



# Operating instructions

**Solar charge controller**  
10 A / 15 A / 20 A / 30 A

**EN**

739.704 | Z10 | 16.35

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Subject to change without notice.

# 1 Safety instructions

## 1.1 Safety instructions are identified as follows



In this manual, safety instructions for personal safety are identified with this symbol.

Instructions relating to the functional safety of the system and the controller are in **bold** type.

## 1.2 General safety instructions



Be sure to observe the following instructions when installing the controller and handling the batteries:

Incorrect handling of batteries results in a danger of explosion!

Escaping battery acid can result in acid burns!



Be sure to always keep children away from batteries and acid!

Smoking, open flames and open lights are not permitted when handling batteries. Avoid the generation of sparks and wear eye protection during installation. Be sure to always observe and follow the handling instructions in the usage instructions and on the battery.

Use well isolated tools only!

Do not use measurement equipment you know to be damaged or defective!

The charge controller's constructive protective measures can deteriorate if it is not operated as specified by the manufacturer.

Factory labels and markings may not be altered, removed or rendered unreadable. All work must be carried out in accordance with the national and the relevant local electrical regulations!

If the device is installed abroad, information on rules and protective measures must be obtained from the corresponding institutions/authorities.

Do not start the installation until you are sure that you have understood all technical details in these instructions and always perform the work in the sequence described in these instructions!

The manual must also be available to third parties for all work performed on the system.

This manual is a component of the system controller and must be included with it when sold on.

## 2 Exclusion of liability

The manufacturer cannot monitor the compliance to this manual, nor the conditions and methods of installation, operation, usage and maintenance of the system controller. Improper installation of the system may result in damage to property and, as a result, to bodily injury.

Therefore, we assume no responsibility or liability for loss, damage or costs which result from, or are in any way related to, incorrect installation, improper operation, or incorrect use and maintenance.

Similarly, we assume no responsibility for patent right or other right infringements of third parties caused by usage of this system controller.

The manufacturer reserves the right to make changes to the product, technical data or assembly and operating instructions without prior notice.

**Please note: Opening, manipulating or attempting to repair the device or operating the device in an improper manner will invalidate all legal guarantee claims.**

### 3 Area of application

These instructions describe the functions and installation of a charge controller for photovoltaic (PV) systems to be used for charging 12 V or 24 V lead-acid batteries in the hobby and leisure, residential, business, commercial and small company areas.

The charge controller is only suitable for controlling solar modules. Never connect any other type of charging source to the charge controller. This can destroy the controller and / or the charging source. If other charging sources are to be used together with the device, first consult your dealer or installer and observe the information in the SOC calculation section of these instructions.

The controller is basically only suitable for use with the following types of 12 V or 24 V rechargeable batteries:

- Lead-acid batteries with liquid electrolyte
- Sealed lead-acid batteries; AGM, GEL

The respective battery type must be set in the controller, see Setting the battery type to Gel / Liquid. Observe the instructions of the battery manufacturer before connecting the battery.



**Important! The controller is not suitable for use with nickel-cadmium, nickel-metal-hydride, lithium-ion or any other types of rechargeable or non-rechargeable batteries. These types of battery must not be connected to the controller. Be sure to observe the safety instructions for the respective battery used.**

The corresponding manufacturer's installation manual must be observed when installing the remaining components, e.g. solar modules, batteries and load.



**The controller is only suitable for indoor use. It must be installed in a manner providing protection from weathering influences such as rain and direct sunlight. Ventilation openings must not be covered. The controller may only be used for the specified intended purpose. Also make sure that the permissible model-specific rated currents and voltages are not exceeded. No liability is accepted when the device is used in a manner other than for the intended purpose. Handle the product with care.**

### 4 Controller protection functions

The controller is equipped with various systems for protecting its electronics, the battery and connected load. Triggering of the protection devices is indicated by an error message (Section Error messages). The protection devices automatically reset when the error has been corrected.



