



Addressing voltage issues

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Voltage irregularities are one of the greatest power quality issues facing industry today. In fact, about 95 percent of the problems revealed in electrical networks stem from voltage sags or surges. ABB's [power protection systems](#) eliminate these common issues, improving your business's overall performance.



power

**Perry Field**

General Manager
Power Conditioning
Discrete Automation and Motion division

Welcome to the second issue of Power for 2015. ABB Power Protection has started the second quarter of the year in full swing with many new and interesting projects.

A significant milestone was reached when we received our first order, which was soon followed by a second, for the PCS100 Medium Voltage UPS. Both products (2 MVA and 4 MVA PCS100 MV UPS) will be installed in a leading liquid crystal display (LCD) manufacturing facility in Japan. In this issue of Power, I give an inside perspective on medium voltage UPS technology and future product developments.

ABB are providing industrial UPS protection for Samsung's phase two \$3 billion LCD production facility in Suzhou, China. Phase two will implement five PCS100

Industrial UPS-I units, a total of 10,500 kVA, to protect against crippling power disruptions. Alongside phase two, phase one of this mega investment is currently protected by eight PCS100 UPS-I units, bringing the total installed amount after completion of phase two to 27,000 kVA. This recent project highlights ABB's commitment to providing our customers with leading edge technology that will propel them to the next level and beyond.

In line with ABB's global strategy, ABB in the UAE has signed a third party channel agreement with Site Technology LLC to develop the commercial UPS business in the UAE. ABB appoints channel partners to offer fast, effective and reliable sales, support and services to its customers. This significant deal will enable Site Technology to continue their previous initiatives in Saudi Arabia, Qatar and Lebanon, with a short-term target to cover Iraq and Jordan soon, as part of its drive to expand across the region.

Still remaining in the Middle East region, ABB's modular UPS, the DPA 500, is reaching new heights by providing back-up power for a multi-million dollar aviation project. This project is the region's largest aviation sector project, and represents a step towards providing ongoing power protection solutions for this industry.

Have you ever considered voltage conditioning as a way to improve your data center's overall performance? Voltage sags are by far the biggest risk to power continuity. This can make a strong

case for small, lightweight, battery-free active voltage conditioners as a way to condition power to less sensitive loads. The data center advice article discusses different options to consider when your business can absorb a limited outage without catastrophic loss of data. Companies that have adopted this option include those that use weather supercomputers, such as NIWA in New Zealand, and leading animation companies, such as WETA Digital (who produced the hit movie Avatar and the Lord of the Rings trilogy). It goes to show that when power outages are very rare, the answer is reliable and efficient voltage conditioning.

Finally, as well as being involved in many projects, ABB Power Protection are involved in numerous events each year all around the world. From channel partner events in Bangkok and Malaysia to customer events in UAE, the team are actively involved in ensuring our customers are aware of our present and upcoming technology.

Enjoy this issue of Power.



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Tackling voltage problems

What they are and how to fix them.



Rolling brownouts, voltage sags, spikes, electrical noise and harmonic distortion. If you haven't experienced any of these power problems yet, you will. In today's market, you can't take the power from your local utility for granted. The growing use of microprocessors in appliances, office equipment and process controls has made us all aware of power quality demands from equipment and the environment, and the unpredictability of its supply.

Industry in developed countries with modern power networks is not immune from voltage problems. Although utilities do their best to supply reliable, high-quality power, minimizing complete outage events, periodic sags and surges on utility lines will continue to be a fact of life. With modern industry using more and more automation, the sensitivity of processes to power quality events is increasing. Furthermore, equipment and machinery can be damaged or even fail when subjected to power anomalies. One or two seconds of outage or a surge can bring your business down for hours or days. No matter where you are, spikes, surges, brownouts and other power issues are potential problems.

Many businesses now realize that power is not an unlimited resource. Part of the problem that utilities face is that they cannot produce enough power to supply growing needs, and it can take years to build additional power plants.

What is a voltage sag?

A voltage sag is not a complete interruption of power; it is a temporary drop below 90 percent of the nominal voltage level. Most voltage sags do not go below 50 percent of the nominal voltage, and they normally last from two to 10 cycles or from 40 to 200 milliseconds.

Voltage sags are probably the most significant power quality problem facing industrial customers today, and they can be a significant issue for large commercial customers as well. There are two sources of voltage sags: external, on the utility's transmission and distribution lines, and internal, within the customer's facility.

High winds can blow tree branches into power lines, connecting the line with the ground and the line to the line. A series of sags will occur as the branches repeatedly touch the power lines.

Voltage Disturbance	Typical Symptoms	Typical Causes
Sags and Swells	Shrinking computer displays (the image doesn't fill the whole screen) or lights that are overly bright or dim	Brief reductions or increases in voltage that occur when a major appliance or other piece of equipment switches on or off A short circuit
Transient Voltage (also known as impulses or spikes, these problems occur when there are sudden increases in voltage)	Processing errors, data loss or burned circuit boards	Lightning strike Starting or stopping major equipment
Radio/Television Interference	Loss of radio/television reception Poor-quality sound or picture that is interrupted by static Popping sounds, crackles, rolling horizontal lines, wavy lines, snow, ghosting or other reception problems	Signals from other equipment, usually within your home or building or that of a neighbor Possible home sources include doorbell transformers, toaster ovens, electric blankets, ultrasonic pest controls, fans, refrigerators, heating pads, light dimmers, touch-controlled lamps, fluorescent lights, aquarium or waterbed heaters, furnace controls, computers or video games At times, the interference may be generated by utility equipment, such as loose hardware, or dirty or damaged insulators
Harmonic Distortion	Appliance or equipment problems, such as communication errors, overheating or electrical hardware damage	Certain electronic equipment, such as computers, monitors, and laser printers, video games, touch-controlled lamps and fluorescent lights, may use electricity in a way that causes distortion of the normal electrical wave pattern Contrary to popular belief, harmonic distortion is not caused by a utility company sending out distorted electrical current

Table 1: Common voltage problems, the symptoms and causes

Snow and ice build-up on power lines can cause flash overs on the insulators. Other external causes are traffic accidents, construction works and animals impacting the power lines.

While utility power can be unpredictable, what happens inside your building can also play havoc with your business's operations. As well as external environmental factors affecting power quality, a range of other issues are caused inside a facility – from inadequate building wiring or incorrect grounding, to large loads sharing the same circuits. These problems can be compounded by starting, running and stopping large machinery and other business-critical systems. If your building is more than 15 years old, it probably wasn't designed to meet the demands of today's high power equipment. The systems supporting your organization's key functions may be overloading the wiring and causing power problems and failures that can harm valuable data and equipment. Even a short event of a few milliseconds can cause processes to unexpectedly stop, potentially resulting in product damage, wastage and production shortages.

The result of a voltage sag

Whether or not a voltage sag causes a problem will depend on the magnitude and duration of the sag and on the sensitivity of your equipment. Many types of electronic equipment are sensitive to voltage sags, including variable speed drive controls, motor starter contactors, robotics, programmable logic controllers, controller power supplies, and control relays. Much of this equipment is used in applications that are critical to an overall process, which can lead to very expensive downtime when voltage sags occur.

Utilities continuously strive to provide the most reliable and consistent electric power possible. In the course of normal utility operations, however, many things can cause voltage

sags. Table one indicates the most common causes of voltage inconsistencies.

How to tackle these issues

Businesses today are implementing power conditioning solutions into their facility plans, in order to ensure power quality is at optimal levels. A good power conditioner will filter and clean incoming AC power and dramatically improve your equipment's performance.

