

4|14

power

A power protection magazine
of the ABB Group



Protected

Industrial power protection – 08

Single conversion UPS for large industrial power protection

High density power distribution – 10

Deploying effective power protection in data centers

Power health – 15

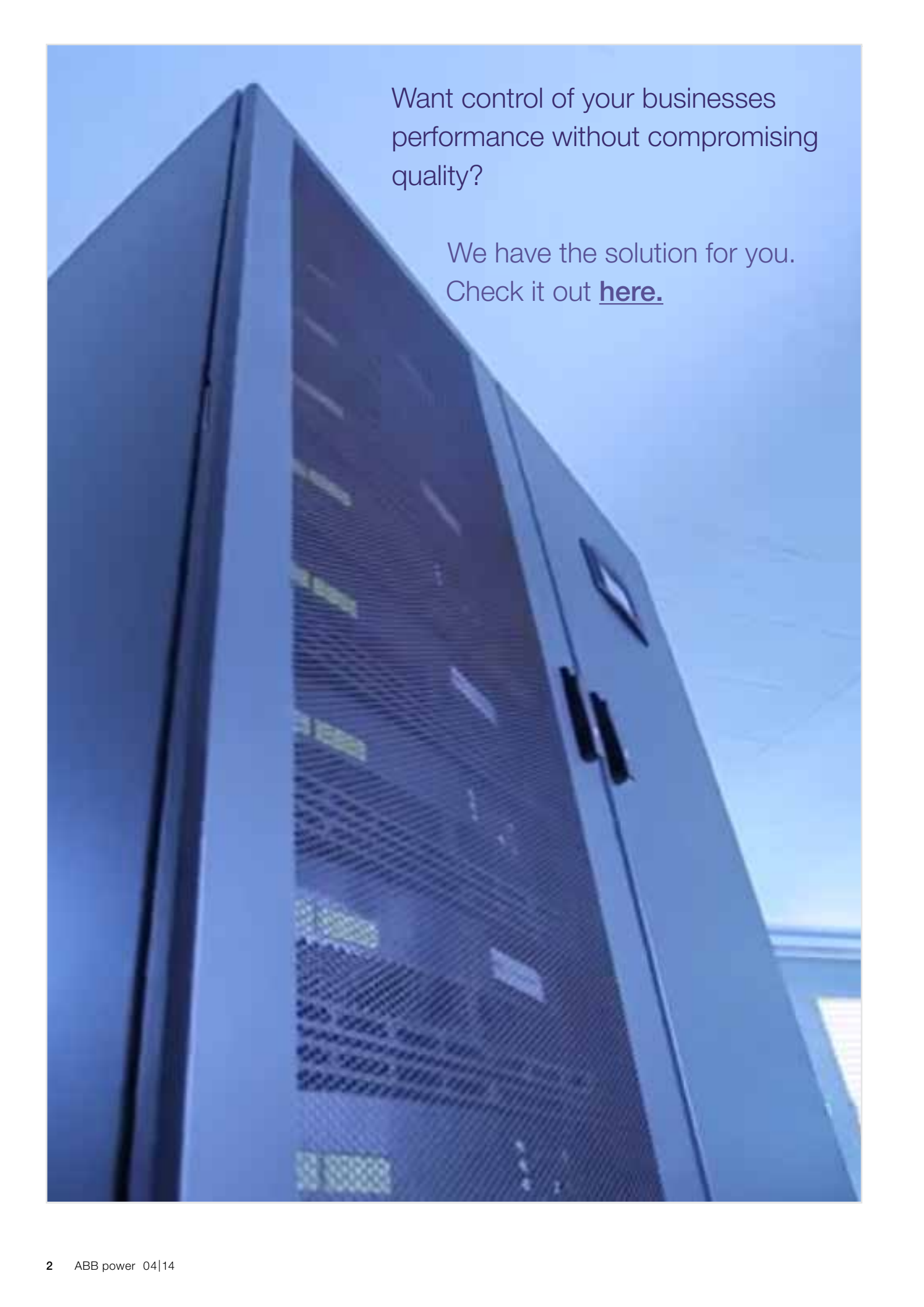
ABB DPA UPScale ST 200 UPS for medical laboratory in Switzerland

Sensing perfection – 16

Protecting the most sensitive equipment for high-end technology

Power and productivity
for a better world™





Want control of your businesses
performance without compromising
quality?

We have the solution for you.
Check it out [here](#).

power



Amina Hamidi

Product Group Manager
Power Protection

We are now over halfway through the year and I am pleased to say that our business is developing in a very satisfactory fashion. Once again, our products have catered for an astonishing range of applications in many different fields, for example in the semiconductor sector, with Sensirion. This Swiss company is a leading manufacturer of silicon-based relative humidity sensors and flow sensors. ABB commissioned a 1500 kVA PCS100 UPS-I for Sensirion in Switzerland to eliminate the poor power quality that was causing disruptions to the production line once or twice a month.

Furthermore, we are active in one of our other staple markets - data centers. ABB won an order for a UPS for a data center belonging to the Polish Geological Institute in Warsaw, Poland. High on the customer's list of requirements was redundancy and the ability to increase power capacity in the future. Added to this, was the need for a compact solution due to lack of space. ABB's UPScale DPA ST 80 ticked all the boxes for this customer.

Many data centers are being located in higher latitudes to exploit natural cooling and it is for just such a northern location that ABB recently received a significant order for a four-frame DPA 500 UPS system. The DPA 500 has been well received by markets around the world as it matches the needs of many customers – especially those responsible for large data centers. The DPA 500 has critical advantages that made it a natural choice for this major customer in Scandinavia.

Later in this magazine, you can read some more about UPSs in data centers in an article that focuses on electrical system design within a data center and how ABB products allow the customer to stay ahead of growing IT demands by deploying efficient, reliable, and safe electrical infrastructure that makes the data center flexible and manageable.

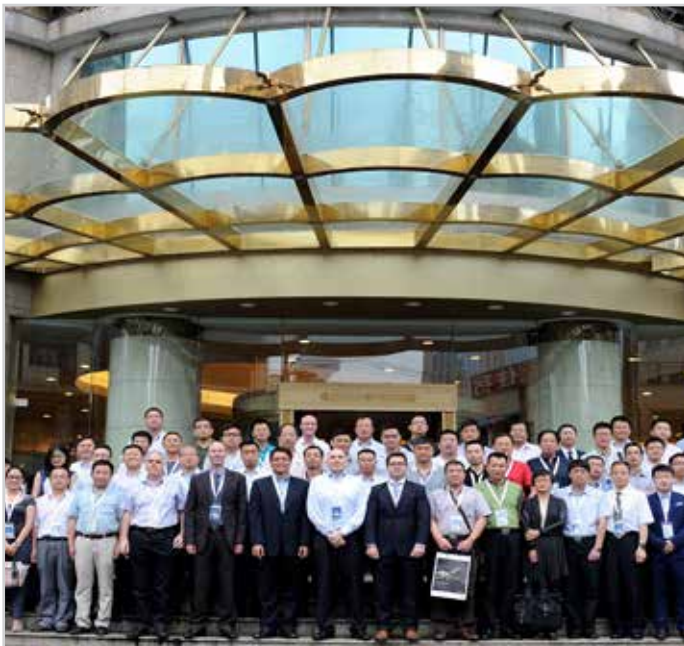
Highlighted in this issue of Power is an article based around single conversion UPS performance for large industrial power protection.

