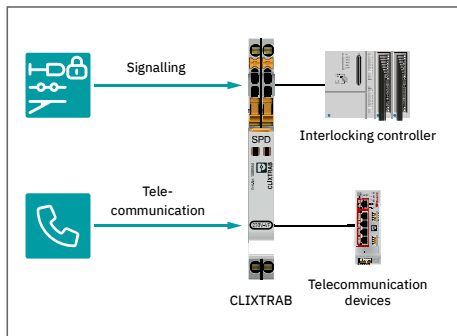


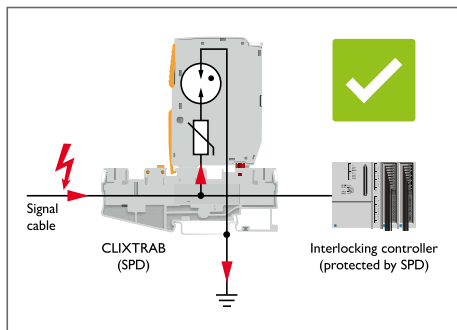
Surge protection in railway infrastructure

Protecting control-command and signaling, as well as telecommunications



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

Application champ

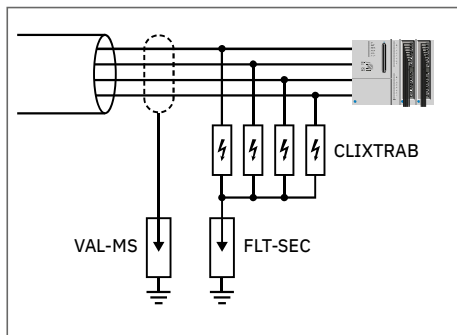


The CLT-10P/2-VF-230V-I-P reliably protects the insulation of railway technology equipment. At the same time, it also ensures that the special requirements such as those listed in the Deutsche Bahn RIL 819.0808 standard are satisfied. The series connection of varistor and gas discharge tube ensures that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

CLIXTRAB – designed for railway-specific applications



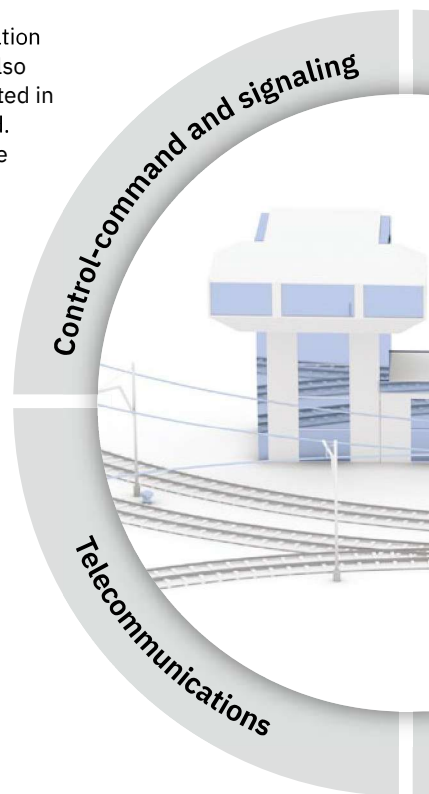
Parameters available for proof of safety



Overview of the surge protective device for the lightning protection concept

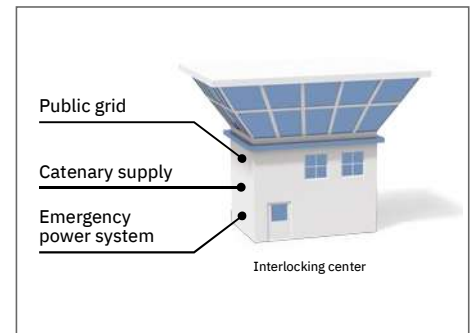
All electrical potentials that lead from the field into a system have to be provided with lightning and surge protection. Signal cables with shielding and metallic rodent protection must also be integrated into the lightning protection concept. With VAL-MS, lightning protection to ground can be realized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

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



Protecting the power supply

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



Redundant power supply to the signal box



SPDs for lightning currents

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

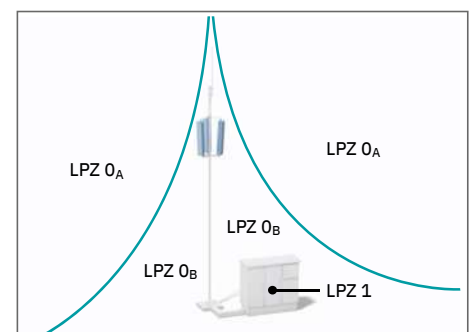
Protecting cellular communication, IT, and buildings

