

##### 1. Solar Cell Modules

- (1) 4 pcs of monocrystalline silicon solar cell 6\*12 cm
- (2) Each solar cell unit :
  - a. Open circuit voltage (Voc) : 0.55V
  - b. Short circuit current (Isc) : 2.3A
  - c. Maximum load voltage (Vpm) : 0.5V
  - d. Maximum load current (Ipm) : 2.2A
  - e. Maximum power (Ppm) : 1.1W
  - f. Efficiency (Eff) : 15%

##### 2. Dimmer

- (1) Adjust the brightness of halogen lamp :
  - a. Input voltage 110VAC or 220VAC
  - b. Output voltage 12V

##### 3. Light Source

- (1) Halogen lamp 12V/50W
- (2) Beam angle 60°



GES-18001

#### ► Solar Cell Module (GES-13001)

##### 1. Digital Multimeter x 2

- (1) DC Voltage : 400mV, 4V, 40V, auto range  
Input resistance  $\geq 10M\Omega$
- (2) AC Voltage : 400mV, 4V, 40V, auto range  
Input resistance  $\geq 10M\Omega$
- (3) DC Current : 400 $\mu$ A, 400mA, 10A, push button selector switch  
10A Range : 10A/250V fuse protected  
mA/ $\mu$ A Ranges : 0.5A/ 250V fuse protected
- (4) AC Current : 400 $\mu$ A, 400mA, 10A, push button selector switch  
10A Range : 10A/250V fuse protected  
mA/ $\mu$ A Ranges : 0.5A/250V fuse protected
- (5) Resistance : 400 $\Omega$ , 4K $\Omega$ , 40K $\Omega$ , 4M $\Omega$ , 40M $\Omega$ , auto range
- (6) Diode test : 0~1.5V
- (7) Continuity : Buzzer for the measured resistance < 30 $\Omega$
- (8) Display : 3  $\frac{3}{4}$  digit LCD, max. indication 3999

##### 2. Energy Storage

- (1) NiMH rechargeable battery 1.2V/80mAh
- (2) Super capacitor 10F/2.7V

##### 3. Load

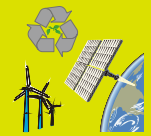
- (1) DC motor : 0.5V~6V, 10mA
- (2) Light bulb : 1.1V, 300mA
- (3) Potentiometer : 100 $\Omega$ , 10-turn

##### 4. Inverter

- (1) Input voltage : 2VDC
- (2) Output :
  - a. Modified sine wave 1Vpp 50/60Hz
  - b. Square wave 2Vpp 50/60Hz

#### ► Power Supply

1. Input voltage 110/220 VAC
2. Output voltage 15VDC



GES-13001

## ► DAQ with Software (GES-13003)

1. Channel 1 and 2 : max. input voltage  $\pm 5V$
2. Channel 3 and 4 : max. input current 1A
3. DAQ type:  
GES-13003 for Windows 8/Windows 7/Vista/XP
4. PC Requirements
  - (1) INTEL CPU P4 or better
  - (2) USB port equipped
  - (3) 1GB of hard disk space
  - (4) CD-ROM drive
  - (5) Operating system: Windows 8/Windows 7/Vista/XP



GES-13003

## ► List of Experiments

1. Measuring the irradiation of various light sources
2. Energy conversion of solar cells
3. Diode characteristic of a solar cell
4. Effect of light-sensing area on the open-circuit voltage of solar cell
5. Effect of light-sensing area on the short-circuit current of solar cell
6. Effect of irradiation on open-circuit voltage and short-circuit current of solar cells
7. Relationship between the angle of irradiation and the short-circuit current of solar cell
8. Open-circuit voltage and short-circuit current of solar cells connected in series-shading
9. Open-circuit voltage and short-circuit current of solar cells connected in parallel-shading
10. I-V curve of solar cells
11. Conversion efficiency and Maximum Power Point(MPP)
12. Simulating a daily course of sunlight
13. Charging a capacitor with solar cells
14. Capacitor discharging
15. Constructing a solar power island system
16. Inverter

## ► Accessories (GES-19001)

1. Test leads : 1 set
2. Experiment manual
3. Instructor's manual
4. Basic solar power meter (GES-18002)
  - (1) Operating with DAQ
  - (2) Measuring range  $10\sim 1200W/m^2$
5. 25% Shading plate  
50% Shading plate  
75% Shading plate  
100% Shading plate



GES-18002

## ► Optional

### ►► Solar Power Meter(TES-1333)

1. Display :  $3\frac{1}{2}$  digit LCD, max indication 1999
2. Measuring range :  $2000 W/m^2$ ,  $634 Btu/(ft^2 \times h)$
3. Resolution :  $0.1 W/m^2$ ,  $0.1 Btu/(ft^2 \times h)$
4. Accuracy :  $\pm 10 W/m^2$ ,  $\pm 3 Btu/(ft^2 \times h)$
5. Sampling rate : 2 Hz



TES-1333