

Selectric

energy of innovation

USER MANUAL
MODULAR UPS
SELECTRIC SPM
(20 kVA Module)

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1. Safety instructions

Important safety instructions: please keep them in a safe place.

Inside the UPS there are high temperature & high pressure. Safety regulations must be observed during the installation, operation, and maintenance of equipment. Failure to follow appropriate operating procedures may result in personal injury or equipment damage. The precautions in this manual are for local use only. The company shall not be responsible for violation of the general safety requirements of operation or violation of safety standards in the design, manufacture and operation of equipment.

1.1 Safety precautions

1. Even if the UPS is not connected to the mains, there may still be an output voltage of 220 VAC on its power output terminal!
2. To ensure the safety of personnel, this series of electrical appliances must have good grounding protection. Check grounding before using the UPS.
3. If it is necessary to replace the battery cable or power cable, the materials should be purchased from an authorized dealer to avoid heating or sparking due to insufficient capacity, which can lead to fire!
4. Do not use open fire to dispose of batteries or accumulators, it may cause explosion and injury to personnel. Do not open the case or change the design of the battery. The electrolyte inside the UPS is very toxic and harmful to the human body!
5. The positive and negative poles of the battery should be avoided, it may cause electric shock or fire!
6. It is strictly forbidden to open the UPS by own forces. There is a risk of electric shock!
7. Before touching the battery, check it for high voltage.
8. Operating conditions and method of storage affect the service life and reliability of the product, therefore, prolonged operation under the following operating conditions should be avoided.
 - ◆ Places with high, low temperatures, humidity exceeding design parameters (temperature 0° C-40° C, relative humidity 5% -95%).
 - ◆ Placement under direct sunlight or near heat sources.
 - ◆ Placement in areas susceptible to vibration or shock.
 - ◆ Dusty rooms, with the presence of corrosive substances, salt and combustible gases.
9. It is strictly forbidden to block the equipment ventilation openings. Poor air access for the intake and exhaust of air leads to an increase in the temperature inside the UPS, a reduction in the service life of the individual parts of the device and thus affects the service life of the entire equipment.

1.2 Symbols used in this manual



Hazardous!
Electrical hazards.



Attention!
Read this information to prevent damage to the equipment.

2. Main parameters

2.1 Overview

This UPS series is a UPS with three inputs and three outputs. The product features a modular design and N+X parallel redundancy technology. The power range spans from 20 kW to 120 kW, which is convenient for users, allowing for flexible configuration and gradual expansion of capacity.

This UPS series can solve almost all power supply problems, such as power outages, high grid voltage, low grid voltage, voltage drops, fluctuations, high-voltage pulses, voltage surges, harmonic distortions, interference, and frequency variations.

2.2 Advantage and functions of the device

◆ UPS with three inputs and three outputs

This series of UPS is a high-power UPS with three inputs and three outputs. The output can be connected to a completely unbalanced load. The three-phase current input allows you to balance the load of the three-phase mains, even if the device is connected to an unbalanced load.

◆ Digital control

All components of this UPS series are digitally controlled with superior performance, ensuring high stability of the entire system.

Self-protection and fault diagnosis capabilities avoid the risks associated with failure of analog devices, which makes the control system more stable and reliable.

◆ Standard 19-inch cabinet

This series of UPSs has a standard 19-inch case that looks compact and fits perfectly into the computer room environment and saves usable space.

◆ Modular design

The UPS has a modular design, the power of the module is 20 kW. The system can include from 1 to 6 modules, which are connected in parallel, the maximum power is 120 kW. Users can flexibly increase the capacity of the system according to the gradual increase in load. Hot-swap technology is used between modules and cabinets, and UPS modules can be added and removed online, which ensures “zero” service time.

◆ High power density design

Module height – 2U

◆ N + X parallel redundancy

In this series of UPSs, a parallel redundancy scheme N+X is implemented. Users can configure different levels of redundancy depending on the importance of the load.

When the number of redundant modules is more than two, the reliability of the UPS system reaches 99.999%, and the average MTBF may reach more than 250,000 hours, which fully meets the high reliability requirements of the main loads of the power supply system.

The number of redundant UPSs can be set using the LCD display. When the load exceeds the redundancy setting, the UPS can sound the alarm in time.

◆ Flexible settings for parallel redundancy

In this series of UPSs, the number of redundant UPS modules can be set arbitrarily, and the UPS can provide output power with maximum performance.

As long as the load does not exceed the total capacity of the module, the UPS can operate normally and issue appropriate warnings.

◆ Parallel redundancy of the control system

The control method of this series of UPSs is decentralized control and centralized control. Each module is monitored and operated independently, and the control and operation is carried out by a centralized control unit. The centralized control unit is redundant in parallel, and the failure of one of the centers will not affect the operation of the entire machine.

◆ Optimized power distribution cabinet

This series of UPSs improves the system layout of modular UPSs, innovates the concept of distributed convergence and ensures the safety of parallel connection of systems.

- ◆ Centralized bypass

To increase the power supply capacity of the bypass power supply, use a centralized bypass power supply.

- ◆ Shared battery for parallel operation

UPS of this series, working in parallel, can share rechargeable batteries. The number of batteries is not limited to the number of parallel machines, which significantly reduces the number of battery configurations. Users can fully configure the batteries based on the backup power time.

- ◆ Additional number of external batteries (30-50 optional)

The number of external batteries can be selected according to the user's needs: 30/32/34/36/38/40/42/44/46/48/50.

- ◆ Adjustable charging current

This series of UPSs can set the battery capacity set by the user using the LCD panel and automatically distribute the required charging current. The constant voltage charging mode can also be configured using the panel LCD screen according to the user's needs. The floating charge mode is switched automatically and smoothly.

- ◆ Smart charging method

This series of UPS uses an advanced two-stage and three-stage charging method. The first stage is high-current constant current charging, which quickly charges to about 90% capacity; the second stage is constant voltage charging, which activates the battery characteristics and charges it fully; the third stage is the float charge mode. This can successfully solve the problems of fast charging and extending the life of the battery, saving user investment in batteries.

- ◆ Large system LCD display of the system (with touch screen)

It uses a very large LCD display with support for two languages: Chinese and English, provides a wide selection of status information, warnings, fault information, etc. Thanks to the display menu, users can intuitively control the LCD display.

- ◆ Single LED module

In this UPS series, an LED display is used for each module, and users can monitor the operating status of the module using the LED display.

- ◆ Smart monitoring function

If the UPS is equipped with an SNMP card, the module can be monitored remotely.

- ◆ It is possible to create small and medium-sized power distribution systems.

This series of UPS is equipped with a variety of additional accessories. Users can install isolation transformers, switchboards, SNMP cards, dry contact relay cards and other optional accessories according to their needs to form a small or medium sized power distribution system.

- ◆ Ease of maintenance

This series of UPS is equipped with a service bypass function. In the event of an emergency, it can switch to bypass power for maintenance, and maintenance personnel can safely perform online maintenance.

- ◆ Short downtime for maintenance

If the number of faulty UPS modules is less than or equal to the number of redundant UPS modules, the faulty UPS modules can be replaced online without affecting the operation of other modules. In this case, the downtime for maintenance is zero; if the number of faulty UPS modules exceeds the number of redundant UPS modules, then since maintenance is carried out by replacing the UPS modules, the downtime for maintenance will not exceed 5 minutes.

- ◆ Centralized monitoring module

This series provides centralized hot-swap monitoring modules. If the monitoring module is disabled, the system can continue to operate normally.

- ◆ EPO function

This series of monitoring devices has an Emergency Power Off (EPO) button built into the panel. In an emergency, pressing the EPO button may immediately turn the unit off. The EPO button is designed to protect and has a transparent cover that prevents incorrect pressing. There is also a Remote Emergency Power Off (REPO) feature.

2.3 Model description

No.	Project	Description
1	UPS module	ARP-120
2	Cabinet	Cabinet for 6 modules: 20 kVA/40 kVA/60 kVA/80 kVA/100 kVA/120 kVA

The following models are presented in the user manual (some models have not yet entered mass production):

Modular cabinet ARP-120-20 for 6 modules provides 6 power configurations: 20 kVA, 40 kVA, 60 kVA, 80 kVA, 100 kVA and 120 kVA.

