Solar inverter

358-010066-00

felicitysolar®

Make life full of hope

USER GUIDE

Solar inverter

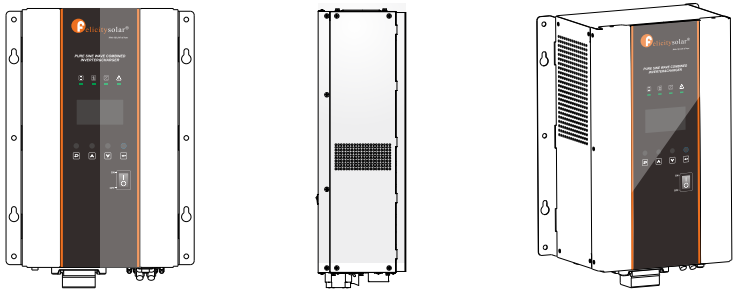
(IVPS0712 / IVPS1512 Series)

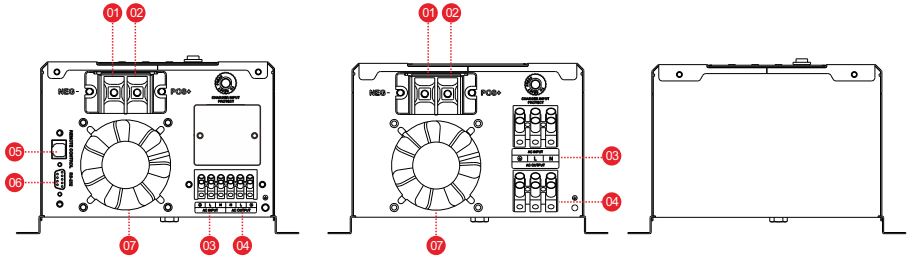
Contents

ADVANTAGE

- Bypass charging function: when the unit off, it can be activated with bypass output and can charge the battery.
- High charging current, the max charging current can be 15A for IVPS0712, 18A for IVPS1512.
- Wide range of AC input voltage: the range of AC input voltage is 90-280V. It can be better compatible with generator working. It is rare to have wide range input voltage for the power frequency inverter.
- Electricity and battery priority is optional: customer can choose Electricity or battery priority according to their needs.
- Battery self-defined: customer can set the overcharge voltage and float voltage, and over-discharge voltage.
- 50/60HZ compatible
- Intelligent: Intelligent adjustment of over-discharge voltage, intelligent fine-tuning of over-discharge voltage according to the power of the load; intelligent cooling fan, intelligent adjustment of speed according to power and charging current and core temperature inside the machine
- Safety: Safety design is upgraded overall. Comprehensive protection, such as over-charge protection/over-discharge protection/overload protection/output short-circuit protection/ over-temperature protection, etc. Among them, transformer over-temperature protection is a leading design in the industry.

PRODUCT OVERVIEW

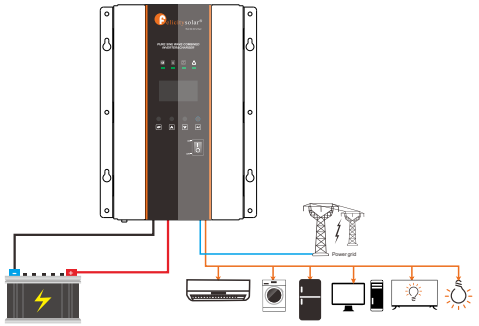




IVPS0712 Overview IVPS1512 Overview

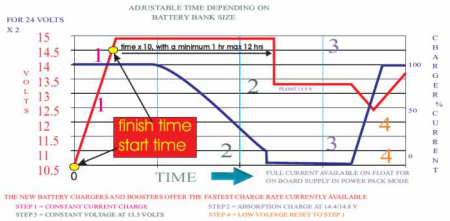
1. Battery negative terminal
2. Battery positive terminal
3. AC Input terminal
4. AC Output terminal
5. Remote control
6. RS-232
7. Fan

