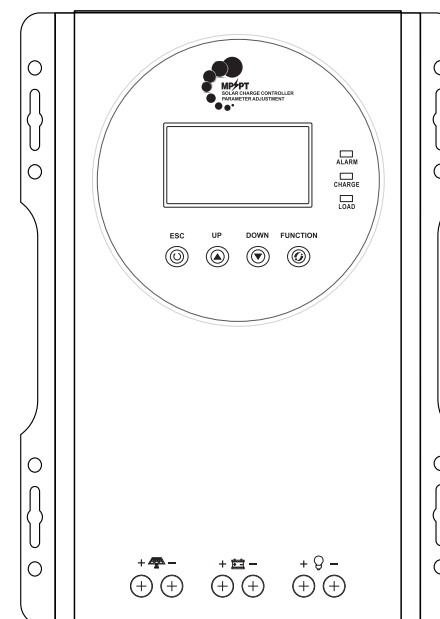


制作说明：A4对折

封面纸质：铜板纸

User Manual of MPPT Solar Charging Controller

40 A/ 50 A/ 60 A
(Maximum PV (VOC) Voltage: DC 150 V)



6. Maintenance and Cleaning

6 . 1 Fuse Replacement

If the fuse is blown caused by high temperature or other faults, it needs to be replaced correctly. Remove the broken fuse from the interface, install the new fuse, check whether the connection is correct and install the equipment.

6 . 2 Clearance of Air Vent Radiator

To clean the fan vent and internal heat sink regularly and wipe with dry or moist cloth.

Note: No washing liquid or corrosive solvent can be used, and liquid is not allowed to flow into the machine to ensure that the ventilation holes of the equipment are not blocked.

7.Warranty

The controller can be repaired free of charge if it is not caused by improper operation within warranty period, otherwise the cost of repair will be charged.

When delivering to the logistic agent, please properly package the equipment to avoid damage to the equipment during transportation.

5. Parameters

MPPT controller technical parameters			
Model	ML4415FN		ML6415FN
System voltage	12 V/ 24 V/36V/ 48 V (Adaptive)		
Nominal current	40A		60A
Charging mode	MPPT maximum power point tracking		
Applicable battery type	Sealed lead acid battery, GEL lead acid battery, flooded lead acid battery		
Charging method	Three stages: constant current, constant voltage, floating charge		
PV input maximum open circuit voltage (VOC)	DC150V		
Starting time	≤10s		
Dynamic response recovery time	≤500us		
Static power	≤1W		
Overall efficiency	≥98.5%		
System identified voltage	8V~64V		
Photovoltaic input voltage	Battery voltage+5~150V		
Solar panel rated input power	12V	540W	800W
	24V	1080W	1600W
	36V	1620W	2400W
	48V	2160W	3200W
Load voltage	Same as the battery voltage(12V or 24V)		
Nominal load current	40A		60A
Load control method	Normally on&off mode		
Load undervoltage protection	10.5V*N (N stands for batteries number) Parameters can be adjustable		
Display	HD LCD backlight display		
Protections	Input and output over-voltage protection, input and output anti-reverse protection, over-temperature protection, load over-current protection		
Working temperature	-20℃~+50℃		
Storage temperature	-40℃~+70℃		
Acoustic Noise(db)	≤50dB		
Humidity	0~90%RH		
Working altitude	0~3000M		
Dimension,L*W*H	180*300*110mm		
Net Weight (KG)	4.3KG		



Important safety instructions (This manual contains important information about the safe installation and operation of the solar charge controller. Please keep this manual for future reference.)

