



IEC 62108

Edition 2.0 2016-09
REDLINE VERSION

INTERNATIONAL STANDARD



Concentrator photovoltaic (CPV) modules and assemblies – Design qualification and type approval

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.160

ISBN 978-2-8322-3668-0

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD.....	5
1 Scope and object.....	7
2 Normative references.....	7
3 Terms and definitions	8
4 Sampling	9
5 Marking	10
6 Testing.....	10
7 Pass criteria	11
8 Report.....	19
9 Modifications	20
10 Test procedures	20
10.1 Visual inspection.....	20
10.1.1 General	20
10.1.2 Procedure.....	20
10.1.3 Major visual defects	21
10.1.4 Requirements	21
10.2 Electrical performance measurement.....	21
10.2.1 Purpose.....	21
10.2.2 Outdoor side-by-side I-V measurement.....	21
10.2.3 Solar simulator I-V measurement.....	23
10.2.4 Dark I-V measurement	23
10.3 Ground path continuity test.....	24
10.3.1 General	24
10.3.2 Purpose.....	24
10.3.3 Procedure.....	24
10.3.4 Requirements	24
10.4 Electrical insulation test	25
10.4.1 Purpose.....	25
10.4.2 Procedure.....	25
10.4.3 Requirements	25
10.5 Wet insulation test.....	26
10.5.1 Purpose.....	26
10.5.2 Procedure.....	26
10.5.3 Requirements	26
10.6 Thermal cycling test	27
10.6.1 Purpose.....	27
10.6.2 Test sample.....	27
10.6.3 Procedure.....	27
10.6.4 Requirements	29
10.7 Damp heat test.....	29
10.7.1 Purpose.....	29
10.7.2 Test sample.....	29
10.7.3 Procedure.....	30
10.7.4 Requirements	30
10.8 Humidity freeze test	30

10.8.1	Purpose	30
10.8.2	Test sample	30
10.8.3	Procedure	31
10.8.4	Requirements	31
10.9	Hail impact test	32
10.9.1	Purpose	32
10.9.2	Apparatus	32
10.9.3	Procedure	33
10.9.4	Requirements	33
10.10	Water spray test.....	33
10.10.1	General	33
10.10.2	Purpose	33
10.10.3	Procedure	34
10.10.4	Requirements	34
10.11	Bypass/blocking diode thermal test.....	34
10.11.1	Purpose	34
10.11.2	Test sample	35
10.11.3	Apparatus	35
10.11.4	Procedure	35
10.11.5	Requirements	36
10.11.6	Procedure 2 – Alternate method	36
10.12	Robustness of terminations test.....	37
10.12.1	Purpose	37
10.12.2	Types of terminations.....	37
10.12.3	Procedure	38
10.12.4	Requirements	38
10.13	Mechanical load test	39
10.13.1	Purpose	39
10.13.2	Procedure	40
10.13.3	Requirements	40
10.14	Off-axis beam damage test.....	40
10.14.1	General	40
10.14.2	Purpose	40
10.14.3	Special case	40
10.14.4	Procedure	40
10.14.5	Requirements	41
10.15	Ultraviolet conditioning test	41
10.15.1	Purpose	41
10.15.2	Procedure	41
10.15	Outdoor exposure test.....	41
10.15.1	Purpose	41
10.15.2	Procedure	42
10.15.3	Requirements	42
10.16	Hot-spot endurance test	42
10.17	Dust ingress protection test	42
10.17.1	Purpose	42
10.17.2	Procedure	43
10.17.3	Requirements	43
Annex A (informative) Summary of test conditions and requirements.....		44