Power conditioning solutions will increase the longevity of your connected components, since contaminated AC adds wear and tear to power supplies and other internal circuits. Therefore, a good power conditioner protects your equipment from damaging AC events such as surges, spikes, lightning and high voltage.

The average surge suppressor or power strip offers little in the way of protection and doesn't filter or clean contaminated power at all. However, ABB power conditioning solutions always offer the highest level of protection and lowest total cost of ownership, whilst having a small footprint in design. Ensuring the continuous operation of small and medium to large businesses is what ABB's power conditioning solutions do best.

The PCS100 portfolio is a unique line-up of low and medium voltage power conversion technologies consisting of static frequency converters, UPSs and voltage and power conditioners that demonstrate highly reliable and cost-effective performance. The product portfolio offers efficient power conversion solutions that are specifically designed to solve power quality problems, such as voltage sags, and stabilize networks.

Product Line	Typical Applications	Product
Industrial UPS	Utility deep sag and surge correction	PCS100 UPS-I Industrial UPS
	Utility outage protection	PCS100 MV UPS Medium Voltage Industrial UPS
Voltage conditioning	Utility sag and surge correction	PCS100 AVC-40 Active Voltage Conditioner for sag correction
	Load voltage regulation	PCS100 AVC-20 Active Voltage Conditioner for voltage regulation
Reactive power conditioning	Load created sag correction	PCS100 RPC Reactive Power Conditioner
	Power Factor correction	
	Harmonic mitigation	
	Unbalance correction	
Frequency conversion	50/60 Hz conversion	PCS100 SFC Static Frequency Converter
	Frequency fluctuation	

Table 2: ABB's PCS100 portfolio, designed to eliminate and condition power quality issues

Covering applications from data centers through to complete industrial plant protection, micro grid systems and shore-to-ship supply, ABB has the power conversion technology for every need, starting from a few kVA to many MVA and a wide range of supply voltages.

I need back-up power

UPS systems offer a reliable solution for a wide range of power-related problems. These systems can provide continuous power to critical loads in the event of an interruption or a total loss of utility power. Additionally, the systems can filter out many of the common electrical disturbances that interfere with the operation of sensitive electronic equipment.

UPS systems offer a way to improve the operating reliability of critical building components. They can eliminate many of the problems brought on by disturbances in utility-supplied power. They can also allow for continued operation when utility power goes down. And as long as systems are properly matched to the building's requirements, they can provide this level of reliability without breaking the budget.

The first step in selecting a UPS system is identifying the need. Local and state requirements will stipulate certain loads that are critical to the operation of the facility, even during a power outage. Examine each of these loads to determine which ones cannot tolerate even a momentary outage in power, as well as those easily damaged by power disturbances. Loads that do not meet either requirement can be connected to a standby generator system instead.

For each load, consider the impact that the loss of utility power will have on operations, including momentary losses. Identify loads that are critical with respect to power outages or damage from power disturbances.

For each of these loads, determine what type of delay would result from even a momentary outage, and how that delay would affect operations. For example, some computer-based control systems may take as long as 10 minutes to reset after a temporary loss of power.

If the length of the delay for a particular load is unacceptable, that load is a candidate for connection to a UPS.

I don't need back-up power

Many businesses require voltage or power conditioning rather than battery back-up power. In those cases where back-up power is unnecessary, a voltage conditioner can provide superior protection. These devices provide voltage regulation and one or more additional power quality-related functions, such as protecting against over/undervoltage, voltage fluctuations, sags and dips, line noise and swells, phase imbalance, short circuits, brownouts and surges.

Combining solutions for optimal performance

Businesses can also adopt a combination of power conditioning systems to enable a more robust power protection solution, especially in large energy user situations. Today, voltage conditioners are also used in conjunction with UPS units. Using voltage conditioning in tandem with UPS provides enhancements such as extending UPS capabilities, increasing UPS efficiency, protecting the UPS system, conditioning the UPS bypass, and protecting HVAC systems.

Power quality problems can occur anywhere, anytime. Evidence of these problems can be as obvious as electrical components that are damaged or fail prematurely, or as subtle as equipment that randomly malfunctions. But the real problem with poor power is the cost of damaged equipment, lost productivity, scraps or missed schedules. Implementing power conditioning systems will help your business override common power quality issues, achieve increased production output and protect crucial operations.

To find out more about ABB's power protection solutions:

Web: www.abb.com/ups

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Cyberex[®] correct charger sizing

For utility/stationary battery chargers.

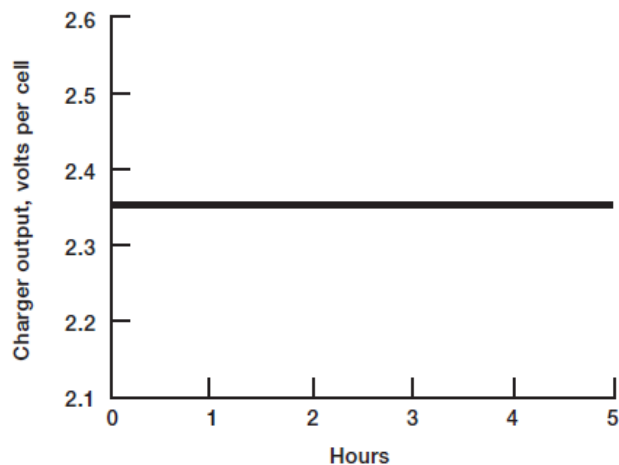


Figure 1: Representation of constant potential charging

The sizing of battery chargers for UPS applications can be a tricky and sometimes confusing exercise. Engineers often employ either a general rule of thumb or provide “margins of safety” that are not specifically required or advised by the technical standards. This sizing method usually results in chargers that are oversized. Properly using the industry standard techniques will aid in avoiding oversized battery chargers.

Proper sizing usually results in smaller capacity chargers and a more efficient lifetime operation with lower initial costs, but more importantly correct sizing determines a charger of proper capacity.

Constant potential, current limited charging

Before getting down to the nuts and bolts of sizing calculations, we need to consider an important background understanding of constant potential, current limited charging.

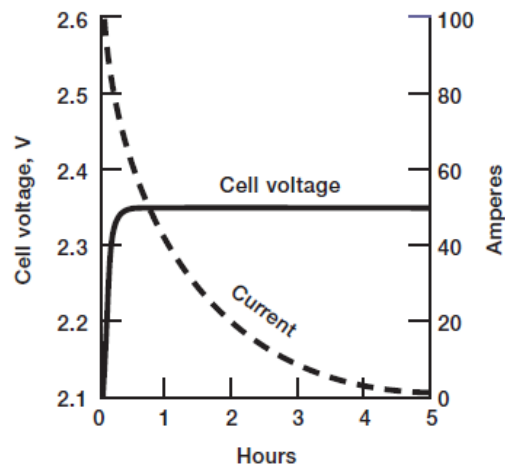
Constant potential (constant voltage) charging description

Constant-potential (CP) charging is considered to be one of the oldest methods of battery charging still in use and had its earliest beginnings in the aircraft industry for recharging lead acid batteries. This technique is commonly used in all forms of stationary applications because batteries may be left on float charge for an extended period of time. In this article we are dealing with the calculations related to constant potential charging.

It is common to see constant potential charging for utility, communications, stationary engine start, UPS and process control systems applications. All of these, and others, will require that a battery remain on float charge for extended periods of time. This charge method maintains the battery's state of charge until such time as the battery is required to support the load. It is common in these applications that the charger may serve as a power supply while the battery is standing by in float mode.

