Safety Precaution

This manual covers the installation and use of UPS.

Please read this manual before installation.

The UPS must be commissioned and maintained by the engineers designated by the manufacturer or its agent. Otherwise, personal safety will be endangered or equipment failure may be caused. Any UPS damage caused by not complying with this rule shall fall outside the warranty.

The UPS is used only for commercial and industrial purposes, and shall not be used as the power supply for life support equipment.

This product belongs to Class A UPS equipment. When it is used for resident power supply, radio interference may be caused. At this time, additional measures shall be taken.


Applicable standards

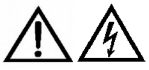
This equipment complies with CE 2006/95/EC (low voltage safety), 2004/108/EC (EMC), Australia and New Zealand EMC standards (C-Tick) and the following UPS standards:
*IEC62040-1-1 general safety requirements of operation zone
*IEC62040-2 EMC, Class C2 UPS
*IEC62040-3 performance requirements and test methods
For details, please refer to Chapter 9 Product Specifications.
The equipment installation shall comply with the above requirements and the accessories specified by the manufacturer shall be used.


Warning: large leakage current

Before connecting the input power (including AC mains and batteries), please ground the equipment reliably.
The ground leakage current is 3.5mA~1,000mA.
When selecting the instantaneous RCCB or RCD device, please consider the transient state and steady state ground leakage current upon the startup of the equipment.
RCCB which is insensitive to unidirectional DC pulse (class A) and transient state current pulse must be selected.
Pay attention that the load to ground leakage current will also pass the RCCB or RCD.
Equipment grounding must comply with local electric regulations.


Warning: Backfeed protection

This USP provides a zero voltage contact close signal to use together with the external automatic circuit breaker (powered separately) to prevent the backfeed of voltage to the input side through the static bypass circuit. If the installer does not need to use this signal, the external bypass input switch equipment must be tagged to alert the maintenance personnel that this circuit is connected to the UPS system.
To put it simply, please isolate the UPS before operating this circuit.


User serviceable device

All the internal maintenance works for the equipment must be carried out with tools and by the relevant trained personnel.
The parts behind the protection cover, which could be opened only by tools, should not be operated by users.
This UPS fully complies with the equipment safety requirements in operation zone. The UPS and the battery chamber have dangerous voltage inside, which are inaccessible to persons other than the maintenance personnel. Because the components with dangerous voltage can be accessed only when the protection cover is opened with tools, the possibility of electric shock has been minimized. There will not be any danger when operating this equipment according to the general instructions and the steps recommended in this manual.

 Battery voltage higher than 400Vdc
The physical maintenance of all the batteries shall be conducted with tools or keys and by the relevant trained personnel. Special care shall be taken when handling batteries. After batteries are connected, the voltage at the battery end will exceed 400VDC, which is fatal to human being. The battery manufacturer has provided the precautions that should be complied with when using the batteries or staying near the batteries. Such precautions must be complied with at any time. The relevant suggestions on the local environment conditions and the regulations on providing PPE, first aid equipment and fire fighting equipment shall be paid special attention to.

 Warning
Warning: This product belongs to Class C2 STS, and it will produce RF interference when used in residence area. In this situation, additional measures shall be taken.

Contents

Chapter 1 Installation Of UPS Module

This chapter introduces the installation of 180kVA~300kVA UPS system (hereinafter referred to as “UPS”), including the initial inspection, location selection, positioning and cable connection.

1.1 Brief Introduction

This chapter briefs the relevant requirements that must be considered when selecting locations and cabling for the UPS and the relevant equipment.

Because each site has its particular characteristics, this chapter will not introduce any detailed installation procedures. It will provide general installation procedures and methods for the reference of the installation personnel, so that they can properly handle the specific situations of the sites.

 Warning: Professional installation required
The UPS can be powered up only when approved by the commissioning engineer. The UPS installation shall be carried out by qualified engineer according to the description of this manual. Detailed mechanical and electric installation documents will be provided for all the equipment not covered in this manual upon delivery.

 Note: Three-phase four-wire input power required
The standard UPS system may be connected to three-phase four-wire (grounded) TN, TT and IT AC power distribution system (IEC60364-3) and provides three-wire to four-wire transformer options. If IT AC power distribution system is used, a 4-pole circuit breaker shall be configured. Please refer to the relevant IT system standards.

 Warning: battery danger
Special care shall be taken when installing batteries. When battery is connected, the voltage at the battery end will exceed 400Vdc, which is fatal to human being. Please wear safety glasses to protect the eyes from being damaged by arc. Remove all the metal items, including finger rings, watch, etc. Use tools with insulating handle. Wear rubber gloves. If the battery has electrolyte leakage or the battery is damaged, it must be replaced. Place the battery into the container that can withstand sulfuric acid and dispose of it according to the local regulations. If the skin contacts the electrolyte, flush it with water immediately.

1.2 Initial Inspection

Before installing the UPS, carry out the following inspections:

1. Visually check the inside and outside of the UPS and battery for any damage caused by transportation. If there is any damage, report to the carrier immediately.

2. Check against the product label for the correctness of the equipment. Equipment label is pasted on the equipment door, which lists the UPS model, capacity and main parameters.

1.3 Location Selection

1.3.1 UPS Room

The UPS is designed for indoor installation. It shall be installed in a clean and well ventilated environment, and the ambient temperature shall meet the product specifications (refer to Table 9-2).

The UPS adopts forced air cooling which is provided by the internal fan. The cold air enters the inside of the UPS through the front air grids of the UPS cabinet and exhausts through the rear air grids of the UPS. Please do not block the ventilation hole.

When necessary, indoor exhaust fan shall be installed to avoid the increase of indoor temperature. For the dusty environment, air screen shall be installed.

Note: the UPS can only be mounted on the concrete or other nonflammable surface.

1.3.2 External Battery Room

Small amount of hydrogen and oxygen will be produced at the end of battery charging, therefore, the fresh air volume of the battery installation environment shall meet the requirements of EN50272-2001.

The ambient temperature for the battery shall be kept constant. The ambient temperature is the main factor that affects the battery capacity and life. The standard operating temperature of the battery is 20 ºC. When running in an environment with higher temperature, the battery life will be shortened; when running in an environment with lower temperature, the battery capacity will be reduced. If the average operating temperature of the battery rises from 20 ºC to 30 ºC, the service life of the battery will be reduced by 50%. If the operating temperature of the battery is over 40 ºC, the service life of the battery will be reduced exponentially. Generally, the allowable ambient temperature for the battery is 15 ºC~25 ºC. The battery shall be kept far away from the heat source and the ventilation hole.

If external battery is used, a battery protection device (e.g., fuse or circuit breaker) shall be installed. The battery protection device shall be installed as close to the battery as possible, and the cabling distance between the battery protection device and the battery shall be minimized.

1.3.3 Storage

If the UPS is not installed immediately, it must be stored indoors and protected from high humidity or high temperature (refer to Table 9-2). The battery shall be stored in a dry, low temperature and well ventilated place. The optimal storage temperature is 20 ºC~25 ºC.

Warning: During the storage of the battery, the battery shall be charged periodically according to the battery manual. During the charging, the UPS may be temporarily connected to the AC mains to activate the battery for charging.

1.4 Positioning

To prolong the service life, the selection of the UPS location shall ensure:

- Convenient wiring
- Sufficient operating room
- Good ventilation which is enough for heat dissipation
- No corrosive gas
- No high humidity or heat source
- Non-dusty environment
- Compliance with fire-fighting requirements
- Ambient environment: +20 ºC to +25 ºC, i.e. the temperature range for maximum efficiency of battery (for the relevant information about the battery storage, transportation and environment, please refer to Table 9-2)

This equipment adopts steel frame structure with removable panel, the top and side panels are fixed by screws.

Open the UPS door, you may access the power terminal, auxiliary terminal and power operating switch. The UPS front door has operation control panel to provide basic operation status and alarm information display. The UPS has front air inlet and rear air outlet.

1.4.1 System Cabinet

Based on the design requirement of each UPS system, a UPS system may include certain equipment cabinets, such as UPS cabinet, external battery cabinet, external bypass cabinet, etc. All the cabinets are of the same height and installed side by side for aesthetic effect.

For the positioning of UPS cabinet, please refer to Chapter 4 Installation Diagram.

1.4.2 Handling Of Cabinet

Warning
The lifting equipment for moving the UPS cabinet shall have enough lifting capacity. When removing the pallet, there shall be enough number of handlers and lifting equipment.

Ensure that the UPS weight does not exceed the lifting capacity of the lifting equipment. Refer to Table 9-3.

The UPS may be moved by fork truck or other similar lifting equipment.

Note: special care shall be taken when handling the batteries installed in the battery cabinet. The handling distance shall be minimized.

1.4.3 Operation Space

The UPS does not have air grid at the two sides, and there is no special space requirement for the two sides.

To facilitate the tightening of the power terminals in the UPS during the daily operation, in addition to meeting the local regulations, enough space shall be reserved at the front of the UPS to ensure that operators can pass freely after the UPS door is completely opened. A clearance of 150mm shall be reserved at the back of the UPS to ensure the smooth exhaust of the UPS.

1.4.4 Front Access

The component layout of the UPS makes it possible to carry out the UPS maintenance, diagnosis and repair from the front and the top, which has greatly reduced the space requirement on the two sides and rear of UPS.

1.4.5 Final Positioning

After the final positioning of the UPS, fix the UPS reliably with the specified anchors.

1.4.6 Anchor Installation

Chapter 4 Installation Diagram has listed the dimensions and positions of the anchor mounting holes on the UPS base through which the equipment can be fixed to the ground. If the UPS is mounted on the raised floor, a proper support shall be provided, which shall be able to withstand the UPS weight (more than 300kg). When designing the support, please refer to Figure 4-2 UPS bottom view.

1.4.7 Cable Inlet Mode

The UPS and battery cabinet may adopt lower inlet mode.

During the wiring, when the barrier at the bottom of the equipment is removed, you will see the inlet hole.

1.5 External Protection Device

Circuit breaker or other protection device shall be installed at the external AC power input of the UPS system. This chapter provides general guidance for the qualified installation engineers. The qualified engineer shall have thorough understanding of the local wiring regulations for installing equipment.

1.5.1 Rectifier And Bypass Input

Overcurrent

Proper overcurrent protection device shall be installed on the mains input distribution line. The requirement on the power cable current capacity and system overload capacity shall be considered (refer to Table 1).The thermomagnetic circuit breaker with IEC60947-2 tripping curve C (normal) at 125% of the current listed in Table 1-1 is recommended.

Separate bypass: If the system adopts separate bypass, protection device shall be installed respectively for the main circuit input and bypass input at the mains input distribution line.

Note: The rectifier power and bypass input power shall use the same neutral line.

Note
For IT grid system, 4-pole protection device shall be installed at the external input distribution and external output distribution of the UPS.

Ground leakage current

The residual current detector (RCD) adopted at the upstream input distribution of the UPS shall:

- Be sensitive to the DC unidirectional pulse (class A) of the distribution network
- Be insensitive to transient state current pulse
- Be of ordinary sensitivity, which is adjustable between 0.3A and 1A.

The residual current circuit breaker (RCCB) shall be sensitive to the DC unidirectional pulse (class A) of the distribution network but insensitive to the transient state current pulse, as shown in Figure 1-1.

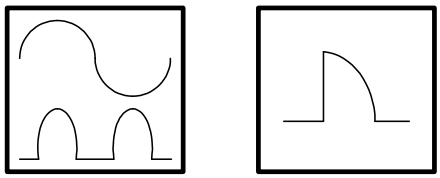


Figure 1.2 RCCB symbol

When the RCD is used in the separate bypass system or parallel system, to avoid mis-alarm, the RCD shall be installed at the upstream input distribution side.

The ground leakage current drawn by the RFI filter in the UPS is between 3.5mA and 1000mA.It is suggested to confirm the differential device sensitivity of the upstream input distribution and the downstream distribution (to the load).

1.5.2 External Battery

The DC compatible circuit breaker in the external battery cabinet provides overcurrent protection for the UPS and its battery.

1.5.3 UPS Output

The UPS output distribution shall be configured with protection device. The protection device shall be different from the input distribution protection switch and able to provide overload protection (refer to Table 1).

1.6 Power Cable

When designing the cables, please comply with the requirements of this chapter and the local wiring regulations, consider the environment conditions and refer to IEC60950-1 Table 3B.

Warning
Before wiring the UPS, ensure that you are clear about the position and status of the UPS input and mains distribution switches. Ensure that these switches are in OFF state, and stick alarm label to the switches to prevent others from operating them.

1.6.1 Maximum Steady State AC And DC Current

Table 1.1 Maximum steady state AC and DC current

UPS rated power (kVA)	Rated current (A)							Bus stud bolt specifications			
	Mains input current upon battery charging at full load[1, 2]			Output current at full load[2]			Battery discharge current at minimum battery voltage	Input/output/bypass cable		External battery cable (bolt)	Torque load (Nm)
	380V	400V	415V	380V	400V	415V		Bolt	Aperture (mm)		
300	560	530	510	450	430	410	1050	M8	8	M8	8
270	504	477	459	405	387	369	945				
240	448	424	408	360	344	328	840				
210	392	371	357	315	301	287	735				
180	336	318	306	270	258	246	630				

Note:

1. Mains input current for the rectifier and bypass common input configuration
2. The nonlinear load (switch power) has impact on the design of the output and bypass neutral cables, because the current in the neutral cable may exceed the rated phase current, which is generally 1.732 times of the rated current

1. Protective grounding wire: The wiring distance shall be minimized when connecting the cabinets and main grounding system. The sectional area of the grounding wire shall be selected according to the AC power failure class, cable length and protection type. According to AS/IEC60950-1, the sectional area is generally 80mm^2 (150kVA).

2. When selecting the battery cable, the current value in table 1-1 shall be referred to, and a maximum voltage drop of 4Vdc is allowed. The load equipment is generally connected to the distribution network with independent protection bus rather than the UPS. In the multi-module parallel system, the length of the module output cable between the each module output terminal and the parallel distribution bus shall be kept consistent, so as to minimize the influence on the current sharing. To avoid the generation of electromagnetic interference, please do not wind the cable.

3. For the positions of the wiring terminals, refer to Figure 4-4.


Warning

Failure to ground as required may cause electromagnetic interference, electric shock or fire.

1.6.2 Distance Between The Equipment Connection Point And The Floor

Table 1.1 Distance between the equipment connection point and the floor

UPS connection point	Minimum distance (mm)
Rectifier AC input power supply	284
Bypass AC input power supply	284
UPS AC output	369
Battery power supply	369
Auxiliary cable: connecting monitoring board (U2)	1104

1.6.3 Wiring


Important

The operations described in this section must be carried out by authorized personnel. If there is any question, please contact the customer service department of our company immediately.

When the equipment is properly located, connect the power cables according to the wiring diagram shown in chapter 4 Installation Diagram and the following steps.

1. Ensure that all the input distribution switches of the UPS have been completely disconnected, and all the internal power switches of the UPS have been disconnected. Stick alarm label to the switches to prevent others from operating them.

2. Open the UPS door, remove the front protection cover, and then you can see the terminal block for connecting the power cables.

3. Connect the protective grounding wire and other necessary grounding wires to the cabinet of the bottom layer of the UPS power equipment (the cabinet side close to the output power terminal block). All the UPS cabinets shall be connected to the user's grounding system.

Note: the connection of the grounding wire and the neutral wire must comply with the relevant local and national regulations

Tag and connect the input cables by selecting one of the following two steps according to the installation type.

Common input connection

4. If the bypass and rectifier share the same mains input, connect the AC input cable to the UPS input terminal (mA-mB-mC-mN). The tightening torque is 5 Nm (M6 bolt). **Ensure to maintain proper phase sequence.**

Connection of separate bypass

5. If the bypass and rectifier adopt two-way mains input, connect the rectifier input cable to the rectifier input terminal (mA-mB-mC-mN), and connect the bypass power input cable to the bypass input terminal (bA-bB-bC-mN). The tightening torque is 5 Nm (M6 bolt). **Ensure to maintain proper phase sequence.**

Note: For the system with two-way mains input for bypass and rectifier, remove the short-circuit bus between the bypass and rectifier input. The neutral wires of bypass input and mains input must be connected together.

Frequency converter mode

If frequency converter configuration is adopted, connect the AC input cable to the rectifier input terminal (mA-mB-mC-mN). The tightening torque is 5Nm (M6 bolt), 13Nm (M8 bolt) or 26Nm (M10 bolt). **Ensure to maintain proper phase sequence and tighten the connecting terminals.** It is not necessary to connect the AC bypass power cable to the bypass input terminal (bA-bB-bC-mN).

Note: For the frequency converter running mode, ensure to remove the short circuit block between the bypass and the rectifier input side.

System output connection

6. Connect the system output cable to the position between the UPS output terminal (oA-oB-oC-oN) and the critical loads. The tightening torque is 5Nm (M6 bolt). **Ensure to maintain proper phase sequence.**

 Warning
If the load is not prepared to receive power supply when the commissioning engineer arrives, the system output cable shall be properly terminated and insulated.

 Warning: dangerous battery side voltage 400Vdc
Ensure the polarity correctness of the cable connection between the battery terminal and the UPS terminal, i.e. positive terminal to positive terminal, negative terminal to negative terminal, and neutral terminal to neutral terminal. However, the cable between the UPS battery terminal and the battery shall be connected only when approved by the commissioning engineer. Ensure the polarity correctness of the cable connection from the battery terminal to the battery switch and from the battery switch to the UPS terminal, i.e. positive terminal to positive terminal, negative terminal to negative terminal, and disconnect the connecting cable/cables between the battery layers. Unless approved by the commissioning engineer, do not connect these cables and close the battery switch.

7. Reinstall all the protection covers.

1.7 Control Cable And Communication

As shown in Figure 1-2, the bypass module front panel has dry contact interface (J5~J10) and communication interface (RS232 interface and SNMP card interface).

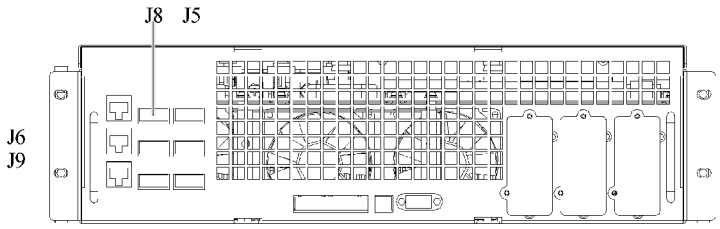


Figure 1.1 Dry contact interface and communication interface

The UPS receives the zero-voltage (dry contact) contact signal from the external input dry contact terminal connected to the phoenix terminal of the bypass module. Through software setting, the signal is valid when these contacts are short circuited with the +12V pin. All the control cables shall be kept away from the power cables and adopt dual insulated cable. When the wiring distance reaches 25m~50m, the sectional area shall be 0.5mm^2~1.5mm^2.

