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

**Part 3:
Determination of compressive strength**

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

Partie 3: Détermination de la résistance en compression



Reference number
ISO 3597-3:2003(E)

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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.

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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 3597-3 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 3597-3:1993), 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 3: Determination of compressive strength

1 Scope

This part of ISO 3597 specifies a method for determining the compressive 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*

3 Apparatus

3.1 Compression-testing machine, capable of maintaining a compression speed of 1 mm/min.

3.2 Two test jigs, for example as shown in Figure 1, each consisting of:

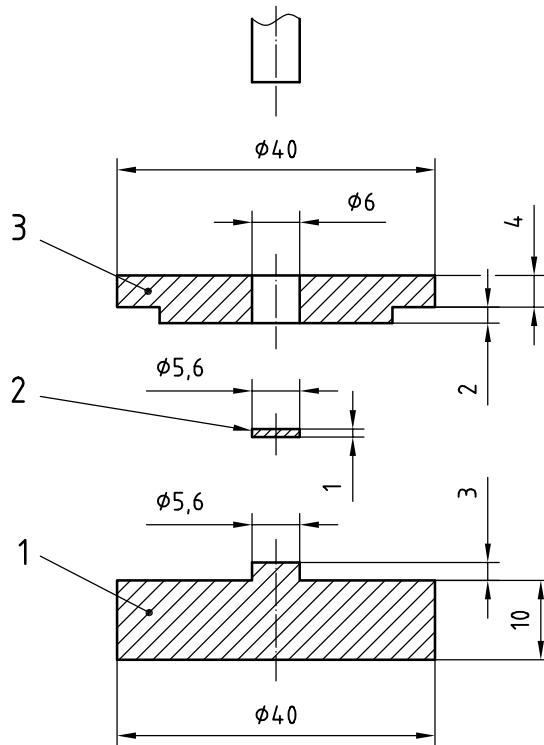
- a) a baseplate (1);
- b) an elastic compression pad (2) (made of polyamide, for example);
- c) a support ring (3).

Parts 1 and 3 of the upper jig may be bolted together to prevent them falling (see Figure 2 for an example of how this may be done).

The opening in the support ring shall fit snugly round the specimen in order to ensure consistent results. The maximum permitted opening diameter is 0,1 mm larger than the specimen diameter. If the specimen diameter is more than 0,1 mm smaller than that of the opening in the support ring, a support ring with a smaller opening shall be used. Deviations from nominal specimen dimensions can occur due to variations in the inner diameter of the mould or resin shrinkage.

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

Dimensions in millimetres



Key

- 1 baseplate
- 2 elastic compression pad
- 3 support ring

Figure 1 — Example of jig for testing specimens of diameter 6,0 mm

4 Preparation and conditioning of specimens

The procedure specified hereafter is suitable for specimens of diameter 6 mm to be tested “as-moulded” and, if required, pre-treated. For each type of test (“as-moulded” or pre-treated), 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. Prepare a sufficient number of rods, using the method specified in ISO 3597-1, and cut them into specimens of length 22,5 mm. Take care to ensure that the cut ends of the specimens are parallel.

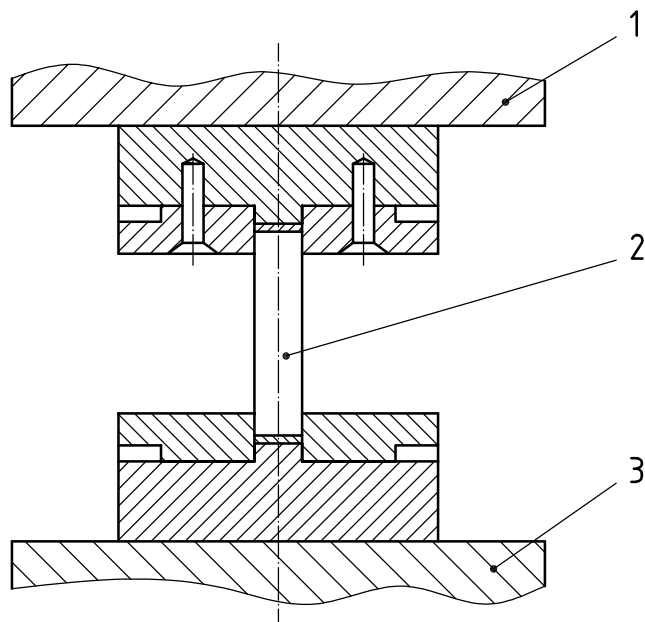
When rods of diameter other than 6 mm are used, the ratio of the rod length L to the rod diameter d shall satisfy the following equation:

$$L = 0,625d^2$$

5 Procedure

5.1 Before carrying out the compressive test, measure the diameter of each test specimen with a micrometer or vernier gauge (3.3) 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 Conduct the compressive test in the same standard laboratory atmosphere as that used for specimen conditioning. Assemble a test specimen with a test jig (3.2) at each end. Place the assembly vertically between the platens of the test machine (3.1) (see also Figure 2). Compress the test specimen at a speed of 1 mm/min until the specimen fails. Record the maximum force, in newtons, that occurred during the test.



Key

- 1 upper plate of test machine
- 2 test specimen
- 3 lower plate of test machine

Figure 2 — Example of test assembly in test machine with bolted upper jig

5.3 The person requiring the test may require that the mode of failure be recorded (see Figure 3).

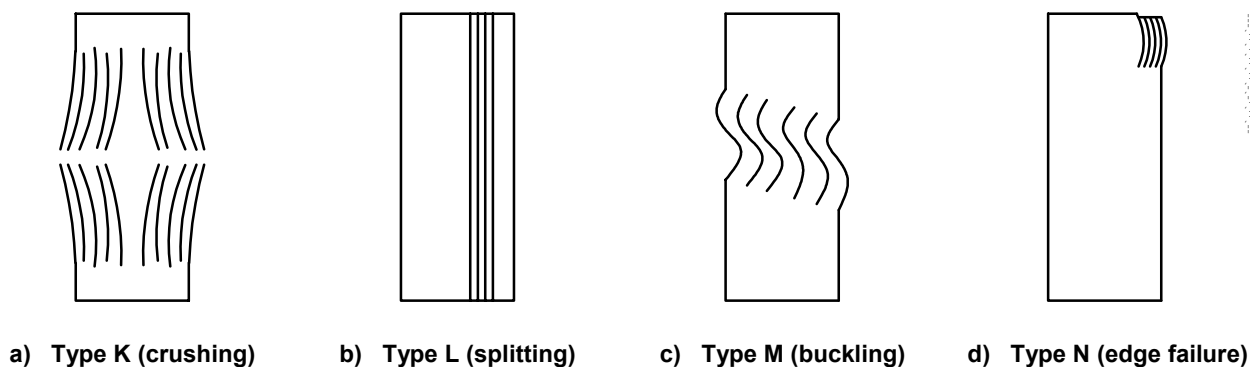


Figure 3 — Typical failure modes

6 Expression of results

For each specimen, calculate the compressive strength σ_C , expressed in megapascals, using the equation:

$$\sigma_C = \frac{4 \times F}{\pi d^2}$$

where

F is the maximum force, in newtons, that is recorded during the test;

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

For each type of test (“as-moulded” or pretreated), calculate the average of the results obtained on each specimen, discarding those results which are lower than 50 % of this average. Report the resulting value as the compressive strength of the material. If fewer than five results are available for this calculation, a further set of test specimens shall be prepared and tested. If this second set results in similar difficulties, record this situation in the test report.

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 specimens;
- e) whether a release agent was used and, if so, details of the agent used;
- f) the curing and post-curing conditions;
- g) the test atmosphere;
- h) the test results:
 - 1) for “as-moulded” specimens, the glass content, diameter, compressive 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 compressive strength after pretreatment.

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