



SLOVENSKI STANDARD
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Glass in building - Insulating glass units - Part 3: Long term test method and requirements for gas leakage rate and for gas concentration tolerances

Glas im Bauwesen - Mehrscheiben-Isolierglas - Teil 3: Langzeitprüfverfahren und Anforderungen bezüglich Gasverlustrate und Grenzabweichungen für die Gaskonzentration

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Verre dans la construction - Vitrage isolant préfabriqué scellé - Partie 3: Méthode d'essai a long terme et prescriptions pour le débit de fuite de gaz et pour les tolérances de concentration du gaz

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Glass in building - Insulating glass units - Part 3: Long term test method and requirements for gas leakage rate and for gas concentration tolerances

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This European Standard was approved by CEN on 1 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.

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EN 1279-3:2002 (E)

Foreword

This document EN 1279-3:2002 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of an identical text or by endorsement, at the latest by May 2003, and conflicting national standards shall be withdrawn at the latest by May 2003.

This document is part of the series EN 1279 "Glass in building - Insulating glass units" that contains 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 annexe A is normative. The annexes B and C are informative.

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 is the product standard for insulating glass units, which defines insulating glass units, and ensures by means of an adequate evaluation of conformity to this standard that:

- 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.

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

NOTE 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. See Bibliography [2] and [3].

This Part of this standard, which is inextricably bound up with the other Parts of the standard, covers:

- the gas leakage rate by testing;
- the gas concentration tolerances;

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as one means of verifying whether a product made in accordance with its system description, conforms with the relevant aspects of the definition of insulating glass units.

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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.*

EN 673, *Glass in Building - Determination of thermal transmittance (U value) - Calculation method.*

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

EN 1279-2, *Glass in Building - Insulating glass units - Part 2: Long term test method and requirements for moisture penetration.*

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

EN 1279-6, *Glass in Building - Insulating glass units - Part 6: Factory production control and periodic tests.*

prEN 12758, *Glass in Building - Glazing and airborne sound insulation - Definitions and determination of properties.*

EN 1279-3:2002 (E)

3 Terms and definitions and symbols

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

3.1

gas-filled insulating glass units

insulating glass unit in which the cavity contains gas(es) in addition to air, usually for improving thermal and/or sound insulation

3.2

gas concentration c

percentage by volume of gas in the cavity

- c_i is the concentration of gas i ;
- $c_{i,0}$ is the nominal value for a system of insulating glass and gas i which is the basis for testing sound insulation and/or calculating or testing thermal insulation to fix the respective R_w and U -value;
- $c_{i,f}$ is the estimated final concentration in percent of gas i . See annex A

NOTE For use of $c_{i,0}$, see also EN 1279-6.

3.3

gas leakage rate L_i

L_i : the proportion expressed as a percentage by volume of gas i leaking from a gas-filled unit per year calculated by the following formula:

$$L_i = 87,6 \cdot 10^6 \frac{m_i}{c_i \cdot V_{\text{int}} \cdot \rho_{o,i}} \frac{T_o \cdot P_i}{T_i \cdot P_o} \quad \text{in \% a}^{-1} \quad (1)$$

where the meaning of the symbols is given in Table 1

Table 1 — Meaning and units of the symbols used in equation (1)

Symbol	Description	Units	
		SI system	for practical use in equation (1)
c_i	gas concentration determined according to 5.4.4	volume fraction in percentage	
m_j	mass of gas that has leaked from a gas-filled unit in a given time, and determined according to 5.4.3	kg/h	µg/h
$\rho_{O,i}$	density of gas i at temperature T_O and pressure P_O	kg/m ³	µg/mm ³
P	absolute atmospheric pressure at which the unit was sealed	Pa	same unit as P_O
P_O	atmospheric pressure at which ρ_O was determined	Pa	e.g. hPa
T	temperature at which unit was sealed	K	K
T_O	temperature at which ρ_O was determined	K	K
V_{int}	internal volume of the test specimen according to 5.4.1	m ³	mm ³
a	one year		

NOTE $\rho_{O,i}$ is often given at $T_O = 273$ K (0 °C) and $P_O = 1014$ hPa

3.4

U_p

U -value (see EN 673) for publication: the thermal transmittance value to be published, normally determined with the gas concentration $c_{i,O}$. See also annex A

3.5

$R_{w,p}(C/C_{tr})$

$R_w(C/C_{tr})$ -value (see prEN 12758) for publication: the weighted sound reduction index to be published, normally determined with the gas concentration $c_{i,O}$. See also annex A

EN 1279-3:2002 (E)**4 Requirements****4.1 Gas leakage rate**

The gas leakage rate, L_j , for gases with concentrations higher than 15 %, and also for air, measured as described in clause 5 shall be

$$L_j < 1,00 \quad \text{in \% a}^{-1} \quad (2)$$

NOTE For most insulating glass units, measured L_j values are much higher than actual L_j values will be after 10 years natural ageing. Therefore the limiting value should not be used for calculating the gas concentration during the lifetime of the unit. See annex B.

