Solar energy

Solutions for photovoltaics

PHOENIX CONTACT
INSPIRING INNOVATIONS

In dialog with customers and partners worldwide

Phoenix Contact is a global market leader in the field of electrical engineering, electronics, and automation. Founded in 1923, the family-owned company now employs around 14,000 people worldwide. A sales network with over 50 sales subsidiaries and 30 additional global sales partners guarantees customer proximity directly on site, anywhere in the world.

Our range of services consists of products associated with various different electrotechnical applications. This includes numerous connection technologies for device manufacturers and machine building, components for modern control cabinets, and tailor-made solutions for many applications and industries, such as the automotive industry, wind energy, solar energy, the process industry or applications in the field of water supply, power transmission and distribution, and transportation infrastructure.

Company independence is an integral part of our corporate policy. Phoenix Contact therefore relies on in-house competence and expertise in a range of contexts: the design and development departments constantly come up with innovative product ideas, developing special solutions to meet customer requirements. Numerous patents emphasize the fact that many of Phoenix Contact's products have been developed in-house.

"Current from solar energy plants plays a significant role in the worldwide energy market. Reasons for the success story include the ever-decreasing system costs, the increasing degree of automation and advancing standardization. These enable reliable and efficient operation of large-scale photovoltaic plants, even under harsh ambient conditions. Phoenix Contact has been an expert provider for solutions and products in the solar energy area for many years. Design an environmentally-friendly and cost-effective energy supply system together with us."

Stefan Gallmann, Global Industry Manager

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Overview: Solutions for photovoltaics

Ground-mounted systems

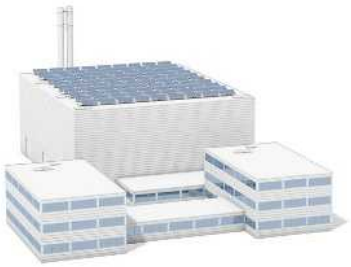
Intelligent connection technology reveals its strengths in the installation of ground-mounted photovoltaic systems: It is quick and easy to do. For efficient operation, Phoenix Contact offers all string combiner box components as well as solutions for park management.

For further information, see page 6 onwards

Tracking systems

Tracking systems aim to deliver maximum energy yields. With durable and reliable technology from Phoenix Contact, you can rest assured that the additional financial expenditure that these systems involve will be worthwhile.

For further information, see page 20 onwards



Roof-mounted systems

Rooftop photovoltaic systems are susceptible to damage from lightning strikes. Protect your systems and connected systems reliably and permanently – with powerful surge protection.

For further information, see page 24 onwards

Building integration

Building-integrated photovoltaics offer huge potential for environmentally-friendly urban energy generation. However, the prevailing structural conditions pose special cabling challenges.
The solution: Phoenix Contact connector systems.

For further information, see page 30 onwards

Autonomous energy supply

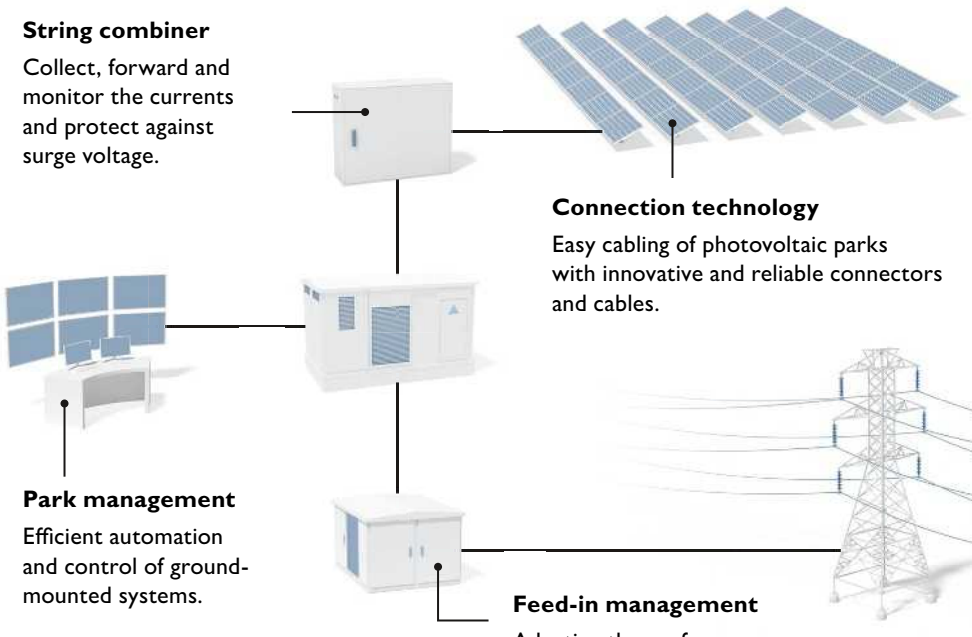
Photovoltaic diesel hybrid systems are often used in regions without reliable network expansion. Components and solutions from Phoenix Contact ensure that the required amount of energy is available at all times.

For further information, see page 34 onwards

Solutions for ground-mounted systems

Photovoltaics make a major contribution toward meeting the continually rising energy requirements. Interest in building increasingly larger and more powerful ground-mounted photovoltaic systems is on the increase worldwide. Networking, monitoring, and communication are indispensable in this regard, particularly in relation to constant network quality and maintenance in line with requirements. At the same time, in the case of larger systems, the aim is an easy and fast connection technology. Discover the advantages of Phoenix Contact solutions for yourself.

Overview: Ground-mounted systems



String combiner

Collect, forward and monitor the currents and protect against surge voltage.

Connection technology

Easy cabling of photovoltaic parks with innovative and reliable connectors and cables.

Park management

Efficient automation and control of ground-mounted systems.

Feed-in management

Adapting the performance of ground-mounted systems to network requirements.

Solutions for ground-mounted systems

Connection technology

From the photovoltaic panel and the string combiner box to the inverter – Phoenix Contact offers numerous cabling solutions that are perfectly tailored to the requirements for ground-mounted photovoltaic systems. These were designed with durability and quick and easy installation in mind. The DC connectors that can be assembled in the field can be mounted in just a few seconds without special tools. The tailored, high-quality components contribute to the long-term and increased availability of your system.

Your advantages:

- Variety and flexibility, thanks to various conductor cross sections from 2.5 to 16 mm²
- UV, temperature, and weather-resistant design
- Future-oriented for voltages of up to 1500 V
- Innovative spring connection for durable and reliable connections without special tools

Connecting and cabling

The innovative spring connection of the DC connectors enables cables from 2.5 to 16 mm² to be connected reliably and safely without special tools. This facilitates a particularly easy and fast on-site assembly.

Distribution

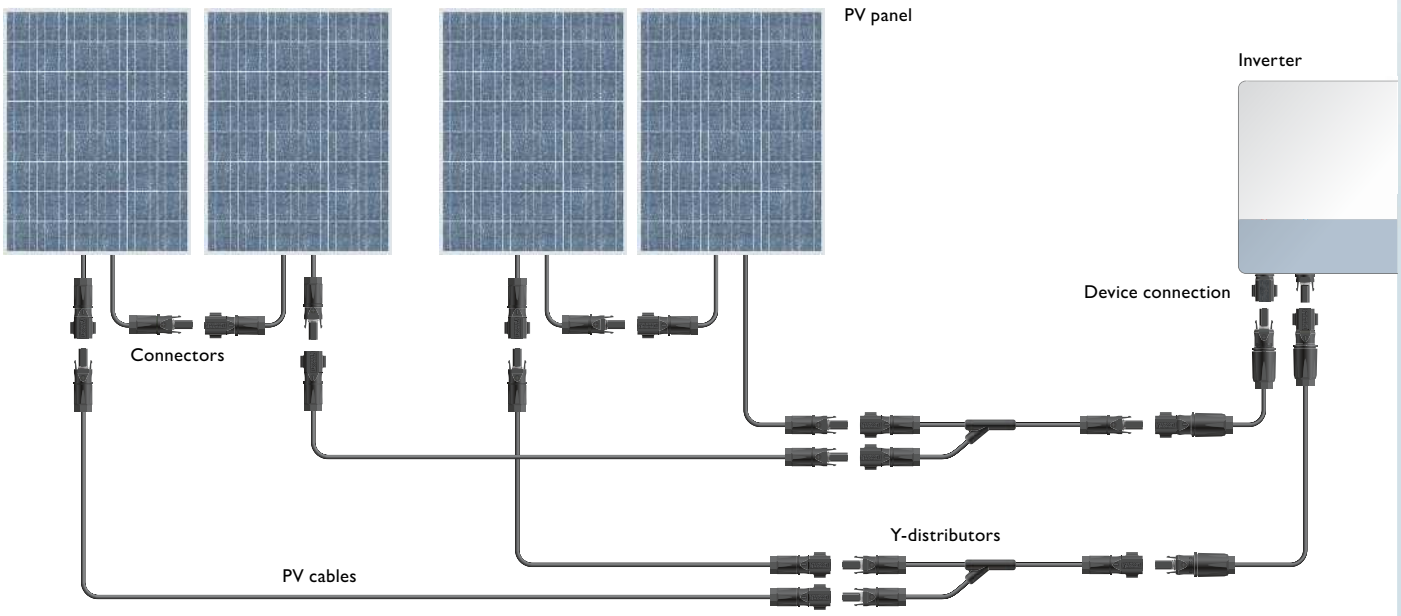
Y-distributors provide even more flexibility in photovoltaic cabling. Route adjacent strings easily and inexpensively to the inverter with only one string cable. Mounting with connectors is also possible. Customer-specific cable lengths are available on request.

Device connection

Phoenix Contact provides connectors and housing feed-throughs for the reliable transmission of signals, data and power. All components are made from high-quality, rugged materials. They have undergone intensive laboratory testing and ensure a permanently stable connection of your devices.

Seamless connection technology from the photovoltaic panel to the supply

Connectors and cables facilitate fixed or flexible installation and are suitable for a temperature range of –40 °C to +85 °C.



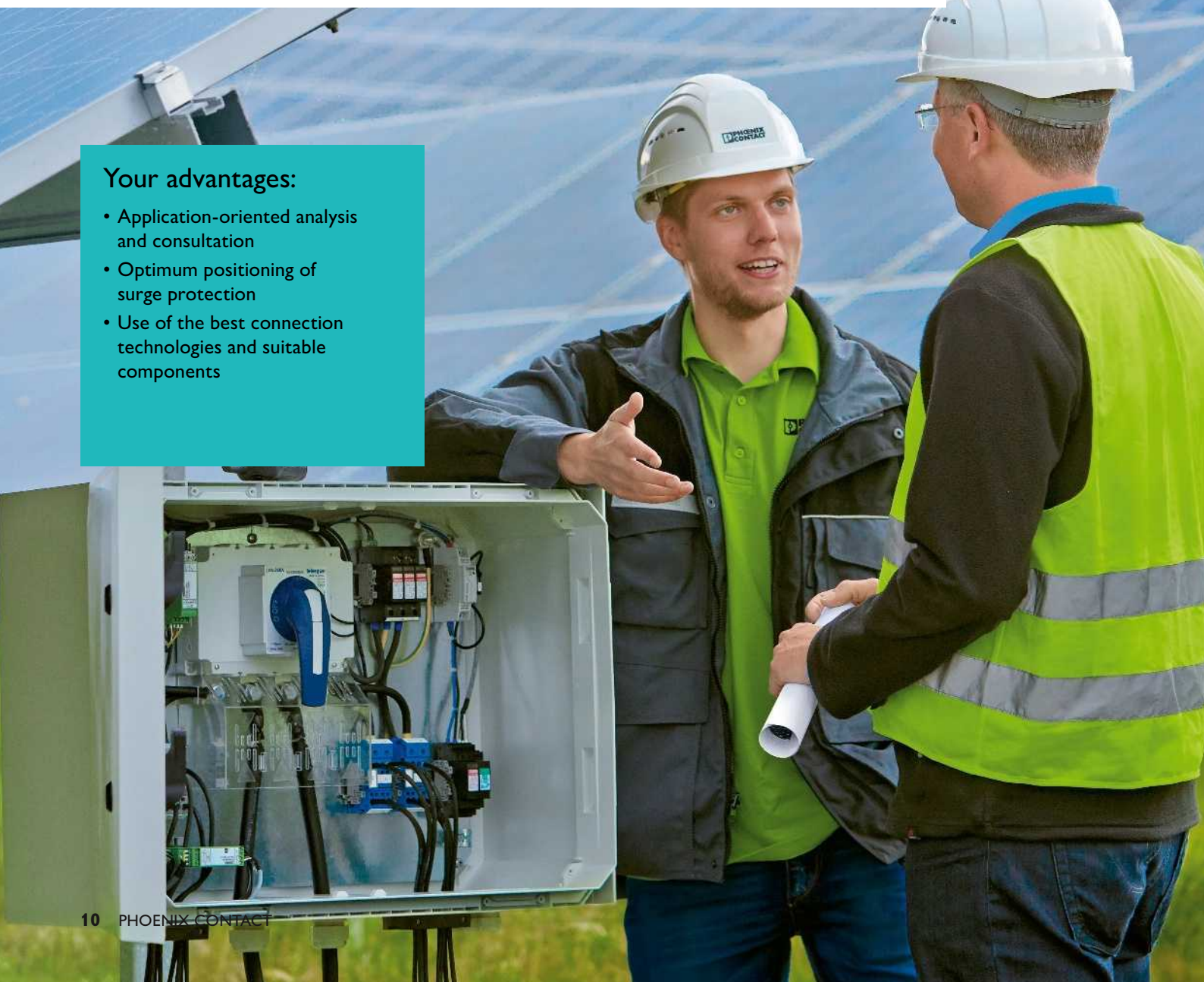
Solutions for ground-mounted systems

String combiner

Planners und installers have the challenge of achieving maximum availability and performance of photovoltaic systems in regions with varying climactic conditions. The important factors here are collecting and distributing string currents, protecting the individual modules against damage from lightning and surge voltages, and monitoring the performance of the system. String combiner boxes (SCBs) from Phoenix Contact meet these requirements in a space-saving housing. During preliminary development clarification, all divisions work closely with our customers.

