Railway technology product list

Electrotechnical products for railway applications
Version 1.4

PHŒNIX CONTACT

Railway technology product list
Clear, compact, and to the point

Does this item have a railway approval? This is a question asked frequently for products designed for use in the railway industry. This document provides a compact summary outlining the railway-specific requirements that products in the Phoenix Contact portfolio fulfill. This enables you to obtain the relevant information for product selection at item level quickly and clearly.

Contents

Norms and standards for railway technology
Explained step by step

Our railway guide explains the norms and standards relevant for the railway industry in an international context. The requirements and areas of application for the standards are explained and clearly supported by graphics. This guide also explains how to run the necessary tests.

You can download our guide at the following link:

phoenixcontact.com/railway_guide

**Railway Guide –
EN 45545**

Practical guide with focus on "electrotechnical equipment"

What this document covers:

Application of grouping rules

The standardized application of the grouping rules under fire protection standard EN 45545-2 represents the interaction of the flammable mass, material properties, distance, and effective separation using fire protection technology. The rules themselves and the framework parameters to be taken into consideration are both explained in order to provide an understanding of how the grouping rules are applied.

This helps to develop an overall picture step-by-step, illustrating the respective requirements in relation to the mass relevant for fire protection.
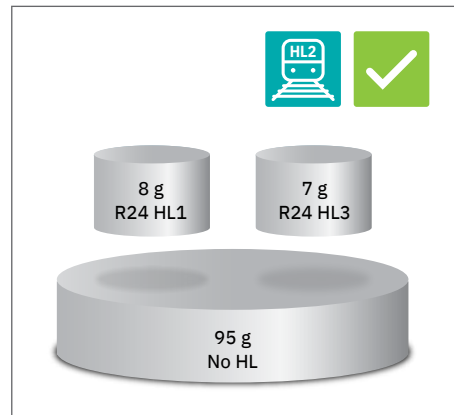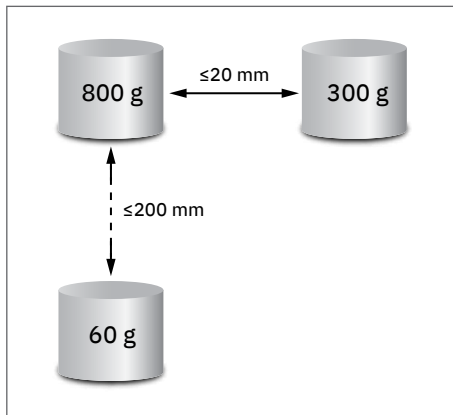
Graphical representation of the grouping regulations of EN 45545-2
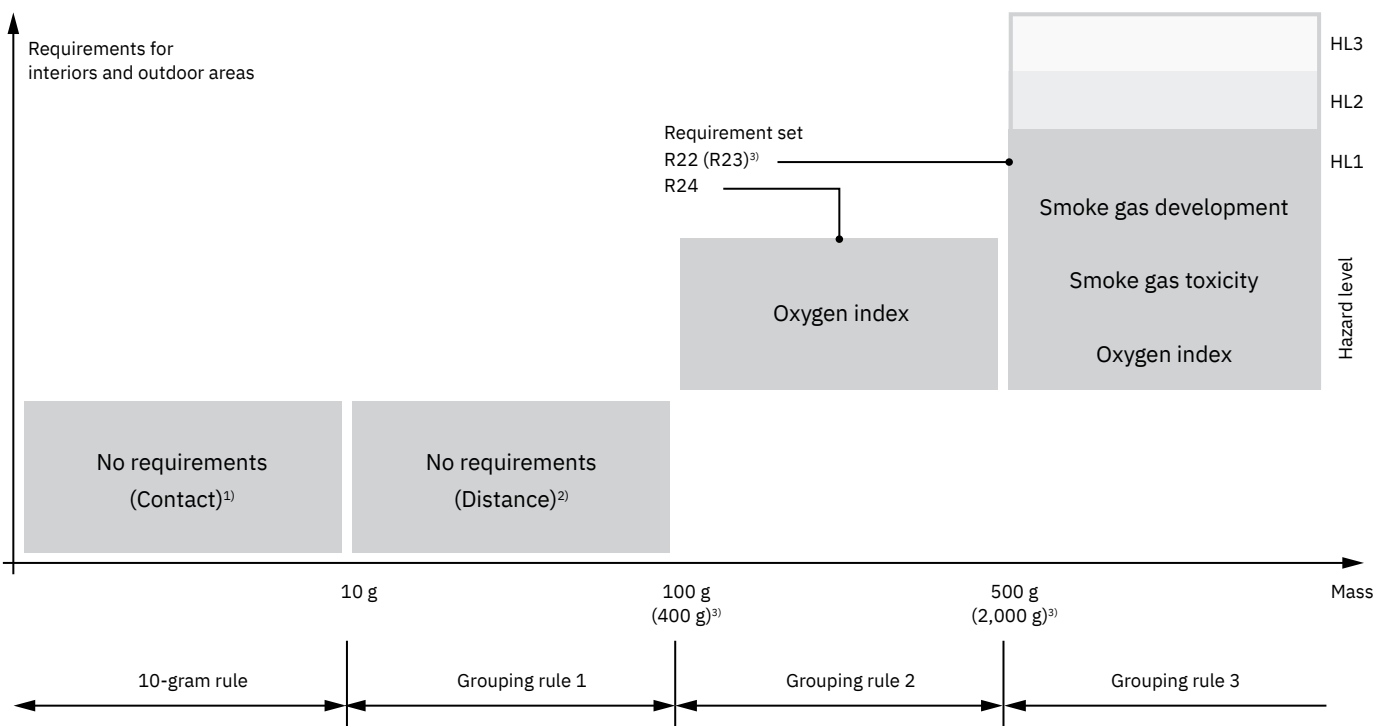
[1] Contact permitted only with classified components.
[2] The distance rule must be observed.
[3] Values in parentheses () apply to outdoor areas.

Industrial cybersecurity

As digitalization increases, so do security risks and thus the risk of a cyberattack. Companies are required by law to protect themselves against cyberattacks, in particular in the field of critical infrastructure.

Industrial security protects against downtime, sabotage, and data loss. Comprehensive protection against unauthorized access is therefore an important requirement for automation systems.

360° cybersecurity

Our complete range

Phoenix Contact offers standardized security in products, industry solutions, and services for the future-proof operation of machines, systems, and infrastructures. Security is embedded in the entire life cycle of our products and solutions. It starts with a secure development process (certified in accordance with IEC 62443-4-1), and includes the integration of critical security functions and regular updates and security patches.

Our approach: we make state-of-the-art security manageable, e.g., through easy configuration, integrated security functions, sophisticated comprehensive solutions, and supportive consulting services. The long-term availability of necessary updates also means that our components have a long useful life.

Security applications in railway technology
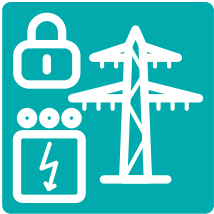
Security for the power supply
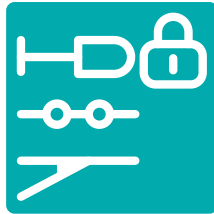
Security for diagnostics and monitoring

Security in operating equipment

All-around complete security

Benefit from a total package for your security requirements. Your data are safe with us. We provide standardized security in products, solutions, and services for the future-proof operation of your infrastructure.

We provide you with:

- Secure products
- Secure services
- Secure solutions
- Ongoing improvements
- Certified security

Control meets security: PLCnext Technology

IEC 62443-4-2-compliant

PLCnext Technology is the ecosystem for industrial automation, consisting of open hardware, modular engineering software, a global community, and a digital software marketplace.

PLCnext Control are the first PLCs in the market to be certified by TÜV Süd in accordance with IEC 62443-4-1 ML 3 Full Process Profile in combination with IEC 62443-4-2. This confirms that the Secure Development Life Cycle was fully applied in developing PLCnext Control.

Product certification in accordance with IEC 62443-4-1 and -4-2 confirms that a product has been developed in accordance with secure design and provides information about which technical security requirements have been implemented.

In addition to the modular PLCnext Control AXC F 2152 and AXC F 3152 controllers, our high-performance RFC 4072S safety controller and the AXC F XT SPLC 1000 safety PLC extension have also been certified.

Benefit from the limitless possibilities of PLCnext Control

Communication protocols

PLCnext Control supports a wide range of relevant communication protocols. These are either already integrated, can be implemented via hardware components, or can be loaded later as function blocks. The fieldbus protocols include PROFINET, EIP, and CAN. HTTP, HTTPS, SFTP, SNTP, IPsec, syslog, and OPC UA are already available as common Ethernet protocols. MQTT, CODESYS, and Modbus/TCP can be loaded later as function blocks.

Edge computing

PLCnext Control for edge applications allows you to create IoT edge solutions for making the best cloud-based use of data from the field. This allows you to close the gap between the IT and OT worlds. You can reduce development and provision times using pre-installed software tools such as Node-RED, a local time series database, and a simple cloud connection. Simple and secure management is guaranteed via an integrated web-based management tool.
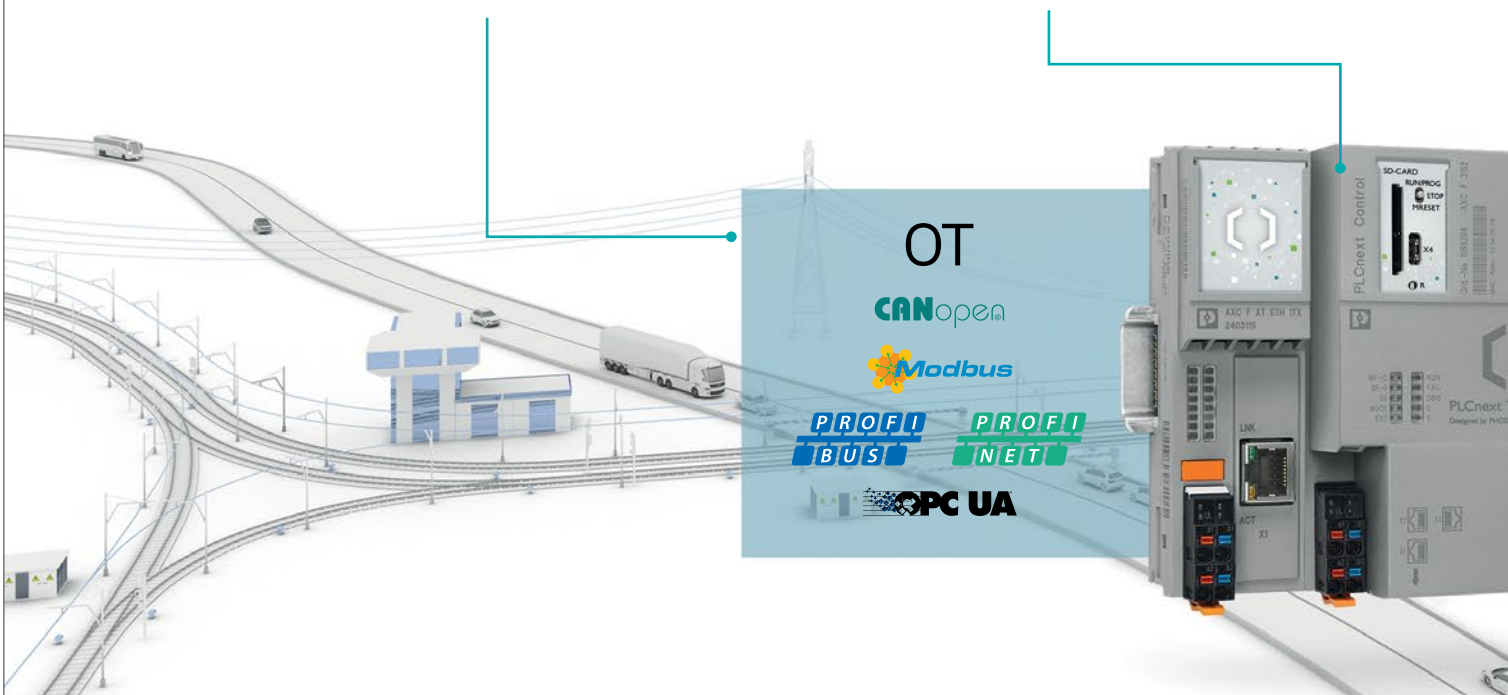
PLCnext Technology product list

The automation technology portfolio for PLCnext Technology can be found in a clearly arranged online listing: phoenixcontact.com/plcnexttechnology_portfolio

PLCnext Community

Benefit from the experience of other users of PLCnext Technology. Whether you are looking for testimonials, apps, expert advice, 24/7 support, events and webinars, launch news, or industry trends, you will find everything in one place right here.

Find out more about the PLCnext Community.

plcnext-community.net

PLCnext Technology
Designed by Phoenix Contact

Real-time capability, combinability of IEC 61131-3 and high-level languages

PLCnext Control enables the implementation of automation projects without the limitations of proprietary systems. The PLCs based on a Linux kernel are characterized by their real-time capability, for both IEC 61131-3 and high-level languages such as C/C++ and Matlab® Simulink®. The patented task handling allows any combination of IEC 61131-3 code, high-level languages, and model-based tools in one task.

Device und update management

The smarter automation components become and the more they communicate with remote (cloud) systems, for example, the more important it is to have up-to-date firmware for the individual components. Updates can be rolled out manually or automatically – and across manufacturers – with OPC UA-based device and update management. This saves time and costs, and minimizes the risk of cyberattacks.

TLS/VPN

IT

OPC UA

MQTT

IEC 60870-5-10x

SNMP
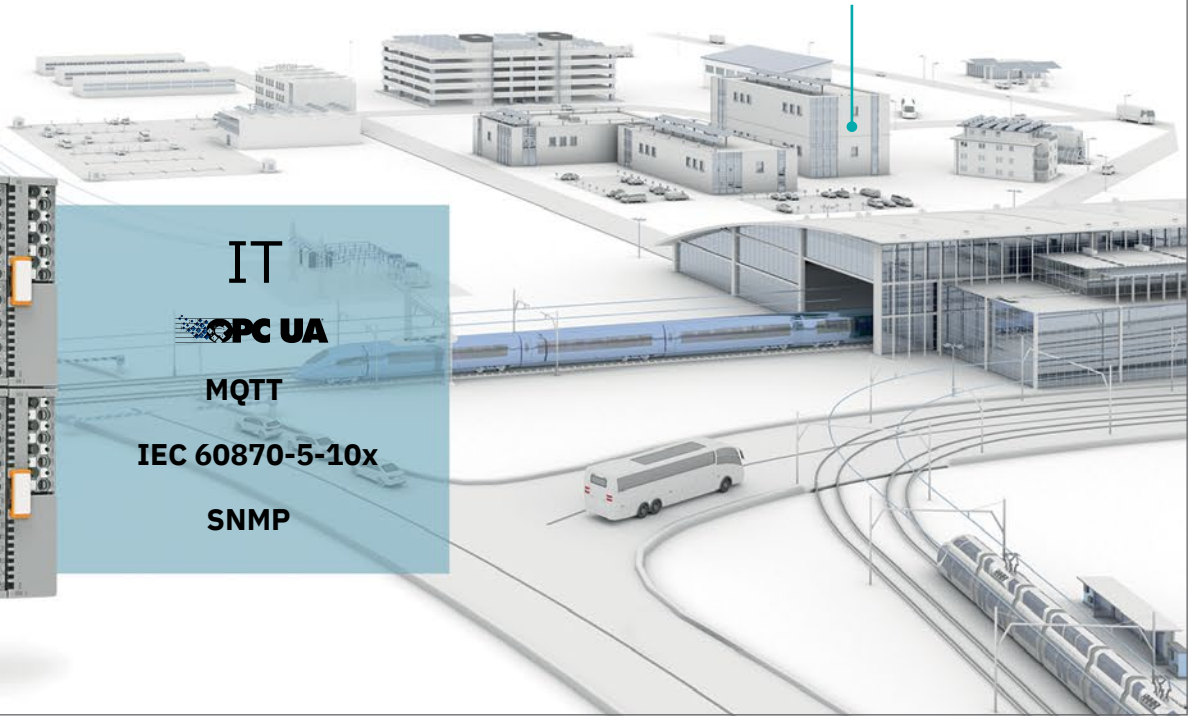
High-performance security routers

Protecting data communication against unauthorized access

As digitalization progresses, more and more communication and data networks are being set up for railway infrastructure. Although they are used for remote diagnostics or monitoring energy and systems and not in the vital area of control and safety technology, these networks must still be protected against unauthorized access by malware or people. After all, these systems are essential for smooth railway operations.

With their comprehensive security functions, mGuard security routers are the security backbone of your infrastructure. The integrated firewall protects against unwanted communication and access. With functions like network segmentation and high processing speed, a high level of security is guaranteed without any restrictions on data traffic. Secure remote access is possible with encrypted VPN communication.
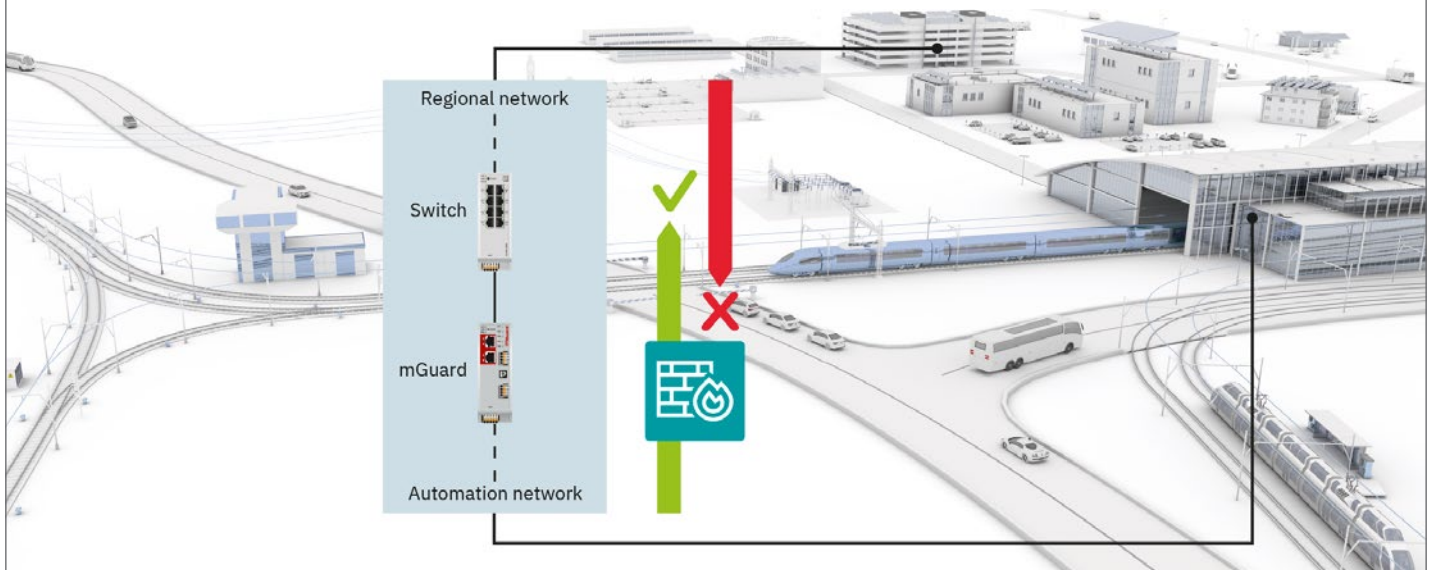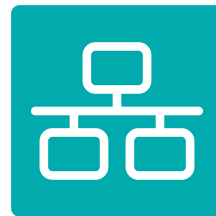

mGuard features

Gigabit data rate	**Firewall**	**Network Address Translation (NAT)**	**Network segmentation**	**Stealth mode**	**Secure remote maintenance**

