



# Manual de Usuario

**UPS ESOL TRI RT  
10kVA-20kVA**

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# Foreword

## Summaries

This document gives a description of the ESOL TRI RT series UPS, including the features, performance, appearance, structure, working principles, installation, operation and maintenance. etc.







Please save the manual after reading, in order to consult in the future.

## Suitable Model


ESOL TRI RT 10KVA、ESOL TRI RT 15KV、ESOL TRI RT 20KVA

## Symbol Conventions

The manual quotes the safety symbols, these symbols used to prompt users to comply with safety matters during installation, operation and maintenance. Safety symbol meaning as follows.

Symbol	Description
 <b>DANGER</b>	Alerts you to a high risk hazard that could, if not avoided, result in serious injury or death.
 <b>WARNING</b>	Alerts you to a medium or low risk hazard that could, if not avoided, result in moderate or minor injury.
 <b>CAUTION</b>	Alerts you to a potentially hazardous situation that could, if not avoided, result in equipment damage, data loss, performance deterioration, or unanticipated results.
	Anti-static prompting.
	Be care electric shock prompting.
 <b>TIP</b>	Provides a tip that may help you solve a problem or save time.

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Symbol	Description
 <b>NOTE</b>	Provides additional information to emphasize or supplement important points in the main text.

## Change History

Changes between document issues are cumulative. The latest document issue contains all the changes made in earlier issues.

### Issue 001 (2018-11-28)

First issue.

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# 1 Safety Description

This chapter introduces the safety announcements. Prior to performing any work on the UPS, please read the user manual carefully to avoid human injury and device damage by irregular operations.

## 1.1 Safety Announcements

This section introduces the safety announcements that must be complied with and pay special attention while installing, using, maintenance and other relative operations.



### CAUTION

Before operating, please read the announcements and operation instructions in this section carefully to avoid accident.

The DANGER, WARNING, CAUTION, etc. in the manual are not all the safety announcements that you must abide by, they are just the supplements for the safety announcements during operating.

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### NOTE

Our Company does not undertake the responsibility caused by violating common safety operation requirements or the safety standard of design, manufacture and use.

### 1.1.1 Safety Instructions



### CAUTION

There exists high temperature and high voltage inside the UPS. During using, please strictly comply with all warnings and operation instruments on the UPS and in the user manual.

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### **CAUTION**

The UPS is class C3 device. If it is used in residential purpose, it may cause wireless interference. User should take actions to avoid the interference.

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- No liquid or other objects are allowed to enter the UPS.
- UPS must be well grounded.
- In case of fire, please use dry power fire extinguisher. If using liquid fire extinguisher, it may cause electric shock.

## 1.1.2 Use Announcements for Battery



### **CAUTION**

Please use specified battery. Non-specified battery will damage the UPS.

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- Only authorized professional can replace battery. Do not wear conductive objects, such as watches, bracelets and rings during operating. Wear rubber shoes and gloves and use tools with insulated handle.
- Don't put tools or other conductive objects on the battery.
- It is prohibited to short the positive pole and negative pole of the battery or connect them reversely, which is to avoid fire or electric shock.
- Before connecting or disconnecting the battery terminals, disconnect charger first.
- The battery must be with the same type, model and manufacturer.
- Battery should be kept away from fire source or other electrical equipments that may easily cause spark to avoid human injury.
- Don't open or destroy the battery. The electrolyte in the battery includes some dangerous objects, such as strong acid, which will be harmful to skin and eyes. If it is careless to touch the electrolyte, clean it by a lot of water immediately and then check it in the hospital.
- The waste battery should be disposed according to the local regulations.

### 1.1.3 Anti-Static Protection



#### CAUTION

The static generated by human bodies may damage the electrostatic-sensitive components on PCB. Before touching the sensitive component, please wear anti-static rings and well connect the other end of the anti-static rings to ground.

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## 1.2 Operation and Maintenance Requirements



#### CAUTION

Only authorized professionals are allowed to open the UPS chassis, or it may cause electric shock and the caused UPS fault is out of the guarantee range.

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- If UPS needs to be moved, rewired or maintained, disconnect all electrical connection, such as AC power, battery power, etc. to isolate power input. Do not do any work on the UPS until it is powered off completely( $\geq 10$ min). Otherwise, the output may exist electricity, which may cause electric shock.
- When dismantling fan, do not put fingers or tools into the rotating fan to avoid device damage or human injury.

## 1.3 Environment Requirements



#### DANGER

Do not put the UPS in the environment where has inflammable, explosive gas or smog, do not do any operation in this environment.

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- Do not use the UPS in the place where has direct sunshine, rain or wet.
  - Do not use the UPS in the place where close to hest source or has metal conductive dust.
  - The normal work temperature of UPS is  $-5^{\circ}\text{C}\sim 40^{\circ}\text{C}$ , relative humidity: 0%-95%, with no condensation (recommended work temperature is  $20^{\circ}\text{C}\sim 25^{\circ}\text{C}$ , humidity is about 50%).
-



- Put the UPS in the flat floor without vibration and the vertical gradient is less than  $5^\circ$  . Keep good ventilation around the UPS. The clearance between the rear or the side of UPS and adjacent devices or wall should be at least 300mm~500mm. Poor ventilation will rise temperature inside UPS, which will reduce the service life of inner components and even affect the life span of the UPS.
- The UPS must be used below 2000m. If the altitude exceeds 2000m, it needs to decrease the rated power according to GB3859.2-93 to use.

## 2 Overview

This chapter mainly introduces the UPS's model meaning, features, structure, work principle, etc.

### 2.1 Product Intro

KR-RM series UPS is whole high frequency, pure online, double-conversion, smart product.. The system is perfect power security for file server, enterprise server, center server, mirco-computer, concentrator, telecom system, data center and others that require high quality power protection. They are widely used in many key business areas, such as post, finance, network, stock, railway, etc.

#### 2.1.1 Model Meaning

ESOL TRI RT □□KVA - RM

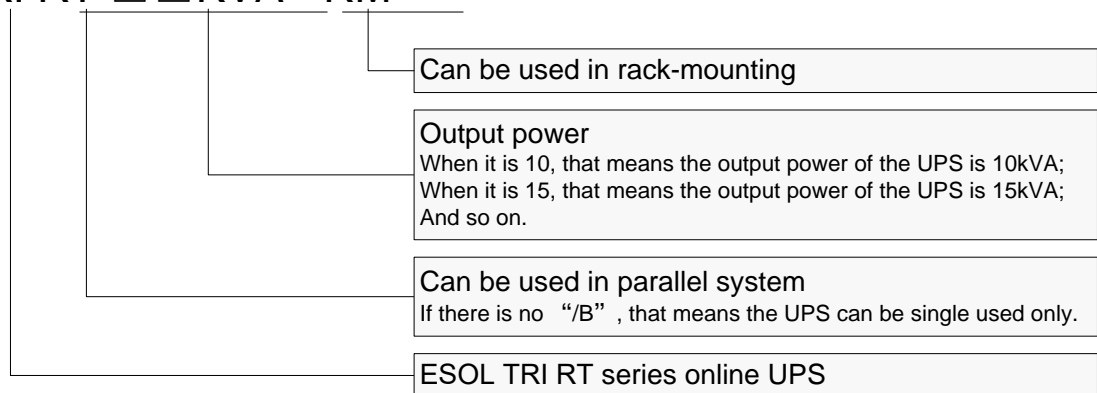


Figure2-1 Model meaning



#### NOTE

Three-phase input three-phase output (three in three out) is 33 mode, three-phase input single-phase output (three in one out) is 31 mode, single -phase input single-phase output (one in one out) is 11 mode.

## 2.1.2 Features

### Completely digitalized smart control

The UPS support various input and output mode, such as 33 mode, 31 mode, 11 mode. The UPS can monitor the grid frequency (50Hz/60Hz) and self-adapt the frequency. The output voltage can be set to 208V/220V/230V/240V, which makes the use more flexible.

### Energy conservation and high efficiency

Adopts three-level inverter technology and PFC control technology, the output voltage wave is perfect and the whole efficiency can be 96%, the input power factor is greater than 0.99, which greatly improves the use ratio of electric energy and reduces the load of power grid.

### Smart fan speed control

The fan speed is adjusted automatically in accordance with the load status, which prolong fan life and reduce noise.

### ECO energy conservation mode design

The UPS is designed with ECO energy conservation mode. When the grid is good, if the UPS operating in this mode, the bypass prior to output, and the efficiency can be 99%.When the bypass voltage or frequency out of normal range and cannot satisfy the user's power supply requirement, it will switch to inverter output, which guarantee the reliability of power supply and also, save energy.

### Low mains input voltage

Adopt the independent rapid detection technology. When output load is small, even the battery voltage is 80V, which is the mains low limit, the battery still doesn't discharge. Therefore, in the mains mode, all output power gets from the grid, which is to ensure the battery in 100% energy storage status, and at the same time, reduce the battery discharge times and prolong the service life.

### Tower-mounting and rack-mounting

User can select tower-mounting or rack-mounting the UPS according to use space, the LCD also can display corresponding direction on the basis of placement mode.

### 2.1.3 Appearance

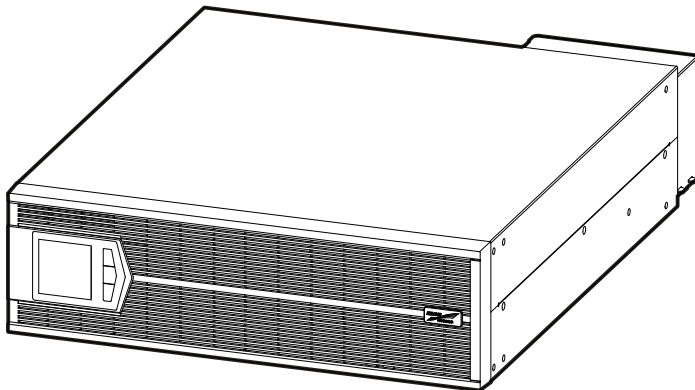


Figure2-2 Appearance

#### Operation panel

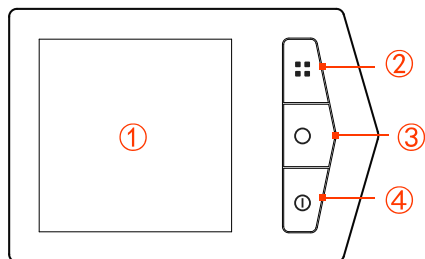


Figure2-3 Operation panel

Table2-1 Illustration for operation panel

No.	Name	Illustration
①	LCD display	Shows the working status and system setting.
②	■ ■ (select) button	<ul style="list-style-type: none"> <li>● Short press "■ ■" button, the LCD shows the output voltage, output frequency, input voltage, input frequency, battery voltage, UPS temperature, output load percentage, fault information, etc. circularly.</li> <li>● Long press "■ ■" button for 5s, the LCD will enter setting page. Short press "■ ■" to select the setting command, long press "■ ■" button to confirm the command.</li> </ul>
③	○ (OFF) button	When UPS is on, long press "○" button for 1s, the UPS will be shut down.

No.	Name	Illustration
④	① (ON) button	<ul style="list-style-type: none"> <li>When UPS off, long press “①” button for 1s, the UPS will be started.</li> <li>When UPS on, at mains mode, long press “①” button for 3s, the UPS begin to perform battery test.</li> <li>At battery mode, long press “①” button for 3s to mute the buzzer (cancel mains abnormal etc. alarm).</li> </ul>

● LCD display

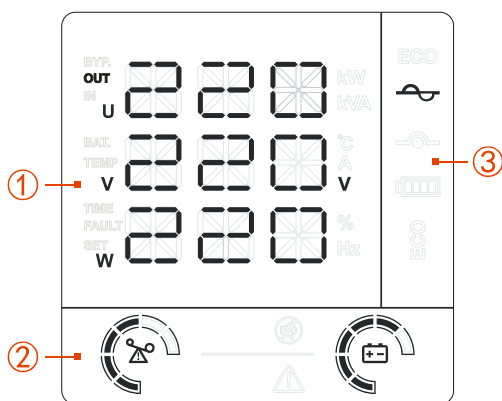









Figure2-4 LCD interface

Table2-2 Illustration for LCD display

No.	Name	Illustration
①	Running status display area	Shows the UPS input, output, temperature, fault type and setting item etc.
②	Output status display area	Shows load capacity (  ), battery capacity (  ), UPS fault indication (  ) and buzzer mute (  ) etc.
③	Work mode display area	Shows the work status of UPS: mains inverter (  ), bypass power supply (  ), battery inverter (  ), ECO ( <b>ECO</b> ).

