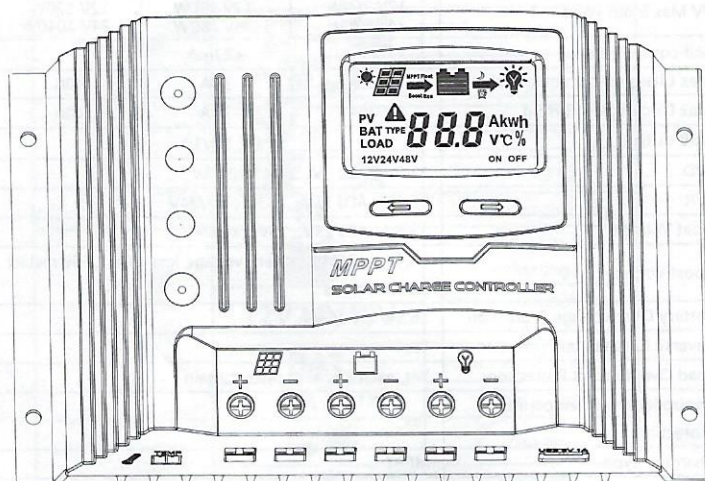


# MPPT SOLAR CHARGE CONTROLLER

## User's Manual



**Max PV input Voltage 100V**

**12V/24V 20A 30A 40A**

Dear Users:

Thank you for selecting our product. Please read this manual carefully before you use this product.

Thank you for using MPPT solar charge controllers, this series product adopted positive design with LCD displaying. Base on MPPT technology, which track the maximum power point of PV array exactly and quickly in any condition. Obtain Max power from solar panel anytime, increased the charging efficiency of solar panel. Used for communication system, off-grid solar system, solar street light system and field monitoring. Excellent digital protect function and professional connector maximum degree avoid damage due to system fault or installation error.

### Features:

- Advanced MPPT technology, fast and stable track the Maximum Power Point, tracking accuracy 99.5%
- Adopt Synchronous Rectifier Technology, significantly improve the transfer efficiency of circuit, maximum 98%.
- accurate identification and tracking multi peak power point function
- PV array limited power input function, to ensure that the controller does not overload operation under any conditions.
- Widely range of Maximum Power Point of PV array, Max PV input Voltage 100V
- 12/24VDC system voltage automatic recognition
- Humanized LCD displaying, dynamic display operation data and working state
- Built-in operation log, account system working state
- Multi load control mode: Normal Mode, Sensor Mode, Timer and Sensor Mode
- 3 stages charging mode, Sealed, Gel, Flooded 3 types battery charging procedure selection
- Temperature Compensation Function
- Accumulation function of charging and discharging, actual time display power generation function
- Fulllest digital protection functions: Reverse connection, Overcharging,

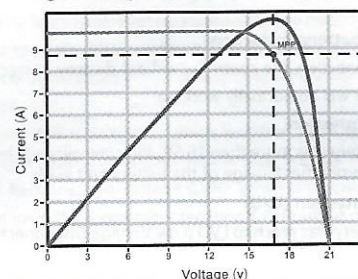
Over-discharging, Over voltage, Overload, Short circuit.

- 16mm<sup>2</sup> connectors, red and black connector distinguish plus and minus

### MPPT Technology Introduction

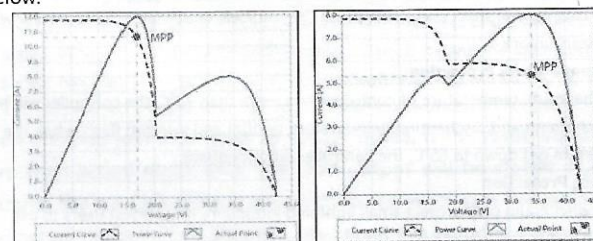
MPPT means Maximum Power Point Tracking, it is more advanced solar charging mode. In view of nonlinearity feature of solar panels, there is a Maximum Power output Point( $P_{Max}$ ), and this point under changing light intensity and temperature. Using traditional PWM solar charge controller, the voltage of solar panel will be clamped by battery, the voltage can not be maintained at  $P_{Max}$  to charge the battery, greatly reduce the utilization rate of solar panels. MPPT technology adopt high efficiency DC-DC power transform technology, with advanced algorithm to track the MPP of solar panels in actual time to obtain Max power from solar panel for charging battery. Compare with PWM controller, MPPT solar charge controller could increase the energy utilization rate 15%-30%.

