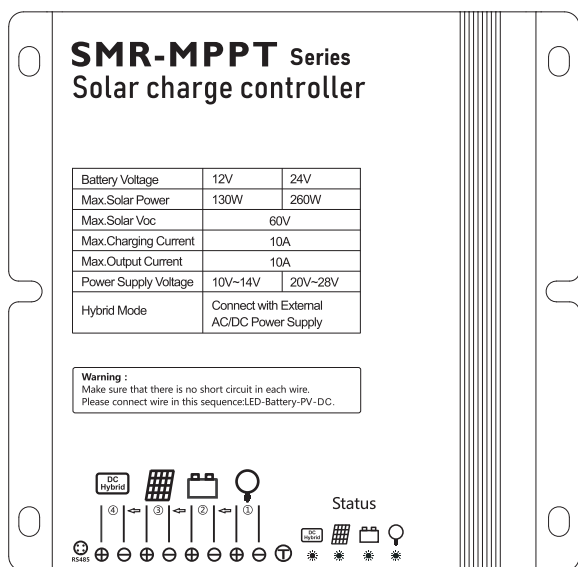


SMR-MPPT-H series

Solar charge controller

12/24V, 10A



User Manual

User Manual_SMR-MPPT-H series_PH
CE, RoHS, ISO9001:2015
Subject to change without notice!

Dear Clients,

Thanks for selecting the SMR-MPPT-H 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 this user manual in full before installing or connecting the solar controller.

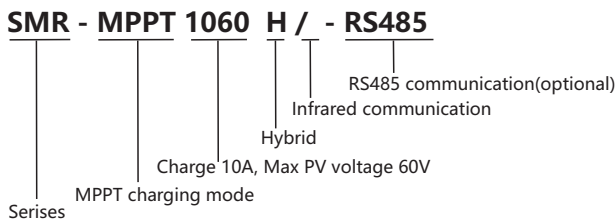
1. Product overview

SMR-MPPT-H series solar controller, designed for the use of solar energy systems intelligent programming MPPT controller. The charging efficiency is about 20% higher than the traditional PWM controller, which can drop the cost of the whole system.

1.1 Product features

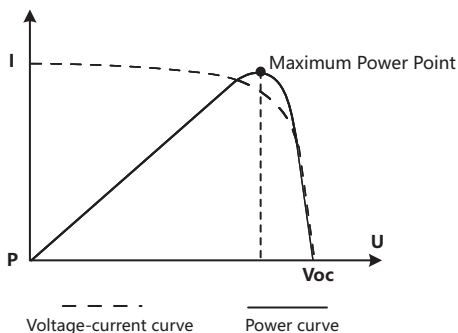
- Innovative Maximum Power Point Tracking (MPPT) technology, tracking efficiency > 99.9%.
- High charge conversion efficiency up to 97.2%.
- Monitoring of the running status and parameters.
- Dual automatic limit function for rated charging current and charging power.
- Clear and easy to understand charging and discharging, fault indication.
- Suitable for Gel, Liquid, AGM and Lithium battery.
- External temperature sensor with automatic temperature compensation.
- Automatic over-temperature power reduction function.
- Four stage charging: MPPT, boost, equalization, float.
- When BMS power off because of LVD, it can activate the system automatically.
- The battery and mains power (AC-DC) complement each other, and the load power supply priority can be set. The controller automatically switches between the two according to the setting to ensure the normal operation of the load.
- 0°C Charging Protection (Lithium).
- The communication interface provides external power supply.
- Waterproof IP67, Strong and durable aluminum case.
- Perfect EMC & thermal design.
- Full automatic electronic protect function

1.2 Product naming rules



2. Instructions

2.1 MPPT charging introduction



MPPT, the full name of "maximum power point tracking", is an advanced charging method. The MPPT controller can detect the power generation of the solar panel in real time and track the maximum voltage current value (VI), so that the system can charge the battery at the highest efficiency. Compared with the traditional PWM controller, the MPPT controller can play the maximum power of the panel, so it can provide a larger charging current, generally speaking, MPPT can improve the energy utilization rate of 15% to 20% than the PWM controller.

