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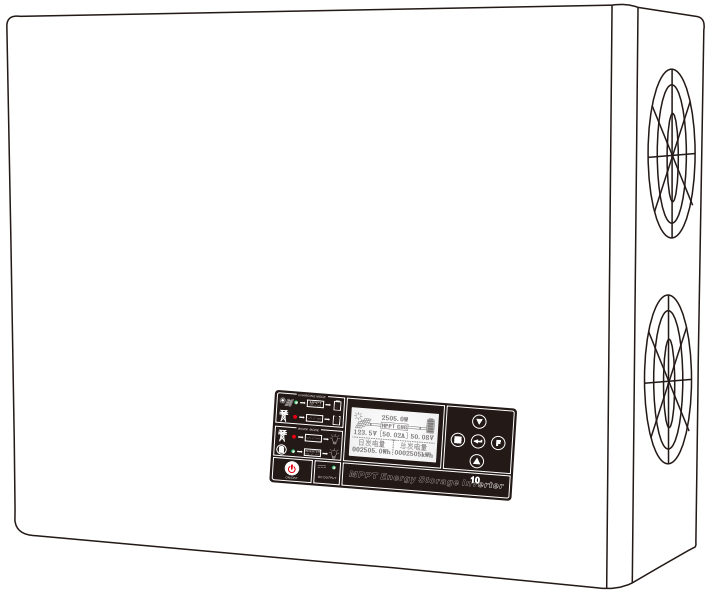
MPPT
Solar Energy Storage Inverter

user manual



ATO-IC series
Model:0.5kw-6KW

Content

1 Safety instructions

Safety instructions

Operating	Danger
	• Before operating, please make sure this product is operated within the allowed working range, otherwise, it will cause damage to this product. • When do not use this product for long time, the battery should be full charged, and battery breaker should be disconnected to avoid battery full discharged caused by long term standing of battery • When do not use this product for long time, it should be charged for more than 2-4 hours by AC or solar energy input after charging the battery breaker should be disconnected.
Maintenance overhaul	Danger
	When disassemble the shell, please do disconnect solar energy input, AC input, AC output and battery breaker, otherwise there will be risk of electric shock. Even after disassembling the sell, there will remains electricity inside the machine, please do no touch naked part of the wire directly to avoid electric shock. Maintenance and overhaul should be conducted by professional maintenance personnels, uses do not disassemble the machine by themselves, otherwise it will cause electric shock and damage to this product.
Others	Danger
	Transforming by oneself is prohibited to avoid serious accident. When abnormal situation appears inside the machine, please disconnect battery breaker and power source input and output wire immediately. If the machine is on fire by any chance, please use dry powder extinguisher and disconnect all switches immediately.

1 Safety instructions

1.1 Safety responsibility immunities

Users should read this chapter carefully and operate according to safety cautions required by this chapter when installing, use and maintain this product. If there appears damage or loss caused by violation operations, it has no business with our company.

1.2 Safety sign illustration

Note: due to dangers caused by violation operations, it might result in moderate damage or light injury to person as well as damage to products.

Danger?Due to dangers caused by violation operations, it might result in fire, persons serious injury even death.

