

## Technical Specification



# SENTINEL PRO

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## 1 GENERAL DESCRIPTION

The SENTINEL PRO family UPS is an online single phase unit, with power levels of up to 3KVA, in a cabinet tower configuration of two different sizes based on the power required.

That UPS is designed to be configured for various operating modes:

- **ON-LINE** is the operating mode which offers maximum load protection and the best output waveform quality (\*)
- **ECO** is the operating mode which offers the least UPS consumption, or rather maximum efficiency (\*\*)
- **SMART ACTIVE** is the operating mode which allows the UPS to decide whether to enable ON-LINE or ECO functionality, based on a statistic regarding the quality of the Power Supply network.
- **STAND-BY OFF [Mode 1]** is the operating mode in which the UPS functions as an emergency device. While power is present the UPS does not intervene. In the event of a blackout, the necessary power is provided by the UPS.

(\*) the effective values (rms) of the voltage and the output frequency are constantly controlled by the microprocessor independently with respect to the waveform of the network voltage, thereby maintaining the output frequency synchronized with the network within a configurable interval.

Outside of this interval, the UPS eliminates its synchronism with the network and brings itself to its nominal frequency; under these conditions, the UPS cannot utilize the bypass.

(\*\*) In order to optimize yield, the load is normally powered by the bypass in ECO mode. In the event that the network should move outside of the preset tolerances, the UPS will switch to ON LINE functionality. Once the network has moved back within the preset tolerances for at least five minutes, the UPS will go back to powering the load through the bypass.

### ADDITIONAL FUNCTIONS

#### · **MANUAL BYPASS**

The Manual Bypass function allows the UPS to be switched to the bypass line. In this configuration, the load is powered directly by the input network and any network disruptions will have a direct effect on the load.

This family of UPS units is completed with relative battery cabinets.

The BB36 and BB72 Battery Boxes have the same aesthetic design as the UPS units and are capable of housing one or two battery branches in parallel.

The BB36-B1 and BB72-B1 Battery Boxes are larger battery cabinets which are suitable for housing 40 Ah batteries.

Both Battery Box versions are available without batteries. These versions come complete with all of the required kits so that the user can decide upon the most suitable configuration to meet his/her needs.

All of the Battery Box versions are supplied without battery charger boards.

For increased recharging current, ER version UPS units are available, which contain high-powered battery charger boards instead of batteries.

## 1.1 *Main features of the UPS unit*

The main features of the SENTINEL PRO series include:

- VFI (On-line) / pure sinusoidal waveform during battery-powered functionality
- Output frequency with automatic selection (auto-sensing)
- Front/rear ventilation
- LCD display
- UPS with configurable and customizable functions (i.e. by-pass thresholds, automatic testing, acoustic alarm, etc.) through proprietary configuration software
- Protected battery expansion connector
- Unlimited expandability of autonomy with dedicated or custom Battery Boxes
- Expansion slot for communication cards (i.e. second USB and RS 232 Port, SNMP, ModBus, etc.)
- RS 232 and USB communication ports
- Frequency converter mode with a derating of 30%
- “Free Running” mode with a derating of 30%
- Eco mode function with 98% yield

## 1.2 *Standard Versions*

- 700VA – 560W – PF 0.8 – 2 batteries, 12V, 7Ah – small cabinet
- 1000VA – 800W – PF 0.8 – 3 batteries, 12V, 7Ah – small cabinet – with battery expansion
- 1500VA – 1200W – PF 0.8 – 3 batteries, 12V, 9Ah – small cabinet
- 2200VA – 1760W – PF 0.8 – 6 batteries, 12V, 7Ah – large cabinet – with battery expansion
- 3000VA – 2400W – PF 0.8 – 6 batteries, 12V, 9Ah – large cabinet - with battery expansion

