



# SLOVENSKI STANDARD

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### Steklo v gradbeništvu - Izolacijsko steklo - 4. del: Preskusne metode za fizikalne lastnosti komponent robnega tesnjenja in vgrajenih delov

Glass in Building - Insulating Glass Units - Part 4: Methods of test for the physical attributes of edge seal components and inserts

Glas im Bauwesen - Mehrscheiben-Isolierglas - Teil 4: Verfahren zur Prüfung der physikalischen Eigenschaften der Komponenten des Randverbundes und der Einbauten

Verre dans la construction - Vitrage isolant préfabriqué scellé - Partie 4 : Méthodes d'essai des propriétés physiques des composants et inserts

Ta slovenski standard je istoveten z: EN 1279-4:2018

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#### **ICS:**

81.040.20      Steklo v gradbeništvu      Glass in building

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EUROPEAN STANDARD

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## Glass in Building - Insulating Glass Units - Part 4: Methods of test for the physical attributes of edge seal components and inserts

Verre dans la construction - Vitrage isolant préfabriqué scellé - Partie 4 : Méthodes d'essai des propriétés physiques des composants et inserts

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This European Standard was approved by CEN on 9 March 2018.

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## Contents

	Page
European foreword.....	5
<b>1 Scope .....</b>	<b>7</b>
<b>2 Normative references .....</b>	<b>7</b>
<b>3 Terms and definitions .....</b>	<b>7</b>
<b>4 Symbols and abbreviations .....</b>	<b>8</b>
<b>4.1 Symbols and units .....</b>	<b>8</b>
<b>4.2 Abbreviated terms .....</b>	<b>9</b>
<b>4.3 Indexes .....</b>	<b>9</b>
<b>5 Requirements for sealants.....</b>	<b>9</b>
<b>5.1 General.....</b>	<b>9</b>
<b>5.2 Physicochemical characterization .....</b>	<b>10</b>
<b>5.3 Outer sealant strength.....</b>	<b>11</b>
<b>5.4 Additional requirements.....</b>	<b>12</b>
<b>5.5 Characteristics for the substitution of sealants .....</b>	<b>12</b>
<b>5.5.1 Crossover stress (<math>\sigma_C</math>).....</b>	<b>12</b>
<b>5.5.2 Water vapour transmission rate (WVTR) .....</b>	<b>12</b>
<b>5.5.3 Gas permeation rate (GPR).....</b>	<b>12</b>
<b>5.6 Test report for sealant.....</b>	<b>12</b>
<b>6 Requirements for desiccants in bulk.....</b>	<b>15</b>
<b>6.1 General.....</b>	<b>15</b>
<b>6.2 Physicochemical characterization of desiccants in bulk.....</b>	<b>15</b>
<b>6.2.1 X-ray Fluorescence Spectroscopy (XRF) .....</b>	<b>15</b>
<b>6.2.2 X-ray Diffraction (XRD).....</b>	<b>15</b>
<b>6.2.3 Bulk density .....</b>	<b>15</b>
<b>6.2.4 Available Water Adsorption Capacity (AWAC).....</b>	<b>15</b>
<b>6.2.5 Correlation between <math>\Delta T</math>, available water adsorption capacity (AWAC) and loss on ignition (LOI) .....</b>	<b>15</b>
<b>6.3 Performance requirements.....</b>	<b>17</b>
<b>6.3.1 Loss on Ignition (LOI at 540 °C).....</b>	<b>17</b>
<b>6.3.2 Standard moisture adsorption capacity (<math>T_C</math>) .....</b>	<b>17</b>
<b>6.3.3 Gas desorption .....</b>	<b>17</b>
<b>6.4 Additional requirements.....</b>	<b>17</b>
<b>6.5 Report for desiccants in bulk.....</b>	<b>17</b>
<b>7 Requirements for preformed flexible spacer incorporating desiccant.....</b>	<b>19</b>
<b>7.1 General.....</b>	<b>19</b>
<b>7.2 Physicochemical characterization .....</b>	<b>19</b>
<b>7.2.1 Identification .....</b>	<b>19</b>
<b>7.2.2 <math>T_C</math> and <math>T_O</math> values.....</b>	<b>19</b>
<b>7.3 Additional requirements.....</b>	<b>20</b>
<b>7.4 Report.....</b>	<b>20</b>
<b>8 Requirements for inserts containing polymer materials.....</b>	<b>20</b>
<b>8.1 General.....</b>	<b>20</b>
<b>8.2 Water content.....</b>	<b>20</b>

