SIST

SLOVENSKI STANDARD
oSIST prEN ISO 1288-2:2014

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Steklo v stavbah - Ugotavljanje upogibne trdnosti stekla - 2. del: Metoda soosnega dvojnega obroča na ravnem steklu z velikimi površinami (ISO/DIS 1288-2:2014)

Glass in building - Determination of the bending strength of glass - Part 2: Coaxial double -ring test on flat specimens with large test surface areas (ISO/DIS 1288-2:2014)

Glas im Bauwesen - Bestimmung der Biegefestigkeit von Glas - Teil 2: Doppelring - Biegeversuch an plattenförmigen Proben mit großen Prüfflächen (ISO/DIS 1288-2:2014)

Verre dans la construction - Détermination de la résistance du verre à la flexion - Partie 2: Essais avec doubles anneaux concentriques sur éprouvettes planes, avec de grandes surfaces de sollicitation (ISO/DIS 1288-2:2014)

Ta slovenski standard je istoveten z: **prEN ISO 1288-2 rev**

ICS:

81.040.20 Steklo v gradbeništvu Glass in building

oSIST prEN ISO 1288-2:2014 **en**

DRAFT INTERNATIONAL STANDARD
ISO/DIS 1288-2

ISO/TC **160**/SC **2** Secretariat: **ANSI**

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Glass in building — Determination of the bending strength of glass —

Part 2: Coaxial double-ring test on flat specimens with large test surface areas

Verre dans la construction — Détermination de la résistance du verre à la flexion —

Partie 2: Essais avec doubles anneaux concentriques sur éprouvettes planes, avec de grandes surfaces de sollicitation

ICS: 81.040.20

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

Reference number
ISO/DIS 1288-2:2013(E)

Contents

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 1288 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 1288-2 was prepared by Technical Committee ISO/TC 160, *Glass in building*, Subcommittee SC 2, *Use considerations*

ISO 1288 consists of the following parts, under the general title *Glass in building — Determination of the bending strength of glass*:

— *Part 1: Fundamentals of testing glass*

— *Part 2: Coaxial double ring test on flat specimens with large test surface areas*

— *Part 3: Test with specimen supported at two points* ***(four point bending)***

— *Part 4: Testing of channel shaped glass*

— *Part 5: Coaxial double ring test on flat specimens with small test surface areas*

This Standard has been based on EN 1288-2 *Glass in building - Determination of the bending strength of glass" - Part 2 : Coaxial double ring test on flat specimens with large test surface areas* prepared by Technical Committee CEN/TC 129 "Glass in building"/WG8 "Mechanical Strength".

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

Glass in building — Determination of the bending strength of glass — Part 2: Coaxial double ring test on flat specimens with large test surface areas

1 Scope

This International Standard specifies a method for determining the bending strength of glass for use in buildings, excluding the effects of the edges.

The limitations of this part of this International Standard are described in ISO 1288-1.

ISO 1288-1 should be read in conjunction with this part of this International Standard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 1288. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 1288 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1288-1, *Glass in building - Determination of the bending strength of glass - Part 1 : Fundamentals of*

ISO 16293-1: *Glass in building – Basic soda lime silicate glass products – Part 1: Definitions and general physical and mechanical properties*

ISO 48, *Rubber, vulcanised or thermoplastic - Determination of hardness (hardness between 10 IRHD and 100 IRHD)*

3 Terms and definitions

For the purposes of this part of ISO 1288, the following terms and definitions apply.

3.1
bending stress
the tensile bending stress induced in the surface of a specimen

NOTE For testing purposes, the bending stress should be uniform over a specified part of the surface.

3.2
effective bending stress
a weighted average of the tensile bending stresses, calculated by applying a factor to take into account non-uniformity of the stress field

3.3
bending strength
the tensile bending stress or effective bending stress which leads to breakage of the specimen

3.4
equivalent bending strength
the apparent bending strength of patterned glass, for which the irregularities in the thickness do not allow precise calculation of the bending stress

