SLOVENSKI STANDARD
SIST EN 50548:2011

01-september-2011

Priključnice fotonapetostnih modulov

Junction boxes for photovoltaic modules

Anschlussdosen für Photovoltaik-Module

Boîtes de connexion pour modules photovoltaïques

Ta slovenski standard je istoveten z: **EN 50548:2011**

ICS:

27.160	Sončna energija	Solar energy engineering

SIST EN 50548:2011 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50548

June 2011

ICS 27.160

English version

Junction boxes for photovoltaic modules

Boîtes de jonction pour modules photovoltaïques

Anschlussdosen für Photovoltaik-Module

This European Standard was approved by CENELEC on 2011-02-14. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 50548:2011 E

Contents

Figures

Tables

Foreword

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

It was submitted to the Formal Vote and was approved by CENELEC as EN 50548 on 2011-02-14.

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

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) 2012-02-14
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2014-02-14

1 Scope

This European Standard applies to junction boxes up to 1 500 V DC for use on photovoltaic modules according to application class A of EN 61730-1:2007.

NOTE For junction boxes according to application classes B and C of EN 61730-1:2007 in photovoltaic-systems, this standard can be used as a guideline.

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 50521, *Connectors for photovoltaic systems — Safety requirements and tests*

EN 60060-1, *High-voltage test techniques — Part 1: General definitions and test requirements* (IEC 60060-1)

EN 60068-1, *Environmental testing — Part 1: General and guidance* (IEC 60068-1)

EN 60068-2-14:2009, *Environmental testing — Part 2—14: Tests — Test N: Change of temperature* (IEC 60068-2-14:2009)

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

EN 60068-2-75, *Environmental testing — Part 2—75: 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 60352-2, *Solderless connections — Part 2: Crimped connections — General requirements, test methods and practical guidance* (IEC 60352-2)

EN 60512-12-1, *Connectors for electronic equipment — Tests and measurements — Part 12—1: Soldering tests — Test 12a: Solderability, wetting, solder bath method* (IEC 60512-12-1)

EN 60512-12-2, *Connectors for electronic equipment — Tests and measurements — Part 12-2: Soldering tests — Test 12b: Solderability, wetting, soldering iron method* (IEC 60512-12-2)

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

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

EN 60695-2-11, *Fire hazard testing — Part 2-11: Glowing/hot-wire based test methods — Glow-wire flammability test method for end-products* (IEC 60695-2-11)

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 60695-11-20:1999, *Fire hazard testing — Part 11-20: Test flames — 500 W flame test methods* (IEC 60695-11-20:1999)

EN 60947-7-1, *Low-voltage switchgear and controlgear — Part 7-1: Ancillary equipment — Terminal blocks for copper conductors* (IEC 60947-7-1)

EN 60998-2-1, *Connecting devices for low-voltage circuits for household and similar purposes — Part 2-1: Particular requirements for connecting devices as separate entities with screw-type clamping units* (IEC 60998-2-1)

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

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, *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)

EN 61032, *Protection of persons and equipment by enclosures — Probes for verification* (IEC 61032)

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

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

EN ISO 868, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)* (ISO 868:2003)

EN ISO 4892-2:2006, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps* (ISO 4892-2:2006)

EN ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps* (ISO 4892-3:2006)

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

3 Terms and definitions

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

3.1
junction box
combination of parts, such as boxes, covers, cover-plates, lids, box extensions, accessories, etc., providing after assembly and installation at the photovoltaic-module as in normal use, an appropriate protection against external influences, and a defined protection against contact with enclosed live parts from any accessible direction

3.1.1
junction box for re-opening
junction box that can be opened at any time. It may content rewirable and non-rewirable connections

3.1.1.1
junction box for factory wiring
junction box containing PV-cables in the box and/or PV-connectors integrated in the enclosure are connected in the end application under controlled conditions, usually at manufacturer's location

3.1.1.2
junction box for field wiring
junction box containing wiring connections that are made in the field

3.1.2
junction box, not intended to be re-opened
junction box that cannot be opened after mounting in the end application. It may contain rewirable and non-rewirable connections

3.2
cable gland
housing usually of cylindrical, hollow form and a secondary member usually threaded to compress the associated seal around the cable passing through the gland. It may have additional functions like insulation, buckle protection, strain relief or combination of them

3.3
sealing
sealing material which will be inserted between two surfaces of the box and which will form a sealed connection after compression

3.4
spout (hub)
open entry of a box permitting the insertion and containment of a conduit

3.5
cable anchorage
ability to limit the displacement of a fitted flexible cable against pull and push forces and torques

3.6
connector (for photovoltaic-systems)
component suitable for use in PV-systems that terminates conductors for the purpose of providing connection to and disconnection from a suitable mating component. It is specially designed to be engaged or disengaged in normal use when live but not under load

3.7
cable (for photovoltaic-systems)
flexible cable suitable for use as connection for PV-modules as a PV-string

3.8
intended use
application conditions of junction boxes that are included within the permissible rated values and environmental conditions and characteristics assigned by the manufacturer

3.9
terminals
part(s) of the terminal necessary for the mechanical clamping and the electrical connection of the conductor(s), including the parts that are necessary to ensure the correct contact pressure

[EN 60999-1:2000, 3.1, modified]

3.10
clearance
shortest distance in air between two conductive parts

[EN 60664-1:2007, 3.2]

3.11
creepage distance
shortest distance along the surface of the insulating material between two conductive parts

[EN 60664-1:2007, 3.3, modified]

3.12
overvoltage category
numeral defining a transient overvoltage condition

[EN 60664-1:2007, 3.10]

3.13
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 60664-1:2007, 3.11]

