

What Are Clamping Voltages, Suppressed Voltage Ratings and Let-throughs?

All these terms relate to a measure of an SPD's ability to protect the downstream equipment by limiting the transient voltage of an applied impulse. No SPD clamps the transient voltage to zero; some small amount of residual voltage is let-through to the protected equipment. A good SPD will limit this let-through voltage to a level that can be tolerated by the equipment being protected. For example, it is not unusual for transients to exceed several thousand volts while most electronic equipment can only withstand in the vicinity of 300Vpeak. Provided the SPD can clamp the incident transient to less than the tolerance threshold of the equipment, adequate protection is provided. Actual equipment withstand voltages vary, but as a guide for electronic equipment transient voltages, twice the nominal peak supply voltage can cause operational problems. Physical damage can occur at voltages around 4 times nominal peak.

Note: Since the let through voltage of an SPD is proportional to the magnitude of the applied surge, it is important when considering the relative performance of different devices, to know what test amplitude in kA, and waveshape (i.e. 8/20µs) was used to measure the let-through voltage.

In UL 1449, Underwriters Laboratories defines the term "Suppressed Voltage Rating" (SVR) as the transient voltage reaching the protected equipment (rounded up to the nearest given value in a table) under a test condition of 6kV 1.2/50µs, 500A 8/20µs. The 500A level was selected by UL as the lowest common denominator to allow even the cheapest lowest surge-rated SPDs to be tested. However, as most manufacturers use 130-175V nominal MOVs (for 120V nominal SPDs) most SVRs will be similar at this 500A 8/20µs level. Larger performance differences will be noted at higher surge ratings. The IEEE C62.41 defines the electrical environment of the service entrance to a facility as being a Category C exposure. This means that transients of up to 10,000A 8/20µs with voltages of up to 20kV can be expected. Under such conditions two SPDs with similar SVR results under UL 1449 may exhibit significantly different let-through voltages.

UL Suppressed Voltage Ratings								
330	400	500	600	700	800	900	1000	1200
1500	1800	2000	2500	3000	4000	5000	6000	

The term Clamping Voltage is defined by different standards to refer to the voltage at which an SPD limits a defined transient voltage/current amplitude and waveshape. More correctly, it is intended to define the "knee" of the VI characteristic for an MOV at which the onset of conduction occurs and is generally measured at the 1mA point i.e. the voltage across the SPD when 1mA dc is being conducted.

