



HVI Lightning Protection

Separation distances: simple planning,
simple implementation



Can you guarantee that your lightning protection system is safe?

In lightning protection, the separation distance is crucial for personal safety, system protection and fire protection. If separation distances cannot be maintained, there is a risk of flashovers between earthed components, electrical installations and the down conductors. This can lead to electric shock, damage to equipment or fires.

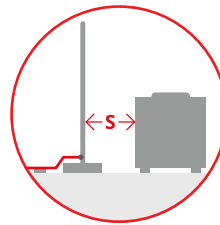
Reliable lightning protection is therefore three-dimensional.

Separation distances between air-termination systems, down conductors and metallic or electrical installations must have the right **horizontal, vertical and depth dimensions**. Theoretically calculable, but often difficult to achieve in practice.

What is the separation distance?

The **separation distance S** is the distance between two conductive parts in which no dangerous sparking occurs.

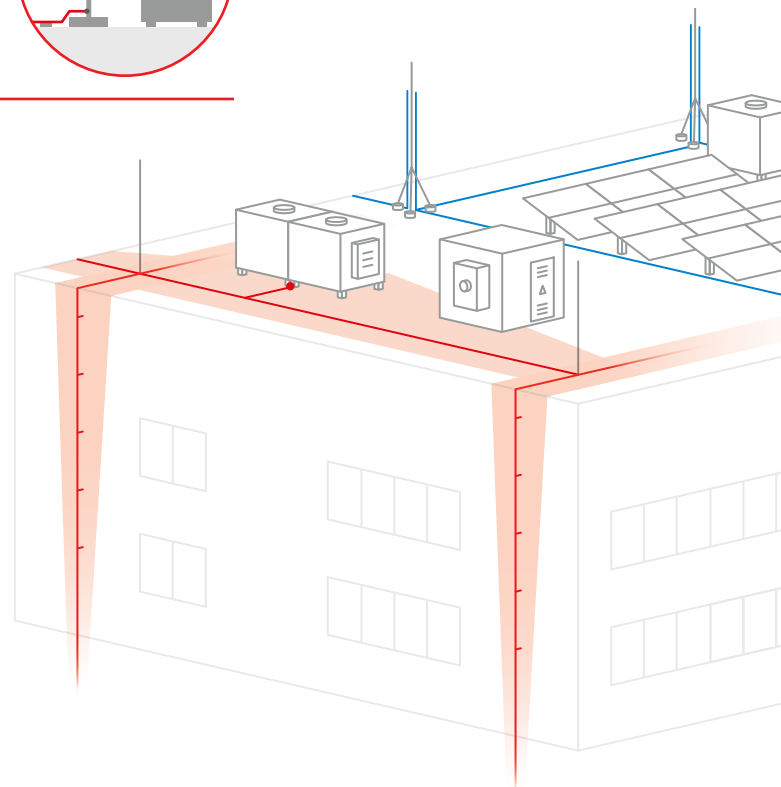
In practice, this means: sufficient space – something sadly often lacking.



Separation distance: key to reliable lightning protection

In lightning protection planning, separation distances must be calculated precisely and adhered to during implementation.

But this is precisely where conventional lightning protection is increasingly reaching its limits. Modern architecture, structural alterations or limited roof space make it difficult to calculate the separation distance and often complicate practical implementation.



Separation distance

Electrical isolation of the external lightning protection system – separation distance:
<http://de.hn/VzH6T>



Conventional lightning protection

HVI Lightning Protection from DEHN

Separation distance

HVI makes lightning protection easier to plan

High-voltage-resistant and insulated down conductors (High-Voltage Insulation / HVI) from DEHN combine special insulation with a semi-conductive sheath. This is a reliable way to prevent flashovers and ensure that lightning currents are safely dissipated, even if the conductors run directly past metal components. HVI technology enables cable routing even in complex architecture or roofs crowded with lots of equipment. This is precisely where conventional approaches usually fail, not only in terms of calculations but also in practical implementation.

