COMPLETE line

# Mining

Innovative technologies for the mining industry

PHŒNIX CONTACT

# We are your partner for mining applications

In mining operations, two aspects are of paramount importance: Safety and availability. In addition, it must be possible to operate a mine economically even in the most inhospitable areas.

Phoenix Contact offers you a wide range of products that meet the demands of the mining industry. These products have proven themselves even in the harshest environments worldwide for decades.

COMPLETE **line**

The new standard for the control cabinet. More information on pages 24 to 27.

# Contents

## Find out more with the web code

You will find web codes throughout this brochure. They consist of a hash symbol followed by a four-digit number combination.

ℹ **Web code: #1234** (example)

This allows you to access further information on our website quickly.

**It couldn't be simpler:**
1. Go to the Phoenix Contact website
2. Enter # and the number combination in the search field
3. Get more information and product versions

#1234        **Search**

Or use the direct link:
**phoenixcontact.net/webcode/#1234**

# Power supplies and UPS – avoid costly failures

Power failures can result in costly production losses and can also cause severe damage. The power supply devices, DC/DC converters, redundancy modules, and uninterruptible power supplies from Phoenix Contact reliably supply your systems. Their scope of functions and design are perfectly tailored to the demands of the mining industry.

In addition to our standard portfolio, we also offer power supplies tailored to your application.

# Products for superior system availability



## Power supplies

A reliable power supply ensures productivity. With our QUINT, TRIO, UNO, and STEP POWER product families, you are ideally equipped to supply any type of application.

ℹ **Web code:** #0151



## DC/DC converters

Featuring maximum functionality and leading technologies, QUINT DC/DC converters deliver safety and reliability. With SFB Technology, the static boost (125%), and preventive function monitoring, they provide maximum system availability.

ℹ **Web code:** #0152



## UPS and buffer modules

IQ Technology is the key to an intelligent power supply. The UPS monitors and optimizes the energy storage system. Avoid interruptions when working with the intelligent QUINT UPS and always know the operating state of your system. Even remote, you can always obtain information about the operating state of your system.

ℹ **Web code:** #0154



## Power supplies with IP67 degree of protection

The robust TRIO POWER IP67 power supplies are ideal for use in applications outside of the control cabinet. The robust aluminum housing ensures ideal protection against extreme environmental conditions such as temperature, dust, and water.

ℹ **Web code:** #2177

## Redundant power supply system

A redundant power supply system is created by connecting two power supply units in parallel. Optimize this solution with the active redundancy modules and the diode modules to maximize system availability.

**ACB Technology**
The QUINT ORING modules permanently monitor the input voltage, the output current, and the decoupling section. Moreover, the ACB Technology (Auto Current Balancing) of the QUINT ORING modules doubles their service life by ensuring a balanced utilization of the redundantly operated power supplies.
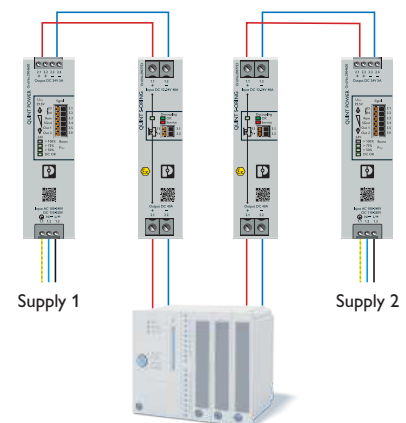
**Consistent isolation**
The QUINT S-ORING ensures redundancy through to the load with the consistently isolated conductor routing.

**Preventive function monitoring**
The active QUINT S-ORING redundancy module, in combination with the QUINT POWER supply, signals all critical operating states in the redundant system.

ℹ **Web code:** #0153



Supply 1                    Supply 2

# Industrial wireless technology – communicate with remote locations

Signals and information from remote parts of a mining facility are often difficult to capture at short notice. Wireless systems enable you to simply and efficiently solve the many challenges that you face in your industrial communications infrastructure. Industrial wireless systems from Phoenix Contact provide reliable and secure transmission of data and signals.

ⓘ **Web code:** #0958

# Excellent wireless technology for any distance and application







## Radioline

The transmission system for extended systems and networks with up to 250 stations. Versatile in application, thanks to the transmission of I/O signals and serial data. Furthermore, you can create different network structures: From point-to-point connections through to mesh networks. Assign inputs and outputs quickly by simply turning the thumbwheel.

**i** **Web code:** #1927

## Remote control

Our cellular routers enable high-speed data connections over 4G LTE networks running at up to 150 Mbps, creating a mobile broadband connection for highly flexible site networking. One advantage is the wide temperature range, which enables use in infrastructure applications in harsh and demanding environments.

**i** **Web code:** #1629

## Wireless I/O

The wireless multiplexer transmits 16 digital and two analog signals bi-directionally, which means it can replace a 40-wire signal cable. Also, the connection is monitored continuously. In the event of faulty or interrupted connections, the outputs are reset to the predefined LOW state. This is signalized by a diagnostic LED.

**i** **Web code:** #1597

## Large distances are easily and efficiently bridged

The proprietary Trusted Wireless technology has been specially developed by Phoenix Contact for industrial applications. It is particularly well suited to the wireless transmission of sensor and actuator signals. This ensures that you have reliable communication over several kilometers.

