
**Plastics — Vertical flame spread
determination for film and sheet**

*Plastiques — Détermination de la propagation verticale de la flamme
sur films et feuilles*

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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).

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).

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 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

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 12992:1995), which has been technically revised.

The main changes compared to the previous edition are as follows:

- [Clause 2](#) has been updated;
- [Clause 3](#) has been updated;
- the precision data have been moved to [Annex A](#).

Introduction

Thin flexible plastic films and sheets are widely used in products for packaging, building, housing, industries and transport media, in various applications. The burning behaviour, in particular, the vertical flame spread of flexible plastic films and sheet, is a concern for fire safety of these applications. This document gives a method of determination of vertical flame spread of flexible plastic films and sheets by small flame source.

This document is also intended as a pre-selection test for materials used for parts in devices and appliances. The final acceptance of the material would be dependent upon its use in complete equipment that conforms with the standards applicable to such equipment.

It should be noted that the test results obtained alone by the test specified in this document cannot give whole aspects of fire hazard of plastics films and sheets.

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Plastics — Vertical flame spread determination for film and sheet

1 Scope

This document specifies a test method for measurement of flame spread properties of vertically oriented specimens of plastics in the form of film and sheet, 3 mm or less thickness, subjected to a small igniting flame.

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 11925-2, *Reaction to fire tests — Ignitability of products subjected to direct impingement of flame — Part 2: Single-flame source test*

ISO 13943, *Fire safety — Vocabulary*

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3 Terms and definitions (standards.iteh.ai)

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>

3.1

afterglow

persistence of glowing combustion after both removal of the ignition source and the cessation of any flaming combustion

[SOURCE: ISO 13943:2008, definition 4.8]

3.2

flame-spread time

time taken by a flame front on a burning material to travel a specified distance on the surface, or to cover a specified surface area under specified conditions

[SOURCE: ISO 13943:2008, definition 4.144]

3.3

flaming droplet

molten material separating from a burning item and continuing to flame during a fire or fire test

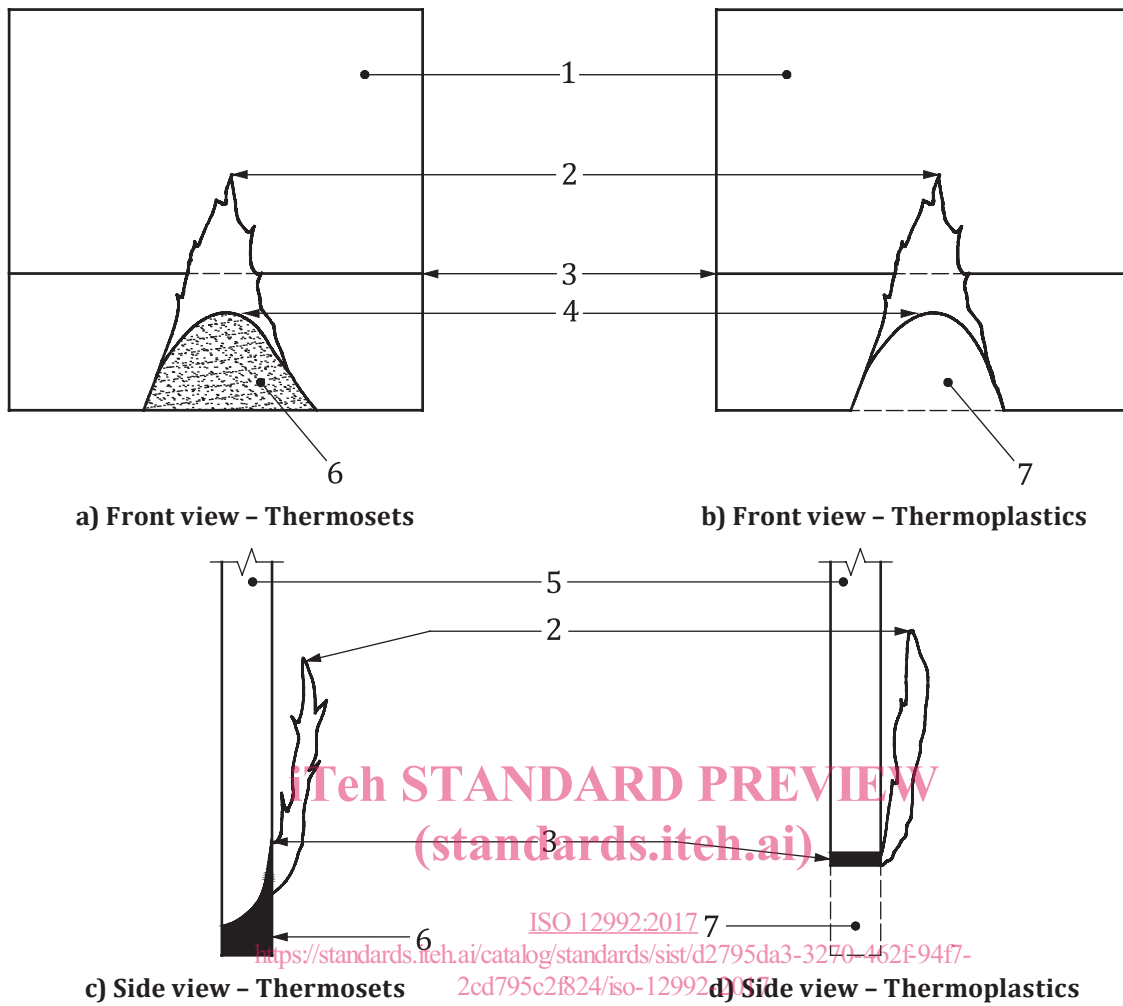
[SOURCE: ISO 13943:2008, definition 4.150]

