

Smart-LF series
Solar Charge Controller
5A/10A/15A/20A

(with Programmable Street-Light Function)

User Manual

Solar Charge Controller

Thanks for selecting the Smart series solar charge controller. Although the Smart is very simple to use, please take the time to read this user manual. This will help you to make full use of many advantages the controller can provide your solar lighting system.

1. Description

With your new Smart-LF series controller you own a state-of-the-art device which was developed according to the latest available technical standards and suitable for LiFePO4 rechargeable battery.

It comes with a number of outstanding features, such as:

- Suitable for LiFePO4 rechargeable battery
- Strong and durable aluminum case, IP67
- 12V/24V Automatic recognition
- 6 modes for solar street light system
- Dimming function: 30%~70% of rated power adjustable
- Digital Unit to configure Smart charge controller via UART
- External temperature probe measuring the ambient temperature is more accurate
- Whole electronic protection

2. Safety instructions and waiver of liability

2.1 Safety

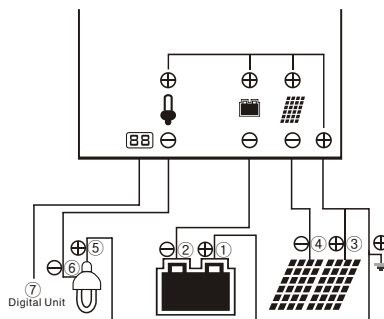
- ① The solar charge controller may only be used in PV systems in accordance with this user manual and the specifications of other modules manufacturers. No energy source other than a solar generator may be connected to the solar charge controller.
- ② Batteries store a large amount of energy, never 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. Installation

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



- To avoid any voltage on the wires, first connect the wire to the controller, then to the battery, panel or load.
- Make sure the wire length between battery and controller is as short as possible.
- Recommended minimum wire size:
SM05-LF: 1.5mm²; SM10-LF: 2.5mm²; SM15/20-LF: 4mm².
- Be aware that the positive terminal of Smart are connected together and therefore have the same electrical potential. If any grounding is required, always do this on the positive wires.
- Connecting capacitive load may trigger short circuit protection.

4. LED indications Faults & Alarms

4.1 LED Display Explanation

LED	Status	Function
Green	Flash(0.4s/0.4s)	Battery connected, day detected
	On	Battery connected, night detected
Red	Off	No faults detected
	Slow flash(0.5s / 2s)	Dimming
Red Green	Off	No battery connected
	Lighted together (1second)	Controller start-up

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4.2 Faults & Alarms

Faults	Status	Reason	Remedy
Loads are not supplied	Red LED on	Battery is low	Load will reconnect as soon as battery is recharged.
	Red LED slow flash	Over current/Short circuit of loads/ Over temp	Switch off all loads. Remove short circuit. Contoller will switch on load automatically after max 1 minute. After the temperature reduces the load opens automatically
	Red LED fast flash	Battery voltage too high(>15.6/31.2V) Battery wires or battery fuse damaged, battery has high resistance	Check if other sources overcharge the battery. If not, controller is damaged. Check battery wires, fuse and battery.
Battery is empty after a short time	Red LED on	Battery has low capacity	Change battery
Battery is not being charged during the day	Green LED on	Solar array faulty or wrong polarity	Remove faulty connection /reverse polarity

5. Safety Features

	Solar terminal	Battery terminal	Load terminal
Reverse polarity	Protected *1	Protected *1	Protected *2
Short circuit	Protected	Protected *3	Switches off immediately
Over current	—	—	Switches off with delay
Reverse Current	Protected	—	—
Over voltage	Max. 55V *4	Max. 40V	—
Under voltage	—	—	Switches off
Over temp.	switches off the load if the temperature reaches the set value		

*1 Controller can not protect itself in a 24V system when polarity of battery or solar is reversed.

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

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

*4 The solar panel voltage should not exceed this limit for a long time as voltage protection is done by a varistor.

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

6. Street-Light Function

The Smart-LF solar charge controller comes with a sophisticated Street-light function. It controls the load output at night and is widely programmable.

