



Data centre

Lightning and surge protection

Keep the data flowing

Powerful lightning and surge protection reduces risks in a data centre. It maintains the flow of data by preventing damage to critical systems, downtimes or even data losses.

Data centres are the cornerstones of our everyday life and the basis of digitalisation. They ensure the flow of information and provide data memory services for crucial processes of everyday life. Whether it is social networks, entertainment, public health, energy, telecommunications, traffic control systems or state bodies – all of these things are reliant on the supply from data centres. Rising in tandem with the growing importance of data centres is the pressure placed on their infrastructure and the safeguarding of an unrestricted flow of data.



The dangers posed by the impact of lightning and surges represent significant and often overlooked risk factors. This is where a lack of precautions can have wide-ranging consequences, such as fires, downtimes of important systems and even data loss. Lightning and surge protection measures are therefore an essential component in a safety concept, because a data centre is much more than just a building. It consists of a large number of electrical and interconnected subsystems, which are all designed to maintain the flow of information, whereby they are online and always available. All of these things, their functionality and especially their

seamless interplay are critical for normal service operation and the continuous flow of data this entails.

Tip

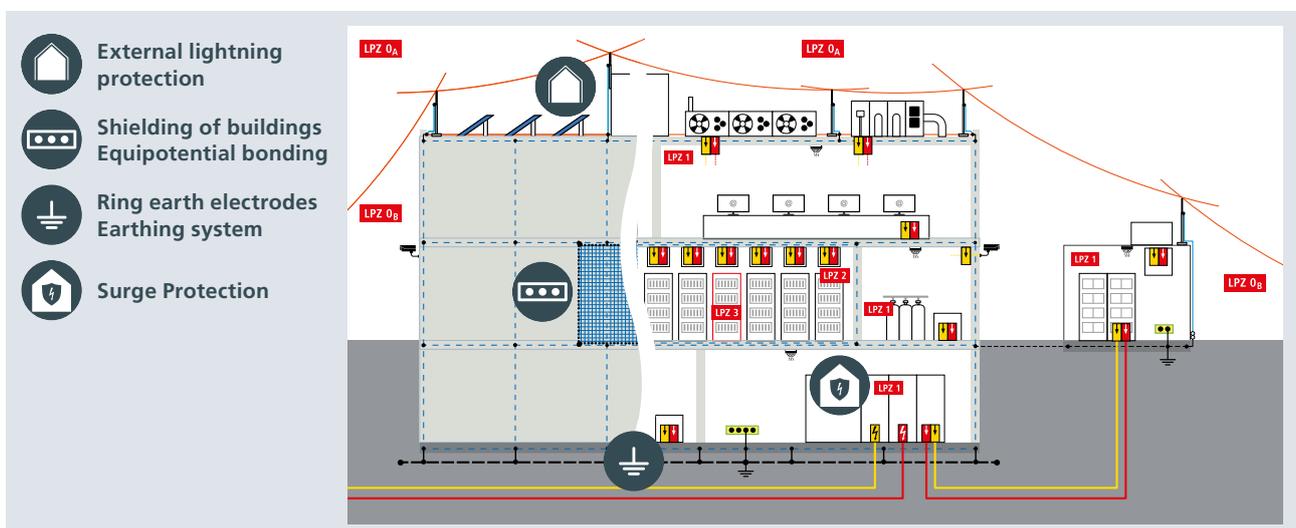
Factor in lightning and surge protection early on in the planning process, because in this phase implementation is considerably easier. Retrofitting is only achieved with difficulty and is associated with a very high financial cost.

Safety from a single source

DEHN is your one-stop shop for safety – as a full service provider of coordinated system solutions for earthing, lightning and surge protection. Benefit from the advantages and synergies of a broad range of products and services.

Ensure data availability and minimise risks with a carefully planned, coordinated and complete lightning and surge protection concept.

Key elements of an integrated protection concept



Identifying risks and complying with specifications

A lightning protection risk analysis assesses and determines the risk potential. It forms the basis for minimising risks and defining an economically optimal selection of protection measures.

