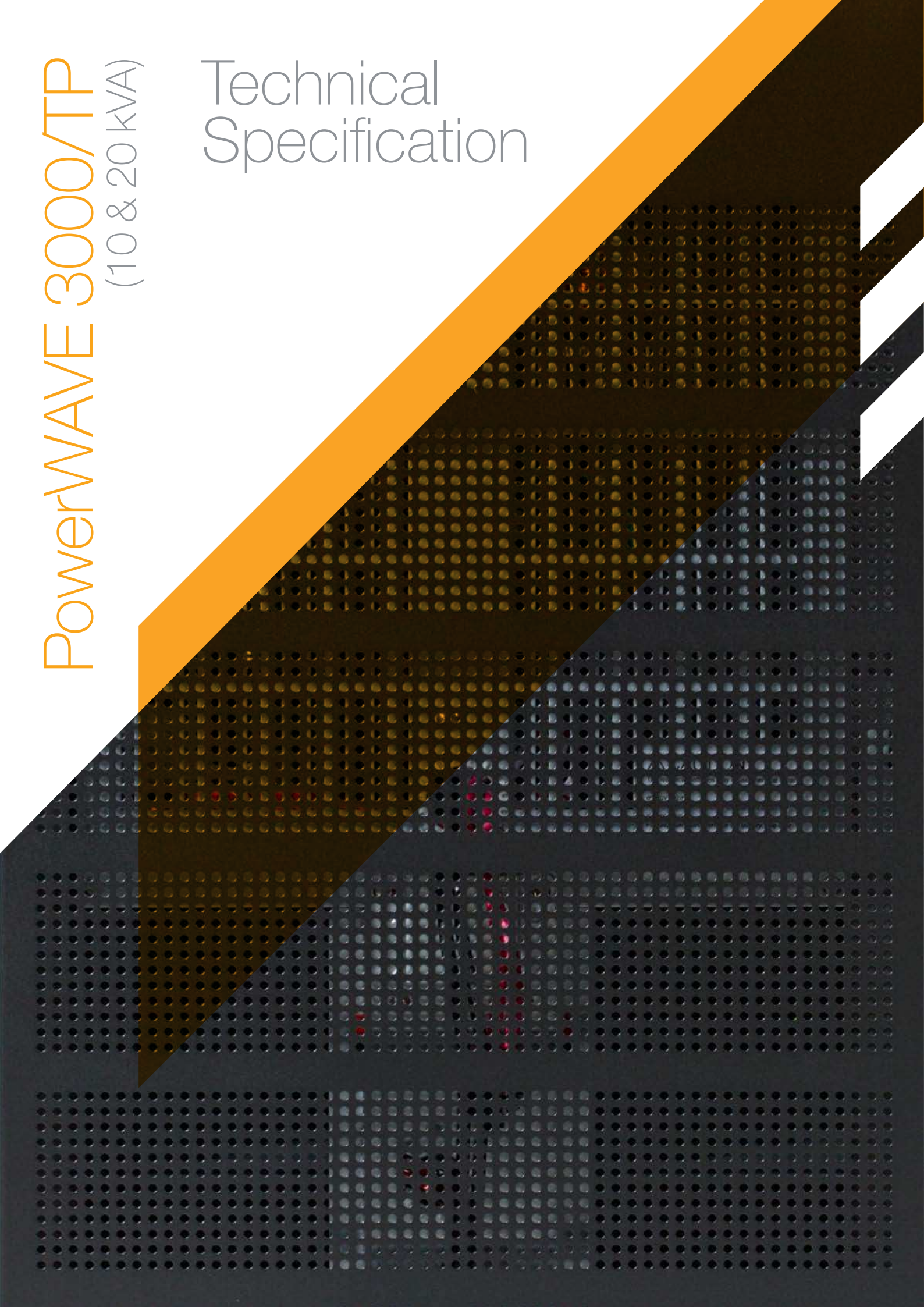


# PowerWAVE 3000/TP (10 & 20 kVA)

## Technical Specification





## PowerWave PW3000/TP DESCRIPTION

Continuous power availability is essential in today's dynamic IT and process-related work environments. It is equally important that any installed power protection system is sufficiently resilient and adaptable to handle any changes brought about by the introduction of new server technologies, migration and centralization.

Such demands are well met by the PowerWave PW3000/TP UPS system which provides the foundation for continuous power availability of network-critical infrastructures both in enterprise data centres, where business continuity has paramount importance, and in process control environments where manufacturing continuity is essential.

### Reliability and quality standards

Incorporating the latest technological developments in power engineering, the PowerWave PW3000/TP represents a completely new generation of transformerless 3 phase UPS-System. Its advanced double conversion VFI (Voltage and Frequency Independent) topology responds fully to both the highest availability and environmentally friendly requirements, compliant with IEC 62040-3 (VFI-SS-111) standards.

Uninterruptible Power Supplies Ltd specialises in the installation and maintenance of Uninterruptible Power Systems; and this powerful UPS is just one example of our wide range of state-of-the-art power protection devices that will provide your critical equipment with a steady and reliable power supply for many years.

### Model range

The PowerWave PW3000/TP range comprises 10kVA or 20kVA UPS models which are contained in identically sized cabinets. Up to forty-eight 12V batteries can be housed within the standard UPS cabinet but, where extended autonomy times are required, additional batteries can be installed in a matching battery cabinet which can be positioned adjacent to the UPS cabinet to form an aesthetically pleasing suit. Each UPS can be connected to up to four battery cabinets.

Up to four PowerWave PW3000/TP UPS cabinets can be connected in parallel to increase the UPS system's rated output, or introduce a level of module redundancy to further enhance the system availability. Additional module(s) can be added to an existing system which contains fewer than four modules without having to shut-down the UPS system or load.



**Key Point:** In a parallel system ALL the connected modules must be of the same output rating – i.e. it is not permissible to combine 10kVA and 20kVA cabinets in a parallel

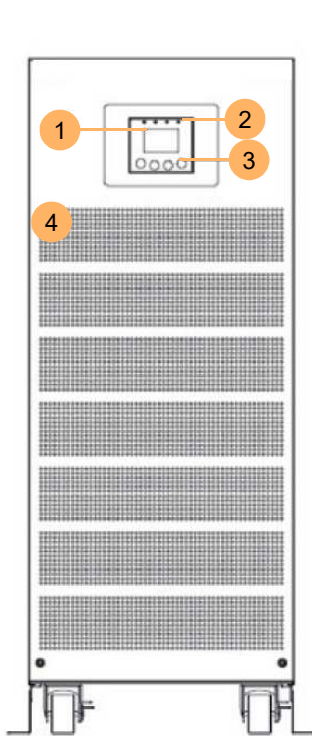
### Key features

High reliability, upgrade ability, low operating cost and excellent electrical performance are just some of the highlights of this innovative UPS solution.

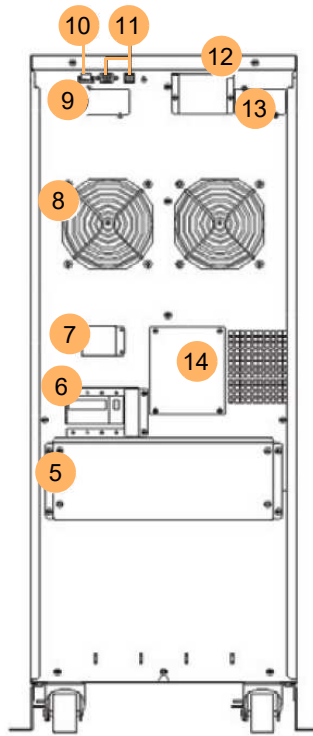
Other key features include:

- Single phase UPS output with either a single or three phase input mains supply
- Supports various input wiring schemes: with either a single input feed connected to both the UPS mains and internal bypass, or a dual input feed using a dedicated single phase bypass supply
- Energy savings thanks to 93% AC-AC efficiency, 97% efficiency in ECO mode – also known as High Efficiency (HE) mode
- Low harmonic distortion (< 5% THDi) and active power factor correction (0.99 input PF) eliminates interference from other network equipment
- Paralleling and redundancy capability (up to 4 units in parallel) increases system capacity and availability
- Integrated automatic and manual bypass simplifies maintenance
- Frequency converter operation allows the UPS to operate at 50/60Hz or 60/50Hz (input/output)
- Compact solution that can achieve 5-16 minutes runtime with internal batteries
- Matching external battery cabinet(s) available for extended autonomy time (up to 4 battery cabinets per UPS)

