

<b>STN</b>	<b>Posúdenie bezpečnosti fotovoltického (PV) modulu</b> <b>Časť 2: Požiadavky na skúšanie</b>	<b>STN</b> <b>EN IEC 61730-2</b>  36 4634
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Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing

Táto norma obsahuje anglickú verziu európskej normy.  
This standard includes the English version of the European Standard.

Táto norma bola oznámená vo Vestníku ÚNMS SR č. 01/19

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**Photovoltaic (PV) module safety qualification - Part 2:  
Requirements for testing  
(IEC 61730-2:2016)**

Qualification pour la sûreté de fonctionnement des modules photovoltaïques (PV) - Partie 2: Exigences pour les essais (IEC 61730-2:2016)

Photovoltaik (PV) Module - Sicherheitsqualifikation - Teil 2: Anforderungen an die Prüfung (IEC 61730-2:2016)

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**EN IEC 61730-2:2018 (E)****European foreword**

The text of document 82/1129/FDIS, future edition 2 of IEC 61730-2, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61730-2:2018.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2018-10-27
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2021-04-27

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This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship with EU Directive 2006/42/EC see informative Annex ZZ, which is an integral part of this document.

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**Annex ZA**  
(normative)  
**Normative references to international publications**  
**with their corresponding European publications**

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	2010
IEC 60068-2-1	-	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	2007
IEC 60068-2-2	-	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	2007
IEC 60068-3-5	-	Environmental testing - Part 3-5: Supporting documentation and guidance - Confirmation of the performance of temperature chambers	EN 60068-3-5	2002
IEC 60598-1 (mod)	2014	Luminaires - Part 1: General requirements and tests	EN 60598-1	2015
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
IEC 60695-2-10	-	Fire hazard testing - Part 2-10: Glowing/hot-wire based test methods - Glow-wire apparatus and common test procedure	EN 60695-2-10	2002
IEC 60904-2	-	Photovoltaic devices - Part 2: Requirements for photovoltaic reference devices	EN 60904-2	2015
IEC 60904-9	-	Photovoltaic devices - Part 9: Solar simulator performance requirements	EN 60904-9	2007
IEC 60950-1 (mod)	2005	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1	2006
-	-		+ A11	2009
-	-		+ A12	2011
-	-		+ AC	2011
IEC 61010-1	-	Safety requirements for electrical equipment for measurement, control and laboratory use - Part 1: General requirements	EN 61010-1	2010
IEC 61032	1997	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	1998
IEC 61140	-	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2016
IEC 61215	series	Terrestrial photovoltaic (PV) modules Design qualification and type approval	EN 61215	series
IEC 61215-2	-	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures	EN 61215-2	2017

**EN IEC 61730-2:2018 (E)**

IEC 61730-1	2016	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction	EN 61730-1	2018
IEC 62790	-	Junction boxes for photovoltaic modules - Safety requirements and tests	EN 62790	2015
ISO 813	2016	Rubber, vulcanized or thermoplastic - Determination of adhesion to a rigid substrate - 90° peel method	-	-
ISO 4046-4	2016	Paper, board, pulps and related terms - Vocabulary - Part 4: Paper and board grades and converted products	-	-
ISO 4587	2003	Adhesives - Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies	-	-
ISO 5893	2002	Rubber and plastics test equipment - Tensile, flexural and compression types (constant rate of traverse) - Specification	-	-
ISO 8124-1	2018	Safety of toys - Part 1: Safety aspects related to mechanical and physical properties	-	-
ISO 11925-2	2010	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test	EN ISO 11925-2	2010
ISO 23529	2016	Rubber - General procedures for preparing and conditioning test pieces for physical test methods	-	-
ISO/IEC 17025	-	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2017
ANSI Z97.1	2009	American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test	-	-
ANSI/UL 1703	2015	Flat-Plate Photovoltaic Modules and Panels -	-	-

## Annex ZZ (informative)

### Relationship between this European standard and the safety objectives of Directive 2014/35/EU [2014 OJ L96] aimed to be covered

This European Standard has been prepared under a Commission's standardization request relating to harmonized standards in the field of the Low Voltage Directive, M/511, to provide one voluntary means of conforming to safety objectives of Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonization of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits [2014 OJ L96].

Once this standard is cited in the Official Journal of the European Union under that Directive, compliance with the normative clauses of this standard given in Table ZZ.1 confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding safety objectives of that Directive, and associated EFTA regulations.

