



Components and systems for photovoltaics

PHOENIX CONTACT – Communicating with customers and partners worldwide

Phoenix Contact is a leading manufacturer of electrical connection and industrial automation technology. Founded more than 80 years ago, the company now has 9,900 employees, of which more than 5,500 are located in Germany. A sales network with over 46 subsidiaries and more than 30 sales representatives guarantees proximity to the customer.

The product range includes high-grade components, systems and services across a wide variety of applications. The selection ranges from modular terminal blocks to interface technology, PCB connection technology, solutions for surge protection through to hardware and software solutions for the automation of industrial systems.



Global player with personal customer contact

Company independence is an integral part of our corporate policy. Phoenix Contact values in-house expertise. The design and development departments continuously implement innovative product ideas and deliver special solutions to meet customer requirements. Numerous patents have resulted from products developed at Phoenix Contact.



Secure your power supply for the future

Global energy demands are continuously increasing. Therefore, regenerative energy is becoming an increasingly important source of energy within the energy mix, both from an ecological and an economical point of view. In addition to wind power, hydropower, and biomass/gas, photovoltaics represents a large share of this energy mix.

Taking into consideration future requirements, this rapidly growing field is expected to become a key contributor for power supply.

Work together with Phoenix Contact to meet the challenge of securing global power supplies. For many years now, we have been a reliable and a competent partner in this field. With the aid of our experience, products, solutions, and services, we can help you operate your systems reliably and economically.

PHOENIX CONTACT –
At home in the world of photovoltaics.



Power Solutions

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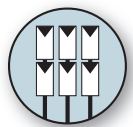


Components for PV modules, connection boxes, and inverters

Whether you're a module manufacturer, device manufacturer, planner or installation engineer – the comprehensive range of products from Phoenix Contact enables you to implement your individual requirements in efficient PV solutions.

The tailored system components and our reliable support contribute to the long-term and increased availability of your PV system.

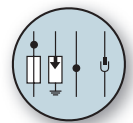
Comprehensive component solutions for all areas of photovoltaics:



PV modules
Power connections



Mover
Tracker



Distributor boxes
Device connections



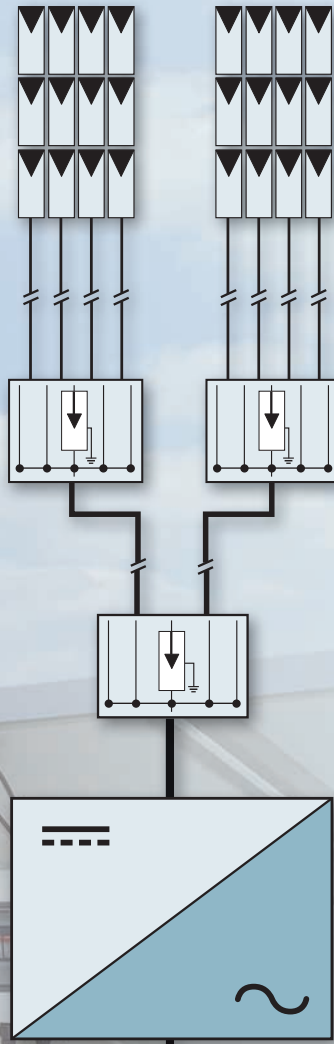
Monitor (visualize)
Control



Inverter
Supply



Reliable electrical engineering components for:



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Photovoltaic modules

- Connection technology for PV modules
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Connection boxes

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- Housing feed-throughs
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- Surge protection

Connection technology for photovoltaic modules

SUNCLIX – quicker connection of PV modules

When installing PV systems, there is now a more efficient way of wiring cables of various length from the module through to the inverter – SUNCLIX.

The SUNCLIX connector, which can be assembled in the field, can be connected quickly, easily, and reliably without the need for special tools. Thanks to the 100% automated SUNCLIX junction box, processes in module production are simplified and costs are reduced.



DC connector

Save money and time with the SUNCLIX connector, which can be assembled in the field. The connector is supplied pre-assembled thus eliminating the need for any additional parts. The spring-cage connection supports quick and easy local connection without the need for special tools. The connector is compatible with surge protection sets from Phoenix Contact and inverters from SMA.

Voltage: 1100 V

Current: 40 A even for 4 mm²

Cable cross-section: 2.5 to 6 mm²

Degree of protection: IP68

Temperature range: -40°C to +90°C

Protection class: II

TÜV-certified according to DIN EN 50521

1. Insert stripped PV conductor



2. Press down on spring and snap in

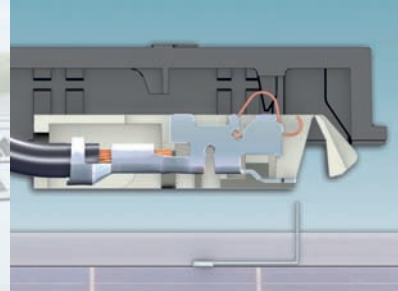


3. Tighten screw connection – and you're done!

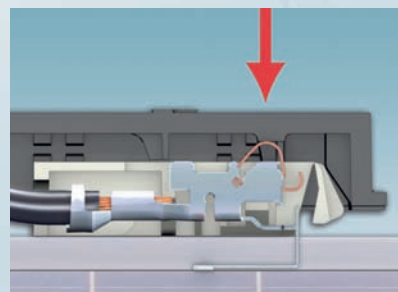


Note: Can only be released using a screwdriver

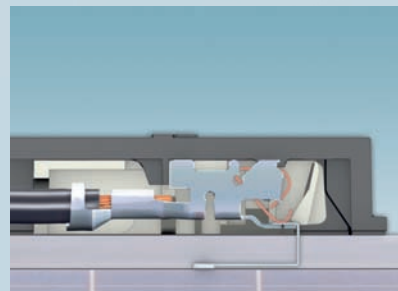




1. Position junction box over ribbon.



2. Put junction box down – ribbon is automatically drawn in.



3. Press down on junction box – ribbon automatically makes contact and the box is secured in place.

Junction box

The SUNCLIX outlet box makes contact with photovoltaic modules quickly and reliably in one step. It is specially designed for thin-layer modules and crystalline modules of low performance classes. A special feature of the outlet box is its fully automated mounting method.

Number of contacts: 2 ribbons plus 1 diode
 Contact spacing: 20 mm (adjustments possible)
 Ribbon dimensions: Up to 4 mm wide/0.2 mm thick
 Outer cable diameter: 5.5 mm ±0.2 mm
 Degree of protection: IP65
 According to the requirements of V VDE 0126-5

Y-distributors, cables, and tool

The SUNCLIX range is rounded off by Y-distributors, three solar cables with a cross-section of 2.5, 4, and 6 mm² plus a corresponding stripping tool. The Y-distributors and solar cables are supplied on rolls in 100 m lengths.

Solar cable properties:
 Structure: Tin-plated individual litz wires, double insulation
 Voltage: 1800 V DC
 Temperature range: -40°C to +90°C
 Color: Black
 Resistant to weather, UV, and ozone
 Corresponds to the new DKE requirement profile 2PfG 1169

→ The selection tables for "Connection technology for PV modules and field cabling" can be found on page 33

Modular terminal blocks for 1000 V DC

Collection – distribution – protection

In the connection boxes, individual module lines are collected and transferred together. In order to keep cable losses to a minimum, the chosen system voltage is relatively high. Here, non-load voltages up to 1000 V DC are the norm. These high DC voltages place particular demands on the components used.

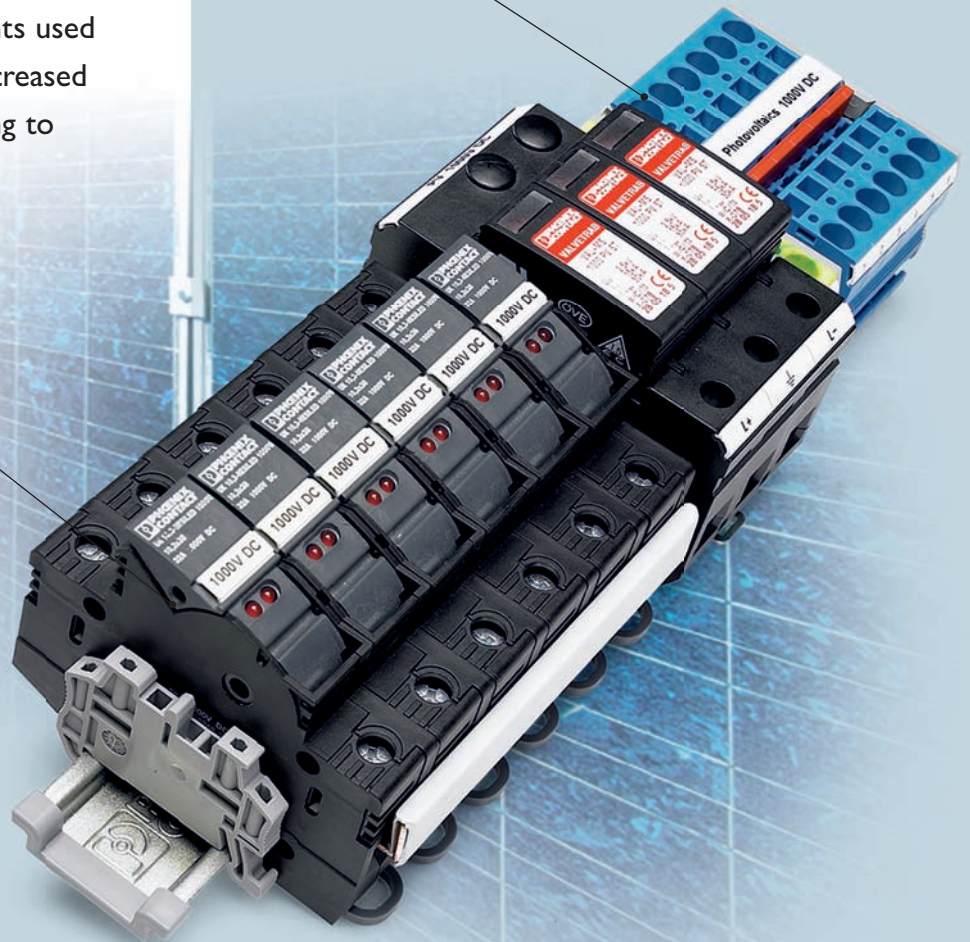
In contrast to AC voltage, the DC voltage that is present allows creepage distances to be created very easily on the surface of insulating elements. The components used in this area must therefore have increased air and creepage distances according to DIN EN 61730.

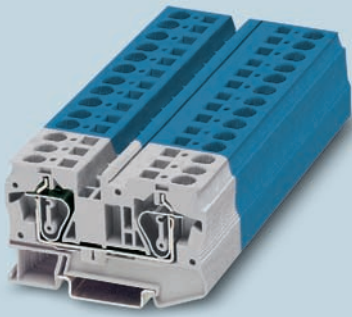
Feed-through terminal blocks

The feed-through terminal blocks can be connected together quickly and easily using plug-in bridges. This makes them an efficient solution for combining multiple strings.

Fuse terminal blocks

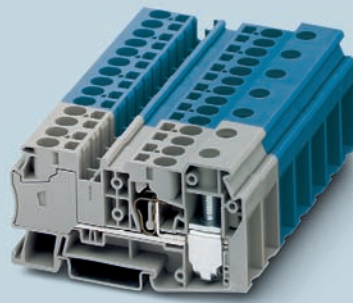
The fuse terminal blocks in the generator connection box protect cables and strings against impermissibly high residual currents and feedback currents in the event that parts of the PV system fail or are shaded.





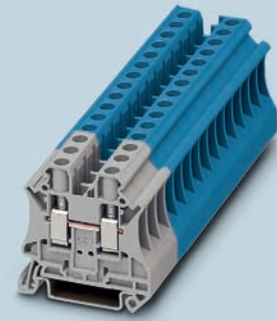
Spring-cage connection terminal blocks

The ST spring-cage feed-through terminal blocks feature a compact design and optimized handling. The contact force is independent of the user. All copper conductor types up to 35 mm² can be clamped with or without pretreatment.



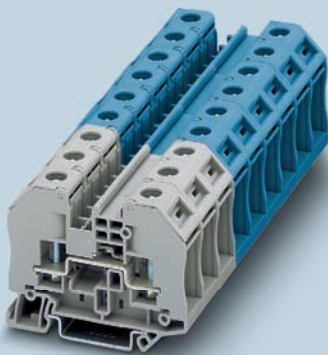
Hybrid connection terminal blocks

The spring-cage hybrid terminal block can be used to route up to four 10 mm² conductors to one 35 mm² conductor. Power is supplied via four spring-cage connections, the output side has a screw connection. Four individual strings can be combined with just one terminal block.



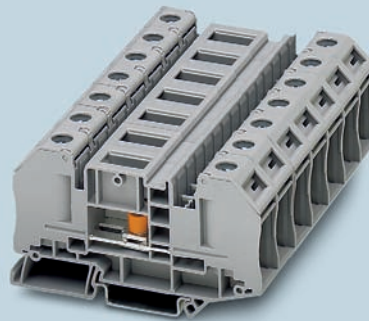
Screw connection terminal blocks

The screw connection terminal blocks feature a maintenance-free conductor connection, which means that the screws do not have to be retightened. All copper conductor types up to 240 mm² can be clamped with or without pretreatment.



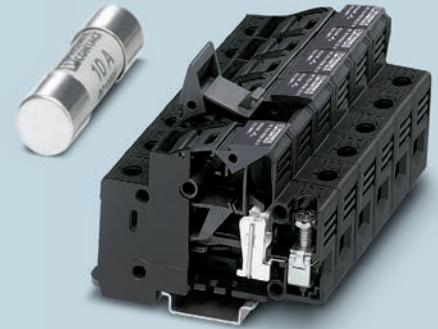
Bolt connection terminals

The rugged bolt connection terminals are fitted with connection bolts up to M8 and can accommodate ring cable lugs with a conductor cross-section of up to 35 mm². On RT versions, the captive integrated cap nut considerably facilitates conductor connection.



Disconnect terminal blocks

The disconnect terminal blocks enable the interruption of a current path without disconnecting the contact points. The feed-through is opened or closed using a disconnect slide that is screwed in. The relevant switching state is clearly indicated by the orange disconnect slide screw.



Fuse terminal blocks and fuses

The fuse terminal blocks accommodate the fuses that are widely used in photovoltaics, which are 10.3 mm x 38 mm in size. The integrated LED in the HESILED version indicates a blown fuse. The fuses feature a special gPV characteristic and are available in ratings from 2 - 20 A.

