tbs electronics OCS 150-60 MPPT Solar Charge Controller Owner's Manual

Contents

tbs electronics

tbs electronics OCS 150-60 MPPT Solar Charge Controller

Product Information

- **Product Name:** MPPT Solar Charge Controller Omnicharge Solar
- **Models:** OCS 150-60 (150V/60A), OCS 250-70 (250V/70A)
- **Manufacturer:** TBS ELECTRONICS BV
- **Address:** De Marowijne 3, 1689AR, Zwaag, The Netherlands
- **Website:** tbs-electronics.com

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Exclusions for documentation and product usage

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1. Makes no warranty as to the accuracy, sufficiency, or suitability of any document.

User Manual Information

Document name, date, and part number: OCS-60-70 User Manual Rev1endfs, August 2023, xxxxxx

Safety Precautions
Thank you for purchasing a TBS Electronics (TBS) Omnicharge Solar MPPT Solar Charge Controller (hereinafter referred to as ‘product’ or ‘solar charger’). Please read this user manual for information about operating the product correctly and safely.

CAUTION:
Follow the safety precautions provided in this manual to ensure safe operation of the product.

Product Features
Omnicharge Solar battery chargers are true next-generation products and contain the latest highly efficient switch mode power supply technology, as well as a smart digital control system. The following are the most important Omnicharge Solar features:

- MPPT charging
- Battery charging explained
- Temperature compensation

MPPT Charging
The Omnicharge Solar charger utilizes Maximum Power Point Tracking (MPPT) technology to optimize solar panel output and maximize charging efficiency.

Battery Charging Explained
Most standard selectable Omnicharge Solar charge programs perform a 3-stage IUoUo charging process comprising of a Bulk/MPPT, an Absorption/Boost, and a Float stage. The charging process depends on the availability of sufficient sunlight. Please refer to the user manual for visual representation of the charging process.

CAUTION:
During a mild equalize charge, the applied voltage to thebattery is higher than the standard charge voltage. Ensure that thebattery and connected battery loads can handle this voltage safely.

Note: The Float stage is not enabled by default when a Lithium battery is selected. If Float charging is required for your Lithium battery, please create a user-defined/custom charge program (see chapter 3.2 in the user manual) and select it as the standard charge program.

Temperature Compensation
When a Lithium battery is installed and a temperature sensor is connected to the charger, there is no charge voltage compensation as this is typically not allowed for this type of battery.

Omnicharge Solar Setup
When using the app for the first time and after pressing the 'Add Device' button, it will ask for permission to use Bluetooth on your device. Press 'OK' to proceed so that the app can scan for TBS devices in the neighborhood.

Note: Bluetooth has a limited range. In open spaces (line of sight), the maximum distance between the charger and mobile device can be up to 20 meters. However, in practical circumstances like inside houses, vehicles, or boats, several objects such as walls or other equipment can limit this range down to only a few meters. The Bluetooth hardware inside your mobile device also affects the range.

SAFETY PRECAUTIONS

Thank you for purchasing a TBS Electronics (TBS) Omnicharge Solar MPPT Solar Charge Controller (hereinafter referred to as 'product' or 'solar charger'). Please read this user manual for information about operating the product correctly and safely.

CAUTION
This user manual is an addition to the installation manual of this product. Please make sure that the installation manual has always been read first, before proceeding with the user manual. The installation manual is included with the charger or can be downloaded from our website at **tbs-electronics.nl/downloads**.
Keep this user manual and all other included documentation close to the product for future reference. For the most recent manual revision, please check the downloads section of our website.

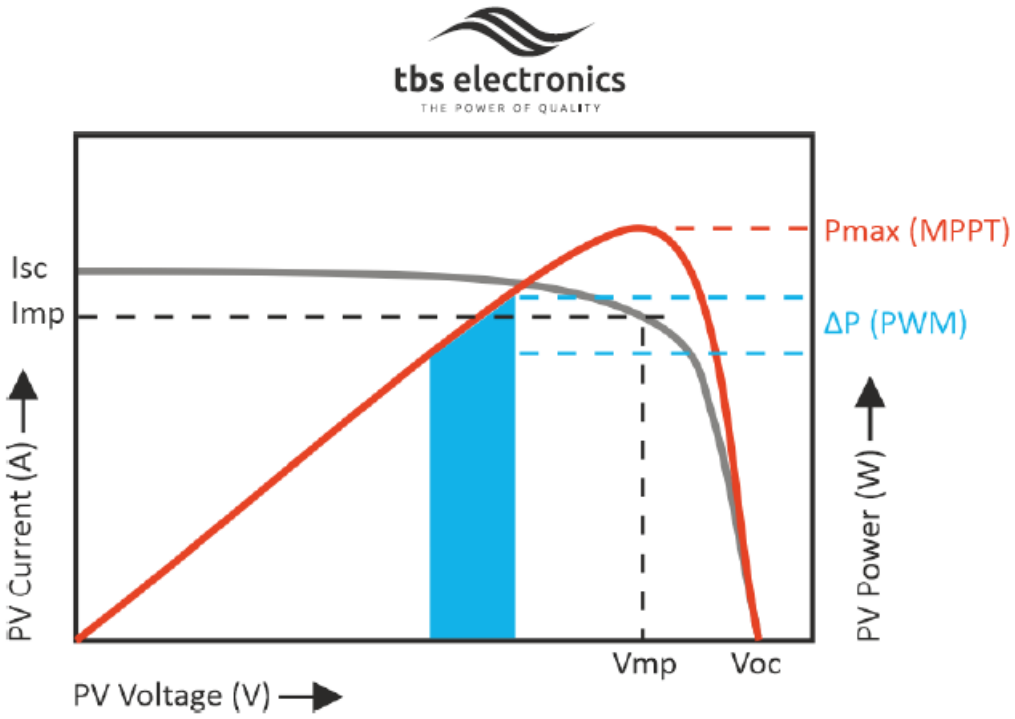
TECHNOLOGY

Product features
Omnicharge Solar battery chargers are true next generation products and contain the latest highly efficient switch mode power supply technology, as well as a smart digital control system. Please see below a summary of the most important Omnicharge Solar features:

- Fast Maximum Power Point Tracking (MPPT) ensures that you always get the maximum amount of power transferred from the PV panels to your battery. Even under the most difficult circumstances. The MPPT efficiency of an Omnicharge Solar charger can reach up to 99%.

- Highly efficient switch power supply technology ensures a low waste of power and allows for a fan-less design
- Clear detachable information display for real time status and parameter monitoring
- Smart selectable charge programs for AGM, Gel, Flooded, Lithium and User defined battery types
- Automatic battery voltage detection
- Battery temperature sensor input
- Programmable battery under- and overvoltage alarm relay
- Battery temperature sensor included
- Historical data storage up to 300 days
- Full protection against battery reverse polarity, PV reverse polarity, short circuits, battery open circuit and solar charger over temperature
- Monitoring and configuration via Dashboard Mobile app (iOS and Android)

MPPT charging
There are essentially two types of charging technologies for solar chargers. These are PWM and MPPT technology. PWM is the most basic one and can be seen as just an automatic switch that connects the PV array directly to the battery as long as charging is needed. This results in a PV voltage that is pulled down to the same level as the battery voltage. And since this voltage level is typically lower than the maximum power point voltage (Vmp) of the PV array, the resulting effective power to charge the battery bank is not optimal.
A solar charger with MPPT technology is more advanced and it is based on a smart high efficiency DC to DC converter that will continuously find the maximum amount of power that is available from the PV array. This is accomplished by varying the input voltage of the charger by controlling the amount of power consumed from the PV array. The main goal is to find the highest result out of the multiplication of battery voltage and charging current (P = V * I). This highest result is called the Maximum Power Point. The image below shows a typical I-V graph of a PV panel. Added in red is a scaled graph representing the generated power (multiplication of I and V) of the same PV panel, including the maximum power point Pmax:

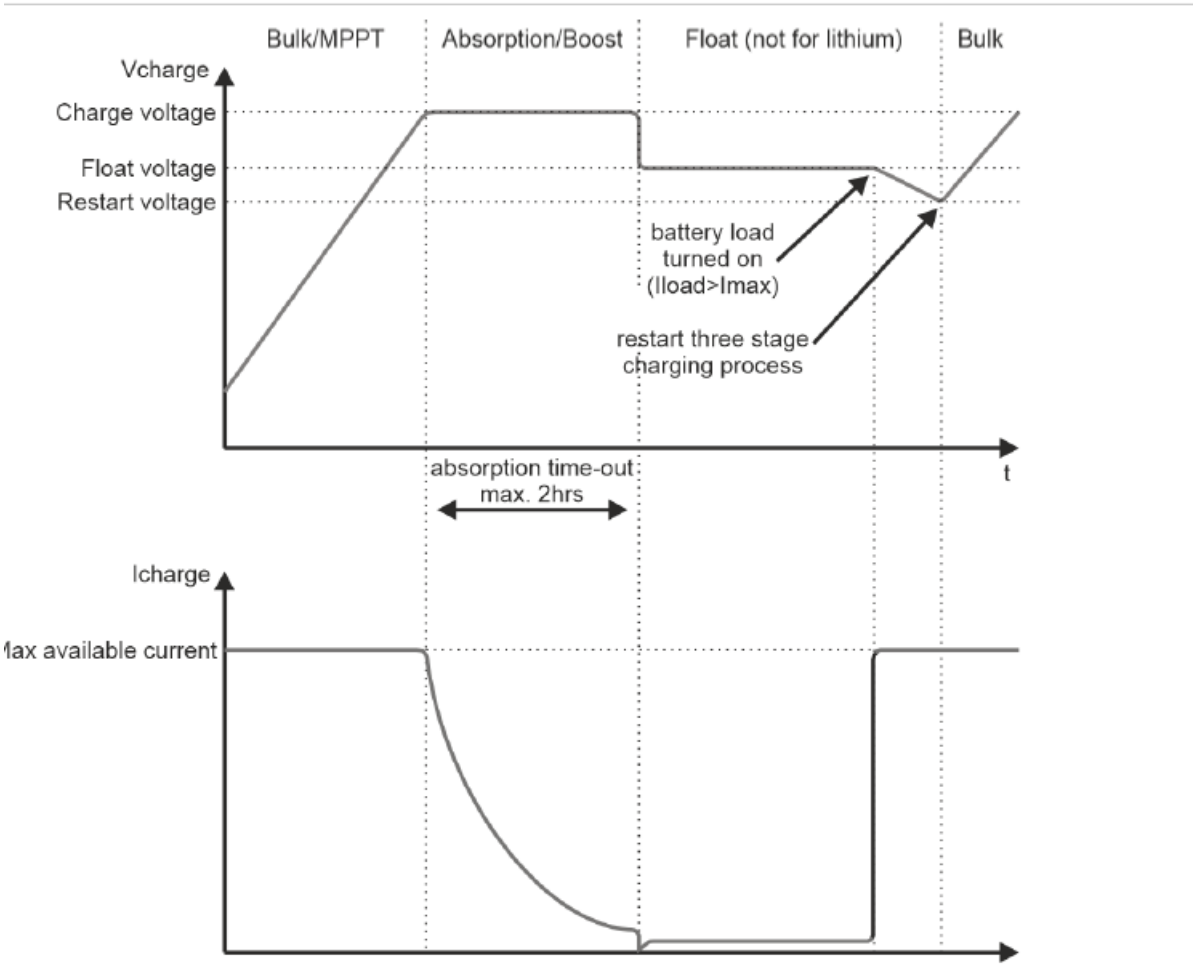


The blue area in the above graph (ΔP) represents the typical operating area of a traditional PWM type solar charge controller. As you can see, Pmax (MPPT) is higher than ΔP (PWM).
The fast and efficient MPPT technology onboard of the Omnicharge Solar products makes sure that the maximum power point is tracked continuously. This is to make sure that it always operates at the maximum power point of the PV array, that may vary continuously against irradiation levels from the sun, partial shading (causing more than one Pmax point) and last but not least PV array temperature.

In general, a well designed MPPT solar charge controller will typically get 15 – 25% more power from your PV array compared to traditional PWM type solar chargers.

Battery charging explained

Most standard selectable Omnicharge Solar charge programs perform a 3-stage IUoUo charging process comprising of a “Bulk/MPPT” , an “Absorption/Boost”, and a “Float” stage. All of course for as long as there is sufficient sunlight. The image below visualizes the 3-stage charging process:



In the Bulk/MPPT stage the charger delivers full available output current and typically returns approximately 80% of charge back into the battery, once the charge voltage is reached. During this stage the charger runs in MPPT mode, transferring maximum PV power into the battery.

When the Charge voltage has been reached, the Absorption/Boost stage will be entered. In this stage the voltage will be held constant and the current will decline automatically as function of the battery’s state of charge. Typically, this stage will return the final 20% of charge to battery. When the absorption time-out of 2 hours (= factory default) has been reached the float stage will be entered. For lithium batteries the charger will remain in the absorption stage as long as there is sufficient solar power available.

Once every 30 days and only if a Flooded (open lead acid type) battery is selected, the Omnicharge Solar charger will automatically perform a mild equalization charge, setting the Absorption/Boost voltage 0.4V @ 12V or 0.8V @ 24V higher than the normal voltage level for a maximum of 2 hours. This process will help minimize the acid stratification and sulfation that typically occurs in all flooded batteries. When you do not wish to have this automatic mild equalize charge performed on your Flooded batteries or wish to alter the equalization voltage level, please create a user defined/ custom charge program (see chapter 3.2) and select it to become the standard charge program. By default mild equalization is never performed on AGM, GEL or Lithium batteries.

CAUTION

During a mild equalize charge, the applied voltage to the battery is higher than the standard charge voltage. Please check if the battery and the connected battery loads can handle this voltage safely.

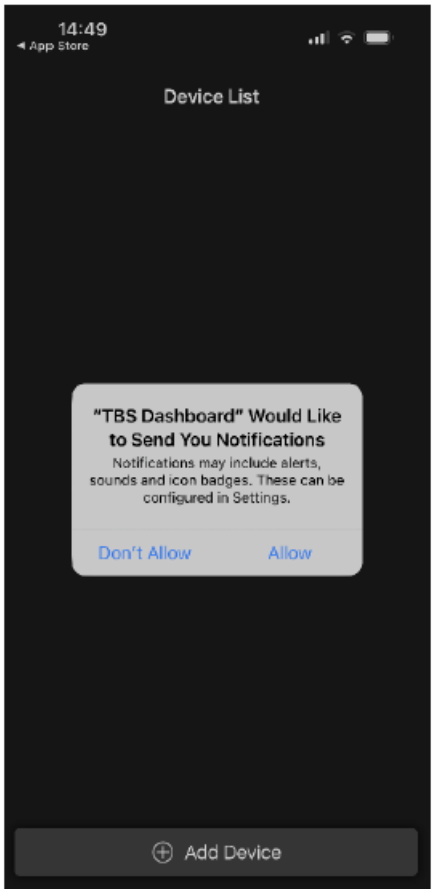
After the Absorption/Boost stage has been finished and when an AGM, GEL or Flooded battery selected, the charger will jump to the Float stage. In this stage the battery voltage will be held constant at a safe level for the battery. This will maintain the battery in optimal condition for as long as there is sufficient sunlight. Connected battery loads will be directly powered by the charger up to the charger's maximum output current level. When even more current is drawn, the battery must supply this which results in a declining battery voltage. At a certain battery voltage level (Restart voltage), the charger jumps back to the Bulk/MPPT stage and will execute a complete charge process again.
By default, the Float stage is not enabled when a Lithium battery is selected. When you do need to Float charge your Lithium battery, please create a user defined / custom charge program (see chapter 3.2) and select it to become the standard charge program.