2.2 MPPT-Four Charging Stage

Battery type: AGM/GEL/LIQ.

As shown in Figure 2-2, the lead-acid battery is charged in the following stages: MPPT charge, constant voltage charge (Equalization charge/Boost charge/Float charge).

The constant voltage charging stage is divided into three stages: Equalization charge, Boost charge and Float charge:

■ MPPT Charge

When the battery voltage does not reach the target constant voltage value, the controller will carry out MPPT charging. When the battery voltage reaches the constant voltage value, the MPPT charging will automatically exit and enter the constant voltage charging (Equalization charge/Boost charge/Float charge).

■ Boost Charge

When the battery has recharged to the Boost voltage setpoint, the controller will charge at a constant voltage, and the charging current will gradually decrease over time. This process will be maintained for 120 minutes before switching to a floating charge.

■ Equalization Charge

Certain types of batteries benefit from periodic equalizing charge, which can stir the electrolyte, balance battery voltage and complete chemical reaction. Equalizing charge increases the battery voltage, higher than the standard complement voltage, which gasifies the battery electrolyte.

※ If the controller detects that the battery voltage is too low, it will automatically start balanced charging, which takes 120 minutes, and then switch to float charging.

※ Balanced charging and strong charging are not repeated during a single full charge process to avoid excessive gas release or battery overheating.



WARNING: Risk of explosion!

Equalizing flooded battery can produce explosive gases, so well ventilation of battery box is necessary.

■ Float Charge

After the Boost voltage stage, the controller will reduce the battery voltage to Float voltage setpoint. When the battery is fully recharged, there will be no more chemical reactions and all the charge current transmits into heat and gas at this time. Then the controller reduces the voltage to the floating stage, charging with a smaller voltage and current. It will reduce the temperature of battery and prevent the gassing, also charging the battery slightly at the same time. The purpose of Float stage is to offset the power consumption caused by self consumption and small loads in the whole system, while maintaining full battery storage capacity.

In Float stage, loads can continue to draw power from the battery. In the event that the system load(s) exceed the solar charge current, the controller will no longer be able to maintain the battery at the Float setpoint. Should the battery voltage remains below the boost reconnect charging voltage, the controller will exit Float stage and return to Bulk charging.

2.3 Lithium battery charging mode

Battery types are available in four and eight series lithium iron phosphate.

As shown in Figure 2-3, the lithium battery charging stage includes: MPPT charging/constant voltage charging.

- **MPPT charging stage:** When the battery voltage has not reached the overcharge protection voltage, the controller will charge MPPT. When the battery voltage reaches the overcharge protection voltage, the MPPT charging will automatically exit and enter the constant voltage charging.
- **Constant voltage charging stage:** the lithium battery is in the constant voltage charging stage, when the battery voltage reaches the overcharge protection voltage, the controller will carry out constant voltage charging, and the charging current will gradually decline over time, this process will remain for 60 minutes, and then stop charging, and re-enter the next charging cycle when the battery voltage reaches the overcharge recovery voltage.

