SLOVENSKI STANDARD
SIST EN 1094-6:2000

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Toplotnoizolacijski ognjevzdržni izdelki - 6. del: Ugotavljanje trajnih sprememb mer oblikovanih izdelkov pri segrevanju (ISO 2477:1987, modificiran)

Insulating refractory products - Part 6: Determination of permanent change in dimensions of shaped products on heating (ISO 2477:1987 modified)

Feuerfeste Erzeugnisse für Isolationszwecke - Teil 6: Bestimmung der bleibenden Längenänderung geformter Erzeugnisse nach Temperatureinwirkung (ISO 2477:1987 modifiziert)

Produits réfractaires isolants - Partie 6: Détermination de la variation permanente de dimensions des produits façonnés sous l'action de la chaleur (ISO 2477:1987 modifiée)

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81.080 Ognjevzdržni materiali Refractories

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Insulating refractory products - Part 6: Determination of permanent change in dimensions of shaped products on heating (ISO 2477:1987 modified)

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This European Standard was approved by CEN on 4 September 1998.

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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 Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This European Standard 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of an identical text or by endorsement, at the latest by March 1999, and conflicting national standards shall be withdrawn at the latest by March 1999.

It is closely based on the text of the International Standard, ISO 2477 'Shaped insulating refractory products - Determination of permanent change in dimensions on heating'.

EN 1094 “Insulating refractory products” consists of seven Parts

Part 1 : Terminology for ceramic fibre products
Part 2 : Classification of shaped products
Part 3 : Classification of insulating products made from ceramic fibres (ENV)
Part 4 : Determination of bulk density and true porosity
Part 5 : Determination of cold crushing strength
Part 6 : Determination of permanent change in dimensions of shaped products on heating
Part 7 : Methods of test for ceramic fibre products (ENV)

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.

Endorsement notice

The text of the International Standard ISO 2477 : 1987 has been approved by CEN as a European Standard with agreed common modifications, as given below:

2 Normative references

- replace ISO 5016 by EN 1094-4;
- delete ISO 5022

5.4

- add electronic digital gauge to the list of length-measuring instruments.

5.5

- add “and is capable of being controlled at 110 °C ± 5 °C” to the description of the drying oven.

6.1 Sampling

- change to read:
“The number of items (e.g. bricks) to be tested shall be determined in accordance with a sampling plan agreed between interested parties. ”

7.4 Test temperature

- change to read:
“The test temperature shall be 750 °C or a higher temperature in multiples of 50 °C.”

7.5 Temperature measurement and distribution

- change the last sentence to read:

"The variation shown between the thermocouples shall not be greater than 10 °C. "

7.6
Heating

add c)

for gas fired furnaces, for test temperatures greater than or equal to 1500 °C:
from ambient temperature up to 1200 °C : between 5 °C /min and 20 °C /min;
from 1200 °C up to 50 °C below the test temperature: between 2 °C /min and 5 °C /min;
for the last 50 °C : between 1 °C /min and 2 °C/min.

For silica insulating products, the heating rate in the temperature range from ambient temperature up to 500 °C shall not exceed 1 °C/min, to avoid cracking.

1 Scope

This European Standard specifies a method for determining the permanent change in dimensions on heating of a shaped insulating refractory product.

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 in the publications listed hereafter. For dated references, subsequent amendments 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.

EN 1094-4 Insulating refractory products - Part 4 : Determination of bulk density and true porosity

ISO 5019-1 Refractory bricks - Dimensions - Part 1: Rectangular bricks

3 Definitions

For the purposes of this European Standard the following definitions apply.

3.1 permanent change in dimensions on heating : The expansion or contraction that remains in a shaped refractory product that is heated to a specified temperature for a specified time and then cooled to ambient temperature.

3.2 insulating refractory product : A refractory product having a true porosity greater than or equal to 45 % *(V/V)* when measured in accordance with EN 1094-4.

