INTERNATIONAL STANDARD

ISO 12625-9

First edition
2005-05-01

Tissue paper and tissue products

Part 9: Determination of ball burst strength

Papier tissu et produits en tissu

Partie 9: Détermination de la résistance à l'éclatement, méthode à la balle

Reference number
ISO 12625-9:2005(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 12625-9 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 SC 2, *Test methods and quality specifications for paper and board*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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

— *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 is applicable to tissue paper and tissue products. In principle, application to other paper types is possible, but not covered by this part of ISO 12625.

Tissue paper and tissue products

Part 9:
Determination of ball burst strength

1 Scope

This part of ISO 12625 specifies a test method for the determination of the resistance to mechanical penetration (ball burst strength procedure) of 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 7500-1, *Metallic materials — Verification of static unaxial testing machines — Part 1: Tension/compression testing machines —Verification and calibration of the force-measuring system*

ISO 12625-1, *Tissue paper and tissue products — Part 1: General guidance on terms*

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.

3.1
grammage
g
mass of a unit area of tissue paper or tissue product as determined by the procedure specified in ISO 12625-6

NOTE The grammage is expressed in grams per square metre (g/m^2).

3.2
bursting force
F
maximum force, that a test piece of a tissue paper or tissue products can withstand under the test conditions, applied at right angles to its surface

NOTE The bursting force is expressed in millinewtons (mN).

3.3
burst index
X
bursting force of the tissue paper or tissue product divided by the grammage of the conditioned sample determined by the standard method of test

NOTE The burst index is expressed in millinewtons square metre per gram ($mN \cdot m^2/g$).

4 Principle

The test consists of measuring the resistance to a mechanical penetration (burst) of the test piece under test, when it is rigidly clamped at the periphery between two concentric annular rings, and is forced to a bulge in a direction perpendicular to the plane wherein the test piece is fixed and centred by a ball of a hard non-deformable, highly polished material, that is fixed in a suitable mechanism for moving at constant speed.

5 Apparatus

5.1 Clamping system

The clamping system is designed to clamp the test piece firmly and uniformly between two concentric annular plane, parallel surfaces. The clamping rings can be activated by, for example, a mechanical or a pneumatic system during testing.

The clamping pressure shall be sufficient to prevent slippage during the test, however, avoiding damaging the test pieces.

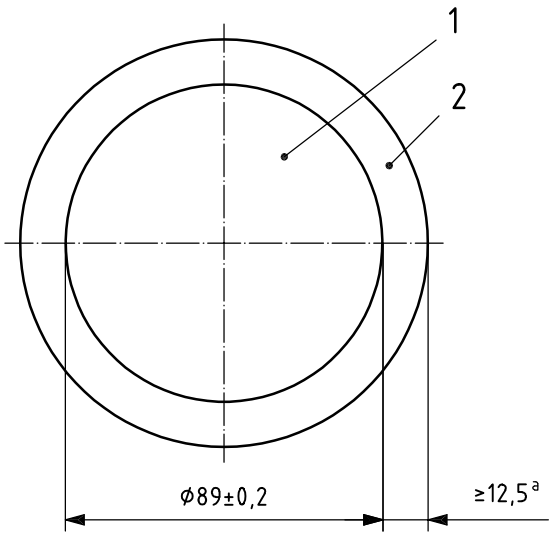
The clamping surfaces of the clamping rings are coated with a commercial grade of a band made of a suitable plastic material, typically 1,5 mm to 2 mm thick having a IRHD hardness (International Rubber Hardness Degree) of 75 ± 5.

The edge of the coated band shall be coincident with the inner diameter of the clamping rings and be at least 12,5 mm wide.

The internal diameter of the two concentric rings shall be $(89{,}0 \pm 0{,}2)$ mm.

For the dimensions of the clamping system, see Figure 1.

Dimensions in millimetres



Key

1 test area

2 clamp ring

[a] Suitable coated band.

Figure 1 — Principle of the clamping system

5.2 Penetration system

The penetration (burst) system consists of a spherical penetration made from any hard, non-deformable, highly polished material with the following dimensions:

— diameter: (16 ± 0,05) mm;

— sphericity: better than 1 micron.

The penetration ball is permanently affixed to the end of a (9,0 ± 1) mm solid hard rod, designed to transmit the force applied to the ball to a suitable load cell and force-measuring system, and will be centred with the annular clamps.

5.3 Force-measuring system

The force-measuring system shall measure the loads with a class of machine range of 1 or better and shall be calibrated and verified in accordance with the requirements of ISO 7500-1. The readout system shall have a display that shows the maximum force at burst and record.

5.4 Drive mechanism

The drive mechanism shall consist of a static uniaxial testing machine with a suitable mechanism for moving the assembly up and down at constant rate in a direction perpendicular to the plane in which the test piece is fixed. This mechanism may provide for a variable or fixed speed of movement. The penetration test speed shall be (125 ± 5) mm/min.