## 1.3 *ER Versions for extended autonomy*

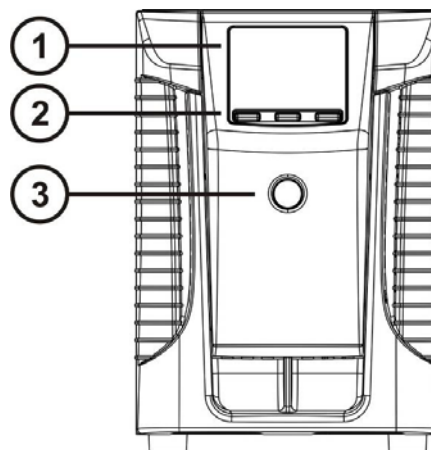
- 1000VA ER, 2200VA ER, 3000VA ER
- Same features as the standard version

## 2 SENTINEL PRO SERIES UPS AESTHETICS

### 2.1 SENTINEL PRO front panel

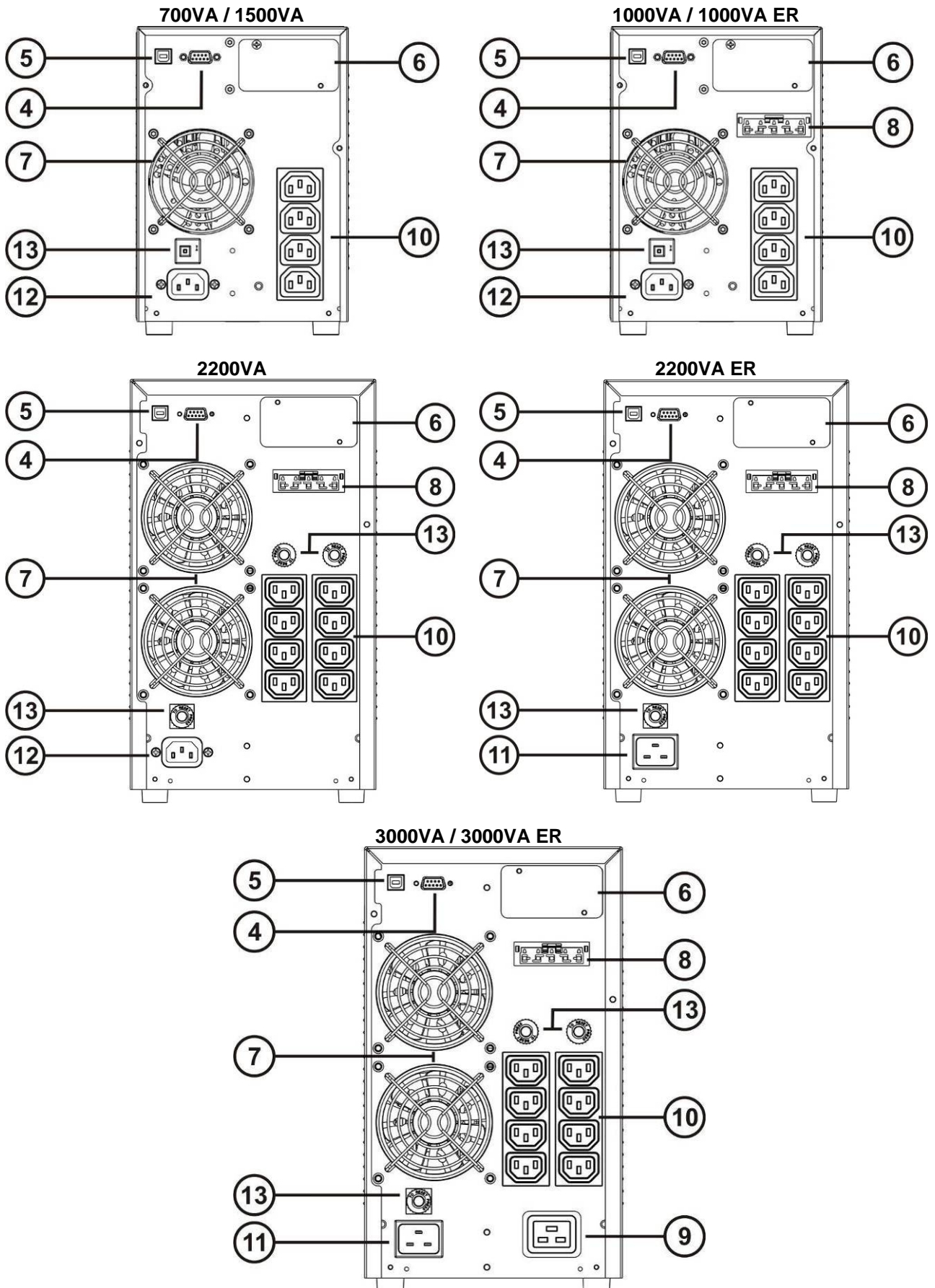


Chassis reference colour: Pantone Black 6U  
Colour of the silver parts: RAL 9006



- 1 – Display
- 2 – Multifunction keys
- 3 – ON/OFF button

**2.2 SENTINEL PRO rear panel**



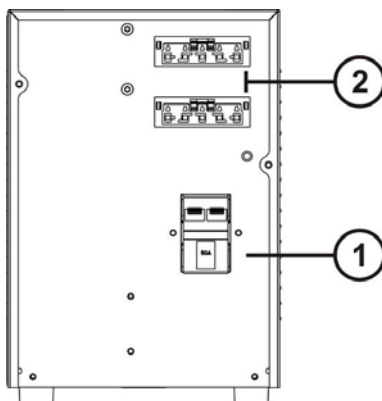
- 4 – RS 232 communication port and opto-isolated contacts
