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Solceller – Säkerhetsfordringar på av solcellsmoduler och enheter med koncentrator (CPV)

*Concentrator photovoltaic (CPV) modules and assemblies –
Safety qualification*

Som svensk standard gäller europastandarden EN IEC 62688:2018. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 62688:2018.

Nationellt förord

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English Version

Concentrator photovoltaic (CPV) modules and assemblies -
Safety qualification
(IEC 62688:2017)

Modules et ensembles photovoltaïques à concentration -
Qualification de la sécurité
(IEC 62688:2017)

Konzentrator-Photovoltaik (CPV-)Module und -
Anordnungen - Sicherheitsqualifikation
(IEC 62688:2017)

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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

European foreword

The text of document 82/1299/FDIS, future edition 1 of IEC 62688, prepared by IEC/TC 82 "Solar photovoltaic energy systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62688:2018.

The following dates are fixed:

- latest date by which the document has to be (dop) 2018-08-02
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standard or by endorsement
- latest date by which the national (dow) 2021-02-02
standards conflicting with the
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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>
-	-	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests	EN 13501-1:2007 +A1:2009	-
IEC 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	-
IEC 60065	-	Audio, video and similar electronic apparatus - Safety requirements	EN 60065	-
IEC 60112	-	Method for the determination of the proof and the comparative tracking indices of solid insulating materials	EN 60112	-
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	-
IEC 60243-2	-	Electric strength of insulating materials - Test methods - Part 2: Additional requirements for tests using direct voltage	EN 60243-2	-
IEC 60417-DB	-	Graphical symbols for use on equipment	-	-
IEC 60529	-	Degrees of protection provided by enclosures (IP Code)	EN 60529	-
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
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	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60664-3	2016	Insulation coordination for equipment within low-voltage systems - Part 3: Use of coating, potting or moulding for protection against pollution	EN 60664-3	2017
IEC 60695-1-10	-	Fire hazard testing - Part 1-10: Guidance for assessing the fire hazard of electrotechnical products - General guidelines	EN 60695-1-10	-
IEC 60695-1-11	-	Fire hazard testing - Part 1-11: Guidance for assessing the fire hazard of electrotechnical products - Fire hazard assessment	EN 60695-1-11	-
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	-
IEC 60695-11-20	-	Fire hazard testing - Part 11-20: Test flames - 500 W flame test method	EN 60695-11-20	-
IEC 60904-3	-	Photovoltaic devices - Part 3: Measurement principles for terrestrial photovoltaic (PV) solar devices with reference spectral irradiance data	EN 60904-3	-
IEC 60947-1	-	Low-voltage switchgear and controlgear - Part 1: General rules	EN 60947-1	-
IEC 60950-1 (mod)	2005	Information technology equipment - Safety - Part 1: General requirements	EN 60950-1 +A11 +AC +A12	2006 2009 2011 2011
IEC 61032	-	Protection of persons and equipment by enclosures - Probes for verification	EN 61032	-
IEC 61140	2016	Protection against electric shock - Common aspects for installation and equipment	EN 61140	2016
IEC 61215-2	-	Terrestrial photovoltaic (PV) modules - Design qualification and type approval - Part 2: Test procedures	EN 61215-2	-
IEC 61508	Series	Functional safety of electrical/electronic/programmable electronic safety-related systems	EN 61508	Series
IEC 61730-1	2016	Photovoltaic (PV) module safety qualification - Part 1: Requirements for construction	EN 61730-1	2016
IEC 61730-2	2016	Photovoltaic (PV) module safety qualification - Part 2: Requirements for testing	EN 61730-2	2016
IEC/TS 61836	-	Solar photovoltaic energy systems - Terms, definitions and symbols	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 62108	2016	Concentrator photovoltaic (CPV) modules and assemblies - Design qualification and type approval	EN 62108	2016
IEC 62305-2	-	Protection against lightning - Part 2: Risk management	EN 62305-2	-
IEC 62305-3	-	Protection against lightning - Part 3: Physical damage to structures and life hazard	EN 62305-3	-
IEC 62548	-	Photovoltaic (PV) arrays - Design requirements	-	-
IEC 62670-1	-	Photovoltaic concentrators (CPV) - Performance testing - Part 1: Standard conditions	EN 62670-1	-
IEC 62790	-	Junction boxes for photovoltaic modules - Safety requirements and tests	EN 62790	-
IEC 62852	2014	Connectors for DC-application in photovoltaic systems - Safety requirements and tests	EN 62852	2015
ISO 179-1	-	Plastics - Determination of Charpy impact properties - Part 1: Non-instrumented impact test	EN ISO 179-1	-
ISO 261	-	ISO general-purpose metric screw threads - General plan	-	-
ISO 262	-	ISO general purpose metric screw threads - Selected sizes for screws, bolts and nuts	-	-
ISO 527	Series	Plastics - Determination of tensile properties	EN ISO 527	Series
ISO 834-1	-	Fire-resistance tests - Elements of building - construction - Part 1: General requirements	-	-
ISO/TR 834-3	-	Fire-resistance tests - Elements of building - construction - Part 3: Commentary on test method and guide to the application of the outputs from the fire-resistance test	-	-
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	-
ISO 1461	-	Hot dip galvanized coatings on fabricated iron and steel articles - Specifications and test methods	EN ISO 1461	-
ISO 2081	-	Metallic and other inorganic coatings - Electroplated coatings of zinc with supplementary treatments on iron or steel	EN ISO 2081	-
ISO 2093	-	Electroplated coatings of tin; Specification and test methods	-	-