1.7.1 Input Dry Contact Interface

The input dry contact interfaces J7 and J8 provide the environment, battery grounding failure and generator contacts. The schematic diagram of the interfaces is as shown in Figure 1-3, and the interface description is shown in Table 1-3.

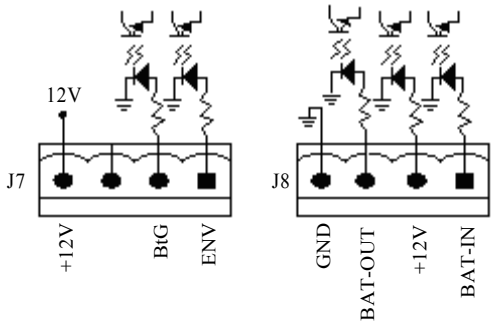


Figure 1.1 Input dry contact interfaces J7 and J8

Table 1.2 Description of input dry contact interfaces J7 and J8

Location	Name	Meaning
J7.1	ENV*	Battery room environment detection (normally closed)
J7.2	BtG	Battery grounding failure
J74	+12V	+12V power supply
J8.1	BAT_IN	Internal battery temperature detection
J8.2	+12V_A	+12V power supply
J8.3	BAT_OUT	External battery temperature detection
J8.4	GND_A	Power supply grounding
Note*: When these dry contacts are triggered, the battery charger will be shut down		

1.7.2 BCB Interface

J6 is the battery circuit breaker (BCB) interface. The schematic diagram of the interfaces is as shown in Figure 1-4, and the interface description is shown in Table 1-4.

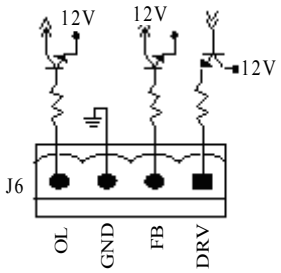


Figure 1.1 BCB interface

Table 1.2 Description of BCB interface

Location	Name	Description
J6.1	DRV	BCB drive signal – (reserved)
J6.2	FB	BCB contact status – (reserved)
J6.3	GND	Power supply grounding
J6.4	OL	BCB online – input (normally open): This pin is valid after the BCB interface signal is accessed

The schematic diagram for the connection between the BCB interface and the BCB is as shown in Figure 1-5.

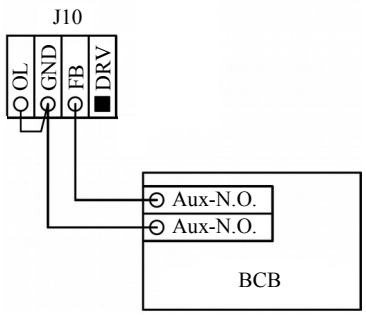


Figure 2.1 BCB interface and BCB connection schematic diagram

1.7.3 Maintenance Bypass Switch And Output Switch Status Interface

J9 is the maintenance bypass switch and output switch status interface. The schematic diagram of the interfaces is as shown in Figure 1-6, and the interface description is shown in Table 1-5.

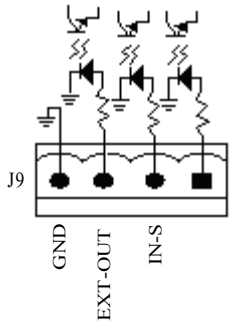


Figure 1.1 Maintenance bypass switch and output switch status interface

Table 1.2 Description of maintenance bypass switch and output switch status interface

Location	Name	Meaning
J9.2	IN_S	Maintenance bypass switch status
J9.3	EXT_OUT	Output switch status
J9.4	GND	Power supply grounding

1.7.4 Output Dry Contact Interface

J5 is the output dry contact interface and provides two relay output dry contact signals. The schematic diagram of the interfaces is as shown in Figure 1-7, and the interface description is shown in Table 1-6.

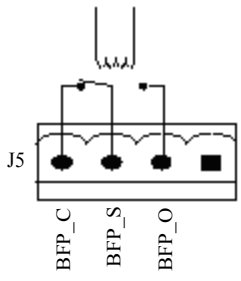


Figure 1.1 Schematic diagram of output dry contact interface

Table 1.2 Output dry contact interface description

Location	Name	Meaning
J5.2	BFP_O	Bypass backfeed protection relay (normally open), closed when the bypass SCR is shorted
J5.3	BFP_S	Bypass backfeed protection relay central point
J5.4	BFP_C	Bypass backfeed protection relay (normally closed), open when the bypass SCR is shorted

1.7.5 Remote EOP Input Interface

The UPS provides emergency power-off (EPO) function. This function is realized by pressing the EPO button on the UPS control panel or the remote contact provided by the user. The EPO button is protected by the hinged plastic cover.

J10 is the remote EOP input interface. The schematic diagram of the interfaces is as shown in Figure 1-8, and the interface description is shown in Table 1-7.

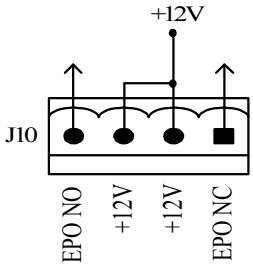


Figure 1.1 Schematic diagram of remote EOP input interface

Table 1.2 Description of remote EOP input interface

Location	Name	Meaning
J10.1	EPO_NC	Trigger EPO when short circuiting J10.2
J10.2	+12V	Trigger EPO when short circuiting J10.1
J10.3	+12V	Trigger EPO when disconnecting J10.4
J10.4	EPO_NO	Trigger EPO when disconnecting J10.3

When pin 3 of J10 is short circuited with pin 4, or pins 2 and 1 are disconnected, EPO will be triggered.

If external EPO function is configured, pins 1 and 2 and pins 3 and 4 of J10 will be the reserved for this function. The external EPO device needs to use shielded cable to connect to the normally open or normally closed remote shutdown switch between the two terminals. If it is not necessary to use function, disconnect pins 3 and 4 or short circuit pins 1 and 2 of J10.

Note
1. The UPS EPO operation will shut down the rectifier, inverter and static bypass, but will not disconnect the UPS input mains internally. To completely power off the UPS, disconnect the upstream input switch when the EPO is triggered. 2. Pins 1 and 2 of J10 have been short circuited upon delivery.

1.7.6 RS232 Interface And SNMP Card Interface

RS232 interface: provides serial data and is used for the commissioning and maintenance on the UPS by the authorized commissioning and maintenance personnel.

SNMP card interface: is used for the onsite installation of the optional communication card, SNMP card.

Chapter 2 Battery

This chapter introduces the relevant information of the battery, including the battery safety, control, maintenance, recycling and battery cabinet.

2.1 Brief Introduction

The UPS battery string is composed of several batteries in series connection and provides rated DC input voltage for the UPS inverter. The required battery backup time (i.e. the time for battery to supply load upon mains failure) is subject to the ampere-hour value of the battery (the battery string may be composed of 30 units of 12V battery).Sometimes, it is necessary to connect several strings of battery in parallel. It is suggested to connect no more than 4 strings of batteries in parallel. Batteries of different types, names or newness shall not be used together.

UPS shall be equipped with battery cabinet.

Two kinds of battery cabinet are available:

1. Complete set of battery cabinet, battery and protection device

2. Battery cabinet and protection device only, without battery

Note
The external battery cabinet for the UPS can contain up to 36 units of 12Ah/12V battery. When conducting maintenance or repair operation, the connection between the battery and the UPS shall be disconnected. The battery switch can be manually opened or closed.

2.2 Safety

Take care when operating the UPS battery. When all the cells are connected, the voltage of the battery string may reach 440Vdc, which is fatal to human being. Please follow the precautions for high voltage operation. Only the qualified personnel are allowed to install and maintain the battery. To ensure the safety, the external batteries shall be installed inside the locked cabinet or specially designed battery room, so that they are kept away from human being (except for the qualified maintenance engineer).

During the battery maintenance, the following items shall be paid special attention to:

- Set the maintenance switch to ON position.
- The software setting value shall be consistent with the actual number of battery cells.

Note
The fuse on the battery EMI board is a fast fuse with the capacity of 600Vdc/30A. Precautions for installation, use and maintenance of the battery are described iin the relevant battery manual provided by the battery manufacturer. The safety precautions described in this section include the important matters that must be considered during the installation design. The design results may be changed according to the local situations.

WARNING: dangerous battery voltage exists behind the protection cover
The parts behind the protection cover, which could be opened only by tools, should not be operated by users. Only the qualified maintenance personnel are allowed to open these protection covers. Before operating the isolating terminal block for external battery connection, please disconnect all the connections. The following precautions shall be paid attention to when using the batteries: 1. The battery shall be firmly and reliably connected. After the connection is completed, the connections between all the terminals and the batteries shall be calibrated. The requirements on torque specified in the specifications or user manual provided by the battery manufacturer shall be satisfied. The connections between all the wiring terminals and the batteries shall be inspected and tightened at least once a year. Otherwise it may cause fire! 2. The battery appearance must be inspected before accepting and using the battery. If there exist any package damage, dirty battery terminal, terminal erosion, rust, or enclosure crack, deformation or liquid leakage, replace it with new product. Otherwise,


WARNING: dangerous battery voltage exists behind the protection cover

battery capacity reduction, electric leakage or fire may be caused.
3. The battery is very heavy. Please use proper method to move and lift the battery, so as to prevent any damage to human being or the battery terminal. Severe damage to the battery may cause fire.
4. The battery connecting terminal shall not be subject to any force, such as the pulling force or twisting force of the cable, otherwise, the internal connection of the battery may be damaged. Severe damage to the battery may cause fire.
5. The battery shall be installed and stored in a clean, cool and dry environment. Do not install the battery in a sealed battery chamber or a sealed room. The battery room ventilation shall at least meet the requirement of EN50272-2001. Otherwise, battery bulging, fire or even human injury may be caused.
6. The battery shall be installed far away from the heating products (e.g. transformer), used or stored far away from any fire source, and shall not be burnt or put into fire for heating. Otherwise, battery leakage, bulging, fire or explosion may be caused.
7. Do not directly connect any conductor between the positive and negative terminals of the battery. Remove the finger rings, watch, necklace, bracelet and other metal items before operating the battery, and ensure that the tools (e.g., wrench) are covered with insulating material. Otherwise, battery burning, human death/injury or explosion may be caused.
8. Do not disassemble, modify or demolish the battery. Otherwise, battery short circuit, liquid leakage or even human injury may be caused.
9. Clean the battery enclosure with the wringed wet cloth. To avoid any static or arcing, do not use dry cloth or duster to clean the battery. Do not use the organic solvent (such as thinner, gasoline, volatile oil) to clean the battery. Otherwise, the battery enclosure may be cracked. In worst case, fire may be caused.
10. The battery has diluted sulfuric acid. In normal use, the diluted sulfuric acid will be absorbed to the baffle and polar plate of the battery. However, if the battery is damaged, the acid may leak from the battery. Therefore, personal protective equipment (e.g., protective glasses, rubber gloves and apron) must be used when operating the battery. Otherwise, if the diluted sulfuric acid enters the eyes, blindness may be caused; if it contacts the skin, the skin may be burnt.
11. The battery may have short circuit, electrolyte dry-up or positive pole erosion failure at the end of its life. If it is still used under this state, the battery may have thermorunaway, bulging or liquid leakage. Please replace the battery before it enters this state.
12. Before connecting or disconnecting the battery connecting cable, please disconnect the charging power.
13. Check if the battery has been unexpectedly grounded. If the battery is unexpectedly grounded, please remove the ground power. If you contact any part of the grounded battery, you may subject to electric shock.

2.3 Battery Cabinet

2.3.1 Brief Introduction

The battery cabinet may be used together with other cabinets to contain batteries of higher capacity and provide longer backup time for the system.

When there are two or more battery cabinets, these cabinets shall be interconnected and arranged side by side. If the battery cabinet is located beside the UPS, the battery cabinet and the UPS shall be connected with bolts.

2.3.2 Ambient Temperature

If the battery cabinet and the UPS are installed in the same room, the maximum designed ambient temperature shall be determined according to the battery rather than the UPS. That is, if valve-controlled battery is used, the indoor ambient temperature shall be 15 ºC~25 ºC rather than 0 ºC~40 ºC (the operating temperature range of the main equipment.) Under the precondition that the average temperature will not exceed 25 ºC, it is allowed to have short time temperature deviation.

2.3.3 Outline Dimensions And Weight

The outline dimensions of the battery cabinet are as shown in Table 2-1.The battery cabinet has the same depth and height with the UPS, and they shall be arranged side by side for aesthetic effect. The battery cabinet has doors. When planning for its location, enough clearance shall be provided so that the doors can be completely opened for the installation and removal of the batteries.

The battery cabinet weight is as shown in Table 2-1.When designing the battery installation, the battery cabinet shall include the weight of the battery and the cables. It is of special significance when the UPS is installed on the raised floor.

Table 1.1 Outline dimensions and weight of battery cabinet

Cabinet name	W×D×H (mm)	Weight (kg, excluding battery)
Battery cabinet	820×700×1400	170

2.3.4 Switch Feature

The external battery of the UPS is protected by the battery fuse or optional battery switch (which provides status contact but has no undervoltage tripping coil). For details, refer to 2.5 Battery control.

2.3.5 Battery Temperature Sensor (Option)

The external battery temperature sensor (option) is composed of a temperature probe and a temperature transmission board, as shown in Figure 2-1. The battery temperature sensor is connected to the UPS monitoring board.

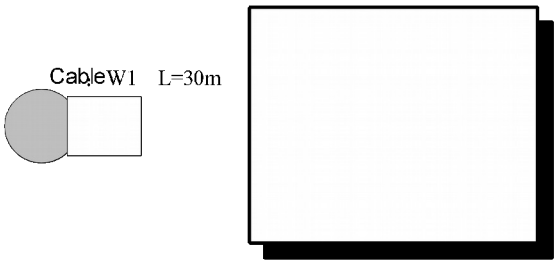


Figure 1.1 A single battery temperature sensor and monitoring U2

2.3.6 Handling Of Battery Cabinet

Warning
The lifting equipment for moving the battery cabinet shall have enough lifting capacity.

Ensure that the battery cabinet weight does not exceed the lifting capacity of the lifting equipment. For the battery cabinet weight, please refer to Table 2-1.

The battery cabinet may also be transported by fork truck or other similar equipment.

Note
When transporting the battery cabinet, do not install the battery in the cabinet. If it is necessary, each battery shall be separately fixed, and the transportation distance shall be minimized. After the final positioning, fix the battery cabinet reliably with the specified anchors.

Earthquake-resisting component (option) may be used to fix the battery cabinet to the concrete floor.

2.3.7 Cable Inlet

The battery cabinet adopts lower inlet mode. During the wiring, when the barrier at the bottom of the equipment is removed, you will see the inlet hole.

2.3.8 Construction Diagram Of Battery Cabinet

For the construction diagram of the battery cabinet, please refer to Figure 2-2 and Figure 2-5.

