Preface

Usage

This manual introduces the main features, performance, and working principles of the intelligent modular UPS, and provides users with information on installation, use, operation, and maintenance.

Users

Technical support engineer
Maintenance engineer

Note

Our company is providing a full range of technical support and service. Customers can contact our local office or customer service center for help.
The manual will update irregularly, due to the product upgrading or other reasons.
Unless otherwise agreed, the manual is only used as guide for users and any statements or information contained in this manual make no warranty expressed or implied.

CONTENTS

1. Safety Precautions

Before handling, installation, operation, and maintenance, please read the instruction manual carefully and follow all safety precautions in the instruction manual. If ignored, it can cause personal injury or equipment damage, or even death.
Our Company shall not be liable for injuries and damage to equipment caused by your company or your customers' failure to comply with the safety precautions of the instruction manual.

Safety Message Definition

Danger: Serious human injury or even death may be caused, if this requirement is ignored.
Warning: Human injury or equipment damage may be caused, if this is requirement is ignored.
Attention: Human injury or equipment damage, loss of data or poor performance may be caused, if this requirement is ignored.
Commissioning Engineer: The engineer who installs or operates the equipment should be well trained in electricity and safety, and familiar with the operation, debug, and maintenance of the equipment.

Warning Label

The warning label indicates the possibility of human injury or equipment damage, and advised the proper step to avoid the danger. In this manual, there are three types of warning labels as below.

Labels	Description
 Danger	Serious human injury or even death may be caused, if this requirement is ignored.
 Warning	Human injury or equipment damage may be caused, if this requirement is ignored.
 Attention	Human injury or equipment damage, loss of data or poor performance may be caused, if this requirement is ignored.

Safety Instruction

 Danger	✧ Performed only by commissioning engineers. ✧ This UPS is designd for commercial and industrial applications only, and is not intended for any use in life-support devices or system.
 Warning	✧ Read all the warning labels carafully before operation, and follow the instructions.
	✧ When the system is running , do not touch the surface with this label, to avoid any hurt of scald.
	✧ ESD sensitive components inside the UPS, anti-ESD measure should be taken before handling.

Move & Installation

 Danger	✧ Keep the equipment away from heat source or air outlets. ✧ In case of fire, use dry powder extinguisher only, any liquid extinguisher can result in electric shock.
 Warning	✧ Don't start the system if any damage or abnormal parts founded. ✧ Contacting the UPS with wet material or hands may be subject to electric shock.
 Attention	✧ Use proper facilities to handle and install the UPS. Shielding shoes, protective clithes and other protective facilities are necessary to aviod injury. ✧ During positioning, keep the UPS way from shock or vibration. ✧ Install the UPS in proper environment, more detail in section 2.3. ✧ Prevent screws, cables, and other conductive objects from falling into the UPS

Debug & Operate

 Danger	✧ Make sure the grounding cable is well connected before connecting the power cables, the grounding cable and neutral cable must be in accordance with the local and national codes practice. ✧ Before moving or re-connecting the cables, make sure to cut off all the input power sources, and wait for at least 10 minutes for internal discharge. Use a multi-meter to measure the voltage on terminals and ensure the voltage is lower than 36V before operation.
 Attention	✧ The earth leakage current of load will be carried by RCCB OR RCD. ✧ Initial check and inspection should be performed after long time storing of UPS.

Maintenance & Replacement

 Danger	✧ All the equipment maintenance and servicing procedures involving internal access need special tools and should be carried out only by trained personnel. The components that can be accessed by opening the protective cover with tools cannot be maintenance by user. ✧ This UPS full complies with "IEC62040-1-1-General and safety requirements for use in operator access area UPS". Dangerous voltages are present within the battery box. However, the risk of contact with these high voltages is minimized for non-service personnel. Since the component with dangerous voltage can only be touched by opening the protective cover with a tool, the possibility of touching high voltage component is minimized. No risk exists to any personnel when operating the equipment in the normal manner, following the recommended operating procedures in this manual.
 Attention	✧ Tighten the screws with a suitable torque ✧ During maintenance, maintenance and component replacement, it is important to avoid contact with or incidental flammable items from the UPS and components. ✧ During maintenance, maintenance and component replacement, anti-static measures must be taken against static on the UPS and internal components

Battery Safety

 Danger	✧ All the battery maintenance and servicing procedures involving internal access need special tools or keys and should be carried out only by trained personnel. ✧ When connected together, the battery terminal voltage will exceed 400Vdc and is potentially lethal. ✧ Battery manufacturers supply details of the necessary precautions to be observed when working on, or in the vicinity of a large bank of battery cells. These precautions should be followed implicitly at all times. Particular attention should be paid to the recommendations concerning local environmental conditions and the provision of protective clothing, first aid and fire-fighting facilities. ✧ Ambient temperature is a major factor in determining the battery capacity and life. The nominal operating temperature of battery is 20℃. Operating above this temperature will reduce the battery life. Periodically change the battery according to the battery user manuals to ensure the back-up time of UPS. ✧ Replace the batteries only with the same type and the same number, or it may cause explosion or poor performance. ✧ When connecting the battery, follow the precautions for high-voltage operation before accepting and using the battery, check the appearance of the batteries. If the package is damaged, or the battery terminal is dirty, corroded or rusted or the shell is broken, deformed or has leakage, replace it with new product. Otherwise, battery capacity reduction, electric leakage or fire may be caused. ✧ Before operating the battery, remove the finger ring, watch, necklace, bracelet and any other metal jewelry. ✧ Wear rubber gloves. ✧ Eye protection should be worn to prevent injury from accidental electrical arcs. ✧ Only use tools (e.g. wrench) with insulated handles. ✧ The batteries are very heavy. Please handle and lift the battery with proper method to prevent any human injury or damage to the battery terminal. ✧ Don’t decompose, modify or damage the battery. Otherwise, battery short circuit, leakage or even human injury may be caused. ✧ The battery contains sulfuric acid. In normal operation, all the sulfuric acid is attached to the separation board and plate in the battery. However, when the battery case is broken, the acid will leak from the battery. Therefore, be sure to wear a pair of protective glasses, rubber gloves and skirt when operating the battery. Otherwise, you may become blind if acid enters your eyes and your skin may be damaged by the acid. ✧ At the end of battery life, the battery may have internal short circuit, drain of electrolytic and erosion of positive/negative plates. If this condition continues, the battery may have temperature out of control, swell or leak. Be sure to replace the battery before these phenomena happen. ✧ If a battery leaks electrolyte, or is otherwise physically damaged, it must be replaced, stored in a container resistant to sulfuric acid and disposed of in accordance with local regulations. ✧ If electrolyte comes into contact with the skin, the affected area should be washed immediately with water.

Disposal

 Warning	✧ Components within the UPS contain heavy metals, and the UPS must be disposed of as industrial waste after scrapping. ✧ Dispose of used battery according to the local instructions.

Symbol description

Symbol	Description
 Note	✧ Indicates additional clarification or emphasis on the body of the text

2. Overview

2.1 Product Introduction

The intelligent modular UPS series products adopt online double conversion design, based on DSP fully digital control, to provide stable and uninterrupted power supply for important loads, which can eliminate power surges, instantaneous high voltage, instantaneous low voltage, wire noise and frequency offset and other "power pollution" on the mains, and provide customers with high efficiency and high power density power supply guarantee.

2.2 UPS System Description

Intelligent modular UPS is configured by the following part: Power distribution switch conversion main circuit, Bypass static switch, Bypass maintenance switch, Built-in battery pack and so on. The system principle is shown in Figure 2-1.
The main circuit is paralleled by multiple UPS power modules, mainly including an AC-DC-AC structure composed of rectifier (REC) inverter (INV).
The bypass switch consists of two SCR in reverse parallel and relays, and the mains power supply directly to the load through the bypass switch. Distribution switches consist of bypass input switch, main input switch, output switch, and manual bypass switch. When repairing a UPS cabinet, a manual bypass switch can be used to ensure uninterrupted power to the load. The built-in battery pack supplies power to the load via an inverter in the event of a mains power outage.

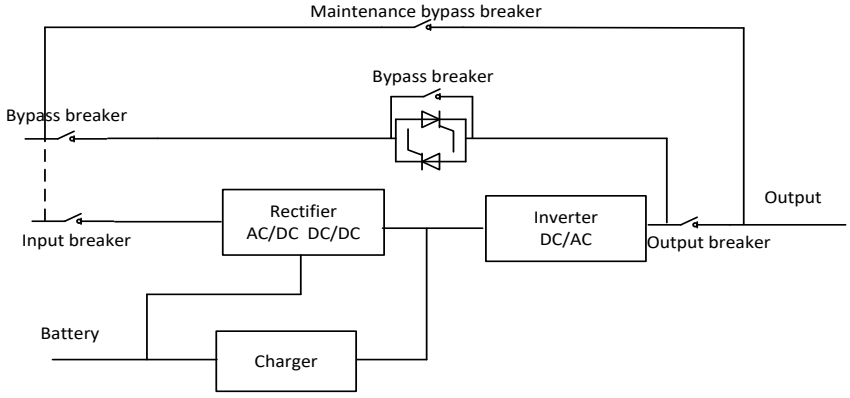


Figure 2-1 System Principle Diagram

2.3 Power Module Structure

Figure 2-2 shows the system structure of a single UPS module, mainly composed of rectifier, inverter and charger. Among them, the rectifier converts the AC input to DC, the inverter converts the DC to the AC output, and the charger charges the built-in battery.

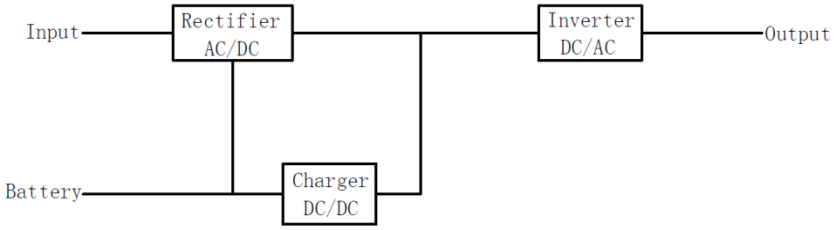


Figure 2-2 Power Module Structure

2.4 Operation Mode

The UPS system adopts on-line double conversion design, which can work in different working modes according to different working conditions:

- Normal mode
- Battery mode
- Bypass mode
- Maintenance mode
- ECO mode
- Auto-restart mode
- Frequency Converter mode

2.4.1Normal Mode

When the main circuit is within the working range, the UPS working in normal mode, through the rectifier (AC-DC) the AC input into a DC voltage (BUS). When the battery pack is connected, part of the DC energy through the charger (DC-DC) to charge the battery, the other part through the inverter (AC-DC) to reverse the DC into AC output, providing high-quality AC power for the load. The Normal mode structure is shown in Figure 2-3.

