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# INTERNATIONAL STANDARD



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**Junction boxes for photovoltaic modules – Safety requirements and tests**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

ICS 27.160

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## CONTENTS

|                                                                                   |    |
|-----------------------------------------------------------------------------------|----|
| FOREWORD .....                                                                    | 5  |
| 1 Scope .....                                                                     | 8  |
| 2 Normative references .....                                                      | 8  |
| 3 Terms and definitions .....                                                     | 11 |
| 4 Constructional requirements and performance .....                               | 15 |
| 4.1 General .....                                                                 | 15 |
| 4.2 Marking and identification .....                                              | 16 |
| 4.2.1 Identification .....                                                        | 16 |
| 4.2.2 Marking .....                                                               | 16 |
| 4.2.3 Technical documentation .....                                               | 16 |
| 4.3 Protection against electric shock .....                                       | 17 |
| 4.4 Terminations, connecting devices and connection methods .....                 | 17 |
| 4.5 Connectors .....                                                              | 18 |
| 4.6 Cables .....                                                                  | 18 |
| 4.7 Resistance to ageing .....                                                    | 18 |
| 4.8 General design .....                                                          | 18 |
| 4.9 Degree of protection (IP) .....                                               | 19 |
| 4.10 Dielectric strength .....                                                    | 19 |
| 4.11 Range of ambient temperature .....                                           | 19 |
| 4.12 Cable anchorage .....                                                        | 19 |
| 4.13 Mechanical strength .....                                                    | 19 |
| 4.14 Insulation .....                                                             | 20 |
| 4.14.1 Type of insulation .....                                                   | 20 |
| 4.14.2 Basic insulation .....                                                     | 20 |
| 4.14.3 Supplementary insulation .....                                             | 20 |
| 4.14.4 Double insulation .....                                                    | 20 |
| 4.14.5 Reinforced insulation .....                                                | 20 |
| 4.15 Clearances and creepage distances .....                                      | 20 |
| 4.15.1 Clearances .....                                                           | 20 |
| 4.15.2 Creepage distances .....                                                   | 21 |
| 4.16 Insulation parts .....                                                       | 23 |
| 4.16.1 Outer accessible parts .....                                               | 23 |
| 4.16.2 Inner parts keeping active parts in position .....                         | 23 |
| 4.17 Current carrying parts and resistance against corrosion .....                | 24 |
| 4.18 Sealing .....                                                                | 24 |
| 4.19 Bypass-diode .....                                                           | 24 |
| 4.20 Knock-out inlets (outlets) intended to be removed by mechanical impact ..... | 24 |
| 5 Tests .....                                                                     | 24 |
| 5.1 General .....                                                                 | 24 |
| 5.2 Preparation of specimens .....                                                | 26 |
| 5.3 Performance of tests .....                                                    | 27 |
| 5.3.1 General .....                                                               | 27 |
| 5.3.2 Durability of marking .....                                                 | 27 |
| 5.3.3 Fixing of lid on rewirable junction box .....                               | 27 |
| 5.3.4 Protection against electric shock .....                                     | 28 |
| 5.3.5 Measurement of clearances and creepage distances .....                      | 28 |

|                                                                                       |                                                                              |    |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------|----|
| 5.3.6                                                                                 | Dielectric strength.....                                                     | 28 |
| 5.3.7                                                                                 | Resistance to corrosion .....                                                | 28 |
| 5.3.8                                                                                 | Mechanical strength at lower temperatures.....                               | 29 |
| 5.3.9                                                                                 | Thermal cycle test (IEC 60068-2-14:2009, Test Nb).....                       | 29 |
| 5.3.10                                                                                | Damp heat test .....                                                         | 30 |
| 5.3.11                                                                                | Weather resistance test .....                                                | 30 |
| 5.3.12                                                                                | Flammability class .....                                                     | 30 |
| 5.3.13                                                                                | Ball pressure test.....                                                      | 31 |
| 5.3.14                                                                                | Glow wire test.....                                                          | 31 |
| 5.3.15                                                                                | Resistance against ageing.....                                               | 31 |
| 5.3.16                                                                                | Wet leakage current test.....                                                | 31 |
| 5.3.17                                                                                | Humidity freeze test.....                                                    | 32 |
| 5.3.18                                                                                | Bypass diode thermal test.....                                               | 33 |
| 5.3.19                                                                                | Test of terminations and connection methods .....                            | 34 |
| 5.3.20                                                                                | Knock-out inlets (outlets) intended to be removed by mechanical impact ..... | 34 |
| 5.3.21                                                                                | Test of cord anchorage .....                                                 | 35 |
| 5.3.22                                                                                | Retention on the mounting surface .....                                      | 37 |
| 5.3.23                                                                                | Reverse current test at junction box.....                                    | 37 |
| 5.4                                                                                   | Test schedule .....                                                          | 38 |
| Annex A (informative)                                                                 | Symbol "Do not disconnect under load" .....                                  | 50 |
| Annex B (normative)                                                                   | Qualification of conformal coatings for protection against pollution.....    | 51 |
| B.1                                                                                   | General.....                                                                 | 51 |
| B.2                                                                                   | Technical properties .....                                                   | 51 |
| B.3                                                                                   | Qualification of coatings.....                                               | 51 |
| Annex C (normative)                                                                   | Measurement of clearances and creepage distances .....                       | 54 |
| Bibliography                                                                          | .....                                                                        | 58 |
| Figure 1 – Thermal cycling test – Temperature and applied current profile .....       |                                                                              | 45 |
| Figure 2 – Humidity-freeze cycle.....                                                 |                                                                              | 45 |
| Figure 3 – Typical arrangement for the cable anchorage pull test.....                 |                                                                              | 46 |
| Figure 4 – Typical arrangement for torsion test .....                                 |                                                                              | 46 |
| Figure 5 – Typical arrangement for flammability test in accordance with 5.3.12.2..... |                                                                              | 47 |
| Figure 6 – Measurement of voltage drop .....                                          |                                                                              | 47 |
| Figure 7 – Bypass diode thermal test .....                                            |                                                                              | 48 |
| Figure 8 – Proper attachment of 5 N weight to junction box.....                       |                                                                              | 49 |
| Figure A.1 – Symbol "DO NOT DISCONNECT UNDER LOAD".....                               |                                                                              | 50 |
| Figure A.2 – Symbol "DO NOT DISCONNECT UNDER LOAD" (IEC 60417-6070:2011-06)....       |                                                                              | 50 |
| Figure C.1 – Examples of methods of measuring clearances and creepage distances.....  |                                                                              | 57 |
| Table 1 – Required type of insulation .....                                           |                                                                              | 20 |
| Table 2 – Rated impulse voltages and minimum clearances.....                          |                                                                              | 21 |
| Table 3 – Creepage distances for basic insulation .....                               |                                                                              | 22 |
| Table 4 – Number of specimens.....                                                    |                                                                              | 25 |
| Table 5 – Values of torque for screw-type clamping units.....                         |                                                                              | 26 |
| Table 6 – Pull forces for cord anchorage.....                                         |                                                                              | 36 |

