

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Connectors for DC-application in photovoltaic systems – Safety requirements and tests**

**Connecteurs pour applications en courant continu pour systèmes photovoltaïques – Exigences de sécurité et essais**

[IEC 62852:2014](https://standards.iteh.ai)

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**CONNECTORS FOR DC-APPLICATION IN PHOTOVOLTAIC SYSTEMS –  
SAFETY REQUIREMENTS AND TESTS**

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**In this Redline version, a vertical line in the margin shows where the technical content is modified by amendment 1. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.**



International Standard IEC 62852 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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# CONNECTORS FOR DC-APPLICATION IN PHOTOVOLTAIC SYSTEMS – SAFETY REQUIREMENTS AND TESTS

## 1 Scope

This International Standard applies to connectors for use in the d.c. circuits of photovoltaic systems according to class II of IEC 61140:2001 with rated voltages up to 1 500 V d.c. and rated currents up to 125 A per contact.

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

This standard also applies to connectors which are intended to be built-in or integrated in enclosures of devices for photovoltaic systems. This standard may be used as a guide for connectors in photovoltaic systems of classes 0 and III according to IEC 61140:2001 as well as for protection for Class II equipment intended for use at less than 50 V d.c. This document does not apply to connectors for data collection, tracker controls or similar, but it may be used as a guide for those connectors.

## 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.

IEC 60050 (all parts): *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)

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IEC 60060-1:~~2010~~, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60068-1:~~2013~~, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-14:~~2009~~, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-75:~~1997~~, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60068-2-78:~~2012~~, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60216-1, *Electrical insulating materials – Thermal endurance properties – Part 1: Ageing procedures and evaluation of test results*

IEC 60216-5, *Electrical insulating materials – Thermal endurance properties – Part 5: Determination of relative thermal endurance index (RTE) of an insulating material*

IEC 60228:~~2004~~, *Conductors of insulated cables*

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

IEC 60352-2:~~2006~~, *Solderless connections – Part 2: Solderless crimped connections – General requirements, test methods and practical guidance*

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

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

IEC 60352-5:~~2012~~, *Solderless connections – Part 5: Press-in connections – General requirements, test methods and practical guidance*

IEC 60352-6:~~1997~~, *Solderless connections – Part 6: Insulation piercing connections – General requirements, test methods and practical guidance*

IEC 60352-7:~~2002~~, *Solderless connections – Part 7: Spring clamp connections – General requirements, test methods and practical guidance*

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

IEC 60512 (all parts), *Connectors for electronic equipment – Tests and measurements*

IEC 60512-1:~~2004~~, *Connectors for electronic equipment – Tests and measurements – Part 1: General*

IEC 60512-11-7:~~2003~~, *Electromechanical components for electronic equipment – Basic testing procedures and measuring methods – Part 11-7: Climatic tests – Test 11g: Flowing mixed gas corrosion test*

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

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

IEC TR 60664-2-1, *Insulation coordination for equipment within low-voltage systems – Part 2-1: Application guide – Explanation of the application of the IEC 60664 series, dimensioning examples and dielectric testing*

IEC 60695-2-11:~~2014~~, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-11-10:~~2013~~, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC TR 60943:~~1998~~, *Guidance concerning the permissible temperature rise for parts of electrical equipment, in particular for terminals*

IEC 60998-2-3:~~2002~~, *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 60999-1:~~1999~~, *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 mm<sup>2</sup> up to 35 mm<sup>2</sup> (included)*

IEC 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 mm<sup>2</sup> up to 300 mm<sup>2</sup> (included)*

IEC 61032:~~1997~~, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61140:~~2001~~, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61210:~~2010~~, *Connecting devices – Flat quick-connect terminations for electrical copper conductors – Safety requirements*

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

IEC 61215-2, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

IEC 61984:~~2008~~, *Connectors – Safety requirements and tests*

IEC 62444:~~2010~~, *Cable glands for electrical installations*

IEC ~~TS~~ 62548, *Photovoltaic (PV) arrays – Design requirements*

IEC 62930, *Electric cables for photovoltaic systems with a voltage rating of 1,5 kV DC*

ISO 868, *Plastics and ebonite – Determination of indentation hardness by means of a durometer (Shore hardness)*

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

ISO 4892-3, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV-lamps*

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

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-581, IEC 60050-826, IEC 60309-1, IEC 60664-1, IEC 60999-1 and IEC 61140, as well as the following apply.

#### 3.1

##### **connector**

component which terminates conductors for the purpose of providing connection to and disconnection from a suitable mating component

[SOURCE: IEC 60050-581:2008, 581-06-01]

### 3.2

#### **multi-way connector**

connector with more than one contact

Note 1 to entry: 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 1 to entry: 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

#### **connector without breaking capacity**

##### **COC**

connector which is not allowed to be engaged or disengaged in normal use when live or under load

[SOURCE: IEC 60050-581:2008, 581-27-73]

### 3.5

#### **type of connector**

##### 3.5.1

##### **free connector**

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

[SOURCE: IEC 60050-581:2008, 581-06-12]

##### 3.5.2

##### **built-in connector**

a pre-manufactured connector that is subsequently integrated into an enclosure

##### 3.5.3

##### **integrated connector**

a connector assembly that is manufactured as an integral component during enclosure fabrication

### 3.6

#### **non-rewirable connector**

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

[SOURCE: IEC 60309-1:1999, 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 1 to entry: Class II according to IEC 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

[SOURCE: IEC 60309-1:1999, 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

[SOURCE: IEC 60999-1:1999, 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 1 to entry: The abbreviation ULT is often used.

**3.13  
maximum 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 1 to entry: The abbreviation LLT is often used.

**3.15  
clearance**

the shortest distance in air between two conductive parts

[SOURCE: IEC 60664-1:2007, 1.3.2]

**3.16  
creepage distance**

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

[SOURCE: IEC 60664-1:2007, 1.3.3]

**3.17  
overvoltage category**

numeral defining a transient overvoltage condition

[SOURCE: IEC 60664-1:2007, 1.3.10]