IEC 61215-1-3

Edition 2.0 2021-02
REDLINE VERSION

INTERNATIONAL STANDARD

colour inside

Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-3: Special requirements for testing of thin-film amorphous silicon based photovoltaic (PV) modules

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.160

ISBN 978-2-8322-9488-8

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

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 4
1 Scope ~~and object~~ 6
2 Normative references 7
3 Terms and definitions 7
4 Test samples 7
5 Marking and documentation 7
6 Testing 7
7 Pass criteria 7
8 Major visual defects 7
9 Report 8
10 Modifications 8
11 Test flow and procedures 8
11.1 Visual inspection (MQT 01) 8
11.2 Maximum power determination (MQT 02) 8
11.3 Insulation test (MQT 03) 8
11.4 Measurement of temperature coefficients (MQT 04) 8
11.5 ~~Measurement of nominal module operating temperature (NMOT) (MQT 05)~~ Placeholder section, formerly NMOT 8
11.6 Performance at STC (MQT 06.1) ~~and NMOT (MQT 06.2)~~ 8
11.7 Performance at low irradiance (MQT 07) 8
11.8 Outdoor exposure test (MQT 08) 8
11.9 Hot-spot endurance test (MQT 09) 8
11.9.1 Purpose 9
11.9.2 Hot-spot effect 9
11.9.3 Classification of cell interconnection 9
11.9.4 Apparatus 9
11.9.5 Procedure 9
11.9.6 Final measurements 9
11.9.7 Requirements 9
11.10 UV preconditioning test (MQT 10) 9
11.11 Thermal cycling test (MQT 11) 9
11.12 Humidity-freeze test (MQT 12) 9
11.13 Damp heat test (MQT 13) 9
11.14 Robustness of terminations ~~test~~ (MQT 14) 10
11.15 Wet leakage current test (MQT 15) 10
11.16 Static mechanical load test (MQT 16) 10
11.17 Hail test (MQT 17) 10
11.18 Bypass diode testing (MQT 18) 10
11.19 Stabilization (MQT 19) 10
11.19.1 Criterion definition for stabilization 10
11.19.2 Light induced stabilization procedures 10
11.19.3 Other stabilization procedures 11
11.19.4 Initial stabilization (MQT 19.1) 11
11.19.5 Final stabilization (MQT 19.2) 11
11.20 Cyclic (dynamic) mechanical load test (MQT 20) 11

11.21 Potential induced degradation test (MQT 21) 11
11.22 Bending test (MQT 22) 11

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

TERRESTRIAL PHOTOVOLTAIC (PV) MODULES – DESIGN QUALIFICATION AND TYPE APPROVAL –

Part 1-3: Special requirements for testing of thin-film amorphous silicon based photovoltaic (PV) modules

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 IEC 61215-1-3:2016. 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 61215-1-3 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition of IEC 61215-1-3, issued in 2016, and constitutes a technical revision.

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

a) A cyclic (dynamic) mechanical load test (MQT 20) added.

b) A test for detection of potential-induced degradation (MQT 21) added.

c) A bending test (MQT 22) for flexible modules.

Informative Annex A of 61215-1:2021 explains the background and reasoning behind some of the more substantial changes that were made in the IEC 61215 series in progressing from edition 1 to edition 2.

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

FDIS	Report on voting
82/1826/FDIS	82/1851/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.

This standard is to be read in conjunction with IEC 61215-1:2021 and IEC 61215-2:2021.

A list of all parts in the IEC 61215 series, published under the general title *Terrestrial photovoltaic (PV) modules – Design qualification and type approval,* can be found on the IEC website.

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.

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.

TERRESTRIAL PHOTOVOLTAIC (PV) MODULES – DESIGN QUALIFICATION AND TYPE APPROVAL –

Part 1-3: Special requirements for testing of thin-film amorphous silicon based photovoltaic (PV) modules

1 Scope ~~and object~~

~~This part of IEC 61215 lays down IEC requirements for the design qualification and type approval of terrestrial photovoltaic modules suitable for long-term operation in general open-air climates, as defined in IEC 60721-2-1.~~

This document lays down requirements for the design qualification of terrestrial photovoltaic modules suitable for long-term operation in open-air climates. The useful service life of modules so qualified will depend on their design, their environment and the conditions under which they are operated. Test results are not construed as a quantitative prediction of module lifetime.

