

**SOLBIAN**



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*Congratulation for the choice you made buying  
the SOLBIANFLEX module for boats.  
Created with the most innovative technologies  
and with high quality components.*

*Photovoltaic modules installation can be done by everyone with tool work attitude. Anyway the worker takes all the responsibility for possible accident happened during the installation, including electric shocks.*

**THE FOLLOWING INSTRUCTIONS ARE ONLY A GUIDE  
AND WE WARMLY RECOMMEND  
TO ASK US FOR ANY QUESTIONS BY VISITING SOLBIAN WEBSITE:**

[www.solbian.com](http://www.solbian.com)

## **WARNINGS**

All the instruction must be carefully read and understood before proceeding with photovoltaic module installation, connection, utilization and maintenance.

Touching the electrically active parts of the module, like terminals, may cause some burnings, sparks or low voltage discharges, even when the module is disconnected. A photovoltaic module produces electricity when the frontal part is exposed to sunlight or to another light source. Even if the voltage produced by a single module is not dangerous for health, when the modules are connected in series, voltages sum up and when they are parallel connected currents add. So a system with more than one module can produce an high voltage or high currents that can be dangerous and can cause injuries or death.

Therefore IT IS VERY IMPORTANT THAT THE ELECTRICAL LAYOUT AND THE INSTALLATION OF THE PV SYSTEM IS DONE BY SKILLED PERSONNEL.

## **PACKAGING CONTENTS**

The Packaging includes:

- ✓ One or more photovoltaic SOLBIANFLEX modules, ready to be attached to the rigid support.
- ✓ Installation Instruction.
- ✓ Two pairs of sheath insulating that shrinks when exposed to heat for the metal ribbons, for each module in the Packaging.

## GENERAL SAFETY

- ✓ Before installing the module verify the permissions or licenses that may be requested by the law.
- ✓ If not specified is recommended to follow the newer national and international laws.
- ✓ A bad installation can cause problems to the entire system. It may be needed to install additional devices as groundings, fuses, diodes, charger or power disconnect switch.
- ✓ Do not use different kind of modules for the same system.

## WARNING AND ELECTRICAL RISKS

- ✓ Photovoltaic modules must be installed and handled only by expert and qualified staff.
- ✓ Do not drop or throw things on the module. Do not walk on it with too rigid shoes.
- ✓ Use the module only for the aim it's made for. Do not try to open it, remove any part, component or original label without producer authorization.
- ✓ Do not focus sunlight or others light sources on modules.
- ✓ Always work on the module in dry conditions, with dry tools.
- ✓ Completely cover the surface of the module with dull material during installation, removal and maintenance: a photovoltaic module produce electricity when exposed to light.
- ✓ Always use properly insulated tools during modules electrical connection.
- ✓ Do not install the module in presence of flammable gas or steam, because there can always be some sparks.
- ✓ Avoid electric discharge during module installation, wiring and maintenance.
- ✓ Do not touch clamps when the module is exposed to light; use proper protection tools to prevent electric discharges.

## PAY ATTENTION TO:

- ✓ Avoid electrical risks during the installation, connection, utilization and maintenance.
- ✓ Photovoltaic Module produces continuous current (C<sub>c</sub> o DC) when exposed to sunlight or other light source. During the module installation or connection, it's warmly recommended to completely cover the frontal part with dull material to avoid electricity production.
- ✓ The module must stay in his original packaging until the moment of installation.
- ✓ Never touch terminals when the module is exposed to light or during the installation. Use insulating gloves to avoid the contact with terminals. As further precaution, use only properly insulated tools.
- ✓ Do not solicit the module with hits dropping it or dropping objects on it.
- ✓ Be sure that all the system parts can't cause mechanic or electric risks.
- ✓ Do not install the module in presence of inflammable gasses or steam, in fact there can always be some dangerous sparks.
- ✓ It is strictly forbidden to install or use a damaged module.
- ✓ Installation and utilization must be done only by qualified workers. Do not allow children to touch the module before or during the installation.
- ✓ Use the module only for the aim it's made for. Follow all the constructor instructions. Do not disassemble or remove any part or label put by the constructor.
- ✓ Do not put any paint or label on the module.
- ✓ Never focus sunlight on the module.
- ✓ Keep these instructions for future utilizations.
- ✓ The word "module" used in this guide refers to one or more photovoltaic panels.

## INSTALLATION

**DO NOT BEND THE MODULE. BENDS WITH A BENDING ANGLE BIGGER THAN 25%, EVEN IN SMALL PARTS OF THE MODULE, MAY CAUSE IRREVERSIBLE DAMAGES TO THE CELLS OF THE MODULE.**

Modules must be properly installed, following the instructions. The structure where the module will be installed on, must be capable of supporting, without deformation, any weather condition, like wind, snow and, for marine applications, saltiness and storms. The structure, anyway, must not receive any type of wrench. Flexure or free bending of the structure may cause the irreversible damage of the module components reducing the efficiency or definitively breaking it.

