
International Standard



5270

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Pulps — Laboratory sheets — Determination of physical properties

Pâtes — Feuilles de laboratoire — Détermination des propriétés physiques

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5270 was developed by Technical Committee ISO/TC 6, *Paper, board and pulps*, and was circulated to the member bodies in February 1978.

It has been approved by the member bodies of the following countries :

Austria	Hungary	Romania
Belgium	India	South Africa, Rep. of
Brazil	Iran	Spain
Chile	Ireland	Sweden
Czechoslovakia	Italy	Switzerland
Egypt, Arab Rep. of	Mexico	Turkey
Finland	Netherlands	United Kingdom
France	Norway	USSR
Germany, F. R.	Poland	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia	New Zealand
Bulgaria	USA
Canada	

Pulps — Laboratory sheets — Determination of physical properties

1 Scope and field of application

This International Standard specifies the methods of test for the determination of the physical properties of laboratory sheets made of pulp. It is intended for laboratory sheets prepared in accordance with ISO 5269/1 and ISO 5269/2 and shall be used in conjunction with the International Standard for the corresponding test methods for paper to which reference is made.

The methods specified in this International Standard deviate, in certain instances, from those specified in the relevant International Standards for paper due to the limited amount of test material available.

NOTE — The preparation and testing of laboratory sheets for the determination of the diffuse blue reflectance factor (ISO brightness) of pulp is specified in ISO 3688, *Pulps — Measurement of diffuse blue reflectance factor (ISO brightness)*.

2 References

ISO 187, *Paper and board — Conditioning of samples*.

ISO 438, *Paper — Determination of bulking thickness and apparent density*.¹⁾

ISO 1924, *Paper and board — Determination of tensile strength*.

ISO 1974, *Paper — Determination of tearing resistance*.

ISO 2758, *Paper — Determination of bursting strength*.

ISO 3687, *Paper and board — Determination of air resistance (Gurley)*.

ISO 5269/1, *Pulps — Preparation of laboratory sheets for physical testing — Part 1: Conventional sheet-former method*.²⁾

ISO 5269/2, *Pulps — Preparation of laboratory sheets for physical testing — Part 2: Rapid-Köthen method*.²⁾

ISO 5626, *Paper — Determination of folding endurance*.

3 Principle

Determination of physical properties of pulp, such as apparent density, tensile index, tear index, burst index, air resistance and folding endurance, using laboratory sheets prepared from suspensions of unbeaten or beaten pulp and in equilibrium with the standard atmosphere for conditioning.

4 Apparatus

The equipment is specified in the respective International Standards referred to.

5 Preparation of specimens

A minimum of four laboratory sheets shall be selected. The sheets shall be free of visible defects and shall be prepared so as to have a grammage (oven-dry basis) of $60,0 \pm 3,0$ g/m² or $75 \pm 2,0$ g/m², as specified in ISO 5269/1 and ISO 5269/2 respectively. The sheets form a set which shall have a total area of not less than 10 dm². For sheets prepared in accordance with ISO 5269/2, it is recommended that a set of 10 faultless sheets be used.

NOTE — Sheet grammage on a conditioned basis would be approximately 65 g/m² for sheets according to ISO 5269/1, and 81 g/m² for ISO 5269/2.

The sheets shall be conditioned and tested in the same standard atmosphere in accordance with ISO 187.

If necessary, the sheets of the set shall be trimmed to specimens of one well-defined size; the area shall be known to an accuracy of 0,5 %.

1) At present at the stage of draft. (Revision of ISO/R 438.)

2) At present at the stage of draft.

6 Procedure

6.1 Grammage

Determine the mass of the specimens by weighing them to an accuracy of 0,2 %. Calculate the grammage g , in grams per square metre, from the formula

$$g = \frac{m}{A \times n}$$

where

m is the mass, in grams, of the conditioned specimens;

A is the area, in square metres, of one specimen;

n is the number of specimens.

Report the result to the first decimal place.

6.2 Apparent density

With the precision micrometer described in ISO 438, measure the thickness of a pile consisting of four specimens with their top sides up. Take measurements at five different places in the pile, taking care that the sheets are not displaced when changing the position of the pile for each measurement. Calculate the mean thickness of a single specimen.

Calculate the apparent density ρ , in grams per cubic centimetre, from the formula

$$\rho = \frac{g}{d}$$

where

g is the grammage, in grams per square metre, of the conditioned specimen, determined in accordance with 6.1;

d is the mean thickness, in micrometres of a single specimen.

