

Surge protection devices: how to choose them?

As everyone knows, **surge protection** devices or surge protective devices (SPD) protect electrical equipment against overvoltages caused by **lightning**. That said, it is not always easy to distinguish between the various technologies or know which to choose.

Let's try to see things more clearly...

First of all, current standards define three categories of surge protective devices for low-voltage electrical installations:

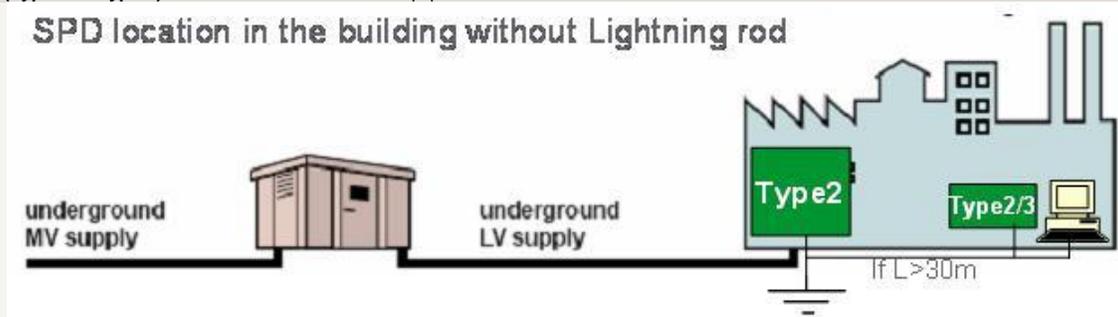
- Type 1: These devices are capable of discharging a very high lightning current, generally from earth to the power distribution system. They are installed in the main electrical switchboard when the building is equipped with a **lightning protection** system.
- Type 2: These are surge protective devices designed to discharge the currents generated by indirect lightning strokes and causing induced or conducted overvoltages on the power distribution network. They are installed in the main distribution switchboard.
- Type 3: These are surge protective devices installed as a supplement to Type 2 devices and are designed to reduce the overvoltage at the terminals of sensitive equipment. Their current discharge capacity is very limited. As a consequence they cannot be used alone.

What surge protective devices should be chosen and where should they be installed?

Lightning protection should be approached from an overall viewpoint. Depending on the application (large industrial plants, data centers, hospitals, etc.), a **risk assessment** method must be used to guide in choosing optimal protection (lightning protection system, surge protective devices). National regulations, moreover, may make it compulsory to use the EN 62305-2 standard (Risk assessment).

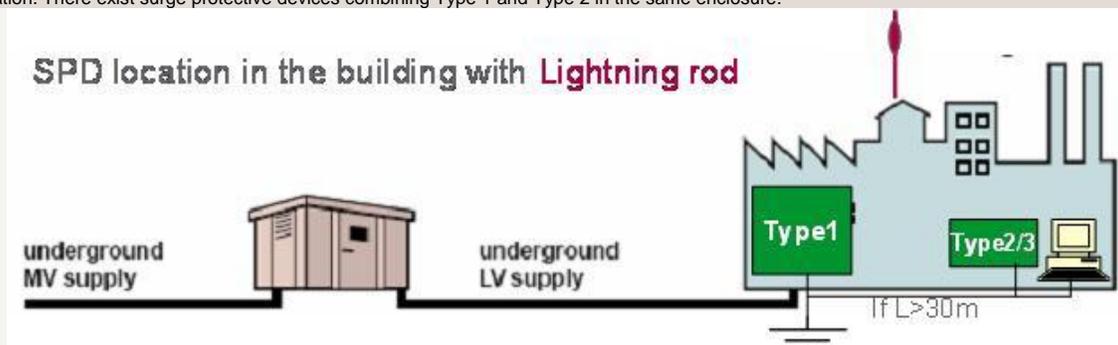
In other cases (housing, offices, buildings not sensitive to industrial risks), it is easier to adopt the following protection principle:

In all cases a **Type 2** surge protective device will be installed in the electrical installation's incoming-end switchboard. Then, the distance between that surge protective device and the equipment to be protected should be assessed. When this distance exceeds 30 metres, an additional surge protective device (**Type 2 or Type 3**) should be installed near the equipment.



Surge Protection Device location

When the building is equipped with a lightning protection system, a **Type 1** surge protective device must be installed at the incoming end of the installation. There exist surge protective devices combining Type 1 and Type 2 in the same enclosure.



And the sizing of surge protective devices?