Product list

High-performance security routers: FL mGuard 2100/4300						
	Port configuration	Port speed	VPN	Special features	Type	Item no.
	2 x RJ45	10/100/1000 Mbps	Up to 2 VPN tunnels	–	FL MGUARD 2102	1357828
			Up to 250 VPN tunnels	Extended firewall functions, DNV approval	FL MGUARD 4302	1357840
			Up to 250 VPN tunnels	Extended firewall functions, PCIE-PC card	FL MGUARD 4102 PCIE	1357842
				Extended firewall functions, PCI-PC card	FL MGUARD 4102 PCI	1441187
	5 x RJ45		Up to 2 VPN tunnels	4-port unmanaged switch	FL MGUARD 2105 [1]	1357850
			Up to 250 VPN tunnels	Advanced firewall functions, DMZ port, 3-port managed switch, DNV approval	FL MGUARD 4305 [1]	1357875

mGuard security routers

Further information on the individual functions and benefits of the mGuard security routers:

**phoenixcontact.com/ security-router-mguard**

mGuard brochure to download

If you would like detailed information on our mGuard security routers, you can download the brochure here:

phoenixcontact.com/mGuard_brochure

FL mGuard 2100/4300

Secure communication for industrial networks
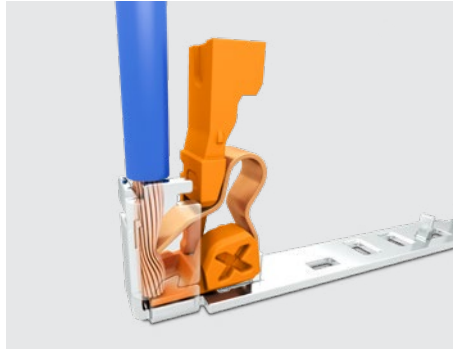
Terminal blocks

The requirements around components for railway infrastructure are stringent. They are used in safety-relevant applications and safeguard the availability of railway operations. Furthermore, in modern rail vehicles, the need for usable area and traveling comfort is growing. At the same time, less and less space is available for the required installations. Phoenix Contact supplies compact connection solutions with various numbers of positions, conductor cross-sections, and installation options that are particularly well-suited for space-saving electrical wiring.
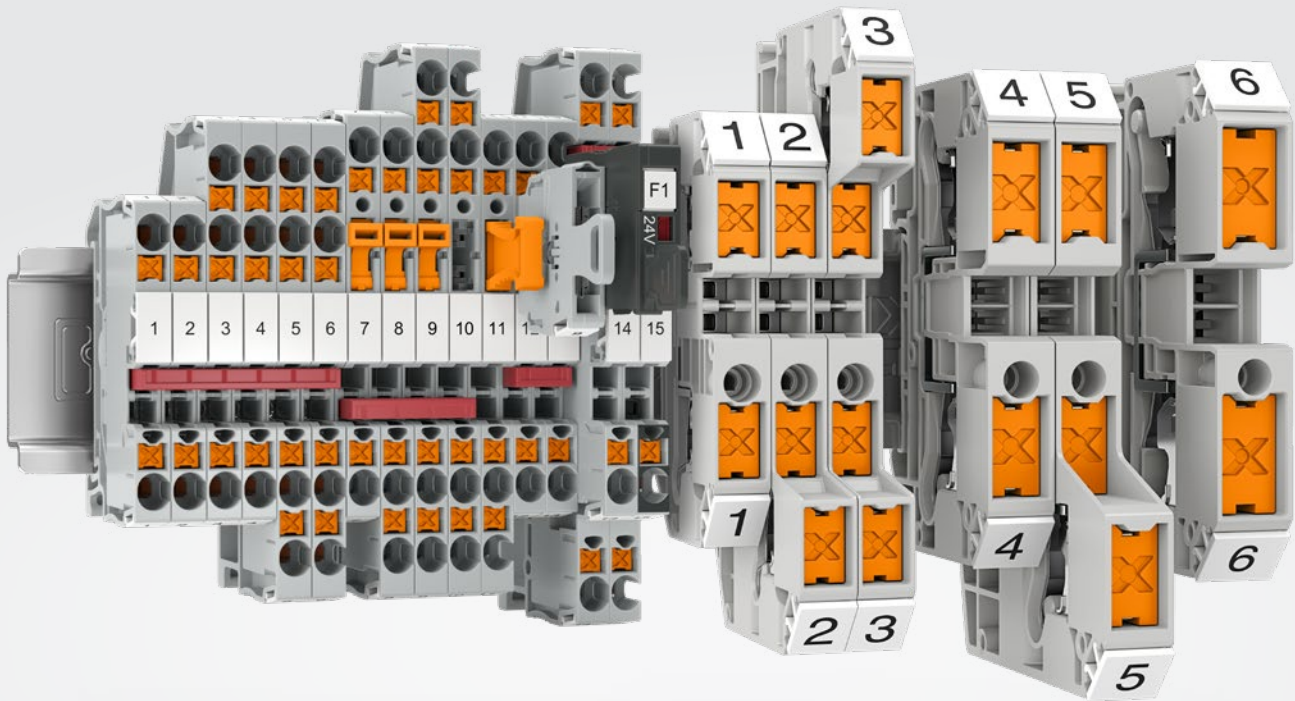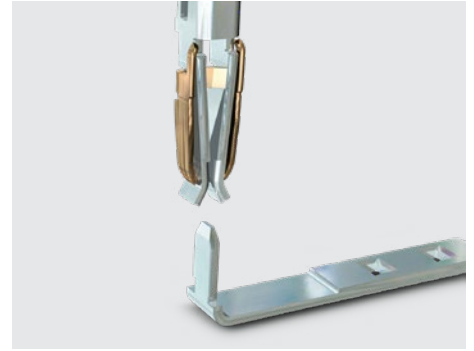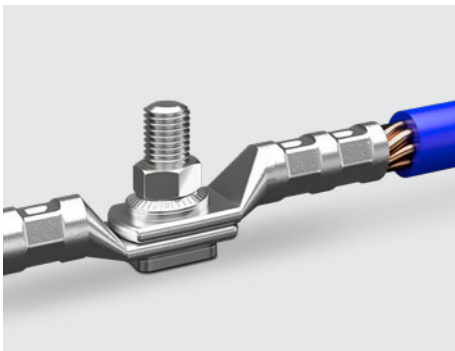
Connection technologies for railway applications
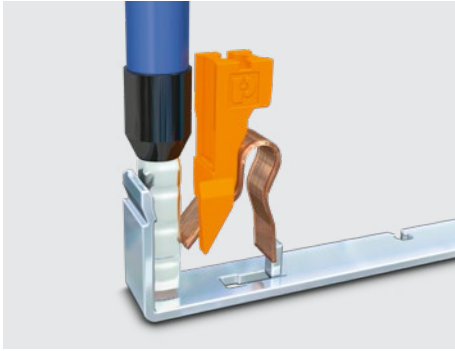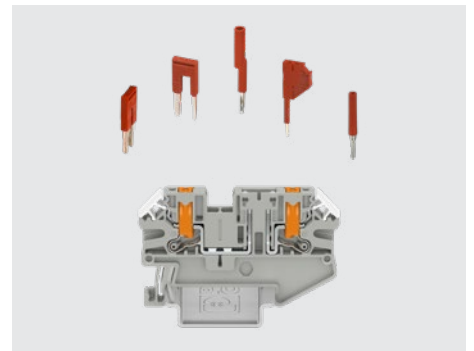
Push-in connection

Push-X connection

Plug-in connection

Bolt connection

Spring-cage connection

Accessories

Product list to download

Due to the large number of terminal block items, we offer our railway-specific portfolio as an Excel list to download:

phoenixcontact.com/railway_article_list

|	A	B	C	D	E	F	G
1			EN 45545-2				EN 50155
2	Item number	Type description	R22	R23	R24	R26	EN 61373 broadband noise
3	3209510	PT 2,5	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
4	3209523	PT 2,5 BU	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
5	3209536	PT 2,5-PE	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
6	3209549	PT 2,5-TWIN	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
7	3209565	PT 2,5-TWIN-PE	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
8	3209578	PT 2,5-QUATTRO	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
9	3209594	PT 2,5-QUATTRO-PE	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
10	3210156	PT 2,5-MT	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
11	3210157	PT 2,5-MTB	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
12	3210163	PT 2,5-MTB BU	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
13	3210169	PT 2,5-TWIN-MT	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
14	3210170	PT 2,5-TWIN-MTB	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
15	3210172	PT 2,5-QUATTRO-MT	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
16	3210184	PT 2,5-QUATTRO-MTB	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
17	3210185	PT 2,5-TG	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
18	3210191	PT 2,5-QUATTRO-MTB BU	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
19	3210192	PT 2,5-TGB	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
20	3210193	PT 2,5-TWIN-TGB	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
21	3210194	PT 2,5-QUATTRO-TGB	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2
22	3210198	PT 2,5-TWIN-TG	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 2

Connection technologies in detail

Push-in connection

The terminal blocks of the CLIPLINE complete range cover a broad range of applications. Connections based on spring technology have become an established method in the railway technology sector. Push-in direct-connection technology combines all the advantages of spring-cage technology and provides enormous cost-savings potential with considerably faster wiring. To make it easier to find our products in the online shop, the acronyms of the specific product families (PT, PTV, etc.) are listed in the second line.

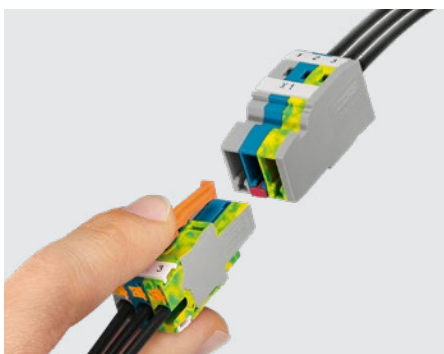**Feed-through terminal block
PT...**

For standard applications.
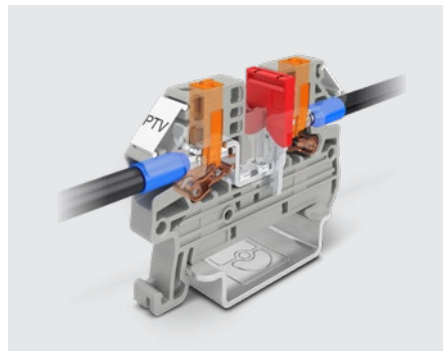
**Feed-through terminal block,
lateral connection
PTV...**

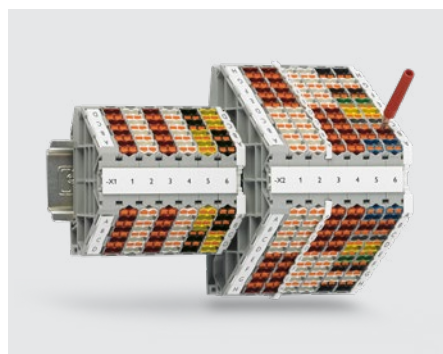For applications with a low installed height.

**Feed-through terminal block,
pluggable terminal blocks
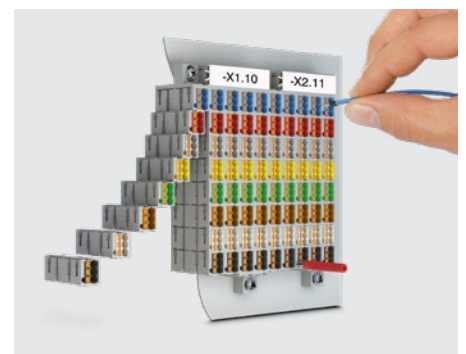PT...1P**

For maintaining or exchanging equipment.

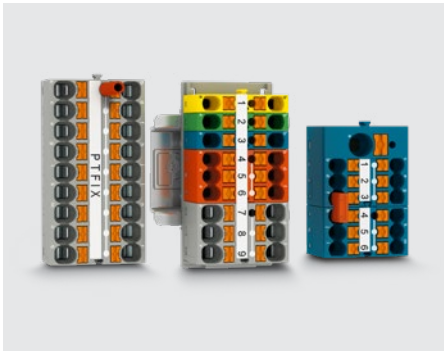**Plug/coupling
PP-H... and PPC...**

For flying leads.

**Potential distributor
PTRV...**
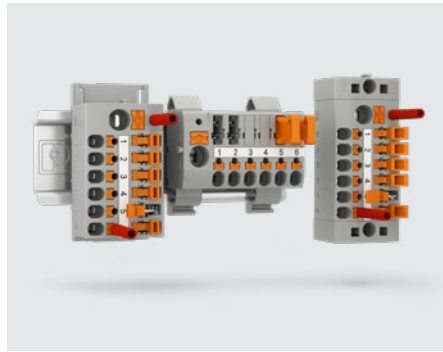
For space-saving, high-position wiring.

**Marshalling patchboard
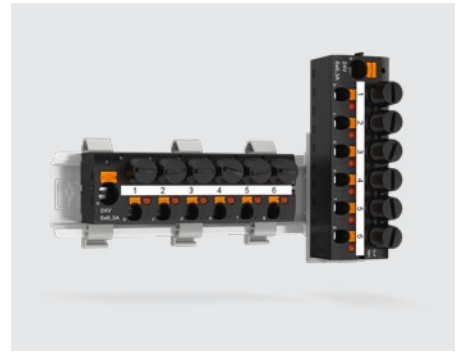PTMC...**

Modular, for signal marshalling.

Distribution blocks
PTFIX...

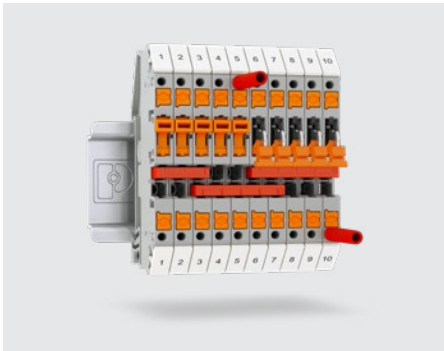For space-saving potential distribution.

Distribution blocks with/without disconnect knife
PTFIX...MT, PTFIX...TG

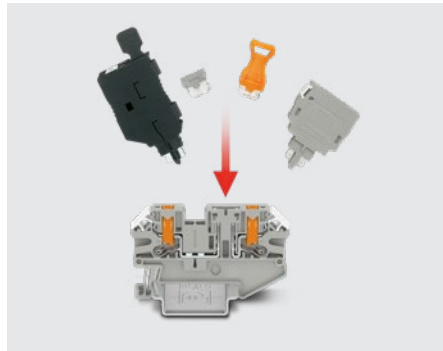For separating signal circuits or with plug-in zone.

Distribution blocks with fuse and LED
PTFIX...SILED...

For fusing with status indicator.

Knife disconnect terminal blocks push-in technology
PT...MT

For switching tasks and for testing, separating, and measuring.

Function terminals
PT...TG

For mounting fuse carriers and component holders.

Component terminal blocks
PT...BE

For installing individually selectable components.

Fuse terminal block
PT...HESI...

For fusing signal circuits.

Screw cap fuse terminal block
PT...DREHSI...

Fuse terminal block with screw cap.

High-current terminal blocks
PTPOWER...

For large cross sections or high currents.

Connection technologies in detail

Push-X connection

The Push-X terminal blocks are characterized by conductor connections that require almost no effort. The new technology combines the advantages of existing spring connection technologies and even enables tool-free conductor connection of the smallest conductors without ferrules. Due to the considerable time savings during wire preparation and wiring, Push-X technology is one of the most efficient connection solutions in the field of terminal blocks.

> For more information, visit: **phoenixcontact.com/push-x**
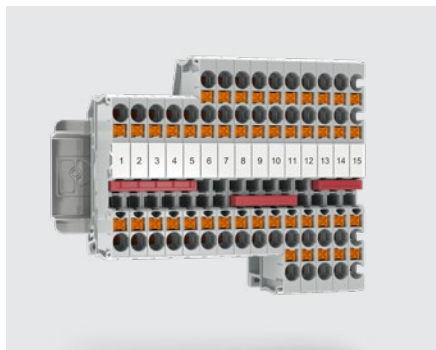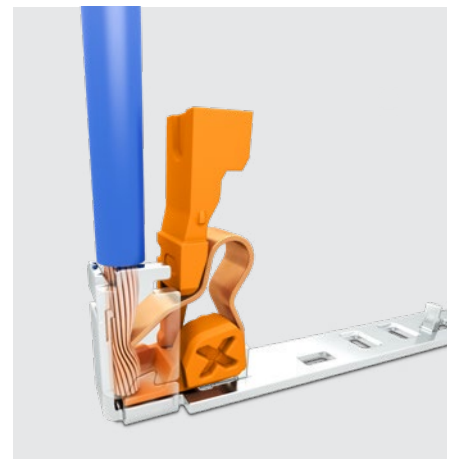
Feed-through and multi-conductor terminal blocks XT...

For standard applications with a conductor cross-section of 0.5 to 4 mm².

Feed-through and multi-conductor terminal blocks with lateral conductor connection XTV...

For standard applications with a conductor cross-section of 0.5 to 25 mm².

Function terminals XT...

For switching tasks, for testing, separating, and measuring purposes, and for the integration of components and fuses.

Spring-cage connection

The spring-cage connection delivers high contact reliability and constant connections, even at high levels of vibration.

Spring-cage connection terminal blocks ST...

Traditional connection technology.

Diode terminal blocks ST...DIO...

With integrated diode.

Bolt connection

Phoenix Contact offers field-tested bolt connection terminal blocks for challenging tasks involving large cross-sections and high currents. They meet the stringent requirements for safety and reliability in mechanical installation. Furthermore, parameters such as low contact resistance and high electric strength are of crucial importance to the quality of the electrical connection.
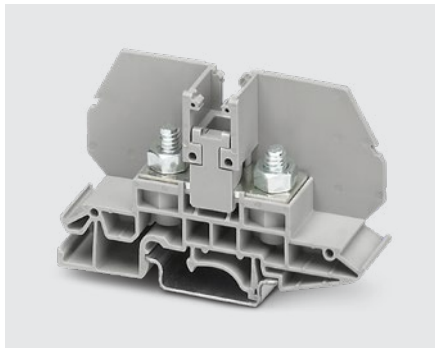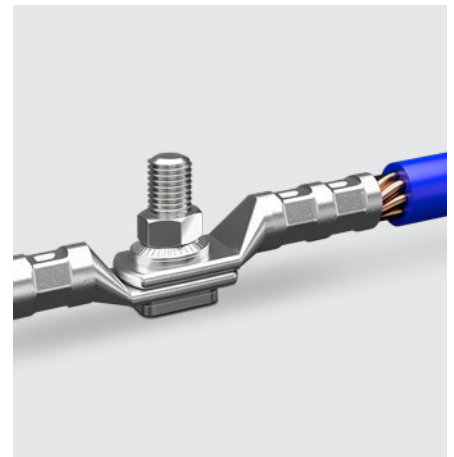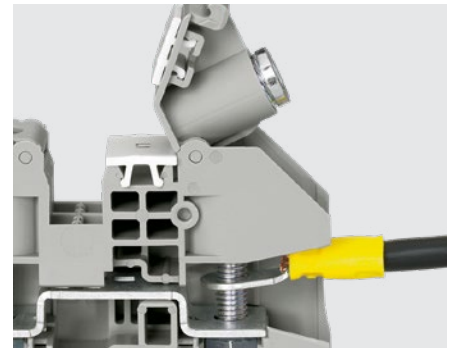
**Bolt terminal blocks
RBO...**

With two bolts, for DIN rail or direct mounting.

**Bolt terminal blocks, compact
HV...**

With one or two bolts, for DIN rail mounting.

**Bolt terminal blocks with hinged cover
RT...**

With captive cover nut.

Accessories

Beyond our extensive portfolio of standard accessories, we offer additional items for railway-specific applications.