HVI Lightning Protection makes it easier for planning engineers and installers to implement complex lightning protection systems and creates permanently safe separation distances. Advantages for you:

Planning

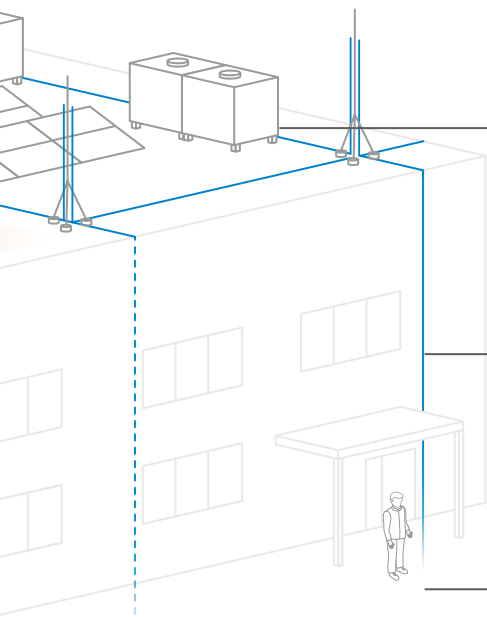
- Compatible with conventional lightning protection
- Large minimum clearances are eliminated

Implementation

- Equipotential bonding is easy to implement
- No extra connection of metal superstructures required

Future-proof

- Free space for future roof superstructures



Safe next to equipment

Conductors can be installed right next to building parts, electrical cables and pipes.

Efficient installation

Modular components and special tools make it quick and easy.

Safe around people

Integrated protection against electric shock for busy areas.

Integration within the building architecture

Colour matching for all conductors with a grey sheath.

HVI – simpler and more economical lightning protection

The choice of a lightning protection system has implications for planning, implementation and operation. It affects not only the technical implementation, but the entire course of the project. Everyday project work quickly makes clear how much lightning protection systems differ in terms of planning and implementation. Particularly in commercial and industrial buildings packed with technical equipment or in retrofitting projects, the choice of system influences the cost for all parties involved.

Typical project situations:

- Roofs with a high density of HVAC systems
- Structural modifications or extensions

In these cases, implementation with conventional lightning protection systems is time-consuming for the planning engineer and complicated for the installer. For the operator, this means projects take longer and cost more money.

HVI addresses this exact issue and reduces complexity where it arises.

A direct comparison illustrates how HVI and conventional lightning protection systems differ.



Challenge	Conventional down conductor with spacers	Equivalent separation distance with an HVI installation
Separation distance compliance	Difficult, often not feasible	Easy and achievable with certainty
Flexibility for retrofitting	Limited	High, even with complex architecture
Risk of flashovers	High if distance not maintained	Minimal due to insulation
Installation complexity for roofs of industrial buildings	High	Reduced
Arrester class for entrance point into building on roof	Type 1 required	Type 2 sufficient

Lightning protection in a nutshell – what you need to know

Classes of LPS as defined by EN IEC 62305

Lightning protection systems are divided into four protection classes in order to provide optimum protection for buildings and installations against the dangers of lightning strikes:

Class I	Class II	Class III	Class IV
Maximum protection for particularly vulnerable objects such as industrial plants, chemical works or large public buildings	For buildings with increased risk, such as commercial buildings or larger residential complexes	Standard for residential and office buildings	Basic protection for less exposed structures such as adjoining buildings or smaller facilities
Interception effectiveness: 99 %	Interception effectiveness: 97 %	Interception effectiveness: 91 %	Interception effectiveness: 84 %
Aim: minimising the risk with maximum exposure	Aim: high protection for medium risk	Aim: reliable protection for typical uses	Aim: basic protection against lightning damage

