



Isolated and electrically insulated lightning protection

Correct design
and dimensioning





Avoid uncontrolled flashovers

Space is limited on modern roofs. For this reason, isolated or electrically insulated lightning protection is often the only option for maintaining the required separation distances.

DIN EN 62305-3 describes the requirements for a lightning protection system. This system is subdivided into external and internal lightning protection. An external lightning protection system has the task of capturing the lightning with the aid of air-termination systems and directing it into the ground in a controlled manner via down conductors. This protects buildings from direct lightning strikes and possible fires. The distance between the air-termination system or down conductor and metal and/or electrical installations of the system to be protected must be sufficient to prevent dangerous flashovers. Such flashovers harbour the risk of sparks and potential fires. It is therefore important that separation distances are calculated in advance.

These requirements are a particular challenge in modern commercial and industrial facilities. The roof often serves as an installation area for ventilation and air conditioning technology, recooling towers, PV systems and much more. With conventional external lightning protection systems, it is often difficult to maintain the prescribed separation distances. One solution to this problem is to install an isolated or electrically insulated DEHNiso or HVI lightning protection system.

Isolated lightning protection

Telescopic lightning protection masts that do not have a direct connection to the building and are solely connected to the building via the earthing system.

DEHNiso lightning protection

Electrically insulated lightning protection uses self-supporting air-termination rods, air-termination masts or cable-covered masts to comprehensively protect the building against direct lightning strikes. The concept of electrically insulated lightning protection has proven itself in practice and is particularly recommended for new buildings. This procedure prevents uncontrolled flashovers between the air-termination systems and earthed, electrically conductive elements and other installations. An alternative method is to attach air-termination and down-conductor systems to the object to be protected using electrically insulating materials such as GRP (glass-fibre reinforced plastic).

HVI Lightning Protection

HVI Lightning Protection comprises high-voltage-resistant, insulated down conductors and matching system components, such as supporting tubes, brackets and connection elements. The special feature is the sheathing of the conductor carrying the lightning current. This conductor, which is coated with insulating material and a semi-conductive layer, replaces the physical separation distance to be maintained, allowing the HVI Conductor to be laid directly on or underneath the parts of the building, electrical cables or pipework to be protected.

Wind load: Correctly dimensioning a lightning protection system

- Basis for the design of concrete bases, fixings and air-termination systems
- Eurocode: observe country-specific regulations

When planning and installing air-termination systems as part of a lightning protection system, the wind load plays a fundamental role in preventing damage and accidents (e.g. the air-termination rod tipping over or breaking). Wind load calculations are the basis for the correct dimensioning and selection of air-termination systems.

Wind load is one of the climatically induced effects on structures or components. It results from the pressure distribution around a structure that is exposed to a wind flow. The wind load acts as a surface load perpendicular to the contact surface and is primarily made up of pressure and suction effects.

Good to know: throughout Europe, the Eurocode forms the basis for structural dimensioning and design. Country-specific normative adjustments must be taken into account. The special part of the Eurocode EN 1991-1-4 deals with wind loads and, due to technical building regulations, is often a component for required structural analyses.



Influencing factors

Local and technical factors are included in the calculation of the actual wind load to be expected:

Local parameters:

- Wind zone: Defines the basic wind speed / dynamic pressure in a specific area
- Terrain type: Defines the surroundings of a structure; e.g. open area, suburb, urban area
- Height above ground level: Defines the height of a building above ground level

Technical parameters of the air-termination system:

- Air-termination system dimensions (height, diameter)
- Materials
- Type of fixing
- Use of HVI Conductors
- Spanning cables

Influencing factors to be considered separately:

- Ridges or summits
- Ice build-up
- Building heights over 300 m
- Terrain heights over 800 m (above sea level)

5 steps for wind load calculation

Step 1: determining the wind zone

This is based on the location of the project. Please take a look at the country-specific requirements. Here you will find the respective wind zone by postcode or location-dependent considerations.

Step 2: determining the terrain type

Terrain-specific loads also influence the wind load. For this reason, it must be determined in which of the following terrain types the structure is located:

- **Terrain type I:** open sea; lakes with at least 5 km open area in wind direction; smooth, flat land without obstacles
- **Terrain type II:** Terrain with hedges, individual farmsteads, houses or trees, e.g. agricultural area
- **Terrain type III:** Suburbs, industrial or commercial areas, forests
- **Terrain type IV:** Urban areas in which at least 15 % of the area is built up with buildings whose average height is > 15 m

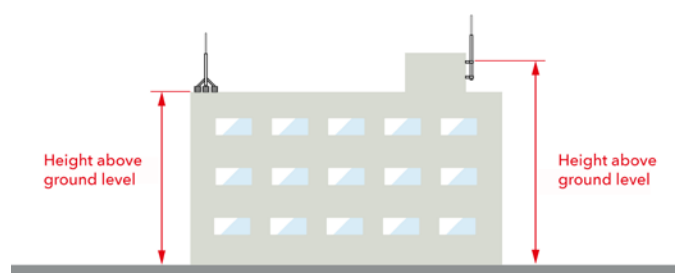
Step 3: determining object heights above ground

This height specification includes the height above ground level.

The height point to be determined (height above ground) depends

on the type of installation of the air-termination system:

- For self-supporting air-termination systems / stands:
Height above ground level = stand erection level
- For air-termination systems attached to a wall / the object:
Height above ground = highest clamping point on the object



Step 4: determining the gust wind speed

Using the parameters defined in steps 1 to 3, the respective gust wind speed can be taken from the tables (see country-specific information).

Step 5: Considering individual technical parameters

In a final step, the determined gust wind speed is compared with the specifications of the planned lightning protection components (information in the installation instructions).

Services and support

DEHN is ready to assist you. And we offer planning tools (e.g. DEHNplan) and services for calculating the wind load and selecting suitable products.

Our **technical support team** can help with specific questions relating to wind load calculations and product selection.

Services and planning support

<http://de.hn/bLPU5>



Separation distance is key

- Separation distance: the basis for planning the lightning protection system
- Challenges: spatial and architectural requirements
- The solution: HVI lightning protection

Maintaining the separation distance prevents dangerous flashovers from occurring between earthed parts of the building structure (e.g. steel girders, reinforcements, lift rails, etc.) or electrical installations and the lightning

current-carrying components of the lightning protection system (air-termination systems, down conductors, etc.). Failure to do so may result in sparks, which can cause personal injury, property damage or fire.

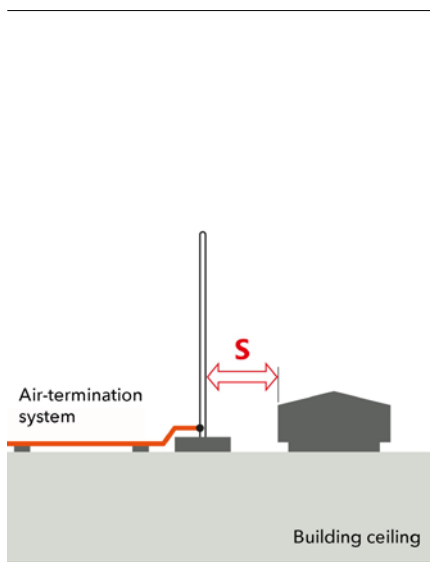
Separation distance – the basis of a lightning protection concept

The lightning current is fed into the down conductors by means of an air-termination system and channelled into the ground in a controlled manner. The design of an isolated or electrically insulated lightning protection system is based on the separation distance.

The calculation is carried out in accordance with the DIN EN 62305-3 standard, which defines the necessary parameters and factors. The minimum distance that must be maintained between the air-termination system or down conductor and the electrical or metallic conductive parts of the building structure is determined. Examples include:

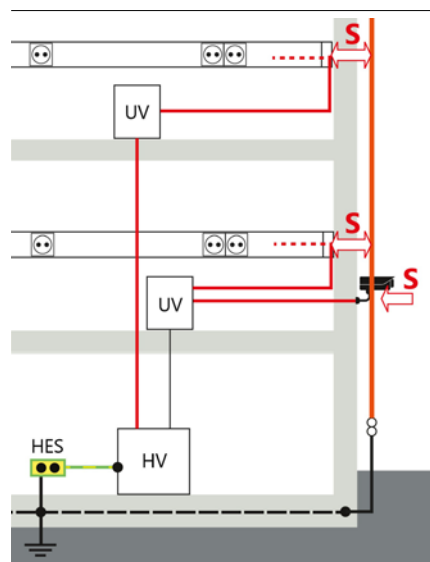
Roof-mounted structures

Such as roofing, roof-mounted fans



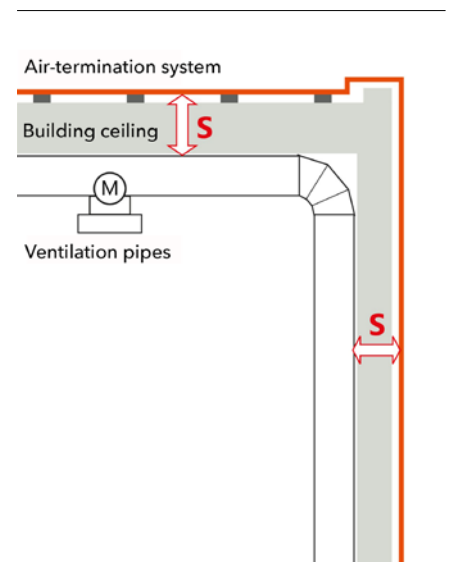
Electrical cables

Such as cable trunking systems, outdoor cameras



Conductive parts of a building

Such as installation tubes, ventilation pipes





Calculating the separation distance

According to DIN EN 62305-3 (VDE 0185-305-3), the required separation distance is calculated as follows:

$$s = \frac{k_i \cdot k_c}{k_m} \cdot l$$

-
- s Separation distance
 - k_i Dependent on the selected class of LPS
 - k_c Dependent on the current distribution in the down-conductor system
 - k_m Dependent on the material of the electrical insulation
 - l The length along the air-termination system or down conductor in metres from the point where the separation distance is supposed to be determined to the next equipotential bonding or earthing point
-

Detailed information on calculating the separation distance is provided by the Lightning Protection Guide in the section "Electrical insulation of external lightning protection – separation distance".