**Shield-connection clamps
SCC...**

With spring-clamp technology for tool-free, one-handed operation.
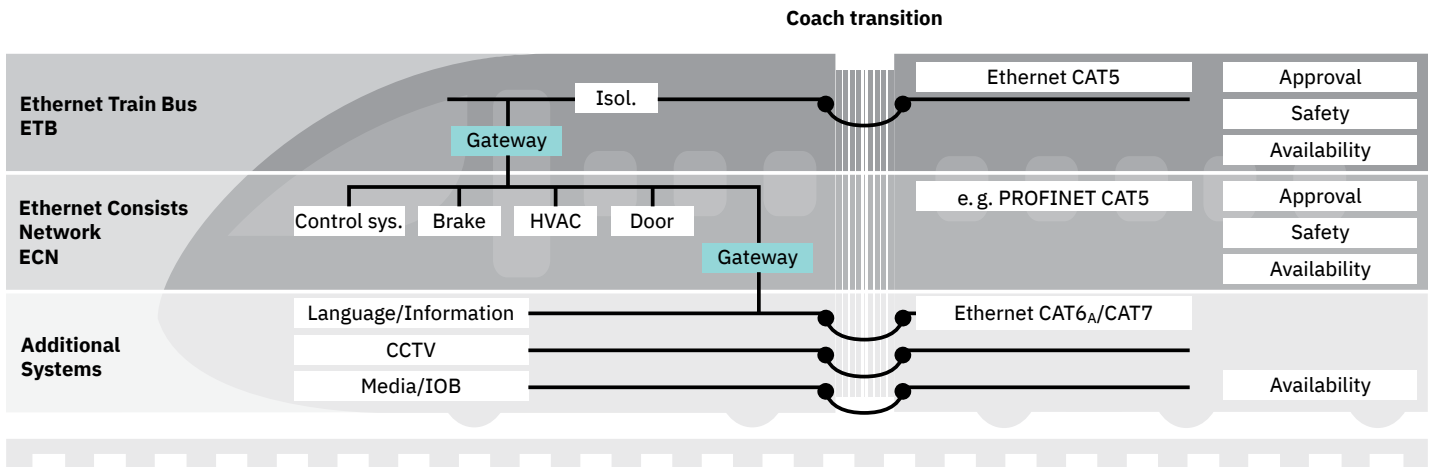
**Component holders
P-CO.../ DIO FIX...**

Plug-in design simplifies maintenance work on the train.

M12 connectors

Molded connectors from the M12 RAIL series provide a reliable cabling system for all control levels in the train. They meet the fire protection requirements of DIN EN 45545-2 and are fully electrically tested. The portfolio also includes connectors designed for assembly for individually adjustable cable lengths. Our push-pull system enables quick, tool-free mounting. All connectors are available in shielded versions, an important criterion in light of high EMC exposure in rail traffic.

Reliable cabling of communication networks in rolling stock

Coach transition

Ethernet Train Bus ETB	Isol. / Gateway / Control sys. / Brake / HVAC / Door	Ethernet CAT5	Approval / Safety / Availability
Ethernet Consists Network ECN	Gateway	e. g. PROFINET CAT5	Approval / Safety / Availability
Additional Systems	Language/Information / CCTV / Media/IOB	Ethernet CAT6$_A$/CAT7	Availability

The TCN (Train Communication Network) train control system is often set up in a hierarchy.
It consists of multiple control levels with different functions and requirements:

Train bus ETB (Ethernet Train Bus)

The train bus ETB (Ethernet Train Bus) is the control level. Relevant for safety and approval, its availability must be constantly ensured. That is why high demands are placed on the cabling and other infrastructure components. Communication takes place via category CAT5 Ethernet.

Vehicle bus ECN (Ethernet Consist Network)

The vehicle bus ECN (Ethernet Consist Network) is subordinate to the train bus. On this level, the communication for controlling the train function and the safety-related monitoring of brakes, doors, and air conditioning are performed. The requirements on this level are equal to those of the train bus. Here, communication is via PROFINET CAT5, for example.
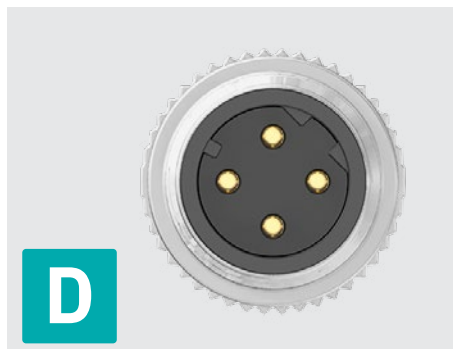
Auxiliary systems

There are also other systems in trains that are not relevant to safety or approval. Availability and demand for higher data rates are key here. Systems increasingly communicate via Cat. 6$_A$ 10 Gigabit Ethernet. This covers tasks such as language and information (on-board radio), monitoring (cameras), and on-board media (Internet).

A

A-coded for signals

ETB train bus

D

D-coded for data

ECN vehicle bus

X

X-coded for large amounts of data

Auxiliary systems

M12 push-pull connectors in detail

The new standard for railway technology

The M12 connectors with a push-pull fast-locking system guarantee easy cabling and space-saving device connection. They provide significant mounting advantages, in particular in tight spaces and with high cabling densities, allowing fast component plugging and unplugging. M12 push-pull connectors are robust and reliable. They enable a secure, durable connection under extreme conditions.
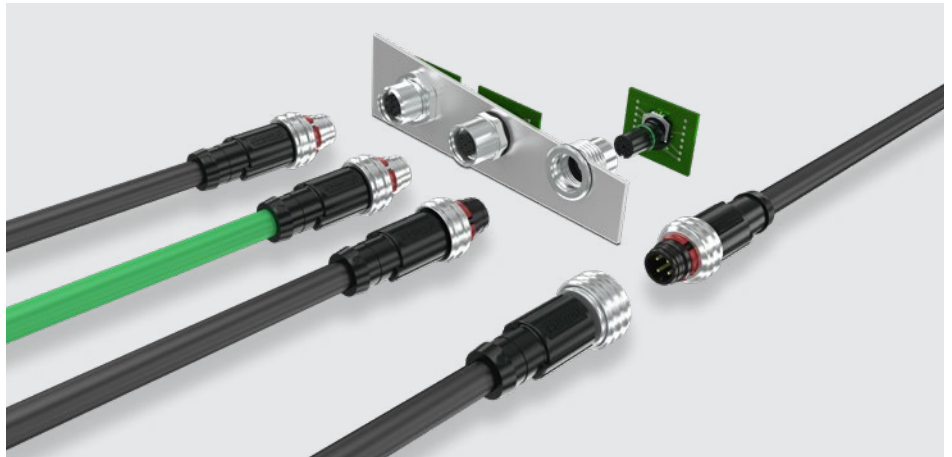
Plug and Produce

With the cross-manufacturer push-pull locking system, you plug in securely and save up to 80% installation time.

Greater flexibility

The M12 duo contour enables flexible field wiring with M12 screw connectors or push-pull connection technology.

More compact designs

With recessed M12 ports, you can achieve more compact device designs and flush integration into the housing.

Flying leads

With connectors that have push-pull internal and external locking, you can realize flying leads.

Individual cabling

With M12 push-pull connectors designed for assembly, you can determine flexible cable lengths and connect them tool-free.
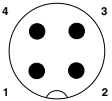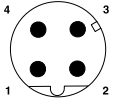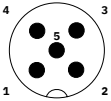

Highly future-proof

The push-pull product range is cross-manufacturer compatible with IEC 61076-2-010 standardization.

Product list M12 push-pull connectors

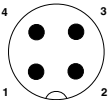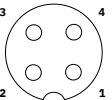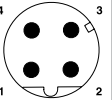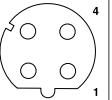*EN 61373, unclassified mass in accordance with EN 45545-2:* 🟩 *<10 g* 🟦 *<100 g*

M12 push-pull device connectors			4-position		5-position
RoHS Lead-free alternative items available		Coding	A	D	A
		Pin assignment	Male	Male	Male
Zinc die-cast housing, with litz wires, for screw fastening					
		Front mounting, M16 x 1.5	1108117	1027688	1027694
		Rear mounting, M16 x 1.5	1108128	1027691	1027697

Housing screw connections, two-piece				
		Pin assignment	Male	Female
Housing for THR and wave soldering contact carriers				
		Front mounting, female, M14 x 1		1249211
		Front mounting, recessed female, M16 x 1, flat gasket		1233777
		Rear mounting, male M15 x 1, female M16 x 1	1027661	1249212
Housing for SMD contact carriers				
		Front mounting, male M14 x 1	1107999	
		Rear mounting, male M15 x 1	1107993	

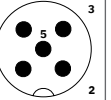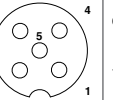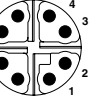*EN 61373, EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3*

M12 push-pull cable connectors			4-position				5-position		8-position
RoHS Lead-free alternative items available		Coding	A		D		A		X
		Pin assignment	Male	Female	Male	Female	Male	Female	
		Even	1438165	1438169	1438182	1438183	1438175	1438180	1489580
		Angled	1438168	1438172	1438184	1438185	1438179	1438181	1489579

M12 cable connectors in detail

On this page and the next double page, you will find our products for the cable side of an M12 connector. This includes both connectors designed for assembly and pre-assembled cables. The M12 RAIL series features sensor/actuator cabling with A-coding, Ethernet and PROFINET cabling in a D-coded design, and X-coded cables for high data rates (10 Gbps). These materials can be used without any problems in a rail vehicle because they satisfy the fire protection requirements of DIN EN 45545-2.

Assembled cables

Choose from assembled sensor/actuator cables, as well as data cables for communication networks and passenger information systems.

Connectors designed for assembly

With our M12 connectors designed for assembly, you can adapt the cabling flexibly to your requirements.

Totally protected shielding

The 360° shield connection with Advanced Shielding Technology ensures approved EMC protection, robustness, and improved performance.
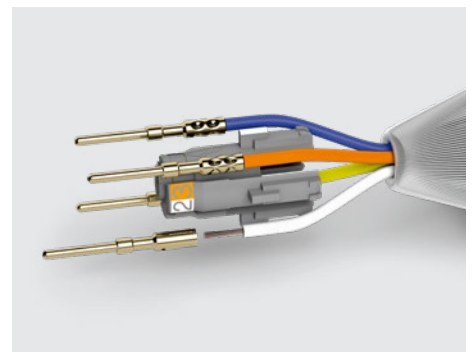
Push-Lock connection

Tool-free wiring of all conductor types with direct insertion. Color-coded lever for reliable assembly.

IDC displacement connection

QUICKON provides a fast connection for M12 connectors. The insulation displacement contact makes a vibration resistant and gas-tight contact.

Crimp connection

Connection can be automated for high production volumes. The extremely compact connector is suitable for railway applications.

Product list M12 cable connectors

SIGNAL

EN 61373 and EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

M12 cable connectors, designed for assembly			4-position		5-position	
	Coding	Design	Male	Female	Male	Female
Push-Lock connection, conductor cross-section: 0.14 mm² … 0.75 mm², shielded						
	A	Even	1424666	1424668	1424658	1424660
		Angled	1424667	1424669	1424659	1424661
Crimp connection, conductor cross-section 0.14 mm² … 0.75 mm², shielded						
	A	Even			1422850	1422852
		Angled			1422851	1422853
IDC connection, conductor cross-section 0.14 mm² … 0.75 mm², shielded						
	A	Even	1413993	1413994	1413991	1413992

DATA

EN 61373 and EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

M12 cable connectors, designed for assembly				4-position		8-position	
	Fieldbuses/ networks	Coding	Design	Male	Female	Male	Female
Push-Lock connection, conductor cross-section: 0.14 mm² … 0.75 mm², shielded							
	PROFINET	D	Even	1424682	1424683		
			Angled	1424684	1424685		
Crimp connection, conductor cross-section 0.14 mm² … 1 mm², shielded							
	PROFINET	D	Even	1150634/ 1422846	1422848		
			Angled	1422847	1422849		
	Ethernet	X	Even			1422844	
			Angled			1422845	
IDC connection, conductor cross-section 0.14 mm² … 0.5 mm², shielded							
	Ethernet	D	Even	1411066	1411069		
	PROFINET	D	Even	1411068	1411071		
	Ethernet	X	Even			1411043	1414586
	PROFINET	X	Even			1411044	1414587

Product list M12 cable connectors

SIGNAL and DATA

EN 61373 and EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

Assembled network cables with M12 cable connectors, railway approved						
Cable length	PROFINET D-coded	Signal, 2-pos. A-coded	Signal, 3-pos. A-coded	Signal, 4-pos. A-coded	Signal, 5-pos. A-coded	Ethernet X-coded
Straight male connector, free cable end						
2 m	1407339		1407296	1407311	1407325	1415599
5 m	1407340			1407312	1407326	1415600
10 m	1407341		1407298	1407313	1407327	1415601
Variable	1412178	1412159		1412169		
Straight female connector, free cable end						
2 m			1407303	1407317	1407331	
5 m			1407304	1407318	1407332	
10 m			1407305	1407319	1407333	
Variable	1412181	1412157		1412167	1412172	
Angled female connector, free cable end						
2 m			1407306	1407320	1407334	
5 m			1407307	1407321	1407335	
10 m				1407322	1407336	
Variable				1412168	1412173	
Angled male connector, free cable end						
2 m				1407314	1407328	
5 m			1407300	1407315	1407329	
10 m				1407316	1407330	
Variable	1412179	1412160			1412175	
Straight male connector, straight male connector						
2 m	1407342				1407337	1415595
5 m	1407343				1407338	1415598
10 m						1431616
Variable	1412177					
Straight male connector, straight female connector						
2 m			1407309	1407323		
5 m				1407324		
10 m						
Variable				1412171	1412176	

Cable types for rolling stock

A A-coded

1		WH 1
2		WH 4
4		WH 3
3		WH 2
5		WH 5

D D-coded

1		WH
3		OG
2		WH
4		GN

X X-coded

M12

1		WH/OG
2		OG
3		WH/GN
4		GN
5		WH/BN
6		BN
7		WH/BU
8		BU
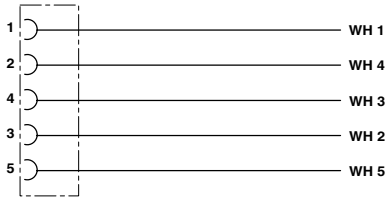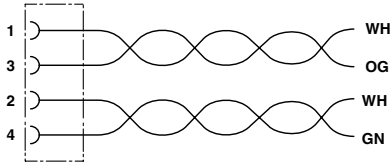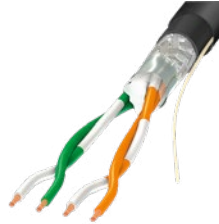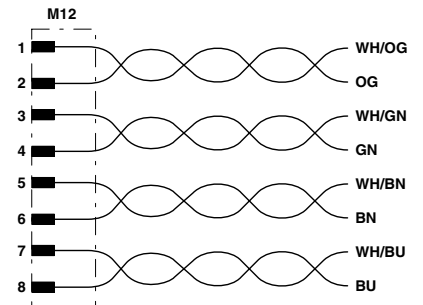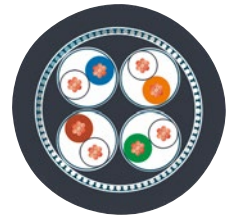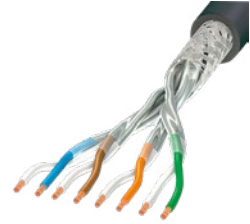
Conformity with typical railway requirements

Phoenix Contact has a wide portfolio of M12 push-pull, cable, and device connectors as well as assembled network cables for rolling stock. An important feature of these products is that they meet the requirements for fire protection (EN 45545-2) and shock and vibration (EN 61373) relevant to railway applications, which are specified with the respective tables.

"EN 61373" stands for the shock and vibration requirements in accordance with category 1 class B. This is the typical requirement for electrical equipment.

The majority of the items meet the fire protection requirements of EN 45545-2 via the requirement sets R22, R23, and R24 up to the highest hazard level HL 3. Alternatively, the mass of the unclassified material is specified. Conformity to the requirements is then achieved via the so-called grouping rules.

For more information on fire protection, please refer to the Railway Guide:

phoenixcontact.com/railway_guide

**EN 61373
EN 45545**

M12 device connectors in detail

On this and the next double page you will find our products for the device side of an M12 connector. This includes device connectors with assembled conductors as well as products for printed circuit board direct mounting.
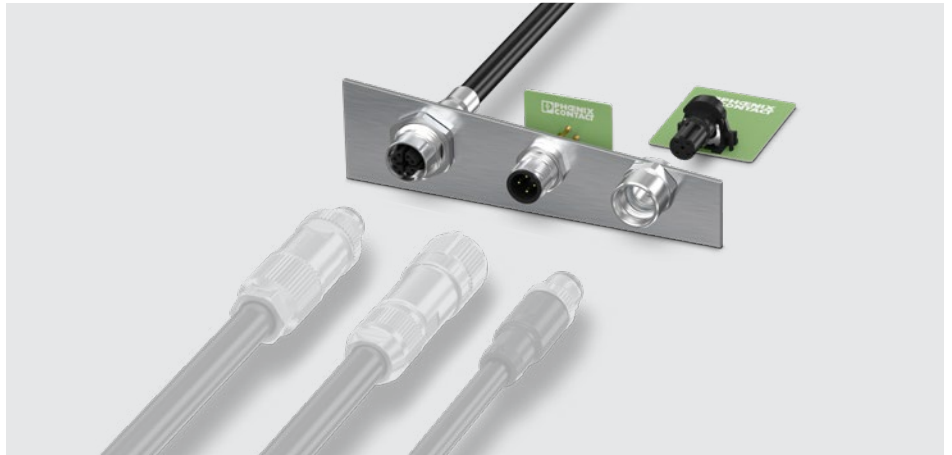
Through-hole reflow soldering

The THR soldering process applies the process steps of SMT manufacturing to a PCB with through-contacted holes.
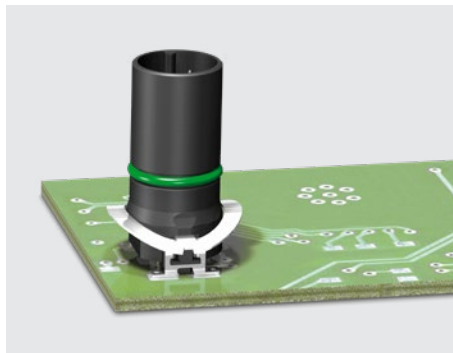
Surface mount technology

SMD is the basis for modern assembly manufacturing and optimizes the assembly manufacturing process.
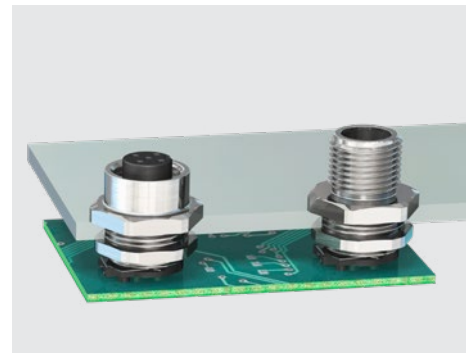
Wide range of device port solutions

Use of housing screw connections with threaded fastening, press-in contour, or for direct integration into the front panel.
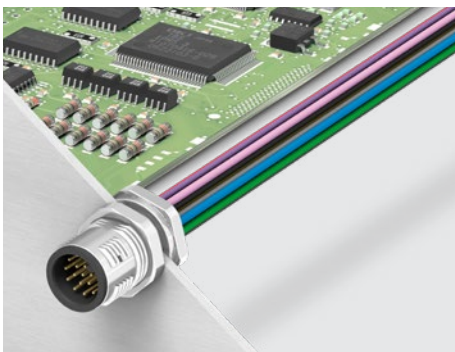
Connectors with litz wire connection

Connectors with preassembled litz wires for immediate use. They are molded on the cable side for optimum seal tightness.
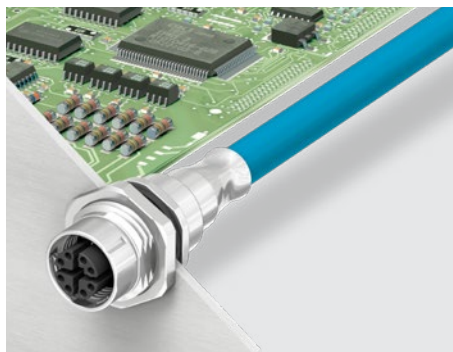
Connectors with cable connection

