A Summary of the new UL1449 Edition 3.0 Standard.

UL 1449 Edition 3.0 was first published on September 29, 2006, and compliance will be required on or before September 29, 2009. At the time of this writing (May 2007), UL is still debating details with this proposed Edition 3.0 and has already reduced the originally proposed test requirements for I_n. (Nominal Discharge Current) and continues to debate the new VPL (Voltage Protection Level) requirements. This document will attempt to explain some of the issues involved with this new Standard.

UL 1449 Edition 2.0 was first published in 1996. This is the current Standard for Surge Protective Devices (SPD) however, there is a recent fault or short circuit testing requirement with compliance required by February 2007 that has come to be known in the industry as Edition 2.5. Technically, this new requirement will still operate under the term Edition 2.0, however, numerous surge manufacturers are currently not in compliance with this recent testing requirement. This has led to some confusion as some manufacturers still publish UL1449 Edition 2.0 compliance regardless of the results of the February 2007 deadline. We will detail the 2.5 testing requirements in this document.

Edition 3.0 of ANSI/UL1449 includes the following three main changes:

1. Added Type designations (1, 2, 3 and 4) for SPDs (Surge Protective Device) based on the installation location within the electrical system:
   Type 1: Similar to secondary surge arrestors of the past - does not require external protection. UL has eliminated surge arrestors as a distinct Type. Unit must now have built in short circuit protection.
   Type 2: Required to be installed after the main service entrance and can rely on external short circuit protection.
   Type 3: Cord connected devices - plug in suppressors.
   Type 4: Components (ie MOV's or DIN mount modular products within other UL Listed enclosures) UR Rated. Testing revised to include Nominal Discharge Current (I_n).

2. With Edition 3.0, for the first time UL will be testing the surge rating performance of SPD's. All previous Editions have focused on safety, not performance. The manufacturer shall specify (declare) the value of the Nominal Discharge Current (I_n) to which the sample will be tested. The value of the Nominal Discharge Current (I_n) shall be selected by the manufacturer: 10 kA or 20 kA for Type 1 SPDs and 3 kA, 5 kA, 10 kA or 20 kA for Type 2 SPDs. The surge generator shall be adjusted to ensure that the value of I_n (selected by the manufacturer) is impressed through the SPD. During the application of these surges the samples are not energized. Surges shall be applied in three groups of five surges. Within 1 second after the application of each surge, the manufacturer's specified (declared) MCOV shall be applied for 60 seconds ±15 seconds. After each group of 5 surges, the sample shall rest for 30 minutes ±5 minutes. After the 15th surge, the MCOV shall be re-applied for at least 15 minutes. The idea of this test is to grade the products robustness against surges. I_n is a measure of life span of the product, and should not be confused with I_{max}, the maximum single shot rating of a product. The I_n rating for the product must survive and **not degrade**. **A 20kA I_n rating per mode is quite high**, and typically will correspond to an I_{max}

value of around 100kA per phase depending on the design of the product. I_{max} Ratings will not exceed 200kA per phase for any product. Any product showing Peak Surge Ratings above 200kA per phase are reporting Aggregate Peak Surge ratings and while this is currently common to the surge industry, this number represents the sum total of the different component's within the SPD and is not representative of true peak capability. I_n and I_{max} Peak Surge Ratings will be significantly lower than most currently published Aggregate Peak Surge Ratings. In addition, more importance will be placed on higher MCOV ratings AND low VPL ratings and the combination of both within the framework of I_n and I_{max} testing will be much more difficult to achieve. This new testing requirement (I_n and I_{max}) will provide a more truthful and representative peak surge rating comparison platform and allow specifying engineers to make prudent decisions when selecting surge products.

3. Changed Suppression Voltage Rating (SVR) to Voltage Protection Level (VPL) and Measured Limiting Voltage testing at 6KV/3KA; Previously SVR was the measure for "let-through" voltage performance of a product at 500 amps. It was agreed that 500 amps was not sufficient to truly measure the performance of a product, therefore a high current let through voltage test was included at 3kA 8/20µs. These numbers have not yet been finalized by UL.

Finally, the largest issue for the surge industry today is actually a previous revision to Edition 2.0 of UL1449, with an effective date of Feb 2007. Edition 2.0, which was first published in August 1996, has a revision (additional requirement) that was quite large, and technically difficult for many in the industry to pass without substantial product redesign. This revision is known and also referred to as Edition 2.5. This additional test of Edition 2.0 ('2.5') involved "intermediate" short circuit current testing. These are 100, 500 and 1000 amp short circuit current tests conducted at full phase voltage. These tests were added to the standard Edition 2.0 in addition to the previously required maximum SCCR tests. These intermediate current tests are in fact designed to replicate a high resistance fault current to the power system, or a disconnected neutral situation, where the fault current would be limited in practice. These lower current short circuit tests in fact end up stressing the thermal and low end of the protection within the SPD.

Manufacturers can pass these tests by either opening thermal and/or current fuses during the test, or containing any flame within the product. Additionally, UL requires that our patented frequency based (FD) Technology be disconnected for these tests, and we are required to submit our products for testing with the frequency based circuit shorted out so that our product conducts under full phase voltage. Passing these tests without the FD Technology activated provides frequency based products with a large real world performance advantage over all other forms of voltage based suppression.

In the past decade, our testing and applications using both voltage and frequency based technologies has determined that most (9 out of 10) voltage based SPD failures are a direct result of TOV and 2X over voltage events and **not lightning**. Frequency based products are **immune** to this problem thus dramatically improving reliability, clamping levels, peak performance, and life span over all other voltage based SPD products.

Submitted by:
Frank Dlouhy
Omega Power