## READ VERY CAREFULLY

Modules fixing must be executed with maximum attention and precision, in fact the glue placed on SOLBIANFLEX modules doesn't permit a replacement or a splitting up of modules without damaging it. First of all, put the sheaths that shrink when exposed to heat into ribbons, paying attention to put the sheaths as nearest as possible to the module. Use a hot source (phon NOT flame) to shrink and then adhere the sheaths to ribbons (pay attention do not heat too much the PV module, it is made with plastic materials!). Another possibility (the only one if it is not possible to sold the ribbons from the beneath of the support) is to put the sheaths into the wires that you will sold to the ribbon, then sold the wires to the ribbons and cover the soldered points and the ribbons with the sheaths. Then you will have two long cables connected directly to the module.

Eventually use some SikaFlex to electrically insulate with a thin coating the metallic part of the ribbon nearest to the module that could be uncovered by sheaths.

Sign a rectangle on the rigid support where the module will be fixed on, with the same internal dimension of the module, to determine its exact position:





Make two (or one large) signs on the rigid supports where metallic ribbons will be located during fixing operations. We suggest to prepare a piece of cardboard with the dimension of the module and to do two holes in the cardboard in the position of ribbons, then put the cardboard on the rigid support and draw two signs in the same position of the holes.



Now make two 10mm holes in the rigid support. Then take two pieces of plastic or rubber pipe with the same external diameter and maximum thickness of 2mm (it's important to leave at least 6mm free), scatter some silicon on the outer part of the pipes end put them in the holes. Cut off the excesses of rubber pipes. The ribbons with the insulating sheath (or all the long wires coming from the module if you have already soldered them to the ribbons) will pass through these pipes.

Pipes attend to seal and protect internal layers of the rigid support. After making the holes we suggest to verify that they are in the right position.

Now detach the protective film (liner) leaving the pasting surface uncovered. We suggest to detach 20-30cm starting by pulling the liner from the short side near the ribbons, and putting first of all the ribbons (or all the long wires coming from the module) into the holes made on the rigid support.

**WARNING:** the glue on the module is extremely effective and aggressive, so avoid the contact with anything. Never touch the uncovered part with hands; the module must be sustained by grabbing it from the part covered by the liner.

**DO NOT BEND THE MODULE. BENDS WITH A BENDING ANGLE BIGGER THAN 25%, EVEN IN SMALL PARTS OF THE MODULE, MAY CAUSE IRREVERSIBLE DAMAGES TO THE CELLS OF THE MODULE. REMEMBER THAT THE GLUE IS REALLY EFFECTIVE AND IT DOESN'T PERMIT A REPLACEMENT.**

It's suggested to do the pasting operation in more than one person: one that holds the module by its long sides and the other that take away the liner and past the uncovered part by pressing it on the rigid support.

After pasting the module it's very important to put pressure on the whole surface. To do that it's possible to trample the module being sure to cover all the surface. Obviously we suggest to use smooth and not too hard shoes.

## ELECTRIC CONNECTIONS

**WARNING:** A bad installation can cause problems to the entire system, can be dangerous for health, and can cause injuries or death.

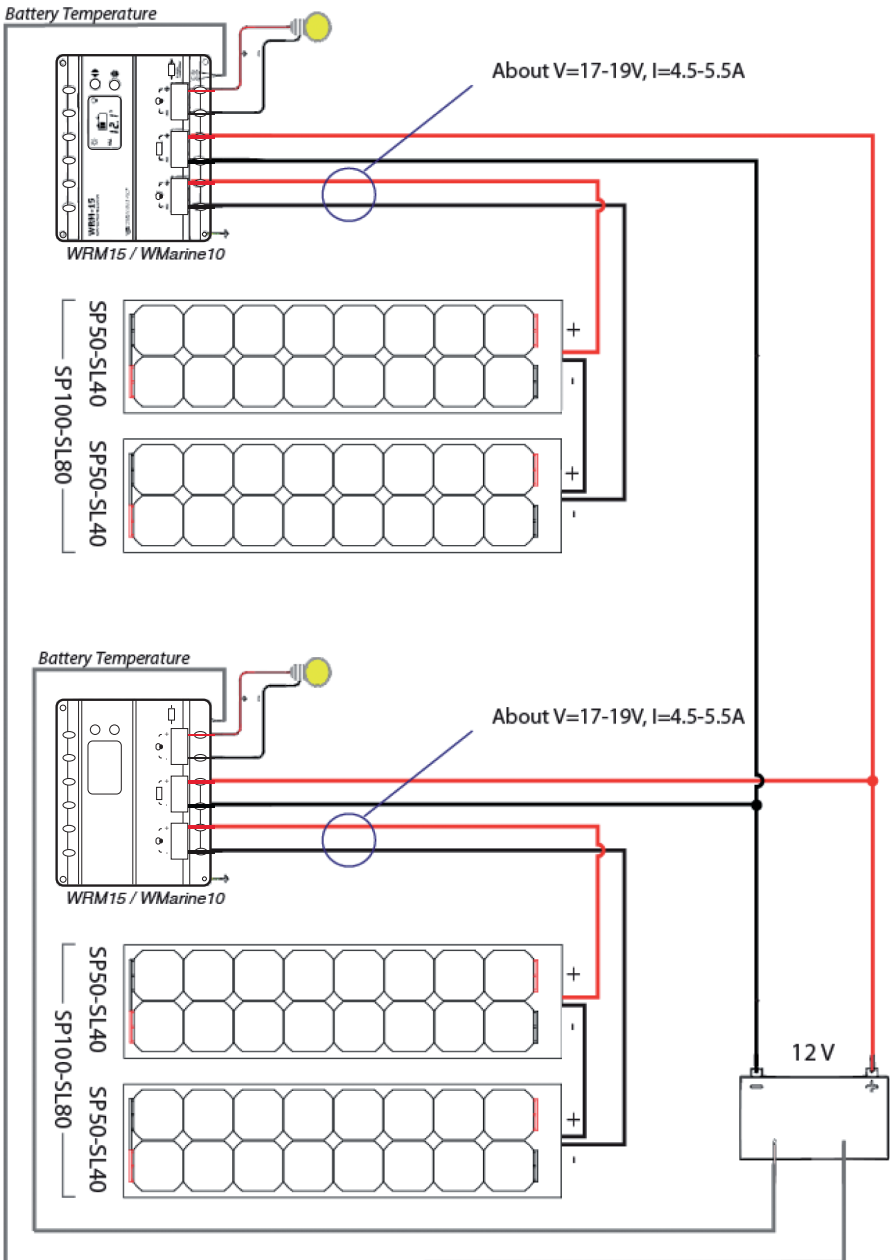
It may be needed to install additional devices as groundings, fuses, diodes, switchboards, charger or power disconnecter switch , etc... They are all components of a general electrical layout and they depend on each other and on all the other parts of the plant (inverter, loads etc..).

