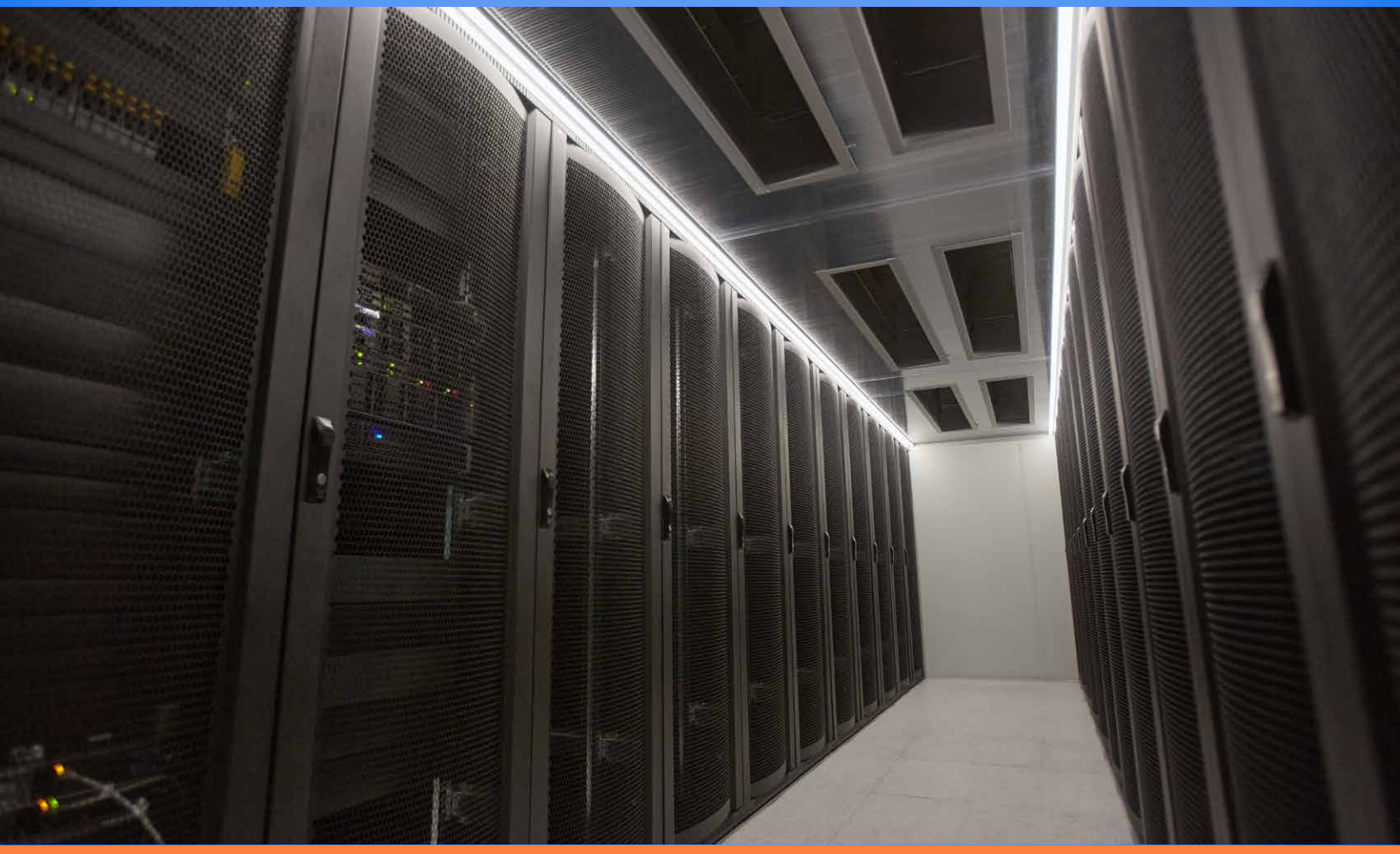
ATLANTIC POWER energy

CHOOSING THE TYPE OF UPS ACCORDING TO MY NEEDS



Choosing the type of UPS according to my needs

Continuity of power supply is vital for the uninterrupted operation of critical equipment in a wide range of sectors, from industry to domestic environment. UPS systems have become an indispensable solution for protection against common power grid problems such as power outages, voltage fluctuations, and current spikes. In this white paper, we'll explore in detail what a UPS is and how it works, typical issues in the power grid that can affect the operation of sensitive equipment, the different types of UPS available on the market, and the key factors to consider when selecting the most suitable UPS for a specific application. We will provide a comprehensive guide to help readers better understand this important electrical infrastructure component and make informed decisions in its implementation.