6 Conditioning

Condition the samples prior to testing in a standard atmosphere at (23 ± 1) °C and (50 ± 2) % relative humidity according to ISO 187, unless otherwise agreed between the parties concerned.

The sample shall remain in the standard atmosphere throughout the testing.

7 Preparation of test pieces

The sample shall be selected in accordance with ISO 186.

Test pieces shall not include areas containing creases, dirt or visible damage.

Test pieces shall be larger in the test area than the clamping rings of the tester, and no area covered by the clamps in one test shall be included in subsequent test areas.

Prepare ten test pieces of the conditioned sample as described in Clause 6.

The exact dimension of the portion of the test specimen tested is defined by the inner dimension of the clamping system.

For converted tissue products, testing shall be carried out on the product as received, regardless of the number of plies which are supplied as a product unit. Generally, a single finished product item can be suitable for use as a test piece.

Tissue that has not been converted into a finished product shall be tested one-ply thick, unless otherwise agreed by the parties interested in the testing.

Toilet tissue is frequently produced in rolls of perforated sheets. In testing such toilet tissue, it is convenient to remove a specimen consisting of three connected sheets. The outer two sheets are used for moving the test piece into the clamping system, whilst the middle sheet is subjected to the test. For toilet tissue that is perforated in lengths larger than 120 mm or unperforated, remove a specimen approximately 300 mm in length.

Modern tissue products may be embossed, printed, perforated for ease of dispensing, or folded, or show a combination of these features. Place the test piece in the clamping system in such a way that these features are not directly over the penetration (*burst*) assembly (particularly folds and perforations).

8 Procedure

The apparatus shall be installed on a horizontal surface, free from externally induced vibrations.

Turn on the power of the instrument at least 30 min prior to use.

Place the test piece in the instrument clamping system.

Activate the clamping system to secure the test piece in place.

Activate the test sequence of the instrument causing the penetration (burst) assembly to move at the test speed.

Upon rupture of the test piece by the penetration (burst) assembly, record the measured force as displayed by the force-measuring system. This value is the resistance to penetration (bursting force, F).

Release the clamping system and remove the test piece.

Repeat the above sequence for all the test pieces of the sample.

9 Calculation

Determine the average value $\bar{F}$ of the resistance to penetration (bursting force) for the ten specimens tested.

Calculate the burst index, X, expressed in newtons square metres per gram, using Equation (1):

$$X = \frac{\bar{F}}{g} \tag{1}$$

where

$\bar{F}$ is the mean bursting force of the specimens, expressed in newtons;

g is the grammage of the tissue, in grams per square metre.

10 Test report

The test report shall include the following information:

a) a reference to this part of ISO 12625;

b) date and place of testing;

c) complete identification of the sample tested and the sampling method used;

d) the results, expressed as an average value of $\bar{F}$, reported in newtons rounded to two decimal places;

e) the standard deviation, reported to two decimal places, and the maximum and minimum values measured;

f) if required, the burst index X to two significant figures;

g) any departure from this part of ISO 12625 and any other circumstances that may have affected the test results.

11 Precision

11.1 General

In an interlaboratory test, eight laboratories tested eleven samples according to this part of ISO 12625. The results are shown in the Table 1.

11.2 Ball burst strength

Table 1 — Results of an interlaboratory test

Sample	Burst index X $N \cdot m^2/g$	Grammage g g/m^2	Mean bursting force $\bar{F}$ N	Standard deviation between laboratories s N	Reproducibility coefficient of variation CV %	Reproducibility limit [a] R N
Wipers	0,20	73,24	14,39	0,42	6,8	1,17
	0,12	47,33	5,63	0,19	11,9	0,53
	0,14	62,71	8,78	0,16	11,3	0,44
Toilet paper	0,14	39,46	5,69	0,40	10,7	1,11
	0,08	35,26	2,95	0,17	16,9	0,46
	0,07	32,25	2,20	0,07	12,5	0,19
	0,09	37,82	3,42	0,12	10,1	0,33
Handkerchiefs	0,09	65,75	5,86	0,29	11,2	0,82
	0,06	39,43	2,52	0,14	14,8	0,38
	0,09	58,43	5,36	0,25	12,4	0,71
	0,10	68,53	6,69	0,52	11,3	1,43

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

Bibliography

[1] ISO 287:1985, *Paper and board —Determination of moisture content — Oven-drying method*

[2] ISO 15755:1999, *Paper and board — Estimation of contraries*

[3] TAPPI T 570 pm - 00, *Resistance to mechanical penetration of sanitary tissue papers (ball burst procedure)*

ICS 85.060

Price based on 7 pages