

Technical Specifications



10/20 kVA/kW THREE-PHASE-SINGLE-PHASE/SINGLE-PHASE
10/60 kVA/kW THREE-PHASE/THREE-PHASE
ON LINE Double Conversion Technology (VFI)



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1. OBJECTIVE

These specifications define the technical characteristics of the **SENTRYUM** uninterruptible power supply (UPS). The UPS is designed to supply a clean and stable electrical supply, irrespective of the condition of the mains or an alternative power supply.

The **SENTRYUM** series of UPS is designed and manufactured by Riello UPS, a leader in this field with a range of products from 600 VA to 1600 kVA and experience in power protection solutions.

For more information, please visit our website at: www.riello-ups.com

2. SYSTEM DESCRIPTION

The **SENTRYUM** UPS is available in 10-120 kVA/kW models utilising the very latest ON LINE double conversion technology.

SENTRYUM is classified as VFI-SS-111 as defined by IEC EN 62040-3.

The **SENTRYUM** series is a transformer-free UPS available in 10-15-20 kVA/kW models with three-phase/single-phase input and single-phase output, and 10-15-20-30-40-60-80-100-120 kVA/kW models with three-phase input and output.

SENTRYUM is designed and built using state of-the-art technology and components. It applies the advanced technologies such as DSP (Digital Signal Processor), dual core microprocessor, three level inverter circuits and resonant control to provide maximum protection to the critical loads with no impact on downstream systems, whilst maintaining optimised energy savings.

SENTRYUM 10-60 kVA/kW, to which this document refers, is designed to protect critical industrial and Information Technology (IT) systems with the following features:

Extensive range of solutions

SENTRYUM has been conceived to optimise the specific requirements by enhancing the installation flexibility.

Riello UPS offers **SENTRYUM** in three different frame solutions to satisfy any critical power demand and application.

The three different frame types available for **10-60 kVA/kW** power rating are: **Compact**, **Active** and **Xtend**.

Compactness

Modern guidelines and sustainable best practices direct us to conceive and design UPS with particular focus on the entire product life cycle, therefore applying ultimate but resilient technologies, recyclable materials and miniaturisation of assemblies whilst ensuring the systems global reliability, which is pivotal for any UPS.

High efficiency

SENTRYUM is a true online double-conversion UPS system providing the very highest levels of power availability, flexibility and unrivalled energy efficiency with superior performance for any small data centre and mission critical applications.

High power availability

SENTRYUM a fully rated design and delivers full power (kVA=kW) regardless of the load power factor or operating temperature (full rated power is available up to 40 °C).

Smart Battery Management

The Riello UPS Smart Battery Management consists of a series of features and capabilities to optimize battery management and obtain the best performance and operating life possible.

Maximum reliability and availability

Distributed parallel configuration of up to 8 units per redundant (N+1) or power parallel system. The UPS continue to operate in parallel even if the connection cable is interrupted (Closed Loop). Advanced technology and the use of high performance components enables Sentryum to provide exceptional performance and utmost reliability.

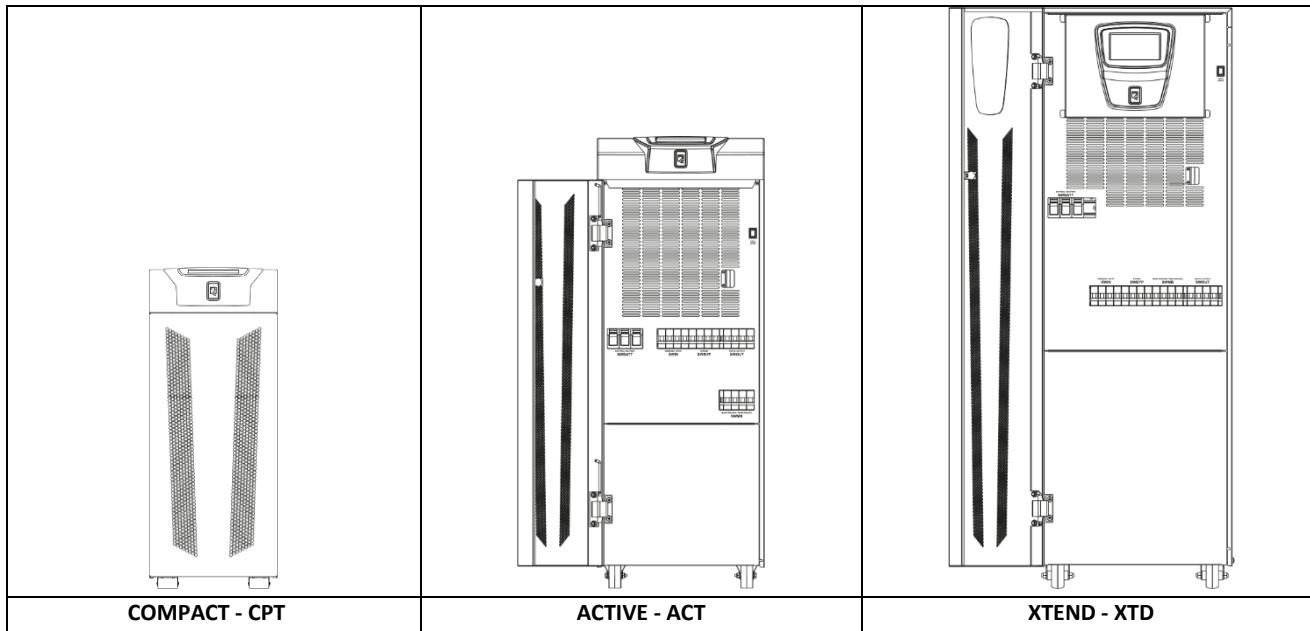
Flexibility

With its flexible range of three solutions, configuration, performance, accessories and options, **SENTRYUM** is suitable for use in a wide range of applications.

Advanced communications

SENTRYUM is equipped with a coloured graphic touch screen display providing UPS information, measurements, operating states and alarms in different languages.

The **SENTRYUM 10-60 kVA/kW** series consists of the following three models:

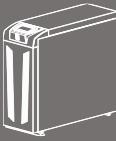
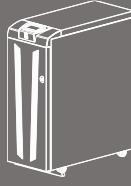
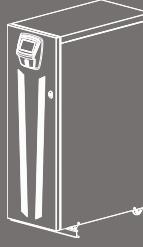


MODEL	DESCRIPTION
S3T 10 CPT	10 kVA input three-phase/output three-phase available in:
S3T 10 ACT	Compact (CPT) – Active (ACT) – Xtend (XTD) versions
S3T 10 XTD	
S3T 15 CPT	15 kVA input three-phase/output three-phase available in:
S3T 15 ACT	Compact (CPT) – Active (ACT) – Xtend (XTD) versions
S3T 15 XTD	
S3T 20 CPT	20 kVA input three-phase/output three-phase available in:
S3T 20 ACT	Compact (CPT) – Active (ACT) – Xtend (XTD) versions
S3T 20 XTD	
S3T 30 ACT	30 kVA input three-phase/output three-phase available in:
S3T 30 XTD	Active (ACT) – Xtend (XTD) versions
S3T 40 ACT	40 kVA input three-phase/output three-phase available in:
S3T 40 XTD	Active (ACT) – Xtend (XTD) versions
S3T 60 ACT	60 kVA input three-phase/output three-phase available in:
S3T 60 XTD	Active (ACT) – Xtend (XTD) versions

MODEL	DESCRIPTION
S3M 10 CPT	10 kVA input single-phase or three-phase/output single-phase available in:
S3M 10 ACT	Compact (CPT) – Active (ACT) – Xtend (XTD) versions
S3M 10 XTD	
S3M 15 CPT	15 kVA input single-phase or three-phase/output single-phase available in:
S3M 15 ACT	Compact (CPT) – Active (ACT) – Xtend (XTD) versions
S3M 15 XTD	
S3M 20 CPT	20 kVA input single-phase or three-phase/output single-phase available in:
S3M 20 ACT	Compact (CPT) – Active (ACT) – Xtend (XTD) versions
S3M 20 XTD	

The three different versions differ in their capability to accommodate a different number of batteries or accessories, such as output isolation transformer, front door air filters or higher levels of IP protection.

2.1 Sentryum 10-60 kVA/kW COMPACT ACTIVE XTEND OUTFIT TABLE

Feature	Compact	Active	Xtend
			
Power range	10-15-20 kVA	10-15-20-30-40-60 kVA	10-15-20-30-40-60 kVA
Output Voltage	3 ph or 1 ph	3 ph / 1 ph (only 10-20)	3 ph / 1 ph (only 10-20)
Terminal / Cables entry	Rear, dedicated terminal cover	Bottom front	Bottom front
Front door	No, front cover	Yes	Yes
Castors		Yes	
Switches	SWIN, SWOUT, SWMB	SWIN, SWOUT, SWMB (SWBYP optional)	SWIN, SWOUT, SWMB, SWBYP
DI (separate bypass input line and switches)	Not Applicable	Optional (Ex-works/on site)	Standard
Battery fuse holder	UPS Internal battery protection (Not Applicable for 60 kVA Active Model)		
Internal batteries	1x 40 blocks	1÷2x 40 blocks [10-20kVA] 2x 40 blocks [30-40kVA] Not Applicable for 60 kVA	1÷3x 40 blocks [10-20kVA] 2÷3x 40 blocks [30-40kVA] 3x 40 blocks [60 kVA]
Cold Start		Standard	
Display 5" Touch Screen	Horizontal	Horizontal	Vertical
Status Led		Standard	
Schuko socket (Powered upstream SWOUT)	Not Applicable	Not Applicable	Standard for 10-40 kVA Not Applicable for 60 kVA

Options & Accessories	Compact	Active	Xtend
Parallel		Optional	
DI (separate bypass)	Not Applicable	Optional	Standard
External Synchro		Optional	
Battery temp.re sensor		Optional	
Extended recharge (ER)		Optional	
IP X1 Protection	Not Applicable	Not Applicable	Optional
Front door air filter	Not Applicable	Not Applicable	Optional
Internal Output transformer	Not Applicable	Not Applicable	Optional
Seismic kit	Not Applicable	Optional	Optional
Fan Failure Alarm for 10-40 kVA *	Not Applicable	Not Applicable	Optional for 10-40 kVA (Ex-works)

* The Fan failure alarm is standard for S3T 60 ACT and S3T 60 XTD models.

3. REFERENCE STANDARDS

Riello UPS operates a Quality Management System certified to ISO 9001/2015 (Certification No. CERT-04674-99-AQ-VEN-SINCERT) covering all company functions from design and manufacture to after sales services.

This certification is a guarantee for the customer with regard to the following aspects:

- use of quality materials;
- meticulousness in the production and testing phases;
- continued customer support.

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 for 10-40 kVA, category C3 for 60 kVA;
- **IEC EN 62040-3:** Methods of specification of performances and test provisions;

The **SENTRYUM** 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 62477-1:** Safety requirements for power electronic converter systems and equipment
- **IEC 61000-2-2:** Electromagnetic compatibility immunity;
- **IEC 61000-3-12:** Harmonic current emissions (for equipment with rated current $> 16 \text{ A} \leq 75$).
- **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 61000-4-6:** Immunity to conducted disturbances, induced by radio-frequency fields
- **IEC 61000-4-8:** Power frequency magnetic field immunity test
- **IEC 61000-6-4:** Emission standard for industrial environments

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.

RoHS directive 2011/65/EU

Restriction of the Use of Certain Hazardous Substances in Electronic and Electrical Equipment. Aims to prevent hazardous substances from entering the production process and thereby keep them out of the waste stream.

4. APPLICATIONS

SENTRYUM UPS are suitable for applications requiring critical load protection, from a simple installation to those more complex where the requirement for the highest levels of reliability and maintainability are paramount.

LAN, Server and Datacentre: the unitary output power factor (kVA=kW) ensures the greatest power availability for efficient UPS loading.

e-business and Telecommunications: parallel operation means that the installed UPS size can be increased (up to 8 units) to keep pace with the growth of the organisation.

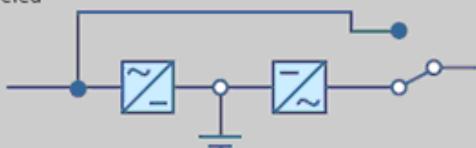
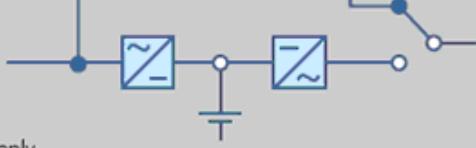
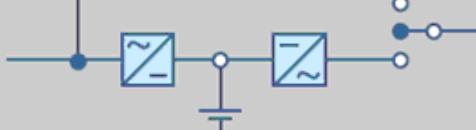
Industrial processes, Transport and Electro-medical systems: the UPS is designed to protect a range of loads, from industrial processes to electro-medical applications. This has been achieved through careful load analysis at the design stage of the **SENTRYUM** project, to ensure the following characteristics:

- Optimum input technical characteristics with zero impact on the power supply source.
- Extremely high inverter short circuit and overload capacity.
- High battery recharge capacity with the option to use a variety of battery types (sealed valve regulated open-vented, Nickel Cadmium, Li-Ion) for long back-up times.
- Compatibility with Supercapacitors for short time back-up needs and green cost-effective solutions
- Higher IP rating on site add on solution.