 **NOTE**

Fault type and corresponding dispose please see **4.8 Troubleshooting**.

## Rear panel

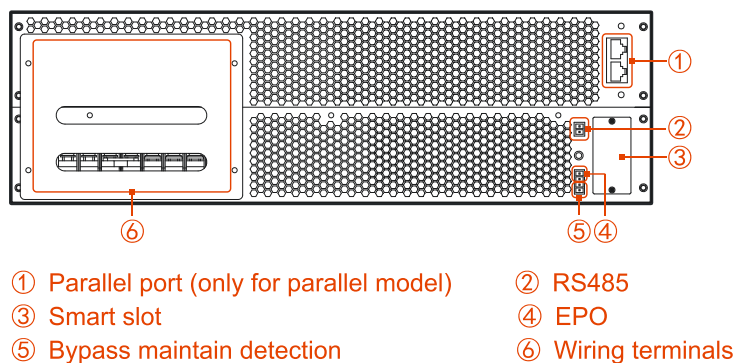


Figure2-5 Structure of rear panel

**NOTE**

For the detail of the wiring terminal of each mode please see **3.4.1 Wiring of UPS**.

**CAUTION**

Only when the bypass maintain detection (BMD) and EPO port are all shorted respectively, the UPS can work normally.

- If BMD port is disconnected, the UPS will turn to bypass power supply, and at the same time, the LCD shows BMD fault. Once the port recovers short connection, the fault will be removed automatically.
- If the EPO port is disconnected, the UPS will shut down all inverter and bypass output and at the same time, the LCD shows EPO fault. The UPS needs to be power down completely and short connect the EPO port, the fault will be removed automatically.

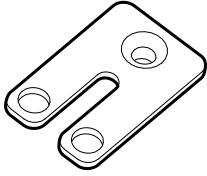
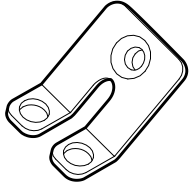
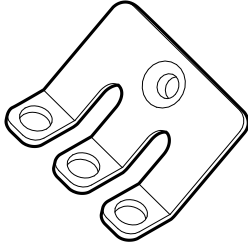
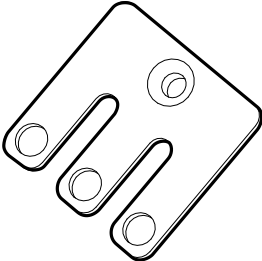
**NOTE**

If the BMD and EPO detection function won't be used, please short the port by equipped 4P terminal. When the function needs to be used, dismantle the short wire of BMD or EPO port and connect it with corresponding status signal input of maintenance bypass breaker or EPO.

## 2.1.4 Fittings Illustration

KR-RM series UPS and distribution module has 4 kinds of copper bar, as shown in Table2-3. User can set the UPS to 33 mode or 31 mode according to needs after connecting the copper bar to the wiring terminal.

Table2-3 Copper bar illustration

Copper bar No.	Illustration	Sketch map
1#	2PIN copper bar N	
2#	2PIN copper bar N	
3#	3PIN copper bar	
4#	3PIN copper bar	

The installation position of each mode is as shown in Figure2-6,

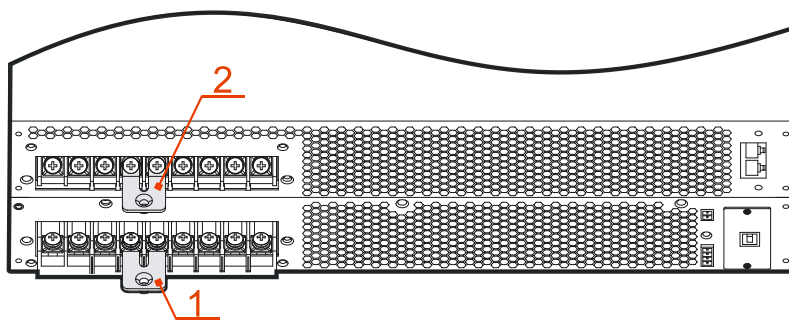


Figure2-6 Copper bar installation position of 33 mode UPS

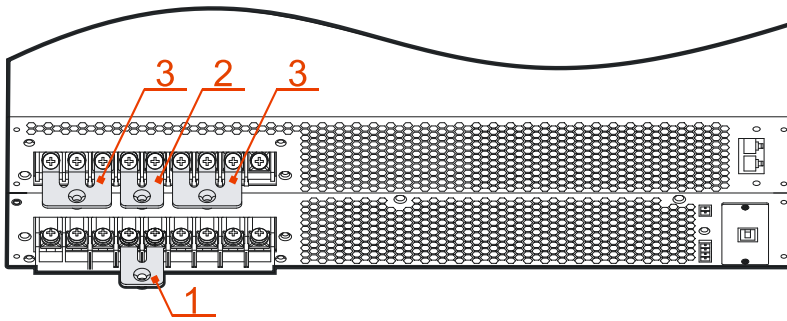


Figure2-7 Copper bar installation position of 31 mode UPS

## 2.2 Work Principle

### 2.2.1 Work Principle Diagram

Work principle diagram of the UPS is as shown in Figure2-8.

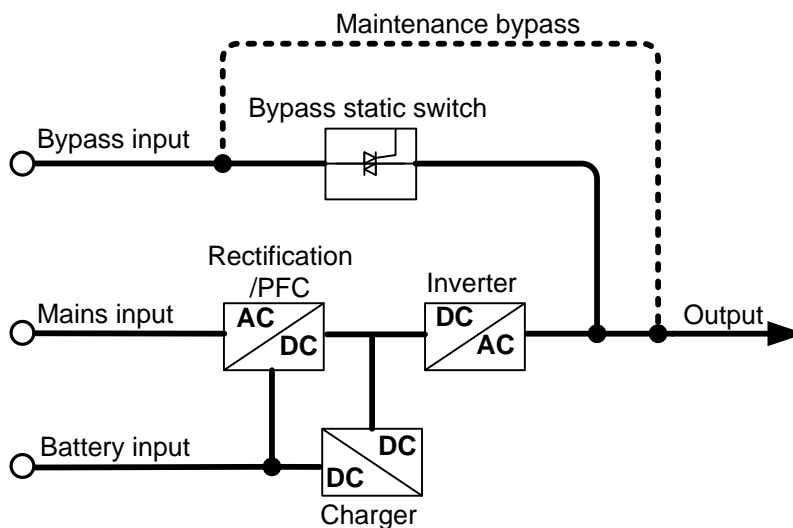


Figure2-8 Work principle diagram

The UPS includes rectification/PFC, inverter, charger, bypass static switch etc function module, the input power includes mains input, bypass input, battery input, the output mode includes inverter output, bypass output and maintenance bypass output (if equipped).

When mains normal, the rectifier starts and the charger charges the battery at the same time. When UPS off, if bypass normal, the system turns to bypass output; when UPS on, the mains boosts by rectification/PFC and output DC bus voltage, and then go through inverter and output pure sine-wave AC power, the output turns to inverter output to load from bypass output (if equipped).



When mains abnormal, the battery voltage boosts by rectification/PFC and output DC bus voltage, and then go through inverter and output pure sine-wave AC power to load. When mains recover normal, the UPS turns to mains mode from battery mode automatically.

### 2.2.2 Work Mode

There are 5 work modes of the UPS: normal mains power supply mode, battery inverter mode, bypass power supply mode, ECO power supply mode and maintenance bypass power supply mode.

#### Normal mains power supply mode

When mains normal, the UPS works in mains inverter status and charge the battery at the same time. The work mode is as shown in Figure2-9.

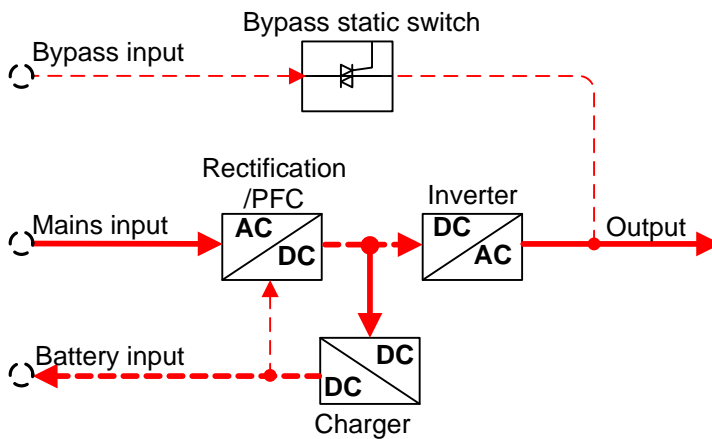


Figure2-9 Normal mains power supply mode (the thick solidline stands for the energy flow direction)

#### Battery inverter mode

When mains abnormal, The work mode is as shown in Figure2-10.

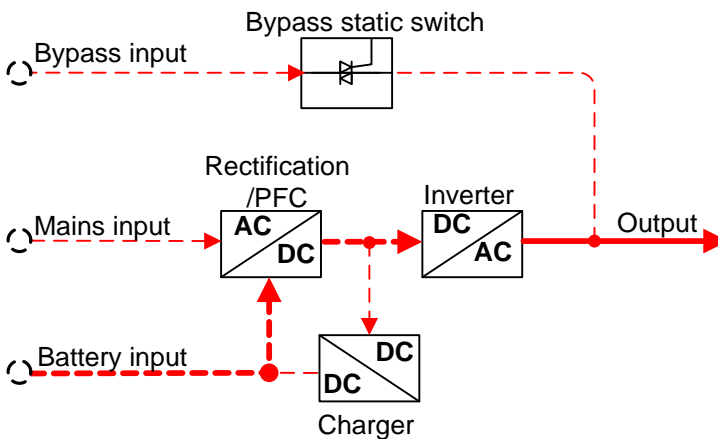


Figure2-10 Battery inverter mode (the thick solidline stands for the energy flow direction)

Before the battery stop discharging, if the mains recover normal, the rectifier will transfer to mains input automatically and charge the battery at the same time. That is to say, the UPS recover normal mains power supply mode. If the mains always abnormal and the battery is running up, the UPS will send sound and light alarm and stop working till battery low-voltage point. At that time, the buzzer long beeps to alarm, the power for load powers down. Under the circumstance of mains power outage completely, the UPS will shut down about 1min later automatically and close the power of the UPS to avoid the battery discharge slimly, thus to protect the service life of battery. Once the mains recovers, the UPS will start automatically and turn to normal mains power supply mode.

### Bypass power supply mode

Under the circumstance of bypass voltage normal, when UPS off or fault (such as inverter output overload, over-current surge or IGBT over-temperature etc) while UPS on, the UPS will output by bypass. When UPS on and the fault removed, it will turn to inverter output again. If the same fault occurs more than 5 times in a short time, the UPS protects and output by bypass until power off manually or power down and remove the fault, restart the UPS and then it will recover normal work.

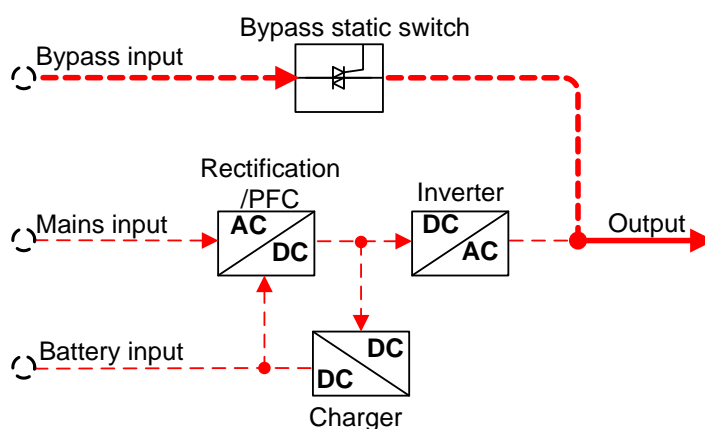


Figure2-11 Bypass power supply mode (the thick solidline stands for the energy flow direction)

### ECO power supply mode (just suitable for single UPS)

At the ECO mode, when bypass voltage normal, the power for load is prior supplied by bypass, when bypass voltage abnormal, the power for load turns to inverter. ECO mode is an economic operation mode. For the load which does not require high quality, user can select ECO mode to reduce the energy consumption. At the ECO mode, the UPS efficiency can be 99%.

