

installation and user manual

# SENTINEL DUAL

SDU 4000





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## ***INTRODUCTION***

Congratulations on purchasing a **UPS Sentinel Dual** product and welcome to **Riello UPS!** To use the support service offered by **Riello UPS**, visit the site **www.riello-ups.com**

Our Company is a specialist in the design, development and manufacturing of uninterruptible power supplies (UPS). The UPS described in this manual is a high quality product which has been carefully designed and built in order to guarantee the highest levels of performance.

This device can be installed by anyone on the condition that they have **READ THIS INSTALLTION AND USER MANUAL CAREFULLY.**

**The UPS and the Battery Box internally generate DANGEROUS electrical voltages. All maintenance operations must be carried out SOLELY by qualified operators.**

This manual contains detailed instructions for using and installing the UPS and any additional Battery boxes. **For information on how to use and maximise the performance of your device, please retain this manual and read it carefully before operating the equipment.**

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## ***ENVIRONMENTAL PROTECTION***

In the development of its products, the company devotes abundant resources to analysing the environmental aspects. All our products pursue the objectives defined in the environmental management system developed by the company in compliance with applicable standards.

No hazardous materials such as CFCs, HCFCs or asbestos are used in this product.

When evaluating packaging, the choice of material has been made favouring recyclable materials. For correct disposal, please separate and identify the type of material of which the packaging is made according to the table below. Dispose of all material in compliance with applicable standards in the country in which the product is used.

| <b><i>DESCRIPTION</i></b> | <b><i>MATERIAL</i></b> |
|---------------------------|------------------------|
| Box                       | Cardboard              |
| Packaging corner          | Polythene/cardboard    |
| Protective bag            | Polythene              |
| Accessories bag           | Polythene              |
| Pallet                    | Heat-treated pine      |

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## ***DISPOSING OF THE PRODUCT***

The UPS and the Battery Box contain electronic internal material that (in case of dismiss / disposal) are considered **TOXIC and HAZARDOUS WASTE**, such as electronic circuit boards and batteries. Treat these materials according to the laws applicable referring to qualified service personnel. Their proper disposal contributes to respect the environment and human health.

© The reproduction of any part of this manual, in whole or in part, is forbidden without the prior consent of the manufacturer. In order to make improvements, the manufacturer reserves the right to modify the product described at any moment and without notice.

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## PRESENTATION

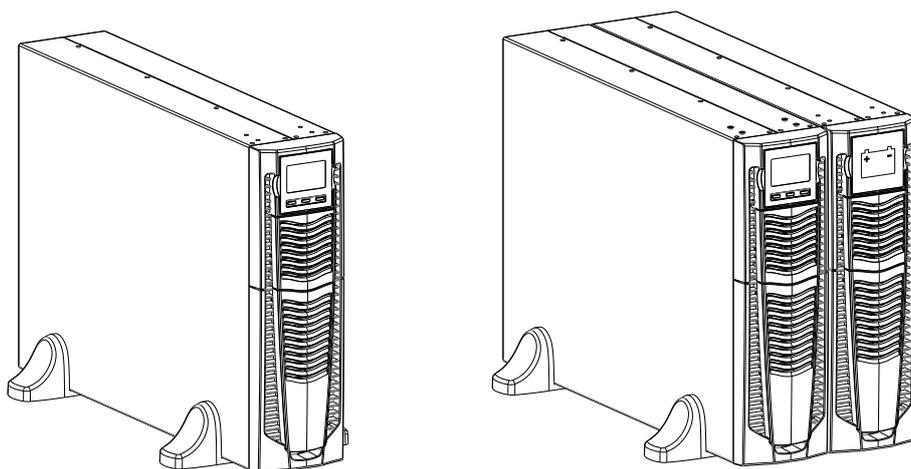
**SENTINEL DUAL** Sentinel Dual is the best solution for powering mission critical applications and electro-medical devices requiring maximum power reliability.

Flexibility of installation and use (digital display, user-replaceable battery set), as well as the many communication options available, makes the Sentinel Dual suitable for many different applications from IT to security.

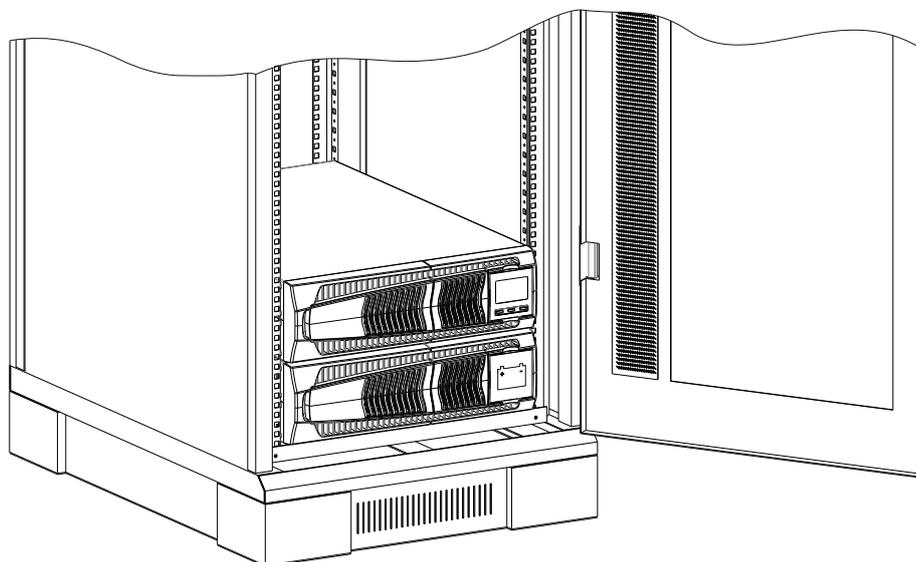
**SENTINEL DUAL** can be installed as Tower (floor standing) or Rack, ideal for network and server rack applications.

**SENTINEL DUAL** is available in the 4000 VA version and it was developed to be powered by a single-phase input network.

The batteries are user replaceable without switching off the equipment and without interruption to the load (Hot Swap).



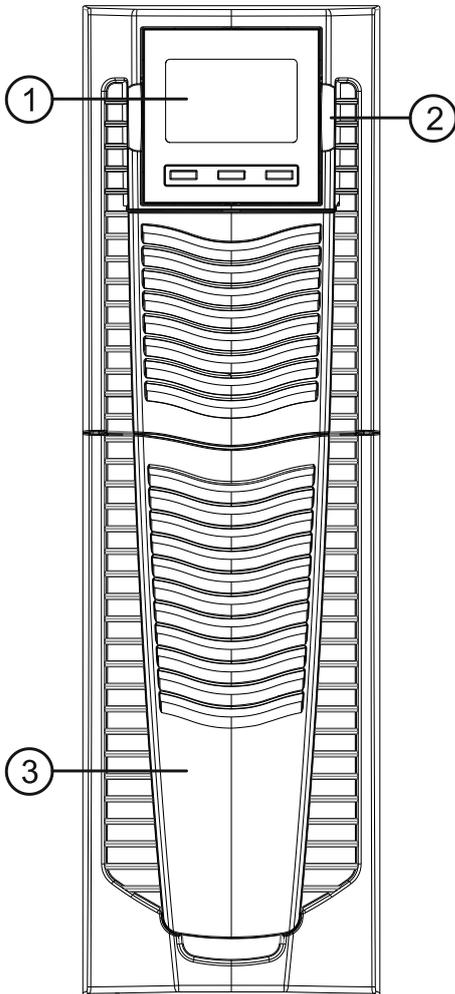
*Example of UPS and UPS + BATTERY BOX (optional) installed in a tower configuration*



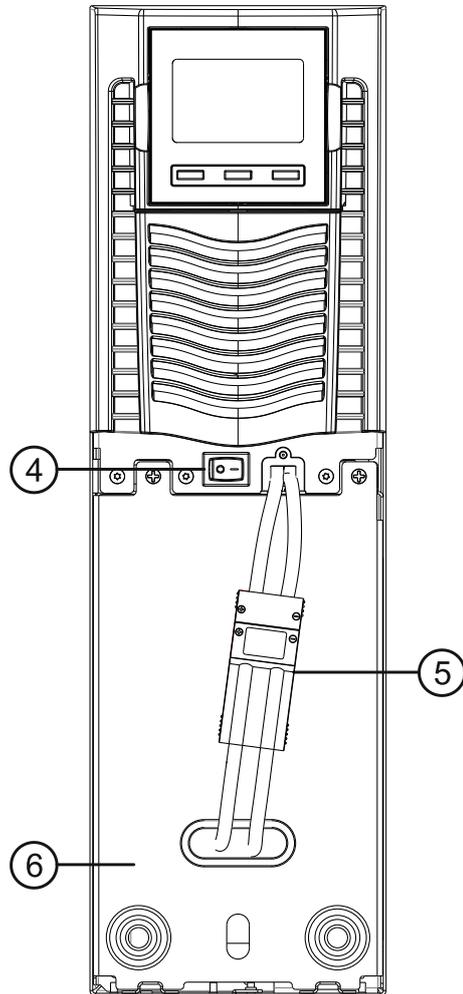
*Example of UPS and BATTERY BOX installed in a rack cabinet*