Connection diagram



SPECIFICATIONS

Line Mode Specifications		
Model	IVPS0712	IVPS1512
Rated Output Power(VA)	750VA	1500VA
Rated Output Power(W)	600W	1200W
Nominal DC Input Voltage	12V	12V
Input Voltage Waveform	Sinusoidal(Utility or generator)	
Nominal Input Voltage	220Vac	
Low Line Disconnect	90Vac±7Vac	
Low Line Re-connect AC Input Range	100Vac±7Vac	
High Line Disconnect	280Vac±7Vac	
High Line Re-connect	270Vac±7Vac	
Max AC Input Voltage	280Vrms	
Nominal Input Frequency	50Hz/60Hz	
Low Line Frequency Disconnect	40±1Hz	
Low Line Frequency Re-connect	42±1Hz	
High Line Frequency Disconnect	65±1Hz	
High Line Frequency Re-connect	63±1Hz	
Output Voltage Waveform	As same as input waveform	
Over-Load Protection (SMPS load)	AC 10A	
Output Short Circuit Protection	AC 10A	
Efficiency(Line mode)	⩾95% (Rated R load, and battery is fully charged)	
Pass Through Without Battery	No	
Max Bypass Overload Current	AC 10A	
Utility Charge Mode Specifications		
Nominal Input Voltage	220Vac	
Input Voltage Range	90~280Vac	
Nominal Output Voltage	Dependent on battery type	
Max Charge Current	15A	18A
Charge Current Regulation	0A~15A	0A~18A
Battery Initial Voltage	Circuit breaker	
Charger Short Circuit	AC 10A	
Breaker Size	Dependent on battery type or Self-defined	
Over Charge Protection	Yes	

Charge Algorithm			
Charging way	Three phases: Boost CC (constant current level) → boost CV (constant voltage level) →Float (constant pressure level)		
Charge Stage Transition Definitions	(1)Boost CC Stage: If A/C input is applied, the charger will run at full current in CC mode until the charger reaches the boost voltage. (2)Boost CV Stage: the charger will keep the boost voltage in Boost CV mode until the T1 timer has run out. Then drop the voltage down to the float voltage, when the charging current is lower than 20% setting value. (3)Float Stage: In float mode, the voltage will stay at the float voltage. If the A/C is reconnected or the battery voltage drops below 12Vdc, the charger will reset the cycle above. 		
Battery Type Setting	Battery Type	Boost CC, CV	Float
		12V	12V
	AGM	14.4V	13.6V
	Flooded	14.6V	13.8V
	Self Defined	Adjustable, up to 16V	

Inverter Mode Specifications		
Model	IVPS07512	IVPS1512
Output Voltage Waveform	Pure sine wave	
Nominal Output Voltage	220Vac±5%	
Nominal Output Frequency(Hz)	50±0.3Hz/60Hz±0.3Hz (Adjustable)	
Output Voltage Regulation	±5%rms	
Peak Efficiency	90%	
Output Short Circuit Protection	Yes	
Cold Start Voltage	11.5V	
Low Battery Alarm	Load < 50% , 11.5V / Load ≥ 50% , 11V	
Low Battery Recovery	Load < 50% , 11.75V / Load ≥ 50% , 11.5V	
Low DC Input Shut-down	Load < 50% , 10.75V / Load ≥ 50% , 10.5V	
High DC Input Alarm & Fault	15.75±0.4V	
High DC Input Recovery	15.5±0.4V	
Zero load power	8W	10W
General Specifications		
Operating temperature	0˚C~40˚C	
Storage temperature	-15˚C~60˚C	
Package Dimension	440x312x246MM	

