



# SLOVENSKI STANDARD SIST EN ISO 5659-2:2017

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**Polimerni materiali - Nastajanje dima - 2. del: Določanje optične gostote s preskusom v eni preskusni komori (ISO 5659-2:2017)**

Plastics - Smoke generation - Part 2: Determination of optical density by a single-chamber test (ISO 5659-2:2017)

Kunststoffe - Rauchentwicklung - Teil 2: Bestimmung der optischen Dichte durch Einkammerprüfung (ISO 5659-2:2017)

Plastiques - Production de fumée - Partie 2: Détermination de la densité optique par un essai en enceinte unique (ISO 5659-2:2017)

**Ta slovenski standard je istoveten z: EN ISO 5659-2:2017**

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83.080.01	Polimerni materiali na splošno	Plastics in general

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EN ISO 5659-2

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English Version

## Plastics - Smoke generation - Part 2: Determination of optical density by a single-chamber test (ISO 5659-2:2017)

Plastiques - Production de fumée - Partie 2:  
Détermination de la densité optique par un essai en  
enceinte unique (ISO 5659-2:2017)

Kunststoffe - Rauchentwicklung - Teil 2: Bestimmung  
der optischen Dichte durch Einkammerprüfung (ISO  
5659-2:2017)

This European Standard was approved by CEN on 9 May 2017.

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## European foreword

This document (EN ISO 5659-2:2017) has been prepared by Technical Committee ISO/TC 61 “Plastics” in collaboration with Technical Committee CEN/TC 249 “Plastics” the secretariat of which is held by NBN.

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of an identical text or by endorsement, at the latest by December 2017, and conflicting national standards shall be withdrawn at the latest by December 2017.

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

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**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*

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 4, *Burning behaviour*.

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This fourth edition cancels and replaces the third edition (ISO 5659-2:2012), which has been technically revised. It details several technical points for sampling (essentially [Annex F](#)) and harmonizes sample preparation with other standards like ISO 5660-1.

A list of all parts in the ISO 5659 series can be found on the ISO website.

## ISO 5659-2:2017(E)

### Introduction

Fire is a complex phenomenon; its development and 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 to (see also ISO/TS 3814 and ISO 13943).

A test such as is specified in this document 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 13943 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 or other enclosure, such as a ship or train, 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.

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# Plastics — Smoke generation —

## Part 2:

# Determination of optical density by a single-chamber test

## 1 Scope

This document specifies a method of measuring smoke production from the exposed surface of specimens of materials or composites. It is applicable to specimens that have an essentially flat surface and do not exceed 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.

It is intended that the values of optical density determined by this test be taken as specific to the specimen or assembly material in the form and thickness tested and are not to be considered inherent, fundamental properties.

The test is intended primarily for use in research and development and fire safety engineering in buildings, trains, ships, etc. and not as a basis for ratings for building codes or other purposes. No basis is provided for predicting the density of smoke that can be generated by the materials upon exposure to heat and flame under other (actual) exposure conditions. This test procedure excludes the effect of irritants on the eye.

NOTE This test procedure addresses the loss of visibility due to smoke density, which generally is not related to irritancy potency (see [Annex E](#)).

It is emphasized that smoke production from a material varies according to the irradiance level to which the specimen is exposed. The results yielded from the method specified in this document are based on exposure to the specific irradiance levels of 25 kW/m<sup>2</sup> and 50 kW/m<sup>2</sup>.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 13943, *Fire safety — Vocabulary*

ISO 14934-3, *Fire tests — Calibration and use of heat flux meters — Part 3: Secondary calibration method*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 13943 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at <http://www.electropedia.org/>

— ISO Online browsing platform: available at <http://www.iso.org/obp>

## ISO 5659-2:2017(E)

**3.1  
assembly**

fabrication of *materials* (3.6) and/or *composites* (3.2)

Note 1 to entry: Sandwich panels are an example of an assembly.

Note 2 to entry: The assembly may include an air gap.

**3.2  
composite**

combination of *materials* (3.6) which are generally recognized in building construction as discrete entities

Note 1 to entry: Coated or laminated materials are examples of composites.

**3.3  
essentially flat surface**

surface which does not deviate from a plane by more than 1 mm

**3.4  
exposed surface**

surface of the *product* (3.9) subjected to the heating conditions of the test

**3.5  
irradiance**

radiant flux incident on an infinitesimal element of the surface containing the point divided by the area of that element

**3.6  
material**

basic single substance or uniformly dispersed mixture

Note 1 to entry: Metal, stone, timber, concrete, mineral fibre and polymers are examples.

**3.7  
mass optical density  
MOD**

measure of the degree of opacity of smoke in terms of the mass loss of the *material* (3.6)

**3.8  
optical density of smoke**

*D*

measure of the degree of opacity of smoke, taken as the negative common logarithm of the relative transmission of light

**3.9  
product**

*material* (3.6), *composite* (3.2) or *assembly* (3.1) about which information is required

**3.10  
specific optical density**

*D<sub>s</sub>*

optical density multiplied by a factor which is calculated by dividing the volume of the test chamber by the *product* (3.9) of the exposed area of the *specimen* (3.11) and the path length of the light beam

Note 1 to entry: See 11.1.1.

**3.11  
specimen**

representative piece of the product to be tested together with any substrate or surface coating

Note 1 to entry: The specimen may include an air gap.

**3.12****intumescent material**

dimensionally unstable *material* (3.6), developing a carbonaceous expanded structure

Note 1 to entry: Generally, a material developing an expanded structure of thickness >10 mm during the test, with the cone heater 25 mm from the specimen, is considered as intumescent material.

**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<sup>2</sup>.

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 or product for testing****5.1 Material or product geometry**

**5.1.1** The method is applicable to essentially flat materials, products, composites or 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 or product as tested.

**5.1.3** It is not possible to calculate the specific optical density of one thickness of a material or product from the specific optical density of another thickness of the material or product.

**5.2 Surface characteristics**

A material or product having one of the following properties is suitable for testing:

- a) an essentially flat exposed surface;
- b) a surface irregularity which is evenly distributed over the exposed surface provided that
  - 1) at least 50 % of the surface of a representative 100 mm<sup>2</sup> area lies within a depth of 10 mm from a plane taken across the highest points on the exposed surface or
  - 2) for surfaces containing cracks, fissures, or holes not exceeding 8 mm in width or 10 mm in depth, the total area of such cracks, fissures, or holes at the surface does not exceed 30 % of a representative 100 mm<sup>2</sup> area of the exposed surface.

When an exposed surface does not meet the requirements of either 5.2 a) or 5.2 b), the material or product shall be tested in a modified form complying as close as possible with the requirements given in 5.2. The test report shall state that the material or product has been tested in a modified form and clearly describe the modification.

**5.3 Asymmetrical products**

It is possible that a product submitted to this test will have faces which differ or contain laminations of different materials arranged in a different order in relation to the two faces. If either of the faces can be exposed in use within a room, cavity, or void, both faces shall be tested.