
International Standard



287

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Paper and board — Determination of moisture content — Oven-drying method

Papier et carton — Détermination de l'humidité — Méthode par séchage à l'étuve

Second edition — 1985-08-15

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[ISO 287:1985](#)

<https://standards.iteh.ai/catalog/standards/sist/43f24430-416f-4ab5-bebb-5de82e4cae87/iso-287-1985>

UDC 676.2 : 543.812

Ref. No. ISO 287-1985 (E)

Descriptors : paper, paperboards, tests, determination of content, water, humidity.

Price based on 4 pages

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.

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

ISO 287 was first published in 1978. This second edition cancels and replaces the first edition, of which it constitutes a minor revision.

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Paper and board — Determination of moisture content — Oven-drying method

1 Scope and field of application

This International Standard specifies an oven-drying method for the determination of the moisture content of paper and board at the time of sampling.

The method is applicable to all paper and board, including corrugated fibreboard and solid fibreboard, provided that the paper or board does not contain any substance, other than water, that will escape at the temperature specified for the test.

2 Reference

ISO 186, *Paper and board — Sampling to determine average quality*.¹⁾

3 Definitions

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

3.1 moisture content: The amount of water in a paper or board. In practice, it is regarded as the ratio of the loss of mass of a test piece when dried according to the standard method of test to its mass at the time of sampling; it is normally expressed as a percentage.

3.2 constant mass: The mass reached by a test piece of paper or board after drying at the specified temperature until the difference between two successive weighings does not exceed 0,1 % of the initial mass of the test piece.

4 Principle

Weighing of the test piece at the time of sampling, and again after drying to constant mass.

5 Apparatus

5.1 Balance, having an accuracy of 0,05 % of the mass to be weighed, or better.

5.2 Test piece containers, for the transport and weighing of test pieces, which shall be water-vapour proof and made in a light-weight construction from a material not subject to change under the conditions of test.

5.3 Oven, capable of maintaining the air temperature at 105 ± 2 °C, and suitably ventilated to maintain uniform temperature in the usable volume whilst extracting the moisture driven off the paper.

6 Preparation of containers

Before sampling, a sufficient number of clean, dry containers shall be numbered and allowed to attain temperature equilibrium with the atmosphere. Each container shall then be weighed and kept closed until the sample is about to be taken.

7 Sampling

The units to be sampled shall be selected in accordance with ISO 186.

NOTE — If the atmosphere at the place of sampling is warm and damp, precautions shall be taken in handling the paper or board to avoid contamination and any gain or loss of moisture. In particular, it is recommended that rubber gloves be worn; to avoid moisture changes due to atmospheric exposure, it is important also to enclose all test pieces in their containers immediately after taking them.

1) At present at the stage of draft. (Revision of ISO 186-1977.)

8 Selection, preparation and weighing of test pieces

For each unit withdrawn from the lot, proceed as specified in 8.1 or 8.2.

8.1 If the unit is a package that can be and may be unwrapped

8.1.1 When the unit is not subdivided (with or without a pallet)

8.1.1.1 Determination of the average value of moisture content in the lot

8.1.1.1.1 For paper or board of grammage less than or equal to 224 g/m²

Avoiding the three outermost sheets and all damaged sheets, take at least four consecutive sheets; quickly fold or cut them and enclose them together in one of the containers. The contents of a container constitute a test piece, which shall have a mass of at least 50 g. Weigh the container with its contents and calculate the mass of the test piece.

Prepare duplicate test pieces for each unit sampled.

NOTES

1 The number of layers discarded may need to be increased according to the efficiency of wrapping and influence of storage conditions.

2 Where, as in the instance of very light-weight papers, the bulk of a 50 g test piece would be very large, a smaller mass may be used but this fact should be stated in the test report.

8.1.1.1.2 For paper or board of grammage greater than 224 g/m²

Avoiding the outermost sheet and all damaged sheets, take one or more sheets to provide sufficient strips, of width 50 to 75 mm and length not less than 150 mm, to give a total mass of at least 50 g. The strips constitute the test piece. Immediately enclose the test piece in one of the containers. Weigh the container with its contents and calculate the mass of the test piece.

Prepare duplicate test pieces for each unit sampled.

8.1.1.2 Determination of the variation in moisture content between the centre and edges of the sheets

Select a layer of sheets in accordance with 8.1.1.1.1 or 8.1.1.1.2 and take sufficient consecutive sheets to give two test pieces each having a mass of at least 50 g and comprising strips cut as shown in the figure. (See the note.)