FRONT PANEL

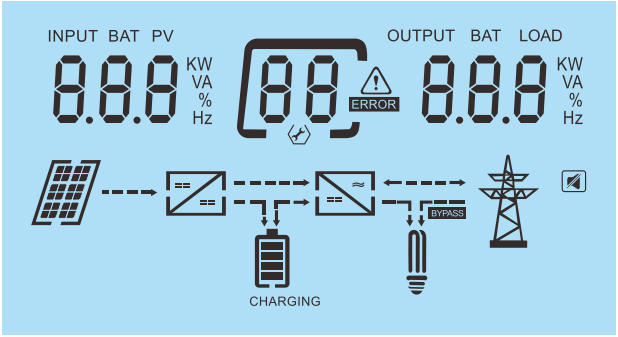
LED Indicator

LED Indicator			Messages
AC / INV	Green	Solid On	Output is powered by utility in Line mode.
		Flashing	Output is powered by battery or PV in battery mode.
CHG	Green	Solid On	Battery is fully charged.
		Flashing	Battery is charging.
FAULT	Red	Solid On	Fault occurs in the inverter.
		Flashing	Warning condition occurs in the inverter.

Function Keys

Function Key	Description
ESC	To exit setting mode
UP	To go to previous selection
DOWN	To go to next selection
ENTER	To confirm the selection in setting mode or enter setting mode

LCD DISPLAY ICONS



Icon	Function description
Input Source Information	
INPUT	Indicates the AC input.
INPUT 8.8.8 KW VA % Hz	Indicate input voltage, input frequency, battery voltage.
Configuration Program and Fault Information	
88	Indicates the setting programs.
88 ERROR	Indicates the warning and fault codes. Warning: flashing with warning code. Fault: lighting with fault code
Output Information	
OUTPUT BAT LOAD 8.8.8 KW VA % Hz	Indicate output voltage, output frequency, load percent, load in VA, load in Watt.
Battery Information	
	Indicates battery level by 0-24%, 25-49%, 50-74% and 75-100%.

In battery mode, it will present battery capacity.

Load Percentage	Battery Voltage	LCD Display
Load >50%	< 11.1V/PCS	
	11.1~ 11.6V/PCS	
	11.6V ~ 12.1V/PCS	
	> 12.1V/PCS	
Load < 50%	< 11.3V/PCS	
	11.3 ~ 11.8V/PCS	
	11.8 ~ 12.3V/PCS	
	> 12.3V/PCS	
Mode Operation Information		
		Indicates the utility.
BYPASS		Indicates load is supplied by utility directly.
		Indicates the inverter / charger is working.
Mute Operation		
		The alarm is disabled.

LCD SETTING

After pressing and holding “ENTER” button for 3 seconds, the unit will enter setting mode. Press “UP” or “DOWN” button to select setting programs. And then, press “ENTER” button to confirm the selection or ESC button to exit.

Setting items

Program	Description	Selectable option	
00	Exit setting		
02	Output frequency setting	50Hz(default) 	Output frequency configuration
		output frequency is 60Hz 	
03	Utility input range setting	Appliance mode(default) 	APL should be selected, when the utility is not well.
		UPS mode 	
05	Battery type setting	The battery type is self-define(default) 	If “Self-defined” is selected, battery charge voltage and low DC cut-off voltage can be set up in program 07, 08 and 11.
		The battery type is Flooded 	
		The battery type is AGM 	
		The battery type is Llb 	
06	Max utility charging current setting	9A (default) 	750VA: Setting range is from 0 to 15A 1500VA: Setting range is from 0 to 18A

