ИБП Riello Sentinel Dual High Power (SDL) - технические спецификации. Юниджет

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Technical Specifications

Sentinel DUAL

6.5/10 kVA THREE-PHASE/SINGLE-PHASE
3.3/10 kVA SINGLE-PHASE/SINGLE-PHASE
On Line Double Conversion Technology (VFI)

riello ups

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1. OBJECTIVE

This technical document has been produced to be used by UPS system designers and installers.

The objective of this document is to provide and illustrate:

- the technical information required to enable you to choose the correct UPS to suit your needs
- the information required to set up and configure the system
- the information concerning the installation and location of the UPS
- the information the UPS displays locally to the user or to the monitoring systems it is connected to (e.g. control centres, etc.)
- a list of the possible options available to configure the UPS to the operators specific requirements.

2. DESCRIPTION OF THE SYSTEM

The **Sentinel Dual** range of UPS systems is available in 3.3-4-5-6-8-10 kVA single/single phase and 6.5-8-10 kVA three/single phase models and uses On Line double conversion (VFI) technology:

- The load is constantly powered by the inverter, which supplies a filtered and stabilised sine wave output voltage and frequency; with the addition of input and output filters which significantly increases the immunity of the load against mains interference and disturbances.

- The technology used offers selectable functions and intelligent self-diagnostics **SENTINEL DUAL** is the best solution for protecting sensitive and vital "mission critical" applications and safety devices (electro medical) with maximum reliability.

3. APPLICATIONS

- Personal computers
- Small computer networks
- Local Area Networks (LAN)
- Workstations
- Servers
- Point Of Sale Systems (POS)
- Data centre
- Industrial PLCs
- Cash registers
- Electro medical devices
- Emergency devices (lights/alarms)
- Telecom devices

4. CHARACTERISTICS

Flexibility of installation and use

- The UPS can be installed as a floor standing tower or 19" rack mount UPS. The front panel digital display can be removed (using the keys provided) and rotated to suite the installation format.

- Low audible noise level (<48 dBA) ensures a very low noise impact on the surrounding environment. This due to the use of high speed IGBT switching technology and PWM controlled ventilation system in relation to temperature and load applied (>20 kHz, above the audible range).

Personalisation of operation

The user can select the following functions from the front control panel:

- **Economy Mode:** used to select Line Interactive (VI) technology to power non-critical loads from the mains supply. The function can be software programmed or manually set from the UPS.
- **Smart Active:** the UPS selects whether to work in on-line (VFI) or Line Interactive (VI) mode depending on the stability of the mains supply
- **Emergency Mode:** the UPS can be programmed to work only when the mains fails (suitable for emergency lighting)
- **Frequency conversion:** 50 or 60 Hz
- **Output voltage selection:** 220-230-240 V

The software provided enables the customisation of a wide range of functions:

- **Auto restart:** automatic restart on mains supply return
- **Bypass on:** when the unit is switched off the loads are automatically routed through the bypass and the battery is charged
- **Shutdown:** due to minimum load
- **Alarm:** end of discharge
- **Delay:** on start up
- **Back up limitation:** restricts the back-up time available
- **Battery test interval**
- **System sensitivity**

Maximum reliability for applications

The system provides a filtered, stable and reliable voltage (On Line double conversion VFI technology in accordance with European standard IEC62040-3) with filters for suppressing atmospheric and mains borne disturbances.
The On Line technology provides the maximum protection for the connected loads. The double conversion stage filters and stabilises the input voltage, and then reproduces it free of any disturbances such as overvoltage, variations in frequency and voltage, noise, etc.
The IEC62040-3 standard defines this technology as VFI (Voltage and Frequency Independent), meaning that the output voltage and frequency are completely independent of any variations or disturbances caused to the incoming mains supply.

High immunity to surges: (4 kV in accordance with IEC61000-4-5) protections against over voltages have been provided (VDR). The UPS has been subjected to an overvoltage surge on its input, defined in the standard (IEC 801-5) as several kV, with a leading edge of 1.2 microseconds and duration of approx. 50 microseconds and maximum energy of 300 Joules.

High level of reliability: The digital control system dramatically improves the overall reliability and efficiency of the UPS; resulting in a reduction in the number of electronic components required, the microprocessor controls and monitors all of the functions of the UPS from one common control card. The control card can be used across a number of various systems, even systems in different ranges, thereby increasing the productivity and reliability of the range.

Low impact on the mains power supply

Power factor correction (UPS input factor close to 1)
The UPS absorbs power from the incoming mains supply with a power factor close to 1, even if the systems supplied by the UPS have a power factor inferior to this. For example, if the UPS supplies a piece of IT equipment with an input power factor of 0.65, the UPS input power factor will still remain close to 1, ensuring that any mains supply power factor correction banks are not overloaded.

Sinusoidal absorption (single/single phase models)
The UPS draws a sinusoidal current from the mains supply, meaning that the system has a very low impact on the mains supply and, as a consequence, on the other pieces of electrical equipment connected to it.

High reliability and battery availability

Hot swapping the batteries

The Sentinel Dual UPS until 6 kVA has 'hot swap' internal batteries. Replacement can take place whilst the UPS is powering the load from the mains supply. The UPS uses a dedicated internal battery pack with an integrated protection system.

When the battery needs to be replaced, the lower front panel can be removed to provide easy access to the battery pack. Pressing the switch located above the pack informs the UPS to switch onto bypass as the battery cannot be used whilst it is being changed.
The user can then release and slide out the pack and replace it as necessary by removing and then reinserting the battery connection.
This operation can be carried out safely due to the integrated protection system and without any disruption caused to the load connected to the UPS.

Automatic battery test

The UPS carries out battery tests automatically; these tests enable the system to periodically check the efficiency of the batteries in order to prevent any faults occurring to them. The test does not in any way compromise the supply to the connected equipment, and given the short duration (seconds), it does not affect the life or the back-up time of the batteries.

The battery test can also be activated manually from the mimic panel by pressing the "ON" key for several seconds.

Active control (LRCD: Low Ripple Current Discharge)

The LRCD device constantly controls the discharge of the battery system when a mains supply failure occurs, thus limiting the harmful ac component (ripple at 50 and 100 Hz) normally produced during battery discharge, maintaining a low ripple prevents damage and prolongs the life of the batteries.

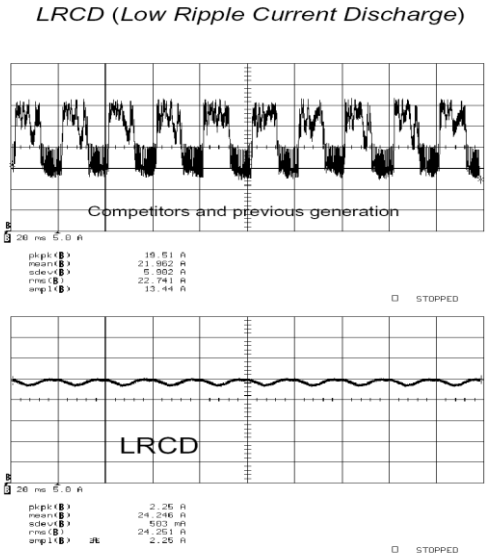


Figure 1. ripple current without and with LRCD

High Hold Up Time (<40 msec)

The system can continue to operate normally even during mains supply interruptions of up to 40ms in duration, this is due to the high hold up time provided by the system. This means that the inverter continues to power the load during such interruptions without the need to draw energy from the batteries. Battery life is a function of temperature and the number of charge/discharge cycles experience so this function helps to optimise the overall battery performance.

Protection against deep discharge

The end of battery discharge voltage is automatically increased when low loads are connected to the UPS. This ensures that deep battery discharges are avoided, as these can dramatically affect the batteries operational working life.

Auto Power Off function

For automatic shutdown of the UPS with minimum loads (<5% of the nominal load): when operating from the battery, the UPS can be programmed to shut down, if the connected load is less than 5% of the nominal value. This function (programmable via software) avoids deep discharge of the battery through the unnecessary powering of very low loads or even with no load over long periods.

Unlimited expandability of back up time

By means of external battery extension packs which can be supplied with or without their own internal battery charger to maintain a reasonable recharge time.

Sinusoidal absorption

The UPS draws a sinusoidal current from the mains supply, meaning that the system has a very low impact on the mains supply and, as a consequence, on the other pieces of electrical equipment connected to it.

Maximum battery reliability

Automatic battery test

The UPS carries out battery tests automatically; these tests enable the system to periodically check the efficiency of the batteries in order to prevent any faults occurring to them. The test does not in any way compromise the supply to the connected equipment, and given the short duration (seconds), it does not affect the life or the back-up time of the batteries.
The period between each test can be configured via the software, or the test can be completely deactivated.
The batteries are also **protected against prolonged slow discharge.** An electronic device automatically disconnects the batteries if the discharge period is too long (for example when the UPS is operating on back-up either with no load or with very low loads). This protects the batteries from discharging completely, which inevitably accelerates the ageing process.