3. Installation instructions

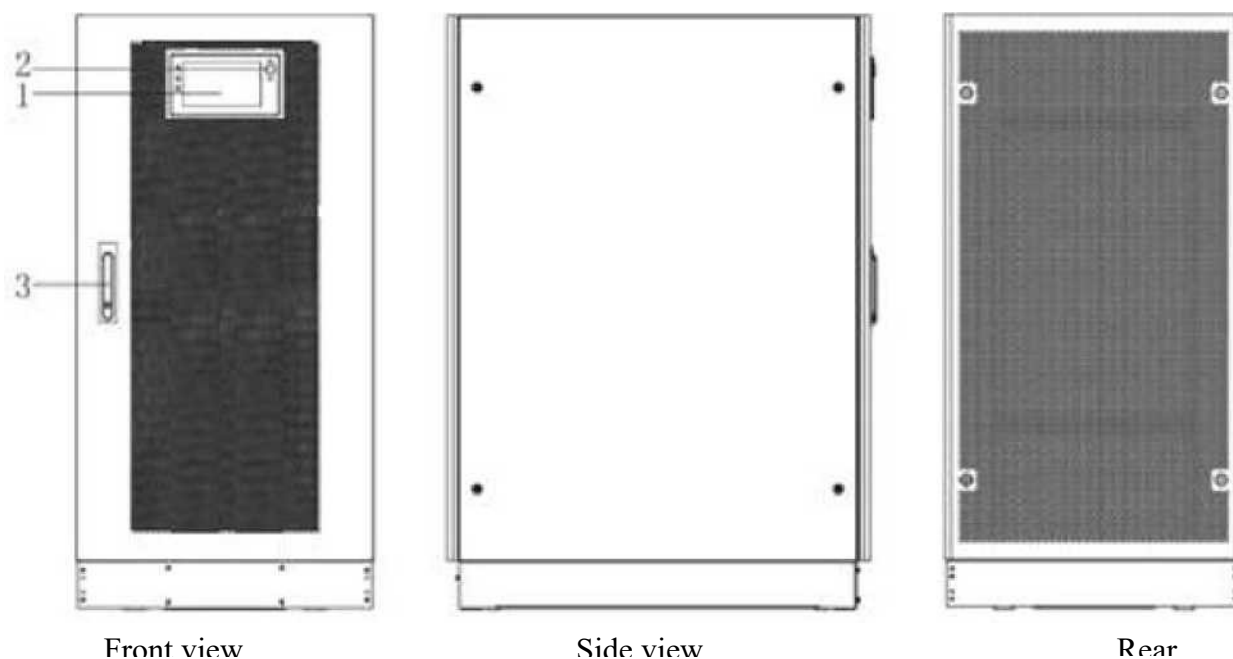
3.1 Initial inspection

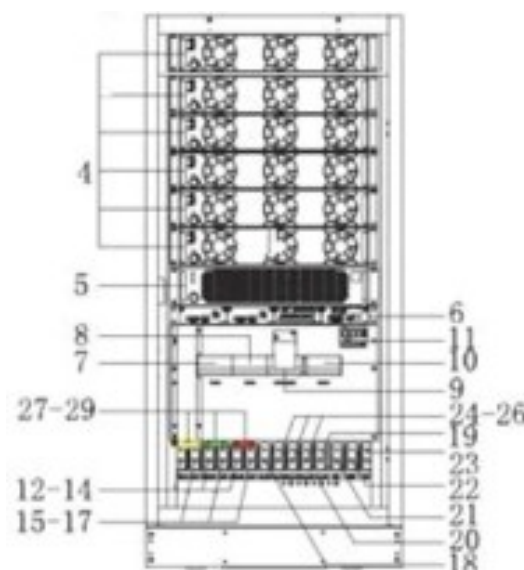
Before installing the UPS, perform the following preliminary checks:

1. Check if this device is the model you intended to purchase.
 2. Unpack the UPS cabinet and check if the unit has been damaged during transportation.
- If any damage or missing parts are found, do not start the machine and inform the carrier and dealer.

Cabinet for 6 modules: 20 kVA/40 kVA/60 kVA/80 kVA/100 kVA/120

3.2 Appearance of the cabinet

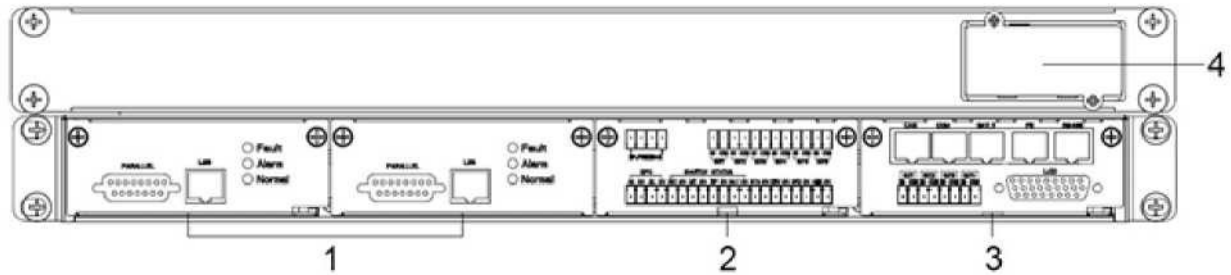




Front view of the interior of the cabinet

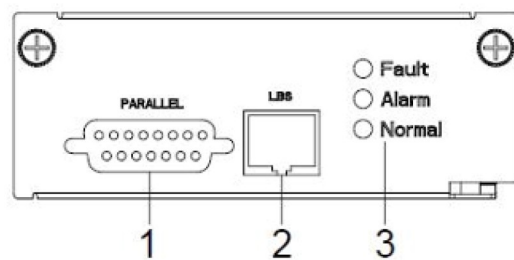
- (1) LCD panel: displays UPS data and status
- (2) EPO button: emergency power off (output shutdown)
- (3) Front door lock
- (4) Power supply module
- (5) Bypass module
- (6) Control unit: ECU board, dry contact board and monitoring unit board
- (7) Main switch
- (8) Bypass switch
- (9) Maintenance bypass switch
- (10) Output switch
- (11) SMNP card
- (12) Main circuit copper busbar input phase A
- (13) Main circuit copper busbar input phase B
- (14) Main circuit copper busbar input phase C
- (15) Bypass phase A input copper busbar: connected only when the main circuit is separated.
- (16) Bypass phase B input copper busbar: connected only when the main circuit is separated.
- (17) Bypass phase C input copper busbar: connected only when the main circuit is separated.
- (18) Neutral input copper busbar
- (19) Neutral output copper busbar
- (20) Ground wire copper busbar
- (21) Battery positive wire input copper busbar
- (22) Battery neutral wire input copper busbar
- (23) Battery negative wire input copper busbar
- (24) Phase A output copper busbar
- (25) Phase B output copper busbar
- (26) Phase C output copper busbar
- (27) Copper busbar for connecting to the main line phase A common source: must be disconnected when the main and bypass lines are separated.
- (28) Copper busbar for connecting to the main line phase B common source: must be disconnected when the main and bypass lines are separated.
- (29) Copper busbar for connecting to the main line phase C common source: must be disconnected when the main and bypass lines are separated.

Centralized control panel:



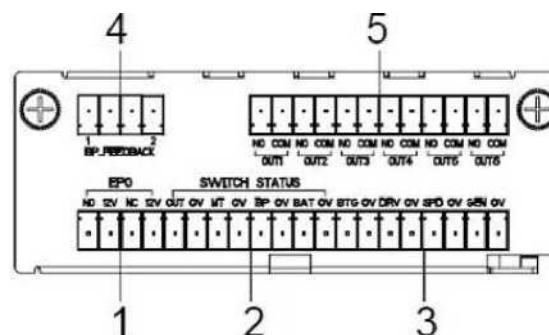
- (1) ECU1 and 2: centralized control unit 1 and 2
- (2) Dry contact card: including switch status dry contact, configurable dry contact, bypass backfeed dry contact, and other output dry contacts
- (3) Monitoring card: including LCD communication, dry contact input, communication interface
- (4) Smart slot: slot for SNMP card or relay card

ECU unit



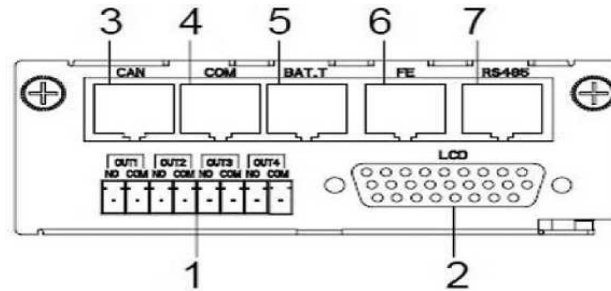
- (1) PARALLEL: parallel interface, two ECU units, when connected in parallel, two parallel interfaces form a loop.
- (2) LBS: LBS interface, two ECU units, when using two LBS units they form a loop.
- (3) LED indicators: fault, alarm, normal operation.

Dry contact unit



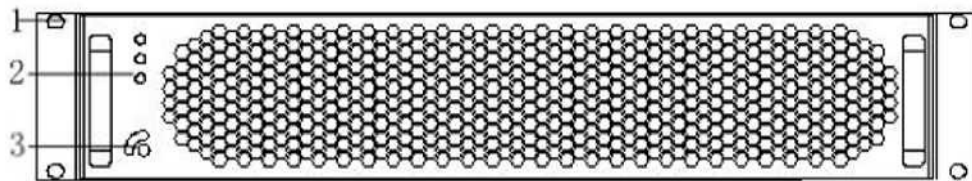
- (1) EPO contacts: there are two types of contacts: EPO_NC and EPO_NO.
- (2) SWITCH STATUS: interface to determine the status of the switch.
- (3) Other contacts: ground detector signal contact, battery disconnect contact, generator access contact, lightning protection activation contact
- (4) BP_FEEDBACK: bypass feedback contact, PIN2 and PIN4
- (5) Custom dry contact: There are 6 dry contact output interfaces that can be configured via the LCD display.

Communication unit

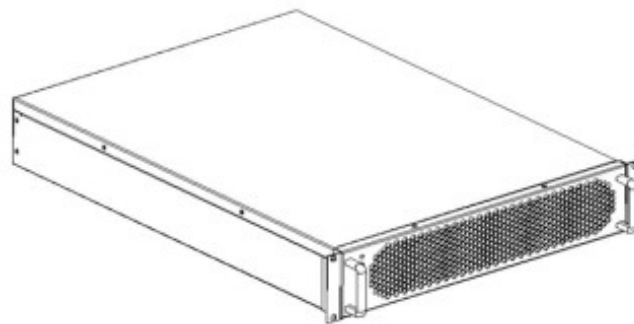


- (1) Output relay interface: there are 4 relay interfaces, which are configured using the LCD display.
- (2) LCD Display: LCD display connector
- (3) CAN: BMS communication interface or remote screen interface
- (4) COM: battery monitor interface
- (5) BAT_T: temperature sensor interface
- (6) FE: network interface
- (7) RS-485: communication interface 485

3.3 Appearance of the module



Front view of the module



Side view

- (1) Fixing screws of the module
- (2) Running indicator of the module
- (3) Module control handle

3.4 Installation instructions

Note: To facilitate operation and maintenance when installing this series of UPS cabinets, it is necessary to leave a space of 800 mm between the front and rear doors of the cabinet.