From the selected layer of sheets, cut four sets of strips of width 50 to 75 mm, one from each edge and two near the centre, taking care not to separate either the sheets or the strips comprising a set. Cut the strips with their longer dimension in the cross-direction.¹⁾ Trim the ends of the strips to remove any paper or board within 150 mm of the edge of the original layer of sheets (see the figure).

Dimensions in millimetres

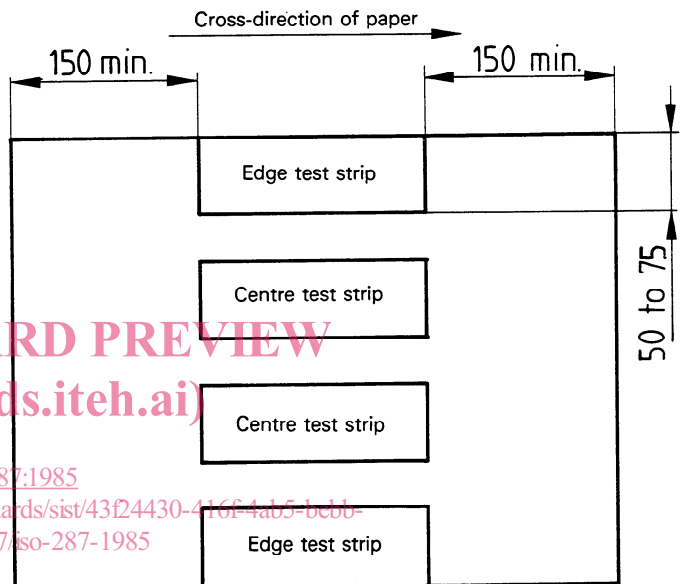


Figure — Positions of edge and centre test strips

Discard the top and bottom strip from each set; combine the two sets representing the centre to form one test piece and the two from the edges to form another. Each test piece shall be of mass at least 50 g. Immediately place each test piece in a container. Weigh each container with its contents and calculate the mass of each test piece.

Prepare duplicate test pieces for each unit and position sampled.

NOTE — Where, as in the instance of very light-weight papers, the bulk of a 50 g test piece would be very large, a smaller mass may be used but this fact should be stated in the test report.

1) This direction of cut is chosen because any moisture variation across the width of the machine remaining in the paper from the paper-making operation will then be equally represented on each strip.

8.1.2 When the unit is composed of elements (reams, parcels etc.) singly or packaged together (with or without pallets)

Select reams or parcels in accordance with ISO 186 and proceed as follows, as appropriate.

8.1.2.1 Determination of the average value of moisture content in the lot

8.1.2.1.1 For paper or board of grammage less than or equal to 224 g/m²

From the centre of each ream or parcel, take at least four consecutive sheets and then proceed as described in 8.1.1.1.1.

Prepare duplicate test pieces for each unit and position sampled.

8.1.2.1.2 For paper or board of grammage greater than 224 g/m²

From the centre of each ream or parcel, take a number of consecutive sheets sufficient to give two test pieces, each having a mass of at least 50 g and prepared in accordance with 8.1.1.1.2.

Prepare duplicate test pieces for each unit and position sampled.

8.1.2.2 Determination of the variation in moisture content between the centre and edges of the sheets

Select a layer of sheets in accordance with 8.1.2.1.1 or 8.1.2.1.2 and proceed as described in 8.1.1.2.

8.1.3 When the unit is a reel

8.1.3.1 Determination of the average value of moisture content in the lot

Remove and discard all damaged layers from the exterior of the reel. Discard also at least three undamaged layers if the grammage is less than or equal to 224 g/m² or at least one undamaged layer if the grammage is greater than 224 g/m². (The number of layers discarded may need to be increased according to the efficiency of wrapping and influence of storage conditions.)

Take, by cutting in the cross-direction, a layer of thickness at least 5 mm and lay it out flat. Take sets of strips, of width 50 to 75 mm in the machine direction, from the selected layer; cut one set of strips from near each reel edge and another set from the region of the mid-point between the edges, or cut a set of strips from the complete width of the reel. Take care not to separate either the sheets comprising the layer or the strips comprising a set.

Discard the top and bottom strip from each set of strips; the remainder together constitutes a test piece and shall have a mass of at least 50 g. Quickly fold or cut the strips comprising the test piece and enclose them together in a container. Weigh the container with its contents and calculate the mass of the test piece. (See the note.)

Prepare duplicate test pieces for each unit and position sampled.

NOTE — Where, as in the instance of very light-weight papers, the bulk of a 50 g test piece would be very large, a smaller mass may be used but this fact should be stated in the test report.

