TECHNICAL SPECIFICATION

ISO/TS 21486

First edition
2022-03

Glass in building — Retesting requirements for laminated solar photovoltaic glass for use in buildings

Verre dans la construction — Exigences relatives aux contre-essais pour le verre feuilleté photovoltaïque pour utilisation dans les bâtiments

Reference number
ISO/TS 21486:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 160, *Glass in building*, Subcommittee SC 1, *Product considerations*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Glass in building — Retesting requirements for laminated solar photovoltaic glass for use in buildings

1 Scope

This document specifies requirements for retesting laminated solar photovoltaic (PV) glass for use in buildings.

This document applies to laminated solar PV glass.

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.

ISO 12543-5, *Glass in building — Laminated glass and laminated safety glass — Part 5: Dimensions and edge finishing*

ISO/TS 18178:2018, *Glass in building — Laminated solar photovoltaic glass for use in buildings*

ISO 29584, *Glass in building — Pendulum impact testing and classification of safety glass*

3 Terms and definitions

No terms and definitions are listed in this document.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Retesting criteria

4.1 Glass modifications

For glass modification, retesting shall be performed in accordance with Table 1.

Table 1 — Parameters, changes and retesting items for glass

Parameters	Changes	Retesting item
Thickness	Decrease: >20 %	1) Appearance 2) Dimensions and edge finishing 3) High-temperature test 4) Hot-spot endurance test 5) Ball drop test 6) Impact test
	a) Increase, or b) Decrease: ≤20 %	Does not require retesting
Varieties	Toughened glass change to non-toughened glass	1) Impact test 2) ball drop test
	Enamelled glass change to non-enamelled glass or coated glass	1) Radiation test 2) High-temperature test 3) Thermal cycling test (200 cycles) 4) Damp heat test 5) Humidity freeze test
	Ordinary glass change to lower iron glass or patterned glass[a]	1) Radiation test 2) High-temperature test 3) Thermal cycling test (200 cycles) 4) Damp heat test 5) Humidity freeze test
	a) Non-toughened glass change to toughened glass, or b) Non-enamelled glass change to enamelled glass, or c) Lower iron glass or patterned glass change to ordinary glass	Does not require retesting

[a] The light transmission of the glass is higher than the uncertainty of the measured glass value.

4.2 Solar cell modifications

4.2.1 Crystalline silicon solar cells

For modifications to crystalline silicon solar cells, retesting shall be performed in accordance with Table 2.

Table 2 — Parameters, changes and retesting items for crystalline silicon solar cells

Parameters	Changes	Retesting items
Thickness	Decrease: ≥10 %	1) Appearance 2) Hot-spot endurance test 3) Impact test
	a) Increase, or b) Decrease: <10 %	Does not require retesting
Size	Increase: ≥10 %	1) Appearance 2) Thermal cycling test (200 cycles) 3) Hot-spot endurance test 4) Impact test
	a) Decrease, or b) Increase: <10 %	Does not require retesting
Cell surface	Treatment	1) Appearance 2) Hot-spot endurance test 3) Damp heat test 4) High-temperature test
Density[a]	Increase: ≥20 % and <50 %	1) Appearance 2) Hot-spot endurance test
	Decrease or increase: <20 %	Does not require retesting
	Increase: ≥50 %	All testing items[b]
Cell type	Changes between monocrystalline silicon and polycrystalline silicon	All testing items[b]

[a] Percentage of solar cells per unit area.

[b] Under this condition, the module shall be considered as a new product and subjected to all the testing items in accordance with ISO/TS 18178.

4.2.2 Thin-film solar cells

For modifications to thin-film solar cells, retesting shall be performed in accordance with Table 3.

Table 3 — Parameters, changes and retesting items for thin-film solar cells

Parameters	Changes	Retesting items
Substrate material	Thickness decrease	1) Appearance 2) Ball drop test 3) Impact test 4) Damp heat test 5) High-temperature test 6) Humidity freeze test
	Thickness increase	Does not require retesting
	Material type	All testing items[a]
Thin-film material	Material type	All testing items[a]

[a] Under this condition, the module shall be considered as a new product and subjected to all the testing items in accordance with ISO/TS 18178.

4.3 Interlayer modifications

For interlayer modifications, retesting shall be performed in accordance with Table 4.

Table 4 — Parameters, changes and retesting items for interlayer

Parameters	Changes	Retesting items
Thickness	Decrease: ≥0,38 mm	1) Appearance 2) High temperature test 3) Damp heat test 4) Radiation test 5) Thermal cycling test (200 cycles) 6) Humidity freeze test 7) Insulation test 8) Wet leakage current test 9) Ball drop test 10) Impact test
	a) Increase, or b) Decrease: <0,38 mm	Does not require retesting
Material	The chemical composition of the interlayer changes such as polyofefin elastomer (POE) and polyvinyl butyral (PVB) and vice versa.	All testing items[a]

[a] Under this condition, the module shall be considered as a new product and subjected to all the testing items in accordance with ISO/TS 18178.

4.4 Interconnector modifications

For interconnector modification, retesting shall be performed in accordance with Table 5.

Table 5 — Parameters, changes and retesting items for interconnector

Parameters	Changes	Retesting items
Thickness	Decrease: ≥10 %	1) Appearance 2) Thermal cycling test (200 cycles) 3) Humidity freeze test 4) High temperature test
	a) Increase, or b) Decrease: <10 %	Does not require retesting
Width	Decrease: ≥20 %	1) Appearance; 2) Thermal cycling test (200 cycles) 3) Humidity freeze test
	a) Increase, or b) Decrease: <20 %	Does not require retesting
Material	Chemical composition material change	1) Appearance 2) Insulation test 3) Wet leakage current test 4) Thermal cycling test (200 cycles) 5) Damp heat test 6) Hot-spot endurance test
Connection method	a) Series and parallel connection exchange, or b) Weld and glue vice versa, or c) Change in position from front to back or side and vice versa	1) Appearance 2) Insulation test 3) Wet leakage current test 4) Hot-spot endurance test

4.5 Insulating strip modifications

For modifications to insulating strips, retesting shall be performed in accordance with Table 6.

Table 6 — Parameters, change and retesting items for insulating strip

Parameters	Changes	Retesting items
Thickness	Decrease: ≥20 %	1) Appearance 2) Thermal cycling test (200 cycles) 3) Humidity freeze test 4) Insulation test 5) Wet leakage current test
	a) Increase, or b) Decrease: <20 %	Does not require retesting
Material	Material change	1) Appearance 2) Radiation test 3) Thermal cycling test (200 cycles) 4) Humidity freeze test 5) Insulation test 6) Wet leakage current test 7) Hot-spot endurance test 8) Damp heat test

4.6 Termination modifications

For termination modification, retesting shall be performed in accordance with Table 7.

Table 7 — Parameters, changes and retesting items for termination

Parameters	Changes	Retesting items
Design	Structure changes affecting sealing (including dimension, position, number of JB)	1) Damp heat test 2) Insulation test 3) Wet leakage current test 4) Robustness of terminations test
	Structure changes not affecting sealing	Does not require retesting
Material	Degradation of material electrical insulation performance[a]	1) Damp heat test 2) Insulation test 3) Wet leakage current test 4) Robustness of terminations test 5) Humidity freeze test
	Improvement of material electrical insulation performance[a]	Does not require retesting
Potting material	Potting material change (different type of material)	1) Damp heat test 2) Insulation test 3) Wet leakage current test 4) Robustness of terminations test 5) Humidity freeze test 6) Thermal cycling test (200 cycles)

[a] The material electrical insulation performance can be evaluated by measurement.

5 Testing requirements

5.1 Appearance

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.2, and the test result shall be in accordance with ISO/TS 18178:2018, 5.2.

5.2 Dimensions and edge finishing

The test method shall be performed according to the test method given in ISO 12543-5, and the test result shall be in accordance with ISO/TS 18178:2018, 5.3.

5.3 High temperature test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.3, and the test result requirement shall be in accordance with ISO/TS 18178:2018, 5.4.

5.4 Damp heat test

The test method shall be performed according to the test method given ISO/TS 18178:2018, 7.4, and the test result requirement shall be in accordance with ISO/TS 18178:2018, 5.5.

5.5 Radiation test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.5, and the test result shall be in accordance with ISO/TS 18178:2018, 5.6.

5.6 Thermal cycling test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.6, and the test result shall be in accordance with ISO/TS 18178:2018, 5.7.

5.7 Humidity freeze test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.7, and the test result shall be in accordance with ISO/TS 18178:2018, 5.8.

5.8 Hot-spot endurance test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.9, and the test result shall be in accordance with ISO/TS 18178:2018, 5.10.

5.9 Impact test

The test method shall be performed according to the test method given in ISO 29584, and the test result shall be in accordance with ISO/TS 18178:2018, 5.11.

5.10 Ball drop test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.10, and the test result shall be in accordance with ISO/TS 18178:2018, 5.12.

5.11 Insulation test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.11, and the test result shall be in accordance with ISO/TS 18178:2018, 5.13.

5.12 Wet leakage current test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.12, and the test result shall be in accordance with ISO/TS 18178:2018, 5.14.

5.13 Robustness of terminations test

The test method shall be performed according to the test method given in ISO/TS 18178:2018, 7.13, and the test result shall be in accordance with ISO/TS 18178:2018, 5.15.

6 Retesting samples

Samples shall be retested in accordance with ISO/TS 18178.

The product is adopted for hot-spot endurance test and thermal cycling test (200 cycles); the sample or product can be selected for other tests.

7 Testing procedures

Testing procedures shall be in accordance with ISO/TS 18178.

8 Test report

The test report shall contain information on at least the following aspects of the test:

— the sample;

— the International Standard used (including its year of publication);

— the method used (if the standard includes several);

— the result(s), including a reference to the clause which explains how the results were calculated;

— any deviations from the procedure;

— any unusual features observed;

— the date of the test.

9 Others

If two or more parameters in Table 1 to Table 7 change simultaneously, the retest items should be the sum of the retest items corresponding to the changed parameters.

ICS 27.160; 81.040.20

Price based on 8 pages