Special measures are required to provide antistatic functionality for floor coverings in areas where mixtures of explosive substances, gases, vapours, fogs, dusts or sensitive measurement equipment are handled or processed.

Such applications include explosives factories, battery installations, gas supply stations, chemical plants, coatings manufacture and processing facilities, laboratories, computer rooms, operating theatres and clean rooms.

The design and construction of antistatic flooring is governed by the following standards and guidelines:

DIN 18352	Tile laying works
AGI work-sheet S 30 March 2005	Antistatic floor coverings (for applications requiring high acid resistance)
BG RCI T033 August 2016	Guidelines for the avoidance of ignition hazards from static electricity
TRGS (Technical Rules for Hazardous Substances) 727 January 2016	Avoidance of ignition hazards due to electrostatic charges

Electrotechnical background:

A person walking over certain types of flooring may experience a discharge of static electricity when touching another body or object (e.g. a door handle). Other than the possible results of shock, static sparks of this kind, which have been felt by everyone at some time or other, seldom pose any real danger to the human body.

In the aforementioned facilities, however, these otherwise innocuous electrical discharges must be avoided at all costs due to the potential damage they may wreak – from the destruction of electronic components to the explosion of entire plants.

Electric charges are a key factor in electrotechnical applications. All persons and objects contain positive and negative charges which normally cancel each other out (neutral state).

Static electricity occurs where solid insulators or liquid substances are in motion or where solid objects and materials are mechanically separated, e.g. by lifting, friction, crushing or pouring. Shifts in electric charges are also caused by the flowing, pouring or spraying of liquids and by the flow of gases and vapours containing small quantities of finely distributed solids.

This process of charge transfer leads to electric potential differences and so-called electrostatic build-up.

Medical facilities (treatment rooms etc.)

Laboratory space subject to explosion hazards

Fundamentals

Static electricity flows in such a way as to eliminate electric potential differences. In other words, contact between an electrostatically charged person/object and a conductive person/object will result in a spontaneous equalization of electric charge (as with the door handle).

This static sparks resulting from this potential equalization may suffice to ignite an explosive atmosphere.

Electric fields are a further by-product of electrostatic build-up. These may impair or halt the proper functioning of sensitive equipment.

Although the occurrence of static electricity can never be prevented, its impact may be mitigated through the choice of suitable materials. Excessive electrostatic build-up on persons and objects and the risk of static sparks may be eliminated by ensuring uniform static dissipation via the floor surface, i.e. by means of suitable earthing arrangements.

Electrical conductivity is a function of electrical resistance (R). While floor coverings with electrical resistance $R < 10^9\ \Omega$ are generally classed as antistatic, lower resistances are sometimes required depending on the specific use (see ZH 1/200).

Given the varying requirements placed on the static dissipation performance of system materials (ceramics, adhesives, joints etc.), detailed, project-specific applications counselling is strongly recommended.

Floor systems are required to comply with the following requirements:

Spaces	Required resistance to earth (RE) of flooring
Facilities housing electronic equipment, e.g. computer centres, computer server rooms, specially equipped offices	$RE < 1 \times 10^9\ \Omega$
Unprotected electronic assemblies or components subject to personal safety requirements, e.g. test areas in electronics manufacturing facilities	$RE < 1 \times 10^8\ \Omega$
Unprotected electronic assemblies or components, e.g. laboratories for production and repair of electronic equipment	$RE < 1 \times 10^8\ \Omega$
Facilities with explosive atmosphere, e.g. laboratories, gas pressure regulating stations	$RE < 10^8\ \Omega$
Medical facilities, freshly laid	$RE < 10^7\ \Omega$
After 4 years	$RE < 10^8\ \Omega$
HF surgery	$RE > 5 \times 10^4\ \Omega$
Facilities for production and storage of explosives, ammunition or other explosive substances	$RE < 10^6\ \Omega$

System solution

System assembly

1 Substrate:
Concrete, cement screed, calcium sulphate (anhydrite) screed, existing tiling etc.

2 Earthing:
Earth bar (per 50 m²) to VDE (German Association for Electrical, Electronic and Information Technologies) regulations (preparation and installation by qualified electrician)