Your advantages:

- Application-oriented analysis and consultation
- Optimum positioning of surge protection
- Use of the best connection technologies and suitable components



Collection and distribution

Quick installation and commissioning and high availability: Using prefabricated SCBs, you can ensure operator satisfaction. Using optimally coordinated components and communication interfaces allows SCBs to be connected to a higher-level park management system quickly and easily.

For additional information, enter the web code into the search field on our website:

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Connection and protection

An extensive product portfolio at a wide variety of terminals provide the right solution for any application. Fuse terminal blocks are ideal for protecting individual strings against reverse currents. Diode terminal blocks are specifically suited for using photovoltaic thin film, while the hybrid terminal block merges up to four strings without additional cabling effort.

Protection against surge voltages

Due to their size and exposed location, ground-mounted photovoltaic systems are particularly at risk from lightning currents and surge voltages. Take preventive action and significantly increase the availability of your system with lightning current and surge protective devices from Phoenix Contact. The protective devices fulfill the EN 50539-11 and UL 1449 3rd ed standards for surge protection in photovoltaic installations and are KEMA-certified.

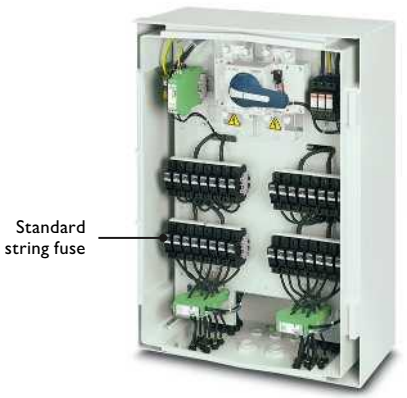
Two intelligent solution concepts tailor-made for any customer requirement

Concept 1 for 32 strings:
SCB with string fuse outside the control box

- Compact design
- Very low temperatures in the SCB thanks to external inline fuse
- Suited for operation under extreme ambient temperatures

Concept 2 for 16 strings:
SCB with standard string fuse

- Temperature-optimized control cabinet design
- Failure due to thermal overload is eliminated



Solutions for ground-mounted systems

String combiner

Photovoltaic systems should achieve maximum energy yield from solar power in the shortest possible time. It is therefore essential to respond immediately to the failure of individual strings. The photovoltaic string current monitoring system from Phoenix Contact enables you to respond immediately to malfunctions and power losses. The system consists of a communication module and various measuring modules, which can be used to reliably monitor the currents and voltages of your system.

Your advantages

- Reduced costs and wiring effort
- A separate power supply unit in the field is not necessary
- Flexibility thanks to 4 and 8-channel versions
- Space-saving installation thanks to the compact design
- Voltage measurement up to 1500 V DC

Monitoring string currents and voltages

Using hall sensors, the current measuring module determines the characteristic data of your photovoltaic systems on a contact-free basis and forwards it to the communication module. 4 and 8-channel versions are available. With the voltage measuring module, you can measure DC voltages up to 1500 V. The module is suitable for measurements in both grounded and isolated photovoltaic systems.

Power supply

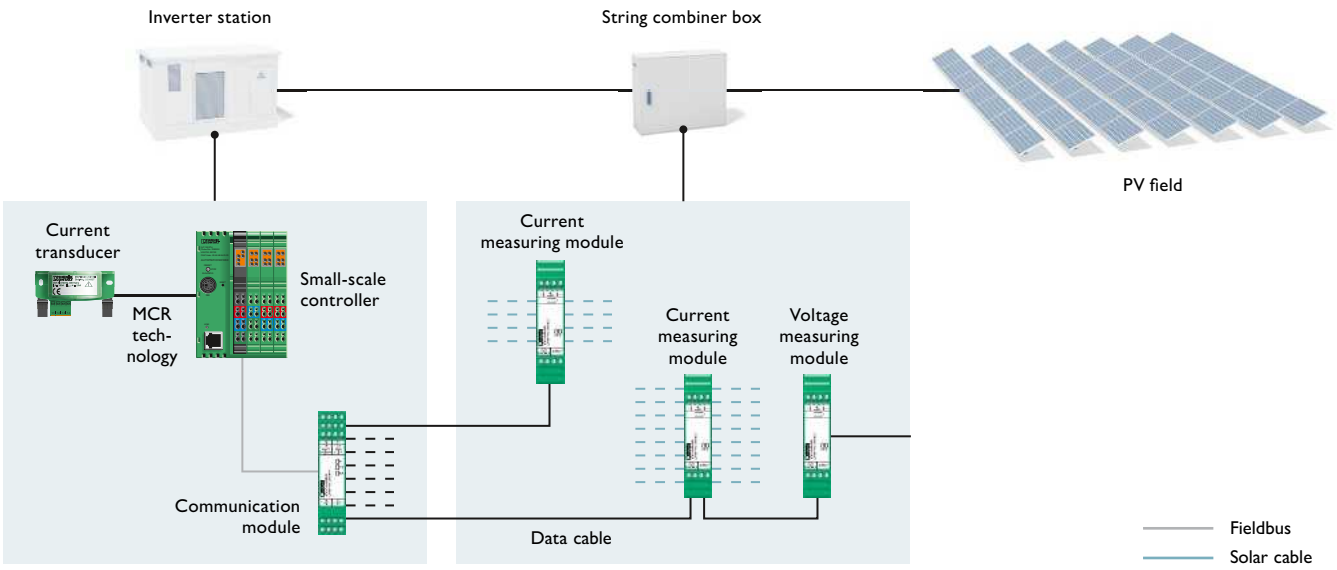
The new DC/DC converter with basic functionality for photovoltaics allows you to supply your string combiner boxes directly from the ground-mounted system. As a result, you save on installation costs and increase system efficiency. Due to the compact design and the high efficiency, the DC/DC converter can also be used in small control boxes.

Converting and monitoring currents from bus cables

The universal AC/DC current transducers are used to monitor DC bus cables up to 600 A. This means that the conductor that is to be monitored does not have to be interrupted. The current transformers make it possible to convert alternating currents for different transmission ratios. Downstream energy meters can be used to record and display characteristic data directly in the control cabinet.

Monitoring photovoltaic strings

The measuring module can be used to measure up to eight direct currents and one DC voltage value at the same time. The complete system enables you to operate eight measuring modules on one communication module. The 2-wire communication cable is used to supply the measuring modules with power. An additional power supply unit is not necessary. The universal current measuring transducer enables measurements of AC/DC currents on bus cables.



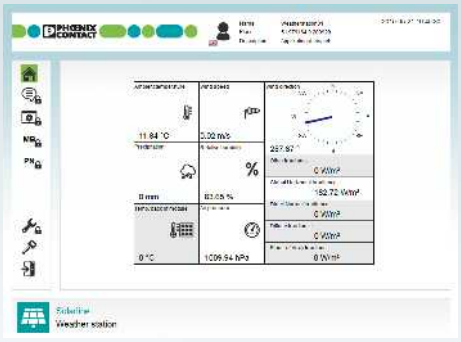
Solutions for ground-mounted systems

Park management: Acquisition of meteorological data

Operators of photovoltaic systems want to be kept informed of the energy efficiency and reliability of their ground-mounted system at all times. A possible measurement of this is the performance ratio, which indicates the ratio of the actual system yield to the theoretically possible yield. If this value decreases unexpectedly, this signifies a system error. Weather stations measure important meteorological data around the clock, such as solar irradiation, wind speed, and temperature. This data is then included in the calculation of the performance ratio.

Your advantages:

- Provision of all required I/O channels
- Connections for all sensors
- Optional sensor heating
- Provision of the sensor data acquired via Modbus according to SunSpec®
- Easy parameterization via the web interface



Connection

The weather station from Phoenix Contact is designed for universal use and supports the connection of up to eleven common sensors via standard interfaces. Furthermore, all electrical components within the weather station are protected reliably against surge voltages.

For additional information, enter the web code into the search field on our website:

#0915

Commissioning

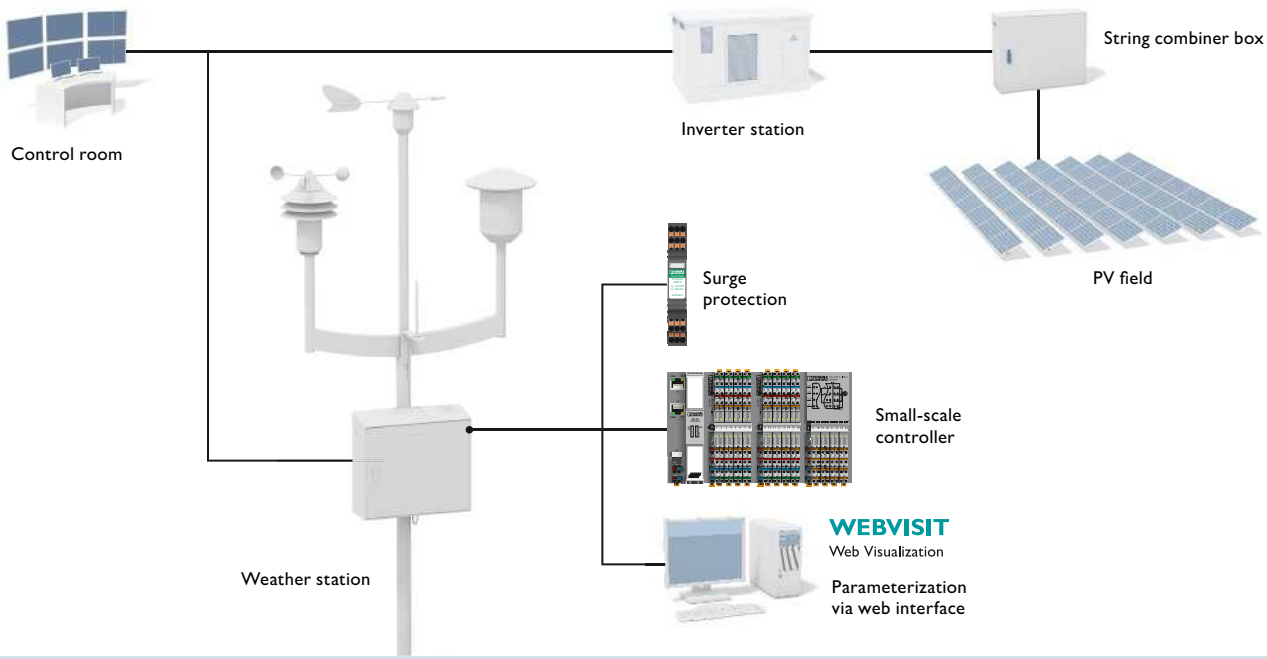
The individual sensors are configured via web interface. No programming knowledge is therefore required in order to start up the weather station. The recorded meteorological data is saved locally on the controller and can be called up, if needed.

Data transmission

To enable an easy connection to a higher-level SCADA system, the meteorological data is provided, if necessary, in a standardized data format such as Modbus, PROFINET or SunSpec® and transmitted via Ethernet. Access to the weather station is possible at any time thanks to the web interface within the system network.