Advanced diagnostics

The control and display panel provides the user with all of the visual (LED and LCD) and acoustic (buzzer) signals regarding the operational status of the UPS. The panel also enables control, monitoring, diagnosis and customisation of the UPS through the easy-to-use menu system.

Low consumption

A low power consumption especially in the “Economy Mode” or “Smart Active Mode” functions where efficiencies of up to 98% can be achieved.

Operating modes to reduce consumption

In addition to the On Line operating mode, another four operating modes are provided. These can be programmed according to user and load characteristic, these being: Economy Mode/Smart Active Mode/Emergency backup and Standby Off.

Economy Mode:

Enables the user to select the Line Interactive (VI) technology, this mode provides power to non-sensitive loads from the incoming mains supply for certain applications. In the event of a mains supply failure occurring or the incoming voltage or frequency exceeding the pre-determined range, the load is automatically switched onto the inverter for continued operation. This function can be programmed via the software. The tolerance range can be programmed using 3 levels of sensitivity (minimum / medium / maximum) depending on the sensitivity of the connected load.

Smart Active Mode

Enables the user to allow the UPS to automatically determine which method of operation (on-line or line interactive) is most suitable dependent on the quality of the incoming mains supply. If the mains supply is not within the acceptable limits for both voltage and frequency, the UPS will supply power to the load from the inverter (on-line). When the mains supply returns to within the acceptable limits, the system will first ensure that the supply remains stable, before switching the load back onto the mains supply.
During both of these operating modes, the load is powered directly from the mains supply via the bypass. However, due to the EMI filters in both the input and output, the mains supply is filtered and therefore free of any electrical disturbances.
If the incoming mains supply fails, the load is supplied directly by the inverter. This function reduces energy consumption as when the mains supply is present, the inverter is off.

Emergency back-up mode

The UPS can function as an emergency stand-by device. This particular operating mode is configurable from the control panel or the software, and enables the supply to emergency lighting. The UPS output remains off under normal operating conditions and the batteries are charged. The output only activates when the mains power supply fails.
The inverter switches on within 320 ms in accordance with the current regulations, which stipulates a maximum delay time of 500 ms, the inverter starts up gradually, thus preventing any sudden current surges.
This operating mode enables considerable energy savings, as the inverter is off under normal conditions and therefore does not consume any energy. In addition, the system does not need to be over-sized, as the gradual start-up of the inverter prevents any current surge problems that might otherwise occur.

Standby-Off operation

The UPS can be configured to power the loads through the bypass when the UPS is powered down. The battery charger remains active during this period.

Flexibility of use

Automatic restart

Auto restart (programmable automatic restart on mains return):

It is possible to program the UPS to automatically restart after the UPS has been switched off for one of the following reasons. This can be programmed via the software supplied.

Auto restart can be selected for the following scenarios:

- On mains return after the UPS has shut down due to full discharge of the batteries.
- On mains return after the UPS has been instructed to power down by remote UPS monitoring and management software.
- Programmed UPS auto shutdown if Auto Power Off has been activated due to load removal.

Start up from battery (cold start)

The UPS can start up on inverter, even when there is no mains supply available.

Standby

Standby operation can be selected: during this mode the inverter is off and the batteries are charged. The standby function is automatically activated when the UPS is shut down and is useful when prolong periods of inactivity occur.

Operation as frequency converter

The UPS can be configured (from the control panel) to function as a frequency converter, therefore when the input frequency is 50 Hz the output frequency can be 60Hz and vice versa. During this mode of operation the automatic by-pass is deactivated.

Frequency auto detection

The UPS can be configured to automatically select the output frequency (50 or 60 Hz), by using the input frequency as its reference (50 or 60 Hz).

Compact dimensions

The compact dimensions make it one of the smallest on the market:
Thanks to:

- Microprocessor control
- IGBT technology
- Internal batteries
- Ventilation, front to rear which eliminates the need for any clearance down either side of the unit.

Low audible noise (<48 dB(A)

Achieved by:

- Use of high frequency IGBT technology
- Electronically controlled ventilation with PWM (Pulse Width Modulation) technology for improved cooling fan Reliability and speed control in relation to the loads applied and internal UPS temperature.
- Special design of the magnetic components

Advanced Communication

Monitoring software including shut down

Powershield^3 provides an efficient and intuitive system for controlling and monitoring the UPS, displaying all of the most important information, such as input voltage, applied load, battery capacity, etc. using a series of bar charts.
The software is able to provide detailed information even if the UPS has malfunctioned, enabling the user to find out why the fault has occurred and when.

Powershield^3 has been developed using a client/server architecture that renders it flexible and easy to use, with multilingual support and on line help.

The Powershield^3 software is provided free of charge with an SNMP agent, this version will operate on Windows, VMware, Mac OSX, Linux and Unix operating systems.
For the complete list of operating systems supported refer to **www.riello-ups.com**.

The software enables the user to programme the automatic start-up and shutdown of the system on a weekly basis.

The UPS is supplied with the following hardware interfaces:

- RS232 serial port
- USB port
- Isolated contacts interface
- Network and communications card slot

5. REFERENCE STANDARDS

5.1. Main reference standards

Riello UPS operates a Quality Management System certified to ISO 9001 / 2000 (Certification No. CERT-04116-99-AQ-MIL-SINCERT) covering all company functions from design and manufacture to after sales services.

In addition, the UPS meets the VFI-SS-111 classification (according to IEC EN 62040-3) and complies with the following specific standards for UPS:

- **IEC EN 62040-1:** Static uninterruptible power supplies (UPS): general and safety provisions;
- **IEC EN 62040-2:** Electromagnetic compatibility (EMC) requirements category C2;
- **EN 62040-3:** Methods of specification of performances and test provisions;

The **SENTINEL DUAL** series also satisfies the following general standards, where applicable:

- **IEC 60529:** Degree of protection provided by enclosures;
- **IEC 60664:** Insulation for low-voltage equipment;
- **IEC 60755:** General Requirements for Residual Current Operated Protective Devices;
- **IEC 60950:** General safety provisions for "Information Technology" equipment;
- **IEC 61000-2-2:** Electromagnetic compatibility immunity;
- **IEC 61000-4-2:** Electrostatic discharge immunity test;
- **IEC 61000-4-3:** Radio frequencies, electromagnetic immunity test;
- **IEC 61000-4-4:** Transitory overvoltage immunity test;
- **IEC 61000-4-5:** Overvoltage immunity test;
- **IEC 61000-4-11:** Voltage dips, short interruptions and voltage variations immunity test.
- **IEC 61000-3-12:** Harmonic current emissions (for equipment with rated current > 16 A ≤ 75

European Directives:

LVD directive 2014/35/EU

The LVD covers all health and safety risks of electrical equipment operating with a voltage between 50 and 1000 V for alternating current and between 75 and 1500 V for direct current.

EMC directive 2014/30/EU
The EMC Directive **limits electromagnetic emissions from equipment;** The Directive also **governs the immunity of such equipment to interferences.**

5.2. Standards relating to systems and installation

The above product regulations refer specifically to uninterruptible power supply systems. It is these regulations that manufacturers of uninterruptible power supply systems are obliged to adhere to. However, with regard to the electrical system, the installer must refer to other standards.

- standard CEI 64-8 (HD384 / IEC60364):
  for electrical systems in general
- standard CEI 64-8 / 7 variant 2: for installation in hospital environments
- standard CEI 11-20: for systems with UPS machines connected to category I or II networks
- standard CEI 17-13 (EN60439-1): relating to control equipment
- standard CEI 21-6/3 (EN50272): for battery installation
- CEI 20: for electrical cables

6. SYSTEM BLOCK DIAGRAM

6.1. Operation of the UPS

Description of the UPS

The purpose of a UPS is to provide a perfect power supply voltage to the equipment connected to it, regardless of the quality and stability of the incoming mains supply. Once connected and switch on, the UPS generates a sinusoidal alternating voltage with stable amplitude and frequency, regardless of any surges and/or variations present on the mains supply.

Whilst the UPS draws energy from the incoming mains supply, the batteries are charged. The microprocessor continuously monitors the amplitude and frequency of the incoming mains voltage, the amplitude and frequency of the voltage generated by the *Inverter*, the applied load, the internal temperature and the state battery charge and efficiency.

The block diagram for the 3.3 and 4 kVA UPS is shown below (see Fig. 5) followed by a description of the individual components. from the 5 until 10 kVA UPS block diagram (see Fig. 6) shown later.

