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Tissue paper and tissue products —

Part 4: Determination of tensile strength, stretch at maximum force and tensile energy absorption

Papier tissue et produits tissue —

Partie 4: Détermination de la résistance à la rupture par traction, de l'allongement à la force maximale et de l'énergie absorbée à la rupture par traction

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 12625-4:2016), which has been technically revised.

The main changes are as follows:

— inclusion of Annex B, which describes a method of determining the tensile modulus.

A list of all parts in the ISO 12625 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user’s national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Tissue paper and tissue products —

Part 4:
Determination of tensile strength, stretch at maximum force and tensile energy absorption

1 Scope

This document specifies a test method for the determination of the tensile strength, stretch at maximum force and tensile energy absorption of tissue paper and tissue products. It uses a tensile-testing apparatus operating with a constant rate of elongation.

It also specifies the method of calculating the tensile index and the tensile energy absorption index.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1924-2, *Paper and board — Determination of tensile properties — Part 2: Constant rate of elongation method (20 mm/min)*

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 12625-1, *Tissue paper and tissue products — Part 1: Vocabulary*

ISO 12625-6, *Tissue paper and tissue products — Part 6: Determination of grammage*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12625-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
tensile strength
maximum tensile force per unit width that a test piece will withstand before breaking

3.2
tensile index
I
tensile strength (3.1) divided by grammage

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3.3
stretch at maximum force
ratio of the elongation of a test piece, over its initial length, at the moment when the maximum tensile force is reached during a tensile test

Note 1 to entry: Stretch at maximum force is expressed as a percentage of the initial test span length.

Note 2 to entry: This procedure uses slack correction and does not start to measure elongation until a force of (0,25 ± 0,05) N.

3.4
tensile energy absorption
TEA
amount of energy absorbed per unit surface area of a test piece while being stretched under application of tensile force, until the onset of break (the moment of maximum tensile force)

[SOURCE: ISO 12625-1:2019, 3.53.1.3]

3.5
tensile energy absorption index
I_Z
tensile energy absorption (3.4) divided by grammage

[SOURCE: ISO 1924-2:2008, 3.7]

3.6
tensile modulus
M
slope between the two force points from a tensile force-elongation curve obtained from a constant rate of elongation apparatus

Note 1 to entry: In the paper industry, "modulus" refers to the tensile stiffness of paper with units of force per unit width (as opposed to true "stress" in engineering terms, which is force per unit area).

Note 2 to entry: This procedure is optional, but if tensile modulus is desired as a measurement from this method, it shall be measured and calculated according to the procedure in Annex B.

4 Principle

A test piece of tissue paper or tissue product, of given dimensions, is stretched to break 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, the corresponding stretch at maximum force and the tensile energy absorption can be calculated.

The test can be carried out by a vertical or a horizontal tensile strength tester.

Precision data are available in Annex A.

5 Apparatus

5.1 Tensile-testing apparatus

5.1.1 General

The tensile-testing apparatus shall be in accordance with ISO 1924-2. It shall be capable of stretching a test piece of tissue paper or tissue product of given dimensions, at a constant rate of elongation of 50 % of the initial test span length per minute (%/min), i.e. 50 mm/min for a 100 mm test span length and

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