Risk management

Foresighted risk management helps a planning engineer to evaluate risks more accurately. It provides the basis for decision-making in order to limit the present risks and provide transparency about which residual risks might sensibly be covered by insurance.

The aim of the assessment is to objectify and quantify the risk to structures and their contents from direct and indirect lightning strikes. The risk analysis specified in EN 62305-2

ensures that a lightning protection concept which is comprehensible for everybody concerned can be created. This is technically and economically optimised so that the requisite protection is ensured with as little cost as possible. The protection measures resulting from the risk analysis are described in detail in parts 3 and 4 of the EN 62305 standard (international basic standards: IEC 62305-3 and IEC 62305-4).

Normative references

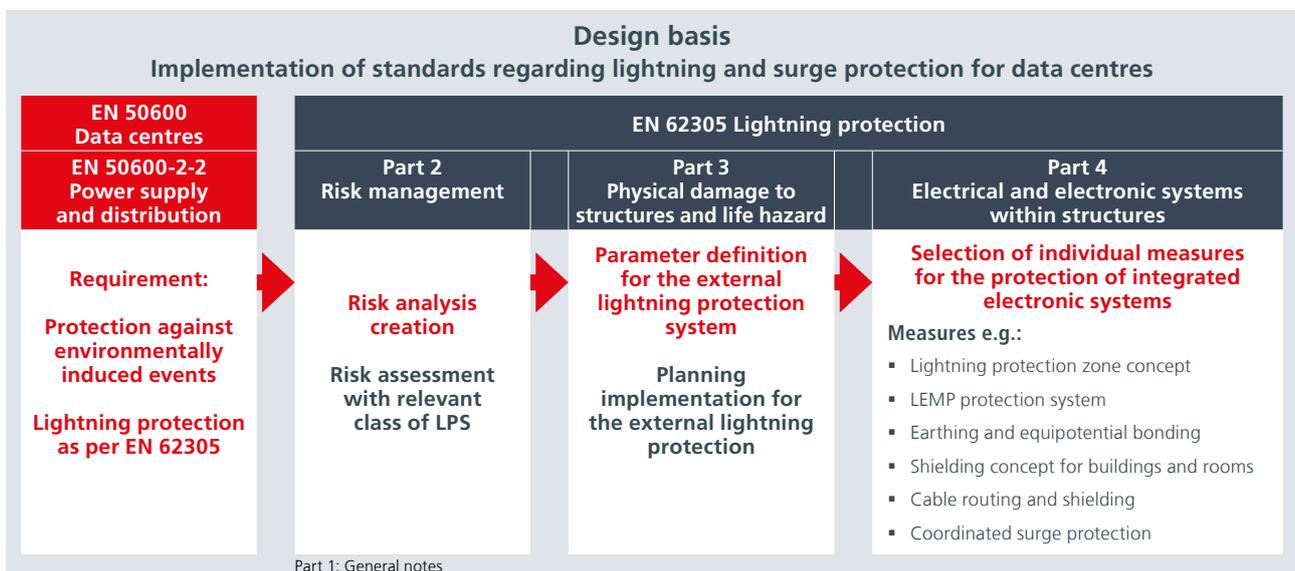
Standards and building regulations prescribe lightning and surge protection measures. EN 50600 – the international standard for the planning, construction and operation of data centres – refers here to EN 62305, which deals with the protection of buildings against the effects of lightning strikes and related phenomena.

EN 62305 constitutes the basis for the standard-compliant selection of lightning and surge protection concepts as well as shielding measures. It includes the following parts:

- EN 62305-1: General principles. The section provides an introduction to the topic of lightning protection with general principles and definitions of terms.
- EN 62305-2: Risk management. The risk assessment is the basis for the correct implementation of the protection measures described in Part 3.

- EN 62305-3: Physical damage to structures and life hazard. This part deals with the practical implementation of an external lightning protection system that protects the building and the people located inside it.
- EN 62305-4 Electrical and electronic systems within structures. This part deals with the protection of electrical and electronic systems against the effects of lightning electromagnetic pulses (LEMP).