### Maintenance bypass power supply mode (suitable for the system with distribution module)

When the UPS needs to be maintained and the power supply for load cannot be interrupted, user can shut down the inverter and make the UPS works in bypass status, then switch on the maintenance

bypass breaker and switch off the mains input breaker and bypass input breaker, output breaker. During the transforming of manual maintenance bypass, AC power is supplied for load by maintenance bypass breaker. At this time, the inner UPS has no electricity, maintainer can perform the maintenance safely.

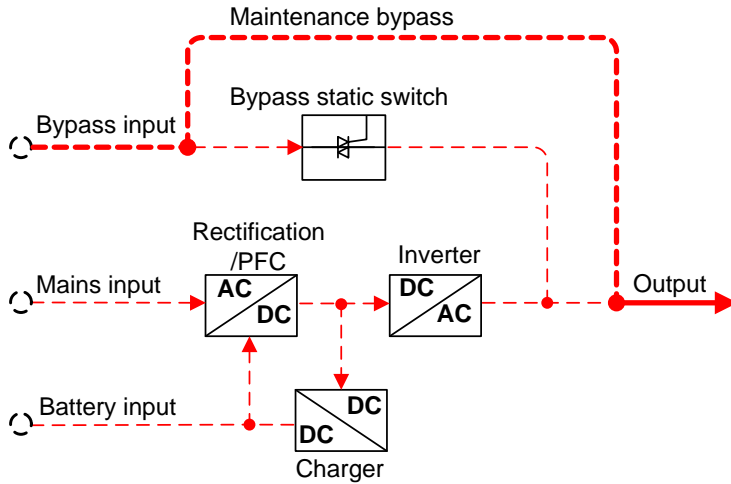


Figure2-12 Maintenance bypass power supply mode (the thick solidline stands for the energy flow direction)

## 2.3 Optionals

KR-RM series UPS can equip distribution module or battery box according to needs.

### 2.3.1 Distribution Module

#### Appearance

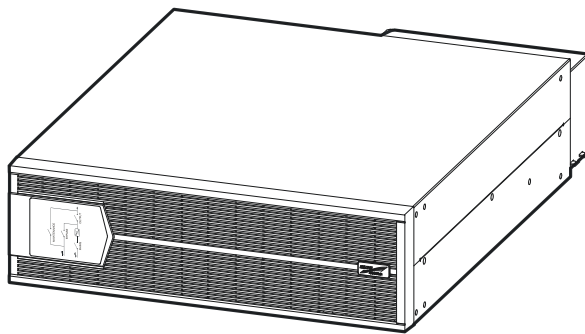


Figure2-13 Appearance of distribution module

#### Front panel

The operation breakers of distribution module locate inside the front panel, when operating, it needs to dismantle the front panel fist. The dismantle way of front panel as shown Figure2-14.

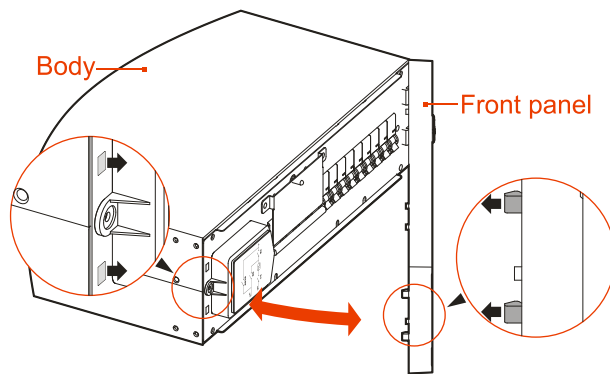
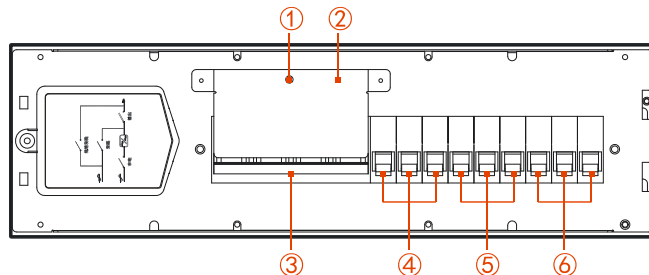


Figure2-14 Dismantle diagram of front panel

 **NOTE**

When install the front panel, insert the buttons at right side into the body, and then insert the buttons at left side into the body.




- ① Maintenance bypass status detection switch
- ② Protection plate of maintenance bypass breaker
- ③ Maintenance bypass breaker
- ④ AC output breaker                      ⑤ AC input breaker
- ⑥ Bypass breaker

Figure2-15 Operation breaker illustration of distribution module (dismantle front panel)

 **NOTE**

Operation method of maintenance bypass mode: dismantle the protection plate of maintenance bypass breaker, the detection switch of maintenance bypass status pop up automatically, the UPS close the inverter and turn to bypass to supply power, then close the maintenance bypass breaker, turn off the AC input breaker, bypass breaker and AC output breaker, at this time, the power for load turns to maintenance bypass, the input and output of the UPS is disconnected, the maintenance can be done.

Recover inverter power supply from maintenance bypass power supply: connect the wires of UPS and distribution module (including bypass maintain detection signal wire), and then close the AC input breaker, bypass breaker and AC output breaker, after the work power of UPS normal and the LCD show bypass output voltage, turn off the maintenance bypass breaker and lock the protection plate of maintenance bypass breaker, finally, press the  (ON) button to start the inverter to supply power.

### Rear panel

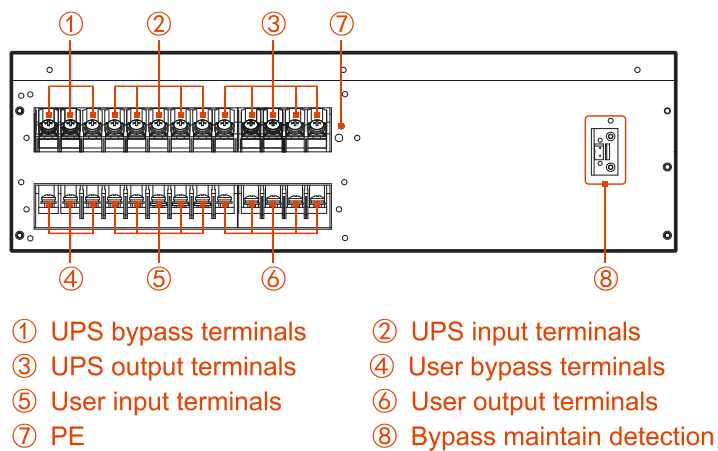


Figure2-16 Rear panel of distribution module

### 2.3.2 Battery Box

#### Appearance

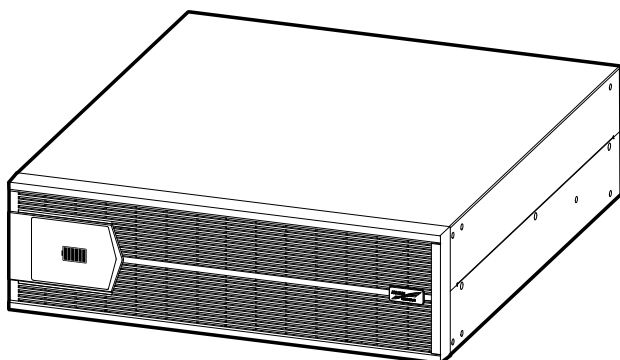


Figure2-17 Appearance of battery box

#### Rear panel

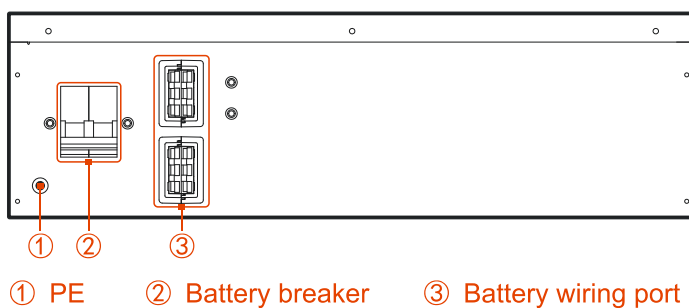


Figure2-18 Rear panel of battery box

## 3 Installation

This chapter mainly introduces the installation of the UPS, including unpacking and checking, cable selection, installation, electrical connection, etc.

### 3.1 Unpacking and Checking

Unpack and check the UPS according to follows.

- Inspect the appearance for shipping damage. If any shipping damage is found, report it to the carrier immediately.
- Check the delivery list to see if the types of accessories are complete and correct. If there is any discrepancy, contact the distributor immediately.

### 3.2 Installation Preparation

The selecting for AC input and output wire, DC input wire and corresponding breakers needs to be judged by the UPS' max. steady state phase current. Table3-1 shows the max. steady state phase current of each work mode, Table3-2 shows the rated current of recommended breakers, Table3-3 shows the min. recommended wire cross-sectional area. Select the wires and breakers according to Table3-1, Table3-2, Table3-3.

Table3-1 UPS max. steady state phase current

	10kVA			15kVA			20kVA		
	33 mode	31 mode	11 mode	33 mode	31 mode	11 mode	33 mode	31 mode	11 mode
AC input (A)	18	18	54	26	26	78	35	35	105
Bypass input (A)	15	46	46	23	68	68	31	91	91
DC input (A)	29	29	29	44	44	44	58	58	58

	10kVA			15kVA			20kVA		
	33 mode	31 mode	11 mode	33 mode	31 mode	11 mode	33 mode	31 mode	11 mode
AC output (A)	15	46	46	23	68	68	30	91	91

### 3.2.1 Select Input Breaker

We suggest to add a breaker (we suggest to select the breaker with feedback double pole disconnection equipment) or distribution cabinet that matches the UPS power at the front of the UPS input to insulate the mains. Considering the UPS charge power and the impact current while power on, the selected breaker must be 1.5 to 2 times of UPS input max. current, and cannot with leakage protection, which is to avoid wrong action of breaker. The distribution box should be manufactured by professional company. The selection of breaker please Table3-2.

Table3-2 Recommended input breaker list

	10kVA			15kVA			20kVA		
	33 mode	31 mode	11 mode	33 mode	31 mode	11 mode	33 mode	31 mode	11 mode
AC input (A)	32*3P	32*3P	63*1P	50*3P	50*3P	100*1P	63*3P	63*3P	125*1P
Bypass input (A)	32*3P	63*1P	63*1P	50*3P	100*1P	100*1P	63*3P	125*1P	125*1P
DC input (A)	50*3P	50*3P	50*3P	63*3P	63*3P	63*3P	80*3P	80*3P	80*3P
AC output (A)	32*3P	63*1P	63*1P	50*3P	100*1P	100*1P	63*3P	125*1P	125*1P

### 3.2.2 Select Wires

For the wire cross-sectional area of AC input, output and battery please see the recommended value in Table3-3, Table3-4 and choose upwards.

#### NOTE

When the UPS set to 31 mode or 11 mode, we provide three-phase short copper bar of bypass input and output, so for the specification of bypass input and output wire, we take single wire as standard to recommend. When the UPS set to 11 mode, we do not provide short copper bar of three-phase input, so, for the specification of AC input wire, we take three wires as standard to recommend. Please pay attention to that the three live wires needs to connect with the same mains input when the UPS is set to single-phase input.