Temperature compensation
When the battery temperature sensor is connected to the Omnicharge Solar charger and an AGM, GEL or Flooded battery is selected, it will automatically provide charge voltage compensation against temperature. The charge voltage is compensated by -3mV/°C/cell with +25°C as a 'no compensation' starting point. So for a 12V battery (6 cells) the charge voltage will increase by +18mV/°C below 25°C and decrease by -18mV/°C above 25°C. For a 24V battery (12 cells) this is respectively +36mV/°C and -36mV/°C.
When no battery temperature sensor is connected to the charger, the charge voltages will remain unchanged at the default set 25°C values, independent of ambient temperature.
When a Lithium battery is installed and a temperature sensor is connected to the charger, there is no charge voltage compensation as this is typically not allowed for this type of battery.

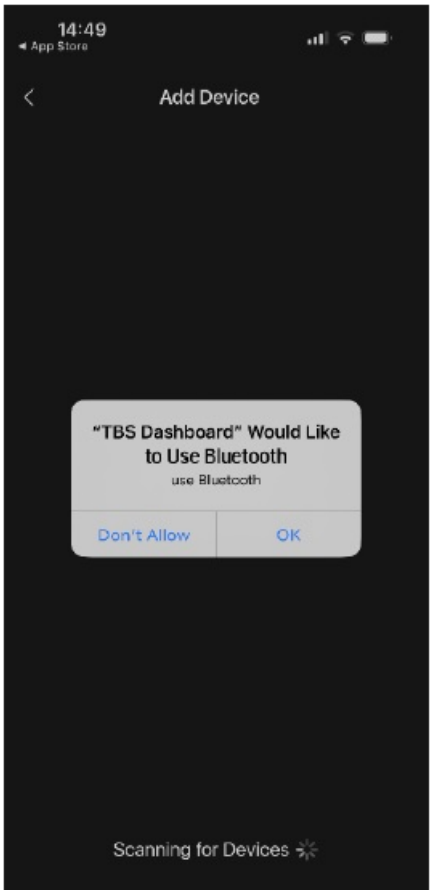
OMNICHARGE SOLAR SETUP

All information on how to commission the Omnicharge Solar charger, how to interpret the LED indicators on the device and how to select the battery type using the setup button on the device itself, is explained in chapter 3 of the installation manual. This manual is included with the charger or can be downloaded from our website at tbs-electronics.nl/downloads. For a more advanced setup and insight in real time parameter data, you can either use the front panel information display or the TBS Dashboard Mobile app. For setting up the solar charger, we strongly advice to use the app for a clearer overview and more options.

Using the Dashboard Mobile app
The easiest way to setup your Omnicharge Solar charger is to use the TBS Electronics Dashboard Mobile app. You can find this app in the Apple App Store and Google Play. Besides setting up the charger, this app will also provide you with real time information about the chargers' operation and access to historic data like solar energy yield and maximum power per day. The global operation of the Dashboard Mobile app is explained below using the iOS version. The Android version will however be very similar with only some differences in the system messages when making a Bluetooth connection. For Android, do make sure that you also allow Location Permission and select 'Precise' and 'While using the app' after that. (TBS Dashboard does not locally or externally store any personal, usage or location data)
Once the app is installed and launched you will see the screen as shown on the right.
Please press 'Allow' to confirm acceptance of this notifications request.
After that, please press the 'Add Device' button at the bottom of the screen.

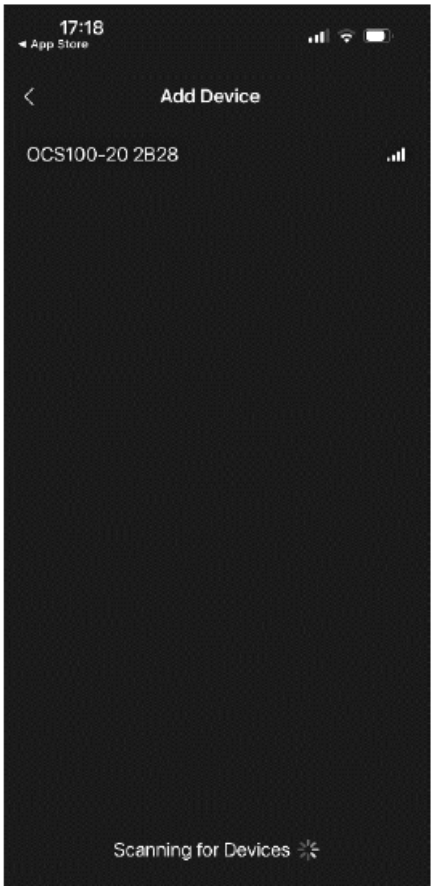


When the app is used for the first time and right after the 'Add Device' button is pressed, it will ask for permission to use Bluetooth on your device.
Please press 'OK' to proceed so that the app can scan for TBS devices in the neighborhood.

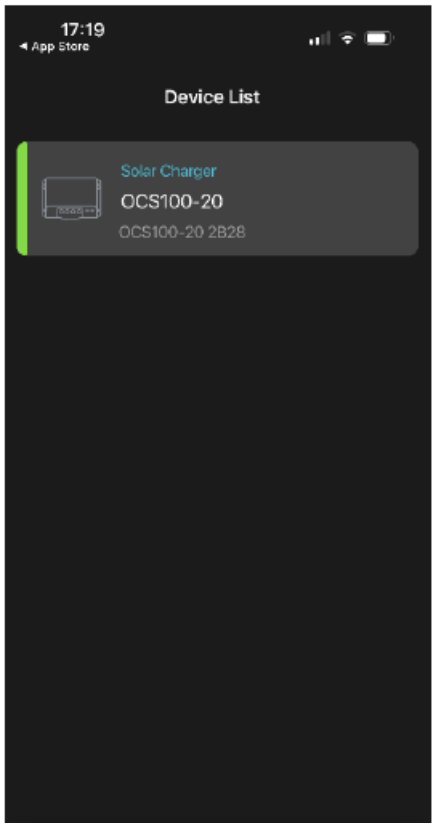


NOTE: Bluetooth in general has a limited range. In open spaces (line of sight) the maximum distance between

charger and mobile device can be up to 20 meters. However, in practical circumstances like inside houses, vehicles or boats, several objects such as walls or other equipment can limit this range down to only a few meters. On top of this, it also depends on the Bluetooth hardware inside your mobile device.
After the app has found a TBS Bluetooth device, please press on it to establish a connection.

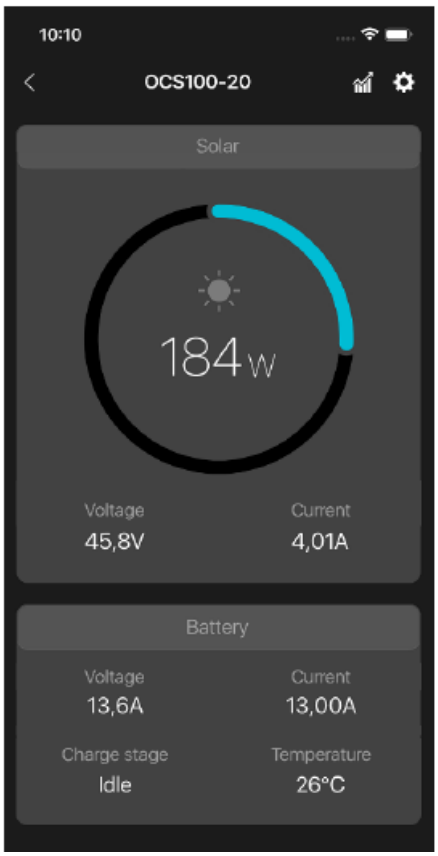


Now the device is shown in the Device List. The green bar on the left side of the tile indicates that it is successfully connected. There are three other color states available, being:



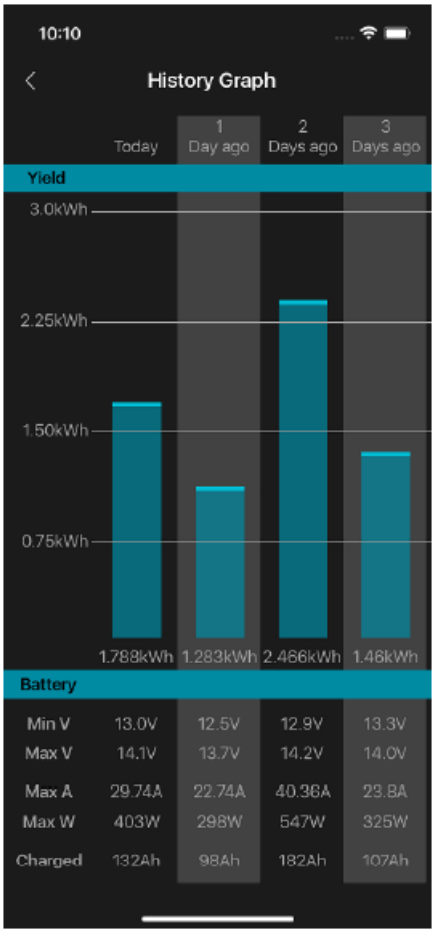
- Orange – Device busy connecting
- Red – Connection error
- Dark grey (Off) – No connection

This device tile will always remain in the Device List for future use, even when it is disconnected. So next time you launch the app, you only have to press the device tile and it connects automatically. You can remove it by swiping the tile to the left and press Delete.
When you press the device tile the app will jump the device's main screen.
In main screen of the device you can observe all available real time data of the solar panels, the battery and the charging status. Once the sun icon is shown inside the solar power gauge, the charger is active. When the moon and stars icon is shown, the charger is inactive due to a lack of solar light.

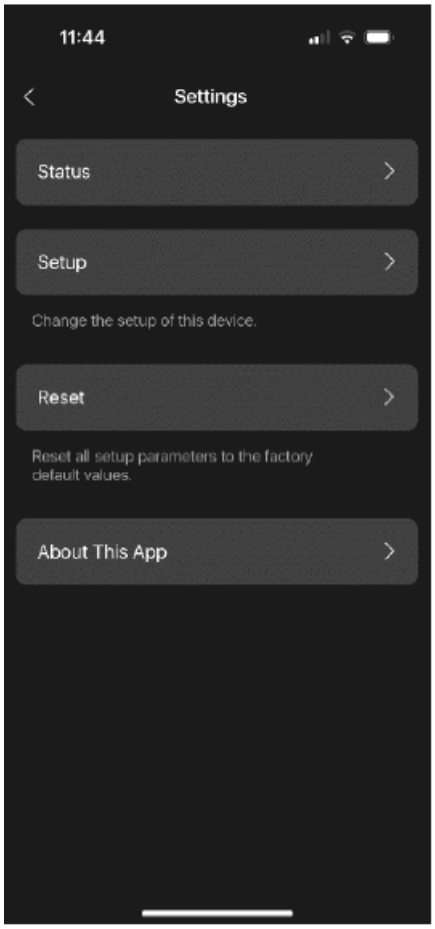


To select a different TBS device (if available), you can press the arrow button on the upper left side of the screen to jump back to the device list screen.
In the upper right corner of this screen there are two buttons for respectively entering the history graph screen or the settings screen.

The history graph screen shows you the solar energy yield of the current day and previous days. Additionally it also indicates the minimum and maximum battery voltages, maximum charge current and charge power and total Amphours charged of each day. You can swipe left to show more days or rotate your device to enter landscape view.
Please note that since the Omnicharge Solar is not equipped with a real time clock, it determines a day length based on solar light input. So the best indications are always given once the current day has completely passed.
In the settings screen you have four options.
The Status button will direct you to a status overview screen showing device name, firmware version, historic data etc.



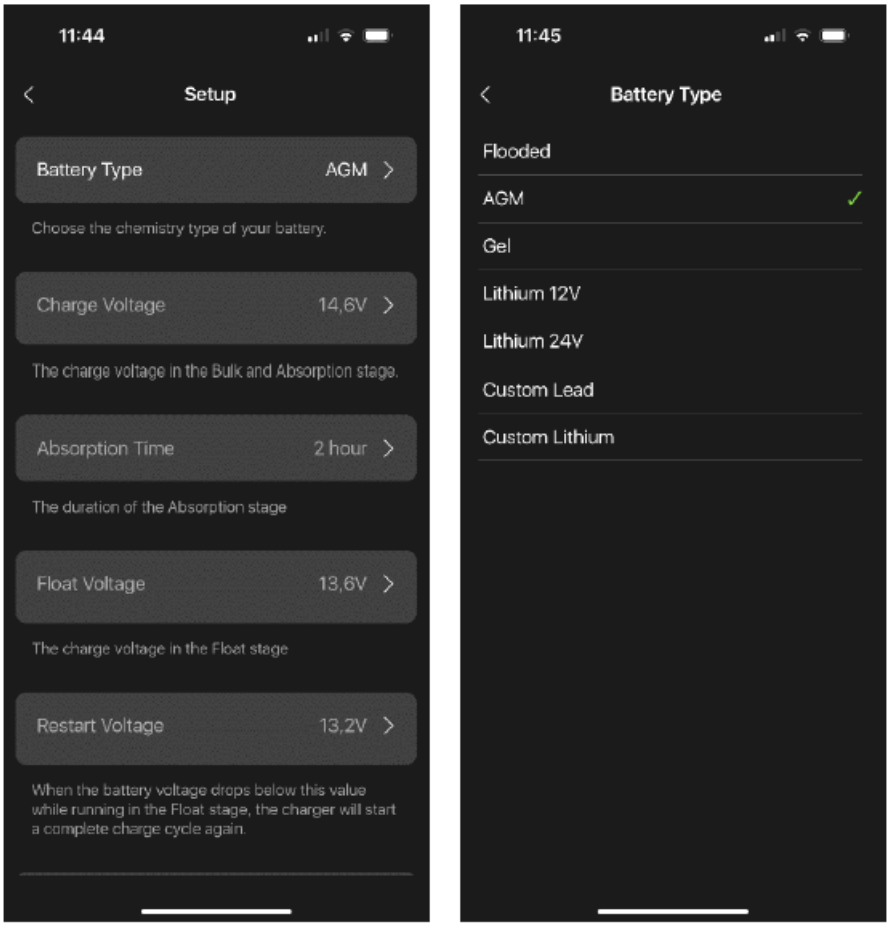
The Setup button will direct you to the Setup screen.
The Reset button allows you to either perform a full factory reset, or to only clear all history data.
And finally the About this App button, which directs you to a screen with app information, legal stuff and a link to our website.



Omnicharge Solar charger setup using the Dashboard Mobile app

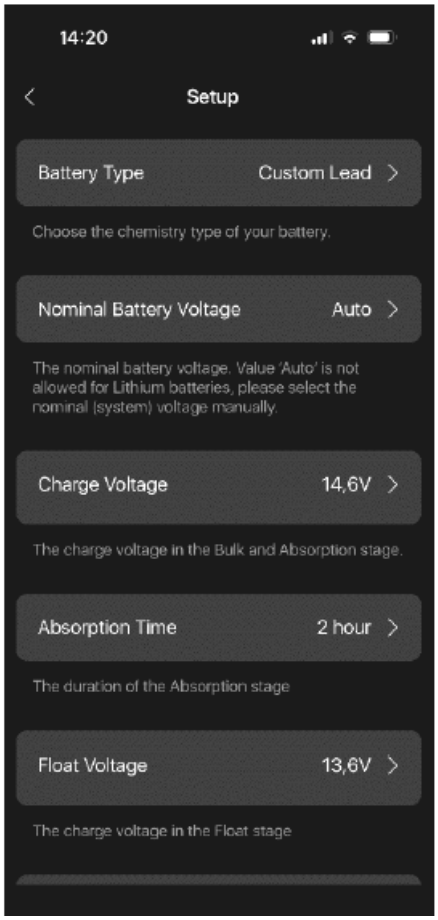
CAUTION
Invalid battery type or other parameter settings can cause serious damage to your batteries and/or connected battery loads. Always consult your battery's documentation for the correct charge voltage settings.
As explained earlier, when you wish to setup the charger in a clearer way or wish to create a charge program with different voltages or other parameters, the Dashboard Mobile app is the way to go.

