

OPTI-Solar

w w w . o p t i - s o l a r . c o m

SC-SM/-Z series
Solar charge controller
10/20A

User Manual

Solar charge controller SC-SM/-Z series User Manual

Dear Client

Thanks for selecting the SC-SM/-Z series solar controller. Please take the time to read this user manual, this will help you to take advantage of controller's new features. This manual gives important recommendations for installing, programming, using and so on. Read it carefully in your own interest please.

1. Description of Function

SC-SM/-Z series intelligent solar controller, is programmable and especially for solar light system.

It comes with some outstanding features, such as:

- 5 stages time can be adjusted
- Can read parameters and running status
- Suitable for Liquid, GEL and Lithium battery
- 12/24V system voltage automatic recognition(Liquid/GEL)
- Automatic temperature compensation(Liquid/GEL)
- Four stages charge way: fast, boost, equal, float(Liquid/GEL)
- When BMS power off because of LVD, it can activate the system automatically(Lithium)
- Charging target and charging recovery voltage can be set(Lithium)
- Day/Night threshold can adjust automatically
- Remote Unit to configure, with LCD display
- IP67, Strong and durable aluminum case
- Full automatic electronic protect function

2. Safety instructions and waiver of liability

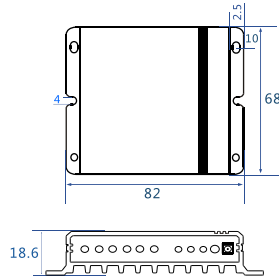
2.1 Safety

- ① The solar charge controller may only be used in PV systems in accordance with this user manual and the specifications of other modules manufacturers. No energy source other than a solar generator may be connected to the solar charge controller.
- ② Batteries store a large amount of energy, never short circuit a battery under all circumstances. We strongly recommend connecting a fuse directly to the battery to protect any short circuit at the battery wiring.
- ③ Batteries can produce flammable gases. Avoid making sparks, using fire or any naked flame. Make sure that the battery room is ventilated.
- ④ Avoid touching or short circuiting wires or terminals. Be aware that the voltages on special terminals or wires can be as much as twice the battery voltage. Use isolated tools, stand on dry ground, and keep your hands dry.
- ⑤ Keep children away from batteries and the charge controller.

2.2 Liability Exclusion

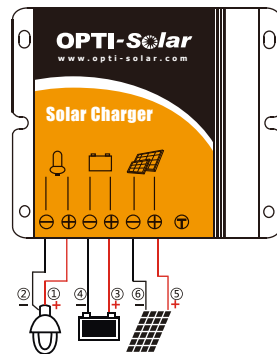
The manufacturer shall not be liable for damages, especially on the battery, caused by use other than as intended or as mentioned in this manual or if the recommendations of the battery manufacturer are neglected. The manufacturer shall not be liable if there has been service or repair carried out by any unauthorized person, unusual use, wrong installation, or bad system design.

3. Dimensions



4. Installation

The following diagrams provide an overview of the connections and the proper order.



1. Follow the chart, connect the load (positive pole and negative pole) with the corresponding red and black cables firstly, then seal them with tape.
2. Connect battery positive pole and negative pole to the corresponding red and black cables, the load will be on.
3. Connect the panel positive pole and negative pole to the corresponding red and black cables, the controller begins to charge.
4. Please refer to the **10.2 Faults and Alarms** to confirm the controller's status.

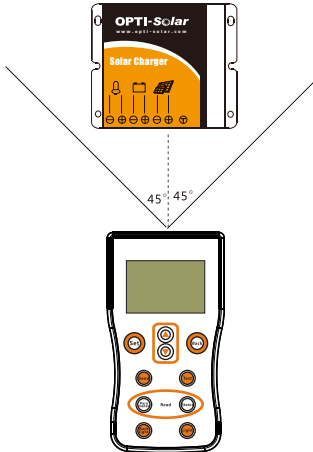
- Make sure the length between battery and controller is as short as possible.
- Recommended minimum wire size:
10A: 2.5mm²; 20A: 4mm².