In the healthcare arena, ABB recently supplied the Swiss-based medical analysis enterprise, the “Dr. Risch Medical Laboratory”, who conduct blood analyses for hospitals and doctors, with a DPA UPScale ST 200 to ensure that their operation has a rock-solid supply of clean power no matter what happens on the utility side. Power interruptions during blood analyses can be particularly troublesome on a lot of levels.

In June, ABB launched two new products – the PCS100 MV UPS and PowerValue RT11 single-phase UPS. The launch took place at ABB's Power Protection channel partner meeting 2014, which was held in Shanghai, China on June 18/19. Around 49 executives from 40 channel partners joined ABB representatives at the meeting. As well as the product launch, business development in the previous year and channel policy updates for 2014 were main topics at the meeting.

I would like to thank you all for your contributions to making all the things mentioned above happen. It is the individual contributions of us all that lead to the success of the company. We still have a good few months of the year left and I am sure more new business will continue to keep us busy. But more about that in the next edition!

Enjoy this issue, and I hope you are enjoying the new [videos](#) ABB's Power Protection team are releasing.



06

Strong business momentum

ABB's Power Protection channel partner meeting

10

High density power distribution

Effective power protection in data centers

Events

06 ABB's Power Protection channel partner meeting

Business development in the previous year and channel policy updates for 2014

White papers

08 Industrial power protection

Single conversion UPS for large industrial power protection

10 Effective power protection in data centers

Increasing energy efficiency is one of the primary objectives of data center designers and operators today

Case studies

15 Power health

DPA UPScale ST 200 UPS for medical laboratory in Switzerland

16 Sensing perfection

Protecting the most sensitive equipment for high-end technology

18 Scandinavian data center

DPA 500 UPS modular design fulfills customer needs

21 The ultimate UPS for confined spaces

ABB has won an order for an uninterruptible power supply (UPS) for a data center belonging to the Polish Geological Institute



16

Sensing perfection

Protecting sensitive equipment

18

Scandinavian data center

DPA 500 UPS fulfills customer needs

21

The ultimate UPS

For confined spaces



ABB's Power Protection can now be found on Facebook. "Like us" so that you know when we have competitions, giveaway's and the latest news releases.

Click [here](#) to become a fan of ABB Power Protection.



The power converters and inverters playlist can now be found on the ABB YouTube channel.

Click [here](#) to watch the latest videos.



Haven't subscribed yet?

It's not too late. Click [here](#) to receive the next issue of Power.



Scan our QR Codes with your smart phone to find web links, videos, or event pages, providing further details about ABB's products or services. Scan the one on the left to subscribe to Power. To use QR Codes with your smart phone camera, download a free QR Code scanner to your phone.

Contact Us

www.abb.com/UPS



Strong business momentum



“We have been ranked top in China’s drive market for years thanks to systematic development of channels and products.”

ABB’s Power Protection channel partner meeting 2014 was held in Shanghai in June this year. 49 executives from 40 channel partners and ABB representatives attended. Business development in the previous year and channel policy updates for 2014 were introduced at the meeting. Another important subject was the PCS100 MV UPS and Power value RT11 single-phase product launches.

Qi Luping, Sales and Marketing Director of ABB Beijing Drive Systems Co., Ltd. (ABB Beijing Drives), delivered an opening speech and welcome message. In his speech, Qi Luping said “2014 marks the 20th anniversary of ABB Beijing Drives. We have been ranked top in China’s drive market for years thanks to systematic development of channels and products. Today, we have already seen very strong momentum of ABB’s power protection business and we are positive that ABB will also be market leader in the China power protection market.”

Urs Waelchli, ABB’s Power Protection General Manager, introduced business development in the past year and key market targets for 2014. “We have achieved solid results in 2013 and first half of 2014 thanks to the joint effort with channel partners.



2



3



4



5

In particular, the partners were invited to share their business development and cooperation with ABB at the meeting. At the breakout session, group discussion was held on the business and business target and opportunity for 2014.

The highlight of the meeting was the launch of PCS100 MV UPS. ABB chose China as the first global market to launch this new product. John Penny, General Manager for ABB's Power Conditioning Global Product Line says "China is a very interesting market for large UPS products being a major center for much of the world's high technology industry. With huge electronics factories drawing from tens to in some cases, more than 100 MWs of power, medium voltage becomes very beneficial. Factory designers can now locate the power protection more remotely in a centralized location, remote from the production floors. Our customers are also asking for every improved reliability, efficiency, ruggedness and small footprint and that has been the focus for our design team and we have delivered."

PCS100 MV UPS : Power value RT11

For technical information on ABB's newly launched products, please contact ABB [here](#).

1. A successful channel partner meeting and launch in Shanghai
2. ABB representatives and channel partners on day one of the three day event
3. Urs Waelchli, ABB Power Protection General Manager, introducing business development in the past year and key market targets for 2014
4. ABB representatives (L-R: Yannis Fidakis, DM Division Channel Manager, GPL Power Protection General Manager, John Penny and GPL Power Protection Sales Manager, Andrew Hiscock)
5. Key channel partners observing ABB's products on display

Industrial power protection

Single conversion UPS for large industrial power protection.



The different types of UPS and their relative merits for various applications are not easily understood. There is a lot of literature from UPS manufacturers that is crafted carefully to push the benefits of their particular product. Within the ABB portfolio we have a wide range of UPS offerings and can position the products according to the technical needs of the customer. This article is about the PCS100 UPS-I product and how it is positioned in the market to meet the customers specific requirements.

Definitions

First we need to define some of the words used in the title. Figure one shows the basic topology for a single conversion and double conversion UPS. Single and double refer to the number of conversions between AC voltage and DC voltage.

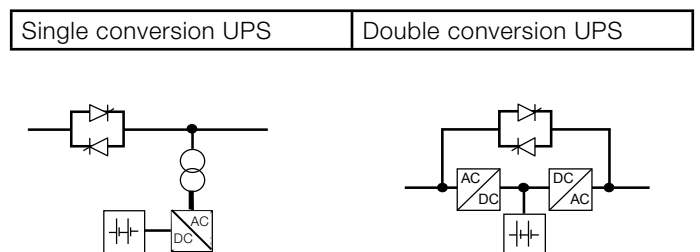


Figure one: Basic topology for a single conversion and double conversion UPS

The 2nd part of the title needing explanation is “industrial”. This word has many different meanings. In some cases an industrial product is one that has higher IP rating, suitable for harsh environments, or an isolation transformer, or even a specialized product for markets such as oil and gas. When we talk about industrial together with the PCS100 we are actually referring to the load’s electrical characteristics. This is the primary product positioning for the PCS100 UPS-I, industrial electrical loads. And finally large, in this context we talk about power requirements of typically half a megawatt and above.