This manual contains all the safety, installation and operation instructions of the series solar charge controller (hereinafter referred to as “controller”):

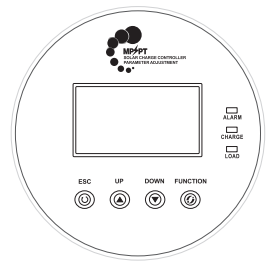
- ◇Mount the controller indoors only. Prevent exposure to the elements and do not allow any contact with water.
- ◇Please install the controller in a well ventilated place to ensure adequate heat dissipation from the controller's heat sink.
- ◇It is recommended that safety and circuit breakers be connected to the input, load and battery terminals to prevent the danger of electric shock in use.
- ◇Power connections must remain tight to avoid potential dangers and excessive heating from a loose connection.
- ◇If the display is not displayed normal at the first time, please cut off the fuse or circuit breaker immediately and check the line if it is connected correctly.
- ◇When the controller is in the normal charging mode, please DO NOT disconnect the battery otherwise the DC load would be damaged.

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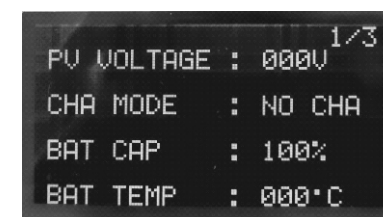
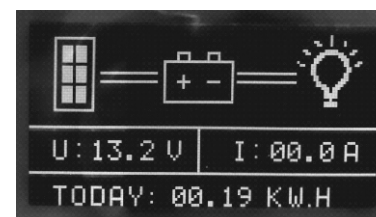
4. Operation

4.1 Button Function

	Button	Description
	ESC	Tap “ESC” button to back to home page.
	UP/DOWN	Tap “UP/DOWN” buttons to turn the page or tap this button under setting mode.
	FUNCTION	Page to setting interface and tap “FUNCTION” button to set up when the words are flickering. After finished setting up, tap the button again to confirm.

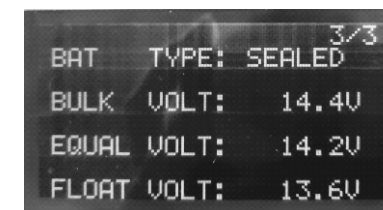
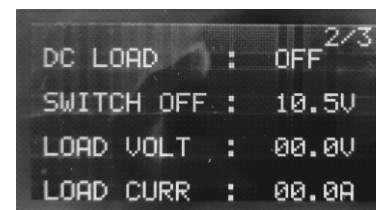
4.2 LCD Display

◆ Browsing Interface



(Note: Please refer to 4.1 the description of browsing mode)

◆ Setting Interface



(Note: Please refer to 4.1 the description of browsing mode)

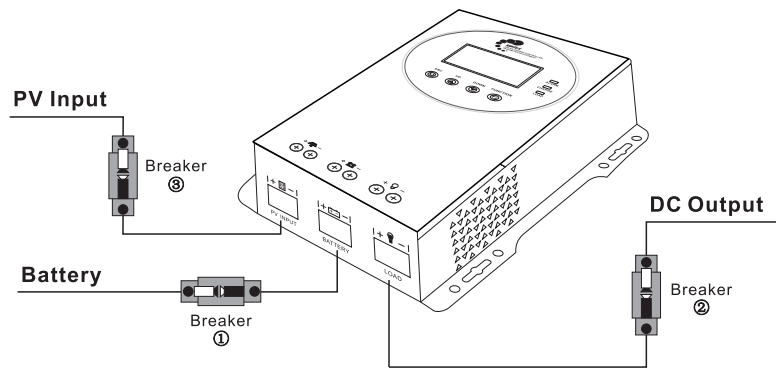
◆ Parameters setting

The users can set the battery type, the load switch mode and load undervoltage protection point by pressing “ESC” and “FUNCTION” buttons at the same time. (Note: it is suggested that the parameters be set in the state of stopping charging in order to avoid breakdown).

And in order to facilitate the opening and closing of the machine and safety, it is recommended to install the circuit breaker. Please refer to the specification selection of the next table wire and circuit breaker.