Float mode

In very simple terms, constant potential charging is successful because the technique requires that the battery be maintained at a certain voltage, using a well regulated supply that provides



current only to achieve and maintain the determined voltage. Once the determined voltage is achieved the back electromotive force (EMF) of the battery will allow the charger to taper the current down to a minimal value so as to maintain a float or maintenance charge such that the battery will neither self discharge nor overcharge.

Equalize mode

It is typical that these chargers offer a dual rate charging system so as to allow the charger to provide an equalized or high rate charge. In this mode the output voltage of the charger is set higher than in the float mode. Again, the charger action is similar to the float mode in that the charger will act as a current source until the desired voltage is achieved. When the desired equalize voltage is achieved, the back EMF of the battery will allow for the output current to taper down.

Constant potential – current limited operation

The battery charger used in constant potential charging will be of the constant potential-current limited type. The charger will be specifically designed to accommodate the charge profile by employing a current limiting circuit that limits the output current of the charger when the battery potential is low. Typically, the charger will have a form of adjustment that allows the output current limit to achieve a maximum level that is somewhere between 105 percent and 125 percent of the charger's catalog rating. Many chargers will also allow for current limit adjustments that fall below the charger's catalog rating.

In application, the constant potential current limited charger will charge a depleted battery by first acting as a current source since it sees a battery with a voltage that is below the value determined to maintain charge. During this period of the profile, the charger will deliver current up to the charger's current limit set point until the desired battery voltage is achieved. When the desired battery voltage is achieved, the charger tapers the output current and then becomes more of a voltage source.

When the charger is operating as a two rate charger and the battery employed must be equalized at a higher voltage than the float voltage value, this equalize process occurs until such time as the charger switches from the equalized to the float mode. When the charger returns to float mode, the current will

drop to zero, or near zero, until such time as the back EMF of the battery goes below the float voltage threshold.

Constant loads vs transient loads

Stationary battery chargers are designed to accommodate constant loads while recharging batteries. Constant loads are those loads that remain steady and present as part of a load profile. Typical of these loads are lamps, instruments, recording equipment etc, which are always on during normal operation.

Transient loads are those which are fleeting and usually represent a very high current demand in relation to the constant load. This current level will be sustained for a very short period of time. Typical examples of transient loads are switchgear action (either charging or releasing of switchgear), engine start, or motor starting. Each of these applications requires a high current demand for a very short period of time. In all cases, it is recommended that these transient loads be accommodated by the battery and not the charger.

The charger is not used to accommodate transient loads for several reasons. First, if the charger was able to respond to these quick-acting load demands there would be no way for the charger to know if it is responding to a switchgear load or a battery demand. Responding quickly to battery demands could result in battery damage.

Sizing a battery charger for transient loads would result in battery chargers that are much larger than needed. Batteries do not provide any form of self-regulation, so therefore the charger must be the regulating force in the battery/charger circuit to ensure that a successful float application is achieved. Chargers in float service are typically designed to keep their transient response rate between 200 ms and 500 ms so as to inhibit the charger's ability to cause any battery damage or load damage. These response rates would be too slow to accommodate most transient loads.

Battery charger sizing

The charger sizing formula

$$\frac{(\text{AH removed})}{\text{x 1.R}} + \text{L (constant loads)} = \text{Amperes charger}$$

T (desired recharge time)

Several permutations of this same formula have been shown in different resources. It is important that the calculation to determine charger size be followed with a certain amount of discipline because, when properly applied, it provides for the least amount of wasteful energy in application.

Power supplies and battery chargers in particular offer the best efficiencies the closer they operate to their full load rating. Therefore, the opposite is also true – if you employ a battery charger that is severely oversized in an application, it will be operating more inefficiently.

The charger sizing formula defined

AH removed – This number is the amp hour (AH) removed from the battery after either a complex load profile is calculated or tabular information is used. While it may be typical to use the battery AH rating, it is actually required that you only recharge what you take from a battery. It is not necessary to recharge a battery from “empty to full” if you are only using a percentage of the battery's capacity.

Other considerations that affect a battery size, such as design margin, age factor, temperature correction, etc, are not to be added in as part of the battery's AH removed. These factors do not reflect the AH removed or discharge from the battery.

1.R, R = Recharge factor – Recharge factor very simply is the additional energy required to recharge a given battery. AH removed represents the energy removed from the battery. In order to return that same amount of energy, we must put back what we take out plus a little more to accommodate the losses. This defines the recharge factor – it tells us how much more energy we must replace to get back to full charge.

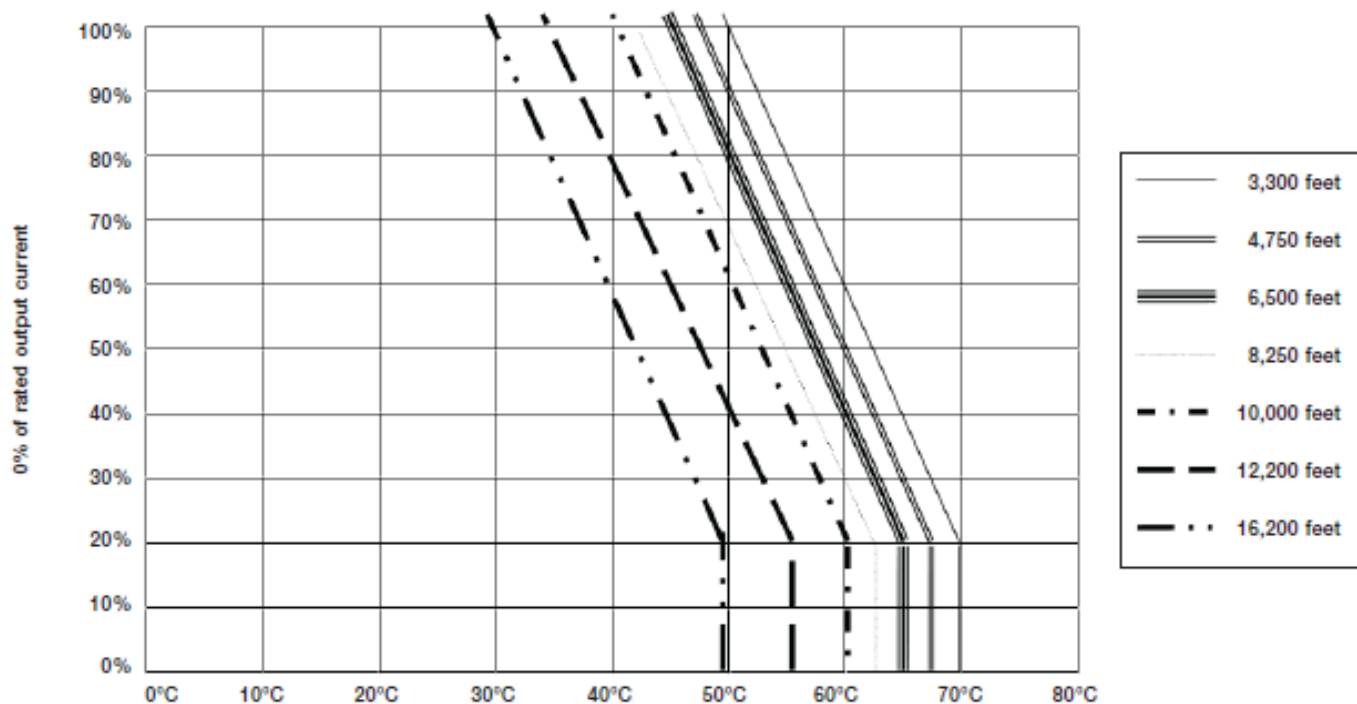


Figure 2: Typical altitude/temperature de-rating chart

Deriving the recharge factor is based on the battery manufacturer's recommendations. Typically, the following values have been used in the industry. Note that you may use these values if a battery manufacturer does not state any specific values to use.

