

**Tihedate tulekindlate profiiltoodete  
katsemeetodid. Osa 10: Kuumenemisel  
tekkiva jäävdeformatsiooni määramine**

Methods of test for dense shaped refractory  
products - Part 10: Determination of permanent  
change in dimensions on heating

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

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| <p>Käesolev Eesti standard EVS-EN 993-10:2000 sisaldab Euroopa standardi EN 993-10:1997 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 11.01.2000 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p> | <p>This Estonian standard EVS-EN 993-10:2000 consists of the English text of the European standard EN 993-10:1997.</p> <p>This document is endorsed on 11.01.2000 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p> |
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| <p><b>Käsitlusala:</b><br/>See Euroopa standard kirjeldab kolme meetodit tihedate tulekindlate profiiltoodete kuumenemisel tekkiva jäävdeformatsiooni määramiseks.<br/><b>MÄRKUS.</b> Meetodit võib rakendada oksüdeeruvate materjalide korral. Siiski võib mõni neist materjalidest teimi jooksul niivõrd kahjustuda, et tema mõõtmete muutumise mõõtmise pole vajaliku täpsusega võimalik.</p> | <p><b>Scope:</b></p> |
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**ICS 81.080**

**Võtmesõnad:** kindlaksmääramine, moodus, mõõtmete püsivus, teimid, termilised teimid, tihedad tulekindlad profiiltooted, tulekindlad materjalid, tulekindlad profiilmaterjalid

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Descriptors: Refractory products, dimensional stability, testing.

**English version**

**Methods of test for dense shaped refractory products**

**Part 10: Determination of permanent change in dimensions on heating**

Méthodes d'essai pour produits  
réfractaires façonnés denses –  
Partie 10: Détermination de la varia-  
tion permanente de dimensions sous  
l'action de la chaleur

Prüfverfahren für dichte geformte  
feuerfeste Erzeugnisse – Teil 10:  
Bestimmung der bleibenden Längen-  
änderung nach Temperatureinwirkung

This European Standard was approved by CEN on 1997-10-16.

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 Central Secretariat or to any CEN member.

The European Standards exist 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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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

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## 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 May 1998, and conflicting national standards shall be withdrawn at the latest by May 1998.

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.

It is closely based on the corresponding International Standard, ISO 2478 'Dense shaped refractory products - Determination of permanent change in dimensions on heating', published by the International Organization for Standardization (ISO).

Reproducibility and repeatability data are not available at present but may be included in a subsequent edition.

EN 993 Methods of test for dense shaped refractory products consists of 18 Parts:

- Part 1 : Determination of bulk density and porosity of dense shaped products
- Part 2 : Determination of true density
- Part 3 : Test methods for carbon-containing refractories
- Part 4 : Determination of permeability to gases
- Part 5 : Determination of cold crushing strength
- Part 6 : Determination of modulus rupture at ambient temperature
- Part 7 : Determination of modulus rupture at elevated temperatures
- Part 8 : Determination of refractoriness-under-load
- Part 9 : Determination of creep in compression
- Part 10 : Determination of permanent change in dimensions on heating
- Part 11 : Determination of resistance to thermal shock (ENV)
- Part 12 : Determination of pyrometric cone equivalent
- Part 13 : Specification for pyrometric cones
- Part 14 : Determination of thermal conductivity (hot wire, cross-array)
- Part 15 : Determination of thermal conductivity (hot wire, parallel)
- Part 16 : Determination of resistance to acids
- Part 17 : Determination of bulk density of granular material (mercury method)
- Part 18 : Determination of bulk density of granular material (water method)

## 1 Scope

This European Standard describes three methods for the determination of the permanent change in dimensions on heating of dense shaped refractory products.

NOTE : The method can be applied to materials sensitive to oxidation. However, some of these materials can be affected during the test in such a way as to make the measurement of the dimensional changes impossible to carry out to the required accuracy.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at appropriate places in the text and the publications 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.

EN 993-1 : Methods of test for dense shaped refractory products - Part 1 : Determination of bulk density, apparent porosity and true porosity.

ISO 3611 : Micrometer callipers for external measurement.

## 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 dense shaped refractory products:** A refractory product having a true porosity of less than 45 % (v/v) when measured in accordance with EN 993-1.

## 4 Principle

Test pieces in the shape of rectangular prisms or cylinders are cut from each brick or item, then dried, and their linear dimensions (Methods 1 and 2) or volume (Method 3) 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 measurements on the test pieces are repeated, and the permanent change in dimensions or volume is calculated.