Table3-3 Recommended cross-sectional area of wire (unit: mm<sup>2</sup>, environment temperature: 25°C)

	10kVA			15kVA			20kVA		
	33 mode	31 mode	11 mode	33 mode	31 mode	11 mode	33 mode	31 mode	11 mode
AC input live wire (U/V/W)	4*3	4*3	4*3	6*3	6*3	6*3	10*3	10*3	10*3
AC input neutral wire (N)	4*1	10*1	10*1	6*1	16*1	16*1	10*1	16*1	16*1
Bypass input live wire (U/V/W)	4*3	10*1	10*1	6*3	16*1	16*1	10*3	16*1	16*1
AC output live wire (U/V/W)	4*3	10*1	10*1	6*3	16*1	16*1	10*3	16*1	16*1
AC output neutral wire (N)	4*1	10*1	10*1	6*1	16*1	16*1	10*1	16*1	16*1
DC input (+/BATN/-)	6*3	6*3	6*3	10*3	10*3	10*3	10*3	10*3	10*3
Grounding wire (PE)	6*1	6*1	6*1	10*1	10*1	10*1	10*1	10*1	10*1

Table3-4 Contrast list between wires and wiring terminals

Wire cross-sectional area (unit: mm <sup>2</sup> )	Wiring terminal type
4	RV3.5-6
6	RV5.5-6
10	RNBS8-6
16	RNBS14-6
25	RNBS22-6

 **NOTE**

The equipped wires by our company are all passed the national standard or UL certification, the quality is perfect and meets the requirements of safety standard. The above wire cross-sectional area is just for the wiring reference of 5m, when the wire length exceeds 20, the cross-sectional area needs to increase correspondingly.



### 3.3 Mechanical Installation

The installation for the UPS can be tower-mounting and rack-mounting, user can select suitable installation way according to actual condition.

#### 3.3.1 Tower-mounting

##### Single UPS installation

Step 1 Take out a pair of support base and 1U joint base, assemble them together, as shown in Figure3-1.

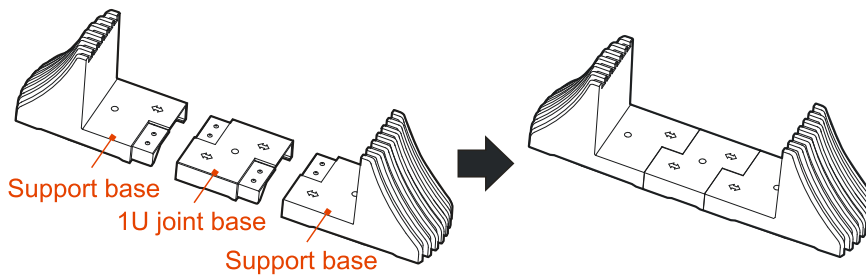


Figure3-1 Assemble support base

Step 2 Put the UPS onto the assembled support base, as shown in Figure3-2.

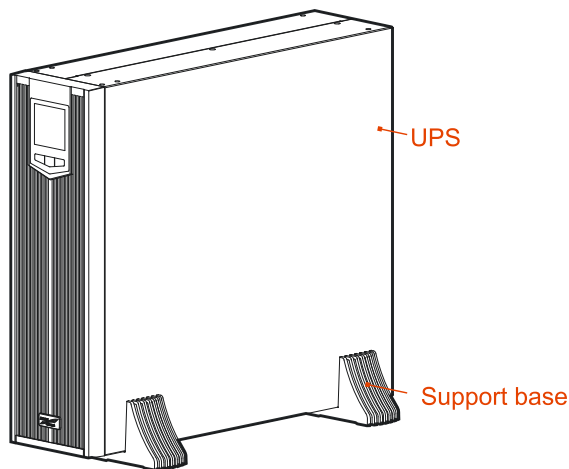


Figure3-2 Install the UPS

----End

##### Install the UPS with battery box or distribution module

When equip battery box or distribution module, the installation procedure is the same. In this section, we take the installation of one UPS and one distribution module as an example to illustrate.

Step 1 Take out a pair of support base and other 1U joint bases, assemble them together, as shown in

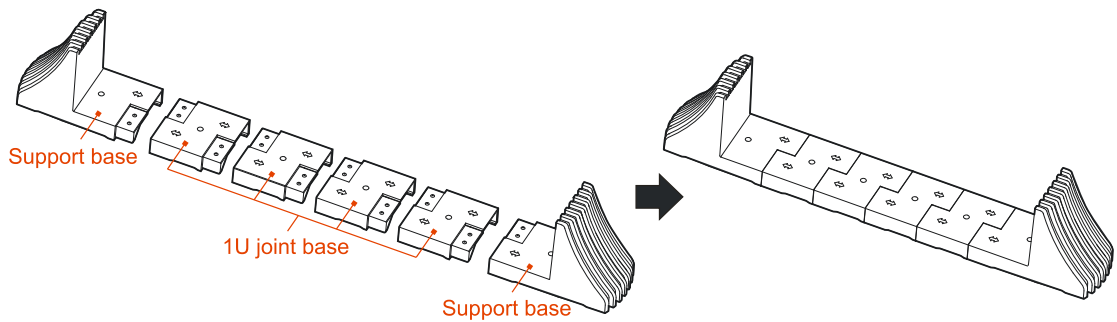


Figure3-3 Assemble support base

 **NOTE**

When one optional added, 3 pieces of 1U joint base need to add, the assemble way is the same.

Step 2 Put the UPS and distribution module onto the assembled support base, as shown in Figure3-4.

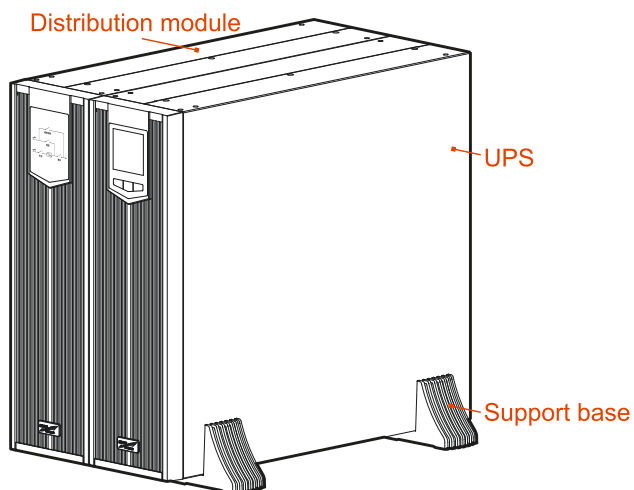


Figure3-4 Install the UPS and distribution module

Step 3 Take out the combination parts and screws, and fasten them onto the top of the UPS and distribution module, as shown in Figure3-5.

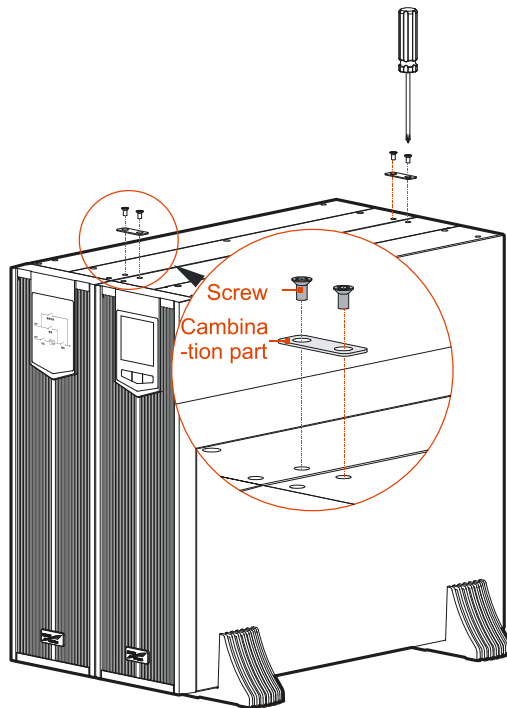


Figure3-5 Install combination units



**CAUTION**

Every two adjacent devices need to be connected by two combination parts at the top of the device, that is to say, every add one optional (distribution module or battery box), it needs to install another 2 combination parts.

---

----End

### 3.3.2 Rack-mounting

KR-RM series UPS and the optional also can be installed in 19 inch standard cabinet to use.



**NOTE**

The rack-mounting procedure of UPS, battery box and distribution module is the same, in this section, we take the UPS installation as an example to illustrate.

- Step 1 Fasten the two angle irons onto the two sides of the UPS by 4 sunk screws M4×8, as shown in Figure3-6.

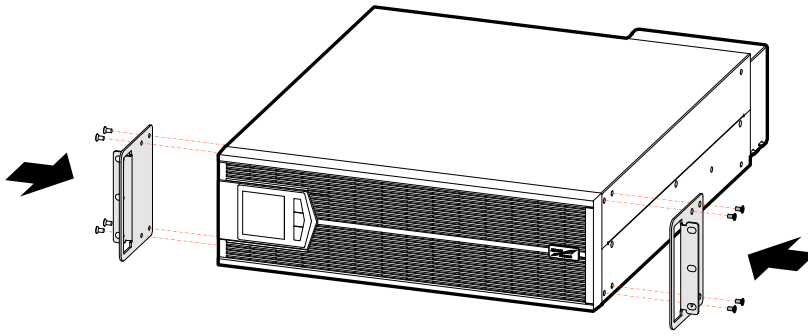


Figure3-6 Install angle iron

**WARNING**

Do not transport the UPS, battery box or distribution module by angle iron.

The front panel can be dismantled front, during transporting, do not make it bear any force.

The device needs to be transported by two or more people.

Step 2 Push the UPS into the cabinet, and fasten it by screws, as shown in Figure3-7.

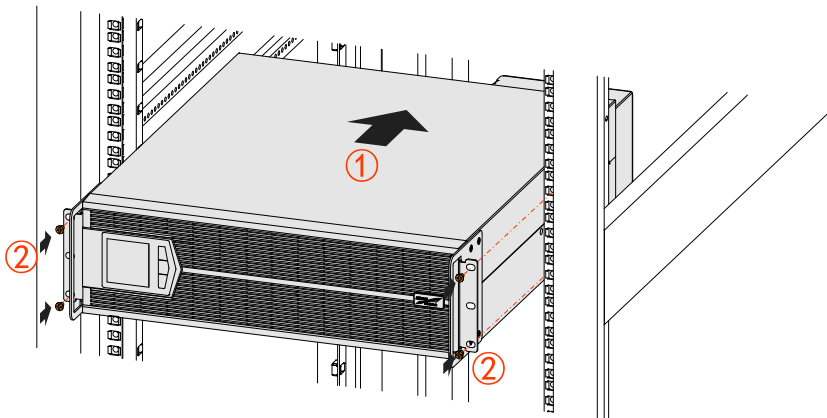


Figure3-7 Fasten the UPS

**CAUTION**

The battery box is heavy, when installing, the battery box must be installed from bottom and down below the UPS.

----End

### 3.4 Electrical Connection



**WARNING**

Before connecting, ensure that the external connected front breakers of mains, battery are all off. DO NOT connect wires with electricity.



**CAUTION**

While wiring, avoid making the power wire at the place where is easy to be trod or tripped.



**NOTE**

Before wiring, the wires of KR-RM series UPS, distribution module(optional) should cross the wiring protection cover (the installation of wiring cover please see section 3.4.1 Install wiring plates), and then connect them to corresponding wiring terminals.

#### 3.4.1 Wiring of UPS

##### 33 mode

The input and output wiring of 33 mode is as shown in Figure3-8.

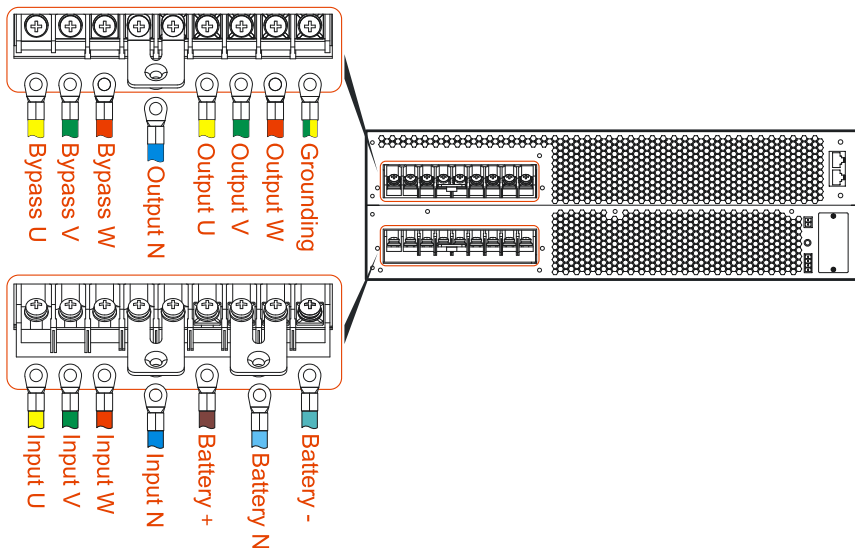


Figure3-8 Wiring diagram of 33 mode

## 31 mode

Take out 2 copper bar 3#, connect them to the wiring terminal of UPS (as shown in Figure3-9). The wiring diagram of 31 mode is as shown in Figure3-9.