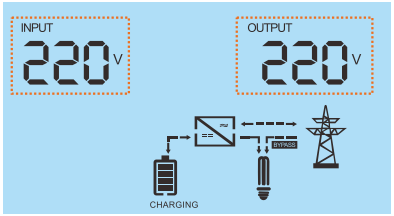
Setting items

Program	Description	Selectable option	
07	Bulk charging voltage setting (C.V voltage)	12V model(14.4V default) 	If self-defined is selected in program 05, this program is enable. Setting range is from 12.0V to 15.3V. Increment of each click is 0.1V.
08	Floating charging voltage	12V model(13.6V default) 	If self-defined is selected in program 5, this program is enable. Setting range is from 12.0V to 15.3V. Increment of each click is 0.1V.
09	Charger priority.	If inverter is working in utility mode, charge priority can be set as below. However, when inverter is working in Battery mode, only PV can charge battery.	
		PV first 	PV will charge battery first. Utility will charge battery only when PV is unavailable.
		PV and Utility (default) 	PV and utility will charge battery together.
		PV Only 	Only PV can charge the battery.
11	Low DC cut-off voltage	12V model(10.5V default) 	If self-defined is selected in program 5, this program is enable. Setting range is from 10.5V to 12.0V. Increment of each click is 0.1V.
12	Overload bypass function	Disable (default) 	If it is enabled, the inverter will switch to utility mode if overload happens in battery mode.
			
15	Buzzer Alarm	Enable (default) 	
			

17	Back light of LCD	**Enable (default)** bL 17 ENA	Setting the control of LCD backlight enable, LCD backlight will always-on. Setting the control of LCD backlight disable,have no operation the LCD backlight will go out after 60s.
		bL 17 dIS	
18	Output source priority	**Utility first (default)** OPS 18 UtI	Utility will provide power to the loads first, battery will provide power to the loads only when utility power is not available.
		PV first OPS 18 PV	PV provides power to the loads first. If PV energy is not sufficient, battery will feed power to the loads. Utility provides power to the loads only when any one condition happens: (1) PV is unavailable; (2)Battery voltage drops to low-level warning voltage or the setting point in program 19.
18	Output source priority	**Battery first** OPS 18 bAt	battery provides power to the loads first, utility provides power to the loads only when battery voltage drops to either low-level warning voltage or the setting point in program 19. And when battery voltage return to the setting point in program 20, the inverter will switch to battery mode;
19	Setting battery voltage point back to utility when selecting "BAT priority" in program 18.	**12V model (default 11.5V)** bUV 19 11.5V	Setting range is from 11.0V to 12.8V. Increment of each click is 0.2V/0.3V.
20	Setting battery voltage point back to battery mode when selecting "BAT priority"in program 18.	**12V model(default 13.5V)** bbV 20 13.5V	Setting range is from 12.0V to 14.5V. Increment of each click is 0.2V/0.3V. "FUL" means the battery should be charged to float mode;
37	Power Key Mode	**Output off (default)** Ptn 37 OOF	When power key is off and utility is charging to battery, Output is off.
		Output on Ptn 37 OON	When power key is off and utility is charging to battery, Output is on.

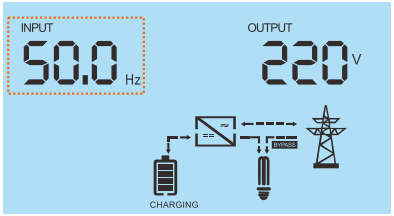
DISPLAY INFORMATION

The LCD information will be switched by pressing "UP "or "DOWN" key. The selectable information is switched as below order: input voltage/frequency, battery voltage, charging current, output voltage / frequency, load percent, load in Watt, load in VA, load in Watt, main CPU Version.



