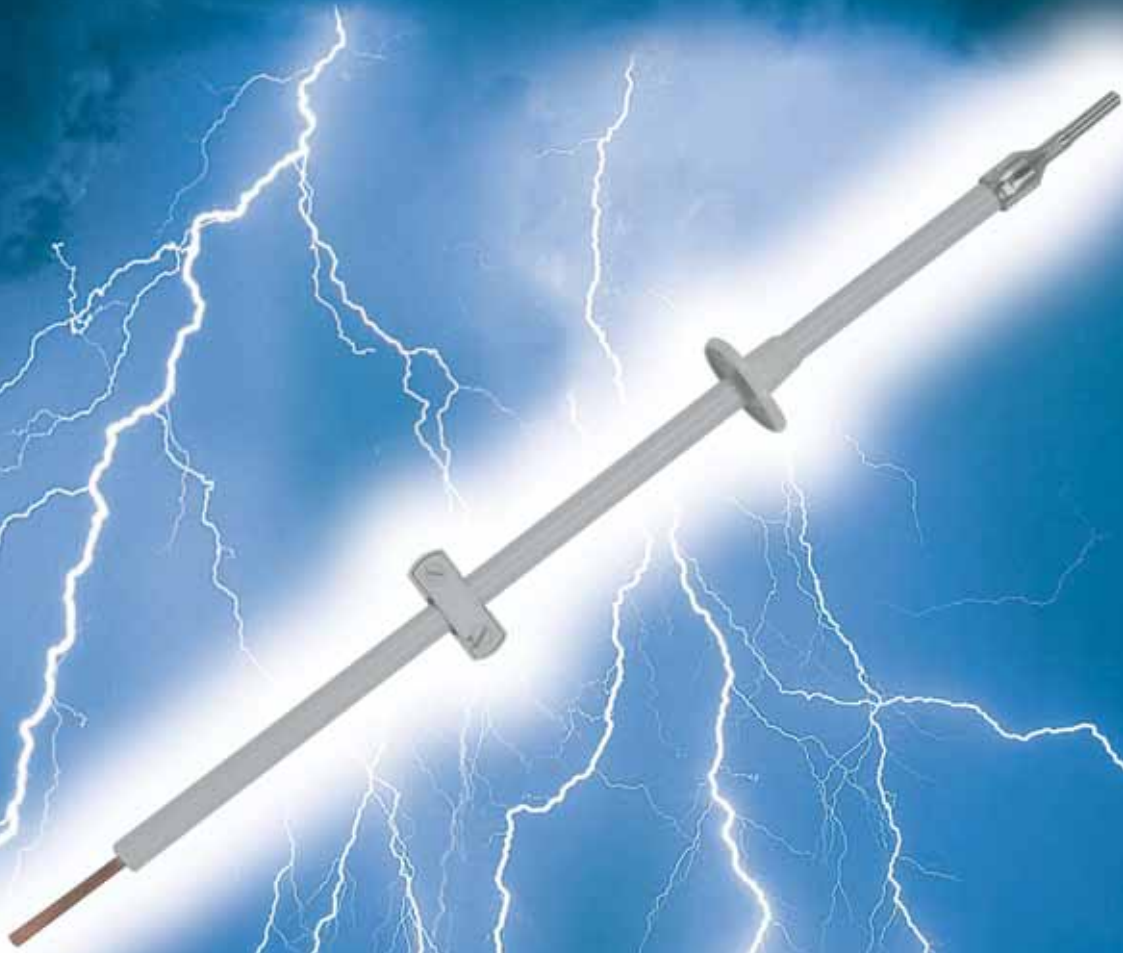




DEHN + SÖHNE

DEHNconductor System – CUI Conductor.





How to control Touch Voltages at Down-Conductor Systems DEHNconductor System - CUI Conductor

Apart from lightning protection for buildings, the new series of lightning protection standards IEC 62305 defines also protection measures for persons within or close to buildings affected by lightning. The risk analysis of IEC 62305-2 defines hazards to persons as parameter D1 (loss of human lives).

IEC 62305-3 points out that in special cases, touch voltages outside of the building and close to the down-conductor systems, can become highly dangerous, although the lightning protection system was designed according to the latest state of standardisation.

Special cases are e.g. entrance areas, sheltering roofs of buildings with high frequency of visitors, like theatres, cinemas, malls, where bare/non-insulated down-conductor systems and lightning protection earthing electrodes are installed close to them.

In case of structures that are especially exposed (to lightning), and which are freely accessible by the public, e.g. shelters, also measures against impermissibly high touch voltages may become necessary.

Public gathering can be locally different and limited, e.g. entrance areas of malls or upleading ways of outlook towers. Therefore only these especially hazardous areas also require measures for reduction of touch voltages.

Definition of touch voltages:

Touch voltages are voltages affecting a human being between his standing surface on the ground (distance approx. 1 m from the down-conductor system) when contacting the down conductor. The current flows via the hand to the body and to the feet (see Fig. 1).

Additionally, the step voltage around the structure has to be considered.

The hazardous area for persons outside of the building is defined in IEC 62305-3.

LPZ 0_C: Risk of contact and step voltages to living beings. Defined within a height of 3 m and a distance of 3 m from ground level outside a building or structure.

According to DIN V VDE V 0185-3 Main Section Subclause 1.7.4, the area to be protected against touch voltages corresponds to the height of the finger tips of a human being with raised hand as well as to separation distance s (see Fig. 2).

