
**Reaction to fire tests for products —
Non-combustibility test**

Essais de réaction au feu de produits — Essai d'incombustibilité

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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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 92, *Fire safety*, Subcommittee SC 1, *Fire initiation and growth*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 127, *Fire safety in buildings*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This sixth edition cancels and replaces the fifth edition (ISO 1182:2010), which has been technically revised. The main changes compared to the previous edition are as follows:

- a second furnace thermocouple has been introduced in [Subclauses 4.4, 7.2.2, 7.2.4](#) and [8.3, Clause 9](#) and [Figure 2](#);
- the calibration procedure of the furnace wall temperature has been adjusted;
- [Formulae \(16\)](#) and [\(17\)](#) have been aligned with the values in Table 3;
- in [Clause 5](#), the range of uncertainty in size of specimen has been reduced;
- [Annex D](#) has been corrected.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This fire test has been developed for use by those responsible for the selection of construction products which, whilst not completely inert, produce only a very limited amount of heat and flame when exposed to temperatures of approximately 750 °C.

The limitation of the field of application to testing homogeneous products and substantial components of non-homogeneous products was introduced because of problems in defining specifications for the specimens. The design of the specimen of non-homogeneous products strongly influences the test results, which is the reason non-homogeneous products cannot be tested to this document.

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Reaction to fire tests for products — Non-combustibility test

1 Scope

This document specifies a test method for determining the non-combustibility performance, under specified conditions, of homogeneous products and substantial components of non-homogeneous products.

Information on the precision of the test method is given in [Annex A](#).

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 13943, *Fire safety — Vocabulary*

IEC 60584-1, *Thermocouples — Part 1: EMF Specifications and tolerances*

EN 13238, *Reaction to fire tests for building products — Conditioning procedures and general rules for selection of substrates*

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:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

product

material, element or component about which information is required

3.2

material

single basic substance or uniformly dispersed mixture of substances

EXAMPLE Metal, stone, timber, concrete, mineral wool with uniformly dispersed binder and polymers.

3.3

loose fill material

material without any physical shape

3.4

homogeneous product

product, consisting of a single material, having uniform density and composition throughout

3.5

non-homogeneous product

product, composed of more than one component, substantial or non-substantial, not having uniform density and composition throughout

**3.6
substantial component**

material that constitutes a significant part of a non-homogeneous product and that has a layer with a mass/unit area more than or equal to 1,0 kg/m² or a thickness more than or equal to 1,0 mm

**3.7
non-substantial component**

material that does not constitute a significant part of a non-homogeneous product and that has a layer with a mass/unit area below 1,0 kg/m² and a thickness below 1,0 mm

**3.8
sustained flaming**

persistence of flame at any part of the visible part of the specimen lasting 5 s or longer

Note 1 to entry: Steady blue-coloured luminous gas zones should not be regarded as flaming. Such gas zones should only be noted under “observations during test” in the test report.

4 Apparatus

4.1 General

The test apparatus shall be capable of creating the conditions specified in 7.1. A typical design of furnace is given in Annex B; other designs of furnace may be used.

NOTE 1 All dimensions given in the description of the test apparatus are nominal values, unless tolerances are specified.

The apparatus shall consist of a furnace comprising essentially a refractory tube surrounded by a heating coil and enclosed in an insulated surround. A cone-shaped airflow stabilizer shall be attached to the base of the furnace and a draught shield to its top.

The furnace shall be mounted on a stand and shall be equipped with a specimen holder and a device for inserting the specimen-holder into the furnace tube.

Thermocouples, as specified in 4.4, shall be provided for measuring the furnace temperatures and the furnace wall temperature. The thermal sensor, as specified in 4.5, shall be provided for measuring the furnace temperature along its central axis.

NOTE 2 Annex C gives details of additional thermocouples to be used if the specimen surface temperature and the specimen centre temperature are required.

4.2 Furnace, draught shield and stand

4.2.1 Furnace tube, made of an alumina refractory material as specified in Table 1, of density (2 800 ± 300) kg/m³. It shall be (150 ± 1) mm high with an internal diameter of (75 ± 1) mm and a wall thickness of (10 ± 1) mm.