8.3	Volatile content.....	20
8.4	Fogging.....	20
8.5	Report .....	20
Annex A (normative) Adhesion test for outer sealants and metal edge seals.....		21
A.1	Outer sealants .....	21
A.2	Metallic edge seals.....	25
Annex B (normative) Adhesion on coatings and interlayer adhesion of coatings .....		27
B.1	General.....	27
B.2	Composition of coatings .....	27
B.3	Evaluation.....	27
B.4	Test report.....	29
Annex C (normative) Fogging test.....		32
C.1	General.....	32
C.2	Principle of the test .....	32
C.3	Test conditions .....	32
C.4	Visual inspection and requirements.....	32
C.5	Exposure equipment.....	33
C.6	Test report.....	33
Annex D (normative) Methods of water vapour transmission rate and gas permeation rate determination .....		37
D.1	Method for determination of water vapour transmission rate (WVTR) .....	37
D.2	Method for determination of gas permeation rate (GPR) .....	40
Annex E (normative) Test methods for desiccants in bulk.....		43
E.1	Determination of loss on ignition LOI, $T_i$ and $T_f$ (at 540 °C) .....	43
E.2	Determination of available water adsorption capacity (AWAC) .....	44
E.3	Calculation of the standard moisture adsorption capacity ( $T_c$ ) .....	46
E.4	Determination of gas desorption .....	46
E.5	Bulk density .....	48
Annex F (normative) Karl Fischer method for determination of moisture content of polymeric matrices incorporating desiccant.....		51
F.1	General.....	51
F.2	Materials and apparatus .....	51
F.3	Preparatory work .....	51
F.4	Determination of moisture content $T_o$ , $T_i$ and $T_f$ .....	52
F.5	Determination of standard moisture adsorption capacity $T_c$ .....	53
F.6	Accuracy of the method .....	53

## EN 1279-4:2018 (E)

<b>Annex G (normative) Gravimetric method for determination of moisture content of polymeric matrices incorporating desiccant.....</b>	<b>54</b>
<b>G.1 General.....</b>	<b>54</b>
<b>G.2 Materials and apparatus.....</b>	<b>54</b>
<b>G.3 Determination of <math>T_0</math>, <math>T_i</math>, <math>T_f</math> and <math>T_c</math>.....</b>	<b>54</b>
<b>Annex H (normative) Volatile content test .....</b>	<b>56</b>
<b>H.1 General.....</b>	<b>56</b>
<b>H.2 Principle of the test .....</b>	<b>56</b>
<b>H.3 Apparatus.....</b>	<b>56</b>
<b>H.4 Test samples .....</b>	<b>56</b>
<b>H.5 Test procedure .....</b>	<b>56</b>
<b>H.6 Test report.....</b>	<b>57</b>
<b>Annex I (informative) Example of a sun simulating radiation source .....</b>	<b>58</b>
<b>Annex J (informative) Sealant sheet preparation for WVTR and GPR measurements .....</b>	<b>59</b>
<b>J.1 Preparation of sheets.....</b>	<b>59</b>
<b>J.2 Method 1.....</b>	<b>59</b>
<b>J.3 Method 2.....</b>	<b>59</b>
<b>J.4 Evaluation of sheet .....</b>	<b>60</b>
<b>Bibliography.....</b>	<b>61</b>

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## European foreword

This document (EN 1279-4:2018) has been prepared by Technical Committee CEN/TC 129 “Glass in building”, the secretariat of which is held by NBN.

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 January 2019 and conflicting national standards shall be withdrawn at the latest by January 2019.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1279 4:2002.

The main changes compared to the previous edition are:

- a) The standard has been fully technically and editorially revised;
- b) The scope has been changed;
- c) Terms and definitions have been transferred to EN 1279-1:2018;
- d) For sealants physicochemical characterization have been added and requirements were changed;
- e) For desiccants in bulk physicochemical characterization, test methods and requirements have been added;
- f) For polymeric matrices incorporating desiccant and inserts requirements have been added;
- g) Annexes have been renumbered;
- h) Annex A has been technically revised
- i) Annex C: Fogging test was transferred from EN 1279-6, Annex C and test temperature was modified;
- j) Annex D: description of the method to determine GPR has been revised;
- k) Annexes E, G, J are new;
- l) Annex F: Karl-Fischer-Determination was transferred from EN 1279-2, Annex C;
- m) Annex H: Volatile test was transferred from EN 1279-6, Annex G;
- n) Former Annex B: Edge seal strength comparison was transferred to EN 1279-1:2018, Annex E;
- o) Former Annex E: Informative tests were deleted.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