Understanding the loads

Now that we have defined the load type we need to understand where these are and what they require. The type of industrial customer that would benefit from power protection are those with high value products that spend extended time in the manufacturing process. Some examples of these are:

- Semiconductor and LCD manufacturing
- Pharmaceutical and chemical manufacturing
- High value textile processes (i.e. carbon fiber)
- Automotive, presses, painting, robots, CNC

All of these processes are targets for power protection, as the cost of an interruption to production can be extremely high. While there are many electrical devices involved in these processes, some common elements can be found. These are listed in the table below and the associated challenges they bring identified.

Load type	Issues
Motors (compressors, conveyors, pumps)	Starting and stopping, inrush, poor power factor, regeneration
Welders, plasma cutters	Inrush currents
Downstream transformers	Inrush currents, magnetizing currents
Rectifiers, variable speed drives, CNC machines	Harmonic currents, dynamic loads

The other challenge with these processes are often the power requirements are into the megawatt range. Combining these load types with ratings in megawatts is precisely the definition of large industrial when referring to PCS100.

Why single conversion for large Industrial electrical loads?

As outlined above, these loads and the amount of power required presents several challenges. One of the recurring themes is inrush current. Inrush current is experienced when a motor or transformer is switched on. In the case of a motor this inrush current can be six times the nominal current draw of the motor. Obviously for a power protection device to handle such high currents can be challenging. And it's not only the magnitude, this current is reactive current which can cause voltage drops if not accounted for. This is where the single conversion topology of the PCS100 is strong. During the vast majority of the time, when the utility power is within tolerance, the utility disconnect switch of the PCS100 UPS-I is conducting.

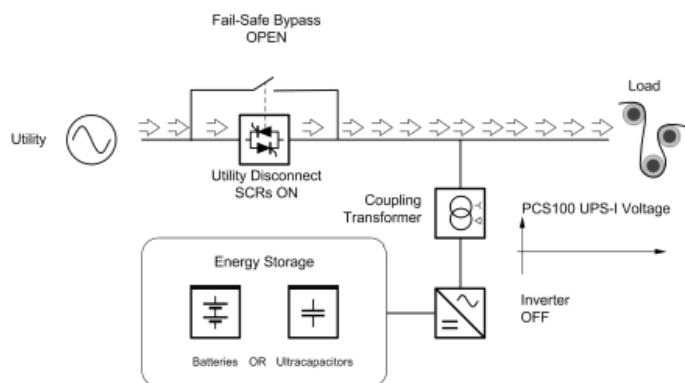


Figure two: Single line showing UD on and conducting power (Refer to PCS100 UPS-I technical catalogue page 7)

This utility disconnect switch is made using silicon controlled rectifiers, SCRs, which are one of the simplest and most robust semiconductors available.

The SCRs chosen for the utility disconnect switch in the PCS100 UPS-I are selected to provide not only the continuous current requirement, but also significant overload capability (up to 300 percent for 5 seconds). It is this overload capacity, together with the fact that the voltage drop across the SCR is very low (in the order of a few volts, even in the overload region) that makes powering these current inrushes possible.

High power needs high efficiency

When the requirement is to protect megawatt levels of loads the efficiency of the power protection equipment becomes very

important. For 1 MW load levels, an efficiency of 99 percent (typical for the PCS100 UPS-I) results in 10 kW of power loss. If high efficiency power protection equipment is not used then the losses can jump to 30-40 kW of power.

The increase in air handling needed to manage this level of power loss in a switch room is significant, as is the wasted energy being dissipated 24/7.

Don't let load faults expose your power protection

Large industrial loads are also often a mix of many machines and processes. This presents a challenge for the power protection equipment in terms of circuit protection and discrimination. Should there be a fault in part of the load, which is not uncommon in manufacturing processes due to the complexity, the UPS must provide the fault current to allow the circuit breaker or fuse to clear.

If the fault cannot be cleared, then the power to the rest of the manufacturing plant will be effected, reducing the plant productivity.

Dollars and cents

While this article is focused on some of the technical aspects around power protection for large industrial loads, there are also commercial aspects that go hand-in-hand. These industrial customers are wanting products with lifetime in accordance with the plans for their plant. This can be anywhere from 10-20 years and managing operational expenses over this time is important. The single conversion PCS100 UPS-I has excellent lifetime primarily due to the fact the main power electronics is in standby for the majority of the time.

To find out more about ABB power conditioning, visit:

www.abb.com/pcs100-power-converters.



High density power distribution

Deploying effective power protection in data centers.

Mission critical systems designed for uptime

Data centers are powered by some of the world's most complex electrical distribution systems. This complexity is driven by the data center industry's intolerance to system downtime. In mission critical data center designs, multiple incoming utility sources and multiple back up power sources such as paralleled engine generators, battery systems and redundant uninterruptable power supplies (UPS) are the norm. In order to keep power flowing to precious Information Technology (IT) loads, careful thought must go into each piece of the vast electrical distribution network. Engineers and system designers utilize redundant distribution paths along with diverse power switching techniques to eliminate single points of failure, allow for concurrent maintainability and do whatever is possible to assure the continuity of power. Along with the demanding requirements for "uptime", data center system owners and designers have other challenges to overcome. Two of the most commonly mentioned objectives for data center design and operations are: (1) reducing the power consumption in a data center and the costs associated with it, and (2) managing the constantly growing demand for IT capacity through flexibility and future proofing.

Energy efficiency

Increasing energy efficiency is one of the primary objectives of data center designers and operators. Nearly all of the power consumed by a data center can be attributed to one of three major categories: IT equipment, cooling the data center, or the data center's electrical power distribution losses, which are the losses associated with delivering power from the source to the IT equipment. A small amount of power is also consumed by the facility infrastructure, other than the cooling, such as lighting and other general usage electrical loads. One of the most frequently used metrics to determine the energy efficiency of a data center is power usage effectiveness, or PUE. PUE is defined by a ratio of the total power entering a data center divided by the power used by the IT equipment.



$$\text{PUE} = \frac{\text{Total Facility Power}}{\text{IT Equipment Power}}$$

The lower the PUE of a data center, the more efficient it is. The ideal PUE value is 1.0. This would be a data center where all of the electrical utility power supplied to the data center is consumed by the IT equipment and no power is consumed for cooling or through power distribution losses. The average data center in the US has a PUE of around 2.0. A PUE of 2.0 indicates that for every watt of IT power, an additional watt is consumed to operate the data center this includes cooling, power losses and other electrical loads. In other words, the typical data center is only 50 percent efficient. It is for that reason there are significant initiatives to

enhance the efficiency of data centers. Engineers, owners and data center equipment manufacturers are working together to create more efficient data centers, several industry solutions will be discussed in a later section.