If from the settings screen you have pressed the Setup button, the first screen on the right will appear. In this screen you can select the desired battery type by pressing the upper button.
When you have selected battery type Flooded, AGM, Gel, Lithium 12V, 24V, 36V or 48V and then press the back button, all corresponding settings can be reviewed but not edited. This is because these are the factory default battery types / charge programs. Except for the Charge Current and the Battery Min/Max Temperatures for charging. These can always be modified.



For most applications the standard charge programs will be sufficient.
When the desired battery type has been selected, please press the back button and the app will ask you to save this setting or not. Press ‘Save’ and the charger will be updated.

If any of the standard selectable battery types does not fulfil your requirements, there is a possibility to create your own battery type or charge program.
For this you need to select battery type Custom Lead if you have a lead based battery installed, or Custom Lithium if you have a lithium based battery installed.
Once selected you will see that all available parameters can now be edited. In the app each parameter is explained with text below the button. Please note that only for lead based batteries you can set the Nominal Battery Voltage to Auto. For Lithium based batteries, you must select a nominal voltage manually.



You will also notice that when Custom Lithium is selected, there are a lot less parameters to edit since a float stage and equalization are not possible for Lithium, as well as temperature compensation of the charge voltage. When you do wish to have a float stage for your lithium battery, please see chapter 3.2.1.
When the desired custom battery type has been edited, please press the back button and the app will ask you to save these settings or not. Press 'Save' and the charger will be updated.

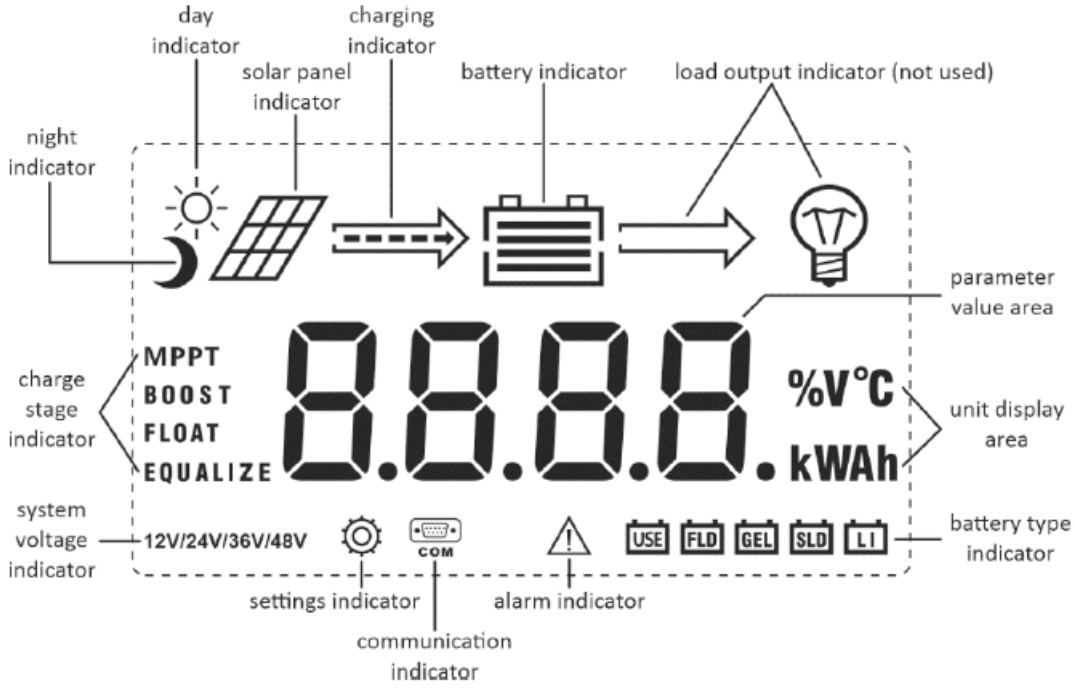
Creating a lithium charge program with a float stage
As explained above, as standard an Omnicharge Solar charger does not offer a float stage for lithium batteries. If desired however, there is a way to still create a charge program with float for a lithium battery. This can only be done by the Dashboard app and not using the front panel display.
For this please select the Custom Lead battery type in the setup screen and use the following parameter settings:

- Charge Current → Enter the desired maximum charge current
- Battery Type → Custom Lead
- Max. Battery Temperature → Enter the desired maximum allowed battery temperature
- Min. Battery Temperature → Enter the desired minimum allowed battery temperature
- Nominal Battery Voltage → select a voltage manually, do not choose Auto
- Charge Voltage → Enter the desired charge voltage
- Absorption Time → Enter the desired absorption time
- Float Voltage → Enter the desired float voltage
- Restart Voltage → Enter the desired restart voltage
- Auto Equalize Charge → Off
- Equalize Voltage → Enter the same value as Charge Voltage
- Equalize Duration → 10min (do not set to 0min.!)
- Temperature Compensation → Not Compensated
- Undervoltage Alarm On Value → Enter the desired voltage

- Undervoltage Alarm Relay → Enter the desired voltage
- Undervoltage Alarm Off Value → Enter the desired voltage
- Undervoltage Alarm Delay Time → Enter the desired time

The parameters indicated in red are very important. Please use exactly these values for correct functionality.

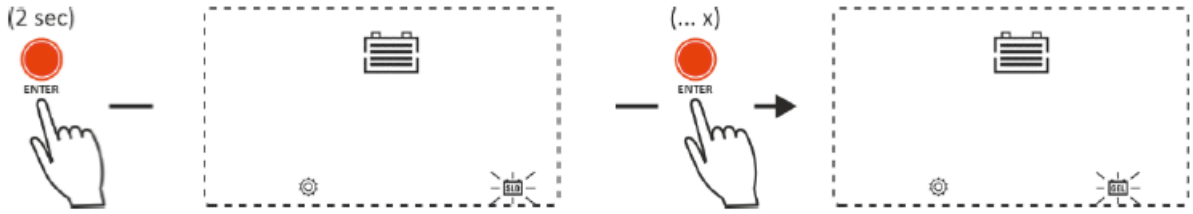
Omnicharge Solar charger setup using the info/control display
As mentioned earlier in this document, it is advised to do all setup tasks using the Dashboard Mobile app. There is however a possibility to do a basic setup using the info/control display of the solar charger as well.
We will first explain the display in more detail using the image below.



In normal operating mode, you can use the SELECT button to cyclically browse through the following screens:

- Main overview (start screen)
- Solar panel voltage
- Battery voltage
- Battery state of charge
- Charge current
- Charge power
- Charged Amphours
- Solar charger operating temperature
- Error code

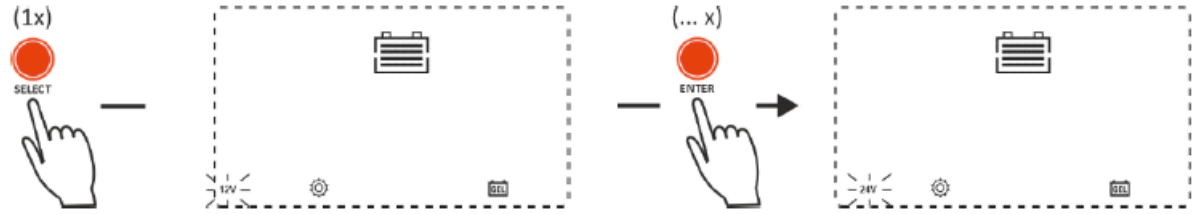
A basic setup covers only the selection of battery type and system voltage. This can be accomplished as follows. At first the ENTER key has to be pressed for 2 seconds until the battery type indicator starts flashing. Then short press the ENTER key a number of times until the desired battery type flashes. Please see the images below:



The following battery types are available:

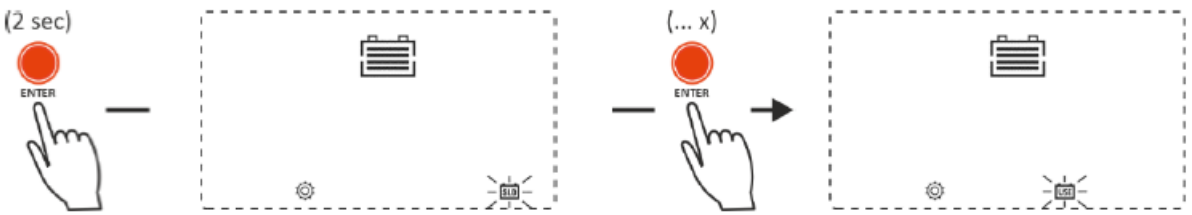
- USE = User defined / Custom battery type
- FLD = Flooded or open lead acid
- GEL = Gel type lead acid
- SLD = Sealed type lead acid or AGM
- LI = Lithium type battery (LiFePo4)

Once the desired battery type has been selected and you are sure that the battery- or system voltage is set correctly too, you can long press ENTER for 2 seconds again to save the setting and jump back to the normal operating mode. When you need to setup the battery- or system voltage as well while still operating in the setup mode, please press the SELECT key to switch over to the voltage selection mode as indicated below:



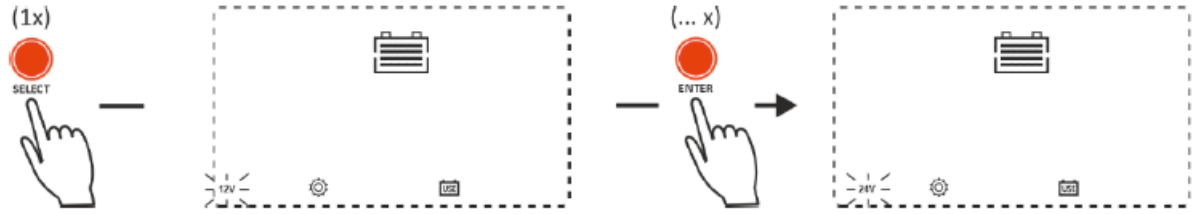
The current voltage select starts flashing. Please press the ENTER key a number of times until the desired battery- or system voltage is flashing. You can choose between 12V, 24V, 36V, 48V and Automatic voltage detection (display shows all available voltages flashing at the same time). Please note that Automatic detection is not available for Lithium based batteries. When the desired system voltage is selected, you can long press the ENTER key for 2 seconds again to save the setting and jump back to the normal operating mode.
The solar charger is now setup correctly for most common systems.

Setting up a user- or custom defined battery or charge program
When you wish to use different charge parameter settings than available as standard, you can select the ‘USE‘ battery type and revise a number of voltages. It remains however strongly recommended to use the Dashboard Mobile app to perform this action. Please see below the procedure to setup a user defined battery or custom charge program. First the ENTER key has to be pressed for 2 seconds until the currently set battery type starts flashing:

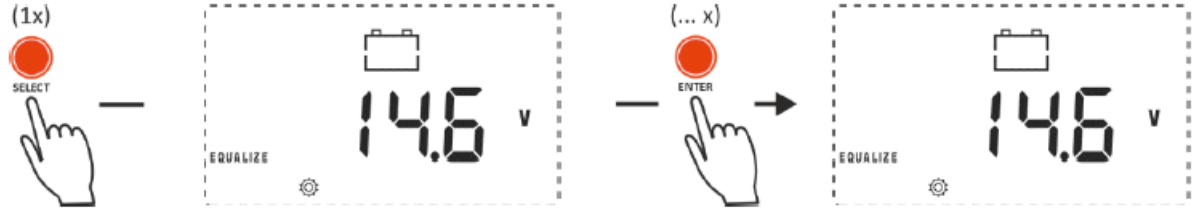


After the ENTER key has been pressed a number of times to select the USE battery type, press the SELECT key to jump to the system voltage selection and make sure the correct system voltage is selected as in the example

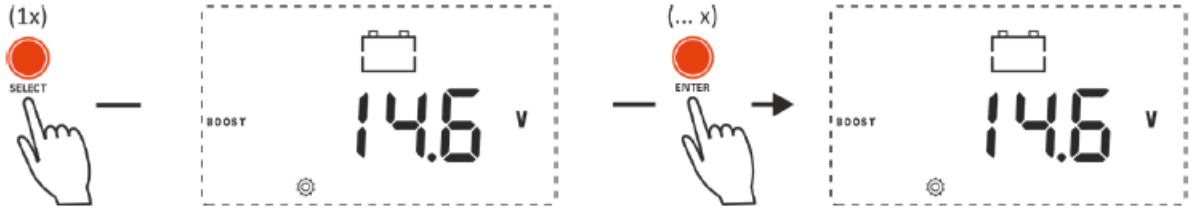
below:



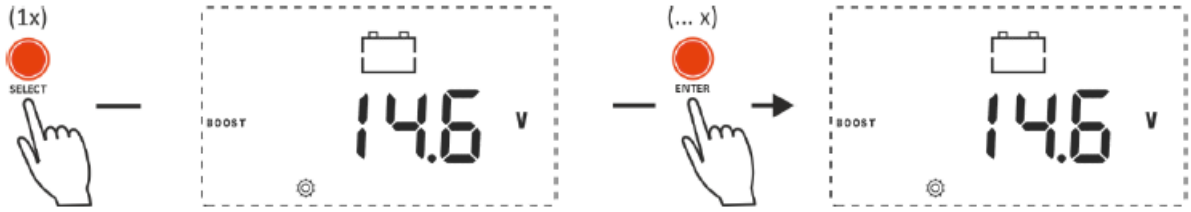
In this example a 24V system voltage is selected. When the SELECT key is pressed the first voltage parameter (Equalize charge voltage) is shown, see below:



CAUTION
When setting up charge voltages using the display, the value range is 9.0 – 17.0V. For a 12V battery system this is fine. But when making settings for 24V, 36V and 48V battery systems, you need to divide your target voltage values by respectively 2, 3 or 4 to stay in the 9.0 – 17.0V range. The solar charger will make sure that the voltage settings are multiplied by the correct factor again to guarantee correct voltages during charging.
The voltage can be edited by short pressing the ENTER key each time to increase the value by 0.1V. When 17.0V is reached, the voltage value will jump back to 9.0V and can be increased again. If you wish to turn off periodic equalize charging, just make sure that this voltage has the same value as the Absorption/Boost charge voltage. In the above example 14.6V is set, while a 24V battery system voltage was selected earlier. This means that the actual Equalize voltage value will be 2x 14.6V = 29.2V
When the SELECT key is pressed after the Equalize charge voltage is set, the next voltage parameter (Absorption/Boost charge voltage) is shown, see below:

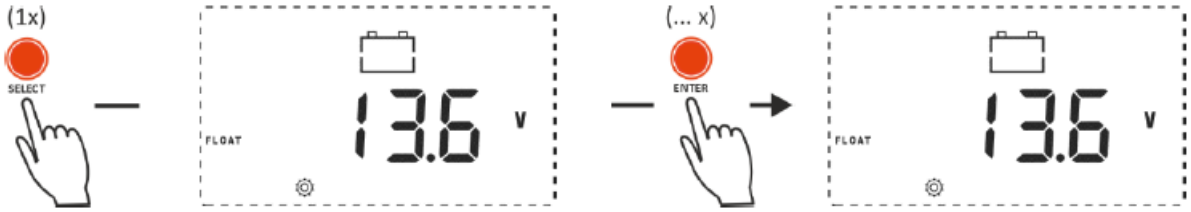


This voltage can be edited by short pressing the ENTER key each time to increase the value by 0.1V. When 17.0V is reached, the voltage value will jump back to 9.0V and can be increased again.
When the SELECT key is pressed after the Absorption/Boost charge voltage is set, the next voltage parameter (Float charge voltage) is shown, see below:

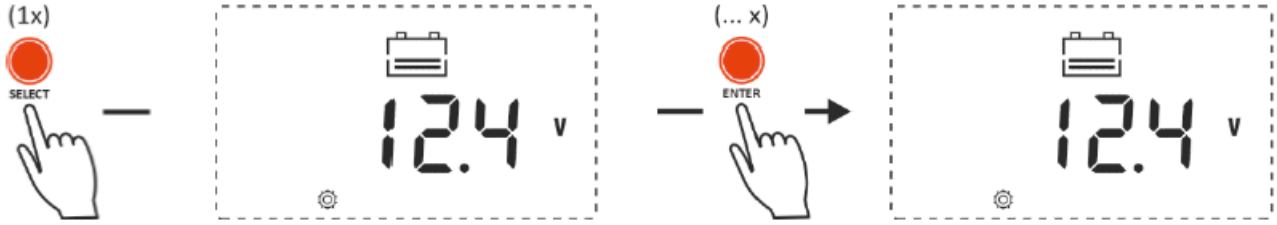


This voltage can be edited by short pressing the ENTER key each time to increase the value by 0.1V. When

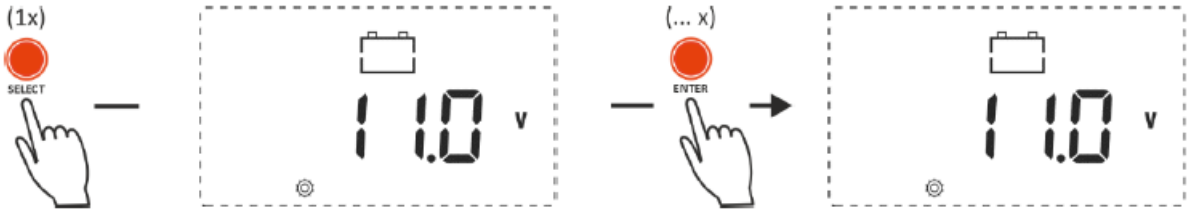
17.0V is reached, the voltage value will jump back to 9.0V and can be increased again.
When the SELECT key is pressed after the Float charge voltage is set, the next voltage parameter (Undervoltage alarm off value) is shown, see below:



This parameter represents the voltage value at which the activated alarm relay will de-activate again, besides clearing the undervoltage alarm message. It can be edited by short pressing the ENTER key each time to increase the value by 0.1V. This value must always be higher than the Undervoltage alarm relay trigger voltage.
When the SELECT key is pressed after the Undervoltage alarm off value is set, the next and final voltage parameter (Undervoltage alarm relay trigger value) is shown, see below:



This parameter represents the voltage value at which the activated alarm relay will de-activate again, besides clearing the undervoltage alarm message. It can be edited by short pressing the ENTER key each time to increase the value by 0.1V. This value must always be higher than the Undervoltage alarm relay trigger voltage.
When the SELECT key is pressed after the Undervoltage alarm off value is set, the next and final voltage parameter (Undervoltage alarm relay trigger value) is shown, see below:



This parameter represents the voltage value at which the undervoltage alarm relay will be activated. It can be edited by short pressing the ENTER key each time to increase the value by 0.1V. This value must always be lower than the Undervoltage alarm off value.
Now that all parameters are set, the ENTER key must be pressed for two seconds to save the settings and jump back to the normal operating mode.

Overview of factory default charge program parameters
Please see the table below for an overview of the main factory default parameter values of each battery type:

	Battery type[1)]			
Parameter	AGM (SLD)	GEL	Flooded (FLD)	Lithium / LiFePo4 (LI)
Charge Voltage	14.6V	14.2V	14.4V	14.4V
Absorption Time	120 minutes	120 minutes	120 minutes	–
Float Voltage	13.6V	13.4V	13.4V	–
Restart Voltage	13.2V	13.2V	13.2V	13.2V
Auto Equalize Charge	–	–	30 days	–
Equalize Voltage	–	–	14.8V	–
Equalize Duration	–	–	120 minutes	–
Temperature Compensation	-3mV/°C/cell	-3mV/°C/cell	-3mV/°C/cell	–
Overvoltage Alarm	16.0V	16.0V	16.0V	16.0V
Undervoltage Alarm On Value	11.6V	11.6V	11.6V	12.0V
Undervoltage Alarm Off Value	12.4V	12.4V	12.4V	12.4V
Undervoltage Alarm Relay On Value	11.0V	11.0V	11.0V	11.4V
Undervoltage Alarm Delay Time	6 seconds	6 seconds	6 seconds	6 seconds

Multiply all voltage values by a factor of 2, 3 or 4 for respectively 24V, 36V and 48V battery systems

TROUBLESHOOTING GUIDELINE

Troubleshooting table
Please see the table below if you experience any problems with the Omnicharge Solar charger and/or the installation.

Problem	**Possible cause**	**Remedy**
Omnicharge Solar charger is not working at all (no LEDs and display).	Battery and/or solar panel incorrectly connected	Please check if the polarities of the battery or solar panel connection are correct
	Battery fuse blown or solar panel switch turned off	Check any fuses and/or DC switches in the battery and solar panel wiring. Measure the voltage at the battery and solar inputs of the charger for correct values.

	Charger damaged	Please contact your TBS dealer for further assistance
Charger seems to be	No solar light	Please make sure that the
powered (battery indicator		solar panels are not covered
LEDs are on) but does not		and exposed to sufficient
charge		sunlight. Night icon is
		showing in display.
	Incorrectly connected solar	Please check solar panel
	panel	wiring to the charger and
		make sure that there are no
		fuses blown or DC switches
		opened and that the
		polarity is correct.
	Solar panel voltage too low	Make sure that the solar
		panels are generating a
		voltage that is at least 2V
		higher than the current
		battery voltage. Check input
		terminals of the charger.
	Solar panel voltage too high	Please check if the solar
		panel is not exceeding the
		maximum input voltage of
		the charger. If it does,
		disconnect immediately and
		revise the installation.
	Battery is full	If the battery is full the charger will s top charging or will greatly reduce t he charge current.
	Incorrect battery settings	Check if the Nominal Battery Voltage corresponds to the actual u sed battery. Error code E1 or E2 is shown on the display.
Charge current is too low	Insufficient solar power	Make sure that the solar panels are exposed to sufficient sunlight. Chec k if the solar panel array is sized co rrectly in terms of power.

	Charger operates too hot	When the charger is too hot, the ch arge current will be reduced autom atically. Please check the charger's mounting location and make sure o f sufficient cooling. E6 is shown on t he display.
Batteries are not fully charged	Battery load current is higher than t he charger's output current	If you wish to fully charge the batter y, please reduce the DC loads conn ected to the battery.
	Incorrect battery settings	Check if the Charge Voltage (bulk/a bsorption) is not set too low for the used battery.
	DC cables too thin	Install larger DC cables. See the D C cable size table in chapter 2.3 of the installation manual.
	Insufficient solar power	Make sure that the solar panels are exposed to sufficient sunlight. Chec k if the solar panel array is sized co rrectly in terms of power.
Batteries are overcharged	Nominal Battery Voltage setting too high	Check if the Nominal Battery Voltag e corresponds to the actual used b attery.
	Battery Charge Voltage setting too high	Please if all battery charge voltages are set correctly (Charge Voltage a s well as Float voltage if applicable)
	Equalization issue	Please check if the connected batte ry is suitable for the equalization st age. In general, only Flooded (open lead) batteries are allowed to be equalized periodically.
	Battery too old or damaged	Replace battery
Unable to connect using Bluetooth	Charger not powered up	Please check if at least one LED is lit on the charger
	Too large distance between charger and mobile device	Make sure that you are in the neigh borhood of the charger. The maxim um theoretical distance for Bluetoot h is 15-20m. But in practice due to surrounding objects, this distance i s much smaller for correct operation.

	Bluetooth not allowed in Dashboard Mobile app	Please make sure that you have all owed Bluetooth connections to be made by Dashboard Mobile. If you did not, please uninstall the app an d re-install it or change this in the d evice's system settings afterwards.
	Bluetooth not enabled on mobile de vice	Please check the Bluetooth settings of your device

If none of the above remedies will help solving the problem you encounter, it's best to contact your local TBS distributor for further help and/or possible repair of your Omnicharge Solar unit. Do not disassemble the charger yourselves, it is not user serviceable and it will also void your warranty.