Table 1 — Composition of the furnace tube refractory material

Material	Composition % (kg/kg mass)
Alumina (Al ₂ O ₃)	>89
Silica and alumina (SiO ₂ , Al ₂ O ₃)	>98
Ferric oxide (Fe ₂ O ₃)	<0,45
Titanium dioxide (TiO ₂)	<0,25
Manganese oxide (Mn ₃ O ₄)	<0,1
Other trace oxides (sodium, potassium, calcium and magnesium oxides)	The balance

The furnace tube shall be fitted in the centre of a surround made of insulating material 150 mm in height and of 10 mm wall thickness, and fitted with top and bottom plates recessed internally to locate the ends of the furnace tube. The annular space between the tubes shall be filled with a suitable insulating material.

NOTE 1 An example of a typical furnace tube design is given in [B.2](#).

An open-ended cone-shaped airflow stabilizer shall be attached to the underside of the furnace. The stabilizer shall be 500 mm in length, and reduce uniformly from 75 ± 1 mm internal diameter at the top to $10 \pm 0,5$ mm at the bottom. The stabilizer shall be manufactured from 1 mm-thick sheet steel, with a smooth finish on the inside. The joint between the stabilizer and the furnace shall be a close, airtight fit, with a smooth finish internally. The upper half of the stabilizer shall be insulated externally with a suitable insulating material.

NOTE 2 An example of suitable insulating material is given in [B.3](#).

4.2.2 Draught shield, made of the same material as the stabilizer cone, and provided at the top of the furnace. It shall be 50 mm high and have an internal diameter of (75 ± 1) mm. The draught shield and its joint with the top of the furnace shall have a smooth finish internally, and the exterior shall be insulated with a suitable insulating material.

NOTE An example of suitable insulating material is given in [B.4](#).

4.2.3 Stand, firm and horizontal, on which the assembly of the furnace, stabilizer cone and draught shield are mounted. There shall be a base and draught screen attached to the stand to reduce draughts around the bottom of the stabilizer cone. The draught screen shall be 550 mm high and the bottom of the stabilizer cone shall be 250 mm above the base plate.

4.3 Specimen holder and insertion device

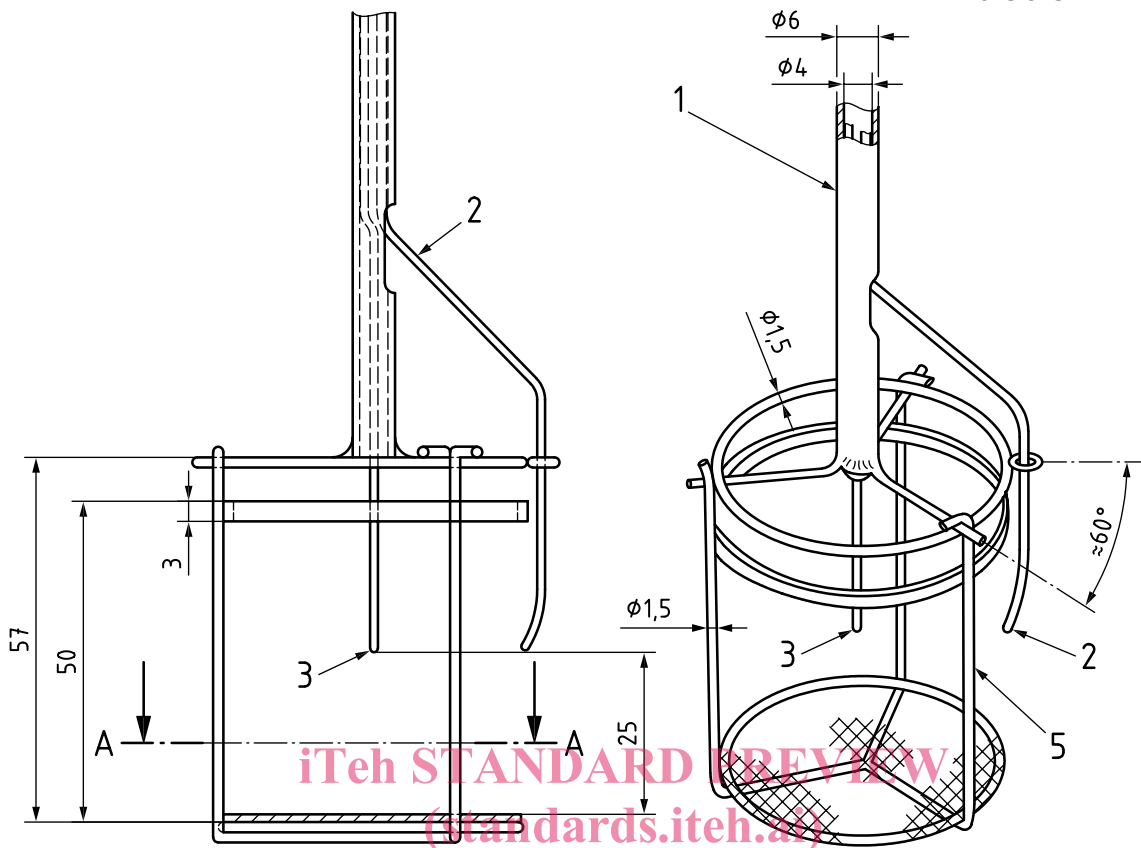
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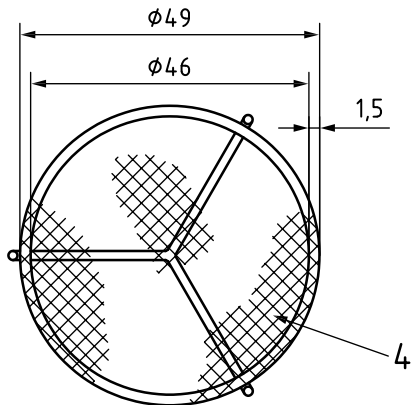
4.3.1 Specimen holder, as specified in [Figure 1](#) and made of nickel/chromium or heat-resisting steel wire. A fine metal gauze tray of heat-resisting steel shall be placed in the bottom of the holder. The mass of the holder shall be (15 ± 2) g.

