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The Complete Range at a Glance

**CLIPLINE**
Modular Terminal Blocks
Marking and Mounting Materials Tools

**PLUSCON**
Industrial Plug Connectors

**INTERFACE**
Signal Level Matching

**TRABTECH**
Surge Voltage Protection

**COMBICON**
Printed CircuitBoard Connection Systems and Electronic Housings

**AUTOMATION**
Automation Technology

---

**Search and find with a system**
The complete catalog consists of 6 parts with all the Phoenix Contact products in 2000 pages.

- From the modular terminal block to mounting material and tools and through to the complete PC-aided project planning and marking system, everything that you need for perfect control cabinet wiring can be found in the **CLIPLINE** catalog.
- The **PLUSCON** catalog documents industrial connectors for data, signal and power cables. The product portfolio also contains connectors for optical fibers and pneumatic lines.
- The **COMBICON** catalog provides industrial electricians with the complete range of PCB terminal blocks and plug connectors for printed circuit boards. Electronic housings, plug-in card blocks and DIN socket strips make this catalog a standard for every development department.
- Professional surge voltage protection can be found in the **TRABTECH** catalog. Structured according to surge voltage protection for power supply units, data interfaces and Measurement and Control applications, Phoenix Contact provides one of the most comprehensive programs on the market.
- The **INTERFACE** catalog includes not only interfaces for binary, serial and analog signals, but also power supply units, PLC system cabling and electronic load relays.
- Starting with the serial sensor/actuator box and going through to visualization software, the **AUTOMATION** catalog provides everything that makes automation technology from Phoenix Contact stand out.

As an alternative to the printed copy, the complete catalog is also available on CD-ROM in German and in English.

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**eBusiness Solutions**
from Phoenix Contact

Phoenix Contact is online at [www.phoenixcontact.com](http://www.phoenixcontact.com). The Website has been consistently developed to form an information platform. Services such as Web-based training, product information services with documentation database, newsletter and download services are already a matter of course.

An ideal complement to the established business processes are the Phoenix Contact eBusiness solutions.

With EDI and electronic catalogs we provide the support for our customers to optimize their business processes through Internet.

Our eBusiness team will be pleased to help you with any questions.

E-Mail: eBusiness@phoenixcontact.com.
Surge Voltage Protection TRABTECH

The Problem...
Transistors are the heart of all microprocessor-based technologies. These subminiature ON/OFF switches are the center of a sophisticated nuclear submarine control system as well as simple household appliances. The density of transistor population on integrated circuits has increased at an unimaginable rate.

There are many advantages to transistors, such as faster data acquisition, real time control, and fully automated processes. Unfortunately, a trade-off to the increased performance and efficiency is the susceptibility of these semiconductor devices to voltage and current fluctuations or transients. A best case result can be unreliable equipment readings and operation, with periodic failures. A worst case result can be a completely destroyed plant automation system.

Figures published by electronic insurance companies show that the occurrence of damage to sensitive electronic equipment due to surge voltage is rapidly increasing every year.

Listed in the below table is a sampling of electronic equipment and applications typically effected by transient voltage. When you add all the costs associated with equipment failure including; downtime, labor costs, lost productivity, and in some industries regulatory non-compliance, the preventative expense of a properly networked surge protection systems seems negligible.

The Solution...
Installing surge protection devices to protect your investment and increase your reliability is the answer. With over 20 years experience and as a leader in the surge protection industry, Phoenix Contact provides one of the most comprehensive line of protection solutions available on the market. From Power line to data line Phoenix Contact offers surge protection solutions to a wide variety of industries.

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Phoenix Contact
Combination lightning arrestors and TVSS systems
SYSTEMTRAB SYS N...

Combination lightning arrestors and TVSS systems
SYSTEMTRAB SYS FT...

Lightning arrestor systems
SYSTEMTRAB SYS N...

Lightning arrestor components
FLT-PLUS CTRL...
FLT-PLUS...

Power supply

Device protection
MAINS-PLUGTRAB PT...
MNT-NEMA

Device protection
EM-DUO...

Device protection/filtering
FILTRAB NEF...
SFP TVSS...

Accessories

Terminal block multi-stage voltage protection
TERMITRAB

Protection module and accessories
COMTRAB CTM.../CT...

Protective equipment for Ethernet

Protective equipment for RS-232 interfaces

Information technology

Surge protection device for wireless data, signal, mobile phone system and radio communication

Surge protection device for video surveillance

Surge protection device for cable TV (CATV), satellite systems and broadband modems

Protective equipment for telecommunications systems
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Lightning arrestor components
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TVSS protection for three phase application
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TVSS components
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Pluggable surge protection device-Hybrid design
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Fiel mounted surge protection device-Hybrid design
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CHECKMASTER
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CM-PA... page 115

Phoenix Contact
The Comprehensive Concept for Transient Voltage Surge Suppression: TRABTECH

What causes power surges and why are they dangerous?

Power surges are transient voltages or currents that exceed the electrical limits of a system or piece of equipment. Lightning discharge or such man-made interferences as inductive load switching and power grid switching often cause these surges.

Lightning can cause power surges in several ways. In some cases, lightning may directly hit a plant. More common, however, nearby lightning strikes induce transient conditions onto electrical circuits which can damage electronic equipment.

In addition to lightning, facilities often experience large transients when inductive loads are switched. If unprotected, this can lead to equipment interruption and eventual damage resulting in costly downtime and repairs.

In order to prevent power surges from destroying electrical and electronic systems, all the interfaces at risk, such as signal inputs and power supplies must be connected to surge protection devices. Different surge protection components and approaches are used depending on the application.

What is the best way to protect my application?

The best way to properly approach a surge protection system is to first review the possible interfaces that will be susceptible. Remember that there are many "backdoors" which surges typically use to enter an electronic system. These should also be addressed. Types of circuits that are typically vulnerable from transient voltage include:
- AC and DC Power Supplies
- Measurement and Control Signals (I/O)
- Data Networks and Industrial Bus Systems
- Telemetry and telephone interfaces
- Antenna lines.

You can think of the system or device to be protected as being in a protection zone, see illustration. At all the intersections surge protection devices should be installed to match the nominal data of the particular type of circuit or interface to be protected. Therefore, making it impossible for transient voltage to enter the system.
Power systems protection can be accomplished in two or three stages depending on the installation and the expected source of transient surge. The surge protection devices for the individual stages differ in the level of surge arresting capacity and the protection level (clamping voltage) they belong to. A conventional three-stage concept would include the following:

**Stage 1:** Main service protection
**Stage 2:** Subdistribution protection
**Stage 3:** Device protection

Stage 1 and 2 can many times be combined in one protection system combining lightning arresting capability with switching voltage protection.

Unfortunately effective surge protection does not stop at protection of your power lines. Measurement and control signals also need to be considered, as they are additional pathways for transients to travel into sensitive electronic equipment. The choice of surge protection device depends on the type of signal processing, such as two, three, or four-conductor technology, the maximum signal voltage, and the transmission frequency.

The basic surge protection circuit is a hybrid one containing fast acting silicon avalanche diode technology coordinated with a high current handling gas discharge tube or metal oxide varistor technology. The benefit of a hybrid circuit approach provides surge current handling capacity of up to 20 kA with very accurate voltage limiting to extremely low values and short response times.

Data and telecommunication circuits are also a common pathway from which transients can enter your sensitive electronics. These surge protection devices typically utilize a coordinated hybrid circuit consisting of fast-reacting suppressor diodes and high capacity gas-filled tubes. Careful attention must be made so as to minimize attenuation on the circuit to prevent interference on the high speed switching signals.

In addition to the electrical parameters, it is best to match the surge protection device to the interface type of the application. Therefore, a wide variety of termination interface and packaging is available.
How Surge Voltages Occur in Power and Data Lines

The Causes
Surge voltages are often caused by switching operations and during electrostatic discharge.

Damage due to electromagnetic interference in electrical and electronic systems via lightning discharge is also common.

The coupling of surge voltages from one system to another can be classified as galvanic, inductive or capacitive. The different types of coupling are explained here using the example of a lightning discharge to a facility.

Galvanic Coupling
Surge voltages couple directly from the interference source to the susceptible equipment using common impedances.
High lightning current values cause a surge voltage at the ground impedance, which in turn couples into the connected lines via the common ground connection. A surge voltage also occurs along lines carrying lightning current and due to the fast rise time of the current this surge voltage can mainly be traced back to the inductive component according to ohms law: \( U_{L} = L \cdot \frac{di}{dt} \).

Inductive (Magnetic) Coupling
Inductive coupling into a conductor occurs because of the effects of the magnetic field created by adjacent surge current carrying conductors. This is similar to the effect that occurs in a transformer.
When a surge occurs on a conductor, there is a high change in current versus change in time \( \frac{di}{dt} \). At the same time, a correspondingly high magnetic field is built up around this conductor (like the primary winding function of a transformer). In other conductors such as signal and data lines run in close proximity to a power conductor, this magnetic field induces surge voltage.
The effect is many times damaged equipment with no direct influence from the source of the surge.

Capacitive Coupling
The capacitive coupling effect occurs because of the electric field created between two points with a high voltage potential difference.
An example of capacitive coupling is when lightning strikes a lightning protection system on a facility and a high electromagnetic force is generated at this point [1]. The result is then an electric field created between [1] and other points with a lower voltage potential such as a conductor from the power supply or signal lines within the building [2]. The voltage between [1] and [2] strives to equalize and there is a charge transfer. This leads to either an increase in voltage or to a surge voltage in the conductor effected [2] and the equipment connected to it.
Types of Damage Caused By Surges

How much damage will a power surge cause? That depends on the kind of equipment and/or components it reaches. Damage to electronic circuits isn't always immediately destructive in nature. Dissipative and disruptive damages are also costly and often more frequent effects from surge events.

**Destructive Damage**

Destructive damage is the easiest to troubleshoot; lightning strikes... equipment stops working. When you troubleshoot the equipment you immediately see signs of a power surge. Printed circuit board traces or components are burnt. Other examples of destructive damage include melted wire insulation and metallic parts that are deformed. You may even see smoke. It is obvious that too much energy got to your equipment and exceeded the physical and electrical breakdown level of the components.

**Disruptive Damage**

The disruptive event often occurs when a transient voltage is induced onto a signal or data line. The digital input is expecting to see a set voltage level or data stream and a transient spike confuses this process. The results are confused logic, lost files, data stream disruption and/or corruption, and ultimately system lock-up. Disruptive effects are common place to most computer users, but are generally blamed on software or hardware problems. A disruptive event that occurs during a manufacturing process can be quite costly as an entire batch or process may be lost when the "lock up" occurs.

**Dissipative Damage**

Dissipative damage can also be called the "silent killer" of electronic devices. As low energy transients strike microprocessor components the tiny semiconductor junctions are pitted away slowly until eventual damage occurs. Troubleshooting electronics that suffer from dissipative damage can be difficult as little or no physical damage is visible, yet the components will cease to function. Dissipative effects are the cumulative result of electronic stress usually caused by internally generated, lower energy, but constantly present transient events.
Surge Protection Devices for AC Power Systems

Lightning Current Arrester: First Protection Stage

When lightning is the concern, the first stage of protection should be a FLASHTRAB device or system. The FLASHTRAB technology uses a patented arc chopping spark gap to arrest the high energy of lightning events, while extinguishing the line follow-current. This approach deals directly with the high energy of even a direct flash to the building or service wiring while maintaining system uptime by the self-extinguishing follow current feature.

FLASHTRABs can be installed on the load side or line side of the main-service disconnect. However, they should always be the first step in a proper protection network. A second protection stage should then be implemented to address utility switching events.

Combination Lightning Current Arrester / TVSS: First and Second Protection Stage

For installations where transient voltage from utility and other sources are a concern, the combination lightning arrester and TVSS systems should be implemented. These systems incorporate the FLASHTRAB lightning arrester with a coordinated MOV second stage to address the low energy switching events. In most cases this eliminates the need for downstream distribution panel protection.

These combination systems can be purchased in indoor / outdoor enclosures as well as kits for installation into user supplied cabinets and enclosure systems.
TVSS (Transient Voltage Surge Suppressor) — Second Protection Stage

VALVETRABs are high-powered MOV protection designed to provide the second stage in a protection network. Their modular DIN rail mount package make them ideal for OEM and End User installations.

When designing a lightning and surge protection system, VALVETRABs are installed at the sub-distribution panels or into single and three-phase power distribution circuits.

For installations where lightning is not a concern, the VALVETRAB products are sufficient for the first stage of the protection network.

Device Protection Third Protection Stage

The final protection stage for an AC power distribution network should be directly before the critical equipment. These devices are typically connected in series with the single phase power feeding the equipment power supply. In an industrial application, this means a hard-wired DIN rail mount device that connects in series with equipment. For office or residential equipment, this means an outlet socket that a typical NEMA style plug can adapt to.

In addition to protection from transient voltages, this is the point of installation where filtering from high frequency noise is an additional benefit.
The FLASHTRAB Advantage
Combining Lightning Arresting and TVSS Technology

High Surge Current Handling and Low Protection Level
While the FLASHTRAB technology is robust enough to handle 50 kA of long duration test waveform (10/350μs), the control circuit provides low voltage protection level as low as 900 Volts, even at such high currents. Other technology (parallel MOV and SAD) sacrifices protection voltage (clamping voltage) at high discharge currents.

Lifetime Testing
Because FLASHTRAB technology was designed specifically to handle the long duration lightning impulse events, the lifetime testing has proven it to be many times more robust than TVSS designs based on parallel MOV and SAD technologies. In fact, independent laboratory testing of the units with lightning impulse testing proved the units capable of handling over 7000 events before testing was stopped with no visible failures evident.

Technology Breakthrough
The FLASHTRAB + CTRL components use a lightning arresting technique referred to as arc chopping to arrest lightning surge currents while self-extinguishing follow-current. The addition of the control circuit allows protection levels as low as 900 volts independent of surge current level. This combination makes the FLASHTRAB + CTRL devices very unique technology in the surge protection marketplace.

Superior Energy Handling
Traditional TVSS solutions used for lightning protection often make use of multiple stacks of electronic grade silicon components (MOV and / or SAD) to increase their robustness against lightning strikes. The result is often theoretical ratings of surge current in the hundreds of thousands of amps. The problem with this approach is the components used in this way were never designed to handle the energy of the typical lightning event. FLASHTRAB technology is designed to handle the high currents AND long duration events typical of a lightning strike. The following diagrams show the dramatic difference in testing standards. The 10/350μs test contains an estimated 10 times the charge of an 8/20μs test which is used to evaluate MOV performance. This comparison is in acc. to IEEE C 62.41.2 Table A.2.

Insulation
Arc Transfer
Plate (typical both sides)

Ignition
Electrode

Arc Horns

Arc Transfer Plate (typical both sides)

Crash Plate

1. Ignition due to trigger voltage.
2. Bridging of arc arresting distance between the electrodes.
3. Arc is driven outwards.
4. Sprayed over crash plate from electrode tips.
5. Arc is distributed...
6. ... moves across the arc transfer plates.
7. Arc transfer plates feed the arc in between the eraser plates.
8. Between the eraser plates single arcs are created and the reverse voltage brakes and extinguishes the following current.

8/20μs Test

10/350μs Test

Phoenix Contact
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Proven Technology and Experience
Phoenix Contact FLASHTRAB technology has been successfully used to protect electrical and electronic equipment in over 1 million installations throughout the world. Phoenix Contact has been successfully solving surge and lightning problems for industrial, commercial, telecommunication, and residential customers for over 20 years.

Tested to the Only Lightning Protection Test Waveform
FLASHTRAB technology can handle up to 50 kA / mode of surge current based on the only standardized Lightning test waveform (IEC 61024). MOV and SAD technologies are NOT designed to address the energy of a direct lightning discharge event.

Lightning Protection with Pluggable Transient Voltage Surge Suppression (TVSS)
For installations where transient surge voltage from utility and other sources are a concern, the FLASHTRAB systems are available with additional TVSS protection eliminating the need for downstream distribution panel protection. As an added feature, the TVSS protection modules can be hot-swapped in the unlikely case of a failure.

Simple and Cost Effective
While MOV arrays, Selenium-Enhanced Suppression, and Diode Arrays sound impressive, FLASHTRAB technology has been proven an effective solution worldwide typically for much less cost.

FLASHTRAB FLT+CTRL
The systems and components based on the FLASHTRAB + CTRL and intended for industrial applications. The 50 kA follow current extinguishing capability make these products well suited for any industrial service entrance application.

FLASHTRAB FLT 35 CTRL
These systems and components are ideal for light industrial and residential 120 VAC applications where lightning is a major concern. The 5 kA follow current extinguishing capability make these systems ideal for applications such as: RTUs, Telemetry Cabinets, Wireless Base Stations and Residential applications.
FLASHTRAB+CTRL
Combination Lightning
Arrestor and TVSS Systems

For Industrial
End Use Applications

Features
- Combination lightning arrestor and TVSS (Transient Voltage Surge Suppressor). Complete coordinated hybrid surge protection system.
- Discharges 50 kA lightning discharge current as tested by the only lightning protection test standard – IEC 61024, 10/350µs waveform (500 kA, 8/20µs equivalent – IEEE C62.42.1, Table A.2)
- Revolutionary Arc Chopping Spark Gap Technology. Discharges complete lightning surge currents while extinguishing up to 50 kA of line follow current.
- Residual voltage as low as 900 volts during full surge current discharge.
- Systems include 200 kA IC surge rated fusing with disconnect
- Removable (Hot Swap) TVSS modules allow quick and easy verification testing and replacement.
- Local and remote diagnostics
- NEMA 4 enclosures for installation indoor and outdoor. NEMA 4X stainless steel enclosures for installation in corrosive environments.
- Ten year no-nonsense warranty including free replacement of any failed components.

General Descriptions:
FLASH-VALVE...
This series of products combines the FLASHTRAB lightning arrester with the VALVETRAB TVSS module in an integrated ready to install enclosure system. These systems come with series 200 kA IC fuse and disconnect.

NEMA 4 versions are integrated into a watertight enclosure for outdoor or indoor applications.

NEMA 4X versions are integrated into a watertight and corrosion resistant 316 Stainless Steel enclosure system for outdoor or indoor corrosive environment

Common Applications:
- Water / Wastewater Treatment Facilities
- Pumping and lift stations
- Gas pipeline compressor and gate stations
- Mobile phone / radio base stations
- Petrochemical facilities
- Commercial buildings
- Data Centers
- Telecommunication Rectifiers

Application:
Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114

Technical data
- IEC category NDE requirement class/EN type:
- Protection Modes:
- Technology - (Functional Description):
- Connection:
- Mounting:
- Nominal line voltage UN:
- Max. Cont. Operating Voltage: MCOV
- Lightning test current I,n,p peak value (-GND):
- Measured limiting voltage at 50 kA (8/20µs) (Clamping voltage data)
- Category C1 Combination Wave (20 kV, 10 kA)- L-GND

Power System

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<td>SYS N4 FT+CT-VAL 480/277</td>
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<tr>
<td>SYSTEMTRAB, 3 phase, WYE connected incl. FLT-PLUS CTRL 0.9/I + VAL-MS 230</td>
<td>SYS N4 FT+CT-VAL 208/120-240</td>
</tr>
<tr>
<td>SYSTEMTRAB, Split Single Phase connected incl. FLT-PLUS CTRL 0.9/I + VAL-MS 230</td>
<td>SYS N4 FT+CT-VAL 240/120</td>
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<tr>
<td>SYSTEMTRAB, 3 phase, High Leg DELTA connected incl. FLT-PLUS CTRL 2.5/1 + VAL-MS 500</td>
<td>SYS N4 FT+CT-VAL 208/120-340</td>
</tr>
<tr>
<td>SYSTEMTRAB, 3 phase, Ungrounded DELTA connected (3W+G) incl. FLT-PLUS CTRL 2.5/1 + VAL-MS 500</td>
<td>SYS N4 FT+CT-VAL 440 DELTA</td>
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</tr>
</thead>
<tbody>
<tr>
<td>SYS N4 FT+CT-VAL 208/120-240</td>
<td>56 08 74 5</td>
<td>1</td>
</tr>
<tr>
<td>SYS N4 FT+CT-VAL 240/120</td>
<td>56 08 85 6</td>
<td>1</td>
</tr>
<tr>
<td>SYS N4 FT+CT-VAL 208/120-340</td>
<td>56 08 74 5</td>
<td>1</td>
</tr>
<tr>
<td>SYS N4 FT+CT-VAL 440 DELTA</td>
<td>56 03 41 9</td>
<td>1</td>
</tr>
</tbody>
</table>

1) Similar to charge of 10 times higher 8/20µs current per IEEE C62.41.2 Table A.2

Common Applications:
- Water / Wastewater Treatment Facilities
- Pumping and lift stations
- Gas pipeline compressor and gate stations
- Mobile phone / radio base stations
- Petrochemical facilities
- Commercial buildings
- Data Centers
- Telecommunication Rectifiers

For Industrial
End Use Applications

General Descriptions:
FLASH-VALVE...
This series of products combines the FLASHTRAB lightning arrester with the VALVETRAB TVSS module in an integrated ready to install enclosure system. These systems come with series 200 kA IC fuse and disconnect.

NEMA 4 versions are integrated into a watertight enclosure for outdoor or indoor applications.

NEMA 4X versions are integrated into a watertight and corrosion resistant 316 Stainless Steel enclosure system for outdoor or indoor corrosive environment
SYS N4/I ...

15.76 in (400 mm)  19.7 in (500 mm)  19.7 in (500 mm)

SYS N4X ...

SYS N4X/I ...

N / GND  L1  L2  L3

N / GND  L1  L2  L3

N / GND  L1  L2  L3

Phoenix Contact

15

SYS N4/I FT+CT-VAL 480/277 56 02 74 6

SYS N4X FT+CT-VAL 480/277 56 02 74 2 1

SYS N4X FT+CT-VAL 208/120-240 56 02 73 3 1

SYS N4X FT+CT-VAL 480 DELTA 56 03 42 1 1

Type  Article no .  Pos.

SYS N4/I FT+CT-VAL 480/277  56 02 20 1  1

SYS N4/I FT+CT-VAL 208/120  56 02 20 2  1

SYS N4/I FT+CT-VAL 240/120  56 03 41 6  1

SYS N4/I FT+CT-VAL 240HL  56 03 46 3  1

SYS N4/I FT+CT-VAL 480/277  56 01 42 0  1

SYS N4X FT+CT-VAL 208/120  56 03 16 7  1

SYS N4X FT+CT-VAL 208/120-240  56 02 73 3  1

SYS N4X FT+CT-VAL 240/120  56 03 41 8  1

SYS N4X FT+CT-VAL 240HL  56 03 46 4  1

SYS N4X FT+CT-VAL 480 DELTA  56 03 42 1  1

SYS N4X FT+CT-VAL 480 DT  56 02 74 7  1

SYS N4X FT+CT-VAL 208/120-240  56 02 73 3  1

SYS N4X FT+CT-VAL 240/120-240  56 02 73 3  1

SYS N4X FT+CT-VAL 240HL  56 03 46 4  1

SYS N4X FT+CT-VAL 480 DELTA  56 03 42 1  1
FLASHTRAB+CTRL
Combination Lightning
Arrestor and TVSS Systems

For Industrial
OEM and Panel Mount Applications

General Descriptions:
FLASH-VALVE...
This series of products combines the
FLASHTRAB+CTRL lightning arrestor with
the VALVETRAB TVSS module in an
integrated ready to install DIN rail mount
system.

The rail assembly kits come complete with
everything needed to install into your own
enclosure or control cabinet. Dry contacts
are available for connection to remote
indication such as warning lights, audio
alarms, auto-dialers, and PLC inputs.

Common applications include installation
into MCCs, pump control panels, and power
distribution gear.

Verification testing can be
accomplished on all plugs by using the
CHECKMASTER, see page 114

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYS FT+CT-VAL 208/120</td>
<td>56 03 41 5</td>
<td>1</td>
</tr>
<tr>
<td>SYS FT+CT-VAL 240/120</td>
<td>56 03 43 0</td>
<td>1</td>
</tr>
<tr>
<td>SYS FT+CT-VAL 230</td>
<td>56 03 41 5</td>
<td>1</td>
</tr>
<tr>
<td>SYS FT+CT-VAL 480/277</td>
<td>56 02 79 4</td>
<td>1</td>
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<tr>
<td>SYS FT+CT-VAL 480 DELTA</td>
<td>56 03 42 3</td>
<td>1</td>
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</table>

Technical data

<table>
<thead>
<tr>
<th>IEC category</th>
<th>VDE requirement class/EN type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category and Type</td>
<td></td>
</tr>
<tr>
<td>Protection Modes</td>
<td></td>
</tr>
<tr>
<td>Technology - (Functional Description)</td>
<td></td>
</tr>
<tr>
<td>Connection</td>
<td></td>
</tr>
<tr>
<td>Mounting</td>
<td></td>
</tr>
<tr>
<td>Nominal line voltage Uₐp</td>
<td></td>
</tr>
<tr>
<td>Max. Cont. Operating Voltage: MCCV</td>
<td></td>
</tr>
<tr>
<td>Lighting test current Iₕp</td>
<td></td>
</tr>
<tr>
<td>measured limiting voltage at 50 kA (8/20)us (Clamping voltage data)</td>
<td></td>
</tr>
<tr>
<td>Category C3 Combination Wave (20 kV, 10 kA)- L-GND</td>
<td></td>
</tr>
<tr>
<td>Category B3/C1 Combination Wave (6 kV, 3 kA)- L-GND</td>
<td></td>
</tr>
<tr>
<td>UL 1449 SVR (6 kV, 500 A). L-GND</td>
<td></td>
</tr>
</tbody>
</table>

| Follow (Power) current Interrupt Capability |
| Series connected fuse |
| Response time t₀ |
| Leakage current |
| Temperature range |
| Degree of protection in acc. with IEC 529/ EN 60 529 |
| Insulation housing |
| Insulation class in acc. with UL 34 |
| Thread |
| Torque |
| Approvals |

Based on test standards:

1) Similar to charge of 15 times higher 8/20µs current per
IEEE C62.41.2 Table A.2
SYSTEMTRAB
FLASHTRAB+CTRL
Lightning Arrestor Systems

For Industrial End Use Applications

Features
• Revolutionary Arc Chopping Spark Gap Technology. Discharges complete lightning surge currents while extinguishing up to 50 kA of follow current.
• Discharges 50 kA lightning discharge current as tested by the only lightning protection test standard — IEC 61024, 10/350μs waveform (500 kA, 8/20μs equivalent — IEEE C62.42.1, Table A.2)
• Residual voltage below 900 volts during full surge current discharge.
• Systems include 200 kA IC surge rated fusing with disconnect
• UL Listed for installation as Lightning Arrestor or TVSS. Lightning Arrestor Standard - C62.1. TVSS standard - UL 1449, 2nd Edition. 6D52
• NEMA 4 enclosures for installation indoor and outdoor.
• Ten year no-nonsense warranty including free replacement of any failed components.

General Descriptions:
FLT+CTRL...
These enclosure systems are designed to function as a lightning arrester when downstream TVSS solutions are already installed. The FLT+CTRL enclosure can be installed on either the line side or load side of the main service disconnect. The purpose is to arrest even direct lightning strikes to the structure or electrical service. Remnant voltage is typically less than 900 Volts.

Applications that also require protection against switching transients should install a FLASH-VALVE assembly shown on the previous pages.

Technical data
- IEC category NDE requirement class/EN type:
- Protection Modes:
- Technology - (Functional Description):
- Connection:
- Mounting:
- Nominal line voltage UN:
- Max. Cont. Operating Voltage: MCOV
- Lightning test current lop peak value (-GND): (10/350) μs
- Measured limiting voltage at 50 kA (8/20μs) (Clamping voltage data):

Type
SYS FT+CT 1.5 3PH
SYS FT+CT 1.5 3PH
SYS FT+CT 1.5 3PH
SYS FT+CT 1.5 3PH

Connection data
<table>
<thead>
<tr>
<th>(IEC [mm])</th>
<th>rigid</th>
<th>solid</th>
<th>stranded</th>
<th>AWG</th>
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<tr>
<td>10-50</td>
<td>15-35</td>
<td>6-1</td>
<td>8-1</td>
<td></td>
</tr>
</tbody>
</table>

Type
SYS FT+CT 1.5 3PH
SYS FT+CT 1.5 3PH
SYS FT+CT 1.5 3PH
SYS FT+CT 1.5 3PH

Service Entrance-Lightning Arrestor
- all modes (assumes N-GND Bond at service entrance
- Current limiting Arc Gap
- Screw clamp terminal block (no special tools needed)
- Wall mount:
- UL 1449 ed.2
- ERU 1449 ed.2
- NEMA LS-1

Approvals:
- Based on test standards:
- Similar to charge of 10 times higher 8/20μs current per IEEE C62.41.2 Table A.2

Phoenix Contact
FLASHTRAB + CTRL
Lightning Arrester
Components

For Industrial OEM and DIN Rail Mount
Applications

Features:
• Revolutionary Arc Chopping Spark Gap
  Technology. Discharges complete
  lightning surge currents while
  extinguishing up to 50 kA of follow current.
• Discharges 50 kA lightning discharge
  current as tested by the only lightning
  protection test standard – IEC 61024, 10/350μs waveform (500 kA, 8/20μs
  equivalent – IEEE C62.42-1, Table A.2)
• Low residual voltage during full surge
  current discharge. Residual voltage
  dependent on version selected (0.9, 1.5, or
  2.5 kV)
• DIN rail mount components allow flexibility
  in user designed configurations.
• UL Recognized for installation as Lightning
  Arrester or TVSS. Lightning Arrester
  Standard - C62.1. TVSS standard -
  UL 1449, 2nd Edition. 6D52
• Ten year no-nonsense warranty including
  free replacement of any failed
  components.

General Descriptions:

• UL Recognized for installation as Lightning
  Arrester or TVSS. Lightning Arrester
  Standard - C62.1. TVSS standard -
  UL 1449, 2nd Edition. 6D52
• DIN rail mount components allow flexibility
  in user designed configurations.
• UL Recognized for installation as Lightning
  Arrester or TVSS. Lightning Arrester
  Standard - C62.1. TVSS standard -
  UL 1449, 2nd Edition. 6D52
• Ten year no-nonsense warranty including
  free replacement of any failed
  components.

Consult factory for application
assistance in configuring your own
lightning arrester system

FLICKER

Description
FLASHTRAB, 1 pos.
FLASHTRAB, as above, however with control lamp
Wiring bridge, single phase
Universal end holder, for setting the end of an FLT group,
9.6 mm wide
Technical data
IEC category/VDE requirement class/EN type:
Technology - (Functional Description):
Connection:
Mounting:
Nominal line voltage Ua:
Max. Cont. Operating Voltage MCOV:
Lightning test current Iimp (10/350μs):
peak value:
Measured limiting voltage at 50 kA 8/20μs (Clamping voltage data):
Category CSI Combination Wave (26 kV, 10 μA)
Category B/G Combination Wave (6 kV, 3 kA)
UL 1449 SVR (6 kV, 500 A)
Follow (Power) current Interrupt Capability:
Series connected fuse:
Response time tR:
Leakage current with indicator:
Temperature range:
Degree of protection in acc. with IEC 529/EN 50 529:
Insulation housing:
Inflammability class in acc. with UL 94:
Thread:
Torque:
Approvals:
Based on test standards:

Similar to charge of 10 times higher 8/20 μs current per
IEEE C62.41.2 Table A-2

Type
FLT-PLUS CTRL-0.9
FLT-PLUS CTRL-1.5
FLT-PLUS CTRL-2.5
FLT-PLUS CTRL-0.9/I
FLT-PLUS CTRL-1.5/I
FLT-PLUS CTRL-2.5/I

Nominal line voltage (V):
500 V 50/60 Hz
440 V 50/60 Hz
330 V 50/60 Hz

Max. Cont. Operating Voltage MCOV (V):
50 kA
50 kA
50 kA

Follow (Power) current Interrupt Capability:
Series connected fuse:
Response time tR:
Leakage current with indicator:
Temperature range:
Degree of protection in acc. with IEC 529/EN 50 529:
Insulation housing:
Inflammability class in acc. with UL 94:
Thread:
Torque:
Approvals:
Based on test standards:

On the basis of IEC 51 643-1, EN 61 643-11
FLASHTRAB-PLUS
Lightning Arrestor Components

For Industrial OEM and DIN Rail Mount Applications

Features:
- Revolutionary Arc Chopping Spark Gap Technology. Discharges complete lightning surge currents while extinguishing up to 50 kA of follow current.
- Discharges 50 kA lightning discharge current as tested by the only lightning protection test standard – IEC 61024, 10/350μs waveform (500 kA, 8/20μs equivalent – IEEE C62.42.1, Table A.2)
- DIN rail mount components allow flexibility in user designed configurations
- UL Recognized for installation as Lightning Arrestor or TVSS. Lightning Arrestor Standard - C62.1. TVSS standard - UL 1449, 2nd Edition. 6D52
- Ten year no-nonsense warranty including free replacement of any failed components.

