
Paper and board — Testing of cores —

Part 6:

Determination of bending strength by the
three-point method

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*Partie 6: Détermination de la résistance à la flexion par la méthode des
trois points*

[ISO 11093-6:1996](#)

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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.

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 11093-6 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 3, *Dimensions and grammages of paper, board and pulp products*.

ISO 11093 consists of the following parts, under the general title *Paper and board — Testing of cores*:

- *Part 1: Sampling*
- *Part 2: Conditioning of test samples*
- *Part 3: Determination of moisture content using the oven drying method*
- *Part 4: Measurement of dimensions*
- *Part 5: Determination of characteristics of concentric rotation*
- *Part 6: Determination of bending strength by the three-point method*
- *Part 7: Calculation of flexural modulus by the three-point method*
- *Part 8: Determination of natural frequency and flexural modulus by experimental modal analysis*
- *Part 9: Determination of flat crush resistance*

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Paper and board — Testing of cores —

Part 6:

Determination of bending strength by the three-point method

1 Scope

This part of ISO 11093 specifies a three-point method for the determination of the bending strength of cylindrical board cores which meet the following criteria:

- internal diameter: 50 mm to 300 mm,
- minimum wall thickness: 5 mm,
- minimum length of core: 1 400 mm.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11093. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11093 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 11093-1:1994, *Paper and board — Testing of cores — Part 1: Sampling.*

ISO 11093-2:1994, *Paper and board — Testing of cores — Part 2: Conditioning of test samples.*

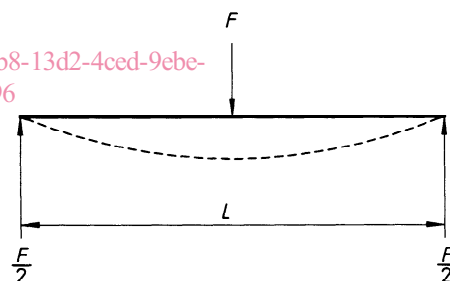
3 Definition

For the purposes of this part of ISO 11093, the following definition applies.

3.1 bending strength: Maximum resistance of a specimen of given dimensions against bending until breakage.

4 Principle

The core specimen is considered as a “beam” in the mechanics of material approach. During the test, the test specimen is stressed by a vertical force (F) at the midpoint of its length while being supported at each end only (see figure 1). For the determination of the bending strength, stress is applied until the test specimen breaks.



F Applied force

L Test length (span)

Figure 1 — Three-point method of beam loading

5 Apparatus

5.1 Load testing machine, capable of applying a load at a constant rate of deflection of $(0,500 \pm 0,025)$ kN/s.

5.2 Two prism supports (see figure 2). For each support, the angle between the two faces supporting the core test specimen shall be $120^\circ \pm 2^\circ$. The length (l), parallel to the core length, shall be (50 ± 1) mm. The width (b) shall be large enough to allow the core test specimen to rest on the supporting faces and not on the outer edges of the prism. The

support edges shall be rounded to a radius (r) of $(0,5 \pm 0,1)$ mm.

The prism support shall be positioned on pivots on each side of the prism so as to ensure uniform contact of the test specimen on the prism and a constant measuring length during the test.

5.3 Load prism, used to apply the load to the core surface and of the same basic shape and dimensions as the prism supports (5.2), except that the length (l) parallel to the core length shall be (100 ± 1) mm.

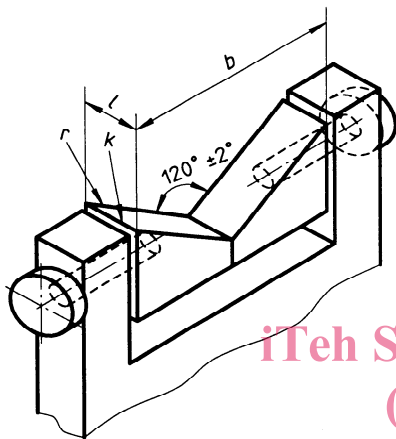


Figure 2 — Schematic drawing of prism support (ISO 11093-6:1996)

6 Sampling and preparation of test specimens

Obtain samples in accordance with ISO 11093-1.

Prepare at least three test specimens such that their lengths are 100 mm greater than the test length, L (see figure 1), which shall be at least 12 times the external diameter of the core under test.

Condition the test specimens in accordance with ISO 11093-2.

7 Test procedure

Carry out the test under the same atmospheric conditions as those used to condition the test specimens.

Place the prism supports symmetrically to and equidistant from the loading prism. The distance between the two axes of the support prisms is the test length (see clause 6) and shall be known to an accuracy of ± 2 mm. Place the test specimen centrally on the supports to within ± 5 mm.

Place the loading prism at the top centre of the test length of the core, diametrically opposed to the prism supports, and apply the load until the test specimen breaks. Record the maximum load value, in kilonewtons, as the bending strength.

Repeat the test procedure for the remaining test specimens. Calculate the mean bending strength.

8 Test report

The test report shall include the following information:

- reference to this part of ISO 11093;
- type and designation of the sample;
- date and place of sampling;
- date and place of testing and signature of tester;
- number of test specimens;
- core dimensions, i.e. length, internal diameter, external diameter;
- test length (L);
- individual and mean values, expressed in kilonewtons, for bending strength;
- any departure from the procedure specified in this part of ISO 11093 and any circumstances that may have affected the results.

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