Model	Rated Charging Current	Rated Discharging Current	Battery Wire (mm ² /AWG)	Load Wire (mm ² /AWG)	Rated Charging Current
30A	30A	40A	8/8	14/7	>50A
40A	40A	40A	14/7	14/7	>63A
50A	50A	60A	16/6	20/5	>100A
60A	60A	60A	20/5	20/5	>100A

3 . 7 Steps of Switch on and off



Make sure that the controller is installed and connected correctly!

Opening process: Step 1: open the circuit breaker ① on the battery side, make sure that the controller is connected with the battery (the LCD of the controller will display the content), and set the battery type.

Step 2: if you need to use the DC load output, then set the output control mode first, and then open the DC output circuit breaker ②.

Step 3: open the circuit breaker ③ on the input side of the solar panel PV, if the PV input voltage is in the charge range of the controller, then the controller will enter the charging state.

Closing process: turn off the circuit breaker in turn: ③②①



Caution:

- 1 .If the system needs to connect to the inverter, please connect the inverter to the battery directly, but DO NOT connect to the load terminal of the controller.
- 2 .When the controller is in the normal charge state, do not disconnect the battery connection, otherwise the DC load may be damaged. Therefore, the damage to the controller will not be within the warranty.

1. MPPT Controller General Information

1 . 1 Overview

Thank you for choosing our MPPT solar charging controller!

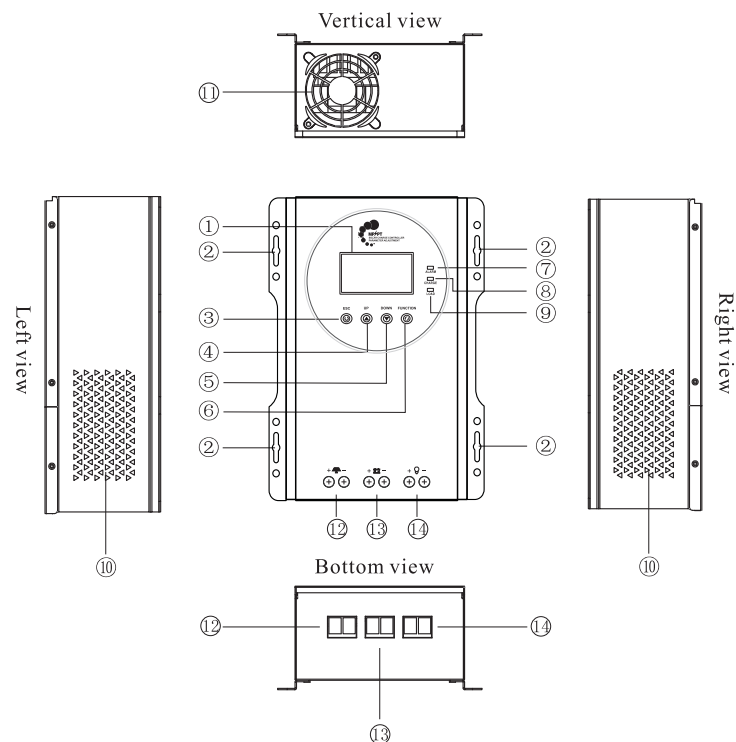
Equipped with the advanced MPPT control algorithm and a built-in LCD display showing system status and parameters, this product is a practical and a high-performing solution for your solar system. It is the brain of the off-grid solar system that coordinates solar panel and battery loads. With the continuous optimization of the products, the series has its unique advantages:

- ◆ The various sampling data show on the screen, convenient user access.
- ◆ The PV input voltage range up to 150V, suitable for various specifications of solar panels.
- ◆ The power supply uses ultra low power chip, reducing static standby power consumption, reduce energy loss.
- ◆ Continuous optimization design, super high cost performance.

