

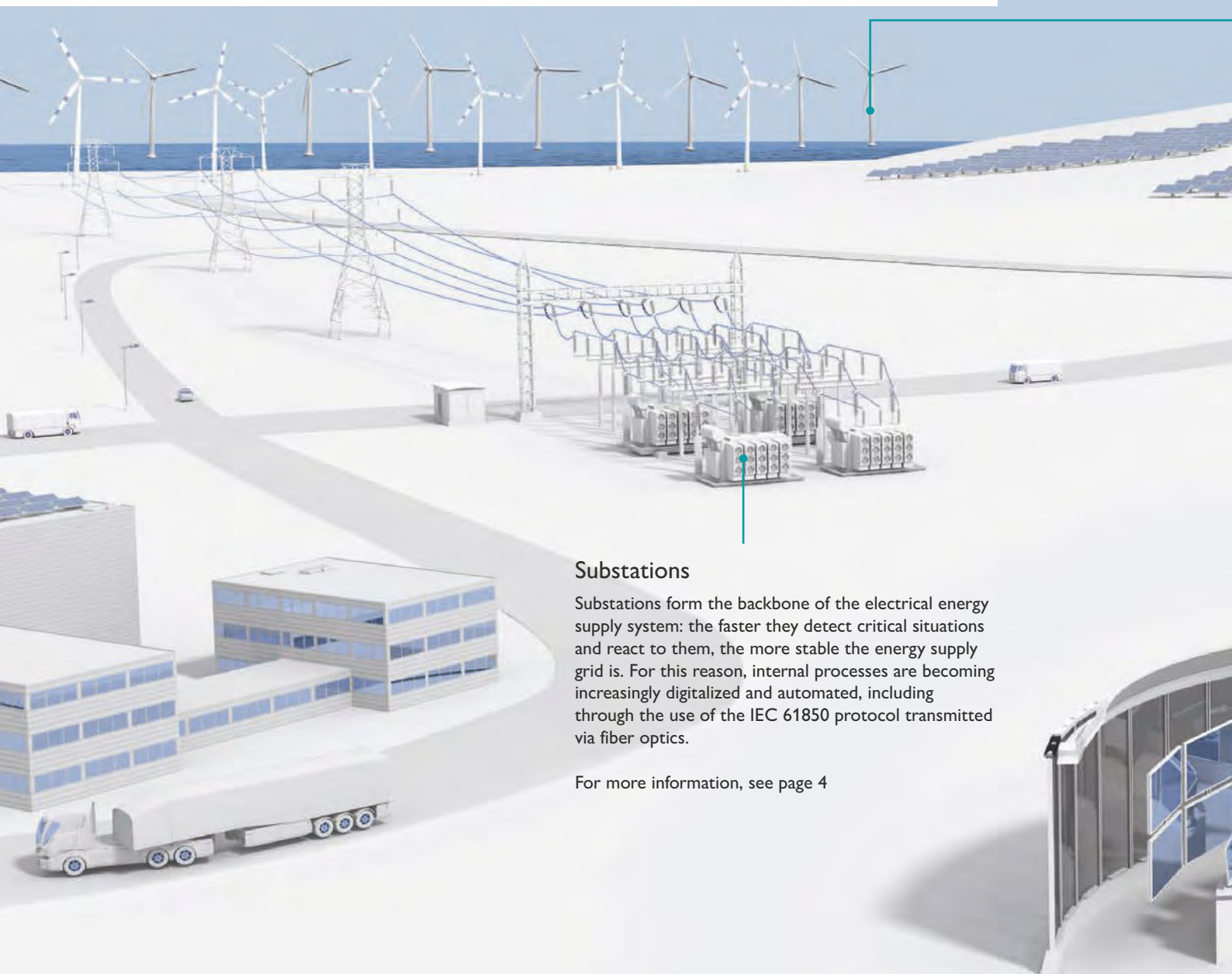


# Solutions for smart grids

Intelligent connectivity for the future

# Future-proof connection technology

The future of sustainable energy supply lies in intelligent power grids, or smart grids, as they are known. Their comprehensive connectivity is both the essence of and at the same time a challenge for modern energy management: energy generators, control rooms, and loads must process ever more real-time data digitally. In addition, the number of data interfaces in the power grids is increasing. Every connection, from copper wire to fiber optics, must be able to transmit important data. Only a reliable and robust connection technology can ensure the smooth exchange of data and form the basis for a secure energy supply.



