INTERNATIONAL STANDARD

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Paper and board — Testing of cores —

Part 6: Determination of bending strength by the three-point method

Papier et carton — Essais des mandrins —

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

Reference number
ISO 11093-6:2005(E)

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Foreword

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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 11093-6 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*.

This second edition cancels and replaces the first edition (ISO 11093-6:1996), which has been technically revised.

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: Determination 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*

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 test length of core (span): 1 100 mm.

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 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system*

ISO 11093-1, *Paper and board — Testing of cores — Part 1: Sampling*

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

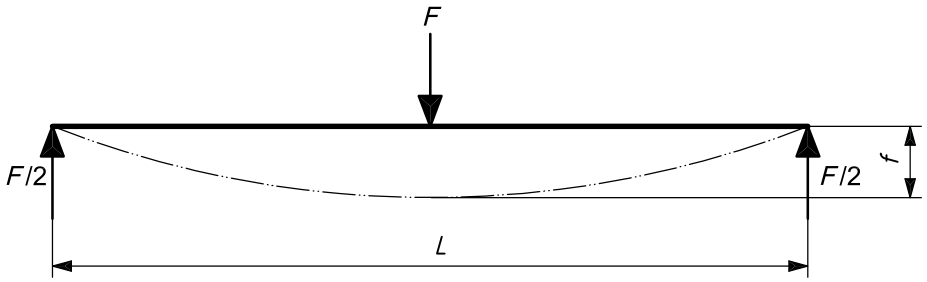
3 Terms and definitions

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

3.1
bending strength
maximum resistance of a test piece of given dimensions against bending until breakage under specified conditions

4 Principle

The core test piece is considered as a "beam" in the mechanics of material approach. During the test, the test piece 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 piece breaks.



F applied force

L test length of the core (span)

Figure 1 — Three-point method of beam loading

5 Apparatus

The following apparatus shall be used.

5.1 Load-testing machine

The load-testing machine shall be capable of applying a load at a constant relative speed of (25 ± 2,5) mm/min and shall be calibrated and verified to conform to the requirements of ISO 7500-1.

The switch-off limit for the breaking force ΔF for a testing machine with an automatic break detection is defined by

— 30 N, or

— 3 %

from the true value.

The direction of the load application is perpendicular to the test piece axis and shall be adjusted with an accuracy of ± 1°.

5.2 Two prism supports

The two prism supports (see Figure 2), shall each have an angle between the two faces supporting the core test piece of 120° ± 2°. 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 piece 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 ± 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 piece on the prism and a constant measuring length during the test.

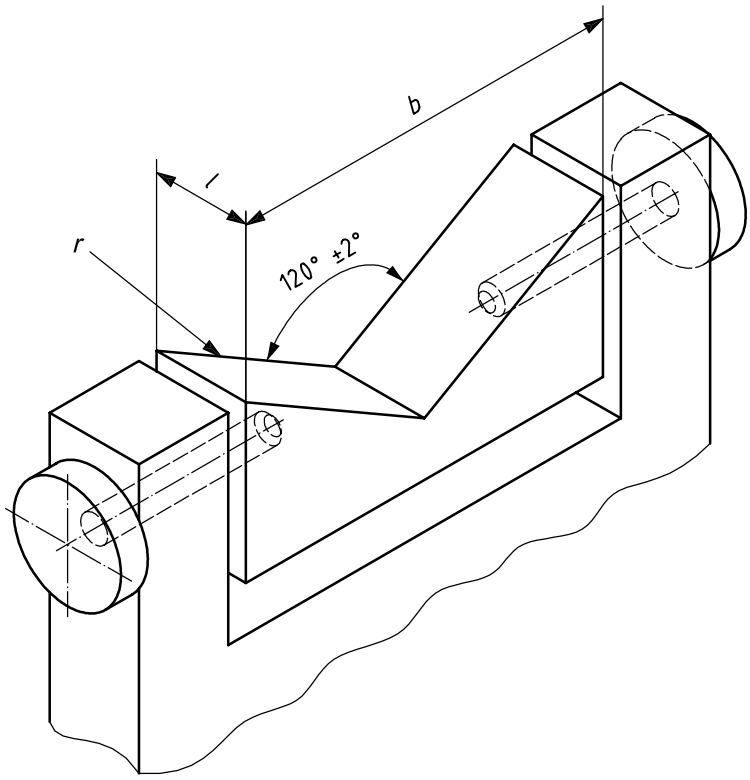


Figure 2 — Schematic drawing of prism support

5.3 Load prism

The load prism is used to apply the load to the core surface and is of the same basic shape and dimensions as the prism supports (5.2), except that its length l (see Figure 2) parallel to the core length L (see Figure 1), shall be (100 ± 1) mm.

6 Sampling and preparation

Ensure that the test pieces used are representative of the sample received. If the determination is to represent a lot, the sampling procedure shall be carried out in accordance with ISO 11093-1.

Prepare at least three test pieces such that their lengths are 100 mm greater than the test length of the core, L (see Figure 1).

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

7 Procedure

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

Arrange the test assembly such that the test piece is located centrally on the prism supports to within ± 5 mm, and the load prism is positioned centrally between the support prisms to within ± 2 mm and diametrically opposed to them. The distance between the two axes of the support prisms is the test length of the core, L (see Figure 1). The test length of the core shall be in accordance with Clause 6 and shall be known to an accuracy of ± 2 mm.

Apply the load at a constant rate of (25 ± 2,5) mm/min until the test piece breaks. Record the maximum load value, in kilonewtons, as the bending strength.

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

8 Test report

The test report shall include the following information

a) a reference to this part of ISO 11093;

b) complete identification of the samples tested and the sampling method used;

c) date and place of sampling;

d) date and place of testing, name and signature of tester;

e) number of test pieces;

f) core dimensions, i.e. length, internal diameter, external diameter;

g) test length of core (L);

h) individual and average values, expressed in kilonewtons, for bending strength;

i) 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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