



# Back-up energy and power

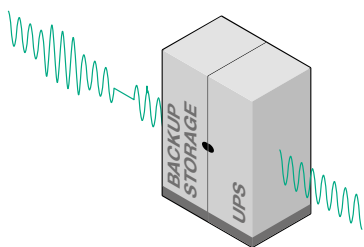
## Why have back-up energy?

The energy storage stage within a UPS system is a key element, as its purpose is to provide the load with immediate power when the main power supply is unavailable. The choice and sizing of the energy storage system is based on various factors such as load characteristics, quality of the power supply network, the electrical infrastructure where the UPS is installed, and the environmental characteristics of the technical room.

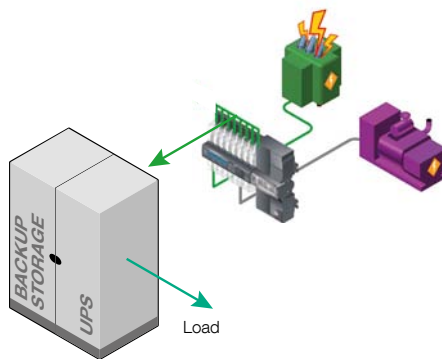
In UPS applications energy storage is used for two main reasons:

**Power quality:** to support the UPS system when the mains network values fall outside the maximum acceptable UPS values, while the mains network is unavailable or until the load is switched off in a controlled manner.

**Power bridging:** to give the system upstream of the UPS time to switch between the mains network and the back-up power system, this being in most cases a generator.



Power quality



Power bridging

## Power and energy

When the main power supply is unavailable the storage system provides the UPS with the necessary energy. This can take place in two ways depending on the specific application:

- 'Power' type applications - the UPS is provided with a large quantity of power for a limited period of time e.g. power bridging applications or where the main supply is affected by micro interruptions. Back-up storage systems optimised for power-type applications can be discharged with high power, recharged very quickly, and generally perform well under cyclic operating conditions (frequent charging/discharging).
- 'Energy' type applications - the UPS is provided with power for an extended period of time e.g. when the main supply is unavailable for longer than one minute.

## Sizing and Total Cost of Ownership

Various factors must be taken into account when choosing an energy storage system in order to optimise the total cost of ownership and achieve the best technical solution. The differentiating factors to consider with back-up storage technologies include:

- Purchasing costs vs budget.
- Dimensions and weight.
- Expected equipment lifetime and number of charge/discharge cycles.
- Environmental conditions.
- Characteristics of the power supply network (frequency/duration of unavailability etc.).
- Safety to be guaranteed in the technical room.
- Maintenance requirements.

# Battery storage systems

## Batteries

These are electrochemical devices that store energy chemically and convert it into electricity.

Their use with UPS systems involves several batteries being connected in series (string) to reach the DC stage voltage required by the UPS. Strings are often connected in parallel to increase runtime in the event of a mains outage and/or for redundancy.

Batteries can be installed within the UPS (normally for small UPS systems) or assembled in external cabinets or on shelving. The batteries available for use with UPS systems include:

- Normal/long life VRLA batteries with flame-retardant containers.
- Long life open-vented lead batteries with flame-retardant containers.
- Long life nickel-cadmium (NiCd) batteries for special applications.
- Lithium-ion (Li-ion) batteries with integrated monitoring and equalisation system.

## Nickel-Cadmium batteries

NiCd technology uses alkaline liquid electrolyte and is especially robust and reliable. These batteries are designed to operate in difficult environmental conditions and support demanding work cycles (frequent charging/discharging), and are usually installed in dedicated rooms on shelving that enables the electrolyte to be topped up.

As Cadmium is toxic the use of this type of battery is limited. Furthermore, the requirement for regular complete discharge cycles restricts the number of possible applications with UPS systems.

## VRLA batteries

VRLA (Valve Regulated Lead Acid) batteries are lead batteries with a sealed safety valve container for releasing excess gas in the event of internal overpressure.

Their development was aimed at limiting the emission of hydrogen into the atmosphere and to avoid the use of liquid electrolyte. The liquid electrolyte is replaced by gel electrolyte (GEL technology) or absorbed inside the separators (AGM technology) to prevent acid leaking.