## Substations

Substations form the backbone of the electrical energy supply system: the faster they detect critical situations and react to them, the more stable the energy supply grid is. For this reason, internal processes are becoming increasingly digitalized and automated, including through the use of the IEC 61850 protocol transmitted via fiber optics.

For more information, see page 4

## Wind farms

Wind farms are the powerhouses of regenerative energy: they are steadily increasing in number. This requires intelligent energy management, including real-time communication and remote maintenance. Reliable copper and fiber optics enable secure information exchange.

For more information, see page 8

## Solar parks

Solar parks represent established renewable energy: these energy suppliers round out the productive capacity of a smart grid. A critical factor in their cost-effectiveness is a long service life, thanks among other things to high-quality and reliable field connectors.

For more information, see page 10

## Power stations

Power stations are the cornerstones of modern energy supply: they are the most important providers of system services for stabilizing the different power grids. They have to be able to efficiently capture, transmit, and process data. Reliable splice boxes and patch cables are indispensable for ensuring that they remain capable of supplying energy in the future.

For more information, see page 6

## Energy storage and distribution

Energy storage units deliver smart energy for grid support: they can absorb and output energy as needed. Having the right hybrid connection technology lays the foundation for simple installation while at the same time ensuring superior availability.

For more information, see page 14

## Grid control rooms

Control rooms are the brains of a smart grid: they bundle signals and data. The connection technology must ensure secure and fast transmission rates. Secure operation requires connectors with a high packing density and the highest data rates possible.

For more information, see page 12

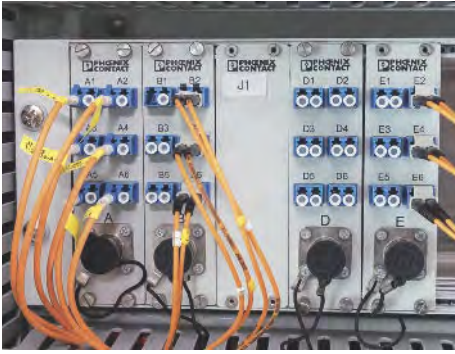
# Substations: Fast response time for secure energy

Substations are the backbone of the electrical energy supply system. The faster and more independently they can react to changes in the network, the more secure the energy supply. For this reason, internal processes are becoming increasingly digitalized and automated, including through the use of the IEC 61850 protocol. Fiber optics enable error-free data transmission.

## Your advantages

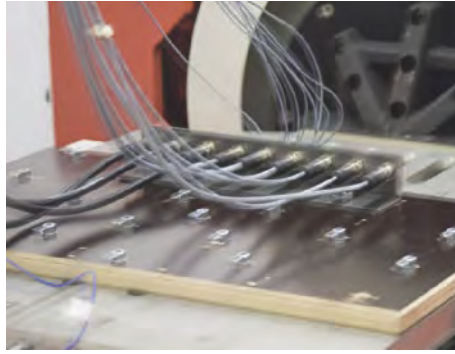
- ✓ Stable communication, thanks to protocol transmission via fiber optics
- ✓ Flexible, modular connection options, thanks to components for 19-inch rack or DIN rail mounting
- ✓ Top product security, thanks to intensive testing programs for long-term use in harsh field environments
- ✓ Secure and fast data transmission is possible, even under severe electromagnetic strain

## Example applications for substations



### Station control room

Within a substation, data is transferred to the station control room. Multi-fiber connectors reduce the costs of wiring in the field control cabinet necessary for this: the standard patch cables are concentrated, the data is transmitted via Q-ODC cables to the control room, where it is then marshalled back onto traditional patch cables. Thus, the controllers and analyzer units in the control room receive all the data quickly and securely.



