SUNESS

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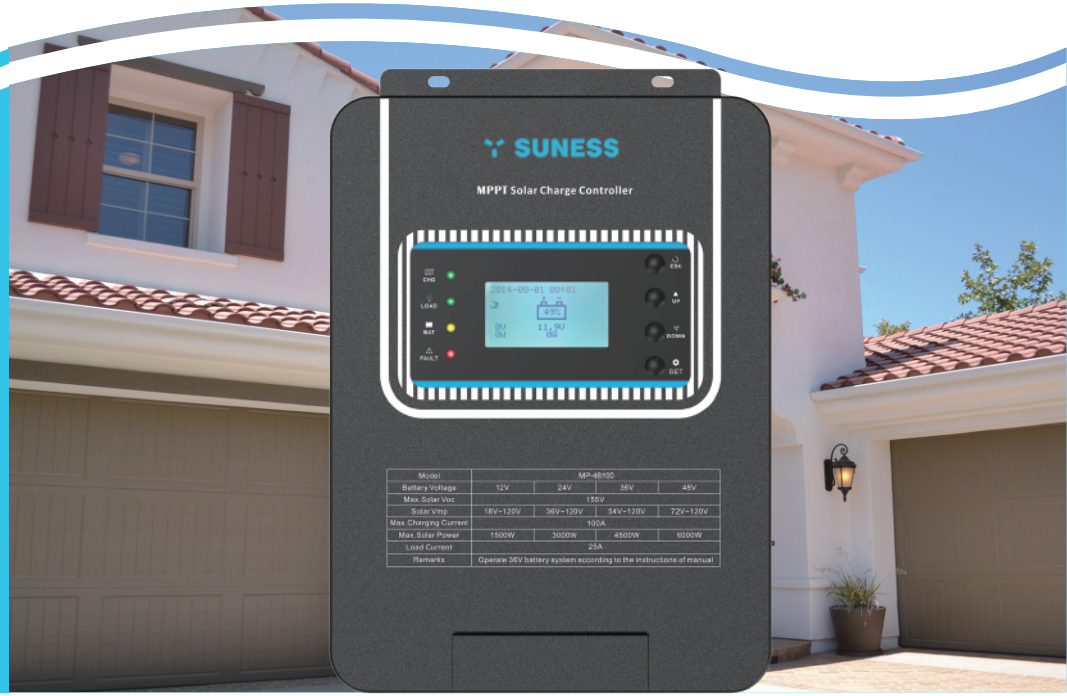
# USER MANUAL




## Solar charge controller

In order to prevent improper operation before use, please carefully read thismanual.

# Contents



**This manual is only for controller model: MP-4880 / MP-48100**

## 1. Safety tips

- Before using the machine, please read the instructions carefully and operate the controller after safety training.
- When the controller is damaged and needs to be repaired, hand it to a professional repair center, and do not disassemble the machine by yourself.
- When installing the controller, be sure to disconnect all power supplies.
- Install the controller in a well ventilated place to avoid direct sunlight, high temperature and rain.
- Suggest reinstalling the appropriate fuse or circuit breaker outside the controller.
- It is recommended to select the appropriate cable size to prevent overheating.Check the tightness of the wiring after installation to avoid the danger of heat accumulation caused by fake connection.

## 2. Product introduction

### 2.1 Product description

This product can detect the power generation of solar panels in real time and track the highest voltage current value(VI)so that the system can charge the battery with the maximum power output.Applied to solar off-grid photovoltaic systems,coordinating the work of solar panels,batteries,and loads is the core control component of off-grid photovoltaic systems.

This product adopts liquid crystal dynamic display running state,running parameters, control parameters and so on.Users can easily access the paramenters throungh keys and can modify the control parameters as necessary to meet different system requirements.

The controller adopts RS232/RS485 communication, which can monitor the running state and parameters of the controller through the upper computer. In addition， It also supports the parallel use of multiple solar charging controllers.

