
**Protective clothing — Protection
against flame — Method of test for
limited flame spread**

*Vêtements de protection — Protection contre les flammes — Méthode
d'essai pour la propagation de flamme limitée*

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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.

The committee responsible for this document is ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing*.

This second edition cancels and replaces the first edition (ISO 15025:2000), of which all clauses, several figures and [Annex C](#) have been technically revised. A new [Clause 8](#) on sampling and sample preparation has been added. A new [Annex D](#) on precision has been added.

To improve precision, the following major modifications have been made from the first edition:

- a) the width of the specimen for Procedure B has been changed from 160 mm to 80 mm;
- b) the gas used has been limited to commercial grade propane;
- c) definitions of several reported observations have been added or revised;
- d) more detailed instructions for preparing hemmed specimens, multilayer specimens and seamed specimens have been added.

Introduction

The first edition of this document was initially prepared by ISO/TC 38/SC 19 as part of the revision of ISO 6940 and ISO 6941. This specific work item was transferred to Technical Committee ISO/TC 94/SC 13 in April 1997.

This method of test is closely related to the method of test specified in ISO 6941. It uses the same basic equipment but narrower specimen holders and templates for one procedure. Materials which do not burn to the upper or vertical edges of the test specimen used in this test may be classified as producing limited flame spread.

This method assesses the properties of textile fabrics in response to a short contact with a small igniting flame under controlled conditions.

The influence of seams on the behaviour of fabrics can be determined by this method, the seam being positioned within the test specimen so as to be subjected to the test flame.

Whenever practicable, trimmings should be tested as part of the fabric assembly on which they are or will be used.

A list of standards related to this document is given in the Bibliography.

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Protective clothing — Protection against flame — Method of test for limited flame spread

1 Scope

This document specifies two procedures (surface ignition and bottom-edge ignition) for determining flame spread properties of vertically oriented flexible materials in the form of single or multicomponent fabrics (coated, quilted, multilayered, sandwich constructions and similar combinations), when subjected to a small defined flame. This test standard does not apply to situations where there is restricted air supply or exposure to large sources of intense heat, for which other test methods are more appropriate.

This test method is not appropriate for materials that demonstrate extensive melting or shrinkage.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 11610 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

afterflame time

duration of flaming after removal of ignition source

Note 1 to entry: It is also defined as the length of time for which a *material* continues to flame under the specified test conditions, after the ignition source has been removed

Note 2 to entry: Afterflame time is measured and reported to the nearest second.

3.2

afterglow

persistence of glowing combustion of a *material* (3.10) under specified test conditions, after cessation of afterflaming or, if no afterflaming occurs, after removal of the ignition source

Note 1 to entry: Afterglow is a continuation of combustion with the evolution of heat and light but without flame. Some materials absorb heat during the flame application and continue to emit this absorbed heat inside the charred area after removal of the igniting flame. This glowing inside the charred area without combustion should not be recorded as afterglow.

3.3

afterglow time

duration of *afterglow* (3.2)

Note 1 to entry: It is also defined as the time for which a glowing combustion continues, under specified test conditions after cessation of afterflaming or, if no afterflaming occurs, after removal of the ignition source

Note 2 to entry: Afterglow time is measured and reported to the nearest second.

**3.4
char**

formation of a carbonaceous brittle residue when *material* (3.10) is exposed to thermal energy

**3.5
damaged length**

length of the break in the tested *material* (3.10) after folding it lengthwise and creasing by hand along a line through the highest peak of the charred areas and subsequent tearing

**3.6
debris**

material (3.10) separating from the specimen during the test procedure and falling from the specimen without flaming

**3.7
flame application time**

time for which the ignition flame is applied to the test specimen

**3.8
flaming debris**

material (3.10) separating from the specimen during the test procedure and igniting the filter paper

**3.9
hole**

opening, break or discontinuity of any size not present in the original structure of the test specimen's fabric but caused by application of the test flame

Note 1 to entry: This document describes the reporting of holes in any separable layer of a multilayer specimen obtained during surface ignition testing [see 9.2.1.3 g) and Clause 10 i) 7)].

**3.10
material**

substances, excluding hardware, of which an item of clothing is made

**3.11
multilayer assembly**

combination of two or more fabrics as separate layers

EXAMPLE An outer shell, interlining and lining together form a multilayer assembly.

Note 1 to entry: A single multilayer material, such as a quilted, bonded or laminated fabric, does not constitute such an assembly.

**3.12
multilayer material**

material (3.10) consisting of different fabric layers intimately combined prior to the garment manufacturing stage, e.g., by weaving, quilting, coating or gluing

4 Principle

A defined flame from a specified burner is applied for 10 s to the surface or the bottom edge of textile specimens which are vertically oriented.

Information is recorded on melting, the spread of flame and afterglow and on the formation of debris, flaming debris or a hole. Afterflame time and afterglow time are recorded. Recording of damaged length is optional in the edge ignition procedure.

Surface exposure tests may be performed on both sides of multilayer fabric assemblies and in the case of a single layer fabric with different properties on each side.

For edge ignition tests, each layer of multilayer assemblies can be tested either separately or together as an assembly. Refer to related product standards citing this test method to determine if test specimens shall be hemmed.

5 Health and safety of test operators

Burning of materials may produce smoke and toxic gases which can affect the health of operators. Between tests, the atmosphere of the test location, which should be of adequate dimensions to avoid endangering the health of operators, should be cleared of smoke and fumes by an extractor fan or other means of ventilation (see [7.1](#)).

Smoke and fume emission may be subject to national regulations concerning atmospheric pollution control.

6 Fuel

Commercial grade propane of at least 95 % purity shall be used with the flow being controlled by a fine control valve and flow meter.

Commercial grade propane is the standard gas. If methane, butane or butane/propane mixtures are used, this fact shall be recorded in the test report as a deviation from this document [see [Clause 10 c](#)] because use of such gases will influence the flame temperature and lead to variation in results.

7 Apparatus

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7.1 Test apparatus — General requirements

Construction: consisting of material which shall not be adversely affected by the fumes and that is resistant to heat and flame.

NOTE Some products of combustion are corrosive.

Location: surrounded without cabinet by a volume of air sufficient not to be affected by any reduction of oxygen concentration.

Where an open-fronted fume hood is used for the test, provision shall be made to permit the specimen to be mounted at least 300 mm from any wall.

7.2 Specimen holders

7.2.1 Consisting of a rectangular metal frame constructed of 10 mm to 20 mm wide metal and having a specimen support pin at each corner of a rectangle of (190 ± 1) mm length by (150 ± 1) mm width for Procedure A and (190 ± 1) mm length by (70 ± 1) mm width for Procedure B (see [Figure 1](#)).

7.2.2 Supporting pins, for the specimen having a $(2 \pm 0,5)$ mm diameter and a length of (25 ± 1) mm.

NOTE Longer pins can be needed for mounting thick or multilayer specimens.

7.2.3 Spacer stub, for the purpose of locating the specimen in a plane at least 20 mm away from the frame (see [9.1.2.1](#) and [9.1.3.1](#)), of 2 mm diameter and a length of at least 20 mm and positioned adjacent to each of the four pins.

7.3 Gas burner

As described in [Annex A](#) and illustrated in [Figure 2](#), capable of being moved from a standby position, where the tip of the burner is at least 75 mm from the test specimen, to either the horizontal or inclined position (see [Figure 3](#)).

7.4 Mounting frame

Constructed to a design capable of holding the test specimen holder and the gas burner in the specified relative orientation.

7.5 Templates

Flat and rigid, made of a suitable material and of a size corresponding to the size of the specimen (200 mm × 160 mm for Procedure A and 200 mm × 80 mm for Procedure B).

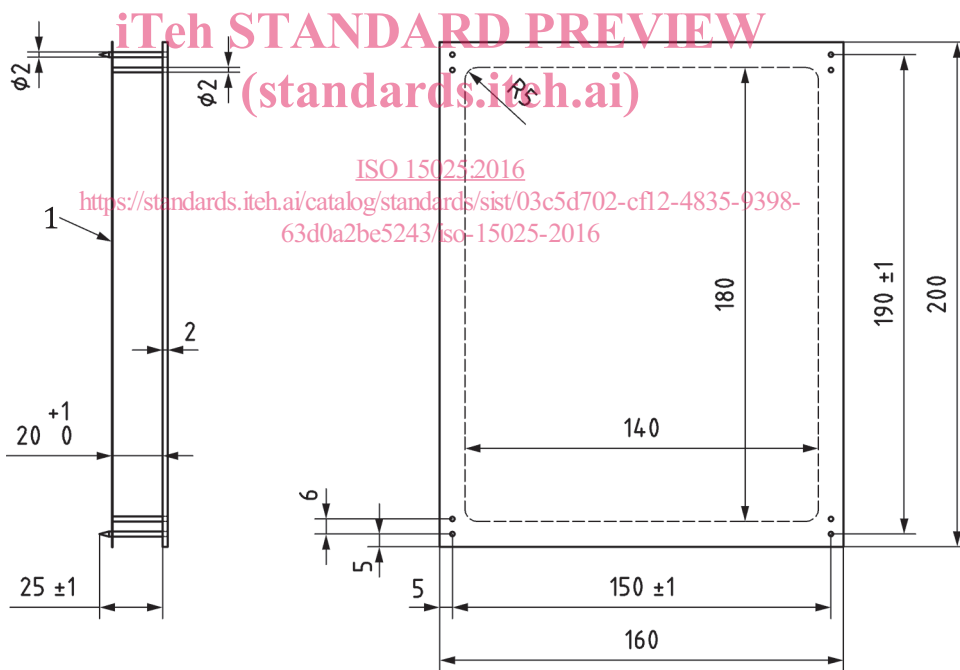
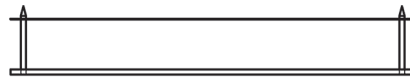
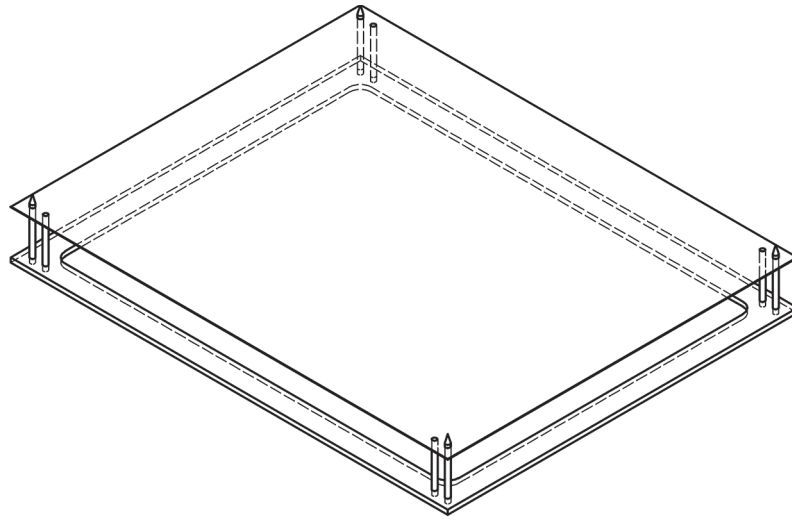
Holes approximately 4 mm in diameter shall be drilled in each corner of the template and positioned so that the distances between the centres of the holes correspond to the distances between the pins on the specimen holder (see [Figure 1](#)). The holes shall be located equidistant about the vertical centreline of the template.

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Dimensions in millimetres



a) Test specimen holder for Procedure A