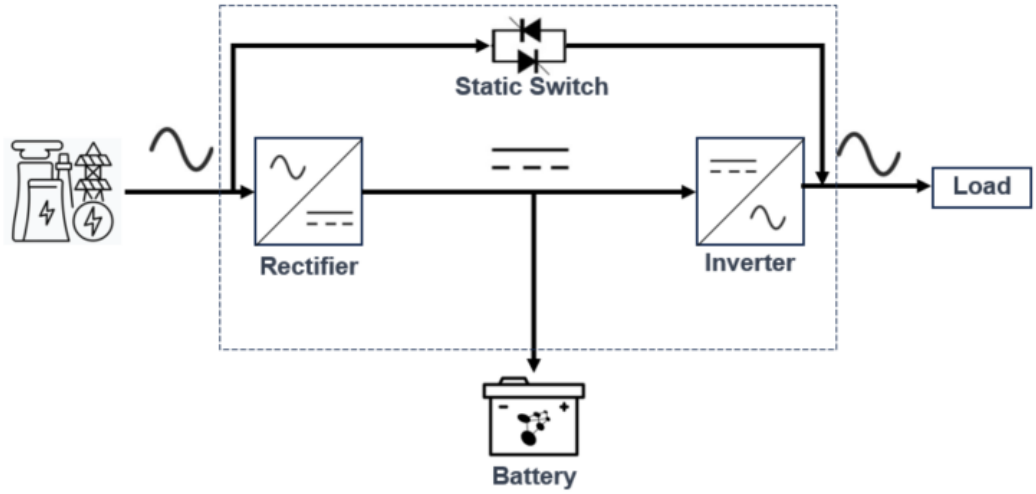
What is a UPS and how does it work?

UPS (Uninterruptible Power Supply) are essential devices in the field of electronics and computing. It is an electronic device that provides backup electrical power to computer, servers, telecommunications, medical, and other electronic devices when the primary power source is not available. Its function is crucial to protect against power outages, voltage fluctuations, and other power related issues that could damage or disrupt the proper operation of this equipment.

How a UPS Works

The basic operation of a UPS involves converting electrical energy from an AC power source into energy stored in batteries. When a power outage or main power fluctuation occurs, the UPS kicks in, supplying power to connected devices from its internal batteries, from where it performs a DC-to-AC conversion again. This transition between main power and backup power must occur almost instantaneously to ensure continuity of power supply without perceptible interruptions.

Components of a UPS



- **Rectifier:** The rectifier is the component responsible for converting AC input power into DC power, which will be used to charge the UPS batteries and power the inverter.
- **Batteries:** Batteries are the heart of the UPS, as they store the energy that will be used during power outages. They are usually rechargeable lead-acid or lithium-ion batteries.
- **Inverter:** The inverter is responsible for converting DC power from batteries into AC power, which is the form of power used by most electronic equipment.
- **Bypass:** Bypass allows power to flow directly from the main power supply to connected devices when there are no problems with the power supply, when there is an internal fault in the equipment or when some repair or maintenance intervention is required to the UPS, thus preventing it from passing through the equipment while keeping the load on.
- **Control & Management Circuit:** This component constantly monitors the input power quality, battery status, charging of connected devices, and other relevant parameters to ensure optimal UPS operation. It also allows remote monitoring of the UPS, when network cards are incorporated, which handle different communication protocols.

Typical Problems in the Power Grid

The power grid is subject to a variety of issues that can adversely affect the quality and stability of the power provided. From sudden power outages to voltage fluctuations and other phenomena, these issues can cause costly damage and significant downtime to sensitive electronic systems and devices, compromising the operation of critical processes.

