
**Cellular plastics — Determination of
horizontal burning characteristics of small
specimens subjected to a small flame**

*Plastiques alvéolaires — Détermination des caractéristiques de combustion
de petites éprouvettes en position horizontale, soumises à une petite
flamme*

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Contents

	Page
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Significance of test	2
5 Apparatus	2
6 Specimens	7
7 Conditioning	8
8 Test procedure	8
9 Calculations	11
10 Precision	11
11 Test report	12

Annex

A Classification system	13
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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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.

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

International Standard ISO 9772 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 4, *Burning behaviour*.

This second edition cancels and replaces the first edition (ISO 9772:1994), which has been technically revised.

Annex A of this International Standard is for information only.

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Cellular plastics — Determination of horizontal burning characteristics of small specimens subjected to a small flame

1 Scope

1.1 This International Standard specifies a small-scale laboratory screening procedure for comparing the relative burning characteristics of horizontally oriented, small cellular plastic specimens having a density less than 250 kg/m³ determined in accordance with ISO 845, when exposed to an ignition source.

NOTE Another standard exists covering flexible cellular plastic and cellular rubber: ISO 3582:2000, *Flexible cellular polymeric materials — Laboratory assessment of horizontal burning characteristics of small specimens subjected to a small flame*.

1.2 This method of test is intended for quality assurance and limited product evaluation of cellular plastic materials under controlled laboratory conditions, and is not intended to assess the fire behaviour of e.g. building materials or furnishings under actual fire conditions.

1.3 The optional classification system described in annex A is intended for the preselection of cellular plastic materials for products.

1.4 The burning behaviour of cellular plastics is influenced by test specimen orientation (vertical or horizontal). This method of test evaluates specimens which are oriented horizontally.

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2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 291:1997, *Plastics — Standard atmospheres for conditioning and testing*.

ISO 845:1988, *Cellular plastics and rubbers — Determination of apparent (bulk) density*.

ISO 1043-1:—¹⁾, *Plastics — Symbols and abbreviated terms — Part 1: Basic polymers and their special characteristics*.

ISO 1923:1981, *Cellular plastics and rubbers — Determination of linear dimensions*.

ISO 10093:1998, *Plastics — Fire tests — Standard ignition sources*.

ISO/IEC 13943:2000, *Fire safety — Vocabulary*.

1) To be published. (Revision of ISO 1043-1:1997)

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions of ISO/IEC 13943 and the following apply.

3.1

afterflame time

length of time for which a material continues to flame, under specified test conditions, after the ignition source has been removed

3.2

afterglow time

length of time for which a material continues to glow, under specified test conditions, after the ignition source has been removed and/or extinguishment of flame

4 Significance of test

4.1 Tests conducted on a material under the conditions specified can be of considerable value when comparing the horizontal burning characteristics of different materials, controlling manufacturing processes or assessing any changes in formulation or treatment prior to use.

4.2 Assessment of fire hazard requires consideration of factors such as fuel contribution, intensity of burning (rate of heat release) and products of combustion, as well as environmental factors such as intensity of source, orientation of exposed material and ventilation conditions.

4.3 Horizontal burning characteristics, as measured by this test procedure, may be affected by factors such as density, any anisotropy of the cellular material, its melting characteristics, its colour and its thickness.

4.4 Certain materials may shrink from the applied flame without igniting. In this event, the test results are not valid and additional test specimens will be required to obtain 10 valid test results. If this proves impossible due to non-ignition of all the specimens, then this test is not suitable for these materials.

4.5 The horizontal burning characteristics of some cellular plastic materials may change with time and tests are therefore conducted before and after heat ageing.

5 Apparatus

5.1 Laboratory fume hood, having an inside volume of at least 0,5 m³. The chamber shall permit observation of tests in progress and shall be draught free whilst 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 lux.

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 may be needed to provide reproducible results.

5.2 P/PF2 laboratory burner, as specified in ISO 10093, having a barrel length of (100 ± 10) mm and an internal diameter (9,5 ± 0,3) mm. The barrel shall not be equipped with an end attachment, such as a stabilizer.