♦ Install the UPS in a clean and dry place, away from vibration, dust, high humidity, flammable gases, flammable liquids or corrosive substances. If it is necessary to maintain the temperature in the room, an exhaust fan should be installed to evacuate the blast air to the outside. If the UPS is operating in a dusty environment, an air filter can be added.

♦ The ambient temperature should be between 0°C and 40°C. If the operating temperature exceeds 40°C, the maximum load shall be reduced by 12% for every 5°C increase in temperature. The maximum ambient temperature during UPS operation should not exceed 50°C.

♦ If the machine is disassembled and used at low temperatures, the water droplets can condense. Before installation and use, be sure to allow the internal and external surfaces of the machine to

dry completely, otherwise there is a risk of electric shock.

The battery should be installed in an environment where all batteries can be stored at a certain temperature, or even in an environment where the temperature of the battery is relatively balanced. Temperature is the main factor of battery life and capacity. Under normal use, the battery temperature should be maintained between 15°C and 25°C. Be sure to keep the battery away from heat sources, main air intakes, etc.



Warning!

The manufacturer specifies the battery operating temperature range from 20 °C to 25 °C. Temperatures above 25 °C shorten battery life, while temperatures below 20 °C reduce battery capacity.

♦ If the battery is not used, it should be stored in a cabinet to protect it from moisture and heat. Unused batteries must be recharged every six months. The battery can be charged by temporarily connecting the UPS to the main power supply.

♦ The altitude at full load and normal operation of the UPS shall not exceed 1500 meters. When using the UPS in high mountain areas, reduce the load. The load corresponding to normal operation at each height is indicated in the following table:

(Load factor = maximum load during normal operation at high altitudes ÷ UPS rated power)

Height, m	1500	2000	2500	3000	3500	4000	4500	5000
Load factor	100%	95%	90%	85%	80%	75%	70%	65%

♦ This series of UPS uses forced fan cooling, so the installation site should be properly ventilated. The front and rear doors of the UPS are equipped with mesh vents, the doors must not be blocked or obstructed.

3.5 External protection device

For safety reasons, it is necessary to install a circuit breaker outside the UPS system to protect the mains and battery (when using an external battery). Considering that each installation has its own characteristics, this chapter is a guide only for electricians certified according to the local rules for the installation of electrical circuits.

♦ External battery

The installation of a thermoelectromagnetic DC circuit breaker (or fused disconnect) next to the battery protects the UPS and the battery connected to it from overcurrent.

♦ UPS output

Each external switchboard used to distribute the output power shall be equipped with protective devices to protect the UPS from overloads.

♦ Overcurrent

The switchboard for AC input must be equipped with a protective device that can distinguish between the flow rate in the power cable and the system overload.

3.6 Power cable

♦ The cables are designed to meet the voltage and current requirements described in this section and for local wiring according to ambient conditions (temperature and natural conditions).



Warning!

Before starting work, make sure that external isolators are installed at your location and at the work site, connected to the UPS input/bypass power supply and the mains switchboard.

Check that these power supplies are electrically isolated and place the necessary warning signs to prevent accidental operation.

♦ To facilitate subsequent expansion, it is recommended that the input and output power cables are configured according to the capacity of the maximum number of modules during initial

installation. Recommended cable diameters are as follows:

Rated Power (KVA)	Cable Size				
	Main input (mm2)	Bypass input (mm2)	AC output (mm2)	DC input (mm2)	Grounding (mm2)
20	8	8	8	15	8
40	16	16	16	35	15
60	35	35	35	70	35
80	35	35	35	95	35
100	95	95	95	120	95
120	95	95	95	150	95

- ♦ The selection, connection, and routing of cables must comply with local standards and regulations.
- ♦ When external conditions change, such as the connection type or operating medium temperature, it is necessary to refer to IEC-60364-5-52 or relevant local specifications.
- ♦ The current values in the table above are specified for a rated voltage of 380 V. For a rated voltage of 400 V, the current value must be multiplied by 0.95; for a nominal voltage of 415 V, the current value must be multiplied by 0.92.
- ♦ When the main load is non-linear, the cross-section of the N wire must be increased by 1.5–1.7 times.
- ♦ If the main and bypass lines have the same source, the input cables are arranged in accordance with the main cable inputs.
- ♦ It is recommended that the AC cable length does not exceed 30 m. The DC cable length should be no more than 50 meters.



Protective grounding cable: all parts of the machine must be connected to the grounding system by the shortest possible line. The cross-section of the grounding conductor should be determined taking into account the fault level, cable length, and the protection type of the AC source.



Warning!

The absence of grounding can lead to electromagnetic interference or the risk of electric shock and fire.

3.7 Power line terminal requirements

Model	Terminal	Connection method	Bolt diameter	Opening diameter	Torque
6-Module cabinet	Main input	Crimping a Cable with an OT Terminal	M10	10.5 mm	26N*m
	Bypass input	Crimping a Cable with an OT Terminal	M10	10.5 mm	26N*m
	Battery input	Crimping a Cable with an OT Terminal	M10	10.5 mm	26N*m
	Output	Crimping a Cable with an OT Terminal	M10	10.5 mm	26N*m

	Grounding	Crimping a Cable with an OT Terminal	M10	10.5 mm	26N*m
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3.8 Switch configuration recommendations

UPS model (kVA)	Main switch	Bypass switch	Maintenance bypass switch	Main output switch	Battery switch DC
20κ	63A 3P	63A 3P	63A 4P	63A 3P	100A 3P
40κ	80A 3P	80A 3P	80A 4P	80A 3P	160A 3P
60k	125A 3P	125A 3P	125A 4P	125A 3P	175A 3P
80κ	160A 3P	160A 3P	160A 4P	160A 3P	250A 3P
100κ	200A 3P	200A 3P	200A 4P	200A 3P	315A 3P
120κ	250A 3P	250A 3P	250A 4P	250A 3P	400A 3P



Protective grounding cable: all parts of the machine must be connected to the grounding system by the shortest possible line. The cross-section of the grounding conductor should be determined taking into account the fault level, cable length, and the protection type of the AC source.



Warning!

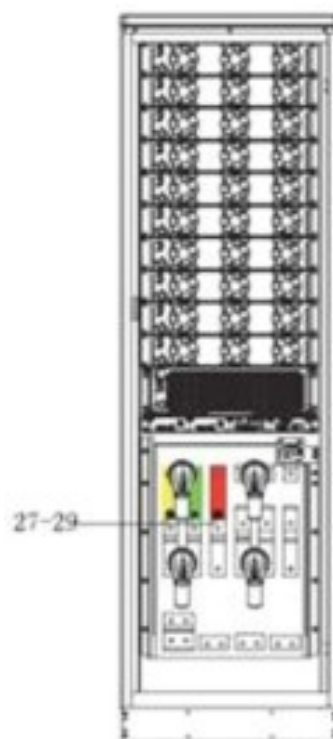
The absence of grounding can lead to electromagnetic interference or the risk of electric shock and fire.

3.9 Power cable connection

Before installing the equipment, it is necessary to determine the UPS connection method: the common input method for the main and bypass sources or the split input method for the main and bypass sources. If the split input method for the main and bypass circuits is used, follow these steps to remove the copper busbar connecting the main circuit and the bypass:

Main and bypass circuits separation

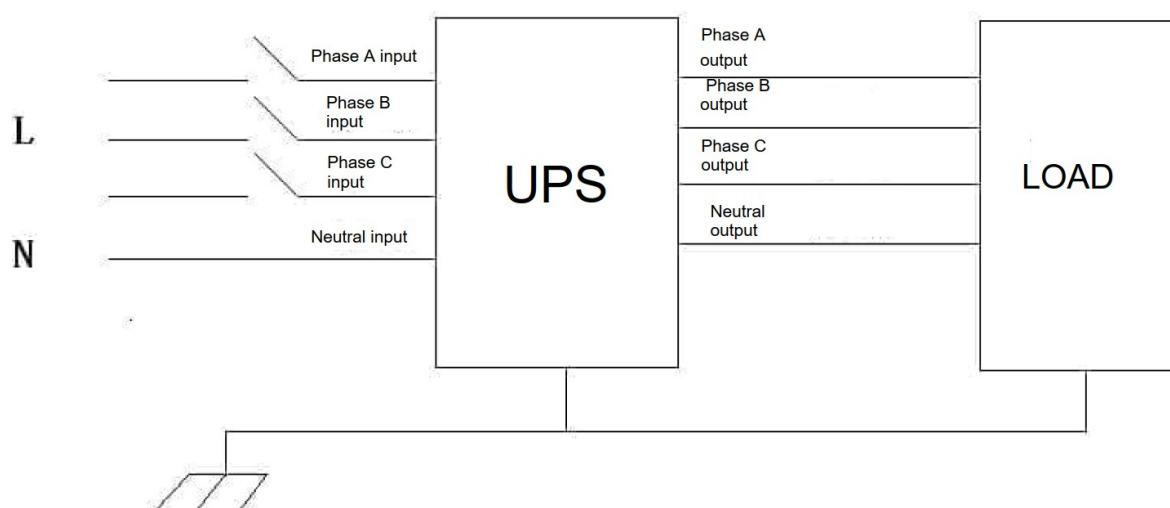
The figure below shows the position of the screw connecting the copper busbar of the main side connection and the copper busbar of the main circuit breaker. By default, the device is configured with a factory-set common input connection for the main and bypass sources. To switch to the separated main-bypass mode, refer to the diagram below and remove the copper busbars labeled 25, 26, and 27.



After installing the device, connect the power cable as described below.

Verify the insulation of the UPS from the external power grid and the position of the air circuit breaker at the input/output of the UPS power module.