6.2. Block diagram of the UPS

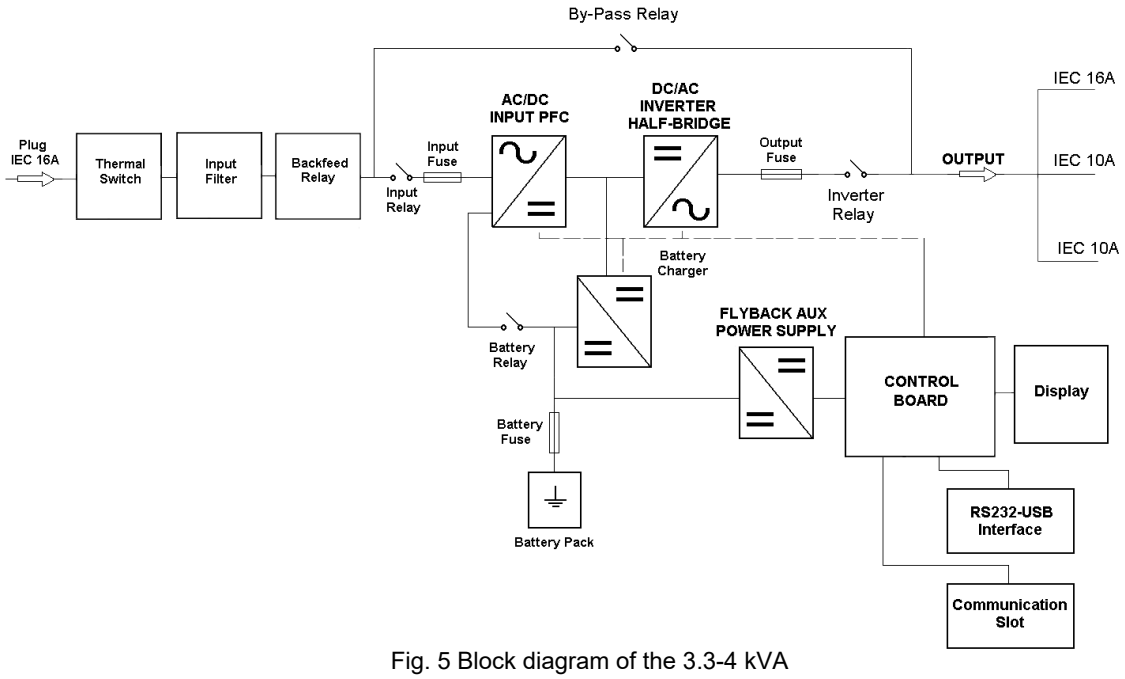


Fig. 5 Block diagram of the 3.3-4 kVA

KEY:

1) Input protection (restorable thermal protection).

2) EMI input filter + back-feed protection:

Input filter for protecting the UPS and load against any electromagnetic disturbances.
Back-feed protection: intervenes when the mains power supply fails, therefore isolating the UPS from the input socket to prevent any back feed to the mains power supply. This protection is required to prevent any voltage from returning to the supply, which could put the operator at risk whilst carrying out maintenance work.

3) Input fuse:

The input fuse is discriminated with respect to the re-settable input fuse (1): a fault occurring to the rectifier/booster will open this protection before the thermal input fuse intervenes, ensuring that the power supply to the connected load is not interrupted, as the by-pass line will remain powered.

4) AC/DC input stage (PFC):

When the mains power supply is present, this converts the mains alternating current (AC) into a direct current (DC) whilst controlling the power factor. If the mains power supply fails, it increases the voltage from the battery to an appropriate voltage level to power the inverter stage.

5) DC/AC Inverter stage:

Converts the direct current (DC) into alternating current (AC) to supply the load.

6) Automatic bypass:

The automatic bypass automatically switches the UPS output onto the input mains in the event of an overload and/or inverter fault.

7) Inverter switch:

Transfers the load to the bypass supply.

8) Battery pack:

Maintenance-free, sealed lead acid batteries: Supplies power to the inverter to support the load when the incoming mains power supply fails.

9) Battery charger:

A DC-DC converter which converts the output voltage from the rectifier/booster to a suitable level to recharge the batteries, it is deactivated when the mains power supply fails.

10) Battery protection:

Battery to UPS protection fuses

11) Interface card:

An RS232, a USB (Universal Serial Bus) interface and isolated contacts are supplied as standard. The UPS automatically detects whether the RS232 or USB port has been selected for remote communication.

12) Network adapter and communication card slot:

The communications card slot can be used to insert various interface card: for example a second RS232 serial card, an SNMP interface for communication over the computer network, an RS232 serial interface duplexer or a volt free contact card.

13) Display:

The display panel provides the user with visual (LED + LCD) and acoustic (buzzer) signals relating to the status of the UPS. The panel also enables the user to control and customise the operation of the UPS.

14) Output sockets:

1 x IEC standard 16 A socket + 2 x 10 A IEC sockets are available at the rear of the unit for load connection.

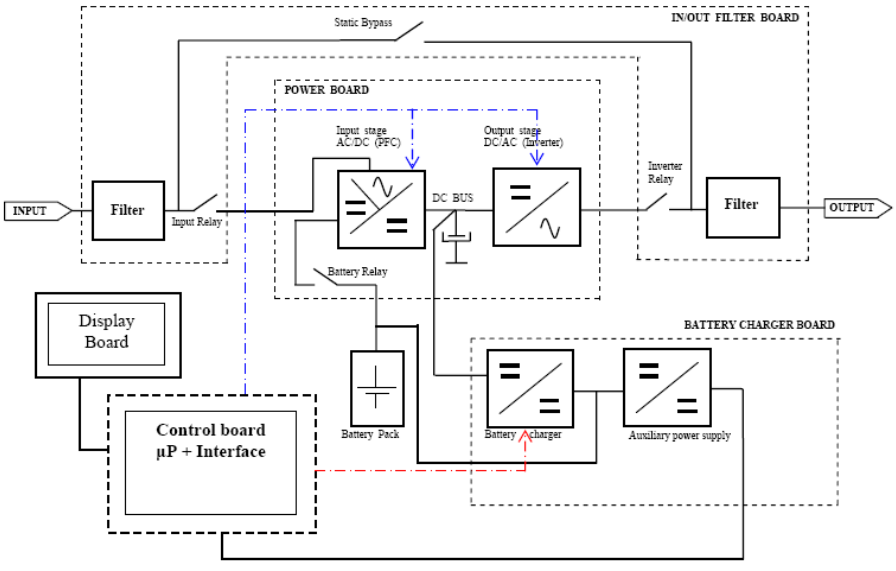


Fig. 6 Block diagram of the 5, 6, 8, 10 kVA Single/Single phase and 6,5, 8, 10 kVA Three/Single Phase

6.3. Operating modes

Operating modes:

The default operational mode that provides maximum protection to the load is the ON LINE mode. During this mode the load is supplied with a sine wave that is stabilised and regulated in terms of voltage and frequency, the waveform is independent of the incoming mains supply (VFI technology) and controlled by the digital microprocessor.

The following other modes can also be selected:

- **ECONOMY** (LINE INTERACTIVE)
- **SMART ACTIVE** (shown on the display as “SMART”)
- **STANDBY OFF** (shown on the display as “STBYOFF”)

During economy mode the load is normally powered via the bypass, in order to optimise the operating efficiency. If the incoming mains supply exceeds the predefined operating range (voltage or frequency), the UPS switches to battery operation.
If the user cannot decide which operating mode is the most suitable for the application (ON LINE or ECONOMY), this decision can be left to the UPS by selecting the SMART ACTIVE mode. In this mode, the UPS automatically decides which mode to use based upon an assessment of the quality and availability of the incoming mains supply.
The STANDBY OFF mode is used for emergency lighting applications when the load is not powered until the incoming mains supply fails, at which point the output from the UPS is switched on.

OPERATING MODE	STATUS OF THE MAINS SUPPLY AND LOADS	COMMENTS
STAND-BY	Mains present, loads not powered*	The UPS is in a condition of minimum power consumption because the booster and the inverter are switched off. The microcontroller is powered and carries out supervision and self-checking functions, the batteries are charging and everything is ready for the UPS to be started up. The UPS only operates in stand-by mode from the batteries if it has been set for programmed start up via software.
ON-LINE	Mains present, loads powered from the inverter with energy drawn from the mains	This is the normal state for this operating mode. The loads are powered from the inverter with a frequency and voltage stabilised waveform. The battery chargers ensure that the batteries are charged.
ON-LINE	Mains present, loads powered from by-pass	The UPS goes into this state on start up from the mains (before passing to the inverter), or when a distorting load is applied or there is a temporary overload
ON-LINE	Mains absent, loads powered from the inverter with energy drawn from the batteries	The UPS goes into this state when the mains fails (Black out) or goes out of the admitted range (overvoltage or undervoltage). The loads are powered from the inverter with a frequency and voltage stabilised waveform and energy is received from the batteries.
LINE-INTERACTIVE	Mains present, loads powered from bypass	This is the normal state for this operating mode. The loads are powered from the bypass through the internal EMI filters when the mains returns within the set voltage and frequency ranges; the batteries are charged.
LINE-INTERACTIVE	Mains present, loads powered from the inverter with energy drawn from the mains	The UPS goes into this state when the bypass (mains) voltage and frequency go out of the set range.
LINE-INTERACTIVE	Mains absent, loads powered from the inverter with energy drawn from the mains	The UPS goes into this state when the mains fails (Black out) or goes out of the admitted range for operation from the mains (overvoltage or undervoltage)

* if the Standby Off function, which provides power to the load when the unit is switched off by means of the Bypass circuit, is not set.