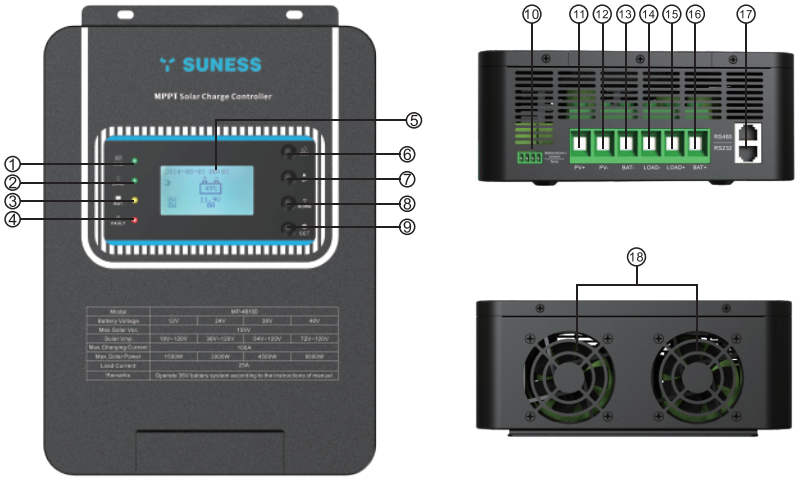
The internal controller has a comprehensive electronic fault self-measurement function and a powerful electonic protection function,which can avoid the damage of product components due to installation errors and system failures.

## 2.2 Product features

- ◆ Advanced dual or multi-peak tracking technology, when the panel is shaded or some of the panel is damaged, the I-V curve will appear multiple peaks, and the controller can still accurately track the maximum power point.
- ◆ The built-in maximum power tracking algorithm can significantly improve the energy efficiency of photovoltaic system, which is about 15% and 20% higher than the traditional PWM charging efficiency.
- ◆ Combining multiple tracking algorithms, it can track accurately in a very short time. To the best working point of I-V curve.
- ◆ MPPT tracking efficiency can reach 99.9%.
- ◆ Conversion efficiency≤98%.
- ◆ Load Rated Current 25A.
- ◆ PV Wide Voltage Input(Prohibit DC power input).
- ◆ Automatic identification battery system.
- ◆ External battery, environment temperature detection.
- ◆ Temperature compensate for battery.
- ◆ 3-stage charging (MPPT charging, boost charging, floating charging).
- ◆ With limited-current charging mode.
- ◆ Clock Module.
- ◆ RS232/485 Communication.
- ◆ Supports multiple battery types.
- ◆ Supports capacitive load instantaneous high current start.
- ◆ Load Overcurrent/Short Circuit Protection.
- ◆ PV/BAT anti-reverse connection protection.
- ◆ Overtemperature protection.
- ◆ TVS Lightning Protection.
- ◆ Supports the parallel use of multiple controllers.



## 2.3 Product ovieview




| Position | Description | Position | Description |
|---|---|---|---|
| ① | Charging indicator | ⑩ | Battery/environment temperature sensor port |
| ② | Load indicator | ⑪ | PV input positive |
| ③ | BAT indicator | ⑫ | PV input negative |
| ④ | Fault indicator | ⑬ | Battery input negative |
| ⑤ | LCD display | ⑭ | DC load Output negative |
| ⑥ | ESC button | ⑮ | DC load Output positive |
| ⑦ | UP button | ⑯ | Battery input positive |
| ⑧ | Down button | ⑰ | RS485/RS232 |
| ⑨ | Set button | ⑱ | Fan |

## 3. Product installation

### 3.1 Precautions

- Installation and wiring must comply with national and local electrical specifications and be installed by a professional.
- Make sure all power is cut off before installation.
- Be very careful when installing batteries. Protective glasses should be worn for the installation of open lead-acid batteries. Rinse with clean water as soon as you come into contact with battery acid.
- Avoid placing metal objects near batteries to prevent short-circuit of batteries.
- The battery may produce acid gas when charging, make sure the environment is well ventilated.
- Batteries may produce combustible gases, keep away from sparks.
- Install the controller in a well ventilated place to avoid direct sunlight, high temperature and rain.
- Suggest reinstalling the appropriate fuse or circuit breaker outside the controller.
- Select the appropriate cable size to prevent overheating;Check the tightness of the wiring after installation to avoid the danger of heat accumulation caused by fake connection.