# UPS VIEWS

## FRONT VIEW



*With front panel*



*Without front panel*

① Extractable/rotatable display plate

② Release slits

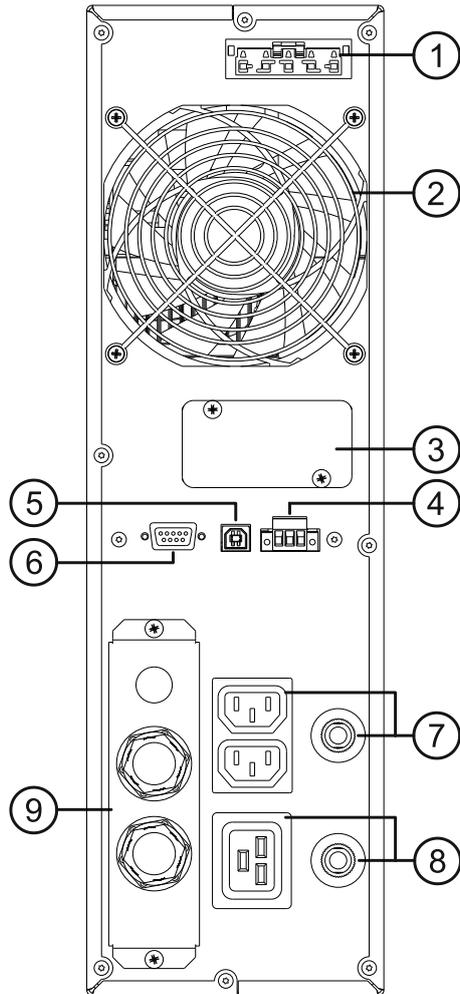
③ Removable front panel

④ I/O Switch

⑤ Battery pack connector

⑥ Battery pack retention panel

## REAR VIEW



① Battery expansion connector

② Cooling fan

③ Communication Card Slot

④ Remote control terminal

⑤ USB communication port

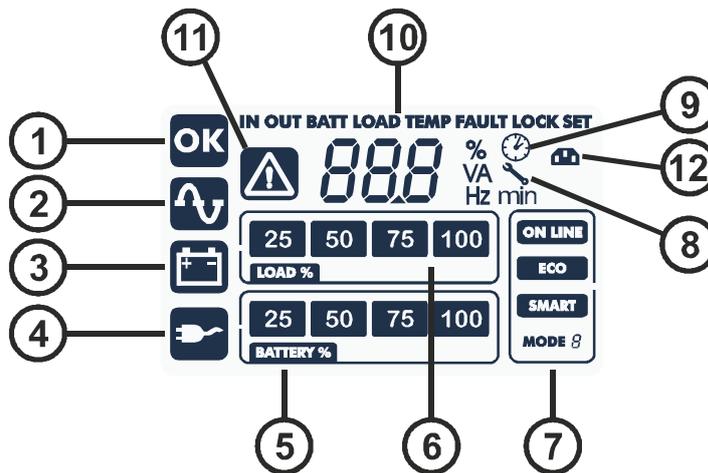
⑥ RS232 communication port

⑦ EnergyShare sockets (10A max) and overcurrent protection

⑧ IEC sockets (16A max) and overcurrent protection

⑨ Protection box for IN/OUT connection

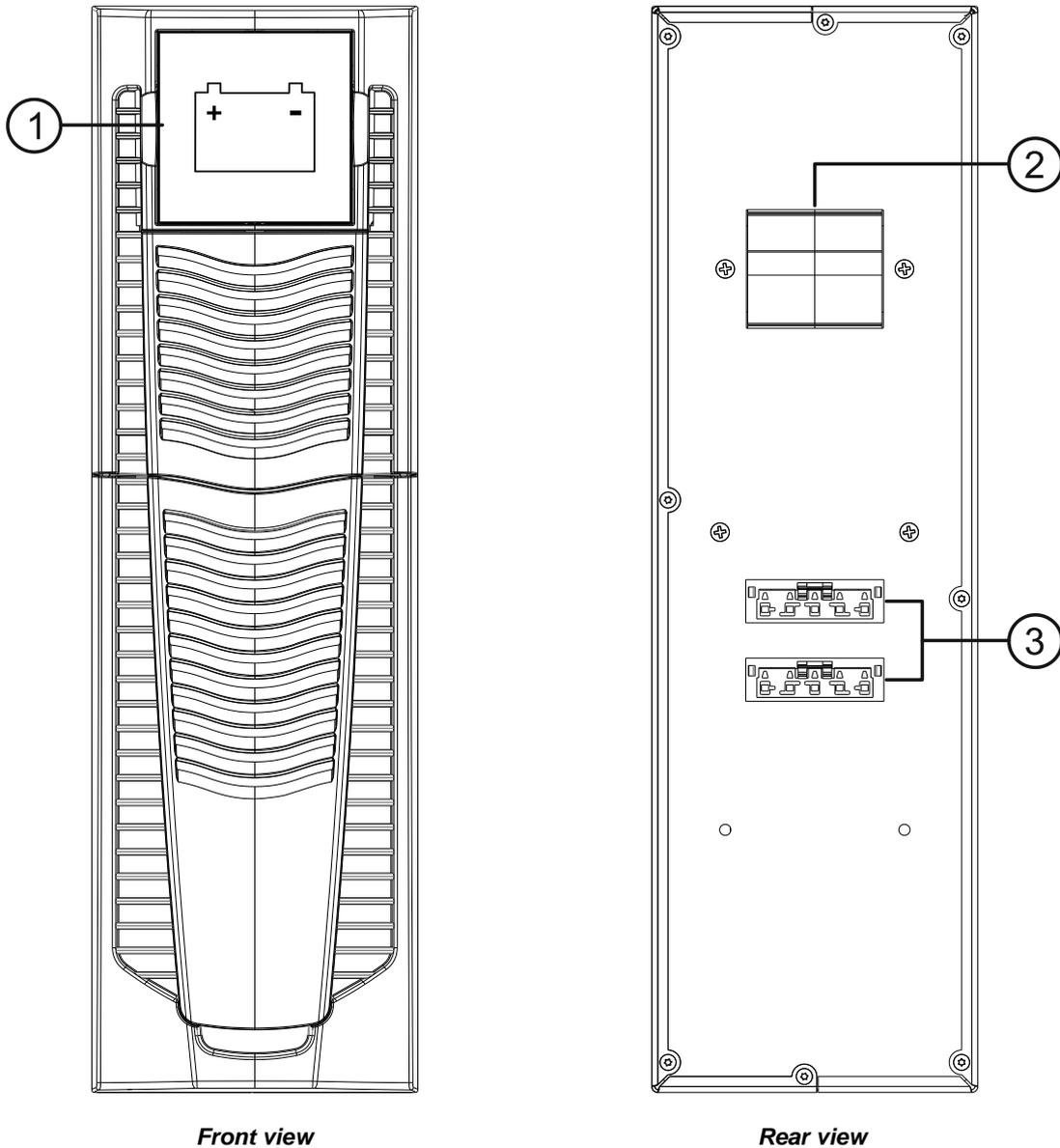
## DISPLAY PANEL VIEW



- |                            |                            |
|----------------------------|----------------------------|
| Ⓐ "SEL" button             | Ⓔ Load level indicator     |
| Ⓑ "ON" button              | Ⓕ Configuration area       |
| Ⓒ "STAND-BY" button        | Ⓖ Maintenance request      |
| ① Regular operation        | ⑨ Timer                    |
| ② Mains operation          | ⑩ Measurement display area |
| ③ Battery operation        | ⑪ Stand-by / alarm         |
| ④ Load powered by bypass   | ⑫ EnergyShare              |
| ⑤ Battery charge indicator |                            |

## BATTERY BOX (OPTIONAL)

The BATTERY BOX, with the same dimensions and aesthetic appearance of the UPS, is optional. The BATTERY BOX contains batteries which allow the operating time of the uninterruptible power supplies to be increased during extended blackouts. The number of batteries contained can vary according to the type of UPS for which the BATTERY BOX is intended. It is therefore necessary to take great care to ensure that the battery voltage of the BATTERY BOX is the same as the voltage permitted by the UPS. Several BATTERY BOXES can be connected in series to achieve a longer extended runtime.



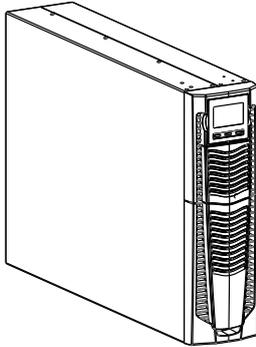
- ① Extractable/rotatable Battery Box plate
- ② Battery isolator
- ③ Battery expansion connector

# INSTALLATION

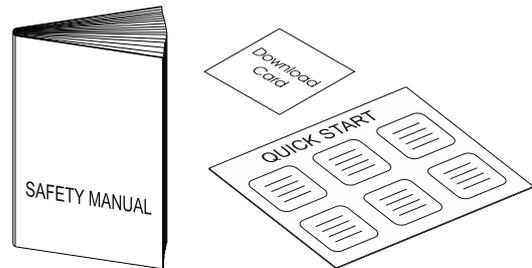
## INITIAL CONTENT CHECK

After opening the packaging, it is first necessary to check the contents.  
The package must contain:

UPS (and eventual BATTERY BOX)



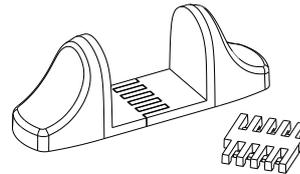
Safety manual + Quick start guide + Download card



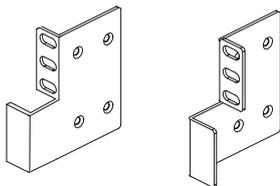
USB cable



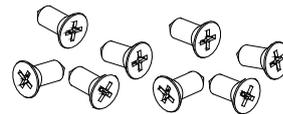
Support feet + extensions



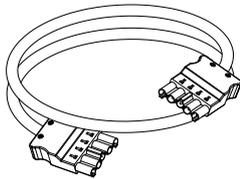
Handles for rack installation



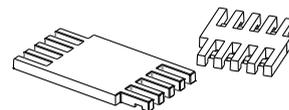
Handle screws



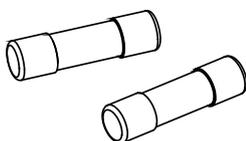
Connection cable UPS - Battery Box  
(only for Battery Box)



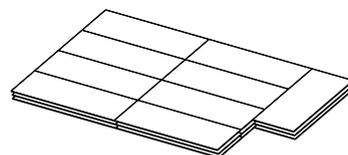
Support feet extensions  
(only for Battery Box)



Fuses  
(only for Battery Box)



Warning labels against backfeed



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## ***INSTALLATION ENVIRONMENT***

The UPS and the Battery Box must be installed in ventilated, clean environments which are sheltered from bad weather. The relative humidity in the environment must not exceed the maximum values shown in the Technical Data table. The ambient temperature, whilst the UPS is in operation, must remain between 0 and 40°C, and the UPS must not be positioned in places which are exposed to direct sunlight or to hot air.



The recommended operating temperature for the UPS and the batteries is between 20 and 25°C. The actual operating life of the batteries is 5 years on average with an operating temperature of 20°C. If the operating temperature reaches 30°C, the operating life is halved.



This is a category C2 UPS product. In a residential environment, this product may cause radio interference, in which case the user may be required to take additional measures.

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## TOWER VERSION

This chapter describes the steps for preparing the UPS and Battery Box for tower version use.

