

## 280 Watt Solar Power System

### Overview

This solar photovoltaic generating system consists of 4 off 70 Watt crystalline modules, a self-contained photovoltaic controller with low-voltage disconnect function, 2 off sealed lead-acid batteries and 550 Watt sinewave inverter.

The system will provide mains quality electrical power throughout the year. The daily energy delivered is dependent on the location in which the system is installed. The following table gives examples:

Location	Daily capacity in Watt-hours (230 V)	
	Minimum	Maximum
Northern Europe	280	660
Southern Europe	500	960
Sub-Saharan Africa	840	1080

As an example, 500 Watt-hours will illuminate 6 off 11 Watt low-energy light bulbs for 4 hours each, and leave 236 Watt-hours of energy for other appliances.

### Parts List

The following parts will be required:

1. 4 off Phaesun 70 Watt 12 Volt Photovoltaic module
2. 1 off Morningstar PS-30 Photovoltaic controller
3. 2 off Ever-Exceed 100 Ah Battery (or local equivalent – min 100 Ah)
4. 1 off Steca Solarix Sinus 550W inverter
5. 1 off Support for module – for example perforated steel angle
6. 16 mm<sup>2</sup> cable – length depending on installation
7. Earthing rod and clamp (if no earth available on site)
8. Electrical wiring accessories as appropriate
9. Sundries – screws, cable clips, terminals – dependent on installation

Items 1 to 4 are available from [www.solar-power-answers.co.uk](http://www.solar-power-answers.co.uk) The other items should be obtained locally to suit the installation. All are easily available from electrical factors or DIY shops.

## **Installation**

Take great care when performing the installation. If you are at all unsure of your abilities, consider engaging the services of a qualified electrician. Be aware that the battery contains sulphuric acid, which is highly corrosive. It can also deliver extremely high currents into a short circuit; remove all metal jewellery before starting work and use insulated tools wherever possible.

The system components are installed as follows:

**Modules:** Install the modules in an unshaded position with a tilt from the horizontal equal to the angle of latitude plus 15°. So, if you are in France at a latitude of 45°, tilt the module upwards by 60°. The module should be facing south in the northern hemisphere and north in the southern hemisphere. Good positions include the roof of the building or a pole firmly anchored in the ground or to the building. A suitable structure can easily be fabricated from perforated steel angle (Dexion® or similar). Ensure that the mounting is sufficiently rigid to withstand extreme weather conditions. Connect all modules in parallel and connect the output cable (16 mm<sup>2</sup>) to the module at this stage as it will be difficult to do later, but do not connect it to the controller.

**Batteries:** Position the batteries in a dry, well ventilated location protected as far as possible from extremes of temperature. They are heavy, so should be either on the floor or on a well-supported shelf or other structure. Connect the batteries in parallel with cable of minimum size 16 mm<sup>2</sup>. It is important that the battery cable is connected to diagonally opposite terminals.

**Controller and Inverter:** The controller and inverter are mounted to the wall as near as possible to the battery, and in any case no further than 2 metres from it. They must be protected from damp and extremes of temperature.

**Earthing:** If no earth is available, drive an earth rod into the ground outside, as near as possible to the battery location. Use green and yellow earth cable of at least 10 mm<sup>2</sup> to connect the earth rod to the battery negative terminal.

**Wiring:** The battery, inverter and module cables must be made from a minimum of 16 mm<sup>2</sup> cable. Keep the length of each cable run to a practical minimum as this helps to prevent power loss in the system, with the maximum length of the module cable being 10 metres. It is very important that the correct polarity is adhered to, i.e. positive terminals should always be connected to positive and negative terminals to negative. Use red cables for positive and black for negative. Use terminals on the end of the cables where appropriate and ensure that all terminals are properly tightened. Secure cables to prevent damage.

The building wiring must be completed in accordance with the wiring regulations in force in the country of installation. It is recommended that the services of a qualified electrician are employed for this purpose. Ensure that all lamps are of the low-energy type, and keep the number of sockets to minimum in order to discourage excessive power use.

Make the connections to the controller in the following order:

1. Output cable to output (load) terminals on inverter
2. Battery cable to terminal marked "battery" on controller
3. Battery cable and inverter cable to battery terminals

#### 4. Module cable to input terminals on controller

Be aware that AC power will be produced as soon as the inverter is connected to the batteries. Ensure that all AC wiring is complete before this step.

### **Commissioning**

Refer to the manuals supplied with the controller and inverter to understand the function of the indicator lamps on the front panels. Once you have ensured that the battery is charging by means of the indicators, switch on any loads to ensure correct operation.

### **Wiring Diagram**

