MPT®
Charge Controller

Sunny Island Charger

Installation Guide

Version 2016-1

Contents

1 Notes on this Manual

This manual describes how to install, commission and service the Sunny Island Charger.

1.1 Validity

This manual applies to the following Sunny Island Charger type:

- SIC50-MPT®

1.2 Target Group

This manual is intended for the installer and the operator.

1.3 Storage of the Manual

All manuals for the device and for the installed components must be stored in the immediate vicinity of the charge controller and must be accessible at all times.

1.4 Symbols Used

The following types of safety messages and general information appear in this document:

DANGER! DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING! WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION! CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE! NOTICE indicates a situation that can result in property damage if not avoided!

Information provides tips that are valuable for the optimal installation and operation of your product.

2 Safety Instructions

2.1 Appropriate Usage

The charge controller is a DC/DC converter that reduces the direct current of the PV array to the direct current of a battery in order to charge it. The charge controller can be operated in two different operating modes:

Stand-alone operation	**SMA operation**
The “Stand-alone” operating mode must be selected if the charge controller is operated in a stand-alone grid system equipped with a Sunny Island 3324/4248 or without a Sunny Island.	The “SMA” operating mode must be selected if the charge controller is operated in a system equipped with a Sunny Island 5048/2012/2224.
Section **??** “Operating mode” (page **??**) explains how to set the operating mode.	

In SMA operating mode, the Sunny Island protects the battery from deep discharge. In stand-alone operating mode without Sunny Island, an external device must protect the battery from deep discharge.

The charge controller may only be operated with PV array (modules and cabling) of protection class II. Do not connect any sources of energy other than PV modules to the charge controller.

Already when designing the PV plant, ensure that the values comply with the permitted operating range of all components at all times. The maximum open circuit voltage of the PV array may not be greater than the maximum input voltage of the charge controller (140 V), even at very low ambient temperatures. The voltage of the PV array must always be at least 5 V higher than the battery voltage during operation. The charge controller is suitable for battery currents of up to 50 A at 48 V/24 V/12 V nominal battery voltage.

The suitability of a PV array for the charge controller primarily depends on the output voltage and output power of the PV array. In this regard, observe the limits specified by the module manufacturer.

Appropriate usage also includes observing all documentation.

2.2 General Safety Instructions

DANGER!

Danger to life due to high voltages in the charge controller.

- All work on the charge controller must only be carried out by an electrically skilled person.

CAUTION!

Danger of burn injuries due to hot enclosure parts.

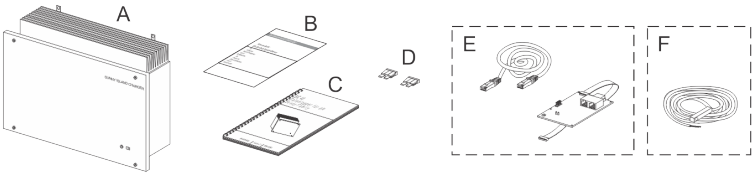
- Do not touch the enclosure of the charge controller during operation.

Grounding the PV array

Observe all local regulations for grounding the PV array. SMA Solar Technology AG connecting the array frame and other electrically conductive surfaces so that there is continuous conduction and to ground them in order to ensure optimal protection for plants and persons.

3 Unpacking

3.1 Scope of Delivery



Object	Quantity	Description
A	1	Charge controller
B	1	Document set
C	1	Technical description
D	2	Thermal fuse (30 A)
E	1	SIC-PB communication interface and RJ45 cable (5 m)*
F	1	Battery temperature sensor**

* optional, required for SMA operation
** optional

3.2 Check for Transport Damage

Check the charge controller for visible external damage, such as cracks in the enclosure. Contact your dealer if you find any damage.

3.3 Identifying the Charge Controller

You can identify the charge controller by the type label. The type label is on the right side of the enclosure.

4 Battery Management and Charge Control

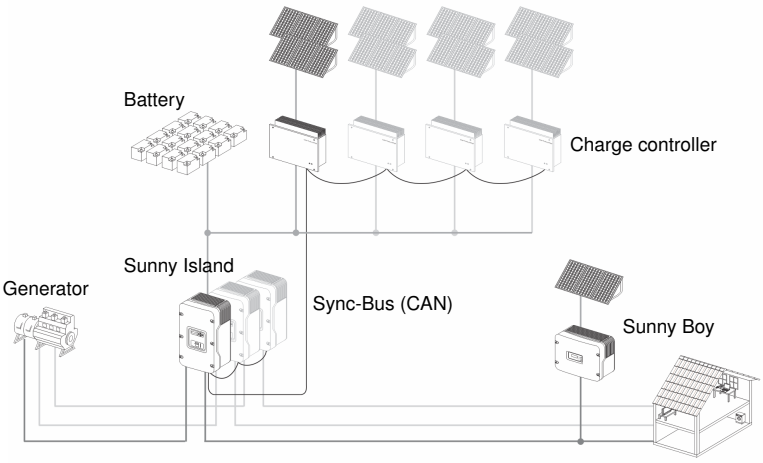
4.1 SMA Operation

The SIC-PB communication interface must be installed and connected to the Sunny Island 5048/2012/2224 for SMA operation. If a communication connection is established, the Sunny Island will control of battery management, including charge control.

The charge controller receives the current and temperature-compensated nominal charging voltage from the Sunny Island and transmits the battery's present charging current back to the Sunny Island. This ensures that the battery is always optimally charged and that the Sunny Island calculates the correct charging state. For further details on battery management see the Sunny Island documentation.

If communication does not function in SMA operation, the battery will only be charged with voltages of 13.5 V/27 V/54 V.

