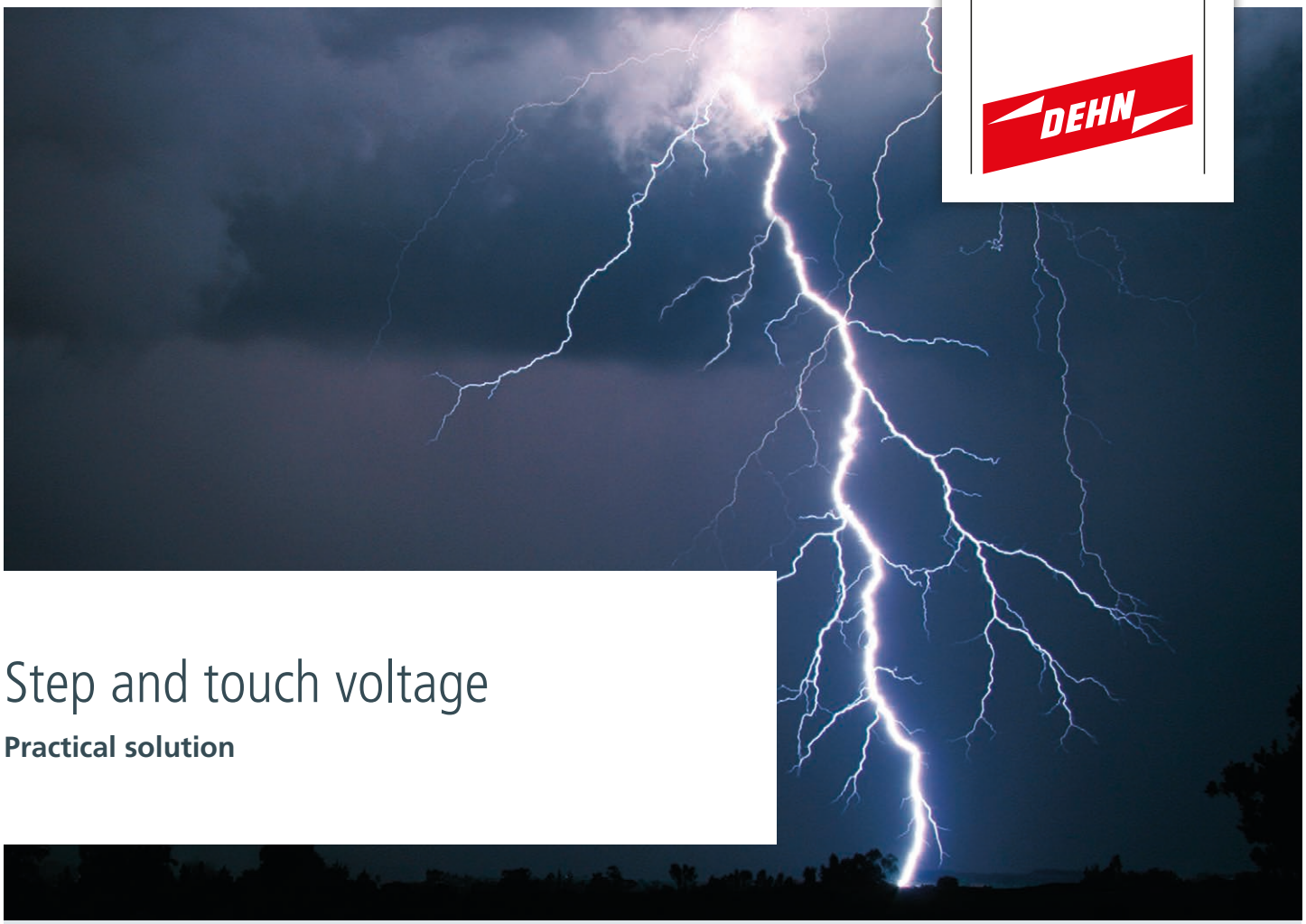


Step and touch voltage

Practical solution

Contents

Step and touch voltage

Practical solution

IEC 62305-3 (EN 62305-3) points out that, in special cases, touch or step voltage outside a building in the vicinity of the down conductors can present a life hazard, even if the lightning protection system has been designed according to the latest standards. Special cases are, for example, the entrance areas or covered areas of highly frequented structures such as theatres, cinemas, shopping centres or nursery schools where bare down conductors and earth electrodes are in close proximity. Measures against impermissibly high step and touch voltages may also be required for structures which are particularly exposed (prone) to lightning strikes and freely accessible to the general public. These measures (e.g., potential control) are primarily taken for churches, observation towers, shelters, floodlight pylons in sports grounds and bridges. The number of people can vary from place to place (e.g., in the entrances of shopping centres or the stairwells of observation towers). Therefore, measures to reduce step and touch voltage are only required in these high-risk areas.