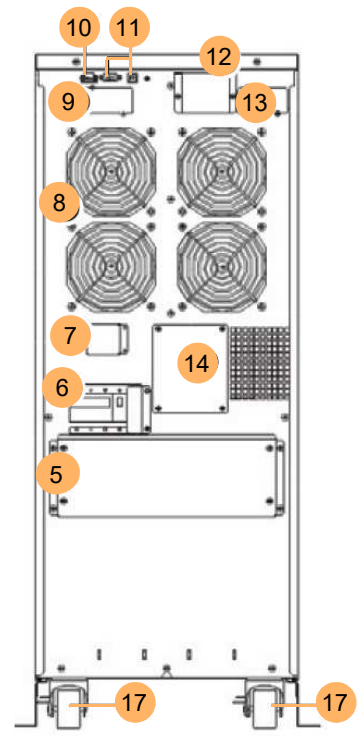
**IMPORTANT NOTE:** *The UPS does not contain internal fused isolators to protect the UPS bypass input mains supply. It is the customer's responsibility to provide suitable external switchgear and fuses (or other devices), correctly sized to provide the recommended level of UPS protection. We also recommend that a spare set of fuses are held locally to ensure they are easily available if required.*



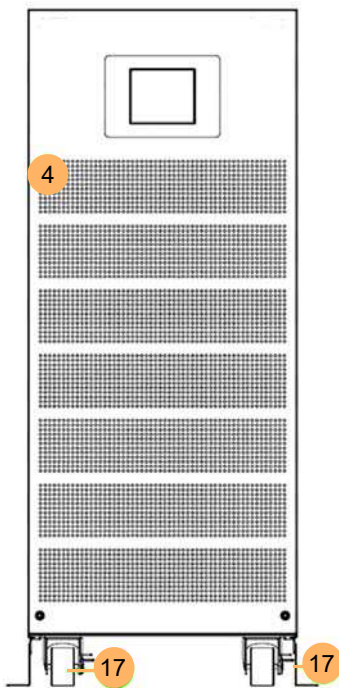
10/20 kVA Front View



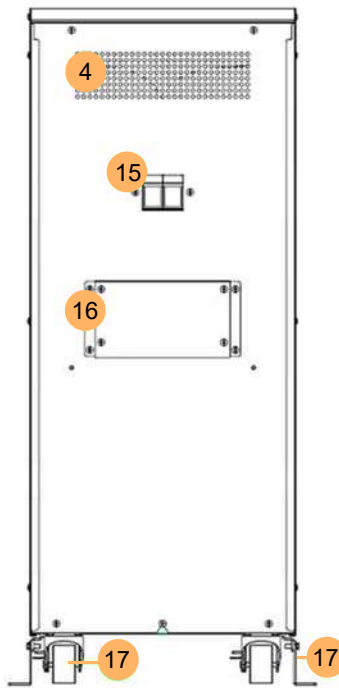
10 kVA Back View



20 kVA Back View



Battery Cabinet Front View



Battery Cabinet Back View

- |    |  |
|----|--|
| 1  | Operator Panel LCD Display                     |
| 2  | Operator Panel LEDs                            |
| 3  | Operator Panel Control Keys                    |
| 4  | Ventilation inlets                             |
| 5  | Power terminal block cover                     |
| 6  | Mains and Bypass input supply circuit breakers |
| 7  | Backfeed protection connection terminals       |
| 8  | Cooling extractor fans                         |
| 9  | AS400 Interface slot                           |
| 10 | Emergency Power Off (EPO) contact              |
| 11 | RS232 port / USB port                          |
| 12 | Parallel port (for parallel control bus cable) |
| 13 | SNMP Interface slot                            |
| 14 | Maintenance Bypass Isolator cover plate        |
| 15 | Battery fuses                                  |
| 16 | Battery terminal connection cover              |
| 17 | Wheel, support brackets and brakes             |

## GENERAL SPECIFICATION

UPS MODULE	10kVA	10kVA +5 min battery	10kVA +16 min battery	20kVA	20kVA +5 min battery
<b>GENERAL</b>					
Output power factor	0.9			0.9	
Rated output power (@ pf=0.8)	10 kVA			20 kVA	
Rated output power (@ pf=1.0)	9 kW			18 kW	
Weight	56 kg	117 kg	177 kg	66 kg	187 kg
Dimensions WxHxD	350x890x712	350x890x712	350x890x712	350x890x712	350x890x712
Colour	Pantone Process Black C				
Topology	True on-line double conversion				
<b>INPUT CHARACTERISTICS</b>					
Nominal input voltage	1ph + N: 220 / 230 / 240 VAC    3ph + N: 380 / 400 / 415 VAC				
Input voltage tolerance	1ph + N: 110-276 VAC    3ph + N: 190-486 VAC				
Power factor	≥0.99				
Input power at rated output (no batt charging)	9.68 kW			19.35 kW	
1Ph Input current at rated output (no batt charging)	44.4A / 42.5A / 40.7A (@ 220V / 230V / 240V)			88.9A / 85.0A / 81.5A (@ 220V / 230V / 240V)	
3Ph Input current at rated output (no batt charging)	14.9A / 14.1A / 13.6A (@ 380V / 400V / 415V)			29.7A / 28.2A / 27.2A (@ 380V / 400V / 415V)	
Input power at rated output (max batt charging)	10.99 kW			10.99 kW	
1Ph Input current at rated output (max batt charging)	50.5A / 48.3A / 46.2A (@ 220V / 230V / 240V)			94.9A / 90.8A / 87.0A (@ 220V / 230V / 240V)	
3Ph Input current at rated output (max batt charging)	16.9A / 16.0A / 15.4A (@ 380V / 400V / 415V)			31.7A / 30.1A / 29.0A (@ 380V / 400V / 415V)	
Input current THD	<5% linear load, <7% non-linear load				
Frequency range	45-55 Hz for 50 Hz system / 55-65 Hz for 60 Hz system				
Frequency tolerance	±2%				
<b>OUTPUT CHARACTERISTICS</b>					
Rated output voltage	220 / 230 / 240 VAC				
Voltage tolerance	±2%				
Voltage distortion	≤ 2% linear load, ≤ 5% non-linear load				
Overload capability (linear load)	5 minutes: 105%~110%; 1 minute: 110%~130%; 10 seconds: 130%~150%; 2 seconds >150%				
Nominal frequency	50 or 60 Hz ±0.1 Hz				
Crest factor	3:1				
<b>EFFICIENCY (230V / 50Hz)</b>					
100% Load	Up to 93%				
In ECO mode (HE mode)	Up to 97%				

UPS MODULE	10kVA	10kVA +5 min battery	10kVA +16 min battery	20kVA	20kVA +5 min battery
<b>BATTERIES</b>					
Inbuilt batteries	No	Yes	Yes	No	Yes
Number of batteries	–	1 x 24	2 x 24	–	2 x 24
Battery capacity	–	9 Ah	9 Ah	–	9 Ah
Charger current	4A	4A	4A	4A	4A
Recharge time	–	3h to 90%	8h to 90%	–	8h to 90%
<b>AUTONOMY TIMES (MINS)</b> (Half load / Full load)					
UPS Internal Batteries	–	16 / 5	41 / 16	–	16 / 5
UPS +1 Battery cabinet	41 / 16	59 / 28	92 / 42	16 / 5	42 / 16
UPS +2 Battery cabinet	92 / 42	118 / 49	150 / 60	42 / 16	60 / 27
UPS +3 Battery cabinet	150 / 60	180 / 80	213 / 90	60 / 27	90 / 42
UPS +4 Battery cabinet	213 / 90	245 / 103	246 / 132	90 / 42	118 / 53
<b>ENVIRONMENTAL</b>					
Protection rating	IP20				
Audible noise	55 dB Measured at 1 metre from the front of the UPS on 100% load and fully charged batteries.				
Storage temperature	-15°C to +60°C for UPS; 0°C to +35°C for battery				
Operating temperature	0°C to +40°C				
Relative humidity	0-95% (non condensing)				
Altitude (above sea level)	1000m without de-rating				
<b>COMMUNICATIONS</b>					
User interface	Menu-driven LCD display				
Communication card options	Network interface (SNMP card) Dry contact (AS400 card) USB / RS232 Computer interface				
<b>STANDARDS</b>					
Safety	IEC/EN62040-1				
EMC	IEC/EN62040				
ROHS	EN50581:2012				
Performance	IEC/EN62042-3				
Manufacturing	ISO 9001:2008, ISO 14001:2004				