The challenge:

maintaining separation distances in practice

For aesthetic reasons, modern architecture can make it difficult to install down conductors with GRP spacers on a building.

In addition, difficulties arise with extensions, renovations and changes of use of existing installations, as conventional lightning protection systems may not be able to fulfil the separation distance requirements. In addition, the roof is often the last available installation area for various applications. Nevertheless, lightning protection systems are usually prescribed specifically for public, commercial or industrial buildings, and it is essential to observe the necessary separation distances.

The solution: HVI Lightning Protection

The required separation distances often cannot be realised with conventional lightning protection systems. Not so with the HVI lightning protection system. With its unique design and special sheath, HVI Lightning Protection enables the separation distance to be maintained – and in the simplest possible way.

SEPERATION DISTANCE

Electrical insulation of the external lightning protection system – separation distance:
<http://de.hn/2ZGY7>



HVI lightning protection

Safety and flexibility of the highest level

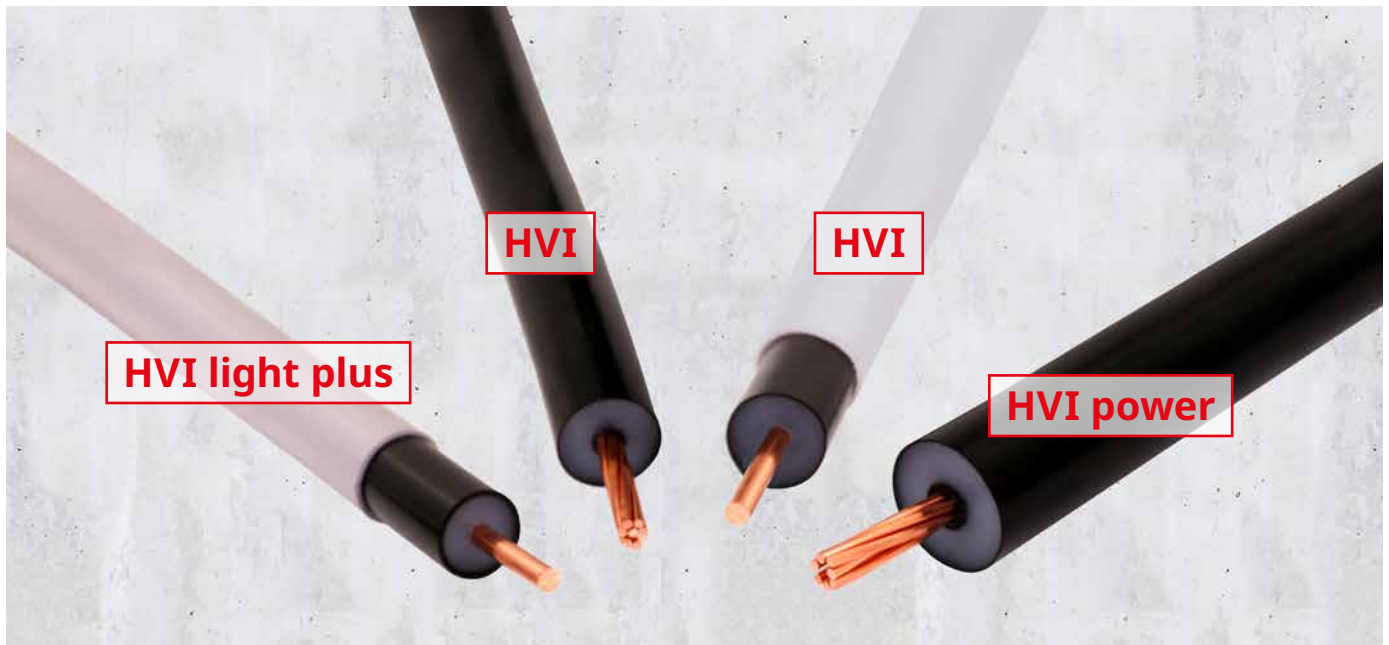
HVI Lightning Protection – what makes it special: the lightning current is conducted safely and creepage discharges and flashovers are avoided. This makes it easy to maintain the required separation distances.

HVI Lightning Protection offers maximum protection and maximum flexibility during installation. The HVI Conductor is a high-voltage-resistant, insulated down conductor from DEHN. The conductor carrying the lightning current is encased in high-voltage-resistant insulation and a semi-conductive sheath in such a way that uncontrolled disruptive discharges and creeping flashovers are prevented and lightning currents are safely dissipated. In contrast to insulated conductors with a metallic, braided shield, there is therefore no risk of high-energy induction currents with the HVI Conductor. The lightning-current-carrying connection of metallic, earthed building installations is not required. Additional equipotential bonding measures can therefore be easily coordinated and installed.

Another advantage: HVI Conductors meet the need for a modern look and design. The grey conductors can be painted in the same colour as the building and all variants can be installed behind the façade. The system thus enables optimum adaptation to the building architecture and offers a wide variety of design options.

HVI lightning protection system – all the benefits at a glance

- Reliably maintain separation distances: You install directly next to conductive parts of the building or directly next to electrical cables or pipework
- Easy to install: you can install safely, easily and quickly with modular components and special tools
- Integration within the building architecture: all HVI Conductors with a grey sheath can be colour-matched
- Easy to retrofit: HVI Lightning Protection takes up little space and leaves room for the future installation of roof structures such as PV or air-conditioning technology
- Suitable for use in Ex zones 1 and 21, as well as 2 and 22
- Can be tested with 1 kV and 15 kV



HVI product family

The large number of installations and intensive development activities have given us a head start in terms of experience, which is reflected in the HVI Conductor types. These correspond to the different installation requirements for lightning protection systems.

The possible uses of HVI Conductors are extremely diverse and suitable for every application. Only DEHN offers such a wide range – and over 20 years of experience in insulated lightning protection.

The range includes the conductor types:

- HVI light plus
- HVI
- HVI power

HVI lightning protection: Which conductor do you need and when?

The separation distance is a decisive factor when selecting the right conductor:

	HVI light plus	HVI		HVI power
Separation distance in air	≤ 60 cm	≤ 75 cm		≤ 90 cm
Structure	Solid	Solid / stranded		Stranded
Version	Signal grey	Black	Light grey	Black
Outer diameter	Ø21 mm	Ø20 mm	Ø23 mm	Ø27 mm
Lightning current carrying capability	150 kA	150 kA		200 kA
Class of LPS (for single down conductor)	II - IV *)	II - IV *)		I - IV
Protection against electric shock	✓	×	✓	×
Approval for use in hazardous areas	✓	✓		✓
Paintable	✓	×	✓	×
Without additional equipotential bonding	✓	×		×

*) From two down conductors also for class of LPS I.

HVI Lightning Protection

<http://de.hn/c6yS2>



Systematic safety

HVI technology in focus

- Precise and safe conducting of lightning currents
- No compromises with separation distances
- Flexible installation

Technology for controlled lightning current conducting

HVI technology ensures the required separation distance is permanently maintained between down conductors and building structures, even in complex building shapes and with limited space. The multi-layer structure of the conductor consists of lightning-current-carrying inner conductors, a special high-voltage-resistant insulating sheath, a black semi-conductive sheath that controls

capacitive effects, and a grey protective coat that shields against mechanical influences. HVI components are all tested in accordance with the DIN IEC/TS 62561-8 standard and meet the requirements for components for an electrically insulated lightning protection system. The conductors can be tested at 1 kV and 15 kV and contribute to the protection of people and buildings in accordance with standards.

Technical features at a glance:

- 1 Inner conductor, solid / stranded
- 2 High-voltage-resistant insulation layer
- 3 Semi-conductive sheath: controls capacitive effects and prevents creeping discharges
- 4 Outer sheath: protects against electric shock and mechanical influences



Efficient and safe installation

HVI technology is significantly easier to install than conventional systems. Pre-assembled components and clearly defined installation routes mean there is no need for time-consuming measurements of separation distances. This saves time on the construction site, minimises sources of error and increases safety for people and equipment, especially with complex roof and façade structures. The connection elements for installation inside the supporting tube are marked in red to facilitate installation and prevent errors. HVI Conductors are available on a reel or pre-assembled, reducing waste and optimising material usage.



Discreet but impressive technology

HVI Conductors blend harmoniously into modern architectural designs. The compact design and their ability to be routed flexibly create clear lines without any distracting elements. The design quality of a building envelope is preserved, while the lightning protection system remains fully functional and safe.



DEHN Lightning Protection Van

The DEHN Lightning Protection Van delivers practical solutions directly to where they are needed: on construction sites, at planning offices or with technical field sales teams. It serves as a mobile consulting platform for sharing expertise on standard-compliant lightning and surge protection.

Specific applications can be discussed on site, products can be demonstrated in use, and individual protection concepts can be explained. The vehicle's equipment means we can clearly explain complex interrelationships – from earthing and separation distances to the selection of suitable protective devices.



Lightning Protection Van –
Arrange an appointment
<http://de.hn/a5ryN>



HVI light plus

- Separation distance $s \leq 60$ cm (in air)
- Reduced installation and planning costs
- Optical integration: Grey tone that matches concrete walls

The high-voltage-resistant insulated down conductor provides advantages for installation and planning. The multitude of product properties combined within it enable integrated protection against electric shock, elimination of an additional equipotential bonding connection in certain cases, approval for use in hazardous areas, a solid inner conductor of just 16 mm^2 – and much more. These features make HVI light plus suitable for a wide range of lightning protection projects.

The coaxially constructed conductor consists of a solid inner conductor with a high-voltage-resistant insulation and a semi-conductive outer sheath. This design allows the HVI light plus to maintain an equivalent separation distance in air of 60 cm to earthed metal building installations without creepage discharge. This measure prevents uncontrolled flashovers and the lightning current is directed to the earthing system. The lightning current carrying capability of the HVI light plus is 150 kA and it can be used in lightning protection classes II, III and IV where $k_c = 1$ (single down conductor).

The adjustment range is established without the need for an additional equipotential bonding connection. This leads to simplified planning and assembly options and, as a result, to considerable time savings.

