

**Tihedate tulekindlate profiiltoodete  
katsemeetodid. Osa 12: Püromeetrilise  
koonuse ekvivalendi (tulekindluse)  
määramine**

Methods of test for dense shaped refractory  
products - Part 12: Determination of pyrometric cone  
equivalent (refractoriness)

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 993-12:2000 sisaldab Euroopa standardi EN 993-12:1997 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 993-12:2000 consists of the English text of the European standard EN 993-12:1997.</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> See standard esitab meetodi püromeetrilise koonuse ekvivalendi (tulekindluse) määramiseks tulekindlate materjalide korral, kaasa arvatud profiilmaterjalid ja ilma kindla kujuta materjalid. Selle kasulik rakendamise ulatus sõltub sobiliku püromeetrilise etalonkoonuse kättesaadavusest. Standardis EN 993-13 kindlaks määratud püromeetrilised etalonkoonused sobivad temperatuurivahemikus 1500 °C kuni 1800 °C. Et püromeetrilised etalonkoonused on valmistatud peamiselt temperatuuri mõju hindamiseks räniühenditest toodetele ja madala alumiiniumoksiidisisaldusega tulekindlatele aeamott-toodetele, siis nendest erinevatel materjalidel ei pruugi tulemused olla niisama täpsed.</p>	<p><b>Scope:</b></p>
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ICS 81.080

**Võtmesõnad:** kindlaksmääramine, kõrgtemperatuurilised teimid, madala alumiiniumoksiidisisaldusega tulekindlad ega, moodus, püromeetrilised koonused, tulekindlad materjalid, tulekindlad ränimaterjalid, tulekindlus, valik

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Descriptors: Refractory products, refractoriness, testing.

**English version**

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

**Part 12: Determination of pyrometric cone equivalent (refractoriness)**

Méthodes d'essai pour produits réfractaires façonnés denses – Partie 12: Détermination de la résistance pyroscopique (réfractarité)

Prüfverfahren für dichte geformte feuerfeste Erzeugnisse – Teil 12: Bestimmung des Kegelfallpunktes (Feuerfestigkeit)

This European Standard was approved by CEN on 1997-02-27.

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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

It is closely based on the text of the International Standard ISO 528 : 1983 'Refractory products - Determination of pyrometric cone equivalent (refractoriness).

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, apparent porosity and true 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 of rupture at ambient temperature
- Part 7 : Determination of modulus of 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 reference 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)

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 September 1997, and conflicting national standards shall be withdrawn at the latest by September 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 1 Scope

This European Standard specifies a method for determining the pyrometric cone equivalent (refractoriness) for refractory materials including shaped and unshaped products. Its useful range of application depends on the availability of suitable pyrometric reference cones. In the temperature range from 1500 °C to 1800 °C, the pyrometric reference cones specified in EN 993-13 are suitable.

As pyrometric reference cones are primarily manufactured for estimating the effect of temperature on siliceous, low alumina fireclay and fireclay products, the results on materials other than these may not be as precise.

## 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 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 993-13:1995      Methods of test for dense shaped refractory products - Part 13 :  
Specification for pyrometric reference cones for laboratory use

ISO 565              Test sieves - Woven metal wire cloth and perforated plate and  
electroformed sheet - Nominal sizes of apertures.

## 3 Definitions

For the purposes of this European Standard, the following definitions apply:

**3.1 refractoriness** : The characteristic property of a material that allows it to withstand high temperature.

**3.2 pyrometric reference cone** : A blunt-tipped skew triangular pyramid with sharp edges, of specified shape and dimensions and of such composition that when mounted and heated under specified conditions, it bends in a known manner with reference to the temperature.

**3.3 reference temperature, or temperature of collapse** : The temperature at which the tip of a pyrometric reference cone reaches the level on which the base of the cone is mounted when the cone is heated at a specified rate under specified conditions.

## 4 Principle

Test pieces of refractory materials or products are raised in temperature, under specified conditions, alongside pyrometric reference cones of known refractoriness and their behaviour is compared with that of the reference cones.