



# SLOVENSKI STANDARD

## SIST EN 1402-5:2004

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### Neoblikovani ognjevzdržni izdelki - 5. del: Priprava vzorcev za preskus

Unshaped refractory products - Part 5: Preparation and treatment of test pieces

Ungeformte feuerfeste Erzeugnisse - Teil 5: Herstellung und Behandlung von Probekörpern

Produits réfractaires non façonnés - Partie 5. Préparation et traitement des éprouvettes

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#### **ICS:**

81.080      Ognjevzdržni materiali      Refractories

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 1402-5**

October 2003

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Supersedes ENV 1402-5:1999

English version

## Unshaped refractory products - Part 5: Preparation and treatment of test pieces

Produits réfractaires non façonnés - Partie 5: Préparation et traitement des éprouvettes

Ungeformte feuerfeste Erzeugnisse - Teil 5: Herstellung und Behandlung von Probekörpern

This European Standard was approved by CEN on 20 June 2003.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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 1402-5:2003 (E)****Foreword**

This document (EN 1402-5:2003) has been prepared by Technical Committee CEN/TC 187 "Refractory products and materials", the secretariat of which is held by BSI.

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of an identical text or by endorsement, at the latest by April 2004, and conflicting national standards shall be withdrawn at the latest by April 2004.

This document supersedes ENV 1402-5:1999.

EN 1402 "*Unshaped refractory products*" consists of eight parts:

— *Part 1: Introduction and classification*

— *Part 2: Sampling for testing*

— *Part 3: Characterization as received*

— *Part 4: Determination of consistency of castables*

— *Part 5: Preparation and treatment of test pieces*

— *Part 6: Measurement of physical properties*

— *Part 7: Tests on pre-formed shapes*

— *Part 8: Determination of complementary properties*

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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, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

## Introduction

The values of the properties obtained using these test-pieces are used to assess the homogeneity of unshaped materials. They are reference values which do not necessarily correspond with those obtained in industrial applications. Other methods of test-piece preparation or treatment, which differ from those specified by this standard, can lead to different values.

## 1 Scope

This part of this European Standard specifies methods for the preparation and treatment (curing, drying and firing) of test pieces from unshaped refractory materials. The dimensions of the test pieces are specified.

The methods are applicable to dense and insulating castables and to ramming materials with the four types of chemical composition defined in EN 1402-1.

The dimensions of the test pieces are stated and the preparation of the mixture, compaction methods, storage and post-treatment of the test pieces are described.

## 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).

EN 993-3, *Methods of test for dense shaped refractory products - Part 3: Test methods for carbon-containing refractories.*

EN 1402-1, *Unshaped refractory products - Part 1: Introduction and classification.*

EN 1402-2, *Unshaped refractory products - Part 2: Sampling for testing.*

EN 1402-4, *Unshaped refractory products - Part 4: Determination of consistency of castables.*

## 3 Dimensions of test pieces

Shape A: Length: 230 mm; width: 114 mm; thickness: 64 mm;

Shape B: Length: 230 mm; width: 64 mm; thickness: 54 mm;

Shape C: Length: 230 mm; width: 64 mm; thickness: 64 mm.

The width of the test piece as tested shall correspond to the height during preparation. The vibration of the test piece during preparation shall be recorded, and for shape C the compaction surface shall be marked for reference. The selection of test pieces for each type of material shall be as given in Table 1, except that for basic dense castables and ramming materials, test pieces with a diameter of 50 mm and height of  $50 \text{ mm} \pm 1 \text{ mm}$  are permissible. Shape C shall be used as the referee shape.

Table 1 — Type of shape for tests

Castables	Dense Castables	Max Grain Size <15 mm		Shape B or C	Shape A
			Direct Characterization <sup>b</sup>	X	
			Other tests		X
		Max Grain Size >15 mm	Direct Characterization <sup>b</sup>	X <sup>a</sup>	
			Other tests		X
	Insulating castables			X	
Ramming Materials	Ramming mixes		X		
	Plastics		X		
<sup>a</sup> For these materials, shapes B and C are prepared by cutting from shape A. <sup>b</sup> Tests for which results are directly obtained from the bars without size modifications are modulus of rupture, cold compressive strength, and permanent change in dimensions on heating.					

