

UL 1449 4TH EDITION LOCATION AND/OR TYPE DESIGNATIONS

SURGE PROTECTION NOTE 6

BY JASON HSU,
APPLICATIONS
ENGINEER

INTRODUCTION

UL 1449 4th edition assigns type designations to Surge Protective Devices (SPD) (1, 2, 3, 4, 5) reflecting the installation locations within the electrical distribution system. These designations were adopted from IEEE categories C, B, & A respectively.

Comprehending the various location categories presented by UL 1449 4th Edition will not only provide a better understanding as to where these type of products are installed, but will also assist in selecting the proper SPD for that particular application.

LOCATION AND/OR TYPE DESIGNATIONS:

The IEEE Standard introduced the concept of location categories as a method towards a reduction of surge occurrences for Scenario I. Scenario I is one of two scenarios that the IEEE Standard considered in the attempt to simplify the assessment of surge immunity. The alternative was a risk analysis that was beyond the scope of this recommended practice, and was in fact the prerogative and duty of equipment manufacturers.

Per the IEEE Standard C62.41.2, Section 4.2 Lightning Surges, Scenario I was defined as the following:

In the event of a lightning flash not directly involving the structure, two different coupling mechanisms occur:

- Surges coupled into the power system, either directly or indirectly, and impinging at the service entrance of the building of interest, such as a direct flash to the outside power system or to adjacent buildings supplied from the same utilization voltage transformer.
- Electric and magnetic fields penetrating the structure and coupling inductively in the building wire.

TERMS

- **SPD:** Surge Protective Device

UL 1449 4TH EDITION LOCATION AND/OR TYPE DESIGNATIONS

According to the concept of location categories, Location **Category A** applies to the parts of the installation at some distance from the service entrance. Location **Category C** applies to the external part of the structure, extending some distance into the building. Location **Category B** extends between Location Categories C and A.

The requirements throughout UL 1449 cover Surge Protective Devices (SPDs) designed for repeated limiting of transient voltage surges as specified in the standard on 50 or 60 Hz power circuits not exceeding 1000V and designated as follows according to UL 1449 4th Edition (Section 1.1 UL 1449 4th Edition, effective March 11, 2016):

- **Type 1** - Permanently connected SPDs intended for installation between the secondary of the service transformer and the line side of the service equipment overcurrent device, as well as the load side, including watt-hour meter socket enclosures and Molded Case SPD's intended to be installed without an external overcurrent protective device.

Type 1 devices must be installed on the line or load side of the main Overcurrent Protection (OCP), in the past this was referred to as Secondary Surge Arresters (SSA). The difference with UL 1449 3rd edition, at the time, was the new, more rigorous safety testing which was not required in the previous edition (2nd edition). The UL 1449 4th edition is similar in terms of incorporating new/revised requirements pertaining to the construction, testing, marking and instruction manual.
- **Type 2** - Permanently connected SPDs intended for installation on the load side of the service equipment overcurrent device; including SPDs located at the branch panel and Molded Case SPDs.

Type 2 devices must be installed on the load side of the main OCP. In the past, these devices may have been associated with, or referred to as hardwired Transient Voltage Surge Suppressor (TVSS), and in some cases may not require external OCP.
- **Type 3** - Point of utilization SPDs, installed at a minimum conductor length of 10 meters (30 feet) from the electrical service panel to the point of utilization, for example cord connected, direct plug-in, receptacle type and SPDs installed at the utilization equipment being protected. The distance (10 meters) is exclusive of conductors provided with or used to attach SPDs.

Type 3 SPDs are point of utilization, direct plug-in-type devices. These components are similar to surge strips. They are required to be installed 10 meters (30 feet) from the panel (rational based on IEEE Cat. A location).
- **Type 4** - Component Assemblies - Component assembly consisting of one or more Type 5 components together with a disconnect (integral or external) or a means of complying with the limited current tests in Section 44.4 UL 1449 4th Edition.

Type 4 SPDs are surge suppression components, which could be a basic component or a complete module. Type 4 components can be tested to Type 1, Type 2, or Type 3 applications.
- **Type 1, 2, 3 Component Assemblies** - Consists of a Type 4 component assembly with internal or external short circuit protection.

