Structural Earthing and Lightning protection systems for building as per IEC 62305
Structural Earthing and Lightning protection systems for building as per IEC 62305
Chapter 1: Standards/regulations

Current lightning protection standards:

<table>
<thead>
<tr>
<th>International Standard</th>
<th>IEC 62305-1... -4</th>
<th>01-2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Standard</td>
<td>EN 62305-1... -4</td>
<td>02-2006</td>
</tr>
<tr>
<td>CENELEC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| National Standard       | VDE 185-305-1... -4 | 10-2006 |
| Germany                 |                   |         |

VDE 0185-305-1 ...-4:2006-10 replaces VDE V 0185- ...-4:2002-11
Chapter 5: Constructing External & Internal Lightning Protection

Introduction

Lightning protection systems

External lightning protection
- Air termination systems
- Conductors
- Earthing
- Shielding of enclosed spaces
- Avoiding proximity

Internal lightning protection
- Equipotential bonding for lightning protection
- Shielding of enclosed spaces
- Avoiding proximity

Surge protection
Surge protection is not part of the installation of a lightning protection system, rather it is a separate operation. Despite this, coordination with external lightning protection is necessary.
Chapter 1: Standards/regulations

Current lightning protection standards: systematisation

Lightning protection system
( general principles )

- External lightning protection
- Internal lightning protection
- Interception systems
- Conductors
- Earthing
- Shielding of enclosed spaces
- Proximities
- Lightning protection equipotential bonding

DIN VDE 0185-305-1… -4 (10/2006)
IEC 62305-1… -4 (01/2006)
Chapter 2: Planning and constructing a lightning protection system

2.4 Conductor systems: Earthing system

Earthing layout as per: VDE 0185-305-3

Type A
- Horizontal earther
- Vertical earther
  - Deep earther, rod earther

Type B
- Ring earther
- Foundation earther
- Surface earther
2.4 Conductor systems: Earthing system

Information about earthing layout, Type A

The Type A radiative or deep earthers do not fulfil the need for equipotential bonding or potential control.

A Type A earthing system is useful for low building structures (e.g. family homes), existing building structures, for LPSs with interceptor rods and wires, and for separate LPSs. This type of arrangement incorporates horizontal and vertical earthers connected to every conductor.
Chapter 2: Planning and constructing a lightning protection system

2.4 Conductor systems: Earthing system
Earthing system Type B – foundation earther
**DIN 18014:2007-09**

Excerpt from terminology

**on 3.3 foundation earther:**

Note 1:
In this standard, foundation earther means the earthing system embedded in the foundation. If the earther is, for instance, **outside** the foundations because the foundations are insulated, then in this standard it is referred to as a **ring earther**.

**3.4 ring earther**
Conductive, closed ring embedded in and in contact with the earth or in the granular sub-base.

**3.13 closed ditch**
A seal surrounding all sides of the building at ground level, made of bitumen or plastic (also called a black ditch); or made from water-impermeable concrete (also known as a white ditch); or combination seals (e.g. ground plate made from water-impermeable concrete in conjunction with seals on the basement walls).

**3.14 perimeter insulation**
Heat insulation surrounding the outside of the building at ground level.
5. Execution

on 5.2.1 Materials for foundation earthers

Foundation earthers:
- Round steel of at least 10 mm diameter or
- Steel strips of minimum dimensions 30 mm × 3.5 mm

- The steel may be galvanised or ungalvanised.

- If using the foundation earther as part of the lightning protection system, materials must be used that comply with DIN EN 50164-2 (VDE 0185 Part 202).
Earthing system

Foundation earther

1  Foundation earther, e.g. flat strips 30 mm × 3.5 mm, galvanised
2  Connection lug for foundation earther, e.g. flat strips 30 mm × 3.5 mm, V4A (1.4571)
3  Connection to reinforcement with reinforcement clamp
4  Connection clamp for foundation earther
5  Additional connections every 2 m (clamps) between foundation earther and reinforcements
5. Execution

on 5.3 Connecting foundation earther components

The components of a foundation earther must be connected together using welded, screw or clamp connections which are electrically conductive and mechanically strong.

…..Welded connections to reinforcement rods are only permitted with the approval of the construction engineer.

If the foundation earther is used as part of a lightning protection system, then connecting components compliant with DIN EN 50164-1 must be used.
Connectors for foundation earthers

It is often important when installing a foundation earther to include the foundation reinforcements in the earthing system. The way foundation earthers are usually tied to reinforcements is often inadequate.
DIN 18014:2007-09 foundation earthers: Explanations and examples

Author: Martin Mauermann, Fritz Mauermann GmbH & Co. KG
Aid to choosing loop width for ring or foundation earthers if lightning protection is required.

