

ICS 85.010



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 24328.3-2020

Replacing GB/T 24328.3-2009

**Tissue paper and tissue products - Part 3: Determination of
tensile strength, stretch at maximum force and tensile energy
absorption**

卫生纸及其制品 第3部分: 抗张强度、最大力值时伸长率和抗张能量吸收的测定
(English Translation)

Issued on: July 21, 2020

Implemented on: February 1, 2021

Issued by: SAMR; SAC

Table of Contents

Foreword	3
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 Principle	7
5 Apparatus	8
6 Conditioning	9
7 Preparation of test pieces	9
8 Test procedure	10
9 Calculation	10
10 Test report	13
Annex A (Informative) Precision	14
Bibliography	16

1 Scope

This Part of GB/T 24328 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.

This Part applies to tissue paper and tissue products.

2 Normative references

The following documents are indispensable for the application of this document.

For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

GB/T 450 Paper and board - Sampling for testing and identification of machine and cross direction, wire side and felt side (GB/T 450-2008, ISO 186:2002, MOD)

GB/T 10739 Paper, board and pulps - Standard atmosphere for conditioning and testing (GB/T 10739-2002, eqv ISO 187:1990)

GB/T 12914 Paper and board - Determination of tensile properties - Constant rate of elongation method (20 mm/min) (GB/T 12914-2018, ISO 1924-2:2008, MOD)

GB/T 24328.1 Tissue paper and tissue products - Part 1: General guidance on terms (GB/T 24328.1-2020, ISO 12625-1:2019, MOD)

GB/T 24328.5 Tissue paper and tissue products - Part 5: Determination of grammage (GB/T 24328.5-2009, ISO 12625-6:2005, MOD) 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.

5.1.1 General

The tensile-testing apparatus shall be in accordance with GB/T 12914. It is capable of stretching a test piece of tissue paper or tissue product of given dimensions, at a constant rate of elongation of (50 ± 2) mm/min, and recording the tensile force as a function of elongation on a strip chart recorder or any electronic device.

The elongation shall be recorded to an accuracy of ± 0.1 mm. The measurement of the elongation shall start at a tension of (1.0 ± 0.5) N/m.

The force-measuring system shall measure loads with an accuracy of ± 1 % of the reading or ± 0.05 N, whichever is greater, and shall be calibrated and verified regularly.

5.1.2 Means for measuring the area of the force-elongation curve

The tensile-testing apparatus shall provide a means for measuring the area between the force-elongation curve and the elongation axis to an accuracy of ± 2 % of the true value as determined by numerical integration of the raw data.

Note: Most modern tensile testers are equipped with an electronic or electro-mechanical integrator. The area can also be determined from a graphical output of the data on chart paper using a planimeter.

5.1.3 Clamps

The tensile-testing apparatus shall have two clamps of 15 mm or 50 mm in width. Each clamp shall be designed to grip the test piece firmly along a straight line across the full width of the test piece, without causing any damage or slippage, and shall have means for adjusting the clamping force.

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. be free of creases,

kinks, wrinkles, folds or other thickness variations.

For finished products with dimensions or perforations which make cutting of a test piece of 150 mm impossible, cut the longest piece possible. In such cases, a test span length of (50 ± 1) mm shall be used. This deviation from the normal procedure shall be recorded in the test report.

7.3 Number of test pieces

Cut 10 test pieces from one sample and 10 test pieces in the cross direction for the selected specimens, making a total of at least 20 test pieces from each sample.

8 Test procedure

8.1

Ensure that the tensile-testing apparatus (5.1) is calibrated and check the zero position of the recording device. Check that the clamps are aligned to meet the requirements in 5.1.3.

8.2

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

8.3

Place the test piece in the clamps so that any observable slack is eliminated but the test piece is not placed under any significant strain. The test piece shall not be clamped with a tension greater than 5 N/m.

8.4

Do not touch the test area of the test piece between the clamps with the fingers. Align the test piece as parallel as possible to the pulling direction, tightly clamp the test piece and initiate the test.

8.5

Record all readings, except for test pieces that break within 5 mm from the clamping line, until 10 valid results are available for each direction. If more than 20 % of the test pieces break within 5 mm of the clamping line, reject all the readings. Inspect the apparatus for conformity with the specifications and take the appropriate remedial measures.

8.6

If it is necessary to report the tensile index of the test piece, the grammage of the test piece shall be determined according to GB/T 24328.5.

9.1 General

Calculate and report the results separately for the machine direction and for the cross direction from Formula (1) to Formula (6).

Where: A - the mean stretch at maximum force in %;

epsilon - the mean elongation at maximum force in millimetres (mm); l - the length of the test piece between the clamps, before elongation, in millimetres (mm). Report the result to the first decimal place.

9.5 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 from Formula (4): and the mean tensile energy absorption,, from Formula (5):

Where:

Z - the tensile energy absorption by a test piece during the test until maximum force, in joules per square metre (J/m²);

- the mean tensile energy absorption in joules per square metre (J/m²);

E - the work, in millijoules (mJ), equivalent to the area under the force/elongation curve; w - the initial width, in millimetres (mm), of the test piece (standard width is 15 mm or 50 mm); l

- the initial test length, in millimetres (mm), of the test piece (standard 100 mm); n - the number of single values of the tensile energy absorption.

Report the mean tensile energy absorption to the first decimal place.

9.6 Tensile energy absorption index

Calculate the tensile energy absorption index, IZ, using Formula (6):

A.1 General

A.1.1 The qualified laboratories of the Comparative Testing Service of the Confederation of European Paper Industries (CEPI-CTS) conducted a comparative test on 2 tissue paper products. The data for tensile strength are presented in A.2. The data for stretch at maximum force are presented in A.3.

A.1.2 The repeatability and reproducibility results from the test are reported in Table A.1 to Table A.4.

A.1.3 Precision data for tensile energy absorption is not available at the moment.

A.1.4 The calculations were made according to ISO/TR 24498 and TAPPI T 1200 sp-07.