BRITISH STANDARD

BS EN ISO
6941 : 1995

Textile fabrics —

Burning behaviour —

Measurement of flame spread properties of vertically oriented specimens

The European Standard EN ISO 6941 : 1995 has the status of a British Standard

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This British Standard, having been prepared under the direction of the Textiles and clothing Standards Policy Committee; was published under the authority of the Standards Board and comes into effect on
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Contents

National foreword

This British Standard has been prepared under the direction of the Textiles and Clothing Standards Policy Committee and is the English language version of EN ISO 6941 : 1995 *Textile fabrics — Burning behaviour — Measurement of flame spread properties of vertically oriented specimens*, including Amendment A1, published by the European Committee for Standardization. It is identical with ISO 6941 : 1984, including Amendment 1, published by the International Organization for Standardization (ISO).

BS ISO 6940 and BS EN ISO 6941, including their amendments, supersede equivalent tests in BS 5438 : 1989, which are deleted by amendment. BS 5438 : 1976 is retained for the time being as it is required for use in legislation.

EN 26941 was prepared as a result of international discussions in which the UK took an active part.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN ISO 6941

January 1995

ICS 13.220.40

Descriptors: Textiles, fabrics, tests, fire tests, determination, flame propagation, test equipment, burners

English version

Textile fabrics — Burning behaviour — Measurement of flame spread properties of vertically oriented specimens

(ISO 6941 : 1984, including Amendment 1 : 1992)

Textiles — Comportement au feu — Détermination des propriétés de flamme d'éprouvettes orientées verticalement (ISO 6941 : 1984 amendement 1 : 1992 inclus)

Textilien — Brennverhalten — Messung der Flammenausbreitungseigenschaften vertikal angeòrdneter Proben (ISO 6941 : 1984, einschließlich Änderung 1 : 1992)

This European Standard was approved by CEN on 1995-01-02. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN ISO 6941 : 1995 E

Foreword

This European Standard has been prepared by the Technical Committee CEN/TC 248, Textiles and textile products, the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1995, and conflicting national standards shall be withdrawn at the latest by July 1995.

According to the CEN/CENELEC Internal Regulations, the following countries are bound to implement this European Standard: Austria, Belguim, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

NOTE. Normative references to international publications are listed in annex ZA (normative).

Textile fabrics — Burning behaviour — Measurement of flame spread properties of vertically oriented specimens

1 Scope and field of application

This International Standard specifies a method for the measurement of flame spread properties of vertically oriented textile fabrics intended for apparel, curtains, draperies and large tents including awnings and marquees, in the form of single or multicomponent (coated, quilted, multilayered, sandwich construction and similar combinations) fabrics.

The method should be used solely to assess the properties of materials or systems in response to heat flame under controlled laboratory conditions. The results may not apply to situations where there is restricted air supply or prolonged exposure to heat as in a conflagration.

2 References

ISO 139, *Textiles — Standard atmospheres for conditioning and testing.*

ISO 4880/1, *Burning behaviour of textiles and textile products — Vocabulary — Part 1.*

3 Definitions

For the purpose of this International Standard, the following definitions apply (see ISO 4880/1):

3.1 afterflame: Persistence of flaming of a material, under specified test conditions, after the ignition source has been removed.

3.2 afterflame time: The length of time for which a material continues to flame, under specified test conditions, after the ignition source has been removed. (*Also called* Duration of flame.)

3.3 afterglow: Persistence of glowing of a material, under specified test conditions, after cessation of flaming or, if no flaming occurs, after removal of the ignition source.

3.4 afterglow time: The time for which a material continues to glow, under specified test conditions, after cessation of flaming, or after removal of the ignition source. (*Also called* Duration of afterglow.)

3.5 flame spread time: The time taken by a flame on a burning material to travel a specified distance under specified test conditions.

4 Principle

A defined ignition flame from a specified burner is applied for a defined period of time to textile specimens which are vertically oriented. The flame spread time is the time in seconds for a flame to travel between marker threads located at defined distances. Other properties relating to flame spread may also be observed, measured and recorded.

