SVENSK STANDARD SS-EN IEC 61730-1

Fastställd	Utgåva	Sida	Ansvarig kommitté
2018-06-13	2	1 (1+58)	SEK TK 82

Solceller – Säkerhetsfordringar på solcellsmoduler – Del 1: Utförande

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

Som svensk standard gäller europastandarden EN IEC 61730-1:2018. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 61730-1:2018.

Nationellt förord

Europastandarden EN IEC 61730-1:2018[*)]

består av:

– **europastandardens ikraftsättningsdokument,** utarbetat inom CENELEC
– **IEC 61730-1, Second edition, 2016 - Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction**

utarbetad inom International Electrotechnical Commission, IEC.

EN från CENELEC som är identiska med motsvarande IEC-standarder och som görs tillgängliga för nationalkommittéerna efter den 1 januari 2018 får en beteckning som inleds med EN IEC istället för som tidigare bara EN.

Tidigare fastställd svensk standard SS-EN 61730-1, utgåva 1, 2007, SS-EN 61730-1/A1, utgåva 1, 2012, SS-EN 61730-1/A2, utgåva 1, 2013 och SS-EN 61730-1/A11, utgåva 1, 2014, gäller ej fr o m 2021-04-27.

[*)] Corrigendum AC:2018-06 till EN IEC 61730-1:2018 är inarbetat i standarden.

ICS 27.160.00

Denna standard är fastställd av SEK Svensk Elstandard,
som också kan lämna upplysningar om **sakinnehållet** i standarden.
Postadress: Box 1284, 164 29 KISTA
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Standarder underlättar utvecklingen och höjer elsäkerheten

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

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Stora delar av arbetet sker internationellt

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

Var med och påverka!

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 61730-1

April 2018

ICS 27.160

Supersedes EN 61730-1:2007
Incorporates corrigendum June 2018

English Version

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)

This European Standard was approved by CENELEC on 2016-09-21. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Ref. No. EN IEC 61730-1:2018 E

SEK Svensk Elstandard

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
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2021-04-27

This document supersedes EN 61730-1:2007.

The contents of the corrigendum of June 2018 have been included in this copy.

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

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 Directive 2014/35/EU see informative Annex ZZ, which is an integral part of this document.

Endorsement notice

The text of the International Standard IEC 61730-1:2016 was approved by CENELEC as a European Standard without any modification.

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.

Publication	Year	Title	EN/HD	Year
		Electric cables for photovoltaic systems	EN 50618	2014
IEC 60050	series	International Electrotechnical Vocabulary	-	-
IEC 60112	-	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

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	-	-

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	-	-

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION –

Part 1: Requirements for construction

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 61730-1 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*

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 qualification*[1]

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*