

**Tihedate tulekindlate profiiltoodete  
katsemeetodid. Osa 15: Soojajuhtivuse  
määramine kuuma traadi meetodil  
(paralleelmeetodil)**

Methods of test for dense shaped refractory  
products - Determination of thermal conductivity by  
the hot-wire (parallel) method

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 993-15:2005 sisaldab Euroopa standardi EN 993-15:2005 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 22.06.2005 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 993-15:2005 consists of the English text of the European standard EN 993-15:2005.</p> <p>This document is endorsed on 22.06.2005 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></p> <p>This European Standard describes a hot-wire (parallel) method for the determination of thermal conductivity of refractory products and materials. It is applicable to dense and insulating shaped products and to powdered or granular materials (see 6.2), for thermal conductivities of less than 25 W/m.K.</p>	<p><b>Scope:</b></p> <p>This European Standard describes a hot-wire (parallel) method for the determination of thermal conductivity of refractory products and materials. It is applicable to dense and insulating shaped products and to powdered or granular materials (see 6.2), for thermal conductivities of less than 25 W/m.K.</p>
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Võtmesõnad:

English version

**Methods of test for dense shaped refractory products -  
Determination of thermal conductivity by the hot-wire (parallel)  
method**

Méthodes d'essai pour produits réfractaires façonnés  
denses - Partie 15: Détermination de la conductivité  
thermique par la méthode du fil chaud (parallèle)

Prüfverfahren für dichte geformte feuerfeste Erzeugnisse -  
Teil 15: Bestimmung der Wärmeleitfähigkeit nach dem  
Heißdraht- (parallel-) Verfahren

This European Standard was approved by CEN on 21 March 2005.

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.

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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## Foreword

This document (EN 993-15:2005) 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 November 2005, and conflicting national standards shall be withdrawn at the latest by November 2005.

This document supersedes EN 993-15:1998.

EN 993 Methods of test for dense shaped refractory products consists of 20 Parts as follows:

- 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 (refractoriness)*
- Part 13: *Specification for pyrometric reference cones for laboratory use*
- Part 14: *Determination of thermal conductivity by the hot-wire (cross-array) method*
- Part 15: *Determination of thermal conductivity by the hot-wire (parallel) method*
- Part 16: *Determination of resistance to sulphuric acid*
- Part 17: *Determination of bulk density of granular materials by the mercury method with vacuum*
- Part 18: *Determination of bulk density of granular materials by the water method with vacuum*
- Part 19: *Determination of thermal expansion by a differential method*
- Part 20: *Determination of resistance to abrasion at ambient temperature*

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

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## 1 Scope

This European Standard describes a hot-wire (parallel) method for the determination of thermal conductivity of refractory products and materials. It is applicable to dense and insulating shaped products and to powdered or granular materials (see 6.2), for thermal conductivities of less than 25 W/m.K. The limits are imposed by the thermal diffusivity of the test material and therefore by the dimensions of the test pieces; higher thermal conductivities can be measured if larger pieces are used. Electrically conducting materials cannot be measured.

NOTE 1 The thermal conductivity of products with a hydraulic or chemical bond can be affected by the appreciable amount of water that is retained after hardening or setting and is released on firing. These materials may therefore require pre-treatment; the nature and extent of such pre-treatment and the period for which the test piece is held at the measurement temperature as a preliminary to carrying out the test, are details that are outside the scope of this standard and should be agreed between the parties concerned.

NOTE 2 In general it is difficult to make measurements on anisotropic materials and the use of this method for such materials should also be agreed between the parties concerned.

## 2 Terms and definitions

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

### 2.1

**thermal conductivity,  $\lambda$**

density of heat flow rate divided by the temperature gradient, in units of watt per metre Kelvin (W/m.K)

### 2.2

**thermal diffusivity,  $a$**

$$a = \frac{\lambda}{\rho \cdot c_p}$$

where:

$\lambda$  is the thermal conductivity

$\rho$  is the bulk density

$c_p$  is the specific heat capacity at constant pressure per weight

NOTE Thermal diffusivity is expressed in units of square metre per second ( $\text{m}^2\text{s}^{-1}$ )

### 2.3

**power,  $P$**

rate of energy transfer, in watts (W)

## 3 Principle

The hot-wire method (parallel) is a dynamic measuring procedure based on the determination of the temperature increase against time at a certain location and at a specified distance from a linear heat source embedded between two test pieces.