Acquisition of meteorological data for ground-mounted systems

Operators of ground-mounted systems require acquisition of all meteorological data provided by the sensors. This data must be transmitted to a central SCADA system for monitoring and control via suitable interfaces. Data acquisition and transmission must be guaranteed in all ambient conditions which may occur in the field.



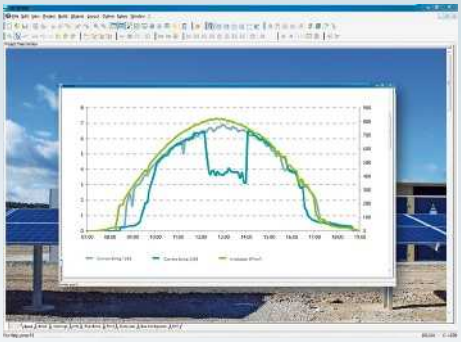
Solutions for ground-mounted systems

Park management: Networking and automation

Use continuous production data acquisition and intelligent data management to enhance the efficiency and yield of your photovoltaic system. The network infrastructure components from Phoenix Contact allow you to safely and reliably network your ground-mounted photovoltaic system. Thanks to intelligent automation and visualization tools, you can continuously record and evaluate data from the ground-mounted system. In addition, you can maintain ground-mounted systems remotely via public networks.

Your advantages:

- Low engineering and operating costs thanks to intelligent automation solutions
- Redundant and thus failsafe networks
- Standardized data transmission in accordance with SunSpec® or IEC 61850
- Fast engineering thanks to specific function blocks



Networking

Network your ground-mounted system quickly and easily with components from Phoenix Contact and create redundant and firewall-protected networks. Irrespective of which transmission medium you use, we have the right network components for you to set up a failsafe communication solution. The basis for this includes the high-performance Gigabit switches, modems, controllers and media converters.

Monitoring and control

A profitable operation of large photovoltaic systems requires continuous monitoring and control at the segment level. The Array Control switchgear and controlgear assembly from Phoenix Contact assumes this function and records all relevant data related to the current performance of the arrays, the ambient conditions and the inverter status. This data is transmitted to a higher-level SCADA system in the central control room.

For additional information, enter the web code into the search field on our website:

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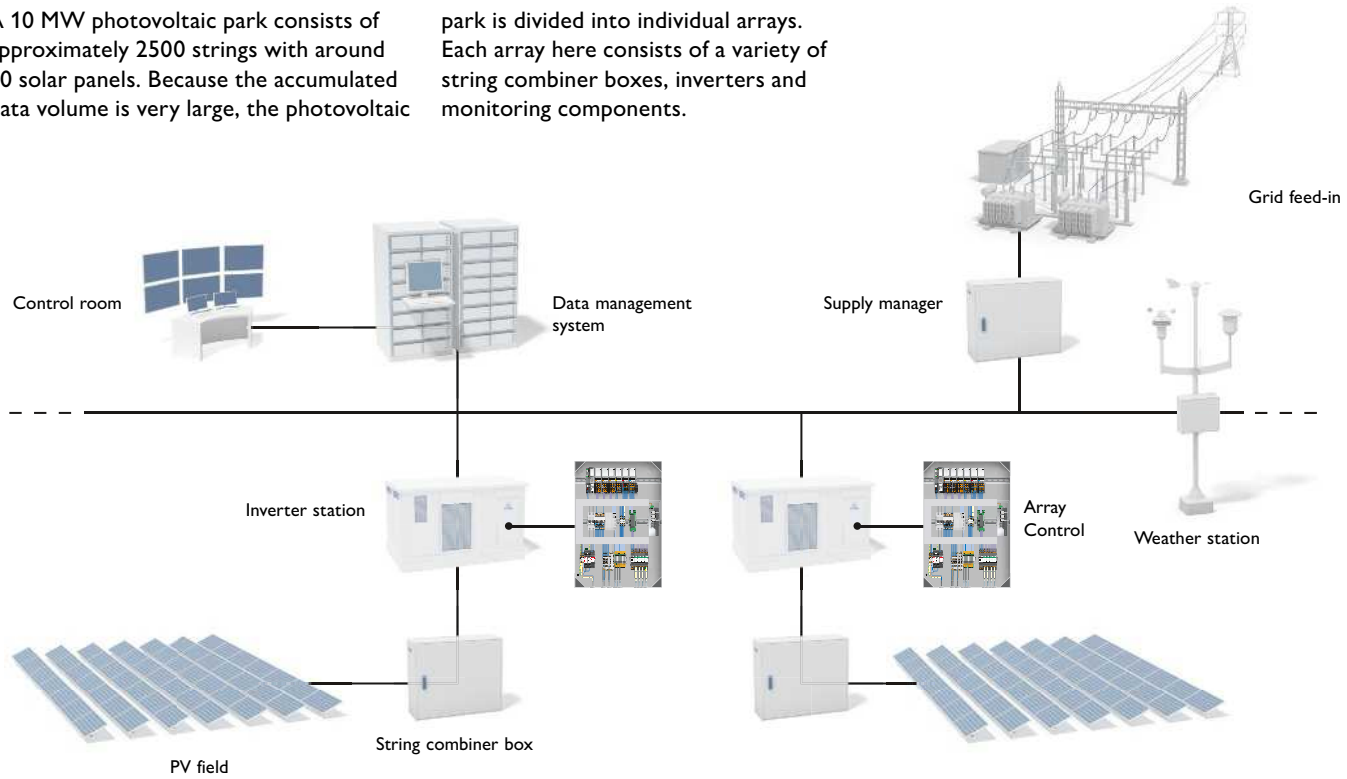
Automation and visualization

Continual control is the key to efficient photovoltaic park management. Phoenix Contact provides standard and customer-specific solutions for the automation and visualization of photovoltaic systems. Innovative software products, such as libraries for function modules in accordance with IEC 61131. A variety of drivers for dataloggers and interfaces for inverters complete the overall package.

Array Control – for efficient operation of large-scale photovoltaic systems

A 10 MW photovoltaic park consists of approximately 2500 strings with around 20 solar panels. Because the accumulated data volume is very large, the photovoltaic park is divided into individual arrays. Each array here consists of a variety of string combiner boxes, inverters and monitoring components.



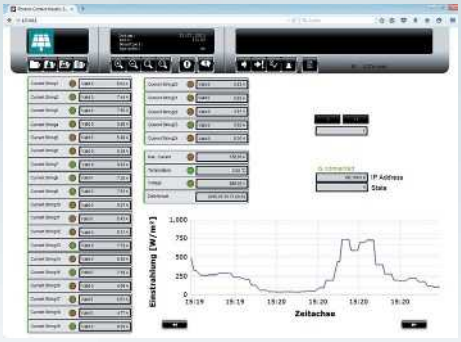
Solutions for ground-mounted systems

Feed-in management

Distributed photovoltaic systems also need to play their part in high grid stability. The responsible network operators specify in their network connection conditions for photovoltaic systems the ranges to be maintained for network frequency and voltage, and for reactive power. To check these values, regulators for energy generation systems (EGS) record the present voltage and reactive power at grid connection points. The respective control values for the inverter are determined based on these values. The solution consisting of hardware and software from Phoenix Contact ensures that the engineering effort with respect to feed-in control is kept to a minimum.

Your advantages:

- Network operator-specific EGS regulator
- Display energy data on the device by pressing the button
- Individual long-term archiving, thanks to powerful database technology
- Tailored reporting, thanks to flexible data analysis and evaluation



Feed-in control

At the heart of the EGS regulator are class 100 Inline controllers, which are programmed in accordance with IEC 61131. A comprehensive portfolio of extension modules is available for small-scale controllers. Park operators can adapt this solution optimally to the requirements of the respective photovoltaic system.

Network integration

With the network-capable energy meters, you can monitor characteristic electrical data both centrally and on site. You can therefore gather all relevant characteristic data for your photovoltaic system using a small-scale controller and log it in an SQL database. The energy meters from Phoenix Contact provide you with the right solution for optimal network integration of your photovoltaic system.

Management

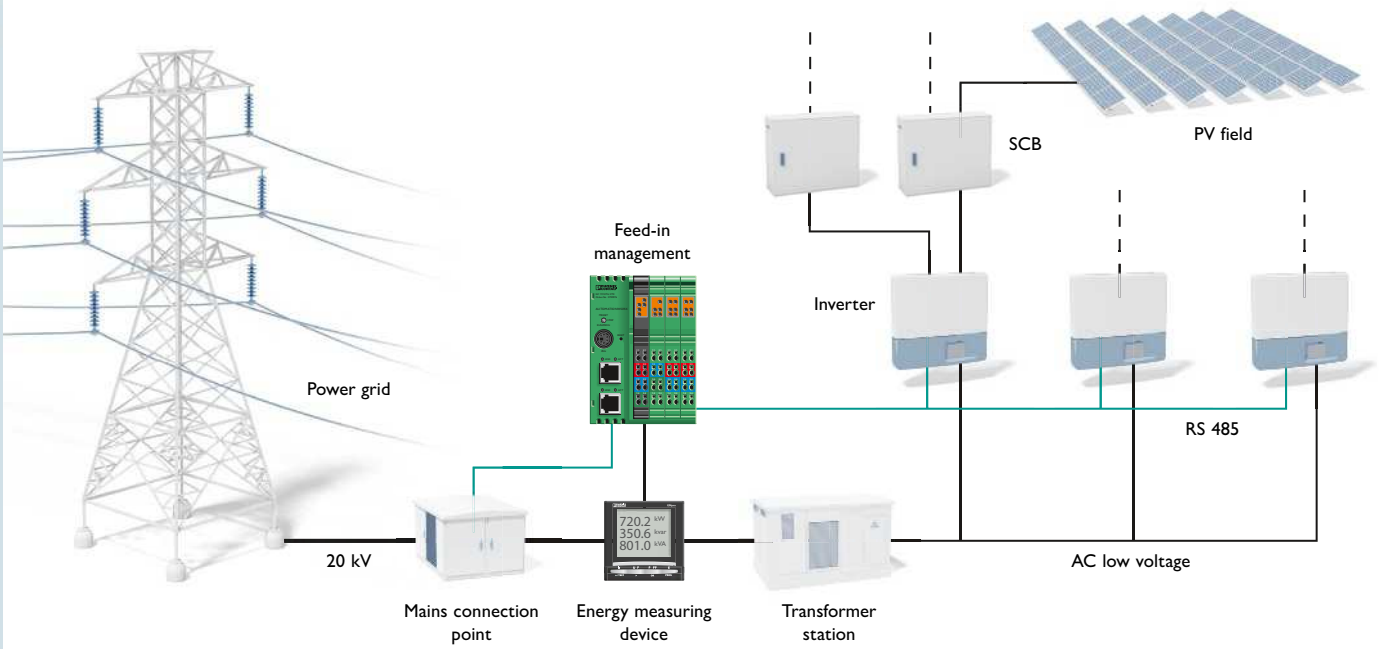
Phoenix Contact provides manufacturer-neutral data management software for recording, archiving and evaluating direct or calculated operating data. The graphic depiction of trends and the logging of selected parameters enable an efficient and comprehensive operations management of photovoltaic systems.

For additional information, enter the web code into the search field on our website:

#0917

Feed-in control for stable power grids

Along with the connection to the feed-in management of the network operator, individual reactive power regulation poses a great challenge. The network parameters at the network connection point are recorded by measuring devices and transmitted to a central EGS regulator. Then, the actuating values calculated from the reactive power regulator are transmitted to the inverter installed in the system.



Solutions for tracking systems

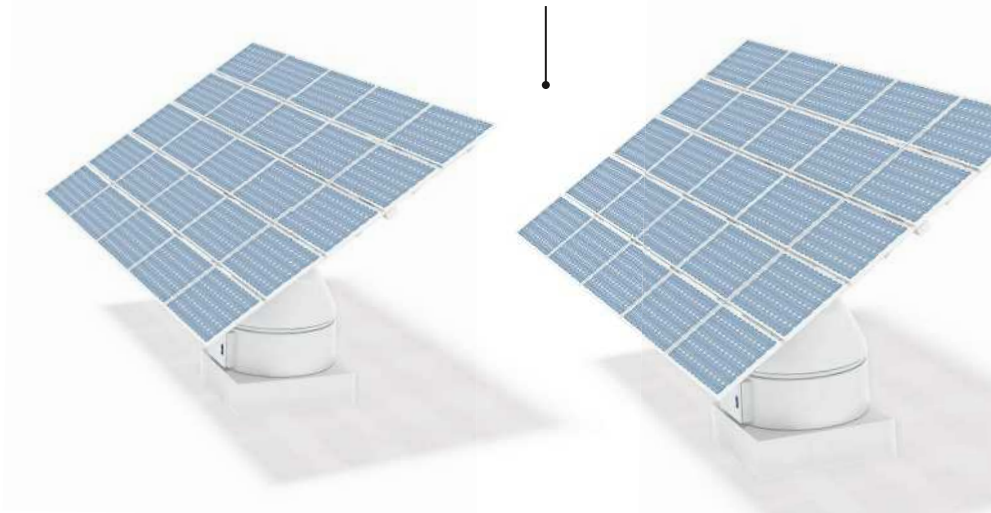
Taking the sunflower as an example, photovoltaic tracking systems also track the course of the sun. In comparison with permanently installed photovoltaic systems, tracking systems therefore generate far higher yields.

