

Glass in building — Insulating glass units —

Part 2: Long term test method and requirements for moisture penetration

The European Standard EN 1279-2:2002 has the status of a
British Standard

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National foreword

This British Standard is the official English language version of EN 1279-2:2002.

The UK participation in its preparation was entrusted by Technical Committee B/520, Glass and glazing in building, to Subcommittee B/520/2, Insulating glass products, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

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Glas im Bauwesen - Mehrscheiben-Isolierglas - Teil 2: Langzeitprüfverfahren und Anforderungen bezüglich Feuchtigkeitsaufnahme

This European Standard was approved by CEN on 5 September 2002.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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Foreword

This document (EN 1279-2:2002) has been prepared by Technical Committee CEN/TC 129 "Glass in building", the secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2003, and conflicting national standards shall be withdrawn at the latest by May 2003.

The described testing is part of type evaluation of insulating glass units.

This European Standard "*Glass in Building - Insulating glass units*" consists of the following Parts:

- *Part 1: Generalities, dimensional tolerances and rules for the system description.*
- *Part 2: Long term test method and requirements for moisture penetration.*
- *Part 3: Long term test method and requirements for gas leakage rate and for gas concentration tolerances.*
- *Part 4: Methods of test for the physical attributes of edge seals.*
- *Part 5: Evaluation of Conformity.*
- *Part 6: Factory production control and periodic tests.*

The annexes A to D are normative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies requirements for moisture penetration and the long term test method for insulating glass units and ensures by means of an adequate evaluation of conformity to this standard that over time:

- energy savings are made because the U -value and solar factor do not change significantly;
- health is preserved because sound reduction and vision do not change significantly;
- safety is provided because mechanical resistance does not change significantly.

It covers additional characteristics that are of importance for trade. Marking conditions are included.

For glass products with electrical wiring or connections for e.g. alarm or heating purposes, this standard covers only wiring subject for electrical potential difference to earth less than 50 V a.c. or less than 75 V d.c.

The main intended uses of the insulating glass units are installations in buildings and constructions such as in windows, doors, curtain walling, roofs and partitions where there exists protection against direct ultraviolet radiation at the edges.

NOTE 1 In cases where there is no protection against direct ultraviolet radiation at the edges, such as structural sealant glazing systems, additional European technical specifications should be followed.

NOTE 2 Units where the nature is only artistic are not part of this standard.

This Part of this standard, which is inextricably bound up with the other Parts of this standard, covers the moisture penetration by testing as one means of verifying whether a product made in accordance with its system description conforms with the relevant aspect of the definition on insulating glass units.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text, and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

EN 572-1, *Glass in Building - Basic soda lime silicate glass products - Part 1: Definitions and general physical and mechanical properties.*

EN 572-2, *Glass in Building - Basic soda lime silicate glass products - Part 2: Float glass.*

prEN 1279-1:1998, *Glass in Building - Insulating glass units - Part 1: Generalities, dimensional tolerances and rules for the system description.*

EN 1279-3, *Glass in Building - Insulating glass units - Part 3: Long term test method and requirements for gas leakage rate and for gas concentration tolerances.*

EN 1279-4, *Glass in Building - Insulating glass units - Part 4: Methods of test for the physical attributes of edge seals.*

ISO 760, *Determination of water - Karl Fischer method (General method).*

3 Terms and definitions, abbreviations and symbols

3.1 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in prEN 1279-1:1998 together with the following apply.

3.1.1

standard laboratory conditions

ambient temperature of $(23 \pm 2) ^\circ\text{C}$ and a relative humidity of $(50 \pm 5) \%$

3.1.2

standard moisture adsorption capacity

capacity of a desiccant material to adsorb a quantity of moisture under controlled limit environment conditions

3.1.3

controlled limit environment conditions

environment temperature $10 ^\circ\text{C}$ with a dew point temperature of $-5 ^\circ\text{C}$, giving a relative humidity of 32,8 %

3.1.4

moisture penetration index

amount of drying capacity consumed after standardised ageing conditions

3.1.5

accuracy

precision of the test method itself within confidence limits of 99 %

3.2 Abbreviations

r.h. relative humidity

3.3 Symbols

I Moisture penetration index (can be expressed in decimal or in percentage terms);

