

TECHNICAL SPECIFICATION

**Terrestrial photovoltaic (PV) modules – Guidelines for increased confidence in
PV module design qualification and type approval**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2016 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 Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
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 corrigenda or an amendment might have been published.

IEC Catalogue - webstore.iec.ch/catalogue

The stand-alone application for consulting the entire bibliographical information on IEC International Standards, Technical Specifications, Technical Reports and other documents. Available for PC, Mac OS, Android Tablets and iPad.

IEC publications search - www.iec.ch/searchpub

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 It also gives information on projects, replaced and withdrawn publications.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 also once a month by email.

Electropedia - www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 30 000 terms and definitions in English and French, with equivalent terms in 15 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

More than 60 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

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: csc@iec.ch.

Document generated by EVS

TECHNICAL SPECIFICATION

Terrestrial photovoltaic (PV) modules – Guidelines for increased confidence in PV module design qualification and type approval

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 27.160

ISBN 978-2-8322-3134-0

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

CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references.....	6
3 Terms, definitions and acronyms.....	7
4 Documentation requirements	10
5 Resource management.....	10
5.1 Provision of resources for product warranty system.....	10
5.2 Succession planning	10
6 Product realization.....	10
6.1 General.....	10
6.2 Planning of product realization	11
6.3 Determination of requirements related to the product	11
6.4 Review of requirements related to the product	11
6.5 Customer communication	12
6.6 Organization manufacturing feasibility	12
6.7 Design and development.....	12
6.7.1 Design and development planning	12
6.7.2 Design and development inputs.....	12
6.7.3 Manufacturing process design inputs.....	13
6.7.4 Design and development outputs.....	13
6.7.5 Manufacturing process design outputs.....	13
6.7.6 Design and development validation	13
6.7.7 Control of design and development changes.....	14
6.8 Purchasing.....	14
6.8.1 Purchasing process.....	14
6.8.2 Purchasing information.....	15
6.8.3 Verification of purchasing process	15
6.9 Production and service provision	15
6.9.1 Control of production and service provision	15
6.9.2 Control plan	16
6.9.3 Validation of processes for production and services provisions.....	17
6.9.4 Identification and traceability	17
6.9.5 Customer property	18
6.9.6 Preservation of product	18
6.10 Control of monitoring and measuring equipment.....	18
6.10.1 General	18
6.10.2 Control of performance rating (IV) measurement equipment.....	18
7 Monitoring and measurement.....	19
7.1 Customer satisfaction.....	19
7.2 Monitoring and measurement of a manufacturing process	19
7.3 Monitoring and measurement of product	20
7.4 Ongoing product monitoring.....	20
7.5 Internal audit.....	20
7.6 Control of nonconforming product.....	20
7.6.1 Control of nonconforming product.....	20
7.6.2 Analysis of data	21

7.7	Continual improvement.....	21
7.8	Corrective and preventive action.....	21
Annex A (informative) Correspondence between ISO 9001:2008 and IEC TS 62941		22
Bibliography		25

This document is a preview generated by EVS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**TERRESTRIAL PHOTOVOLTAIC (PV) MODULES –
GUIDELINES FOR INCREASED CONFIDENCE IN PV
MODULE 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.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62941, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

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

FDIS	Report on voting
82/994/DTS	82/1049/RVC

Full information on the voting for the approval of this technical specification 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 web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- Transformed into an International standard
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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

TERRESTRIAL PHOTOVOLTAIC (PV) MODULES – GUIDELINES FOR INCREASED CONFIDENCE IN PV MODULE DESIGN QUALIFICATION AND TYPE APPROVAL

1 Scope

This Technical Specification is applicable to sites manufacturing photovoltaic (PV) modules certified to IEC 61215 or IEC 61646 for design qualification and type approval. The design qualification and type approval of PV modules depend on appropriate methods for product and process design, as well as appropriate control of materials and processes used to manufacture the product. This technical specification lays out best practices for product design, manufacturing processes, and selection and control of materials used in the manufacture of PV modules that have met the requirements of IEC 61215, IEC 61646, or IEC 62108. These guidelines also form the basis for factory audit criteria of such sites by various certifying and auditory bodies.

The object of this technical specification is to provide more confidence in the ongoing consistency of performance and reliability of certified PV modules. The requirements of this technical specification are defined with the assumption that the quality management system of the organization has already fulfilled the requirements of ISO 9001 or equivalent quality management system. By maintaining a manufacturing system in accordance with this guideline, PV modules are expected to maintain their performance as determined from the test sequences in IEC 61215, IEC 61646, or IEC 62108.

This technical specification is applicable to all PV modules independent of design and technology i.e. flat panel, concentrator photovoltaic (CPV). Quality controls for CPV and nonconventional flat-plate manufacturing will differ somewhat from those of more conventional designs; this technical specification has not considered these differences.

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 60812, *Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)*

IEC 60891, *Photovoltaic devices – Procedure for temperature and irradiance corrections to measured I-V characteristics*

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

IEC 60904-2, *Photovoltaic devices – Part 2: Requirements for photovoltaic reference devices*

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

IEC 60904-4, *Photovoltaic devices – Part 4: Reference solar devices – Procedures for establishing calibration traceability*

IEC 60904-7, *Photovoltaic devices – Part 7: Computation of the spectral mismatch correction for measurements of photovoltaic devices*

IEC 60904-9, *Photovoltaic devices – Part 9: Solar simulator performance requirements*

IEC 61215, *Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61646, *Thin-film terrestrial photovoltaic (PV) modules – Design qualification and type approval*

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 61853-1, *Photovoltaic (PV) module performance testing and energy rating – Part 1: Irradiance and temperature performance measurements and power rating*

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

IEC 62759-1, *Photovoltaic (PV) modules – Transportation testing – Part 1: Transportation and shipping of module package units*

IEC TS 62915, *Photovoltaic (PV) modules – Retesting for type approval, design and safety qualification*¹

IEC TS 62916, *Bypass diode electrostatic discharge susceptibility testing for PV modules*¹

ISO/IEC Guide 98-3:2008, *Uncertainty of measurement – Part 3: Guide to the expression of uncertainty in measurement*

3 Terms, definitions and acronyms

For the purposes of this document, the terms and definitions in ISO 9000:2005, IEC TS 61836 and the following apply.

3.1

containment

action taken to protect the customer from the effect of a situation. Containment may include correcting an existing situation or adding additional screening or retesting

3.2

control plan

documented description of the systems and processes required for controlling the product and process quality by addressing the key characteristics and engineering requirements

¹ To be published.