UPDATE 3|11

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PHOENIX CONTACT

Dr. Martin Wetter,
Head of BU Surge Protection TRABTECH

The Energy Challenge!

Dear readers,

"Germany enacts new energy policy!" – This was the big headline making the rounds in all major German newspapers in June, right after the Bundestag decided to finally abandon nuclear power after all. Switzerland and Italy, backed by a clear majority of the population, also formulated a new policy to abolish nuclear energy. Politics have done their part by putting a new law into place, but for power providers the work has just begun.

Completely fading out nuclear energy generation within only ten years is a decision that presents the energy sector with vast challenges. These include expanding the generation of regenerative energy – with a focus on wind and solar power – and the urgently needed expansion of the power line networks. It is especially these networks that will have to operate more flexibly and perform at a much higher level. Scenarios that need to be considered do not stop with decentralized power generation, but new developments on the consumer front; for instance, electric vehicles and the associated demand for power to fuel them, are also part of the picture. By the way, charging a small electric car within two hours requires a rated power of over 30 kW, which roughly corresponds to the power of a floodlight pole in a sports stadium. This example illustrates that providing for the option of charging cars at a normal home outlet is not going to be an easy task.

The path to successfully leaving behind outdated energy sources clearly points to wind and solar power. Phoenix Contact is highly dedicated to providing comprehensive solutions for controlling, monitoring, and protecting these kinds of facilities. Rethinking the way we will meet our energy needs represents a huge challenge. We accept this challenge and will contribute innovative solutions to help pave the way to successfully tapping into sustainable energy sources.

Editorial

Interview

Cover Story

On Site

Technology

New Products

Current News

Tracking Down Lightning

Lightning Protection for On- and Offshore Wind Power Systems

Prof. Dr.-Ing. Klaus Scheibe from the Kiel University of Applied Sciences performs groundbreaking research in the field of lightning. He is particularly interested in devising measures to protect industrial objects, such as wind turbines, against lightning strikes. He kindly found the time for an interview with the UPDATE editors.

Prof. Dr.-Ing. Klaus Scheibe, Department of Computer Science and Electrical Engineering, Kiel University of Applied Sciences.

UPDATE: Professor Scheibe, what kind of damage occurs when lightning strikes in wind turbines?
Professor Scheibe: If lightning protection measures have been properly carried out – that is, in accordance with valid lightning protection standards and the principles for installing surge voltage protection components and those for electromagnetic compatibility – no damage to any of the facility's components is to be expected, provided regular maintenance is performed. However, if this is not the case, wind turbines can get damaged when lightning strikes. This includes damage to rotor blades, other mechanical system components, or also electrical and electronic system components.

UPDATE: Are offshore facilities subjected to a greater risk from lightning strikes?
Professor Scheibe: Yes, because repairing and recommissioning system components of offshore wind turbines is much more difficult and time consuming than for land-based systems. Also, large or heavy system components and the required cranes may need to be transported to the offshore facility by boat. This contributes to significantly increasing downtimes of such facilities compared to onshore systems. In addition, modern offshore wind turbines generate about 5 to 6 MW power, again increasing the energy loss in the event of a downtime.
UPDATE: How important is lightning monitoring for operators of wind turbines?
Professor Scheibe: Monitoring is an essential operating safety element – and this also includes the effects of lightning. What makes it even more important is the fact that expected current loads resulting from lightning strikes, comprising parameters such as lightning current amplitude, rate of change of the surge current, load and specific energy, are difficult to assess.
While surge voltage protection devices meet the demanding provisions of DIN EN 61643-11, in the field they are subjected to extreme loads. For this reason, monitoring is very important in this area as well. What would greatly simplify things for the operator is if they were able to perform remote monitoring, for instance, using a wireless network.

UPDATE: What is your recommendation to operators of wind turbines in order to maximize the safety and uptime of their systems?
Professor Scheibe: Wind turbine operators should involve manufacturers of lightning and surge voltage protection systems at a very early planning stage, and they must ensure that the system is implemented in compliance with EMC constraints.
Proper coordination of the protective measures includes following the manufacturer's installation instructions to the dot, in particular as concerns ground conductors. On top of this, the specific spatial conditions of a wind turbine need to be taken into consideration. In this context, the capacitive and inductive interference into the low-voltage power supply, signal lines and data lines that can occur when lightning strikes is of particular importance.