- Verify the electrical insulation of the incoming power cable and place the necessary warning signs to prevent unauthorized start.
- Power the UPS on.
- Open the rear door of the machine and remove the terminal block partition to facilitate connection.
- Select cables of the appropriate size (refer to the cable diameter table); note that the cable lug hole diameter must be greater than or equal to the terminal diameter. Ensure correct power distribution.





Warning!

Disconnect the bypass connection to ensure that the power distribution connection between the bypass input and the main input copper busbar is disconnected. The main input and the bypass input must be connected to the same neutral line.

Select the appropriate cable size (refer to the cable diameter table); note that the hole in the cable lug must be greater than or equal to the terminal diameter.



Warning!

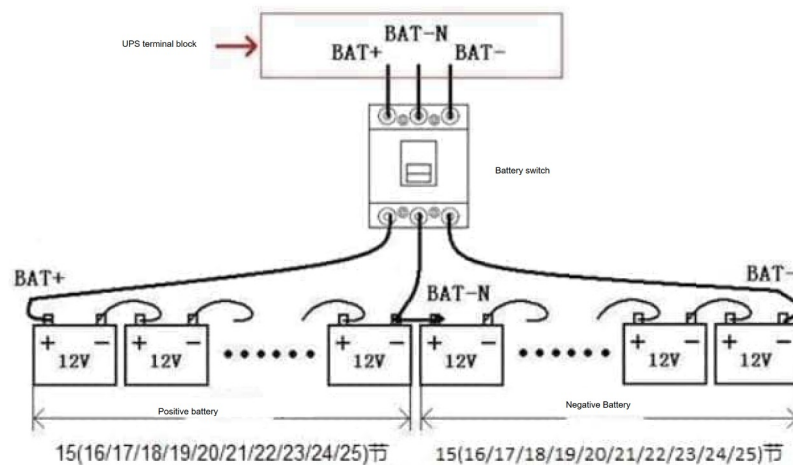
If the load equipment is not ready to receive power, ensure that the output cable terminal of the UPS system is securely insulated, connect all cables that require grounding to the copper grounding bar of the device, and ensure safe grounding.

The connection bars for grounding and neutral wires must comply with current local and national requirements.

3.10 UPS battery connection

This UPS series uses a dual positive and negative battery architecture, comprising a total of 30 (optional 32/34/36/38/40/42/44/46/48/50) series-connected blocks. The neutral line is drawn from the connection between the cathode of the 15th (16/17/18/19/20/21/22/23/24/25) block and the anode of the 16th (17/18/19/20/21/22/23/24/25/26) block, resulting in a total of three wires connected to the positive and negative terminals of the battery and the UPS.

The battery located between the positive pole of the battery and the battery center line is referred to as the positive battery, while the battery located between the negative pole of the battery and the battery center line is referred to as the negative battery. Users can select the battery capacity and the number of groups according to their needs. The battery connection method is shown in the figure below:



The figure above shows:

BAT+ is connected to the anode of the positive battery, BAT-N is connected to the cathode of the positive battery and the anode of the negative battery, and BAT- is connected to the cathode of the negative battery.

The number of battery cells is factory-set to 40, and the battery capacity is set to 100 Ah (the charging current is 10 A). When connecting 30, 32, 34, 36, 38, 42, 44, 46, 48, or 50 blocks, set the corresponding number of batteries and the corresponding battery capacity upon turning on the power mode. The charging current is automatically distributed according to the battery capacity

(the charging current value can be adjusted). For information regarding the above settings, please refer to the "Interface Display" section.



Warning!

Ensure that the polarity is connected correctly. The correct connection method is connecting the positive terminal to the negative terminal of each battery.

Note: do not mix batteries of different manufacturers, different models, or different new and old batteries.



Warning!

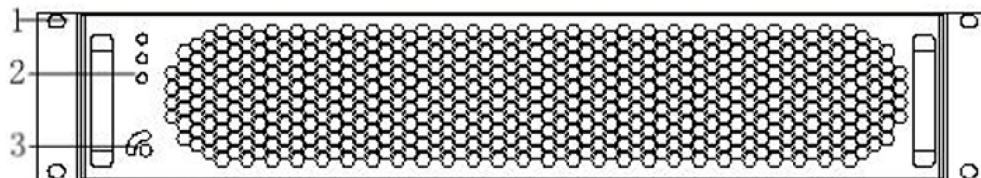
Ensure that the polarity of the connections to the battery circuit breaker and from the battery protection circuit breaker to the UPS battery is strictly observed, in the following order: (+) to (+) / (-) to (-). Prior to the arrival of an engineer, disconnect one or more connections of the battery, do not connect them, and do not close the battery circuit breaker.

3.11 Installation of additional modules, removal, or replacement in real time mode

The UPS modules of this series must be installed in the UPS module to form a complete UPS system.

Replacing the UPS modules of this series is very simple and can be carried out in real time mode (while the UPS is operating in normal mode). The UPS control system can automatically detect the new installation or removal of a module, and turn the corresponding UPS module on or off. The user only needs to perform a few simple steps.

Note: The power module is heavy, and two people are required to move it!



Installing the power module

- (1) Remove the panel of the UPS module body;
- (2) Turn the power module switch handle to the OFF position. Install the power module into the module slot in the cabinet. The module is inserted into the cabinet along the slot until it is fully inside, then the LED lights up. First, the LED flashes red, then turns solid red, and then a green LED begins to flash, which means that the module is in power connection standby mode.
- (3) Secure the UPS module with bolts (M5) in the bolt holes at position 1, as shown in the figure above, and turn the module switch handle to the ON position. At this time, the module will receive the power-on command, and the red indicator will light up and go out, which means that the module is entering the system normal operation mode and supplying power to the output.
- (4) Reset the number of modules on the cabinet LCD.
- (5) After the module starts, the system will automatically detect the module installation, integrate into the overall system, and operate in normal mode. Module installation is complete.

Removing the module

- (1) Turn the power module switch handle to the "OFF" position, the red indicator will light up, and the green indicator will start flashing, indicating that the module is turned off.
- (2) Unscrew the module fixing bolts and pull out the module

NOTE:

- (1) Figure 3 above shows the control handle for turning the module on and off. When turning on the module, the handle must be turned to the ON position for normal startup.

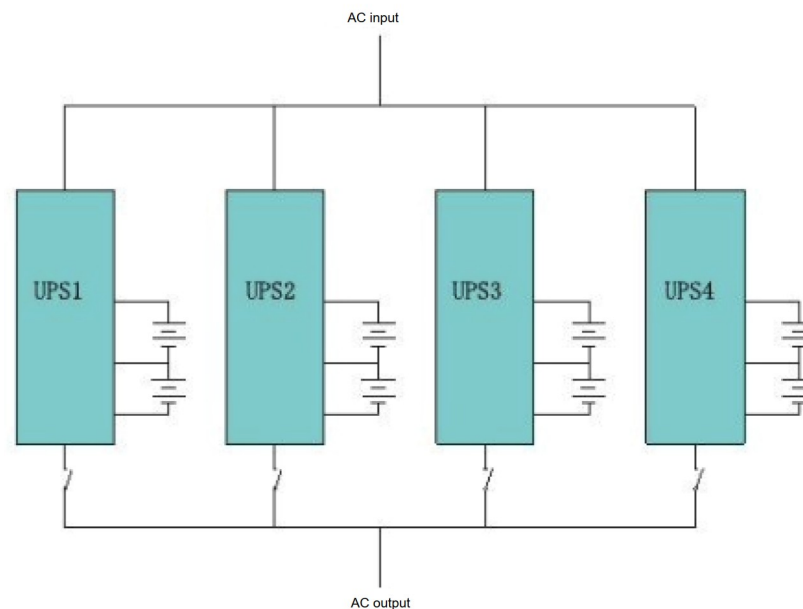
- (2) When turning off, turn the handle to the "OFF" position and ensure that the red indicator is solid and the green indicator is flashing before disconnecting the module.
- (3) When connecting or disconnecting the module, the switch handle must be turned to the "OFF" position to avoid damaging the switch.
- (4) The module must be fully inserted before it can be turned on and off.

3.12 Assembling a parallel UPS system

The basic installation steps for a parallel system consisting of two or more units are similar to those for a single unit. The following paragraph only covers the installation steps specific to a parallel system.

3.12.1 Assembling a parallel UPS system

Arrange the UPS units according to the diagram below and connect them to each other.



Ensure that the UPS input circuit breakers are in the disconnected position and there is no voltage at the UPS output. Parallel batteries can be connected individually or shared.

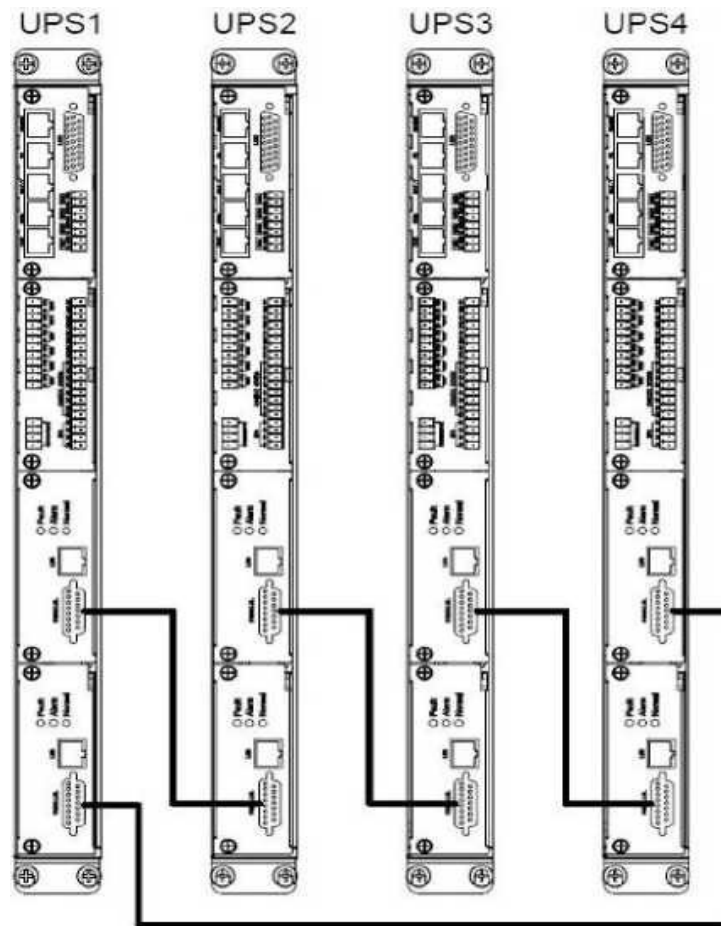


Warning!