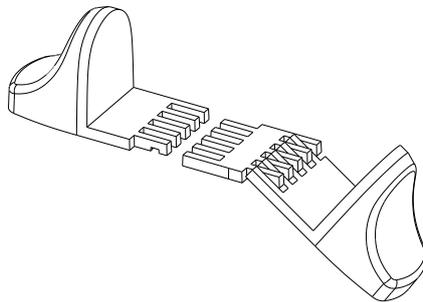


**BEFORE CARRYING OUT THE FOLLOWING SEQUENCE OF OPERATIONS, ENSURE THAT:**

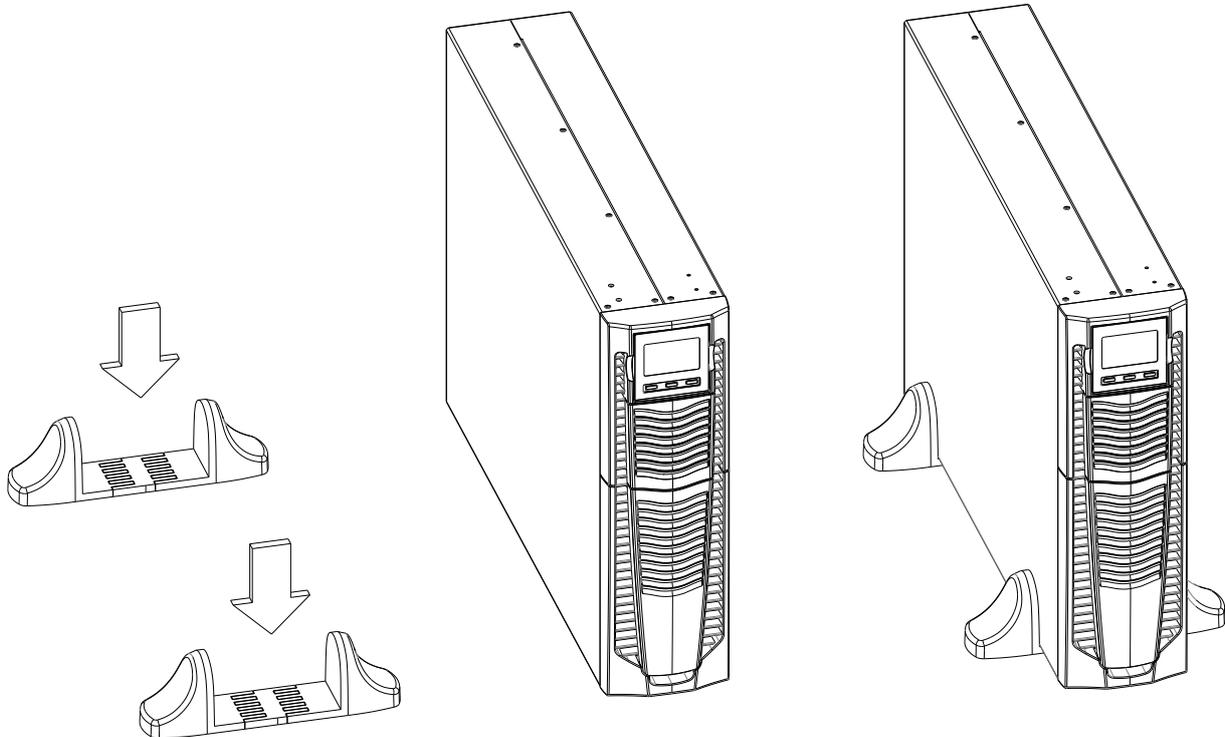
- **THE UPS IS COMPLETELY SWITCHED OFF AND NOT CONNECTED TO THE MAINS POWER SUPPLY OR TO ANY LOAD.**
- **THE BATTERY BOX IS DISCONNECTED FROM THE UPS, FROM ANY OTHER BATTERY BOXES AND WITH THE BATTERY ISOLATOR OPEN**

Once removed from the packaging, the UPS is already preset for installation in the tower configuration. To complete the configuration, simply mount the UPS on the two support feet.

- Each leg consists of three parts, connecting to each other at joints. To put a leg together proceed as shown in the figure.



- Assemble two legs and secure the UPS on top of them as shown in the figure below.

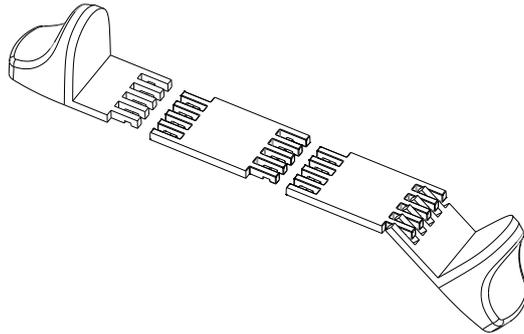


## TOWER VERSION WITH BATTERY BOX

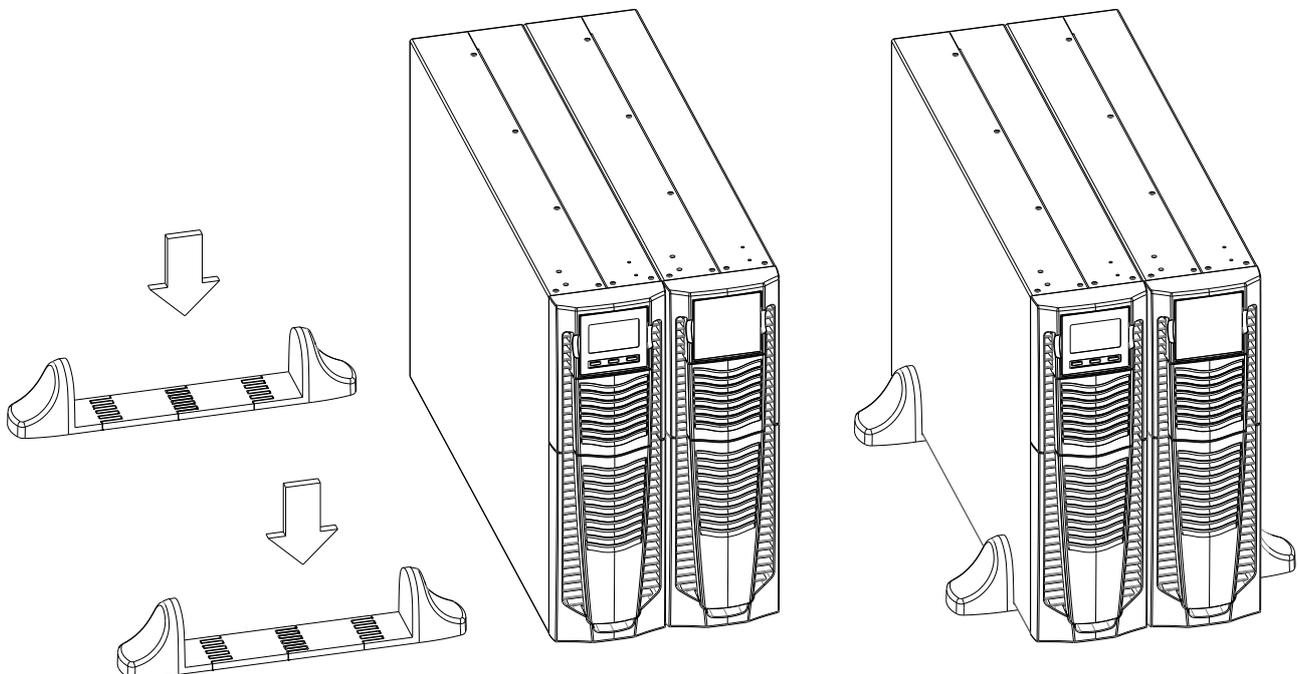


BEFORE CARRING OUT THE FOLLOWING SEQUENCE OF OPERATIONS, ENSURE THAT:

- THE UPS IS COMPLETELY SWITCHED OFF AND NOT CONNECTED TO THE MAINS POWER SUPPLY OR TO ANY LOAD.
  - THE BATTERY BOX IS DISCONNECTED FROM THE UPS, FROM ANY OTHER BATTERY BOXES AND WITH THE BATTERY ISOLATOR OPEN
- For the Battery Box version, each foot is composed of four parts: two supports and an extension. Assemble two feet as indicated in the figure below.



- Slide the UPS and the Battery Box into the two supports.



- For any additional Battery Boxes repeat the sequence of operations shown above.

## RACK VERSION

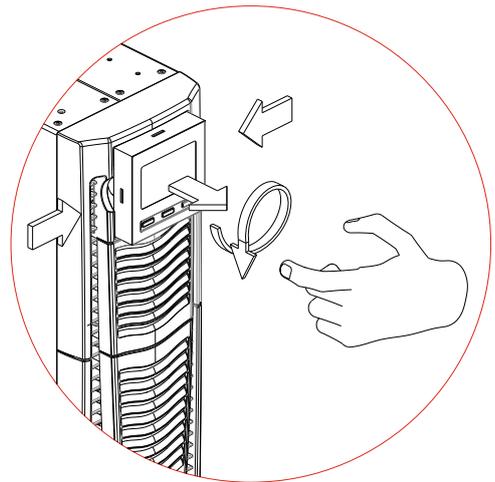
The sequence of operations to be followed in order to transform the UPS or Battery Box into rack version are described below.



**BEFORE CARRING OUT THE FOLLOWING SEQUENCE OF OPERATIONS, ENSURE THAT:**

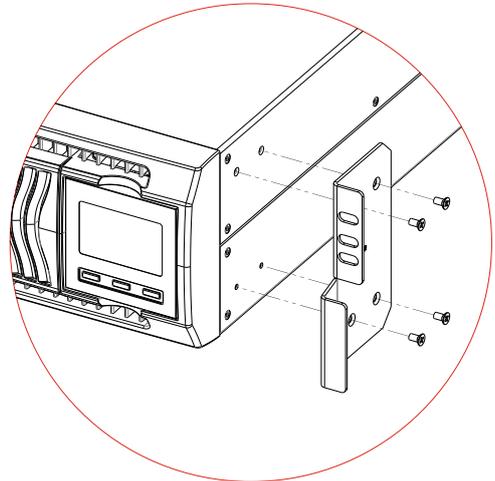
- **THE UPS IS COMPLETELY SWITCHED OFF AND NOT CONNECTED TO THE MAINS POWER SUPPLY OR TO ANY LOAD.**
- **THE BATTERY BOX IS DISCONNECTED FROM THE UPS, FROM ANY OTHER BATTERY BOXES AND WITH THE BATTERY ISOLATOR OPEN**

1. Pick up the panel from the sides and gently pull it away from its position just enough to be able to rotate it.  
ATTENTION: the panel must be removed carefully.  
DO NOT ATTEMPT IN ANY WAY TO REMOVE THE PANEL FROM THE UPS



2. Rotate the panel 90° counter clockwise and reinsert it carefully into the special housing.

3. At this point, with the UPS or Battery Box in the horizontal position, secure the handles using the screws provided, as shown in the figure.



**NOTE:** Given the heavy weight, the use of support brackets is mandatory during rack installation (guide with L-shaped support). For the same reason, it is recommended that the UPS and Battery Box be installed in the lower part of the rack cabinet.