3.4

seat of flame

flame location at the leading edge of the affected area

Note 1 to entry: See [Figure 1](#).



Key

- | | | | |
|---|---------------|---|-----------------------------|
| 1 | test specimen | 5 | test specimen cross section |
| 2 | top of flame | 6 | burnt area |
| 3 | marker line | 7 | shrunk area |
| 4 | seat of flame | | |

Figure 1 — Identification of seat of flame

4 Significance of the test

4.1 Results obtained using the method described in this document can provide a sensitive measure of the burning characteristics of material under certain controlled laboratory conditions, and hence, may be useful for preselection or quality control purposes.

4.2 Results obtained from specimens of differing thickness, with different ignition sources and/or by different procedures are not comparable. Correlation with flammability behaviour under other fire conditions is not implied.

4.3 This test is not relevant for specimens which distort away from and out of reach of the test flame without ignition. Other test methods should be explored for such specimens.

4.4 Results obtained by this document shall not be used alone to describe or appraise the fire hazard presented by a particular material type or shape under actual fire conditions. The results may be used as one element of a fire risk assessment, which takes into account all the factors which are pertinent to the assessment of the fire hazard of a particular end use for the material.

Precision data are given in [Annex A](#).

5 Principle

5.1 A defined flame from a specified ignition source is applied to film or sheet specimens that are vertically oriented, for a specified period of time.

5.2 The flame-spread time ([3.2](#)) is recorded and the flame spread rate between these two markings is calculated.

5.3 Other properties relating to flame propagation, such as flaming droplets, extinguishing characteristics and afterglow, are observed and recorded.

6 Apparatus

6.1 Laboratory fume hood

The laboratory fume hood shall have an inside volume of at least 0,5 m³. The chamber shall permit observation of tests in progress and shall be draught free while allowing normal thermal circulation of air past the test specimen during burning. The inside surfaces of the chamber shall be of a dark colour. When a light meter, facing towards the rear of the chamber, is positioned in place of the test specimen, the recorded light level shall be less than 20 lx.

For safety and convenience, this enclosure (which can be completely closed) shall be fitted with an extraction device, such as an exhaust fan, to remove products of combustion that may be toxic. The extraction device shall be turned off during the test and turned on again immediately after the test to remove the fire effluents. A positive closing damper may be needed.