### Comprehensive testing programs

All of our products undergo intensive testing programs. We use the IEC standard 61850-3 – developed specially for use in substations – as the basis. We then add other customer-specific tests, such as environment and durability tests. This is especially important if our products are being used in regions with extreme ambient conditions.



### Field control cabinets

The components incorporated into drive boxes and field control cabinets in air-insulated control gear are subject to special demands. Without the proper connection technology, fluctuating temperatures, UV radiation, and even rodents can cause problems.

## Example product solutions for substations



### Modular 19-inch patch bays

- 12 module inserts can be integrated via Plug and Play
- Front-side operation only
- High packing density: 12x Q-ODC-12 on 72x LC duplex
- One module marshals 1x Q-ODC-12 to 6x LC duplex (OM1 62.5/125µm).
- 3 RU

**i** Web code: #1626



### Robust patch cables

- Push-pull circular connectors with 12 fibers
- Protection class: IP68 (tested for 30 days submerged in three meters of water)
- High temperature range: -40°C to +85°C
- Pull-out force up to 500 N
- Fiber category: OM1

**i** Web code: #1626



### Terminal outlets for harsh deployments

- Robust design
- Protection class IP65/IP67
- Versions for 2 x protected RJ45, SC-RJ, and M12 available
- Integrated cable management system

**i** Web code: #1642

# Power stations: Quick decisions in a harsh environment

Large power stations in particular are important providers of balancing power. To ensure fluctuation-free energy generation, internal processes must be digitalized to a high degree. Robust and redundant components are indispensable for making rapid automated decisions – especially under harsh outdoor operating conditions.

## Your advantages

- ✓ Field assembly connectors for flexible use in the field
- ✓ Reduced cabling costs for marshalling and distribution solutions
- ✓ Future-proof solutions for data rates up to 10 Gbps
- ✓ Flexible, modular solutions for control cabinets

## Example applications for power stations



### Data network for auxiliary power consumption

In modern large-scale power stations, the IEC 61850 protocol is used for controlling and monitoring the auxiliary power consumption. Q-ODC patch cables are compliant with this standard.



### Controllers for control valves

Steam power stations require a large number of control valves. A high degree of reliability can be achieved thanks to redundant connection to the SCADA system using fiber optics.



### Pipe wall temperature measurement

Monitoring the boiler temperature is fundamental to the operation of steam power stations. The data from up to 2000 sensors per splice box is bundled and then distributed.

## Example product solutions for power stations



### Splice boxes for DIN rail mounting

- Compact dimensions with a generously sized splicing tray
- Fully prepared ready to splice
- Available for multimode and single mode, and unequipped
- For connectors: 6 x & 12 x LC duplex, 6 x SC duplex, 6 x ST duplex, 6 x E2000® duplex®
- Robust metal version

**i** Web code: #1625



### Compact patch panels

- One-piece housing design
- Width of 18 mm (1 HP)
- Front-release modules
- Variety of module inserts for RJ45, LC duplex, and SC simplex
- Optional Security Layer 1 accessory
- Copper modules with optional overall shielding braid

**i** Web code: #1643



### RJ45 connectors for field assembly

- IDC fast connection
- High vibration resistance

**i** Web code: #1736

### FO connectors for field assembly

- Easy assembly without bonding or polishing
- Available for SC and LC
- For pigtails and patch cables in multimode and single mode

**i** Web code: #1735

# Wind farms: Intelligent energy management in real time

Wind turbine generators are being planned as ever larger and more powerful energy generators. As wind farms grow in size, the individual wind turbines must be networked in ring or star configurations. Furthermore, intelligent energy management that includes real-time communication and remote maintenance is also necessary. We offer a variety of solutions, including for lightning strike monitoring, surge protection, remote maintenance, and lighting. The connection technology required for this is available in the form of copper and fiber optic cables.