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 4892-2	-	Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps	EN ISO 4892-2	-
ISO 5657	-	Reaction to fire tests - Ignitability of building products using a radiant heat source	-	-
ISO 8124-1	-	Safety of toys - Part 1: Safety aspects related to mechanical and physical properties	-	-
ENV 1187-1 to -4		Test methods for roof coverings under the influence of a thermal attack of burning brands and radiant heat		
ANSI/UL 790	2004	Standard for Standard Test Methods for Fire Tests of Roof Coverings	-	-
ANSI/UL 746B	-	Standard for Polymeric Materials - Long Term Property Evaluations	-	-
ANSI/UL 746C	-	Standard for Polymeric Materials - Use in Electrical Equipment Evaluations	-	-
ANSI/UL 1703	-	Standard for Flat-Plate Photovoltaic Modules and Panels	-	-
ASTM E162-13	-	Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source	-	-
ASTM D3755-14	-	Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials Under Direct-Voltage Stress	-	-
ASTM D257-14	-	Standard Test Methods for DC Resistance or Conductance of Insulating Materials	-	-
ASTM D1002-10	-	Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)	-	-

CONTENTS

FOREWORD.....	8
1 Scope	10
2 Normative references	10
3 Terms and definitions	13
4 Sampling	15
5 Marking	20
5.1 Nameplate	20
5.2 Hazards	21
5.2.1 High intensity light	21
5.2.2 Field connections.....	21
5.2.3 Hot surfaces	22
6 Report	22
7 Requirements for construction – Module application classes	23
7.1 General.....	23
7.2 Class II – general access, hazardous voltage, current and power, double insulated/reinforced insulation.....	23
7.2.1 Electrical output.....	23
7.2.2 Protection	23
7.2.3 Application.....	24
7.3 Class 0 – Restricted access, hazardous voltage, current and power basic insulation only with no protection from faults	24
7.3.1 Electrical output.....	24
7.3.2 Protection	24
7.3.3 Application.....	24
7.4 Class 0-X – additional fire or concentrated light hazard.....	24
7.5 Class III – general access limited voltage, current and power	24
7.5.1 Electrical output.....	24
7.5.2 Protection	24
7.5.3 Application.....	24
7.6 Fire safety.....	25
8 Construction	25
9 Modifications	25
10 Requirements for supplied documents	25
10.1 General.....	25
10.2 Fire	25
10.3 Electrical.....	25
10.4 Mechanical	26
10.5 Temperature	26
10.6 Field assembly.....	26
10.7 Component ratings.....	26
11 Overcurrent protection	26
12 Metal parts	27
12.1 Combinations of metals.....	27
12.2 Corrosion protection	27
12.3 Edges	27
13 Polymeric materials	27

