INTERNATIONAL STANDARD

ISO 3597-2

Second edition
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Textile-glass-reinforced plastics — Determination of mechanical properties on rods made of roving-reinforced resin —

Part 2: Determination of flexural strength

Plastiques renforcés verre textile — Détermination des propriétés mécaniques sur joncs de stratifils —

Partie 2: Détermination de la résistance en flexion

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 3597-2 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 3597-2:1993), which has been technically revised.

ISO 3597 consists of the following parts, under the general title *Textile-glass-reinforced plastics — Determination of mechanical properties on rods made of roving-reinforced resin*:

— *Part 1: General considerations and preparation of rods*

— *Part 2: Determination of flexural strength*

— *Part 3: Determination of compressive strength*

— *Part 4: Determination of apparent interlaminar shear strength*

Textile-glass-reinforced plastics — Determination of mechanical properties on rods made of roving-reinforced resin —

Part 2: Determination of flexural strength

1 Scope

This part of ISO 3597 specifies a method for determining the flexural strength of composite rods of circular cross-section made of roving-reinforced resin. The test may be carried out on "as-moulded" rods, or on rods that have been pretreated by immersion in boiling water (or another medium) for a specified time. The test is intended for inspection and quality control of rovings or for evaluating their suitability for use in a resin system. The results obtained are not intended for the generation of design data.

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 3597-1, *Textile-glass-reinforced plastics — Determination of mechanical properties on rods made of roving-reinforced resin — Part 1: General considerations and preparation of rods*

ISO 14125, *Fibre-reinforced plastic composites — Determination of flexural properties*

3 Apparatus

3.1 Flexural-testing apparatus, as specified in ISO 14125, with the following additional characteristics:

3.1.1 The load applicator shall be a steel rod waisted in the middle to ensure a distribution of stresses. A load applicator suitable for a 6-mm-diameter test specimen is shown in Figure 1. It is important that the radius R of the waist is not more than 0,25 mm larger than the actual (measured) radius of the test specimen.

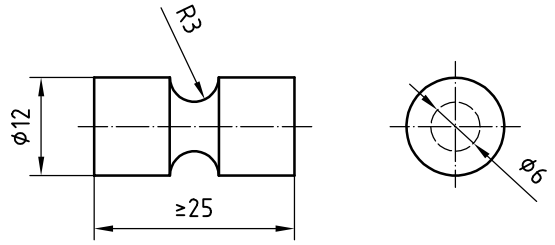
3.1.2 The span between the supports shall be 16 times the diameter of the test specimen.

3.2 Micrometer or **vernier gauge**, capable of measuring to the nearest 0,1 mm.

4 Preparation and conditioning of test specimens

Prepare and condition a suitable number of specimens in accordance with the method given in ISO 3597-1. For each type of test ("as-moulded" or pretreated), the minimum required number of specimens is eight. If specific statistical limits are agreed between interested parties, additional specimens may be tested to permit statistical analysis of the results. The required specimen length is 20 times its diameter, i.e. 120 mm for a rod of diameter 6 mm.

Dimensions in millimetres



NOTE When specimens with a different diameter are tested, a load applicator of different dimensions needs to be used.

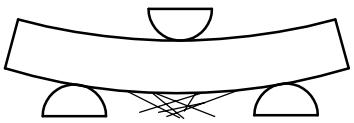
Figure 1 — Example of load applicator for testing specimens of diameter 6 mm

5 Procedure

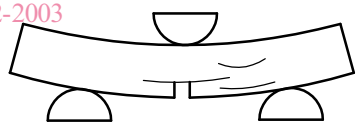
5.1 Before carrying out the flexural-strength test, measure the diameter of each test specimen with a micrometer or vernier gauge (3.2) to the nearest 0,1 mm at two points around the circumference located 90° apart at the centre of the specimen. Use the average of these two measurements in the calculation of the results.

5.2 Carry out the flexural-strength test on the specimens in accordance with ISO 14125, modified as specified in 3.1, in the same standard laboratory atmosphere as that used for specimen conditioning. The speed of the load applicator shall be 5 mm/min. Polyethylene film may be placed between the support and the rod to avoid compressive failure. No information is available about the influence on the results when using such film.

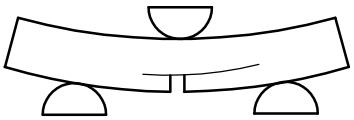
5.3 The person requiring the test may require that the mode of failure be recorded (see Figure 2).



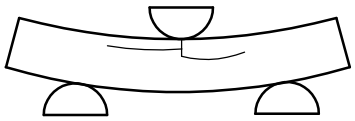
a) **Tensile fracture of fibres**



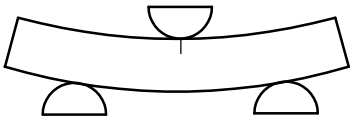
b) **Tensile fracture (including interlaminar shear)**



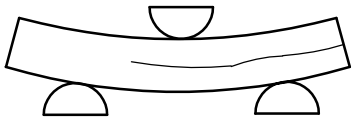
c) **Tensile fracture at outermost layer**



d) **Compressive fracture (including interlaminar shear)**



e) **Compressive fracture**



f) **Interlaminar-shear fracture**

Figure 2 — Examples of possible failure modes (Tensile- and compression-initiated failures, remote from the loading points, are acceptable failure modes. Failures initiated by interlaminar shear are not acceptable.)

6 Expression of results

For each test specimen, calculate the flexural strength σ_F, expressed in megapascals, using the equation:

$$\sigma_F = \frac{8 \times F \times l}{\pi d^3}$$

where

F is the breaking force, in newtons;

l is the span, in millimetres;

d is the diameter, in millimetres, of the test specimen.

7 Precision

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

8 Test report

The test report shall include the following information:

a) a reference to this part of ISO 3597;

b) all information necessary for complete identification of the roving tested;

c) all information necessary for complete identification of the resin used;

d) the diameter of the mould used to prepare the test rods;

e) whether a release agent was used and, if so, details of the agent used;

f) the curing and postcuring conditions;

g) the test atmosphere;

h) the test results:

1) for “as-moulded” specimens, the glass content, diameter, flexural strength and, if required, mode of failure of each specimen tested and (except for the mode of failure) the average value;

2) if testing was also carried out after pretreatment:

— the medium used;

— the length of the pretreatment;

— the individual and average values of the flexural strength after pretreatment.

ICS 59.100.10; 83.120

Price based on 3 pages