SLOVENSKI STANDARD
SIST-TS CLC/TS 50539-12:2014

01-februar-2014

Nadomešča:
SIST-TS CLC/TS 50539-12:2012

Nizkonapetostne naprave za zaščito pred prenapetostnimi udari - Naprave za zaščito pred prenapetostnimi udari za specifične aplikacije, vključno z enosmernimi - 12. del: Izbira in načela za uporabo - SPD, priključeni na fotonapetostne inštalacije

Low-voltage surge protective devices - Surge protective devices for specific application including d.c. -- Part 12: Selection and application principles - SPDs connected to photovoltaic installations

Überspannungsschutzgeräte für Niederspannung - Überspannungsschutzgeräte für besondere Anwendungen einschließlich Gleichspannung -- Teil 12: Auswahl und Anwendungsgrundsätze - Überspannungsschutzgeräte für den Einsatz in Photovoltaik Installationen

Parafoudres basse tension - Parafoudres pour applications spécifiques incluant le courant continu -- Partie 12: Principes de choix et d'application - Parafoudres connectés aux installations photovoltaïques

Ta slovenski standard je istoveten z: **CLC/TS 50539-12:2013**

ICS:

27.160	Sončna energija	Solar energy engineering
29.120.50	Varovalke in druga medtokovna zaščita	Fuses and other overcurrent protection devices

SIST-TS CLC/TS 50539-12:2014 **en,fr,de**

TECHNICAL SPECIFICATION

SPÉCIFICATION TECHNIQUE

TECHNISCHE SPEZIFIKATION

CLC/TS 50539-12

December 2013

ICS 29.120.50

Supersedes CLC/TS 50539-12:2010

English version

Low-voltage surge protective devices - Surge protective devices for specific application including d.c. - Part 12: Selection and application principles - SPDs connected to photovoltaic installations

Parafoudres basse tension - Parafoudres pour applications spécifiques incluant le courant continu - Partie 12: Principes de choix et d'application - Parafoudres connectés aux installations photovoltaïques

Überspannungsschutzgeräte für Niederspannung - Überspannungsschutzgeräte für besondere Anwendungen einschließlich Gleichspannung - Teil 12: Auswahl und Anwendungsgrundsätze - Überspannungsschutzgeräte für den Einsatz in Photovoltaik-Installationen

This Technical Specification was approved by CENELEC on 2013-10-21.

CENELEC members are required to announce the existence of this TS in the same way as for an EN and to make the TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. CLC/TS 50539-12:2013 E

Contents

Page

Figures

Tables

Foreword

This document (CLC/TS 50539-12:2013) has been prepared by CLC/TC 37A "Low voltage surge protective devices".

This document supersedes CLC/TS 50539-12:2010.

CLC/TS 50539-12:2013 includes the following significant technical changes with respect to CLC/TS 50539-12:2010:

a) scope and definitions have been revised to align CLC/TS 50539-12 with EN 50539-11;

b) structure of the document has been revised for better clarification;

c) only Type 1 d.c. SPDs can be used for cases described in 6.4;

d) multi-earthed solar systems have been introduced for SPD selection and for current sharing calculation;

e) Table 1 (impulse withstand) has been introduced;

f) current sharing in Annex A has been revised;

g) Annex B has been created;

h) risk assessment has been introduced in Annex C.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

1 Scope

This Technical Specification describes the principles for selection, location, coordination and operation of SPDs to be connected to PV installations. The d.c. side is rated up to 1 500 V d.c. and the a.c. side, if any, is rated up to 1 000 V rms 50 Hz.

The electrical installation starts from a PV generator or a set of interconnected PV modules with their cables, provided by the PV generator manufacturer, up to the user installation or the utility supply point.

For PV installations including batteries, additional requirements will be necessary.

NOTE 1 HD 60364-7-712, CLC/TS 61643-12 and EN 62305-4 are also applicable.

NOTE 2 This Technical Specification deals only with SPDs, and not with SPDs components integrated inside equipment.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CLC/TS 61643-12, *Low-voltage surge protective devices – Part 12: Surge protective devices connected to low-voltage power distribution systems – Selection and application principles (IEC 61643-12)*

EN 50539-11, *Low-voltage surge protective devices – Surge protective devices for specific application including d.c. – Part 11: Requirements and tests for SPDs in photovoltaic applications*

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

EN 61000-4-5, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test (IEC 61000-4-5)*

EN 61643-11, *Low-voltage surge protective devices – Part 11: Surge protective devices connected to low-voltage power systems – Requirements and tests methods (IEC 61643-1)*