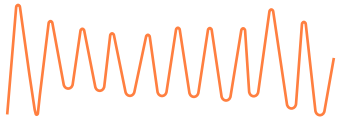
Below is a detailed overview of common problems in the power grid and how UPSs can help fix them or minimize their impact.

1. Power outages: Power outages are temporary interruptions in the power supply. UPSs provide immediate backup power, allowing connected equipment to continue operating without interruption for long enough to perform proper shutdown or maintain critical operation.

BLACKOUT / INTERRUPTION

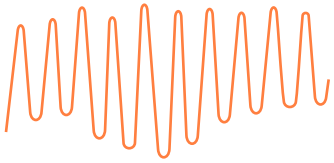
2. Voltage fluctuations: Voltage fluctuations can damage sensitive electronic equipment. UPSs regulate the output voltage, providing a constant and stable electrical current even when the power grid experiences variations, thus protecting equipment from damage..

3. Surges: Surges: Surges, are sudden, temporary increases in the voltage of the power grid. UPSs can automatically detect and suppress power surges, preventing them from reaching connected equipment and protecting them from damage.



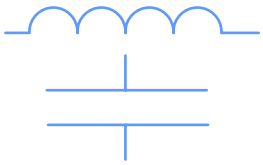
SAG or BROWNOUT

4. Undervoltages or voltage drops: Undervoltages are temporary decreases in the voltage of the power grid. UPSs automatically compensate for undervoltages by providing additional power from the batteries, ensuring that connected equipment receives a stable and continuous power supply.



SWELL or SURGE

5. Electrical noise or electromagnetic interference: Electrical noise and electromagnetic interference can adversely affect the performance of electronic equipment. By acting as a filter between the power grid and connected devices, UPSs can reduce or eliminate electrical noise and electromagnetic interference, thereby improving the quality of the power supply.



6. Harmonics: Harmonics are non-sinusoidal currents or voltages that can cause problems in electrical equipment and the power grid in general. Harmonics in electrical systems are caused by non-linear loads. These loads draw current in short bursts rather than in a smooth sinusoidal waveform. When these non-linear loads, such as computers, variable speed drives, or LED lighting, are connected to the electrical grid, they introduce distortion into the voltage and current waveforms. This distortion results in the generation of harmonics, which are multiples of the fundamental frequency of the electrical system. Harmonics can lead to various problems, including overheating of equipment, increased losses in the electrical system, and interference with sensitive electronic devices. Therefore, it's essential to mitigate harmonics through proper system design and the use of harmonic filters. By providing a stable and clean power source, UPSs can mitigate the adverse effects of harmonics on sensitive equipment.

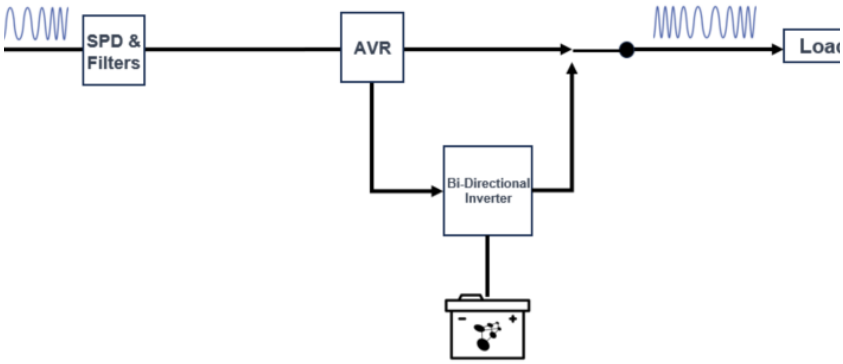
7. Downtime and data loss: Downtime caused by power grid issues can be costly for businesses and organizations. UPSs reduce downtime by providing a seamless transition to backup power during power outages, ensuring continuity of critical operations and preventing data loss.

Types of UPS

There are several types of UPS, each with its own unique features and benefits. From the simplicity and affordability of the Offline UPS to the maximum protection and power quality provided by the Online UPS, each type of UPS offers a solution to meet various power protection needs. We will analyze interactive UPSs and online equipment, as they are the ones that provide medium and high protection, discarding other topologies with a very low level of protection and efficiency.