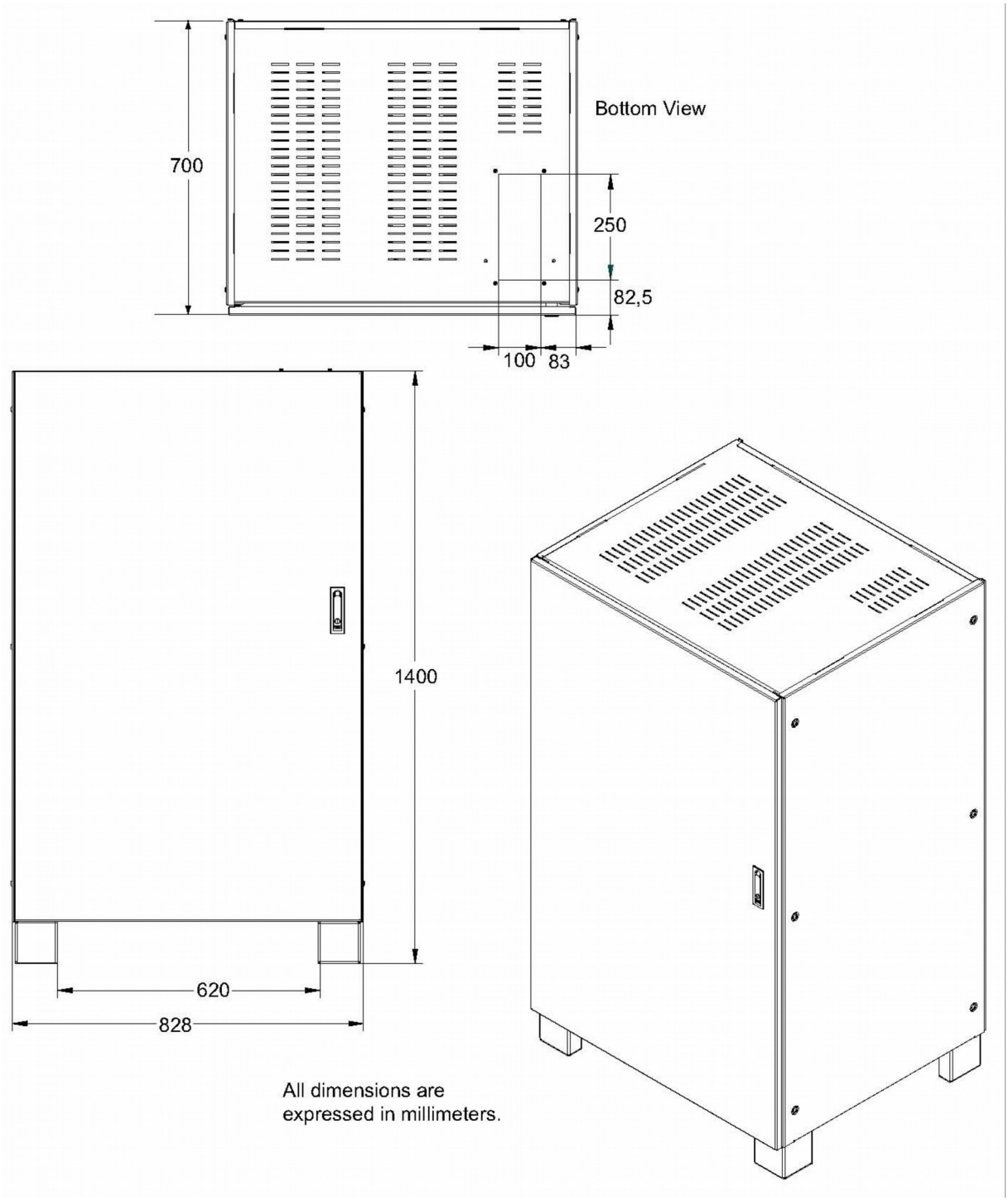


Figure 1.1 Schematic diagram for bottom inlet of battery cabinet

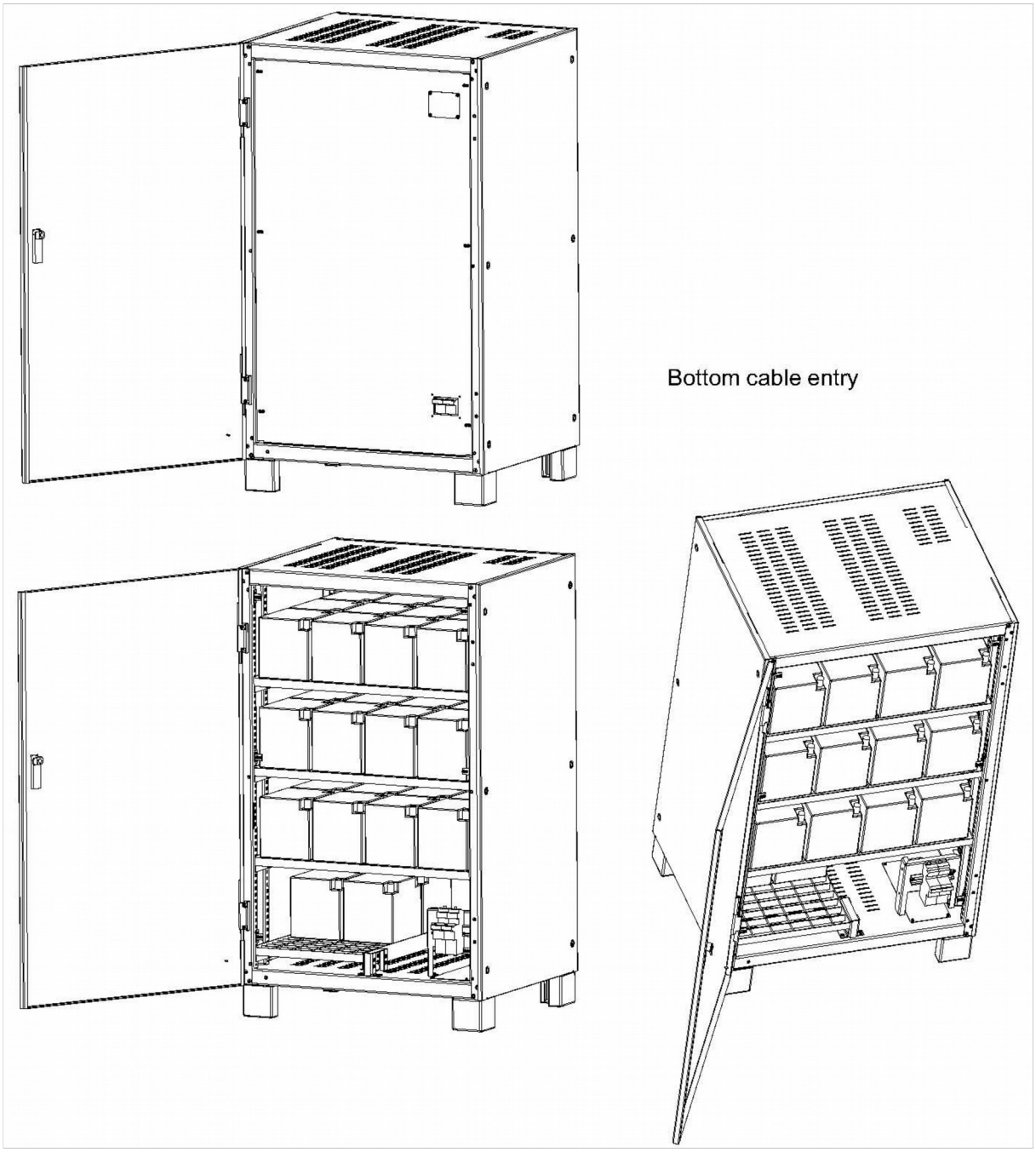


Figure 1.2 Schematic diagram for positions of battery cabinet fuse and optional switch

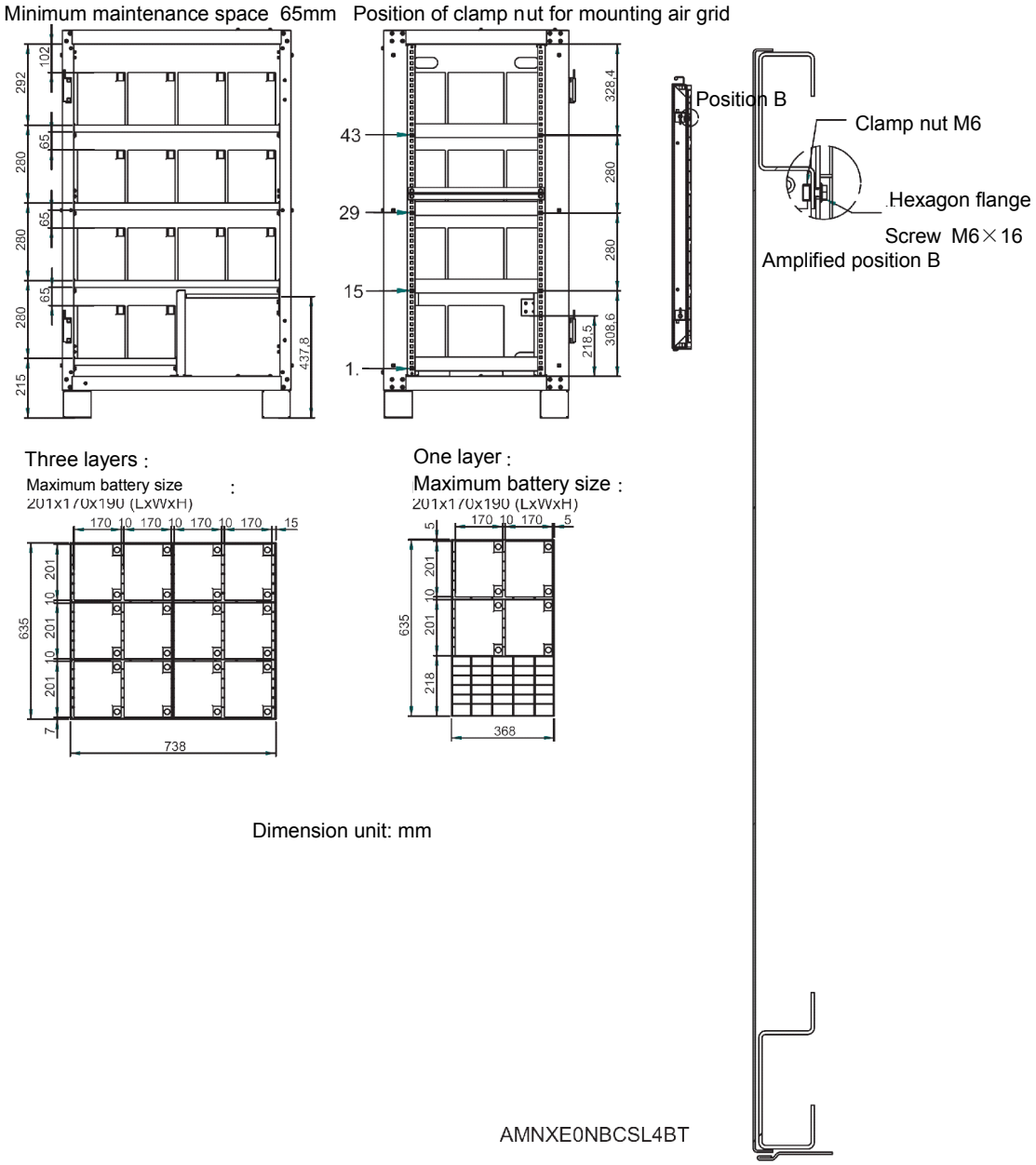
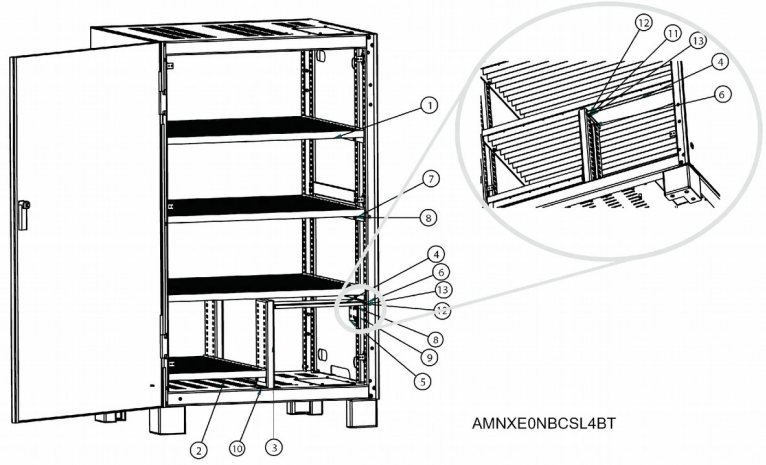


Figure 1.3 Schematic diagram for internal layout of battery cabinet



Part no.	Part name
1	Iron grid
2	Iron grid
3	Middle polar
4	Cover component BC for small NXe
5	Grounding busbar
6	Floating nut M4
7	Floating nut M6
8	Flange screw M6×16
9	Flange nut M6
10	Sunk screw M6×16
11	Spring washer M4
12	Plain washer M4
13	Mushroom Phillips screw M6×12

Figure 1.4 Bottom inlet battery cabinet

2.4 Battery Power Cable

2.4.1 Overview

Please install and connect the batteries according to the following description and graphic presentation.

2.4.2 Battery Installation

1. Before installation, check the battery appearance to ensure that there is no damage, inspect and count the accessories, and carefully read this manual and the user manual or installation instruction provided by the battery manufacturer.

2. There shall be a clearance of 10mm between the vertical sides of the batteries for the smooth flow of the air around the batteries.

3. Certain clearance shall be maintained between the battery top and the upper layer to facilitate the monitoring and maintenance of the battery.

4. The batteries shall be installed from the bottom layer and from bottom to top, so as to avoid a too high gravity center. The battery shall be properly installed and protected from vibration or shock.

5. Measure the battery voltage, and calibrate the battery voltage after the startup of the UPS.

2.4.3 Battery Wiring

1. When the battery cabinet is installed on the raised floor, the battery power cable and control cable of battery switch can enter the UPS cabinet through the cabinet bottom. If the UPS and battery cabinet are installed side by side on the solid floor, these cables can penetrate the cabinet through the inlet holes on the lower part of the battery cabinet.

2. When multiple batteries are used, they shall be connected in series and then in parallel. Before loading and power-up, it must be detected that the total voltage of the batteries is as specified. The negative and positive poles of the batteries must be connected to the corresponding negative and positive battery terminals of the UPS according to the labels on the battery and UPS. If the battery is reversely connected, explosion and fire may be caused, it may result in battery and UPS damage or even human injury.

3. When the battery cable connection is completed, install insulating shield for the terminals.

4. When connecting the cable between the battery terminal and the battery switch, the switch end shall be connected first.

5. The bending radius of the cable shall be larger than 10D, where D is the outer diameter of the cable.

6. When the battery cable is connected, it is prohibited to pull the battery cable or the cable terminal.

7. Do not cross the battery cables during the connection, and do not tie the battery cables together.

2.4.4 Battery Room Design

No matter which type of installation system is adopted, the following items shall be paid special attention to (refer to Figure 2-6):

1. Layout of cells

No matter which battery installation system is used, the battery shall be located in such a pattern that it will not contact two naked live parts with the potential difference of over 150V at the same time. If it is unavoidable, insulated terminal shield and insulated cable shall be used for the connection.

2. Workbench

The workbench (or pedal) must be skid-proof and insulated, and at least 1m wide.

3. Wiring

All the wiring distances shall be minimized.

4. Battery circuit breaker (BCB)

The BCB is generally installed in the wall-mounted box near the battery. For the connecting method of the UPS switch box, please refer to 2.5 Battery control.

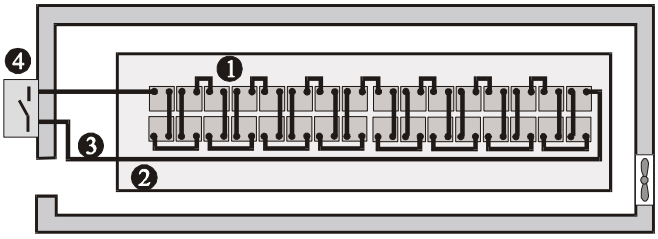


Figure 1.1 Battery room design

2.5 Battery Control

The battery temperature detection cable is connecting to the position between the UPS auxiliary terminal X3 BCB, the battery temperature sensor and the battery, as shown in Figure 2-1.

The connecting cable of the X3 BCB shall have protective grounding wire or shield layer, be kept away from the power cable, and adopt two-layer insulated cable. When the wiring distance reaches 25m~50m, the sectional area shall be 0.5mm^2~1mm^2.The shielded cable is connected to the battery cabinet or BCB rather than the UPS protective ground.

2.6 Battery Maintenance

For the battery maintenance and maintenance precautions, refer to IEEE-Std-1188-2005 and the relevant manuals provided by the battery manufacturer.

Note
Periodically check the screws of the battery connecting parts for any loose connection. If there is any loose screw, tighten it immediately. Check to ensure that all the safety devices are in place and operate normally, and that the battery management parameters are set properly. Measure and record the air temperature inside the battery room. Check if the battery terminal has any damage or heating sign, and if the enclosure or cover is damaged.

2.7 Battery Recycling

If the battery has liquid leakage or is damaged, place the battery into the container that can withstand sulphuric acid and discard it according to the local regulations.

Used lead acid storage battery belongs to dangerous waste, and it is a key item for used battery pollution control. The storage, transportation, use and disposal of the battery shall comply with the national and local laws and regulations on dangerous waste and used battery pollution prevention and other standards.

According to the relevant national regulations, the used lead acid storage battery must be recycled and shall not be disposed of with other methods. Random discard or any other improper disposal of the used lead acid storage battery may cause severe environment pollution and the relevant person will be investigated of corresponding legal responsibilities.

As a lead acid storage battery supplier, Power Co., Ltd has built a perfect service network and used battery recycling system to help the customer legally and properly dispose of the lead acid storage battery. For detailed information about the used battery recycling system of Power Co., Ltd, please consult the office of Power Co., Ltd located at or near the place of the customer. If the customer refuses to accept this special note or does not use the used battery recycling system of Power Co., Ltd, Power Co., Ltd will not undertake any environment responsibility caused by the improper disposal of the used battery products.

Chapter 3 Installation Of Parallel System

This chapter details the installation and wiring of the parallel system.

3.1 Overview

The parallel system installation shall be carried out according to the installation steps of UPS module and the requirements of this chapter.

In addition to an EPO button provided on the front panels of each UPS module for controlling the EPO of each module respectively, the parallel system also provides remote EPO functions for controlling each UPS module to shut down simultaneously from a remote terminal, as shown in Figure 3-1.

Note
1. The remote EPO switch must provide dry contact signal, which is normally open or closed. 2. The open circuit voltage provided is 12Vdc, <20mA. 3. The external EPO device can be composed of another control system which can disconnect the UPS mains supply or the bypass input. 4. The normally closed EPO-J10: 1,2 on the monitoring board has been short circuited at factory.

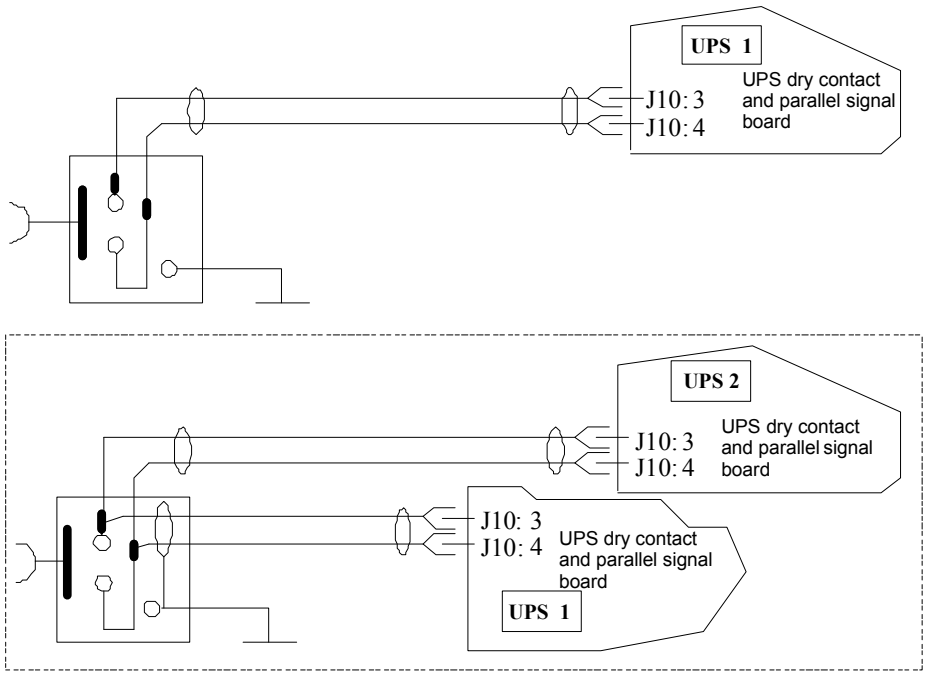


Figure 1.1 Connection diagram of EPO circuit

3.2 Each UPS Module In The Parallel System

The basic installation steps of parallel system are the same as those of UPS module. The following sections describe the differences between the parallel system installation and UPS module installation.

3.2.1 Cabinet Installation

Place each UPS module side by side, and arrange the connections between each module as shown in fig. 3-2. An external bypass cabinet is recommended for convenience of maintenance and system test.

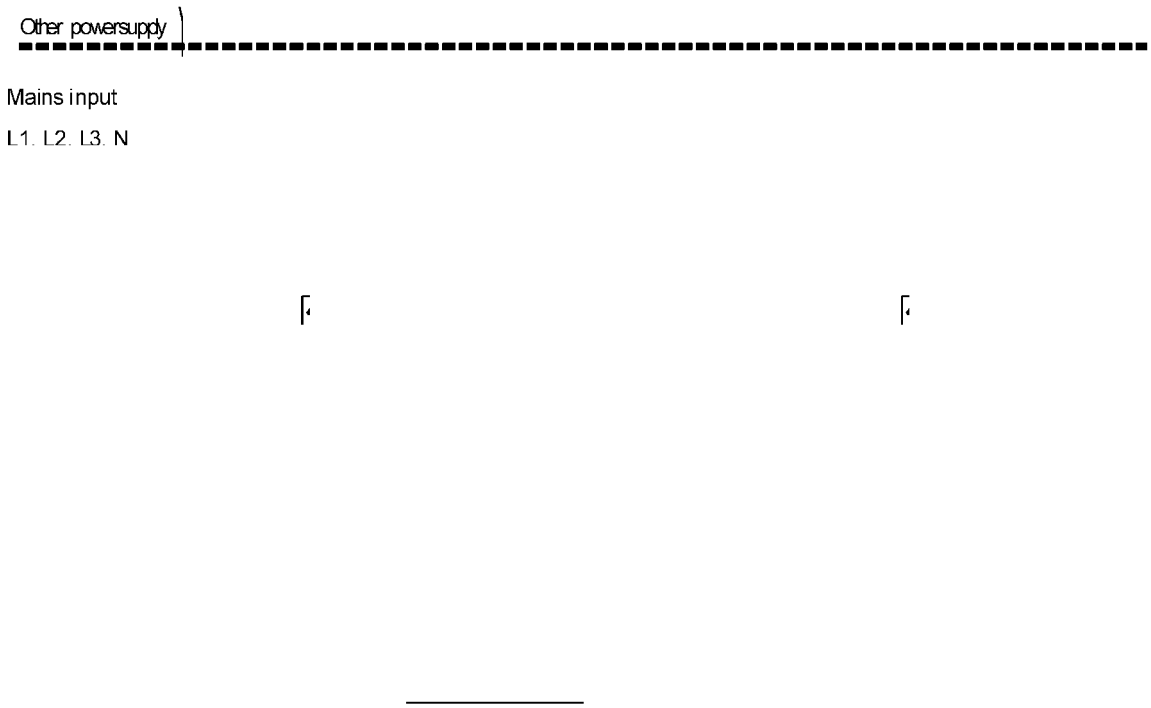


Figure 1.1 Typical "1+N" system schematic diagram (with common input, independent battery and output/bypass distribution cabinet)

3.2.2 External Protection Device

Refer to Chapter I Installation of UPS module.

