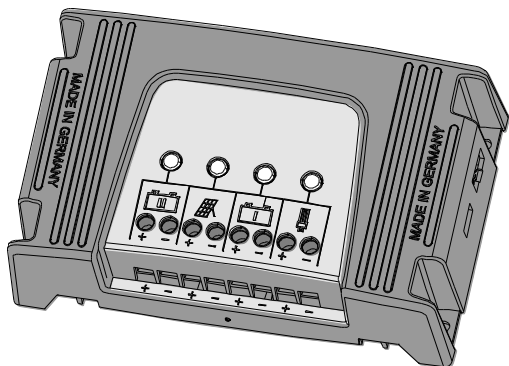


Solar charge controller



**Solar charge controller for
two batteries 12 V/24 V 20 A**

Installation and operating instructions

EN

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1 About these operating instructions

These operating instructions are part of the product.

- Read these operating instructions carefully before use.
- Keep these operating instructions in the vicinity of the product over the entire lifetime of the product.
- Pass these operating instructions on to every subsequent user of the product.

1.1 Description of symbols

Safety instructions are labelled as follows:



Keyword

- Measures for avoiding danger
-

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

2 Safety

2.1 Designated use

- The solar charge controller may only be used for charging and controlling lead-acid batteries (with liquid or solid electrolyte).
- The solar charge controller may only be connected to a solar generator (solar module or array of solar modules within the limits of the permissible connection values) and must not be connected to any other energy source.
- The specifications of the solar charge controller and the connected components listed in these operating instructions must be adhered to.
- The manufacturer's specifications for the solar modules and batteries must be adhered to.

2.2 General safety instructions

- Follow the general and national safety and accident prevention regulations.
- The factory-applied labels on the device must not be modified or removed.
- Keep children away from photovoltaic systems.
- Do not open the device.



Danger of fire and explosion

- Do not use the solar charge controller in any of the following situations:
 - In dusty environments
 - In the vicinity of solvents
 - In environments where inflammable gases and vapours can be present
- Do not expose the batteries to open flames or sparks.
- Ensure that the room is adequately ventilated.
- Perform regular checks to ensure that the system is functioning (charging) correctly.
- Follow the charging instructions of the battery manufacturer.

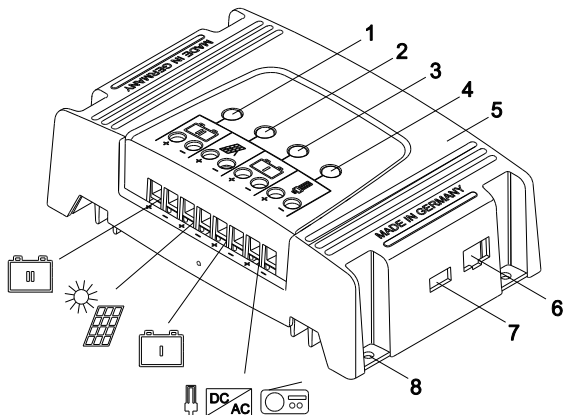
3 Description

The solar charge controller utilises the electrical power generated by solar modules for charging two batteries and for directly supplying electrical loads.

Product features:

- Automatic voltage adjustment 12 V/24 V DC
- Charging of main and auxiliary batteries
- Monitoring of the charge state of the batteries
- Dynamic charge control depending on the charge state of the batteries (charging priority given to the main battery)
- Automatic switch-on after shutdown
- Suitable for systems with negative pole connected to common ground
- Solar charge controller provides overcharge protection and deep discharge protection for the batteries
- Automatic monthly maintenance charge
- Hibernation mode
- Separate load circuit for external loads (can only be used when the main battery is sufficiently charged; indicated by LED 4 lit up yellow or green at the load output)

- USB charge socket (e.g. for charging a mobile phone)
- Can be expanded with an external remote display
- Can be integrated into the StecaLink bus system

Structure:

- 1 LED 1 and terminal block for auxiliary battery (battery II)
- 2 LED 2 and terminal block for solar module
- 3 LED 3 and terminal block for main battery (battery I)
- 4 LED 4 and terminal block for connecting loads (load circuit)
- 5 Plastic housing
- 6 Connection for StecaLink bus system
- 7 USB charge socket
- 8 Fastening holes (4 holes)

The solar charge controller can be used indoors and in vehicles. The charging programme is optimised for one main battery and one auxiliary battery.