4 Principle

Test pieces in the shape of rectangular prisms are cut from each brick, or item, then dried and the distance between two opposite faces on each test piece is measured. The test pieces are heated in a furnace having an oxidizing atmosphere at a prescribed rate to a specified temperature, which is maintained for a specified time. After cooling to ambient temperature, the test pieces are measured again, and the permanent change in dimensions is calculated.

5 Apparatus

5.1 Furnace, either electric or gas-fired, capable of heating the test pieces described in 6.2, in a continuously oxidizing atmosphere, at the specified rate (see 7.6), and of maintaining the test temperature for the required time.

NOTE : The use of an electric furnace is recommended, but a gas-fired furnace can be used provided that the furnace atmosphere is continuously oxidizing and there is provision for monitoring this condition.

5.2 Thermocouples, a minimum of three, to measure the temperature and the temperature distribution over the space occupied by the test pieces.

5.3 Temperature/time registration device, for use in conjunction with the thermocouples (see 5.2), so that a continuous record of the temperature is obtained.

5.4 Length-measuring instrument, enabling measurements to be made of the distance between opposite faces of the test pieces to an accuracy of 0,1 mm, e.g. Vernier callipers, a dial-gauge comparator or electronic digital gauge.

5.5 Drying oven, which shall be fan-assisted, shall have openings which permit efficient ventilation, and is capable of being controlled at 110 °C ± 5 °C.

6 Test pieces

6.1 Sampling

The number of items (e.g. bricks) to be tested shall be determined in accordance with a sampling plan agreed between interested parties.

6.2 Preparation of test pieces

6.2.1 One test piece, comprising a rectangular prism having approximate dimensions 100 mm x 114 mm x 76 mm or 100 mm x 114 mm x 64 mm, shall be cut from each item.

NOTE : Where the size of the item permits, more than one test piece can be taken, although one per item is preferred.

6.2.2 If, owing to the size of the item, a test piece cannot be cut having the dimensions specified in 6.2.1, a rectangular test prism shall be obtained by cutting a 100 mm length from the item, and the width and thickness of the test piece shall be measured and recorded.

NOTE : Standard rectangular bricks in accordance with ISO 5019-1 have a width of 114 mm and a thickness of 76 mm or 64 mm.

6.2.3 The two opposite faces of the test piece (100 mm apart) shall be plane and parallel before the test.

7 Procedure

7.1 Drying of the test pieces

Dry each test piece in the drying oven (see 5.5) at 110 °C ± 5 °C to constant mass.

7.2 Measurement of test pieces

Make four measurements on each test piece, to the nearest 0,2 mm, of the distance, L_o,, between the two opposite faces nominally 100 mm apart. Make two of these measurements parallel to the centre lines (EF and GH in figure 1) of the top and bottom faces of the test pieces, approximately 15 mm in from the edges of those faces, and two parallel to the centre lines (AB and CD) of the front and rear faces of the test piece, approximately 15 mm in from the edges of those faces. Mark the positions of measurement with refractory paint.

7.3 Mounting of test pieces in the furnace

Place the test pieces in the furnace (see 5.1), each one resting on a 100 mm x 76 mm (or 100 mm x 64 mm) face and protected from direct radiation in an electrically heated furnace or from the flame of the gas burner in a gas-fired furnace. Do not superimpose test pieces one on another. To allow free circulation of the hot gases, the test pieces shall be separated from each other by a distance of not less than 50 mm, and shall be not nearer than 70 mm to the walls of the furnace.

The test pieces shall be placed in the furnace on bricks, 30 mm to 65 mm thick, of the same material as the test pieces, laid flat on the apices of two supports of triangular cross-section, 20 mm to 50 mm in height and about 80 mm apart, as shown in figure 1.

7.4 Test temperature

The test temperature shall be 750 °C or a higher temperature in multiples of 50 °C.

7.5 Temperature measurement and distribution

Using at least three thermocouples placed away from the walls of the furnace, away from the heaters and so as not to be in contact with any flames, measure and record the temperature distribution over the limits of the space occupied by the test pieces. The variation shown between the thermocouples shall not be greater than 10 °C.