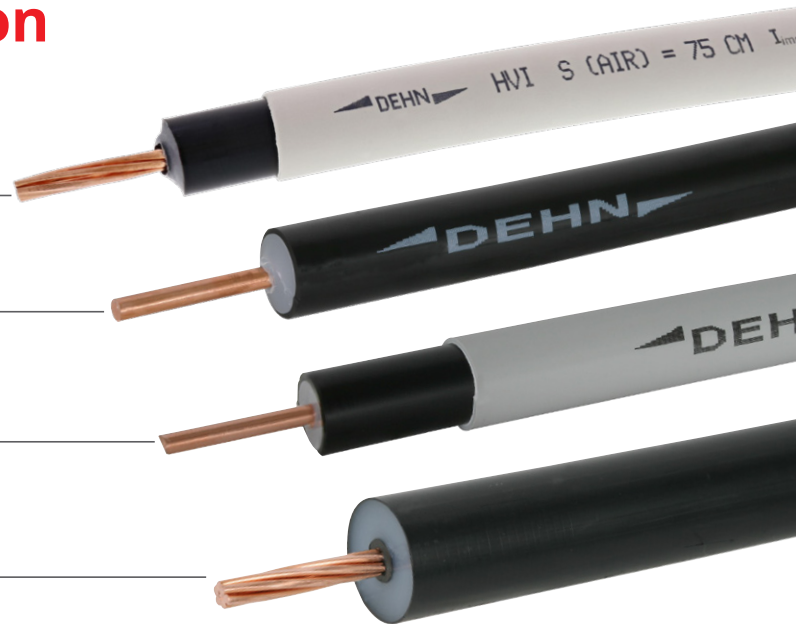
Flexible, practical, reliable – HVI for every application

HVI light plus

HVI light black

HVI light light grey

HVI power



Four versions enable customised planning, simple installation and reliable lightning protection, even with complex roof superstructures or retrofitted lightning protection systems. Each HVI Conductor is tailored to specific installation requirements – roof superstructures and structural conditions determine the choice. The separation distance is crucial.

Your decision-making aid

The table shows at a glance which conductor is suitable for which separation distances. This allows you to quickly and confidently select the optimum solution.

	HVI light plus	HVI	HVI	HVI power
Separation distance in air	≤ 60 cm	≤ 75 cm	≤ 75 cm	≤ 90 cm
Structure	Solid	Solid / stranded	Solid / stranded	Stranded
Version	Signal grey	Black	Light grey	Black
Outer diameter	Ø 21 mm	Ø 20 mm	Ø 23 mm	Ø 27 mm
Lightning current carrying capability	150 kA	150 kA	150 kA	200 kA
Class of LPS (for single down conductor)	II – IV *)	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.

Approval for use in hazardous areas: simplified planning and flexible options in lightning protection construction

To ensure maximum safety in sensitive environments, planning engineers and lightning protection installers can choose from the entire HVI product range without any restrictions. All HVI versions are approved for use in potentially explosive atmospheres, specifically in Ex zones 1 and 21, as well as 2 and 22.

HVI Lightning Protection
<http://de.hn/3p8F9>



HVI light plus – the all-rounder for a wide range of applications

The HVI light plus combines the advantages of all HVI Conductors in a single conductor. Planning engineers and installers benefit from a solution that is easy to plan, quick to install and safe to use, with the flexibility to adapt to a wide variety of project conditions.

- Separation distance $s \leq 60$ cm (in air)
- Lightning current carrying capability 150 kA
- Integrated protection against electric shock
- Minimal installation work thanks to a solid inner conductor
- Grey sheath matches concrete surfaces, can be painted over
- No additional equipotential bonding connection, if $s \leq 45$ cm

Additional technical features:

- Equivalent separation distance $s \leq 60$ cm (in air), or $s \leq 120$ cm (solid building material)
- Classes of LPS II, III and IV when $k_c = 1$ as a single down conductor
- Approval for use in hazardous areas: zones 1/21 and 2/22
- Tested as a single conductor and within the system as per IEC/TS 62561-8
- Conductor cross-section: 16 mm²
- Outer diameter: 21 mm
- Minimum bending radius: 210 mm

More than 20 years' experience in electrically insulated lightning protection

Only DEHN offers planning engineers and installers proven technology and tried-and-tested solutions that allow reliable project delivery.