## UPS CONTROL PANEL

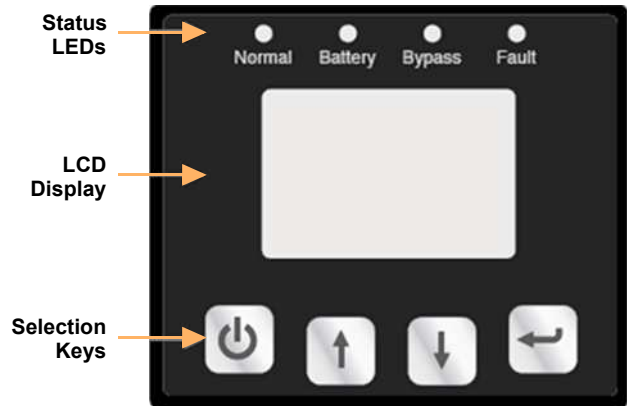
Located on the UPS cabinet front panel, the UPS Control Panel contains four status LED indicators, an LCD display, and a row of selection keys which include an ON/OFF key and three navigation keys. These keys are used to select various control, monitoring and configuration menus presented on the LCD display.

### LED status indicators

The four LEDs located along the top of the Control Panel indicate the UPS operating mode or fault situation.

Depending on the UPS status, the individual LEDs may FLASH or remain constantly OFF or ON; and under some circumstances all five LEDs will illuminate in turn in a 'rotating' sequence.

The table below illustrates the LED status for various operating conditions. Where the LED state is indicated by a 'X' it means that the status is not specific, but depends on a particular failure or warning mode.



UPS STATUS	NORMAL (green)	BATTERY (amber)	BYPASS (amber)	FAULT (red)
Bypass Mode / with no output power			FLASH	X
Bypass Supply abnormal			FLASH	
Bypass Mode / with output power			ON	X
UPS Turning ON	SEQUENCE	SEQUENCE	SEQUENCE	SEQUENCE
On-line mode	ON			X
On-battery mode	ON	ON		X
ECO mode (HE Mode)	ON		ON	X
Battery Test mode	SEQUENCE	SEQUENCE	SEQUENCE	SEQUENCE
Fault mode			X	ON
Warning	X	X	X	FLASH

### LCD Display

A complete overview of the UPS operating status including the input, output, battery and load parameters is provided by the LCD display.

Under normal operating conditions the display shows white text on a blue back-light but under fault conditions this changes to dark text on an orange back-light, accompanied by an audible warning, as shown in the adjacent table.

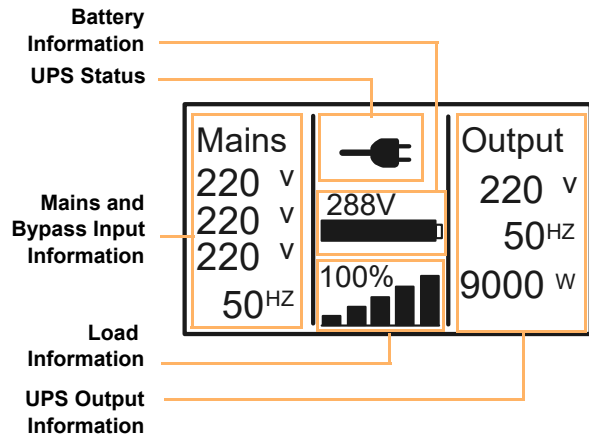
UPS Condition	Buzzer Status
Active failure	Continuous
Active warning	Beep once per second
UPS on Battery	Beep every four seconds
Low Battery	Beep every second
On Bypass	Beep every two minutes
Overload	Beep twice per second

### Default screen











During start up, a 'Welcome' logo is presented on the screen for around 5 seconds while the UPS initialises then the default status screen, shown below, is displayed. The default screen is displayed automatically during normal operation if the control panel keys are not operated for 15 minutes.

The default screen indicates the following:





- Battery information – including the battery voltage and a graphical indication of the available battery charge
- UPS Status – symbolic indication of the UPS operating mode and fault/abnormal conditions. A list of status symbols is shown in the table below.
- UPS input information – including an indication of the input mains/bypass voltage, and frequency
- Load information – graphical and numerical percentage indication of the connected UPS load
- UPS output information – including an indication of output voltage, frequency and load (W)



### UPS Status symbols

Symbol	Status	Description
	ON-LINE	UPS is operating with the load supplied by the inverter.
	ON BATTERY	UPS is operating from battery power, usually due to a mains failure.
	ON BYPASS	UPS is operating with the load supplied from the bypass mains power via an internal filter. Note: if there is a bypass supply failure while the UPS is on bypass, it will not transfer back to mains or to battery-mode unless it is operating in ECO-mode.
	ECO Mode (HE mode)	UPS is operating with the load supplied from the bypass mains power via an internal filter. In case of bypass mains failure, the UPS transfers to Online-mode or Battery-mode and the load is supplied continuously. ECO-mode can be enabled/disabled through the LCD settings menu or through the monitoring software.
	CONVERTER mode	UPS is set to operate with a different input and output frequency – either 50Hz-60Hz or 60Hz-50Hz. In case of input mains power failure, the UPS transfers to ON BATTERY mode.
	WARNING	UPS is operating in the presence of an abnormal situation that does not stop the UPS from working.
	FAULT	The UPS has experienced a fault condition. It may disconnect the load or transfer the load to bypass depending on the cause of the failure. In all cases, there will be a constant alarm and the LCD back-light will become red.
	OVERLOAD	UPS is overloaded. The load should be reduced to <90% of the UPS rated capacity in order to stop the alarm.
	BATTERY TEST	UPS is performing a battery test.
	BATTERY DISCONNECTED	UPS battery is disconnected or defective – accompanied by an alarm.

## Operator keys

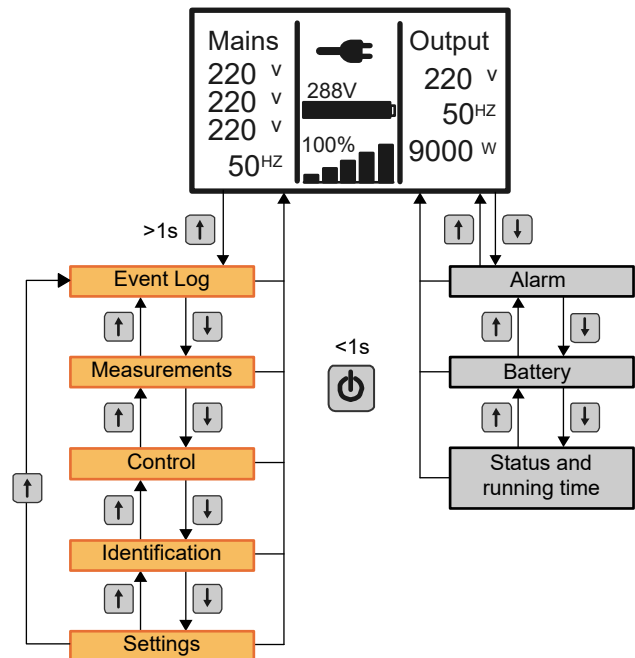
KEYS	Function	Operation
	Power ON / OFF	Press for one second to turn ON the UPS. Press for three seconds to turn OFF the UPS or change the UPS operating mode between 'on-line' and 'on-bypass'. Press briefly (<1s) to escape from the current menu back to the default screen.
	SCROLL UP	Press for less than one second to scroll UP through the current menu options. Press for greater than one second to access the Main Menu screen.
	SCROLL DOWN	Press for less than one second to scroll DOWN through the current menu options.
	SELECT / EDIT	This key is used when editing the value of a parameter in the setup/configuration screens. When pressed for less than one second it accepts the entered value and if pressed for more than one second it saves the setting and exits the screen.