The HVI light plus has been tested with regard to its lightning current carrying capability and impulse withstand voltage both as a single conductor and as a system in accordance with DIN IEC/TS 62561-8 and offers simplified design possibilities.

Advantages:

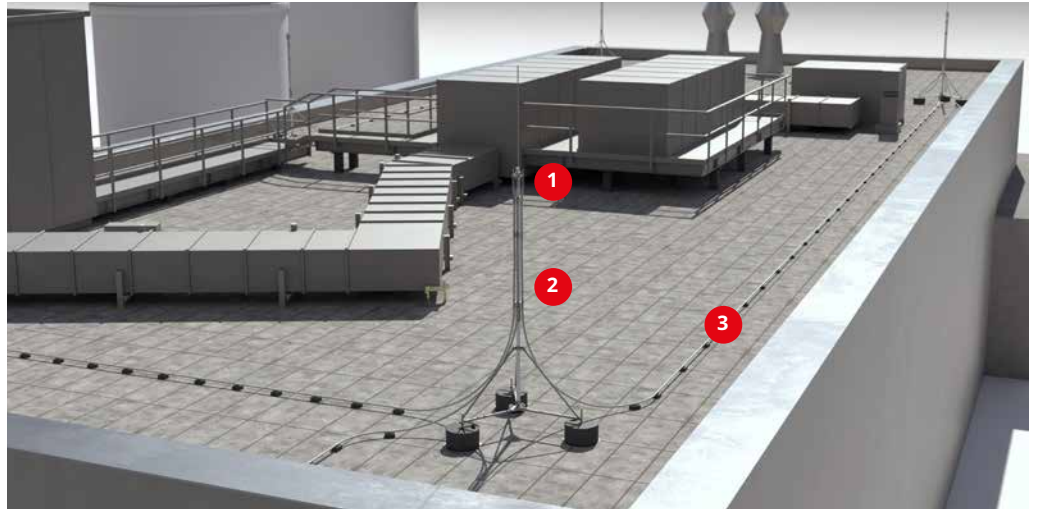
- Reduced installation and planning costs thanks to a solid inner conductor and the elimination of the need for an additional equipotential bonding connection.
- Cost saving, since existing tools can be used for the HVI range.
- Protection against electric shock with an additional grey sheath
- Visual integration by using a grey tone that blends into concrete walls; it can also be painted over.

Technical parameters:

- Equivalent separation distance $s \leq 60$ cm (in air), or $s \leq 120$ cm (solid building material)
- Lightning current carrying capability 150 kA
- Class of LPS II - IV (when $k_c = 1$ down conductor)
- Tested to DIN IEC/TS 62561-8
- Available in reels (100 / 500 m) for on-site assembly, as cut-to-length conductors packed in boxes up to 70 m or pre-assembled conductors for installation inside and outside the tube
- Approval for use in hazardous areas: zones 1/21 and 2/22



Product range
HVI light plus
<http://de.hn/Mo8PH>



1 Conductor and connection heads



HVI light plus Conductor
 (On a 100-m reel)

Part No. 819 600

Material: Cu/PE

Diameter: 21 mm



HVI light plus Conductor
 (cut to length)

Part No. 819 609

Material: Cu/PE

Diameter: 21 mm



Connection kit for HVI light plus
 for installation inside
 the tube

Part No. 819 645

Material: StSt

Connector: Bolt, Ø10 mm, L 50 mm



Connection element for
 HVI light plus Conductor

Part No. 819 640

Material: StSt

Diameter: 21 mm

2 Supporting tubes and stands



HVI light plus Conductor
 inside the supporting tube
 with air-termination tip
SET:
 Total height 2,400 mm

Components:

Supporting tube (GRP/Al) Ø40 mm,
 l = 2,400 mm;
 Air-termination tip (stainless steel)
 l = 500 mm

Part No. 819 674

Standard: DIN IEC/TS 62561-8

HVI light plus pre-assembled for
 installation inside the tube.



Tripod for supporting tubes
 with side outlet

Part No. 107 390

Material: StSt

Hinged tripod with half shell for
 tubes Ø40/50 mm;
 Radius 680 mm, inclination angle 10°.



Adapter set

Part No. 107 399

Material: StSt

Use with tripods and four-legged
 stands for reducing Ø50 mm to
 Ø40 mm.

3 Conductor holder and fixing components

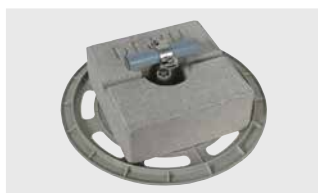


HVI light plus Ex W55 holder

Part No. 275 460

Material: StSt

Cable routing: fixed



Roof conductor holder set
 with base plate and concrete
 block

Part No. 253 229

Material: StSt

Holder: Rd. 20–23 mm



Air-termination mast fixing
 kit Ø40

Part No. 819 642

Material: StSt / aluminium / plastic

Conductor holder: 4x



Fixing kit for Ø40/50 sup-
 porting tubes

Part No. 819 296 / 819 297

Material: Plastic

4x in GRP area

HVI

- Separation distance $s \leq 75$ cm (in air)
- Available in black or grey finish
- Available with solid or stranded inner conductor

The HVI Conductor has a wide range of applications. It protects larger roof-mounted structures, antennas or masts with information technology equipment from direct lightning strikes – even in potentially explosive atmospheres. It is used for a separation distance $s \leq 75$ cm in air and $s \leq 150$ cm for solid building materials.

It also offers the option of installing conductors directly up to the earthing system. If this is not required, it can be connected to existing conventional lightning protection systems (elevated ring conductor).

The HVI Conductor can be installed inside the supporting tube and therefore offers no additional wind attack surface. If the current needs to be split between several conductors in order to reduce the separation distance, or if longer cable lengths are required, up to four additional conductors can be installed on the outside of the supporting tube using a special fixing kit. Due to the current distribution, it can also be used in class of LPS I.

Advantages

- Ideal solution for a wide range of uses.
- Ideal for harsher environments thanks to additional GRP/StSt supporting tubes
- Safe and TÜV-certified solution for the non-sparking discharge of lightning currents in Ex zones 1 and 21

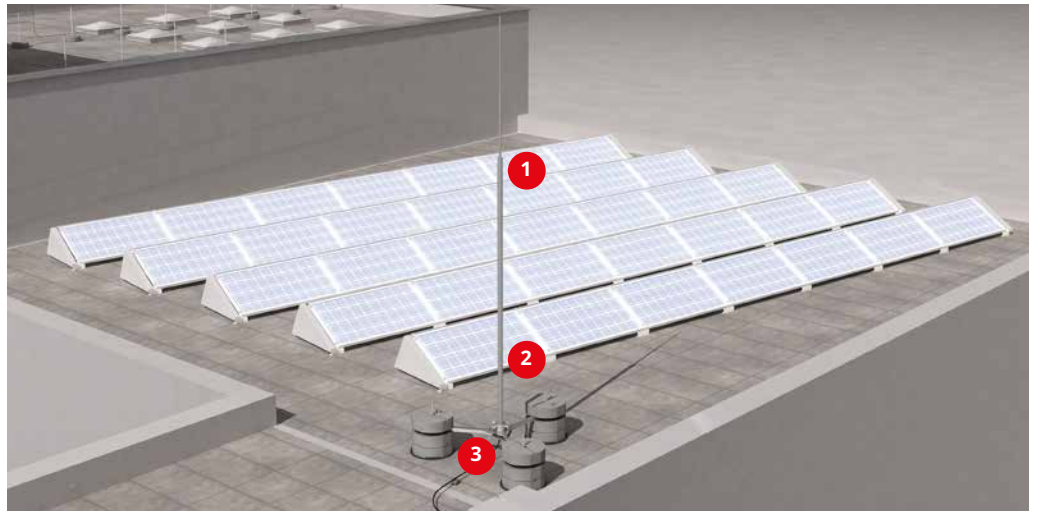
Technical features

- Equivalent separation distance $s \leq 75$ cm (in air), or $s \leq 150$ cm (solid building material)
- Tested with I_{imp} 150 kA ($k_c = 1$; 10/350 μ s)
- Tested to DIN IEC/TS 62561-8
- Supporting tube in aluminium or stainless steel version
- Easy installation of the internally routed conductor thanks to side outlet on the supporting tube
- Outer diameter: 23 mm black; 20 mm grey
- Available in reels (100 / 400 m light grey / 500 m black) for on-site assembly, as cut-to-length conductors packed in boxes up to 70 m or pre-assembled conductors for installation inside and outside the tube



HVI product range

<http://de.hn/aQazX>



1 Conductor and connection heads

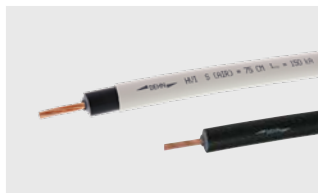


**HVI Conductor
(on a reel 100 / 400 m)**

Part No. 819 135 / 819 136 / 819 156 /
819 158 (solid)

Colour: Black / light grey

Diameter: 20 mm / 23 mm



**HVI Conductor
(cut to length)**

Part No. 819 131 / 819 132

Colour: Black / light grey

Diameter: 20 mm / 23 mm



Connection kit for HVI Conductor and heat-shrinkable sleeve

Part No. 819 650 | Material: StSt

Part No. 819 997 | Material: PE

Connector: Bolt, Ø10 mm, L 50 mm



Connection kit for HVI Conductor for installation inside the tube

Part No. 819 655

Material: StSt

Diameter: 23 mm

2 Supporting tubes and stands



Supporting tube with air-termination rod and side outlet

Components:
Supporting tube (GRP/Al) Ø50 mm,
l = 3,200 mm;
Air-termination tip (Al)
l = 2,500 mm

Part No. 105 326

Material: GRP/Al



Height-adjustable and hinged tripod for Ø50 supporting tubes

Part No. 105 351 / 105 357

Material: HDG steel / HDG steel

Radius: 620 mm / 220 mm



Four-legged stand, hinged with half shell for tubes Ø40-50

Part No. 107 490

Material: StSt

Radius: 680 mm

3 Conductor holder and fixing components



Wall mounting bracket adjustable range 150-200 mm

Part No. 105 344

Material: StSt

Supporting tube/air-termination rod clamping range: 40-50 mm



Conductor holder with tensioning strap

Part No. 275 320

Material: StSt

Holder: Rd. 20-23 mm



Roof conductor holder for round standing seam roofs

Part No. 202 850

Material: StSt

Holder: Rd. 20-23 mm



Conductor holder for the HVI Conductor

Part No. 275 239

Material: StSt

Holder: Rd. 23 mm

HVI power

- Separation distance $s \leq 90$ cm (in air)
- Lightning current carrying capability of 200 kA ($k_c = 1$)
- Used in hazardous areas

The HVI power Conductor represents the most powerful version of high-voltage-resistant insulated conductors. It is used in various environments such as industrial plants, hospitals, data centres and silos. Large separation distances are required in particular for buildings with considerable dimensions or increased protection class and safety-related requirements.

In many industrial sectors, there is a risk of explosive atmospheres forming during technical operations. When planning and installing lightning protection systems, it is therefore essential to be sensitive to the potential lightning-related ignition sources. This is possible by electrically insulating the lightning protection system from conductive parts of the building structure and installation. A safe and tested solution for the discharge of lightning currents is provided by the special type of conductor installation of the HVI power Conductor from DEHN.

Advantages

- Suitable for all classes of LPS (where $k_c = 1$)
- Safe and TÜV-certified solution for the non-sparking discharge of lightning currents in Ex zones 1 and 21

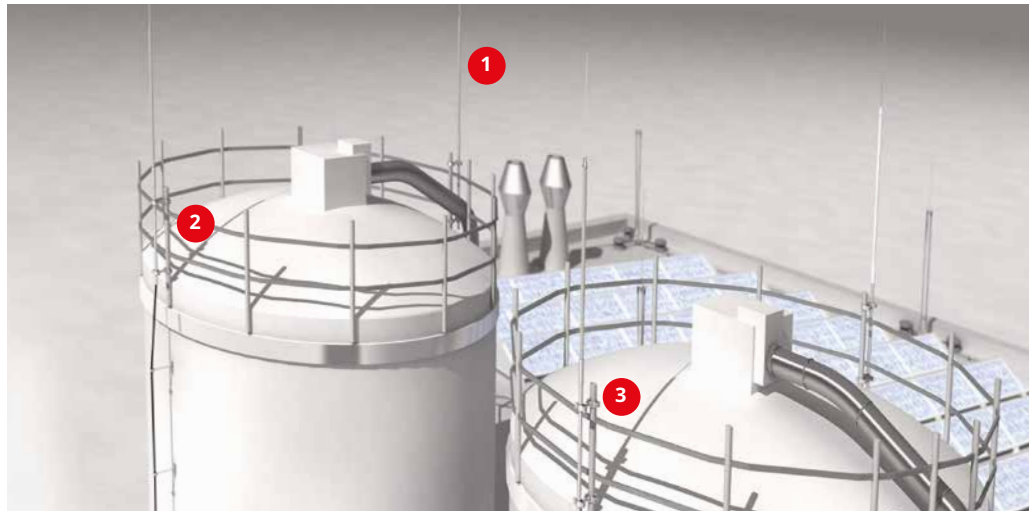
Technical features

- Equivalent separation distance $s \leq 90$ cm (in air), or $s \leq 180$ cm (solid building material)
- Tested with I_{imp} 200 kA ($k_c = 1$; 10/350 μ s)
- Tested to DIN IEC/TS 62561-8
- Supporting tube in aluminium or stainless steel version
- Outer diameter of 27 mm
- Available in reels (100 m) for on-site assembly, as cut-to-length conductors packed in boxes up to 80 m or pre-assembled cable for installation inside and outside the tube
- Stainless steel mounting material for use in corrosive environments



**Product range
HVI power**

<http://de.hn/2HiBd>



1 Conductor and connection heads



**HVI power long Conductor
(On a 100-m reel)**

Part No. 819 137

Colour black

Diameter: 27 mm



**HVI power Conductor
(cut to length)**

Part No. 819 163

Colour black

Diameter: 27 mm



**Connection kit for HVI
power Conductor Ø27 mm
for installation inside the
supporting tube**

Part No. 819 142

Material: StSt

Connector: Bolt, Ø10 mm, L 50 mm



**Connection kit for HVI
power Conductor Ø27 mm
for installation outside the
supporting tube**

Part No. 819 149

Material: StSt

Connector: Bolt, Ø10 mm, L 50 mm

2 Supporting tubes



**Supporting tube with air-ter-
mination rod without side
outlet**

Components:
Supporting tube (GRP/Al) Ø50 mm,
l = 3,500 mm;
Air-termination tip (Al)
l = 1,000 mm

Part No. 105 563



**Railing clamp
Ø48-60 mm**

Part No. 105 354

Material: StSt

Supporting tube/air-termination
rod clamping range: 48-60 mm



**Wall mounting bracket
Adjustable range 150-200 mm**

Part No. 105 344

Material: StSt

Supporting tube/air-termination
rod clamping range: 40-50 mm

3 Conductor holder and fixing components

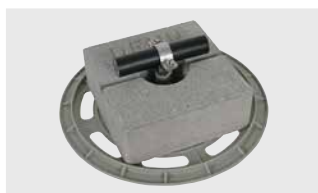


**Conductor holder with plas-
tic base**

Part No. 275 249

Material: StSt

Holder: Rd. 27 mm



**Roof conductor holder set with
base plate and concrete block**

Part No. 253 333

Material: StSt

Holder: Rd. 27 mm



HVI power Ex P240 holder

Part No. 275 455

Material: StSt

Holder: Rd. 27 mm



**Conductor holder for
HVI power Conductor**

Part No. 275 339

Material: StSt

Clamping range: 50-300 mm

Practical example: Retrofitting a HVAC system

Planning steps for adapting the external lightning protection system

Retrofitting

The adaptation of roof systems and the retrofitting of ventilation systems often associated with it are necessary for various reasons. In many buildings, the existing ventilation systems are outdated and no longer meet current requirements. These outdated systems can no longer fulfil their functions efficiently. At the same time, installed heating and cooling generators often reach their performance limits and are unable to cope with additional tasks.

Another aspect is the increasing importance of reducing CO₂ emissions and lowering energy consumption. In this context, the need to implement more environmentally friendly and energy-efficient solutions is becoming increasingly important. Customised approaches that integrate highly efficient heat and cold recovery play a key role here.

These targeted improvements can increase the performance of ventilation systems and reduce operating costs in the long term. These new solutions are often found as retrofitted installations on roof surfaces.

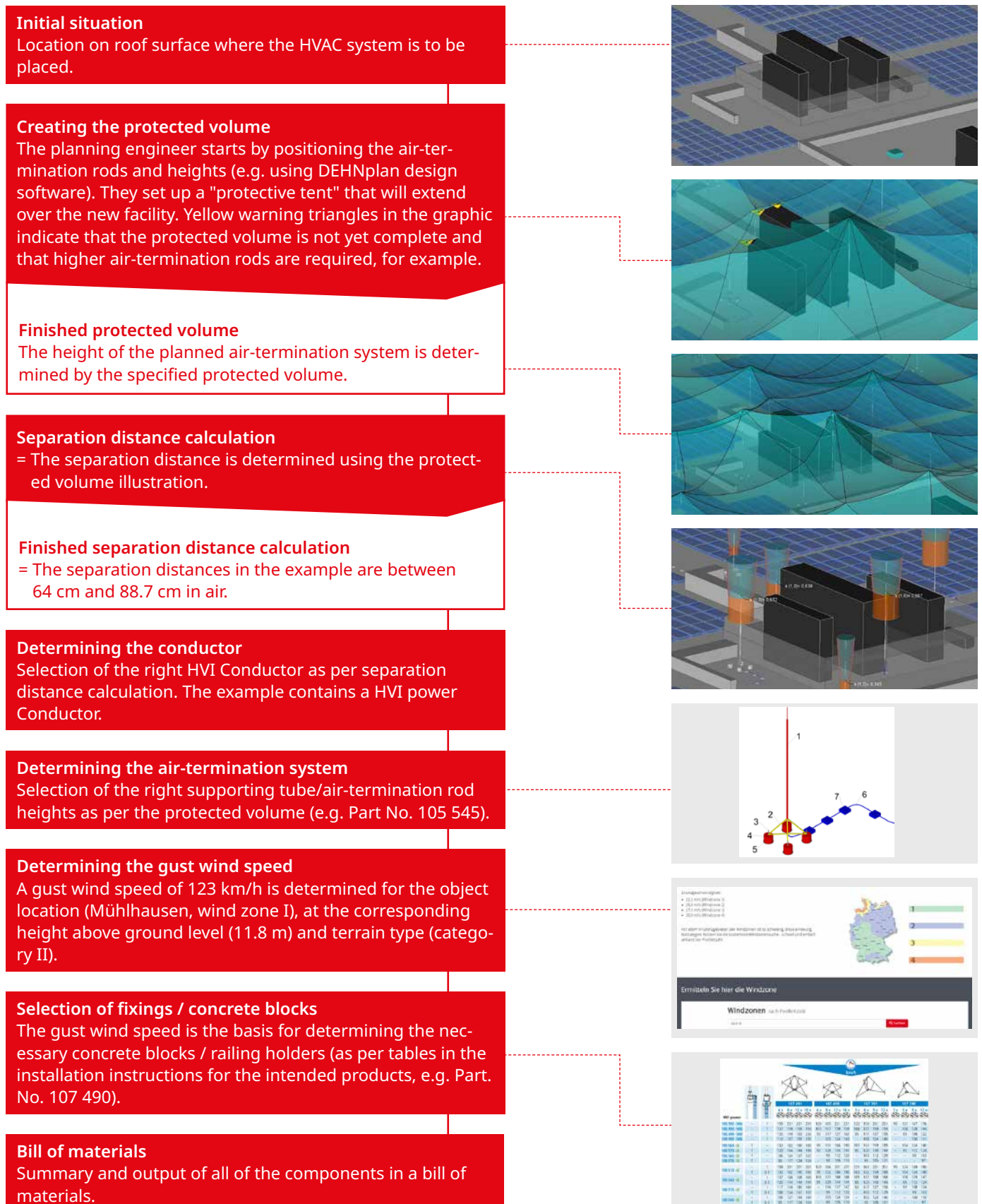
The challenge

If there are already lightning protection systems in situ, the subsequent integration of technical systems, such as air conditioning split units, chillers, cooling towers, recooling units, air-conditioning systems, flue gas systems or PV installations, requires special attention. And the lack of space usually poses a further challenge. Free roof space on today's industrial, functional or commercial buildings is often very limited due to the wide range of technical building requirements. This is a challenge for planning and professional integration into the lightning protection system.



