INTERNATIONAL STANDARD 4604

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Textile glass — Woven fabrics — Determination of conventional flexural stiffness — Fixed-angle flexometer method

Verre textile — Tissus — Détermination de la rigidité conventionnelle en flexion — Méthode du flexomètre à angle fixe

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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.

International Standard ISO 4604 was developed by Technical Committee ISO/TC 61, *Plastics*, and was circulated to the member bodies in November 1976.

It has been approved by the member bodies of the following countries :

Australia	India	Portugal
Austria	Iran	Romania
Belgium	Israel	Sweden
Brazil	Italy	Switzerland
Bulgaria	Japan	Turkey
Canada	Korea, Rep. of	United Kingdom
Czechoslovakia	Mexico	U.S.A.
Finland	Netherlands	Yugoslavia
France	Philippines	
Germany	Poland	

No member body expressed disapproval of the document.

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Textile glass — Woven fabrics — Determination of conventional flexural stiffness — Fixed-angle flexometer method

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method of determining the conventional flexural stiffness of a textile glass fabric by means of a fixed-angle flexometer. This method is not suitable for testing fabrics that are limp or that have a marked tendency to curl or twist or fray.

2 REFERENCES

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

ISO 291, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 4605, *Textile glass — Woven fabrics — Determination of mass per unit area.*

3 PRINCIPLE

A rectangular strip of fabric is supported on a horizontal platform in a direction perpendicular to one edge of the platform. The strip is moved in the direction of its length so that an increasing portion overhangs and bends down under its own weight. When the tip of the specimen has reached a plane passing through the edge of the platform and inclined at an angle of 41,5° below the horizontal, the overhanging length is measured.

The conventional flexural stiffness is calculated from the overhanging length of the test specimen and the mass per unit area of the fabric.

NOTE — This determination of the conventional flexural stiffness is based on a report published in *Shirley Institute Memoirs* **9** (1930), p. 81 and *Journal of the Textile Institute* **21** (1930) T 380.

4 APPARATUS

4.1 Fixed-angle flexometer, the essential features of which are shown in the figure.

On the horizontal platform P rests a slide S, graduated on its upper surface in millimetres.

The under surface of S is covered with a layer of high friction and antistatic material such as sheet rubber and the upper surface of P is polished so that, when S is moved, it will carry forward a specimen placed between the slide and the platform P.

The width of the slide S shall be 25 mm and the length at least 300 mm, and its mass shall be 10 ± 2 g per centimetre of length.

When the front edge of the slide coincides with the front edge of P, the zero of the scale on S coincides with a datum line D on the instrument. Two sighting lines, L_1 and L_2, passing through the upper forward edge of P and inclined at an angle of 41,5° below the horizontal, are inscribed on the transparent side pieces of the instrument.

The range of the instrument is governed by its size. It shall allow the determination of the overhanging length of the specimen.

4.2 Template, 250 mm × 25 mm.

4.3 Suitable cutting device.

5 CONDITIONING AND TESTING ATMOSPHERES

The test specimens shall be conditioned for at least 6 h in the chosen standard testing atmosphere as specified in ISO 291 or ISO 139 until the mass of a specimen does not change by 0,25 % of its original mass at intervals of 2 h.

The test shall be carried out in the same atmosphere.