## LCD Menu navigation

All the UPS control, monitoring and configuration functions are actioned through a series of menus displayed on the LCD and navigated using the operator keys.

From the default screen, you can cycle through the Alarm, Battery and Status/Running Time monitoring screens by pressing the UP and DOWN keys for less than one second. To return to the LCD default screen, from any monitoring screen, press the ON/OFF key for less than one second.

To access the Main Menu from the default screen, you must press the UP key for longer than one second. This presents the Main Menu options in the order shown and described individually below.



### Event Log sub-menu

The Event Log displays a time-stamped list of the 50 most recent warning and fault events. These events are displayed on separate Warning and Fault event lists which can be scrolled through using the UP/DOWN keys.

### Measurements sub-menu

Using the UP / DOWN keys to scroll through the Measurements sub-menu allows the following UPS operating parameters to be observed:

- Output Power (W)
- Output Current (A)
- Output Voltage (V)
- Input Voltage (V)
- Bypass Voltage (V)
- Battery Voltage (V)
- DC Bus Voltage (V)
- Output Power (VA)
- Load Percentage (%)
- Output Frequency (Hz)
- Input Frequency (Hz)
- Bypass Frequency (Hz)
- Battery Capacity (%)
- Temperature (°C)

### Control sub-menu

The Control menu allows the following UPS operating features to be set:

Control	Description	Values	Default
Buzzer Mute	Mute the audible warning alarm.	No / Yes	No
Turn OFF Single UPS*	Allows an individual module to be turned off in a parallel system.	No / Yes	No
UPS Battery Test	Initiate test of the batteries of a single UPS.	Schedule / No / Yes	No
Clear EPO status	Reset the UPS from emergency power off status.	No / Yes	No
Reset Fault state	Reset warning and alarming status and buzzer.	No / Yes	No
Clear Event Log	Reset all the events from the log file.	No / Yes	No
Restore factory setting	Rests the following parameters: <ul style="list-style-type: none"> <li>• Recover all settings in the LCD menu,</li> <li>• restore the EPO polarity</li> <li>• locks the DC start-up (can be executed only when UPS is in bypass mode)</li> </ul>	No / Yes	No

*\*Only relevant to parallel-module installation*

### Identification sub-menu

The Identification menu provides display access of:

- The UPS model data
- UPS serial number
- Firmware revision details

This information is often requested when seeking assistance from the manufacture or service agent.

## Settings sub-menu

The Settings sub-menu allows various UPS operating parameters to be configured, as shown below. Apart from selecting the display language, access to the Settings menu is password protected.

Sub-menu Item	Description	Values	Default
Language	Select menu language.	English / Chinese	English
User password	Protects against unapproved access.	Enabled / Disabled	Disabled
Audio alarm	Enable / disable alarm sounds.	Enabled / Disabled	Enabled
Output voltage	Define local output voltage.	200/208/220/230/240V	230V
Output frequency	Define local output frequency. (UPS detects the frequency in 'autosensing'.)	Autosensing / 50Hz /60Hz	Autosensing
Power strategy	Define the operating mode	Normal / HE- mode / Frequency converter	Normal
DC start (Cold start)	Start the UPS from batteries, without mains power.	Enabled / Disabled	Enabled
Automatic battery test period	Define the frequency of the battery tests.	0-31 days	7 days
Auto restart	After power outage, the load restart automatically when mains power is recovered.	Enabled / Disabled	Enabled
Automatic overload restart	The UPS automatically restarts if it shuts-down due to overload.	Enabled / Disabled	Enabled
Auto bypass	The automatic bypass can be disabled if the bypass power supply is very unstable. UPS runs only on-line or on-battery.	Enabled / Disabled	Disabled
Short circuit clearance	<i>When enabled:</i> short circuit can last for 4s before cutting off the output. If short circuit is removed during this time, the UPS will continue to run. <i>When disabled:</i> short circuit will only last for 100ms before the UPS output is cut off.	Enabled / Disabled	Disabled
Bypass voltage low limit	When the voltage in the bypass is below this limit, the UPS changes operating mode.	176 ~ 215V	184V
Bypass voltage high limit	When the voltage in the bypass is above this limit, the UPS changes operating mode.	245 ~ 276V	264V
Bypass frequency low limit	When the frequency in the bypass is above this limit, the UPS changes operating mode.	40 ~ 49.5 Hz	45 Hz
Bypass frequency high limit	When the frequency in the bypass is above this limit, the UPS changes operating mode.	50.5 ~ 70 Hz	55 Hz
HE-mode voltage low limit	When the voltage in the bypass is below this limit, the UPS changes operating mode.	1% ~1 0%	5%
HE-mode voltage high limit	When the voltage in the bypass is above this limit, the UPS changes operating mode.	1% ~ 10%	5%
HE-mode frequency low limit	When the frequency in the bypass is below this limit, the UPS changes operating mode.	1% ~ 10%	5%
HE-mode frequency high limit	When the frequency in the bypass is above this limit, the UPS changes operating mode.	1% ~ 10%	5%
External Battery modules**	Define the number of external battery modules.	0 - 97	0
Set running time	Reset the UPS running time for tests purposes.	Day:hour:minute:second	Running time
LCD contrast	Change the contrast in the LCD display.	-5 ~ +5	0
Battery remaining time	When enabled, the battery remaining time is displayed in the menu measurements.	Enabled / Disabled	Disabled

**\*\* Ensure the actual battery quantity is same as indicated in the settings otherwise you might damage the batteries.**

## CUSTOMER INTERFACE OPTIONS

### Computer communication options.



A USB and an RS232 port are provided to enable communication between the UPS and a remote computer station. Only one communication port can be active at a time and the priority is given to the USB port.

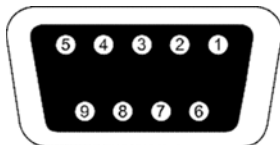
When appropriate power management software, such as WAVEMON, is installed, the computer can continuously monitor the input mains voltage and UPS status, and display a message in response to any UPS system changes.

In the event of a power failure, and a predicted UPS shutdown due to low battery autonomy, the WAVEMON monitoring system will save the existing load data before initiating a shutdown of the load equipment.

#### USB Port

To establish communication between the UPS and a computer, connect the USB cable (supplied with the UPS) between the UPS USB port and the USB port on the computer. The USB port is compliant with USB 1.1 protocol.

#### RS232 Port



Pin	Signal	Description	I/O
2	TXD	Transmit to external device	Output
3	RXD	Receive from external device	Input
5	GND	Ground (tied to chassis)	Input

To establish a serial communication link between the UPS and a computer, connect one end of the serial communication cable (supplied with the UPS) to the RS-232 port on the UPS and the other end to the RS-232 port on the computer. The cable pin-out for the RS-232 communication is shown above.

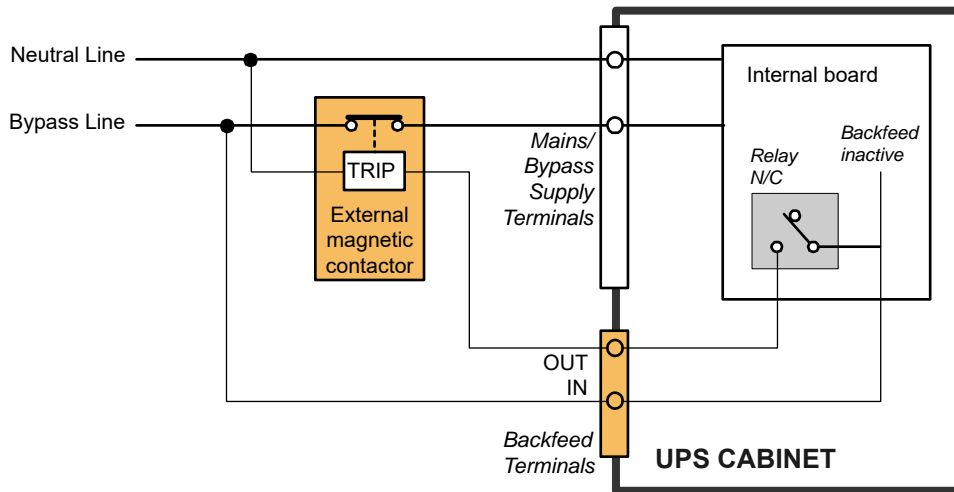
#### Emergency Power-OFF (EPO)



An external Emergency Power OFF (EPO) circuit can be connected to the UPS to enable it to be shut down remotely in an emergency situation. By default the external EPO circuit requires a normally closed contact which shuts down the UPS when opened. A link must be fitted to the EPO connector located on the back of the UPS if the EPO facility is not used, as shown above.