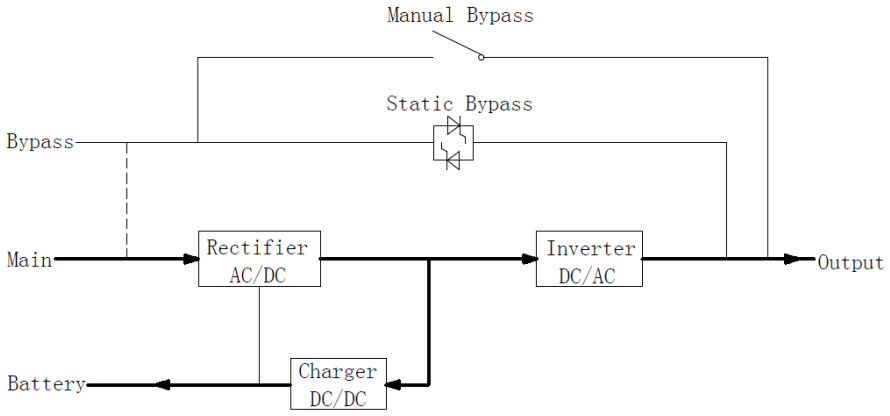


Figure 2-3 Normal mode operation diagram

Note:

The dark line indicates the route involved in this working mode, and the arrow indicates the direction of energy flow, the same goes for the following.

2.4.2 Battery Mode

The mode of operation in which the battery outputs AC power through the inverter to power the load is called battery mode. Upon failure of the AC main input power, the inverter of UPS, which obtains power from the battery, supply the critical AC load. There is no interruption in power to the critical load upon failure. After restoration of the AC mains input power, the" Normal mode" operation will continue automatically without the necessity of user intervention. The Battery mode structure is shown in Figure 2-4.

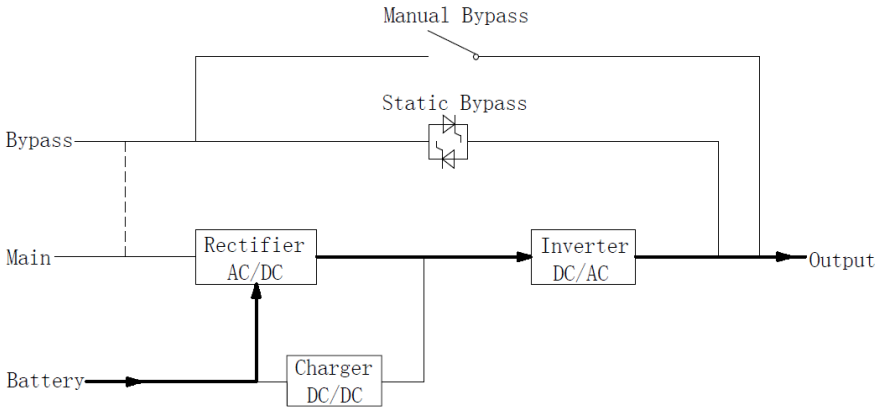


Figure 2-4 Battery Mode operation diagram

2.4.3 Bypass Mode

If the overload capacity of the inverter is exceeded under Normal mode, or if the inverter becomes unavailable for any reason, the static transfer switch will perform a transfer of the load from the inverter to the bypass source. The load power supply quality in bypass mode is not protected by UPS, and it is susceptible to conditions such as power failure, voltage waveform or frequency abnormality, and the load have the risk of power loss. The Bypass mode structure is shown in Figure 2-5.

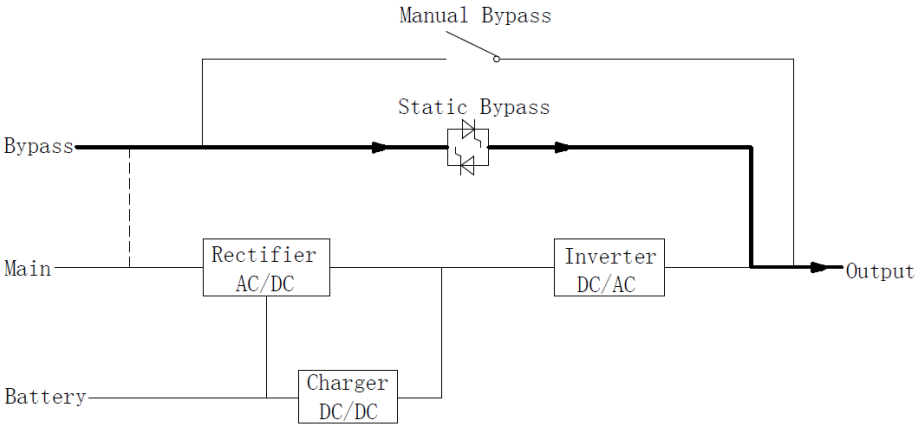


Figure 2-5 Bypass mode operation diagram

2.4.4 Maintenance Mode (Manual Bypass)

When the UPS system and battery are repaired or equipment fault repair, the load is directly powered by the mains through manual bypass by manually closing the manual bypass switch to achieve uninterrupted maintenance of the load. The Maintenance mode structure is shown in Figure 2-6.

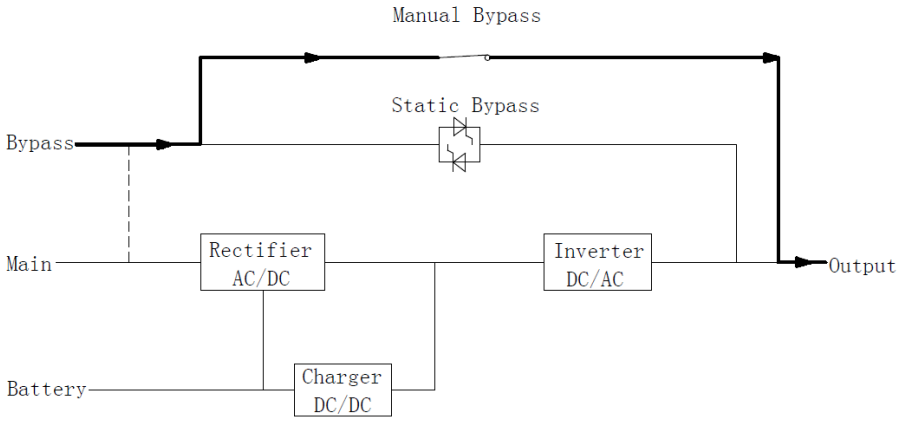


Figure 2-6 Maintenance mode structure

Danger:

During Maintenance mode, dangerous voltages are present on the terminal of input, output and neutral.

2.4.5 ECO Mode

ECO mode is the UPS economic mode, which can be set by background software. The rectifier and inverter are standby, when the utility from the bypass fails, the UPS will transfer to normal Mode and the inverter powers the load. In ECO mode of operation, the system can achieve greater efficiency. The ECO mode structure is shown in Figure 2-7.

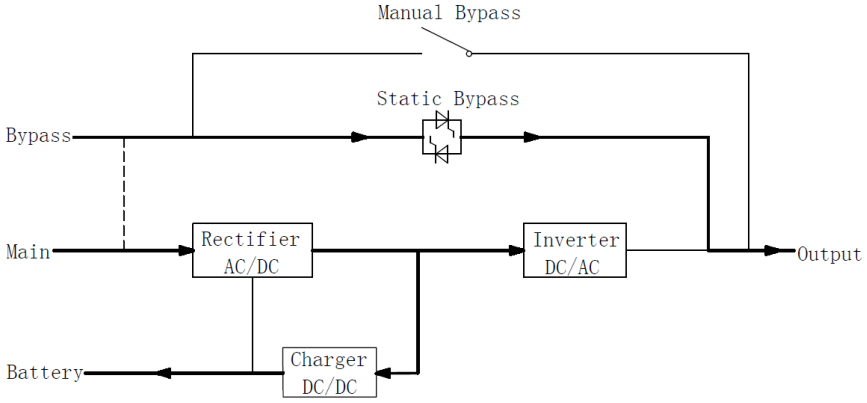


Figure 2-7 ECO Mode operation diagram

Note:

There is a short interruption time (less than 10ms) when transferring from ECO mode to battery mode, it must be sure that the interruption has no effect on loads.

2.4.6 Auto-restart Mode

UPS provides automatic power-on function, that is, the mains power outage time is too long, the battery discharge to the EOD voltage causes the inverter to shut down. If the mains power recovery, UPS will automatically start UPS. **The mode and the delay time are programmed by the commissioning engineer.**

2.4.7 Frequency Converter Mode

By setting the UPS to “Frequency Converter Mode”, the UPS could present a stable output of fixed frequency (50 or 60Hz). The input frequency range is 40Hz~70Hz. In this mode, the static bypass is invalid, the battery is optional, and the battery is determined whether to use the battery depending on whether it is necessary to run in battery mode.

2.5 UPS Structure

2.5.1 UPS Configuration

The UPS configurations are shown in Table 2-1.

Table 2-1 UPS Configuration

Location	Item	Quantity	Remark
Cabinet	PDU breaker	4	Standard
	Monitor&bypass module	1	Standard
	Down entry cable protecter	2	Standard
Power module	Power module	1~6	On-site installation or pre-configuration
Battery module	Battery module	10	On-site installation or pre-configuration

2.5.2 UPS Structure

The UPS appearance is shown as Figure 2-8.

