

Whitepaper Surge Protection Device for Public LED Lighting

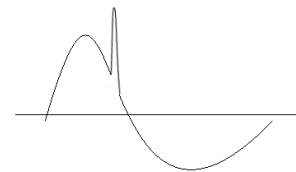
A Surge Protection Device (SPD) truncates voltage spikes, resulting in a current flowing through the SPD. Because the spike is very short (in the μs range), the energy level of the often considerable peak current is limited.

Surge protection can be achieved with various components which each have their own typical properties and possible applications. In this context, the most important are:

- MOV, Metal Oxide Varistor, a semiconductor which becomes conductive when a certain voltage is exceeded
- Gas discharge tube (GDT)

Considerations regarding the choice and application of the SPD:

- The SPD's function and location where it will be installed.
- This determines the size of the voltage spike that must be truncated (kV specification), and the corresponding peak current that must be discharged (kA specification).
- The related energy level. The lower the energy level, the smaller the SPD needs to be.
- The status of the SPD is displayed by coloured flags or LED indicators. The SPD's condition must be inspected regularly to guarantee protection. Defect SPD's shall be replaced.
- The SPD can be connected in parallel to the device which needs to be protected. In case of failure the SPD will disconnect it selves but the LED will keep working as normal.
- The SPD is often installed in-line. In the event of a lightning strike or as a result of ageing, the SPD can cause an interruption in the electrical circuit. In a lighting armature, the light will turn off. The resulting darkness is unfortunate, however it is also a clear indication that there is something wrong in the lamppost.



*Illustration 1:
Transient surge*

Protection class I en II



Class I

In class I equipment, the protection of people and the device itself is achieved by grounding the device. In the event of a fault, the grounding lead ensures that the overcurrent protection (fuse or circuit breaker) or RCD is activated on time.



Class II

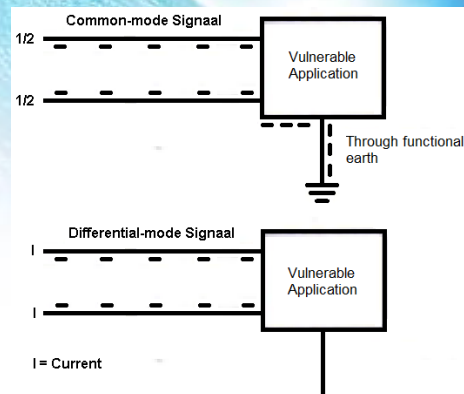
Class II devices are double-insulated or have an extra strong, insulating housing.

The protection class selected for the installation partly determines the choice of the SPD. There are indications that the overvoltage protection problems in class II installations (double-insulated) are bigger than in class I.



SPDs in public lighting grids

Overvoltage can occur both on the supply lines (line and neutral) relative to the ground (common mode) and between line and neutral themselves (differential mode). For that reason, the protection must be applied to the various combinations of line, neutral, and ground conductor. The two possible options are shown in the illustration.

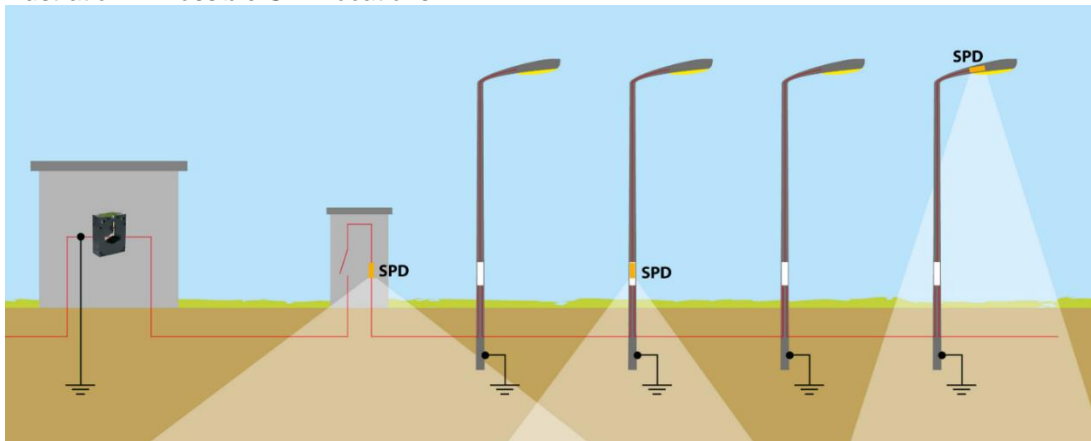


For full protection, a grounding system is always required. This applies to class II grids (double-insulated) as well, which often leads to ambiguities or conflicts with the regulations for double-insulated equipment.

There are various types of protection:

- Type 1: heavy, 3-phase protection installed in the supply cabinet
- Type 2: medium protection, installed in for example the lamppost connection box
- Type 3: light protection, installed in for example a LED armature

Illustration 2: Possible SPD locations



In the supply cabinet (type 1) In the connection box (type 2) In the armature (type 3)

A calculated overvoltage protection design is very important. It is a complete system with protection in both the supply cabinet and in the lamppost, as well as possibly also in the armature itself.

Damage is inevitable in the event of a direct lightning strike to a lamppost or its immediate environment. The overvoltage protection is aimed at limiting the damage as much as possible by preventing the strike to spread through the lighting grid. By installing an SPD in every lamppost, the energy will be better discharged, limiting the extent of the damage. With SPDs installed, it is likely that only a section of a street will be left in the dark, while without proper protection, an entire city district could be hit by a blackout (Esbjerg DK, October 2014).

Overvoltage protection is often compared to taking out an insurance policy: nobody can guarantee that there will be no damage, as few things can endure a direct lightning strike. However, in the event that something does happen, the damage and costs are limited. This insurance does require an investment in the purchase of SPDs and, importantly, increases maintenance costs by requiring regular inspection of the SPD status (replacement due to defect or end-of-life). Installing the SPD in the easily accessible lamppost connection box and/or using an in-line SPD (a defective component causes the light to turn off) has definite benefits here.

For more information, feel free to contact ELEQ by phone at +31 521 533 333 or send an e-mail to info@eleq.com

Read more about overvoltage in public LED lighting in the whitepaper “86006 Overvoltages LED Public Lighting”.