Line-Interactive UPS

Interactive UPS, as the name implies, interacts more directly with power from the power grid. This type of UPS constantly monitors the input voltage and automatically adjusts its output to keep it within a safe range. When a power outage occurs, the Interactive UPS switches to battery backup power and regulates the power output to provide a stable power supply.



How it works:

During normal operation, the Interactive UPS continuously monitors the input voltage of the power grid.

If the input voltage drops below or rises above safe limits, the Interactive UPS automatically adjusts its output to compensate, providing clean, stable power to connected devices.

When a power outage occurs, the Interactive UPS switches to battery backup power and continues to regulate the output to keep it within safe limits.

Advantages:

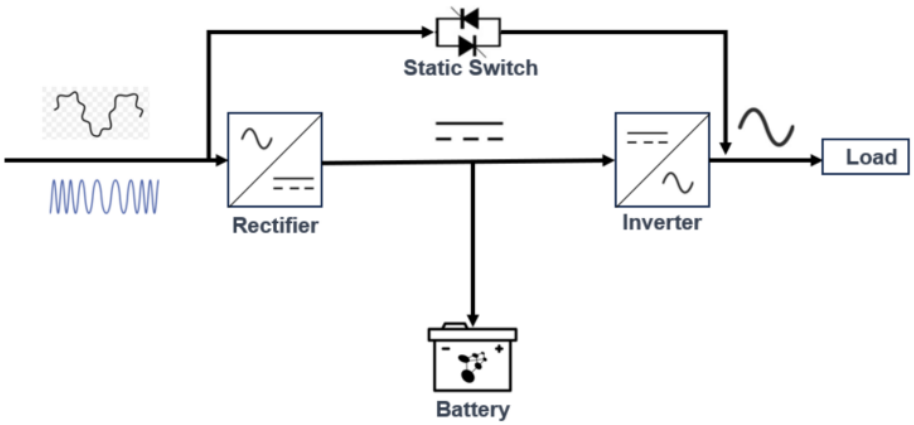
- Voltage Fluctuation Protection: Actively regulates the output voltage to protect devices against harmful fluctuations.
- Its price is lower than online equipment.

Disadvantages:

- Limited Load Capacity: They may have a jitter protection capability and limited load compared to Online UPSs. It also operates with much lower efficiencies than online teams.
- Their transfer time can be longer than in online teams. It is not recommended for critical loads.

UPS Online (Double Conversion)

The Online UPS, also known as the Double Conversion UPS, provides maximum protection and power quality. In this type of UPS, power from the power grid is first converted to DC and then converted back to AC to power connected devices, ensuring clean and consistent power at all times. In addition, connected devices always receive from the DC bus, even when mains power is available, providing additional protection against voltage fluctuations and other grid issues, as a supply will always be maintained by creating a new wave with pure sine waveform from scratch.



How it works:

Power from the power grid is first converted to DC by a rectifier.

DC is used to charge the batteries and power an inverter that converts the DC back to AC.

Connected devices always receive power from the inverter, ensuring stable and constant power even during power outages and voltage fluctuations.

Advantages:

- Maximum Protection: Provides maximum protection against power outages, voltage fluctuations, harmonics, and other network issues.
- Power Quality: It offers exceptionally high power quality, as the devices are always being powered by the inverter.

Disadvantages:

- Cost: Online UPSs tend to be more expensive than other types of UPS due to their more complex design and higher protection capacity.

Modular and Monolithic UPS

Another classification focused on their construction are monolithic UPS and modular equipment. Monolithic and modular UPSs are two different approaches, offering solutions for different power capacity needs and requirements.

Monolithic UPS:

LMonolithic UPSs are self-contained, self-contained units that include all the components needed for operation, such as rectifiers, inverters, batteries, controllers, and power management systems, all integrated into a single chassis or enclosure. These systems are usually designed to deliver a specific power capacity and are not easily expandable in terms of capacity. If more power is needed, the entire UPS should usually be replaced with a larger capacity one.

Features and Advantages of Monolithic UPS:

- Ease of Deployment: Monolithic UPSs are easy to install and get up and running, as they come as a single device out of the box.
- Compact: By integrating all components into a single chassis, monolithic UPSs are compact and take up less space compared to modular systems.
- Initial Cost: They often have a lower upfront cost compared to modular systems, making them attractive for applications with limited budgets.
- Simplified Maintenance: Due to their integrated design, monolithic UPSs tend to require less maintenance and are easier to manage.