#### Caution

**Danger of damage to the controller. Despite the protective functions, the controller can still be damaged when more than one component is incorrectly connected.**

The protective functions of the controller cover the following points:

- **Protection against reverse connected solar modules**  
The rated power of the solar modules must not exceed the rated power of the controller!
- **Protection against reverse connected load devices on the load output**  
Protects the controller but not the load device.
- **Protection against reverse connected battery**  
Charging and discharging of the battery are prevented.
- **Short circuit fuse at module input**
- **Short circuit fuse at load output**
- **Protection against excessive charging current**  
The controller disconnects the battery and switches off the load.
- **No-load protection when operated without battery or load**  
Load output is protected from the module voltage.
- **Reverse current protection**  
Prevents reverse current from flowing into the solar modules at night. An additional reverse current diode is not required!

- **Overvoltage and undervoltage protection**  
Immediately switches off the load output in the case of excessively high or low battery voltage.
- **Overtemperature protection**  
If the temperature inside the controller becomes too high, then the controller load output is switched off to reduce the power loss.
- **Load output overload protection**  
If the permissible load current is exceeded, then the load output is switched off.
- **Overvoltage protection**  
A varistor at the module input provides protection against overvoltages > 47 V. The component limits the surge energy to 4.4 joules.
- **Deep discharge protection / Overcharging protection** Prevents excessive discharging / charging of the battery.
- **Conforms to the relevant European CE standards**

## 5 Installation

### 5.1 Mounting location

Mount the device near to the battery, in the orientation shown below, on a surface with the following properties:

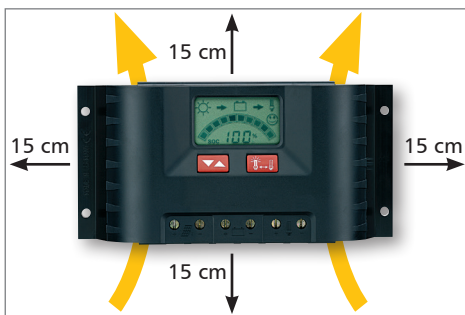
- stable
- vertical
- non-flammable
- level
- dry

The battery cable should be as short as possible (1 – 2 m) and have a sufficiently large cross-section to keep losses as low as possible, e.g. 2.5 mm<sup>2</sup> at 10 A and 2 m; 4 mm<sup>2</sup> at 20 A and 2 m; 6 mm<sup>2</sup> at 30 A and 2 m. For correct functioning of the temperature compensation of the charging voltage, the same ambient temperature must exist at both the controller and the battery. If this is not possible for installation reasons, then an external temperature sensor is available as an optional accessory.

Do not install the controller outside. The device must be mounted protected from moisture, dripping water, spray, rainwater and direct or indirect heating, e.g. from direct sunlight.

The device generates heat during normal operation. The rear ventilation required for cooling the device must not be hindered by the mounting location or by installation in an additional casing.

A free space of at least 15 cm on all sides of the device must be provided to ensure the necessary circulation of air for cooling. The permissible ambient temperature must be adhered to at the mounting location.



The integrated LC display should be protected from UV radiation (e.g. sunlight). Long-term exposure to UV radiation can permanently discolour the LC display.

## 5.2 Connecting the controller



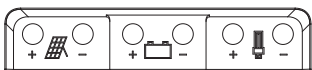
Solar modules generate electricity under incident light. The full voltage is present, even when the incident light levels are low. You should therefore work carefully and avoid creating sparks. Observe the appropriate safety precautions.



Double the normal system voltages can be present during installation and electrical connection of the DC side of the photovoltaic system (up to 24 V in a 12 V system and up to 48 V in a 24 V system). It is always a good idea to cover the solar modules.



When laying cables, ensure that no damage occurs to any of the constructional fire safety measures present in the building. The controller must not be installed or operated in wet rooms (e.g. bathrooms) or in rooms where inflammable gases may generate, e.g. from gas bottles, paint, varnish, solvents, etc. Do not store any of the mentioned materials in rooms where solar controllers are installed!



Connect the individual components to the connection with the corresponding symbols.