8.1.3.2 Determination of the variation in moisture content across the reel

Proceed as specified in 8.1.3.1, taking test pieces from at least three positions across the reel, but cut test pieces with the 50 to 75 mm dimension in the cross-direction and the larger dimension in the machine direction. Carry out the test procedure on test pieces from each position and report the results separately.

Prepare duplicate test pieces for each unit and position sampled.

8.2 When the unit is a package that cannot or should not be completely unwrapped (for example reels, pallets or possibly reams, in storage or selected by Customs)

8.2.1 Determination of the average value of moisture content in the lot

8.2.1.1 If the machine direction of the paper or board is known

Cut a window of dimension 50 to 75 mm wide and at least 150 mm long with the short dimension being parallel to the machine direction. Cut the sheets to a sufficient depth to enable the requisite number of strips, after discarding the top three strips and any damaged strips, to constitute a test piece of at least 50 g. Immediately place the test piece in a container. Weigh the container and its contents and calculate the mass of the test piece.

Vary the position of the window from unit to unit.

Prepare duplicate test pieces for each unit and position sampled.

Alternatively test pieces 50 to 75 mm wide and the full cross-direction width of the sheet may be used.

NOTE — Where, as in the instance of very light-weight papers, the bulk of a 50 g test piece would be very large, a smaller mass may be used but this fact should be stated in the test report.

8.2.1.2 If the machine direction is not known

Cut windows approximately 100 mm × 100 mm such that one dimension is parallel to the long side of the sheet. Then proceed as in 8.2.1.1.

NOTE — Where, as in the instance of very light-weight papers, the bulk of a 50 g test piece would be very large, a smaller mass may be used but this fact should be stated in the test report.

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8.2.2 Determination of variations in moisture content across the reel or between the centre and the edges of the sheets

Proceed as specified in 8.2.1.1 taking test pieces 50 to 75 mm wide and at least 150 mm long but with the long dimension parallel to the machine direction. Take at least three test pieces across the reel or sheet. Carry out the test procedure on test pieces from each position and report the results separately.

Carry out duplicate tests on each unit and position sampled.

9 Procedure

9.1 Dry the test piece in the oven (5.3), either in its container (5.2) with the lid removed, or after being removed from the container and spread out, maintaining the air temperature at 105 ± 2 °C. Ensure that, if the test piece comprises more than one strip, the strips are separated to permit full air circulation during drying. If the test piece is removed from its container, also dry the container, preferably in the same oven.

NOTE — Ensure that, while the test pieces are being dried, other test pieces are not introduced into the oven.

9.2 When the test piece is considered to be completely dry, enclose it quickly in the container and allow the container to cool in a desiccator. This may require an appreciable time with certain types of container. Equalize the air pressures inside and outside the container by momentarily opening and reclosing the container. Re-weigh the container and contents and calculate the mass of the dried test piece. Replace the test piece and container in the oven and allow a further period of drying, equal to at least one-half of the initial drying period. Re-weigh the test piece in its container. Repeat this process of further drying and re-weighing as necessary until constant mass is reached, the drying period between consecutive weighings being in all instances not less than one-half of the total drying time previously received. Consider the test piece to have reached constant mass when two consecutive weighings at the required time interval do not differ by more than 0,1 % of the original mass of the test piece. The initial drying period shall be not less than 30 min for material of grammage less than or equal to 224 g/m² and not less than 60 min for grammages greater than 224 g/m².

10 Expression of results

10.1 Calculation

Express the result, based upon the mass of the test piece as sampled, as a percentage, rounded to the nearest 0,1 %.

10.2 Precision

The precision of the method will be affected by

- variations in moisture content throughout the lot
- the number of test values averaged
- handling and atmospheric exposure.

No values can at present be given for the precision of the method.

11 Test report

The test report shall include the following information :

11.1 When an average value of moisture content in the lot is required

- | | | |
|---|---|------------------------|
| <ul style="list-style-type: none"> a) mean value b) maximum and minimum values c) standard deviation d) number of tests | } | for the total selected |
|---|---|------------------------|

11.2 When information on variations in moisture content across the sheet or reel is required

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> a) mean value b) maximum and minimum values c) standard deviation d) number of tests e) sampling positions | } | for each of the selections made according to the scheme in 8.1 or 8.2, as appropriate |
|--|---|---|

Where alternative procedures are given, state which has been adopted, and give particulars of any circumstance or influence thought to have affected the results.

It is recommended that 95 % confidence limits of the mean be given.

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