

# TECHNICAL SPECIFICATION



Photovoltaic (PV) modules – Type approval, design and safety qualification –  
Retesting

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IEC TS 62915:2018

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

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

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**PHOTOVOLTAIC (PV) MODULES – TYPE APPROVAL,  
DESIGN AND SAFETY QUALIFICATION – RETESTING**

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

IEC TS 62915, which is a technical specification, has been prepared by IEC technical committee 82: Solar photovoltaic energy systems.

The text of this technical specification is based on the following documents:

Enquiry draft	Reports on voting
82/1331/DTS	82/1378A/RVDTS

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 document 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 website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

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# PHOTOVOLTAIC (PV) MODULES – TYPE APPROVAL, DESIGN AND SAFETY QUALIFICATION – RETESTING

## 1 Scope

This document sets forth a uniform approach to maintain type approval, design and safety qualification of terrestrial PV modules that have undergone, or will undergo modification from their originally assessed design.

Changes in material selection, components and manufacturing process can impact electrical performance, reliability and safety of the modified product. This document lists typical modifications and the resulting requirements for retesting based on the different test standards. It provides assistance; at some level engineering judgement may be needed.

The test sequences are selected to identify adverse changes to the modified product.

Those products successfully following the herein defined test sequences are considered to be compliant with the standard against which they have originally been assessed in a full qualification.

The number of samples to be included in the retesting program and the pass/fail criteria are listed in the referenced standards IEC 61215 and IEC 61730.

Tests required by changes from previous to new standard editions of IEC 61215 and IEC 61730 are not covered by this document and are evaluated separately.

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## 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 61215 (all parts), *Terrestrial photovoltaic (PV) modules – Design qualification and type approval*

IEC 61215-1:2016, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 1: Test requirements*

IEC 61215-2:2016, *Terrestrial photovoltaic (PV) modules – Design qualification and type approval – Part 2: Test procedures*

IEC 61730 (all parts), *Photovoltaic (PV) module safety qualification*

IEC 61730-1:2016, *Photovoltaic (PV) module safety qualification – Part 1: Requirements for construction*

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

IEC 62790, *Junction boxes for photovoltaic modules – Safety requirements and tests*



### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61215-1, IEC 61215-2, IEC 61730-1 and IEC TS 61836, as well as the following 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

##### **different material**

material that differs in its chemical composition, type designation, or specification from the material it replaces

#### 3.2

##### **nominal value**

value of a quantity used to designate and identify a component, device, equipment, or system

[SOURCE IEC 60050-151:2001, 151-16-09]

#### 3.3

##### **tolerance**

permitted deviation of declared nominal value

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### 4 Retesting

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#### 4.1 General

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This clause is separated into one subclause each for crystalline silicon and for thin-film technologies. The document is organized by major modification headings with specific supporting examples and parenthetical reference to the specific clauses of the relevant IEC standards.

Any change in the design, materials, components, material combinations, manufacturers or processing of the PV module type family from the last tested version may require a repetition of some or all of the qualification tests according to the clauses that follow in order to maintain type and safety approval. For any change in material specification, including, e.g., electrical, optical, mechanical properties, the nominal values and tolerances shall be considered. For any assessment of a new thickness or dimension, the initially tested thickness or dimension shall be used as reference. Any variation of a parameter may be assessed as change if the new value is out of the tolerance from the nominal value of this parameter.

Materials in direct contact with each other shall be tested in all applicable combinations. The required test items shall be selected only from those tests which are applicable for change of both materials. An example for an assessment procedure is given in Annex A, Clause A.4.

The number of samples to be included in the retesting program and the pass criteria are to be taken from the relevant clause/subclause of the referenced standards ('pass criteria').

Each PV module delivered for retesting shall be subjected to electrical stabilisation (MQT 19), as applicable by the relevant type approval standard.

All initial measurements as listed in the referenced standards shall be performed before the specific tests, e.g. tests MQT 01 / 03 / 06.1 / 15 / 19 for an IEC 61215 retest program.

Any scenario including a change in the optical path or electric circuitry that requires retesting as defined hereinafter shall include an STC output power measurement (MQT 06.1). The measured stabilized power, open-circuit voltage and short-circuit current shall be assessed against the rating (Gate No. 1), and the relative change in output power shall be assessed (Gate No. 2) according to the pass criteria laid down in the standard (see IEC 61215-1:2016, 7.2).

Final diagnostic measurements are listed in the referenced test procedure; as a minimum the same tests as performed initially shall be performed.

The Durability of markings (MST 05) and the Sharp edge test (MST 06) need to be considered in general for all design changes which may impact the results of these tests.

If multiple tests from a test sequence are required, they shall be done in the sequence prescribed by the referenced standard.

Changes in the PV module design might require assessment against IEC 61730-1 (requirements for construction) besides the indicated test programs.

Required tests in this Clause 4 are written for combined IEC 61215 (all parts) and IEC 61730 (all parts) evaluations. For simplification, the term “all parts” is omitted in the following. For single IEC 61730 evaluations, care has to be taken that tests listed herein for IEC 61215 may also be referenced and required by IEC 61730 to ensure compliance.

## 4.2 Test programs for crystalline silicon PV modules

NOTE See Table A.1 for a summary of the retest requirements for crystalline silicon PV modules.

### 4.2.1 Modification to frontsheet IEC TS 62915:2018

A change from glass to non-glass or vice-versa requires a full qualification.