**Important! The battery can be damaged when the connection cable is short circuited. Install a fuse in the battery connection cable to protect the battery.**

Observe the following connection sequence when commissioning the system:

1. Connect the battery to the charge controller – plus and minus.
2. Connect the photovoltaic modules to the charge controller – plus and minus.
3. Connect the load to the charge controller – plus and minus.

Follow the reverse procedure when uninstalling!

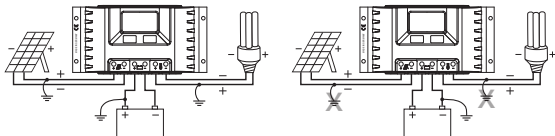
**Note: If you do not follow the correct connection sequence, automatic adjustment for 12 V / 24 V systems will not work correctly and the battery can be damaged!**

## 5.3 Grounding

When constructing a stand-alone solar energy system, from a technical point of view the controller does not necessary need to be grounded. However, be sure to always observe the applicable respective national regulations regarding grounding. All positive connections can be grounded but with negative grounding only one connection can be grounded.



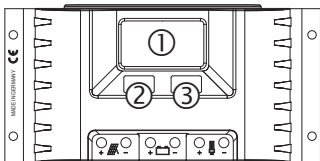
**Caution**  
**Danger of damage to the controller. Make sure that no common connection exists for the *Module Minus*, *Battery Minus* and *Load Minus* connections, e.g. via a ground connection.**



## 6 Operation

The display shows numerous types of system data using symbols and numbers. All settings and display windows are controlled via the two buttons.

### 6.1 Display and control elements

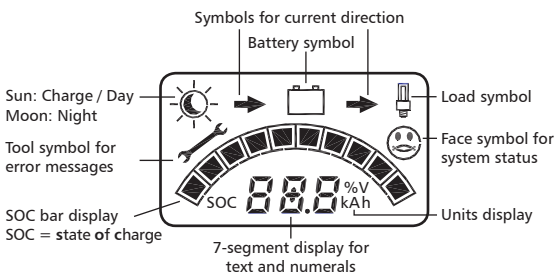


① Display window for system information and error messages

② Button for switching between the display windows or for accessing settings

③ Manual load switch or confirmation button when performing settings

### 6.2 Display windows



The display windows contain different types of system information. The left button can be used to switch between the different display windows. After the last window, the first window is displayed once more.

The following figures show examples of system information in the *SOC control* operating mode. The following differences exist in the *Voltage control* and *Voltage control with bar display* operating modes:

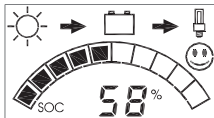
- **Voltage control:** The windows do not contain any SOC bar display. The SOC window shows the battery voltage instead of the SOC.
- **Voltage control with bar display:** The bar display shows the battery voltage in all windows. The SOC window shows a numerical value for the battery voltage instead of the SOC.

#### Notes:

- Changing the operating mode: see Section [Accessing and changing settings](#).
- Scaling of the bar display in the *Voltage control with bar display* mode: see Section [Technical data / Bar display scaling](#).

**Note that the accuracy of the bar display cannot be compared with the accuracy of a measuring device!**

### 6.2.1 SOC window



Displays the charge state, day / night status and load on / off status.

In the *Voltage control* operating mode, the battery voltage is displayed instead of the SOC value.

In the *Voltage control with bar display* operating mode, the battery voltage is displayed both alphanumerically and as a bar display.

### 6.2.2 Voltage window



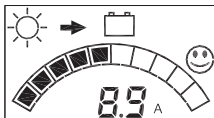
Displays the battery voltage measured by the controller.

### 6.2.3 Module current



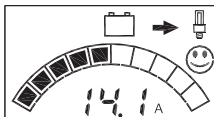
Displays the solar module output current.

### 6.2.4 Charging current



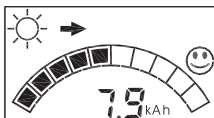
Displays the charging current into the battery.

### 6.2.5 Load current



Displays the current being consumed from the load output.