Wet vented lead acid – 1.1, 1.15

Valve regulated lead acid – 1.15

Wet vented nickel cadmium – 1.3, 1.35, 1.4

Valve regulated nickel cadmium – 1.4

T (desired recharge time) – This value is provided in whole hours and will typically be a number between eight hours and 24 hours. Typically, eight to 12 hours, and in certain cases as much as 24 hours, is used as an acceptable recharge time. The basis for this is determined by the application, but the limits between eight hours and 24 hours are a practical matter.

For the most part, batteries will not accept a charge, regardless of how much current is available, in less than about eight hours and will not recharge from a practical standpoint in more than 24 hours, using typical constant potential-current limited charging techniques. While this comment is a generalization it is also a safe bet. If you want to recharge a battery either faster or slower than the eight hour to 24 hour window, check with the specific battery manufacturer. Certain battery products may be able to recharge either faster or slower than the general rule allows.

L (constant loads) – This number will represent those loads that are constant. As mentioned previously, these are the loads represented by the profile as always present. They are not the loads that are transient. It is important to note that if you have a very high constant load it may be added in here. Load intensity is not a determining factor by itself. High load intensity coupled with very short time duration together defines transient loads. As

previously stated, transient loads should be accommodated by the battery and not the battery charger.

Amperes charger – Charger output current is defined as the result of the calculation. However, there are some additional considerations in finally selecting a battery charger.

Unlike a typical battery size calculation, sometimes it makes sense to pick a charger with an output that is slightly smaller than calculated. For example, if the calculation determines a 26.5 A charger output, it is perfectly acceptable to use a 25 A output charger rather than a 30 A charger. This is because of several factors – the most important is that the charger's current limit range is probably at least 110 percent of rating without any degradation of output. Therefore, the 25 A charger can output 27.5 A continuously, without degradation, so the requirement to accommodate a 26.5 A charger output is within the acceptable range of the 25 A charger being selected.

Other amperes charger considerations – It is also important to consider the following factors which may be introduced by the specifier:

- Temperature correction
- Altitude correction
- Design margin
- Anticipated growth

Temperature correction and altitude correction

The factors related to these items require more than basic consideration.

In many cases the actual correlation is such that you can de-rate the charger by application rather than performance. For example, as you increase altitude the ambient temperature could be lower. Since that is interrelated, you could have a

charger in an application at 10,000 feet but the highest ambient temperature might be only 40 °C rather 50 °C to still allow for 100 percent of rated output (see Figure 2). In this case there would be no reason to select a larger charger to accommodate the environment, since the existing charger could meet the new environmental situation. It is imperative that you consult a charger manufacturer's de-rating chart to determine actual charger performance.

Design margin

This is based on the designer's knowledge of a possible condition of load. There is no standard for design margin in battery chargers since they do not age and lose capacity over time as batteries do. Therefore any consideration of design margin is in addition to any standard and the result of the designer's judgment.

Anticipated growth

This is based on good planning. If you know that the application will eventually require a larger charger due to loads already anticipated, it is good engineering practice to add that capacity to the charger at the outset. However, two considerations should be given when this occurs. First, be sure that the selected charger can tolerate the charger to battery ratio and still provide all the filtering and regulation desired. Typically, charger to battery ratio is expressed as 4:1, where the charger output current is no larger than 1/4 of the battery's overall AH capacity. In many cases, if the ratio is not met, a charger classified as a battery eliminator can solve this issue. Second, instead of starting out with a larger charger, it may be prudent to add another charger of similar output at a later time in parallel to the existing charger to accommodate the needed added capacity.

Charger sizing sample calculation

Assuming a 200 AH wet vented lead acid battery, where the AH removed is 150 AH, the recharge time is eight hours and the constant load is 25 A, the following formula would be populated as follows:

$$\frac{(\text{AH removed}) \times 1.15}{T (\text{Desired recharge time})} + L (\text{Constant loads}) = \text{Amperes charger}$$

$$\frac{150\text{AH} \times 1.15}{8 \text{ Hrs.}} + 25\text{A} = 46.563 \text{ Amp charger} \rightarrow \text{use 50 Amp output charger}$$

Proper use of the battery charger formula to determine charger size will result in a correctly sized charger and account for the many important considerations in designing a stationary battery charger application. Understanding all the details and required information to properly size a battery charger will result in more efficient installations and less waste in terms of costs at inception and energy use during the life of the installation.

To find out more about ABB's UPS solutions:

Web: www.abb.com/ups



ABB Cyberex website

LCD company in Japan secures two PCS100 Medium Voltage UPSs for complete power protection



Left to right: Holger Hannemann (ABB in NZ), Amina Hamidi (ABB in Switzerland), Takashi Yamada and Tatsuo Achiwa (ABB in Japan)

ABB in Japan has secured not one but two orders for the newly launched PCS100 Medium Voltage UPS for a leading LCD company based in Japan. The first order is for a 2 MVA, 6.6 kV ultra-capacitor MV UPS, with the intention of increasing the system capacity up to 6 MVA as the facility load increases. The second order is a 4 MV 6.6 kV ultracapacitor MV UPS for another location in Japan.

In order for LCD facilities to produce highly technological devices for day-to-day electronic needs, systems are put in place to ensure continuous improvement and output is reached. The cost of lost production, downtime, lost quality and ultimately lost profit can be extremely significant for LCD manufacturing plants. The semiconductor processes in LCD facilities are highly sensitive and are dependent on a stable and well regulated electrical power supply to tools and equipment. The most common and costly power quality problem indicated by the customer in Japan was voltage sags caused by environmental factors, such as the weather. The PCS100 MV UPS will be installed to provide the energy to ride through these very deep voltage sags and short power outages, with the PCS100 MV UPS being suitable for direct connection to many of the tool loads.

ABB's regional sales and marketing manager of Northeast Asia for Power Protection, Takashi Yamada, commented on the achievement, "This first order for medium voltage UPS

will be a good reference in the market, especially in a tough industrial country like Japan. With ABB's technology in place, I am confident we will continue to work and build upon the system, due to the modularity the PCS100 MV UPS can offer."

Why medium voltage

The PCS100 MV UPS has been designed to provide clean, reliable and efficient power, and lower costs for customers in industry and in large data centers who have sensitive or critical loads. The single-conversion topology used is a natural choice for medium voltage as losses are extremely small, meaning efficiencies well in excess of 99.5 percent can be achieved. The PCS100 MV UPS can be installed to protect the complete supply or just selected sensitive loads. The PCS100 MV UPS can start at 2 MVA and grow in size as the factory or data center develops. As well as EDU modularity, the PCS100 MV UPS has inverter modularity, giving extremely high levels of availability through inverter redundancy.

To find out more about ABB's medium voltage UPS solutions:

Web: www.abb.com/ups

Email: powerconditioning@abb.com



PCS100 MV UPS video



PCS100 MV website

Inside perspective on medium voltage UPS



An interview with Perry Field – General Manager, ABB Power Conditioning.

What advantages do the MV UPSs from ABB Power Conditioning offer users in terms of installation and housing?

The ABB MV UPS is extremely compact for the level of power protection offered. As well as this, with medium voltage the currents in the conductors are lower, meaning locating the power protection in an electrical room, or away from the main production site, is possible without expensive cable runs. The efficiency level of the ABB MV UPS is also class leading, at not only 99 percent but 99.5 percent typical efficiency.

Are there any recent case studies that you are particularly proud of?

Yes of course, but unfortunately we cannot mention names yet! One customer is an electronics component supplier to one of the largest consumer electronics companies globally. Their most recent purchase was for 2 MVA and 4 MVA PCS100 MV UPS systems.