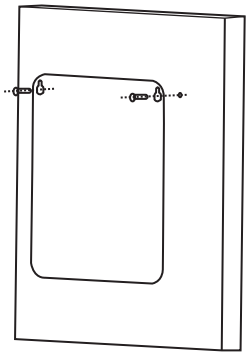
### 3.2 Wire specifications

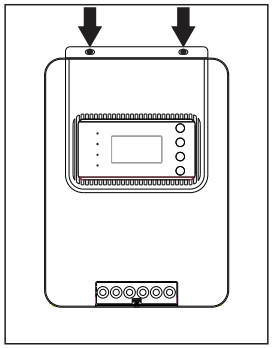
| Model | MP-2410 | MP-2420 | MP-2430 | MP-4860 | MP-4880 | MP-48100 |
|---|---|---|---|---|---|---|
| PV Line Mode | 1*14AWG | 1*10AWG | 2*10AWG | 2*8AWG | 2*6AWG | 2*4AWG |
| Battery Line Mode | 1*14AWG | 1*10AWG | 2*10AWG | 2*8AWG | 2*6AWG | 2*4AWG |
| Load Line Mode | 1*10AWG | 1*10AWG | 1*10AWG | 1*8AWG | 1*8AWG | 1*8AWG |



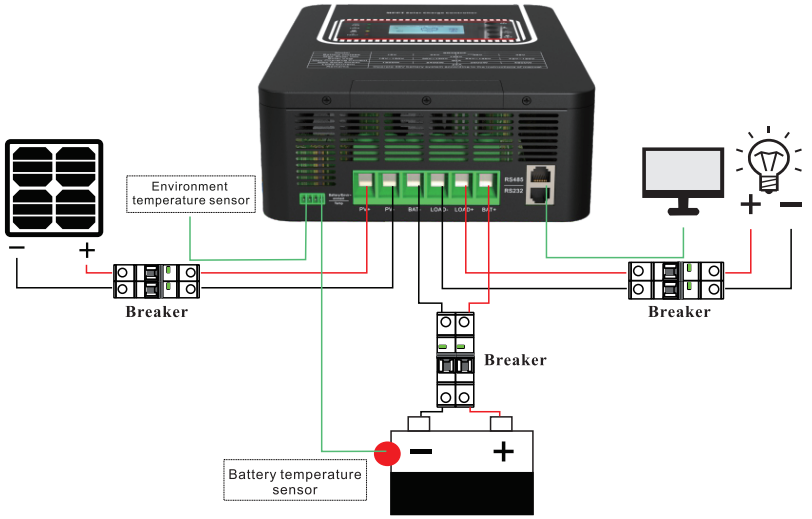
### 3.3 Installation steps

- First, put the installation position guide board in the appropriate position, then mark the location of the installation location hole with a marker pen, drill two installation holes of appropriate size in the two marks, and fix the screws.
- Aim the controller fixing hole at two fixed screws and hang it.
- Make sure the screw is firm and the machine is not easy to fall of.





