



GES-100

Solar Cell Trainer



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 irradiances for various load units, students study the photoelectric effect of solar cells and plot the current-voltage characteristic as well as charging/discharging curves.

► Features

- Self-contained solar cell trainer
- Adjustable solar irradiation and azimuth for sunlight simulation
- DAQ equipped, easy 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 $\geq 10\text{M}\Omega$
- (2) AC Voltage : 400mV, 4V, 40V, auto range
Input resistance $\geq 10\text{M}\Omega$
- (3) DC Current : 400 μA , 400mA, 10A, pushbutton select switch
10A Range : 10A/250V fuse protected
mA/ μA Ranges : 0.5A / 250V fuse protected
- (4) AC Current : 400 μA , 400mA, 10A, pushbutton select switch
10A Range : 10A/250V fuse protected
mA/ μA Ranges : 0.5A/250V fuse protected
- (5) Resistance : 400 Ω , 4K Ω , 40K Ω , 4M Ω , 40M Ω , 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

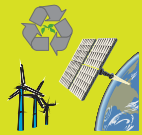
- (1) DC motor : 0.5V~6V, 10mA
- (2) Light bulb : 1.1V, 300mA
- (3) Potentiometer : 100 Ω , 10-turn

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 110/220VAC
2. Output voltage 15VDC



GES-13001

► DAQ with Software (GES-13002 or GES-13003)

1. Channel 1 and 2 : max. input voltage $\pm 5V$
2. Channel 3 and 4 : max. input current 1A
3. DAQ type :
 - (1) GES-13002 for Vista/XP/2000
 - (2) GES-13003 for Windows 7/Vista/XP/2000
 Please confirm the required type before purchasing.
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 Vista/XP/2000 (GES-13002)
 - (6) Operating system: Windows 7/Vista/XP/2000 (GES-13003)



GES-13002/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 $10 \sim 1200 W/m^2$
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