### 6.2.6 Ah – Battery charge meter



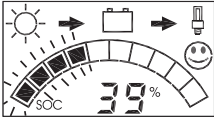
Displays the total Ah charged into the battery since initial installation or the last reset of the meter. Pressing and holding both buttons for 3 seconds resets the meter to 0. The value is retained when the battery is disconnected. After reaching a value of 99.9 kWh, the meter jumps back to 0 Ah.

### 6.2.7 Ah – Battery discharge meter



Displays the total Ah discharged via the load output since initial installation or the last reset of the meter. Pressing and holding both buttons for 3 seconds resets the meter to 0. The value is retained when the battery is disconnected. After reaching a value of 99.9 kWh, the meter jumps back to 0 Ah.

### 6.2.8 Deep discharge protection advance warning



The following symbols flash in the various operating modes to provide advance warning of deep discharge.

- SOC bar (*SOC with bar display*)
  - Voltage value (*Voltage control*)
  - Voltage value and voltage bar display (*Voltage control with bar display*)
- The face symbol still looks happy.

### 6.2.9 Load disconnection



The following symbols flash when the deep discharge protection is active:

- Bar display (not in *Voltage control* mode)
- Battery symbol
- Right arrow
- Load symbol
- Alphanumeric value

The face symbol remains sad until the switch-on threshold is reached.

## 7 Functions

This section describes the basic functions of the charge controller. Operation of the controller is described under the respective menu items in Section [Configuring the controller](#).

### 7.1 SOC calculation

The controller monitors various battery parameters (V, I) during normal operation and uses this information to calculate the state of charge of the battery (SOC = state of charge). The state of charge represents the amount of energy currently available in the battery. The device uses a continuous learning process to automatically compensate for changes in the system, e.g. through ageing of the battery.

This SOC provides you with an accurate overview of the charge state of the battery at all times. The controller also uses the SOC information for selecting the charging method and for deep discharge protection to provide optimum treatment of the battery. If one or more of the parameters cannot be correctly measured, e.g. because a load or charging source is directly connected to the battery, then the SOC calculation will not be correct. The controller can then be configured to use a simpler, voltage-controlled charging process, the *Voltage control (with bar display)* mode; see Section [Operating modes](#).

The SOC calculation is restarted each time the controller is commissioned.

### 7.2 Charge control

The controller performs constant voltage charging of the battery. The maximum current available from the charging source is used for charging the battery until the final charge voltage is reached. Once charge controlling takes place, the charge current is controlled via pulse-width modulated (PWM) shunting of the module input (shunt charge controller).

Different charging methods are used, normal charging, boost charging and compensation charging, depending on the behaviour of the battery. The battery type and operating mode settings are taken into account. The final charge voltage is temperature compensated. A test is automatically performed every 30 days to see if maintenance charging is required.

### 7.3 Deep discharge protection

The controller protects the connected battery from excessive discharging. When the battery drops below a particular charge state (with SOC control) or battery voltage (with voltage control), the load output is switched off to prevent further discharge of the battery. Advance warning and disconnection due to deep discharge are indicated on the display. The deep discharge thresholds are predefined and cannot be adjusted.

### 7.4 Night light function

The night light function allows the load output only to be switched on in darkness (at night). The load output remains switched off when light is present (day). The light information is provided via the connected solar module as follows:

- The load is switched on as soon as the information from the solar module indicates darkness. The load is switched off after a configurable time.
- When light is detected, the controller switches off the load output, regardless of how long the load has been switched on. The different properties of the different modules make it impossible to exactly specify the darkness threshold.

A switch-on delay cannot be configured.

## 7.5 Daylight function

This function allows a switch-on point for the load output to be defined that occurs during the night / darkness when daylight is detected. The aim is to switch on a load a specified number of hours *before* dawn. The load output remains switched off outside this period.

The controller recognises *Day* (= sun symbol) when the module voltage is greater than the battery voltage and the battery can be charged. Recognition duration: approx. 30 s.

This duration extends to 15 minutes, when *Night* was previously detected due to a solar module not being connected or a module with a reverse current diode was detected and the module was then correctly reconnected and battery charging took place.

