PD IEC TS 63163:2021

BSI Standards Publication

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

Documents
Document Sharing Hub

Full document details: PD IEC TS 63163:2021

# National foreword

This Published Document is the UK implementation of IEC TS 63163:2021.

The UK participation in its preparation was entrusted to Technical Committee GEL/82, Photovoltaic Energy Systems.

A list of organizations represented on this committee can be obtained on request to its committee manager.

**Contractual and legal considerations**

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

© The British Standards Institution 2021
Published by BSI Standards Limited 2021

ISBN 978 0 580 52040 2

ICS 27.160

**Compliance with a Published Document cannot confer immunity from legal obligations.**

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 October 2021.

**Amendments/corrigenda issued since publication**

| Date | Text affected |
|---|---|

Documents
Document Sharing Hub

Full document details: PD IEC TS 63163:2021

# IEC TS 63163

Edition 1.0 2021-09

# TECHNICAL SPECIFICATION

## 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

Documents
Document Sharing Hub

Full document details: PD IEC TS 63163:2021

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

Documents
Document Sharing Hub

Full document details: PD IEC TS 63163:2021

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

Documents
Document Sharing Hub

Full document details: PD IEC TS 63163:2021

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.

Documents
Document Sharing Hub

Full document details: PD IEC TS 63163:2021

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.

Documents
Document Sharing Hub

Full document details: PD IEC TS 63163:2021

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

## 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*

AVA Documents Document Sharing Hub

Full document details: PD IEC TS 63163:2021