Thanks to meshed transmission technology, a path is always available for communication.
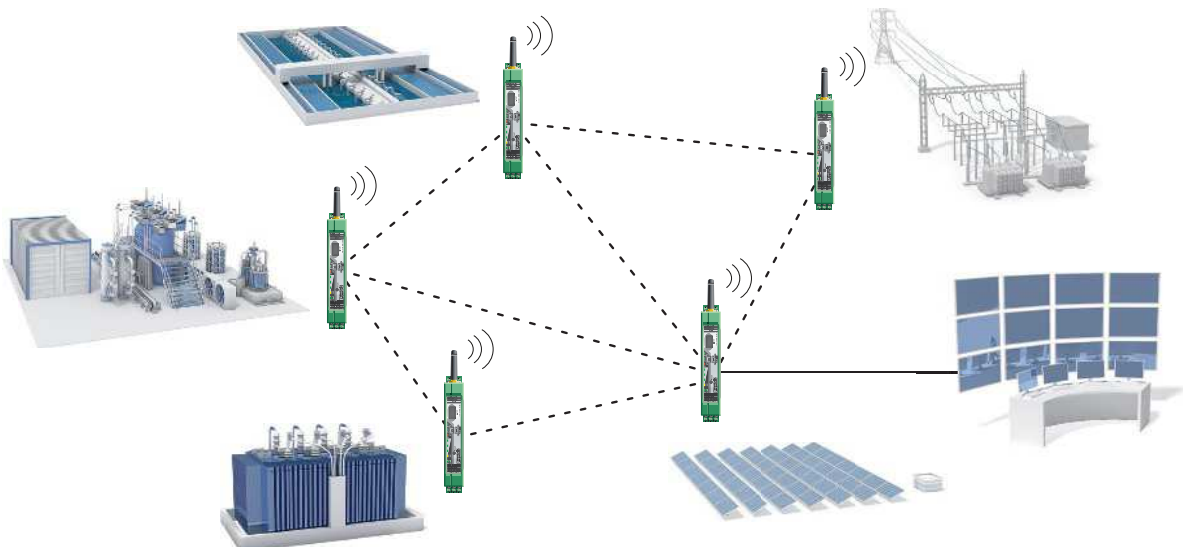
# Functional safety – safe startup and shutdown

Adhering to safety guidelines is of the utmost importance in the mining industry. The implementation of safety standards requires consistent and efficient solutions. The safety portfolio from Phoenix Contact meets these requirements. The products for functional safety are characterized by their easy installation and configuration. From safe coupling relays to safe controllers, you always find the right logic module for your standard and efficient solution in our portfolio.

# Safety for any function



## Highly compact, safe coupling relays

With an overall width starting at 6 mm, PSRmini relays are the most narrow SIL-certified coupling relays in the world for safe switch-on and switch-off. The diagnostic LEDs enable SIL-3-qualified inspections to be performed directly on the module.

ℹ **Web code:** #0507

## Conventional safe coupling relays

The PSRclassic series includes conventional coupling relays with force-guided contacts for safe shut down. With a housing width starting from 17.5 mm, they correspond with market-standard housing dimensions and feature approvals for all global markets.

ℹ **Web code:** #1548

## Safe I/Os with SafetyBridge Technology

Realize decentral safety solutions with SafetyBridge Technology, without the need for safety controllers and regardless of the network used. The technology is integrated into the Axioline F and Axioline Smart Elements I/O systems and is compatible with all bus couplers of these systems.

ℹ **Web code:** #1544

## Customized safety solutions

The configurable PSRmodular safety system from Phoenix Contact enables you to adapt your safety technology individually to your specific needs. It makes it possible to cost-effectively implement small applications with three safety functions as well as applications with up to 160 I/Os. Alongside monitoring classic safety functions such as emergency stop signals, safety door locks, light grids, and safety shut-off mats, you can also realize safety functions such as speed, downtime, direction of rotation, and secure analog value monitoring. The system is suitable for machines and process applications up to PL e or SIL 3.
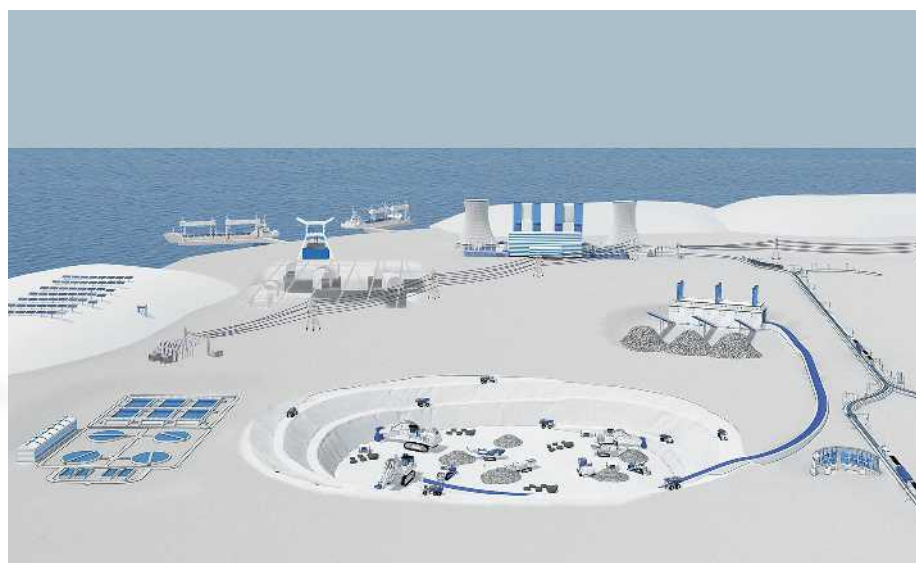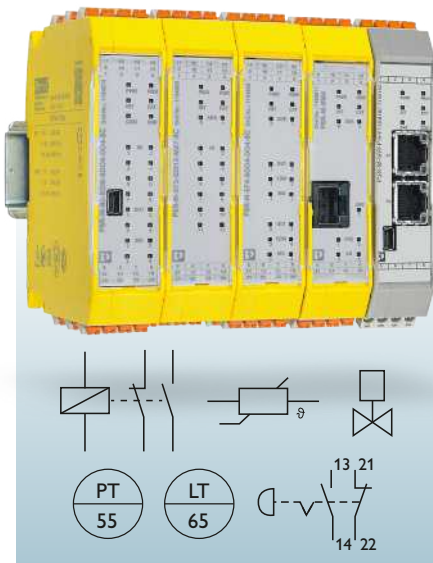
# Network technology and data security – safe and reliable communications

The security of data, networks, and installations is essential for a reliable infrastructure. Phoenix Contact offers a wide range of high-quality network components and security products.