I_{av} Average value of the moisture penetration indices I , obtained over five measurements;

m_O Mass of dish when empty, clean and dry;

m_C Mass of dish plus desiccant plus water adsorbed from r.h. of 32 % air;

m_f Mass of dish plus desiccant plus water initially adsorbed plus water adsorbed when subjected to the climate conditions in the cabinet;

m_i Mass of dish plus desiccant plus water initially adsorbed;

m_r Mass of dish plus desiccant plus water adsorbed in equilibrium with a defined reference level of relative humidity of air, or dish plus dried desiccant at high temperatures;

M_m Mass of desiccant in mixtures with non-desiccant material;

M_t Total mass of desiccant when, for the purpose of testing, in a mixture with non-desiccant material, the non-desiccant material is replaced by the same volume of desiccant;

R Ratio between the masses of desiccant M_m and M_t ;

T_C Standard moisture adsorption capacity of desiccant;

$T_{C,av}$ Average standard moisture adsorption capacity of desiccant T_C obtained over two measurements;

T_f Final moisture content of desiccant;

$T_{f,u}$ Uncorrected final moisture content of desiccant;

T_i Initial moisture content of desiccant;

$T_{i,av}$ Average initial moisture content of desiccant T_i obtained over four measurements;

$T_{i,u}$ Uncorrected initial moisture content of desiccant;

Temperature of test specimens in test cabinet;

c Temperature of the central test specimen in test cabinet during constant temperature phase;

h High temperature of the central test specimen in the test cabinet during the high humidity/temperature cycling phase;

l Low temperature of the central test specimen in the test cabinet during the high humidity/temperature cycling phase;

s Temperature of the central test specimen in the test cabinet as the cycle moves between high temperature and low temperature and vice versa.

4 Requirements

4.1 Moisture penetration index

Insulating glass units shall fulfil their functions during an economically reasonable working life. Therefore the following values are verified on test specimens submitted to the climate test described in this Part of the standard:

The average moisture penetration index I_{av} over the five test specimen shall not exceed 0,20.

Although breakage of the glass does not constitute failure, the average moisture penetration index I_{av} shall be the average over not less than, and no more than, five units. Spare units shall be used instead of the broken test specimens.

The unit with the highest moisture penetration index shall have an index value I not exceeding 0,25.

4.2 Edge seal strength

For the requirements on edge seal strength, refer to EN 1279-4.

4.3 Gas leakage rate

When the system description includes gas-filled insulating glass units, for additional testing and requirements on gas leakage rate, refer to EN 1279-3.

5 Method of test

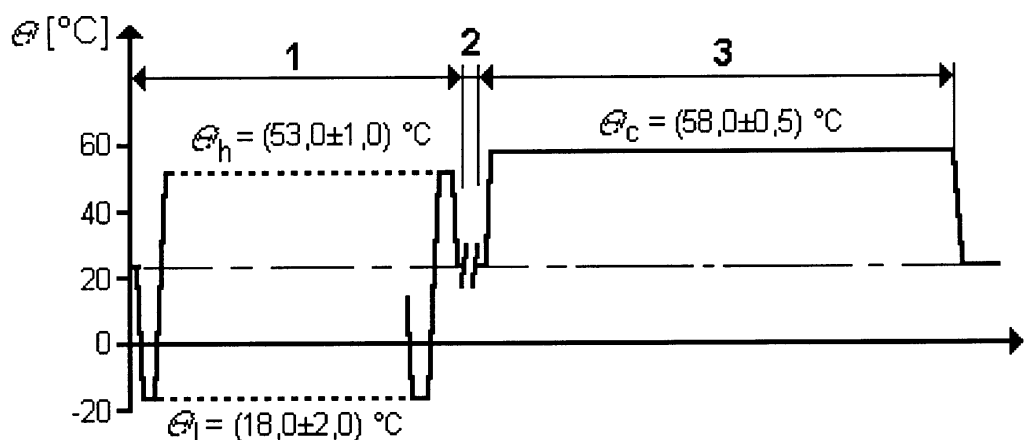
5.1 Principle

Sets of insulating glass units are exposed to a climate test. The initial and final dew point and the initial and final moisture content, as applicable, are measured and the moisture penetration index is calculated.

5.2 Climate conditions in cabinet

The high humidity/temperature test procedure consists of two parts. The climate condition in the cabinet comprises as a first part 56 temperature cycles of 12 h from $-18\text{ }^{\circ}\text{C}$ to $+53\text{ }^{\circ}\text{C}$ with slopes of $14\text{ }^{\circ}\text{C/h}$, followed by a second part comprising constant temperature of $+58\text{ }^{\circ}\text{C}$ for seven weeks. High humidity shall be as described.

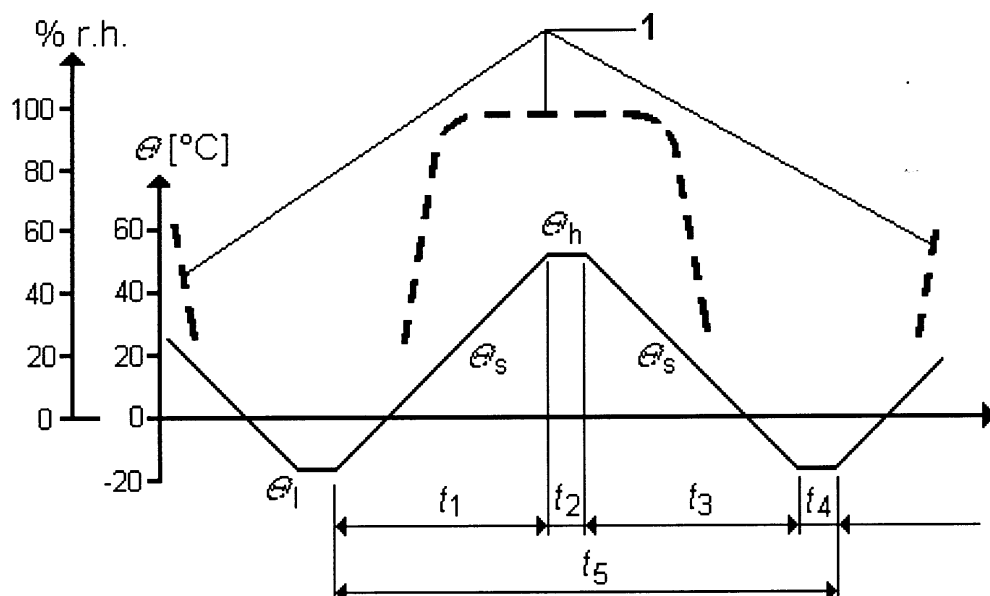
The exact specifications of the temperature, humidity and time, and their tolerances, are given in Figures 1 and 2.



Key

- 1 56 temperature cycles of 12 h (is four weeks)
- 2 Interval of 2 h to 4 h for moving test pieces from one cabinet to a second cabinet when two cabinets are used
- 3 (1176 ± 4) h (seven weeks) constant temperature and a relative humidity of r.h. 95 %. Condensation on test specimen is allowed

Figure 1 — Overview of climate conditions in cabinet. is the glass temperature of the centrally located test specimen - Temperature cycles start with the cooling part



Key

- 1 Relative humidity during temperature cycle. Top value of r.h. 95 %. During the cold part of the cycle, the high humidity is interrupted. Condensation on test specimen from time to time is allowed.
- Time intervals: $t_1 = 5 \text{ h}$, $t_2 = 1 \text{ h}$, $t_3 = 5 \text{ h}$, $t_4 = 1 \text{ h}$, $t_5 = \text{total cycle time } 12 \text{ h}$;
- Tolerance on time intervals: less than 1 min;
- Temperatures of the centrally located test specimen during cycle:
 - $\theta_h = (53,0 \pm 1,0) \text{ }^\circ\text{C}$ (high temperature);
 - $\theta_l = (-18,0 \pm 1,0) \text{ }^\circ\text{C}$ (low temperature);
 - $\theta_s = (14 \pm 2) \text{ }^\circ\text{C/h}$ (slopes).

Figure 2 — Temperature/time and humidity/time relations in cycling stage

NOTE The two parts of the process can be carried out in a single cabinet or in two separate cabinets. If two cabinets are used allow up to 4 h for moving the test specimens from one to the other for the second period.

The indicated temperatures and temperature tolerances in Figures 1 and 2 are valid for the glass of that unit which is centrally located in the cabinet(s). The temperature of that centrally located test specimen shall be recorded continuously. Also the relative humidity and air temperature, measured at the most suitable location in the test cabinet(s) shall be recorded continuously. Any deviations in temperature and in relative humidity will be noted in the test report.

The glass temperatures of the other test specimens in the cabinet shall be:

- during cycling:
 - high temperature $= (\theta_h \pm 1,0) \text{ }^\circ\text{C}$;
 - low temperature $= (\theta_l \pm 2,0) \text{ }^\circ\text{C}$;