Lightning protection concept compliant with DIN EN 62305-4?

- Yes → Ring or foundation earther laid in grid max 5 x 5 m
- No → DIN EN 62305-4

Completely enclosed perimeter insulation or plastic dimpled membrane?

- Yes → Building seal “black ditch” or “white ditch”?
- No → Lay foundation earther in a grid of max. 20 x 20 m

Building seal “black ditch” or “white ditch” (IM / LP)?

- Yes → Lay ring earther beneath the ground plate in a grid of max. 10 x 10 m
- No → Lay equipotential bonding conductor inside the ground plate / ditch in a grid of max. 20 x 20 m

Foundation without any particular insulation/seal? (thin plastic sheeting / geotextiles permitted)

- Yes → Lay foundation earther in a grid of max. 20 x 20 m
- No → DIN 18014

Explanation of terms

**Completely enclosed** = insulation on surrounding walls, strip foundations and ground plate

**IM** = impermeable, **LP** = liquid-proof

**Ring earther** = conductive, closed ring embedded in and in contact with the earth or in the granular sub-base

**Foundation earther** = conductive system embedded in the concrete of a building’s foundations, usually in the form of a closed ring.

*There may be other system-specific requirements applicable to operative, protection and lightning protection earthing systems.*

Author: Reyno Thormählen 13.02.2008
6.1 Closed ditch (black, white ditch or combined seals)

In the case of buildings with closed ditches a ring earther is to be installed outside the ditch. The connection lugs are to be routed up either on the outside surface or inside the back seal liner in the concrete, and then fed into the building above the highest groundwater level. The ring earther must have the same loop width as a foundation earther. In order to establish equipotential bonding in lightning protection systems and for EMC purposes, steel rods or strips must be laid in the foundations and connected to the reinforcements and the equipotential bonding bar. In the event of a lightning strike, sparks may not jump through the insulation from the foundation to the earthing system. According to DIN EN 62305-3 (VDE 0185-305-3) this is achieved by means of a maximum loop width of 10 m × 10 m.

The ring earther and the connection lugs are to be made from corrosion-resistant material such as rust-proof steel, material number 1.4571 or at least the equivalent.
- **Black ditch**
  Black ditch – this is a water-pressure-proof seal around a building consisting of multiple layers of plastic or bitumen strips (black material).
• White ditch

White ditch – a white ditch is made from impermeable concrete. This concrete can absorb water, but even if exposed to water for long periods the water does not penetrate it completely. In other words, moisture does not appear on the inside. According to DIN EN 206-1/DIN 1045-2, the maximum depth to which water may penetrate impermeable concrete is 5 cm. The types of impermeable concrete available on the market only allow water to penetrate about 1.5 cm after a 12 month setting period.
Earthing system
Earthing system
5. Execution

on 5.1 General:
For buildings with special requirements, such as buildings with comprehensive IT infrastructure, other measures must be included such as those defined in DIN EN 50310 (VDE 0800-2-310).

For high-voltage systems with nominal voltages above 1 kV, DIN VDE 0101 (VDE 0101) also has to be observed.

In buildings with individual foundations, **PEB BUILDINGS**: foundation earther:
length in foundation min. 2.5 m
→ The foundation earthers in these individual foundations must be connected together on the lowest level to form one closed ring.

→ In the case of foundations separated by more than 5.0 m, each foundation must be fitted with a foundation earther, and if the spacing is less than 5.0 m then every other foundation must be fitted with one.

The foundation earther must be arranged so that it is enclosed on all sides by at least 5 cm of concrete.

Source: elektro-plus foundation earthers
Chapter 2: Planning and constructing a lightning protection system

2.4 Conductor systems: Earthing system

Earthing steel girders
Chapter 2: Planning and constructing a lightning protection system

2.4 Conductor systems: Earthing system

Earthing systems in extensive building complexes

If earthers belonging to a number of buildings are connected together, then a looped earthing system is created as shown in Fig. E.42.

Legend
1 Building with looped reinforcement network
2 Tower inside plant
3 Separate facility
4 Cable routes

Note
This system offers a low impedance and considerable EMC benefits. The loop size near buildings and other objects should be around 20 × 20 m.