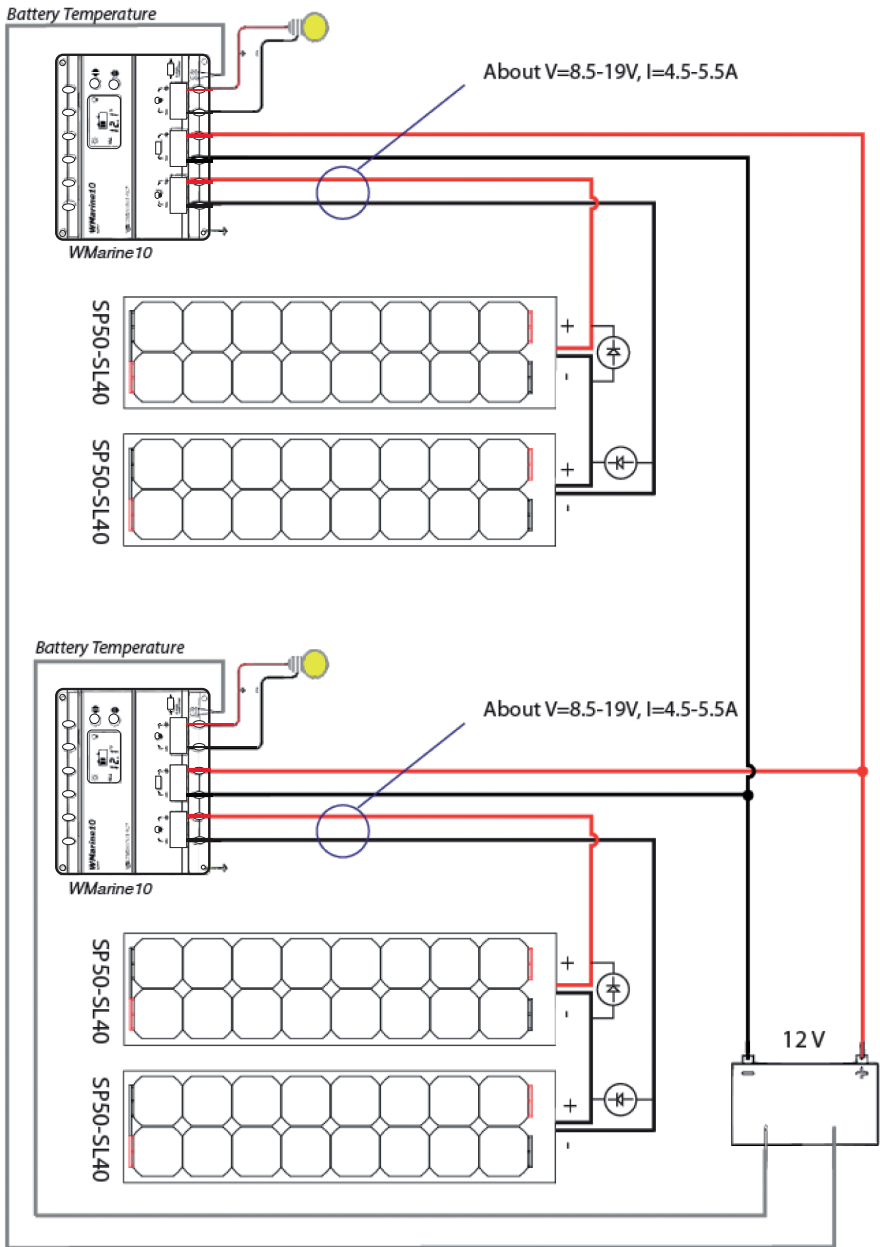
It is very important that the electrical layout of the PV system is done by skilled and authorised Staff.