Modular UPS:

Modular UPSs, on the other hand, are systems that are made up of independent modules that can be added or removed as needed to increase or decrease the power capacity of the system. Each module in a modular UPS system typically includes a fraction of the total system capacity and may contain components such as rectifiers, inverters, batteries, and control systems. These modules can be installed in parallel to increase the power capacity or redundancy of the system, offering significant flexibility and scalability.

Features and Advantages of Modular UPS:

- Scalability: Modular UPSs offer greater scalability than monolithic UPSs, as modules can be easily added or removed based on changing power needs.
- Redundancy and Availability: By allowing parallel configuration of multiple modules, modular UPSs offer greater redundancy and availability, as one module can shoulder the load in the event of another failure.
- Easy Maintenance: Individual modules in a modular system can be replaced or maintained without interrupting the operation of the system as a whole, simplifying maintenance tasks and reducing downtime.
- Energy Efficiency: By allowing the operation of only the modules needed to meet the load at any given time, modular UPSs can be more energy efficient than monolithic systems at partial loads.

Monolithic (Stand-Alone)

- Low MTBF.
- Integrated design.
- Fixed capacity (some scalable by software).
- Lower costs.
- Parallel connection.

Modular

- Low MTTR.
- Hot swappable modules.
- Shorter repair times.
- Scalable capacity.
- Redundancy.
- Higher costs.

Altantic Power have a wide range of interactive and online double-conversion UPSs, in monolithic and modular constructions, covering all the needs present in our customers.

Factors to Consider When Selecting a UPS

Properly selecting and sizing a UPS is crucial to ensure that it meets application requirements and effectively protects connected equipment. Below are the main factors to consider:

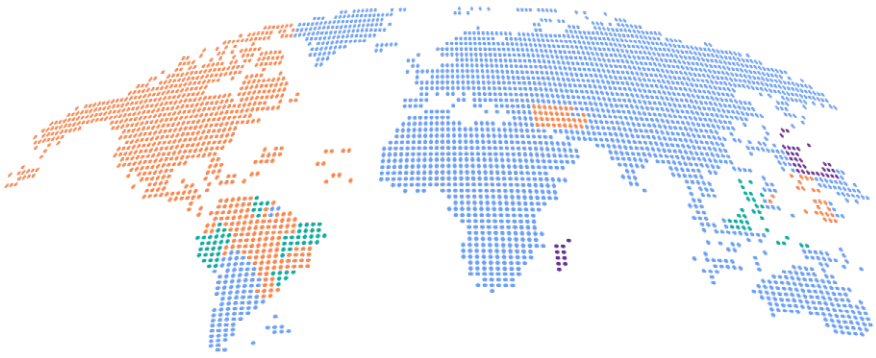
1. Total load to be protected:

Before selecting a UPS, it is critical to calculate the total load that needs to be protected. This involves identifying all the electronic equipment that will be connected to the UPS and adding up their power consumptions in watts (W) or volt-amperes (VA). This can be done by checking equipment labels or using an energy meter. It is important to leave room for future expansions and to take into account the efficiency of the UPS.

Description	Charge
Servers	5.200 VA
OLT	5.800 VA
Switches	4.800 VA
Auxiliary loads	6.180 VA
Future growth	5.000 VA
Available	
Available	
Total	62.924 VA

