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Nizkonapetostne električne inštalacije - 7-712. del: Zahteve za posebne inštalacije ali lokacije - Fotonapetostni (PV) sistemi

Low-voltage electrical installations - Part 7-712: Requirements for special installations or locations - Photovoltaic (PV) systems

Errichten von Niederspannungsanlagen - Teil 7-712: Anforderungen für Betriebsstätten, Räume und Anlagen besonderer Art - Photovoltaik-(PV)-Stromversorgungssysteme

Installations électriques basses tensions - Partie 7-712: Exigences pour les installations et emplacements spéciaux - Systèmes photovoltaïques (PV)

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English Version

Low-voltage electrical installations -
Part 7-712: Requirements for special installations or locations -
Photovoltaic (PV) systems

Installations électriques basses tensions -
Partie 7-712: Exigences pour les installations et
emplacements spéciaux -
Systèmes photovoltaïques (PV)

Errichten von Niederspannungsanlagen -
Teil 7-712: Anforderungen für Betriebsstätten, Räume
und Anlagen besonderer Art -
Photovoltaik-(PV)-Stromversorgungssysteme

This Harmonization Document was approved by CENELEC on 2015-07-27. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document at national level.

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This Harmonization Document exists in three official versions (English, French, German).

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
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European foreword

This document (HD 60364-7-712:2016) has been prepared by CLC/TC 64 "Electrical installations and protection against electric shock".

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-10-08
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2019-04-08

This document supersedes HD 60364-7-712:2005 + corrigendum April 2006.

HD 60364-7-712:2016 includes the following significant technical changes with respect to HD 60364-7-712:2005:

- the scope has been amended to provide explanation for which PV supply systems this Harmonization Document is suitable;
- terms and definitions are updated to the used wording for the technical definitions of PV-Systems;
- safety related requirements are brought in line with the latest editions of Harmonization Documents from the HD 60364-4 series, especially on the protection for safety HD 384.4/HD 60364-4. The respective structure has been adopted;
- calculation principles for the selection of protective devices are provided and brought in line with the product standards for PV modules;
- where HD 60364-4-443 is not appropriate, a method for a risk assessment is introduced;
- to ensure safety of the various operators (maintenance personnel, inspectors, public distribution network operators, emergency aid services, etc.), a warning symbol to indicate the presence of a photovoltaic installation on a building was introduced;
- particular usage of overvoltage devices and their selection is explained;
- Annex B provides calculation methods for $U_{OC\ MAX}$ and $I_{SC\ MAX}$.

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.

Introduction

For the purpose of this part, the requirements of HD 60364/HD 384 apply.

The Parts 7XX of HD 60364 contain particular requirements for special installations or locations which are based on the requirements of the general parts of HD 60364 (Part 1, Part 4, Part 5 and Part 6). These Parts 7XX have to be considered in conjunction with the requirements of the general parts.

The particular requirements of this part of HD 60364 supplement, modify or replace certain of the requirements of the general parts of HD 60364 being valid at the time of publication of this part.

The absence of reference to the exclusion of a part or a clause of a general part means that the corresponding clauses of the general part are applicable (undated reference).

Requirements of other Parts 7XX being relevant for installations covered by this part also apply. This part may therefore also supplement, modify or replace certain of these requirements valid at the time of publication of this part.

The clause numbering of this part follows the pattern and corresponding references of HD 60364. The numbers following the particular number of this part are those of the corresponding parts, or clauses of HD 60364 being valid at the time of publication of this part as indicated in the normative references of this document (dated reference).

If additional requirements or explanations are needed which have no direct relation to general parts or other Parts 7XX the numbering of such clauses are stated as 712.101, 712.102, 712.103 etc.

NOTE In the case where new or amended general parts with modified numbering were published after this part was issued, the clause numbers referring to a general part in this Part 712 may no longer align with the latest edition of the general part. Dated references should be observed.

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HD 60364-7-712:2016**712 Photovoltaic systems (PV generator)****712.1 Scope**

This section applies to the electrical installation of PV generator intended to supply all or part of an installation and feeding of electricity into the public grid or local distribution.

In this section, the electrical equipment of a PV generator, like any other item of electrical equipment, is dealt with only so far as its selection and application in the installation is concerned.

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

Requirements of this document apply to

- PV generators for supply to an installation which is not connected to a system for distribution of electricity to the public,
- PV generators for supply to an installation in parallel with a system for distribution of electricity to the public,
- PV generators for supply to an installation as an alternative to a system for distribution of electricity to the public,
- appropriate combination of the above.

Requirements for PV generators with batteries or other energy storage methods are under consideration.

712.2 Normative references (standards.iteh.ai)

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 50539-12, *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*

EN 50521, *Connectors for photovoltaic systems – Safety requirements and tests*

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 50618, *Electric cables for photovoltaic systems*

EN 60269-6, *Low-voltage fuses – Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems* (IEC 60269-6)

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

EN 60670 series, *Boxes and enclosures for electrical accessories for household and similar fixed electrical installations* (IEC 60670 series)

EN 60898-2, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 2: Circuit-breakers for a.c. and d.c. operation* (IEC 60898-2)

EN 60947-2, *Low-voltage switchgear and controlgear – Part 2: Circuit-breakers* (IEC 60947-2)

EN 60947-3, *Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units* (IEC 60947-3)

EN 61439 series, *Low-voltage switchgear and controlgear assemblies* (IEC 61439 series)

EN 61557-8, *Electrical safety in low voltage distribution systems up to 1 000 V a.c. and 1 500 V d.c. – Equipment for testing, measuring or monitoring of protective measures – Part 8: Insulation monitoring devices for IT systems* (IEC 61557-8)

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

EN 61730-1:2007, *Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction* (IEC 61730-1:2004, mod.)

