

Plastics - Determination of burning behaviour by oxygen index - Part 3: Elevated-temperature test (ISO 4589-3:2017)

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

See Eesti standard EVS-EN ISO 4589-3:2017 sisaldab Euroopa standardi EN ISO 4589-3:2017 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 4589-3:2017 consists of the English text of the European standard EN ISO 4589-3:2017.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 10.05.2017.	Date of Availability of the European standard is 10.05.2017.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile [standardiosakond@evs.ee](mailto:standardiosakond@evs.ee).

ICS 13.220.40, 83.080.01

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardikeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardikeskusega:

Koduleht [www.evs.ee](http://www.evs.ee); telefon 605 5050; e-post [info@evs.ee](mailto:info@evs.ee)

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation:

Homepage [www.evs.ee](http://www.evs.ee); phone +372 605 5050; e-mail [info@evs.ee](mailto:info@evs.ee)

English Version

Plastics - Determination of burning behaviour by oxygen  
index - Part 3: Elevated-temperature test (ISO 4589-  
3:2017)

Plastiques - Détermination du comportement au feu au  
moyen de l'indice d'oxygène - Partie 3: Essai à haute  
température (ISO 4589-3:2017)

Kunststoffe - Bestimmung des Brennverhaltens durch  
den Sauerstoff-Index - Teil 3: Prüfung bei erhöhter  
Temperatur (ISO 4589-3:2017)

This European Standard was approved by CEN on 20 March 2017.

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 CEN-CENELEC 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 CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

## European foreword

This document (EN ISO 4589-3:2017) 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 November 2017 and conflicting national standards shall be withdrawn at the latest by November 2017.

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 EN ISO 4589-3:1996.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: 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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

### Endorsement notice

The text of ISO 4589-3:2017 has been approved by CEN as EN ISO 4589-3:2017 without any modification.

# Contents

Page

<b>Foreword</b>	<b>iv</b>
<b>Introduction</b>	<b>v</b>
<b>1 Scope</b>	<b>1</b>
<b>2 Normative references</b>	<b>1</b>
<b>3 Terms and definitions</b>	<b>1</b>
<b>4 Principle</b>	<b>2</b>
<b>5 Apparatus</b>	<b>2</b>
5.1 Arrangement	2
5.2 Test chimney	2
5.3 Test specimen holder	3
5.4 Gas supplies	3
5.5 Gas control devices	3
5.6 Oxygen analyser	3
5.7 Flame igniter	4
5.8 Timing device	4
5.9 Fume extraction system	4
<b>6 Calibration and maintenance of equipment</b>	<b>4</b>
<b>7 Preparation of test specimens</b>	<b>4</b>
7.1 Sampling	4
7.2 Test specimen dimensions and preparation	4
7.3 Marking of test pieces	4
7.4 Conditioning	4
<b>8 Procedure</b>	<b>5</b>
8.1 Setting up the apparatus and test specimen	5
8.2 Igniting the test specimen	5
8.3 Assessing burning behaviour	5
8.4 Selecting successive volume fractions of oxygen	5
8.5 Determining the preliminary volume fraction of oxygen	5
8.6 Volume fraction of oxygen changes	6
<b>9 Calculations and expression of results</b>	<b>6</b>
<b>10 Comparison with a specified minimum value of the temperature index at a specified temperature (short procedure)</b>	<b>6</b>
<b>11 Precision</b>	<b>6</b>
<b>12 Test report</b>	<b>6</b>
<b>Annex A (normative) Measurement of flammability temperature (FT)</b>	<b>12</b>
<b>Annex B (informative) Interlaboratory test data on flammability temperature</b>	<b>15</b>
<b>Annex C (informative) Typical test results sheet</b>	<b>16</b>
<b>Bibliography</b>	<b>19</b>

## 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*.

This second edition cancels and replaces the first edition (ISO 4589-3:1996), which has been technically revised.

A list of all parts in the ISO 4589 series can be found on the ISO website.

## Introduction

This document has been prepared to extend the methods available for the determination of flammability by oxygen index (OI) (see ISO 4589-2) to typical elevated temperatures to which a plastic material can be exposed in a service situation. It also provides a method for determining the temperature at which combustion of a small bar of material is just supported in air under certain test conditions; the resulting temperature is termed the flammability temperature.

This document is intended to be used in conjunction with ISO 4589-2 which describes the basic OI test method.

Results obtained in accordance with this document are not applicable to describe or appraise the fire hazard presented by a particular material or shape under actual fire conditions, unless used as one element of a fire risk assessment which takes into account all of the factors which are pertinent to the assessment of the fire hazard of a particular application for the material.

# Plastics — Determination of burning behaviour by oxygen index —

## Part 3: Elevated-temperature test

### 1 Scope

This document specifies methods for determining the minimum volume fraction of oxygen, in a mixture with nitrogen, that will support combustion of small vertical test specimens under specified test conditions over a range of temperatures between 25 °C and 150 °C. The range of temperatures is typically between 40 °C and 150 °C. The results are defined as temperature index values at the test temperature, which is typical of the practical temperature that a plastic material can experience in an overheated service situation.

Methods are provided for testing materials that are self-supporting at the test temperature in the form of vertical bars or sheet up to 10,5 mm thick. However, they are not applicable to form V which requires a supporting frame as defined in ISO 4589-2:2017, Table 2. These methods are suitable for solid, laminated or cellular materials characterized by an apparent density 100 kg/m<sup>3</sup> or higher. The methods are also applicable to some cellular materials having an apparent density of less than 100 kg/m<sup>3</sup>. A method is provided for testing flexible sheet or film materials while supported vertically.

This document also includes a method (see [Annex A](#)) for determining the temperature at which the OI of small vertical test specimens in air is 20,9 % under specified test conditions. The temperature at which this occurs is defined as the flammability temperature (FT) and the method is limited to the determination of temperatures less than 400 °C. The method is not applicable to materials having an OI of <20,9 %.

NOTE 1 It might not be possible to apply these methods satisfactorily to materials that exhibit high levels of shrinkage when heated, e.g. highly oriented thin film.

NOTE 2 For assessing the flame propagation properties of cellular materials of density <100 kg/m<sup>3</sup>, attention is drawn to the method described in ISO 3582.

### 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 4589-1, *Plastics — Determination of burning behaviour by oxygen index — Part 1: General requirements*

ISO 4589-2:2017, *Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-temperature test*

ISO 13943, *Fire safety — Vocabulary*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4589-1, ISO 13943 and the following apply.