Working principle of a Sunny Island system with a charge controller

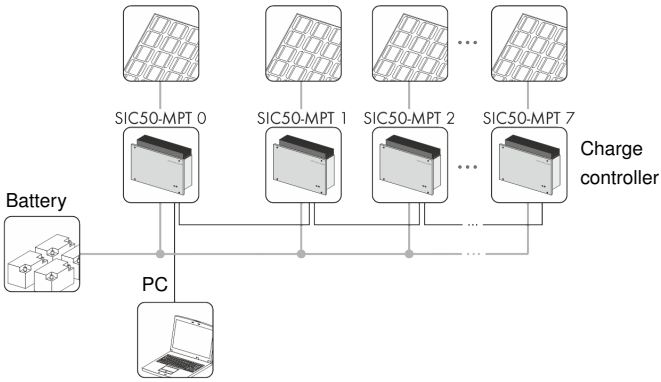


4.2 Stand-Alone Operation

During stand-alone operation or during operation with the 3324/4248 Sunny Island inverters, the charge controller automatically controls the charging voltage of the battery, depending on the battery type set and current charging phase, according to the “four-phase charging process” (MPP, boost, continuous, float). During the first phase, charging is carried out using the maximum power provided by the PV array. During the second phase, the charging current is reduced and the battery voltage is regulated to the charging voltage set for the boost phase. This phase is only completed if the battery voltage ever drops below 2.08 V/cell during the preceding discharging phase. Otherwise, the charging process is immediately continued with the third phase, “continuous”. The continuous and the boost charging phases are identical, except that the continuous phase has a slightly lower charging voltage. Once continuous charging is completed, the charge controller switches to float charging until the next complete discharge.

If a battery temperature sensor is connected, the charging voltage is adjusted to the temperature using -4 mV/°C and cell.

Working principle of the charge controller in stand-alone operation



5 Assembly

CAUTION!

Risk of injury due to the charge controller's heavy weight.

- Take the weight of the charge controller of approx. 10 kg into account.

5.1 Selecting the Mounting Location

DANGER!

Danger to life due to fire or explosion.

The charge controller enclosure can become hot during operation.

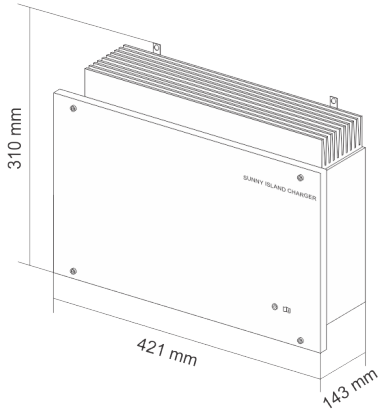
- Do not mount the charge controller on flammable construction materials.
- Do not mount the charge controller near highly flammable materials.
- Do not mount the charge controller in potentially explosive areas.

CAUTION!

Danger of burn injuries due to hot enclosure parts.

- Mount the charge controller in such a way that it cannot be touched inadvertently during operation.

5.1.1 Dimensions



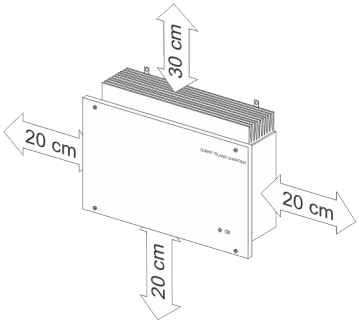
5.1.2 Ambient Conditions

- The mounting location and method must be suitable for the weight and dimensions.
- Mount on a solid surface.
- The mounting location must be accessible at all times.
- The charge controller must be easy to remove from the mounting location at any time.
- The ambient temperature should be between -25°C and +60°C to guarantee optimal operation.
- Do not expose the charge controller to direct sunlight to avoid power losses due to overheating.

5.1.3 Safety Clearances

Observe the following safety clearances to walls, other devices or objects to ensure sufficient heat dissipation.

Direction	Safety clearance
Sides	20 cm
Top	30 cm
Bottom	20 cm

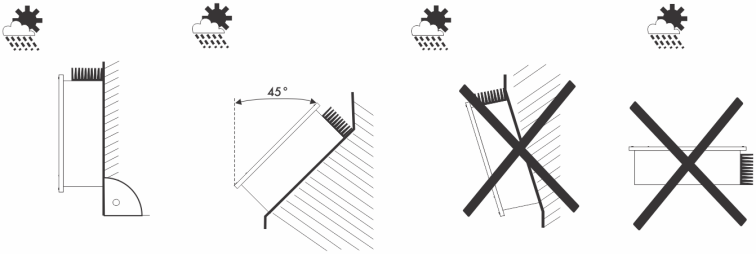


Multiple charge controllers installed in areas with high ambient temperatures

If necessary, increase the clearances between the individual charge controllers. In addition, make sure there is enough ventilation to ensure sufficient cooling of the charge controller.

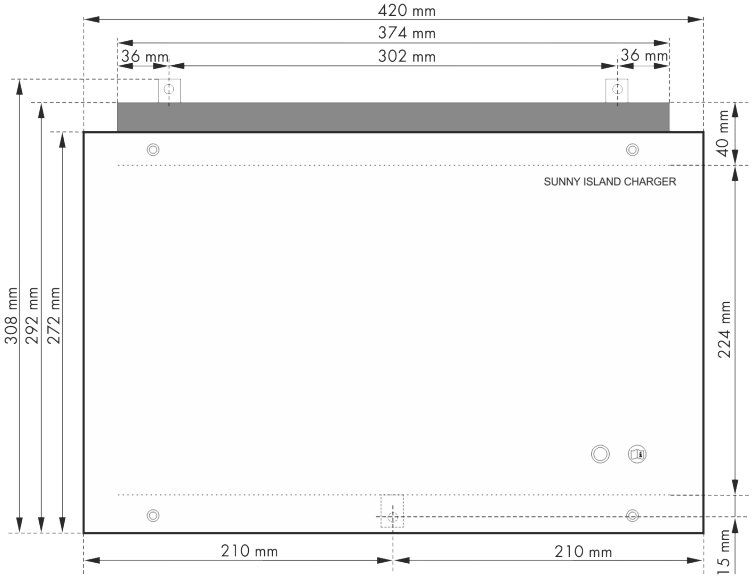
5.1.4 Position

- Mount vertically or tilted backwards by max. 45°.
- Install at eye level in order to allow operation conditions to be read at all times.
- Never mount the device with a forward tilt.
- Do not mount horizontally.