3.14
pollution degree
numeral characterising the expected pollution of the micro-environment

[EN 60664-1:2007, 3.13]

3.15
rated voltage
value of voltage assigned by the manufacturer to the junction box and to which operation and performance characteristics are referred

[EN 60664-1:2007, 3.9, modified]

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

3.16
rated insulation voltage
r.m.s. withstand voltage value assigned by the manufacturer to the junction box, characterising the specified (long term) withstand capability of its insulation

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

[EN 60664-1:2007, 3.9.1, modified]

3.17
rated impulse voltage
impulse withstand voltage value assigned by the manufacturer to the junction box, characterising the specified withstand capability of its insulation against transient overvoltages

[EN 60664-1:2007, 3.9.2, modified]

3.18
impulse withstand voltage
highest peak value of impulse voltage of prescribed form and polarity that does not cause breakdown of the insulation under specified conditions

[EN 60664-1:2007, 3.8.1]

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

3.19
r.m.s. withstand voltage
power-frequency withstand voltage
highest r.m.s. value of a voltage that does not cause breakdown of insulation under specified conditions

[EN 60664-1:2007, 3.8.2]

3.20
current

3.20.1
rated current
current value assigned by the manufacturer, which the junction box can carry continuously (without interruption) and simultaneously through all its contacts and bypass-diodes, if applicable, wired with the largest specified conductor, at the highest specified ambient temperature, without the upper limiting temperature being exceeded

3.20.2
reverse current (I_{REV})
current value assigned by the manufacturer, which the junction box can carry at the highest specified ambient temperature, without causing a hazardous situation

NOTE The reverse current is comparable with the reverse test current of the photovoltaic module (see EN 61730-2).

3.21
functional insulation
insulation between conductive parts that is necessary only for the proper functioning of the equipment

[EN 60664-1:2007, 3.17.1]

3.22
basic insulation
insulation applied to live parts to provide basic protection against electric shock

NOTE Basic insulation does not necessarily include insulation used exclusively for functional purposes (see EN 61140:2002, 3.10.1).

3.23
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 61140:2002, 3.10.2)

[EN 60664-1:2007, 3.17.3, modified]

3.24
double insulation
insulation comprising both basic insulation and supplementary insulation (see EN 61140:2002, 3.10.3)

[EN 60664-1:2007, 3.17.4, modified]

3.25
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 (EN 61140:2002, 3.10.4)

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

[EN 60664-1:2007, 3.17.5, modified]

3.26
application class A according to EN 61730-1:2007
junction boxes that are provided for use in this application class can be used in systems where free access is expected and rated values exceed 120 V DC.

junction boxes that comply with the requirements of this standard and that are classified in this application class are considered to meet the requirements of safety class II

3.27
application class B according to EN 61730-1:2007
junction boxes that are provided for use in this application class may only be used in systems where access is restricted by fences, locality, etc.

junction boxes that are classified in this application class and that are protected by basic insulation, are considered to meet the requirements of safety class 0

3.28
application class C according to EN 61730-1:2007
junction boxes that are provided for use in this application class can be used in systems where free access is expected and rated values less than 120 V DC.

junction boxes that comply with the requirements of this standard and that are classified in this application class are considered to meet the requirements of safety class III

NOTE Safety classes are defined within EN 61140.

3.29
maximum working voltage
voltage value at module side assigned by the manufacturer to the junction box, characterising the specified (long term) withstand capability of its insulation at module side

4 Constructional requirements and performance

4.1 General

For junction boxes according to this standard, no values have been defined for electric rated voltage and current. These values shall be declared by the manufacturer.

Junction boxes shall be suitable for the durable use outside in an ambient temperature area from - 40 °C to + 85 °C.

Junction boxes shall be so designed and dimensioned that they can withstand the electrical, mechanical, thermal and corrosive stresses occurring in their intended use and present no danger to the user or the environment.

Compliance with these requirements is verified by specified tests of this European Standard.

4.2 Marking and identification

4.2.1 Identification

Junction boxes shall be identified and characterised by the following:

a) manufacturer's name, trademark or mark of origin;

b) type identification;

c) rated current;

d) rated voltages or rated insulation voltages;

e) rated impulse voltage, if specified;

f) maximum working voltage;

g) pollution degree;

h) degree of protection by enclosure according to EN 60529;

i) range of temperature; (lowest and upper ambient temperature), if different from this standard;

j) type of terminals;

k) connectable conductors;

l) reference to this standard, if applicable;

m) warning notice „Do not disconnect under load" or adequate symbol (see Annex A);

NOTE For Item m), alternatively an adequate warning notice can be used in the respective national language.

n) polarity of connector, if applicable;

o) type and number of bypass-diodes, if applicable;

p) reverse current (I_{REV}).

4.2.2 Marking

The marking shall be indelible and easily legible.

The minimum marking on the junction boxes shall be that of items a), b) and n) in 4.2.1.

If connection of junction box is performed by connectors, the warning notice listed in m) of 4.2.1 shall be on a label or similar on or close to the connector.

If connection of the junction box is performed by a fixed cable that has implemented a connector on its end, the warning notice listed in m) of 4.2.1 shall be on a label or similar on or close to the connector. A notice to attaching the sticker shall be specified in the technical documentation. Markings a) and b) of 4.2.1 shall be found on the smallest unit of packaging.

4.2.3 Technical documentation

Identification items of 4.2.1 not marked on the junction box according to 4.2.2 and the following information shall be given in the technical documentation of the manufacturer:

a) information on termination regarding the cable and cell connection, if applicable;

b) information regarding the connector (-system), if applicable;

c) information regarding mounting (e.g. backsheet-material of the module) and mounting material (e.g. sealing material, adhesive), if applicable.