Emergency systems

The UPS can be configured in accordance with the standard EN 50171 (Centralised Power Supply Systems).

With the battery type, the autonomy and recharge times, in accordance with the EN 50171 standard. 3 different modes of operation can be selected in order to adapt to all different system requirements.

Different operation mode (EN50171)	SENTRYUM Configurations
<p>1. Always powered</p> 	<p>UPS on mode: ON LINE (See chapter 6 "UPS description")</p>
<p>2. Powered from the mains</p> 	<p>UPS on mode: ECO (See chapter 6 "UPS description")</p>
<p>3. Emergency only</p> 	<p>UPS on mode: STANDBY OFF (See chapter 6 "UPS description")</p>

Note: Contact your local agent for dedicated emergency light solutions in accordance with the standard EN 50171.

5. CONFIGURATIONS

The configurations available are the following:

Single UPS

The single UPS solution, normally used for simple installations, can be expanded in parallel to satisfy increases of connected load or to introduce a higher redundant level.

Parallel configuration

Up to 8 UPSs having the same power rating (4 units when using the single-phase version) can be connected in parallel to increase the power of the uninterruptible power system (power parallel) or to enhance its reliability (redundant parallel).

The system is defined as "redundant parallel" when the stopping of one or several UPSs does not determine the loss of the power supply.

All the UPSs power the load simultaneously with automatic current sharing.

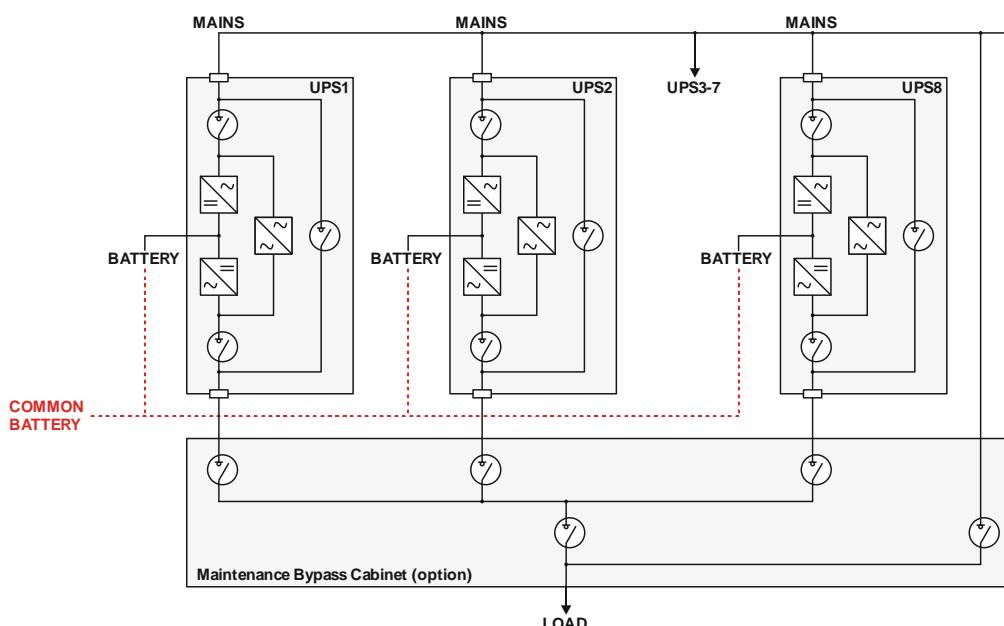
The units exchange information in relation to the operating status and the sync signals, via a communication loop providing dual redundancy. This means that even in the event of the accidental interruption of both connections, only the UPS affected by this interruption will switch off, whilst the other unit will continue to operate without any interference.

Thanks to the "**Hot System Expansion**" feature means that a new UPS can be added to the system while the other units are online and powering the load from the inverter.

The UPS being integrated will configure itself automatically with the system data without any disturbance to the load.

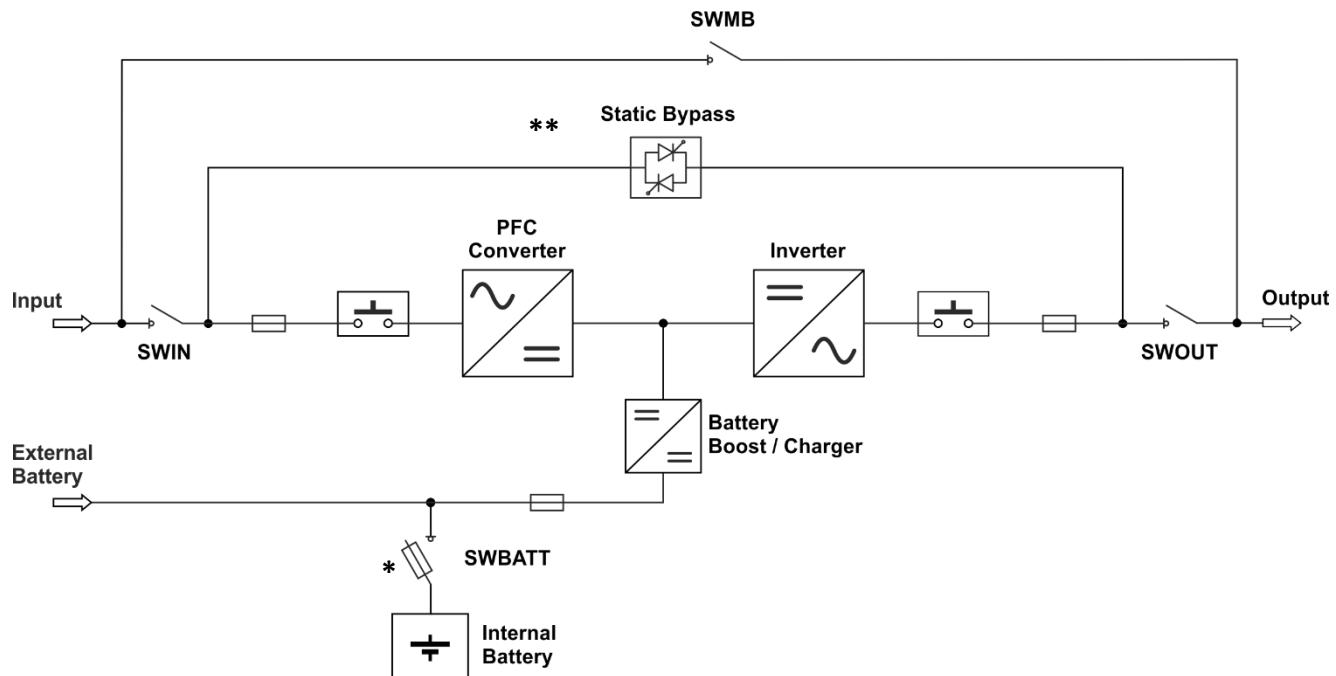
Note:

- Maximum communication cable length between two UPS should not exceed 50 meters keeping in mind that total length for the overall ring is 100 meters.
- The standard communication cable, part of installation kit is 5 meters long for all **SENTRYUM** range 10-60; the user may arrange for a longer cable (in accordance with the specification above) using a standard RJ45 type cable as available on the market.
- For parallel configuration where a transformer is required to be connected downstream of each single UPS, please contact your local agent in advance.
- Parallel UPS are set with separate battery configuration (as depicted below); common battery configuration can be arranged using the Configuration Software (for authorised personnel only).

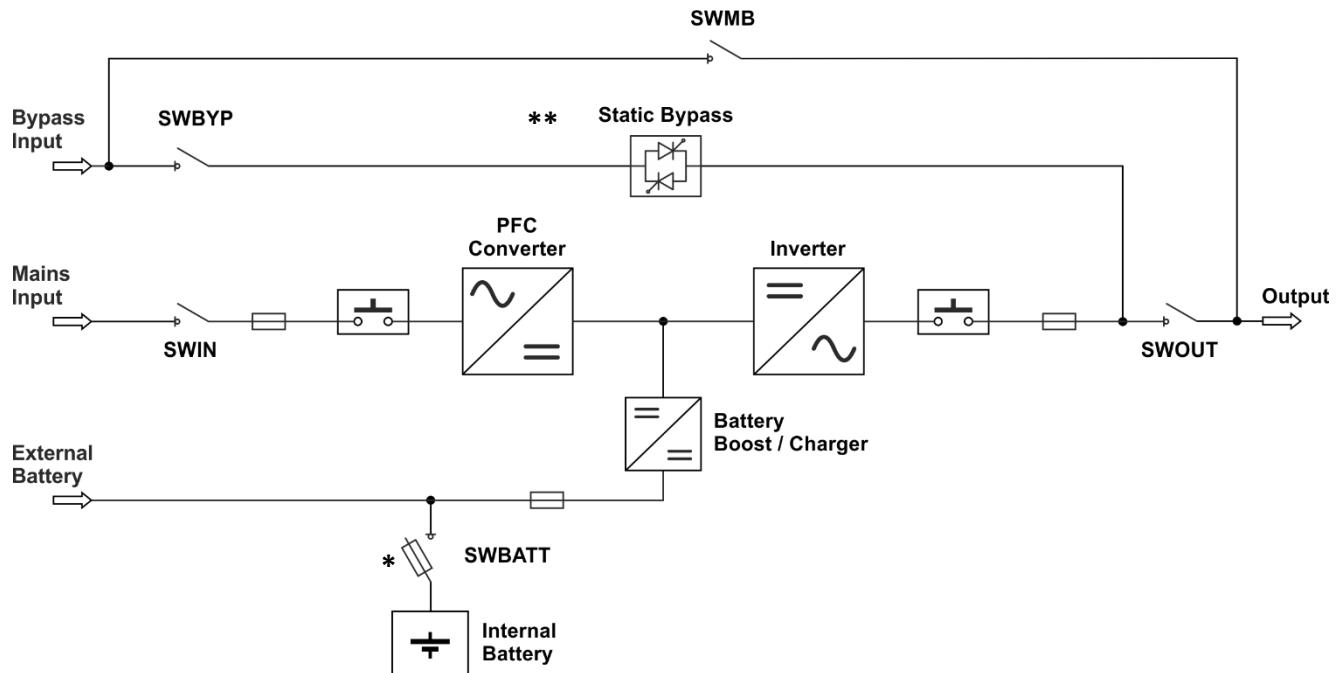


6. UPS DESCRIPTION

The **SENTRYUM 10-60 kVA/kW** block diagram is as follows:



SENTRYUM 10-60 kVA/kW "Dual Input" version (separate bypass line) block diagram is the following:



*** NOTE:** The **S3T 60 ACT** model cannot contain internal batteries. Therefore, the **SWBATT** switch, which is related to the internal battery backup only, is not provided with this UPS model.

**** NOTE:** The **S3T 60 ACT-XTD** models are provided with fuses on the static bypass line. For more details, see paragraph 6.4.

