

## GES-500

### Wind and Solar Hybrid System



GES-500 (Wind and Solar Hybrid system) is composed of Solar panel, Battery bank module, MPPT Solar charging controller module, DC-AC Inverter module, Grid-tie inverter module, Wind generator set, Wind energy monitor module, Three-phase rectifier module, Wind and Solar hybrid controller module, Load module and meters. By means of combining all these control systems to create a teaching platform for implementation of the wind power and solar power experiment together. It can help the students understand the theory of solar on-grid and off-grid, the wind power generation system and further to study the engineering practical application technology.

#### ► Features

- The software can display and store the data.
- Using the digital meter, the user can observe the current operation status of the system.
- All the input and output terminals are adopting the safety plugs, users can implement the experiments with the connecting wires easily and safely.
- Equipped with the Polarity reverse protection to avoid the modules being damaged due to the wrong input of inverse power.
- Adjustable light source for the sunlight intensity
- Adjustable solar panel, simulating the situation of the sunlight irradiation from different angles.

#### ► Specifications

##### ► Wind Generator Set (GES-58001)

1. Blade Diameter : 600mm
2. Frequency : 20-60Hz
3. Voltage : 1Φ 220V
4. Output : 2HP
5. Airflow max. : 340 m<sup>3</sup>/min



##### ► Horizontal Axis Wind Turbine (GES-58002)

1. Power Output : 200W(3Φ AC 0~20V Output)
2. Diameter : 0.68m
3. Number of Blades : 5
4. Start-up wind speed : 3 m/s
5. Rated wind speed : 12m/s
6. Cut off wind speed : 20m/s
7. Yaw : Shroud wind force automatic adjustment



##### ► Anemometer (GES-58003)

1. Power Supply : DC 12V
2. Output Signal : TTL



##### ► PV Set (GES-58005)

1. Halogen : AC 110 or 220, 1000W
2. Dimmer : AC 110 or 220, 1200W
3. PV Module
  - a. Maximum Power : 50W
  - b. Voltage : 17.5V
  - c. Current : 2.86A
  - d. Open Circuit Voltage : 21.5V
  - e. Short Circuit Current : 3.23A
4. Temperature sensor
5. Solar power sensor



##### ► Wind Energy Monitor (GES-53001)

1. Anemometer : 0~15m/s
2. ACV Meter : 0-50VAC
3. Communication interface : RS-485



##### ► Three-phase Rectifier (GES-53002)

1. DCV Meter : DC 0-50V
2. DCA Meter : DC 0-10A
3. Input Voltage Rated : 3Φ 0~100VAC
4. Output Voltage Rated : DC 0~50V
5. Fuse : 10A
6. For wind powered generator use



##### ► Wind/Solar Hybrid System Controller (GES-53003)

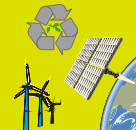
1. Controller rated voltage : 10V
2. Wind rated power : 200W
3. PV rated power : 100W
4. Maximum PV OCV : 30V
5. Rated output current : 10A
6. Wind generator dump load voltage : 16.5V ±1
7. Battery low voltage cutoff (LVC) : 10.8V adjustable
8. LCD display : display output voltage and battery capacity
9. LED indicator : indicate states of wind generator, solar, battery, and system fault



##### ► Solar Energy/Temperature Meter (GES-53004)

1. PV Box : Connected PV module for Measuring the temperature and solar power
2. °C/°F Switch: Select Celsius or Fahrenheit
3. Communication interface : RS-485





## ▶ MPPT Solar Charging Controller (GES-53005)

1. Input Voltage : 16~55V
2. Battery Voltage : 12V
3. Load Voltage : 13.5V
4. Power output : 150W
5. Load Mode Switch: DDS(Dawn to Dusk Switch) and LVD (Low Voltage Disconnect)



## ▶ Grid-tie Inverter (GES-53006)

1. Power Output : 400W
2. DC Input Voltage : DC 12~28V
3. Output Voltage : AC 110V 50/60Hz  
AC 220V 50/60Hz
4. Polarity Indicator: Reverse supply protection
5. Overheat : Over heating protection
6. MPPT : For maximum power point tracking
7. Output Indicator : Power ON



## ▶ DC-AC Inverter (GES-53007)

1. Power Output : 300W
2. Output Waveform : Pure Sine Wave
3. Output Voltage : AC 110V 50/60Hz,  
AC 220V 50/60Hz
4. Input Voltage : DC 10~15V
5. Polarity Indicator : Reverse supply protection
6. Abnormal Voltage Indicator : Indicator lights up, if DC input <10V.