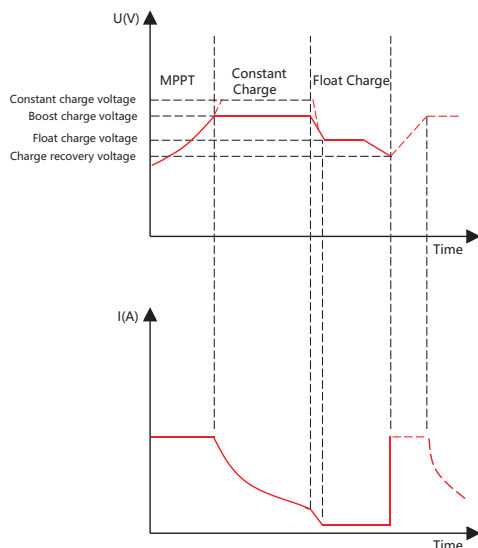


Figure 2-2 Lead-acid battery charging curve

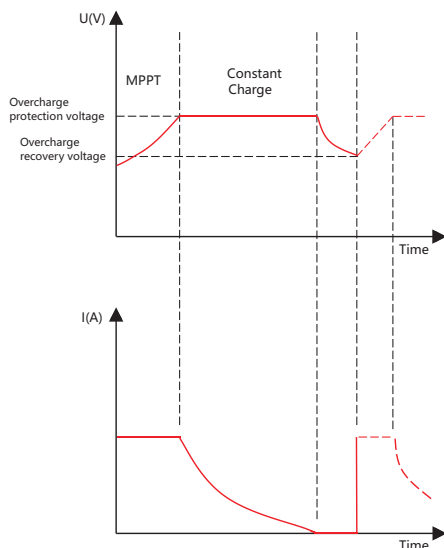


Figure 2-3 Lithium battery charging curve

3. Safty Instruction and Waiver of Liability

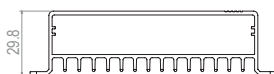
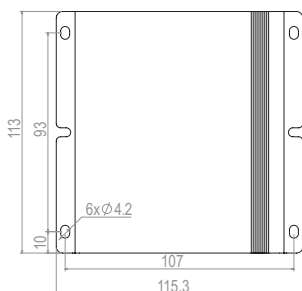
3.1 Safety

- ①The solar charge controller may only be used in PV systems in accordance with this user manual and the specs of other module manufacturers. No energy source other than solar gen. may be connected to the solar charge controller.
- ②Batteries store a large amount of energy, never short circuit a bat. under all circumstances. We strongly recommend connecting a fuse directly to the battery to protect any short circuit at the bat. wiring.
- ③Batteries can produce flammable gases. Avoid making sparks, fire or any naked flame. Make sure that the bat. room is ventilated.
- ④Avoid 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.
- ⑤Keep children away from batteries and the charge controller.

3.2 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.

4. Dimensions (Unit: mm)

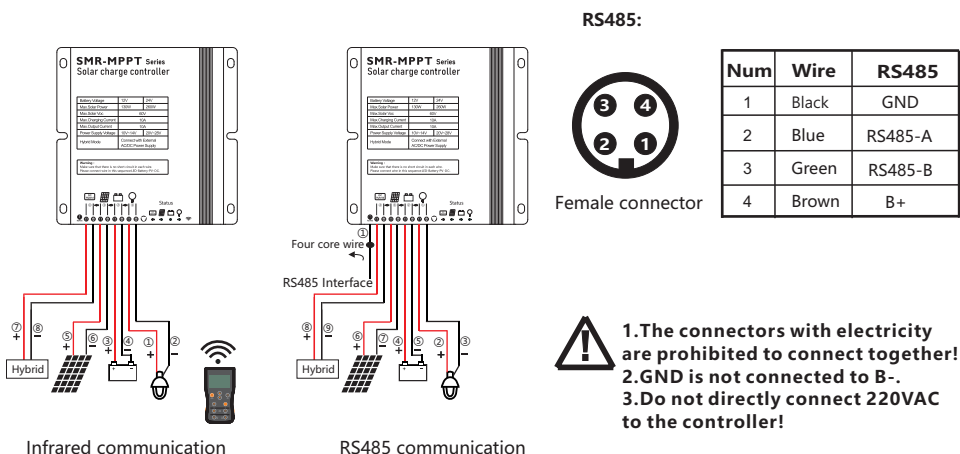


SMR-MPPT1060H/RS485

5. Installation

5.1 Electrical connection diagram

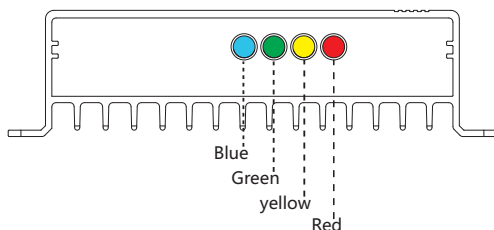
The following diagrams provide an overview of the connections and the proper order.