## POWER CONNECTION



**ALL OPERATIONS DESCRIBED IN THIS SECTION MUST BE PERFORMED BY QUALIFIED PERSONNEL ONLY. Our Company assumes no liability for damages caused by incorrect connections or operations not contained in this manual.**



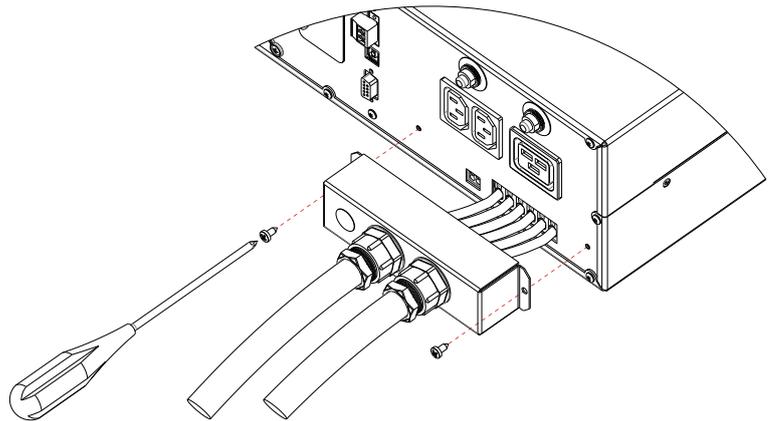
**The UPS has HAZARDOUS electrical voltages inside it, even when the input and/or battery switches are off. The inside of the UPS is protected by safety panels which should not be removed by untrained personnel. All installation and maintenance or operations involving access inside the UPS require the use of tools and may ONLY be performed by trained personnel.**

**To carry out the following operations, the UPS must be disconnected from the mains power supply, switched off, and with all the equipment switches and fuse holders open.**

1. We recommend using double-insulated multi-core cables to be connected, respectively, to the "INPUT" and "OUTPUT" terminals.
2. For the cross section, refer to the paragraph "Connection cables cross section details".
3. The wires should be stripped and inserted into the terminals (for the length of the stripping, refer to the paragraph "Connection cables cross section details").

**NOTE:** To remove the wire, insert a flat blade screwdriver into the clamp slot above the wire inlet.

4. Secure the cables with the cable glands.
5. When the installation is complete, close the drawer cover and secure with the screws.



*Terminals cover installation*

## INTERNAL PROTECTIVE DEVICES OF THE UPS

Located within the UPS are fuses (not accessible, not recoverable) in order to protect the rectifier input stage and the batteries.

### SHORT CIRCUIT

If a fault occurs on the load, the UPS protects itself by limiting the value and the duration of the current supplied (short circuit current). These values also depend on the UPS operating status at the time of the fault, these can either be (in the "Technical Data" table the protection characteristics and timings are described):

- UPS in NORMAL OPERATION: the load is switched instantaneously to the bypass line; the input line is connected to the output without any internal protection.
- UPS in BATTERY OPERATION: the UPS protects itself by providing an higher current than the nominal one (see paragraph "Technical Data") and turns itself off after this time has elapsed.

### BACKFEED

The UPS has internal protection against backfeed. However, the label supplied with the UPS must be affixed to all disconnectors installed within the electrical system upstream of the UPS.

## EXTERNAL PROTECTIVE DEVICES

### LINE PROTECTION: MAGNETOTHERMAL OR FUSE

Within the UPS there are protection devices for output and internal faults.

You must protect the input line with the appropriate protection devices. These devices must comply with the regulations of the country where the UPS is installed.

In order to set up the power line, install a magnetothermal switch upstream from the UPS with intervention curve C or D (breaking capacity  $\geq 3\text{kA}$ ) or gR fuses with nominal current of 25A.

### SAFETY DEVICES: RCD (RESIDUAL CURRENT DEVICE)



The UPS can cause a D.C. current in the PE conductor.

An RCD located upstream is suggested: its trip current should be the sum of UPS + Load leakage current, with a suitable margin to prevent unwanted interventions.

Only a RCD Type B is allowed.

## CONNECTION CABLES CROSS SECTION DETAILS

The minimum cross section of the input and output cables (on terminals) is 4sqmm\*.

The stripping length of the cables must be 15mm.

\* The cross sections refer to bare cables (without lugs) with a maximum length of 10 meters.

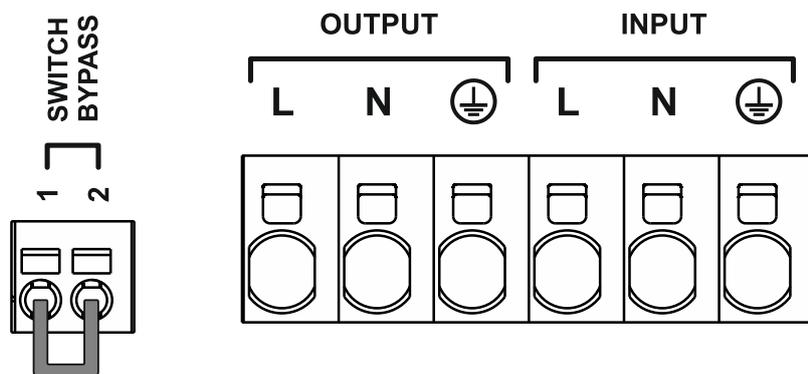
## CONNECTIONS



**The first wire to be connected is the protective earth wire, which is to be inserted in the terminal marked with symbol .**

**During operation the UPS must be connected to the earthing system.**

Connect the input and output cables to the terminal board as shown in the figure below:



### NOTE

1. If an "external manual bypass" is not provided, make sure that there is a jumper between terminals 1 - 2 (Switch bypass).
2. The maximum cross section of the cables that may be inserted in the terminal board 1 & 2 are:
  - 2.5 sqmm for bare cables
  - 1.5 sqmm for cables with lugs

The stripping length is 8 mm.

## BATTERY BOX INSTALLATION



**ATTENTION:**

**CONFIRM ON THE SPECIFICATION LABEL THAT THE VOLTAGE FROM THE BATTERY BOX IS THE SAME AS THAT ALLOWED BY THE UPS.**

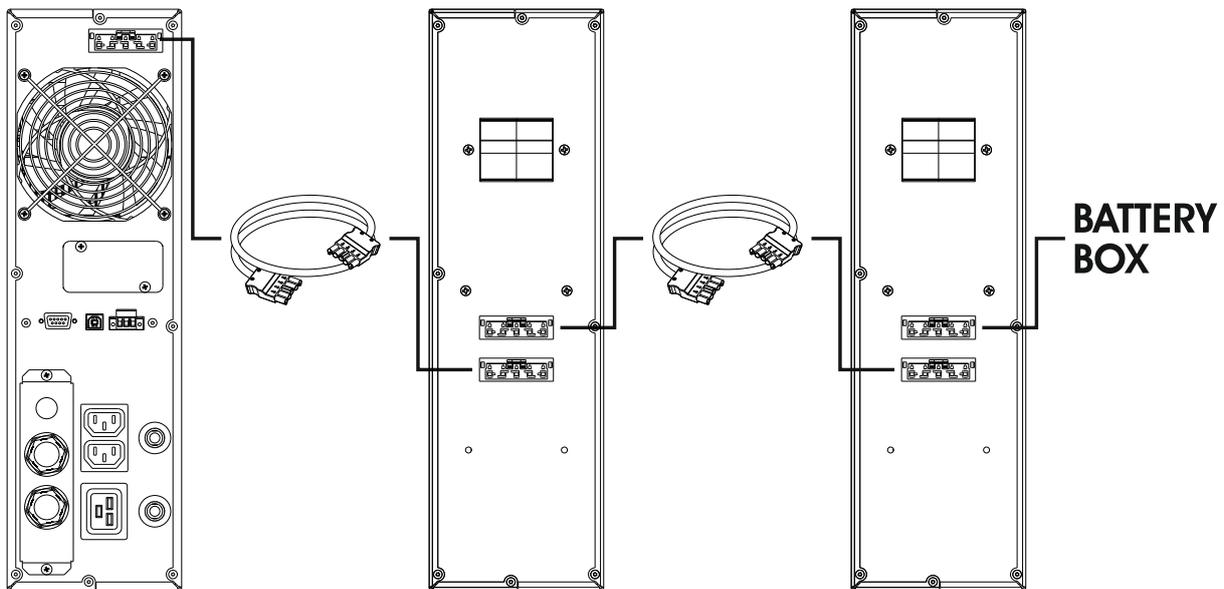
**CONFIRM THAT THE BATTERY BOX IS EQUIPPED WITH A 50A gR FUSE TO PROTECT THE BATTERY EXPANSION PORT OF THE UPS.**

**THE CONNECTION BETWEEN THE UPS AND THE BATTERY BOX MUST BE MADE WITH THE BATTERY BOX FUSE HOLDERS OPEN.**

**CONNECT THE CABLE BETWEEN THE UPS AND BATTERY BOX.**

**CLOSE THE FUSE HOLDERS ONLY IF THE UPS IS POWERED ON OR IN STAND-BY CONDITION.**

Battery boxes can be installed in series for extended runtimes. Connect the Battery Boxes in series as shown in the figure below:



### CONFIGURING THE RATED BATTERY CAPACITY

Before installing one or more Battery Boxes, the UPS must be configured in order to update the rated capacity value (total Ah UPS's internal batteries + external batteries) using the dedicated configuration software.

The Battery Box must only be installed while the UPS is switched off and disconnected from the mains power supply.



**CAUTION:**

The connection cables cannot be extended by the user.

The maximum length of the connecting cables between the UPS (without internal batteries) and the Battery Box is 3 meters.

After connecting the UPS to its Battery Boxes, insert the fuses and turn the Battery Box battery isolators (SWBATT) to the ON position.

It is recommended that you do not connect more than 5 Battery Boxes in cascade to a single UPS. To increase capacity, we recommend installing a Battery Box with higher battery capacity.

## CONNECTIONS AND SWITCHING ON FOR THE FIRST TIME

- 1) Power ON the UPS.
- 2) Press the 1/0 switch located under the removable front panel.
- 3) After a few moments, the UPS will switch on, the display will light up, there will be a beep and the  icon will start to flash. The UPS is in stand-by mode: meaning that it is only consuming a small amount of power. The microcontroller supervising the self-diagnoses is powered; the batteries are charging; and everything is ready for UPS activation. Battery operation is also in stand-by mode provided that the timer is active.
- 4) Connect the equipment to the output of the UPS using cables no longer than 10 metres.  
WARNING: Do not connect the IEC 10A and 16A sockets to devices that absorb more than 10A or 16A respectively. For equipment that exceeds these levels, use the appropriate terminals only.
- 5) Check which operating mode is set on the display and, if necessary, see the “**Configuring operating modes**” paragraph to set the required mode. For advanced configurations, set up the UPS with the appropriate configuration software.

## SWITCHING ON FROM THE MAINS

- 1) Press the “ON” button for 1 second. After pressing it, all the icons on the display light up for 1 second and the UPS beeps.
- 2) Switch on the equipment connected to the UPS.

**When switching on for the first time only:** after 30 seconds, check that the UPS is operating correctly:

- 1) Simulate a blackout by disconnecting power to the UPS.
- 2) The load must continue to be powered, the  icon on the display must light up and there must be a beep every 4 seconds.
- 3) When power is reconnected, the UPS must go back to operating from the mains.

## SWITCHING ON FROM THE BATTERY

- 1) Press the 1/0 switch located under the removable front panel.
- 2) Hold down the “ON” button for at least 5 seconds. All the icons on the display light up for 1 second.
- 3) Switch on the equipment connected to the UPS.

## SWITCHING OFF THE UPS

In order to switch off the UPS, hold down the “STBY” button for at least 2 seconds. The UPS goes back to stand-by mode and the  icon starts to flash:

- 1) If the mains power is present, the 1/0 switch must be pressed to completely turn off the UPS.
- 2) During battery mode operation with the timer not set, the UPS automatically switches off after 30 seconds. However if, the timer is set, press and hold down the “STBY” key for at least 5 seconds to turn off the UPS. For complete shutdown, press the 1/0 switch.