3.2.3 Power Cable

The wiring of the power cable is similar to that of UPS module. The input power supply of the bypass and the main circuit must use the same neutral line input terminal. If the input has a current leakage protector, the leakage protector must be arranged at a position before the connection point of the input cable to the input terminal. Refer to *Chapter I Installation of UPS module.*

Note: The power cables (including the bypass input cable and UPS output cable) of the UPS modules shall adopt the same length and specifications, so that current sharing effect can be realized in bypass mode.

3.2.4 Control Cable

Parallel cable

Dual-layer insulating shielded parallel cables with the lengths of 5m, 10m and 15m shall be used to connect between all the UPS modules to form a close loop, as shown in fig. 3-3. The parallel board is installed at the left side of each UPS bypass module. The close loop connection can ensure the reliability of parallel system control. Before startup, make sure that the cables are in firm connections! Refer to fig. 3–3.

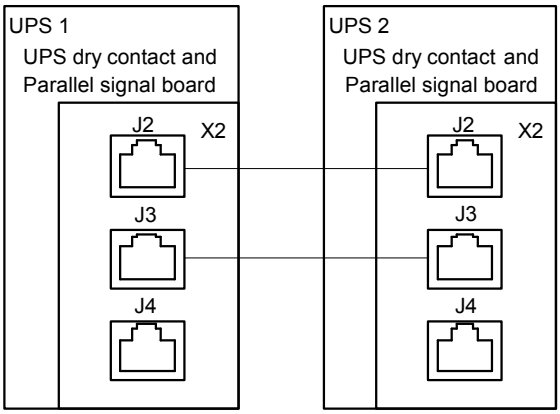


Figure 1.1 "parallel control cable connection of the "1+N" system (where X2 is the dry contact and the parallel signal board)

3.3 Dual-Bus System

3.3.1 Cabinet Installation

As shown in fig. 3-4, the dual-bus system is composed of two independent UPS systems. Each UPS system may include one or several parallel UPS modules. The dual-bus system has high reliability and is applicable to the load with multiple input terminals. For the single-input load, an optional static transfer switch can be added to start the load bus synchronization (LBS) system which is provided in standard models. Please perform system installation in accordance with the installation instructions for the system of different configurations.

Place each UPS module side by side, and arrange the connections between each module as follows.

The dual-bus system realizes the synchronous outputs of the two independent (or parallel) UPS systems with the LBS. One system is the master system, while the other is the slave system. The operation mode of the dual-bus system includes the normal or bypass mode of the master system and/or slave system.

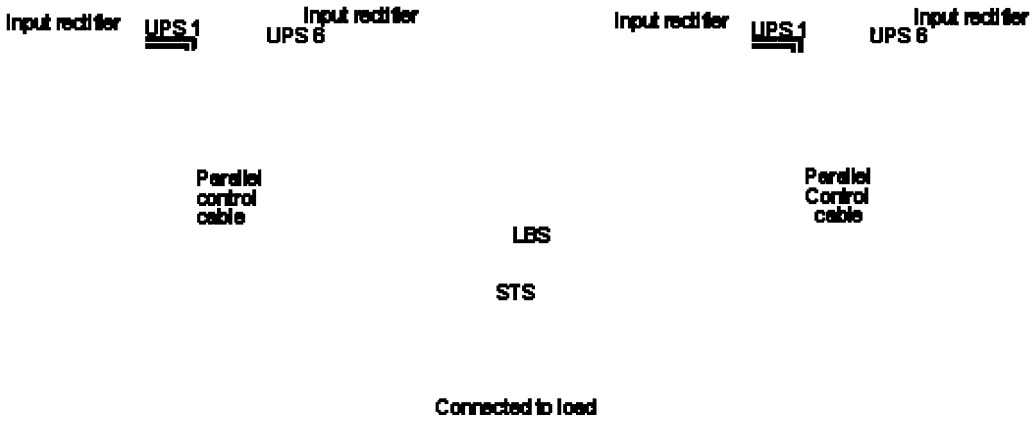


Figure 1.1 Typical dual-bus system (with static transfer switch and load bus synchronization system)

3.3.2 External Protection Device

Refer to Chapter I Installation of UPS module.

3.3.3 Power Cable

The wiring of the power cable is similar to that of the UPS module. The bypass and main circuit input power supply must use the same neutral line input terminal. If an input leakage current protection device is used, the leakage

current protection device must be installed before the connection point of the input cable to the neutral input terminal. Refer to *Chapter I Installation of UPS module.*

3.3.4 Control Cable

For the dual-bus system of UPS to UPS connect the LBS cables to any two LBS interfaces of the two parallel systems, as shown in Figure 3-5.

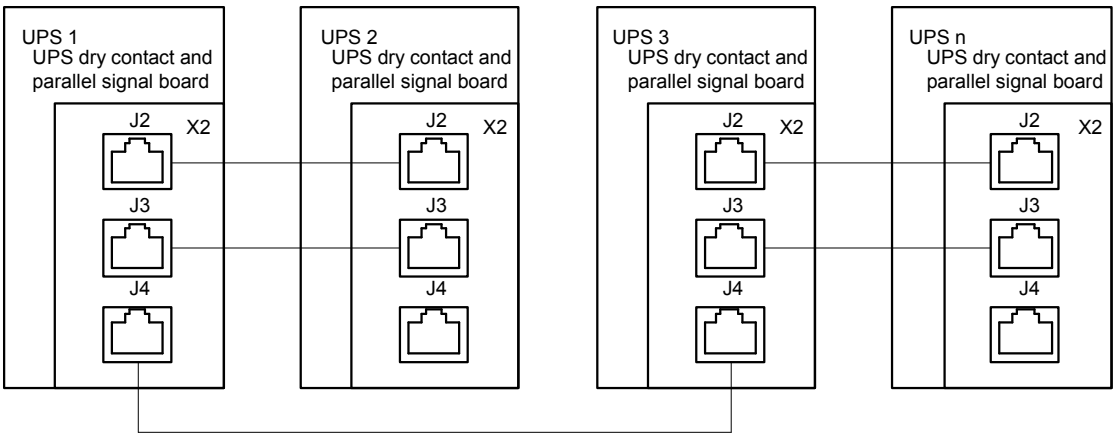


Figure 1.1 Connection of typical dual-bus system (using LBS system)

Note: the connection example of the dual-bus system composed of two 1+1 parallel systems connected by parallel bus (8).

3.3.5 Dual-Bus Synchronization Option (LBS Interface Box)

For the dual-bus system of UPS to non-UPS (other series of Liebert UPS or UPS manufactured by other manufacturer), LBS interface box shall be installed on the non- UPS. At this time, the other UPS system will run as the master system, including the following two situations:

- Both the master system and the slave system run in normal mode.
- The master system runs in bypass mode, while the slave system runs in normal mode.

Note
The LBS interface box can even be used to extend the length of the LBS cable of the dual-bus system composed of two groups of UPS systems to 150m.

Chapter 4 Installation Diagram

This chapter provides UPS installation diagrams.

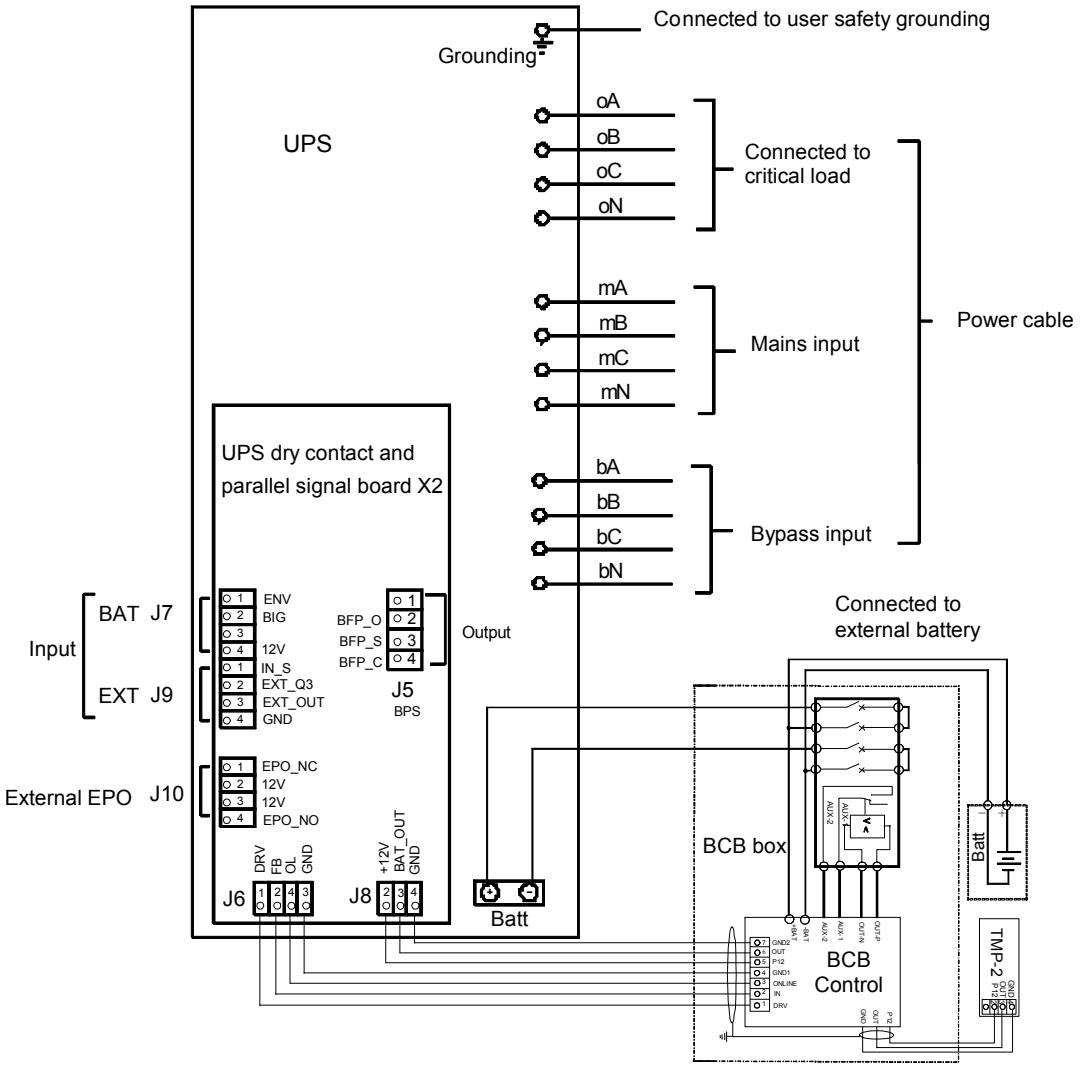


Figure 1.1 Electric connection diagram of UPS

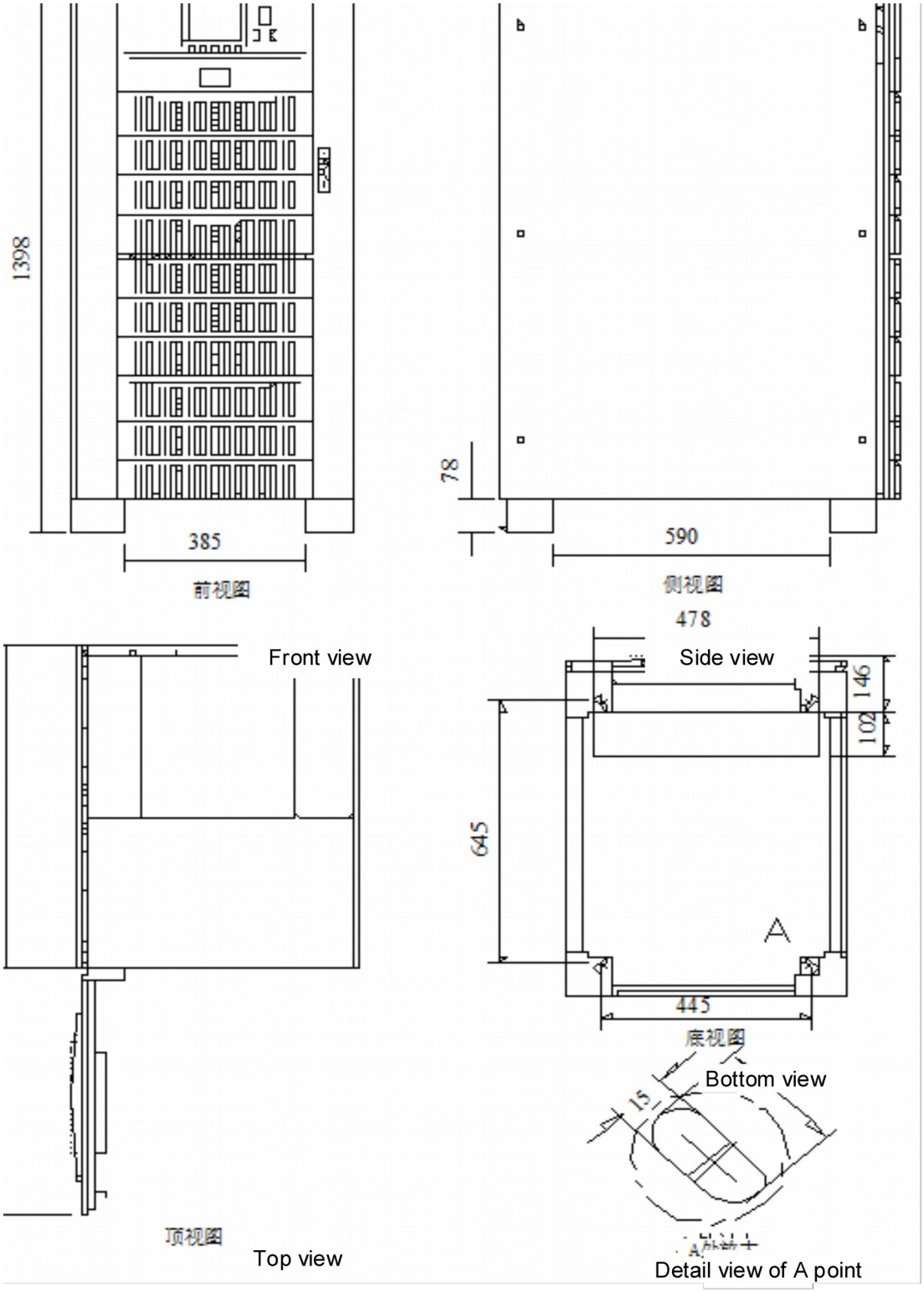


Figure 1.2 Mounting dimensions schematic diagram of UPS (unit: mm)

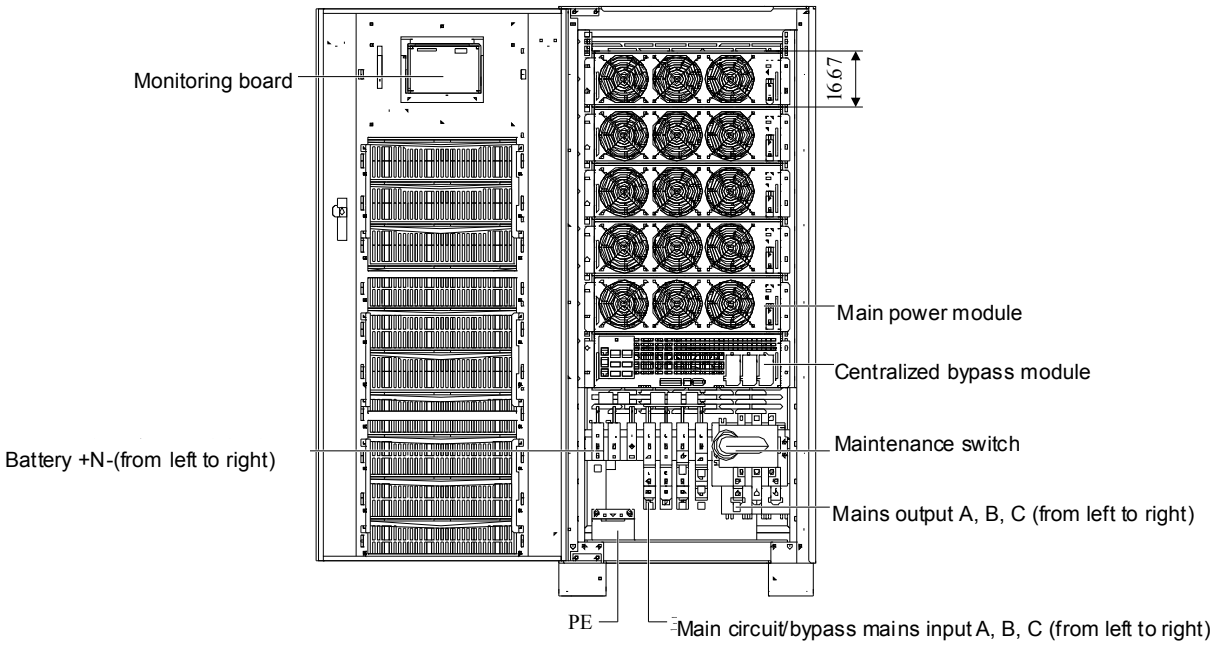


Figure 1.3 front view of UPS (door opened)

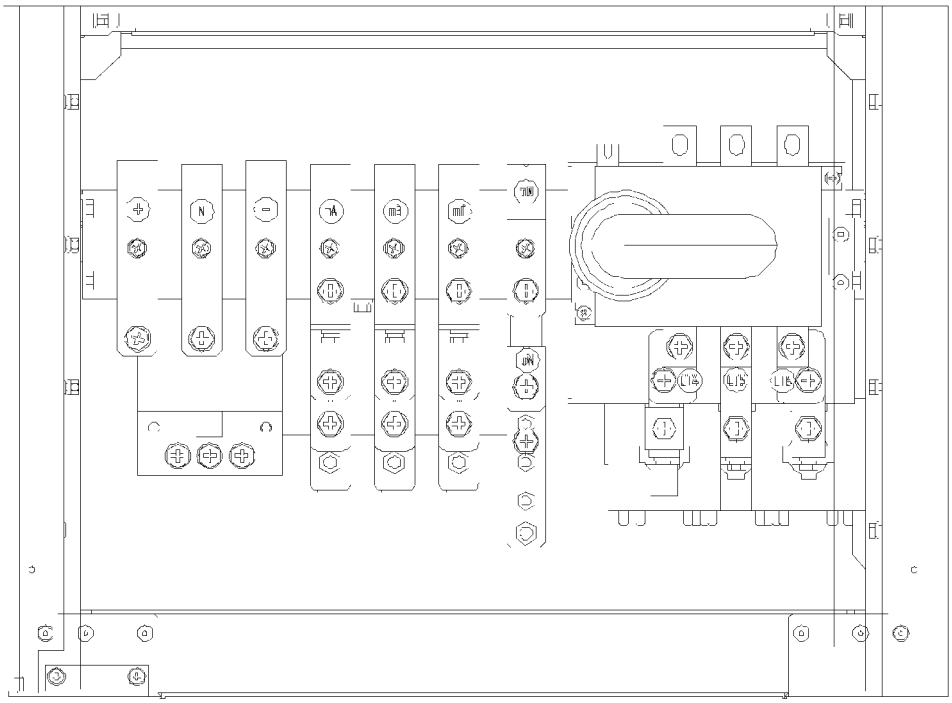


Figure 1.4 Schematic diagram of UPS terminals

Figure 1.5 Master power module

Figure 1.6 bypass power module

Notes on bypass power module installation:

1. Installation of the modules shall start from bottom to top, and the order of pulling out the modules shall be from top to bottom, so as to avoid unstable gravity center!
2. Before inserting the module, make sure that the ready switch shall be in a not ready state.
3. After inserting the modules, first fix all the bolts into position before switching on the ready switch.
4. Before pulling out the module, first switch off the ready switch and then remove the bolts.
5. Before reinserting the modules that have been pulled out, you shall wait for 5 minutes after power-down.