More information on the
HVI light plus on the web
<http://de.hn/6Ua85>

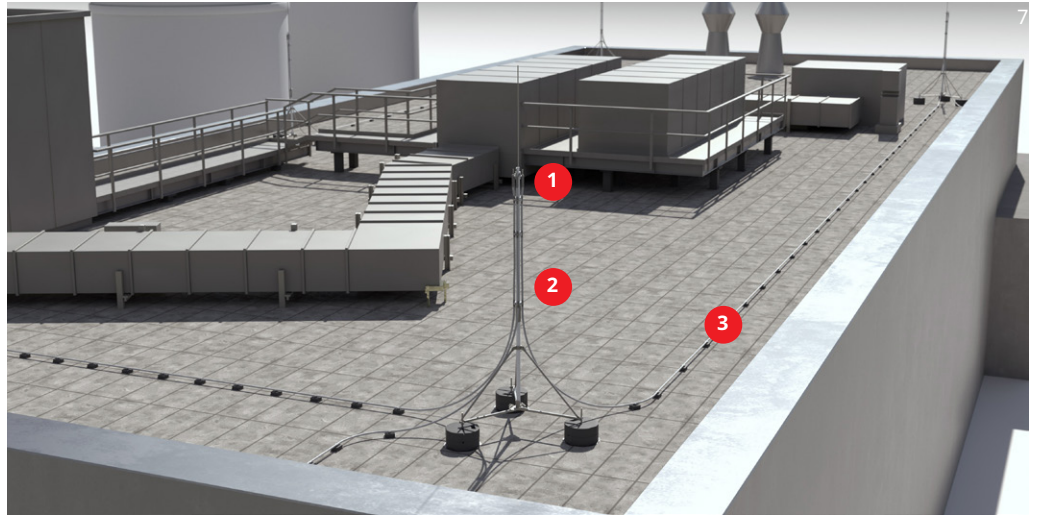


Lightning protection in a nutshell – what you need to know

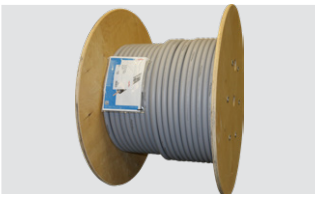
Protection against electric shock in HVI systems

When lightning strikes, life-threatening touch voltages occur on the down conductors of a lightning protection system. So steps must be taken to ensure that no one can come into contact with the down conductors. If this is not possible due to insufficient distance or other shielding measures, HVI Conductors from DEHN are a safe alternative. The integrated touch voltage protection of the grey HVI Conductors opens up new possibilities for planning and installing lightning current down conductors, especially in confined spaces near house entrances, windows and other areas.

Product range
HVI light plus
<http://de.hn/9oBNG>



1 Conductor and connection heads

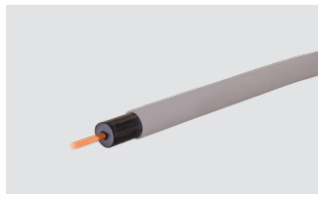


HVI light plus Conductor
 (On a 100-m reel)

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.

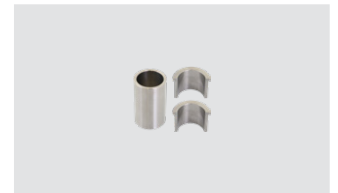


Tripod for supporting tubes
 with side outlet

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

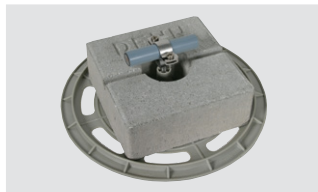


HVI light plus Ex W55 holder

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: Stainless
 steel / aluminium / plastic

Conductor holder: 4x



Fixing kit for
 Ø40/50 supporting tubes

Part No. 819 296 / 819 297

Material: Plastic

4x in GRP area

HVI Conductor – tried and tested for down conductors where $s \leq 75$ cm

- Separation distance $s \leq 75$ cm (in air)
- Lightning current carrying capability 150 kA
- Two versions: black or grey
- Grey version with protection against electric shock
- Flexible conductor selection: solid or stranded
- Supporting tubes made of GRP, stainless steel or aluminium for harsh environments

The HVI Conductor protects large roof-mounted structures, antennas or masts with IT equipment from direct lightning strikes – even in potentially explosive atmospheres.