- 5 – USB Port
- 6 – Expansion slot
- 7 – Cooling fans
- 8 – Battery expansion connector
- 9 – IEC 16A output socket
- 10 – IEC 10A output socket
- 11 – IEC 16A input plug
- 12 – IEC 10A input plug
- 13 – Thermal switch

### 2.3 Battery Box front panel

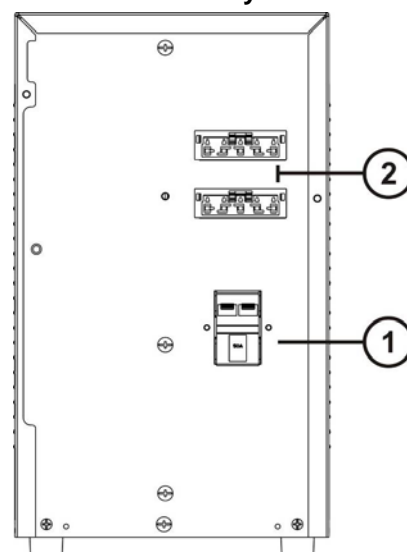


### 2.4 Battery Box rear panel

36V Battery Box



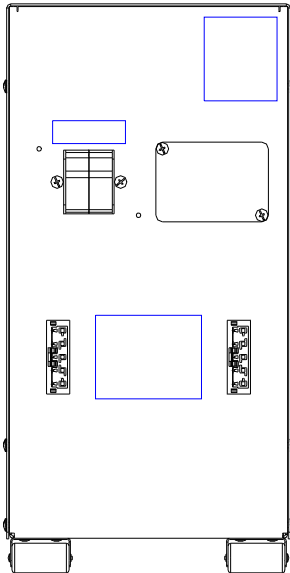
72V Battery Box



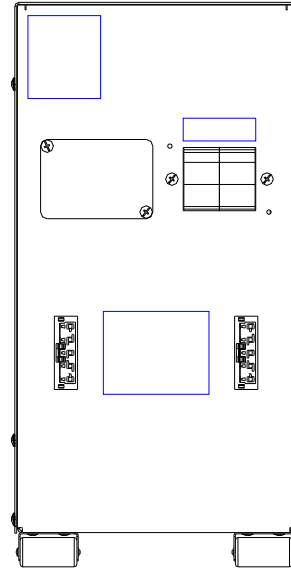
- 1- Battery disconnection switch (SWBATT)
- 2 - Battery expansion connector

