

Third Edition: Focus on I_N Nominal Discharge Current (I_N) – What and Why?

While the details of the test are provided below, the questions often asked are:

- What is the rationale for this test?
- Why was it included in the safety standard?

First of all, it is important to understand that Nominal Discharge Current (I_N) is related only to the test described below. It is defined as: "The peak value of the current, selected by the manufacturer, through the SPD having a current waveshape of 8/20 where the SPD remains functional after 15 surges". It is not an electrical phenomenon or an electrical anomaly. The test was developed as a result of a need to meet the requirements of NFPA 780 for lightning protection system application (Type 1) and in part to harmonize to some degree with IEC 61643. What the test does demonstrate is that an SPD installed in the environment as described in the tests can do so without creating a safety hazard and do so repeatedly.

Nominal Discharge Current (I_N) is not the same as Peak Surge Current. They are different parameters.

As shown in UL 1449 3rd Edition, the Nominal Discharge Current (I_N) is a completely new test under UL 1449, this test is conducted using an 8/20 μ s current driven waveform. A series of 15 impulses are conducted in three groups of 5. The current selected for each test is based on the SPD Type as follows:

- Type 1 or 2 for permanently connected devices,
- Type 3 for cord connected and direct plug in devices,
- Type 4 for component and point of use applications.
 - Type 1 devices require testing at 10 or 20 kA to meet the requirements of NFPA 780 for lightning arresters.
 - Type 2 devices can be tested using a 3, 5, 10 or 20 kA current value.
 - Type 3 devices do not actually have to go through the nominal discharge current (I_N) test. These can be tested with the duty cycle test using a 6 kV/3 kA combination wave. However, if a manufacturer wishes to avoid certain marking restrictions and installation restrictions (10 meters from the service entrance), then, they may undergo a Type 2 nominal discharge current (I_N) test.

In all cases, the current applied under the nominal discharge current (I_N) is NOT a combination wave but rather the actual 8/20 current wave is impressed through the device. During the current impulse, no applied power or system power is present. Then immediately

following each current impulse, the MCOV of the device is applied for one minute. A rest period is allowed between the three groups of 5 surges. Then, the MCOV is applied for 30 minutes following the completed tests.

As a reminder, an SPD Type 1 Device indicates that it is a permanently connected device that can be installed on the line-side OR the load-side of the main overcurrent disconnect and meets the requirements of NFPA 780 and NEC 2008 Article 285 as a secondary surge arrester.

A Type 2 Device on the other hand, is a permanently connected device that can be installed ONLY on the load side of the main overcurrent protective device.

Type 3 devices are cord connected or direct plug in type devices while Type 4 are considered component or partial assemblies requiring an enclosure and may have exposed terminals. Type 4 devices are typically recognized components rather than complete listed devices.