NOTE — Attention is drawn to annex B regarding quality of experimental techniques.

5 Health and safety of test operators

Burning of textiles may produce smoke and toxic gases which can affect the health of operators. The testing area should be cleared of smoke and fumes by suitable means.

6 Apparatus and materials

6.1 Construction of testing equipment

Some products of combustion are corrosive. The equipment should be constructed of material which will not be adversely affected by the fumes.

6.2 Location of test

A location in which the air movement is less than 0,2 m/s at the commencement of the test and is not further influenced by mechanical devices operating during the test is required. The volume of air surrounding the test location shall be such that the test is not affected by any reduction of oxygen concentration. Where an open-fronted cabinet is used for the test, provision shall be made to permit the specimen to be mounted at least 300 mm from any wall.

6.3 Template

A flat rigid template made of suitable material and of a size corresponding to the size of the specimen shall be used. Holes approximately 2 mm diameter are drilled in the template and positioned so that the distances between the centres of the holes correspond to the distances between the pins on the frames (see figure 1). The holes shall be located equidistant about the vertical centrelines of the template (see the note in 7.2).

6.4 Specimen holder

A specimen holder consisting of a rectangular frame 560 mm high having two rigidly connected parallel rods spaced 150 mm apart on which are fitted pins for mounting the test specimen which is located in a plane at least 20 mm from the frame. The mounting pins shall be not greater than 2 mm diameter and at least 27 mm long. The pins are located on the parallel rods at locations shown in figure 1. The frame is fitted onto a suitable support to maintain the rods in a vertical orientation during testing.

NOTE — For the purpose of locating the specimen on the pins in a plane away from the frame, spacer stubs 2 mm diameter may be provided adjacent to the pins.

6.5 Gas burner

A gas burner as described in annex A.

NOTE — Small differences in the design and dimensions of the burner can influence the configuration of the burner flame and so affect the results of the tests.

6.6 Gas

Commercial grade propane or butane gas.

6.7 Marker threads

White mercerized cotton threads having a maximum linear density of 50 tex.

6.8 Timing devices

An appropriate number of suitable timing devices having an accuracy of at least 0,2 s.

6.9 Measuring instruments

Rulers graduated in millimetres.

7 Test specimens

7.1 Size

The size of each specimen shall be 560 mm × 170 mm.

7.2 Pin location marks

Place the template (see 6.3) centrally on top of the specimen and, by using the holes in the template, mark the positions through which the pins must pass.

NOTE — Where the fabric is of open construction (e.g. scrim, gauze), small pieces of adhesive tape may be affixed to the fabric at the pin sites and the pin positions marked on the tape.

7.3 Number

Cut three specimens from each of the length direction and the width direction. Where the two surfaces of the fabric are different, cut another set of specimens and test both surfaces. Where the two surfaces are similar test the face side of the fabric. Extra specimens may be needed if retesting is necessary (see 8.8).

NOTE — The flame spread time for a fabric may depend on whether the machine direction is upwards or downwards, or whether the face or the back of the fabric is ignited.

7.4 Conditioning of test specimens

Condition test specimens in one of the following ways:

a) in the standard temperate atmosphere of 20 ± 2 °C and (65 ± 2) % rh in accordance with ISO 139;

b) drying in an oven at 105 ± 2 °C for not less than 1 h, then cooling in a desiccator for at least 30 min; or

c) any other conditioning atmosphere as agreed by the interested parties.

8 Procedure

8.1 Carry out the test in an atmosphere having a temperature between 10 and 30 °C and a relative humidity between 15 % and 80 %.

8.2 Light the burner and preheat it for 2 min. Adjust the flame height to 40 ± 2 mm measured as the distance between the top of the burner tube and the tip of the yellow part of the flame when the burner is vertically oriented and the flame is viewed in dim light.

8.3 If testing is not being performed immediately, place the specimens in sealed containers until testing begins. Begin testing each specimen within 2 min of removing it from the conditioning atmosphere or sealed container.

