



OCEANVOLT

**Connecting solar panels to the
Oceanvolt system**

&

**Recharging the house battery
pack on boats that have
Oceanvolt systems with Lithium
batteries**

1. General

Oceanvolt electric propulsion system uses 48 VDC voltage with one or more groups of four 12 V batteries connected in series. The system is fully compatible with solar panels.

Since the propulsion voltage is 48 VDC, a separate 12/24VDC battery is required to power up the house electronics. The Oceanvolt system is versatile and allows different ways to recharge both the 12/24 VDC house battery pack and the 48 VDC propulsion battery pack.

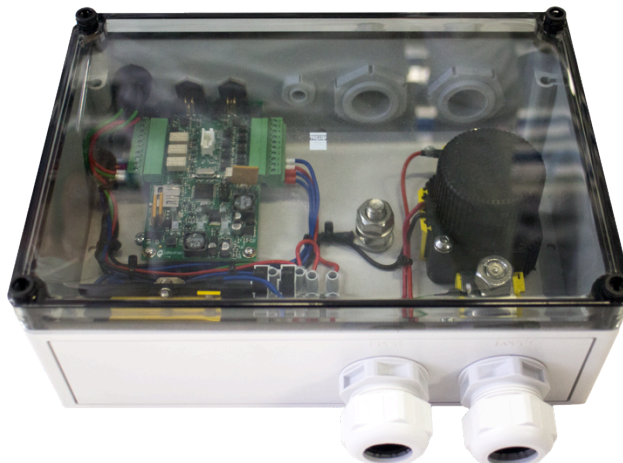
Warning: never connect anything straight to 48 VDC propulsion battery packs poles – always connect into load side of the busbar, after the BMS relay.



2. Recharging the 48 VDC propulsion battery pack

The 48 VDC propulsion battery pack is recommended to have its own shore power charger.

Additionally solar panel charging system can be used. If no shore power charger is installed the system has to have a solar charger with panels in order to facilitate balancing of the lithium ion batteries. Balancing is a process in which the individual cell voltages are adjusted by the BMS into approximately same voltage.



Balancing cannot be done via regeneration or via a generator (in hybrid systems), only with solar and shore power chargers.

Third way to recharge the propulsion battery pack is via regeneration function (using motors as generators under sail) that comes as standard.

2.1. Shore power

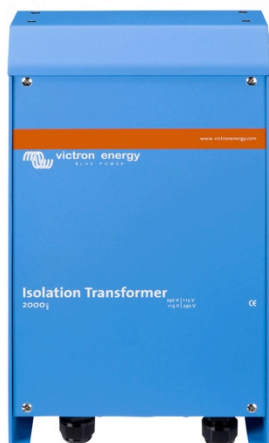
The 48 VDC shore power charger is a 220 VAC/48 VDC charger, available either as a 25 amp or 50 amp versions (1,4 or 2,8 kw).

Oceanvolt uses the Victron Skylla family of products as shore power chargers.



The shore power should be connected into the charger via its own circuit breaker, but it can be in parallel with the 220 VAC/12 VDC/24VDC house battery charger (Blue power) on the same AC shore power plug. This way when connected to a shore power both chargers will work independently.

On 110 VAC systems the 48 VDC charger need to have an isolation transformer that converts the 110 VAC to 220 VAC prior to the charger. If the isolation transformer is installed the system will not accept 220 VAC – if both 110 VAC and 220 VAC are required the 220 VAC requires its own shore power plug and circuit breaker which bypasses the isolation transformer.



The charger has a remote control that allows tuning the amount of amperage taken from the shore power. This is handy in case the same plug on shore has several boats connected drawing large currents.

In addition to a single charger, Oceanvolt system is also compatible with charger/inverters. These can be either 220 VAC/48 VDC or 110 VAC/48 VDC. The former is Victron Multiplus (available as 3 or 5 kw) and the latter Victron Quattro (3 or 5 kw). The benefit of the charger /inverter is that it creates a powerful AC network on board and thus allows using the 48 VDC battery pack energy for all energy needs on board. If the inverter is used, the house battery charger should be connected into the outlet of the inverter – this allows charging the house battery pack from the propulsion battery pack on a safe and proper manner. The charging process can be interrupted and triggered from the remote panel of the inverter, it also allows tuning the amperage drawn from the pier.



The charger/inverter models allow connection to the CCGX and thus allow monitoring of the state of charge, AC consumption and other parameters. Charger models cannot be connected to the CCGX.



The charger and charger/inverter are connected to the load side of the batteries, after the BMS main Gigavac contactor

3. Solar panels

Solar panels can be connected into system either into the house battery system or into the propulsion battery pack, or both.

3.1. House battery pack with solar panels



Oceanvolt recommends connecting minimum of 50 W panels to the house battery pack via Victron MPPT 100/15 solar controller. It can handle multiple panels connected in parallel up to 15 amps of current. The MPTT should be connected into Victron CCGX module to visualize the solar energy harvesting. If more power is required several panels can be connected in parallel and more MPTTs used. This avoids shading effect: one panel at the shade will only drop out that particular panel over panels connected in series which would drop out entire chain of panels.



3.2. Propulsion battery pack with solar panels

48 VDC propulsion battery pack is recommended to be connected with solar panels always, only if the boat is primarily under shore power then the panels can be left out.

The charging voltage should be between 60 -150 VDC. In practice this requires 4 -7 regular panels connected in series. The panels should be facing towards the sun on similar way, as even one panel in shade would drop the voltage below threshold. The panel power is not the criteria– the combined voltage determines the suitability. The power is of course influencing the overall efficiency of the package.

If the space does not allow connecting 4 panels in series smaller amount can be used with Genasun Boost controller. The Genasun boost takes a 12-20 VDC panel input and boosts it up to 56 VDC- a proper voltage for the lithium ion batteries. The Genasun allows max 8 amperes but more Genasuns can be used to increase capacity.

With the Genasun a small Gigavac relay shall be used – please contact Oceanvolt for the details, as the relay needs to be connected into the BMS relay. Panels installed on opposite sides of the boat can be connected into a single Genasun even if the combined current would exceed 8 amps as they are not likely to be on the sun at the same time.

The Genasun information can be connected into the Victron CCGX with a Victron BMV and VE Direct cable.



4. DC/DC converters

Oceanvolt does not recommend using 48 VDC/12(24) VDC converters as they might interfere the operation of the BMS pre-charge and are not optimal as chargers for the house battery pack.

5. Regeneration

All Oceanvolt systems have build in regeneration function as standard. It allows using the electric motor as a generator under sails, producing power between 50W up to 4 kW, depending on the boat speed. The regeneration can be triggered once the boat speed is above 5 knots and less than 15 knots. The battery pack charge has to be less than 95%, at higher charge the regeneration is turned off automatically. The regeneration function will not balance the batteries; this requires either shore power or solar power connected to the 48 VDC system.