
International Standard



6940

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Textile fabrics — Burning behaviour — Determination of ease of ignition of vertically oriented specimens

Textiles — Comportement au feu — Détermination de la facilité d'allumage d'éprouvettes orientées verticalement

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6940 was prepared by Technical Committee ISO/TC 38, *Textiles*.

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Textile fabrics — Burning behaviour — Determination of ease of ignition of vertically oriented specimens

1 Scope and field of application

This International Standard specifies a method for the measurement of ease of ignition of vertically oriented textile fabrics intended for apparel, curtains and draperies in the form of single- or multi-component (coated, quilted, multilayered, sandwich construction and similar combinations) fabrics.

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

2 References

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

ISO 4880, *Burning behaviour of textiles and textile products. Vocabulary.*

ISO 4916, *Textiles — Seam types — Classification and terminology.*

3 Definition

For the purpose of this International Standard, the following definition applies (see ISO 4880):

3.1 minimum ignition time: Minimum time of exposure of a material to an ignition source to obtain sustained combustion under specified test conditions.

4 Principle

A defined ignition flame from a specified burner is applied to textile specimens which are vertically oriented. The time necessary to achieve ignition is determined as the mean of the measured times for ignition of the fabric.

NOTE — Attention is drawn to annex C 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 Templates

Flat rigid templates made of suitable material and of a size corresponding to the size of the specimens shall be used. Holes approximately 2 mm diameter are 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 frame (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 holders

6.4.1 Two specimen holders, each consisting of a metal frame on which are mounted 4 pins to support the test specimen (see figure 1). One specimen holder (No. 1) is for specimens 80 mm × 80 mm, the other specimen holder (No. 2) is for specimens 200 mm × 80 mm. The pins for supporting the specimen have a maximum diameter of 2 mm and a minimum length of 27 mm for locating the specimen in a plane at least 20 mm away from the frame.

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

6.4.2 If provision is made for multiple testing of specimens on the No. 1 specimen holder, the location of the pins shall be such that a space of 10 mm is provided between adjacent mounted specimens.

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 Timing device

A timing device to control and measure the application time of the flame accurate to 0,2 s or better. The device shall have provision for setting time intervals of 1,0 s or less.

7 Test specimens

7.1 Size

The size of each specimen shall be as follows (see 8.6):

- a) for frame 1: 80 mm × 80 mm, tolerance $\begin{matrix} +5 \\ 0 \end{matrix}$
(Figure 1, dimension $X = 70$)
- b) for frame 2: 200 mm × 80 mm, tolerance $\begin{matrix} +5 \\ 0 \end{matrix}$
(Figure 1, dimension $X = 190$)

7.2 Pin location marks

Place the template (see 6.3) for the appropriate specimen size centrally on top of the specimen and, by using the holes in the template, mark the position 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

A sufficient number of specimens shall be tested until at least five cases of ignition and five cases of non-ignition occur for each of the length direction and width direction on the size of frame used for the fabric under test (see 8.8). For surface ignition, where the two surfaces of the specimen are dissimilar or preliminary examination indicates it (see annex C), each face of the sample shall be tested in this manner (see 8.8 and 8.9).

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

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 For all fabrics, position the burner as described in 8.5.1. Where a fabric intended for curtains and drapes fails to ignite in the position of the burner described in 8.5.1, the fabric may be ignited by the method described in 8.5.2.

8.5.1 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.

8.5.2 Edge ignition: Position the burner in front of and 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.

8.6 Apply the flame to the 80 mm × 80 mm specimen on frame No. 1 for a time period which preliminary testing indicates will approximate to the minimum ignition time. Ignition shall be deemed to have occurred if either the flame on the specimen persists for a period of at least 5 s after removal of the igniting flame, or if the specimen burns to the top or to the vertical edges of the specimen, after removal of the igniting flame.

8.7 If the specimen burns to the top edge of the specimen during application of the igniting flame, or within 5 s of removing the igniting flame, retest the sample using a 200 mm × 80 mm specimen on frame No. 2.

NOTE — Care should be taken to observe the burning behaviour of textiles which have been given flame-retardant treatments or which melt. It may be necessary to commence testing such textiles from 1 s flame application time.

8.8 Record the timer setting and whether the test specimen ignites. Extinguish any flame on the specimen if ignition has occurred then reduce the timer setting by 1 s. If ignition has not occurred increase the time setting by 1 s up to a maximum time of 20 s, or as indicated in the applicable product standard. Repeat each trial on a new specimen continuing testing until there are at least five cases of ignition and five cases of non-ignition (failure to ignite). If the specimen ignites at 1 s record the subsequent non-ignition as "0" and then retest at 1 s. If a fabric does not ignite within 20 s, five specimens from each direction and each face, where appropriate, shall be tested at 20 s.