5.2 Wiring steps

- ① First connect the RS485 well (If there is no RS485 interface, proceed to the second step directly);
 - ② As the chart, Connect the load first with corresponding red (positive) and black (negative) cables, then seal them with tape.
 - ③ Connect the battery with corresponding positive and negative cables, load will be on.
 - ④ Connect panel with the corresponding red (positive) and black (negative) cables, the controller begins charging.
 - ⑤ Finally, connect the external mains power (AC-DC) to the DC terminal of the controller.
 - ⑥ Confirm the LED display status, please refer to the "10.2 Faults and Alarms" to identify the reason.
- Make sure the wire length between battery and controller is as short as possible.
 - Recommended Wire size: 2.5mm²

6. LED indications



6.1 Controller LED light status indication

LED	Status	Function
Green LED	On	Solar panel is correctly connected, but not charged
	Fast flash(0.1s on/0.1s off)	MPPT charging
	Flash(0.5s on/0.5s off)	Boost or Equalization charging(GEL,Liquid,AGM)
	Slow flash(0.5s on/2s off)	Float Charging
Yellow LED	On	Battery is normal
	Slow flash(0.5 on/2s off)	Battery voltage is low
	Fast flash(0.1 on/0.1s off)	Low voltage protection
	Off	Over voltage protection
Red LED	Off	Work normal
	On	The load has been turned off
	Flash(0.5s on/0.5s off)	Over temperature protection
	Fast flash(0.1s on/0.1s off)	Short circuit or Over current protection
Blue LED	On	In the work of municipal
	Off	The mains power connection is abnormal (voltage between 0~10V, 14~20V, above 28V)
	Slow flash	The mains power connection is normal

*If the controller is in multiple protection states at the same time, the priority order of displaying fault information is: short circuit protection -->overcurrent protection -->low voltage protection -->overvoltage protection -->over temperature protection.

7. Switching of mains power

This product has the function of complementary mains power supply, which can switch between battery power supply and mains power supply (AC-DC) power supply according to the set requirements. The priority can be set to battery priority and mains power priority. When the battery and mains power supply are recognized normally (see the attached table for the recognition range), the controller will work according to the set power supply priority.

Priority of mains power:

1. When the controller is set to prioritize mains power and the mains power is recognized normally (the battery is correctly connected and the battery voltage is normal), mains power (AC-DC) is given priority to supplying power to the load. At this time, the blue LED light is constantly on, indicating that the controller is discharging at the mains power (AC-DC) end;
2. If the mains power (AC-DC) drops or exceeds the recognition range, it will switch to the battery to supply power to the load. At this time, the blue LED will turn off, indicating that the mains power (AC-DC) has not been correctly connected. After the mains power (AC-DC) is recognized normally, it will switch to the mains power (AC-DC) for discharge.

Battery priority:

1. When the controller is set to battery priority and the battery is recognized normally (the mains power is correctly connected and the mains voltage is normal), the battery prioritizes supplying power to the load. At this time, the blue LED will flash slowly, indicating that the mains power (AC-DC) is connected normally, but the controller has not been discharged by the mains power (AC-DC);
 2. If the battery voltage is lower than the low voltage protection+0.2V, it will switch to the mains power (AC-DC) supply until the battery voltage is higher than the low voltage recovery voltage and the controller is in a charging state, then the controller will switch back to discharging the battery.
- ※ The controller will make a judgment based on the voltage system at the battery end. When the voltage systems connected to the battery end and the mains end are inconsistent (i.e., one end is a 12V system and the other end is a 24V system), the controller will stop discharging.
- ※ If only connected to the mains, the controller can work normally directly.

※ Battery voltage recognition range:

Battery type	Voltage range	System
AGM, GEL, Liquid	10.0V < Battery voltage < 15.0V	12V
	20.0V < Battery voltage < 30.0V	24V
	else	Not recognized
Li	Set overcharge protection value for remote control < 17.0V	12V
	Set overcharge protection value for remote control > 17.0V	24V

※ Identification range of mains (AC-DC) voltage:

Mains (AC-DC) voltage	System
10.0V~14.0V	12V
20.0V~28.0V	24V
0V~10.0V , 14.0V~20.0V , 28.0V~∞	Not recognized

※ The mains power does not charge the battery at any time, only the solar panels charge the battery.