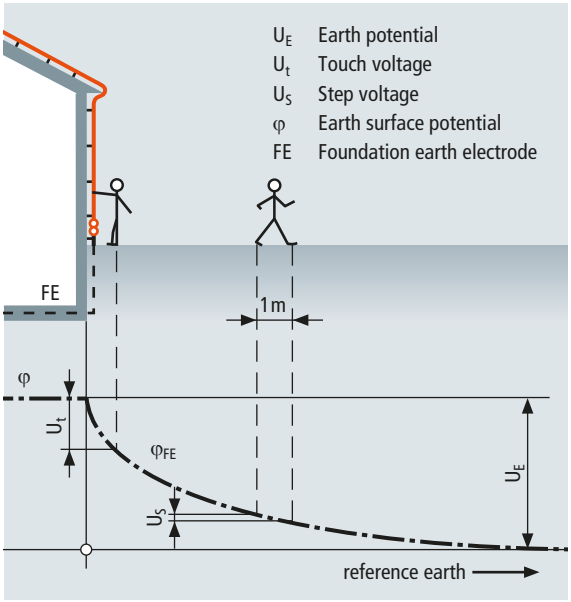
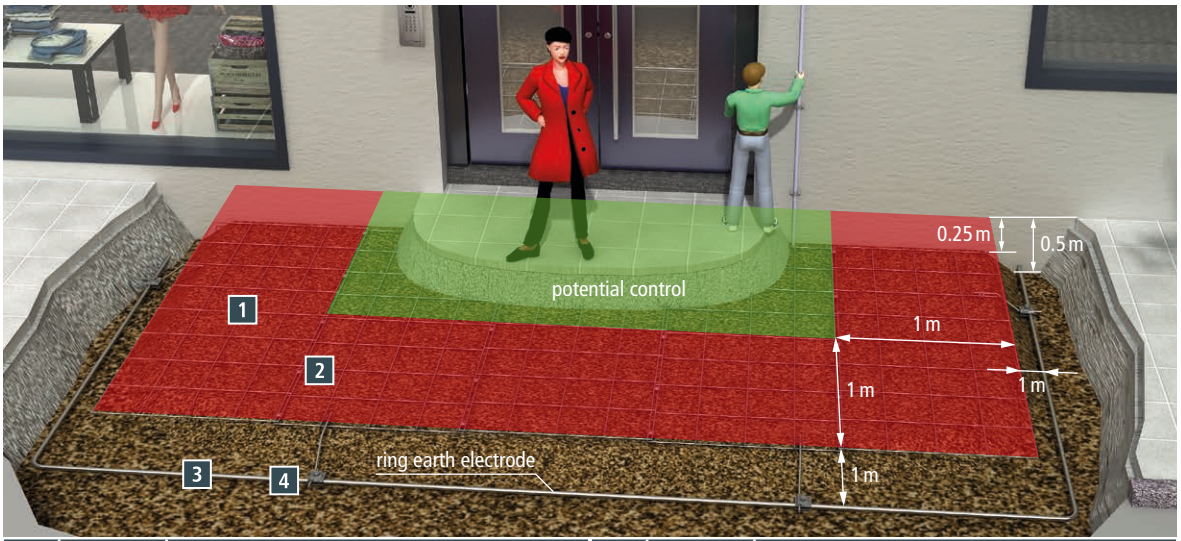


Figure 1 Touch and step voltage

Definition of step voltage

Step voltage is a part of the earth potential which can be bridged by a person taking a step of 1 m. The current path runs via the human body from one foot to the other (**Figure 1**).
The step voltage depends on the shape of the potential gradient area. As shown in the figure, the step voltage decreases as the distance from the building increases. The risk for people therefore becomes lower, the further away they are from the structure. A measure to reduce this risk is as follows.