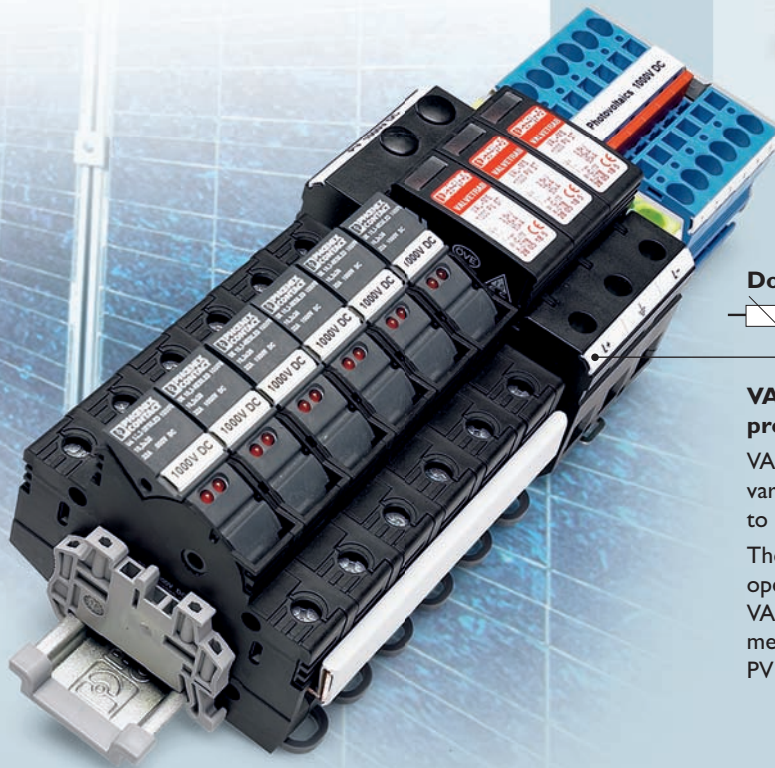
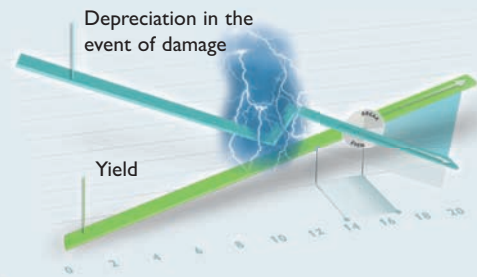
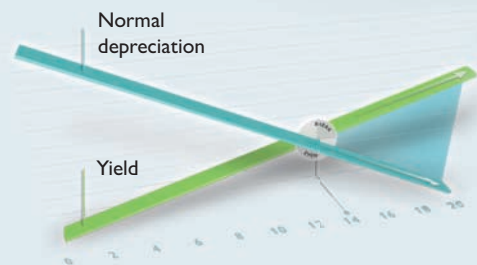
→ The selection tables for "Modular terminal blocks – Fuses – Accessories" can be found on page 40

Surge protection for DC and AC voltages

Increased operational reliability for inverters and PV installations

A profitability assessment and the resulting amortization period form the basis for choosing any photovoltaic system. However, all too often cost calculations do not include an estimation of the threat of lightning strike. The unexpected malfunction of an inverter due to a lightning strike can, however, result in reinvestment of up to 20%. Preventive surge protection increases system availability and therefore ensures that the break-even point is reached as expected.

Surge protection is investment protection



Double the safety



VALVETRAB surge protection devices provide double the reliability

VALVETRAB surge protection devices have two varistor arresters, whereby each varistor is able to carry the full system voltage on its own.

The double varistor design means that operational reliability is doubled for inverters. VALVETRAB-MS arresters therefore already meet future directives for the protection of PV systems.

Grounding conditions in the DC voltage area

Depending on the system structure, various surge protection devices can be used:



Isolated
DC system



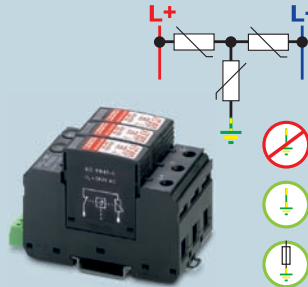
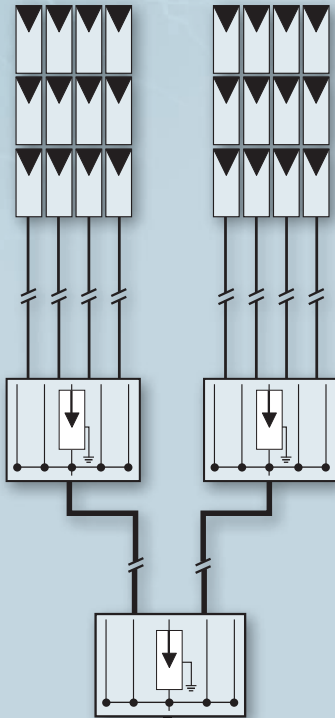
DC system grounded
on one side



DC system grounded
on one side with fuse

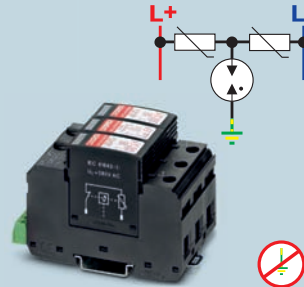
1000 V DC surge protection

VALVETRAB-MS: Plug-in type 2 surge protection devices, where the individual arrester connectors are each equipped with an optomechanical status indicator.



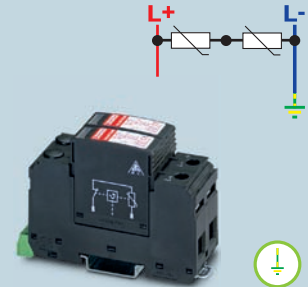
Surge protection based on
varistor arresters

- Either with or without floating remote indication contact
- Also available as upside down version (UD)



Surge protection based on
spark gaps

- Free of leakage current
- Either with or without floating remote indication contact



Surge protection for DC
systems grounded on one
side without fuse

- Either with or without floating remote indication contact

240/415 V AC surge protection

Type 2 surge arresters: VALVETRAB compact

An additional type 2 arrester should also be installed to protect the inverters on the AC side.

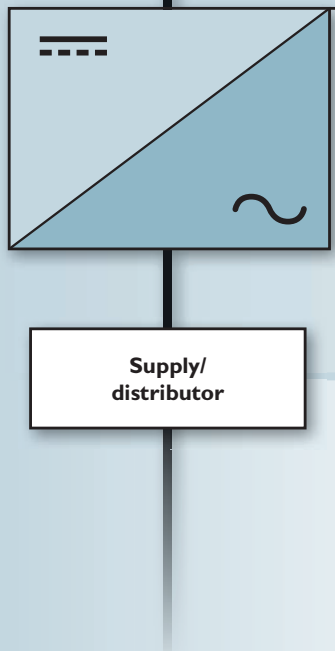
- Slim design (12 mm per path)
- Arrester connectors with optomechanical status indicator
- With floating remote indication contact



Type 1 lightning arresters: FLASHTRAB compact

Arrester equipment is usually standard in PV installations. The use of type 1 lightning protection devices is therefore recommended.

- High-performance lightning arresters with high follow current quenching capacity
- Arrester connectors with optomechanical status indicator
- With floating remote indication contact

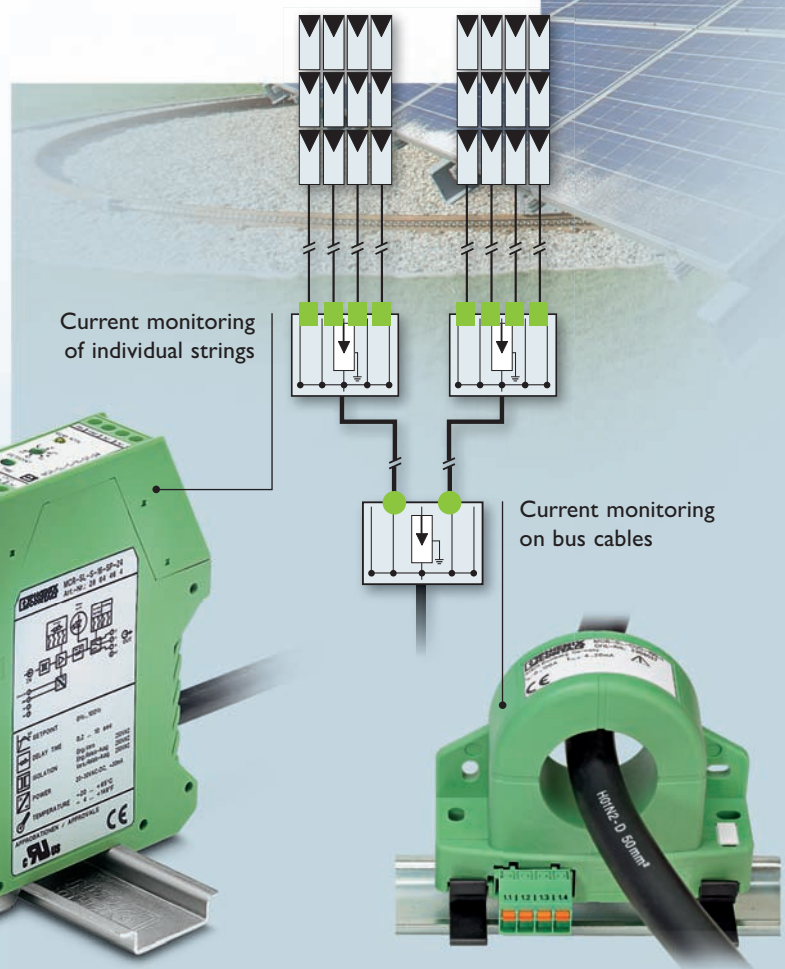


→ The selection tables for "Surge protection for DC and AC voltages" can be found on page 42

Current transformers, motor starters, and compact controllers

Monitor performance data and control tracking systems

Photovoltaic systems should achieve maximum energy yield from solar power in the shortest possible time. It is therefore essential that individual strings respond immediately to failures. Here, the continuous monitoring of all the performance data of a PV system ensures direct and therefore fast error detection.



Current transformers – flexible performance data acquisition of string and bus cables

MCR current transducers convert DC and AC currents up to 300 A into standard analog signals, even in the event of distorted waveforms. This wide area of application of converters simplifies the structure of seamless power monitoring in PV systems.

- System power acquisition regardless of the inverter type
- Increased energy efficiency thanks to fast error detection – shorter downtimes
- Direct identification of minimum power levels of individual strings
- Realtime r.m.s. value measurement
- Integration in monitoring systems (data logging, remote diagnostics)

Current transformers for string cables

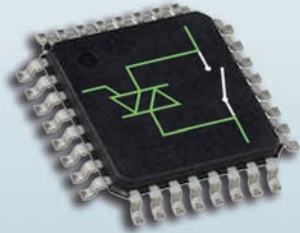
- High level of measuring accuracy < 0.5%
- Through connection of up to \varnothing 10.5 mm
- Programmable and configurable
- Progressive adjustment of measuring range
- True r.m.s. value measurement
- With optional relay and transistor output

Current transformers for bus cables

- 100 A, 200 A or 300 A types available
- High level of measuring accuracy < 1%
- Through connection of up to \varnothing 30.5 mm
- True r.m.s. value measurement

Durability thanks to hybrid technology

A combination of wear-free solid-state technology and rugged relay technology controlled by a microprocessor enables "gentle" switching. The result is that the service life of CONTACTRON hybrid motor starters is ten times longer than purely mechanical switching devices. CONTACTRON therefore offers the ideal solution for frequent switching operations in mover/tracker systems.



Forward running



Reverse running



Motor protection



Emergency stop

Class 100 compact controllers

Web-based PLC solutions with high efficiency factor:

- Highly flexible thanks to modular expansion with standard and function terminals from the Inline I/O system
- Easy integration in existing networks based on international standards such as INTERBUS, Ethernet, and GSM/GPRS as an option
- Compatible data exchange by means of integrated IT standards such as HTTP, FTP, SNMP, SQL, and OPC
- Intuitive programming in accordance with IEC 61131 using PC Worx/PC Worx Express automation software
- Excellent price/performance ratio



Hybrid motor starters with up to four functions

CONTACTRON hybrid motor starters are very compact and offer quick wiring. They are available in around 40 different versions for 0.6 A, 2.4 A, and 9 A performance classes and 24 V DC or 230 V AC input voltages.

The advantages:

- Up 75% less space required
- Wiring time reduced by up to 75%
- Service life ten times longer
- One device – up to four functions

Easy automation using ILC compact controllers

- Processing speed of 90 μ s per 1000 instructions
- INTERBUS and Ethernet interfaces
- 8 KB to 48 KB retentive data memory
- Up to 4096 I/O points (depending on type)
- Integrated web/FTP server
- OPC function
- Built-in GSM/GPRS modem (depending on type)

→ The selection tables for "Current transformers", "Motor starters", and "Compact controllers" can be found on page 36 onwards

Device connection technology

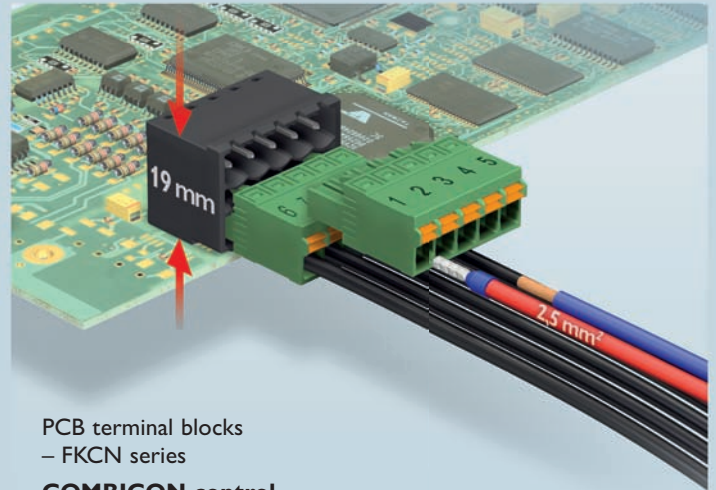
Rugged housing feed-throughs and reliable contact through to the PCB

You'll always find the right connection for your devices or motors – from the PCB connection, through IP6X-protected housing feed-throughs, to circular connectors.

When standard solutions just don't do the job, we'll work with you to develop your own individual connection solution.