Emergency Power Off (EPO) (from 5 until 10 kVA versions)

This isolated input is used to switch off the UPS remotely in an emergency. Any remote “Emergency Power Off” (EPO) switch that is normally closed must be connected to the connector located at the back of the UPS.

The UPS is supplied with the EPO terminals short circuited: remove the short circuit if this contact is to be connected to the auxiliary of a remote emergency switch.
The EPO circuit is self-powered with SELV type circuits. No external power supply voltage is therefore required. When it is closed (normal condition) there is a current of 10 mA max.

Programmable auxiliary socket (EnergyShare – from 5 until 10 kVA versions)

The UPS is provided with two output sockets which can be programmed to switch off or remain on during a mains supply failure – EnergyShare. The events that trigger the EnergyShare can be user-selected using the UPSTools configuration software (see paragraphs Configuration software and UPS Configuration).
It is possible for example to select switch off after a certain time of operation from battery, on reaching the end of a battery discharge pre-alarm threshold, or during an overload condition.

7. INTERFACING

Communication ports

The UPS is supplied with an RS232 and USB serial interface. The serial interface must be supplied with a ±12 V isolated power supply.
The serial interface has a female sub-D 9-pole connector that carries the signals for the interface (fixed baud rate = 1200) and three auxiliary opto-isolated contacts with the following pin configuration:

Pin	Name	Function	Notes
7	+12 V		
2	TX	Serial transmission line	
3	RX	Serial receive line	
8	BL	Auxiliary opto-isolated contact	Signals end of discharge
9	BW	Auxiliary opto-isolated contact	Signals operation from battery or mains fail
1	ALARM	Auxiliary opto-isolated contact	Signals operation from by-pass
5	GND		

In addition to the USB and serial port, the UPS also has an expansion slot located at its rear, where various types of interfaces can be inserted. For example a second serial/USB, serial multiplexer. The signals sent to the slot are shown in the table below.

PIN	NAME	TYPE	FUNCTION
1			Not used
2			Not used
3	ALARM	UD	Signals UPS fault
4	INIT	UD	System initialisation
5	REMOTE ON	ID	Remote UPS start up
6			Not used
7			Not used
8	REMOTE OFF	ID	Remote UPS shutdown
9	INVOFF	ID	Inverter shutdown and passage onto bypass
10	BL	UD	Signals end of discharge
11	BW	UD	Signals operation from battery
12	BY-PASS	UD	Signals operation from bypass
13	DCD2	ID	DCD secondary serial line
14	DTR2	UD	DTR secondary serial line
15			Not used
16	+5 V	PWR	
17			Not used
18	+12 V	PWR	
19			Not used
20			Not used
21			Not used
22	RX2	ID	RX secondary serial line
23	TX2	UD	TX secondary serial line
24	GND	PWR	Not used
25			
26			Not used

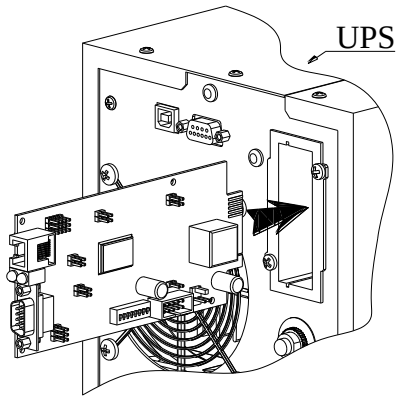
Where UD = digital output, ID = digital input, PWR = power signal.
The communication protocol used for the remote control of the UPS via the serial port is: PSGPSER.

7.1. Ex

The UPS has an exp

- Second RS2
- Serial port du
- Ethernet netv
- RS232 + RS4
- Volt free cont

For more informatior
manufacturer's web



8. OPTI

8.1. Su

BB108-A4		
BC108-M1		
BC108-M8*		
BB192-A3		
BB192-A6		
BB240-A3		
BC240-A5	T 455x175x660 / R 4Ux19"x660	65

* Only tower

Battery expansion pack:

This is used to extend the UPS back up time. It is supplied in a metal cabinet to match the UPS and is available without or with an additional battery charger to help maintain reasonable recharge times.

8.2. Communication software

MAIN FEATURES

1) Sequential shut-down with defined priority:

PowerShield³ enables the user to shut down the network without having to individually switch off each PC or server, and before doing so, PowerShield³ will save the work that was being done regardless of the application that was being used. The user may also define their own shutdown procedure and also prioritise the shutdown of critical components within the system (such as vital and non-vital servers).

2) Multiplatform compatibility:

PowerShield³ provides the user with a standard control and monitoring capability, using TCP/IP communication protocol. This enables the user to monitor computers that use different operating systems from a single console. For example, not only could the user monitor a UNIX server from a PC with Windows 98, the user could also connect to UPS systems situated in different locations by using either a dedicated network (intranet) or the Internet.

3) Events scheduling:

PowerShield³ enables the user to define their own shutdown/switch off and on procedures, for the systems that are connected to the UPS. Not only does this noticeably increase the degree of security of the system, it also enables the user to make significant energy savings.

4) Management of messages:

PowerShield³ keeps the user constantly informed of the status of the UPS, whether locally or by sending messages to users connected to the network. It is also possible to create a list of the people who will receive messages by e-mail and SMS should a fault or sudden blackout occur.

OPERATING SYSTEMS SUPPORTED Powershield^3

- Windows 2000, 2003 Server, XP, Vista, 7, 8, 2012 Server.
- VMware ESXi 4.x 5.x
- Mac OSX
- The most commonly available UNIX systems such as: IBM AIX, HP UNIX, SUN OS SPARC, SUN Solaris INTEL and SPARC, SCO Unix and UnixWare, Silicon Graphic IRIX, Compaq True64 UNIX and DEC UNIX, Linux, BSD UNIX and FreeBSD UNIX.

8.3. Function of the communication software

1) Graphic monitoring of UPS status

PowerShield³ is the easy to use yet powerful program that enables the user to monitor and control the UPS systems. There are various graphical versions including Windows, Java.

2) Detailed display with all UPS values

PowerShield³ provides all the data required to make an accurate and swift assessment of the UPS operation and status.

3) UPS block and operating diagrams

PowerShield³ displays a block diagram of the UPS, thus providing the user with conceptual information as to the status of the system.

4) Saving the event history log and graphic display of the main values

All of the events regarding the operation of the UPS are saved and recorded, thus allowing the user to monitor such data as the input voltage, applied load or the remaining back-up time available from the batteries.

5) Alarm notification via e-mail and SMS

It is possible to configure PowerShield³ to automatically notify of an alarm via an e-mail or SMS message.

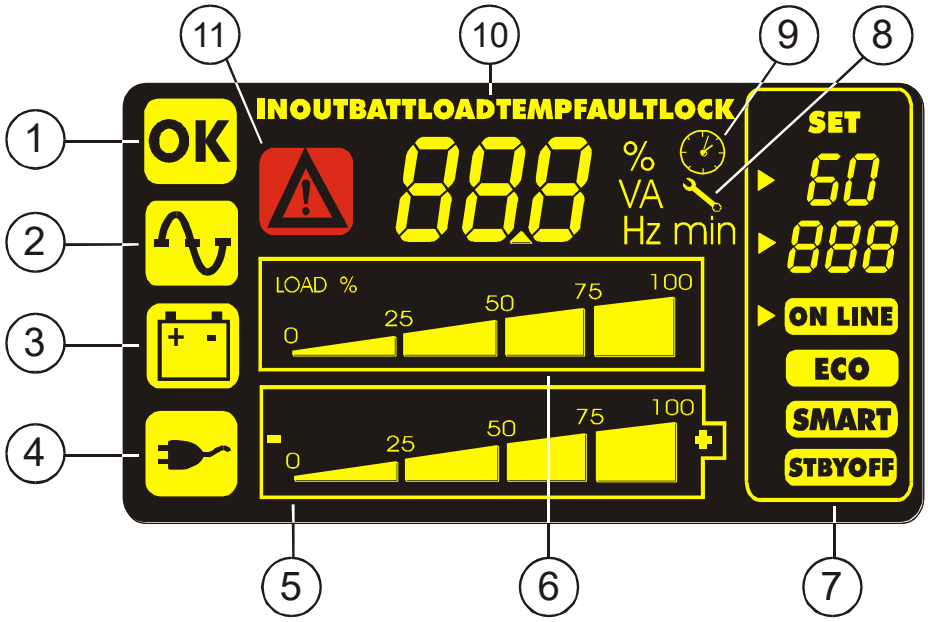
6) Programming UPS controls

Enables the user to program all of the commands that would normally be carried out manually, to be performed automatically, for example: shutting down or switching the servers back on, UPS battery test, etc.

9. CONTROL / DISPLAY PANEL

9.1. Control and signalling panel

View of the display



Display LCD

1	Regular operation	7	Configuration area
2	Operation from mains	8	Service intervention
3	Operation from battery	9	Timer
4	Load on bypass	10	Measurements display
5	Battery level indicator	11	Stand-by / fault
6	Load level indicator		

The upper part of the front panel houses a display with yellow/green reversed backlighting. The layout of the display, designed to Riello UPS specifications, can be divided into 3 basic areas.

