

**SLOVENSKI STANDARD**  
**oSIST prEN 1748-2-1:2017**  
**01-oktober-2017**

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**Steklo v stavbah - Posebni osnovni proizvodi - Steklena keramika - 2-1. del:  
Definicije in splošne fizikalne in mehanske lastnosti**

Glass in Building - Special basic products - Glass ceramics - Part 2-1: Definitions and general physical and mechanical properties

Glas im Bauwesen - Spezielle Basiserzeugnisse - Glaskeramik - Teil 2-1: Definitionen und allgemeine physikalische und mechanische Eigenschaften

Verre dans la construction - Produits de base spéciaux - Vitrocéramiques - Partie 1 : Définitions et propriétés physiques et mécaniques générales

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**Ta slovenski standard je istoveten z: prEN 1748-2-1**

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**ICS:**

01.040.81	Steklarska in keramična industrija (Slovarji)	Glass and ceramics industries (Vocabularies)
81.040.20	Steklo v gradbeništvu	Glass in building
81.060.01	Keramika na splošno	Ceramics in general

**oSIST prEN 1748-2-1:2017**

**en,fr,de**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**DRAFT**  
**prEN 1748-2-1**

August 2017

ICS 01.040.81; 81.040.20; 81.060.01

Will supersede EN 1748-2-1:2004

English Version

## Glass in Building - Special basic products - Glass ceramics - Part 2-1: Definitions and general physical and mechanical properties

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 129.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
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EUROPÄISCHES KOMITEE FÜR NORMUNG

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## European foreword

This document (prEN 1748-2-1:2017) has been prepared by Technical Committee CEN/TC 129 “Glass in building”, the secretariat of which is held by NBN.

This document is currently submitted to the CEN Enquiry.

This document will supersede EN 1748-2-1:2004.

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

The main changes compared to the previous edition are the following:

- a) Clause 1: drawn and casted process have been removed;
- b) Chemical composition has been modified in Table 1 to express composition in elements;
- c) Clause 5: luminous transmittance have been modified;
- d) Clause 6: new thickness tolerances have been added for floated glass ceramics and sub Clause 6.3 “Tolerances and squareness” has been completely revised; the squareness of rectangular glass panes is now expressed by the difference between its diagonals;
- e) Clause 7 has been completely revised (including the Zebra method of observation optical faults);
- f) Categories of defects have been removed, only one quality is defined (Table 9);
- g) a new informative Annex A given complementary information related to REACH has been added;
- h) the document has been editorial revised.

EN 1748 is currently composed with the following parts:

- EN 1748-1-1, *Glass in building — Special basic products — Borosilicate glasses — Part 1-1: Definition and general physical and mechanical properties*;
- EN 1748-1-2, *Glass in building — Special basic products — Borosilicate glasses — Part 1-2: Evaluation of conformity/Product standard*;
- EN 1748-2-1, *Glass in Building — Special basic products — Glass ceramics — Part 2-1: Definitions and general physical and mechanical properties*;
- EN 1748-2-2, *Glass in building — Special basic products — Glass ceramics — Part 2-2: Product standard*.

**prEN 1748-2-1:2017 (E)****1 Scope**

This European Standard specifies and classifies special basic products - glass ceramics, indicates their chemical composition, their main physical and mechanical characteristics, their dimensional and minimum quality requirements (in respect of optical and visual faults).

This European Standard applies to special basic products - glass ceramics supplied in stock sizes, supplied sizes or in cut sizes for final end use.

This European Standard does not apply to final cut sizes having a dimension less than 100 mm or a surface area less than 0,05 m<sup>2</sup>.

**2 Normative references**

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 410:2011, *Glass in building — Determination of luminous and solar characteristics of glazing*

ISO 9385:1990, *Glass and glass-ceramics — Knoop hardness test*

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

**3.1 glass ceramics**

type of glass consisting of a crystalline and a residual glass phase

Note 1 to entry: The glass is obtained by normal glass manufacturing methods, e.g. floating or rolling and is subsequently subjected to a heat treatment which transforms, in a controlled manner, part of the glass into a fine grained crystalline phase; the glass ceramics has properties which deviate from those of the glass from which it was transformed.

