

IEEE Standard Specifications for Surge Protectors Used in Low-Voltage Data, Communications, and Signaling Circuits

Sponsor

**Surge Protective Devices Committee
of the
IEEE Power Engineering Society**

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Abstract: This standard applies to surge protectors for application on multiconductor and coaxial, balanced or unbalanced, data, communications, and signaling circuits with voltages less than or equal to 1000 V rms, or 1200 V dc. These surge protectors are intended to limit voltage surges, current surges, or both.

Keywords: communications circuits, data circuits, electrical protection, signaling circuits, surge protectors

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Introduction

(This introduction is not part of IEEE Std C62.64-1997, IEEE Standard Specifications for Surge Protectors Used in Low-Voltage Data, Communications, and Signaling Circuits.)

This first issue of IEEE Std C62.64-1997 has been developed by the Low-Voltage Data, Communications, and Signaling Circuit Working Group of the Low-Voltage Surge Protective Devices Subcommittee. It provides preferred values of the parameters that are used to specify the performance of these surge protectors. The tests that are used to characterize the parameters are in IEEE Std C62.36-1994, so the two standards are companion documents.

This standard is directed toward service providers who wish to provide electrical protection against surges on low-voltage circuits. The standardized preferred values promote consistency by helping users in selecting appropriate parameter values, and by aiding suppliers in focusing their resources on parameters of interest. Yet, this standard is flexible enough that applications needing values that differ from the preferred levels can use whatever is required.

This standard covers a wide range of possible protectors. They may limit voltages, currents, or both. Not all specification values apply to each protector. The user of the standard selects, from among the many possible specifications, the tests and parameter values needed by the application. For instance, a protector for an application that requires only voltage limiting would not specify values from the current-limiting specifications (see Clause 6), and would select only the parameters from the voltage-limiting specifications (see Clause 5) that are required by the application. In that way, a voltage-limiting surge protector may include, for example, a specification value for return loss (see 7.2), but not for longitudinal balance (see 7.3).

The preferred values of this standard also provide standardized values of important parameters for use with international standardization efforts.

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IEEE Standard Specifications for Surge Protectors Used in Low-Voltage Data, Communications, and Signaling Circuits

1. Overview

This standard is divided into seven clauses. Clause 1 provides the scope of this standard. Clause 2 lists references to publications that are needed to apply this standard. Clause 3 provides general specifications that may be needed for a surge protector regardless of its voltage- or current-limiting function. Clause 4 provides mechanical and environmental specifications that may be needed regardless of a protector's voltage- or current-limiting function. Clause 5, for protectors that limit surge voltages, is partitioned into two subclauses. The first provides specifications that avoid disturbing the circuit when no voltage surges are present; the second covers the voltage-limiting performance of the protector when a surge is present. Clause 6, for protectors that limit surge currents, is partitioned into two subclauses. The first provides specifications that avoid disturbing the circuit when no current surges are present; the second covers the current-limiting performance of the protector when a surge is present. Clause 7 provides specifications that may apply to either type of protector, and are intended to avoid disturbing the circuit when no surges are present.

1.1 Scope

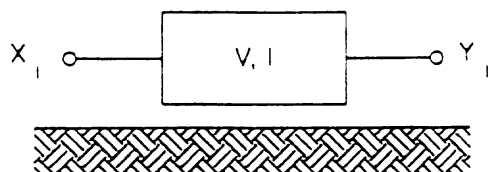
This standard applies to surge protectors for application on multiconductor and coaxial, balanced or unbalanced, data, communications, and signaling circuits with voltages less than or equal to 1000 V rms, or 1200 V dc. These surge protectors are intended to limit voltage surges, current surges, or both.

This standard provides performance criteria and tables of preferred values for performance based on characterization tests performed in accordance with IEEE Std C62.36-1994¹. The surge protectors covered are multiple-component series or parallel combinations of linear or nonlinear elements, packaged for the purpose of limiting voltage, current, or both. Figure 1 of IEEE Std C62.36-1994, reproduced here for convenience, illustrates as functional block diagrams the surge protectors covered by this standard.

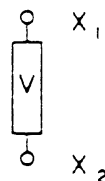
This standard is not intended to cover packaged single gas tube, air gap, varistor, or avalanche junction surge-protective devices, which are included in IEEE Std C62.31-1987, IEEE Std C62.32-1981, IEEE Std C62.33-1982, and IEEE Std C62.35-1987, respectively. Safety aspects of performance specifications are not covered; such aspects are covered in the National Electrical Code® (NEC®) (NFPA 70-1996). Specifically excluded from this standard are protectors for low-voltage power circuit applications.

¹Information on references can be found in Clause 2.

TWO-TERMINAL DEVICES

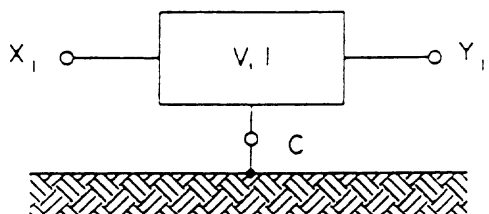


CONFIGURATION 2A

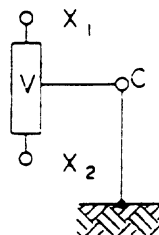


CONFIGURATION 2B

THREE-TERMINAL DEVICES

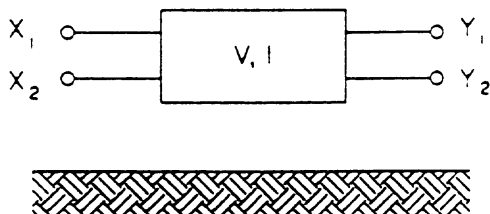


CONFIGURATION 3A



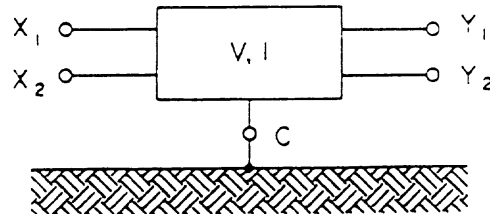
CONFIGURATION 3B

FOUR-TERMINAL DEVICE



CONFIGURATION 4

FIVE-TERMINAL DEVICE



CONFIGURATION 5

Figure 1—Basic configurations

The surge protectors covered by this standard are to be tested by means of the connections or terminations that are used when the surge protector is installed in the field. For surge protectors that are intended to be used with a base or connector, that base or connector shall be part of the tests.

The tables of preferred performance values of this standard provide a means of comparison among various surge protectors. They also provide a common engineering language beneficial to the user and manufacturer of surge protectors used in low-voltage data, communications, and signaling circuits.

This standard uses terminology for surge protective devices as defined in IEEE Std 100-1996.

1.2 Specification types

Tables of specifications in this standard often refer to *specification types*. In such tables, each specification type is given an alphanumeric designation that refers only to the parameter of that table. All of the parameter values on the same row as the designator apply to that specification type. A given surge protector may have a different specification type designation in other tables. For instance, a surge protector may have specification

type designation 1 for the insulation resistance specification, but specification type designation B for the impulse-limiting voltage specification, and specification type designation 3 for impulse reset.

1.3 Preferred values

The values for the parameters listed in the tables for the various specification types are preferred in the sense that their use promotes uniformity. However, specific applications may require values other than the preferred values of the tables.

2. References

This standard shall be used in conjunction with the following publications:

IEEE Std 100-1996, IEEE Standard Dictionary of Electrical and Electronics Terms.²

IEEE Std 455-1985 (Reaff 1992), IEEE Standard Test Procedure for Measuring Longitudinal Balance of Telephone Equipment Operating in the Voice Band (ANSI).

IEEE Std C62.31-1987 (Reaff 1993), IEEE Standard Test Specifications for Gas-Tube Surge-Protective Devices (ANSI).

IEEE Std C62.32-1981 (Reaff 1993), IEEE Standard Test Specifications for Low-Voltage Air Gap Surge-Protective Devices (Excluding Valve and Expulsion Type Devices) (ANSI).

IEEE Std C62.33-1982 (Reaff 1994), IEEE Standard Test Specifications for Varistor Surge-Protective Devices (ANSI).

IEEE Std C62.35-1987 (Reaff 1993), IEEE Standard Test Specifications for Avalanche Junction Semiconductor Surge-Protective Devices.

IEEE Std C62.36-1994, IEEE Standard Test Methods for Surge Protectors Used in Low-Voltage Data, Communications, and Signaling Circuits.

ITU Recommendation K.17, Tests on Power-Fed Repeaters, Geneva, 1988.³

NFPA 70-1996, National Electrical Code® (NEC®) (ANSI).⁴

3. General specifications

3.1 Marking and documentation

The following information shall be provided by the manufacturer, by means of markings, product information data sheets, technical practice bulletins, or other suitable documentation:

- a) Manufacturer's name or trademark, and model identifier;
- b) Intended application;

²IEEE publications are available from the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331, USA.

³ITU-T publications are available from the International Telecommunication Union, Place des Nations, CH-1211, Geneva 20, Switzerland.

⁴The NEC® is available from the NFPA, Publications Sales, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101, USA. It is also available from the IEEE.

- c) Operating temperature-humidity exposure category (controlled or uncontrolled);
- d) Any applicable safety agency approvals;
- e) Complete list of specification types, in accordance with the characteristics in this specification, to the extent that the specifications are applicable;
- f) Installation instructions;
- g) If the surge protector has replaceable components, then the replacement instructions shall be included in the documentation or marking information;
- h) If the surge protector is dependent on polarity, or if it could be incorrectly installed, then the terminal identification shall be included in the marking information;
- i) If the surge protector has mechanical, optical, or other means to indicate the need to be replaced or reset, an explanation of the meaning of the indicator shall be included in the documentation or marking;
- j) If the surge protector contains radioactive material, it shall be marked in accordance with applicable regulations.

3.2 Marking

Each surge protector shall be marked in such a manner as to identify the manufacturer and model. Any marking on the surge protector of the information specified in 3.1 shall be indelible and legible.

3.3 Mechanical design

The surge protector shall not have sharp edges, corners, etc., that could injure personnel during installation or maintenance. If preloaded springs are employed in the construction, they shall be adequately contained such that they do not cause injury during installation or removal of the surge protector.

The surge protector shall have sufficient mechanical strength such that it does not explode, thereby creating hazardous projectiles, when subjected to surges within the scope of this standard.

3.4 Lead pull-out

External leads shall be capable of withstanding a 20 lb (89 N) pull for 1 min.

3.5 Mounting arrangements

The surge protector shall be capable of being mounted securely in its intended position. Any visual indicators shall be readily accessible and viewable.

4. Mechanical and environmental specifications

4.1 Operating temperature and humidity

Two categories of operating temperature and humidity for the application of surge protectors are covered in this standard. Each category has an associated range of temperature and relative humidity.

- Controlled temperature and humidity
 - Temperature: 2 °C to 50 °C
 - Relative humidity: 10% to 80%