Cable designs with optimum tightness due to cable-side potting for all common networks and fieldbuses.
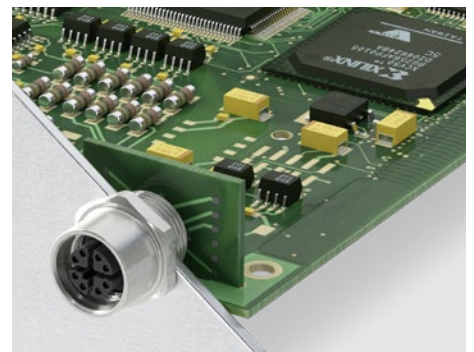
For wave soldering processes

Connectors for use in wave soldering processes feature simple PCB mounting.
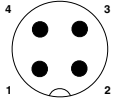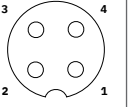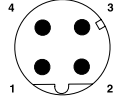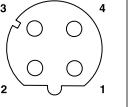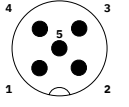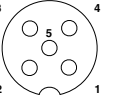
Product list M12 device connectors

SIGNAL and DATA

EN 61373, unclassified mass in accordance with EN 45545-2: ■ <10 g ■ <100 g

M12 device connectors		4-position				5-position	
RoHS Lead-free alternative items available	Coding	A		D		A	
	Pin assignment	Male	Female	Male	Female	Male	Female
Screw fastening, front mounting							
	Zinc die-cast housing with litz wire, M16 x 1.5	1523450	1523434	1551558	1535202	1520055	1520039
	Stainless steel housing with litz wire, M16 x 1.5	1405233	1458855			1458868	1458871
Screw fastening, rear mounting							
	Zinc die-cast housing with litz wire, M16 x 1.5	1419629	1419632	1419603	1419616	1419645	1419658
	Zinc die-cast housing with cable, M16 x 1.5, cable length 1 m, PUR black	1419399	1419302			1419409	1419328
Solder connection for reflow and wave soldering processes, two-piece							
	Straight, shielded, THR, tape-and-reel	1457500	1457623	1457513	1457636	1457539	1457652
	Straight, THR, tape-and-reel	1457490	1457610			1457526	1457649
	Angled, shielded, wave soldering, blister packaging	1439887	1432444	1436673	1432457	1439890	1432431
Solder connection for reflow processes, two-piece, SMD contact carrier							
	Straight, shielded, SMD, tape-and-reel, additional gasket for the device when not plugged in	1412010	1412004	1412011	1412005	1412012	1412006
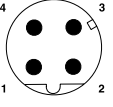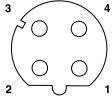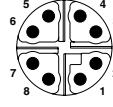
Product list M12 device connectors

DATA

EN 61373, unclassified mass in accordance with EN 45545-2: <10 g   <100 g

M12 device connectors for networks		4-position		8-position
RoHS Lead-free alternative items available	Coding	D		X (Cat. 6$_A$)
	Pin assignment	Male	Female	Female
Front mounting, with assembled cable, Ethernet				
	M16 x 1.5, can be positioned, water blue, cable type 93E, cable length: 2 m		1405837	
Rear mounting, with assembled cable, Ethernet				
	M16 x 1.5, water blue, cable type 93E, cable length: 2 m		1405866	
	M16 x 1.5, water blue, cable type 94F, cable length: 0.5 m			1424135
Rear mounting, with assembled cable, PROFINET				
	Pg9, green, cable type 93B, cable length: 0.5 m	1437805	1437766	
Rear mounting, for wave soldering processes, Ethernet hybrid				
	M16 x 1.5, one-piece, wave soldering			1424177
Contact carrier for wave and reflow soldering processes, Ethernet two-piece				
	Straight, shielded, THR, tape-and-reel			1413446
	Straight, shielded, SMD, tape-and-reel			1081252
	Angled, shielded, wave soldering			1424180

DATA

EN 50155, EN 61373, unclassified mass in accordance with EN 45545-2: <100 g

Network isolator for electrical isolation					
	Connection method	Transmission rate	Interfaces	Type	Item no.
	M12 D-coded, female	10/100 Mbps	Ethernet PROFINET	FL ISOLATOR 100-M12	2902985

Reliable data cabling

The portfolio for control level cabling systems in the rail vehicle can be found here in a list:

phoenixcontact.com/railway-data-cabling

M12 push-pull cable connectors

Access the product list for M12 push-pull cable connectors suitable for use in rail vehicles online:

phoenixcontact.com/railway-field-connector

M12 push-pull device connectors

Gain an overview of the portfolio of M12 connectors for installation in devices here:

phoenixcontact.com/railway-device-connector
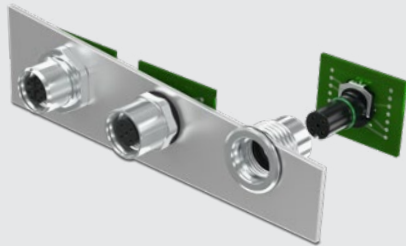
Heavy-duty connectors

The HEAVYCON HPR and ADVANCE housings are especially suitable for outdoor application. Featuring a robust design with IP68/IP69K degree of protection, they protect the built-in fixed-position or modular contact inserts. They satisfy the stringent requirements of the railway industry. At the same time, they provide a permanent and interference-free connection for electrical cables and data transmission, both inside and at the gangway connections.

Conformity with typical railway requirements

All products in this chapter meet the requirements of EN 61373 for shock and vibration in accordance with Category 1 Class B.

For fire protection in rail vehicles in accordance with EN 45545-2, the classification of the products or the combustible mass of non-classified components is relevant. Contact inserts are typically classified in accordance with EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3. In the following product tables, the fire protection relevant mass of seals of the metallic housings and cable glands is highlighted in color. The graphics below explain how to use these components in rail vehicles in compliance with the standards.

The Railway Guide also provides detailed information on EN 45545-2.

> Go directly to the downloadable guide here:
> **phoenixcontact.com/railway_guide**

EN 61373
EN 45545

10-gram rule
Housing seals with a flammable mass of up to 10 g are not included in the fire protection technology assessment if they only touch classified components.
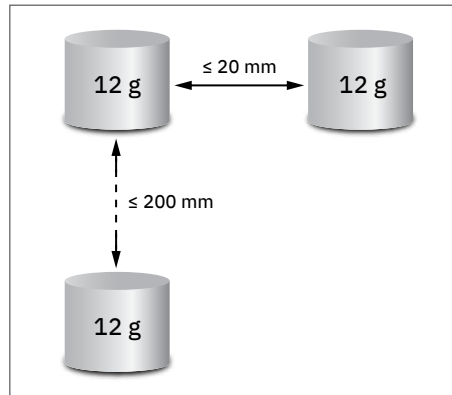
Distance rule
Housing seals (<12 g) are to be grouped if the minimum distances are not met. Until the 100 g limit is reached, eight connectors can be installed directly next to each other.

Fire protection separation
Metallic cable glands are effective separation in terms of fire protection. Therefore, they can be installed without compliance with the distance rule.

Product list to download

We offer information on fire protection classification as an Excel list for downloading:

phoenixcontact.com/railway_article_list

	A	B	C	D	E	F
1			EN 45545-2			EN 50155
2	Item number	Type description	R22	R23	R24	EN 61373 broadband noise
3	1648160	HC-B 6-I-CT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
4	1648157	HC-B 6-I-CT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
5	1648128	HC-B 6-I-UT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
6	1648115	HC-B 6-I-UT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
7	1648225	HC-B 10-I-CT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
8	1648212	HC-B 10-I-CT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
9	1648186	HC-B 10-I-UT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
10	1648173	HC-B 10-I-UT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
11	1648283	HC-B 16-I-CT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
12	1648270	HC-B 16-I-CT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
13	1648241	HC-B 16-I-UT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
14	1648238	HC-B 16-I-UT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
15	1407731	HC-B16-I-PT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
16	1407732	HC-B16-I-PT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
17	1423020	HC-B16-I-TPT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
18	1423019	HC-B16-I-TPT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
19	1648348	HC-B 24-I-CT-F	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B
20	1648335	HC-B 24-I-CT-M	HL 1 - HL 3	HL 1 - HL 3	HL 1 - HL 3	Category 1, Class B

Product lists – heavy-duty connectors

ADVANCE B housings

Unclassified mass in accordance with EN 45545-2: ☐ *0 g* ▢ *<10 g* ▢ *10 - 12 g*

	Installed height	Thread	Metric			
			B06	B10	B16	B24
Sleeve housings with screw locking mechanism						
	Straight Short	M20	1420904	1420912		
		M25	1420905	1420913	1420921	1420929
	Straight Tall	M25	1420900	1420908	1420917	1420925
		M32	1420901	1420909	1420918	1420926
		M40			1420919	1420927
	Lateral Short	M20	1420902	1420910		
		M25	1420903	1420911	1420920	1420928
	Lateral Tall	M25	1420898	1420906	1420914	1420922
		M32	1420899	1420907	1420915	1420923
		M40			1420916	1420924
Panel mounting flanges						
	Individual		1686533	1686533	1686533	1686533
	Set of 2		1604638	1604638	1604638	1604638

HPR B housings

Unclassified mass in accordance with EN 45545-2: ☐ *0 g* ▢ *<10 g*

	Installed height	Thread	Metric			
			B06	B10	B16	B24
Sleeve housings with screw locking mechanism						
	Straight Tall	M20	1411879			
		M25	1411106	1411882		
		M32		1411067	1411059	1411888
		M40			1411885	1411062
	Lateral Tall	M20	1411878			
		M25	1411119	1411881		
		M32		1411070	1411058	1411887
		M40			1411884	1411061
Panel-mount bases for screw locking mechanism						
	Without cover		1411122	1411083	1411060	1411055
Surface-mount housings for screw locking mechanism						
	Without cover	M20	1411880			
		M25	1411135	1411883		
		M32		1411096	1411054	1411889
		M40			1411886	1411063
Covers with screw locking mechanism						
	For panel-mount side		1418441	1418444	1418445	1418446

Contact inserts with a fixed number of positions for B housings

EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

	Connection	Version		Housing size						
				B06		B10		B16		B24
B series				**Number of positions**						
				6		**10**		**16**		**24**
	Push-in	Female	Male	1407727	1407728	1407729	1407730	1407731	1407732	1407735 1407736
	TWIN push-in	Female	Male	1423016	1423015	1423018	1423017	1423020	1423019	1423022 1423021
	Screw	Female	Male	1648128	1648115	1648186	1648173	1648241	1648238	1648306 1648296
	Crimp CK 2,5	Female	Male	1648160	1648157	1648225	1648212	1648283	1648270	1648348 1648335
BB series				**Number of positions**						
				10		**18**		**32**		**46**
	Push-in	Female	Male	1014417	1014418	1014419	1014420	1014421	1014422	1014423 1014424
	Crimp CK 2,5	Female	Male	1584703	1584774	1584729	1584716	1584745	1584732	1584758 1584761
Series BBB[1]				**Number of positions**						
								40		**64**
	Crimp CK 2,5	Female	Male					1409930	1409921	1409914 1409901
DD series				**Number of positions**						
				24		**42**		**72**		**108**
	Crimp CK 2,5	Female	Male	1584046	1584033	1584062	1584059	1584091	1584075	1584130 1584114
HS series				**Number of positions**						
								6		
	Push-in	Female	Male					1031080	1031082	
	Screw	Female	Male					1406530	1406531	
HV series				**Number of positions**						
						3		**6**		**10**
	Push-in	Female	Male			1407743	1407739	1407744	1407740	1407745 1407741
	Screw	Female	Male			1405261	1405260	1405263	1405262	1405265 1405264

[1] R22 HL1-HL2

Cable glands
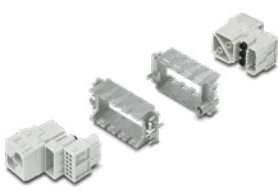
Unclassified mass in accordance with EN 45545-2:   <10 g   10 - 12 g

M12-M40 cable glands							
Thread	M20	M25	M25	M32	M32	M40	M40
Cable diameter (mm) min./max.	6/12	10/14	11/17	13/18	15/21	18/25	19/28
Item no.	1411163	1424527	1411165	1424528	1411166	1424529	1411167

Product lists – heavy-duty connectors

Snap-in frames for B housings for modular contact inserts

Metal, 0 g unclassified mass

	Description	Housing size			
		B06	**B10**	**B16**	**B24**
Module carrier frames with side latch springs		**Module slots**			
		2	**3**	**4**	**6**
	For sleeve housings (A, B, C, etc.)	1182087	1182089	1182093	1182095
	For panel mounting bases, surface mounting housings, and coupling housings (a, b, c, etc.)	1182085	1182088	1182090	1182094

Modular contact inserts for snap-in frames

EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

POWER		Number of positions								
		1		**1**		**2**		**2**		**2**
Connection		Axial screw		Axial screw		Axial screw		Axial screw		Axial screw
IEC rated data		200 A, 1,000 V, 70 mm²		PE, 70 mm²		100 A, 1,000 V, 35 mm²		70 A, 1,000 V, 25 mm²		40 A, 1,000 V, 10 mm²
Module slots		2		2		2		1		1
Female	Male	1417379	1417381	1417380	1417382	1417390	1417392	1417296	1417297	1417387	1417389
		2		**2**		**3**		**3**		**3/4**
Connection		Push-in		Crimp CK 4,0		Push-in		Crimp CK 4,0		Crimp CK 4,0
IEC rated data		40 A, 830 V, 6 mm²		40 A, 1,000 V, 10 mm²		40 A, 500 V, 6 mm²		40 A, 500 V, 10 mm²		40/10 A, 830 V, 6/2.5 mm²
Module slots		1		1		1		1		1
Female	Male	1424222	1424223	1414361	1414360	1424218	1424219	1414359	1414358	1414365	1414364
		4		**4**		**5**		**5x2**		**6**
Connection		Push-in		Crimp CK 4,0		Push-in		TWIN push-in		Push-in
IEC rated data		35 A, 690 V, 6 mm²		40 A, 690 V, 6 mm²		16 A, 400 V, 2.5 mm²		16 A, 400 V, 1.5 mm²		16 A, 500 V, 2.5 mm²
Module slots		1		1		1		1		1
Female	Male	1424220	1424221	1414362	1414363	1417373	1417372	1423962	1423961	1424224	1424225
		6		**6**		**8**		**8**		**20**
Connection		Crimp CK 2,5		Crimp CK 2,5		Push-in		Crimp CK 2,5		Crimp CK 2,5
IEC rated data		16 A, 830 V, 4 mm²		16 A, 500 V, 4 mm²		16 A, 400 V, 2.5 mm²		16 A, 500 V, 4 mm²		16 A, 500 V, 4 mm²
Module slots		1		1		1		1		2
Female	Male	1414369	1414368	1414367	1414366	1424226	1424227	1414371	1414370	1414373	1414372

Modular contact inserts for snap-in frames

SIGNAL		Number of positions					
		12		**12**		**17**	**25**
Connection		Push-in		Crimp CK 1,6		Crimp CK 1,6	D-SUB crimp
IEC rated data		10 A, 250 V, 1.5 mm²		10 A, 250 V, 2.5 mm²		10 A, 160 V, 2.5 mm²	4 A, 50 V, 0.5 mm²
Module slots		1		1		1	1
Female	Male	1424228	1424246	1414355	1414354	1414357 / 1414356	1414375 / 1414374

DATA		Number of positions				
		8		**4**		**4**
Connection		D-SUB crimp		Coaxial crimp		Coaxial crimp contacts
Data transmission rate		Cat. 6$_A$, 10 Gbps				≤2 GHz
IEC rated data		5 A, 50 V, 0.5 mm²				75 Ω / 50 Ω
Module slots		1		1		1686245 / 1676815
Female	Male	1417303	1417302	1417370	1417371	1686258 / 1676802

Connection		RJ45 gender changer		RJ45, crimp		RJ45 patch cables
Data transmission rate		10 Gbps, 500 MHz		10 Gbps, 500 MHz		
Description		Cat. 6$_A$		Cat. 6$_A$		For RJ45 patch cable
Module slots		1		1		1
Female		1419886		1419887		1419885 / 1435214

Pneumatics	Number of positions	
	2	**3**
Hose inner Ø	6 mm	1.6 mm
Module slots	1	1
Female	1417434	1417433

Modular contact inserts
POWER

Modular contact inserts
SIGNAL

Modular contact inserts
DATA

Product lists – heavy-duty connectors

HPR D7 housing

Unclassified mass in accordance with EN 45545-2: □ *0 g*   ▢ *<10 g*

Version	HPR (IP68/IP69K)	
	M20	**M25**
Sleeve housings		
Straight	1424638	1424639
Panel-mount bases, straight		
Without cover	1424637	
Panel-mount bases, angled		
	1424635	
Surface-mount housing		
With closed bottom	1424641	
Cover		
For pin inserts	1424636	
For socket inserts	1424636	

Contact inserts for D7 housings

EN 45545-2 for R22, R23, and R24: HL1-HL2-HL3

	Connection	Version				
A series			**Number of positions**			
			3		**4**	
	Push-in	Female	Male	1585265	1585252	1585281	1585278
	Screw	Female	Male	1585223	1585210	1585249	1585236
D series			**Number of positions**			
			7		**8**	
	Crimp CK 1,6	Female	Male			1584363	1584350
Q series			**Number of positions**			
			2		**3**	
	Crimp CK 4	Female	Male	1419895	1419893	1419897	1419896
			5			
	Crimp CK 2,5	Female	Male	1406537	1406538		
			7		**12**	
	Crimp CK 1,6	Female	Male	1418623	1418624	1418625	1418626
			RJ45			
	RJ45 gender changer Cat. 6$_A$	Female	1422590			
	RJ45 pin insert Cat. 6$_A$	Male	1077117			
	RJ45 adapter for patch cables	Male	1077120			
	RJ45 adapter for RJ industrial inserts	Male	1077119			

Crimp contacts, turned

	For cross-section (mm²)	AWG	Silver		Male, lagging	Gold	
			Female	Male		Female	Male
CK1,6-ED, turned							
	0.14 … 0.37	26 … 22	1663394	1663336		1674969	1674901
	0.50	20	1663404	1663349		1674480	1672453
	0.75	18	1663417	1663352		1672440	1674914
	1.00	18	1663420	1663365		1674943	1674888
	1.50	16	1663433	1663378		1674930	1674875
	2.50	14	1663446	1663381		1674985	1674927
CK2,5-ED, turned							
	0.14 … 0.37	22 … 26				1585647	1585663
	0.50	20	1663640	1663572		1674859	1674804
	0.75	18	1663653	1663585			
	0.75 … 1.0	18	1663666	1663598	1663857	1674833	1674781
	1.50	16	1663679	1663608	1663860	1674820	1674778
	2.50	14	1663682	1663611	1663873	1674862	1674817
	3.00	12	1663695	1663624			
	4.00	12	1663705	1663637		1674846	1674794
CK4,0-ED, turned							
	1.50	16	1663271	1663239			
	2.50	14	1663284	1663242			
	4.00	12	1663297	1663255			
	6.00	10	1663307	1663268			
	10.00	8	1586183	1586198			
D-SUB							
	0.08 … 0.2	28 … 24				1418787	1418784
	0.2 … 0.5	24 … 20				1418788	1418786

Crimp contacts, punched

	For cross-section (mm²)	AWG	Silver	
			Female	Male
CK1,6-ER, punched, single				
	0.34 … 1.0	22 … 18	1004362	1004360
	1.5 … 2.5	16 … 14	1004366	1004365
CK1,6-BR, punched, taped product				
	0.34 … 1.0	22 … 18	1004381	1004380
	1.5 … 2.5	16 … 14	1004383	1004382