2. Voltage, Frequency and Connection Type:

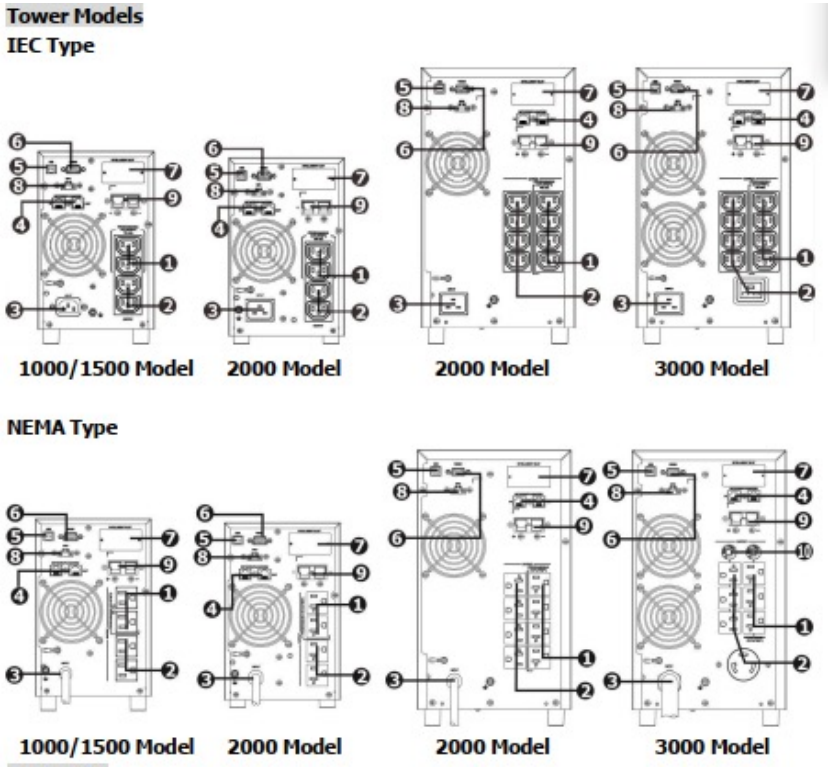
The UPS must be compatible with the voltage and frequency of the local power grid. In addition, consideration must be given to whether the connection will be single-phase or three-phase, depending on the requirements of the equipment to be protected and the electrical infrastructure available on site.



220-240V/50Hz 100-127V/60Hz 220-240V/60Hz 100-127V/50Hz

3. Types of Outlet Outlets:

The UPS must provide the types of outlet outlets needed for the equipment to be connected. This can include standard AC outlets, such as NEMA, IEC, or Schuko, as well as specific outlets for specialized equipment, such as servers or networking equipment

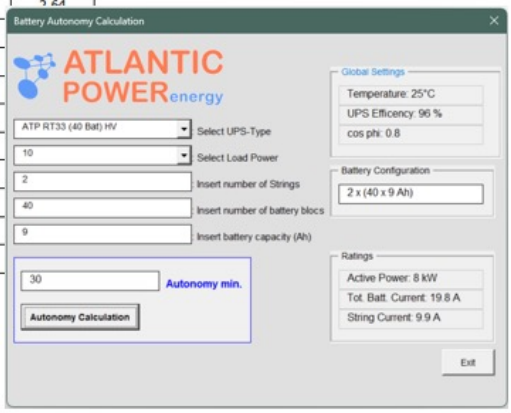


4. Battery runtime:

UPS runtime refers to how long it can provide backup power to connected equipment during a power outage. This depends on the capacity of the UPS batteries and the total charge expected to be powered during the outage. It is important to calculate the range required to ensure that critical equipment can be kept operational for the time needed to restore the main power supply or to perform a proper shutdown.

Runtime Chart (internal battery)