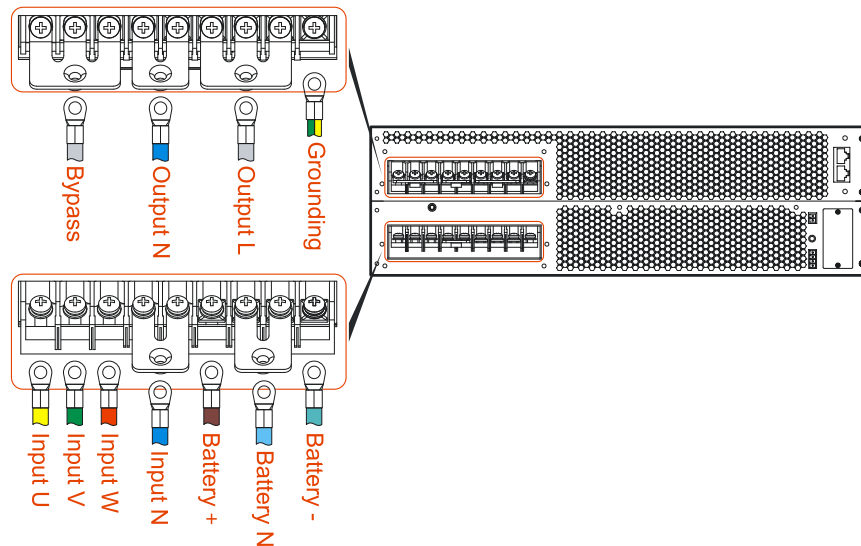


Figure3-9 Wiring diagram of 31 mode

## 3.4.2 Wiring Between UPS and Battery Box

**NOTE**

The wiring of parallel connected battery box and each mode UPS is the same, in this section, we take KR3320 as an example to illustrate.

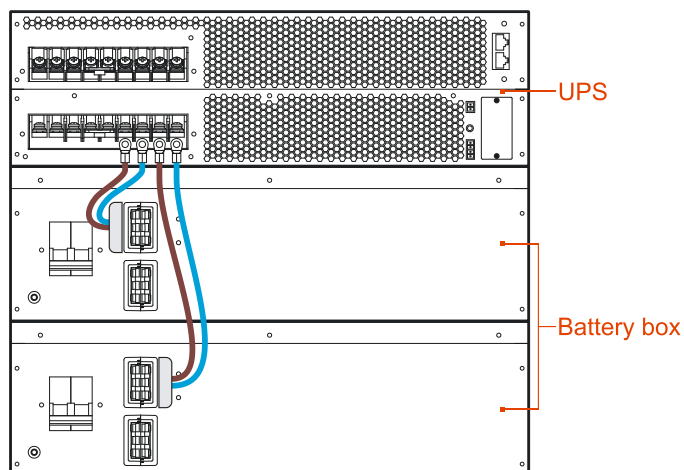


Figure3-10 Wiring diagram between UPS and two parallel connected battery boxes

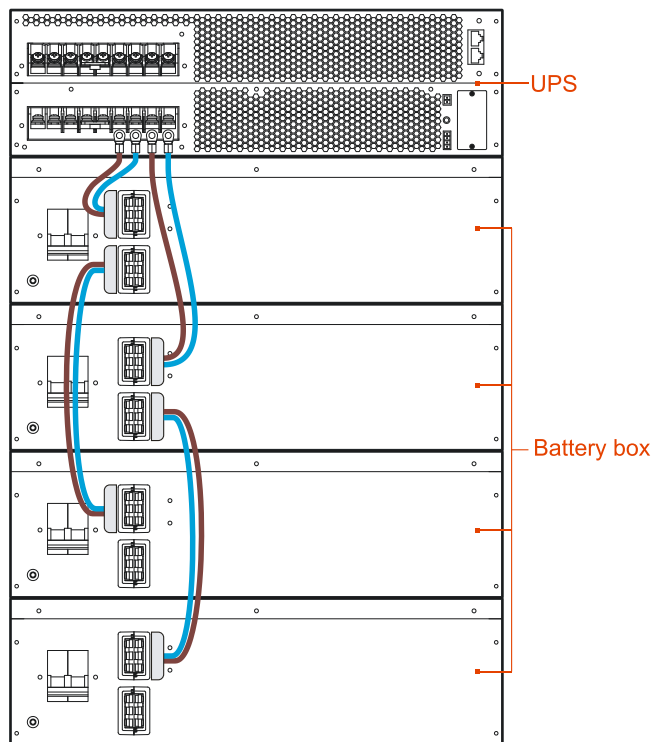


Figure3-11 Wiring diagram between UPS and several parallel connected battery boxes



**WARNING**

The wiring between UPS and parallel connected battery boxes must be connected strictly according to Figure3-10, Figure3-11, avoid wrong connection or short circuit.

---

### Wiring of external batteries

If user needs to connect batteries externally, please connect the wires as follows.

This series UPS's battery input adapt positive and negative battery group (each battery group default has 16 positive cell and 16 negative cell). There are two wiring ways of external battery group, Figure3-12 shows one wiring way: one battery cabinet has 32 cells and one 3P breaker, the external wiring includes BAT+, BAT- and battery neutral wire; Figure3-13 shows the other wiring way: there are 16 cells separately in two independent batter cabinet, every battery cabinet has one 2P breaker, the external wiring includes BAT+, BAT-. No matter which wiring way, the BAT+, BAT- inside the UPS has been shorted. The selection of battery wires and breaker specification please see Table3-2, Table3-3.

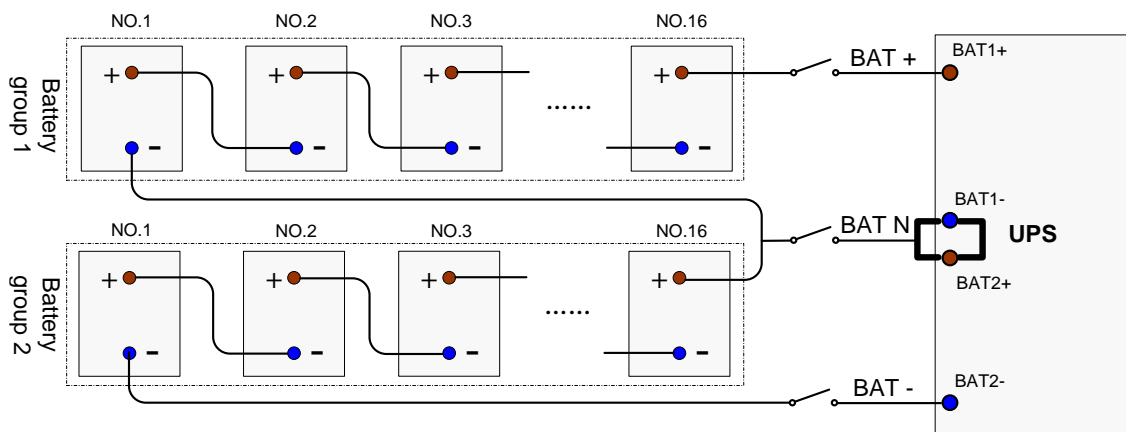


Figure3-12 Wiring diagram 1of external batteries

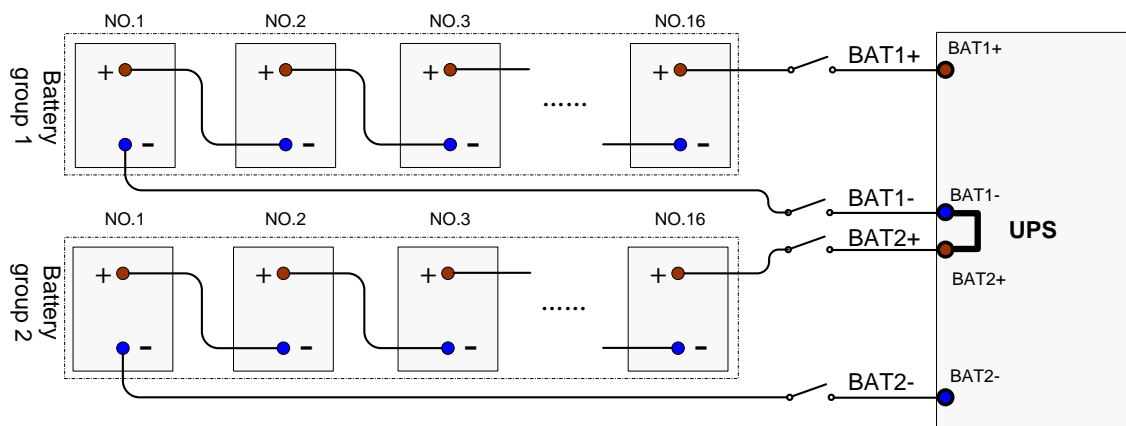


Figure3-13 Wiring diagram 2of external batteries

### 3.4.3 Wiring Between UPS and Distribution Module

33 mode

Dismantle the UPS copper bar 1# and 2# (as shown in Figure2-6), and take out the copper bar 1# from the package of distribution module, install them to the distribution module, as shown in Figure3-14 1, the model of copper bar please see **2.1.4 Fittings Illustration**.



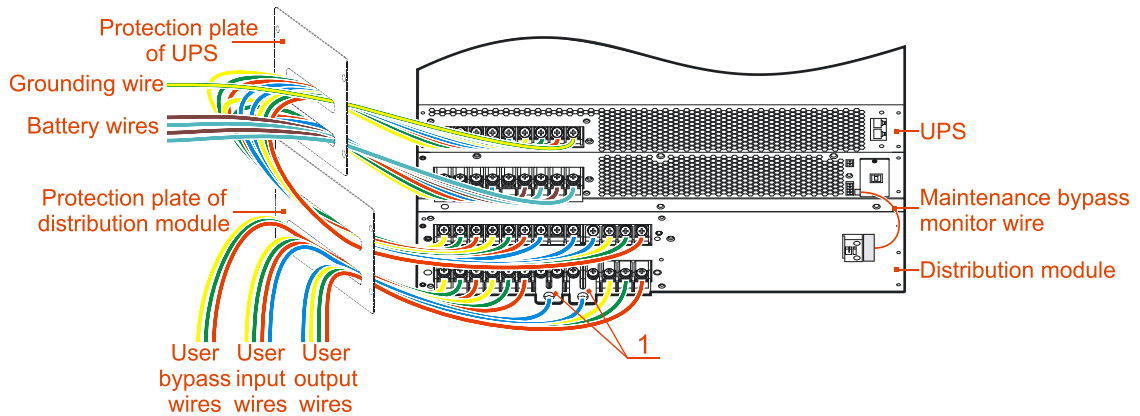


Figure3-14 Wiring diagram of 33 mode UPS and distribution module

### 31 mode

Dismantle the UPS copper bar 1# and 2# (as shown in Figure2-7), and take out the copper bar 1# and 4# from the package of distribution module, install them to the distribution module, as shown in Figure3-15 1 and 4, the model of copper bar please see **2.1.4 Fittings Illustration**.

