

Hljgi Y'dUd]f`]b'dfc]nj cX]`n'h]ggi Y'dUd]f`U!` ("XY.`8 c`c Yj Ub`Y'bUHyNbY'lfXbcgh]`]b
UVgcf dW]g_Y'bUHyNbY'YbYf[]Y

Tissue paper and tissue products - Part 4: Determination of tensile strength, stretch at break and tensile energy absorption

Tissue-Papier und Tissue-Produkte - Teil 4: Bestimmung der breitenbezogenen Bruchkraft, der Bruchdehnung und des Arbeitsaufnahmevermögens

Papier tissue et produits tissues - Partie 4: Détermination de la résistance a la rupture par traction, de l'allongement a la rupture par traction et du travail absorbé a la rupture par traction

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Ta slovenski standard je istoveten z: EN 12625-4:1999

ICS:

85.080.20 Tissue papir

Tissue paper

SIST EN 12625-4:2000

en

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EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 12625-4

January 1999

ICS 85.080

Descriptors: home sanitary articles, paper, paper products, tests, tensile tests, tensile strength, elongation at break, break strength, tensile testing machines, sampling, procedure

English version

Tissue paper and tissue products - Part 4: Determination of
tensile strength, stretch at break and tensile energy absorption

Papier tissue et produits tissues - Partie 4: Détermination
de la résistance à la rupture par traction, de l'allongement à
la rupture par traction et du travail absorbé à la rupture par
traction

Tissue-Papier und Tissue-Produkte - Teil 4: Bestimmung
der breitenbezogenen Bruchkraft, der Bruchdehnung und
des Arbeitsaufnahmevermögens

This European Standard was approved by CEN on 2 December 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 172 "Pulp, paper and board", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 1999, and conflicting national standards shall be withdrawn at the latest by July 1999.

EN 12625 contains the following parts:

- Part 2: Procedures for sampling and conditioning (currently available as ENV)
- 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

The following Standards of this series are in preparation:

- Part 1: General guidance on terms
- Part ...: Water absorption rate and water absorption capacity (basket method)
- Part ...: Optical properties (whiteness, opacity, colour)

In addition, it is expressly stated, that the detection of impurities and contraries in tissue paper and tissue products should be applied according to the following European Standard:

- prEN ISO 15755 "Paper and board - Estimation of contraries (ISO/FDIS 15755:1998)"

For the determination of moisture content in tissue paper and tissue products, EN 20287 should be applied.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This part of EN 12625 specifies a test method for the determination of the tensile strength, stretch at break and tensile energy absorption of tissue paper and tissue products using a tensile testing apparatus operating with a constant rate of elongation.

This European Standard also specifies the method of calculating the tensile index and the tensile energy absorption index.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ENV 12625-2

Tissue paper and tissue products – Part 2: Procedures for sampling and conditioning

EN 12625-6

Tissue paper and tissue products – Part 6: Determination of grammage

EN ISO 536

Paper and board – Determination of grammage (ISO 536 : 1995)

EN ISO 1924-2

Paper and board – Determination of tensile properties – Part 2: Constant rate of elongation method (ISO 1924-2 : 1994)

3 Definitions

For the purposes of this Standard, the following definitions apply:

3.1 tensile strength: maximum tensile force supported by the unit width of a test piece of tissue paper or a tissue product until the onset of rupture in a tensile test.

3.2 tensile index: tensile strength (expressed in kilonewtons per metre) divided by grammage (according to 3.2 of EN ISO 1924-2).

3.3 stretch at break: ratio of the increase in length (elongation) of a test piece at the moment when maximum tensile force is reached during a tensile test, to its length before the test.

3.4 tensile energy absorption: amount of energy per unit area of a test piece of tissue paper or a tissue product absorbed during straining until the onset of rupture (the moment of maximum tensile force) in a tensile test.

3.5 tensile energy absorption index: tensile energy absorption divided by grammage (according to 3.5 of EN ISO 1924-2).

4 Principle

A test piece of tissue paper or a tissue product supplied as a finished article of given dimensions is stretched (elongated) to rupture at a constant rate of elongation using a tensile testing apparatus that measures and records the tensile force as a function of the elongation of the test piece.

From the recorded data the tensile strength and the corresponding stretch (elongation) at break and the tensile energy absorption are calculated.

5 Apparatus

5.1 Tensile testing apparatus

Tensile testing apparatus according to EN ISO 1924-2 designed to stretch (elongate) a test piece of tissue paper or tissue product of given dimensions at a constant rate of elongation of $(50,0 \pm 2)$ mm/min and to record the tensile force as a function of elongation on a strip chart recorder or any equivalent device.

5.1.1 Means of measuring and indicating the tensile force and the elongation / accuracy

The tensile testing apparatus shall have a means for recording the elongation to an accuracy of 0,1 mm and the force to an accuracy of $\pm 1,0$ % of the true force. The measurement of the elongation should start at a tension of (5 ± 1) N/m.

