

# EasySolar-II GX manual

## 1. Introduction



The Victron EasySolar-II GX integrates the following elements:

- A powerful MultiPlus-II inverter/charger
- A SmartSolar MPPT solar charge controller
- A GX device with a 2x16 character display

These elements come prewired, and preconfigured together inside a single unit. This greatly simplifies most installations, saving time and money.

This document explains how all components fit together, how to install the product, and what documentation to use for configuration and other details of its individual parts.

## 2. Safety instructions

### 2.1. In general



#### WARNING

Please read the documentation supplied with this product first, so that you are familiar with the safety signs and directions before using the product. This product is designed and tested in accordance with international standards. The equipment should be used for the designated application only.

## 2.2. WARNING: DANGER OF ELECTRICAL SHOCK

### WARNING

The product is used in combination with a permanent energy source (battery). Even if the equipment is switched off, a dangerous electrical voltage can occur at the input and/or output terminals. Always switch the AC power off and disconnect the battery before performing maintenance.

### WARNING

The product contains no internal user-serviceable parts. Do not remove the front panel and do not put the product into operation unless all panels are fitted. All maintenance should be performed by qualified personnel.

### WARNING

Never use the product at sites where gas or dust explosions could occur. Refer to the specifications provided by the manufacturer of the battery to ensure that the battery is suitable for use with this product. The battery manufacturer's safety instructions should always be observed.

### WARNING

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

Do not lift heavy objects unassisted.

## 2.3. Installation

Read the installation instructions before commencing installation activities. For electrical work, follow the local national wiring standard, regulation and these installation instructions.

This product is a safety class I device (supplied with a ground terminal for safety purposes). Its AC input and/or output terminals must be provided with uninterruptible grounding for safety purposes. An additional grounding point is located on the outside of the product. The ground conductor should be at least 4mm<sup>2</sup>. If it can be assumed that the grounding protection is damaged, the product should be taken out of operation and prevented from accidentally being put into operation again; contact qualified maintenance personnel.

Ensure that the connection cables are provided with fuses and circuit breakers. Never replace a protective device by a component of a different type. Refer to the manual for the correct part.

### **Do not invert neutral and phase when connecting the AC.**

Check before switching the device on whether the available voltage source conforms to the configuration settings of the product as described in the manual.

Ensure that the equipment is used under the correct operating conditions. Never operate it in a wet or dusty environment. Ensure that there is always sufficient free space around the product for ventilation, and that ventilation openings are not blocked. Install the product in a heatproof environment. Ensure therefore that there are no chemicals, plastic parts, curtains or other textiles, etc. in the immediate vicinity of the equipment.

This inverter is provided with an internal isolation transformer providing reinforced insulation.

Protect the solar modules from incident light during installation, e.g. cover them.

Never touch uninsulated cable ends.

Use only insulated tools.

## 2.4. Transport and storage

On storage or transport of the product, ensure that the mains supply and battery leads are disconnected.

No liability can be accepted for damage in transit if the equipment is not transported in its original packaging.

Store the product in a dry environment; the storage temperature should range from  $-20^{\circ}\text{C}$  to  $60^{\circ}\text{C}$ .

Refer to the battery manufacturer's manual for information on transport, storage, charging, recharging and disposal of the battery.

## 3. Installation

This product may only be installed by a qualified electrical engineer.

### 3.1. General

Mount close to the battery, but never directly above the battery (in order to prevent damage due to gassing of the battery).

There should be a clear space of at least 10 cm around the appliance for cooling.

Excessively high ambient temperature will result in the following:

- Reduced service life.
- Reduced charging current.
- Reduced peak capacity, or shutdown of the inverter.

Never position the appliance directly above the batteries.

This product has been designed for wall mounting. For mounting purposes, a hook and two holes are provided at the back of the casing (see appendix G). The device can be fitted either horizontally or vertically. For optimal cooling, upright vertical fitting is preferred.

The interior of the product must remain accessible after installation.

Try and keep the distance between the product and the battery to a minimum in order to minimize cable voltage losses.

