

THIRD EDITION Limited Current Abnormal Overvoltage Tests

To recap some of our previous discussions, we have looked closely at the various ratings required by UL 1449 Third Edition. These included the Nominal Discharge Current Ratings (I_N). As you will recall, the I_N Rating is derived from the Nominal Discharge Current Tests which are based on an 8/20 μ s current waveform. During these tests, the current is impressed through the device at the specific values declared by the manufacturer. For example, a Type 1 device is tested with either 10 or 20 kA impressed through the device.

As stated previously, the Limited Current Abnormal Overvoltage Test, the Intermediate Current Test and Short Circuit Current tests in Third Edition are done using an abnormal overvoltage and available fault current rather than a specific current value impressed through the device.

The available fault current utilized in these tests varies based on SPD Type and the specific test being conducted as shown below.

This article will focus on the rationale supporting the Limited Current Abnormal Overvoltage Test.

Brief Test Description utilizing the parameters for a 120V circuit only for purposes of this discussion

CURRENT TEST	SPD TYPE	TEST VOLTAGE	CURRENT
Limited Current Abnormal Overvoltage	Type 1 SPD Type 2 SPD Type 4 used in a Type 1 or Type 2 application	240 V	10, 5, 2.5, 0.5 A
Limited Current Abnormal Overvoltage	Type 3 & Type 4	240 V	5, 2.5, 0.5, 0.125 A
If pass criteria is met as per the standard, then Leakage Current or Grounding Continuity tests are performed based on SPD design.			

The purpose of this specific test is to ensure that when a limited current fault occurs on the line, the SPD will respond in an appropriate manner.

This type of fault can occur in installations where the SPD is installed on the load side of a very small transformer, or in an installation of an SPD deep within a facility. In both cases, the amount of available fault current may be very small. This limited current fault condition is discussed as well in IEEE C62.72-2007 with specific

reference to a phase-to-ground fault. It is stated that "the current flow is usually quite low and typically only ranges from 1A to 20A." Finally, the residential application may be the most common occurrence of a limited current fault condition in which the neutral is open. Each of these events has the potential to result in an increased overvoltage scenario (abnormal overvoltage).

Again, In all cases, the pass criteria for the Current Tests are as follows:

During and following the tests, the following conditions shall NOT result -

- 1. Emission of flame, molten metal, glowing or flaming particles through any openings (pre-existing or created as a result of the test) in the product,**
- 2. Charring, glowing or flaming of the supporting surface, tissue paper, or cheesecloth,**
- 3. Ignition of the enclosure,**
- 4. Creation of any openings in the enclosure that result in accessibility of live parts, when evaluated in accordance with the accessibility of live parts test in 58.2,**
- 5. Loss of structural integrity to a degree that the equipment collapses or experiences such displacement of parts that there is a risk of short-circuiting or grounding of current carrying devices.**

The overall purpose of these tests is to ensure that when an SPD is subjected to an abnormal overvoltage anomaly, regardless of whether the anomaly takes place with a low, medium or high available fault current, the device responds appropriately and does not create a fire or shock hazard.