## Your advantages

- ✓ Products with IP20 or IP65/IP67 degree of protection
- ✓ High temperature resistance and all components tested for vibration resistance
- ✓ Complete cabling solution for the lightning monitoring system (LM-S)
- ✓ Individual cabling solutions available on request

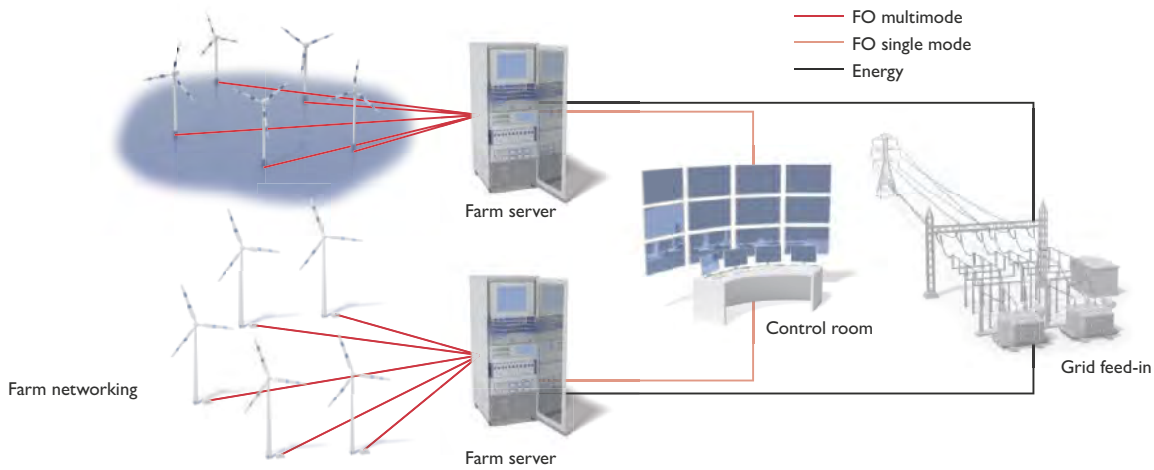


# Smooth communication in wind farms

Within wind farms, data and signals are transmitted via fiber optic multimode cables. In turn, data and signals are transmitted between wind farms and the control room via FO single mode. FO cables have the advantage of enabling communication over significantly greater distances without

repeaters. This ensures future-proof real-time communication, because only the active components need to be replaced, not the cabling. Furthermore, FO cables are more compact than copper cables and easier to lay. In addition, FO cables are not sensitive to EMC interference, surge

voltages, or lightning strikes. This ensures smooth data and signal transmission.



## Example product solutions for wind farms



### Push-pull connectors

- Connectors for field assembly
- Protection class IP65/IP67
- Available in versions for SC-RJ, RJ45, and Power
- Optional interlock to protect against unintentional unmating
- For cable diameters from 5.5 to 10 mm

**i** Web code: #1737



### D-SUB connectors

- 9-pos. to 44-pos. contact carriers
- Standard, HD, and hybrid contact inserts
- Contact inserts with solder pin, solder cup, or flat-ribbon cable connection
- All-metal housing and anti-magnetic, metal-plated plastic housing (PC+ABS in accordance with UL94 V0)

**i** Web code: #0340



### Assembled patch cables

- Customer-specific FO patch cables, e.g. for Phoenix Contact lightning monitoring systems (LM-S)
- Corrugated tubing between sensor and analyzer unit provides additional conductor protection
- Optimal attenuation values including individual test report
- Fiber type: PCF (200/230 μm)

**i** Web code: #1644

# Solar parks: Cost-effectiveness, thanks to long service life

Solar parks are a firmly established part of the energy supply system, but are subject to high demands with respect to their performance and cost-effectiveness. The components must withstand continuous extreme weather conditions, and faulty modules must be quickly identified and replaced. Using high-quality connection technology is the only way to reduce costly installation and service calls, and to increase the return on investment. For solar parks, we offer robust and long-lasting connectors and current measurement modules – all of which can be installed quickly and conveniently.