Type 1, 2, 3 component assembly devices are intended to be factory installed into electrical distribution equipment or end-use equipment. They are Recognized Component SPDs evaluated for use in Type 1, 2 or 3 SPD applications. Such components must pass all the same electrical safety failure test as listed Type 1, 2 or 3 SPDs. While these devices are 100% compliant from a safety failure testing point of view, these Type 1, 2 and 3 component assembly SPDs have conditions of acceptability such as exposed terminals or other mechanical construction that requires them to be installed or housed within a listed assembly to provide protection from exposure to live parts or other requirements.

UL 1449 4TH EDITION LOCATION AND/OR TYPE DESIGNATIONS

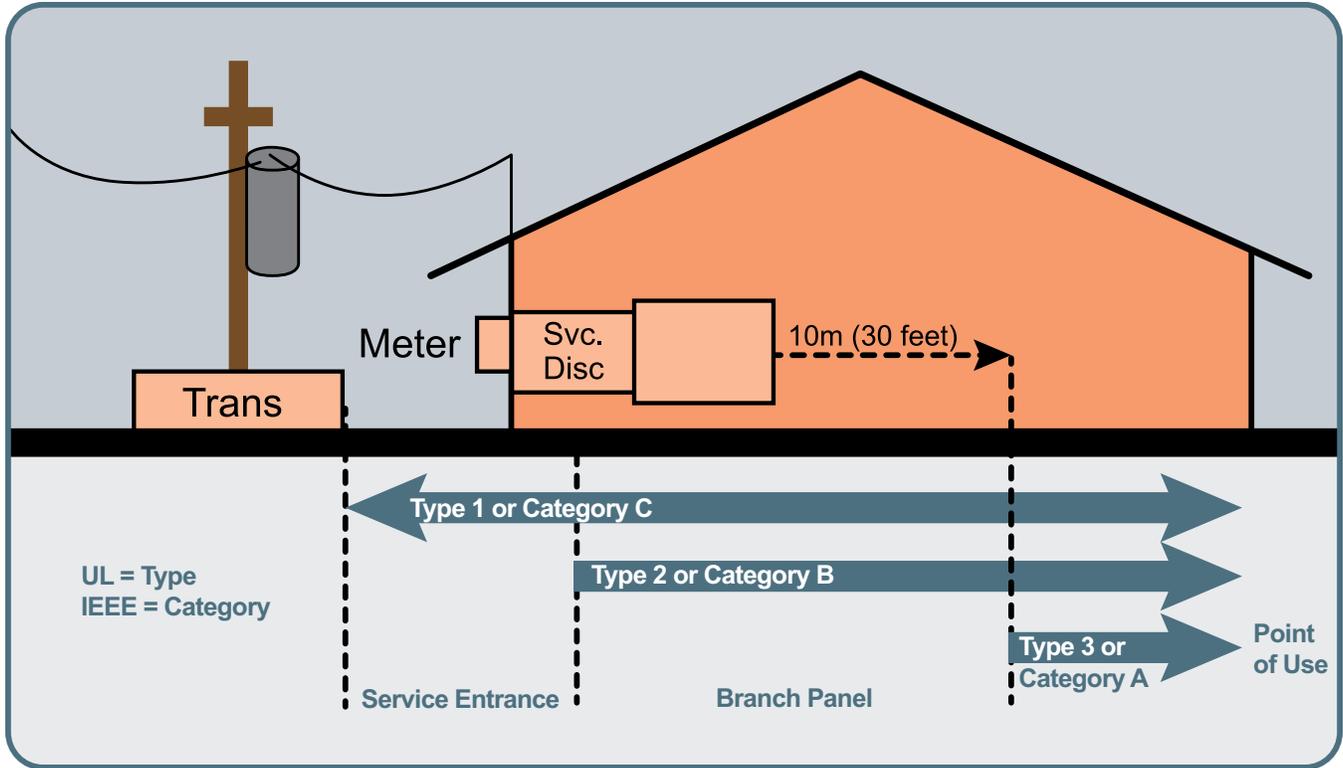


Figure 1: The above picture shows the locations within the electrical distribution and the associated Type device adopted by IEEE Categories A, B, & C

- Type 5** - Discrete component surge suppressors, such as MOVs that may be mounted on a Printed Wiring Board (PWB), connected by its leads or provided within an enclosure with mounting means and wiring terminations.