"Monitoring is an essential element of operating safety."

UPDATE: Thank you very much for this interview.

New Energy for the Future!

Products and Solutions for Photovoltaic Systems and Wind Turbines

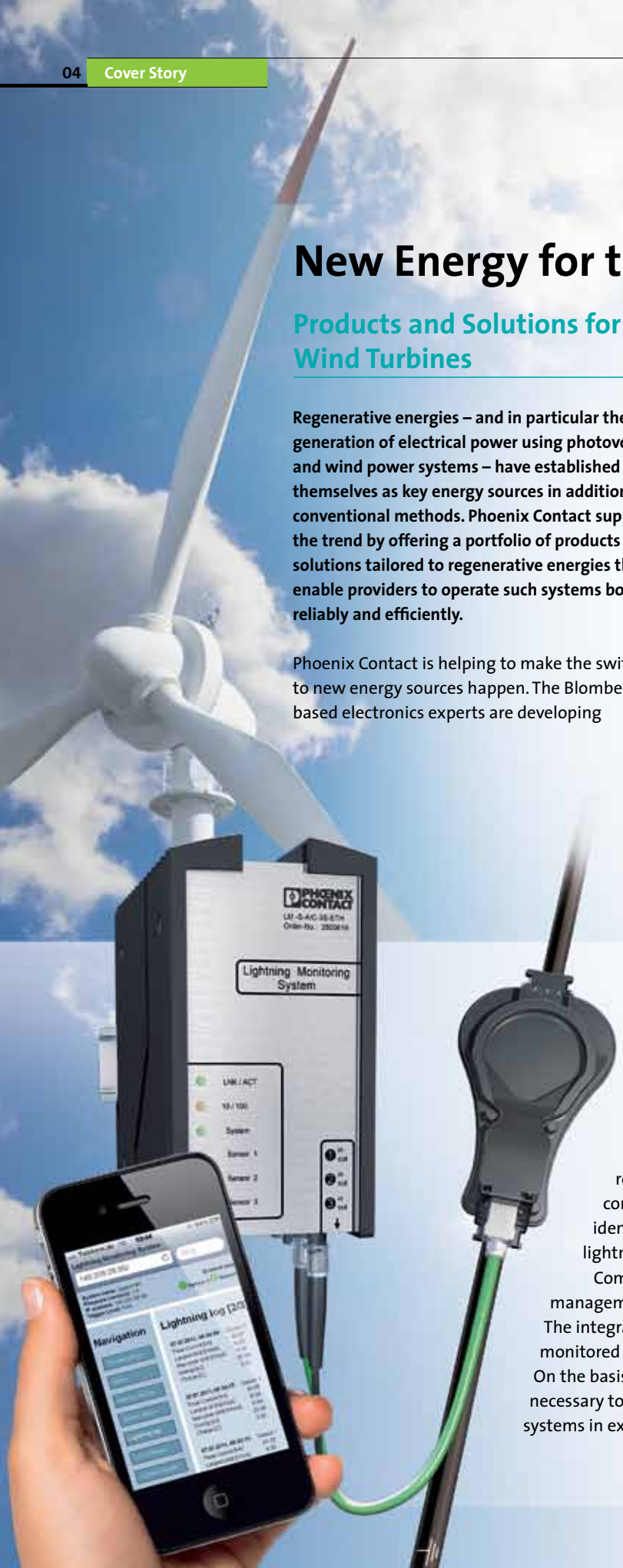
Regenerative energies – and in particular the generation of electrical power using photovoltaic and wind power systems – have established themselves as key energy sources in addition to conventional methods. Phoenix Contact supports the trend by offering a portfolio of products and solutions tailored to regenerative energies that enable providers to operate such systems both reliably and efficiently.