FO splice boxes

FO splice boxes are transfer and distribution points between field levels (fiber-optic cables) and the active components of the communication infrastructure (switches, routers, and converters). Our splice boxes provide plenty of space for the secure connection of fiber-optic cables and, at the same time, have compact outer dimensions. They can be used at temperatures from -25°C to +70°C, and selected versions can even be used between -40°C and +85°C. Because they feature different fiber and connector types and up to 12 duplex front connections, our splice boxes are flexible and future-proof.
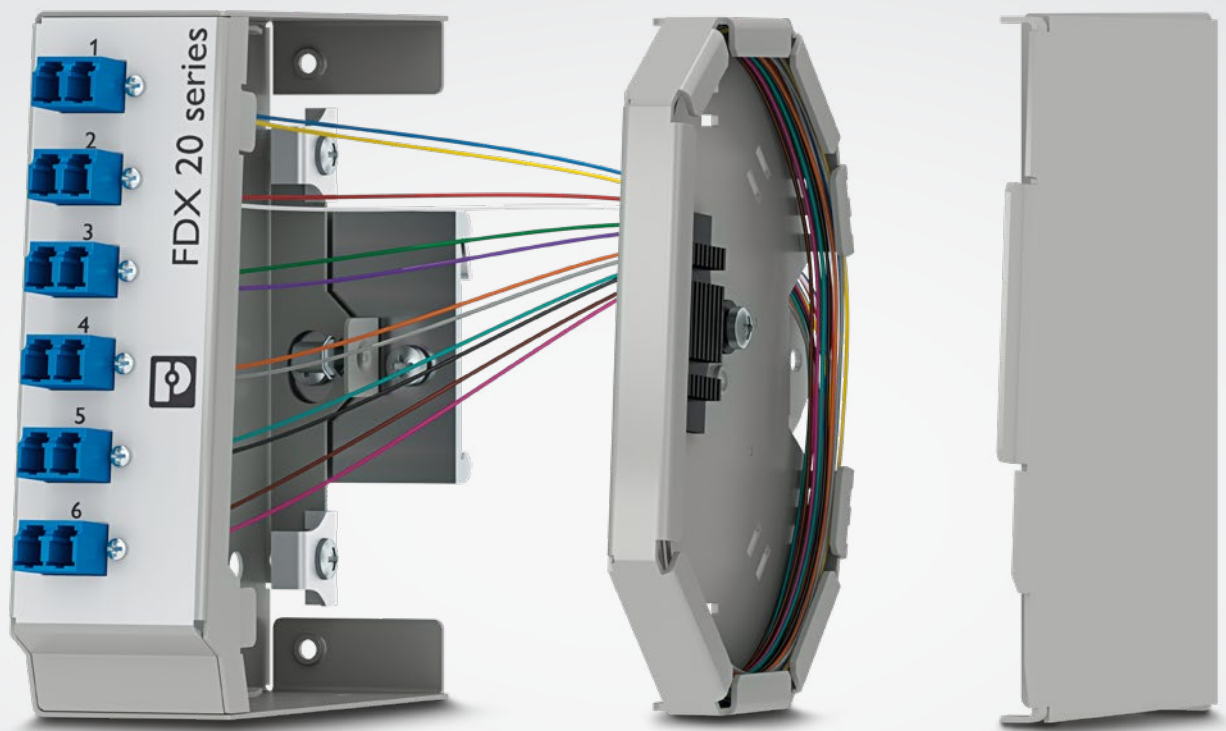
FO connection technology in the field

Fiber optic cables are usually laid underground over many kilometers. In order to effectively protect the sensitive fiber optics from climatic influences, they must be very mechanically resistant.

The fiber optic splice/distributor box for DIN rail mounting has a metal housing and solid cable glands. This provides the necessary mechanical strength to accommodate the fiber-optic cable, fixate cable elements, and guide them securely. The DIN rail adapter can be mounted from the rear on the base of the housing. This allows different orientations of the box.

In the splice box variant, fusion splicing technology is used to connect the FO fibers of the incoming cable precisely to the fibers of the splice box. These fibers inside the housing are already assembled with the FO connectors (pigtails) and plugged onto the FO couplings.

The distributor box variant is equipped without pigtails. It is used to accommodate fiber-optic cables that are already assembled with connectors or are assembled with connectors in the field. These connectors are then simply plugged onto the fiber-optic couplings inside the box.

Fixation for strain relief elements of the FO cable

Splice tray
with splice holder

EN 45545

FO cable and cable gland

FO fibers
of the preassembled wire pigtails

Strain relief
for tubes from fiber-optic loose tube cable
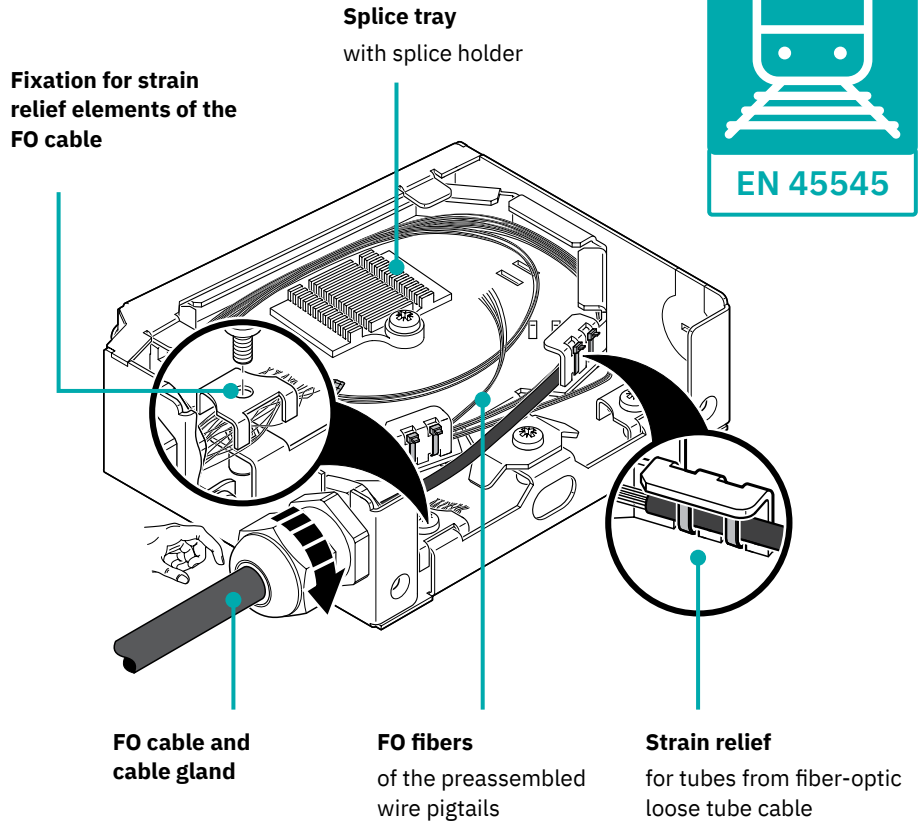
Connector type LC

Lucent connector
Small form factor (SFF) connector.
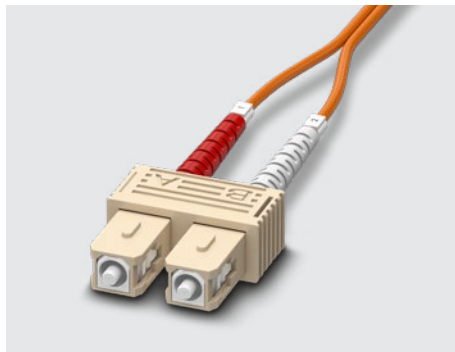
Connector type SC

Subscriber connector
Connector with push-pull technology.

Connector type LSH (E-2000™)

Connector with laser protection flap.

Product lists – splice boxes

FO splice boxes, FDX-20 series, IP20

	DIN rail mounting					
	6x LC duplex	12x LC duplex	6x SC duplex	6x ST duplex 6x SC duplex	6x ST duplex 6x ST duplex	6x LSH duplex
Without pigtails, multimode, polymer couplings	1019710	1019705	1019686			
Without pigtails, multimode, metal couplings	1343385		1343387	1343388	1343383	
Without pigtails, singlemode, polymer couplings	1343386		1084827			
Without pigtails, singlemode, metal couplings					1343384	
OM1 (G62.5/125 µm)	1343377		1343380	1019684		
OM2 (G50/125 µm)	1019713	1019709	1019700	1019683		
OM3 (G50/125 µm)	1343378		1343381			
OM4 (G50/125 µm)	1019712	1019708	1019698			
OS2 PC (E9/125 µm)	1019711	1019707	1019692	1019682		
OS2 APC (E9/125 µm)	1083665		1343382			1019680
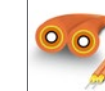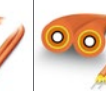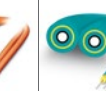
FO splice boxes, FDX-20 series, 19-inch mounting

	12x LC duplex	24x LC duplex	12x SC duplex	24x SC duplex	12x ST duplex	24x ST duplex
OM1 (G62.5/125 µm)					1145399	1145389
OM2 (G50/125 µm)	1145416	1145375	1145408	1145407	1145398	1145397
OM4 (G50/125 µm)	1145415	1145413	1145406	1145403		
OS2 (PC) (E9/125 µm)	1145411	1145409	1143631	1145400	1145395	1145392

FO connectors and patch cables, cables by the meter

FO connectors – GOF

	LC duplex			SC duplex		
Type	LC duplex			SC duplex		
Description	MM	SM PC	SM APC	MM	SM PC	SM APC
Item no.	1089521	1089520	1089519	1089518	1089517	1089516
Tool set	1089515					

FO patch cables (length: 1.0 m)

Description	OM1			OM2			OM3	
Type	LC	SC	ST	LC	SC	ST	LC	SC
LC	1146497	1146498	1146499	1115633	1115607	1115588	1185473	1185480
SC	1146498	1146504		1115607	1115536	1115574	1185480	1185485
ST	1146499		1146501	1115588	1115574	1115560		

Description	OM4		OS2 UPC			OS2 APC		
Type	LC	SC	LC	SC	ST	LC	SC	
LC	1115625	1115601	1115636	1115618	1115596	1115630	1115613	
SC	1115601	1115424	1115618	1115550	1115582	1115613	1115544	
ST			1115596	1115582	1115565			

FO cables by the meter

Type	Loose tube									
Fiber category	OM1	OM2	OM3	OM4	OS2	OM1	OM2	OM3	OM4	OS2
Number of fibers	12					24				
Item no.	1286223	1286222	1286221	1286220	1286219	1286217	1286215	1286214	1286211	1286210

Type	Full breakout			Mini breakout		Zip cord			
Fiber category	OM2			OM4		OM1	OM2	OM3	OM4
Number of fibers	2	2	4	12	24	2			
Item no.	1406429	1406430	1406431	1286209	1286208	1411566	1411561	1411563	1411564

Marking systems and marking material

Marking solutions for railway technology must be reliable and stable.
Fire protection also plays a crucial role. The MARKING system from Phoenix Contact provides the ideal marking solution for all railway industry applications. Select from among more than 2,000 halogen-free marking solutions optimized for fire protection, more than 10 different marking systems, and three marking technologies.

Product lists – marking material

Equipment and plant marking

DIN EN 45545-2 (R22)	DIN EN 45545-2 (R23)	DIN EN 45545-2 (R24)	UL 94	DIN EN 60529:2000-09	Halogen-free[1]	Lower application range [°C]	Upper application range [°C]	Material	Marking systems				Type	
									TOPMARK NEO	BLUEMARK ID / ID COLOR	THERMOMARK CARD 2.0	THERMOMARK PRIME 2.0		
HL1-HL3	HL1-HL3	HL1-HL3	V0		X	-40	120	PC	X	X	X	X	UCT-EM…	
HL1-HL2	HL1-HL2	HL1-HL2	V2			-35	120	PA		X			UC-EMLP…	
HL1-HL2	HL1-HL2	HL1-HL2	V2		X	-40	120	PA		X			UC-PMP…	
HL1-HL3	HL1-HL3	HL1-HL3	V0			-35	105	PA					CARRIER/L-PMP…	
HL1-HL3	HL1-HL3	HL1-HL3	V0			-40	105	PA					CARRIER-PMP…	
Metal				IPX9K[5]		-25	125	AL	X				LS-EMSP-AL…	
Metal				IPX9K[5]		-25	125	AL	X				LS-EMLP-AL…	
Metal				IPX9K[5]		-80	350[3]	V4A	X				LS-EMSP-V4A…	
Metal				IPX9K[5]		-40	250[4]	V4A	X				LS-EMLP-V4A…	
Metal				IPX9K[5]		-25	120[2]	AL		X			EMSP-AL…	
Metal				IPX9K[5]		-25	120[2]	AL		X			EMLP-AL…	
Metal				IPX9K[5]		-25	120[2]	AL		X			EMP-AL…	

[1] For the definition of halogen-free, see Attachment 1.
[2] Silver color version: Slight changes in the material surface are possible at temperatures over 80°C.
   The other color variants (BK, BU, RD, OR, BU, GN) have a reduced temperature application range of -25°C to +70°C.
[3] Color changes are possible at temperatures above 350°C.
[4] Color changes are possible at temperatures above 250°C.
[5] Based on the marking.
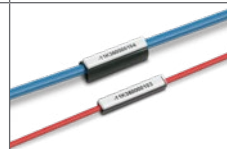
Product lists – marking material

Wire and cable marking

DIN EN 45545-2 (R22)	DIN EN 45545-2 (R23)	DIN EN 45545-2 (R24)	UL 94	CSA C22.2 No. 198.1	DIN EN 60529:2000-09	Halogen-free[1]	Lower application range [°C]	Upper application range [°C]	Material	Marking systems								Type
										TOPMARK NEO	BLUEMARK ID / ID COLOR	THERMOMARK CARD 2.0	THERMOMARK PRIME 2.0	THERMOMARK GO / GO.K	THERMOMARK E.300/600 (D)	THERMOMARK ROLL 2.0	THERMOMARK E.300 DOUBLE	
HL1-HL3	HL1-HL3	HL1-HL3	V0			X	-30	125	PO						X	X	X	WMS-OT HF…
HL1-HL2	HL1-HL3	HL1-HL3				X	-30	85	TPU									PATG HF…
HL1-HL3	HL1-HL3	HL1-HL3	V2				-40	120	PC	X	X	X	X					UCT-WMT…
HL1-HL3	HL1-HL3	HL1-HL3	V2			X	-40	125	PC (transparent)									KMK HP…
HL1-HL3	HL1-HL3	HL1-HL3	V0			X	-40	120	PC	X	X	X	X					UCT-EMP…
HL1-HL3	HL1-HL3	HL1-HL3	V0			X	-40	120	PC	X	X	X	X					UCT-WMTBA…
HL1-HL3	HL1-HL3	HL1-HL3	V0			X	-40	120	PC	X	X	X	X					UCT-WMCO…
HL1-HL3	HL1-HL3	HL1-HL3				X	-55	100	PO					X				MM-WMS-2… Shrink ratio: 2:1
HL1-HL3	HL1-HL3	HL1-HL3				X	-30	105	PO						X	X	X	WMS-2 HF… Shrink ratio: 2:1

Wire and cable marking

DIN EN 45545-2 (R22)	DIN EN 45545-2 (R23)	DIN EN 45545-2 (R24)	UL 94	CSA C22.2 No. 198.1	DIN EN 60529:2000-09	Halogen-free[1]	Lower application range [°C]	Upper application range [°C]	Material	Marking systems								Type
										TOPMARK NEO	BLUEMARK ID / ID COLOR	THERMOMARK CARD 2.0	THERMOMARK PRIME 2.0	THERMOMARK GO / GO.K	THERMOMARK E.300/600 (D)	THERMOMARK ROLL 2.0	THERMOMARK E.300 DOUBLE	
HL1-HL2	HL1-HL2	HL1-HL2	V2			X	-40	120	PA		X							UC-WMTB...
HL1-HL2	HL1-HL2	HL1-HL2	V2			X	-40	120	PA		X							UC-WMC...
			V2			X	-25	100	PUR						X	X	X	WMTB HF...
						X	-40	100	PE						X	X	X	WML HF...
Metal					IPX9K[4]		-25	125	AL	X								LS-WMTB-AL...
Metal					IPX9K[4]		-80	350[3]	V4A	X								LS-WMTB-V4A...
Metal					IPX9K[4]		-25	120[2]	AL		X							WMTB-AL...

[1] For the definition of halogen-free, see Attachment 2.
[2] Silver color version: Slight changes in the material surface are possible at temperatures over 80°C.
   The other color variants (BK, BU, RD, OR, BU, GN) have a reduced temperature application range of -25°C to +70°C.
[3] Color changes are possible at temperatures above 350°C.
[4] Based on the marking.

Product lists – marking material

DIN EN 45545-2 (R22)	DIN EN 45545-2 (R23)	DIN EN 45545-2 (R24)	UL 94	Halogen-free[1]	Lower application range [°C]	Upper application range [°C]	Material	Marking systems				Type	
								TOPMARK NEO	BLUEMARK ID / ID COLOR	THERMOMARK CARD 2.0	THERMOMARK PRIME 2.0		
HL1-HL3	HL1-HL3	HL1-HL3	V0	X	-40	120	PC	X	X	X	X	UCT-TMF... UCT-TM ...	
HL1-HL2	HL1-HL2	HL1-HL2	V2	X	-40	120	PA		X			UC-TM... UC-TMF...	

[1] For the definition of halogen-free, see Attachment 2.

Marking systems
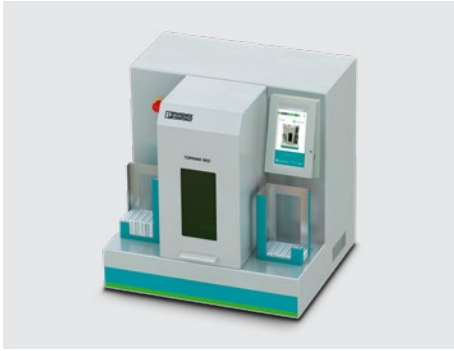
TOPMARK NEO

TOPMARK NEO creates markings via laser direct marking to meet the strictest requirements in the shortest amount of time.

BLUEMARK ID (COLOR)

BLUEMARK ID uses inkjet technology to print markings quickly, simply, and with razor-sharp definition.

THERMOMARK E.300 / E.600 (D)

The basic printer of the THERMOMARK E SERIES processes all materials off the roll – including large quantities of materials for permanent industrial use.

THERMOMARK E SERIES

Combine the THERMOMARK E.300(D)/ E.600(D) printer with one of four applicators for automated conductor and cable or terminal identification.

THERMOMARK ROLL 2.0

The thermal transfer printer prints labels and shrink sleeves in roll and continuous formats for all applications.

THERMOMARK CARD 2.0

The thermal transfer printer is the efficient solution for printing plastic labels in card and sheet format.

THERMOMARK PRIME 2.0

The mobile thermal transfer printer with integrated operating software and powerful battery creates markings directly on site.

THERMOMARK GO

The mobile label printer is controlled using a smart device and can create markings with flexibility in an industrial environment.

THEROMARK GO.K

The THERMOMARK GO.K handheld printer is ideal for fast identification on site.