## DISPLAY PANEL MESSAGES

This chapter describes, in detail, the various information that can be displayed on the LCD.

### UPS STATUS MESSAGES

| ICON  | STATUS     | DESCRIPTION  |
|---|------------|--|
|    | Fixed      | Indicates a fault  |
|   | Flashing   | The UPS is in stand-by mode  |
|    | Fixed      | Indicates regular operation  |
|    | Fixed      | The UPS is operating from the mains  |
|   | Flashing   | The UPS is operating from the mains, but the output voltage is not synchronised with the mains voltage   |
|    | Fixed      | The UPS is operating from the battery. In this condition, the UPS emits an acoustic signal (beep) at regular 4-second intervals.                   |
|   | Flashing   | Low battery pre-alarm. Indicates that battery autonomy is coming to an end. In this condition, the UPS emits a beep at regular 1-second intervals. |
|  | Fixed      | Indicates that the loads connected to the UPS are powered by the bypass  |
|  | Dynamic    | Indicates the estimated percentage charge of the batteries   |
|  | Dynamic    | Indicates the percentage of load applied to the UPS compared with the nominal value.   |
|  | Flashing   | Maintenance is required. Contact the support centre.   |
|  | Fixed      | Indicates that the timer is active (programmed switch-on and switch-off). The timer can be activated/deactivated using the configuration software. |
|   | Flashing   | 1 minute until the UPS switches back on or 3 minutes until it switches off   |
|  | Off *      | The EnergyShare sockets are not configured (always connected).   |
|   | Fixed*     | The EnergyShare sockets was configured via configuration software. At this time the sockets are connected.   |
|   | Flashing * | The associated event occurred; the EnergyShare outlets have been disconnected.   |

\* For more information about the configuration of the EnergyShare sockets, see "Additional functions"

## MEASUREMENT DISPLAY AREA

The front panel can be used to display important UPS operating information. When the UPS is switched-on, the display shows the main voltage value.

To display a different measurement, press the “SEL” button repeatedly until the desired measurement appears.

In the event of a fault/alarm (FAULT) or a lock (LOCK), the display will automatically show the type and code of the corresponding alarm.

Some examples are shown below:

| GRAPHIC EXAMPLE <sup>(1)</sup>  | DESCRIPTION  | GRAPHIC EXAMPLE <sup>(1)</sup>   | DESCRIPTION                  |
|---|--|--|------------------------------|
|    | Mains voltage  |    | Residual battery autonomy    |
|    | Mains frequency  |    | Battery charge percentage    |
|    | UPS output voltage   |    | Total battery voltage        |
|   | Output voltage frequency   |   | Applied load percentage      |
|  | Fault / Alarm <sup>(2)</sup> : the corresponding code is displayed |  | Current absorbed by the load |
|  | Lock <sup>(2)</sup> : the corresponding code is displayed          |  | UPS internal temperature     |

<sup>(1)</sup> The values shown in the images in the table are purely as an indication.

<sup>(2)</sup> The FAULT / LOCK codes can only be displayed if they are active (presence of a fault/alarm or a lock).

---

## OPERATING MODE CONFIGURATION

The area of the display shown in the figure displays the active operating mode and allows the user to choose other modes directly from the display panel.



### HOW TO PROCEED:

- To access the configuration area, hold down the “SEL” button for at least 3 seconds till the “SET” icon lights up.
- To change the mode, press the “ON” button.
- To confirm the mode chosen, hold down the “SEL” button for at least 3 seconds till the “SET” icon lights down.

### POSSIBLE SETTINGS

The UPS is designed to be configured in various operating modes:

- **ON-LINE** is the mode with the greatest load protection and the best quality of the output waveform (\*)
- **ECO** is the mode with which the UPS consumes the least amount of power, and is therefore the most efficient (\*\*)
- **SMART ACTIVE:** in this mode, the UPS decides whether to operate in ON-LINE or ECO mode according to a statistic about the quality of the mains power.
- **STAND-BY OFF [Mode 1]:** the UPS operates as an emergency power supply. If mains power is present, the load is not powered, however should the mains supply fail, the load is powered by the UPS.

Additional operating modes can be set through the configuration software.

(\*) The effective value (rms) of the output frequency and voltage is constantly controlled by the microprocessor, independently from the waveform of the mains voltage, maintaining the output frequency synchronised to the mains within a configurable range.

Outside this range, the UPS output de-synchronises from the mains supply, moving to the nominal frequency; in this condition, the UPS cannot use the bypass.

(\*\*) In order to optimise performance, in ECO mode, the load is normally powered by the bypass. If the mains goes out of the permitted tolerance range, the UPS switches to ON LINE operation. If the mains returns within the permitted tolerance range for at least five minutes, the UPS goes back to powering the load from the bypass.

### ADDITIONAL FUNCTIONS

#### MANUAL BYPASS

Using the Manual Bypass feature, the UPS can be switched to bypass. In this condition the load is powered directly by the input mains, any disruption in the mains directly affects the load.



**CAUTION:**

**BEFORE CARRYING OUT THE FOLLOWING SEQUENCE OF OPERATIONS, ENSURE THAT THE UPS'S INPUT AND OUTPUT FREQUENCY COINCIDE AND THAT THE UPS IS NOT OPERATING FROM THE BATTERY**

**Attention: even when the UPS is switched on, the load is disconnected in the event of a mains blackout.**

If the input mains deviates from the established tolerances, the UPS automatically switches to Stdby mode and disconnects the load.

To force the UPS into manual bypass mode, press and hold down the ON and SEL keys simultaneously for at least 4 seconds. The code "C02" appears on the display.

To return to the normal operation mode press the ON and SEL keys again for at least 4 sec.

**PROGRAMMABLE AUXILIARY SOCKETS (EnergyShare)**

The EnergyShare sockets are outlets that allow for the automatic disconnection of the load applied to them in certain operating conditions. The events that determine automatic disconnection of the EnergyShare sockets can be selected by the user through the configuration software. For example, it is possible to select disconnection after a certain period of battery operation; or when the pre-alarm threshold for battery discharge has been reached, or when an overloading event occurs.

By default the Energyshare sockets are not configured and therefore function as other outlets.

The EnergyShare function is associated with an icon on the display whose meaning is explained in the paragraph entitled "Display panel messages".

The presence and the number of these sockets will depend upon the UPS type, these sockets are easily recognised by the EnergyShare label located beside them.

**REMOTE CONTROL TERMINAL BOARD and R.E.P.O.**

The remote control terminal allows for implementation of the REPO function (Remote Emergency Power Off) and to remotely switch ON and switch OFF the UPS.

The UPS is provided by the manufacturer with the REPO terminals short-circuited. For installation remove the short circuit and connect to the device's normally closed contact

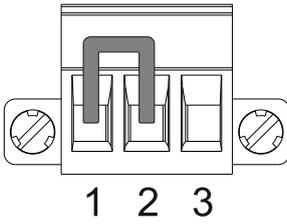
In case of an emergency, if the stop device is used, the REPO control is opened and the UPS goes into stand-by mode and the load is completely disconnected.

**Attention:** before restarting the UPS, reset the stop device.

The circuitry of the remote control terminal board is self-powered with SELV circuits. Therefore, an external voltage supply is not required. When a contact is closed, a maximum current of 15mA circulates.

All connections with the remote control terminal board are made through a cable which guarantees a double insulation connection.

Logic of the connections:

|   |           |   |
|---|-----------|---|
|  | R.E.P.O.  | This feature is activated by opening the contact between pin's 1 and 2.                   |
|   | REMOTE ON | This feature is activated by closing the contact between pin's 2 and 3 for a few seconds. |

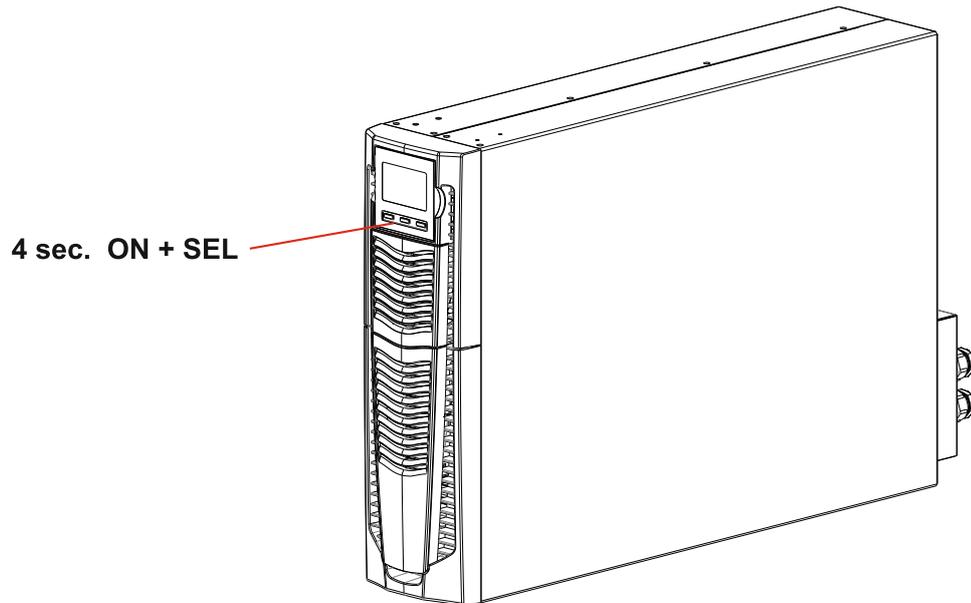
## BATTERY PACK REPLACEMENT

The UPS is also equipped with a dedicated battery pack that allows for easy replacement of batteries (**hot swap**) in complete safety, thanks to the protected connection system.

