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NSAI Standards

Irish Standard
I.S. EN 61730-2:2007

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

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I.S. EN 61730-2:2007

Incorporating amendments/corrigenda issued since publication:
EN 61730-2:2007/A1:2012

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This document replaces:	*This document is based on:* EN 61730-2:2007	*Published:* 25 May, 2007

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61730-2/A1

February 2012

ICS 27.160

English version

Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing
(IEC 61730-2:2004/A1:2011)

Qualification pour la sûreté de fonctionnement des modules photovoltaïques (PV) - Partie 2: Exigences pour les essais (CEI 61730-2:2004/A1:2011)

Photovoltaik (PV) -Module - Sicherheitsqualifikation - Teil 2: Anforderungen an die Prüfung (IEC 61730-2:2004/A1:2011)

This amendment A1 modifies the European Standard EN 61730-2:2007; it was approved by CENELEC on 2011-12-19. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Ref. No. EN 61730-2:2007/A1:2012 E

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Foreword

The text of document 82/660/FDIS, future edition 1 of IEC 61730-2:2004/A1, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61730-2:2007/A1:2012.

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)	2012-09-19
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2014-12-19

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61730-2:2004/A1:2011 was approved by CENELEC as a European Standard without any modification.

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Replace the Annex ZA of EN 61730-2:2007 by:

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
–	–	Glass in building - Thermally toughened soda lime silicate safety glass – Part 1: Definition and description	EN 12150-1	–
–	–	Datasheet and nameplate information for photovoltaic modules	EN 50380	–
IEC 60060-1	–	High-voltage test techniques – Part 1: General definitions and test requirements	HD 588.1 S1	–
IEC 60068-1	–	Environmental testing – Part 1: General and guidance	EN 60068-1	–
IEC 60243-1	–	Electrical strength of insulating materials - Test methods – Part 1: Tests at power frequencies	EN 60243-1	–
IEC 60410	–	Sampling plans and procedures for inspection by attributes	–	–
IEC 60664-1 + A1 + A2	–	Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests	EN 60664-1	–
IEC 60904-2	–	Photovoltaic devices – Part 2: Requirements for reference solar devices	EN 60904-2	–
IEC 61032	–	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	–
IEC 61140	–	Protection against electric shock - Common aspects for installation and equipment	EN 61140	–
IEC 61215	–	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61215	–
IEC 61646	–	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61646	–
IEC 61730-1 (mod)	–	Photovoltaic (PV) module safety qualification– Part 1: Requirements for construction	EN 61730-1	–
ISO/IEC 17025	–	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	–
ANSI/UL 514C	–	Non-metallic outlet boxes, flush device boxes and covers	–	–

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Publication	Year	Title	EN/HD	Year
ANSI/UL 790	–	Tests for Fire Resistance of Roof Covering Materials	–	–
ANSI/UL 1703	–	Flat – Plate Photovoltaic Modules and Panels	–	–
ANSI Z97.1	–	American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test	–	–

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61730-2

May 2007

ICS 27.160

English version

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

(IEC 61730-2:2004, modified)

Qualification pour la sûreté de fonctionnement des modules photovoltaïques (PV) – Partie 2: Exigences pour les essais (CEI 61730-2:2004, modifiée)

Photovoltaik (PV) -Module – Sicherheitsqualifikation – Teil 2: Anforderungen an die Prüfung (IEC 61730-2:2004, modifiziert)

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Ref. No. EN 61730-2:2007 E

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Foreword

The text of the International Standard IEC 61730-2:2004, prepared by IEC TC 82, Solar photovoltaic energy systems, together with the common modifications prepared by the Technical Committee CENELEC TC 82, Solar photovoltaic energy systems, was submitted to the formal vote and was approved by CENELEC as EN 61730-2 on 2006-12-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2008-02-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-02-01

Annex ZA has been added by CENELEC.

_____

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Endorsement notice

The text of the International Standard IEC 61730-2:2004 was approved by CENELEC as a European Standard with agreed common modifications as given below.

COMMON MODIFICATIONS

General

Replace all references to "IEC 61730-1", "IEC 61730-2" and "this part of IEC 61730" by "EN 61730-1", "EN 61730-2" and "this part of EN 61730".