M12 circular connectors
PLUSCON circular

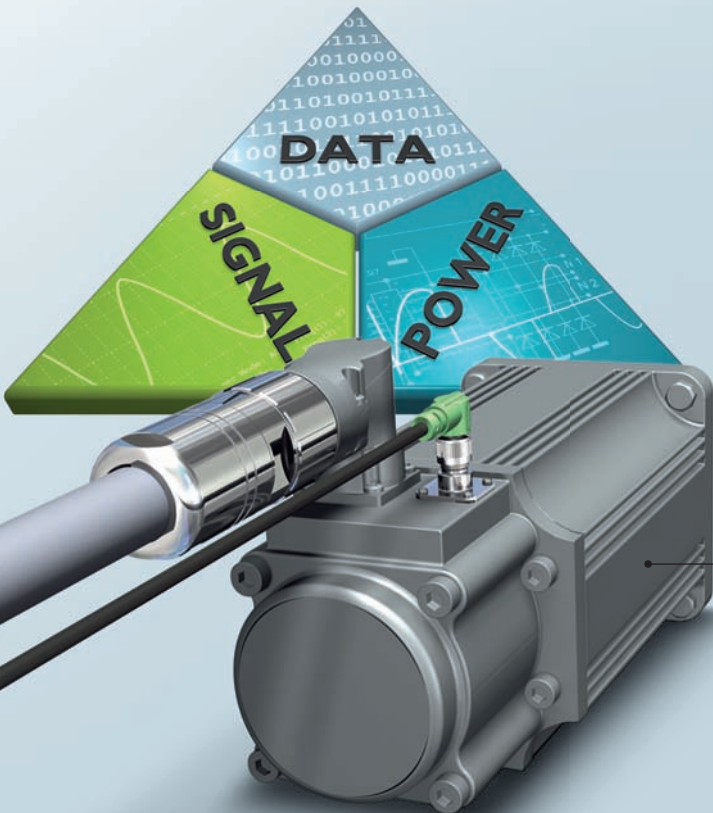


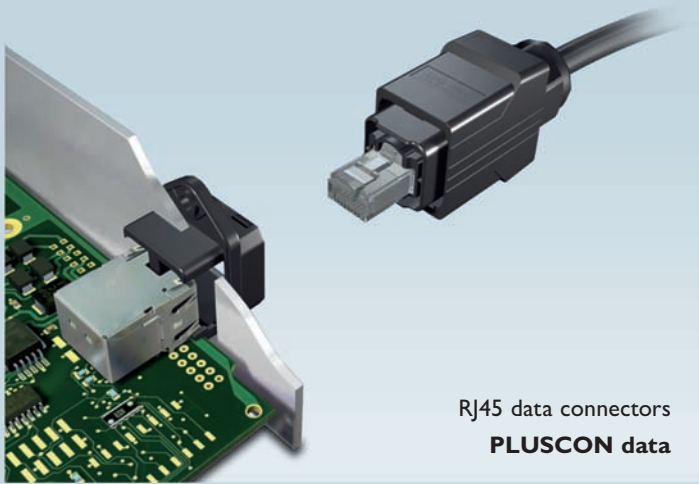
PCB terminal blocks
– FKCN series
COMBICON control

Device connection technology – SIGNAL

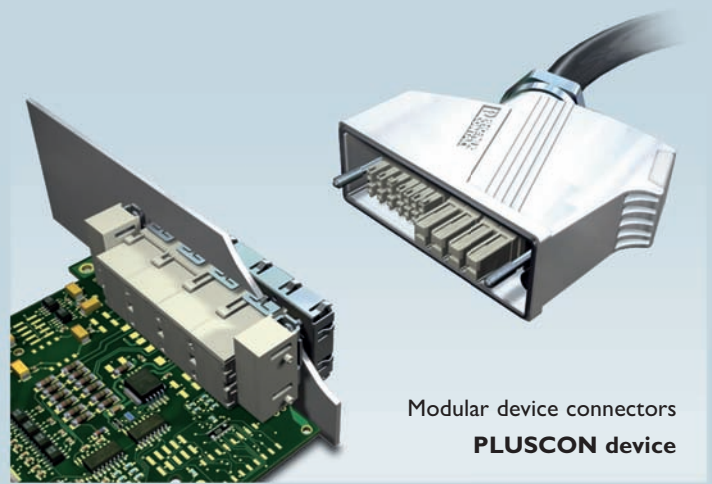
- PCB terminal blocks and PCB connectors with 2.00 to 7.62 mm pitch for wave soldering, reflow soldering, and press-in mounting
- M5 to M27 flush-type connectors with solder connection or punched-on individual litz wires with IP65/IP67 protection
- M8 and M12 connectors that can be assembled with IDC, spring-cage, pierce or screw connection with IP65/IP67 protection

For reliable motor connection, a range of circular connectors from M8 to M58 is available for signals and power.

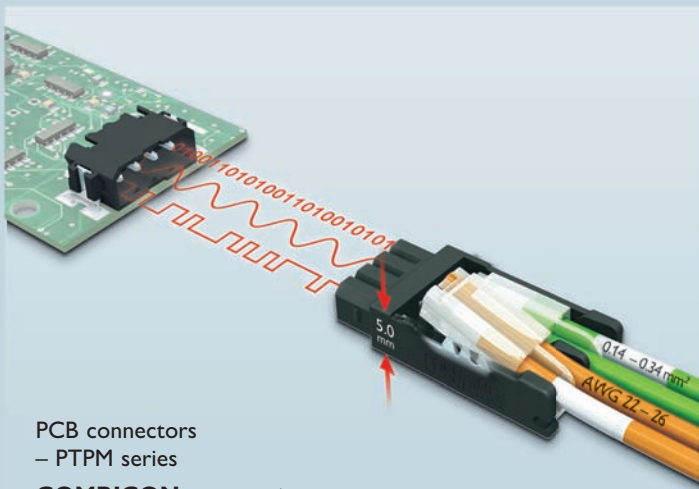




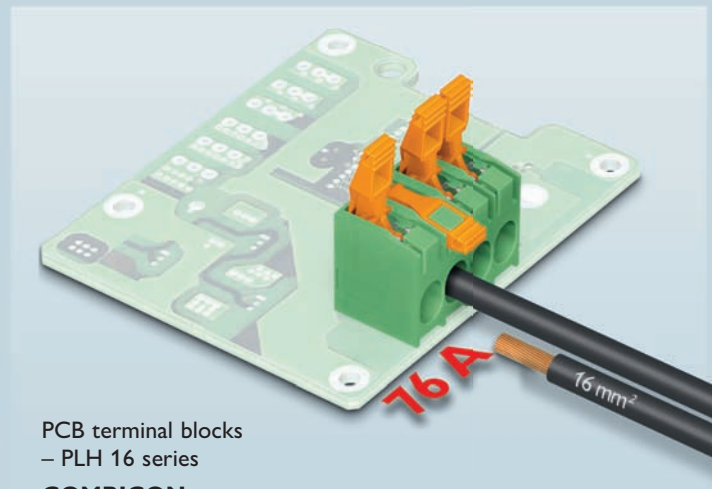
RJ45 data connectors
PLUSCON data



Modular device connectors
PLUSCON device



PCB connectors
– PTPM series
COMBICON compact



PCB terminal blocks
– PLH 16 series
COMBICON power

Device connection technology – DATA

- PCB terminal blocks and PCB connectors for network technology and bus communication
- Connectors and panel feed-throughs for RJ45, USB, D-SUB, and M12 interfaces with IP65/IP67 protection

Device connection technology – POWER

- PCB terminal blocks and PCB connectors for power up to 125 A
- Heavy-duty connectors in various sizes with IDC, spring-cage, screw, and crimp connection for power up to 200 A with IP65/IP67/IP69K protection

Compact type 3 surge protection – for direct installation in devices

- For grounded, isolated networks (230 V, single-phase)
- Double spring-cage connections (V/T wiring)
- Integrated audible fault alarm
- Fixing clips for easy mounting



→ The selection tables for "Device connection technology – IP20 and IP65/IP67" can be found on page 34

System solutions for various types of system

Photovoltaic systems are increasingly being extended with functions to continuously improve their efficiency. The monitoring of performance data with simultaneous status visualization is just one way to improve the level of service in the long term.

Large outdoor systems with tracked collector surfaces require intelligent management solutions with modular control systems and scalable network structures. Comprehensive surge protection concepts ensure enhanced operational reliability and investment protection for the system.

Phoenix Contact can provide you with the right solution concepts to meet all of these requirements from a single source.



From standard PV installation through to outdoor systems



Pages 18 - 19

Set solutions for surge protection

Plug 'n' protect – pre-assembled PV-SETs are the ideal solution for standard PV systems.



Pages 20 - 21

Monitoring and production data acquisition

Production data acquisition, status monitoring, and remote maintenance – network solutions for the optimum integration of PV systems in building automation.



Pages 22 - 25

Controllers and system management

Modular automation technology for sensors and actuators provides excellent efficiency and offers individual solutions.



Pages 26 - 27

Autonomous PV systems and wireless transmission systems

Systems for autonomous power supply are the ideal solution for weather stations, for example. Here, wireless solutions are a valuable addition to data transmission.

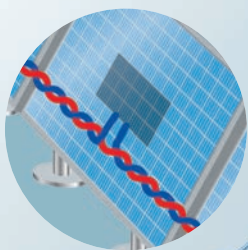
Surge protection in rugged IP65 installation housing

PV-SETs – Perfect protection for PV installations

Pre-assembled PV-SETs simplify the installation of surge protection solutions in a PV system. They are particularly user-friendly when used in conjunction with SUNCLIX connectors. The PV-SET 1000 DC is already equipped with the appropriate connections.

Correct cable installation

Short cable paths and twisting the string cables minimize inductive voltage couplings. Large conductor loops should be avoided.

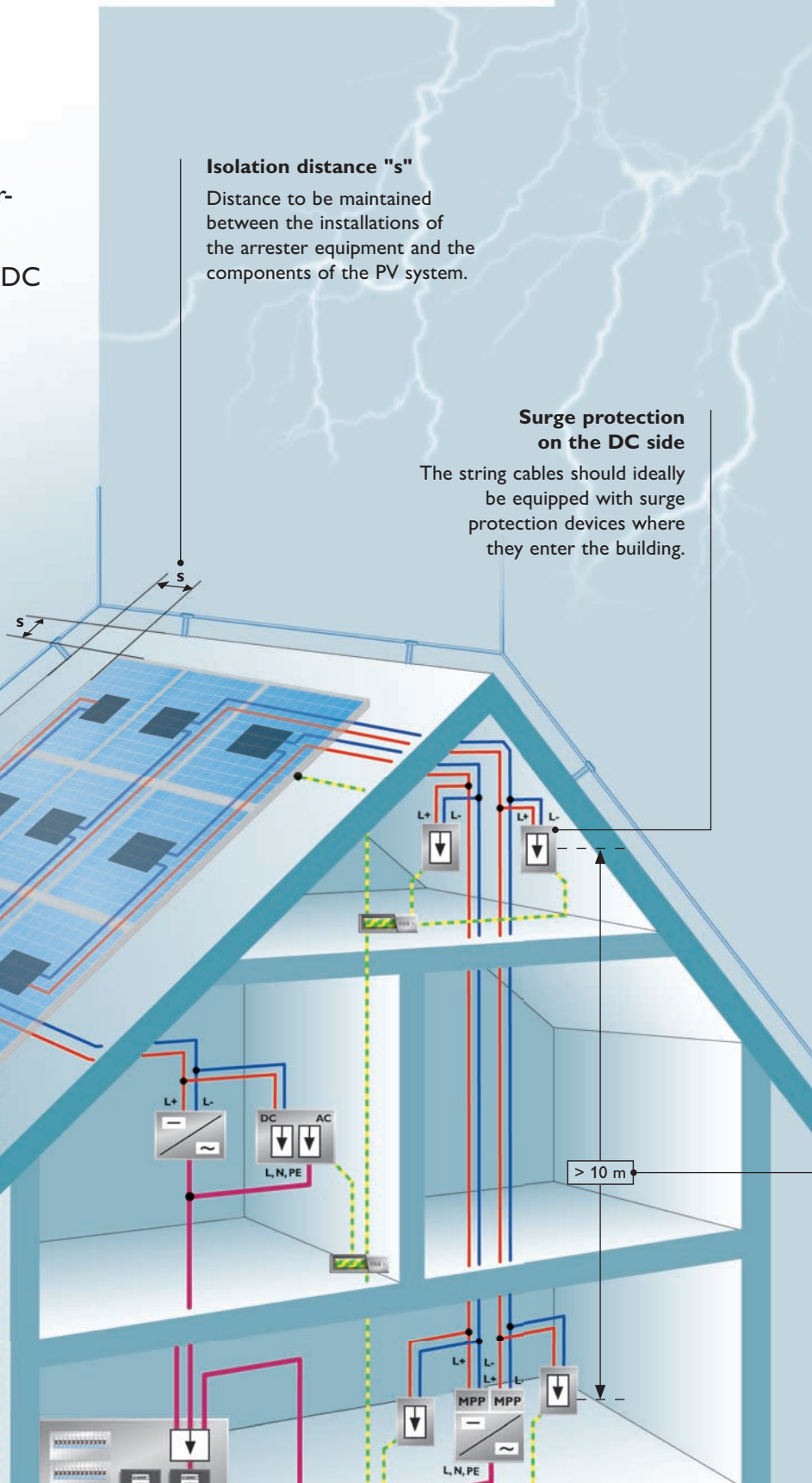


Isolation distance "s"

Distance to be maintained between the installations of the arrester equipment and the components of the PV system.

Surge protection on the DC side

The string cables should ideally be equipped with surge protection devices where they enter the building.





**1000 V DC
PV-SET 1000 DC**

Surge protection in IP65 housing for single string photovoltaic systems, connection via SUNCLIX male/female connector.

- 1. Single string system
- 2. X string system
- 3. Multistring system



**1000 V DC/240 V AC
PV-SET 1000 DC/AC**

Surge protection in IP65 housing for photovoltaic systems, protection of the DC and AC side of an inverter.

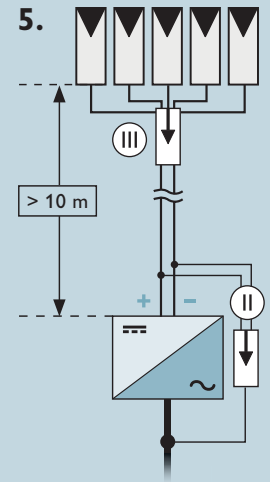
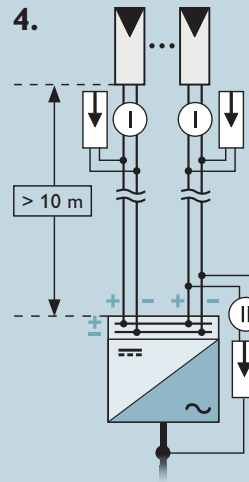
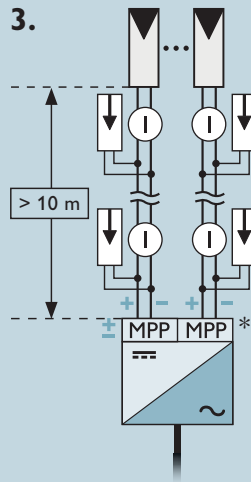
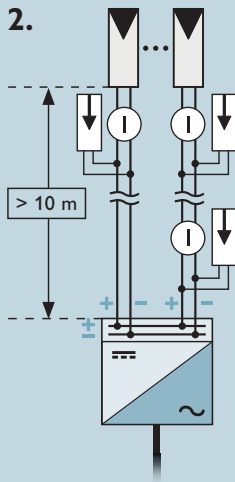
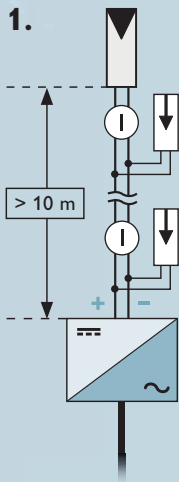
- 4. Combined DC/AC protection



**600 V DC
PV-SET 5ST/600 DC**

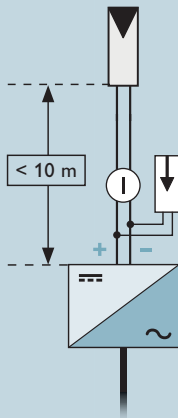
Surge protection, generator disconnect, and modular terminal blocks in IP65 housing, for up to five photovoltaic strings.