In climates where 98th percentile operating temperatures exceed 70 °C, users are recommended to consider testing to higher temperature test conditions as described in IEC TS 63126. Users desiring qualification of PV products with lesser lifetime expectations are recommended to consider testing designed for PV in consumer electronics, as described in IEC 63163 (under development). Users wishing to gain confidence that the characteristics tested in IEC 61215 appear consistently in a manufactured product may wish to utilize IEC 62941 regarding quality systems in PV manufacturing.

This document is intended to apply to all thin-film amorphous silicon (a-Si; a-Si/µc-Si) based terrestrial flat plate modules. As such, it addresses special requirements for testing of this technology supplementing IEC 61215-1:~~2016~~2021 and IEC 61215-2:~~2016~~2021 requirements for testing.

This document does not apply to modules used with concentrated sunlight although it may be utilized for low concentrator modules (1 to 3 suns). For low concentration modules, all tests are performed using the irradiance, current, voltage and power levels expected at the design concentration.

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

The object of this test sequence is to determine the electrical characteristics of the module and to show, as far as possible within reasonable constraints of cost and time, that the module is capable of withstanding prolonged exposure outdoors. Accelerated test conditions are empirically based on those necessary to reproduce selected observed field failures and are applied equally across module types. Acceleration factors may vary with product design and thus not all degradation mechanisms may manifest. Further general information on accelerated test methods including definitions of terms may be found in IEC 62506.

Some long-term degradation mechanisms can only reasonably be detected via component testing, due to long times required to produce the failure and necessity of stress conditions that are expensive to produce over large areas. Component tests that have reached a sufficient level of maturity to set pass/fail criteria with high confidence are incorporated into the IEC 61215 series via addition to Table 1 in IEC 61215-1. In contrast, the tests procedures described in this series, in IEC 61215-2, are performed on modules.

This document defines PV technology dependent modifications to the testing procedures and requirements per IEC 61215-1:~~2016~~2021 and IEC 61215-2:~~2016~~2021.

2 Normative references

The normative references of IEC 61215-1:~~2016~~2021 and IEC 61215-2:~~2016~~2021 are applicable without modifications.

IEC 61215-1-3

Edition 2.0 2021-02

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-3: Special requirements for testing of thin-film amorphous silicon based photovoltaic (PV) modules

Modules photovoltaïques (PV) pour applications terrestres – Qualification de la conception et homologation – Partie 1-3: Exigences particulières d'essai des modules photovoltaïques (PV) au silicium amorphe à couches minces



IEC 61215-1-3:2021-02(en-fr)

CONTENTS

FOREWORD 4
1 Scope 6
2 Normative references 7
3 Terms and definitions 7
4 Test samples 7
5 Marking and documentation 7
6 Testing 7
7 Pass criteria 7
8 Major visual defects 7
9 Report 7
10 Modifications 7
11 Test flow and procedures 8
11.1 Visual inspection (MQT 01) 8
11.2 Maximum power determination (MQT 02) 8
11.3 Insulation test (MQT 03) 8
11.4 Measurement of temperature coefficients (MQT 04) 8
11.5 Placeholder section, formerly NMOT 8
11.6 Performance at STC (MQT 06.1) 8
11.7 Performance at low irradiance (MQT 07) 8
11.8 Outdoor exposure test (MQT 08) 8
11.9 Hot-spot endurance test (MQT 09) 8
11.9.1 Purpose 8
11.9.2 Hot-spot effect 8
11.9.3 Classification of cell interconnection 8
11.9.4 Apparatus 9
11.9.5 Procedure 9
11.9.6 Final measurements 9
11.9.7 Requirements 9
11.10 UV preconditioning test (MQT 10) 9
11.11 Thermal cycling test (MQT 11) 9
11.12 Humidity-freeze test (MQT 12) 9
11.13 Damp heat test (MQT 13) 9
11.14 Robustness of terminations (MQT 14) 9
11.15 Wet leakage current test (MQT 15) 9
11.16 Static mechanical load test (MQT 16) 9
11.17 Hail test (MQT 17) 10
11.18 Bypass diode testing (MQT 18) 10
11.19 Stabilization (MQT 19) 10
11.19.1 Criterion definition for stabilization 10
11.19.2 Light induced stabilization procedures 10
11.19.3 Other stabilization procedures 10
11.19.4 Initial stabilization (MQT 19.1) 10
11.19.5 Final stabilization (MQT 19.2) 11
11.20 Cyclic (dynamic) mechanical load test (MQT 20) 11
11.21 Potential induced degradation test (MQT 21) 11