13.1	General.....	27
13.1.1	Overview	27
13.1.2	Solid insulation and cemented joints	27
13.1.3	Requirements for polymers	28
13.1.4	Operational categories for CPV modules and assemblies	29
13.2	Polymers serving as an enclosure for live parts (such as a junction box, connector, or plug).....	30
13.3	Polymers serving in direct support of live parts (such as integrated terminals and potting compounds).....	30
13.4	Polymers serving as an outer surface of a receiver (such as a front sheet or back sheet on a flat-plate profile receiver in a medium-X assembly).....	30
13.5	Polymers serving as an internal electrical barrier providing the sole insulation between live parts	31
13.6	Polymers serving as encapsulants	31
13.7	Polymers serving as adhesives for attachment (such as for a junction box).....	31
13.8	Polymers serving as moisture barriers (such as edge sealants)	31
13.9	Polymers serving as gaskets or seals (such as with front glass).....	31
13.10	Polymers serving as frames (such as with flat-plate profile medium-concentration receivers).....	32
13.11	Polymers serving as CPV optics	32
13.12	Polymers exposed to sunlight, serving as a mechanical support, not functioning in categories 13.2 to 13.11.....	32
13.13	Polymers exposed to concentrated sunlight	32
14	Internal wiring and current-carrying parts.....	32
14.1	General.....	32
14.2	Internal wiring	32
14.3	Splices.....	32
14.4	Mechanical securement	33
15	Connections	33
15.1	Field connections – general requirements	33
15.2	Field wiring terminals	33
15.3	Connectors	34
15.4	Output lead or cables.....	34
16	Bonding and grounding.....	34
16.1	General.....	34
16.2	Lightning protection	35
17	Protection against electric shock and energy hazards.....	35
17.1	General.....	35
17.2	Fault conditions	35
17.3	Protection against electric shock.....	36
17.3.1	General	36
17.3.2	Module classification	36
17.3.3	Creepage and clearance distances	37
17.3.4	Degrees of pollution in the micro-environment	40
17.3.5	Cemented joints.....	40
18	Field wiring compartments with covers	42
18.1	General.....	42
18.2	Strain relief	42
18.3	Sharp edges	42
18.4	Conduit applications – Metallic.....	42

18.5	Conduit applications – Non-metallic	42
19	Requirements for testing – Test categories	43
19.1	General.....	43
19.2	Preconditioning tests	43
19.3	General inspection.....	44
19.4	Electrical shock hazard	44
19.5	Fire hazard	44
19.6	Mechanical stress	45
20	Testing	45
20.1	General.....	45
20.2	Visual inspection.....	50
20.2.1	General	50
20.2.2	Requirements	50
20.3	Accessibility test	51
20.3.1	Purpose	51
20.3.2	Apparatus.....	51
20.3.3	Procedure.....	51
20.3.4	Requirements	51
20.4	Grounding/Bonding path continuity test.....	51
20.4.1	Purpose	51
20.4.2	Procedure.....	51
20.4.3	Requirements	51
20.5	Dielectric voltage withstand test.....	51
20.5.1	Purpose	51
20.5.2	Procedure.....	52
20.5.3	Requirements	52
20.6	Wet insulation test	52
20.6.1	Purpose	52
20.6.2	Procedure.....	52
20.6.3	Requirements	52
20.7	Reverse current overload	53
20.7.1	Purpose	53
20.7.2	Procedure.....	53
20.7.3	Requirements	53
20.8	Thermal cycling.....	53
20.8.1	General	53
20.8.2	Purpose	54
20.8.3	Procedure.....	54
20.8.4	Requirements	54
20.9	Humidity freeze	54
20.9.1	General	54
20.9.2	Purpose	54
20.9.3	Procedure.....	54
20.9.4	Requirements	54
20.10	Damp heat	54
20.10.1	General	54
20.10.2	Purpose	54
20.10.3	Procedure.....	55
20.10.4	Requirements	55