The mGuard devices are powerful network routers with integrated firewall and IPsec encryption. Managed Switches allow you to increase your productivity and secure a fast and continuous flow of information.

# Intelligent network technology with security



## Security routers

Companies can only succeed if their systems operate securely and without errors. Failures, sabotage, and data losses cause large-scale economic damage. Therefore, Phoenix Contact offers the mGuard product family: An industrial firewall and router solution to individually protect your automated systems.

**i** **Web code:** #1270

## Managed Switches

Switches need to meet special demands in industrial environments, such as robustness and support of the protocols used in the industry. Depending on the application, we offer different Managed Switches with which you can ensure smooth data traffic in your application.

**i** **Web code:** #1555

## Splice boxes

The FDX 20 series splice boxes ensure continuously reliable real-time data transmission. With their compact and uniform design, the splice boxes for both DIN rail and the 19" mounting provide plenty of interior space for the secure connection of fiber optics.

**i** **Web code:** #0336

## Worldwide communication and data security

With its mGuard technology, Phoenix Contact provides a solution for safe remote maintenance via the Internet or cellular communication that can be integrated into systems and machines without installing any software. These tried and tested security appliances can be used in any environment, regardless of the operating system. No changes to the configuration of the system or its surrounding network are necessary. Maximum security is guaranteed by the combination of firewall and VPN (virtual private network) technologies that are integrated into many mGuard devices.
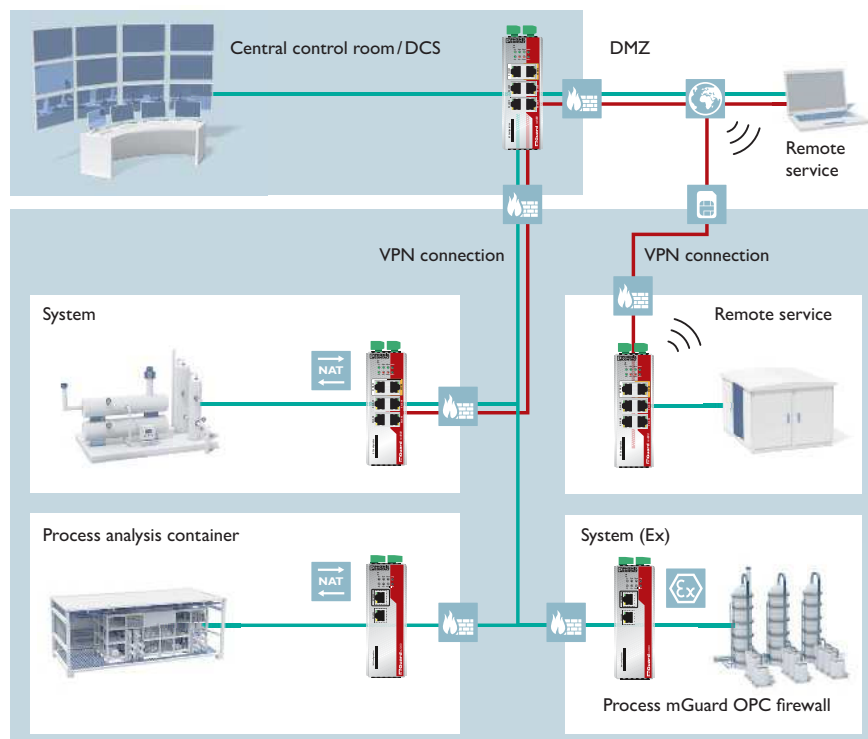
# Monitoring and diagnostics – keep an eye on your installation

Log, follow, and monitor the processes of individual modules or complete system parts with monitoring and diagnostics products and solutions from Phoenix Contact. These multifunctional monitoring products are the solution for the continuous monitoring of key electrical and physical system parameters. The Human Machine Interfaces are multifunctional and compatible with all major communication standards (e.g., TCP/IP, PROFINET, EtherNet/IP™, Modbus/TCP, etc.).

# Solutions for monitoring and diagnostics



## HMIs and industrial PCs

Whether directly on site or in the central control room – Human Machine Interfaces are also used in places where they are exposed to extreme environmental impacts and stress. Depending on requirements, you can select devices for WebVisit software, Visu+ software, or for HTML5 applications.

**i** **Web code:** #0910

## Monitoring relays

EMD monitoring relays allow you to detect errors in important system parameters at an early stage, report them, or switch off system components in a targeted manner. In addition, you ensure the trouble-free and economical operation of your system and a cost-effective solution for numerous key monitoring functions.