## 4 Apparatus

### 4.1 Separator

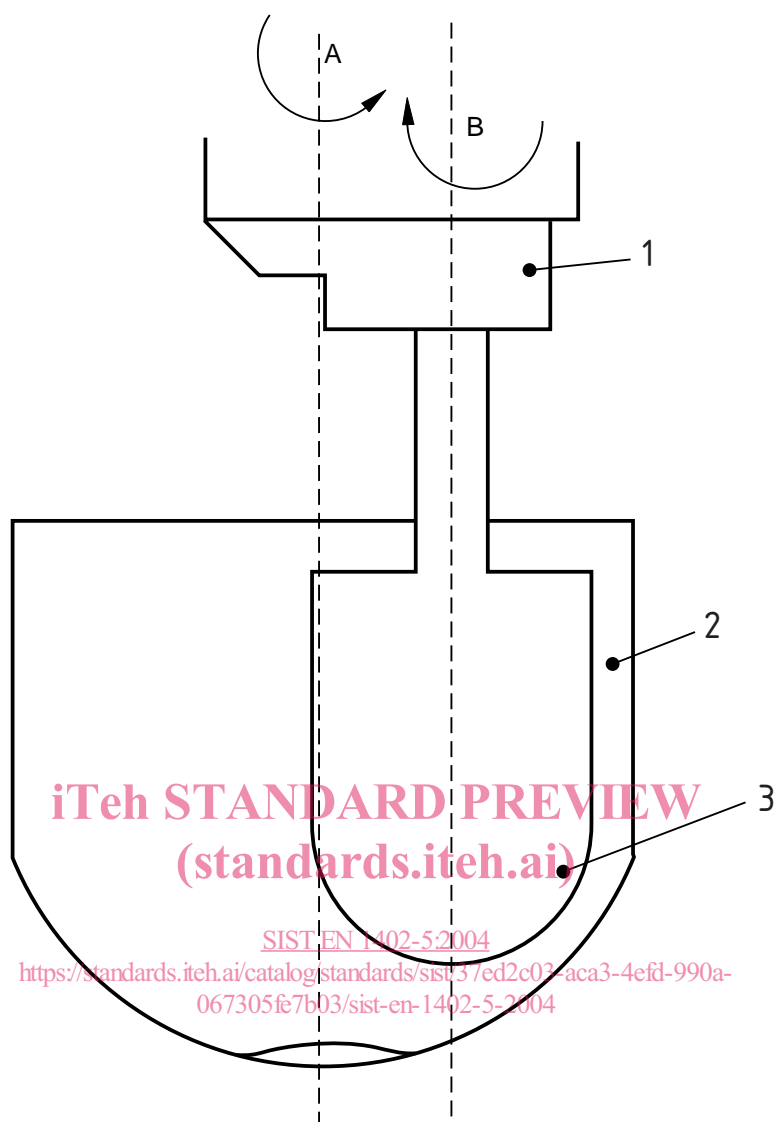
A riffle sampler, suitable for use with the maximum particle size of the product, or a shovel for the quartering method. The riffle separation shall be at least 2,5 times the maximum grain size.

### 4.2 Mixer

#### 4.2.1 Pan

See Figure 1. The pan shall be symmetrical around axis A and shall have a capacity of 15 l to 30 l. Both the pan and the mixing blade (see 4.2.2) shall be constructed from a material that does not react with the test material.





### Key

- 1 Drive
- 2 Pan
- 3 Mixing blade

**Figure 1 — Principle of the mixer**

#### 4.2.2 Mixing blade

The shape of the mixing blade shall be adapted to the internal dimensions of the pan. The radius swept shall be such that the distance between the blade and the wall of the pan and the space between the blade and the bottom of the pan are at least as large as the maximum grain size of the material. For products with a maximum grain size of 6 mm or less, the distance between the blade and the wall shall be 6 mm. For products with larger grain sizes (up to 25 mm), the blade is used in a manner such that the distance to the wall of the pan is 25 mm.

The mixing blade shall revolve at a speed between 40 r/min and 65 r/min around axis A (the symmetry axis of the mixing pan), the blade rotating simultaneously in the opposite direction at a speed between 120 r/min and 145 r/min around axis B (symmetry axis of the blade).

**EN 1402-5:2003 (E)****4.3 Vibrating table**

The vibrating table shall be flat and horizontal and shall perform only uniaxial vertical vibrations at a frequency of 50 Hz. The table shall be capable of being set at a double amplitude of 0,75 mm for regular castables and of 0,50 mm for deflocculated castables (see EN 1402-1) with an accuracy of  $\pm 0,05$  mm for the entire procedure. There shall be an automatic adjustment to the required double amplitude despite the weight of the mould.

**4.4 Pneumatic rammer**

A compressed-air rammer shall have a rammer foot suitable for the width of the mould and having a smooth, flat working surface, i.e. 52 mm  $\times$  25 mm for shape B and 62 mm  $\times$  25 mm for shape C.

