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

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN 993-10:2020 sisaldab Euroopa standardi EN 993-10:2020 ingliskeelset teksti.	This Estonian standard EVS-EN 993-10:2020 consists of the English text of the European standard EN 993-10:2020.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 07.10.2020.	Date of Availability of the European standard is 07.10.2020.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

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ICS 81.080

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EUROPEAN STANDARD

**EN 993-10**

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2020

ICS 81.080

Supersedes EN 993-10:1997

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 variation  
permanente de dimensions sous l'action de la chaleur

Prüfverfahren für dichte geformte feuerfeste  
Erzeugnisse - Teil 10: Bestimmung der bleibenden  
Längenänderung nach Temperatureinwirkung

This European Standard was approved by CEN on 1 September 2020.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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

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## European foreword

This document (EN 993-10:2020) 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 2021, and conflicting national standards shall be withdrawn at the latest by April 2021.

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

This document supersedes EN 993-10:1997.

The main change from the previous edition is the addition of precision data in clause 10 derived from a large scale interlaboratory study completed by 10 European laboratories.

Reproducibility and repeatability data are available only for a limited number of testing methods and materials, but may be complemented in subsequent editions.

The series of standards EN 993 'Methods of test for dense shaped refractory products' consists of 20 parts, some of which have been withdrawn and replaced by equivalent standards:

- *Part 1: Determination of bulk density and porosity*
- *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, ambient temperatures*
- *Part 7: Determination of modulus of rupture, elevated temperatures*
- *Part 8: Determination of refractoriness-under-load – withdrawn – replaced by EN ISO 1893*
- *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) – withdrawn – replaced by EN ISO 8894-1*
- *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)*
- *Part 19: Determination of thermal expansion by a differential method*

- Part 20: Determination of resistance to abrasion at ambient temperature – withdrawn – replaced by *EN ISO 16282*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

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## 1 Scope

This document specifies three methods for the determination of the permanent change in dimensions on heating of dense shaped refractory products.

NOTE The methods 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

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 13385-1, *Geometrical product specifications (GPS) — Dimensional measuring equipment — Part 1: Design and metrological characteristics of callipers*

ISO 5022, *Shaped refractory products — Sampling and acceptance testing*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <https://www.iso.org/obp>

— IEC Electropedia: available at <https://www.electropedia.org/>

### 3.1

#### **permanent change in dimensions on heating**

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

Note 1 to entry: Change is either on the basis of length ( $\Delta L$ ) or volume ( $\Delta V$ ).

[SOURCE: ISO 2477:2005, 3.1]

### 3.2

#### **dense shaped refractory product**

product with specific dimensions, having a true porosity of less than 45 % by volume, when measured in accordance with EN 993-1

### 3.3

#### **sample**

representative collection of items that can be obtained by sampling in accordance with ISO 5022

### 3.4

#### **item**

refractory brick or shape