- 5. X string system



Usually one PV-SET or arrester is sufficient for each connection direction (DC or AC side).

For cable lengths over ten meters, installation of additional arresters is recommended.



Rounding off the protection concept

The data and communication interfaces on the inverter used for measured value acquisition must also be connected to suitable surge protection devices.

The DATATRAB product range provides optimum protection for this.



* Maximum point of power systems

→ The selection table for "Surge protection – Set solutions" can be found on page 43

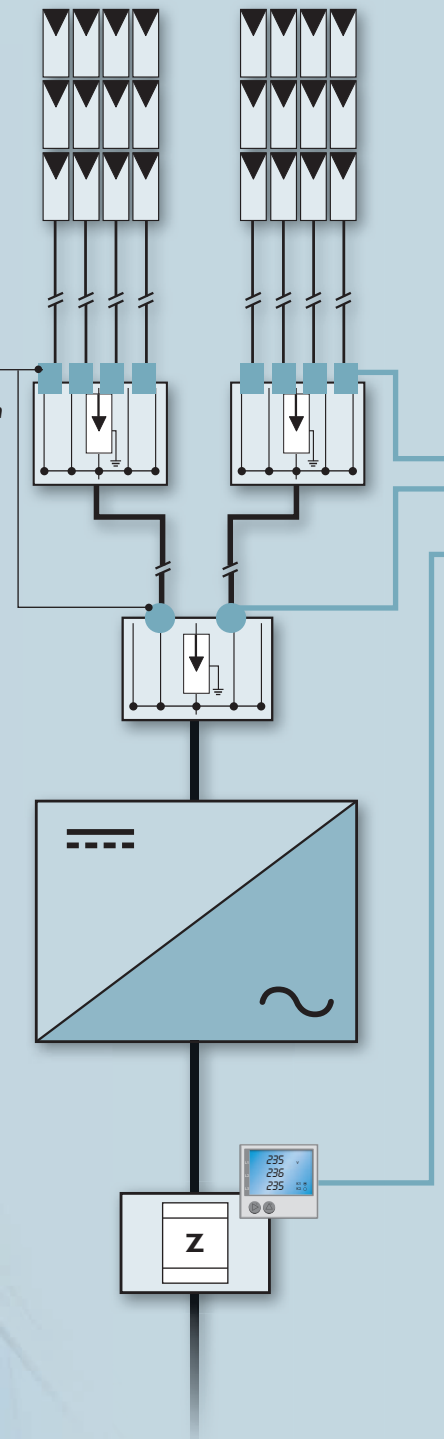
Energy data acquisition and status diagnostics

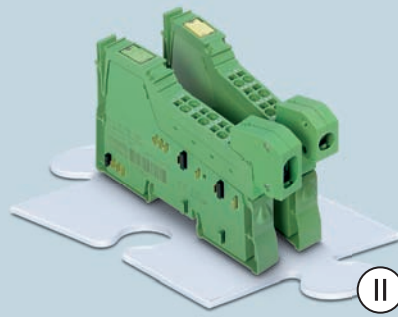
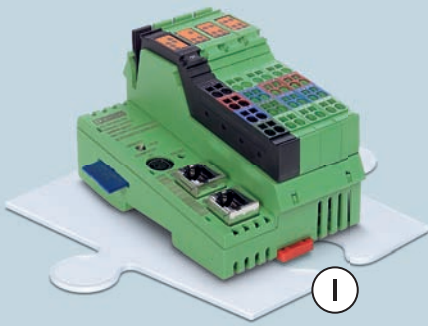
Tailored controllers – cost-effective and modular expansion

The various different modules in our Inline I/O system, such as incremental encoder terminals or other analog modules, can be used to easily implement your individual photovoltaic solution.

Monitor and operate system states as required via web panels or directly on site.

Performance data acquisition with current transformers for string or bus cables
See page 12





Compact controllers

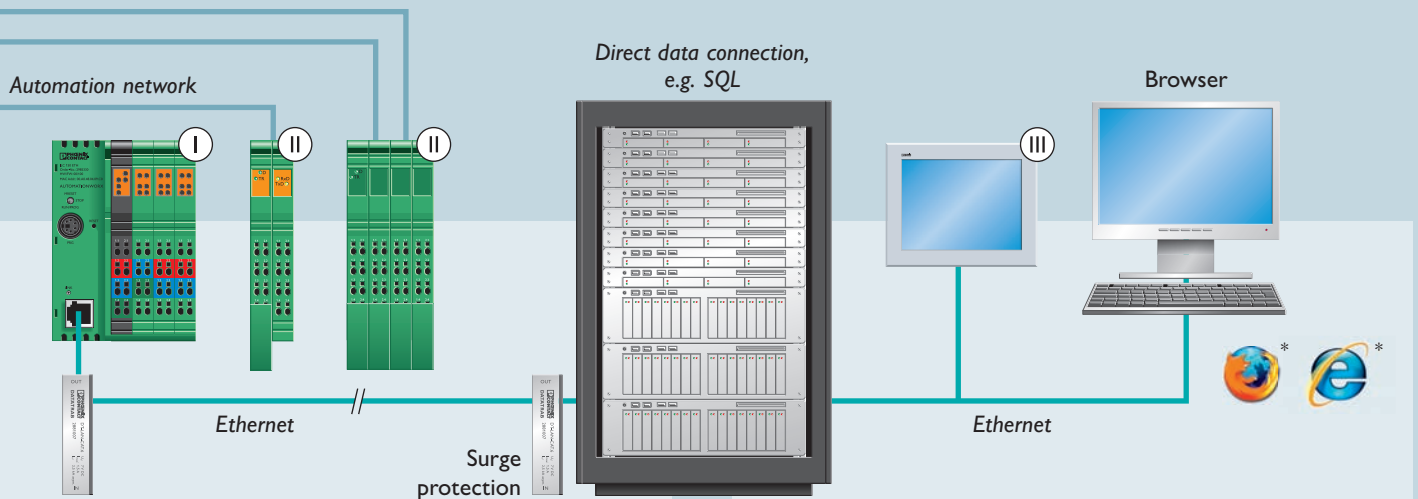
Input and output modules

Operation and monitoring

Class 100 controllers are the smallest members of the Phoenix Contact control technology family. They are equipped with modern automation and IT technology and are at the heart of the cost-effective system solution. The compact PLCs support low-cost entry into the world of automation.

We offer a wide range of input and output modules as well as various function terminals to extend controllers. For example, you can acquire temperature, mass, and position data using just one module, which can be mounted flexibly on the compact controller.

When used in conjunction with class 100 compact controllers, PV systems can be operated and monitored cost-effectively with web panels.



Easy implementation using standard function blocks

By using standard hardware and software automation components, the energy data on the DC and AC voltage side can be acquired accordingly. This data is processed and stored centrally for archiving. Standard hardware and software components are available for automated energy data acquisition. These user libraries are available to download in the e-shop.

Request status and performance data via the web browser

The current data and status of the system can be visualized using a web panel with integrated micro-browser. Alternatively, standard PCs with web browser can also be used.

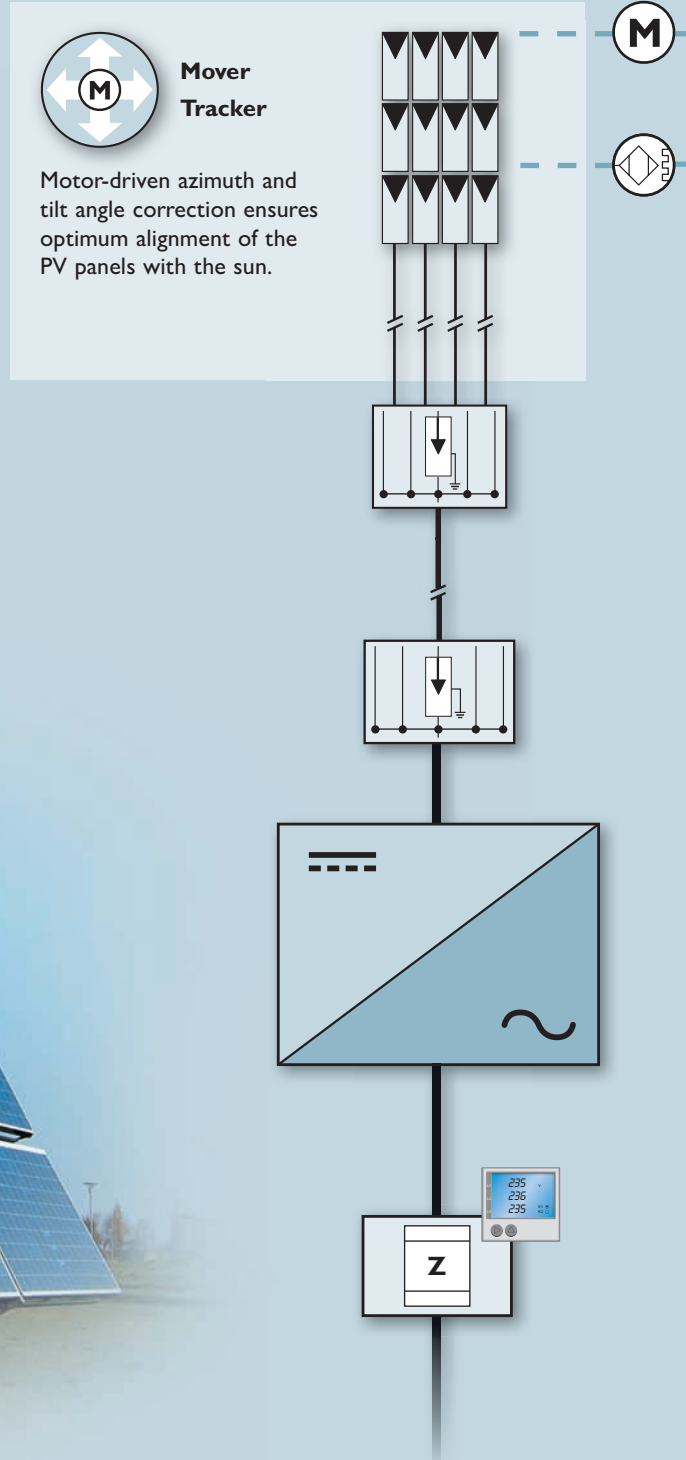
* The logos shown are international trademarks of the relevant companies in the applicable countries.

→ The selection tables for "Controllers and I/O systems" can be found on page 38

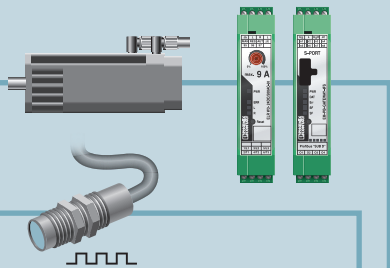
Single-panel tracking and system management

Efficient tracker and mover control

In order to increase effective energy generation, photovoltaic systems can be tracked. Standard products are used here, which have proved themselves in harsh industrial conditions. Monitoring and diagnostics are an integral part of a control system.



Motor starter/
motor manager



I

Compact controller with GSM/GPRS modem

The ILC 150 GSM/GPRS compact controller has an integrated modem and is the ideal solution for remote control and remote maintenance.

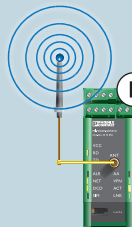


II

GPRS/EDGE modem with VPN router

The modem can be used worldwide thanks to quad band technology. It supports GPRS and EDGE with data rates of up to 210 kbps. A firewall and VPN reliably protect your application against unauthorized access. Configuration is easy thanks to web-based management.

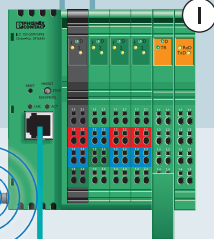
GSM



II Data connection
via Ethernet,
FO or GSM



Ethernet

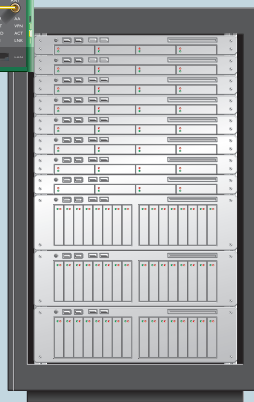


I

Local startup

- Web browser
- Program libraries
- Calculation of the position of the sun based on longitude, latitude, date, and time

The system is parameterized locally on site. A web panel or notebook with web browser is used to enter the corresponding coordinates, date, and time. Specific program adjustments are not required, as the function is implemented as a customer solution.



Browser



* The logos shown are international trademarks of the relevant companies in the applicable countries.

Data connection supported via Ethernet, FO or GSM

If no connection is available to public networks, data transmission via GSM/GPRS to a central location is supported. Monitoring and diagnostic data can then also be called from this location.

→ The selection tables for "Controllers and I/O systems" can be found on page 38

Multi-panel tracking and park management

Scalable network infrastructure with a high degree of data security

Master/slave systems are used for efficient energy generation in solar parks. In addition to structured and secure data exchange, they also provide redundancy for the entire system. As the central control unit, the master distributes the corresponding data and forwards the collected information to the higher-level control system.

Slave system

- Multiple single-panel systems in a slave system
- Multiple multi-panel systems
- Controller communication via TCP/IP
- Specific data structures
- Local monitoring
- Data transfer with specific arrays/structures

Master system

- Single-panel systems with additional master functions
- Multi-panel system with additional master functions
- Master functions
- Position calculation
- Control of data traffic to the slaves
- Communication with the park server
- Data transfer with specific arrays/structures

Can be extended to create a multiple-master/slave system.