There are 6 modes available:

Mode 1. Single time and Dusk to Dawn mode

Mode 2. Double time mode (can set the dimming time)

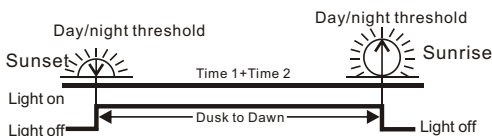
Mode 3. Double time mode (can set the load off time)

Mode 4. Double time mode (can set the load off time, Full Power + Dimming)

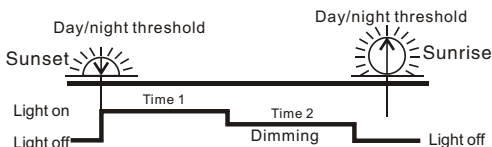
Mode 5. Double time mode (can set the load on time before morning coming)

Mode 6. Double time mode (can set the load on time before morning coming, Full power + Dimming)

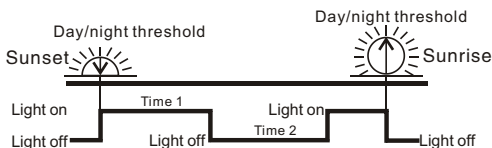
■ Mode 1. Single time and Dusk to Dawn mode



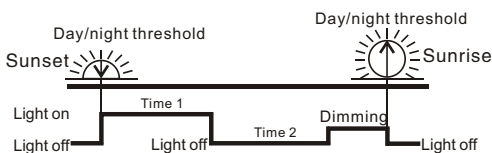
■ Mode 2. Double time mode (can set the dimming time)



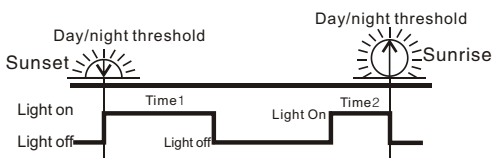
■ Mode 3. Double time mode (can set the load off time)



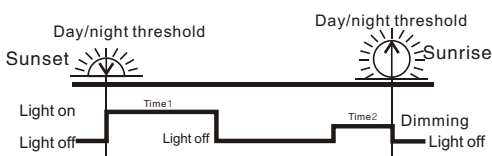
■ Mode 4. Double time mode (can set the load off time, Full Power + Dimming)



■ Mode 5. Double time mode (can set the load on time before morning coming)



■ Mode 6. Double time mode (can set the load on time before morning coming, Full power + Dimming)



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Description of Day/Night threshold,

The controller recognizes day and night based on the solar array open circuit voltage (only functional in street-light mode). This day/night threshold can be modified according to local light conditions and the solar array used.

It will take effect in next day if the mode of controller is changed via Digital Unit.

7. Low Voltage Disconnect Function (LVD)

Low voltage disconnect voltage (LVD) : 10.5/21.0V

Low voltage reconnect voltage (LVR) : 11.5/23.0V

- If the controller goes into low voltage protection, it will restore only when the battery being recharged and the voltage reaching the reconnect voltage.
- Around oblique line value separately on behalf of 12V and 24V system's value.

9. Technical Data

Model	SM05-LF	SM10-LF	SM15-LF	SM20-LF
Nominal voltage	12V/24V automatic recognition			
Max solar current or load current	5 A	10 A	15 A	20 A
Over charge voltage	14.6/29.2 V			
Over charge release voltage	14.0/28.0 V			
Load disconnect voltage	10.5/21.0 V			
Load reconnect voltage	11.5/23.0 V			
Lighting hours	0~18 Hours			
Day/Night threshold	3.0~7.5V/6.0~15.0V			
Battery type	LiFePO4			
Max solar voltage	55V			
Max battery voltage	40V			
Dimming	30~70% of rated power			
Cable length	120mm/80mm			
Over voltage protection	15.6/31.2 V			
Dimensions /Weight	85 x 70 x 20 mm / 200g		85 x 85 x 20mm/210g	
Wire size	SM05-LF: 1.5mm ² ; SM10-LF: 2.5mm ² ; SM15/20-LF: 4mm ²			
Typical power consumption	<12mA			
Ambient temp.	-40°C ~ +60°C			
Case protection	IP67			
Max altitude	4000m			

8. Default Settings

	Default Settings
Load control mode	Mode 1(Dusk to Dawn)
Low voltage disconnect	10.5/21.0V
Low voltage reconnect	11.5/23.0V
Battery type	LiFePO4
Day/Night threshold	3.0/6.0V

You can configure Smart-LF solar charge controller with Digital Unit. See Digital unit manual for details.

The Setup of Smart-LF series solar charge controller is almost the same as Smart series, the only difference is the Battery Type, Load disconnect voltage and Load reconnect voltage of Smart-LF are already be set and can not be changed by Digital Unit.

Subject to change without notice. Ver: CL15.