Flexible integration in new and existing systems

Directly for earthing or into an existing system

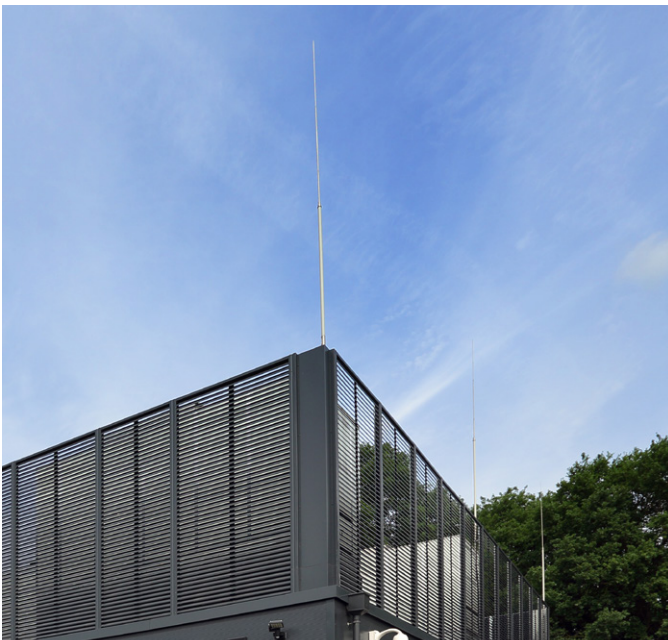
The conductor can be routed directly to the earthing system or integrated into existing lightning protection systems, even with elevated or separate ring conductors.

Compact installation, no additional wind load

The HVI Conductor can be installed inside the supporting tube and therefore creates no additional surface exposed to wind. To reduce the separation distance by sharing the current, or if long conductor lengths are required, up to four additional conductors can be installed on the outside of the supporting tube using a special fixing kit.

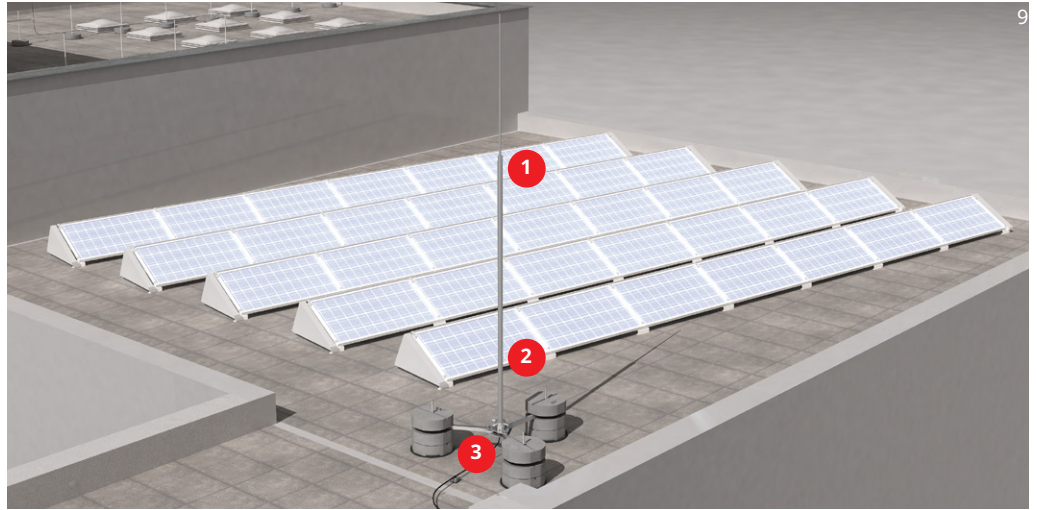
Additional technical parameters:

- Equivalent separation distance $s \leq 75$ cm (in air), or $s \leq 150$ cm (solid building material)
- Classes of LPS II, III and IV when $k_c = 1$ as a single down conductor
- Approval for use in hazardous areas: zones 1/21 and 2/22
- Tested with I_{imp} 150 kA ($k_c = 1$; 10/350 μ s), tested to IEC/TS 62561-8
- Conductor cross-section: 19 mm²
- Outer diameter: 23 mm black; 20 mm grey
- Minimum bending radius: 200 mm black, 230 mm grey

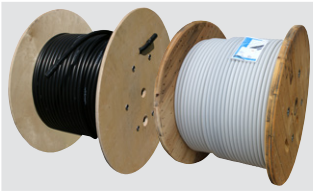


HVI product range

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



1 Conductor and connection heads

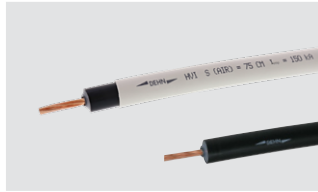


HVI Conductor
(on a reel 100 / 400 m)

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

Colour: Black / light grey

Diameter: 20 mm / 23 mm

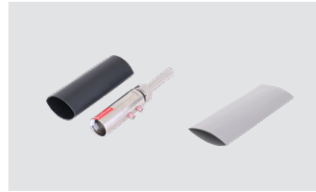


HVI Conductor
(cut to length)

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 installa-
tion 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



Hinged four-legged stand
with half shell for Ø40/Ø50
tubes

Part No. 107 490

Material: StSt

Radius: 680 mm

3 Conductor holder and fixing components



Wall mounting bracket
adjustable range 50-200 mm

Part No. 105 344

Material: StSt

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



Conductor holder with ten-
sioning 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 – maximum protection for sensitive areas

- Separation distance $s \leq 90$ cm (in air)
- Maximum lightning current carrying capability in the HVI product range: 200 kA
- Ideal for large buildings and critical infrastructure
- Can be used in class of LPS 1 with one down conductor

The HVI power Conductor is the most powerful conductor in the HVI series and is used wherever particularly robust lightning protection is required – for example, in industrial plants, data centres, hospitals or similarly sensitive areas. If class of LPS 1 is required and only one down conductor is possible, the HVI power is used – with a lightning current carrying capability of 200 kA.

Reliable lightning protection in hazardous areas

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. In potentially explosive atmospheres, the special type of cable routing used for HVI power Conductors protects against flashovers.

Additional technical parameters:

- Equivalent separation distance $s \leq 90$ cm (in air), or $s \leq 180$ cm (solid building material)
- Classes of LPS I, II, III, IV when $k_c = 1$ as a single down conductor
- Approval for use in hazardous areas: zones 1/21 and 2/22
- Tested with I_{imp} 200 kA ($k_c = 1$; 10/350 μ s), tested to IEC/TS 62561-8
- Conductor cross-section: 25 mm²
- Outer diameter: 27 mm
- Minimum bending radius: 270 mm

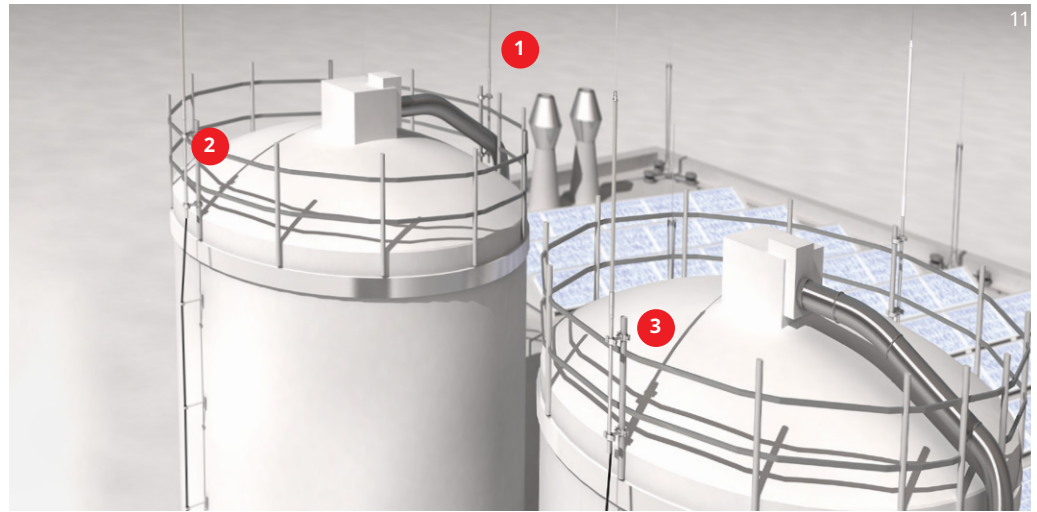
Designed for harsh environments:

- Stainless steel mounting materials
- Supporting tube made from aluminium or stainless steel

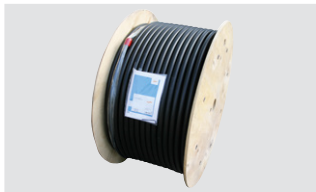


HVI power product range

<http://de.hn/c9GhW>



1 Conductor and connection heads

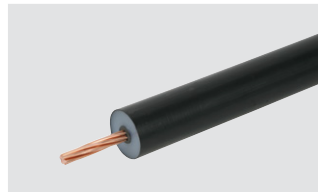


HVI power long Conductor
(On a 100-m reel)

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 and stands



Supporting tube with air-termination 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

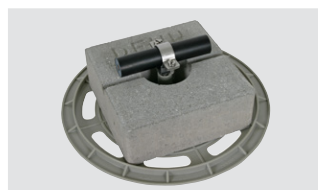


Conductor holder with plastic base

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

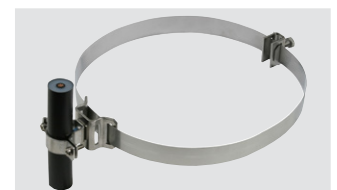


HVI power Ex P240 holder

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

HVI check – measuring system for reliable status checks

HVI check can be used to reliably detect mechanical and electrical damage such as holes or electrical breakdown caused by overloads. Two measuring methods (1 kV and 15 kV) enable targeted testing directly on site – with easy installation.

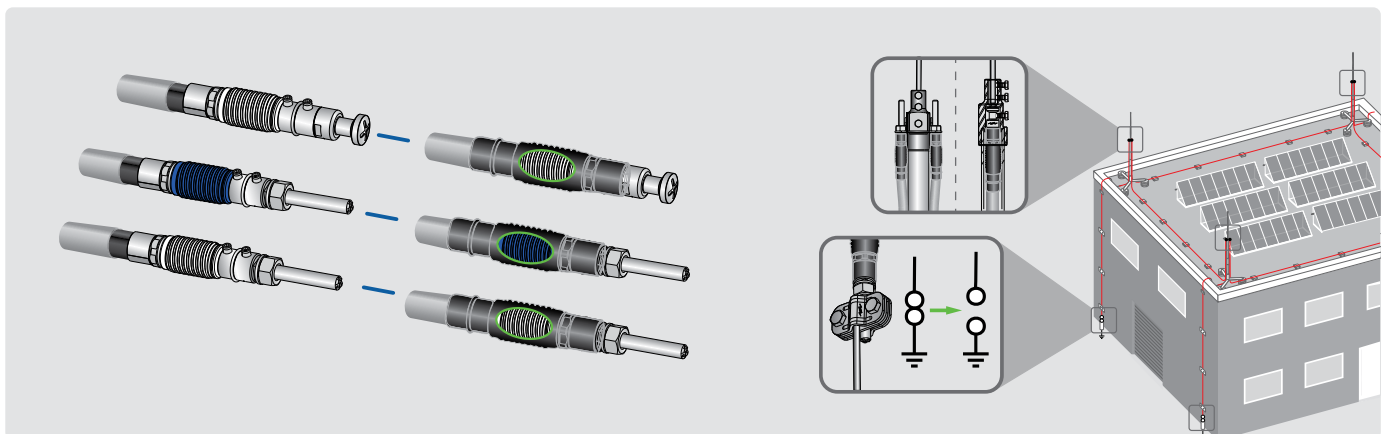
Advantages at a glance

- **Can be used flexibly:** Choice between 1 kV for general testing and 15 kV for targeted search for disruptive discharge drill holes
- **Reliable diagnostics:** Mechanical and electrical damage is detected with certainty
- **Easy to use:** Use with commercially available insulation measurement devices

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.