|                                                                                                          |    |
|----------------------------------------------------------------------------------------------------------|----|
| Table 7 – Values for torsion test .....                                                                  | 36 |
| Table 8 – Marking, information, documentation, test group A .....                                        | 38 |
| Table 9 – Material test, test group B (single tests) .....                                               | 39 |
| Table 10 – Constructional requirements, test group C (single tests) .....                                | 40 |
| Table 11 – Mechanical tests, test group D (single tests) .....                                           | 40 |
| Table 12 – Test sequence I, test group E (tests to be performed consecutively in this order).....        | 41 |
| Table 13 – Test sequence II, test group F (tests to be performed consecutively in this order).....       | 42 |
| Table 14 – Test sequence III, test group G (tests to be performed consecutively in this order).....      | 43 |
| Table 15 – Test sequence IV, test group H (tests to be performed consecutively in this order).....       | 44 |
| Table 16 – Reverse current test, test group I .....                                                      | 44 |
| Table 17 – Test sequence V, test group J (tests to be performed consecutively in this order).....        | 44 |
| Table B.1 – Test parameters, test conditions and test procedures.....                                    | 52 |
| Table B.2 – Test sequence and conformity check (tests to be performed consecutively in this order) ..... | 53 |
| Table C.1 – Dimensions of $X$ .....                                                                      | 54 |

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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**JUNCTION BOXES FOR PHOTOVOLTAIC MODULES –  
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.
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International Standard IEC 62790 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Modifications in normative references and terms and definitions;
- b) Improvement of declaration of categories for junction boxes in 4.1;
- c) Clarification for ambient temperature in 4.1;
- d) Addition of requirement to provide information concerning RTE/RTI or TI in 4.2;
- e) Reference to IEC 62930 instead of EN 50618 in 4.6;
- f) Addition of "Functional insulation" in Table 1;
- g) Addition of "Distance through cemented joints" in Table 3;
- h) Correction of procedure of process to categorize material groups (deletion of PTI) in 4.15.2.3;
- i) Requirement for approval of RTE/RTI or TI for insulation parts in 4.16.1 and 4.16.2;
- j) Change of requirements concerning electrochemical potential in 4.17.2;
- k) Clarification for IP-test in 5.3.4.2;
- l) Addition of test voltage for cemented joints in 5.3.6 and 5.3.16;
- m) Addition of detailed description on how to prepare the test sample for the thermal cycle test in 5.3.9.1;
- n) New test procedure for bypass diode thermal test (5.3.18) in accordance with MQT 18.1 of IEC 61215-2:2016;
- o) New test procedure for reverse overload current test in 5.3.23;
- p) New Figure 1 for thermal cycle test.

The text of this International Standard is based on the following documents:

| FDIS         | Report on voting |
|--------------|------------------|
| 82/1719/FDIS | 82/1738/RVD      |

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

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

The committee has decided that the contents of this document 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 document. At this date, the document will be

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

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# JUNCTION BOXES FOR PHOTOVOLTAIC MODULES – SAFETY REQUIREMENTS AND TESTS

## 1 Scope

This document describes safety requirements, constructional requirements and tests for junction boxes up to 1 500 V DC for use on photovoltaic modules in accordance with class II of IEC 61140:20042016.

This document applies also to enclosures mounted on PV-modules containing electronic circuits for converting, controlling, monitoring or similar operations. Additional requirements concerning the relevant operations are applied under consideration of the environmental conditions of the PV-modules. This document does not apply to the electronic circuits of these devices, for which other IEC standards apply.