Features:

- ◆ It has an efficient MPPT algorithm, MPPT efficiency is not lower than 99.5% and converter efficiency up to 98%.
- ◆ Three-stage charging mode: constant current, constant voltage and floating charge. It prolongs service life of the batteries.
- ◆ Battery system voltage is recognized automatically.
- ◆ Three kinds of commonly used lead-acid battery (Seal\Gel\Flooded) parameter settings can be selected by the users.
- ◆ It provides a current-limiting charging function. When the PV power is too large, the controller automatically keeps the charging power and the charging current will not exceed the rated value.
- ◆ HD LCD display allows you to check the device running data, working status and also can modify the parameters of the controller display.

1 . 2 Characteristics



Item	Name	Item	Name
1	LCD Screen	8	Charging LED indicator
2	Mounting hole	9	Load LED indicator
3	Return button	10	Cooling vent
4	Page up button	11	Fan vent
5	Page down button	12	PV terminals
6	Function	13	Battery terminals
7	Alarm LED indicator	14	Load terminals

1 . 3 Maximum Power Point Tracking Technology

Due to the nonlinear output of a solar panel or solar array, there is a maximum energy point (Max Power Point, or MPP) on the output curve at which the solar panel achieves its highest efficiency. Traditional solar charge controllers with switch charging PWM technology cannot track this highest efficiency point of a solar panel, so most of the time they work with reduced

When the PV array is connected to the controller with the correct polarity, the maximum PV array power must NOT exceed 3 times of the nominal (rated) controller power; when the PV array is accidentally connected to the controller with the reversed polarity, the maximum PV array power must NOT exceed 1.5 times of the controller nominal power. Please refer to the table below:

Model	Rated Charge Current	Rated Charge Power	Max. PV Array Power	Max. PV Open Circuit Voltage
ML4415FN	40A	540W/12V	1620W/12V	150 V(Min. Temperature) 25℃ 138V
		1080W/24V	3240W/24V	
		1620W/36V	4860W/36V	
		2160W/48V	6480W/48V	
ML6415FN	60A	800W/12V	2400W/12V	
		1600W/24V	4800W/24V	
		2400W/36V	7200W/36V	
		3200W/48V	9600W/48V	

3 . 4 System Voltage and Battery Type

1) The controller can charge the DC12V, DC24V, DC36V and DC48V batteries. The controller recognized the system according to the voltage of the first connected battery and re-identified after the power failure was restarted. Therefore, please confirm whether the LCD display system is consistent with the actual system when starting, otherwise, it is necessary to recheck the battery voltage.

Note:battery group detailed system identification voltage please refer to the technical parameters table!

2)The controller has been set up to charge 3 kinds of conventional battery parameters for the following forms. (parameters is in 12V system at 25℃, please use double value in 24V, use three times value in 36V and use four times value in 48V.)

Battery type	Constant voltage	Floating voltage
Flooded	14.6V	13.6V
Sealed	14.4V	13.6V
Gel	14.2V	13.6V

3 . 5 DC Load Output Voltage

The controller has DC LOAD output function, and its output voltage range is the same as the battery group. If the battery's voltage is 24V, then DC can output a voltage of 24V at this moment.

3 . 6 Specifications for Cables and Air-Circuit Breakers

The wiring and installation methods must conform to all national and local electrical code requirements.

PV array specification of Wiring

Since PV array output can vary due to the PV module size, connection method or sunlight angle, the minimum wire can be calculated by the I_{sc} of PV array. Please refer to the value of I_{sc} module specification. (When the PV modules connect in series, the I_{sc} is equal to the PV module's in PV I_{sc} . When the PV modules connect in parallels, the I_{sc} is equal to the sum of PV module's I_{sc} .)

3.2 Serial connection (string) of PV modules

As the core component of PV system, controller could be suitable for various types of PV modules and maximize converting solar energy into electrical energy. According to the open circuit voltage (V_{oc}) and the maximum power point voltage (V_{MPP}) of the MPPT controller, the series number of different types PV modules can be calculated.