Fig. E.42 VDE 0185-305-3
2.4 Conductor systems: Earthing system

Ring earther / potential control

If many people are often near the building structure you intend to protect, then potential control should be envisaged for that area in order to protect those people.

Other ring earthers should be installed around 3 m away from the first and the other ring earthers.

These ring earthers should be connected to the first ring earther using connection conductors.
Chapter 2: Planning and constructing a lightning protection system

2.4 Conductor systems: Earthing system  Earthing system Type B

Ring earther / potential control

An example of potential control in a building structure using a looped earthing system.

Source: VDE 0185-305-3
DOWN CONDUCTOR SYSTEMS – As per IS 2309
Chapter 2: Planning and constructing a lightning protection system

2.2 Conductor systems: Natural components

Utilising reinforcements as conductors and shielding against LEMP

1 Connection between air termination device and conductors
2 Interceptor cable
3 Reinforcements
4 Conductors and ring conductors
5 Equipotential bonding rail belonging to internal lightning protection system
6 Test terminal
7 Connection capable of conducting current
8 Connector, e.g. tie connector

typical dimensions:
\[ a \leq 5 \text{ m}, \quad b = \leq 1 \text{ m} \]

Source: DIN V VDE V 0185 T3-4, Fig. 64
Chapter 2: Planning and constructing a lightning protection system

2.2 Conductor systems: Natural components

Arrangement of connection points in an industrial facility made from steel-reinforced concrete

1. Concrete pillar
2. Metal facade
3. Connection (earthing fixed point)
4. Connector
5. Earthing cable

Source: VDE 0185
2.2 Conductor systems: Natural components

An example of steel reinforced concrete pillars being used as conductors

In building structures that feature steel reinforced concrete pillars and walls, the conductors can be routed in the reinforcements.

They must be laid a section at a time.

This requires very exact coordination. The connection points must be set up carefully using clamping connectors.

The conductors also have to be clamped to the steel reinforcements.
Using the steel reinforcements in a building structure as a conductor system

Steel reinforced concrete elements are excellently suited for use as conductors, providing that use is included in the plans at an early enough stage.

Particular specifications must be fulfilled when the steel-reinforced concrete elements are manufactured. The way the conductor system is implemented should be checked and documented (photographs).

Earthing fixed points should be used as connection points for conductors and equipotential bonding.
Welded connections between reinforcement rods are only permitted with the approval of the construction engineer. The reinforcement rods should be welded together along a length of at least 30 mm.

**Fig. E.5:** Welded connections between reinforcement rods in concrete, provided this is permitted

**Legend**
1 Reinforcement rods  
2 Welded join, at least 30 mm long
Chapter 2: Planning and constructing a lightning protection system

2.3 Conductor systems: spacing

Example 2: Determining the number of conductors

1. Example of insufficient spacing

2. Example of insufficient spacing
Chapter 2: Planning and constructing a lightning protection system

2.3 Conductor systems: Spacing

The electrical insulation of external lightning protection systems

Electrical insulation between the air termination device or conductor on the one hand, and the building's structural metallic installations and internal systems on the other, can be achieved by means of a distance $d$ between these parts, 'd' being greater than the spacing $s$, where:

$$s = k_i \times \frac{k_c}{k_m} \times L$$

$k_i$ - dependent on the LPS’s chosen protection class (see Table 10);
$K_c$ - dependent on the lightning current flowing through the conductors (see Table 11);
$k_m$ - dependent on the electrical insulation materials (see Table 12);
$L$ - the length of air termination device or conductor, in metres, from the point from which the spacing is to be determined to the next point of equipotential bonding.
Chapter 2: Planning and constructing a lightning protection system

2.3 Conductor systems: Spacing

<table>
<thead>
<tr>
<th>Protection class of LPS</th>
<th>$K_i$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>(DIN VDE 0185-305-3)</em></td>
</tr>
<tr>
<td>I</td>
<td>0.08</td>
</tr>
<tr>
<td>II</td>
<td>0.06</td>
</tr>
<tr>
<td>III and IV</td>
<td>0.04</td>
</tr>
</tbody>
</table>

\[
k_c = \frac{1}{2n} \times 0.1 + 0.2 \times 3 \sqrt{\frac{c_s}{h}}
\]

\[
s = k_i \times \frac{k_c}{k_m} \times L
\]
### Chapter 2: Planning and constructing a lightning protection system

