



BRAKING LOADS AND SOLUTIONS  
**POWER ABSORBER (PWA)**

RIELLO ELETTRONICA  **riello ups**



## Braking loads and regenerative energy

In many applications with controlled motors (e.g. lifts, cranes, industrial drives), during **deceleration, descent or stopping phases**, the motor can act as a generator, returning energy to the system: in this case, we refer to **regenerative energy derived from braking loads**.

### INDUSTRIAL APPLICATIONS:

- **Printing machines:** the deceleration of high-speed rollers; the inertia of the motor generates electrical energy.
- **Lifts and hoists:** the cabin produces return energy during descent or stopping.
- **Cranes and hoists:** lowering heavy loads induces regeneration on the motor.
- **Machine tools** (lathes, milling machines): rapid braking of the spindle generates a counter-electromotive force.
- **Industrial pumps and compressors:** the forced deceleration of the fluid/gas causes regenerative energy on the motor.

When powered by the mains, the regenerative load can return energy to the electrical network: however, when the load is powered by an uninterruptible power supply, **the return energy tends to flow back towards the UPS DC bus. If not properly managed, this can cause overvoltages and impact the correct operation of the UPS.**





## Risks for UPS systems in the presence of regenerative energy

Uninterruptible power supplies are generally designed and used to supply power to critical loads, not to receive or feed it back into the grid. Furthermore, even if some models are capable of doing so, the problem remains of managing this regenerative energy when the grid is not present and the UPS is running on battery power. When a regenerative load returns energy to the UPS, a functional risk condition may occur.

### OVERVOLTAGE ON THE DC BUS

Standard UPSs do not have circuits dedicated to absorbing or dissipating regenerative energy. In the absence of a controlled discharge system, this energy accumulates on the DC bus, causing uncontrolled overvoltage that leads to the immediate shutdown of the UPS itself and the transfer of the load to the bypass line, if present.

For this reason, **regenerative energy must be dissipated using dedicated solutions** to ensure power stability and system protection. **Riello UPS Power Absorber (PWA)** solutions offer a safe and integrated way to manage these braking loads, ensuring both technical reliability and operational safety in a simple and immediate manner.

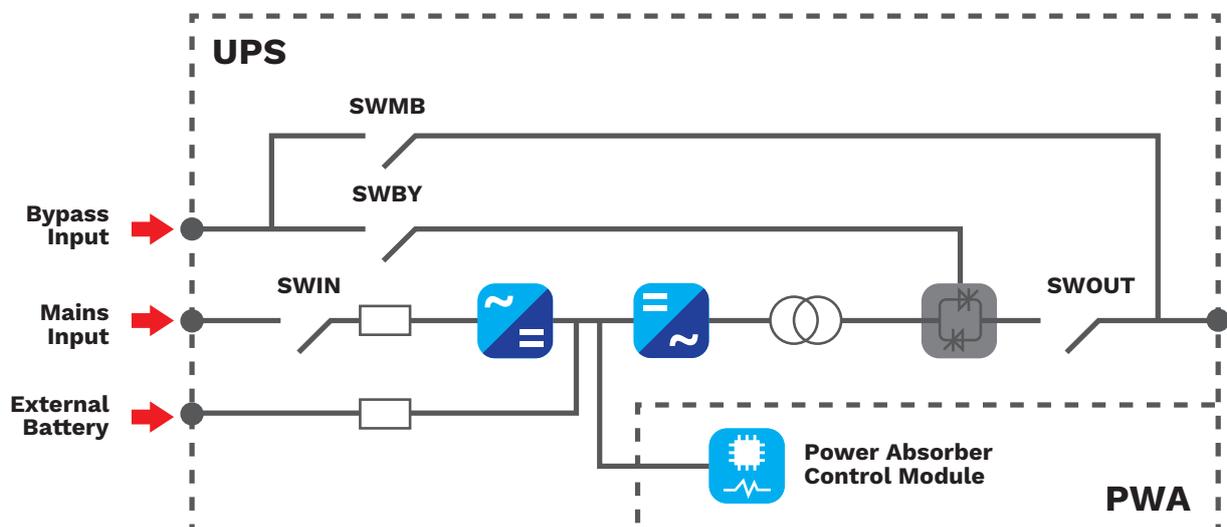




## Main advantages of Riello UPS Power Absorber (PWA) solutions

Available on the **Master MPS (MPM/MPT)** and **Master HP/HE (MHT/MHE)** UPS product ranges, the PWA is a module integrated into the UPS consisting of a **bank of resistors controlled directly by the UPS microprocessor**, which intercepts the energy returned from regenerative loads and **dissipates it in a controlled manner**.

When a load begins to return energy, the PWA module **activates instantly, dissipating it and ensuring operational continuity** without the risk of shutdowns and alarms.



Technical diagram of the UPS with Power Absorber module.



THE INTEGRATION OF A UPS WITH POWER ABSORBER TECHNOLOGY OFFERS SEVERAL INTERESTING ADVANTAGES:

- **Greater safety and protection of equipment:** the PWA ensures that regenerative energy is safely dissipated, protecting the UPS, batteries and connected loads from voltage spikes or overload conditions. This translates into longer equipment and electronic component life and a reduced risk of failure.
- **Reliable power quality:** even during braking events, the supply voltage generated by the UPS remains stable (no transfer to bypass). Power quality is maintained within strict voltage/frequency specifications, enabling sensitive processes to continue operating.
- **Easy integration and installation:** thanks to the integration of the solution, installing a UPS with PWA is as simple as installing a standard UPS. No external discharge resistors or custom cabling are required, reducing installation time and costs and further floor space requirements. The units arrive ready for use; simply connect the UPS as per normal procedures and the PWA function is immediately active.
- **Compact design:** the impact on space is minimal as the PWA hardware is integrated into the UPS cabinet. This allows energy return protection to be integrated even in confined electrical rooms or existing UPS configurations without significantly increasing the footprint required.
- **Wide compatibility:** the same UPS that protects equipment from blackouts now also manages regenerative events. This makes the solution a unique choice for a wide range of applications, from industrial and manufacturing automation to building lifts and other areas where braking loads are present.



## Guidelines for configuring the Riello UPS PWA system

To ensure optimal integration of the Power Absorber (PWA), it is necessary to follow a structured configuration process, which involves assessing both **the size of the UPS and the characteristics of the regenerative energy produced by the connected loads.**

### SELECTING THE SIZE OF THE UPS

The UPS must be sized based on the total power requirement of the installation:

- **MPM/MPT SERIES:** suitable for systems from 30 kVA (27 kW) to 80 kVA (72 kW).
- **MHT/MHE SERIES:** designed for higher capacities from 100 kVA (90 kW) to 800 kVA (800 kW).

### REGENERATIVE ENERGY PARAMETERS

To correctly size the power absorber, three key parameters must be defined:

- **Peak regenerative power [kW]:** the maximum instantaneous power returned from the load to the PWA.
- **Peak duration [s]:** maximum time interval during which the peak power is maintained.
- **Event frequency [s]:** minimum interval between successive regeneration events, which is essential for heat dissipation and cooling cycle management.

These parameters must be collected during system design to ensure that the PWA can dissipate energy effectively without compromising UPS performance.



### CABINET CONFIGURATION

Three versions of the PWA are available, capable of dissipating up to 40 kW, 150 kW and 300 kW respectively.

Each version is accompanied by a **timepower curve (kW vs. seconds)** that defines the permissible operating range for energy dissipation.

These curves must be taken into account during system design to ensure compliance with the thermal and electrical limits of the PWAs.

Parallel UPS configurations are supported. In these cases, both the total output power and the regenerative dissipation capacity increase linearly according to the number of units.