Power supply solutions

For railway technology we provide a comprehensive portfolio consisting of power supplies, DC/DC converters, redundancy modules, UPSs, and energy storage devices. With high MTBF values, a robust design, and preventive function monitoring via signal contacts, all the devices provide a high degree of availability. Important standards and requirements for rail vehicles, such as EN 50155, EN 61373, and EN 45545-2, as well as PCBs with a protective coat, are met depending on the device type.
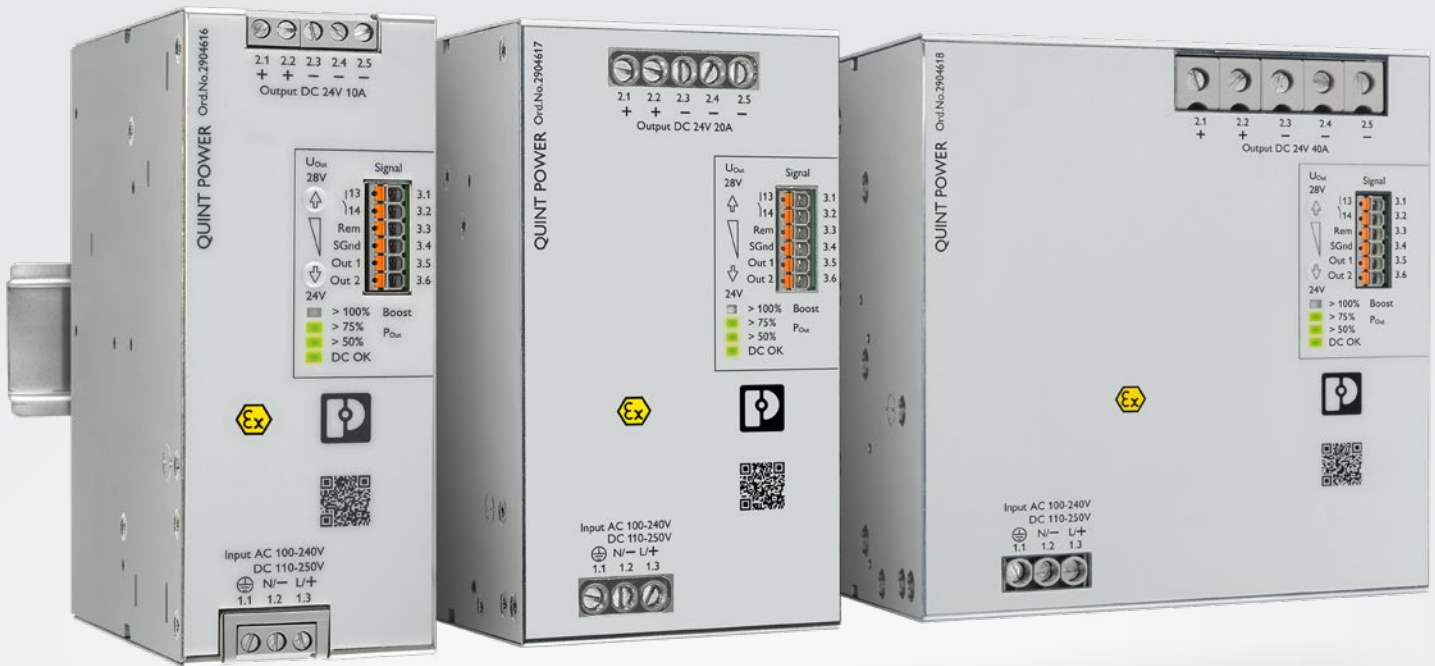
Product lists – power supply solutions

AC/DC power supplies for preferred use in rail vehicles

Input voltage	Output voltage	Output current	EN 61373	EN 50121-3-2	EN 50155	EN 45545	Conformal coating	-40°C start	Type	Item no.
1 AC	24 V DC	10 A	X	X	X	X	X	X	QUINT4-PS/1AC/24DC/10/+	2904616
1 AC	24 V DC	20 A	X	X	X	X	X	X	QUINT4-PS/1AC/24DC/20/+	2904617
1 AC	24 V DC	40 A	X	X	X	X	X	X	QUINT4-PS/1AC/24DC/40/+	2904618
1 AC	24 V DC	10 A	X	X	X	X	X	1	QUINT4-PS/1AC/24DC/10/CO	2904625
1 AC	24 V DC	2.5 A	X			X			STEP3-PS/1AC/24DC/2.5/PT	1088491
1 AC	24 V DC	3.8 A	X	X				1	QUINT4-PS/1AC/24DC/3.8/PT	2909577
1 AC	24 V DC	5 A	X			X			TRIO-PS-2G/1AC/24DC/5	2903148
1 AC	24 V DC	5 A	X	X	X	X	X	1	QUINT-PS/1AC/24DC/5/CO	2320908
1 AC	24 V DC	10 A	X			X			TRIO-PS-2G/1AC/24DC/10	2903149
1 AC	24 V DC	10 A	X	X	X		X	1	QUINT-PS/1AC/24DC/10/CO	2320911
1 AC	24 V DC	20 A	X	X	X		X	1	QUINT-PS/1AC/24DC/20/CO	2320898
3 AC	24 V DC	20 A	X	X	X		X	1	QUINT-PS/3AC/24DC/20/CO	2320924
Redundancy module 24 V DC		20 A	X	X	X		X	1	QUINT4-S-ORING/12-24DC/1x40/+	2907753

Legend: 1 = -40°C start, type-tested

DC/DC converter for preferred use on railway vehicles

Input voltage	Output voltage	Output current	EN 45545-2	EN 50155	EN 61373	EN 50121-3-2	Protective coating	-40°C start, type-tested	Type	Item no.
12 … 24 V DC	24 V DC	1.3 A	X			X		X	QUINT4-PS/12-24DC/24DC/1.3/PT	1066716
24 V DC	24 V DC	5 A	X		X	X	X	X	QUINT4-PS/24DC/24DC/5/PT/CO	2910132
24 V DC	24 V DC	10 A			X	X	X	X	QUINT4-PS/24DC/24DC/10/PT/CO	2910133
24 V DC	24 V DC	20 A			X	X	X	X	QUINT4-PS/24DC/24DC/20/SC/+	1046881
24 V DC	24 V DC	5 A			X	X		X	QUINT-PS/24DC/48DC/5	2320128
48 … 110 V DC	24 V DC	2.5 A			X	X		X	QUINT4-PS/48-110DC/24DC/2.5/PT	1066708
60 … 72 V DC	24 V DC	10 A	X	X	X	X	X	X	QUINT-PS/60-72DC/24DC/10/CO	2905011
96 … 110 V DC	24 V DC	10 A	X	X	X	X	X	X	QUINT-PS/96-110DC/24DC/10/CO	2905012

Product lists – power supply solutions

AC/DC power supplies with unique properties for railway infrastructure

Input voltage	Output voltage	Output current	EN 50121-3-2	EN 50121-4	EN 50121-5	16.7 Hz	-40°C, start type-tested	See key	Type	Item no.
1 AC	5 V DC	5 A	X	1	X	X	X	2, 3	QUINT4-PS/1AC/5DC/5/PT	2904595
1 AC	12 V DC	2.5 A	X	X	X	X	X	2, 3	QUINT4-PS/1AC/12DC/2.5/PT	2904605
1 AC	12 V DC	7.5 A	X	X	X	X	X	2, 3	QUINT4-PS/1AC/12DC/7.5/PT	2904607
1 AC	12 V DC	15 A	X	1	1	X	X		QUINT4-PS/1AC/12DC/15	2904608
1 AC	24 V DC	1.3 A	X	1	X	X	X	2, 3	QUINT4-PS/1AC/24DC/1.3/PT	2909575
1 AC	24 V DC	2.5 A	X	1	X	X	X	2, 3	QUINT4-PS/1AC/24DC/2.5/PT	2909576
1 AC	24 V DC	2.5 A	X	X	X	X	X	2, 3	QUINT4-SYS-PS/1AC/24DC/2.5/SC	2904614
1 AC	24 V DC	3.8 A	X	1	X	X	X	2, 3	QUINT4-PS/1AC/24DC/3.8/PT	2909577
1 AC	24 V DC	5 A	X	1	1	X	X		QUINT4-PS/1AC/24DC/5	2904600
1 AC	24 V DC	10 A	X	1	1	X	X		QUINT4-PS/1AC/24DC/10	2904601
1 AC	24 V DC	10 A	X	X	1	X	X	4	QUINT4-PS/1AC/24DC/10/CO	2904625
1 AC	24 V DC	20 A	X	1	1	X	X		QUINT4-PS/1AC/24DC/20	2904602
1 AC	24 V DC	20 A	X	X	1	X	X	1, 4	QUINT4-PS/1AC/24DC/20/+	2904617
1 AC	24 V DC	40 A	X	1	1	X	X		QUINT4-PS/1AC/24DC/40	2904603
1 AC	48 V DC	5 A	X	1	1	X	X		QUINT4-PS/1AC/48DC/5	2904610
1 AC	48 V DC	10 A	X	1	1	X	X		QUINT4-PS/1AC/48DC/10	2904611
1 AC	48 V DC	10 A	X	X	1	X	X	4	QUINT4-PS/1AC/48DC/10/CO	2904626
1 AC	48 V DC	20 A	X	1	1	X	X		QUINT4-PS/1AC/48DC/20	2904612
1 AC	110 V DC	4 A	X			X	X		QUINT-PS/1AC/110DC/4	2904613
3 AC	24 V DC	5 A	X	1	1		X		QUINT4-PS/3AC/24DC/5	2904620
3 AC	24 V DC	10 A	X	1	1		X		QUINT4-PS/3AC/24DC/10	2904621
3 AC	24 V DC	20 A	X	1	1		X		QUINT4-PS/3AC/24DC/20	2904622
3 AC	24 V DC	40 A	X	1	1		X		QUINT4-PS/3AC/24DC/40	2904623

Legend: 1 = see Attachment 1; 2 = 3.1 kV withstand voltage input/output/housing; 3 = protection class II; 4 = protective coating;
5 = SIL 3 in accordance with IEC 61508 with regard to overvoltage at the output

DC/DC converters with unique properties for railway infrastructure

Input voltage	Output voltage	Output current	EN 50121-3-2	EN 50121-4	EN 50121-5	3.1 kV[1]	EN 50124-1	Type	Item no.
24 ... 48 V DC	48 V DC (max. 56 V DC)	2 A	X	X	X	X	X	QUINT4-PS/24-48DC/48DC/2/PT	1098676
1 AC 400 V DC	48 V DC	5 A	X	X	X		X	TRIO-PS-2G/230AC-400DC/48DC/5	1157806

[1] 3.1 kV withstand voltage resistant input/output/housing

Product list – UPS and energy storage devices

All modules are subject to shock and vibration testing in accordance with EN 50155/EN 61373. The devices meet the fire protection requirements of EN 45545-2. In the case of the energy storage units, fire load insulation is ensured by a special housing.

Conformity for EMC and environmental conditions must be evaluated together with the power supply used and in relation to the application. You are welcome to contact us for further information.

UPSs and energy storage systems with special properties for railroads

Function	Nominal voltage (Input/output)	Nominal current	Energy	EN 61373	Type	Item no.
Capacity module	24 V DC/24 V DC	5 A	4 kJ	X	QUINT4-CAP/24DC/5/4kJ	2320539
Capacity module	24 V DC/24 V DC	10 A	8 kJ	X	QUINT4-CAP/24DC/10/8kJ	2320571
Capacity module	24 V DC/24 V DC	20 A	16 kJ	X	QUINT4-CAP/24DC/20/16kJ/USB	1065635
Uninterruptible power supply	24 V DC/24 V DC	10 A		X	QUINT4-UPS/24DC/24DC/10	2907066
Uninterruptible power supply	24 V DC/24 V DC	20 A		X	QUINT4-UPS/24DC/24DC/20	2907071
Lithium-ion battery	24 V DC	30 A	120 Wh	X	UPS-BAT/LI-ION/24DC/120WH	2320351

Application example

Phoenix Contact offers a modular system for uninterruptible power supply solutions that can be supplemented with a wide range of products. In this example, our heavy-duty connectors act as a robust interface. The power supply converts the three-phase current to 24 V, and an uninterruptible power supply is connected downstream for energy storage. Our electronic circuit breakers protect the individual load circuits against overload and short circuit. Stainless steel marking labels complete the modular system.

EN 50155 / EN 61373 tested, EN 45545-2 housing

3AC 400 V → 24 V DC → UPS → $I>I_N$ → 24 V DC, 24 V DC

Heavy-duty connector — Power supply — Capacity module — Electronic circuit breaker — Device marking

alternatively

Backup

UPS with LI-ION energy storage
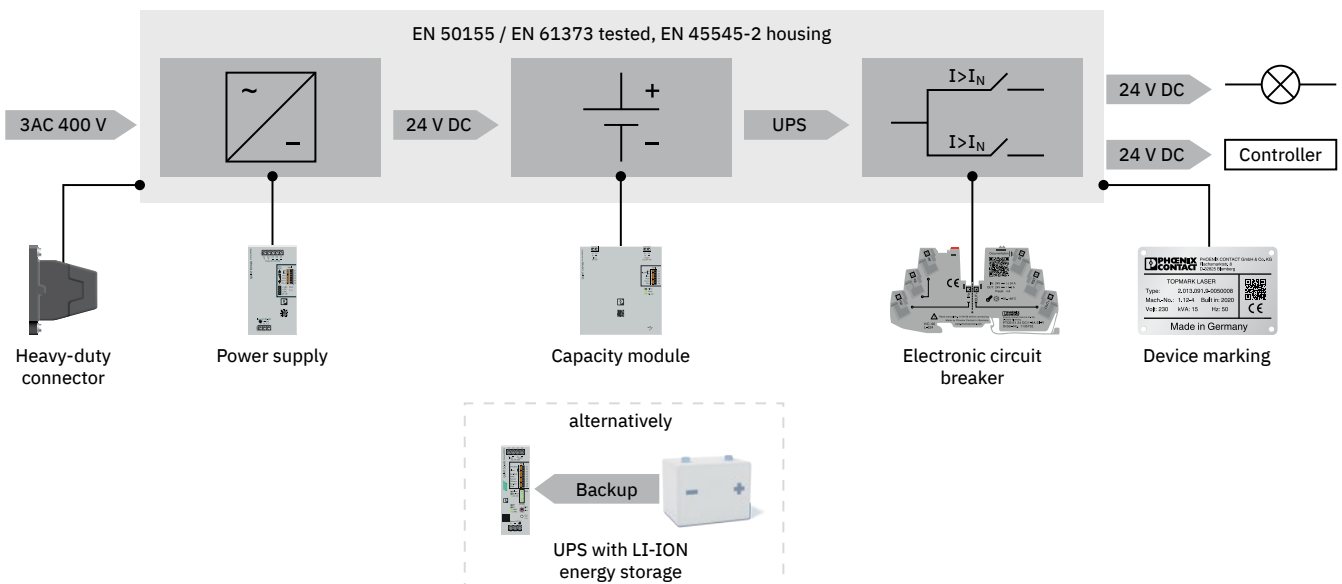
Relays

The coupling relays from Phoenix Contact are certified in accordance with the DIN EN 50155 standard and satisfy the special requirements necessary for the railway industry. They withstand extreme temperatures and, with Push-in connection technology, also provide a high degree of shock and vibration resistance. The portfolio is completed by our extensive range of accessories, e.g., with bridges and marking materials.
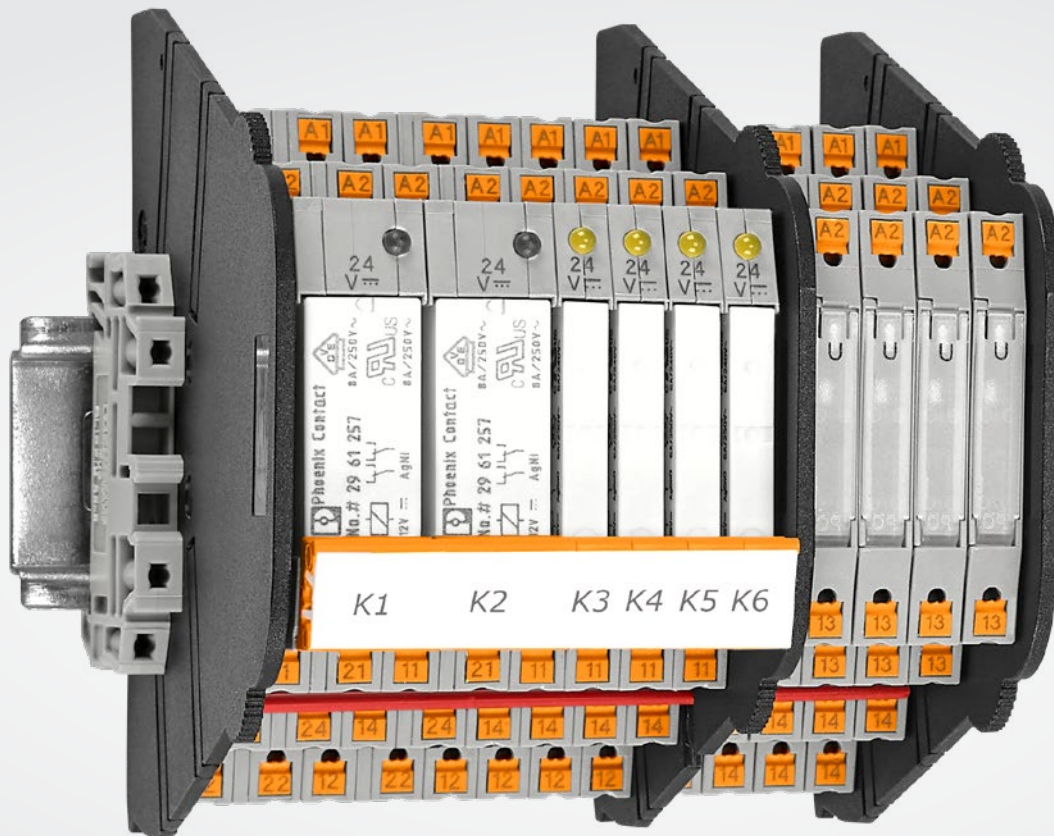
Product lists – relays

Electromechanical relay modules

Input voltage	Contact switching type	Switching voltage (max.)	Limiting continuous current	EN 45545-2	EN 50155	EN 61373	EN 50121-3-2	Temperature range -40°C to +70°C	Type	Item no.
24 V DC	1 changeover contact	250 V AC/DC	6 A	X	X	X	X	X	PLC-RPT- 24UC/21/RW	2900318
24 V DC	2 changeover contacts	250 V AC/DC	6 A	X	X	X	X	X	PLC-RPT- 24UC/21-21/RW	2900346
24 V DC	2 changeover contacts	30 V AC 36 V DC (250 V AC/DC[1])	50 mA (6 A[1])	X	X	X	X	X	PLC-RPT- 24UC/21-21AU/RW	2900349
24 V DC	1 changeover contact	30 V AC 36 V DC (250 V AC/DC[1])	50 mA (6 A[1])	X	X	X	X	X	PLC-RPT- 24UC/21AU/RW	2900321
24 V DC	1 changeover contact	250 V AC/DC	10 A	X	X	X	X	X	PLC-RPT- 24UC/21HC/RW	2900324
72 V DC	1 changeover contact	250 V AC/DC	6 A	X	X	X	X	X	PLC-RPT- 72UC/21/RW	2900319
72 V DC	2 changeover contacts	250 V AC/DC	6 A	X	X	X	X	X	PLC-RPT- 72UC/21-21/RW	2900347
72 V DC	2 changeover contacts	30 V AC 36 V DC (250 V AC/DC[1])	50 mA (6 A[1])	X	X	X	X	X	PLC-RPT- 72UC/21-21AU/RW	2900350
72 V DC	1 changeover contact	30 V AC 36 V DC (250 V AC/DC[1])	50 mA (6 A[1])	X	X	X	X	X	PLC-RPT- 72UC/21AU/RW	2900322
110 V DC	1 changeover contact	250 V AC/DC	6 A	X	X	X	X	X	PLC-RPT-110UC/21/RW	2900320
110 V DC	2 changeover contacts	250 V AC/DC	6 A	X	X	X	X	X	PLC-RPT-110UC/21-21/RW	2900348
110 V DC	2 changeover contacts	30 V AC 36 V DC (250 V AC/DC[1])	50 mA (6 A[1])	X	X	X	X	X	PLC-RPT-110UC/21-21AU/RW	2900351
110 V DC	1 changeover contact	30 V AC 36 V DC (250 V AC/DC[1])	50 mA (6 A[1])	X	X	X	X	X	PLC-RPT-110UC/21AU/RW	2900323
110 V DC	1 changeover contact	250 V AC/DC	10 A	X	X	X	X	X	PLC-RPT- -110UC/21HC/RW	2900326
230 V AC (16.7 Hz)	2 changeover contacts	30 V AC 36 V DC (250 V AC/DC[1])	50 mA (6 A[1])	X	X				PLC-RPT-230UC/21-21AU/RWF	2900345
24 V DC	1 changeover contact	30 V AC 36 V DC (250 V AC/DC[1])	50 mA (3 A[1])	X	X				PLC-BPT- 24DC/21RW[2]	2900261

[1] With damaged gold coating.
[2] Base only, single relays (item number 2961383 or 2961493) must be ordered separately.

