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Electrical installations of buildings – Part 7-712: Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems

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HARMONIZATION DOCUMENT **HD 60364-7-712**

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English version

Electrical installations of buildings
Part 7-712: Requirements for special installations or locations – Solar photovoltaic (PV) power supply systems
(IEC 60364-7-712:2002)

Installations électriques des bâtiments
Partie 7-712: Règles pour les installations et emplacements spéciaux – Alimentations photovoltaïques solaires (PV)
(CEI 60364-7-712:2002)

Elektrische Anlagen von Gebäuden
Teil 7-712: Anforderungen für Betriebsstätten, Räume und Anlagen besonderer Art – Solar-Photovoltaik(PV)-Versorgungssysteme
(IEC 60364-7-712:2002)

This Harmonization Document was approved by CENELEC on 2005-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document on a national level.

Up-to-date lists and bibliographical references concerning such national implementation may be obtained on application to the Central Secretariat or to any CENELEC member.

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

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

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Foreword

The text of the International Standard IEC 60364-7-712:2002, prepared by IEC TC 64, Electrical installations and protection against electric shock, together with the common modifications prepared by SC 64A, Protection against electric shock, of Technical Committee CENELEC TC 64, Electrical installations of buildings, was submitted to the Unique Acceptance Procedure and was approved by CENELEC as HD 60364-7-712 on 2005-03-01.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level	(doa)	2005-09-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement	(dop)	2006-03-01
- latest date by which the national standards conflicting with the HD have to be withdrawn	(dow)	2008-03-01

In this Harmonization Document editorial modifications to the International Standard are indicated by a vertical line in the left margin of the text.

Annexes ZA and ZB have been added by CENELEC.

712 Solar photovoltaic (PV) power supply systems

NOTE The abbreviation “PV” is used for “solar photovoltaic”.

712.1 Scope

The particular requirements of this section apply to the electrical installations of PV power supply systems including systems with AC modules.

NOTE 1 Standards for PV equipment are being prepared by IEC TC 82.

NOTE 2 Requirements for PV power supply systems which are intended for stand-alone operation are under consideration.

712. 2 Normative references

See annex ZA.

712.3 Definitions

(See also Figures 712.1 and 712.2).

For the purpose of this part, the following definitions apply. For other general definitions, see IEC 60050-826.

712.3.1
PV cell
basic PV device which can generate electricity when exposed to light such as solar radiation

712.3.2
PV module
smallest completely environmentally protected assembly of interconnected PV cells

712.3.3
PV string
circuit in which PV modules are connected in series, in order for a PV array to generate the required output voltage

712.3.4
PV array
mechanically and electrically integrated assembly of PV modules, and other necessary components, to form a DC power supply unit

712.3.5
PV array junction box
enclosure where all PV strings of any PV array are electrically connected and where protection devices can be located if necessary

712.3.6
PV generator
assembly of PV arrays

712.3.7
PV generator junction box
enclosure where all PV arrays are electrically connected and where protection devices can be located if necessary

712.3.8
PV string cable
cable connecting PV modules to form a PV string

712.3.9
PV array cable
output cable of a PV array

712.3.10
PV DC main cable
cable connecting the PV generator junction box to the DC terminals of the PV inverter

712.3.11
PV inverter
device which converts DC voltage and DC current into AC voltage and AC current

712.3.12
PV supply cable
cable connecting the AC terminals of the PV inverter to a distribution circuit of the electrical installation

712.3.13
PV AC module
integrated module/inverter assembly where the electrical interface terminals are AC only. No access is provided to the DC side

712.3.14
PV installation
erected equipment of a PV power supply system

712.3.15
standard test conditions (STC)
test conditions specified in EN 60904-3 for PV cells and PV modules

712.3.16
open-circuit current under standard test conditions $U_{OC\ STC}$
voltage under standard test conditions across an unloaded (open) PV module, PV string, PV array, PV generator or on the DC side of the PV inverter

712.3.17
short-circuit current under standard test conditions $I_{SC\ STC}$
short-circuit current of a PV module, PV string, PV array, PV generator under standard test conditions

712.3.18
DC side
part of a PV installation from a PV cell to the DC terminals of the PV inverter

712.3.19
AC side
part of a PV installation from the AC terminals of the PV inverter to the point of connection of the PV supply cable to the electrical installation

712.3.20
simple separation
separation between circuits or between a circuit and earth by means of basic insulation

712.30 Assessment of general characteristics

712.31 Purpose, supplies and structures

712.312 Types of distribution systems

712.312.2 Types of system earthing

Earthing of one of the live conductors of the DC side is permitted, if there is at least simple separation between the AC side and the DC side.

NOTE Any connections with earth on the DC side should be electrically connected so as to avoid corrosion.

712.4 Protection for safety

712.41 Protection against electric shock

PV equipment on the DC side shall be considered to be energized, even when the system is disconnected from the AC side.