EN 62109-1:2010, *Safety of power converters for use in photovoltaic power systems – Part 1: General requirements* (IEC 62109-1:2010)

EN 62109-2:2011, *Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters* (IEC 62109-2:2011)

EN 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)* (IEC 62262)

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

EN 62305-3:2011, *Protection against lightning – Part 3: Physical damage to structures and life hazard* (IEC 62305-3:2010, mod.)

EN 62305-4:2011, *Protection against lightning – Part 4: Electrical and electronic systems within structures* (IEC 62305-4:2010, mod.)

EN 62423:2012, *Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses* (IEC 62423:2009, mod. + corr. Dec. 2011)

EN 62446:2009, *Grid connected photovoltaic systems – Minimum requirements for system documentation, commissioning tests and inspection* (IEC 62446:2009)

EN 62852, *Connectors for DC-application in photovoltaic systems – Safety requirements and tests* (IEC 62852)

HD 384 / HD 60364 series, *Low-voltage electrical installations* (IEC 60364 series)

HD 60364-4-41:2007 + corr. July 2007, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock* (IEC 60364-4-41:2005, mod.)

HD 60364-4-443:2016, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances – Clause 443: Protection against transient overvoltages of atmospheric origin or due to switching* (IEC 60364-4-44:2007/A1:2015, mod.)

HD 60364-5-551:2010 + corr. Dec. 2010, *Low-voltage electrical installations – Part 5-55: Selection and erection of electrical equipment – Other equipment – Clause 551: Low-voltage generating sets* (IEC 60364-5-55:2001/A2:2008 (Clause 551))

IEC 60050-826:2004, *International Electrotechnical Vocabulary – Part 826: Electrical installations*

HD 60364-7-712:2016**712.3 Terms and definitions**

For the purpose of this document, the terms and definitions given in IEC 60050-826:2004 and the following apply.

712.3.1**PV module**

smallest completely environmentally protected assembly of interconnected PV cells

712.3.2**PV string**

circuit of one or more series-connected modules

712.3.3**PV array**

assembly of electrically interconnected PV modules, PV strings, PV sub-arrays and PV array combiner boxes

Note 1 to entry: For the purposes of this document, a PV array is all components up to the d.c. input connection means of the inverter or other power conversion electrical equipment or d.c. loads. A PV array does not include its foundation, tracking apparatus, thermal control, and other such components.

Note 2 to entry: A PV array may consist of a single PV module, a single PV string, or several parallel-connected strings, or several parallel-connected PV sub-arrays and their associated electrical components.

712.3.4**PV generator**

PV array (712.3.3) including the inverter and the PV a.c. supply circuit

712.3.5**combiner box**

switchgear assembly where PV sub-arrays or PV strings are connected and which may also contain electrical accessories

712.3.6**PV sub-array**

electrical subset of a PV array formed of parallel-connected PV strings

[SOURCE: IEC/TS 62548:2013, 3.1.42]

712.3.7**PV string cable**

additional cable, not provided with the PV modules, for interconnecting a PV string and a PV distribution board

712.3.8**PV array cable**

output cable of a PV array

712.3.9**PV inverter**

device which converts d.c. voltage and d.c. current of the PV array into a.c. voltage and a.c. current

712.3.10**PV a.c. supply cable**

cable connecting the a.c. connection means of the PV inverter to a distribution board

712.3.11**PV a.c. supply circuit**

circuit connecting the a.c. connection means of the PV inverter to a distribution board

712.3.12**PV installation**

erected electrical equipment of a PV power supply system

712.3.13**Standard Test Conditions**

STC

test conditions specified in EN 60904-3 for PV cells and PV modules

712.3.14**open-circuit voltage under standard test conditions**

$U_{OC\ STC}$

voltage under standard test conditions across an unloaded (open) PV module, PV string, PV array, PV sub-array

712.3.15**open-circuit maximum voltage**

$U_{OC\ MAX}$

maximum voltage across an unloaded (open) PV module, PV string, PV array, PV sub-array

Note 1 to entry: The method for determining $U_{OC\ MAX}$ is provided in Annex B.

712.3.16**short-circuit current under standard test conditions**

$I_{SC\ STC}$

short-circuit current under standard test conditions of a PV module, PV string, PV sub-array, PV array

712.3.17**short-circuit maximum current**

$I_{SC\ MAX}$

short-circuit maximum current of a PV module, PV string, PV array

Note 1 to entry: The method for determining $I_{SC\ MAX}$ is provided in Annex B.

712.3.18**SPD short-circuit current rating**

I_{SCPV}

maximum prospective short-circuit current from the PV generator

712.3.19**d.c. side**

part of a PV installation from the PV modules to the d.c. connection means of the PV inverter

712.3.20**a.c. side**

part of a PV installation from the a.c. connection means of the PV inverter to the point of connection of the PV supply cable to the electrical installation

712.3.21**Maximum Power Point Tracking**

MPPT

internal control method of an inverter ensuring a search for operation at maximum power

712.3.22**MOD_MAX_OCPR**

PV module maximum overcurrent protection rating

Note 1 to entry: See EN 61730-2.