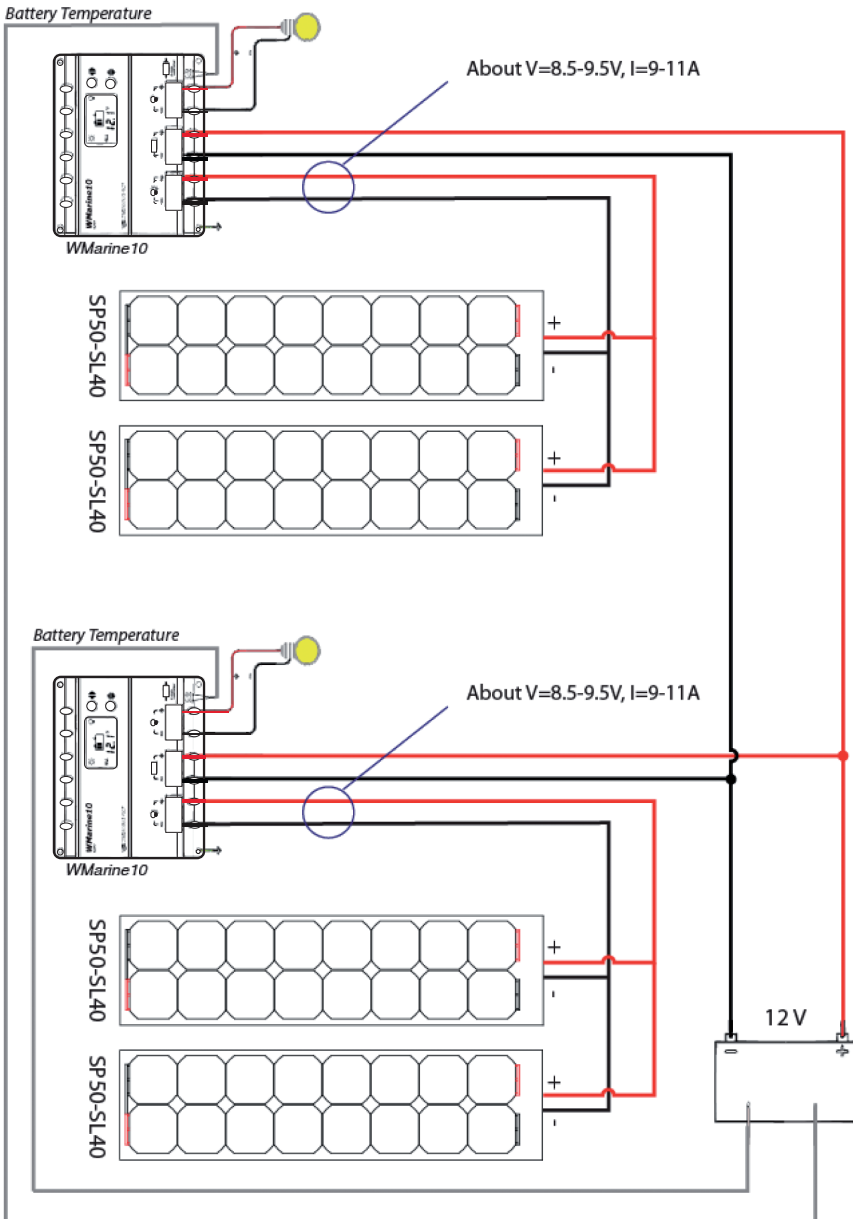
A way to avoid all these problems is to use the simplest and safest connection layout: One Solbian Charge Regulator for One Solbian Module, directly connected to the battery.