The first area, consists of the icons on the left and a red triangle, this area is dedicated to the UPS status (on mains, on battery, on bypass, normal operation and alarm).

The second area comprises of two bar graphs, numerical indications and the upper part of the central area is reserved for measurements. The two bar graphs show the load and percentage of battery charge, while the numerical indications show the input frequency and voltage, output frequency and voltage, estimated battery backup time (mins), estimated battery charge level (%), battery voltage, load in percentage and the current and temperature of the internal heat sinks. Each of these indications has a name and unit of measurement; press the middle button under the display to scroll from one to the other.

The same figures are also used to indicate alarm or lock up codes.

The last area on the right consists of the set-up area which is accessed by pressing down the middle button for several seconds. The output voltage and frequency and the operating mode can be changed directly from the front panel (removing the need to use dip switches). The visual signals can be accompanied by an audible buzzer that provides an acoustic alarm in the following cases:

- on start-up / shutdown
- when the output is synchronized with the input
- transfer from inverter to bypass and vice versa
- during operation from the battery
- during overload
- during a fault or lock

9.2. Display panel indications

This section describes in detail all the information that can be shown on the LCD display. All the information displayed can be divided into three main groups:

- UPS status indicators
- Measurements display area
- Configuration area

UPS status indicators

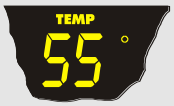
ICON	STATUS	DESCRIPTION
	Constant	Indicates a fault
	Flashing	The UPS is in stand-by state
	Constant	Indicates normal operation
	Constant	The UPS is operating from the mains
	Flashing	The UPS is operating from the mains, but the output voltage is not synchronised with the mains voltage
	Constant	The UPS is operating from the battery. When it is in this state the UPS emits an audible signal (beep) at regular intervals of 4 sec.
	Flashing	End of discharge pre-alarm. Indicates that the battery back-up time is coming to an end. In this condition the UPS emits a beep at regular intervals of 1 sec.
	Constant	Indicates that the loads connected to the UPS are powered from the bypass
	Dynamic	If the UPS is operating from the mains, it indicates the battery charge status (%). If the UPS is operating from the battery, it indicates the battery back-up time (%)
	Dynamic	Indicates the % of load applied to the UPS with respect to the nominal value
	Flashing	A Service is required (service centre). Contact your local Riello UPS service centre.
	Constant	Indicates that the timer is activated (UPS auto-start up and/or auto-shutdown). The timer can be activated/deactivated via the software provided

9.1. Measurements display areas

The most important UPS measurements can be shown in sequence on the display. When the UPS is started up, the display shows the value of the mains voltage. To go on to a different display press the “SEL / SET” button repeatedly until the required measurement is displayed.

If a fault / alarm (FAULT) or a lock (LOCK) should occur, the type and corresponding alarm code is automatically shown on the display.

Some examples are shown below:

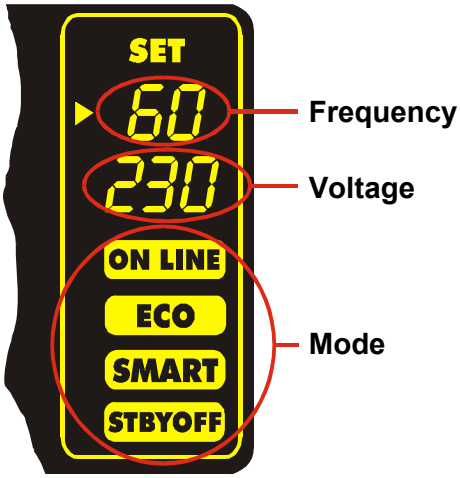
GRAPHIC EXAMPLE [1]	DESCRIPTION	GRAPHIC EXAMPLE [1]	DESCRIPTION
	Mains voltage		Total battery voltage
	Mains frequency		Percentage of the applied load
	Voltage output from the UPS		Current absorbed by the load
	Frequency of the output voltage		Temperature of the cooling system for the UPS internal electronics
	Estimated battery backup time		Fault / Alarm [2]: the corresponding code is displayed
	Percentage of battery charge		Lock [2]: the corresponding code is displayed

9.3. Configuration area

The configuration area groups together the main UPS operating parameters and displays its current status. The parameters contained in this area can be changed directly from the display panel.

CONFIGURABLE PARAMETERS:

- **Frequency:** Output voltage frequency
- **Voltage:** Output voltage
- **Mode:** UPS operating mode



The figure opposite shows the setup display area (configuration area) showing the three configurable parameters.

HOW TO CHANGE THE SETTINGS:

To access the configuration area, hold the “SEL / SET” button down for at least 2 sec.

- The word “SET” will light up and an arrow (►) will appear to the left of Frequency.
- The arrow shows the selected setting. To select a different parameter press the “SEL / SET’ button.
- To change the selected item, press the “ON” button.
- To exit from the configuration area, hold the “SEL / SET” button down for at least 2 sec.

POSSIBLE SETTINGS

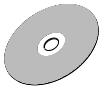
Frequency:	• 50 Hz • 60 Hz • Off (frequency auto-sensing)
Voltage:	• 220 V • 230 V • 240 V
Mode	• ON LINE • ECO • SMART • STBYOFF

10. UPS CONFIGURATION

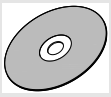
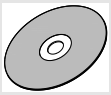
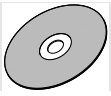
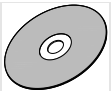
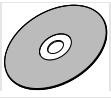
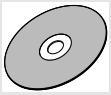
The following table shows all the possible configurations available to customise the UPS to the user's requirements.

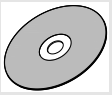
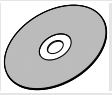
KEY:

Indicates that the configuration can be changed from the display panel as well as by the configuration software provided.



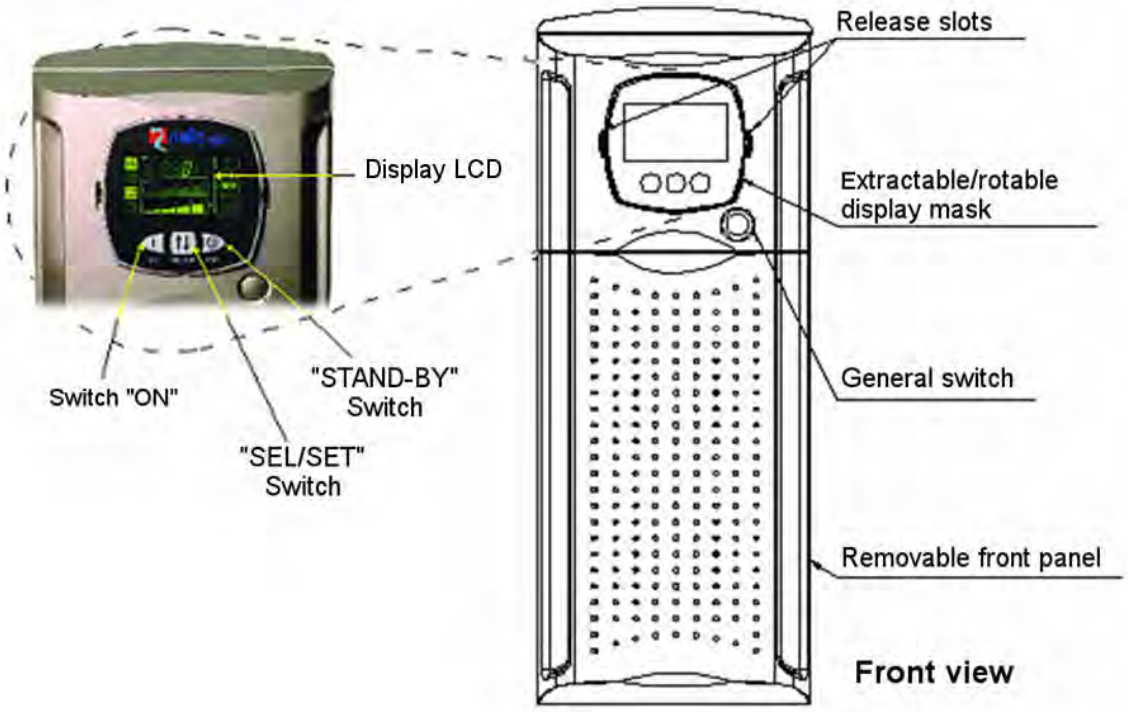
Indicates that the configuration can only be changed via the configuration software provided.