General Descriptions:
FLT-PLUS
The FLT-PLUS components are similar to the FLT+CTRL except without any ignition circuit. This means the spark over voltage is approximately 4 kV. When used with downstream TVSS components it should be assured that at least 10 meters of cabling distance exists to properly coordinate the first and second stage of protection.
These individual DIN rail mount components allows users to take advantage of the FLASHTRAB-PLUS lightning arresting features in their custom designed configuration. Bridging and accessories are shown on page 28.
The FLASHTRAB-PLUS components can be installed on either the line side or load side of the main service disconnect. The purpose is to arrest even direct lightning strikes to the structure or electrical service.

Consult factory for application assistance in configuring your own lightning arrestor system.
POWERSET
FLASHTRAB 35+CTRL
Combination Lightning
Arrester and TVSS Systems

For 120 VAC Single Phase
Light Industrial OEM and Panel Mount
Applications

Features
- Combination lightning arrester and TVSS
  (Transient Voltage Surge Suppressor) for
  120 VAC light industrial applications.
- Complete coordinated hybrid surge
  protection system.
- Discharges 35 kA lightning discharge
  current as tested by the only lightning
  protection test standard – IEC 61024,
  10/350µs waveform. (Similar to charge of
  10 times higher 8/20 ms current per
  IEEE C62.41.2 Table A.2)
- Encapsulated self-extinguishing spark gap
  arrests the lightning current, while
  extinguishing up to 5 kA of line follow
  current without exhausting.
- Residual voltage as low as 900 volts during
  full surge current discharge.
- Removable (Hot Swap) TVSS modules
  allow quick and easy verification testing
  and replacement.
- Local and remote system diagnostics
- DIN rail assemblies make installation into
  user equipment fast and easy.
- DIN rail assemblies make installation into
  DIN rail mount system.
- Local and remote system diagnostics
- Residual voltage as low as 900 volts during
  full surge current discharge.
- Ten year no-nonsense warranty.

General Description
FLT35-VALVE...
This series of products combines the
FLT35+CTRL lightning arrester with the
VALVETRAB TVSS module in an integrated
ready to install DIN rail mount system.
The two versions on this page are for
120 VAC single phase power systems. For
systems where the N-GND bond is some
distance away from the installation, a special
version is available with extra N-GND
bond protection.
The rail assembly kits come complete with
everything needed to install into your own
enclosure or control cabinet. Dry contacts
are available for connection to remote
indication such as warning lights, audio
alarms, auto-dialers, and PLC inputs.

Verification testing can be
accomplished on all plugs by using the
CHECKMASTER, see page 114

Common Applications:
- RTU and Telemetry cabinet installations.
- Telecommunication rectifiers.
- OEM power quality equipment.
- Residential and commercial facilities with
  120 VAC service.
- Mobile phone / Radio base stations.
General Description

FLT35-VALVE...

This series of products combines the FLT35+CTRL lightning arrestor with the VALVETRAB TVSS module in an integrated ready to install DIN rail mount system.

The two versions on this page are for 120 VAC split-single, and three-phase power systems. For systems where the N-GND bond is some distance away from the installation, a special version is available with extra N-GND protection.

The rail assembly kits come complete with everything needed to install into your own enclosure or control cabinet. Dry contacts are available for connection to remote indication such as warning lights, audio alarms, auto-dialers, and PLC inputs.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

### Connection data

<table>
<thead>
<tr>
<th>IEC</th>
<th>rigid</th>
<th>flexible</th>
<th>stranded</th>
<th>AWG</th>
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<tbody>
<tr>
<td>FLT</td>
<td>0.5-25</td>
<td>0.5-25</td>
<td>20-2</td>
<td></td>
</tr>
<tr>
<td>VAL-MS 230</td>
<td>0.5-25</td>
<td>0.5-25</td>
<td>20-2</td>
<td></td>
</tr>
<tr>
<td>Rem. ind. contact</td>
<td>0.14-1.5</td>
<td>0.14-1.5</td>
<td>28-16</td>
<td></td>
</tr>
</tbody>
</table>

### Description

**POWERSET**: 120/240 Split Single Phase (3W+G). Protection N-GND; Arrester combination FTL 35 CTRL-0.9/1 + VAL-MS 230/FM + FLT 100 N/PE CTRL-1.5

**POWERSET**: 120/240 Split Single Phase (3W+G), N-GND Bond. Arrester combination FTL 35 CTRL-0.9/1 + VAL-MS 230/FM

**POWERSET**: 120/208 V AC 3 phase WYE (4W+G), Protection N-GND; Arrester combination FTL 35 CTRL-0.9/1 + VAL-MS 230/FM + FLT 100 N/PE CTRL-1.5

**POWERSET**: 120/208 V AC 3 phase WYE (4W+G), N-GND Bond. Arrester combination FTL 35 CTRL-0.9/1 + VAL-MS 230/FM

**POWERSET** II/1-100 FM

**POWERSET** II/2-100 FM

**POWERSET** II/3-100 FM

**POWERSET** II/4-100 FM

**MPB** (order data, see page 29)

**ZBN 18** (order data, see page 29)

**M-PEN** (order data, see page 29)

**CLIPFIX 35**

### Technical data

**IEC category**

**VDE requirement class/EN type:**

**Technology** - (Functional Description).

**Connection:**

**Mounting:**

**Nominal line voltage UN:**

**Max. Cont. Operating Voltage:**

**Lightning test current:**

**Peak value (-GND):**

**Charge/energy:**

**Measured limiting voltage at 35 kA (8/20)us (Clamping voltage data):**

**L-GND/L-N**

**Category C3 Combination Wave (20 kV, 10 kA)**

**Category B3/C1 Combination Wave (6 kV, 3 kA)**

**UL 1449 SVR (6 kV, 500 A)**

**Follow (Power) current Interrupt Capability:**

**Series connected fuse:**

**Response time t<sub>f</sub>:**

**Leakage current:**

**Temperature range:**

**Degree of protection in acc. with IEC 529/EN 60 529:**

**Insulation housing:**

**Inflammability class in acc. with UL 94:**

**Thread:**

**Torque:**

**Approvals:**

Based on test standards:

1) Similar to charge of 10 times higher 8/20 μs current per IEEE C62.41.2Table A2

2) Depends to the kind of connection between L and L'
FLASHTRAB 35 CTRL
Lightning Arrestor Components
For 120 VAC Light Industrial OEM and DIN Rail Mount Applications

Features
• Lightning arrester for 120 VAC light industrial applications.
• Discharges 35 kA lightning discharge current as tested by the only lightning protection test standard – IEC 61024, 10/350µs waveform (350 kA, 8/20µs equivalent – IEEE C62.42.1, Table A.2)
• Encapsulated self-extinguishing spark gap arrests the lightning current, while extinguishing up to 5 kA of follow current without exhausting.
• Residual voltage as low as 900 volts during full surge current discharge.
• DIN rail mount components allow flexibility in user designed configurations
• UL 1449, 2nd Edition. 6D52
• Ten year no-nonsense warranty.

General Description
FLT 35/3...
These lightning arrestors can be used in three phase 120/208 VAC systems as the first stage of protection. One DIN rail mount housing contains the lightning arrester circuit for a three-phase system.

FLT 35/3/+1
These versions are for installations where a N-GND bond occurs some distance away from the installation and can therefore be vulnerable to differences in potential.

FLT 35 CTRL...
These individual lightning arrestors can be used for custom configurations to protect 120VAC systems. Bridging and accessories are shown on page 28.

FLT 50 N/PE and FLT 100-260
These lightning arrestors are to be used as the N-GND protection in applications where a N-GND bond is not close to the equipment being protected.

Consult factory for application assistance in configuring your own lightning arrester system.
i-channel encapsulated and triggered lightning arresters

Housing width FLT 35/3: 17.5 (1 div.) / FLT 100-35: 35 (2 div.)

Encapsulated installation block for 4/5-wire networks

Housing width FLT 35/3L: 52.5 (3 div.) / FLT 35/3+1: 70 (4 div.)

1-channel encapsulated and triggered lightning arresters

 FLT 35 CTRL-0.9
 Article no. 28 17 41 1
 Pos. 1
 Pkt. 1

 FLT 35 CTRL-1.5
 Article no. 28 16 86 4
 Pos. 1
 Pkt. 1

 FLT 35 CTRL-0.911
 Article no. 28 17 42 4
 Pos. 1
 Pkt. 1

 FLT 35 CTRL-1.5/t
 Article no. 28 17 43 7
 Pos. 1
 Pkt. 1

 FLT 50 WPE CTRL-1.5
 Article no. 28 17 45 3
 Pos. 1
 Pkt. 1

 FLT 100 WPE CTRL-1.5
 Article no. 28 56 38 8
 Pos. 1
 Pkt. 1

 Type Article no. Pcs. Type Article no. Pcs. Type Article no. Pcs.
 FLT 35 CTRL-0.9 28 17 41 1 1
 FLT 35 CTRL-1.5 28 16 86 4 1
 FLT 35 CTRL-0.911 28 17 42 4 1
 FLT 35 CTRL-1.5/t 28 17 43 7 1
 FLT 50 WPE CTRL-1.5 28 17 45 3 1
 FLT 100 WPE CTRL-1.5 28 56 38 8 1

 FLT 35/3 and FLT 35/3+1
 Encapsulated installation block for 4/5-wire networks

Housing width FLT 35/3: 17.5 (1 div.) / FLT 35/3+1: 70 (4 div.)

Hybrid-current limiting Arc Gap

Screw clamp terminal block (no special tools needed)

DIN rail mount

-40 °C to + 85 °C

UL 1449 ed.2, IEEE C62.1, IEEE C62.41, NEMA LS-1

IEC 61 643-1:1998-02, pr EN 61 643-1,
UL 1449 ed.2, IEC 62-1, IEC 62/41, NEMA LS-1
VALVETRAB
TVSS Protection for Three-Phase Applications

Features:
- Modular DIN rail mount TVSS (Transient Voltage Surge Suppression). Provides end-user and OEM power installations with increased system uptime and reliability.
- High surge current capacity protects electrical systems and equipment from switching and indirect lightning transients.
- Diagnostic monitoring of protection status with local and remote failure indication. Provides users with maximum protection reliability.
- Removable (Hot Swap) TVSS modules allow quick and easy verification testing and replacement.
- Modular design provides flexibility to meet voltage and grounding configurations for worldwide applications.
- National and international certifications including: UL 1449 - 2nd edition, CE, IEC, VDE, and CSA. Allows one TVSS supplier for global applications.
- Five year no-nonsense warranty including free replacement plugs. In the unlikely event of a plug failure, replacement at no additional component cost.

General Description:
VAL-MS 230/3+1...
This version is for European and other International 230/400 VAC three phase applications making it the ideal product for OEMs wanting to sell their equipment outside the U.S. The configuration is appropriate for installation on IEC defined TT and TN power supplies.

VAL-MS .../3+1...-UD
These versions are appropriate for popular U.S. three phase voltage systems. The special hybrid circuit means insures that there can be no leakage current to ground.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114

Common Applications
- Power distribution panels
- Motor load and control centers
- Power distribution equipment
- Control panels
- Power quality equipment
- Junction boxes feeding sensitive three phase loads
- CNC machines
- Semiconductor fabrication equipment
- Machine tool equipment
- Robotics
- Motor drives

- Maximum system reliability and uptime.

- Mode (line-to-ground) protection insuring both normal mode (line-to-line) and common mode (line-to-line) protection insuring maximum system reliability and uptime.

- Special hybrid circuit means insures that there can be no leakage current to ground.

- Five year no-nonsense warranty including free replacement plugs. In the unlikely event of a plug failure, replacement at no additional component cost.
### VAL-MS 120/3+1/FM-UD
- **Type:** 4-channel surge voltage arrester combination in the 3+1 circuit
- **Rating:** 120/208 V AC 3 phase WYE Connected (4W+G)
- **Housing width:** 70 mm (4 div.)
- **Specifications:**
  - Hybrid - MOV / Gas Discharge Tube (N-GND) - "3+1 circuit"
  - Screw clamp terminal block (no special tools needed)
  - DIN rail
- **Use Cases:**
  - Service Entrance and Distribution Panel
- **Ordering Information:**
  - **Type** | **Article no.** | **Pcs.** | **Pkt.**
  - VAL-MS 120/3+1/FM-UD | 28 56 69 2 | 1 | 1

### VAL-MS 320/3+1/FM-UD
- **Type:** 4-channel surge voltage arrester combination in the 3+1 circuit
- **Rating:** 277/480 V AC 3 phase WYE Connected (4W+G)
- **Housing width:** 70 mm (4 div.)
- **Specifications:**
  - Hybrid - MOV / Gas Discharge Tube (N-GND) - "3+1 circuit"
  - Screw clamp terminal block (no special tools needed)
  - DIN rail
- **Use Cases:**
  - Service Entrance and Distribution Panel
- **Ordering Information:**
  - **Type** | **Article no.** | **Pcs.** | **Pkt.**
  - VAL-MS 320/3+1/FM-UD | 28 56 68 9 | 1 | 1

### VAL-MS 120/240/3+1/FM-UD
- **Type:** 4-channel surge voltage arrester combination in the 3+1 circuit
- **Rating:** 240 V AC High Leg DELTA Connected (4W+G)
- **Housing width:** 70 mm (4 div.)
- **Specifications:**
  - Hybrid - MOV / Gas Discharge Tube (N-GND) - "3+1 circuit"
  - Screw clamp terminal block (no special tools needed)
  - DIN rail
- **Use Cases:**
  - Service Entrance and Distribution Panel
- **Ordering Information:**
  - **Type** | **Article no.** | **Pcs.** | **Pkt.**
  - VAL-MS 120/240/3+1/FM-UD | 56 03 35 4 | 1 | 1

---

**Note:**
- Phoenix Contact
- 25
VALVETRAB
TVSS Components

For DIN Rail Mount and Control Cabinet Applications

Features
- Modular DIN rail mount TVSS (Transient Voltage Surge Suppression). Provides end-user and OEM power installations with increased system uptime and reliability.
- Individual suppression components allow user to customize protection system for any TVSS application.
- High surge current capacity protects electrical systems and equipment from switching and indirect lightning transients.
- Diagnostic monitoring of protection status with local and remote failure indication. Provides users with maximum protection reliability.
- Removable (Hot Swap) TVSS modules allow quick and easy verification testing and replacement.
- Modular design provides flexibility to meet voltage and grounding configurations for worldwide applications.
- National and international certifications including: UL 1449 - 2nd edition, CE, IEC, VDE, and CSA. Allows one TVSS supplier for global applications.
- Five year no-nonsense warranty including free replacement plugs. In the unlikely event of a plug failure, replacement at no additional component cost.

General Description
VAL-MS...
The VAL-MS... consist of a plug and base part number. The plug is available in a variety of nominal voltages to meet most national and international power system voltages. All plugs include failure indication, and the base element with f/M includes dry contacts for wiring to external annunciators.

F-MS 12...
This high-powered gas discharge tube is most commonly used as a protection element between Neutral connections and the ground of the power supply. This provides protection to ground without leakage current.

VAL-MS.../YF
This special VALVETRAB configuration includes a hybrid circuit consisting of MOV and Gas Discharge tube. The applications for this product typically involve protection of power supplies where no leakage current is allowed to ground.

NOTE:
Please consult Phoenix Contact Technical Services for assistance in configuring your protection system.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

Surge voltage arrester with N-PE residual current spark gap as 3+1 circuit

\[ i_1, i_2, i_3 = \text{Partial surge currents along cable and varistors} \]
\[ i_4 = \text{Residual surge current along N-PE spark gap} \]
\[ i_5 = i_1 + i_2 + i_3 + i_4 \]

<table>
<thead>
<tr>
<th>Connection data</th>
<th>0.5-35</th>
<th>0.5-25</th>
<th>20-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote indicator</td>
<td>Online</td>
<td>Online</td>
<td>Online</td>
</tr>
<tr>
<td>Connection data</td>
<td>0.14-1.5</td>
<td>0.14-1.5</td>
<td>28-16</td>
</tr>
</tbody>
</table>

Note:
The contact position in the circuit diagrams on the right is with the connector plugged in and undisturbed operating mode.

Wiring bridge, single phase:
Marking labels, unprinted and printed
Marker pen
Technical data
IEC category/VDE requirement class/EN type:
Category and Type:
Protection Modes:
Technology - (Functional Description):
Connection:
Mounting:
Nominal line voltage UN:
120 V AC
230 V AC
277 V AC
400 V AC
500 V AC
Maximum surge current per mode:
Category C3 Combination Wave (20 kV, 10 kA)
Category BC/C13 Combination Wave (6 kV, 3 kA)
UL 1449 SVR (6 kV, 500 A)
Residual voltage at 5 kA:
Series connected fuse:
Response time \( t_f \):
Leakage current:
Temperature range:
Degree of protection in acc. with IEC 529/EN 60 529:
Insulation housing:
Inflammability class in acc. with UL 94:
Remote indic. contact/PDT:
Max. perm. operating current \( I_{opc} \) AC (2/3) kA
Max. perm. operating current \( I_{opc} \) DC (0/150) A
Thread:
Torque:
Approve:
Based on test standards:
<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAL-MS-SE</td>
<td>28 17 74 1</td>
<td>10</td>
</tr>
<tr>
<td>VAL-MS-SE/FM</td>
<td>28 17 73 8</td>
<td>10</td>
</tr>
<tr>
<td>VAL-MS 230</td>
<td>28 39 12 7</td>
<td>1</td>
</tr>
<tr>
<td>VAL-MS 60 ST</td>
<td>28 07 57 3</td>
<td>10</td>
</tr>
<tr>
<td>VAL-MS 120 ST</td>
<td>28 07 58 8</td>
<td>10</td>
</tr>
<tr>
<td>VAL-MS 230 ST</td>
<td>28 07 59 9</td>
<td>10</td>
</tr>
<tr>
<td>VAL-MS 320</td>
<td>28 07 60 9</td>
<td>10</td>
</tr>
<tr>
<td>ZBN 18 (order data, see page 29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPB ... (order data, see page 29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M-PEN (order data, see page 29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Entrance and Distribution Panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIN rail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60 V</td>
<td>120 V</td>
<td>230 V</td>
</tr>
<tr>
<td>100 V/120 V</td>
<td>200 V</td>
<td>250 V</td>
</tr>
<tr>
<td>200 V/120 V</td>
<td>350 V/250 V</td>
<td>500 V/350 V</td>
</tr>
<tr>
<td>40 kA</td>
<td>40 kA</td>
<td>40 kA</td>
</tr>
<tr>
<td>50 kV (15 kA)</td>
<td>800 V</td>
<td>1.35 kV</td>
</tr>
<tr>
<td>&lt; 50 kV (15 kA)</td>
<td>&lt; 850 V</td>
<td>&lt; 1.15 kV</td>
</tr>
<tr>
<td>&lt; 300 V</td>
<td>&lt; 590 V</td>
<td>&lt; 1.5 kV</td>
</tr>
<tr>
<td>300 V</td>
<td>400 V</td>
<td>1 kV</td>
</tr>
<tr>
<td>300 V</td>
<td>550 V</td>
<td>1 kV</td>
</tr>
<tr>
<td>125 A</td>
<td>125 A</td>
<td>125 A</td>
</tr>
<tr>
<td>25 ns</td>
<td>25 ns</td>
<td>25 ns</td>
</tr>
<tr>
<td>0.3 mA</td>
<td>0.3 mA</td>
<td>0.26 mA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-MS 12</td>
<td>28 17 97 4</td>
<td>1</td>
</tr>
<tr>
<td>F-MS 12 ST</td>
<td>28 17 99 0</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAL-MS 230VF ST</td>
<td>28 17 99 0</td>
<td>10</td>
</tr>
<tr>
<td>VAL-MS 350VF ST</td>
<td>28 17 99 0</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-PEN (order data, see page 29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service Entrance and Distribution Panel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DIN rail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>210 V AC</td>
<td>230 V AC</td>
<td>350 V AC</td>
</tr>
<tr>
<td>20 kA</td>
<td>20 kA</td>
<td>20 kA</td>
</tr>
<tr>
<td>≤ 500 V (10 kA)</td>
<td>≤ 1.2 kV (10 kA)</td>
<td></td>
</tr>
<tr>
<td>≤ 1 kV</td>
<td>≤ 1 kV</td>
<td></td>
</tr>
<tr>
<td>1 kV</td>
<td>≤ 0.95 kV</td>
<td></td>
</tr>
<tr>
<td>≤ 500 V</td>
<td>≤ 1 kV</td>
<td></td>
</tr>
<tr>
<td>125 A</td>
<td>125 A</td>
<td>125 A</td>
</tr>
<tr>
<td>≤ 100 ns</td>
<td>≤ 100 ns</td>
<td></td>
</tr>
<tr>
<td>1 mA</td>
<td>1 mA</td>
<td></td>
</tr>
</tbody>
</table>

On the basis of IEC 61 643-1, EN 61 643-1, UL 1449, 2nd edition
General Descriptions
DK-BIC 35
This product is useful when designing surge protection systems with Phoenix Contact's modular VALVETRAB and FLASHTRAB components. It is a feed-through block in the same footprint as the VALVETRAB and FLT35 series of products. Therefore, you can use it to bus connections and power back and forth across the DIN rail.

ZBN 18...
The marking labels can be ordered with standard symbols or as a blank strip to be custom marked with either a pen or by a Computer Marking System (CMS). These marking strips are useful for the FLASHTRAB, VALVETRAB, and PLUGTRAB series of surge protective devices.

MPB...
The MPB bridge bars can be used for bridging VALVETRAB and FLASHTRABs together as well as to other DIN rail mount devices such as circuit breakers and terminal blocks.

<table>
<thead>
<tr>
<th>Description</th>
<th>Color</th>
<th>Type</th>
<th>Article no.</th>
<th>Article no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feed-through terminal block</td>
<td>DK-BIC-35</td>
<td>27 4988 9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Marking labels, unprinted, printed horizontally with L1, L2, L3, N, +, 4, 4, 4, 4, 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marker pen, for labeling marking labels Marking wipe and water-proof, light-resisting to a limited extent</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPB wiring bridge, to bridge one phase or the equipotential connections, for single-phase wiring of m.c.b.s.</td>
<td>&amp;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPB wiring bridge, to bridge two phases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPB wiring bridge, to bridge three phases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPB wiring bridge, to bridge four phases or L1, L2, L3, N</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexible wiring bridge, 16 mm² a cable lug on one side, in a choice of three lengths</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rated voltage Uc</td>
<td>500 V DC/AC</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Nominal current In</td>
<td>125 A/50 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lightning test current Imax (10/50) u.s.</td>
<td>100 kA/50 As</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charge / Specific energy</td>
<td>2.5 M32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature range</td>
<td>40 °C to +80 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection in acc. with IEC 60529/ EN 60 529:</td>
<td>IP 20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation housing</td>
<td>PA-F</td>
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<td></td>
</tr>
<tr>
<td>Immobility class in acc. with UL 94:</td>
<td>V0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connection data</td>
<td>rigid/flexible / AWG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thread / Torque</td>
<td>M5/4.5 Nm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approvals</td>
<td>UL</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Test standards</td>
<td>On the basis of IEC 61643-1:1998-02, UL 1059, UL 486E</td>
<td></td>
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</tr>
<tr>
<td>Type</td>
<td>Article no.</td>
<td>Pcs.</td>
<td>Pkt.</td>
<td></td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>ZBN 18: SO/CMS</td>
<td>08 06 76 3</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZBN 18: UNPRINTED</td>
<td>28 06 12 8</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZBN 18, LGS/L1-N</td>
<td>27 45 57 6</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZBN 18, LGS/GROUND</td>
<td>27 45 58 9</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-PEN 0.35</td>
<td>08 11 22 8</td>
<td>10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPB 18/1-2</td>
<td>28 06 20 9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-3</td>
<td>28 06 21 2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-4</td>
<td>28 06 22 5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-5</td>
<td>27 48 56 4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-6</td>
<td>27 48 27 8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-8 BU</td>
<td>27 48 47 0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-8 BU</td>
<td>27 48 57 7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-8</td>
<td>27 48 58 0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-12</td>
<td>27 48 69 3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/1-57</td>
<td>29 05 23 8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/2-4</td>
<td>29 59 33 0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/3-6</td>
<td>28 06 24 1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/3-9</td>
<td>28 06 25 4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/4-8</td>
<td>28 06 28 3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB 18/4-12</td>
<td>28 09 29 6</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MPB F300x16/1GS</td>
<td>28 16 33 9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>MPB F400x16/1GS</td>
<td>28 16 34 2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>MPB F500x16/1GS</td>
<td>28 18 35 5</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

---

**ZBN 18**
Marking labels

**MPB F... and MPB 18...**
TRABTECH wiring bridge
MAINS-PLUGTRAB
Device Protection

For DIN Rail Mount and Control Cabinet Installations.

Features:
• Modular DIN rail mount TVSS (Transient Voltage Surge Suppression). Provides end-user and OEM power installations with increased system uptime and reliability.
• Removable (Hot Swap) TVSS modules allow quick and easy verification testing and replacement.
• Series-connected providing easy installation with low ground-impedance connection.
• Integrated DIN rail grounding foot provides low impedance ground connection and optimum surge protection performance.
• 24, 60, 120 and 230 V AC plugs available for national and international voltage applications.
• 48 V DC versions for special telecommunication rectifier applications.
• 10 kA (8/20µs) surge current rating for protection against switching and indirect lightning transients.
• Diagnostic monitoring of protection status with local and remote failure indication. Provides users with maximum protection reliability.
• National and international certifications including: UL 1449 - 2nd edition, CE, IEC, VDE, and CSA. Allows one TVSS supplier for global applications.
• Five year no-nonsense warranty including replacement at no additional component cost.

General Description
PT 2-PE/S... This product is for protection of single phase power supplies and rectifiers such as found in telecommunication applications. The DIN rail mount feature makes it ideal for control cabinet applications. The pluggable surge protection element allows hot-swap capability in the unlikely event of a plug failure.

PT 2+1-S-48DC This product is ideal for protection of 48 V DC power supply and rectifiers such as found in telecommunication applications. The SAD (Silicon Avalanche Diode) circuit provides very low clamping voltage.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114

Common Applications:
• PLC and DCS power supplies
• Telecommunication rectifiers
• RTU and Telemetry cabinets
• Control cabinets
MAINTRAB
Device Outlet Protection

For Equipment with NEMA Style AC plugs

Features:
• Diagnostic monitoring of protection status with visual and audio indication. Provides users with maximum protection reliability.
• Outlet protects all equipment connected to it. Save money by installing a simple power strip and protect all outlets on the power strip.
• Five year no-nonsense warranty including free replacement plugs. In the unlikely event of a plug failure, replacement at no additional component cost.

General Description
MNT-1/A NEMA
The MAINTRAB outlet protection provides surge protection for AC powered equipment from internal sources of transients. The hybrid circuit provides protection in both normal mode (line-to-neutral) and common mode (line-to-ground).

Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge voltage protection, Attachment plug with optical and acoustic signalling</td>
<td>black for plugging into a socket, for device protection black</td>
</tr>
</tbody>
</table>

Technical data

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 2+1-S-48DC</td>
<td>28 17 95 8</td>
<td>10</td>
</tr>
<tr>
<td>PT 2+1-S-48DC-ST</td>
<td>28 39 64 8</td>
<td>10</td>
</tr>
<tr>
<td>PT-BE/FR</td>
<td>28 39 28 2</td>
<td>10</td>
</tr>
</tbody>
</table>

Series connected fuse:

Screw clamp terminal block (no special tools needed)

DIN rail

48 DC
60 V DC
25 A
500 A
60 Hz ± 5% ± 10% ± 15%
-40 °C to +85 °C
120 V
15 A
0.03 A
UL in process

IEC 61643-1:1999-02.
NEMA LS-1

Phoenix Contact
NEF Filters
Device Protection / Filtering

Features
- Provides additional protection against high frequency interference providing additional equipment reliability and EMC compliance.
- National and international certifications including: UL 1283, CE, IEC, and VDE. Allows one supplier for global applications.
- Modular DIN rail mount package provides quick and easy installation into control cabinets and OEM applications. No additional mounting accessories required.

General Description:
The NEF filters are low pass filters for single phase power supplies up to 240 VAC. The additional filtering provides EMC compliance for many CE requirements. Used with the MAINS-PLUGTRAB provides protection against transient voltage and high frequency noise.

Description
- Interference filter, with universal tool for mounting on DIN or V-rail
- Zack strip, 16-section, white

Technical data
- Category and Type
- Protection Modes
- Technology (Functional Description)
- Connection data
- Mounting
- Nominal voltage UN:
- Max. Cont. Operating Voltage: MCOV
- Maximum Continuous Line Current IN: UL 1449, 2nd edition
- Series connected use:
- Leakage current:
- Input attenuation (50 Hz): L-N / L-GND
- Inductance per path:
- Temperature range:
- Degree of protection in acc. with IEC 529/EN 60 529
- Inflammability class in acc. with UL 94
- Thread:
- Torque:
- Approvals:
- Test standards:
- Symmetrical curve (50 Hz)
- Asymmetrical curve (50 Hz)

Diagram and Tables
- Housing width: 25
- Technical data table
- Connection data
- Type
- Article no.
- Characteristics graph
NEF 1-3
Interference filter

Housing width 25

IN

OUT

unprotected

protected

NEF 1-10
Interference filter

Housing width 40

IN

OUT

unprotected

protected

Type | Article no. | Pcs. | Pkt.
---|------------|-----|-----
NEF 1-3 | 27 94 11 0 | 10 | 1
ZB 6 (order data, see page 71)

Point of Use - Hard Wired Single Phase
L-N, L-GND, N-GND
Hybrid - MOV / Gas Discharge Tube
Screw clamp terminal block (no special tools needed)
DIN rail
230/240 V AC
264 V AC
3 A
3 A
\( < 0.5 \text{ mA} \)
\( < 35 \text{ dB} \) (1 MHz)
2.7 mH
\(-25 ^\circ \text{C to } +85 ^\circ \text{C (HPF)}\)
IP 20
V2-V6
M3
0.8 Nm

EN 133 200: 1994/DIN EN 133 200/VDE 0565 part 3-1: 1996-06
UL 1414, UL 1283, NEMA LS-1

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Type | Article no. | Pcs. | Pkt.
---|------------|-----|-----
NEF 1-10 | 27 88 97 7 | 5 | 1
ZB 6 (order data, see page 71)

Point of Use - Hard Wired Single Phase
L-N, L-GND, N-GND
Hybrid - MOV / Gas Discharge Tube
Screw clamp terminal block (no special tools needed)
DIN rail
230/240 V AC
264 V AC
10 A
10 A
\( < 2.5 \text{ mA} \)
\( < 40 \text{ dB} \) (1 MHz)
1.8 mH
\(-25 ^\circ \text{C to } +85 ^\circ \text{C (HPF)}\)
IP 20
V2-V6
M3
0.4 Nm

EN 133 200: 1994/DIN EN 133 200/VDE 0565 part 3-1: 1996-06
UL 1414, UL 1283, NEMA LS-1

---

Characteristic attenuation curve

---

Characteristic attenuation curve
**EM-DUO w/ SPD**

**Device Protection**

**DIN rail mount convenience outlet with TVSS**

**Features**
- DIN-rail mount surge protected utility outlet makes control cabinet installation fast and easy.
- Each 120 VAC outlet is protected against transient voltages increasing system reliability.
- Robust PVC housing is fully isolated.
- Available with protected terminal blocks outputs to protect additional hard-wired loads.
- Diagnostic monitoring of protection status with local failure indication. Provides users with maximum protection reliability.
- UL-1449 2nd edition listed.

**General Description**

**EM-DUO-120/15/SPD...**

The dual utility outlet with surge protection device protects laptops, instrumentation, or other sensitive 120 VAC powered equipment from damage caused by transients on your AC power branch circuit.