Ensure that the N, A, B, and C lines are in good working condition and reliably grounded.

3.12.2 Parallel UPS cable connection

As shown in the figure below, each UPS is equipped with a parallel control board. The parallel UPS must be connected using double-insulated shielded control cables. A closed-loop connection ensures more efficient control.



3.12.3 Requirements for assembling parallel systems

A parallel system is equivalent to a high-capacity UPS but features higher reliability. To ensure equal power distribution among all UPS units and to comply with relevant electrical safety regulations, the following requirements must be met:

- 1) All UPS units must have the same rating and be connected to the same bypass power source.
- 2) The bypass and main input power sources must be connected to the same neutral line.
- 3) All UPS units must be connected to a common output busbar.
- 4) All bypass input cables and UPS output cables must be of the same length and specification to ensure a more even current distribution when the machine operates in bypass mode.

3.13 LBS system

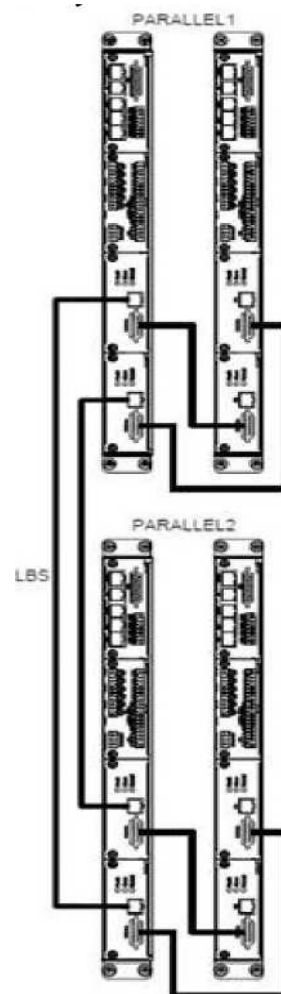
The LBS system includes: LBS LCD display with master-slave configuration, LBS communication cable, and STS device.

3.13.1 LCD display configuration

Configure each UPS as a master or slave. If a UPS or a UPS system is the LBS master device, the UPS or UPS system must be set as the master.

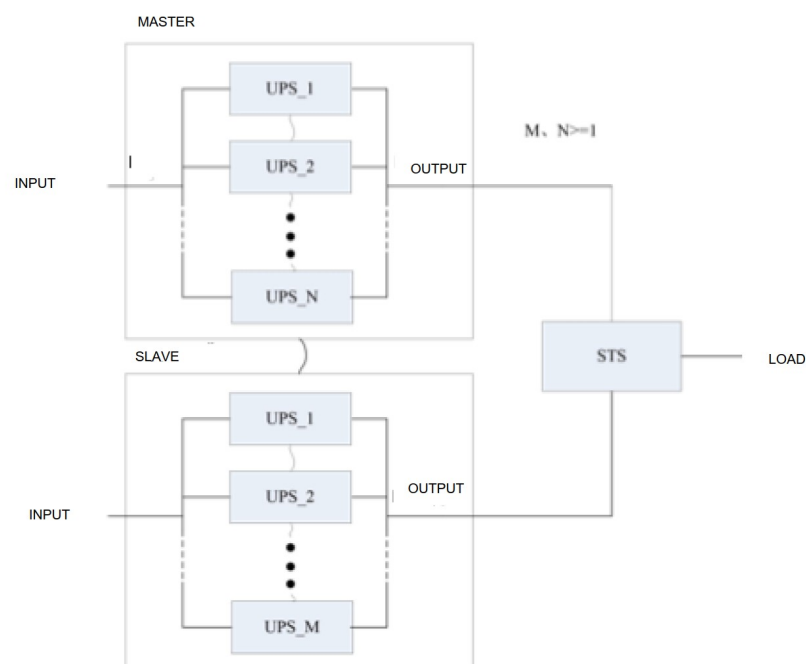
3.13.2 LBS communication cable connection

Each UPS features two LBS interfaces. An RJ45 communication cable must be used to connect the LBS interfaces of the two UPS units into a loop.



3.13.3 LBS UPS system assembly

The following figure shows the diagram of the LBS system:



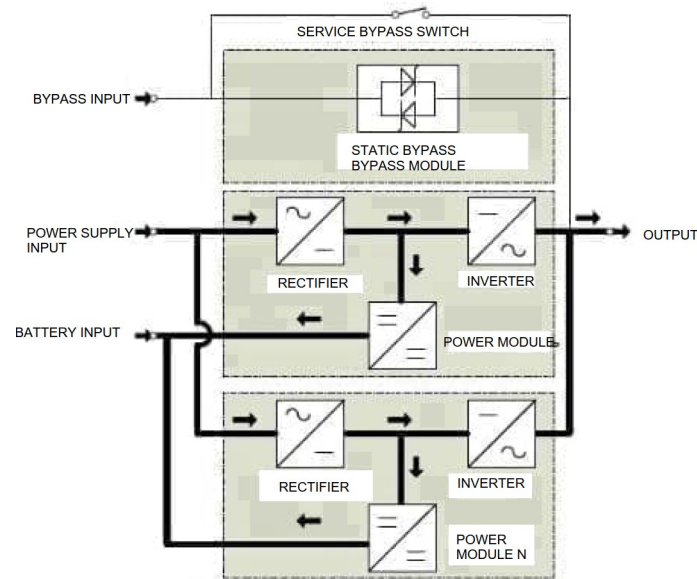
4. UPS operation instructions

4.1 Operating modes

This series of UPS is an online double-conversion UPS and has the following operating modes:

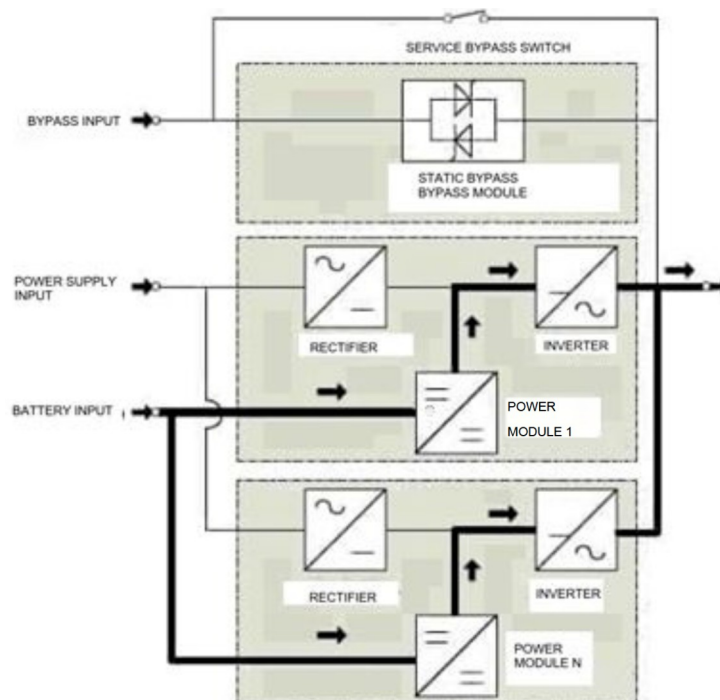
♦ Normal mode

The UPS is continuously powered by the inverter, and the rectifier converts alternating current into direct current to power the inverter. At the same time, the battery is evenly charged or float-charged through the charger.



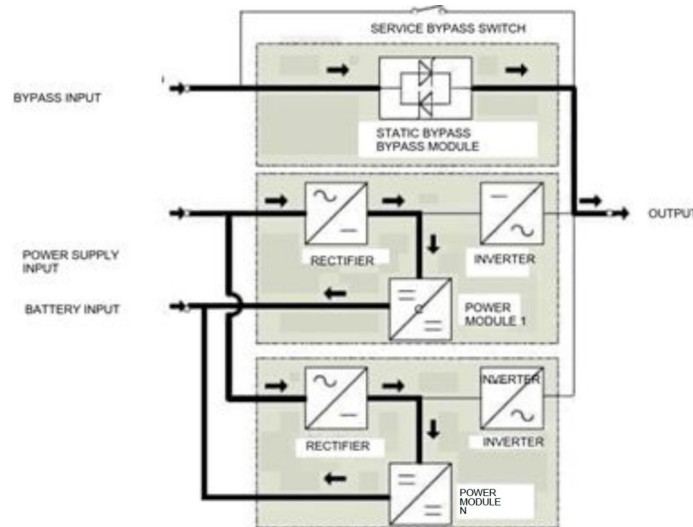
♦ Battery operation mode (energy storage mode)

When the mains power fails, the inverter continuously supplies power to the load through battery discharge. When the mains power fails or is restored, the switching between normal mode and battery operation mode occurs fully automatically, without operator participation.