**3.2 floated glass ceramics**

flat, transparent or translucent, clear or tinted glass ceramics having parallel and polished faces obtained by continuous casting and flotation on a metal bath

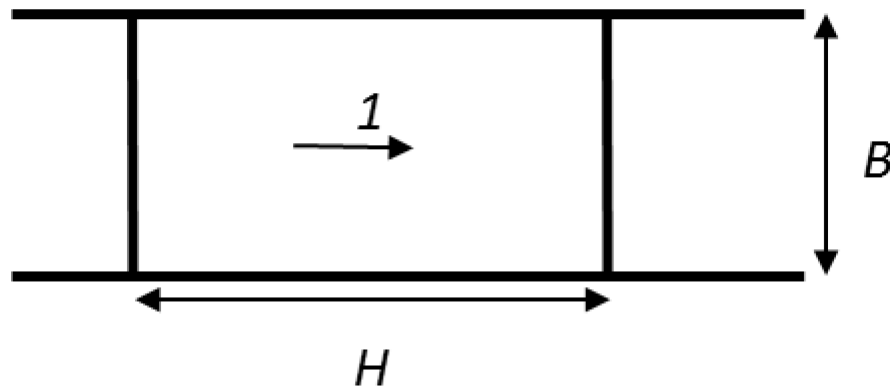
Note 1 to entry: In French called 'glace' and in German 'Floatglas'.

**3.3 rolled glass ceramics**

flat, transparent or translucent, clear or tinted glass ceramics obtained by continuous casting and rolling

**3.4 length, H and width, B**

defined with reference to the direction of draw of the glass ribbon as shown in Figure 1

**Key**

1 → - direction of draw

H - length

B - width

**Figure 1 — Relationship between length, width and direction of draw****3.5****stock sizes**

glass ceramics delivered in manufacturer's standard stock sizes

**3.6****supplied size**

pane of glass ceramics that has been supplied either as raw material for further processing and/or cutting down to a size for installation

Note 1 to entry: This is a size outside the stock size.

**3.7****final cut size**

pane of glass ceramics that has been cut down to the dimensions being required either for installation or processing into a final product

Note 1 to entry: Examples of processed final products are insulating glass units or laminated glass of those dimensions.

**3.8****optical fault**

fault which lead to distortions on the appearance of objects observed through the glass ceramics

**3.9****visual fault**

fault which alter the visual quality of the glass ceramics

Note 1 to entry: Visual faults include spot faults and linear / extended faults.

**prEN 1748-2-1:2017 (E)****3.10****spot fault**

nucleus which is generally accompanied by a halo of distorted glass

Note 1 to entry: Spot fault can be solid inclusions, bubbles, etc.

**3.11****halo**

area locally distorted, generally around a point defect

**3.12****linear / extended fault**

fault which can be on or in the glass ceramics, in the form of deposits, marks or scratches that occupy an extended length or area

**3.13****edge defect**

defect which can occur on the edge of a cut size piece in the form of entrant and emergent fault and/or bevel

**3.14****concentration**

**c**  
sum of the lengths of gaseous inclusions > 1,0 mm in any circle of 400 mm diameter

**4 Chemical composition**

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**4.1 General**

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The special basic products covered by this European Standard are all manufactured from glass ceramics.

The magnitude of the proportions by mass of the constituents of glass ceramics covered by this standard is given in Table 1, see also Annex A.

NOTE Oxygen is not mentioned in Table 1 (see Annex A).



**Table 1 — Magnitude of the proportions by mass of the constituents of glass ceramics**

Constituents	Proportion by mass of element
Silicon (Si)	23 % - 38 %
Aluminium (Al)	7,9 % - 14,5 %
Lithium (Li)	0 % - 2,4 %
Sodium (Na)	0 % - 1,5 %
Calcium (Ca)	0 % - 5,8 %
Magnesium (Mg)	0 % - 4,9 %
Zinc (Zn)	0 % - 4,1 %
Potassium (K)	0 % - 1,7 %
Zirconium (Zr)	0 % - 3,7 %
Titanium (Ti)	0 % - 3,0 %
Barium (Ba)	0 % - 7,2 %
Other components excluding oxygen <sup>a</sup>	< 5 %

<sup>a</sup> Properties other than photometric characteristics shall not be significantly altered by these other components

## 4.2 Tint

Body tinted glass ceramics is obtained by the addition of suitable materials.