### 3.4 Wiring diagram



## 4. Product operation and display

### 4.1 LED indication

( CHG )Charging indicator light:

| LED status | Charging status |
|---|---|
| Light on | MPPT charge(CC) |
| Flash slowly(light on for 1 second, and then off for 1 second, period is 2 seconds) | Boost charge （CV） |
| Flash single(light on for 0.1 seconds, and then off for a 1.9 seconds, period is 2 seconds) | Floating charge(FV) |
| Light off | No charge(IDLE) |

( BAT )BAT indicator light:

| LED status | Battery status |
|---|---|
| Light on | Normal |
| Flash slowly(light on for 1 second, and then off for 1 second, period is 2 seconds) | Low voltage |
| Flash instantly(light on for 0.1 seconds, and then off for a 0.1 seconds, period is 0.2 seconds) | Over voltage |

( LOAD )Load indicator light:

| LED status | Load status |
|---|---|
| Light off | No load |
| Flash instantly(light on for 0.1 second, and then off for 0.1 second, period is 0.2 seconds) | Overload/short-circuit/low voltage |
| Light on | Load output normal |

( FAULT )Error indicator light:

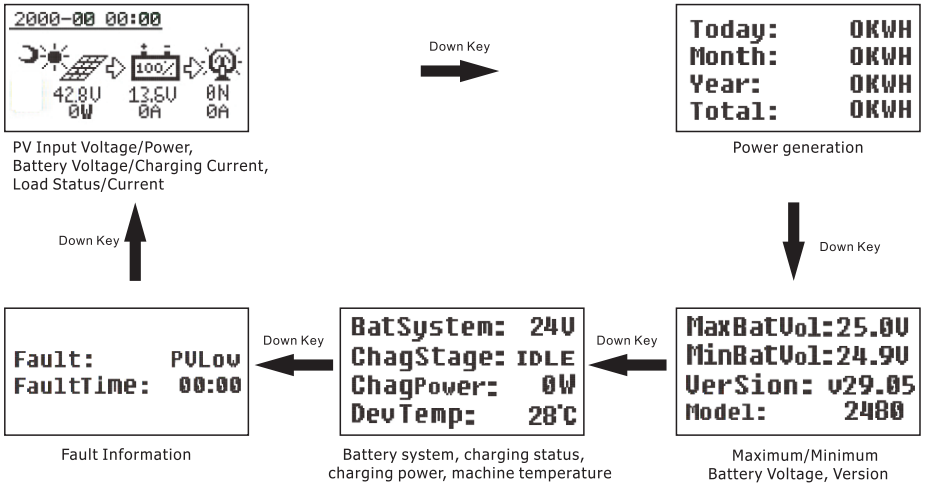
| LED status | MPPT working status |
|---|---|
| Light off | Work normally |
| Light on | Work abnormally |



### 4.2 Button operation

| | |
|---|---|
| ESC | Back to main page;Quit without saving |
| UP | Turn up;Subtract parameters under setting mode |
| DOWN | Turn down;Add parameters under setting mode |
| SET | Enter the setting menu;Set or save |

### 4.3 Home page




### 4.4 Parameter setting page

Instruction: The following types of parameter setting are similar, they are the first time you press SET to enter the setting home page, press UP/DOWN (with a black icon) to select the parameter type, then press SET to confirm entry, then press UP/DOWN (with a black icon) to select the parameters that need to be modified, press SET setting, then the black icon will flash and be in the modified state,Then press UP/DOWN to add or subtract the parameters to the value you want, and if it's completed, press SET to confirm the save;
If you don't want to save, press ESC to exit. (After the SET key setting parameter is saved, you cannot press SET repeatedly to set it again. You need to switch other parameters at will and then return to set it...)

**❶36V Battery System Setting**

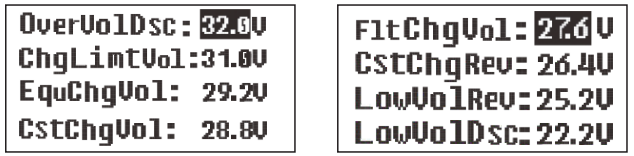
Since the system only recognizes 12V/24V/48V batteries automatically, when 36V batteries are needed, enter System Set and change AUTO to 36V.

★ Note: The controller needs to be restarted after the change, otherwise the controller will work under abnormal system voltage.


**❷ Battery type**

Enter System Set to set the battery type as SLD (sealed lead acid battery), GEL (gelled lead acid battery), FLD (flooded lead acid battery), LFP（lithium iron phosphate battery）, NCM（ternary lithium battery） and USE（Customize).