For safety purposes, this product should be installed in a heat-resistant environment. You should prevent the presence of e.g. chemicals, synthetic components, curtains or other textiles, etc., in the immediate vicinity.

### 3.2. Grounding

Battery grounding: this device can be installed in a positive or negative grounded system. TBD something about non isolated and to ground referenced connections?

Note: apply a single ground connection (preferably close to the battery) to prevent malfunctioning of the system.

- Chassis grounding: A separate earth path for the chassis ground is permitted because it is isolated from the positive and negative terminal.
- The USA National Electrical Code (NEC) requires the use of an external ground fault protection device (GFPD). These MPPT chargers do not have internal ground fault protection. The system electrical negative should be bonded through a GFPD to earth ground at one (and only one) location.
- The charger must not be connected with grounded PV arrays. (one ground connection only)
- The plus and minus of the PV array should not be grounded. Ground the frame of the PV panels to reduce the impact of lightning.

**\*\*WHEN A GROUND FAULT IS INDICATED, BATTERY TERMINALS AND CONNECTED CIRCUITS MAY BE UNGROUNDED AND HAZARDOUS.**

### 3.3. Connection of battery cables

In order to utilize the full capacity of the product, batteries with sufficient capacity and battery cables with sufficient cross section should be used. See table.

Battery cable recommendations	48/3000
Recommend battery capacity	100-400 Ah
Recommended DC fuse	125 A
Recommended cross section	
0 - 5 m	35 mm <sup>2</sup>
5 - 10 m	70 mm <sup>2</sup>

Remark: Internal resistance is the important factor when working with low capacity batteries. Please consult your supplier or the relevant sections of our book 'Energy Unlimited', downloadable from our website.

#### WARNING

- Use a torque wrench with insulated box spanner in order to avoid shorting the battery.
- Maximum torque: 14 Nm
- Avoid shorting the battery cables.

#### Procedure

1. Undo the two screws at the bottom of the enclosure and remove the service panel.
2. Connect the battery cables: see Appendix A.
3. Tighten the nuts well for minimal contact resistance - maximum torque: 14 Nm

### 3.4. Connection of AC cabling

#### WARNING

The MultiPlus-II is a safety class I product (supplied with a ground terminal for safety purposes). **Its AC input and/or output terminals and/or grounding point on the outside of the product must be provided with an uninterruptible grounding point for safety purposes.**

The MultiPlus-II is provided with a ground relay (relay H, see appendix B) that automatically connects the Neutral output to the chassis if no external AC supply is available. If an external AC supply is provided, the ground relay H will open before the input safety relay closes. This ensures the correct operation of an earth leakage circuit breaker that is connected to the output.

- In a fixed installation, an uninterruptible grounding can be secured by means of the grounding wire of the AC input. Otherwise the casing must be grounded.
- In a mobile installation (for example, with a shore current plug), interrupting the shore connection will simultaneously disconnect the grounding connection. In that case, the casing must be connected to the chassis (of the vehicle) or to the hull or grounding plate (of the boat).

In case of a boat, direct connection to the shore ground is not recommended because of potential galvanic corrosion. The solution to this is using an isolation transformer.

#### **Torque: 2 Nm**

The terminal blocks can be found on the printed circuit board, see Appendix A.

#### **Do not invert neutral and phase when connecting the AC.**

##### **3.4.1. AC-in**

The AC input cable can be connected to the terminal block 'AC-in'. From left to right: "N" (neutral), "PE" (earth) and "L" (phase)

This product can cause a DC current in the external protective earthing conductor. Where a residual current-operated protective (RCD) or monitoring (RCM) device is used for protection in a case of direct or indirect contact, only an RCD or RCM of Type B is allowed on the supply side of this product.

The AC input must be protected by a fuse or magnetic circuit breaker rated at 32A or less, and cable cross-section must be sized accordingly. If the input AC supply is rated at a lower value, the fuse or magnetic circuit breaker should be down sized accordingly.