5.3 Burner wing top, having an opening of internal length (48 ± 1) mm and internal width (1,3 ± 0,05) mm (see Figure 1).

NOTE To ensure the wing top opening is uniform in width, a (1,3 ± 0,05) mm steel wire or spacer can be slid along its length.

5.4 Support gauze, approximately 215 mm long by 75 mm wide, having 13 mm of its length bent to form a right angle at one end as shown in Figure 2. It shall consist of 6,4 mm mesh gauze constructed of $(0,90 \pm 0,05)$ mm diameter stainless steel or low carbon steel wire. A different support gauze is necessary for each specimen unless means are provided to burn off any residue from a prior test.

5.5 Support-gauze holder, consisting of two laboratory ring stands with clamps adjustable to the desired angles and heights or a support-gauze holder constructed from aluminium or steel as shown in Figure 3, and satisfying the following conditions:

- the long axis of the gauze is maintained to within 1° of the horizontal;
- the nearest end of the specimen is (13 ± 1) mm above the burner wing top (see Figure 4);
- the space both above and below the specimen is not obstructed;
- a means is provided for positioning the burner in the correct location relative to the specimen, preferably with a sliding mechanism and a stop to allow fast movement of the burner flame towards and away from the specimen;
- the gauze is equidistant from the front and back, and from both sides, of the test chamber, and is (175 ± 25) mm above the base of the test chamber.

5.6 Two timing devices, accurate to 1 s.

5.7 Measuring scale, graduated in millimetres, to measure the length, width and thickness of the test specimen.

5.8 Gas supply: technical-grade methane gas with a purity of at least 98 % and having a heat content of (37 ± 1) MJ/m³, with regulator and meter to ensure uniform gas flow.

Other gas mixtures having a heat content of approximately (37 ± 1) MJ/m³ or propane having a heat content of (94 ± 2) MJ/m³ have been shown to provide similar results when using the procedure of clause 8. In cases of dispute, however, technical-grade methane shall be used.