The outlets are packaged in a touch safe box to eliminate the possibility of accidental shock. The universal mounting foot allows the outlet box to be mounted vertically in your panel and a reliable connection can be achieved via an easy to wire screw clamp terminal block.

**EM-DUO-120/15/SPD/AUX**

This version features the benefit of hard-wired terminal blocks output so in addition to protection of the NEMA outlet, you can protect other loads connected to this power distribution.

**Technical data**

- **IEC category / VDE requirement class / EN type:**
  - Category and Type:*
  - Protection Modes:
  - Technology - (Functional Description):
  - Connection:
  - Mounting:
  - Nominal line voltage UN:
  - Max. Cont. Operating Voltage: MCOV:
  - Maximum Continuous Line Current I(N) - (UL 1449, 2nd edition): 15 A
  - Maximum Surge Current (Single Impulse - 8/20μS): 5 kA
  - Measured limiting voltage categories:
    - C1 / B3 Combination Wave (6kV, 3kA; L-N(PE))
    - UL 1449 SVR (6kV, 500A) L-N
  - Series connected fuse:
    - UL 1449 5V 900A L-N
  - Response time ta:
    - ≤ 5 ns
  - Leakage current (operating current):
    - 100 μA
  - Temperature range:
    - 0 °C to + 40 °C
  - Insulating housing:
  - Approvals:

**Connection data**

- | (IEC) | rigid | solid | stranded | AWG | I [A] | U [V] |
- | [mm²] | | | | | | |
- | 0.2-6 | 0.2-4 | 24-10 | 15 | 120 |

**Type**

- **EM-DUO-120/15/SPD**
- **EM-DUO-120/15/SPD/AUX**

**Point of Use - Hard Wired Single Phase**

- L-N, L-GND, N-GND

**Screw clamp terminal block (no special tools needed) and NEMA outlet DIN rail**

---

*Note: Specific details and diagrams are not fully transcribed due to image quality limitations.*
SFP TVSS / Filter

Device Protection

TVSS and Combined Filter for High Frequency Applications

Features
- Combination TVSS and EMI/RFI filter circuit provides tight voltage clamping, electrical noise filtering, and high surge current handling capacity for total equipment protection.
- DIN rail mount housing with reliable screw clamp terminal block connections provides fast and easy control cabinet installation.
- 10 kA (8/20µs) (per mode) surge current rating for protection against switching and indirect lightning transients.
- Rugged metal housing improves EMI/RFI filtering.
- Diagnostic monitoring of protection status with local and remote failure indication. Provides users with maximum protection reliability.
- National and international certifications including: UL 1449 – 2nd edition, CE, IEC, VDE, and UL 1283. Allows one TVSS supplier for global applications.
- Five year no-nonsense warranty. In the unlikely event of a failure, replacement at no additional cost.

General Description
SFP 1-20/120AC...
This product provides both EMI/RFI filtering and transient voltage surge suppression in one industrial DIN rail mount package. Best used in applications where tight clamping and high surge current capabilities are required.

Common Applications:
- PLC and DCS power supplies
- RTU and Telemetry Cabinets
- Instrumentation and Control Cabinets
- Medical equipment power distribution
- Motion control systems

Diagram and technical specifications:
- Connection data
- Remote ind. Contact
- Description
- Surge protection TVSS with filter
- Technical data
- IEC category / VDE requirement clas / EN types
- Protection Modes
- Technology (Functional Description)
- Connection
- Mounting
- Nominal Line Voltage U(N):
- AC
- Max. Cont. Operating Voltage: MCOV:
- AC
- Maximum Continuous Line Current I(N) - UL 1449. 2nd edition:
- Maximum surge current (Single Impulse - 8/20µs) per mode:
- Measured limiting voltage at 3 kA (8/20µs) Clamping voltage data:
- Series connected use:
- Response time t(1):
- Leakage current/operating current:
- Temperature range:
- Insulation Housing:
- Insulation class in acc. with UL 94:
- Degree of protection in acc. with IEC 60529/ EN 60 529:
- Remote int. contact POF/ N/C:
- Thread:
- Power/Remote:
- Approvals:
- Based on test standards:

Articulate no.
SFP 1-20/120AC 28 56 70 2 1

II/D / T3
Point of Use - Hard Wired Single Phase
L-N, L-GND, N-GND
Hybrid - MOV / Gas Discharge Tube
Screw clamp terminal block (no special tools needed)
DIN rail
150 V
175 V
20 A/45°C
10 kA
25 ns
0,5 mA/10 mA
-40 °C bis + 85 °C
V0
IP 20
250 V AC, 1 A
M3/M2
0.5-0.6 Nm/0.25 Nm
UL 1449 and UL 1283
IEC 61643-1, EN 61643-11
UL 1283, UL 1449 ed.2, NEMA LS-1
Surge Protection Devices for Measurement and Control Signals

Discrete Signal Protection – Common (Ground) Referenced Circuits
Signal circuits with a common reference such as those used for on/off control (binary) should be protected with a circuit that keeps the transient voltage between line and common below an acceptable level depending on the nominal operating voltage of the system.

Hybrid protection circuits are typically used to provide low clamping voltage and high surge current handling capacity.

The block diagram below shows the typical hybrid design protection circuit for discrete signal protection.

Analog Signal Protection – Floating Ground Circuits with Two Conductors
Floating ground signals such as 4-20 mA loops should be protected with a circuit that offers tight clamping line to line (normal mode) and coarse protection line to line and line to ground (normal and common mode). This design assures the integrity of the floating ground signal as no component with leakage current is connected to ground (only the gas discharge tube makes a ground connection).

Hybrid protection circuits are typically used to provide low clamping voltage and high surge current handling capacity.

The block diagram below shows the typical hybrid design protection circuit for floating ground two conductor signal circuits.
Three and Four Wire Signal Protection

Three and four wire sensor signals such as RTD and Strain gage (load cell) applications require a special approach for surge protection. Transient voltage should be clamped line to line (normal mode) between all signal lines, and line to ground for common mode surge current handling.

To prevent signal loss when protecting sensor signals, special care must be taken to assure no series impedance is added to the circuit (therefore, affecting the normal operation).

Hybrid protection circuits are typically used to provide low clamping voltage and high surge current handling capacity.

The block diagram below shows the typical hybrid design protection circuit for three and four wire signal protection.

120 VAC Discrete Signal Protection

For 120 VAC discrete (on / off) I/O signals a unique suppression circuit must be used. When protecting signal circuits with voltages higher than 24 VAC, common mode gas discharge tube protection can be problematic. The gas discharge tube can ignite with enough “follow-current” to interrupt upstream fusing. This is undesirable because you now sacrifice system uptime by having to replace fuses. Therefore, the protection circuit for 120 VAC discrete I/O signals features primarily an MOV circuit as the protection scheme, which eliminates the follow-current issues.

Thermal disconnects are typically used in these protection circuits.

The block diagram shows the typical circuit design for protecting non-isolated 120 VAC discrete I/O. For isolated cards (separate line and neutral for each I/O point) the MAINS PLUGTRAB on page 30 should be used.

Intrinsically Safe Circuits

Surge protective devices used in Intrinsically Safe circuits must meet special international standards for use in such hazardous areas. To insure a safe installation, 500 V isolation from all metal installations and other intrinsically safe circuits is a requirement of EN 50 020/DIN EN 50 020/VDE 0170/0171 part 7:1996-04 and DIN VDE 0165. Additionally, special approvals are required to insure that the devices installed in a hazardous area application are safe.
<table>
<thead>
<tr>
<th>Signal description</th>
<th>Technology</th>
<th>Sample applications</th>
<th>Common reference potential</th>
<th>Reference potential grounded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current loops</strong></td>
<td></td>
<td>Level measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transmission over longer distances</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pressure measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flow measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Temperature measurement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 (4) - 20 mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| **Voltage signals** |            | Potentiometer settings (transmission over short distances) |                      |                            |
|                     |            | Slide settings      |                           |                            |
|                     |            | Push buttons        |                           |                            |
|                     |            | ON/OFF Actuators    |                           |                            |
|                     |            | Solenoid            |                           |                            |
|                     |            | Limit Switches      |                           |                            |
| 0 - 10 V            |            |                      |                           |                            |

| 24 V DC and 120 V AC discrete I/O (binary – ON/OFF) |            | 120 V AC ON/OFF Control |                           |                            |
| Temperature sensors (RTD, Thermocouples) |            |                            |                           |                            |
| Loadcells / Strainage |            |                            |                           |                            |

| **Intrinsically safe circuits** |            | Level measurement at the tank 4-20 mA signals) |                      |                            |
| Temperature sensors |            |                            |                           |                            |
| Loadcells / Strainage |            |                            |                           |                            |

⚠️ For documentation on the corresponding sample installations, please see pages 116-119.
<table>
<thead>
<tr>
<th>Connection system</th>
<th>Pluggable</th>
<th>Recommended surge voltage protection device</th>
<th>Design width per single conductor or double conductor</th>
<th>No. of single or double conductors per module</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 1x2...</td>
<td>✓</td>
<td>PT 1x2...</td>
<td>18 mm/DC 9 mm/DC</td>
<td>1 DC</td>
<td>42</td>
</tr>
<tr>
<td>CTM 1x2... with CTM 10-MAG and CT-TERMIBLOCK</td>
<td>✓</td>
<td>9.5 mm/DC</td>
<td>1 DC</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>TT-2-PE-...</td>
<td>✓</td>
<td>6 mm/DC</td>
<td>1 DC</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>CTM 1x2... with CTM 10-MAG and LSA disconnect strip</td>
<td>✓</td>
<td>9.5 mm/DC</td>
<td>1 DC</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>PT 1x2...</td>
<td>✓</td>
<td>PT 1x2...</td>
<td>18 mm/DC 9 mm/DC</td>
<td>1 DC</td>
<td>42</td>
</tr>
<tr>
<td>CTM 1x2... with CTM 10-MAG and CT-TERMIBLOCK</td>
<td>✓</td>
<td>9.5 mm/DC</td>
<td>1 DC</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>TT-2-PE-...</td>
<td>✓</td>
<td>6 mm/DC</td>
<td>1 DC</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>CTM 1x2... with CTM 10-MAG and LSA disconnect strip</td>
<td>✓</td>
<td>9.5 mm/DC</td>
<td>1 DC</td>
<td>62</td>
<td></td>
</tr>
<tr>
<td>PT 2x1... with PT 2x1-BE</td>
<td>✓</td>
<td>9 mm/C</td>
<td>2 C+ GND</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>PT 4x1... with PT 4x1-BE</td>
<td>✓</td>
<td>4.4 mm/C</td>
<td>4 C+ GND</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>CTM 2x1... with CTM 10-MAG and CT-TERMIBLOCK</td>
<td>✓</td>
<td>4.5 mm/DC</td>
<td>2 C</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>TT-2/2/-...</td>
<td>✓</td>
<td>3 mm/C</td>
<td>2 C</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>CTM 2x1... with CTM 10-MAG and LSA disconnect strip</td>
<td>✓</td>
<td>4.5 mm/C</td>
<td>2 C</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>PT 2x1... with PT 2x1+F-BE</td>
<td>✓</td>
<td>9 mm/C</td>
<td>2 C+ GND</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>PT 4x1... with PT 4x1+F-BE</td>
<td>✓</td>
<td>4.4 mm/C</td>
<td>4 C+ GND</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>TT-2/2/-... + PT 2-F-...</td>
<td>✓</td>
<td>6 mm/C + 17.5 mm/B</td>
<td>2 C</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>PT 2xVA-120AC-ST with PT BE/FM</td>
<td>✓</td>
<td>9 mm/C</td>
<td>2 C+ GND</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>PT 2-PE/S-120AC-ST with PT BE/FM</td>
<td>✓</td>
<td>18 mm/DC</td>
<td>1 DC+ GND</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>PT 4... with PT 4-BE</td>
<td>✓</td>
<td>4.4 mm/C</td>
<td>4 C</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>PT 2xEX(I)</td>
<td>✓</td>
<td>9 mm/DC</td>
<td>2 DC</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>TT-EX(I)</td>
<td>✓</td>
<td>6 mm/DC</td>
<td>1 DC</td>
<td>51</td>
<td></td>
</tr>
<tr>
<td>PT 4-EX(I)</td>
<td>✓</td>
<td>9 mm/DC</td>
<td>4 C</td>
<td>44</td>
<td></td>
</tr>
</tbody>
</table>

- LSA-PLUS
- Screw connection
- C → Single conductor
- DC → Double conductor
- B → Bus bar
**MCR-PLUGTRAB PT**

**Pluggable Surge Protection Devices – Hybrid Designs**

**Features**
- Double density packaging provides protection for up to four discrete or two analog signals per 17.5 mm of DIN rail space.
- Up to 10 kA (8/20 μs) surge current handling capacity for protection against internal and external sources of surges including lightning strikes.
- Easy plug-to-base connections facilitate installation.
- Self-coding for different voltage plugs provides assurance against misapplication.
- Quick-mount grounding foot provides easy connection and low impedance ground for the best voltage clamping performance.
- Pluggable suppression can be "hot-swapped" for verification testing.
- Hybrid protection circuit provides "fine" voltage clamping with "coarse" surge current handling.
- Class I, Div 2 certified for hazardous area locations (UL 1604) allows Div 2 installation without special and costly enclosures or purge systems.
- 5-year free plug replacement warranty provides added risk free investment.

**General Descriptions:**

**PT 2x2...**
This series of products is for protecting two analog loops (4-20 mA) in one 17.5 mm protection package. Each PT 2x2 protects two independent floating ground signal circuits.

**PT 4x1...**
This series of products is for protecting up to four discrete I/O (on/off) signals (using a common return) in one 17.5 mm protection package.

**PT 4...**
The PT 4 is for protecting three and four wire sensor signals such as RTD and Strain Gage (load cell) applications. The protection circuit features a "zero-ohm" decoupling so that no series impedance can effect the low level sensor signals. Protection is normal mode and common mode for all signal conductors.

**Note: Selection of PT Base Element**

**PT ...-BE**
This base element should be used in installations where the common return or shield is to be grounded at the DIN rail. The connections for ground (9/10) are connected directly to the mounting foot (3/4).

**PT ...+F-BE**
This base element should be used in installations where the common return (or shield) is to be isolated (floating) from the earth ground at the connection point. Terminate the common return (or shield) to positions 9/10 and earth ground to positions 3/4. Now you will have gas tube isolation (no leakage current) between your common return (or shield) and earth ground. In addition to any normal mode protection, you will also have protection line to common (or shield), and common (or shield) to ground.

See installation instructions on page 116 for more detail.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

**Shield fast connection SSA**

See page 72
Double conductor protection for two floating signal circuits

Protection for four conductors with a common reference potential

Housing width 17.5

Three/four-conductor protection for floating signal circuits

Housing width 17.5
Pluggable Surge Protection Devices – Hybrid Designs

General Descriptions:
PT 1x2...
This series of products is for protecting one analog loop (4-20 mA) in one 17.5 mm protection package. Each PT 1x2 protects one independent floating ground signal circuit.

PT 2x1...
This series of products is for protecting up to two discrete I/O (on / off) signals (using a common return) in one 17.5 mm protection package.

PT P EJS+1x2-24...
These products combine protection for one 24 VDC (AC) power supply circuit and one floating ground analog loop (4-20 mA) signal. Common applications include four wire (24 VDC) powered transmitters. The PT PE/S+1x2-24... protects these four wire applications with only one product saving cost and panel space.

PT 2x1 VA...
This series of products protects two 120 VAC discrete I/O for non-isolated PLC cards. The MOV circuit features thermal protection with LED and remote contact indication of suppression failure. For isolated 120 VAC discrete I/O cards use the MAINS-PLUGTRAB PT 2-PE/S found on page 30.

Note: Selection of PT Base Element
PT ...-BE
This base element should be used in installations where the common return or shield is to be grounded at the DIN rail. The connections for ground (9/10) are connected directly to the mounting foot (3/4).

PT ...+F-BE
This base element should be used in installations where the common return (or shield) is to be isolated (floating) from the earth ground at the connection point. Terminate the common return (or shield) to positions 9/10 and earth ground to positions 3/4. For isolated 120 VAC discrete I/O cards use the MAINS-PLUGTRAB PT 2-PE/S found on page 30.

see installation instructions on page 116 for more detail.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.
**PT 2x1...**
Protection for two conductors with a common reference potential.

**Housing width 17.5**

**PT PE/S+1x2-24-ST**
Combination arrester for the power supply and a floating signal circuit.

**Housing width 17.5 (1 div.)**

**PT 2x1VA...**
Protection for two conductors.

Housing width 17.5
MCR-PLUGTRAB PT Pluggable Surge Protection Devices – Hybrid Designs for EEx ia Circuits

General Descriptions:
The PT...EX(I) are surge protection devices designed specifically for the special requirements of intrinsically safe circuits. The areas of application are the EX protection zones 0, 1, and 2 and NFPA defined Division 1 and 2 areas. The protective circuits comply with standards such as EN 50020/DIN EN 50020/VDE 0170/0171 part 7:1996-04 and DIN VDE 0165 by providing 500 V isolation to all metal installers and other safe circuits.

PT 2xEX(I)-24DC
This product is for the protection of two mutually independent intrinsically safe circuits.

PT 4-EX(I)-24DC
This product is for the protection of intrinsically safe circuits in three or four-wire sensor circuits. The protection circuit features a "zero-ohm" decoupling so that no series impedance can effect the low level sensor signals.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

<table>
<thead>
<tr>
<th>Description</th>
<th>Voltage UN</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MCR-PLUGTRAB plug</td>
<td>24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MCR-PLUGTRAB header for mounting on</td>
<td>24 V DC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zack strip, white</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shield fast connection, for diameters</td>
<td>3 - 6 mm</td>
<td>5 - 10 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Technical data

<table>
<thead>
<tr>
<th>IEC category/VDE requirement class</th>
<th>Max. cont. operating voltage: MCOV:</th>
<th>DC/AC</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. cont. operating current I at 40 °C:</td>
<td>450 mA</td>
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<tr>
<td>Max. single impulse discharge (8/20)μs:</td>
<td>10 kA/10 kA</td>
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<td></td>
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<tr>
<td>Total surge current (8/20)μs:</td>
<td>20 kA</td>
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<td>Limiting (clamping) voltage at 1 kV/μs:</td>
<td>45 V</td>
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<tr>
<td>Response time t for paths:</td>
<td>1.2 μs</td>
<td></td>
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</tr>
<tr>
<td>Resistance per path:</td>
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<tr>
<td>Temperature range:</td>
<td>-40 °C to +85 °C</td>
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<tr>
<td>Inflammability class in accord. with UL 94:</td>
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<tr>
<td>Degree of protection in accord. with IEC 529: EN 60 529:</td>
<td>IP 20</td>
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<tr>
<td>Approvals:</td>
<td>Class 1, Division 2, Groups A, B, C &amp; D</td>
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<td></td>
<td></td>
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<tr>
<td>Intrinsic Safety Rated:</td>
<td></td>
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<tr>
<td>Based on test standards:</td>
<td>IEC 60255</td>
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<td></td>
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</tbody>
</table>

PT 2xEX(I)-24DC
Two conductor protection for 2 EEx ia circuits

Housing width 17.5

Connection data

Connection data

Type | Article no. | Pcs. Pkt. | | | |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 2xEX(I)-24DC-ST</td>
<td>28 39 22 9</td>
<td>10</td>
<td></td>
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</tr>
<tr>
<td>PT 2xEX(I)-BE</td>
<td>28 39 27 9</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ZBFM 5 (order data, see page 71)</td>
<td>28 39 25 10</td>
<td></td>
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<tr>
<td>ZBN 18 (order data, see page 29)</td>
<td>28 39 29 10</td>
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<tr>
<td>SSA 3-6</td>
<td>28 39 29 10</td>
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<tr>
<td>SSA 3-10</td>
<td>28 39 51 10</td>
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<td>SSA 3-6</td>
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<td>SSA 3-10</td>
<td>28 39 51 10</td>
<td></td>
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</tr>
<tr>
<td>C1, C2, C3, D1</td>
<td>30 V/21 V</td>
<td>2.5 kA</td>
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<td>1.2 μs</td>
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<td>C1, C2, C3, D1</td>
<td>45 V/34 V/1 kV</td>
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</table>
MCR-PLUGTRAB PT
Pluggable Surge Protection Devices – Coarse Protection

General Description:
PT... -F
This specialty series of products provide only coarse gas discharge tube protection for those applications where fine protection at the device already exists. Therefore, coarse gas discharge tube protection is all that is needed.

The PT 2-F protects two conductors while the PT 4-F protects four.

NOTE:
These products should NOT be used independently on circuits with nominal voltages > 24 VDC (AC).

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.
SURGETRAB
Low Profile Hybrid Circuit Protection

Features:
• Low profile housing meets application requirements where vertical space is limited.
• Up to 10 kA (8/20(4s) surge current handling capacity for protection against internal and external sources of surges including lightning strikes.
• Hybrid protection circuit provides "fine" voltage clamping with "coarse" surge current handling.
• Integral grounding foot provides low impedance ground for best voltage clamping performance.

General Descriptions:
UBK 2...
This specialty series of products provide only coarse gas discharge tube protection for those applications where fine protection at the device already exists. Therefore, coarse gas discharge tube protection is all that is needed.

Note:
The UBK 2... should NOT be used independently on circuits with nominal voltages > 24 VDC (AC).

UBK 2-PE...
The UBK 2-PE products are for protecting one analog loop (4-20 mA) signal in a 17.5 mm wide protection package. The -HD version features zero-ohm decoupling and is best used for circuits where no series impedance is required.

UBK 2/2...
The UBK 2/2 series is for protecting up to two discrete I/O (on / off) signals (using a common return) in one 17.5 mm wide protection package.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
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</thead>
<tbody>
<tr>
<td>110 V AC</td>
<td>UBK 2-110</td>
<td>27 07 07</td>
<td>10 0</td>
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<tr>
<td>500 V AC</td>
<td>UBK 2-500</td>
<td>27 98 53</td>
<td>10 0</td>
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</tr>
<tr>
<td>24 V AC</td>
<td>UBK 2-PE-24-HB</td>
<td>28 07 07</td>
<td>10 0</td>
<td></td>
</tr>
<tr>
<td>24 V AC</td>
<td>UBK 2-PE-24-HD</td>
<td>28 07 48</td>
<td>10 0</td>
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<td>24 V AC</td>
<td>UBK 2/2-24-HB</td>
<td>28 07 49</td>
<td>10 0</td>
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</table>

ZBFM 5 (order data, see page 71)
ZBN 18 (order data, see page 29)

ZBFM 5 (order data, see page 71)
ZBN 18 (order data, see page 29)

UBK 2
Coarse protection for a double conductor

Housing width 17.5
PIPETRAB and BOXTRAB
Field-Mounted Surge Protection Devices – Hybrid Designs.

Features:
• Field-mount package for installation at field transmitters without additional enclosure.
• Up to 10 kA (8/20µs) surge current handling capacity for protection against internal and external sources of surges including lightning strikes.
• Hybrid protection circuit provides “fine” voltage clamping with “coarse” surge current handling.
• Replaceable protection modules save money and time.
• Class 1, Div 2 certified for hazardous area locations (UL 1604) allows Div 2 installation without special and costly enclosures or purge systems.
• 5-year free replacement warranty provides added risk free investment.

General Description:
S-PT1-2PE-24DC
The S-PT1... comes in its own stainless steel pipe-stub enclosure to protect one analog loop (4-20 mA) by mounting directly to the conduit. The surge protector wires directly into the loop with minimal impedance and features an integrated grounding disc for ease of installation and maximum performance.

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIPETRAB, Pipe stub with integrated PCB, Surge protection device</td>
<td>S-PT1-2PE-24DC</td>
<td>28 18 12 2</td>
</tr>
<tr>
<td>Spare PCB, Surge protection device without pipe stub</td>
<td>S-PT1-2PE-24DC/P</td>
<td>28 18 21 6</td>
</tr>
<tr>
<td>BOXTRAB, in the surface-mounted housing for operational and machine-data collection devices</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Technical data

- **IEC category/VDE requirement class:**
  - Nominal voltage: AC
  - Max. other operating voltage: N/COV: DC/AC
- **Max. cont. operating current Iₙ:**
  - Max. surge current:
  - Core-Core/Core-1
  - Core-Core/Core-4
- **Limiting (clamping) voltage at 1 kV/us:**
  - Core-Core/Core-1
  - Core-Core/Core-4
- **Response time tₐ:**
  - Core-Core/Core-1
  - Core-Core/Core-4
- **Resistance per path:**

- **Temperature range:**
  - -40 °C to +85 °C
- **Degree of protection in acc. with IEC 529 EN 60 529:**
  - IP 60
- **Approvals:**
  - Class 1, Division 2, Groups A, B, C & D
  - Intrinsic Safety Rated
  - Based on test standards:

Replacement circuits can be ordered without the pipe stub housing.

BXT...
This series of products is for protecting four wire 120 VAC powered transmitters such as magnetic flow meters. The NEMA 4/4X box includes the PLUGTRAB PT 2-PE/S protection circuit for the 120 VAC power and the PT 1x2 protection circuit for the 4-20 mA current loop. Both protection circuits are part of the PLUGTRAB PT product line and are therefore testable and warranted against failures for up to 5-years.

The BXT... is also available as a rail assembly for mounting in user supplied enclosures.
**Features:**
- Base element for Pluggable PROCESS INTERFACE Intrisic Safety Barriers provides a combination of hybrid surge protection device with Intrinsic Safety Barrier.
- Up to 10 kA (8/20μs) surge current handling capacity for protection against internal and external sources of surges including lightning strikes.
- Quick-mount grounding foot provides easy connection and low impedance ground for the best voltage clamping and IS performance.
- Hybrid protection circuit provides "fine" voltage clamping with "coarse" surge current handling.
- 500-Volt isolation to meet IS circuit requirements.
- 5-year warranty provides added risk free investment.
- Base includes circuit disconnect for quick commissioning, system start-up, and troubleshooting.

**General Description**

**TT-PI-TB...**
This product accepts the PROCESS INTERFACE signal conditioners for non-hazardous area applications.

**TT-PI-EX-TB...**
This device is specially designed for the PROCESS INTERFACE Intrinsic Safety Barriers and meets Exi requirements.

**TT-PI-EX-TB/T...**
This device has the additional feature of a PT 100 resistor for cold junction compensation. To be used with PROCESS INTERFACE series of Intrinsic Safe Temperature modules.

<table>
<thead>
<tr>
<th>Basic terminal block</th>
<th>TT-PI-EX-TB</th>
<th>TT-PI-TB</th>
<th>TT-PI-EX-TB/T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area of application</td>
<td>Ex i (intrinsic safety &quot;i&quot;)</td>
<td>Ex i (degree of protection &quot;i&quot;) and without explosion protection</td>
<td>Ex i and Ex n</td>
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<tr>
<td>Analog IN</td>
<td></td>
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<tr>
<td>Repeater power supply</td>
<td>with HART</td>
<td>PI-EX-RPSS+I</td>
<td>PI-EX-RISS+I</td>
</tr>
<tr>
<td>Input isolator</td>
<td>with HART</td>
<td>PI-EX-AS-VI</td>
<td>PI-EX-AS-VI</td>
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<td></td>
<td>without HART</td>
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<tr>
<td>Analog OUT</td>
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<tr>
<td>Output isolator</td>
<td>with HART</td>
<td>PI-EX-ID-VI</td>
<td>PI-EX-ID-VI</td>
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<td></td>
<td>without HART</td>
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<tr>
<td>Digital IN</td>
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<tr>
<td>Digital Input (NAMUR or dry contacts)</td>
<td>PI-EX-NAM/RNO-NE</td>
<td>PI-EX-NAM/RNO-NE</td>
<td>PI-N-NAM/RNO-NE</td>
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<td>PI-EX-NAM/RNC-NE</td>
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<tr>
<td>Digital OUT</td>
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<tr>
<td>Solenoid driver</td>
<td>PI-EX-SD/22/45-C</td>
<td>PI-EX-SD/22/45-C</td>
<td>PI-EX-SD/22/45-C</td>
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<td>PI-EX-SD/22/60-B</td>
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<tr>
<td>Temperature</td>
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<tr>
<td>Temperature transducer</td>
<td>PI-EX-RTD-I</td>
<td>PI-EX-RTD-I</td>
<td>PI-EX-RTD-I</td>
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</tbody>
</table>

**Technical data**

- IEC category: VDE requirement class: DC/AC
- Max. cont. operating voltage: 100 V DC/AC
- Max. cont. operating current: 5 A
- Maximum single impulse discharge (1/10 μs): 15 kA
- Total surge current (8/20 μs): 15 kA
- Limiting (clamping) voltage at 1 kV: 30 V
- Response time: 1 μs
- Resistance per path: 1 MΩ
- Temperature range: -40°C to 85°C
- Inflammability class in acc. with UL 94: V0
- Degree of protection in acc. with IEC 529/EN 60 529: IP67
- Approvals: based on test standards:

**Description**

- Basic terminal block, with knife disconnection, test connections and surge voltage protection, for mounting on...
- Intrinsically safe basic terminal block, with knife disconnection, test connections and surge voltage protection, for mounting on...
- Intrinsically safe basic terminal block, as above, but with additional temperature measurement of the input terminal blocks for cold point compensation, for mounting on...
- Cont. plug-in jumper, 500 mm long:
- Zack marker sheet, flat, unprinted:
- Zack strip, flat, labeled horizontally:
- Zack strip, flat, labeled horizontally:
- Special printing Zack marker sheet, flat:

**PROCESS INTERFACE PI product summary** (for interface modules, see INTERFACE catalog)
TT-PI-TB
Basic terminal block, with knife disconnection and surge voltage protection

Housing width 12.4

Intrinsically safe basic terminal block with knife disconnection and surge voltage protection

Temperature measurement, and surge voltage protection

Housing width 12.4

Connection data

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<th>Article no.</th>
<th>Price PL1</th>
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<tr>
<td>FBST 500-PLC RD</td>
<td>26 66 78 4</td>
<td>20</td>
</tr>
<tr>
<td>FBST 500-PLC BU</td>
<td>26 66 69 2</td>
<td>20</td>
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<tr>
<td>FBST 500-PLC GY</td>
<td>28 96 63 8</td>
<td>20</td>
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<td>08 03 61 8</td>
<td>10</td>
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<tr>
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TT-PI-EX-TB
Intrinsically safe basic terminal block with knife disconnection and surge voltage protection

Housing width 12.4

Connection data

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TT-PI-EX-TB/T
Intrinsically safe basic terminal block with knife disconnection, temperature measurement, and surge voltage protection

Housing width 12.4

Connection data

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<tr>
<th>Type</th>
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<th>Price PL1</th>
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<tr>
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<tr>
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<tr>
<td>ZBFM 6: SO/CMS...</td>
<td>08 03 65 9</td>
<td>1</td>
</tr>
</tbody>
</table>

Cl, C2, C3
45 V/31 V
250 mA/40 °C
5 kA/5 kA
10 kA
< 70 V 650 V
< 1 nS 100 ns
4.7 Ω ± 10 %
- 40 °C to + 65 °C

V0
IP 20
:
UL: 9786；F: 913, FM 3610
IEC 61643-21:2000-09, EVDE 0845 part 3-1:1999-07

Cl, C2, C3
30 V/21 V
450 mA/40 °C
5 kA/5 kA
10 kA
< 45 V 1850 V
< 1 nS 100 ns
4.7 Ω ± 10 %
- 40 °C to + 65 °C

V0
IP 20
:
UL: 9786；F: 913, FM 3610
IEC 61643-21:2000-09, EVDE 0845 part 3-1:1999-07

- Required marking is to be specified when ordering

Phoenix Contact
MULTISTAGE TERMTRAB
Surge Protection in a Modular
High-Density Terminal Block –
Hybrid Designs

Features:
• High-density package provides wire
termination and hybrid protection circuit
design in 6.2 mm of DIN rail space.
• Up to 5 kA (8/20 μs) surge current handling
capacity (per line) for protection against
internal and external sources of surges
including lightning strikes.
• Hybrid protection circuit provides "fine"
voltage clamping with "coarse" surge
current handling.
• Quick-mount grounding foot provides easy
connection and low impedance ground for
the best voltage clamping performance.
• Class 1, Div 2 certified for hazardous area
locations (UL 1604) allows Div 2 installation
without special and costly enclosures or
surge systems.

General Descriptions:
TT-2-PE...
These products protect one floating ground
analog loop (4-20 mA) per 6.2 mm wide
terminal block. Providing a hybrid surge
protection circuit and multi-level wire
termination in one housing, these products
are idea for applications with high I/O counts
and limited space requirements.

