

STN	Posúdenie bezpečnosti fotovoltického (PV) modulu Časť 1: Konštrukčné požiadavky	STN EN IEC 61730-1 36 4634
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Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction

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 1:
Requirements for construction
(IEC 61730-1:2016)**

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

Photovoltaik (PV) Module - Sicherheitsqualifikation - Teil 1:
Anforderungen an den Aufbau
(IEC 61730-1:2016)

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Europäisches Komitee für Elektrotechnische Normung

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EN IEC 61730-1:2018 (E)**European foreword**

The text of document 82/1128/FDIS, future edition 2 of IEC 61730-1, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61730-1:2018.

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
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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.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050	series	Electric cables for photovoltaic systems	EN 50618	2014
IEC 60112	-	International Electrotechnical Vocabulary Method for the determination of the proof and the comparative tracking indices of solid insulating materials	- EN 60112	- -
IEC 60216-1	-	Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results	EN 60216-1	2013
IEC 60216-2	-	Electrical insulating materials - Thermal endurance properties - Part 2: Determination of thermal endurance properties of electrical insulating materials - Choice of test criteria	EN 60216-2	2005
IEC 60216-5	-	Electrical insulating materials - Thermal endurance properties - Part 5: Determination of relative thermal endurance index (RTE) of an insulating material	EN 60216-5	2008
IEC 60243-1	2013	Electric strength of insulating materials - Test methods - Part 1: Tests at power frequencies	EN 60243-1	2013
IEC 60243-2	2013	Electric strength of insulating materials - Test methods - Part 2: Additional requirements for tests using direct voltage	EN 60243-2	2014
IEC 60269-6	-	Low-voltage fuses - Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems	EN 60269-6	2011
IEC 60364-7-712	-	Electrical installations of buildings - Part 7 -712: Requirements for special installations or locations - Solar photovoltaic (PV) power supply systems	HD 60364-7-712	2016
IEC 60417	Data- base	Graphical symbols for use on equipment. Index, survey and compilation of the single sheets.	-	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	1991
IEC 60664-1	-	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007

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IEC 60664-3	2003	Insulation coordination for equipment within low-voltage systems - Part 3: Use of coating, potting or moulding for protection against pollution	EN 60664-3	2003
IEC 60695-10-2	-	Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method	EN 60695-10-2	2014
IEC 60695-11-10	-	Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods	EN 60695-11-10	2013
IEC 60904-3	-	Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3	2016
IEC 60950-1 (mod)2005		Information technology equipment - Safety - Part 1: General requirements	EN 60950-1	2006
-	-		+ A11	2009
-	-		+ A12	2011
-	-		+ AC	2011
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 61558-1	2005	Safety of power transformers, power supplies, reactors and similar products - Part 1: General requirements and tests	EN 61558-1	2005
-	-		+ corrigendum Aug.	2006
IEC 61701	-	Salt mist corrosion testing of photovoltaic (PV) modules	EN 61701	2012
IEC 61730-2	-	Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing	EN 61730-2	2018
IEC 62548	2016	Photovoltaic (PV) arrays - Design requirements	-	-
IEC 62716	-	Photovoltaic (PV) modules - Ammonia corrosion testing	EN 62716	2013
IEC 62788-1-2	-	Measurement procedures for materials used in photovoltaic modules - Part 1-2: Encapsulants - Measurement of volume resistivity of photovoltaic encapsulation and backsheet materials	EN 62788-1-2	2016
IEC 62790	-	Junction boxes for photovoltaic modules - Safety requirements and tests	EN 62790	2015
IEC 62852	-	Connectors for DC-application in photovoltaic systems - Safety requirements and tests	EN 62852	2015
ISO 1456	-	Metallic and other inorganic coatings - Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium	EN ISO 1456	2009
ISO 1461	-	Hot dip galvanized coatings on fabricated iron and steel articles_ - Specifications and test methods	EN ISO 1461	2009
ISO 2081	-	Metallic and other inorganic coatings_ - Electroplated coatings of zinc with supplementary treatments on iron or steel	EN ISO 2081	2018
ISO 2093	1986	Electroplated coatings of tin; Specification and test methods	-	-

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IEC/TR 60664-2-1	2011	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/TS 61836	-	Solar photovoltaic energy systems - Terms, definitions and symbols	CLC/TS 61836	2009
IEC/TS 62915	2018	Photovoltaic (PV) Modules - Retesting for type approval, design and safety qualification	-	-
UL 746B	2013	Standard for Polymeric Materials - Long Term Property Evaluations	-	-

EN IEC 61730-1:2018 (E)**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)	

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>	

EN IEC 61730-1:2018 (E)

Safety objectives of Directive 2014/35/EU	Clause(s) / sub-clause(s) of this EN	Remarks / Notes
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:		
3 (a) meets the expected mechanical requirements in such a way that persons, domestic animals and property are not endangered;	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)	
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;	EN 61730-2, 4.5 EN 61730-2, 10.15, (MST 21) EN 61730-2, 10.17, (MST 23)	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.
3 (c) does not endanger persons, domestic animals and property in foreseeable conditions of overload.	EN 61730-1, 5.2 EN 61730-1, 5.2.2.1 k) and MST 26	

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Photovoltaic (PV) module safety qualification –
Part 1: Requirements for construction**

**Qualification pour la sûreté de fonctionnement des modules photovoltaïques
(PV) –
Partie 1: Exigences pour la construction**





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Edition 2.0 2016-08

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Partie 1: Exigences pour la construction**

INTERNATIONAL
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CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	9
3.1 General terms and definitions	10
3.2 Components.....	11
3.3 Installation and application	12
3.4 Insulation system	12
3.5 Ratings	14
4 Classification, applications and intended use.....	16
4.1 General.....	16
4.2 PV modules of class 0	16
4.2.1 General	16
4.2.2 Insulation.....	16
4.2.3 Application.....	16
4.3 PV modules of class II.....	17
4.3.1 General	17
4.3.2 Insulation.....	17
4.3.3 Application.....	17
4.4 PV modules of class III.....	17
4.4.1 General	17
4.4.2 Insulation.....	17
4.4.3 Application.....	18
4.5 Intended use	18
5 Requirements for design and construction	18
5.1 General.....	18
5.2 Marking and documentation.....	19
5.2.1 General	19
5.2.2 Marking	19
5.2.3 Documentation.....	21
5.3 Electrical components and insulation	23
5.3.1 General	23
5.3.2 Internal wiring	23
5.3.3 External wiring and cables.....	23
5.3.4 Connectors	23
5.3.5 Junction boxes for PV modules	23
5.3.6 Frontsheets and backsheets.....	24
5.3.7 Insulation barriers	24
5.3.8 Electrical connections	24
5.3.9 Encapsulants	25
5.3.10 Bypass diodes	25
5.4 Mechanical and electromechanical connections	25
5.4.1 General	25
5.4.2 Screw connections	26
5.4.3 Rivets	27
5.4.4 Thread-cutting screws	27
5.4.5 Form/press/tight fit.....	27

5.4.6	Connections by adhesives.....	27
5.4.7	Other connections.....	28
5.5	Materials.....	28
5.5.1	General.....	28
5.5.2	Polymeric materials.....	28
5.5.3	Metallic materials.....	31
5.5.4	Adhesives.....	31
5.6	Protection against electric shock.....	31
5.6.1	General.....	31
5.6.2	Protection against accessibility to hazardous live parts.....	32
5.6.3	Insulation coordination.....	33
5.6.4	Distance through insulation (dti).....	34
Annex A (informative) Symbol "Do not disconnect under load".....		40
Annex B (normative) Insulation coordination.....		41
B.1	General.....	41
B.2	Influencing factors.....	41
B.2.1	General.....	41
B.2.2	Overvoltage category (4.3.3.2 of IEC 60664-1:2007) and rated impulse voltage.....	41
B.3	Clearances.....	43
B.4	Creepage distances.....	45
B.4.1	General.....	45
B.4.2	Voltage.....	45
B.4.3	Orientation and location of a creepage distance.....	45
B.4.4	Shape of insulating surface.....	45
B.4.5	Time under voltage stress.....	45
B.5	Cemented joints.....	46
B.6	Enclosed parts.....	46
B.7	Distance through insulation.....	46
B.7.1	Cemented joints.....	46
B.7.2	Insulation through thin layers.....	46
B.8	Methods of measuring clearances (cl) and creepage distances (cr).....	47
B.9	Figures examples.....	47
Figure 1 – IEC 60417-5017.....		21
Figure 2 – IEC 60417-5021.....		21
Figure 3 – IEC 60417-5018.....		21
Figure 4 – Examples for individual layer assessment for relied upon insulation.....		37
Figure A.1 – Symbol "DO NOT DISCONNECT UNDER LOAD".....		40
Figure A.2 – Symbol "DO NOT DISCONNECT UNDER LOAD" (IEC 60417-6070).....		40
Figure B.1 – Examples (1 to 11) of methods of measuring clearances and creepage distances.....		50
Figure B.2 – Example for insulation coordination at glass/foil PV modules – No cemented joint configuration.....		50
Figure B.3 – Example for creepage distance at glass/glass modules with edge insulation – No cemented joint configuration.....		51
Figure B.4 – Example for a glass/glass module with cemented joints.....		51

Table 1 – Correlation between classes for protection against electric shock and former terms for application classes	16
Table 2 – Required type of insulation as defined in IEC 61140	33
Table 3 – Distances through insulation, creepage distances (cr) and clearances (cl) for Class II PV modules	38
Table 4 – Distances through insulation, creepage distances (cr) and clearances (cl) for Class 0 and class III PV modules	39
Table B.1 – Rated impulse voltage	42
Table B.2 – Minimum clearances.....	44
Table B.3 – Multiplication factors for clearances of equipment rated for operation at altitudes up to 7 000 m.....	44
Table B.4 – Dimensions of X.....	47

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION –**Part 1: Requirements for construction**

FOREWORD

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International Standard IEC 61730-1 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition of IEC 61730-1, issued in 2004, and its amendments 1 (2011) and 2 (2013); it constitutes a technical revision.

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

- a) Adaption of horizontal standards and inclusion of IEC 60664 and IEC 61140.
- b) Implementation of insulation coordination, overvoltage category, classes, pollution degree (PD), and material groups (MG).
- c) Implementation of component qualification.
- d) IEC Guide 108 *Guidelines for ensuring the coherency of IEC publications – Application of horizontal standards*.

e) Definition of creepage (cr), clearance (cl) and distance through insulation.

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

FDIS	Report on voting
82/1128/FDIS	82/1146/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.

A list of all parts in the IEC 61730 series, published under the general title *Photovoltaic (PV) module safety qualification*, can be found on the IEC website.

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 1: Requirements for construction

1 Scope

This part of IEC 61730 specifies and describes the fundamental construction requirements for photovoltaic (PV) modules in order to provide safe electrical and mechanical operation. Specific topics are provided to assess the prevention of electrical shock, fire hazards, and personal injury due to mechanical and environmental stresses. This part of IEC 61730 pertains to the particular requirements of construction. IEC 61730-2 defines the requirements for testing.

This International Standard series lays down IEC requirements of terrestrial photovoltaic modules suitable for long-term operation in open-air climates. This standard is intended to apply to all terrestrial flat plate module materials such as crystalline silicon module types as well as thin-film modules.

PV modules covered by this standard are limited to a maximum DC system voltage of 1 500 V.

This International Standard defines the basic requirements for various applications of PV modules, but it cannot be considered to encompass all national or regional codes. Specific requirements, e.g. for building, marine and vehicle applications, are not covered.

This International Standard does not address specific requirements for products that combine a PV module with power conversion equipment, monitoring or control electronics, such as integrated inverters, converters or output disabling functions.

While parts of this standard may be applicable to flat plate PV modules with internally generated low level concentration below 3 times, it was not written specifically to address these concerns.

This International Standard is designed to coordinate with the test sequences in the IEC 61215 series, so that a single set of samples may be used to perform both the safety and qualification of a photovoltaic module design.

The object of this International Standard is to define the requirements for the construction of photovoltaic modules with respect to safety. These requirements are intended to minimize the misapplication and misuse of PV modules or the failure of their components which could result in fire, electric shock and personal injury.

Additional construction 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 60050 (all parts), *International Electrotechnical Vocabulary*

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

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

IEC 60216-2, *Electrical insulating materials – Thermal endurance properties – Part 2: Determination of thermal endurance properties of electrical insulating materials – Choice of test criteria*

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

IEC 60243-1:2013, *Electric strength of insulating materials – Test methods – Part 1: Tests at power frequencies*

IEC 60243-2:2013, *Electric strength of insulating materials – Test methods – Part 2: Additional requirements for tests using direct voltage*

IEC 60269-6, *Low-voltage fuses – Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems*

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

IEC 60417-DB, *Graphical symbols for use on equipment*

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 60664-3:2003, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

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 60904-3, *Photovoltaic devices – Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data*

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

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– 9 –

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

IEC 61558-1:2005, *Safety of power transformers, power supplies, reactors and similar products – Part 1: General requirements and tests*

IEC 61701, *Salt mist corrosion testing of photovoltaic (PV) modules*

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

IEC TS 61836, *Solar photovoltaic (PV) energy systems – Terms, definitions and symbols*

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

IEC 62716, *Photovoltaic (PV) modules – Ammonia corrosion testing*

IEC 62788-1-2, *Measurement procedures for materials used in photovoltaic modules – Part 1-2: Encapsulants – Measurement of volume resistivity of photovoltaic encapsulants and other polymeric materials*

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

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

IEC TS 62915, *Photovoltaic (PV) Modules – Retesting for type approval, design and safety qualification¹*

ISO 1456, *Metallic and other inorganic coatings – Electrodeposited coatings of nickel, nickel plus chromium, copper plus nickel and of copper plus nickel plus chromium*

ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods*

ISO 2081, *Metallic and other inorganic coatings – Electroplated coatings of zinc with supplementary treatments on iron or steel*

ISO 2093, *Electroplated coatings of tin – Specification and test methods*

EN 50618, *Electric cables for Photovoltaic systems*

UL 746B, *Polymeric Material – Long Term Property Evaluations*

koniec náhľadu – text ďalej pokračuje v platenej verzii STN