UPS	REGENERATION	FREQUENCY EVENT	DIMENSIONS [mm]
<b>MPM/MPT 10 PWA</b> <b>MPM/MPT 15 PWA</b> <b>MPM/MPT 20 PWA</b>	40 kW max – 5 s 4 kW continuous	See graph 1 (next page)	825x740x1400
<b>MPM/MPT 30 PWA</b> <b>MPM/MPT 40 PWA</b>	40 kW max – 5 s 4 kW continuous	See graph 1 (next page)	825x740x1400
<b>MPM/MPT 60 PWA</b> <b>MPM/MPT 80 PWA</b>	40 kW max – 5 s 4 kW continuous	See graph 1 (next page)	1070x740x1400
<b>MHT/MHE 100 PWA</b> <b>MHT/MHE 120 PWA</b>	150 kW max – 5 s 15 kW continuous	See graph 2 (next page)	1200x850x1900
<b>MHT/MHE 160 PWA</b> <b>MHT/MHE 250 PWA</b>	150 kW max – 5 s 15 kW continuous	See graph 2 (next page)	1400x850x1900
<b>MHT/MHE 300 PWA</b> <b>MHT/MHE 400 PWA</b>	150 kW max – 5 s 15 kW continuous	See graph 2 (next page)	1900x1000x1900
<b>MHT/MHE 500 PWA</b> <b>MHT/MHE 600 PWA</b>	300 kW max – 5 s 30 kW continuous	See graph 3 (next page)	2900x1000x1900
<b>MHE 800 PWA</b>	300 kW max – 5 s 30 kW continuous	See graph 3 (next page)	4000x1000x1900



### POWER ABSORPTION PROFILE: KW VS TIME

The following usage profiles illustrate the operating limits and heat recovery requirements of the three available PWA versions:

**Version A:** 40 kW Peak / 5 s - 4 kW Continuous (MPM/MPT Series).

**Graph 1: kW vs Seconds [MPM/MPT]**



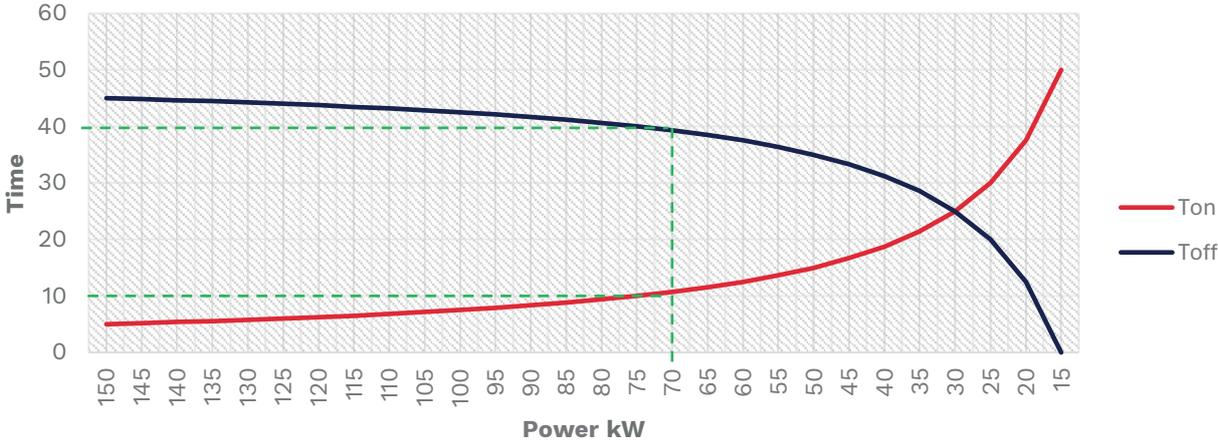
EXAMPLE SCENARIO:

- Regenerated power: 25 kW
- Peak duration: ≤ 8 seconds (Ton)
- Minimum interval between events: ≥ 42 seconds (Toff)

This configuration is suitable for **low and medium-power regenerative applications with moderate event frequency.**