NOTE For junction boxes in accordance with classes 0 and III of IEC 61140:20042016, in photovoltaic-systems, this document can be used as a guideline.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

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

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

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

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

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

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

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 60352-2, *Solderless connections – Part 2: Crimped connections – General requirements, test methods and practical guidance*

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

~~IEC 60512-12-2, Connectors for electronic equipment – Tests and measurements – Part 12-2: Soldering tests – Test 12b: Solderability, wetting, soldering iron method~~

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

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

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

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

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

IEC 60529, 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 60664-3, Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution~~

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

IEC 60695-10-2, Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method

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

IEC 60695-11-20:1999, Fire hazard testing – Part 11-20: Test flames – 500 W flame test method

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

IEC 60947-7-1, Low-voltage switchgear and controlgear – Part 7-1: Ancillary equipment – Terminal blocks for copper conductors

~~IEC 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 60998-2-2, 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 60998-2-3, *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 60999-1:~~2000~~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, *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, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61140:~~2001~~2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61191-1, *Printed board assemblies – Part 1: Generic specification – Requirements for soldered electrical and electronic assemblies using surface mount and related assembly technologies*

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

IEC 61215-1:2016, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1: Test requirements*

IEC 61215-2:2016, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

IEC 61730-1:2016, *Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction*

~~IEC 61730-2:2004, Photovoltaic (PV) module safety qualification – Part 2: Requirements for testing~~

IEC 62852, *Connectors for DC-application in photovoltaic systems – Safety requirements and tests*

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

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

ISO 4892-2:~~2013~~, *Plastics – Methods of exposure to laboratory light sources – Part 2: Xenon-arc lamps*

ISO 4892-3:~~2006~~, *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*

~~EN 50618, Electric cables for photovoltaic systems~~

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE



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**Junction boxes for photovoltaic modules – Safety requirements and tests**

**Boîtes de jonction pour modules photovoltaïques – Exigences de sécurité et essais**

# CONTENTS

|                                                                                   |    |
|-----------------------------------------------------------------------------------|----|
| FOREWORD .....                                                                    | 5  |
| 1 Scope .....                                                                     | 7  |
| 2 Normative references .....                                                      | 7  |
| 3 Terms and definitions .....                                                     | 9  |
| 4 Constructional requirements and performance .....                               | 13 |
| 4.1 General.....                                                                  | 13 |
| 4.2 Marking and identification .....                                              | 14 |
| 4.2.1 Identification.....                                                         | 14 |
| 4.2.2 Marking .....                                                               | 14 |
| 4.2.3 Technical documentation .....                                               | 15 |
| 4.3 Protection against electric shock.....                                        | 15 |
| 4.4 Terminations, connecting devices and connection methods .....                 | 15 |
| 4.5 Connectors .....                                                              | 16 |
| 4.6 Cables .....                                                                  | 16 |
| 4.7 Resistance to ageing .....                                                    | 16 |
| 4.8 General design .....                                                          | 16 |
| 4.9 Degree of protection (IP).....                                                | 17 |
| 4.10 Dielectric strength.....                                                     | 17 |
| 4.11 Range of ambient temperature .....                                           | 17 |
| 4.12 Cable anchorage.....                                                         | 17 |
| 4.13 Mechanical strength.....                                                     | 17 |
| 4.14 Insulation .....                                                             | 18 |
| 4.14.1 Type of insulation .....                                                   | 18 |
| 4.14.2 Basic insulation .....                                                     | 18 |
| 4.14.3 Supplementary insulation.....                                              | 18 |
| 4.14.4 Double insulation .....                                                    | 18 |
| 4.14.5 Reinforced insulation .....                                                | 18 |
| 4.15 Clearances and creepage distances.....                                       | 19 |
| 4.15.1 Clearances .....                                                           | 19 |
| 4.15.2 Creepage distances .....                                                   | 19 |
| 4.16 Insulation parts .....                                                       | 21 |
| 4.16.1 Outer accessible parts .....                                               | 21 |
| 4.16.2 Inner parts keeping active parts in position .....                         | 21 |
| 4.17 Current carrying parts and resistance against corrosion .....                | 21 |
| 4.18 Sealing .....                                                                | 22 |
| 4.19 Bypass-diode .....                                                           | 22 |
| 4.20 Knock-out inlets (outlets) intended to be removed by mechanical impact ..... | 22 |
| 5 Tests .....                                                                     | 22 |
| 5.1 General.....                                                                  | 22 |
| 5.2 Preparation of specimens .....                                                | 23 |
| 5.3 Performance of tests.....                                                     | 25 |
| 5.3.1 General .....                                                               | 25 |
| 5.3.2 Durability of marking.....                                                  | 25 |
| 5.3.3 Fixing of lid on rewirable junction box .....                               | 25 |
| 5.3.4 Protection against electric shock .....                                     | 25 |
| 5.3.5 Measurement of clearances and creepage distances .....                      | 26 |

