

## ABB surge protective devices

### **What is a surge protective device (SPD)?**

A device designed to limit surge energy to electrical equipment. It does this by diverting or limiting surge current. An SPD is wired in parallel to the equipment it is intended to protect. Once the surge voltage exceeds its designed rating, it “begins to clamp” and starts to conduct energy directly to the electrical grounding system. An SPD has a very low resistance during this time and “shorts” the energy to ground. Once the surge is over, it “opens” up, so it does not trip upstream circuit breakers.

### **What is the difference between TVSS and SPD?**

In an effort to consolidate terms, Underwriters Laboratories decided in September 2009 to no longer use “TVSS” and “secondary surge arrester.” Surge protective device (SPD) is now used on AC power systems rated less than 1000 V AC. UL also classified SPD into four Types, Type 1, Type 2, Type 3 and Type 4. This classification is based on the application and the location where the SPDs are to be used.

### **What are the UL SPD type categories and what do they mean?**

**Type 1** SPDs are permanently connected devices that bear a UL listing for installation at any location between the secondary of the utility service transformer and the service entrance primary disconnect. A Type 1 SPD can also be installed anywhere on the load side of the service entrance and is allowed to be installed anywhere on the low-voltage electrical system without requiring a dedicated fuse or breaker.

**Type 2** SPDs are permanently connected devices that bear a UL listing for installation on the load side of the service entrance primary disconnect. Type 2 SPDs may or may not require the use of a dedicated fuse or breaker.

**Type 3** SPDs are installed at a conductor length of 10 meters (30 feet) or greater from the electrical panel. These devices are typically cord connected, direct plug-in, receptacle-type SPDs installed at the load equipment being protected.

**Type 4** SPDs are components and assemblies that do not have a UL listing. They might carry the UL recognized mark. Examples are metal oxide varistors (MOVs) and gas tubes.

### **How does a type 1 SPD compare to a type 2 SPD?**

A Type 1 SPD does not require a means of disconnect and can be connected to either side of the service entrance. A Type 2 requires a means of disconnect such as a circuit breaker.

### **What SPD should I choose for my facility?**

For a detailed answer to this question, please contact your local ABB representative.

General purpose applications as set forth in IEEE standards:

- **For service entrance**, a Type 1 SPD with a surge current rating greater than 200 kA/mode.
- **For secondary distribution**, a Type 1 or Type 2 SPD with a surge current rating greater than 80 kA/mode.
- **For branch and point of use**, a Type 2 SPD with a surge current rating greater than 60 kA/mode.

The location and descriptions come from the IEEE C62.41 standards, which identify surge risk within a facility in relation to the service entrance.

### **What is cascade surge protection?**

Cascade protection applies surge protection at each location within an electrical distribution system. An SPD can be placed at the service entrance, secondary distribution and on branch panels. At each point, the surge is reduced to a lower level, minimizing the surge to the sensitive equipment.

### **What is the UL nominal discharge current (I<sub>n</sub>) rating?**

The UL nominal discharge current is defined as the peak value of 8/20 microsecond surge current conducted through the SPD. The SPD must still function after 15 applied surges. The highest nominal discharge current rating by UL is 20 kA. An SPD for use at the service entrance in UL 96A lightning protection systems must be UL listed and have a nominal discharge current rating of 20 kA.

**What is the UL short circuit current rating (SCCR)?**

UL 1449 and the National Electrical Code (NEC) require the SCCR (short circuit current rating) to be marked on all SPD units. It is not a surge rating, but the maximum allowable current an SPD can interrupt in the event of a failure. NEC Article 285.6 requires the SPD to be installed where the available fault current is less than the SCCR rating of the SPD unit.

**What is suppressed voltage rating (SVR)?**

SVR was included in an earlier version of UL 1449 and is no longer used in the UL 1449 standard. The SVR was replaced by VPR.

**What is voltage protection rating (VPR)?**

VPR is included in the UL 1449 4th Edition and is the clamping performance data for SPDs. Each SPD mode is subjected to a 6 kV/3 kA combination surge wave, and its measured clamping value is rounded up to the nearest value based on table 63.1 from UL 1449 4th Edition.

**How are SPDs related to UL 96A?**

UL 96A is the standard for lightning protection systems. For a building to meet UL 96A, it must have a Type 1 SPD with a nominal discharge current rating of 20 kA installed at the service entrance.

**How are SPDs related to UL 1283?**

Some SPD models include noise filtration. This noise filtration is tested to the UL 1283 safety standard.

**What is the most important factor in SPD installation?**

The lead length of wires connecting the SPD can significantly improve or degrade the performance. The shorter the lead length, the better the performance.

**Do SPDs protect against direct lightning strikes?**

A direct lightning strike is the most powerful and difficult surge to protect against. Proper grounding and bonding of the electrical system and employing proper surge protection can protect sensitive equipment. An SPD with a higher single surge current rating will perform best against this type of event, if the unit is properly installed and the grounding system is adequate. The maximum single withstand surge current rating is defined in IEEE SPD Standard C62.62.

**Is “response time” a valid specification?**

Response time specifications are not supported by any standards organizations overseeing surge protective devices. IEEE C62.62 standard test specification for SPDs specifically states it should not be used as a specification.

**Are joule ratings a specification used for SPDs?**

In the past, some manufacturers have used joule ratings in their specifications. They are not considered a good indicator for SPD performance, nor are they recognized by any standards organizations.

