BRITISH STANDARD

BS EN
1946-1:1999

Thermal performance of building products and components — Specific criteria for the assessment of laboratories measuring heat transfer properties —

Part 1: Common criteria

The European Standard EN 1946-1:1999 has the status of a British Standard

ICS 91.100.01; 91.120.10

National foreword

This British Standard is the English language version of EN 1946-1:1999.

The UK participation in its preparation was entrusted by Technical Committee RHE/9, Thermal insulating materials, to Subcommittee RHE/9/2, Thermal properties of insulating materials, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 5 and a back cover.

This British Standard, having been prepared under the direction of the Engineering Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 May 1999

Amendments issued since publication

Amd. No.	Date	Text affected

ISBN 0 580 32161 4

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 1946-1

January 1999

ICS 91.100.01; 91.120.10

Descriptors: building products, heat transfer, thermal properties, testing, laboratory assessment, documentation

English version

Thermal performance of building products and components — Specific criteria for the assessment of laboratories measuring heat transfer properties — Part 1: Common criteria

Performance thermique des produits et composants pour le bâtiment — Critères particuliers pour l'évaluation des laboratoires mesurant les propriétés de transmission thermique — Partie 1: Critères communs

Wärmetechnisches Verhalten von Bauprodukten und Bauteilen — Technische Kriterien zur Begutachtung von Laboratorien bei der Durchführung der Messungen von Wärmeübertragungseigenschaften — Teil 1: Allgemeingültige Regeln

This European Standard was approved by CEN on 13 December 1998.

CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 1946-1:1999 E

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 1999, and conflicting national standards shall be withdrawn at the latest by July 1999.

This European Standard is divided into parts. The first part covers common criteria applicable to all heat transfer property measurements; each subsequent part covers the specific technical criteria applicable to each heat transfer property measurement method described in appropriate standards.

The following parts have been developed:

— *Part 1: Common criteria;*

— *Part 2: Measurements by guarded hot plate method;*

— *Part 3: Measurements by heat flow meter method;*

— *Part 4: Measurements by hot box methods;*

— *Part 5: Measurements by pipe test methods.*

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.

Contents

Introduction

In the field of heat transfer property testing, many pieces of test equipment have been constructed by the laboratories themselves and they often differ significantly in their detailed design, so that each equipment is assessed as for a prototype.

This makes the assessment of the equipment accuracy a very complex matter, requiring in-depth knowledge and understanding of the equipment and test procedures employed and of the factors that can influence the accuracy of the results. Because of the complexity of standardized procedures for the assessment of equipment accuracy, they have been separated from standards on equipment description and testing procedures to be used by the operator in every day testing practice.

There is therefore a need for a link between the accreditation standards of the EN 45000 series and each relevant standard test method, by providing standardized assessment procedures specifically suitable to heat transfer property measurements.

While the majority of this standard is devoted to fixing standardized procedures for the assessment of equipment accuracy, the adoption of these procedures in laboratory assessment according to EN 45000 series standards defines by itself the required level of competence of the laboratory personnel.

1 Scope

This standard gives specific technical criteria to be used within the frame of the general criteria given in EN 45001 and EN 45002 for the assessment of laboratories performing heat transfer property measurements of building products and components according to standardized test methods. It is relevant both to assessments conducted internally and to those carried out formally by an accreditation body, and is intended to be of assistance to all interested parties.

It gives contents of the documentation required by EN 45001 (equipment manual, calibration and maintenance files, measurement procedure document) and the procedures for the assessment of equipment accuracy and performance check. All other requirements regarding laboratories undertaking heat transfer property measurements are given in the EN 45000 series.

This part 1 of this standard gives assessment requirements common to various test methods; the subsequent parts give assessment requirements, which are relevant to each test method. The application of this standard assumes an adequate level of competence for the personnel involved.

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 to applies.