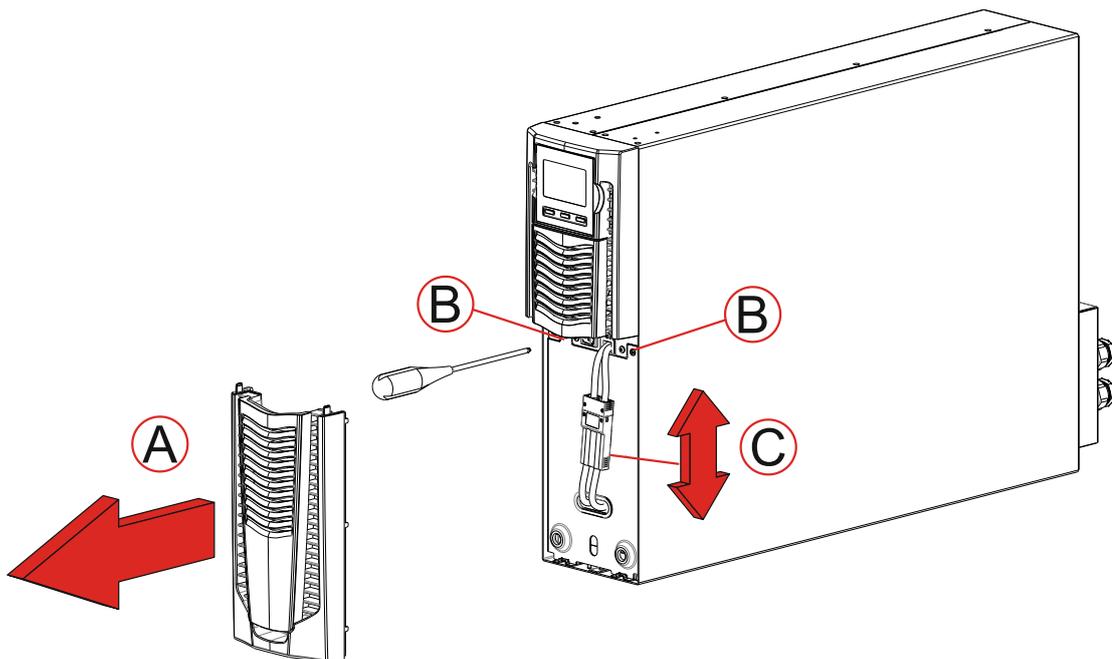


- **WHEN THE BATTERY PACK IS DISCONNECTED, THE LOADS CONNECTED TO THE UPS ARE NOT PROTECTED IN THE EVENT OF A MAINS FAILURE**
- **THE BATTERY PACK IS VERY HEAVY. USE EXTREME CAUTION WHEN REPLACING IT.**

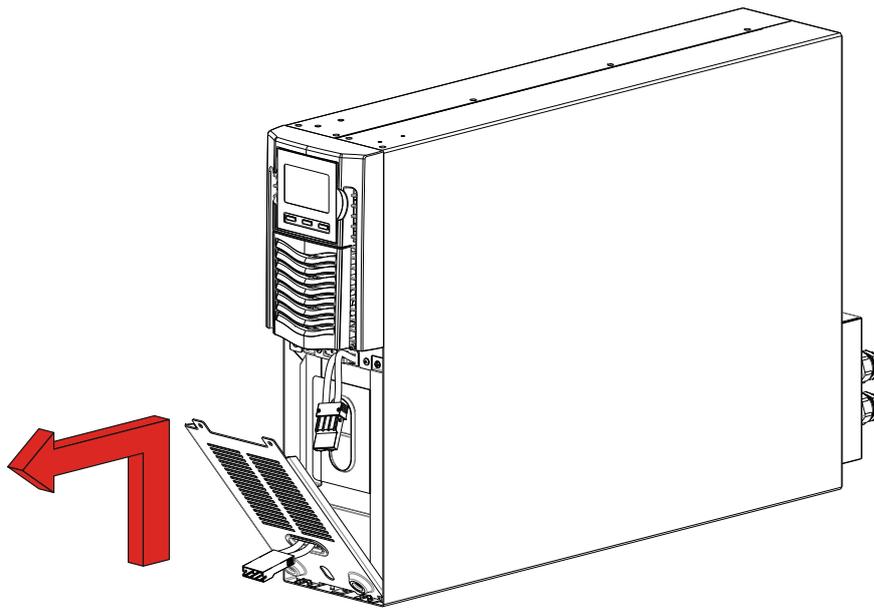
1. Set the UPS to bypass mode manually by pressing the ON-SEL buttons for 4 seconds (see paragraph entitled "Manual Bypass"). The display should show the message "C02".  
NOTE: in this condition the load is powered by bypass.



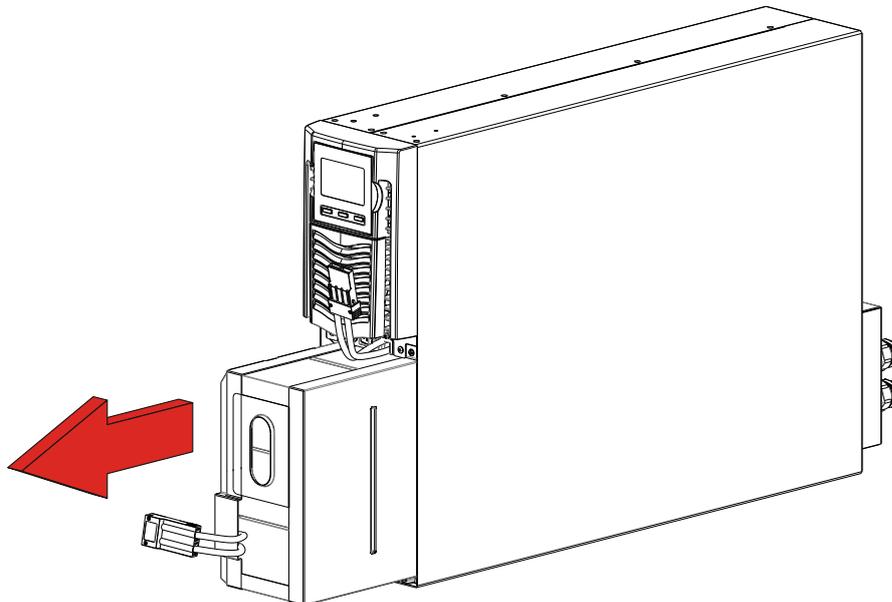
2. The battery pack is positioned behind the UPS front panel. Remove the front panel as shown in the figure below (A). Remove the screws from the battery pack's retention panel (B). Disconnect the connector that connects the battery pack to the UPS (C).



3. Remove the battery pack's retention panel carrying out the operations shown in the figure below.



4. Slip off the battery pack pulling it towards the outside, as shown in the figure below. Be careful when extracting and lifting up the battery pack as it is heavy.  
ATTENTION: the new battery pack must contain the same number and type of batteries (see the label located on the battery pack near the connector).



5. Insert the new battery pack into the compartment, sliding it into the UPS. Put the battery pack retention panel back in position and secure it with the two screws removed previously. Connect the battery pack cable to the UPS and close the front panel. Set the UPS to normal operation mode by pressing ON + SEL for at least 4 seconds.
6. Make sure that the display does not show the code "C02".
7. Press the ON key for 5 seconds to start the battery status verification procedure.

## SOFTWARE

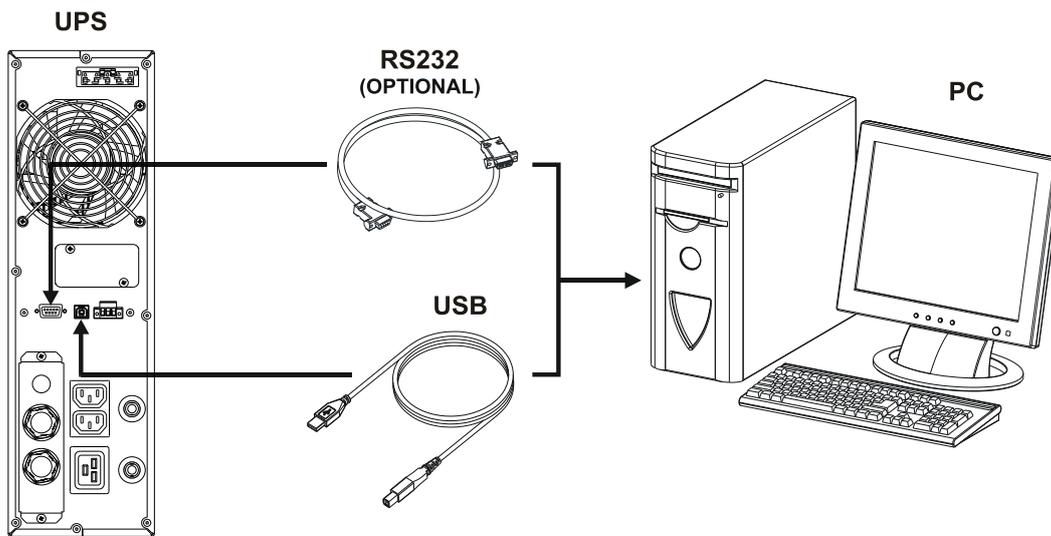


### CAUTION:

If the RS232 communication port is used, it is not possible to communicate with the USB port and vice versa. It is advisable to use a cable which is shorter than 3 metres for communication with the UPS. To obtain additional communication ports with different functions, independent from the standard USB and RS232 ports on the UPS, various accessories are available which can be inserted into the communication card slot.



To check the availability of new, more updated software versions or for more information about the accessories available, consult the website [www.riello-ups.com](http://www.riello-ups.com).



## MONITORING AND CONTROL SOFTWARE

The **PowerShield<sup>3</sup>** software guarantees effective, intuitive UPS management, displaying all the most important information such as input voltage, applied load and battery capacity. It is also able to perform shutdown operations, send e-mails and network messages automatically when certain events (selected by the user) occur.

### INSTALLATION OPERATIONS

- 1) Connect one of the UPS's communication ports to one of the PC's communication ports using the cable supplied.
- 2) Download the software from the web site [www.riello-ups.com](http://www.riello-ups.com) selecting the specific operating system.
- 3) Follow the installation program instructions.
- 4) For more detailed information please read the user manual which can be downloaded from [www.riello-ups.com](http://www.riello-ups.com).

## CONFIGURATION SOFTWARE

Configuration and customisation software (**UPSTools**) allows the configuration and complete visualisation of UPS status via USB or RS232 port. For a list of possible configurations available to the user, refer to the "UPS Configuration" paragraph.

### INSTALLATION OPERATIONS

- 1) Connect one of the UPS's communication ports to one of the PC's communication ports using the cable supplied.
- 2) Follow the installation program instructions, For more detailed information about installation and use, refer to the software manual which can be downloaded from our website [www.riello-ups.com](http://www.riello-ups.com).