Where do you currently supply to? Are there plans to expand operations in the near future?

We supply globally throughout the ABB network. The present product offering currently is up to 6.6 kV and 6 MVA. Plans are already in progress to increase the voltage offering to cover more of the common voltages worldwide.

How do you see your sector progressing over the next decade?

I think there will be two key trends over the next decade: 1) Economies of scale will further drive the development of large manufacturing facilities, with increased automation, and colocation datacentres. 2) Responsible use of resources. This means using energy efficiently and being able to adapt to the changing energy generation landscape.

How will ABB Power Conditioning be a part of this change?

If you look to our product portfolio and where we are going with our products, it is clear that we are constantly evolving as we stay on the cutting edge of technology. Power and productivity for a better world is the motto of ABB, and ABB Power Conditioning fulfils this exactly, increasing our customers' productivity while being responsible with how we use the world's resources.

Do you have a question about PCS100 MV UPS technology?
Email: powerconditioning@abb.com

With the recent interest around medium voltage UPS technology, ABB decided to sit down with the general manager for ABB Power Conditioning, Perry Field, whose team has recently introduced the PCS100 MV UPS, to discuss the technology and future expectations for the product.

Why has ABB Power Conditioning developed a range of medium-voltage (MV) uninterruptible power supplies (UPSs)?

This development came about as a result of the changing landscape in industry and data centers. To gain economies of scale, facilities are becoming larger and demanding increasing levels of power. As power requirements increase, moving to medium voltage is a natural step.

How do these MV UPSs help industries that have sensitive or critical loads?

Increased automation demands more and more high quality power to protect complete manufacturing processes, not only control systems. Performing power protection at medium voltage allows complete facility protection, ensuring all sensitive loads are protected.

How do these MV UPSs tackle the ever-increasing number of renewable energy generators entering the power grid?

Distributed renewable generators in the grid do not increase the reliability of the grid, but in fact the opposite. Voltage fluctuations are more common with increasing renewable energy and events such as clouds covering a photo-voltaic generation park cause large power fluctuations in the grid network.



A new phase

Samsung use
ABB technology to
protect their mega
investment in China.

In 2013, ABB provided a power protection solution consisting of eight PCS100 UPS-Is to Samsung for phase one, to protect their \$3 billion liquid crystal display (LCD) production facility in Suzhou, China. Now with phase two being built, ABB are providing further power protection which will implement five PCS100 Industrial UPS-I systems, a total of 10,500 kVA, to protect against crippling power disruptions, preventing loss of materials and resources. After completion of phase two, the combined PCS100 UPS-Is installed at the Samsung facility (including phase one) will be 27,000 kVA.

Samsung's \$3 billion LCD production facility in Suzhou is the biggest single LCD investment ever made by a South Korean company in China. The state-of-the-art facility is safeguarded from the most common power quality issue – voltage sags – and the power quality solution is one of the many that ABB has supplied to semiconductor companies in Asia.

Situated within Samsung's huge production complex at Suzhou Industrial Park in Jiangsu province, the 7.5 generation fabrication line is capable of producing 100,000 glass substrates per month. The facility will mainly produce 48-inch and 55-inch full HD and 4K ultra HD LCD panels using these glass substrates, measuring 2200 mm x 2500 mm. Together with Samsung's existing LCD module production plant at its Suzhou complex, the new LCD line enables Samsung to create an integrated LCD production base for China – by far the world's largest market for LCD televisions.

Providing protection

To ensure that production at its multi-billion dollar plant is not brought to a standstill by power failures, voltage sags or other electrical disruptions, Samsung selected ABB to provide the facility with a power protection solution.

For Samsung, the most important feature of ABB's PCS100 UPS-I was the small footprint of the system, and that it was able to fit into the equipment room for phase two. The phase two electrical rooms were designed to the same specifications as phase one (where the eight other PCS100 UPS-I's are located), making for a seamless installation.

ABB's Power Conditioning sales manager, Andrew Hiscock, commented on this achievement. "While we have exceptional reliability, this is the standard level expected by Samsung, and our competitor's product is also very reliable, I believe the small footprint of the PCS100 UPS-I and efficient product performance over two years that helped ABB win phase two. We are still the only company with a 3,000 kVA UPS system in a Samsung facility."

Among the many differentiating features of the PCS100 UPS-I solution for semiconductor applications are:

- Large low voltage power capacity of 3 MVA (most other solutions require medium voltage systems for this capacity)
- Ultra-fast transfer time of less than 1.8 milliseconds
- Exceptionally small footprint up to 50 percent smaller than competing solutions
- Long and more economical operating life – 15 years compared to the three to five years of UPS batteries
- Comprehensive customer support

ABB provide protection to other Samsung facilities

Other Samsung facilities that have implemented ABB's power protection solutions include the Xi'an facility in China. This plant selected 22 PCS100 UPS-I units for its \$7 billion NAND flash plant. The plant has a monthly output of 100,000 nanometer chips and has been operating since the end of 2013. NAND chips are used primarily in memory cards, USB flash drives, solid-state drives, and similar products for data storage and transfer.



ABB's PCS100 Industrial UPS that has been installed for phase one in Samsung's Suzhou facility to protect against voltage sags

To date, ABB has supplied more than 1,256 systems (AVC, UPS-I and RPC) – a total of 978.8 MVA of PCS100 power protection solutions – to high-tech semiconductor and flat panel LCD manufacturing facilities worldwide.

To find out more about ABB's PCS100 AVC solutions:

Web: www.abb.com/ups

Video: [The features of the PCS 100 UPS-I](#)

Email: powerconditioning@abb.com



PCS100 UPS-I website

UPS soaring to new heights

ABB's flexible UPS design fully meets the non-standard requirements of a major aviation customer.



ABB has secured an order to provide UPS back-up power for a multi-million dollar aviation project based in the Middle East. This project is the region's largest in the aviation sector, and represents a step towards ongoing power protection solutions for this industry.

The new international airport required a power protection solution that would provide back-up power should the main power supply fail. Due to the power requirement for 600 kVA UPS units, ABB's UPSs were not initially considered as a solution (ABB's commercial UPS product line covers up to 500 kW in one single unit).

However, following Winston Churchill's advice of "never, never, never give up," ABB and its channel partner continued to monitor the project. As happens in most major projects, the load specifications were revised and 600 kW units were deemed to be unnecessary. With this change, ABB's channel partner immediately reentered the tender process with a series of product presentations and technical discussions.

Fully backed by technical support from ABB's UAE unit and the factory, the channel partner conducted a presentation for the relevant authorities and consultants. This presentation successfully opened the door for the ABB submission to be put forward. However, there were several complex requirements in the specifications that required further close cooperation between the channel partner and ABB, as well as several technical sessions with the main contractor's engineers.

After a few months of collaboration, ABB and the channel partner were awarded a letter of intent and, subsequently, the final order. This is the largest single order for ABB in the MEA Region to date.

To find out more about ABB's UPS solutions:

Web: www.abb.com/ups





ABB and Site Technology LLC now working closely together to provide a commercial UPS offering in the UAE

Market penetration in the UAE to develop a commercial UPS offering

In line with ABB's global strategy for profitable growth and market penetration, ABB in the UAE has signed a third-party channel agreement with Site Technology LLC to develop the commercial UPS business in the UAE.

ABB has the bases covered when it comes to power protection of sensitive loads. Covering applications from computer rooms through to large data centers and complete industrial plant protection, ABB has the UPS or voltage conditioning technology for every application, from projects requiring just a few kilowatts of protection to those that require many megawatts, along with the ability to cover a wide range of supply voltages.