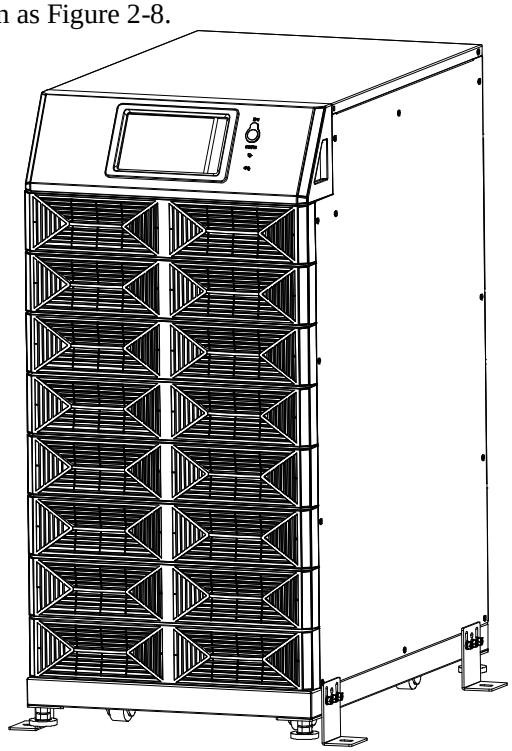


Figure 2-8 Overall system appearance

The front view of the system is shown in Figure 2-9 below:

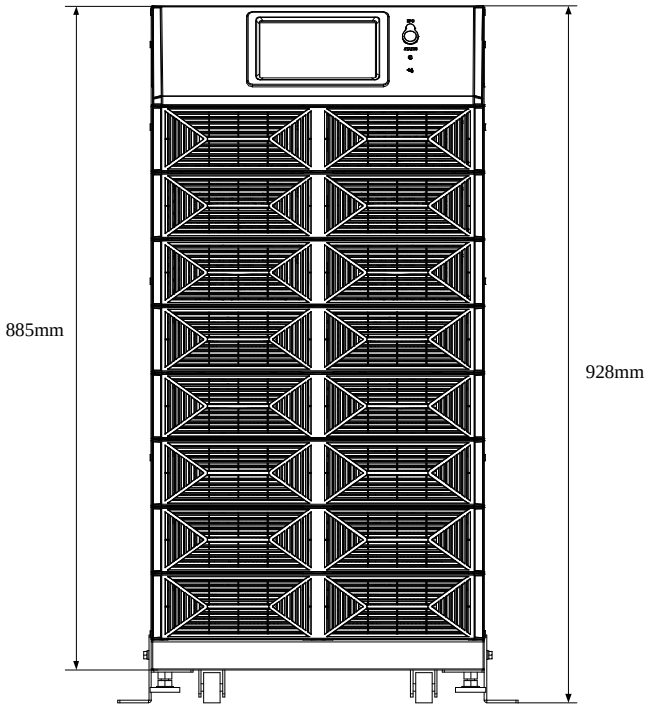


Figure 2-9 Cabinet front view

The rear view of the cabinet is shown in Figure 2-10 below:

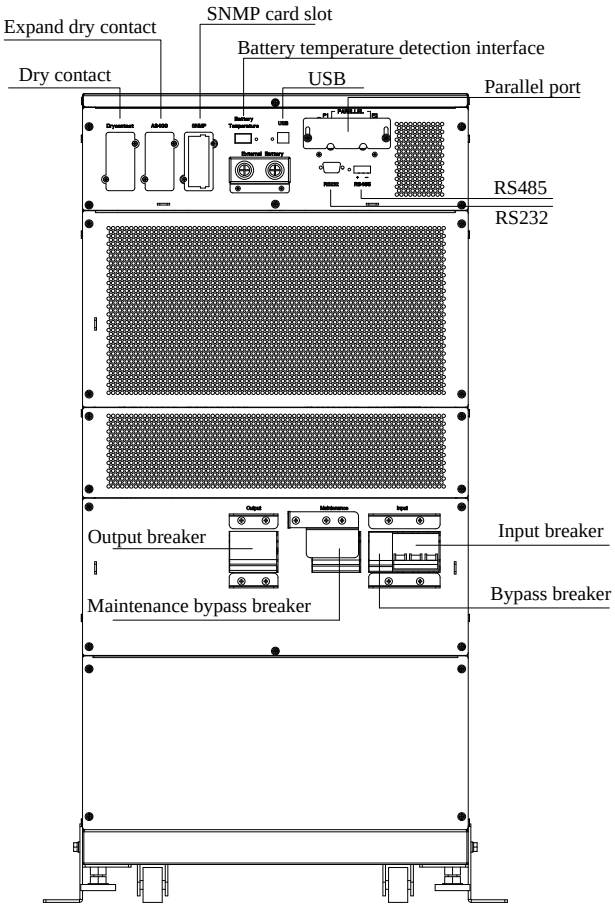


Figure 2-10 Rear view of the cabinet

3 Installation

3.1 Location

3.1.1 Installation Environment

1. The UPS is intended for indoor installation and uses forced convection cooling by internal fans. Please make sure there is enough space for the UPS ventilation and cooling.
2. Keep the UPS far away from water, heat and inflammable and explosive corrosive material. Avoid installing the UPS in the environment with direct sunlight, dust, volatile gases, corrosive material and high salinity
3. Avoid installing the UPS in the environment with conductive dirt.
4. The operating environment temperature for batteries is 20℃-25℃. Operating above 25℃ will reduce the battery life, and operation below 20℃ will reduce the battery capacity.
5. The battery will generate a little amount of hydrogen and oxygen at the end of charging; ensure the fresh air volume of the battery installation environment must meet EN50272-2001 requirements.

3.1.2 Site Selection

1. Ensure the ground or installation platform can bear the weight of the UPS cabinet, batteries and battery racks.
2. No vibration and less than 5-degree inclination horizontally.
3. The equipment should be stored in a room so as to protect it against excessive humidity and heat sources.
4. The battery needs to be stored in dry and cool place with good ventilation. The most suitable storage temperature is 20℃ to 25℃.

3.1.3 Weight and Dimensions

The dimension and weigh for the UPS cabinet is shown in Figure 3-1and Figure 3-2.

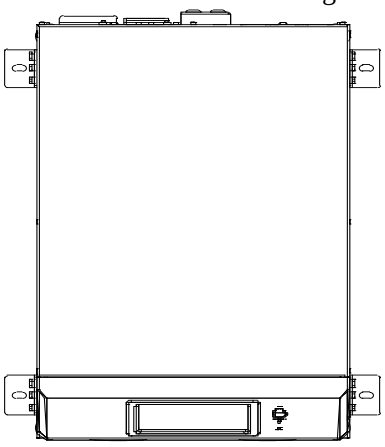


Figure 3-1 Cabinet top view

Attention

Reserve at least 0.8 meters in front of the cabinet for easy opening of the front door and replacement of the power module. At least 0.5 meters of space should be reserved behind the cabinet for air flow for heat dissipation and maintenance operations. The reserve room of the cabinet is shown in Figure 3-3.

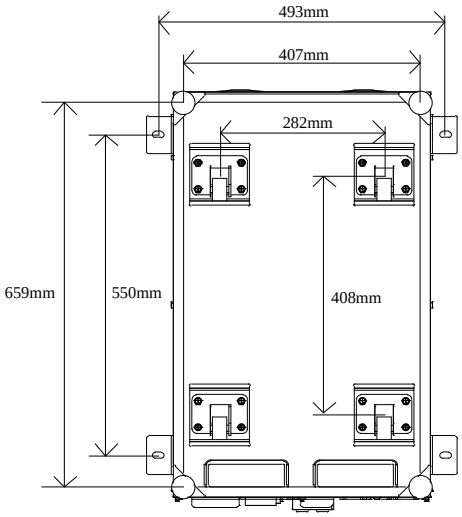


Figure 3-2 Cabinet bottom view

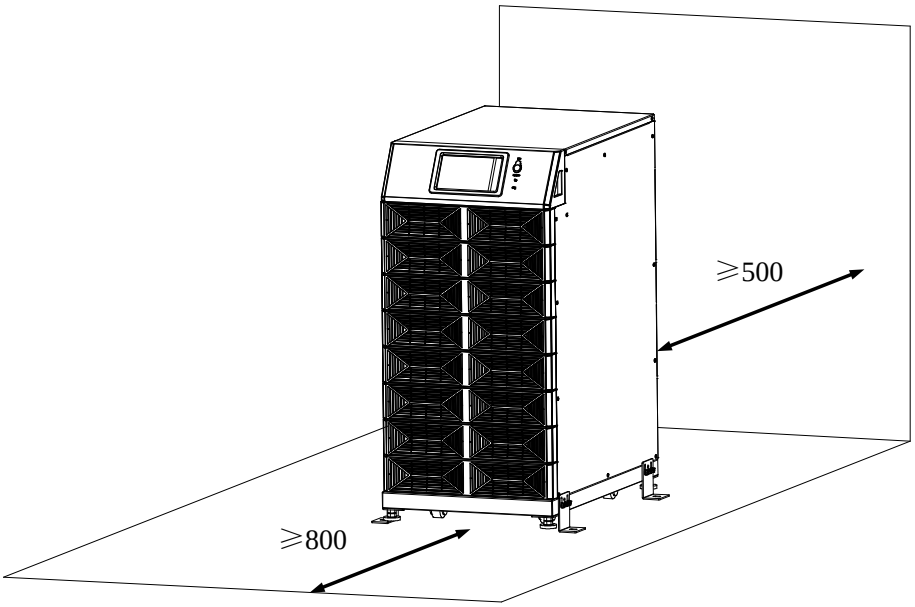


Figure 3-3 Figure of cabinet space reservation（unit：mm）

Ensure that the ground or mounting platform can withstand the weight of the UPS cabinet, battery and battery rack, and the weight of the battery and battery rack is calculated based on actual usage The weight for the UPS cabinet is shown in Table 3-1.

Table 3-1 Weight for the cabinet

Configuration	Weight
UPS cabinet	66.5kg
UPS battery cabinet	67.3kg
5KVA power module	7.5kg
Battery module	17.8kg

3.2Unpacking and Inspection

3.2.1 Moving and Unpacking of the Cabinet

The specific steps of the cabinet handling and unpacking are as follows：
Step 1 Confirm that the UPS package is free of damage (In case of shipping damage, please notify the carrier immediately);

Step 2 Use a forklift to transport the equipment to a designated location. The schematic diagram is shown in Figure 3-4.