TT-2/2...
These products protect two discrete I/O
(on / off) signals that share a common
reference potential (return). Therefore, for an
eight point discrete PLC card only four
TT-2/2... are needed taking up only 1 inch of
DIN rail space to achieve professional surge
and lightning protection and wire termination.

TT-2PE/S1...
This special product is for protection of two-
wire (floating ground) signal circuits that
require limited series impedance. The special
zero-ohm decoupling circuit assures reliable
termination and measurement with hybrid
surge protection.

TT-EX...
These products feature special approvals
and design considerations for protecting
current loops in intrinsically safe circuits.
**TT-2/2-24DC**
Protection for two conductors with a common reference potential
- Terminal width: 6.2
- End cover width: 2

**TT-2-PE/S1-24DC**
Double conductor protection for a floating signal circuit
- Terminal width: 6.2
- End cover width: 2

**TT-EX(I)-24DC**
Surge voltage protection for EEx is circuits
- Terminal width: 6.2
- End cover width: 2

---

**Connection data**
(IEC)
- rigid: solid
- flexible: stranded

**AWG**
- 0.2-2.5
- 0.2-2.5
- 24-14

**Type**
**Article no.**
**Pcs.**
**Pkt.**

**Circuit design**
- TT-2/2-24DC
- TT-2-PE/S1-24DC
- TT-EX(I)-24DC

---

**Phoenix Contact**
51
MULTISTAGE TERMITRAB
Surge Protection in a Modular High-Density Terminal Block — Hybrid Designs

Spring Terminations

General Descriptions:

**TT ST 2PE...**
These products protect one floating ground analog loop (4-20 mA) per 6.2 mm wide terminal block with reliable and fast-connect spring terminations.

Providing a hybrid surge protection circuit and multi-level wire termination in one housing, these products are ideal for applications with high I/O counts and limited space requirements.

**TT ST M-2PE...**
Similar to the above, this version includes a knife switch disconnect for each circuit. This allows quick commissioning, system start up and troubleshooting.

**TT-ST-2/2...**
These products protect two discrete I/O (on / off) signals that share a common reference potential (return). Therefore, for an eight point discrete PLC card only four TT-ST-2/2 are needed taking up only 1 inch of DIN rail space to achieve professional sure and lightning protection and wire termination.

**TT-ST-M-2/2...**
Similar to above, this version includes knife switch disconnects for each circuit. This allows quick commissioning, system start up and troubleshooting.

**TT-ST-M-SFP-24AC**
This unique device provides an LC circuit for 24V signal circuits to provide EMI / RFI protection in addition to spring clamp wire termination. Each device protects two discrete signals or one analog circuit.
TT-ST-...-2/2
Protection for two conductors with a common reference potential
Terminal width 6.2
End cover width 2.2

TT-ST-M-SFP
Interference filter
Terminal width 6.2
End cover width 2.2

IEC rigid flexible AWG
Connection data 0.5-4 0.5-2.5 24-12

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-ST-2/2-24DC</td>
<td>28 58 88 1</td>
<td>10</td>
</tr>
<tr>
<td>TT-ST-M/2-24AC</td>
<td>28 58 93 3</td>
<td>10</td>
</tr>
<tr>
<td>TT-ST-M/2-24AC</td>
<td>28 56 91 7</td>
<td>10</td>
</tr>
<tr>
<td>TT-ST-2/2-24DC</td>
<td>28 58 84 8</td>
<td>10</td>
</tr>
<tr>
<td>TT-ST-M-SFP</td>
<td>28 58 99 4</td>
<td>50</td>
</tr>
</tbody>
</table>

ZB 6 (order data, see page 71)

<table>
<thead>
<tr>
<th>Type</th>
<th>Order No.</th>
<th>Pcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-D-ST-EK</td>
<td>28 58 89 4</td>
<td>50</td>
</tr>
<tr>
<td>TT-STM-SFP</td>
<td>28 58 89 4</td>
<td>50</td>
</tr>
</tbody>
</table>

UL pending
IEEE C 62.36
TERMITRAB
Single Component Protection
Integrated into Spring Cage
Terminal Block (STTB)

Features:
- Single component protection designed into 6.2 mm wide wire termination complements protection circuits that already exist in the protected equipment.
- Spring cage terminal block provides fast and reliable wire connection.
- Single component SAD versions ideal for protection against internally generated sources of transients such as inductive kickback and back-emf from solenoid and relay switching.
- Low-cost solution for applications where lightning is NOT a concern.
- Quick-mount grounding foot provides easy connection and low impedance ground for best voltage clamping performance (not available on all versions).

General Descriptions:
Note: For surge protection against lightning influenced events a multistage hybrid surge protection circuit should be used. See the MCR-PLUGTRAB, MULTISTAGE TERMITRAB, or COMTRAB product series.

TT-STTB-F...
These products are coarse only protection with a high-energy gas discharge tube. These are best for applications where suitable line (SAD) suppression is already incorporated into the protected equipment. The ...-PE versions feature the integrated ground connection to the DIN rail.

NOTE:
The versions with gas discharge tube only should NOT be used on signal circuits with voltages greater than 24 V DC.

TT-STTB-PE
These products are fine only protection with a fast acting Surge Arresting Diode (SAD). These are good for protecting I/O against internally generated fast switching transients such as those generated by relays and inductive coils. The ...-PE versions feature the integrated ground connection to the DIN rail.

<table>
<thead>
<tr>
<th>Description</th>
<th>Voltage (V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERMITRAB, spring cage terminal block with surge voltage protection, for mounting on Lr</td>
<td>6 V DC, 24 V DC, 48 V DC, 120 V DC</td>
</tr>
<tr>
<td>TERMITRAB, spring cage terminal block with PE foot and surge voltage protection, for mounting on Lr</td>
<td>12 V DC, 24 V DC, 48 V DC, 120 V DC</td>
</tr>
<tr>
<td>Zack strip, 10-section, white</td>
<td></td>
</tr>
</tbody>
</table>

Technical data:
- IEC category/VDE requirement class: C2, C3, D1
- Max. cont. operating voltage: 110 V/AC
- Max. cont. operating current at 40°C: 32 A
- Maximum single impulse discharge (8/20) µs: L-L-L-L
- Total surge current (6/20) µs: L-L-L-L
- Limiting (clamping) voltage at 1 kV/µs: L-L-L-L
- Response time t₁: L-L-L-L
- Temperature range: -40°C to +85°C
- Inflammability class in acc. with UL 94: V0
- Degree of protection in acc. with EN 60 529: IP 20
- Approvals: Based on test standards:
  - Further voltage levels on request.
Spring-cage terminal block with gas-filled surge voltage arrester

Spring-cage terminal block with suppressor diode

Spring-cage terminal block with suppressor diode

Terminal width 6.2
End cover width 2.2

Connection data

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-STTB-F-PE</td>
<td>28 58 20 5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>ZB 6 (order data, see page 71)</td>
<td>28 58 49 5</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-D-STTB-BK</td>
<td>28 30 74 7</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>ATP-STTB 4</td>
<td>28 58 16 9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TT-STTB-12</td>
<td>28 58 16 9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TT-STTB-24</td>
<td>28 58 14 0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TT-STTB-48</td>
<td>28 58 15 3</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TT-STTB-PE-12</td>
<td>28 58 17 9</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TT-STTB-PE-24</td>
<td>28 58 18 2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>TT-STTB-PE-48</td>
<td>28 58 19 5</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C2, C3, D1</th>
<th>50 V/110 V</th>
<th>32 A</th>
<th>245 A</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZB 6 (order data, see page 71)</td>
<td>560 V/-</td>
<td>1 ns</td>
<td>5 100 ns</td>
</tr>
<tr>
<td>TT-D-STTB-BK</td>
<td>5100 V/-</td>
<td>1 ns</td>
<td>5 1 ns</td>
</tr>
<tr>
<td>ATP-STTB 4</td>
<td>-40°C to +85°C</td>
<td>V0</td>
<td>IP 20</td>
</tr>
<tr>
<td>IEEE C 62.30</td>
<td>-40°C to +85°C</td>
<td>V0</td>
<td>IP 20</td>
</tr>
</tbody>
</table>

Circuit design in the TT-STTB-F-PE

Circuit design in the TT-STTB-

Circuit design in the TT-STTB-PE
TERMITRAB
Single Component Fine, Medium, or Coarse Protection Integrated into Modular Terminal Block (SLKK5)

Features:
• Single component protection designed into 6.2 mm wide wire termination complements protection circuits that already exist in the protected equipment or installation.
• Single component SAD and MOV versions ideal for protection against internally generated sources of transients such as inductive kickback and back-emf from solenoid and relay switching.
• Low-cost solution for applications where lightning is NOT a concern.
• Quick-mount grounding foot provides easy connection and low impedance ground for best voltage clamping performance (not available on all versions).

General Descriptions:
Note: For surge protection against lightning influenced events a multistage hybrid surge protection circuit should be used. See the MCR-PLUGTRAB, MULTISTAGE TERMITRAB, or COMTRAB product series.

TT-SLKK5...
These products feature the popular Phoenix Contact double level terminal block SLKK5. Each version incorporates a surge protection component from the connected signal line to the DIN rail, which can then be grounded for proper surge protection performance.

Versions are available in a variety of voltages with Surge Arresting Diode (SAD), Metal Oxide Varistor (MOV), Gas Discharge Tube, and RF suppression capacitor options.

NOTE: The versions with gas discharge tube only should NOT be used on signal circuits with voltages greater than 24 V DC.

Connection data
<table>
<thead>
<tr>
<th>Article no.</th>
<th>Description</th>
<th>Type</th>
<th>Voltage</th>
<th>Current</th>
<th>Temp. range</th>
<th>Inflammability class</th>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-SLKK5-C</td>
<td>Surge voltage protection modular terminal block</td>
<td>12N</td>
<td>12.0 V AC</td>
<td>12A</td>
<td>-20°C to +85°C</td>
<td>V2</td>
<td>IP 20</td>
</tr>
<tr>
<td>TT-SLKK5-5</td>
<td>Surge voltage protection modular terminal block</td>
<td>12N</td>
<td>12.0 V AC</td>
<td>12A</td>
<td>-20°C to +85°C</td>
<td>V2</td>
<td>IP 20</td>
</tr>
</tbody>
</table>

Technical data
- IEC category/VDE requirement class:
- Max. cont. operating voltage: MOV:
- Max. cont. operating current Iₚ at 40°C:
- Maximum single impulse discharge (8/20)µs:
- Total surge current (6/20)µs:
- Limiting (clamping) voltage at 1 kV/µs:
- Response time tₚ:
- Temperature range:
- Inflammability class in acc. with UL 94:
- Degree of protection in acc. with IEC 60529/EN 60 529:
- Approvals:
- Based on test standards:

![Characteristic attenuation curve TT-SLKK-C 12N...](image)
TT-SLKK5-S...  
with varistor diode

TT-SLKK5-S...  
with suppressor diode

TT-SLKK5-F/110AC  
with gas-filled surge voltage arrester

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-SLKK5-S-5DC</td>
<td>28 09 90 4</td>
<td>50</td>
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</tr>
<tr>
<td>TT-SLKK5-S-12DC</td>
<td>28 09 91 6</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5-S-48DC</td>
<td>28 09 92 3</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5-S-0DC</td>
<td>28 09 93 6</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5-S-12AC</td>
<td>28 09 95 2</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5-S-24AC</td>
<td>28 09 96 5</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>DP-UKK 35 BK</td>
<td>27 70 83 3</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>D-UKK 35 BK</td>
<td>27 70 22 8</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>ZB 6 (order data, see page 71)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-SLKK5/12DC</td>
<td>27 94 85 3</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5/24DC</td>
<td>27 94 91 6</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5/48DC</td>
<td>27 94 92 5</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5/110DC</td>
<td>27 94 93 2</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5/12AC</td>
<td>27 94 94 5</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5/24AC</td>
<td>27 94 95 6</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5/48AC</td>
<td>27 94 96 1</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5/60AC</td>
<td>27 94 97 4</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>TT-SLKK5/110AC</td>
<td>27 94 98 7</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>DP-UKK 35 BK</td>
<td>27 70 83 3</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>D-UKK 35 BK</td>
<td>27 70 22 8</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>ZB 6 (order data, see page 71)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IEEE C 62.38

Phoenix Contact
TERMITRAB
Single Component Fine, Medium, or Coarse Protection Integrated into Modular Terminal Block (UKK5)

Features:
• Single component protection designed into 6.2 mm wide wire termination complements protection circuits that already exist in the protected equipment or installation.
• Single component SAD and MOV versions ideal for protection against internally generated sources of transients such as inductive kickback and back-emf from solenoid and relay switching.
• Low-cost solution for applications where lightning is NOT a concern.
• Double level terminal block incorporates removable suppression element, knife switch disconnect, and test point options for multi-function wire termination.

General Descriptions:
Note:
For surge protection against lighting influenced events a multistage hybrid surge protection circuit should be used. See the MCR-PLUGTRAB, MULTISTAGE TERMINTRAB, or COMTRAB product series.

TT-UKK5-T...
These products feature a pluggable MOV suppression component. If the MOV fails, the plug can be hot-swaped without downtime. These products do NOT include thermal disconnect. See PLUGTRAB PT 2x1 YA for this option.

TT-UKK5-D...
These double-level terminal blocks feature a single surge protection component between the top level and bottom level. The screw heads come with test sockets for quick testing of the loop.

NOTE:
The versions with gas discharge tube only should NOT be used on signal circuits with voltages greater than 24 VDC.

TT-UKK5-M...
These double-level terminal blocks feature a knife switch disconnect in addition to a single surge protection component between the top level and bottom level. This allows quick and easy testing of the loop without disconnecting wires. The surge protection component is therefore installed line to line.

NOTE:
The versions with gas discharge tube only should NOT be used on signal circuits with voltages greater than 24 VDC.

Circuit diagram: TTUKK5-T...

<table>
<thead>
<tr>
<th>Description</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge voltage protection modular terminal block, with integrated suppressor diode between the two levels, with universal foot for mounting on</td>
<td>5 V DC</td>
</tr>
<tr>
<td></td>
<td>12 V DC</td>
</tr>
<tr>
<td></td>
<td>24 V DC</td>
</tr>
<tr>
<td></td>
<td>48 V DC</td>
</tr>
<tr>
<td></td>
<td>60 V DC</td>
</tr>
<tr>
<td>Surge voltage protection modular terminal block, with integrated suppressor diode between the two levels, with universal foot for mounting on</td>
<td>12 V AC</td>
</tr>
<tr>
<td></td>
<td>24 V AC</td>
</tr>
<tr>
<td></td>
<td>48 V AC</td>
</tr>
<tr>
<td></td>
<td>60 V AC</td>
</tr>
<tr>
<td>Surge voltage protection modular terminal block, with gas-filled surge arrester between the two levels TERMITRAB header, with universal foot, with screw connections on both sides</td>
<td>12 V DC</td>
</tr>
<tr>
<td></td>
<td>24 V DC</td>
</tr>
<tr>
<td></td>
<td>28 V DC</td>
</tr>
<tr>
<td></td>
<td>48 V DC</td>
</tr>
<tr>
<td></td>
<td>60 V DC</td>
</tr>
<tr>
<td></td>
<td>120 V AC</td>
</tr>
</tbody>
</table>

Zack strip, 10-section, white

Fig. 58/1: Feed-through modular terminal block with suppressor diode

Fig. 58/2: Feed-through modular terminal block with gas-filled surge voltage arrester

Fig. 58/3: Knife disconnect terminal block with suppressor

Fig. 58/4: Knife disconnect terminal block with gas-filled surge voltage arrester
### Modular Terminal Block with Plug-in Protection Element

**Technical Data**

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pieces</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZB 6 (order data, see page 71)</td>
<td>27 88 40 1</td>
<td>50</td>
</tr>
<tr>
<td>TT-UKK5-T-V12 DC-ST</td>
<td>28 07 23 3</td>
<td>50</td>
</tr>
<tr>
<td>TT-UKK5-T-V24 DC-ST</td>
<td>28 07 39 1</td>
<td>50</td>
</tr>
<tr>
<td>TT-UKK5-T-V48 DC-ST</td>
<td>24 07 24 3</td>
<td>50</td>
</tr>
<tr>
<td>TT-UKK5-T-V60 DC-ST</td>
<td>28 07 25 9</td>
<td>50</td>
</tr>
<tr>
<td>TT-UKK5-T-V120 AC-ST</td>
<td>28 16 08 3</td>
<td>50</td>
</tr>
<tr>
<td>TT-UKK5-T-F60 AC</td>
<td>27 88 21 0</td>
<td>50</td>
</tr>
</tbody>
</table>

### Connection Data

<table>
<thead>
<tr>
<th>Terminal width</th>
<th>Rigid</th>
<th>Solid</th>
<th>Stranded</th>
<th>AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.2</td>
<td>0.2-4</td>
<td>0.2-4</td>
<td>24-12</td>
<td></td>
</tr>
</tbody>
</table>

### Technical Data

- **IEC category**
- **VDE requirement class**
- **Max. cont. operating voltage: MCCB DC/AC**
- **Max. cont. operating current**
- **Max. simple impulse discharge**
- **Total surge current**
- **Limiting (clamping) voltage at 1 kV/µs**
- **Response time**
- **Temperature range**
- **Inflammability class in acc. with UL 94**
- **Degree of protection acc. to IEC 529/EN 60 529**
- **Based on test standards**

### Further Information

- Further nominal voltages available on request.
- Further information on request.
TERMITRAB
Single Component Fine or Coarse Protection Integrated into Modular Terminal Block

Features:
- Single component protection designed into 6.2 mm wide wire termination complements protection circuits that already exist in the protected equipment or installation.
- Single component SAD versions ideal for protection against internally generated sources of transients such as inductive kickback and back-emf from solenoid and relay switching.
- Low-cost solution for applications where lightning is NOT a concern.
- Quick-mount grounding foot provides easy connection and low impedance ground for best voltage clamping performance (not available with TT-UK-R-F...).

General Descriptions:
Note: For surge protection against lighting influenced events a multistage hybrid surge protection circuit should be used. See the MCR-PLUGTRAB, MULTISTAGE TERMITRAB, or COMTRAB product series.

TT-UK 5
These products feature a 6 mm wide feed-through terminal block with integrated suppressor diode (SAD) between the clamping body and the mounting rail.

TT-URTK/S
These products feature a sliding-link disconnect on the current carrying bar. The SAD provides surge protection between the signal line and DIN rail.

TT-UK-R-F
These products feature gas discharge tube protection between the two adjacent connections. This can be wired for line to line protection or line to ground protection.

NOTE:
The versions with gas discharge tube only should NOT be used on signal circuits with voltages greater than 24 VDC.

<table>
<thead>
<tr>
<th>Description</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>TERMITRAB</td>
<td>5 V DC</td>
</tr>
<tr>
<td></td>
<td>12 V DC</td>
</tr>
<tr>
<td></td>
<td>24 V DC</td>
</tr>
<tr>
<td></td>
<td>48 V AC</td>
</tr>
<tr>
<td></td>
<td>60 V DC</td>
</tr>
<tr>
<td>TERMITRAB</td>
<td>12 V AC</td>
</tr>
<tr>
<td></td>
<td>24 V AC</td>
</tr>
<tr>
<td></td>
<td>48 V AC</td>
</tr>
<tr>
<td>TERMITRAB-URTK/S</td>
<td>24 V DC</td>
</tr>
<tr>
<td></td>
<td>24 V AC</td>
</tr>
<tr>
<td></td>
<td>48 V AC</td>
</tr>
<tr>
<td></td>
<td>110 V DC</td>
</tr>
<tr>
<td></td>
<td>110 V AC</td>
</tr>
</tbody>
</table>

**Technical data**

- IEC category/VDE requirement class: DC/AC
- Max. cont. operating voltage: MCOV: L-L/L, L-L/L
- Maximum single impulse discharge (8/20)µs: L-L/L
- Limiting (clamping) voltage at 1 kV/µs: L-L/L
- Response time tₚ: L-L/L
- Temperature range: Inflammability class in acc. with UL 94: L-L/L
- Degree of protection in acc. with IEC 529/EN 60 529: DC/AC

Approvals:
Based on test standards:
1. White labels printed with are enclosed for mounting rail identification.
2. Further nominal voltages available on request.
### Modular Terminal Block with Integrated Suppressor Diode

- **Type**: TT-UK5
- **Terminal width**: 6.2 (IEC)
- **Rigid** solid
- **Flexible** stranded
- **AWG**

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-UK5/3 DC</td>
<td>27 94 67 3</td>
<td>50</td>
</tr>
<tr>
<td>TT-UK5/12 DC</td>
<td>27 94 68 5</td>
<td>50</td>
</tr>
<tr>
<td>TT-UK5/24 DC</td>
<td>27 94 69 9</td>
<td>50</td>
</tr>
<tr>
<td>TT-UK5/48 DC</td>
<td>27 94 70 9</td>
<td>50</td>
</tr>
<tr>
<td>TT-UK5/60 DC</td>
<td>27 94 71 2</td>
<td>50</td>
</tr>
</tbody>
</table>

**Connection data**: 0.2-4 rigid, 0.2-4 flexible, 24-12 stranded

---

### Disconnect Terminal Block with Integrated Suppressor Diode

- **Type**: TT-URTK/S...
- **Terminal width**: 8.2
- **Rigid** solid
- **Flexible** stranded
- **AWG**

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-URTK/S-24 DC</td>
<td>27 88 27 8</td>
<td>50</td>
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<tr>
<td>TT-URTK/S-24 AC</td>
<td>27 88 28 1</td>
<td>50</td>
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<tr>
<td>TT-URTK/S-48 AC</td>
<td>27 88 31 7</td>
<td>50</td>
</tr>
<tr>
<td>TT-URTK/S-110 DC</td>
<td>27 88 36 2</td>
<td>50</td>
</tr>
<tr>
<td>TT-URTK/S-110 AC</td>
<td>27 88 23 5</td>
<td>50</td>
</tr>
</tbody>
</table>

**Connection data**: 0.5-10 rigid, 0.5-6 flexible, 20-8 stranded

---

### Double Terminal Block with Integrated Gas-Filled Surge Voltage Arrester

- **Type**: TT-UK-R-F...
- **Housing width**: 15.5
- **Enclosed housing**
- **Rigid** solid
- **Flexible** stranded
- **AWG**

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs. Pkt.</th>
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</thead>
<tbody>
<tr>
<td>TT-UK-R-5/250 DC</td>
<td>27 88 24 9</td>
<td>25</td>
</tr>
</tbody>
</table>

**Connection data**: 0.2-2.5 rigid, 0.2-2.5 flexible, 24-14 stranded

---

### Additional Tables and Data

#### Type

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-UK5/5 DC</td>
<td>27 94 67 3</td>
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<tr>
<td>TT-UK5/12 DC</td>
<td>27 94 68 5</td>
<td>50</td>
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<td>TT-UK5/24 DC</td>
<td>27 94 69 9</td>
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<td>TT-UK5/48 DC</td>
<td>27 94 70 9</td>
<td>50</td>
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<tr>
<td>TT-UK5/60 DC</td>
<td>27 94 71 2</td>
<td>50</td>
</tr>
</tbody>
</table>

**Connection data**: 0.2-4 rigid, 0.2-4 flexible, 24-12 stranded

---

### End Cover

**Dimension**: 1.8, 2.2

---

### ZB 6

(order data, see page 71)

---

### ZB 8

(order data, see CLIPLINE catalog)

---

### ZB 10

(order data, see CLIPLINE catalog)

---

### Technical Specifications

- **Rated Voltage**: 24 V/20 V
- **Rating**: 57 A
- **Insulation**: 1 ns
- **Operating Temperature**: -40°C to +85°C
- **Protection**: IP 20

---

IEEE C62.36
COMTRAB MODULAR
Pluggable Surge Protection Devices – Hybrid Designs

Features:
• Modular plugs allow complete installation flexibility.
• Pluggable protection plugs fit into special DIN rail mount terminal block or panel mount LSA-PLUS mounting system.
• Up to 5 kA (8/20 μs) surge current handling capacity for protection against internal and external sources of surges.
• Pluggable suppression can be "hot-swapped" for verification testing.
• Hybrid protection circuit provides "fine" voltage clamping with "coarse" surge current handling.
• 5 year plug replacement warranty provides added risk free investment.

General Descriptions:
CTM 1x2...
This series of products is for protecting one analog loop (4–20 mA) in one 9.5 mm protection package. Each CTM 1x2 protects one independent floating ground signal circuit. Used with the 10 position base (CT-TERMIBLOCK) allows protection of 10 analog loops in 117 mm (4.6") of DIN rail space.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

CTM 2x1...
This series of products is for protecting two discrete I/O (on/off) signals (using a common return) in one 9.5 mm protection package. Used with the 10 position base (CT-TERMIBLOCK) allows protection of 20 discrete signals in 117 mm (4.6") of DIN rail space.

CTM 1x2-12DC
Surge voltage protection for a double conductor with fine protection diode and resistance decoupling
12 V DC
50 V DC
110 V AC

CTM 1x2-24DC
Surge voltage protection for two single conductors with fine protection diode and resistance decoupling
24 V DC
60 V DC
110 V AC

CTM 1x2-60DC
Surge voltage protection for ISDN systems
60 V DC
110 V AC

CTM 1x2-110AC
Surge voltage coarse protection
110 V AC

CTM card cage,
for 10 double-conductor disconnect and switching strips, with ground rail for accommodating 10 CTM plugs

Technical data
12 V DC 24 V DC 60 V DC 110 V AC
Voltage
12 V 24 V 360 mA 360 mA 380 mA 380 mA
Current
5 kA 5 kA 5 kA 5 kA
Impulse discharge (8/20)\(\text{as}^1\): L-UL-1 5 kA 5 kA 5 kA 5 kA
Total surge current (8/20)\(\text{ps}^1\): Lai 10 kA 10 kA 10 kA 10 kA
Limiting (clamping) voltage at 1 kV/as: L-UL-0 s 25 V/s 700 V/s 700 V/s 160 V/s
Input attenuation \(\alpha\): 0.3 dB to 20 MHz in a 100 Ω system
Cut-off frequency \(f_5\): 2 MHz in a 100 Ω system
Response time \(t_x\): 1.8 MHz 20 MHz
Resistance per path: 3.3 Ω
Temperature range: -25 °C to +75 °C
Inflammability class in acc. with UL 94: V0
Degree of protection in acc. with IEC 60529/EN 60 529: IP 20
Approval: Based on test standards: IEEE C 62.36

1) Two protective plugs are necessary to protect the ISDN-S0 bus.
**CTM 2x1...**
Protection for two conductors with a common reference potential
Housing width 9.5

![CTM 2x1 diagram](image)

**CTM ISDN**
Protection for a pair of conductors of the ISDN S_0 bus
Housing width 9.5

![CTM ISDN diagram](image)

**CTM 2x1-110AC-GS**
Coarse protection for two conductors
Housing width 9.5

![CTM 2x1-110AC-GS diagram](image)

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
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<tbody>
<tr>
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<td>28 36 57 1</td>
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<tr>
<td>CTM 2x1-12DC</td>
<td>28 36 50 4</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>CTM 2x1-94DC</td>
<td>28 36 50 0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>CTM 2x1-68DC</td>
<td>28 36 54 2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>CTM 2x1-110MC</td>
<td>28 36 62 9</td>
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<table>
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<tbody>
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<tr>
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</thead>
<tbody>
<tr>
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</tbody>
</table>

**CTM 10-MAG**
(see page 40)

<table>
<thead>
<tr>
<th>Type</th>
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<th>Pcs.</th>
<th>Pkt.</th>
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</thead>
<tbody>
<tr>
<td>CTM 2x1-5DC</td>
<td>28 36 57 1</td>
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<td></td>
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<td>28 36 54 2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>CTM 2x1-110MC</td>
<td>28 36 62 9</td>
<td>10</td>
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<tr>
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<td>28 38 55 5</td>
<td>10</td>
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<td>28 38 60 7</td>
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</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
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</thead>
<tbody>
<tr>
<td>CTM MAG 10 (see page 40)</td>
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<table>
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<th>Article no.</th>
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<tbody>
<tr>
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<td>28 36 54 2</td>
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<td>CTM MAG 10</td>
<td>28 36 62 9</td>
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**CTM 10-MAG**
(see page 40)

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTM 2x1-5DC</td>
<td>28 36 57 1</td>
<td>10</td>
<td></td>
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<tr>
<td>CTM 2x1-12DC</td>
<td>28 36 50 4</td>
<td>10</td>
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<tr>
<td>CTM 2x1-94DC</td>
<td>28 36 50 0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>CTM 2x1-68DC</td>
<td>28 36 54 2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>CTM 2x1-110MC</td>
<td>28 36 62 9</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

**CTM ISDN**
Protection for a pair of conductors of the ISDN S_0 bus
Housing width 9.5

![CTM ISDN diagram](image)

**CTM 2x1-110AC-GS**
Coarse protection for two conductors
Housing width 9.5

![CTM 2x1-110AC-GS diagram](image)
COMTRAB
Pluggable Surge Protection Devices — Hybrid Designs

Analog circuits (floating ground)

Features:
- High density package terminates and protects up to 10 signal pairs for applications where space is a limited.
- Pluggable protection plugs fit into special DIN rail mount terminal block or panel mount LSA-PLUS mounting system.
- Up to 5 kA (8/20 μs) surge current handling capacity for protection against internal and external sources of surges.
- Pluggable suppression can be "hot-swapped" for verification testing.
- Hybrid protection circuit provides "fine" voltage clamping with "coarse" surge current handling.
- 5 year plug replacement warranty provides added risk free investment.

General Description
CT 10-2PE/FS...
This product provides hybrid circuit surge protection for up to 10 floating ground pairs (analog loops) in 117 mm of DIN rail space. The CT-TERMIBLOCK provides the grounding connection to the DIN rail. This version is good in circuits with nominal current up to 1.5 Amps.

CT 10-2PE/FSR...
Similar to the version above, this device includes additional de-coupling impedance which increases the normal mode surge current handling to 5 kA (8/20μs). The maximum nominal current is limited to 200 mA.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

Comparative table for CT and CTM surge arresters

<table>
<thead>
<tr>
<th>CT8.../CT 10...</th>
<th>CTM...</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT 8-2PE-5 DC</td>
<td>CTM-50D</td>
</tr>
<tr>
<td>CT 8-2PE-12 DC</td>
<td>CTM 1x2-12D</td>
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<td>CT 8-2PE-24 DC</td>
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</tr>
<tr>
<td>CT 8-2PE-60 DC</td>
<td>CTM 1x2-60D</td>
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<tr>
<td>CT 8-2PE-116 DC</td>
<td>CTM 1x2-116D</td>
</tr>
<tr>
<td>CT 8-2PE-185 DC</td>
<td>CTM 1x2-185D</td>
</tr>
<tr>
<td>CT 10-2PE-12 DC</td>
<td>CTM 1x2-12D</td>
</tr>
<tr>
<td>CT 10-2PE-24 DC</td>
<td>CTM 1x2-24D</td>
</tr>
<tr>
<td>CT 10-2PE-56 DC</td>
<td>CTM 1x2-56D</td>
</tr>
<tr>
<td>CT 10-2PE/FSR-24 DC</td>
<td>CTM 1x2-24D</td>
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<td>CT 10-5/2-2 DC</td>
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<td>CT 10-60/2-2 DC</td>
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<tr>
<td>CT 10-5/ISDN</td>
<td>CTM-5ISDN</td>
</tr>
<tr>
<td>CT 10-10/ISDN</td>
<td>CTM-10ISDN</td>
</tr>
</tbody>
</table>

1) Ground connection with CT 1-8-ES
2) Ground connection with CT 1-10-ES

Phoenix Contact
Note: The circuit diagrams only show one protection path of the respective protective device.

