ALLinONE

Installation manual

Manuale di installazione

- Charges any kind of lead batteries and LiFePO4 batteries (12/24 V)
  Carica tutte le batterie al piombo e batterie LiFePO4 (12/24 V)
- Light and flexible
  Leggero e flessibile
- The most efficient solar cells on the market
  Celle fotovoltaiche back-contact ad alta efficienza
- Ready to use
  Pronto per l'uso

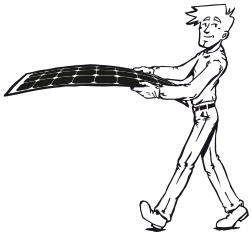
SOLBIAN
FREEDOM POWERED BY THE SUN



MADE IN ITALY

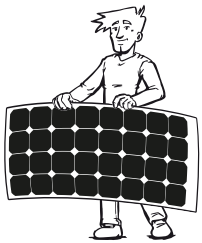
SOLBIAN.EU

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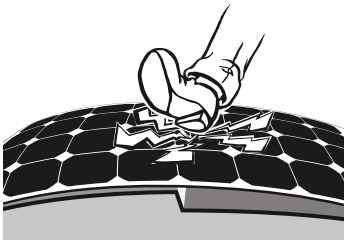
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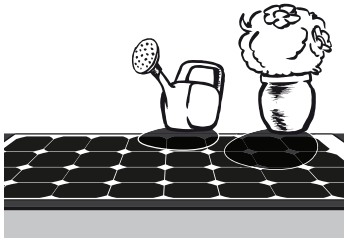
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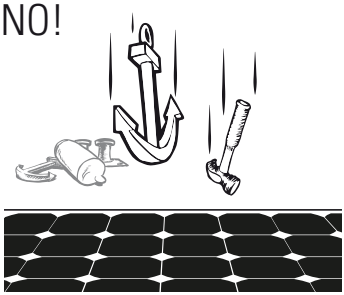
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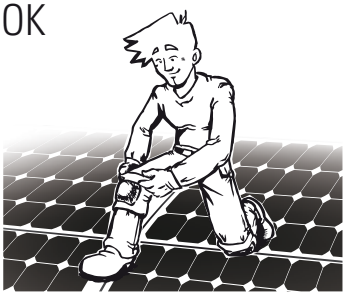
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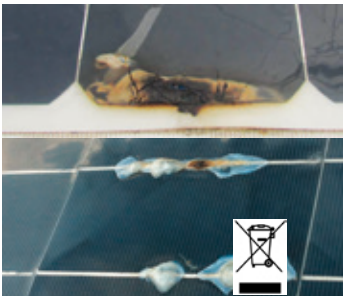


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SOLBIAN

FREEDOM POWERED BY THE SUN

Installation manual

7 Manuale di installazione

Thank you for purchasing a Solbian product. Our photovoltaic modules are built using innovative technology and superior quality materials. They will supply your energy needs in the most harsh environmental conditions and with the versatility to suit many different applications. Please read these instructions carefully, to ensure correct utilization and a long life.

This manual is not an explicit or implicit warranty. Solbian accepts no responsibility for damage caused by the installation, use and maintenance of its products. Solbian reserves the right to modify its products, the technical specifications and this installation manual without notice.

THE FOLLOWING INSTRUCTIONS ARE EXCLUSIVELY GENERAL ADVICE. WE RECOMMEND THAT YOU HAVE THE MODULES INSTALLED BY QUALIFIED TECHNICIANS, RESPECTING STANDARDS IEC 62548 AND 62257. WE RECOMMEND THAT YOU CONTACT US DIRECTLY FOR DETAILS CONCERNING TECHNICAL ASSISTANCE.

RECOMMENDATIONS

The following instructions must be read carefully and fully understood before proceeding with the installation, connection and use of SolbianFlex modules. Contact with electrical components, such as terminals, can cause burns and electric shock even when the module has not yet been connected to an electrical circuit. **A photovoltaic module generates electricity as soon as it is exposed to the sun or to a source of light.** Although the electrical output of one single SolbianFlex module is not dangerous, the connection of several modules in series or in parallel increases respectively the voltage and current. A photovoltaic system comprising of several modules can therefore generate voltages and currents which are dangerous and could be lethal
SOLBIAN will not be held responsible in any way for accidents and damage to persons, including electric shock, caused by incorrect use or installation.