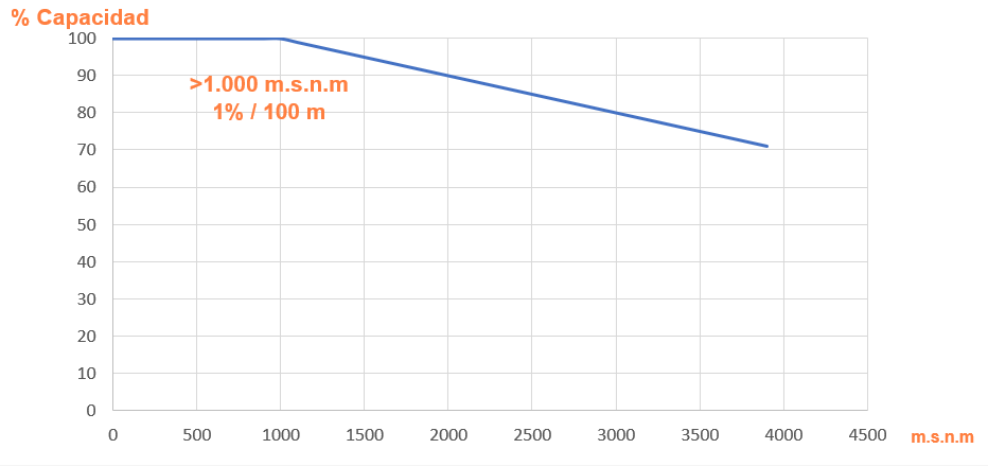
Model	ATP One 1000	ATP One 1000	ATP One 1500	ATP One 1500	ATP One 2000	ATP One 2000	ATP One 3000
Battery / Load percentage	(9Ah x 2)	(7Ah x 3)	(9Ah x 3)	(7Ah x 4)	(9Ah x 4)	(7Ah x 6)	(9Ah x 6)
100.00%	2.43	4.24	2.57	3.17	2.43	4.24	
90.00%	3.19	5.15	3.36	4.13	3.19	5.15	
80.00%	4.14	6.29	4.34	5.21	4.06	6.29	
70.00%	5.31	7.85	5.42	6.51	5.31	7.85	
60.00%	6.93	10.08	6.93	8.33	7.06	10.26	
50.00%	9.44	13.28	9.46	11.16	9.56	13.70	
40.00%	12.92	17.71	12.89	15.15	13.20	18.33	
30.00%	18.52	24.69	18.43	21.35	19.12	25.83	
20.00%	29.90	38.92	29.44	33.52	31.06	41.71	
10.00%	63.67	82.66	61.16	70.72	68.38	94.31	



5. Derating:

Derating in a UPS refers to the reduction in the UPS's rated output capacity as altitude above sea level increases. This reduction is due to the fact that the density of the air decreases with altitude, which affects the cooling capacity of the equipment and therefore its ability to output energy.

In areas located at high altitudes, such as in the mountains or in certain geographic regions, it is necessary to consider height derration when sizing a UPS to ensure its optimal operation and responsiveness in the event of power outages. When selecting a UPS for use in high-altitude areas, it is important to refer to the manufacturer's specifications and be aware of any reductions in rated output capacity that may occur due to height meltdown. This will ensure that the UPS can meet the expected power requirements under real-world operating conditions.



6. Operating Environment:

Consideration should be given to the operating environment in which the UPS will be used, including factors such as ambient temperature, humidity, and the presence of dust or corrosive gases. The selected UPS must be able to operate safely and reliably under these conditions.

Conclusion

UPS selection and sizing are critical aspects of ensuring the reliable protection of sensitive equipment and continuity of operations in critical environments. From the careful evaluation of the total load to be protected to the consideration of factors such as voltage, frequency and type of connection, as well as range and meltdown, every aspect plays a crucial role in choosing the most suitable UPS for a specific application. Additionally, understanding the different types of UPSs, such as monolithic and modular, provides a solid foundation for making informed decisions about power infrastructure.

In addition, it is important to note that success in UPS implementation depends not only on the initial selection of equipment, but also on careful planning, proper installation, and regular maintenance over time. Collaborating with energy system experts and incorporating best practices in energy management are critical to maximizing system efficiency, reliability, and availability. Ultimately, by addressing these considerations holistically, organizations can effectively mitigate the risks associated with power outages and other electrical issues, and ensure the continuity of critical operations at all times.

With more than 15 years of experience in the sector, Atlantic Power stands out as a leading manufacturer of UPS, precision air conditioners, VRLA and Lithium Ion batteries, generators, switchs and reclosers for MV, infrastructure for datacenters. With an extensive track record of delivering reliable and efficient energy solutions throughout North, Central and South America, as well as the Caribbean, our company prides itself on offering not only high-quality products, but also exceptional technical service that ensures customer satisfaction at every stage of the process, from initial consultation to installation and ongoing maintenance.

Our equipment is renowned for its high reliability and low failure rate, making it the preferred choice for a wide range of critical applications in various industries. At Atlantic Power, we are committed to providing state-of-the-art energy solutions that exceed our customers' expectations and ensure the continuity of their operations at all times.

We continue to innovate to provide our customers with state-of-the-art products with the best standards of safety, quality and efficiency.

For more information visit us at www.atlanticpowerenergy.com