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Irish Standard Recommendation
S.R. CEN/TS 15548-1:2014

Thermal insulation products for building equipment and industrial installations - Determination of thermal resistance by means of the guarded hot plate method - Part 1: Measurements at elevated temperatures from 100 °C to 850 °C

S.R. CEN/TS 15548-1:2014

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English Version

Thermal insulation products for building equipment and industrial installations - Determination of thermal resistance by means of the guarded hot plate method - Part 1: Measurements at elevated temperatures from 100 °C to 850 °C

Produits isolants thermiques pour les équipements de bâtiments et les installations industrielles - Détermination de la résistance thermique par la méthode de la plaque chaude gardée - Partie 1: Mesurages à haute température entre 100 °C et 850 °C

Wärmedämmstoffe für die Haustechnik und für betriebstechnische Anlagen - Bestimmung des Wärmedurchlasswiderstandes nach dem Verfahren mit dem Plattengerät - Teil 1: Messungen bei erhöhten Temperaturen von 100 °C bis 850 °C

This Technical Specification (CEN/TS) was approved by CEN on 28 June 2014 for provisional application.

The period of validity of this CEN/TS is limited initially to three years. After two years the members of CEN will be requested to submit their comments, particularly on the question whether the CEN/TS can be converted into a European Standard.

CEN members are required to announce the existence of this CEN/TS in the same way as for an EN and to make the CEN/TS available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the CEN/TS) until the final decision about the possible conversion of the CEN/TS into an EN is reached.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (CEN/TS 15548-1:2014) has been prepared by Technical Committee CEN/TC 89 “Thermal performance of buildings and building components”, the secretariat of which is held by SIS.

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

This document supersedes CEN/TS 15548-1:2011.

Significant changes between this and the previous edition are:

— In clause 5.4.3, modifications of Figure 1 and Figure 2; now denoted Figure 1a and Figure 1b

— In A.4, for clause 2.1.4.1.2, the value for minimum numbers of sensors is changed to 10√A or 2

— In A.6, for clause 1.7.3, the values are changed to 20 K and 50 K respectively.

— In A.6, for clause 3.3.3, the lower and upper limits of temperature differences across the specimen have been changed to 30 K and 70 K respectively.

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

Introduction

This Technical Specification is an interim solution to the need for a standard to complement EN 12667:2001 in the approximate temperature range 100 °C to 850 °C.

The Technical Specification is chosen to publish the knowledge gained in the field of measuring thermal conductivity at elevated temperature now, as the finalisation of a standard is a complex matter requiring further investigations.

Among existing apparatus for steady state thermal testing, the guarded hot plate can be operated at selected mean temperatures over the temperature range -100 °C to 850 °C. In general these apparatus exist in three forms covering roughly the following temperature ranges -100 °C to ambient, ambient to 100 °C and above 100 °C. However it has been found that it is not possible to achieve the uncertainties of ± 2 % claimed as achievable for the low and ambient temperature forms when using the high temperature version in accordance with ISO 8302. More realistic figures adopting the method and procedures detailed in this document are ± 5 % up to 450 °C and ± 7 % at temperatures above 450 °C.

Many issues are more difficult at high temperatures. There are design issues due to apparatus material stability, the level of temperature measurement uncertainty is higher than at ambient temperatures and there is also greater degradation in the performance of temperature sensors when operated at high temperatures, requiring calibration checks to be more frequent. At high temperature it is more likely to get hot spots on a plate due to non uniformity of a heater; these could be near temperature sensors and give false readings. Any air gaps will have greater heat flow across them due to radiation heat exchange and finally provisions for specimen expansion or shrinkage are needed.

Due to the above considerations the following clauses of EN 12667:2001 have been expanded and detailed:

5 Apparatus

5.1 General

5.2.4 Heating Unit

5.2.5 Metering Area

5.2.6 Edge insulation and auxiliary guards

5.2.7 Cooling units

5.3.5 Accuracy and repeatability

6 Test specimens

6.2 Selection and size

7 Testing procedure

7.3.8 Settling time and measurement interval

Annex A

Annex B.2

1 Scope

This Technical Specification provides the additional information to that given in EN 12667, EN 12664, EN 12939 and ISO 8302 on the design of apparatus and operational procedures required to determine the thermal resistance of thermal insulation products in the temperature range 100 °C to 850 °C using the guarded hot plate method.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1946-2, *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 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 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 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)*

EN ISO 9288, *Thermal insulation - Heat transfer by radiation - Physical quantities and definitions (ISO 9288)*

ISO 8302:1991, *Thermal insulation - Determination of steady-state thermal resistance and related properties - Guarded hot plate apparatus*

3 Terms and definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document the terms and definitions given in EN ISO 7345 and EN ISO 9288 apply.

3.2 Symbols and units

Symbol	Quantity	Unit
A	metering area measured on a selected isothermal surface	m^2
d	thickness; average thickness of specimen	m
e	edge number ratio	-
m	mass (of the specimen)	kg
Δm	mass change	kg
q	density of heat flow rate	W/m^2
R	thermal resistance	$m^2 \cdot K/W$
ΔR	increment of thermal resistance	$m^2 \cdot K/W$