The controller must first have recognised at least one night / day cycle before the daylight function can be activated. This means that the daylight function cannot be activated in the first night following the installation day. The function can only become active in the following night.

The switching point is thus not based on a specific time of day but rather relative to the point when the controller detects the transition from night to day.

This point can be influenced by bad weather, fog or the natural seasonal changes in the lengths of day and night, so a certain amount of tolerance is required. This is especially the case when the natural conditions are interrupted by manual intervention such as disconnection or covering of the solar modules. Despite this, the controller recalculates the reference point for the daylight function after each night / day transition and therefore automatically adapts to the natural conditions after a few days.



### Note

The daylight function is **not** executed when the time periods for the night light and daylight functions overlap. *Overlap* means: The switch-off point of the night light function lies after the switch-on point of the daylight function. When the night light function ends, then the daylight function will also end. An overlap of the time periods can be caused by:

- Incorrect setting of the night light and daylight time periods by the user
- Seasonal reductions in the length of the night
- Poor weather (heavy cloud)
- Covering of the module (snow)

Alternatively: Set the night light function to ON (load output remains switched on all night, regardless of the daylight function settings).

# 8    Configuring the controller

The following section describes the configuration settings that can be performed on the controller.

## 8.1    Accessing and changing settings

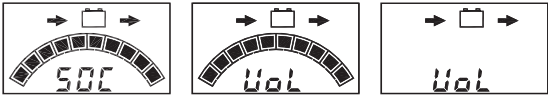
Pressing and holding the left button for at least 3 seconds brings you to the first settings window (Operating mode). Further pressing of the left button displays other windows. After the last window, the first window is displayed once more.

Press the right button when you want to change settings in the currently displayed window. The display then starts flashing. You can now use the left button to select different settings. You must press the right button to save the settings you have made. The display then stops flashing.

You can return to the normal display by waiting for 30 seconds or by pressing and holding the left button for 3 seconds. This applies to all windows.

The settings are retained when the battery is disconnected.

## 8.2    Operating modes



The device is supplied with *SOC control* preset. This means that the charging method and deep discharge protection are controlled by the calculated SOC value. If loads are directly connected to the battery and not to the controller or the battery is also charged from a different source, then the *Voltage control (with bar display)* operating mode must be selected. Otherwise, the SOC calculation may be incorrect.

**Notes on the *Voltage control with bar display* operating mode:**

- Each of the 10 bar segments represents a particular voltage. The voltage values are described in Section *Technical data, Bar display scaling*.
- If the voltage lies exactly between two bar segments, then the display may jump back and forth between the two segments.

## 8.3    Setting the battery type to Gel / Liquid



The default setting is "Li". Setting the battery type affects the final charge voltage of the controller. If you use a Gel or AGM battery,

then you must set the battery type to GEL.

**Please note: An incorrect battery type setting can damage the battery!**

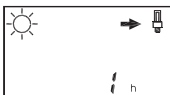
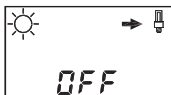
## 8.4    Night light settings

This setting offers three possibilities in the following sequence

- OFF: The function is deactivated (default).
- Load switch-on duration selection from 1 to 12 hours (lower middle Fig.).
- ON: The load output remains switched on all night.



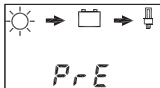
## 8.5 Daylight settings



The daylight function has the following settings:

- OFF: The function is deactivated (default).
- 1 h ... 12 h: Switch-on point before detection of daytime (upper right Fig.).

## 8.6 Restoring default values (presetting)

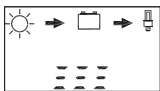


Calling the presetting function (PRE) deletes any previous settings and restores the settings in the charge controller to the factory defaults.

The factory defaults are:

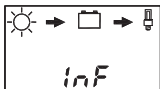
SOC control / Li battery / Night light OFF / Daylight OFF

## 8.7 Self test



The self test can be used to check if the charge controller is functioning correctly. It also allows localisation of possible errors.

The self test can only be performed within 5 minutes of a Power-On Reset (controller start-up through connection of power to the battery connection). After this period, activating the function causes "InF" to be displayed (left Fig.).