5.9 A manometer and gas flow meter, calibrated for the gas used and capable of reading the values shown in Table 1.

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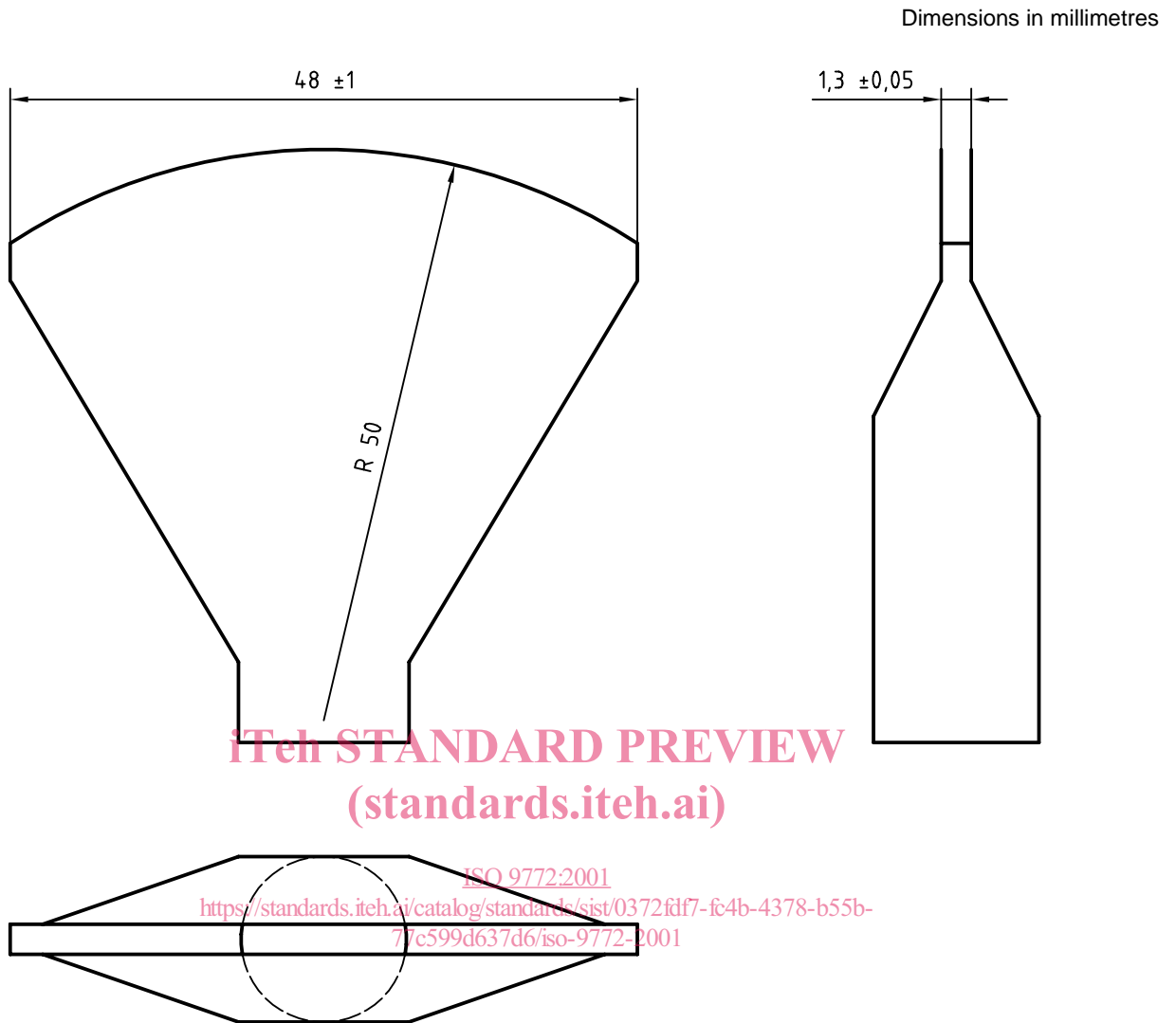
5.10 Cotton indicator, consisting of dry, absorbent 100 % cotton having a maximum mass of 0,08 g.

5.11 Desiccator, containing anhydrous calcium chloride or another drying agent, which can be maintained at $(23 \pm 2)^\circ\text{C}$ and gives a relative humidity not exceeding 20 %, in accordance with ISO 291:1997.

5.12 Conditioning room or chamber, capable of being maintained at $(23 \pm 2)^\circ\text{C}$ and a relative humidity of (50 ± 5) % relative humidity, in accordance with ISO 291:1997.

5.13 Air-circulating oven, with a minimum of five air-changes per hour, capable of being maintained at $(70 \pm 2)^\circ\text{C}$ or another agreed temperature.

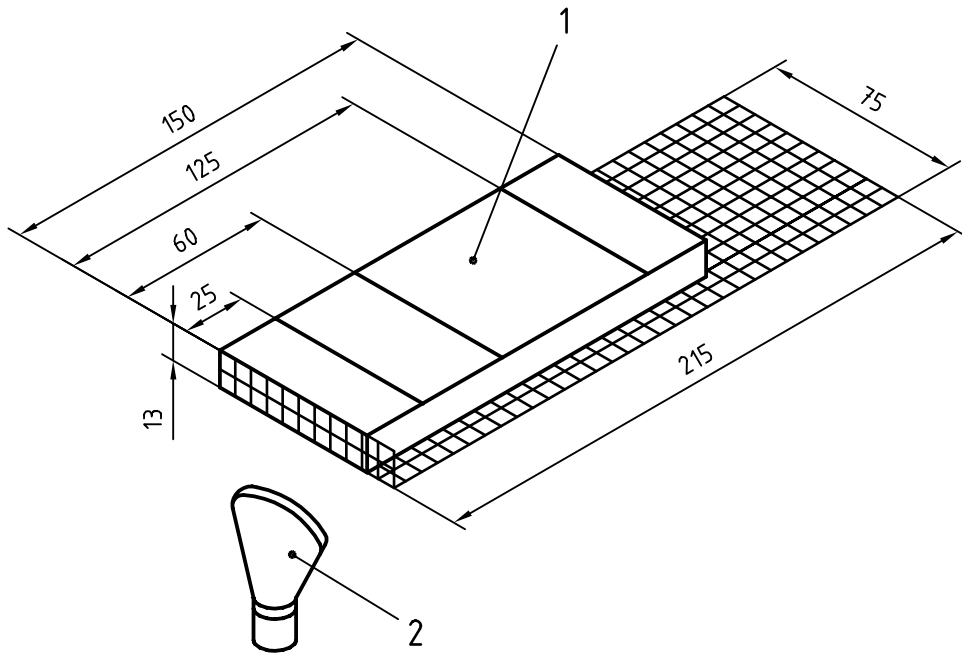
5.14 Dial-gauge micrometer, for measuring the specimen thickness, with a 650 mm² pressure foot exerting a pressure of $(0,175 \pm 0,035)$ kPa.



