



SLOVENSKI STANDARD
SIST EN 50521:2009
01-december-2009

Konektorji za fotonapetostne sisteme - Varnostne zahteve in preskusi

Connectors for photovoltaic systems - Safety requirements and tests

Steckverbinder für Photovoltaik-Systeme - Sicherheitsanforderungen und Prüfungen

Connecteurs pour systèmes photovoltaïques - Exigences de sécurité et essais

Ta slovenski standard je istoveten z: EN 50521:2008

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Connectors for photovoltaic systems - Safety requirements and tests

Connecteurs pour systèmes
photovoltaïques -
Exigences de sécurité et essais

Steckverbinder für Photovoltaik-Systeme -
Sicherheitsanforderungen und Prüfungen

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

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CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 82, Solar photovoltaic energy systems.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50521 on 2008-10-01.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2009-10-01
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with the EN have to be withdrawn (dow) 2011-10-01

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Contents

1	Scope	5
2	Normative references	5
3	Definitions	7
4	Classification	10
4.1	General	10
4.2	Type of connector	10
4.3	Additional characteristics	10
5	Constructional requirements and performance	11
5.1	General	11
5.2	Marking and identification	11
5.3	Provision against incorrect mating (non-intermateable)	12
5.4	Protection against electric shock	12
5.5	Terminations and connection methods	12
5.6	Resistance to ageing	13
5.7	General design	13
5.8	Design of a free connector	14
5.9	Degree of protection (IP-Code)	14
5.10	Dielectric strength	14
5.11	Mechanical and electrical durability	14
5.12	Range of ambient temperature	14
5.13	Temperature rise	14
5.14	Cable anchorage	15
5.15	Mechanical strength	15
5.16	Connector without locking device	15
5.17	Connector with locking device	16
5.18	Clearances and creepage distances	16
5.19	Insulation	17
5.20	Insulation parts	18
5.21	Current carrying parts and resistance against corrosion	18
6	Tests	18
6.1	General	18
6.2	Preparation of specimens	19
6.3	Performance of tests	20
6.4	Test schedule (routine test) for non-rewirable free connectors	25
6.5	Test schedule	26
Annex A (normative) Symbol		33
Bibliography		34
Figures		
Figure 1 – Device for the bending test		23
Figure A.1 – Symbol "DO NOT DISCONNECT UNDER LOAD"		33

Tables

Table 1 – Values for cable anchorage testing	15
Table 2 – Rated impulse voltages	16
Table 3 – Plan of specimens required for tests	19
Table 4 – Values of torque for screw-type clamping units.....	20
Table 5 – Test voltages	24
Table 6 – Mechanical test group A (test group A are for themselves separate tests)	26
Table 7 – Service life test group B.....	28
Table 8 – Thermal test group C (mated test specimen).....	29
Table 9 – Climatic test group D (mated test specimen)	30
Table 10 – Degree of protection, test group E	31
Table 11 – Insulation material, test group F	32

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1 Scope

This Standard applies to connectors of application Class A according to EN 61730-1 for use in photovoltaic systems with rated voltages up to 1 000 V d.c. and rated currents up to 125 A per contact.

This standard applies to connectors without breaking capacity but might be engaged and disengaged under voltage.

NOTE For connectors according to Class B and C of EN 61730 as well as for protection for Class II equipment intended for use between 0 V and 120 V d.c. in photovoltaic-systems this standard may be used as a guide.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 50262:1998, *Cable glands for electrical installations*
A1:2001
A2:2004

EN 60068-1:1994, *Environmental testing – Part 1: General and guidance*
(IEC 60068-1:1988 + A1:1992 + corr. 1988)

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

EN 60068-2-70:1996, *Environmental testing – Part 2: Tests – Test Xb: Abrasion of marking and letterings caused by rubbing of fingers and hands* (IEC 60068-2-70:1995)

EN 60068-2-75, *Environmental testing – Part 2: Tests – Test Eh: Hammer tests* (IEC 60068-2-75)

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

EN 60228, *Conductors of insulated cables* (IEC 60228)

EN 60309-1:1999, *Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements*
(IEC 60309-1:1999)

EN 60352-2, *Solderless connections – Part 2: Solderless crimped connections – General requirements, test methods and practical guidance* (IEC 60352-2)

EN 60352-3:1994, *Solderless connections – Part 3: Solderless accessible insulation displacement connections – General requirements, test methods and practical guidance* (IEC 60352-3:1993)

EN 60352-4:1994, *Solderless connections – Part 4: Solderless non-accessible insulation displacement connections – General requirements, test methods and practical guidance* (IEC 60352-4:1994)

EN 60352-5, *Solderless connections – Part 5: Solderless press-in connections – General requirements, test methods and practical guidance* (IEC 60352-5)

EN 60352-6, *Solderless connections – Part 6: Insulation piercing connections – General requirements, test methods and practical guidance* (IEC 60352-6)