Sealed batteries do not allow for water to be added to the electrolyte, therefore the evaporation of the water contained in the electrolyte, due for example to high room temperatures or internal heating as a result of charging/discharging cycles, decreases their lifetime.

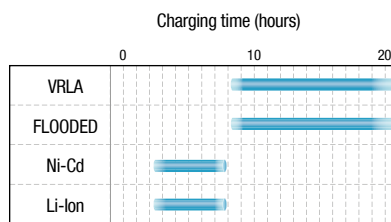
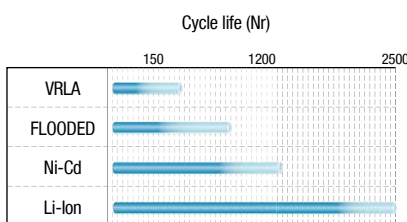
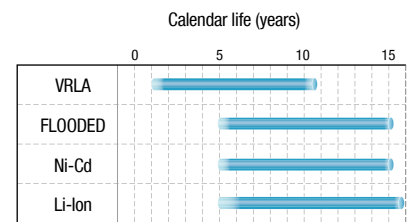
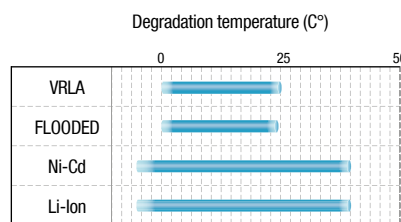
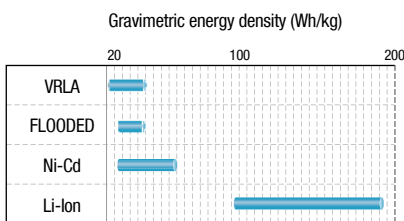
## Open-vented lead batteries

These batteries are made with lead-based electrodes and immersed in a liquid electrolyte comprising water and sulphuric acid. They have an expected lifetime of 15-20 years and statistically are very reliable until at least halfway through their lifetime. Subsequently, a cell short circuit may occur, causing a slight reduction in the runtime but this does not cause a critical situation. Using a liquid electrolyte has some disadvantages, such as shelf installation instead of cabinets to enable electrolyte top-ups and regular inspections, and requires a suitably ventilated dedicated room for reasons of safety.

## Lithium-ion batteries

Recently introduced to batteries for UPS applications, lithium-ion technology clearly differs from conventional lead and nickel-cadmium batteries. The most significant features include the considerable reduction in weight and floor space for the same runtime, the possibility of recharging them quickly, and their long cyclic and calendar lifetime.

However, their relatively brief history in high-power applications, and the need to introduce monitoring and equalisation electronics into batteries (which increases the initial cost), are still inhibiting on their widespread use.





# Battery cabinets

The value of your back-up time  
from 10 to 900 kVA

Back-up storage



## Complementary pages

- > MASTERYS BC
- > MASTERYS BC+
- > DELPHYS BC
- > MASTERYS GP
- > MASTERYS GP4
- > DELPHYS GP
- > DELPHYS XTEND GP
- > MODULYS GP
- > MOLDULYS RM GP
- > MASTERYS IP+
- > DELPHYS MP Elite+
- > DELPHYS MX
- > CPSS Emergency

## Total protection during downtime

- Designed to satisfy and respect safety protection standards (EN 50272-2 and EN 62040-1).
- The right size of protection device tailored to your power rating.
- Robust cabinet.
- Normal and long-life batteries.
- Compatible with different battery brands.
- Chemical safety means shelves protected against corrosion of  $H_2SO_4$  that can cause risks of electric shock and short circuit (fire).
- Designed according to the specific UPS model for easy connections, correct recharge current and appropriate discharge rating to optimize battery life.
- Modular hot-swap battery cabinets with string protection and individual string disconnection.

## Easy installation and maintenance

- Frontal switch/breaker protection.
- Frontal input output connections.
- Easy battery replacement.
- Suitable for rigid cables and cable-glands.
- Suitable for tripping coil contact (on request).
- Height aligned with UPS.