Phoenix Contact is helping to make the switch to new energy sources happen. The Blomberg-based electronics experts are developing products, systems, and solutions in close cooperation with leading power companies.

Photovoltaic Products

Phoenix Contact offers various components and systems for the photovoltaic sector, ranging from solar modules through to feed-in technology. The string current can be monitored with current transducers and the brand-new Solarcheck current monitoring system, which helps to boost the efficiency of any PV system. Connection technology tailor-made to meet the needs of the PV industry, such as the Sunclix system, guarantees cost-efficient installation and safe operation.

In the event the standard does not fit a particular system, we offer to develop customized connection solutions for module and device manufacturers. We also offer terminal



LM-S Lightning Monitoring System

The LM-S Lightning Monitoring System provides online information on wind turbine lightning strikes. The system comprises an evaluation unit with up to three sensors. The sensors are mounted on the lightning rods that conduct the lightning current. Fiber-optic cables connect the sensors to the evaluation unit. The system identifies and analyzes all important parameters of the lightning surge currents based on the Faraday effect. Communication with existing supervisory control or management systems is established via an Ethernet interface. The integrated Web interface allows access to key data from all monitored systems around the clock via the system's own network. On the basis of this information, users can decide whether it is necessary to make a service call. This is especially advantageous for systems in exposed locations, as is the case with wind turbines.

blocks that meet the specific requirements of crystalline and thin-film modules. This is complemented by harmonized lightning and surge voltage concepts essential for facility operators in order to safeguard their investments.

As regards energy data capture, status diagnostics, panel tracking, and solar farm management, solutions for these areas are developed by Phoenix Contact experts according to our customers' specifications.

Wind Power Products

The product spectrum for wind turbines ranges from special connection systems for the distribution level, power supplies, and process signal transducers all the way through to end-to-end automation including safety technology. The latter encompasses controller computers, I/O systems, and also radio devices. These products provide the basis for devising comprehensive solutions that optimize the operation of wind turbines and communication among systems in wind parks.

What makes Phoenix Contact stand out as a supplier of electrical and electronic components and automation technology is the broad product range and system technology that can be tailored to any application. The result: Consistent and flexible solutions for nearly any requirement scenario – from small wind turbines to multi-megawatt installations. ■

Christoph Manegold

Solutions for Wind and Solar Power

Phoenix Contact supplies the wind energy sector with solutions that ensure efficient operations of individual systems or entire wind farms. The central building block for operational facility management is a scalable control system. Here the range starts with 100-series ILC controllers and goes all the way to 400-series high-performance controllers. Built to withstand harsh environments, the controllers ensure high system availability, both onshore and offshore.

A tracking solution based on ILC mini controllers equipped with a special function module helps operators maximize the yield of their photovoltaic systems. Special program libraries also allow operators to implement specific applications for multi-panel systems or for operating entire solar farms. Comprehensive solutions for energy data capture provide the basis for reliable facility monitoring and quick response times in the event of a malfunction.

Sunclix DC Plug Connector with Fast Connector

DC plug systems for photovoltaic installations need to offer a high level of safety and longevity and should also facilitate fast assembly. Sunclix plug connectors allow solar installers to connect wires quickly and easily without the need for special tools. This is made possible by unique spring technology that establishes safe and long-term contact of wires. The locking mechanism, which prevents accidental removal of the plug from the device, can be opened with a normal screwdriver. Y connectors available in various cross sections, clearances, and lengths can be used to arrange strings and modules in parallel.

Panel feed-throughs with a pre-assembled PV cable help users integrate pluggable DC interfaces into power inverters and generator terminal boxes. These are available in various wire cross sections. All Sunclix DC plug connectors comply with protection class IP68 (2m/24h) and the DIN EN 50521 standard.

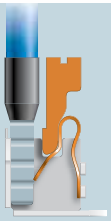
The entire I/O station can withstand strong mechanical loads of up to 25 g and is impervious to EMC interference. This makes Axioline ideal for use in the harsh conditions prevalent in wind turbine installations.

As Fast as the Wind ...