8.9 If necessary, repeat the surface ignition test on the second surface of the fabric.

9 Expression of results

9.1 Method of calculation (see annex B)

9.1.1 Calculate the mean of the recorded times at which ignition or non-ignition, whichever has occurred least, was observed for each direction (and each surface tested in the case of surface ignition).

9.1.2 If the data used in 9.1.1 relate to ignition, subtract 0,5 from the mean value calculated in 9.1.1. If the data used in 9.1.1 relate to non-ignition, add 0,5 to the mean value calculated in 9.1.1.

9.1.3 Round the resulting value to the nearest second. Report as the mean ignition time for the fabric in the direction tested. In the case of surface ignition, also report the mean ignition time for that surface of the textile in the direction tested.

9.2 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) size of specimen used (see 7.1);
- j) orientation of the burner for igniting the test specimen (see 8.5);
- k) if the fabric did not ignite in 20 s;
- m) a tabulation for each direction in the case of edge ignition or each surface and direction in the case of surface ignition (see 7.3), of the number of cases of ignition and non-ignition observed at each timer setting used during the test (see annex B, Tables 1 and 2);
- n) mean ignition time for each direction or, in the case of surface ignition, for each direction and surface of the fabric (or fabric construction) tested (see 9.1);
- p) minimum ignition time of the textile material as the lowest of the mean ignition times for each specimen.

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Dimensions in millimetres
min. = minimum