**EN 1279-4:2018 (E)**

EN 1279, *Glass in Building - Insulating glass units* consists of the following parts:

- *Part 1: Generalities, system description, rules for substitution, tolerances and visual quality;*
- *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 seal components and inserts;*
- *Part 5: Product standard;*
- *Part 6: Factory production control and periodic tests.*

These parts are inextricably bound up with each other.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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## 1 Scope

This document specifies the requirements and describes the test methods for edge seal components and inserts. This includes the identification, the determination of physical attributes and the evaluation of characteristics for use in substitution rules in accordance with EN 1279-1:2018.

For the purpose to demonstrate that edge seal components will allow the insulating glass unit to conform to the requirements given in EN 1279-1:2018, Clause 6, EN 1279-2:2018 and EN 1279-3:2018 also apply.

## 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.

EN 410, *Glass in building — Determination of luminous and solar characteristics of glazing*

EN 1279-1:2018, *Glass in building — Insulating glass units — Part 1: Generalities, system description, rules for substitution, tolerances and visual quality*

EN 1279-2:2018, *Glass in building — Insulating glass units — Part 2: Long term test method and requirements for moisture penetration*

EN 1279-3:2018, *Glass in building — Insulating glass units — Part 3: Long term test method and requirements for gas leakage rate and for gas concentration tolerances*

EN 1279-6:2018, *Glass in building — Insulating glass units — Part 6: Factory production control and periodic tests*

EN 13022-1, *Glass in building - Structural sealant glazing - Part 1: Glass products for structural sealant glazing systems for supported and unsupported monolithic and multiple glazing*

EN ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1)*

EN ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system (ISO 7500-1)*

EN ISO 10563, *Buildings and civil engineering works — Sealants — Determination of change in mass and volume (ISO 10563)*

EN ISO 11358-1:2014, *Plastics — Thermogravimetry (TG) of polymers — Part 1: General principles (ISO 11358-1:2014)*

ISO 5893, *Rubber and plastics test equipment — Tensile, flexural and compression types (constant rate of traverse) — Specification*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1279-1:2018 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>

## 4 Symbols and abbreviations

### 4.1 Symbols and units

Symbols and the respective units used in this European Standard are given in Table 1.

**Table 1 — Symbols and units**

Symbol	Characteristic	Unit
$t$	Time	h
$A$	Area of test sample	mm <sup>2</sup>
$D$	Bulk density	g/l
$P_v$	Volume permeation rate	ml · m <sup>-2</sup> · d <sup>-1</sup>
$P_m$	Mass permeation rate	g · m <sup>-2</sup> · d <sup>-1</sup>
$T_c$	Standard moisture adsorption capacity	% by weight
$T_O$	Moisture content of preformed flexible spacer incorporated desiccant	% by weight
$T_i$	Initial moisture content	% by weight
$T_f$	Final moisture content	% by weight
$V$	Volume (of gas)	ml
$W$	Weight	g
$\Delta W$	Difference in weight	g
$\Delta T$	Difference in temperature	K
$\Delta P_{H_2O}$	Difference in water vapour pressure across the test sample	%
$\Delta P_m$	Mean error of the mass permeation rate	dimensionless
$\varepsilon$	Elongation (of the bond due to mechanical loading)	%
$\varepsilon_C$	Crossover elongation	%
$\varepsilon_B$	Elongation at break	%
$\rho$	Density	kg · m <sup>-3</sup>
$\sigma$	Stress (applied to the bond due to mechanical loading)	MPa
$\sigma_s$	Tensile strength	MPa
$\sigma_c$	Crossover stress	MPa
$x$	Ratio	dimensionless

## 4.2 Abbreviated terms

The following abbreviated terms are used in this European Standard:

ATR	Attenuated Total Reflection
AWAC	Available Water Adsorption Capacity
GC	Gas Chromatograph
GPR	Gas Permeation Rate
IR	Infrared Spectrum
KF	Karl Fischer
LOI	Loss on Ignition
r.h.	Relative humidity
TGA	Thermogravimetric Analysis
UV	Ultraviolet
WVTR	Water Vapour Transmission Rate
XRF	X-ray Fluorescence Spectroscopy
XRD	X-ray Diffraction Spectroscopy

## 4.3 Indexes

av	average
f	final
i	initial
v	volume

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## 5 Requirements for sealants

### 5.1 General

The edge seal system shall provide sufficient resistance to moisture ingress into and loss of filling gas from IGU cavity. Additionally, outer or single sealants shall be capable of building up durable adhesive and cohesive strength to retain integrity of the edge seal system exposed to environmental and mechanical loads during the economically reasonable working life of IGU.

Inner sealants may also be used as an assembly aid to bond the glass to the spacer bar during the manufacturing process.

NOTE Other components of IGU edge seal can influence the durability of the edge seal.

Supplier of sealant shall demonstrate the conformity with the declared characteristics by having the test report(s) issued in accordance with 5.6.

**EN 1279-4:2018 (E)**

The required test reports shall contain the test results of relevant strength and substitution characteristics as specified in 5.3 and 5.5 respectively together with physicochemical characterization test results as specified in 5.2.

The supplier of sealant shall demonstrate the compliance with additional requirements as specified in 5.4 by having test reports in accordance with EN 1279-2:2018 and, where relevant, with EN 1279-3:2018. Tests previously performed in accordance with the previous versions of EN 1279-2 and EN 1279-3 shall be also accepted.

**5.2 Physicochemical characterization**

Physicochemical characterization of inner and outer sealants shall be carried out as given in Table 2. Chemically reactive systems shall be cured for 28 days at standard laboratory conditions, where applicable for test requirements.

**Table 2 — Physicochemical characterization of sealants**

<b>Physicochemical characterization test</b>	<b>Test method <sup>a</sup></b>
Determination of change in volume	EN ISO 10563
Infrared spectrum	in the range from 400 cm <sup>-1</sup> to 4000 cm <sup>-1</sup> , in ATR mode, on germanium, zinc sulphide or diamond, on the freshly cut surface of the sealant sample
Thermogravimetric analysis	EN-ISO 11358-1:2014, 8.2, "Temperature scanning mode"
Density / specific gravity <sup>b</sup>	EN ISO 1183-1, procedure A
<sup>a</sup> General requirements for all sealants are given in the table. See specific conditions for inner and outer sealants below in the text. <sup>b</sup> For cured sealant.	

For the thermogravimetric analysis apply following specific conditions.

For inner sealant:

- purging gas: nitrogen and synthetic air respectively, with flow rate approximately 100 ml/minute;

NOTE 1 Flow rate deviations are depending on the type of the testing equipment.

- sample size: approximately 10 mg;
- heating rate: 20 K/minute;
- heating mode: heating up from 40 °C to 800 °C in nitrogen flow, then 10 min isotherm in synthetic air flow, then heating up to minimum 850 °C, then 10 min isotherm at 850 °C in synthetic air.

NOTE 2 During the initial heating (up to 800 °C, in nitrogen flow) the anaerobic decomposition and the desorption from carbon black filler of the materials occur. The remaining amount of carbon based material is determined by thermal oxidation in following heating steps in the flow of synthetic air.

For outer sealant:

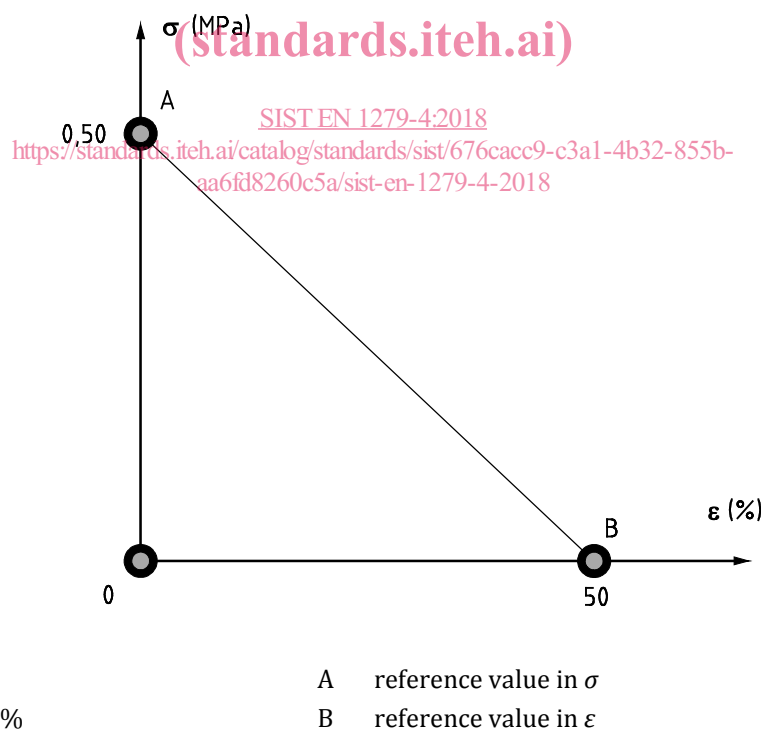
- conditioning before testing: at least 1 day at standard laboratory conditions;
- purging gas: nitrogen and synthetic air respectively, with flow rate approximately 100 ml/min, depending on equipment;
- sample size: approximately 50 mg;
- heating rate: 20 K/minute;
- heating mode: heating up from 40 °C to minimum 850 °C in nitrogen flow, then 10 min isotherm at 850 °C in synthetic air flow.

The rate of heating shall not change during significant weight loss. In cases where the given method departs from this requirement, the method shall be adapted to prevent this.

### 5.3 Outer sealant strength

When tested in accordance with Annex A, outer sealant shall show sufficient cohesive and adhesive strength before and after the aging. For each curve either the point of maximum tension or the point of failure or the end of each curve shall lie outside the triangle area defined by points A0B as shown in Figure 1, i.e. crossover stress,  $\sigma_c$ , shall be determined and declared (see also Figure A.5).

If substitution of sealant is required rules given in EN 1279-1:2018, Annex D shall be followed.



**Figure 1 — Strength requirement for outer sealant**

If IGU manufacturer performs the sealing operation on a coated glass without deletion of the coating, a test report in accordance with Annex B shall be obtained.

**EN 1279-4:2018 (E)**

NOTE 1 While it is assumed in this standard that sealant will always be in contact with float glass, it is the responsibility of the IGU manufacturer to ensure that the decision to skip edge deletion operation does not affect unacceptably the adhesion of sealant to glass and the durability of IGU.

NOTE 2 The requirements for the use of coated glass in accordance with EN 1096 are detailed in Annex B.

**5.4 Additional requirements**

A test report in accordance with EN 1279-2 for the inner and outer sealant shall be available on request. Additionally, for gas filled IGU, test report in accordance with EN 1279-3 for the inner and outer sealant shall be available on request.

Sealants shall pass the fogging test in accordance with Annex C and will be reported in combination with the volatile content measurement according to Annex H.

NOTE The fogging test and the volatile content measurement are usually performed by the sealant manufacturer.

**5.5 Characteristics for the substitution of sealants****5.5.1 Crossover stress ( $\sigma_c$ )**

Crossover stress,  $\sigma_c$ , shall be determined and reported for outer and single sealants in accordance with Annex A.

**5.5.2 Water vapour transmission rate (WVTR)**

Water vapour transmission rate (WVTR) for all sealants shall be determined and reported in accordance with Annex D.

**5.5.3 Gas permeation rate (GPR)**

Gas permeation rate (GPR) for all sealants shall be determined and reported in accordance with Annex D.

**5.6 Test report for sealant**

The test report shall provide as a minimum detailed information on the performed tests including the physicochemical characterization (Table 3 shows an example). Additional results may be included.

Table 3 — Example of sealant test report

<b>Name of the test house, its address and logo</b>		
Report No ..... Date .....		
<b>Insulating glass units - Sealant properties</b>		
<b>Client</b>	Name:	.....
	Legal Address:	.....
<b>Manufacturer</b>	Name:	.....
	Plant Address:	.....
<b>Sealant</b>	Function:	.....
	(e.g. outer sealant)	
	Trade name:	.....
	Polymer base:	.....
	(e.g. polysulphide)	
	Batch number:	Part A ..... Part B (if applicable) .....
	Mix ratio	volume ..... weight .....
<a href="https://standards.iteh.ai/catalog/standards/sist/676cacc9-c3a1-4b32-855b-aa6fd8260c5a/sist-en-1279-4-2018">https://standards.iteh.ai/catalog/standards/sist/676cacc9-c3a1-4b32-855b-aa6fd8260c5a/sist-en-1279-4-2018</a> <b>Results in accordance with EN 1279-4:2018</b>		
<b>Physicochemical characterization (EN 1279-4:2018, 5.2)</b>		
Volume shrinkage	Sealant	$\Delta V = 1,1 \%$
Infrared spectrum	Cured sealant	