EN 45001, *General criteria for the operation of testing laboratories.*

EN 45002, *General criteria for the assessment of testing laboratories.*

EN 45020, *General terms and their definitions concerning standardization and related activities.*

3 Definitions

For the purposes of this standard, the definitions of "test", "test method" and "(laboratory) proficiency testing" given in EN 45020 and the following definitions apply.

3.1

heat transfer property measurement

determination of a heat transfer property according to a standardized test method

3.2

equipment manual

document containing information on performance specifications, descriptions, design, error analysis and initial performance check for equipment

3.3

measurement procedure document

document containing information on specimen handling and preparation, testing procedures, test reporting, scheduled equipment checks and maintenance

3.4

calibration and maintenance file

file documenting, for all equipment, all calibrations and calibration results and all maintenance actions

3.5

laboratory test work registers

registers or files containing for each test all the documentation and correspondence to identify the test specimen, the measured data, raw calculations, computer printouts, and copy of the final report

3.6

reference material

material or substance, one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials
[ISO Guide 30:1992]

3.7

certified reference material

reference material, accompanied by a certificate, one or more of whose property values are certified by a procedure which establishes traceability to an accurate realization of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence
[ISO Guide 30:1992]

3.8

(measurement) standard

material measure, measuring instrument, reference material or measuring system intended to define, realize, conserve or reproduce a unit or one or more values of a quantity to serve as a reference
[International Vocabulary of Basic and General Terms in Metrology, ISO, 1993]

3.9

transfer standard

standard used as an intermediary to compare standards
[International Vocabulary of Basic and General Terms in Metrology, ISO, 1993]

NOTE The term "transfer device" should be used when the intermediary is not a standard.

4 Assessment

4.1 EN 45000 series requirements

This standard assumes that:

a) the accreditation body responsible for the assessment meets the general criteria specified in EN 45000 series and operates systems and assessment procedures in conformity with the general criteria set out in EN 45000 series;

b) the test laboratory is organized and run in accordance with the general criteria set out in EN 45001;

c) the test equipment and measurement procedures used by the laboratory for heat transfer property measurements conform with the requirements set out in the relevant standard test methods;

d) the assessment of equipment accuracy and the related performance checks and proficiency testing conform with the appropriate part of this standard and are adequately documented.

4.2 Documentation

For the purpose of this standard and in conformity with EN 45001, the laboratory is required to have appropriate documentation. The information to be given in this documentation, as defined in subsequent parts, is mandatory. General guidance on the content of these documents for heat transfer property measurement is given in clause **5** of this part: specific information on the content of these documents for each type of heat transfer property measurement is respectively given in clauses **4**, **5** and **6** of the relevant part of this standard.

4.3 Laboratory staff

Staff responsible for testing, maintenance and calibration shall be able to explain and verify all the items included in the equipment manual and measurement procedure document, including their relationship to the standard test method accuracy and reproducibility.

The staff responsible for testing shall be capable of deciding whether a specimen can or cannot be tested in the available laboratory equipment and shall be able to take appropriate preliminary decisions on testing conditions and specimen handling when required by the relevant standard test method.

4.4 Proficiency testing

The assessment shall include proficiency tests on specimens whose dimensions and reported heat transfer properties are within the range for which the laboratory is seeking accreditation.

NOTE 1 In general, good equipment design and a detailed performance check is sufficient to ensure the correct operation of the equipment within the expected accuracy in all planned testing conditions. Nevertheless, the actual demonstration of the proper operation of the equipment can only be achieved through proficiency tests. Specimens for proficiency testing are usually transfer standards, see **3.9**, which have been developed by a national standard laboratory or equivalent.

As testing errors and the ultimate accuracy and reproducibility of a test are highly dependent on test specimen properties and testing conditions, the specimens for proficiency testing shall cover the most critical testing conditions, and the performance checks carried out by the laboratory shall cover all expected testing situations.