IMPORTANT INFORMATION

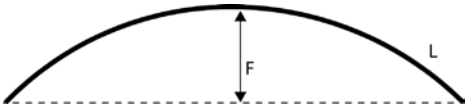
This manual contains important information about safety, which must be read carefully and understood before proceeding with the installation and use of SolbianFlex photovoltaic modules and their accessories.
Please keep the receipt of purchase and the original packaging for the duration of the warranty.

WARNINGS AND ELECTRICAL RISKS

- ✓ Do not use different models of photovoltaic modules on the same system.
- ✓ Check the compatibility of the charge regulator (if purchased separately) with SolbianFlex products.
- ✓ Do not modify the electrical connections of the modules, in particular do not open or remove the sealed Junction Box which joins the internal structure of the module to the external electrical connections.
- ✓ Do not cut or pierce the module, this could cause live components to be exposed and/or damage the module.
- ✓ Do not bend or apply excessive force to the cables.
- ✓ Do not expose the photovoltaic module to direct light during installation of the system and in any case take care that when the module is exposed to light. It produces current and therefore its terminals are electrically live.
- ✓ The operations of maintenance, installation, removal of the photovoltaic modules must take place on dry surfaces.
- ✓ Use exclusively tools with insulated grips.
- ✓ Do not use photovoltaic modules in the presence of inflammable or explosive substances.
- ✓ Keep the modules in their original packaging up to the moment of their installation.
- ✓ Ensure that the position of the photovoltaic modules does not cause mechanical or electrical risks.
- ✓ Do not use damaged photovoltaic modules (damaged during shipping, installation or in use).
- ✓ Do not apply protections, paint or varnish to the module. Contact the manufacturer for information about cleaning and protection of SolbianFlex modules.

RISKS FROM MECHANICAL DAMAGE

The photovoltaic cells contained in SolbianFlex modules are fragile. The manufacturing technology of the modules provides protection for the cells, provided that certain precautions are taken.



SolbianFlex modules are flexible, but they cannot be rolled-up or folded. The minimum allowed curvature radius is 1 m. For a 1 m long module, the maximum arc (F) is 122 mm.
Excessive bending must be avoided when handling the modules. See Fig. 1 for correct handling. The module may be handled by the edge (Fig. 2), but only if it is held vertically and without exerting excessive pressure to the edges of the cells. The modules should not be held by the short ends or corners as this may cause excessive bending under their own weight (Fig. 3).
SolbianFlex modules may be walked on, but only when they are firmly mounted on a flat, smooth, rigid surface, with no bumps, hollows or irregularities (Fig. 4), taking care, barefoot or with soft-soled shoes, avoiding heels and shoes with a rigid sole (Fig. 5).

Uninstalled modules or modules in removable installations (using eyelets, snap fastners etc.) must not be walked on.
If sharp or heavy objects are allowed to fall onto the modules, they can cause fractures in the cells (Fig. 7).
If, during installation or maintenance, it is necessary to kneel on the module, it is advised to use adequate protection, to avoid damaging the cells (Fig. 8).

HOT-SPOT

A module containing damaged cells, or even a module in good condition in which one or a small number of cells are completely shaded (Fig. 6), can suffer from a HOT-SPOT, i.e. local overheating, even up to the point of causing the protective material to smoke and reach temperatures over 200°C (392 °F) on small areas.
In principle, this phenomenon could cause a fire, a danger which is always present where electrical apparatus is used. However, normally the damage is limited to small local burning as in the examples shown in Fig. 9.
In the event of HOT-SPOTS forming, the module must be disconnected immediately. In this way, the flow of current is stopped and further temperature rises are avoided. As an alternative, it is possible to cover the module, to avoid exposure to light. In the case of several modules connected in series, the only solution is to disconnect the module.