CT 10-2PE/FS-24
Two-stage protection for 10 double conductors

CT 10-2PE/FSR-24
Two-stage protection for 10 double conductors with decoupling

Table:
<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT 10-2PE/FS-24</td>
<td>28 07 96 1</td>
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</tr>
<tr>
<td>CT 10-2PE/FSR-24</td>
<td>28 07 96 6</td>
<td>1</td>
</tr>
</tbody>
</table>

CT-TERMIBLOCK 10 DA (see page 69)

Technical data:
- IEC category/VDE requirement class: Cl, C2, C3
- Max. cont. operating voltage: DC/AC 40 V/28 V
- Max. cont. operating current: 200 mA/25 °C
- Max. single impuls discharge: 5 kA
- Total surge current: 5 kA
- Limiting (clamping) voltage: 70 V/650 V
- Response time: 1 ns/s 100 ns
- Temperature range: -25 °C ... +75 °C
- Inflammability class: V0
- Degree of protection: IP 20
- Approvals: IEEE C 62.39

Based on test standards:
- IEC 60529/EN 60 529:
- UL 94:
- IEEE C 62.39
COMTRAB
Pluggable Surge Protection Devices – Hybrid Designs

Discrete Signal Circuits (ground referenced)

General Description
CT10-18S+F/PE
These devices provide fine protection with silicon avalanche diodes line to ground on each conductor with gas discharge tube protection in between the return and earth ground.

CT10-18FS+F/PE
These devices provide additional hybrid circuit protection with a gas discharge tube on each signal line to common return.

CT10FSR+F/PE
These devices include decoupling impedance in the signal line paths which increases the normal mode protection. Maximum nominal current rating is limited to 140 mA.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

CT 10-18S+F/PE...
Fine protection for 18 signal lines

CTI OFSR+F/PE
These devices include decoupling impedance in the signal line paths which increases the normal mode protection. Maximum nominal current rating is limited to 140 mA.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

Note:
The circuit diagrams only show one protection path of the respective protective device.

Technical data
IEC category/VDE requirement class:
Max. cont. operating voltage: MCOV: Uc:
Maximal cont. operating current IN:
Maximal single impulse discharge (8/20)ms:
Total surge current (8/20)ms:
Limiting (clamping) voltage at 1 kV/us:
Response time t:
Resistance per path:
Temperature range:
Inflammability class acc. with UL 94:
Degree of protection in acc. with IEC 60529/EN 60 529:
Approvals:
Based on test standards:

Type | Article no. | Pos. Pkt.
--- | --- | ---
CT 10-18S+F/PE-24 | 28 07 91 3 | 1

CT-TERMIBLOCK 10 DA (see page 69)

CT-TERMIBLOCK, Disconnect strip screw terminal block to hold the COMTRAB protection modules

CT-TERMIBLOCK, Disconnect strip screw terminal block to hold the COMTRAB protection modules

CT-TERMIBLOCK, Disconnect strip screw terminal block to hold the COMTRAB protection modules

CT-TERMIBLOCK 10 DA (see page 69)

CT-TERMIBLOCK 10 DA (see page 69)
CT 10-18FS+F/PE...

Two-stage protection for 18 signal lines.

Connection data can be plugged into CT-TERMIBLOCK and LSA-PLUS disconnect and switching strips.

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
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</thead>
<tbody>
<tr>
<td>CT 10-18FS+F/PE-24</td>
<td>28 07 92 6</td>
<td>1</td>
</tr>
</tbody>
</table>

CT-TERMIBLOCK 10 DA (see page 69)

C1, C2, C3
40 V/230 V
1.5 A/25 °C
-514 A/25 °C
5 kA
60 V
1 mA/100 m
-
-
-25 °C ... + 75 °C
IP 20
IEEE C 62.36

CT 10-18FSR+F/PE...

Two-stage protection for 18 signal lines with decoupling.

Connection data can be plugged into CT-TERMIBLOCK and LSA-PLUS disconnect and switching strips.

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT 10-18FSR+F/PE-24</td>
<td>28 07 93 9</td>
<td>1</td>
</tr>
</tbody>
</table>

CT-TERMIBLOCK 10 DA (see page 69)

C1, C2, C3
40 V/230 V
140 mA/25 °C
5 kA/5 kA
5 kA
60 V
1 mA/100 m
22 Q
22 U
-25 °C ... + 75 °C
IP 20
IEEE C 62.36
COMTRAB CT 10-9VA
Pluggable Protection for 120 V AC Discrete Signals

General Description
CT 10-9VA-...AC
These COMTRABs are designed for protection of up to nine 120 V AC discrete I/O for non-isolated PLC cards. The MOV circuit features thermal protection with LED indication of suppression failure. For isolated 120 V AC discrete I/O cards use the MAINS-PLUGTRAB PT 2-PE/S-120AC.

Other voltage options are available.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

Dimensional drawing: CT 10-9VA-F/PE...

Technical data
IEC category/VDE requirement class: NDE
Maximal cont. operating voltage: MCOV: Uc:
Maximal cont. operating current Ic:
Maximal single impulses discharge (8/20) μs:
Total surge current (8/20) μs:
Response time t:
Temperature range:
Inflammability class in acc. with UL 94:
Degree of protection in acc. with IEC 60529/EN 60 529:
Approvals:
Based on test standards:

CT-TERMIBLOCK, Disconnect strip screw terminal block to hold the COMTRAB protection modules.

Connection data can be plugged into CT-TERMIBLOCK and LBA PLUS disconnect and switching strips

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT 10-9VA-F/PE-60AC</td>
<td>28 30 47 2</td>
<td>Surge voltage protection for 9 channels of 60 V DC</td>
</tr>
<tr>
<td>CT 10-9VA-F/PE-120AC</td>
<td>28 30 48 5</td>
<td>Surge voltage protection for 9 channels of 120 V DC</td>
</tr>
<tr>
<td>CT 10-9VA-F/PE-230AC</td>
<td>28 30 49 8</td>
<td>Surge voltage protection for 9 channels of 230 V DC</td>
</tr>
</tbody>
</table>

CT-TERMIBLOCK 10 DA (see page 69)

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>...60AC</td>
<td>28 30 47 2</td>
<td>Surge voltage protection for 9 channels of 60 V DC</td>
</tr>
<tr>
<td>...120AC</td>
<td>28 30 48 5</td>
<td>Surge voltage protection for 9 channels of 120 V DC</td>
</tr>
<tr>
<td>...230AC</td>
<td>28 30 49 8</td>
<td>Surge voltage protection for 9 channels of 230 V DC</td>
</tr>
<tr>
<td>C1, C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 V 75 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5 kA/5 kA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 kA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-25 ns/100 ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-25 ns/100 ns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40 °C ... + 85 °C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IEEE C 62.36
Accessories for COMTRAB Surge Protective Devices

General Descriptions

**CTM-10-MAG**
This magazine provides slots for up to 10 of the COMTRAB Modular protection plugs. The grounded rail integrated in the magazine connects the CTM plugs with the grounding connection.

**CT-TERMIBLOCK**
This base module is used as the termination point for the COMTRAB family. Grounding terminal blocks are available on both sides providing an easy, reliable, and high performance installation.

<table>
<thead>
<tr>
<th>Description</th>
<th>Dim. in mm A</th>
<th>Double cond. B</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTM card cage, for 10 double conductor disconnect and switching strips, with grounded rail for accommodating 10 CTM plugs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CT-TERMIBLOCK, disconnect strip screw terminal block for accommodating the COMTRAB protection modules</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marker card, printed vertically, self-adhesive, 10 identical 16-pos. marker strips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>as above, however, printed according to customers requirements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marker card, printed vertically, self-adhesive, 10 identical 20-pos. marker strips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>as above, however, printed according to customers requirements</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Technical data**
Insulation housing: Intertekimmttity class in acc. with UL 94.

**Type** | **Article no.** | **Price Pk.** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CTM 10-MAG</td>
<td>26 35 51 0</td>
<td>1</td>
</tr>
</tbody>
</table>

**CT-TERMIBLOCK**
Disconnect strip screw termination block

<table>
<thead>
<tr>
<th>Connector data</th>
<th>(IEC1 mm²)</th>
<th>rigid</th>
<th>flexible</th>
<th>stranded</th>
<th>AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.2-2.5</td>
<td>0.2-2.5</td>
<td></td>
<td></td>
<td></td>
<td>24-14</td>
</tr>
</tbody>
</table>

**Technical data**
Insulation housing: Intertekimmttity class in acc. with UL 94.

**Type** | **Article no.** | **Price Pk.** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CT-TERMIBLOCK 8 DA</td>
<td>04 41 72 4</td>
<td>10</td>
</tr>
<tr>
<td>CT-TERMIBLOCK 10 DA</td>
<td>04 41 71 1</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: 1-16</td>
<td>08 05 52 9</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: 17-32</td>
<td>08 05 63 2</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: 33-48</td>
<td>05 05 64 5</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: 49-64</td>
<td>08 05 65 6</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: SO/16POL</td>
<td>08 05 66 1</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: 1-20</td>
<td>08 05 67 4</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: 21-40</td>
<td>08 05 68 7</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: 41-63</td>
<td>08 05 69 8</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: 61-90</td>
<td>06 05 70 0</td>
<td>10</td>
</tr>
<tr>
<td>SK 4,8/5: SO/20POL</td>
<td>08 05 71 3</td>
<td>10</td>
</tr>
</tbody>
</table>

**Type** | **Housing width A [mm]** |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8 DCs</td>
<td>969</td>
</tr>
<tr>
<td>10 DCs</td>
<td>116.9</td>
</tr>
</tbody>
</table>

Dimensional table with CT-TERMIBLOCK

[Diagram of CTM 10-MAG and CT-TERMIBLOCK]
### Description

**COMTRAB Accessories**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LSA-PLUS disconnect strip, for 8 or 10 double conductors to hold the CTM and CT 10 protection modules</td>
<td>27 65 43 7</td>
<td>1</td>
<td>164</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Grounded rail, for use in combinations with 1 double conductor protection modules CTM and disconnect strip</td>
<td>27 65 35 6</td>
<td>1</td>
<td>124</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Mounting clip, for 3 disconnect or ground wire strips with 8/10 double conductors</td>
<td>27 65 59 0</td>
<td>1</td>
<td>104</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Mounting clip, as above, however, for 10 strips</td>
<td>27 65 54 7</td>
<td>1</td>
<td>124</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Cable bush, for inserting in assembly troughs as protection for the lines guided through the laminated frame</td>
<td></td>
<td></td>
<td>84.5</td>
<td>65</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>104.5</td>
<td>65</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>84.5</td>
<td>245.5</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>104.5</td>
<td>245.5</td>
<td>10</td>
</tr>
</tbody>
</table>

**Type**

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs. Pkt</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT 8-TL</td>
<td>27 65 43 7</td>
<td>1</td>
</tr>
<tr>
<td>CT 10-TL</td>
<td>27 65 35 6</td>
<td>1</td>
</tr>
<tr>
<td>CT 1-8-ES</td>
<td>27 65 59 0</td>
<td>1</td>
</tr>
<tr>
<td>CT 1-10-ES</td>
<td>27 65 54 7</td>
<td>1</td>
</tr>
<tr>
<td>CT 8-MB/3</td>
<td>27 65 43 3</td>
<td>1</td>
</tr>
<tr>
<td>CT 10-MB/3</td>
<td>27 65 37 2</td>
<td>1</td>
</tr>
<tr>
<td>CT 8-MB/10</td>
<td>27 65 46 6</td>
<td>1</td>
</tr>
<tr>
<td>CT 10-MB/10</td>
<td>27 65 38 9</td>
<td>1</td>
</tr>
<tr>
<td>CT KDT</td>
<td>27 65 51 8</td>
<td>1</td>
</tr>
</tbody>
</table>
Accessories for Measurement and Control Protection Products

Features
- Easy to install labeling provides clear wiring guidelines for the TRABTECH surge voltage protection.
- ZB labels can be custom printed or ordered with consecutive numbering for complete labeling flexibility. Contact factory for custom label options.

ZBFM 5 ...

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Article no.</th>
<th>Pos. pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zack marker sheet, flat, unprinted: 120-section</td>
<td>ZBFM 1/WH: UNPRINTED</td>
<td>08 03 59 5</td>
<td>10</td>
</tr>
<tr>
<td>10 strips x 12 labels, sufficient for 120 terminal blocks, for all terminal blocks in a 5.2 mm pitch, labeling with M-PEN or CMS system</td>
<td>ZBFM 5/OG: UNPRINTED</td>
<td>08 07 18 0</td>
<td>10</td>
</tr>
<tr>
<td>Special printing Zack marker sheet, flat, 120-section, divisible, marking according to customer requirements</td>
<td>ZBFM 5: SO/CMS,...</td>
<td>08 03 94 7</td>
<td>1</td>
</tr>
</tbody>
</table>

ZB 6

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Article no.</th>
<th>Pos. pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zack strip printed horizontally, 10-section, Lt, L2, L3, N, PE</td>
<td>ZB 6: UNPRINTED</td>
<td>10 51 30 3</td>
<td>10</td>
</tr>
<tr>
<td>Zack strip printed horizontally, 10-section, U, V, W, N, +</td>
<td>ZB 6, LGS: L1-N, PE</td>
<td>10 51 41 4</td>
<td>10</td>
</tr>
<tr>
<td>Zack strip printed horizontally, 10-section, with consecutive numbers 1-10</td>
<td>ZB 6, LGS: U-N</td>
<td>10 51 43 0</td>
<td>10</td>
</tr>
<tr>
<td>Zack strip printed horizontally, 10-section, divisible, marking according to customer requirements</td>
<td>ZB 6, LGS: CONSEC, NOS</td>
<td>10 51 61 6</td>
<td>10</td>
</tr>
<tr>
<td>Zack strip printed horizontally, 10-section, divisible, marking according to customer requirements</td>
<td>ZB 6, SO/CMS 1</td>
<td>10 50 49 9</td>
<td>10</td>
</tr>
</tbody>
</table>

Reference Potential Terminal Block

Features
- Provides connection for common DIN rail reference. Black color indicates it is NOT an earth ground connection.

USLKG 4 BK/BK

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Article no.</th>
<th>Pos. pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference potential terminal block, with black insulation housing, for mounting on Con or Con</td>
<td>USLKG 4 BK/BK</td>
<td>37 98 78 9</td>
<td>10</td>
</tr>
</tbody>
</table>

Technical data
- Rated surge voltage / contamination class: 8 kV / 3
- Surge voltage category / insulating material group: III / I, II
- Connection data acc. to IEC 947-2: 0.2 mm² - 4 mm²
- Connection capacity: flexible with ferrules without plastic sleeve: 0.20 mm² - 2.5 mm²
- Multi-conductor connection (2 cond. with same cross section) rigid/flexible: 0.2 mm² - 1.5 mm²
- Stripping length: Plug gauge (IEC 947-1:1988): 9 mm
- Terminal point: Thread / Torque
- Fixing: Thread / Torque
- Type of insulation material / inflammability class in acc. with UL 94: PA / V2
- Dimensions: Width / length Height (NS 35: 7.5 / NS 35: 15 / NS 32: 9.2

Phoenix Contact 71
Fast Shield Connection

Features
• Allows quick and reliable shield connections for maximum signal integrity and protection.
• Labeling feature insures properly marked wiring.
• Reliable termination method insures shield is properly connected.

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shield fast connection,</td>
<td>SSA 3-6</td>
<td>28 29 35</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>for diameters 3-6 mm</td>
<td>SSA 5-10</td>
<td>28 39 51</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>for diameters 5-10 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SSA
Shield fast connection

SSA
Shield fast connection

Phoenix Contact
Surge Protection Devices for Data Networks and Industrial Bus Systems

Data Networks / Industrial Bus Systems

Data networks and industrial bus systems are typically used to move volumes of data point to point, locally (LANs) or over wide areas (WANs). In addition to causing physical damage, transients induced onto data lines can interrupt data streams and prevent the information from getting to its intended recipient. These interruptions can cause costly downtime and reduced system availability.

The major data networks and bus systems use coaxial, twinax, twisted pair, or fiber optics for the transmission medium. Because of their high data transfer speeds, special care must be taken with surge protection circuits so as to not attenuate the normal data flow.

The most important issues for selecting surge protection devices for data circuits are: termination connector, signal voltage level, and data rate.
Many data applications utilize standard serial interfaces for transferring data. These include RS 232, RS 422, and RS485 standards. Data is typically transmitted point to point or with RS 485 multi-drop (master / slave) configurations are possible.

Shielded twisted pair is typically the transmission medium for serial data. Connections can be hard-wired or standard D-SUB connectors are often used.

The number of conductor lines is either two or four with RS 422 and RS 485. RS 232 is typically two wire with a common reference potential but can sometimes include multiple handshaking lines.

Industrial bus systems are typically a variation of RS485 or have proprietary electrical characteristics depending on the manufacturer or developer. Examples of industrial bus systems based on RS 485 include: Interbus, Profibus, Data Highway, and Modbus. Other proprietary systems include Modbus +, Data Highway +, and Control Net.

Because industrial bus systems are typically run on the factory floor or in some cases outdoors, there is always a high threat of damage or interruption due to surges.

These systems are based on serial data transfer concepts, and can have data rates up to 12Mbit / sec.

The connection can be hard-wired or utilized standard D-SUB or BNC connectors.

A LAN is a higher-level communication system for interconnecting various devices, usually in such a way that all users have access to common resources (such as printers) and can communicate with each other. The medium for LANs is commonly either fiber optics, shielded coaxial cable, or shielded twisted pair.

The coaxial cable is commonly terminated with BNC connectors for data communication circuits. The twisted pair cables are terminated with modular RJ-45 connectors.

There are different standards for data circuit wiring that are referred to as “Category 4” or “Category 5” wiring. These designs are made specifically for very low impedance and capacitance. The Phoenix Contact surge protectors shown on the following pages meet these wiring standards.
# Table of interfaces with the allocation of suitable surge voltage arresters

<table>
<thead>
<tr>
<th>Interface</th>
<th>Surge Voltage Protection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>AB Remote I/O</td>
<td>PT 5-HF-12DC</td>
<td>83</td>
</tr>
<tr>
<td>ADSL</td>
<td>PT 2-ISDN-NT CTM 1x2-110AC</td>
<td>109 62</td>
</tr>
<tr>
<td>ARCNET (Plus)</td>
<td>C-UFB- 5DC/E D-LAN-CAT.5E PT 3-PB-ST &amp; PT 1x2+F-BE</td>
<td>102 80 83</td>
</tr>
<tr>
<td>ASI</td>
<td>PT 2-PE/8-24AC PT 2+15-48DC-ST &amp; PT 1x2+F-BE</td>
<td>30 31</td>
</tr>
<tr>
<td>ATM</td>
<td>D-LAN-CAT.5E</td>
<td>80</td>
</tr>
<tr>
<td>CAN bus</td>
<td>PT 3-HF-12DC-ST &amp; PT 1x2+F-BE</td>
<td>83</td>
</tr>
<tr>
<td>Cheapernet, Ethernet (10 Base 2)</td>
<td>C-UFB- 5DC/E-LAN D-LAN-CAT.5E</td>
<td>81 80</td>
</tr>
<tr>
<td>Control-Net</td>
<td>C-UFB- 5DC/E</td>
<td>102</td>
</tr>
<tr>
<td>Data Highway DH</td>
<td>PT 3-HF-12DC</td>
<td>83</td>
</tr>
<tr>
<td>Data Highway (Plus), DH+</td>
<td>PT 3-HF-12DC-ST &amp; PT 1x2+F-BE</td>
<td>83</td>
</tr>
<tr>
<td>Data Highway RS 485 (DH-485)</td>
<td>PT 3-HF-12DC</td>
<td>83</td>
</tr>
<tr>
<td>DeviceNet</td>
<td>PT 3-HF-12DC-ST &amp; PT 1x2+F-BE</td>
<td>83</td>
</tr>
<tr>
<td>Dupline</td>
<td>PT 1x2-12DC MT V24</td>
<td>42 85</td>
</tr>
<tr>
<td>EX(I)</td>
<td>PT 2EX(I)-24DC PT 4xEX(I)-24DC TT-EX(I)-24DC</td>
<td>44 44 51</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interface</th>
<th>Surge Voltage Protection</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet, Cheapernet (10 Base 2)</td>
<td>C-UFB- 5DC/E-LAN D-LAN-CAT.5E</td>
<td>81 60</td>
</tr>
<tr>
<td>Ethernet (10 Base 5)</td>
<td>CN-UFB-5DC/E-LAN</td>
<td>81 60</td>
</tr>
<tr>
<td>Ethernet (10 Base T)</td>
<td>CN-UFB-5DC/E-LAN D-LAN-CAT.5E</td>
<td>81 60</td>
</tr>
<tr>
<td>Fast Ethernet (100 Base T)</td>
<td>D-LAN-CAT.5E CTM ISDN</td>
<td>80 60</td>
</tr>
<tr>
<td>Fieldbus Foundation</td>
<td>PT 5-HF-12DC-ST &amp; PT 2x2+F-BE PT 3-HF-12DC-ST &amp; PT 1x2+F-BE MT RS485</td>
<td>83 83 88</td>
</tr>
<tr>
<td>FSK</td>
<td>PT 1x2-5DC-ST &amp; PT 1x2-BE CTM ISDN</td>
<td>42 63</td>
</tr>
<tr>
<td>Radio plants (GPS, GSM)</td>
<td>CN-UB 230DC</td>
<td>98</td>
</tr>
<tr>
<td>Genius I/O Bus</td>
<td>PT 2x2-12DC-ST &amp; PT 2x2+F-BE</td>
<td>41</td>
</tr>
<tr>
<td>Hart</td>
<td>PT 1x2-24DC-ST &amp; PT 1x2-BE</td>
<td>42</td>
</tr>
<tr>
<td>HDSL</td>
<td>PT 2-ISDN-NT CTM 1x2-110AC</td>
<td>109 63</td>
</tr>
<tr>
<td>INTERBUS</td>
<td>D-UFB-18-S-RBI D-UFB-18-S-RBO PT 4... CT 10...</td>
<td>92 93 41 64</td>
</tr>
<tr>
<td>INTERBUS Inline</td>
<td>PT 5-HF-5DC-ST &amp; PT 2x2+F-BE TT-SLKK5-F/110AC</td>
<td>83 57</td>
</tr>
<tr>
<td>INTERBUS Field Multiplexer</td>
<td>PT 3-PB-ST &amp; PT 1x2+F-BE</td>
<td>83</td>
</tr>
<tr>
<td>Interface</td>
<td>Surge Voltage Protection</td>
<td>Page</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------</td>
<td>------</td>
</tr>
<tr>
<td>ISDN (S₀ bus)</td>
<td>D-TR1/ISDN</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>CT10-5/ISDN</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>CTM ISDN</td>
<td>109</td>
</tr>
<tr>
<td>ISDN (S₂₀ bus)</td>
<td>D-TR1/ISDN</td>
<td>108</td>
</tr>
<tr>
<td></td>
<td>CT10-5/ISDN</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>CTM ISDN</td>
<td>109</td>
</tr>
<tr>
<td>ISDN (U₄₀ interface)</td>
<td>PT 2-ISDN-NT</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>CTM 1x2-110AC</td>
<td>62</td>
</tr>
<tr>
<td>ISDN (U₄₀ interface)</td>
<td>PT 2-ISDN-NT</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>CTM 1x2-110AC</td>
<td>62</td>
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<tr>
<td>Cathodic protection</td>
<td>PT 2-F</td>
<td>41</td>
</tr>
<tr>
<td>LON (TP/XF-78 and TP/XF-1250)</td>
<td>PT 3-PB</td>
<td>94</td>
</tr>
<tr>
<td>LON (TP-RS485-38)</td>
<td>PT 3-HF-12DC</td>
<td>83</td>
</tr>
<tr>
<td>MODBUS(-PLUS)</td>
<td>PT 5-HF-12DC</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>MT RS485</td>
<td>88</td>
</tr>
<tr>
<td>MODBUS(RS 232)</td>
<td>PT 5-HF-12DC</td>
<td>83</td>
</tr>
<tr>
<td>Process bus, panel bus (P bus)</td>
<td>PT 3-HF-12DC-ST &amp; PT 1x2+F-BE</td>
<td>83</td>
</tr>
<tr>
<td>Profibus DP (FMS)</td>
<td>PT 3-PB-ST &amp; PT 1x2-BE</td>
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<td>PT 3-HF-12DC-ST &amp; PT 1x2-BE</td>
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<tr>
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<td>MT RS485 (up to 187.5 kBit/s)</td>
<td>88</td>
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<tr>
<td>Profibus PA</td>
<td>PT 2xEX(I)-24DC</td>
<td>44</td>
</tr>
<tr>
<td>RS 422A, V.11, X.27, RS 423A</td>
<td>D-UFB-V11/...</td>
<td>86</td>
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<td></td>
<td>PT 5-HF-12DC</td>
<td>83</td>
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<td>CTM 1x2-12DC</td>
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<td>RS 449</td>
<td>PT 5-HF-12DC</td>
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<tr>
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<td>CT 10-18FS+F/PE-24</td>
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<tr>
<td>RS-485 (2-wire)</td>
<td>PT 5-HF-12DC</td>
<td>83</td>
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<td>MT RS485</td>
<td>88</td>
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<tr>
<td></td>
<td>D-UFB-485/...</td>
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<table>
<thead>
<tr>
<th>Interface</th>
<th>Surge Voltage Protection</th>
<th>Page</th>
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<tr>
<td>RS-485</td>
<td>PT 3-HF-12DC</td>
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<td>SecuriLan LON bus</td>
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<td></td>
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<tr>
<td>SINEC L1</td>
<td>PT 5-HF-5DC &amp; LT-D1 &amp; TT-SLKK5-F/110AC</td>
<td>83</td>
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<td>57</td>
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<tr>
<td>SINEC L2 DP</td>
<td>PT 3-PB-ST &amp; PT 1x2-BE</td>
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<td>PT 3-HF-12DC-ST &amp; PT 1x2-BE</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>MT RS485 (up to 187.5 kBit/s)</td>
<td>88</td>
</tr>
<tr>
<td>SUCONET K1</td>
<td>PT 3-HF-12DC</td>
<td>83</td>
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<tr>
<td></td>
<td>PT 1x2-12DC</td>
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</tr>
<tr>
<td></td>
<td>MT RS485</td>
<td>85</td>
</tr>
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<td>CTM 1x2-12DC</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td>D-UFB-V24/5-DSUB9/...</td>
<td>85</td>
</tr>
<tr>
<td>T1/E1 (DS1)</td>
<td>D-DS1</td>
<td>109</td>
</tr>
<tr>
<td></td>
<td>PT 5-HF-12DC</td>
<td>83</td>
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<td>Analog telephone</td>
<td>WT-RJ12...FM</td>
<td>111</td>
</tr>
<tr>
<td></td>
<td>D-FM-A/RJ45-BB</td>
<td>111</td>
</tr>
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<td></td>
<td>CTM 1x2-110AC</td>
<td>62</td>
</tr>
<tr>
<td>Token Ring</td>
<td>D-LAN-CAT.5E</td>
<td>80</td>
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<tr>
<td></td>
<td>PT 5-HF-5DC-ST &amp; PT 2x2-BE</td>
<td>83</td>
</tr>
<tr>
<td>TTY, 0(4) - 20 mA</td>
<td>MT-TTY-1</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>D-UFB-TTY1/...</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>PT 2x2...</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>CTM 1x2-24DC</td>
<td>62</td>
</tr>
<tr>
<td>TV, radio</td>
<td>CF-TV</td>
<td>104</td>
</tr>
<tr>
<td>V.24/RS-232-C</td>
<td>D-UFB-V24/...</td>
<td>84</td>
</tr>
<tr>
<td></td>
<td>MT-V24</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>PT 5-HF-12DC</td>
<td>83</td>
</tr>
<tr>
<td>VDSL</td>
<td>PT 2-F</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>CTM1x2-110AC-GS</td>
<td>63</td>
</tr>
<tr>
<td>Video signal</td>
<td>C-UFB...</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>PT 5-HF...</td>
<td>83</td>
</tr>
<tr>
<td></td>
<td>PT 2x2-HF...</td>
<td>83</td>
</tr>
</tbody>
</table>
Overview of Designs of Surge Protection Devices for Data Networks and Industrial Bus Systems

COAXTRAB and D-LAN
Surge Protection Devices for Coaxial and Twisted Pair Conductors

DATA-PLUGTRAB
Pluggable Surge Protection Devices for High Speed Data Networks

DATATRAB
Surge Protection Devices with D-SUB connection for Serial Data Interfaces

Features
• Metal housing provides superior shielding (EMI / RFI) properties for high-speed data interfaces.
• RJ45, BNC, or Type N connectors provide easy interface to most popular network cabling.
• Hybrid protection circuit provides “fine” voltage clamping with “coarse” surge current handling.
• 5-year free replacement warranty provides added risk-free investment.

Features
• Up to 10 kA (8/20 μs) surge current handling capacity for protection against internal and external sources of surges including lightning strikes.
• Easy plug-to-base connections facilitate installation.
• Self-coding for different voltage plugs provides assurance against misapplication.
• Quick-mount grounding foot provides easy connection and low impedance ground for the best voltage clamping performance.
• Pluggable suppression can be “hot-swapped” for verification testing.

Features
• Metal housing provides superior shielding properties (EMI / RFI) for high-speed data interfaces.
• D-SUB connectors provide easy interface to popular serial data interfaces.
• Hybrid protection circuit provides “fine” voltage clamping with “coarse” surge current handling.
• 5-year free plug replacement warranty provides added risk-free investment.

Explanation of the type designation

<table>
<thead>
<tr>
<th>Type</th>
<th>IN (unprotected)</th>
<th>OUT (protected)</th>
<th>Fixing</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-UFB-..JSB-B</td>
<td>Male connect.</td>
<td>Fem. connect.</td>
<td>Bolt</td>
</tr>
<tr>
<td>D-UFB-..JBS-B</td>
<td>Fem. connect.</td>
<td>Male connect.</td>
<td>Bolt</td>
</tr>
<tr>
<td>D-UFB-..JSB-S</td>
<td>Male connect.</td>
<td>Fem. connect.</td>
<td>Screw</td>
</tr>
<tr>
<td>D-UFB-..JBS-S</td>
<td>Fem. connect.</td>
<td>Male connect.</td>
<td>Screw</td>
</tr>
</tbody>
</table>

Version with bolt
Version with screw

Figure 78/1 Dimensional drawing: COAXTRAB with BNC connection
Figure 78/2 Dimensional drawing: COAXTRAB with N connector
Figure 78/3 Dimensional drawing: D-LAN... / D-TR...
Figure 78/4 Dimensional drawing: PT ...-HF
Figure 78/5 Dimensional drawing: DATATRAB with/without universal foot
DATA-MODUTRAB
Surge Protection Devices with hard wired interface for serial data applications

Features
• Modular DIN rail mount for easy installation into control cabinets and junction boxes.
• Hybrid protection circuit provides "fine" voltage clamping with "coarse" surge current handling.
• 5-year free plug replacement warranty provides added risk free investment.
Surge voltage protection adapter for EDP networks
DATATRAB

General Description
DATATRAB D-LAN-... is a universal surge voltage protection device for protection of Ethernet cabling systems based on 10/100Base T standards. The D-LAN accepts a standard RJ 45 connection and incorporates 8 lines of surge protection. The special low attenuation design meets cabling requirements for Category 5 cabling.

Description
DATATRAB adapter, Protective adapter to be inserted into the data line for the protection of the LAN interface incl. RJ 45 cable
DATATRAB adapter, RJ 45 cable for D-LAN-CAT.5E-U, Cat.5, S/UTP 2 x 2 x 0.14 mm²
With RJ 45 connector on both sides 1.0 m
RJ 45 cable for D-LAN-CAT.5E-U, Cat.5, S/UTP 2 x 2 x 0.14 mm² 0.5 m

Technical data
IEC category/VDE requirement class: C1, C2, C3
Max. max. operating voltage MCOV: DC/AC 7 V DC
Max. max. operating current IN: 1.5 A
Max. single impulse discharge (8/20)us: L-UL-1 350 A/2.5 kA
Limiting (clamping) voltage at 1 kV/µs: L-L/L-4 s 22 V/80 V
Response time τa: Input attenuation αL in a 100/150 Ω system (typ.): D-C/RJ45-8/1,5 100 ns
Cut-off frequency f9 in a 100/150 Ω system (typ.): > 100 MHz
Temperature range: -40°C to +80°C
Degree of protection in acc. with IEC 60529/EN 60 529: IP 20
Approvals: Class D DIN EN 50173-1:2002 cls-497 B
Based on test standards: IEEE C 62.36

Dimensional drawing: D-LAN-CAT5.E

80
Phoenix Contact
General Description
The COAXTRAB C-UFB... and CN-UFB... have been designed to protect Ethernet networks using 10Base 2 and 10Base 5 cabling (BNC and Type N connectors). The hybrid circuit provides protection both normal mode (line to line) and common mode (line to ground).
DATA-PLUGTRAB
Pluggable Data Surge Protection Devices – Hybrid Designs For Protection of Industrial Bus Systems

General Description
The DATA PLUGTRABs are designed especially for protecting industrial bus systems such as Interbus, Profibus, Data-Highway, and Modbus. See page 76-77 for details on which DATA-PLUGTRAB to choose for the most popular bus systems.