#### 2.3 Conductor systems: Spacing

Table 12 – insulating an external LPS – values of coefficient $k_m$

<table>
<thead>
<tr>
<th>Material</th>
<th>$k_m$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>1</td>
</tr>
<tr>
<td>Concrete, brick</td>
<td>0.5</td>
</tr>
<tr>
<td>GRP insulating beam (note manufacturer's figures)</td>
<td>0.7</td>
</tr>
</tbody>
</table>

**NOTE 1** If more than one material is used in layers, then in practice the lowest value of $k_m$ is used.

**NOTE 2** The use of other insulators is under discussion.

Source: VDE 0185-305-3 Table 12
## 2.3 Conductor systems: Spacing as per VDE 0185-305-3

Table C.1 – insulating an external LPS – values of coefficient $k_c$

<table>
<thead>
<tr>
<th>Type of air termination device</th>
<th>Number of conductors: $n$</th>
<th>$k_c$</th>
<th>Earthing arrangement type A</th>
<th>Earthing arrangement type B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single rod</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Wire</td>
<td>2</td>
<td>0.66</td>
<td>0.5 ... 1$^a$</td>
<td></td>
</tr>
<tr>
<td>Loops</td>
<td>3 or more</td>
<td>0.44</td>
<td>0.25 ... 0.5$^b$</td>
<td></td>
</tr>
<tr>
<td>Loops</td>
<td>4 or more, connected by horizontal ring conductors</td>
<td>0.44</td>
<td></td>
<td>1/n ... 0.5$^c$</td>
</tr>
</tbody>
</table>

a) Range of values of $k_c = 0.5$ if $c << h$, up to $k_c = 1$ if $h << c$ (see Fig. C.1).
b) The equation for $k_c$ in Fig. C.2 is an approximation for cubic building structures and for $n \geq 4$. The values of $h$, $cs$ and $cd$ are assumed to range from 5 m to 20 m.
c) If the conductors are connected horizontally using ring conductors, then the current distribution in the lower parts of the conductor system is more even and $k_c$ is reduced accordingly. This applies especially to high systems.
d) These figures apply if the individual earthing conductors have approximately the same earthing resistance. If their earthing resistances differ greatly, then it assumed that $k_c = 1$.

Same values = between min. and max. maximum factor 2

Source: VDE 0185-305-3 Table11
Chapter 2: Planning and constructing a lightning protection system

2.2 Conductor systems

Typical spacing between conductors

<table>
<thead>
<tr>
<th>Lightning protection class</th>
<th>Typical spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>10 m</td>
</tr>
<tr>
<td>II</td>
<td>10 m</td>
</tr>
<tr>
<td>III</td>
<td>15 m</td>
</tr>
<tr>
<td>IV</td>
<td>20 m</td>
</tr>
</tbody>
</table>

The number of conductors is related to the spacing "s"

You should stay within a maximum deviation of 20%
### Purpose of insulated conductor

<table>
<thead>
<tr>
<th>Conductor with insulation</th>
<th>With OBO isCon</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Conductor with insulation" /></td>
<td><img src="image2.png" alt="With OBO isCon" /></td>
</tr>
</tbody>
</table>

**Key Points**
- **Conductor with insulation**
  - Ensures safety and protection of electrical elements.
- **With OBO isCon**
  - Advanced technology for enhanced electrical performance.
Structure of isCon cable

- Slightly conductive EVA, UV-resistant
- Conductive XPLE
- Conductive XPLE
- XPLE insulation
- 35 mm² copper conductor

XPLE = cross-linked polyethylene
EVA = Ethylene Vinyl Acetate copolymer
Purpose of insulated conductor

<table>
<thead>
<tr>
<th>No spacing maintained</th>
<th>Air as insulator theoretically OK / practically not OK</th>
<th>With OBO isCon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masonry Conductor 8 mm Electrical installation</td>
<td>Masonry Conductor 8 mm Electrical installation</td>
<td>Masonry isCon Electrical installation</td>
</tr>
</tbody>
</table>

Air as insulator theoretically OK / practically not OK
Chapter 2: Planning and constructing a lightning protection system

Constructing a lightning protection system (LPS)

How does a lightning protection system work?
2.1 Protection using air termination systems

Planning using the protective angle, rolling sphere and loop methods

The loop method is suitable for protecting flat surfaces.

The protective angle method is suitable for buildings of a simple shape, but is limited to the heights specified in Table 2.

The rolling sphere method is suitable for all cases.