Annex B (normative) Retesting guideline	47
B.1 Product or process modifications requiring limited retesting to maintain certification	47
B.2 Modifications of CPV cell technology	47
B.3 Modifications in optical encapsulation on the cell (Includes optical coupling between the cell and a glass secondary optical element bonded to the cell)	48
B.4 Modification in cell encapsulation outside of intended light path	48
B.5 Modification of cell package substrate used for heat transfer	48
B.6 Accessible optics (primary or secondary)	49
B.7 Inaccessible optics (secondary)	49
B.8 Frame and/or mounting structure	49
B.9 Enclosure	50
B.10 Wiring compartment/junction box	50
B.11 Interconnection terminals	50
B.12 Interconnection materials or technique (to cells and between receivers)	51
B.13 Change in electrical circuit design in an identical package	51
B.14 Output power	51
B.15 Thermal energy transfer means	52
B.16 Adhesives	52
Bibliography
Figure 1 – Schematic of point-focus dish PV concentrator	13
Figure 2 – Schematic of linear-focus trough PV concentrator	14
Figure 3 – Schematic of point-focus fresnel lens PV concentrator	15
Figure 4 – Schematic of linear-focus fresnel lens PV concentrator	16
Figure 5 – Schematic of a heliostat CPV	17
Figure 6 – Qualification test sequence for CPV modules	18
Figure 7 – Qualification test sequence for CPV assemblies	19
Figure 8 – Temperature and current profile of thermal cycle test (not to scale)	29
Figure 9 – Profile of humidity-freeze test conditions	32
Figure 10 – Bypass diode thermal test	37
Table 1 – Terms used for CPVs	9
Table 2 – Allocation of test samples to typical test sequences	11
Table 3 – Thermal cycle test options for sequence A	29
Table 4 – Pre thermal cycle test options for sequence B
Table 4 – Humidity freeze test options for sequence B	31
Table 5 – Minimum wind loads	39
Table A.1 – Summary of test conditions and requirements	44

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONCENTRATOR PHOTOVOLTAIC (CPV) MODULES AND ASSEMBLIES –
DESIGN QUALIFICATION AND TYPE APPROVAL**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

International Standard IEC 62108 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition, issued in 2007. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- a) Changes in outdoor exposure from 1000 h to 500 h.
- b) Changes in current cycling during thermal cycling test.
- c) Added dust ingress test.
- d) Eliminated thermal cycling associated with damp heat test.
- e) Eliminated UV exposure test.

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

FDIS	Report on voting
82/1142/FDIS	82/1161/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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

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

CONCENTRATOR PHOTOVOLTAIC (CPV) MODULES AND ASSEMBLIES – DESIGN QUALIFICATION AND TYPE APPROVAL

1 Scope and object

This International Standard specifies the minimum requirements for the design qualification and type approval of concentrator photovoltaic (CPV) modules and assemblies suitable for long-term operation in general open-air climates as defined in IEC 60721-2-1. The test sequence is partially based on that specified in IEC 61215-1 for the design qualification and type approval of flat-plate terrestrial crystalline silicon PV modules. However, some changes have been made to account for the special features of CPV receivers and modules, particularly with regard to the separation of on-site and in-lab tests, effects of tracking alignment, high current density, and rapid temperature changes, which have resulted in the formulation of some new test procedures or new requirements.

The object of this test standard is to determine the electrical, mechanical, and thermal characteristics of the CPV modules and assemblies and to show, as far as possible within reasonable constraints of cost and time, that the CPV modules and assemblies are capable of withstanding prolonged exposure in climates described in the scope. The actual life of CPV modules and assemblies so qualified will depend on their design, production, environment, and the conditions under which they are operated.

This standard shall be used in conjunction with the retest guidelines described in Annex B.

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 60068-2-21:2006, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

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

~~IEC 61215:2005, Crystalline silicon Terrestrial photovoltaic (PV) modules – Design qualification and type approval~~

IEC 61215-2:2016, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

IEC 62670-1, *Photovoltaic concentrators (CPV) – Performance testing – Part 1: Standard conditions*

~~ISO/IEC 17025:2005, General requirements for the competence of testing and calibration laboratories~~

ANSI/UL 1703:2002 ~~ed.3 March 15~~, *Standard for Safety: Flat-Plate Photovoltaic Modules and Panels*

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Concentrator photovoltaic (CPV) modules and assemblies – Design qualification and type approval

Modules et ensembles photovoltaïques à concentration – Qualification de la conception et homologation