8.4 Place the specimen on the pins of the test frame, making certain that the pins pass through the points marked off from the template and that the specimen is at least 20 mm removed from the frame. Fit the frame on the support so that the specimen is vertical. (See 7.2.)

8.5 Attach the marker threads horizontally in front of the specimen at the locations shown in figure 1. At each location, mount a loop of thread so that the two segments are spaced 1 mm and 5 mm from the plane of the front of the specimen. Attach each loop to a suitable timing device. Impose sufficient tension to the thread to maintain its position relative to the specimen.

8.6 For all fabrics intended for apparel, curtains and drapes, position the burner as described in 8.6.1. Where fabrics intended for curtains and drapes fail to ignite with the burner in this position, the burner position described in 8.6.2 is used if required by the relevant fabric specification. For fabrics for large tents, awnings and marquees, the burner position described in 8.6.2 is used.

8.6.1 Surface ignition: Position the burner perpendicular to the surface of the specimen such that the axis of the burner is 20 mm above the line of the lower pins in line with the vertical centreline of the face of the specimen (see figure 2a)]. The end of the burner is 17 mm from the face of the specimen.

8.6.2 Edge ignition: Position the burner in front of, but below, the specimen such that it lies in a plane passing through the vertical centreline of the specimen and perpendicular to its face [see figure 2b)], such that the longitudinal axis is inclined upwards at 30° to the vertical towards the lower edge of the specimen. The distance between the tip of the burner and the lower edge of the specimen is 20 mm.

NOTE — The edge of the specimen should bisect the flame.

8.7 Test three specimens in the length direction and three specimens in the width direction at the selected ignition time. Apply the flame to the specimen for 5 s. Ignition shall be deemed to have occurred if flaming of the specimen continues for 5 s after removal of the igniting flame. If ignition does not occur, apply the flame for 15 s to another conditioned specimen.

8.8 If any result in any set of three specimens exceeds the minimum result by 50 %, test another set of three specimens for that direction or face. If one or two specimens in any set of three specimens fail to burn to the top marker thread, test another set of three specimens for that direction or face.

8.9 Measure the following times, in seconds:

a) from the start of the application of the igniting flame to the severance of the first marker thread;

b) from the start of the application of the igniting flame to the severance of the second marker thread; and

c) from the start of the application of the igniting flame to the severance of the third marker thread.

8.10 If required, the following characteristics may be noted:

a) the afterflame time and afterglow time in seconds;

b) the maximum burnt or damaged width and the maximum burnt or damaged length;

c) whether the flame reaches a vertical edge of the specimen;

d) whether or not a hole is burnt or melted in the specimen;

e) whether any flaming fabric debris falls below the bottom edge of the frame and continues to flame.

9 Precision

The precision of this method is being established.

10 Test report

The test report shall include the following particulars:

a) a statement that the test was carried out in accordance with this International Standard and details of alterations to it, if any;

b) date of test;

c) conditioning atmosphere used for the test specimens (see 7.4);

d) ambient conditions of temperature, relative humidity and barometric pressure in the area in which the test is carried out;

e) techniques used to attach fabrics which cannot be supported on the pins;

f) gas used to ignite the test specimens;

g) identification of the fabric tested;

h) orientation of the burner for igniting the test specimen (see 8.6);

j) time used to ignite the specimen;

k) the following times, in seconds, for the length and width directions and for each face tested:

1) the flame spread times measured according to 8.9 a), b) and c),

2) the mean of the times from the first marker thread to the second marker thread,

3) the mean of the times from the second marker thread to the third marker thread,

4) if six specimens are tested (see 8.8), determine the mean from the results for all the specimens that burn to the respective marker threads and report the number of values averaged. Do not compute a mean of less than three values;

m) the number of specimens that failed to ignite;

n) the number of specimens which ignited but failed to burn to the first marker thread;

o) if required, any additional characteristics noted (see 8.10).