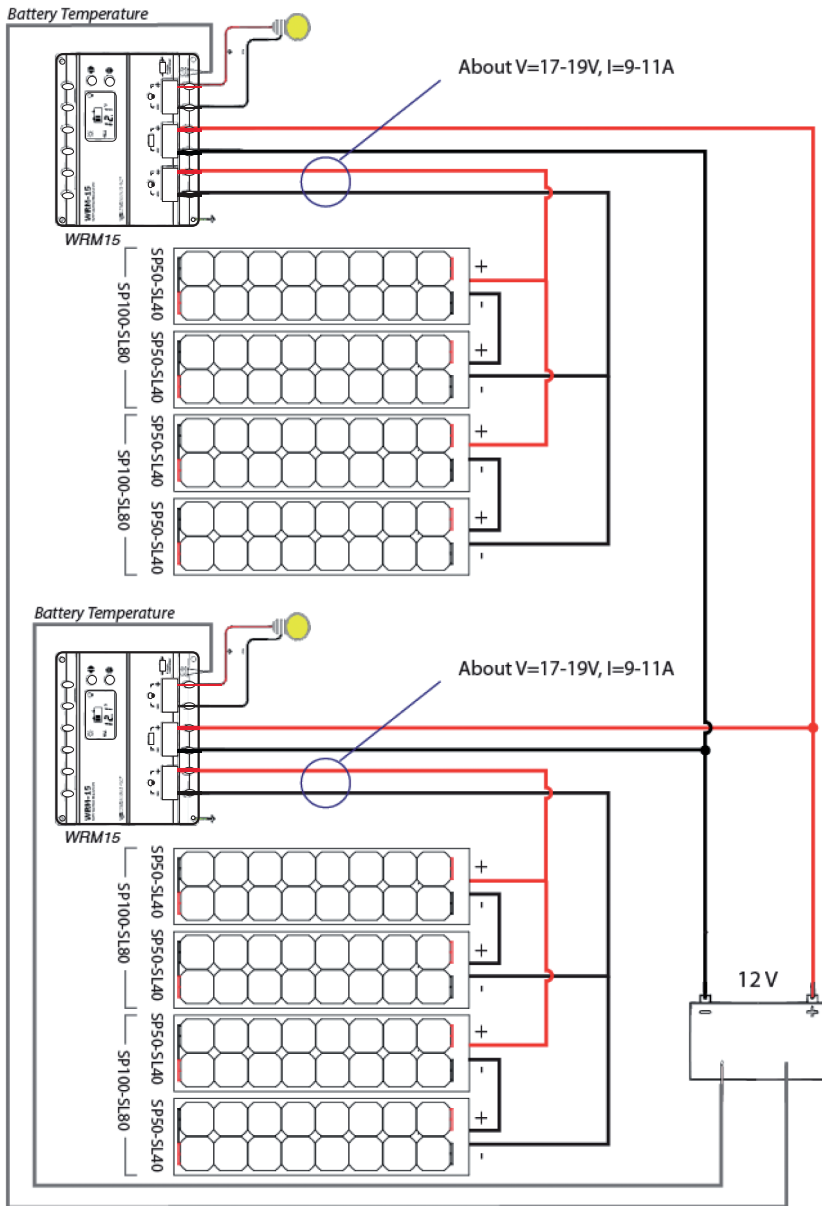
This is also the most efficient way to use the “SolbianFlex” modules because in this way the modules are all independent each other and controlled each one by a dedicated high efficient MPPT charge regulator.

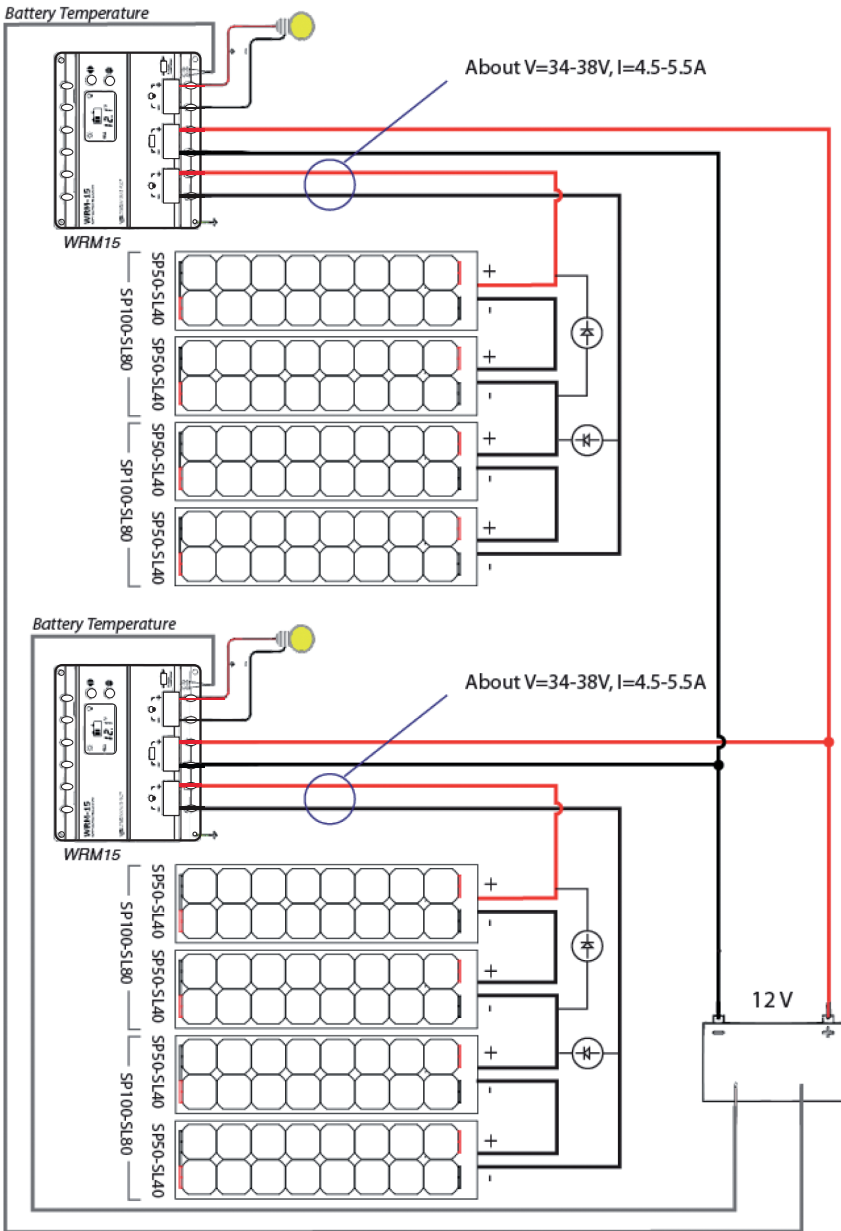
In the following we assume the equivalency between two “SOLBIANFLEX” 16 cells modules connected in series and a 32 cells module SOLBIANFLEX (actually this equivalence is not completely satisfied, in fact it is possible to have some mismatching problems between two SOLBIANFLEX 16 cells). According to that here we suggest some very simple layouts for 12 V batteries, where it is possible to substitute the Western CO. charge regulators with the high performance “Solbian Genasun” ones choosing the Step-up (boost) or the Step-down (buck) type according to the input/output voltages in the different cases:



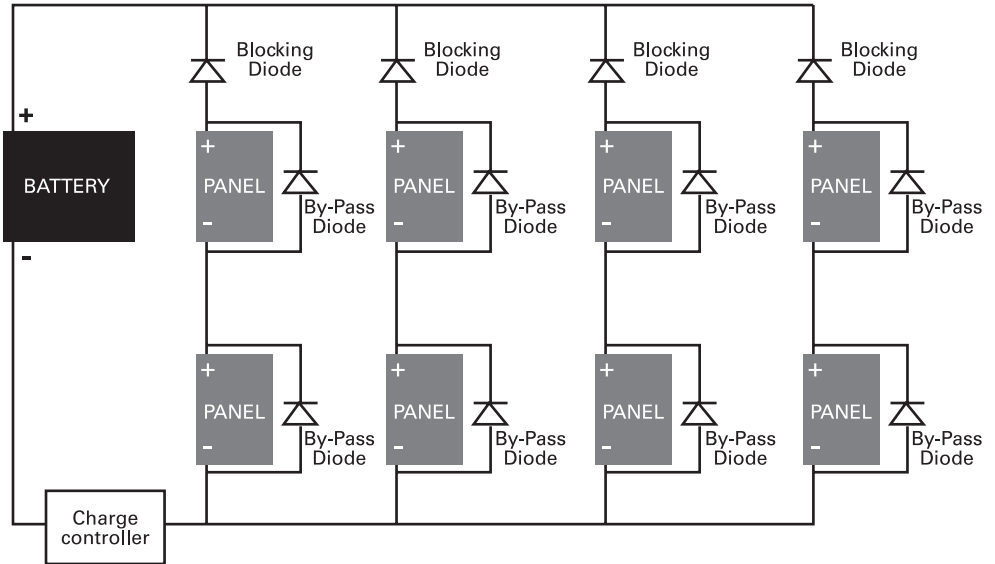








Connecting more modules in series and/or in parallel the voltages and/or the current increase for safety reasons, it is necessary to add some other devices. For example in the following example blocking diodes are inserted to each series of two modules, so to avoid that some of these series becomes a “load” for the other modules when it is under shadow.



For protection from surges (ex: lightning) it would be worth to use also fuses (one for each string) and isolators to disconnect the strings in the event of failure or maintenance fuses. Of course the choice of the block diodes, fuses, etc. depends on the electrical configuration and must be done by skilled personnel.



## UTILIZATION ADVISES

- ✓ The position of modules must permit air to freely circulate at least on the face exposed to sunlight. This reduces the temperature and gives a better performance.
- ✓ Electrical conductors section must be sufficient to grant a maximum voltage drop of 2% of nominal voltage.
- ✓ We recommend using flame-retardant cables and gas emitters resistant to acids basis and marine environment in general.
- ✓ If the support structure is made by conductor material, the module fixing must be done avoiding any possible contact between ribbons and the support; according to the law the structure, in this case, must be electrically grounded.

Recommended pairs of copper wire tat guarantee a maximum voltage drop of 1.5% of the battery nominal voltage.

### Max lenght wires couple [m] for 12V battery nominal voltage

CURRENT	WIRE SECTION			
	2.5 mm <sup>2</sup>	4 mm <sup>2</sup>	6 mm <sup>2</sup>	10 mm <sup>2</sup>
5 A	2.6 m	4.2 m	6.3 m	10.4 m
10 A	1.3 m	2.1 m	3.1 m	5.2 m
15 A	0.9 m	1.4 m	2.1 m	3.5 m

### Max lenght wires couple [m] for 24V battery nominal voltage

CURRENT	WIRE SECTION			
	2.5 mm <sup>2</sup>	4 mm <sup>2</sup>	6 mm <sup>2</sup>	10 mm <sup>2</sup>
5 A	5.2 m	8.4 m	12.5 m	20.9 m
10 A	2.6 m	4.2 m	6.3 m	10.4 m
15 A	1.7 m	2.8 m	4.2 m	7.0 m

## PHOTOVOLTAIC GENERATOR MAINTENANCE

Photovoltaic modules don't need too much maintenance, thanks to the absence of the mobile mechanical parts. Maintenance can be resumed in this few procedures:

- ✓ Clean the module. In case of marine environment often wash it with fresh water to avoid saline encrustation and to limit saltiness damages;
- ✓ Often check the module to avoid delamination or detachment from support problems;
- ✓ Check electrical connection and wires condition;
- ✓ Check the electrical system efficiency.

