SLOVENSKI STANDARD
SIST EN ISO 5659-2:2000

01-maj-2000

Polimerni materiali - Nastajanje dima - 2. del: Določanje optične gostote s preskusom v eni preskusni komori (ISO 5659-2:1994, vključno s tehničnim popravkom 1:1997)

Plastics - Smoke generation - Part 2: Determination of optical density by a single-chamber test (ISO 5659-2:1994, including Technical Corrigendum 1: 1997)

Kunststoffe - Rauchentwicklung - Teil 2: Bestimmung der optischen Dichte durch Einkammerprüfung (ISO 5659-2:1994, einschließlich Technische Korrektur 1:1997)

Plastiques - Production de fumée - Partie 2: Détermination de la densité optique par un essai en enceinte unique (ISO 5659-2:1994, Rectificatif Technique 1:1997 inclus)

Ta slovenski standard je istoveten z: **EN ISO 5659-2:1998**

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83.080.01	Polimerni materiali na splošno	Plastics in general

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EUROPEAN STANDARD
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English version

Plastics - Smoke generation - Part 2: Determination of optical density by a single-chamber test (ISO 5659-2:1994, including Technical Corrigendum 1:1997)

Plastiques - Production de fumée - Partie 2: Détermination de la densité optique par un essai en enceinte unique (ISO 5659-2:1994, Rectificatif Technique 1:1997 inclus)

Kunststoffe - Rauchentwicklung - Teil 2: Bestimmung der optischen Dichte durch Einkammerprüfung (ISO 5659-2:1994, einschließlich Technische Korrektur 1:1997)

This European Standard was approved by CEN on 12 June 1998.

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.

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
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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

Foreword

The text of the International Standard from Technical Committee ISO/TC 61 "Plastics" of the International Organization for Standardization (ISO) has been taken over as an European Standard by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN.

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 February 1999, and conflicting national standards shall be withdrawn at the latest by February 1999.

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.

Endorsement notice

The text of the International Standard ISO 5659-2:1994, including Technical Corrigendum 1:1997 has been approved by CEN as a European Standard without any modification.

NOTE: Normative references to International Standards are listed in annex ZA (normative).

Annex ZA (normative)
Normative references to international publications with their relevant European publications

This European 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 European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

Publication	Year	Title	EN	Year
ISO 291	1997	Plastics - Standard atmospheres for conditioning and testing	EN ISO 291	1997

INTERNATIONAL STANDARD

ISO 5659-2

First edition
1994-12-15

Plastics — Smoke generation —

Part 2:
Determination of optical density by a single-chamber test

Plastiques — Production de fumée —

Partie 2: Détermination de la densité optique par un essai en enceinte unique

Reference number
ISO 5659-2:1994(E)

Contents

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 5659-2 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 6, *Ageing, chemical and environmental resistance*.

ISO 5659 consists of the following parts, under the general title *Plastics — Smoke generation*:

- *Part 1: Guidance*
- *Part 2: Determination of optical density by a single-chamber test*
- *Part 3: Determination of optical density by dynamic flow*

Annex A forms an integral part of this part of ISO 5659. Annexes B and C are for information only.

Introduction

Fire is a complex phenomenon: its development and its effects depend upon a number of interrelated factors. The behaviour of materials and products depends upon the characteristics of the fire, the method of use of the materials and the environment in which they are exposed (see also ISO/TR 3814 and ISO/IEC Guide 52).

A test such as is specified in this part of ISO 5659 deals only with a simple representation of a particular aspect of the potential fire situation, typified by a radiant heat source, and it cannot alone provide any direct guidance on behaviour or safety in fire. A test of this type may, however, be used for comparative purposes or to ensure the existence of a certain quality of performance (in this case smoke production) considered to have a bearing on fire behaviour generally. It would be wrong to attach any other meaning to results from this test.

The term "smoke" is defined in ISO/IEC Guide 52 as a visible suspension of solid and/or liquid particles in gases resulting from incomplete combustion. It is one of the first response characteristics to be manifested and should almost always be taken into account in any assessment of fire hazard as it represents one of the greatest threats to occupants of a building on fire.