The solar panel used for 12 system Vpp is 17V, due to the constant current characteristic of solar panels, when the 12V battery is charged by solar panel, the voltage of solar panel will be clamped by battery. If the max charging current is 10A at this time, then the input power to the battery =  $10A \times 12V = 120W$ , not yet completely play the maximum utilization rate of solar panels. MPPT controller could adjust the voltage and current of solar panels to reach Max output power, the input power to the battery =  $9A \times 17V \times 0.98$  (circuit exchange efficiency) =  $150W$ , it can be seen that the MPPT controller could significantly improve the charging efficiency.



The MPPT point under changing light intensity and temperature of environment, The MPPT controller could adjust the MPP timely according to different conditions.

In application the solar panel have burnt cells or shadow effect, may cause multi MPP appearance, but only one of these point is actual MPP as shown below.



MPPT double peaks drawing

When multi MPP points appear, if the program is not perfect, it will cause the solar system to work in the non actual MPP points, waste most of power from solar panel, seriously affect the normal operation of solar system. Our company's MPPT controller could accurately track the actual MPP point in the double peaks or multi peaks state, improve the utilization of solar array and avoid the waste of resources.

### Important Safety Information

- ① This controller is base on solar panel feature researching, if use other power supply instead of solar panel, the controller may cause fault.
- ② It is better to install controller in the room, if install the controller outside, please keep the environment dry, avoid direct sunlight and waterproof well.
- ③ The controller will be hot in process of working, please keep the environment ventilation, away from flammable.
- ④ The Voc of solar panels is high (especially 24V/48V system, please take care.
- ⑤ The battery had acidic electrolysis, please put on goggles during installation. If you accidentally exposed to electrolysis, please rinse with water.





- ⑥ The battery has huge power, forbid any conductor short circuit the positive and negative poles of battery. Suggest to adding a fuse between battery and controller. (Slow motion type, the action current of the fuse should be 1.5 times rated current of the controller)
- ⑦ Please install the controller in a place where children can not touch.

### The suggest of using

- ① The controller could detect the temperature of environment to adjust the voltage of charging, so that the controller should be closed to battery as near as possible.
- ② Recommend system current density of cables less than  $3A/mm^2$ . Unreasonable cable selection will increase the system consumption, even burning.
- ③ Try to use multi strand copper wire in order to connecting with the terminal firmly. Loose power connection and/or corroded wires may result in resistive connections that melt wire insulation, burn surrounding materials or even cause fire.
- ④ Please keep the battery full charged (one time each month at least), or the battery will be destroyed.
- ⑤ This product have limited solar panel input power function, in theory, no matter how much power of solar panel input, the controller will limited the input power under rated power, but must pay attention to the following two points:
  - ◆ The short circuit of solar panel less than rated current of controller.
  - ◆ The Open Circuit Voltage of solar panel increased with decreasing temperature, please ensure in any case, the Open Circuit Voltage of solar panel array will not exceed 100V, otherwise it will trigger protection or damage to the controller.

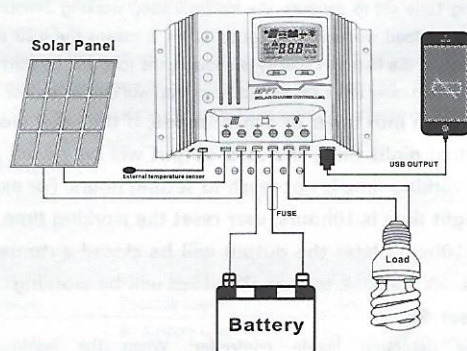
### Installation of Instruction

#### ■ Controller Fixed

- 1) The controller should be installed well-ventilated place, avoid direct sunlight, high temperature and do not install in location where water can enter the controller.
- 2) Please select correct screw to fix the controller on the wall or other platform. Screw M4 or M5, Screw cap diameter less than 10mm.
- 3) Please reserve enough space between the wall and controller, to allow for cooling and cable connection.
- 4) The mounting holes distance is 189mm\*85mm, diameter of hole is 5mm.
- 5) Aluminum fins for natural cooling, we strong suggest hanging installation, this is better for air flow cooling effect