All types of lead-acid batteries can be connected (with liquid or solid electrolyte).

When only one battery is used then this must be connected to the main battery terminals.

The charging times depend on the power provided by the solar module and the capacity of the battery.

With a maximum load current of 20 A the load circuit is suitable for external appliances with a power rating of up to 240 W at 12 V and 480 W at 24 V.

The solar charge controller begins operating as soon as a battery is connected. If the solar module delivers no voltage for more than 48 hours, the solar charge controller will enter hibernation mode (all LEDs are deactivated). When a voltage is delivered again by the solar module, the charge controller will resume functioning again within 30 minutes.

The user does not need to operate the solar charge controller or make any settings.

Four multicolour LEDs indicate the operating status, charge state and any faults that may occur (see "Faults and remedies").

LED displays

Battery charge state	LED 1 and LED 3 displays (solar module not charging)	LED 1 and LED 3 displays (solar module charging)
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↑	100 %	Green flashing ¹⁾	Green slowly alternating between bright/dark
		Green fully lit ²⁾	
	50 %	Yellow fully lit	Yellow slowly alternating between bright/dark
↓	0 %	Red fully lit ³⁾	Red slowly alternating between bright/dark
		Red flashing ⁴⁾	

¹⁾ Cut-off voltage reached, excess energy available

²⁾ Charge state: fully charged

³⁾ Charge state: low charge

⁴⁾ Battery deeply discharged

LED 2 Solar module	Meaning
Green fully lit	Solar module connected, no charging current flowing
Green slowly alternating between bright/dark	Charging current flowing
Yellow fully lit	Solar module voltage too low
Off	Solar module voltage below 8 V
LED 4 Load circuit	Meaning
Green fully lit	Load switched on
Green slowly alternating between bright/dark	Special function switched on (only in conjunction with an optional external remote display)
Yellow fully lit	Pre-warning: battery weak
Off	Load circuit switched off to protect the batteries

4 Installation



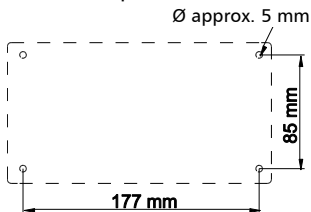
Danger of fire and explosion

- The solar charge controller may only be connected to loads and the batteries by suitably trained and qualified personnel in accordance with the applicable regulations.
 - The installation and operating instructions for all components of the photovoltaic system must be observed.
 - Ensure that no cables are damaged.
-
- Do not mount the solar charge controller outdoors or in wet rooms.
 - Do not subject the solar charge controller to direct solar irradiation or other sources of heat.
 - Protect the solar charge controller from dirt and moisture.

- Mount the solar charge controller upright on a non-inflammable surface.
- Maintain a minimum clearance of 10 cm above and below the unit to ensure free circulation of air.
- Mount the solar charge controller as close as possible to the batteries (but with a safety clearance of at least 30 cm).

Step 1 Mounting the solar charge controller

1. Use the drilling template to mark the hole positions on the wall.
2. Drill 4 holes (\varnothing depending on the wall material and the fasteners used).
3. Use 4 suitable screws (not provided) to fasten the controller to the wall. The cable openings must face downwards.

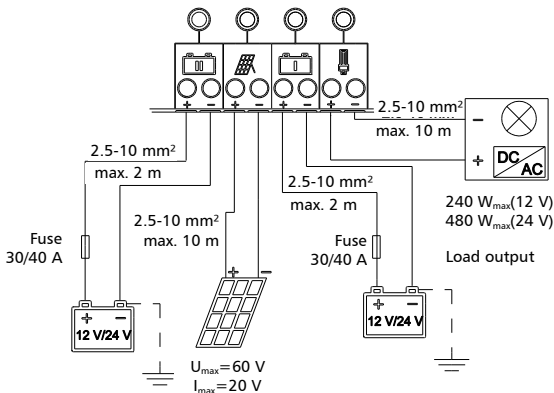


Step 2 Connecting the solar charge controller



Danger of fire and explosion

- Solar modules generate electricity under incident light. The full voltage is present, even when the incident light levels are low. You must therefore protect the solar modules from incident light during installation, e.g. cover them.
- Do not touch exposed cable ends.
- Take care to ensure that the cables do not touch each other.
- Use only insulated tools.
- Ensure that all loads to be connected are switched off.
- Connections must always be made in the sequence described below.