Solid-state relay modules

Input voltage	Contact switching type (electronic)	Switching voltage (max.)	Limiting continuous current	EN 45545-2	EN 50155	EN 61373	Temperature range -25°C to +70°C	Type	Item no.
24 V DC	1 N/O contact	3...33 V DC	3 A	X	X	X	X	PLC-OPT- 24DC/ 24DC/3RW	2900379
24 V DC	1 N/O contact	12...140 V DC	3 A	X	X	X	X	PLC-OPT- 24DC/110DC/3RW	2900391
36 V DC	1 N/O contact	12...140 V DC	3 A	X	X	X	X	PLC-OPT- 36DC/110DC/3RW	2900392
48 V DC	1 N/O contact	12...140 V DC	3 A	X	X	X	X	PLC-OPT- 48DC/110DC/3RW	2900393
72 V DC	1 N/O contact	12...140 V DC	3 A	X	X	X	X	PLC-OPT- 72DC/110DC/3RW	2900394
96 V DC	1 N/O contact	12...140 V DC	3 A	X	X	X	X	PLC-OPT- 96DC/110DC/3RW	2900395
110 V DC	1 N/O contact	3...33 V DC	3 A	X	X	X	X	PLC-OPT-110DC/ 24DC/3RW	2900380
110 V DC	1 N/O contact	12...140 V DC	3 A	X	X	X	X	PLC-OPT-110DC/110DC/3RW	2900396

Device circuit breakers

In contrast to conventional circuit breakers, electronic circuit breakers provide several systematic advantages for train applications. Their tripping characteristic is ideally suited to the voltage behavior of switched-mode power supply units, eliminating the need for supply reserves. In addition, they are up to 60% narrower and can be flexibly adapted to the application with the adjustable nominal current. A reset input makes it possible to shorten downtimes and enables positioning outside the train driver's working area. Integrated remote signaling enables permanent monitoring of the circuit breaker status without the need for expensive additional modules. This enables extremely flexible train design.

Product list – circuit breakers

| 24 V DC device circuit breakers								
Nominal current	Nominal current value	Number of channels	EN 61373	EN 45545-2	EN 50121-3-2 [1]	Test at -40°C	Type	Item no.
1 A	Fixed	1	X	X	X		PTCB E1 24DC/1A SI-R	1135751
2 A	Fixed	1	X	X	X		PTCB E1 24DC/2A SI-R	1135749
4 A	Fixed	1	X	X	X		PTCB E1 24DC/4A SI-R	1135745
6 A	Fixed	1	X	X	X		PTCB E1 24DC/6A SI-R	1135740
8 A	Fixed	1	X	X	X		PTCB E1 24DC/8A SI-R	1135734
1 A	Fixed	1	X	X	X		PTCB E1 24DC/1A NO	2909902
2 A	Fixed	1	X	X	X		PTCB E1 24DC/2A NO	2909903
3 A	Fixed	1	X	X	X		PTCB E1 24DC/3A NO	2909904
4 A	Fixed	1	X	X	X		PTCB E1 24DC/4A NO	2909906
6 A	Fixed	1	X	X	X		PTCB E1 24DC/6A NO	2909908
8 A	Fixed	1	X	X	X		PTCB E1 24DC/8A NO	2909910
1…8 A	Adjustable	1	X	X	X		PTCB E1 24DC/1-8A SI-R	1135752
1…4 A	Adjustable	1	X	X	X		PTCB E1 24DC/1-4A SI-R	1135753
1…8 A	Adjustable	1	X	X	X		PTCB E1 24DC/1-8A NO	2908262
1…3 A	Adjustable	1	X	X	X		PTCB E1 24DC/1-3A NO	2909909
1…4 A	Adjustable	1	X	X	X		PTCB E1 24DC/1-4A NO	2908261
0.5 … 10 A	Adjustable	4	X			X	CBM E4 24DC/0.5 … 10A NO-R	2905743
0.5 … 10 A	Adjustable	8	X			X	CBM E8 24DC/0.5 … 10A NO-R	2905744
1…4 A	Adjustable	4	X				CBMC E4 24DC/1-4A S-R	1065727
1…10 A	Adjustable	4	X				CBMC E4 24DC/1-10A S-R	1065729
1…4 A	Preconfigured	4	X				CBMC E4 24DC/1-4A S-R-C	1103876
1…10 A	Preconfigured	4	X				CBMC E4 24DC/1-10A S-R-C	1103875
1…4 A	Adjustable	4	X				CBMC E4 24DC/1-4A NO	2906031
1…10 A	Adjustable	4	X				CBMC E4 24DC/1-10A NO	2906032
1…4 A	Preconfigured	4	X				CBMC E4 24DC/1-4A NO-C	2908713
1…10 A	Preconfigured	4	X				CBMC E4 24DC/1-10A NO-C	2908716

PTCB …

CBM …

CBMC …

S = status output; SI = status output, inverted; R = reset input; NO = floating signal contact; C = preconfigured
[1] Immunity signal burst 1 kV

Lightning and surge protection

Railway infrastructure and signaling combine a large number of trades that need to be protected against the effects of lightning and surge voltages. All conductors and devices of the power supply, control-command and signaling, as well as telecommunications systems must be protected through a holistic overvoltage protection concept. The large variety of voltages and frequencies in the different systems must be taken into account when selecting the surge protective device. A feature of all these systems is the insulated structure (IT systems), which ensures a high degree of system availability but also poses special challenges for the protection and monitoring technology. Phoenix Contact can provide you with surge protective devices and solutions that are ideal for all requirements.
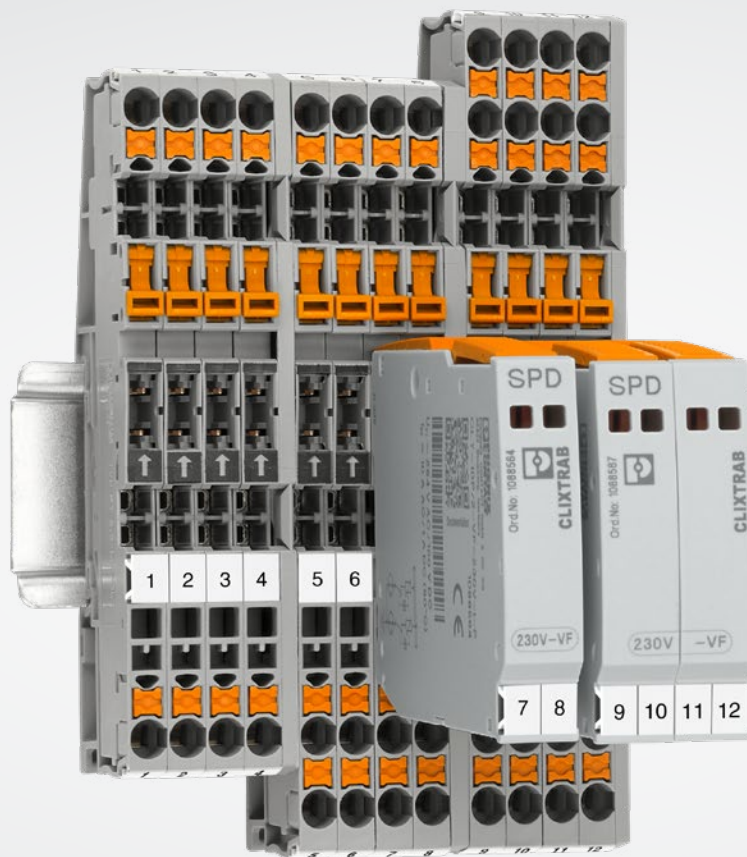
CLIXTRAB for railway protection
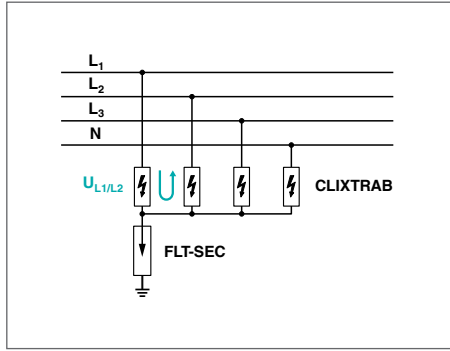
Easy handling

CLIXTRAB enables easy installation with the combination of Push-in terminal blocks and pluggable surge protection.

Powerful

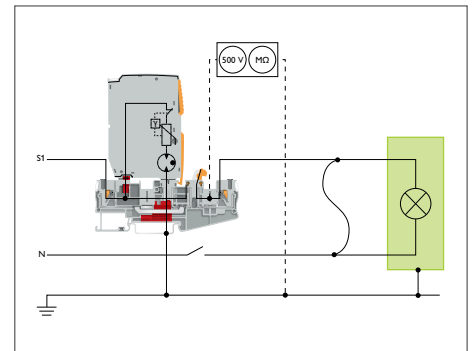CLIXTRAB is suitable for applications such as point drives with 3 ~ 400 V AC. The maximum continuous current is 10 A.

Fast error identification

Quick and easy diagnostics with mechanical status indicator and optional remote signaling for integration into digital infrastructures.
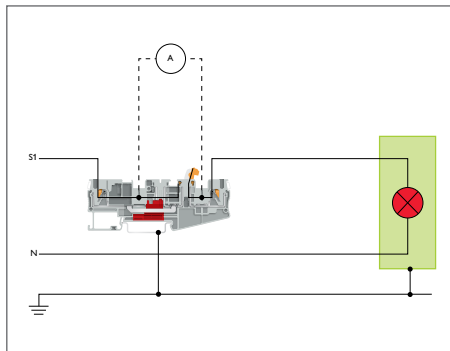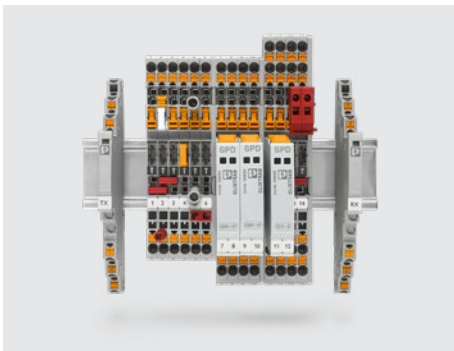
CLIPLINE complete

CLIXTRAB is a part of the Phoenix Contact terminal block system and uses the standardized bridging, testing, and marking accessories.

Current loop measurement

When the knife disconnection is open, the operating current can be measured reliably using test plugs from the standard range of accessories.

Dielectric test

All typical measuring tasks, such as ground fault and cable insulation fault searches, can be carried out professionally with the CLIXTRAB terminal block base.

CLIXTRAB brochure to download

If you would like detailed information on our CLIXTRAB product range, you can download the brochure here:

phoenixcontact.com/clixtrab_brochure

Surge protection in railway infrastructure

Protecting control-command and signaling, as well as telecommunications

Application champ
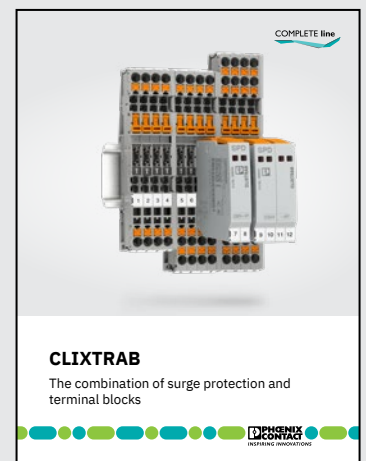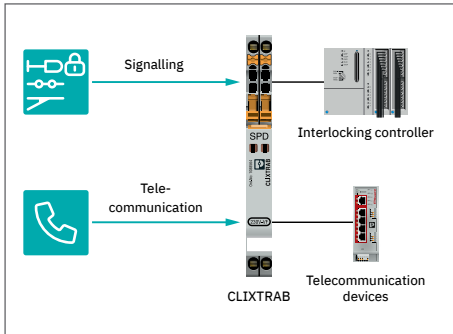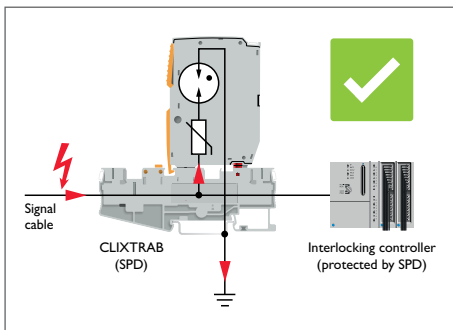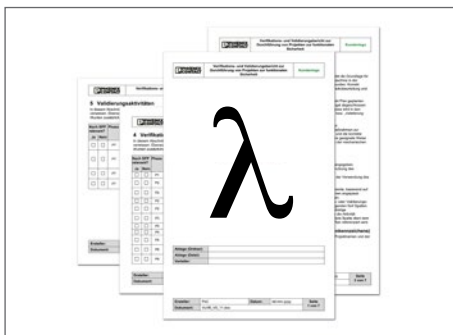
CLIXTRAB has been specially developed for the railway industry. The CLT-10P/2-VF-230V-I-P can protect all typical signal-box lightning protection signal technology applications and is also particularly space-saving. Its special electrical design enables use in 230 V DC and three-phase 400 V AC systems with continuous operating currents of up to 10 A and also meets the high-frequency demands of telecommunications. Items for nominal voltages up to 12, 24, and 60 V DC are available for small signaling and bus systems like CAN bus, for example. CLIXTRAB provides a wide variety of testing and monitoring options.

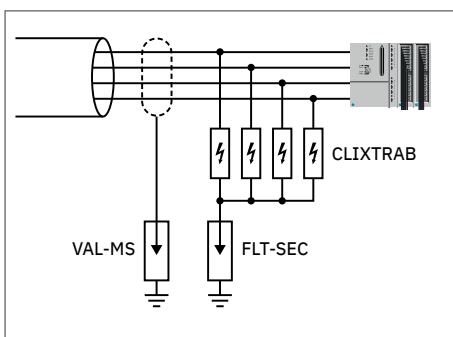*CLIXTRAB – designed for railway-specific applications*

The CLT-10P/2-VF-230V-I-P reliably protects the insulation of railway technology equipment. At the same time, it also ensures that the special requirements such as those listed in the Deutsche Bahn RIL 819.0808 standard are satisfied. The series connection of varistor and gas discharge tube ensures that there are no leakage currents or feedback between the signal lines (VF circuit). The pluggable surge protective device can be unplugged without interrupting the signal circuit.

Parameters available for proof of safety

Phoenix Contact provides extensive documentation for planning the surge protection concept. Technical data, circuit diagrams, and 3D data, as well as MTBF values and the error rate (λ lambda values), are available for each product. This makes it possible to calculate the effects on the signal circuit and, for example, to generate proof of safety.

Overview of the surge protective device for the lightning protection concept

All electrical potentials that lead from the field into a system have to be provided with lightning and surge protection. Signal cables with shielding and metallic rodent protection must also be integrated into the lightning protection concept. With VAL-MS, lightning protection to ground can be realized without traction currents being able to flow through the shielding.

CLIXTRAB protects the signal wires against lightning. CLIXTRAB modules discharge the lightning energy to the common DIN rail. From there, the lightning-protection equipotential bonding is performed via the FLT-SEC combi arrester to ground. This ensures that the system remains safely insulated in the event of ground faults.

Protecting the power supply

Along with the issue of safety, the availability of the railway infrastructure is of massive importance. A key component here is the signal box. Therefore, signal towers are typically equipped with a redundant power supply system. They are generally supplied by the public power grid. An alternative supply can be drawn from the catenary – the overhead line. The operation of emergency power systems is also an alternative in the event of emergencies. Each of these feed-in options have to be equipped with appropriate lightning and surge protection.

Public grid
Catenary supply
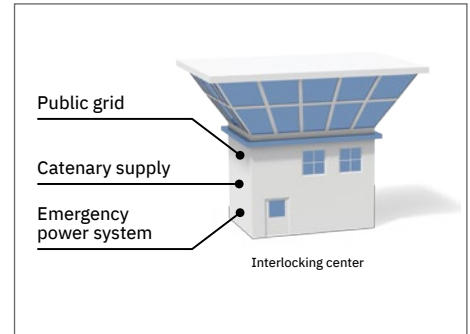Emergency power system
Interlocking center

Redundant power supply to the signal box

When selecting the correct surge protective device for the various feed-in options, there is a variety of railway-specific factors to take into consideration, such as the different voltage levels and frequencies. Phoenix Contact provides the appropriate surge protective devices for the various forms of feed-in, from the supply network operators, from your own overhead line, or from the emergency power system.

Surge protective device capable of carrying lightning currents

Power supply

Other trades
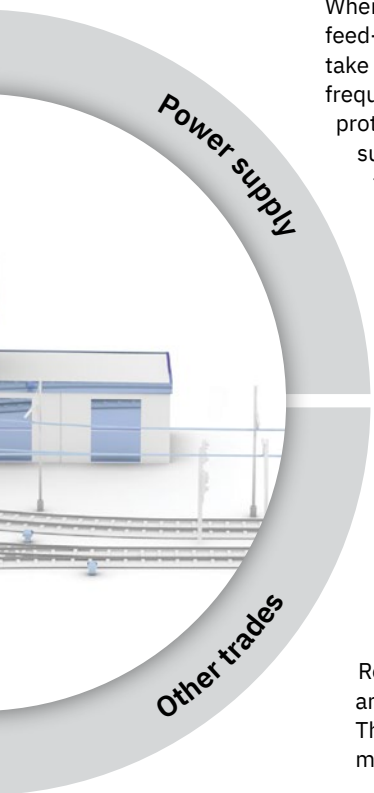
Protecting cellular communication, IT, and buildings

Due to their exposed location and sensitive electronics, video surveillance systems are at particular risk from lightning and surge voltages. Interference results in a sensitive loss of control – driving blind, so to speak. Replacing defective cameras involves a great deal of effort and expense and can lead to operational interruptions. These costs exceed the investment costs for protective measures many times over.

Camera systems and information technology

GSM-R (GSM-Rail), also known as the digital train wireless system, together with the European Train Control System (ETCS), is a fundamental part of the European Rail Traffic Management System (ERTMS). The GSM-R systems are also at particular risk from lightning and surge voltages. The areas around the power supply and the coaxial antenna lines, for example, are equipped with protective devices to maximize system availability. An all-encompassing lightning and surge protection concept, with classification into the respective lightning protection zone (LPZ), plays a key role here.

LPZ 0_A
LPZ 0_A
LPZ 0_B
LPZ 0_B
LPZ 1
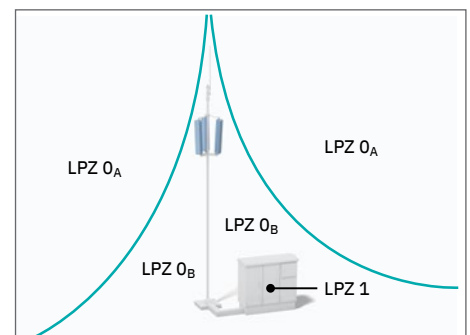
Lightning protection zone concept for antenna systems

Insulation and voltage limitation of surge protective devices

## Coordination of the electric strength

Surge protective devices protect the insulation of electrical equipment. Before the insulation breaks leading to an electrical disruptive discharge and the destruction of the device insulation, the SPD connected in parallel "breaks down" and establishes the equipotential bonding. In order for this principle to work, the voltage protection level of the SPD always has to be lower than the insulation strength of the equipment. A practical value is a difference of 30%. If the insulation strength is 4 kV, the system is sufficiently protected by an SPD with a voltage protection level of 4 kV - 30% = 2,800 V. The graphic shows a measurement of the voltage protection level for the combination (series connection) of CLIXTRAB and FLT-SEC with the 3 kA (8/20 µs) test pulse. The complete test results in a voltage protection level of Up = 2.5 kV, meaning that electrical systems with an insulation strength of 4 kV is sufficiently protected. For all operating voltage situations, the surge protection naturally remains isolating.