#### ■ Controller Connection

- ★ All terminals are in tight status after factory, in order to well connected, please loose all terminals at first.
- ★ The following order of connection please do not free change, the controller have battery voltage auto selection function, or cause system voltage recognition fault.
- ★ Before connection, please confirm the voltage of system fit for our controller, the open circuit of solar panel and maximum power at the using range of controller.



#### In order to avoid fault installation, please refer to below procedure

- 1) As figure, first connected the battery to controller correct poles. In order to avoid short circuit, please screw the cable of battery to the controller in advance, then connected to battery poles secondly. If your connection is correct, the LCD displaying will show battery voltage and other technical data. If LCD no displaying, please check the fault. The length of cable between battery and controller as shorter as possible. Suggest to 30CM -100CM.
- If short circuit happened on the terminals of controller, it will be result in fire or explode. Please be careful. (We strongly suggest to connecting a fuse at the battery side 1.5time of rated current of controller.)
- 2) As figure, connected solar panels with controller correctly, if the connection is successful and sunshine is full, the LCD will show solar panel and an arrow from solar panel to battery will be light, we have below suggestions about solar panels connection.
    - ◆ Risk of electric shock, please pay attention to protection
    - ◆ The max input voltage from solar panel could reach 100v, please try to use series connection in order to simplified cables.

- ◆ In series connection could get down the current of solar panel, reduce sectional area of cable and voltage drop.
- For example: 17V 120Wx2 solar panels charge 12V battery, if we use PWM controller, we have to in parallel connection, the solar panel array voltage is 17V, current is 14A, current density is  $3A/mm^2$ . So we need sectional area  $5 mm^2$ . If we in series connection solar panels array voltage is 34V, current is 7A, At this time we need sectional area of cable  $2.5 mm^2$ , half conductor area reduced than parallel connection.

- 3) As figure, connected loads with controller correctly. In order to avoiding injury from load voltage, please close to the output of controller with button at first, then connected the load on the controller. The controller do not offer reverse connection protection for load, so please take care, reverse connection for output will be destroy loads.

**Attention: If users want to connect inverter or inrush starting current loads, please connected them with battery directly, do not connected them with controller, or the controller load can not be start or destroy.**

- 4) Insert type external temperature sensor: external temperature sensor used for temperature compensation, please closed to battery as nearer as possible, if the temperature sensor do not plug in, the controller will default  $25^{\circ}C$ .
- 5) RS485 communication interface: Monitored by professional wire and host computer. (optional)
- 6) USB output :USB could offer 5V ,Max 1000mA for mobile, laptop, MP3 and so on. (40A not available USB output at the moment )

**Warning: Please do not connect USB loads to anywhere, the USB output negative poles is in series with Load negative poles.**

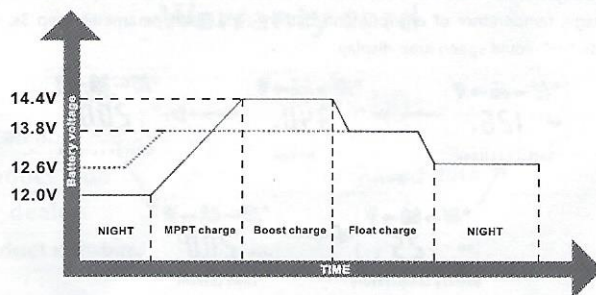
#### ■ About ground connection of solar system

Please noted, this solar charge controller designed by all positive connection, all components inside the controller are positive combined together. If your solar system needs ground connection, please let positive ground connection.