The responsibility for the preparation of ISO 5659 was transferred during 1987 from ISO/TC 92 to ISO/TC 61 on the understanding that the scope and applicability of the standard for the testing of materials should not be restricted to plastics but should also be relevant to other materials where possible, including building materials.

The attention of all users of this test is drawn to the warnings which immediately precede the "Scope" clause.

Plastics — Smoke generation —

Part 2:
Determination of optical density by a single-chamber test

WARNING

1 Avoidance of misleading inferences

This standard method of test should be used solely to measure and describe the properties of materials, products or systems in response to heat or flame under controlled laboratory conditions, and should not be considered or used by itself for describing or appraising the fire hazard of materials, products or systems under actual fire conditions or as the sole source on which regulations pertaining to smoke production can be based.

2 Avoidance of danger to test operators

So that suitable precautions to safeguard health are taken, the attention of all concerned in fire tests is drawn to the fact that harmful gases are evolved in combustion of test specimens. Care must also be taken during cleaning operations on the smoke chamber to avoid inhalation of fumes or skin-contact with smoke deposits.

Attention is drawn to the hazards arising from the hot radiator cone, and the use of a mains-voltage electricity supply.

A safety blow-out panel, as specified in 7.2.1.1, is essential for the protection of operators from the risk of explosion from sudden pressure surges.

1 Scope

1.1 This part of ISO 5659 specifies a method of measuring smoke production from the exposed surface of specimens of essentially flat materials, composites or assemblies not exceeding 25 mm in thickness when placed in a horizontal orientation and subjected to specified levels of thermal irradiance in a closed cabinet with or without the application of a pilot flame. This method of test is applicable to all plastics and may also be used for the evaluation of other materials (e.g. rubbers, textile-coverings, painted surfaces, wood and other building materials).

1.2 Values of optical density determined by this test are specific to the specimen or assembly material in the form and thickness tested, and are not to be considered inherent, fundamental properties.

1.3 The test is intended for use in research and development and not primarily as a basis for ratings for building codes or other purposes. No basis is provided for predicting the density of smoke which may be generated by the materials upon exposure to heat and flame under other exposure conditions, nor has any correlation been established with measurements derived from other test methods.

The fact that this test procedure excludes the effect of irritants on the eye should also be taken into account when applying the test results.

1.4 It is emphasized that smoke production from a material varies according to the irradiance level to which the specimen is exposed. In making use of the results of this method, it should be borne in mind that the results are based on exposure to the specific irradiance levels of 25 kW/m^2 and 50 kW/m^2.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 5659. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 5659 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 3261:1975, *Fire tests — Vocabulary.*

ISO/TR 3814:1989, *Tests for measuring "reaction-to-fire" of building materials — Their development and application.*

ISO 5659-1:—[1], *Plastics — Smoke generation — Part 1: Guidance.*

ISO 5725:1986, *Precision of test methods — Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests.*

ISO/IEC Guide 52:1990, *Glossary of fire terms and definitions.*

3 Definitions

For the purposes of this part of ISO 5659, the definitions given in ISO/IEC Guide 52 and the following definitions apply.

3.1 assembly: A fabrication of materials and/or composites, for example sandwich panels. This may include an air gap.

3.2 composite: A combination of materials which are generally recognized in building construction as discrete entities, for example coated or laminated materials.

3.3 essentially flat surface: A surface in which departure from a plane does not exceed ± 1 mm.

3.4 exposed surface: That surface of the product subjected to the heating conditions of the test.

3.5 irradiance (at a point on a surface): The radiant flux incident on an infinitesimal element of the surface containing the point divided by the area of that element.

3.6 material: A basic single substance or uniformly dispersed mixture, for example metal, stone, timber, concrete, mineral fibre, polymers.

3.7 mass optical density (MOD): A measure of the degree of opacity of smoke in terms of the mass loss of the material under the conditions of the test.

3.8 optical density of smoke (D)**:** A measure of the degree of opacity of smoke; the negative common logarithm of the relative transmission of light.