Material: copper or stainless steel

Figure 1 — Burner wing top

Dimensions in millimetres



Key

- 1 Specimen
- 2 Burner wing top

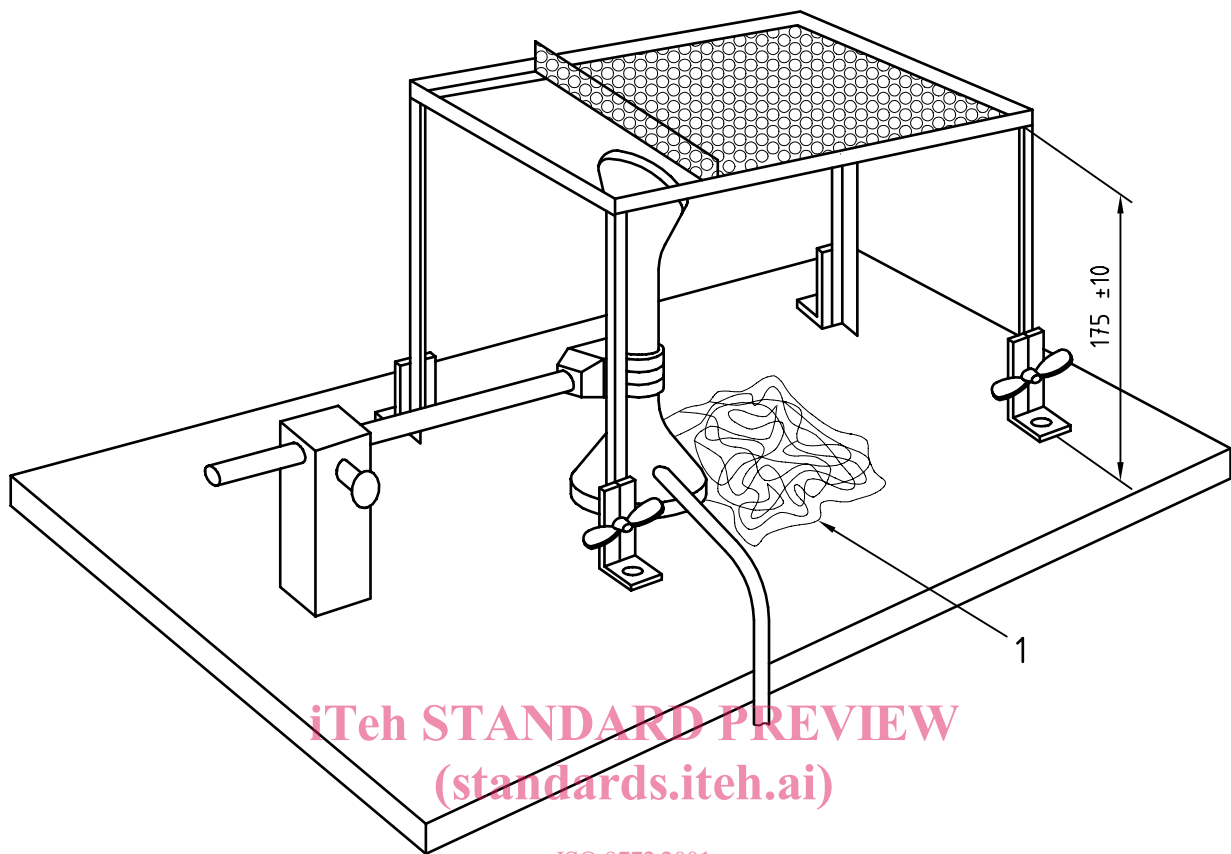
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Figure 2 — Test specimen and support gauze