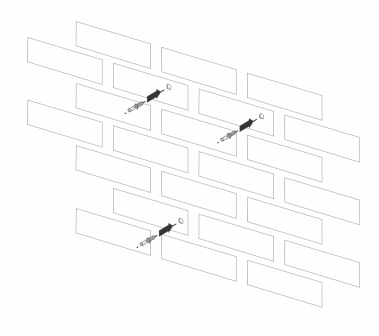


5.2 Mounting Instructions

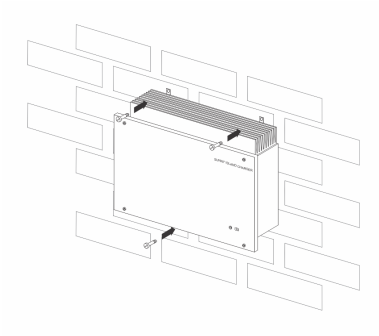
1. Mark the position of the drill holes.



2. Drill the holes (diameter: at least 8 mm) at the indicated positions and use wall anchors (at least M8).



3. Screw the charge controller onto the wall using the three mounting plates. Use fastening material suitable for the surface.



4. Make sure that the device is securely in place.

6 Electrical Connection

6.1 Safety

DANGER!

Danger to life due to high voltages in the charge controller.

- Disconnect the PV array using a disconnection unit and secure it against accidental reactivation.
- Disconnect the miniature circuit breaker and ensure that it cannot be reconnected.
- Ensure that no voltage is present in the system.

WARNING!

Risk of injury due to electric shock.

If all cables with different voltages are routed in parallel, damaged cable insulations may lead to a short circuit.

- Route all cables separately.

NOTICE!

Electrostatic discharges may damage the charge controller.

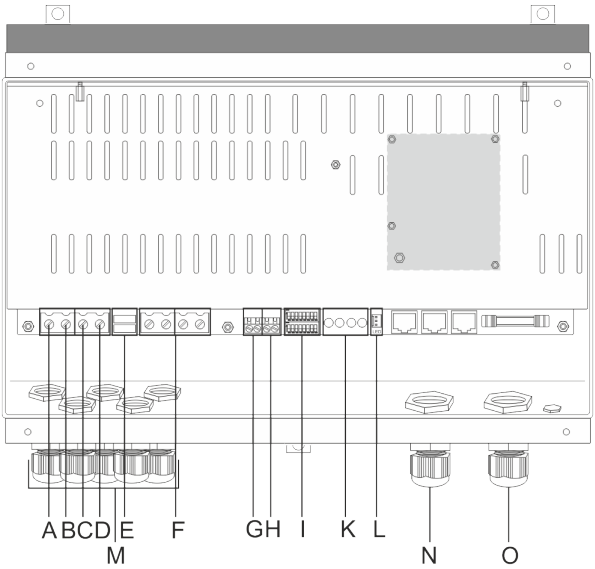
- Ground yourself before touching a component inside the charge controller.

NOTICE!

Overvoltage can destroy the system.

- Use an external overvoltage protector in areas with an increased risk of thunderstorms and lightning.

6.2 Overview of the Connection Area



Object	Description
A	“PV+” connection terminal for “PV+” cable of the PV array
B	“PV—” connection terminal for “PV—” cable of the PV array
B	“BAT—” connection terminal for “BAT—” cable of the battery
D	“BAT+” connection terminal for “BAT+” cable of the battery
E	Thermal fuses
F	“EARTH” connection terminal for grounding
G	Connection terminal for the battery temperature sensor cables
H	Connection terminal for the signaling contact cables
I	DIL switch for configuration
K	Internal LEDs (only visible to the installer)
L	LED connection of the multicolored LED in the lid
M	M20 metric-thread cable glands for the battery, PV array and PE cables
N	M25 metric-thread cable gland for the signaling contact and the battery temperature sensor cables
O	M25 metric-thread cable gland for communication cable

6.3 Grounding

6.3.1 Grounding the Charge Controller

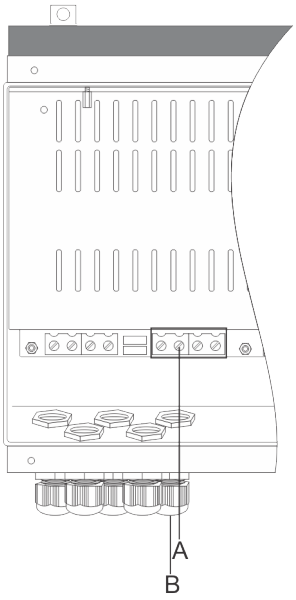
DANGER!

Risk of lethal electric shock.

The charge controller has the protection class I.

- Ground the charge controller properly, regardless of whether the battery and PV are grounded.

1. Open the charge controller. Loosen the screws of the enclosure lid and remove the lid.
2. Unscrew the lock nut of the metric-thread cable gland (B) and slide it along the PE cable.
3. Route the PE cable through the cable gland into the charge controller and connect it to the “EARTH” connection terminal (A).
4. Retighten the lock nut of the cable gland.



6.3.2 Grounding the Battery and the PV Plant

DANGER!

Danger to life due to high voltages at the battery's negative ground terminal.

- Ground the battery. Not grounding the battery is permitted only if the battery connections have protection against accidental contact.

NOTICE!

Grounding the positive pole may lead to destruction of the battery.

- Never ground the positive pole of the battery or the PV plant.

Cross-section of the Protective Conductor

MSTE SOLAR GmbH cannot make any general statements regarding the required cross-section of the protective conductor for external grounding of the battery. The conductor dimensions depend on the type and size of the battery connected, the external fuse (DC side) and the material used in the protective conductor.

Determining the cross-section

When determining the cross-section of the protective conductor, all standards and guidelines that apply at the installation location must be observed.