**Note:** Although the EPO facility is factory set to be a normally-closed contact, it can be reconfigured through the USB/RS232 port to be a normally-open contact.

## Backfeed protection

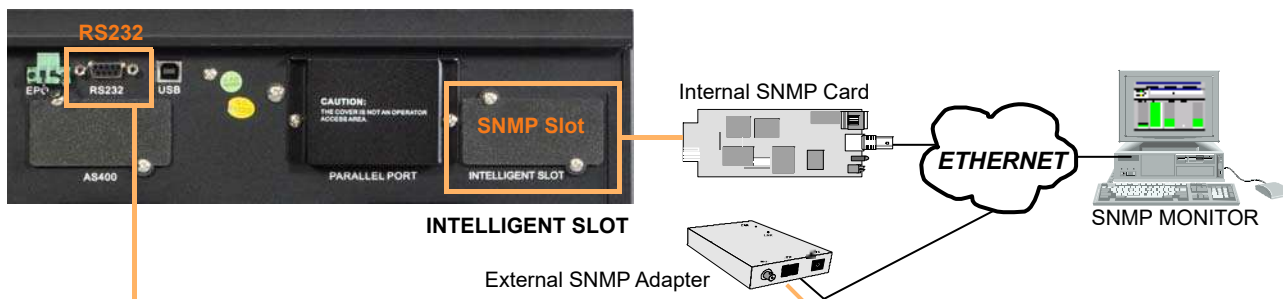


A power isolation contactor can be fitted in the UPS bypass supply line, as shown above, to protect the UPS against back-feeding in the event of a critical static switch failure.

The external contactor magnetic 'trip' coil is connected to the backfeed contactor control terminals located behind a small cover on the back of the UPS.

An AC contactor rated at 100A minimum should be used – for example a three phase contactor of 3x 40A rating with the three poles wired in parallel. The trip coil should be rated according to bypass supply.

## Serial Network Management (SNMP) card



Simple Network Management Protocol (SNMP) is a world-wide, standardised communication protocol that can be used to monitor any network-connected device via a simple control language and display the results in an application running within a standard web browser. The SNMP adaptor can be initially configured using a network patch cable or a PC with a terminal connection.

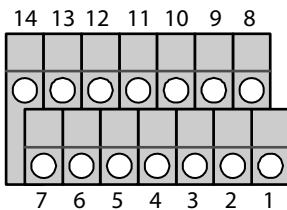
The adapter card, which is also compatible with Modbus over RS232/RS485 and TCP/IP, fits into the 'Intelligent Slot' located on the back of the PowerWave PW3000/TP. Alternatively, connectivity can be implemented using an external SNMP adapter connected to the UPS RS232 output, as shown.

The SNMP/Ethernet adapter output is via an RJ-45 connector which allows it to be connected to the network using a standard network cable. Once connected, the UPS-Management software agent which is already installed in the SNMP adapter monitors the UPS operating parameters and outputs its data in SNMP format to the connected network. In a multi-module UPS system the SNMP interface can communicate 'system-wide' data or data for an individual UPS module.

### SNMP Card installation

The UPS does not have to be shutdown before installing a communication card.

### AS400 Interface card



The optional AS400 Interface card fits into the 'AS400' slot located on the back of the PowerWave PW3000/TP. The card provides five UPS status/alarm outputs and monitors three switched inputs via two 7-way Phoenix terminal blocks.

The card also contains an RS232 interface which can be used to configure the card's operation. Using some basic terminal communication software, such as Hyperterminal, it is possible to change both the function and polarity of the relay; for example, to select an individual switch segment to be Normally-Open or Normally-Closed, and immediate/delayed operation. Detailed operating instructions are included in the option package.

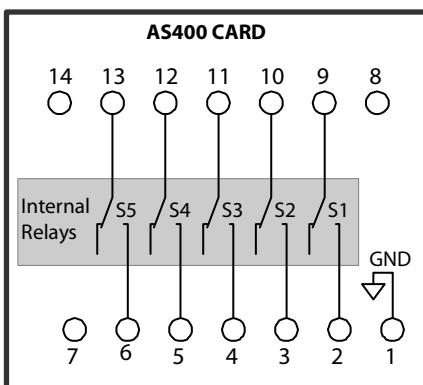
### RS232 Interface

The inbuilt RS232 interface is accessed via an RJ45 connector located adjacent to the I/O terminal blocks. An RJ45 to 9-way D-Type adapter cable is provided with the equipment to allow connection to a computer's serial port.



**WARNING:** The RJ45 connector must only be used for RS232 applications. If it is connected to a network switch it may damage the UPS and/or network equipment.

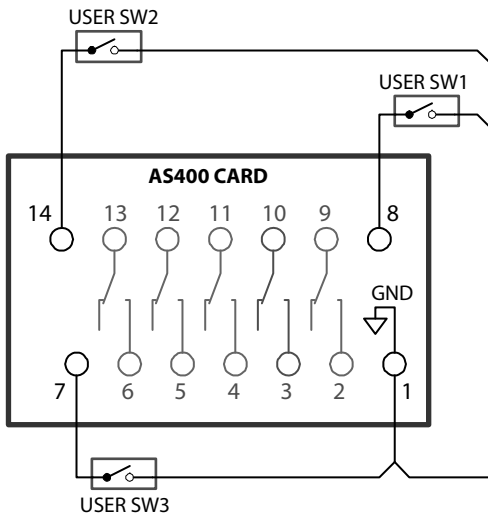
### AS400 Alarm outputs



The switched outputs are configured as 5 segments:

Segment 1	Terminal 9-2	Utility (mains) Failure
Segment 2	Terminal 10-3	Battery Low
Segment 3	Terminal 11-4	General Alarm
Segment 4	Terminal 12-5	Bypass Status
Segment 5	Terminal 13-6	Summary Alarm

The card's internal volt-free contacts are rated at 250VAC/8A, 30VDC/8A, 110VDC/300mA, 220VDC/120A, and the terminal block accommodates cables in the range 0.5 mm<sup>2</sup> to 1.5 mm<sup>2</sup>.



The switched inputs are configured as 3 segments:

Segment 6	Terminal 8-1	User Configurable – Battery Mode Shutdown (Default) – Any Mode Shutdown – Emergency Power Off – Remote ON/OFF
Segment 7	Terminal 14-1	Reserved for UPS ON Signal (Switch On UPS)
Segment 8	Terminal 7-1	Reserved for UPS OFF Signal (Switch OFF UPS)

### AS400 Interface Card installation

The AS400 Interface Card should be installed and configured by the commissioning engineer.

## UPS MONITORING AND AUTOMATED CONTROL SOFTWARE

### The importance of UPS management

The utility supply is inevitably unreliable every now and then; and assuring continuous power to all the facilities connected to it can be a difficult task. The situation is further complicated if worldwide systems are managed via a Local Area Network (LAN) or Wide Area Network (WAN). However, by using the PowerWave PW3000/TP UPS system in conjunction with purpose-designed network management tools, a systems administrator can take measures to back-up data and prevent system errors or data loss even in the event of a relatively long utility supply outage. In the case of an abnormal utility supply, suitable UPS management software will also enable a system administrator to monitor all concerned networks from a central point and identify bottlenecks at an early stage.

Despite extensive system monitoring, serious damage can still occur if an administrator fails to intervene in a timely manner, so it is important that the installed UPS software will react automatically in such a case and shut down the supplied system in a safe and controlled manner.

Uninterruptible Power Supplies Ltd considers it important to have a complete solution for its UPS systems, and offers its customers a number of remote control and monitoring tools to provide optimum protection.

### SNMP monitoring/control software

Working in conjunction with the adapter card described above, Uninterruptible Power Supplies Ltd offer suitable monitoring and control software with SNMP functionality for NetWare, OS/2 and all Windows NT systems on INTEL and ALPHA network platforms.