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



Camera systems and information technology

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

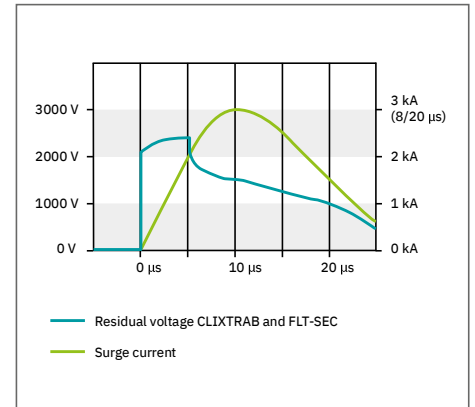


Lightning protection zone concept for antenna systems

Insulation and voltage limitation of surge protective devices

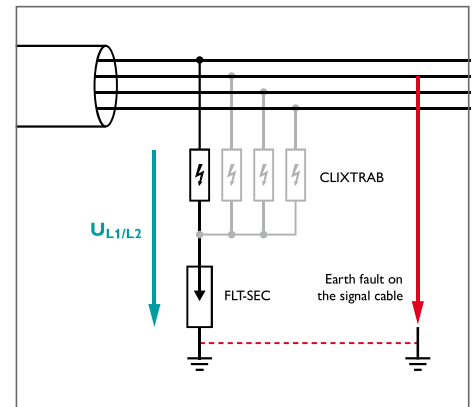
Coordination of the electric strength

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



Effect of ground faults on the voltage on surge protective devices

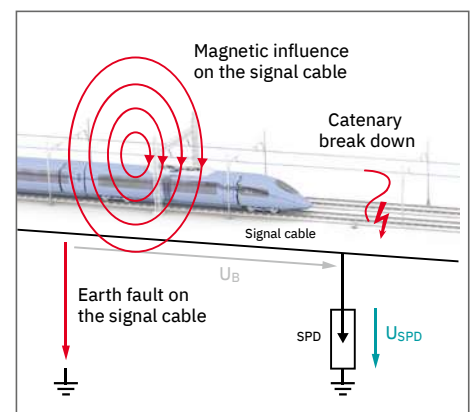
Signaling systems in railway systems are typically insulated as IT systems (French: Isol   Terre). The reason is the tolerance to the first ground fault, which does not lead to shutdown and thus increases the availability of the system. The ground fault is detected and reported by insulation monitoring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



Influence on the surge protective devices through induced voltages

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

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



Product list – lightning and surge protection

Control-command and signaling, as well as telecommunications			
	Description	Type	Item no.
	CLIXTRAB is the surge protective device for the typical requirements of control-command and signaling as well as telecommunications. The standard item is 2-position in design. The 4-position version can be used for point drives.	CLT-10P/2-VF-230V-I-P CLT-20P/4-VF-230V-I-P	1088564 1088567
	For bus systems such as CAN bus.	CLT-10P/2-2-12V-I-P CLT-10P/2-2-24V-I-P CLT-10P/2-2-60V-I-P	1088569 1088570 1088573
	Terminal block as the base of the CLIXTRAB module. As feed-through terminal block, 3-position and 4-position versions. The standardized bridging, testing, and marking accessories can be used.	PT 2,5-MT-CLT PT 2,5-TWIN-MT-CLT PT 2,5-QUATTRO-MT-CLT	1087698 1251104 1251103
	Combi arrester, connects the shared potential of the CLIXTRAB DIN rail to the ground potential.	FLT-SEC-P-T1-1C-440/35-FM	2905987
	Grounding terminal block, connects the DIN rail of the CLIXTRAB modules to the combi arrester.	PTV 6-SG WH XTV 16-SG WH	1375754 1428615
	Surge protective device for the cable shielding.	VAL-MS 350 VF/FM	2856579
	Remote signaling set for monitoring CLIXTRAB overload tripping. When tripped, a message is sent via a floating contact.	TTC-6-FMTX-PT TTC-6-FMRX-PT	1193565 1193571
Power supply			
	Description	Type	Item no.
	Public grid as TN-C system 3 ~ 230/400 V, 50 Hz	FLT-SEC-T1+T2-3C-350/25-FM	2905469
	Overhead line as TN-S system 2 ~ 231/462 V, 16.7 Hz	FLT-SEC-P-T1-2S-350/25-FM	2905418
	Emergency power system TN-C-S and TT system 3 ~ 230/400 V, 50 Hz	FLT-SEC-P-T1-3S-350/25-FM	2905421
IT			
	Description	Type	Item no.
	Surge protective device	DT-LAN-CAT.6+	2881007
	Patch panel with surge protection	PP-RJ-SCC-F	2703022
GSM-R			
	Description	Type	Item no.
	Surge protective device	CN-LAMBDA/4-2.25-BB	2801057
	Type 1+2 combined lightning current and surge arrester	FLT-SEC-T1+T2-3S-350/25-FM	2905470
	Type 2 surge protective device	VAL-SEC-T2-3S-350-FM	2905340