With data centres, it is not only about preventing property damage and the risk to human life. It is also important here to prevent the failure of electrical and electronic systems, which is why there is a special focus on part 4 of EN 62305. For data centres, the following procedure for the planning and implementation of lightning and surge protection measures has been tried and tested in practice:



Earthing and external lightning protection

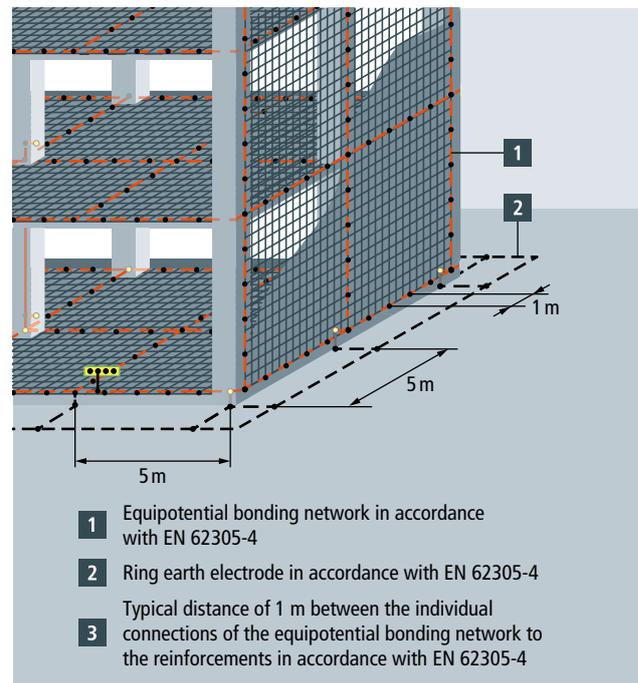
A functional earthing system is a basic requirement for the safe operation of electrical systems and the external lightning protection, which forms a secure shield around the building. It intercepts direct lightning strikes and channels them away safely into the ground.

Earthing and LEMP shielding

The earthing system of a data centre has a variety of tasks. For this reason, great care must be taken to ensure proper implementation. Making subsequent corrections is almost impossible. The earthing is not only the continuation of the air-termination system and the down-conductor system for distributing the lightning current into the ground, but is also the basis for equipotential bonding, the shielding system and the equipotential surface. National standards such as DIN 18014 usually apply for the erection of earthing systems in buildings. In conjunction with lightning protection systems, and taking an LEMP concept into account, the requirements of EN 62305-3 and -4 must also be heeded. These include, for example, the following special features:

With a mesh size of 5 m x 5 m, a ring earth electrode is installed underneath the floor slab, with which the equipotential bonding network inside the building is connected. Furthermore, an equipotential bonding network – also with a mesh size of 5 m x 5 m – around the entire data centre is recommended. This is not only the basis for an equipotential surface for reducing separation distances, but also forms an ideal structure for equipotential bonding and optimised lightning current distribution. If the reinforcement is connected to this meshed network every metre, then this forms the basis of the shielding against the electromagnetic field (LEMP) caused by lightning. Additional shielding in the form of rebar mats with small dimensions installed in the external

walls / the façade and in the walls of sensitive electronic areas such as server rooms reduces LEMPs further and protects the valuable centrepiece – the server rooms and data memory.



External lightning protection with HVI Conductors

The main task of the external lightning protection system is to intercept lightning strikes efficiently and safely and to conduct into the earthing system via the down-conductor system. When it comes to data centres with LPS class I, the challenge regularly faced is accommodating the required number of air-termination rods at the correct separation distance on the roof surface. HVI Conductors offer a reliable and simple solution (HVI = High-Voltage Insulation): separation distances are thus reliably maintained.

The separation distance is defined in EN 62305-3 as the "distance between two conductive parts in which no dangerous sparks can emerge". In practice, this means that a minimum clearance between the air-termination system / down conductor and power supply cables, signal lines or

other conductive parts of the infrastructure must be maintained. This prevents uncontrolled flashovers. By using the insulated HVI Conductor, safe dissipation of lightning currents to the ground is ensured.