## Your advantages

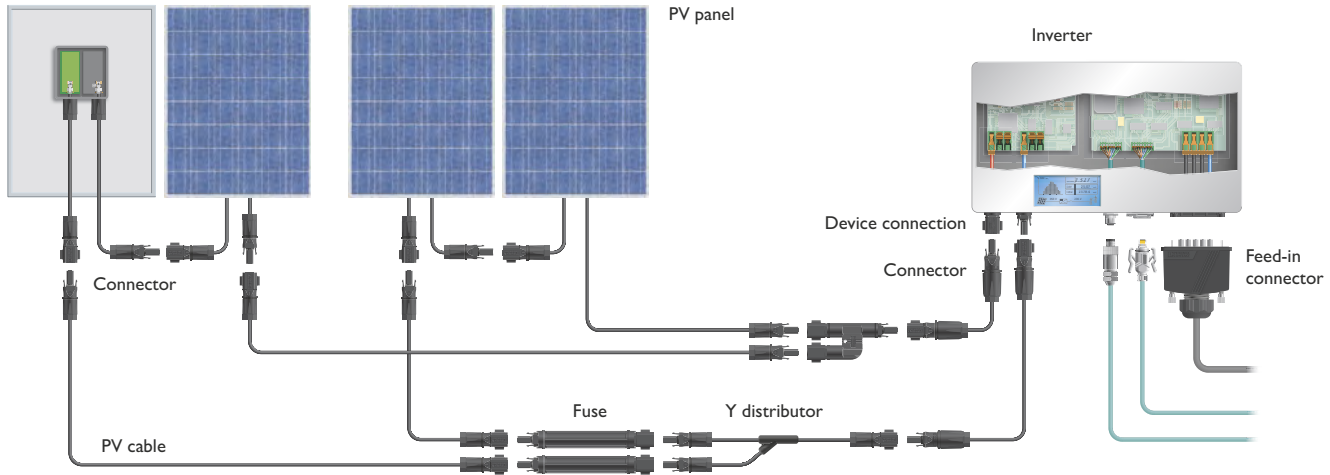
- ✓ Multiple-use spring connection technology for connectors
- ✓ Only two connector versions for conductor cross-sections from 2.5 mm<sup>2</sup> to 16 mm<sup>2</sup>
- ✓ No special tools required

# A wide range of solutions from a single source

Optimal connectivity in solar parks reduces the bandwidth of the required connection components. You can create your own custom solar park solution from our comprehensive portfolio with just a few different connectors for signals, data, and power, and with hybrid applications.

Our connectors are easy to install and are reliable both indoors and in the field. Thanks to our innovative contact technologies, our high quality standards, and our global service, you can achieve the perfect performance ratio for your solar park.

Your advantage: you can focus fully and completely on your projects. There is no longer any need to coordinate unscheduled service calls, because there will not be any.