High-Speed Axioline Peripherals for System Control

Axioline is a new I/O system for sensors and actuators. Featuring an integrated high-speed bus, it allows signals to be transferred with hardly any delay. Combined with easy handling and a sturdy design, this makes the technology highly attractive for use in wind turbines.

Modern wind turbines are equipped with complex process control systems, signal processor-powered infeed converters, as well as systems for monitoring the system status. The numerous decentrally installed subsystems result in high management costs. Many system designers therefore opt for a harmonized, flexible bus system with a high transmission rate that is built to last in harsh environments.



Push-in terminals make wiring fast and easy, without the need for tools.

Rapid installation: The Startup+ software helps users set up and troubleshoot the wiring.

Simple, Fast, and Sturdy

Inspired by this demand, Phoenix Contact developed Axioline, a new I/O system with Ethernet connection that combines the advantages of Industrial Ethernet with the benefits of a traditional terminal block. The simple, robust, and fast real-time I/Os open up new potentials for further optimizing facility automation. For example, Axioline can be used to directly connect oscillation or vibration sensors to the process control for condition monitoring, to control high-performance semiconductors for feeding power into the grid, or to improve measuring systems. ■

Stefan Gallmann

Taking the Sting out of Lightning

Heavy-Duty PWT Lightning Arresters

Wind turbine operators demand the highest standards in terms of safety and uptime to achieve a fast ROI. The new PWT lightning arrester offers a high arrester rated voltage, remote status notification, and a long service life, thus meeting all of the above demands.

The new Powertrab PWT 35-800 AC-FM type I arrester was specially designed for application in exposed industrial facilities, in particular for on- and offshore wind turbines.

Featuring a nominal conductor voltage (U_c) of 800 V AC, the protection device, which is also free of secondary and leakage currents, is in a league of its own. Its lightning current-carrying capacity of (I_{imp}) 35 kA (10/350 µs) per phase means that it fully complies with lightning protection class I for IT power supplies. Moreover, the device is built to withstand even greater loads, further increasing its service life. With a high TOV (temporary overvoltage) withstand capability of 1960 V AC, the Powertrab PWT is even resistant to fault feedback from the medium-voltage system.

Condition Monitoring Is Possible

A new, multi-level monitoring system allows the Powertrab arrester to provide current, reliable information on its status. In addition to a function display which can be read on site, the arrester also permanently transmits its state to the remote facility control center. In the event the device has sustained minor damage, this information is immediately available to the service team. At this point, Powertrab is still operational, fully protecting the facility. The advantage: Premature servicing is avoided – the affected protection device is replaced at the next regular maintenance interval. ■

Rolf-Dieter Wagner

The Powertrab PWT lightning arrester is designed for space-saving assembly in the control cabinet.

When PV solutions are integrated into buildings, they also serve as an architectural feature. The compact design of the miniature connectors helps to improve the overall aesthetic impression.

Innovation Across the Board

Miniature PV Plug Connector System for On-Wall Modules

Installing PV systems into buildings is a trend that has been continuously picking up. Phoenix Contact has dedicated a lot of time and research into developing a miniature family of plug connectors which can be installed out of sight behind the PV modules or directly into the facade frame. The robust components operate reliably even in adverse weather conditions.

The miniature connectors have an outer diameter of 11 mm and were specifically designed for thin-film and BIPV (building integrated photovoltaic) modules. They are available in a pre-assembled or a customizable version.

The customizable plug connector facilitates quick and easy on-site assembly without the need for special tools. This helps to greatly reduce the time and effort required to install the system.

The pre-assembled version is mainly intended for thin-film modules but also supports components such as string lines, diodes, and fuses. These high-performance (15 A, 1000 V) miniature connectors complying with protection class IP67 can be used for a broad range of applications and require only very little installation space thanks to their compact size.

Another noteworthy feature lies in the twisted, gold-plated contacts that prevent friction corrosion and guarantee a long electrical service life owing to the precious metal coating. These products not only cater to the needs of the solar industry but are also ideal for application in many other fields, including machine and plant construction, event technology, ship building, underground parking lots, and greenhouses.

Compact Diode Box

Phoenix Contact offers a compact 'string diode' box that prevents regenerative currents that can occur in thin-film modules as a result of shadow effects. The entire product family is plug compatible and thus provides users with a consistent tool for wiring the PV system. ■

Andreas Schamber

The new miniature plug connectors have an outer diameter of only 11 mm.

High-Voltage Specialists

Terminal Blocks for the Generator Terminal Box (GTB)

Photovoltaic systems generate direct currents of up to 1000 V, calling for especially sturdy wiring components. To answer this demand, Phoenix Contact offers a terminal block line for connecting the generator that has been designed and tested for use in PV systems.

The DIN VDE 0100-712 standard for low-voltage electrical installations applies when designing generator terminal boxes (GTBs) as it defines the requirements for operating sites, rooms, and special facilities. In this context, the generator terminal box forms the interface between the modules and the inverter.

Broad Product Range

The PV range comprises, among others, disconnect terminals, diode terminals, spacer plates, feed-through terminals, and fuse terminals. The disconnect terminal is used to isolate individual module strings when performing maintenance or repair work. Also, measurements and tests can be performed via the terminal block's checking and bridge shafts. The disconnect terminal also comes in handy during system installation since PV modules permanently deliver energy.

The diode terminal for photovoltaic systems with thin-film modules serves as a string diode that prevents individual string modules from being operated in the event of a fault, for example when shadow effects or feedback current defects occur. The terminals are factory populated with type P1000 M diodes. On demand, customized arrangements are also possible.

The feed-through terminals are easily and quickly interconnected using plug-in jumpers, thus providing an efficient means of combining multiple strings. The fuse terminals in the GTB protect cables and strings from inadmissibly high fault and regenerative currents that may occur when parts of the PV system fail or fall into shadow. ■

Markus Scholz

The generator terminal box acts as an interface between the modules and the inverter.

The disconnect terminal facilitates isolation of PV system parts during maintenance and measuring work.

The Amaraleja facility combines 2,520 solar trackers comprising a total of 262,080 photovoltaic modules.

Reaching for the Sun

Solar Power Plant Automation with ILC 150 ETH

In Amaraleja, Portugal, a solar farm comprising 2,520 solar trackers generates up to 45.8 MW of electrical power. ILC 150 ETH compact controllers from Phoenix Contact collect the solar panels' operating data and prepare them for further processing.

A large PV system distributed over a wide area is very challenging as regards intelligent error management and the continuous monitoring of operating or process data. At the Amaraleja facility, the ILC 150 ETH compact controller from Phoenix Contact takes care of these tasks. What made the decision-makers choose this compact PLC for collecting and pre-processing operating data of the individual solar panel strings is the modular, flexible, and scalable I/O system of Phoenix Contact's Inline range, which also complies with protection class IP 20. In addition, the compact controller comes with an Ethernet interface, greatly facilitating networking.

Signal transducer for conditioning the analog input signals.

Cost-Efficient Monitoring

The large Amaraleja facility combines single-string monitoring on the direct current side and inverter monitoring on the alternating current side. This is complemented by sensors that collect environmental measuring data at various select locations. A shunt resistor or a Hall-effect sensor and a Rogowski coil are used to measure the string current. Both measuring transducers are part of the Phoenix Contact product line. On the feed-in side, inverters are used and their operating parameters must be monitored as well. Depending on the type of inverter, the data is either directly downloaded from the device via the serial interface and Modbus/RTU or, if modern components are used, via Ethernet and Modbus/TCP.

As Inline controllers of the 100-type performance class from Phoenix Contact are factory equipped with an Ethernet interface, Modbus/TCP devices can be connected to the PLC with ease. Owing to pre-built communication libraries for the PC Worx engineering environment, programming becomes a simple task. ■

Michael Gulsch

The ILC 150 ETH Inline controller and the connected I/O modules serve as a central unit for collecting all operating data.

Superior Technology for the A1

Automation Technology from Phoenix Contact at Work in the Brussels Audi Plant

The new Audi A1 is built in Brussels' Vorst district, at one of Audi AG's most modern production facilities. Phoenix Contact supplied control hardware and software and performed comprehensive on-site training and support. Standardized technology across all international sites helps to increase efficiency and profitability.