For the following modifications:

- Different material, i.e. any change in specification of the material or any of its layers
- Glass: reduction of thickness by more than 10 %; non-glass: change of thickness by more than 20 % of any one of the individual layers (while maintaining the required minimum distance through insulation)
- For glass, if there is a reduction in the strengthening process (for example retest if change is from tempered glass to heat strengthened or annealed)
- Different surface treatment, e.g. any coating on frontsheet (inside or outside)
- Change of amount of adhesives, primers or other additives
- Addition or removal of adhesives, primers or additives

Repeat for IEC 61215:

- Hot-spot endurance test (MQT 09) if change in material, heat strengthening process or if thickness is reduced
- UV preconditioning test (MQT 10) / Thermal cycling test, 50 cycles (MQT 11) / Humidity freeze test (MQT 12) / Retention of junction box on mounting surface (MQT 14.1) (can be omitted for glass with identical UV cut-off)
- Damp heat test (MQT 13) if non-glass or if surface treatment is added/changed (inside or outside)
- Static mechanical load test (MQT 16) (can be omitted for different inside and outside surface treatments that do not impair mechanical strength)
- Hail test (MQT 17) (can be omitted for different surface treatment on the inside)

Repeat for IEC 61730:

- Insulation thickness test (MST 04) if non-glass
- Cut susceptibility test (MST 12) if non-glass
- Impulse voltage test (MST 14) if reduced thickness or if change in material
- Temperature test (MST 21) if non-glass and change in material
- Ignitability test (MST 24) if non-glass
- Module breakage test (MST 32) (can be omitted for different surface treatments that do not impair mechanical strength)
- Peel test (MST 35) or Lap shear strength test (MST 36) if design includes cemented joint (not for reduction of thickness, not for different outer surface treatment and not for change in glass strengthening process)
- Materials creep test (MST 37) (not for reduction of thickness and not for different outside surface treatment)
- Sequence B if non-glass
- Sequence B1 if design qualified for pollution degree 1 (not for reduction of thickness, not for different surface treatment and not for change in glass strengthening process)

For increased thickness, the Materials creep test (MST 37) is required.

#### 4.2.2 Modification to encapsulation system

For the following modifications:

- Different material
- Different type or change in amount of additive or different chemical composition of encapsulant
- Different manufacturer of encapsulant
- Different encapsulation process (e.g. curing degree, temperature/pressure profile)
- Reduction in thickness of total encapsulation by more than 20 % prior to processing (thickness can also be expressed in density, e.g. in g/cm<sup>3</sup>)

Repeat for IEC 61215:

- Hot-spot endurance test (MQT 09)
- UV preconditioning test (MQT 10) / Thermal cycling test, 50 cycles (MQT 11) / Humidity freeze test (MQT 12)
- Damp heat test (MQT 13)
- Hail test (MQT 17) if frontsheet is polymeric

Repeat for IEC 61730:

- Cut susceptibility test (MST 12) if frontsheet or backsheet is polymeric
- Impulse voltage test (MST 14) if reduced thickness or if change in material
- Module breakage test (MST 32) if material composition changes
- Peel test (MST 35) or Lap shear strength test (MST 36) if design includes encapsulant as a part of a qualified cemented joint
- Materials creep test (MST 37)
- Sequence B (only for different material or reduction in thickness)
- Sequence B1 if design qualified for pollution degree 1

#### 4.2.3 Modification to cell technology

For the following modifications:

- Metallization material composition (e.g. paste)
- Change in busbar metallization area by more than 20 %
- Change in number of busbars
- Change in anti-reflective coating
- Semiconductor layer material
- Change in crystallization process (e.g. mono- vs. poly-crystalline)
- Change of manufacturing site of the solar cells not under the same quality management system
- Use of cells from a different manufacturer
- Change in nominal cell thickness greater than 10 %
- Different size of cell or use of cut cells (e.g. halved)

Repeat for IEC 61215:

- Hot-spot endurance test (MQT 09)
- Thermal cycling test, 200 cycles (MQT 11)
- Damp heat test (MQT 13) (may be omitted if outer surface of cell is chemically identical (metallization and AR coating))
- Static mechanical load test (MQT 16) for reduction of cell thickness only

Repeat for IEC 61730:

- Temperature test (MST 21) <https://standards.iteh.ai/catalog/standards/sist/73b2424c-827d-4466-89a0-41ca1522f70b/iec-ts-62915-2018>
- Reverse current overload test (MST 26)

#### 4.2.4 Modification to cell and string interconnect material or technique

For the following modifications:

- Different material (e.g. alloy, chemistry and core)
- Change in mechanical properties by more than 10 % of tensile strength, yield strength and elongation
- Change in thickness by more than 10 %
- Change in (total) cross-section of interconnect material (e.g., more busbars / more busbars with less width)
- Different bonding technique
- Change in the number of interconnect or bonding points or decrease in bonding area per contact point
- Different length of interconnect material between last bond on one cell and first bond on the adjacent cell
- Different solder material, flux or conductive adhesive
- Change in insulation tape (thickness, material, manufacturer)

Repeat for IEC 61215:

- Hot-spot endurance test (MQT 09) for changes in bonding technique, interconnect material, solder material, flux or conductive adhesive
- Thermal cycling test, 200 cycles (MQT 11)