|                       |                                                                              |    |
|-----------------------|------------------------------------------------------------------------------|----|
| 5.3.6                 | Dielectric strength.....                                                     | 26 |
| 5.3.7                 | Resistance to corrosion .....                                                | 26 |
| 5.3.8                 | Mechanical strength at lower temperatures.....                               | 26 |
| 5.3.9                 | Thermal cycle test (IEC 60068-2-14:2009, Test Nb).....                       | 27 |
| 5.3.10                | Damp heat test .....                                                         | 28 |
| 5.3.11                | Weather resistance test .....                                                | 28 |
| 5.3.12                | Flammability class .....                                                     | 28 |
| 5.3.13                | Ball pressure test.....                                                      | 29 |
| 5.3.14                | Glow wire test.....                                                          | 29 |
| 5.3.15                | Resistance against ageing.....                                               | 29 |
| 5.3.16                | Wet leakage current test.....                                                | 29 |
| 5.3.17                | Humidity freeze test.....                                                    | 30 |
| 5.3.18                | Bypass diode thermal test.....                                               | 30 |
| 5.3.19                | Test of terminations and connection methods .....                            | 31 |
| 5.3.20                | Knock-out inlets (outlets) intended to be removed by mechanical impact ..... | 32 |
| 5.3.21                | Test of cord anchorage .....                                                 | 32 |
| 5.3.22                | Retention on the mounting surface .....                                      | 34 |
| 5.3.23                | Reverse current test at junction box.....                                    | 34 |
| 5.4                   | Test schedule .....                                                          | 35 |
| Annex A (informative) | Symbol "Do not disconnect under load" .....                                  | 45 |
| Annex B (normative)   | Qualification of conformal coatings for protection against pollution.....    | 46 |
| B.1                   | General.....                                                                 | 46 |
| B.2                   | Technical properties .....                                                   | 46 |
| B.3                   | Qualification of coatings.....                                               | 46 |
| Annex C (normative)   | Measurement of clearances and creepage distances .....                       | 49 |
| Bibliography          | .....                                                                        | 53 |
| Figure 1              | – Thermal cycling test – Temperature and applied current profile .....       | 40 |
| Figure 2              | – Humidity-freeze cycle.....                                                 | 41 |
| Figure 3              | – Typical arrangement for the cable anchorage pull test.....                 | 41 |
| Figure 4              | – Typical arrangement for torsion test .....                                 | 42 |
| Figure 5              | – Typical arrangement for flammability test in accordance with 5.3.12.2..... | 42 |
| Figure 6              | – Measurement of voltage drop .....                                          | 43 |
| Figure 7              | – Bypass diode thermal test .....                                            | 43 |
| Figure 8              | – Proper attachment of 5 N weight to junction box.....                       | 44 |
| Figure A.1            | – Symbol "DO NOT DISCONNECT UNDER LOAD" .....                                | 45 |
| Figure A.2            | – Symbol "DO NOT DISCONNECT UNDER LOAD" (IEC 60417-6070:2011-06)....         | 45 |
| Figure C.1            | – Examples of methods of measuring clearances and creepage distances.....    | 52 |
| Table 1               | – Required type of insulation .....                                          | 18 |
| Table 2               | – Rated impulse voltages and minimum clearances.....                         | 19 |
| Table 3               | – Creepage distances for basic insulation .....                              | 20 |
| Table 4               | – Number of specimens.....                                                   | 23 |
| Table 5               | – Values of torque for screw-type clamping units.....                        | 24 |
| Table 6               | – Pull forces for cord anchorage.....                                        | 33 |

|                                                                                                          |    |
|----------------------------------------------------------------------------------------------------------|----|
| Table 7 – Values for torsion test .....                                                                  | 34 |
| Table 8 – Marking, information, documentation, test group A .....                                        | 35 |
| Table 9 – Material test, test group B (single tests) .....                                               | 36 |
| Table 10 – Constructional requirements, test group C (single tests).....                                 | 37 |
| Table 11 – Mechanical tests, test group D (single tests) .....                                           | 37 |
| Table 12 – Test sequence I, test group E (tests to be performed consecutively in this order).....        | 38 |
| Table 13 – Test sequence II, test group F (tests to be performed consecutively in this order).....       | 38 |
| Table 14 – Test sequence III, test group G (tests to be performed consecutively in this order).....      | 39 |
| Table 15 – Test sequence IV, test group H (tests to be performed consecutively in this order).....       | 39 |
| Table 16 – Reverse current test, test group I .....                                                      | 39 |
| Table 17 – Test sequence V, test group J (tests to be performed consecutively in this order).....        | 40 |
| Table B.1 – Test parameters, test conditions and test procedures.....                                    | 47 |
| Table B.2 – Test sequence and conformity check (tests to be performed consecutively in this order) ..... | 48 |
| Table C.1 – Dimensions of <i>X</i> .....                                                                 | 49 |

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**JUNCTION BOXES FOR PHOTOVOLTAIC MODULES –  
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.
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International Standard IEC 62790 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Modifications in normative references and terms and definitions;
- b) Improvement of declaration of categories for junction boxes in 4.1;
- c) Clarification for ambient temperature in 4.1;
- d) Addition of requirement to provide information concerning RTE/RTI or TI in 4.2;
- e) Reference to IEC 62930 instead of EN 50618 in 4.6;
- f) Addition of "Functional insulation" in Table 1;

- g) Addition of "Distance through cemented joints" in Table 3;
- h) Correction of procedure of process to categorize material groups (deletion of PTI) in 4.15.2.3;
- i) Requirement for approval of RTE/RTI or TI for insulation parts in 4.16.1 and 4.16.2;
- j) Change of requirements concerning electrochemical potential in 4.17.2;
- k) Clarification for IP-test in 5.3.4.2;
- l) Addition of test voltage for cemented joints in 5.3.6 and 5.3.16;
- m) Addition of detailed description on how to prepare the test sample for the thermal cycle test in 5.3.9.1;
- n) New test procedure for bypass diode thermal test (5.3.18) in accordance with MQT 18.1 of IEC 61215-2:2016;
- o) New test procedure for reverse overload current test in 5.3.23;
- p) New Figure 1 for thermal cycle test.