NOTE 2 Specimens measured by the laboratory and re-tested at a national standard laboratory or equivalent, providing that the material of the specimen is recognized as sufficiently stable for this purpose, are an acceptable alternative.

5 Documentation

5.1 General

This clause gives specific information to be provided in the documentation specified in EN 45001, and which is suggested to be split in three parts:

— equipment manual;

— calibration and maintenance files;

— measurement procedure document.

5.2 Equipment manual

5.2.1 *General*

For each piece of heat transfer property measurement equipment, the equipment manual shall provide:

a) equipment performance specification;

b) equipment description, including electrical components and instrumentation;

c) equipment design and error analysis;

d) equipment performance check;

as specified in **5.2.2** to **5.2.5** of this part of the standard, together with the more detailed information specified in clause **4** of the part of this standard specific to the particular method.

5.2.2 *Equipment performance specification*

For each piece of equipment to be operated according to a standardized test method, upper and lower limits for relevant tested properties and testing conditions shall be specified e.g:

— thermal resistance;

— specimen dimensions;

— mean test temperature;

— temperature difference through the specimen;

— environmental conditions (temperature, relative humidity) at the edge of the specimen.

NOTE Some of the above properties or testing conditions may affect upper and lower limits of other properties or testing conditions, e.g. maximum specimen thickness may be affected by the specimen thermal conductivity.

Specific information on applicable measured properties and testing conditions is given in **4.2** of the part of this standard pertaining to the appropriate measurement method.

5.2.3 *Equipment description*

The following information shall be provided for each piece of equipment operated according to a standardized test method:

— principle of operation;

— type of apparatus (e.g. two-specimen guarded hot plate apparatus with auxiliary gradient guard);

— principal dimensions of the apparatus;

— simple diagrams illustrating the design of the equipment;

— position and numbering of temperature sensors;

— electrical components/instruments and ancillary equipment;

— details of data acquisition system and related computer programs for data analysis.

To avoid duplication, reference can be made to manuals supplied by the instrument manufacturers or to relevant clauses of the standard describing the method.

5.2.4 *Equipment design and error analysis*

Detailed information shall be given of the leading design criteria and the related error analysis (best measurement capability) leading to an estimate of the measurement uncertainties under the different testing conditions, referring to the limits for measured properties and testing conditions specified in **5.2.2**.

5.2.5 *Equipment performance check*

The procedure for the validation of the above error analysis through a performance check shall be described in detail, so that it can be repeated, as necessary, for subsequent verifications.

A final performance check against one or more certified reference materials or transfer standards shall be performed. See relevant parts.

Performance check results shall be documented.

5.3 Calibration and maintenance files

Absolute test methods (e.g. the guarded hot plate) do not require an apparatus calibration, but temperature sensors and ancillary instrumentation directly affecting accuracy of results shall be subjected to periodic calibration with traceability to national measurement standards. See the part of this standard specific to the particular method.

Comparative test methods (e.g. the heat flow meter method) require a calibration of the heat flow rate transducer, in addition to the calibrations applicable to absolute test methods.

Equipment maintenance actions and the results of calibrations shall be annotated in the calibration and maintenance files.

5.4 Measurement procedure document

For each piece of equipment, the measurement procedure document shall contain all detailed instructions that the operator has to follow to perform measurements within the stated uncertainty. This includes operations dictated by the relevant standard test method or product standard and internal procedures. A check list of items to be found in the measurement procedure document is the following. See also the information specified in clause **6** of the part specific to each method:

a) specimen handling as required by EN 45001;

b) specimen preparation for testing;

c) testing procedures, including step-by-step instruction for the operation of all equipment needed to run measurements according to a standard test method;

d) test reporting;

e) appropriate checks and maintenance actions to keep the appropriate quality level of the measurements (including schedule and required annotations on the calibration and maintenance files);

f) reference to the error analysis (see **5.2.4**), showing the uncertainty of results.

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