Due to ageing, specimen holders can lose weight. The mass of the holder shall be regularly checked.

Dimensions in millimetres



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Key

- 1 stainless steel tube
- 2 specimen surface thermocouple
- 3 specimen centre thermocouple
- 4 aperture mesh 0,9 mm diameter of wire 0,4 mm
- 5 vertical specimen holder bar

Figure 1 — Specimen holder

The specimen holder shall be capable of being suspended from the lower end of a tube of stainless steel having an outside diameter of 6 mm and a bore of 4 mm.

4.3.2 Insertion device, suitable for lowering the specimen holder precisely down the axis of the furnace tube smoothly and carefully, such that the geometric centre of the specimen is located rigidly at the geometric centre of the furnace during the test. The insertion device shall consist of a metallic sliding rod moving freely within a vertical guide fitted to the side of the furnace.

The specimen holder for loose fill materials shall be cylindrical and of the same outer dimensions as the specimen (see 5.1), and made of a fine metal wire gauze of heat-resisting steel similar to the wire gauze used at the bottom of the normal holder specified in 4.3.1. The specimen holder shall have an open end at the top. The mass of the holder shall not exceed 30 g.

4.4 Thermocouples, with a wire diameter of 0,3 mm and an outer diameter of 1,5 mm. The hot junction shall be insulated and not earthed. The thermocouples shall be of either type K or type N. They shall be of tolerance class 1 in accordance with IEC 60584-1. The sheathing material shall be either stainless steel or a nickel-based alloy. All new thermocouples shall be artificially aged before use to reduce reflectivity.

NOTE A suitable method of ageing is to run a test without any test specimen inserted for 1 h.

The two furnace thermocouples, TC1 and TC2, shall be located with each of their hot junctions ($10 \pm 0,5$) mm from the tube wall and at a height corresponding to the geometric centre of the furnace tube (see Figure 2). In the upper picture of Figure 2, the two furnace thermocouples (key 8 and 9) are inserted in this plane to indicate the dimensions, i.e. the distances to the furnace wall and the specimen surface, but are not located in this plane. The position of the furnace thermocouples in relation to each other and to the surface thermocouple can be seen in the lower drawing of Figure 2. The correct position of the thermocouple shall be maintained with the help of a guide attached to the draught shield.

The position of the thermocouples shall be set using the locating guide illustrated in Figure 3. The length of the furnace thermocouple outside the guide shall be (40 ± 5) mm.