Then, the sizing of Type 2 surge protective devices depends mainly on the exposure zone (moderate, medium, high): there are different discharge capacities for each of these categories ($I_{max} = 20, 40, 65 \text{ kA}$ (8/20)).

For Type 1 surge protective devices, the minimum requirement is a discharge capacity of $I_{imp} = 12.5 \text{ kA}$ (10/350). Higher values may be required by the risk assessment when the latter is requested.

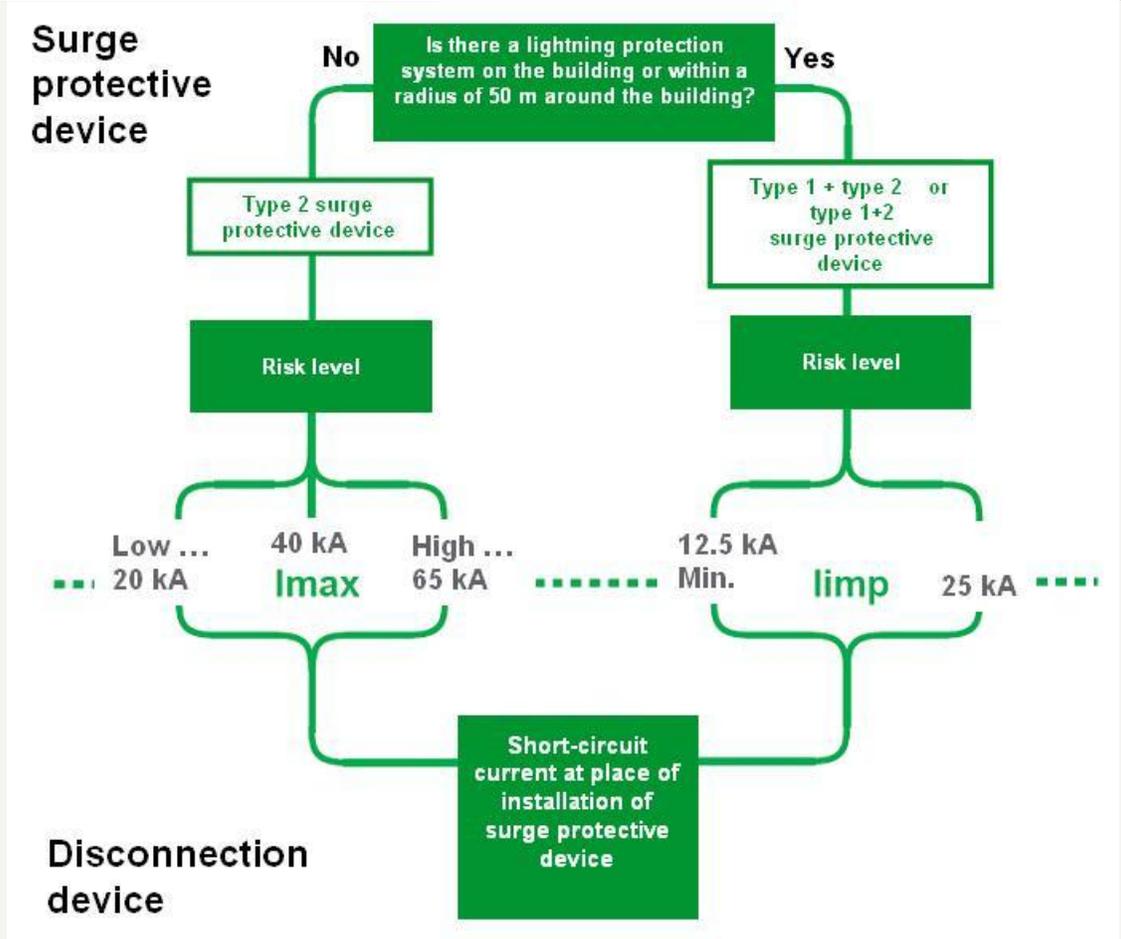
How to choose the protection devices associated with the surge protective devices?

Finally, the protection device associated with the surge protective device (circuit breaker or fuse) will be chosen according to the short-circuit current at the place of installation. In other words, for a residential electrical switchboard, a protection device with an $I_{sc} < 6 \text{ kA}$ will be chosen.

For office applications, the I_{sc} is generally $< 20 \text{ kA}$.

Manufacturers must provide the table for coordination between the surge protective device and the associated protection device. More and more surge protective devices already incorporate this protection device in the same enclosure.

Simplified selection principle (excluding full risk assessment)



simplified selection principle

Source: <http://engineering.electrical-equipment.org/electrical-distribution/how-choose-surge-protection-device.html>