2 Normative references

Replace the entire clause by:

See Annex ZA.

3 Application classes

3.2 Class A: General access, hazardous voltage, hazardous power applications

Replace the text by:

Modules rated for use in this application class may be used in systems operating at greater than 120 V DC. Modules qualified for safety through EN 61730-1 and this part of EN 61730 within this application class are considered to meet the requirements for safety class II.

3.4 Class C: Limited voltage

Change the title of the subclause as given above.

Replace the text by:

Modules rated for use in this application class are restricted to systems operating at less than 120 V DC. Modules qualified for safety through EN 61730-1 and this part of EN 61730 within this application class are considered to meet the requirements for safety class III.

NOTE Safety classes are defined within EN 61140.

5 Application classes and their necessary test procedures

Table 7 Delete "MST 23" from the row referring to "Fire test" and replace the content of footnote ** by:

** A European fire test is under consideration.

8 Testing

Figure 1 Delete "MST 23" from the box referring to "Fire test" and add "*" referring to a footnote reading:

* A European fire test is under consideration.

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10 Test procedures

10.4.2 Apparatus

Renumber the note into NOTE 1.

Add the following notes:

NOTE 2 The maximum over-current protection rating of a module can be interpreted as the module series fuse rating. A series fuse may be required in the installation of PV arrays. According to Subclause 12.2 of EN 61730-1 the maximum over-current protection rating has to be provided by the manufacturer.

NOTE 3 A procedure for determination of maximum reverse current is described in EN 50380.

10.8 Replace the entire subclause by:

10.8 Fire test

Under consideration.

10.9.2 Procedure

Renumber the note into NOTE 1.

Add the following note:

NOTE 2 The maximum over-current protection rating of a module can be interpreted as the module series fuse rating. A series fuse may be required in the design of PV arrays. According to Subclause 12.2 of EN 61730-1 the maximum over-current protection rating has to be provided by the manufacturer.

10.10 Module breakage test MST 32

Add the following note:

NOTE If the glass is qualified in accordance with EN 12150-1 this test can be omitted.

11.1.2 Preconditioning

Replace the text by:

It is advisable to perform the partial discharge-test before using the back sheet foil in the PV module construction.

NOTE In order to achieve a certain statistical relevance 10 pieces should undergo the test. The size of the specimen depends on requirement originating from the test apparatus.

11.1.3 Apparatus

Add the following sentence:

The geometry of the electrodes shall be in conformance with EN 60243-1.

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11.1.4 Procedure

In item a) **add** the following notes:

NOTE 1 Any voltage below maximum systems voltage can be used but the test should start at zero voltage because it may happen that maximum systems voltage is not stated or unknown.

NOTE 2 When increasing the test voltage partial discharges may appear periodically. In that case, the inception voltage is the test voltage at which permanent discharges occur for a duration of at least 60 s.

In item b) **add** the following note:

NOTE 3 Because partial discharges can disappear periodically, partial discharges at extinction voltage should stay below 1 pC for a minimum of 60 s.

In item e) **replace** "U_{OC}" by "V_{OC}".

Annex A

Delete the annex.

Bibliography

Add the following notes for the standards indicated:

IEC 60068-2-21	NOTE Harmonized as EN 60068-2-21:1999 (not modified).
IEC 60364-1	NOTE Superseded by IEC 60364-1:2005, which is at draft stage for harmonization as HD 60364-1 (modified).
IEC 60529	NOTE Harmonized as EN 60529:1991 (not modified).
IEC 61345	NOTE Harmonized as EN 61345:1998 (not modified).