## 5 Physical and mechanical characteristics

### 5.1 General characteristics

Conventional numerical values for the physical and mechanical characteristics of glass ceramics excluding 'Characteristic bending strength ( $f_{g,k}$ ) are given in Table 2. These values are not precise requirements with which the glass ceramics shall strictly comply, but are the generally accepted figures for use in calculations where a high degree of accuracy is not required.

Table 2 — Physical and mechanical characteristics of glass ceramics

Characteristic	Symbol	Value and unit
Density (at 18°C)	$\rho$	2400 kg/m <sup>3</sup> to 2600 kg/m <sup>3</sup>
Hardness (Knoop)	$HK_{0,1/20}$	600 - 750 <sup>a</sup>
Young's modulus (modulus of elasticity)	$E$	$9 \times 10^{10}$ Pa
Poisson's ratio	$\mu$	0,2
Specific heat capacity	$C_p$	$0,8 - 0,9 \times 10^3$ J/(kg*K)
Nominal value of average coefficient of linear expansion between 20°C and 300°C	$\alpha$	Zero
Resistance against temperature differential and sudden temperature change		650 K <sup>b</sup>
Thermal conductivity	$\lambda$	1,5 - 1,7 W/(m*K)
Mean refractive index to visible radiation (at 589,3 nm)	$n$	1,5
Emissivity (corrected)	$\varepsilon$	0,837
<sup>a</sup> Knoop Hardness in accordance with ISO 9385. <sup>b</sup> Generally accepted value that is influenced by edge quality.		

## 5.2 Characteristic bending strength

The characteristic bending strength value applies to quasi-static loading over a short time, e.g. wind loading, and relate to a 5 % probability of breakage at the lower limit of the 95 % confidence interval.

The value of the characteristic bending strength,  $f_{g,k}$  for floated glass ceramics is 45 MPa, the value of the characteristic bending strength,  $f_{g,k}$  for rolled glass ceramics is 25 MPa.

NOTE Methods of determination of the bending strength of glass are given in EN 1288-1, EN 1288-2, (see [1] and [2]). Design of glass panes is covered by prEN 16612 (see [3]).

## 5.3 Designation of clear glass ceramics

### 5.3.1 General

A glass ceramics product is designated as clear glass ceramics when it is not tinted and when the light transmittance of the glass ceramics material, unmodified by the possible presence of a coating or surface roughness of, for example, a rolled glass ceramics complies with 5.3.2 and 5.3.3.

In order to measure the light transmittance characteristics of glass ceramics, to determine whether it can be designated as clear glass ceramics, it is necessary, in some cases, to carry out a pre-treatment such as the following:

- coatings on smooth surfaces shall be eliminated, without modifying the thickness of the glass ceramics substrate;
- rough surfaces, with or without coatings, shall be eliminated by smoothing and polishing. The thickness of the glass ceramics will be modified by this process.

The light transmittance of the glass ceramics substrate shall be measured with its surfaces in a polished condition.

NOTE The light transmittance values given in 5.3.2 and 5.3.3 are not suitable for design. They are values used only for the designation of clear glass ceramics and exclude the effects of coatings and of surface roughness. The values of light transmittance used for design can be obtained from the glass ceramics manufacturer. They are determined in accordance with EN 410.

### 5.3.2 Clear transparent glass ceramics

A transparent glass ceramics product is designated as clear glass ceramics when it is not tinted and when its light transmittance:

- after any necessary pre-treatment,
- measured according to EN 410 and
- rounded to the nearest 0,01

is greater than or equal to the value given in Table 3 for the nominal thickness of the glass ceramics product.

NOTE The limiting value given in Table 3 is appropriate provided that the measured thickness of the glass ceramics product is within the allowable tolerances for the nominal thickness of that glass ceramics product.

**Table 3 — Minimum light transmittance values for designating a transparent glass ceramics product as clear**

Nominal thickness in mm	Minimum value
3	0,81
4	0,80
5	0,77
6	0,75
7	0,73
8	0,70

### 5.3.3 Clear translucent glass ceramics

A translucent glass ceramics product is designated as clear glass ceramics when it is not tinted and when its light transmittance:

- after any necessary pre-treatment,
- measured according to EN 410 and
- rounded to the nearest 0,01;

is greater than or equal to the value obtained by linear interpolation from Table 4, for the measured thickness of the specimen.

NOTE The limiting value will vary with the exact thickness of the specimen after its pre-treatment.