Dimensions in millimetres
min. = minimum

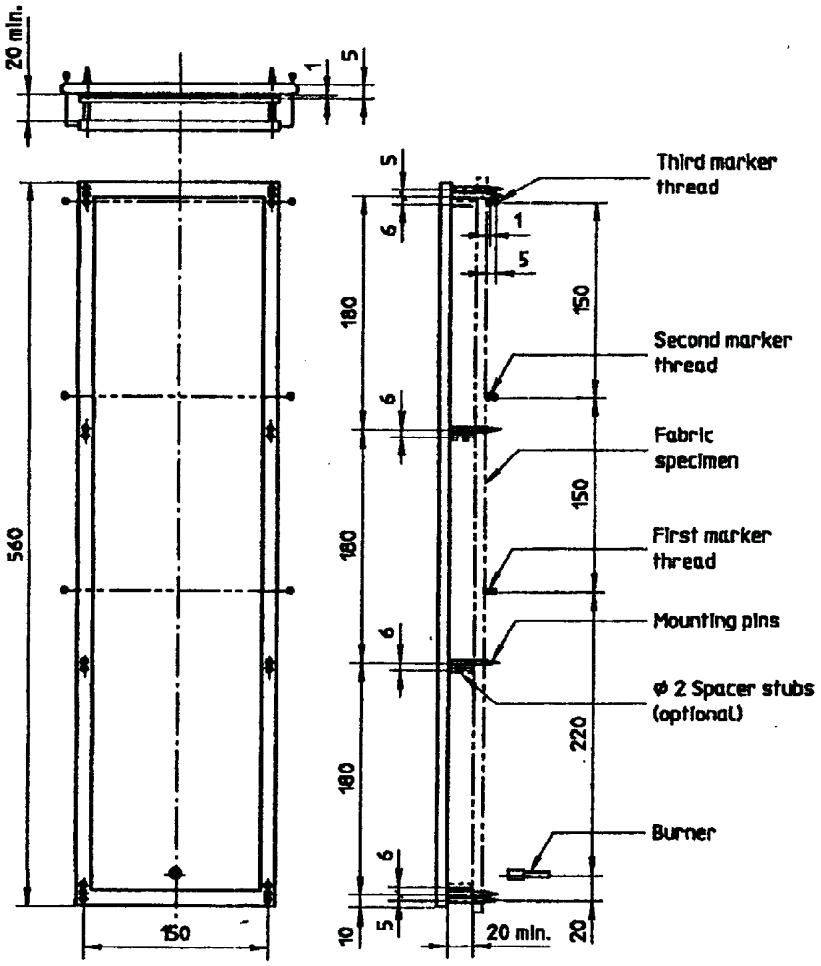
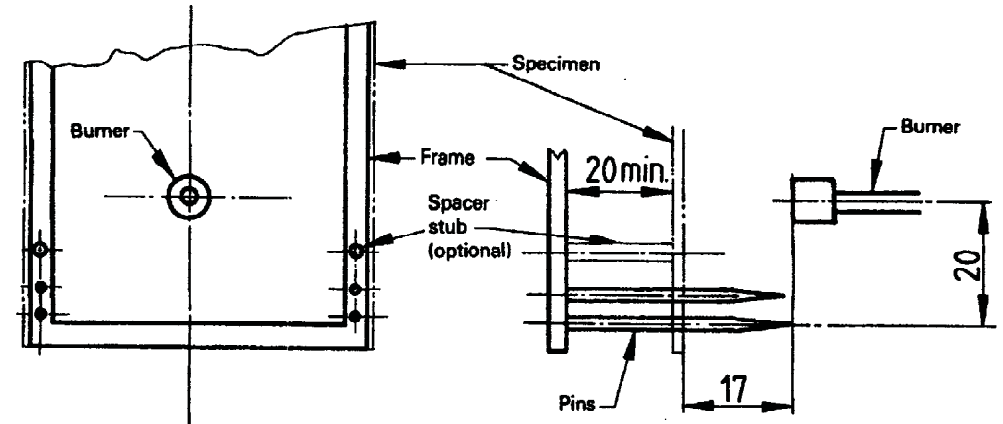
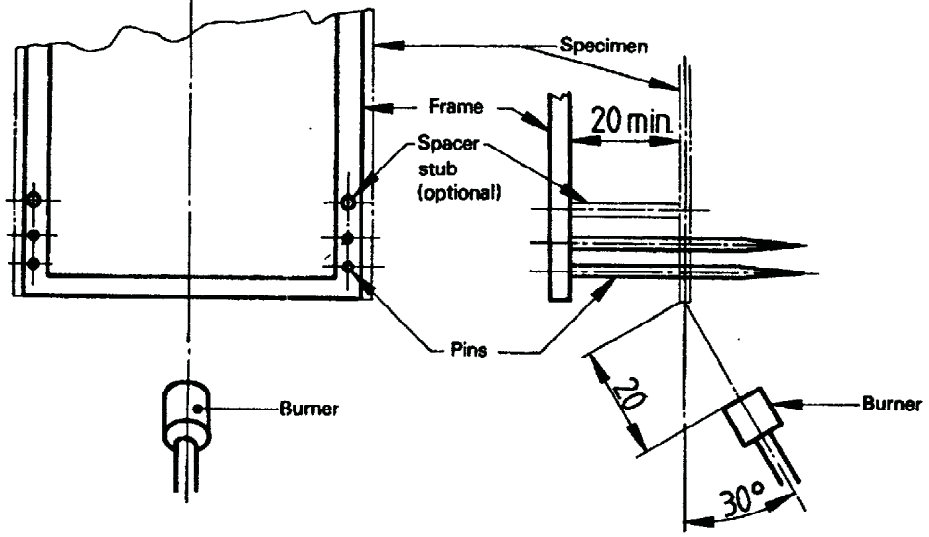


