Easy protection

Protection for video surveillance systems

Video surveillance is now an integral tool in many areas. The primary goal of this surveillance is to ensure security or to support and monitor automated processes. Protection against overvoltages is important in this context, and frequently also mandatory.

Standard requirements

The IEC 62676 standard series, in particular Part 4, contains recommendations and requirements for selecting, planning, constructing, commissioning, servicing, and inspecting video surveillance systems (VSS).

The series also establishes requirements for surge protection (Section 12.10 "Lighting and surge protection"). If there is a danger of electrical malfunctions or lightning strikes, a lightning and surge protection system in accordance with IEC 62305-3 and IEC 62305-4 must be provided. Furthermore, IEC 60364-4-44 and IEC 60364-5-53 are also relevant for lightning and surge protection.

Assessment of dangers due to lightning strikes

Deciding if lighting strikes pose a danger is part of the building design process. A video surveillance system does not increase the risk of lightning strikes. The belief that electrical systems on a roof or exterior walls attracts lightning is a misconception. This discussion is also popular in relation to photovoltaic systems. For you as a planner, builder, or inspector of a video surveillance system, it is therefore only important if the building to be monitored has a lightning protection system or not. Necessary lightning and surge protection measures for the video surveillance system can then be determined on this basis.

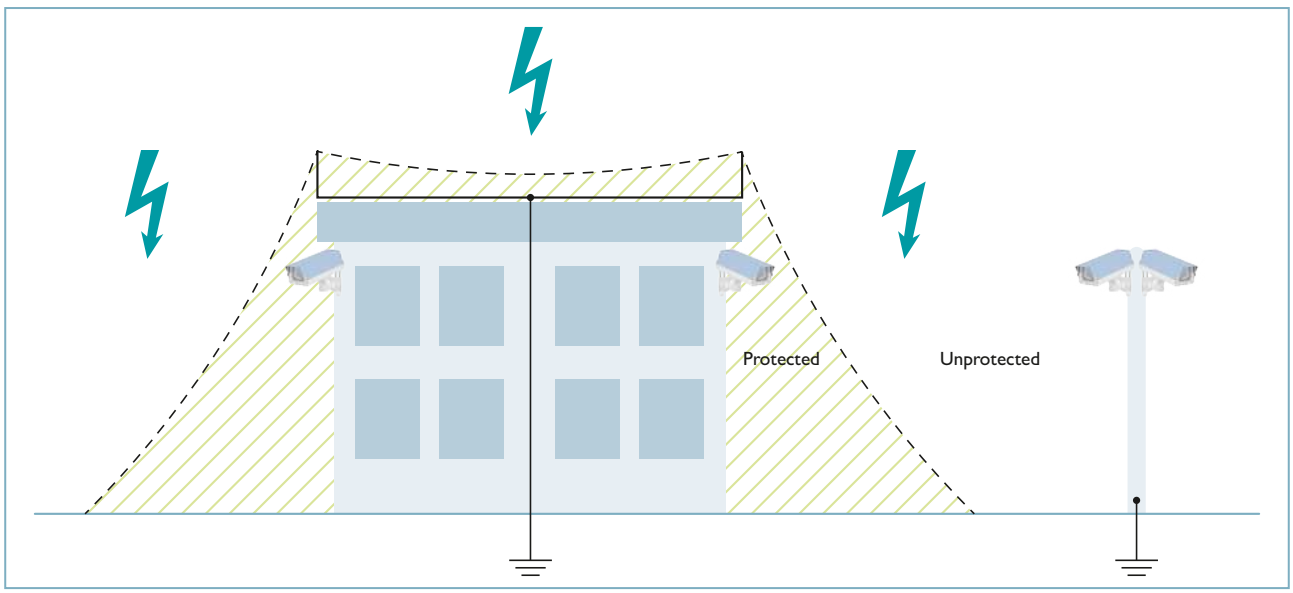
Building with external lightning protection

In buildings with exterior lightning protection systems, the protection of all lines routed from unprotected areas into the protected area is mandatory according to IEC 62305-3.