As a trusted system partner of Audi, Phoenix Contact provided control technology for the auto body production line and the associated conveyor infrastructure, among other things. "Ingolstadt headquarters developed a standard solution based on a PLC from Phoenix Contact, so my department continued this process as part of the A1 project. We decided to use the Profinet bus system for communication between the robot lines as well as in all transport systems. In addition to controllers, industrial PCs, and Web panels, we use switches, I/O modules, connectors, safety relays, and connection terminals from Phoenix Contact," explains Geert de Coppel, responsible for control technology and software at Audi.

Audi Brussels opted for the Remote Field Controller RFC 470 controller, which features Profinet, Interbus, and Ethernet interfaces. Geert de Coppel comments on the task: "Every PLC is responsible for addressing multiple components of the transport system in its sector, as well as connecting them to the adjacent robot controls. This is why the RFCs must be able to manage a large number of operator panels."

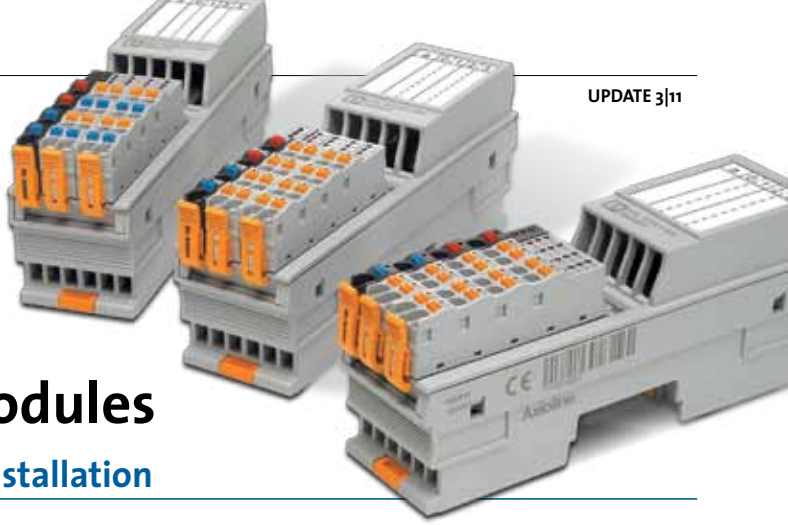
Software Modules for Simplified Programming

On top of this project, Phoenix Contact put their heads together with the Audi Planning Department in Ingolstadt to jointly develop various basic function modules for the software that controls the soldering lines and conveyor technology. Wim van Goethem, an engineer at installation partner Imtech, is very happy about the Audi Group's decision to cooperate with Phoenix Contact: "The automation specialists' teams have developed many modules used in numerous programs, for example, for controlling valves, conveyor belts, or rotary tables." ■

Joris Huegaerts, Marc Wevers

The modular, standardized control cabinet design significantly simplifies setting up, operating, and maintaining the production facility.

An RFC 470 can monitor up to 15 HMI devices via a standardized OPC data connection, which requires high performance, say Geert de Coppel (l.) from Audi and Wim van Goethem from Imtech.



Compact Modules

For Space-Saving Installation

The Axioline real-time I/O system now offers new, extra-compact module types featuring a high channel density. The two new highly compact digital I/O modules AXL DI 16/1 and AXL DO 16/1 accommodate 16 channels with single-wire connections. This makes them ideally suited for installation in tight spaces, such as the hubs or blades of wind turbines.

The new, digital output module AXL DO 8/2-2A with 8 channels, 2-wire connections, and an output current of 2 A per channel complements the two modules. This product is also based on the new, compact Axioline housing. ■

Protected Signals

Coaxial Protective Adapter for Antenna Connections

The new CSMA-LAMBDA/4-2.0-BS-SET coaxial protection adapter from Phoenix Contact protects antenna connections of radio systems for narrow-band signals with a frequency range of 1.7 GHz to 2.3 GHz.