Figure 1 — Specimen holder

Dimensions in millimetres



a) Surface ignition



b) Edge ignition

Figure 2 — Burner ignition location

Annex A

Description and construction of the burner[1)]

A.1 Description

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

A.2 Construction

The construction of the burner is shown in figure 3a). The burner consists of three parts:

A.2.1 Gas jet

The orifice diameter of the gas jet [see figure 3b)] 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 Burner tube

The burner tube [see figure 3d)] consists of four zones:

1) air chamber;
2) gas mixing zone;
3) diffusion zone;
4) 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.

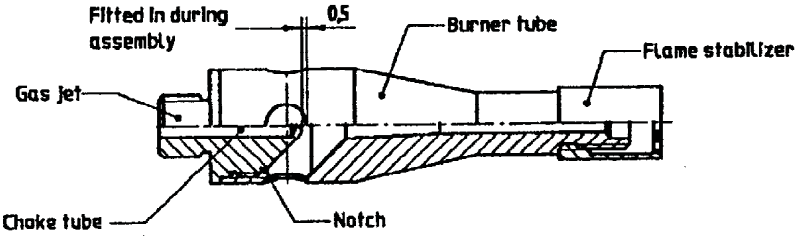
The diffusion zone is of conical shape and has the dimensions indicated in figure 3d). The burner has a bore of 1,7 mm inside diameter and outlet of 3,0 mm inside diameter.

A.2.3 Flame stabilizer

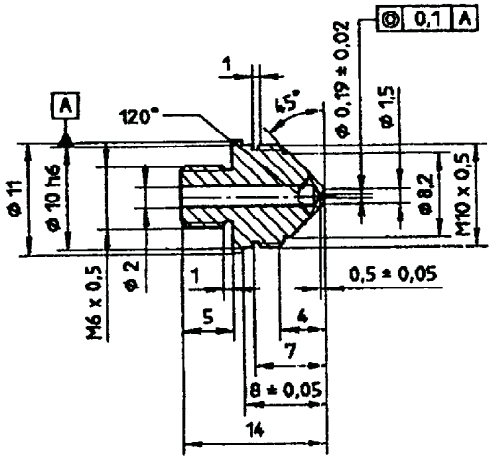
The flame stabilizer is as detailed in figure 3c).