**Warning: For some force to ground connected system, such as solar communication system, portable solar system, they are negative ground connected, at this time please do not positive connected, or can cause short circuit.**

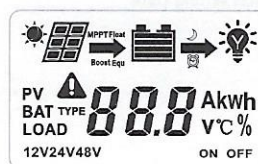
### Battery Charging Process

This controller has 3stages charging mode, bulk, boost, float, through fast high efficiency safety charging mode, effectively prolong the service life of the battery.



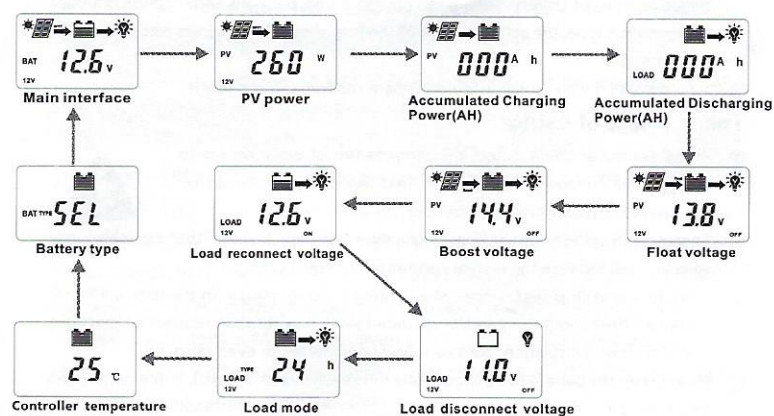
- ① **Bulk charging** : Fast charging stage, the voltage of battery is not reach to full charged set point. (Float point or Boost point), the controller will be work at MPPT mode. In process of Maximum Power of solar panel charging.
- ② **Boost charging** : Each time the battery voltage less than 12.6V, the controller will auto boost charging one time. When the boost voltage reach to set point, the controller will join into constant voltage charging mode instead of MPPT mode, and gradually reduce the charging current, the boost charging continued 2H then go to float charging mode. (Due to the load capacity and generated changing, the controller can't keep constant voltage charging, the constant voltage charging time will be accumulated, accumulate 2hours cancel boost charging mode.
- ③ **Float charging** : After join into float mode, the controller will get down charging current, to carry out weak charging to keep the battery at float voltage. (If the battery isn't less than 12.6V, the controller will not start boost charging mode, only keep floating)

### Main Interface





Name	Symbol	Indicate function
Solar Panel		Correct connect solar panel and in daytime
		No connect solar panel or wrong connection or at night
		charging
		Float charging mode
		Boost charging mode
		no charging
Battery	<b>PV</b>	Data about charging
		Battery capacity indicating
	<b>12V24V48V</b>	Present System Voltage Show
	<b>BAT</b> <b>BAT TYPE</b>	Data about battery Battery Type
Load		Load on
		Load off
		Load Sensor Timer mode output
		Load Sensor mode output
	<b>LOAD</b>	Data about load
	<b>LOAD TYPE</b>	Load working mode



- 1) Generated Power : This interface show the solar panels current output power.
- 2) Charging Ampere hour number: account current system generation ampere hour, long press "→" button could zero clearing.
- 3) Discharging Ampere hour number: account current system using ampere hour, long press "→" button could zero clearing.
- 4) Float Voltage: When the voltage of battery reach to this set point, the controller will start constant voltage charging mode, limited the rising of battery voltage, decrease the charging current to keep the battery in full condition. Press "←" button enter into menu interface of float voltage. Long press "←" button ≥5S the parameter on the interface will be flash, here is set up state. Loose the button, press "←" or "→" could plus or minus the data. After confirm the needed data, long press "←" ≥5S, the data save and come out set up state. If no any operation inner 20s, automatically back to main interface.
- 5) Boost Voltage: When the battery voltage less than 12.6V, the HVD auto reach to 14.4V at the same time keep 2hours then back to float voltage.
- 6) Low Voltage Reconnection Voltage (LVR): When the controller detected and closed the output of load. If the controller reconnect the output, the voltage of battery must be higher than LVR voltage or press "→" at main interface force to release. The procedure same with (4).
- 7) Low Voltage Disconnection Voltage(LVD): When the voltage of battery is low, the load output will be cut off. When the controller detected the battery voltage was less than LVD point, the cut off function will be immediately working. At the same time, the status of controller is in lock. Users have to charge the battery, when the battery

voltage is higher than LVD voltage or press "→" at main interface force to release. The procedure same with (4)

- 8) Load Working Mode Selection: The control default load working 24hours. When the Load Working Time set to 24hours, the load will keep working 24hours in no fault status. When the load working time set to ≤23H, it means the load start timer or sensor function. If the battery capacity is enough, the load will be started at sunset. The load will work under timer setting hours or stop working till sunrise.