Designing for the future

As the demand for IT continues to increase exponentially, so too will the need for new servers and more data centers. Studies show the number of data centers in the U.S. more than doubled between the years 2000-2006 and then doubled again from 2007 to 2011, with no end to growth in sight. Internet companies, colocation providers and corporations of all types need to be constantly planning their next move to stay ahead of the growing demand. As soon as one data center is built some companies are already working on the design of their next facility. For other companies that may not have that luxury, it is imperative that current data center designs are created to meet future needs. The average lifespan of a piece of electrical distribution equipment may be twenty years, however the average lifespan of an IT server is three to five years. As servers become smaller and more powerful, will your current electrical infrastructure support these changes? For example, day one power demands in your new data center may be 7 kW per rack, however after multiple IT refreshes, and the addition of new blade servers, power demands are now 30 kW per rack (or more). Will your standard PDUs, RPPs, or busway support these high density loads? These are the type of questions that must be considered when specifying and procuring new electrical distribution equipment for a data center. Cyberex PDUs and RPPs are designed to support high density loads, and can accommodate multiple IT refreshes with minimal downtime or disruption to the system.

Key considerations

Interrupting rating: Interrupting rating (IR) is the maximum short-circuit current that an overcurrent protective device can safely interrupt. An overcurrent protective device must have an interrupting rating greater than or equal to the available fault current at its line side terminals per NEC 110.9 and OSHA 1910.303(b)(4). This is an extremely important rule to follow. Not only could noncompliance result in fines or shutdown from OSHA, but if a fault event was to occur and an overcurrent device with an inadequate interrupting rating was called upon to act, the results could be catastrophic. In order to ensure overcurrent devices and all electrical equipment are used appropriately it is necessary to have an understanding of the available fault current at all levels of the electrical distribution system – even the whitespace. As changes are made on the floor, servers are added or removed, or RPPs are moved from one area of the data center to the other, precautions must be taken to ensure the equipment has the proper interrupting rating for its new placement in the system.

Series ratings for circuit breakers: The NEC does make an exception to the rule for interrupting rating in 240.86. When certain test criteria have been met, upstream overcurrent devices may protect downstream circuit breakers where the available short circuit current exceeds the downstream circuit breakers IR. This is referred to as a series rated combination. For most manufacturers of data center distribution equipment, the use of series ratings mean that a main circuit breaker must operate along with the branch breaker in order to protect the branch breaker from

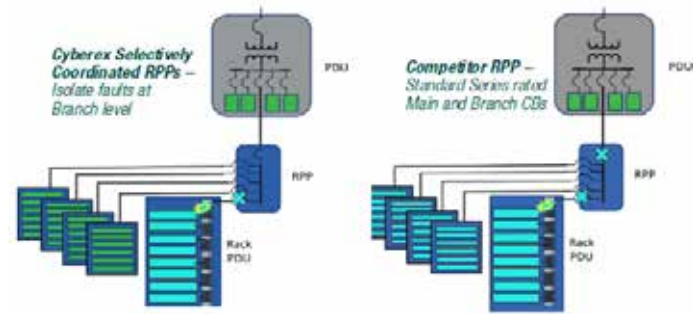


Figure one and two

damage. The alternative, fully rated overcurrent protective devices, must be utilized for branch and main protection in order to achieve selective coordination. Cyberex FaultGuard™ RPPs have been tested and manufactured with a unique series coordinated design. The RPPs branch circuit breakers are provided an increased series rating, however have been designed to act independently of the main to open faults up to 35 kA, ensuring selective coordination. When higher fault currents exist, or more power is needed on the data center floor, the Cyberex Fused HPP can provide fully rated, fully coordinated, protection from faults up to 200 kA.

Short circuit current rating: Short circuit current rating (SCCR) is the amount of fault current that a component or piece of equipment in an electrical system can safely withstand without being damaged. (NEC 110.10) Equipment placed in a system must have a SCCR greater than the amount of fault current available at that point in the system. It is worth noting that just because a piece of equipment has circuit breakers with a given interrupting rating, that does not mean that equipment is SCCR rated to a similar value. The SCCR of that device can be lower due to 'weaker links' within the equipment.

Selective coordination: Selective coordination was a recent addition to the NEC for life safety emergency systems and will now be a requirement in 2014 NEC 645.27 critical operations data systems. However long before it was a code requirement, the practice of overcurrent device coordination has been used in critical data center systems. Selective coordination defines a systems ability to isolate a fault and increase system reliability. If a fault was to occur in a selectively coordinated system the overcurrent protective device closest to the fault will clear the fault and leave the rest of the system undisturbed. If the system was not selectively coordinated the breaker closest to the fault may or may not clear the fault before upstream devices start to open causing unnecessary loss of power to critical loads. As discussed in previous sections many manufacturers of data center equipment rely on series ratings to protect the branch breakers in their RPPs and PDUs. Traditional series ratings require the main overcurrent device protecting a panelboard to operate along with the branch device in order to clear a downstream fault. This eliminates coordination in a system.

The amount of fault current available at the data center floor distribution plays a significant role on how selective coordination can be achieved. When higher fault currents are present, average



main and branch breaker combinations of RPPs, PDUs, and busway will require main circuit breakers to act in order to protect 'branch' breakers with lower interrupting ratings. This lack of coordination and shutdown of an entire panelboard or busway run to clear an overcurrent on one circuit, will result in unnecessary downtime to critical server loads.

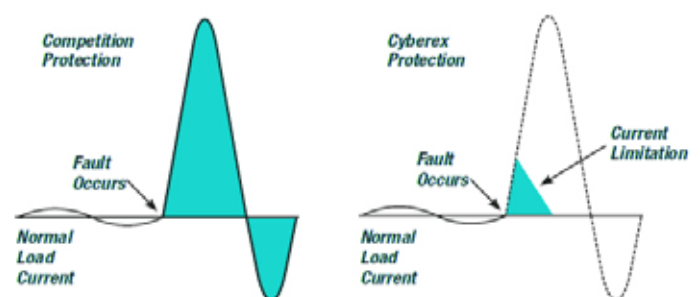
Figure one: (Left on page 11) Designed for selective coordination, a fault occurring at a server rack is opened by the branch device of an RPP leaving power on to other server racks in a data center. Figure two: (Right on page 11) Due to the lack of coordination, a fault occurring at a server rack causes an RPP main breaker to trip and shuts down power to multiple server racks that should have been unaffected by the fault.

At ABB, we understand the importance of coordinating overcurrent protection in a data center and have designed our RPPs with inherent selective coordination of main and branch devices. For fault conditions of up to 35 kA at 240 V (or less), the current limiting branch circuit breakers of the Cyberex FaultGuard™ RPP will operate independently of the main circuit breaker and isolate fault conditions at the branch level without disrupting the rest of the panel circuits. For high density data center systems the Cyberex Fused HPP offers selective coordination for the full range of fault currents up to 200 kA at up to 600 V. Providing this level of overcurrent protective device coordination within a data center could prove to be the difference between removing one server rack vs losing a whole row of critical loads if a fault was to occur in the system.