## POSSIBLE BREAKDOWNS

Breakdown events or defects are really rare. Some malfunction causes are:

- ✓ Cells break due to overmuch bending of the module;
- ✓ Cells break due to the module mechanical stress;
- ✓ Cells break due to defective pasting of the module on the rigid support (i.e. the presence of air bubbles between module and support may cause damages);
- ✓ Water infiltrations between module and support;
- ✓ Presence of water in the J-Box.

## TWO YEARS REPAIR, REPLACEMENT OR REFUND REMEDY

SOLBIAN warrants its Photovoltaic Solar Modules (MODULES) of SP, SL, CP and Custom Series, including factory-assembled DC connectors and cables, if any, to be free from defects in materials and workmanship under normal application, installation, use and service conditions.

If MODULES fail to conform to this warranty, during the period ending Twenty four (24) months from the date of sale to the customer of the SOLBIAN product (CUSTOMER), SOLBIAN will, at its option, either repair or replace the product, or refund the purchase price as paid by the CUSTOMER (SALES DATE). The repair or replacement, refund or remedy shall be the sole and exclusive remedy provided under the "Limited Product Warranty" and shall not extend beyond the Twenty four (24) months period set forth herein.

This -Limited Product Warranty- does not warrant a specific power output, which shall be exclusively covered under clause 2 hereinafter (Limited Peak Power Warranty).

## LIMITED PEAK POWER WARRANTY - LIMITED REMEDY

**2 YEARS:** If, within a period of (2) two years from the Sales Date any MODULE(s) exhibits a power output less than 95% of the minimum -Peak Power at STC- as specified as of the Sales Date in SOLBIAN Flash Report (or than the MODULE nominal power for the models where the Flash Report is not included), provided that such loss in power is determined by SOLBIAN (at its sole and absolute discretion) to be due to defects in material or workmanship, SOLBIAN will, at its sole option, either (1) replace such loss in power by either (a) providing additional MODULES to the CUSTOMER to make up for such loss in power or (b) replacing the defective MODULE(s) at the option of SOLBIAN or (2) refund the percentage of the cost of the MODULE (as measured by the then prevailing market price for similar MODULES) to the CUSTOMER representing the percentage of the power output less than 90% of the minimum -Peak Power at STC- as specified as of the Sales Date in SOLBIAN Data sheet or Flash Report if existing.

**5 YEARS:** If, within a period of (5) five years from the Sales Date any MODULE(s) exhibits a power output less than 85% of the minimum -Peak Power at STC- as specified as of the Sales Date in SOLBIAN Flash (or than the MODULE nominal power for the models where the Flash Report is not included), provided that such loss in power is determined by SOLBIAN (at its sole and absolute discretion) to be due to defects in material or workmanship, SOLBIAN will, at its sole option, either (1) replace such loss in power by either (a) providing additional MODULES to the CUSTOMER to make up for such loss in power or (b) replacing the defective MODULE(s) at the option of SOLBIAN or (2) refund the percentage of the cost of the MODULE (as measured by the then prevailing market price for similar MODULES) to the CUSTOMER representing the percentage of the power output less than 80% of the minimum -Peak Power at STC- as specified as of the Sales Date in SOLBIAN Data sheet or Flash Report if existing. The remedies set forth in this clause 2 shall be the sole and exclusive remedies provided under the -Limited Peak Power Warranty.

## EXCLUSIONS AND LIMITATIONS

In any event, all warranty claims must be received within the applicable warranty period for this warranty to be effective.

The -Limited Product Warranties- and the -Limited Peak Power Warranties- do not apply to any MODULES which have been subjected to:

- ✓ Misuse, abuse, neglect or accident;
- ✓ Alteration, improper installation or application (IEC-62257 and IEC-62124 recommendations);
- ✓ Non-observance of SOLBIAN's installation and maintenance instructions; and in particular, the ban of punching, cutting, hammering and bending the modules with a bending radius smaller than 1500 mm;
- ✓ Electrical connections of the modules beyond the examples contained in SOLBIAN's installation instructions or following specifications not explicitly validated by SOLBIAN;
- ✓ Repair or modifications by someone other than an approved service technician of SOLBIAN;
- ✓ Power failure surges, lightning, flood, fire, accidental breakage or other events outside SOLBIAN's control.

Both the -Limited Product Warranties– and -Limited Peak Power Warranties- do not cover any costs associated with installation, removal or re-installation of the PV-modules and (except as explicitly set forth in the final paragraph of Section 5) customs clearance or any other costs for return of the MODULES.

Warranty claims will not be honored if the type or serial number of the MODULES have been altered, removed or made illegible.

This -Limited Warranty for PV Modules- does not apply to MODULES marked as "Grade B"

## LIMITATION OF WARRANTY SCOPE

These -Limited Warranties for PV Modules- as set forth herein are expressly “in lieu of ” and exclude all other express or implied warranties, including but not limited to warranties of merchantability and of fitness for particular purpose, use, or application, and all other obligations or liabilities on the part of SOLBIAN, unless such other obligations or liabilities are expressly agreed to in writing signed and approved by SOLBIAN.