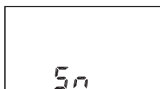


Perform the self test as follows:

1. Disconnect the solar module.
2. Disconnect load.
3. Disconnect the battery.
4. Reconnect the battery after waiting for 30 seconds.
5. Select the "Self test" menu item within 5 minutes (upper Fig.).
6. Press the right button; the display flashes.
7. Press the left button; the self test starts.
8. Only when "InF" is displayed:  
Disconnect the battery, wait 30 seconds, reconnect the battery, proceed from step 5.
9. The error code is displayed for a number of seconds (see table below).  
If an error code other than **000** is displayed: Note the code and contact a Steca dealer with this information for error analysis.
10. All segments are displayed and then hidden, then the self test window is displayed again (upper Fig.).
11. In the flashing self test window, press the left button to repeat the self test or press the right button to end the self test.

| Code                     | Description   |
|--------------------------|---|
| 000                      | After displaying the code 000, all LCD segments are displayed and then hidden.<br>The controller is OK.   |
| 100                      | Defective solar module input. Possible causes: <ul style="list-style-type: none"> <li>Solar module was not disconnected before the test. Check this and repeat the test if necessary.</li> <li>Defective controller. Contact your dealer for a more detailed examination or replacement.</li> </ul>                       |
| 010                      | Defective load output. Possible causes: <ul style="list-style-type: none"> <li>Load was not disconnected before the test. Check this and repeat the test if necessary.</li> <li>Defective controller. Contact your dealer for a more detailed examination or replacement.</li> </ul>                                      |
| 001                      | Defective electronic battery fuse. Possible causes: <ul style="list-style-type: none"> <li>Solar module <i>and</i> load were not disconnected before the test. Check this and repeat the test if necessary.</li> <li>Defective controller. Contact your dealer for a more detailed examination or replacement.</li> </ul> |
| 011<br>101<br>110<br>111 | <ul style="list-style-type: none"> <li>Solar module <i>or</i> load were not disconnected before the test. Check this and repeat the test if necessary.</li> <li>Defective controller. Contact your dealer for a more detailed examination or replacement.</li> </ul>  |

## 8.8 Serial number query



Every controller has a unique serial number that can be queried via this window. Press the right button and the Sn will start to flash. The serial number can now be queried by pressing the left button.

The numerals are displayed sequentially: - - - 1 2 3 4 5 6 7 8 - - - . The display can be paused and continued using the right button.

Note the entire numeric sequence for the full serial number.

## 9 Error messages



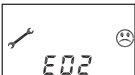
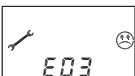





**Please note: Never open the device to find faults and do not attempt to replace components yourself. Incorrectly performed repairs can result in danger for the user and the system. This will also invalidate all warranty claims.**

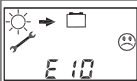

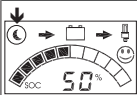
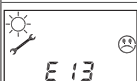
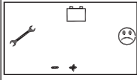
When the device detects faults or impermissible operating states, this is indicated by a flashing error code on the display.

Errors are basically either temporary faults, e.g. temporary overloading of the device, or serious system errors that require external intervention.

Since multiple errors cannot be displayed at the same time, the error with the highest error number (priority) is always displayed first. If multiple errors exist, then the next error code is not displayed until the higher-priority error has been fixed.

The error codes have the following meanings:

| Display  | Meaning  | Cause / Remedy   |
|--|--|--|
| <br>E02   | Communication error with the internal storage (EEPROM).  | Disconnect the load, solar modules and battery. Re-install the device. If the error recurs, then please contact your specialist dealer.  |
| <br>E03   | Communication error on the external Steca bus (6-pin edge connector).  | Check the plug connection at the 6-pin edge connector, check the power supply and check for correct functioning of external expansions.<br>If the error recurs, then please contact your specialist dealer.                  |
| <br>E04  | Short circuit in external temperature sensor.  | Check the contacts of the 2-pin edge connector and remove the short circuit.<br>Check sensor.  |
| <br>E05 | Overtemperature. The controller has switched off the load due to internal overheating.   | Allow the controller to cool down. Check for possible causes of overheating (mounting location, other heat sources). Possibly reduce the charging current or load current. Make sure the controller is adequately ventilated |
| <br>E07 | Battery voltage too low.<br>Voltage < 10.5 V or < 21.0 V.  | Check installation. Check the battery voltage and manually recharge the battery if necessary. Loads directly connected to the battery can cause deep discharge!  |
| <br>E08 | Battery voltage too high.<br>Voltage > 15.5 V or > 31.0 V.   | Check installation. Check the battery voltage and check any additional charging sources if present.  |
| <br>E09 | Excessive load current. The permissible load current of the controller was exceeded, causing the load output to be switched off. | Reduce the load current at the load output.<br>The load may cause current peaks.<br>Try reconnecting the load.   |

| Display   | Meaning  | Cause / Remedy   |
|---|--|--|
|  | <p>Excessive module current.</p> <p>The permissible input current of the controller was exceeded.</p>  | <p>Reduce the charging current or module power.</p>  |
|  | <p>Short circuit at load output.</p>   | <p>Rectify short circuit. Disconnect and reconnect the load.</p>   |
|  | <p>Moon symbol during daylight hours:</p> <ul style="list-style-type: none"> <li>• Short circuit at module input</li> <li>• No module connected</li> <li>• Module connected with incorrect polarity</li> </ul> | <ul style="list-style-type: none"> <li>• Correct the short circuit at module input. Sun symbol appears after 10 s.</li> <li>• Connect the module. Sun symbol appears after 15 min.</li> <li>• Connect the module with the correct polarity.</li> </ul> |
|  | <p>No battery is connected to the controller or the connection to the battery is interrupted.</p>  | <p>Controller is supplied only by the solar modules. Connect the battery and replace the fuse in the battery cable if necessary.</p>   |
|  | <p>The battery is connected to the controller with the wrong polarity.</p>   | <p>Disconnect the battery and reconnect it to the controller with the correct polarity.</p>  |

## 10 Legal guarantee

According to the German legal requirements, for this product the customer has a 2 year legal guarantee.

The manufacturer warrants to the specialized trade a voluntary warranty of 5 years from the invoice or receipt date. The manufacturer's warranty applies to products are purchased and in operation in an EU country or Switzerland.

The seller will remove all manufacturing and material faults that occur in the product during the legal guarantee period and affect the correct functioning of the product. Natural wear and tear does not constitute a malfunction. Legal guarantee does not apply if the fault can be attributed to third parties, unprofessional installation or commissioning, incorrect or negligent handling, improper transport, excessive loading, use of improper equipment, faulty construction work, unsuitable construction location or improper operation or use. Legal guarantee claims shall only be accepted if notification of the fault is provided immediately after it is discovered Legal guarantee claims are to be directed to the seller.

**The seller must be informed before legal guarantee claims are processed. For processing a legal guarantee claim an exact fault description and the invoice / delivery note must be provided.**

The seller can choose to fulfil the legal guarantee either by repair or replacement. If the product can neither be repaired nor replaced, or if this does not occur within a suitable period in spite of the specification of an extension period in writing by the customer, the reduction in value caused by the fault shall be replaced, or, if this is not sufficient taking the interests of the end customer into consideration, the contract is cancelled.

Any further claims against the seller based on this legal guarantee obligation, in particular claims for damages due to lost profit, loss-of-use or indirect damages are excluded, unless liability is obligatory by German law.