Current limitation: ABB's Cyberex products utilize current limiting circuit breakers that bring a whole new level of protection and peace of mind to the distribution of electrical power on the data center floor. In 240.2 the NEC defines a current limiting breaker as

a device that, "when interrupting currents in its current-limiting range, reduces the current flowing in the faulted circuit to a magnitude substantially less than obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance." (1- from NEC) In order to list a current limiting breaker under the UL standard the breaker must interrupt and isolate a fault within the first half of an AC cycle, 8 ms.

It is important to note for a breaker to be defined as current limiting it must be UL listed, and labeled "current limiting breaker" on the device.



Current limiting overcurrent protection provides a number of invaluable benefits to a critical system such as a data center. Two of the most notable benefits of current limitation are increased protection for downstream system components and the mitigation of arc flash hazard for workers. Current limitation reduces the hazardous effects of a fault on downstream system components. Without a current limiting device, the energy released during a fault is directly proportional to the amount of fault current available at that point in the system. When a current limiting device is used, the energy released during a fault is proportional to the let through of the upstream overcurrent device. Both mechanical and thermal

forces are drastically reduced through current limitation, which in a data center, means less potential damage or strain on the sensitive and expensive IT equipment. This heightened protection helps remove worries of extended downtime due to repairs or replacement of damaged equipment.

Safety and flexibility: Working on live electrical equipment is never recommended, however sometimes becomes a “necessary” task due to the criticality of system loads in a data center. The Cyberex FaultGuard™ RPP significantly enhances worker safety due to its touch safe panelboard chassis and plug in current limiting branch breakers. The Fused HPP can allow for circuit amp sizes to be changed without the need to de-energize the panel. When wired per switch size, simply turn off the branch switch and replace with a new fuse of a desired amp size. Fuses can be utilized from one amp up to the switch size, rejection features prevent over-fusing. This allows your protection to grow along with your load demand and provides RPP infrastructure for multiple IT refreshes, including increases in current or voltage. Along with drastically reducing the shock hazard, the use of current limiting overcurrent devices significantly reduces the arc flash potential to which a worker could be exposed. At a high level, arc flash calculations depend on two main factors. First the time it takes for the upstream overcurrent device to clear the fault, and the second the magnitude to which the fault can reach before it is extinguished. Current limitation is the driving factor to reducing the energy released during an arc flash event.

Employing high density solutions in modern data centers safely

Data center owners and system designers are constantly faced with challenges as they try to keep pace with the exponential growth of the data storage industry. This demand to increase data center efficiency and push the limits of power density at the rack has introduced new design trends. One proposed solution to help meet these demands is raising the distribution voltage in the whitespace to 400 V, 415 V or 480 V. Utilizing this higher distribution voltage on the data center floor allows system designers to bring twice the power to the same rack footprint as traditional 208/120 V distribution. This can provide system owners with a significant advantage due to the premium cost of data center real estate in the whitespace. See the table below outlining the increased power delivery for a given current as the voltage increases.

Circuit Current	De-Rated Value	Three Phase		
		208VAC	415VAC	480VAC
20A	16A	5.8kW	11.5kW	13.3kW
30A	24A	8.6kW	17.3kW	19.9kW
40A	32A	11.5kW	23.0kW	26.6kW
50A	40A	14.4kW	28.8kW	33.2kW
60A	48A	17.3kW	34.6kW	39.9kW

Figure three: Shows power delivery at multiple voltages for a given current

400 V design also provides notable efficiency increases versus traditional data center design. On average, upstream transformation and removing a traditional 480 to 208 V PDM transformer can result in efficiency gains of 2–4 percent. The other option, upgrading transformation downstream to a 480 to 415 V ultra-efficient Cyberex TP1 or CSL-3 transformer can also increase efficiency by 2-3 percent and still provide isolation benefits along with greater flexibility of using multiple voltages on the data center floor.

Efficiencies will also be realized in the IT device's power supply. Most standard IT equipment can accept a range from 120 to 240 VAC. Running devices at 240 V vs. standard 120 V will provide an increase in efficiency of approximately another 2–4 percent. This higher efficiency will directly lower a data center's power bills, and indirectly reduce data center cooling cost and overheating issues.

There are multiple distribution architectures a designer can choose from, the following describe three typical design options:



Figure four: Shows a traditional U.S. data center distribution system. 480 V UPS system to a PDM with a step down transformer to 120/208 V then distributed through RPPs to server racks and IT loads



Figure five: Shows a design traditional to Europe. Transformation to 415/240 V is done upstream of the data center sometimes from medium voltage or from 480 V (in the U.S.) 415 V UPS are used and then 415/240 V is distributed through RPPs to the server racks and IT Loads



Figure six: Shows a flexible and efficient design choice for 415 V in U.S. Performing the transformation to 415 V downstream closer to the server racks provides multiple advantages, including the use of standard 480 V upstream equipment, such as the UPS, and also allowing lower wiring costs, from smaller conductors and elimination of neutral conductor from UPS to PDU. The configuration in figure six also provides the flexibility of having multiple voltages available in a data center. Many data centers are not ready to fully commit to high density distribution and still require 120/208 V power for some legacy server loads. Downstream transformation provides this advantage, by simply installing a standard Cyberex PDM when 120/208 V is needed.

Challenges with high density: While helping to meet these demands, data center systems designed at higher voltages (400, 415, 480 V), provide system owners and designers with a new set of challenges and concerns to overcome. Selective coordination, increased arc flash potential, protecting sensitive IT equipment and complying with SCCR and IR code requirements take center stage. These heightened concerns are mainly driven by the removal of a transformer and the potential increase in available fault current when compared to traditional 208 V designs. ABB's Cyberex RPPs help remove the electrical concerns that come along with high density data centers. The use of current limiting overcurrent protection in Cyberex products helps lessen the potential hazard of arc flash events and also increases protection for IT equipment. The use of touch safe components reduces the shock hazard and increases flexibility after installation.

Cyberex RPPs also are designed with built in selective coordination between main and branch overcurrent devices. Solutions are available for the full range of voltages and available fault currents.

Understanding the impact of busway systems on fault current

A growing trend for 400 V data center design is the use of busway to distribute power to server loads. When designing a 400 V system with busway, one of the principal challenges that must be overcome is dealing with higher fault currents on the busway and at the server racks. When the transformer is removed from the data center floor, and step down transformation is performed upstream from higher voltages, higher fault current is introduced into the system and is distributed to downstream loads. Along with higher fault currents comes additional concerns such as safety, selective coordination, compliance, and of course cost. Busway provides less fault current impedance than traditional cable distribution, requiring the need for larger more expensive circuit breakers or fuses throughout the data center.

The following examples compare fault current on Busway vs RPP distribution in a data center.

