INTERNATIONAL STANDARD

ISO 5637

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Paper and board — Determination of water absorption after immersion in water

Papier et carton — Détermination de l'absorption d'eau après immersion dans l'eau

Reference number
ISO 5637 : 1989 (E)

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 approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 5637 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps.*

This second edition cancels and replaces the first edition (ISO 5637 : 1978), clauses 4, 6, 7, 8 and 9 of which have been technically revised.

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Paper and board — Determination of water absorption after immersion in water

1 Scope

This International Standard specifies a method for the determination of the water absorption of paper and board after total immersion in water for a specified time.

The method is applicable to all types of paper and board which have a degree of water resistance. It is not applicable to very absorbent papers such as toilet tissue.

NOTE — The method is analogous to that specified in ISO 769 : 1972, *Fibre building boards — Hard and medium boards — Determination of water absorption and of swelling in thickness after immersion in water.*

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 186 : 1985, *Paper and board — Sampling to determine average quality.*

ISO 187 : 1977, *Paper and board — Conditioning of test samples.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 water absorption: The mass of water absorbed per unit area under the specified conditions of test.

3.2 relative water absorption: The ratio of the mass of water absorbed to the mass of the conditioned test piece.

4 Principle

Weighing the test piece before and after immersion in water and calculating the water absorption, in grams per square metre, or the relative water absorption as the percentage increase in mass.

5 Reagent

Water, freshly distilled or deionized, at 23 °C ± 1 °C. Keep in a closed container until required for use.

6 Apparatus

6.1 Balance, accurate to 0,01 g.

Check the balance frequently by applying accurately measured masses, with both increasing and decreasing loads.

6.2 Tank of water, large enough to hold at least 10 test pieces in a vertical position, and thermostatically controlled without circulation.

Take care to ensure that the tank has been carefully washed with the reagent water (see clause 5) so that it is free from surfactants.

6.3 Support system that prevents a limp test piece from folding over on itself (see 8.3 and 8.4), such as a wire drainage jig with spring clips or similar to hold three corners of the test piece.

6.4 Tared containers of suitable size, such as pre-weighed polyethylene bags.

7 Sampling preparation of test pieces

7.1 Sampling

Select the sample in accordance with ISO 186.

7.2 Preparation of test pieces

Cut at least 10 pieces each of them measuring 200 mm ± 1 mm × 250 mm ± 1 mm, with the longer side in the machine direction. Cut the test pieces one at a time, ensuring that the edges are straight, cleanly cut and undamaged. Cut an extra piece for checking saturation (see 8.2).

NOTE — Any accurately known area, e.g. die-cut test pieces at least 100 mm × 100 mm, may be used, provided that the precision of the balance (6.1) and the calculations (9.1) are adjusted accordingly and provided that it has been established that the adjusted results are equivalent to those for standard size test pieces for the specific type of paper or board. The effect of a change in test piece dimensions may depend on the product when testing products which absorb slowly at the surface and quickly at the edges.

7.3 Conditioning

Condition the test pieces in accordance with ISO 187.

8 Procedure

8.1 Weigh each test piece separately in a tared container (6.4) to an accuracy of ± 0,01 g.

8.2 Select the appropriate immersion time from the following:

- low water resistance: 5 min ± 5 s;
- medium water resistance: 30 min ± 1 min;
- high water resistance: 24 h ± 15 min.

Unless it is known that the immersion time chosen will not cause complete saturation of the test pieces, verify using the extra test piece (see 7.2). After immersion for the selected time and determination of mass (8.4 and 8.5), replace in the water for a further immersion period equal to at least half the initial time.

If the selected immersion time causes the test piece to be completely saturated, use the next shorter immersion time (unless otherwise specified).

NOTE — Saturation of a test piece is achieved when continued immersion results in no further increase in mass.

8.3 Immerse each test piece vertically in clean water (clause 5) in the tank (6.2), suspending the test piece by the clips, so that the machine direction is vertical and the upper edge is at least 20 mm below the surface. Ensure that the test pieces are well separated from each other and from the bottom and sides of the tank.

8.4 After the selected immersion time has expired, remove the test pieces from the water and, suspending them vertically from one corner, allow the water to drain off for 2 min. If necessary, for limp test pieces such as towelling, use the support system (6.3) to prevent the test piece from folding over on itself and entrapping water between the folds. Otherwise, discard test pieces that fold over upon themselves during draining. Return each drained test piece to its tared container (6.4).

8.5 Repeat the mass determination on each test piece.

8.6 From the measurements made, calculate for each test piece the water absorption or the relative water absorption as required, using the appropriate method given in clause 9. Report the mean value and the range of results or standard deviation or coefficient of variation of the property required.

9 Expression of results

9.1 Water absorption

The water absorption, expressed in grams per square metre, is given by the formula

$$(m_2 - m_1) \times \frac{10\,000}{A}$$

where

m_1 is the mass, in grams, of the conditioned test piece before immersion;

m_2 is the mass, in grams, of the test piece immediately after immersion for the specified period;

A is the test piece area, in square centimetres.

Express the result to the nearest 1 g/m^2.

9.2 Relative water absorption

The relative water absorption, expressed as a percentage, is given by the formula

$$(m_2 - m_1) \times \frac{100}{m_1}$$

where m_1 and m_2 are as defined in 9.1.

Express the result to the nearest 1 %.

10 Test report

The test report shall include the following particulars:

a) reference to this International Standard;

b) time of immersion (see 8.3);

c) mean value of the property required;

d) range or standard deviation or coefficient of variation of the property required;

e) number of tests;

f) temperature and relative humidity of test atmosphere;

NOTE — This requirement is included because, at the present time, the water temperature of 23 °C may not be the same as the temperature of the conditioning room.

g) any deviation from the procedure specified in this International Standard, including the use of non-standard size test pieces.

NOTE — If the test pieces delaminate, the test report should be limited to a statement that this has occurred.

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