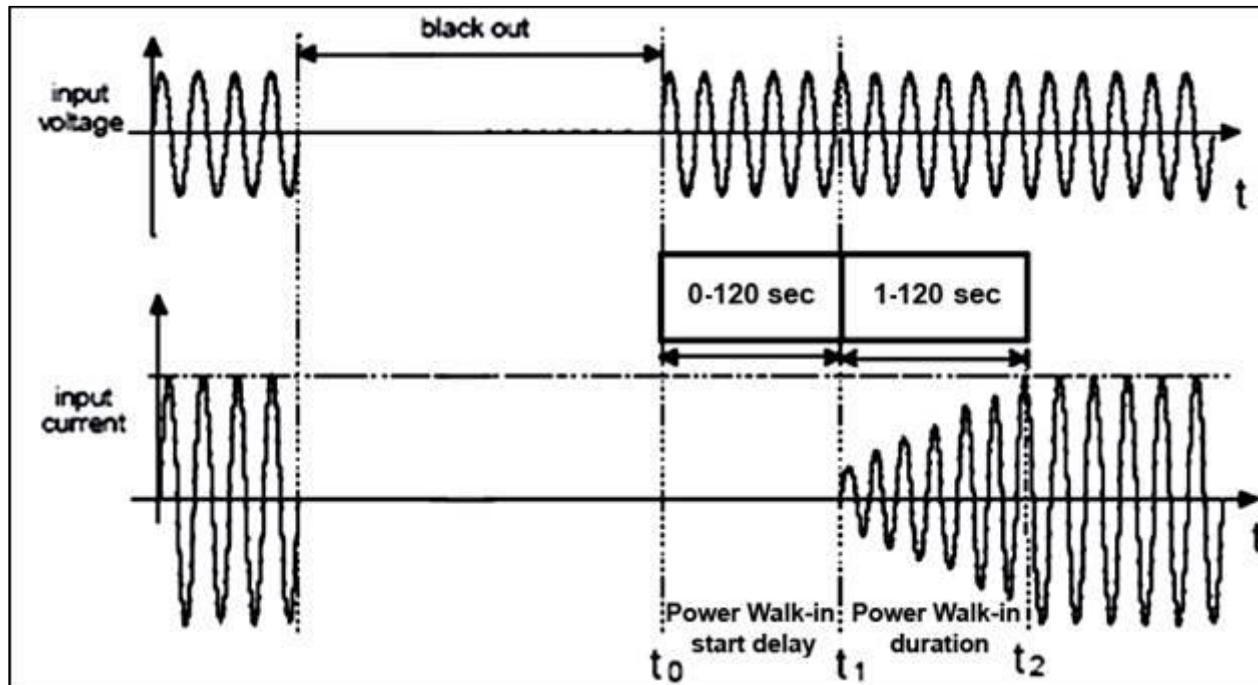
6.1 PFC CONVERTER (ZERO IMPACT SOURCE)

The PFC Converter converts the AC voltage into a DC supply to power the Inverter; if the mains or alternative power supply fails, the Converter will raise the battery voltage to a value suitable with which to power the Inverter. The PFC control technology benefits from Dual core Digital Signal Processor (DSP) microprocessors, advanced Programmed Logic Device (PLD) and latest generation of IGBT modules to achieve a low impact on the power supply source, low harmonic distortion and high input power factor.

The UPS negligible input harmonic distortion of 3% and high input power factor (> 0.99); make it possible to reduce the size of a possible generator and/or a distribution transformer MT/BT placed upstream.

A zero impact on the supply source is ensured, due to the following configurable operational control parameters:

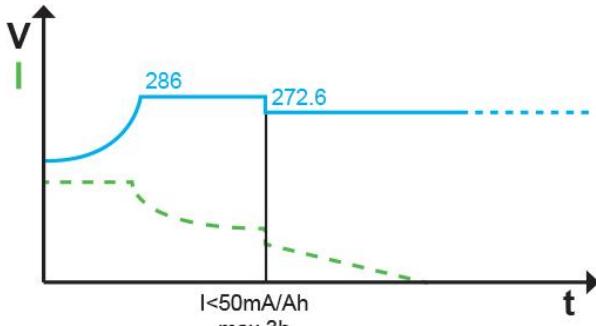
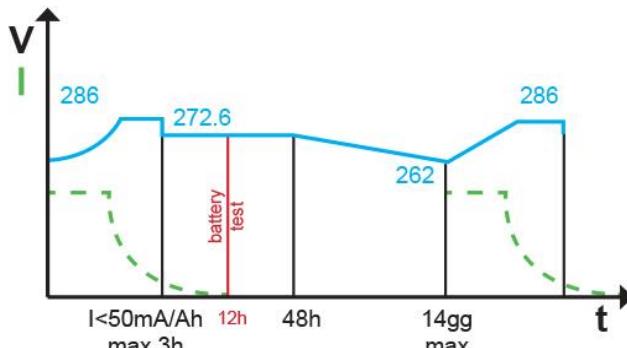
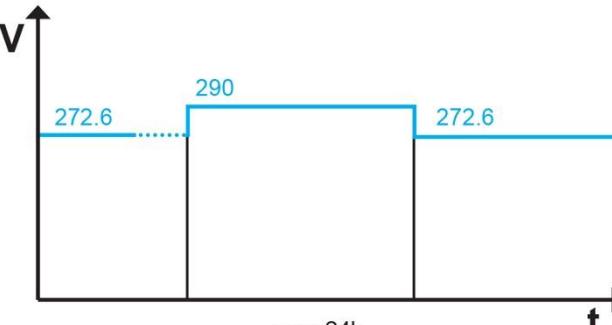
- **Power Walk in-start Delay (t0-t1):** when the mains power supply returns, this parameter delays the input stage start up for a period of time that can be set between 0 and 120 seconds. This function is particularly useful when the mains power supply returns after an interruption (or when the generator set is started) and the source is required to supply various UPS or, more typically, multiple loads.
- **Power Walk-in duration (t1-t2):** when the mains power supply returns, absorption of the mains power supply progressively reaches the nominal value within a time period that can be set from 1 to 120 seconds. This function is normally disabled but whether active or not the UPS maximum input current (Inrush) is always limited and never greater than the nominal current.



6.2 BATTERY CHARGER (Smart Battery Management)

The "Smart Battery Management" is a set of functions arranged to help extend the working life of the connected battery set and optimise its performance.

Battery recharging: the UPS can be used with sealed lead batteries (VRLA), AGM, open-vented, NiCad and lithium batteries. According to the type of battery used, three different charging methods are available:

Recharging modes (selectable via the Configuration Software)	SENTRYUM configurations
	<p>Floating: the charge state of the battery is continuously monitored; when the mains power supply is present, the batteries are charged at a pre-set voltage level and limited current relative to the recharge time required and the capacity of the connected battery.</p>
	<p>Two-level recharge (standard): this recharge is at limited current with two levels of voltage. In the first instance, the process uses a quick charge voltage, whilst in the second stage a float charge. This type of charging is mainly used with open-vented batteries or other types when an accelerated recharge time is required.</p>
	<p>Cyclical recharge: this recharge is sometimes recommended by battery manufacturers to prolong the battery life. It consists of battery charge and discharge cycles as indicated in the diagram.</p>
	<p>"Commissioning Charge": this charge method is useful every time new batteries are installed in the UPS. By increasing the voltage to 290 (adjustable value) Volts for a maximum of 24 hours, perfect equalisation of the battery charge is assured, thus guaranteeing a uniform discharge and wear of the individual battery blocks.</p>

The various recharge methods and the pre-set voltage values are defined using the Configuration Software.

The presence of the external temperature sensor option may activate (via the configuration software) compensation of the voltage depending on the temperature (20 mV/°C on each battery block).

The Riello UPS Smart Battery Management consists of a series of features and capabilities to optimize battery operation and preserve the battery life:

Battery test: during normal operation the battery is automatically tested at regular intervals. The battery test can also be manually activated.

The UPS switches to battery just for the short time needed to execute the battery test and only when the mains are present as backup, therefore the battery charge level and the load safety are not compromised.

If the test returns a negative result a warning is displayed on the UPS panel (or remote panel, if installed).

Protection against slow discharges: for long runtimes and low load discharges, the end of discharge voltage is raised to approximately 1.8 V/cell as recommended by the battery manufacturers to avoid a deep discharge state.

Protection against the battery polarity error: The Sentryum is provided with a reverse polarity detection circuit concerning the battery connection to prevent any damage to the UPS unit. A **Battery polarity error** fault alarm will be raised in the event of any faulty connections from the battery cables to the UPS terminals.

Ripple current: recharge ripple current (residual AC component) is one of the most important causes of poor battery reliability and reduced operating life. The UPS battery charger is a high-frequency design with a negligible level of ripple current.

Battery recharge limit current: The battery recharge current is limited to a prefixed value of Cnom/8 (i.e. 12.5% Cnom). The percentage limit can be adjusted using the Configuration Software assuming that Sentryum is able to deliver up to 30 Amps of battery recharge current (refer to technical data table).

Cold-Start: This feature allows the Inverter to be switched on and the load to be powered by the battery, when the mains power supply is not present. The cold start function is fitted as standard within all Sentryum units with the cold start button located either at the front or rear of the unit according with the version type (CPT, ACT, XTD); for details refer to UPS installation manual.

Battery charger current: The **SENTRYUM** battery charger provides, as standard, 6 Amps for 10-15-20 kVA, 10 Amps for 30-40-60 kVA; it is possible to supply the UPS (ex-works) with a higher rated recharging current (ER version) therefore delivering up to 12 A for the 10 kVA version, up to 20 A for the 15 and 20 kVA, up to 30 A for the 30, 40 kVA and 60 kVA power rating.

UPS without batteries: the UPS must always be operated with the batteries connected; if they are not connected alarms will be generated and the UPS will not be able to ensure business continuity if mains power supply fails. It is however possible to configure, via the Configuration Software, the following "Battery mode" setting: **Without (no autonomy)**. This means that the UPS is provided without batteries and no battery cabinet is connected; the bypass line is still available. In this case the unit is working as Voltage Stabilizer, but note that any mains failure will cause a blackout to the UPS load.

The Sentryum allows a wide battery block range per string.

The standard 20+20 battery blocks @ 12 V with Neutral central point can be adjusted from 15+15 to 22+22 battery blocks; nominal power de-rating is automatically applied below 20+20 battery block configuration (see the limits indicated in the "Technical data table") and therefore all the related parameters will be adjusted accordingly (nominal power, nominal current, battery voltage parameters, etc.).

6.3 INVERTER

The DC/AC Converter (Inverter) converts the direct current into a stabilised sinusoidal alternating current to power the load. When the UPS is in ON LINE mode, the load is always powered by the Inverter.

The Inverter type is an IGBT (*Insulated Gate Bipolar Transistor*) based three level design; innovative resonant control as well as dual core DSP microprocessor and high commutation inverter frequencies (18 kHz) make it possible to ensure high quality output voltage, with low noise levels, high operating efficiency and outstanding dynamic performance under any operating condition.

Voltage adjustment

The output voltage can be adjusted using the independent phase control and DSP microprocessor; this enables a better static and dynamic response. In detail:

- a) **static condition:** the Inverter output voltage remains within $\pm 0.5\%$ for all variations of the input voltage within the accepted limits;
- b) **dynamic condition:** for load variations from 20 to 100% and 100 to 20%, the output voltage remains within $\pm 1\%$, with resistive linear load (refer to the technical data table).

Frequency adjustment

The Inverter output frequency is generated autonomously by an internal oscillator, in synchronisation with the bypass supply. Frequency stability is operating condition dependent:

- a) **Frequency stability**

- a) **With the mains supply present:** the internal oscillator follows any frequency variations of the bypass supply, in relation to the pre-set value - normally $\pm 5\%$ (configurable from $\pm 0.10\%$ to $\pm 10\%$).
- b) **With no mains supply present:** the Inverter autonomously generates the frequency of the output voltage with a stability of $\pm 0.01\%$.

- b) **Frequency variation speed**

The maximum Inverter output frequency variation speed is 1 Hz/s (adjustable from 0.1 to 4 Hz/s).

Distortion of the output voltage

Inverter output waveform distortion with a resistive linear load is maintained within $\pm 1\%$. With a non-linear load, thanks to the ultimate digital control, the output voltage distortion does not exceed 1.5%.

Overload

The Inverter is sized to provide a power overload for a limited length of time (see the limits indicated in the "Technical data table").

When the time period or power limits are exceeded, the load is transferred to the bypass supply.

Short circuit capacity

If a current surge occurs whilst the UPS is operating from the batteries the Inverter will carefully analyse the output voltage and current in order to distinguish if the short circuit is genuine or an overload. The UPS will detect a short circuit if ($V_{OUT} < 190$ V):

- During battery operation (mains power supply failure) the Inverter can supply a current limited to $2.7 \times I_n$ for 200 ms + $1.5 \times I_n$ for 300 ms.
- With the mains supply present, the UPS will changeover to bypass and supply a limited current for 1 s (current $> 103\%$ and output voltage < 190 Volt). However, if the current is greater than 200%, but the voltage is within the limit, UPS will not discriminate the short circuit, continuing to feed the load for 20 seconds; during this time the upstream or downstream protections devices outside of the UPS should be able to be discriminated.

The table below recommends the sizing of the various protection devices located downstream of the UPS in order to guarantee their discrimination even in the event of a power failure:

Output protections (recommended values for selectivity)	
Normal fuses (GI)	In (Nominal current)/4
Normal switches (C curve)	In (Nominal current)/4
Ultra-fast fuses (GF)	In (Nominal current)/2

6.4 STATIC SWITCH (Automatic Bypass)

A static switch is an electronic device that can automatically transfer the loads connected to the UPS to the bypass supply in an emergency for example when:

- a) Inverter overload limits are exceeded;
- b) internal over temperature limits are exceeded;
- c) the Inverter fails;
- d) DC voltage goes outside the permitted range.