Testable, insulated connection elements and simplified measurement principle

HVI check test instruction:
<http://de.hn/4cYPo>



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	Measuring point terminal	ISO head stripping tool
HVI light plus	Part No. 819 646	Part No. 819 647	Part No. 819 648	Part No. 819 649	Part No. 597 125
HVI	Part No. 819 173	Part No. 819 174	Part No. 819 175	Part No. 819 649	Part No. 597 126
HVI power	Part No. 819 176	Part No. 819 177	Part No. 819 178	Part No. 819 179	Part No. 597 128
	Material: StSt	Material: StSt	Material: StSt	Material: StSt	Material: Aluminium
	Connector: Bolt Ø 10 mm, L 50 mm	Connector: special mushroom head	Connector: M12 thread, square	Clamping range: Ø 18–20 mm	Cutting head

Insulating cap for the dielectric withstand test	Discharge bar	Warning sign	Chain post set Secur
Part No. 597 815	Part No. 758 021	Part No. 700 059	Part No. 700 110
Material: Plastic	Material: Glass-fibre reinforced polyester tube	Material: Free foam, weather-resistant	Material: Plastic Base material: Cement
Opening: Ø 34 mm	Connector: Spring-loaded earth clamp		Colour: Red / white



Reliable lightning protection planning – step by step

- **Initial situation**
Location on the roof surface where, for example, an air conditioning or ventilation system is to be installed.
- **Calculating the necessary separation distance based on a conventional lightning protection system**
The separation distance is determined using the protected volume display in DEHNplan.
- **Determining the conductor and air-termination system**
Selection of the right HVI Conductor as per separation distance calculation. Selection of the right supporting tube/air-termination rod heights as per the protected volume.
- **Determining the gust wind speed**
The applicable wind load is determined based on the relevant location and environmental parameters. This results in a design wind speed to be used for subsequent planning.
- **Selecting fixings / concrete blocks**
The gust wind speed is the basis for determining the necessary concrete blocks / railing holders.
- **Documentation**
Clear summary of all components in a bill of materials, as well as detailed set-up and installation information for safe implementation.

The challenge for lightning protection

Integrating technical installations such as PV, flue gas, air-conditioning and ventilation systems requires special planning. Many industrial, functional or commercial roofs only have limited space, which makes professional installation of conventional lightning protection systems difficult.

HVI makes planning easy

HVI reduces dependence on local conditions right from the design stage. Flexible cable routing and separation distances that can be reliably maintained enable standard-compliant design – even in confined roof spaces, under PV frames or with only one down conductor.

From the risk analysis to standard-compliant planning



DEHNrisk – the future of lightning protection analysis

With DEHNrisk, you can determine the lightning risk for structures comprehensively, quickly and precisely. The web-based application provides support in determining the lightning protection class and other necessary measures.

More about DEHNrisk on the web:

<http://de.hn/GGqp4>



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.

More information about DEHNplan:

<http://de.hn/8Uvn4>



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We work with you to find the optimum lightning and surge protection solution. From start to finish. Or very flexibly for certain parts.

Discover our wide range of services with which we support you in every phase of your project: from risk assessment to planning the earthing system and external lightning protection.



Plan reliably – taking wind loads into account

Wind load is a key factor when planning air-termination systems in lightning protection systems. Only with correct calculations can damage such as tipping over or the breaking of air-termination rods be avoided.

The Eurocode EN 1991-1-4 forms the basis for structural design throughout Europe, supplemented by national standards. Whether wind zone, terrain type or special conditions such as ice build-up or high altitudes, the multitude of potential influencing factors makes careful calculation essential.

More information on the web
<http://de.hn/a1x9T>





<http://de.hn/3p8F9>

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

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