Calculate the mean apparent density and report the result to two significant figures.

6.3 Tensile index

Determine the tensile strength by the procedure specified in ISO 1924. Test at least two test pieces from each specimen and a minimum of eight test pieces altogether. The distance between the clamps shall be 100 ± 2 mm (see note 1 to 7.2 in ISO 1924) and failure of the test piece shall be obtained in a mean time of 10 ± 3 s.

Calculate the tensile index X_1 , in newton metres per gram, from the formula

$$X_1 = \frac{F_1}{b \times g}$$

where

F_1 is the scale reading, in newtons;

b is the width, in metres, of the test piece;

g is the grammage, in grams per square metre, of the conditioned test piece, determined in accordance with 6.1.

Calculate the mean tensile index and report the result to the nearest 0,5 N.m/g.

6.4 Tear index

Determine the tearing resistance as described in ISO 1974, using four test pieces at a time taken from at least two specimens. Clamp the test pieces so that their non-glazed sides face the shaft of the pendulum. Make at least two such tests.

Calculate the mean scale reading. Then calculate the tearing resistance, in millinewtons, and the tear index, in millinewton square metres per gram, from the formulae

$$F_2 = \frac{SP}{n}$$

$$X_2 = \frac{F_2}{g}$$

where

F_2 is the mean tear resistance, in millinewtons;

S is the mean scale reading;

P is the pendulum factor, i.e. theoretically the number of sheets torn simultaneously for which the pendulum scale has been calibrated to give a direct tearing resistance reading in millinewtons, commonly 3 (double-tear testers), 8, 16 or 32 (single-tear testers).

n is the number of sheets torn simultaneously;

X_2 is the tear index, expressed in millinewton square metres per gram;

g is the grammage, in grams per square metre, of the conditioned specimens, determined in accordance with 6.1.

Report tear index values less than 10 mN.m²/g to the nearest 0,05 mN.m²/g and values equal to or greater than 10 mN.m²/g to the nearest 0,1 mN.m²/g.

6.5 Burst index

Determine the bursting strength as specified in ISO 2758. Make at least one burst on each side of each of at least four specimens. Test pieces less than 70 mm × 70 mm in area may be used, provided that they are wide enough to be securely clamped.

Calculate the burst index X_3 , in kilopascal square metres per gram, from the formula

$$X_3 = P/g$$

where

P is the mean bursting strength, in kilopascals;

g is the grammage, in grams per square metre, of the conditioned test piece, determined in accordance with 6.1.

Report burst index values less than $10 \text{ kPa}\cdot\text{m}^2/\text{g}$ to the nearest $0,05 \text{ kPa}\cdot\text{m}^2/\text{g}$ and values equal to or greater than $10 \text{ kPa}\cdot\text{m}^2/\text{g}$ to the nearest $0,1 \text{ kPa}\cdot\text{m}^2/\text{g}$.

6.6 Air resistance

Determine the air resistance as specified in ISO 3687. The air pressure shall be applied to the top side of the sheets.

Perform at least four determinations on test pieces from at least two specimens and calculate the mean time, in seconds, for the passage of 100 ml of air.

Report the result to two significant figures.

NOTE — Other methods for the determination of air resistance or air permeance may be adopted at a later stage.

6.7 Folding endurance

By one of the procedures specified in ISO 5626, determine the logarithm (to the base 10) of the number of double folds obtained on each test piece. Test at least five test pieces taken from at least three specimens.

Report the mean of the logarithms to the second decimal place as the folding endurance. State also the type of tester used.

7 Test report

The test report shall include the following particulars :

- a) reference to this International Standard;
- b) all the indications necessary for complete identification of the sample;
- c) if the laboratory sheets have been prepared from laboratory-beaten pulp, reference to the relevant International Standard and the relevant particulars listed in the test report in that standard;
- d) if the sheets have been prepared from unbeaten pulp or pulp beaten otherwise than by a standard method, reference to the relevant International Standard for the method of disintegration and the relevant particulars listed in the test report in that standard;
- e) reference to the International Standard for the preparation of laboratory sheets;
- f) the standard atmosphere for conditioning and testing;
- g) the results and details stated in the relevant paragraphs in clause 6 of this International Standard;
- h) any unusual features observed in the course of the test;
- j) any operations not specified in this International Standard or in the International Standards to which reference is made or regarded as optional, which might have affected the results.

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