CONTENTS

FOREWORD.....	5
1 Scope and object.....	7
2 Normative references.....	7
3 Terms and definitions	7
4 Sampling	9
5 Marking	10
6 Testing	10
7 Pass criteria	11
8 Report.....	18
9 Modifications	19
10 Test procedures	19
10.1 Visual inspection.....	19
10.1.1 General	19
10.1.2 Procedure.....	19
10.1.3 Major visual defects	20
10.1.4 Requirements	20
10.2 Electrical performance measurement.....	20
10.2.1 Purpose	20
10.2.2 Outdoor side-by-side I-V measurement.....	20
10.2.3 Solar simulator I-V measurement.....	22
10.2.4 Dark I-V measurement	22
10.3 Ground path continuity test.....	23
10.3.1 General	23
10.3.2 Purpose	23
10.3.3 Procedure	23
10.3.4 Requirements	23
10.4 Electrical insulation test	24
10.4.1 Purpose	24
10.4.2 Procedure	24
10.4.3 Requirements	24
10.5 Wet insulation test.....	25
10.5.1 Purpose	25
10.5.2 Procedure	25
10.5.3 Requirements	25
10.6 Thermal cycling test	25
10.6.1 Purpose	25
10.6.2 Test sample	26
10.6.3 Procedure	26
10.6.4 Requirements	27
10.7 Damp heat test.....	28
10.7.1 Purpose	28
10.7.2 Test sample	28
10.7.3 Procedure	28
10.7.4 Requirements	29
10.8 Humidity freeze test	29

10.8.1	Purpose	29
10.8.2	Test sample	29
10.8.3	Procedure	29
10.8.4	Requirements	29
10.9	Hail impact test	30
10.9.1	Purpose	30
10.9.2	Apparatus	30
10.9.3	Procedure	31
10.9.4	Requirements	31
10.10	Water spray test.....	31
10.10.1	General	31
10.10.2	Purpose	31
10.10.3	Procedure	32
10.10.4	Requirements	32
10.11	Bypass/blocking diode thermal test.....	32
10.11.1	Purpose	32
10.11.2	Test sample	33
10.11.3	Apparatus	33
10.11.4	Procedure	33
10.11.5	Requirements	33
10.11.6	Procedure 2 – Alternate method	34
10.12	Robustness of terminations test.....	35
10.12.1	Purpose	35
10.12.2	Types of terminations.....	35
10.12.3	Procedure	35
10.12.4	Requirements	36
10.13	Mechanical load test	36
10.13.1	Purpose	36
10.13.2	Procedure	37
10.13.3	Requirements	37
10.14	Off-axis beam damage test.....	37
10.14.1	General	37
10.14.2	Purpose	37
10.14.3	Special case	37
10.14.4	Procedure	37
10.14.5	Requirements	38
10.15	Outdoor exposure test.....	38
10.15.1	Purpose	38
10.15.2	Procedure	38
10.15.3	Requirements	38
10.16	Hot-spot endurance test	39
10.17	Dust ingress protection test	39
10.17.1	Purpose	39
10.17.2	Procedure	39
10.17.3	Requirements	39
Annex A (informative)	Summary of test conditions and requirements.....	40
Annex B (normative)	Retesting guideline	43
B.1	Product or process modifications requiring limited retesting to maintain certification	43

B.2	Modifications of CPV cell technology	43
B.3	Modifications in optical encapsulation on the cell (Includes optical coupling between the cell and a glass secondary optical element bonded to the cell)	44
B.4	Modification in cell encapsulation outside of intended light path	44
B.5	Modification of cell package substrate used for heat transfer	44
B.6	Accessible optics (primary or secondary)	45
B.7	Inaccessible optics (secondary)	45
B.8	Frame and/or mounting structure	45
B.9	Enclosure	46
B.10	Wiring compartment/junction box	46
B.11	Interconnection terminals	46
B.12	Interconnection materials or technique (to cells and between receivers)	47
B.13	Change in electrical circuit design in an identical package	47
B.14	Output power	47
B.15	Thermal energy transfer means	48
B.16	Adhesives	48
Figure 1	– Schematic of point-focus dish PV concentrator	12
Figure 2	– Schematic of linear-focus trough PV concentrator	13
Figure 3	– Schematic of point-focus fresnel lens PV concentrator	14
Figure 4	– Schematic of linear-focus fresnel lens PV concentrator	15
Figure 5	– Schematic of a heliostat CPV	16
Figure 6	– Qualification test sequence for CPV modules	17
Figure 7	– Qualification test sequence for CPV assemblies	18
Figure 8	– Temperature and current profile of thermal cycle test (not to scale)	28
Figure 9	– Profile of humidity-freeze test conditions	30
Figure 10	– Bypass diode thermal test	34
Table 1	– Terms used for CPV	9
Table 2	– Allocation of test samples to typical test sequences	11
Table 3	– Thermal cycle test options for sequence A	27
Table 4	– Humidity freeze test options for sequence B	29
Table 5	– Minimum wind loads	36
Table A.1	– Summary of test conditions and requirements	40

