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Tissue paper and tissue products —

Part 8: Water-absorption time and water-absorption capacity, basket-immersion test method

Papier tissue et produits tissues —

Partie 8: Temps d'absorption d'eau et capacité d'absorption d'eau, méthode d'essai d'immersion au panier

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

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 12625-8 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 172, *Pulp, paper and board,* in collaboration with Technical Committee ISO/TC 6, *Paper, board and pulps,* Subcommittee 2, *Test methods and quality specifications for paper and board,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition cancels and replaces ENV 12625-8:2001, which has been technically revised.

With regard to ENV 12625-8:2001, the following changes have been made:

a) the description of the preparation and conditioning of the test pieces was formulated more precisely;

b) the instruction for the manual test method procedure, as well as for the automated test method procedure, were described more precisely;

c) figures for the precision of both test methods were added;

d) editorial updating;

e) change of the status from ENV to ISO.

ISO 12625 consists of the following parts, under the general title *Tissue paper and tissue products*:

— *Part 1: General guidance on terms*

— *Part 3: Determination of thickness, bulking thickness and apparent bulk density*

— *Part 4: Determination of tensile strength, stretch at break and tensile energy absorption*

— *Part 5: Determination of wet tensile strength*

— *Part 6: Determination of grammage*

— *Part 7: Determination of optical properties*

— *Part 8: Water-absorption time and water-absorption capacity, basket-immersion test method*

— *Part 9: Determination of ball burst strength*

Introduction

This part of ISO 12625 describes one principle for determination of water-absorption properties of tissue paper and tissue products, a principle in which sheets of the sample are inserted in a cylindrical basket, which is immersed in water. The results are expressed as:

— water-absorption time;

— water-absorption capacity.

In European and International trade, both water-absorption time and water-absorption capacity represent important parameters required in the field of comparison of tissue products.

Tissue paper and tissue products —

Part 8:
Water-absorption time and water-absorption capacity, basket-immersion test method

1 Scope

This part of ISO 12625 specifies basket-immersion test methods (one manual and one automated) for the determination of water-absorption time and water-absorption capacity of absorbent tissue paper and tissue products.

It is expressly stated that the detection of impurities and contraries in tissue paper and tissue products should be applied according to ISO 15755.

For the determination of moisture content in tissue paper and tissue products, ISO 287 should be applied.

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 186, *Paper and board — Sampling to determine average quality*

ISO 187, *Paper, board and pulps — Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples*

ISO 14487, *Pulps — Standard water for physical testing*

3 Terms and definitions

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

3.1
water-absorption time
time required for complete wetting of a test piece after the start of water immersion

3.2
water-absorption capacity
mass of water that is absorbed per unit mass of the test piece under specified conditions

4 Principle

A test piece of the tissue paper or the tissue product is placed in a cylindrical basket and allowed to immerse in water under its own weight.

The time required for complete wetting of the test piece is measured, the mass of water absorbed then being determined after a stated immersion time followed by a given draining time, under specified conditions.

5 Reagent

5.1 De-ionized water, with a conductivity of 0,25 mS/m in accordance with ISO 14487, and a temperature of (23 ± 1)° C in accordance with ISO 187.

To avoid interference due to contamination of the water from previous test pieces, change the water after each series.

6 Preparation and conditioning of the test pieces

6.1 Sampling

The sample shall be selected in accordance with ISO 186. When sampling finished roll products, eliminate at least the first six layers and the last six layers because of the possible presence of adhesive or mechanical damage.

6.2 Preparation of test pieces

From the sample, prepare five test pieces by cutting test pieces of (76 ± 1) mm width, with the length in the machine direction sufficient for the mass of each test piece to be (5,0 ± 0,2) g.

When preparing test pieces comprising a number of superimposed sheets, all individual sheets shall have the same face up.

If several sheets are cut at once, separate them before testing.

Record the mass of each test piece (m_0) to the nearest milligram.

Other specific test piece sizes could be agreed between the parties concerned and shall be reported in the test report.

6.3 Conditioning

Condition the test pieces in accordance with ISO 187.

7 Manual test method

7.1 Apparatus

7.1.1 Water container, large enough for the basket to be fully submerged when lying on its side (total volume: 3 l).

The container shall be filled with de-ionized water (5.1) at (23 ± 1) °C to a depth of 100 mm.

7.1.2 Immersion and draining equipment, having a support, which is adjusted in a way that the hanging cylindrical basket forms a 30° angle with the horizontal (see Figure 1).