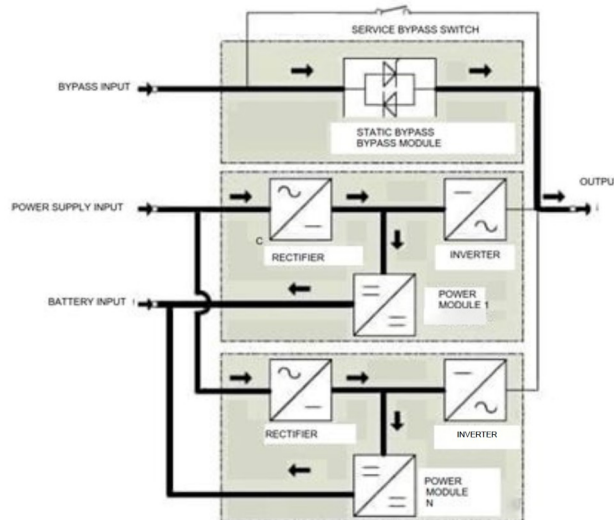
♦ Bypass mode

If the inverter fails or is overloaded, and the inverter is synchronized with the bypass, the static switch is activated, transferring the system from inverter power to bypass power without interruption. If the inverter and bypass are not synchronized, the system will temporarily transfer from inverter power to bypass power via the static switch. The interruption time is no more than 15 ms.



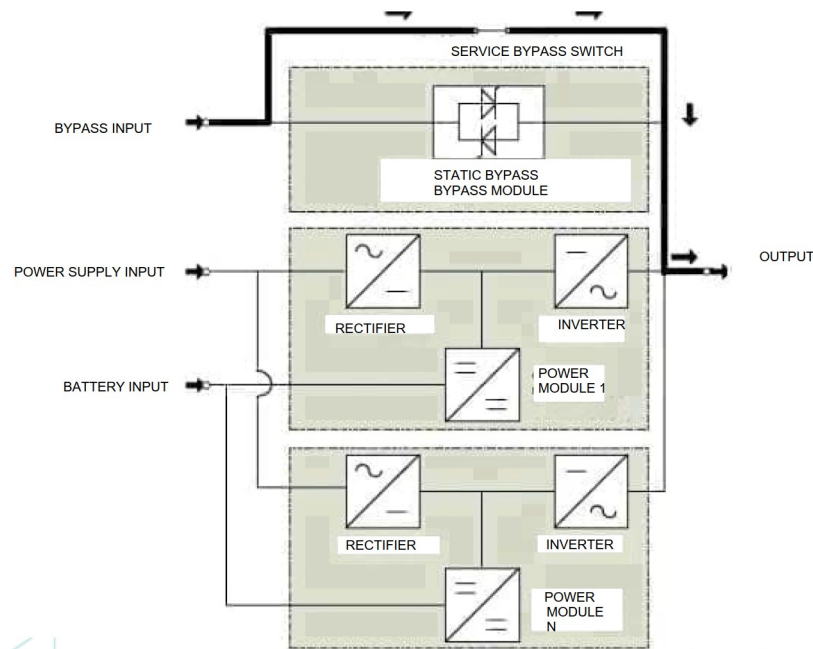
♦ ECO mode

In AC power mode, if the load does not require high-quality power supply, the UPS can be configured to operate in economizing mode (ECO) to improve efficiency, whereby the UPS will switch to bypass circuit power supply. When the mains voltage exceeds the acceptable limit, the UPS switches to battery inverter power, and the corresponding information is displayed on the LCD.



♦ Maintenance mode (manual bypass mode)

In the event of an internal UPS fault requiring maintenance, the system can switch to manual bypass mode to ensure uninterrupted power supply to the load. The circuit can withstand the corresponding full rated load.



4.2 UPS power on and off

4.2.1 Automatic restart sequence



Ensure if the connections are all correct!

- ◆ Disconnect the battery circuit breaker as described in the manual.
- ◆ Open the front and rear doors of the UPS to access the main switch.



Use the output terminals to perform these actions.

If the load device is connected to the UPS output, please check the reliability of the load connection. If the load is not ready to receive power, ensure that it is disconnected from the UPS output.

- ◆ Close the cabinet main switch and the bypass switch (the main switch and the output switch are located at the front of the cabinet, and the bypass switch is located at the rear of the cabinet).

When the main input voltage is within the main range, the internal rectifier starts within 30 seconds, followed by the inverter. When the output switch is closed, the inverter indicator lights up.

- ◆ Close the cabinet output switch.

When the power module rectifier is not started, the bypass indicator lights up. When the inverter starts, the UPS transfers from bypass mode to inverter mode, the bypass indicator goes out, and the inverter indicator lights up.

The display may show messages indicating normal UPS operation or a fault.

4.2.2 Test procedure



The UPS is operating normally.

System start and self-test will take approximately 60 seconds.

- ◆ Disconnect the main input switch to simulate a mains power failure, turn off the rectifier, and continue supplying battery power to the inverter. At this time, the battery indicator lights up.
- ◆ Close the main input switch to simulate the AC input. The rectifier will automatically restart after 20 seconds and power the inverter. The simulated test output load can reach the maximum

output power of the UPS.



When the UPS is operating normally, it is powered by the inverter.

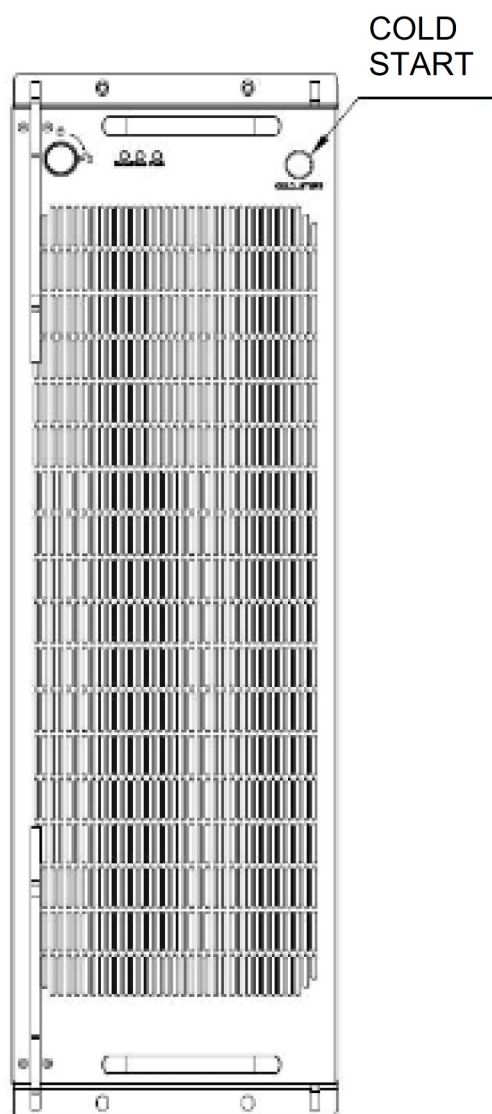
4.2.3 Cold start



Attention!

Use this turn-on method to power the UPS when there are faults in the main AC power supply but the battery is normal.

- ◆ Close the battery switch.
- ◆ Close the output switch.
- ◆ Press the cold start button on the bypass module.



When the battery bank is charged, the rectifier starts operating, and after approximately 30 seconds, the inverter starts and the battery indicator lights up.



Attention!

Press the cold start button 30 seconds after closing the battery switch.

4.2.4 Maintenance bypass

To improve operating efficiency, the UPS is equipped with a manual bypass system. The UPS power is directly supplied to the output through the maintenance bypass, bypassing the UPS.



Attention!

When the internal manual bypass system is activated, the UPS does not protect the load and is powered solely from the AC mains.

Enabling the bypass mode



Attention!

If the UPS operates normally and can be controlled via the display, proceed to steps 1–5. If not, go directly to step 4.

- ◆ Use the LCD panel to turn off the inverter.
- ◆ After the UPS switches to bypass mode, close the maintenance bypass switch.
- ◆ Disconnect the battery circuit breaker.
- ◆ Disconnect the cabinet main switch.
- ◆ Disconnect the cabinet bypass switch.
- ◆ Disconnect the cabinet output switch.

At this time, the bypass power source supplies power to the load through the maintenance switch.

Switching to normal operation mode (from manual bypass mode)



Attention!

Do not make attempts to close the breaker to return the UPS to normal operation mode until you ensure there are no internal UPS faults.

- ◆ Open the front door of the UPS to access the switch.
- ◆ Turn on the cabinet output switch.
- ◆ Turn on the cabinet bypass and main circuit breaker.

The UPS is powered by the static bypass instead of the maintenance bypass, the bypass indicator lights up.

- ◆ Turn off the maintenance switch.

At this time, the output is powered by the bypass module.

- ◆ Turn on the inverter using the LCD panel.

The UPS detects that the maintenance mode is complete. After approximately 30 seconds, the rectifier enters normal operating mode. If the inverter is ready, the system will transfer from bypass mode to normal mode.

4.2.5 Full shutdown procedure



Performing this procedure will completely power down the UPS and the load. After turning off all power switches, isolators, and circuit breakers, there will be no output power.

- ◆ Turn off the inverter from the LCD panel;
- ◆ The UPS normal status indicator flashes;
- ◆ Disconnect the battery circuit breaker;
- ◆ Open the UPS door to access the main switch and bypass switch;
- ◆ Disconnect the cabinet main switch;
- ◆ Disconnect the cabinet bypass switch;
- ◆ Disconnect the cabinet output switch, close the UPS cabinet;
- ◆ To completely isolate the AC power source, the mains input switch outside the main circuit must also be disconnected (including all switches used in the separate bypass connection);
- ◆ The main distribution board is typically located far from the UPS area, and a label must be placed on it informing maintenance personnel that the UPS circuit is under repair.



After 5 minutes, the internal DC bus capacitor will be fully discharged.