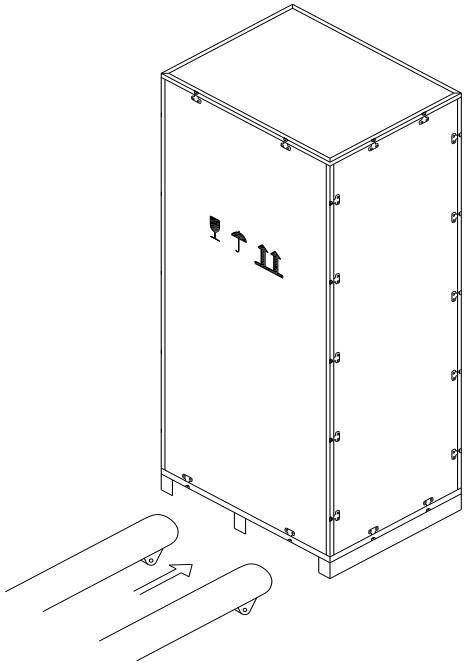


Figure 3-4 Ship the device to the designated location

Step 3 Using a one-line cone and pliers, open the top plate of the steel-edged wooden box first, and then open the four side plates separately. This is shown in Figure 3-5;

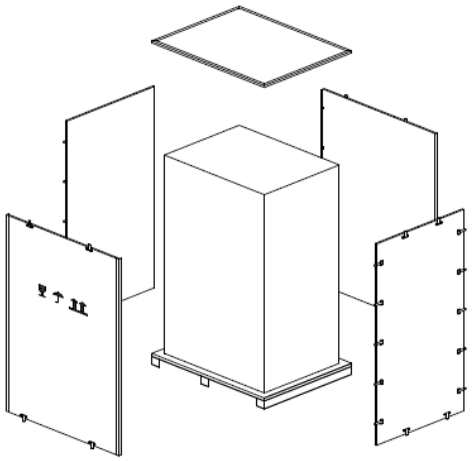


Figure 3-5 Unpack the box

Step 4 After removing the side panels around the box, remove the cushioning foam, install the ramp pallet, and push the UPS down the pallet. This is shown in Figure 3-6;

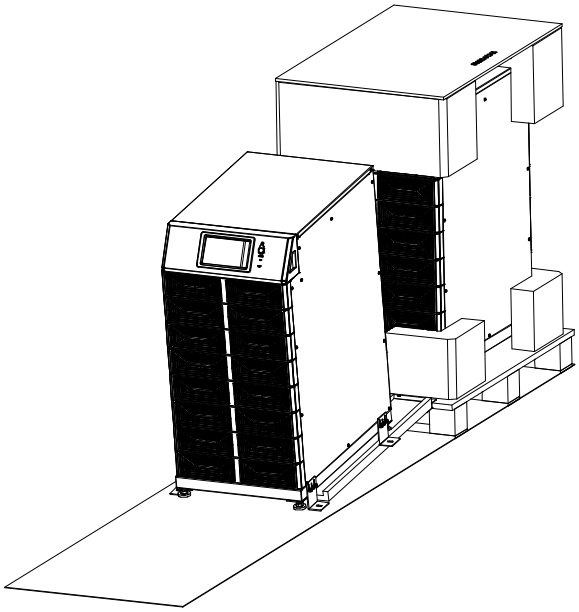


Figure 3-6 Remove the buffer foam

Step 5 Check the integrity of the equipment:
1. Inspect the appearance of the UPS, if there is the shipping damage; please notify the carrier immediately;
2. Check the complete and correct model of the random accessories against the shipping packing list. If you find that the attachment is missing or the model does not match, you should make on-site records in time and contact our local office;
Step 6 After confirming that the equipment is in good condition, remove the screws that hold the cabinet and the wooden tray;
Step 7 Place the enclosure in the installation position.

Attention

Be careful to disassemble and do not scratch the cabinet.

3.2.2 Unpacking the Modules

The specific steps for module disassembly are as follows:
Step 1 Place the box smoothly as shown in Figure 3-7;

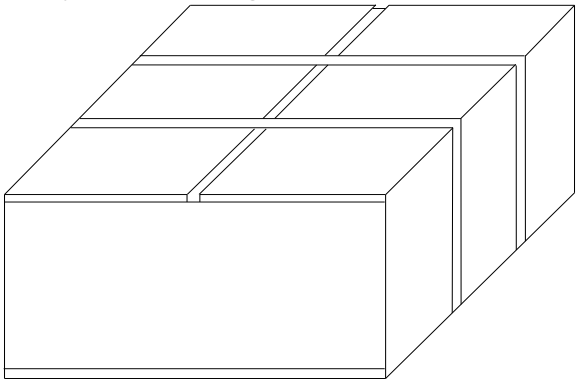


Figure 3-7 Place the box smoothly

Step 2 Cut the plastic bag, cut off the scotch tape, and open the carton as shown in Figure 3-8;

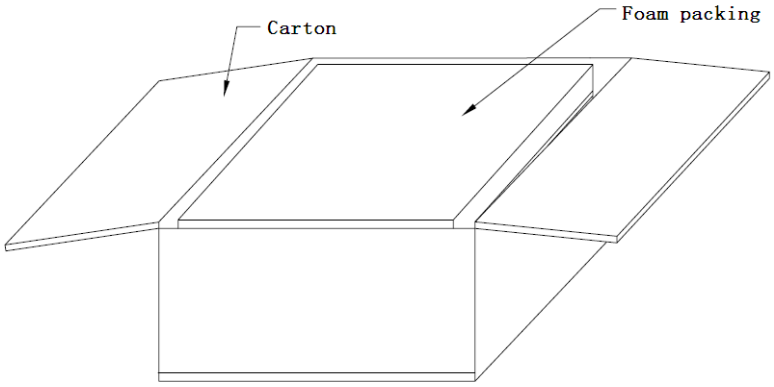


Figure 3-8 Cut the plastic bag, cut off the scotch tape, and open the carton

Step 3 Open the foam packaging lid and see the device with plastic packaging, as shown in Figure 3-9

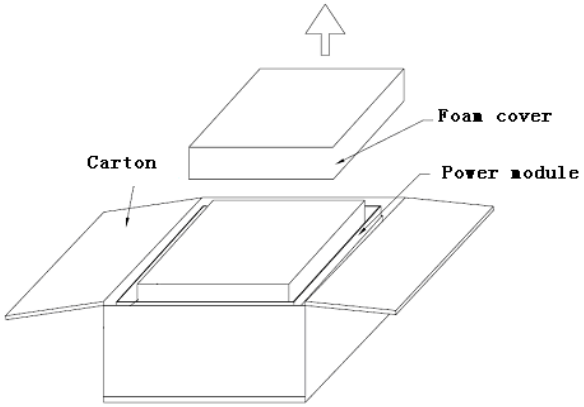


Figure 3-9 Open the foam package lid

Step 4 Remove the device with plastic packaging, unpack the plastic package, and get the module.

Attention

After the packaging is disassembled, please dispose of the waste according to the green environmental protection requirements.

3.3 Installation

Cabinet Installation

There are two ways to fix the cabinet. One is that the cabinet is installed independently, moving the cabinet to the desired location. To strengthen the fixation, a screw needs to be added to hold the machine foot pads together with the support frame or ground. The other is that the cabinet is mounted on a standard server rack. The rack-mounted of the UPS is shown in Figure 3-10.

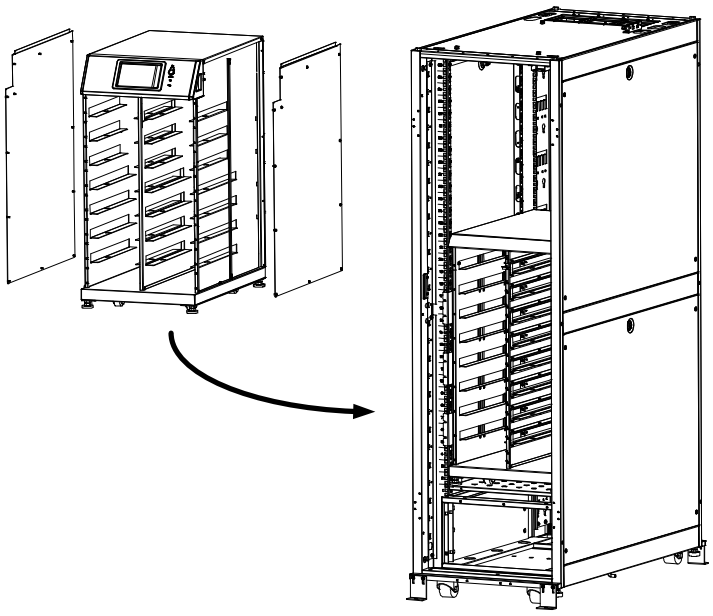


Figure 3-11 Rack-mounted Installation

The rack mounting steps are as follows:

Step 1 Unplug the power module;

Step 2 Remove the cabinet side doors and foot pads;

Step 3 Install the pallets on the server rack;

Step 4 Insert the cabinet into the server rack and secure the screws;

Step 5 Insert the power module into the cabinet and secure the screws

Attention

When the floor load capacity is insufficient, auxiliary equipment should be added to disperse the gravity of the cabinet to a larger support plane. For example, tile a large area of iron plates or increase the area of support feet.

Power Module Installation

After the cabinet is fixed, the power module can be installed, and the installation position of the power module and the cabinet is shown in Figure 3-11. The principle of installing the power module is to install it from the bottom up to prevent the cabinet from tipping over due to the center being too high.

The specific installation steps of the power module are as follows:

Step 1 Ensure that the power module body and port are not damaged;

Step 2 Hold the module handle and support the module body so that the edges of the front of the power module are embedded in the mounting slot rails;

Step 3 Push the module completely into the mounting slot to ensure that the module aviation terminals and the cabinet aviation terminals are fully connected;

Step 4 Screws are punched through a fixing hole in the front panel of the module to lock the module completely into the cabinet.

Step 5 Complete the installation of the power module.

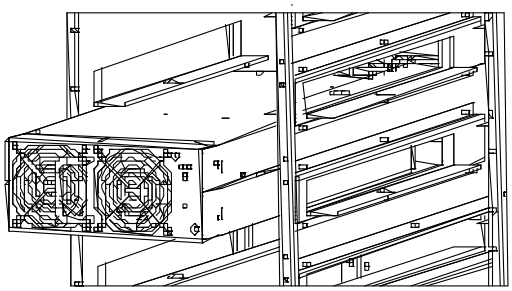


Figure 3-12 Power module installation diagram

3.4 Battery

The battery pack is connected to the UPS system by the +, - two wires of the battery, The two modules on the left and right of the battery module are connected in series into a group, and each battery module is made of 6 12V lead-acid batteries in series, and up to five groups can be inserted. The installation method is the same as that of the power module. The battery module installation is shown in Figure 3-12.