Type 5 devices are incomplete as SPDs. They require further evaluation and are not permitted to be installed in the field as a stand-alone SPD. They are generally the components used in the design and construction of complete SPDs or other SPD assemblies.

The Nominal Discharge Current (I_n) was newly introduced in UL 1449 3rd Edition. It is defined as the peak value of the current (20kA maximum) through the SPD (8/20 μ s waveform) where the SPD remains functional after 15 repetitive impulses (three groups of five surges) of a specific value, determined by the manufacturer (values shown in the table below). A maximum time of 1 minute \pm 15 seconds is permitted between the surges. During the I_n test, every mode of protection is tested,

including any require overcurrent protection device. During this test the unit is tested at its rated voltage or what is referred to in UL 1449 as the Maximum Continuous Operating Voltage (MCOV).

SPD Type	Nominal Discharge Current (I_n)
Type 1	10kA or 20kA
Type 2	3kA, 5kA, 10kA or 20kA

Table 1: Nominal discharge current - For Type 1 and Type 2 SPDs and Type 1, 2 Component Assemblies (Section 40.7.1 UL 1449 4th Edition)

It is important to note is that the manufacturer has the ability to select which I_n value the device is tested at, which means that SPD products need to be investigated in detail to understand the published ratings. In the event that a device cannot pass at any given value, it is permitted by UL that the SPD manufacturer can re-test at a lower level until a stable value is obtained and recorded to pass the test. This means that a manufacturer has a number of I_n values they are able to test to achieve compliance.

UL 1449 4TH EDITION LOCATION AND/OR TYPE DESIGNATIONS

SUMMARY

The majority of Mersen's SPD line is ANSI/UL 1449 4th Edition, Type 1 SPD, File #E210793. Mersen offers various SPD products that are also listed as Type 1 Component Assembly, Type 2 Component Assembly, Type 2 and Type 4.

Type 1 devices can be used in all other locations (from service entrance to point of use). This does not only provide the end user a simple installation, but also provides ease that the SPD may not be misapplied by installing it in an incorrect location.

SURGE PROTECTION PRODUCTS FROM MERSEN

Surge-Trap® NEMA Type 1 SPDs

Mersen's Surge-Trap NEMA Type 1 SPD line includes six surge protection products designed and manufactured by Mersen with the latest materials, layouts, and components, including the industry-leading TPMOV Technology. All are NEMA devices for ANSI/UL 1449 Type 1 and 2 applications, indoor and outdoor use, and provide UL96A lightning protection plus a variety of other features and benefits to meet clients' needs. To aid partners offering Mersen products, the company designed an intuitive cataloging system and partner portal that makes it easy to compare features and quickly find the right product for customers. For more information regarding Mersen's surge protection products, visit: ep-us.mersen.com/solutions/surge-protection/

Surge-Trap® Pluggable and Surge-Trap Modular

Surge-Trap Pluggable and Surge-Trap Modular Surge Protective Devices are no-fuse, fail-safe surge suppressors featuring Mersen's patented TPMOV technology inside. The pluggable and modular SPDs are UL 1449 3rd Edition approved. They are DIN-rail mountable featuring a fail safe, self-protected design, visual indicator, and a small footprint. A remote indicator option provides status to critical control circuits. Surge-Trap Pluggable and Surge-Trap Modular SPDs have a high short circuit rating and a thermally protected MOV, which eliminates the need for additional overcurrent protection devices. For more information regarding Mersen's surge protection products, visit: ep-us.mersen.com/solutions/surge-protection/



Surge-Trap NEMA Type 1 SPDs



Surge-Trap Pluggable and Surge-Trap Modular

CONTACT

USA

374 Merrimac Street, Newburyport, MA 01950
T 978 462 6662 | F 978 462 0181
info.nby@mersen.com

CANADA

6200 Kestrel Road, Mississauga, ON L5T 1Z1
T 905 795 0077 | F 905 795 2508
technicalservices.mis@mersen.com

TT-SPN6-001 | PDF | 6.18 | ©2018 Mersen. All rights reserved.

ADDITIONAL RESOURCES

- UL 1449 4th Edition
- IEEE Standard C62.41.1 and C62.41.2
- NEMAsurge.org
 - Surge Protective Device (SPD) Type Application Considerations