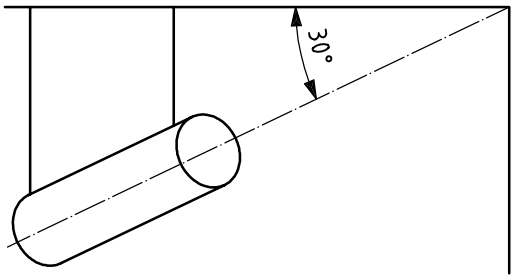

Figure 1 — Principle of drainage position

7.1.3 Timer, accurate to within 1/100 s.

7.1.4 Balance, with an accuracy of 0,001 g.

7.1.5 Cylindrical basket, made of gauge wire, having the dimensions (height and diameter) shown in Figure 2, constructed of any non-corroding steel gauge wire with a diameter of 0,5 mm to yield a total mass of the cylindrical basket of (3 ± 0,1) g, having a material density of 8,0 g/cm^3 to 8,1 g/cm^3.

Dimensions in millimetres

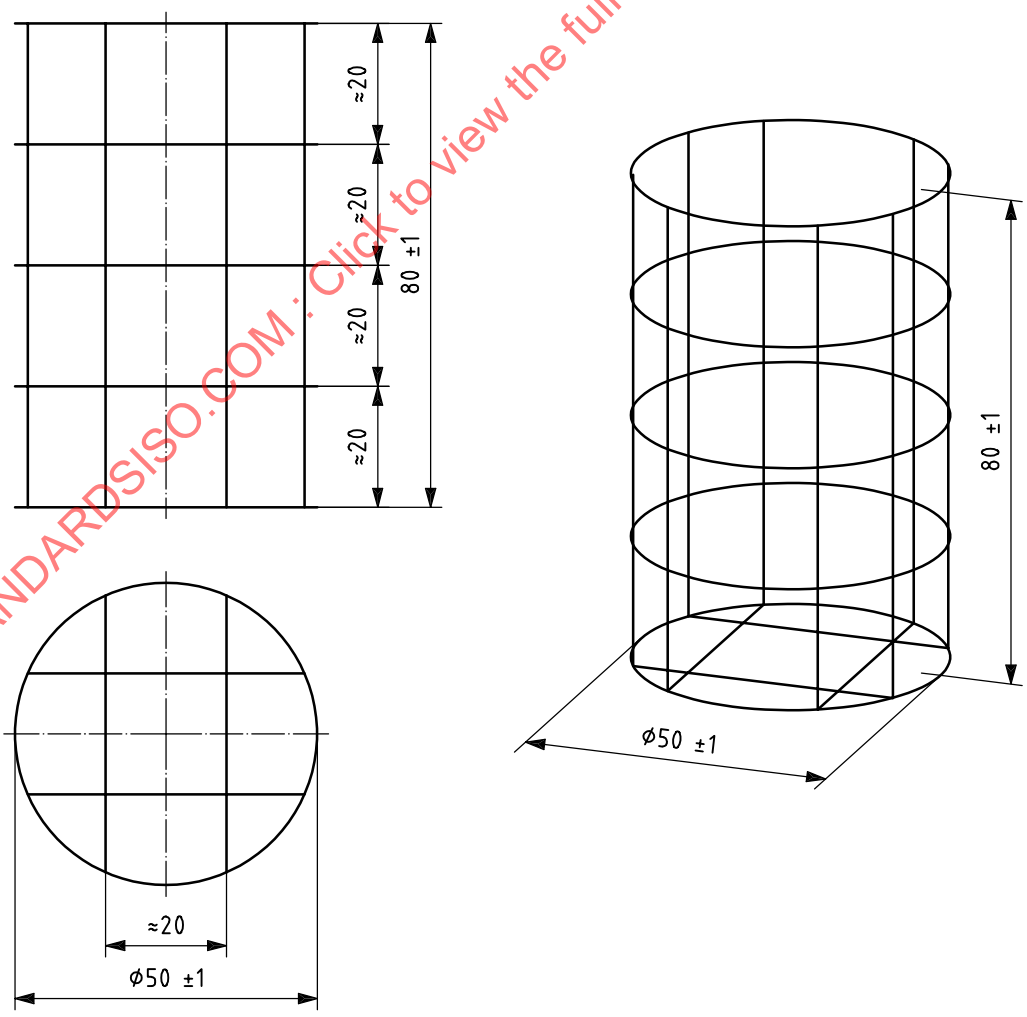

Figure 2 — Schematic drawing of the cylindrical basket

7.2 Procedure, manual test method

Record the mass of the cylindrical basket (m_b) to the nearest milligram.

Place the weighed test piece in the cylindrical basket (7.1.5). Roll the test piece so that it matches the curvature of the cylindrical basket. Do not fold it. Then place the test piece in the cylindrical basket, so that it is loosely packed with its 76 mm edge parallel to the side of the basket.