Site Technology LLC is a leading turnkey solutions provider that offers a wide range of services, such as design, supply, installation, commissioning, maintenance and operations of all systems and equipment in different specialized activity sectors.

Gus Abboud, local division manager, Discrete Automation and Motion (DM), MEA, highlighted the importance of the co-operation between the two companies and said, "It's with great pleasure that I sign this long term agreement with Site Technology. We have full confidence in Site Technology, not only in the UAE, but also in the larger Middle East and Africa markets. This is part of our strategic initiative, where ABB comes together with partners to maximize profitable growth."

"The intention is to expand ABB's offering of various products via Site Technology, in order to take advantage of their local setup and strong structure in key segments that are essential for the DM Power Conversion business," added Naji Karam, sales manager for DM PC Lower Gulf.

Site Technology said its cooperation with ABB in the UAE market was a natural continuation of its previous initiatives in Saudi Arabia, Qatar and Lebanon, with a short term target to cover Iraq and Jordan in the near future, as part of its drive to expand across the region. Site Technology hosted the signing ceremony in its Beirut offices.

Fast, reliable support

ABB appoints channel partners to offer fast, effective and reliable sales, support and services to its customers. ABB's channel partners are trained and authorized to support customers in a range of product specialist roles – from consulting, component dimensioning to project management and after-sales services.

To find out more about ABB's UPS solutions:

Web: www.abb.com/ups

Video: [Market penetration in the UAE to develop the commercial UPS offering](#)





Compelling UPS architecture

Conceptpower DPA 500 protects a leading mobile operator and ICT solutions provider in the Czech Republic.

ABB's partner ALTRON has recently announced that it has become the first company in the Czech and Slovak Republics to install, as part of a complex data center solution, new cutting-edge ABB Conceptpower DPA UPS units.

The solution, implemented for a major Czech mobile operator and ICT solutions provider, contained, amongst other components, eight Conceptpower DPA 500 kW modular UPS units.

"I am pleased that we were able to provide our customer with cutting-edge technologies that unquestionably belong among the best available in the world today. Their advantages include high efficiency, reliability and fully autonomous control logic of individual modules. This is the first installation of this kind in the Czech Republic," said ALTRON Managing Director Antonin Hemmer.

The Conceptpower DPA 500 product range from ABB meets customer requirements for UPS systems from 100 kW to 3 MW and ensures maximum reliability, as well as offering excellent CAPEX costs and minimal OPEX costs. ALTRON is an ABB channel partner and this installation has made them even keener to install other new ABB units and technologies.

There were several other important criteria. These were: time, redundancy, space and cost. It did not take ABB's representatives long to explain how ABB's DPA was the best choice. The DPA offers easy installation, without interruption of DC operation, and maintenance, assuring continuity of critical processes, and is simple to integrate into the existing DC monitoring and management system. With its small footprint, this UPS is ideal in situations where real estate is limited. Extra modules can be added to the rack to cater for future power increase requirements, with no extra floor space being taken up. The ABB brand and the fact that it was made in Switzerland were also factors.

Eight DPA 500s (3 × 100 kVA modules each) are replacing eight existing 480 kVA end-of-life standalone UPSs at the customer's data center. The idea is to reduce cost investment as the power requirement is currently lower (8 × 300 kVA) than the installed UPS capability, but it must then also be easy to scale up to higher powers in the future.

Why DPA 500?

Conceived for data centers, ABB's Conceptpower DPA 500 modular UPS fulfills power requirements from 100 kW to 3 MW and provides maximum availability for those who aim for zero downtime, as well as a low cost of ownership.

Modern-day modular parallel UPS solutions enable organizations to simply, and cost effectively, increase their UPS power, improve availability and enjoy the long-term benefits of scalable UPS solutions that can grow in sensible incremental steps as the organization grows. 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 – so called "end of row."



ABB's DPA 500

The basic element of the Conceptpower DPA 500 UPS is a 100 kW slide-in module. Five of these modules can be installed in a single frame, and six frames can be configured in parallel – giving a maximum rating of 3 MW. The Conceptpower DPA 500 is the only modular UPS on the market that can easily scale up from 100 kW to 3 MW of clean, reliable power.

To find out more about ABB's UPS solutions:

Web: www.abb.com/ups

Video: [ConceptPower DPA 500](#)



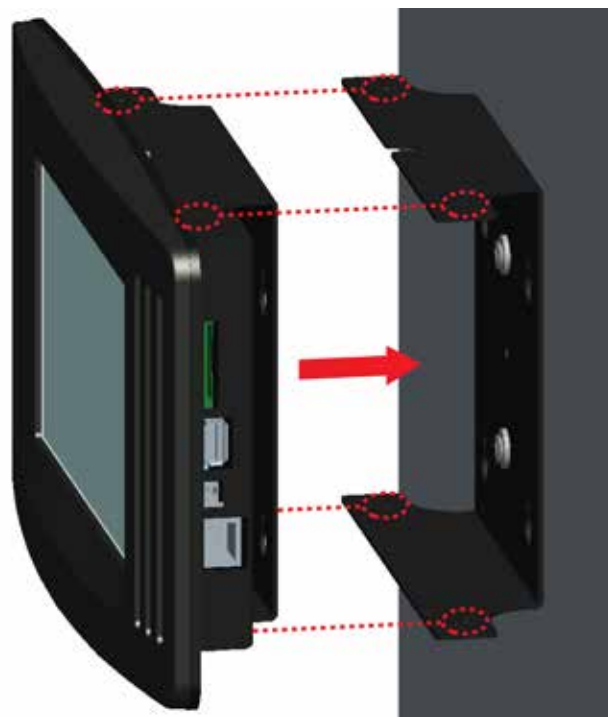


Boosting surveillance

New remote panel
for remote real-time
UPS surveillance.

ABB's commercial UPS product line launches a new remote touch screen display to enhance remote monitoring and real-time surveillance of ABB's UPS operation.

ABB's Remote Panel is a touch screen display used for remote real-time surveillance, monitoring and service operation of ABB's commercial UPSs.



The remote panel can either be placed on a desk or mounted on a wall

ABB's Remote Panel is a touch screen display used for remote real-time surveillance, monitoring and service operation of ABB's UPSs. It enables the direct monitoring of an entire UPS system – showing several UPSs or UPS modules in parallel, as well as the status of each individual UPS or module.

In addition to monitoring, it provides all relevant measurements at module and system level. Changing the operating mode is also possible through a password-protected menu.

The remote system display enables the operator to perform the following:

- Check operational status and measurements
- Monitor the power flow through the UPS system
- Check events and alarm history
- Silence alarms
- Set programmable parameters
- Check the status of the batteries
- Execute operational commands (password protected)

Highlights

- Display of the UPS status remotely in real time
- Monitoring of one UPS module or complete systems
- Flexible design – it can be placed either on a desk or fixed to a stand or wall.
- 7" touch screen with high graphical definition and interactive mimic diagram
- Hot-swappable (can be installed/connected while the UPS is running)
- Very low power consumption
- Selection of 17 languages
- Extended events log (up to 1,000 events)
- Interfaces: RS 485/SPI, SD card, USB
- Up to 100 m distance from the UPS via Ethernet cable
- No network requirements

Compatibility

The Remote Panel display is compatible with the following ABB UPS systems:

UPS	Number of remote panels	Number of remote panels if using SNMP multidrop
PowerWave 33	1 per UPS	1 per UPS
DPA UPScale	1 per UPS	1 per UPS
Conceptpower DPA 500	1 per system*	1 per system*

*Either one graphical display per system or one remote panel per system can be used with Conceptpower DPA 500. The remote panel can only be used if the graphical system display is not used as they are connected to the same port in the interface panel.