Cable cross sections

		Distance		
		3 m	5 m	10 m
Current	20 A	4 mm ²	6 mm ²	10 mm ²
	10 A	2.5 mm ²	4 mm ²	6 mm ²
	5 A	2.5 mm ²	2.5 mm ²	4 mm ²

The specified cable cross sections are minimum values. Please choose somewhat higher cross sections (max. 10mm²) for a higher efficiency.

Cable terminal tightening torque

1.2 Nm

Cable lengths

Max of 10 m for solar module connection cable

Max of 2 m for battery connection cable

Max of 10 m for load connection cable

Reference potential

Common negative pole (negative pole connected to common ground), earthing is not required

Connecting the batteries (first battery I, then battery II)

The main battery is connected to "Battery I", the auxiliary battery is connected to "Battery II".

1. Label the battery connection cables as a plus cable (B1+ or B2+) and a minus cable (B1- or B2-).
2. Lay the battery connection cables parallel to each other between the solar charge controller and the batteries, but do not yet connect them.
3. Install a 30 A (for a cable cross-section of 6 mm²) or 40 A (for a cable cross-section of 10 mm²) fuse with fuse holder in the plus cable as close as possible to the battery pole.
(The fuse holder is not included in the scope of delivery.)
4. Remove the fuse from the fuse holder.
5. Connect the battery connection cables with the correct polarity to the terminal pairs with the corresponding battery symbol (battery I or battery II).
6. Connect the plus cable to the positive pole of the battery.
7. Connect the minus cable to the negative pole of the battery.
The negative pole can be earthed if required.
8. Insert the external fuse

When the battery is correctly connected, LED 1 or LED 3 lights up green, yellow or red depending on the charge state. LED 4 lights up green or yellow depending on the charge state of the main battery.

Connecting the solar module

1. Ensure that the solar module is protected from incident light.
2. Label the solar module connection cables as a plus cable (M+) and a minus cable (M-).
3. Lay the two solar module connection cables parallel to each other between the solar module and the solar charge controller, but do not yet connect them.
4. Connect the plus cable M+ with the correct polarity to the solar module terminal pair on the solar charge controller.

5. Connect the minus cable M- with the correct polarity to the solar module terminal pair on the solar charge controller.
6. Remove the covering from the solar module.

When the solar module is correctly connected, LED 2 lights up green (permanently or alternating between bright/dark).

Connecting loads

Loads that must not be deactivated by the solar charge controller deep discharge protection, e.g. emergency lights or radio connection, can be connected directly to the battery and separately fused.

1. Ensure that the loads are switched off and the corresponding fuses are removed.
2. Label the load connection cables as a plus cable (L+) and a minus cable (L-).
3. Lay the load connection cables parallel to each other between the solar charge controller and the loads, but do not yet connect them.
4. First connect the L+ load cable with the correct polarity to the right pair of terminals on the solar charge controller (with the lamp symbol).
5. Then connect the L- load cable with the correct polarity to the right pair of terminals on the solar charge controller (with the lamp symbol).
6. Replace any removed fuses and then switch on the loads.

When the loads are correctly connected, LED 4 remains lit in green or yellow.

Step 3 Completion work

1. Secure all cables in the immediate vicinity of the solar charge controller using strain relief fittings (clearance of approx. 10 cm).
2. Check the LED displays.

The solar charge controller is ready for operation.

5 Maintenance

- Clean the solar charge controller as necessary using a brush or soft cloth. Do not use water for cleaning.
- Ensure adequate ventilation at the rear side of the housing (heatsinks).
- Check the cable strain relief.
- Check that all cable connections are secure. Tighten screws if necessary.
- Check all terminals for signs of corrosion.
- All components of the photovoltaic system must be checked at least annually, according to the specifications of the respective manufacturers.