## Example product solutions for solar parks



### SUNCLIX connectors

- Assemble without special tools, thanks to spring connection technology
- Only two connector types for conductor cross sections from 2.5 to 16 mm<sup>2</sup>
- Unique connector interface prevents intermating and improves quality

**i** Web code: #0358



### SUNCLIX device connectors

- Uniform interface for all devices in the PV system
- Preassembled in accordance with customer requirements, or for assembly in production
- Longitudinal water tightness up to IP65 ingress protection even when not mated

**i** Web code: #0359



### SUNCLIX fuse plugs

- Robust, easy-to-install fuse elements for outdoor use
- High-quality Littelfuse fuse-link
- Nominal currents: 3.5 to 25 A
- Voltage: 1000 or 1500 V (EN)
- Degree of protection: IP68 (tested for 24 hours submerged in two meters of water)
- Certified in accordance with 2PFG 2380/02.14

**i** Web code: #1918

# Control rooms: Efficient data analysis for a stable network

Control rooms bundle and evaluate centralized data. Therefore a high packing density and high data rates are required to ensure secure operation. The number of tasks that network control rooms must perform is growing, because more and more effort is required to keep the smart grid stable. Power station control rooms must be able to respond with flexibility to price and load fluctuations. In addition, all of the systems must be designed with redundancy in order to avoid any loss of communication. Our connection technology, such as splice boxes and patch bays, efficiently and reliably supports data bundling in control rooms.



## Your advantages

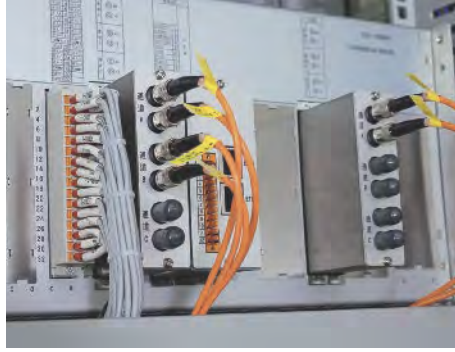
- ✓ Maximum reliability, thanks to individual measurement protocols for patch cables
- ✓ High degree of flexibility, thanks to patch cables in custom lengths from a lot size of 1
- ✓ High product safety, thanks to intensive testing programs and the use of high-quality individual components
- ✓ Customized solutions can be developed upon customer request
- ✓ Cables with UL and LSZH approvals

## Example applications for control rooms



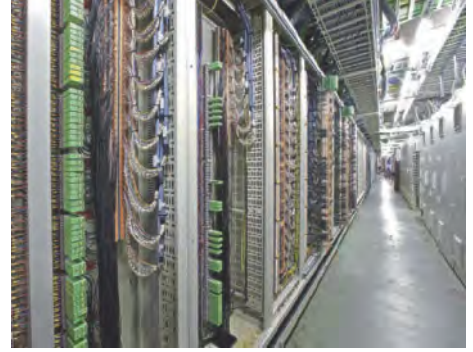
### Network control room

Due to the digitalization of substations, network control rooms must process more and more data. A critical factor here is the ability to transmit data securely and reliably across large distances. Fiber optic cables, including the associated splice boxes and patch bays, transmit data the fastest and most securely.



### Station control technology

The station control technology is linked directly to the high-voltage devices. Perfectly tuned and reliable solutions are in demand that meet high environmental protection standards at the same time. Patch cables and Q-ODC connectors can make savings possible here.



### Power station control engineering

Providing comprehensive data compactly and reliably is a challenge for power station control engineering. Specially developed solutions are necessary and must be perfectly tuned to each other: such as compact marshalling units, system cabling, and consistent marking.

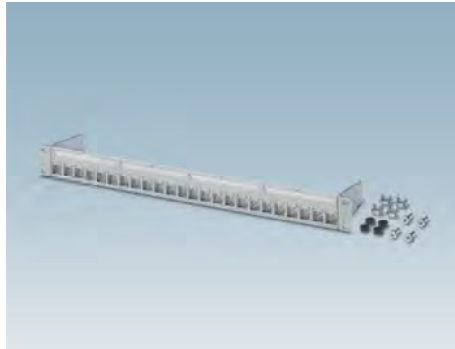
## Example product solutions for control rooms



### 19-inch splice boxes

- Stable versions in sheet steel
- Fully prepared ready to splice
- Removable drawer with quick release
- For 12 x / 24 x LC duplex in OM2 and OM4
- 100% control, including test report
- Up to four cable entries including cable glands

