SLOVENSKI STANDARD
SIST EN 13541:2001

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Steklo v stavbah - Varnostna zasteklitev - Preskušanje in razvrščanje odpornosti proti zvočnemu tlaku pri eksploziji

Glass in building - Security glazing - Testing and classification of resistance against explosion pressure

Glas im Bauwesen - Sicherheitssonderverglasung -Prüfverfahren und Klasseneinteilung des Widerstandes gegen Sprengwirkung

Verre dans la construction - Vitrage de sécurité - Mise a essai et classification de la résistance a la pression d'explosion

Ta slovenski standard je istoveten z: **EN 13541:2000**

ICS:

13.230	Varstvo pred eksplozijo	Explosion protection
81.040.20	Steklo v gradbeništvu	Glass in building

SIST EN 13541:2001 **en**

EUROPEAN STANDARD
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English version

Glass in building - Security glazing - Testing and classification of resistance against explosion pressure

Verre dans la construction - Vitrage de sécurité - Mise à essai et classification de la résistance à la pression d'explosion

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This European Standard was approved by CEN on 16 August 1999.

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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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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This European Standard 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of an identical text or by endorsement, at the latest by May 2001, and conflicting national standards shall be withdrawn at the latest by May 2001.

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, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

The choice of an explosion pressure resistant glazing material (e.g. security glazing product) in an individual case should be established by the user. Experts in the field of explosions are able to determine in most situations the expected level and duration of the shock wave, based on the type of explosion and the distance from the heart of the explosion.

The classification of explosion pressure resistance is based on the maximum positive pressure of the reflected shock wave and the duration of the positive pressure phase.

1 Scope

This standard specifies a test method, performance requirements and classification for explosion pressure resistant glazing for use in buildings .

The explosion pressure resistant glazing is intended to offer resistance against explosive with respect to human safety.

This standard concerns a method of test against blast waves generated using a shock tube or similar facility to simulate a high explosive detonation.

The classification is only valid for the tested glass sizes of about 1 m^2. Based on theoretical considerations and/or experimental work, the results can be used for estimating the explosion-pressure-resistance of other glass sizes.

NOTE 1 In order to also ensure a certain resistance against flying fragments, reference can be made to EN 356.

NOTE 2 The resistance classes are not assigned to specific situations. For each individual case the specifier, if necessary with the help of experts in the field of explosion, should be consulted.

NOTE 3 The protection provided by explosion-resistant-glazing not only depends on the product itself, but also on the design and fixing of the glass.
In prEN 12488, prEN 13123-1, prEN 13124-1, WI 00033086, WI 00033087, respectively, recommendations are given for proper installation of security glazing*).

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 in it by amendment or revision. For undated references, the latest edition of the publication referred to applies (including amendments).

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 standard, the following terms and definitions apply.

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*) See bibliography.

3.1
explosion pressure resistant glazing
security glazing that affords a defined resistance against a specified explosive blast

NOTE The glass and/or plastics component of an explosion pressure resistant glazing unit may be separated by air spaces.

3.2
sample
a number of nominally identical glazing units on which type testing is performed for a certain explosion pressure class

3.3
shock tube
tube with sufficient dimensions and rigidity in order to generate a plane shock wave as from a spherical detonation

3.4
test piece
one member of the sample prepared for testing

3.5
attack face
face of the explosion pressure resistant glazing, marked by the manufacturer and/or supplier, that is designed to face the explosive blast

4 Classification and designation

Table 1 specifies the classification of and the appropriate test conditions for explosion pressure resistant glazing.

If all three test pieces of the sample fulfil the performance requirements of a certain class according to clause 6, and the test conditions lie within the tolerance given in Table 1, then the security glazing product may be classified in the relevant class.

Table 1 - Classification of explosion-pressure-resistant glazing

Classification Code	Characteristics of the plane shock wave		
	Positive maximum overpressure of the reflected blast wave Pr (kPa)	Positive specific impulse i_+ (kPa . ms)	Duration of the positive pressure phase t_+ (ms)
ER1	$50 \leq Pr < 100$	$370 \leq i_+ < 900$	≥ 20
ER2	$100 \leq Pr < 150$	$900 \leq i_+ < 1500$	≥ 20
ER3	$150 \leq Pr < 200$	$1500 \leq i_+ < 2200$	≥ 20
ER4	$200 \leq Pr < 250$	$2200 \leq i_+ < 3200$	≥ 20

NOTE 1 The specific impulse (i_+) results from the pressure-time history versus time, in accordance with prEN 13123-1 and prEN 13124-1.

$$i_+ = \int_0^{t+} p(t) \cdot dt = Pr \cdot t_+ \left\{1/A - 1/A^2 \left[1 - \exp(-A)\right]\right\}$$

where :

Pr is the positive maximum overpressure;
t_+ is the duration of the positive pressure phase;
A is the wave form parameter (values lie between 0 and 4).

NOTE 2 No extrapolation can be made for bigger samples.

5 Test pieces for type testing

5.1 Type, dimensions and marking

The construction and materials of the test pieces shall comply with the specification of the manufacturer.

The test pieces (or the sample) submitted for type testing shall be representative of the normal production quality.

The dimensions of the test pieces shall be:

- length (1100 ± 5) mm;
- width (900 ± 5) mm;

The edges of the test pieces shall be arrissed for ease of handling.

Every test piece shall be clearly marked to identify the product. The attack face shall be marked by the supplier.

5.2 Number of test pieces

The sample submitted for type testing shall consist of three test pieces for each attack face and each class for which testing shall be required.

NOTE To ensure against invalid test results because of invalid test performance it is advisable to submit at least one extra test piece.

6 Requirements

Each of the 3 test pieces of a sample, according to clause 5, submitted for testing, shall comply with the following requirements when tested according to clause7:

- the test piece shall not have any "through" holes, from the front to the back;
- there shall not be any opening between the clamping frame and the edges of the test piece.

NOTE An opening between the clamping frame and the edges of the test piece can be caused by insufficient clamping pressure. If so, the test can be repeated with a higher clamping pressure. In this case the test report shall state the applied clamping pressure.

7 Test Method

7.1 Apparatus

7.1.1 Specimen holder

The specimen holder shall be intrinsically rigid, and rigidly fixed onto a solid foundation and/or into solid masonry.

The specimen holder shall have facilities to ensure:

- plane parallel clamping of the test piece in a vertical position;
- support of the test piece only by the frame;
- clamping of the edges on all sides over an edge width of (50 $\pm$ 10) mm;
- clamping between rubber strips of (50$\pm$2) mm wide and (4$\pm$1) mm thick, and hardness (50$\pm$10) IRHD in accordance with ISO 48;
- a clamping pressure of (14 $\pm$ 3) N/cm^2;