But what is actually protected and what isn't? Areas that cannot directly be struck by lightning are protected. In a building with an exterior lightning protection system, a direct strike into the building is prevented. Lightning rods are positioned so that the lightning strikes there. This creates a protected space underneath so that areas on top of the roof or on exterior walls can also be protected from direct lightning strikes.

Use surge protection to protect all lines routed from the unprotected area into the protected area. It is installed directly at the building's entry point and must be able to carry lightning current:

- For power lines, SPD of IEC test classification T1 (SPD type 1)
- For data and MCR lines, SPD of IEC test classification D1



Protected/unprotected areas on a building

Building with external lightning protection and higher requirements for EMC protection

Buildings with an external lightning protection system and higher requirements for EMC protection must be divided into lightning protection zones in accordance with IEC 62305-4. This requires protective measures in the building as specified in IEC 62305-4 to counter the effects of a lightning electromagnetic pulse (LEMP) on the internal electrical and electronic systems.

Designing a lightning protection zone is part of planning the building's overall lightning protection system. The zones and zone transition areas are needed when designing the video surveillance system. This applies in particular for the cable installation.

To protect cabled couplings against electromagnetic malfunctions from one zone to the next, all lines in the zone transition areas must be protected with surge protection. The surge protective devices (SPD) at the zone transitions must be able to safely arrest the possible loads. The performance of protective modules is described by IEC test classifications.

Connections to the equipotential bonding must be available at the zone transitions. In general, long lines to the equipotential bonding must be avoided.

Lightning protection zones (LPZ) in accordance with IEC 62305-4:

Outer zones:

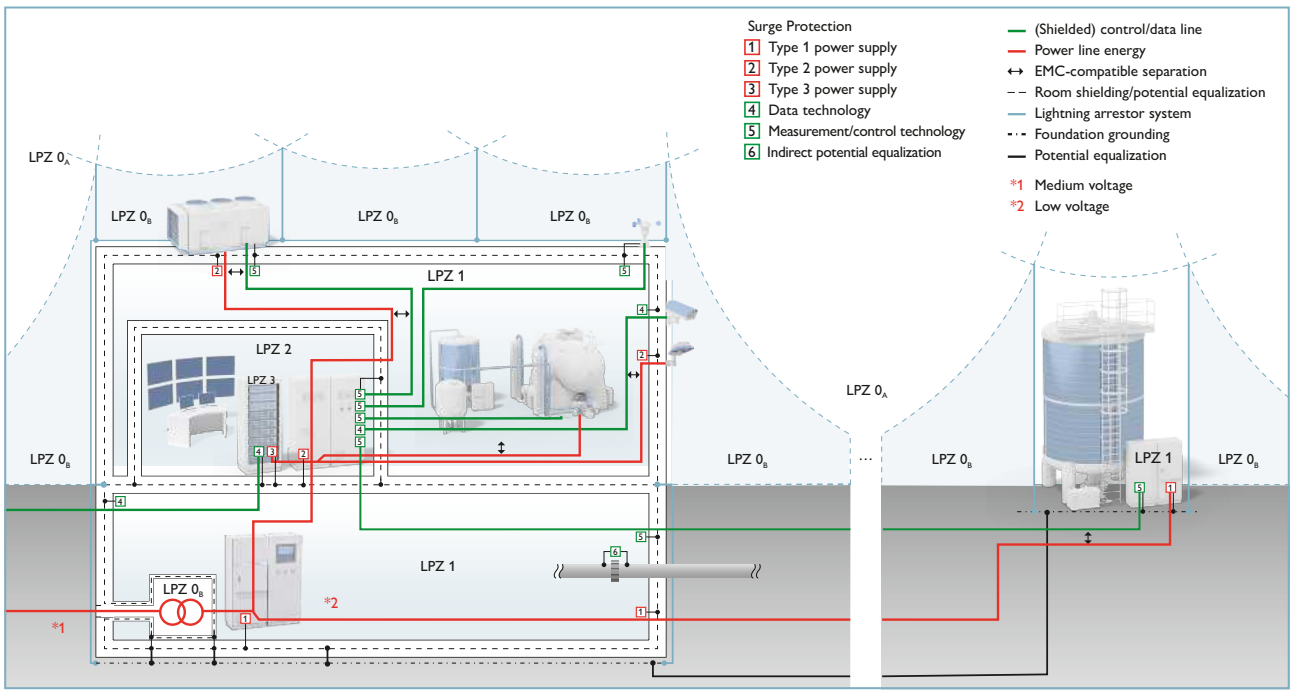
LPZ 0_A: the zone endangered by direct lightning strikes and the full lightning electromagnetic field.