The required cross-section of the protective conductor can be calculated using the following formula. Tripping times for short-circuit currents of between 2 000 A and 10 000 A are typically about 25 ms.

$$S = \frac{\sqrt{I_{SC}^2 * t}}{143}$$

t =short-circuit duration in $seconds$
I_{SC} = maximum battery current (short-circuit current) in $amperes$
S =conductor cross-section in mm^2

A protective conductor with a cross-section of 16 mm is therefore sufficient for short-circuit currents up to 10 000 A.

6.4 PV Array Connection (DC)

NOTICE!

Improperly connecting the charge controller to the PV array may irreparably damage it.

- Never connect several charge controllers in parallel on the side of the PV array.

The following threshold values at the DC input of the charge controller may not be exceeded:

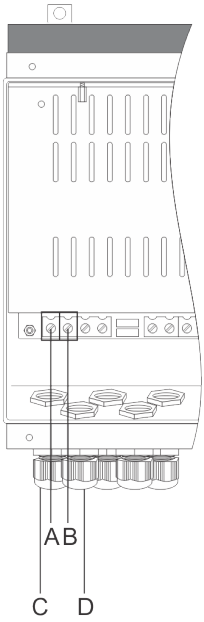
Maximum input voltage	Maximum input current
140 V (DC)	40 A (DC)

Connection Procedure

Sectioning point between PV array and charge controller

The DIN VDE 0100-712 standard stipulates that an all-pole sectioning point must be installed between the PV array and the charge controller. Observe this standard as well as all standards and guidelines that apply at the installation location for connecting the PV array.

1. Unscrew the lock nut of the metric-thread cable gland (C) and slide it along the PV array's "PV+" cable.
2. Route the "PV+" cable of the PV array through the cable gland into the charge controller and connect it to the "PV+" connection terminal (A).
3. Retighten the lock nut of the cable gland.
4. Unscrew the lock nut of the metric-thread cable gland (D) and slide it along the PV array's "PV—" cable.
5. Route the "PV—" cable of the PV array through the cable gland into the charge controller and connect it to the "PV—" connection terminal (B).
6. Retighten the lock nut of the cable gland.



6.5 Battery Connection (DC)

Connection Requirements

Battery capacity

The battery capacity depends on the connected PV power. Observe the following table.

Nominal battery voltage	Battery capacity per kWp PV
48 V	at least 120 Ah/kWp PV
24 V	at least200 Ah/kWp PV
12 V	at least 400 Ah/kWp PV

Excessively long battery cables reduce system efficiency

The cables leading from the battery to a DC distributor to which both the Sunny Island and the charge controller are connected may not be longer than 5 m.

- Observe all standards and guidelines that apply at the installation location (e.g. DIN VDE 0510 “Rules for Accumulators and Battery Systems”).
- Observe all specifications of the battery manufacturer.

Cable Requirements

NOTICE!

Irreparable damage of the cable leading from the charge controller to the battery.

- Do not lay the battery cables under plaster or in armored plastic pipes.

Cable Protection

In addition to the thermal fuses in the charge controller, install a separate fuse as close to the battery as possible. Install a suitable fuse according to the maximum specified DC currents. You can, for example, install a 63 A miniature circuit breaker.

NOTICE!

Irreparable damage of the cable leading from the charge controller to the battery.

- Lay the battery cables so that they are protected against ground faults and short circuits if no line circuit breaker is present.
- Make sure that the cable cross-section is sufficient.

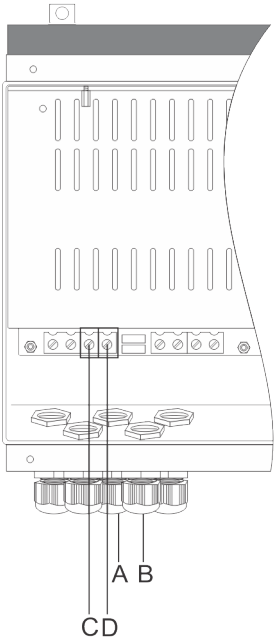
Connection Procedure

NOTICE!

Reversing the poles when connecting the battery may irreparably damage the charge controller.

- Make sure that the poles of the cables leading to the battery are correct.

1. Unscrew the lock nut of the metric-thread cable gland (A) and slide it along the battery's "BAT—" cable.
2. Route the "BAT—" cable of the battery through the cable gland into the charge controller and connect it to the "BAT—" connection terminal (C).
3. Retighten the lock nut of the cable gland.
4. Unscrew the lock nut of the metric-thread cable gland (B) and slide it along the battery's "BAT+" cable.
5. Route the "BAT+" cable of the battery through the cable gland into the charge controller and connect it to the "BAT+" connection terminal (D).
6. Retighten the lock nut of the cable gland.



Replacing the thermal fuses when reversing the poles of the DC cables

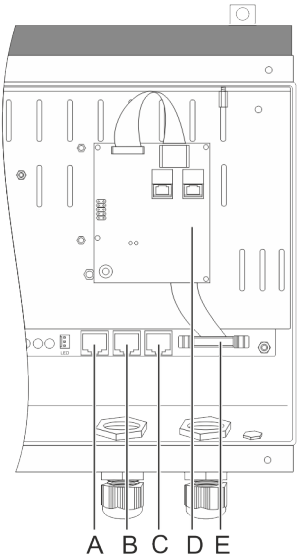
If the poles of the DC cables are reversed when connecting, the thermal fuse will be irreparably damaged. Proceed as described in section **??** "Replacing the Thermal Fuses" (page **??**) to replace the thermal fuses.

Multicolored LED

Once the battery has been connected, the multicolored LED of the charge controller will glow red. If the LED is not glowing, the poles of the DC cables are reversed and the thermal fuses must be replaced. If this is not the case, the charge controller is defective and must be replaced. In this case, contact MSTE SOLAR GmbH. See section **??** "Contact" (page **??**).