If at the time of switchover, the inverter voltage is not synchronised with that of the bypass power supply, the transfer is enabled with a fixed delay (10 ms). In consideration of the various types of loads it is possible to adjust the transfer delay (10-100 ms) or to disable the transfer. All the settings can be modified via the Configuration Software.

Bypass Input (Emergency Supply Voltage)

Transfer to the emergency supply only takes place if the voltage and the frequency are considered 'suitable' for the load and the limits for transfer can be adjusted via the Configuration Software.

- Default voltage range: -22%, +15% (configurable from -22% to +15%);
- Default frequency range: $\pm 5\%$ (configurable from $\pm 0.10\%$ to $\pm 10\%$).

Overload

The static switch hasn't got any protection device against overload, in order to guarantee maximum continuity.

Overshoot protection shall be provided by protective devices within the overall installation to ensure UPS compatibility.

UPS static switch is sized to support the following overload periods; above these limits the UPS is automatically turned Off:

- 110% permanently
- 125% for 60 minutes
- 150% for 10 minutes
- 200% 1 min
- $>200\%$ 20 s

Note: for further overload limit details, clearing I^2t energy and rated conditional short circuit current (Icc), refer to the technical data table.

Redundant Auxiliary Power Supply for the Automatic Bypass

The **SENTRYUM** is equipped with a redundant auxiliary power supply to allow the automatic bypass to function even if the main power supply has failed.

If the UPS fails in addition to the main power supply, the load is powered through the automatic bypass.

The control card, the display and communication slots remain powered, thus maintaining the communication interfaces to enable the UPS monitoring.

Backfeed protection

The UPS has an internal protection against backfeed. This protection acts by means of a sensing circuit which turns the inverter off if a fault within the static switch is detected. During this condition, to avoid interrupting the supply to the connected load, the UPS switches to the bypass line.

If this fault occurs during battery operation, the inverter is stopped.

A volt free contact can be configured to drive a disconnecting device to be installed upstream of the bypass input to the UPS, in this case when a backfeed fault occurs, the system opens the external disconnecting device, hence avoiding the requirement to stop the inverter (refer to the user manual to configure this option).

6.5 UPS OPERATING MODES

The UPS can be operated in five main operating modes: ON LINE, FREQUENCY CONVERTER, ECO, SMART ACTIVE, STANDBY OFF, these operating modes are described as follows:

Mode: ON LINE

Normal Operation: the rectifier, draws power from the mains power supply, supports the Inverter and charges the batteries; the load is powered by the Inverter which provides a clean and secure supply, synchronised to the bypass supply.

Emergency Operation: if the mains power supply exceeds the permitted input range (voltage and frequency), the rectifier is shut down and the Inverter is automatically powered by the battery set for the pre-set back-up time and without disruption to the load. When the mains power supply returns, the rectifier gradually starts up, charges the batteries and eventually powers the Inverter.

Operation from By-pass: if an Inverter overload exceeds permitted limits, or is manually shutdown, the load automatically transfers to the emergency bypass via the static switch and without disruption to the load.

Mode: FREQUENCY CONVERTER

The UPS can be configured as a frequency converter via the Configuration Software, therefore when the input frequency is 50 Hz the output frequency can be 60 Hz and vice versa. During this mode of operation, the automatic by-pass is disabled. The UPS can work in frequency converter mode with or without the batteries (must be configured via the Configuration Software).

In Frequency converter mode the static bypass is not available, therefore the user cannot perform a manual bypass operation.

Mode: ECO

The load is normally powered from the emergency bypass supply and the rectifier maintains the battery charge. When the mains power supply exceeds the permitted input range, the load is automatically transferred (transfer time < 2 ms typical) to the output of the Inverter until the mains power supply returns within range.

This mode is useful when powering loads that do not require the regulated no-break supply from the Inverter and allows the system to achieve a very high efficiency of up to 99%.

Mode: SMART ACTIVE

When the UPS is configured to operate in SMART ACTIVE mode, it automatically selects whether to operate in ON LINE or ECO mode. The decision is made based on statistical calculations performed by the UPS and based on the quality of the mains and bypass supplies: if the latter remains suitable for a certain period, the unit selects ECO mode, otherwise it remains in ON LINE mode.

Mode: STANDBY OFF

If selected the UPS is set to operate only in an emergency: when the mains power is present, the load is powered off while, in the event of a black-out, the load is powered by the inverter from the batteries (activation time is less than 0.5 s) and is then powered off again when mains power is restored (default time is zero seconds, however this can be adjusted via the Configuration Software).

Note: The above listed operating modes are available whether a single unit, or parallel system configuration.

7. CONTROL PANEL

The control panel consists of a 5" touch screen graphic display (resolution is 480x272 pixel) and multicolour status led placed below the display which delivers immediate and clear information regarding the overall status of the UPS by changing the colour (light blue, dark blue, orange and red) according with the operating mode and condition.

7.1 DISPLAY AND STATUS LED

Graphic display provides UPS information, measurements, operating states, alarms and configuration in different languages. The default screen displays the UPS status, graphical indication of the energy path through the UPS and the operational condition of the various assemblies (rectifier, batteries, inverter, bypass) within the UPS. Multilevel access menu grants easy, intuitive and secure access to information, measurement, and configuration, for both service personnel and user according with the profile.

DISPLAY:



STATUS LED

Below the touch screen display, an illuminated Riello logo will inform the user at a glance, the status of the UPS.

The operational conditions are indicated via the various colours as follows. For further details refer to UPS user manual.



Light blue (pulsing): Normal operation

No anomalies are present, and the system is working in the selected mode.



Dark blue: Bypass operation

The system is working from a temporary bypass.



Orange: Anomaly

The system is working from battery, forced to bypass or an anomaly or warning has occurred.



Blinking red: Fault condition

A fault or lock occurred, or the load is not powered due to an unexpected condition (e.g. Emergency Power Off).

7.2 DISPLAY ICONS AND SYMBOLS



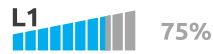
System input/mains status



% Battery charge level



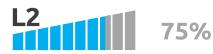
System output status



% Phase 1 load level



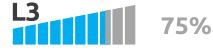
Bypass status



% Phase 2 load level



Battery status



% Phase 3 load level



System status



Manual bypass switch closed (SWMB)



Grey: communication lost (Com-Lost)



Orange: anomaly



Light blue: normal status



Flashing red: alarm



Blue: Temporary bypass status

The tab icon located on the righthand side of the display makes it possible to expand/reduce the main menu; this drop-down list contains the access to the following operations:

		Command launcher		Access level selection. The icon changes depending on the preset access level
		Buzzer toggle button		UPS info
		Settings menu		Event log

7.3 DISPLAY OPERATIONS

1-MEASUREMENT

By tapping the four icons at the edge of home page display it is possible to collect the UPS measurements and particularly:

System input/mains icon: Input voltage (ph-ph and ph-neutral) plus input current and frequency

System output icon: Output voltage, (ph-ph and ph-neutral) rms and peak current, power (kW/kVA/pf) and load level

Bypass icon: Input voltage phase to phase and phase to neutral plus frequency

Battery icon: Battery voltage and current, charging level and autonomy time

1-COMMANDS

Command icon makes it possible to access the system and battery commands.

2-BEEPER

Beep icon can silence the alarm by pressing the beeper toggle button.

3-SETTING

Main set up icon access to the UPS configuration referring to languages, and display settings (system clock, screen saver buzzer, and display access profile password) - Refer to paragraph "UPS configuration".

4-ACCESS LEVEL

Access level icon allows the selection to the required access level for the user operating the UPS; up to three levels are available named: "User", "Power User", "Expert" (Expert is for service personnel, only).

5- UPS INFO

Info icon access to the UPS general information pages (UPS model, serial number, power rating, firmware version, and general configuration sum up).

6- EVENT LOG

Event Log icon access to the system log; by using the arrows, the user can scroll up and down the event list.

The UPS will record the last 960 events occurred. The older ones are then overwritten.

Note: For more information about the display menu and operations refer to the UPS user manual.

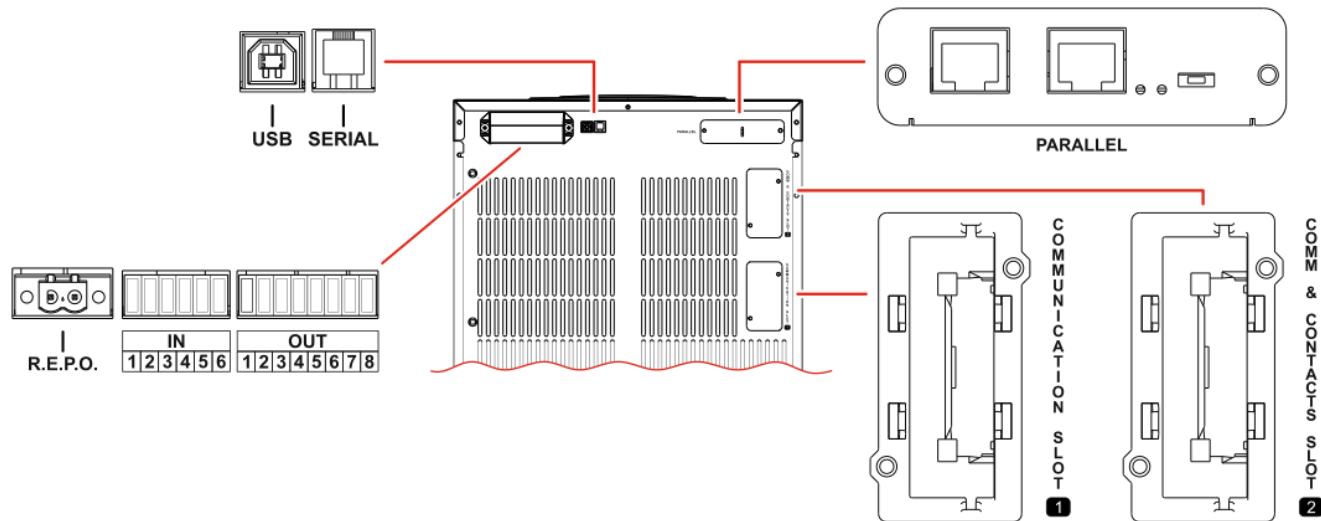
7.4 UPS CONFIGURATIONS

Configurations which can be modified from the display are listed here below:

FUNCTION	DESCRIPTION	DEFAULT	POSSIBLE CONFIGURATIONS	ACCESS LEVEL
Language	Selection of the mimic panel language	English	<ul style="list-style-type: none"> • English • Italian • German • French • Spanish • Portuguese • Czech • Polish • Russian • Danish • Chinese • Turkish 	“PowerUser”
Homepage timeout	Selection of the screen saver timeout	5 min	1-240 minutes	“PowerUser”
Buzzer	Disables the alarm buzzer	ON	<ul style="list-style-type: none"> • OFF • ON 	“PowerUser”
Date and time	UPS internal clock setup	-	-	“PowerUser”
Operating mode	Selection from among five different operating modes	ON LINE	<ul style="list-style-type: none"> • ON LINE • ECO • FREQUENCY CONVERTER • SMART ACTIVE • STANDBY OFF 	“Expert”
Battery low	Estimated autonomy time remaining for “battery low” warning	3 min	1-7 @ 1 min step	“Expert”
Auto Restart	Enables the auto restart function	5 s	<ul style="list-style-type: none"> • OFF • ON (configurable 0-240 seconds) 	“Expert”
Auto Power Off	Enables and configures the auto power off function	OFF	<ul style="list-style-type: none"> • OFF • ON (configurable 2-10%) 	“Expert”
Output voltage	Selection of the output voltage (Phase - Neutral)	230 V	<ul style="list-style-type: none"> • 220-240 V (custom) • 208 V • 200 V 	“Expert”
Output frequency	Selection of the inverter frequency	50 Hz	<ul style="list-style-type: none"> • 50 Hz • 60 Hz 	“Expert”
Automatic battery test	Enables and schedules the automatic battery test	40 h	<ul style="list-style-type: none"> • OFF • ON (programmable) 	“Expert”
User password change	Replacement of the current password with a new one	-	Any combination of characters for a maximum of 16	“User”
“PowerUser” password change	Replacement of the current password with a new one	-	Any combination of characters for a maximum of 16	“PowerUser”
“Expert” password change	Replacement of the current password with a new one	Expert	Any combination of characters for a maximum of 16	“Expert”

8. COMMUNICATION INTERFACES

Communication interfaces are located at the rear of the UPS with the same layout no matter which model (Compact, Active, Xtend). The arrangement shown below is slightly different for the S3T 60 XTD model; for more details, refer to the installation manual.



8.1 COMMUNICATION BOARD

It includes R.E.P.O., IN/OUT signals interface, USB communication port, serial port.