LPZ 0_B: the zone protected against direct lightning strikes, but endangered by the full lightning electromagnetic field.

Inner zones:

LPZ 1: the zone in which the lightning electromagnetic field can be attenuated by spatial shielding.

LPZ 2: the ... n zone in which the lightning electromagnetic field can be attenuated further by additional spatial shielding.



Lightning protection zones in an industrial system in accordance with IEC 62305 part 4

Zone transition	$0_A \rightarrow 1$	$0_B \rightarrow 1$	$1 \rightarrow 2$	$2 \rightarrow 3$
SPD type for power lines	T1	T2	T2	T3
SPD type for data/MCR lines	D1	C2	C2	C1

Buildings without external lightning protection

In buildings without an external lightning protection system, protection must be included upstream of couplings from the supply network. When there are distant lightning strikes, the lightning currents disperse through the supply network into the connected load systems. Even these partial lightning currents can cause significant damage to the electrical system. Therefore, using surge protection for power supplies at the feed point of the electrical system (the building's main distribution) is necessary and often even mandatory. Further protective measures may be necessary according to IEC 60364-5-53 (DIN VDE 0100-534).

Overvoltages can also be carried via telephone and data lines. In this case, any connected devices such as switches, routers, or phone systems can become damaged. Protection is recommended for buildings without external lightning protection. In these times of steadily increasing networking, you should implement this recommendation.

Dispersing the lightning strike throughout the supply network significantly weakens its energy. The surge protection installed at the building's entry point must be able to safely arrest this weakened energy from distant lightning strikes and the switching actions from the supply network:

- For power lines, SPD of IEC test classification T2 (SPD type 2)
- For data and MCR lines, SPD of IEC test classification C2

Protection of important and sensitive surveillance systems

Regardless of the protective measures required by the standards, a risk assessment concerning overvoltage damage should always be made. Especially in video surveillance systems, malfunctions and failures could result in a sensitive loss of control – flying blind, so to speak. In addition, this requires replacing a defective camera at a great expense, up to blocked traffic, or even an interruption of operations.

Costs for a replacement following an overvoltage exceed the investment costs for protective measures many times over. A clever surge protection concept is a sensible and economical investment to ensure a robust and reliable video surveillance system.

Protection is simple: install surge protection upstream of all sensitive and important devices, such as cameras and switches. This is especially the case for long lines. The risk of malfunctions coupling into these lines increases with each meter, even if the lines are installed entirely in the building, that is, in the protected area. This is because buildings rarely have an installation that complies with EMC directives.

Installation in buildings with external lightning protection

Protection against a direct lightning strike

Always install cameras and other electrical devices in the protected area. This is the only way to protect the installation against direct lightning strikes.

However, installation in the protected area is not always possible. Parking lot surveillance on masts can be difficult to install in a protected area. Also, connections to other buildings cannot always be routed only in protected areas. In such cases, ensure that no overvoltages can enter the building via such lines. Appropriate surge protection is therefore important here.

Protecting masts against direct lightning strikes is possible, but also involves work and expense. Coordinate these measures with a company specializing in constructing lightning protection.

Keep in mind that only properly positioned air terminals in the exterior lightning protection system can protect cameras and other electrical equipment against direct lightning strikes.

If cameras and other electrical devices are not protected against direct lightning strikes, the correct use of surge protective devices can prevent partial lightning currents and surges from spreading through the wiring network.

