



UL 1449: Key Changes From 2nd Edition to 3rd Edition

A White Paper presented by:

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UL 1449: Key Changes from 2nd Edition to 3rd Edition

Key concepts:

- UL 1449, 3rd Edition became effective on Sept. 29, 2009
- Key changes included:
 - Restructuring of some requirements
 - Nomenclature change and type designations added
 - Measured limiting voltage (MLV) – 2nd Edition
 - Voltage protection rating (VPR) – 3rd Edition
 - Nominal discharge current test added
 - Surge arrestors rolled into 3rd Edition

Introduction

Surge protective devices (SPDs) for industrial applications need to meet very strict standards to prevent downtime and increase reliability. One of the key approvals for SPDs is UL 1449, “Standard for Safety for Surge Protective Devices.”

UL 1449, 3rd Edition, became effective Sept. 29, 2009. This short paper summarizes some of the key changes between the 2nd and 3rd editions, so that end users understand the benefits of choosing surge protection approved to the latest standard.

Restructured Requirements

- Organize general requirements and particular product requirements
- Particular requirements for permanently connected SPDs
- Cord-connected SPDs
- Direct plug-in SPDs

Nomenclature and Type Designations

TVSS is replaced by SPD (surge protective device), which is an umbrella term for all devices covered in UL 1449 and then subdivided into “Types” based on installation location. The following Types are defined:

- Type 1: SPDs after service transformer but before the first circuit breaker
- Type 2: Permanently connected SPDs after the circuit breaker
- Type 3:
 - Point of use SPDs
 - Cord connected, direct plug-in
- Type 4: Component SPDs, discrete components

Measured Limiting Voltage & Voltage Protection Rating

“Measured limiting voltage” is the terminology used in the 2nd Edition, and “voltage protection rating” is the terminology used in the 3rd Edition. Both are expressions for the maximum voltage allowed to remain during protection or when a surge occurs. The method used to measure the voltage and the “conditioning” of the product has changed. In both cases, the current value is lower than the surge current capabilities of the product.

Measured Limiting Voltage Rating (2nd Edition Terminology)

The voltage is evaluated before and after conditioning by:

- Cord-connected and direct plug-in products
 - **0.5 kA (500 amps)** is used during evaluation
 - Peak voltage applied is 6 kV (6,000 volts)
- Permanently connected
 - 0.5 kA is used during evaluation
 - Peak voltage applied is 6 kV
- NOTE: All are evaluated at on 0.5 kA

The products are conditioned by:

- Cord-connected and direct plug-in products (Same as 2nd Edition)
 - **0.5 kA** is used
 - Peak voltage applied is 6 kV
 - Voltage and current applied 20 times under normal voltage
- Permanently connected (higher current for conditioning)
 - **3.0 kA (3,000 Amps)** is used
 - Peak voltage applied is 6 kV
 - Voltage and current applied 20 times under normal voltage

The products are then specified by:

- Measured value rounded up 100 volt increments
 - < 330 volts
 - 400, 500, 600, 700, 800, 900, 1,000 volts
- Or larger steps if over 1,000 volts
 - 1,200, 1,500, 1,800 volts
 - 2,000, 2,500 volts
 - 3,000, 4,000, 5,000, 6,000 volts

Voltage Protection Rating (3rd Edition Terminology)

The voltage is evaluated before and after conditioning by:

- Cord-connected and direct plug-in products – Type 3
 - **3.0 kA** is used (2nd Ed: 0.5 kA)
 - Peak Voltage applied is 6kV (Same as 2nd Edition)
- Permanently connected – Type 2 (1 or 4 also)
 - **3.0 kA** is used (2nd Ed. Was 0.5 kA)
 - Peak voltage applied is 6 kV (Same as 2nd Edition)
- NOTE: All are values increased from 0.5 kA to 3.0 kA

The products are conditioned by:

- Cord-connected and direct plug-in products (Type 3)
 - **3.0 kA** is used (2nd Edition: 0.5 kA)
 - Peak voltage applied is 6 kV (Same as 2nd Edition)
 - Conditioning applied 15 times (2nd Edition: 20 times)
- Permanently connected (Type 2 and 1)
 - **Vendor-defined value** is used (2nd Edition: 3.0 kA)

- Peak voltage applied is 6 kV **minimum**
- Conditioning applied 15 times (2nd Edition: 20 times)

The products are conditioned by the **nominal discharge current** (I_n) levels defined by the manufacturer:

- “Manufacturer shall specify (declare) the value. . . .”
- Permanently connected – Type 1
 - 10 kA
 - 20 kA
- Permanently connected – Type 2
 - 3 kA
 - 5 kA
 - 10 kA
 - 20 kA

The products are then specified the same as in 2nd Edition:

- Measured value rounded up 100 volt increments
 - < 330 volts
 - 400, 500, 600, 700, 800, 900, 1,000 volts
- Or larger steps if over 1,000 volts
 - 1,200, 1,500, 1,800 volts
 - 2,000, 2,500 volts
 - 3,000, 4,000, 5,000, 6,000 volts
- Applying the surge current 15 times is a significant testing impact.
- 15 times is three cycles of:
 - Applying surge current
 - Applying nominal voltage or MCOV (maximum continuous operating voltage)
 - Removing nominal voltage
- High surge currents require use of “boomer”
- 2nd Edition testing is performed on the Haefely Generators

Nominal Discharge Currents (I_n) Defined

- 3.0 kA
- 5.0 kA
- 10 kA
- 20 kA

Summary

UL 1449, 3rd Edition, restructured some of the key requirements for surge protective devices (SPD) and redefined some of the technology and terminology. SPDs that meet the latest version of the standard can increase the reliability of your system and provide peace of mind.

About Phoenix Contact

Phoenix Contact is a leading developer of industrial electrical and electronic technology. The company’s diverse product range includes components and system solutions for industrial and device connection, automation, electronic interface and surge protection. Phoenix Contact GmbH & Co. KG, Blomberg, Germany, operates 47 international subsidiaries. Phoenix Contact’s formal Integrated Management System is registered to ISO quality, environmental and safety standards (ISO 9001:2008, 14001:2004 and 18001:2007).