When USE is selected, the user can modify the parameter values of battery overvoltage disconnection voltage, charging limit voltage,equalizing charge voltage,boost charge voltage, floating charge voltage, boost recovery voltage, load disconnection voltage and load disconnection recovery voltage according to the actual situation of the battery.(When modifying parameters, follow the battery parameter logic in section 6.2 )




**❸ Battery capacity**

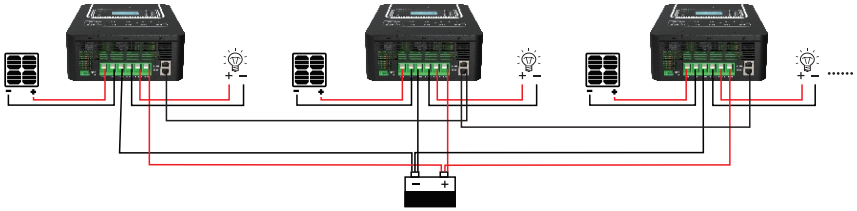
The battery capacity setting range is 100Ah ~ 400Ah, and the default value is 335Ah. The charging current of the system is 0.3C. If 0.3C value is greater than the maximum charging current of the system, it will only be charged with the maximum charging current.


**❹ Parallel function setting(System default no-parallel state Adress is "0")**

First connect the communication line, select a controller to set Address as "1" as the host, and other controllers to set Adreess as "2", "3"... as slave, then S2, S3... will be displayed on the slave main page;If the subtitle blinks, the communication connection is successful. If it does not blink, the communication fails.




**Parallel connection diagram**



**❺ Charging Current Limiting Setting**

Charging current setting range 5A~80A for MP-4880 model controller
Charging current setting range 5A~100A for MP-4880 model controller


**❻ Battery Temperature Compensation**

◆ The setting range is 0~8mV/℃, and the system default value is 3mV/℃.Because the overcharge point of the battery changes with the temperature, it is necessary to automatically compensate the temperature of the protection voltage of the overcharge point, which can effectively delay the life of the battery.


**❼ Load Setting (PV needs to be turned on when power is first turned on)**

◆ When the load is connected and the load switch is set to ON, the main page will display the load pattern and information, otherwise it will not be displayed.

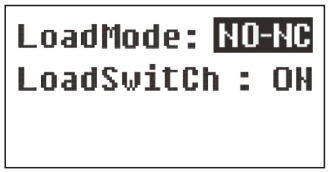
◆ When the subtitle "Load OverCur" appears, it indicates a load overflow alarm, which needs to reduce the load to the allowable range, and then long press "ESC" to recover.
**Note:** the machine needs to restart after 4 times of overcurrent protection to turn on the load.

◆ When the subtitle "Load LowVolt" appears, it indicates a low-voltage load alarm, which requires recharging to raise the battery voltage to the load recovery voltage point of the load to restore normal.

◆ When the subtitle "Load Short" appears, it means the load short-circuit warning. It will recover automatically when the fault is removed.
**Note:** After five short-circuit protections, the machine needs to be restarted to turn on the load.

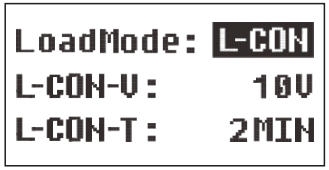
**Four load working modes: normal on/off mode, light control mode, time control mode, light control + time control mode.**

| Load mode | ON(Satisfy the following conditions) | OFF(Satisfy the following conditions) |
|---|---|---|
| Normally on/off (NO-NC) | Manually turn it on | Manually turn it off |
| Time control (T-CON) | Reaches the setting time,turn on immediately | Reaches the setting time,turn off immediately |
| Light control (L-CON) | PV voltage is lower than setting value + Set the delay time to turn on | PV voltage is higher than setting value+ Set the delay time to turn off |
| Light and time control(L&T-CON) | PV voltage is lower than setting value + Set the delay time to turn on+Set the load woking time | PV voltage is higher than setting value+ Set the delay time to turn off +Load woking time completed |