## UPS CONFIGURATION

The table below illustrates all the possible configurations available to the user in order to best adapt the UPS for individual requirements. It is possible to perform these operations using the configuration software.

| FUNCTION                               | DESCRIPTION   | DEFAULT  | POSSIBLE CONFIGURATIONS   |
|--|---|----------|---|
| <b>Output nominal frequency *</b>      | Selects the rated output frequency  | Auto     | <ul style="list-style-type: none"> <li>• 50 Hz</li> <li>• 60 Hz</li> <li>• Auto: automatic learning of the input frequency</li> </ul>                                     |
| <b>Output voltage</b>                  | Selects the nominal output voltage  | 230V     | 220 ÷ 240 in 1V steps   |
| <b>Operating mode</b>                  | Selects one of the 4 different operating modes  | ON LINE  | <ul style="list-style-type: none"> <li>• ON LINE</li> <li>• ECO</li> <li>• SMART ACTIVE</li> <li>• STAND-BY OFF (MODE 1)</li> </ul>                                       |
| <b>Bypass operation *</b>              | Selects the mode of use of the bypass line  | Normal   | <ul style="list-style-type: none"> <li>• Normal</li> <li>• Disabled with input/output synchronisation</li> <li>• Disabled without input/output synchronisation</li> </ul> |
| <b>Power-off due to minimum load</b>   | Automatic UPS power-off in battery operation mode if the load is lower than 5%  | Disabled | <ul style="list-style-type: none"> <li>• Enabled</li> <li>• Disabled</li> </ul>   |
| <b>Autonomy limit</b>                  | Maximum battery operation time  | Disabled | <ul style="list-style-type: none"> <li>• Disabled (complete battery discharge)</li> <li>• (1 ÷ 65000) sec. in 1 sec. steps</li> </ul>                                     |
| <b>Battery low warning</b>             | Estimated autonomy time remaining for the battery low warning   | 3 min.   | (1 ÷ 255) min. in 1 min. steps  |
| <b>Battery test</b>                    | Interval of time for the automatic battery test   | 40 hours | <ul style="list-style-type: none"> <li>• Disabled</li> <li>• (1 ÷ 1000) h in 1hour steps</li> </ul>   |
| <b>Maximum charge alarm threshold</b>  | Selects the user overcharge limit   | Disabled | <ul style="list-style-type: none"> <li>• Disabled</li> <li>• (0 ÷ 103) % in 1% steps</li> </ul>   |
| <b>Input frequency tolerance range</b> | Selects the permitted range for the input frequency for switching to the bypass and for the synchronisation of the output | ± 5%     | (±3 ÷ ±10) % in 1% steps  |

\* for "Frequency converter" mode configurations or if the synchronisation with the bypass is disabled, the UPS will derate the output power.

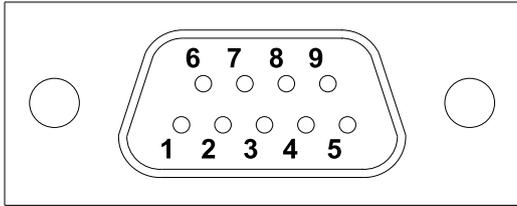
| FUNCTION                                 | DESCRIPTION  | DEFAULT                           | POSSIBLE CONFIGURATIONS   |
|--|--|-----------------------------------|---|
| <b>Bypass voltage thresholds</b>         | Selects the permitted voltage range for switching to the bypass        | Low: 180V<br>High: 264V           | <ul style="list-style-type: none"> <li>• Low: 180 ÷ 200 in 1V steps</li> <li>• High: 250 ÷ 264 in 1V steps</li> </ul> |
| <b>Bypass voltage Thresholds for ECO</b> | Selects the permitted voltage range for operation in ECO mode          | Bassa: 200V<br>Alta: 253V         | <ul style="list-style-type: none"> <li>• Low: 180 ÷ 220 in 1V steps</li> <li>• High: 240 ÷ 264 in 1V steps</li> </ul> |
| <b>Intervention sensitivity for ECO</b>  | Selects the intervention sensitivity during operation in ECO mode      | Normal                            | <ul style="list-style-type: none"> <li>• Low</li> <li>• Normal</li> <li>• High</li> </ul>                             |
| <b>Power-on delay</b>                    | Waiting time for automatic switching back on after mains power returns | 5 sec.                            | <ul style="list-style-type: none"> <li>• Disabled</li> <li>• (1 ÷ 255) sec. in 1 sec. steps</li> </ul>                |
| <b>Remote power-on/off function</b>      | Select the feature associated with the remote control terminal board.  | Pin 1-2 REPO<br>Pin 2-3 Remote ON | <ul style="list-style-type: none"> <li>• Pin 1-2 REPO</li> <li>• Pin 2-3 Remote ON, Remote ON/OFF</li> </ul>          |

## COMMUNICATION PORTS

On the back of the UPS (see *UPS Views*), the following communication ports are present:

- RS232 connector
- USB connector
- Expansion slot for additional communication cards

### RS232 CONNECTOR

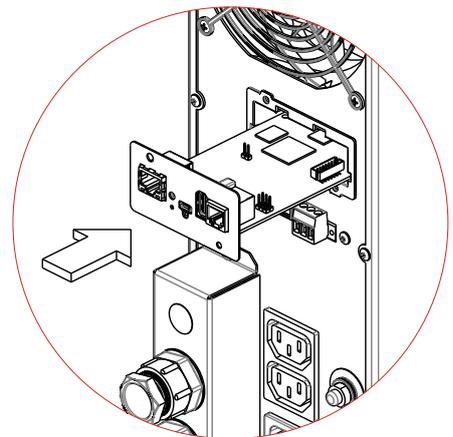
| RS232 CONNECTOR  |  |  |
|--|--|--|
|  |  |  |
| PIN #  | SEGNALE  | NOTE   |
| 1  | Programmable OUTPUT #3 *: [default: UPS in lock]           | (*) Opto-isolated contact max. +30Vdc / 35mA.<br>These contacts can be associated with other events using the configuration software<br><br>For further information about interfacing with the UPS, refer to the dedicated manual. |
| 2  | TXD  |  |
| 3  | RXD  |  |
| 5  | GND  |  |
| 6  | Power supply DC (Imax = 20mA)                              |  |
| 8  | Programmable OUTPUT #1 *: [default: low battery pre-alarm] |  |
| 9  | Programmable OUTPUT #2 *: [default: battery operation]     |  |

### COMMUNICATION SLOT

The UPS is equipped with an expansion slot for optional communication cards (see figure on right) which allows the device to communicate using the main communication standards.

Some examples:

- Second RS232 / USB port
- Serial duplicator
- Ethernet network card with TCP/IP, HTTP, HTTPS and SNMP protocols
- JBUS / MODBUS protocol converter card
- PROFIBUS protocol converter card
- Card with relay isolated contacts



To check the availability of other accessories, visit the website [www.riello-ups.com](http://www.riello-ups.com).

# TROUBLESHOOTING

An irregular operation of the UPS is frequently not due to malfunctions, but to simple problems, inconveniences or distractions. Therefore, the user is advised to consult the table below providing useful information on how to solve the most common problems.



**WARNING:** the table below often refers to the use of the maintenance *BYPASS* (SWMB). If the device is installed, before restoring the correct operation of the UPS, make sure that it is switched on and **not in *STAND-BY***.

NOTE: For the exact meaning of the codes mentioned in the table, please read the “ALARM CODES” section.

| PROBLEM  | POSSIBLE CAUSE   | SOLUTION   |
|--|--|--|
| THE DISPLAY DOES NOT LIGHT UP  | 1/0 SWITCH IS SET TO 0   | Set the switch to 1  |
|  | CONNECTION TO THE INPUT TERMINAL MISSING                                 | Connect the mains to the terminals following the indications in the paragraph on Installation  |
|  | NEUTRAL CONNECTION MISSING   | The UPS cannot function without the neutral connection. <b>WARNING:</b> the absence of this connection can damage the UPS and/or the load. Connect the mains to the terminals as explained in the paragraph on installation. |
|  | THE ISOLATOR (SWIN) IS OPEN  | Close the isolator   |
|  | MAINS POWER MISSING (BLACKOUT)   | Make sure the mains power is present. If necessary, perform battery start-up to power the load.  |
|  | INTERVENTION OF THE UPSTREAM PROTECTION DEVICE                           | Restore the protection.<br><b>WARNING:</b> make sure there is no overload or short circuit on the UPS output.  |
| THE DISPLAY IS ON BUT THE LOAD IS NOT POWERED                                    | THE UPS IS IN STAND-BY MODE  | Press the “ON” button on the front panel to power the loads.   |
|  | THE STAND-BY OFF MODE IS SELECTED  | It is necessary to change mode. The STAND-BY OFF (emergency power supply) mode, in fact, only powers the loads in the event of a blackout.   |
|  | NO CONNECTION TO THE LOAD  | Check the connection to the load.  |
|  | MALFUNCTION OF THE UPS AND AUTOMATIC BYPASS OUT OF USE                   | Insert the maintenance bypass (SWMB) and contact the nearest service centre  |
| THE UPS OPERATES OFF THE BATTERIES EVEN THOUGH MAINS POWER IS PRESENT            | INTERVENTION OF THE UPSTREAM PROTECTION DEVICE                           | Restore the protection.<br><b>WARNING:</b> make sure there is no overload or short circuit on the UPS output.  |
|  | THE INPUT VOLTAGE IS OUT OF THE ALLOWED OPERATING VALUES FOR MAINS POWER | Problem caused by the mains power. Wait for the input mains voltage to return within the tolerance limits. The UPS will return automatically to mains operation.   |
| THE UPS DOES NOT TURN ON AND THE DISPLAY SHOWS ONE OF THE CODES: <b>A06, A08</b> | THE TEMPERATURE OF THE UPS IS LOWER THAN 0°C                             | Check the temperature of the environment in which the UPS is located; if it is too low, bring it past the minimum threshold (0°C).   |

| PROBLEM   | POSSIBLE CAUSE   | SOLUTION   |
|---|--|--|
| THE DISPLAY SHOWS THE CODES: <b>L10, L11, F11</b>   | INPUT RELAY FAULTY   | Switch off and disconnect the UPS from the power supply and contact the support centre.  |
| THE DISPLAY SHOWS THE CODE: <b>L02</b>  | CONTROL CARD IS NOT INSERTED CORRECTLY   | Switch off and disconnect the UPS from the power supply and contact the support centre.  |
| THE BUZZER SOUNDS CONTINUOUSLY AND THE DISPLAY SHOWS ONE OF THE CODES: <b>A54, F50, F51, F52, F55, L50, L51, L52</b>                | THE LOAD APPLIED TO THE UPS IS TOO HIGH  | Reduce the load to within the threshold of 100% (or user threshold in the case of code <b>A54</b> ).<br>If the display shows a lock: remove the load and switch the UPS off and back on again. |
| THE DISPLAY SHOWS THE CODE: <b>A61</b>  | REPLACE THE BATTERIES  | Contact the support centre for battery replacement.  |
| THE DISPLAY SHOWS THE CODE: <b>A62</b>  | BATTERIES MISSING OR BATTERY BOX MISSING OR NOT CONNECTED                                      | On the versions with an additional battery charger in place of the batteries, check that the Battery Box is inserted and connected to the UPS correctly.                                       |
| THE DISPLAY SHOWS THE CODE: <b>A63</b>  | THE BATTERIES ARE FLAT; THE UPS IS WAITING FOR THE BATTERY VOLTAGE TO EXCEED THE SET THRESHOLD | Wait until the batteries have recharged or force power-on manually by holding down the "ON" button for at least 2 seconds.   |
| THE BUZZER SOUNDS CONTINUOUSLY AND THE DISPLAY SHOWS ONE OF THE CODES: <b>F03, F05, F07, F13, F21, F40, F41, F42, F43</b>           | THE UPS IS MALFUNCTIONING; IT WILL PROBABLY LOCK SOON  | If possible, disconnect the power to the load, switch the UPS off and back on again; if the problem occurs again, call the support centre.   |
| THE BUZZER SOUNDS CONTINUOUSLY AND THE DISPLAY SHOWS ONE OF THE CODES: <b>F04, L04</b>  | THE TEMPERATURE OF THE DISSIPATORS INSIDE THE UPS IS TOO HIGH                                  | Check that the temperature of the environment in which the UPS is located does not exceed 40°C.  |
| THE BUZZER SOUNDS CONTINUOUSLY AND THE DISPLAY SHOWS ONE OF THE CODES: <b>F53, L53</b>  | THERE IS A FAULT ON ONE OR MORE OF THE UTILITIES POWERED BY THE UPS                            | Disconnect all the utilities, switch the UPS off and back on again, reconnect the utilities one at a time to identify which one is faulty.   |
| THE BUZZER SOUNDS CONTINUOUSLY AND THE DISPLAY SHOWS ONE OF THE CODES: <b>F60, L03, L05, L07, L13, L20, L21, L40, L41, L42, L43</b> | THE UPS IS MALFUNCTIONING  | If possible, disconnect the power to the load, switch the UPS off and back on again; if the problem occurs again, call the support centre.   |
| THE BUZZER SOUNDS CONTINUOUSLY AND THE DISPLAY SHOWS THE CODE: <b>L45</b>   | ABNORMAL OUTPUT VOLTAGE  | If possible, disconnect the power to the load, switch the UPS off and back on again: if the problem disappears, check the features of the load otherwise call the support centre.              |
| THE DISPLAY SHOWS ONE OF THE CODES: <b>C01, C02, C03</b>  | A REMOTE COMMAND IS ACTIVE   | If unwanted, check the status of the command inputs on any optional contact card.  |
| THE DISPLAY SHOWS <b>C02</b>  | THE MANUAL BYPASS FUNCTION IS ACTIVE   | To exit manual bypass mode, press the ON+SEL buttons at the same time for at least 4 seconds.  |



