

Installation Manual and knowledge base

Please take your time to read the following instruction.
There are also some nice knowledge we would like to share.

Do not worry about existing chargers

The regulator will work in parallel with other types of chargers and you can keep the old mains charger and generator/alternator. They will not interfere in a bad manner and you can enjoy a care free charge of your batteries.

Choose the regulator

Chose the type of regulator: Standard or MPPT

A simple regulator might be a cost-effective solution. A MPPT regulator may be more costly but will render more energy from any type of solar panel. In real life one should count on between 0-20% increases in production.

So how to choose? Let's say you would get 10% more production out of your solar panel with an MPPT regulator. Then compare the cost for 10% bigger solar panels versus the more expensive MPPT regulator. If you have a limited space we would suggest that you choose a SUNBEAMsystem solar panel to get the most out of the available space. Then also consider if you need the MPPT function as well. If you have unlimited space it might sometimes be cheaper to choose an inexpensive regulator and buy several panels or a single larger panel.

Find the regulator Size

The regulator will be stamped with a maximum number like 10A or 20A. This is the highest current produced by the solar panel(s) on the battery side. It has nothing to do with the size of the battery bank.

10A equals about 130W in total of Solar Panels, 20A 260W and 40A 520W. (for a 24V battery system, double the watt).

Example : You will use two 50W solar panels, that sums up to 100W. Since a 10A regulator will handle up to 130W solar panels this is the correct choice.

Type of batteries

Most regulators are meant for Sealed Lead Acid batteries. If you have Gel or AGM type you need to make sure that your regulator could be set to charge this type of battery. If you have Lithium batteries you need to take extra care in choosing the regulator because old type of lithium batteries needs special charge programs. On the other hand the latest types of advanced Lithium batteries will accept almost any type of charger.

Advanced: 24 Volt systems

In you got a 24V system all our regulators will sense this automatically. – The only difference is that two panels (of the same model) need to be connected in series (connect the panels plus to minus and use the "left over cables" to connect to the regulator)

Alternatively you could choose a Boost-regulator manufactured by Genasun. This will enable the use of a single solar panel on a 24V system.

Advanced: Performance

The competitive user might notice that a MPPT regulator most often performs better when not used with solar panel wattage close to the maximum rating. Hence an oversized regulator might produce a few percent more.

Installation

Fitting of the solar panel

Our Flush-model panels are superior when fitted on a hard surface. For bonding we recommend either double side tape or sika flex 291. Both types of bonding needs much less tape or glue than one would first think. Alternatively one could also use screws for panels equipped with eyelets.

Do not use 100W on a soft surface

Our Flush panels and all panels in the 100W size are designed to be permanently glued or screwed to a firm surface. If you plan for any type of semi- permanent or temporary usage then the maximum recommended size is 50W with a Junction Box

Does the angle matter? – No not that much

If you live in the northern hemisphere you might find yourself in the situation where the sun is 45 degrees over the horizon in the south. If you then instantly compare a solar panel lying flat on the ground with a solar panel directed towards the sun you will notice more than 30 % drop in production. However IF you would measure on the two panels mentioned above over an entire day you would only get a 11% drop in the total production for the panel lying flat on the ground compared with the panel angled 45 degrees towards south. This is because of the sun's movement over the day.

This is GREAT NEWS for all of us planning to put solar panels on moving boats and vehicles. Because fitting of a solar panel on a hard roof /deck is almost always the most practical and safe solution.

Connect the solar panel and regulator.

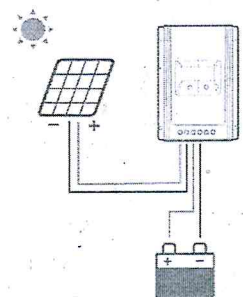
In moist environments like a yacht or RV one should always use pre-tinned cables for the best performance over time.

Connect the regulator to the service battery like illustrated below. By doing this a regulator with autosensing will recognize the battery system.

Between the regulator and battery a zero voltage drop is preferable. Hence it is important to place the regulator close to the batteries or main cables.

Connect the solar panel. Run the solar panel cable inside and join with a big cross area cable in suitable length. Use our online calculator to find a suitable cable cross area.

