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IEEE Standard Test Specifications for Surge-Protective Devices (SPDs) for Use on the Load Side of the Service Equipment in Low-Voltage (1000 V and Less) AC Power Circuits

IEEE Power and Energy Society

Sponsored by the
Surge Protective Devices Committee

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IEEE Std C62.62™-2018
(Revision of IEEE Std C62.62-2010)

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Abstract: Surge-protective devices (SPDs) intended to be installed on the load side of the service equipment connected to 50 Hz or 60 Hz ac power circuits rated at 1000 V (root mean squared [rms]) or less are the focus of this standard. Performance characteristics and standard methods for testing and rating are established for these devices, which may be composed of any combination of components. The tests in this standard are aimed at providing comparisons among the variety of SPDs available.

Keywords: combination wave, current-driven test, disconnector, IEEE C62.62™, induced failure, maximum continuous operating voltage, MCOV, nominal discharge current, one-port SPD, operational duty cycle, ring wave, SCCR, service equipment, short-circuit current rating, SPD, SPD Type, surge protection, surge tests, surge-protective device, temporary overvoltage, TOV, transient voltage-surge suppressor, TVSS, two-port SPD, Type 1 Component Assembly, Type 1 SPD, Type 2 Component Assembly, Type 2 SPD, Type 3 Component Assembly, Type 3 SPD, Type 4 Component Assemblies, Type 5 SPD

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Introduction

This introduction is not part of IEEE Std C62.62-2018, IEEE Standard Test Specifications for Surge-Protective Devices (SPDs) for Use on the Load Side of the Service Equipment in Low-Voltage (1000 V and Less) AC Power Circuits.

The purpose of this standard is to provide users, independent laboratories, and manufacturers with a test specification applicable to surge protective devices (SPDs) intended for limiting transient overvoltages that can appear on alternating current (ac) power circuits of 1000 V (root mean squared) or less. The standard contains test specifications that allow the user to compare various SPDs. It is one of several documents based in part on IEEE Std C62.41.2™-2002[1] that characterizes the surge environment to which low-voltage ac power circuits are exposed.

The surge tests described herein are not intended to duplicate lightning or other naturally occurring transients specifically; rather, they provide a method of evaluation and comparison of SPDs. The surge tests included in this standard have been time and application proven to provide a good and fair evaluation of SPDs.

The interest in low-voltage ac SPDs has grown with the trend to protect sophisticated electrical and electronic equipment that is exposed and susceptible to surges from the environment and generated within the electrical system itself. This standard provides test methods for SPDs.

This test specification has evolved from its original forms, IEEE Std C62.62-2000 and IEEE Std C62.62-2010, in that the title and scope have changed from the 2000 revision. The title and scope limit the application of this document to SPDs intended for installation on the load side of the service equipment. IEEE Std C62.34™ [B8][2] covers test specifications for SPDs intended for installation on the line side of the service equipment (referred to as Type 1 SPDs by other standards).

Furthermore, the following table summarizes a comparison of tests from the 2000 revision of the standard to the 2010 revision. This revision has been circulated with only minor changes (updated standard references and similar) from the 2010 revision to gain comments and feedback from the users of the document.

IEEE Std C62.62-2000	IEEE Std C62.62-2010
Surge Response Voltage Test: 100 kHz Ring Wave Test Combination Wave Test Other waveforms per IEEE Std C62.41-1991	Surge Tests: 100 kHz Ring Wave Test Combination Wave Test Current-Driven Tests Voltage-Surge Tests Nominal Discharge Current Test
Maximum Continuous Operating Voltage (MCOV) Test	Maximum Continuous Operating Voltage (MCOV) Test
Maximum Single Withstand Surge Current Test	Nominal Discharge Current Test/ Operational Duty Cycle Test
Minimum Surge Life Test	Nominal Discharge Current Test/ Operational Duty Cycle Test
Voltage Regulation Test	Voltage Regulation Test
Load Current Capability Test	Rated Load Current Test
Protection Status Indication Test	—
Standby Power Dissipation Test	Standby Power Consumption Test (Informative Annex)
Insulation Resistance Test	Insulation Resistance Test (Informative Annex)
Dielectric Withstand Test	Dielectric Withstand Test (Informative Annex)

[1]Information on references can be found in Clause 2
[2]The numbers in brackets correspond to those of the bibliography in Annex B