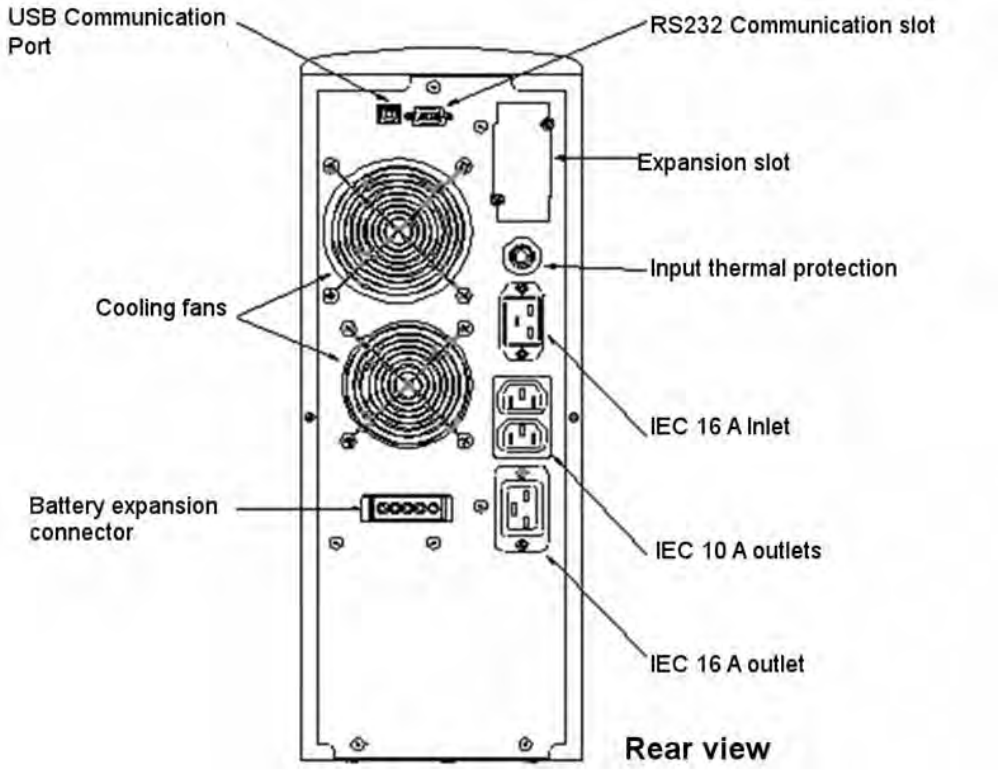
FUNCTION	DESCRIPTION	DEFAULT	POSSIBLE CONFIGURATIONS	MODE
Output frequency	To select the nominal output frequency	Auto	• 50 Hz • 60 Hz • Auto: automatic sensing from the input frequency	
Output voltage	To select the nominal output voltage	230 V	• 220 V • 230 V • 240 V • 220 - 240 in 1 V steps (only via the software)	
Operating mode	To select one of the 4 different operating modes	ON LINE	• ON LINE • ECO • SMART ACTIVE • STAND-BY OFF	
Start-up delay	Delay before automatic restart on the mains returns	5 sec.	• Disabled • 1 - 255 in 1 sec. steps	
Shutdown due to minimum load	Automatic shutdown of the UPS when operating from the battery if the load is less than 5%	Disabled	• Enabled • Disabled	
Back up time limit	Maximum time of operation from the battery	Disabled	• Disabled (full battery discharge) • 1 - 65000 in 1 sec. steps	
End of discharge alarm	Estimated remaining back up time for the end of discharge alarm	3 min.	• 1 - 255 in 1 min. steps	
Battery test	Time interval between the automatic battery test	40 hours	• Disabled • 1 - 1000 1 hour steps	
Alarm threshold for maximum load	Selects the user overload limit	Disabled	• Disabled • 0 - 103 in 1% steps	
Display brightness	Selects the level of brightness of the LCD display	Maximum	• Minimum ÷ Maximum in 20 steps	
Acoustic alarm	Selects the operating mode of the acoustic alarm	Low	• Normal • Low: does not sound for momentary bypass intervention	

ADVANCED FUNCTIONS				
Input frequency tolerance	Selects the allowed input frequency range for the transfer to bypass and for synchronisation of the output	± 5%	• ± 0.25% • ± 0.5% • ± 0.75% • ± 1 - ±10 in 1% steps	
Bypass voltage thresholds	Selects the allowed voltage range for the transfer onto bypass	Low: 180 V High: 264 V	• Low: 180 - 200 in 1V steps • High: 250 - 264 in 1V steps	
Bypass voltage thresholds for ECO	Selects the allowed voltage range for operation in Economy mode	Low: 200 V High: 253 V	• Low: 180 - 220 in 1 V steps • High: 240 - 264 in 1 V steps	
Sensitivity of intervention for ECO	Selects the sensitivity of intervention during operation in Economy mode	Normal	• Low • Normal • High	
Power supply of the load in standby	Power supply of the load on bypass with UPS switched off (standby state)	Disabled (load NOT powered)	• Disabled (not powered) • Enabled (powered)	
Bypass operation	Selects bypass line operating mode	Normal	• Normal • Disabled with input / output synchronisation • Disabled without input / output synchronisation	