## 2.5 BBox T12 rear panel

36V Battery Box



72V Battery Box



- 1- Battery disconnection switch (SWBATT)
- 2 - Battery expansion connector



### 3 TECHNICAL DATA TABLE

#### 3.1 SENTINEL PRO UPS

SENTINEL PRO UPS	700VA	1000VA	1500VA	2200VA	3000VA
		1000VA ER		2200VA ER	3000VA ER

#### INPUT

Rated voltage	[Vac]	220 - 230 - 240				
Maximum allowed input voltage	[Vac]	300				
Voltage range for no battery intervention (configurable through UPSTools)		Maximum: 276 Vac Minimum: 184 Vac AT 100% load Minimum: 184Vac ÷ 140Vac (from 100% to 50% load in linear mode) Return to network powered functionality: 190 Vac				
Rated frequency	[Hz]	50 – 60				
Power factor		≥ 0.98				
Current distortion @ maximum load		≤ 7%				
Maximum current@184Vac (1)	[A]	3.7	5.2	7.8	11.2	15.5
Rated current@220Vac (2)	[A]	3.3	4.5	6.5	9.5	12.5
Circuit breaker	[A]	7	7	10	12	16
Rated current (only for ER versions) @220Vac(2)	[A]	N/A	6	N/A	13.5	16
Circuit breaker (only for ER versions) (2)	[A]	N/A	10	N/A	16	20

(1) @ rated load, minimum voltage of 184 Vac, battery charging

(2) @ rated load, rated voltage of 220 Vac, battery charging

#### BYPASS

Accepted voltage range for switching	[Vac]	Minimum configurable threshold: <u>180</u> ÷ 200 Maximum configurable threshold: 250 ÷ <u>264</u>				
Accepted frequency range for inverter synchronization		Selectable: 3% ÷ 10% Default: ±5 %				
Switching time	[msec]	Typical: 4				

#### BATTERY

Number of batteries / V	[no.] / [V]	2 / 12V	3 / 12V	3 / 12V	6 / 12V	6 / 12V
Standard capacity	[Ah]	7Ah (a)	7Ah (a)	9Ah (b)	7Ah (a)	9Ah (b)
Charging current	[A]	0.7÷0.8A @ UPS on with maximum fan speed About 1A with UPS in Stand-By				
Charging time (c)	[h]	< 4h for 80% of the load				
Expandability and rated voltage of the Battery Box		Not expandable	36Vdc	Not expandable	72Vdc	72Vdc
Charging current (only for ER versions)		N/A	8A (d)	N/A	8A (d)	8A (d)
Minimum Battery Box capacity (only for ER versions)		N/A	> 40Ah (e)	N/A	> 40Ah (e)	> 40Ah (e)

- (a) 12V/7Ah Batteries: **CSB GP1272-F2** or **CSB GP1272(28W)** or **CSB UPS12360-7** or **YUASA NPW36-12**
- (b) 12V/9Ah Batteries: **CSB HR1234W-F2** or **YUASA NPW45-12**
- (c) For the ER versions, the charging time depends on the batteries installed in the Battery Box
- (d) The charging current depends on the input voltage and the internal temperature of the UPS. Under normal conditions, temperature derating of about 2-3A may occur
- (e) In order to select the minimum capacity of the Battery Box, verify the maximum charging current accepted by the batteries.