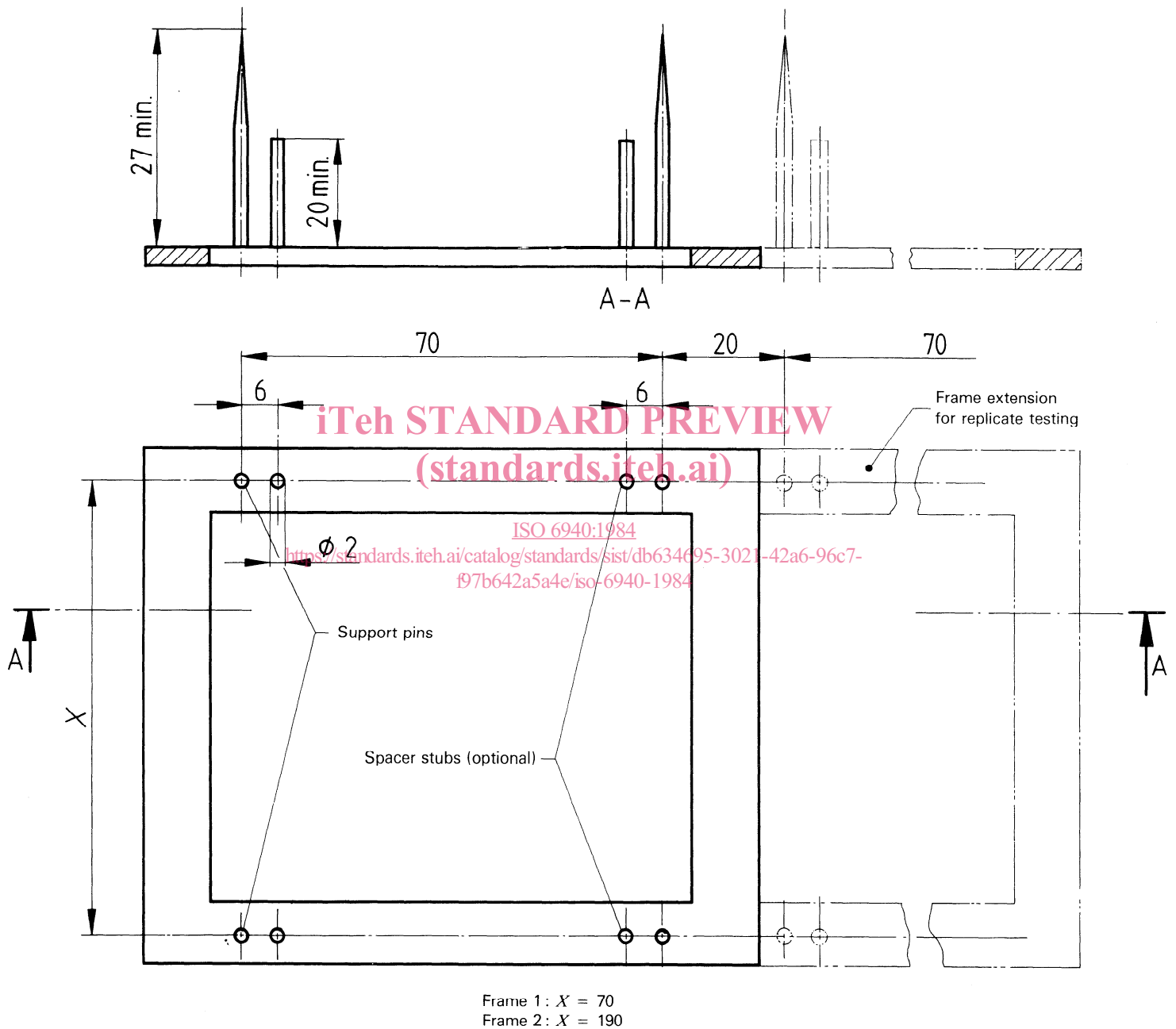


Figure 1 — Specimen holder

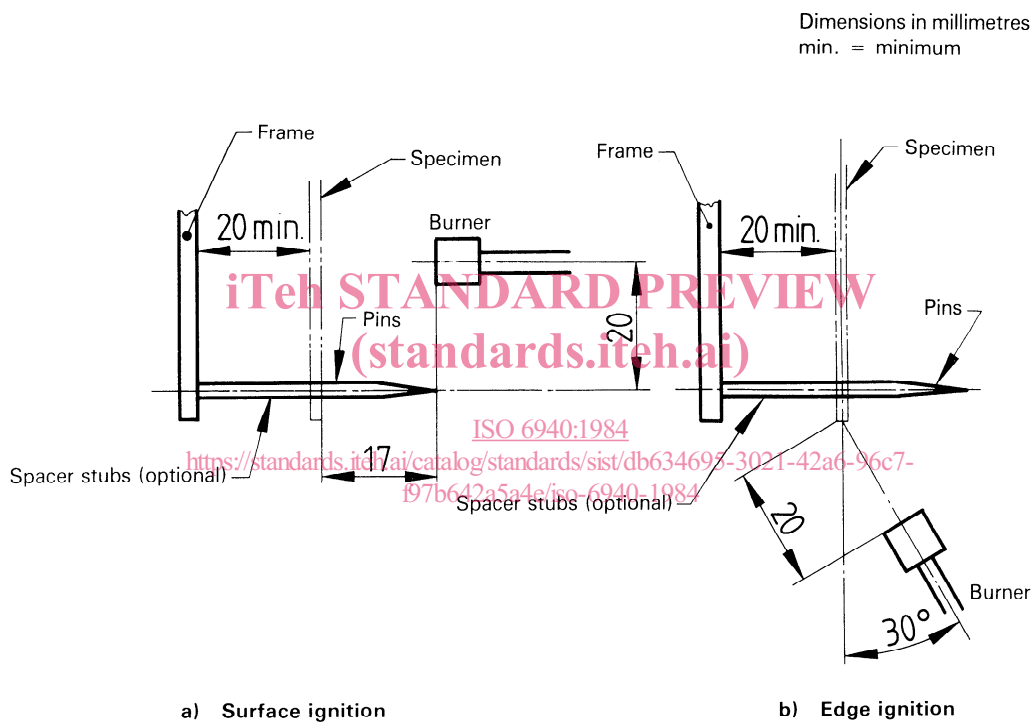


Figure 2 — Burner ignition location

Annex A

Description and construction of the burner¹⁾

(Forms an integral part of the Standard.)

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 $0,18^{+0,03}_0$ 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).

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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