Application scenarios include antenna connections of mobile, Trusted Wireless, and IO radio systems. The set comprises a protection device and adapters equipped with SMA connectors. If desired, the protection device can be directly installed into the antenna cable or the end device without an additional adapter cable. The CN-UB/MP mounting plate is available for installation in a control cabinet. ■

Cable Included

Pre-Assembled Photovoltaic Plug Connectors

The Sunclix plug connector family now also comes in a pre-assembled version with connected solar cable. It was mainly designed for panel and junction box manufacturers. But the plug connector is also suitable for other specialized applications, such as generator terminal and surge voltage protection boxes on the direct current side. Available for all common cable cross sections, 2, 5, 4, and 6 mm², it covers basically all PV applications. ■

Monitoring String Currents the Easy Way

Solarcheck PV Monitoring System

The two-part monitoring system comprises a measuring module and a communication module.

The compact 22.5-mm measuring module determines the current values of up to eight PV strings without taking up a lot of space. Measuring is performed with Hall sensors. The live cables are threaded through holes in the module during installation, meaning there is no need to disconnect the cables. This prevents the introduction of any further contact points, which would generate contact resistance and thus represent a potential source of error. The device also detects direct current voltages of up to 1200 volts, providing a constant overview of the installation's power and productivity.

The communication module collects measurements from up to eight measuring modules and relays them to a superordinate controller as a Modbus RTU slave. Up to 31 communication modules can be integrated without a repeater, allowing for the reliable monitoring of almost 2000 photovoltaic strings.

Mobile Markers

Simple and Professional Labeling of PV Systems

Phoenix Contact offers a customizable marking system that addresses various PV-specific needs.

Thermomark Card can print any kind of plastic labels in card and mat format. Thermomark Roll processes labels and heat-shrink tubing in specific formats or endless rolls. An outstanding feature of these printers is the high printing speed of eight seconds per card. The compact printers are built for use on the shop floor but also support mobile use at the construction site. The Clip Project planning and marking software is pre-installed on a robust notebook. The Plug & Play system is immediately ready for printing and offers a bidirectional interface to common CAE systems. The software also facilitates quick, direct entry of labeling data.

Always “App to Date …”

Phoenix Contact Catalog App

The complete Phoenix Contact catalog is now also available as an app for the Apple iPhone, iPad, and iPod. The tool can be downloaded from the app store for free.

The catalog app enables customers to conveniently locate articles and view all key data at a glance. The tool displays extensive article data as a PDF document, which can be saved. Wish lists that can be stored and managed further facilitate product searches. After users find products with the catalog app, they can directly place an order with Phoenix Contact. The tool is available in both English and German.

Convenience and mobility to the max: catalog app for the iPhone.

‘Acid Test’ for Batteries

New Test Lab for Lithium-Ion Batteries Opened

Phoenix Testlab GmbH opened a lab in Blomberg, Germany, for testing high-performance electrical vehicle batteries. The spacious 950-square-meter lab provides all the space and equipment needed to perform any thermal-climatic and corrosive tests.

The range of lithium-ion systems to be tested spans from single cells and modules through to a full-sized EV battery. The test systems were individually adjusted to meet the technical demands of the test service provider's customers. Powerful assemblies allow for dynamic cyclization of single battery modules or large battery systems. The test portfolio also includes controlling the batteries' temperature in climatic test enclosures. In the next stage, the test provider will commission a new, highly powerful shaker. This will be used to perform shock testing of even large battery systems. Completion of a new walk-in salt fog chamber is scheduled for October 2011. Both testing facilities allow batteries to be tested during ongoing operation. When designing the battery lab, the implementation of comprehensive safety systems was a key focus.

http://www.phoenix-testlab.de

Battery tests are carried out in testing chambers; this one is equipped with a climatic test enclosure.

UPDATE
1/12 will be published in February 2012.

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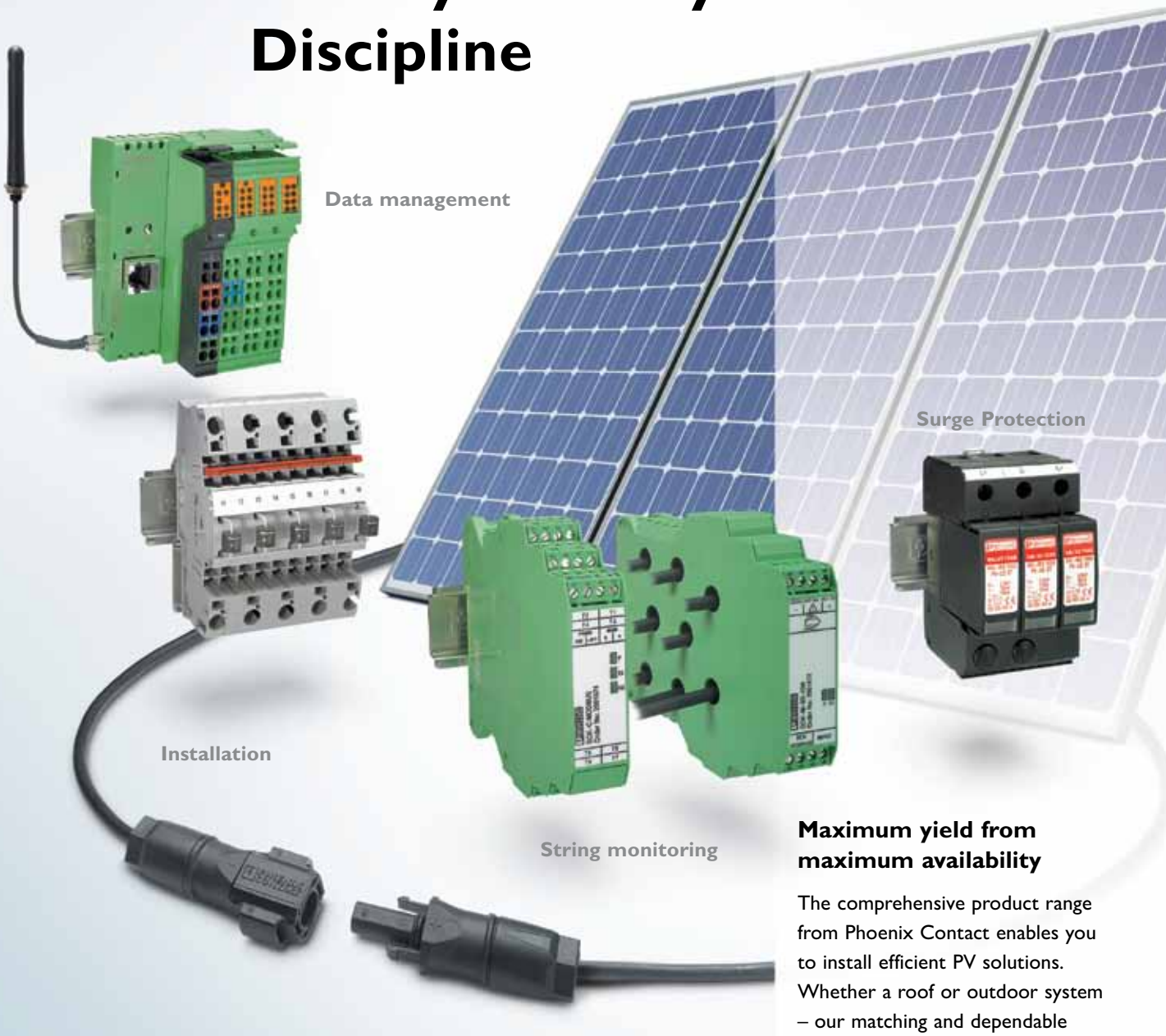
Photovoltaic

Reliability in Every Discipline



Maximum yield from maximum availability

The comprehensive product range from Phoenix Contact enables you to install efficient PV solutions. Whether a roof or outdoor system – our matching and dependable system components contribute to the maximum availability of your PV system.

For more information, call
Phone +49 (52 35) 3-1 20 00 or visit
phoenixcontact.de

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