## Electrical protection coordination for your safety

Battery protection is essential for safety. We perform tests in our laboratories under abnormal conditions (i.e. short-circuit) to guarantee the maximum safety for the installation.

As batteries can cause fire if the protection is not adequate, we test all battery protections in real operating conditions.

- Switch/Breaker with fuse.
- Magnetothermal MCCB.

The protective devices are sized according to the UPS and to the battery short-circuit current.

## Technical data

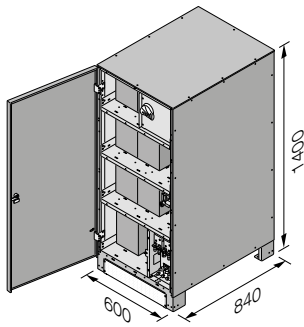
Standard degree of protection	IP20 (according to IEC 60529)
Optional degree of protection	IP32 <sup>(1)</sup>
Operating temperature	0 ÷ 40 °C (+15 ÷ +25 °C recommended for long battery life <sup>(1)</sup> )
Ambient storage and transport temperature	-5 °C ÷ +40 °C max (recommended: 25 °C)
Relative humidity (condensation-free)	up to 95%
Conforms to standards	EN 50272-2, EN 62040-1
Product declaration	CE

(1) Versions with a higher degree of protection and versions with a wider operating temperature range are available on request.

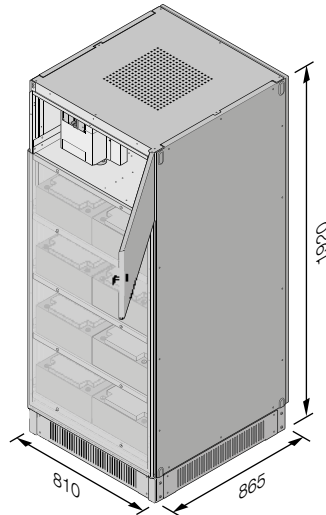
Please contact SOCOMEC for specific battery brands and custom solutions.

## Dimensions<sup>(1)</sup>

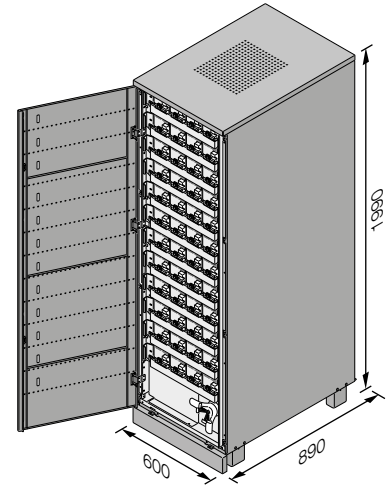
Small Masters battery cabinet



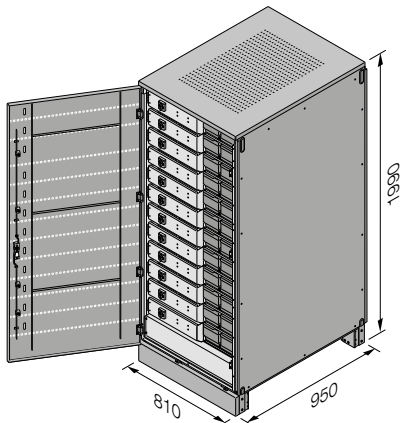
Masters and Delphys battery cabinet



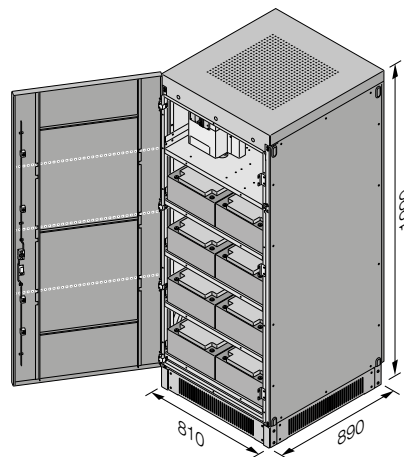
Modular hot-swap battery cabinet - small capacity



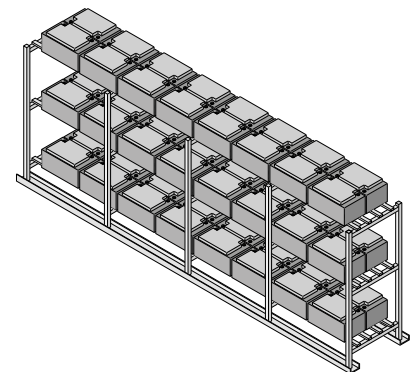
Modular hot-swap battery cabinet - medium capacity



Modular battery cabinet - large capacity



Battery Rack



<sup>(1)</sup> The dimensions specified refer to standard battery cabinets.  
Custom solutions are available on request. Please check with your local sales office.



# W-BMS

## Wireless Battery Monitoring System

Back-up storage



COOLV187A

### Technology

- > Radio frequency

### Technical advantages

- > Easy to use
- > Easy to set up
- > Trend analysis to guard against breakdowns
- > Remote monitoring
- > Remote alarm notification
- > Data acquisition
- > Analysis software

### The three W-BMS components

- > **CU (Control Unit):**
  - Collects and stores the DAM and IDAM data.
  - Manages the communication with the PC.
  - Sends SMS/E-Mail notifications.
- > **DAM (Data Acquisition Module):**
  - Measures the voltage, the temperature and the internal resistance of each battery.
  - Stores the most significant data.
- > **IDAM (Current Acquisition Module):**
  - Measures the current of either a battery or a string of batteries.
  - Stores the most significant data.

### The battery is a key component in the operation of a UPS

W-BMS, the SOCOMEC Battery Monitoring System, is an effective battery monitoring solution which maximizes the availability of the supply in applications where power continuity is vital.

Because 75% of uninterruptible power supply (back-up power supply) system breakdowns are down to batteries, the reliability of these components is a key feature of your electrical system. Therefore, accurate, detailed monitoring of their operating condition is vital. This actually guarantees maximum continuity of the supply to the system's critical loads, loads which cannot tolerate even a brief interruption let alone a prolonged power cut.

### Anticipate malfunctions

W-BMS is a vital tool in the continuous supply of critical systems and performs preventative battery monitoring.

This solution provides the opportunity to eliminate any unscheduled power cut due to battery failure.

### Make cost savings

W-BMS enables you to make operating savings by:

- Improving UPS uptime.
- Reducing maintenance operations by 75%.
- Maximizing battery return on investment.
- Anticipating battery malfunctions.
- Guaranteeing the safety of maintenance personnel.

### Ensure the continuity and safety of the supply to critical loads

It is vital to always know the operating status of the lead acid batteries supplying critical applications. W-BMS ensures that these are in good condition and will work when you need them. Unlike other battery monitoring systems, W-BMS has been specifically designed to monitor the impedance of the different battery monoblocs every day. By avoiding the time-consuming and potentially dangerous manual method of testing individual batteries, W-BMS increases the likelihood of identifying a power failure and greatly increases the safety of maintenance personnel.

### Close battery monitoring

Most battery monitoring systems perform an impedance test once a week or once a month. However, a battery can fail in as little as two days. It is therefore vital that your system monitors your batteries much more frequently.

W-BMS has been designed to monitor the impedance of each of the battery packs or cells 24/7.

### Modular design and central monitoring

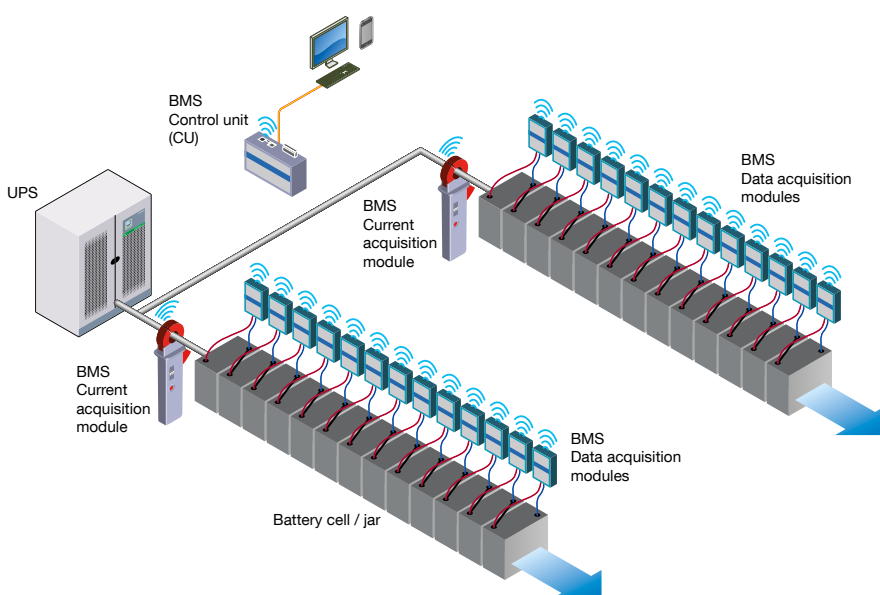
W-BMS is the only battery monitoring system that can monitor different voltage monoblocs or different types of batteries (for example generator batteries) centrally.

W-BMS is the easiest battery monitoring system to install and maintain.

### Scalable and simple

Whether you want to add a battery branch, a part or a building, the W-BMS system offers you a vital modular system to future-proof your system.

With only three main components, expanding your system is easy. No rewiring is required and the components can even be moved to cope with your new architecture. Similarly, you can extend your system to cover your auxiliary batteries (for generator batteries, for example). W-BMS can be adjusted to cope with any changes and is a flexible, permanent solution. Your return on investment is thus guaranteed.

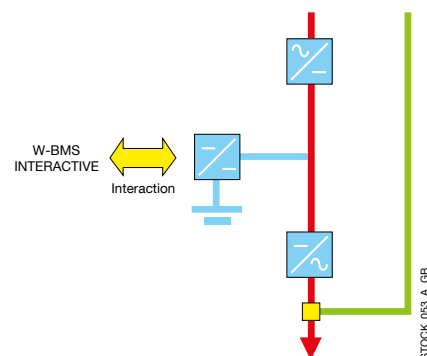


### W-BMS INTERACTIVE option, to optimize battery lifetime

Including all the features of the standard W-BMS, W-BMS INTERACTIVE operates directly with the UPS battery recharging system (EBS). It optimizes battery capacity and maximizes battery life and return on investment.

- **Increase charger precision:** the UPS charger is able to adapt the recharge parameters according to all the information collected by W-BMS INTERACTIVE. Such corrective actions aim to standardize cell behavior to improve battery lifetime and availability.
- **Automatic battery testing:** when required, W-BMS INTERACTIVE and the UPS perform an automatic battery test. The UPS calibrates slow, safe discharge while W-BMS INTERACTIVE collects data and analyses cell blocks.
- **Proactive measures:** when a block starts to weaken, W-BMS INTERACTIVE and the UPS perform an automatic procedure to recover the block before it is totally unusable, and to enhance global battery capacity.

Control Unit (CU)		
Supply voltage	4.5 ÷ 5.5 VDC (external power supply or USB port)	
Current consumption	500 mA max	
Digital input	2x (opto-isolated)	
Digital output	2x (dry-contact)	
Data storage	microSD card	
Number of battery blocks	up to 1024 (full version), up to 50 (light version)	
Connectivity	Ethernet, Modbus/TCP, USB, GSM (SIM-card not included)	
Data Acquisition Module (DAM)		
Model	L type	H type
Rated voltage	2 VDC	12 VDC
Voltage range	1.5 ÷ 5.5 VDC	5 ÷ 18 VDC
Acoustic level at 1 m (ISO 3746)	80 mA @ 2 VDC	30 mA @ 12 VDC
Measurements	voltage, impedance, temperature	
Battery connection	blade connector (faston), ring or alligator clip	
Current Acquisition Module (IDAM)		
Model	type 1	type 2
Rated current	300 A	600 A
Supply voltage	9 ÷ 18 VDC (external power supply or battery)	
Current consumption	50 mA	
Current range	up to 300 A	up to 600 A





# Li-Ion Battery UPS

Compact innovative power protection solution

Back-up storage



## The solution for

- > Data centres
- > IT infrastructures
- > Applications requiring a back-up time up to 15 minutes

## UPS interaction

The ultimate solution for fuller control over system availability. The Socomec LI-ION BATTERY UPS solution includes an interactive control system to check and manage all the Li-Ion cells' parameters (i.e. temperature, voltage, current, charging status, etc.) and to dynamically adapt how the UPS operates depending on the status of the Li-Ion battery.