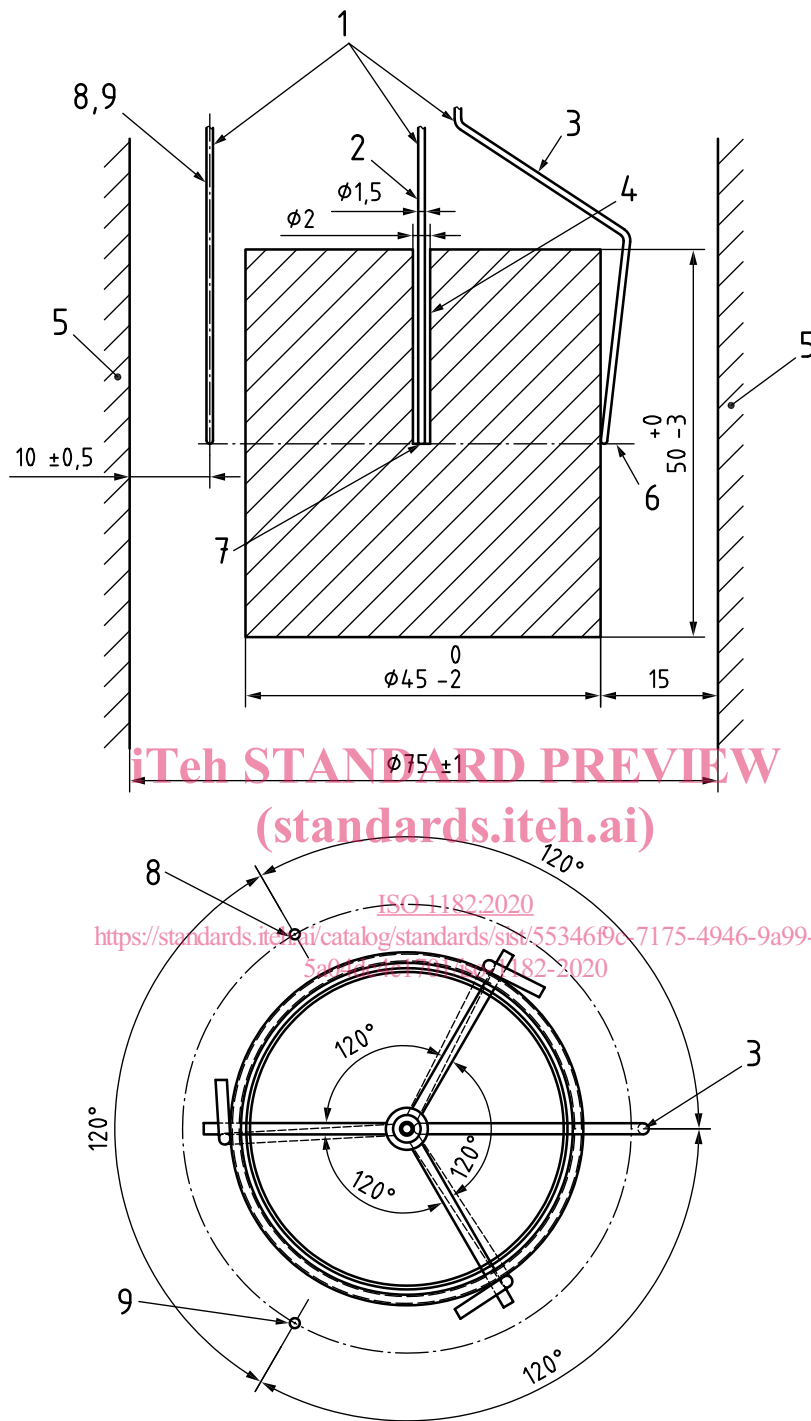
The furnace thermocouples shall be initially calibrated at 750 °C. Any correction term received at the calibration shall be added to the output. ISO 1182:2020

The furnace thermocouples shall be replaced after 200 test runs.

Details of any additional thermocouples required and their positioning are given in Annex C. The use of these two thermocouples is optional.

4.5 Thermal sensor, made of a thermocouple of the type specified in 4.4, brazed to a copper cylinder of diameter ($10 \pm 0,2$) mm and height ($15 \pm 0,2$) mm. The hot junction shall be at the geometrical centre of the copper cylinder.

4.6 Contact thermocouple, made of a thermocouple of the type specified in 4.4. The thermocouple shall be curved according to Figure 4.



Key

- | | | | |
|---|-------------------------------|---|-------------------------------------------|
| 1 | sheathed thermocouples | 6 | mid-height of constant temperature zone |
| 2 | specimen centre thermocouple | 7 | contact between thermocouple and material |
| 3 | specimen surface thermocouple | 8 | furnace thermocouple 1 |
| 4 | 2 mm diameter hole | 9 | furnace thermocouple 2 |
| 5 | furnace wall | | |

Figure 2 — Relative position of furnace, specimen and thermocouples