8. Factory default Settings

8.1 Factory default settings

Num	Name	Setting data	Setting range
1	Time1	4H	1~6.5H+24H+D2D ^{*1}
2	Dim1	100%	0~100% ^{*2}
3	Dim NP	0%	0~100%
4	Time2	0H	0~7.5H
5	Dim2	100%	0~100%
6	Dim NP	0%	0~100%
7	Time3	0H	0~7.5H
8	Dim3	100%	0~100%
9	Dim NP	0%	0~100%
10	Time4	0H	0~7.0H+TOT
11	Dim4	0%	0~100%
12	Dim NP	0%	0~100%
13	Time5	0H	0~7.5H

14	Dim5	100%	0~100%
15	Dim NP	0%	0~100%
16	D/N Thr	5.0V	3.0~20.0V
17	D/N Dly	0m	0~30min
18	Load I	0.30A	0~10A ^{*3}
19	Dim Auto	Yes	Yes/No ^{*4}
20	Dim V	12.5V	10.0~32.0V ^{*4}
21	Dim %	8%	1~40% ^{*4}
22	Battery	GEL	LI/GEL/LIQ/AGM
23	LVD	11.2V	9.0~30.0V
24	LVR	12.2V	9.6~31.0V
25	Delayoff	10s	10~150s
26	Priority Type	Battery	Battery/Hybrid

Note:

^{*1}.After completing the 24-hour mode setting, the parameter reading is 7H, indicating successful setting.

^{*2}.There are only two working states for power: 0 and 100%, and any non-zero power operates at 100%.

^{*3}.Only effective for the street lamp controller, the actual load current is based on the actual load.

^{*4}.Only effective for the street lamp controller, not for this controller.

8.2 Read the running status

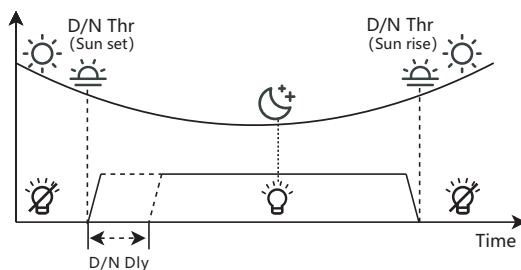
Pressing the "Status" key of the SU12G to read the running status of the controller.

Num	Name	Name describe	Unit	Example
	Status :	Charge		
1	Batt VI	Battery voltage	V	12.5V
2	Load I	Load current	A	0.00A
3	Load V	Load voltage	V	12.5V
4	PV V	PV voltage	V	50.0V
5	PV I	PV current	A	3.0A
6	Energy	Total generating capacity	AH	15AH
7	OD Times	Over discharge times	Times	0
8	FC Times	Fully charge times	Times	0
9	Day1-HV	A day ago highest voltage	V	14.5V
10	Day1-LV	A day ago lowest voltage	V	12.8V
11	Day2-HV	Two days ago highest voltage	V	14.6V
12	Day2-LV	Two days ago lowest voltage	V	12.2V
13	Day3-HV	Three days ago highest voltage	V	14.3V
14	Day3-LV	Three days ago lowest voltage	V	11.9V

9. Operation mode

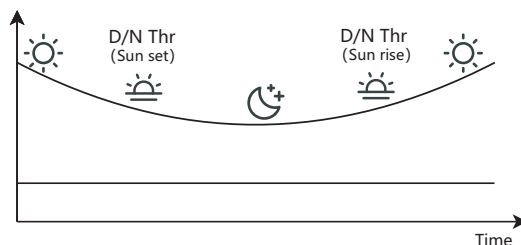
MPPT-DC series controller with advanced load control function. The modes of lighting can be based on customer needs.