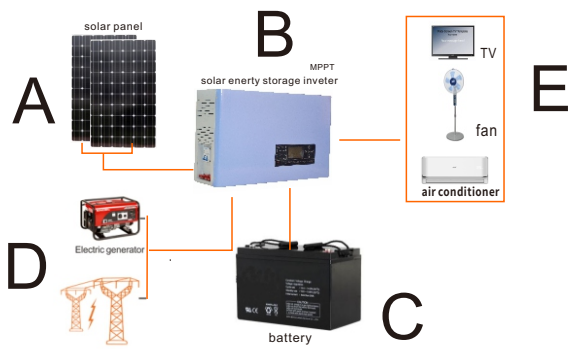
Safety instructions

Transport	Danger
	It should avoid strong vibration, fall, collisions and packing box upset down is prohibited during moving.Do not loss accessories, instructions and guarantee card etc. during unpacking and moving.
	Note
	Please pay attention to safety during moving to avoid harming to your body.
Unpacking and inspecting	Note
	• If product damage or lack of components, you can not install, or accident maybe happened. • If packing list not agree with the product, please do not install and contact supplier on time.
Installation	Danger
	• Wiring work must be conducted by qualified electrical engineering personnel, otherwise there is risk of electric shock or damage to the system • Must make sure power supply is off before wiring, or there is risk of electric shock or fire. • Solar energy input need good lightning protection, AC input has overload and electricity leakage protection. • Cables must meet with related requirements, distribution section must meet with safety regulations. • Installing must be conducted strictly according to installation steps illustrated in the following chapters, otherwise it will cause damage to products.
	Note
	• When moving and installing, please handling with care to avoid injuring feet or damage to products. • This product should be keep away from inflammable objects and heat source, as well as no shelter to back panel cooling fan. • When installing, do keep sundries from dropping inside the product, otherwise it will cause system failure. • The product must be ground connected reliably, ground wire should be as short as possible, to avoid electric shock.

2 Product description

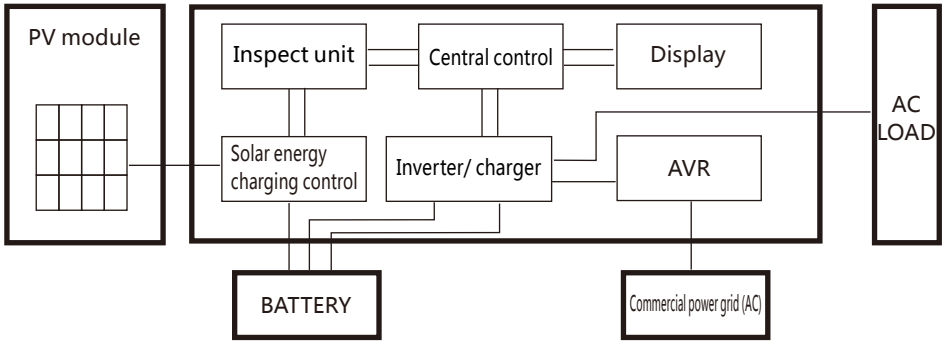
2.1 Consists of off-grid PV power system

The off-grid PV power system consists of PV modules, controller/ inverter, batteries and AC(power grid).



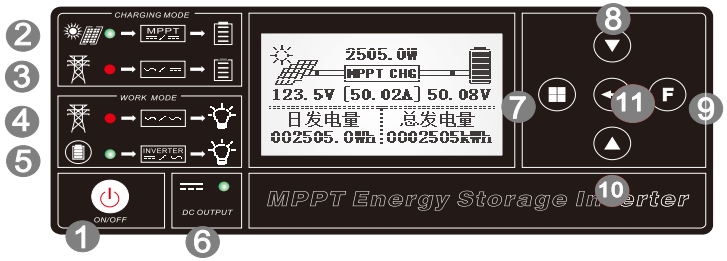
Name	Describe	Note
A	PV module	Monocrystalline, polycrystalline
B	inverter	Charging control unit/ inverter unit
C	Battery	Optional battery type(the defaultitem is lead-acid battery)
D	Commercial power grid (AC)	50Hz/220V、230V、240V 60Hz/110V、120V
E	AC load	Inductiveness, resistiveness, capacitive