11.22 Bending test (MQT 22) 11

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

TERRESTRIAL PHOTOVOLTAIC (PV) MODULES – DESIGN QUALIFICATION AND TYPE APPROVAL –

Part 1-3: Special requirements for testing of thin-film amorphous silicon based photovoltaic (PV) modules

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 61215-1-3 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

This second edition cancels and replaces the first edition of IEC 61215-1-3, issued in 2016, and constitutes a technical revision.

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

a) A cyclic (dynamic) mechanical load test (MQT 20) added.
b) A test for detection of potential-induced degradation (MQT 21) added.
c) A bending test (MQT 22) for flexible modules.

Informative Annex A of 61215-1:2021 explains the background and reasoning behind some of the more substantial changes that were made in the IEC 61215 series in progressing from edition 1 to edition 2.

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

FDIS	Report on voting
82/1826/FDIS	82/1851/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.

This standard is to be read in conjunction with IEC 61215-1:2021 and IEC 61215-2:2021.

A list of all parts in the IEC 61215 series, published under the general title *Terrestrial photovoltaic (PV) modules – Design qualification and type approval,* can be found on the IEC website.

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.

TERRESTRIAL PHOTOVOLTAIC (PV) MODULES – DESIGN QUALIFICATION AND TYPE APPROVAL –

Part 1-3: Special requirements for testing of thin-film amorphous silicon based photovoltaic (PV) modules

1 Scope

This document lays down requirements for the design qualification of terrestrial photovoltaic modules suitable for long-term operation in open-air climates. The useful service life of modules so qualified will depend on their design, their environment and the conditions under which they are operated. Test results are not construed as a quantitative prediction of module lifetime.

In climates where 98th percentile operating temperatures exceed 70 °C, users are recommended to consider testing to higher temperature test conditions as described in IEC TS 63126. Users desiring qualification of PV products with lesser lifetime expectations are recommended to consider testing designed for PV in consumer electronics, as described in IEC 63163 (under development). Users wishing to gain confidence that the characteristics tested in IEC 61215 appear consistently in a manufactured product may wish to utilize IEC 62941 regarding quality systems in PV manufacturing.

This document is intended to apply to all thin-film amorphous silicon (a-Si; a-Si/µc-Si) based terrestrial flat plate modules. As such, it addresses special requirements for testing of this technology supplementing IEC 61215-1:2021 and IEC 61215-2:2021 requirements for testing.

This document does not apply to modules used with concentrated sunlight although it may be utilized for low concentrator modules (1 to 3 suns). For low concentration modules, all tests are performed using the irradiance, current, voltage and power levels expected at the design concentration.

The object of this test sequence is to determine the electrical characteristics of the module and to show, as far as possible within reasonable constraints of cost and time, that the module is capable of withstanding prolonged exposure outdoors. Accelerated test conditions are empirically based on those necessary to reproduce selected observed field failures and are applied equally across module types. Acceleration factors may vary with product design and thus not all degradation mechanisms may manifest. Further general information on accelerated test methods including definitions of terms may be found in IEC 62506.

Some long-term degradation mechanisms can only reasonably be detected via component testing, due to long times required to produce the failure and necessity of stress conditions that are expensive to produce over large areas. Component tests that have reached a sufficient level of maturity to set pass/fail criteria with high confidence are incorporated into the IEC 61215 series via addition to Table 1 in IEC 61215-1. In contrast, the tests procedures described in this series, in IEC 61215-2, are performed on modules.

This document defines PV technology dependent modifications to the testing procedures and requirements per IEC 61215-1:2021 and IEC 61215-2:2021.

2 Normative references

The normative references of IEC 61215-1:2021 and IEC 61215-2:2021 are applicable without modifications.

SOMMAIRE

AVANT-PROPOS 14
1 Domaine d'application 16
2 Références normatives 17
3 Termes et définitions 17
4 Échantillons d'essai 17
5 Marquage et documentation 17
6 Essais 17
7 Critères d'acceptation 17
8 Défauts visuels majeurs 17
9 Rapport 18
10 Modifications 18
11 Série et procédures d'essais 18
11.1 Examen visuel (MQT 01) 18
11.2 Détermination de la puissance maximale (MQT 02) 18
11.3 Essai diélectrique (MQT 03) 18
11.4 Mesurage des coefficients de température (MQT 04) 18
11.5 Section de l'espace réservé, précédemment NMOT 18
11.6 Performances dans les STC (MQT 06.1) 18
11.7 Performances sous faible éclairement (MQT 07) 18
11.8 Essai d'exposition en site naturel (MQT 08) 18
11.9 Essai de tenue à l'échauffement localisé (MQT 09) 18
11.9.1 Objet 18
11.9.2 Effet de l'échauffement localisé 19
11.9.3 Classification des interconnexions de cellules 19
11.9.4 Appareillage 19
11.9.5 Procédure 19
11.9.6 Mesurages finaux 19
11.9.7 Exigences 19
11.10 Essai de préconditionnement aux UV (MQT 10) 19
11.11 Essai de cycle thermique (MQT 11) 19
11.12 Essai humidité-gel (MQT 12) 19
11.13 Essai de chaleur humide (MQT 13) 19
11.14 Essai de robustesse des sorties (MQT 14) 19
11.15 Essai de courant de fuite en milieu humide (MQT 15) 20
11.16 Essai de charge mécanique statique (MQT 16) 20
11.17 Essai à la grêle (MQT 17) 20
11.18 Essai de la diode de dérivation (MQT 18) 20
11.19 Stabilisation (MQT 19) 20
11.19.1 Définition de critères pour la stabilisation 20
11.19.2 Procédures de stabilisation induite par la lumière 20
11.19.3 Autres procédures de stabilisation 21
11.19.4 Stabilisation initiale (MQT 19.1) 21
11.19.5 Stabilisation finale (MQT 19.2) 21
11.20 Essai de charge mécanique cyclique (dynamique) (MQT 20) 21
11.21 Essai de dégradation induite par le potentiel (MQT 21) 21

11.22 Essai de flexion (MQT 22)..... 21

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

_____

MODULES PHOTOVOLTAÏQUES (PV) POUR APPLICATIONS TERRESTRES – QUALIFICATION DE LA CONCEPTION ET HOMOLOGATION –

Partie 1-3: Exigences particulières d'essai des modules photovoltaïques (PV) au silicium amorphe à couches minces

AVANT-PROPOS

1) La Commission Électrotechnique 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. À 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 61215-1-3 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 de l'IEC 61215-1-3, parue en 2016. Cette édition constitue une révision technique.

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

a) Ajout d'un essai de charge mécanique (dynamique) cyclique (MQT 20).

b) Ajout d'un essai de dégradation induite par le potentiel (MQT 21).

c) Ajout d'un essai de flexion (MQT 22) dédié aux modules souples.

L'Annexe informative A de l'IEC 61215-1:2021 explique le contexte et le raisonnement qui justifient certaines modifications les plus importantes apportées à la série IEC 61215 dans l'évolution de l'édition 1 à l'édition 2.

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
82/1826/FDIS	82/1851/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 internationale.

La version française de la norme n'a pas été soumise au vote.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2.

La présente norme doit être utilisée conjointement avec l'IEC 61215-1:2021 et l'IEC 61215-2:2021.