With the compact hybrid motor starters from Phoenix Contact, you can switch and reverse tracking systems safely and reliably. In addition, Phoenix Contact offers a comprehensive range of automation components for controlling a tracking park.

Overview: Tracking systems

Tracking systems

Tracking systems with solutions from Phoenix Contact reliably track the sun.



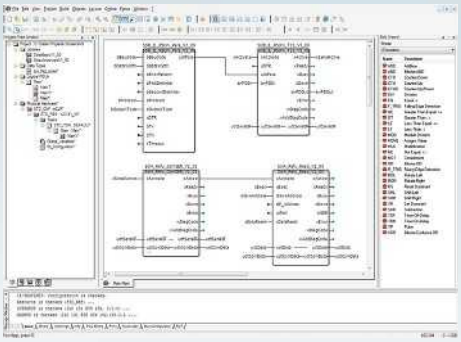
Solutions for tracking systems

Tracking systems

The yield from solar panels can be optimized with the help of a single or double-axis tracking system. Exact tracking aligns the solar cells with the sun so that sunlight invariably falls perpendicular to the solar panels. This guarantees optimum energy generation. Continually monitoring the system status is of great importance in this regard. With software and hardware from Phoenix Contact, you can implement an efficient and reliable monitoring system for your tracking park.

Your advantages:

- Quick startup – via web browser and function block libraries
- Remote access to your tracking park via Ethernet or a mobile phone network
- Ideal, motor-driven alignment of your photovoltaic panels by means of solar altitude calculations



Drive control

Small-scale controllers with an integrated Modbus interface are ideal for controlling tracking systems. Step motor drivers and frequency inverters can be connected directly without any additional modules. Analog or incremental input channels are available for position detection.

Tracking

The hybrid motor starter offers four functions for tracking the photovoltaic panels: forward running, reverse running, motor protection and emergency stop. In comparison to mechanical contactors, the motor starter is significantly more durable, saves space and can be quickly wired.

Function block libraries

Phoenix Contact provides a comprehensive library with complete function blocks. They include, among other features, complex modules in accordance with DIN/NREL algorithms for solar altitude calculation and for monitoring the photovoltaic tracker. This ensures that the photovoltaic modules are always aligned perfectly with the sun at any time of the day or year and provide maximum yield.

For additional information, enter the web code into the search field on our website:

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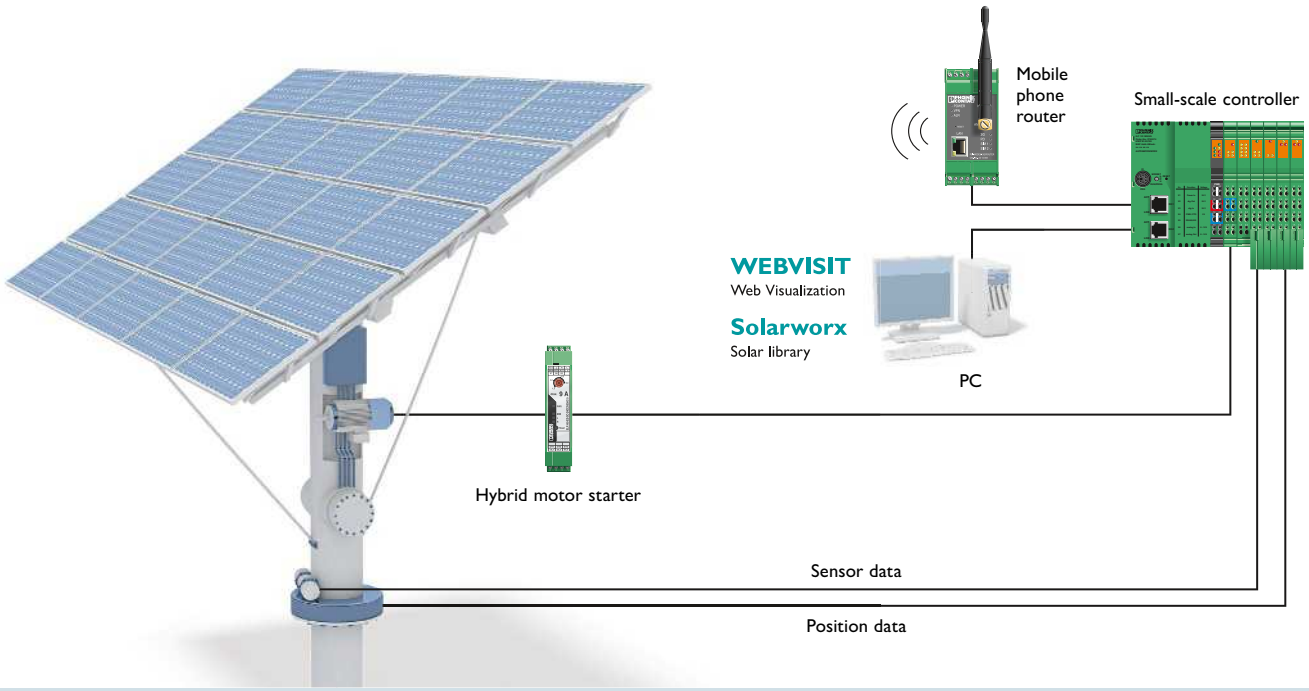
Control and regulate tracking systems efficiently

Increase the yield from your photovoltaic system by systematically tracking photovoltaic panels.



Solutions for roof-mounted systems

Large, slightly slanted roof surfaces provide ideal conditions for the profitable deployment of photovoltaics. As a result of declining panel prices and increasing energy costs, photovoltaic systems on private, commercial, and public buildings are becoming increasingly attractive, even without state subsidies. To monitor the installations and provide permanent protection against lightning currents and surge voltages of all kinds, Phoenix Contact offers a wide range of products for photovoltaic roof-mounted systems. For the maximum degree of safety in the event of danger or maintenance, individual panels can be de-energized. For less optimal roof surfaces, micro inverters are a great alternative. The new connection system for micro inverters is great for universal use and particularly user-friendly.

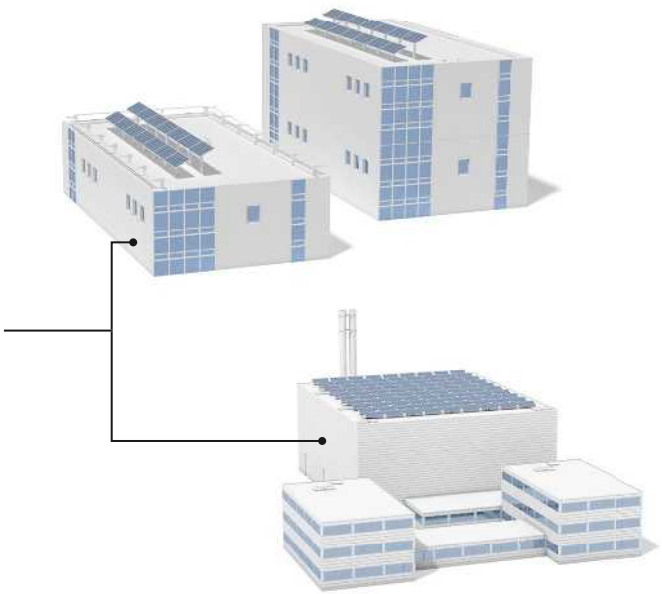
Overview of roof-mounted systems

Monitoring and protecting

Reliably protect photovoltaic roof-mounted systems of any kind against surge voltages and disconnect them if necessary.

Micro inverters

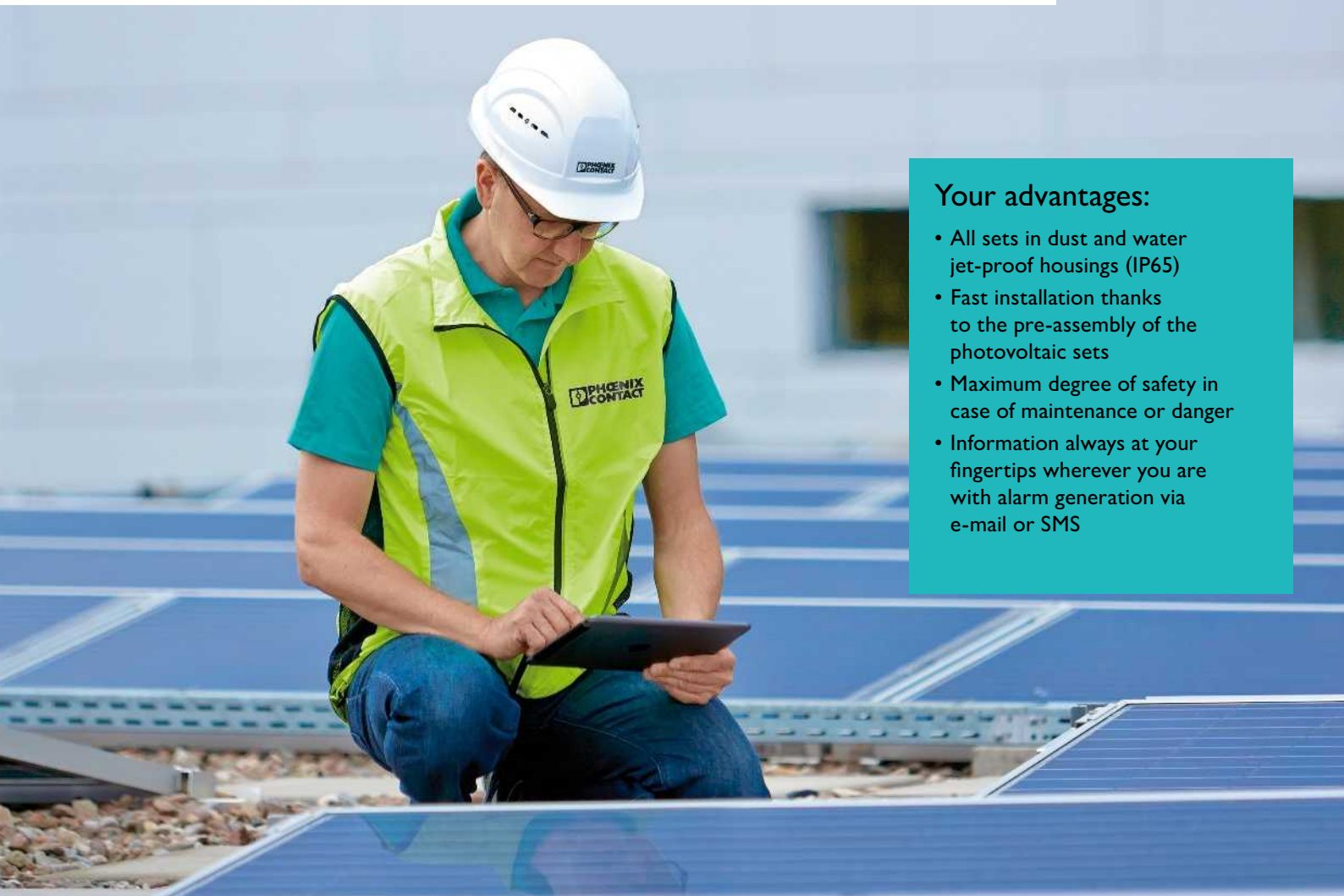
Connect your micro inverters on the AC and DC side so that there is a continuous connection.



Solutions for roof-mounted systems

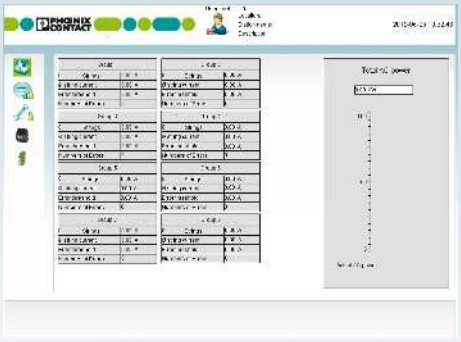
Monitoring and protecting

It is not always a direct lightning strike in the photovoltaic panel that causes surge voltage damage. Surge voltages can also be coupled across module surfaces and DC voltage cables. Additional causes of error include defective cables and photovoltaic panels. For all cases of danger, error and maintenance, you can use the new Phoenix Contact panel shutdown to put your entire roof-mounted system into a safe state. With monitoring software specifically tailored for roof-mounted systems of up to 500 KW, you will discover all system errors instantaneously and can react immediately when needed.