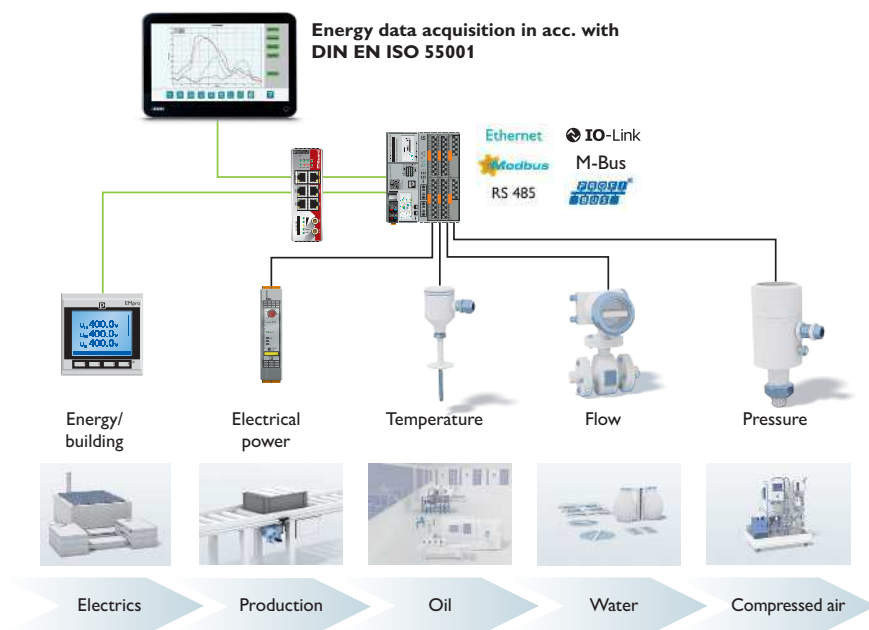**i** **Web code:** #1105

## Energy measuring devices

EMpro energy measuring devices can be configured and integrated into your network in minutes. Benefit from the simple, direct connection of conventional Rogowski coils, and from the many practice-oriented web server and device functions. An integrated REST interface and direct connection to the cloud pave the way to the digital world. 24 V versions complete the product range.

**i** **Web code:** #1267

## Data acquisition solutions for asset management (DIN EN ISO 55001)

Continuously recorded energy flows form the basis of a targeted energy management system. Access comprehensive characteristic electrical data of your system and benefit from the advantages:

- Reduced energy costs with the identification of potential energy savings
- Optimized system utilization with intelligent system component switching, balanced supply utilization, and reduction of harmonics
- Reduced peak loads with predictive trend calculations and load management
- Production processes safeguarded and downtimes minimized with key system parameter monitoring



Energy data acquisition in acc. with DIN EN ISO 55001

Ethernet  IO-Link  Modbus  M-Bus  RS 485

Energy/ building — Electrical power — Temperature — Flow — Pressure

Electrics — Production — Oil — Water — Compressed air

# Surge protection –
# protect your equipment

Phoenix Contact is a pioneer in the development of surge protective devices.
Decades of experience and fundamental research in cooperation with universities
are the foundation for our technology expertise. Our own accredited pulse and
high-current laboratory helps us to implement our products safely and in accordance
with standards from the initial idea through to serial production.
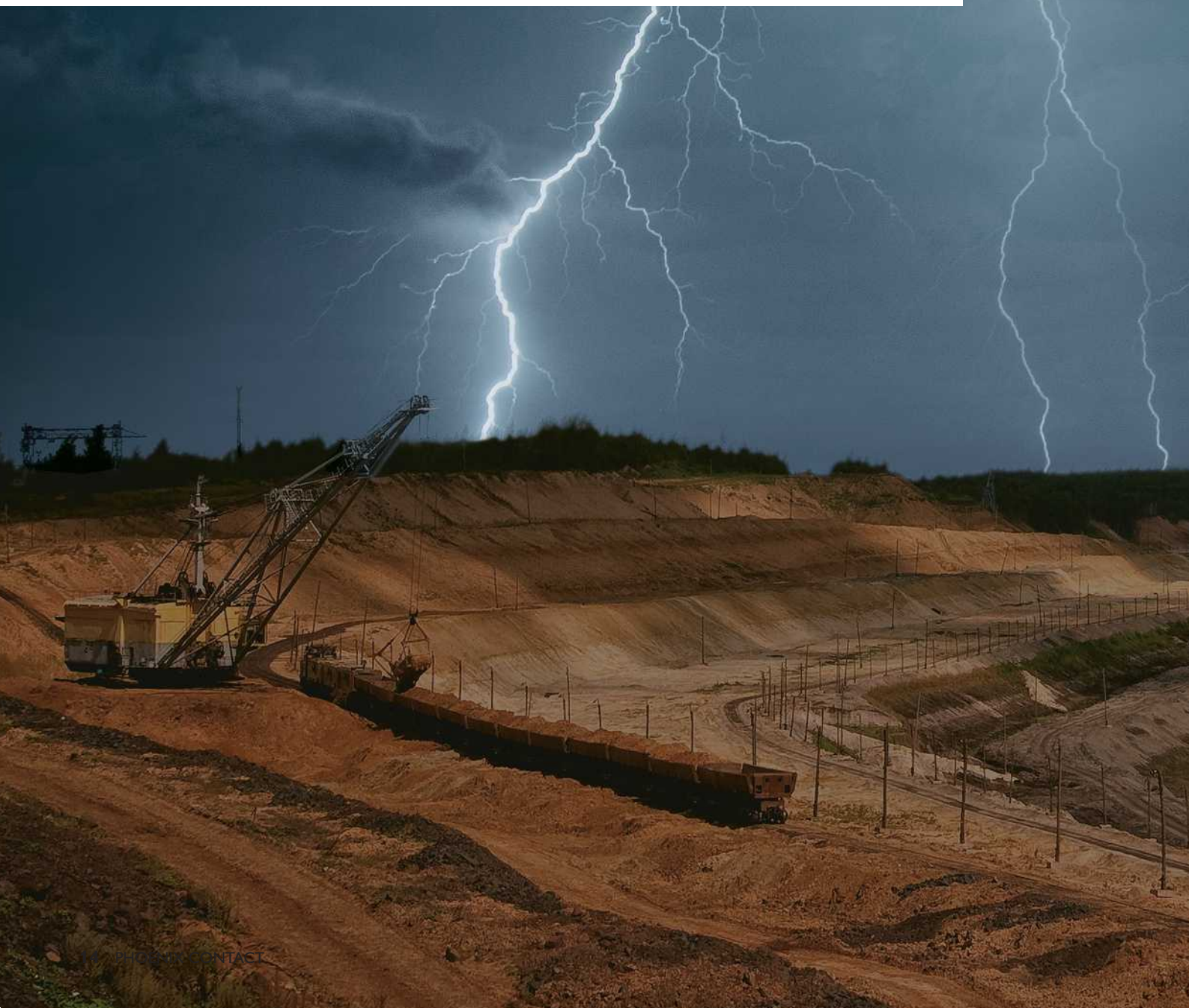
# Reliable system protection at the highest level
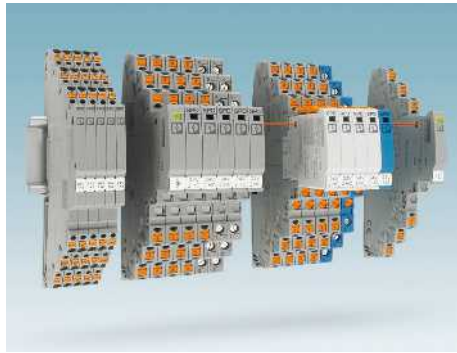