Planning – step by step

Using the example of a retrofitted heating, air conditioning and ventilation system, the following flow chart provides an insight into the necessary planning steps.



HVI check

- Dielectric withstand test of the HVI Conductors
- 1-kV and 15-kV measuring methods
- Test involves low installation effort

HVI check is DEHN's measuring system for determining the function and condition of HVI Conductors. Both measuring methods can be used to reliably detect both mechanical and electrical damage (e.g. holes or electrical breakdown as a result of overloads) to HVI Conductors.

HVI check includes the two measuring methods 1 kV and 15 kV, testable / insulated connection elements, insulating caps, tools and clamps. The test is to be carried out with a commercially available insulation measuring device.

Advantages

- **Freedom of choice and flexibility.** A method can be selected depending on the lightning protection system and individual requirements: 1 kV for locating various types of damage/impairment and 15 kV for rapid detection of holes.
- **Safety.** Electrical and mechanical damage can be found quickly by means of a HVI check.
- **Cost saving and familiar handling.** The test can be carried out with a commercially available insulation measuring device that you may already own.
- **Saving time and effort.** Performing the test involves little installation work.

Measuring method







The following types of defect can be identified depending on the method:

Type of defect	Measuring method	
	1 kV	15 kV
HVI Conductor screwed through the centre – connection of inner conductor with earthed metal façade	✓	✓
HVI Conductor screwed through the centre – connection of inner conductor with the semiconductive sheath	✓	✓
HVI Conductor severed	✗	✓
HVI Conductor with electrical breakdown after overload – in Ex zone 1 and 21 (without an explosive atmosphere)	✗	✓
HVI Conductor with hole – in Ex zone 1 and 21 (without an explosive atmosphere)	✗	✓

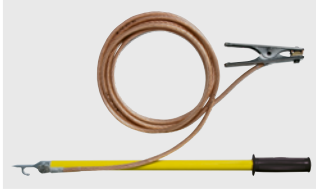

Note: It is assumed that the HVI Conductors have been installed with insulated connection elements throughout.



Products

1-kV and 15-kV measuring method			
	Insulated connection element, earth-side (BO10)	Insulated connection element, installation inside the tube	Insulated connection element, installation outside the tube
HVI light plus Conductor	Part No. 819 646	Part No. 819 647	Part No. 819 648
HVI Conductor	Part No. 819 173	Part No. 819 174	Part No. 819 175
HVI power Conductor	Part No. 819 176	Part No. 819 177	Part No. 819 178
	Material: StSt	Material: StSt	Material: StSt
	Connector: Bolt, Ø10 mm, L 50 mm	Connector: special mushroom head	Connector: M12 thread, square
1-kV and 15-kV measuring method			
	Measuring point terminal	ISO head stripping tool	Insulating cap for the dielectric withstand test
HVI light plus Conductor	Part No. 819 649	Part No. 597 125	Part No. 597 815
HVI Conductor	Part No. 819 649	Part No. 597 126	
HVI power Conductor	Part No. 819 179	Part No. 597 128	
	Material: StSt	Material: Aluminium	Material: Plastic
	Clamping range: Ø18–20 mm	Cutting head	Opening: Ø34 mm

Safety components

		
Discharge bar	Chain post set Secur	Warning sign
Part No. 758 021	Part No. 700 110	Part No. 700 059
Material: Glass-fibre reinforced polyester tube	Colour: Red / white	Material: Free foam, weather-resistant
Connector: Spring-loaded earth clamp	Post material: Plastic Base material: Cement	

HVI check test instruction

<http://de.hn/4cYPo>



General accessories



HVI cutter

Part No. 597 032

Cable shears for easily cutting all HVI Conductor types down to length.



Stripping tool HVI strip 20 for HVI light plus / HVI Conductor

Part No. 597 220

For stripping Ø20-mm conductors.



Stripping tool HVI strip 27 for HVI power Conductor

Part No. 597 227

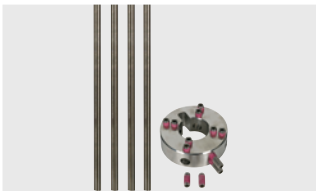
For stripping Ø27-mm conductors.



DEHN helix

Part No. 597 231

Stripping tool for HVI Conductors.



Lateral air-termination tips for Ø50mm supporting tubes

Part No. 819 185 | Material: Al

Part No. 819 186 | Material: StSt

Length: 1030 mm

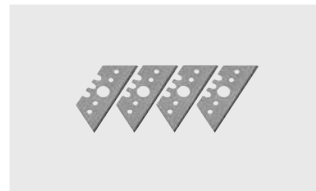


Spare blades for HVI head 20

Part No. 597 101

Material: StSt

Spare blades, 4x



Spare blades for HVI head 27

Part No. 597 102

Material: StSt

Spare blades, 4x



Information sign DE, EN / FR, IT

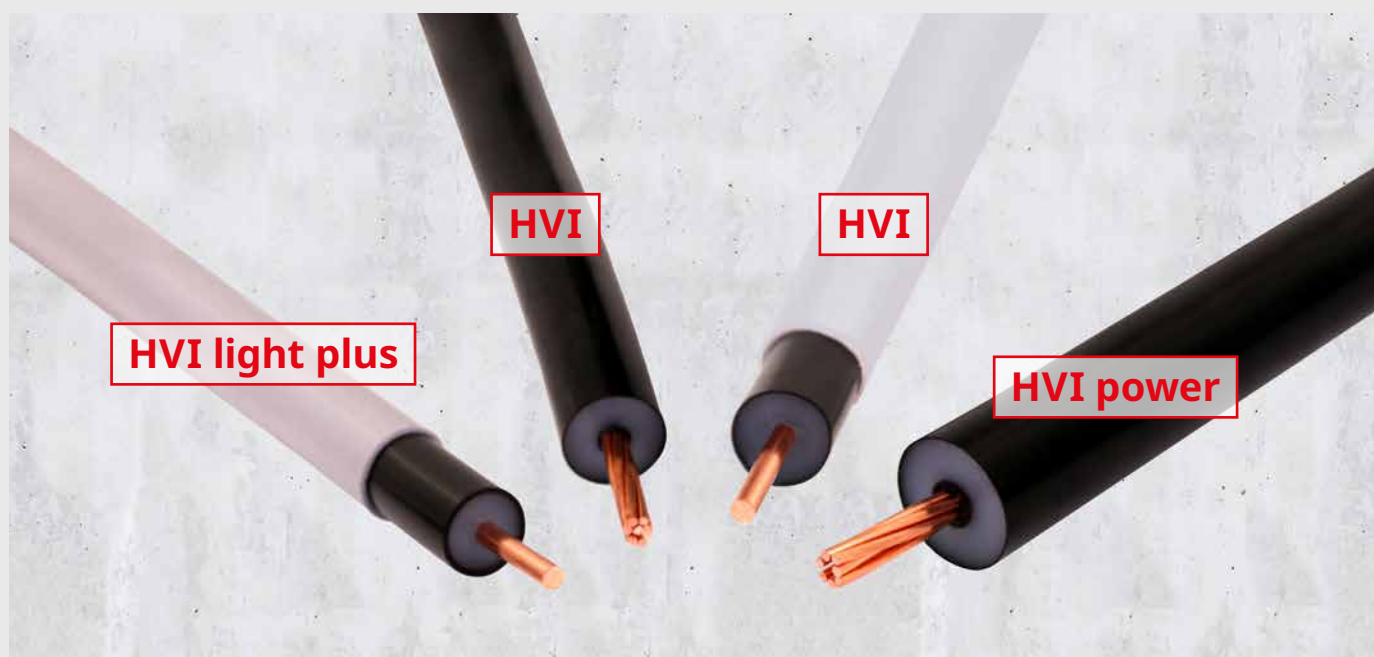
Part No. 480 598 / 480 597

Material: Plastic

"Attention! Isolated lightning protection HVI Conductor".

Types of HVI Conductors: Technical information

	HVI light plus	HVI	HVI power	
Equivalent separation distance (in air)	≤ 60 cm	≤ 75 cm	≤ 90 cm	
Equivalent separation distance (solids)	≤ 120 cm	≤ 150 cm	≤ 180 cm	
Structure	Solid	Solid / stranded		Stranded
Cross-sections	16 mm ²	19 mm ²		25 mm ²
Colour	Signal grey	Black	Light grey	Black
Protection against electric shock	Yes	—	Yes	—
Inner conductor material	Copper	Copper		Copper
Outer diameter	21 mm	20 mm	23 mm	27 mm
Minimum bending radius (10x outer diameter)	210 mm	200 mm	230 mm	270 mm
Operating temperature	-30°C to +70°C	-30°C to +70°C		-30°C to +70°C
Temperature for installation	-5°C to +40°C	-5°C to +40°C		-5°C to +40°C
Tensile load capacity	800 N	950 N	1200 N	
UV/weather-resistance	Yes	Yes	Yes	
Tested with I _{imp} (10 / 350 μs)	150 kA	150 kA	200 kA	
Use in class of LPS (when k _c = 1)	II, III, IV	II, III, IV	I, II, III, IV	
Max. permitted cable length LPL I (when k _c = 1)	—	—	11.25 m	
Max. permitted cable length LPL II (when k _c = 1)	10.0 m	12.5 m	15.0 m	
Max. permitted cable length LPL III/V (when k _c = 1)	15.0 m	18.75 m	22.5 m	
Installation in Ex zones 1 and 21	Permitted	Permitted	Permitted	
Cable weight / 100 m	~ 45 kg	~ 48 kg	~ 63 kg	~ 73 kg



Current status of the lightning protection standard

Attached, isolated and electrically insulated lightning protection

The third edition of the lightning protection standard DIN EN 62305-3 | VDE 0185-305-3:2025-10 provides uniform, internationally applicable definitions of terms relating to isolated lightning protection, insulated lightning protection and conventional lightning protection. Different interpretations and designs of lightning protection systems are now a thing of the past.

In this context, the third edition of lightning protection standard DIN EN 62305-3 distinguishes between the following types of external lightning protection systems (LPSs):

- Non-isolated lightning protection system
- Isolated lightning protection system
- Electrically insulated lightning protection system

What exactly do these terms mean? The following list provides an overview of the normative designations and examples of suitable practical implementation. A combination of the designs shown is also possible.

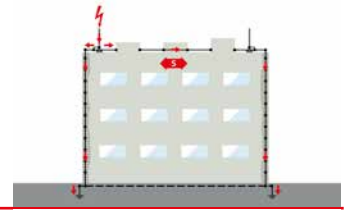
On the following pages, you will also find further information on the designs and lightning protection components:

- DEHNiso-Combi
- DEHNiso spacers
- Self-supporting air-termination rods
- Telescopic lightning protection masts

Non-isolated lightning protection system

The lightning current (path) can come into contact with the structure to be protected.
The separation distance is not maintained.

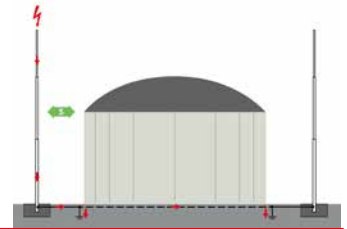
External lightning protection system not isolated from the structure to be protected.
The systems and building structure are integrated into the lightning protection system.



Isolated lightning protection system

The lightning current (path) has no electrical contact with the structure to be protected, except via the earthing system in the ground.
The separation distance is maintained.

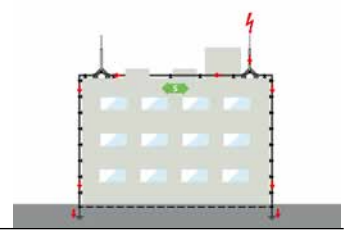
External lightning protection system isolated from the structure to be protected.
The lightning protection system is **electrically und spatially isolated** from the system, e.g. in the form of telescopic lightning protection masts.



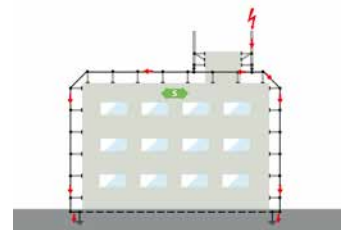
Electrically insulated lightning protection system

The lightning current (path) has no electrical contact with the structure to be protected, except via the earthing system in the ground.
Separation distance is maintained.

Version with electrically insulated HVI system
External lightning protection system not spatially isolated yet electrically insulated **from the structure to be protected**.
This includes a complete lightning protection system (with air-termination system and down conductors) of electrically insulating down conductors; e.g. using HVI Lightning Protection.



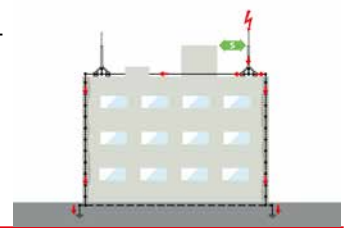
Version with electrically insulated DEHNiso system
External lightning protection system not spatially isolated yet electrically insulated **from the structure to be protected**.
This includes a complete lightning protection system (with air-termination system and down conductors) of electrical insulators.



Partially isolated lightning protection system

Isolated external lightning protection system for a part of the structure to be protected.
The rest of the building structure is designed as a non-isolated lightning protection system; e.g. by integrating the building structure / reinforcement.

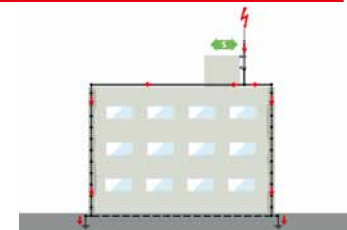
Separation distance is maintained for part of the structure; e.g. on the roof by means of self-supporting air-termination rods.



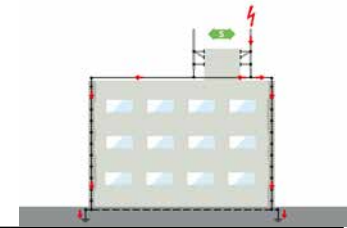
Partially electrically insulated lightning protection system

Lightning protection system electrically insulated for a part of the structure to be protected.
The rest of the building structure is designed as a non-isolated lightning protection system; e.g. by integrating the building structure / reinforcement.

Version with electrically insulated HVI system
The separation distance is maintained for part of the structure; e.g. at roof level, by means of **electrically insulating HVI down conductors**.



Version with electrically insulated DEHNiso system
The separation distance is maintained for part of the structure; e.g. at roof level, by means of **electrical insulators (DEHNiso)**.



	Lightning current [kA]		LPS design with insulated conductor in accordance with DIN 62561-8 HVI Lightning Protection using high-voltage-resistant insulated conductors (e.g. HVI power Conductors)		Insulator according to DIN 62561-8 DEHNiso spacer made of glass-fibre-reinforced plastic (GRP)
	Partial lightning currents		LPS design with round conductor in accordance with DIN EN 62561-2; e.g. DEHNalu wire		Separation distance 's' maintained
	Earthing system				Separation distance 's' not maintained

DEHNiso-Combi

- The easy way to install air-termination systems
- Suitable for large-scale protected volumes

DEHNiso-Combi is a practical, modular and flexible component range that meets the mechanical and design requirements at your site. DEHNiso-Combi enables air-termination systems even when the contours of the volume to be protected are complicated. The electrical and metal installations protruding above the roof level are protected against lightning strikes, and the coupling of parts of the lightning current into the structure is prevented.

The separation distance is maintained by an insulating joint in the supporting tube and a spacer bar made of glass-fibre reinforced plastic. DEHNiso-Combi makes it very easy to install air-termination systems.

Advantages

- Creation of large-scale protected volumes thanks to intelligent positioning of the air-termination rods
- Comprehensive fixing system: attached (tube, profile system, wall) or self-supported on stands
- Retrospectively installed superstructures

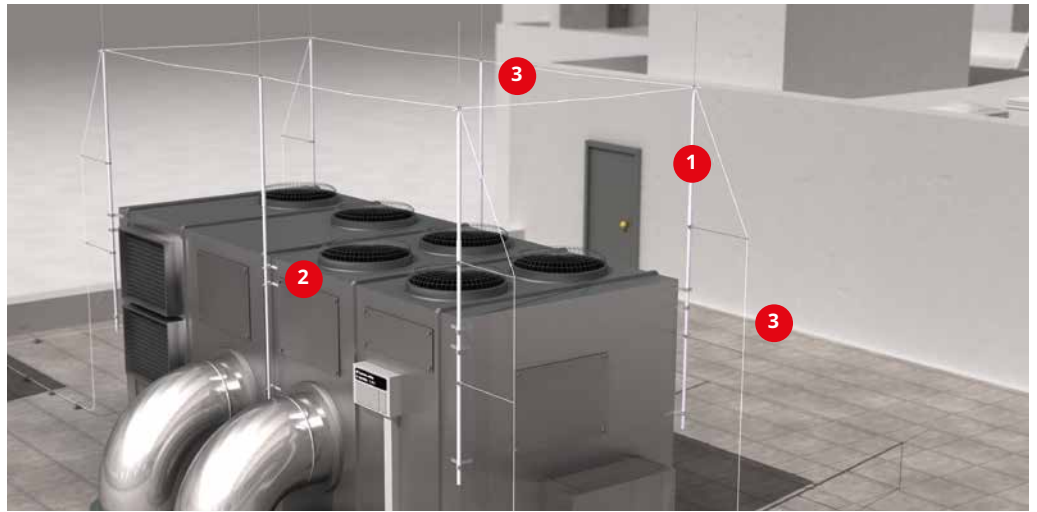
Technical features

- Tested to DIN IEC/TS 62561-8
- Dimensioned and proven taking account of possible wind loads (Eurocode)
- Tested and proven material factor $k_m = 0.7$ for calculating the separation distance

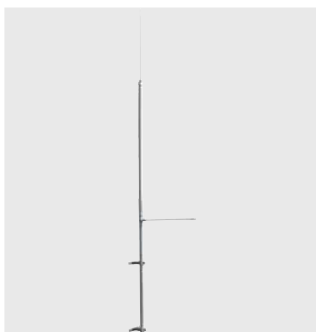


**DEHNiso-Combi
product range**

<http://de.hn/nb95B>



1 Air-termination systems



**DEHNiso-Combi SET:
Total height 4,200 mm**

Part No. 105 440

Standard: DIN IEC/TS 62561-8

Components: Supporting tube (GRP/Al) Ø50 mm, l = 3,200 mm;
Air-termination tip (stainless steel) l = 1,000 mm;
Wall mounting bracket (StSt);
Spacer (GRP/Al) l = 1,030 mm.



**Alternatively:
Supporting tube Ø50**

Part No. 105 300

Material: GRP/Al

Length: 3,200 mm

2 Fixing components and stands



**Wall mounting bracket
flat, horizontal**

Part No. 105 340

Material: StSt

Distance from wall: 80 mm

Air-termination rod, clamping range: 50 mm



Wall mounting bracket, vertical with saddle clamp

Part No. 105 342

Material: StSt

Distance from wall: 46 mm

Air-termination rod, clamping range: 40–50 mm



Fixing clamp Ø50

Part No. 105 361

Material: StSt

Clamping range, tube: Ø50–300 mm

Length of spacer: 30 mm



**Hinged tripod
for DEHNiso-Combi**

Part No. 105 201

Material: HDG steel

Radius: 1,435 mm

Length: Supporting tube 4.7–6.2 m

3 Conductor holder and accessories



Aluminium cable

Part No. 840 050

Material: Al

50-mm² aluminium cable as per EN 62561-2 for use in lightning protection systems as a down conductor or as a spanning cable for air-termination systems.



**MV clamp for fixing the
bracing cables**

Part No. 105 079

Material: StSt

Holder: Rd 8–10 mm



**Air-termination tip for
screwing into the head of
the supporting tube**

Part No. 105 071

Material: StSt

Air-termination tip (l x Ø):
1,000 x 10 mm



3x brace for DEHNiso-Combi

Part No. 105 601

Material: StSt

Brace length: 2,910 mm

DEHNiso spacers

- Components for maintaining the separation distance
- Product range available for nearly all applications
- Available pre-assembled or as an individual assembly kit

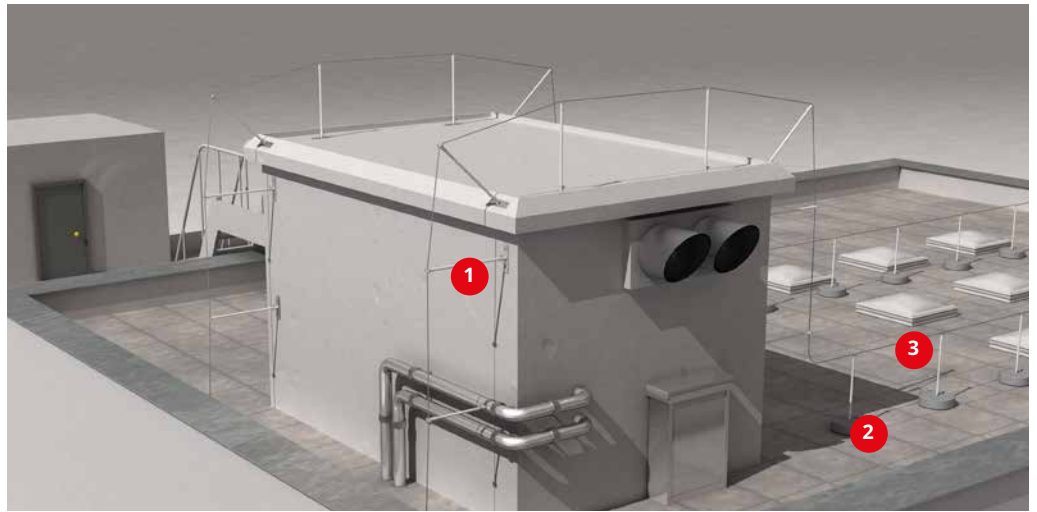
The DEHNiso spacer system is a practical, versatile component range for maintaining separation distances. The modular system offers a simple and economical solution for almost all applications. It can be used as a static support for self-supporting air-termination rods. It is also possible to support ring conductors while observing the separation distance.

Advantages

- Pre-assembled spacer bars suitable for the respective installation location (tube, wall, profile)
- Can be configured on site: all system components are available individually (GRP bar, conductor holder, pipe clamps)
- Technical features
- Tested to DIN IEC/TS 62561-8
- Dimensioned and proven taking account of possible wind loads (Eurocode)
- Tested and proven material factor $k_m = 0.7$ for calculating the separation distance
- High-quality GRP insulation material



Product range
DEHNiso spacers
<http://de.hn/5bcHb>



1 Spacers

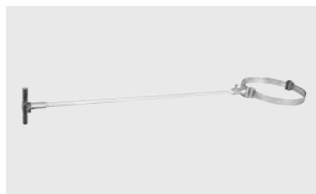


Spacer with rod holder and fixing plate

Part No. 106 115

Material: StSt

Length: 530 mm



Spacer with rod holder and pipe clamp

Part No. 106 245

Material: StSt

Length: 530 mm



Spacer with conductor holder

Part No. 106 165

Material: StSt

Length: 515 mm



Spacer for supporting tube Ø50

Part No. 106 331

Material: GRP/StSt

Length: 1,030 mm

2 Roof conductor holder



Base plate

Part No. 253 300

Material: Plastic

Diameter: 300 mm



Concrete block

Part No. 253 301

Material: Concrete (C35/45)

Weight: 4.6 kg



Profile bar Ø10

Part No. 253 310

Material: GRP

Length: 3,000 mm



Conductor holder with lock bush

Part No. 253 302

Material: Plastic

Holder: Rd. 8 mm

3 Air-termination rods and accessories



Concrete base with fixing wedge and plastic base plate

Part No. 102 340

Material: Concrete (C45/55)

Weight: 17 kg



DEHNalu round wire

Part No. 840 018

Material: AlMgSi

Length: 148 mm



Air-termination rod L2000

Part No. 106 210

Material: Al

GRP insulating clearance: 975 mm



MV clamp for DEHNiso

Part No. 393 069

Material: StSt

Clamping range: Rd. 16/16 mm

Self-supporting air-termination systems

- For use in large areas (e.g. flat roofs)
- Space-saving versions available
- Solutions that can be used flexibly

With self-supporting air-termination rods, large areas can be integrated into the protected volume. There is no need for additional mechanical contacting of roof superstructures, air-conditioning units or fans. Self-supporting air-termination rods are erected using N-legged stands in combination with concrete bases. The number of concrete bases depends on the maximum gust wind speed. Correctly designing for stability and dimensioning the air-termination rod appropriately will provide the planning engineer, installer or property owner with a high-quality air-termination system.

Advantages

- Comprehensive product range: air-termination rod heights from 1.0 m to 14.0 m
- Weight-optimised, easy transport and assembly
- Highly stable and low spatial requirements
- Flexible and for universal use

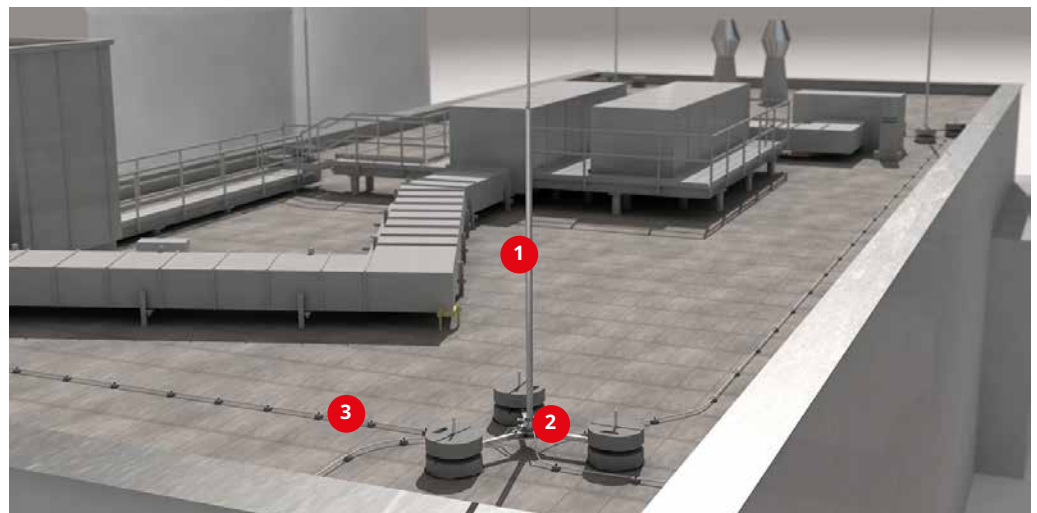
Technical features

- Adjustment of the air-termination rod for roof or building inclination up to an inclination angle of 5-10°
- System solution tested to EN 62561-1
- Dimensioned and proven taking account of possible wind loads (Eurocode)



Product range
Self-supporting
air-termination systems

<http://de.hn/5jMUj>



1 Air-termination systems

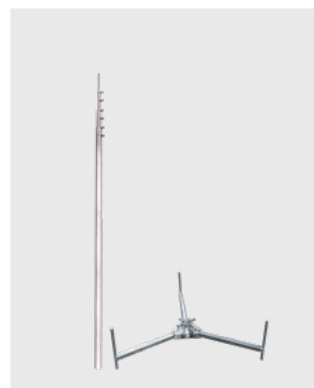


Air-termination rod
Ø40/16/10 with tripod SET:
Total height 4,000 mm

Part No. 105 400

Material: Air-termination rod: Al
 Tripod: HDG steel

SET components: self-supporting
 air-termination rod,
 height 4,000 mm;
 hinged tripod,
 radius 560 mm.



Alternatively: self-supporting,
telescopic air-termination
rods SET:
Total height 5,200 mm

Part No. 105 711

Material: Air-termination mast: Al
 Tripod: HDG steel

Transport length: 1,650 mm

SET components: self-supporting
 air-termination rod, height
 5,200 mm; hinged tripod,
 radius 560 mm.

2 Fixing components and stands



Wall fixing with saddle
clamp for tubes Ø40

Part No. 105 140

Material: StSt

Distance from wall: 80 mm

Air-termination rod, clamping
 range: 40 mm



Railing clamp with spacer
for Ø40 tubes

Part No. 105 162

Material: StSt

Clamping range
 Tube: 45-65 mm
 Air-termination rod: 40-50 mm



Wall fixing for Ø40-50 tubes

Part No. 105 347

Material: HDG steel

Distance from wall: 230-400 mm

Air-termination rod, clamping
 range: 40-50 mm



Hinged four-legged stand with
half shell for Ø40-50 tubes

Part No. 107 490

Material: StSt

Holder: 50 and 40 mm

Radius: 680 mm

3 Conductor holder and accessories



DEHNhold conductor holder
with female thread

Part No. 274 160

Material: StSt

Holder: Rd. 8-10 mm



Conductor holder saddle
clamp DEHNQUICK

Part No. 390 121

Material: HDG steel

Holder: Rd. 6-10 mm



Concrete base C45 / 55 and
plastic base plate

Part No. 102 010 / 102 050

Material: Concrete / EVA

Weight: 17 kg, with fixing wedge



Conductor holder type FB2
for flat roofs

Part No. 253 050

Stone material: Concrete
 Conductor holder: Plastic

Cable routing: loose

Telescopic lightning protection masts

- For installations on open areas
- Large protected volumes can be formed
- Bucket/screw-in foundation und foundation baskets available

Our extensive range of telescopic lightning protection masts protects installations in open spaces from direct lightning strikes. Depending on the height of the air-termination system, the masts can be erected using screw-in or bucket foundations. No excavation or foundation work is required for telescopic lightning protection masts with screw-in foundations. The screw-in foundation is simply screwed into the natural soil and also fixed with earth rods without any preparation. For telescopic lightning protection masts with a bucket or concrete foundation, a foundation is constructed onto which the telescopic lightning protection masts are mounted using a flange plate.