2.2 System block diagram



2 product description

2.3 Product components description

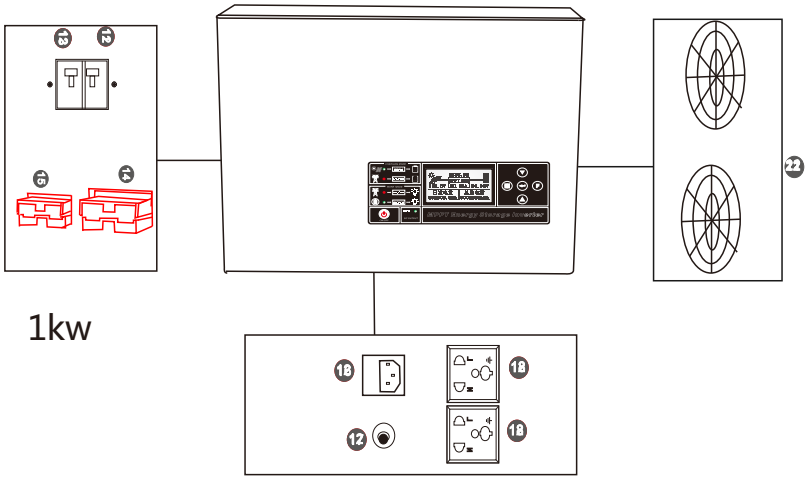


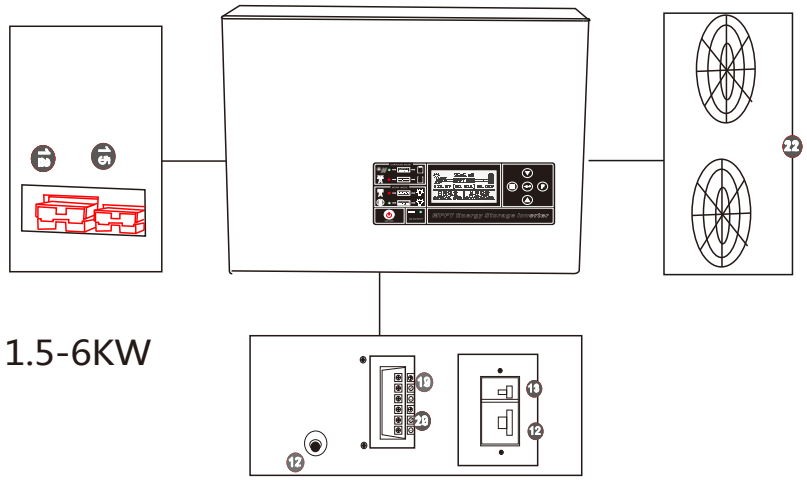
LCD display panel

Description of machine identification	
1	Main power switch
2	Solar charging mode
3	AC charging mode
4	AC priority
5	DC priority
6	DC output indicator light
7	Menu
8	Down
9	Shortcut key
10	Up
11	Enter
12	Battery switch
13	Solar charging switch
14	Battery connection port
15	Solar input port
16	AC input port
17	Reset protection
18	Output universal socket
19	AC input
20	AC output
21	Cooling fan

2 product description

2.3 Product components description





3 Technical data

Model	0730	1030	1530	1560	2030	2060	3030
Rated Capacity	700W (1000VA)	1000W (1500VA)	1500W(2000VA)		2000W(3000VA)		3000W (5000VA)
Max.PV input voltage(Vdc)	12V (DC18V~DC150V) ; 24V(DC34V~DC150V);48V(DC65V-150V); 96V(DC130-DC180V)						
Max.charge current(A)	30A	30A	30A	60A	30A	60A	30A
Battery voltage(Vdc)	12/24V	12/24V	24/48V	24/48V	24/48V	24/48V	24/48V
Max.PV input power(W)	420W/840W	420W/840W	420W/840W	1700W/3400W	840W/1650W	1700W/3400W	840W/1650W
Battery float voltage(Vdc)	12V(13.75V);24V(27.5V)48V(55V);96V(110V)						
Battery equalizing charge voltage(Vdc)	12V(14.2V); 24V(28.4V);48V(56.8V);96V(113.6V)						
Battery	Optional						
AC charging current (A)	Standard:0-30A						
AC output voltage(Vac)	110/220/230/240±3%						
AC output frequency(Hz)	50/60±3%						
efficiency	≥85%						
Overload capacity	105-120% 30S;120-150% 10S;>150% 5S						
Output wave	Pure sine wave						
Output power factor	≥0.8(> 30% Load)						
Wave form distortion factor	≤3%						
Switch time	≤4mS						
Complete protections	DC&AC overload,under-voltage,SPD,short-circuit,overcharge,over discharge,over-temperature,ect						
Cooling	High-velocity fan cooling						
Noise emission [dBA]	<60						
Operating temperature range(℃)	-10 ~ 50						
Relative humidity in operation	10% ~ 90%(non considensing)						
Max.operating altitude(M)	<5000 (>1000m,derating)						
Float charge current Charge voltage (lead acid battery)	12V System	13.75V	can custom float voltage				
	24V System	27.5V					
	48V System	55V					
	96V System	110V					
Equalizing Charge voltage (lead acid battery)	12V System	14.2V	can custom Equalizing voltage				
	24V System	28.4V					
	48V System	56.8V					
	96V System	113.6V					

