

Surge Protection Devices for Overvoltages of Atmospheric Origin

The decision to protect equipment from the effects of overvoltages of atmospheric origin (lightning) requires specialist knowledge. BS EN 62305 details requirements for lightning protection and BS7671 Regulation 443 details overall requirements for the incorporation of Surge Protection Devices (SPD), including section 443.2.4, which provides criteria for risk assessments for installations which might need protection beyond those arising from normal external influences (AQ).

Although not specialists in the field, we have incorporated a range of SPDs into products over recent years and we are happy to provide input to specifiers and customers when different devices are being considered for incorporation within our products. SPDs should comply with BS EN 61643 and selection of the correct device requires the following to be established:

Class of protection required (Type 1, 2 or 3)

- Voltage protection level (U_p)
- Maximum continuous operating voltage (U_c)
- Circuit design current (I_b)
- Temporary over-voltages (U_{TOV})
- Nominal discharge current (I_{nspd}) and impulse current (I_{imp})
- Prospective fault current and the follow current interrupt rating
- Earthing arrangement of the supply (TN-C-S, TNS, TT, IT)



Three-phase Type 1 Protector supplied via
63A HRC fuses

Type 1 Protector - Located at an area where high lightning currents are expected. Typically fitted at the service entrance for indoor installations and may be required to be fitted to all outdoor boards.

Type 2 Protector - Located at sub-distribution boards to control overvoltages, often residual voltages, from upstream Type 1 SPDs.

Type 3 Protector - Located close to equipment, typically at the socket outlet, they provide local protection by limiting overvoltages caused by switching operations to safe levels.

Having identified the correct Type of device, the most important factor in SPD selection is the voltage protection level (U_p). The SPD's voltage protection level must be lower than the impulse withstand voltage (U_w) of the equipment being protected. Lightning impulse current (I_{imp}) is only relevant where Type 1 surge protection is required i.e. where a building or structure is at risk from a direct lightning strike and incorporates a lightning protection system. Once provided with the above details, we can propose SPDs to satisfy the key requirements.

When SPDs are incorporated in to our assemblies, it is necessary to protect them with an overcurrent protective device (OCPD), which usually comprises of HRC fuses but can be a suitably rated MCB or MCCB. The SPD manufacturer will specify the maximum rating of the OCPD. However, it is also necessary to provide discrimination between the supply OCPD and the OCPD feeding the SPD. As a rule of thumb the OCPD protecting the SPD should be rated at approximately half the value of the upstream OCPD, up to the maximum fuse rating specified by the SPD manufacturer.

In assemblies it is normal to use smaller cables for connection to the SPD than would normally be used for a given OCPD rating, as an SPD does not consume current in normal operation. However, it is also necessary to ensure adequate short circuit protection is maintained for the cables that supply the SPD and we are happy to provide calculations to justify the cable sizes selected.

An installed SPD will always present a higher let-through voltage to equipment compared to the voltage protection level (U_p) stated on the manufacturer's datasheet. This is due to additive inductive voltage drops across the conductors of the SPD's connecting leads, which requires connecting leads to be as short as possible. For SPDs installed in parallel the total lead length between line conductors, protective conductors and SPD should preferably not exceed 0.5m and in no case exceed 1m. For SPDs installed in series, the lead length between the protective conductor and SPD preferably should not exceed 0.5m and never exceed 1m.

If you would like to discuss the issues relating to the incorporation of SPDs in to our assemblies, please contact our Crayford or Leeds Customer Service Centres in the first instance.