Advantages

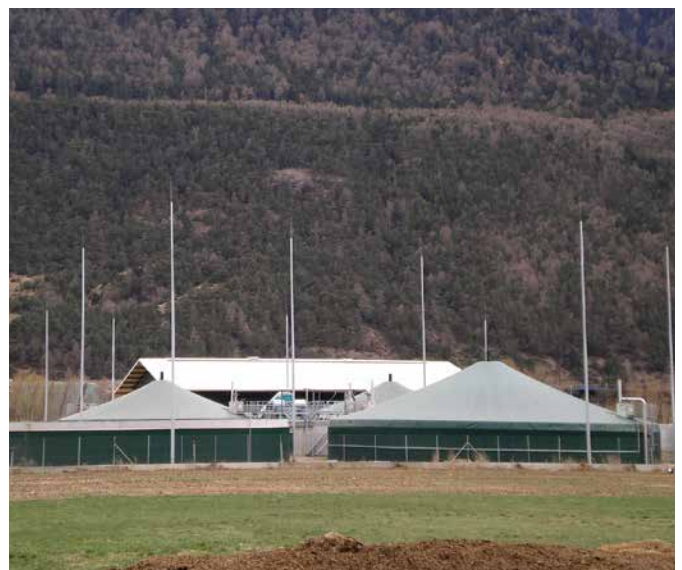
- Comprehensive product range: air-termination rods heights of 6.0 to 24.85 m (above ground)
- Large protected volumes can be formed
- Low spatial requirements

Technical features

- Maximum transport length of 6.0 m
- System solution tested to EN 62561-1
- Dimensioned and proven taking account of possible wind loads (Eurocode)

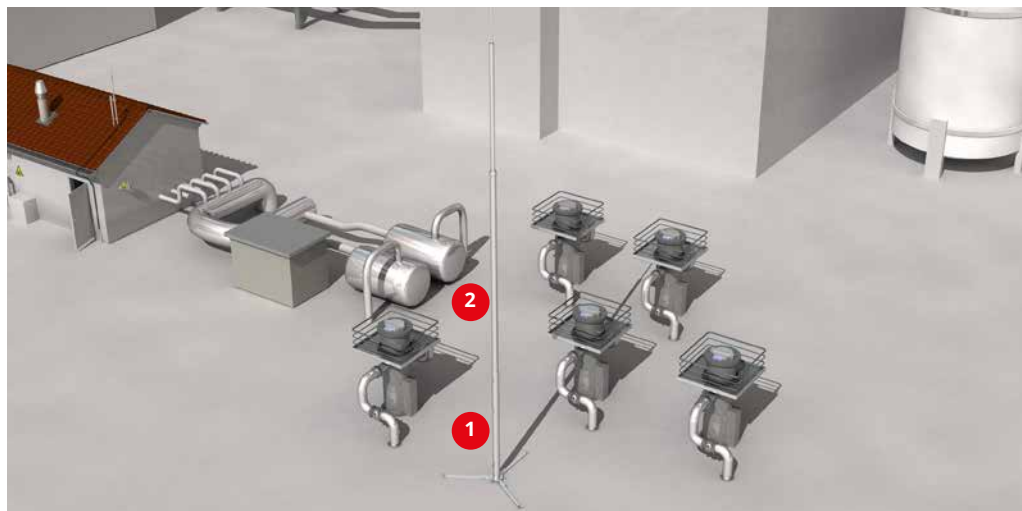
Isolated lightning protection

For isolated lightning protection, telescopic lightning protection masts are completely isolated from the building structure and are solely connected to the building via the earthing system. The isolation prevents potential flash-overs and enables the safe dissipation of lightning currents outside the building.

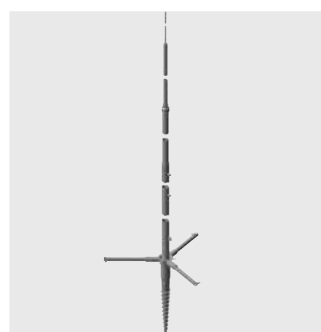


Product range
Telescopic lightning
protection masts

<http://de.hn/9u5yV>



1 Sets: telescopic lightning protection masts with screw-in foundation up to 11 metres in height above ground

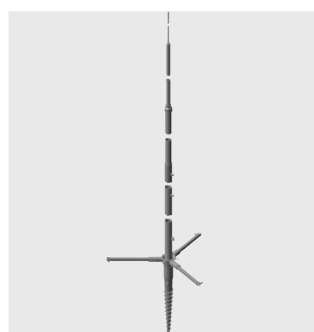


SET: telescopic lightning protection mast 6 m above ground with screw-in foundation

Part No. 103 121

Standard DIN EN 62561-(1+2)

SET components:
Air-termination mast (HDG steel);
Air-termination rod (StSt);
Screw-in foundation (HDG steel)



SET: telescopic lightning protection mast 11 m above ground with screw-in foundation

Part No. 103 126

Standard DIN EN 62561-(1+2)

SET components:
Air-termination mast (HDG steel);
Air-termination rod (StSt);
Screw-in foundation (HDG steel)

2 Telescopic lightning protection mast for bucket or concrete foundation from 13.38 to 24.88 metres above ground

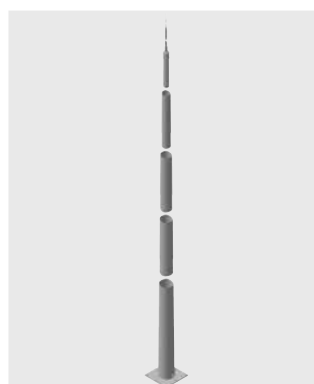


Telescopic lightning protection mast 13.38m above ground for bucket or concrete foundation

Part No. 103 013

Material: HDG steel

Height: 13.38 m above ground



Telescopic lightning protection mast 24.88m above ground for bucket or concrete foundation

Part No. 103 125

Material: HDG steel

Height: 24.88 m above ground

Telescopic lightning protection mast/air-termination mast for protecting installations against direct lightning strikes
The mast is erected in a bucket foundation (pre-fabricated) or an on-site concrete foundation with foundation basket.



Bucket foundation – Version: bucket foundation I

Part No. 103 030

Material: Concrete (C50/60)

Holder: Rd. 8–10 mm

As prefabricated part for easy erection of telescopic lightning protection masts. For masts with a height above ground level from 13.35 to 19.35 m.

Flange plate 400 x 400 mm.



Foundation basket for in-situ concrete – small

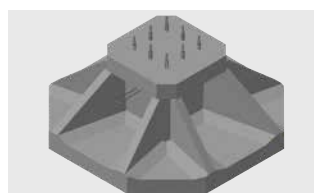
Part No. 103 040

Material: Steel

Holder: Rd. 6–10 mm

For setting in concrete with threaded bolts, suitable for the flange plate of the telescopic lightning protection masts. For masts with a height above ground level from 13.35 to 19.35 m.

Flange plate 400 x 400 mm.



Bucket foundation – Version: bucket foundation II

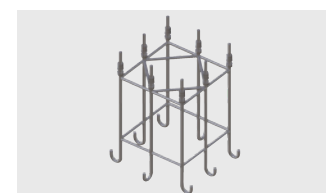
Part No. 103 031

Material: Concrete (C50/60)

Weight: 17 kg, with fixing wedge

As prefabricated part for easy erection of telescopic lightning protection masts. For masts with a height above ground level from 22.35 to 24.88 m.

Flange plate 565 x 565 mm.



Foundation basket for in-situ concrete – large

Part No. 103 041

Material: Steel

Cable routing: loose

For setting in concrete with threaded bolts, suitable for the flange plate of the telescopic lightning protection masts. For masts with a height above ground level from 22.35 to 24.88 m.

Flange plate 565 x 565 mm.

DEHN Services Always at your side

DEHN Engineering Services

Planning support with protection concepts and calculations for external and internal lightning protection. 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.

DEHNplan – design software

With DEHNplan, you can easily plan standard-compliant external lightning protection for your project. The BIM-enabled software facilitates your planning with a visual representation of the protected volume and separation distances. Very helpful in practice: the programme automatically creates a bill of materials.

DEHNsupport Toolbox – design software

Use the DEHNsupport Toolbox software to calculate individual aspects of your lightning protection concept. Four different calculation modules are available here. Risk analysis, calculation of air-termination rod and earth electrode lengths, and calculation of the separation distance. For your project, you obtain an overview plan with the right protective devices.

DEHNconcept

takes on your lightning protection planning:
<http://de.hn/45aV5>



DEHNplan

Fast and standard-compliant external lightning protection:
<http://de.hn/2Dpa4>



DEHNsupport Toolbox

Plan lightning protection systems digitally:
<http://de.hn/6vvro>



Whether support with planning or specific help with a query – take advantage of DEHN's range of services to the extent that suits you best. We support you at every phase of your project: with complete planning, appropriate software, selection guides and the right products.

DEHNacademy – seminar programme

We are happy to pass on our DEHN practical know-how to you. Use the DEHNacademy to keep you and your team up to date as well! The seminar programme for external lightning protection – with practical examples of professional planning, application and installation.

Technical Support

Get yourself some advice. The experts at DEHN's technical support team will be happy to answer your questions on specific products, planning services and software. Get support here. Free, and from experts.

Contact technik.support@dehn.de for a personal consultation

HVI lightning protection – on the web

The latest information, an overview of the products and relevant documents for direct download – on our website you will find all the key information about the HVI lightning protection product range.

DEHNacademy

All seminars and training courses:
<http://de.hn/8JmzS>



Technical Support

<http://de.hn/7p3Ac>



HVI Lightning Protection

Always stay up to date:
<http://de.hn/9nQfg>





<http://de.hn/c7ma1>

**Surge Protection
Lightning Protection / Earthing
Safety Equipment**

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