**When the load join into timer or sensor mode, if the reset working time more than actual night time, the load output will be closed at sunrise, although the working time is not reach to setting hours. For example, the local actual night time is 10hours, user reset the working time at night is 12hours, but 10hours later the output will be closed automatically, the balance hours will be back to zero. The load will be working with next sunset signal.**

- 9) Temperature detection inside controller: When the inside temperature of controller more than 75°C, the charging current will be down, exceed 85°C closed charging.

- 10) Battery Type Selection: Built-in 3 types battery data. Different battery will use different parameter. (Default SEL battery parameter)

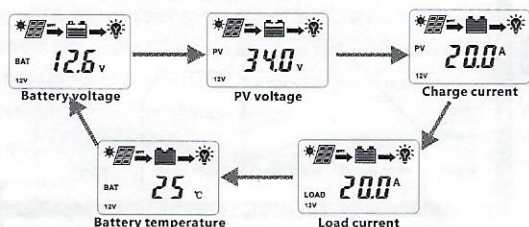
**Attention: About the control parameter of battery, we had fully consider user' s working condition, if customers want to adjust the parameter, please refer to battery supplier suggestion, or unreasonable adjust will destroy battery.**

Battery Type	SEL	GEL	FLD
Over Voltage Protection	16.5V	16.5 V	16.5 V
Charging Limited	15.0 V	15.0 V	15.0 V
Over Voltage Reconnection	15.0 V	15.0 V	15.0 V
Boost	14.4 V	14.2 V	14.6 V
Float	13.8 V	13.8 V	13.8 V
Boost Restart	12.6V	12.6V	12.6V

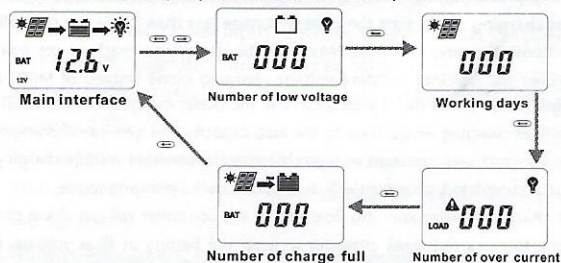
## Operation and Indication of controller

### ➤ Main Interface

- ❖ If no operation at main interface inner 10s, the main interface will cycle show battery voltage, temperature of environment, battery type, each parameter keep 3s, Long press "→" could speed loop display.



- ❖ At main interface short press "→" could on or off the load.
- ❖ At main interface, long press "←" and "→" together 5s could show operation log, such as times of LVD, working days, times of over current protection, times of HVD.













### ➤ At main interface press "←" button could enter into menu interface

At main interface, long press "←" button ≥5S could join into data setting state, loose button and short press "←" and "→" could set the data, long press "←" again more than 5s could save the data and cancel setting state.



## Protection Function

## ❖ Fault Symbol Indication

State	Symbol	Condition
LVD Protection	 	Battery empty and Warning Flash together
Battery Over Voltage Protection	 	Battery full and Warning Flash together
Load Over Current Protection	 	Load and Warning Flash together
Controller Over Temperature Protection	 	Temperature symbol and Warning Flash together
Solar Panel Over Voltage Protection	 	Solar Panel symbol and Warning Flash together

## ❖ Short Circuit and Reverse Connected Protection (Solar Panel)

When the solar panels have short circuit or reverse connection, the controller will be off the charging immediately, after clearing of the short circuit, the charging will be automatically feedback.

## ❖ Solar Panel Over Voltage Protection

When the input voltage from solar panel more than 100V, the controller will be off immediately, after input voltage less than 100V the controller will be auto restart charging.