IEEE Std C62.62-2000	IEEE Std C62.62-2010
Failure Safety Mode Test	Short-Circuit Current Rating Test Intermediate Current Test (Informative Annex) Limited Current Abnormal Overvoltage Test (Informative Annex)
Response to Front of Wave Test	Front of Wave Test (Informative Annex)
—	Maximum Operating Temperature Withstand Test
—	Load-Side Short-Circuit Test
—	Load-Side Surge Withstand Test
—	Operational Voltage Test (Informative Annex)
—	Grounding Continuity Test (Informative Annex)
—	Leakage Current Test (Informative Annex)

Although a number of the tests from the 2000 and 2010 revisions also appear in this revision, many have been modified. Another important revision is the formatting of the test specifications to include the rationale, purpose, test procedure and setup, and expected results.

Annex A (informative) describes additional tests that may be used to establish particular application requirements but are not a requirement of this document and provides supplemental information regarding the subject of SPDs.

Recently, new terminology has been introduced to describe SPDs—in particular, the SPD "Type." This terminology is included and defined in this publication. To provide clarification to the user of this document, Type 1 SPDs (generally used for the line side of the service equipment—seemingly out of the scope of this document) are included. The rationale for inclusion is that Type 1 SPDs are also permitted to be used on the load side of the service equipment (within the scope of this document) as well as the line side.

Directly correlating the ANSI/UL 1449 [B3] SPD Types to the location categories as described in IEEE Std C62.41.2-2002 is sometimes complicated due to the overlap of the boundaries of the location categories. The illustration of the IEEE Location Categories Concept is included in A.15 for reference.

Generally, Type 1 SPDs are intended for use in Category C locations; however, application of Type 1 SPDs is not limited to the Category C location. They may also be used on the load side of the service equipment, which includes Category B and Category A.

Furthermore, Type 2 SPDs are intended for the load side of the service equipment but can have the same ratings as a Type 1 SPD. The fuzzy boundary between Category C and Category B overlaps at the service equipment; therefore, Type 2 SPDs may be considered for both Category C and Category B.

Type 3 SPDs are generally expected to be used in Category A locations. However, because Type 3 SPDs are direct plug-in or cord-connected SPDs for use with convenience outlets, they may be located in the Category C/Category B boundary (a convenience outlet located close to the service equipment), and the corresponding tests for those locations may be considered.

Type 4 Component Assemblies may be intended as Type 1 SPDs, Type 2 SPDs, or Type 3 SPDs and must be considered based on their intended application.

For the 2018 revision of this standard, no new tests were added; however, significant clarification has been made to make the standard easier to understand and implement. Further, the standard has been better harmonized with other standards (including those from IEC and UL). Additional and significant safety considerations have been added. Further, the Nominal Discharge Current Test has been updated and corrected to better reflect the test.

From Clause 1 of IEEE Std C62.41.2-2002:

> *There are no specific models that are representative of all surge environments; the complexities of the real world need to be simplified to produce a manageable set of standard surge tests. To this end, a surge environment classification [location categories] scheme is presented. This classification provides a practical basis for the selection of waveforms and amplitudes of surge voltages and surge currents that may be applied to evaluate the surge withstand capability of equipment [SPDs, in this case] connected to these power circuits. It is most important to recognize that proper coordination of equipment capability and environment characteristics is required: each environment and the equipment to be protected have to be characterized and the two reconciled.*

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IEEE Standard Test Specifications for Surge-Protective Devices (SPDs) for Use on the Load Side of the Service Equipment in Low-Voltage (1000 V and Less) AC Power Circuits

1. Overview

1.1 Scope

This standard applies to surge-protective devices (SPDs) intended to be installed on the load side of the service equipment connected to 50 Hz or 60 Hz alternating current (ac) power circuits rated at 1000 V (root mean squared [rms]) or less. Performance characteristics and standard methods for testing and rating are established for these devices, which may be composed of any combination of components. The tests in this standard are aimed at providing comparisons among the variety of surge-protective devices available.

1.2 Purpose

The purpose of this standard is to provide users, independent laboratories, and manufacturers with test methods and test specifications applicable to low-voltage surge-protective devices used on the load side of the service equipment, intended for limiting transient overvoltages that can appear on ac power circuits of 1000 V (rms) or less.

2. Normative references

The following referenced documents and URLs are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEEE Std 4™-1995, IEEE Standard Techniques for High-Voltage Testing.[3,4]

IEEE Std C62.41.2™-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.

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