## Surge protection for MCR technology

With overall width starting at just 3.5 mm, TERMITRAB complete offers a complete product portfolio for nearly every application in measurement and control technology. Whatever the type of signal to be protected, you will find a perfectly suited circuit version for your application.

[i] **Web code:** #0292
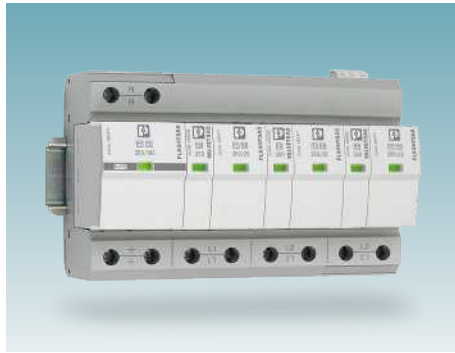
## Surge protection for power supply systems

The surge protective devices of the SEC family ensure the reliable, uninterrupted operation of your system. A backup-fuse-free application and the uniform, compact design enable the efficient and easy planning of your control cabinets.

[i] **Web code:** #0143

## Device circuit breakers

Safely protect your equipment against overload and short-circuit currents in a space-saving way. With our multi-channel device circuit breakers, you can protect multiple circuits with a single small-footprint device. All channels can be individually adjusted and thus individually adapted to the connected load.

[i] **Web code:** #0156

## Multi-level protection concept

Thanks to the surge protective devices from the Safe Energy Control range, it is extremely easy to assemble multi-level protection concepts for standard installations. Parameters such as the maximum continuous voltage, voltage protection level, and discharge capacity are ideally tailored to one another. The basic structure of the concept takes the form of multi-stage surge protection in the power supply with a lightning arrester type 1 in the main supply, a surge protector type 2 in the subdistributions, and the device protection type 3.
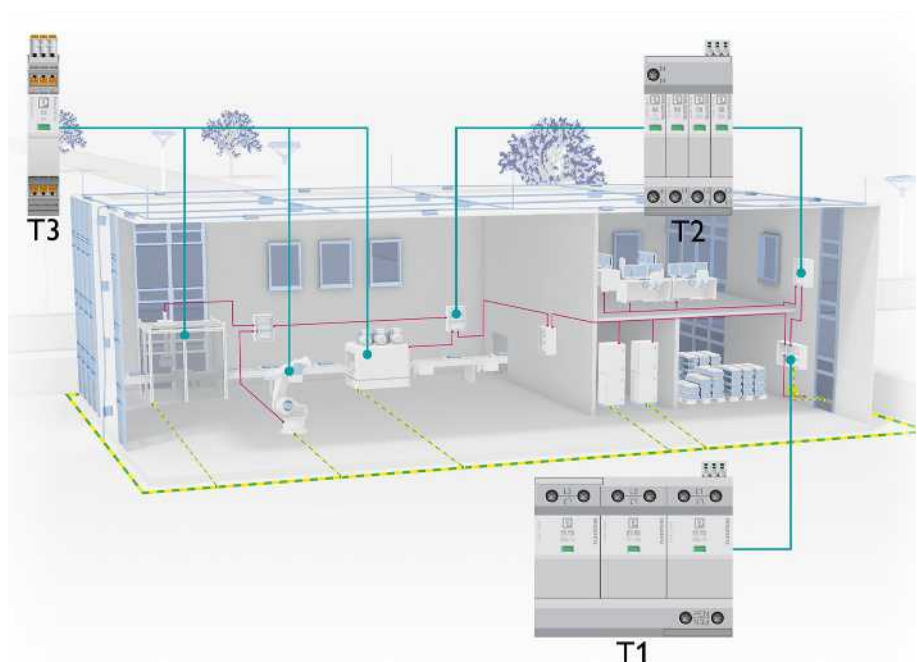


Increase system security and system availability with a tailored protection concept.

