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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Low-voltage surge protective devices – Part 01: General Requirements and test methods

Parafoudres basse tension – Partie 01: Exigences générales et méthodes d'essai

IEC 61643-01:2024-12(en-fr)

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LOW-VOLTAGE SURGE PROTECTIVE DEVICES –

Part 01: General requirements and test methods

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC 61643-01 has been prepared by subcommittee SC37A Low-voltage surge protective devices, of IEC technical committee 37: Surge arresters. It is an International Standard.

This document, together with IEC 61643-11:—[1] (second edition), cancels and replaces the first edition of IEC 61643-11 published in 2011. This edition constitutes a technical revision.

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1 Under preparation. Stage at the time of publication: IEC/AFDIS 61643-11:2024.

This edition includes the following significant technical changes with respect to the first edition of IEC 61643-11:

a) Clarification on test application either to a complete SPD, to a "mode of protection", or to a complete "SPD assembly";

b) Additional measurement of voltage protection level on "combined modes of protection" between live conductors and PE (see new Annex F);

c) Additional duty test for T1 SPD and T2 SPD with follow current to check for increased follow current at lower impulse current amplitude (see 9.3.5.5);

d) Modified and amended short circuit current test requirements to better cover up-to-date internal SPD disconnector technologies (see 9.3.6.3);

e) Improved dielectric test requirements for the SPD's main circuits and added dielectric test requirements for "electrically separated circuits" (see 9.3.7 and 9.3.8);

f) Additional clearance requirements for "electrically separated circuits" (see 9.4.4);

g) Additional information and details for SPDs for DC installations.

The text of this International Standard is based on the following documents:

Draft	Report on voting
37A/419/FDIS	37A/422/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

A list of all parts in the IEC 61643 series, published under the general title *Low-voltage surge protective devices*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This document is a product family standard dealing with the safety and performance of Surge Protective Devices (SPDs) and takes precedence over horizontal and generic standards covering the same subject.

This part of IEC 61643 addresses the general safety and performance tests for SPDs.

This document recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of SPDs when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice.

This document takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the SPD is connected to the supply mains. However, national wiring rules might differ.

If the intended applications of an SPD are covered by different parts of the IEC 61643-X1 series of standards, all relevant parts are applied.

This document is only to be applied together with the latest edition of one or more of the subsequent parts of the IEC 61643-X1 series of standards.

SPDs containing additional features or functions not addressed in this document and the relevant subsequent part(s) can require additional consideration and tests to ensure the main SPD function is not adversely affected and no hazards can arise from these additional features or functions. If appropriate standards exist to cover such functions, they are to be applied.

There are three SPD Types for SPDs intended to be installed in power systems:

T1 SPDs are subjected to impulses simulating conducted partial lightning currents.

T2 SPDs and T3 SPDs are subjected to impulses of shorter duration.

LOW-VOLTAGE SURGE PROTECTIVE DEVICES –

Part 01: General requirements and test methods

1 Scope

This part of IEC 61643 contains the common requirements for all SPDs.

This document is applicable to devices for surge protection against indirect and direct effects of lightning or other transient overvoltages, hereafter referred to as Surge Protective Devices (SPDs).

SPDs are intended to be connected to circuits or equipment rated up to 1 000 V AC (RMS) or 1 500 V DC. Performance and safety requirements, tests and ratings are specified in this document. SPDs contain at least one nonlinear component and are intended to limit surge voltages and divert surge currents.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-2-11:2021, *Environmental testing – Part 2-11: Tests – Test Ka: Salt mist*

IEC 60068-2-14:2023, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60099-4:2014, *Surge arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60269 (all parts), *Low-voltage fuses*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

IEC 60695-2-11:2021, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end products (GWEPT)*

IEC 60695-10-2:2014, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

IEC 60898(all parts), *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations*

IEC 60947-2:2016, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers*
IEC 60947-2:2016/AMD1:2019

IEC 61000 (all parts), *Electromagnetic compatibility (EMC)*

IEC 61180, *High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, test equipment*

IEC 61210:2010, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

IEC TR 61643-03:2024, *Low-voltage surge protective devices – Part 03: SPD testing guide*

IEC 61643-11:—[2], *Low-voltage surge protective devices – Part 11: Surge protective devices connected to AC low-voltage power systems – Requirements and test methods*

3 Terms, definitions, abbreviated terms and symbols

For the purposes of this document, the following terms, definitions, abbreviated terms and symbols apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1 Terms and definitions

3.1.1
1,2/50 voltage impulse
voltage impulse with a nominal virtual front time of 1,2 µs and a nominal time to half-value of 50 µs

Note 1 to entry: IEC 60060-1 provides the voltage impulse definitions of front time, time to half-value and waveshape.

3.1.2
8/20 current impulse
current impulse with a nominal virtual front time of 8 µs and a nominal time to half-value of 20 µs

Note 1 to entry: IEC 62475 provides the current impulse definitions of front time, time to half-value and waveshape.

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2 Under preparation. Stage at the time of publication: IEC/AFDIS 61643-11:2024.

3.1.3
acceptance test
contractual test to prove to the customer that the item meets certain conditions of its specification

[SOURCE: IEC 60050-151:2001, 151-16-23]

3.1.4
combination SPD
SPD that contains either at least one combination mode of protection or at least one voltage limiting mode of protection and one voltage switching mode of protection

3.1.5
combination mode of protection
mode of protection that incorporates both, voltage switching components and voltage limiting components

3.1.6
combination wave
wave characterized by defined voltage amplitude (U_{OC}) and waveshape under open-circuit conditions and a defined current amplitude (I_{CW}) and waveshape under short-circuit conditions

Note 1 to entry: The voltage amplitude, current amplitude and waveform that is delivered to the SPD are determined by the combination wave generator (CWG) impedance Z_f and the impedance of the DUT.

3.1.7
combination wave generator short-circuit current
I_{CW}
prospective short-circuit current of the combination wave generator, at the point of connection of the device under test

Note 1 to entry: When the SPD is connected to the combination wave generator, the current that flows through the device is generally less than I_{CW}.

3.1.8
continuous current
I_C
current flowing through the SPD's mode of protection while energized at U_{test}

3.1.9
current path
electrical path intended to conduct at least part of an impulse current applied to an SPD`s mode of protection

Note 1 to entry: An SPD`s mode of protection may contain only one current path or several current paths, when voltage limiting and/or voltage switching components are connected in parallel.

Note 2 to entry: Examples are provided in Annex B of IEC TR 61643-03:2024.

3.1.10
decoupling network
electrical circuit intended to prevent surge energy from being propagated to the power network during energized testing of SPDs

Note 1 to entry: This electrical circuit is sometimes called a "back filter".

3.1.11
degradation (of performance)
undesired permanent departure in the operational performance of equipment or a system from its intended performance