6 Self test

A self test of the solar charge controller can be executed if required. An adjustable, stabilised power supply unit with current limiting is required for the self test.

1. Disconnect all connections to the solar charge controller and wait for at least 1 minute.
2. Adjust the power supply to a voltage of 7.25 V (± 0.25 V) and set the current limit to max. 2 A (0.5 A to 2 A).
3. Connect the power supply unit with the correct polarity to the solar module terminals.

The self test starts automatically. The results are displayed according to the following table:

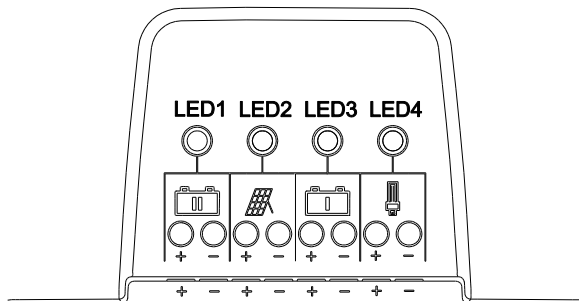
Display	Meaning
LEDs 1 to 4 flash green	Self test passed, no device faults
LEDs 1 to 4 flash red	Internal power supply fault or temperature sensor fault
LED 1 flashes red	Fault in auxiliary battery charge control

Display	Meaning
LED 2 flashes red	Defective USB charge socket
LED 3 flashes red	Fault in main battery charge control
LED 4 flashes red	Defective load switch

7 Faults and remedies

After a shutdown the supply to the loads in the load circuit and the battery charging are resumed as soon as the conditions causing the shutdown are again within a permissible range.

Please consult your point of sale if the fault cannot be corrected using the measures described.



Fault display LEDs

Error/ Fault message	Cause	Remedy
No display	Hibernation mode active	<ul style="list-style-type: none"> - Check solar module voltage - Wait 30 minutes
	Battery voltage too low	Charge the battery
	The external fuse in the battery connection cable has blown	Replace the external fuse
	Battery (Battery I) not connected	<ul style="list-style-type: none"> - Disconnect all connections - Connect a (new) battery - Reconnect the solar module and loads
	Battery is defective	
LEDs 1 and 3 flash red, LEDs 2 and 4 flash yellow	Internal power supply fault or temperature sensor fault	Replace the solar charge controller
LEDs 1 to 4 flash yellow/red	Shutdown due to overtemperature	Check the load circuit for overload and/or reduce the load if necessary

Error/ Fault message	Cause	Remedy
Load circuit		
LED 4 lights up red	Short circuit in load circuit	<ul style="list-style-type: none">- Disconnect loads- Correct the cause of the short circuit- Reconnect loads
LED 4 flashes red (slowly)	Overload warning	Reduce current consumption of the loads, if necessary switch off or disconnect loads
LED 4 flashes red (fast)	Shutdown due to overload	Reduce current consumption of the loads, if necessary switch off or disconnect loads
LED 4 off	Shutdown due to battery undervoltage	<ul style="list-style-type: none">- Charge the battery- Equip loads directly connected to the battery with deep discharge protection- Check the battery and replace if necessary

Error/ Fault message	Cause	Remedy
Battery		
LED 1 and/or LED 3 lights up blue	Battery is con- nected with the wrong polarity	Connect the battery with the correct polarity
LED 1 and/or LED 3 flashes red/green	Battery overvolt- age	<ul style="list-style-type: none">- Disconnect the battery- Correct the cause of the overvoltage- Reconnect the battery
LED 1 and LED 3 flash red alter- nately	Impermissible battery combina- tion 24 V battery (battery I) and 12 V battery (battery II)	<ul style="list-style-type: none">- Disconnect the batter- ies- Connect a permissible battery combination