**i** Web code: #1738



### 19-inch patch bay

- High packing density for 24 x RJ45 sockets per 1 rack unit
- For zinc die-cast RJ45 sockets for field assembly
- Sockets can be assembled without special tools
- Data rates up to 10 Gbps
- Custom marking fields
- Available in black and gray

**i** Web code: #1822



### Fiber optic patch cables

- High-quality FO patch cables in customer-specific lengths
- UPC polish, including custom IL and RL test report
- Fiber categories: OM1-OM4
- Fibers insensitive to bending (OM3, OM4)
- Connectors: LC duplex, SC duplex, SC-RJ, ST, and FSMA
- Fire protection classes: UL listed, UL OFNR, and LSZH (low smoke, zero halogen)

**i** Web code: #0333

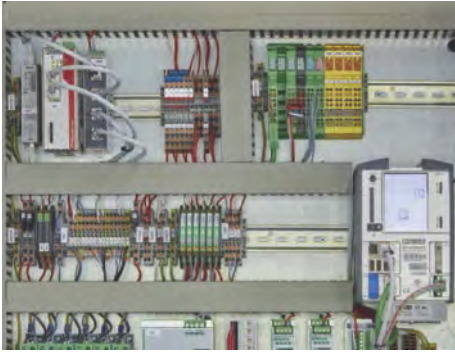
# Energy storage and distribution: Building status always in view

Smart power distribution is already a reality in building technology. The operations and maintenance technology is equipped with hybrid power connections that also include interfaces for data and signals, in addition to conventional interfaces for power. Within a smart grid, the operator is kept up to date on the building status and building technology, whether on site or on the move. We provide you with this interface technology for your energy systems, whether for conventional power distribution, in production, or for use in the field.

## Your advantages

- ✓ Secure transmission of signals, data, and power
- ✓ Suitable for harsh ambient conditions, thanks to high degree of protection up to IP69K
- ✓ Flexible deployment options, thanks to reliable, proven connection technologies
- ✓ Convenient assembly, thanks to tolerance compensation
- ✓ High power densities and hybrid transmission technology for compact solutions in tight installation conditions

## Example applications for energy storage and distribution



### Efficient energy management

Energy storage units are revitalizing the electricity market. Generated energy is stored by smart hardware components in an energy-efficient manner, or routed to consumers. Whether singly or in packages: our high-quality components contribute to increasing the efficiency of your control cabinet



### Can be replaced quickly in the rack

Individual modules in a battery rack must be able to be replaced quickly in order to avoid long downtimes. Our connection technology for battery replacement systems ensures easy installation. Thanks to the Variocon connection technology, data and power can be effectively bundled in a hybrid connector.



### Immune to extreme stresses

Wind, sun, and rain are just three of the many environmental effects that the PRC family of connectors are able to defy. The compact design also enables 75% space savings in housing design compared to a CEE connector of the same power class.

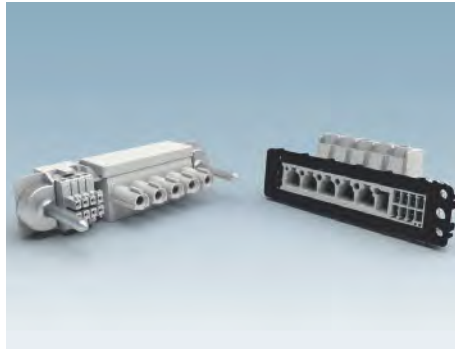
## Example product solutions for energy storage and distribution



### Modular rectangular connectors

- High degree of protection, IP68/IP69K
- For currents up to 70 A and voltages up to 1000 V
- Different sizes and a variety of materials
- Screw, crimp, and PCB connection

**i** Web code: #1828



### Modified rectangular connectors

- Suitable for use in battery racks
- Simultaneous transmission of power and signals
- Blind mate and tolerance compensation
- Easy and quick installation while simultaneously minimizing errors

**i** Web code: #0536



### Circular connectors

- Plastic connectors for industrial and outdoor use
- High degree of protection, IP69K
- Currents up to 35 A and voltages up to 690 V
- Release with tool (optional accessory) or by hand
- Very high power density, thanks to compact design

**i** Web code: #0200

## You benefit from an excellent level of service

Different colors, shapes, markings, and customized cable assemblies provide you with a wide range of options. In addition to customer-specific adaptations, we also realize innovations individually tailored to your needs. We will support you from the initial concept and design-in all the way to production and quality assurance.

### **Customer-specific adaptations**

Whether you need individual colors, complete cable assemblies, special printing, or a specific number of contacts, we will be happy to help you find solutions adapted to your specific requirements.

### **Individual new products**

In addition to customer-specific adaptations, we also realize innovations individually tailored to your needs. We will be there every step of the way to provide you with help and support, from the initial concept and design-in all the way to production and quality assurance. Take advantage of our extensive development and manufacturing expertise for your individual solution.

### **Service and support**

During the design-in process, we support you with state-of-the-art selection guides, comprehensive product and technology information, and advice tailored to your individual requirements – anywhere in the world.





Wide range of color versions



Customer-specific cable assemblies



Individual printing



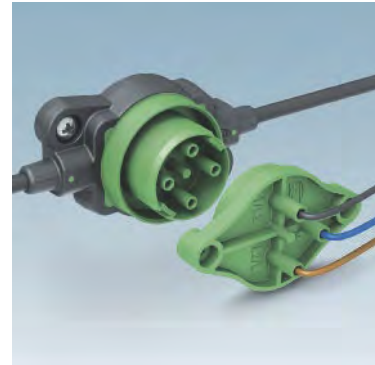
Special punching, coding, and pin lengths



Connection block for temperature sensors



Hybrid connector for charging stations



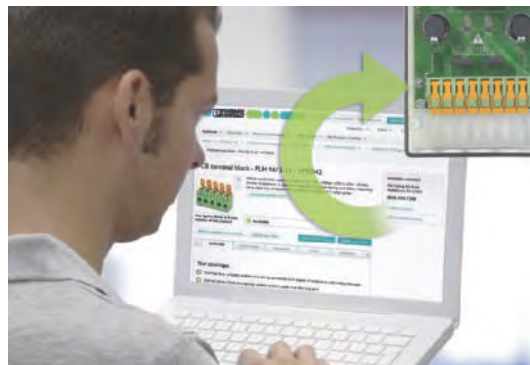
Connection system for LED street lighting



Compact controller with front connection technology



Fast selection of products in the web portal, thanks to many convenient functions, such as online configurators



Convenient download of the 3D data for your chosen product



International training provided to customers on products and technologies

## Your partner for intelligent connectivity

We provide you with the right solutions and products for intelligent power grids. These solutions are based on a broad spectrum of innovative connection technology and surge protection for the energy industry. Furthermore we are always nearby anywhere in the world: our sales network with over 50 subsidiaries and more than 30 additional sales partners guarantees competent advice directly on site.





**Germany, Blomberg**

Company headquarters with development, production, and sales



**Germany, Bad Pyrmont**

Development, production, and sales



**India**

Development, production, and sales



**China**

Development, production, and sales



**USA**

Development, production, and sales



**Brazil**

Production and sales



**Poland**

Production and sales

## Open communication with customers and partners worldwide

Phoenix Contact is a global market leader based in Germany. We are known for producing forward-thinking products and solutions for the comprehensive electrification, networking, and automation of all sectors of the economy and infrastructure. With a global network, we maintain close relationships with our customers, something we believe is essential for our common success.

You can find your local partner at  
[phoenixcontact.com](http://phoenixcontact.com)