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5.Remote controller, Default setting

When SC-SM /-Z series controller is connected to the system, you can choose "DC 5-Stage" icon on the display of S-Unit infrared remote controller, as shown below! Detailed Setting operations, please read S-Unit User Manual

Remark : Be sure to set only SC-SM /-Z unit at a time



5.1 Read the parameters

Press the "Parameter" key of the S-unit to read the setting parameters of the controller.

Num	Name	SC-SM/-Z
1	Time1	24H
2	Dim1	100%
3	Time2	0H
4	Dim2	100%
5	Time3	0H
6	Dim3	100%
7	Time4	0H
8	Dim4	100%
9	Time5	0H
10	Dim5	100%
11	D/N Thr	5V
12	D/N Dly	0min
13	Load I	—
14	Dim Auto	—
15	Battery	GEL
16	CVT	—
17	CVR	—
18	LVD	11.2V
19	LVR	12.0V



1. Dimming function, if you set 0%, the load will be off, otherwise the load will be on.
2. The setting data of "Load I" and "Dim Auto" is for "DC" series with LED driver built-in, does not apply to this type controller.

5.2 Read the running status

Press the "Status" key of the S-unit to read the running status of the controller.

Num	Name	Name describe	Unit
Status : Charge			
1	Batt V	Battery voltage	V
2	Load I	Load current	A
3	Load V	Load voltage	V
4	PV V	PV voltage	V
5	PV I	PV current *	A
6	Energy	Total generating capacity	AH
7	OD Times	Over discharge times	Times
8	FC Times	Fully charge times	Times
9	Day1-HV	A day ago highest voltage	V
10	Day1-LV	A day ago lowest voltage	V
11	Day2-HV	Two days ago highest voltage	V
12	Day2-LV	Two days ago lowest voltage	V
13	Day3-HV	Three days ago highest voltage	V
14	Day3-LV	Three days ago lowest voltage	V



SC-SM /-Z series controller can not detect PV current the remote control displays "---"

5.3 Test function(Streetlight mode)

Press the "Test" key of S-Unit, the controller will turn on load for 1min. During daytime, the testing function can help users to verify correct installation or for system trouble shooting. 1min later the load will automatically turn off.



Default "24H" mode, the test key is invalid.

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6. Starting up the controller

6.1 Self Test

As soon as the controller is connected to battery, it starts self test. Then the display changes to normal operation.

6.2 Battery Type

SC-SM series controller applies to Liquid and Gel battery, the factory default setting is suitable for Gel battery. SC-SM Li series controller applies to Lithium rechargeable battery. The charging target and charging recovery voltage can be set according to customer requirements.

6.3 System Voltage(Liquid/ GEL battery)

SC-SM series controller adjusts itself automatically to 12V or 24V system voltage. As soon as the battery voltage at the time of start-up is within 10V to 15V, the controller implies a 12V system, else if the battery voltage is within 20V to 30V, the controller implies a 24V system.

7. Safety Features

	Solar terminal	Battery terminal	Load terminal
Reverse polarity	Protected	Protected	Protected *1
Short circuit	Protected	Protected *2	Switches off immediately
Over current	—	—	Switches off with delay
Reverse Current	Protected	—	—
Over voltage	Max.55V *3	Max. 40V	—
Low voltage	—	—	Switches off
Over temp.	If the temperature reaches the set value, the controller cuts off the load.		

*1. Controller can protect itself, but loads might be damaged.

*2. Battery must be protected by fuse, or battery will be permanently damaged.

*3. The solar panel voltage should not exceed this limit for a long time.