Une liste de toutes les parties de la série IEC 61215, publiées sous le titre général *Modules photovoltaïques (PV) pour applications terrestres – Qualification de la conception et homologation,* peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document 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 au document recherché. À cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

MODULES PHOTOVOLTAÏQUES (PV) POUR APPLICATIONS TERRESTRES – QUALIFICATION DE LA CONCEPTION ET HOMOLOGATION –

Partie 1-3: Exigences particulières d'essai des modules photovoltaïques (PV) au silicium amorphe à couches minces

1 Domaine d'application

Le présent document établit les exigences pour la qualification de la conception des modules photovoltaïques (PV) pour applications terrestres adaptés à une utilisation de longue durée dans les climats à l'air libre. La durée de vie utile des modules ainsi qualifiés dépend de leur conception, de leur environnement et de leurs conditions de fonctionnement. Les résultats d'essai ne sont pas considérés comme une prévision quantitative de la durée de vie des modules.

Sous des climats pour lesquels les températures de fonctionnement du 98^{e} percentile dépassent 70 °C, il est recommandé aux utilisateurs d'envisager d'effectuer des essais dans des conditions d'essai à des températures plus élevées telles que décrites dans l'IEC TS 63126. Il est recommandé aux utilisateurs qui souhaitent qualifier des produits PV ayant une durée de vie moins longue d'envisager des essais conçus pour des produits PV utilisés dans l'électronique grand public, comme cela est spécifié dans l'IEC 63163 (en cours d'élaboration). Les utilisateurs qui souhaitent être assurés qu'un produit fabriqué présente de manière cohérente les caractéristiques soumises aux essais dans le cadre de l'IEC 61215 peuvent vouloir utiliser l'IEC 62941 relative aux systèmes de qualité pour la fabrication des modules photovoltaïques (PV).

Le présent document est destiné à s'appliquer à tous les modules à plaque plane au silicium amorphe (a-Si; a-Si/µc-Si) à couches minces pour applications terrestres. À ce titre, il spécifie des exigences d'essai particulières à cette technologie en complément des exigences d'essai données dans l'IEC 61215-1:2021 et l'IEC 61215-2:2021.

Le présent document ne s'applique pas aux modules utilisés avec un ensoleillement intense, même s'il peut être utilisé pour les modules à faible concentration (ensoleillement 1 à 3). Pour les modules à faible concentration, tous les essais sont réalisés en utilisant les niveaux d'éclairement, de courant, de tension et de puissance prévus à la concentration théorique.

L'objet de cette séquence d'essais est de déterminer les caractéristiques électriques du module et de démontrer, dans toute la mesure du possible et avec des contraintes de coût et de temps raisonnables, que le module est capable de supporter une exposition prolongée en site naturel. Les conditions d'essais accélérés sont fondées de manière empirique sur les conditions nécessaires pour reproduire les défaillances sur site observées sélectionnées et sont appliquées de manière égale aux types de modules. Les facteurs d'accélération peuvent varier avec la conception du produit et ainsi les mécanismes de dégradation peuvent ne pas tous se produire. D'autres informations générales concernant les méthodes d'essais accélérés, y compris les définitions des termes, peuvent être consultées dans l'IEC 62506.

Certains mécanismes de dégradation de longue durée ne peuvent être raisonnablement détectés que par des essais de composants, en raison des longs délais exigés pour produire la défaillance et de l'existence nécessaire de conditions de contrainte dont la réalisation est coûteuse sur de grandes surfaces. Les essais de composants qui ont atteint un niveau de

maturité suffisant pour établir des critères d'acceptation/refus en toute fiabilité sont intégrés dans la série IEC 61215 par le biais d'un ajout dans le Tableau 1 de l'IEC 61215-1. En revanche, les procédures d'essai décrites dans cette série IEC 61215-2, sont réalisées sur des modules.

Le présent document définit les modifications dépendantes de la technologie photovoltaïque, apportées aux exigences et procédures d'essai de l'IEC 61215-1:2021 et de l'IEC 61215-2:2021.

2 Références normatives

Les références normatives de l'IEC 61215-1:2021 et de l'IEC 61215-2:2021 s'appliquent sans modification.