## ❖ Reverse Connection of battery Protection

If the battery reverse connection, the controller will not destroy, corrected the connection the controller will be normally working.

## ❖ Battery Over Voltage Protection

When the voltage of battery was more than 16.5V, the controller will be auto closed charging and output to avoid the damage of the battery and loads.

## ❖ Battery Low Voltage Protection (LVD)

When the voltage of battery was reach to LVD (Low Voltage Disconnection) point, the controller will be auto closed the output in order to avoid over-discharge the battery.

## ❖ Overload Protection

If the current of load is more than 1.1times rated current of controller, the controller will be cut off the output after 60s and lock. Users have to decrease loads and press "→" unlock, or 30s later the controller will auto restart unlock.

## ❖ Load Short Circuit Protection

When the current of load more than 2times of rated current, the controller will be confirm short circuit, the controller will be auto cut off the output and lock. Users have to clearing the short circuit and press "→" unlock, or 30s later the controller will auto restart unlock

## ❖ Over Temperature Protection

When the inside temperature of controller was more than 75°C, the controller will be off the charging and discharging, temperature symbol and warning flash, when the temperature get down to 65°C, the controller auto feedback.

## ❖ Lightning Protection

This product could only protect small lightning induction, we suggest users to use lightning rod at frequency area.

## Fault and Handling

Fault Phenomenon	Possible reason	Solution
LCD no display after connected with battery	<ul style="list-style-type: none"> <li>Battery Low</li> <li>Battery Reverse Connection</li> <li>The connection cut off</li> </ul>	Please confirm the voltage of battery reconnect the controller with battery firmly and correctly.
Full of sunshine vertical on solar panel, no solar symbol and no charging symbol on LCD.	The solar panel connection open circuit, short circuit, or reverse connected	Please check the cable of solar panels if they are correct connection and firmly.
The controller displaying LVD	The battery is over discharging	Please check the system design is reasonable or not. Please full charge the battery
The controller displaying Over Voltage Protection of battery	The voltage of battery is too high	Please first cut off the solar panel and see if the voltage get down normal level. If the fault do not finish, please cut off the battery with controller and reconnect again
The controller displaying Over Current Protection	The load is short circuit, or over load or high surge power	Please check the load cables have short circuit, the power of the load over rated design, the surge power of load too high

## Technical Data

40119-30A

System Voltage	12V/24V		
PV Max Input Voltage	100V at minimum operating environment temperature 95V at 25°C environment temperature		
MPP voltage range	(Vbat+2V)~75V		
PV Max Input Power	12V 260W 24V 520W	12V 390W 24V 780W	12V 520W 24V 1040W
Self-consumption	≤23mA		
Max Charging current	20A	30A	40A
Max Discharging current	20A	30A	40A
USB output	DC 5V/1A		
LVD	11.0V ADJ 9V....12V ; ×2/24V		
LVR	12.6V ADJ 11V....13.5V ; ×2/24V		
Float Voltage	13.8V ADJ 13V....15V ; ×2/24V		
Boost Voltage	14.4V ; ×2/24V battery voltage less than 12.6v restart boost 2hours		
Battery Over Voltage Protection	16.5V ; ×2/24V		
Reverse Connection Protection	Yes		
Load Over Current Protection	Yes, each 30s auto restart again		
Controller Over Temperature Protection	Yes		
Charging Type	MPPT		
Temperature Compensation	-24 mV /°C for 12Vsystem ; ×2/24V ;		
Working Temperature	-20°C---+50°C		
Terminals scale	16mm <sup>2</sup>	16mm <sup>2</sup>	25mm <sup>2</sup>
Waterproof grade	IP32		
Size	200mm×127mm×54mm	200mm×183mm×54mm	232.5mm×200.1mm×54mm
New weight	0.87KG	1.2KG	1.7KG

\* Please under rated power using under high temperature environment.

Optional communication function RS485

Version number : 201701

## Customer service

## Warranty card

User's name	Contact NO.
Detail address	
Product model	Purchased date
dealer	
Product number	
<p>Stick invoice here</p>	