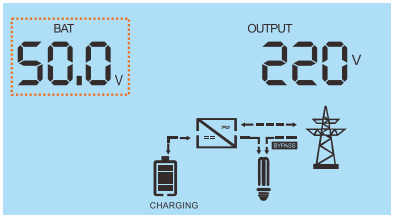
Input voltage/Output voltage

Utility voltage is 220V, output voltage is 220V



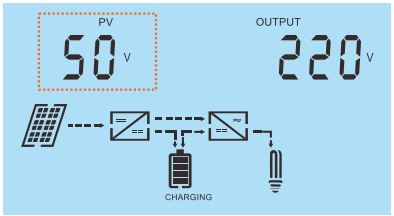
Input frequency

Utility frequency is 50.0Hz



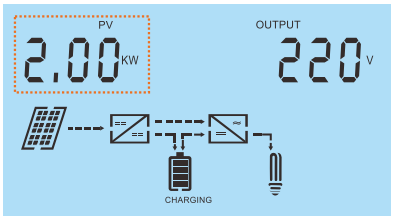
Battery voltage

Battery voltage is 50.0V



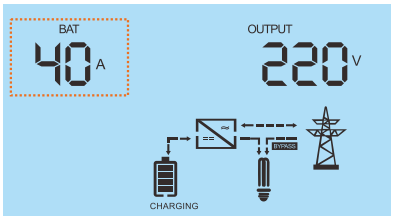
PV voltage

PV voltage is 50V
(for PWM / MPPT Charge Controller)



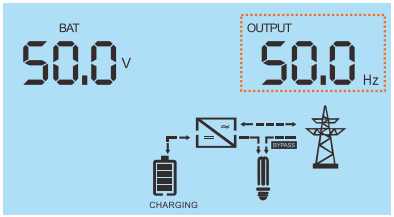
PV power

PV power is 2KW
(for PWM / MPPT Charge Controller)



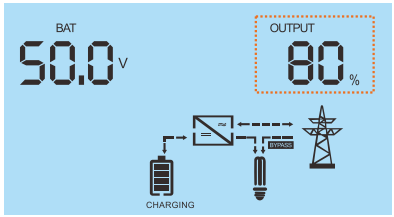
Charging current

Charging current is 40A



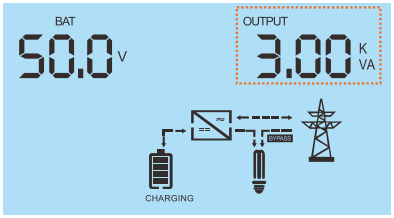
Output frequency

Output frequency is 50Hz



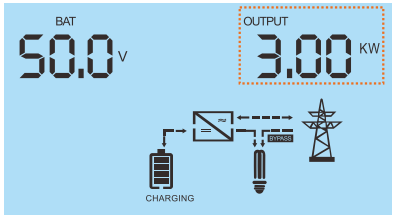
Load percentage

Load percent is 80%



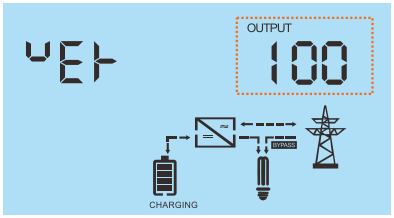
Load in VA

The load is 3.0KVA



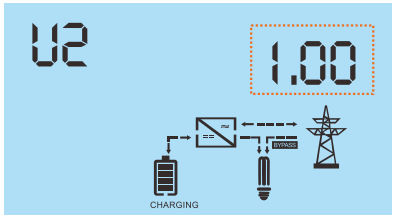
Load in Watt

The load is 3.0KW.



CPU software version

CPU software version 100

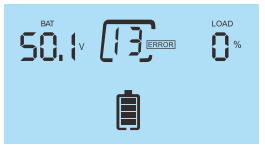
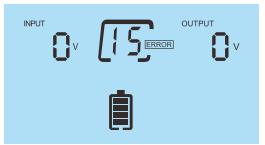
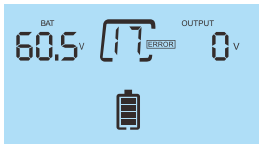
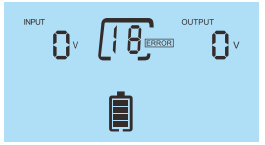


PWM Charge Controller software version

CPU software version 1.00
PWM Charge Controller software version
(for PWM Charge Controller Build-in)

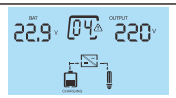
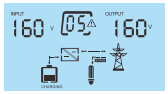
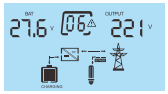
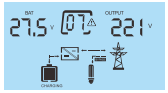
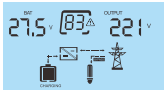
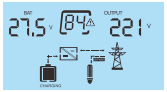
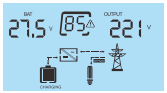
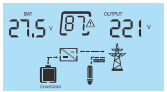
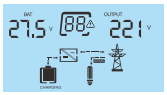
FAULT CODE TABLE

When fault event happens, inverter will cut off output, and the red LED is solid on. At the same time, fault code is shown on the LCD screen.