MECHANICAL INSTALLATION

- ✓ Do not bend the modules with a radius of bending less than 1m, otherwise the photovoltaic cells could be permanently damaged.
- ✓ SolbianFlex modules alone cannot withstand the loads caused by high winds or snow. The installation must bear in mind the structural resistance of the modules' support. The structure must not be continually subjected to stress. Improper use of SolbianFlex modules can cause irreversible damage to the system, thereby compromising the efficiency and usage of the system.
- ✓ The position of the installation should take advantage of the maximum exposition to the sunlight and the minimum shading. Remember that even partial shading of the module can cause a substantial reduction in the amount of energy produced. Do not place objects on the modules exposed to the light (Fig. 6).
- ✓ The position of SolbianFlex modules must allow adequate circulation of air on the surfaces exposed to sunlight. This is sufficient to lower the temperature and ensure high efficiency

INSTALLATION WITH EYELETS/SCREWS

SolbianFlex modules may be supplied with metal eyelets for installation. In this case, the modules are fixed using ropes, straps or other similar devices, to rigid surfaces which support the modules and resist atmospheric agents. Holes may be used to screw the modules to a rigid surface, in the same position as the eyelet holes. In both cases, **the modules cannot be walked on**.

INSTALLATION USING LOXX FASTENERS

LOXX fasteners are special steel clips which allow easy fixing and removal of the modules. They can be used for mounting onto rigid surfaces or onto textiles, such as the Bimini on a boat or tents etc. Different LOXX fasteners are suitable for the two types of installation.

INSTALLATION USING DOUBLE-SIDED ADHESIVE OR GLUE

Before commencing, the surface onto which the modules are to be installed must be perfectly clean and dry. The installation of SolbianFlex modules using structural double-sided tape supplied by the manufacturer must be carried out carefully and with precision, as this permanent method does not allow repositioning. The surface on which the modules are installed does not necessarily need to be regular, but if it is not, the modules cannot be walked on. Similar results can be obtained with silicon or polyurethane glue. In this case, Solbian is not responsible for the results, but may be consulted about the adhesive to use.
When using commercial glue, be careful not to create an irregular surface, if the modules are to be walked upon. The glue should be applied uniformly with a thickness not exceeding 2mm.
Before proceeding with a permanent installation using glue or double-sided tape, we recommend that you check the performance of the module by measuring Voc and Isc and comparing with the datasheet.

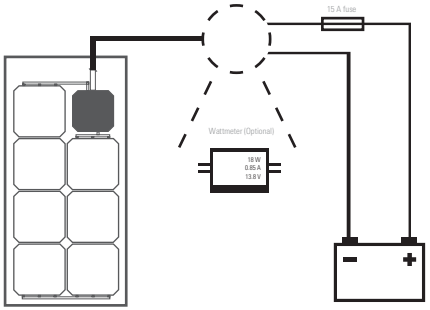
WARNING: The double-sided adhesive backing tape makes a very strong bond with the support material and does not allow repositioning. Trying to remove a module, even if it is only partially attached, can seriously damage the cells.

PROTECTIVE FILM ON FRONT OF MODULE

The modules are shipped with a protective film on the front surface. We recommend that you remove this after the installation has been completed. In any case, the protective film **must be removed before using the module for the first time.**

ELECTRICAL INSTALLATION: ALLinONE series

The PV modules of the ALLinONE series include an on-board high efficiency MPPT charge controller. Thanks to this electronic feature they can directly charge lead batteries with 12 or 24 V nominal voltage.



ALLinONE modules are supplied with a flexible cable resistant to weathering that can be directly connected to the positive and negative poles of your battery. Alternatively, the cables may be attached to the positive and negative bus bars or posts, to avoid wiring clutter at the batteries. The electronics are configured at the factory, the right model must be ordered for the chosen battery type.

The length and section of supplied cable are defined as to prevent too large voltage drop between charge controller and battery. If extension is needed it must be realized with 4 mm² copper section cables. In any case a total cable length larger than 8 meters is not advised.

Each ALLinONE, thanks to the integrated electronics, behaves like an independent charger, thus more ALLinONEs can be used to charge the same battery simply by connecting them in parallel on the battery leads. The maximum charging current of the battery must in any case be considered. As an example, with a 120 Ah lead battery the recommended charging current could be 12 A max and thus already two SP72 ALLinONE (each one supplying a max current of 6 Amps) are close the recommended limit.

Remember that your batteries are a powerful energy source; be sure to install protective fuses on your wiring reasonably close to where they are connected on the battery end (as per standard safe electrical procedures).

MAINTENANCE OF THE PHOTOVOLTAIC SYSTEM

Due to the absence of moving parts, the required maintenance is minimal. The following instructions are important:

- ✓ Keep the modules clean. Wash with fresh water, especially in a marine environment, to avoid damage caused by saltwater.
- ✓ The surface of the modules may be cleaned using neutral soap and water, wiping carefully and without using abrasive material. Denatured alcohol (methylated spirit) can be used to remove grease etc.
- ✓ Check the structural integrity of the installation and the electrical connections periodically.
- ✓ Check the efficiency of the system using the monitoring functions in the charge regulators (LEDs or displays).