The text of this International Standard is based on the following documents:

| FDIS         | Report on voting |
|--------------|------------------|
| 82/1719/FDIS | 82/1738/RVD      |

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

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

The committee has decided that the contents of this document 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 document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
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## JUNCTION BOXES FOR PHOTOVOLTAIC MODULES – SAFETY REQUIREMENTS AND TESTS

### 1 Scope

This document describes safety requirements, constructional requirements and tests for junction boxes up to 1 500 V DC for use on photovoltaic modules in accordance with class II of IEC 61140:2016.

This document applies also to enclosures mounted on PV-modules containing electronic circuits for converting, controlling, monitoring or similar operations. Additional requirements concerning the relevant operations are applied under consideration of the environmental conditions of the PV-modules. This document does not apply to the electronic circuits of these devices, for which other IEC standards apply.

NOTE For junction boxes in accordance with classes 0 and III of IEC 61140:2016, in photovoltaic-systems, this document can be used as a guideline.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

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

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

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

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

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

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

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 60352-2, *Solderless connections – Part 2: Crimped connections – General requirements, test methods and practical guidance*

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

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

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

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

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

IEC 60529, *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 60695-2-11, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60695-10-2, *Fire hazard testing – Part 10-2: Abnormal heat – Ball pressure test method*

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

IEC 60695-11-20, *Fire hazard testing – Part 11-20: Test flames – 500 W flame test method*

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

IEC 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 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, *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, *Protection of persons and equipment by enclosures – Probes for verification*

IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61191-1, *Printed board assemblies – Part 1: Generic specification – Requirements for soldered electrical and electronic assemblies using surface mount and related assembly technologies*

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

IEC 61215-1:2016, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1: Test requirements*

IEC 61215-2:2016, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

IEC 61730-1:2016, *Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction*

IEC 62852, *Connectors for DC-application in photovoltaic systems – Safety requirements and tests*

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

ISO 868:2003, *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 lamps*

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

## SOMMAIRE

|                                                                                                        |    |
|--------------------------------------------------------------------------------------------------------|----|
| AVANT-PROPOS .....                                                                                     | 57 |
| 1 Domaine d'application .....                                                                          | 59 |
| 2 Références normatives .....                                                                          | 59 |
| 3 Termes et définitions .....                                                                          | 61 |
| 4 Exigences de construction et performances .....                                                      | 66 |
| 4.1 Généralités .....                                                                                  | 66 |
| 4.2 Marquage et identification .....                                                                   | 66 |
| 4.2.1 Identification .....                                                                             | 66 |
| 4.2.2 Marquage .....                                                                                   | 67 |
| 4.2.3 Documentation technique .....                                                                    | 67 |
| 4.3 Protection contre les chocs électriques .....                                                      | 67 |
| 4.4 Extrémités, dispositifs de connexion et méthodes de connexion .....                                | 68 |
| 4.5 Connecteurs .....                                                                                  | 69 |
| 4.6 Câbles .....                                                                                       | 69 |
| 4.7 Résistance au vieillissement .....                                                                 | 69 |
| 4.8 Conception générale .....                                                                          | 69 |
| 4.9 Degré de protection (IP) .....                                                                     | 69 |
| 4.10 Rigidité diélectrique .....                                                                       | 70 |
| 4.11 Plage de température ambiante .....                                                               | 70 |
| 4.12 Serre-câble .....                                                                                 | 70 |
| 4.13 Résistance mécanique .....                                                                        | 70 |
| 4.14 Isolation .....                                                                                   | 70 |
| 4.14.1 Type d'isolation .....                                                                          | 70 |
| 4.14.2 Isolation principale .....                                                                      | 71 |
| 4.14.3 Isolation supplémentaire .....                                                                  | 71 |
| 4.14.4 Double isolation .....                                                                          | 71 |
| 4.14.5 Isolation renforcée .....                                                                       | 71 |
| 4.15 Distances d'isolement et lignes de fuite .....                                                    | 71 |
| 4.15.1 Distances d'isolement .....                                                                     | 71 |
| 4.15.2 Lignes de fuite .....                                                                           | 72 |
| 4.16 Parties isolantes .....                                                                           | 74 |
| 4.16.1 Parties extérieures accessibles .....                                                           | 74 |
| 4.16.2 Parties internes maintenant les parties actives en place .....                                  | 74 |
| 4.17 Parties conductrices et résistance à la corrosion .....                                           | 74 |
| 4.18 Étanchéité .....                                                                                  | 75 |
| 4.19 Diode de dérivation .....                                                                         | 75 |
| 4.20 Entrées (sorties) d'une ouverture défonçable destinées à être retirées par impact mécanique ..... | 75 |
| 5 Essais .....                                                                                         | 75 |
| 5.1 Généralités .....                                                                                  | 75 |
| 5.2 Préparation des éprouvettes .....                                                                  | 76 |
| 5.3 Réalisation des essais .....                                                                       | 78 |
| 5.3.1 Généralités .....                                                                                | 78 |
| 5.3.2 Durabilité du marquage .....                                                                     | 78 |
| 5.3.3 Fixation du couvercle sur une boîte de jonction démontable .....                                 | 78 |
| 5.3.4 Protection contre les chocs électriques .....                                                    | 79 |