712.411 Protection against both direct and indirect contact

712.411.1 Protection by extra low-voltage: SELV and PELV

For SELV and PELV systems, $U_{OC\,STC}$ replaces U_n and shall not exceed 120 V DC.

712.413 Fault protection

712.413.1 Protection by automatic disconnection of supply

NOTE Protection by automatic disconnection of supply on the DC side requires special measures which are under consideration.

712.413.1.1.1.1 On the AC side, the PV supply cable shall be connected to the supply side of the protective device for automatic disconnection of circuits supplying current-using equipment.

712.413.1.1.1.2 Where an electrical installation includes a PV power supply system without at least simple separation between the AC side and the DC side, an RCD installed to provide fault protection by automatic disconnection of supply shall be type B according to IEC 60755 Amendment 2.

Where the PV inverter by construction is not able to feed DC fault currents into the electrical installation, an RCD of type B according to IEC 60755 Amendment 2 is not required.

712.413.2 Protection by use of class II or equivalent insulation should preferably be adopted on the DC side.

712.413.3 Protection by non-conducting locations is not permitted on the DC side.

712.413.4 Protection by earth-free local equipotential bonding is not permitted on the DC side.

712.433 Protection against overload on the DC side

712.433.1 Overload protection may be omitted to PV string and PV array cables when the continuous current-carrying capacity of the cable is equal to or greater than 1,25 times $I_{SC\,STC}$ at any location.

712.433.2 Overload protection may be omitted to the PV main cable if the continuous current-carrying capacity is equal to or greater than 1,25 times $I_{SC\ STC}$ of the PV generator.

NOTE The requirements of 712.433.1 and 712.433.2 are only relevant for protection of the cables. See as well the manufacturer's instructions for protection of PV modules.

712.434 Protection against short-circuit currents

712.434.1 The PV supply cable on the AC side shall be protected against short-circuit currents by an overcurrent protective device installed at the connection to the AC mains.

712.444 Protection against electromagnetic interference (EMI) in buildings

712.444.4.4 To minimize voltages induced by lightning, the area of all wiring loops shall be as small as possible.

712.5 Selection and erection of electrical equipment

712.51 Common rules

712.511 Compliance with standards

712.511.1 PV modules shall comply with the requirements of the relevant equipment standard, e.g. EN 61215 for crystalline PV modules. PV modules of class II construction or with equivalent insulation are recommended if $U_{OC\ STC}$ of the PV strings exceeds 120 V DC.

The PV array junction box, PV generator junction box and switchgear assemblies shall be in compliance with EN 60439-1.

712.512 Operational conditions and external influences

712.512.1.1 Electrical equipment on the DC side shall be suitable for direct voltage and direct current.

PV modules may be connected in series up to the maximum allowed operating voltage of the PV modules ($U_{OC\ STC}$ of the PV strings) and the PV inverter, whichever is lower. Specifications for this equipment shall be obtained from the equipment manufacturer.

If blocking diodes are used, their reverse voltage shall be rated for 2 x $U_{OC\ STC}$ of the PV string. The blocking diodes shall be connected in series with the PV strings.

712.512.2.1 As specified by the manufacturer, the PV modules shall be installed in such a way that there is adequate heat dissipation under conditions of maximum solar radiation for the site.

712.513 Accessibility

712.513.1 The selection and erection of equipment shall facilitate safe maintenance and shall not adversely affect provisions made by the manufacturer of the PV equipment to enable maintenance or service work to be carried out safely.

712.52 Wiring systems

712.522 Selection and erection in relation to external influences

712.522.8.1 PV string cables, PV array cables and PV DC main cables shall be selected and erected so as to minimize the risk of earth faults and short-circuits.

NOTE This may be achieved for example by reinforcing the protection of the wiring against external influences by the use of single-core sheathed cables.

712.522.8.3 Wiring systems shall withstand the expected external influences such as wind, ice formation, temperature and solar radiation.

712.53 Isolation, switching and control

712.536 Isolation and switching

712.536.2 Isolation

712.536.2.1.1 To allow maintenance of the PV inverter, means of isolating the PV inverter from the DC side and the AC side shall be provided.

NOTE Further requirements with regard to the isolation of a PV installation operating in parallel with the public supply system are given in 551.7 of IEC 60364-5-55.

712.536.2.2 Devices for isolation

712.536.2.2.1 In the selection and erection of devices for isolation and switching to be installed between the PV installation and the public supply, the public supply shall be considered the source and the PV installation shall be considered the load.

712.536.2.2.5 A switch disconnector shall be provided on the DC side of the PV inverter.

712.536.2.2.5.1 All junction boxes (PV generator and PV array boxes) shall carry a warning label indicating that active parts inside the boxes may still be live after isolation from the PV inverter.

712.54 Earthing arrangements, protective conductors and protective bonding conductors

Where protective equipotential bonding conductors are installed, they shall be parallel to and in as close contact as possible with DC cables and AC cables and accessories.