Your advantages:

- All sets in dust and water jet-proof housings (IP65)
- Fast installation thanks to the pre-assembly of the photovoltaic sets
- Maximum degree of safety in case of maintenance or danger
- Information always at your fingertips wherever you are with alarm generation via e-mail or SMS



Protect against surge voltages

With its pre-assembled sets, Phoenix Contact offers reliable system solutions that protect the inverter directly in front of the DC and AC voltage inputs. Surge voltage couplings are directly discharged to the ground potential. This protects inverters and other sensitive devices from surge voltage.

For additional information, enter the web code into the search field on our website:

#0920

Panel switch-off

The new photovoltaic panel switch-off from Phoenix Contact intelligently and safely shuts down photovoltaic panels in the case of danger or maintenance. As a result, integration into new and existing systems is especially easy. It also has an intelligent start unit, which ensures automatic restarting of the photovoltaic system under safe conditions.

Monitoring

The monitoring software PV Monitor+ is the efficient solution for securing the long-term yield of your roof-mounted photovoltaic systems. Voltages and currents are captured by a modular small-scale controller. If values exceed or fall below the set parameters, an alert is sent out by e-mail or SMS. As such, you can keep an eye on system performance at all times and intervene in processes if required.

For additional information, enter the web code into the search field on our website:

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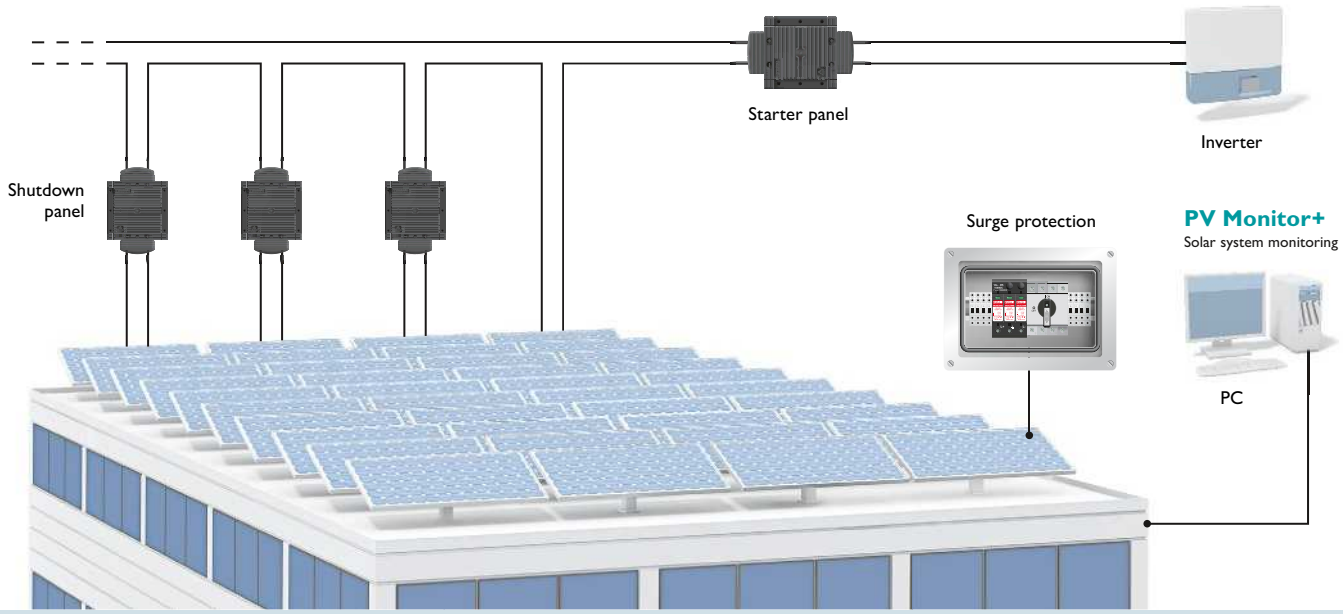
Monitoring and protecting roof-mounted systems

From surge protection up to shutoff at the panel level, Phoenix Contact provides a comprehensive product portfolio for roof-mounted systems. The photovoltaic panel shutdown de-energizes each individual panel. Disconnection is carried out automatically if a fault occurs as well as during each shutdown of the inverter. The PV Monitor+ software monitoring solution is optimally designed for commercially used photovoltaic systems and completes the overall package.



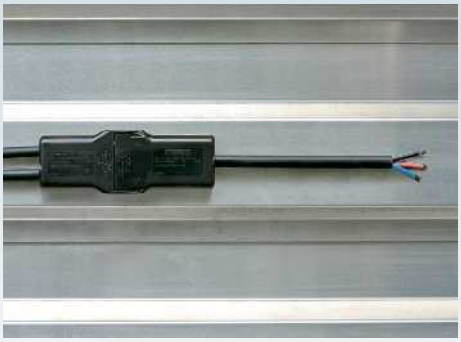
Solutions for roof-mounted systems

Micro inverters

Micro inverters are installed directly at the photovoltaic panels. This ensures that shadows or other performance-reducing events no longer affect other panels. This is used to achieve considerably greater yields. Even complicated interconnections of the panels are no longer necessary. Are you looking for an universal, easy-to-install connection technology for your micro inverters? The new connection system from Phoenix Contact was developed specifically to meet your requirements. It can be pre-assembled according to your requirements to enable user-friendly installation at the installation site via plug & play.

Your advantages:

- 3-pos., coded pin connector pattern (protection against polarity reversal)
- Maximum reliability, thanks to SUNCLIX contacts
- Use of micro inverters with 500 W output power possible
- Comprehensive connection system for the AC and DC side of your micro inverters



Device connection

With the SUNCLIX DC connectors as device plugs for micro inverters or for field assembly, you can also achieve high performance and maximum quality on the module side.

AC connection technology

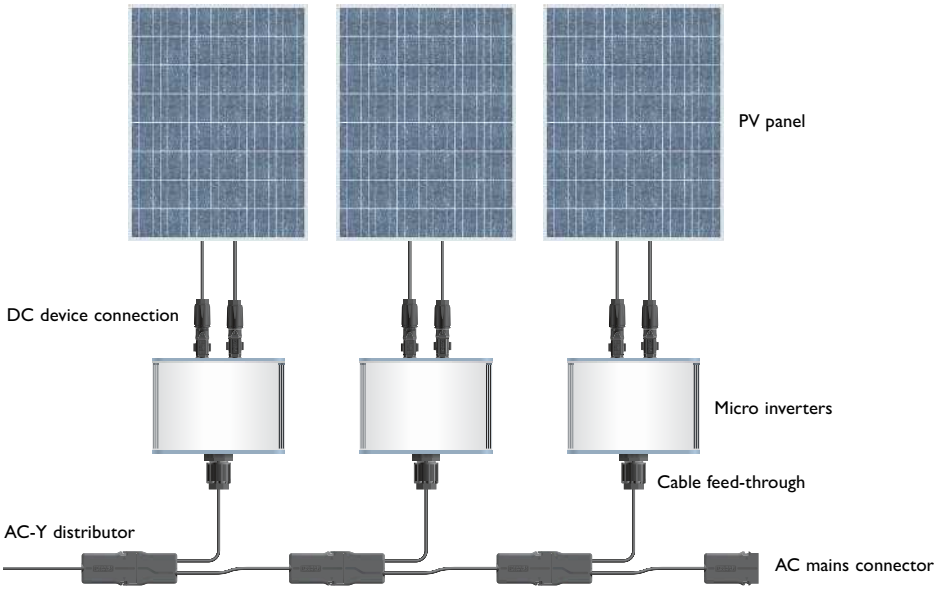
The AC-Y connectors consist of two 3-pos. connections, which are connected to each other via the trunk line without the risk of polarity reversal. In addition to accommodating the trunk line, the coupling side also accommodates the drop line, which serves as a connection to the inverter.

Mains connection

The mains connectors provide the connecting link between the photovoltaic system and mains. Depending on the system structure, the mains can be connected via the plug or the coupling side of the AC-Y connector. The free cable end is either connected in a distributor box or fed into a service panel via a cable sleeve.

Connecting micro inverters

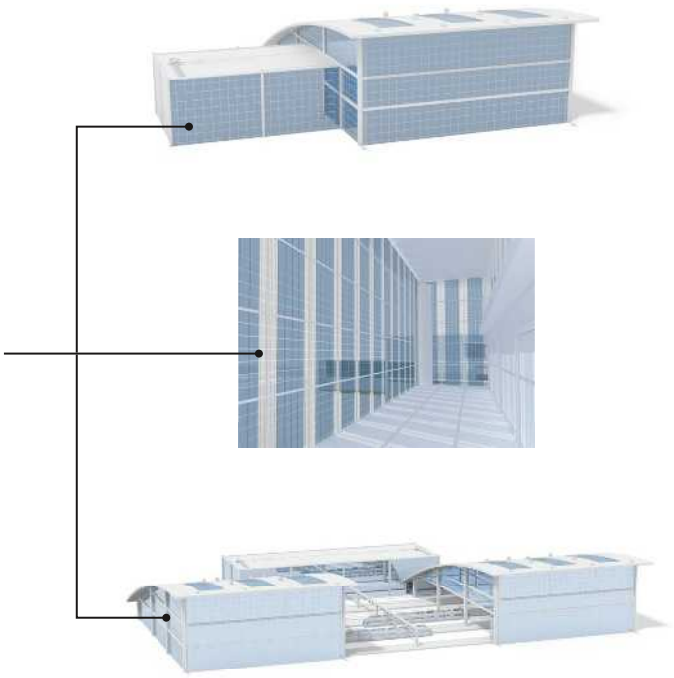
When using micro inverters, each individual panel is always operated at the optimal operating point, regardless of whether this area is partially shaded at times or not. Additional yield of the overall system of up to 20% can be achieved by using micro inverters, as opposed to string inverter architectures. Connect your micro inverters on the DC and AC side with the new Phoenix Contact connection system.



Solutions for building integration

An increasing number of building contractors, architects, engineers, and specialist planners are opting for building-integrated photovoltaics (BIPV). Solar panels are ideal for assuming the functions of traditional facade paneling made from glass, natural stone or ceramic. They replace facade plates commonly used in construction and can, therefore, be used simultaneously as outside weather protection for the building shell. It is the combination of aesthetics, CO_2-free power generation, and weather protection that makes solar panels on facades and roofs such an attractive proposition. They also enable the available space on the building to be used more efficiently.