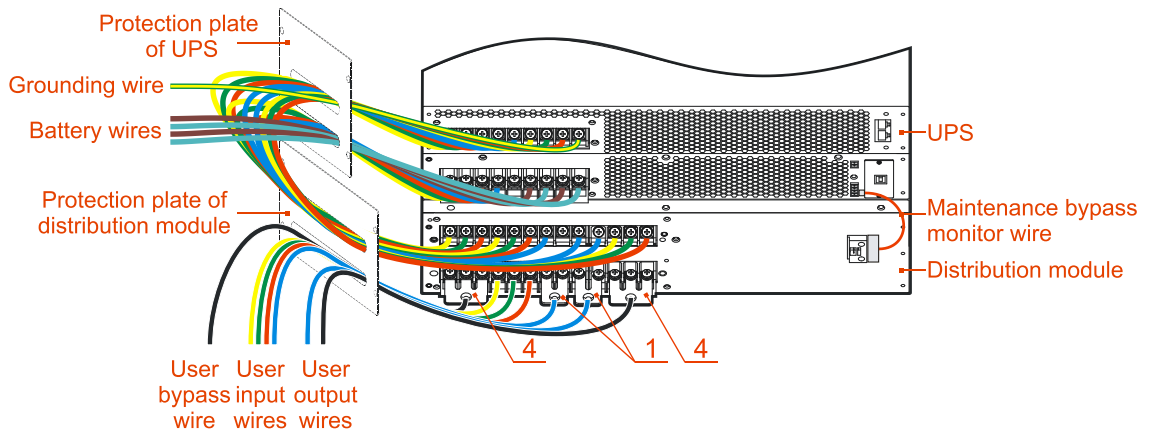


Figure3-15 Wiring diagram of 31 mode UPS and distribution module



### CAUTION

Ensure that the wires are connected properly and firmly, and then install the wiring protection plate to the device (the installation procedure is as follows).

## Install wiring plates

 **NOTE**

The wiring covers' install procedure of each mode UPS and distribution module is the same, in this section, we take KR3320 as an example to illustrate.

- Step 1 Take out the protection cover, and fasten one type-L protection cover to the back of the UPS by 2 pieces of flat head screw M4, as shown in Figure3-16.

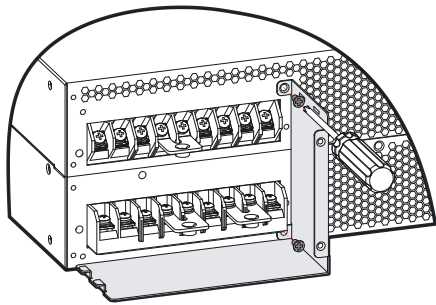


Figure3-16 Install type-L protection plate 1

- Step 2 Insert the other type-L protection cover into the installed one, and fasten it by 2 pieces of flat head screw M4, as shown in Figure3-17.

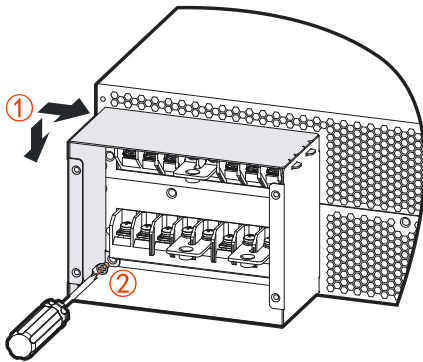


Figure3-17 Install type-L protection plate 2

- Step 3 Fasten the wiring cover onto the two protection covers, as shown in Figure3-18.

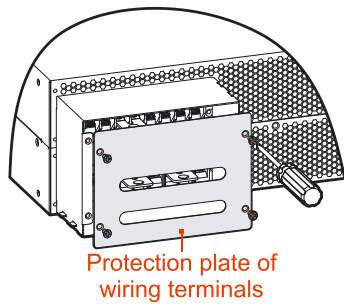


Figure3-18 Fasten wiring plate

----End

### 3.4.4 Wiring of Parallel System

- Step 1 Install the battery and UPS of parallel system separately according to **3.3 Mechanical Installation**.
- Step 2 Connect the wires of input, output, battery and grounding in parallel system on the basis of Figure3-19, Figure3-20.

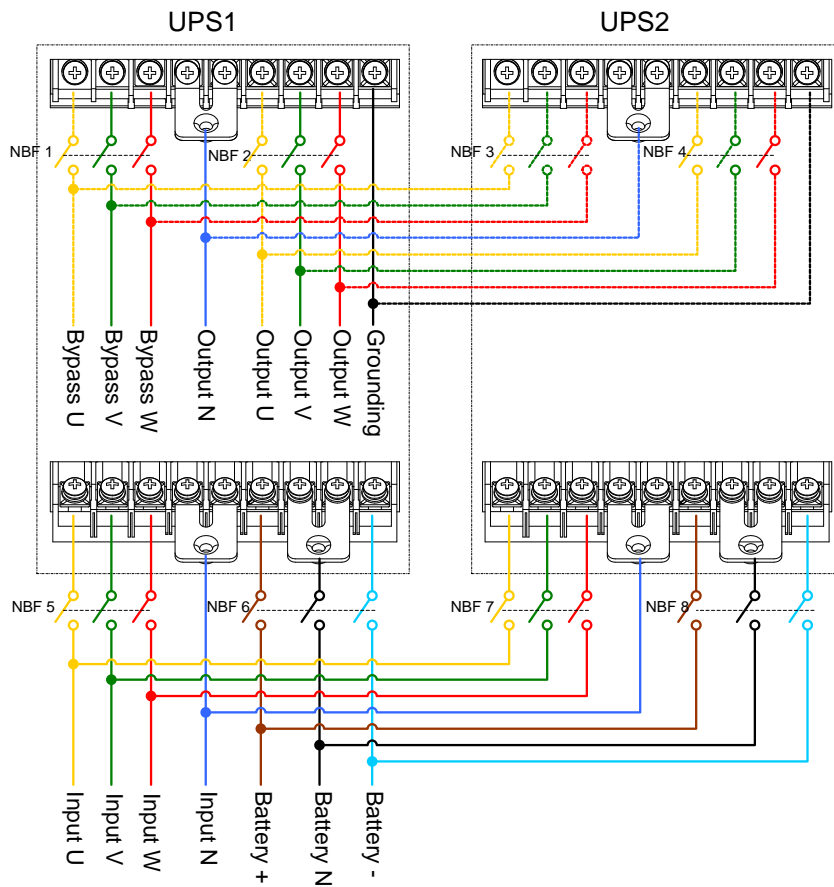


Figure3-19 Wiring diagram of 33 mode parallel system

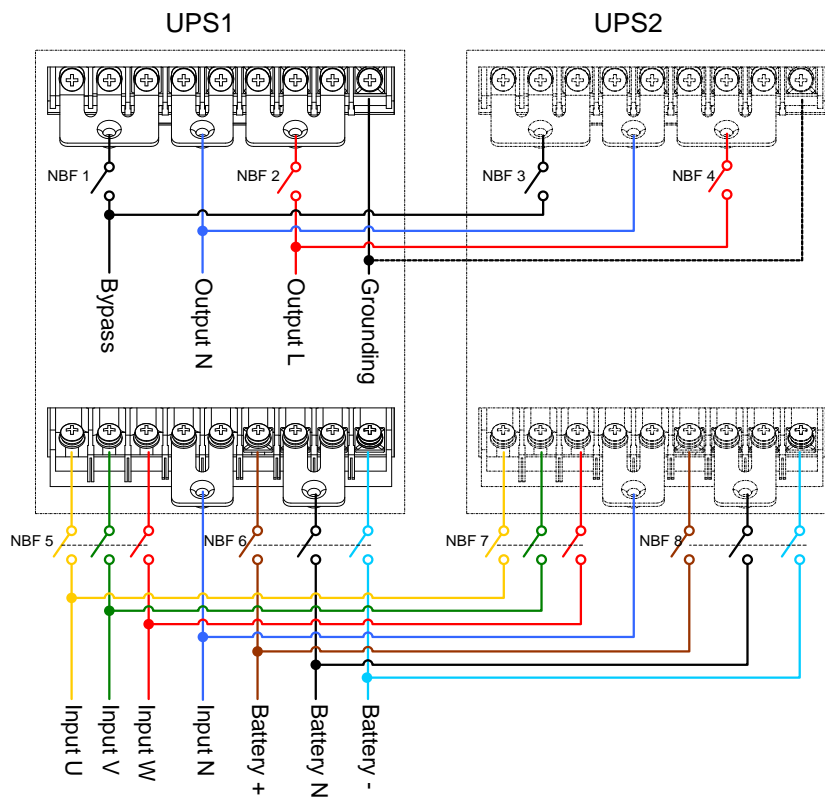


Figure3-20 Wiring diagram of 31 mode parallel system

Step 3 Connect the parallel port of each unit in parallel by parallel wires, as shown in Figure3-21.

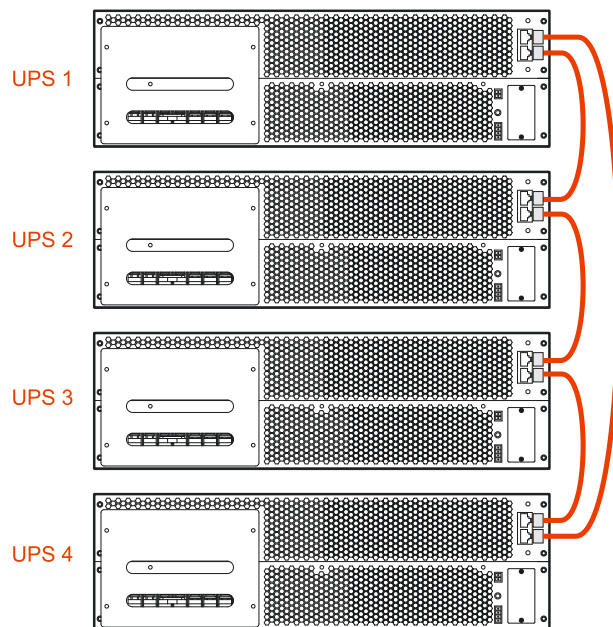


Figure3-21 Wiring diagram of parallel wire



**NOTE**

The wiring of parallel port of each mode UPS is the same, in above figure, we take KR/B3320-RM as an example to illustrate.



**CAUTION**

- The wiring and phase sequence of each unit in the parallel system must be the same strictly, which is to ensure the bypass power of parallel system is the same phase.
- The parallel system of this series UPS can share battery groups, but the battery amount of each UPS must be the same.
- Connect the parallel ports of each unit in parallel by equipped shielding communication wire. The two RJ45 parallel ports are the same, they are redundancies and backup for each other to increase the reliability of the system, once one of them is not connected, the UPS will send alarm prompting. After connecting the parallel communication wire, fasten the wire to the fixing holes on rear plate by cable tie.

---

----End

# 4 Use and Operation


This chapter mainly describes the operation process, operation method, daily maintenance and troubleshooting, etc.

## 4.1 Check Before Startup

- Check if the wire connection is firm and the color of AC wires is in accordance with the specification.
- Check if UPS is grounded reliably.
- Check if the voltage between the neutral wire and grounding wire is less than 5Vac.
- If the UPS equipped with remote monitoring device, check if the wiring of the RS485 port is correct.
- If it is long backup model, check if the wiring between UPS and battery box is correct and reliable.
- Check if the wiring is neat and the wire binding is in accordance with the specification.
- Check if the installation and wiring are good for transformation, expansion and maintenance in future.
- Check that there is no short-circuit in the output of the UPS and the load capacity isn't beyond the rated capacity of the UPS.

## 4.2 Startup Operation

Step 1 Switch on the external mains, bypass and battery switch.

Step 2 Press the  (ON) button on the front panel for 1s to start the UPS.

Step 3 About 10s later, if the UPS works steadily, start loads, such as PC, etc.



### CAUTION


Start load according to "high power device→small power device", which is to avoid overload protection when starting high power device.

---

----End

## 4.3 Shutdown Operation

Step 1 Close load and keep the UPS running without load for about 10min to exhaust heat.

Step 2 Press  (OFF) button on the front panel for 1s to shut down the UPS.

Step 3 Switch off the external battery, bypass and mains switch.

----End

## 4.4 Parallel System Operation

### 4.4.1 Start Parallel System



### CAUTION

Before completely starting the parallel system, please do not start load, and ensure that all switches of output distribution cabinet are off.

---

Step 1 Ensure that each unit of parallel system is installed properly, start each unit of parallel system according to the **4.2 Startup Operation** one by one.

Step 2 After each unit in parallel system outputs by inverter, measure the inverter voltage of each paralleled unit. The voltage difference between max. and min. voltage should be within 8V. Close the breaker of paralleled unit in parallel distribution cabinet, measure the circulating current of parallel unit, and the current should be less than 3A.

When the voltage different larger than 8V, measure the output voltage of the UPS and check if the output are all 220V, if the voltage different larger than 15V, please report it to our company to maintain it. In addition, once the circulating current of parallel unit too large, it will lead to the inverter fault. If the circulating current larger than 3A, please report it to our company to maintain it.