Lightning protection zone concept and surge protection

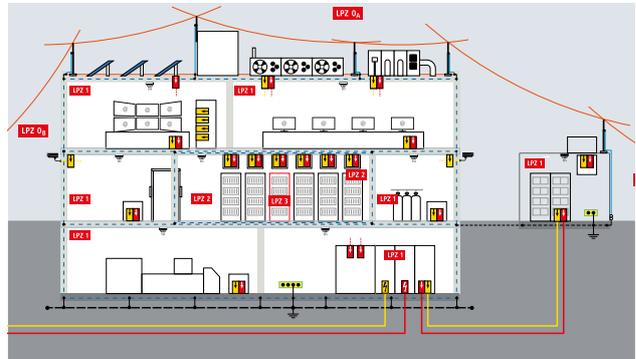
With lightning protection zone concepts, the building is divided into zones with different risk potential. These form the basis for the defining of specific lightning and surge protection measures.

Lightning protection zone concept

A comprehensive tool for the planning of complete lightning and surge protection for complex buildings is the lightning protection zone concept described in EN 62305-4.

According to this principle, the data centre must be divided into internal lightning protection zones (LPZ) according to the risk level posed by the LEMP.

This allows for an overview of the arrangement of different lightning and surge protection measures depending on the importance and sensitivity of the devices and systems to be protected.



Surge protection

A high degree of system availability can only be achieved if suitable measures are also taken for internal lightning protection. Only this way can the electrical and electronic systems be protected against the effects of lightning strikes and switching operations.

Lightning equipotential bonding, which must be established for all conductive systems entering the building from outside, is a key component of the internal lightning protection system. All systems connected to operating voltage are incorporated into the equipotential bonding indirectly with type-1 arresters. Type-2 surge arresters are usually used in downstream sub-distribution boards.

But signal lines are also critical for control, monitoring, safety and other supporting systems. Signal lines are our "hands", "eyes" and "ears" in a data centre system and are primarily of importance for maintenance. DEHN offers a

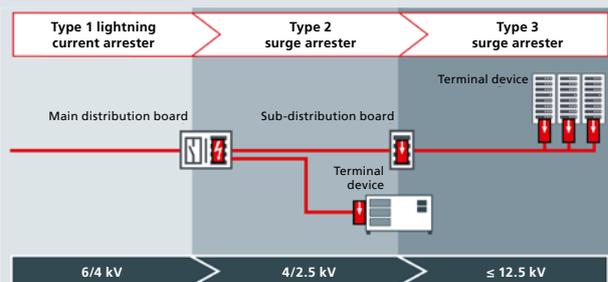
wide range of lightning protection solutions for all types of signalling protocols. Either through our "DEHNselect IT on-line" software selection or together with our experienced technical support, you will find the right solution for your application.



Good to know: Three-stage protection principle

In addition to taking the different lightning protection zones into account, an effective surge protection concept is also based on three protection stages, in which the incoming energy is gradually reduced to a low level that is safe for terminal devices:

- **Stage 1** represents type-1 lightning current arresters / combined arresters at the entrance point into the building (lightning equipotential bonding).
- **Stage 2** is type-2 surge arresters usually installed in the downstream sub-distribution boards.
- **Stage 3** includes type-2 or type-3 surge arresters, which can be installed directly at the terminal device or in socket outlets.



Interaction of the individual protection stages ensures the best possible protective effect. To this end, the relevant arresters must be energy coordinated according to IEC 60364-5-53 clause 534.