Source: DIN VDE 0185-305-3 5.2
Chapter 2: Planning and constructing a lightning protection system

2.1 Protection using air termination systems

<table>
<thead>
<tr>
<th>Protection class</th>
<th>Rolling sphere method Radius of rolling sphere r / m</th>
<th>Loop method Loop spacing W / m</th>
<th>Protective angle method Protective angle $\alpha^\circ$</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20</td>
<td>5 x 5</td>
<td>See next image</td>
</tr>
<tr>
<td>II</td>
<td>30</td>
<td>10 x 10</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>45</td>
<td>15 x 15</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>60</td>
<td>20 x 20</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Not applicable beyond the values marked with a •.
For such cases, only the rolling sphere and loop methods can be used.

Note 2: $H$ is the height of the air termination device above the reference area on the area being protected.

Source: VDE 0185-305-3 Table 2
2.1 Air termination systems – protective angle method

The volume protected by vertical interceptor rods

The space protected by an interceptor rod is posited as a circular cone with a vertical axis whose apex is on the axis of the interceptor rod, and whose surface forms an angle $\alpha$ with that axis, which is specified in Table 3 in terms of the protection class and the height of the air termination device.

A  Interceptor rod apex
B  Reference plane
OC  Radius of protected area
$h_t$  Height of interceptor rod apex above the reference area
$\alpha$  Protective angle as defined in Table 3

Volume protected by an interceptor rod

Source: VDE 0185-305-3
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – protective angle method

Protective angle method

Protective angle for an interceptor rod up to 2 m high

<table>
<thead>
<tr>
<th>Protection class</th>
<th>Angle (°)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>70</td>
</tr>
<tr>
<td>II</td>
<td>72</td>
</tr>
<tr>
<td>III</td>
<td>76</td>
</tr>
<tr>
<td>IV</td>
<td>79</td>
</tr>
</tbody>
</table>

Source: VDE 0185-305-3 Table 2
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – protective angle method

Protecting roof structures – positioning the air termination device

\[ h_1 \] Height of interceptor rod
\[ H \] Height of building structure
\[ h_2 = h_1 + H \]
\[ \alpha_1 \] Protective angle to \( h_1 \) as defined in Table 2
\[ \alpha_2 \] Protective angle to \( h_2 \) as defined in Table 2

Source: VDE 0185-305-3
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – protective angle method

Protective angle method

1. Air termination system, parapet cable
2. Protective angle $\alpha$
3. Conductor
4. Joint
5. Earthing system, foundation earthing

Source: VDE 0185-305-3
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – loop method

Protecting roof structures – positioning the air termination device

<table>
<thead>
<tr>
<th>Protection class</th>
<th>Loop spacing / m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5*5</td>
</tr>
<tr>
<td>2</td>
<td>10*10</td>
</tr>
<tr>
<td>3</td>
<td>15*15</td>
</tr>
<tr>
<td>4</td>
<td>20*20</td>
</tr>
</tbody>
</table>

Aerial view of a building

Source: VDE 0185-305-3
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – loop method

Protecting roof structures – positioning the air termination device

<table>
<thead>
<tr>
<th>Protection class</th>
<th>Loop spacing / m</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5*5</td>
</tr>
<tr>
<td>2</td>
<td>10*10</td>
</tr>
<tr>
<td>3</td>
<td>15*15</td>
</tr>
<tr>
<td>4</td>
<td>20*20</td>
</tr>
</tbody>
</table>

Source: VDE 0185-305-3
2.1 Air termination systems – loop method: Example

Example of how an air termination device is planned using the loop method for protection class III

The edges of the roof can only be protected using interceptor rods!
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – loop method: Mistakes

**Incorrect** installation / no protection of corners or edges

Corners and edges are *not* protected.

The interceptor cable runs 0.5 m below the parapet.
When deciding where to locate a lightning protection system's air termination devices, special care must be taken to **protect the corners and edges** of the building structure you are protecting, especially those corners and edges situated around the roof's surfaces and the upper parts of the facades.
In the case of roofs in which connections cannot be established with the building's steel reinforcements, interceptor cables can be laid in the grooves between road plates, and mushroom-shaped interceptors can be affixed to the loop nodes.

In such arrangements, people and vehicles using the roof parking are not protected against lightning. For this reason, a warning sign should tell people not to use the roof parking area in a thunderstorm.