R.E.P.O.: This insulated input is used to switch off the UPS in an emergency. The UPS is supplied with the "Remote Emergency Power Off" (R.E.P.O.) terminals short circuited. At installation, remove the short-circuit and connect to the normally closed contact of the shutdown device, using a double-insulating cable.

When activated from a remote push-button or other device in an emergency, the R.E.P.O connection opens and the UPS switches to standby mode. The UPS no longer powers the load.

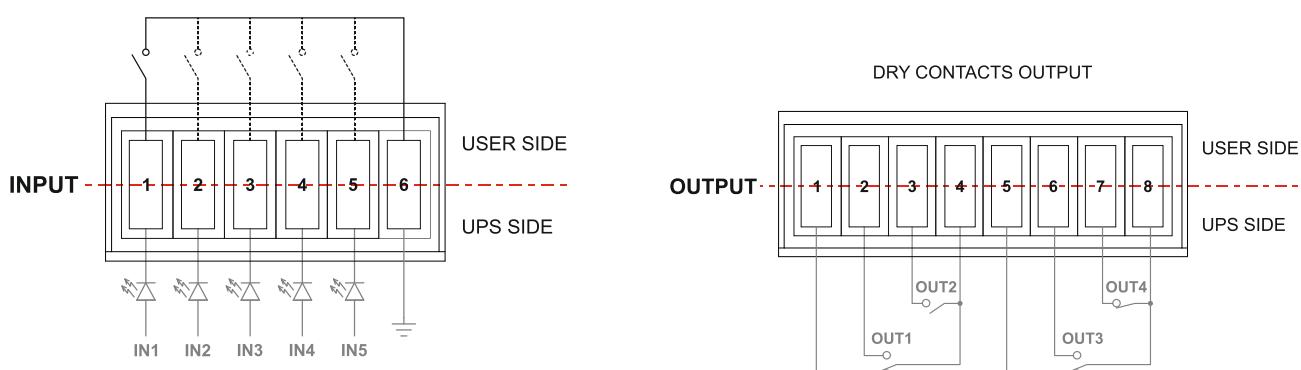
The R.E.P.O circuit is supplied with SELV type circuits. No external supply voltage is required. When it is closed (normal condition), a maximum current of 10 mA flows.

After an emergency shutdown, the UPS will only return to on line operating mode once it receives a start-up command from the mimic panel (provided that the Remote Emergency Power Off device is not still active).

IN/OUT signal interface makes it possible to configure five opto insulated UPS input commands and four different output alarms.

The UPS is delivered with standard input and output alarm configuration (both enabled via the display prior to "Expert" access level).

The commands and alarms list can only be modified using the Configuration Software.



In case of an external maintenance bypass or Battery Cabinet installation, the relative switch auxiliary contacts must be connected selecting the appropriate inputs (amongst the five) and programming them accordingly.

FACTORY DEFAULT SETTING

INPUT	FUNCTION
IN 1 #	Position of the External SWMB
IN 2 #	Position of the External SWOUT
IN 3 #	CB OFF
IN 4 #	Bypass ON
IN 5	System ON

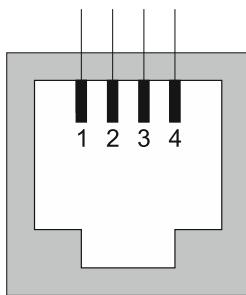
The output dry contacts are rated to 1A @ 24 Vdc or
1 A @ 30 Vac

FACTORY DEFAULT SETTING

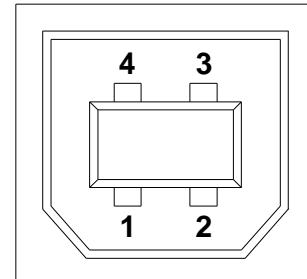
OUTPUT	FUNCTION
OUT 1	Load on Bypass
OUT 2	Battery working
OUT 3	Battery low
OUT 4	Fault or Lock (F+L)

These inputs must be enabled from display panel.
The only input signal enabled is "IN 5".

RS232 Connector



USB Connector



PIN #	SIGNAL
1	GND
2	TX serial line
3	RX serial line
4	Reserved

PIN #	SIGNAL
1	VBUS
2	D-
3	D+
4	GND

8.2 PARALLEL CARD

Whenever one or more units are connected in parallel to achieve higher power availability or redundancy, the parallel card ensures the communication between the units. For further information refer to paragraph 5 and the parallel card installation manual.

8.3 COMMUNICATION SLOTS

The UPS has two panel expansion slots for slot-in interface accessories that can be used for a variety of communications options, including:

- Second RS232 port
- Serial port duplicator
- Ethernet network agent with TCP/IP protocol, HTTP and SNMP
- RS232 + RS485 port with MODBUS protocol
- EnergyManager card to be used for Li-Ion batteries (see paragraph 11.15)

Communication slot labelled as "2" is also suitable to host relay cards such as:

-MULTICOM 384 (**three** opto insulated inputs and **four** programmable contacts 250 Vac, 3 Amps)

-MULTICOM 392 (**three** opto insulated inputs and **eight** programmable volt free output contacts 25 Vac / 30 Vdc, 1 Amp)

In order to carry out card installation and configuration refer to the specific cards dedicated user manual.

For further accessory information please visit our website.

8.4 EXTERNAL SYNCHRONISATION

This non-insulated input can be used to synchronise the Inverter output to a suitable signal from an external source. It is essential when the SENTRYUM is used in combination with Static Switch Transfer Systems.

During installation, it is important to:

- use an insulation transformer with insulated single-phase output (SELV), 12-24 Vac and a power ≥ 0.5 VA (available if required as an optional item- refer to the options paragraph);
- connect the transformer secondary to the "EXTERNAL SYNC" terminal through a double-insulation cable with a cross-sectional area of 1 sqmm. (refer to the picture on the right)

The external synchronisation must be configured via the Configuration Software assigned to authorised personnel.



External synchronisation (identified as "EXT SYNC") and External battery temperature sensor (identified as "EXT T_BATT") input connections are positioned within the terminals area close to the input/output power connections for all three UPS versions.

8.5 EXTERNAL BATTERY TEMPERATURE SENSOR

The UPS has a special connection point for measuring the temperature inside an external Battery Cabinet and indicating the temperature on the UPS display, along with adjusting the battery voltage in accordance with the room temperature (refer to paragraph 11.3).

Connect the sensor to the "EXT T_BATT" terminals (refer to the picture on the right)

8.6 MONITORING AND CONTROL SOFTWARE

The PowerShield³ 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

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

9. ISOLATING SWITCHES

The UPS is supplied with the following isolation switches located at the rear or front of UPS depending on the chassis type (refer to the UPS installation manual for details):

- Mains input switch (SWIN)
- Output switch (SWOUT)
- Manual bypass switch (SWMB)
- Internal battery fuse holder isolator (SWBATT)
- Bypass input switch (SWBYP) (Not available for *Compact*, optional for *Active*, standard for *Xtend* versions)

Note: SWBATT fuse holder isolator (not available on S3T 60 ACT model) protects the internal battery only; any additional battery cabinets should come with their own dedicated provision to protect the external battery.

10. UPS CABINET

The cabinet is made of galvanised steel with an IP20 rating (degree of Ingress Protection), even with the front door open. Side and cover panels have a thickness of 0.8 mm and are treated with powder coating.

Ventilation is forced and is provided by speed-controlled fans located on the front; the air flow is front to rear with the output at the back.

Each fan is monitored individually for the 60 kVA UPS power rating (both ACT and XTD models); in the event of a fan failure, an alarm will be raised. The Fan failure kit is instead an option (ex-works) for the 10-40 kVA UPS power rating (**Xtend** version only).

For more information see par. 11.16.

The three different versions are equipped with wheels to easily move and position the UPS during the installation.

11. OPTIONS AND ACCESSORIES

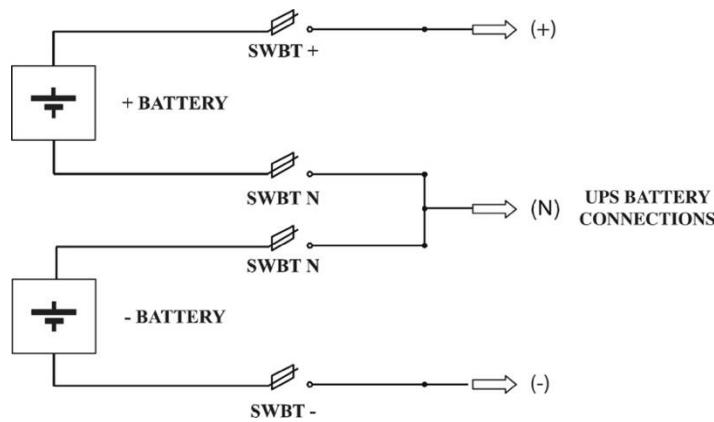
11.1 BATTERY CABINETS

The battery cabinet should be used to provide suitable power backup time during the failure of the incoming mains power supply. The number of batteries housed within the cabinet varies according to UPS rating and the required backup time.

The UPS can monitor the status of the battery switch located within the cabinet via an auxiliary switch contact connected to Input contact on the communication board or to the MultiCOM 392 (contact configuration is reserved only for authorised personnel via the Configuration Software)

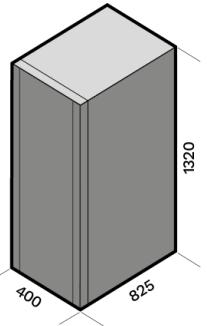
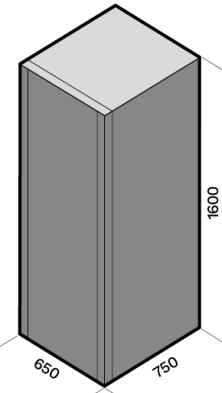
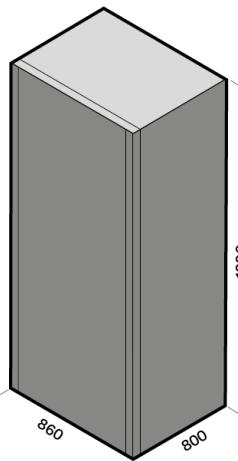
If one or more Battery Cabinets are installed the UPS must be configured to update the rated capacity value (Ah of batteries inside the UPS if present, plus the Ah of all external battery cabinets). This operation can only be performed via the Configuration Software.

The Riello UPS Battery Cabinet configuration is shown below.



Other solutions may be developed on site, bearing in mind that:

- The structure of the battery enclosure must respect that described above.
- The number of batteries must remain constant: 20+20 12 Volt blocks (or wide battery block range, as described in the par. 6.2) and multiple strings in parallel if required.
- The battery capacity (expressed in Ah) must fall within the range of 4 and 20 times the available recharging current (see the "Technical Specifications Table").

MODELS BATTERY CABINETS	BTC 1320 480V AB T5 3F	BTC 1600 480V AB S5 3T	BTC 1900 480V AB V9 3T
DIMENSIONS (mm) W x D x H			

For further details on Battery Cabinet installation refer to the UPS user manual.

11.2 UPS WITH SUPERCAPACITORS

This option, available upon request (prior to UPS purchase) on the XTEND – XTD cabinet only, provides the UPS with Supercapacitors instead of conventional battery as backup power.

Sentryum supercapacitor version may not operate with associated lead batteries.

The UPS version with Supercapacitors will not display the autonomy time. Furthermore, the battery test command (and scheduling) together with cold start function will not be available.

Note: Contact your local agent for supercapacitor solution details.

11.3 EXTERNAL BATTERY TEMPERATURE SENSOR

The UPS has a specific connection point for measuring the temperature inside an external Battery Cabinet and indicating the temperature on the UPS display.

The specific kit supplied by the manufacturer includes a bipolar double insulated cable measuring 10 meters. The use of a bipolar cable without insulation exposes the UPS and the user to risks resulting from a lack of insulation as the reading refers directly to the UPS neutral earthing.

Once installed, it is necessary to enable the temperature display information and activate the voltage compensation. Both operations can be performed using the Configuration Software.

The kit enables the connection of a temperature probe for a Battery Cabinet placed adjacent to the UPS or 10 meters away. If it is not enough it is possible to extend it up to 25 meters (sensor cable length shall be arranged by the user).

For further details refer to dedicated option installation manual.

11.4 EXTENDED RECHARGE BATTERY CURRENT (ER VERSION)

The UPS can be provided from the factory with a more powerful battery charger to deliver higher battery recharging current.

UPS (kVA)	Standard charging current [A]	ER charging current [A]
10	6	12
15-20	6	20
30-40-60	10	30

11.5 SEPARATE INPUT LINES (DI)

Sentryum **Active** version within the range 10-60 kVA is supplied with a common input to the rectifier and bypass stages.

In addition, the UPS may be supplied from the factory with separate lines ("Dual Input" Version).

This turns the standard UPS into a "Dual Input" version. This modification can be performed later onsite if required, thanks to the installation of a dedicated kit that can be fitted by authorised personnel, whom are properly trained.

There are four installation kits depending on the UPS type (S3M-10-20; S3T-10-20; S3T-30-40; S3T 60).

If the UPS is changed from single Input to "Dual Input" version, UPS protections should be sized accordingly (refer to UPS installation manual).

SENTRYUM Xtend version comes as standard from the factory with a separate bypass line, whilst the Sentryum **Compact** version does not have this option available.

11.6 EXTERNAL MAINTENANCE BYPASS

An external remote maintenance bypass can be installed with the UPS, to allow, for example, UPS replacement without disruption to the load.

If this option is chosen, it is mandatory to connect the "SERVICE BYPASS" terminals (see "UPS installation manual") to the NC auxiliary contact of the SERVICE BYPASS switch. Closing the SERVICE BYPASS switch opens this auxiliary contact which informs the UPS that the maintenance bypass has been activated. If such a connection is not made, operation of the remote maintenance bypass may disrupt the supply of power to the load and damage the UPS.

Refer to UPS installation manual for further details.

Note: Always check that the remote maintenance bypass installation (if selected) is compatible with any transformer options selected for the UPS - see paragraph 11.8 Optional Transformer.

11.7 EXTERNAL SYNC KIT

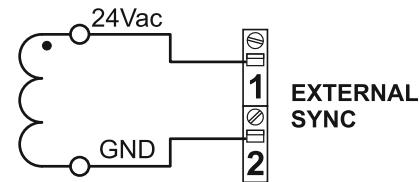
In order to synchronise the inverter output to an external source, a synchronisation kit is available. This kit contains an isolated single-phase low voltage output transformer (SELV).

Connect the transformer secondary to the "EXT SYNC" terminal block (marked as 1 and 2) located within the power connections area (refer to "Power connection details" paragraph of the UPS installation manual for further details) using a double insulated cable with a 1 sqmm cross-section.

Make sure to respect the polarisation as in the figure at the right.

After installation, enable the control using the Configuration Software.

To minimise disturbances, keep the cable length as short as possible (suggested 25 m maximum). If extended length is required, please contact your local service centre.



11.8 OPTIONAL TRANSFORMERS

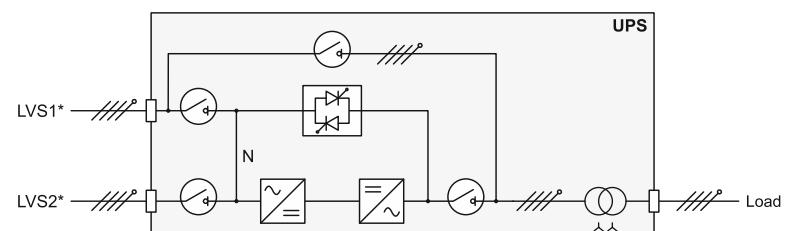
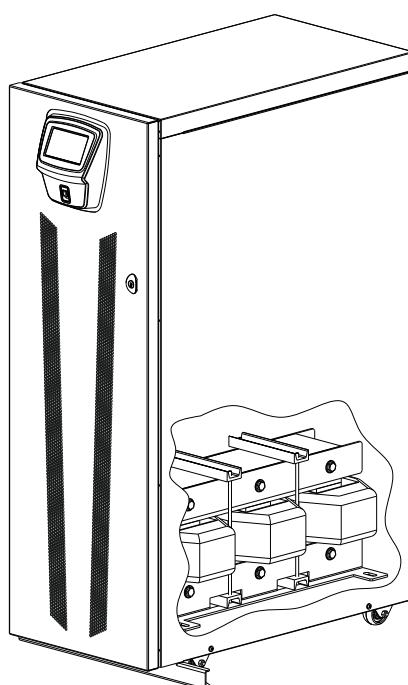
A transformer can be installed in combination with UPS. Transformer options include: supply neutral reference, Galvanic insulation and output voltage (step-up or down).

a) **Transformer located inside the UPS** (this option is only available from the factory on S3T 10-60 and S3M 10-20 **Xtend** versions only).

The optional internal transformer is connected to the output to guarantee galvanic isolation both during inverter and bypass operating modes.

A Star-Star type transformer is used which does not induce phase displacement between the input and output; the neutral of the secondary is not earthed, hence making the UPS suitable for TT, TN and IT connections; therefore on site, the UPS output neutral shall be bound to earth according with neutral installation arrangement.

The transformer is connected to the output terminals of the UPS, therefore the values shown on the display refer to quantities measured upstream of the transformer.



Model	Dimensions	Weight	Circuit Primary/ Secondary	Vector Group	Class Temperature / Insulation
S3T 10 XTD OT		188			
S3T 15 XTD OT		230			
S3T 20 XTD OT	440*840*1320	232	Star / Star	YnYn0	H / H
S3T 30 XTD OT		328			
S3T 40 XTD OT		332			
S3T 60 XTD OT		380			
S3M 10 XTD OT		158			
S3M 15 XTD OT	440*840*1320	195	Mono / Mono	/	H / H
S3M 20 XTD OT		197			

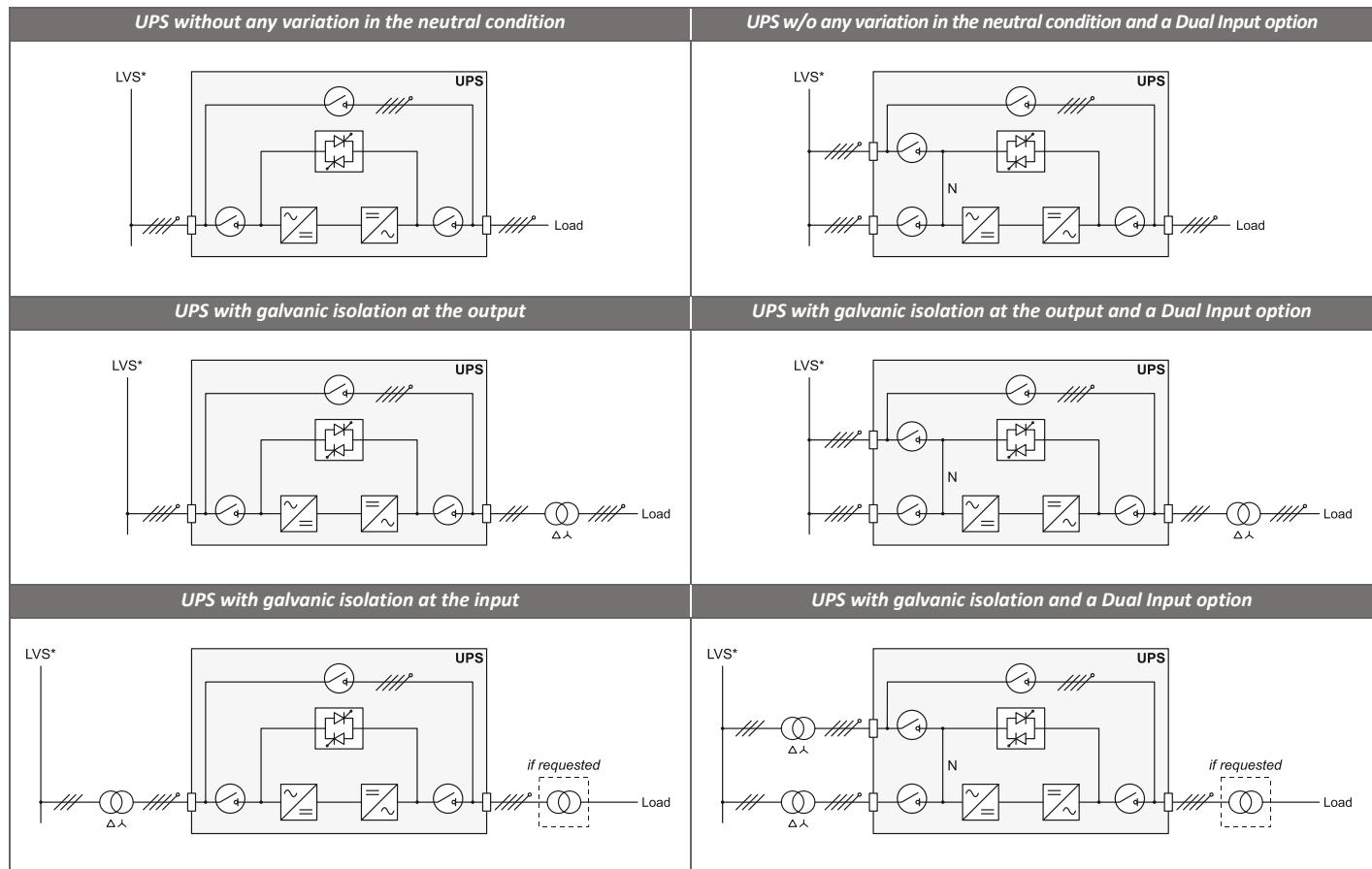
Note: The presence of the transformer inside the UPS changes the neutral system. The eventual installation of a "remote maintenance bypass" in parallel with the UPS is incompatible with the presence of the transformer. If fitted, make sure that simultaneously with the closing of the bypass switch the UPS is insulated from the plant by opening the disconnectors of the input and output.

b) **Transformer located outside the UPS** (depending on the requirements and the type of electrical set up described below).
This option can be applied to the entire Sentryum 10-60 kVA range and versions (Compact, Active, Xtend).

Note: the presence of the transformer will modify the neutral arrangements of the installation. The eventual installation of a "remote maintenance bypass" to isolate the UPS, in case of breakdown / maintenance has to be located after the transformer (if the same is installed in the UPS input) or upstream of the transformer (if the same is installed in the UPS output).

The following drawings provide a general overview of the possible installation scenarios.

Every configuration should be carefully evaluated according with the real installation environment.

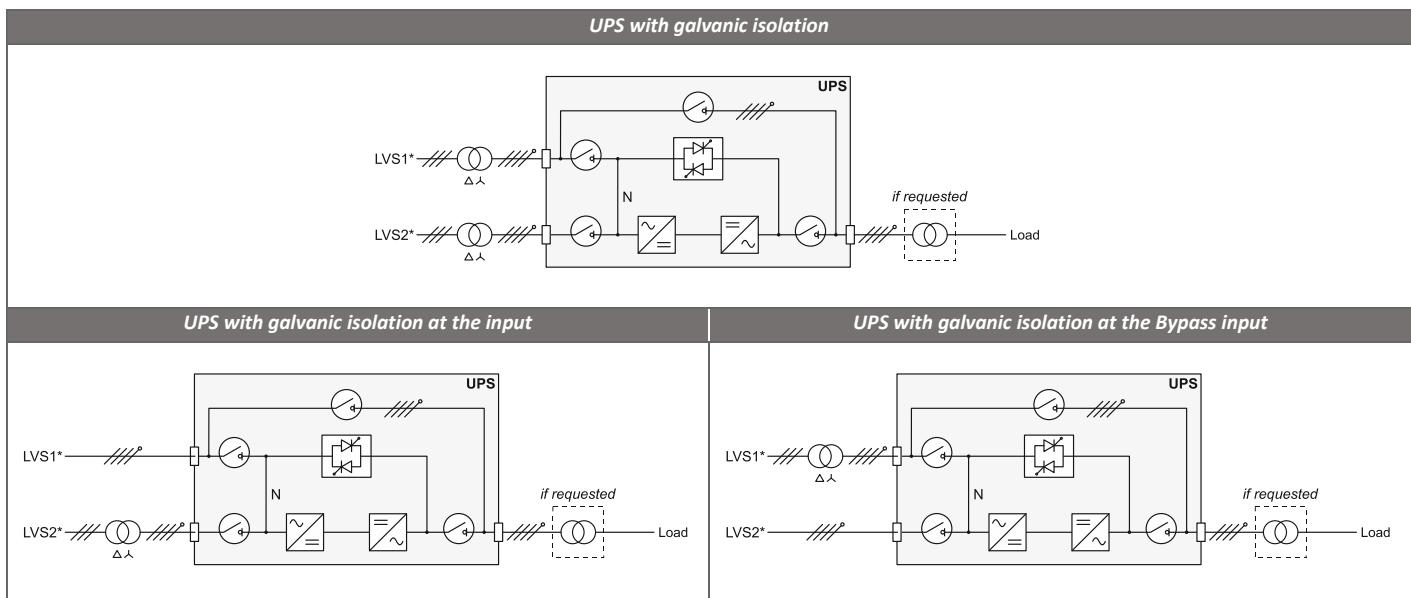


* LVS: low voltage source

Separated lines upstream (DI):

If the Dual Input option is present and the bypass is supplied from a separate low voltage source, protective devices must be present on both the main input supply and the bypass supply. (refer to UPS installation manual)

Neutral of the input line and that of the bypass are joined inside the equipment, therefore they will refer to the same potential. If the two mains supplies are different, it is necessary to use an isolation transformer on one of the inputs.