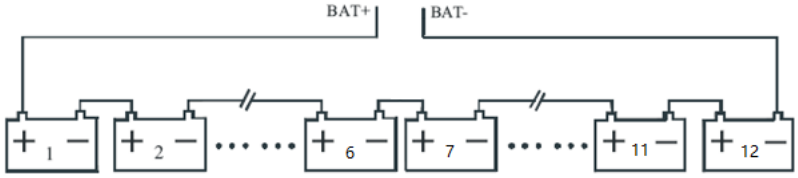


Figure 3-13 Schematic of a battery series connection

Warning

The battery has a voltage and is in danger of being fatal, so please observe safety precautions when installing. After the battery module is installed, the battery terminals are charged. Complete the UPS installation and wiring before installing the battery module.

3.5 Cable Entry

The cabinet of the UPS is designed to be down-line entry. The system entry method is shown in Figure 3-13.

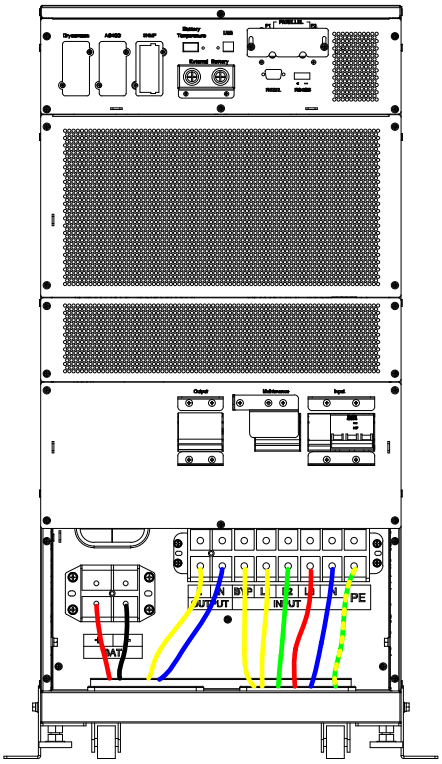


Figure 3-14 Schematic diagram of the cable entry

Down entry: Remove the rear cover and remove the inlet hole cover at the bottom. Fix the Rectangular rubber coil inlet holes. The cable is all connected to the terminals according to the wiring signal through the sheath. Finally, secure the rear cover back.

3.6 Power Cables

3.6.1 Cables Specification

The UPS power cables are recommended in Table 3-2.

Table 3-2 Recommended cables for power cables

Item			20KVA
Main Input	Main Input Current		40A
	Recommended cable (mm²)	A	10
		B	10
		C	10
		N	10
Output	Main Output Current		91A
	Recommended cable (mm²)	A	25
		N	25
Bypass Input	Bypass Input Current		90A
	Recommended cable (mm²)	A	25
		N	25
Battery Input	Battery Input Current		155A
	Recommended cable (mm²)	+	70
		-	70
Ground	Recommended cable (mm²)	PE	10

Note:
The recommended cable section for power cables are only for the situations described below:

- *Ambient temperature: 30℃.*
- *AC loss less than 3%, DC loss less than1%, The length of the AC power cables are no longer than 50 m and the length of the DC power cables are no longer than 30 m.*
- *For 90℃ copper conductor flexible cables, when the external conditions change, please refer to IEC60364-5-52 and relevant local codes for verification. The current values in the table are based on 380V. For the 400V rated voltage, the current value needs to be multiplied by 0.95; for the 415V rated voltage, the current value needs to be multiplied by 0.92.*

3.6.2 Specifications for Power Cables Terminal

Specifications for power cables connector are listed as Table 3-3.

Table 3-3 Requirements for power terminal

Port	Bolt	Torque Moment
Main, Bypass, Output, Ground	M8	12 Nm
Battery	M10	15 Nm

3.6.3 Connecting Power Cables

The specific wiring process is carried out as follows.

Step 1 Verify that all the switches of the UPS are completely open and the UPS internal maintenance bypass switch is open. Attach necessary warning signs to these switches to prevent unauthorized operation.

Step 2 Open the back door of the cabinet, remove the plastic cover. The input and output terminal, battery terminal and protective earth terminal are shown in Figure 3-14;

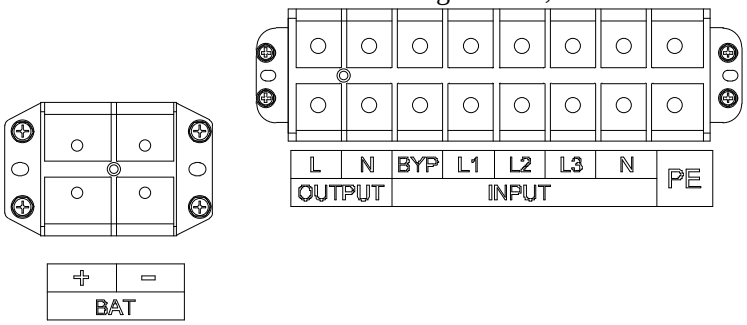


Figure 3-15 Connection terminals

Step 3 Connect the protective earth wire to protective earth terminal (PE);

Step 4 Connect the AC input supply cables to the main input terminal and AC output supply cables to the output terminal;

Step 5 Connect the battery cables to the battery terminal;

Step 6 Check to ensure there is no mistake and re-install all the protective covers.

Warning

- *When connecting power cables, follow the torque listed in Table 3.3 to ensure the tightness of*

the wiring terminals and avoid potential safety hazards.

- *Before wiring the UPS, confirm the position and status of the UPS input switch and the mains power distribution switch. Make sure that the switch is in the off state and attach a warning sign to prevent others from operating the switch*
- Before the external battery cable is connected, the battery module needs to be unplugged, otherwise the battery terminal is charged, and there is a electric shock danger.

3.6.4 Circuit Breaker

The circuit breakers (CB) for the system are recommended in Table 3-4.

Table 3-4 Recommended CB

Location	20KVA
Main Input(front end)	40A/3P
Bypass Input(front end)	125A/1P
Main Output(back end)	125A/2P
Maintenance Bypass	125A/2P

Attention

The CB with RCD (Residual Current Device) is not suggested for the system.

3.7 Control and Communication Cables

The rear panel of the cabinet provides dry contact interface(J2-J9) and communication interface (RS232, RS485, SNMP, Parallel card interface and USB port), as it is shown in Figure 3-15.

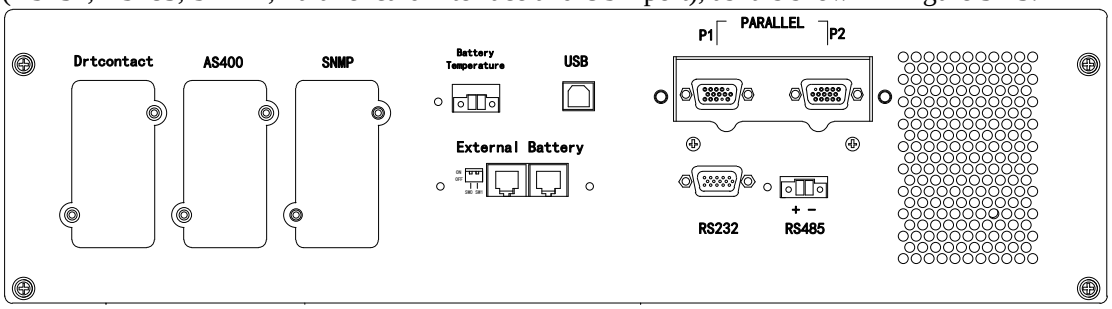


Figure 3-16 Communication interface

3.8 Battery temperature interface

The battery temperature interface detects the external battery temperature for battery temperature compensation.

The battery temperature interface diagram is shown in Figures 2-16, and the interface description is shown in Table 3-5.

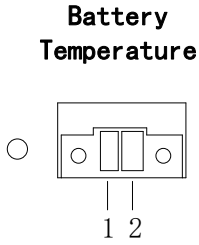


Figure 3-17 Temperature interface

Table 3-5 Description of J2 and J3

Port	Name	Function
Pin 1	TEMP_BAT	Detection of battery temperature
Pin 2	TEMP_COM	common terminal

Note

Specified temperature sensor is required for temperature detection (R25=5Kohm, B25/50=3275), please confirm with the manufacturer, or contact the local maintenance engineers when placing an order.

3.8.1 External battery cabinet communication interface

The external battery connector is used for the communication cable connection of the external battery cabinet, as shown in Figure 3-17.
This product can support the connection of two external battery cabinets up to a maximum, when the external battery cabinet is connected, it is necessary to set the battery cabinet ID dip switch according to the number of accessed battery cabinets.
Dial down the DIP switch box to OFF, dial up the DIP switch box to ON, the settings are described in Table 3-6:

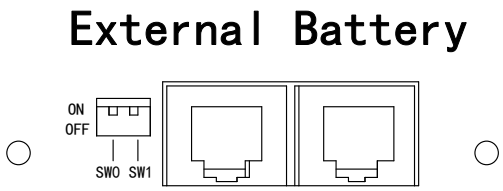


Figure 3-18 External battery cabinet communication interface

Table 3-6 External battery cabinet ID interface settings

Port	A set of battery cabinets	Two sets of battery cabinets
SW0	OFF	ON
SW1	OFF	OFF

3.8.2 Communication interface

- RS232, RS485 and USB interface: Provide serial data for authorizing commissioning and maintenance personnel to debug and maintain the UPS, and can also be used for networking for machine room integration monitoring systems.
- External battery interface: Used for communication between the cabinet and the external battery cabinet.
- SNMP card: SNMP card for field installation communication (option)
- Dry contact card: Dry contact expansion interface (option)
- AS400 card: AS400 card expansion Interface (Option)

Bypass back feed protection

When using the bypass back-feed protection function, the bypass input needs to be equipped with a protection device with trip function, and this trip signal needs to be connected to the system dry contact interface (optional)

Attention

- *The rectifier and the bypass input power supply must use the same neutral line*
- *For IT grid systems, four-pole protection devices must be installed in the ups' external input and output distribution.*

4 Control and LCD Panel

Contents

This chapter introduce the functions and usage methods of each component of the UPS operation control display panel, and provides LCD display information, including LCD display type, detailed menu information, prompt window information and UPS alarm list.