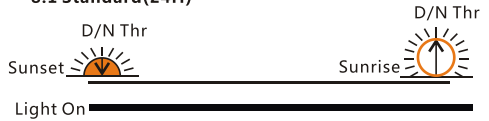


Warning: The combination of different error conditions may cause damage to the controller. Always remove the error before you continue connecting the controller.

8. Output Function

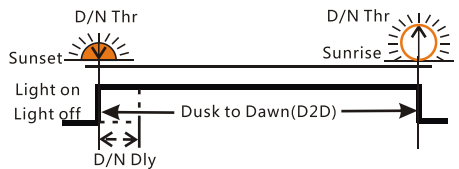
SC-SM /-Z controller with advanced light control function. The modes of lighting can be based on customer needs.

8.1 Standard(24H)



If "Time1" of "DC 5-Stage" is set to "24H" and sent to the controller successfully, the controller's load will always be open.

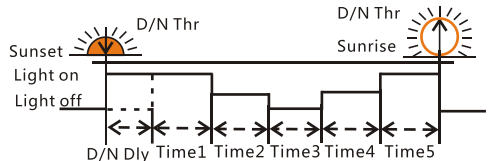
8.2 Dusk to Dawn (D2D)



If "Time1" of "DC 5-Stage" is set to "D2D", the controller works in dusk to dawn mode.

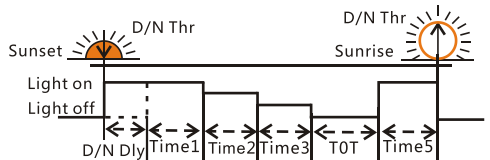
- 1 SC-SM/Li series controller is set to D2D mode the corresponding dimming setting is still valid.
2. If "Time1" is set to D2D mode, "Time4" can not be set to TOT mode.

8.3 Five-stage Night Mode



You can set the Time 1-5 and Dim 1-5 with S-Unit.

8.4 TOT mode(can set the load on time before morning coming)



If "Time4" of the S-Unit is set to "TOT", this mode is TOT mode.

* If Time4 is set to TOT mode, Time1 can not set to D2D mode.

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9.LVD, LVR, Threshold

9.1Low Voltage Disconnect(LVD)

SC-SM/-Z series setting range : 8.0~30.0V

SC-SM series has two low voltage protection modes: battery capacity control and battery voltage control, the setting range is as follows:

① Battery capacity control

SOC1 : 11.0 ~ 11.6V/22.0 ~ 23.2V

SOC2 : 11.1 ~ 11.7V/22.2 ~ 23.4V

SOC3 : 11.2 ~ 11.8V/22.4 ~ 23.6V

SOC4 : 11.4 ~ 11.9V/22.8 ~ 23.8V

SOC5 : 11.6 ~ 12.0V/23.2 ~ 24.0V

②Battery voltage control

LVD setting range : 10.8 ~ 11.8V/21.6 ~ 23.6V.

9.2Low Voltage Reconnect(LVR)

SC-SM series setting range: 11.4~12.8V/22.8~25.6V.

SC-SM Li series setting range: 8.6~31.0V.

1.If the controller goes into low voltage disconnect, it will restore only when the battery being recharged to the recovery voltage.

2.LVR should be higher than LVD at least 0.6/1.2V.

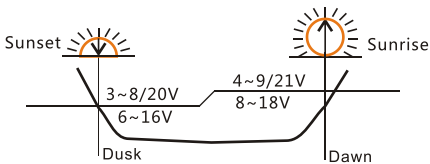
9.3 Day/Night Threshold, Day/Night Delay

The controller recognizes day and night based on the solar array open circuit voltage. This day/night threshold can be modified according to local light conditions and the solar array used.

SC-SM series setting range : 3.0~8.0V / 6.0~16.0V

In the evening, when the solar array open circuit voltage reaches the setting day/night threshold, you can adjust the day/night delay time to make the load turn on a little later.

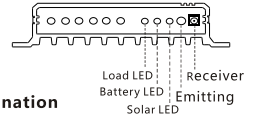
Day/Night delay time setting range: 0~30min.



