
**Textile glass — Mats — Determination of
tensile breaking force**

Verre textile — Mats — Détermination de la force de rupture en traction

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 3342 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This fourth edition cancels and replaces the third edition (ISO 3342:1995), of which it constitutes a minor revision. The main changes are as follows:

- a) the normative references have been updated;
- b) former Subclauses 5.2, 5.3 and 5.6 have been deleted;
- c) explanatory footnotes concerning the terms “elementary unit” and “laboratory sample” have been added.

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Textile glass — Mats — Determination of tensile breaking force

1 Scope

This International Standard specifies a method for the determination of the tensile breaking force of textile glass mats.

The method is intended for chopped-strand mat but is equally applicable to certain types of continuous-strand mat usually intended for pultrusion.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

tensile breaking force

maximum force required to break the test specimen in a tensile test carried to rupture

NOTE It is generally expressed in newtons.

4 Principle

A pre-conditioned test specimen of standard dimensions is subjected to tension by a suitable mechanical device which indicates the tensile breaking force on a recorder or scale.

NOTE The test results might vary significantly depending on whether they are obtained on rolls of mat or on the mat prior to winding into rolls (normally, the result is higher prior to winding). The method specified in this International Standard describes the procedure for testing rolls of mat.

5 Apparatus

5.1 Tensile-testing machine.

5.1.1 All testing machines shall include the following elements.

- a) A pair of suitable clamps to grip the specimen. They shall have a width of 160 mm and a minimum depth of 25 mm. The faces of the clamps shall be plane and parallel, shall ensure uniform pressure over the whole width of the test specimen and shall prevent it from slipping. The clamps shall also ensure, at all times, alignment of the axis of the test specimen with the direction of the applied force. The initial distance between the clamps shall be 200 mm.
- b) A means for applying tension to the specimen.

- c) A mechanism that will continuously indicate or record the force sustained by the specimen. The mechanism shall be practically free from inertia at the specified speed of testing and shall indicate the force with an accuracy within 1 % of the true value.

The reference machine is one having a constant rate of extension. Other types of test machine exist, e.g. with constant rate of loading or constant rate of traverse. If only such machines are available, they may be used subject to agreement between interested parties, but the results from different types of machine cannot necessarily be compared.

5.1.2 The maximum error in the indicated force, at any point in the range in which the machine is used, shall not exceed 1 % of the true force. The error in the length of specimen exposed between the clamps shall not exceed 2 mm. The accuracy of the tensile-testing machine shall be verified, for example by means of calibrated springs with appropriate characteristics.

5.2 Template for cutting out specimens.

For chopped-strand mat: polished template 150 mm wide and 316 mm long.

For continuous-strand mat for pultrusion applications: polished template 75 mm wide and 316 mm long.

5.3 Suitable trimming tool.

For example a knife, scissors or a disc cutter.

6 Conditioning and test atmosphere

6.1 Conditioning

Condition the material under test in one of the standard laboratory atmospheres specified in ISO 291 at the rate of

- 16 h for an elementary unit¹⁾;
- 1 h for test specimens or a laboratory sample²⁾.

Indicate in the test report the conditioning atmosphere chosen.

6.2 Test atmosphere

Carry out the tests in one of the standard laboratory atmospheres specified in ISO 291.

The provisions of Subclauses 6.1 and 6.2 do not have to be used for routine quality control purposes at fabrication. In this case, the person responsible for the laboratory shall assess the influence of the actual conditions (temperature, humidity) on the results obtained. When drawing up specifications, and for any testing done in formal relation with these specifications, the standard conditioning specified above shall be used.

7 Test specimens

Before preparing any test specimens, remove and discard from the roll at least two layers of mat to obtain an area free from any damage. From this area, cut a strip at least 400 mm wide, using the trimming tool (5.3). Handle this strip with great care in order to avoid creasing it. Take the same precautions with the test specimens cut out as described below.

1) The elementary unit is normally the smallest entity of a given product that is commercially available.
2) A laboratory sample is a part of the elementary unit from which the specimen(s) will be selected for the test. A laboratory sample is taken when it is impractical to bring the elementary unit into the test laboratory.

Using the template (5.2), cut from this strip test specimens 150 mm wide (or 75 mm for continuous-strand mat) and 316 mm long, with the major axis of the specimens lying parallel to the longitudinal direction of the mat. If additional tests are to be made with the major axis of the specimens parallel to the transverse direction of the mat, cut out specimens 316 mm long across the mat width. Cut out these specimens ensuring that they are equidistant from each other and are not less than 10 mm from the edges in the case of trimmed mats.

In the case of continuous-strand mat, use only longitudinal specimens, i.e. specimens with their major axis parallel to the longitudinal direction of the mat.

By default, one determination of the tensile breaking force shall be based on five specimens or more, depending on the width of the mat.

If the width of the mat does not allow sufficient test specimens to be taken side by side, selection may be completed by cutting specimens from additional strips, again ensuring that the specimens are evenly distributed.

It might be convenient to cut the specimens from those which have been used to determine the mass per unit area of the mat in accordance with ISO 3374. In this case, ensure that the specimens are handled with care.

The product specification or the persons ordering the test might require other methods of preparation of the test specimens. If so, these shall be described in the test report.

8 Procedure

8.1 Adjust the distance between the clamps to give a free specimen length of 200 mm.

8.2 Adjust the speed of the testing machine to give a rate of clamp separation of 200 mm/min \pm 10 mm/min.

8.3 Ensure that the clamps are properly aligned.

Position the specimen in the clamps so that the longitudinal axis of the specimen is aligned with the mechanical axis of the tensile tester.

Tighten the clamps, evenly and firmly, applying a slight tension to the specimen so that it is straight.

Start the tensile tester and stretch the specimen to the point of rupture.

Record the force, in newtons, required to break the specimen.

Discard results obtained from test specimens that break within 10 mm of the clamps or that slip in the clamps, and test an appropriate number of additional specimens so as to obtain the required number of results (see Clause 7).

If the break is not a clean one, this shall be noted in the test report.

9 Expression of results

Calculate the tensile breaking force, in newtons, of the mat as the mean of the individual values obtained for each test specimen, and round the mean to the nearest 1 N.

If required, calculate the range of the results obtained for the specimens from a particular elementary unit.

10 Precision

The precision of this test method is not known because interlaboratory data are not available. When such data are obtained, a precision statement will be added at the following revision.

11 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) all details necessary for the complete identification of the mat tested;
- c) the number of specimens tested;
- d) the conditioning and test atmospheres chosen;
- e) the type of tensile-testing machine used, the capacity of the machine and the scale range used;
- f) the tensile breaking force in the longitudinal direction and, if applicable, in the transverse direction of the mat;
- g) if required, the range of the results for the specimens from the same elementary unit;
- h) a note describing the rupture of the specimen if the break is not a clean one;
- i) details of any operation not specified in this International Standard as well as of any incident liable to have affected the results;
- j) the date of the test;
- k) any other relevant information.

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