9.1 Dusk to Dawn(D2D)



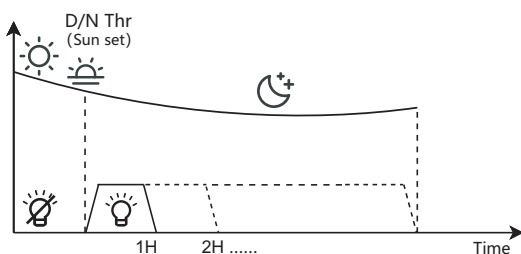
When the solar voltage is lower than the light control point voltage, the load opens until the light control point closes in the early morning of the next day.

9.2 Normally open mode(24H)



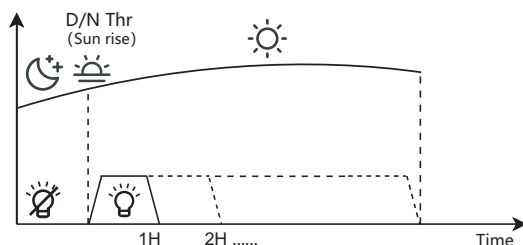
When the load of the controller is set to normally open mode and not in a protected state, the load will be turned on for 24 hours.

9.3 Night mode



When the solar voltage is lower than the light control point voltage, the load is turned on for several hours (see "6. Status and Parameters" for parameter settings).

9.4 Daytime mode(Only set through RS485)



When the controller enters the charging state, the load is turned on for several hours (see "6. Status and Parameters" for parameter settings).

10. LVD, LVR, Threshold, Dimming

10.1 Low Voltage Disconnect(LVD)

①GEL,Liquid,AGM:

Low voltage disconnect setting range: 10.8~11.8V/21.6~23.6V

②Li:

Low voltage disconnect setting range: 9.0~30.0V

10.2 Low Voltage Reconnect(LVR)

①GEL,Liquid,AGM:

Low voltage reconnect setting range: 11.4~12.8V/22.8~25.6V

②Li:

Low voltage reconnect setting range: 9.6~31.0V

※ LVR should be higher than LVD at least 0.6/ 0.2V.

10.3 Day/Night Threshold and Day/Night Delay

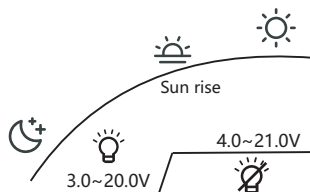
The controller recognizes day and night based on the solar array open circuit voltage. This day/night threshold can be modified according to local light conditions and the solar array used.

Day/Night threshold setting range: 3.0~20.0V.

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.

The load turn-off requirement of the light control point voltage is 1V higher than the set value, that is, when the solar panel voltage is 4.0~21.0V in the morning, the load will be turned off.



※ 1.Day/Night threshold voltage should be set around 0.22 times of open circuit voltage.

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.

11. Faults & Alarms

Fault	Status	Reason	Remedy
Load are not powered	low voltage protection	Battery capacity is low	Load will be reconnected when battery is recharged
	Overcurrent,short protection circuit	Loads are over current or short circuit	Switch off all loads, remove short circuit,load will be restored immediately
	Over temperature protection	Controller temperature is too high	Load reconnects after temperature reduces
High battery voltage	Over voltage protection	High battery voltage>(CVT+0.2V)	Check if other sources overcharge the battery.If not,controller is damaged
		Battery wires or damaged battery fuse battery has high resistance	Check battery wires,fuse and battery.
Unable to recognize the system voltage	The red, yellow, and green lights flash at the same time	The battery voltage is out of the normal range during startup	Charge or discharge the battery to keep the battery voltage within the normal operating range
	The yellow and blue lights flash at the same time	The system voltage identified by the battery end and the mains end is inconsistent	The battery terminal and the mains terminal use the same level of voltage, such as 12V (or 24V)
Battery is empty after a short time	Low voltage protection	Battery has low capacity	Change battery
Battery can't be charged	The green light stays on	PV panel fault or reverse connection	Check panels and connection wires

12. Safety Features

•Waterproof protection

waterproofing grade: IP67

•Lithium battery BMS overcharge detection protection

When the controller detects that the BMS is overcharged, the controller immediately stops charging to prevent the high voltage of the photovoltaic end from being added to both ends of the BMS for a long time, resulting in high voltage damage to the BMS.