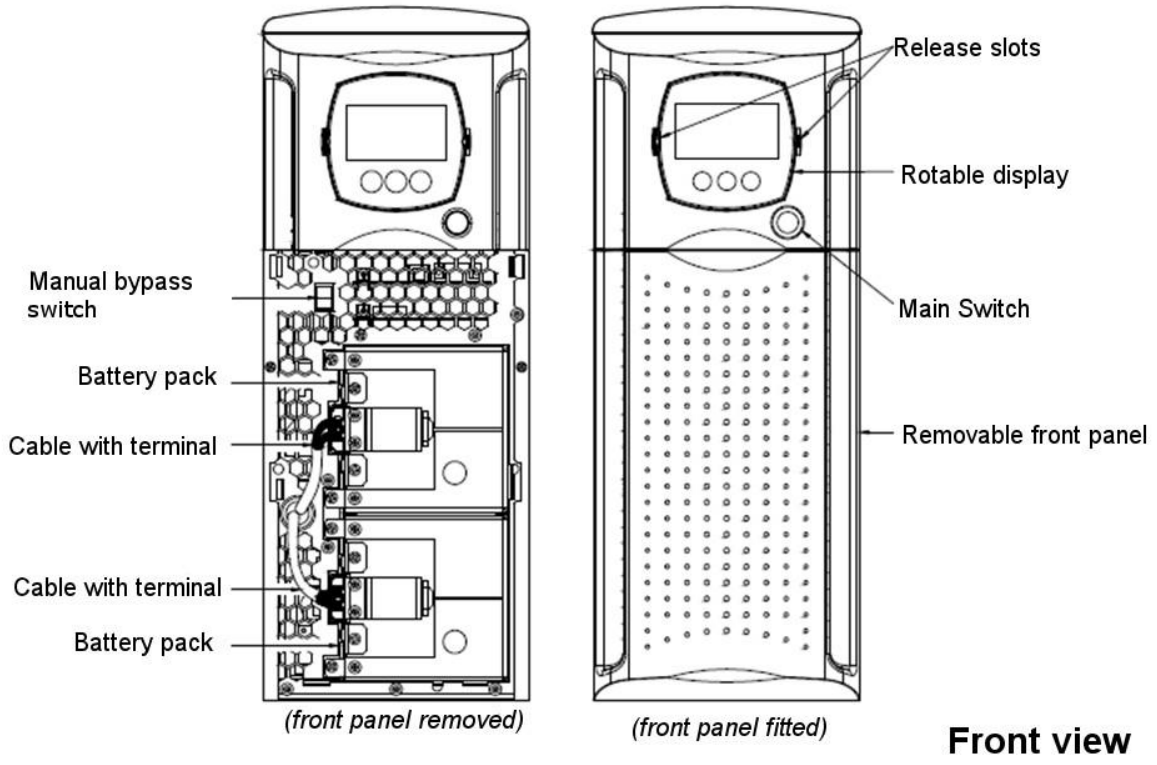
11. VIEWS OF THE UPS

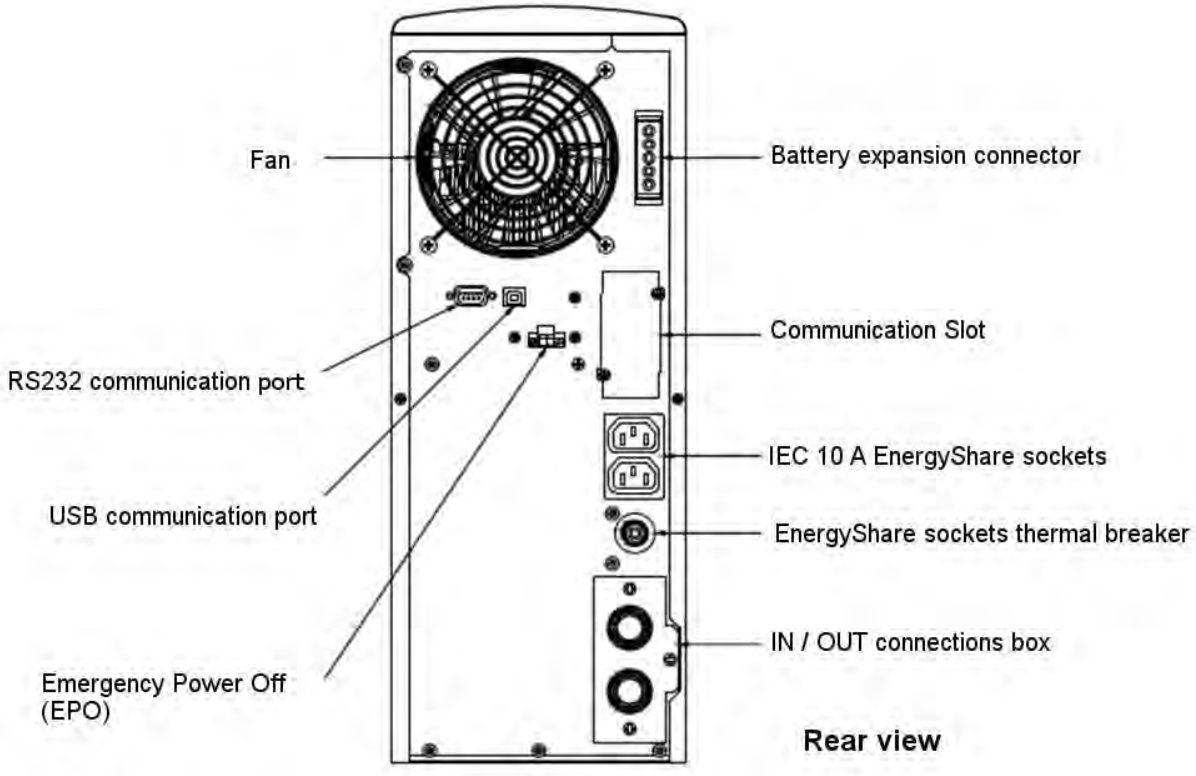
11.1. Views UPS 3.3 and 4 kVA



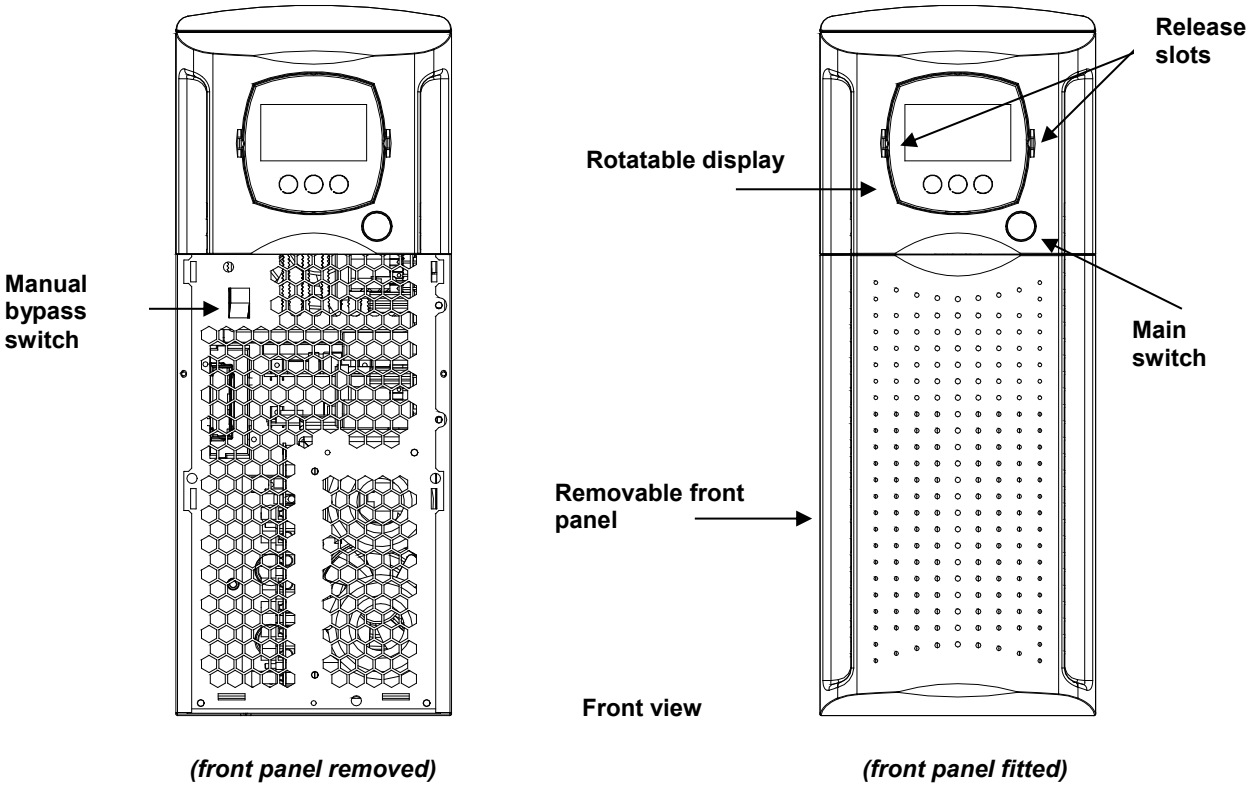


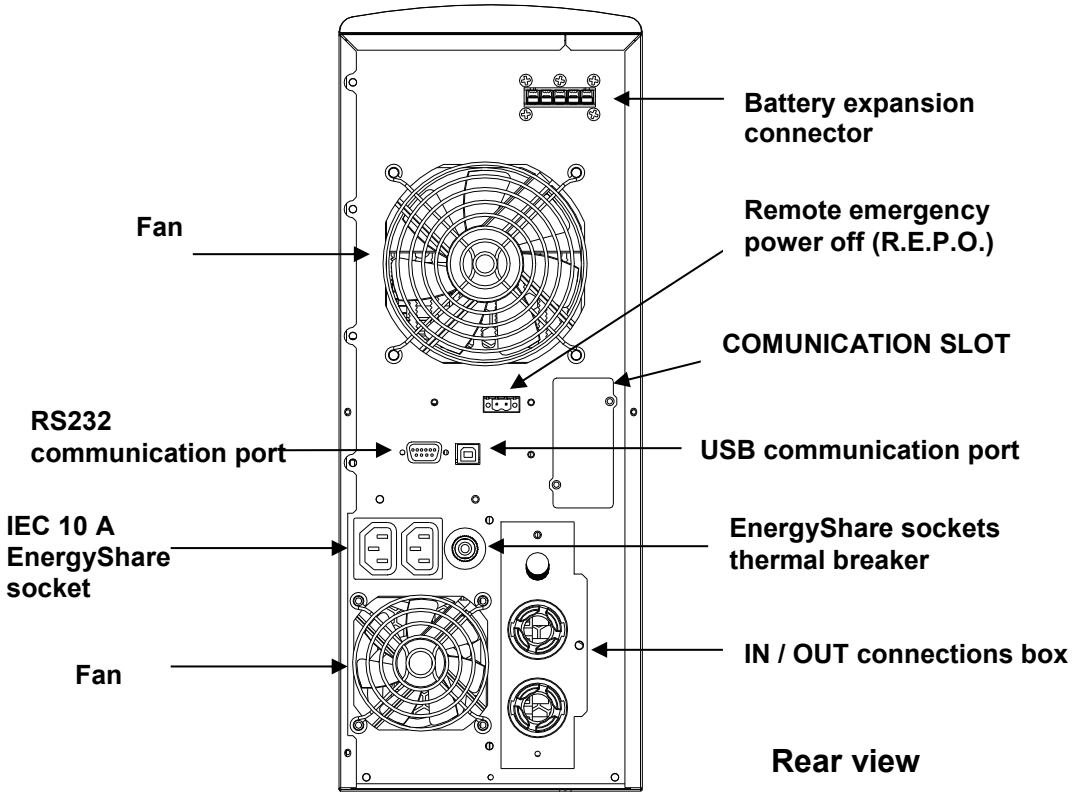
11.2. Views UPS 5 and 6 kVA



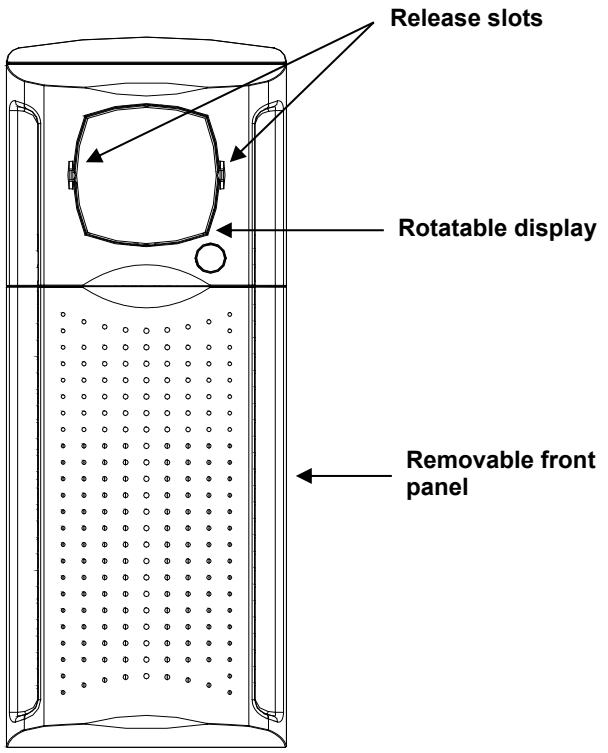


11.3. Views UPS 8–10 kVA and 6.5-10 TM

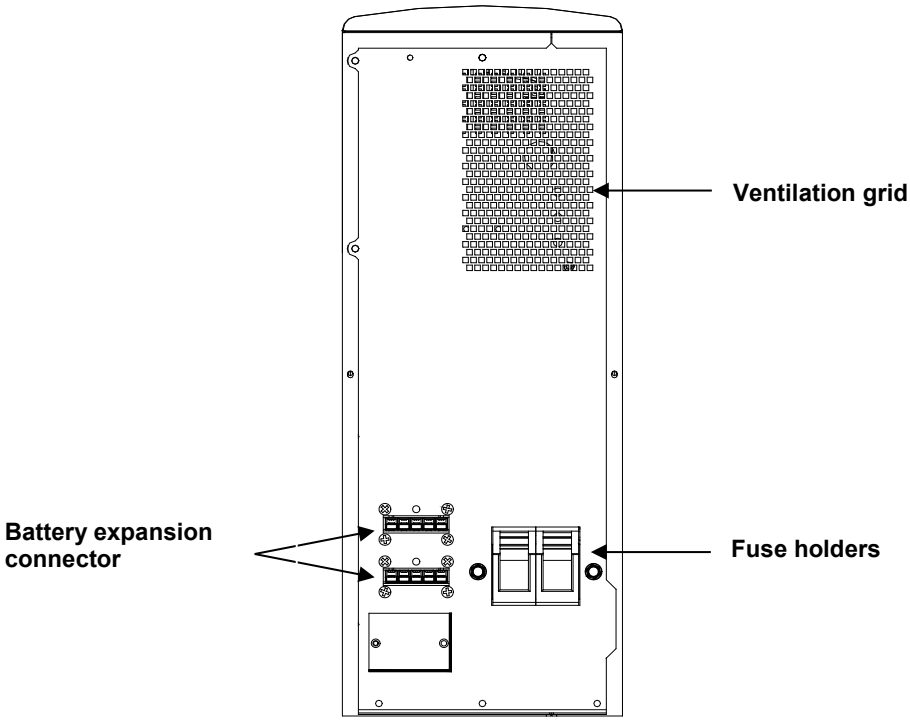




11.4. View battery cabinet 8-10 kVA and 6.5-10 TM



Front view



Rear view

12. TECHNICAL DATA

12.1. Models

Sentinel Dual Model

MODEL	POWER	DIMENSIONS (HxLxP) mm	WEIGHT (kg)
SDL 3300	3300 VA / 2300 W	T 455 x 175 x 520 o R 4U x 19"x 520	38
SDL 4000	4000 VA / 2400 W	T 455 x 175 x 520 o R 4U x 19" x 520	40
SDL 5000	5000 VA / 4500 W	T 455 x 175 x 660 o R 4U x 19" x 660	62
SDL 6000	6000 VA / 5400 W	T 455 x 175 x 660 o R 4U x 19" x 660	64
SDL 8000	8000 VA / 7200 W	2 x (T 455 x 175 x 660) o (R 4U x 19"x 660)	94
SDL 10000	10000 VA / 9000 W	2 x (T 455 x 175 x 660) o (R 4U x 19" x 660)	95
SDL 6500 TM	6500 VA / 5850 W	2 x (T 455 x 175 x 660) o (R 4U x 19" x 660)	93
SDL 8000 TM	8000 VA / 7200 W	2 x (T 455 x 175 x 660) o (R 4U x 19" x 660)	94
SDL 10000 TM	10000 VA / 9000 W	2 x (T 455 x 175 x 660) o (R 4U x 19" x 660)	95

12.2. Back-up expansion packs

For types and back up times of the Sentinel Dual models refer to the Riello UPS's price list.

12.3. Values summary sheet

MODELS	3300	4000	5000	6000	8000	10000	6500 TM	8000 TM	10000 TM
INPUT									
Input phases	1						3 + N		
Nominal voltage	220-230-240 V single-phase						380-400-415 V		
Maximum input voltage without battery	276 V single-phase						478 V three-phase		
Minimum input voltage without battery (applied load 100%)	184 V single-phase						318 V		
Minimum input voltage without battery (applied load 50%)	92 V single-phase				138 V		238 V		
Nominal frequency	50-60Hz ±5 Hz								
Maximum current	15 A	16 A	29 A	35 A	38 A	46 A	12 A*	14 A*	17 A*
Nominal current	11 A	12 A	23 A	28 A	29.5 A	36 A	8 A*	10 A*	12 A*
Power factor	>0.98						>0.95		
Current distortion (THDi)	<7%		<6%				<26%		
Input protection	Resettable thermal protection 16 A Overvoltage protection (VDR)		Overvoltage protection (VDR)						
"Hold up" time	40 ms		≥35 msec						

MODELS	3300	4000	5000	6000	8000	10000	6500 TM	8000 TM	10000 TM
BY-PASS									
Maximum acceptable voltage for switching onto mains	264 V single-phase								
Minimum acceptable voltage for switching onto mains	180 V single-phase								
Frequency tolerance accepted for switching	±5% of the selected frequency (configurable)								
Bypass protection	Resettable thermal protection 16 A Overvoltage protection (VDR)		Overvoltage protection (VDR)						
BATTERY									
Nominal battery connector voltage	108 V		192 V		240 V				
Type of battery	Lead acid, maintenance free High efficiency								
Configuration of the batteries	Single level (floating)								
Type of recharge	1 A								
Recharge time	6-8 h								
Recharge voltage	122 V		217 V		271 V				
End of discharge voltage	85.5 V		152 V		190 V				
