

**Plastid. Põlevusomaduste määramine  
hapnikuarvu abil. Osa 1: Juhised**

Plastics - Determination of burning behaviour by  
oxygen index - Part 1: Guidance

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN ISO 4589-1:2000 sisaldab Euroopa standardi EN ISO 4589-1:1999 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 11.01.2000 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN ISO 4589-1:2000 consists of the English text of the European standard EN ISO 4589-1:1999.</p> <p>This document is endorsed on 11.01.2000 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b> ISO 4589 consists of the following parts, under the general title, Plastics - Determination of burning behaviour by oxygen index: Part 1: Guidance Part 2: Ambient-temperature test Part 3:Elevated-temperature test</p>	<p><b>Scope:</b> ISO 4589 consists of the following parts, under the general title, Plastics - Determination of burning behaviour by oxygen index: Part 1: Guidance Part 2: Ambient-temperature test Part 3:Elevated-temperature test</p>
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**ICS** 13.220.40, 83.080.01

**Võtmesõnad:** determination, fire tests, flammability testing, general conditions, oxygen index, plastics, tests

English version

Plastics – Determination of burning behaviour  
by oxygen index

Part 1: Guidance  
(ISO 4589-1 : 1996)

Plastiques – Détermination du com-  
portement au feu au moyen de l'indice  
d'oxygène – Partie 1: Guide  
(ISO 4589-1 : 1996)

Kunststoffe – Bestimmung des  
Brennverhaltens durch den Sauer-  
stoff-Index – Teil 1: Anleitung  
(ISO 4589-1 : 1996)

This European Standard was approved by CEN on 1999-05-06.

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.

The European Standards exist 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.

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**CEN**

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

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

## Foreword

International Standard

ISO 4589-1 : 1996 Plastics – Determination of burning behaviour by oxygen index – Part 1: Guidance, which was prepared by ISO/TC 61 'Plastics' of the International Organization for Standardization, has been adopted by Technical Committee CEN/TC 249 'Plastics', the Secretariat of which is held by IBN, as a European Standard.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, and conflicting national standards withdrawn, by December 1999 at the latest.

In accordance with the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard:

Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

## Endorsement notice

The text of the International Standard ISO 4589-1 : 1996 was approved by CEN as a European Standard without any modification.

NOTE: Normative references to international publications are listed in Annex ZA (normative).

## Introduction

The oxygen index (OI) test at ambient temperature was first described by Fenimore and Martin<sup>[2]</sup> in 1966. The first use of the method in standards was ASTM Standard Test Method D 2863:1970<sup>[6]</sup>, and it has since been published in a wide range of national and international standards. It was published as ISO 4589 in 1984 and has now been revised as ISO 4589-2. The OI test at elevated temperatures is described in ISO 4589-3.

In the period since ASTM D 2863 became a standard, a considerable number of papers have been published about this test. An example is the review by Weil, Hirschler, *et al.*<sup>[3]</sup> relating to the relevance of the test to real fire situations. Other papers have suggested empirical formulae relating OI to the amounts of added fire retardant, or describe practical investigations on the equipment performance (see Kanury<sup>[4]</sup>). A clear consensus on the value of the two variants of the test has emerged, however, and it is the purpose of this guidance document to discuss the use of the equipment and the applicability of both test methods.

## 1 Scope

**1.1** This part of ISO 4589 constitutes a guidance document for the OI test. It provides information to guide the reader in the use of the test procedures described in parts 2 and 3.

**1.2** Part 2 describes a method for determining the minimum concentration of oxygen by percentage volume in a mixture of oxygen and nitrogen introduced at  $23\text{ °C} \pm 2\text{ °C}$  that will just support combustion of a material under specified test conditions. The results are defined as OI values. For comparative purposes, a procedure is also provided for determining whether or not the OI of a material lies above some specified minimum value, which is particularly important for quality control purposes. There is also a procedure for the testing of thin films between 20  $\mu\text{m}$  and 100  $\mu\text{m}$  thickness.

**1.3** Part 3 describes methods of carrying out the same determination over a range of temperatures typically between 25  $\text{°C}$  and 150  $\text{°C}$  (although temperatures up to 400  $\text{°C}$  may be used). The results are defined as OI values at the test temperature. Part 3 also describes a method for determining the temperature at which the OI of the small vertical test specimens is 20,9. The result is defined as the flammability temperature. Part 3 is not applicable to materials having an OI value of less than 20,9 at 23  $\text{°C}$ .

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4589. 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 4589 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 4589-2:1996, *Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-temperature test.*

ISO 4589-3:1996, *Plastics — Determination of burning behaviour by oxygen index — Part 3: Elevated-temperature test.*

## 3 Principles of the test

**3.1** In part 2, the material can be tested either as a rigid specimen or as a flexible specimen in a specified holder which is mounted in a transparent chimney in which a mixture of oxygen and nitrogen flows upwards in a laminar flow pattern. After specimen conditioning, the test is carried out at room temperature. This constitutes the test in its simplest form. In the top-surface ignition procedure, the applied flame is allowed to impinge on the top surface of the specimen for a maximum time of 30 s coupled with periodic removal of the flame every 5 s to check if the specimen is burning. This also ensures that the specimen temperature does not rise excessively, since this would normally lower the OI value. In the propagating-ignition procedure, the flame is allowed to impinge to a depth of approximately 6 mm down the vertical sides of the specimen. In the thin-film procedure, the film is wrapped in a 45° spiral around a rod and taped, after which the rod is withdrawn and the top end of the specimen is cut off at a distance of 20 mm from the top.