EN 60352-7, *Solderless connections – Part 7: Spring clamp connections – General requirements, test methods and practical guidance* (IEC 60352-7)

EN 60512 series, *Connectors for electronic equipment – Tests and measurements* (IEC 60512 series)

EN 60512-1, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 1: General* (IEC 60512-1)

EN 60512-11-7:2003, *Connectors for electronic equipment – Tests and measurements – Part 11- 7: Climatic tests – Test 11g: Flowing mixed gas corrosion test* (IEC 60512-11-7:2003)

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code)* (IEC 60529:1989)

EN 60664-1:2003, *Insulation coordination for equipment within low voltage systems – Part 1: Principles, requirements and tests* (IEC 60664-1:1992 + A1:2000 + A2:2002)

EN 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure* (IEC 60695-2-10)

EN 60695-11-10, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods* (IEC 60695-11-10)

EN 60998-2-3, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-3: Particular requirements for connecting devices as separate entities with insulation-piercing clamping units* (IEC 60998-2-3)

EN 60999-1:2000, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)* (IEC 60999-1:1999)

EN 60999-2:2003, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 2: Particular requirements for clamping units for conductors above 35 mm² up to 300 mm² (included)* (IEC 60999-2:2003)

EN 61140:2002, *Protection against electric shock – Common aspects for installation and equipment* (IEC 61140:2001)

EN 61210:1995, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements* (IEC 61210:1993, mod.)

EN 61215:2005, *Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval* (IEC 61215:2005)

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

EN 61984, *Connectors – Safety requirements and tests* (IEC 61984)

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

EN ISO 4892-2, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc sources* (ISO 4892-2)

EN ISO 6988:1994, *Metallic and other non organic coatings – Sulfur dioxide test with general condensation of moisture* (ISO 6988:1985)

IEC 60050-581:1978, *International Electrotechnical Vocabulary (IEV) – Chapter 581: Electromechanical components for electronic equipment*

IEC 60050-826:1982, *International Electrotechnical Vocabulary (IEV) – Chapter 826: Electrical installations*

IEC 60060-1:1989, *High-voltage test techniques – Part 1: general definitions and test requirements*

IEC/TR 60629¹⁾, *Standard sheets for a modular system (for installation accessories for use in domestic and similar installations)*

IEC 60760:1989, *Flat, quick-connect terminations*

¹⁾ Withdrawn publication.

IEC/TR 60943, *Guidance concerning the permissible temperature rise for parts of electrical equipment, in particular for terminals*

3 Definitions

For the purposes of this document, definitions from IEC 60050-581, IEC 60050-826, EN 60309-1, EN 60664-1, EN 60999-1 and EN 61140, together with the following, apply.

3.1

connector

component which terminates conductors for the purpose of providing connection to and disconnection from a suitable mating component
[IEV 581-06-01]

3.2

multi-way connector

connector with more than one contact

NOTE Multiple single-way connectors used in a PV-junction box are not to be regarded as a multi-way connector according to this standard.

3.3

connector under voltage (CuV)

connector specially designed to be engaged or disengaged in normal use when live but not under load

NOTE In this standard, the term "live" is used if contacts are under an applied voltage, but not necessarily carrying current. The term "load" is used if a current is flowing through the contacts.

3.4

free connector

connector for attachment to the free end of a wire or cable

[IEV 581-06-12]

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3.5

fixed connector

connector for attachment to a rigid surface

[IEV 581-06-10]

3.6

non-rewirable connector

connector so constructed that the cable cannot be separated from the connector without making it permanently useless

[EN 60309-1, definition 2.5, modified]

3.7

connector for Class II equipment

connector in which the protection against indirect contact is realised by double or reinforced insulation

NOTE Class II according to EN 61140.

3.8

intended use

application conditions of connectors which are included within the permissible rated values and environmental conditions and characteristics assigned by the manufacturer

3.9

interlock

device, either electrical or mechanical, which prevents the contacts of a connector from becoming live before it is in proper engagement with its counterpart, and which either prevents the connector from being withdrawn while its contacts are live or makes the contacts dead before separation

[EN 60309-1, definition 2.9, modified]

3.10**cycle of mechanical operation**

one insertion and one withdrawal of the connector with his counterpart

3.11**clamping unit**

part(s) of the terminal necessary for the mechanical clamping and the electrical connection of the conductor(s), including the parts which are necessary to ensure the correct contact pressure
[EN 60999-1, definition 3.1]

3.12**upper limiting temperature**

maximum temperature of a connector as defined by the manufacturer, in which the connector is intended to operate

NOTE The abbreviation ULT is often used.

3.13**ambient temperature**

maximum temperature of the ambient assigned from the manufacturer, in which the connector is able to operate permanently without the upper limiting temperature being exceeded

3.14**lower limiting temperature**

minimum temperature of a connector as defined by the manufacturer in which a connector is intended to operate

NOTE The abbreviation LLT is often used.