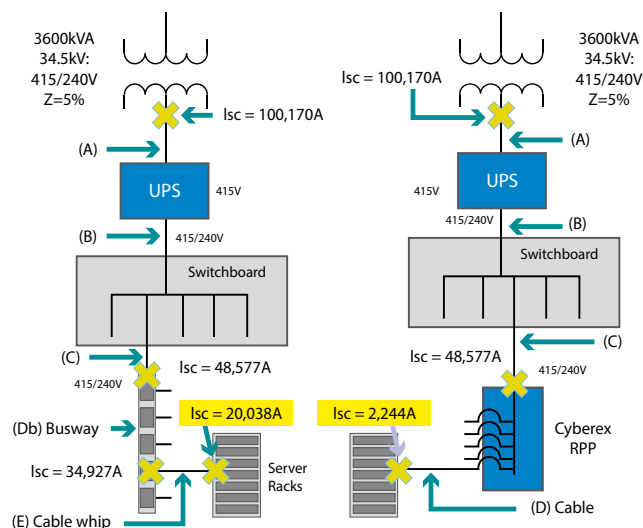


Figure seven: Provides a high level set of calculations comparing available fault currents in a data center using busway vs using RPP architecture. When upstream medium voltage is transformed to 415 V and distributed throughout the data center floor via busway, it is likely that high fault currents will be available throughout the system and near sensitive IT equipment. When removing PDU transformers from a distribution system traditional cable methods reduce available fault potential, help ensure selective coordination, and allow for the use of more cost efficient overcurrent protection

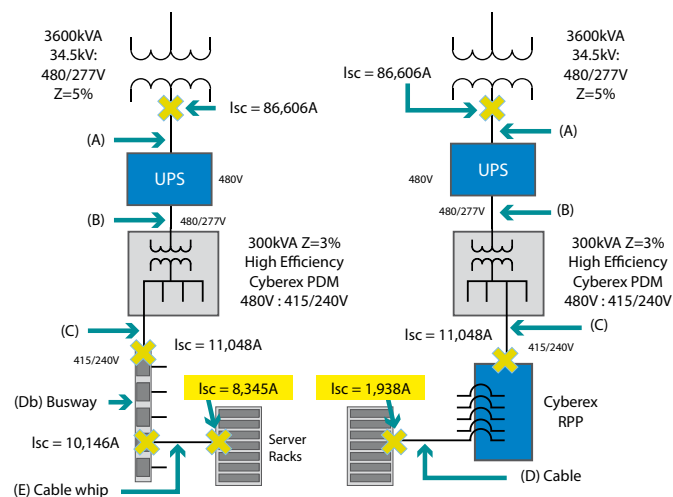


Figure eight: Again provides two sets of calculations comparing available fault currents in a data center using busway vs using RPP architecture. In this example medium voltage is transformed to 480 V. 480 V power is distributed upstream and 480 V UPSs are utilized. Transformation to 415 V is provided by PDUs on or near the data center floor. This method significantly reduces fault current for both busway and RPP power distribution. However fault current still remains higher when busway is used. This may force the use of more expensive circuit breakers in Rack PDUs in order to meet IR and SCCR requirements. Selectively coordinating your data center with standard molded case circuit breakers may also be more challenging and require the use of electronic trip LSI circuit breakers due to the higher voltage and fault current present on busway systems

For more information visit:

www.tnbpowersolutions.com/cyberex_hpp



Power health

ABB's DPA UPScale ST 200 UPS for medical laboratory in Switzerland.

A guaranteed supply of clean power is essential for many modern businesses. However, in the health industry, it can be particularly critical. ABB has recently supplied the Swiss-based medical analysis enterprise, the "Dr. Risch Medical Laboratory", who conduct blood analyses for hospitals and doctors, with a DPA UPScale ST 200 uninterruptible power supply (UPS) to ensure that their operation has a rock-solid supply of clean power, no matter what happens on the utility side.

The processes involved in analyzing blood are particularly sensitive to power interruptions and the consequences of any analysis error can be very serious. Therefore, good quality power must be maintained to the analysis equipment at all costs. So, when the Dr. Risch Medical Laboratory was expanding its analytic operations and emergency backup power system, it was very careful in its choice of UPS provider.

The laboratory already had a UPS, from a non-ABB supplier, but this was too weak to support the expanded array of analysis equipment and the enlarged computing center, so a number of potential suppliers of a new system were reviewed. A single visit by an ABB representative, was enough for the laboratory to appreciate the many advantages of ABB's DPA UPScale ST 200 UPS.

ABB's UPScale ST 200 is a modular UPS system for organizations that aim for zero downtime and low cost of ownership. It delivers true modular power protection up to 200 kW in a single, industry-standard frame. Its flexible design provides a "pay as you grow" model - power modules can simply be added, as needed, without any footprint penalty. Servicing is easy as modules can be replaced without powering down. The UPScale ST 200 enables cost reduction through a best-in-class efficiency of up to 95.5 percent across a wide load range and near-unity input power factor at partial and full loading (PF of >0.99 at 100 percent load).

"Very important for the lab were the redundancy aspects of the DPA UPScale ST 200," says Swiss ABB LPG Manager for Power Protection, Nadir Mandioni. "We delivered six 20 kW modules, one of which is redundant, that is, it switches in only if one of the other five fails. Also, the DPA UPScale's unique decentralized parallel architecture means each UPS module contains all the hardware and software required for full system operation; modules share no common components.