Fault Code	Fault information	Trouble Shooting	
13	Overload happens	Not allowed to overload when the inverter in battery mode, If overload, please turn off the inverter first, and then decrease the load let the load power less than the rated output power of invert, turn on the inverter again. If overload and the AC input is on, wait for 30s and it will clear away the fault automatically and work normally.	
14	Output voltage high	Restart the inverter or Contact our engineer.	
15	Output short	If AC input is on, must cut off the AC input first and then turn off the inverter, disconnect all AC output wiring and turn on it. If the screen still display fault, please connect our engineer. And if the inverter can work again, please check the output wiring and load, make sure all of them not shorted connection.	
17	Battery voltage high	Read the battery voltage from the screen, and measure the voltage of battery with multimeter . if both of the voltage are more than 60v, maybe the battery have some problem we must stop using it.	
18	Over temperature	Turn off the inverter, let it cool down, after the temperature back to normal and you can use it again.	
21	Over current happen in charging mode	Please contact our engineer.	
22	Inv soft start timeout	Please contact our engineer.	
24	Output voltage low	Turn off the inverter, disconnect all AC output wiring and then turn on it, if it still fault please contact our engineer, if it work normally, please check the output whether connect a big power load, disconnect the big one and turn on the inverter, confirm it can work normally.	
28	Current sensor is abnormal	Please contact our engineer.	

WARNING CODE TABLE

When warning event happens, the red LED is flashing. At the same time, the warning code is flashing on the LCD screen.

Warning Code	Warning information	Trouble Shooting	
01	Overload happens	Battery mode, the inverter forbid to over-load, the last working time will depend on the percent of load. Utility mode, the inverter allow to overload but the maximum current will be less than 30A.	
04	Battery low	The voltage of battery is too low, the battery should be charging.	
05	Power derating (low utility voltage)	Read the voltage from the screen and confirm the voltage of AC input is about 90-170v. If it is ,means the voltage of AC input is low, it can work normally. If not, please contact our engineer.	
06	TX NTC is disconnected	Please contact our engineer.	
07	INV NTC is disconnected	Please contact our engineer.	
/	Flash	City electricity is not match to the inverter	
83		Faults for over charging current of built in MPPT	
84		Faults for battery low voltage of built in MPPT	
85		Faults for battery high voltage of built in MPPT	
87		Faults for high temperature of built in MPPT	
88		Faults for pv over voltage of built in MPPT	

MPPT CHARGER CONTROLLER MATCH TO THE INVERTER

In actually application system, MPPT controller and inverter will charge the battery at the same time, the charging current will excessive to occur unsafe situation, so we add the function of match the inverter and the MPPT controller to protect the battery more better, and more scientific to management the charging from solar panel or utility source.

NOTE: The inverter and MPPT controller are both just from our company can be matched and the maximum continuous charging current should be no more than 30% of the battery capacity. For example for the 48V200AH battery pack ,the continuous charging current should be less than 60A.

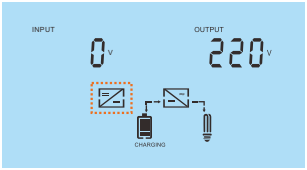
The inverter match to the MPPT controller have 2 main function

1.Enable or disable inverter to match MPPT function.(Special note: when the inverter upgrades the firmware, it needs to disable the function matching MPPT first)

2.Limited the the inverter charging current, the method as follow: A) When the MPPT charging current ≥ the current limited by the inverter ,and then the inverter maximum charging current is 0.B)When the MPPT charging current < the current limited by the inverter, the inverter maximum charging current =the total charging current set by the inverter -MPPT charging current.