POSSIBLE FAILURE MODES

- ✓ **Fractured cells:** Fracturing can be caused by excessive bending of the module during installation or use, or by impact or mechanical stress. Fractured photovoltaic cells do not normally cause a total loss of performance in a module, but more usually a drop in efficiency.
- ✓ **Defects with the charge regulator:** Charge regulators, like all electronic devices, can fail.

ALLinONE modules need to be connected to a battery to properly operate. Measuring voltage and current output from the disconnected leads can be misleading. To measure the values of current, voltage and power we suggest the use a suitable measurement device, like the Wattmeter supplied by Solbian.

To measure the output voltage from the leads, without any load connected and under sun light, can anyway gives some hints about product status. If voltage measured is not close to 14 V and 28 V (for 12 and 24 Volt lead batteries charger) that means the system can be defective.

In any case, first of all, check the state of the electrical connections between modules and batteries with particular focus on polarity (brown cable means positive while blue means negative).

EXCERPT FROM WARRANTY TERMS

SolbianFlex modules are covered by a warranty for manufacturing defects and performance. Here are some of the warranty conditions. The text of the full warranty (the sole applicable warranty) is available on request and is published on the website **www.solbian.eu**

TWO YEAR WARRANTY ON PRODUCT INTEGRITY

SolbianFlex serie SP, SX, CP, ALLinONE and CUSTOM modules are guaranteed for two years from date of purchase. If they fail to perform correctly during 24 months from the date of purchase, Solbian undertakes to repair or replace them at its discretion, or to offer a refund. Repair, replacement or refund are the sole conditions offered by the warranty and cannot be extended beyond 24 months.

RECYCLING AND DISPOSAL

Solbian is part of the European consortium PV-CYCLE, for the recycling of damaged or end-of-life modules, available in many European countries. SolbianFlex photovoltaic modules are electrical apparatus and must be disposed of accordingly, according to the laws of the country. In case of disposal requirements, please contact our sales department.

SPECIFICATION

Solbian Charger is a DC-DC boost converter designed to maximize the power generated by photovoltaic panels for any external condition of temperature and solar radiation intensity. Optimization of power conversion is obtained with embedded logic performing a Maximum Power Point Tracking (MPPT) algorithm on the PV module connected to the converter. To maximize the efficiency and reduce the size, Solbian Charger uses Power MOSFETs for active switching and synchronous rectification, minimizing the number of external devices.

The high efficiency boost converter **with 4-phase interleaved topology** with MPPT avoids the use of electrolytic capacitors, which can severely limit the system lifetime.

Solbian Charger operates at fixed frequency in PWM mode, where the duty cycle is controlled by embedded logic running a "Perturb & Observe" MPPT algorithm. The embedded charge controller prevents battery overvoltage and overcurrent. The controller implements a fast and efficient CC-CV (constant current-constant voltage) IC architecture and logic that is the result of the Solbian's experience of hundreds of design and installations of PV in boats. The set up of the system takes into account the natural "off" cycles during the nights.
Safety of the application is guaranteed by automatic halt of the driver in case of output overvoltage or overtemperature.

SP ALLinONE	SP23	SP47 L/Q	SP72
Power	23w	47w	72w
Battery voltage	12/24 V	12/24 V	12/24 V
Max output current	2/1 A	4/2 A	6/3 A
Number of cells	7	15	23
MPPT Algorithm	BOOST MPPT 4-phase interleaved topology		
Charge algorithm	CC-CV charger		
Peak efficiency	98%		
Tracking efficiency	98%		
Night consumption *	≈ 0		
Operating temperature	-20°C ÷ 45 °C		
Protections	Battery reverse polarity (with external fuse), output short circuit, over temperature		
Cable length	3 meter		
Cable external diameter	8.5 mm	12 mm	12 mm
Wire gauge	1.5 mm² / AWG 15	2.5 mm² /AWG 13	2.5 mm² /AWG 13
Polarity color code	brown cable is + and blue cable is -		
Cable insulation	Neoprene™		

* Electronics are powered by the solar panel and not by the battery