**ATTENTION:**

The UPS in case of a permanent failure will be not able to supply the load. To ensure total protection of your equipment we suggest you install an ATS device (Automatic Transfer Switch) or an external automatic by-pass. For more information visit [www.riello-ups.com](http://www.riello-ups.com)

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## ALARM CODES

Using a sophisticated self-diagnosis system, the UPS is able to check its own status and any anomalies and/or faults which may occur during normal operation and display them on the display panel. If there is a problem, the UPS signals the event by showing the code and the type of active alarm on the display (FAULT and/or LOCK).

### FAULT

FAULT alerts can be divided into three categories:

- **Anomalies:** these are “minor” problems which do not cause the lock of the UPS but reduce performance or prevent certain functions from being used.

| CODE | DESCRIPTION   |
|------|---|
| A06  | Sensor1 temperature under 0°C                             |
| A08  | Sensor2 temperature under 0°C                             |
| A54  | Load percentage greater than the user threshold set       |
| A61  | Replace batteries   |
| A62  | Batteries missing or Battery Box missing or not connected |
| A63  | Waiting for battery charging                              |

- **Alarms:** these are more critical problems than anomalies because, if they persist, they could cause the UPS to lock in a very short time.

| CODE | DESCRIPTION                                      |
|------|--|
| F03  | Incorrect auxiliary power supply                 |
| F04  | Dissipator overtemperature                       |
| F05  | Temperature sensor1 faulty                       |
| F07  | Temperature sensor2 faulty                       |
| F11  | Input relay faulty                               |
| F13  | Capacitor pre-charge failed                      |
| F21  | Capacitor bank overvoltage                       |
| F40  | Inverter overvoltage                             |
| F41  | Continuous output voltage                        |
| F42  | Incorrect inverter voltage                       |
| F43  | Inverter undervoltage                            |
| F50  | Overload: load > 103%                            |
| F51  | Overload: load > 110%                            |
| F52  | Overload: load > 150%                            |
| F53  | Short circuit                                    |
| F55  | Waiting for load reduction to return to inverter |
| F60  | Battery overvoltage                              |

- **Active commands:** Indicates the presence of an active remote command.

| CODE | DESCRIPTION  |
|------|--|
| C01  | Remote control 1 (Switch On/Off)                           |
| C02  | Remote control 2 (load on bypass or manual bypass command) |
| C03  | Remote control 3 (Switch On/Off)                           |
| C04  | Battery test in progress                                   |

## LOCK

LOCK alerts are normally preceded by an alarm signal and their scale leads to the power-off of the inverter and the load being powered by the bypass line (this procedure is excluded for locks due to serious, persistent overloads and short circuits).

| CODE | DESCRIPTION   |
|------|---|
| L02  | Control card is not inserted correctly                  |
| L03  | Incorrect auxiliary power supply                        |
| L04  | Dissipator over temperature                             |
| L05  | Temperature sensor1 faulty                              |
| L07  | Temperature sensor2 faulty / Inverter circuit faulty    |
| L10  | Input fuse broken or input relay stuck (does not close) |
| L11  | Input relay faulty                                      |
| L13  | Capacitor pre-charge failed                             |
| L20  | Capacitor bank undervoltage                             |
| L21  | Capacitor bank overvoltage                              |
| L40  | Inverter overvoltage                                    |
| L41  | Continuous output voltage                               |
| L42  | Incorrect inverter voltage                              |
| L43  | Inverter undervoltage                                   |
| L45  | Abnormal output voltage                                 |
| L50  | Overload: load > 103%                                   |
| L51  | Overload: load > 110%                                   |
| L52  | Overload: load > 150%                                   |
| L53  | Short circuit   |

## TECHNICAL DATA

### INPUT

|                                |       |                           |
|--------------------------------|-------|---------------------------|
| Nominal voltage                | [Vac] | 220 - 230 - 240 (1W+N+PE) |
| Earthing system                |       | TN - TT - IT              |
| Maximum operating voltage      | [Vac] | 300                       |
| Nominal frequency              | [Hz]  | 50 - 60                   |
| Nominal current <sup>(1)</sup> | [A]   | 18.5                      |

### BATTERY

|                 |       |                          |
|-----------------|-------|--------------------------|
| Recharge time   | [h]   | < 4h for 80% of the load |
| Nominal voltage | [Vdc] | 96                       |

### OUTPUT

|   |                            |   |
|---|----------------------------|---|
| Nominal voltage <sup>(2)</sup>                | [Vac]                      | Selectable: 220 / <b>230</b> / 240                        |
| Frequency <sup>(3)</sup>                      | [Hz]                       | Selectable: 50, 60 or <b>auto sensing</b>                 |
| Rated apparent output power                   | [VA]                       | 4000  |
| Rated active output power                     | [W]                        | 3600  |
| Inverter short circuit current <sup>(4)</sup> | [ARMS]                     | ≈ 36.5 (for 300ms, before lock)                           |
| Overload: 100% < load < 110%                  | Bypass line available:     | - bypass activated after 2 secs<br>- locks after 120 secs |
|   | Bypass line NOT available: | locks after 60 secs                                       |
| Overload: 110% < load < 150%                  | Bypass line available:     | - bypass activated after 2 sec<br>- locks after 4 secs    |
|   | Bypass line NOT available: | locks after 4 secs  |
| Overload: load > 150%                         | Bypass line available:     | - bypass immediately activated<br>- locks after 1 sec     |
|   | Bypass line NOT available: | locks after 0.5 secs                                      |

### OTHER

|                                    |      |  |
|------------------------------------|------|--|
| Leakage current to earth           | [mA] | < 1.5  |
| Ambient temperature <sup>(5)</sup> | [°C] | 0 ÷ 40   |
| Humidity                           |      | 5÷95 % non-condensing  |
| Storage temperature                | [°C] | -15 ÷ 40 (UPS with batteries)<br>-25 ÷ 60 (UPS without batteries)                                      |
| Maximum operating altitude         | [m]  | 1000 a.s.l.<br>(derating of 1% for each 100m between 1000 and 4000m)                                   |
| Safety standard                    |      | CEI EN 62040-1<br>(General and safety requirements for UPS)  |
| Protective class                   |      | Class I  |
| IP protection class                |      | IP20 (IP21 available on request)   |
| Protection devices                 |      | excessively low batteries - overcurrent - short circuit - overvoltage - undervoltage - circuit breaker |
| Dimensions W x D x H               | [mm] | 131 x 640 x 448 - Tower<br>19" x 640 x 3U - Rack   |
| Weight                             | [Kg] | 40   |

For more details please consult the web site.

<sup>(1)</sup> @ nominal load, nominal voltage of 220 Vac, battery charging

<sup>(2)</sup> To keep the output voltage within the indicated range of precision, recalibration may be necessary after a long period of operation

<sup>(3)</sup> If the mains frequency is within ±5% of the selected value, the UPS is synchronised with the mains. If the frequency is out of the tolerance range or operating from the battery, the frequency is the one selected ±0.1%

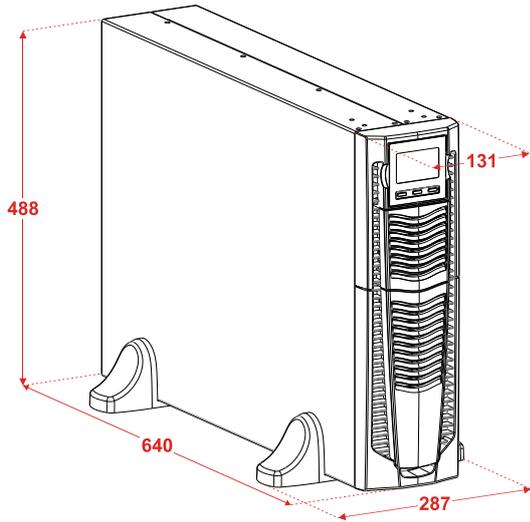
<sup>(4)</sup> Bypass not available

<sup>(5)</sup> 20 - 25 °C for longer battery life

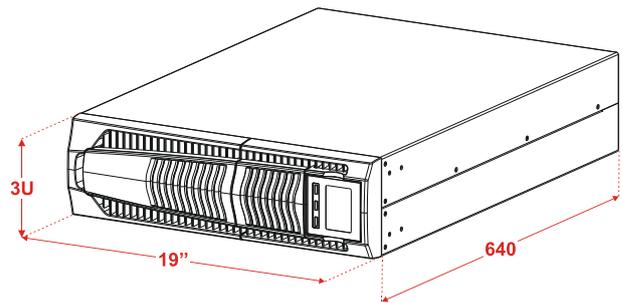
| BATTERY BOX             |       | KSDU096 – A -----<br>KSDU096 – L -----           | KSDU096 – M -----<br>KSDU096 – V ----- |
|-------------------------|-------|--|--|
| Nominal battery voltage | [Vdc] | 96   |  |
| Dimensions W x D x H    | [mm]  | 131 x 640 x 448 - Tower<br>19" x 640 x 3U - Rack |  |
| Weight                  | [kg]  | 28   | 44                                     |

The "-" symbol replaces an alphanumeric code for internal use.

## DIMENSION DETAILS



TOWER installation  
(dimension in mm)



RACK installation





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0MNSDU4K0RUENUB