

**Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance**

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## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 12667:2001 sisaldab Euroopa standardi EN 12667:2001 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 18.06.2001 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 12667:2001 consists of the English text of the European standard EN 12667:2001.</p> <p>This document is endorsed on 18.06.2001 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> This standard specifies principles and testing procedures for determining, by means of the guarded hot plate or heatflow meter methods, the thermal resistance of test specimens having a thermal resistance of not less than 0,5m<sup>2</sup> K/W.</p>	<p><b>Scope:</b> This standard specifies principles and testing procedures for determining, by means of the guarded hot plate or heatflow meter methods, the thermal resistance of test specimens having a thermal resistance of not less than 0,5m<sup>2</sup> K/W.</p>
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**ICS** 91.100.01, 91.120.10

**Võtmesõnad:** calorimeters, test equipm, test specimens, testing, testing devices, tests, thermal conductivity, thermal protection, thermal resistance, thermal transmission coefficient, thermal transmittance, thermodynamic properti, thermodynamic properties, transmittance

ICS 91.100.01; 91.120.10

English version

Thermal performance of building materials and  
products – Determination of thermal resistance by means  
of guarded hot plate and heat flow meter methods

Products of high and medium thermal resistance

Performance thermique des matériaux  
et produits pour le bâtiment – Détermi-  
nation de la résistance thermique par la  
méthode de la plaque chaude gardée  
et la méthode fluxmétrique – Produits  
de haute et moyenne résistance  
thermique

Wärmetechnisches Verhalten von  
Baustoffen und Bauprodukten –  
Bestimmung des Wärmedurchlass-  
widerstandes nach dem Verfahren mit  
dem Plattengerät und dem Wärme-  
strommessplatten-Gerät – Produkte  
mit hohem und mittlerem  
Wärmedurchlasswiderstand

This European Standard was approved by CEN on 2000-06-25.

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 Management Centre 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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

**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 89 "Thermal performance of buildings and building components", the secretariat of which is held by SIS.

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 July 2001, and conflicting national standards shall be withdrawn at the latest by December 2001.

This document is one of a series of standards on thermal test methods which support product standards for building materials.

The annexes A, B, C and D are normative.

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.

## Introduction

Steady state heat transfer properties may be measured by a number of standardized test methods: the choice of the most appropriate method depends on specimen characteristics. This standard covers the guarded hot plate and the heat flow meter methods only.

For routine testing, the operator of these two methods needs only this standard and the relevant product standard, which may impose additional requirements related to specimen preparation or testing conditions.

Detailed requirements for measurements in any testing condition of thermal resistance of any compatible plane specimen are given:

- for the guarded hot plate method, in ISO 8302:1991 and EN 1946-2:1999;
- for the heat flow meter method, in ISO 8301:1991 and EN 1946-3:1999.

This standard provides general information on the apparatus, all mandatory limits for the equipment design and operation, and the specification of testing procedure, for specimens, with high and medium thermal resistance, described in relevant technical specifications (e.g. a European product standard or a European technical approval). The information given is technically equivalent to that in ISO 8301:1991 and ISO 8302:1991, for both these methods. It is only intended for the routine testing of specimens (within the limitations of thickness and inhomogeneity etc. given in annex A) using equipment which has been constructed according to 5.1 and which has already been validated according to EN 1946-3:1999 or EN 1946-2:1999.

It also includes examples of equipment designs that meet the requirements of 5.1, so that the assessment of the accuracy of equipment designed accordingly does not need an error analysis but only the equipment performance check.

Measurements on products of medium and low thermal resistance and on moist products of any thermal resistance are covered in EN 12664. Measurements on thick products of high and medium thermal resistance are covered in EN 12939.

## 1 Scope

This standard specifies principles and testing procedures for determining, by means of the guarded hot plate or heat flow meter methods, the thermal resistance of test specimens having a thermal resistance of not less than  $0,5 \text{ m}^2 \cdot \text{K/W}$

**NOTE 1** The above limit is due to the effect of contact thermal resistances. An upper limit for measurable thermal resistance depends upon a number of factors described in this standard, but a unique figure cannot be assigned.

It applies in principle to any mean test temperature, but the equipment design in annex D is essentially intended to operate between a minimum cooling unit temperature of  $-100 \text{ }^\circ\text{C}$  and maximum heating unit temperature of  $+100 \text{ }^\circ\text{C}$ .

**NOTE 2** Limits to the mean test temperature are only imposed by the materials used in the apparatus construction and by ancillary equipment.

It supplies additional limits for equipment performance and test conditions.

It does not supply general equipment design procedures, equipment error analysis, equipment performance check or the assessment of equipment accuracy.

It supplies example designs of equipment complying with the requirements set down in this standard.

This standard does not supply general guidance and background information (e.g. the heat transfer property to be reported, product-dependent specimen preparations, procedures requiring multiple measurements, such as those to assess the effect of specimen non-homogeneities, those to test specimens whose thickness exceeds the apparatus capabilities, and those to assess the relevance of the thickness effect). Due to these limitations, this standard should be used in conjunction with the product standard relevant to the product to be tested.

Although intended primarily for building materials, it can also be used for specimens of any material that conforms to the requirements specified.

This standard does not cover measurements on moist products of any thermal resistance or measurements on thick products of high and medium thermal resistance.

## 2 Normative references

This 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 are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred applies (including amendments).

**NOTE** References to ISO 8301:1991 and ISO 8302:1991 do not cover the complete test methods, but are limited to such items as equipment design and performance check, not covered by European Standards or parts of them; references to ISO 8301:1991 or ISO 8302:1991 are not needed for routine testing according to this standard.

EN 1946-2:1999	Thermal performance of building products and components - Specific criteria for the assessment of laboratories measuring heat transfer properties – Part 2: Measurements by guarded hot plate method
EN 1946-3:1999	Thermal performance of building products and components - Specific criteria for the assessment of laboratories measuring heat transfer properties – Part 3: Measurements by heat flow meter method
EN 12664	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Dry and moist products of medium and low thermal resistance
EN 12939	Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Thick products of high and medium thermal resistance
EN ISO 7345	Thermal insulation - Physical quantities and definitions (ISO 7345:1987)
ISO 8301:1991	Thermal insulation - Determination of steady-state thermal resistance and related properties - Heat flow meter apparatus
ISO 8302:1991	Thermal insulation - Determination of steady-state thermal resistance and related properties - Guarded hot plate apparatus

### 3 Definitions, symbols and units

#### 3.1 Terms and definitions

For the purposes of this standard, the terms and definitions in EN ISO 7345 apply. Most relevant definitions for the measurement of heat transfer properties on high and medium thermal resistance products are to be found in A.2.

#### 3.2 Symbols and units

Symbol	Quantity	Unit
$A$	metering area measured on a selected isothermal surface	$m^2$
$A_d$	area of the defect	$m^2$
$A_m$	area of the metering section	$m^2$
$R$	thermal resistance	$m^2 \cdot K/W$
$\mathcal{F}$	transfer factor	$W/(m \cdot K)$
$T_1$	temperature of the warm surface of the specimen	K
$T_2$	temperature of the cold surface of the specimen	K
$T_m$	mean test temperature (usually $(T_1 + T_2)/2$ )	K
$V$	volume	$m^3$
$c$	specific heat capacity	$J/(kg \cdot K)$
$d$	thickness; average thickness of a specimen	m
$e$	edge number ratio	-