5.1.2 Clamps

The tensile testing apparatus shall have two clamps for holding a test piece of 50 mm width. Each clamp shall be designed to grip the test piece firmly but without damage along a straight line across the full width of the test piece (the clamping line) and shall have means for adjusting the clamping force.

NOTE: The clamps should preferably grip the test piece between a cylindrical and a flat surface, with the plane of the test piece tangential to the cylindrical surface. Other types of clamps may be used if they provide that the test piece does not slip nor suffer any damage during the test.

During the test the clamping lines shall be parallel to each other. They shall also be perpendicular to the direction of the applied tensile force and to the long dimension of the test piece.

The distance between the clamping lines (the test span length) shall be adjustable to ± 1 mm.

5.2 Planimeter

Planimeter or other means of measuring the area between the force-elongation curve and the elongation axis, or an integrator for directly computing the work to rupture, to an accuracy of ± 2 % of the true value.

5.3 Cutting device

The cutting device shall meet the requirements in accordance with EN ISO 536 and shall produce test pieces $(50,0 \pm 0,5)$ mm wide, undamaged, straight, smooth and with parallel edges.

6 Sampling

If the test is to be done on a batch of tissue paper or tissue products, sample the batch in accordance with ENV 12625-2.

7 Preparation of test pieces (standards.iteh.ai)

7.0 General

Test pieces shall be selected in accordance with ENV 12625-2.

Condition the specimens in accordance with ENV 12625-2 and keep them in the conditioning atmosphere throughout the test.

7.1 Dimensions

Each test piece shall measure $(50 \pm 0,5)$ mm in width and at least 150 mm in length, avoiding perforations and faults. It shall be of a length sufficient to clamp it in the tensile testing apparatus with a test span length of (100 ± 1) mm.

NOTE: A test span length of (50 ± 1) mm can be chosen to allow ready-to-use articles to be tested. This deviation from the normal procedure is to be recorded in the test report. With a test span length of 50 mm vs 100 mm the elongation will deviate to slightly higher values!

With the exception of tissue paper or tissue products having an embossed pattern all over or partly over their surface, the test pieces shall be free of creases, kinks, wrinkles, folds or other thickness variations.

7.2 Number of test pieces

Test at least one test piece per test sheet or specimen. The test sheet shall include the number of single plies typically required for its intended use. Test pieces shall be cut from every ten test sheets or specimens in machine and cross direction. Should, in isolated cases, the requisite number of ten test sheets or specimens be unavailable, test at least ten test pieces in each direction in the minimum of one specimen available.

8 Procedure

Ensure that the tensile testing apparatus is calibrated and check the zero position of the recording device. Place the single- or multi-ply test piece in the clamps so that any observable slack is eliminated but the test piece is not placed under any significant strain.

Do not touch the test area of the test piece between the clamps with the fingers. Align and tightly clamp the test piece and make the test.

Test at least 20 test pieces from each sample: ten in the machine direction and ten in the cross direction.

The relative elongation rate between the clamps shall be kept at a constant (50 ± 2) mm/min.

Record all readings, except for test pieces that break within 5 mm away from the clamping line. The latter case shall be subject to the following provision:

If more than 20% of the test piece cut from a particular specimen break within 5 mm away from the clamping line, reject all the readings obtained for that specimen, inspect the apparatus for conformity with the specifications and take the appropriate remedial measures.

9 Calculation

Calculate and report the results separately for the machine direction and for the cross direction.

9.1 Tensile strength

Calculate the mean breaking force (maximum tensile force) in newton of all single values available representing acceptable test results. Calculate the tensile strength (mean) from the equation (1):

$$S = \frac{F}{w_i} \cdot 10^3 \quad (1)$$

where

- S is the tensile strength (mean), expressed in newtons per metre (S is the single value of the tensile strength);
- F is the maximum tensile force (mean) in newtons ("breaking force"), (F is the single value of the maximum tensile force);
- w_i is the initial width, in millimetres, of the test piece (standard 50 mm).

Express the tensile strength of the test piece in the dry conditioned state in newtons per metre to three significant figures.

9.2 Tensile index

Calculate the tensile index from the equation (2):

$$I = \frac{S}{g} \cdot 10^3 \quad (2)$$

where

- I is the tensile index, expressed in newtons metres per gram;
- S is the tensile strength (mean), expressed in newtons per metre;
- g is the mean grammage, expressed in grams per square metre, determined in accordance with EN 12625-6.

Express the tensile index in newton metres per gram to three significant figures.

9.3 Stretch at break

Calculate the mean elongation at break which is corresponding to the stretch of the test piece at break. Express the stretch as the elongation at break ϵ as a percentage of the original test span length and report the result to the first decimal place.

9.4 Tensile energy absorption

Determine the area under the force-elongation curve up to the point of maximum tensile force and calculate the tensile energy absorption Z from the equation (3):

$$Z = \frac{E}{w_i \cdot l_i} \quad (3)$$

Calculate the mean value of the tensile energy absorption Z from the equation (4):