* LVS1: low voltage source 1; LVS2: low voltage source 2;

11.9 FRONT DOOR AIR FILTER

Sentryum (**Xtend** version only) can be supplied (ex-works) with a special door fitted with a dust filter to preserve UPS operation even within a dusty environment.

It is possible to replace the standard door onsite with the special one having the embedded filter (dedicated kit).

If the correct maintenance works are carried out to keep the filter clean, the UPS performance will not be restricted (No power downgrading).

11.10 IP30 VERSION

Sentryum (**Xtend** version only) can be supplied (ex-works) with a special frame complying to IP30.

IP30 protection degree does not affect the UPS performance (No power downgrading).

11.11 IPX1 KIT

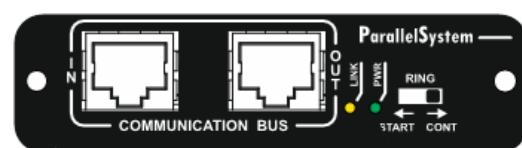
Sentryum (**Xtend** version only) can be supplied (ex-works) with an on-site installation kit for an optional roof, to protect the UPS against vertical falling drops of water. This kit is suitable for standard **Xtend** chassis (to achieve IP21 protection degree) or for IP30 version (to achieve IP31 protection degree).

Neither the IP21 nor IP31 protection degree affect the UPS performance (No power downgrading).

11.12 PARALLEL

Any Sentryum UPS can be paralleled with other units of the same size through an optional parallel board, inserted into the dedicated slot.

For further information about the parallel feature, please refer to the paragraph 5 "Parallel kit" manual.



11.13 REMOTE PANEL

Multi Panel: MultiPanel is a remote monitoring device that can provide a detailed UPS status overview in real time. It is compatible with all Riello UPS and can display values for UPS specific input and output supplies, and battery set measurements. MultiPanel has a high-definition graphical display and can report in 13 languages: English, Italian, German, French, Spanish, Russian, Chinese, Polish, Turkish, Finnish, Czech, Hungarian and Portuguese. It has 3 independent serial ports, one of which allows for UPS monitoring via the MODBUS protocol (on either an RS485 or RS232 serial line). The others can be used with devices such as the Netman or a PC running PowerShield³ software.

For further information please refer to option dedicate manual.



11.14 COMMUNICATION CARDS

The UPS is equipped with two expansion slots for accessory communication cards that make it possible to communicate with the UPS using different communication protocols.

For further information refer to paragraph 8.3.

11.15 ENERGYMANAGER FOR LI-ION BATTERIES

This optional card must be used when the UPS is connected to the BMS (Battery Monitoring System) of a Li-Ion battery system which has been approved by Riello UPS, please refer to the specific user manual of this card for the full list.

The EnergyManager includes two ports:

- Ethernet port 10/100 Mbps (RJ45 connector)
- RS485 serial port (RJ12 connector)

The two ports can be utilised depending on the battery type to communicate with the BMS of the battery cabinet, as described within the specific user manual.

11.16 FAN FAILURE ALARM KIT FOR 10-40 KVA (XTEND Version)

Sentryum (**Xtend** version only) can be supplied (ex-works) with the Fan failure alarm kit.

This kit requires each fan is monitored individually.

In the event of a fan failure, an alarm will be raised on the UPS display and via remote monitoring device (if present); this immediately informs the user so that necessary actions can be taken to restore the system to correct operation.

The Fan failure alarm is instead standard for the 60 kVA UPS power rating (both ACT and XTD models).

11.17 SEISMIC KIT FOR 10-60 KVA (ACTIVE and XTEND Versions)

With a specific kit, Sentryum (**Active** and **Xtend** versions only) is modified to operate in seismic activity installations according to the following:

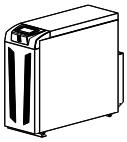
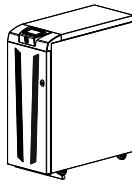
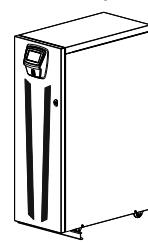
- Sentryum ACTIVE 10-60kVA: ICC ES AC156 (2020), SDS = 1.98 g for z/h=1; Ip=1.5.
- Sentryum XTEND 10-60kVA: ICC ES AC156 (2020), SDS = 1.18 g for z/h=1; Ip=1.5

Further details are available in the dedicated documentation.

For the complete list of compatible units, please refer to the price list.

12. ENVIRONMENT AND MECHANICAL CHARACTERISTICS

Mechanical Characteristics	Sentryum Compact S3M/S3T	Sentryum Active S3M/S3T	Sentryum Xtend S3M/S3T	
Cabinet layout description	Free standing type with wheels and terminals/switches on the rear side	Free standing type with wheels and terminals/switches on the front side	Free standing type with wheels and terminals/switches on the front side	
Range [kW]	10-15-20 (1 Ph) 10-15-20 (3 Ph)	10-15-20 (1 Ph) 10-15-20-30-40-60 (3 Ph)	10-15-20 (1 Ph) 10-15-20-30-40-60 (3 Ph)	
Battery	Room for: (20+20) 7/9 Ah blocks	Room for: 2 x (20+20) 7/9 blocks Not Applicable for 60 kVA	Room for: 3 x (20+20) 7/9 Ah blocks * (Output transformer alternative to internal batteries) * Note for 60 kVA only: 3 x (20+20) 9 Ah (not 7 Ah)	
Weight without battery [kg]	10 kVA 15 kVA 20 kVA 30 kVA 40 kVA 60 kVA	48 50 52 - - -	72 74 76 78 82 87	103 105 107 112 116 130
Dimensions [mm]	<ul style="list-style-type: none"> Width Depth Height 	<ul style="list-style-type: none"> 280 840 700 	<ul style="list-style-type: none"> 380 850 1025 	<ul style="list-style-type: none"> 440 840 1320
Ventilation	Forced, front to rear			
Cabinet IP rating	- IP20 finger proof (either with the cabinet doors open or closed) No other IP ratings available		- IP20 finger proof (either with the cabinet doors open or closed) No other IP ratings available	
Cable input	Bottom (rear side)		Bottom (front side)	
Colour	RAL 7016			
EMC Compatibility	EN 62040-2 C2 category for 10-40 kVA, C3 category for 60 kVA			
Audible noise at 1 mt (according to IEC EN 62040-3) [dBA ±2 dBA]	10 kVA:		45 @ 50% load 52 @ 100% load	
	15-20 kVA:		50 @ 50% load 56 @ 100% load	
	30 kVA:		45 @ 50% load 52 @ 100% load	
	40 kVA:		50 @ 50% load 56 @ 100% load	
	60 kVA:		50 @ 50% load 68 @ 100% load	
UPS Ambient temperature	0 – 40 °C			

Mechanical Characteristics	Sentryum Compact S3M/S3T	Sentryum Active S3M/S3T	Sentryum Xtend S3M/S3T
Recommended ambient temperature for battery (if present)			
Relative ambient humidity		5 - 95% (without condensing)	
Maximum Operating Altitude (According with IEC EN 62040-3)		Full power up to 1000 m a.s.l. (power derating of 0.5% for each 100 m between 1000 and 4000 m)	
Storage Temperature		From -25 °C up to +60 °C (UPS) -15, +40 °C (for the batteries)	
Seismic compliance (with the Optional Seismic kit)	Not Applicable	ICC-ES AC156 (2020) Sds=1.98 g for z/h=1; Ip=1.5	ICC-ES AC156 (2020) Sds=1.18 g for z/h=1; Ip=1.5

13. TECHNICAL DATA 10 - 60 kVA - Three-phase output version

INPUT	Sentryum S3T						
	10	15	20	30	40	60	
Nominal voltage	[V]	380-400-415 Three-Phase plus neutral					
Voltage range (without switching to battery power)	[V]	320÷480 @ 100% load 240÷480 @ 50% load					
Maximum load applicable with ONE input phase missing ⁽¹⁾	-	66%					
Maximum load applicable with TWO input phases missing ⁽¹⁾	-	33%					
Nominal frequency	[Hz]	50 or 60					
Input frequency tolerance	[Hz]	40 to 72					
Maximum Input Current ⁽²⁾	[A]	21	31.5	40	63	80	120
Total Harmonic distortion (THDi) with full load and source THDv <1%	[%]	≤ 3					
Power factor	-	≥ 0.99					
Rectifier progressive start-up (Power Walk-in duration)	[s]	Programmable from 1 to 120 in step of 1 (Disabled by default)					
Adjustable delay for the rectifier start up (Power Walk-in start delay)	[s]	Programmable from 0 to 120 in steps of 1 (3 by default)					
Converter technology	-	IGBT high frequency					
PFC control	-	Average current mode digital PFC (on each phase)					

⁽¹⁾ From system OFF the UPS will only start up if all three phases and neutral are present; once the UPS is working, these conditions are satisfied.

⁽²⁾ The input current is stated for the following general conditions:

- Input voltage at 364 Volt
- Battery charging current of 6 Ampere (10-15-20 kVA) and 10 Ampere (30-40-60 kVA)

DC CIRCUIT		Sentryum S3T					
		10	15	20	30	40	60
Battery arrangement	-	20+20 blocks (@ 12 V) with Neutral central point					
Number of battery cells @ 2 V	-	120+120					
Battery block range per string	-	15+15 to 22+22 15+15 @ 75% nominal power 16+16 @ 80% nominal power 17+17 @ 85% nominal power 18+18 @ 90% nominal power 19+19 @ 95% nominal power 20+20 @ full nominal power 21+21 @ full nominal power 22+22 @ full nominal power					
Float voltage (2.27 V/cell adjustable)	[V]	273+273 ⁽⁴⁾					
Boost voltage (2.38 V/cell adjustable)	[V]	286+286 ⁽⁴⁾					
End of discharge voltage - load dependent (1.6 V/cell adjustable)	[V]	190+190 ⁽⁴⁾					
Maximum charging voltage	[V]	315+315					
Standard battery recharging current ⁽³⁾	[A]	4 @ full load 6 @ 94% load	6	10		10	
Extended Battery recharging current ⁽³⁾ (ER version)	[A]	4 @ full load 7 @ 90% load 9 @ 80% load 11 @ 70% load 12 @ 65% load	6 @ full load 11 @ 90% load 15 @ 80% load 18 @ 70% load 20 @ 65% load	10 @ full load 17 @ 90% load 22 @ 80% load 27 @ 70% load 30 @ 65% load	10 @ full load 19 @ 90% load 26 @ 80% load 30 @ 75% load 30 @ 65% load	10 @ full load 24 @ 90% load 30 @ 80% load 30 @ 75% load 30 @ 65% load	10 @ full load 24 @ 90% load 30 @ 80% load 30 @ 75% load 30 @ 65% load
Maximum current drawn from batteries with UPS working at nominal power	[A]	27.5	41	55	82	110	165
Battery recharge method (default)	-	Two level recharge					
Residual low frequency current ripple (<1 kHz)	-	< 2% C10 (for 9 Ah battery)			< 2% C10 (for 18 Ah battery)		< 2% C10 (for 27 Ah battery)
Voltage compensation (if battery temperature sensor active)	[V]	20 mV/°C (12 Volt block)					

⁽³⁾ The currents refer to input voltages \geq 364 Volt

⁽⁴⁾ This value refers to 20+20 blocks; refer to service documents for customised setting according with a different number of batteries.