3 Grid layout:
Copper strip grid laid at max. 4–5 m centres.
Minimum copper strip cross-sectional area 1 mm².
Example:
- SE-CU 58 material no. 20070
- E-CU 58 material no. 20065
- 3 M conductive strip no. 1181, width 19 mm
- Sopro copper strip

4 Covering composition depending on ceramic type:

4.1 Non-conductive tile body with special conductive glaze

4.2 Continuously conductive ceramic body

4.3 Non-antistatic tile covering with antistatic tile grout and antistatic adhesive bed

Product recommendation

Bedding and grouting materials:
Depending on the ceramic covering composition (see Point 4), the bedding and grouting materials shall be made conductive by mixing in a special conductive dispersion (Sopro ELD 458).

Sopro ELD 458 …

… is a conductive dispersion used to prepare flexible, static-dissipating, hydraulically setting, thin-bed tile adhesives and tile grouts.

For static dissipation in:

- operating theatres, computer rooms and offices
- power stations, chemical plants
- production and storage facilities subject to explosion hazards

Note:

Addition of Sopro ELD 458 conductive dispersion causes tile grout to turn black/anthracite! Tile grout remains black/anthracite when cured!

Sopro ELD 458

Bonding

Sopro's No.1
for walls and floors

Sopro VF XL 413
for floors only

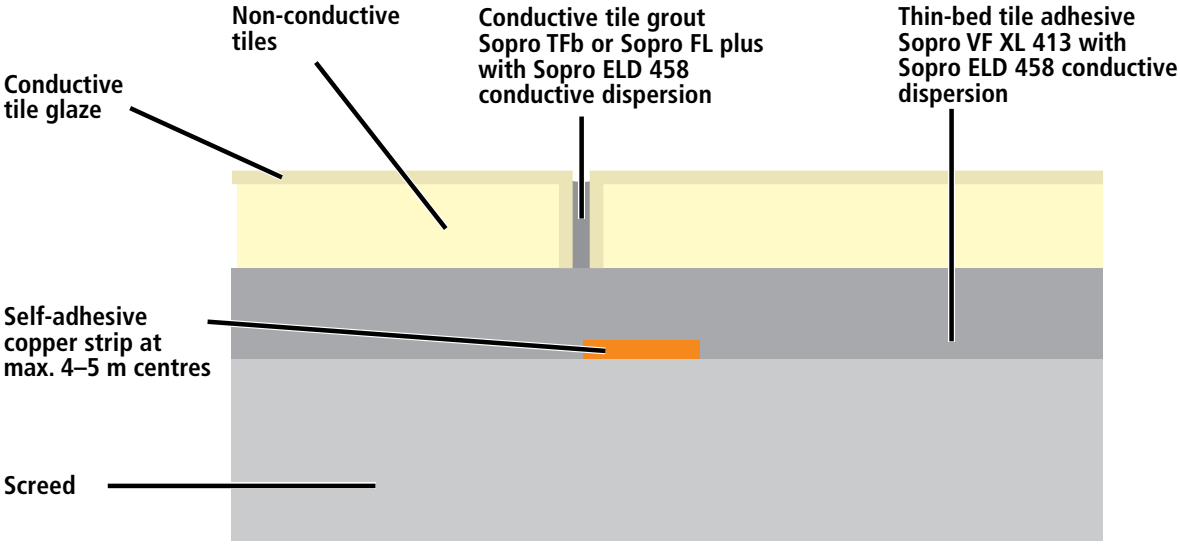
Grouting

Sopro TFb or
Sopro TF+

Sopro FL plus or
Sopro DF 10

System solution

4.1 Non-conductive tile body with special conductive glaze

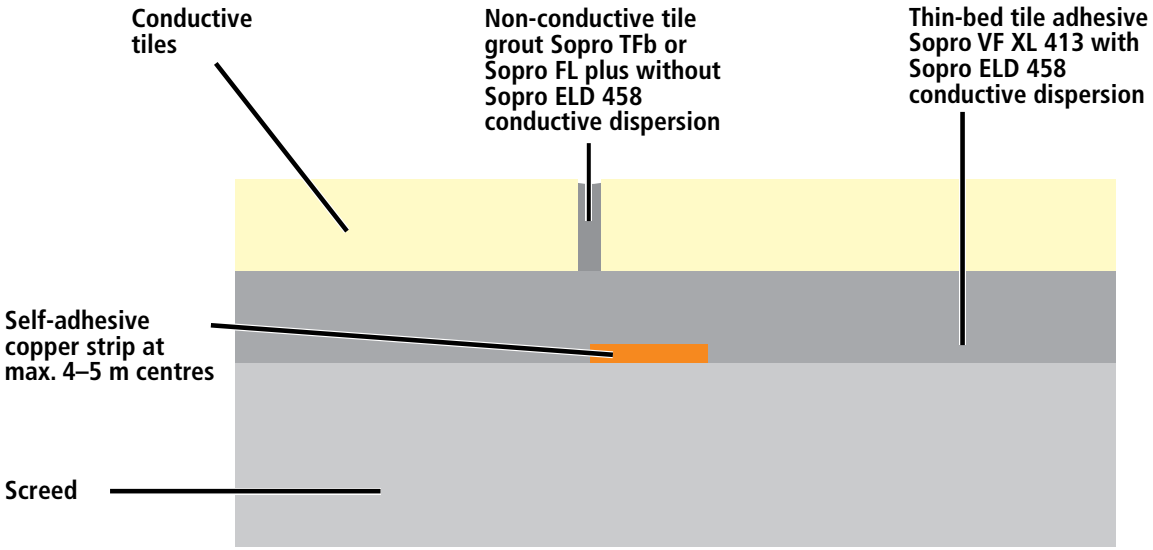


Procedure:

- Clean substrate.
- Prime (absorbent/non-absorbent substrate) with Sopro GD 749 primer or Sopro HPS 673 bonding primer.
- Lay (self-adhesive) copper strip in grid pattern on screed at max. 4–5 m centres. If copper strip is not self-adhesive, fix using Sopro VF XL 413 VarioFlex® large-format flexible tile adhesive with Sopro ELD 458 conductive dispersion as additive.
- Arrange for electrician to connect grid to equipotential bonding system.
- Lay tiles with flexible, hydraulically setting adhesive (Sopro VF XL 413, Sopro's No.1 etc.) with Sopro ELD 458 conductive dispersion as additive.
- Grout tile covering using Sopro TFb or Sopro FL plus with Sopro ELD 458 conductive dispersion as additive.