20.11	Bypass diode thermal.....	55
20.11.1	Purpose.....	55
20.11.2	Special test sample	55
20.11.3	Procedure.....	55
20.11.4	Requirements	55
20.12	Hot spot endurance.....	55
20.12.1	General	55
20.12.2	Procedure.....	56
20.12.3	Requirements	56
20.13	Off-axis beam damage	56
20.13.1	General	56
20.13.2	Purpose	56
20.13.3	Special case	56
20.13.4	Procedure.....	56
20.13.5	Requirements	56
20.14	Water spray	57
20.14.1	General	57
20.14.2	Purpose	57
20.14.3	Procedure.....	57
20.14.4	Requirements	57
20.15	Mechanical load.....	57
20.15.1	Purpose	57
20.15.2	Procedure.....	58
20.15.3	Requirements	58
20.16	Robustness of terminations.....	58
20.16.1	Purpose	58
20.16.2	Types of terminations	58
20.16.3	Procedure.....	58
20.16.4	Requirements	58
20.17	Impulse voltage.....	58
20.17.1	Purpose	58
20.17.2	Requirements	60
20.18	CPV temperature test.....	60
20.18.1	Purpose	60
20.18.2	Test apparatus	60
20.18.3	Procedure.....	60
20.18.4	Requirements	61
20.19	Fire test recommendation for CPV modules	62
20.19.1	General	62
20.19.2	Burning brand fire tests	62
20.20	CPV electrical parameters	64
20.20.1	General	64
20.20.2	Maximum open-circuit voltage	64
20.20.3	Maximum short-circuit current.....	64
20.20.4	The procedure for calculating maximum power (Max P) is to be in accordance with the following:	65
20.21	Outdoor exposure	65
20.21.1	General	65
20.21.2	Purpose.....	65

20.21.3	Procedure.....	65
20.21.4	Requirements	65
20.22	Sharp edge test	66
20.22.1	General	66
20.22.2	Purpose	66
20.22.3	Procedure.....	66
20.22.4	Requirements	66
20.23	Blocked heat sink test.....	66
20.23.1	Purpose	66
20.23.2	Procedure.....	67
20.23.3	Requirements	67
20.24	Locked rotor test.....	67
20.24.1	Purpose	67
20.24.2	Procedure.....	67
20.24.3	Requirements	68
Annex A (informative)	Bimetallic junction	69
Annex B (normative)	Recommendations for testing of modules from production	70
B.1	General.....	70
B.2	Module output power.....	70
B.3	Insulation test	70
B.4	Wet insulation test	70
B.5	Visual inspection.....	71
B.6	Cable connections	71
B.7	Bypass diodes	71
B.8	Ground continuity.....	71
Annex C (normative)	Alternative test method to electricity safety of CPV receivers	72
C.1	General.....	72
C.2	Specifications for the proposed test method.....	72
C.3	Test method.....	73
C.3.1	Overview	73
C.3.2	Product identity	73
C.3.3	Manufacturer	73
C.3.4	System number.....	73
C.4	Test procedure.....	73
C.4.1	Physical background.....	73
C.4.2	Sampling	74
C.4.3	Marking	74
C.4.4	Test procedure	75
C.4.5	Pass criteria	76
Bibliography		77
Figure 1	– Schematic of a point focus dish PV concentrator.....	17
Figure 2	– Schematic of a linear focus trough PV concentrator	18
Figure 3	– Schematic of a point focus Fresnel lens PV concentrator	19
Figure 4	– Schematic of a linear focus Fresnel lens PV concentrator	20
Figure 5	– Field connection warning label	21
Figure 6	– Symbol for hot surface can be used	22

Figure 7 – IEC 62688 safety test plan for CPV modules (IEC 62108:2016).....	47
Figure 8 – Combined IEC 62108:2016 and IEC 62688 test plan for CPV modules	48
Figure 9 – IEC 62688 safety test plan for CPV assemblies (IEC 62108:2016)	49
Figure 10 – Combined IEC 62108:2016 and IEC 62688 test plan for CPV assemblies.....	50
Figure 11 – Waveform of the impulse voltage test.....	59
Figure C.1 – Decision chart of the alternative test.....	73
Figure C.2 – Formula (C.1)	73
Figure C.3 – Example of the acceleration of the breakdown voltage degradation by the voltage stress	74
Figure C.4 – Fitting to the power function in the double logarithmic chart.....	76
Table 1 – Touch temperature limits	22
Table 2 – Sizes of terminals for supply conductors.....	34
Table 3 – Minimum acceptable clearance distances.....	38
Table 4 – Multiplication factors for clearances of equipment rated for operation at altitudes up to 5 000 m	38
Table 5 – Minimum creepage distances for basic insulation	39
Table 6 – Minimum creepage distances for reinforced insulation.....	39
Table 7 – Rated impulse voltage	40
Table 8 – Wall thickness of polymeric boxes intended for conduit	43
Table 9 – Preconditioning tests.....	43
Table 10 – General inspection tests	44
Table 11 – Electrical shock hazard tests	44
Table 12 – Fire hazard tests	44
Table 13 – Fire hazard test applicability	45
Table 14 – Mechanical stress tests	45
Table 15 – Impulse voltage versus maximum system voltage.....	59
Table 16 – Brand size and its number	62
Table A.1 – Voltages developed on bimetallic junction (IEC 60943:1998, Table 3)	69
Table C.1 – Maximum acceptable testing time	75

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CONCENTRATOR PHOTOVOLTAIC (CPV) MODULES AND ASSEMBLIES – SAFETY QUALIFICATION

FOREWORD

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International Standard IEC 62688 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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

FDIS	Report on voting
82/1299/FDIS	82/1323/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 website 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.