The UPS interaction guarantees the most reliable performance and improves the system's availability by:

- > Ensuring a proper control of the Li-Ion battery
- > Preventing any irreversible overcharge failure
- > Performing automatic corrective actions in case of any critical conditions that can affect battery performance.

## High sustainability

Socomec is committed to developing solutions that reduce the environmental impact from the design stage and throughout their entire life cycle.

The Li-Ion Battery UPS energy system is the latest solution designed for helping environmental sustainability:

- > No toxic materials
- > REACH / RoHS compliant materials
- > No gas emissions
- > No risk of acid leakage.

## Maximum availability

- Very fast UPS battery recharge.
- Ensured scalability for power upgrades or redundancy.
- Reduced maintenance of battery components.

## Extreme reliability

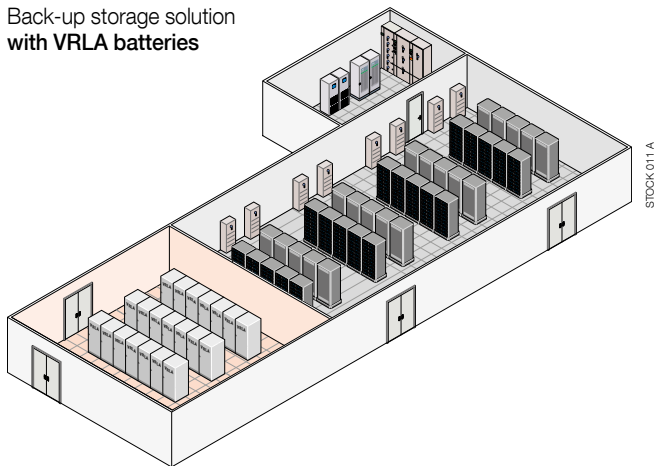
- Optimum performance in all critical operating conditions.
- Interactive UPS battery control.
- Embedded cell-to-cell monitoring.
- Wide operating temperature range (0 °C to +40 °C).

## Cost-effective solution

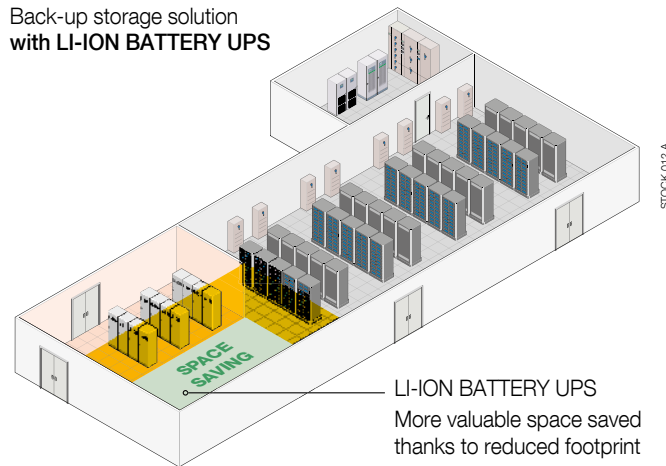
- High power density in a reduced footprint.
- 15+ years' expected service life.
- Higher cycling capacity: 10 times more than VLRA Battery UPS.
- Fewer cooling requirements.