To find out more about ABB's UPS solutions:

Web: www.abb.com/ups





Data center tip

Consider voltage conditioning to improve your data center's overall performance.



The PCS100 AVC range offered by ABB corrects voltage sags and surges within a few milliseconds, and is available in load capacities of 150 kVA to 2.4 MVA

While data center construction is becoming leaner and more modular, technical solutions are becoming more diverse. Servers and storage devices – long seen as the mission-critical core of data centers – are increasingly viewed as being synergistic with infrastructure such as ventilation and cooling systems. This has heightened interest in improving the integrity of power streams in the plant environment through the retrofit of new technology.

Uninterruptible power supply (UPS) solutions are seen by most data centers as the gold standard of voltage conditioning. A UPS safeguards against surges, sags and outages, making it ideal for server applications where even a brief outage is unacceptable. By contrast, the failure of a support system – if limited in duration – can often be accommodated without any severe impact. Furthermore, certain types of data centers, such as animation or weather supercomputers, can absorb a limited outage without catastrophic loss of data.

Active voltage conditioners (AVCs) are designed to be a cost-effective option for plant managers who have decided that UPS voltage conditioning is not an optimal solution. While this can stem from any number of reasons, the decision point is the same – AVCs protect against surges and sags but they have no battery, and therefore cannot provide power in an outage.

In some data center cases, the use of AVCs as a power conditioning technology is justified, especially if outages are very rare. Voltage sags are by far the biggest risk to power continuity: sags typically account for 90 percent or more of power events. This can make a strong case for the small, lightweight, battery-free AVC as a way to condition power to less-sensitive loads.

The PCS100 AVC range offered by ABB corrects voltage sags and surges within a few milliseconds, and is available in load capacities of 150 kVA to 2.4 MVA. The PCS100 product line will become increasingly specialized this year with the introduction of the AVC-40 and AVC-20. The AVC-40 is

designed for sag correction where the network is stable but affected by external factors such as the weather, and the AVC-20 will provide continuous voltage regulation where the network is weak and unstable.

To find out more about ABB's PCS100 AVC solutions:

Web: www.abb.com/ups

Email: powerconditioning@abb.com



PCS100 AVC website



ABB's PCS100 AVC technology is protecting Toshiba's CT Scanner from power quality events at Wairau Hospital in Blenheim, New Zealand

Optimal patient care

ABB provides critical protection for patient care in the healthcare industry.

ABB has provided power protection solutions to New Zealand's Blenheim, Whakatane and Tauranga hospitals to condition the power supply for Toshiba's AquilionPRIME and AquilionONE CT Scanners. The PCS100 Active Voltage Conditioner (PCS100 AVC) will eliminate unwanted voltage sags that can compromise the CT Scanner's performance. Installing the PCS100 AVCs will enable fast, accurate voltage sag and surge correction as well as continuous voltage regulation – a must for machines that are responsible for patient care.



ABB's PCS100 AVC installed at Whakatane Hospital in New Zealand to protect the CT Scanners from suffering a power quality event

Voltage sags, voltage surges, phase unbalance and flicker are common events that often cause electric and electronic equipment to malfunction. When such events occur in critical control operations, such as CT scanners, they can cause serious disruption to the services offered by hospitals.

The three New Zealand hospitals were at risk of power quality problems for their CT Scanners (located in the radiology and emergency departments) that rely heavily on 24/7 availability for diagnosis of trauma cases. Computed tomography (CT) provided a significant breakthrough in medical care by generating detailed anatomical images. The technology can improve diagnoses, assist with management of medical procedures, and enhance treatment. It is crucial that this technology is protected from power quality events caused by weather conditions or internal factors within hospitals.

Without a reliable power protection system in place to condition the voltage supply for the CT scanners, the efficiency of the scanners would be jeopardized. This would ultimately result in patients having to wait longer for scans, delaying diagnosis and treatment. Philip Thomas, radiology team leader at Blenheim's Wairau Hospital, outlined the reason for adopting a power protection solution. "We were advised to install the PCS100 AVC as part of the installation of the new scanner. There were concerns that the power supply in this area was of a 'dirty' nature, which may have compromised the CT system performance."

With ABB's PCS100 AVCs in place, the hospitals will experience benefits such as a stable power source to the CT scanner, resulting in prompt and accurate patient diagnosis. This is achieved by the PCS100 AVC being able to correct voltage sags, phase angle errors, unbalance and surges, while providing continuous voltage regulation. Using state of the art power electronics technology, the correction is stepless, which minimizes

disturbances and ensures a regulated premium power supply for important loads. The PCS100 AVC requires no energy storage as it draws the additional current required to make up the correction voltage from the utility supply, ensuring lowest total cost of ownership is achieved.

Toshiba Medical's New Zealand service manager, Ian Bray, reiterated the importance of power protection for critical resource tools, such as CT scanners. "A clean and stable power supply is essential for the CT scanner to consistently produce high quality images for patient diagnosis. Power transients, surges and disruptions also have the potential to damage the electronic components within the CT scanner resulting in unnecessary expense and downtime."

About Toshiba

Toshiba medical is a global company with over 200,000 employees worldwide. Toshiba's vision is the realization of a "Human Smart Community" through an emphasis on energy, storage and healthcare by delivering excellent user experiences.

To find out more about ABB's PCS100 AVC solutions:

Web: www.abb.com/ups

Email: powerconditioning@abb.com



PCS100 AVC brochure



PCS100 AVC video



PCS100 AVC website



German Chancellor Angela Merkel and Indian Prime Minister Narendra Modi are introduced to YuMi by ABB Chief Executive Officer Ulrich Spiesshofer

Hannover Messe 2015

ABB participates at the biggest industrial fair in Germany.

This year, ABB participated at Hannover Messe introducing new trends and technologies such as YuMi, the world's first truly collaborative dual-arm robot. Among those to witness this new technology firsthand was the German Chancellor, Angela Merkel, and Indian Prime Minister, Narendra Modi. ABB Power Protection also highlighted the PCS100 Active Voltage Conditioner and UPS products. With the food and beverage industry being a hot topic, ABB had a dedicated area showcasing its portfolio in this industry, including Fonterra – ABB Power Protection's recent successful project.