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**CONCENTRATOR PHOTOVOLTAIC (CPV) MODULES AND ASSEMBLIES –
DESIGN QUALIFICATION AND TYPE APPROVAL**

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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62108 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition, issued in 2007. It constitutes a technical revision.

The main technical changes with regard to the previous edition are as follows:

- a) Changes in outdoor exposure from 1000 h to 500 h.
- b) Changes in current cycling during thermal cycling test.
- c) Added dust ingress test.
- d) Eliminated thermal cycling associated with damp heat test.
- e) Eliminated UV exposure test.

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

FDIS	Report on voting
82/1142/FDIS	82/1161/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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

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

CONCENTRATOR PHOTOVOLTAIC (CPV) MODULES AND ASSEMBLIES – DESIGN QUALIFICATION AND TYPE APPROVAL

1 Scope and object

This International Standard specifies the minimum requirements for the design qualification and type approval of concentrator photovoltaic (CPV) modules and assemblies suitable for long-term operation in general open-air climates as defined in IEC 60721-2-1. The test sequence is partially based on that specified in IEC 61215-1 for the design qualification and type approval of flat-plate terrestrial crystalline silicon PV modules. However, some changes have been made to account for the special features of CPV receivers and modules, particularly with regard to the separation of on-site and in-lab tests, effects of tracking alignment, high current density, and rapid temperature changes, which have resulted in the formulation of some new test procedures or new requirements.

The object of this test standard is to determine the electrical, mechanical, and thermal characteristics of the CPV modules and assemblies and to show, as far as possible within reasonable constraints of cost and time, that the CPV modules and assemblies are capable of withstanding prolonged exposure in climates described in the scope. The actual life of CPV modules and assemblies so qualified will depend on their design, production, environment, and the conditions under which they are operated.

This standard shall be used in conjunction with the retest guidelines described in Annex B.

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 60068-2-21:2006, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

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

IEC 61215-2:2016, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

IEC 62670-1, *Photovoltaic concentrators (CPV) – Performance testing – Part 1: Standard conditions*

ANSI/UL 1703:2002, *Standard for Safety: Flat-Plate Photovoltaic Modules and Panels*

SOMMAIRE

AVANT-PROPOS.....	53
1 Domaine d'application et objet	55
2 Références normatives	55
3 Termes et définitions	55
4 Echantillonnage.....	57
5 Marquage.....	58
6 Essais	58
7 Critères d'acceptation	59
8 Rapport.....	67
9 Modifications	68
10 Procédures d'essai	68
10.1 Inspection visuelle.....	68
10.1.1 Généralités	68
10.1.2 Mode opératoire.....	68
10.1.3 Défauts visuels majeurs	69
10.1.4 Exigences.....	69
10.2 Mesure des performances électriques.....	69
10.2.1 Objet	69
10.2.2 Mesure I-V de l'ensemble en site naturel	70
10.2.3 Mesure I-V sous simulateur solaire.....	71
10.2.4 Mesure I-V d'obscurité	71
10.3 Essai de continuité de mise à la terre	72
10.3.1 Généralités	72
10.3.2 Objet	72
10.3.3 Mode opératoire.....	73
10.3.4 Exigences.....	73
10.4 Essai d'isolation électrique	73
10.4.1 Objet	73
10.4.2 Mode opératoire.....	73
10.4.3 Exigences.....	74
10.5 Essai d'isolement en milieu humide	74
10.5.1 Objet	74
10.5.2 Mode opératoire.....	74
10.5.3 Exigences.....	75
10.6 Essai de cyclage thermique.....	75
10.6.1 Objet	75
10.6.2 Echantillon d'essai	75
10.6.3 Mode opératoire.....	76
10.6.4 Exigences.....	77
10.7 Essai de chaleur humide	78
10.7.1 Objet	78
10.7.2 Echantillon d'essai	78
10.7.3 Mode opératoire.....	78
10.7.4 Exigences.....	79
10.8 Essai d'humidité-gel	79