•Lithium battery low temperature charging protection

When 0 ° C is enabled and the ambient temperature is lower than 0 ° C, the controller stops charging to prevent irreversible damage to the lithium battery caused by low temperature charging.

•High temperature protection

When the ambient temperature or the internal temperature of the controller is higher, the controller stops charging and discharging to prevent the risk of damage to the lithium battery or controller due to excessive temperature.

- **Battery reverse connection protection**

After the battery is reversed, the system does not work and will not burn the controller.

- **PV input overvoltage protection**

If the input voltage of the PV panel is too high, the controller automatically cuts off the PV input.

- **PV input reverse protection**

When the photovoltaic array polarity is reversed, the controller will not be damaged, and will continue to work normally after correcting the wiring error.

- **Load overcurrent protection**

When the customer sets the load current is too large, the controller load power output is rated power to ensure that the controller and LED load will not be damaged.

- **Load short circuit protection**

When a short circuit occurs, the controller immediately cuts off the load output to prevent damage to the controller. After the load short-circuit condition is lifted, the controller automatically restores the output within a moment.

- **Anti-charge protection at night**

Prevent the battery from discharging through the panel at night.

- **TVS lightning protection**

13. Technical Data

	Item	SMR-MPPT1060H	SMR-MPPT1060H-RS485
Battery Parameters	Max Charging Current	10A	
	System Voltage	12V/24V automatical recognition	
	Battery Type	Lithium, Liquid, Gel, AGM (Programmable, default: Gel)	
	Liquid, Gel and AGM	MPPT Charging Voltage	<14.5/29.0V@25°C
		Boost Voltage	14.0~14.8V/28.0~29.6V(Default: 14.5/29.0V@25°C, Programmable)
		Equalization Voltage	14.0~15.0V/28.0~30.0V(Default: 14.8/29.6V@25°C, Liquid/AGM, Programmable)
		Float Voltage	13.0~14.5V/26.0~29.0V(Default: 13.7/27.4V@25°C, Programmable)
		Low Volt. Disconnect	10.8~11.8V/21.6~23.6V(Default: 11.2/22.4V, Programmable)
		Reconnect Voltage	11.4~12.8V/22.8~25.6V(Default: 12.2/24.4V, Programmable)
		Overcharge Protect	15.5/31.0V
		Temp. Compensation	-4.17mV/K per cell (Boost, Equalization), -3.33mV/K per cell (Float)
	Lithium	Charging Volt. target	10.0~32.0V(Lithium, Programmable)
		Charging Volt. recovery	9.2~31.8V(Lithium, Programmable)
		Low voltage disconnect	9.0~30.0V(Lithium, Programmable)
		Low voltage reconnect	9.6~31.0V(Lithium, Programmable)
		0°C Charging protection	Yes, No, Slow(Lithium, default: Yes)
	Max volt on Bat. Terminal		35V
Panel Parameters	Max input power	130W/260W	
	Max volt on PV terminal	60V *1	
	Dusk/Dawn detect volt.	3.0~20.0V(Programmable)	
	Day/Night delay time	0~30min (Programmable)	
	MPPT tracking range	(Battery Voltage +1.0V) ~Voc*0.9 *2	
	Max tracking efficiency	>99.9%	
Mains	Mains mode	External DC power supply	
	Power supply voltage	10V~14V(12V system); 20V~28V(24V system)	
Load	Output Current	10A	
System Parameters	Communication mode	Infrared	RS485
	Power supply priority	Mains priority/battery priority (Default: battery priority, programmable)	
	Max charge conversion	97.2%	
	Self consumption	7~18mA	
	Dimensions	113*115.3*29.8mm	
	Net weight	516g	
	Ambient temperature	-35~+60°C	
	Ambient humidity	0~100%RH	
	Protection degree	IP67	

*1.This value represents the maximum voltage of the solar panel at the minimum operating ambient temperature.

*2.Voc means the open circuit voltage of the solar panel.

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