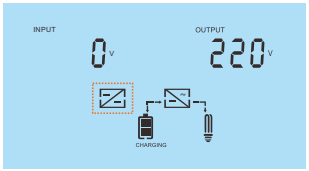
Match the inveter to the MPPT controller:

1. To enable the inverter to match the MPPT controller, the inverter and MPPT controller should be switched on first, and the communication lines between them have been connected;
2. Then press the "Down" button of the inverter for more than 2.5 seconds, until the MPPT charger icon flashes. Release the button,. The icon flash indicates that the inverter is trying to communicate with MPPT.The icon of the inverter stops flashing 10 seconds after the button is released, and when the communication is successful, it means that it has been enabled successfully.
3. Once enabled successfully, matching MPPT function flag will be saved in EEPROM, and restart the inverter needn't to manually enable again.
4. After successful enabling, the pv-voltage, power and other information of MPPT will be displayed when page-turning on the LCD screen.

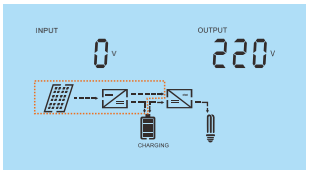
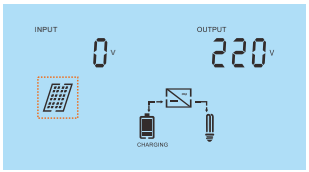
Action	Instruction	LCD display
Match the MPPT function enable	Long press "Down" button until the icon in the red box in the right picture flashes, indicating that the inverter is trying to communicate with MPPT. The icon stops flashing after the inverter loosens the button for 10 seconds	

MATCHING MPPT FUNCTION IS PROHIBITED:

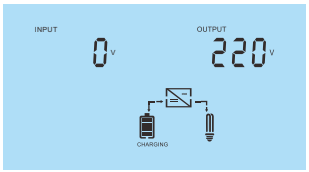
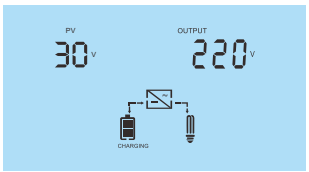
1. To prevent the inverter from matching the MPPT function, the MPPT should be turned off or the communication connection between the two should be disconnected.
2. Then long press the "Down" button of the inverter for more than 2.5 seconds, until the MPPT charger icon flashes. At this point, the button can be released. The flashing icon indicates that the inverter is trying to communicate with MPPT. The flashing icon will stop 10 seconds after the button is released. Failure to communicate indicates a successful prohibition.
3. After successful prohibition, matching the MPPT function flag will be saved in EEPROM. Restart the inverter without manual prohibition again.
4. After successful prohibition, pv-voltage, power and other information of MPPT will no longer be displayed on the LCD screen.

Action	Instruction	LCD display
Matching MPPT function is prohibited	Long press "Down" button until the icon in the red box in the right picture flashes, indicating that the inverter is trying to communicate with MPPT. The icon disappears after the inverter loosens the button for 10 seconds	

MATCHING MPPT FUNCTION SUCCESSFULLY ENABLED:

Action	Instruction	LCD display
Match MPPT function to enable successfully	If MPPT is in charging state: When the MPPT function is successfully enabled, the icon in the red box in the right picture will appear	
Match MPPT function to enable successfully	If MPPT is not in the charging state, but PV voltage is greater than 30V and is in the startup state: When the MPPT function is successfully enabled, the icon in the red box in the right picture will appear	

Matching MPPT function is prohibited successfully:

Action	Instruction	LCD display
Match MPPT function	When the matching MPPT function is prohibited successfully, MPPT icon information will no longer be displayed	
Whether matching MPPT function enables judgment	1. If the MPPT function is enabled, the LCD interface page turning will display PV voltage,power and other information; 2. If the matching MPPT function is prohibited, the LCD interface page turning will not display PV voltage, power and other information;	

Power inverter