4.2.6 Parallel system start procedure

- ◆ Connect the parallel cable, input/output cable, and battery cable;
- ◆ Measure the voltage of the positive and negative battery banks and temporarily disconnect the battery circuit breaker.
- ◆ Turn on the cabinet output switch.
- ◆ In accordance with the start procedure for a single cabinet, change the operating mode of each cabinet: change the mode from single to parallel; set the total number of parallel cabinets for each cabinet: maximum four cabinets in parallel; set an identifier of each cabinet.
- ◆ Close the cabinet main switch and the bypass switch. Close the external input main switch to turn on the AC power.
- ◆ After turning on the AC power, check the LCD screens on the front doors of all cabinets to ensure that the cabinet ID number and the cabinet number in the parallel network information match the actual ones.
- ◆ Turn on all external battery switches of the cabinet and check whether the charging current displayed on the front door LCD is normal.



Attention!

Parallel connection of cabinets must be performed when a single cabinet has no faults.

4.3 Display interface

Various UPS functions can be controlled using the cabinet color touch screen. UPS
The display interface is as follows:



4.4 Information display / record

This section lists possible UPS event messages and alarm messages. Messages are arranged in alphabetical order. This section lists all error messages to help you troubleshoot the problem.

Fault info

No	Fault info	Sound	Display indicator
1	Rectifier overheat	2 times per second	Fault indicator flashes
2	Rectifier bus fault	2 times per second	Fault indicator flashes
3	Rectifier overcurrent fault	Long sound	Fault indicator on
4	Rectifier power fault	Long sound	Fault indicator on
5	Input thyristor fault	Long sound	Fault indicator on
6	Discharge thyristor fault	Long sound	Fault indicator on
7	Charge thyristor fault	Long sound	Fault indicator on
8	Fan fault	Long sound	Fault indicator on
9	Fan power fault	Long sound	Fault indicator on
10	Charger overtemperature	Long sound	Fault indicator on
11	Soft start failure	Long sound	Fault indicator on
12	Battery charger fault	Long sound	Fault indicator on
13	Rectifier internal communication fault	2 times per second	Fault indicator flashes
14	Rectifier initialization fault	Long sound	Fault indicator on
15	Module connection fault	Once per 2	Fault indicator on

		seconds	
16		Once per 2 seconds	Fault indicator on
17	Rectifier fault	Long sound	Fault indicator on
18	Inverter fault	Long sound	Fault indicator on
19	Inverter bridge shoot-through fault	Long sound	Fault indicator on
20	Inverter relay short circuit	Long sound	Fault indicator on
21	Inverter relay off	Long sound	Fault indicator on
22	Inverter bus fault	2 times per second	Fault indicator on
23	Output short circuit	Once per second	Fault indicator flashes
24	Inverter internal communication fault	Once per 2 seconds	Fault indicator flashes
25	Inverter initialization fault	Long sound	Fault indicator on
26	Inverter self-test while start fault	Long sound	Fault indicator on
27	Inverter DC component fault	Once per 2 seconds	Fault indicator on
28	Busbar voltage abnormal	Long sound	Fault indicator on
29	Inverter power fault	Long sound	Fault indicator on
30	Inverter overtemperature	Once per 2 seconds	Fault indicator on
31	Parallel current sharing fault	Once per 2 seconds	Fault indicator on
32	Cabinet mode error	Long sound	Fault indicator on
33	Fuse broken	Long sound	Fault indicator on
34	Inter-cabinet bus fault	Once per 2 seconds	Fault indicator on
35	ECU connection fault	Once per 2 seconds	Fault indicator flashes
36	ECU power fault	Long sound	Fault indicator on
37	ECU internal communication fault	Long sound	Fault indicator on
38	ECU initialization fault	Once per 2 seconds	Fault indicator flashes
39	Bypass thyristor off	Long sound	Fault indicator on
40		Long sound	Fault indicator on
41	Bypass thyristor open circuit	Long sound	Fault indicator on
42		Long sound	Fault indicator on
43	Overtemperature protection	Long sound	Fault indicator on
44		Long sound	Fault indicator on
45	Output current CT reverse connection fault	Long sound	Fault indicator on

46	Dry contact card power fault	Long sound	Fault indicator on
47	Dry contact card internal communication fault	Long sound	Fault indicator on
48	Bypass backfeed protection	Long sound	Fault indicator on
49	Bypass module bus fault	Long sound	Fault indicator on
50	Bypass module communication fault	Long sound	Fault indicator on
51	Bypass module initialization fault	Long sound	Fault indicator on
52	Bypass module connection fault	Long sound	Fault indicator on
53	Bypass module fan fault	Long sound	Fault indicator on

Alarm info

No	Fault info	Sound	Display indicator
1	High battery voltage	Once per second	Alarm indicator flashes
2	Low battery voltage warning	Once per second	Alarm indicator flashes
3	Battery reverse polarity	Once per 2 seconds	Alarm indicator flashes
4	Battery discharge	Once per second	Alarm indicator flashes
5	Low battery voltage	Once per second	Alarm indicator flashes
6	No Battery	Once per second	Alarm indicator flashes
7	Input voltage phase reversed	Once per second	Alarm indicator flashes
8	Input neutral missing	Once per 2 seconds	Fault indicator on
9	Abnormal mains frequency	2 times per second	Fault indicator flashes
10	Abnormal mains voltage	2 times per second	Fault indicator flashes
11	Rectifier internal communication fault	2 times per second	Fault indicator flashes
12	No mains power	2 times per second	Fault indicator flashes
13	Rectifier setting parameter abnormal	2 times per second	Fault indicator flashes
14	Inverter bus abnormal	2 times per second	Fault indicator flashes
15	Inverter overload	2 times per second	Fault indicator flashes
16	Inverter not synchronized	Long sound	Fault indicator flashes
17	Inverter setting parameter abnormal	2 times per second	Fault indicator flashes

18	Inverter internal communication fault	2 times per second	Fault indicator flashes
19	Bypass switch time	2 times per second	Fault indicator flashes
20	Configured unit number mismatch	2 times per second	Fault indicator flashes
21	Parallel system overload	2 times per second	Fault indicator flashes
22	Bypass overload	2 times per second	Fault indicator flashes
23	Switch fault	2 times per second	Fault indicator flashes
24	ECU internal communication fault	2 times per second	Fault indicator flashes
25	Inter-cabinet bus line abnormal	2 times per second	Fault indicator flashes
26	ECU bus fault	2 times per second	Fault indicator flashes
27	ECU abnormal	2 times per second	Fault indicator flashes
28	Bypass phase reversed	2 times per second	Fault indicator flashes
29	Bypass out of tracking range	2 times per second	Fault indicator flashes
30	Bypass out of protection range	2 times per second	Fault indicator flashes
31		2 times per second	Fault indicator flashes
32	Bypass unavailable	Once per second	Fault indicator flashes
33		Once per second	Fault indicator flashes
34	ECU setting parameter error	2 times per second	Fault indicator flashes
35	Bypass module parallel bus fault	2 times per second	Fault indicator flashes
36	Bypass module communication fault	2 times per second	Fault indicator flashes
37	The bypass module cannot supply power in switching mode.	2 times per second	Fault indicator flashes

4.5 Parameters

Network Management Card with Environment Monitoring



Attention!

For appearance and instructions, please refer to the user manual.

Packaged together with the network management card with environment monitoring.

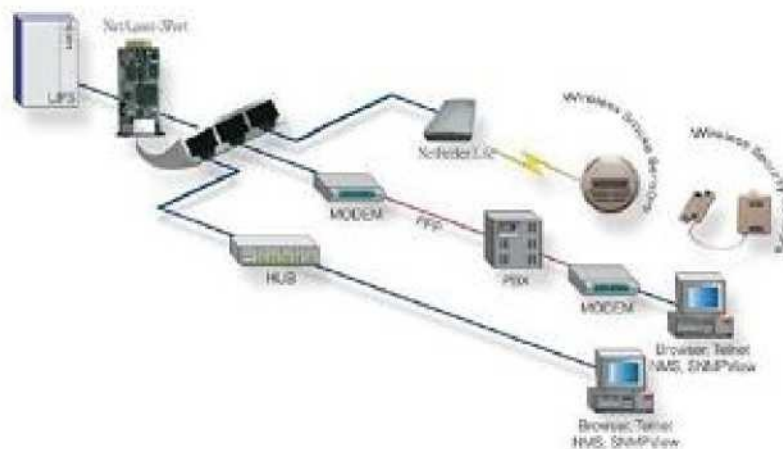
Network management card assembly

- ◆ Loosen the two screws (on both sides of the card).
- ◆ Carefully pull out the card and install it in reverse order.



NetAgent port II-3 supports modem connectivity. When the network is unavailable, you can connect to the Internet through this port for remote control via the Internet.

NetAgent II supports several languages that can automatically change depending on the network language.



Network Card SNMP

Appendix 1. Performance indicators

Parameters and Specifications of Modular UPS (three inputs three outputs)		
Type	Module Power	20kVA/20kW
	Cabinet capacity	ARP-120-20 /6
	Number of modules installed	6
Input	Rated voltage	380/400/415 VAC (three-phase five-wire)
	Frequency range	40~70 Hz
	Power factor	≥0.99
Output	Rated voltage	380/400/415VAC
	Rated frequency	50/60 Hz
	Frequency range	±0.2%
	Power factor	1
	Overload capacity	110%: 60 min; 125%: 10 min; 150%: 60 sec
	Harmonics (THDv)	< 2% (Linear load); < 5% (Non-linear load)
	Efficiency	96%
Battery	Rated voltage	32 blocks (Configurable from 30 to 50 blocks)
	Maximum module charging current	10A
General Performance	Module size (W*D*H), mm	440×620×86(2U)
	Module Net Weight, kg	20.8
	Cabinet size (W*D*H), mm	600×850×1350
	Net weight of the cabinet, kg	142
	Temperature and Humidity	0~40°C;
	Relative humidity	0~95% (non-condensing)
	Level of protection	IP20
	Communication	RS485 (optional SNMP, LBS, parallel, etc.)
Design Standard		YD/T 2165- 2017

1. When the equipment is installed at an altitude of more than 1500 meters, the output power of the equipment will decrease by 1% for every 100 meters of increase in altitude.
2. The current product specifications are subject to change without notice.

