SVENSK STANDARD
SS-EN 12664

Fastställd/Approved: 2001-11-02
Publicerad/Published: 2001-11-02
Utgåva/Edition: 1
Språk/Language: engelska/English
ICS: 91.100.01; 91.120.10

Byggmaterials och byggprodukters termiska egenskaper – Bestämning av värmemotstånd med hjälp av plattapparat med skyddszon och värmeflödesmätarapparat – Torra och fuktiga produkter med medelstort och litet värmemotstånd

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

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Europastandarden EN 12664:2001 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 12664:2001.

Denna standard ersätter SS 24211, utgåva 1.

The European Standard EN 12664:2001 has the status of a Swedish Standard. This document contains the official English version of EN 12664:2001.

This standard supersedes the Swedish Standard SS 24211 edition 1.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00. Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 12664

January 2001

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 - Dry and moist products of medium and low thermal resistance

Performance thermique des matériaux et produits pour le bâtiment - Détermination de la résistance thermique par la méthode de la plaque chaude gardée et la méthode fluxmétrique - Produits secs et humides de moyenne et basse résistance thermique

Wärmetechnisches Verhalten von Baustoffen und Bauprodukten - Bestimmung des Wärmedurchlasswiderstandes nach dem Verfahren mit dem Plattengerät und dem Wärmestrommessplatten-Gerät - Trockene und feuchte Produkte mit mittlerem und niedrigem Wärmedurchlasswiderstand

This European Standard was approved by CEN on 25 June 2000.

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.

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 Management Centre has the same status as the official versions.

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

EUROPEAN COMMITTEE FOR STANDARDIZATION
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Ref. No. EN 12664:2001 E

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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, D and E are normative. The annexes F and G are informative.

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 dry and moist specimens, with medium and low 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 an equipment designed accordingly does not need an error analysis but only the equipment performance check.

Although this standard can be used for testing dry specimens of high and medium thermal resistance, i.e. on products having a thermal resistance of not less than 0,5 $m^2 \cdot K/W$, the simpler procedures of EN 12667:2001 are recommended for such specimens. Measurements on thick products of high and medium thermal resistance are covered in EN 12939, see the Bibliography.

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 either in the dry state or conditioned to equilibrium with moist air, having a thermal resistance of not less than 0,1 $m^2 \cdot K/W$ and a (hygro)thermal transmissivity or thermal conductivity up to 2,0 $W/(m \cdot K)$. (It is expected that the thermal resistance of most masonry specimen will be less than 0,5 $m^2 \cdot K/W$).

> NOTE 1 The lower limit for measurable thermal resistance is due to the effect of contact thermal resistances, which require special testing techniques described in this standard. Although this standard can be used for testing dry specimens of high and medium thermal resistance, i.e. on products having a thermal resistance of not less than 0,5 $m^2 \cdot K/W$, the simpler procedures of EN 12667:2001 are recommended for such specimens.

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 °C and maximum heating unit temperature of +100 °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, suggested materials for vapour-tight envelopes when testing moist specimens, 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 shall only be used in conjunction with the product standard relevant to the product to be tested.

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

It may be used for specimens made from the core material of hollow masonry units but formed voids are not permitted in the specimen.

This standard does not cover 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 12667:2001	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
EN ISO 7345	Thermal insulation - Physical quantities and definitions (ISO 7345:1987)
EN ISO 9288	Thermal Insulation - Heat transfer by radiation - Physical quantities and definitions (ISO 9288:1989)
EN ISO 9346	Thermal insulation - Mass transfer - Physical quantities and definitions (ISO 9346:1987)
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, EN ISO 9288, EN ISO 9346 apply. Most relevant definitions for the measurement of heat transfer properties on medium and low thermal resistance products and the definition of hygrothermal transmissivity 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
D_w	moisture diffusivity	m^2/s
E	temperature difference error in non-plane specimens	-

Symbol	Quantity	Unit
Fo	Fourier's number	-
R	thermal resistance	$m^2 \cdot K/W$
$\mathcal{T}$	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
Z_v	moisture resistance	s/m
a	moisture factor	$W \cdot m^2/(kg \cdot K)$
c	specific heat capacity	$J/(kg \cdot K)$
d	thickness; average thickness of a specimen	m
e	edge temperature ratio	-
e_h	heat flow meter output voltage	mV
er_p	percent error due to phase changes	-
er_d	percent error due to non-uniform moisture distribution	-
f	calibration factor of the heat flow meter	$W/(mV \cdot m^2)$
f_r	multiplying factor for measured thermal resistance	-
g	density of moisture flow rate	$kg/(m^2 \cdot s)$
h_e	latent enthalpy of evaporation per mass	J/kg
m	mass (of the specimen)	kg
q	density of heat flow rate	W/m^2
p	deviation of the specimen surface from a true plane	mm
r	thermal resistivity	$K \cdot m/W$
t	time	s
v	humidity by volume	kg/m^3
v_{sat}	humidity by volume at saturation	kg/m^3
w	moisture content mass by volume	kg/m^3
w_m	mean moisture content mass by volume	kg/m^3
ΔR	increments of thermal resistance	$m^2 \cdot K/W$
ΔT	temperature difference (usually $T_1 - T_2$)	K
Δd	increments of thickness	m
Δm	relative mass change	-
Δt	time interval	s
Δw	change in moisture content (mass by volume)	kg/m^3