

INTERNATIONAL STANDARD

**ISO
4606**

Second edition
1995-05-15

Textile glass — Woven fabric — Determination of tensile breaking force and elongation at break by the strip method

*Verre textile — Tissus — Détermination de la force de rupture en traction
et de l'allongement à la rupture par la méthode de la bande*



Reference number
ISO 4606:1995(E)



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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 4606 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This second edition cancels and replaces the first edition (ISO 4606:1979), of which it constitutes a technical revision.

Annex A of this International Standard is for information only.

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Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Textile glass — Woven fabric — Determination of tensile breaking force and elongation at break by the strip method

1 Scope

This International Standard specifies a method for the determination of the tensile breaking force and elongation at break of frayed strips of woven textile glass fabrics conditioned in a standard test atmosphere.

The method is applicable to unimpregnated textile glass fabrics and to textile glass fabrics that have been impregnated with sizing or stiffening materials, but not to fabrics coated with rubber or plastics (see annex A for informative references).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 139:1973, *Textiles — Standard atmospheres for conditioning and testing*.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing*.

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 initial gauge length: The length of a specimen under a specified pre-tensioning force, measured

from nip to nip of the jaws of the clamps holding the specimen, with the clamps in their starting position.

3.2 breaking force: The maximum force applied to a test specimen in stretching it to rupture.

3.3 elongation; extension: The increase in length of a specimen under tension, usually expressed as a percentage of the initial length.

4 Principle

A strip of woven fabric is stretched to rupture by a suitable mechanical apparatus which indicates the breaking force and the elongation at break. The breaking force and the elongation at break may be determined either by taking readings directly from the indicating instruments on the apparatus or from an autographic force/extension curve.

Provision is made for two different types of test specimen:

- Type I is intended for use with stiff fabrics (e.g. scrim fabrics made with coarse yarns, i.e. yarns with a linear density greater than or equal to 300 tex, or fabrics in which the yarns are bonded to each other by a finish or stiffening).
- Type II is intended for more pliable fabrics, due to its easier handling, and thereby reduction of the experimental error.

5 Apparatus

5.1 Tensile-testing machine

The tensile-testing machine shall comprise the elements described in 5.1.1 to 5.1.4.



5.1.1 Pair of clamps, suitable for holding the specimen.

The clamps shall be wider than the unravelled specimen (see 7.1 and 7.2), i.e. more than 50 mm (or more than 25 mm — see 7.1) wide. The faces of the clamps shall be flat and parallel and shall exert a uniform pressure over the entire width of the specimen. They shall not allow the specimen to slip or to become damaged in any way (a hydraulic or a pneumatic pressure system, for example, may be necessary).

The faces of the clamps should preferably be smooth, but when specimens cannot be held satisfactorily, even with packing, serrated or corrugated clamps may be used. Paper, felt, leather or sheets of plastic or rubber may be used as jaw-packing materials.

The clamps shall be designed so that the axis of the test specimen remains aligned with the direction of the applied force throughout the test. The initial distance between the clamps (gauge length) shall be 200 mm ± 2 mm for type I test specimens and 100 mm ± 1 mm for type II test specimens.

5.1.2 Tensile-testing machine, the reference system being a constant-rate-of-extension (CRE) machine capable of producing a specimen-extension rate of 100 mm/min ± 5 mm/min for type I test specimens and 50 mm/min ± 3 mm/min for type II test specimens.

Other types of machine may be used, i.e. constant-rate-of-traverse (CRT) and constant-rate-of-loading (CRL) machines, but there may be no overall correlation between the results obtained with the CRE machine and those obtained with other machines. In cases of dispute, the CRE method shall be the reference method.

In the case of CRT and CRL machines, the speed of operation of the machine shall be set to break the specimen within 5 s ± 2 s or, by agreement between the interested parties, within a period of time calculated from the extension at break using the following equation:

$$t_B = \frac{E_L \times 60}{CRE}$$

where

- t_B is the time to break, in seconds;
- E_L is the extension at break, in millimetres;
- CRE is the constant rate of extension, in millimetres per minute (taken from table 1).

Table 1 — Test specimens and test parameters

Test parameters	Units	Test specimen	
		Type I	Type II
Length of specimen	mm	350	250
Width of specimen (before unravelling)	mm	65	40
Gauge length	mm	200	100
Unravelled width	mm	50	25
Rate of extension	mm/min	100	50

5.1.3 Mechanism for indicating or recording the force applied to the specimen, practically free from inertia at the specified speed of testing. The maximum error in the indicated force shall not, under the conditions of use, be greater than 1 % of the actual force.

5.1.4 Mechanism for indicating or recording the specimen extension, practically free from inertia at the specified speed of testing and accurate to within 1 % of the measured value, or better.

5.2 Other equipment

5.2.1 Template (see figure 1), for use in cutting out, from the laboratory sample, an intermediate sample measuring 350 mm × 370 mm if type I test specimens are to be prepared or 250 mm × 270 mm if type II test specimens are to be prepared. The template has two apertures for marking out the limits of the central (test) portion of the specimens (the gauge length).

5.2.2 Suitable cutting tool, for example a knife, pair of scissors or cutting wheel.

6 Sampling

Unless specified otherwise, either in the product specification or by agreement between the interested parties, take a laboratory sample approximately 1 m long after having removed the outer layer of the roll or piece of fabric, which is susceptible to damage (remove at least 1 m).