10.8.1	Objet	79
10.8.2	Echantillon d'essai	79
10.8.3	Mode opératoire.....	79
10.8.4	Exigences.....	80
10.9	Essai de tenue à la grêle.....	80
10.9.1	Objet	80
10.9.2	Equipement	81
10.9.3	Mode opératoire.....	81
10.9.4	Exigences.....	82
10.10	Essai de pulvérisation d'eau.....	82
10.10.1	Généralités	82
10.10.2	Objet	82
10.10.3	Mode opératoire.....	82
10.10.4	Exigences.....	83
10.11	Essai thermique de la diode de dérivation/diode antiretour.....	83
10.11.1	Objet	83
10.11.2	Echantillon d'essai	83
10.11.3	Equipement	83
10.11.4	Mode opératoire.....	83
10.11.5	Exigences.....	84
10.11.6	Procédure 2 – Méthode alternative	84
10.12	Essai de robustesse des sorties	85
10.12.1	Objet	85
10.12.2	Types de sorties	86
10.12.3	Mode opératoire.....	86
10.12.4	Exigences.....	86
10.13	Essai de charge mécanique.....	87
10.13.1	Objet	87
10.13.2	Mode opératoire.....	88
10.13.3	Exigences.....	88
10.14	Essai de dommages du faisceau hors axe	88
10.14.1	Généralités	88
10.14.2	Objet	88
10.14.3	Cas particulier	88
10.14.4	Mode opératoire.....	89
10.14.5	Exigences.....	89
10.15	Essai d'exposition en site naturel.....	89
10.15.1	Objet	89
10.15.2	Mode opératoire.....	89
10.15.3	Exigences.....	90
10.16	Essai de tenue à l'échauffement localisé.....	90
10.17	Essai de protection contre la pénétration de poussière.....	90
10.17.1	Objet	90
10.17.2	Mode opératoire.....	90
10.17.3	Exigences.....	91
Annexe A (informative) Résumé des conditions et exigences d'essai		92
Annexe B (normative) Lignes directrices de contre-essai		95
B.1	Modifications de produit/processus nécessitant un contre-essai limité pour conserver la certification	95