Chapter 5 Operation

This chapter provides information relevant to UPS operation. Content of this chapter includes operation mode of UPS, characteristics of parallel system, battery management and protection, etc.

WARNING: dangerous mains supply and/or battery voltage exist behind the protection cover
The parts behind the protection cover, which could be opened only by tools, shall not be operated by users. Only the qualified maintenance personnel are allowed to open these protection covers.

5.1 Brief Introduction

UPS provides stable uninterrupted high quality AC power supply for your critical loads, such as communication and data processing devices and equipment. The UPS output voltage is not subject to influences exerted by the voltage and frequency fluctuation and interruption caused by insufficient mains supply, interruption and peaks.

The UPS adopts latest high frequency double conversion pulse width modulation (PWM) technology and full digital control (DSP) technology, providing high reliability and easy use.

As shown in fig. 5-1, the AC mains supply input is converted to DC power supply through a rectifier. Then the DC power supply or the DC power supply from the battery is converted to AC power supply for the loads through an inverter. Where an interruption of the mains supply occurs, the battery will provide backup power supply for the loads through the inverter. The mains supply can even provide power supply for the loads through static bypass.

When it is necessary to perform maintenance and repair work for the UPS, the load can be switched to the maintenance bypass power supply without the interruption of power supply to the load.

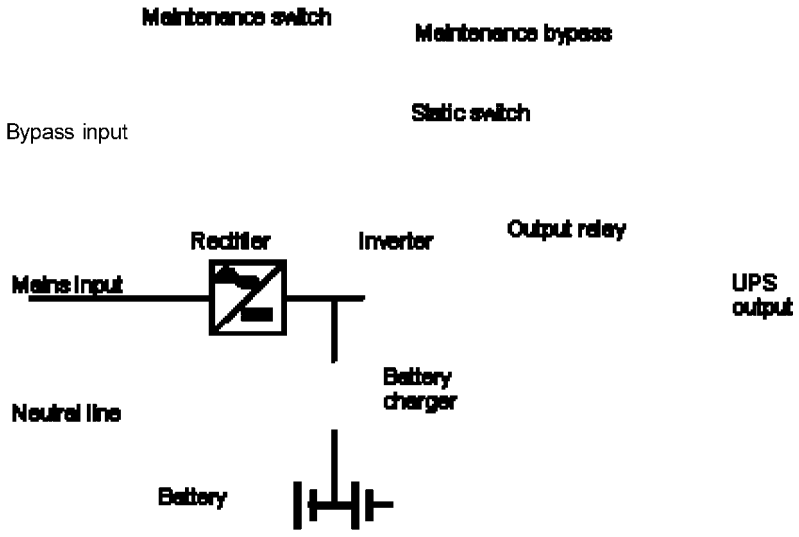


Figure 1.1 Schematic diagram of the UPS module system with the separate bypass input configuration

5.1.1 Separate Bypass Input

Figure 5-1 describes the schematic diagram of the UPS module that has “separate bypass power supply” (i.e., the bypass adopts independent mains input). In the separate bypass configuration, the static bypass and the maintenance bypass share the same independent bypass power supply, which is connected to a special bypass power supply through an independent power supply switch. If an independent bypass power supply is not available, the bypass shall be short-circuited to the rectifier input power supply terminal.

5.1.2 Static Transfer Switch

The “static switch” as shown in fig. 5-1 comprises an electronic-controlled transfer circuit, which allows the load to be connected to the inverter output or to the bypass power supply through the static bypass lines. Normally, the load power is supplied by the inverter; upon overload or inverter failure, the load will be automatically transferred to static bypass power supply.

Under normal operation conditions, the inverter output must be in thorough synchronization with the static bypass power supply, only in this way, can the uninterrupted transfer between the inverter power supply and the static bypass power supply be realized. The synchronization of the inverter output and the static bypass power supply is realized through the control circuit of the inverter. When the static bypass power frequency is within the permitted synchronization range, the inverter control circuit will always synchronize the inverter output frequency with the static bypass power frequency.

The UPS also provides manual control maintenance bypass. When it is necessary to turn off the UPS for routine maintenance and repairs, the UPS can provide power supply for critical loads through the maintenance bypass.

Note
When the UPS is working in bypass mode or is supplying the loads through the maintenance bypass, the load equipment will have no AC power abnormity protection.

5.2 “1+N” Parallel System

As shown in fig. 5-3, the “1+N” system can be composed of up to 4 UPS modules, therefore the system capacity or reliability or both can be improved. Each UPS module in parallel connection shares the load equally.

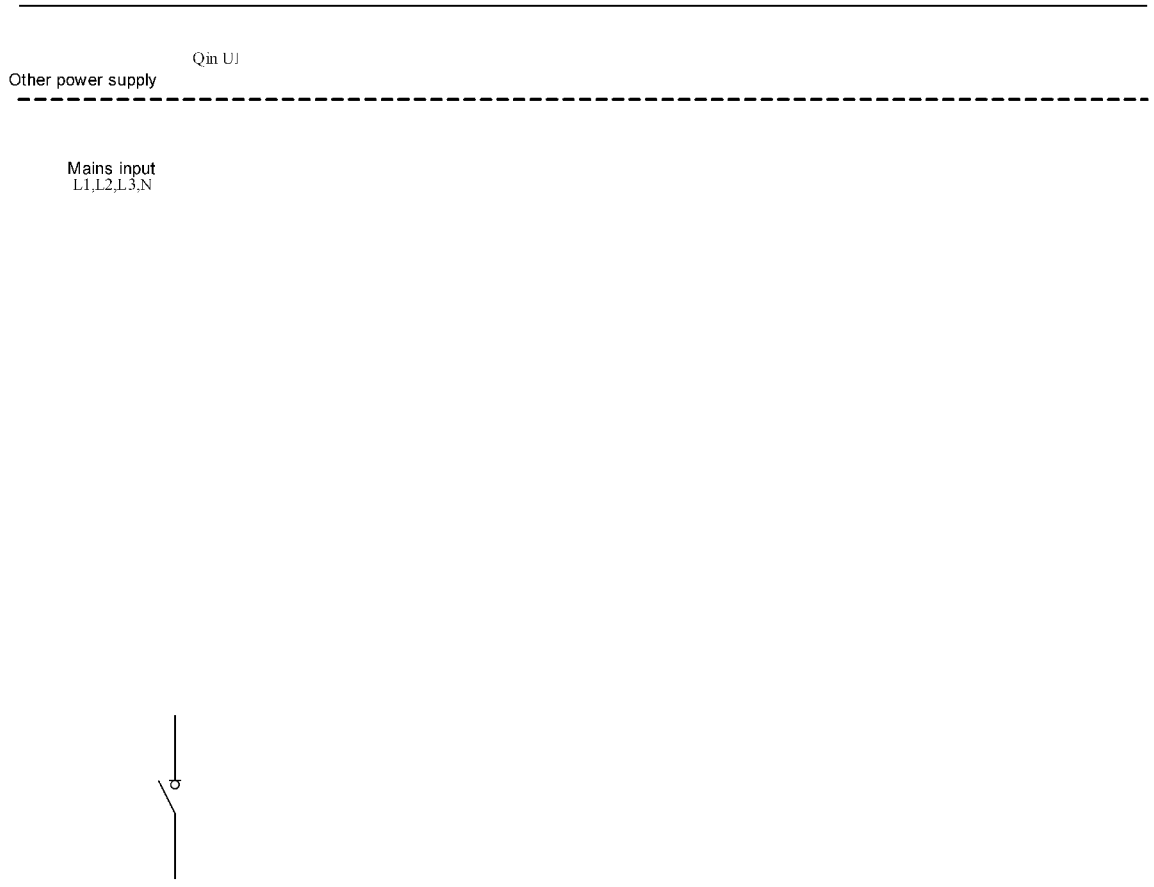


Figure 1.1 “1+N” UPS system with external maintenance bypass switch

Additionally, two UPS modules or "1+N" systems can also constitute a distributed redundant system. Each UPS module or system has an independent output, and output synchronization is realized through a load bus

synchronizer, which allows seamless transfer between the two systems for the critical load. Refer to *5.3 Operational mode* for details.

5.2.1 Characteristics Of The Parallel System

1. The software and the hardware of the parallel UPS are completely the same as that of the UPS module, and the configuration of the parallel system can be realized through parameter setting software. The parameters of the UPS modules in the parallel system shall be set as the same.

2. The parallel control cables form a close loop connection, providing reliability and redundancy for the system. Dual-bus control cable is used for the connection between any two UPS modules of two buses. Intelligent parallel logic provides maximum flexibility for the user. For example, each UPS module in the parallel system can be shut down or started in any order. Seamless transfer between normal mode and bypass mode can be realized and automatically recovered; i.e., once the overload condition is eliminated, the system will resume to original operational mode automatically.

3. The total load of the parallel system can be checked and viewed through the LCD of each UPS module.

5.2.2 UPS Parallel Requirements

A UPS system composed of multiple UPS modules in parallel connection is equal to a large UPS system, but provides higher system reliability. To ensure equal usage of each UPS module and compliance with relevant wiring standards, the following requirements shall be met:

1. All the UPS modules must be in the same capacity and connected to the same bypass power supply.

2. The bypass and the rectifier input power must be connected to the same neutral line input terminals.

3. If a residual current device (RCD) is used, it must be configured correctly and installed in front of the common neutral line input terminal. Or the device must monitor the protective ground current of the system. Refer to the section “WARNING: Large leakage current” before the Contents.

4. All outputs of the UPS modules shall be connected to a common output bus.

Note
If the power does not have a common neutral line or no neutral line is available, an isolating transformer shall be provided.

5.3 Operation Mode

The UPS is an online, double conversion and reverse switching UPS system which has the following operation modes:

- Normal mode
- Battery mode
- Automatic startup mode
- Bypass mode
- Maintenance bypass mode (manual bypass)
- Parallel redundancy mode
- Frequency converter mode
- Sleep mode

5.3.1 Normal Mode

Mains supply provides AC power to the rectifier of the UPS, and then the rectifier provides DC power to the inverter, finally, the inverter provides uninterrupted AC power to the load. At the same time, the rectifier will float or boost charge the battery through the battery charger.

5.3.2 Battery Mode

The battery mode is an operation mode wherein the battery provides backup power supply for the load by the inverter through the battery boost-up circuit. When mains failure occurs, the system will automatically switch to the battery mode, and the power supply to the load will not be interrupted. When the mains supply resumes later on, the system will switch back to normal mode automatically without manual intervention and load power interruption.

Note: battery cold start method can also be adopted to start UPS directly from battery (charged) mode when the mains supply is off. In this way, the battery power can be used independently, improving the system utilization rate under some conditions.

5.3.3 Automatic Startup Mode

The UPS has automatic startup function. When the inverter shuts down because the mains fails and the battery discharges to EOD voltage, if the mains is resumed, the UPS will start up automatically after certain time delay. This function and the delay time for automatic startup can be set by the commissioning engineer.

5.3.4 Bypass Mode

In normal mode, upon the inverter failure, inverter overload or manual shutdown of the inverter, the static transfer switch will transfer the load from the inverter side to the bypass power side without load power interruption. If the inverter is not in synchronization with the bypass at this time, and the static switch transfers the load from the inverter side to the bypass power side, short time load power interruption will occur. This function can help avoid large current circulation caused by asynchronous parallel AC power. The load power interruption time is settable and generally less than 3/4 of the cycle; for example, when the frequency is 50Hz, the interruption time is less than 15ms; when the frequency is 60Hz, the interruption time is less than 12.5ms.

5.3.5 Maintenance Bypass Mode (Manual Bypass)

If maintenance and repair work for the UPS need to be performed, you can transfer the load to the maintenance bypass through the manual bypass switch without interrupting the power supply.

The manual bypass switch is arranged inside the UPS module, with its capacity meeting the total load capacity requirements.

5.3.6 Parallel Redundancy Mode (System Expansion)

In order to improve the system capacity or reliability or both, several UPS modules can be arranged into direct parallel connection, and the parallel control logic in each UPS module will ensure automatic equal load sharing of all the UPS modules. The parallel system can be composed of 4 UPS modules to the maximum.

5.3.7 Frequency Converter Mode

The UPS can be set as frequency converter mode to provide stable output frequency of 50Hz or 60Hz. The input frequency range is 40Hz~70Hz. In this mode, the static bypass is invalid, and the battery is optional-depending on whether or not a battery mode operation is needed.

5.3.8 Sleep Mode

When the sleep mode is enabled, in order to improve the system efficiency to the maximum, the number of modules in sleep shall be maximized with the precondition of ensuring the load power supply. This mode has limit for the module IDs in the system: when there are 5 modules, the module IDs are 1, 2, 3, 4 and 5 sequentially; when there are 4 modules, the module IDs are 1, 2, 3 and 4 sequentially; when there are 3 modules, the module IDs are 1, 2 and 3 sequentially; when there are 2 modules, the module IDs are 1 and 2 sequentially.

5.4 Battery Management (Set In The Course Of Commissioning)

5.4.1 General Functions

1. Constant current boost charge.

The charging current is settable.

2. Constant voltage boost charge.

The boost charge voltage is settable in accordance with battery type.

For valve-control type lead-acid battery, the maximum boost charge voltage shall not be over 2.4V/cell.

3. Floating charge.

The floating charge voltage is settable in accordance with battery type.

For valve-control type lead-acid battery, the floating charge voltage shall be from 2.2V/cell to 2.3V/cell.

4. Floating charge temperature compensation (optional).

Temperature compensation coefficient is settable in accordance with battery type.

5. EOD protection.

When the battery voltage drops to the EOD voltage, the battery converter will shut down automatically to disconnect the battery for avoiding over-discharge. The EOD voltage is settable: for valve-control lead-acid battery, the setting range is 1.6V~1.75V/cell; for nickel-cadmium battery, the range is 1.9V~1.1V/cell.

6. Battery low voltage alarm time.

Setting range: 3-60 minutes before EOD, with the default of 5 minutes.

5.4.2 Advanced Functions (To Be Set By The Commissioning Engineer Through Software)

Battery self detection maintenance

The battery will discharge automatically and periodically, with each discharge volume equal to 20% of the battery capacity, and the actual load must exceed 20% of the nominal capacity of the UPS. If the load is less than 20%, the automatic discharge maintenance cannot be performed. Interval time of automatic discharge time is settable between 30~360 days. Battery self detection can be disabled.

Preconditions: the battery shall be float charged for at least 5 hours, and the load shall be between 20%~100%.

Trigger: automatically started, or manually started using battery maintenance test commands on the LCD panel.

Battery automatic detection interval time: 30-360 days (default: 60 days).

5.5 Battery Protection (To Be Set By The Commissioning Engineer)

BLV alarm

Before the EOD, battery low voltage alarm will be released. After the alarm, the battery shall have a capacity for 3-minute full load discharge. This time is settable by the user, with the setting range of 3-60 minutes.

EOD protection

If the battery voltage drops to the EOD voltage, the battery converter will shut down. The EOD voltage is settable: for valve-control lead-acid battery, the setting range is 1.6V~1.75V/cell; for nickel-cadmium battery, the range is 1.9V~1.1V/cell.

Battery circuit breaker disconnection alarm

This alarm appears when the battery circuit breaker is disconnected.

External battery is connected to the UPS through an external battery circuit breaker. This circuit breaker is manually closed, and is tripped by the control switch of the UPS control circuit.

Chapter 6 Operational Steps

This chapter details the operational steps of UPS.

For all the control operational keys and LED displays involved in the operational steps, refer to Chapter 7 Operation and control display panel. During the operation, beeper alarm may occur anytime. Press SILENCE ON/OFF to clear the sound alarm.

 WARNING: dangerous mains supply and/or battery voltage exist behind the protection cover
The parts behind the protection cover, which can be opened only by tools, shall not be operated by users. Only qualified maintenance personnel are permitted to open these protection covers.

6.1 Power Supply Switch

The UPS power supply switch only provides one maintenance switch at the front lower right (silk print: MAINTAIN CB), all the other switching actions are automatically handled by the DSP logic.

6.2 UPS Startup

Only after the UPS has been installed completely and commissioned successfully by the engineer and the external power switch has been switched on, can the UPS startup steps be carried out.

6.2.1 Startup Steps For Normal Mode

These startup steps are applicable for starting up UPS under completely power-off conditions.

The operational steps are as follows:

1. Disconnect the external power switch. Open the UPS door, lead in the power wires, and ensure correct power phase sequence.

 Warning
When performing UPS startup steps, the UPS output terminal will be live. If the load is connected to the UPS output terminal, please verify with the user whether the power supply for the load is safe. If the load is not ready for accepting the power supply, the load must be isolated from the UPS output terminal.