EN 61643-21, *Low voltage surge protective devices – Part 21: Surge protective devices connected to telecommunications and signalling networks – Performance requirements and testing methods (IEC 61643-21)*

EN 62305-2:2012, *Protection against lightning – Part 2: Risk management (IEC 62305-2:2010, mod.)*

EN 62305-4, *Protection against lightning – Part 4: Electrical and electronic systems within structures (IEC 62305-4)*

HD 60364-4-443, *Electrical installations of buildings – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances – Clause 443: Protection against overvoltages of atmospheric origin or due to switching (IEC 60364-4-44)*

HD 60364-5-534, *Low-voltage electrical installations – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control – Clause 534: Devices for protection against overvoltages (IEC 60364-5-53)*

ITU-T Recommendation K.20, *Resistibility of telecommunication equipment installed in a telecommunications centre to overvoltages and overcurrents*

ITU-T Recommendation K.21, *Resistibility of telecommunication equipment installed in customer premises to overvoltages and overcurrents*

3 Terms and definitions

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

3.1
PV generator
assembly of PV arrays connected to one input of the inverter

3.2
PV-installation
erected equipment of a PV power supply system

3.3
open-circuit maximum voltage
$U_{OC\ MAX}$
maximum voltage across an unloaded (open) PV generator, PV string, PV array or on the d.c. side of the PV inverter

Note 1 to entry: Calculation of $U_{OC\ MAX}$ is performed in Annex B.

3.4
lightning protection system
LPS

complete system used to reduce physical damage due to lightning flashes to a structure

Note 1 to entry: It consists of both external and internal lightning protection systems.

[SOURCE: EN 62305-1:2011, 3.42]

3.5
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: EN 61643-11:2012, 3.1.1]

3.6
external lightning protection system
part of the LPS consisting of an air-termination system, a down-conductor system and an earth-termination system

[SOURCE: EN 62305-1:2002, 3.43]

3.7
separation distance
s
distance between two conductive parts at which no dangerous sparking can occur

[SOURCE: EN 62305-3:2011, 3.28, modified — abbreviation 's' is added]

3.8
lightning equipotential bonding
EB
bonding to the LPS of separated conductive parts, by direct connections or via surge protective devices, to reduce potential differences caused by lightning current

[SOURCE: EN 62305-3:2011, 3.23]

3.9
bonding bar
metal bar on which metal installations, external conductive parts, electric power and telecommunication lines, and other cables can be bonded to an LPS

[SOURCE: EN 62305-3:2011, 3.24]

3.10
bonding conductor
conductor connecting separated conductive parts to LPS

[SOURCE: EN 62305-3:2011, 3.25]

3.11
standard test conditions
STC
test conditions specified in EN 60904-3 for PV cells and PV generators

3.12
open circuit voltage under standard test conditions
$U_{OC\ STC}$
voltage under standard test conditions across an unloaded (open) PV generator, PV string, PV array or on the d.c. side of the PV inverter

3.13
short-circuit current under standard test conditions
$I_{SC\ STC}$
short-circuit current of a PV generator, PV string or PV array under standard test conditions

3.14
external LPS isolated from the structure to be protected
LPS with an air-termination system and down-conductor system positioned in such a way that the path of the lightning current has no contact with the structure to be protected

Note 1 to entry: In an isolated LPS, dangerous sparks between the LPS and the structure are avoided.

[SOURCE: EN 62305-3:2011, 3.3]

3.15
current branch of an SPD
intended current path, between two nodes that contains one or more protective components

Note 1 to entry: A current branch of an SPD may be identical with a mode of protection of a SPD.

Note 2 to entry: This intended current path does not include additional terminals.

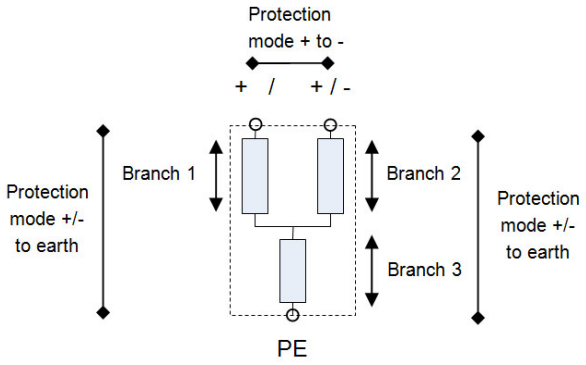


Figure 1 – Current branches vs. modes of protection of an SPD

[SOURCE: EN 50539-11:2013, 3.1.7]

4 Systems and equipment to be protected

Overvoltages can destroy, degrade or cause malfunction of a PV installation. Therefore, PV installations shall be protected in presence of overvoltage risk. The most sensitive parts of the equipment should first be protected: the inverter and the control/monitoring equipment, the PV generator and the wiring (installation itself).