<b>SENTINEL PRO UPS</b>	<b>700VA</b>	<b>1000VA</b>	<b>1500VA</b>	<b>2200VA</b>	<b>3000VA</b>
		<b>1000VA ER</b>		<b>2200VA ER</b>	<b>3000VA ER</b>

**OUTPUT**

Rated voltage [Vac]	Selectable: 220 / 230 / 240				
Static variation (3)	1.5%				
Dynamic variation (4)	≤ 5% in 20 msec				
Waveform	Sinusoidal				
Voltage distortion @ linear load	≤ 2%				
Voltage distortion @ distorting load	≤ 5%				
Frequency (5) [Hz]	Selectable: 50 / 60 / Hz / automatic detection				
Current crest factor	≥ 3 : 1				
Rated power [VA]	700VA	1000VA	1500VA	2200VA	3000VA
Rated power [W]	560W	800W	1200W	1760W	2400W
Derating: Frequency converter / forced frequency de-synchronization	-30%				
Overload: 100% < load < 110%	Bypass line available:		activates the bypass after 2 sec. shut down after 120 sec.		
	Bypass line unavailable:		shutdown after 60 sec.		
Overload: 110% < load < 150%	Bypass line available:		activates the bypass after 2 sec. shutdown after 4 sec.		
	Bypass line unavailable:		shutdown after 4 sec.		
Load overload > 150%	Bypass line available:		activates the bypass instantaneously shutdown after 1 sec.		
	Bypass line unavailable:		shutdown after 0.5 sec.		
Inverter short circuit	Short circuit current ≤ Power [VA] / 220V x 2 shutdown after 300ms				

- (3) Network/Battery @ 0% - 100% load
- (4) @ Network / battery / network @ 0% / 100% / 0% resistive load
- (5) If the network frequency is within ±5% of the selected value, the UPS is synchronized with the network. If the frequency is off tolerance or battery-powered functionality is enabled, the frequency is that which is selected + 0.1%

SENTINEL PRO UPS	700VA	1000VA	1500VA	2200VA	3000VA
		1000VA ER		2200VA ER	3000VA ER



**AUTONOMIES**

Measured autonomy @ 100% linear load – only internal batteries	5'	6'30"	5'	5'	4'30"
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**MISCELLANEOUS**

Leakage current to ground [mA]	≤ 1.5			≤ 2		
AC/AC yield in ON-LINE mode	87.2%	88.9%	90.4%	90.6%	91.2%	
Automatic consumption in ECO mode (batteries disconnected)	8W	9W	9W	10.4W	10.2W	
DC/AC yield in BATTERY mode	83.5%	85.0%	86.2%	86.4%	86.6%	
Automatic consumption from the network (batteries disconnected)	41W	46W	40W	65W	58W	
Automatic consumption in Stand-by mode (batteries disconnected)	6W	6W	6W	7W	14W	
Automatic consumption with on/off switch turned off	0.5W	0.5W	0.5W	0.5W	0.33W	
Power loss with resistive nominal load	[W]	80	100	130	180	230
	[BTU/h]	270	335	445	610	790
	[kcal/h]	68	85	112	155	200
Operating room temperature (6) [°C]	0 – 40					
Humidity	< 90% without condensation					
Installation height	Operation: 1000 m at nominal power (-1% power for every 100 m above 1000 m) 4000 m maximum Transport: <15000 m					
Protection devices	Excessive battery discharge – overcurrent – short circuit – over voltage – undervoltage – thermal					
Overvoltage protection	2 VDR x 300 Joule					
Noise levels	< 40 dB(A) at 1 m					
Dimensions L x D x H [mm]	158 x 422 x 235			190 x 446 x 333		
Packaging dimensions L x D x H [mm]	245 x 500 x 340			325 x 585 x 470		
Net weight [Kg]	11	13	14	26	28	
Gross weight [Kg]	12.5	14.5	15.5	29	31	
Net weight (only for ER versions) [Kg]	N/A	7	N/A	14	15	
Gross weight (only for ER versions) [Kg]	N/A	8.5	N/A	17	18	

**ADDITIONAL INFORMATION**

Safety compliance	EN 62040-1 and 2006/95/EC Directives	
EMC compliance	EN 62040-2 cat. C2 and 2004/108/EC Directives	
Certifications		