## ▶ Digital DCV/DCA Meter (GES-53008)

1. Measuring Voltage Range : DC 0~100V
2. Measuring Current Range : DC 0~20A
3. Communication interface : RS-485



## ▶ Battery Bank (GES-53009)

1. Battery Type : NiCd
2. Battery Pack : Parallel
3. Nominal Voltage : 12V
4. Nominal Capacity : 14.4Ah
5. Charge Voltage : 14V
6. Fuse : 10A
7. Polarity Indicator : Reverse supply protection



## ▶ Multifunction Power Meter (GES-53010)

1. Measuring and Display ACV/ACA/Watt/Frequency/Power factor/KWH/KWH time
2. Measuring Voltage Range : AC 80~260V
3. Measuring Current Range : AC 0~15A
4. Measuring Watt/VA Range : 0~3900W
5. Measuring KWH Range : 0~9999KWH
6. Measuring Frequency Range : 45~60Hz
7. Use universal socket
8. Communication interface : RS-485



## ▶ DC Generator Load Resistor (GES-53011)

1. Adjustable wire-wound Resistor : 100 Ohm
2. Power Rated : 200W
3. Fuse : 10A



## ▶ DC Load (GES-53012)

1. 12 VDC 7W LED Bulb
2. 12VDC Fan
3. Polarity Indicator : Reverse supply protection



## ▶ AC Load (GES-53013)

1. Light Bulb 20W AC 110V or 220V
2. Light Bulb 40W AC 110V or 220V
3. AC Fan AC 110V or 220V
4. Fuse : 2A



## ▶ List of Experiments

### ▶ Solar Power Generation System Manual

- Ex1 Power system of Solar cells
- Ex2 Introduction of Solar cells system
- Ex3 Conversion test of solar photovoltaic energy
- Ex4 Solar cell characteristic curve test
- Ex5 The influence of temperature on solar cell
- Ex6 Solar cells affected by different light angles curves
- Ex7 The efficiency and maximum power of solar cell
- Ex8 Solar cells generation-off-grid
- Ex9 Solar cells generation-streetlight
- Ex10 Solar cells generation-grid-tie

### ▶ Wind Power System Manual

- Ex1 The principle of wind power
- Ex2 Introduction of wind system
- Ex3 Wind speed experiment wind turbine
- Ex4 Open circuit and loading experiment of wind turbine
- Ex5 Wind energy utilization factor of wind turbine
- Ex6 Power curve experiment of wind turbine
- Ex7 Wind power generation-off-grid
- Ex8 Wind power generation-grid-tie

### ▶ Scenery complementary laboratory manual

- Ex1 Wind and solar hybrid system
- Ex2 The efficiency of DC-AC inverter
- Ex3 The efficiency and Islanding effect of grid-tie inverter
- Ex4 Wind and solar hybrid system-off-grid
- Ex5 Wind and solar hybrid system-streetlight
- Ex6 Wind and solar hybrid system-grid-tied

## ▶ Accessories

1. Experiments manual
2. Connection leads and plugs : 1set
3. CD : software
4. USB to RS-485 Converter
5. 12 VDC 7W LED Bulb
6. Light Bulb 20W AC 110V or 220V
7. Light Bulb 40W AC 110V or 220V

## ▶ 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

## ▶ Optional

### ▶ Vertical Axis Wind Turbine (GES-58004)

1. Power Output : 70W (3Ø AC 0~20V Output)
2. Dimension : Rotor Diameter 0.8m /  
Rotor High 0.7m
3. Number of Blades : 8
4. Start-up wind speed : 3 m/s
5. Rated wind speed : 12m/s
6. Cut off wind speed : 20m/s



### ▶ DC Electronic Load (GES-53021)

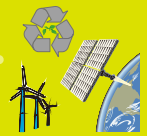
1. Operating with GES-500 software
2. Measuring Voltage Range : DC 2V~30V
3. Measuring Current Range : 0~20A
4. Measuring Power Range : 200W
5. Communication interface : USB
6. Power supply : DC 12V from adapter
7. Fuse : 20A



## ▶ Optional but Necessary

### ▶ Digital Multimeter

- ▶ DC Power Supply
- 1. Output Voltage : 0~±30V
- 2. Output Current : 6A



GES-500A	
Module	Device Name
GES-53004	Solar Energy/Temperature Meter
GES-53005	MPPT Solar Charging Controller
GES-53006	Grid-tie Inverter
GES-53007	DC-AC Inverter
GES-53008	Digital DCV/DCA Meter
GES-53009	Battery Bank
GES-53010	Multifunction Power Meter
GES-53011	DC Generator Load Resistor
GES-53012	DC Load
GES-53013	AC Load
GES-58005	PV Set
	<b>Optional</b>
GES-53021	DC Electronic Load

GES-500B	
Module	Device Name
GES-53001	Wind Energy Monitor
GES-53002	Three-phase Rectifier
GES-53003	Wind / Solar Hybrid System Controller
GES-53006	Grid-tie Inverter
GES-53007	DC-AC Inverter
GES-53008	Digital DCV/DCA Meter
GES-53009	Battery Bank
GES-53010	Multifunction Power Meter
GES-53011	DC Generator Load Resistor
GES-53012	DC Load
GES-53013	AC Load
GES-58001	Wind Generator Set
GES-58002	Horizontal Axis Wind Turbine
GES-58003	Anemometer
	<b>Optional</b>
GES-53021	DC Electronic Load
GES-58004	Vertical Axis Wind Turbine