# Connection technology –
## fast and convenient installation

In the mining industry, the quality of the electrical contact points is an essential criterion for the reliability of the complete systems. Phoenix Contact offers you a comprehensive range of Ex-approved terminal blocks. In field cabling, you save time and money with pluggable cabling. Standardized interfaces and fast-connection technologies ensure fast and convenient installation. With our range of flexibly combinable round and industrial connectors, we offer you the right solution for every application.
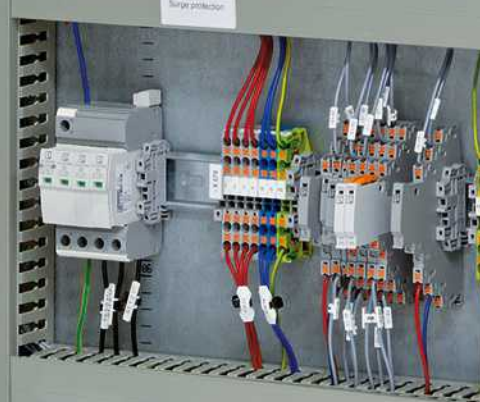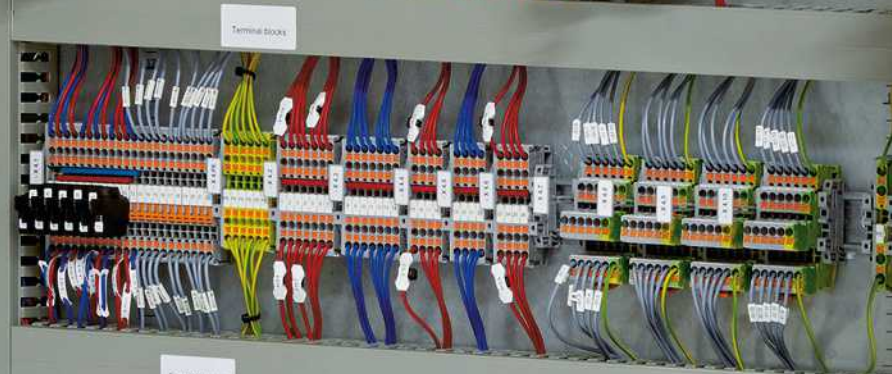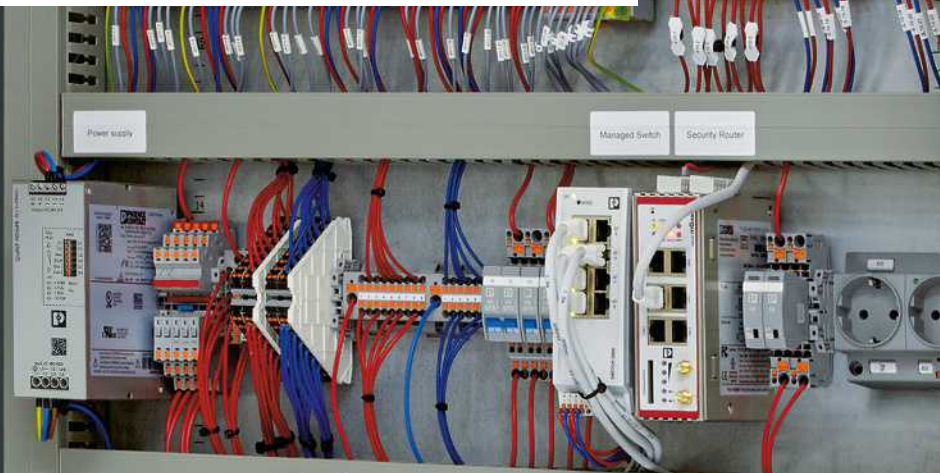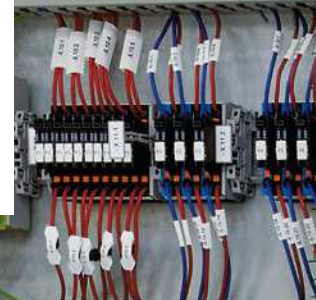
# Convenient control cabinet wiring and field cabling







## Terminal blocks

With the CLIPLINE complete terminal block system, the choice of connection technology is yours. All terminal blocks can be freely combined with the CLIPLINE complete accessories. The various series ensure that the requirements of all applications are covered, from 0.14 mm² to 240 mm². You can modularize assemblies quickly with the individually configurable COMBI connectors.

**i** **Web code:** #0567

## Circular connectors

Take advantage of the M17 to M58 circular connectors for your signals, data, and power. In addition to prefabricated cables, our product family includes field-assembly connectors and junction boxes. For demands that go beyond the classic specifications, we offer a range of specially tailored products.

**i** **Web code:** #0368

## Industrial connectors

Our HEAVYCON complete connectors can be flexibly combined with one another and are compatible with the market standard. The contact inserts can be wired easily using fast connection technologies such as Push-in. With modular contact inserts, you can transmit signals, data, power, and compressed air via a single connection.

**i** **Web code:** #0002

---

## Push-in Technology – the best connection for high vibrations

Push-in, the connection technology of the future: This is the long-term development experience and expertise of Phoenix Contact. Benefit from the advantages of easy, tool-free wiring with our wide range of Push-in products, from the field through to the controller.
Push-in – the original from Phoenix Contact.

### Push-in Technology
Designed by PHOENIX CONTACT
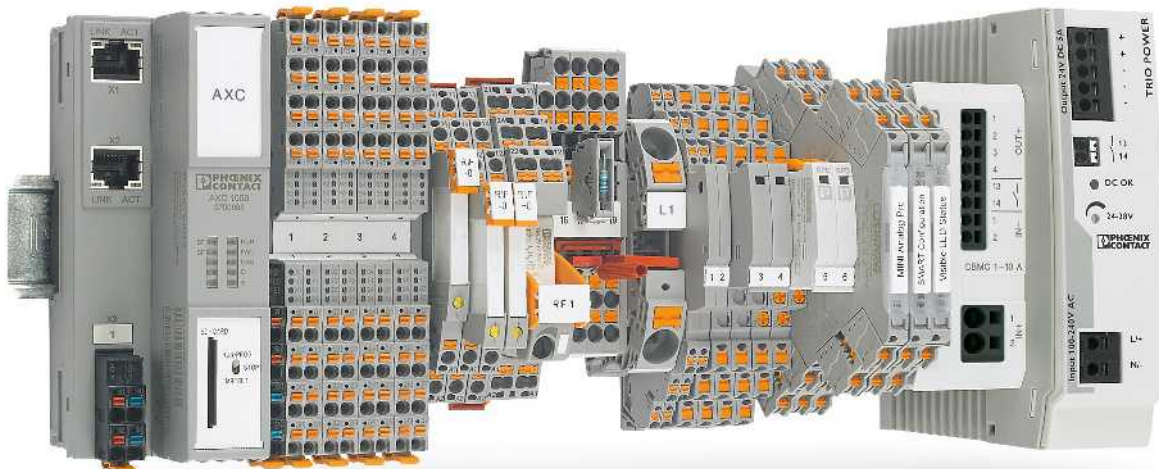
# Marking and labeling –
# clear and resistant marking

The extreme environmental conditions in the mining environment impose the highest demands on man and machine. A clear and resistant marking offers you orientation and safety in this environment. Reliable resistance under extreme stress is the basic requirement for the corresponding markings. Marking systems from Phoenix Contact offer you high-quality and perfect-fit solutions for this area.