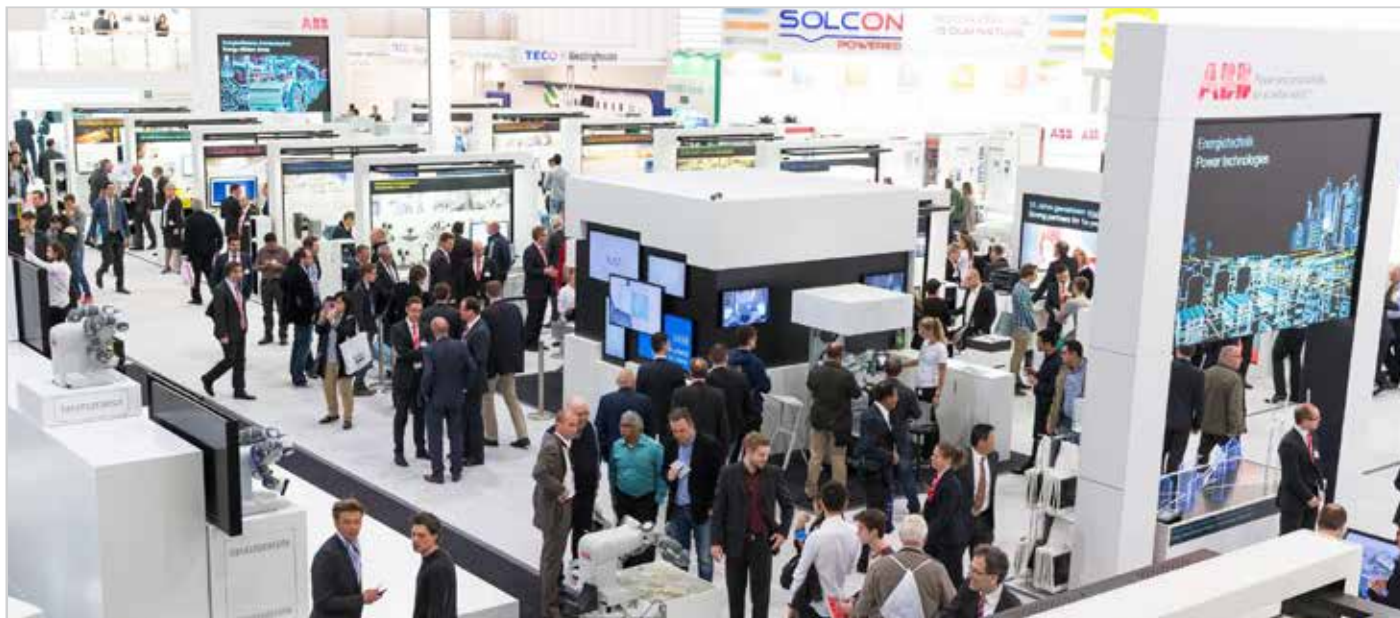


ABB at Hannover: Merkel and Modi, YuMi, the Internet of Things, services, products and people – all in one stand and at one company



ABB PCS100 Active Voltage Conditioner and UPS products on the ABB stand



ABB's Chief Executive Officer Ulrich Spiesshofer

More than 220,000 trade visitors used Hannover Messe to catch up on the latest technologies and make key investment decisions. With such high visitor numbers, Hannover Messe is the world's leading trade fair for industrial technology.

The keynote theme for this year's trade fair was "Integrated Industry – Join the Network", striking an inspirational note among exhibitors and attendees from industry, business and government.

ABB's power protection portfolio proved successful, attracting new customers who were interested in how their process equipment could be protected from power sags and surges. The whole power protection range is now CE certified, demonstrating compliance with the relevant European Union safety directives. This increases the credibility of ABB's products, boosting customer confidence and thus building long-term relationships on an international scale.

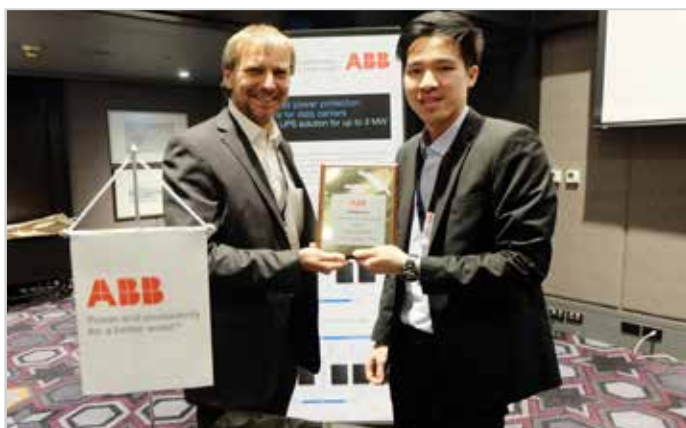
ABB's comprehensive power protection range offers many advantages, including high reliability, with efficiency ratings exceeding the high 90 percent range, small footprint in design, saving valuable floor space, and various designs that

can scale with your business to maximize availability, suited to commercial and industrial purposes.

To find out more about ABB's power protection solutions visit:

Web: www.abb.com/ups

ABB's Power Protection holds Channel Partner's Summit in Bangkok



ABB's Power Protection Product Group held its regional Channel Partner Summit in Bangkok, Thailand, from March 31 to April 1, 2015, with more than 60 participants attending. The event was opened by Derrick Koh, Regional Sales Manager, followed by Amina Hamidi, PG Manager for Power Protection.

The event gave an opportunity to present sales awards as a gesture of appreciation for successful performances throughout 2014. Among these awards were some top performers:

- Top distributor of the year: PT Vektordaya Mekatrika for outstanding performance in terms of growth and achievement compared to budget.
- Best modular project of the year: Harry & King Corporation for selling a large volume of Conceptpower DPA 500 units to the stock exchange in Taiwan.
- Best new distributor of the year: Powermatic co., LTD for establishing strong and relevant business in Thailand in

a short period of time, including the establishment of major references, such as a state-owned public broadcaster.

- Highest percentage increase from previous year for power conditioning: ABB in Thailand.

Derrick Koh commented on the interest shown in power protection. "The Asia sales summit allows our new partners to completely engage themselves with confidence in our sales, product, marketing and service support, while existing partners are provided with opportunities to share challenges and discuss strategies to bring us to the next level. It is uplifting to see we have partners from 10 countries attending with so much interest in our power protection technologies."

To find out more about ABB's power protection solutions visit:

Web: www.abb.com/ups

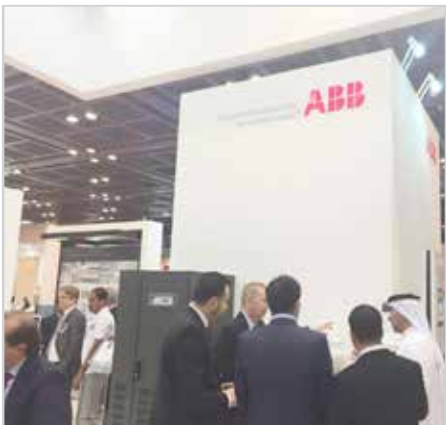


ABB participates at one of the largest exhibitions in the Middle East region, WETEX in Dubai.

Wetex is considered one of the largest exhibitions in the Middle East region, with more than 1,500 exhibitors from 42 different countries leading the water, energy and environment technology industries.

During the exhibition, the ABB booth (which showcased a Powerwave 33 160 kVA UPS) had more than 300 visitors. On the first day, Sheikh Hamdan bin Rashid Al Maktoum, Deputy Ruler of Dubai and the Minister of Finance and Industry of the United Arab Emirates, visited the booth, where ABB showcased their latest technologies and equipment.

ABB's power protection products can be implemented into any commercial or industrial application. With global sales and support, customers (including people who visited the booth at WETEX) can be assured that their business can be protected from power quality events by adopting a power protection solution that suits their needs.

To find out more about ABB's power protection solutions visit:

Web: www.abb.com/ups

On a global scale



Power protection

06. Big is beautiful

Data center power trends

12. Downtime eliminated

Modular UPS can prevent costly downtime in data centers

16. New generation energy storage

Applications and opportunities for energy storage

20. Critical processing

ABB supply a power protection solution to a boutique semiconductor company

Outlook for power protection



Power protection

06. What's in store for power protection

Product releases and modifications in 2015

15. Speedy return on Fonterra's new protection system

Protecting against five power quality events since installation

16. Big data equals big power

Medium voltage UPS is the new "black" amongst large power users

18. Investor protection

Protecting a stock exchange data center from power disruptions



Coming soon. Superior voltage conditioning for commercial and industrial applications.



The PCS100 AVC 20 and 40 products will soon be available with ratings from 150 kVA to 3.6 MVA. Both products will offer high scalability in terms of voltage and power level, total lowest cost of ownership, sophisticated control software and an efficiency exceeding 98 percent.

For more information: email powerconditioning@abb.com or visit www.abb.com/ups

Power and productivity
for a better world™