### T10 Battery Box

T10 BATTERY BOX	AB36-M1	BB36-A3	BB36-M1	AB72-M1	BB72-A3	BB72-M1
Rated battery voltage [Vdc]	36Vdc			72Vdc		
Number of batteries / V [no.]/[V]	0 / 12V	3 / 12V	3+3 / 12V	0 / 12V	6 / 12V	6+6 / 12V
Standard capacity Ah	0	7	14	0	7	14
Dimensions L x D x H [mm]	158 x 422 x 235			190 x 446 x 333		
Packaging dimensions L x D x H [mm]	245 x 500 x 340			325 x 585 x 470		
Net weight [Kg]	6	14	21	12	27	41
Gross weight [Kg]	7	15	22	14	29	43

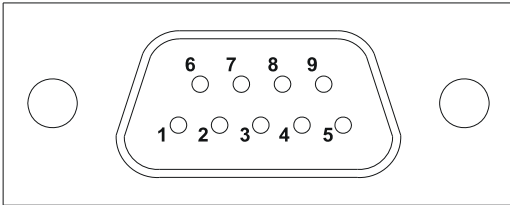
### 3.2 T12 Battery Box

T12 BATTERY BOX	BB36-B1	BB72-B1	AB72-B1
Rated battery voltage [Vdc]	36Vdc	72Vdc	36Vdc / 72Vdc
Number of batteries / V [no.]/[V]	3 / 12V	3 / 12V	0 / 12Vdc
Standard capacity Ah	40	40	0
Dimensions L x D x H [mm]	158 x 422 x 235		
Packaging dimensions L x D x H [mm]	590 x 320 x 760		
Net weight [Kg]	55	100	10
Gross weight [Kg]	65	110	20

## 4 COMMUNICATION PORTS AND FIRMWARE

The UPS comes with a standard RS 232 port with input and output signals, a USB Port and an expansion slot for connecting additional electronic boards.

### RS 232 CONNECTOR

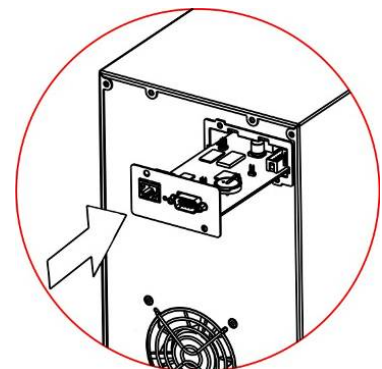
RS 232 CONNECTOR		
		
PIN #	SIGNAL	NOTES
1	Programmable output *: [default: UPS shutdown]	(*) Opto-isolated contact max. +30Vdc / 35mA. These contacts can be associated with other events using the appropriate software  (**) Opto-isolated control +5÷15Vdc. These contacts can be associated with other events using the appropriate software  For additional information about interfacing with the UPS unit, please refer to the appropriate manual
2	TXD	
3	RXD	
4	Programmable input **: [default: disabled]	
5	GND	
6	DC Power Supply (Imax = 20mA)	
7	Programmable input **: [default: disabled]	
8	Programmable output *: [default: discharge pre-alarm]	
9	Programmable output *: [default: battery-powered functionality]	

### COMMUNICATIONS SLOT

The UPS comes supplied with an expansion slot for optional communication cards (see the diagram on the right), which can allow the device to communicate using the most common communication standards.

