# IEC 61730-1

Edition 3.0 2023-09

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

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## Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction

**Qualification pour la sûreté de fonctionnement des modules photovoltaïques (PV) – Partie 1: Exigences pour la construction**

IEC 61730-1:2023-09 (en-fr)

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

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

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## Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction

**Qualification pour la sûreté de fonctionnement des modules photovoltaïques (PV) – Partie 1: Exigences pour la construction**

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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# PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION –

## Part 1: Requirements for construction

## FOREWORD

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IEC 61730-1 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems. It is an International Standard.

This third edition cancels and replaces the second edition published in 2016. This edition constitutes a technical revision.

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

a) Revision of Clauses 2 and 3.
b) Addition of requirements for qualification of specific components according to their standard documents (junction box, connectors, frontsheets/backsheets).
c) Significant changes to the definition and testing of relied upon insulation materials (RUI). These requirements are described in the pre-qualification document for frontsheets and backsheets (IEC 62788-2-1). This includes:
    1) clarifications on the concept and measurement of DTI, and related materials test requirements;

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2) frontsheet/backsheet weathering requirements.

d) Removal of all reference to "open rack", with updates according to an intended use for applications according to the application's 98$^{th}$ percentile module operating temperature.

e) Modules meeting Class 0 for use in restricted access areas are not required to pass the breakage test, (MST 32).

f) Marking and documentation subclauses have been revised and aligned with the IEC 61215 series.

g) Electronic copies are now allowed instead of paper copies of required safety documentation.

h) Requirements for bifacial modules:

1) addition of new term, aBSI;

2) relevant tests have been changed to account for higher current of bifacial modules;

3) for bifacial modules, marking that indicates which side is designed as the front side, or if both are designed for prolonged exposure to direct sunlight (> 300 W/m$^2$);

4) relevant parameters for installing bifacial modules clarified;

5) overprotection rating;

6) documentation has been modified.

i) In 6.2, marking requirements for connectors have been added.

j) Related to the intended use temperature range:

1) Clause 5 and 6.2 have been modified to include temperature ratings, with > 70 °C 98$^{th}$ percentile module operating temperature as the default maximum. Guidance for factors which could impact the module operating temperature for a system design/location are provided, and responsibility for proper installation is placed upon the installer.

2) Changes to insulation coordination sections (6.6, Annex B and Annex C).

3) Subclauses on insulation coordination (6.6.3) and distance through solid insulation (6.6.4) have been updated to clearly state the insulation coordination requirements, and are aligned with Annex B.

4) Annex B has been revised to show the basis for the dimensioning related to insulation coordination and is aligned with 6.6.3 and 6.6.4.

5) Annex C has been created to show specific use cases and describe how changes to materials or use of additional testing can modify the required dimensioning. Diagrams have been updated.

6) A new term, distance through functional insulation (DTFI), has been defined to describe the spacing between fully encapsulated live parts of different potential (the larger of creepage and clearance for the relevant voltage).

7) Testing requirements to verify a clearance value less than the listed value (but not below the creepage distance) are defined.

8) Requirements for junction boxes, cables and connectors, and polymeric frontsheets/backsheets have been removed (these are now covered in their respective standards).

9) In Table 2, functional insulation is required for insulation between live parts of different potential inside a PV module for all module types.

10) In Table 3 and Table 4:

i) lines related to pollution degree 3 have been removed, since this is not applicable to module laminates passing the requirements of IEC 61730-2;

ii) the minimum values for DTI have been increased to include the minimum 0,030 mm thickness (pinhole considerations);

iii) lines related to reinforced insulation have been combined;

iv) lines related to basic insulation have been combined, and functional insulation included on those lines;

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v) lines for DTFI have been added.

11) Insulation coordination requirements for Class III modules have been removed from Table 4, and functional insulation requirements are included in text (no DTI thickness requirement).

The text of this International Standard is based on the following documents:

| Draft | Report on voting |
|---|---|
| 82/2140/FDIS | 82/2165/RVD |

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 International Standard is English.

A list of all parts in the IEC 61730 series, under the general title *Photovoltaic (PV) module safety qualification*, can be found on the IEC website.

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.

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

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# PHOTOVOLTAIC (PV) MODULE SAFETY QUALIFICATION –

# Part 1: Requirements for construction

## 1 Scope

This part of IEC 61730 specifies and describes the fundamental construction requirements for photovoltaic (PV) modules in order to provide safe electrical and mechanical operation. Specific topics are provided to assess the prevention of electrical shock, fire hazards, and personal injury due to mechanical and environmental stresses. This document pertains to the particular requirements of construction. IEC 61730-2 defines the requirements for testing. Modules with modified construction are qualified as described in IEC TS 62915.

This document lays down requirements for terrestrial PV modules suitable for long-term operation in open-air climates with 98$^{th}$ percentile module operating temperatures of 70 °C or less. Guidelines for modules to be used at higher operating temperatures are described in IEC TS 63126. The useful service life of modules so qualified will depend on their design, their environment, and the conditions under which they are operated. Therefore, test results are not construed as a quantitative prediction of module lifetime.

This document is intended to apply to all terrestrial flat plate module materials, such as crystalline silicon module types as well as thin-film modules.

PV modules covered by this document are limited to a maximum DC system voltage of 1 500 V.

This document defines the basic requirements for various applications of PV modules, but it cannot be considered to encompass all national or regional codes. Specific requirements, e.g. for building, floating, marine and vehicle applications, are not covered.

This document does not address specific requirements for products that combine a PV module with power conversion equipment, monitoring or control electronics, such as integrated inverters, converters or output disabling functions, which are addressed in IEC 62109-3.

While it is possible that parts of this document are applicable to flat plate PV modules with internally generated low-level concentration below three times, it was not written specifically to address these concerns.

This document is designed to coordinate with the test sequences in the IEC 61215 series, so that a single set of samples can be used to perform both the safety and design qualification of a PV module.

Additional construction requirements outlined in relevant ISO standards, or the national or local codes which govern the installation and use of these PV modules in their intended locations, can apply in addition to the requirements contained within this document.

Any change to materials, design, or internal spacing are subject to a re-evaluation of the PV module or its component(s), as applicable, according to the IEC 61730 series and IEC TS 62915.

## 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.

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