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Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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 When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
–	–	Glass in building - Thermally toughened soda lime silicate safety glass – Part 1: Definition and description	EN 12150-1	–[1)]
–	–	Datasheet and nameplate information for photovoltaic modules	EN 50380	2003
IEC 60060-1	–[1)]	High-voltage test techniques – Part 1: General definitions and test requirements	HD 588.1 S1	1999[2)]
IEC 60068-1	–[1)]	Environmental testing – Part 1: General and guidance	EN 60068-1	1994[2)]
IEC 60243-1	1998	Electrical strength of insulating materials - Test methods – Part 1: Tests at power frequencies	EN 60243-1	1998
IEC 60410	–[1)]	Sampling plans and procedures for inspection by attributes	–	–
IEC 60664-1 + A1 + A2	1992 2000 2002	Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests	EN 60664-1	2003
IEC 60904-2	–[1)]	Photovoltaic devices – Part 2: Requirements for reference solar devices	EN 60904-2	2007
IEC 61032	1997	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	1998
IEC 61140	–[1)]	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2002[2)]
IEC 61215	2005	Crystalline silicon terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61215	2005
IEC 61646	1996	Thin-film terrestrial photovoltaic (PV) modules - Design qualification and type approval	EN 61646	1997
IEC 61730-1 (mod)	2004	Photovoltaic (PV) module safety qualification– Part 1: Requirements for construction	EN 61730-1	2007
ISO/IEC 17025	–[1)]	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2005[2)]

[1)] Undated reference.
[2)] Valid edition at date of issue.

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Publication	Year	Title	EN/HD	Year
ANSI/UL 514C	–[1)]	Non-metallic outlet boxes, flush device boxes and covers	–	–
ANSI/UL 790	–[1)]	Tests for Fire Resistance of Roof Covering Materials	–	–
ANSI/UL 1703	–[1)]	Flat – Plate Photovoltaic Modules and Panels	–	–
ANSI Z97.1	–[1)]	American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test	–	–

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION –

Part 2: Requirements for testing

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

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

FDIS	Report on voting
82/357/FDIS	82/366/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.

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IEC 61730 consists of the following parts, under the general title *Photovoltaic (PV) module safety qualification:*

Part 1: Requirements for construction

Part 2: Requirements for testing

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

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

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PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION –

Part 2: Requirements for testing

1 Scope and object

This part of IEC 61730 describes the testing requirements for photovoltaic (PV) modules in order to provide safe electrical and mechanical operation during their expected lifetime. Specific topics are provided to assess the prevention of electrical shock, fire hazards, and personal injury due to mechanical and environmental stresses. IEC 61730-1 pertains to the particular requirements of construction. This part of IEC 61730 outlines the requirements of testing.

This standard attempts to define the basic requirements for various application classes of photovoltaic modules, but it cannot be considered to encompass all national or regional building codes. The specific requirements for marine and vehicle applications are not covered. This standard is not applicable to modules with integrated AC inverters (AC modules).

This standard is designed so that its test sequence can co-ordinate with those of IEC 61215 or IEC 61646, so that a single set of samples may be used to perform both the safety and performance evaluation of a photovoltaic module design.

The test-sequences of this standard are arranged in an optimal way so that tests of IEC 61215 or IEC 61646 can be used as basic preconditioning tests.

NOTE 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 module in a high voltage system, that should be addressed by the systems design, location, restrictions on access and maintenance procedures.

The object of this document 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 personal injury. The standard defines the basic safety test requirements and additional tests that are a function of the module end-use applications.

Test categories include general inspection, electrical shock hazard, fire hazard, mechanical stress, and environmental stress.

NOTE 2 The additional testing requirements outlined in relevant ISO standards, or the national or local codes which govern the installation and use of these modules in their intended locations, should be considered in addition to the requirements contained within this document.

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2 Normative references

The following referenced documents are indispensable for the application 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 60410, *Sampling plans and procedures for inspection by attributes*

IEC 60664-1:1992, *Insulation co-ordination for equipment within low-voltage systems – Part 1 Principles, requirements and tests*
Amendment 2 (2002)

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

IEC 60904-6, *Photovoltaic devices – Part 6: Requirements for reference solar modules*

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 61215:2004, *Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61646:1996, *Thin-film terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61730-1:2004, *Photovoltaic (PV) module safety qualification* – Part 1: *Requirements for construction*

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

ANSI/UL 514C, *Non-metallic outlet boxes, flush device boxes and covers*

ANSI/UL 790, *Tests for Fire Resistance of Roof Covering Materials*

ANSI/UL 1703, *Flat – Plate Photovoltaic Modules and Panels*

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