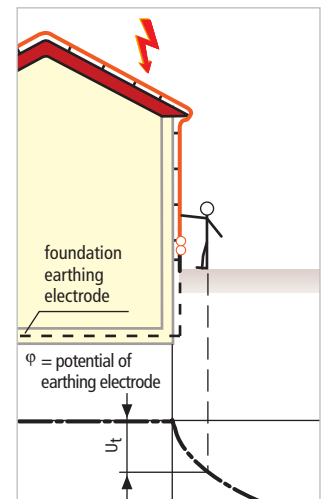


Fig.1: Illustration of touch voltage U_t

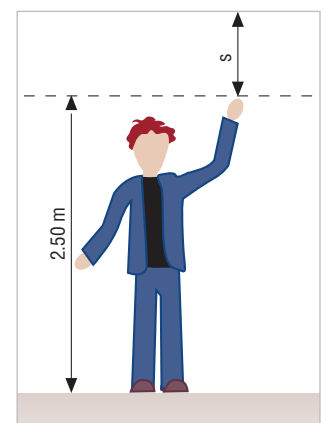


Fig.2: Protected area for a person

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According to DIN V VDE V 0185 Part 3 Main Section 1 Subclause 4.3.7 or Main Section 4 Subclause 5.3, the risk of a person to be injured when touching the down conductor can be reduced by taking the following measures:

- The probability of people gatherings can be reduced by installing informative and prohibitive signs or perhaps even barriers
- The position of the down-conductor systems can be changed, e.g. no installation close to entrance areas of the building.
Note: A metal downpipe, even if it is not defined as a down conductor, can represent a risk to people when being touched. Here, the metal pipe can be replaced by a PVC pipe
- The down conductor is coated with insulating material (min. 3 mm cross-linked polyethylene (XLPE)) with a resistance against impulse withstand voltages of 100 kV (wave form 1.2/50 μ s)
- The specific resistance of the surface layer of the ground, in a distance of up to 3 m around the down conductor, is not less than 5 k Ω m. Generally, a layer of asphalt, 5 cm thick, can fulfil this requirement

There is no risk of impermissibly high touch voltages from steel frame or reinforced concrete constructions, if the reinforcement is interconnected safely or the down conductors are integrated into the concrete. Furthermore, touch voltages can be neglected for metal façades, if these are integrated into the equipotential bonding and/or used as natural components of the down-conductor system.

The new CUI conductor helps to avoid touch voltages in hazardous areas (LPZ 0_C) (see Fig. 3). The CUI conductor has an inner copper conductor with a diameter of 8 mm and a high-voltage resistant insulation (see Fig. 4).

The requirements on these conductors are

- an impulse voltage resistance of 100 kV (1.2/50 μ s) and
- avoiding of creepage sparkovers even in rain

The impulse voltage resistance of 100 kV (1.2/50 μ s) is achieved with an insulation made of a special cross-linked polyethylene (XLPE).

Without taking corresponding measures, high impulse voltages cause sparkovers at insulating surfaces. This effect is known as a creepage sparkover. If the creepage discharge inception voltage is exceeded, a surface discharge is initiated, which can easily spark over a distance of some metres to earthed parts.

In order to avoid upcoming creepage discharges even in rain, the CUI conductor is supplied with an additional shield to provide a dry area. Fig. 5 shows this shield on the conductor and the drops after the rain test.

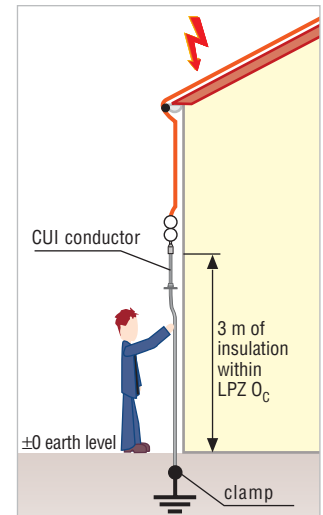


Fig.3: Protective measures against shock voltage



Fig.4: Design of a CUI conductor



Fig. 5



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When developing the CUI conductor, it was tested with "standardised rain" according to DIN IEC 60 Part 1 (VDE 0432 Part 1) Subclause 9. During this test, a defined volume of water was sprayed on the conductor with a spraying angle of approx. 45°. This test is shown in Figs. 6 and 7.

The CUI conductor is available in two standard lengths, 3.5 m and 5 m, and is mounted vertically to the wall with the corresponding conductor holder. The head piece and shield are premounted by the manufacturer. The conductor can be shortened at site, but not be extended.

For connecting to the down conductor, e.g. isolating or MV clamps can be used. When connecting the CUI conductor to the earth-termination system, e.g. cross units can be used, which have to be supplied additionally with anticorrosive elements.

For installing the CUI conductor, DEHN installation instructions No. 1482 have to be observed.



Fig. 6



Fig. 7



CUI Conductor
Inner conductor
Insulation
Outer diameter
Colour

Cu (Rd 8 mm)
IPE
approx. 20 mm
light grey

Type	Part No.
CUI conductor length 3.5 m	830 208
CUI conductor length 5 m	830 218

Conductor holder for installing at the wall of the building

Conductor
Height 19 mm

Conductor
Height 10 mm

Conductor
Cleave



Part No. 275 220



Part No. 275 229



Part No. 275 129

Support Rd	Material	Fixing hole	Part No.
20 mm	plastic	∅ 6.5 mm (M8 thread)	275 220
20 mm	StSt (V2A)	∅ 6.5 x 16 mm	275 229
20 mm	StSt (V2A)	∅ 6.5 x 8 mm	275 129

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