Step 3 Switch on the total output breaker of output distribution cabinet, each output branch breaker, and then start the load.

----End

#### 4.4.2 Shut Down Parallel System

Generally, it isn't recommended to start or close parallel system frequently.

Step 1 Shut down all load.

Step 2 Press the "O" button of each unit for 1s to shut down the unit of parallel system.

Step 3 Switch off the related breakers of each unit (when daily use, the breakers can be not closed).

----End

#### 4.4.3 Exit Parallel System Online

When one UPS in parallel system fault, it will exit from parallel system automatically with sound & light alarm. at that time, perform the operations shown in Figure4-1, the fault UPS will be exited from parallel system completely to achieve online hot maintenance or replacement.

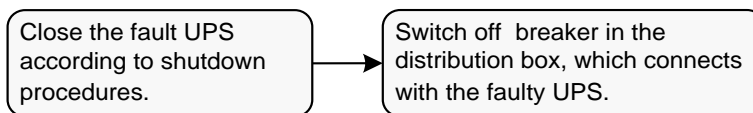


Figure4-1 Exit parallel system online



#### CAUTION

When the parallel system works normally, it's better not to exit the output from parallel system before the unit closed, or the power system will be abnormal.

#### 4.4.4 Add New UPS into Parallel System Online

When it has to add one or more UPS into parallel system, perform the operations shown in . When the added UPS works steadily, it will add into parallel system automatically and achieve current-sharing.



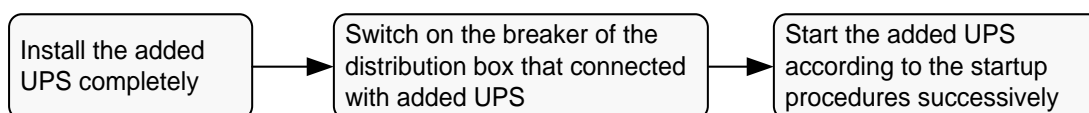


Figure4-2 Add new UPS into parallel system

### 4.4.5 Redundance Function of Parallel System

When system adopts N+1 redundance design, the total output cannot larger than N times of single unit's rated power. When one paralleled unit fault, it can put into use or exit parallel system and do not affect the operation of system, which enhance the system reliability. When output exceed N times of single unit's rated power, the overload unit (exceeding  $N/(N+1)$  times of single unit's rated power) will send alarm. for example, for the backup system with two UPS, once one UPS overload for 50% rated power, it will send overload alarm.

## 4.5 Periodic Preventative Maintenance

To improve the efficiency and reliability of the UPS, perform the following maintenance regularly.

- Clean the UPS by dry cloth regularly. Don't use liquid or spray cleaner. Before cleaning, shut down the UPS.
- Check if the wiring of input and output is firmly and well connected.
- Check the working status of cooling fans regularly. Prevent sundries from blocking the air outlet. If damaged, please replace it in time.
- Check the battery voltage and the working status of UPS regularly.

## 4.6 Battery Maintenance

The working life of battery is based on the environment temperature and discharge times. Using battery in the high temperature for a long time or discharging battery deeply will reduce the working life of battery.

When selecting battery box, please pay attention to following items:

- Charge the battery for 10 hours before using. During charging, the UPS still can be used, but if power outage at the same time, the discharging time may be less than the standard backup time.
- Generally, charge and discharge the battery once every 4 to 6 months. Discharge the battery till under-voltage and power off and then charge it. In high temperature area, charge and discharge the battery once every 2 months. The charging time for the standard battery should be more than 10 hours every time.

- If the UPS hasn't been used for a long time, it is recommended to charge the battery more than 10 hours every three months.
- Generally, the working life of battery is 3 to 5 years. If battery is not so good, replace it in time. The battery replacement should be performed by authorized professional.

## 4.7 UPS Setting

Long press **■** button for 5s to enter setting page, then short press **■** button to switch among PRL/SGL mode (just for parallel model), ECO/INV mode, inverter output 208V/220V/230V/240V, input and output mode 11/31/33, time setting, tower/rack mounting, press **①** (ON) button to confirm the setting.

### PRL parallel mode

**PRL** setting page: when the parallel UPS has been set to single mode and it needs to set to parallel mode, enter this setting page, the **PRL** flickers. If you confirm to select the setting, press **①** (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm to select the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-3.

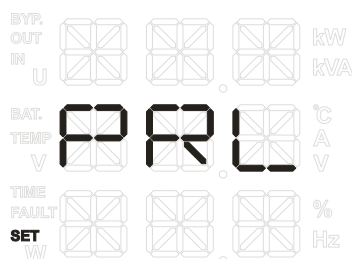


Figure4-3 PRL mode

### SGL single mode

**SGL** setting page: when the UPS has been set to parallel mode and it needs to set to single use mode, enter this setting page, the **SGL** flickers. If you confirm to select the setting, press **①** (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm to select the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-4.

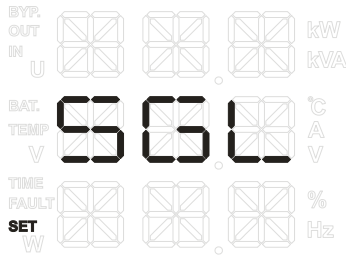


Figure4-4 SGL mode

**NOTE**

The above PRL mode and SGL mode just can be set in parallel system. The setting page shows one mode only. When the UPS is parallel mode, the setting page shows SGL, it allows to be set to single mode, when the UPS is single mode, the setting page shows PRL, it allows to be set to parallel mode.

ECO prior mode

ECO prior setting page: when the UPS has been set to inverter prior mode and it needs to set to ECO prior mode, enter this setting page, the **ECO** flickers. If you confirm to select the setting, press **①** (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm to select the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-5.

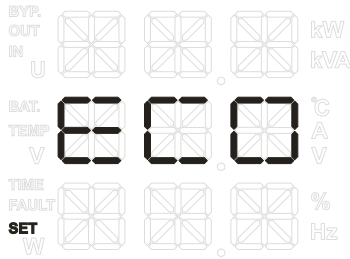


Figure4-5 ECO mode

INV prior mode

INV prior setting page: when the UPS has been set to ECO prior mode and it needs to set to in INV prior mode, enter this setting page, the **INV** flickers. If you confirm to select the setting, press **①** (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm to select the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-6.

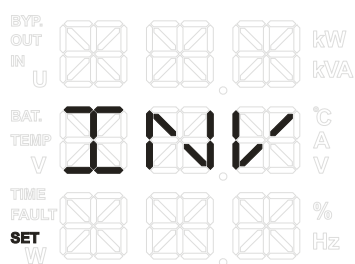


Figure4-6 INV first mode

## Inverter voltage setting

Inverter voltage 208V setting page: in the setting page, **208** flickers. If you confirm to select the setting, press **①** (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm to select the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-7.

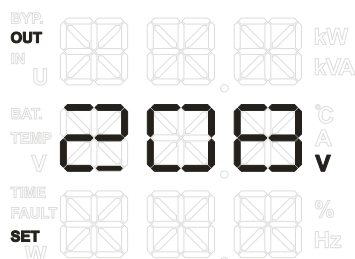


Figure4-7 Inverter voltage 208V setting

The setting of 220V, 230V, 240V inverter voltage is the same.

## Input and output mode setting

Input and output mode setting page: in the setting page, **P/N I/O 3/1** flickers. If you confirm to select the setting, press **①** (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm to select the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-8.

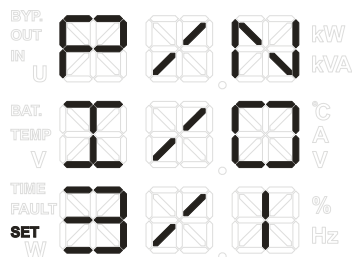



Figure4-8 31 mode setting

The setting of 33 mode, 11 mode is the same. Default setting is 33 mode.

 **NOTE**

The UPS supports various input and output mode, such as 33 mode, 31 mode, 11 mode, default setting is 33 mode. If the UPS needs to set to 31 or 11 mode, please connect the wires according to corresponding electrical connection and then dismantle the short-circuit wire of EPO, then power on and set the mode to 31 mode or 11 mode, then power down and connect the EPO short-circuit wire again.

### Time setting

Time setting page: in the page, **TIM** flickers. If you confirm to select the setting, press  (ON) button more than 1s, it will enter year/month/day setting page to set. If you do not confirm to select the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-9.

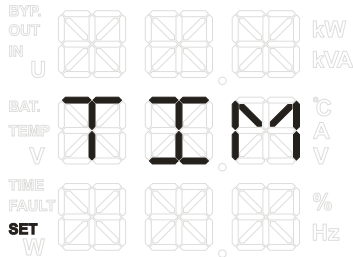






Figure4-9 Time setting

Year/month/day setting page: in the page, press  (ON) button more than 1s, it will enter year/month/day setting page. In the setting page, the 6 numbers all can be set. Corresponding setting place flickers. Press  (ON) button or  (OFF) button more than 1s to move up or move down the setting place, short press  (select) button to change from 0 to 9 circularly. If you do not confirm to select the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-10.

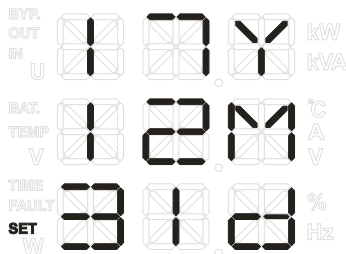


Figure4-10 Year, month, day setting

Hour/minute/second setting page: after setting the year/month/day, it will enter hour/minute/second setting page. In the setting page, the 6 numbers all can be set. Corresponding setting place flickers.

Press  $\text{①}$  (ON) button or  $\text{②}$  (OFF) button more than 1s to move up or move down the setting place, short press  $\text{■}$  (select) button to change from 0 to 9 circularly. If you do not confirm the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-11.

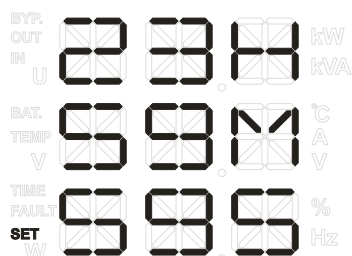


Figure4-11 Hour, minute and second setting

Time setting confirm page: after setting hour/minute/second, it will enter confirm page. In the page, **SAV TIM SET** flickers. If you confirm the setting, press  $\text{①}$  (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-12.

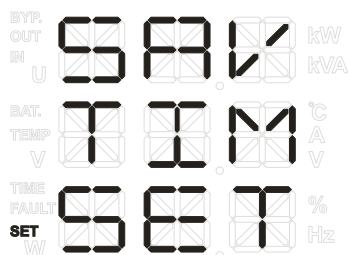


Figure4-12 Time setting confirm

## Rack display setting

Rack-mounting setting page: when the UPS has been set to tower display mode and it needs to set to rack display mode, enter this setting page, **RCK** flickers. If you confirm the setting, press  $\text{①}$  (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-13.

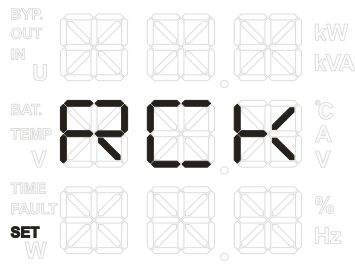


Figure4-13 Rack setting

### Tower display setting

Tower display setting page: when the UPS has been set to rack display mode and it needs to set to tower display mode, enter this setting page, **TWR** flickers. If you confirm the setting, press **ⓘ** (ON) button more than 1s, exit the setting page, the setting succeeds. If you do not confirm the setting, 20s later, it will exit the setting page automatically. Corresponding LCD display is as shown in Figure4-14.

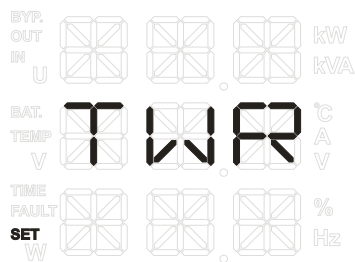


Figure4-14 Tower setting

## 4.8 Troubleshooting

### 4.8.1 Common Fault

As shown in Table4-1, it only includes some common fault diagnosis. If any doubt, contact the local office or distributor for details.