3.15**clearance**

the shortest distance in air between two conductive parts
[EN 60664-1, definition 1.3.2]

3.16**creepage distance**

shortest distance along the surface of the insulating material between two conductive parts
[EN 60664-1, definition 1.3.3]

3.17**overvoltage category**

numeral defining a transient overvoltage condition
[EN 60664-1, definition 1.3.10]

3.18**pollution**

any addition of foreign matter, solid, liquid, or gaseous, that can result in a reduction of electric strength or surface resistivity of the insulation
[EN 60664-1, definition 1.3.11]

3.19**pollution degree**

numeral characterizing the expected pollution of the micro-environment
[EN 60664-1, definition 1.3.13]

3.20**rated voltage**

value of voltage assigned by the manufacturer to the connector and to which operation and performance characteristics are referred
[EN 60664-1, definition 1.3.9, modified]

NOTE Rated voltage is equivalent to the rated system voltage according to EN 61730-1.

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3.21**rated insulation voltage**

r.m.s. withstand voltage value assigned by the manufacturer to the connector, characterising the specified (long term) withstand capability of its insulation
[EN 60664-1, definition 1.3.9.1, modified]

NOTE The rated insulation voltage is not necessarily equal to the rated voltage, which is primarily related to functional performance.

3.22**rated impulse voltage**

impulse withstand voltage value assigned by the manufacturer to the connector, characterising the specified withstand capability of its insulation against transient overvoltages
[EN 60664-1, definition 1.3.9.2, modified]

3.23**impulse withstand voltage**

highest peak value of impulse voltage, of prescribed form and polarity which does not cause breakdown of the insulation under specified conditions
[EN 60664-1, definition 1.3.8.1]

NOTE The impulse withstand voltage is equal to or higher than the rated impulse voltage.

3.24**r.m.s. withstand voltage (power-frequency withstand voltage)**

highest r.m.s. value of a voltage which does not cause breakdown of the insulation under specified conditions
[EN 60664-1, definition 1.3.8.2]

3.25**rated current**

current value assigned by the manufacturer, which the connector can carry continuously (without interruption) and simultaneously through all its contacts wired with the largest specified conductor, preferably at an ambient temperature of 85 °C, without the upper limiting temperature being exceeded

NOTE If other ambient temperature values are used for the definition of the rated current, the manufacturer should state in the technical documentation the ambient temperature on which the rating is based, with reference, if appropriate, to the derating curve defined in EN 60512-5-2, test 5b.

3.26**functional insulation**

insulation between conductive parts which is necessary only for the proper functioning of the equipment
[EN 60664-1, definition 1.3.17.1]

3.27**basic insulation**

insulation applied to live parts to provide basic protection against electric shock
[EN 60664-1, definition 1.3.17.2]

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes (see EN 61140, 3.10.1).

3.28**supplementary insulation**

independent insulation applied in addition to basic insulation, in order to provide protection against electric shock in the event of a failure of basic insulation (see EN 61140, 3.10.2)
[EN 60664-1, definition 1.3.17.3]

3.29**double insulation**

insulation comprising both basic insulation and supplementary insulation (see EN 61140, 3.10.3)
[EN 60664-1, definition 1.3.17.4]

3.30 reinforced insulation

single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in the relevant EN standard (see EN 61140, 3.10.4)
[EN 60664-1, definition 1.3.17.5]

NOTE A single insulation system does not imply that the insulation must be a homogeneous piece. It may comprise several layers which cannot be tested separately as basic or supplementary insulation.

3.31 internal insulation

part of basic insulation providing the required clearance and creepage distances inside a conductive housing or enclosure

3.32 application Class A according to EN 61730-1

connectors which are provided for using in this application class can be used in systems where free access are expected and rated values exceed 120 V d.c.

connectors which comply with the requirements of this standard and which are classified in this application class are considered to meet the requirements of protection Class II (EN 61730-1, modified)

3.33 application Class B according to EN 61730-1

connectors which are provided for use in this application class may only be used in systems where free access is restricted by fences, location etc.

connectors which are classified in this application class and which are protected by basic insulation are considered to meet the requirements of protection Class 0

3.34 application Class C according to EN 61730-1

connectors which are provided for use in this application class can be used in systems where free access are expected and rated values less than 120 V d.c.

connectors which comply with the requirements of this standard and which are classified in this application class are considered to meet the requirements of protection Class III

NOTE Protection classes are defined in EN 61140.

4 Classification

4.1 General

In order to apply the relevant test requirements, connectors shall be classified by the manufacturer's specification, according to their intended use under consideration of application Class A, according to EN 61730-1 and characteristics, as set out below.

4.2 Type of connector

- a) Fixed connector.
- b) Free connector.

4.3 Additional characteristics

- c) Connector with cable anchorage.
- d) Degree of protection of a connector.
- e) Connector for Class II equipment.