# Robust markings for demanding applications



**Marking materials**
The MARKING system features a comprehensive material range for marking terminals, conductors and cables, devices and systems. You can therefore individually and consistently mark control cabinets for use in the mining industry using just one system, for example.

[i] **Web code:** #0849



**Marking software**
The PROJECT complete software offers you a variety of options for the individual design of your markings. In addition, it controls all printing systems from Phoenix Contact. Printing data can easily be created.

[i] **Web code:** #1853



**Laser marker**
TOPMARK NEO is the powerful and versatile solution for creating robust markings for the mining industry. The compact laser marker labels materials made of plastic and metal using engraving, carbonizing, or tempering.

[i] **Web code:** #0849

## Industrial identification for the mining industry

The different working areas in the mining industry place very different demands on markings for the environment and components. The Phoenix Contact MARKING system product range provides you with an extensive selection of markings of a wide variety of materials and marking systems for all applications.

**Robust materials for permanent marking**
Markings made of stainless steel and aluminum stand out for their excellent resistance to extreme environmental conditions, chemicals, and mechanical impact. They can therefore withstand the high demands of the mining industry. Riveted to systems or attached to pipelines with cable ties made of the same robust

materials, they mark the environment permanently and in accordance with standards.
In addition, a huge range of plastic markings for special applications is available that features UV-resistant, heat-resistant, and vibration-resistant products, for example.

# Excellent processes from development through to delivery

Innovative products and highly automated production processes require the highest level of systematically developed product and process quality. Corresponding processes ensure this quality from development through to series production.

# 95 years of quality is no coincidence

## Zero error strategy

Lean, error-free, and disturbance-free production processes without rejects or reworking are the goals we are continually striving for. To achieve these goals, we are integrating advanced quality planning early on in product and process development. In series production, operational quality assurance monitors processes and organizations, while Supplier Quality Engineering actively integrates the suppliers. This allows us to ensure flawless products that meet market requirements and specifications.

## Advanced quality planning

Systematically and using modern methods, we convert our customers' product requirements into process and quality requirements right from the start of a development project. After risk analysis, we design and qualify a corresponding test concept based on the production control plan. Processes and products are qualified following conventional industrial standards and procedures.

## Operational quality assurance

We are continuously monitoring, scrutinizing, and optimizing our production processes. While doing so, it is important that we apply the experience and knowledge of our employees so that the entire company is motivated to continuously improve. Quality circles, 8D methodology, process audits, and the use of statistical methods for assessing processes and solving problems also keep quality, costs, and delivery dates continuously in line with one another.

## Supplier quality engineering

Integrating suppliers and vendors early on in the process ensures our product and process quality as well as our capacity to deliver. The tasks involved in Supplier Quality Engineering (SQE) include the management of qualification programs along with complaint processing and production part acceptances in cooperation with our suppliers. Integrated into a tight network consisting of Purchasing, Production, and Product and Process Development, SQE contributes globally to our high quality standard.