Overview: Building integration



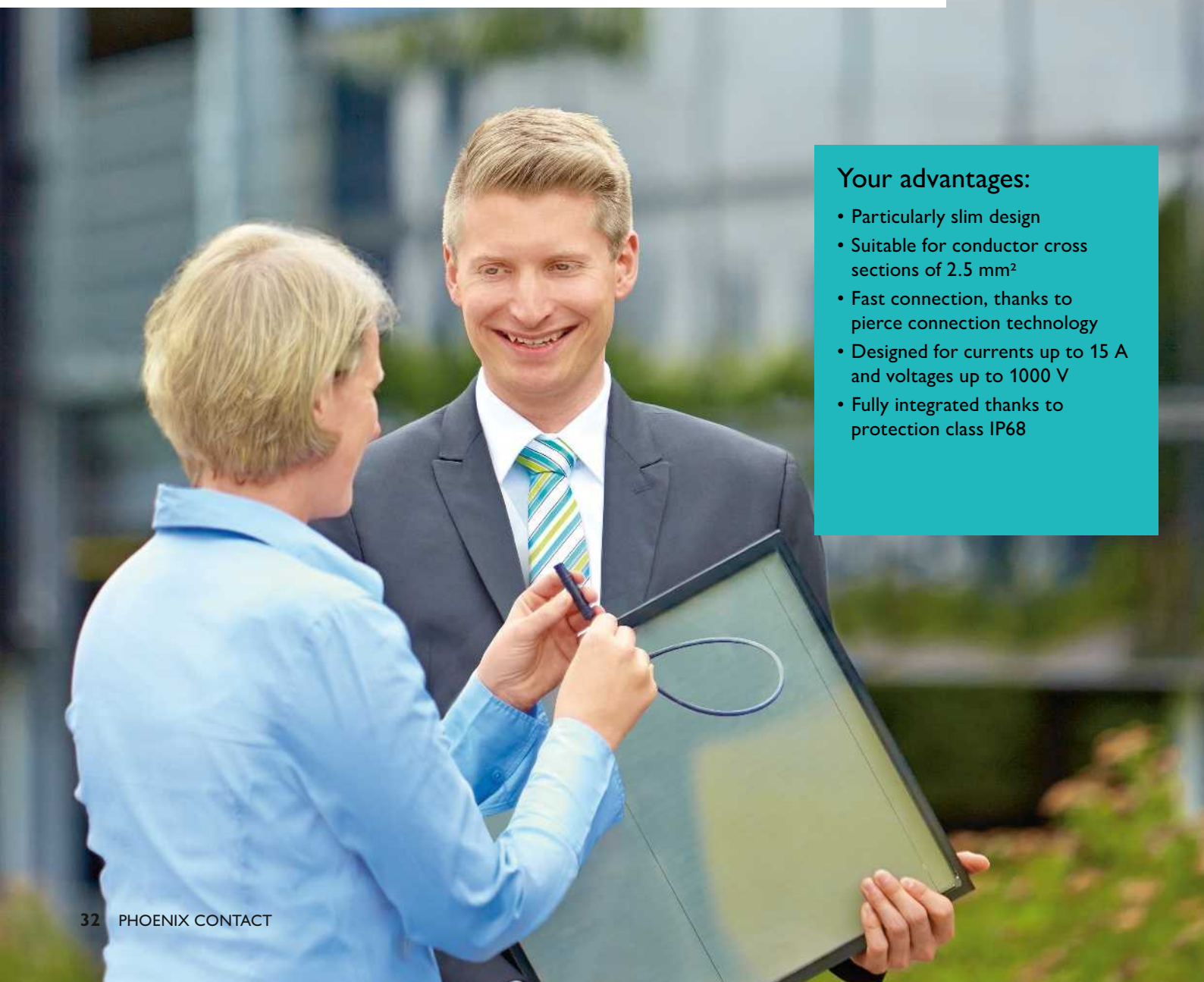
Connecting and combining

The BIPV miniature connection system meets the special requirements of the connection technology.

Solutions for building integration

Connecting and combining

Absorb solar energy not just from the roof, but from the entire building surface: Phoenix Contact has developed a new miniature DC connection system for this trend in energy production using photovoltaics. This allows you to efficiently use the facade of a building to produce energy. Spaces that are usually tight impose special connection technology requirements for building-integrated photovoltaic panels. The Phoenix Contact miniature connection system meets these requirements perfectly.



Your advantages:

- Particularly slim design
- Suitable for conductor cross sections of 2.5 mm²
- Fast connection, thanks to pierce connection technology
- Designed for currents up to 15 A and voltages up to 1000 V
- Fully integrated thanks to protection class IP68

Connecting building-integrated panels

One module junction box is used per position. Both module junction boxes are integrated into the building-integrated module and sealed with sealant. Their adaptable width enables module junction boxes to be integrated very easily.

Compact connection technology

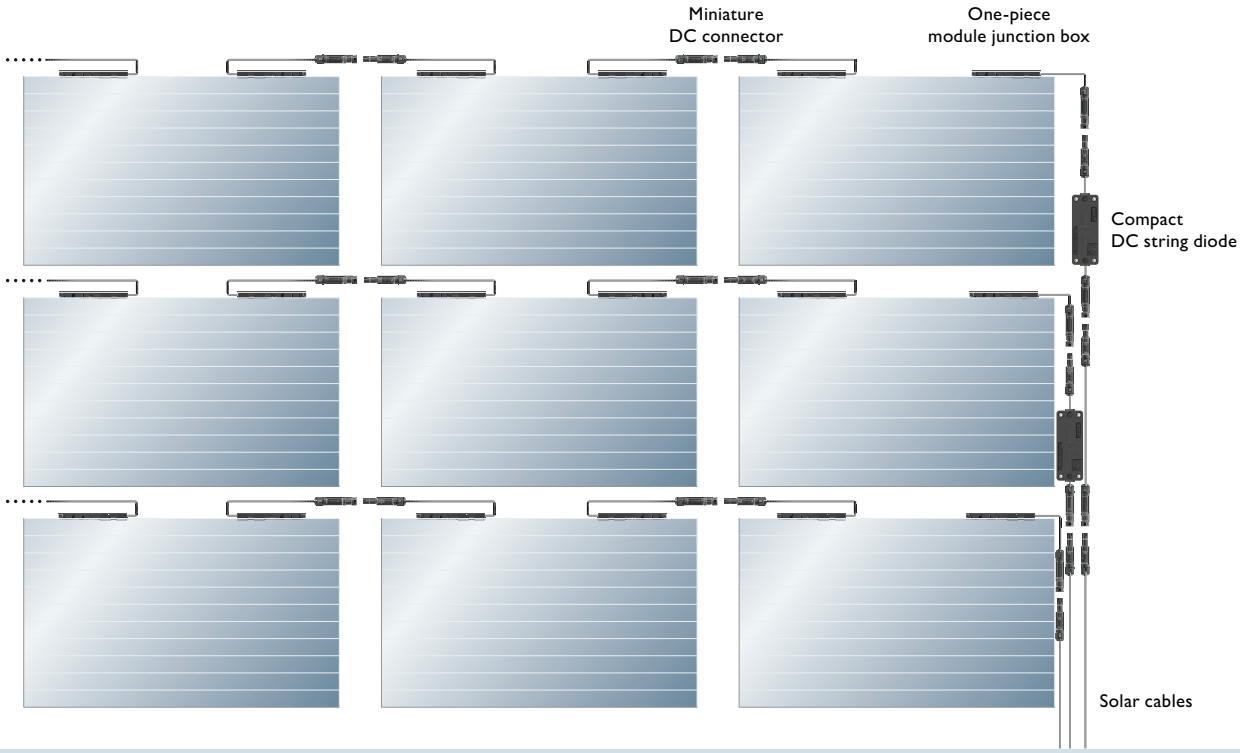
The compact design of the connectors enables concealed installation behind the photovoltaic panels or direct installation within the facade frames. Assembly is quick and easy and requires no special tools.

Protection against reverse currents

Reverse currents can occur in photovoltaic panels as a result of shading. The stable housing and flat design of the DC string diode ensure the safe flow of current between the building-integrated panels. It protects the modules against reverse currents of up to 5 A at 1000 V in accordance with IEC. The maximum reverse voltage is 2200 V.

Connection technology for BIPV

From the junction box to the string diode, all the components are hidden from view in the building facade.



Solutions for autonomous energy supply

1.2 billion people worldwide have no access to electricity. As a result, diesel generators are used in many locations to produce the necessary, independent source of energy. However, the price of the fuel for these generators is continuously rising. The use of hybrid photovoltaic systems not only reduces this financial burden, it also lowers CO_2-emissions in a sustainable manner. In rural regions without a local power grid and in developing and emerging countries, hybrid photovoltaic systems are a cost-efficient and environmentally-friendly alternative for generating electricity far removed from corresponding grids.

Overview: Autonomous energy supply

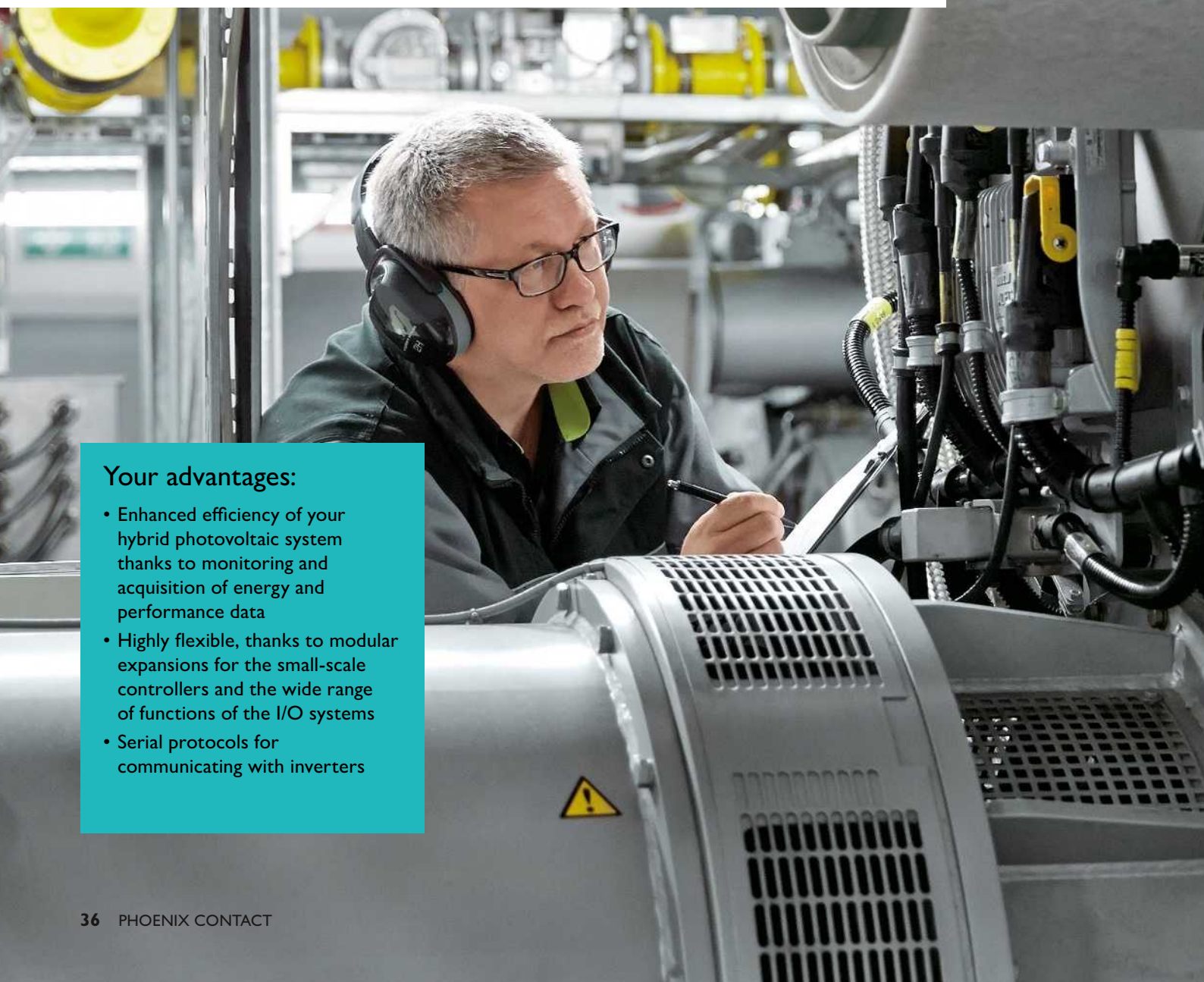
Hybrid photovoltaic systems

Monitor and regulate energy quantities and provide them in a targeted manner.

Solutions for autonomous energy supply

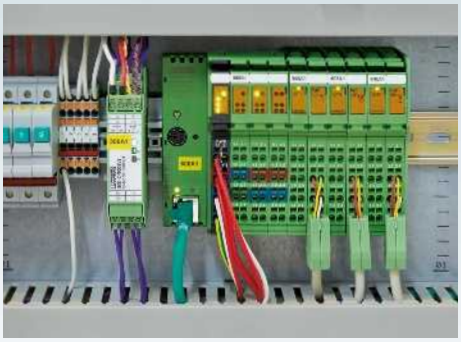
Hybrid photovoltaic systems

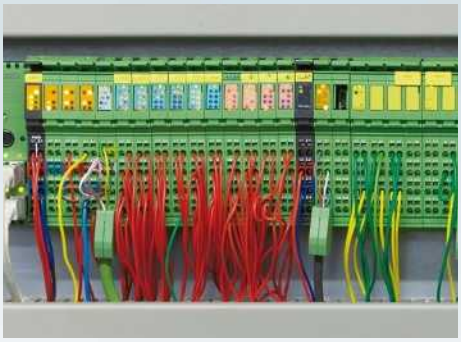
Along with supplying private households, hybrid photovoltaic systems are also used in the industrial environment, for example for sea water desalination, in mining, in agricultural operations and for supplying energy to remote holiday resorts. Hybrid photovoltaic systems are frequently installed under extreme climatic conditions. Therefore, along with the energy generation units, the accumulator and the inverter, the devices required for controlling and regulating these units must also withstand the ambient conditions. The solutions and components from Phoenix Contact meet these requirements ideally.



