INTERNATIONAL STANDARD

ISO 12625-18

First edition
2022-10

Tissue paper and tissue products —

Part 18: Determination of surface friction

Papier tissue et produits tissue —

Partie 18: Détermination du frottement superficiel

Reference number
ISO 12625-18:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **iv**

1 Scope **1**

2 Normative references **1**

3 Terms and definitions **1**

4 Principle **1**

5 Apparatus **2**
5.1 Friction-testing apparatus 2
5.2 Stylus 2
5.3 Drive unit 2
5.4 Specimen holder 2
5.4.1 Base plate 2
5.4.2 Rectangular frame 2

6 Sampling **3**

7 Conditioning of test pieces **3**

8 Preparation of the test pieces **3**
8.1 General 3
8.2 Number and dimensions 3

9 Test procedure **4**

10 Calculation and expression of the results **4**
10.1 General 4
10.2 Reporting the results 5
10.2.1 $\bar{\mu}$ and M 5
10.2.2 Standard deviation and coefficient of variation (COV) 5

11 Test report **5**

Annex A (informative) **Measurement principle of surface friction** **6**

Annex B (informative) **Precision data** **9**

Bibliography **11**

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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*.

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.

Tissue paper and tissue products —

Part 18:
Determination of surface friction

1 Scope

This document specifies a test method for the determination of the surface friction of tissue paper and tissue products using a contact-type surface tester.

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*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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
coefficient of friction
COF
μ
ratio of the frictional force resisting movement of the surface being tested to the contact force applied normal to that surface (stylus weight) when tested under specified conditions

Note 1 to entry: See Formula (1).

4 Principle

A stylus is applied on a test piece with a contact force of 50 mN. Friction profiles of coefficient of friction against the scan length are generated as the sample plate travels past the stylus at a constant speed of 1 mm/s over a distance of 30 mm. From the friction profile, average of COF and mean deviation are calculated.

Precision data are available in Annex B.

5 Apparatus

5.1 Friction-testing apparatus

The load measuring device of the friction tester shall be accurate to ±0,5 mN within the force range of (5 mN to 100 mN) and ±0,5 % for forces above 100 mN at the data acquisition rate of 10 Hz or higher.

5.2 Stylus

A U-tube shape (made of, e.g. steel grade SUS304-WPB[1)]) with the bent configuration of (0,25 ± 0,002) mm at each side. The stylus horizontal portion of the stylus has a length of (5 ± 0,05) mm (see Figure 1).

Dimensions in millimetres

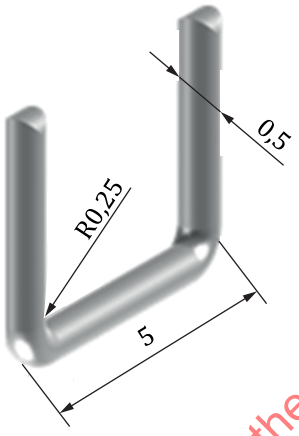


Figure 1 — Stylus

5.3 Drive unit

Drive unit for advancing the test piece beneath the stylus with constant traversing speed of (1,0 ± 0,05) mm/s.

5.4 Specimen holder

5.4.1 Base plate

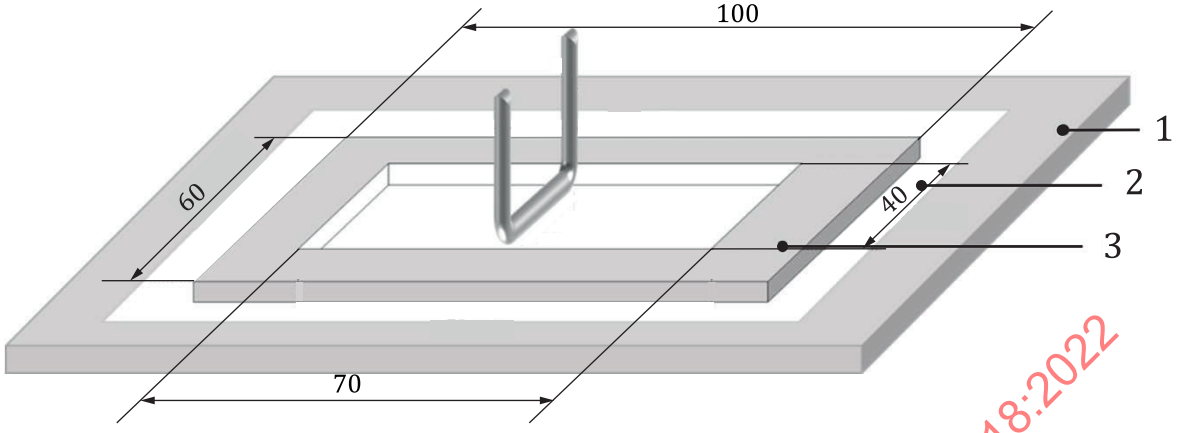
A horizontal smooth metal plate having a length of at least 140 mm and a width of at least 100 mm. The plate is attached to the drive.