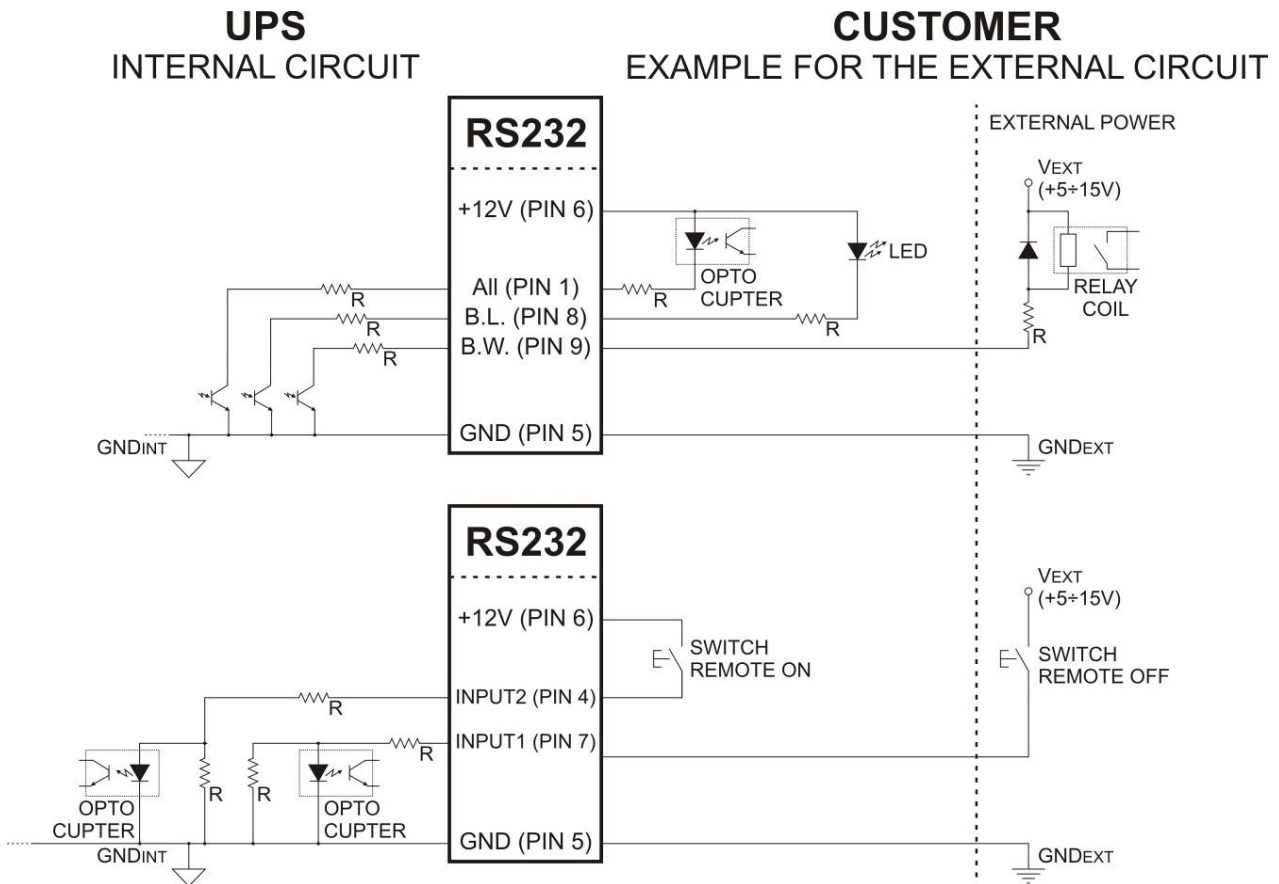
Some examples include:

- Additional RS 232 and USB communication ports
- Serial duplicator
- Ethernet network card with TCP/IP, HTTP and SNMP protocols
- JBUS / MODBUS protocol converter card
- PROFIBUS protocol converter card
- Card with isolated relay contacts



Please consult the website [www.riello-ups.com](http://www.riello-ups.com) to check the availability of additional accessories

#### 4.1 Examples for connecting signals through the RS 232 port



#### 4.2 Technical data for “pin 6” power through the RS 232 port

The voltage provided by the serial port's 6pin power depends on the absorbed current.

$V_{cc_{max}}$ : 10.8Vdc without load

$V_{cc_{min}}$ : 8Vdc @ 25mA

#### 4.3 Firmware

The firmware of the UPS unit can be updated by inserting the appropriate programming card into the expansion slot. This operation must be carried out by authorized personnel.