3 Technical data

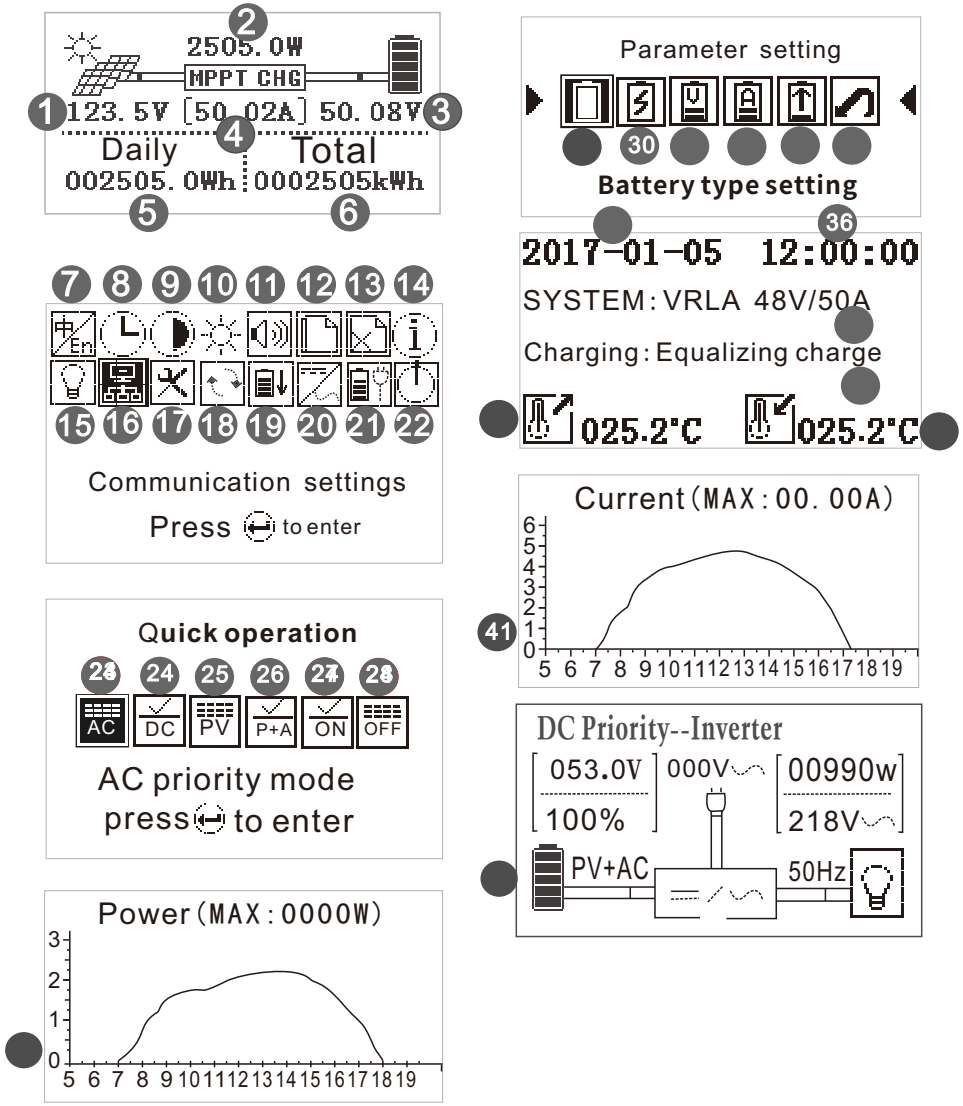
Model	3060	4060	4060-96V	5060	5060-96V	6060	6060-96V
Rated Capacity	3000W (5000VA)	4000W(6000VA)		5000W(7000VA)		6000W(8000VA)	
Max.PV input voltage(Vdc)							
Max.charge current(A)	60A	60A	96V60A	60A	96V60A	60A	96V60A
Battery voltage(Vdc)	24/48V	24/48V	96V	48V	96V	48V	96V
Max.PV input power(W)	1700W/ 3400W	840W/1650W	6800W	3400W	6800W	3400W	6800W
Battery float voltage(Vdc)	12V(13.75V);24V(27.5V)48V(55V);96V(110V)						
Battery equalizing charge voltage(Vdc)	12V(14.2V); 24V(28.4V);48V(56.8V);96V(113.6V)						
Battery	Optional						
AC charging current (A)	Standard:0-30A						
AC output voltage(Vac)	110/220/230/240±3%						
AC output frequency(Hz)	50/60±3%						
efficiency	≥85%						
Overload capacity	105-120% 30S;120-150% 10S;>150% 5S						
Output wave	Pure sine wave						
Output power factor	≥0.8(> 30% Load)						
Wave form distortion factor	≤3%						
Switch time	≤4mS						
Complete protections	DC&AC overload,under-voltage,SPD,short-circuit,overcharge,over discharge,over-temperature,ect						
Cooling	High-velocity fan cooling						
Noise emission [dBA]	<60						
Operating temperature range(℃)	-10 ~ 50						
Relative humidity in operation	10% ~ 90%(non considensing)						
Max.operating altitude(M)	<5000 (>1000m,derating)						
Float charge current Charge voltage (lead acid battery)	12V System	13.75V	can custom float voltage				
	24V System	27.5V					
	48V System	55V					
	96V System	110V					
Equalizing Charge voltage (lead acid battery)	12V System	14.2V	can custom Equalizing voltage				
	24V System	28.4V					
	48V System	56.8V					
	96V System	113.6V					