## PLANNING THE INSTALLATION

### General guidelines

A certain amount of pre-planning will help ensure a smooth and trouble-free installation of the UPS system. The following guidelines should be taken into account when planning a suitable UPS location and operating environment.

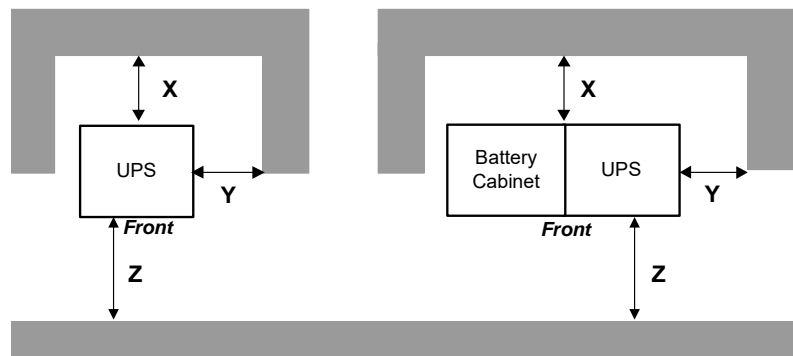
1. The UPS is designed for indoor installation only.
2. The route to the installation location must allow the equipment to be transported in an upright position.
3. The floor at the proposed installation site and en-route from the off-loading point must be able to safely take the weight of the UPS and battery equipment plus fork lift during transit.
4. Locations with high ambient temperature, moisture or humidity must be avoided.
  - a) The installation site humidity should be <90% non-condensing.
  - b) The prescribed ambient temperature is 0°C to +40°C. An ambient temperature of 20°C is recommended to achieve a long battery life.
  - c) Any requested cooling air flow must be available. The air entering the UPS must not exceed +40°C.
  - d) The air conditioning system must be able to provide a sufficient amount of cooling air to keep the room within the prescribed temperature range.
5. The following environmental conditions should also be considered:
  - a) Fire protection standards must be respected. The floor material should be non-flammable.
  - b) The location must be free of dust and corrosive/explosive gases.
  - c) The location must be vibration free.
  - d) A minimum clearance of 50cm is required on the sides of the equipment to allow the free passage of cooling air.

### Clearances

The following notes are applicable to both the UPS and external battery cabinet.

The UPS cabinet is force ventilated with extractor fans mounted on the UPS back panel drawing cooling air through the inlet grills on the front of the unit. Sufficient space must be provided at the back and sides of the cabinet to permit adequate air-flow.

Rear access is required for connecting the UPS power and control cables, and also to operate the UPS power switches. If direct rear access is not available, sufficient space must be provided at the side of the cabinet to allow the operator to reach around the cabinet to operate the power switches.



Clearance	X	Y	Z
Minimum (mm)	~500	500~1000	1000

**Note:** Full access is required to both sides of the cabinet for maintenance.

The UPS cabinet is mounted on wheels, so if the installation does not afford direct side access the UPS connecting cables should be of sufficient length to allow the cabinet to be moved forward to offer unhindered side access when required.

We recommend the following minimum clearances:

- Rear access (X): a minimum of 500mm for unrestricted airflow
- Side (Y): a minimum of 500mm for free airflow, but may need increasing to 1000mm to afford rear access for operating the equipment power switches if direct rear access is not available (see also the note above)
- Front (Z): allow a minimum of 1000mm for maintenance access and the safe passage of personnel

## POWER CABLING

The input cables, output cables and external battery power cables are connected to a terminal block rail located on the back of the UPS cabinet, behind a removable cover. All power cables enter the bottom of the terminal box through cable glands which are installed as required. See pages 19 to 22 for specific connection details.

A terminal box, similar to the one used on the UPS, is affixed to the back of the external battery cabinet.

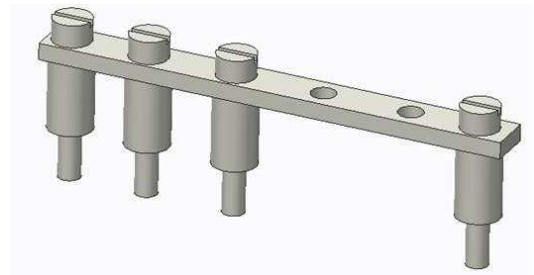
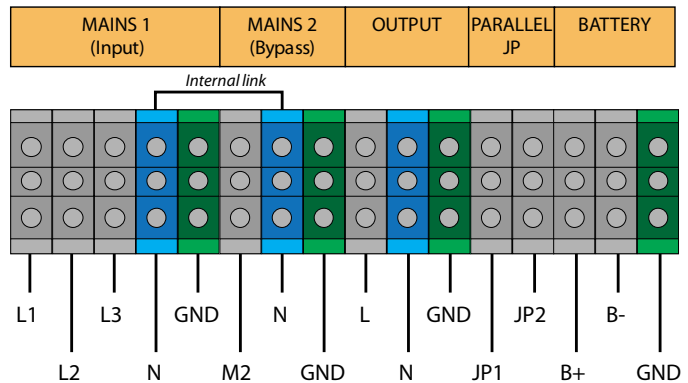
### Input supply configurations

The UPS input supply (MAINS 1) and bypass supply (MAINS 2) can be connected to suit various supply configurations. These configurations are illustrated on pages 19 to 22 and can be described as:

- *Three phase dual input* – Three phase mains input (L1,L2,L3) and separate single phase bypass input (M2)
- *Three phase single input* – Three phase mains input (L1,L2,L3) with the bypass line (M2) linked to (L1)
- *Single phase dual input* – Single phase mains input (L1,L2,L3 linked) and separate single phase bypass line (M2)
- *Single phase single input* – Single phase mains input linked to the bypass input (L1,L2,L3,M2 all linked)

The input supply arrangement is selected by fitting a configuration link to the MAINS 1 and MAINS 2 terminal blocks. A 'jumper kit' comprising four screws, four spacers and a small busbar with 6-holes, is shipped with the UPS module to enable the UPS power connections to be linked accordingly. The jumper bar is fitted to the connections along the centre of the DIN-rail terminal blocks, with the spacers as shown.

**Note:** If only the three left-most screws are required to be fitted, the bar can be cut to length.



### UPS Cable and fuse sizing

The UPS input mains and bypass supplies can be wired in one of four configurations:

- Three phase dual input – Three phase mains input and separate single phase bypass input
- Three phase single input – Three phase mains input with bypass input linked to the mains input L3
- Single phase dual input – Single phase mains input and separate single phase bypass input
- Single phase single input – Single phase mains input linked directly to the bypass input

All four configurations are illustrated on pages 19 to 22 respectively, including details of external cabling and fuse sizing.