**Table ZZ.1 – Correspondence between this European standard and Annex I of Directive 2014/35/EU [2014 OJ L96]**

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
1. General conditions		
1 (a) the essential characteristics, the recognition and observance of which will ensure that electrical equipment will be used safely and in applications for which it was made, shall be marked on the electrical equipment, or, if this is not possible, on an accompanying document;	EN 61730-1, 5.2	
1 (b) the electrical equipment, together with its component parts, shall be made in such a way as to ensure that it can be safely and properly assembled and connected;	EN 61730-1, 5.2	
1(c) the electrical equipment shall be so designed and manufactured as to ensure that protection against the hazards set out in points 2 and 3 is assured, providing that the equipment is used in applications for which it was made and is adequately maintained.	EN 61730-1, 5.2 refer to 2a) to 2d) and 3a) to 3c) of this table cl. 5.4 (intended use)	

**EN IEC 61730-2:2018 (E)**

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
<p>2. Protection against hazards arising from the electrical equipment</p> <p>Measures of a technical nature shall be laid down in accordance with point 1, in order to ensure that:</p>		
<p>2 (a) persons and domestic animals are adequately protected against the danger of physical injury or other harm which might be caused by direct or indirect contact;</p>	<p>EN 61730-1, 5.2.2, 5.3.4, 5.3.5, 5.5.4, 5.6.4.2  EN 61730-2, 4.4  EN 61730-2, 10.9, (MST 11)  EN 61730-2, 10.11, (MST 13)  EN 61730-2, 10.12, (MST 14)  EN 61730-2, 10.13, (MST 16)  EN 61730-2, 10.14, (MST 17)</p>	
<p>2 (b) temperatures, arcs or radiation which would cause a danger, are not produced;</p>	<p>EN 61730-1, 5.1, 5.2.2.1, 5.2.3, 5.3, 5.5 and Annex B (B6)  EN 61730-2, 4.2  EN 61730-2, 10.15, (MST 21)</p>	
<p>2 (c) persons, domestic animals and property are adequately protected against non-electrical dangers caused by the electrical equipment which are revealed by experience;</p>	<p>EN 61730-1, 5.2.3  EN 61730-2, 10.7, (MST 06)  EN 61730-2, 10.10, (MST 12)  EN 61730-2, 10.21, (MST 32)  EN 61730-2, 10.23, (MST 34)</p>	
<p>2 (d) the insulation is suitable for foreseeable conditions.</p>	<p>EN 61730-1, 5.2.2.1 k) and MST 26  EN 61730-1, 5.2.2, 5.2.2.1, 5.3.4, 5.3.5, 5.5.4, 5.6 and 5.6.4.2  EN 61730-2, 4.4  EN 61730-2, 10.13, (MST 16)  EN 61730-2, 10.14, (MST 17)</p>	

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
<p>3. Protection against hazards which may be caused by external influences on the electrical equipment            Technical measures shall be laid down in accordance with point 1, in order to ensure that the electrical equipment:</p>		
<p>3 (a) meets the expected mechanical requirements in such a way that persons, domestic animals and property are not endangered;</p>	<p>EN 61730-1, 5.1, 5.2.3, 5.3, 5.4 and 5.5            EN 61730-2, 4.2            EN 61730-2, 10.7, (MST 06)            EN 61730-2, 10.21, (MST 32)            EN 61730-2, 10.23, (MST 34)</p>	
<p>3 (b) is resistant to non-mechanical influences in expected environmental conditions, in such a way that persons, domestic animals and property are not endangered;</p>	<p>EN 61730-2, 4.5            EN 61730-2, 10.15, (MST 21)            EN 61730-2, 10.17, (MST 23)</p>	<p>No remote access to modules to influence function.             There are no mandatory requirements for fire tests, spread of flame and burning-brand tests for PV modules in this standard.</p>
<p>3 (c) does not endanger persons, domestic animals and property in foreseeable conditions of overload.</p>	<p>EN 61730-1, 5.2            EN 61730-1, 5.2.2.1 k) and MST 26</p>	

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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE



**Photovoltaic (PV) module safety qualification –  
Part 2: Requirements for testing**

**Qualification pour la sûreté de fonctionnement des modules photovoltaïques  
(PV) –  
Partie 2: Exigences pour les essais**



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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION –****Part 2: Requirements for testing**

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International Standard IEC 61730-2 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition of IEC 61730-2, issued in 2004 and its amendment 1 (2011), and constitutes a technical revision.

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

- a) Rearrange test sequences.
- b) MST 01: Visual inspection: added nameplate requirement and modified pass criteria.
- c) Added sharp edge test MST 06.
- d) Added insulation thickness test MST 04.
- e) MST 11: Accessibility test: defined force for test finger.
- f) MST 12: Cut susceptibility test: defined blade radius for cut test.