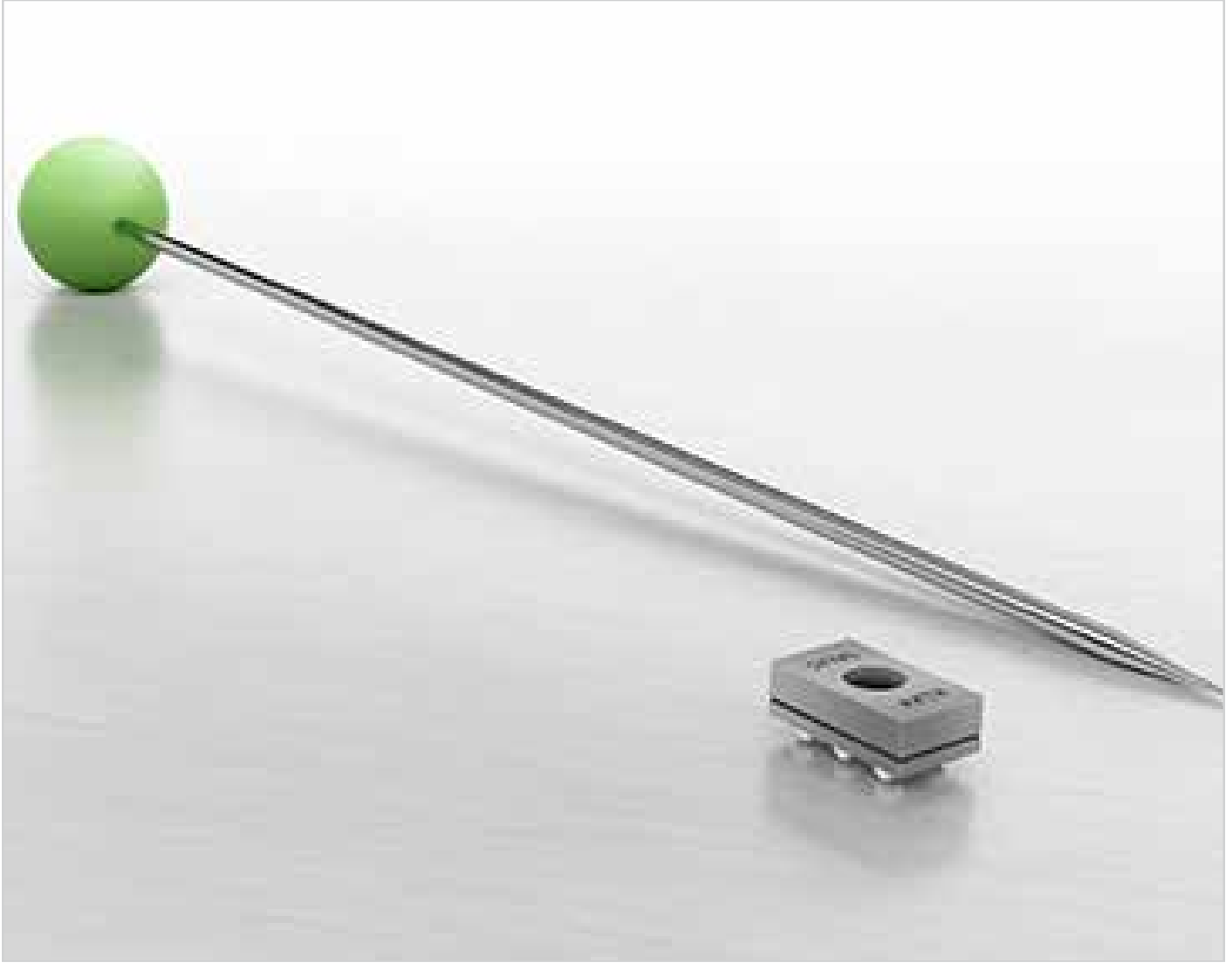


The power availability this delivers is one of the critical features that the laboratory was after."

In addition to the 120 kW (n+1) UPS, ABB also delivered a diesel generator and elements of the power infrastructure. The project timeframe was three months from the first visit to order completion.

For more information visit: www.abb.com/ups.





Sensing perfection

Protecting the most sensitive equipment for high-end technology.

In order to ensure sensitive equipment is protected from voltage sags, a continuous power supply must be maintained. External factors, such as a faulty utility grid, increase power disruptions, creating unnecessary production downtime. Ultimately this creates loss in revenue to a business. Based in Switzerland, Sensirion, a leading sensor manufacturer was plagued with this power quality problem. ABB provided a 1500 kVA industrial UPS (PCS100 UPS-I) to prevent these monthly voltage fluctuations, improving the power supply by 100 percent.

“After installation of the PCS100 UPS-I, the system was recording 18 events... Sensirion could avoid four total outages during that time”.

The area Stäfa (near the lake of Zurich and where Sensirion's headquarters are located) is known to have very short power disturbances. Contributing factors can be an inadequate utility grid or natural forces, such as weather. The most common power quality problem however is voltage sags, which accounts for more than 92 percent of all power quality events. Sensirion was suffering from monthly power failures, all between 10 ms and 2 seconds. Although this doesn't sound like much, very deep sags and short term power outages up to one second are the second most common power quality problem. These short voltage dips cause damage to sensitive equipment and increase production downtime. For Sensirion, the production of sensors, such as micro sensors their factory were making was being affected.

The utility provider was not able to improve the situation on the 50 Hz grid side, therefore Sensirion reverted back to a power protection solution already installed by ABB in 2013. This was a 150 kVA PCS100 UPS-I. However due to a higher power protection requirement, a 1500 kVA PCS100 UPS-I was installed and commissioned into the factory to cope with growing power demands. Coupled with reliable engineers from ABB who were able to provide onsite service support, the new solution a seamless transition.

The small footprint in design of the PCS100 UPS-I played a vital role in successful installation. The Sensirion factory was already built, highlighting limited space where the PCS100 UPS-I could be placed. Due to this, the function of the Failsafe Bypass had to be integrated in the external Manual Bypass. The PCS100 UPS-I was connected by cables to the main distribution instead of busbars. Therefore, a special option of a cable connection cabinet had to be used. This flexibility created assurance for Sensirion that even though this was a unique installation, no additional expense was included. Over other solutions, ABB's PCS100 UPS-I was the only product that could cope with the available space and cooling facilities. Further advantages, beside the compact footprint of the PCS100 UPS-I, is the efficiency of the system. “In addition and based on our experience, an autonomy period of up to seven seconds (depending on the load) covers our needs totally,” says Patrick Good, Infrastructure Manager at Sensirion.

The PCS100 UPS-I complied with the energy saving policy of Sensirion (long lifetime energy storage). The use of ultracapacitors instead of lead acid batteries was also favored by Sensirion. This was because ultracapacitors provide seconds of coverage for short power quality events, which was the main problem facing Sensirion. ABB offer battery options that are designed to deliver autonomy up to several minutes. However, ultracapacitors have extremely high power density and long lifetime, resulting in a very compact and low maintenance solution.



ABB's 1500 kVA PCS100 UPS-I installed at Sensirion in Stäfa

Since installation, Sensirion has seen no problems with the power supply system when manufacturing sensors, an improvement of 100 percent. Patrick further commented, “during the past two months after installation of the PCS100 UPS-I, the system was recording 18 events, where a quarter would have affected our production (due to the length and depth of the sags). This means Sensirion could avoid four total outages during that time. This ultimately increased our productivity.”

About Sensirion

Sensirion is a leading sensor manufacturer, providing relative humidity sensors and flow sensor solutions with unique performance. Together with the humidity and temperature sensors, the product range includes liquid flow sensors, mass flow meters, mass flow controllers and differential pressure sensors. Using micro sensor solutions, OEM customers benefit from the proven CMOSens® Technology and excellent technical support. Among a large variety of applications, the flow and humidity sensors are successfully used in medical technology, consumer electronics and the automotive industry.

Download ABB's PCS100 UPS-I brochure [here](#).
Watch the PCS100 UPS-I product video [here](#).

To find out more about ABB power conditioning, visit:
www.abb.com/pcs100-power-converters.

To find out more about Sensirion visit:
www.sensirion.com.





Scandinavian data center

DPA 500 UPS modular design fulfills
customer needs.



This project is a key reference for ABB's modular UPS. It shows that very critical applications are best served by using modular UPS technology with an N+1 configuration.

One industry segment is growing almost as fast as the Internet can expand: the data center business. The huge collections of servers and storage devices housed in data centers contain an immense amount of information that is used by governments, banks, commerce, medicine and a whole host of industries, including search engines, like Google, and social networking sites. The effect of a power failure in such an installation can be catastrophic. It will impact company revenue and image, so great care is taken to make sure that the very best backup power scheme is in place. A reliable and efficient uninterruptible power supply (UPS) is a mainstay of such a scheme.

Once the UPS is installed, however, it becomes a focus of reliability – for what use is it if it fails just when it is needed? In many cases, the result of a UPS failure can be disastrous. For this reason, the most critical loads are protected by the very best UPS design - decentralized parallel architecture (DPA). DPA not only provides the best availability, but also the best efficiency, serviceability, scalability and flexibility. Taken together, these features all deliver a low total cost of ownership (TCO).

Many data centers are being located in higher latitudes to exploit natural cooling and it is in such a northern location that

ABB recently received a significant order for a four-frame DPA 500 UPS system. The DPA 500 has been well received by markets around the world as it matches exactly the needs of many customers – especially those responsible for large data centers. The DPA 500 has critical advantages that made it a natural choice for this major customer in Scandinavia.

Modular

The key to the DPA 500s success is that the UPS is modularized and each module has all the hardware and software needed for autonomous operation - rectifier, inverter, battery converter, static bypass switch, back-feed protection, control logic, display, and mimic diagram for monitoring and control. A module's output is not affected by failures elsewhere in the UPS. If redundancy is provided for - ie, there are more modules than needed to supply the critical load - then one or more modules can be lost without jeopardizing the load. Availability is maximized which is a key requirement in a data center.

Further, as UPS power requirements change it is simple to add modules and increase the power capabilities; the initial configuration does not have to be over specified to cater for possible future expansion. This means the user only cables, powers and cools what is needed. Besides availability, power consumption is the topic of greatest concern for most

data center operators and the energy savings made over the service life of the UPS by this modular approach are substantial.

Online-swapping and serviceability

DPA 500 modules can be online-swapped, ie, removed or inserted, without risk to the critical load and without the need to power down or transfer to raw mains supply. This unique aspect of modularity directly addresses continuous uptime requirements, significantly reduces repair times, reduces inventory levels of specialist spare parts and simplifies system upgrades. Service personnel do not need special skills. Spares can be held on-site or at a nearby service center.

This online-swap technology, as well as having a significant impact on cost, can also help achieve so-called six nines (99.9999 percent) availability - highly desirable for data centers in pursuit of zero downtime.

Energy and space costs

The DPA 500's modularity and scalability ensure a low cost of ownership, but costs are held down too by the DPA 500's best-in-class energy efficiency - up to 96 percent. The DPA 500 efficiency curve is very flat so there are significant savings in every working regime. Further, better efficiency results in less cooling, creating further savings. Modularity lends itself well to keeping UPS footprint small, too which is ideal where real estate is limited and expensive.

Standardized modules

DPA 500 modules are standardized. This keeps costs low. A straightforward, standardized modular concept simplifies and speeds every step of the deployment process - from planning, through installation and commissioning to final use. High-quality standardized products significantly reduce intervention time during maintenance or in the event of failure, components can be changed quickly and easily and service is simplified. Modular systems with standardized connections can be pre-wired and field-configured at the factory allowing for more thorough testing and better reliability.

ABB representative Conny Hurtig said, "our client in Scandinavia recognized all the advantages the truly modular architecture of the DPA 500 brings and decided to go with ABB. They needed extensions and changes to the current 12 kV and 0.4 kV systems, backup power and UPS system and the two DPA 500s fitted the UPS bill perfectly. ABB's modular UPSs were chosen mainly because of their reliability, advanced technology, and the prestige and high quality associated with the ABB brand."

The four-frame, DPA 500 N+1 configurations will be installed in two new IT room segments and have startup power capacities of 500 kW and 900 kW respectively, with 10 minute battery backup. They can be upgraded to 900 kW and 1,500 kW. For further flexibility, UPS capacity can be quickly switched from one system to the other, in minutes. The battery bank comprises 690 Powersafe 12V92F from energy storage solution provider EnerSys on open racks and 15 ABB battery breakers. An ABB AKKA battery monitoring system for 690 blocks was also supplied, with measurement resolution in the mV range. AKKA periodically transmits battery performance



data at block level and ensures that the critical backup power systems are ready when needed. The monitoring solution is fully in compliance with DPA battery tests. Communication is by Modbus over SNMP (USHA).

Heikki Rantama, ABB representative comments, "apart from the technical specification, the customer was well aware of the advantages of ABB's local support and the quality of this Swiss product. But ABB's novel concept, even though we didn't follow the customer's specs, swung things for us too."

This Scandinavian project is a key reference for ABB modular UPS. It shows that very critical applications are best served by using ABB modular UPS technology with an N+1 configuration.

For more information visit: www.abb.com/ups.



The ultimate UPS for confined spaces



ABB has won an order for an uninterruptible power supply (UPS) for a data center belonging to the Polish Geological Institute in Warsaw, Poland. ABB's UPS was the only company that could fulfill all the customer's specifications.

High on the customer's list of requirements was redundancy and the possibility to increase power capacity in the future. Added to this was the fact that they had limited space for a UPS, so the solution would have to be compact. ABB's UPScale DPA ST 80 ticked all the boxes.

Aleksander Redlich, director from FAST-Group Sp. z o.o., ABB's partner, says, "the data center is small ABB's UPS supplies all the power they want in a small space and gives them the chance to expand later. They also benefit from a very short repair time and very high efficiency. In fact, the UPScale was the only UPS on the market that fulfilled all the technical requirements."

The Project Manager on the customer's side, comments, "we are very satisfied with the DPA UPScale ST 80 3x20 kW (40 kW / N + 1 configuration) that we bought earlier and therefore decided to specify similar UPSs for the next tenders". The Polish Geological Institute in Warsaw is now using two DPA UPScale ST 80s, a DPA UPScale ST 80 2x20 kW, a PowerWave 33 60 kVA and a PowerScale 40 kVA.

Following on from the success of this project, the team are now talking to the customer about a data center with a 200 kW IT load.

For more information visit: www.abb.com/ups.



Stabilizing voltage



Power protection

06. Demand for chip-based products

ABB's solutions for the semiconductor industry

08. Oil and gas industry in Russia

Future investment for Gubkinskiy GPP

10. Rail power

ABB provide UPS support for the North-South Railway in Saudi Arabia

12. Industrial UPS in a data center

Is it time for industrial UPS systems in data centers?

Grid stabilization

16. Harnessing the power of the ship

ABB converter technology help save 20 percent fuel on ships

Complete power



New products

06. PCS100 Medium Voltage UPS

For complete power protection

11. PowerValue 31/11

A single-phase UPS with scalable runtime

12. Cyberex® PowerBuilt™

System reliability and critical load protection

Power protection

22. Semiconductor protection

ABB provides power protection to HHGrace in China

24. Product excellence for Munich Re

Product excellence and lowest total cost of ownership



Add bits without losing bytes



A data center with full uptime. That target is why ABB's uninterruptible power supply has true, online-swap modularity. UPS modules can be inserted or removed without powering down – so the UPS power you need is always available to back up your customers' bytes, even when modules are swapped for maintenance purposes. And if you want to upscale, simply insert additional modules – that way, you just pay for the power you need. Easy set-up and maintenance means service personnel do not need special skills, and overall costs are lower too. To learn a bit more, simply visit

www.abb.com/ups

Power and productivity
for a better world™