### Power cabling for a parallel system



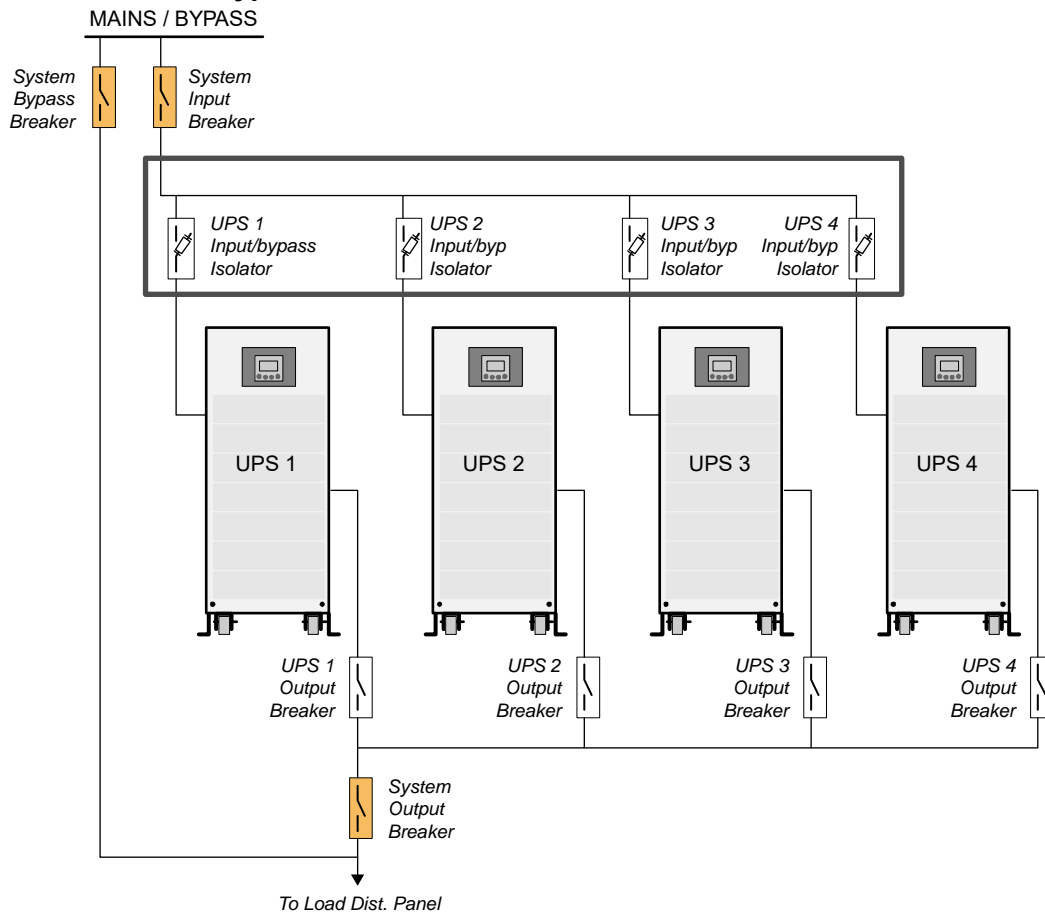
**Key Point:** The information pages 19 to 22 is given for guidance only:

- Fuse and Cable recommendations are to IEC 60950-1:2001.
- All external fuses, isolators and cables must be rated and installed in accordance with the prescribed IEC standards or local regulations—e.g. BS76771:2008 incorporating amendment No1:2011
- All 10kVA modules are fitted with a 40A internal input circuit breaker and 20kVA modules with 100A.

In a parallel UPS system the length of the input cables from the input distribution board to each cabinet should be as equal as possible, with a maximum difference of 20%. This is necessary to obtain accurate load sharing between the cabinets.

This also applies to the UPS output cables, where each module should be connected to an output circuit breaker located on a switch panel no further than 20 meters from the cabinets.

### External maintenance bypass



In addition to the details shown on pages 19 to 22, an external maintenance bypass facility such as that shown above should be installed in conjunction with a parallel module system to increase the system flexibility. By opening its input fused isolator and output breaker, this circuit allows an individual module to be fully isolated from the system for repair or total replacement. It also allows the entire system to be bypassed by closing the System Bypass Breaker and opening the System Output Breaker; which in turn allows testing of the entire parallel system.

To avoid the possibility of module damage, it is crucial that ALL the UPS modules are all operating on their internal bypass before the System Bypass Breaker is closed, and it is therefore usual to incorporate some form of safety interlocking mechanism between the UPS external breakers.

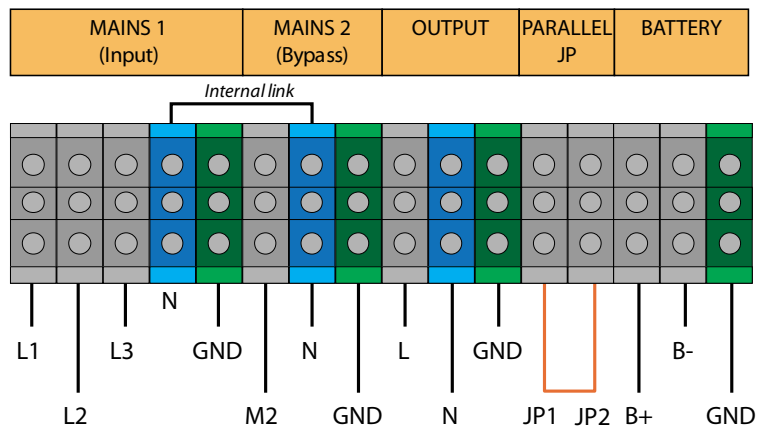
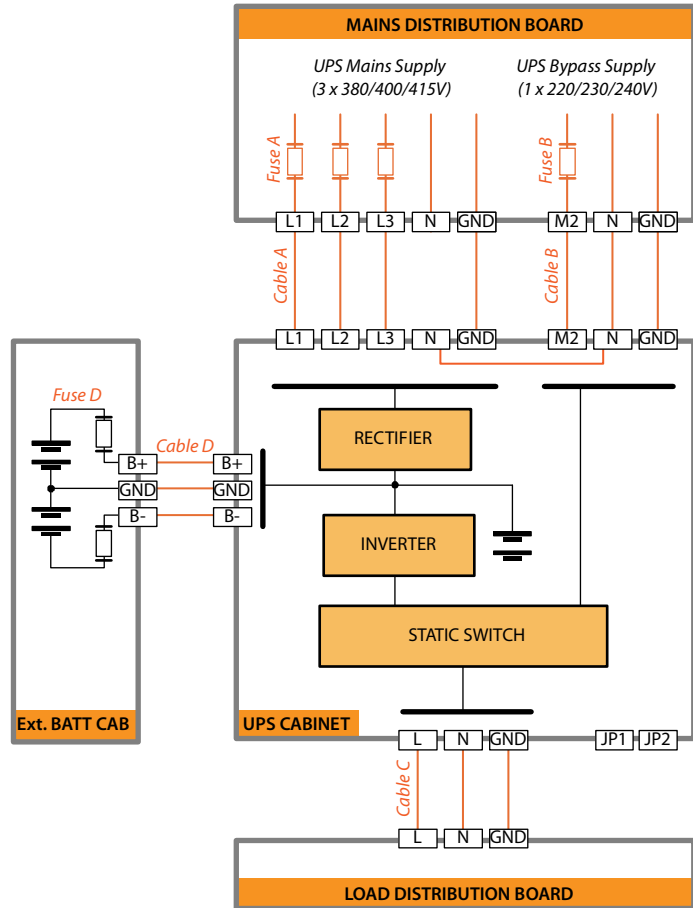
### Three phase dual input cabling details

	10kVA	20kVA
Cable A	16 A	33 A
Cable B	48 A	90 A
Cable C	48 A	90 A
Cable D	Bespoke	
Safety Earth	max 16 mm <sup>2</sup>	max 25 mm <sup>2</sup>

*Note: @400V/230V nominal input.*

#### WIRING NOTES

1. Connect the supply neutral to the bypass neutral terminal (MAINS 2 [N]).  
 DO NOT connect the supply neutral to the input neutral terminal (MAINS 1 [N]) as there is a possibility that the bypass current could return through, and overload, the smaller cable of MAINS 1.
2. Connect the mains input cable to [L1, L2, L3]
3. Connect the bypass line cable to [M2].
4. Connect the battery cables to the external battery cabinet if used.
5. Remove the link between [JP1] and [JP2] if the module is part of a parallel module system.
6. Connect the output terminals to the output breaker/load distribution board. The load distribution breakers should have a leakage current protective function to suit to the UPS voltage and current ratings.