**WARNING**

It is forbidden to use the roof parking area during a thunderstorm.
If you intend to protect the roof parking area against direct lightning strikes, then this can be done using interceptor rods or raised interceptor cables. The necessary height $h$ of the air termination devices is defined in E.4.2.4.2 of VDE 0185-305-3.
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – examples of applications for roof structures: Elevator building

At least two conductors
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – examples of applications for roof structures: skylight

Observe spacing!
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – protecting roof structures: Compensating for expansion

Thermal material expansion can cause changes in length

Every 10–20 m
Aluminium: always ≤ 10 m
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – protecting roof structures: Parapet

Flexible connection
Chapter 2: Planning and constructing a lightning protection system

2.1 Air termination systems – examples of applications for roof structures: Peaked roof

1.0 m

0.15 m

1

2

3

1

2

3
Chapter 4: Tested lightning protection components

Lightning protection components

Quote:

"All components must comply with the EN 50164 series of standards"

Source: VDE 0185-305-3: 2006-10 E5.5
Chapter 4: Tested lightning protection components

Lightning protection components

Tested lightning protection components, EN 50164-1

<table>
<thead>
<tr>
<th>Prüfklasse</th>
<th>Geprüft mit</th>
<th>Anwendung</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3x $I_{imp}$ 100 kA</td>
<td>Fangeinrichtung</td>
</tr>
<tr>
<td></td>
<td>(10/350)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prüfklasse</th>
<th>Geprüft mit</th>
<th>Anwendung</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3x $I_{imp}$ 50 kA</td>
<td>Mehrere Ableitungen, über die sich der Blitzstrom aufteilen kann (min. 2 Ableitungen)</td>
</tr>
<tr>
<td></td>
<td>(10/350)</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 4: Tested lightning protection components

Tested lightning protection components (examples)
Chapter 4: Tested lightning protection components
Tested lightning protection components (examples)

Testing as per DIN EN 50164 -1

Heavy sparking occurs: the component is **not** capable of carrying lightning currents.
Equipotential bonding of services

Lightning EBB (Equipotential Bonding Bar)

- LPZ 0
- Power
- Water
- Gas
- Fire
- LPZ 1
Chapter 3.2. Conductor technologies and types

Combination conductor LPZ 0 → 2

Technical specifications

OBO Coordinated Lightning Controller

- **Type**: MCD 50-B
- **Class**: Type 1
- **Area of use**: LPZ 0 → 2
- **Functional principle**: spark gap
- **Maximum surge current**: 100/125/150 kA (10/350)
- **Protection level**: <1.3 kV
- **Back-up fuse**: no separate back-up fuse needed for systems up to 500 A (if "wired through": max. 125 A)
- **Suitable for pre-meter area as a combination conductor for coarse and medium protection (protection level < 1.3 kV, LPZ 0 → 2)***

**Application**: In the presence of external lightning protection system, outdoor line infeed and high-availability mains.

**Area of use**: Industrial systems, office buildings, hospitals, public buildings, in accordance with IEC, EN, VDE standards.
Chapter 3.2. Conductor technologies and types

Combination conductor for single-family dwellings

Technical specifications

OBO CombiController V50

Type: V 50-B+C
Class: Type 1+2
Functional principle: varistor system
Maximum surge current: 12.5 kA (10/350)
Conductor capacity: 50 kA (10/350)
Protection level: < 1.3 kV

Back-up fuse: no separate back-up fuse required up to 125 A.

Application: In the presence of external lightning protection system, outdoor line infeed and high-availability mains.

Area of use: Building with class III + IV external lightning protection system, outdoor line infeed and high-availability mains.
Surge conductors / varistor technology

**OBO SurgeController**

- **Type**: V 20-C
- **Class**: Type 2
- **Functional principle**: varistor system
- **Nominal conduction capacity**: 20 kA \((8/20)\)
- **Maximum conduction capacity**: 40 kA \((8/20)\)
- **Protection level**: < 1.3 kV
- **Back-up fuse**: no separate back-up fuse required up to 125 A.

**Use**: Surge protection for installation on top-hat rail in main or sub-distribution box.
Chapter 6: Surge protection for data lines, telecommunications systems and ICA systems

Planning customer systems, basement
Surge protection, examples of installation

Broadband: Coaxial cable
Chapter 6: Surge protection for data lines, telecommunications systems and ICA systems

Planning customer systems, basement
Surge protection, examples of installation

0/4-20 mA fill level display for cistern:
New product: Net Defender

The Net Defender provides surge protection in high-speed networks of category EA and CAT 6A with channel link. As well as a wide frequency range of up to 500 MHz, the Net Defender supports Power over Ethernet (POE) with nominal currents of up to 1 A. High-quality Bel Steward sockets ensure quick plug-in installation.
OBO-Bettermann provides a five-year guarantee on all its surge protection equipment.
Thank you for your attention