1. Day/Night threshold voltage of load disconnect is 1V/2V higher than the setting data, means the load will disconnect when the solar voltage at 4~9V/8~18V(Smart-N5 series) / 4.0~21.0V(Smart-N5 Li series).

2.The controller has an automatic day/night threshold adjustment function. If the lowest voltage of solar array is higher than the setting day/night threshold, the load has no output in first night, 24 hours later the controller can automatically adjust the day/night threshold to meet the requirements of lighting at night.

10.LED indications and Faults & Alarms



10.1LED Display Explanation

LED	Status	Function
Solar LED	Slow flash(1s/1s)	Float charging
	Flash(0.4s/0.4s)	Boost charging
	Fast flash(0.1s/0.1s)	Equal charging
	Flash(0.4s/0.4s)	Charging
	Off	Stop charging
	On	Over temperature protection
Battery LED	On	Battery works normal
	Slow flash(1s/1s)	Low voltage protection
	Fast flash(0.1s/0.1s)	Over voltage protection
Load LED	On	Load works normal
	Off	Load has no output
	Slow flash(1s/1s)	Overcurrent protection
All LED	Fast flash(0.1s/0.1s)	Short circuit protection
	Slow flash(1s/1s)	Can not recognize system voltage
	Both on 1s	Start up Self test
	Both off	No connection to battery

10.2Faults & Alarms

Fault	Status	Reason	Remedy
Loads are not powered	Low volt. protection	Battery capacity is low	Load will be reconnected when battery is recharged
	Overcurrent, short circuit protection	Loads are over current or short circuit	Switch off all loads, remove short circuit, load will be reconnected after 1 minute automatically
	Over temp. protection	Controller temp. is too high	Load reconnects after temp. reduces
High voltage at battery terminal	Over voltage protection	High battery voltage >15.5V/31.0V *	Check if other sources overcharge the battery. If not, controller is damaged.
		Battery wires or battery fuse damaged, battery has high resistance .	Check battery wires, fuse and battery.
Can't recognize system voltage	All LED slow flashing (1s on/1s off)	Battery voltage is not in right range	Charge or discharge, make battery voltage in the right range
Battery is empty after a short time	Low voltage protection	Battery has low capacity	Change battery
Battery can't be charged	Solar LED is off	PV panel fault or reverse connection	Check panels and connection wires

SC-SM /-Z Series: If the battery voltage is 0.2V higher than "CVT" , the controller will trigger over voltage protection.

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11. Technical Data

Model	SC-10 SM	SC-20 SM
Max. Current	10A	20A
System Voltage	12/24V	
Fast Voltage	<14.5V/29.0V (25°C)	
Boost Voltage	14.5V/29.0V (25°C)	
Equal Voltage	14.8V/29.6V (25°C) (Liquid)	
Float Voltage	13.7V/27.4V (25°C)	
Charging voltage target	—	
Charging voltage recovery	—	
Low voltage disconnect	10.8~11.8V/21.6~23.6V; SOC1~5	
Low voltage reconnect	11.4~12.8V/22.8~25.6V(Programmable)	
Day/Night threshold	3.0~8.0V/6.0~16.0V(Programmable)	
Battery type	Liquid, GEL (Programmable)	
Temp compensation	-4.17 mV/K per cell (Boost, Equal) ; -3.33 mV/K per cell (Float)	
Day/Night delay time	0~30min(Programmable)	
Max. panel voltage	40V	
Max. battery voltage	55V	
Dimensions	82 x 68 x 18.6mm	
Weight	190g	
Wire size	2.5mm ²	4mm ²
Self consumption	10mA	
Ambient temperature	-35°C ~ +60 °C	
Degree of protection	IP67	
Max. Altitude	4000m	

Note : Around oblique line value separately on behalf of 12V and 24V system' s value.