5 Overvoltages in a PV installation

Overvoltages can be found under several conditions in a PV installation. They may be

— caused by direct strike (S1) to the external lightning protection system (LPS) of the building or lightning flashes nearby (S2) the buildings and/or PV installations,

— caused by direct strikes (S3) and lightning induced currents (S4) distributed into the electrical network,

— transmitted from the distribution network due to operations (switching).

NOTE S1, S2, S3 and S4 are abbreviations used in EN 62305 series (sources of damage).

The protection requirements within this document are based on the assumption that the cable interconnecting the d.c. components of the PV installation is sufficiently protected from direct lightning either by appropriate routing or by shielding, e.g. use of appropriate cable management system.

6 Installation and location of SPDs

6.1 General

According to CLC/TS 61643-12 and EN 62305 series, installation and location of SPDs for protection of PV installations depends on multiple factors, the main ones being

— the flash ground density of the location,

— the presence of overhead lines,

— the characteristics of the low-voltage power distribution system (e.g. overhead network or not) and of the equipment to be protected,

— if protection measures are needed to protect the PV-installation against direct lightning impacts with an external LPS.

When installations are protected by an external LPS, the requirements for SPD selection depends on

- the selected class of the LPS (see Annex A: simplified method),
- if the separation distance s is kept between the LPS and the PV installation (isolated LPS) or not kept (non-isolated LPS).

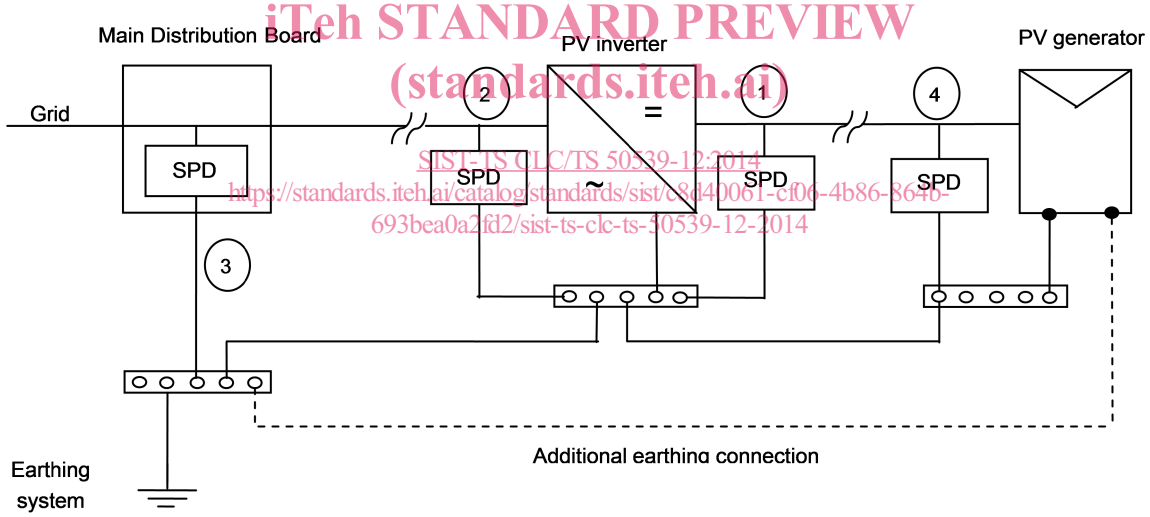
For further detail on external LPS and separation distance requirements, see EN 62305-3.

NOTE The separation distance s is typically less than 1 m.

All SPDs installed on the same line have to be coordinated (see CLC/TS 61643-12).

Examples for installations of SPDs for the different cases are shown in Figure 2 to Figure 5.

6.2 PV installation without external LPS



Key

1 SPD PV type 2 according to EN 50539-11

2 SPD type 2 according to EN 61643-11

3 SPD as required in HD 60364-5-534 and according to EN 61643-11

4 SPD PV type 2 according to EN 50539-11

Figure 2 – Installation of SPDs in case of PV installation without external LPS

In general, one set of SPDs on the d.c. side and one set of SPDs on the a.c. side of the inverter should be installed as close as possible to the inverter.

The SPD in location 2 is not needed (see 9.2.1.4) if the distance between the SPD in location 2 (main distribution board) and the inverter is less than 10 m. In this case, only one SPD is required in location 2 (main distribution board).