No.	Part No.	Component	No.	Part No.	Component
1	618 214	Mesh mat V4A (2 m x 1 m)	3	860 020	Round wire 10 mm V4A (20 m)
2	540 271	Connecting clamp for mesh mats	4	390 079	MV clamp V4A

Figure 2 Potential control by means of mesh mats

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Preventing step voltage by installing mesh mats

If the areas where people might be lingering are defined (e.g. shelters, platforms), step voltage can be prevented by potential control. In practice, mesh mats with a mesh size ≤ 0.25 m x 0.25 m are installed in the foundations/ground below the areas on which people stand.

To ensure a long service life of this metal grid, it is advisable to use stainless steel (V4A, e.g. material no. AISI/ASTM 316 Ti) mesh mats with a rod diameter of 3 to 4 mm. It must be ensured that they are pickled and passivated as required by DIN VDE 0151. Mesh mats are installed max. 0.25 m below the ground surface. In addition, a ring earth electrode must be installed 1.0 m from the mesh mats at a depth of 0.5 m. The mesh mats must be installed at least 1.0 m beyond the area to be protected (building demarcation).

What is more, they must be connected to the down conductor and earth-termination system of the building. Please note that leaving the mesh mats during a lightning strike can present a life hazard.

The mesh mats can be connected as follows (**Figure 3**):

- Possibility 1: Joint-to-joint installation
- Possibility 2: Overlapping installation

Protection against touch voltage

Touch voltage is the voltage between the down conductor and the feet of a person (about 1 m away) in contact with the down conductor. The current path leads from the hand via the body to the feet (**Figure 1**). The area in which people outside a building are at risk of experiencing touch voltages is defined as up to a height of 3 m from the earth and a radius of 3 m from the down conductor. The CUI Conductor is connected to the existing foundations / ring earth electrode of the building.

According to the standard, an exposed down conductor must be covered with insulating material with an impulse withstand voltage of 100 kV (1.2/50 µs), e.g. at least 3 mm cross-linked polyethylene, to effectively protect people from injury resulting from touch voltage.

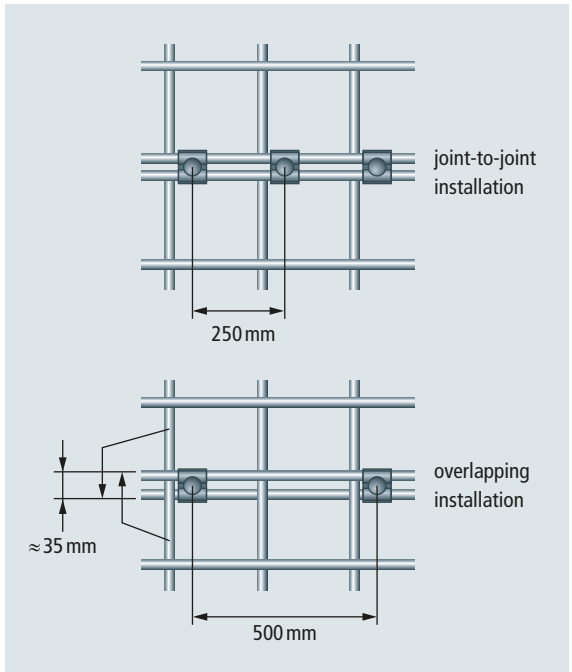

Figure 3 Connection of mesh mats

No.	Part No.	Component
1	830 208	CUI Conductor (3.5 m long)
2	275 220	Conductor holder for CUI Conductor
3	390 079	MV clamp V4A

Figure 4 Protection against touch voltage by means of a CUI Conductor

Step and touch voltage

Practical solution

The CUI Conductor (insulated copper) has an inner copper conductor with a diameter of 8 mm and high-voltage-resistant insulation.
These conductors should meet the following requirements:

- Impulse withstand voltage of 100 kV (1.2/50 µs) and
- Prevention of creeping flashover even in rainy conditions.

To prevent creeping flashover even in rainy conditions, the CUI Conductor features an additional sheath which forms a dry area.

Conclusion

The measures explained in this practical solution allow you to implement a safe and practical protection concept against step and touch voltages. Touch-proof down conductors (CUI Conductors) and mesh mats for coping with step voltages are the prerequisite for reliable personal protection. This allows you to implement a safe overall concept according to IEC 62305-3 (EN 62305-3).

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PL014/E/0819