##### **3.4.2. AC-out-1**

The AC output cable can be connected directly to the terminal block 'AC-out'. From left to right: "N" (neutral), "PE" (earth) and "L" (phase) With its PowerAssist feature the Multi can add up to 3kVA (that is  $3000 / 230 = 13A$ ) to the output during periods of peak power requirement. Together with a maximum input current of 32A this means that the output can supply up to  $32 + 13 = 45 A$ .

An earth leakage circuit breaker and a fuse or circuit breaker rated to support the expected load must be included in series with the output, and cable cross-section must be sized accordingly.

##### **3.4.3. AC-out-2**

A second output is available that disconnects its load in the event of battery operation. On these terminals, equipment is connected that may only operate if AC voltage is available on AC-in-1, e.g. an electric boiler or an air conditioner. The load on AC-out-2 is disconnected immediately when the uponing switching to battery operation. After AC power becomes

available on AC-in-1, the load on AC-out-2 will be reconnected with a delay of approximately 2 minutes. This is to allow a genset to stabilise.

It is possible to over-ride this default behaviour of AC-out-2 by using a programmable assistant.

### 3.5. Connection of PV Array

#### 3.5.1. Sizing the array

We recommend to use the [MPPT Sizing Calculator available on our website](#).

- The solar charge controller will operate only if the PV voltage exceeds battery voltage (Vbat).
- PV voltage must exceed Vbat + 5V for the controller to start. Thereafter minimum PV voltage is Vbat + 1V.
- Maximum PV Array open circuit voltage is 250V.
- Maximum PV Array short circuit current is 35A.

For example:

- Minimum number of cells in series: 144 (4x 12V panel or 2x 24V panel in series).
- Maximum: 360 cells (10x 12V or 5x 24 panel in series).

*Remark: at low temperature, the open circuit voltage of a 360 cell array may exceed 250V, depending on local conditions and cell specifications. In that case, the number of cells in series must be reduced.*

#### 3.5.2. Connection

The PV Connection uses M6 bolts.

Note that the 100 Amp fuse is not end-user replaceable. When blown, the unit must be returned to a service agent for repair. It only blows after other components in the device have failed.

### 3.6. Optional connections

tbd (see MultiPlus-II, GX and Solar Charger Manual)

The integrated GX device includes a single VE.Can interface. This can be used to connect to either Victron VE.Can devices (eg VE.Can MPPTs) OR the port can be reconfigured via the Remote Console for use with a [compatible CAN-bus Battery](#).

The VE.Direct port is for connection of other VE.Direct devices, such as a BMV battery monitor, or an additional MPPT solar charge controller, so that they can be monitored by the GX.

## 4. Configuration

### 4.1. Inverter/charger

See [MultiPlus-II manuals](#)

Programming the Inverter/charger requires use of a laptop computer with [VEConfigure](#). Connect the computer to the inverter/charger using a [MK3 USB dongle](#), or over the internet with [Remote VEConfigure](#).

### 4.2. SmartSolar MPPT 250/70 charge controller

The Solar Charger is configured using our VictronConnect app. The easiest method of connecting to the Solar Charger part is via Bluetooth. This works for Android, iOS and macOS. It does not work for Windows.

When required to use Windows, unplug the VE.Direct cable from the Solar Charger, and use a [VE.Direct USB interface cable](#) to your Windows laptop. Once completed, reconnect the VE.Direct cable that runs between the internal GX device and the Solar Charger.

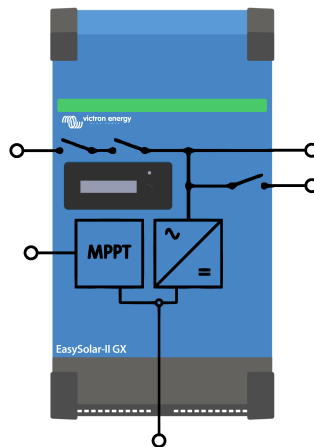
Further reading:

- [SmartSolar MPPT 250/70 documentation](#)
- [VictronConnect manual](#)

### 4.3. GX Device

A short range wifi chip is built in. To extend the wifi range, use a [compatible USB wifi interface](#).

## 5. Internal Topography



## 6. Troubleshooting

tbd. (solar charger & MultiPlus manual)