8 Technical data of MPPT solar charger controller

Model		12/24/48V					48/96V		
		TYC-20IR	TYC-30IR	TYC-40IR	TYC-50IR	TYC-60IR	TYC-40A96	TYC-50A96	TYC-50A96
		TYC-20AL	TYC-30AL	TYC-40AL	TYC-50AL	TYC-60AL	TYC-40AL96	TYC-50AL96	TYC-50AL96
Charge mode		MPPT Automatic maximum power point tracking							
Charge method		3 stage :constant currenet(MPPT),equalizing charge,float charge							
System type		12/24/48V Automatic identify、48/96V Automatic identify (36V、72V manual setting)							
Short -start time		≤10S							
Dynamic response time to recover		≤500us							
Quiescent dissipation		≤2W							
Machine efficiency		≥96.5%							
PV module utilization		≤99.97%							
Limit the input votage		DC170V(96V：225V)							
input over-voltage protection points		DC175V(96V:230V)							
input over-voltage recovery points		DC170V(96V:225V)							
Identify range of battery voltage	12V	DC9V-15V							
	24V	DC18V-30V							
	48V	DC36V-60V							
	96V	DC72V-120V							
Input characteristics									
MPPT working voltage range	12V	DC18V-150V							
	24V	DC34V-150V							
	48V	DC65V-150V							
	96V	DC130V-180V							
Input low voltage protection points	12V	DC16V							
	24V	DC30V							
	48V	DC60V							
	96V	DC120V							
Input low pressure recovery points	12V	DC18V							
	24V	DC34V							
	48V	DC65V							
	96V	DC130V							
The maximum input power of solar panel	12V	280W	420W	570W	700W	900W	48V2270W/ 96V5540W	48V2800W/ 96V5600W	48V3400W/ 96V6800W
	24V	550W	840W	1130W	1400W	1700W			
	48V	1100W	1650W	2270W	2800W	3400W			
		Output characteristics							
Optional battery type(the default is lead-acid battery)		Lead-acid battery,colloidal batteries,liquid batteries,lithium batteries (Also can be customized for other types of battery charging)							

Note:
If "TYC" MPPT controller is not installed in our inverter-controller, this part of MPPT functions and data can not be displayed on the screen.