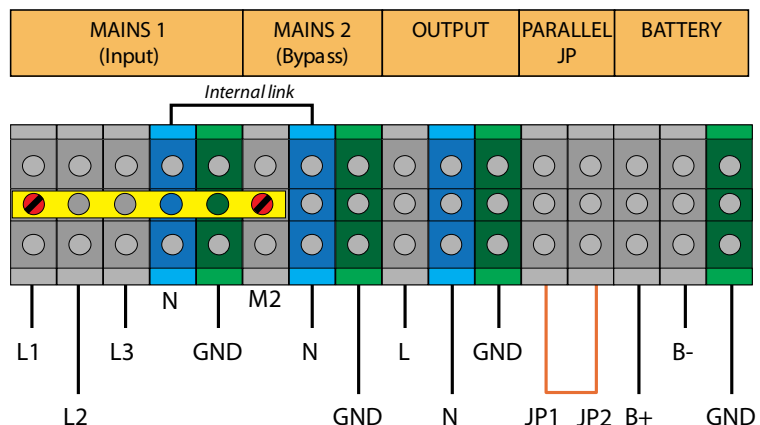
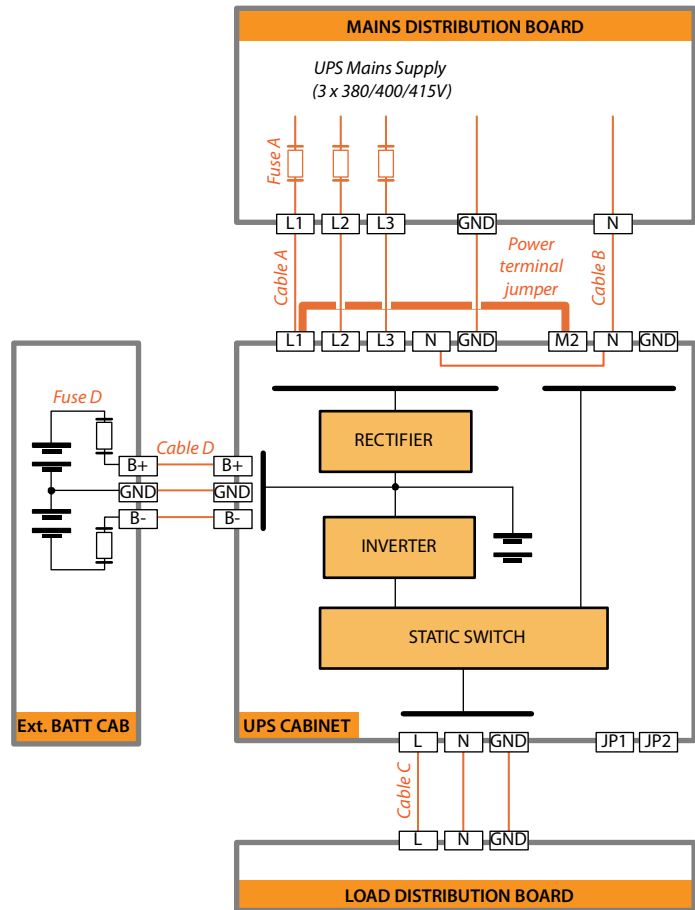
### Three phase single input cabling details

	10kVA	20kVA
Cable A	16 A (48 A on L1)	33 A (90 A on L1)
Cable B	48 A	90 A
Cable C	48 A	90 A
Cable D	Bespoke	
Safety Earth	max 16 mm <sup>2</sup>	max 25 mm <sup>2</sup>

Note: @400V/230V nominal input.

#### WIRING NOTES

1. Connect the supply neutral cable to the bypass neutral terminal (MAINS 2 [N]), which is also connected to the mains input neutral terminal within the UPS. There is no need to connect the input mains neutral (MAINS 1 [N]).
2. Install the power terminal jumper between the MAINS 1 [L1] and MAINS 2 [M2].
3. Connect the mains input cable to [L1, L2, L3].
4. Connect the battery cables to the external battery cabinet if used.
5. Remove the link between [JP1] and [JP2] if the module is part of a parallel module system.
6. Connect the output terminals to the output breaker/load distribution board. The load distribution breakers should have a leakage current protective function to suit to the UPS voltage and current ratings.



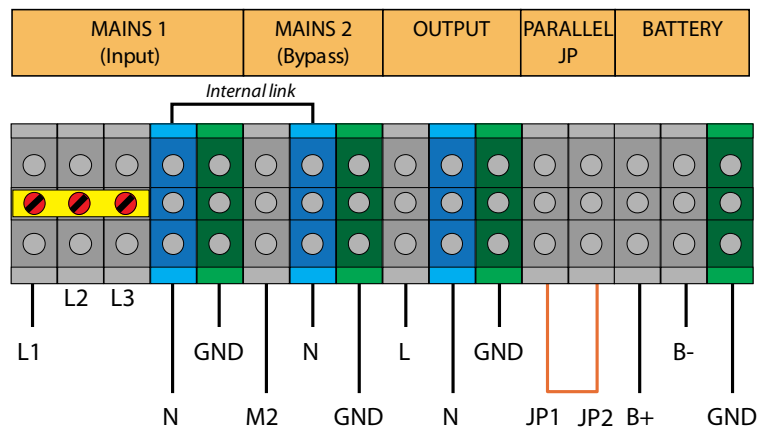
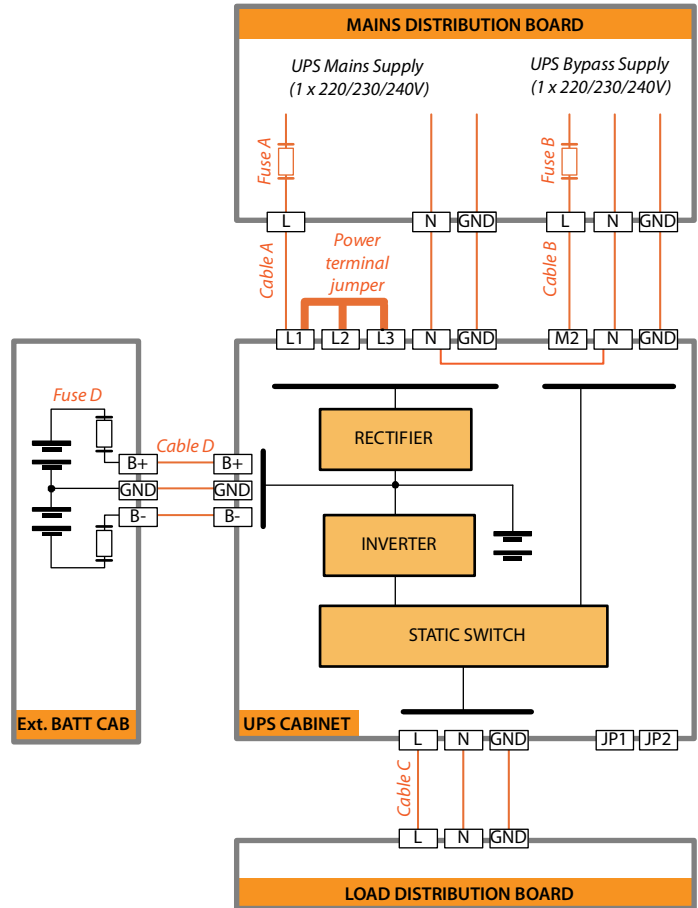
## Single phase dual input cabling details

	10kVA	20kVA
Cable A	48 A	90 A
Cable B	48 A	90 A
Cable C	48 A	90 A
Cable D	Bespoke	
Safety Earth	max 16 mm <sup>2</sup>	max 25 mm <sup>2</sup>

Note: @400V/230V nominal input.

### WIRING NOTES

1. Connect the input neutral cables to MAINS 1 [N] and MAINS 2 [N].
2. Install the power terminal jumper between MAINS 1 [L1, L2, L3].
3. Connect the input line cable to MAINS 1 [L1].
4. Connect the bypass line cable to MAINS 2 [M2].
5. Connect the battery cables to the external battery cabinet if used.
6. Remove the link between [JP1] and [JP2] if the module is part of a parallel module system.
7. Connect the output terminals to the output breaker/load distribution board. The load distribution breakers should have a leakage current protective function to suit to the UPS voltage and current ratings.



### Single phase single input cabling details

	10kVA	20kVA
Cable A	48 A	90 A
Cable B	48 A	90 A
Cable C	48 A	90 A
Cable D	Bespoke	
Safety Earth	max 16 mm <sup>2</sup>	max 25 mm <sup>2</sup>

*Note: @400V/230V nominal input.*

#### WIRING NOTES

1. Connect the supply neutral cable to the bypass neutral terminal (MAINS 2 [N]), which is also connected to the mains input neutral terminal within the UPS. There is no need to connect the input mains neutral (MAINS 1 [N]).
2. Install the power terminal jumper between MAINS 1 [L1, L2, L3] and MAINS 2 [M2].
3. Connect the input line cable to [L1].
4. Connect the battery cables to the external battery cabinet if used.
5. Remove the link between [JP1] and [JP2] if the module is part of a parallel module system.
6. Connect the output terminals to the output breaker/load distribution board. The load distribution breakers should have a leakage current protective function to suit to the UPS voltage and current ratings.