Table4-1 Troubleshooting

Fault phenomenon	Possible reason
The mains normal, after starting the UPS, it outputs normally, but it works in the battery mode and the buzzer beeps intermittently.	<ol style="list-style-type: none"> <li>1. Check if the contactors and wiring terminals in the input circuit are in good condition;</li> <li>2. Check if the displayed input voltage amplitude or frequency of mains on the LCD is beyond the allowable range of UPS;</li> <li>3. Check if the mains input breaker is disconnected, if yes,</li> </ol>

Fault phenomenon	Possible reason
	please close the breaker again.
After installing UPS, connecting with power will fuse the fuse or cause tripping operation.	The wiring of UPS input or output is short circuit.
After starting, the LCD display and output are normal. But once connecting with load, it will stop outputting immediately.	<ol style="list-style-type: none"> <li>1. UPS is overload seriously or the output circuit is short-circuit. Please reduce load to proper capacity or find the short-circuit reason. The common reason is that the output changeover socket short-circuit or the input short-circuit after UPS damage.</li> <li>2. The load is not started according to "high power device → small power device". Restart the UPS, and after the UPS works steadily, start high power load first, and then start small power ones successively.</li> </ol>
Buzzer long beeps, fault indicator lights on, UPS works in bypass mode and inverter failure.	<ol style="list-style-type: none"> <li>1. The output is overload. The load is too heavy and beyond the rated power of the UPS. Please reduce load or select a UPS with larger power capacity. If it is temporary bypass caused by impact of load start and recovers automatically, it still is normal.</li> <li>2. UPS over-temperature protection. Check if the air inlet and air outlet of UPS is blocked or the working temperature of UPS is beyond the allowable range</li> </ol>
Usually, UPS works normally. When power failure, it doesn't transfer to battery mode or it transfers to battery mode and battery under-voltage protection soon.	<ol style="list-style-type: none"> <li>1. Battery aging, the battery capacity loss. Please replace battery.</li> <li>2. Battery charger fault. At ordinary time, the battery cannot be charged.</li> <li>3. Battery wire doesn't connect well or the terminals contact is bad.</li> </ol>
When the load is PC, everything works normally. When power failure, UPS works normally, but the computer system halted.	The grounding connection is not so good. The floating voltage between the neutral wire and the grounding wire is too high.



Table4-2 Meaning of fault symbol and buzzer status

LCD fault symbol		Buzzer status	Meaning
Fault info. page (page up or page down by "  " button)	EPO	Long beep	UPS has emergency protection (if equipped with EPO function), Bypass output and inverting output are all closed.
	P/N I/O ERR	Long beep	UPS work mode setting and actual wiring mismatch, please check the mains and bypass wiring, and see if the wiring matches the work mode setting.
	SEQ	Long beep	UPS mains phase sequence abnormal. Please check if the phase sequence of mains wiring is normal.
	BMD	Long beep	UPS maintenance bypass fault, the inverter output is closed. Please check the detection port of maintenance bypass on rear plate is short circuit.
	BUS	Long beep	The inner busbar voltage fault, the inverter output is closed.
	TMP	Long beep	UPS is over-temperature protected, the inverter output is closed. Please check if cooling fan is damaged or air vents are blocked.
	OUT	Long beep	UPS output fault. Please check if the output of the UPS is short-circuit or overload.
	BAT	Long beep	UPS battery fault, battery low-voltage or over-voltage protection.
	PRA	Long beep	The parameter setting of parallel system is mismatching. Please check if the inverter voltage mode or parallel mode of parallel system is mismatching.
	PRL	Long beep	1. The parallel wire drops. 2. The UPS in parallel system fault, such as EPO, overload.
PWR	Long beep	UPS inner work power fault. If abnormal and cannot recover automatically, please report it to our	

LCD fault symbol		Buzzer status	Meaning
			company to maintain.
	FAN	Slow beep (alarm once about every 2.0s)	Fan fault alarm prompting, please check if the fan is damaged or blocked.
	CHG	Slow beep (alarm once about every 2.0s)	1. Charging over-temperature protection (Please check if the fan of charge board is invalid) 2. Output of charger protects for output short-circuit.
		Slow beep (alarm once about every 2.0s)	The charging fuse fault, please check is the fuse on charging board is invalid.
	BYP	Slow beep (alarm once about every 2.0s)	At mains status, the bypass voltage abnormal, frequency abnormal, phase sequence abnormal, or mode setting mismatches the wiring. Please check if the bypass breaker is closed, if the bypass phase sequence is normal, if the wiring way of bypass matches the system mode setting.
	CAN	Slow beep (alarm once about every 2.0s)	The CAN communication of parallel system abnormal, please check if the parallel wire is damaged or there is only one UPS in parallel system works.
	SCI	Long beep	UPS inner communication abnormal. Please check if the inner wiring is abnormal.
	INV	Long beep	UPS inverter fault.
Load energy bars all flicker		Rapid beep (Alarm once about every 0.2s)	Output overload alarm. The output is going to close, please reduce load.
Battery energy bar all flicker		Slow beep (Alarm once about every 2.0s)	Battery voltage is too high. Please check if battery or charger fault.
Battery energy bars all		Rapid beep	Battery is about to run out. Please pay attention to

LCD fault symbol	Buzzer status	Meaning
off, the outline border flicker	(Alarm once about every 0.2s)	protect the load and save the data of PC.

## 4.8.2 Fault Status

UPS fault includes: EPO protection, work mode and actual wiring mismatching protection, mains phase sequence abnormal fault, maintenance bypass fault, UPS DC bus voltage fault, UPS IGBT over-temperature fault, UPS fan fault (including fan blocked, fan damage etc.), UPS output fault (including output overload protection, output short-circuit etc.), UPS battery fault (including battery over-voltage/ under-voltage protection etc.), UPS parameter mismatching fault, UPS parallel wire fault, UPS inner power fault, charger fault (charging over-temperature, charging short-circuit or charging fuse fault), bypass fault, parallel communication abnormal, inner communication abnormal, inverter fault etc. Corresponding LCD display of each fault is as shown in Table 4-3.

Table 4-3 Actual LCD display and corresponding description

Fault info	Fault description	LCD display
EPO	Emergency power off protection (EPO)	
P/N I/O ERR	Work mode and actual wiring mismatching protection (Phase/number Input/output error)	
SEQ	Mains phase sequence abnormal fault (Sequence)	
BMD	Maintenance bypass fault (Bypass Maintain Detection)	
BUS	DC bus fault (BUS)	
TMP	UPS over-temperature fault (Temperature)	
FAN	UPS fan fault (Fan)	

Fault info	Fault description	LCD display
OUT	UPS output fault (Output)	OUT
BAT	Battery over-voltage/ under-voltage fault (Battery)	BAT
PRA	Parallel parameters inconformity (Parameter)	PRA
PRL	Parallel wire fault (Parallel)	PRL
PWR	UPS work power fault (Power)	PWR
CHG	UPS charger fault (Charge)	CHG
BYP	UPS bypass abnormal (Bypass)	BYP
CAN	CAN communication of parallel system abnormal (CAN)	CAN
SCI	Inner communication abnormal (SCI)	SCI
INV	Inverter fault (Inverter)	INV

 **NOTE**

The above table is just for user to know about the meaning of abnormal alarm prompting, If it may be inner components failure, please contact the professional.

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# 5 Package, Transportation and Storage

This chapter mainly introduces the package, transportation and storage of the UPS.

## 5.1 Package

During packing, please pay attention to the place direction requirements. At the side of the package, there is afraid of wet, handle with care, upward, stack layer limit, etc. alarm marks. And also, the device model is printed on the package. At front of the package, the LOGO of Kehua Company and device name is printed.

## 5.2 Transportation

During transporting, pay attention to the warning marks and avoid severe impact on the package. Place the device according to the marked direction, which is to avoid damage the component. Any inflammable, explosive, corrosive object is not allowed to shipping with the device. While midway transportation, do not put the device in the open air. The device cannot suffer any rain, snow or liquid material or mechanical damage.

## 5.3 Storage

During storing, place the UPS according to the marked direction. The package box should be far away from ground for 200mm, and keep at least 500mm from wall, eat source, cold source, window or air inlet.

Storage temperature: 0~40°C, relative humidity is 20%~80%.In the warehouse, any inflammable, explosive, corrosive object or harmful gas is not allowed, and also, strong mechanical shake, impact or magnetic field is forbidden. The storage period of these requirements, generally, is 6 months. If the UPS is stored more than 6 months, it is necessary to check again. If the UPS is stored for a long time, please charge the battery every 3 months.

# A Technical Specifications

Index		Model	ESOL TRI RT10KVA	ESOL TRI RT 15KVA	ESOL TRI RT20KVA
		Input	Input mode	3 $\phi$ 4W+PE (can be set to 1 $\phi$ 2W+PE)	
Voltage range (V)	<p>When the input voltage in the range of 176Vac~280Vac, the UPS can bear load of 100% rated power.</p> <p>When the input voltage in the range of 80Vac-176Vac, the output of the UPS needs to decrease rated power linearly to use.</p>				
Frequency range (Hz)	50/60 $\pm$ 10(50/60 self-adaption)				
Bypass synchronism track range (Hz)	50/60 $\pm$ 10%Hz				
Bypass input voltage range (V)	220/230/240 $\pm$ 20% (phase voltage) (default is 220)				
Input power factor	$\geq$ 0.99				
Input THDI	Resistive full load: $\leq$ 3%; non-linear full load: $\leq$ 5%				
Battery voltage (VDC)	$\pm$ 144~ $\pm$ 240 (can be selected from $\pm$ 12 cells ~ $\pm$ 20 cells, default is $\pm$ 16 cells, when the battery voltage is set from $\pm$ 12 cells ~ $\pm$ 15 cells, the output of the UPS decreases to 75% rated) (12V battery)				
Charge current (A)	1~10A settable (default is 4A)				
Output	Output mode	3 $\phi$ 4W+PE (can be set to 1 $\phi$ 2W+PE)			
	Capacity (kVA/kW)	10/9	15/13.5	20/18	

Index		Model	ESOL TRI RT10KVA	ESOL TRI RT 15KVA	ESOL TRI RT20KVA
	Voltage (V)	L-N: 220/230/240 (default is 220) L-L: 380/400/415 (default is 380)			
	Frequency (Hz)	When mains normal, it tracks the bypass input frequency; When mains abnormal, it tracks the frequency of $50 \pm 0.1$ or $60 \pm 0.1$ (default is 50)			
	Wave form	Sine-wave			
	Voltage distortion	Resistive full load: $\leq 1\%$ ; non-linear full load: $\leq 4\%$			
	Power factor	0.9 (when PF set to 1.0, the UPS can output long time)			
	Transfer time of bypass and inverter (ms)	Synchronization: $< 1\text{ms}$ ; asynchronization: $< 10\text{ms}$			
	System efficiency	Up to 96%			
	Overload capacity	$< 115\%$ : no protection $115\% \sim 130\%$ : 15min $130\% \sim 150\%$ : 1min $> 150\%$ : 200ms			
Others	DC startup function	Equipped			
	Panel display	LCD shows the running status of the UPS			
	Communication port	RS485, EPO, RS232+Dry contact(SLOT)			
	Alarm function	Alarm for battery low-voltage, mains abnormal, UPS fault, output overload, etc.			
	Protection function	Protection for battery under-voltage, overload, short-circuit, over-temperature, input over-voltage, communication abnormal, etc.			
	Noise (dB)	$< 55$			$< 58$
	Work temperature ( $^{\circ}\text{C}$ )	$-5 \sim 40$			

Index	Model	ESOL TRI RT10KVA	ESOL TRI RT 15KVA	ESOL TRI RT20KVA
		Relative humidity	0 ~ 95%, non-condensation	
	Size (W×D×H) (mm <sup>3</sup> )	438×500×130		
	Weight (kg)	20		

- Specifications are subject to change without prior notice.

# B Acronyms and Abbreviations

<b>AC</b>	Alternating Current
<b>BMD</b>	Bypass Maintain Detection
<b>DC</b>	Direct Current
<b>ECO</b>	Economic Operation Model
<b>EPO</b>	Emergency Power Off
<b>LCD</b>	Liquid Crystal Display
<b>PE</b>	Protective Earthing
<b>RS485</b>	Recommend Standard485
<b>SNMP</b>	Simple Network Management Protocol
<b>UPS</b>	Uninterruptible Power System