

INTERNATIONAL STANDARD

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**Low-voltage surge protective devices –
Part 31: Requirements and test methods for SPDs for photovoltaic installations**

**Parafoudres basse tension –
Partie 31: Parafoudres pour usage spécifique y compris en courant continu –
Exigences et méthodes d'essai des parafoudres pour installations
photovoltaïques**



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LOW-VOLTAGE SURGE PROTECTIVE DEVICES –**Part 31: Requirements and test methods
for SPDs for photovoltaic installations****FOREWORD**

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International Standard IEC 61643-31 has been prepared by subcommittee 37A: Low-voltage surge protective devices, of IEC technical committee 37: Surge arresters.

The text of this standard is based on the following documents:

FDIS	Report on voting
37A/306/FDIS	37A/310/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This part of IEC 61643 addresses safety and performance tests for surge protective devices (SPDs) to be installed on the DC side of photovoltaic installations to protect against induced and direct lightning effects.

There are three classes of tests:

- 1) The Class I test is intended to simulate partial conducted lightning current impulses. SPDs subjected to Class I test methods are generally recommended for locations at points of high exposure, e.g., line entrances to buildings protected by lightning protection systems.
- 2) SPDs tested to Class II or Class III test methods are subjected to impulses of shorter duration.
- 3) SPDs are tested on a “black box” basis as far as possible.

Tests take into account that photovoltaic generators:

- behave like current generators,
- that their output current depends on the incident light intensity and temperature,
- that their short-circuit current is slightly higher than the operating output current,
- are connected in series and/or parallel combinations leading to a great variety of voltages, currents and powers from a few hundreds of W (in residential installations) to several MW (photovoltaic fields).

The specific electrical parameters of PV installations on the DC side require specific test requirements for SPDs.

IEC 61643-32 addresses the selection and application principles of SPDs in practical situations for PV application (work in progress).

LOW-VOLTAGE SURGE PROTECTIVE DEVICES –

Part 31: Requirements and test methods for SPDs for photovoltaic installations

1 Scope

This part of IEC 61643 is applicable to Surge Protective Devices (SPDs), intended for surge protection against indirect and direct effects of lightning or other transient overvoltages. These devices are designed to be connected to the DC side of photovoltaic installations rated up to 1 500 V DC.

These devices contain at least one non-linear component and are intended to limit surge voltages and divert surge currents. Performance characteristics, safety requirements, standard methods for testing and ratings are established.

SPDs complying with this standard are exclusively dedicated to be installed on the DC side of photovoltaic generators and the DC side of inverters.

SPDs for PV systems with energy storage (e.g. batteries, capacitor banks) are not covered.

SPDs with separate input and output terminals that contain specific series impedance between these terminal(s) (so called two-port SPDs according to IEC 61643-11:2011) are not covered.

SPDs compliant with this standard are designed to be permanently connected where connection and disconnection of fixed SPDs can only be done using a tool. This standard does not apply to portable SPDs

NOTE 1 In general SPDs for PV applications do not contain a specific series impedance between the input/output terminals due to power efficiency considerations.

NOTE 2 Wherever reference is made to the electric power system or the power system within this document, this refers to the DC side of the photovoltaic installation.

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

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

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 61000-6-3, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*

IEC 61180-1, *High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements*

IEC 61643-11:2011, *Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems – Requirements and test methods*

IEC 62475:2010, *High-current test techniques – Definitions and requirements for test currents and measuring systems*

3 Terms, definitions, acronyms and symbols

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

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

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

3.1 Terms and definitions

3.1.1

Surge Protective Device

SPD

device that contains at least one nonlinear component that is intended to limit surge voltages and divert surge currents

Note 1 to entry: An SPD is a complete assembly, having appropriate connecting means.

[SOURCE: IEC 61643-11:2011, 3.1.1]

3.1.2

one-port SPD

SPD having no intended series impedance

Note 1 to entry: A one-port SPD may have separate input and output connections

Note 2 to entry: Overcurrent protection devices e.g. fuses or circuit breakers are not considered as specific intended series impedance.

[SOURCE: IEC 61643-11:2011, 3.1.2, modified (Note 2 to entry added)]

3.1.3

voltage-switching SPD

SPD that has a high impedance when no surge is present, but can have a sudden change in impedance to a low value in response to a voltage surge

Note 1 to entry: Common examples of components used in voltage-switching SPDs are spark gaps, gas tubes and thyristors. These are sometimes called "crowbar-type" components.

[SOURCE: IEC 61643-11:2011, 3.1.4, modified (original term referred to "voltage switching type SPD")]