4 LCD display description



4 LCD display description

Functional description	
1	Solar input voltage
2	Solar power generation
3	Battery voltage
4	Battery charging current
5	Daily electricity generation
6	Cumulative power generation
7	Language settings
8	Date and time settings
9	Contrast settings
10	Brightness setting
11	Sound setting
12	Record query(Fault record)
13	Clear record
14	SYS info query
15	DC output setting
16	Communication settings
17	Operating parameter settings
18	Working mode
19	Charging mode
20	Switching voltage setting
21	Mains charging setting

4 LCD display description

Functional description	
22	Standby mode
23	City power priority mode
24	Battery priority mode
25	Solar charging mode
26	Solar+city power charging mode
27	Boot mode
28	Standby mode
29	Battery type setting
30	Rated voltage setting
31	Charging voltage setting
32	Charging current setting
33	Discharge limit setting
34	Restore factory settings
35	Display date
36	Display time
37	System specifications and capacity
38	Charging state
39	External temperature
40	Real-time temperature
41	Current curve
42	Power curve

5 Functional Setting attention

1.Factory reset password

When the operating parameters are set incorrectly to cause MPPT controller not work, the operating parameters can be restored to the factory settings.

Press DOWN key 3 times and press UP key 3 times, then press ENTER key to enter the operation parameter

2.Charge votage setting

Lithium battery series only have float (constant voltage) charging mode, and the equalizing chargemode is use by lead-acid battery series.

3.Battery type setting

The factory default is to automatically recognize the rated voltage grade. The automatic identification of rated voltage grade only identify lead-acid battery series. Lithium battery is not included in the automatic identification range. When the voltage grade is automatically recognized, the setting of charge voltage and the discharge lower limit voltage are not allowed. It must be manually set the voltage grade first, and then to set the charge voltage and discharge lower limit voltage.

4.Operation parameter setting

Note: The operation parameter setting must be conducted by qualified electrical engineering personnel, otherwise the mis-operaton might cause the MPPT does not work or damage the battery.

Note: Before setting the operating parameters, you must disconnect the PV module from the MPPT controller. Then in order set below parameter: 1. battery type setting, 2. the rated voltage setting, 3. the charging voltage setting, 4. the charging current setting, 5.the discharging lower limit setting. And then check the displayed parameter of system information whether it is consistent or not.

5.Power test run

Note: Before power test, please check all the DC wire positive and negative terminals are fully connected correctly.

Please follow below steps to operate:

1. Check the positive and negative terminals of wire must be full connected correctly, and measure that whether the open circuit voltage of the PV module is within the operating range of the controller.
2. Firstly, turn on the circuit breaker of the connection of controller and battery.
3. Secondly, turn on the circuit breaker of the connection of controller and solar panel.
4. Finally, the controller starts to enter the self-test mode; if the system conditions are correct, the controller automatically enter the work mode; if the system conditions are not correct, the controller will be a fault prompt, refer to the chapter to solve the fault.
5. Battery type, the controller factory default is lead-acid battery, please refer to the battery type settings.

5 Functional setting attention

6.Record query

In the default main interface, press the ENTER key to enter the main menu, press the DOWN key to select the record query, press the ENTER key to enter the record query, press the DOWN key or UP key to select the curve record query or fault record query, press the ENTER key to enter the curve record query or Fault record query, press the DOWN or UP key to enter the record, a total of 10 records. Press MENU to return to the previous menu and main interface. 16

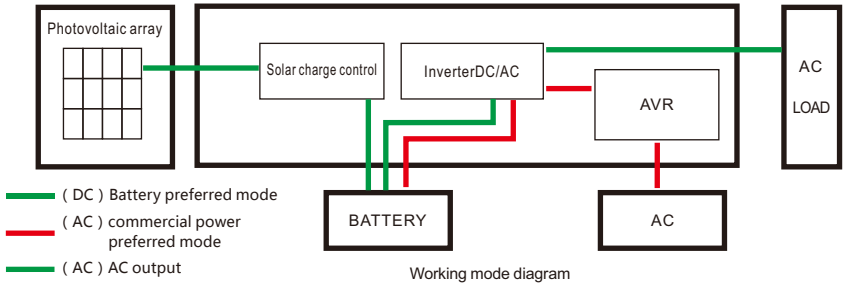
6.4.11.2 Battery rated voltage

i The factory default is to automatically recognize the rated voltage grade. The automatic identification of rated voltage grade only identify lead-acid battery series. Lithium battery is not included in the automatic identification range. When the voltage grade is automatically recognized, the setting of charge voltage and the discharge lower limit voltage are not allowed. It must be manually set the voltage grade first, and then to set the charge voltage and discharge lower limit voltage.

i Lithium battery series only have float (constant voltage) charging mode, and the equalizing chargemode is use by lead-acid battery series.