3.9 product: The material, composite or assembly about which information is required.

3.10 specific optical density (D_s)**:** The optical density multiplied by a factor which is calculated by dividing the volume of the test chamber by the product of the exposed area of the specimen and the path length of the light beam (see 11.1.1).

3.11 specimen: A representative piece of the product which is to be tested together with any substrate or treatment. This may include an air gap.

4 Principles of the test

Specimens of the product are mounted horizontally within a chamber and exposed to thermal radiation on their upper surfaces at selected levels of constant irradiance up to 50 kW/m^2; the test may be carried out in the absence or in the presence of a pilot flame.

The preferred conditions are as follows:

a) specimens are exposed to an irradiance of 25 kW/m^2 in the presence or absence of a pilot flame;

b) specimens are exposed to an irradiance of 50 kW/m^2 in the absence of a pilot flame;

NOTE 1 Some materials will not ignite when exposed to the conditions given in a) and b).

1) To be published.

The smoke evolved is collected in the chamber which also contains photometric equipment. The attenuation of a light beam passing through the smoke is measured. The results are reported in terms of specific optical density.

5 Suitability of a material for testing

5.1 Material geometry

5.1.1 The method is applicable to essentially flat materials, composites and assemblies not exceeding 25 mm in thickness.

5.1.2 The method is sensitive to small variations in geometry, surface orientation, thickness (either overall or of the individual layers), mass and composition of the material, and so the results obtained by this method only apply to the thickness of the material as tested. It is not possible to calculate the specific optical density of one thickness of a material from the specific optical density of another thickness of the material.

5.2 Physical characteristics

Materials submitted for evaluation by this method could have faces which differ or could contain laminations of different materials arranged in a different order in relation to the two faces. If either of the faces is likely to be exposed to a fire condition when in use, then both faces shall be evaluated.

6 Specimen construction and preparation

6.1 Number of specimens

6.1.1 The test sample shall comprise a minimum of nine specimens: six specimens shall be tested at 25 kW/m^2 (three specimens with a pilot flame and three specimens without a pilot flame) and three specimens shall be tested at 50 kW/m^2 without a pilot flame.

6.1.2 An additional number of specimens as specified in 6.1.1 shall be used for each face, in accordance with the requirements of 5.2.

6.1.3 An additional nine specimens (i.e. three specimens per test mode) shall be held in reserve if required by the conditions specified in 10.8.2.

6.2 Size of specimens

6.2.1 The specimens shall be square, with sides measuring ($75\ ^{0}_{-1}$) mm.

6.2.2 Materials of nominal thickness 25 mm or less shall be evaluated at their full thickness. For comparative testing, materials shall be evaluated at a thickness of 1,0 mm ± 0,1 mm.

All materials consume oxygen when they burn in the chamber, and the smoke generation of some materials (especially rapid-burning or thick specimens) is influenced by the reduced oxygen concentration in the chamber. As far as possible, materials shall be tested in their end-use thickness.

6.2.3 Materials with a thickness greater than 25 mm shall be cut to give a specimen thickness of ($25\ ^{0}_{-1}$) mm, in such a way that the original (uncut) face can be evaluated.

6.2.4 Specimens of multilayer materials with a thickness greater than 25 mm, consisting of core material(s) with facings of different materials, shall be prepared as specified in 6.2.3 (see also 6.3.2).

6.3 Specimen preparation

6.3.1 The specimen shall be representative of the material and shall be prepared in accordance with the procedures described in 6.3.2 and 6.3.3. The specimens shall be cut, sawn, moulded or stamped from identical sample areas of the material, and records shall be kept of their thicknesses and, if required, their masses.

6.3.2 If flat sections of the same thickness and composition are tested in place of curved, moulded or speciality parts, this shall be stated in the test report. Any substrate or core materials for the specimens shall be the same as those used in practice.

6.3.3 When coating materials, including paints and adhesives, are tested with the substrate or core as used in practice, specimens shall be prepared following normal practice, and in such cases the method of application of the coating, the number of coats and the type of substrate shall be included in the test report.