Alarm codes
As explained in chapter 3.3, the display can also show an error code in case of abnormal conditions or faults. The table below shows all available error codes and the corresponding explanation.

Error code	Explanation
E0	No error, normal operation
E1	Battery over discharge. The battery voltage has dropped below the ‘Undervoltage Alarm Rela y On Value’. The internal alarm relay will be triggered as well. This error is released again onc e the battery voltage has exceeded the ‘Undervoltage Alarm Off Value’.
E2	Battery over voltage, charging disabled
E3	Battery over discharge. The battery voltage has dropped below the ‘Undervoltage Alarm On V alue’. This error is released again once the battery voltage has exceeded the ‘Undervoltage Al arm Off Value’.
E6	Solar charger overtemperature alarm. The charge controller is operating too hot and will start decreasing the charge current. Or it will shut down and restart when the temperature is within normal limits again.
E7 or E16	Battery over temperature. The Battery temperature sensor has detected a too high battery temperature and stops charging. Once the temperature falls back to normal le vels again, charging will continue.
E8	PV input power overload. The solar charger remains to operate normally, but current is now li mited by the charger rather than the solar panels.
E10	PV input overvoltage. The solar panel voltage is higher than the maximum allowed input volta ge of the solar charger. Turn off the system immediately to avoid permanent solar charger da mage.
E15	Battery not connected while PV input power is provided. When a lead based battery type is se lected, the battery output voltage is zero. When a Lithium based battery is selected, the batter y output delivers a constant voltage.
E19	Battery under temperature. The Battery temperature sensor has detected a too low battery te mperature and stops charging. Once the temperature falls back to normal levels again, chargi ng will continue.

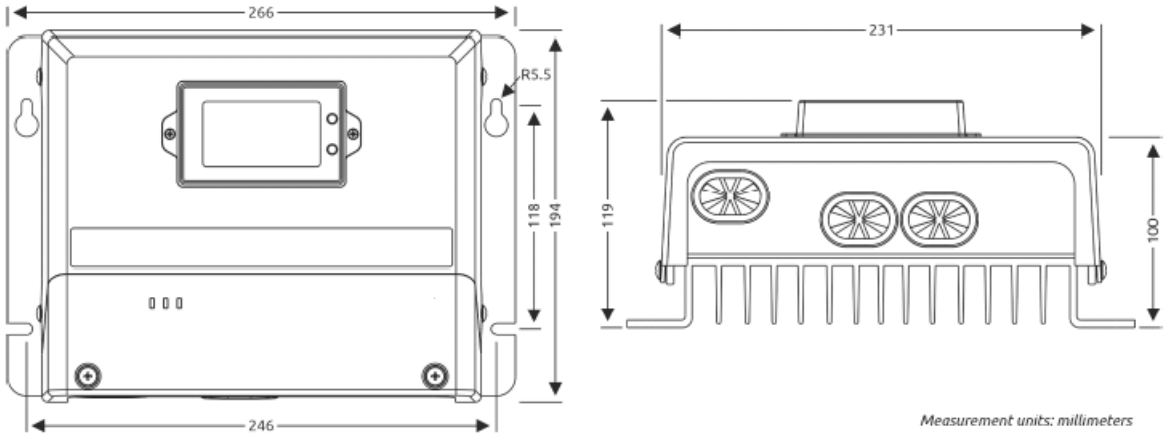
TECHNICAL SPECIFICATIONS

Parameter	OCS 150-60	OCS 250-70
System voltage	12Vdc / 24Vdc / 36Vdc / 48Vdc	
Maximum charge current[1)]	60A	70A
Self consumption	0.54W	
Battery voltage range	9.0 – 64.0Vdc	
Max. PV open circuit voltage	150Vdc	250Vdc
Max. PV short circuit current	50A	40A
MPPT voltage range	Vbatt + 2 up to 120Vdc	Vbatt + 2 up to 180Vdc
Max. PV input power 12V	800W	920W
24V	1600W	1840W
36V	2400W	2760W
48V	3200W	3680W
Charge characteristic	IUoUo, intelligent 3-stage, temp. compensated	
Supported battery types[2)]	Flooded / Gel / AGM / LiFePo4 / Custom (user defined)	
Maximum conversion efficiency	98%	
Maximum MPPT efficiency	99%	
LED indicators	Charge mode, Battery state and Battery type	
Display	Yes (detachable for remote use)	
Battery temperature sensor	Included	
Alarm relay	Yes (10A @ 230Vac or 30Vdc)	
Cooling	Natural convection (no fan)	
Protections	Battery and PV reverse polarity, output short circuit and over temper ature	
Operating temperature range	-35°C … +60°C	
Storage temperature range	-40°C … +80°C	
Communication	Through Dashboard Mobile app (iOS and Android)	
Connections (PV + Battery)	Screw terminals (35mm^2 / 2 AWG)	
Dimensions (HxWxD)	266x194x119mm	
Weight	3.6kg	
Protection class	IP32 (mounted in upright position)	
Standards	EMC: 2014/30/EU, Safety: EN62109-1, Functionality EN62509-1 and RoHS: 2011/65/EU	

- Maximum output current tolerance is +/-5%. Automatic output current derating at Tambient > 45°C. Maximum output current is programmable via Dashboard Mobile app.
- Selectable by setup button or display on solar charger or via Dashboard Mobile app

Please act according to your local rules and do not dispose of your old products with your normal household waste. The correct disposal of your old product will help prevent potential negative consequences for the environment and human health.

Dimension drawings
Dimensions OCS 150-60 and 250-70:



WARRANTY CONDITIONS

TBS Electronics (TBS) warrants this product to be free from defects in workmanship or materials for 24 months from the date of purchase. During this period TBS will repair the defective product free of charge. TBS is not responsible for any costs of the transport of this product.
This warranty is void if the product has suffered any physical damage or alteration, either internally or externally, and does not cover damage arising from improper use, or from use in an unsuitable environment.
This warranty will not apply where the product has been misused, neglected, improperly installed or repaired by anyone other than TBS. TBS is not responsible for any loss, damage or costs arising from improper use, use in an unsuitable environment, improper installing of the product and product malfunctioning.
Since TBS cannot control the use and installation (according to local regulations) of their products, the customer is always responsible for the actual use of these products. TBS products are not designed for use as critical components in life support devices or systems, that can potentially harm humans and/or the environment. The customer is always responsible when implementing TBS products in these kind of applications. TBS does not accept any responsibility for any violation of patents or other rights of third parties, resulting from the use of the TBS product. TBS keeps the right to change product specifications without previous notice.
Examples of improper use are :

- Too high PV input voltage applied
- Reverse connection of PV or battery polarity
- Connecting wrong batteries (too high battery voltages)
- Mechanical stressed enclosure or internals due to harsh handling or incorrect packaging
- Contact with any liquids or oxidation caused by condensation

DECLARATION OF CONFORMITY

- **MANUFACTURER** : TBS Electronics BV

- **ADDRESS** : De Marowijne 3 1689 AR Zwaag The Netherlands

Declares that the following products :

- **PRODUCT TYPE** : MPPT Solar Charge Controller
- **MODELS** : OCS 150-60 and OCS 250-70

Conforms to the requirements of the following Directives of the European Union :

- EMC Directive 2014/30/EU
- Low voltage Directive 2014/35/EU
- RoHS Directive 2011/65/EU

The above product is in conformity with the following harmonized standards :

- **EMC** : EN61326-1:2021
- **Safety** : EN62109-1:2010 and EN62509:2010

www.tbs-electronics.com

TBS Electronics BV
De Marowijne 3
1689AR Zwaag
The Netherlands
OCS-60-70 User Manual Rev1endfs

Documents / Resources

	tbs electronics OCS 150-60 MPPT Solar Charge Controller [pdf] Owner's Manual OCS 150-60, OCS 250-70, OCS 150-60 MPPT Solar Charge Controller, MPPT Solar Charge Controller, Solar Charge Controller, Charge Controller, Controller

References

- Downloads | S.Munter Elektrotechniek
- Home - TBS Electronics EN
- Downloads - TBS Electronics NL
- Home - TBS Electronics EN