In the case of sealants based on polysulfide, polyurethane, silicone or polyisobutylene, determining the gas leakage rate of argon (Ar) may replace the measurement of the gas leakage rate for sulfurhexafluoride (SF₆) and air.

4.2 Tolerances on gas concentration

For tolerances on gas concentration, refer to EN 1279-6.

4.3 Dew point and moisture penetration index

For testing and requirements on dew point and moisture penetration, refer to EN 1279-2.

4.4 Edge seal strength

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

4.5 Additional requirements for other gases than argon, sulfurhexafluoride and air

For those requirements, refer to annex A.

5 Testing**5.1 Principle of testing**

In the test, the gas leakage rate at 20 °C is measured after subjecting the test specimen to a climate as specified in EN 1279-2 with the following modifications:

- the number of cycles is reduced to 28; and
- the time at a constant temperature of 58 °C is reduced to 4 weeks.

For measuring the gas leakage rate, the unit is placed in a gastight container and, after a given time, the amount of gas which has leaked from the unit is measured. After this measurement, the gas concentration in the unit is analysed and the gas leakage rate calculated.

5.2 Apparatus**5.2.1 Climate exposure equipment**

Test apparatus for the climate exposure as specified in EN 1279-2.

5.2.2 Container for gas leakage rate measurement

A controlled temperature container shall be used for measuring the gas leakage rate, which shall be hermetically sealable, and capable of receiving the unit to be tested while inducing as little stress as possible, so that the residual volume in the container is as small as possible while the sealed edge zones of the unit are exposed to the circulation of purging gas.

The quantity of ambient air penetrating into the container from outside, or the quantity of each constituent leaking from the container, shall be measured in a blank test using a solid glass body of approximately the same dimensions as the test specimens.

The container shall be deemed to have an adequate degree of tightness if the measured quantity of gas during the measurement does not exceed 10 % of the mass of gas leaking from the test specimen.

The container shall have fittings for introducing specific gases and for taking gas specimens.

For multiple glass units with at least one outer pane made of organic material, it shall be ensured that the gas diffusion through this (these) pane(s) is included in the measurement.

5.2.3 Gas analysis equipment

A gas analysis equipment shall be used which is capable of:

- a) analysis of the gaseous constituents essential to the insulation function of the glass unit, for concentrations of $50 \cdot 10^{-6}$;
- b) determination of percentages by volume of gas of up to 100 % within ± 3 % (relative).

These tasks shall not necessarily be performed using the same equipment.

5.2.4 Gas sampling device

A device shall be used for taking gas specimens from the glass unit, ensuring that the result is not distorted by ingress of air, segregation phenomena, or similar.

5.3 Test specimens

5.3.1 Preparation of test specimens

The test specimens shall consist of two panes of 4 mm clear float glass in accordance with EN 572-1 and EN 572-2. The length shall be (502 ± 2) mm and the width (352 ± 2) mm. The gap shall be nominal 12 mm, or if not manufactured, a gap as near to 12 mm as possible. The test specimens shall be representative of the system description as defined in prEN 1279-1.

If glass/plastic units are produced in such a way that gas leakage out of the unit through the plastic is possible, deviating from the paragraph above, glass shall be substituted by plastic.

Unless otherwise agreed, the design of the insulating glass unit, including the type and quantity of desiccant and of gas, shall conform to that manufactured in normal production (except for the measurement of the air loss rate, where 100 % air is allowed). The panes of the test specimen shall be flat when the unit is sealed. During sealing, the temperature, T in K, and the absolute pressure, P in hPa, shall be measured to the nearest 1 K and 3 hPa respectively.

The test specimens have to be manufactured in such a way that the gas concentration meets $c_j = c_{j,0}$ (+ 10 % to - 5 % absolute), for each gas when gas mixtures are used.

For the production of the test specimens, EN 1279-6 is mandatory.