The mass of the rammer and the frequency of ramming shall be chosen in order to obtain a prescribed green bulk density, which shall be reported in the test report.

**4.5 Sand rammer**

A device known as a 'sand-rammer' shall be used consisting of a mould 50 mm inside diameter, and 140 mm in length, a 6,67 kg  $\pm$  50 g weight sliding on the shaft of the apparatus and arranged to fall a distance of 50 mm before engaging a collar attached to the shaft. At the lower end of the shaft there is a plunger, the diameter of which is about 0,3 mm smaller than the inside diameter of the mould (see Figures 2 and 3).

NOTE A more detailed description of this piece of apparatus is given in EN 1402-3.

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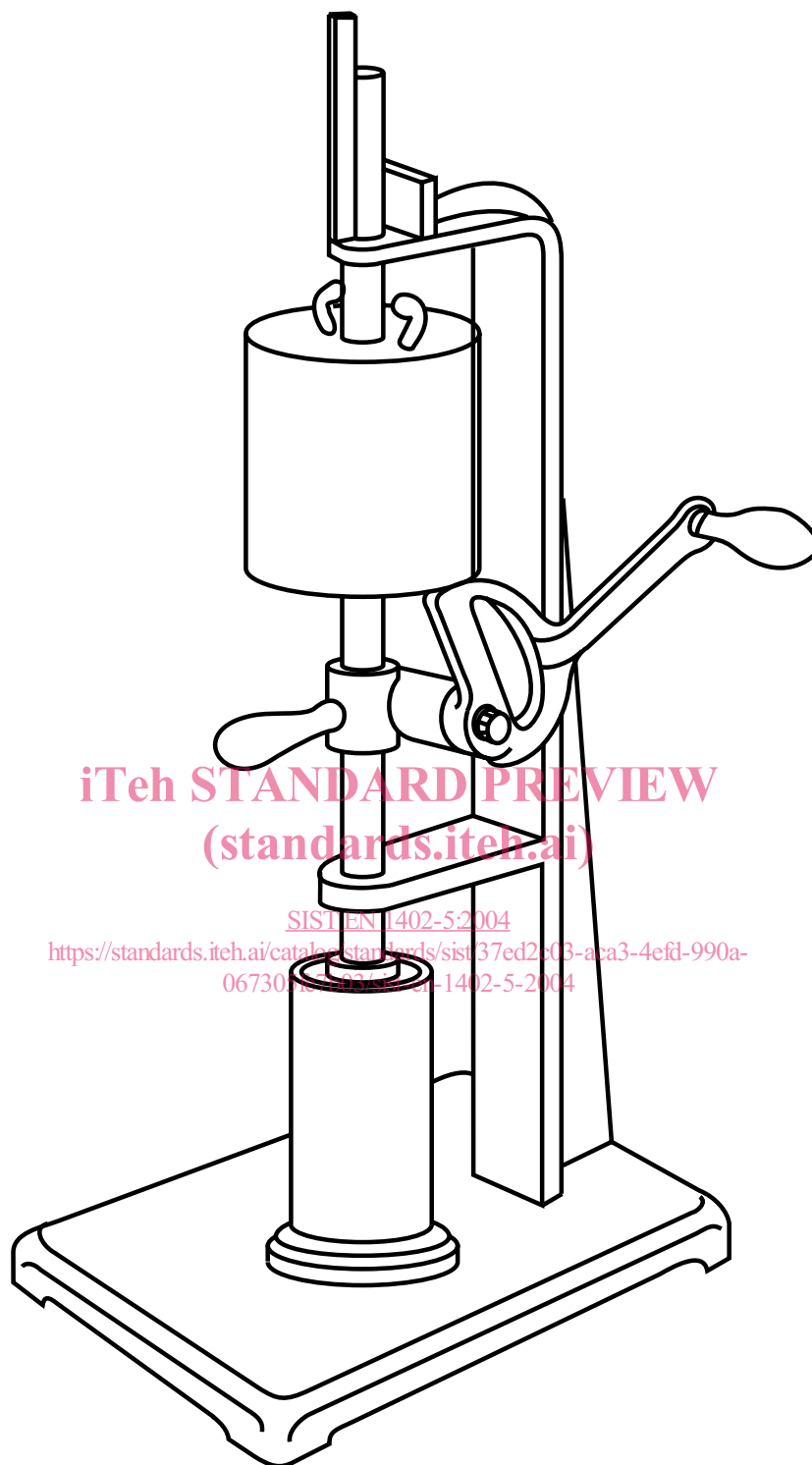


Figure 2 — Sand-rammer for shaping ramming mixes test pieces