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Dimensions in millimetres

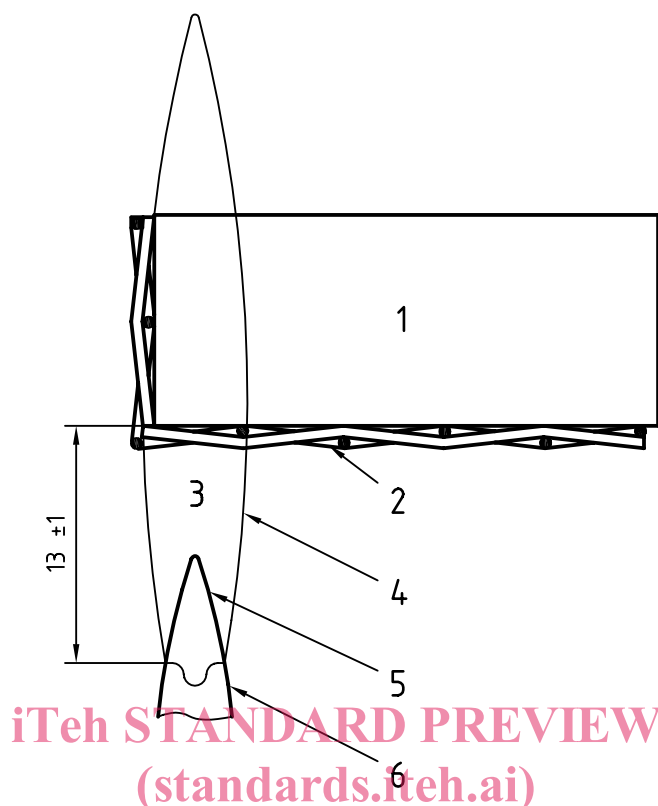


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Key
1 Cotton indicator

Figure 3 — Support gauze holder

Dimensions in millimetres

**Key**

- 1 Test specimen, maximum thickness 13 mm
 2 Specimen support gauze, 6,4 mm mesh
 3 Blue flame
 4 Profile of visible flame, 38 mm high
 5 Profile of inner core
 6 Burner wing top

Figure 4 — Details of flame and relative positions of burner wing top, test specimen and specimen support gauze

6 Specimens

6.1 All specimens shall be cut from a representative sample of the material. Care shall be taken to remove all dust and any particles from the surface.

6.2 The standard test specimen shall be (150 ± 10) mm long by (50 ± 1) mm wide. Materials supplied in thicknesses over 13 mm shall be cut to (13 ± 1) mm thickness with any skin on one side. Materials supplied in thicknesses of 13 mm or less shall be tested at the thickness supplied, without removing any skin (see 6.5). If materials with adhesive applied are to be tested, specimens having adhesive on one side only shall be used (see 6.5).

NOTE Tests made on test specimens of different thicknesses, densities or directions of anisotropy are not comparable.

6.3 Prepare a minimum of 20 specimens for the test. This includes 10 additional specimens in the event that the situation described in 4.4, 4.5 or in clause A.3 is encountered.

6.4 Mark each specimen across its width with lines at 25 mm, 60 mm and 125 mm from one end, referred to hereafter as gauge marks (see Figure 2).