Appendix 2. Widespread issues and solutions

If there are malfunctions during UPS normal operation, this may be due to errors during installation, connection or operation. Please check these three aspects first. If the data are confirmed, please contact our customer service center. Please provide the following information:

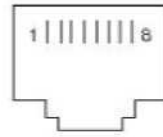
- (1) Product model and serial number (can be found on the LCD display).
 - (2) In the event of a malfunction, please provide as detailed a description of the malfunction as possible (information on the screen, status of the indicator lamp, etc.).
- Reading this manual in detail will help users to use this UPS correctly. For the convenience of users, some common errors are listed below for reference.

No	Issue	Possible reasons	Corrective Actions
1	LCD does not display	Network is not connected properly The communication line connected to the front panel is not connected correctly.	Unplug the network cable or telephone line, then plug it back in securely.
2	LCD blue screen	LCD display is subject to strong interference	Unplug the network cable, then plug it back in securely.
3	UPS won't turn on after it has been connected to the mains	Input power source is not connected; input voltage is too low; the input switch of the module is not closed.	Use a voltmeter to check if the UPS input voltage/frequency meets specifications; Check if the input switches of all modules are closed.
4	The mains power supply is normal, but the mains power indicator is off and the UPS is operating in battery mode.	The input switch of the module is not closed; the input power line is not connected.	Turn on the input switch. Ensure the input power cable is connected correctly.
5	UPS reports no fault, but there is no output voltage.	The output power cable is poorly connected.	The output power cable is poorly connected.
6	The UPS cannot switch to bypass or inverter mode.	UPS not inserted completely; The screws on the left side of the module are not tightened; Output switch is not closed	Pull out the UPS module and insert it back; tighten the screws. Close the output switch.
7	UPS module fault indicator is solid red.	The UPS module is damaged.	Extract the UPS module and replace it with a new one.
8	Power supply indicator flashes.	The AC voltage exceeds the UPS input range.	If the UPS is operating in battery mode, pay attention to the battery backup time.
9	Battery indicator flashes. No charging voltage and charging current.	Battery switch is not closed / battery is damaged or battery wiring is reversed; The number of cells and battery capacity are set incorrectly.	Turn off the battery switch. If the battery is damaged, the entire battery unit must be replaced and the battery cables must be correctly connected. Enter the battery number / capacity setting interface and

			set the corresponding parameters.
10	The buzzer beeps every 0.5 seconds and the LCD displays “output overload”.	Device overload.	Disconnect a part of the load.
11	Long buzzer beep, “output short circuit” fault indication on the LCD.	UPS output short circuit.	Ensure the load is not short-circuited and restart.
12	The module lights up red.	Module inserted incorrectly	Disconnect the module and reconnect it.
13	The UPS operates only in bypass mode and does not switch to inverter output.	Operating mode is set to ECO mode or the number of bypass transfers is exceeded.	Set the independent operation mode. Increase the number of bypass transfers or restart the machine.
14	Cannot perform a cold start.	Battery is not connected; battery fuse is blown; battery voltage is low.	Turn on the battery switch; replace the battery fuse; use AC to turn on the UPS to charge the battery.
15	Buzzer yields a continuous beep, fault indicator lights up, LCD displays “Rectifier Fault”, “Inverter Fault”, or “Output Fault”, etc.	UPS internal fault.	UPS requires maintenance, please contact the distributor.

Appendix 3. CAN communication interface description

Male connector type:



Communication between CAN Adapter and UPS CAN

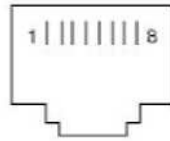
BMS	UPS (RJ45)	Description
Pin 1	Pin 1	CAN_H
Pin 2	Pin 2	CAN_L
Pin 3/7	Pin 3/7	CAN_GND

CAN provides the following functions:

- ◆ Lithium battery BMS communication
- ◆ Remote communication via display

Appendix 4. RS-485 communication interface description

Port type:



Connection between RS485 adapter and UPS RS-485:

RS485 adapter (RJ45)	UPS (RJ45)	Description
Pin 1/5	Pin 1/5	485 + “A”
Pin 2/4	Pin 2/4	485- “B”

RS-485 provides the following functions:

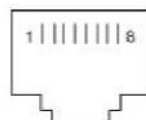
- ◆ Monitors the current state of the UPS power supply.
- ◆ Monitors current UPS alarm information.
- ◆ Monitors the current operating parameters of the UPS.
- ◆ Controls whether the UPS is turned on and off at the scheduled time and performs system setup.

RS485 communication data format:

Baud rate	9600 bps
Byte length	8 bits
Stop bit	1 bit
Parity	No

Appendix 5. COM communication interface description

Male connector:



Communication between RS485 adapter and UPS COM

RS485 adapter (RJ45)	UPS (RJ45)	Description
Pin 1/5	Pin 1/5	485 + "A"
Pin 2/4	Pin 2/4	485- "B"

COM provides the following functions:

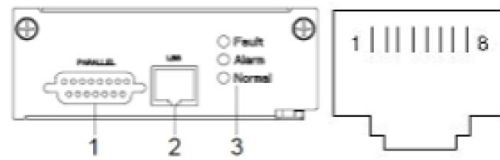
- ◆ Battery monitor communication

COM communication data format:

Baud rate	9600 bps
Byte length	8 bits
Stop bit	1 bit
Parity	No

Appendix 6. LBS communication interface description

Port type:



LBS-UPS communication

UPS (RJ45)	UPS (RJ45)	Description
1/2/3 pin	1/2/3 pin	LBS
5/7/8 pin	5/7/8 pin	Signal Ground

LBS Function:

Combines two UPSs to form a parallel dual-bus system.



Attention! The LBS communication line cannot use twisted pair cables; parallel cables must be used!

Appendix 7. Grounding and lightning protection

Grounding and lightning protection of the low-voltage power supply system is a system project, and grounding and lightning protection of the UPS is part of this system project. In accordance with the requirements of relevant international, national, and industry standards, before the power transmission line enters the UPS room, appropriate measures must be taken to ensure lightning protection on both the high-voltage and low-voltage sides of the AC power transformer. There are strict requirements for the length and method of grounding of the low-voltage power cable introduced into the UPS room, for the lightning protection of the room, for the shielding of the room and for the grounding wire of the lightning protection of the room.

To ensure the personal safety of UPS users, the instrument must be reliably grounded before operation. That is, the metal housing of the UPS is connected to the grounding bus in the room where the UPS is installed. Ensure that the input grounding terminal on the rear terminal block of the UPS is securely connected to the grounding busbar. In addition, the power frequency grounding resistance of the UPS room grounding busbar should comply with the regulations of relevant standards. Generally, it should be less than 5 ohms. Each UPS has undergone internal grounding continuity tests to ensure the reliability and safety of the internal ground wire connections.

This UPS features a perfect lightning protection design. All lightning protection components used are from internationally renowned manufacturers or are military-grade products. The lightning protection devices are designed and installed in strict accordance with IEC standards. Once the aforementioned lightning protection measures for the other parts of the low-voltage power supply system are completed according to regulations, the hazard of lightning strikes to the UPS room can be minimized.

Depending on the surge current capacity and installation location, the lightning protection of UPS systems generally does not exceed two stages. The first stage, the lightning protection device is generally called a Class C surge protective device (SPD), with a maximum surge current capacity of 40kA. 8/20 μ s waveform. It is installed between the UPS and the AC power distribution unit. The second stage, the lightning protection device is generally called a Class D surge protective device, with a maximum surge current capacity of 8kA. 8/20 μ s waveform. It is installed inside the UPS.

This series of UPS is equipped with a standard Class D surge protective device internally, and it is recommended that users select OBO B+C class.

Users may decide whether to select a Class C surge protective device and its manufacturer based on the actual conditions of the UPS room. Regardless of the brand of Class C surge protective device chosen, the connection between the Class C surge protective device and the UPS must follow the wiring method described below: the protective earth of the UPS (the UPS metal enclosure) and the Class C lightning protection ground must be made together and then collectively connected to the ground busbar of the UPS room.

Please note:

1. For the phase line L and neutral line N entering and leaving the surge protective device, it is recommended to use copper core cables with a cross-sectional area of 6—50mm². For the protective earth PE line, it is recommended to use a 25mm² copper core cable, and the minimum shall not be less than 6mm². For specific installation, please refer to the relevant instruction manual of our company.
 2. According to the experimental results, we require that the cable distance between the incoming terminal of the Class C lightning protection box and the incoming terminal of the UPS be 5-10 meters, and ensure that this section of cable will not be struck by lightning. A distance that is too short will affect the lightning protection.
 3. For applications with a high risk of lightning strikes, it is recommended to install a Class B surge protective device 12 meters or further upstream of the Class C surge protective device. After obtaining technical support from our company, users can purchase and install the Class B lightning protection box by themselves.
- 

Appendix 8. Packing list

Packing list of the cabinet:

No	Item Name	Quantity	Units
1	UPS power distribution cabinet	1	Tower
2	UPS User Manual	1	Book
3	Certificate of Conformity	1	Sheet
4	Product warranty card	1	Sheet
5	Desiccant	1	Pack

Module Packing List:

No	Item Name	Quantity	Units
1	UPS power supply module	1	Tower



Selectric

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ELECTRICAL EQUIPMENT DESIGNED FOR MAXIMUM RELIABILITY

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