2. Close the external power switch and lead in the mains supply.

At this time, the LCD will display the startup screen. The rectifier starts up, and the rectifier LED flashes in green. 30s after the rectifier enters the normal operational state, the rectifier LED will maintain the steady green state. After initialization, the bypass static switch will be switched on. UPS analog LED statuses are as follows:

LED	Status
Rectifier LED	Green
Battery LED	Off
Bypass LED	Green
Inverter LED	Off
Load LED	Green
Status LED	Yellow

3. Press INVERTER ON for 2s.

The inverter starts up, and the inverter LED flashes in green. After the inverter goes into normal operation, UPS will change from bypass power supply state to inverter power supply state, the bypass LED is off, and the inverter and load LEDs light up.

UPS is in normal operation. UPS analog LED statuses are as follows:

LED	Status
Rectifier LED	Green
Battery LED	Off

Bypass LED	Off
Inverter LED	Green
Load LED	Green
Status LED	Green

6.2.2 Startup Operational Steps For The Battery Mode

1. Check if the battery is well connected.

2. Press the battery startup button on the front panel of any power module (refer to fig. 6-1).

The LCD will display the startup screen, and the battery LED flashes in green. 30s after the rectifier enters normal operation, the battery LED will stop flashing, and maintain steady green state.

3. Press and hold the INVERTER ON key for 2s, the UPS will operate in battery mode.

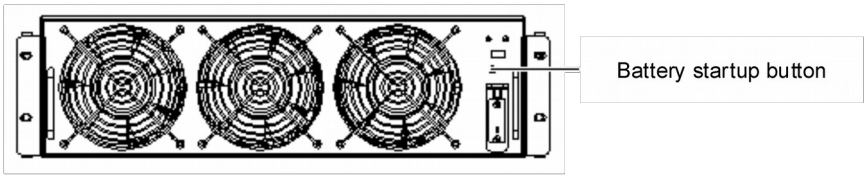


Figure 1.1 Schematic diagram of the positions of the battery startup button

6.3 Operational Modes Switching Steps

6.3.1 Switching From Normal Mode To Battery Mode

Switch off the external power switch and cut off the mains supply, the UPS will enter the battery mode. If it is necessary to switch the UPS back to normal mode, wait for several seconds and then switch on the external power switch, and resume the mains supply. After 10s, the rectifier will restart automatically, and resume the power supply of the inverter.

6.3.2 Switching From Normal Mode To Bypass Mode

Press INVERTER OFF key to switch the UPS to bypass mode.

Note
In bypass mode, the load is directly powered by the mains rather than the pure power supply output from the inverter.

6.3.3 Switching From Bypass Mode To Normal Mode

In bypass mode, press the INVERTER ON key. After the inverter is in normal operation, the UPS will be switched into normal mode.

6.3.4 Switching From Normal Mode To Maintenance Bypass Mode

Performing this step will switch the load from the UPS inverter output to the maintenance bypass, provided that the UPS is in normal operation state.

Caution
Before performing the switching operation, please read the LCD message first, make sure that the bypass is in normal operation, and the inverter is in synchronization with the bypass. If this condition is not satisfied, short time power supply interruption to the load may occur.

1. Press the INVERTER OFF key at the right of the operational control display panel and hold for at least 2s. The inverter LED is off, and the status LED (6) will display in yellow, the beeper alarms, the load will be switched to the static bypass, and the inverter will be shut down.

Note
Press the SILENCE ON/OFF switch to clear the alarm sound, but the alarm message on the LCD will not disappear until the alarm state is cleared.

2. Open the UPS door, turn the maintenance switch from OFF position to ON position. The power supply for the load is provided by the manual maintenance bypass.

Warning
If the module needs to be maintained, wait for about 10 minutes for the internal DC bus capacitor to discharge before pulling out the corresponding faulty module. Even when the knob switch is in the maintenance bypass position, part of the UPS circuit will still be live. Therefore, only qualified personnel are permitted to perform UPS maintenance work.

Caution
When the UPS is in maintenance bypass mode, the load has no mains supply abnormity protection.

6.4 Steps For Completely Shutting Down The UPS

If the UPS needs to be completely shut down, just switch the UPS from normal operation state to maintenance bypass mode following the operational steps described in *6.3.4 Switching from normal mode to maintenance bypass mode*.

If the UPS needs to be isolated from the AC power, the external power input switch shall be switched off (if the rectifier and the bypass power are independently supplied, both of the two input switches shall be switched off). Refer to Figure 6-2.

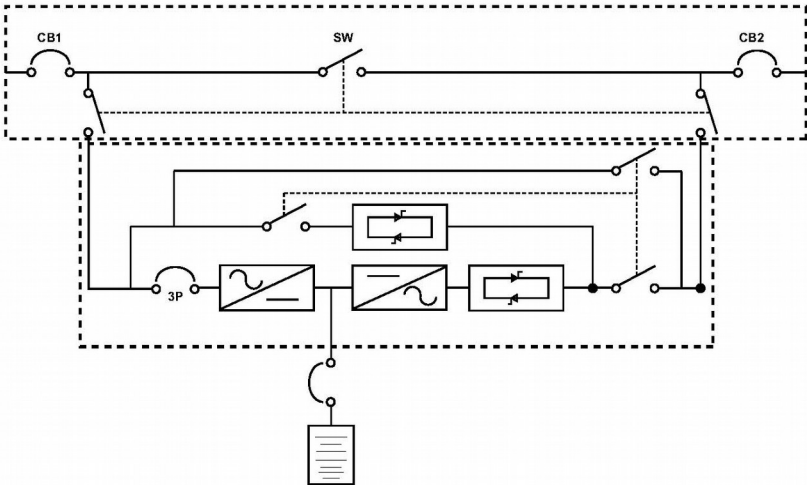


Figure 1.1 Example of UPS module with external maintenance bypass cabinet

Warning
In order to prevent personal injury, the maintenance power supply shall be cut off.

6.5 Steps For Shutting Down UPS Without Cutting Off Power Supply Of The Load

Note
Before performing this step, make sure that the UPS has been installed with external maintenance bypass cabinet.

The following operational steps are applicable for shutting down UPS completely without cutting off the power supply of the load.

1. Perform steps 1-3 stated in 6.3.4 Switching from normal mode to maintenance bypass mode.
2. Make sure that the maintenance switch is at ON position.

Warning
Attach a label at the site of the AC input distribution (which is generally far from UPS), warning that the UPS is in maintenance. Wait for about 5 minutes to allow the internal DC bus capacitor to discharge; then the UPS is completely powered off.

Note
After the UPS is shut down, and the load is switched to the maintenance bypass, if necessary, the maintenance bypass power switch can be operated at any time. Only after the UPS (including the maintenance bypass cabinet) is installed by qualified personnel and put into normal operation, can this step be carried out. For details, refer to fig. 6-2.

6.6 Emergency Power OFF (EPO) Operation Steps

Emergency Power Off (EPO) switch is used for shutting down the UPS under emergency conditions (such as fire, flood, etc). The system will shut down the rectifier and inverter, and quickly cut off the power supply for the load (including the inverter and bypass outputs), and the battery will stop charging or discharging.

If the UPS still has the mains input, it means that the UPS control circuit is still live, but the UPS output has been turned off. If the UPS mains supply needs to be cut off completely, the external mains input switch of the UPS shall be completely switched off.

6.7 Automatic Startup

When the mains failure occurs, the UPS, which supplies the load through the battery system, will not stop output until the battery reaches its end of discharge (EOD) voltage.

UPS will restart automatically to resume the output power supply only when the following conditions are met.

- After mains supply resumes
- UPS has been set to automatic startup
- After automatic startup delay (default: 10 minutes) elapses. In the course of automatic startup delay, the UPS charges the battery to avoid the risk of load power-off caused by another power interruption of the mains supply.
- If the UPS is not set to automatic startup, the user can manually start up the UPS by pressing the FAULT CLEAR key.

6.8 Steps For Resetting UPS

When the UPS is shut down due to EPO (emergency power off), inverter overtemperature, overload, battery overvoltage, or because it has exceeded the limit of transfer times (BYP: XFER COUNT BLOCK), resume the normal operation of the UPS with the following UPS recovery steps after eliminating the faults by taking relevant measures according to the alarm messages on the display.

After the user confirms the fault has been eliminated, perform the following steps:

1. Press FAULT CLEAR key to allow the system to exit EPO state.

2. Press the INVERTER ON key at the right of the operation control panel and hold for over 2s.

Note
When the rectifier restarts, the bypass provides power supply for the load. When the rectifier starts up, the rectifier LED flashes. In 30s after the rectifier enters the normal operational state, the rectifier LED will maintain steady green state. In 5 minutes after the overtemperature signal disappears, and when the overtemperature fault is cleared, the rectifier will automatically start up.

After pressing the EPO button, and if the mains supply of the UPS has been cut off, the UPS will shut down completely. When the mains supply is resumed, the UPS will start up and enter bypass mode operation, resuming the output.

Warning
If the maintenance switch is at the ON position, and the UPS has mains input , then the UPS has output.

It takes 10 minutes for the UPS module to discharge to safe voltage, during that 10 minutes, no maintenance work shall be carried out.

6.9 Guide For The Power Module Maintenance Operation

(Only servicing engineer is permitted to perform the following operations)

Guide for the master power module maintenance

Assuming that the system is in normal mode and the bypass operates normally:

1. Shut down the inverter manually, and the UPS switches to bypass power supply.

2. Pull out the ready switch of the master power module which needs to be maintained or repaired.

3. Loosen the bolts of the master power module and wait for 2 minutes, then pull out the master power module for maintenance.

Note
For the sake of safety, measure the DC bus capacitor voltage with multi-meter, and make sure that it is less than 60V.

4. After the master power module maintenance is completed, verify that the address bit of the master power module is different from those of the other power modules in operation, and it shall be within the range of 1~5. If they are the same, it shall be adjusted to a different address bit.

5. Insert the master power module (the interval time for inserting each module shall be over 10s), make sure that the ready switch of the master power module is in pulled-out state, and tighten the bolts at the two sides of the power module.

6. Wait for 2 minutes, and insert the ready switch of the master power module, then the master module will join in the system operation automatically.

Guide for the bypass power module maintenance

Note
Maintenance work for the bypass power module shall not be carried out in battery mode.

Assuming that the system is in normal mode and the bypass operates normally:

1. Shut down the inverter manually, the UPS switches to bypass power supply; switch on the maintenance bypass switch, the UPS switches to maintenance bypass power supply.

2. Press the EPO button, make sure that the battery current is 0; switch off the battery circuit breaker or disconnect the battery connector.

3. Pull out the ready switch of each master power module, and pull out all the master modules.

4. Pull out the bypass power modules that need to be maintained or repaired, wait for 5 minutes and then carry out maintenance work to the bypass power modules.

Note
For the sake of safety, measure the DC bus capacitor voltage with multi-meter, and make sure that it is less than 60V.

5. After completing the maintenance work for the bypass power modules, insert the bypass power modules. Wait for 2 minutes until the bypass LED changes to steady green, which indicates that the bypass is supplying power normally.

6. Verify that the address bit of the master power module is different from those of the other power modules in operation, and it shall be within the range of 1~5. If they are the same, it shall be adjusted to a different address bit.

7. Insert the master power module (the interval time for inserting each module shall be over 10s), make sure that the ready switch of the master power module is in pulled-out state, and tighten the bolts at the two sides of the power module.

8. Insert the ready switch of the master power module (the interval time for inserting each module shall be over 10s), make each module ready in position.

9. Switch off the maintenance bypass switch, and the system switches to bypass power supply. Turn on the inverter manually, the UPS switches to inverter power supply.

6.10 Language Selection

The LCD menu and data support the display in 12 languages, including Chinese, Dutch, English, French, German, Italian, Japanese, Polish, Portuguese, Russian, Spanish and Swedish.

Select the language you want according to the following steps:

1. Press F3 or F4 (move to left or right) to select MENU LANGUAGES under the menu of AC OUTPUT.

2. Press F5 (confirm) to move the cursor to the data window of the screen.

3. Press F3 or F4 (scroll upwards or downwards) to select the language you want.

4. Press F5 (confirm) to confirm.

5. Press F2 (exit) repeatedly to return to the AC OUTPUT menu. Now, all the texts on the LCD shall have changed to the language you selected already.

6.11 Change Current Date And Time

To change the system’s date and time, perform the following steps:

1. Press F3 or F4 (move to left or right) to select FUNCTION SETTINGS under the menu of AC OUTPUT.

2. Press F5 (confirm) to move the cursor to the data window of the screen.

3. Press F3 or F4 (scroll upwards or downwards) to select DATE AND TIME SETTINGS, and press F5 (confirm) to confirm.

4. Move the cursor to the date and time display line, press F5 (confirm).

5. Press F3 or F4 (scroll upwards or downwards) to enter current date and time.

6. Press F5 (confirm) to confirm, press F2 (exit) to return to the AC OUTPUT menu.

6.12 Access Password

The system provides password protection for the UPS operation control. The default password is “12345”. Only after passing the password verification can the UPS and battery test operations be performed.

Chapter 7 Operator Control And Display Panel

The chapter introduces the function and usage of each component of UPS operator control and display panel in detail and provides LCD display information, including LCD screen type, detailed menu information, message of prompt window and UPS alarm list.

7.1 Brief Introduction

The UPS operator control and display panel is on the front door. Through the operator control and display panel, UPS operations can be controlled and all the UPS parameters, UPS and battery status and alarm messages can be obtained. As shown in Figure 7-1, the operator control and display panel can be divided into three parts according to its function: simulation current diagram, LCD display and menu key and operation control key.

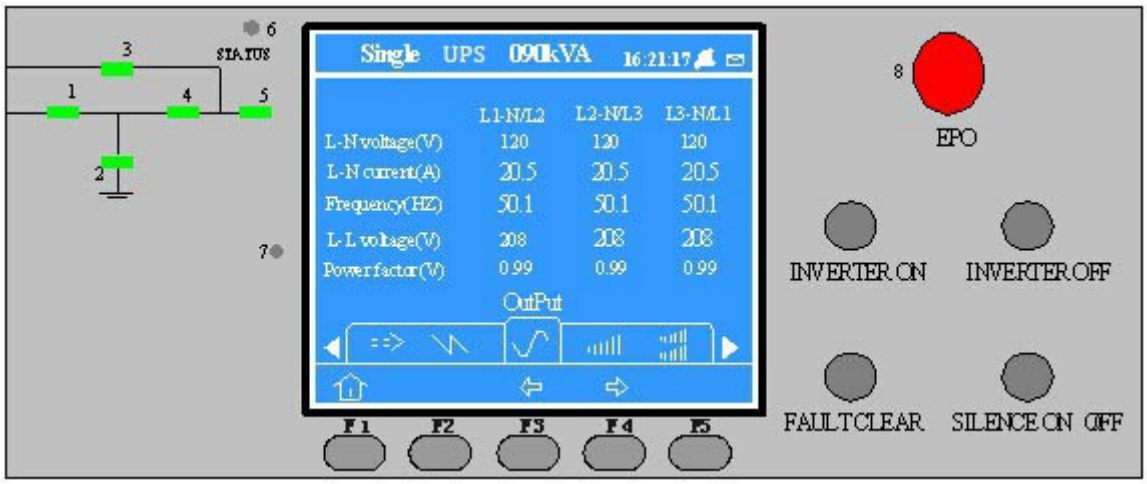


Figure 1.1 Operator control and display panel

Table 1.2 Operator control and display panel component description

No.	Function		Button	Function
1	Rectifier LED		EPOEPO	Emergency Power OFF (EPO) Switch
2	Battery LED		INVERTER ON	Inverter start-up switch
3	Bypass LED		INVERTER OFF	Inverter shut-down switch
4	Inverter LED		FAULT CLEAR	Failure reset switch
5	Load LED		SILENCE ON/OFF	Alarm silence switch
6	Status LED		F1~F5	LCD menu key
7	Alarm beeper			
8	EPO button protection cover			

7.1.1 LED

LED is provided in the Simulation Current Diagram to display the UPS operation paths and the current status. The description of each LED status is as shown in Table 7-2.

Table 1.1 LED status description

LED	Status	Meaning
Rectifier LED	Constant green	The rectifier is in normal operation
	Flashing green	The mains is normal, while the rectifier does not work
	Constant red	Rectifier failure
	Off	The rectifier does not work and the mains is not normal
Battery LED	Constant green	Load is powered by the battery
	Flashing green	EOD pre-alarm
	Constant red	Battery is abnormal (such as battery failure, battery not available or battery reversely connected) or battery converter is abnormal (such as failure, overload or over temperature)
	Off	The battery and battery converter are normal; the battery is in the process of charging
Bypass LED	Constant green	The load is powered by the bypass
	Constant red	The bypass power is abnormal or exceeds normal range, or the static bypass switch has failure
	Off	The bypass is normal
Inverter LED	Constant green	The load is powered by the inverter
	Flashing green	Inverter power-up, start and synchronization
	Constant red	Inverter failure
	Off	The inverter is not working
Load LED	Constant green	The UPS is normal with output
	Constant red	The UPS has output but is overloaded
	Off	The UPS does not have output
Status LED	Constant green	Normal operation
	Constant yellow	UPS alarm (e.g. AC failure)
	Constant red	UPS failure (e.g. fuse or hardware failure)

7.1.2 Sound Alarm (Beeper)

There are three different kinds of sound alarms when the UPS is in operation, as shown in Table 7-3.

Table 1.1 Sound alarm description

Alarm sound	Meaning
Short single-beeping alarm	The sound appears when any functional operation key is pressed
Beeping every 1s	The sound appears when the UPS generates alarms (e.g. AC failure)
Continuous beeping	The sound appears when the UPS has failures (e.g. fuse or hardware failure)

7.1.3 Operation Control Key

Five operation control keys are provided on the operator control and display panel. For the function description of the operation control keys, please refer to Table 7-4.

Table 1.1 Function description of operation control key

Operation control key	Function description
Emergency Power OFF (EPO) Switch	Used for disconnecting power of the loadand shutting down the rectifier, inverter, static bypass and battery
Inverter start-up switch	Used for starting the inverter
Inverter shutdown switch	Used for shutting down the inverter
Failure reset switch	Recovering the UPS function (on the condition that failure has been cleared)
Alarm silence switch	Alarm sound can be silenced by pressing the key.,And the beeper can be restarted by pressing the key again

7.1.4 LCD And Menu Key

LCD screen and five menu keys (F1, F2, F3, F4, F5) are provided on the operator control and display panel. For the function description of each menu key, please refer to Table 7-5.

Table 1.1 Menu key function description

Key	F1	F2	F3	F4	F5
Function 1	HOME	ESC	Left	Right	OK
Function 2			Up	Down	

The LCD display interface is user friendly, and it can provide 320×240 lattice graphic display. Through the LCD display interface and the user friendly menu drive operation system, users can browse the UPS input, output, load and battery parameters easily, obtain the current status and alarm information of the UPS system in time, and perform relevant function setting and control operations. The LCD can provide up to 1024 pieces of history alarm messages for customers, providing reliable basis for failure diagnosis.

7.2 Types Of LCD Screen

7.2.1 Startup Screen

When the UPS is started, it will have self-detection, and the startup screen appears and lasts for about 15 seconds, as shown in Figure 7-2.

