Power protection for data centers
Data centers are major power users, with larger installations consuming tens of megawatts. As customers are often highly reliant on the operation of a data center, it is critical that data is available at all times and that it is stored in a reliable and energy-efficient way. ABB’s uninterruptible power supply (UPS) systems ensure this. A reliable UPS will guarantee a flow of continuous, clean power to the data center no matter what happens on the power supply side. No critical data center operates without an effective UPS.

ABB provides a range of modular and standalone UPS solutions. All these UPS solutions are recognized as being at the forefront of power protection innovation and technology and are class-leading in terms of system reliability efficiency, availability, scalability and flexibility – using less energy, generating less CO₂, saving valuable floor space and achieving significant total cost of ownership savings – making them ideal for data center applications.

To this ABB can add a comprehensive power infrastructure such as gensets, active voltage conditioners, switchgear and power conditioning equipment to build a complete, fully matched power protection solution for each and every data center to ensure a true, no-break supply in the event of a power failure. Additionally, with Decathlon, ABB’s data center infrastructure management (DCIM), data center managers can manage their data center operations enterprise-wide through a unified view that spans mechanical, electrical and IT systems – so they can deliver services faster, in the most reliable, efficient and sustainable way possible.
Power protection for those who need zero downtime

UPSs play a vital role in ensuring IT reliability. As a result, the reliability of the UPS itself is a major consideration. Any time a UPS fails and becomes unavailable, mission-critical electrical loads are put at risk. The surest way to increase UPS availability is to have the correct design, use high quality components, ensure redundancy and eliminate downtime by minimizing MTTR (mean time to repair).

Availability is formally defined as:

\[
\text{Availability} = \frac{MTBF}{MTBF + MTTR}
\]

MTBF (mean time between failure) and MTTR are common parameters in the UPS industry and both impact system availability. Modular UPS designs minimize the system’s MTTR. ABB’s Decentralised Parallel Architecture™ (DPA) allows the modules to work as one system but without interdependence. In the unlikely event of one UPS module failing, the overall system will continue to operate normally, but with one less module of capacity. The failed module will be fully disconnected and will not impact the operating modules.

True, safe-swap modularity enables the safe removal and/or insertion of Conceptpower DPA modules without risk to the critical load and without the need to power down or transfer to raw mains supply. This unique feature directly addresses today’s requirement for continuous uptime. The ability to swap modules online in a Conceptpower DPA system significantly reduces its MTTR and simplifies system upgrades. The modular approach pays off too when it comes to serviceability and availability – online swapping of modules means you do not have to switch off or bypass during replacements, so there is no downtime.

This online-swap technology, along with significant reductions in repair time, can also achieve so-called six nines availability (99.9999 percent) – highly desirable for data centers in pursuit of zero downtime. Not only does this improve availability but it also reduces cost as service engineers spend less time on-site and any risks of data or production loss are minimized. Also, inventory levels of specialist spare parts are reduced.

DPA enables further fault tolerance: Each module contains all the hardware and software required for full system operation. Modules have no common components. Each UPS module has its own independent static bypass, rectifier, inverter, logic control, control panel, battery charger and batteries. With all the critical components duplicated and distributed between individual units, potential single points of failure are eliminated.

ABB’s UPSs boast the lowest cost of ownership of any UPS system by offering energy efficiency (up to 96 percent), scalability and ergonomic design to enable easy serviceability.
In a data center, the principal mission of the UPS is to protect the servers. The UPS function can be located centrally or located beside each row of servers ("end of rack row"). A centralized power protection concept is appropriate, in most cases, for large data centers and a distributed power protection concept may be applicable in small data centers or large data centers with decentralized power protection demands.

The building block concept permits a range of different power protection solutions for data centers. Some example configurations are presented here.

1. Distributed power protection solutions for data centers – end of rack row UPS

The power demand of one row of server racks can vary from 20 kW up to hundreds of kW. Only a modular UPS is capable of adapting to changes in power demand in a growing infrastructure.

a) Servers with single power supply

b) Servers with dual power supply
Standardization and modularization have revolutionized the design of power back-up systems for data centers. ABB’s UPS product range allows easy expansion of power capacity up to 5 MW. And all by adding standard modules or UPS units. Large and small data centers can now be built by using the same predesigned, pre-manufactured and pretested sub-systems as building blocks.

2. Centralized power protection solutions for data centers – servers with dual power supply

a) Modular UPS solution for up to 3 MW

Tier IV power infrastructure
A sample reference scenario, 1200 kW Tier 4, illustrates one example of how ABB’s Concept-power DPA 500 can be used to create a high-performance infrastructure. Each system has N + 1 redundancy. The system flexibility allows upgrading or downgrading power capacity as required.

Scalable up to 3 MW
The system flexibility allows upgrading or downgrading power capacity. Additional modules and units can be added to make it up to 3 MW.
b) Standalone UPS solution for up to 5 MW

Up to 10 independent UPS units (PowerWave 33) can operate in a parallel configuration, achieving a total power capacity of up to 5 MW. In all parallel configurations, each UPS unit operates independently but is synchronized with the others. Using this scalable architecture of the PowerWave 33, a modular and fully redundant UPS system can also be easily implemented.

c) Medium-voltage UPS solution

A medium-voltage UPS-I can be installed to protect the power supply to the entire data center, or just to protect server and mechanical loads. Installing the UPS protection at the medium-voltage level provides the most energy-efficient configuration and allows installation outside the main data center building.
Further power protection applications in data centers

1. Mechanical load protection

The reliability of mechanical plant and, in particular, cooling systems, is critical to overall data center availability. ABB has industrially rated UPSs and voltage conditioners that are suited to the difficult motor loads on these supplies.