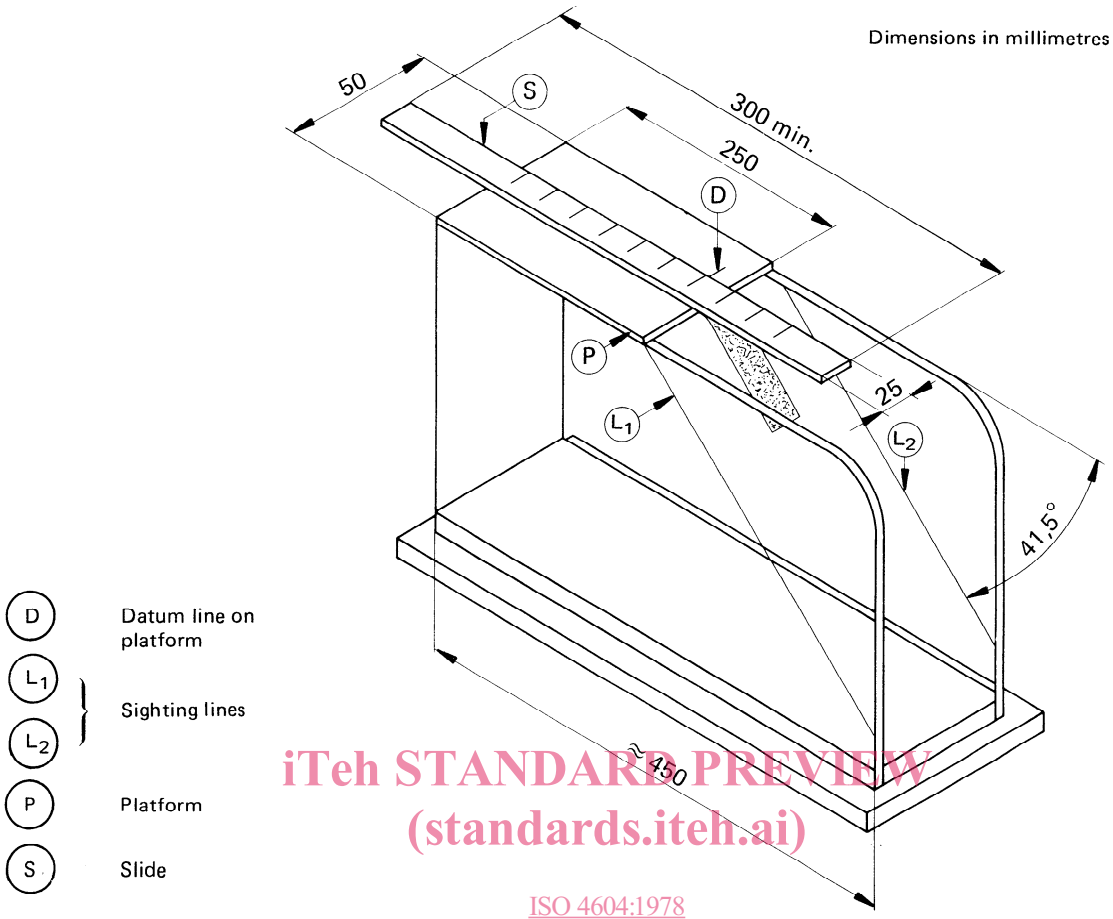

FIGURE 1 — **Fixed-angle flexometer for determination of stiffness**

6 TEST SPECIMENS

Rectangular specimens of width 25 mm and length 250 mm shall be cut from the fabrics to be tested.

Six specimens shall be taken with their long edges parallel to the direction of the warp threads (subsequently referred to as warp specimens) and six in the perpendicular direction (subsequently referred to as weft specimens). On each test specimen, identify the fabric faces.

The specimens shall be cut so that, as far as possible, no two warp specimens contain the same warp threads and no two weft specimens contain the same weft threads.

Selvedges, end pieces and creased or folded places shall not be included in the specimens. The fabric and the specimens shall be handled as little as possible.

7 PROCEDURE

7.1 Place the flexometer (4.1) on a level table. Place the test specimen on the platform P with one end coinciding with the front edge of the platform. Place the slide S on the specimen so that the zero of the scale is in line with the mark D. Push the slide slowly forward so that the specimen is made to project over the edge of P and bends down under its own weight. Move the slide forward until the end of the specimen comes into line with the two lines L_1 and L_2.

If the specimen twists, align the mid-point of the end with L_1 and L_2.

Read the graduation on the slide S opposite the datum line D. The reading, in millimetres, is the overhanging length of the specimen.

NOTES

1 A minor readjustment of the position of the slide may have to be made immediately before this reading is taken.

2 It will be found helpful in carrying out this procedure to place the flexometer so that the zero of the slide S lies towards the observer and on a level which enables the graduation to be read with comfort. The position of the end of the specimen relative to the sighting lines may then be observed in a mirror suitably placed or attached to one side of the instrument.

7.2 Carry out the same operation with two other specimens taken in the same direction and with the same surface of the fabric upwards. Repeat with the other three specimens taken in the same direction and with the other surface of the fabric upwards.

7.3 Repeat steps 7.1 and 7.2 on the specimens taken in the other direction.

8 EXPRESSION OF RESULTS

Calculate for each direction (warp or weft) of the fabric, and separately for each face, the average overhanging length l.

Using the appropriate average value, calculate the conventional flexural stiffness G separately for each face of the fabric and separately for the warp and weft directions of the fabric by the formula

$$G = 9{,}81\ \rho_A \left(\frac{l}{2}\right)^3$$

where

ρ_A is the mass per unit area, in grams per square metre, of the fabric;

l is the appropriate average overhanging length, in metres;

G is the conventional flexural stiffness for the considered direction and face, in millinewton metres.

9 TEST REPORT

The test report shall include the following particulars :

a) reference to this International Standard;

b) complete reference to the textile glass fabric tested, including its construction;

c) conditioning temperature and relative humidity chosen from ISO 291 or ISO 139;

d) conditioning time, in hours, if different from that specified;

e) number of warp and weft test specimens tested, if different from that specified;

f) conventional warp flexural stiffness for each face of the fabric;

g) conventional weft flexural stiffness for each face of the fabric;

h) details of procedure not provided for in this International Standard and any incidents which might have had an influence upon the results.

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