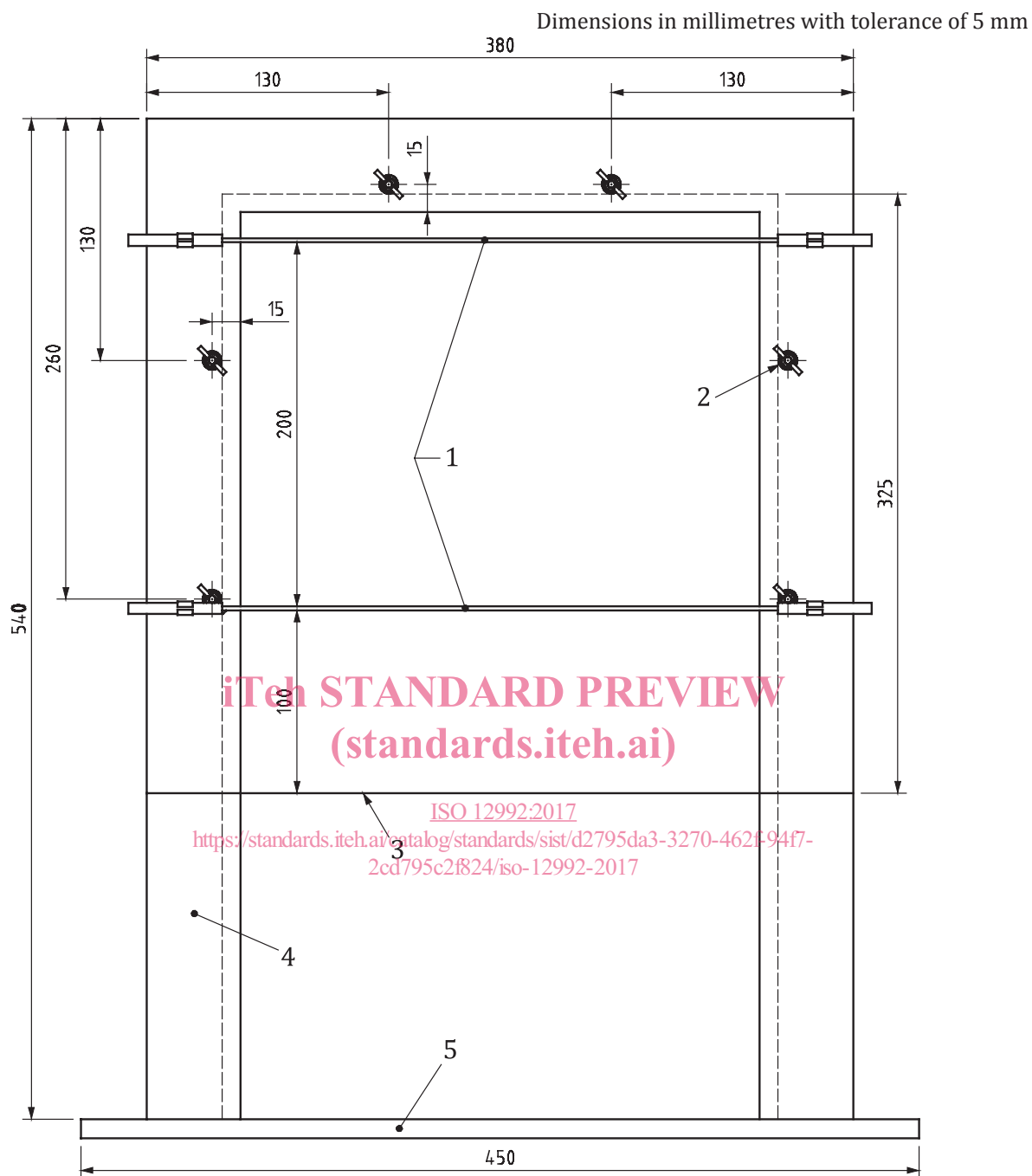
NOTE The amount of oxygen available to support combustion is naturally important for the conduct of these flame tests. For tests conducted by this method when burning times are protracted, chamber sizes greater than 0,5 m³ can be needed to provide reproducible results.

6.2 Conditioning room or chamber

The conditioning room or chamber shall be capable of being maintained at (23 ± 2) °C and (50 ± 5) % relative humidity.

6.3 Specimen holder

As described in [Figure 2](#) to [Figure 4](#), the specimen holder shall be capable of supporting the specimen securely in a vertical position without excessively stressing it and providing support for marker rods across the front of the specimen.