# We are there for you

With over 50 subsidiaries and more than 30 agencies around the world, we are always close by. Specialists for your application and a globally positioned sales network are available to advise you on site, with expertise and in person. Our broad spectrum of internationally approved products and comprehensive knowledge of the industry enable us to help you create special solutions and concepts for your specific mining industry application.
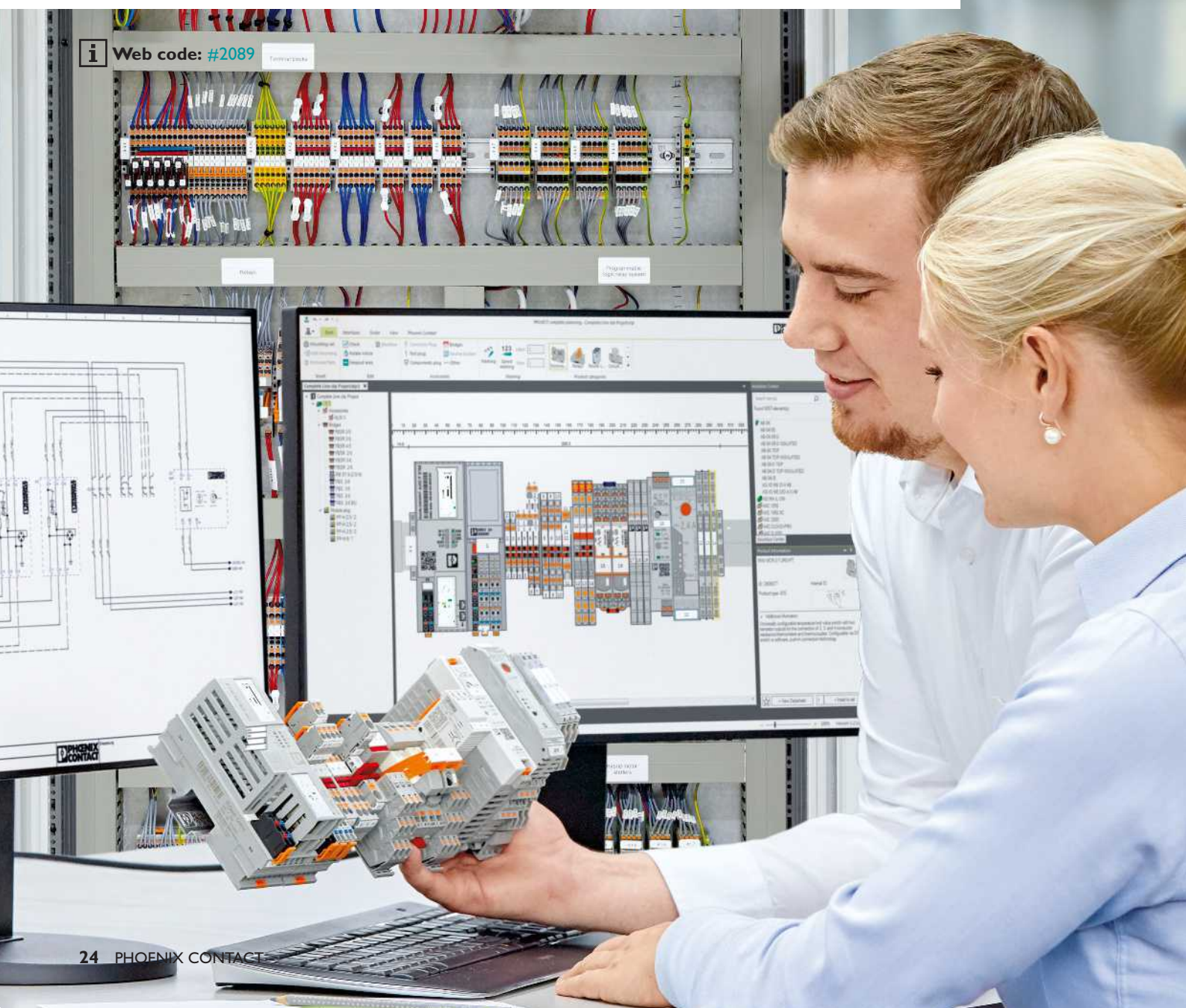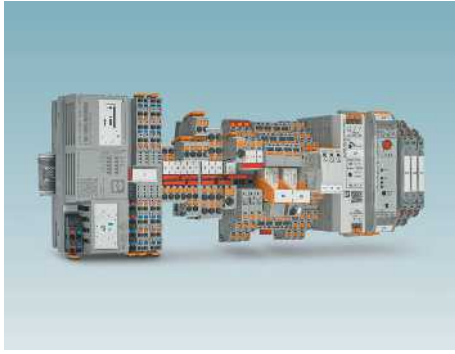
# COMPLETE line
# The comprehensive solution for the control cabinet

COMPLETE line is a system comprised of technologically leading and coordinated hardware and software products, consulting services, and system solutions that help you optimize your processes in control cabinet manufacturing. Engineering, purchasing, installation, and operation become significantly easier for you.

**Web code:** #2089

# Your advantages in detail:



## Comprehensive product portfolio

With COMPLETE line, we offer a complete product portfolio of technologically leading products. This includes:
- Controllers and I/O modules
- Power supplies and device circuit breakers
- Terminal blocks and distribution blocks
- Relay modules and motor starters
- Signal conditioners
- Safety technology
- Surge protection
- Heavy-duty connectors



## Intuitive handling

Thanks to the simple, intuitive handling of the coordinated hardware components, you will save time during installation, startup, and maintenance. Push-in connection technology allows you to wire applications quickly – without using tools. The broad, technologically leading product portfolio will always provide you with the right product for standard or special applications.



## Save time throughout the entire engineering process

The PROJECT complete planning and marking software supports the entire process of control cabinet manufacturing. The program features an intuitive user interface that enables the individual planning, automatic checking, and direct ordering of terminal strips.



## Reduced logistics costs

Reduced variety of parts, thanks to standardized marking, bridging, and testing accessories. The COMPLETE line system coordinates products, design, and accessories so that you benefit from maximum reusability and thus reduce your logistics costs.



## Optimized processes in control cabinet manufacturing

COMPLETE line supports you, from engineering through to manufacturing, in designing your control cabinet production as efficient as possible. This is how your customized concept for optimizing your processes in control cabinet manufacturing is created. Our terminal strip production helps you to flexibly manage order peaks or to supply your control cabinet production with fully assembled DIN rails just in time.



## The new standard for the control cabinet

Discover the extensive COMPLETE line product portfolio and find out more about COMPLETE line and your comprehensive solutions for the control cabinet.

Visit our website:
**phoenixcontact.com/completeline**

# Worldwide service and support – we are there for you

At Phoenix Contact, the focus is always on you, the customer. With over 50 subsidiaries and more than 30 agencies around the world, we are always close by.

As a result, you receive expert, first-hand advice and benefit from fast and timely delivery of a complete package consisting of high-quality, optimally coordinated components. Our expertise and high level of in-house production also allow customized solutions tailored to you. We also support you after your purchase with our comprehensive after-sales services.

[i] **Web code:** #2247

# Your advantages in detail:



## Fast terminal strip production

The terminal strip production service provides help in managing order peaks flexibly, and enables terminal strips to be delivered just in time for series production. The fully assembled and marked terminal strips, complete with accessories, then simply have to be installed and connected.



## Individual set solutions

To reduce the effort of materials and stock management, you can order pre-picked material sets under a single order number.



## Customer-specific solutions

Can't find what you're looking for in our range? No problem: From minor adaptations to completely new product developments, we focus on your specific requirements.



## Global approvals and certificates

Our numerous certificates are proof that you can put your full trust in our products, because quality is essential. We strive to satisfy this requirement in every respect. For this reason, our systems, processes, and products are inspected and certified several times over.



## Comprehensive after-sales services

We are there for you – not just before your purchase, but also after with our comprehensive after-sales services. This includes our repair service, exchange service, and replacement parts service.



## Comprehensive training program

From the basics to specialist expertise: We provide you with the skills you need in line with your specific requirements.

# 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

**PHŒNIX CONTACT**