1) The burner may be obtained from Dr.-Ing. Georg Wazau, Mess- und Prüftechnik, Keplerstr. 12, D-1000 Berlin 10, Germany, F.R.

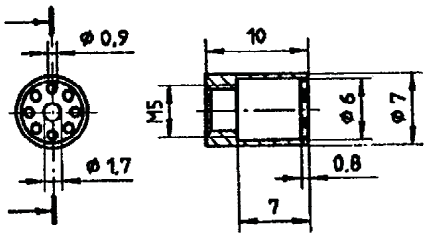
Dimensions in millimetres



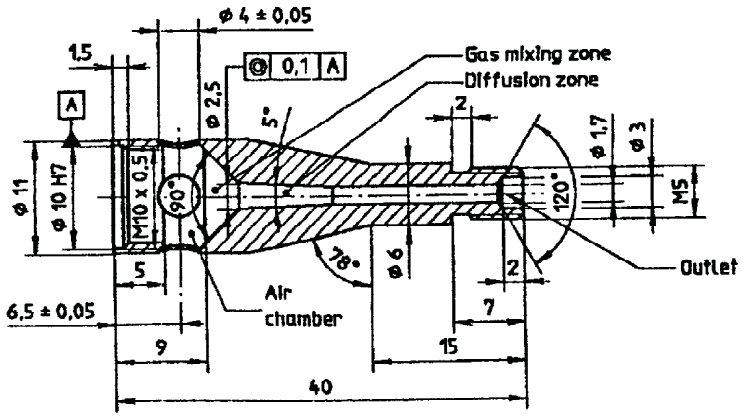
a) Gas burner arrangement



b) Gas jet



c) Flame stabilizer



d) Burner tube

Figure 3 — Gas burner

Annex B

Experimental techniques

The quality of experimental technique required will depend to a significant extent on the design of the equipment used. For example, the less automatic the equipment, the greater will be the need for a skilled operator 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 butane or propane gas cylinder, which could be located outside the building. In this case, a manually-operated shut-off valve should be installed inside the room housing the apparatus where the piping enters. On each occasion the equipment is used, time should be allowed for pure butane or propane to reach the burner jet and thus provide a steady flame.

The equipment should be installed and used so that it is not possible for smouldering particles, which may be carried away by the hot gases or may fall from the specimen, to come 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, both to maintain safety and to ensure that the trip threads can move freely. All parts must be kept clean.

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 thread must be extinguished before placing it with other waste thread in a non-combustible container.

Annex ZA (normative)

Normative references to international publications with their relevant European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendment to or revisions or any of these publications applies to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

Publication	Year	Title	EN/HD	Year
ISO 139		*Textiles — Standard atmospheres for conditioning and testing*	EN 20139	

National annex NA (informative)

Committees responsible

The United Kingdom participation in the preparation of this European Standard was entrusted by the Textiles and Clothing Standards Policy Committee to Technical Committee TCM/63 upon which the following bodies were represented:

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Bolton Institute of Higher Education
British Carpet Manufacturers' Association Ltd.
British Clothing Industry Association
British Furniture Manufacturers' Federation
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National Fillings Trades Association
National Wool Textile Export Corporation
Soap and Detergent Industry Association
Society of Dyers and Colourists
Textile Finishers' Association
Textile Institute
Textile Research Council (FCRA)
Warrington Fire Research Centre

National annex NB (informative)

Cross-references

Publication referred to	Corresponding British Standard
ISO 139 : 1973	BS EN 20139 : 1992 *Textiles — Standard atmospheres for conditioning and testing*
ISO 4880/1 : 1984	BS ISO 4880 : 1993 *Burning behaviour of textiles and textile products — Vocabulary*

BS EN ISO 6941 : 1995
ISO 6941 : 1984

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