Figure 1.1 Startup screen

7.2.2 Main Screen

After the UPS startup screen finishes self-detection, the main screen appears, as shown in Figure 7-3. The main screen can be divided into 4 display windows: system information window, menu window, data window and keyboard explanation window.

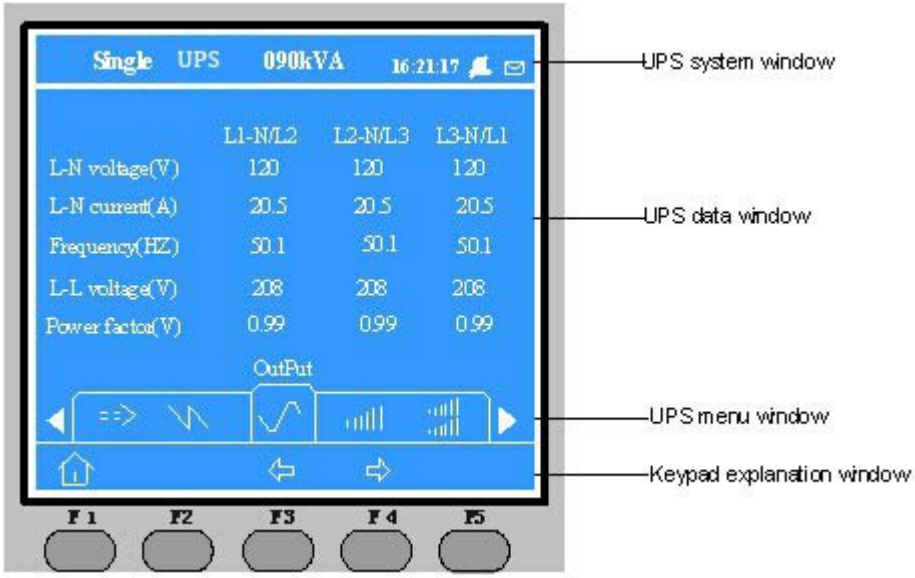


Figure 1.1 Main screen

The icon of the current screen on top of F1~F5 keys explains the meanings of each key. In any menu of the main screen, press F1 to return to “AC input” menu, and press F3 and F4 simultaneously to enter the screen as shown in Figure 7-4 to select power module.

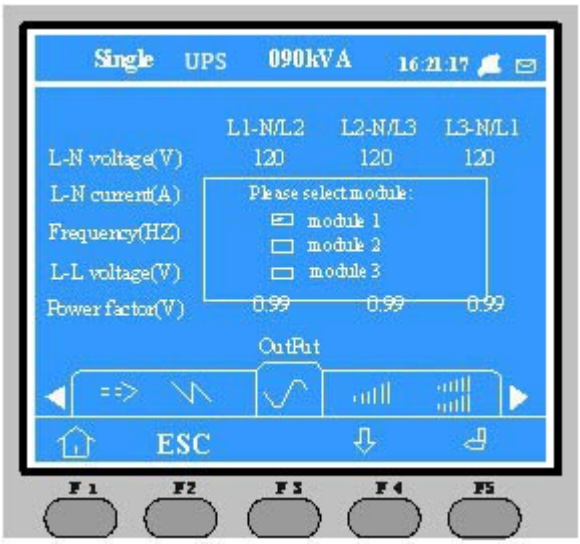


Figure 1.2 Power selection module

7.2.3 Default Screen

During the operation of the system, if there is no alarm within 2 minutes, then the default screen will appear, as shown in Figure 7-5. The screen backlight will be off in a short time. Press any key (F1~F5) and this screen will appear again.

Figure 1.1 Default screen

7.3 Detailed Menu Description

The main LCD screen, as shown in Figure 7-3, will be described in detail.

System information window

System information window: showing the current time, UPS name and status, techno operation is required for the information of this window. The detailed explanation is shown in Table 7-6.

Table 1.1 Item description of system information window

Item	Explanation
UPS	Name of UPS series
12:30:36	Current time(format: 24-hour, hour: minute:second)
Online module/parallel system (1#)	Configured as online module or parallel system
🔕/ 🔔	Alarm silence status 🔕: Silenced; 🔔 : not silenced

Menu window and data window

Menu window displays the names of menu of the data window. The data window displays the relevant item information of the selected menu in the menu window. The relevant UPS parameters can be viewed and the relevant function can be set through the menu window and data window. For details, refer to Table 7-7.

Table 1.1 Item description of menu window and data window

Name	Item	Explanation
Main circuit input	Phase voltage (V)	Phase voltage
	Phase current (A)	Phase current
	Frequency (Hz)	Input frequency
	Line voltage (V)	Line voltage
	Power factor	Power factor
Transformer input	Phase voltage (V)	Phase voltage
	Line voltage (V)	Line voltage
Bypass input	Phase voltage (V)	Phase voltage
	Frequency (Hz)	Bypass frequency
	Line voltage (V)	Line voltage
AC output	Phase voltage (V)	Phase voltage
	Phase current (A)	Phase current
	Frequency (Hz)	Output frequency
	Line voltage (V)	Line voltage

Name	Item	Explanation
	Power factor	Power factor
Transformer output	Phase voltage (V)	Phase voltage
	Line voltage (V)	Line voltage
Load of this module	Apparent power (kVA)	Sout: apparent power
	Active power (kW)	Pout: active power
	Inactive power (kVAR)	Qout: inactive power
	Percentage of load (%)	Load (percentage of UPS rated load)
	Peek ratio	Output current peak ratio
Parallel load	Apparent power (kVA)	Sout: apparent power
	Active power (kW)	Pout: active power
	Inactive power (kVAR)	Qout: inactive power
	Module having no parallel data	When the UPS is set as a single module, only the load of this module is available, and there is no system load.
Battery data	Battery voltage (V)	Battery bus voltage
	Battery current (A)	Battery bus voltage
	Battery temperature (ºC)	Battery temperature (ºC)
	Remaining time (Min.)	Remaining backup time of battery
	Battery capacity (%)	Percentage relative to new battery capacity
	Battery in boost charging	Battery in the state of boost charging
	Battery in float charging	Battery in the state of float charging
	Battery disconnected	Battery disconnected
Current record	(Current alarm)	Display the current alarm. For the alarm list displayed by the LCD on the UPS operator control and display panel, refer to Table 7-9.
History record	(History alarm)	Display all the history alarmsFor the alarm list displayed by the LCD on the UPS operator control and display panel, refer to Table 7-9.
Menu language	(Language options)	With 12 LCD language options
Function setting	LCD contrast setting	Adjusting LCD contrast
	Date format setting	Four format options: Month/day/year, Day/month/year, Month/day/year and Year/month/year
	Date time setting	Setting date and time
	Serial port 1 baud rate setting	Communication baud rate setting of Intellislot intelligent card interface 1
	Serial port 2 baud rate setting	Communication baud rate setting of Intellislot intelligent card interface 2
	Serial port 3 baud rate setting	Communication baud rate setting of Intellislot intelligent card interface 3
	UPS equipment address	Applicable to RS485 communication method
	Communication method setting	Communication method setting
	Setting of failure call-back times	Set the alarm call-back times here if the communication method of Intellislot intelligent card interface 1 is Modem.
	Setting of failure call-back number 1	Set the first nubmer for the alarm call-back here if the communication method of Intellislot intelligent card interface 1 is Modem
	Setting of fault call-back number 2	Set the second number for the alarm call-back here if the communication method of Intellislot intelligent card interface 1 is Modem
	Setting of fault call-back number 3	Set the third number for the alarm call-back here if the communication method of Intellislot intelligent card interface 1 is Modem
	Access password setting	User may change the access password
Test order (starting/stopping battery/system test/forced boost charging)	Battery maintenance test	The battery maintenance test discharges part of the battery to get the rough data of the battery capacity.The load must be within the range of 20% to 80%
	Battery capacity test	The battery maintenance test discharges the battery completely to get the exact data of the battery capacity.The load must be within the range of 20% to 80%
	System test	It is UPS self-test. A window will appear to display the result of the system test five seconds after the user starts the function
	Stopping test	Manually stop the battery maintenance test, battery capacity test or sytem test.
	Forced boost charging	Manually boost charge the battery
	Stopping forced boost charging	Manually stop the boost charging of the battery
System version	UPS version	UPS inverter, rectifier and monitoring software versions are provided
	UPS model	UPS model information is provided, for example: 400V-60Hz

Keyboard explanation window

The relevant functions of the menu keys (*F1*~F5) in the current screen are explained in symbol form.

7.4 Message Of Prompt Window

During the operation of the system, when the system intends to warn the user of some system conditions, or the user is required to confirm certain order or perform other operations, the prompt window will appear, as shown in Table 7-8.

Table 1.1 Prompt window and its meaning

Prompt window	Explanation
Transfer between bypass and inverter and short-time power-off will occur, please confirm or cancel	The inverter and bypass power are asynchronous; the load transfer between the bypass and inverter will lead to short-time power-off
Load larger than module capacity, unable to finish transfer	The total loads must be less than the module capacity so that the parallel system can switch from bypass to inverter output (load power-off)
Abnormal bypass, power-off caused by shut-down, please confirm or cancel	When the bypass is abnormal, shutting down inverter will lead to no output of UPS. Wait for the user to confirm or cancel it
Too large loads, overload caused by shut-down, please confirm or cancel	Shutting down the inverter will lead to overload of other inverters of the parallel system. Wait for the user to confirm or cancel it
Insufficient startup capacity, unable to bear the current loads	The started inverter of the parallel system is not able to bear the current bypass loads. User needs to start more UPSs
The battery capacity will be discharged completely, please confirm or cancel	If the user chooses battery maintenance test, the battery will be discharged until the UPS is shut down. The promt sceen will appear for the user's confirmation. The battery discharge can be ended by canceling it and the mains supply through the inverter will be recovered
System self-detection completed, everything is OK	No operation needed
System self-inspection is completed, please check the current alarm	Inspect the current record window information
Enter access password	The access password needs to be enterred for battery or UPS test (default password is 12345)
Requirements for the battery self-detection are not satisfied, please check the battery and load conditions	The requirements for the battery self-detection are not satisfied. User shall inspect whether the battery is in boost charging state and whether the load capacity is larger than 20%
Requirements for forced boost charging are not satisfied, please check the battery status	The message will appear when the user chooses forced boost charging order while its requirements are not satisfied (such as battery not available and charger failure)

7.5 Alarm List

The following table is the complete list of all the UPS alarm messages displayed by the “Current records” and “History records”, as stated in Table 7-7.

Table 1.1 Alarm list

Alarm	Explanation
Inverter communication failure	Communication failure between internal monitoring board and inverter
Rectifier communication failure	Communication failure between internal monitoring board and rectifier
Parallel communication failure	Communication failure of inverters of each module in the parallel system 1. Check whether some UPS modules in the parallel system are not powered up; if yes, power up these UPS systems and then check whether the alarm disappears. 2. Press FAULT CLEAR Key
Battery overtemperature	The battery temperature is too high. Check the battery temperature and ventilation
Ambient overtemperature	The ambient temperature is too high. Check UPS room ventilation
End of battery service life	Battery aged (reserved)
Battery replacement required	The battery fails to pass the test, and thus has to be replaced
BLV pre-alarm	BLV pre-alarm appears before the battery voltage reaches the end of discharge voltage.The battery capacity allows for 3-minute full-load discharge after the pre-alarm. The time can be set by the user, with the setting range of 3 to 60 minutes. Please shut down the loads timely
EOD	When the battery voltage reaches end of discharge voltage, the inverter will be shut down. Check the mains power-off status to recover the mains as soon as possible
Abnormal main circuit voltage	The mains voltage exceeds normal range and causes the rectifier to shut down. Check the rectifier input phase voltage
Main circuit under-voltage	The mains under-voltage leads to derating operation. Check the rectifier input line voltage
Abnormal main circuit frequency	The mains frequency exceeds normal range and causes the rectifier to shut down. Check the input voltage and frequency of the rectifier
Rectifier failure	Rectifier has failure and shuts down, the battery discharges
Rectifier over-temperature	Too high temperature of the heatsink leads to the shutdown of the rectifier, and the UPS can be automatically recovered. Check the environment and ventilation
Battery contactor failure	Battery contactor or switch does not respond to the control signal
Battery charger failure	The battery charger voltage exceeds the limit
Auxiliary power 1 power-off	UPS is in operation with abnormal or without control power
Main circuit reverse phase	AC input reverse phase
Rectifier overcurrent	Rectifier overcurrent
Soft start failure	The rectifier can not be started due to the low DC bus voltage
Bypass out of synchronization	This alarm is triggered by the inverter software program when the bypass voltage amplitude or frequency exceeds normal range. The amplitude set value is fixed as rated value ± 10%. This alarm will be automatically cleared when the bypass voltage returns to normal. 1. First check and ensure that the bypass voltage and frequency displayed on the panel are within the setting range. Note: the rated voltage and frequency are designated by "output voltage" and "output frequency" respectively. 2. If the voltage appears to be abnormal, measure the actual bypass voltage and frequency. If there is abnormality, check the external power supply
Bypass out of protection	This alarm is triggered by the inverter software program when the bypass voltage amplitude or frequency is too high or too low. The amplitude set value is fixed as rated value ± 10%. This alarm will be automatically cleared when the bypass voltage returns to normal. First check whether there is any related alarm such as "Bypass circuit breaker disconnected", “Bypass reverse phase” and "input zero-loss fault." If it exists, first clear the relevant alarm. Then check and ensure that the bypass voltage and frequency displayed on the panel are within the setting range; Note: the rated voltage and frequency are designated by "output voltage class setting" and "output frequency class setting" respectively. If the voltage appears to be abnormal, measure the actual bypass voltage and frequency. If there is any abnormality, check the external power supply. If this alarm occurs frequently, the bypass upper limit set point can be increased appropriately by using the configuration software according to the user’s opinion

Alarm	Explanation
Asynchronous Inverter	When the phase angle difference between the inverter and the bypass phase voltage exceeds over 6 degrees, this alarm will be triggered by the inverter software program. The amplitude set value is fixed to be the rated value± 10%. The alarm will be automatically cleared when the alarm conditions disappear. 1. First check if there is “Bypass out of synchronization” or “Bypass out of protection” alarm. If yes, first remove the alarm. 2. Check whether the bypass voltage waveform is normal. If it is distorted seriously, the user has to confirm it and find the solution
Inverter failure	When the inverter output voltage exceeds the limit, the load will switch to the bypass.
Inverter over-temperature	If the inverter heatsink temperature is too high, will the inverter stop operation. The alarm is triggered by the signal of temperature monitoring thermostat on the inverter bridge heatsink. After the overteperature signal is removed and 5-minute delay, the UPS will be automatically recovered. If there is over-temperature indeed, check: 1. whether the ambient temperature is too high; 2. Whether the duct has been blocked; 3. Whether there is fan failure; 4. Whether there is inverter overtime overload
Fan failure	At least one heatsink fan has failure
Inverter thyrsitor failure	At least one static switch at the inverter side is disconnected or has short circuit. The failure is locked until power-down
Bypass thyrsitor failure	At least one static switch at the bypass side is disconnected or has short circuit. The failure is locked until power-down
Invalid operation	There is wrong operation
Output fuse blown	At least one inverter output fuse is blown. The inverter is shut down and the load switches to the bypass
Auxiliary power 2 power-off	UPS is in operation with abnormal or without redundancy control power
Output overload of single module	The alarm appears when the load exceeds 105% of the rated value.When the overload condition is removed, the alarm will be automatically cleared. Check the percentage of the load displayed on the LCD panel, determine which phase has overload and confirm if the alarm is correct. If the alarm is correct, measure the actual output current to verify the correctness of the displayed value. Disconnect non-critical loads. In the parallel system, the alarm will appear if the load is imbalanced seriously
Parallel system overload	The alarm occurs when the total load of UPS parallel system exceeds 105% of the rated UPS parameter. When the overload condition is removed, the alarm will be automatically cleared. Check the percentage of the load displayed on the LCD panel, determine which phase has overload and confirm if the alarm is correct. If the alarm is correct, measure the actual output current to verify the correctness of the displayed value. Disconnect non-critical loads. In parallel system, the alarm will appear if the load is imbalanced seriously
Single module overload overtime	UPS is overloaded, and the permitted overload time has been exceeded. Note: 1. The maximum load phase displays overload overtime firstly. 2. When the load exceeds the rated value, the alarm “single module overload” appears. 3. When the allowed overload time is exceeded, the static switch at the inverter side will be disconnected and the load will switch to the bypass; Inverter will be shut down and restarted after 10s. 4. 5 minutes after the load decreases to below 95%, the system will switch to the inverter power supply. Check the percentage of the load displayed on the LCD panel, and determine if the alarm is correct. If the LCD displays that there did exist overload, check the actual load and confirm whether UPS has overload before the alarm
Abnormal bypass shutdown	The bypass and inverter voltage are both abnormal. The load power supply is disconnected
Inverter overcurrent	The inverter pulse width modulation module has overcurrent
Bypass reverse phase	Bypass voltage reverse phaseIn normal conditions, Phase B will lag 120 degrees compared with Phase A and phase C will lag 120 degrees compared with Phase B. Check if the bypass power phase of UPS is correct. If not, correct it
Transfer to bypass due to load shock	The load shock makes the system transfer to the bypass supply, and the UPS can be automatically recovered. The load can be started one by one to minimize the shock from the inverter load
Limitation of transfer times	If the overload transfer times exceed the set value within 1 hour, the load will stay in the bypass power mode. The UPS can recover automatically within one hour and switch to the inverter power supply mode
Current sharing failure of	The UPS modules in the parallel system can not share loads equally