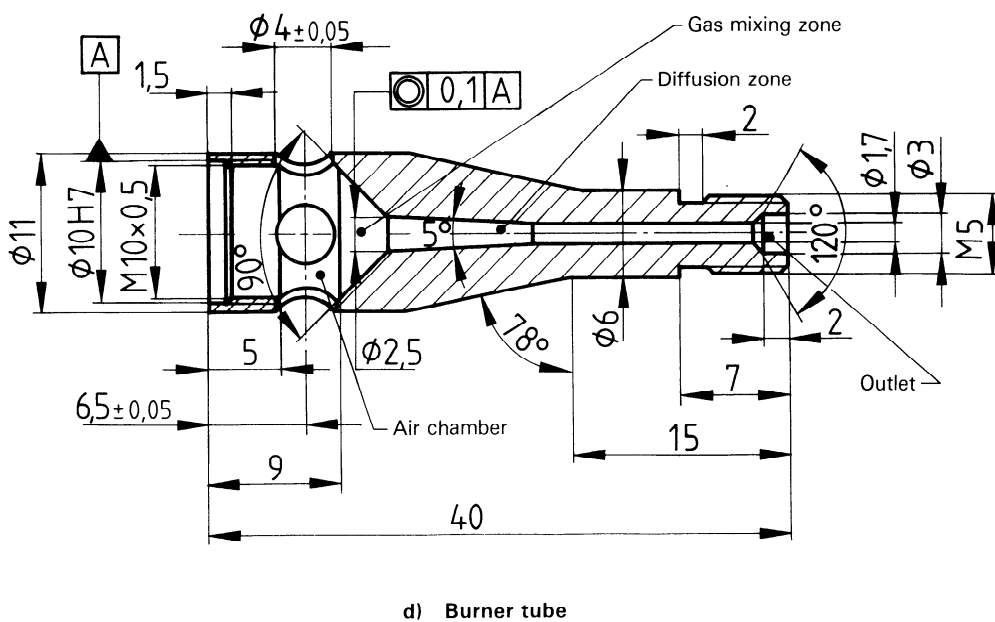
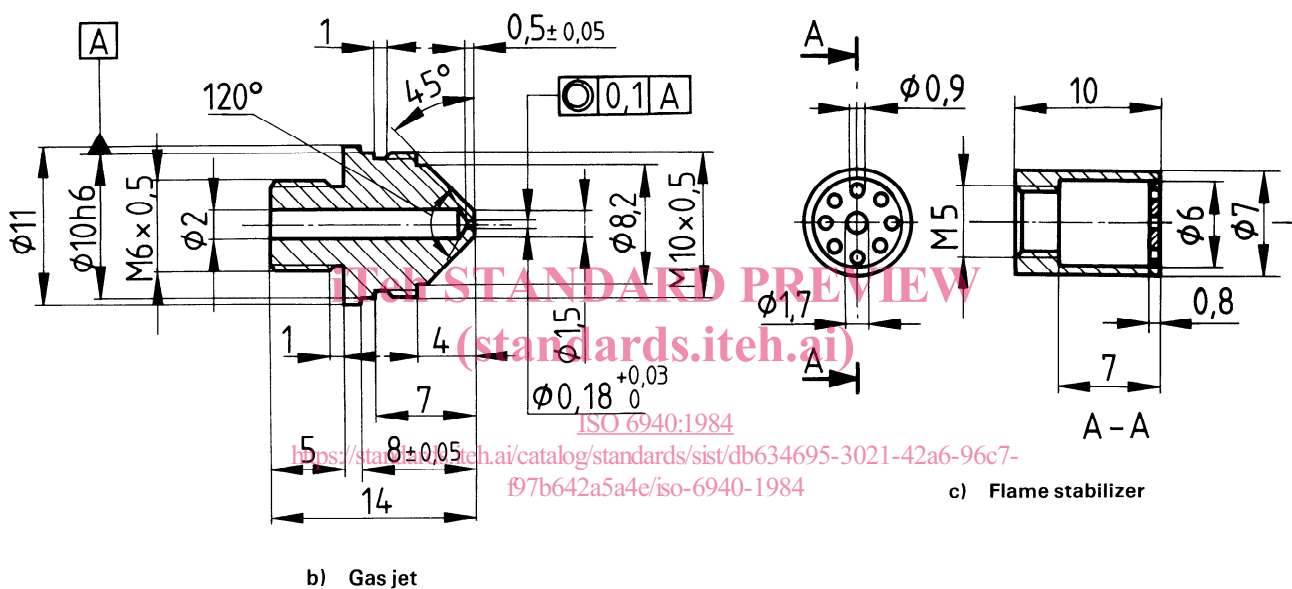
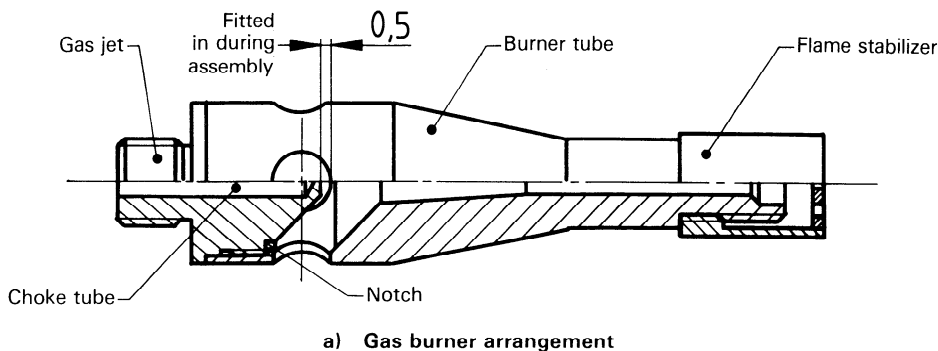


Figure 3 — Gas burner