6.6 Communication

6.6.1 Interface



Object	Description
A	MSTE bus output
B	MSTE bus input
C	RJ45 socket for connecting a serial interface
D	Socket for SIC-PB communication interface
E	Socket for communication interface connection

6.6.2 Connection to PC Serial Interface

Connecting a PC to the charge controller is possible in both operating modes (SMA operation and stand-alone operation). Measured values can only be read. The connection is established via the RJ45 socket of the first charge controller (device address 0) to the PC's serial interface. Use a RJ45 to RS232 adapter cable for this.

Configuring the Software

Use a terminal program in order to display the measured values on the PC. There are various terminal programs available, e.g., Hyper Terminal. Hyper Terminal is a Microsoft Windows standard program and is located under "Start\Programs\Accessories\Communication".

The following table shows the connection settings for the terminal program:

Setting	Value
Bits per second	300
Data bits	8
Parity	none
Stop bits	1
Flow control	none

Pin Assignment of the RJ45 Socket on the Charge Controller

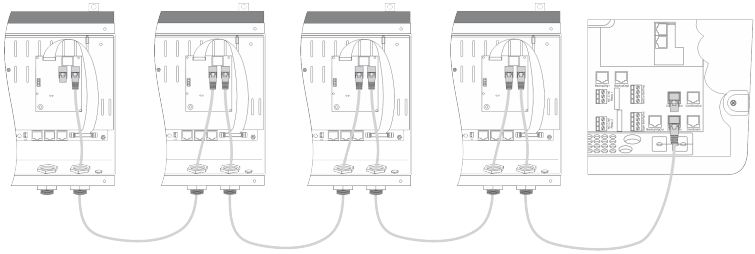
Pin	Function	Level	Description
1	Short circuit with PIN 2	must be established for activating RS232	
2	Short circuit with PIN 1	must be established for activating RS232	
3	TXD	RS232, +9 V, −9 V	charge controller output
4	GND	0 V	reference potential
9	Shield, protective earth		

Pin Assignment of the PC's Serial Interface

Pin	Function	Level	Description
5	GND	0V	reference potential
2	RXD	RS232, +9V, −9V	PC input

6.6.3 SMA Operation

The communication between the charge controller and the Sunny Island 5048 / 2012 / 2224 allows the charge controller to be controlled in a coordinated manner. This ensures precise calculation of the state of charge in the Sunny Island without an additional battery current measuring shunt.
All important operating data of the charge controller can be read on the Sunny Island display. In addition, the most important values are saved on the Sunny Island SD card.
Up to four charge controllers can be connected in parallel to one Sunny Island system.



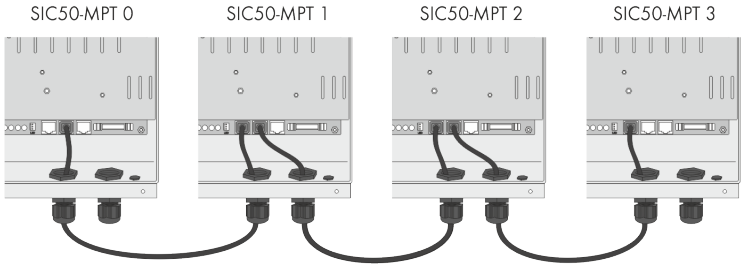
More information on installing and connecting the SIC-PB communication interface can be found in the SIC-PB installation guide.

Pin Assignment of the Micro Ribbon Cable

Pin	Function	Level	Description
8	GND	0V	reference potential
10	GND	0V	reference potential
11	RXD	TTL	charge controller input
12	TXD	TTL	charge controller output

6.6.4 Stand-alone Operation

Up to 8 charge controllers can be connected to each other. Connect the MSTE bus input of the charge controller with the MSTE bus output of the following charge controller. Use an RJ45 cable for this.



Pin Assignment of the MSTE Bus

Pin	Function	Level	Description
4	GND	0V reference potential	
3	TXD bus / RXD bus	TTL, open collector	resting potential: +5 V active: 0 V
9	Shield, protective earth		

Communication Protocol

The charge controller sends and receives data through the TXN bus and the RXD bus. The data is coded in ASCII format.

Character Sequence of the Request

The character sequence of the request consists of 4 characters. The code letter and the device address must be coded in ASCII format.

0	1	2	3
Control character 13 13 (carriage return)	Control character 10 (line feed)	Code letter	Device address

Character Sequence of the Response

The character sequence of the response consists of 14 characters. It begins with the control characters 13 and 10 (carriage return and line feed). They are followed by the code letter of the measured value and the device address.
The following table shows an example for the character sequence of the response (device SIC50-MPT 0 with operating voltage of +50.0 V):

0	1	2	3	4	5	6	7	8	9	10	11	12	13
13	10	V	0	=	+	0	0	5	0	.	0	V	!

Code Letter of the Measured Values

Code letter	Description
D	Temperature of the charge controller
E	Device fault (see section **??** “Failure Search”, page **??**)
I	Charging current
L	Charging threshold of the battery voltage
P	Charging power
S	Voltage at the PV array
T	Temperature of the battery
V	Operating voltage

6.7 Additional Connections

6.7.1 Signaling Contact

You can connect a signaling contact to your charge controller that automatically closes in case of battery overvoltage (battery voltage $>$ 65 V). The signaling contact operates like a make contact and can be loaded with voltages of up to 200 V (DC) and a contact load of 1 A/15 W.

NOTICE!

If a switch in the charge controller short circuits, the battery may be irreparably damaged.

If a short circuit occurs in the charge controller, the battery is no longer protected against overcharging.

- MSTE SOLAR GmbH recommends using the signaling contact to ensure that, in case of a failure, the battery is disconnected from the charge controller by a relay or contactor.
- If several charge controllers are connected to the stand-alone grid system, a signaling contact must be connected between each charge controller and the battery.