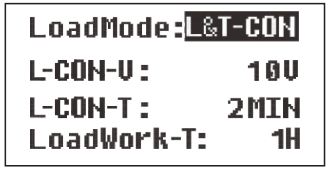




(NO-NC)


(T-CON)




(T-CON)

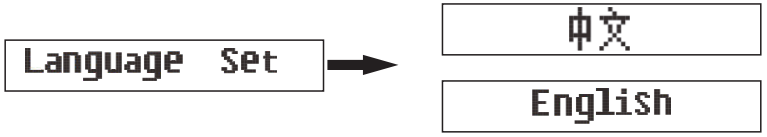



(T&T-CON)

**❽ Time/Date Setting**


**❾ Language Setting**

Enter the Language Set, press SET to switch the selection, then press ESC to exit.






## 5. Product maintenance and troubleshooting

### 5.1 System maintenance

- ◆ To maintain the best long-term performance, it is recommended that more than two inspections of the project be performed annually.
- ◆ Make sure the airflow around the controller is not blocked.
- ◆ Check the controller for dirt, nesting insects and corrosion, and clean up in time.
- ◆ Check all wires for signs of corrosion, insulation damage, high temperature or discoloration, looseness of wiring and timely maintenance or replacement of wires.

**Risk of electric shock!Make sure that all the power supply of the controller is disconnected when doing the above operation, and then check or operate accordingly!**

### 5.2 Trouble shooting

When the controller fails to operate, the Fault indicator lights up red, and the failure information is displayed on the last page of the home page. When the failure is resolved, the controller automatically clears the failure information.

| Error code | Description | Suggestion |
|---|---|---|
| PVLow | Input PV voltage is too low | 1.Please increase PV voltage.<br>2.If error message still exists,contact factory. |
| PVHigh | Input PV voltage is too high | 1.Please decrease the PV voltage.<br>2.If error message still exists,contact factory. |
| BatLow | Battery low voltage | 1.Please check the battery voltage.<br>2.If error message still exists,contact factory. |
| BatHigh | Battery high voltage | 1.Please check the battery voltage.<br>2.If error message still exists,contact factory. |
| OverChg | Charging overvoltage | 1.Please restart the solar charge controller.<br>2.If error message still exists,contact factory. |
| LoadOverCur | Load overflow | 1.Please decrease the DC Load.<br>2.If error message still exists,contact factory. |
| LoadShort | Load short circuit | 1.Please check the DC Load.<br>2.If error message still exists,contact factory. |
| HeatTErr | Heatsink temperature error | 1.Please wait for the heatsink temperature to drop.<br>2.If error message still exists,contact factory. |
| BatErr | Battery error | 1.Please check if the connected batteries match the controler system voltage.<br>2.If error message still exists,contact factory. |

| | | |
|---|---|---|
| ComLoss | Communication loss | 1.Please check the communication cable.<br>2.If error message still exists,contact factory. |
| BATDetErr | Differential from host battery | 1.Please check the batteries connected and the display voltage of each machine.<br>2.If error message still exists,contact factory. |
| FanErr | Fan Error | 1.Please restart the solar charge controller.<br>2.If error message still exists,contact factory. |
| | Display abnormal | 1.Long press the ″UP″button.<br>2.If error message still exists,contact factory. |