Error/ Fault message	Cause	Remedy
Solar module		
LED 2 lights up blue	Solar module connected with incorrect polarity	Connect the solar module with the correct polarity
LED 2 lights up red	Short circuit at solar module input	Correct the cause of the short circuit
LED 2 flashes red (slowly)	Solar module overcurrent	<ul style="list-style-type: none"> - Disconnect the solar module - Correct the cause of the overcurrent - Reconnect the solar module
LED 2 flashes red (fast)	Shutdown due to overcurrent	<ul style="list-style-type: none"> - Disconnect the solar module - Correct the cause of the overcurrent - Reconnect the solar module
LED 2 flashes red/green	Solar module overvoltage	<ul style="list-style-type: none"> - Disconnect the solar module - Correct the cause of the overvoltage - Reconnect the solar module

8 Technical data

General information

Dimensions	190 mm x 120 mm x 58 mm
Weight	500 g
Current consumption	Approx. 20 mA
Reference potential	Minus
Earthing	The negative pole can be earthed but this is not essential. Never earth the plus pole!
Maximum heatsink temperature (rear side of unit)	70 °C
Protection class	IP 31
Ambient temperature T_{amb}	-20 °C to +50 °C Power limiting possible at $T_{amb} > 40$ °C (depending on other operating conditions)
Storage temperature	-30 °C to +70 °C

Solar module

Maximum short-circuit current	20 A
Maximum open-circuit voltage	60 V DC
Reverse polarity protection at module input	Up to 36 VDC

Battery charging

Type	Lead-acid batteries with gel (default setting) or liquid electrolyte
Voltage	12 V DC / 24 V DC

Mixed connection of 12 V and 24 V batteries is only permitted according to the adjacent table.

Not permitted! →
The solar charge controller can be damaged.

Battery I	Battery II
12 V	12 V
24 V ¹⁾	24 V ¹⁾
12 V	24 V ¹⁾
24 V	12 V

Line compensation	Automatic compensation of the charge cut-off voltage by the voltage drop value determined across the battery cable
Temperature compensation of the charge cut-off voltage	-4 mV/K/cell (initial value at 25 °C)

¹⁾ Solar module voltage $U_{mpp} \geq 30$ V required

Detailed battery charging data	12 V system	24 V system
Permissible battery voltage range	9-17 V	17.1-34 V
Deep discharge pre-warning at	12.0 V	24 V
Deep discharge protection at	11.7 V	23.4 V
Switch-on voltage	12.5 V	25 V
Cut-off voltage for float charge (Float)	14.1 V	28.2 V
Cut-off voltage/activation for maintenance charge (Boost)	14.4 V / ≤ 12.7 V	28.8 V / ≤ 25.4 V
Cut-off voltage/activation for equalise charge (Equal) (only with the liquid battery type setting)	15.0 V / ≤ 12.2 V	30.0 V / ≤ 24.4 V

Load circuit

Output voltage (same as battery I)	12 V DC or 24 V DC
Maximum output current	20 A

Connections

Terminals	for batteries, solar module and load circuit
USB charge socket	5 V, 1500 mA
Other connections	StecaLink bus system (RJ 45)

Display

LEDs	4 (multicolour)
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Electronic protection functions

- Overcharge/deep discharge protection for the batteries
- Reverse polarity protection for the solar module¹⁾, load circuit and batteries
- Battery overvoltage shutdown
- Automatic electronic fuse
- Overtemperature and overload protection
- Short-circuit protection for load circuit and solar module
- Overvoltage protection at solar module input
- Open circuit protection without battery
- Reverse current protection

The protection functions are activated in the case of simple individual faults. If multiple faults occur simultaneously the protection functions will not be activated and the solar charge controller can be destroyed.

¹⁾ Only up to an open-circuit voltage $U_{oc} < 36$ V

9 Commercial and legal guarantee conditions

In accordance with German statutory regulations, there is a 2-year legal guarantee on this product for the customer.

The manufacturer provides a voluntary 5-year commercial guarantee to the specialist dealer from the date of invoice or receipt. The commercial guarantee applies to products purchased and operated in EU countries or Switzerland.

The seller will correct all manufacturing and material faults that occur in the product during the guarantee period and affect the correct functioning of the product. Natural wear and tear does not constitute a malfunction. No guarantee can be offered 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 or improper operation or use. Guarantee claims shall only be accepted if notification of the fault is provided immediately after it is discovered.

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

The seller can choose to fulfil the 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 sufficiently taking the interests of the end customer into consideration, the contract is cancelled.

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