INVERTER		Sentryum S3T					
		10	15	20	30	40	60
Nominal power	[kVA]	10	15	20	30	40	60
Nominal active power	[kW]	10	15	20	30	40	60
Nominal power with load power factor from 0.8 inductive to 0.8 capacitive - without power downgrading (0-40 °C)	[kVA]	10	15	20	30	40	60
Nominal current @ 400 V	[A]	14.5	21.7	29	43.5	58	86.6
Nominal voltage	[V]	380/400/415 Three-Phase plus neutral					
Downgrading for different output voltages	[%]	220 Volt [Ph-N]: -2 208 Volt [Ph-N]: -8 200 Volt [Ph-N]: -11					
Nominal frequency	[Hz]	50 or 60					
Static stability	[%]	± 0.5					
Dynamic stability	-	Resistive Load: ± 1% @ 20->100% and 100->20% within 20 ms @ full load Mains / battery / Mains within 20 ms Non-Linear Load: IEC EN 62040-3 class performance 1					
Voltage distortion with resistive linear and non-linear load (IEC EN 62040-3)	[%]	< 1 with resistive linear load ≤ 1.5 with non-linear load					
Inverter frequency stability without by-pass supply synchronisation	[%]	0.01					
Rate of Frequency variation	[Hz/s]	1 (adjustable from 0.5 to 4)					
Voltage phase Dissymmetry with balanced and unbalanced loads	[%]	± 1					
Voltage phase shift with balanced and unbalanced loads	[°]	120 ± 1					
Inverter Overload (Vin ≥ 364 Vac and Ambient Temperature @ 30 °C)	-	103% Infinite 110% 60 min 125% 10 min 150% 60 s 200% 0.5 s > 200% 0.2 s					
Short circuit current (Ph-N)	[In x ms]	2.7 x In per 200 ms + 1.5 x In per 300 ms (standalone)					
Maximum Efficiency on battery-operation	[%]	95.9	96.4	96.4	96.5	96.5	96.68
Converter technology	-	IGBT three level high frequency					
Inverter control	-	Voltage/current DSP signal processing					

BYPASS		Sentryum S3T					
		10	15	20	30	40	60
Nominal power	[kVA]	10	15	20	30	40	60
Nominal voltage	[V]	380-400-415 Three-Phase plus neutral					
Output maximum nominal current ⁽⁵⁾	[A]	16	24	32	48	64	95
Bypass voltage range	[V]	from 312 to 460 (adjustable in step of 4)					
Nominal frequency	[Hz]	50 / 60					
Bypass input frequency range	[%]	±5 (configurable from ±0.10 to ±10)					
Transfer time bypass to Inverter (UPS in "ECO mode")	[ms]	2 typical					
Max current in short circuit for: 20 ms (T _j 25°C)	[A@20 ms]	1500	1500	1500	2000	2000	-
Max energy passing through [I ² t @ T _j 25°C]	[A ² s]	11250	11250	11250	20000	20000	-
Max current in short circuit for: 20 ms	[A@20 ms]	-					1000
I ² t internal fuse pre-arc value	[A ² s]	-					4200
Overload capability on bypass line	-	110% Infinite 125% 60 min 150% 10 min 200% 1 min > 200% 20 s					
Rated conditional short circuit current in accordance with the input protection as indicated within the installation manual	-						
I _{cc} @ 400V (with the use of internal maintenance bypass switch - SWMB)	[kA]	6					10
I _{cc} @ 400V (without the use of internal maintenance bypass switch - SWMB) **	[kA]	6					25
Operations	-	Continuous operation at nominal load with ventilation fault					

⁽⁵⁾ The bypass current is stated for the following conditions:

- Bypass voltage at 400 Volt
- Load level 110%

** For more details, see chapter "SWMB handle removal" within installation manual

User Interfaces		Sentryum S3T					
		10	15	20	30	40	60
Communication ports	-	1x Touch screen display 5" (480x272 pixel) 1x USB 1x RS232 (RJ10) 4x programmable output alarms 5x programmable opto-isolated input commands 2x Communication Slots					
Auxiliary commands	-	1x REPO (Remote Emergency Power Off) 1x External synchro input 1x Temperature sensor input					

Efficiency, Losses, Ventilation		Sentryum S3T					
		10	15	20	30	40	60
AC/AC Efficiency @ Full load	[%]	96.11	96.24	95.98	96.13	96.14	95.90
AC/AC Efficiency @ 75% load	[%]	96.05	96.32	96.26	96.34	96.39	96.15
AC/AC Efficiency @ 50% load	[%]	95.60	96.20	96.29	96.46	96.60	96.43
AC/AC Efficiency @ 25% load	[%]	94.39	95.28	95.67	96.05	95.27	96.09
Power dissipated with resistive nominal load (pf=1) and with battery charged *	[kW kcal/h BTU/h]	0.41 350 1400	0.59 505 2000	0.84 720 2860	1.21 1040 4130	1.61 1385 5500	2.57 2210 8775
Weighted UPS Efficiency **	[%]	95.41	96.00	96.13	96.33	96.47	96.27

* 3.97 B.T.U. = 1 kcal

** According to IEC EN 62040-3 2021-05

System Auto Consumption and ECO Mode efficiency		Sentryum S3T					
		10	15	20	30	40	60
Auto-consumption: UPS in ON LINE mode w/o load	[W]	100	119	165	226	341	
Auto-consumption: UPS in STAND BY mode w/o load	[W]		20				38
Efficiency: UPS in ECO Mode at 50% load rate	[%]	99.00	99.42	99.61	99.62	99.20	
Efficiency: UPS ECO Mode at 100% load rate	[%]	99.31	99.55	99.63	99.87	99.09	

14. TECHNICAL DATA 10 - 20 kVA - Single-phase output version

INPUT		Sentryum S3M		
		10	15	20
Nominal voltage	[V]	380-400-415 Three-Phase plus neutral or 220-230-240 Single-Phase plus neutral		
Voltage range (without switching to battery power)	[V]	320 - 480 @100% load / 240 - 480 @50% load (3 Ph) 184 - 276 @100% load / 140 - 276 @50% load (1 Ph)		
Maximum load applicable with ONE input phase missing ⁽⁶⁾ (if 3 Ph Input)	-	66%		
Maximum load applicable with TWO input phases missing ⁽⁶⁾ (if 3 Ph Input)	-	33%		
Nominal frequency	[Hz]	50 or 60		
Input frequency tolerance	[Hz]	40 to 72		
Maximum Input Current ⁽⁷⁾ 3Ph / 1Ph	[A]	21 / 63	31.5 / 94.5	40 / 120
Total Harmonic distortion (THDi) with full load and source THDv <1% (if 3 Ph Input)	[%]	≤ 3		
Total Harmonic distortion (THDi) with full load and source THDv <1% (if 1 Ph Input)	[%]	≤ 2.5		
Power factor (3Ph / 1 Ph)	-	0.99 / 0.99		
Rectifier progressive start-up (Power Walk-in duration)	[s]	Programmable from 1 to 120 in steps of 1 (Disabled by default)		
Adjustable delay for the rectifier start up (Power Walk-in start delay)	[s]	Programmable from 0 to 120 in steps of 1 (3 by default)		
Converter technology	-	IGBT three level high frequency		
PFC control	-	Average current mode digital PFC (on each phase)		

⁽⁶⁾ From system OFF the UPS will only start up if all three phases and neutral are present; once the UPS is working, these conditions are satisfied.

⁽⁷⁾ The input current is stated for the following general conditions:

- Input voltage at 364 Volt
- Battery charging current of 6 Ampere

DC CIRCUIT		Sentryum S3M		
		10	15	20
Battery arrangement	-	20+20 blocks (@ 12 V) with Neutral central point		
Number of battery cells @ 2 V	-	120+120		
Battery block range per string	-	15+15 to 22+22 15+15 @ 75% nominal power 16+16 @ 80% nominal power 17+17 @ 85% nominal power 18+18 @ 90% nominal power 19+19 @ 95% nominal power 20+20 @ full nominal power 21+21 @ full nominal power 22+22 @ full nominal power		
Float voltage (2.27 V/cell adjustable)	[V]	273+273 ⁽⁹⁾		
Boost voltage (2.38 V/cell adjustable)	[V]	286+286 ⁽⁹⁾		
End of discharge voltage - load dependent (1.6 V/cell adjustable)	[V]	190+190 ⁽⁹⁾		
Maximum charging voltage	[V]	315+315		
Standard battery recharging current ⁽⁸⁾	[A]	4 @ full load 6 @ 94% load	6	6
Extended Battery recharging current ⁽⁸⁾ (ER version)	[A]	4 @ full load 7 @ 90% load 9 @ 80% load 11 @ 70% load 12 @ 65% load	6 @ full load 11 @ 90% load 15 @ 80% load 18 @ 70% load 20 @ 65% load	
Maximum current drawn from batteries with UPS working at nominal power	[A]	27.5	41	55
Battery recharge method (default)	-	Two level charging		
Residual current ripple	-	< 2% C10 (for 9 Ah battery)		
Voltage compensation (if battery temperature sensor active)	[V]	20 mV/°C (12 Volt block)		

⁽⁸⁾ The currents refer to input voltages \geq 364 Volt

⁽⁹⁾ This value refers to 20+20 blocks; refer to service documents for customised setting according with a different number of batteries.

INVERTER		Sentryum S3M		
		10	15	20
Nominal power	[kVA]	10	15	20
Nominal active power	[kW]	10	15	20
Nominal power with load power factor from 0.8 inductive to 0.8 capacitive - without power downgrading (0 - 40°C)	[kVA]	10	15	20
Nominal current @ 400 V	[A]	43	65	87
Nominal voltage	[V]	220/230/240 Single-Phase plus neutral		
Downgrading for different output voltages	[%]	220 Volt [Ph-N]: -2 208 Volt [Ph-N]: -8 200 Volt [Ph-N]: -11		
Nominal frequency	[Hz]	50 or 60		
Static stability	[%]	± 0.5		
Dynamic stability	-	Resistive Load: $\pm 1\%$ @ 20->100% and 100->20% within 20ms @ full load Mains / battery / Mains within 20 ms Non-Linear Load: IEC EN 62040-3 class performance 1		
Voltage distortion with resistive linear and non-linear load (IEC EN 62040-3)	[%]	< 1 with resistive linear load ≤ 1.5 with non-linear load		
Inverter frequency stability without by-pass supply synchronisation	[%]	0.01		
Rate of Frequency variation	[Hz/s]	1 (adjustable from 0.5 to 4)		
Inverter Overload (Vin \geq 364 Vac and Ambient Temperature @ 30 °C)	-	103% Infinite 110% 60 min 125% 10 min 150% 60 s 200% 0.5 s > 200% 0.2 s		
Short circuit current (Ph-N)	[n x ms]	2.7 x In for 200 ms + 1.5 x In for 300 ms (standalone)		
Maximum Efficiency on battery-operation	[%]	95.9		
Converter technology	-	IGBT three level high frequency		
Inverter control	-	Voltage/current DSP signal processing		

BYPASS		Sentryum S3M		
		10	15	20
Nominal power	[kVA]	10	15	20
Nominal voltage	[V]	220-230-240 Single-Phase plus neutral		
Output maximum nominal current ⁽¹⁰⁾	[A]	48	72	96
Bypass voltage range	[V]	from 180 to 264 (adjustable in step of 4)		
Nominal frequency	[Hz]	50 / 60		
Bypass input frequency range	[%]	±5 (configurable from ±0.10 to ±10)		
Transfer time bypass to Inverter (UPS in "ECO mode")	[ms]	2 typical		
Max current in short circuit for: 20 ms (T _j 25°C)	[A@20 ms]	2000	2650	2650
Max energy passing through [I ² t @ T _j 25°C]	[A ² s]	20000	35000	35000
Overload capability on bypass line	-	110% Infinite 125% 60 min 150% 10 min 200% 1 min >200% 20 s		
Rated conditional short circuit current in accordance with the input protection as indicated within the installation manual	-			
I _{cc} @ 400V (with or without the use of internal maintenance bypass switch - SWMB)	[kA]	6	10	
Operations	-	Continuous operation at nominal load with ventilation fault		

⁽¹⁰⁾ The bypass current is stated for the following conditions:

- Bypass voltage at 400 Volt
- Load level 110%

User Interfaces		Sentryum S3M		
		10	15	20
Communication ports	-	1x Touch screen display 5" (480x272 pixel) 1x USB 1x RS232 (RJ10) 4x programmable output alarms 5x programmable opto-isolated input commands 2x Communication Slots		
Auxiliary commands	-	1x REPO (Remote Emergency Power Off) 1x External synchro input 1x Temperature sensor input		

Efficiency, Losses, Ventilation (UPS working with single input voltage)		Sentryum S3M		
		10	15	20
AC/AC Efficiency @ Full load	[%]	95.83	96.06	95.75
AC/AC Efficiency @ 75% load	[%]	96.00	96.29	96.05
AC/AC Efficiency @ 50% load	[%]	95.81	96.13	96.19
AC/AC Efficiency @ 25% load	[%]	94.62	94.95	95.67
Power dissipated with resistive nominal load (pf=1) and with battery charged *	[-kW -kcal/h -BTU/h]	0.44 375 1485	0.62 530 2100	0.89 765 3030
Weighted UPS Efficiency **	[%]	95.56	95.88	96.03

* 3.97 B.T.U. = 1 kcal

** According to IEC EN 62040-3 2021-05

System Auto Consumption and ECO Mode efficiency		Sentryum S3M		
		10	15	20
Auto-consumption: UPS in ON LINE Mode w/o load	[W]	100		120
Auto-consumption: UPS in STANDBY Mode w/o load	[W]		20	
Efficiency: UPS in ECO Mode at 50% load rate	[%]	99.02		99.02
Efficiency: UPS ECO Mode at 100% load rate	[%]	99.09		98.9

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