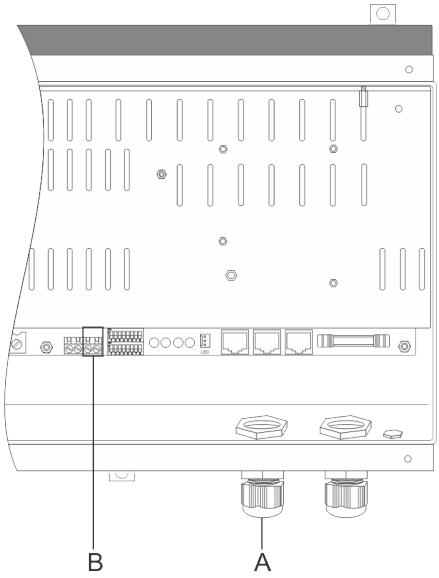
Cable Requirements

Signaling Contact Cable

To maintain the IP65 protection rating, use a cable with an outer diameter of 5 mm - 7 mm to connect the signaling contact.

Connection Procedure

1. Unscrew the lock nut of the M25 metric-thread cable gland (A) and slide it along the signaling contact cables.
2. Remove the seal insert from the cable gland and remove the filler plug.
3. Route the signaling contact cable through a cable opening into the seal insert.
4. Insert the seal insert along with signaling contact cables into the cable gland.
5. Route the cables of the signaling contact through the cable gland into the charge controller and connect them to the connection terminal (B).
6. Retighten the lock nut of the cable gland.



6.7.2 Battery Temperature Sensor

To allow a temperature-independent charge control during stand-alone operation or during operation with a Sunny Island 3324/4248, you can connect an external battery temperature sensor (BAT-TEMP-SENSOR: replacement battery temperature sensor, KTY type with 10 m connection cable for Sunny Island, Sunny Backup or Sunny Island Charger) to the charge controller.

SMA Operation

No external battery temperature sensor is required when operating in “SMA operation” mode.

NOTICE!

Damage to battery due to excessive or insufficient charging.

In “Stand-alone operation” mode, a battery temperature sensor must be connected. Otherwise, the battery may be excessively or insufficiently charged if temperatures outside of the temperature range +15 °C to +25 °C occur frequently.

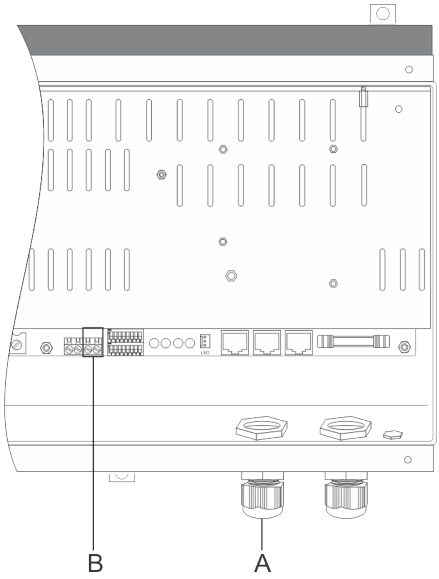
- Connect an external battery temperature sensor if the charge controller is operated in stand-alone mode or together with a Sunny Island 3324/4248.

2 k resistor

A 2 k resistor is connected by default to the connection terminal for the battery temperature sensor. If neither the resistor nor a battery temperature sensor are connected during stand-alone operation or during operation with a Sunny Island 3324/4248, the charge controller cannot be commissioned.

Connection Procedure

1. Remove the resistor.
2. Unscrew the lock nut of the M25 metric-thread cable gland (A) and slide it along the cable of the battery temperature sensor.
3. Remove the seal insert along with the cable opening from the cable gland.
4. Route the cables through the cable openings in the seal insert.
5. Connect the battery temperature sensor cables to the connection terminal (B).
6. Retighten the lock nut of the cable gland.

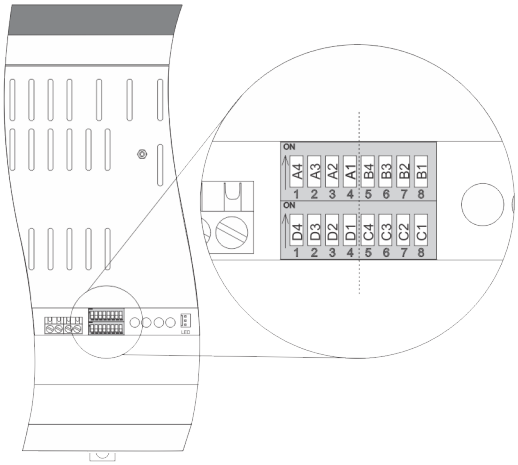


7 (First) Commissioning

7.1 Configuring the Charge Controller

Configure the charge controller before commissioning. You can carry out the basic configuration using the operating switch (DIL switch). The operating mode, battery system, battery type, device address of the charge controller and a fault diagnosis can be configured by changing the position of the DIL switch.

Assignment of the DIL Switches
The DIL switches have the following assignments:



7.1.1 Operating Mode

The operating mode is set using the “D4” DIL switch.

Operation with Sunny Island 3324/4248
If the charge controller is operated in the stand-alone grid system together with a Sunny Island 3324/4248, set the DIL switch D4 to “OFF”, since this Sunny Island does not support the charge controller’s type of communication.

The following table displays the switch position for the required operating mode.

Switch	**SMA operation** (operation with Sunny Island)	**Stand-alone operation**
D4	ON	OFF

7.1.2 Battery System

The battery system is set using the C1, C2 and C3 DIL switches. The following table displays the switch position of the required battery system.

Switch	12 V battery system	24 V battery system	48 V battery system
C1	ON	OFF	OFF
C2	OFF	ON	OFF
C3	OFF	OFF	ON

7.1.3 Device Address

The sequential order of the devices is determined by configuring the device address. The device address is set using the D1, D2 and D3 DIL switches.

Stand-alone operation
In the “Stand-alone operation” mode, the device address must be set to 0.

SMA operation
In the “SMA operation” mode, up to four charge controllers may be connected to the Sunny Island. The device addresses intended for these four devices are one to four.