**Version B:** 150 kW Peak / 5 s – 15 kW Continuous (MHT/MHE 100-400 Series).

**Graph 2: kW vs Seconds [MHT/MHE]**



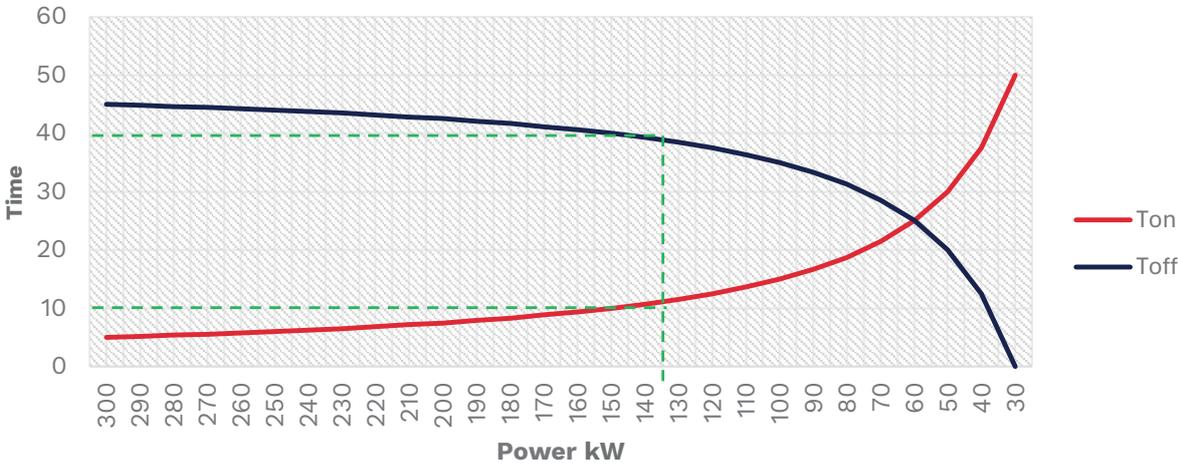
EXAMPLE SCENARIO:

- Regenerated power: 70 kW
- Peak duration: ≤ 10 seconds (Ton)
- Minimum interval between events: ≥ 40 seconds (Toff)

This version supports **high-power industrial applications with frequent and intense regenerative cycles.**

**Version C:** 300 kW Peak / 5 s – 30 kW Continuous (MHT/MHE 500-800 Series).

**Graph 3: kW vs Seconds [MHT/MHE]**



EXAMPLE SCENARIO:

- Regenerated power: 135 kW
- Peak duration: ≤ 10 seconds (Ton)
- Minimum interval between events: ≥ 40 seconds (Toff)

This version supports **high-power industrial applications with very frequent and intense regenerative cycles.**

The adoption of UPSs equipped with PWA allows for the combination **of power protection and safe management of regenerative energy**, a crucial advantage for critical infrastructures where **operational reliability is essential.**



## Why Riello UPS?

“Made in Italy” technology for excellent results

Global player

Offers comprehensive, customer focused services

Smart and sustainable energy

### WHY CHOOSE RIELLO UPS?

Riello UPS designs and manufactures its UPS systems in Italy, allowing it to exercise direct control over quality and reliability by closely monitoring the entire design, production, sales and after-sales service cycle.

Our company is **the leader in Italy and one of the top companies worldwide in the UPS market.**

We develop solutions equipped with innovative, cutting-edge technologies, ready for smart electricity distribution networks, which represent the future of energy.