Release the cylindrical basket, on its side, from a height of (25 ± 5) mm above the water surface into the water container (7.1.1) and simultaneously start the timer (7.1.3).

Observe the wetting of the test piece and stop the timer as soon as the test piece is completely wetted.

Record the time required for complete wetting of the test piece.

Allow the cylindrical basket and test piece to remain submerged in the water for (30 ± 1) s.

Remove the cylindrical basket by keeping it in a horizontal position, and then hang it on the support (see 7.1.2) to form an 30° angle with the horizontal.

Allow the basket to drain for (60 ± 1) s.

Immediately weigh the basket with its contents. Record the mass (m_n) to the nearest milligram.

Repeat the procedure with each of the remaining four test pieces, but be sure that the specifications required in 7.1.1 are respected.

Change the water after each series of five tests.

8 Automated test method

8.1 General

By using an apparatus which records the time electronically, the test can be performed in a more practical way, while giving comparable results.

8.2 Apparatus

Any suitable apparatus that supports the drainage, as shown in Figure 1.

8.2.1 **Water container**, as described in 7.1.1.

8.2.2 **Draining equipment**, as described in 7.1.2.

8.2.3 **Timer**, as described in 7.1.3.

8.2.4 **Balance**, as described in 7.1.4.

8.2.5 **Cylindrical basket**, as specified in 7.1.5.

8.3 Procedure, automated test method

Record the mass of the cylindrical basket (m_b) to the nearest milligram.

Place the weighed test piece in the cylindrical basket (7.1.5). Roll the test piece so that it matches the curvature of the cylindrical basket. Do not fold it. Then place the test piece in the basket so that it is loosely packed with its 76 mm edge parallel to the side of the basket.

Follow the apparatus instructions; start the test and follow the instructions of the supplier of the apparatus.

Record the time required for complete wetting of the test piece.

Allow the cylindrical basket and test piece to remain submerged in the water for (30 ± 1) s.

Remove the cylindrical basket, keeping it in a horizontal position and hang it on the support (see 7.1.2) to form an 30° angle with the horizontal.

Allow the basket drain for (60 ± 1) s.

Immediately weigh the cylindrical basket with its contents. Record the mass (m_n) to the nearest milligram.

Repeat the procedure with each of the remaining four test pieces.

Change the water after each series of five tests.

9 Calculation and expression of results

Calculate the mean water-absorption time, and the standard deviation of the five replicate tests, in seconds. Report the water-absorption time, in seconds, to the nearest 0,1 s.

Calculate the water-absorption capacity (W_a), in grams per gram of each test piece, from formula (1):

$$W_a = \frac{m_n - m_o - m_b}{m_o} \quad (1)$$

where

W_a is the water-absorption capacity, in grams per gram of each test piece;

m_n is the mass of the cylindrical basket and its contents after submersion and draining, in grams with 3 decimals;

m_o is the dry mass of each test piece, in grams with 3 decimals;

m_b is the mass of the cylindrical basket, in grams with 3 decimals.

Calculate the mean water-absorption capacity as the average of the five replicate tests, in grams of water per gram of the test piece, and the standard deviation and report the result to the nearest decimal.

10 Test report

The test report shall include the following information:

a) a reference to this part of ISO 12625;

b) the date and place of testing;

c) all details necessary for the identification of the sample;

d) dimensions of the test pieces (if appropriate);

e) test procedure used (manual or automated);

f) mean water-absorption time and standard deviation;

g) mean water-absorption capacity and standard deviation;

h) any deviation from this part of ISO 12625 that may have affected the result.

11 Precision

11.1 General

From an interlaboratory study, 12 laboratories tested 10 tissue samples, according to this part of ISO 12625. Reported data have been obtained with the manual method. Results are shown in Tables 1 and 2.

11.2 Reproducibility

The reproducibility is the variation between individual results, independently obtained by two operators, working in different laboratories, on the same material.

Table 1 — Results of an interlaboratory test

Sample	Mean water-absorption time s	Standard deviation between laboratories s	Reproducibility coefficient of variation %	Reproducibility limit [a] R s
A	3,2	0,2	6,3	0,6
B	25,6	3,5	13,7	9,7
C	2,6	0,2	7,7	0,6
D	7,9	0,4	5,1	1,1
E	3,8	0,3	7,9	0,8
F	4,7	0,5	10,6	1,4
Ga	10,1	1,2	11,9	3,3
Gb	6,8	0,7	10,3	1,9
H	4,8	0,6	12,5	1,7
I	3,8	0,3	7,9	0,8

[a] Agreement expected with 95 % probability, $R = 1{,}96\sqrt{2} \times s$.