SOLBIAN shall have no responsibility or liability whatsoever for damage or injury to people or property, or for other loss or injury resulting from any cause whatsoever arising out of or related to the MODULES, including, without limitation, any defects in the MODULE, or from use or installation.

Under no circumstances shall SOLBIAN be liable for incidental, consequential or special damages, howsoever caused. Loss of use, loss of profits, loss of production, and loss of revenues are specifically and without limitation excluded.

SOLBIAN aggregate liability, if any, in damages or otherwise, shall not exceed the invoice value as paid by the CUSTOMER, for the single unit of MODULE.

## OBTAINING WARRANTY PERFORMANCE

If the CUSTOMER has a justified claim covered by this -Limited Warranties for PV Modules- an immediate notification directly to SOLBIAN shall be filed by mailing a registered letter in writing to the address of SOLBIAN listed hereunder, or, sending an email letter to the email account of SOLBIAN listed hereunder.

Together with the notification, the CUSTOMER should enclose the evidence of the claim about the corresponding serial number of the MODULE(s) and the date on which the MODULE(s) have been purchased.

The return of any PV-modules will not be accepted unless prior written authorization, provided by SOLBIAN. In connection with both the -Limited Product Warranties- and -Limited Peak Power Warranties-SOLBIAN shall reimburse CUSTOMER for reasonable, customary and documented transportation charges by sea freight for both the return of the MODULES and reshipment of any repaired or replaced MODULES, only if this cost is authorized by SOLBIAN customer service department.

## SEVERABILITY

If a part, provision or clause of this -Limited Warranty for PV Modules-, or the application thereof to any person or circumstance, is held invalid, void or unenforceable, such holding shall not affect and shall leave all other parts, provisions, clauses or applications of this -Limited Warranty for PV Modules-, and to this end such other parts, provisions, clauses or applications of this -Limited Warranty for PV Modules- SHALL BE TREATED AS SEVERABLE.

## DISPUTES

In case of any discrepancy in a warranty-claim, a first-class international test-institute such as Fraunhofer ISE in Freiburg/ Germany or TÜV Rheinland in Cologne/ Germany shall be involved to judge the claim finally. All fees and expenses shall be borne by the losing party, unless otherwise awarded. The final explanation right shall be borne by SOLBIAN.

YOU MAY HAVE SPECIFIC LEGAL RIGHTS OUTSIDE THIS WARRANTY, AND YOU MAY ALSO HAVE OTHER RIGHTS THAT VARY FROM STATE TO STATE. THIS LIMITED WARRANTY DOES NOT AFFECT ANY ADDITIONAL RIGHTS YOU HAVE UNDER LAWS IN YOUR JURISDICTION GOVERNING THE SALE OF CONSUMER GOODS, INCLUDING, WITHOUT LIMITATION, NATIONAL LAWS. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE LIMITATIONS OR EXCLUSIONS IN THIS LIMITED WARRANTY STATEMENT MAY NOT APPLY TO YOU.

## VARIOUS

The repair or replacement of the MODULES or the supply of additional MODULES, does not cause the beginning of new warranty terms, nor shall the original terms of this "Limited Warranty for PV-Modules" be extended. Any replaced MODULES shall become the property of SOLBIAN made for their disposal. SOLBIAN has the right to deliver another type (different in size, color, shape and/or power) in case SOLBIAN discontinued producing the replaced MODULES at the time of the claim.

## WARRANTY TRANSFER

This warranty is transferable when the product remains installed in its original location with the warranty registration.

## FORCE MAJEURE

SOLBIAN shall not be responsible or liable in any way to the customer or any third- parties arising from any non-performance or delay in performance of any terms and conditions of sale, including this “Limited Warranty for PV Modules”, due to acts God, war, riots, strikes, warlike conditions, plague or other epidemics, fire, flood, or any other similar cause or circumstance beyond the reasonable control of such SOLBIAN. In such cases, performance by SOLBIAN of this Limited Warranty shall be suspended without liability for the period of delay reasonably attributable to such causes.

## VALIDITY

This Limited Power Warranty for PV Modules is valid for all MODULES dispatched between 1st January 2012 and 31st December 2012.

## NOTES

Peak Power at STC is the power in Watt peak that a PV-module generates in its Maximum Power Point.

STC are as follows:

Light spectrum of AM 1.5, (b) an irradiation of 1000 W per m<sup>2</sup> and (c) a cell temperature of 25 degree centigrade at right angle irradiation. The measurements are carried out in accordance with IEC 61215 as tested at the connectors or junction box terminals “as applicable” per calibration and testing standards of SOLBIAN valid at the date of manufacture of the PV-modules.

Modules of Solbian SP series use “back-contact cells” and therefore cannot be measured by standard flash sun simulator. Continuous simulator, or special flash - tester for said type of cells (e.g. Sinton FMT Tester) must be used.



**SOLBIAN ENERGIE ALTERNATIVE S.r.l.**

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