Your advantages:

- Enhanced efficiency of your hybrid photovoltaic system thanks to monitoring and acquisition of energy and performance data
- Highly flexible, thanks to modular expansions for the small-scale controllers and the wide range of functions of the I/O systems
- Serial protocols for communicating with inverters





Measuring energy

The power measurement terminal for the tried-and-tested Inline I/O system records all voltages, currents and power generated by the hybrid photovoltaic systems. This means that you can obtain industry-proven automation and energy measurement components from a single source. The power measurement terminal enables analysis of alternating current values. Instantaneous values can be recorded and then evaluated.

Energy regulation

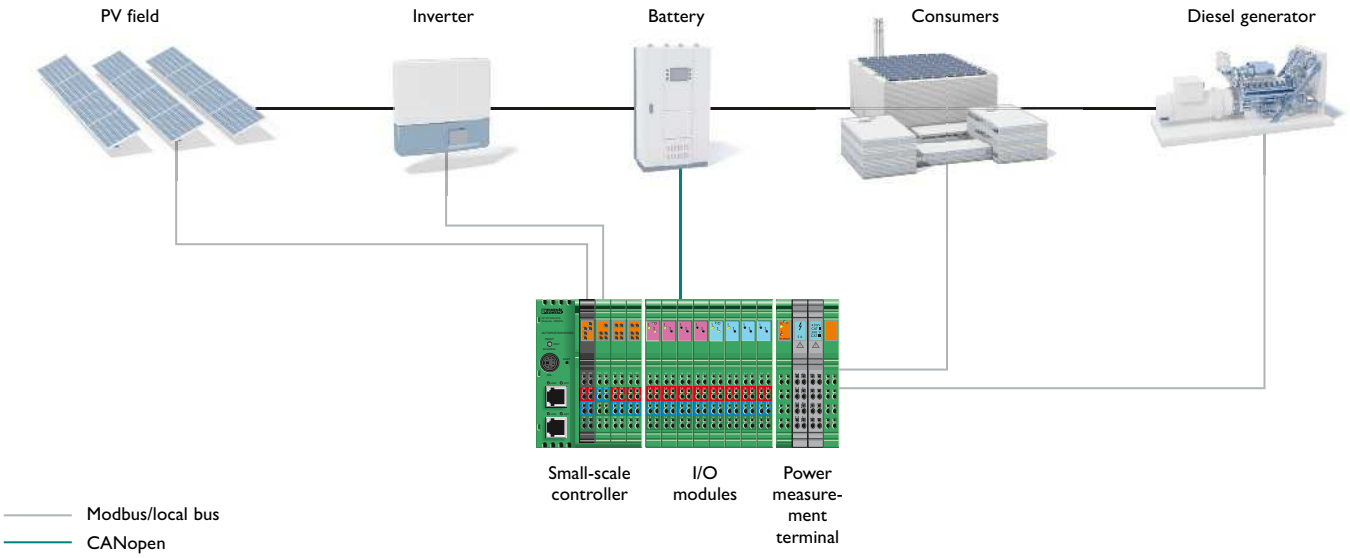
The Phoenix Contact small-scale controllers can be used not only to regulate the complete hybrid photovoltaic systems, but also to implement continuous monitoring and efficient energy management. They provide the option to connect I/O signals or Modbus nodes. Additional controllers and systems can also be connected via the Ethernet interface.

Data interfaces

A wide range of I/O modules and various function terminal blocks suitable for all applications are available. For example, you can record analog and digital data with one panel each, which can be flexibly mounted on the controller.

Supplying power, even in remote regions

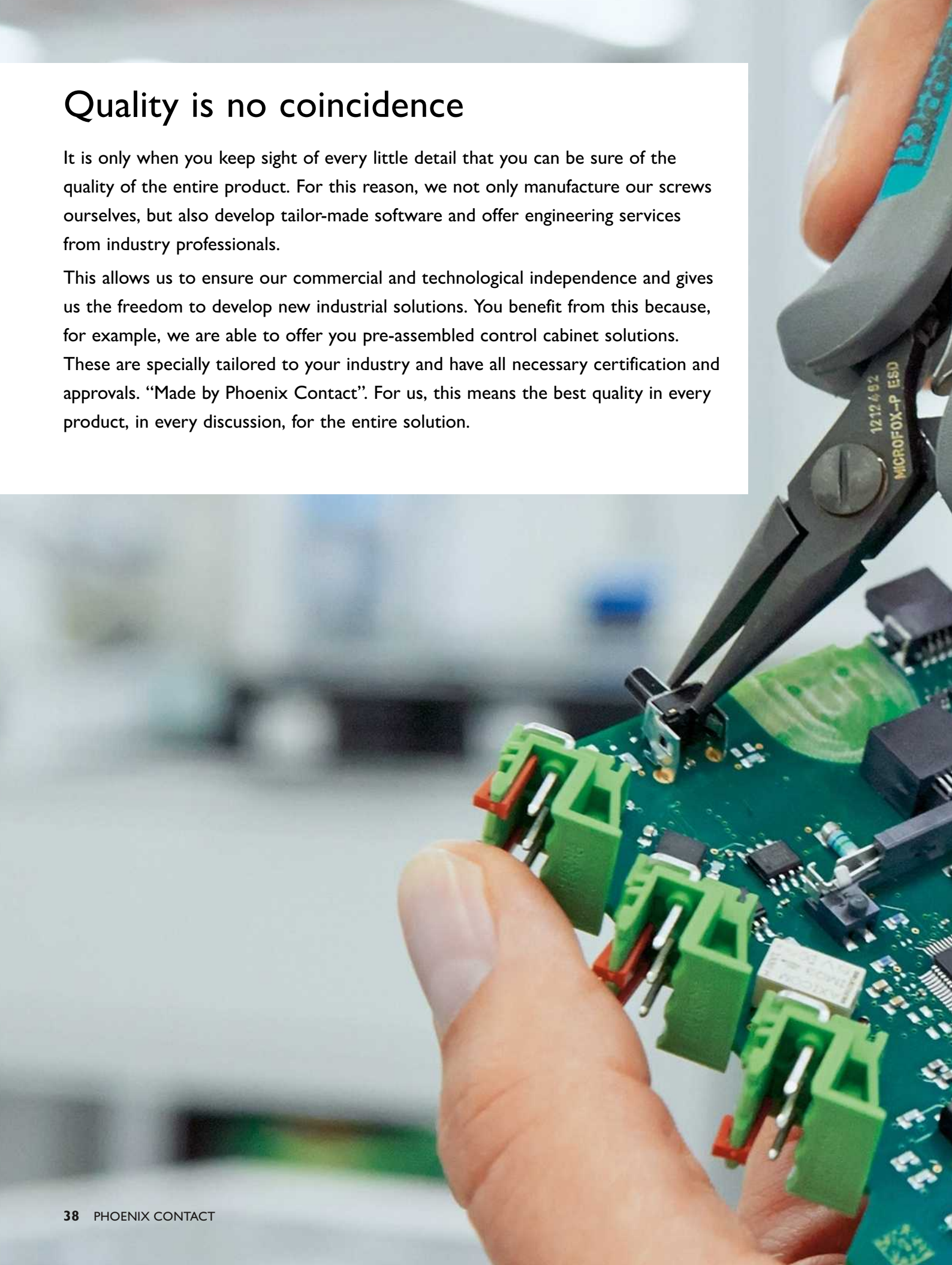
To ensure reliable operation of hybrid photovoltaic systems, all components of the system must be optimally coordinated. A Phoenix Contact small-scale controller can be used to control and regulate the entire application. It works like an energy manager and ensures that the energy quantities required by the consumer are available at the right place and at the right time.

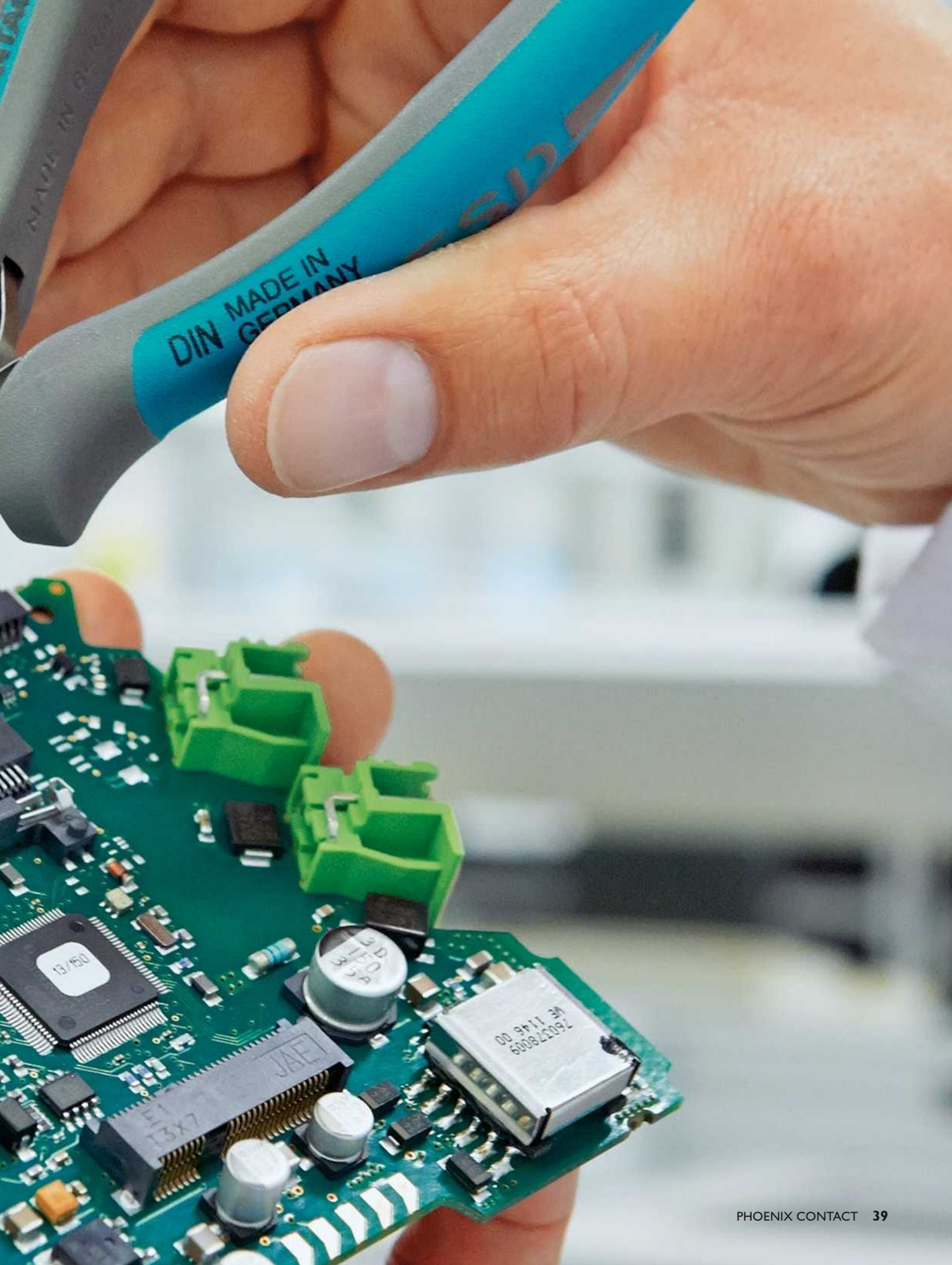


Quality is no coincidence

It is only when you keep sight of every little detail that you can be sure of the quality of the entire product. For this reason, we not only manufacture our screws ourselves, but also develop tailor-made software and offer engineering services from industry professionals.

This allows us to ensure our commercial and technological independence and gives us the freedom to develop new industrial solutions. You benefit from this because, for example, we are able to offer you pre-assembled control cabinet solutions. These are specially tailored to your industry and have all necessary certification and approvals. “Made by Phoenix Contact”. For us, this means the best quality in every product, in every discussion, for the entire solution.