4 Symbols (and abbreviated terms)

A	Effective surface area of quasi-uniform stress	m^2
E	Modulus of elasticity (Young's modulus) of the specimen.	Pa
	NOTE for soda lime silicate glass (see EN 572-1) a value of 70 GPa is used.	
F	Piston force	N
F_{max}	Piston force upon breakage, "breaking force"	N
F_{ring}	Force transmitted by the loading ring to the specimen, "ring load"	N
h	Thickness or average thickness of specimen	m
L	Side length of the square specimens	m
μ	Poisson number of specimen	
	NOTE for soda lime silicate glass (see EN 572-1) a value of 0,23 is used.	
p	Gas pressure on the surface area defined by the loading ring	Pa
$p(F)$	Nominal gas pressure as a function of the piston force	Pa
$p_{max}(F_{max})$	Nominal gas pressure upon breakage	Pa
r	Location co-ordinate	m
r_1	Radius of loading ring	m
r_2	Radius of supporting ring	m
r_{3m}	Average specimen radius (for evaluation)	m
σ	Stress	Pa
σ_{bB}	Bending strength	Pa
σ_{beqB}	Equivalent bending strength	Pa
t	Time	s
$\Delta F/\Delta t$	Rate at which piston force rises	N/s
F^*, p^*, σ^*	Non-dimensional quantities corresponding to F, p and σ (see equations (1) to (5))	

5 Principle of test method

The square specimen, of side length, L, and having virtually plain parallel surfaces, is placed loosely on a supporting ring (a circular ring with a radius r_2). The specimen is subjected to a load, F_{ring}, by means of a loading ring (radius r_1), which is arranged concentrically to the supporting ring. In addition, the area, A, defined by the loading ring $0 < r < r_1$ is placed under gas pressure, p, which has a specific relationship with the ring load, F_{ring} (see figure 1).

When the specimen is subjected to the ring load and the associated gas pressure, depending upon the dimensions r_1, r_2, L, and h, a radial tensile stress field, which is sufficiently homogeneous for the test purpose, is developed on the convexly bent surface over the area defined by the loading ring (see [1], [2], [3] of annex B). The tangential tensile stress is equal to the radial tensile stress at the central point (r=0) of the specimen, but decreases as the radius, r, increases.

Outside the loading ring, the radial and tangential stresses fall sharply towards the edge of the specimen, so that the risk of breakage outside the loading ring is low. On the edge of the specimen itself, the radial stress is zero and the tangential stress is a compressive stress, this being the case on both the concavely and the convexly bent sides of the specimen. The edge of the specimen is thus always under tangential compressive stress (see ISO 1288-1).

By increasing the force, F, and the gas pressure, p, the tensile stress in the central part of the specimen is increased at a constant rate (see (6.1b)) until breakage, so the origin of the break can be expected to occur in the surface area subjected to maximum tensile stress within the loading ring.

NOTE With the test apparatus as shown in figure 1, a force, pA, acts against the piston force, F, due to the gas pressure, p. The force transferred by the loading ring is $F_{ring} = F - pA$. Thus a distinction should be made between the piston force and the ring load.

The bending strength, σ_{bB}, or equivalent bending strength, σ_{beqB}, is calculated from the maximum value, F_{max}, of the piston force, measured at the time of breakage, and the thickness, h, of the specimen, taking into account the prescribed dimensions of the specimen and various characteristic material values. This assumes that the gas pressure, p, follows the piston force, F, according to the nominal function $p(F)$, (see figure 3).