## LI-ION BATTERY UPS: footprint comparison with VRLA batteries

Back-up storage solution with VRLA batteries

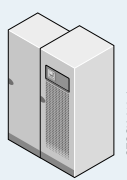
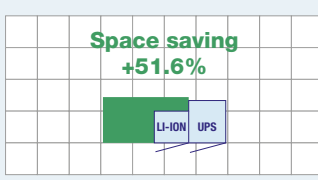
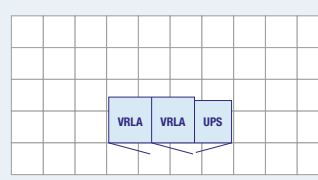
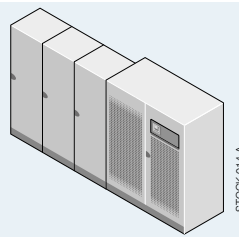
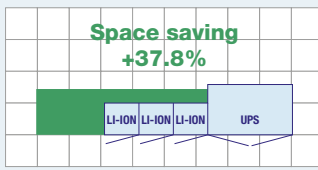
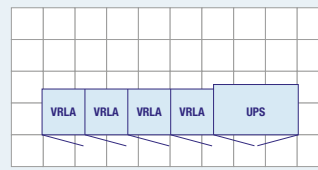
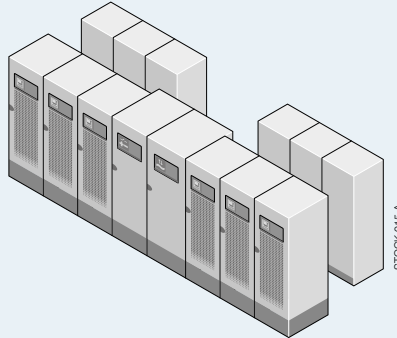
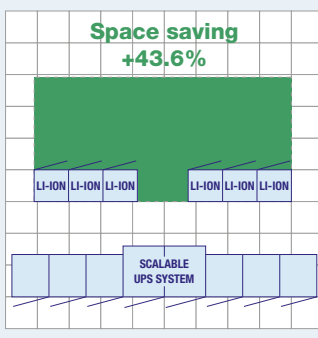
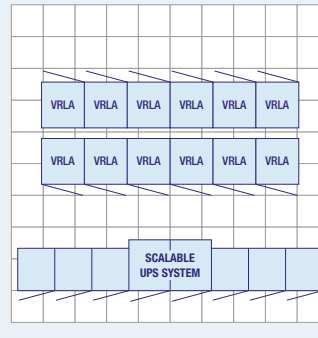


Back-up storage solution with LI-ION BATTERY UPS



LI-ION BATTERY UPS  
More valuable space saved thanks to reduced footprint

## LI-ION BATTERY UPS: footprint comparison vs. Lead-Acid batteries

LI-ION BATTERY UPS Examples of configurations <sup>(1)</sup>	FOOTPRINT	
	LI-ION BATTERY UPS	VRLA BATTERY
 STOCK 013 A Power: <b>200 kVA</b> Back-up time: <b>8 min</b>	 STOCK 016 A GB <b>Space saving +51.6%</b> Footprint: <b>0.95 m²</b>	 STOCK 019 A GB Footprint: <b>1.96 m²</b>
 STOCK 014 A Power: <b>500 kVA</b> Back-up time: <b>9 min</b>	 STOCK 017 A GB <b>Space saving +37.8%</b> Footprint: <b>2.69 m²</b>	 STOCK 020 A GB Footprint: <b>4.32 m²</b>
 STOCK 015 A Power: <b>1.2 MVA</b> Back-up time: <b>8 min</b>	 STOCK 018 A GB <b>Space saving +43.6%</b> Footprint: <b>7.87 m²</b>	 STOCK 021 A GB Footprint: <b>13.93 m²</b>

(1) Other configurations: please contact us.





# Li-Ion Capacitor UPS

Powerful and reliable solution for applications requiring short back-up times

Back-up storage



Lithium-Ion capacitor module



Lithium-Ion capacitor cells

## The solution for

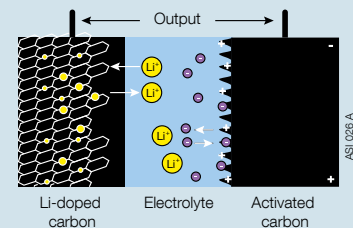
- > Data centres
- > IT infrastructures
- > Industrial processes

## Attestations



LI-ION CAPACITOR UPS is designed and developed in Europe by Socomec in partnership with JSR, Japanese leader in materials innovation.