- Residual voltage CLIXTRAB and FLT-SEC
- Surge current
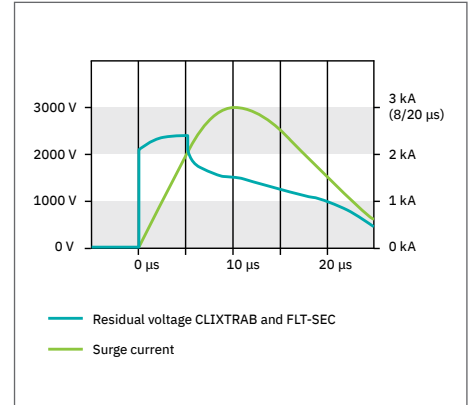
## Effect of ground faults on the voltage on surge protective devices

Signaling systems in railway systems are typically insulated as IT systems (French: Isolé Terre). The reason is the tolerance to the first ground fault, which does not lead to shutdown and thus increases the availability of the system. The ground fault is detected and reported by insulation monitoring devices, but can persist for a longer period of time to maintain system availability. Since the ground potential assumes the potential of the affected conductor in the event of a fault, in a three-phase system, the line-to-line voltage is present across the surge protection between conductor and ground. To be able to withstand this increased operating voltage, the DIN rail to which all CLIXTRAB modules are connected is insulated and not connected directly to ground. The potential of the DIN rail is tapped off via a grounding terminal block and connected to the main equipotential bonding and to ground via another spark gap-based combi arrester, FLT-SEC.
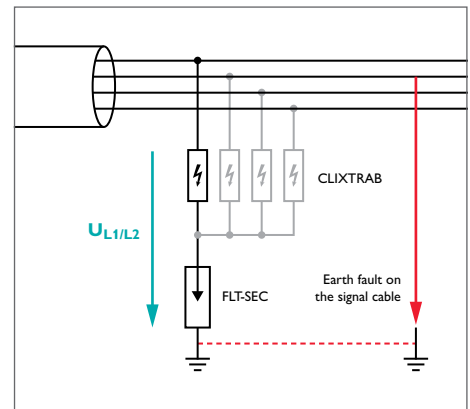
Influence on the surge protective devices through induced voltages

With the occurrence of the ground fault described above, another effect comes into play on electrified railway lines – the interference voltage. It is created by induction from the traction currents in the signal cables running parallel to the track. This interference voltage is superimposed onto the operating voltages of the external elements. When rating the surge protective device for USPD, the sum of the peak values of both voltages must be used. The combination of CLIXTRAB and FLT-SEC is rated and tested in accordance with the requirements of a 3 ~ 400 V AC operating voltage subject to the continuous interference voltage of 250 V AC.

Significantly higher voltages arise when the overhead line breaks. In this case, high short-circuit currents flow for up to 100 ms, which leads to a short-term interference voltage of up to 1,500 V. The combination of CLIXTRAB and FLT-SEC (SPD) has been tested accordingly and also satisfies this requirement.
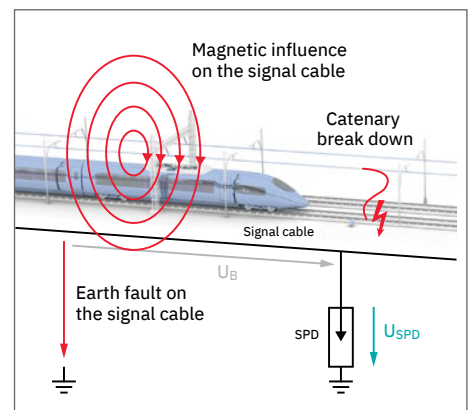
Product list – lightning and surge protection

Control-command and signaling, as well as telecommunications

Description	Type	Item no.
CLIXTRAB is the surge protective device for the typical requirements of control-command and signaling as well as telecommunications. The standard item is 2-position in design. The 4-position version can be used for point machines.	CLT-10P/2-VF-230V-I-P CLT-20P/4-VF-230V-I-P	1088564 1088567
For bus systems such as CAN bus.	CLT-10P/2-2-12V-I-P CLT-10P/2-2-24V-I-P CLT-10P/2-2-60V-I-P	1088569 1088570 1088573
Terminal block as the base of the CLIXTRAB module. As a feed-through terminal block, three- and four-position version. The standardized bridging, testing, and marking accessories can be used.	PT 2,5-MT-CLT PT 2,5-TWIN-MT-CLT PT 2,5-QUATTRO-MT-CLT	1087698 1251104 1251103
Combi arrester, connects the shared potential of the CLIXTRAB DIN rail to the ground potential.	FLT-SEC-P-T1-1C-440/35-FM	2905987
Grounding terminal block, connects the DIN rail of the CLIXTRAB modules to the combi arrester.	PTV 6-SG WH XTV 16-SG WH	1375754 1428615
Surge protective device for the cable shielding.	VAL-MS 350 VF/FM	2856579
Remote signaling set for monitoring CLIXTRAB overload tripping. When tripped, a message is sent via a floating contact.	TTC-6-FMTX-PT TTC-6-FMRX-PT	1193565 1193571

Power supply

Description	Type	Item no.
Public grid as TN-C system 3 ~ 230/400 V, 50 Hz	FLT-SEC-T1+T2-3C-350/25-FM	2905469
Overhead line as TN-S system 2 ~ 231/462 V, 16.7 Hz	FLT-SEC-P-T1-2S-350/25-FM	2905418
Emergency power system TN-C-S and TT system 3 ~ 230/400 V, 50 Hz	FLT-SEC-P-T1-3S-350/25-FM	2905421

IT

Description	Type	Item no.
Surge protective device	DT-LAN-CAT.6+	2881007

GSM-R

Description	Type	Item no.
Surge protective device	CN-LAMBDA/4-2.25-BB	2801057
Type 1+2 combined lightning current and surge arrester	FLT-SEC-T1+T2-3S-350/25-FM	2905470
Type 2 surge protective device	VAL-SEC-T2-3S-350-FM	2905340

Hand tools and automatic devices

Whether for manual or automated processing – we have the right solution for cutting, stripping, crimping, mounting, and measuring. Along with standard tools and automatic devices, our comprehensive range of tools features special hand tools for the particular challenges faced in the railway industry.

The right tool for every application

Cutting profiles

Cut DIN rails or cable ducts without chips or burrs.

Cutting conductors

Cutting tool for use in the railway industry.

Stripping conductors

Process conductors with standard or special insulation.

Crimping conductors
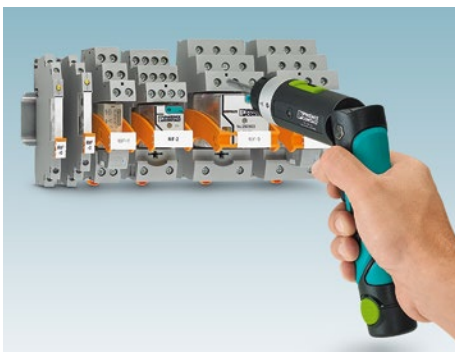
Crimp all types of contacts safely and effortlessly.

Automating conductor processing
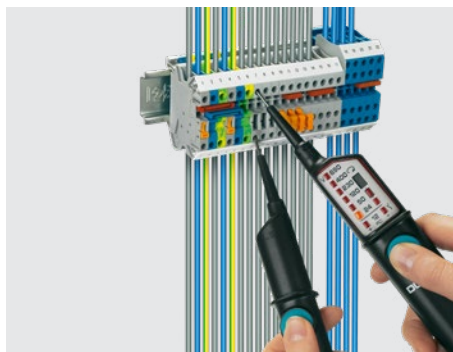
Automate cutting, stripping, and crimping.

Installation and removal

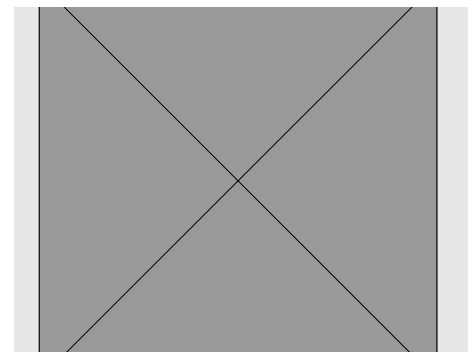Suitable mounting and removal tool for crimp contacts.

Reliable mounting

Tool for easy and safe screwing.

Safe testing

Professional measurement and testing.

Storing tools neatly

Always have the right tool at hand.

Product lists – tools

Cutting profiles

	Type	Item no.
	PPS STANDARD I/M	1206230
	PPS CLASSIC I/M	1206256
	PPS BASIC I/M	1207585
	CUTFOX-CD	1212474
	PPS CD M	1207569

Cutting conductors

	Type	Item no.
	CUTFOX 12	1212128
	CUTFOX 18	1212129
	CUTFOX 16 VDE	1212126
	CUTFOX 25 VDE	1212127
	CUTFOX 25	1212130
	CUTFOX 35	1212131
	CUTFOX 45	1212132
	CUTFOX 50 STEEL	1212526
	CUTFOX 52	1212133
	CUTFOX 62	1212134
	CUTFOX 100	1212135
	CUTFOX-ES	1212621
	CUTFOX-ES-1	1139721
	CUTFOX-S VDE	1212207
	CUTFOX-SP VDE	1212206
	CUTFOX-SP BOLT VDE	1212831
	MICROFOX-SP-1	1212487
	MICROFOX-SP	1212488
	MICROFOX-SB	1212489

Stripping conductors

	Type	Item no.
	WIREFOX 4	1212156
	WIREFOX 10	1212150
	WIREFOX 16	1212155
	WIREFOX 6SC	1212158
	WIREFOX-D 11	1212160
	WIREFOX-D 16	1212173
	WIREFOX-D 28	1212174

Stripping conductors

	Type	Item no.
	WIREFOX-D 40	1212161
	WIREFOX 16-1	1212157
	WIREFOX SAC	1212623
	WIREFOX SAC-1	1212757
	WIREFOX ASI	1212154
	WIREFOX-D SHIELD	1212172

Crimping conductors

Description		Type	Item no.
Tools for turned/rolled contacts			
		CRIMPFOX-TC MP-6	1202888
		CRIMPFOX-TC MP	1212510
		CRIMPFOX-TC HC 4	1297083
		CRIMPFOX-TC HC 10	1314533
		CRIMPFOX-P CK 1.6 ER 2.5 OIC-L	1069228
Crimping pliers for insulated and non-insulated ferrules			
		CRIMPFOX CENTRUS 10S	1213154
		CRIMPFOX CENTRUS 10H	1213156
		CRIMPFOX CENTRUS 6H	1213146
		CRIMPFOX CENTRUS 6S	1213144
		CRIMPFOX DUO 10	1031721
		CRIMPFOX DUO 16S	1202877
		CRIMPFOX 10T-F	1134913
		CRIMPFOX VARIO 4S	1108766
		CRIMPFOX VARIO 16S	1108767
		CRIMPFOX 16R TWIN	1212845
		CRIMPFOX 25R	1212039
		CRIMPFOX 50R	1212041
Crimping pliers for insulated and non-insulated cable lugs			
		CRIMPFOX-RCI 2.5	1212053
		CRIMPFOX-RCI 6	1212057
		CRIMPFOX-RCI 6-1	1212059
		CRIMPFOX-RCI DIN 6	1212729
		CRIMPFOX-RC 2.5	1212063
		CRIMPFOX-RC 6	1212710
		CRIMPFOX-RC 10	1212061
		CRIMPFOX-RC 25	1212065
		CRIMPFOX-RCT 25-1	1212066
		CRIMPFOX-C50	1212340
		CRIMPFOX-C120	1212318

Automating conductor processing

	Type	Item no.
	CUTFOX 10	1206829
	E.FOX S 10 (EF)	1554299
	WF 1000	1212149
	WF 1000 120V	1212258
	CF 3000-2,5	1205477
	CF 3000-2,5 120V	1205516
	CF 1000-1.5	1208199
	CF 1000-10	1212456
	CRIMPHANDY 0.5	1212463
	CRIMPHANDY 0.75	1212464
	CRIMPHANDY 1.0	1212465
	CRIMPHANDY 1.5	1212466
	CF 500-230V	1208348
	CF 500-120V	1208351

Installation and removal

	Type	Item no.
	UNIFOX MT-CK 1.6/2.5	1089092
	UNIFOX RT-CK 1.6	1072069
	UNIFOX RT-CK 2.5	1072067
	UNIFOX RT-CK 4.0	1072064
	UNIFOX-C VDE	1212202
	UNIFOX-CE VDE	1212203
	UNIFOX-P VDE	1212204
	UNIFOX-PC VDE	1212205
	UNIFOX-PE VDE	1212529
	UNIFOX-F VDE	1212363
	UNIFOX-R VDE	1212364
	UNIFOX-WP	1212365
	UNIFOX-CT 4.8	1212475
	UNIFOX-CT 4.8P	1212609
	UNIFOX-CT M 7.9	1212610
	SF-CCK 9	1212525
	USS 4	1203149

Safe testing

	Type	Item no.
	DUSPOL EXPERT	1209091
	MEASURING TAPE 5M I/M	1200304

Reliable mounting

	Type	Item no.
	TSD 02 SAC	1208487
	TSD 04 SAC	1208429
	TSD 08 SAC	1212597
	TSD 20 SAC	1212020
	TSD 25 SAC	1212315
	TSD-M 1.2NM	1212224
	TSD-M 3NM	1212225
	TSD-M 6NM	1212226
	SAC BIT M8-D10	1208461
	SACC BIT M8-D12	1208474
	SAC BIT M12-D15	1208432
	SAC BIT M12-D16	1200305
	SACC BIT M12-D20	1208445
	SACC BIT M12-D23	1202885
	SAC BIT QUICKON-W13	1212033
	SACC BIT M12-W18	1231753
	SF-SL/PH SET VDE	1212539
	SF-SL/PZ SET VDE	1212540
	SF-SL/PH/PZ-SL SET S-VDE	1212701
	SF-LHEX SET	1212544
	SF-LTX SET	1200162
	SF-TX SET VDE	1212537
	SF-TXH SET	1212538
	SF-BIT SET	1212545
	SF-M SET	1212543
	SF-ASD 16 SET	1200295
	SF-ASD 21 SET 230V	1212530

Storing tools neatly

	Type	Item no.
	CRIMPFOX CENTRUS 10S SET	1026994
	CRIMPFOX DUO 10 SET	1044971
	CRIMPSET 6	1202072
	TOOL-KIT STANDARD	1212422
	TOOL-WRAP	1212505
	TOOL-WRAP-2	1200100
	TOOL-BAG	1212504

Appendix

Attachment 1: Conformity with EMC standards

Conformity with EMC standards is documented in the manufacturer's declaration for each device. Depending on the device type and specific application, this may mean the following:

- Decoupling signaling inputs and outputs via an SPD or relay.
- EMC filter for DC output lines that exit the control cabinet.

Attachment 2: Halogen-free

The term halogen-free, based on international standards for PCV base materials (e.g., IEC 61249-2-21, IPC 4101 C), relates to the elements chlorine and bromine in flame protection agents. In accordance with DIN EN ISO 1043-4, this also forbids the use of halogenated flame protection agents.

As defined in the ZVEI position paper (requirements for the use of halogen-free products in the electrical and electronics industry), no flame protection agents containing halogen or PVC are present in the components.

Disclaimer

The contents of this brochure were prepared with the utmost care. However, the information provided here is not binding. The current product documentation is always decisive for correct, complete, and up-to-date information.
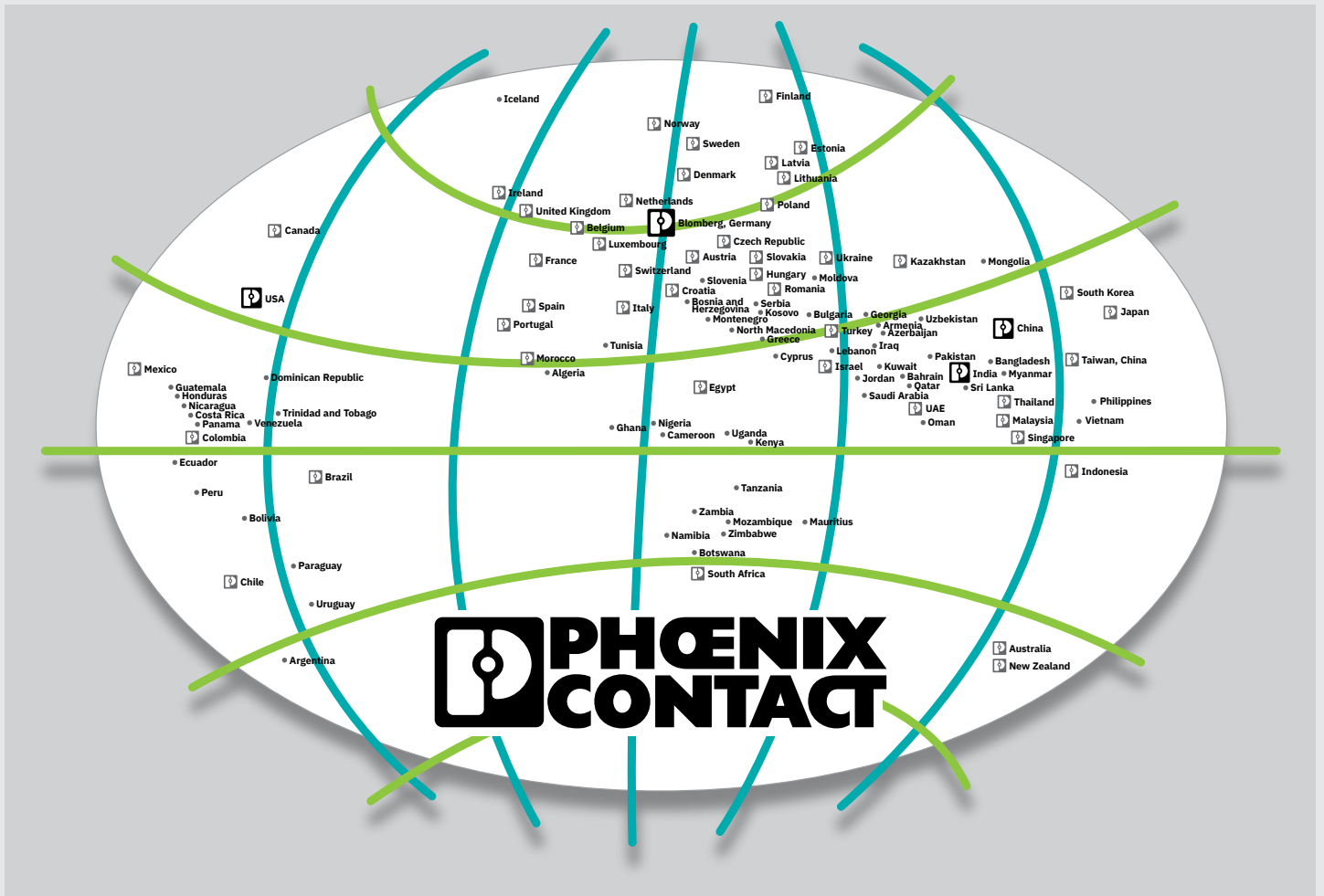
Open communication with customers and partners worldwide

Phoenix Contact is a global market leader based in Germany. We are known for producing future-oriented products and solutions for the electrification, networking, and automation of all sectors of the economy and infrastructure. With a global network reaching across more than 100 countries with over 21,000 employees, we maintain close relationships with our customers, something we believe is essential for our common success.

Our wide range of innovative products makes it easy for our customers to implement the latest technology in a variety of applications and industries. This especially applies to the target markets of energy, infrastructure, industry, and mobility.

You can find your local partner at

phoenixcontact.com