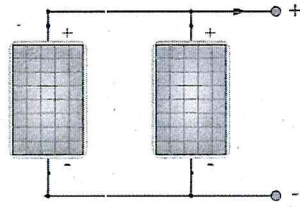
Note that in the diagram the "load" port is not used. This is an extra feature that can be used with a timer that is set in relation to sun rise and set.



Multiple Solar Panels

Parallel Connection

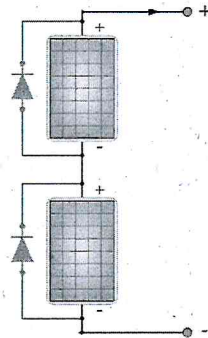
Any SUNBEAMsystem panels can be put in parallel with other SUNBEAMsystem panels without extra considerations. For the best result use models with similar V_{mp} (found on the back)



As wattage and cable length increases, the cross area of the main cables running from the solar panels to the regulators needs to be increasingly bigger to avoid losses in the cables.

Serial Connection

The recommended max is 5 units in one series (as long as your MPPT-regulator allows for this). By-pass diodes according to the picture are needed. On JBox models there is a by-pass diode built into the box but on Flush models this needs to be connected separately for each solar panel.



To understand if a serial connection suits your installation, please consider the pros and cons of this solution.

Pros:

Higher voltage on the solar panel side and cable backbone.

Cons:

- 1) A small power loss in the by-pass diode not experienced on the diode-less Flush models.
- 2) The diodes will increase partial shading performance but serial connected panels will still produce less in most shading conditions compared to parallel connected panels.

Serial Connections for Flush Models

To achieve a secure installation as well as the best performance in shading conditions a by-pass diode is needed for every single panel.

If needed one could choose to exclude the diodes. SUNBEAMsystem solar panels are safer than older types of panels and could be put in series without by-pass diodes if the total wattage is kept below 150W and the total number of SUNBEAMsystem panels is not higher than two. This setup will however underperform in any type of shading conditions.

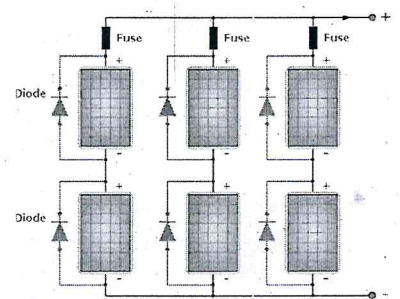
NOTE: Incorrect diodes can damage your panels. Our retailers will provide the right sized diodes needed for your installation upon request.

Large Arrays

For large arrays a combination of Serial and parallel connections will have to be used to find the right combination of voltage and high amounts of panels.

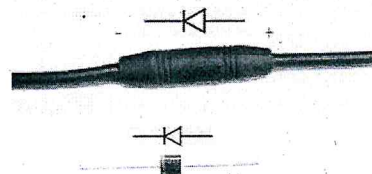
- ✓ The maximum number of panels in series is five
- ✓ Mind the regulator max Ampere.
- ✓ Earlier mentioned pros and cons regarding parallel vs. serial connections applies here as well.
- ✓ Use a balanced symmetrical setup.
- ✓ Use backbone cables with sufficient cross area.
- ✓ Choose solar panels of the same size and model.
- ✓ One by-pass diode needs to be installed per each panel (Do not applies to JBox models).
- ✓ For each serial group one fuse should be present. The fuse rating should be according to I_{oc} printed on the backside of one of the panels multiplied with 1.25. (example, $6 \times 1.25 = 7.5$, choose 8A fuses).

The Fuses replaces blocking diodes traditionally used. The choice of fuses will improve the production compared to using blocking diodes.



The direction of the diodes is crucial so please take extra care when connecting. **Please not that when the only indication is +/- it should be connected in reverse to the solar panel.** The direction of the printed band should be the same as the band in front of the arrow in the diode symbol.

Study the pictures below carefully.



NOTE: Incorrect diodes can damage your panels. Our retailers will provide the right sized diodes needed for your installation upon request.

Multiple Solar Panel Arrays

If a high expected consumption has to be met with many large solar panel arrays then one should follow some simple advice. On an environment with different main directions or reoccurring shading conditions (like a yacht) one could benefit from having several arrays with one MPPT regulator each. For example, one starboard and one port array

The same rules and recommendations mentioned above for single arrays applies for multiple arrays. Please also make sure you choose the same brands and models for the regulators (one regulator per array).