## 6. Product specifications

### 6.1 Technical Data

| Model | | MP-2410 | MP-2420 | MP-2430 | MP-4860 | MP-4880 | MP-48100 |
|---|---|---|---|---|---|---|---|
| Nominal System Battery Voltage | | 12V,24V ( Auto detection ) | | | 12V,24V,48V ( Auto detection ) ; 36V(Setting) | | |
| Maximum Solar Input Voltage | | 50V | | | 155V | | |
| Battery Voltage | | 12V | 24V | | 12V | 24V | 36V / 48V |
| PV Array MPPT Voltage Range | | 15-45V | 30-45V | | 15-120V | 30-120V | 45-120V / 60-120V |
| Maximum Battery Current | | 10Amps | 20Amps | 30Amps | 60Amps | 80Amps | 100Amps |
| Max PV Input Power | 12V | 140W | 270W | 400W | 800W | 1100W | 1500W |
| | 24V | 270W | 540W | 800W | 1600W | 2150W | 3000W |
| | 36V | / | / | 1200W | 2400W | 3200W | 4500W |
| | 48V | / | / | 1600W | 3200W | 4300W | 6000W |
| Rating Load Current | | 20A | | | | 25A | |
| Mode Of Communication | | RS232 | | | | RS232/RS485 | |
| Parallel Function | | NO | | | | Support multiple | |
| Protection | | PV anti-reverse protection; Battery anti-reverse protection;<br>PV voltage too high/low protection; Battery voltage too high/low protection;<br>Load overcurrent protection; Load short circuit protection;<br>Overtemperature protection; | | | | | |
| Applicable Battery Type | | SLD(Sealed lead-ancid battery) GEL(gelled lead-ancid battery )<br>FLD(Flooded lead-ancid battery) LFP(Lithium lead-ancid battery)<br>NCM(Ternery Lithium battery) USE(Customize) | | | | | |
| Unloaded Loss | | ≤2.3W | | | | | |
| Cooling | | Fan Cooling | | | | | |
| Conversion Efficiency | | ≤98% | | | | | |
| MPPT Efficiency | | > 99% | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| IP Rate | IP20 | | | | | |
| Ambient Humidity | 0%-95% ( NO Condensation) | | | | | |
| Operating Temperature | -10℃--50℃ | | | | | |
| Elevation Height | ≤2000 | | | | | |
| Temperature Compensation Coefficient | -3mV/℃/2V ( default ) | | | | | |
| LCD Display | | | | 128*64mm | 128*64mm | |
| Product Size (L*W*H)(mm) | | | | | 292*207*87mm | |
| Net Weight(KG) | | | | | 3.0KG | 3.1KG |

### 6.2 Battery type default parameters

**Table of parameters of various types of batteries**

| Battery Type | SLD (sealed lead-acid battery) | Battery type GEL (gelled) | FLD (flooded lead-acid battery) | LI (lithium iron phosphate battery) | NCM (Ternary lithium battery) | USE(Custom) |
|---|---|---|---|---|---|---|
| Overvoltage disconnect voltage | 16.0V | 16.0V | 16.0V | 16.0V | 14.6V | 9-17V |
| Charging limit voltage | 15.5V | 15.0V | 15.0V | / | / | 9-17V |
| Equilibrium voltage | 14.6V | / | 14.8V | / | / | 9-17V |
| Boost charging voltage | 14.4V | 14.2V | 14.6V | 14.4V | 12.6V | 9-17V |
| Float voltage | 13.8V | 13.8V | 13.8V | / | / | 9-17V |
| Boost recovery voltage | 13.2V | 13.2V | 13.2V | 13.2V | 10.5V | 9-17V |
| Load recovery voltage | 12.6V | 12.6V | 12.6V | 12.6V | 10.4V | 9-17V |
| Load disconnect voltage | 11.1V | 11.1V | 11.1V | 11.1V | 9.2V | 9-17V |



When using USE to customize the battery type, the default voltage parameters are the same as those of the sealed lead-acid battery. If the user needs to modify the battery charging and discharging parameters, the following logic must be followed:

◆Overvoltage disconnect voltage >Charging limit voltage>Equilibrium voltage>Boost voltage >Float voltage>Boost recovery voltage;

◆Load disconnection recovery voltage >Load disconnect voltage;

◆Boost recovery voltage >Load disconnection recovery voltage ;

### 7. Over-temperature protection curve