2. Power factor and harmonic correction

Utilities will often penalize for poor power factor caused by direct-connected motors on cooling plant, harmonics from motor drives and even some server loads and UPSs. Standard power factor correction using capacitors is difficult to apply in data centers, especially where standby generators are installed. Some server loads, particularly when heavily loaded, can cause a leading power factor, which is a particular problem for standby generators. ABB’s PCS100 RPC (reactive power conditioner) is ideal for correcting power factor and low-order harmonics in data center applications.
### Comprehensive power protection solutions

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Conceptpower DPA 250/500</td>
<td>double-conversion online modular UPS</td>
<td>Power range: up to 500 kW System power range: up to 3 MW Backup time: from 5 minutes up to several hours Efficiency: Up to 96 % Efficiency in eco-mode: &gt; 99 %</td>
</tr>
<tr>
<td>PowerWave 33</td>
<td>double-conversion online standalone UPS</td>
<td>System power range: up to 5 MW Backup time: from 5 minutes up to several hours Efficiency: Up to 96 % Efficiency in eco-mode: &gt; 99 %</td>
</tr>
<tr>
<td>PCS100 MV UPS</td>
<td>single-conversion UPS</td>
<td>High-reliability, new generation single-conversion design Modular format Efficiency: &gt; 99 % Small footprint Supercapacitor, lithium-ion and lead-acid storage options.</td>
</tr>
<tr>
<td>PCS100 UPS-I</td>
<td>single-conversion industrial UPS</td>
<td>Modular design Efficiency: &gt; 99 % Small footprint Industrial rating Protects mechanical systems from outages, sags and swells</td>
</tr>
<tr>
<td>PCS100 AVC</td>
<td>active voltage conditioner</td>
<td>Continuous-online Fast inverter-based response Sag and surge protection System rating to 6 MVA</td>
</tr>
<tr>
<td>PCS100 RPC</td>
<td>reactive power conditioner</td>
<td>Modular-redundant Fast operation – inverter based Can correct leading or lagging power factor Corrects low-order harmonics System rating to 2 MVAr</td>
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Data center infrastructure management with Decathlon®

Decathlon® provides the tools to manage a flexible network of power, cooling and IT systems through a single operational environment for maximum reliability, energy efficiency and optimal utilization of all data center assets. With Decathlon, data center professionals – from both IT and facilities disciplines – obtain the visibility, decision support and control technologies they need to maximize capacity and optimize their entire data center operations while reducing cost and risk. The newest version of Decathlon is the only DCIM system in the industry that tightly integrates with third-party solutions, providing maximum flexibility to meet uncompromising data center service levels, whether completely on-premise or in the cloud.

Decathlon provides a scalable, modular solution that adapts to the data center’s operational maturity. Its open platform allows for reuse of infrastructure point-solutions to simplify migration. The above diagram illustrates the core functionality and application modules that Decathlon provides to ensure optimal performance of data center assets – including mechanical, electrical and IT systems.

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<td>Control and automation</td>
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<td>External interfaces</td>
<td>Mechanical</td>
<td>Electrical</td>
<td>IT and O/S</td>
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<tr>
<td></td>
<td>Application management</td>
<td>Other</td>
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</tr>
</tbody>
</table>

Decathlon® secure cloud
Global energy intelligence
Data center infrastructure management with Decathlon®

Select the Decathlon implementation that is right for you. For example, you can choose to monitor and manage UPS and battery systems either on-premise or via the Decathlon secure cloud.

Features include:
- SMS/email alerts
- Secure outward-only GSM or VPN connections
- Automated diagnostics
- Alarm response escalation and on-site callout support
- 24x7 UPS subject matter expertise support

On-premise – option 1
- Performance status
- Unified alarming
- Real-time monitoring

On-premise – option 2
- Can monitor and control your entire data center.

Secure outbound-only data for remote monitoring

Features include:
- SMS/email alerts
- Secure outward-only GSM or VPN connections
- Automated diagnostics
- Alarm response escalation and on-site callout support
- 24x7 UPS subject matter expertise support

24 x 7 support from subject matter experts
Services

A well-maintained power protection system will ensure the integrity and availability of power to critical installations, 24 hours a day, week after week, year after year without fail.

ABB offers the most comprehensive and cost-effective service available - ensuring the UPS, gensets, batteries and other complementary products of your power protection system are expertly maintained on a regular basis and are always ready and able to support your critical business load.

From initial contact, through installation, commissioning and maintenance to disposal, ABB provides its customers with an unrivalled single source for all their power protection service needs. Our wide range of services include: Initial site surveys, system design, installation and commissioning, preventative maintenance, repair, battery maintenance, replacement and testing, capacitor replacement, remote monitoring, load bank testing, witness testing, disposal.

ABB’s world of data center products

ABB is a global supplier of a wide range of power and automation products and is a one-stop-shop for much of the equipment needs of a modern data center. ABB offers products that are to be found all-the-way from the utility to the power distribution system in the data center as well as in the infrastructure control.

The breadth of our global manufacturing, local project execution and service capabilities means we streamline the purchase process and deliver solutions to our customers through a single point of contact. ABB offers, for example, a full range of switchgear, voltage conditioning equipment, transformers, generators. ABB has a presence in every country in the world and can offer unrivalled expert service and consultancy. Please contact your local ABB representative or visit www.abb.com for more details.