

# Low-voltage SPDs

## technical characteristics and installation

### Lightning and overvoltage protection

- Protection against the effects of lightning essentially relies on:
- Protecting buildings by installing a lightning protection system (LPS or lightning conductor) that can capture the lightning and discharge the lightning current to earth
  - Use of SPDs to protect equipment
  - The earth network design (passive installation protection)

### The external lightning protection system (LPS): lightning conductor

An external lightning protection system (LPS) protects buildings against lightning strikes. It is usually based on the use of lightning conductors (single rod, with sparkover device, meshed cage, etc) and/or the metal structure of the building. Standard EN/IEC 62305 defines 4 protection levels for these systems outside the building, depending on the site configurations, the activity and the geographical area. These levels involve the use of SPDs with minimum discharge performance.

Lightning protection level I/II: Type 1 Iimp 25 kA (IT: Iimp 35 kA)  
 Lightning protection level III/IV: Type 1 Iimp 12.5 kA

### The surge protective device (SPD)

- Is used to:
- Protect sensitive devices against overvoltages due to lightning by limiting overvoltages to values the equipment can withstand
  - Minimise any potentially harmful consequences for people's safety (home-based medical equipment, security or environmental systems, etc)
  - Maximise equipment continuity of operation and minimise production losses

### SPDs and standards

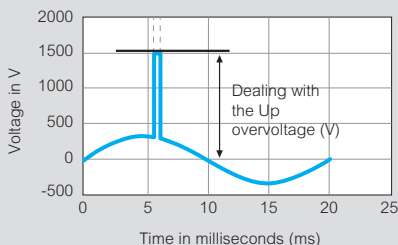
#### 1 - Product standards EN 61643-11 and IEC 61643-11

There are 3 types of SPD, which are characterised according to 3 test types:

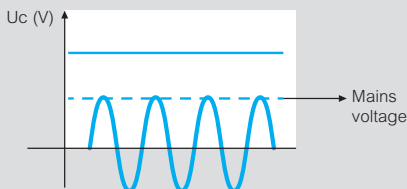
- Types 1 (T1), tested with a "long" current wave (10/350  $\mu$ s, high energy) whose maximum peak is Iimp
  - Types 2 (T2), tested with a "short" current wave (8/350  $\mu$ s) whose maximum peak is Imax or In
  - Types 3 (T3), tested with a short voltage wave (1.2/50 $\mu$ s), whose maximum peak is Uoc (similar wave to the 8/20 current wave of T2s)
- SPDs can be characterised as one of several types: Type 1 + Type 2 or Type 2 + Type 3

#### Other characteristics

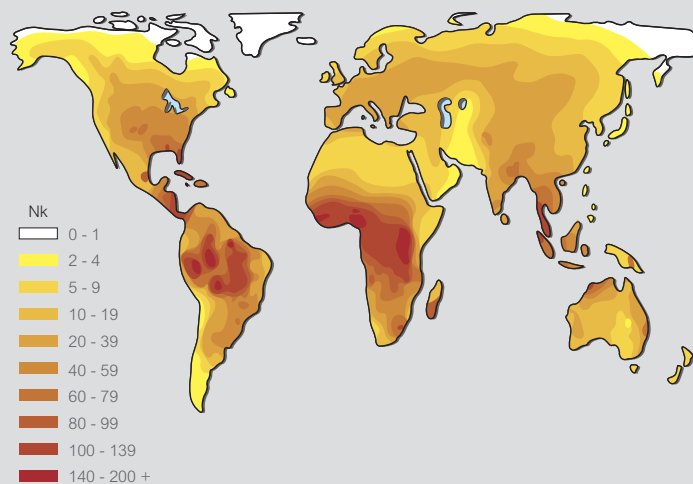
- Up protection voltage: maximum voltage at the SPD terminals while dealing with overvoltages



- Uc critical voltage: SPD ignition voltage. The mains voltage must always be less than this value (watch out for the double IT system fault: Uc must be > 400 V).



### 2 - Keraunic level (Nk)



Nk = Keraunic level (Number of days a year when thunder is heard at a given point)  
 The standards and risk analyses now rely on new data: Ng  
 Ng = lightning strike density expressed in Number of lightning strikes/km<sup>2</sup>/year  
 If there are no Ng measurements, it is possible to calculate Ng from the Nk with the following equation: Ng = Nk/10

### 3 - Installation standards

SPDs are dealt with by standards HD/IEC 60364-4-443 (selection of SPDs and mandatory aspects) and HD/IEC 60364-5-534 (installation). The most recent versions (2015) insist on the use of SPDs in installations:

- where people are at risk (installations providing a security service, medical services, hospitals, etc)
- offering a public or cultural service (public service, communication exchanges, museums, religious buildings, etc)
- in the service sector and industry (hotels, banks, industries, shops, farms, etc)

- equipped with a Lightning Protection System (LPS, lightning conductor) or designed in accordance with EN/IEC 62305
- likely to hold a large number of people (apartment buildings, office buildings, schools, etc in Europe)

In the case of smaller installations (small shops, private houses, etc), a risk analysis should be conducted (article 443.5)

Failing this, SPDs must be installed. However, SPDs are not mandatory in private homes if the cost of installing it is more than a fifth of the cost of the installation. Installing SPDs as per the recommendations in the selection charts on p. 80 to 83 will ensure conformity with the installation standard.

### Overall installation protection

In large installations, several SPDs are required for maximum overvoltage protection efficiency, especially if the SPD at the supply end has a Up protection level higher than 1.5 kV (EN 62305 and TS 61643-12)

As a general rule, it is advisable to install additional SPDs as well as the SPD installed at the supply end of the installation, when the equipment to be protected is more than 10 m away from the SPD at the supply end

In Commercial-Industrial buildings: this involves installing an SPD in secondary distribution boards if they are more than 10 m away from the main LV distribution board, and also protection devices close to the equipment if these are more than 10 m away from the secondary distribution board

In the home: Installation of a proximity SPD (T3 wall socket or multi-outlet type) if sensitive equipment is more than 10 m away from the protection board

Finally, as recommended in the installation standard, if there is a low-voltage SPD on the power circuit, we strongly recommend that an SPD is installed on the communication line (Cat.No 4 122 00)