1 External lightning protection



2 Shielding of buildings

3 Equipotential bonding



4 Ring earth electrodes / earthing system



5 Low-voltage switchgear

6 Container with emergency battery power supply



7	Diesel generator for emergency power supply
8	Server room (with busbar)
9	Server room (with separate sub-distribution board)
10	Roof superstructures

11	PV system
12	Safety cameras
13	Fire alarm system
14	Security centre, offices

Sample products: External lightning protection, lightning equipotential bonding, earthing



External lightning protection		
1	Supporting tube GRP / Al with air-termination tip	Conventional and isolated lightning protection means fire protection and especially the protection of people. IEC 62305 deals with external lightning protection and protects buildings against the effects of a direct lightning strike. HVI lightning protection is a high-voltage-resistant, insulated down conductor which, in combination with matching supporting tubes and air-termination rods, forms the isolated lightning protection equipment and prevents flashovers also on cramped data centre roofs with many roof-mounted structures.
	Tripod / concrete base	
	HVI long Conductor	
	Roof conductor holder for HVI Conductors Adapter for installing HVI Conductors	
	Conductor holder for HVI Conductors	
	UNI disconnecting clamp	



Shielding of buildings / equipotential bonding		
2	Mesh mat	The main function of the equipotential bonding network is to prevent hazardous potential differences between all devices/ installations inside the building and to reduce the magnetic field of the lightning strike.
	Connecting clamp for mesh mat	
3	Pipe clamp	The low-inductance equipotential bonding network required is achieved by multiple interconnection of all metal components inside the structure.
	Equipotential bonding bar R15	
	Earthing pipe clamp	



Ring earth electrodes / earthing system		
4	Strip steel	The earthing system of a data centre has a variety of tasks. The earthing is not only the continuation of the air-termination system and the down-conductor system for distributing the lightning current into the ground, but is also the basis for equipotential bonding, the shielding system and the equipotential surface. The earthing system that arises in this way is connected to the technical installations inside the data centre via fixed earthing terminals or equipotential bonding bars.
	Connecting clamp	
	Rebar clamp DEHNclip	
	Water-pressure-tight wall bushing	
	Connection clamps with threaded bolt	
	Round steel	
	Cross clamp	
	Anti-corrosion tape	

Sample products: Surge protection



Low-voltage switchgear			
5		DEHNvenCI	Combined arrester with an integrated arrester backup fuse capable of withstanding lightning currents for protecting the low-voltage switchgear assembly.
		DEHNguard ACI	Modular surge arrester with integrated ACI technology for protecting the conductors coming from the UPS.
		BLITZDUCTORconnect	Space-saving, modular combined arrester for the information technology with a width of 6 mm for protecting the signal lines of the UPS.
		DEHNrecord SD	Multifunctional measuring and analysis device for monitoring voltage quality in low-voltage systems.
Container with emergency battery power supply			
6		DEHNguard ACI	Modular surge arrester with integrated ACI technology for protecting the conductors coming from the low-voltage switchgear assembly.
		BLITZDUCTORconnect	Space-saving, modular combined arrester for the information technology with a width of 6 mm for protecting the signal lines of the UPS.
Diesel generator for emergency power supply			
7		DEHNguard ACI	Modular surge arrester with integrated ACI technology for protecting the conductors running towards the low-voltage switchgear assembly.
		DEHNpatch	Universal surge arrester for the protection of IP-based network applications in structured cabling according to class E _A up to 500 MHz.
Server room (with busbar)			
8		DEHNguard	Modular surge arrester for protecting the server.
		BLITZDUCTORconnect	Space-saving, modular combined arrester for the information technology with a width of 6 mm for protecting the signal lines.