The following table displays the switch position of the device addresses:

Device address	D3	D2	D1
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

7.1.4 Battery Type

In stand-alone operation, the battery type and the charging voltage must be set. The battery type and charging voltage are set using the B1, B2, B3 and B4 DIL switches. When performing these settings, observe all the specifications of the manufacturer.
The possible settings for the charging voltage/cell can be found in the following tables.

Battery type	Charging process			Switch			
	Boost	Continous	Float	B1	B2	B3	B4
Typical flooded battery	2,392 V	2,35 V	2,3 V	OFF	OFF	OFF	OFF
Type 2 flooded battery	2,392 V	2,35 V	2,267 V	OFF	OFF	ON	OFF
Type 3 flooded battery	2,375 V	2,35 V	2,283 V	OFF	ON	OFF	OFF
Type 4 flooded battery	2,358 V	2,33 V	2,25 V	OFF	ON	ON	OFF
Typical sealed battery	2,4 V	2,375 V	2,33 V	ON	OFF	OFF	OFF
Type 2 sealed battery	2,4 V	2,35 V	2,3 V	ON	OFF	ON	OFF
Type 3 sealed battery	2,467 V	2,35 V	2,3 V	ON	ON	ON	OFF
Type 4 sealed battery	2,583 V	2,35 V	2,3 V	OFF	OFF	OFF	ON

7.2 Commissioning

Check the following requirements before commissioning:

- Fuses designed correctly
- All DC cables completely connected (PV strings and batteries)
- Battery temperature sensor connected (only in stand-alone operation or when operated with a Sunny Island 3324/4248)
- DIL switches configured

Commissioning Procedure

1. Check the polarity of the battery and the PV array.
2. Close the charge controller. Fasten the lid to the enclosure using four screws.
3. Connect the cables leading from the charge controller to the battery to the battery.
4. Switch on the miniature circuit breaker and the disconnection unit.
5. The LED changes its color from red to green. The green LED indicates that the device is operating. This means that the commissioning procedure was successful. If the PV voltage drops and falls below the battery voltage, the LED will change from green to orange. If the PV voltage exceeds the battery voltage, the device will restart and the LED will change from orange to green.

8 Opening and Closing

8.1 Opening the Charge Controller

DANGER!

Danger to life due to high voltages in the charge controller.

- Disconnect the miniature circuit breaker and ensure that it cannot be reconnected.
- Switch off power supply to the signaling contact and ensure that it cannot be reactivated (if applicable).
- Ensure that no voltage is present in the system.

1. Remove the screws from the lid and set them aside.
2. Pull the lid slightly forward.
3. Disconnect the PE connection from the lid.
4. Carefully remove the multicolored LED from the charge controller's "LED" socket.
5. Remove the enclosure lid and set it aside.

8.2 Closing the Charge Controller

1. Create a PE connection to the lid.
2. Carefully insert the plug of the multicolored LED into the charge controller's "LED" socket.
3. Close the charge controller. Fasten the lid to the enclosure using four screws.
4. Switch on the miniature circuit breaker and the disconnection unit.
5. Check the LED to see if the charge controller is operating correctly.

9 Maintenance and Cleaning

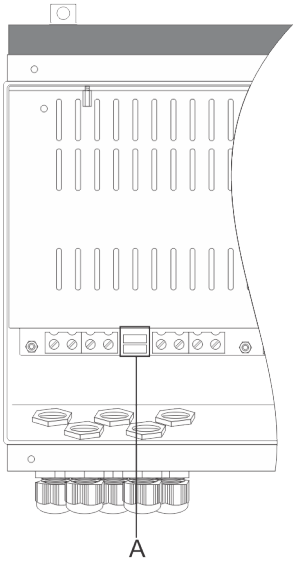
9.1 Replacing the Thermal Fuses

NOTICE!

Using incorrect thermal fuses may irreparably damage the charge controller.

- Only use the thermal fuses included in the scope of delivery.

1. Open the charge controller as described in section **??** “Opening the Charge Controller” (page **??**).
2. Remove broken thermal fuses from the sockets (A).
3. Insert new thermal fuses (included in the scope of delivery).
4. Close the charge controller as described in section **??** “Closing the Charge Controller” (page **??**).



9.2 Cleaning the Cooling Fins

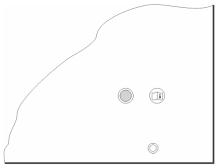
It is only necessary to clean the cooling fins if the charge controller’s heat dissipation is restricted by dirt.

- Carefully remove dirt with a suitable soft brush.

10 Meaning of the Light Emitting Diodes (LEDs)

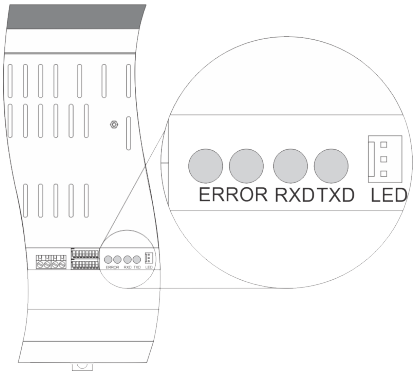
10.1 Multicolored LED

LED	Meaning
Green	Operation (PV voltage > battery voltage)
Red	Fault/error
Orange	Low PV voltage (PV voltage< battery voltage)



10.2 Internal LEDs

Internal LEDs The internal LEDs are located inside the charge controller and are only visible to the installer.



Yellow (ERROR)	Yellow (ERROR)	Green (RXD)	Green (TXD)	Meaning
Is glowing	Is glowing			error/stop
				charge controller is charging
		Is blinking		charge controller is receiving data from Sunny Island
			Is blinking	charge controller is transmitting data

11 Failure Search

11.1 SMA Operation

You can find the description of all parameters and errors in the Sunny Island manual.

11.2 Stand-alone Operation

You can read the error messages through the serial interface using the terminal program. The device number is shown as x in the following.