4.1 LCD panel

The LCD panel for power module is shown in Figure 4-1:

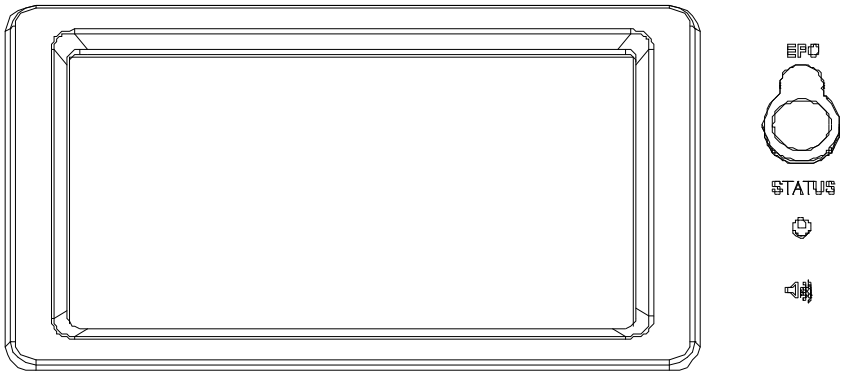


Figure 4-1 The LCD panel

4.2 LED Indicator

The LED indicator has green and red colours to indicate the statuses and faults by combinations of different colours and the time it lasts. The combinations are listed in Table 3-1.

Table 3-1 LED Statues and faults of different combinations

Indicator	Function	Button	Function
STATUS	Status indicator	EPO	Emergency power off

The LED description is shown in Table 3-2.

Table 3-2 LED description

Indicator	Status	Description
Status	green	Operation normally
	red	UPS abnormal

4.3 Operation Button

The control panel operation button functions are as follows:

Table 3-3 Button description

Button	Description
EPO	Emergency power off; In case of emergency such as fire, press the emergency shutdown key, upS will turn off rectifier, inverter, current, charger, bypass

4.4 LCD Display

Power on the UPS, the monitoring system begins to self-test, and the WELCOME screen will appear on the LCD control panel. After 3s, enter the main display interface, which is shown in Figure 4-2:

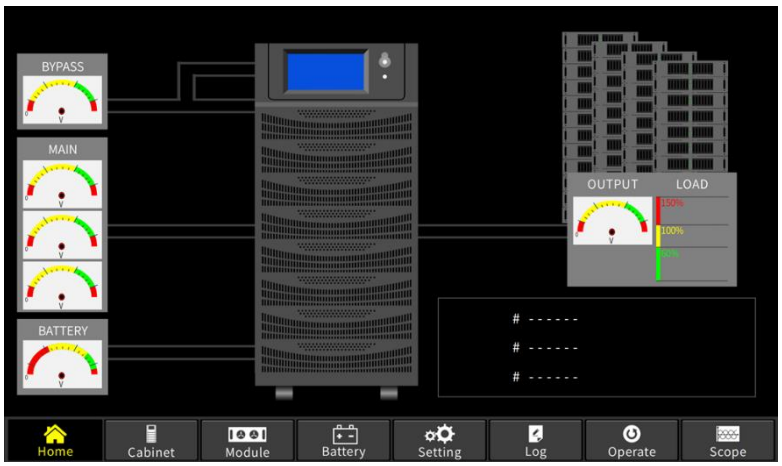
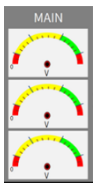
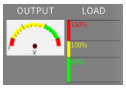
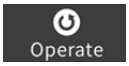
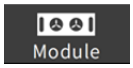


Figure 4-2 UPS main interface

The homepage mainly includes status information, information display, alarm display and main menu. This is shown in Table 3-4:

Table 3-4 Menu description

Menu symbols	Description
	Bypass parameters (voltage, current, frequency, PF)
	Main input parameters (voltage, current, frequency, PF)
	Cabinet menu (cabinet input, output, load rate, PF)
	History log
	Current alarm, system information
	Battery parameters: battery voltage, battery current, charge and discharge status, battery temperature, number of cell cells, battery remaining time, remaining capacity, battery operating days, battery discharge time, battery maintenance time
	Function command menu: Time Setting, Language Setting, Communication Protocol Setting, LCD Setting, Backlight Time Setting, Contrast Setting, Rating Setting, Battery Setting, User Setting, Function Command.
	Output parameters (voltage, load rate)
	Function commands: manual bypass/ transfer back to inverter, fault clear, on/off key enable, battery history data reset, dust net history data reset, battery self-test, battery maintenance, stop battery test

Menu symbols	Description
	Module menu (power module input, output, charger parameter information, rectifier inverter temperature)

The system information displayed under the main page is shown in Table 3-5:

Table 3-5 System information

Content	Meaning
S/P/E/A/A???	S-Single mode P- Parallel mode (Two or more UPS work in parallel) E-ECO mode (The bypass powers the load and the inverter is in standby) A-Self-aging mode (Set up via background software. Press enter to confirm when appears "A???"
09:20	Current time
M/F/B/null	M- Motor mode. When loaded with a motor type, the machine is started from the inverter directly. F- Transformer mode. Bypass is disabled in this mode. B- Bypass prohibit mode. Bypass is prohibited.

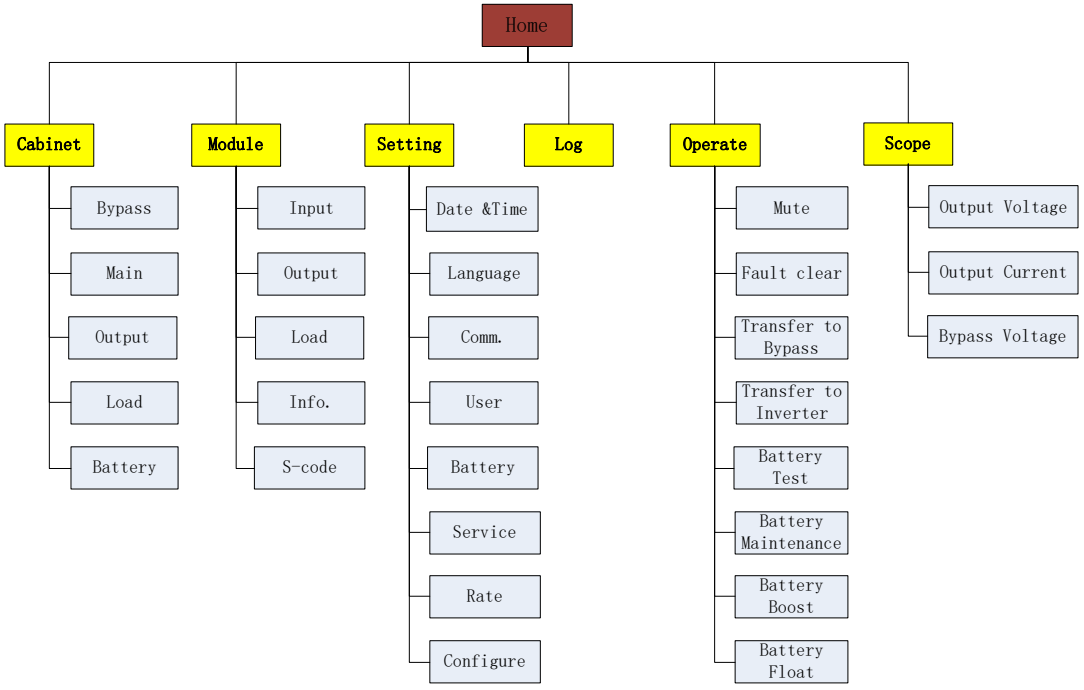


Figure 4-3 The LCD menu tree

Table 3-6 provides a complete list of all UPS system events and alarms displayed in the history.

Table 3-6 List of system events and alarms

Event	Describe
Load On UPS	The system is in a normal inverter power supply state
Load On UPS	The system is in a bypass power state
UPS no output	The system has no output
Battery Boost	The battery is in Boost charging state
Battery Float	The battery is in Floating charging state
Battery Discharge	The system operates in a battery discharge state
Battery Connected	Battery connect to the UPS
Battery Not Connected	The battery is not connected
Maintenance CB Closed	Maintenance breaker is closing
Maintenance CB Open	Maintenance breaker is open
Generator Input	External generator access
Generator Input disappear	Disconnect the external generator
Utility Abnormal	The input mains power supply is abnormal
Utility Abnormal disappear	Mains power returned to normal
Bypass Volt Abnormal	The bypass voltage is abnormal
Bypass Volt Abnormal disappear	The bypass voltage returns to normal
Bypass Module Fail	The bypass fails
Bypass Module Fail disappear	The bypass returns to normal
Bypass Module Fail	The bypass output is overloaded
Bypass Module Fail disappear	The bypass output returns to normal
Bypass Over Load Tout	The bypass overload status continues and the overload times out.
Bypass Over Load Tout disappear	The bypass overload status disappears
Byp Freq Over Track	The bypass frequency is out of tracking range
Byp Freq Over Track disappear	The bypass frequency return to the tracking range
Exceed Tx Times Lmt	More than 5 switching times between bypass and inverter in the last hour
Exceed Tx Times Lmt disappear	Clear the number of switchovers
Output Short Circuit	The system output is short-circuited
Exceed Tx Times Lmt disappear	The system output short circuit disappears
Battery EOD	The battery voltage reaches the battery shutdown point
Battery EOD disappear	The battery voltage returns above the battery shutdown point
Battery Test	The system enters battery self-test mode
Battery Test OK	The system self-test battery is normal
Battery Test failed	The system self-detects a problem with the battery
Battery Maintenance	The system is in battery maintenance state
Battery Maintenance OK	Battery maintenance status complete
Battery Maintenance failed	The battery maintenance process did not complete properly
Stop Test	The battery self-test or battery maintenance status stops
Fault Clear	Clears the failure
Log Clear	Delete all history
Module inserted	The N# module joins the system
Module Exit	The N# module exits the system
Rectifier Fail	The N# module rectifier has failed
Rectifier Fail disappear	N# module rectifier fault dispear