The following table is provided for general guidance only:

PV _{input} < DC 150 V Prohibit the total input voltage greater than 150V								
System	36cell Voc<23V		48cell Voc<31V		54cell Voc<34V		60cell Voc<38V	
Voltage	Max	Best	Max	Best	Max	Best	Max	Best
12V	4	2	2	1	2	1	2	1
24V	6	3	4	2	4	2	3	2
48V	6	5	4	3	4	3	3	3

PV _{input} < DC 150 V Prohibit the total input voltage greater than 150V					
System	72cell Voc<46V		96cell Voc<62V		Thin-Film Module Voc>80V
Voltage	Max	Best	Max	Best	
12V	2	1	1	1	1
24V	3	2	2	1	1
48V	3	2	2	2	1

NOTE: The above parameter values are given under Standard Test Conditions (STC): irradiance 1000W/m², Module Temperature 25°C, Air Mass 1.5.)

3.3 PV Array Input Total Power

This MPPT controller has a limiting function of charging current, the charging current will be limited within rated range. Therefore, the controller will charge the battery with the rated charging power even if the input power at the PV exceeds. Such as: for 12V Solar System with 30A controller, no matter the input power of the solar panel is greater than the rated number, the charging current will not be more than 30A. The actual operation power of the PV array conforms to the conditions below:

1) PV power less or equal to controller rated power, the maximum power of the controller is equal to the actual power of the PV array.

2) If the PV array actual power is more than the controller nominal rated power, the controller will reduce the PV array power and charge the battery at its nominal rated power.

If the PV array power is higher than the nominal rated power of the controller, and the controller has to limit the PV power, the battery charging time will be extended accordingly.



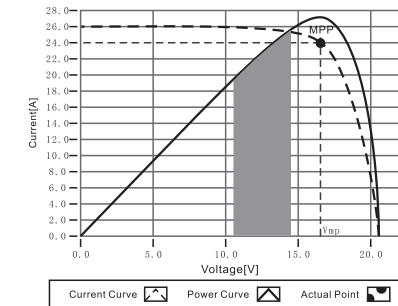
WARNING: The controller will be damaged if a PV array is connected to the controller PV terminals with the right polarity and the max PV power is more than 3 times greater than the rated controller power!



WARNING: The controller will be damaged if a PV array is connected to the controller PV terminals with reversed polarity and the max PV power is more than 1.5 times greater than the rated controller power!

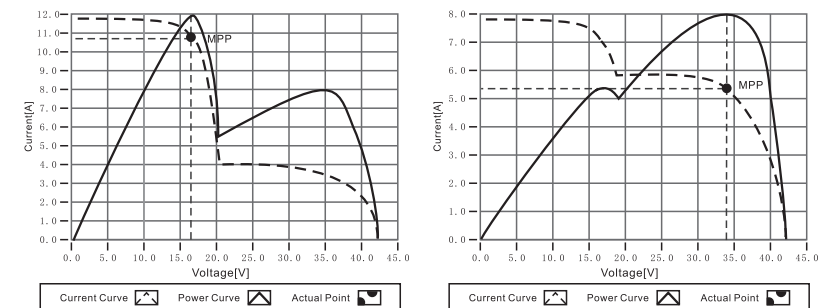
efficiency and do not extract the full energy available from the solar panel.

The below figure is the maximum power point curve of a solar panel. The shaded area is the charging range of a standard PWM controller. The MPPT technology of this controller can shift the point on the curve to the higher current, and raise the efficiency by 20%-60% compared to a standard PWM controller. (The efficiency may be different due to the working environment.)



