

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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

**(standards.iteh.ai)**

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

<https://standards.iteh.ai/catalog/standards/sist/6170979a-e35-4b5e-af71-d70b4fbb3b5c/iec-62852-2014>



## THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2014 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
Fax: +41 22 919 03 00  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

#### IEC Catalogue - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

#### IEC publications search - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee,...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and also once a month by email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 14 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

#### IEC Glossary - [std.iec.ch/glossary](http://std.iec.ch/glossary)

More than 55 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [csc@iec.ch](mailto:csc@iec.ch).

### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Catalogue IEC - [webstore.iec.ch/catalogue](http://webstore.iec.ch/catalogue)

Application autonome pour consulter tous les renseignements bibliographiques sur les Normes internationales, Spécifications techniques, Rapports techniques et autres documents de l'IEC. Disponible pour PC, Mac OS, tablettes Android et iPad.

#### Recherche de publications IEC - [www.iec.ch/searchpub](http://www.iec.ch/searchpub)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études,...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et aussi une fois par mois par email.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire en ligne de termes électroniques et électriques. Il contient plus de 30 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans 14 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

#### Glossaire IEC - [std.iec.ch/glossary](http://std.iec.ch/glossary)

Plus de 55 000 entrées terminologiques électrotechniques, en anglais et en français, extraites des articles Termes et Définitions des publications IEC parues depuis 2002. Plus certaines entrées antérieures extraites des publications des CE 37, 77, 86 et CISPR de l'IEC.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [csc@iec.ch](mailto:csc@iec.ch).

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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

**(standards.iteh.ai)**

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

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX



ICS 27.160

ISBN 978-2-8322-1898-3

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD .....	4
1 Scope .....	6
2 Normative references .....	6
3 Terms and definitions .....	8
4 Classification .....	12
4.1 General .....	12
4.2 Type of connector .....	12
4.3 Additional characteristics .....	12
5 Constructional requirements and performance .....	13
5.1 General .....	13
5.2 Marking and identification .....	13
5.2.1 Identification .....	13
5.2.2 Marking .....	13
5.2.3 Technical documentation .....	13
5.3 Provision against incorrect mating (non-intermateable) .....	14
5.4 Protection against electric shock .....	14
5.5 Terminations and connection methods .....	14
5.6 Resistance to deterioration .....	15
5.7 General design .....	15
5.8 Design of a free connector .....	15
5.9 Degree of protection (IP Code) .....	16
5.10 Dielectric strength .....	16
5.11 Mechanical and electrical durability .....	16
5.12 Range of ambient temperature .....	16
5.13 Temperature rise .....	16
5.14 Cable anchorage .....	16
5.15 Mechanical strength .....	17
5.16 Connector without locking device .....	17
5.17 Connector with locking device .....	17
5.18 Clearances and creepage distances .....	17
5.18.1 General .....	17
5.18.2 Clearances .....	18
5.18.3 Creepage distances .....	18
5.19 Insulation parts .....	20
5.19.1 General .....	20
5.19.2 Outer accessible parts .....	20
5.19.3 Inner parts .....	20
5.20 Current carrying parts and resistance against corrosion .....	20
6 Tests .....	20
6.1 General .....	20
6.2 Preparation of specimens .....	21
6.3 Performance of tests .....	22
6.3.1 General .....	22
6.3.2 Durability of marking .....	23
6.3.3 Protection against electric shock .....	23
6.3.4 Temperature rise .....	23

6.3.5	Mechanical operation.....	23
6.3.6	Bending (flexing) test (see IEC 60309-1:1999, 24.4).....	24
6.3.7	Measurement of clearances and creepage distances.....	25
6.3.8	Dielectric strength.....	25
6.3.9	Corrosion test.....	26
6.3.10	Mechanical strength at lower temperatures.....	26
6.3.11	Change of temperature (IEC 60068-2-14 test Na).....	26
6.3.12	Damp heat test.....	26
6.3.13	Insertion and withdrawal force.....	27
6.3.14	Effectiveness of connector coupling device.....	27
6.3.15	Terminations and connecting methods.....	27
6.4	Test schedule (routine test) for non-rewirable free connectors.....	28
6.5	Test schedule.....	28
Annex A (informative) Warning symbols used on connectors.....		35
Annex B (normative) Measurement of clearances and creepage distances.....		36
Bibliography.....		40
Figure 1 – Device for the bending test.....		25
Figure A.1 – Symbol "DO NOT DISCONNECT UNDER LOAD".....		35
Figure A.2 – Symbol "DO NOT DISCONNECT UNDER LOAD" (IEC 60417-6070).....		35
Figure B.1– Examples of methods of measuring clearances and creepage distances.....		39
Table 1 – Values for cable anchorage testing.....		17
Table 2 – Rated impulse voltages and minimum clearances.....		18
Table 3 – Creepage distances for basic insulation.....		19
Table 4 – Plan of specimens required for tests.....		21
Table 5 – Values of torque for screw-type clamping units.....		22
Table 6 – Mechanical test group A (test group A are separate tests).....		28
Table 7 – Service life test group B.....		29
Table 8 – Service life test group C.....		30
Table 9 – Thermal test group D (mated test specimen).....		31
Table 10 – Climatic test group E (mated test specimen).....		32
Table 11 – Degree of protection, test group F.....		33
Table 12 – Insulation material, test group G.....		34
Table B.1 – Dimensions of X.....		36

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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

This International Standard is derived from EN 50521.

The text of this standard is based on the following documents:

FDIS	Report on voting
82/878/FDIS	82/905/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

## **iTeh STANDARD PREVIEW (standards.iteh.ai)**

[IEC 62852:2014](#)

<https://standards.iteh.ai/catalog/standards/sist/0f70593a-e35-4b5e-af71-d70b4fbb3b5c/iec-62852-2014>

# 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.

## 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): <sup>IEC 62852:2014</sup> *International Electrotechnical Vocabulary* (available at <http://www.electropedia.org>)  
<http://standards.iec.org/catalog/standards/sist/01/05/95a-cb5-4b5c-a171-d70b4fbb3b5c/iec-62852-2014>

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 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 60512-1:2001, *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*

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

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 62852:2014](#)

[https://standards.iteh.ai/catalog/standards/sist/0f70593a-e35-4b5e-af71-](https://standards.iteh.ai/catalog/standards/sist/0f70593a-e35-4b5e-af71-d70b4fb3b5/iec-62852-2014)

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

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

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

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

## iTeh STANDARD PREVIEW

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.

[IEC 62852:2014](https://standards.iteh.ai/catalog/standards/sist/0f70593a-e35-4b5e-af71-d70b4fbb3b5c/iec-62852-2014)

**3.1 connector** <https://standards.iteh.ai/catalog/standards/sist/0f70593a-e35-4b5e-af71-d70b4fbb3b5c/iec-62852-2014>

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

[IEC 62852:2014](#)

Note 1 to entry: Class II according to IEC 61140.

<https://standards.iteh.ai/catalog/standards/sist/0f70593a-e35-4b5e-af71-d70b4bb3b5c/iec-62852-2014>

#### **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**

**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], <https://standards.iteh.ai/catalog/standards/sist/0f70593a-e35-4b5e-af71-d70b4fbb3b5c/iec-62852-2014>

**3.17**

**overvoltage category**

numeral defining a transient overvoltage condition

[SOURCE: IEC 60664-1:2007, 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

[SOURCE: IEC 60664-1:2007, 1.3.11]

**3.19**

**pollution degree**

numeral characterising the expected pollution of the micro-environment

[SOURCE: IEC 60664-1:2007, 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

Note 1 to entry: Rated voltage is equivalent to the rated system voltage according to IEC 61730-1.

[SOURCE: IEC 60664-1:2007, 1.3.9, modified]

**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

Note 1 to entry: The rated insulation voltage is not necessarily equal to the rated voltage, which is primarily related to functional performance.

[SOURCE: IEC 60664-1:2007, 1.3.9.1, modified]

**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

[SOURCE: IEC 60664-1:2007, 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

Note 1 to entry: The impulse withstand voltage is equal to or higher than the rated impulse voltage.

[SOURCE: IEC 60664-1:2007, 1.3.8.1]

**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

[SOURCE: IEC 60664-1:2007, 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 1 to entry: 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 IEC 60512-5-2, test 5b.

**3.26****functional insulation**

insulation between conductive parts which is necessary only for the proper functioning of the equipment

[SOURCE: IEC 60664-1:2007, 1.3.17.1]

**3.27****basic insulation**

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

Note 1 to entry: Basic insulation does not necessarily include insulation used exclusively for functional purposes (see IEC 61140:2001, 3.10.1).

[SOURCE: IEC 60664-1:2007, 1.3.17.2]

### **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 IEC 61140:2001, 3.10.2)

[SOURCE: IEC 60664-1:2007, 1.3.17.3]

### **3.29 double insulation**

insulation comprising both basic insulation and supplementary insulation (see IEC 61140:2001, 3.10.3)

[SOURCE: IEC 60664-1:2007, 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 IEC standard (see IEC 61140:2001, 3.10.4)

Note 1 to entry: A single insulation system does not imply that the insulation is a homogeneous piece. It may comprise several layers which cannot be tested separately as basic or supplementary insulation.

[SOURCE: IEC 60664-1:2007, 1.3.17.5]

### **3.31**

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

## **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 class II, according to IEC 61140 and characteristics, as set out below.

### **4.2 Type of connector**

- a) Free connector.
- b) Built-in connector.
- c) Integrated connector.

### **4.3 Additional characteristics**

- a) Connector with cable anchorage.
- b) IP-code of a connector according to IEC 60529.
- c) Connector for Class II equipment.
- d) Non-rewirable connector.
- e) Rewirable connector.
- f) Terminations and connection methods.

## 5 Constructional requirements and performance

### 5.1 General

This standard does not define electrical rating values for voltage and current. These values are assigned by the manufacturer.

Connectors shall be suitable for durable outdoor use in an ambient temperature area from  $-40\text{ °C}$  to  $+85\text{ °C}$ .

Multi-way connectors shall be designed so that these requirements for earth-faulted and short-circuit-proofed installation complies with IEC TS 62548 or IEC 60364-7-712.

Compliance with the requirements is verified by the specified tests of this standard.

### 5.2 Marking and identification

#### 5.2.1 Identification

Connectors shall be identified and characterised by the following:

- a) manufacturer's name, trademark or mark of origin;
- b) type reference (for example, the catalogue number);
- c) rated current in amperes (A);
- d) rated voltages or rated insulation voltages between line to earth and line to line in volts (V);
- e) rated impulse voltage in kilovolts (kV), if specified;
- f) pollution degree;
- g) degree of protection by enclosure according to IEC 60529;
- h) range of temperature (ULT and LLT, maximum ambient temperature);
- i) type of terminals;
- j) connectable conductors;

NOTE For current capacity of cables and wires, see IEC 60364-5-52.

- k) reference to this standard or to the Detail Specification (DS), if applicable;
- l) symbols „Do not disconnect under load“, as given in Annex A; alternatively an adequate warning notice can be found in particular national language;
- m) polarity of connector, if applicable.

#### 5.2.2 Marking

The marking shall be indelible and easily legible.

The minimum marking on the connector shall be that of item a), l) and m) in 5.2.1.

Symbol or warning notice listed in l) of 5.2.1 shall be imprinted or labelled close to connector. A notice to attach the label shall be given in technical documentation.

Markings a) and b) of 5.2.1 shall be applied on the smallest package unit.

#### 5.2.3 Technical documentation

Identification items of 5.2.1 not marked on the connector according to 5.2.2 and the following information shall be given in the technical documentation of the manufacturer: