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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

Reference number
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International Organization for Standardization

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Foreword

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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).

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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.

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

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 ± 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

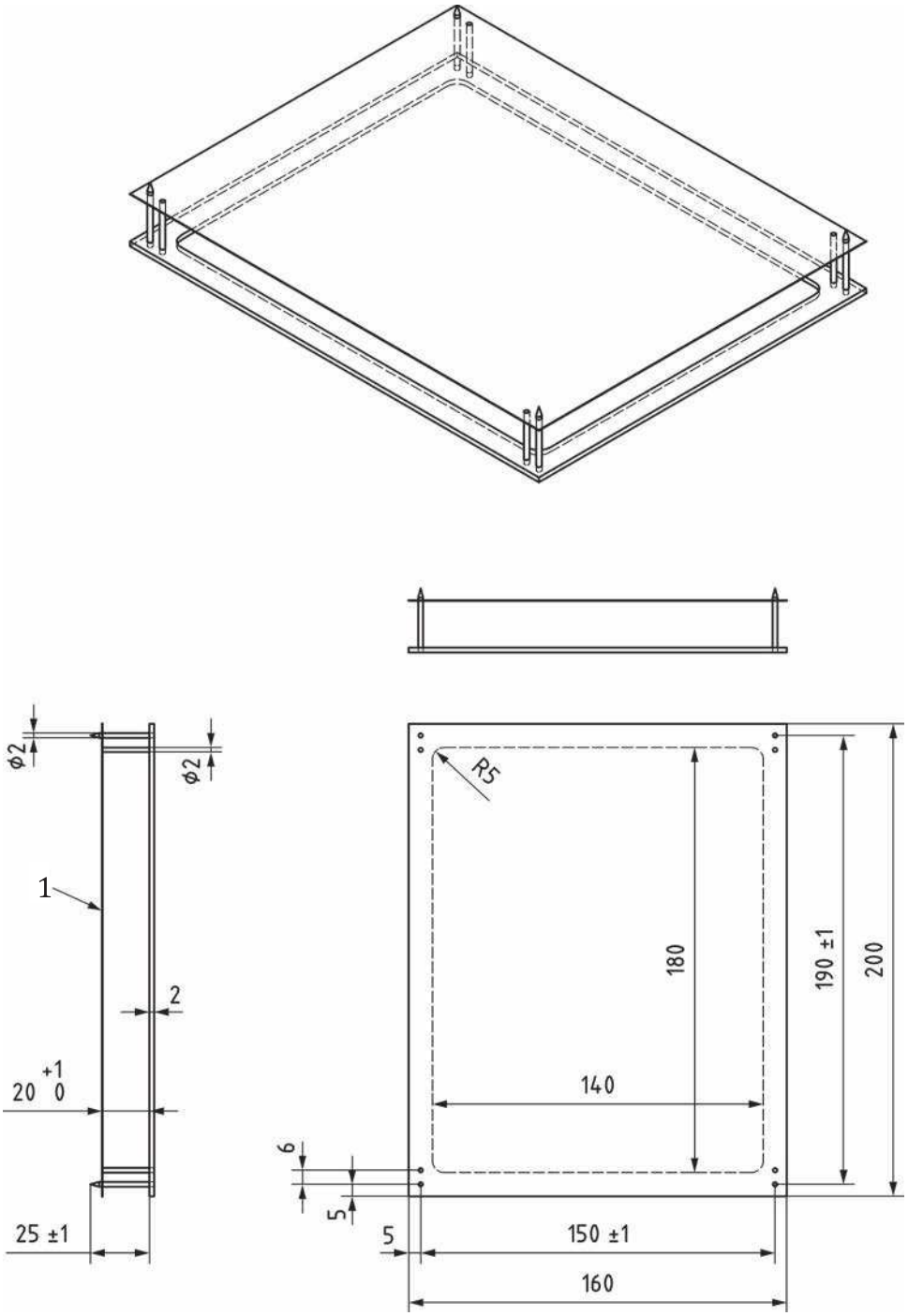
Constructed to a design capable of holding the test specimen holder and the gas burner in the specified relative orientation.

7.5 Templates

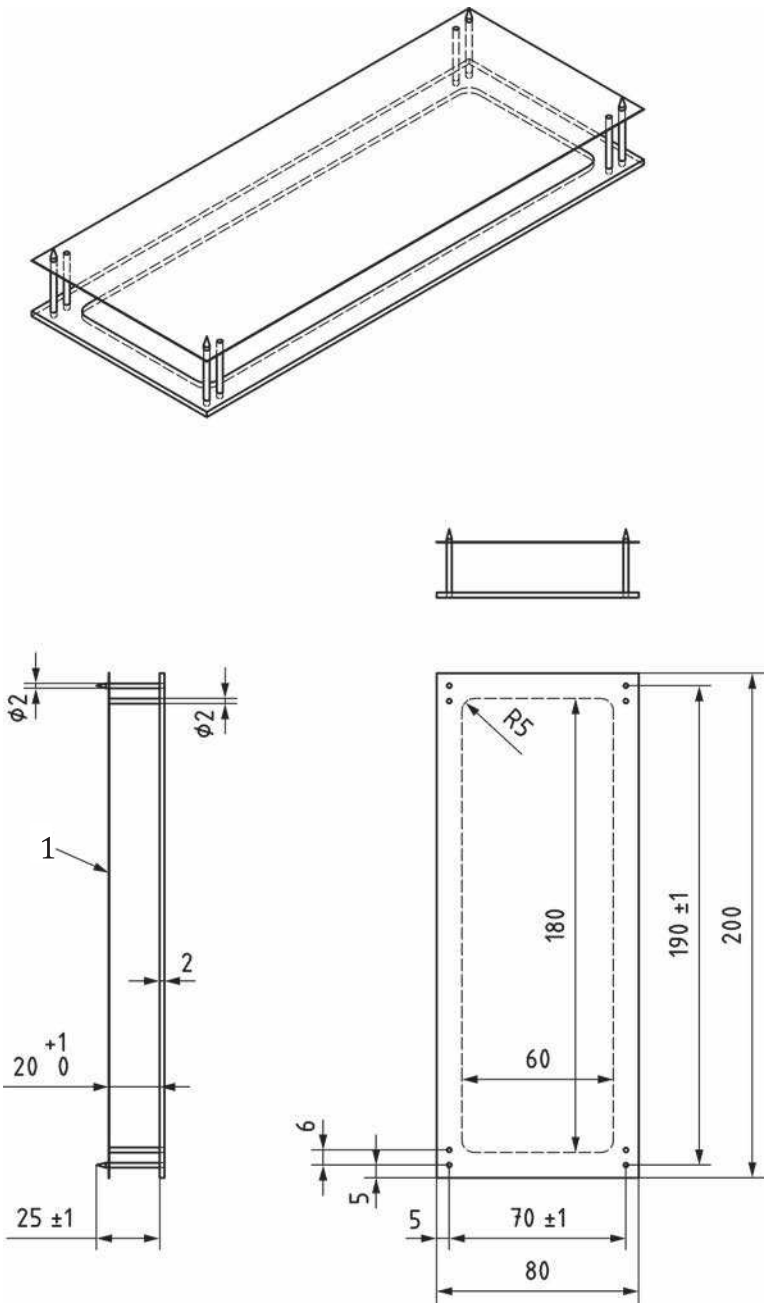
Flat and rigid, made of a suitable material and of a size corresponding to the size of the specimen (200 mm × 160 mm for Procedure A and 200 mm × 80 mm for Procedure B).

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.

Dimensions in millimetres



a) Test specimen holder for Procedure A



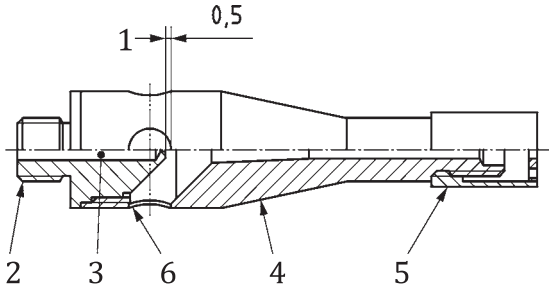
b) Test specimen holder for Procedure B

Key

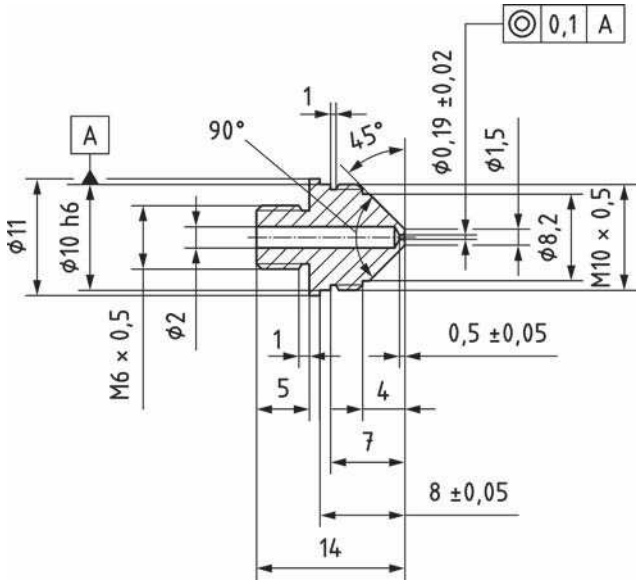
1 fabric sample

Figure 1 — Test specimen holder

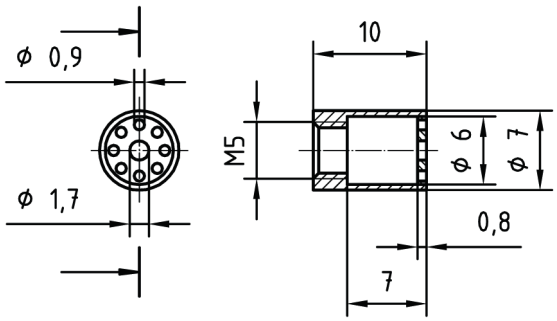
Dimensions in millimetres



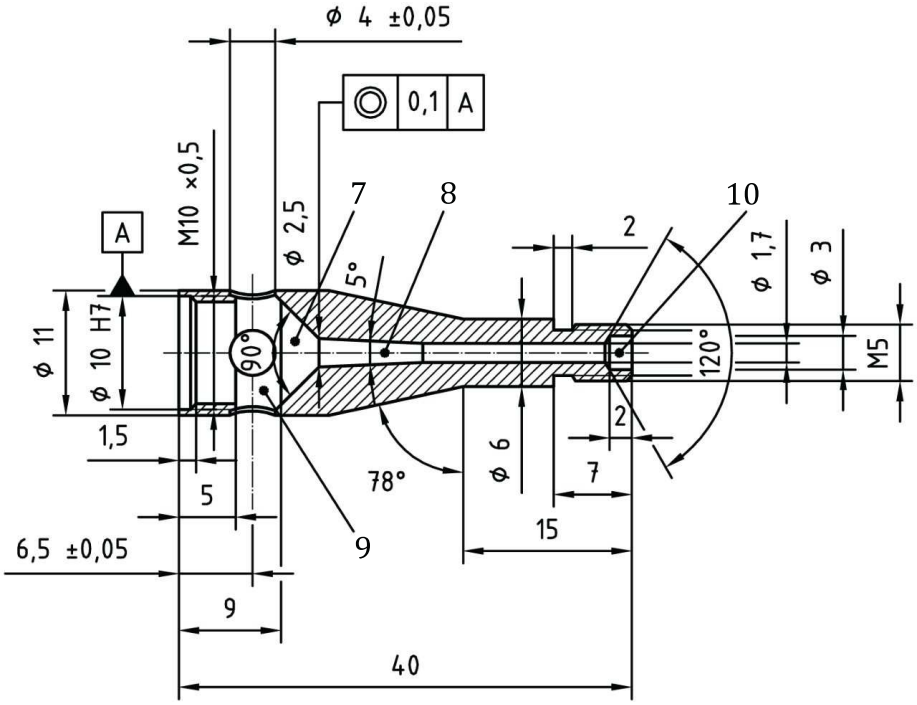
a) Gas burner arrangement



b) Gas jet



c) Flame stabilizer



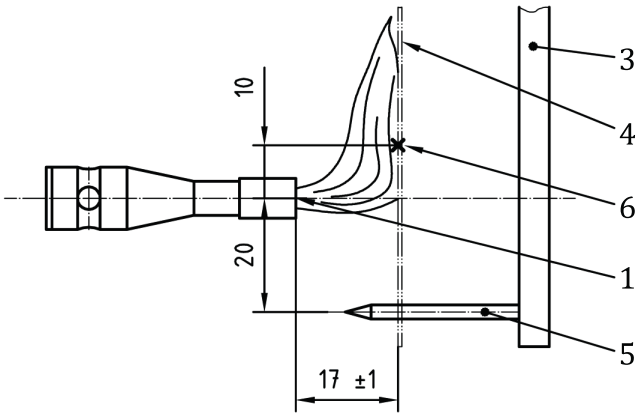
d) Burner tube

Key

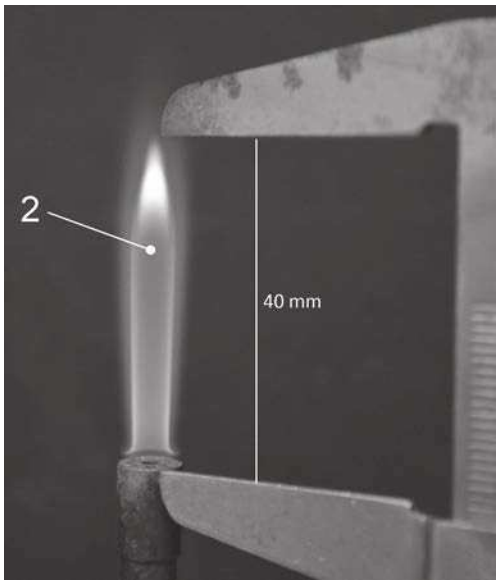
1	fitted in during assembly	6	notch
2	gas jet	7	gas-mixing zone
3	choke tube	8	diffusion zone
4	burner tube	9	air chamber
5	flame stabilizer	10	gas outlet

Figure 2 — Gas burner

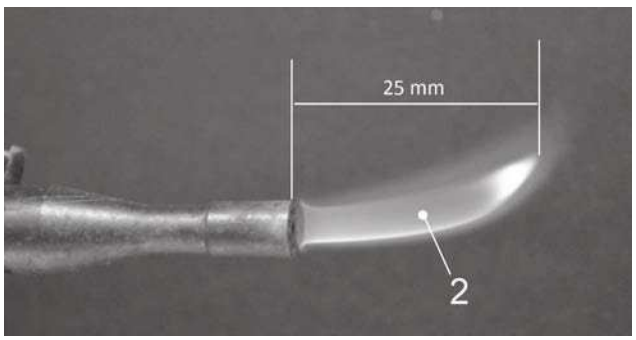
Dimensions in millimetres



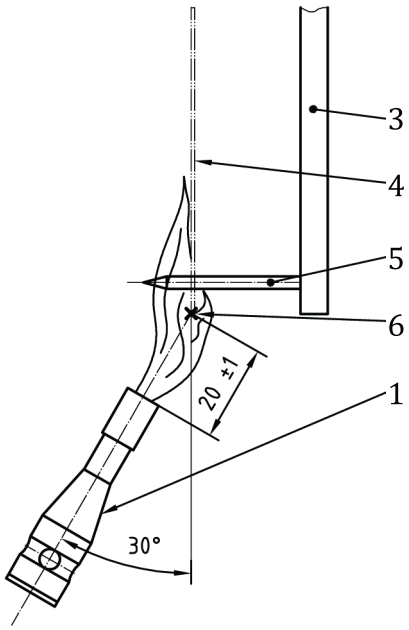
a) Surface ignition



b) Vertical stand-by flame height



c) Horizontal stand-by flame length



d) Bottom edge ignition

Key

1 burner
2 flame
3 mounting frame
4 specimen
5 mounting pin
6 nominal flame application point

Figure 3 — Flame position and adjustment

7.6 Timing devices

— One timing device to control and measure the flame application time, which can be set at 1 s intervals with a resolution of 0,2 s or better.

— Two timing devices with a resolution of 0,2 s or better are required to measure the afterflame time and/or afterglow time. These devices are started automatically at the instant of test flame termination or removal and are stopped manually.

NOTE Preferably, a video recording of the test can be made, provided that an on-screen timer is provided with the specified resolution.

7.7 Filter paper

The filter paper for detection of flaming debris (see 9.1.4) shall have the following characteristics:

— area specific mass: 60 g/m^2 to 100 g/m^2;

— size: ≥(150 mm × 100 mm);

— thickness: 0,15 mm to 0,25 mm;

— alpha cellulose content: ≥95 %.

8 Sampling and sample preparation

8.1 Sampling

8.1.1 Number of specimens

Using the appropriate template (7.5), mark two sets of three test specimens. Mark one set perpendicular to the other. For woven/knitted or similar materials, orient the lengthwise axis of the template in the machine and cross-machine direction.

For surface ignition, preliminary tests should be undertaken to establish if one surface of the fabric under examination is likely to produce different flammability behaviour from the other. If they are different, the worst or both surfaces should be tested.

For testing of seams, three specimens of each seam type shall be tested.

An extra test specimen is required for the installation procedure (see 9.1.2 and 9.1.3).

8.1.2 Specimen-holder pin location marks

Mark the position through which the pins on the specimen holder shall pass by means of the holes in the template (7.5).

Where the fabric is of open construction (for instance scrim, gauze), small pieces of adhesive tape may be affixed to the fabric at the pin sites and the position marked on the tape.

8.1.3 Test specimen size

Cut out test specimens with dimensions of (200 ± 2) mm × (160 ± 2) mm for Procedure A and (200 ± 2) mm × (80 ± 2) mm for Procedure B. If specimens are to be hemmed along the lower edge to be impinged by the flame, the hemmed specimen shall be (200 ± 2) mm long. When testing hems or seams, specimens shall be taken from garments or the thread used shall be flame resistant or as in the product being evaluated.

8.1.4 Multilayer specimens (including trim)

When specimens are composed of multiple layers or materials that are not continuous over the entire specimen, position the material as follows.

For Procedure A, so that the longer dimension is vertically aligned in the middle of the specimen and horizontally so that the multilayer area is impinged by the flame.

For Procedure B, so that the smaller dimension is along the bottom edge of the specimen, in a manner consistent with its use in the protective clothing, including the manner of attachment and orientation, and so that the multilayer area is impinged by the flame.

Specimens containing retroreflective tape or emblems and lettering are typical examples of multilayer specimens where this specimen preparation procedure should be used.

8.1.5 Seams

Any seam to be tested shall be constructed vertically from two pieces of fabric each measuring (200 ± 2) mm and of sufficient width depending on the nature of the seam. Alternatively, seams may be taken from the finished product to be tested. After seam construction or sampling, the seamed specimen shall be trimmed along each vertical edge so that the finished specimen size conforms to 8.1.3 with the seam located in the vertical centreline of the specimen. After trimming the specimen, mark the position through which the pins on the specimen holder shall pass by means of the holes in the template (7.5).

8.2 Conditioning atmosphere of the test sample

Unless otherwise specified, test specimens shall be conditioned for at least 24 h in an atmosphere having a temperature of (20 ± 2) °C and a relative humidity of (65 ± 5) %. If testing is not carried out immediately after conditioning, place the conditioned test specimens in a sealed container. Testing of each specimen shall begin within 2 min of removing it from either the conditioning atmosphere or the sealed container. Any deviation from the specified conditions should be reported on the test report as a deviation from this document [see Clause 10 a) and e)].

Care should be taken to avoid injury when mounting the specimens on the pins in the time specified. If necessary, the specimen may be mounted on the specimen holder (7.2) before removal from the conditioning atmosphere.

9 Procedure

NOTE More practical information concerning the laboratory aspects of these procedures is given in Annex B.

9.1 Installation of the test apparatus

9.1.1 Test conditions

The tests shall be performed in an atmosphere having a temperature of (23 ± 5) °C, a relative humidity between 15 % and 80 % and air movement at the point of test less than 0,2 m/s at the commencement of the test of each specimen. Any deviation from the specified conditions should be reported on the test report as a deviation from this document [see Clause 10 e)].

Air movement shall not be influenced by mechanical devices operating during the test.

Draught shields may be required to maintain stability of the test flame.

9.1.2 Procedure A — Surface ignition

9.1.2.1 Mounting of the test specimen

Place the test specimen (see 8.1.1) on the pins of the test specimen holder, making certain that the pins pass through the points marked off from the template and that the back of the specimen is at least 20 mm away from the rectangular metal frame of the test specimen holder. Fit the test specimen holder to the mounting frame with the specimen vertical. Check the mounted test specimen to ensure absence of wrinkles, draping or sagging. For specimens that exhibit drape or sagging, ensure that each specimen is mounted taut but not stretched.

Seamed specimens shall be mounted on the frame with the seam in the vertical centre so that it is impinged by the flame.

9.1.2.2 Operating position of the burner

Position the burner (7.3), without flame, perpendicular to the surface of the test specimen so as to align the axis of the burner 20 mm above the line of the lower pins and with the vertical centreline of the face of the test specimen. Make sure that the tip of the burner stabilizer is (17 ± 1) mm from the surface of the test specimen [see Figure 3 a)].

The position of the burner should be checked after each test of six specimens.

9.1.2.3 Flame adjustment — Horizontal reach

Set the burner (7.3) in a vertical standby position [see Figure 3 b)]. Light the burner and preheat it for at least 2 min with the height of the yellow part of the flame set to approximately 40 mm. Move the burner into a horizontal standby position [see Figure 3 c)] and adjust the horizontal reach of the flame to (25 ± 2) mm, measured as the distance from the tip of the burner stabilizer to the extreme end of the yellow part of the flame when viewed against a dark background. The flame reach shall be checked before testing each set of six specimens.

9.1.2.4 Flame position

Move the burner from a standby position to a horizontal operating position (see 9.1.2.2). Confirm that the flame impinges on the test specimen in the correct location [see Figure 3 a)].

9.1.2.5 Debris

If debris is observed during the installation procedure of 9.1.2.1 to 9.1.2.4, the additional procedure of 9.1.4 shall be used for subsequent testing to determine whether the debris is to be termed flaming debris. Melting of debris also shall be noted.

9.1.3 Procedure B — Bottom-edge ignition

9.1.3.1 Mounting of the test specimen

Place the test specimen (see 8.1) on the pins of the test specimen holder, making certain that the pins pass through the points marked off from the template and that the back of the specimen is $\left(20^{+1}_{0}\right)$ mm away from the rectangular metal frame of the test specimen holder. Fit the test specimen holder to the mounting frame with the specimen vertical. Check the mounted test specimen to ensure absence of wrinkles, draping or sagging. For specimens that exhibit drape or sagging, ensure that each specimen is mounted taut but not stretched.

Seamed specimens shall be mounted on the frame with the seam in the vertical centre so that it is impinged by the flame.

9.1.3.2 Operating position of the burner

Position the burner, without flame, in front of, but below, the test specimen so as to lie in a plane passing through the vertical centreline of the test specimen and perpendicular to its surface with the longitudinal axis inclined upwards at a 30° angle to the vertical bottom edge of the test specimen. Make sure that the distance between the tip of the burner stabilizer and the bottom edge of the test specimen is (20 ± 1) mm, measured as shown in Figure 3 b).

The position of the burner should be checked after each test of six specimens.

For specimens that exhibit drape or may sag, adjustment may need to be made for each individual specimen in order to ensure that the distance is the same (20 ± 1 mm) for each specimen.

9.1.3.3 Flame adjustment — Vertical flame height

Set the burner (7.3) in a vertical standby position. Light the burner and preheat it for at least 2 min. Adjust the height of the yellow part of the flame to (40 ± 2) mm, measured as the distance from the tip of the burner stabilizer to the extreme end of the yellow part of the flame when viewed against a dark background [see Figure 3 d)]. The flame height shall be checked before testing each set of six specimens.

9.1.3.4 Flame position

Move the burner from the standby position to the inclined operating position (see 9.1.3.2). Check that the bottom edge of the test specimen bisects the flame [see Figure 3 d)].

9.1.3.5 Debris

If debris is observed during the installation procedure of 9.1.3.1 to 9.1.3.4, the additional procedure of 9.1.4 shall be used for subsequent testing to determine whether the debris is to be termed flaming debris. Melting of debris also shall be noted.

9.1.4 Detection of flaming debris

If debris is observed in the installation procedure (9.1.2.5 or 9.1.3.5) or in subsequent testing, the following additional procedure shall be employed to determine if the debris is to be classified as flaming debris.

A piece of filter paper (7.7), at least (150 × 100) mm, shall be placed on a horizontal solid surface (50 ± 5) mm below the bottom edge of the specimen with the centre of the filter paper directly below the centreline of the specimen.

If the burner mechanism touches the filter paper when using bottom-edge ignition, a suitable slot should be cut in the mounting plate and in each piece of filter paper used.

9.2 Test procedure

9.2.1 Procedure A — Surface ignition

9.2.1.1 Set up the apparatus as described in 9.1.2.

9.2.1.2 Position the first of a set of six test specimens on the specimen holder (see 9.1.2.1). For woven/knitted materials, record whether the machine or cross machine direction is vertical.

9.2.1.3 Apply the test flame for 10 s and observe and record:

a) whether any flaming reaches the upper edge or either vertical edge of the test specimen;

b) afterflame time measured to the nearest second;

c) whether afterglow spreads beyond the flame spread area (usually the carbonized area) into the undamaged area;

d) afterglow time measured to the nearest second;

e) the occurrence of debris;

f) whether debris ignites the filter paper (flaming debris) or melts, if applicable;

g) the occurrence of melting;

h) with sufficient light from above or behind the specimen, observe any hole formation irrespective of size. Record the number of holes that develop (i.e. that were not present in the original structure), the size of the largest hole to the nearest millimetre and in which layer(s) for a multilayer specimen. When testing multilayer specimens, the formation of hole(s) shall be counted and reported in each separable layer as well as the number of holes that can be observed as passing through all layers of the multilayer specimen.

NOTE Single threads across any hole do not reduce the size of the hole for the purpose of this test.

9.2.1.4 Repeat 9.2.1.2 and 9.2.1.3 on the remaining five test specimens, with the same surface of all specimens exposed towards the flame. Test all six specimens within a total of 20 min from completion of the preheat procedure and flame adjustment (see 9.1.2.3).

9.2.2 Procedure B — Bottom-edge ignition

9.2.2.1 Set up the apparatus as described in 9.1.3.

9.2.2.2 Position the first of a set of six new test specimens on the specimen holder. For woven/knitted materials, record whether the machine or cross machine direction is vertical.

9.2.2.3 Apply the test flame for 10 s and observe and record behaviour as listed in 9.2.1.3, with the exception of h) which is not applicable to bottom-edge ignition. When required, measure damaged/char length using the procedure in Annex C.

NOTE The measurement of damaged/char length is optional.

9.2.2.4 Repeat 9.2.2.2 and 9.2.2.3 on the remaining five test specimens, with the same surface of all specimens exposed towards the flame. Test all six specimens within a total of 20 min from completion of the preheat procedure and flame adjustment (see 9.1.3.3).

10 Test report

The test report shall include the following information:

a) a statement that the test was carried out in accordance with this document and details of any deviation from it;

b) the procedure followed, i.e. surface ignition or bottom-edge ignition, and if applicable, the surface exposed towards the flame;

c) the type of gas used if other than the standard commercial grade propane;

d) the date of test;

e) the ambient conditions of temperature and relative humidity in the area in which the test is carried out (indicate any deviations from 9.1.1);

f) the technique used to attach fabrics which cannot be supported on pins (see 8.1.2);

g) an identification of the garment or fabric tested including details of any pretreatment, for instance a cleansing procedure, and including the thread used for hemming specimens, if applicable;

h) for Procedure B, whether the layers of a multilayer assembly were tested separately or together as an assembly, or both;

i) for each test specimen, the information itemized in 9.2.1.3 and 9.2.2.3, namely:

   1) whether any flaming reaches the upper edge or either vertical edge of the test specimen;

   2) afterflame time to the nearest second;

   3) whether afterglow spreads beyond the flame spread area (usually the carbonized area) into the undamaged area;

   4) afterglow time to the nearest second;

   5) the occurrence of melting;

   6) the occurrence of debris;

   7) whether debris ignites the filter paper (flaming debris) or melts, if applicable;

   8) for Procedure A, the number of holes that develop, the size of the largest hole to the nearest millimetre and in which layer(s) for a multilayer specimen [see 9.2.1.3 h)];

   9) for Procedure B, the damaged/char length, if elected.

Annex A
(normative)

Description and construction of the burner

A.1 Description

The burner provides a flame of suitable dimensions, the length of which can be adjusted from 10 mm to 60 mm.

A.2 Construction

The construction of the burner is shown in Figure 2 a). The burner consists of three parts:

A.2.1 Gas jet

The orifice diameter of the gas jet [see Figure 2 b)] shall be (0,19 ± 0,02) mm. The orifice shall be drilled and after drilling, all burrs shall be removed from both ends of the drilled hole without rounding the corners.

A.2.2 Flame stabilizer

The flame stabilizer is given in detail in Figure 2 c).

A.2.3 Burner tube

The burner tube [see Figure 2 d)] consists of four zones:

a) air chamber;

b) gas-mixing zone;

c) diffusion zone;

d) gas outlet.

Within the air chamber, the burner tube has four air holes 4 mm diameter for air inlet. The forward edge of the air holes is approximately level with the tip of the jet.

The diffusion zone is of conical shape and has the dimensions indicated in Figure 2 d). The burner has a bore of 1,7 mm internal diameter and an outlet of 3,0 mm internal diameter.

Annex B
(informative)

Laboratory techniques

The quality of the laboratory techniques required will depend to a significant extent on the design of the equipment used. For example, the poorer the automation of the equipment, the greater the need will be for a more skilled operator to perform the test in order to obtain high precision.

Some practical points of a general nature are as follows.

a) For reasons of safety, the test equipment should be remote from the gas cylinder which can be located outside the building. In this case, a manually operated shut-off valve should be installed inside the room-housing of the test apparatus where the piping enters. On each occasion the equipment is used, time should be allowed for pure gas to reach the burner jet and provide a steady flame.

   The equipment should be installed and used in a manner to prevent smouldering particles, which may be carried away by hot gases or fall from the specimen, from coming to rest on combustible materials. Protective clothing, fire extinguishers and alarm signals should be available to the operator.

b) It is important to keep the apparatus clean to maintain safety.

c) Some unfinished fabrics, such as single jersey knitted fabrics, are liable to curl. This tendency may be reduced by subsequent processing. It is desirable to test this type of fabric in its finished state.

d) Residual material adhering to the pins after testing may be removed by scraping with a wire brush. Any smouldering material should be extinguished before placing it with other waste in a non-combustible container.

Note the warning regarding the health and safety of test operators in Clause 5.

Annex C
(normative)

Measurement of damaged/char length

If required, remove the specimen from the frame and measure the length of the damaged/charred area after cooling for a minimum of 5 min as follows.

Fold the specimen lengthwise and crease by hand along a line through the highest peak of the charred area. Insert a hook, made using a 76 mm length of steel wire bent 13 mm from one end to form a 45° hook, into the specimen (or into a hole of 6 mm diameter or less punched out for the hook) at one side 6 mm from the adjacent outside edge and 6 mm from the bottom end. To the hook, attach a weight of sufficient mass such that the mass of the weight and hook together shall equal the total required tearing load as specified in Table C.1.

Table C.1

Mass of test specimen material before any fire retardant or coating g/m^2	**Total tearing load for determining the damaged length** kg
50 to 200	0,1
Over 200 to 500	0,2
Over 500 to 800	0,3
Over 800	0,45

Gently apply a tearing force to the specimen by grasping the bottom corner at the edge opposite to the hook and slowly raising the specimen and weight clear of the supporting surface.

Lay the specimen flat, measure the distance, *D*, from the top end of the tear to the top edge of the specimen to the nearest 2 mm. Calculate the damaged/char length using Formula (C.1):

$$\text{Damaged/char length} = (200 - D)\ \text{mm} \quad \text{(C.1)}$$

Annex D
(informative)

Precision and results of interlaboratory trials

These procedures are used to determine the length of time that the specimen continues to flame following removal of the flame and whether or not flame spread to the edge of the specimen occurs. They consistently detect two groups of fabrics:

— fabrics which give little or no afterflame and

— fabrics which burn completely.

However, there are some intermediate fabrics which can demonstrate more extensive, but not complete, flame spread under specific circumstances. These intermediate fabrics can give widely scattered results from one specimen to another, will likely give different results with different test procedures, for instance surface or bottom-edge ignition, and may give different results in different laboratories.

An interlaboratory trial was conducted in 2014 to 2015, involving six fabrics tested in seven laboratories using both Procedure A and Procedure B and taking into account most of the changes introduced in this document.

For the Procedure A (surface ignition) tests, null results were reported by every laboratory for each quantifiable variable; therefore no analysis of data was possible.

Procedure B (edge ignition) results: Data for damaged/char length, and afterflame and afterglow times for both five replications and three replications of the Procedure B test, using both narrow specimens as in this document and wide specimens as in the first edition of ISO 15025, were analysed following ISO 5725-2. The following information on repeatability and reproducibility of the data for three replications were derived from that trial. It should be noted that neither repeatability nor reproducibility was consistently better for five replications than for three; however, both repeatability and reproducibility were better for narrow than for wide specimens.

Table D.1 — Damaged/char length for Procedure B, narrow specimens as in this edition, testing six fabrics in each of seven laboratories

	Damaged/char length (mm)					
Fabrics	A	B	C	D	E	F
Mean (μ)	8,67	6,67	47,43	31,10	66,24	86,05
Repeatability (S_r) for three replications (within each laboratory)	2,32	4,96	9,93	9,65	7,26	11,18
Reproducibility (S_R) among laboratories	7,4	6,80	25,13	24,75	9,26	10,90

Table D.2 — Afterflame time for Procedure B, narrow specimens as in this document, testing six fabrics in each of seven laboratories

	Afterflame time (s)					
Fabrics	A	B	C	D	E	F
Mean (μ)	0	1,95	0	5,24	0	0
Repeatability (S_r) for three replications (within each laboratory)	0	1,07	0	7,47	0	0
Reproducibility (S_R) among laboratories	0	1,34	0	10,82	0	0

Table D.3 — Afterglow time for Procedure B, narrow specimens as in this document, testing six fabrics in each of seven laboratories

	Afterglow time (s)					
Fabrics	A	B	C	D	E	F
Mean (μ)	3,88	1,24	7,38	0,53	0,14	0,14
Repeatability (S_r) for three replications (within each laboratory)	1,20	0,69	0,87	0,89	0,00	0,00
Reproducibility (S_R) among laboratories	3,00	0,90	3,55	1,26	0,38	0,38

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