Maximum Power Point Curve

In practice, due to shading from clouds, trees, snow etc, a solar panel might have multiple MPP points, but in reality there is only one true Maximum Power Point (see below examples):

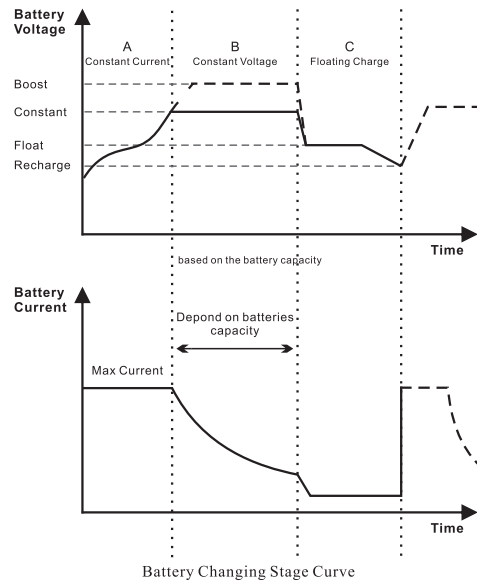


Curves with multiple MPP points

If there are multiple MPPT points, if there is no good algorithm, it will lead to work on the unreal MPPT point. This solar charge controller has a special MPPT technology that can handle multiple MPPT points and track the true MPPT point quickly and accurately, improving the system efficiency and avoiding energy waste.

1.4 Battery Charging Stage

The controller have 3 stages charge mode, Constant Current Charging (Bulk Charging), Constant Voltage Charging (CV) and Floating Charging (CF) for rapid, efficient, and safe battery charging.



a) Battery Changing Stage Curve

In this stage, the battery voltage has not yet reached the constant voltage point (Equalize or Boost Voltage) and the controller operates in a constant current mode, delivering its maximum current to the batteries (MPPT charging).

b) Constant Voltage Charging: CV (Constant and Boost Charging)

When the battery voltage reaches the constant voltage set point, the controller will start to operate in constant voltage charging mode, this process the charging current will drop gradually.

c) Floating Charging: CF

After the constant voltage stage, the controller will reduce charging current to maintaining the battery voltage on the Floating Voltage set point. Charging the battery with a smaller current and voltage on Floating Voltage stage, while maintaining full battery storage capacity.

In Floating charging stage, loads are able to obtain almost all power from solar panel. If loads exceed the power, the controller will no longer be able to maintain battery voltage in Floating charging stage. If the battery voltage remains below the Recharge Voltage, the system will leave Floating charging stage and return to Bulk charging stage.

2. Installation Instructions

2.1 Selecting the Mounting Location

The position should be taken into consideration of the weight and size of the controller.

The ambient temperature of the position should be within the range of $-20^{\circ}\text{C} \sim 50^{\circ}\text{C}$.

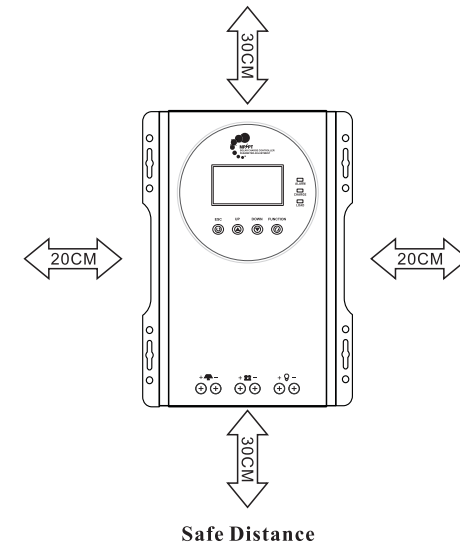
A good ventilation environment should be maintained in the position.

Install position should avoid direct sunlight

2.2 Safe Distance

Refer to the following safety clearance to ensure that other equipment or objects are not within this range to ensure that there is sufficient space for heat dissipation.

Direction	Safe Distance
Left-Right direction	>20cm
Up-Down direction	>30cm



2.3 Precautions for controller installation

Please read the safety instructions of the title page carefully before installation!

3. MPPT Controller Connection

3.1 Connection of the PV Power System