Event	Describe
Inverter Fail	The N# module inverter has failed
Inverter Fail disappear	N# module inverter fault clear
Rectifier Over Temp	N# The module rectifier is over-temperature
Rectifier Over Temp disappear	N# module rectifier over-temperature
Fan Fail	The N# module fan is faulty, not connected or stalled
Fan Fail disappear	The N# fan returns to normal
Output Over load	The N# module output is overloaded
Output Over load disappear	N# module output overload dispear
Inverter Overload Tout	The N# module output is overloaded with a timeout
Inverter Overload Tout disappear	The N# module output overloaded timeout dispear
Inverter Over Temp	The inverter of the N# module is overheated
Inverter Over Temp	The over temperature of the N# module inverter disappears
On UPS Inhibited	The inverter prohibits power supply
On UPS Inhibited	The inverter forbidden disappear
Manual Transfer Byp	Manually transfer the system to the bypass
Esc Manual Transfer Byp	Manually transfer the system to the normal
Cumulative time	The cumulative time
Battery/ charger failed	The battery or charger has failed
Battery/charger failed disapear	Battery or charger fault lifted
Bypass Fan Fail	The bypass module fan fault disappear
Input Neutral Lost	Input N line disconnect
Manual Shutdown	The N# module shuts down manually
Manual Boost Charge	Manually adjust to the boost charging
Manual Float Charge	Manually adjust to the floating charge
UPS Locked	UPS lock shutdown occurs
Sync Pulse Fail	There is a large difference with the power of each module
Sync Pulse Fail disappear	The power difference between each module returned to normal
Sync Pulse Fail	The synchronization signal of each module is abnormal
Sync Pulse Fail disappear	The synchronization signal of each module returns to normal
Input Volt Detect Fail	The input voltage value of a module is abnormal
Input Volt Detect Fail disappear	The module input voltage value returns to normal
Battery Volt Detect Fail	An abnormal battery voltage was detected
Battery Volt Detect Fail disappear	The battery voltage was detected to return to normal
Output Volt Detect Fail	The output voltage value of a module is abnormal
Output Volt Detect Fail disappear	The module input voltage value returns to normal
Bypass Volt Detect Fail	An abnormality in the bypass voltage was detected
Bypass Volt Detect Fail disappear	An abnormality in the bypass voltage disappear
INV Bridge Fail	The inverter is faulty
INV Bridge Fail disappear	The inverter faulty disappears
Input Curr Unbalance	The outlet temperature is not within the set range
Input Curr Unbalance disappear	The air outlet temperature returns to the normal range
Input Curr Unbalance	There is a difference in the three-phase input current of the module
Input Curr Unbalance disappear	The module input current returns to normal

Event	Describe
DC Bus Over Volt	The bus voltage is overvoltage
DC Bus Over Volt disappear	The bus voltage returns to normal
REC Soft Start Fail	The rectifier could not be started
REC Soft Start Fail disappear	The rectifier returned to normal
Relay Connect Fail	The inverter relay is open
Relay Connect Fail disappear	The relay is closed
Relay Short Circuit	The inverter switch is short-circuited
Relay Short Circuit disappear	The short circuit of the inverter switch disappears
PWM Sync Fail	The rectifier and inverter PWM synchronization signals are abnormal
PWM Sync Fail disappear	The rectifier and inverter PWM synchronization signals return to normal
Intelligent Sleep	The system enters Smart Sleep
Intelligent Sleep disappear	Exit Smart Hibernation
Manual Transfer to INV	Manually switch to inverter
Input current limit Tout	Input current limit time is up
Input current limit Tout disappear	The input current limit time disappears
No Inlet Temp. Sensor	The air inlet temperature probe is not connected or disconnected
No Inlet Temp. Sensor disappear	The air inlet temperature probe returns to normal
No Outlet Temp. Sensor	The outlet temperature probe is not connected or disconnected
No Outlet Temp. Sensor disappear	The outlet temperature probe returned to normal
Inlet Over Temp.	The air inlet temperature is too high
Inlet Over Temp disappear	The air outlet temperature returned to normal
Capacitor Time Reset	Clears the capacitor cumulative runtime record
Fan Time Reset	Clears the fan cumulative runtime record
Battery History Reset	Clears battery history data
Battery Over Temp.	The battery is overheated
Battery Over Temp.disappear	The battery overheat disappears
Bypass Fan Expired	Reached the bypass fan repair period
Bypass Fan Expired disappear	Reaching Bypass fan maintenance period alarm disappear
Capacitor Expired	Reached the bypass fan repair period
Capacitor Expired disappear	Reaching Bypass fan repair period disappears
Fan Expired	Module fan maintenance cycle time is up
Fan Expired disappear	Reaching Module fan maintenance cycle disappears
Terminal failed	The docking terminal has failed
Terminal failed disappear	The docking terminal failure disappears
Dust Filter Expired	Dust filter maintenance time is up
Dust Filter Expired disappear	Dust filter maintenance time disappears
Battery Expired	Battery maintenance period is up
Battery Expired disappear	The battery maintenance period disappears

5 Operation

5.1 UPS Star-up

5.1.1 Startup in Normal Mode

The UPS must be started up by commissioning engineer after the completeness of installation. The steps below must be followed:
1) Ensure all the external circuit breakers are open.
2) Close the input external circuit breakers, and the system starts initializing. If the system has dual inputs, please close both of the breakers.
3) The LCD in front of the cabinet is lit up. The system enters the home page, Notice the energy bar in the home page, and pay attention to the LED indicators. The "REC" indicator flashes, it indicates the rectifier is starting up. The LED indicators are listed below in Table 5-1.

Table 5-1 Rectifier starting up

Indicator	Status	Indicator	Status
Rectifier	green	Inverter	Off
Battery	Off	Status	red
Bypass	Off		

4) After about 30 seconds, the "REC" indicator goes steady green; it means the finish of the rectifier startup. And at the same time the battery indicator goes green, the static bypass switch closes, and then the inverter is starting up. The LED indicators are listed below in Table 5-2.

Table 5-2 Inverter starting up

Indicator	Status	Indicator	Status
Rectifier	green	Inverter	off
Battery	green	Status	green
Bypass	green		

5) After 90 seconds, the UPS transfer from the bypass to the inverter after the inverter goes normal. The LED indicators are listed below in Table 5-3;

Table 5-3 Inverter supplying the load

Indicator	Status	Indicator	Status
Rectifier	green	Inverter	green
Battery	green	Status	green
Bypass	off		

6) Close the external output switch to supply power to the load, complete the powering up the UPS.

Note

First power up the UPS, users can set the language, date and time, system parameters. Next when the system starts, the stored setting will be loaded.
Users can browse all events during the process of the starting up by checking the menu Log.
Users can check the information of the power module by the keys in the front of it.

5.2 Transfer The Operating Mode

5.2.1 Switching The UPS from Normal Mode to Battery Mode

Disconnect the input switch to cut off the mains and the UPS enters battery mode. To switch the UPS back to normal mode, wait a few seconds before closing the input switch and re-supplying the mains. After 10 seconds, the rectifier automatically restarts and the power supply to the inverter is restored.

5.2.2 Switching The UPS from Normal Mode to Bypass Mode

Enter the menu “Operate”, touch the icon “transfer to bypass” 

and the system should transfer to bypass mode.

Warning

- *Before manually switching to bypass, make sure that the bypass is normal, if the bypass is not normal, it can cause the switching bypass to be unsuccessful.*
- *When manually shutting down modules one by one, make sure that the remaining modules are not overloaded.*

5.2.3 Switching The UPS from Bypass Mode to Normal Mode

Enter the menu “Operate”, touch the icon “transfer to inverter” and the system should transfer to normal mode.

5.2.4 Switching The UPS from Normal Mode to Manual Bypass Mode

The UPS is operating in normal mode, and this procedure allows you to switch the load from the inverter output to maintenance bypass mode which can realize the maintenance of bypass module.
1) Select the transfer to bypass command on the LCD and transfer to static bypass according to the section 4.2.2.
2) The inverter indicator strip is off, the status indicator strip is off, and the buzzer alarms. The load switches to static bypass and the inverter shuts down.
3) Close the manual bypass switch, the load is powered by the maintenance bypass and the static bypass;
4) At this time, the bypass module can be unplugged and the system can be powered by a maintenance bypass.

Warning

Before performing the switching operation, first check the LCD display to ensure that the bypass is normal and that the inverter is synchronized with the bypass. Failure to meet this condition may result in a short interruption in the supply of power to the load.

Attention

Open the power modules after 10 minutes let the voltage of bus capacitor back to a safe range.

5.2.5 Switching The UPS from Manual Bypass to Normal Mode

This procedure allows you to transfer the UPS from manual bypass to normal mode.
1) Power up the UPS, after 30s the indicator of the bypass is green, the load is powered through bypass and maintenance bypass.
2) Turn off the maintenance bypass switch and the load is powered through the static bypass;
3) Rectifier start, after 30 s the rectifier starts up, its indicator light bar is green, the inverter starts, one minute later switch to the inverter power supply mode, the system returns to normal mode.

5.3 EPO

The EPO button located in the operator control and display panel is designed to switch off the UPS in emergency conditions (fire, flood, etc.) To achieve this, just press the EPO button, and the system will turn off the rectifier, the inverter and stop powering the load immediately (including the inverter and the bypass), and the batteries stop charging or discharging.
If the input utility is present, the UPS control circuit will remain active; however, the output will be turned off. To completely isolate the UPS, users need to switch off the external mains input supply to the UPS.

Warning

When the EPO is triggered, the load is not powered by the UPS. Be careful to use the EPO function.

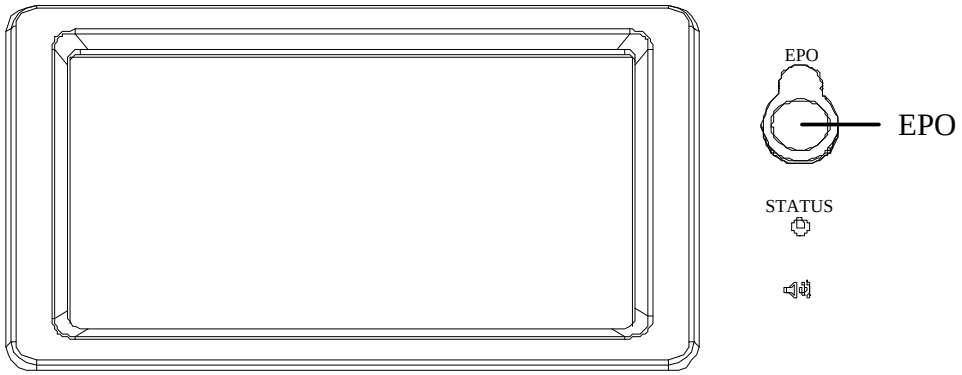


Figure 5-1 EPO Button

6 System Maintenance

Contents

This chapter introduces UPS maintenance, including the maintenance instructions of power module, battery module and monitoring bypass module and the replacement method of dust filter.