Sample products: Surge protection



Server room (with separate sub-distribution board)			
9		DEHNGuard	Modular surge arrester for protecting the server.
		BUSstector	Surge arrester with KNX bus terminal design for protecting KNX sensors.
		DEHncord	Compact surge protection for space-saving wall or DIN rail mounting in the terminal device.
Roof superstructures			
10		DEHNGuard ACI	Modular surge arrester for protecting the voltage supply of cooling towers and ventilators.
		BLITZDUCTORconnect	Space-saving, modular combined arrester for the information technology with a width of 6 mm for protecting the signal lines.
PV system			
11		DEHncube	Prewired multipole surge arrester with IP 65 degree of protection for photovoltaic systems for the DC side of photovoltaic systems for outdoor installation.
Safety cameras			
12		DEHNpatch outdoor	Universal surge arrester for GBit Ethernet applications, power over Ethernet (PoE++/4PPoE) and similar applications in structured cabling to class E indoors and outdoors in an IP66 housing.
Fire alarm system			
13		DEHNGuard ACI	Modular surge arrester for protecting the fire alarm system.
		DEHNrail	Surge arrester for protecting the lift control, fans, sprinklers, etc.
		BLITZDUCTORconnect	Space-saving, modular combined arrester with a width of 6 mm for protecting fire alarm system interfaces.
Security centre, offices			
14		DEHNrail	Protection of the power supply of burglar alarm systems.
		DEHNflex	Surge arrester for protecting terminal equipment from transient overvoltages.
		DEHNpatch	Universal surge arrester for the protection of IP-based network applications in structured cabling according to class E _A up to 500 MHz.
		BLITZDUCTORconnect	Space-saving, modular combined arrester for the information technology with a width of 6 mm for protecting the signal lines.

Services and information

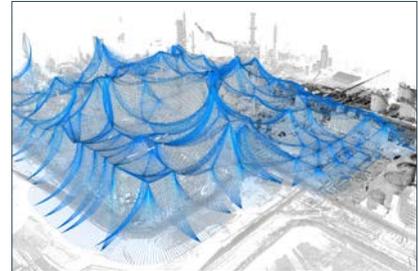
Whether support with planning or specific help with a query – take advantage of DEHN's range of services.

DEHNconcept – Planning Service

Hand over the entire planning of the lightning protection system and earthing system to the DEHNconcept team. This will save you time on potentially laborious planning and fine-tuning and gives you certainty. You obtain the plan as a finished module in an open format (dxf/dwg) and a 3D model (nwd format). This way you can integrate this easily into your documentation.

The range of services includes, for example:

- Complete plan of the lightning protection and earthing concept as per EN 62305
- Risk analysis as per EN 62305-2: Protection against lightning – Part 2: Risk management.
- Surge protection concepts
- Dimensioning of earth-termination systems for transformer stations
- Digitisation of existing buildings by means of laser scanning



More information at:
de.hn/8zKMq



DEHNsupport Toolbox and DEHNplan – digitally plan lightning protection systems

Whether it is risk management, the calculation of air-termination rods and earth electrode lengths or determining separation distances – the DEHNsupport Toolbox supports you with the planning of your lightning protection concepts. Five modules help you to evaluate the risk potential of structures.

DEHNplan allows you to easily design a standard-compliant external lightning protection system for your project. The BIM-compatible software facilitates planning by means of visual representation of the protected volume and the separation distances.



More information at:
de.hn/9NPbZ



DEHN safety equipment – protect employees and secure system availability

Work on electrical installations is becoming more and more challenging. Protect your employees from the dangers that can arise due to high electrical voltages and ensure the availability of your systems. As an employer, you are on the safe side when you adhere to the TOP principle from the German Occupational Health and Safety Act.

Only have necessary activities performed on switchgear installations in line with a risk assessment as per DGUV-I 203-077 with equipment that is appropriate for your switchgear installation. Evaluate the risks in your electrical systems using our DEHNarX service. Technical solutions like the products for working according to the 5 safety rules of electrical engineering or the DEHNshort arc fault protection system underpin your protection concept.



More information at:
de.hn/3LcU8



Concise compiled for you, you will find current and relevant information on the topic of data centres at a click here:

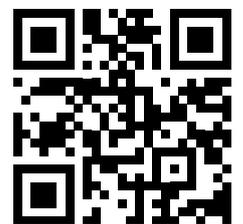
de.hn/bxxC7



Surge Protection
Lightning Protection/Earthing
Safety Equipment
DEHN protects.

DEHN SE
Hans-Dehn-Str. 1
92318 Neumarkt
Germany

Tel. +49 9181 906-0
Fax +49 9181 906-1100
info@dehn-international.com
www.dehn-international.com



de.hn/bxxC7

Technical changes, misprints and errors are reserved.
The illustrations are non-binding.

DS381/EN/0422

© Copyright 2022 DEHN SE

Cover photo: Digiplex Data Center, Norway