
Paper and board — Testing of cores —

Part 5:

Determination of characteristics of concentric
rotation

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Papier et carton — Essais des mandrins —

Partie 5: Détermination des caractéristiques de rotation

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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 11093-5 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 3, *Dimensions and grammage 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: *Dimensional measurements*
- Part 5: *Determination of characteristics of concentric rotation*
- Part 8: *Machine test for dynamic cleavage*
- Part 9: *Determination of flat crush resistance*

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Paper and board — Testing of cores —

Part 5:

Determination of characteristics of concentric rotation

1 Scope

This part of ISO 11093 specifies a method for determining the characteristics of concentric rotation of cylindrical board cores which meet the following criteria:

- minimum wall thickness: 5 mm
- minimum external diameter: 60 mm
- maximum sample length: 3 200 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 Principles

3.1 Determination of the roundness deviation (f_R) by three-point measurement

Measurement between three points in a plane perpendicular to the core axis where two points are fixed in predetermined positions and the other moves in the direction of the measurement.

3.2 Determination of the straightness deviation (f_S) by five-point measurement

Measurement between five points in planes perpendicular to the core axis where four measuring points are fixed in pairs in predetermined positions in two planes to the core axis and the other in a central plane perpendicular to the core axis moves in the direction of the measurement.

4 Apparatus

The apparatus, shown in figure 1, consists of a rack (1) bearing two pairs of moveable supports (2). Each pair consists of two free rotating support rollers (3) where the distance between the faces of the two can be adjusted. The diameter of each roll shall be $85 \text{ mm} \pm 1 \text{ mm}$ and the face $20 \text{ mm} \pm 1 \text{ mm}$. For example a 6209 roller bearing can be used.

Two measuring feelers are provided for carrying out the measuring. One (4) is placed above one of the pairs of supports and the other (5) is moveable between the pairs of supports on the rack. The measuring feelers are dial gauges graduated in 0,01 mm and accurate to at least 0,015 mm, with a measuring range of 50 mm and a measuring strength of approximately 1,2 N. The scale shall have a minimum interval of 0,01 mm. The feeler should be a flat surface with a diameter of 10 mm.

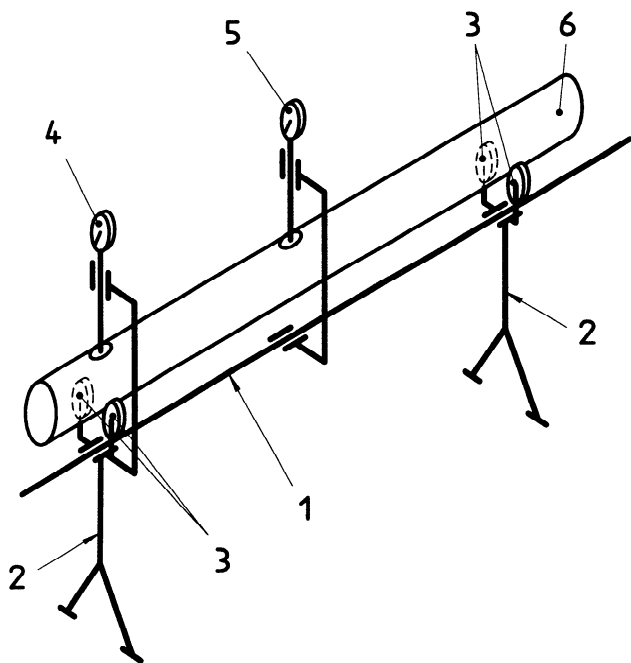
5 Preparation of test pieces

5.1 Sampling

Sampling shall be carried out in accordance with ISO 11093-1.

5.2 Test pieces

For cores less than 3 200 mm long, the complete undamaged core shall be tested.



- 1 Rack
- 2 Supports
- 3 Support rollers
- 4 Measuring feeler
- 5 Measuring feeler, moveable
- 6 Test piece

Figure 1 — Schematic representation of the apparatus

For cores more than 3 200 mm long, a test piece from 1 200 mm to 3 200 mm long shall be cut. If there is an obvious difference in warpage of various positions of the long core, the sample shall be taken from where the warpage is greatest.

5.3 Conditioning of test pieces

The test pieces shall be conditioned in accordance with ISO 11093-2.

6 Measuring procedure

Measuring shall be carried out in a standard atmosphere identical to that used for the conditioning (see 5.3). The measuring feelers shall not produce any measurable deformation of the test piece during measuring.

6.1 Positioning of the support

Adjust the distance between the two support rollers within both pairs so that tangents of support lines of the core form an angle of $120^\circ \pm 5^\circ$. Adjust the distance between the inner faces of the support rollers of both pairs to the core length less $(200 \text{ mm} \pm 10 \text{ mm})$. This is the test length. Position the core centrally on the support rollers.

6.2 Measuring of roundness deviation

Place the measuring feeler in contact with the core vertically above the imagined core axis and in the centre of a support roller pair within an accuracy of $\pm 1 \text{ mm}$. Rotate the core through 360° and record the highest and lowest readings of the measuring feeler gauge to an accuracy of $\pm 0,01 \text{ mm}$. The difference between the two readings is the individual value for the roundness deviation (f_R), expressed in millimetres.

6.3 Measuring of straightness deviation

Place the moveable measuring feeler in contact with the core vertically above the imagined core axis at a point half-way between the two support roller pairs. Rotate the core through 360° and record the highest and lowest readings of the measuring feeler gauge to an accuracy of $\pm 0,01 \text{ mm}$. Record the difference between the two readings. The straightness deviation (f_S), is half of the highest measured difference, determined to an accuracy of $\pm 0,01 \text{ mm}$.

7 Test report

The test report shall include the following particulars:

- a) reference to this part of ISO 11093;
- b) type and designation of the cores tested;
- c) place and date of sampling;
- d) place and date of test;
- e) number of test pieces;
- f) core dimensions;
- g) test length;
- h) mean and standard deviation of the roundness deviation (f_R);
- i) mean and standard deviation of the straightness deviation (f_S);
- j) deviation, if any, from the method specified;
- k) date and signature.

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