System solution

4.2 Tiles with continuously conductive ceramic body

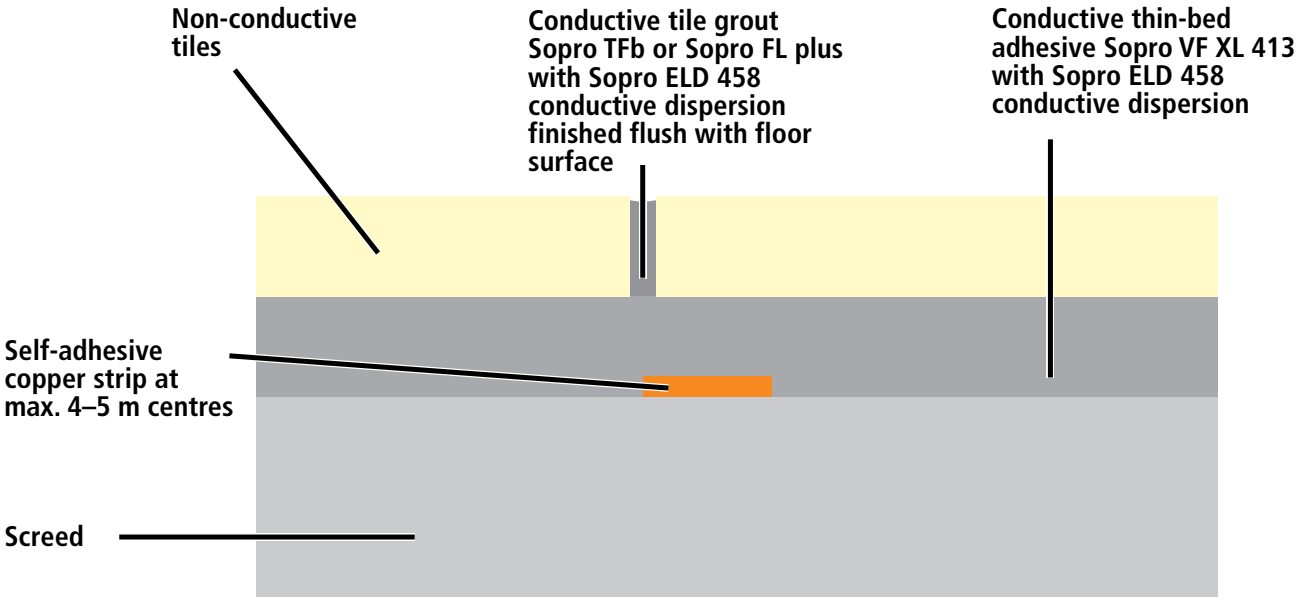


Procedure:

- Clean substrate.
- Prime (absorbent/non-absorbent substrate) with Sopro GD 749 primer or Sopro HPS 673 bonding primer.
- Lay (self-adhesive) copper strip in grid pattern on screed at max. 4–5 m centres. If copper strip is not self-adhesive, fix using Sopro VF XL 413 VarioFlex® large-format flexible tile adhesive with Sopro ELD 458 conductive dispersion as additive.
- Arrange for electrician to connect grid to equipotential bonding system.
- Lay tiles with flexible, hydraulically setting adhesive (Sopro VF XL 413, Sopro's No.1 etc.) with Sopro ELD 458 conductive dispersion as additive.
- Grout tile covering using Sopro TFb or Sopro FL plus without addition of Sopro ELD 458 conductive dispersion as tile body itself is conductive.
- Alternatively, grout with Sopro FEP, Sopro FEP plus or Sopro FEP 604 for high acid resistance.

System solution

4.3 Non-antistatic tile covering with antistatic tile grout and antistatic adhesive bed, max. sizes 240 x 115 mm or 150 x 150 mm



Procedure:

- Clean substrate.
- Prime (absorbent/non-absorbent substrate) with Sopro GD 749 primer, Sopro SG 602 primer-sealer or Sopro HPS 673 bonding primer.
- Lay (self-adhesive) copper strip in grid pattern on screed at max. 4–5 m centres. If copper strip is not self-adhesive, fix using Sopro VF XL 413 VarioFlex® large-format flexible tile adhesive with Sopro ELD 458 conductive dispersion as additive.
- Arrange for electrician to connect grid to equipotential bonding system.
- Lay tiles with flexible, hydraulically setting adhesive (Sopro VF XL 413, Sopro's No.1 etc.) with Sopro ELD 458 conductive dispersion as additive.
- Grout tile covering using Sopro TFb or Sopro FL plus with Sopro ELD 458 conductive dispersion as additive.

Important note:

Given that static dissipation is achieved solely via the joints in the tile covering, the specified tile sizes shall not exceed a certain size (240 × 115 mm or 150 × 150 mm).

The joints must be finished flush with the floor surface.