## Lithium-ion capacitors: operating principle



- > The activated carbon is a capacitor cathode
- > The Li-doped carbon anode is a battery anode, undergoing Li doping during charge and de-doping during discharge
- > Hybrid construction creates a capacitor which yields the best performance features of batteries and capacitors

## High sustainability

Socomec is committed to developing solutions that reduce the environmental impact from the design stage and throughout their entire life cycle.

LI-ION CAPACITOR UPS is the latest solution designed for helping environmental sustainability:

- > Safe, low-toxic materials
- > REACH/RoHS compliant materials
- > No gas emission
- > No risk of acid leakage.

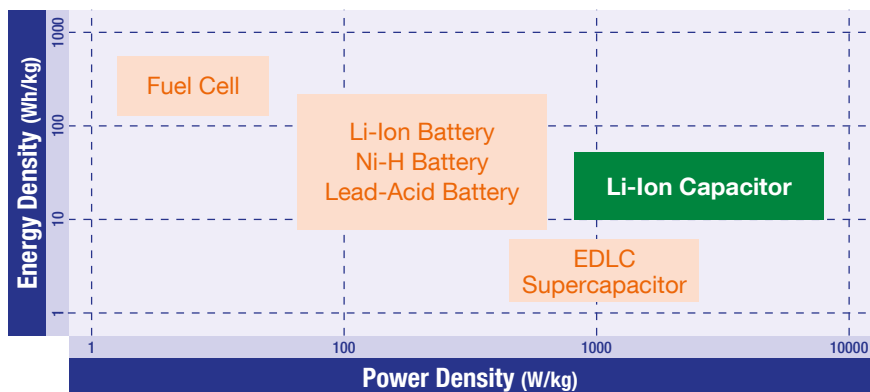
Power outages lasting a few seconds to several minutes may cause damage, loss in production and cost increases to applications and processes sensitive to short duration downtime.

To ensure the optimum availability and a long-life cycle for batteries, the power supply has to be protected by a powerful UPS back-up storage solution with:

- Very short recharging time.
- Low maintenance.
- Constant monitoring.

LI-ION CAPACITOR UPS is the innovative UPS back-up storage solution specifically designed to protect:

- Applications requiring back-up times of a few seconds to several minutes.
- Processes sensitive to frequent micro interruptions.
- Applications working in critical environments where hazardous substances are not allowed.
- Applications with severe ambient conditions.



Bridging the gap between batteries and supercapacitors.

# Li-Ion Capacitor UPS

Powerful and reliable solution for applications requiring short back-up times

## Maximum availability

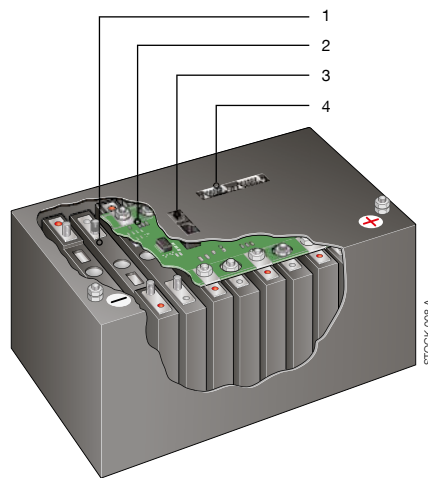
- Ultra-fast recharge.
- Ensured scalability for capacity or redundancy.
- Fire-safe construction.

## Extreme reliability

- Optimum performance in all critical operating conditions.
- Ageing-free in any frequent process micro interruption.
- Wide operating temperature range.
- Embedded cell-to-cell monitoring.

## Cost-effective solution

- Ultra-high power density in a reduced footprint.
- 15+ years' service life.
- Easy and extremely low maintenance.



1. Lithium-Ion capacitor cells
2. Control and communication board
3. RJ45 interface for battery blocks communication
4. RS485 interface for battery strings communication

## High modularity and granularity