Alarm	Explanation
parallel system	
shutdown due to abnormal bus	Abnormal DC bus voltage leads to the inverter shutdown.The load switches to the bypass
Neighboring unit request for switching to bypass	All the modules of the entire parallel system are switched to the bypass power supply at the same time. The LCD of the UPS module forced to switch to the bypass supply will display the alarm message
Parallel board failure	Parallel board failure. It can make the system switch to the bypass
DC bus overvoltage	Too high DC bus voltage will lead to the shutdown of rectifier, inverter and battery transformer. Check if there is failure at the rectifier side.If not, check if there is overload. Restart the inverter after the recovery of the failure
Parallel wire connection failure	In the parallel system, the parallel wire is connected wrongly.Reset the fault by pressing FAULT CLEAR Key, and then restart the inverter by pressing INVERTER ON Key
Bypass overcurrent failure	The bypass current exceeds 135% of the rated value. The UPS only generates alarm, but has no other actions
LBS activated	The LBS setting is enabled, which means the UPS is operated as a LBS master or slave in the dual bus configuration system
Setting storage failure	The history record has not been saved (reserved)
Input zero-loss fault	DC input mains neutral wire has not been detected
Protocol version conflict	The protocol versions of monitoring board and DSP board are not compatible
Battery grounding failure	The battery grounding failure dry contact generated alarm
Manual startup	Start the inverter manually through the front panel button
Manual shutdown	Shut down the inverter manually through the front panel button
EPO	Press the EPO button on the panel or receive the external EPO order
Interrupted transfer confirmation	User can power off the load and switch to the bypass by pressing “Confirm” key according to the instruction
Cancelling Interrupted transfer	User can power off the load and switch to the bypass by pressing “Cancel” key according to the instruction
Single module risk shutdown confirmation	User can shut down the single module of the parallel system by pressing “Confirm” key according to the instruction
Parallel risk shutdown confirmation	User can shut down the parallel system by pressing “Confirm” key according to the instruction
Failure clearing	Press the “FAULT CLEAR” Key on the panel
Alarm silence	Press the “SILENCE ON/OFF” Key on the panel
Manual startup failed	The inverter fails to be started manually. It may be due to invalid operation (maintanence bypass swich closed), or because the DC bus or rectifier is not ready
Cacelling alarm silence	Press the “FAULT CLEAR” or “SILENCE ON/OFF” Key on the panel
Bypass mode	The UPS in the bypass mode
Main circuit inverter mode	The UPS in normal mode
Battery inverter mode	The UPS in the battery mode
Joint inverter power mode	When the UPS is in the joint power mode, the battery and rectifier will supply power to the load through inverter at the same time
Power unavailable	UPS shut down and output disconnected
Generator connected	The generator connecting signal is received. The joint power mode can be started according to UPS setting
BCB disconnected	Status of battery switch (disconnected)
BCB closed	Status of battery switch (closed)
Battery in float charging	Battery status (under float charging)
Battery in boost charging	Battery status (under boost charging)
Battery discharging	Battery status (under discharging)
Battery cycling test in progress	In the progress of regular automatic battery maintenance discharge test (20% capacity discharged)
Battery capacity test in progress	User starts the battery capacity discharge test (100% capacity discharged)
Battery maintenance test in progress	User starts the battery maintenance discharge test (20% capacity discharged)
UPS system test in progress	User starts the UPS system self-detection test
Inverter setting in progress	Inverter is being started and synchronized
Rectifier setting in progress	Rectifier is being started and synchronized
Fan failure of maintenance bypass cabinet	There is fan failure in the maintenance bypass cabinet
External input isolating transformer overtemperature	The external input isolating transformer has overtemperature
External output isolating	The external output isolating transformer has overtemperature

Alarm	Explanation
transformer overtemperature	
Abnormal battery room environment	The battery room environment calls for attention
Battery contactor disconnected	The battery contactor is disconnected
Battery contactor closed	The battery contactor is closed
Battery reversely connected	Reconnect the battery and check the battery wiring
Battery unavailable	Check the battery and battery wiring
Automatic startup	End of battery discharge leads to UPS shutdown; when the mains recovers, the inverter will be started automatically
Rectifier online upgrade	Rectifier software upgrade is in progress
Inverter online upgrade	Inverter software upgrade is in progess
Monitoring online upgrade	Monitoring software upgrade is in progress
Input contactor failure	The input contactor has failure
Contactor power board 1 failure	The contactor power board 1 has failure
Contactor power board 2 failure	The contactor power board 2 has failure
Abonormal LBS	Abonormal LBS
DSP software error	The inverter software and rectifier software are of different model

Chapter 8 Options

This chapter introduces the options of UPS products, which shall be installed before UPS installation.

8.1 Battery Grounding Failure Kits:

In addition to the leakage current protection device installed before the external mains input terminal of UPS system and the isolating transformer equipped in the UPS, the battery grounding failure kits are also provided to detect and remove the battery grounding failures so as to ensure the reliable operation of the system. Monitored leakage current range: 30mA~3000mA.

Power: 230Vac (L-N)

When the battery grounding failure is detected, the alarm message will appear on the UPS display panel.

In addition, dry contact failure alarm signal will be provided for remote monitoring.

Table 1.1 Dry contact failure alarm signal for remote monitoring

Terminal	Name	Definition
21	Common port	Battery grounding failure kits can be set as alarm or pre-alarm
22	Normally closed	
24	Normally open	

The battery grounding failure kits include a current transformer (CT) and a DC sensitive leakage current detecting device. The installation and connection of the option is as shown in Figure 8-1.

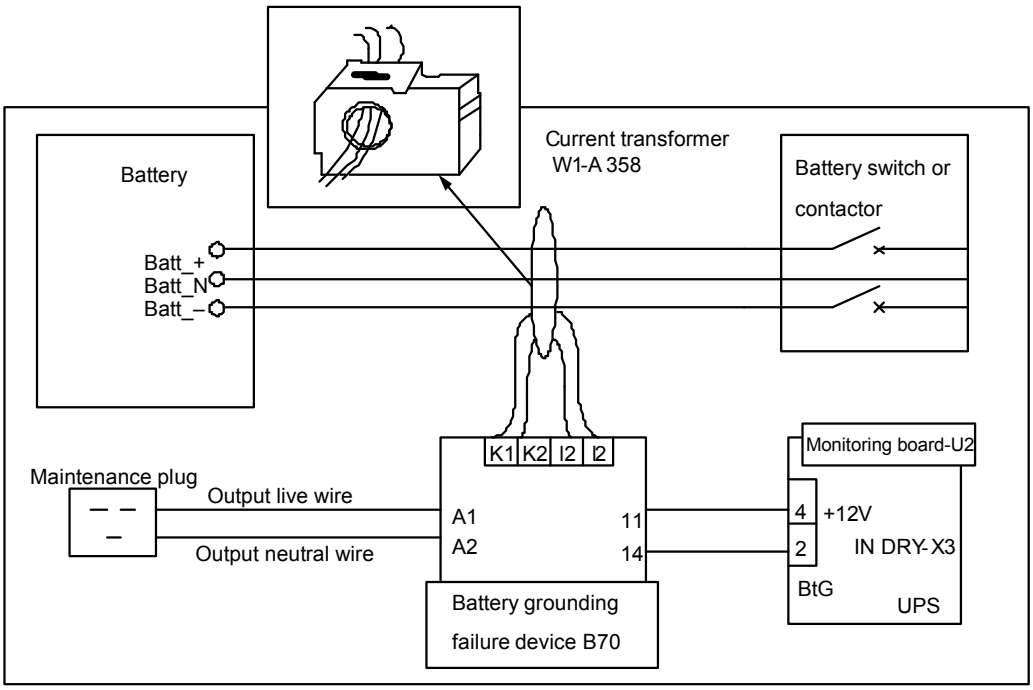


Figure 1.1 Battery grounding failure wiring diagram

8.2 Remote Alarm Monitoring Board

The remote alarm monitoring board (RAM) can provide UPS status and alarm data. It is driven by the zero voltage alarm status contact from the relay alarm board. (It is the common option of the UPS series model, which can be bought by the user if necessary even when it is not included in the equipment list)

8.3 Dust Screen Replacement

Only one Philips screwdriver is needed to install the two dust screens to the UPS system. Each dust screen has a fixing strip on both sides for fixing. Procedures for replacing the dust screen are as follows:

1. Open the UPS front door, and the dust screen inside the front door can be seen, as shown in Figure 8-2.
2. Remove the fixing strip on one side and loosen the retaining screw on the other side without removing it, as shown in Figure 8-2.
3. Remove the dust screen that needs to be replaced.
4. Insert a clean dust screen.
5. Install the removed fixing strip to its original place and fasten the retaining screw.
6. Fasten the retaining screw of the fixing strip on the other side.

Figure 1.1 Dust screen replacement

Chapter 9 Product Specifications

This chapter provides the specifications for the UPS products.

9.1 Applicable Standards

The UPS design conforms to the European and international standards, as shown in Table 9-1.

Table 1.1 European and international standard

Item	Standard
General safety requirement for UPS operation zone	EN62040-1-1/IEC62040-1-1/AS62040-1-1
UPS EMC requirement	EN62040-2/IEC62040-2/AS62040-2 (Class C2)
UPS performance determination method and test requirement	EN62040-3/IEC62040-3/AS62040-3 (VFI SS 111)
Note: The listed standards incite the relevant terms of the general standards of IEC and EN on safety (60950), electromagnetic radiation and immunity (IEC/EN/AS61000 series) and structure (IEC/EN/AS60146 series and 60529)	

9.2 Environment Characteristics

Table 1.1 Environment characteristics

Item	Unit	Requirement
Noise within 1m	dB	56.0
Altitude height	m	≤1000, derating 1% for every 100m within the range of 1000~2000
Relative humidity	%	0~95, without condensation
Operating temperature	ºC	0~40; Note: the battery lifetime will be reduced by half for every increase of 10 ºC above 20 ºC
UPS storage/transport temperature	ºC	-20~70
Suggested battery storage temperature	ºC	-20~30 (20 ºC-20~30 (20 ºC is the best battery storage temperature)

9.3 Mechanical Characteristics

Table 1.1 Mechanical characteristics

Rated power (KVA)	Unit	180	210	240	270	300
Mechanical dimensions (W×D×H)	mm	600×900×2070				
Weight (excluding battery)	kg	300	334	368	402	436
Color		Black				
Protection class, IEC (60529)		IP20 (front door open or closed)				

9.4 Electrical Characteristics (Input Rectifier)

Table 1.1 Rectifier AC input (mains)

Rated power (KVA)	Unit	180~300
Rated Ac input voltage[1]	Vac	380/400/415 (three-phase, sharing neutral wire with bypass input)
Input voltage range[2]	Vac	228~437
Frequency [2]	Hz	50/60 (range: 40~70)
Power factor	kW/kVA, full-load (half-load)	0.99 (0.98)
output power	kVA rated[3] (Maximum[4])	300
Input current	kVA rated[3] (Maximum[4])	600
Total harmonic distortion	THDI%FL	3
Startup time	s	10s to full rated current (settable, range: 5~30s, 5s for one class)
Note: 1. The rectifier can work normally under any rated power voltage and frequency with no need for any adjustments. 2. At the 305V input voltage point, the UPS with rated load can keep the set output voltage, without battery discharging. 3. IEC 62040-3/EN50091-3: rated load, rated input voltage 400V, battery charging. 4. IEC 62040-3/EN50091-3: rated load, rated input voltage 400V, battery charging at the maximum rated current		

9.5 Electrical Characteristics (DC Section)

Table 1.1 Battery

DC section						
Rated power (KVA)	Unit	180~300				
Battery bus voltage	Vdc	Rated : 432 (the float charge voltage of valve-control lead-acid battery is 540V) Range: 400~616				
Number of lead-acid battery cells	Nominal	36=[1 cell (12V)]				
	Maximum	40=[1 cell (12V)]				
	Minimum	30=[1 cell (12V)]				
Float charge voltage	V/cell (VRLA)	2.25 (setting range :2.2~2.3), constant current and constant voltage charging mode				
Temperature compensation	mV/ ºC/cl	-3.0 (setting range: 0~-5.0, 25 ºC or 30 ºC, or disabled)				
Ripple voltage	% V float charge	≤1				
Ripple current	% C_{10}	≤5				
Boost charge voltage	V/cell (VRLA)	2.35 (setting range :2.2~2.40), constant current and constant voltage charging mode				
Boost charge control		Float charge to boost charge current trigger 0.050C_{10} (setting range: 0.030~0.070) Boost charge to float charge current trigger 0.050C_{10} (setting range: 0.030~0.025) 24-hour safety time limit (setting range: 8 to 30 hours) Boost charge mode unsettable				
End of discharge voltage	V/cell (VRLA)	1.63 (setting range: 1.60~1.75) Automatic reversion, End of discharge voltage × discharge current mode (End of discharge voltage increased with low discharge current)				
Battery charge	V/cell	2.4 (setting range: 2.3~2.4) constant current and constant voltage charging mode Automatic trigger or disabled of boost charge mode is settable				
Battery charge volume[1] Maximum current (adjustable) [2]	UPS (kVA)	180	210	240	270	300
	Charge power (kW)	27	31.5	36	40.5	45
	Maximum charge current A	66	77	88	99	110
Note: 1. With the decrease of the loads, UPS charging capacity will automatically increase in the state of low input voltage(but limited by the rated maximum capacity) 2. The maximum current applies to the end of discharge voltage of 240 cells with 1.67V/cell						

9.6 Electrical Characteristics (Inverter Output)

Table 1.1 Inverter output (to critical loads)

Rated power (KVA)	Unit	180~300
Rated AC voltage[1]	Vac	380/400/415 (three-phase four-wire, sharing neutral wire with bypass)
Frequency [2]	Hz	50/60
Inverter overload	%	105, 60min

Rated power (KVA)	Unit	180~300
capacity		110, 10min 125, 1min >150, 200ms>150, 200ms
Current upon failure	%	310% current limiting 200ms
Non-linear load capacity[3]	%	100
Current capacity of neutral wire	%	170
Steady-state voltage stability	%	±1
Transient voltage response[4]	%	±5
Total harmonic distortion	%	<1 (for linear load), <4 (for non-linear load[3])
Synchronization range		Rated frequency:±2Hz (setting range: ±0.5~±3Hz)
Maximum synchronization frequency change rate	Hz/s	1; setting range: 0.1~3 (for single module), 0.2 (for parallel system)
Note: 1. The parameter is set as 400V by the manufacturer and can be set as 380V or 415V by the commissioning engineer. 2. The parameter is set as 50Hz by the manufacturer and can be set as 60Hz by the commissioning engineer. It can be set as the frequency converter mode. 3. EN50091-3 (1.4.58) peak ratio: 3: 1. 4. IEC62040-3/EN50091-3 includes 0%~100%~0% load transient. The recovery time means the time it takes to recover to 5% of the steady state output voltage, i.e. half a cycle		

9.7 Electrical Characteristics (Bypass Mains Input)

Table 1.1 Bypass mains input

Rated power (KVA)		Unit	180~300
Rated AC voltage[1]		Vac	380/400/415; three-phase four-wire, sharing neutral wire with rectifier input and offering cetral options for output
rated current	380V	A	450
	400V	A	430
	415V	A	410
Overload		%	110, Long-term
Upstream protection and bypass line		N/A	Thermomagnetic switch, with the capacity equal to 125% of the rated output current IEC 60947-2 curve C
Rated neutral wire current		A	1.7×In
Frequency [2]		Hz	50/60
Transfer time (between bypass and inverter)		ms	Synchronous transfer: ≤1; asynchronous transfer (default): 15 (50Hz), 13.3 (60Hz); or 40, 60, 80 optional
Bypass voltage range		%Vac	Upper limit: +10, +15 or +20, default:+15; Lower limit: -10, -20, -30 or -40, default: -20; delay time for receiving static bypass voltage: 10s
Bypass frequency range		%	±10 or ±20, default: ±10
Synchronization range		Hz	Rated frequency:±2 (setting range: ±0.5~±3)
Note: 1. The parameter is set as 400V by the manufacturer, and can be set as 380V or 415V by the commissioning engineer. 2. The parameter is set as 50Hz by the manufacturer, and can be set as 60Hz by the commissioning engineer. If UPS is set to be in the frequency converter mode, then the bypass status will be ignored			

9.8 Frequency, Thermal Loss And Air Exchange

Table 1.1 Frequency, thermal loss and air exchange

Rated power (KVA)	Unit	180	210	240	270	300
System efficiency						
Normal mode(dual conversion)	%	96				
Inverter efficiency (DC/AC) (Battery has the nominal voltage: 432Vdc, with full rated linear load)						
Battery mode	%	96				
Thermal loss and *blast volume*						
Normal mode	kW	7.2	8.4	9.6	10.8	12

No load	kW	7.2	8.4	9.6	10.8	12
Maximum forced wind cooling (front inlet and rear outlet)	L/sec	288	336	384	432	480
Note: input and output voltages are 400Vac; battery has been charged, full rated linear load is connected						

Appendix 1 Lectotype And Connection Of External Battery Circuit Breaker

Table 1 Reference table for circuit breaker rated current and connecting cable size selection

Rated power (KVA)	Unit	180	210	240	270	300
Maximum battery discharge current at full load	A	630	735	840	945	1050
Reference rated current of circuit breaker	A	650	750	850	950	1050
Size of connecting cable	mm^2	210	245	280	315	350

Note:

1. If the external battery is configured to have separate wiring of positive terminal and negative terminal (i.e., 4 wires will lead out from the battery side), for the 300kVA UPS, because of the rated current limit, it is recommended to adopt a 4P plastic enclosure DC circuit breaker (the DC rated voltage of the circuit breaker shall be single-pole 250Vdc/two-pole 500Vdc/three-pole 750Vdc, and the rated short circuit disconnecting capacity limit is 35KA) or two 2P plastic enclosure DC circuit breakers (the DC rated voltage of the circuit breaker shall be single-pole 250Vdc/two-pole 500Vdc, and the rated short circuit disconnecting capacity limit is 45KA). The connection between the battery, circuit breaker and UPS is as shown in Figure 1.
2. If the external battery is configured to adopt CT wiring (i.e., 3 wires will lead out form the battery side), it is recommended to adopt a 4P plastic enclosure DC circuit breaker (the DC rated voltage of the circuit breaker shall be single-pole 250Vdc/two-pole 500Vdc/three-pole 750Vdc, and the rated short circuit disconnecting capacity limit is 45KA). The connection between the battery, circuit breaker and UPS is as shown in Figure 2

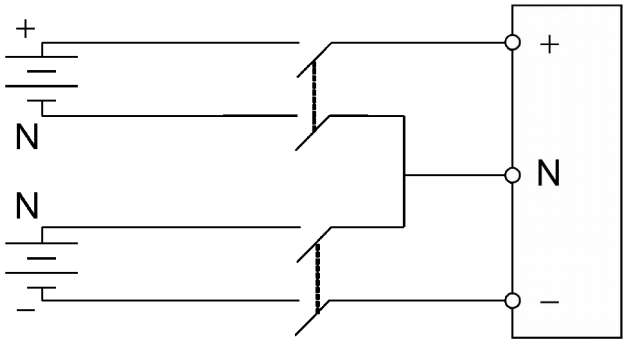


Figure 1 Wiring diagram of battery, circuit breaker and UPS when the external battery adopts four-wire connection

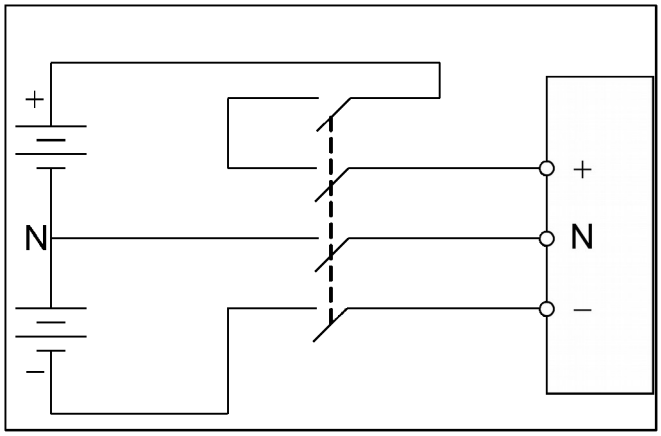


Figure 2 Wiring diagram of battery, circuit breaker and UPS when the external battery adopts three-wire connection