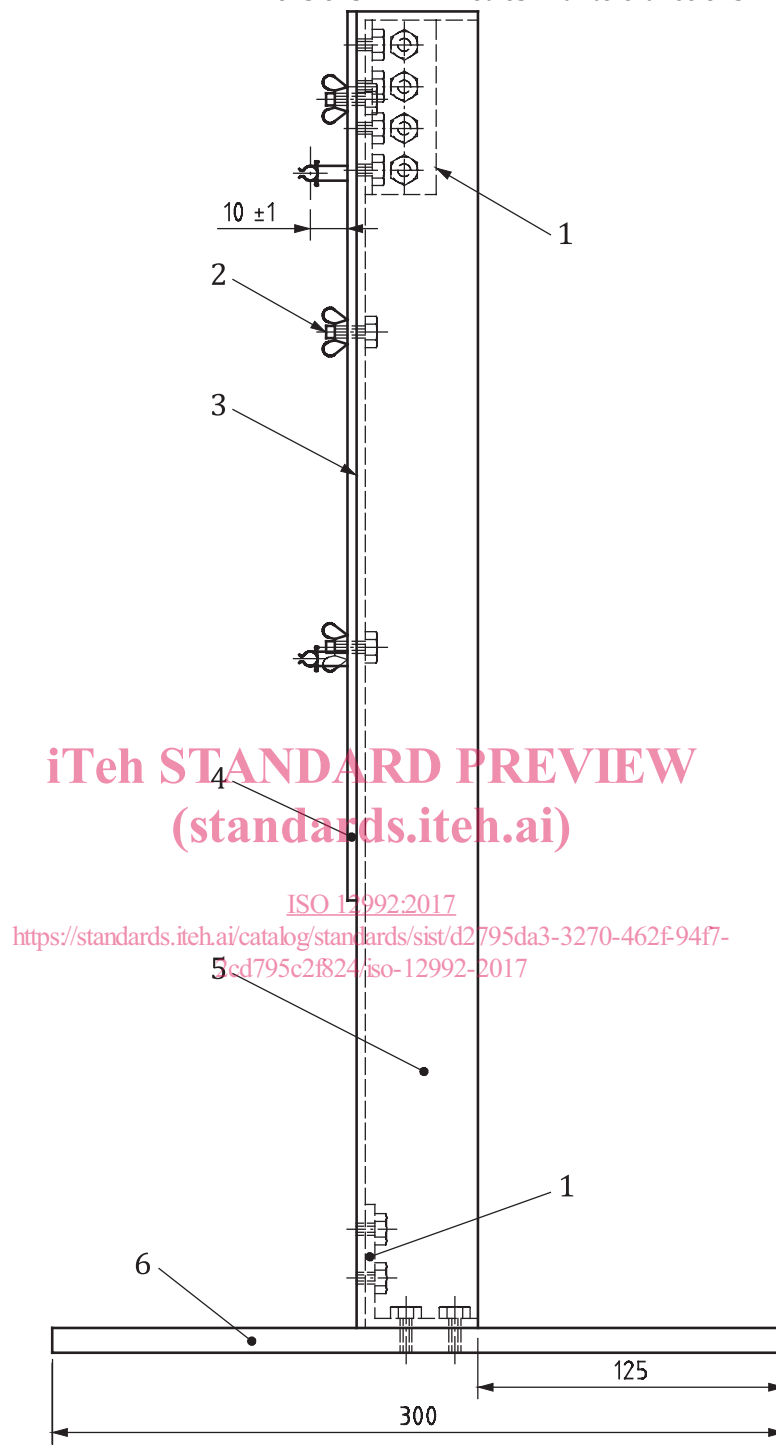


Key

- | | | | |
|---|--|---|--|
| 1 | marker rod in front of marker line | 4 | extruded aluminium angle (50 × 50 × 3,5) |
| 2 | wing nut or cam-action clump | 5 | aluminium plate (450 × 300 × 6) |
| 3 | specimen located between protruding screws | | |

Figure 2 — Specimen support fixture (Front view)

Dimensions in millimetres with tolerance of 5 mm not otherwise specified



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Key

- | | | | |
|---|--|---|-----------------------------|
| 1 | angle bracket installed with bolts, screws or rivets | 4 | specimen hold-down plate |
| 2 | wing nut or cam-action clump | 5 | support frame |
| 3 | specimen | 6 | 6 mm + 1 mm aluminium plate |

Figure 3 — Specimen support fixtures (Side view)