6 Work mode instructions

Work mode instructions



Working mode diagram

（1） （DC） Battery preferred mode

Under (DC) battery preferred mode, the batteries supply power to load, as shown of green arrow in the above picture.

1、not only the power produced by solar panels will supply to user's appliances, but also the redundant power will be restored in the batteries

2、When power produced by solar panels is not sufficient for user's load, the power restored in batteries will supplement to load.

3、When batteries's power is not sufficient, power produced by solar panels is not sufficient, the system will switch over to AC to supply power to load. If batteries' power is gravely insufficient, the system will switch over to AC to supply power to load, besides, it will automatically start up AC to charge for batteries. When batteries are full charged to 100%, the system will return to (DC) battery work mode automatically.

（2） （AC） commercial power preferred mode

Under (AC) commercial power preferred mode, commercial power supply power to load, it is output to load through system AVR and isolating part, to make sure the stability of output power source.

1. AC input supply power for user's load, at this time, power produced by solar panels only charge for batteries.
2. When batteries' power is gravely insufficient, except for supply power for users' load, AC will start up to auxiliary charge for batteries. But it won't fully charge to batteries.
3. When AC is off or abnormal, the system will switch over to batteries to supply power for load.

（3） Power saving mode

Under power saving mode, users can set the charging mode to PV charge preferred mode, at this time, AC will not charge to batteries.

（4） Off-peak power consumption mode

For countries and regions where electric accounted according to time-of use, users can set timing work mode switching according to requirements.Regarding off-peak power consumption function, it will use AC power during the time of low power grid load and cheap power rate, it will fully charge to batteries at the same time.During the time of peak power grid load, it will make use of power stored in batteries to realize the purpose of off-peak power consumption and save electricity cost.

7 Trouble shooting and solutions

Trouble shooting and solutions		
Abnormal phenomena		solution
inverter	Overheated	1. Pls check whether the inverter is placed next to the heat source. Whether the fan port of the inverter has a shelter and the fan is working.
	Overload	1. Reduce load
	Battery overdischarge	1. The battery capacity is small and pls reduce load. 2. Battery aging. Pls repalce battery. 3. Weather. Extended charging time
	Output short circuit	1. Checking circuit.If it is due to overload, pls reduce the electrical load and restart the machine.
	Mains is not charged	1. Check for mains input. 2. Pls select AC prority option for working mode in the menu and choose PV+AC for charging mode.
	No AC output	1.The system is in standby mode, pls restart. 2.The system is in alarm protection state, pls release the alarm.
Controller	PV is not charging	1.Whether the operating voltage of the photovoltaic module within the operating range of the MPPT controller. 2.Check if the voltage displayed on the PV system screen is accurate or not. 3.Check whether the photovoltaic input switch of the controller is disconnected or not.
	No curve display	1.Check whether the time on the controller screen coincides with the time in the location

9 Quality guarantee

If the product fails during the quality assurance period, our company will provide free maintenance services or replace new products.

Evidence

During quality guarantee, our company requires customer shows purchase invoice and date of the products. At the same time, logo on the products should be clear and distinct, or we have the right not to provide quality guarantee.

Conditions

- Substandard products after replacement should be handled by our company.
- Customer should leave reasonable maintenance time to repair the failure equipment.

Responsibility immunities

Our company have the right not to provide quality guarantee on the conditions below:

- The whole machine or components have exceeded free guarantee period.
- Transportation damage
- Incorrect installation, modification or use.
- Operated beyond very harsh environment illustrated in this manual.
- Machine failure or damage caused by maintain, change or disassemble by non-our company services.
- Damages caused by abnormal natural environment.

Products failure caused by situations above, if customer requires maintenance service, we can provide paid maintenance service after our company service institution judgments.

Illustration

Any variation in product dimension and parameters will be subject to our company latest information, without prior notice.