A bilingual version of this publication may be issued at a later date.

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.

CONCENTRATOR PHOTOVOLTAIC (CPV) MODULES AND ASSEMBLIES – SAFETY QUALIFICATION

1 Scope

This document describes the fundamental construction and testing requirements for Concentrator Photovoltaic (CPV) modules and assemblies 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.

This document attempts to define the basic requirements for various application classes of concentrator photovoltaic modules and assemblies, but it cannot be considered to encompass all national and regional codes.

This document is designed so that its test sequence can coordinate with those of IEC 62108, so that a single set of samples may be used to perform both the safety and performance evaluation of a CPV module and assembly.

CPV modules that are constructed in the flat plate module format and operate at 3X and less geometric concentration ratio are considered for evaluation to IEC 61730-1 and IEC 61730-2.

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 60065, *Audio, video and similar electronic apparatus – Safety requirements*

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

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

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

IEC 60417, *Graphical symbols for use on equipment – 12-month subscription to regularly updated online database comprising all graphical symbols published in IEC 60417*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

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

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 60664-3:2016, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-1-10, *Fire hazard testing – Part 1-10: Guidance for assessing the fire hazard of electrotechnical products – General guidelines*

IEC 60695-1-11, *Fire hazard testing – Part 1-11: Guidance for assessing the fire hazard of electrotechnical products – Fire hazard assessment*

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

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

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

IEC 60947-1, *Low-voltage switchgear and control gear – Part 1: General rules*

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

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

IEC 61508 (all parts), *Functional safety of electrical/electronic/programmable electronic safety-related systems*

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

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

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

IEC 62108:2016, *Concentrator photovoltaic (CPV) modules and assemblies – Design qualification and type approval*

IEC 62305-2, *Protection against lightning – Part 2: Risk management*

IEC 62305-3, *Protection against lightning – Part 3: Physical damage to structures and life hazard*

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

IEC 62670-1, *Concentrator photovoltaic (CPV) performance testing – Part 1: Standard conditions*

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

IEC 62852:2014, *Connectors for DC-application in photovoltaic systems – Safety requirements and tests*

ISO 179-1, *Plastics – Determination of Charpy impact properties – Part 1: Non-instrumented impact test*

ISO 261, *ISO general-purpose metric screw threads – General plan*

ISO 262, *ISO general-purpose metric screw threads – Selected sizes for screws, bolts and nuts. Media and price*

ISO 527 (all parts), *Plastics – Determination of tensile properties*

ISO 834-1, *Fire-resistance tests – Elements of building construction – Part 1: General Requirements*

ISO TR 834-3, *Fire-resistance tests – Elements of building construction – Part 3: Commentary on test method and test data application* guide to the application of the outputs from the fire-resistance test

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 coatings – Electroplated coatings of zinc with supplementary treatments on iron or steel*

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

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

ISO 5657, *Reaction to fire tests – Ignitability of building products using a radiant heat source*

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

ENV 1187-1 to -4, *Test methods for roof coverings under the influence of a thermal attack of burning brands and radiant heat*

ANSI/UL 790 (April 2004), *Standard Test Methods for Fire Tests of Roof Coverings*

ANSI/UL 746B, *Standard for Polymeric Materials – Long Term Property Evaluations*

UL 746C, *Standard for Polymeric Materials – Use in Electrical Equipment Evaluations*

UL 1703, *Standard for Flat-Plate Photovoltaic Modules and Panels*

ASTM E162-13, *Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source*

ASTM D3755-14, *Standard Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials Under Direct-Voltage Stress*

ASTM D257-14, *Standard Test Methods for DC Resistance or Conductance of Insulating Materials*

ASTM D1002-10, *Standard Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)*

EN 13501-1:2007 + A1, *Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests*