IEC TS 63163

Edition 1.0 2021-09

TECHNICAL SPECIFICATION

This document is a preview generated by EVS

Terrestrial photovoltaic (PV) modules for consumer products – Design qualification and type approval



IEC TS 63163:2021-09(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC online collection - oc.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

This document is a preview generated by EVS

IEC TS 63163

Edition 1.0 2021-09

TECHNICAL SPECIFICATION

This document is a preview generated by EVS

Terrestrial photovoltaic (PV) modules for consumer products – Design qualification and type approval

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.160

ISBN 978-2-8322-1024-3

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

® Registered trademark of the International Electrotechnical Commission

CONTENTS

FOREWORD 4
1 Scope 6
2 Normative references 6
3 Terms, definitions and abbreviated terms 7
4 Selection of test samples 9
5 Marking and documentation 10
5.1 Nameplate 10
5.2 Documentation 11
5.2.1 Minimum requirements 11
5.2.2 Information to be given in the documentation 11
5.2.3 Assembly instructions 12
6 Testing 12
6.1 General 12
6.2 Qualification test sequence – Category 1 13
6.3 Qualification test sequence – Category 2 13
6.4 Qualification test sequence – Category 3 15
6.5 Test conditions 16
7 Pass criteria 17
7.1 General 17
7.2 Major visual defects 18
8 Report 18
9 Modifications 19
10 Test procedures 19
10.1 Visual inspection (CMQT 01) 19
10.2 Performance at STC (CMQT 06.1) 19
10.3 Maximum power determination (CMQT 02) 19
10.4 Outdoor exposure test (CMQT 10.4) 19
10.5 Hot-spot endurance test (CMQT 10.5) 19
10.6 UV preconditioning test (CMQT 10.6) 20
10.7 Thermal cycling test (CMQT 10.7) 20
10.8 Humidity-freeze test (CMQT 10.8) 20
10.9 Damp heat test (CMQT 10.9) 20
10.10 Robustness of terminations test (CMQT 10.10) 20
10.11 Wet leakage current test (CMQT 10.11) 20
10.12 Static mechanical load test (CMQT 10.12) 20
10.13 Bypass diode thermal test (CMQT 13) 21
10.14 Stabilization (CMQT 10.14) 21
10.15 Bending test (CMQT 10.15) 21
10.16 Folding test (CMQT 10.16) 21
10.16.1 Purpose 21
10.16.2 Procedure for foldable module 21
10.16.3 Final inspection 21
10.16.4 Requirements 21

This document is a preview generated by EVS

10.17 Drop test (CMQT 10.17) 21
10.17.1 General 21
10.17.2 Drop the module from 1 m height onto a concrete floor. 21
10.17.3 Final measurements 22
10.17.4 Requirements 22
10.18 Hail test (CMQT 10.18) 22
10.19 Insulation test (CMQT 10.19) 22
Annex A (informative) Overview of categories and potential applications 23

Figure 1 – Geometry that shows radius of curvature of a flexible module 8
Figure 2 – Qualification test sequence – Category 1 13
Figure 3 – Qualification test sequence – Category 2 14
Figure 4 – Qualification test sequence – Category 3 16
Figure 5 – Drop test 22

Table 1 – Summary of test levels 16
Table A.1 – Overview of categories and potential applications 23

This document is a preview generated by EVS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

TERRESTRIAL PHOTOVOLTAIC (PV) MODULES FOR CONSUMER PRODUCTS – 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.

IEC TS 63163 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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

Draft	Report on voting
82/1899/DTS	82/1931/RVDTS

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

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

This document is a preview generated by EVS

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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.

This document is a preview generated by EVS

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

This document is a preview generated by EVS

1 Scope

This document is intended to apply to terrestrial modules for consumer applications for outdoor operation shorter than those qualified to IEC 61215. The useful service life of modules so qualified depends on their design, their environment and the conditions under which they are operated.

This document classes those PV modules into Category 1, Category 2, and Category 3 with respectively low, medium and high expected outdoor exposure. For the purposes of designing this document, Category 1 (mobile applications) is for applications such as smart phone charging which most likely have “low” outdoor exposure. Category 2 (portable applications) is for emergency power/hiking/camping applications with “medium” outdoor exposure and it needs to have mechanical durability testing due to repeated deployment, potential for being dropped, and other mechanical stresses. Category 3 (attached applications) is for “high” outdoor exposure for applications, such as for motor homes, but is not intended for long-term utility or long-term household rooftop applications. A summary of product categories and potential applications is presented in Annex A.

Category 1 products are intended for installation where general user access and contact to uninsulated live parts is anticipated. Modules are not be combined in series strings operating at more than 35 V (V_{oc}) and do not have a system voltage rating above 35 V. These PV modules are not intended for use in parallel with other PV modules or energy sources, unless the combination provides protection from reverse current and overvoltage protection. The short-circuit current is less than 8 A and the maximum power is less than 240 W when tested under standard test conditions.

This document does not address the particularities of PV modules with integrated electronics, such as energy storage devices, charge controllers, batteries, inverters which may be sold in conjunction with the PV modules. This specification is intended to qualify the PV portion of these devices. It may, however, be used as a basis for testing such PV modules, but does not qualify the electronic portion.

This document does not apply to modules used with concentrators.

The purpose of the test sequence is to determine the electrical, thermal, and mechanical durability characteristics of the module, and to show that the module is capable of withstanding outdoor exposure for different outdoor durations designated as “low”, “medium”, and “high”. Mobile and attached applications are considered to require lower mechanical durability than portable applications, which are more prone to mechanical damage. However, the actual outdoor exposure limits of the modules depend on their design, their environment and the conditions under which they are operated.

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 60269-6, *Low-voltage fuses – Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems*

IEC 60904-1, *Photovoltaic devices – Part 1: Measurement of photovoltaic current-voltage characteristics*

IEC TS 60904-1-2:2019, *Photovoltaic devices – Part 1-2: Measurement of current-voltage characteristics of bifacial photovoltaic (PV) devices*

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

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

IEC 61215-1:2021, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1: Test requirements*

IEC 61215-1-1:2021, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-1: Special requirements for testing of crystalline silicon photovoltaic (PV) modules*

IEC 61215-1-2:2021, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-2: Special requirements for testing of thin-film Cadmium Telluride (CdTe) based photovoltaic (PV) modules*

IEC 61215-1-3:2021, *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*

IEC 61215-1-4:2021, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1-4: Special requirements for testing of thin-film Cu(In,GA)(S,Se)2 based photovoltaic (PV) modules*

IEC 61215-2:2021, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

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

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

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

IEC TS 62915, *Photovoltaic (PV) modules – Type approval, design and safety qualification – Retesting*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC TS 61836 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
flexible module
PV module that exhibits a radius of curvature of 500 mm or less in at least one direction according to the manufacturer's specification and is capable of bending to conform to a flat or curved surface

Note 1 to entry: A curved module with a rigid shape is not considered a flexible module.

Note 2 to entry: Radius of curvature is defined as shown in Figure 1. During testing, the applied radius of curvature is no smaller than that specified by the manufacturer.

This document is a preview generated by EVS