Separation distance between electrical devices and the lightning protection system

Always install cameras and other electrical devices far enough away from the air terminals and arresters of the lightning protection system. This also applies to the cable installation. It should be easy to understand that lines should not be attached to lightning conductors. If lightning strikes, the lightning current will spark over to all lines and devices that are too close. These parts and all devices connected to these parts will very likely be disrupted or damaged.

A sufficient distance from parts of the lightning protection system is essential for the video surveillance system to operate reliably. The necessary distance is defined by the separation distance "s" and calculated individually for each point. It is therefore essential to consult the constructor of the lightning protection system. In addition, the installing company can also provide assistance if separation distances cannot be maintained. In such cases, parts of the lightning protection system are moved or designed with insulation.

The right surge protection

Surge protective devices with lightning current carrying capability

Surge protective devices (SPD) that can safely arrest these lightning currents with very high energy levels must be installed at all points where lightning currents are expected:

- At the transition between the unprotected to the protected area (IEC 62350-3).
- At the zone transition from $0_A \rightarrow 1$ (IEC 62305-4).
- To protect the line network at locations that cannot be protected against direct lightning strikes.

For buildings with lightning protection systems of lightning protection level I/II

Plug-in type 1+2 combined lightning current and surge arrester for 1-phase power supply networks with separate N and PE (L1, PE, N).

Lightning impulse current I_{imp}: 25 kA

FLT-SEC-P-T1-1S-350/25-FM - 2905415

For buildings with lightning protection systems of lightning protection level III/IV

Plug-in type 1+2 combined lightning current and surge arrester for 1-phase power supply networks with separate N and PE (L1, PE, N).

Lightning impulse current I_{imp}: 12.5 kA

VAL-MS-T1/T2 335/12.5/1+1-FM - 2800186

Surge protection of IEC-test classification D1, C2 and C1 for Gigabit-Ethernet (up to 10 Gbps in acc. with $CAT6_A$).

Suitable for Power-over-Ethernet (PoE++ / 4PPoE) "Mode A" and "Mode B".

DT-LAN-CAT.6+ - 2881007

Surge protective devices without lightning current carrying capability

Surge protective devices (SPD) that can safely arrest significantly lower energy levels, and are therefore much more compact, can be installed at all points where lightning currents are not expected.

Plug-in type 2 surge protective devices for 1-phase power supply networks with separate N and PE (L1, PE, N).

Nominal discharge current I_n: 20 kA

VAL-SEC-T2-1S-350-FM - 2905333

Plug-in type 2/3 surge protection for 1-phase power supply networks with separate N and PE (L1, PE, N).

Nominal discharge current I_n: 5 kA

PLT-SEC-T3-230-FM-PT - 2907928

Patch panel, RJ45 jack to push-in terminal, with integrated surge protection of IEC test classification C2 for Gigabit-Ethernet (up to 1 Gbps in acc. with CAT5e).

Suitable for Power over Ethernet (PoE).

PP-RJ-SCC-F - 2703022

PoE injector, 30 W, RJ45-jack to push-in-terminal, with integrated surge protection of IEC test classification C2 for Gigabit-Ethernet (up to 1 Gbps in acc. with CAT5e).

INJ 2103-T - 1004065

INJ 2113-T – 1004066 (version with 60 W)

Comprehensive solutions for video surveillance

As a leading automation provider, Phoenix Contact offers comprehensive solutions for wired or wireless IP video surveillance in industrial and commercial applications. This includes an extensive product portfolio of connection and automation technology for use between the camera and video server.

Industrial Ethernet components, power supplies, surge protection, connectors, cables, lines, terminal blocks, and 19-inch components ensure safe connection between the camera and video server. The required components are available individually, as modules, or as ready-to-connect boxes. The products are suitable for industrial use and therefore enable high network availability even in critical applications.

Further information about the Smart Ethernet Box:
phoe.co/SmartEthernetBox

3011430343

phoenixcontact.com

Learn more

Further information on our surge protection is available at
phoenixcontact.com/surgeprotection