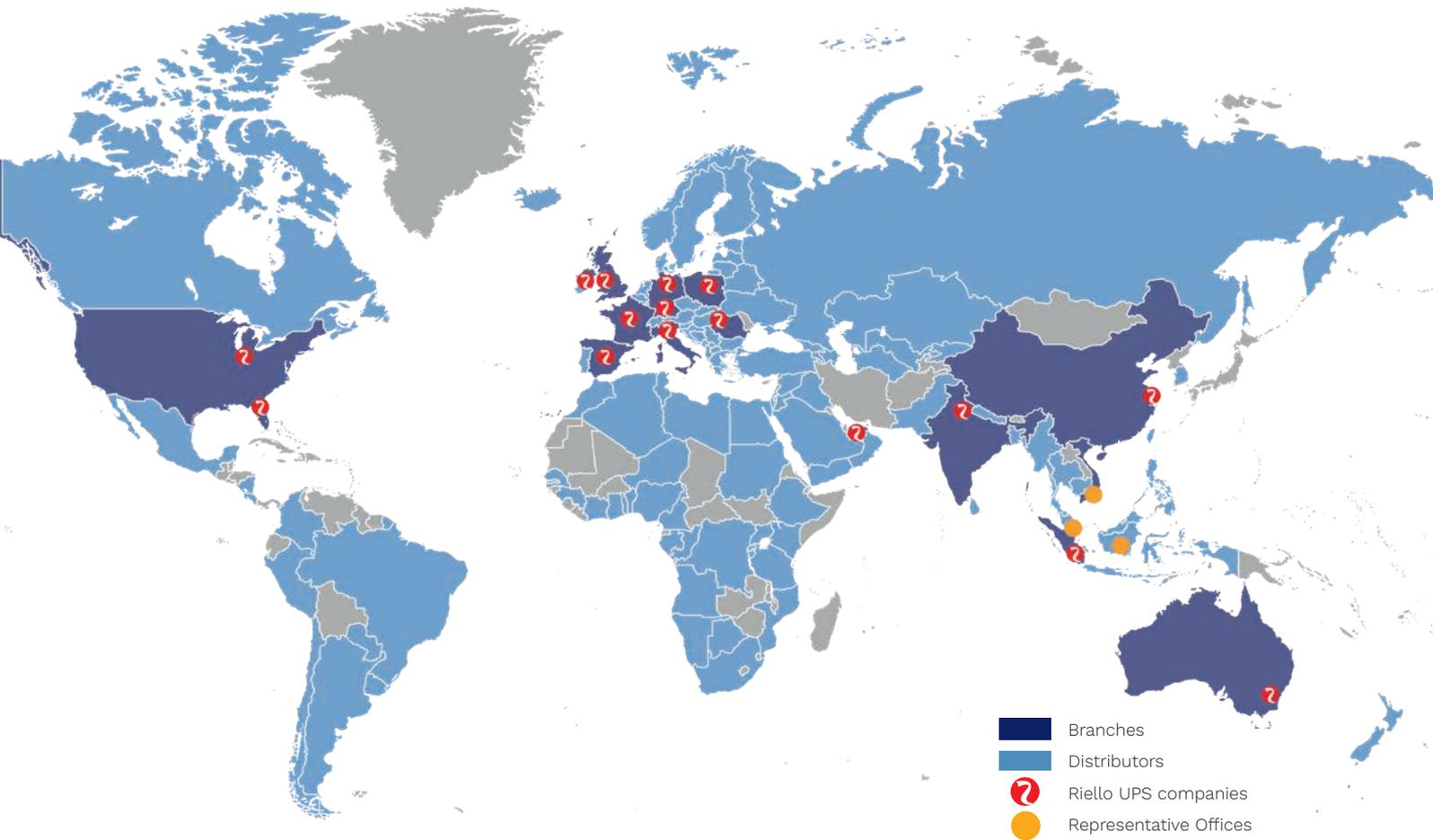
Our comprehensive, award-winning range of uninterruptible power supplies includes **24 product lines suitable for every situation.**

Thanks to our two research centres in Legnago (Verona) and Cormano (Milan), examples of excellence in Italy and worldwide, we are constantly innovating our product portfolio, keeping it at the top in terms of performance, energy efficiency and competitiveness.

**Riello UPS has 15 legal entities and subsidiaries worldwide and distribution and service channels in over 90 countries.**

For more information:

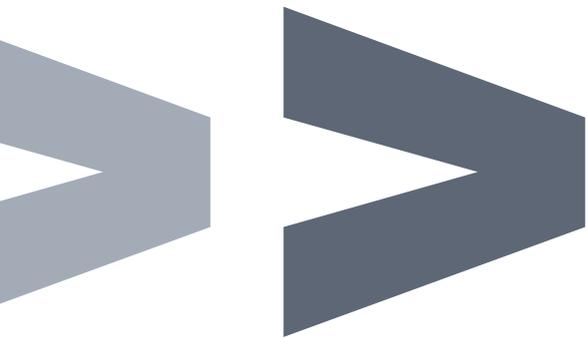
**[www.riello-ups.com](http://www.riello-ups.com)**



INTELLIGENT ENERGY “RELIABLE POWER FOR A SUSTAINABLE WORLD” IS THE PHILOSOPHY OF RIELLO UPS SUMMARISED IN A FEW SIMPLE WORDS - A GLOBAL BRAND CONSTANTLY SEARCHING FOR THE MOST INNOVATIVE SOLUTIONS.

One of the most difficult challenges in the world of UPSs is to **minimise energy operating costs without compromising device efficiency levels**. The entire range of Riello UPS ON LINE UPS units, from 1 kVA upwards, is fully compliant with the Elite classification of the **Code of Conduct (CoC)** for UPS energy efficiency (2021-2023), published by CEMEP in agreement with the Joint Research Centre of the European Commission. Compared to standard UPSs, **Riello UPS solutions are more efficient and guarantee energy savings** that translate into a rapid return on investment and a significant reduction in carbon dioxide emissions, benefiting the environment.





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