# 11 Technical data

The manufacturer reserves the right to make technical changes.

| Electrical data                       |                                      |
|---------------------------------------|--------------------------------------|
| Operational voltage                   | 12 V or 24 V, automatically detected |
| 12 V voltage range                    | 6.9 V – 17.2 V                       |
| 24 V voltage range                    | 17.3 V – 43 V                        |
| Permissible ambient temperature range | –10 °C to +50 °C                     |
| Permissible storage temperature range | –20 °C to +80 °C                     |
| Own consumption in mA                 | 12.5 mA                              |
| PWM frequency                         | 30 Hz                                |
| Maximum input voltage                 | < 47 V                               |
| Minimum battery voltage               | 6.9 V                                |

| Currents  |  |         |                                    |         |
|---|--|---------|------------------------------------|---------|
|   | PR 1010  | PR 1515 | PR 2020                            | PR 3030 |
| Max. constant module current at 25 °C                 | 10 A   | 15 A    | 20 A                               | 30 A    |
| Max. constant load current at 25 °C                   | 10 A   | 15 A    | 20 A                               | 30 A    |
| Overtemperature switch-off                            |  |         |                                    |         |
| Load switch-off > 85 °C                               |  |         |                                    |         |
| Load switch-on < 75 °C                                |  |         |                                    |         |
| Data on final charge voltage                          |  |         |                                    |         |
| Depending on configured battery type                  | Gel battery (GEL)  |         | Liquid electrolyte (Li)            |         |
| Normal charging (float)                               | 13.9 V / 27.8 V  |         | 13.9 V / 27.8 V                    |         |
| Boost charging (boost), for 2 h                       | 14.4 V / 28.8 V  |         | 14.4 V / 28.8 V                    |         |
| Equalisation charging (equal), for 2 h                | —  |         | 14.7 V / 29.4 V                    |         |
| 30-day maintenance charging when necessary            | 14.4 V (28.8 V) (for 2 h)  |         | 14.7 V (29.4 V) (for 2 h)          |         |
| Temperature compensation                              | -4 mV per K and cell (internal sensor present, optional external sensor possible)  |         |                                    |         |
| Charge control activation                             |  |         |                                    |         |
| Activation thresholds of the different charging modes | SOC control  |         | Voltage control                    |         |
| Normal charging                                       | SOC ≥ 70 %   |         | ≥ 12.7 V or ≥ 25.4 V               |         |
| Boost charging  | SOC 40 % – 69 %  |         | 11.7 V – 12.7 V or 23.4 V – 25.4 V |         |
| Equalisation charging                                 | SOC < 40 %   |         | < 11.7 V or 23.4 V                 |         |
| 30-day maintenance charging                           | If no compensation charging or boost charging has taken place in the last 30 days. |         |                                    |         |

| Load disconnection   |   |                   |
|--|---|-------------------|
|  | SOC control   | Voltage control   |
| Load disconnection advance warning                                     | SOC < 40 %  | < 11.7 V / 23.4 V |
| Load disconnection   | SOC < 30 %  | <11.1 V / 22.2 V  |
| Load reconnection  | SOC > 50 %  | >12.5 V / 25.0 V  |
| Bar display scaling<br>(only in Voltage control with bar display mode) |   |                   |
| > 13.0 V / 26.0 V  | 10 bar segments                                       |                   |
| > 12.9 V / 25.8 V  | 9 bar segments  |                   |
| > 12.8 V / 25.6 V  | 8 bar segments  |                   |
| > 12.7 V / 25.4 V  | 7 bar segments  |                   |
| > 12.5 V / 25.0 V  | 6 bar segments  |                   |
| > 12.0 V / 24.0 V  | 5 bar segments  |                   |
| > 11.7 V / 23.4 V  | 4 bar segments  |                   |
| > 11.1 V / 22.2 V  | 3 bar segments  |                   |
| > 11.0 V / 22.0 V  | 2 bar segments  |                   |
| ≤ 11.0 V / 22.0 V  | 1 bar segment   |                   |
| Mechanical data  |   |                   |
| Degree of protection   | IP31  |                   |
| Mounting method  | Wall mounting   |                   |
| Weight   | 350 g   |                   |
| Casing   | Recyclable plastic case                               |                   |
| Dimensions L x W x H   | 187 x 96 x 44 mm                                      |                   |
| Mounting hole clearances   | 60 mm vertical, 177 mm horizontal                     |                   |
| Connection terminals<br>(fine / single core)                           | 16 mm <sup>2</sup> / 25 mm <sup>2</sup><br>AWG: 6 / 4 |                   |



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