Error code	Description
Ex=+0000.0	no error
Ex=+0000.2	DC input voltage missing (also at night and during periods with low solar irradiation)
Ex=+0000.4	overvoltage at DC input voltage
Ex=+0000.8	battery temperature too high or sensor cable interrupted
Ex=+0001.6	battery temperature too low or short circuit in the sensor cable
Ex=+0003.2	charge controller temperature is higher than 90 °C
Ex=+0006.4	battery temperature is lower than −30 °C
Ex=+0012.8	battery voltage is lower than 8.1 V
Ex=+0025.5	short circuit, overload or overcurrent at battery or PV array (also before first commissioning)

12 Decommissioning

12.1 Disassembly

CAUTION!

Risk of injury due to the charge controller's heavy weight.

- Take the weight of the charge controller of approx. 10 kg into account.

DANGER!

Danger to life due to high voltages in the charge controller.

- Switch off all fuses and ensure that they cannot be reactivated.

1. Wait until the LED on the charge controller has gone out.
2. Open the charge controller. Loosen the screws of the enclosure lid and remove the lid.
3. Disconnect the PV array from the charge controller.
4. Disconnect the battery from the charge controller.
5. Remove the communication cable from the charge controller.
6. Close the charge controller. Fasten the lid to the charge controller using four screws.
7. Remove the charge controller.

12.2 Packaging

If possible, always package the charge controller in the original packaging. If this is no longer available, you can also use an equivalent box that fulfills the following requirements:

- Suitable for loads up to 10 kg
- Can be closed fully

12.3 Storage

Store the charge controller in a dry place with ambient temperatures between −25 °C and +60 °C.

12.4 Disposal

Dispose of the charge controller at the end of its service life in accordance with the disposal regulations for electronic waste which apply at the installation site at that time.

13 Technical Data

	SIC50-MPT
Input (PV array)	
Max. PV power (12 V / 24 V / 48 V)	630 W/1250 W /2400 W
Max. DC voltage	140 V_{DC}
Optimal MPPT voltage range (12 V / 24 V / 48 V)	25 V ... 60 V/ 40 V ... 80 V / 70 V ... 100 V
Number of MPP trackers	1
Max. PV current for 12 V / 24 V / 48 V system	40 A / 40 A / 40 A
PV current control unit	MPPT (approximate current control every minute, fine control every two seconds)
Clamping position	screw terminals
Recommended cable cross-section	10 mm^2
Max. cross-section of cables that can be connected	16 mm^2
Torque (bolt or screw terminals)	0,5 Nm... 0,6 Nm

	SIC50-MPT
Output (battery)	
Nominal DC power up to 40 °C (12 V / 24 V / 48 V)	600 W / 1200 W / 2400 W
Power limitation at 50 °C / 60 °C	12V : 600W / 600W 24V : 1200W / 1000W 48V : 1500W / 1000W
Nominal battery voltage (adjustable)	12 V / 24 V / 48 V
Battery voltage range	8 V ... 65 V
Battery type	flooded and sealed lead acid batteries
Max. charging current(12 V / 24 V / 48 V)	50 A / 50 A / 50 A
Permanent charging current (12 V / 24 V / 48 V)	50 A / 50 A / 50 A
Charge control	IUoU
Clamping position	screw terminals
Recommended cable cross-section	10 mm^2
Max. cross-section of cables that can be connected	16 mm^2
Fuse type (max. contact unit)	thermal fuse (2 x 30 A)
Torque (bolt or screw terminals)	0,5 Nm ... 0,6 Nm

	SIC50-MPT
Efficiency / Power consumption	
Max. efficiency	98 %
Euro-Eta	97,3 %
Self-consumption during the day	$<$ 5 W @ U_{Batnom} = 48 V_{DC}
Internal consumption at night	$<$ 3 W @U_{Batnom} = 48 V_{DC}

	SIC50-MPT
General	
Dimensions (W x H x D)	421mm x 310mm x 143mm
Protection rating according to IEC 60529	IP65
Weight	10 kg
Device protection	short circuit / reverse polarity / overload / overvoltage and undervoltage / overtemperature and undertemperature
EC Declaration of Conformity	www.mste-solar.de
Display	1 x multicolored LED
Mounting type	suspended
Configuration	plug & play in combination with Sunny Island (CAN Piggy-Back required) DIL switch with stand-alone applications and in SMA operation
Parallel operation	up to four devices through CAN bus
Battery temperature compensation	$-$4 mV / $^{\circ}$C
Interfaces	CAN Piggy-Back (optional)
External temperature sensor	KTY type (optional)

	SIC50-MPT
Ambient conditions	
Permissible ambient temperature during operation	$-$25 $^{\circ}$C ... +60 $^{\circ}$C
Air humidity	0 % $-$ 100 %
Altitude (operational)	5000 m above mean sea level
Transport height	16 000 m above mean sea level

	SIC50-MPT
Safety	
Device overtemperature	derating/deactivation
Device undertemperature	deactivation at $-30\ ^{\circ}C$
Overvoltage (PV)	deactivation $>$140 V
Undervoltage (PV)	deactivation at $U_{PV} < U_{Bat}$
reconnection at	$U_{PV} = U_{Bat} + 5$ V
Overvoltage (battery)	deactivation $U_{Bat} > 65$ V
Undervoltage (battery)	deactivation $<$ 8 V reconnection $>$ 8,5 V
Short circuit PV	deactivation
Battery short-circuit	deactivation
Reverse polarity PV	deactivation
Reverse polarity in battery	fuse tripping

	SIC50-MPT
Displays	
Operation display	multicolored LED
Transmitted data display	internal LED (not visible from outside)
Received data display	internal LED (not visible from outside)
Sunny Island display	battery current, PV power, PV voltage, operating mode, error

14 Contact

If you have technical problems concerning our products, contact MSTE SOLAR GmbH. We need the following information in order to provide you with the necessary assistance:

- Serial number of the charge controller
- Quantity of additional charge controllers
- Type and quantity of connected PV modules
- Type of connected stand-alone grid inverter
- Type of battery connected
- Nominal battery capacity
- Nominal battery voltage
- Communication products connected

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