PT 5-HF...
This series of products protects up to four data signal conductors. The specially designed circuit provides high speed SAD technology normal mode (line to line) between all signal conductors and gas discharge tube technology common mode (line to ground) for all signal conductors.

PT 2x2-HF...
This series of products protects two 2-conductor floating ground data circuits. Each pair is protected with high speed SAD technology in normal mode (line to line) and gas discharge tube technology in common mode (line to ground) for each signal conductor pair.

PT 3-HF...
These products provide protection for two data signal conductors with a common reference potential. Each data signal is protected with high speed SAD technology in normal mode (line to line) and gas discharge tube technology in common mode (line to ground).

Note: Selection of PT Base Element
PT...-BE
This base element should be used in installations where the common return or shield is to be grounded at the DIN rail. The connections for ground (9/10) are connected directly to the mounting foot (3/4).

PT...+F-BE
This base element should be used in installations where the common return (or shield) is to be isolated (floating) from earth ground at the connection point. Terminate the common return (or shield) to positions 9/10 and earth ground to positions 5/6. Now you will have gas tube isolation (no leakage current) between your common return (or shield) and earth ground. In addition to any normal mode protection, you will also have protection line to common (or shield), and common (or shield) to ground.

See installation instructions on page 120 for more detail.

Verification testing can be accomplished on all plugs by using the CHECKMASTER, see page 114.

Technical data
IEC category: NDE
Requirement class:
Max. cont. operating voltage: MCOV:
Max. cont. operating current IN:
Max. single impulse discharge (8/20)μs:
Total surge current (8/20)μs:
Limiting (clamping) voltage at 1 kV/us:
Response time ta:
Input attenuation α1 in a 100 Ω system (typ.):
Cut-off frequency f9 (3dB) in a 100 Ω system (typ.):
Resistance per path:
Resistance per path:
Temperature range:
Inflammability class in acc. with UL 94:
Degree of protection in acc. with IEC 60529/EN 60 529:
Approvals:
Class 1, Division 2, Groups A, B, C & D:
Based on test standards:

Connection data
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<th>Description</th>
<th>Voltage (V)</th>
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<tr>
<td>DATA-PLUGTRAB connector,</td>
<td>5 V DC</td>
</tr>
<tr>
<td>can be plugged into the</td>
<td>12 V DC</td>
</tr>
<tr>
<td>header, for mounting</td>
<td>24 V DC</td>
</tr>
<tr>
<td>between connections 3/4</td>
<td></td>
</tr>
<tr>
<td>(.) and 9/10</td>
<td></td>
</tr>
<tr>
<td>INC-PLUGTRAB header,</td>
<td></td>
</tr>
<tr>
<td>for mounting on Lr with</td>
<td></td>
</tr>
<tr>
<td>bridge between connections</td>
<td></td>
</tr>
<tr>
<td>3/4 (.) and 9/10</td>
<td></td>
</tr>
<tr>
<td>INC-PLUGTRAB header,</td>
<td></td>
</tr>
<tr>
<td>for mounting on Lr with</td>
<td></td>
</tr>
<tr>
<td>gas-filled surge arrester</td>
<td></td>
</tr>
<tr>
<td>between connections 3/4</td>
<td></td>
</tr>
<tr>
<td>(.) and 9/10</td>
<td></td>
</tr>
<tr>
<td>Zack strip, white</td>
<td></td>
</tr>
<tr>
<td>Shield fast connection,</td>
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</tr>
<tr>
<td>for diameters</td>
<td></td>
</tr>
<tr>
<td>3-5 mm</td>
<td></td>
</tr>
<tr>
<td>for diameters</td>
<td></td>
</tr>
<tr>
<td>5-10 mm</td>
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<table>
<thead>
<tr>
<th>Technical data</th>
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</tr>
</thead>
<tbody>
<tr>
<td>IEC category/VDE requirement class: DC/AC</td>
<td></td>
</tr>
<tr>
<td>Max. cont. operating voltage MCOV:</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Max. cont. operating current İL:</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Max. single impulse discharge (6/20)μs:</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Total surge current (8/20)μs:</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Limiting (clamping) voltage at 1 kV/us:</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Response time τa:</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Input attenuation α1 in a 100 Ω system (typ.):</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Cut-off frequency f9 (3dB) in a 100 Ω system (typ.):</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Resistance per path:</td>
<td>L/L/L+</td>
</tr>
<tr>
<td>Resistance per path:</td>
<td>L/L/L+</td>
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Phoenix Contact
### Signal Circuit Protection in Three or Four-Conductor Technology

**Housing width 17.5 (1 div.)**

**Surge Voltage Protection for Floating Signal Circuits**

**Housing width 17.5 (1 div.)**

**Surge Voltage Protection for Profibus**

<table>
<thead>
<tr>
<th>Type</th>
<th>Article No.</th>
<th>Pcs.</th>
<th>Pkt.</th>
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<tbody>
<tr>
<td>PT 5-HF-5DC-ST</td>
<td>28 38 76 2</td>
<td>10</td>
<td>10</td>
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<tr>
<td>PT 5-HF-12DC-ST</td>
<td>28 38 77 5</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>PT 2x2-BE</td>
<td>28 39 20 8</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>PT 2x2+F-BE</td>
<td>28 39 22 4</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Supported Bus Systems (see table 76-77 or call factory if you do not see your bus system listed):
- MODBUS +
- Ethernet 10Base T
- RS 232

### Supported Bus Systems

- Data Highway (DH)
- Data Highway + (DH+)
- Device Net (requires PT 2-PE/S-24AC for protection of bus power)
- Modbus
- Profibus (up to 12Mbit/s)
- Remote I/O
- RS 232

---

*Phoenix Contact*
DATATRAB
Surge Protection for RS-232 Serial Data Interfaces

General Description
The DATATRAB products specifically for RS-232 signals include a hybrid protection circuit for "fine" protection line to line and "coarse" protection line to ground. Special versions include additional protection for handshaking lines required for some RS-232 interfaces.

D-UFB-V24...
These products feature metal housings for EMI/RFI shielding and standard 9 and 15 position D-SUB connectors for easy installation. See table 5 on page 78 for connector selection guide.

MT-V24
These MT-V24 products feature a DIN rail mount housing with screw clamp terminals for hard wire applications.

<table>
<thead>
<tr>
<th>IEC category</th>
<th>rigid</th>
<th>solid</th>
<th>stranded</th>
<th>AWG</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA-MODUTRAB</td>
<td>0.2-4</td>
<td>0.2-2</td>
<td>24-12</td>
<td></td>
</tr>
<tr>
<td>DATATRAB IN</td>
<td>D-25-SUB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DATATRAB OUT</td>
<td>D-25-SUB</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Description
DATATRAB 1), protection adapter for V.24 data transmission

DATATRAB 2), as above, however for mounting on ___

DATA-MODUTRAB 3), protection module for mounting on ___

DATA-PLUGTRAB-plug, DIN rail mount housing, 12 V DC

Connection data

Type | Article no. | Pcs | Pkt
--- | --- | --- | ---
D-UFB-V24/8-SB-B 1) 2) | 27 82 09 6 | 6 |
D-UFB-V24/8-BS-B 1) 2) | 27 82 10 6 | 6 |
D-UFB-V24/8-SB-S 1) 2) | 27 82 12 2 | 2 |
D-UFB-V24/8-BS-S 1) 2) | 27 82 11 9 | 9 |

Characteristics of the device

PT 5-HF-12DC
The PLUGTRAB PT products can also be used for RS-232 data signals. The DIN rail mount housing and pluggable features make the PLUGTRAB PT ideal for control cabinet applications.

![Surge protection devices chart](image-url)
## D-UFB-V24/S-DSUB 9/...

Fine protection for V.24 data transmission

### Module width 30

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-UFB-V24/S-DSUB 9/SB-B¹</td>
<td>27 62 77 3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>D-UFB-V24/S-DSUB 9/SB-S¹</td>
<td>27 62 78 6</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>D-UFB-V24/S-DSUB 9/SB-U¹</td>
<td>27 62 79 9</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Pin configuration D-UFB-V24/...
- Data lines: 2, 3
- Signal ground: 7

### MT V24

Coarse and fine protection for V.24 data transmission

### Module width 17.5

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
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</thead>
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<tr>
<td>MT V24¹</td>
<td>27 62 22 3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

### Pin configuration MT V24:
- Data lines: 2, 3
- Gnd: 7

### PT 5-HF-12DC

Coarse and fine protection for V.24 data transmission

### Module width 17.5

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 3-HF-12DC (see page 83)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT 5-HF-12DC (see page 83)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PT...-BE (see page 83)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Pin configuration PT 5-HF-12DC:
- Data lines: 2, 3, 4, 5, 6, 8, 20
- Gnd: 7

## Characteristic attenuation curve MT V24...

[Graph showing the characteristic attenuation curve for MT V24]
DATATRAB
Surge Protection for RS-422
Serial Data Interfaces

General Description
The DATATRAB products specifically for RS-422 signals include a hybrid protection circuit for "fine" protection line to line and "coarse" protection line to ground. A variety of connection interfaces are available including standard 15 and 25 pin D-SUB connectors and hard wired DIN rail mount versions. See table 5 on page 78 for connector selection guide.

Pin configuration D-UFB-V11/... and D-UFB-V11/S
Data line pair 1: T(A), T(B) 2, 9
Data line pair 2: R(A), R(B) 4, 11
Signal ground: 8

Pin configuration D-UFB-V11-SUB 25...
Data line pair 1: T(A), T(B) 25, 19
Data line pair 2: R(A), R(B) 15, 17
Signal ground: 7, 11

DATA-PLUGTRAB PT 5-HF is a two-part surge voltage protection device. This surge arrester is also used in data transmission systems with the V.11/RS-422 interface (ITU-T V.11:1993/EIA-422/DIN 66 020-1). It must be mounted on mounting rails and is connected using screw terminal blocks.

Pin configuration PT 5-HF-12DC:
Data line pair 1: T(A), T(B) 1, 5
Data line pair 2: R(A), R(B) 7, 11
Signal ground: 9, 3

DATA-PLUGTRAB plug can be plugged into the header 12 V DC
MCPR-PLUGTRAB header, for mounting on with gas-filled surge arrester between connections 3/4 (i) and 9/10

Technical data
IEC category/VDE requirement class:
Max. cont. operating voltage: MCOV:
Max. cont. operating current: IIN:
Max. single impulse discharge (8/20) us:
Limiting (clamping) voltage at 1 kV/psi:
Response time ty:
Input attenuation AL in a 50/600 S2 system (typ.):
Cut-off frequency f(t) in a 50/600 4 system (typ.):
Resistance per path:
Temperature range:
Inflammability class in acc. with UL 94:
Degree of protection in acc. with IEC 60529/ EN 60 529:
Approvals:

Based on test standards:
1) Explanations for the mechanical versions, see page 86.

* Characteristic attenuation curve

Surge voltage protection devices

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine protection, signal-signal (sym.)</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Fine protection, signal-ground (asym.)</td>
<td>⬤</td>
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<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Coarse protection, signal-signal (sym.)</td>
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<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
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<tr>
<td>Coarse protection, signal-ground (asym.)</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Coarse protection, signal- +</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
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<tr>
<td>Coarse protection, ground-</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Decoupling</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
</tbody>
</table>

Matrix: Characteristics of the device

86
Phoenix Contact

Characteristic attenuation curve
Coarse and fine protection for V.11 data transmission

Coarse and fine protection for V.11 data transmission

Module width 17.5

Module width 17.5

Unprotected

Protected

Unprotected

Protected

Type | Article no. | Pcs.
--- | --- | ---
D-UFB-V11-SUB 25-BS-B | 27 63 87 8 | 1
D-UFB-V11-SUB 25-BS-S | 27 89 18 3 | 1
D-UFB-V11/S-SB-S | 27 82 18 0 | 1

Unprotected

Protected

Unprotected

Protected

Type | Article no. | Pcs.
--- | --- | ---
PT 5-HF-12DC-ST | 28 38 77 5 | 10
PT 2x3+F-BE | 28 39 22 4 | 10

C1, C2, C3, D1
12 V DC
175 mA/25 °C
5 kA 0.5 kA
≤ 22 V 600 V 600 V
≤ 1 mA 100 ns
≤ 2 dB to 600 kHz 0 dB to 10 kHz
≤ 5 MHz/50 kHz
22 Ω
-40 °C to +60 °C

IP 20

IEEE C62.35

C1, C2, C3, D1
12 V DC
1 A/25 °C
0.4 kA 0.5 kA (GND-Φ)
≤ 22 V 600 V 600 V
≤ 1 mA 100 ns
0.1 dB to 200 kHz/20 kHz
1.5 MHz/150 kHz
12 Ω
-40 °C to +60 °C

IP 20

IEEE C62.35

Characteristic attenuation curve

Characteristic attenuation curve

IEEE C62.36
DATATRAB
Surge Protection for RS-485 Serial Data Interfaces

General Description
The DATATRAB products specifically for RS-485 signals include a hybrid protection circuit for "fine" protection line to line and "coarse" protection line to ground.

A variety of connection interfaces are available including standard 9 pin D-SUB connectors and hard wired DIN rail mount versions. See table 5 on page 78 for connector selection guide.

Pin configuration MT RS485...:
- Data line pair 1 T(A)/T(B) 3, 8
- Data line pair 2 R(A)/R(B) 4, 9
- Signal ground 2, 7

Pin configuration MT RS485/S:
- 12 V line 1, 6
- Data line pair 1 T(A)/T(B) 3, 8
- Data line pair 2 R(A)/R(B) 4, 9
- Signal ground 2, 7

Pin configuration PT 5-HF...:
- Data line pair 1 T(A)/T(B) 1, 5
- Data line pair 2 R(A)/R(B) 7, 11
- Signal ground 9

Note: Selection of PT Base Element

PT ...-BE
This base element should be used in installations where the common return or shield is to be grounded at the DIN rail. The connections for ground (9/10) are connected directly to the mounting foot (3/4).

PT ...+F-BE
This base element should be used in installations where the common return (or shield) is to be isolated (floating) from the earth ground at the connection point. Terminate the common return (or shield) to positions 9/10 and earth ground to positions 3/4.

Note: Selection of PT Base Element

Module width 50
MT RS485/S
Fine protection for RS-485 data transmission
Module width 50

PT 5-HF-...
Signal circuit protection in
three or four-conductor technology
Housing width 17.5 (1 div.)

Type | Article no. | Pcs. | Pkt.
--- | --- | --- | ---
MT RS485/S | 27 62 27 | 1

PT 5-HF-5DC-ST | 28 38 76 | 10
PT 5-HF-12DC-ST | 28 38 77 | 10
PT 2x2-BE | 28 39 20 | 10
PT 2x2-F-BE | 28 39 22 | 10
ZBFM 5 (order data, see page 71) | 28 39 22 | 10
ZDN 13 (order data, see page 29) | 28 39 22 | 10
SSA... (see page 72) | 28 39 22 | 10

<table>
<thead>
<tr>
<th>5 DC</th>
<th>12 DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2, C3, D1</td>
<td>C1, C2, C3, D1</td>
</tr>
<tr>
<td>12 V/9 V</td>
<td>14 V/9 V</td>
</tr>
<tr>
<td>0.2 V/0.9 V</td>
<td>450 mA</td>
</tr>
<tr>
<td>20 kA</td>
<td>20 kA</td>
</tr>
<tr>
<td>≤ 55 Vdc</td>
<td>≤ 55 Vdc</td>
</tr>
<tr>
<td>≤ 500 ns ≤ 500 ns</td>
<td></td>
</tr>
<tr>
<td>0.2 dB to 5 MHz (typ.)</td>
<td>0.2 dB to 5 MHz (typ.)</td>
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<tr>
<td>70 MHz</td>
<td>10 MHz</td>
</tr>
<tr>
<td>2.2 Q</td>
<td>2.2 Q</td>
</tr>
<tr>
<td>-40 °C to +85 °C</td>
<td>-40 °C to +85 °C</td>
</tr>
<tr>
<td>V0</td>
<td>V0</td>
</tr>
<tr>
<td>IP 20</td>
<td>IP 20</td>
</tr>
<tr>
<td>IP20</td>
<td>IP20</td>
</tr>
<tr>
<td>IEEE C62.36</td>
<td>IEEE C62.36</td>
</tr>
</tbody>
</table>

Characteristic attenuation curve
Derating curve PT 5-HF-12DC
General Description

These products are ideal for RS-485 applications where the cable is terminated with a standard 9-pin D-SUB connector. The product easily connects to the bus cable providing coarse and fine protection for two or four wire RS-485 signals. Use the type S version if particular low attenuation values are required.

Pin configuration D-UFB-485/...
Data line pair 1T(A)/T(B) 3, 8
Data line pair 2 R(A)/R(B) 4, 9
Signal ground 2, 7

Pin configuration D-UFB-485/S...
12 V line 1, 6
Data line pair 1T(A)/T(B) 3, 8
Data line pair 2 R(A)/R(B) 4, 9
Signal ground 2, 7

Description

DATATRAB, protection adapter for RS-485 data transmission

DATATRAB, as above, however with universal foot for mounting on DIN rail or l-bracket.

Technical data
EC category/VDE requirement class: IEC category II
Max. cont. operating voltage (MOCV): 75 V DC/25 °C
Max. cont. operating current (IIN): 5 kA, 6 kA
Limiting (clamping) voltage at 1 kV/s: L-L A+ - L-L A-
Response time (tR): 3.2 dB to 1 MHz/0.4 dB to 100 kHz
Cut-off frequency (f0) in a 50/600 Ω system (typ.): 2 MHz/150 kHz
Resistance per path: 20 Ω

Degree of protection in acc. with IEC 60529/EN 60 529: IP 20

Approvals:
Based on test standards:

Surge voltage protection devices

Characteristics of the device

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs/Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-UFB-485/S-BS-B</td>
<td>27 82 60 1</td>
<td>1</td>
</tr>
<tr>
<td>D-UFB-485/S-B-U</td>
<td>27 82 59 1</td>
<td>1</td>
</tr>
</tbody>
</table>

C2, C3, D1
12 V DC
175 mA/25 °C
5 kA, 6 kA
= 22 kV 600 V
= 1.0 ms/100 ns
= 3.2 dB to 1 MHz/0.4 dB to 100 kHz
5 MHz/450 kHz
22 Ω
- 40 °C to + 60 °C
- 20 °C

IEEE C62.36

1) Explanation for the mechanical version, see page 88.
DATATRAB
Surge Protection for INTERBUS
Remote Bus Systems

General Description
The D-UFB-IB... products are designed specifically for INTERBUS remote bus systems using standard D-SUB 9 position connectors. The surge protection modules can be easily DIN rail mounted for control cabinet applications.

D-UFB-IB-S-RBI
This product is designed specially for protection of INTERBUS remote bus input circuit applications. In addition to the fine protection circuit line to line and line to shield, the protection circuit features gas tube isolation shield to ground. An additional capacitor is also used between the shield and ground to reduce EMI / RFI effects.

D-UFB-IB-S-RBO
This product is designed specially for protection of INTERBUS remote bus output circuit applications. The protection circuit features fine protection line to line and line to shield / ground.

PT 5 HF-5DC
This PLUGTRAB PT product can be used especially for INTERBUSINLINE remote bus protection. The specially designed circuit provides high speed SAD technology normal mode (line to line) between all signal conductors and gas discharge tube technology common mode (line to ground) for all signal conductors.

Technical data
- IEC category/VDE requirement class: C1, C3, D1
- Max. cont. operating voltage Uc: 5.8 V DC
- Max. cont. operating current Ic: 300 mA / 25 °C
- Max. single impulse discharge (8/20)μs: L-LL-L ± 0.35 kA / 0.35 kA
- Total surge current (8/20)μs: L-1 ± 1.5 kA
- Response time tR: ≤ 500 ns
- Input attenuation a in a 50/500 Q system (typ.): 0.1 dB to 8.5 MHz
- Cut-off frequency f9 (3dB) in a 50 Q system (typ.): 100 MHz
- Resistance per path: ≤ 2.5 Ω
- Temperature range: -40 °C to +80 °C
- Inflammability class in acc. with UL 94: V-1
- Degree of protection in acc. with IEC 60529/ EN 60 529: IP 10
- Approvals: Class 1, Division 2, Groups A, B, C & D
- Based on test standards: IEEE C62.36
D-UFB-IB-S-RBO
Protection adapter for 2-conductor remote bus output

PT 5 HF 5DC
Surge voltage protection device for INTERBUS-INLINE

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-UFB-IB-S-RBO</td>
<td>27 48 36 9</td>
<td>1</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pos. Pcs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 5-HF-5DC-ST</td>
<td>26 38 76 2</td>
<td>10</td>
</tr>
<tr>
<td>PT 2x2-24AC-ST¹</td>
<td>26 38 28 3</td>
<td>10</td>
</tr>
<tr>
<td>PT 1x2-24AC-ST²</td>
<td>26 56 35 8</td>
<td>10</td>
</tr>
</tbody>
</table>

---

1) For technical data and accessories, see page 41
2) For technical data and accessories, see page 42
DATATRAB
Surge Voltage Protection for INTERBUS Field Multiplexer
IBS-MUX
DATA-PLUGTRAB

General Description
The PT 3-PB is ideal for protection of the Phoenix Contact INTERBUS field multiplexers. See diagram below for wiring description.

Note: Selection of PT Base Element
PT ...-BE
This base element should be used in installations where the common return or shield is to be grounded at the DIN rail. The connections for ground (9/10) are connected directly to the mounting foot (3/4).

PT ...+F-BE
This base element should be used in installations where the common return (or shield) is to be isolated (floating) from the earth ground at the connection point. Terminate the common return (or shield) to positions 9/10 and earth ground to positions 3/4. Now you will have gas tube isolation (no leakage current) between your common return (or shield) and earth ground. In addition to any normal mode protection, you will also have protection line to common (or shield), and common (or shield) to ground.

Technical data

<table>
<thead>
<tr>
<th>IEC category/VIDE requirement class:</th>
<th>VDC</th>
<th>Voltage</th>
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<tbody>
<tr>
<td>Max. cont. operating voltage MCVR</td>
<td>5 V</td>
<td>DC</td>
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<tr>
<td>Max. cont. operating current IP</td>
<td>450 mA</td>
<td></td>
</tr>
<tr>
<td>Max. single impulse discharge (8/20)us:</td>
<td>L-UL-+</td>
<td>10 kA/10 kA</td>
</tr>
<tr>
<td>Total surge current (8/20)us:</td>
<td>L-UL-+</td>
<td>20 kA</td>
</tr>
<tr>
<td>Limiting (clamping) voltage at 1 kV/us:</td>
<td>L-UL-+</td>
<td>55 V/55 V</td>
</tr>
<tr>
<td>Response time t3</td>
<td>&gt;500 ns</td>
<td>500 ns</td>
</tr>
<tr>
<td>Input attenuation a1 in a 50/600 Ω system (typ.):</td>
<td>0.2 dB to 5 MHz (typ.)</td>
<td></td>
</tr>
<tr>
<td>Cut-off frequency f3 (3dB) in a 50/600 Ω system (typ.):</td>
<td>70 kHz</td>
<td></td>
</tr>
<tr>
<td>Resistance per path</td>
<td>5.2 Ω</td>
<td></td>
</tr>
<tr>
<td>Temperature range:</td>
<td>-40 °C to +85 °C</td>
<td></td>
</tr>
<tr>
<td>Inflammability class in acc. with UL 94:</td>
<td>V0</td>
<td></td>
</tr>
<tr>
<td>Degree of protection in acc. with IEC 60529/EN 60529:</td>
<td>IP 20</td>
<td></td>
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<tr>
<td>Approval:</td>
<td>UL-1694</td>
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</tr>
<tr>
<td>Based on test standards:</td>
<td>IEEE C62.33</td>
<td></td>
</tr>
</tbody>
</table>

For dimensional drawing and accessories, see page 95.
DATATRAB
Surge Voltage Protection for TTY Interfaces

General Description
These products are designed specifically for applications using the TTY (digital current loop) interface. They are also acceptable for use with 4-20mA analog loop applications.

D-UFB-TTY-1...
These products feature a D-SUB 25 connector.

MT-TTY-1
These products are hard wire TTY applications

Pin configuration D-UFB-TTY-1:...
Data line pair A 9/10
Data line pair B 24/25

Pin configuration MT-TTY-1:
Data line pair A 9/10
Data line pair B 24/25

Technical data
IEC category/UL requirement class:
Max. cont. operating voltage: MCOV:
Max. cont. operating current IN:
Max. single impulse discharge (8/20)μs:
Total surge current (8/20)μs:
Limiting (clamping) voltage at 1 kV/μs:
Response time tR:
Input attenuation A in a 50/600Ω system (typ.):
Cut-off frequency fC (3dB) in a 50/600Ω system (typ.):
Resistance per path:
Temperature range:
Inflammability class in acc. with UL 94:
Degree of protection in acc. with IEC 60529/EN 60529:
Approvals:
Based on test standards:

2) Explanation for the mechanical version, see page 86.

Characteristic of the device
Free protection, signal-signal (sym.)
Coarse protection, signal-signal (sym.)
Coarse protection, signal-
Decoupling
Adapter D-25-SUB
Rail mounting

Characteristic attenuation curve

Phoenix Contact
Surge Protection Devices for High Frequency Coaxial Cable Systems

General
Radio and video systems are particularly susceptible to lightning influences. As with other applications, the influence can be due to direct or indirect lightning events. The antenna and cables commonly used for such applications, despite their relatively good shielding properties, are extremely vulnerable to large electromagnetic forces (such as lightning). Static charge build-up is an additional danger as it can reach many thousands of volts.

As with data signals, the frequency and data rates of these signals mean special care in selecting proper surge protection devices so that the signal itself is not attenuated. Additionally the connector should be matched to the surge protection device to provide an easy installation and to minimize attenuation effects.

Wireless Data, Signal and Mobile Phone Systems: GPS, CDMA, GSM, FHSS, DSSS.

Because the radio and antenna are often located outdoors, the transceivers used for mobile phone, wireless data and telemetry applications are highly susceptible to electromagnetic influences from lightning and other sources. The antenna cables are coaxial type usually terminated with Type N, 7/16th DIN or BNC.

With frequency ranges generally > 900MHz, it is important to select a technique that does not attenuate the high frequency signal. Gas discharge tube technology is often the preferred solution. The gas tube does not introduce capacitance to the circuit and can handle the surge currents associated with lightning influences.
Two-way radio communication systems
Two-way radio systems are used quite frequently in the construction, police and fire fighting industries. The base stations for these radios often have external antennas which therefore make them highly susceptible to lightning influences. The mechanical connection of the antenna is usually made with a UHF or type N connector.

With frequency ranges generally >500MHz, it is important to select a technique that does not attenuate the high frequency signal. Gas discharge tube technology is often the preferred solution. The gas tube does not introduce capacitance to the circuit and can handle the surge currents associated with lightning influences.

Video surveillance systems
Video cameras are used in a wide range of commercial and industrial security applications. Many times the installation sites are outdoors making them exposed to the influences of lightning activity. In addition to the power, and control signals that are run to the cameras, coaxial cable is typically used for the video signals.

The coaxial surge protection devices for video applications feature finely tuned, high performance coarse and fine protection components. BNC and TNC connectors are available for easy installation. Versions are available for applications with grounded or isolated shield.

Cable TV and Broadband Modems
Television and cable modems connected to the cable network are also susceptible to lightning influences. Even if the cable is buried under ground, close by lightning events can couple unwanted transient energy on the cable lines and enter your modem or TV causing expensive damage.

Surge protection devices for these applications use a specially tuned circuit with Type F connectors for easy installation.
COAXTRAB
Surge Protection Devices for Wireless Data, Signal, and Mobile Phone Systems

Features
• Series connected surge protection modules make installation fast and easy.
• High-power gas discharge tube technology shunt high current lightning discharge currents while maintaining low capacitance for minimized attenuation.
• Very low insertion loss.
• Impedance matching allows high transmission capabilities without signal attenuation or degradation.
• Metal housing provides superior shielding (EMI/RFI) properties for high-speed data interfaces.

General Descriptions: CN-UB-280DC
The COAXTRAB CN-UB... features removable gas tube for easy replacement if direct lightning strike causes a failure. The unit can be either mounted directly to the coaxial cable, or with the use of a mounting bracket can be attached directly to a bulkhead. Type N connectors are available as a male-female, or female-female configuration.

C-UB...
The COAXTRAB C-UB features BNC connectors for applications with transmission frequencies up to 1 GHz. The /E version is available for applications with isolated ground connections. The devices with 50 Ω BNC connectors can also be used in 75 Ω systems.
### CN-UB/E
Protection adapter with N connector

- **Housing length**: 83

### C-UB
Protection adapter with BNC connection

- **Housing length**: 68

### C-UB/E
Protection adapter with BNC connection

- **Housing length**: 80

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN-UB/E</td>
<td>27 63 69 1</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>C-UB</td>
<td>27 82 24 5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>C-UB/E</td>
<td>27 63 70 1</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

#### Specications

- **Type**: C2, C3
- **Frequency**: 12 to 200 MHz
- **Non-Terminated Impedance**: 50 Ohm
- **Power Dissipation**: 40 W/12 W
- **Temperature Range**: -40 °C to +80 °C
- **Ratings**:
  - 180 V/130 V
  - 70 V/50 V
  - 180 V/130 V
  - 70 V/50 V
  - 1 A/25 °C
  - 3.5 A/25 °C
  - 5 kA/5 kA
  - 5 kA/5 kA
- **Duration**: 100 ns

#### IEEE C62.36

- **Frequency**: 10 MHz
- **Ratings**:
  - 5 kA/5 kA
  - 5 kA/5 kA
- **Duration**: 100 ns

---

**Characteristic attenuation curve**

- **Frequency**: 10 MHz
- **Ratings**:
  - 5 kA/5 kA
  - 5 kA/5 kA
- **Duration**: 100 ns

---

**Characteristic attenuation curve**

- **Frequency**: 10 MHz
- **Ratings**:
  - 5 kA/5 kA
  - 5 kA/5 kA
- **Duration**: 100 ns

---

**Characteristic attenuation curve**

- **Frequency**: 10 MHz
- **Ratings**:
  - 5 kA/5 kA
  - 5 kA/5 kA
- **Duration**: 100 ns
COAXTRAB
Surge Protection Devices for Wireless Data, Signal, and Mobile Phone Systems

General Description
CN-LAMDA...
This product uses a 1/4 wave snubber circuit to filter out frequencies above and below the 2 GHz operating frequency.

<table>
<thead>
<tr>
<th>Description</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>COAXTRAB, Protection adapter for antenna connection</td>
<td>N connector</td>
</tr>
<tr>
<td>COAXTRAB 7/16 SET, consisting of: CN...BB + adapter N on a 7/16 male/fem. connector, CN...BB + 2 adapters N on a 7/16 female connector</td>
<td>7/16 connector</td>
</tr>
<tr>
<td>Equipment lead: Length: 1.5 m, conductor cross section 1.5 mm², with cable lug</td>
<td></td>
</tr>
<tr>
<td>CN-UB assembly board</td>
<td></td>
</tr>
</tbody>
</table>

Technical data:
- IEC category/VDE equipment class: Max. cont. operating current: I
- Maximum single impulse discharge (8/20)μs: Core-Core/Core-1
- Limiting (clamping) voltage at 1 kV: Core-Core/Core-1
- Input attenuation at: 50 Ohms: C2, C3, D1
- Standing wave ratio (SWR) at: 50 Ohms: C2, C3, D1
- Perm. HF power Pmax at SWR=1.1 at a 50 Ω system: C2, C3, D1
- Temperature range: Degree of protection in acc. with IEC 60529/EN 60 529 Class 1, Division 2, Groups A, B, C & D. Based on test standards:

(1.7-2.3 GHz) therefore providing ideal voltage limiting properties. Versions are available with 7/16 DIN connectors.

CN-LAMDA/4-2.0...
Protection adapter with N connector

C7/16-LAMDA/4-2.0...-SET
Protection adapter set

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CN-LAMDA/4-2.0-BB</td>
<td>28 18 66 3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CN-LAMDA/4-2.0-SB</td>
<td>28 18 67 8</td>
<td>1</td>
<td></td>
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<tr>
<td>C-UFB-PA</td>
<td>27 52 36 2</td>
<td>10</td>
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<td>CN-UBMP</td>
<td>28 18 13 5</td>
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</tr>
<tr>
<td>C7/16-LAMDA/4-2.0-BB-SET</td>
<td>28 39 05 9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C7/16-LAMDA/4-2.0-BG-SET</td>
<td>28 39 04 8</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>C-UFB-PA</td>
<td>27 62 36 2</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>CN-UB/MP</td>
<td>28 18 13 5</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>C2, C3, D1</td>
<td>5 A</td>
<td>20 kA/20 kA</td>
<td>≤ 10 V/10 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>≤ 0.2 dB of 1.7 - 2.3 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>≤ 2.5 of 1.7 - 2.3 GHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>≤ 400 Wx500 W (2 GHz)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-40 °C to +100 °C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>= 55</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IEEE C62.36</td>
</tr>
</tbody>
</table>

1) For dimensional drawing CN-UB assembly board, see page 98

Dimensional drawing: CN...SB Dimensional drawing: CN...BB
**Surge Protection Devices for Two-way Radio Communication Systems**

**RF-TRAB**
- Surge voltage protection for coaxial cables
- Surge voltage protection for coaxial N connectors
- Replacement gas-filled surge arrestor

**RF-TRABA**
- Protection adapter with UHF connector
- Protection adapter with UHF connector and N connector

### Description

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF-TRAB</td>
<td>27 82 13 5</td>
<td>10</td>
</tr>
<tr>
<td>RF-TRAB 500</td>
<td>27 68 38 4</td>
<td>10</td>
</tr>
<tr>
<td>RF-TRABA 1</td>
<td>27 82 57 5</td>
<td>1</td>
</tr>
<tr>
<td>RF-TRABA 2</td>
<td>27 89 78 8</td>
<td>1</td>
</tr>
</tbody>
</table>

### Technical Data

- **IEC category:**
  - DC/AC
- **VDE requirement class:**
  - DC/AC
- **Max. cont. operating voltage (MCOV):**
  - 200 W
- **Max. cont. operating current (IN):**
  - 10 A
- **Maximum single impulse discharge (8/20) μs:**
  - Core-Core/Core-
  - 10 kA
- **Limiting (clamping) voltage at 1 kV/μs:**
  - Core-Core/Core-
  - 1500 V
- **Response time t₀:**
  - Core-Core/Core-
  - 100 ns
- **Input attenuation a₁ in a 50 Ω system (typ.):**
  - 0.3 dB to 250 MHz
- **Cut-off frequency f₀ (3 dB) in a 50 Ω system (typ.):**
  - 1000 MHz
- **Standing wave ratio (SWR) in a 50 Ω system:**
  - ≤ 1.2 to 80 MHz
  - ≤ 300 W to 200 W
  - ≤ 1000 W to 800 W
- **Temperature range:**
  - -40 °C to + 90 °C
- **Degree of protection in acc. with IEC 60529/EN 60 529:**
  - IP 20

### General Description

**RF-TRAB**

These products are designed for UHF frequencies and are available as a series connected device with a UHF or Type N connector. Versions are available with or without a T-element.

---

**Characteristic attenuation curve**

- Frequency vs. Attenuation

---

**Characteristic attenuation curve**

- Frequency vs. Attenuation

---

**Phoenix Contact**
General Description

C-UFB.../E and CTNC-UFB.../E

These COAXTRABs have been specially designed to meet the demands of video systems with isolated (floating) grounds. The protection circuits feature a hybrid circuit with a fast acting silicon avalanche diode array line to shield and high current handling gas discharge tube protection line to shield, line to ground, and shield to ground.

The products feature BNC or TNC connectors with termination impedance of 50 Ω or 75 Ω.

To cover a variety of video formats, clamping voltages of 5 V, 30 V, and 6.2 V are available.

C-UFB...

These COAXTRABs are for video systems with grounded shield connections. The protection circuit features a hybrid circuit with a fast acting silicon avalanche diode array and high current handling gas discharge tube protection circuit line to shield (ground).

The /1 version features a short profile especially for applications with limited mounting space.

---

**Technical data**

<table>
<thead>
<tr>
<th>COAXTRAB, as surge voltage protection for coaxial cables, connection via male and female connector</th>
<th>Tech, as surge voltage protection for coaxial cables, connection via male and female connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. cont. operating voltage MCOV: DC/AC</td>
<td>Max. cont. operating current IN:</td>
</tr>
<tr>
<td>185 mA/25 °C</td>
<td>10 kA/10 kA</td>
</tr>
<tr>
<td>150 V/500 V</td>
<td>150 V/500 V</td>
</tr>
<tr>
<td>500 ns/100 ns</td>
<td>500 ns/100 ns</td>
</tr>
<tr>
<td>1.7 dB to 20 MHz</td>
<td>1.7 dB to 20 MHz</td>
</tr>
<tr>
<td>170 MHz</td>
<td>170 MHz</td>
</tr>
<tr>
<td>22 Ω</td>
<td>22 Ω</td>
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<tr>
<td>-40 °C to +80 °C</td>
<td>-40 °C to +80 °C</td>
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<tr>
<td>IP 20</td>
<td>IP 20</td>
</tr>
<tr>
<td>IEEE C62.36</td>
<td>22 Ll</td>
</tr>
</tbody>
</table>

---

**Characteristic attenuation curve**

---

**Dimensional drawing**

---

**Connect.**

- **Voltage**
  - 5 V DC
  - 24 V DC
  - 5 V DC
  - 5 V DC
  - 5 V DC

**Type**

- **Article no.**
  - C-UFB-5DC/E: 27 82 30 3
  - C-UFB-24DC/E: 27 82 31 3
  - C-UFB-5DC/E 75: 27 63 60 4

---

**Connect.**

- **Voltage**
  - 5 V DC
  - 30 V DC
  - 6.2 V DC

---

**Type**

- **Article no.**
  - C-UFB-5DC/E: 27 82 30 3
  - C-UFB-24DC/E: 27 82 31 3
  - C-UFB-5DC/E 75: 27 63 60 4
### Protection Adapters

**CTNC-UFB-5DC/E**
- Protection adapter with TNC connection

**C-UFB...**
- Protection adapter with BNC connection

**C-UFB.../1**
- Protection adapter with BNC connection

### Table: Specifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTNC-UFB-5DC/E</td>
<td>27 62 08 7</td>
<td>10</td>
<td>C-UFB-5DC</td>
</tr>
<tr>
<td>C-UFB-PA</td>
<td>27 62 36 2</td>
<td>10</td>
<td>C-UFB-PA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-UFB-5DC</td>
<td>27 97 50 0</td>
<td>10</td>
<td>C-UFB-5DC</td>
</tr>
<tr>
<td>C-UFB-24DC</td>
<td>27 97 86 1</td>
<td>10</td>
<td>C-UFB-24DC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-UFB-P/A</td>
<td>27 62 36 2</td>
<td>10</td>
<td>C-UFB-P/A</td>
</tr>
</tbody>
</table>

### Additional Specifications

- **CTNC-UFB-5DC/E**
  - Article no.: 27 62 08 7
  - Pcs.: 10
  - Type: C-UFB-5DC

- **C-UFB-PA**
  - Article no.: 27 62 36 2
  - Pcs.: 10
  - Type: C-UFB-PA

- **C-UFB-5DC**
  - Article no.: 27 97 50 0
  - Pcs.: 10
  - Type: C-UFB-5DC

- **C-UFB-24DC**
  - Article no.: 27 97 86 1
  - Pcs.: 10
  - Type: C-UFB-24DC

- **C-UFB-P/A**
  - Article no.: 27 62 36 2
  - Pcs.: 10
  - Type: C-UFB-P/A

---

**Characteristics**

- **Frequency Characteristic Attenuation Curve**
  - **CTNC-UFB-5DC/E**
  - **C-UFB...**
  - **C-UFB.../1**
COAXTRAB
Surge Protection Devices for Cable TV (CATV), Satellite Systems and Broadband Modems

General Description
CF-TV
These products are designed to protect sensitive electronic equipment from damage due to excessive voltage or currents generated by lightning or static build-up. Applications included broadband cable modems, satellite systems, and CATV. The units are series connected with built-in F-connectors.

Description
COAXTRAB,
Surge voltage protection for antenna inputs on television sets with F connector, and for mounting on (c) or (v)
Equipotential bonding cable,
length: 1.5 m,
conductor cross section 1.5 mm², with M3 ring cable lug

Technical data
IEC category/VDE requirement class:
Max. cont. operating voltage: MCOV:
Max. cont. operating current IN:
Max. single impulse discharge (8/20)ps:
Core-Shield Limiting (clamping) voltage at 1 kV/ps:
Core-Shield Response time ta:
Input attenuation a1 in a 50 Ω system (typ.):
Cut-off frequency f (3dB) in a 50 Ω system (typ.)
Temperature range:
Degree of protection in acc. with IEC 60529: EN 60 529
Based on test standards:

Type | Article no. | Pcs. Pkt.
--- | --- | ---
CF-TV 30DC-BB | 28 18 06 7 | 1
CF-TV 30DC-BB-U | 28 18 07 0 | 1
C-UFB-PA | 27 62 36 2 | 10

C1, C3
30 V/21 V
2 A/25 °C
330 A
<125 V
≤ 25 ns
<1 dB to 4 MHz...1100 MHz
4 MHz to 1 GHz
-40 °C to +80 °C
IEEE C62.36

Dimensional drawing: COAXTRAB CF-TV 30DC-BB
Surge Protection Devices for Telecommunication Systems

General

Telecommunications or Telephony implies that a form of communication will take place using the capabilities of a telephone set and network to achieve this goal. Many telephone lines are run on the same poles as and often right underneath power service lines making them just as susceptible to direct and nearby lightning events as the AC power lines. Not only do surges directly couple onto telephone lines, but changes in the magnetic field of the closely located power conductors will cause transient energy to be inductively coupled onto the phone lines.

Recent advances in the sharing of data and the Internet have made the integrity of telephone wiring and infrastructure critical to many applications. The phone company will often install a type of "lightning arrester" on the outside of the building to prevent large surge currents from entering a building on the phone lines. However, this was never intended or designed to protect sensitive electronic equipment. Its intention was more to prevent fire and electrocution for someone talking on the phone when a lightning strike occurs.

In the industrial control and factory automation industries telephony has also become a major means for transmitting and sharing data between remote stations and central control. An example of this is a SCADA (Supervisory Control and Data Acquisition) system where the acquisition of data is often spread over large geographical areas. This information is collected at RTUs (Remote Terminal Units) and often transmitted back to a central monitoring and control station over telephone lines. When a storm passes through, transients can be induced from nearby lightning events and passed down the phone line into the RTU. If the RTU fails it is very costly for the company to then send out repair people to replace modems in addition to the lost data and lost equipment costs.
ISDN — Integrated Services Digital Network

ISDN lines are specifically designed to be a global telephony standard with applications to include voice and data transmission. The characteristics of the interface are suitable for the faster data rates and higher bandwidth that is currently required by many data sharing, control, and Internet applications.

The voltage levels for the ISDN interface are <5 volts. ISDN signals are four wire (two pair) that interface to equipment with an RJ45 connector. The pins that are used are 1, 2, 3 & 6. The data rate is 64 kbits/second.

Analog (POTs)

Plain Old Telephone. POTs lines were originally designed for the transmission of voice over the phone lines; however, they are also widely used for data with common serial modems. Only relatively slow data rates are possible over analog lines — 56kbits/second if your lucky. But, because of low cost and high availability it is quite common to use analog phone lines for transmitting data.

Physically a POTs line generally means four wires. These are configured in two pairs of two conductors and terminated with a RJ11 or RJ12 connector. The lines are referred to as tip and ring. Although there are four lines, only two are used to communicate via voice or modem. However, some applications may use the second two lines for other applications.

Another issue when protection POTs lines is that the voltage that is applied to the system to make the handset ring. The ring voltage is typically around 86 VAC. A surge protection device for these application should be designed to pass the ring voltage.

T1 / E1

A T-1 (or E-1) interface can be thought of as a direct conduit to the telephone company switching station. T-1 also referred to as DS-1 describes a method of multiplexing multiple channels of voice or data signals over a small number of conductors. It was originally developed to increase the voice channel capacity of circuits within the telecommunication central offices. T-1 lines are now a reliable solution for transmitting large amounts of data and broadband Internet connections.

T-1 signals are 24 channels multiplexed onto four wires (two for transmit and two for receive) that operate at a speed of 1.53 Mbps. The medium for a T-1 line can be either copper or fiber. When the interface is copper, the connector typically used is a RJ45 connector with pins 1-2, 4-5 used for communication.
DATATRAB
Surge Protection Devices for ISDN and T1 Interfaces

Features
- Series connected surge protection modules make installation fast and easy.
- Hybrid circuit provides low clamping voltage with high surge current discharge capability.
- Very low insertion loss.
- Metal housing provides superior shielding (EMI/RFI) properties for high-speed data interfaces.
- Special designs for high data transmission without attenuation.

General Description
D-TR1/ISDN-A/RJ45-BB
This product is series connected into the ISDN RJ45 interface. The hybrid silicon avalanche diode array and Gas Discharge Tube provides tight clamping voltage line to line on each signal pair and high surge current handling capacity line to line, line to shield, and shield to ground.

D-DS1-A/RJ45-BB
This product is series connected for T1 or E1 multiplexed telco signals. The hybrid silicon avalanche diode array and Gas Discharge Tube provides tight clamping voltage line to line on each signal pair and high surge current handling capacity line to line, line to shield, and shield to ground.

CTM ISDN, CT 10-5/ISDN and PT 2-ISDN NT
These DIN rail mount solutions for ISDN and T1 interfaces provide an alternative mounting method. Additionally they are pluggable so that they can be easily tested with the CHECKMASTER.

Note: Selection of PT Base Element
PT 2x2-BE
This base element should be used in installations where the common return or shield is to be grounded at the DIN rail. The connections for ground (9/10) are connected directly to the mounting foot (3/4).

Technical data
- IEC category/VDE requirement class: C2, C3
- Max. cont. operating voltage: MCOV: DC/AC 6.2 V AC/50 V DC (S8 phantom supply)
- Max. cont. operating current: IN: 1.5 A ±25 °C
- Max. single impulse discharge (8/20) ps: Core-Core/Core-1 350 A/2.5 kA
- Limiting (clamping) voltage at 1 kV/it: Core-Core/Core-1 65 V/1.4 kV (Shield-4)
- Response time: Core-Core/Core-4 < 500 ns/50 ns
- Input attenuation a1 in a 100 Ω system (typ.): 0.8 dB to 100 MHz
- Cut-off frequency f3 dB in a 100 Ω system (typ.): > 100 MHz
- Temperature range: -40 °C to +80 °C
- Inflammability class in acc. with UL 94: V0
- Degree of protection in acc. with IEC 60529/EN 60529: IP 20
- Approvals: Based on test standards: IEEE C62.36
### D-DS1-A/RJ45-BB
DATATRAB adapter for T1/E1 systems RJ-45

![Diagram](image1.png)

**Connection data**
- IN: RJ-45 female conn.
- OUT: RJ-45 fem. conn.

**Type**

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-DS1-A/RJ45-BB</td>
<td>28 30 06 0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>D-C/RJ45-1,5</td>
<td>28 18 19 3</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

### CTM ISDN and CT 10-5/ISDN
Protective plug for ISDN interfaces

![Diagram](image2.png)

**Connection data**
- IN: unprotected
- OUT: protected

**Connection data**
- can be plugged into CT-TERMIBLOCK and LSA-PLUS disconnect and switching strips

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT 10-5/ISDN</td>
<td>28 18 19 1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>CTM ISDN</td>
<td>28 38 55 5</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

### PT 2-ISDN NT
Two conductor protection for the U_{CA} interface

![Diagram](image3.png)

**Connection data**
- IN: unprotected
- OUT: protected

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 2-ISDN NT</td>
<td>28 58 09 8</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>PT 1K2-BE</td>
<td>28 96 11 3</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

### CT 10-5/ISDN

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2, C3</td>
<td>6 V/4 V</td>
<td>1.5 A</td>
<td>350 A/5 kA</td>
</tr>
<tr>
<td>1.5 A/55 °C</td>
<td>1.5 kA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>350 A/5 kA</td>
<td>5 kA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 kA</td>
<td>0.1 dB to 10 MHz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 100 MHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 25 °C to + 80 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- 25 °C to + 75 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IP 20</td>
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</table>

### CTM ISDN

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs.</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2, C3</td>
<td>6 V/4 V</td>
<td>1.5 A</td>
<td>350 A/5 kA</td>
</tr>
<tr>
<td>1.5 A/55 °C</td>
<td>1.5 kA</td>
<td></td>
<td></td>
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<tr>
<td>350 A/5 kA</td>
<td>5 kA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 kA</td>
<td>0.1 dB to 10 MHz</td>
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<td></td>
</tr>
<tr>
<td>&gt; 100 MHz</td>
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<tr>
<td>&lt; 25 °C to + 80 °C</td>
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<td>- 25 °C to + 75 °C</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>IP 20</td>
<td></td>
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</tr>
</tbody>
</table>

IEEE C62.36

1) The CTM 10-MAG magazine is required for equipotential bonding, see page 69.
Surge Protection Devices for Analog Phone Lines (POTs)

General Description

Telecommunications protection with RJ12/RJ45 female connectors can be used internationally for the protection of analog telecommunications interfaces, such as telephones, telefaxes, modems, and answering machines with a maximum operating voltage of 185 V.

WESTERNTRAB WT RJ 12... is an outlet box with a 6-position Western female connector RJ12 and integrated surge voltage protection.

The control line is connected via printed circuit screw terminal blocks that are labeled accordingly and are arranged on the installation side of the socket base.

The protective circuit fulfills the relevant function due to the separate grounding line that leads from the connection terminal block provided to the local equipotential bonding.

Note:
The RJ12 female connectors of the WT-RJ 12... can also accept RJ11 plugs.

D-FM-A/RJ45-BB

This product is series connected for analog phone lines (POTs). The hybrid silicon avalanche diode array and Gas Discharge Tube provides tight clamping voltage line to line on each signal pair and high surge current handling capacity line to line, line to shield, and shield to ground. The circuit is designed to safely pass ring voltages, while clamping transient voltages. Connection is possible with both RJ11 and RJ12 connectors.

MT-2FM-RJ12

This is a DIN rail mount version of the above. Ideal for RTU applications where phone lines are used for Telemetry. The IN and OUT connections can be made via screw clamp terminal blocks. Additionally the OUT side can be connected with RJ11 and RJ12 connectors. All four lines of the interface (two pair) are protected.

### Possible pin assignment of D-FM-A/RJ45-BB

<table>
<thead>
<tr>
<th>Plug connector</th>
<th>No. pins</th>
<th>Pin assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>RJ45</td>
<td>8</td>
<td>4/5; 3/6</td>
</tr>
<tr>
<td>RJ12 (with insert)</td>
<td>6</td>
<td>3/4; 2/5</td>
</tr>
<tr>
<td>RJ11 (with insert)</td>
<td>4</td>
<td>2/3; 1/4</td>
</tr>
</tbody>
</table>

### Characteristic attenuation curve WT-RJ 12...

**Description**

- Westerntrab: Outlet box to protect telecommunications interfaces
- DATATRAB adapter: Protective adapter to be inserted into the analog telecommunications lines with RJ45-RJ11 plug connectors
- DATA-MODUTRAB: Protective device for mounting on

#### Technical data

- IEC category: VDE requirement class: C2, C3
- Max. cont. operating voltage: 185 V DC
- Max. cont. operating current (IN): 25 mA
- Max. pulse current (8/20µs): 2.5 kA
- Surge current (8/20µs): 5 kA
- Limiting (clamping) voltage at 1 kV/us: Core-Core/Core-1 230 V/ 700 V
- Response time (t1 at 1 kV/us): Core-Core/Core-1 10 ns
- Input attenuation (a1) in a 600Ω system (typ.): 0.1 dB to 500 kHz
- Cut-off frequency (f5 at 3dB) in a 600Ω system (typ.): 2 MHz
- Resistance per path: 1 Ω
- Temperature range: -40 °C to +80 °C
- Degree of protection in acc. with IEC 60529/EN 60529: IP 20
- Approvals: BZT (O)
- Based on test standards: IEEE C62.36® symmetrical curve (600Ω)

### Dimensional drawing: WT-RJ 12-2FM A/G

#### Connection data IN

- Article no.: 26 67 32 4
- Article no. Pkt.: 1

#### Connection data OUT

- Article no.: 26 67 32 4
- Article no. Pkt.: 1

### Dimensional drawing: WT-RJ 12-2FM A/G

#### Dimensional drawing: WT-RJ 12-5FM A/K AP

---

Phoenix Contact
WT-RJ 12-S/FM A/K AP
Surface-mounted fitted socket, angled take-up with RJ 12 connection, 1 socket.

D-FM-A/RJ45-BB
Protective adapter for analog telecommunication interfaces

MT-2FM-RJ12
Surge voltage protection for analog interfaces
Housing width 20

Connection data IN 0.14-1.5
Connection data OUT 0.14-1.5
Connection data RJ 45 female connector 2 x RJ 12 female connector

Dimensional drawing: D-FM-A/RJ45-BB
Dimensional drawing: MT-2FM-RJ12
Because surge protection devices are exposed to high voltage and current stresses, it is possible that they will sometimes be sacrificial to protect your sensitive equipment. This is especially the case when subjected to lightning influences. Additionally, users often appreciate being able to troubleshoot and do verification testing of surge protection devices.

Many of the TRABTECH products feature pluggable surge protection devices making them easy to check with Phoenix Contact testing equipment.

Each of the Pluggable products are covered by a 5-year product replacement warranty. Therefore, if any of the devices fail, it can sent back for immediate replacement.

The "Hot-Swap" features of the pluggable device mean that testing can be done without interruption of critical signal or data lines.

The CHECKMASTER is a fully automatic and portable testing system that can be used in the maintenance shop or in the field to check your surge protection devices. Power or data line products can be quickly and easily tested with the CHECKMASTER. Data logging is also possible with an RS-232 interface for tracking and record keeping. The memory can hold up to 200 test results.
With the CHECKMASTER, plugs for the following families of surge protection devices can be tested:

- MAINS-PLUGTRAB
- MCR-PLUGTRAB
- DATA-PLUGTRAB
- COMTRAB
- COMTRAB Modular
- VALVETRAB
- COAXTRAB
- MINITRAB
CHECKMASTER
Automated Tester and Accessories

Features:
- Test adapters for various TRABTECH product families mean you can check surge protection devices from power line to data line.
- Simple user interface and LCD display provide fast and easy operation.
- Bar code reader automatically identifies surge protection device voltage and configuration minimizing testing time.
- Full diagnostics displayed and output via RS-232 interface for complete and easy documentation.

---

### Description

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tester, for checking the functions of TRABTECH surge voltage protection devices, with CM-PA-PT/N</td>
</tr>
</tbody>
</table>

#### TRABTECH Test adapter, for testing the function of
- COMTRAB CTM
- COMTRAB CT 6
- COMTRAB CT 10
- PLUGTRAB PT
- PLUGTRAB UFB
- TF-TRAB
- VALVETRAB

#### TRABTECH Test adapter, for testing the function of
(Together with CM-PA-PT/A)
- MINITRAB
- COAXTRAB C-UFB

### Technical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Box/Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHECKMASTER</td>
<td>28 39 92 4</td>
<td>1</td>
</tr>
</tbody>
</table>

- **Nominal voltage:** 100 V - 240 V AC
- **Frequency:** 50-60 Hz
- **Power consumption:** < 60 VA
- **Degree of protection:** IP 20
- **Protection class:** 8.2 kg
- **Weight:** 8.2 kg
- **Serial Interface:** V.24/RS-232, DTE
- **Data transmission rate:** 9600 Bd
- **Data format:** ASCII
- **Handshake:** 8 data bits, 2 stop bits, no parity bit
- **Data transmission:** Transparent mode

---
Example of CHECKMASTER test report in English

Phoenix Contact CHECKMASTER software revision: 1.02

Result number: 1
Name: UFBK_2-PE 24DC/HF
Article number: 06.11.2001 11:37
Test result: Module OK

Result number: 2
Name: OP 17.1
Article number: 06.11.2001 11:38
Test result: Module defective
Gas arrester defect.
Path 1 defective
Path 2 defective

Result number: 3
Name: OP 17.2
Article number: 06.11.2001 11:44
Test result: Module OK

Result number: 4
Name: PTA 2x2-HP 24DC
Article number: 06.11.2001 11:46
Test result: Module defective
Diode defective
Path 11 defective

Result number: 5
Name: CT 8-2PE 110DC
Article number: 06.11.2001 11:48
Test result: Module defective
Test canceled

CM-PA... Test adapter
PTT-ADAPTER MINITRAB Test adapter for MINITRAB
PTT-ADAPTER C-UFB Test adapter for COAXTRAB

<table>
<thead>
<tr>
<th>Type</th>
<th>Article no.</th>
<th>Pcs</th>
<th>Pkt.</th>
</tr>
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<tbody>
<tr>
<td>CM-PA-CTM</td>
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<tr>
<td>CM-PA-CTB</td>
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<tr>
<td>CM-PA-CT10</td>
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<tr>
<td>CM-PA-PT/N</td>
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<td>CM-PA-PT/A</td>
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<td>CM-PA-TF</td>
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<tr>
<td>CM-PA-VAL</td>
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</table>

PTT-ADAPTER MINITRAB

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<th>Pcs</th>
<th>Pkt.</th>
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<tr>
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PTT-ADAPTER C-UFB

<table>
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<th>Article no.</th>
<th>Pcs</th>
<th>Pkt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTT-ADAPTER C-UFB-24DC</td>
<td>27 98 22 6</td>
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</table>
Applications
Protection for signal lines in MCR technology

Protection of a binary signal input and actuator circuit with PLUGTRAB, reference potential (minus pole) floating, including equipment protection for the power supply

Material:
- n x PT 4x1-24DC-ST (connector)
- n x PT 4x1+F-BE
- 1 x PT 2-PE/S-230AC-ST (connector)
- 1 x PT BE/FM (header)

Protection of a binary signal input and actuator circuit with PLUGTRAB, reference potential (minus pole) grounded, including device protection for the power supply

Material:
- n x PT 2x1-24DC-ST (connector)
- n x PT 2x1+F-BE (header)
- 1 x PT 2-PE/S-230AC-ST (connector)
- 1 x PT BE/FM (header)

Protection of a binary signal input and actuator circuit with PLUGTRAB, reference potential (minus pole) grounded, including device protection for the power supply

Material:
- n x PT 4x1-24DC-ST (connector)
- n x PT 4x1-F-BE
- 1 x PT 2-PE/S-230AC-ST (connector)
- 1 x PT BE/FM (header)

*Binary* signals e.g. locators

Equi. bonding bus bar

Control

Field

IN

OUT

24 V

L

2

1

3

N

Position indicator

Relay

Indicator lights

Equi. bonding bus bar
Protection of an analog measurement with PLUGTRAB, including device protection for the power supply

Material:
1 x PT 1x2-24DC-ST (connector)
1 x PT 1x2-BE (header)
1 x PT 2-PE/S-230AC-ST (connector)
1 x PT BE/FM (header)

Protection of an analog measurement with PLUGTRAB, including device protection for the power supply

Material:
1 x PT PE/S+1x2-24-ST (connector)
1 x PT PE/S+1x2-BE (header)
1 x PT 2-PE/S-230AC-ST (connector)
1 x PT BE/FM (header)

Protection for a 4-Wire Measurement

Material:
1 x PT 4-24DC-ST (connector)
1 x PT 4-BE (header)

for intrinsically safe circuits:
1 x PT 4-EX(I)-24DC-ST (connector)
1 x PT 4-BE (header)

Protection of a 6-wire measurement with PLUGTRAB, including device protection for the power supply

Material:
1 x PT 4x1-12AC-ST (connector)
1 x PT 4x1+F-BE (header)
1 x PT 2x1-12AC-ST (connector)
1 x PT 2x1+F-BE (header)
1 x PT 2-PE/S-230AC-ST (connector)
1 x PT BE/FM (header)
Applications
Protection for signal lines in MCR technology

Protection of a binary signal input with TERMITRAB, reference potential (minus pole) grounded

Material:
\( n \times TT-2/2-24DC \)

Protection of a binary signal input with TERMITRAB, reference potential (minus pole) floating (insulated construction)

Material:
\( n \times TT-2/2-24DC \)
\( 1 \times PT 2-F-ST \) (connector)
\( 1 \times PT BE/FM \) (header)

Protection of analog measurements with TERMITRAB

Material:
\( n \times TT-2-PE-24DC \)

Protection of analog intrinsically safe measurements with TERMITRAB

Material:
\( n \times TT-EX(I)-24DC \)
Protection of a binary signal input with COMTRAB, reference potential (minus pole) floating

Material:
1 x CT 10-18FSR+F/PE-24DC
1 x TERMIBLOCK CT 10

Protection of a binary signal input with higher voltages with COMTRAB

Material:
1 x CT 10-9VA-F/PE...AC
1 x TERMIBLOCK CT 10
Surge voltage protection for the SINEC bus systems

Protection of SINEC L2 with a PT 3
To network SIMATIC S7 automation equipment, SINEC L2-DP or PROFIBUS and SINEC L2-FMS are used.
This figure shows a protective circuit in which the cable shield is grounded directly.

Material:
1. 1 x PT 3-PB-ST (connector)
2. 1 x PT 1x2-BE (header)
3. 1 x PT 2-PE/S-230AC-ST (connector)
4. 1 x PT-BE/FM (header)

Protection of SINEC L2 with a PT 5
If it is not possible to ground the cable shield directly, a protective circuit with the PT 5 must be used. The shield is grounded indirectly via a diode.

Attention:
Ground potential differences above 12 V can lead to the protection being destroyed.

Material:
3. 1 x PT 5-HF12DC-ST (connector)
4. 1 x PT 2x2-BE (header)
5. 1 x PT 2-PE/S-230AC-ST (connector)
6. 1 x PT-BE/FM (header)
Applications

Surge voltage protection for INTERBUS

Material:

1. 1 x PT 2-PE/S-230AC-ST (connector)
2. 1 x PT-BE/FM (header)
3. 1 x D-UFB-IB-S-RBI
4. 1 x D-UFB-IB-S-RBO
5. 1 x PT 4-24DC-ST (connector)
6. 1 x PT 4-BE (header)
7. n x CTM 1x2-24DC
8. 1 x CTM 10-MAG
9. 1 x CT-TERMIBLOCK 10 DA
Applications
Surge voltage protection for different signal transmissions

Protection of a controller with bus connection, including device protection for the power supply

Material:
1 x PT 2x2-HF-5DC-ST (connector)
1 x PT 2x2-BE (header)
1 x PT 2-PE/S-230AC-ST (connector)
1 x PT-BE/FM (header)

Protection of video signals, including device protection for the power supply

Material:
2 x C-UFB-5DC
3 x PT 2-PE/S-230AC-ST (connector)
3 x PT-BE/FM (header)

Protection of an RS 485 interface

Material:
1 x PT 5-HF-12DC-ST (connector)
1 x PT 2x2+B-F-BE (header)

Protection of a V.11/RS 422 interface

Material:
1 x PT 5-HF-12DC-ST (connector)
1 x PT 2x2-BE (header)

Protection of a V.24/RS 232 interface

Material:
1 x PT 2x1-12AC-ST (connector)
1 x PT 2x1+F-BE (header)
Installation direction:
Surge voltage protection devices with a multi-stage configuration and which are connected in series in the power circuit are marked with "IN" and "OUT". They must be connected upstream of the device to be protected so that "IN" points towards the direction from which the surge voltage is expected. The device should be connected to the terminal points marked with "OUT". The surge voltage protection device will only function correctly in the case of a surge voltage coupling if the connection is carried out in this way.

Connection:
Connect the ground conductor of the equipment to be protected directly to the ground connection of the surge voltage protection device or to the corresponding connecting terminal block on the "OUT" side of the surge voltage protection device. By maintaining short grounding paths, high voltages between ground connections of the surge voltage protection device and the device to be protected are avoided and thus between ground and active conductors in the device to be protected (see fig.: ground connection).

Equipotential bonding:
In order to ensure that the surge voltage protection devices function correctly, complete equipotential bonding in accordance with the local code specifications, and an installation with spatial separation between protected and unprotected conductors in the device to be protected (see fig.: ground connection).

Cable routing:
Protected and unprotected cables must not be laid directly parallel to each other. They must be separated or shielded so that surge voltages cannot be coupled from unprotected cables to protected ones. If it is unavoidable to cross lines that can influence one another, they must cross at right angles.

Protection:
The capability of gas-filled surge voltage arresters to interrupt currents independently, is limited due to their quenching capacity. If excessively high follow currents are expected in the case of an ignition, a fuse must be installed in series ahead of the surge voltage protection device as a quenching aid.

If there is no other documented technical data for the products, a backup fuse is necessary under the following conditions:
- the nominal voltage of the arrester is higher than 12 V DC
- the nominal current/short-circuit current in the signal circuit is greater than 100 mA.

The fuse is dimensioned so that it can carry the maximum operating current of the power circuit and protects the protective device against short circuiting.

For additional installation instruction, please request the following documents:
- 1364 PLUGTRAB PT series installation and technical brochure
- 1163 SYSTEMTRAB installation instructions

Suppressor diodes
Suppressor diodes are distinguished by short response times (picosecond range) and low limiting voltages. The reverse stand-off voltage $U_r$ is the highest voltage the diode can securely block. A current of 1 mA flows through the suppressor diode at the breakdown voltage $U_b$. At this point the suppressor diode starts limiting the surge voltage. The maximum clamping voltage $U_c$ is the highest voltage which can be present at the suppressor diode in the case of a peak pulse current $I_p$.

These components are something called silicon avalanche diodes, surge arresting diodes or SADs.

---

**Conversion table**

<table>
<thead>
<tr>
<th>AC → DC</th>
<th>DC → AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 V DC</td>
<td>3.5 V AC</td>
</tr>
<tr>
<td>12 V DC</td>
<td>9.5 V AC</td>
</tr>
<tr>
<td>17 V DC</td>
<td>12 V DC</td>
</tr>
<tr>
<td>24 V DC</td>
<td>17 V DC</td>
</tr>
<tr>
<td>34 V DC</td>
<td>24 V DC</td>
</tr>
<tr>
<td>48 V DC</td>
<td>34 V DC</td>
</tr>
<tr>
<td>60 V DC</td>
<td>42 V AC</td>
</tr>
<tr>
<td>64 V DC</td>
<td>60 V DC</td>
</tr>
<tr>
<td>80 V DC</td>
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</tr>
<tr>
<td>100 V DC</td>
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</tr>
<tr>
<td>110 V DC</td>
<td>100 V DC</td>
</tr>
<tr>
<td>158 V DC</td>
<td>110 V DC</td>
</tr>
<tr>
<td>220 V DC</td>
<td>158 V DC</td>
</tr>
<tr>
<td>311 V DC</td>
<td>220 V DC</td>
</tr>
<tr>
<td>710 V DC</td>
<td>311 V DC</td>
</tr>
</tbody>
</table>

**Figure:**

*U/I suppressor diode characteristic curve*

**Key:**
- $U_r$ = reverse stand-off voltage
- $U_b$ = breakdown voltage
- $U_c$ = clamping voltage
- $I_p$ = peak pulse current
- $I_s$ = reverse current

---

**Figure:**

*Ground connection diagram*
Varistors

Varistors are "voltage dependent resistors" which, due to their voltage/current characteristic curves allow a high arresting capacity with a low residual voltage. These components are something called metal oxide varistors or MOVs.

Gas-filled surge voltage arresters

The ArC spark gap in the lightning current arrester FLASHTRAB is based on the Arc Chopping technology. Two spark horns are positioned opposite each other and are kept at a specific distance by an insulating bar. In addition, a baffle plate is fitted below the electrodes in the opening direction. Surface discharge takes place below the insulating bar in the case of a surge voltage. The remaining electric arc is forced outwards and shattered on the baffle plate. The resultant arc sections quench line follow currents.

A marked increase in the line follow current quenching capacity can be attained with spark gap types in which quenching plates are arranged around the spark horns.

Figure: U/I characteristic curve of metal oxide varistors

Key:
A = Surge current
B = Protection level

Figure: Characteristic ignition curve of a gas-filled surge voltage arrester

Sparks gap

Encapsulated spark gap

Figure: Ignition characteristic of a spark gap
Surge voltage protection devices

The great variety of areas of application also require different surge voltage protection devices with properties specific to the application. The arrester differ mainly in the type of circuit used, their surge voltage limiting properties and the design. Phoenix Contact's TRABTECH range of products includes, for instance, adapters, socket outlets or rail-mountable arresters in a modular and compact design, providing practical solutions for systems in all areas of application.

Surge voltage protection devices are designed for high electrical loads, according to their application. However, excessive or very frequent surge voltages may lead to overloading. This can result in a reduction or even a failure of the protection function, and the protection device in question having to be replaced. Surge voltage protection devices should therefore preferably be pluggable and able to be tested.

The TRABTECH range of products from Phoenix Contact takes this requirement into account as far as current technology permits. The product range includes surge voltage protection devices as adapters and a two-part pluggable module construction. The protection devices in the PLUGTRAB range of products from Phoenix Contact take this requirement into account as far as current technology permits. The product range includes surge voltage protection devices as adapters and a two-part pluggable module construction.

The protection devices in the PLUGTRAB range of products are particularly interesting as far as their plugging and testing facilities are concerned. They have been developed with various protective circuits and different nominal voltages for applications in power supply, measurement and control, and data interface protection.

Due to the carefully matched interaction of the various components (i.e. gas-filled surge voltage arresters, varistors and suppressor diodes depending on the required protective circuit), their specific advantages are exploited to a maximum.

Explanation of Terms

A.C. withstand voltage
This is the r.m.s. value of the highest sinusoidal voltage with system frequency which will not lead to a disruptive charge under the given test conditions.

Aging
Modification of the original performance data, caused by disturbing pulses, operation, or unfavorable environmental conditions.

Approximation voltage
The approximation voltage is a voltage that occurs at the approximation when lightning strikes the lightning protection system.

Approximation voltage
Approximation is an insufficient distance between the lightning protection system and metal installations or electrical systems which leads to a risk of flashover or disruptive discharge in the case of a lightning strike.

Arc combustion voltage $U_{bc}$
The arc combustion voltage is the instantaneous value of the voltage on the discharge path while an arc discharge is being arrested.

Associated electrical apparatus
This is electrical apparatus in which not all circuits are intrinsically safe, but which includes circuits whose safety can be influenced by intrinsically safe circuits to which they are connected.

Asymmetrical interferences
Asymmetrical means that the source of interference and the susceptible equipment are grounded, i.e. they have a capacitive or galvanic connection to the ground conductor. As shown in the figure, the interference moves from the source via both conductors to the susceptible equipment and back via ground. The terms "common mode interference" or "common mode" are also used.

Asymmetrical voltage, common mode voltage
Average voltage between each conductor and a determined reference point, usually reference ground or ground.

Burst
This is a pulse which is repeated at certain time intervals.

Clamping Voltage
Peak voltage across SPD measured under conditions of a specified peak pulse current and specified wave form. Note: Peak voltage and peak current are not necessarily coincident in time. (IEEE C62.37-96 defined).

Common mode voltage
Common mode voltage is the voltage which occurs in the case of interference between active conductors and ground.

Continuous operating current $I_{op}$
The current flowing through each protective path of the arrester when it is connected to $U_0$.

Coupling
Interaction between circuits, during which energy is transmitted from one circuit to the other.

Dielectric strength
The highest voltage that may be applied to current-limiting components of an arrester without affecting the arrester. This voltage can be identical with the highest continuous operating voltage $U_c$ of the arrester of higher which depends on the position of the current-limiting component(s) within the arrester.

Differential mode voltage; symmetrical voltage
Voltage between two active conductors from a designated group.

Direct or close-up strikes
These cause surge voltages with an energy content which constitutes a considerable proportion of the total energy of the lightning discharge.

Discharge of static electricity; electrostatic discharge; ESD
Transfer of an electric charge between bodies of different electrostatic potentials when they come close to or into contact with each other.

Disconnect device
This is a device which disconnects an arrester from the system when it fails. It is supposed to prevent a permanent fault in the system and provide an optical indication of the defective arrester.

Electromagnetic compatibility (EMC)
Capability of an installation or a system to function satisfactorily in its electromagnetic environment without introducing electromagnetic interferences to this environment which are unacceptable for other installators.
Electromagnetic environment
Total of all electromagnetic occurrences at a given place.

Electromagnetic interference
Electromagnetic interference is the loss of performance, the malfunction or failure of an electrical or electronic device caused by electromagnetic interferences.

Environmental conditions
The immediate environmental conditions decisive for the creepage distance and clearance being examined.

Equipment to be protected
All devices of a structural system or a range which require surge voltage protection or lightning protection.

Equipotential bonding
This is the elimination of differences in potential between conductive parts, whereby all points take on approximately the same potential.
A distinction is made between functional equipotential bonding and protective equipotential bonding.

Equipotential bonding conductors
These are electrically conductive connections which serve to produce the equipotential bonding.

Equipotential bonding system
This refers to all the interconnected equipotential bonding conductors, including the conductive parts such as housings or extraneous conductive parts which work in the same way.
The equipotential bonding system can be both a grounding system or part of a grounding system.

Equipotential busbar
This is the bar which is used to connect equipment grounding conductors, equipotential bonding conductors and, if necessary, functional grounding conductors with the ground conductor and the ground electrodes.

Follow current I,
Current which flows through the arrester after a discharge process and is supplied by the mains. The follow current differs considerably from the continuous operating current.

Gas-filled surge arrester
The gas-filled surge arrester is a discharge path which is filled with a gas other than air, generally an inert gas.

Ground
This expression refers to the soil and the ground.

Ground, to
To ground means to connect an electrically conductive component (e.g. the lightning protection system) with the ground via a grounding system.

Ground conductor
This is a conductor which connects a device to be grounded with a ground electrode. This is only relevant when the ground conductor is not embedded in the ground or is laid in the ground and insulated.

Ground electrode
This is a conductor which is embedded in the ground and is conductively connected to it. Parts of feed lines which are in the ground but are not insulated are regarded as parts of the ground electrode.

Ground resistance
This is the resistance between the grounding system and the reference ground. The amount of ground resistance results from the combined effect of the individual ground electrodes.

Grounding
Grounding describes all grounding methods and measures utilized.

Immunity to short-circuiting
Highest non-influenced short-circuit current the arrester can withstand.

Impulse
Rapid, brief alteration of a physical variable, followed by a fast return to the original value.

Impulse withstand voltage $U_{\text{imp}}$
The peak value of the highest impulse voltage with a preset form and polarity, which will not lead to a disruptive charge under the given test conditions.
Note: the impulse withstand voltage is equal to or greater than the rated surge voltage.

Inactive parts
Inactive parts are conductive parts that are electrically isolated from all live parts by basic insulation.

Insertion attenuation
With a given frequency, the insertion attenuation of an arrester connected to a given mains, is defined as ratio of the voltages that occur immediately before and after the insertion point of the arrester to be tested. The result is expressed in decibels.

Insulation coordination
The process of correlating the parameters of the insulation of electrical apparatus with
- the expected surge voltages and the parameters of the protective device and
- the expected environmental conditions and the measures taken to protect against pollution.

Interferences
An interference is an electromagnetic variable (can also be electric or magnetic), which can have an undesired influence in an electrical device.

Interference suppression
A measure reducing or avoiding electromagnetic interferences.

Interference voltage, asymmetrical
Interference voltage between a core of a conductor or between a terminal of an electronic device for a conductor and the reference potential.

Interference voltage, symmetrical
Interference voltage between two cores of a conductor (e.g. double conductor) or between two terminals of an electronic device for such a conductor.

Intrinsically safe circuit
A circuit protected against sparks and thermal effects (as specified in the DIN EN 50014 standard which applies to normal operation and specific error conditions) which could cause an ignition in a certain explosive atmosphere.

Intrinsically safe equipment
An electrical device in which all circuits are intrinsically safe.

Lightning Arrester
Generally understood to mean a device that protects electronic and electrical equipment and installations from damage associated with lightning activity.

Lightning protection system
This includes all devices for indoor and outdoor lightning protection of the system to be protected.

Lightning surge current $I_{\text{imp}}$
The lightning surge current is defined by the peak value and the charge. The test is carried out in accordance with the test sequences of the operational test. It is used for classification of the arrester test, class I.

Lightning surge voltage
Surge voltage as a result of lightning discharge.
Lightning test current
The lightning test current 10/350 has a rise time of 10 μs and a decay time to half-value on the wave tail of 350 μs.

Limit discharge surge current
The limit discharge surge current  is a surge current in the form 8/20 μs, which only just causes the disconnect device to operate and does not cause any mechanical damage to the surge arrester.

Live parts
Live parts are conductors and conductive parts of the equipment that are energized under healthy operating conditions.

Maximum Continuous Line Current (nominal current)
The maximum load current a series-connected SPD is able to conduct to a load at rated Maximum Continuous Operating Voltage (MCOV) within its rated temperature range. Usually specified as a label item by safety approval agencies (NEMA standard LS1-1992).

Maximum Continuous Operating Voltage (MCOV).
The maximum steady state voltage at which the SPD device can operate and meet its specification within its rated temperature (NEMA standard LS1-1992).

Maximum Surge Current (8/20).
The maximum 8/20μS surge current pulse the SPD device is capable of surviving on a single-impulse basis without suffering either performance degradation or more than 10 percent deviation of clamping voltage at a specified surge current (NEMA standard LS1-1992).

Nominal discharge surge current
Peak value of the current flowing through the arrester with surge form 8/20. It is used for classification of the arrester test, class II.

Nominal voltage
A suitable rounded voltage value, which is designated by the manufacturer for electrical apparatus for labeling or identification.

Normal mode voltage
Normal mode voltage is voltage that occurs in the case of interference between two conductors of a circuit.

Pressure relief device
The pressure relief device should relieve the arrester of internal overpressure in the case of overload.

Protection level
A parameter that characterizes the performance capabilities of the arrester as regards voltage threshold/limitation over its connecting terminal blocks. This parameter must be higher than the highest voltage threshold value measured and stated by the manufacturer.

Protection Modes (L-N, L-L, L-G, N-G)
This parameter identifies the modes for which the SPD has directly connected protection elements, i.e. line-to-neutral (L-N), line-to-line (L-L), line-to-ground (L-G), neutral-to-ground, (N-G) (NEMA standard LS1-1992).

Protective paths
The components of the surge voltage protection device can be connected conductor/conductor, conductor/ground, conductor/neutral conductor or neutral conductor/ground. A combination of these switching options is also possible. These switching modes are called protective paths.

Pulse packet; burst
Result of a limited number of impulses or waves of a limited duration.

Rate of rise
Medium rate of change of a variable between two specified values, e.g. 10% and 90% of the peak value.

Rated surge arrester voltage
The rated voltage is the highest r.m.s. power-frequency voltage that may be constantly applied to the protective paths of the arrester.

Reference ground
Is an area of the earth, particularly of the earth's surface, which is so far away from the ground conductors, that no noticeable voltages occur between any points of this area as a result of the entry of the current into the earth.

Remote strikes
These cause surge voltages with a considerably lower energy content than close-up strikes.

Residual-current device (RCD)
Residual-current-operated circuit breakers switch off when the grounded discharge current exceeds a certain value.

Residual voltage
The rated peak voltage reached while discharge surge current is flowing through the surge arrester.

Response
A response is when either
- the peak value of the ohmic components of the current through the arrester reaches 5 mA, or
- a voltage dip with an increase in the peak value of the current through the arrester to 5 mA occurs.

Selective residual-current-operated circuit breaker
Selective residual-current-operated circuit breakers are circuit breakers with a time delay which are not triggered by surge currents of a certain intensity.

Source of interference
This refers to the origin of an interference. As a rule, all electrical appliances, such as motors or fluorescent lamps, are potential sources of interference.

Specialist
A specialist is a person who, due to his training, knowledge and experience, as well as familiarity with the relevant regulations, is able to judge the work with which he is entrusted and recognize potential dangers.

Note: several years' experience in the field in question can be taken into account when judging specialist training.

Spike
Single-polarity pulse of relatively brief duration.
Surface discharge surge arrester
The surface discharge surge arrester, in accordance with DIN VDE 0845 part 1, is a surface discharge zone in which the gas discharge is initiated by means of surface discharge.

Surge arresters
Electrical apparatus, consisting mainly of voltage dependent resistors and/or spark gaps. The two elements are either connected in series or in parallel, but each can also be used on its own. Arresters are used to protect other electrical equipment and electrical systems against inadmissible surge voltages.

Surge current 8/20
The surge current 8/20 has a rise time of 8 µs and a decay time to half-value on the wave tail of 20 µs.

Surge Let-through (let-through voltage, remnant voltage).
The part of a surge that passes by a surge protective device with little or no alteration (IEEE C62.45-92 definition).

Surge voltage
Surge voltage is the permanent or temporary voltage between conductors or between conductor and ground in functioning systems (also in switched off systems) which can endanger people and have damaging effects on cables and connected devices.

Surge voltage 1.2/50
Surge voltage with a rise time of 1.2 µs and a decay time to half-value on the wave tail of 50 µs.

Surge voltage category
Allocation of an electrical device to the surge voltage expected.

Surge voltage protection appliances
Surge voltage protection appliances are surge voltage protection devices together with all the appliances in telecommunications systems including their cables for surge voltage protection.

Surge voltage protection device (SPD)
A device to limit transient surge voltages and discharge surge currents. It contains at least one non-linear voltage-limiting component.

Susceptible equipment
This term refers to all electrical equipment whose functioning can be influenced by interferences. The interference manifests itself in the form of malfunctions, faults, reduced reliability and even complete failure of the system concerned.

Switching surge voltage
This is surge voltage caused by a switching operation.

Symmetrical interference
Symmetrical interference means that the source of interference is floating. As shown in the figure, the interference moves from the source via one conductor to the susceptible equipment and back via ground on the other conductor. The term "differential mode" is also used.

Temperature range
These are the minimum and maximum temperatures that may arise in/at the housing. In the case of devices with no self-heating, this value is the permissible ambient temperature. For devices with self-heating, these are the maximum temperatures that may arise in/at the housing during operation.

Transient
Describes a phenomenon or variable which changes during what is, in comparison to the time scale being observed, a short period of time between two consecutive stationary conditions.

Transient Voltage Surge Suppressor (TVSS)
Generally understood to mean a device that protects electronic and electrical equipment and installations from damage associated with surge and transient phenomenon. The source of surge or transient is generally understood to be a switching action (as oppose to lightning).

Transients
These are irregular and relatively short positive and/or negative voltage or current changes between two stationary states.

Tripping current of the disconnect device Iₜₐₜₜₜₜₜ
The tripping current of the disconnect device is the r.m.s. current through the surge arrester. In this case the disconnect device responds within 30 sec.

Varistor
The varistor is a bipolar non-linear resistor with a symmetrical voltage/current characteristic curve and a resistance value which decreases as the voltage increases.

100% lightning impulse sparkover voltage
This is the voltage which causes the surge arrester to operate with the lightning impulse voltage 1.2/50.

Note: With some arrester designs (e.g. varistors) the 100 % lightning impulse sparkover voltage cannot be determined.
EXTENDED TEN YEAR
AND FIVE YEAR LIMITED WARRANTIES FOR
TRABTECH PRODUCT LINE

PHOENIX CONTACT, INC. warrants to the original end user that the products referred to below, if used in accordance with all applicable instructions, safety codes and industry standards, shall be free from defects in material and workmanship, including defects resulting from failure or malfunction of the products from lightning and switching transient events, for the term of years set forth below.

- 10 Year term of warranty for TRABTECH products consisting of or containing FLASHTRAB and FLASHTRAB+CTRL products and systems.

- 5 Year term of warranty for TRABTECH products consisting of VALVETRAB, BRICKTRAB, PLUGTRABs, PIPETRAB, DATATRAB, COAXTRAB, TELETRAB, and MULTISTAGE TERMITRABs

TERMITRABs are not covered under this extended limited warranty but are covered under the standard 1 year warranty outlined in Phoenix Contact's standard Terms and Conditions of Sale.

To view the complete Warranty terms and conditions, please visit our website:

- www.phoenixcon.com/products/trabtech/warranty

or contact our Technical Service Department at 1-800-322-3225
Integrated Management System

The integration of quality, environmental protection and safety at work in the management system of Phoenix Contact, makes it clear how important these three areas are for the company. In all phases of the product life cycle, legal requirements, the requirements of decrees and international standards are fulfilled and partly even exceeded.

Every year, independent institutes recognized worldwide check the conformity with the documents upon which the products are based. Certifications in accordance with the international standards ISO 9001 and ISO 14001 are the result of our corporate philosophy of meeting the needs of our customers, staff and environment as best possible. They serve as the basis for innovative products with the familiar high Phoenix Contact quality standard, actively practiced environmental protection, and responsibility in the field of safety at work. Of course, we integrate all further requirements of standards, international approvals or special customer demands into the company processes.

International acknowledgements by renowned neutral institutes are the success achieved by the Phoenix Contact group for offering satisfactory products and services.

CE identification

The CE mark was introduced as an important instrument for the free movement of goods and services within the European domestic market. By attaching the CE mark to a product, the manufacturer is confirming that it complies with all applicable European Union (EU) directives. EU directives describe the characteristics of the product with respect to equipment safety and avoidance of danger. These are legally binding regulations of the European Union (EU). In other words, compliance with the requirements is a statutory condition for marketing the article within the EU.

Where applicable, the products our company manufactures currently fall within the purview of the following directives:
- 73/23/EEC Electrical equipment for use within specific voltage limits (low-voltage directive)
- 89/336/EEC Electromagnetic compatibility (EMC directive)
- 89/392/EEC Safety of machinery (Machinery directive).
- 94/9/EU Equipment and protection systems for application in hazardous areas ATEX 100a directive

The standards upon which the specified directives are based have been a part of our standard of development for a long time. This guarantees conformance with European directives. The inspections of our products in conformance with the standards are carried out in a test laboratory accredited in accordance with EN 45 001. The inspection reports are recognized as part of a Europe-wide accreditation procedure.

The EMC directive occupies a special place amongst the European directives named. For the first time, it defines electromagnetic compatibility as a fundamental property of equipment based on legally binding guidelines. European jurisprudence therefore acknowledges the importance of electromagnetic compatibility of equipment and systems as an important condition for trouble-free operation of machinery and systems. Phoenix Contact is one of the leading international companies in the industrial surge voltage protection market and correspondingly possesses a broad expertise in EMC matters. This expertise and the experience gained over years of developing and applying industrial interface and communications engineering have led to products of an extremely high quality standard with respect to electro-magnetic compatibility. In order to provide other companies with this know-how too, the subsidiary, Phoenix Test-Lab was founded. Phoenix Test-Lab GmbH is an independent, accredited service company offering EMC testing in conformance with the European directives. At Test-Lab, equipment is also tested for electrical safety, mechanical influences and their behavior with environmental influences. Moreover, Phoenix Test-Lab is the responsible department for the EMC directive 89/336/EEC and the appointed department for the TKE directive 98/13/EC.

Standards and Regulations

All relevant standards and regulations are used as the basis for development and improvement of our products. International standards are subject to continuous changes due to harmonization and new developments. To do justice to this process, the current state of all standards relevant for our products is documented on the Internet under www.phoenixcontact.com.

Online product information service in the World Wide Web

The product range of Phoenix Contact is continuously being expanded.

Due to our commitment to product monitoring, all products are subject to improvements.

Internet serves as an ideal platform to quickly communicate innovations and product improvements on the market. Under www.phoenixcontact.com you can find a regularly updated overview of Phoenix Contact products. Technical documents, such as data sheets and manuals, are available online. The latest driver and demo software can be downloaded. A database with FAQs helps you to solve smaller problems or to find the fastest way to the Support Hotline.

You will get the best overview of new products and services by subscribing online to the free newsletter.

Note:
We reserve the right to undertake modifications on the grounds of technical progress.
Quality Features of Insulation Material

Thermoplastics

The majority of our insulation housings are made of thermoplastic materials. Roughly speaking, these can be divided into amorphous and semi-crystalline substances. Thermoplastics are processed using the economical and environmentally sound injection molding process. They have good recycling properties and can be reused. Electrical and electronic modules, equipment and systems set demanding requirements with regard to their mechanical, thermal and electrical characteristics; a large number of differently modified materials come up to the mark.

Behavior of Plastics under the Influence of Temperature (Operating Temperatures)

All plastics undergo a process referred to as thermal aging when they are subjected to the influence of heat over long periods. This process causes changes in the mechanical and electrical properties of the material. External influences, e.g. radiation, additional mechanical, chemical or electrical stresses, reinforce this effect. Special tests on samples can yield characteristic data which provide a good yardstick for drawing comparisons between different plastics. However, transferring these characteristics to an evaluation of molded plastic parts is only possible to a restricted extent, and can only give the designer a rough guide when it comes to selecting a plastic material. This catalog uses the following assessment criteria: the RTI value according to UL 746 B/ANSI 746 B (Elec. ref. to electric strength) and the Ti value according to IEC 60 216-1 (ref. to a 50 % reduction in tensile strength after 20 000 hours).

IEC 60 947-7-1/EN 60 947-7-1 specifies a permissible temperature increase of 45 K for modular terminal blocks under rated load. Phoenix Contact terminal blocks fulfill this requirement. Attention should be paid that the sum of the ambient temperature and the temperature rise does not exceed the Ti value specified for the individual products.

Thermoplastics: Polyamide PA, Non-Reinforced

We use modern, semi-crystalline polyamide insulation material, which now has become an essential component in electrical engineering and electronics. It has long occupied a leading position and is authorized for use by the relevant approval offices such as CSA, NEMKO, KEMA, PTB, SEV, UL, VDE, etc.

Polyamide also has excellent electrical, mechanical, chemical and other properties even at high operating temperatures. Brief peak temperatures up to about 200 °C are permissible as a result of heat aging stabilization. Depending on the type (PA 4.6, 6.6, 6.10 etc.), its melting point is in the region of 215 °C to 235 °C.

Polyamide absorbs moisture from its surroundings, on average 2.8 %. However, this moisture is not intercalary water from crystallization but chemically bonded H2O groups in a molecular structure. This makes the plastic flexible and resistant to breakage, even at temperatures as low as -40 °C. PA achieves a UL 94 classification of V2 to V0.

Thermoplastics: Polyamide PA-F, Glass Fiber Reinforced

Fiber reinforced polyamides are characterized by great rigidity and hardness as well as operating temperatures even higher than those of the non-reinforced material. This means they are suitable for use in applications such as surge voltage protection.

Reinforced polyamide absorbs less moisture than the non-reinforced material. Otherwise, the characteristics of the two substances are largely similar. Fiber reinforced polyamide has a UL 94 inflammability classification of HB to V0, although V0 materials are usually only available in black.

Thermoplastics: Polyester, PBT

The semi-crystalline thermoplastic polyester in non-reinforced and glass fiber reinforced variants is used for special applications which require thermostability.

The material is characterized by a high operating temperature and excellent mechanical strength and hardness. Polyester does not absorb moisture from its surroundings. PBT is therefore especially suitable for strips, for example, which are surface mounted onto printed circuit boards and subsequently have to pass a burn-in test while they are subjected to the influence of heat. PBT achieves inflammability class V2 to V0 in accordance with UL 94.

Thermoplastics: Polycarbonate PC

Polycarbonate combines many advantages such as rigidity, impact strength, transparency, dimensional stability, good insulation properties and resistance to heat.

The amorphous material only absorbs moisture to a very limited degree, and is used for items such as large, rigid electronics insulation housings.

In its transparent form, polycarbonate is particularly suited for use as covers or marking materials.

PC has good resistance properties against mineral acids, saturated aliphatic hydrocarbons, petrol, greases and oils. The material is less resistant to solvents, benzene, alkalis, acetone and ammonia. Strain cracks may result from contact with certain chemicals. PC achieves a UL 94 classification of V2 to V0.

Thermoplastic: Polyamide PA

D.E. 2431-1/DIN VDE 0303-21

Dielectric strength

Kv/cm 650 400 400 > 300

Resistance to creepage

C/T/l.m 550 250 225 175

Tropical and termite resistance
good good good good

Specific internal insulation resistance

IEC 60 059/VDE 0303 30 and IEC 60 167/VDE 0303 31

Surface resistance

Ω 13 10 10 10 > 10

Inflammability class in acc. with UL 94

V2-V0 HB V0 V2-V0

<table>
<thead>
<tr>
<th>Features</th>
<th>Unit</th>
<th>Polyamide PA</th>
<th>Polyamide PA-F</th>
<th>Polyester PBT</th>
<th>Polycarbonate PC</th>
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* In acc. with UL 746 B/ANSI 746 B (Elec.) ** Minimum value

Phoenix Contact
The rated cross section of modular terminal blocks should be specified by manufacturers according to IEC 60 947-7-1. Specific thermal, mechanical and electrical requirements relate to this cross section. The manufacturer must also specify the rated connection capacity, i.e. the area of the conductor that can be connected, as well as the number of conductors that can be connected simultaneously and the necessary preparation of the conductor ends. The conductors can be rigid (solid or multi-strand) or flexible (fine strand).

These values can be found in the product specific technical data. Moreover, the ranges of cross sections when ferrules are used are indicated - with or without a sleeve of insulating material. Areas in which two solid and stranded conductors are connectable at the same time and with the use of a ferrule - without a sleeve of insulating material - are also indicated.

The rated connection capacity of the Phoenix Contact modular terminal blocks usually exceeds the standard requirements, since according to the latter, only one conductor with one of the next two smaller cross sections (apart from the rated cross section) must be connectable (standardized for the range of cross sections from 0.2 to 35 \text{mm}^2).

"Special treatment" includes soldering the individual strands of a conductor, using cable lugs, bending the eyes, etc. However, it does not include straightening the conductor before inserting it into the terminal point or twisting a multi strand conductor in order to consolidate its ends. Conductors with soldered single strands are unsuitable for connection to screw terminal blocks.

Phoenix Contact modular terminal blocks are designed to allow copper wires to be always connected to them without any special treatment. "Special treatment" or the use of ferrules - both is permissible in accordance with the IEC 60 947-7-1 - is not necessary. Should ferrules be used in order to protect stranded conductors from coming unspliced, the connection capacity of the stranded conductors will generally be reduced by one step.

---

<table>
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<tr>
<th>Cross section (\text{mm}^2)</th>
<th>Solid strand</th>
<th>Multi strand</th>
<th>Fine strand</th>
<th>Gauge no.</th>
<th>American Wire Gauge [AWG]</th>
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<td>16.2</td>
<td>12</td>
<td>13.1</td>
<td>7</td>
<td>5.96</td>
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<tr>
<td>185</td>
<td>18</td>
<td>13</td>
<td>14.1</td>
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<td>240</td>
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<td>14</td>
<td>15.1</td>
<td>7</td>
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<td>15</td>
<td>16.1</td>
<td>7</td>
<td>7.16</td>
</tr>
<tr>
<td>400</td>
<td>26.1</td>
<td>16</td>
<td>17.1</td>
<td>7</td>
<td>7.56</td>
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</tbody>
</table>

Phoenix Contact
Tightening Torque of Terminal Block Screws

IEC 60 947-1:1996/EN 60 947-1:1997, modified, table 4 specifies tightening torques for screw connections based on the type and size of screw for electrical and mechanical type tests. Tightening Phoenix Contact terminal blocks to this torque guarantees that the connected conductors are reliably connected. The technical product data given in this catalog differ from this value; however, they indicate a practical range of tightening torques which provides a gas-tight contact and offers long-term contact stability.

Extract from IEC 60 947-1/EN 60 947, Table 4

The torque in accordance with IEC/EN and the recommended torque for Phoenix Contact terminal blocks are indicated:

<table>
<thead>
<tr>
<th>Thread</th>
<th>Torque [Nm]</th>
<th>CuZn or CUSn screw [Nm]</th>
<th>Steel screw [Nm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 2.5 (M 2.6)</td>
<td>0.4</td>
<td>0.8</td>
<td>0.8</td>
</tr>
<tr>
<td>M 3</td>
<td>0.5</td>
<td>0.8</td>
<td>1.0</td>
</tr>
<tr>
<td>M 3.5</td>
<td>0.6</td>
<td>1.2</td>
<td>-</td>
</tr>
<tr>
<td>M 4</td>
<td>1.2</td>
<td>1.6</td>
<td>2.0</td>
</tr>
<tr>
<td>M 5</td>
<td>2</td>
<td>3</td>
<td>4.5</td>
</tr>
<tr>
<td>M 6</td>
<td>2.5</td>
<td>4</td>
<td>6</td>
</tr>
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