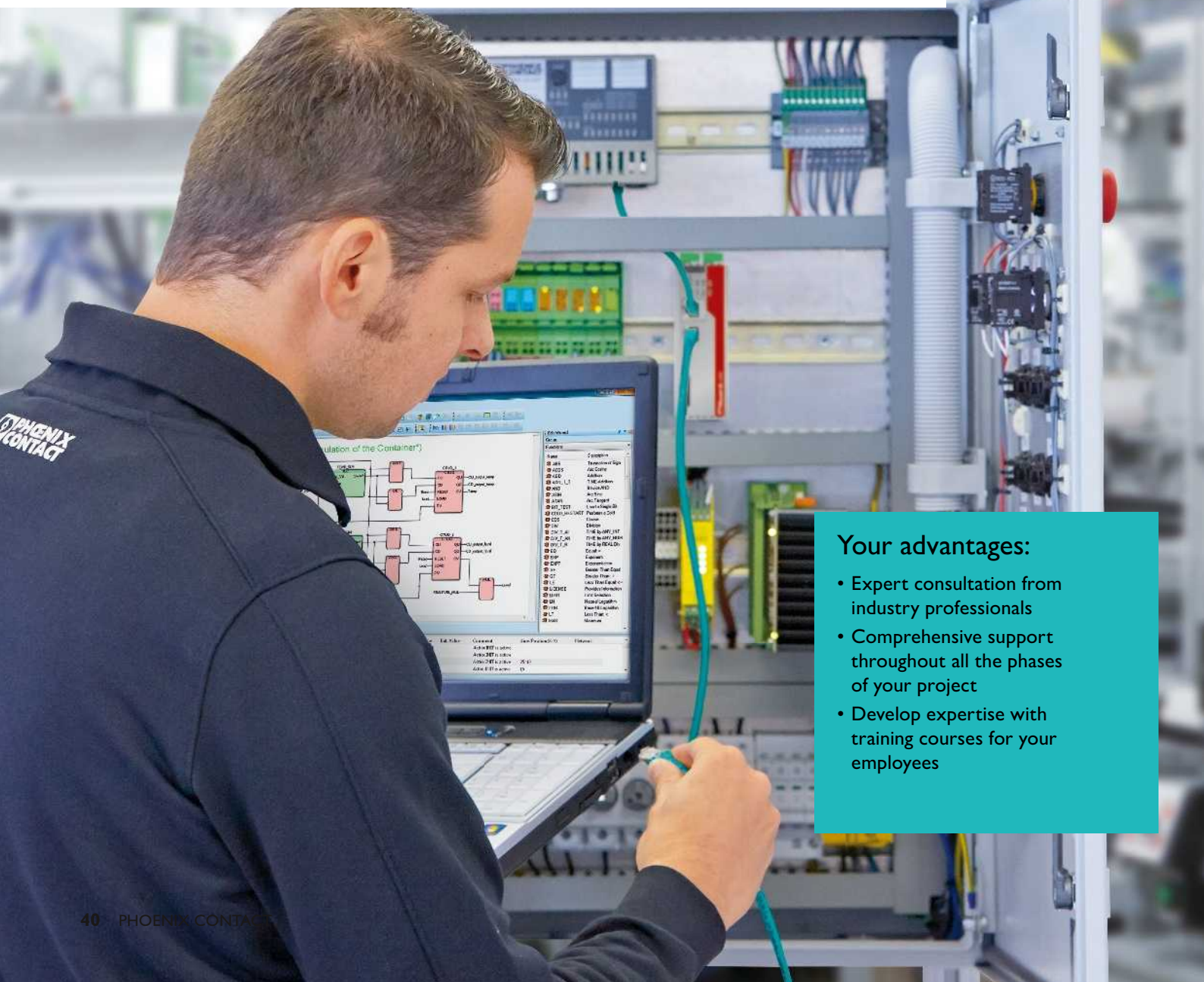

DIN MADE IN GERMANY

Quality is no coincidence

Engineering and control cabinet solutions

We set the highest standards for your solution: everything is tested and certified from the pre-wired and pre-programmed control cabinet solution through to the engineering service. Our industry experts advise you during every phase of your project cycle, and if required, support the engineering of your system.

All Phoenix Contact components are tested intensively in the independent and accredited Phoenix Testlab. Control cabinet solutions are designed and developed according to the required standards and directives. This allows you to be sure that our finished solution products meet the highest requirements.



Your advantages:

- Expert consultation from industry professionals
- Comprehensive support throughout all the phases of your project
- Develop expertise with training courses for your employees

Engineering

Regardless of the challenge facing you when implementing your photovoltaic project, we will be glad to support you. Simply give us an outline of the application you would like to implement and we will provide you with a technical concept that includes suitable hardware and software:

- Configuration
- Programming
- Visualization
- Coaching

Control cabinet solutions

We develop control cabinet solutions together with our customers, which depending on the requirement, are already ready-to-use or prewired so that you are able to carry out final installation.

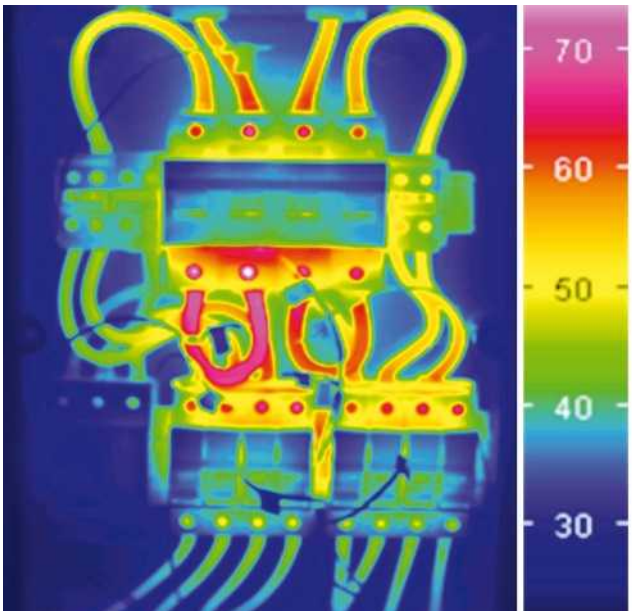
This allows specific industry solutions from a partner network made up of proven control cabinet manufacturers that meet the highest requirements.

At the same time, the quality is ensured at every step of the development process. A process-oriented, integrated management system based on the international standards DIN EN ISO 9001 and 14001 ensures that legislation and standards such as EU directives 2002/96/EU (WEEE) and 2002/95/EU (RoHS) as well as customer specifications are taken into account during product manufacturing.

Quality from planning to production

During preliminary development clarification, all divisions work closely with customers. After clarification and the construction phase, the prototype undergoes specific testing. The knowledge gained is integrated into product optimization.

A temperature test, for example, allows hot spots to be detected. As a result, all components can be arranged in an optimal way. Failure due to thermal overload can therefore be eliminated. The prototypes are subjected to electrical and mechanical testing in our own test laboratories. Climate and vibration tests ensure that the solutions operate error-free in the intended installation environments.



Quality is no coincidence

IT security for photovoltaic networks

Protect your systems against unauthorized access by people or malware. Industrial Ethernet from Phoenix Contact can be easily integrated into your automation infrastructure because we use decades of experience in automation and industrial Ethernet networks to make Ethernet easy. We know and understand the expectations and demands placed on the automation and network technology of your photovoltaic system. Our products, solutions and expert consultation bring this to life.

Your advantages:

- Comprehensive support from industry professionals
- Flexible help during all project phases
- Time savings, thanks to outsourcing
- Building competence through employee qualification

Consultation

We offer on-demand professional support, from consultation, to network analysis and design, right through to configuration support and startup. We not only support you over the phone or by e-mail, but also directly on site, if you so desire. Contact us for more information.

Engineering

Plan and structure the photovoltaic systems and networks. Together with you, we will plan how you can correctly use managed switches in your applications and determine which functions will help you design your network in a high-performance, secure and fail-safe manner. This will allow us to assemble the correct network infrastructure for PROFINET, Ethernet/IP and other Ethernet applications.

Seminars

To enable access to the topic of secure IT networks for photovoltaic systems, we provide you with seminars customized to your needs. In these seminars, you learn the basics of secure network technology and remote maintenance using VPN connections.

Scalable network infrastructure featuring a high degree of data security

The network infrastructure components from Phoenix Contact allow you to safely and reliably network your ground-mounted photovoltaic system. Redundant fiber optic cables ensure permanent communication between the individual network devices. It is also possible to perform maintenance operations on the ground-mounted system remotely via public networks while preventing unwelcome third-party network access.

Quality is no coincidence

Service and support

Implement your photovoltaics projects even more quickly and efficiently. Irrespective of whether you operate, plan, produce or maintain systems – Phoenix Contact's services provide professional support that is tailored to your requirements during all phases. This includes an excellent telephone and online service as well as industrial professionals on site. Numerous seminars at Phoenix Contact headquarters or at your company premises are available for training your employees. We always provide expert consultation on all topics related to your products and solutions during after sales.

Hotline:

- Expert consultation from industry professionals
- Comprehensive support throughout all the phases of your project
- Develop expertise with training courses for your employees

Service

Do you need customized advice? We can offer the necessary technological expertise, combined with vast experience in the Photovoltaics sector. Our expert project management team will guide you through all the important phases of your project. Together with you, we will arrange the necessary services and handle the subtasks during the implementation phase.

Training and workshops

Thanks to intensive contact with our customers and years of on-site experience, we have developed a qualification concept whereby we can specify employee qualifications in order to meet your individual requirements: we offer you the appropriate service depending on the project phase, target group, and prior knowledge.

After sales

Our service teams stand out thanks to their focused expertise, years of practical experience, and maximum degree of flexibility.

Our service network is available to you during installation, startup and operation even in the most remote regions of the world, for example, a free system hotline with 24 h product support. In the event of an emergency, we can provide you with replacement parts outside of office hours.

Phone: + 49 52 81 9 46 28 88

Local expertise

Phoenix Contact supports you worldwide with professional service and support with respect to products, services and solutions.

Depending on requirements, we ensure fast replacement of products or support you in the case of problems by hooking into your system.

Our experts are familiar with the regional conditions and specific challenges of your industry. We are happy to support you all over the world with a tight-knit of industry experts. Contact us for more information.

Quality is no coincidence

Inspiring industry solutions, thanks to excellent products

Phoenix Contact offers innovative products and solutions for all aspects of photovoltaics. The basis for these solutions is the wide range of industrially-tested connection and automation technology. Intelligently combined, these products become systems for a variety of functions such as control, remote monitoring or measuring values. Inspiring industry solutions are created, thanks to industrial expertise, longstanding experience, and consideration of special requirements.

Excellent products

Innovative systems

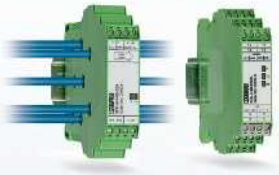
Excellent products

Photovoltaic connectors

From connection technology for photovoltaic panels through DC connectors for field cabling to device connection for signals, data, and power.

Connection terminal blocks

Depending on voltage and strength, the fuse, hybrid, and connection terminal blocks are also available for large conductor cross sections.



DC monitoring

The monitoring system provides reliable information regarding the performance of your photovoltaic system. Faults can be quickly localized and rectified.

Controllers

Modular small-scale controllers for the automation of devices from photovoltaic ground-mounted systems all the way to systems for autonomous energy supply.

Surge protection

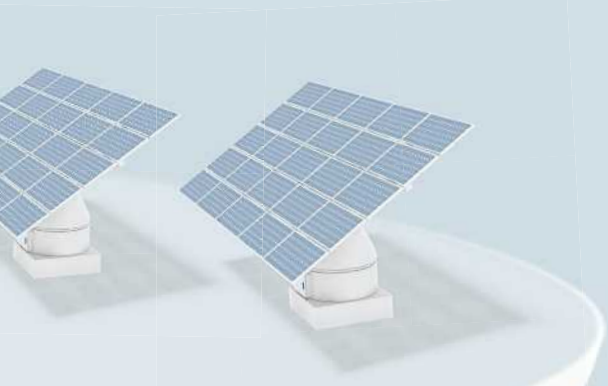
You can now obtain lightning current and surge protection for photovoltaic systems with new protective devices that are designed for a generator voltage up to 1500 V DC.

AC monitoring

The network-capable energy meters record and monitor the electrical characteristics of photovoltaic systems on the AC side.

HMI devices

With the HMI devices, you can keep an eye on your photovoltaic application at all times and intervene in processes if required.



Inspiring
Industry Solutions

Software

Software is the key to more efficient automation. Phoenix Contact offers software from configuration to system operation.

Passion for your Industry

Each industry places particular demands on system automation. In our dedicated industry teams, we focus on these challenges with technical expertise and passion, and together with our customers we develop tailor-made turn-key solutions.

Excellent products are at the heart of our solutions. Cleverly combined to create innovative systems and supplemented by industry-specific features, they ultimately become industry solutions of proven Phoenix Contact quality.

Excellent products

Innovative systems

Inspiring Industry Solutions

phoenixcontact.com

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Printed in Germany

CI505-16.000.L3
MNR 52005953/2016-02-01/06

INSPIRING INNOVATIONS