B.2	Modifications de la technologie de cellules CPV.....	95
B.3	Modifications de l'enrobage optique sur la cellule (incluant le couplage optique entre la cellule et un élément d'optique secondaire en verre appliqué à la cellule).....	96
B.4	Modification de l'enrobage des cellules à l'extérieur du chemin du faisceau lumineux.....	96
B.5	Modification du substrat du boîtier de cellule utilisé pour le transfert thermique.....	96
B.6	Optique accessible (primaire ou secondaire).....	97
B.7	Optique inaccessible (secondaire).....	97
B.8	Châssis et/ou structure de montage.....	98
B.9	Enveloppe.....	98
B.10	Compartiment de câblage/Boîte de jonction.....	98
B.11	Bornes d'interconnexion.....	99
B.12	Matériaux ou technique d'interconnexion (aux cellules et entre les récepteurs).....	99
B.13	Changement de la conception du circuit électrique dans un boîtier identique.....	99
B.14	Puissance de sortie.....	100
B.15	Dispositifs de transfert d'énergie thermique.....	100
B.16	Adhésifs.....	100
Figure 1	– Schéma d'un système PV à concentration parabolique avec point de focalisation.....	61
Figure 2	– Schéma d'un système PV à concentration à réceptacle avec focalisation linéaire.....	62
Figure 3	– Schéma d'un système PV à concentration à lentille de Fresnel avec point de focalisation.....	63
Figure 4	– Schéma d'un système PV à concentration à lentille de Fresnel avec focalisation linéaire.....	64
Figure 5	– Schéma d'un CPV à héliostat.....	65
Figure 6	– Séquence d'essais de qualification pour modules CPV.....	66
Figure 7	– Séquence d'essais de qualification pour ensembles CPV.....	67
Figure 8	– Profil de température et de courant de l'essai de cyclage thermique (pas à l'échelle).....	78
Figure 9	– Profil des conditions de l'essai d'humidité-gel.....	80
Figure 10	– Essai thermique de la diode de dérivation.....	85
Tableau 1	– Termes utilisés pour les CPV.....	57
Tableau 2	– Attribution des échantillons d'essai à des séquences d'essais types.....	59
Tableau 3	– Options de l'essai de cyclage thermique pour la Séquence A.....	77
Tableau 4	– Options de l'essai d'humidité-gel pour la Séquence B.....	80
Tableau 5	– Charges minimales de vent.....	87
Tableau A.1	– Résumé des conditions et exigences d'essai.....	92

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**MODULES ET ENSEMBLES PHOTOVOLTAÏQUES À CONCENTRATION –
QUALIFICATION DE LA CONCEPTION ET HOMOLOGATION**

AVANT-PROPOS

- 1) La Commission Electrotechnique Internationale (IEC) est une organisation mondiale de normalisation composée de l'ensemble des comités électrotechniques nationaux (Comités nationaux de l'IEC). L'IEC a pour objet de favoriser la coopération internationale pour toutes les questions de normalisation dans les domaines de l'électricité et de l'électronique. A cet effet, l'IEC – entre autres activités – publie des Normes internationales, des Spécifications techniques, des Rapports techniques, des Spécifications accessibles au public (PAS) et des Guides (ci-après dénommés "Publication(s) de l'IEC"). Leur élaboration est confiée à des comités d'études, aux travaux desquels tout Comité national intéressé par le sujet traité peut participer. Les organisations internationales, gouvernementales et non gouvernementales, en liaison avec l'IEC, participent également aux travaux. L'IEC collabore étroitement avec l'Organisation Internationale de Normalisation (ISO), selon des conditions fixées par accord entre les deux organisations.
- 2) Les décisions ou accords officiels de l'IEC concernant les questions techniques représentent, dans la mesure du possible, un accord international sur les sujets étudiés, étant donné que les Comités nationaux de l'IEC intéressés sont représentés dans chaque comité d'études.
- 3) Les Publications de l'IEC se présentent sous la forme de recommandations internationales et sont agréées comme telles par les Comités nationaux de l'IEC. Tous les efforts raisonnables sont entrepris afin que l'IEC s'assure de l'exactitude du contenu technique de ses publications; l'IEC ne peut pas être tenue responsable de l'éventuelle mauvaise utilisation ou interprétation qui en est faite par un quelconque utilisateur final.
- 4) Dans le but d'encourager l'uniformité internationale, les Comités nationaux de l'IEC s'engagent, dans toute la mesure possible, à appliquer de façon transparente les Publications de l'IEC dans leurs publications nationales et régionales. Toutes divergences entre toutes Publications de l'IEC et toutes publications nationales ou régionales correspondantes doivent être indiquées en termes clairs dans ces dernières.
- 5) L'IEC elle-même ne fournit aucune attestation de conformité. Des organismes de certification indépendants fournissent des services d'évaluation de conformité et, dans certains secteurs, accèdent aux marques de conformité de l'IEC. L'IEC n'est responsable d'aucun des services effectués par les organismes de certification indépendants.
- 6) Tous les utilisateurs doivent s'assurer qu'ils sont en possession de la dernière édition de cette publication.
- 7) Aucune responsabilité ne doit être imputée à l'IEC, à ses administrateurs, employés, auxiliaires ou mandataires, y compris ses experts particuliers et les membres de ses comités d'études et des Comités nationaux de l'IEC, pour tout préjudice causé en cas de dommages corporels et matériels, ou de tout autre dommage de quelque nature que ce soit, directe ou indirecte, ou pour supporter les coûts (y compris les frais de justice) et les dépenses découlant de la publication ou de l'utilisation de cette Publication de l'IEC ou de toute autre Publication de l'IEC, ou au crédit qui lui est accordé.
- 8) L'attention est attirée sur les références normatives citées dans cette publication. L'utilisation de publications référencées est obligatoire pour une application correcte de la présente publication.
- 9) L'attention est attirée sur le fait que certains des éléments de la présente Publication de l'IEC peuvent faire l'objet de droits de brevet. L'IEC ne saurait être tenue pour responsable de ne pas avoir identifié de tels droits de brevets et de ne pas avoir signalé leur existence.