I



II



III

Router with firewall

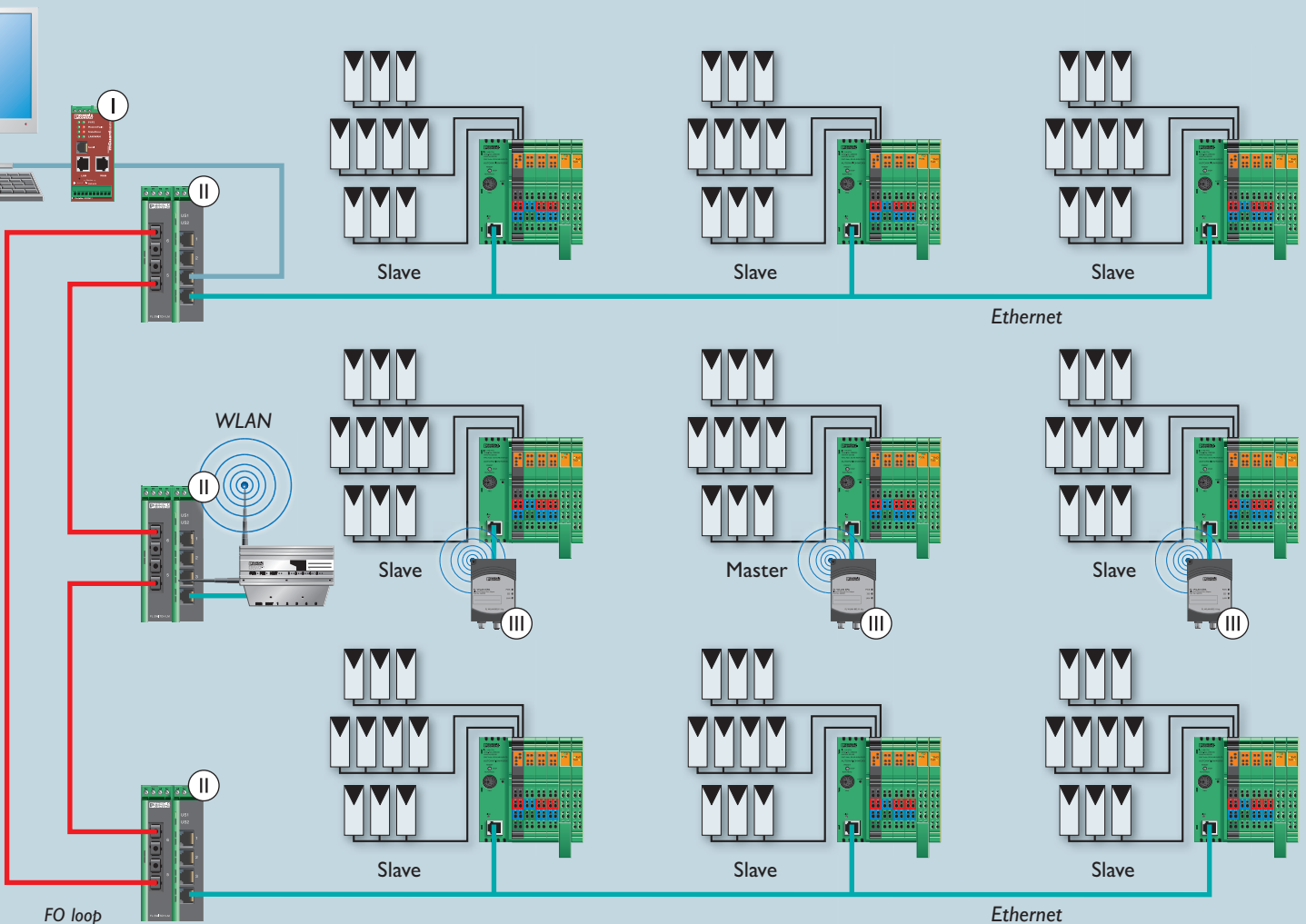
This router with integrated firewall encrypts all data according to the secure IPsec standard, providing secure and easy remote maintenance of machines and systems via public networks. In addition, the router is also available with VPN tunnel as an option.

Managed switch

Our Lean Managed Switches are available for managed Ethernet networks. They support manufacturer-independent redundant network structures using RSTP, as well as full network management using SNMP.

Ethernet port adapter

Factoryline Ethernet and serial port adapters have been developed specifically for use under harsh industrial conditions. They enable the easy and cost-effective integration of automation devices and PLCs with serial or Ethernet connection in a WLAN network.



→ The selection tables for "Network technology" can be found on page 37

Autonomous PV systems

Independent power supply unit in the field

RAD-SOL-SET... solar set systems are the ideal solution for supplying weather measuring stations or even parking meters with power. When combined with wireless solutions, they open up a host of new possibilities for covering remote and under-exploited parts of systems.



RAD-SOL-SET... Autonomous remote control solutions

Various RAD-SOL-SET systems are available. Depending on the installation location and the required power reserve, loads of up to 23 W can be connected permanently.

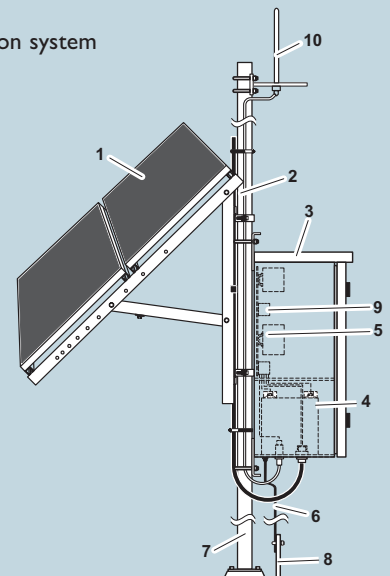
The PV modules generate sufficient power to supply wireless modules, GSM modems, compact controllers, and distributed measuring sensors or other devices and to recharge the solar batteries.

Scope of supply

1. Solar panel
2. Solar panel bracket
3. Control cabinet with prewired charge controller
4. Solar batteries
5. Surge protection
6. Cabling material

Additional components

7. Fixing mast
8. Cross ground rod
9. Wireless transmission system
10. Wireless antenna



→ The selection table for "Autonomous PV systems" can be found on page 36

Wireless transmission of measured values and signals

Professional wireless systems have to operate reliably. Depending on the application, the following transmission technologies have proven themselves:

Bluetooth – for transmitting control data in a physically restricted area (factory automation)

WLAN (IEEE 802.11) – for more expansive infrastructure networks with high performance requirements

Trusted Wireless – for non-time-critical signals that have to be exchanged over longer distances

GSM/GPRS – worldwide data exchange via the mobile phone network



When used in conjunction with autonomous PV systems or large installations in open spaces, wireless transmission paths offer the following special features:

- Lower wiring and maintenance costs
- Easy avoidance of obstacles
- Flexible and fast expansion
- Easy integration in existing structures
- Worldwide remote maintenance

Wireless IO

With Wireless IO, analog and digital signals are transmitted without using a single cable.

RAD Line IO (Trusted Wireless)
Maximum modularity for long distances.

RAD Line Serial IO (Trusted Wireless)
For up to 254 modules in Modbus mesh networks. Available with optional PROFIBUS gateway for the direct integration of IO signals in PROFIBUS.

Wireless MUX (Bluetooth)
Fast transfer of cyclical control signals.

Wireless Serial

The following product lines are available for the wireless signal transmission of V.24 (RS-232), RS-422, and RS-485 serial interfaces:

RAD Line Serial (Trusted Wireless)
Serial interface transmission with up to 254 devices.

PSI Line Bluetooth (Bluetooth)
Serial interface transmission to flexibly changing communication modules.

PSI Modem Line (GSM/GPRS)
Worldwide remote maintenance of PV systems.

Wireless accessories

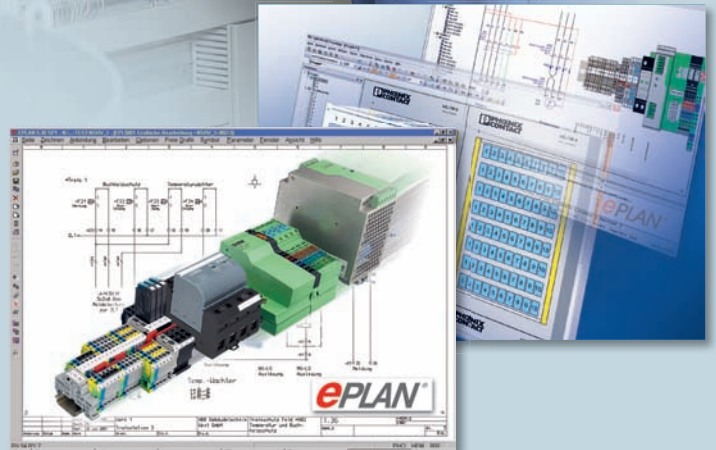
In most cases, in order to operate wireless networks, further accessories are necessary in addition to the actual components. Alongside various antennas and cables, these include adapters, splitters, and surge protection – all of which are, of course, part of our comprehensive wireless portfolio.

→ For additional information and product data for industrial wireless technology, please visit www.phoenixcontact.net/catalog.

Marking systems and software solutions

In addition to system and component solutions, Phoenix Contact provides further support for your entire working environment, not to mention excellent supplier performance and worldwide support services.

The MARKING system from Phoenix Contact is the seamless solution for the quick and easy labeling of your applications. Using CLIP PROJECT configuration software, the labeling text is sent to the printer with just a click of the mouse, regardless of whether you are using a BLUEMARK LED printer, thermal transfer printer or plotter.



CLIP PROJECT planning software

Modular terminal blocks and automation, interface, and surge protection components can now be configured more quickly, easily, and conveniently using CLIP PROJECT advanced.

- Plan and assembly complete DIN rail installations directly on the computer
- 2D preview in realtime with drag & drop editing
- 3D output to check installation depth
- Comprehensive import and export options, e.g., Excel, EPLAN, etc.
- Custom template designs and barcode generation (Professional version)



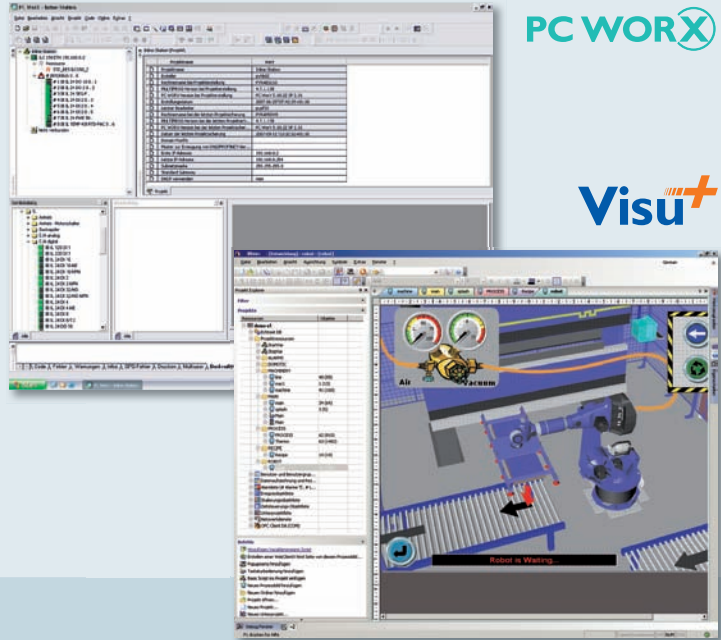
→ The selection table for "Software solutions" can be found on page 39

Programming and visualization

For commercial PV systems and, in particular, tracked systems, continuous production data acquisition significantly contributes to improving efficiency and therefore optimizing yield. When it comes to control system programming, parameterization, and visualization, PC Worx and Visu+ are the ideal software tools.

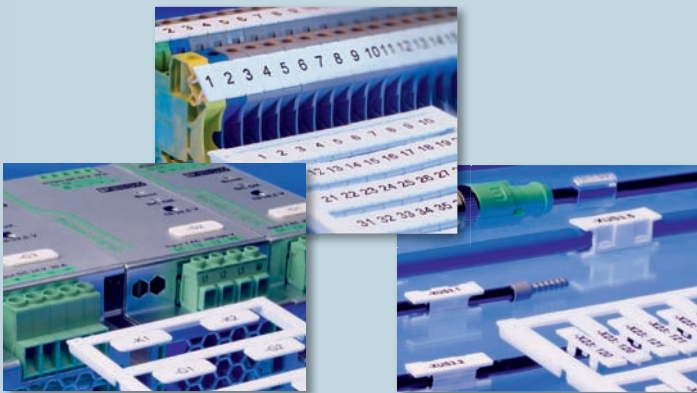
PC Worx is compatible with all PC-based and embedded control systems from Phoenix Contact, is compliant with IEC 61131-3, and has an integrated BUS configuration.

Visu+ features a manufacturer-independent control system connection via the OPC interface, PC Worx data can be used for visualization.



PC WORX

Visu+



MARKING system

Perfectly tailored hardware and software components for error-free terminal, conductor, and device marking. The BLUEMARK printer system is the ideal solution for standardized UniCard sheets:

- Print capacity: 10,000 labels per hour
- Labeling is wipe and scratch-proof immediately after printing according to DIN EN 61010-1/VDE 0411-1
- Latest UV technology and special inks ensure environmentally-friendly drying process with no solvent emissions
- Low level of heat protects the carrier material against deformation or discoloration
- No warm-up time for printing thanks to LED technology



→ The selection table for "Marking systems" can be found on page 36

The right tool for every application

The key feature of a professional tool is that you enjoy working with it!

The excellent feel and ergonomics of the design, a long service life, and functionality guarantee optimum efficiency and quality. These properties are perfectly combined in all tools from Phoenix Contact.



1000 V AC/
1500 V DC



Cutting tools CUTFOX

With CUTFOX, Phoenix Contact offers the perfect cable cutter for every application. Various designs are available for processing different cable diameters.

All parts of the cable cutters that are under particular strain are tempered or specially hardened.

Stripping tools WIREFOX

The WIREFOX product range provides the perfect tool for every stripping task. WIREFOX precision stripping tools from Phoenix Contact make a real impression thanks to their excellent ergonomics and the special geometry of the hardened blades.

Crimping pliers CRIMPFOX

The extensive CRIMPFOX product range offers the professional user a new generation of crimping pliers. A new power transmission method reduces the amount of manual force required by 25% at maximum crimping pressure.

The handles' excellent geometry also makes for light work. The integrated pressure lock ensures long-term stability as well as high-quality, gas-tight crimping.

→ The selection tables for "Tools" can be found on page 43

Service and support



Our specialists are always on hand to help you plan, configure, and implement your ideal solution.

Taking into consideration specific sector requirements, our experts have comprehensive knowledge of the technology in question.

Together with our specialists, you will always find the ideal solution to meet your requirements – for each phase of your project.

Engineering and training

We're here to offer our technological expertise right through from the planning and configuration stage. We work together with you to find the ideal solution for your requirements. Your personal contact will be happy to support you, from product selection through to startup.

We offer an comprehensive range of training courses for the individual qualification of your employees:

- Standard training courses covering the system basics of current technologies
- Customized training – you can coordinate the detailed content, date, and location of training with us
- Workshops for small groups – we communicate project-specific specialist knowledge about your application on site

Our flexible Service Team is always on hand to assist you and you will always speak to a competent contact. We'll be at your site in no time if you require help with system expansion or faults that cannot be resolved over the phone.



Product lists with selection tables

The following product lists contain selected components together with their key technical properties. More detailed information as well as numerous other possible solutions can be found in our complete catalog.

The quickest way to access more information about Phoenix Contact's entire product and service portfolio is to go online.

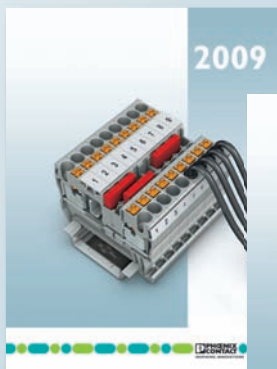
Simply visit us at:

www.phoenixcontact.net/catalog



Industrial Connection Technology,
Marking Systems and Mounting Material

CLIPLINE



Device Connection Technology
and Electronic Housings

COMBICON



Power and Signal Quality

TRABTECH



Components and Systems

AUTOMATION



Connection Technology
for Field Devices and Field Cabling

PLUSCON



Signal Converters, Switching Devices,
Power Supplies

INTERFACE



Corresponding products for your PV application:

Connection technology	
• For PV modules and field cabling	33
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• For devices – IP65/IP67	35
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Motor starters	36
Network technology	
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• Operation and monitoring	37
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Fuses and I/O systems	38
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Surge protection	
• For DC and AC voltages	42
• Set solutions	43
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Connection technology for PV modules and field cabling

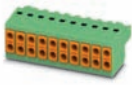

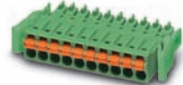

SUNCLIX connectors SUNCLIX outlet box				
Description		SUNCLIX connector for PV modules, can be assembled in the field	SUNCLIX connector for PV modules, can be assembled in the field	SUNCLIX outlet box (junction box) for thin-layer PV modules
Type	Order No.	PV-CF-S 2,5-6 (+) 1774674	PV-CM-S 2,5-6 (-) 1774687	PV-JB 2,5/ 2-20 SAMPLE 1758593
Cross-section	[mm ²]	2.5 - 6	2.5 - 6	2.5
Nominal voltage	[V]	1100 (III/2)	1100 (III/2)	1000
Nominal current	[A]	40	40	10/without diode
Degree of protection		IP68	IP68	IP65
Properties		Temperature range: -40°C to +90°C; protection class II; TÜV-certified according to DIN EN 50521	Temperature range: -40°C to +90°C; protection class II; TÜV-certified according to DIN EN 50521	2 contacts for ribbons, with diode as an option, for 5.3 - 5.7 mm outer cable diameter, meets requirements according to V DE 0126-5

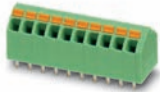
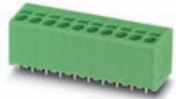
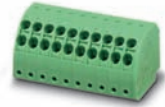

Solar cables (TÜV-certified)		
Structure: tin-plated individual litz wires, double insulation; voltage: 1800 V DC; temperature range: -40°C to +90°C; color: black; resistant to weather, UV, and ozone, meets the new DKE requirement profile 2PFG 1169		
Cross-section: 2,5 mm²	100 m ring	PV-1P-100,0-2,5 1787690
Cross-section: 4 mm²	100 m ring	PV-1P-100,0-4 1787700
Cross-section: 6 mm²	100 m ring	PV-1P-100,0-6 1787713

Y-distributor for PV module connection		
Plug-in single part		PV-YC 6/ 1-0,12 (-/++) 1787726
Plug-in single part		PV-YC 6/ 1-0,12 (+/-) 1787739
Cable drum 100 m, branch every 625 mm		PV-YC 6/ XX-0,625T-0,2D (+) 1787742

Device connection technology – IP20

COMBICON power					
PCB terminal blocks and connectors for power electronics up to 125 A					
Description	Connector with screw connection up to 125 A with 15 mm pitch	Connector with push-in spring-cage connection up to 6 mm ²	Push-lock PCB terminal block with lever-type actuation up to 16 mm ²	Push-in PCB terminal block up to 10 mm ²	
2-pos.	PC 35 HC / 2-STF 1762592	SPC 5/ 2-STCL-7,62 1718481	PLH 16/ 2-10-ZF 1770461	SPT 5/ 2-H-7,5-ZB 1719192	
3-pos.	PC 35 HC / 3-STF 1762602	SPC 5/ 3-STCL-7,62 1718494	PLH 16/ 3-10-ZF 1770474	SPT 5/ 3-H-7,5-ZB 1719202	
4-pos.	PC 35 HC / 4-STF 1762615	SPC 5/ 4-STCL-7,62 1718504	PLH 16/ 4-10-ZF 1770487	SPT 5/ 4-H-7,5-ZB 1719215	
5-pos.	PC 35 HC / 5-STF 1762628	SPC 5/ 5-STCL-7,62 1718517	PLH 16/ 5-10-ZF 1770490	SPT 5/ 5-H-7,5-ZB 1719228	
Cross-section	35 mm ²	10 mm ²	16 mm ²	10 mm ²	
Pitch	15 mm	7.62 mm	10 mm	7.5 mm	
Number of positions	2 - 6	2 - 12	2 - 8	2 - 12	
Nominal voltage IEC/UL	1000 V/600 V	1000 V/600 V	1000 V/600 V	1000 V/600 V	
Nominal current IEC/UL	125 A/115 A	41 A/35 A	76 A/on request	41 A/on request	

COMBICON control/ COMBICON compact					
PCB terminal blocks and connectors for signal and data transmission in MCR technology					
Description	TWIN bus connector with spring-cage connection up to 1.5 mm ²	Flat connector with push-in spring-cage connection up to 2.5 mm ²	Flat connector with push-in spring-cage connection up to 1.5 mm ²	Inverted connector with screw connection up to 2.5 mm ²	
2-pos.	TVFKC 1,5/ 2-ST 1713839	FKCN 2,5/ 2-ST 1732742	FMC 1,5/ 2-ST-3,5-RF 1952021	GIC 2,5/ 2-STF-7,62 1858879	
3-pos.	TVFKC 1,5/ 3-ST 1713842	FKCN 2,5/ 3-ST 1732755	FMC 1,5/ 3-ST-3,5-RF 1952034	GIC 2,5/ 3-STF-7,62 1858882	
4-pos.	TVFKC 1,5/ 4-ST 1713855	FKCN 2,5/ 4-ST 1732768	FMC 1,5/ 4-ST-3,5-RF 1952047	GIC 2,5/ 4-STF-7,62 1858895	
5-pos.	TVFKC 1,5/ 5-ST 1713868	FKCN 2,5/ 5-ST 1732771	FMC 1,5/ 5-ST-3,5-RF 1952050	GIC 2,5/ 5-STF-7,62 1858905	
Cross-section	1.5 mm ²	2.5 mm ²	1.5 mm ²	2.5 mm ²	
Pitch	5.0 mm	5 mm/5.08 mm	3.5 mm	7.62 mm	
Number of positions	2 - 10	2 - 18	2 - 20	2 - 12	
Nominal voltage IEC/UL	320 V/250 V	320 V/on request	160 V/150 V	630 V/250 V	
Nominal current IEC/UL	10 A/8 A	12 A/on request	8 A/8 A	12 A/12 A	


COMBICON control/ COMBICON compact					
PCB terminal blocks and connectors for signal and data transmission in MCR technology					
Description	Spring-cage PCB terminal block angled 45° up to 1.5 mm ²	PCB terminal block with push-in spring-cage connection up to 2.5 mm ²	Connector for pin strip with spring-cage double connection	PCB terminal block for SMD application up to 0.5 mm ²	
2-pos.	SPTA 1,5/ 2-3,81 1751477	SPT 2,5/ 2-V-5,0-EX 1732496	PTDA 1,5/ 2-PH-3,5 1725107	PTSM 0,5/ 2-2,5-H-SMD R 1771020	
3-pos.	SPTA 1,5/ 3-3,81 1751480	SPT 2,5/ 2-V-5,0-EX 1732506	PTDA 1,5/ 3-PH-3,5 1725120	PTSM 0,5/ 3-2,5-H-SMD R 1771033	
4-pos.	SPTA 1,5/ 4-3,81 1751493	SPT 2,5/ 2-V-5,0-EX 1732519	PTDA 1,5/ 4-PH-3,5 1725133	PTSM 0,5/ 4-2,5-H-SMD R 1771046	
5-pos.	SPTA 1,5/ 5-3,81 1751503	SPT 2,5/ 2-V-5,0-EX 1732522	PTDA 1,5/ 5-PH-3,5 1725146	PTSM 0,5/ 5-2,5-H-SMD R 1771059	
Cross-section	1.5 mm ²	Up to 2.5 mm ² , with Ex approval	1.5 mm ²	0.5 mm ²	
Pitch	3.81 mm	5 mm	3.5 mm	2.5 mm	
Number of positions	2 - 12	2 - 12	2 - 16	2 - 8	
Nominal voltage IEC/UL	160 V/300 V	176 V/NA	240 V/150 V	160 V/on request	
Nominal current IEC/UL	9 A/10 A	23 A/NA	8 A/10 A	6 A/on request	

For more connectors and headers, please refer to the COMBICON catalog or visit www.phoenixcontact.net/catalog

Device connection technology – IP65/IP67




PLUSCON circular Circular connectors for sensor/actuator applications					
Description		M8 flush-type connector with halogen-free litz wires, front mounting	M12 flush-type connector with halogen-free litz wires, front mounting	M12 flush-type connector for wave soldering processes, two-piece, rear mounting	M12 flush-type connector, for reflow processes, two-piece, rear mounting
Type	Order No.	SACC-E-M ...	SACC-EC-...	SACC-DSIV-...	SACC-DSIV-...
4-pos.	Male	...8MS-4CON-M8/0,5 1500347	...MS-4CON-M16/0,5 SCO 1523463	...MS-4CON-L90 SCO 1436589	...MS-4CON-L180 SCO THR 1439971
5-pos.	Male	...8MS-5CON-M 8/0,5 DN 1440119	...MS-5CON-M16/0,5 SCO 1520068	...MS-5CON-L90 SCO 1436602	...MS-5CON-L180 SCO THR 1551752
4-pos.	Female	...8FS-4CON-M8/0,5 1500363	...FS-4CON-M16/0,5 SCO 1523447	...FS-4CON-L90 SCO 1436564	...FS-4CON-L180 SCO THR 1439997
5-pos.	Female	...8FS-5CON-M 8/0,5 DN 1440106	...FS-5CON-M16/0,5 SCO 1520042	...FS-5CON-L90 SCO 1436563	...FS-5CON-L180 SCO THR 1542622
Rated voltage	4/5-pos.	30 V	250 V/60 V	250 V/60 V	250 V/60 V
Nominal current I_n	4/5-pos.	4 A/2 A	4 A/4 A	4 A/4 A	4 A/4 A
Contact carrier material		PUR/PA 66	PA 66	PA 66	PA 66
Contact/contact surface material		Cu alloy/Au	CuZn/Au	CuZn/Au	CuZn/Au
Connection method		Individual litz wires	Individual litz wires	Solder pins	THR solder connection

PLUSCON data Connectors with standard interfaces such as RJ45, USB, and M12 for data transmission					
Description		RJ45 female inserts and panel mounting frame, for Freenet system	RJ45 female inserts and panel mounting frame, for PCB connection	USB female inserts and panel mounting frame, for flat-ribbon cable connection	M12 flush-type connector for wave soldering processes, one-piece
Female insert	CAT5	VS-08-BU-RJ45-5-F/PK 1652936	VS-08-BU-RJ45/LP-1 1688586	VS-04-BUA-FK-F/IP67 1653854	
Female insert	CAT6	VS-08-BU-RJ45-6-F/PK 1652949	VS-08-BU-RJ45-6/LV-1 1653090	VS-04-BUB-FK-F/IP67 1653867	
Panel mounting frame		VS-A-F-IP67 1653744	VS-08-A-RJ45/LP-1-IP67 1689446	VS-A-F-IP67 1653744	SACC-DSI-...
Flush-type connector	4-pos., female				...FSD-4CON-L180 SCO 1551503
Flush-type connector	8-pos., female				...FS-8CON-L180/SCO SH 1553860
Rated voltage		50 V	150 V	30 V	250 V
Rated current		1 A	1.5 A	1 A	4 A
Number of positions		8	8	4	4/8-pos.
Contact material		Cu alloy	Cu alloy	Cu alloy	CuZn
Connection method		IDC	Solder connection	Flat-ribbon cable connection	Solder pins



PLUSCON device Modular connector system for transmitting signals, data, and power					
Description		Contact insert sets for the sleeve side, with PE, screw connection	Contact insert sets for the device side, screw connection	Sleeve housing made from die-cast aluminum with metric cable outlet, EMC-compatible	Sleeve housing made from plastic, with metric cable outlet
Type	Order No.	VC-TR...	VC-AR...	VC-AL-T1-Z-M20-S 1583597	VC-K-T1-Z-M20 1852935
Type VC 1	4-pos.	...1/2M-PEA-S22-SET 1607143	...1/2M-S22-SET 1607298	VC-AL-T2-Z-M20-S 1583636	VC-K-T2-Z-M25 1852948
Type VC 2	6-pos.	...2/3M-PEA-S222-SET 1607154	...2/3M-S222-SET 1607311	VC-AL-T3-Z-M25-S 1583678	VC-K-T3-Z-M25 1852961
Type VC 3	8-pos.	...3/4M-PEA-S2222-SET 1607167	...3/4M-S2222-SET 1607322	VC-AL-T4-Z-M25-S 1583733	VC-K-T4-Z-M25 1852974
Type VC 4	10-pos.	...4/5M-PEA-S22222-SET 1607178	...4/5M-S22222-SET 1607335		
Rated voltage		400 V	400 V	–	–
Rated current		20 A	20 A	–	–
Number of positions		4 to 40-pos.	4 to 40-pos.	–	–
Contact material		CuZn	CuZn	–	–
Connection method		Screw connection	Screw connection	–	–

For more connectors, please refer to the PLUSCON catalog or visit www.phoenixcontact.net/catalog




Autonomous PV systems




Autonomous photovoltaic sets				
Type	Order No.	RAD-SOL-SET-24-200 2917722	RAD-SOL-SET-24-100 2885472	RAD-SOL-SET-12-10 2917146
Nominal voltage		24 V DC	24 V DC	12 V DC
Maximum power		200 Wp	100 Wp	10 Wp
Battery capacity		100 Ah	40 Ah	6 Ah
Maximum load		1 - 23 W (maximum connected load for year-round constant load, in relation to power reserve and installation location)	1 - 11 W (maximum connected load for year-round constant load, in relation to power reserve and installation location)	0.1 - 1.2 W (maximum connected load for year-round constant load, in relation to power reserve and installation location)

Marking systems

MARKING system BLUEMARK			
Type	Order No.	BLUEMARK LED 5147888	BLUEMARK FLUID-CARTRIDGE 5147421
Description		Printer with UV LED technology, includes mains cable (EU/US), USB cable, printer drivers, multilingual user manual, „CLIP PROJECT advanced“ planning and marking software, and an ink cartridge (30 ml, color: black)	Ink cartridge for BLUEMARK LED printer, 30 ml, color: black, sufficient for approximately one million characters





Motor starters

CONTACTRON hybrid motor starters		4 in 1 Forward running Reverse running Emergency stop Motor protection 	3 in 1 Forward running Reverse running Motor protection 	3 in 1 Forward running Reverse running Motor protection 
Type	Order No.	ELR H5-IES-SC-24DC/500AC-06 2900582	ELR H5-I-SC-24DC/500AC-0,6 2900573	ELR H5-I-SC-230AC/500AC-2 2900575
Input voltage		24 V DC	24 V DC	120/230 V AC
Output voltage		42 V AC ... 550 V AC	42 V AC ... 550 V AC	42 V AC ... 550 V AC
Load current		0.6 A, maximum	0.6 A, maximum	2.4 A, maximum
Ambient temperature range		-25°C to +70°C	-25°C to +70°C	-25°C to +70°C



CONTACTRON hybrid motor starters		3 in 1 Forward running Reverse running Motor protection 	2 in 1 Forward running Reverse running 	1 in 1 Forward running 
Type	Order No.	ELR H5-I-SC-24DC/500AC-9 2900576	ELR H5-SC-24DC/500AC-9 2900538	ELR H3-SC-24DC/500AC-9 2900530
Input voltage		24 V DC	24 V DC	24 V DC
Output voltage		42 V AC ... 550 V AC	42 V AC ... 550 V AC	42 V AC ... 550 V AC
Load current		9 A, maximum	9 A, maximum	9 A, maximum
Ambient temperature range		-25°C to +70°C	-25°C to +70°C	-25°C to +70°C

Wireless and cable-based network components





Wireless network components					
Type	Order No.	FL WLAN AP 2884075	FL WLAN EPA 2692791	FL Bluetooth AP 2737999	FL Bluetooth EPA 2692788
Operating modes		Access point, client	Client	Access point, client	Client
Antenna		External antennas for 2.4 GHz or 5 GHz (R-SMA male connection)	Integrated circular polarized special antenna	Antennas included (SMA female connection)	Integrated circular polarized special antenna
Standard		IEEE 802.11 a/b/g	IEEE 802.11 b/g	Bluetooth, configurable up to 200 m (open space)	Bluetooth, configurable up to 200 m (open space)
Special features		IP65, power supply: Power over Ethernet, 24 V DC	IP65/IP67, power consumption < 1.1 W	IP20, power supply: 9 V DC ... 30 V DC	IP65/IP67, power consumption < 1.1 W





Cable-based network components					
Type	Order No.	FL Switch LM 4TX/2FX 2832658	FL NAT SMN 8TX 2989365	FL MGuard RS VPN 2989611	FL MGuard GT/GT 2700197
Description		Managed switch with two glass fiber ports	NAT router	Firewall router	Router with intelligent firewall
Special features		Support of RSTP, Large Tree Support, fast ring detection, VLAN	Integrated managed switch	With VPN function, also available with ISDN or analog modem	Up to 200 Mbps data throughput, Gigabit connectivity, SFP slots, stateful inspection firewall for maximum security and extremely easy configuration, replaceable configuration memory





Operation and monitoring

Operation and monitoring					
Type	Order No.	WP 06T 2913645	WP 07T/WS 2700307	WP 09T/WS 2700309	WP 12T/WS 2700306
Display		6" TFT touch display	7" TFT widescreen touch display	9" TFT widescreen touch display	12" TFT widescreen touch display
Processor		RISC ARM9 CPU: 200 MHz	RISC ARM9 CPU: 200 MHz	RISC ARM9 CPU: 200 MHz	RISC ARM9 CPU: 200 MHz
Ambient temperature		0°C to 50°C	0°C to 50°C	0°C to 50°C	0°C to 50°C

Fuses and I/O systems




Compact controllers and bus couplers					
Type	Order No.	ILC 150 ETH GSM/GPRS 2985330	ILC 170 ETH 2TX 2916532	IBS IL 24 BK-T/U-PAC 2861580	IL CAN BK-TC-PAC 2718701
Description		Compact controller	Compact controller	Bus coupler for INTERBUS	Bus coupler for CANopen
Special feature		Integrated GSM/GPRS modem	256 MB Flash memory (plug-in SD card)		
Processing speed		90 µs per 1000 instructions (bit data types)	90 µs per 1000 instructions (bit data types)		
Interfaces		1 x INTERBUS and 1 x Ethernet	1 x INTERBUS and 2 x Ethernet	2 x 6-pos. Inline shield connector	2 x 5-pos. TWIN-COMBICON connector
Ambient temperature		-25°C to +55°C	-25°C to +55°C	-25°C to +55°C	-25°C to +55°C
Width		80 mm	80 mm	85 mm	85 mm

I/O systems in the control cabinet					
Type	Order No.	IB IL 24 DI 2-PAC 2861221	IB IL 24 DO 2-PAC 2861470	IB IL AI 2/SF-PAC 2861302	IB IL AO 1/SF-PAC 2861315
		IB IL 24 DI 4-PAC 2861234	IB IL 24 DO 4-PAC 2861276	IB IL AI 4/EF-PAC 2878447	IB IL AO 1/U/SF-PAC 2861399
		IB IL 24 DI 8-PAC 2861247	IB IL 24 DO 8-2A-PAC 2861603	IB IL AI 8/SF-PAC 2861412	IB IL AO 2/SF-PAC 2863083
		IB IL 24 DI 8/HD-PAC 2700173	IB IL DO 8/HD-PAC 2700172	IB IL AI 8/IS-PAC 2861661	IB IL AO 2/U/BP-PAC 2861467
		IB IL 24 DI 16-PAC 2861250	IB IL 24 DO 16-PAC 2861292	IB IL AI 2-HART-PAC 2862149	IB IL AO 4/8/U/BP-PAC 2878036
		IB IL 24 DI 32/HD-PAC 2862835	IB IL 24 DO 32/HD-PAC 2862822		
Description		Digital input terminals	Digital output terminals	Analog input terminals	Analog output terminals
Number of channels		2 - 32	2 - 32	2 - 8	1 - 8
Ambient temperature		-25°C to +55°C	-25°C to +55°C	-25°C to +55°C	-25°C to +55°C
Width		12 to 48 mm	12 to 48 mm	12 to 48 mm	12 to 48 mm


I/O systems in the control cabinet					
		...W-PAC: AgSnO2 ...W-PC-PAC: AgSnO2, hard gold-plated			
Type	Order No.	IB IL 24/230 DOR1/W-PAC 2861881	IB IL RS 232-PAC 2861357	IB IL RS 232-PAC 2861357	IB IL CAN-MA-PAC 2700196
		IB IL 24/230 DOR4/W-PAC 2861878	IB IL RS 232-PRO-PAC 2878722	IB IL RS 232-PRO-PAC 2878722	(CAN master terminal)
		IB IL 24/230 DOR1/W-PC-PAC 2862178	IB IL RS 485/422-PAC 2861933	IB IL RS 485/422-PAC 2861933	IB IL 24 FLM MULTI-PAC 2737009
		IB IL 24/230 DOR4/W-PC-PAC 2862181	IB IL RS 485/422-PRO-PAC 2863627	IB IL RS 485/422-PRO-PAC 2863627	(branch terminal for Fieldline M8)
Description		Digital relay output terminals	Communication terminals	Communication terminals	Communication terminals
Number of channels		1 - 4	1	1	1
Ambient temperature		-25°C to +55°C	-25°C to +55°C	-25°C to +55°C	-25°C to +55°C
Width		12 to 48 mm	12 to 48 mm	12 to 48 mm	12 mm




I/O systems in the field					
Type	Order No.	FLM DI 8 M8 2773348	FLM DIO 8/4 M8 2773351	FLM DO 4 M8-2A 2736932	FLM DIO 8 M8 2736893
Number of channels		8 inputs	8 inputs	4 outputs	8 outputs
Ambient temperature		-25°C to +60°C	-25°C to +60°C	-25°C to +60°C	-25°C to +60°C
Width		29.8 mm	29.8 mm	29.8 mm	29.8 mm
Degree of protection		IP65/IP67 (protected against dust and jet water)	IP65/IP67 (protected against dust and jet water)	IP65/IP67 (protected against dust and jet water)	IP65/IP67 (protected against dust and jet water)

Software solutions

Planning and marking software CLIP PROJECT							
Programming and visualization PC Worx, Visu+							
Type	Order No.	CLIP PROJECT ADVANCED	5146040	PC WORX DEMO	2985725	VISU+	2985770
		CLIP PROJECT PROFESSIONAL	5146053	Other licenses available on request		Other licenses available on request	
Description		Planning and marking software		Software package for PC-based automation solutions		Development license for Visu+ projects	
CPU		Pentium II > 400 MHz		Pentium 4/Celeron 1 GHz, minimum		Pentium 4/Celeron, 1 GHz	
Main memory/hard disk space		127 MB/2 GB		–		–	
Drive		CD-ROM		DVD-ROM		CD-ROM	
Monitor resolution		1024 x 768		XGA (1024 x 768)		SVGA (800 x 600)	
Operating devices		Mouse recommended		Keyboard, mouse		Keyboard, mouse	
Operating systems		Windows 2000, Windows XP		MS Windows 2000 SP4, MS Windows XP SP2 (recommended), MS Windows Vista Business		MS Windows 2000 SP4, MS Windows XP SP2 (recommended), MS Windows Vista Business	
Special features		Languages: English, German, French, Italian, Spanish, Russian, Polish, Hungarian, Czech, Portuguese, and Chinese		PC WORX BASIC license, includes all 5 IEC languages, with MSFCCompiler, 16 bytes of input and output data (maximum), version-specific license key		Full SCADA (Supervisory Control And Data Acquisition) function with visualization, trend representation, and alarm management	

Current transformers

Active current transformer up to 50 A							
Type	Order No.	MCR-S-10-50-UI-DCI-NC	2814728				
Input current		0 A ... 55 A (AC/DC)					
Curve type		DC, AC or distorted currents					
Connection method		Through connection of 10.5 mm Ø					
Output signal (normal and inverse)		0 ... 5 V/1 ... 5 V/0 ... 10 V/2 ... 10 V/-5 ... 5 V/-10 ... 10 V/0 ... 20 mA/4 ... 20 mA					
Supply voltage		20 V DC ... 30 V DC					
Maximum transmission error		< 0.5%					
Temperature coefficient		< 0.025%/K, typical					
Degree of protection		IP20					
Ambient temperature		-20°C to +60°C					

Current transformers up to 300 A							
Type	Order No.	MCR-SL-CUC-100-I	2308027	MCR-SL-CUC-200-I	2308030	MCR-SL-CUC-300-I	2308043
Input current		0 ... 100 A		0 ... 200 A		0 ... 300 A	
Frequency ranges		DC; 20 ... 6000 Hz		DC; 20 ... 6000 Hz		DC; 20 ... 6000 Hz	
Connection method		Through connection of 30.5 mm Ø		Through connection of 30.5 mm Ø		Through connection of 30.5 mm Ø	
Output signal		4 ... 20 mA		4 ... 20 mA		4 ... 20 mA	
Load		< 300 Ω		< 300 Ω		< 300 Ω	
Supply voltage		(min./max.) 20 ... 30 V DC		(min./max.) 20 ... 30 V DC		(min./max.) 20 ... 30 V DC	
Test voltage: Input/output		3.5 kV, 50 Hz, 1 min.		3.5 kV, 50 Hz, 1 min.		3.5 kV, 50 Hz, 1 min.	
Test voltage: Input/power supply		3.5 kV, 50 Hz, 1 min.		3.5 kV, 50 Hz, 1 min.		3.5 kV, 50 Hz, 1 min.	
Ambient temperature		-40°C to +65°C		-40°C to +65°C		-40°C to +65°C	

Modular terminal blocks – Fuses – Accessories



Modular terminal blocks

Gray (standard)	Blue (BU)	Red (RD)	IEC Cross-section [mm²]	Nominal voltage [V]	Nominal current [A]
Type	Type	Type			
Order No.	Order No.	Order No.			

Spring-cage connection terminal blocks

ST 6	3031487	ST 6 BU	3031490	–	0.2 - 10	1000	52
ST 35	3036178	ST 35 BU	3036181	–	2.5 - 35	1000	125



Three-conductor terminal blocks

ST 6-TWIN	3036466	ST 6-TWIN BU	3036479	–	0.2 - 10	1000	52
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Hybrid connection terminal blocks

STU 35/4X10	3033126	STU 35/4X10 BU	3033210	–	2.5 - 35 // 0.2 - 10	1000	125
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UT screw connection terminal blocks

UT 4	3044102	UT 4 BU	3044115	UT 4 RD	3045127	0.14 - 6	1000	41
UT 6	3044131	UT 6 BU	3044144	UT 6 RD	3045185	0.2 - 10	1000	57
UT 10	3044160	UT 10 BU	3044188	UT 10 RD	3046304	0.5 - 16	1000	76
UT 16	3044199	UT 16 BU	3044209	–	–	1.5 - 25	1000	101
UT 35	3044225	UT 35 BU	3044238	–	–	1.5 - 50	1000	150



UKH screw connection terminal blocks

UKH 25	3009011	–	–	–	–	4.0 - 25	1000	101
UKH 50	3009118	UKH 50 BU	3009105	UKH 50 RD	3048344	16.0 - 70	1000	150
UKH 95	3010013	UKH 95 BU	3010136	–	–	25.0 - 95	1000	232
UKH 150	3010110	UKH 150 BU	3010123	–	–	35.0 - 150	1000	309
UKH 240	3010217	UKH 240 BU	0711852	–	–	70.0 - 240	1000	415
UHSK/S 2000	0704076	–	–	–	–	0.5 - 10.0	1000	57



Bolt connection terminals

RT 3	3049013	RT 3 BU	3049110	–	–	0.1 - 2.5	1000	24
RT 5	3049026	RT 5 BU	3049123	–	–	0.1 - 6	1000	41
RT 8	3049042	RT 8 BU	3049148	–	–	2.5 - 35	1000	125
RTO 3	3049518	RTO 3 BU	3049660	–	–	0.1 - 2.5	1000	24
RTO 5	3049521	RTO 5 BU	3049767	–	–	0.1 - 6	1000	41
RTO 8	3049343	RTO 8 BU	3049864	–	–	2.5 - 35	1000	125



Disconnect terminal blocks

RT 5-T	3049039	–	–	–	–	0.1 - 6	1000	41
RTO 5-T	3049233	–	–	–	–	0.1 - 6	1000	41



Fuse terminal blocks

UK 10,3-HESI 1000V	–	3211236	–	–	–	1.5 - 25	1000	32
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Fuse terminal blocks with LED

UK 10,3-HESILED 1000V	–	3211249	–	–	–	1.5 - 25	1000	32
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Fuses

1000 V nominal voltage, 10,3 x 38 mm size

	Type	Order No.
2 A	FUSE 10,3x38 2A PV	3061295
4 A	FUSE 10,3x38 4A PV	3061305
6 A	FUSE 10,3x38 6A PV	3061318
8 A	FUSE 10,3x38 8A PV	3061321
10 A	FUSE 10,3x38 10A PV	3061334
12 A	FUSE 10,3x38 12A PV	3061347
16 A	FUSE 10,3x38 16A PV	3061350
20 A	FUSE 10,3x38 20A PV	3061363



Covers

	Type	Order No.
1	D-ST 6	3030433
2	D-ST 6-TWIN	3036767
3	D-UT 2,5/10	3047028
4	D-UT 16	3047206
5	D-UHSK 2000	0704021
6	D-RT 3/5	3049097
7	D-RT 8	3049194
8	D-RT 5-T	3049291



Markings

Center groove 1 - 7/lateral groove 8 - 10

	Type	Order No.
1	ZB 6: UNPRINTED	1051003
2	ZB 8: UNPRINTED	1052002
3	ZB 10: UNPRINTED	1053001
4	ZB 12: UNPRINTED	0812120
5	ZB 16,3: UNPRINTED	0820222
6	ZB 20,3: UNPRINTED	0820248
7	ZB 22: UNPRINTED	0811862
8	ZBF 6: UNPRINTED	0808710
9	ZBF 8: UNPRINTED	0808781
10	ZBF 16: UNPRINTED	0827464



Tools

Screwdrivers 1 - 7/wrenches 8 - 12

	Type	Order No.
1	SZS 0,6X3,5	1205053
2	SZS 1,0X4,0	1205066
3	SZS 1,0X5,5	1209114
4	SZS 1,0X6,5	1205079
5	SZS 1,2X8,0	1205082
6	SZF 2-0,8X4,0	1204520
7	SZF 3-1,0X5,5	1206612
8	VDE-ISS 6	1201934
9	VDE-ISS 8	1201947
10	SHN 5.5	1209855
11	SHN 8	1209868
12	SHN 13	1209923

Partition plate (ATP)

1	ATP-ST 6	3024481
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UL Cross-section	[AWG]	Nominal voltage [V]	Nominal current [A]	Size Width/length/height [mm]	Accessories Bridges	Marking	Covers	ATP	Tools
24 - 8	600	50	8.2/69.5/43.5	2	2	1	1	6	
14 - 2	600	115	16/100/59	5	5	-	-	7	
24 - 8	600	50	6.2/47.7/47.5	2	2	2	-	6	
16 - 1/0 // 24 - 8	-	-	16.2/86/46.8	2	5	-	-	7	
26 - 10	600	30	6.2/47.7/47.5	1	1	3	1	1	
24 - 8	600	50	8.2/47.7/47.5	2	2	3	1	2	
20 - 6	600	65	10.2/47.7/47.5	3	3	3	1	2	
16 - 4	600	85	12.2/55.5/55	4	4	4	-	4	
16 - 1/0	600	150	16/60.2/65.7	5	5	-	-	4	
6 - 4	600	85	15/57.5/65	6	4	-	-	4	
6 - 1/0	600	150	20/70.5/83.5	7	6	-	-	5	
4 - 3/0	600	230	25/83/97.5	8	7	-	-	8	
2 - 300 kcmil	600	285	31/100/118.5	9	7	-	-	9	
2/2 - 500 kcmil	600	380	36/100/131.5	10	7	-	-	9	
20 - 8	1000	50	10.2/52/70.5	11	3	5	-	2	
26 - 14	600	30	12.3/66/51	1	4	6	-	4	
26 - 10	600	30	16.3/66/51	2	5	6	-	4	
14 - 2	600	115	20.3/84/63.8	3	6	7	-	4	
26 - 14	600	30	12.3/66/49.9	1	4	6	-	10	
26 - 10	600	30	16.3/66/49.9	2	5	6	-	11	
14 - 2	600	115	20.3/84/62.2	3	6	7	-	12	
26 - 10	600	30	16.3/91.4/51	2	5	8	-	4	
26 - 10	600	30	16.3/91.4/59.9	2	5	8	-	11	
16 - 4	600	30	17.5/81/65.5	12	5	-	-	1	
16 - 4	600	30	17.5/81/65.5	12	5	-	-	1	






Bridges												
2-pos.		3-pos.		4-pos.		5-pos.		10-pos.		20-pos.		
Type	Order No.	Type	Order No.	Type	Order No.	Type	Order No.	Type	Order No.	Type	Order No.	
1	FBS 2-6	3030336	FBS 3-6	3030242	FBS 4-6	3030255	FBS 5-6	3030349	FBS 10-6	3030271	FBS 20-6	3030365
2	FBS 2-8	3030336	FBS 3-8	3030297	FBS 4-8	3030307	FBS 5-8	3030310	FBS 10-8	3030323	-	-
3	FBS 2-10	3005947	-	-	-	-	-	-	-	-	-	-
4	FBS 2-12	3005950	-	-	-	-	-	-	-	-	-	-
5	FBS 2-16	3005963	-	-	-	-	-	-	-	-	-	-
6	FBI 2-15	0201333	FBI 3-15	0201278	-	-	-	-	-	-	-	-
7	FBI 2-20	0201346	FBI 3-20	0201317	-	-	-	-	-	-	-	-
8	EB 2-25/UKH	0201362	EB 3-25/UKH	0201375	-	-	-	-	-	-	-	-
9	EB 2-31/UKH	0201388	EB 3-31/UKH	0201391	-	-	-	-	-	-	-	-
10	EB 2-36/UKH	0201401	EB 3-36/UKH	0201414	-	-	-	-	-	-	-	-
11	FB 10-10-EX	0203247	FB 10-10-EX	0203247	FB 10-10-EX	0203247	FB 10-10-EX	0203247	FB 10-10-EX	0203247	-	-
12	EB 56-18	3009299	EB 56-18	3009299	EB 56-18	3009299	EB 56-18	3009299	EB 56-18	3009299	EB 56-18	3009299

Surge protection for DC and AC voltages

Surge protection products for the DC side up to 1000 V DC Standards/specifications: DIN EN 61643-11, IEC 61643-1, IEC 60364-7-712					
Type	Order No.	VAL-MS 1000DC/2+V-FM 2920502	VAL-MS 1000DC/2+F-FM 2800176	VAL-MS 1000DC/2+F 2800177	VAL-MS 1000DC/1+V 2804542
Number of positions		3	3	3	2
Status message		Optical, remote indication contact	Optical, remote indication contact	Optical	Optical
Arrester rated voltage U_c		1000 V DC	1000 V DC	1000 V DC	1000 V DC
Protection level U_p	(L+) – (L-)	≤ 5 kV	≤ 5 kV	≤ 5 kV	≤ 5 kV
Protection level U_p	(L+ / L-) – PE	≤ 5 kV	≤ 3 kV	≤ 3 kV	–
Residual voltage	(L+) – (L-)	≤ 4 kV (for 5 kA)	≤ 4 kV (for 5 kA)	≤ 4 kV (for 5 kA)	≤ 4 kV (for 5 kA)
Residual voltage	(L+ / L-) – PE	≤ 4 kV (for 5 kA)	≤ 2 kV (for 5 kA)	≤ 2 kV (for 5 kA)	–
Surge protection products for the DC side up to 1000 V DC Standards/specifications: DIN EN 61643-11, IEC 61643-1, IEC 60364-7-712					
Type	Order No.	VAL-MS 1000DC/2+V 2805091	VAL-MS 1000DC/2+V-FM-UD 2805567	VAL-MS 600DC/2+V-FM 2800195	VAL-MS 600DC/2+V 2805457
Number of positions		3	3	3	3
Status message		Optical	Optical, remote indication contact	Optical, remote indication contact	Optical
Arrester rated voltage U_c		1000 V DC	1000 V DC	600 V DC	600 V DC
Protection level U_p	(L+) – (L-)	≤ 5 kV	≤ 5 kV	≤ 3 kV	≤ 3 kV
Protection level U_p	(L+ / L-) – PE	≤ 5 kV	≤ 5 kV	≤ 3 kV	≤ 3 kV
Residual voltage	(L+) – (L-)	≤ 4 kV (for 5 kA)	≤ 4 kV (for 5 kA)	–	–
Residual voltage	(L+ / L-) – PE	≤ 4 kV (for 5 kA)	≤ 4 kV (for 5 kA)	–	–
Surge protection products for the AC side Type 1 lightning arresters Type 2 surge arresters VALVETRAB compact (VAL-CP-...) is also available for 120 V power supply systems or as a version free of leakage current (VF type).					
Type	Order No.	FLT-CP-PLUS-1S-350 2882682	FLT-CP-PLUS-3S-350 2882640	VAL-CP-1S-350 2859563	VAL-CP-3S-350 2859521
IEC category/EN type		I/ [T1]	I/ [T1]	II/ [T2]	II/ [T2]
Lightning Protection Level		III - IV	I	–	–
Nominal voltage U_N		230 V AC ... 240 V AC (50/60 Hz)	230/400 V AC ... 240/415 V AC (50/60 Hz)	230 V AC ... 240 V AC (50/60 Hz)	230/400 V AC ... 240/415 V AC (50/60 Hz)
Arrester rated voltage U_c		350 V AC (50/60 Hz) L-N (L-PEN)	350 V AC (50/60 Hz) L-N (L-PEN)	350 V AC (50/60 Hz) L-N (L-PEN)	350 V AC (50/60 Hz) L-N (L-PEN)
Lightning test current I_{imp} (10/350) μ s		50 kA	100 kA	–	–
Nominal discharge surge current I_n (8/20) μ s		25 kA (per channel)	25 kA (per channel)	20 kA (per channel)	20 kA (per channel)
Protection level U_p		≤ 1.5 kV	≤ 1.5 kV	≤ 1.4 kV	≤ 1.4 kV
Maximum backup fuse according to IEC 61643-1		315 A gL/gG	315 A gL/gG	125 A gL/gG	125 A gL/gG
BLOCKTRAB For all standard distribution boxes and for 60 mm deep installation boxes. DATATRAB For effective surge protection at network speeds of up to 10 Gbps					
Type	Order No.	BT-1S-230AC/A 2803409	DT-LAN-CAT.6+ 2881007	DT-TELE-RJ45 2882925	DT-UFB-485/BS 2920612
IEC category/EN type		III/ [T3]	ETHERNET (including PoE) - 100Base-T - 1000Base-T - 10GBase-T ATM ISDN S_0 ISDN S_{2M}	DSL, analog telephony, ISDN U_{k0}	RS-485
Nominal voltage U_N	Protection level U_p	230 V AC ≤ 1.2 kV (L-N)			DT-UFB-V24/S-9-SB 2803069
Arrester rated voltage U_c		275 V AC			RS-232C/V.24 with 9-pos. D-SUB connection
Nominal discharge surge current I_n (8/20) μ s		3 kA			DT-UFB-V24/S-SB-SET 2803072
Maximum backup fuse according to IEC 61643-1		16 A (gL/C)			RS-232C/V.24, with adapter cable from 9-pos. D-SUB to 25-pos. D-SUB





Surge protection – Set solutions

PV-SETs (complete connection box)				
Type	Order No.	PV-SET 1000 DC/AC 2804458	PV-SET 1000 DC 2804445	PV-SET 5ST/600DC 2920780
Description		Surge protection in IP65 housing for the AC and DC sides of an inverter for single string systems up to 1000 V DC	Surge protection in IP65 housing for single string systems up to 1000 V DC, connection via multi-contact male/female connector.	Surge protection, generator disconnect, and modular terminal blocks in IP65 housing, plug-in varistors with thermal disconnect device between L+, L-, and ground/PE for an inverter with up to five strings
Cross-section	[mm ²]	1.5 - 35	1.5 - 35	0.2 - 16
Nominal voltage		230 V AC/1000 V DC	1000 V DC	600 V DC
Nominal load current		80 A AC/DC, maximum	30 A DC, maximum	30 A DC, maximum

Tools





CUTFOX cutting tools

Thanks to their special cutting geometry, the **front cable cutters** ensure optimum cutting results over the entire cross-section range up to a diameter of 35 mm (300 mm²). The ergonomic design of the handles makes for light work.

				
				
		1000 V AC/ 1500 V DC	1000 V AC/ 1500 V DC	
Type	Order No.	CUTFOX 16 VDE 1212126	CUTFOX 25 VDE 1212127	
Cross-section		Up to 16 mm Ø (up to 50 mm ²)	Up to 25 mm Ø (up to 70 mm ²)	

CUTFOX cutting tools

The VDE-insulated **diagonal cutters** with their inductive-hardened precision cutting ensures long-term stable cutting performance and therefore a clean cut, for both soft and hard wires (piano wire).

				
				
		1000 V AC/ 1500 V DC	1000 V AC/ 1500 V DC	
Type	Order No.	CUTFOX-S VDE 1212207	CUTFOX-SP VDE 1212206	

WIREFOX stripping tools

The WIREFOX-D 11 stripping tool strips single and multi-wire signal, control, and glass fiber cables up to 11 mm in diameter. Easy handling is combined with precise results. The WIREFOX-D SR 6 stripping tool is specifically designed for solar cables.

				
Type	Order No.	WIREFOX-D 11 1212160	WIREFOX-D SR 6 1212507	QUICK WIREFOX 6SC 1207637
Conductor/cable diameter	[mm]	2.5 - 11	2.5 - 6	1.5 - 6
Maximum insulation thickness	[mm]	1.0		Double insulated
Stripping length	[mm]		8.5	

CRIMPFOX pliers

CRIMPFOX-SR 6... crimping pliers are used to process MC3 and MC4 solar connectors from Multi-Contact and SOLARLOK connectors from Tyco. The integrated locator ensures easy processing with optimum crimping results.

				
				
				
Type	Order No.	CRIMPFOX-SR 6-1 1212467	CRIMPFOX-SR 6-2 1212468	CRIMPFOX-SR 6-3 1212469
Conductor	[mm ²]	2.5 - 6	2.5 - 6	2.5 - 6
For solar connectors		MC3	MC4	SOLARLOK

Further information on the products presented here and on the world of solutions from Phoenix Contact can be found at www.phoenixcontact.net/catalog



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