- g) MST 14: removed preconditioning requirement TC200 from Figure 1.
- h) MST 15: Partial discharge test removed.
- i) Renamed dielectric breakdown test MST 16 to insulation test.
- j) MST 21: Temperature test: rewritten test procedure; removed short circuit mode; allow alternative indoor test method.
- k) MST 23: Fire test: subclause rewritten; fire test requirements related to national building codes; moved optional test description to informative annex.
- l) Added ignitability test MST 24.
- m) MST 26: Reverse current overload test: changed specification of wooden board.
- n) MST 32: Module breakage test: defined new dimensions of impactor to allow other filling compounds; consider variety of mounting techniques for glass breakage test; reduced impact height to only 300 mm; corrected diameter of opening according to referenced standard (65 cm<sup>2</sup> instead of 6,5 cm<sup>2</sup>).
- o) Added screw connection test MST 33.
- p) Added peel test MST 35 for proof of cemented joints.
- q) Added lap shear strength test MST 36 for proof of cemented joints.
- r) Added materials creep test MST 37.
- s) Added PV module test sequence with moisture and UV to stress polymers to Figure 1. The new UV sequence was added as a response to the Kyoto meeting, where it was decided to add a coupon test and a PV module test sequence. As it is not possible to perform the ISO UV test on PV modules (no affordable equipment available) it was decided to rely on already available PV module test equipment. R&D work has shown that cycling UV and HF are best to age polymers in PV modules.
- t) Added new sequence for Pollution Degree (PD) testing (sequence B1).
- u) Added annex: Recommendations for testing of PV modules from production.

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

FDIS	Report on voting
82/1129/FDIS	82/1147/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 website 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.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION –

## Part 2: Requirements for testing

### 1 Scope

The scope of IEC 61730-1 is also applicable to this part of IEC 61730. While IEC 61730-1 outlines the requirements of construction, this part of the standard lists the tests a PV module is required to fulfill for safety qualification. IEC 61730-2 is applied for safety qualification only in conjunction with IEC 61730-1.

The sequence of tests required in this standard may not test for all possible safety aspects associated with the use of PV modules in all possible applications. This standard utilizes the best sequence of tests available at the time of its writing. There are some issues – such as the potential danger of electric shock posed by a broken PV module in a high voltage system – that should be addressed by the system design, location, restrictions on access and maintenance procedures.

The objective of this standard is to provide the testing sequence intended to verify the safety of PV modules whose construction has been assessed by IEC 61730-1. The test sequence and pass criteria are designed to detect the potential breakdown of internal and external components of PV modules that would result in fire, electric shock, and/or personal injury. The standard defines the basic safety test requirements and additional tests that are a function of the PV module end-use applications. Test categories include general inspection, electrical shock hazard, fire hazard, mechanical stress, and environmental stress.

The additional testing requirements outlined in relevant ISO standards, or the national or local codes which govern the installation and use of these PV modules in their intended locations, should be considered in addition to the requirements contained within this standard.

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

IEC 60068-2-1, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-3-5, *Environmental testing – Part 3-5: Supporting documentation and guidance; Confirmation of the performance of temperature chambers*

IEC 60598-1:2014, *Luminaires – Part 1: General requirements and tests*

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

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

IEC 60904-2, *Photovoltaic devices – Part 2: Requirements for photovoltaic reference devices*

IEC 60904-9, *Photovoltaic devices – Part 9: Solar simulator performance requirements*

IEC 60950-1:2005, *Information technology equipment – Safety – Part 1: General requirements*

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control and laboratory use – Part 1: General requirements*

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

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

IEC 61215 (all parts), *Terrestrial photovoltaic (PV) modules – Design qualification and type approval*

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

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

IEC 62790, *Junction boxes for photovoltaic modules – Safety requirements and tests*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 813, *Rubber, vulcanized or thermoplastic – Determination of adhesion to a rigid substrate – 90 degree peel method*

ISO 4046-4, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

ISO 4587:2003, *Adhesives – Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies*

ISO 5893, *Rubber and plastics test equipment – Tensile, flexural and compression types (constant rate of traverse) – Specification*

ISO 8124-1, *Safety of toys – Part 1: Safety aspects related to mechanical and physical properties*

ISO 11925-2:2010, *Reaction to fire tests – Ignitability of products subjected to direct impingement of flame – Part 2: Single-flame source test*

ISO 23529, *Rubber – General procedures for preparing and conditioning test pieces for physical test methods*

ANSI Z97.1:2009, *Standard – Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test*

ANSI/UL 1703:2015, *Flat-plate photovoltaic modules and panels*

**koniec náhľadu – text ďalej pokračuje v platenej verzii STN**