La Norme internationale IEC 62108 a été établie par le comité d'études 82 de l'IEC: Systèmes de conversion photovoltaïque de l'énergie solaire.

Cette deuxième édition annule et remplace la première édition parue en 2007. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) Modification de l'essai d'exposition en site naturel de 1 000 h réduites à 500 h.
- b) Modifications des cycles de courant pendant l'essai de cyclage thermique.
- c) Ajout de l'essai relatif à la pénétration de poussière.
- d) Suppression du cyclage thermique associé à l'essai de chaleur humide.
- e) Suppression de l'essai d'exposition aux UV.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
82/1142/FDIS	82/1161/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives à la publication recherchée. A cette date, la publication sera

- reconduite,
- supprimée,
- remplacée par une édition révisée, ou
- amendée.

MODULES ET ENSEMBLES PHOTOVOLTAÏQUES À CONCENTRATION – QUALIFICATION DE LA CONCEPTION ET HOMOLOGATION

1 Domaine d'application et objet

La présente Norme internationale spécifie les exigences minimales pour la qualification de la conception et l'homologation des modules et ensembles photovoltaïques à concentration (CPV, *Concentrator PhotoVoltaic*) pour une utilisation de longue durée dans les climats généraux d'air libre, comme défini dans l'IEC 60721-2-1. La séquence d'essais est partiellement issue de celle spécifiée dans l'IEC 61215-1 pour la qualification de la conception et l'homologation des modules PV au silicium cristallin pour application terrestre à plaque plane. Certaines modifications ont cependant été effectuées pour tenir compte des particularités des récepteurs et modules CPV, en particulier en ce qui concerne la séparation des essais sur site et en laboratoire, les effets de la répartition, de la densité de courant élevée et des variations rapides de température, qui ont entraîné la formulation de certaines nouvelles procédures d'essai ou exigences.

L'objet de la présente norme d'essai est de déterminer les caractéristiques électriques, mécaniques et thermiques des modules et ensembles CPV et de montrer, autant que possible avec des contraintes de coût et de temps raisonnables, que les modules et ensembles CPV peuvent supporter une exposition prolongée aux climats définis dans le domaine d'application. La durée de vie réelle des modules et ensembles CPV ainsi qualifiés dépendra de leur conception, de leur production ainsi que de l'environnement et des conditions dans lesquelles ils fonctionneront.

La présente norme doit être utilisée conjointement avec les directives de contre-essai décrites à l'Annexe B.

2 Références normatives

Les documents suivants sont cités en référence de manière normative, en intégralité ou en partie, dans le présent document et sont indispensables pour son application. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60068-2-21:2006, *Essais d'environnement – Partie 2-21: Essais – Essai U: Robustesse des sorties et des dispositifs de montage incorporés*

IEC 60529, *Degrés de protection procurés par les enveloppes (Code IP)*

IEC 61215-2:2016, *Modules photovoltaïques (PV) pour applications terrestres – Qualification de la conception et homologation – Partie 2: Procédures d'essai*

IEC 62670-1, *Concentrateurs photovoltaïques (CPV) – Essai de performances – Partie 1: Conditions normales*

ANSI/UL 1703:2002, *Standard for Safety: Flat-Plate Photovoltaic Modules and Panels*