6 Apparatus

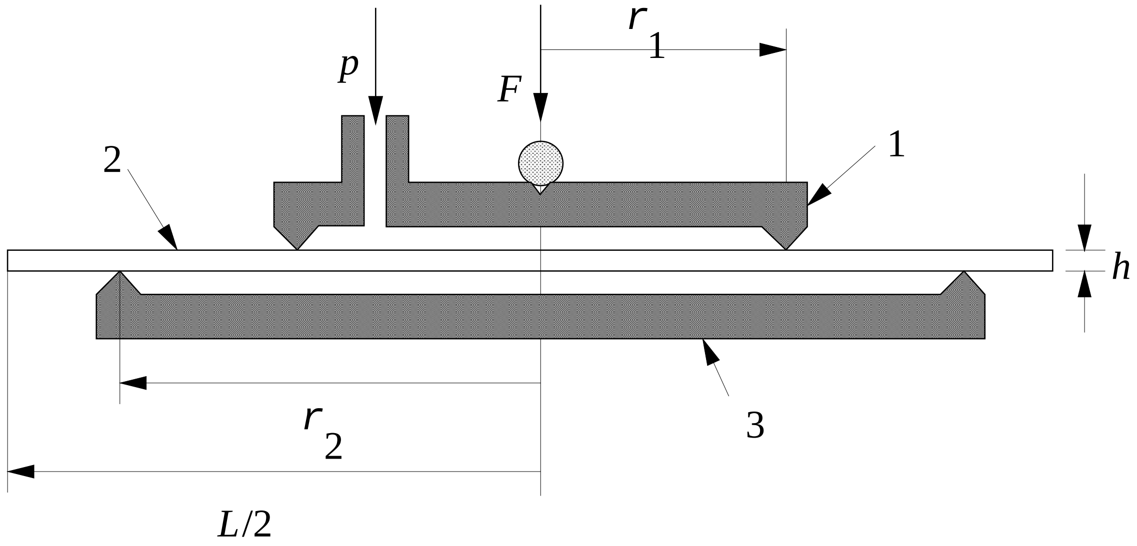
6.1 Testing machine

The bending test shall be carried out using a suitable bending testing machine, which shall incorporate the following features:

a) The stressing of the specimen shall be capable of being applied from zero up to a maximum value in a manner which minimizes shock and is stepless;

b) The stressing device shall be capable of the specified rate of stressing;

c) The testing machine shall incorporate a load measuring device with a limit of error of ± 2,0 % within the measuring range.

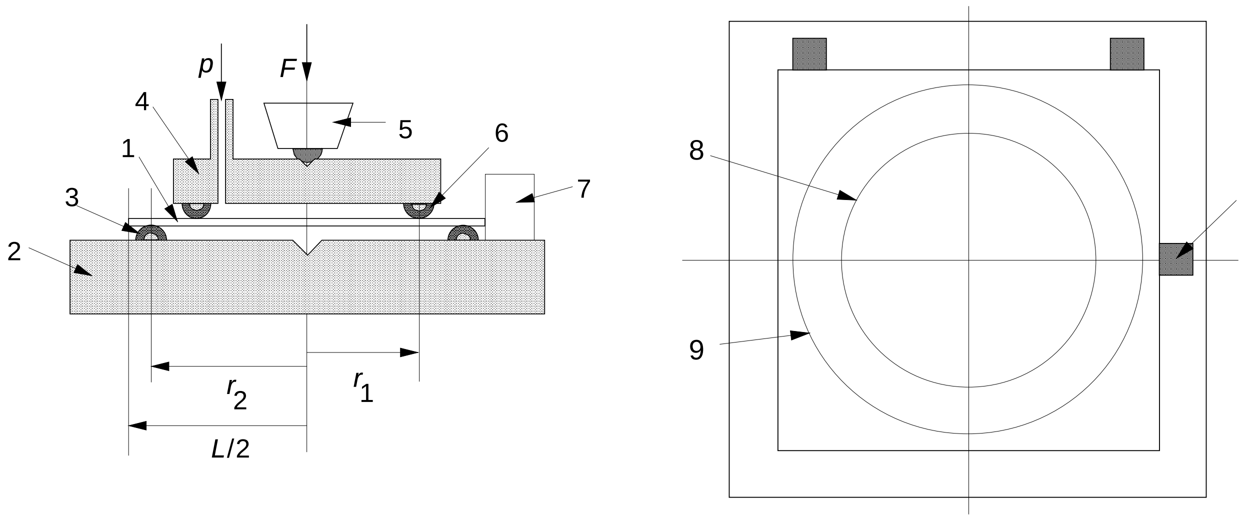


1: Loading ring

2: Specimen

3: Supporting ring

Figure 1 — Basic diagram of test apparatus



1 Specimen

2 Rigid base plate, preferably made of steel, with supporting ring (radius r_2).[1]

3 Rubber profile, adapted to the supporting ring, 3 mm thick, with a hardness (40 ± 10) IRHD (in accordance with ISO 48).

4 Rigid loading ring (radius r_1), preferably made of steel.[1]

5 Force transmitting component, with a ball mechanism to ensure the force is centred in the loading ring.

6 Rubber profile, adapted to the loading ring, 3 mm thick with a hardness (40 ± 10) IRHD (in accordance with ISO 48).[2]

7 Adjustment jaws for centring the specimen.[3]

8 Contact circle of the loading ring

9 Contact circle of the supporting ring

NOTE 1 The radius of curvature of the bearing surface of the ring is 5 mm.

NOTE 2 In the case of specimens which are patterned on the loading ring side, a sponge rubber profile approximately 5 mm thick should also be used to ensure an adequate seal for the gas pressure.

NOTE 3 The jaws are removed before the bending test is started, in order that the edge of the specimen is not clamped.

Figure 2 — Loading device