Stability of the battery voltage (fully charged)	0.7%								
OUTPUT									
Nominal voltage	220 / 230 / 240 Vac selectable								
Waveform	Sinusoidal								
Frequency	50/60 Hz auto-sensing or selectable								
Operation as frequency converter	YES (with batteries)								
Current crest factor (in accordance with standard EN62040-3)	3:1								
Nominal power (VA)	3300	4000	5000	6000	8000	10000	6500	8000	10000
Nominal power (W)	2300	2400	4500	5400	7200	9000	5850	7200	9000
Static variation	±1%				±1.5%				
Dynamic variation (with impact of the load from 0 to 100%)	<5%								
Variation of the output frequency with mains absent	<0.1%								
Speed of frequency variation (Hz/s)	<1								
Restored voltage after dynamic variation	<20 ms								
Voltage distortion (linear load)	<2%				<3%				
Voltage distortion (non-linear load)	<5%								

MODELS	3300	4000	5000	6000	8000	10000	6500 TM	8000 TM	10000 TM
OVERLOAD TIMES									
Overload on battery: **100%<Load≤110%** **110%<Load≤150%** **Load>150%**	60'' 4'' 0.5''								
Maximum effective inverter current	1.5In for 0.5''								
Overload from the bypass: **100%<Load≤110%** **110%<Load≤150%** **Load>150%**	120'' 4'' 1''								
SUNDRY									
AC/AC performance (Double conversion operation) - 25% of load	85%	85%	91%	91%	89%				
AC/AC performance (Double conversion operation) - 50% of load	89%	89%	92.9%	92.9%	91.5%				
AC/AC performance (Double conversion operation) - 75% of load	90%	90%	92%	92%	92%				
AC/AC performance (Double conversion operation) - 100% of load	90%	90%	93%	93%	92.5%				
AC/AC performance (Line Interactive operation)	98%								
Maximum permanent operating temperature	40°C								
Recommended operating temperature (for the batteries)	20/25°C								
Humidity	<90% non-condensing								
Protections	Battery overvoltage - Inverter overvoltage (on peak) - Inverter voltage out of tolerance								
Safety compliance	EN62040-1-1 Directives 73 / 23 / EEC and 93 / 68 / EEC								
EMC compliance	EN62040-2 cl. A, directive 89 / 336 / EEC								
Noise	<48 dB(A)								
Mechanical data	Shielded metal cabinet with plastic front								
Degree of protection	IP20								
Resistance to vibrations (G)	<2								
Dissipated power with load (W/Cal)	208/179	252/217	315/271	458/395	518/445	648/557	421/362	518/445	648/557
Colour	Dark grey								
Differential input current	<10 mA								

MODELLI	3300	4000	5000	6000	8000	10000	6500 TM	8000 TM	10000 TM
OUTPUT PROTECTIONS (RECOMMENDED VALUES TO BE SELECTED)									
Normal fuses (GI)	In (Nominal Current) / 7								
Normal circuit breakers (C curve)	In (Nominal Current) / 7								
Fast blowing fuses (UR-URG)	In (Nominal Current) / 2								
Cable entry	From rear								
Input connections	Socket		Terminal / Optional plug kit						
Output connections	Sockets		Terminal / Optional plug kit						
Cooling	Forced ventilation, variable according to load and ambient temperature								

www.riello-ups.com

SPTSEPA1S16FREN Ver. June 2016 - **Subject to change without notice and inaccuracies**