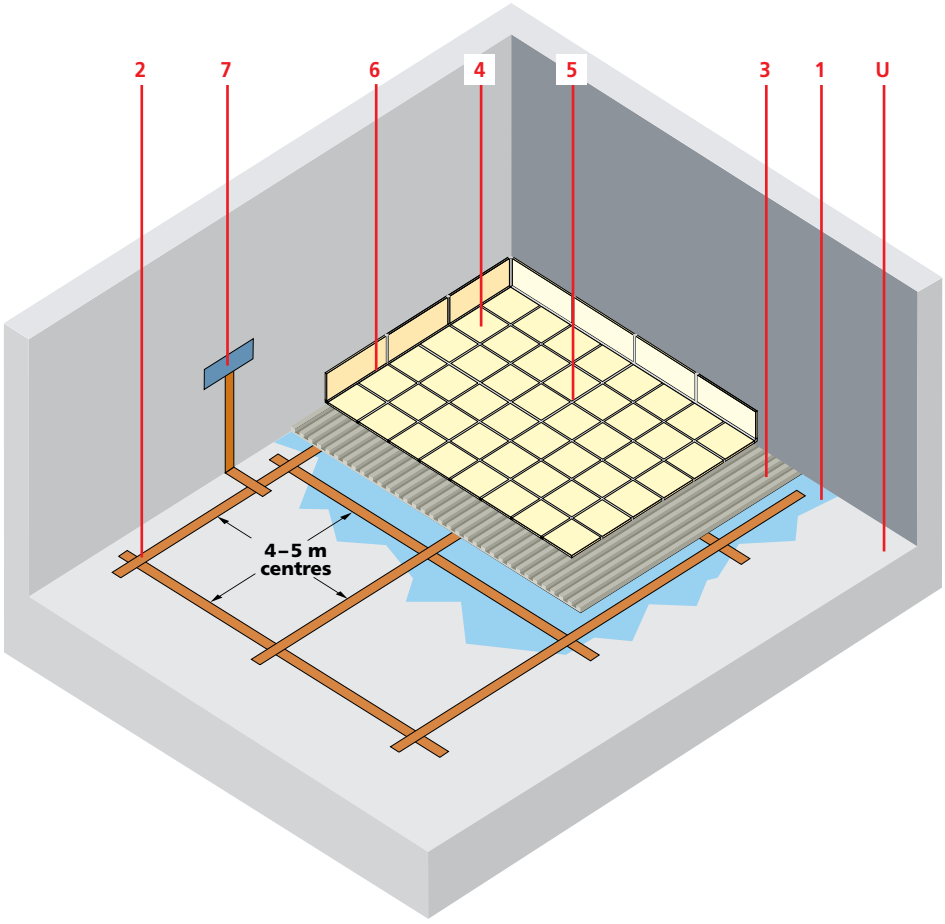
An antistatic tile covering with non-conductive tiles (i.e. static dissipation confined to joints) is to some degree problematic in that properly grouted joints finished flush with the floor surface are an absolute prerequisite. Due to the difficulty of achieving this in practice, **this variant is not recommended and an alternative should be found as early as the design phase!**

The standard test method for antistatic coverings involves the use of a predefined electrode, which, during measurement, also lies on the non-conductive tile.

In practice, the use of this system solution then frequently results in false readings and non-performing floor constructions.

System solution

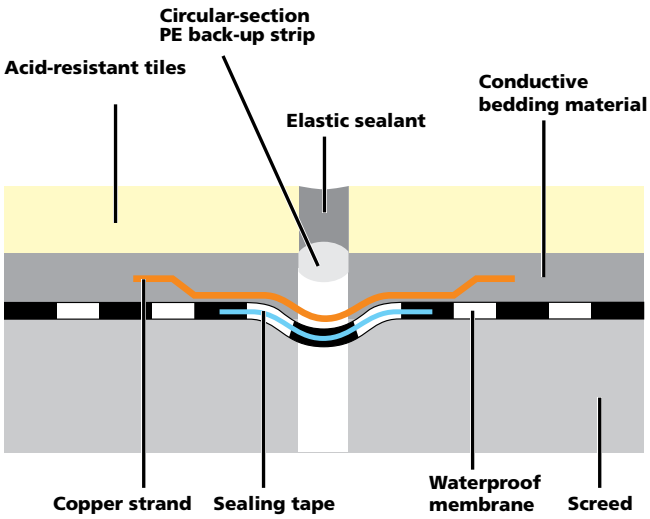
System composition for antistatic tile covering



Copper strip laid on floor surface.

Copper strip, connected to earth bar.

Joint bridging in antistatic tile coverings



1 Sopro GD 749 primer
2 Copper strip, connected to floor covering
3 Conductive adhesive bed incorporating Sopro ELD 458 conductive dispersion
4 Tiles (Detail 4.1: conductive tile glaze/Detail 4.2: conductive tile body)
5 Conductive tile body = non-conductive tile grout
Conductive tile glaze = conductive tile grout
6 Elastic perimeter joint
7 Equipotential bonding system with earth connection for antistatic ceramic floor covering
U Substrate, e.g. screed

System solution

Application

1 Floor levelled using Sopro FS 15 550 and primed to receive covering.

2 Copper strip (self-adhesive) used to produce antistatic floor covering.

3 Copper strip fixed in accordance with required grid size.

4 Copper strip laid on vertical element for later connection to equipotential bonding system.

5 Ceramic covering laid using thin-bed adhesive with electrically conductive additive.

6 Floor covering grouted using Sopro FL plus with Sopro ELD 458 conductive dispersion as additive.