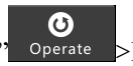
6.1 System Maintenance Instruction

6.1.1 Matters Needing Attention

Only maintaining engineers can maintain the power module and monitoring bypass module.
1) The power module should be disassembled from top to bottom, so as to prevent any inclination from high gravity center of the cabinet.
2) To ensure the safety before maintaining power module and bypass module, use a multi-meter to measure the voltage between operating parts and the earth to ensure the voltage is lower than hazardous voltage, i.e. DC voltage is lower than 36Vdc, and AC maximum voltage is lower than 36 Vac.
3) Bypass module is not recommended to hot swap; only when UPS is in Manual Bypass Mode or UPS is completely powered off, the bypass module can be disassembled.
4) Wait 10 minutes before opening the cover of the power module or the bypass after pulling out from the cabinet.

6.1.2 Instruction for Maintaining Power Module

Confirm the UPS is operating in normal mode and the bypass is working normally before pulling out the power module needed to be repaired.
1) Ensure the remaining power module will not be overloaded.
2) Power off the module.

Enable. LCD panel >Menu ”Operate” 

>Enable Module “OFF” key 

;
3) Press the “OFF” key for 3 seconds, the power module quits from the system.
4) Remove the mounting screw on the two front side of the power module (see Figure 3-11) and pull out the module after 10 min.
5) After the maintenance, push the power module into the cabinet in section (interval at least 10s) and the power module will automatically join the system.

6.1.3 Instruction for Maintaining the Cabinet

Confirm the UPS is operating in normal mode and the bypass is working normally:
1) Transfer the system to bypass module through the LCD control panel;
2) Open the battery switch, close manual bypass switch; the UPS power will be supplied by manual bypass;
3) Remove the mounting screw on the two front sides of the bypass module, Remove the mounting screw on the two front sides of the bypass module;
4) After the maintenance, push the bypass module into the cabinet, fasten the mounting screw on the two front sides of the bypass module and the front signal cable;
5) Close the UPS output and input switch in turn;
6) After 2 minutes, the bypass indicator turns on, bypass working normally;
7) Open the manual bypass switch, inverter starting. After 60s, UPS works on normal mode.

6.1.4 Battery Maintenance

For the Lead-Acid maintenance free battery, when maintaining the battery according to requirements, battery life can be prolonged. The battery life is mainly determined by the following factors:

1) Installation. The battery should be placed in dry and cool place with good ventilation. Avoid direct sunlight and keep away from heat source. When installing, ensure the correct connection to the batteries with same specification.
2) Temperature. The most suitable storage temperature is about 25℃.
3) Charging/discharging current. The best charging current for the lead-acid battery is 0.1C. The maximum charging current for the battery can be 0.2C. The discharging current should be 0.05C-3C.
4) Charging voltage. In most of the time, the battery is in standby state. When the utility is normal, the system will charge the battery in boost mode (constant voltage with maximum limited) to full and then transfers to the state of float charge. The float charge voltage per cell is set to about 13.7V. If the charging voltage is too high, it will overcharge the battery, it will undercharge the battery.
5) Discharge depth. Avoiding deep discharge, this will greatly reduce the life time of the battery. When the UPS runs in battery mode with light load or no load for a long time, it will cause the battery to deep discharge.
6) Check periodically. Observe if any abnormality of the battery, measure if the voltage of each battery is in balance. Discharge the battery periodically every 3-6 months.
7) Regularly check the battery for leakage deformation.

7 Product Specifications

Content

This chapter provides the specifications of the product, including environment characteristics mechanical characteristics and electrical characteristics.

7.1 Applicable Standards

The UPS has been designed to conform to the following European and international standards:

Table 7-1 Compliance with European and International Standards

Item	Normative reference
General safety requirements for UPS used in operator access areas	EN50091-1-1/IEC62040-1-1/AS 62040-1-1
Electromagnetic compatibility (EMC) requirements for UPS	EN50091-2/IEC62040-2/AS 62040-2（C2）

Note

The above mentioned product standards incorporate relevant compliance clauses with generic IEC and EN standards for safety (IEC/EN/AS60950), electromagnetic emission and immunity (IEC/EN61000 series) and construction (IEC/EN60146 series and 60950).

7.2 Environmental Characteristics

Table 7-2 Environmental Characteristics

Item	Unit	Parameter
Acoustic noise level at 1 meter	dB	55dB Single power module
Altitude of Operation	m	≤1000, load de-rated 1% per 100m from 1000m~2000m
Relative Humidity	%RH	0~95, non-condensing
Operating Temperature	℃	0~40; Battery life is halved for every 10 ℃ increase above 20 ℃
UPS Storage Temperature	℃	-40~70
Recommend storage temperature of battery	℃	-20~30 (20℃ Store the temperature for the optimal battery)

7.3 Mechanical Characteristics

Table 7-3 Mechanical Characteristics for Cabinet

Item	Unit	RM3120 cabinet	RM3120 battery cabinet
Mechanical Dimension (W*D*H)	mm	695*443*928	695*443*928
Weight	kg	66.5	67.3
Color	N/A	Black	
Protection Level	N/A	IP20	

Table 7-4 Mechanical Characteristics for Power Module

Item	Unit	PM05D	BM06
Mechanical Dimension W*D*H	mm	200*84.5*431	200*84.5*516
Weight	kg	7.5	17.8

7.4 Electrical Characteristics

7.4.1 Electrical Characteristics (Input Rectifier)

Table 7-5 Rectifier AC input Mains

Item	Unit	Parameter
Grid System	\	3 Phases + Neutral + PE
Rated AC Input Voltage	Vac	380/400/415(three-phase and sharing neutral with the bypass input)
Rated Frequency	Vac	50/60Hz
Input voltage	Vac	277~478Vac (line-ine),full load 147V~277Vac (line-line),load derating from 100%-50% linearly
Input Frequency range	Hz	40~70
Input Power factor	\	>0.95 (Full load)

7.4.2 Electrical Characteristics (Intermediate DC Link)

Table 7-6 Battery

Items	Unit	Parameters
Battery bus voltage	Vdc	Rated:144V
Quantity of lead-acid cells	Nominal	12=[1battery (12V)] , 72=[1battery (2V)] 144V
Float charge voltage	V/cell (VRLA)	2.25V/cell (selectable from 2.1V/cell~2.35V/cell) Constant current and constant voltage charge mode
Temperature compensation	mV/℃/cl	3.0 (selectable from: 0~5.0)
Ripple voltage	% Vfloat charge	≤1
Rippe current	% C10	≤1
Boost charge voltage	VRLA	2.25V/cell (selectable from: 2.20V/cell~2.45V/cell) Constant current and constant voltage charge mode
Final discharging voltage	V/cell	1.65V/cell (selectable from: 1.50V/cell~1.850V/cell) @0.6C discharge current 1.75V/cell (selectable from: 1.55V/cell~1.9V/cell) @0.15C discharge current (EOD voltage changes linearly within the set range according to discharge current)
Charge the battery	V/cell	2.25V/cell(selectable from: 2.3V/cell~2.45V/cell) Constant current and constant voltage charge mode
Charging current	A	1)The charging current of power module：0.5A、0.9A、1.4A、1.8A; 2) The charging current of charger module：0.5A、1A、2A、3A、4A、5A、6A、7A、8A、9A、10A.

Note

The default number of built-in and external batteries is set to 12 at the factory, and the number of built-in batteries cannot be set. Please check the battery voltage marked on the machine nameplate, if the number of external batteries is not 12, you must disconnect the built-in battery, otherwise the battery pack is in danger of damage. To set the specific operation steps of the number of battery cells, please contact the manufacturer's customer service telephone.

7.4.3 Electrical Characteristics (Inverter Output)

Table 7-7 Inverter Output

Rated capacity（kVA）	Unit	20
Rated AC voltage	Vac	220/230/240 (Single Phase+Neutral, share the same N line with bypass)
Rated Frequency	Hz	50/60
Frequency Regulation	Hz	50/60Hz±1%
Voltage regulation	%	±2 (0-100% Linear load)
Inverter overload	%	Normal Mode <110%, 1h 110%~130%,10min 130%~150%,1min >150%,200ms Bttery mode <110%, 10min 110%~125%,1min 125%~130%,10s >130%,200ms
Synchronization range	Hz	Settable, ±0.1Hz ~ ±5Hz, default ±3Hz
Synchronization rate	Hz	Settable, 0.1Hz/S ~ 5Hz/S, default 1Hz/S
Output PF		1
Output dynamic response		<5% (20% - 80% -20% step load)
Dynamic recover time		< 20ms (0% - 100% -0% step load) Recover to 3% in 20ms
Output（THDu）		<1%, 0-100%, Linear load <5%, non-linear load

7.4.4 Electrical Characteristics (Bypass Mains Input)

Table 7-8 Bypass Mains Input

Item	Unit	20kVA
Rated AC voltage	Vac	220/230/240 Single phase, share the same N line with rectifier, providing the reference for outout
Rated AC voltage	A	91
Overload	%	125%, long term operation 125%< load <130% 5min 130%< load <150% 1min >150% 200ms
Rated N line current	A	91
Frequency	Hz	50/60
Transfer time (bypass to inverter)	Ms	Synchronized transfer: 0ms
Bypass voltage range	%	Settable, default -20%~+15% Up limited: +10%, +15%, +20%, +25% (220VAC) +10%, +15%, +20% (230VAC) +10%, +15% (240VAC) Down limited:-10%, -15%, -20%, -30%, -40%
Bypass frequency	%	Settable, +/-1Hz,+/-2Hz,+/-3Hz,+/-4Hz,+/-5Hz default: +/-3Hz
Synchronized	Hz	Rated frequency ±3Hz

7.5 Efficiency

Table 7-9 Efficiency

	Unit	20kVA
System Efficiency		
Normal mode(dual conversion)	%	>94.5
ECO Mode	%	>98
Battery discharging efficiency (battery at nominal voltage 144Vdc, and full-rated linear load)		
Battery mode	%	>90

7.6 Display and Interface

Table 7-10 Display and Interface

Display	LED + Color touch screen
Interface	Standard: RS232, RS485, USB Option: SNMP, Dry Contact, AS400