|                                                                                                              |                                                                                                     |     |
|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----|
| 5.3.5                                                                                                        | Mesure des distances d'isolement et des lignes de fuite .....                                       | 79  |
| 5.3.6                                                                                                        | Rigidité diélectrique .....                                                                         | 79  |
| 5.3.7                                                                                                        | Résistance à la corrosion .....                                                                     | 79  |
| 5.3.8                                                                                                        | Résistance mécanique à des températures inférieures .....                                           | 80  |
| 5.3.9                                                                                                        | Essai de cycle thermique (IEC 60068-2-14:2009, Essai Nb).....                                       | 80  |
| 5.3.10                                                                                                       | Essai de chaleur humide.....                                                                        | 81  |
| 5.3.11                                                                                                       | Essai de résistance aux intempéries .....                                                           | 81  |
| 5.3.12                                                                                                       | Classe d'inflammabilité .....                                                                       | 82  |
| 5.3.13                                                                                                       | Essai à la bille .....                                                                              | 82  |
| 5.3.14                                                                                                       | Essai au fil incandescent .....                                                                     | 82  |
| 5.3.15                                                                                                       | Résistance au vieillissement.....                                                                   | 82  |
| 5.3.16                                                                                                       | Essai de courant de fuite en milieu humide .....                                                    | 82  |
| 5.3.17                                                                                                       | Essai humidité-gel .....                                                                            | 83  |
| 5.3.18                                                                                                       | Essai thermique de la diode de dérivation.....                                                      | 84  |
| 5.3.19                                                                                                       | Essai des extrémités et méthodes de connexion .....                                                 | 85  |
| 5.3.20                                                                                                       | Entrées (sorties) d'une ouverture défonçable destinées à être retirées<br>par impact mécanique..... | 85  |
| 5.3.21                                                                                                       | Essai du serre-cordon.....                                                                          | 86  |
| 5.3.22                                                                                                       | Maintien sur la surface de montage .....                                                            | 88  |
| 5.3.23                                                                                                       | Essai de courant inverse au niveau de la boîte de jonction .....                                    | 88  |
| 5.4                                                                                                          | Programme d'essai .....                                                                             | 89  |
| Annexe A (informative) Symbole "Ne pas débrancher sous charge" .....                                         |                                                                                                     | 100 |
| Annexe B (normative) Qualification des revêtements enrobants pour la protection<br>contre la pollution ..... |                                                                                                     | 101 |
| B.1                                                                                                          | Généralités .....                                                                                   | 101 |
| B.2                                                                                                          | Propriétés techniques .....                                                                         | 101 |
| B.3                                                                                                          | Qualification des revêtements .....                                                                 | 101 |
| Annexe C (normative) Mesurage des distances d'isolement et des lignes de fuite.....                          |                                                                                                     | 104 |
| Bibliographie.....                                                                                           |                                                                                                     | 108 |
| Figure 1 – Essai de cycle thermique – Température et profil de courant appliqué .....                        |                                                                                                     | 95  |
| Figure 2 – Cycle humidité-gel .....                                                                          |                                                                                                     | 95  |
| Figure 3 – Exemple de montage d'essai de traction du serre-câble .....                                       |                                                                                                     | 96  |
| Figure 4 – Exemple de montage d'essai de torsion .....                                                       |                                                                                                     | 96  |
| Figure 5 – Exemple de montage d'essai d'inflammabilité conformément à 5.3.12.2.....                          |                                                                                                     | 97  |
| Figure 6 – Mesurage de la chute de tension.....                                                              |                                                                                                     | 97  |
| Figure 7 – Essai thermique de la diode de dérivation .....                                                   |                                                                                                     | 98  |
| Figure 8 – Fixation appropriée d'une masse de 5 N à la boîte de jonction .....                               |                                                                                                     | 99  |
| Figure A.1 – Symbole "NE PAS DÉBRANCHER SOUS CHARGE" .....                                                   |                                                                                                     | 100 |
| Figure A.2 – Symbole "NE PAS DÉBRANCHER SOUS CHARGE" (IEC 60417-<br>6070:2011-06) .....                      |                                                                                                     | 100 |
| Figure C.1 – Exemples de méthodes de mesurage des distances d'isolement et lignes<br>de fuite .....          |                                                                                                     | 107 |
| Tableau 1 – Type d'isolation exigé.....                                                                      |                                                                                                     | 71  |
| Tableau 2 – Tensions de choc assignées et distances d'isolement minimales.....                               |                                                                                                     | 72  |
| Tableau 3 – Lignes de fuite pour l'isolation principale .....                                                |                                                                                                     | 73  |

|                                                                                                                            |     |
|----------------------------------------------------------------------------------------------------------------------------|-----|
| Tableau 4 – Nombre d'éprouvettes .....                                                                                     | 76  |
| Tableau 5 – Valeurs des couples pour les organes de serrage à vis .....                                                    | 77  |
| Tableau 6 – Forces de traction du serre-cordon .....                                                                       | 87  |
| Tableau 7 – Valeurs de l'essai de torsion.....                                                                             | 87  |
| Tableau 8 – Marquage, informations, documentation, groupe d'essais A.....                                                  | 89  |
| Tableau 9 – Essai de matériau, groupe d'essais B (essais uniques) .....                                                    | 90  |
| Tableau 10 – Exigences de construction, groupe d'essais C (essais uniques).....                                            | 91  |
| Tableau 11 – Essais mécaniques, groupe d'essais D (essais uniques) .....                                                   | 91  |
| Tableau 12 – Séquence d'essais I, groupe d'essais E (essais à réaliser<br>successivement dans cet ordre).....              | 92  |
| Tableau 13 – Séquence d'essais II, groupe d'essais F (essais à réaliser<br>successivement dans cet ordre).....             | 93  |
| Tableau 14 – Séquence d'essais III, groupe d'essais G (essais à réaliser<br>successivement dans cet ordre).....            | 93  |
| Tableau 15 – Séquence d'essais IV, groupe d'essais H (essais à réaliser<br>successivement dans cet ordre).....             | 94  |
| Tableau 16 – Essai de courant inverse, groupe d'essais I .....                                                             | 94  |
| Tableau 17 – Séquence d'essais V, groupe d'essais J (essais à réaliser<br>successivement dans cet ordre).....              | 94  |
| Tableau B.1 – Paramètres d'essai, conditions d'essai et procédures d'essai.....                                            | 102 |
| Tableau B.2 – Séquence d'essais et vérification de la conformité (essais à réaliser<br>successivement dans cet ordre)..... | 103 |
| Tableau C.1 – Dimensions de $X$ .....                                                                                      | 104 |

## COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**BOÎTES DE JONCTION POUR MODULES PHOTOVOLTAÏQUES –  
EXIGENCES DE SÉCURITÉ ET ESSAIS**

## AVANT-PROPOS

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La Norme internationale IEC 62790 a été établie par le comité d'études 82 de l'IEC: Systèmes de conversion photovoltaïque de l'énergie solaire.

Cette deuxième édition annule et remplace la première édition parue en 2014. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) Modifications des références normatives et des termes et définitions;
- b) Amélioration de la catégorisation des boîtes de jonction en 4.1;
- c) Clarification de la température ambiante en 4.1;
- d) Ajout de l'exigence prévoyant de fournir les indices RTE/RTI ou IT en 4.2;
- e) Référence à l'IEC 62930 à la place de la référence à l'EN 50618 en 4.6;

- f) Ajout de "l'isolation fonctionnelle" dans le Tableau 1;
- g) Ajout de "ligne de fuite entre les bords du joint scellé" dans le Tableau 3;
- h) Correction de la procédure du processus de catégorisation des groupes de matériaux (suppression de l'ITC) au 4.15.2.3;
- i) Exigence d'approbation des indices RTE/RTI ou IT pour les parties isolantes en 4.16.1 et 4.16.2;
- j) Modification des exigences concernant le potentiel électrochimique en 4.17.2;
- k) Clarification des essais de vérification du code IP au 5.3.4.2;
- l) Ajout de la tension d'essai pour les joints scellés en 5.3.6 et 5.3.16;
- m) Ajout de la description détaillée sur la façon de préparer les éprouvettes pour l'essai de cycle thermique en 5.3.9.1;
- n) Nouvelle procédure d'essai pour l'essai thermique la diode de dérivation (5.3.18) conformément au MQT 18.1 de l'IEC 61215-2: 2016;
- o) Nouvelle procédure d'essai pour l'essai de courant de surcharge inverse au 5.3.23;
- p) Nouvelle Figure 1 pour l'essai de cycle thermique.

Le texte de cette Norme internationale est issu des documents suivants:

| FDIS         | Rapport de vote |
|--------------|-----------------|
| 82/1719/FDIS | 82/1738/RVD     |

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

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## BOÎTES DE JONCTION POUR MODULES PHOTOVOLTAÏQUES – EXIGENCES DE SÉCURITÉ ET ESSAIS

### 1 Domaine d'application

Le présent document décrit les exigences de sécurité, les exigences de construction et les essais relatifs aux boîtes de jonction jusqu'à 1 500 V en courant continu utilisées sur des modules photovoltaïques conformes à la classe II de l'IEC 61140:2016.

Le présent document s'applique également aux enveloppes montées sur des modules photovoltaïques comportant des circuits électroniques pour la conversion, le contrôle, la surveillance ou opérations similaires. Des exigences supplémentaires concernant les opérations correspondantes sont appliquées en considérant les conditions d'environnement des modules photovoltaïques. Le présent document ne s'applique pas aux circuits électroniques de ces dispositifs pour lesquels d'autres normes IEC s'appliquent.

NOTE Pour les boîtes de jonction conformes aux classes 0 et III de l'IEC 61140:2016 dans les systèmes photovoltaïques, le présent document peut être utilisé en référence.

### 2 Références normatives

Les documents suivants cités dans le texte constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60060-1, *Technique des essais à haute tension – Partie 1: Définitions et exigences générales*

IEC 60068-1, *Essais d'environnement – Partie 1: Généralités et lignes directrices*

IEC 60068-2-14:2009, *Essais d'environnement – Partie 2-14: Essais – Essai N: Variation de température*

IEC 60068-2-70, *Essais d'environnement – Partie 2-70: Essais – Essai Xb: Effacement des marquages et inscriptions par friction des doigts et des mains*

IEC 60068-2-75, *Essais d'environnement – Partie 2-75: Essais – Essai Eh: Essais au marteau*

IEC 60068-2-78, *Essais d'environnement – Partie 2-78: Essais – Essai Cab: Chaleur humide, essai continu*

IEC 60216-1, *Matériaux isolants électriques – Propriétés d'endurance thermique – Partie 1: Méthodes de vieillissement et évaluation des résultats d'essai*

IEC 60216-5, *Matériaux isolants électriques – Propriétés d'endurance thermique – Partie 5: Détermination de l'indice d'endurance thermique relatif (RTE) d'un matériau isolant*

IEC 60352-2, *Connexions sans soudure – Partie 2: Connexions serties – Exigences générales, méthodes d'essai et guide pratique*

IEC 60352-3, *Connexions sans soudure – Partie 3: Connexions autodénudantes accessibles sans soudure – Règles générales, méthodes d'essai et guide pratique*

IEC 60352-4, *Connexions sans soudure – Partie 4: Connexions autodénudantes non accessibles sans soudure – Règles générales, méthodes d'essai et guide pratique*

IEC 60352-5, *Connexions sans soudure – Partie 5: Connexions insérées à force – Exigences générales, méthodes d'essai et guide pratique*

IEC 60352-6, *Connexions sans soudure – Partie 6: Connexions à percement d'isolant – Règles générales, méthodes d'essai et guide pratique*

IEC 60352-7, *Connexions sans soudure – Partie 7: Connexions à ressort – Règles générales, méthodes d'essai et guide pratique*

IEC 60529, *Degrés de protection procurés par les enveloppes (code IP)*

IEC 60664-1:2007, *Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension – Partie 1: Principes, exigences et essais*

IEC 60695-2-11, *Essais relatifs aux risques du feu – Partie 2-11: Essais au fil incandescent / chauffant – Méthode d'essai d'inflammabilité pour produits finis (GWEPT)*

IEC 60695-10-2, *Essais relatifs aux risques du feu – Partie 10-2: Chaleurs anormales – Essai à la bille*

IEC 60695-11-10, *Essais relatifs aux risques du feu – Partie 11-10: Flammes d'essai – Méthodes d'essai horizontal et vertical à la flamme de 50 W*

IEC 60695-11-20, *Essais relatifs aux risques du feu – Partie 11-20: Flammes d'essai – Méthodes d'essai à la flamme de 500 W*

IEC 60947-7-1, *Appareillage à basse tension – Partie 7-1: Matériels accessoires – Blocs de jonction pour conducteurs en cuivre*

IEC 60998-2-3, *Dispositifs de connexion pour circuits basse tension pour usage domestique et analogue – Partie 2-3: Règles particulières pour dispositifs de connexion en tant que parties séparées avec organes de serrage à perçage d'isolant*

IEC 60999-1:1999, *Dispositifs de connexion – Conducteurs électriques en cuivre – Prescriptions de sécurité pour organes de serrage à vis et sans vis – Partie 1: Prescriptions générales et particulières pour les organes de serrage pour les conducteurs de 0,2 mm<sup>2</sup> à 35 mm<sup>2</sup> (inclus)*

IEC 60999-2, *Dispositifs de connexion – Conducteurs électriques en cuivre – Prescriptions de sécurité pour organes de serrage à vis et sans vis – Partie 2: Prescriptions particulières pour les organes de serrage pour conducteurs au-dessus de 35 mm<sup>2</sup> et jusqu'à 300 mm<sup>2</sup> (inclus)*

IEC 61032, *Protection des personnes et des matériels par les enveloppes – Calibres d'essai pour la vérification*

IEC 61140:2016, *Protection contre les chocs électriques – Aspects communs aux installations et aux matériels*

IEC 61191-1, *Ensembles de cartes imprimées – Partie 1: Spécification générique – Exigences relatives aux ensembles électriques et électroniques brasés utilisant les techniques de montage en surface et associées*

IEC 61210, *Dispositifs de connexion – Bornes plates à connexion rapide pour conducteurs électriques en cuivre – Exigences de sécurité*

IEC 61215-1:2016, *Modules photovoltaïques (PV) pour applications terrestres – Qualification de la conception et homologation – Partie 1: Exigences d'essai*

IEC 61215-2:2016, *Modules photovoltaïques (PV) pour applications terrestres – Qualification de la conception et homologation – Partie 2: Procédures d'essai*

IEC 61730-1:2016, *Qualification pour la sûreté de fonctionnement des modules photovoltaïques (PV) – Partie 1: Exigences pour la construction*

IEC 62852, *Connecteurs pour applications en courant continu pour systèmes photovoltaïques – Exigences de sécurité et essais*

IEC 62930, *Electric cables for photovoltaic systems with a voltage rating of 1,5 kV DC* (disponible en anglais seulement)

ISO 868:2003, *Plastiques et ébonite – Détermination de la dureté par pénétration au moyen d'un duromètre (dureté Shore)*

ISO 4892-2, *Plastiques – Méthodes d'exposition à des sources lumineuses de laboratoire – Partie 2: Lampes à arc au Xénon*

ISO 4892-3, *Plastiques – Méthodes d'exposition à des sources lumineuses de laboratoire – Partie 3: Lampes fluorescentes UV*