5.4.2 Rectangular frame

A metal frame with a weight of 500 mN and outer dimensions of 100 mm × 60 mm and inner dimensions 70 mm × 40 mm (see Figure 2).

1) SUS304-WPB is an example of a suitable material available commercially. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

Dimensions in millimetres



Key

1 base plate
2 specimen
3 rectangular frame

Figure 2 — Arrangement of the specimen holder

6 Sampling

If the tests are being made to evaluate a lot, the samples shall be selected in accordance with ISO 186.

If the tests are being made on another type of sample, make sure that the specimens taken are representative of the sample. Each test piece shall be free of perforations, creases, kinks, wrinkles, and other faults not normally inherent in the tissue paper and tissue products.

7 Conditioning of test pieces

Condition the samples in accordance with ISO 187 and keep them in the standard atmosphere throughout the test. Conditioning shall be performed prior to the preparation of test pieces.

8 Preparation of the test pieces

8.1 General

If the tests are being made to evaluate a lot, the sample shall be selected in accordance with ISO 186.

If the tests are being made on another type of sample, make sure that the specimens taken are representative of the sample. Each test piece shall be free from faults not normally inherent to the tissue.

For converted multi-ply tissue products, testing shall be done on the product as it received, regardless of the number of plies which are supplied as a product unit (no ply separation).

Tissue papers that have not been converted into finished products shall be tested as single plies, unless otherwise agreed between the parties concerned.

8.2 Number and dimensions

Test pieces should have minimum size 100 mm in length and 60 mm in width.

Prepare a minimum of 10 test pieces for the machine direction (MD) testing and another 10 test pieces for the cross direction (CD) testing.

9 Test procedure

Test in the same atmospheric conditions as those used to condition the samples.

a) place the instrument on a solid and vibration-free table;

b) place the test piece on the base plate and smooth the test specimen to eliminate the wrinkles if necessary, taking care not to alter the specimen surface;

c) place a rectangular frame on the test piece, see Figure 2;

d) set stylus to contact force (50 ± 1) mN;

e) start the test and record the data for a total run length of 30 mm, at which point the instrument will stop and remove the stylus from test piece then return to the staring position;

f) repeat the test on the next test pieces in order to obtain 10 replicates in machine direction and 10 replicates in cross direction. If a specimen shows unusual behaviour during testing, discard it, then start with a new specimen.

10 Calculation and expression of the results

10.1 General

Determine COF using Formula (1):

$$\mu_i = \frac{F_i}{50} \tag{1}$$

where

μ_i is the COF at point i, dimensionless;

F_i is the frictional force at point i, mN.

Determine the average of COF and the mean absolute deviation (M) using Formulae (2) and (3) of each replica.

$$\bar{\mu} = \frac{1}{N}\sum_{1}^{N}\mu_i \tag{2}$$

$$M = \frac{1}{N}\sum_{1}^{N}|\mu_i - \bar{\mu}| \tag{3}$$

where

$\bar{\mu}$ is the average of COF, dimensionless;

N is the number of data points from 5 mm to 25 mm (N being at least 200);

μ_i is the COF at point i, dimensionless;

M is the mean absolute deviation from the average of COF, dimensionless.

Then, calculate the average of COF and of M from the 10 specimens.

10.2 Reporting the results

10.2.1 $\bar{\mu}$ and M

Report the grand average of COF($\bar{\mu}$) and mean absolute deviation (M) from the 10 measurements in both MD and CD.

Report the results to two significant figures, respectively. See Table A.2 for an example.

10.2.2 Standard deviation and coefficient of variation (COV)

Calculate the standard deviation to three significant figure and coefficient of variation in % to one significant figure.

11 Test report

The test report shall include the following information:

a) a reference to this document, i.e. ISO 12625-18:2022;

b) the date and place of testing;

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

d) the conditioning atmosphere used;

e) the number of test pieces tested;

f) the average of 10 $\bar{\mu}$ and M in MD and CD, with two significant figures;

g) any departure from this document and any circumstances that might have affected the results.

Annex A
(informative)

Measurement principle of surface friction

A.1 General

For surface friction measurement, the specimen is placed on a smooth steel plated and moved under a stylus at a constant rate of (1,0 ± 0,05) mm/s.

A.2 Determination of coefficient of friction and mean absolute deviation

A series of drag force vs. scan length has been measured and the data between the scan length of 5 mm and 25 mm is used to determine COF and *M* (mean absolute deviation) using Formulae (1) and (3).

Table A.1 shows the data of scan length and coefficient of friction of a tissue sample at data acquisition rate of 10 point/sec.

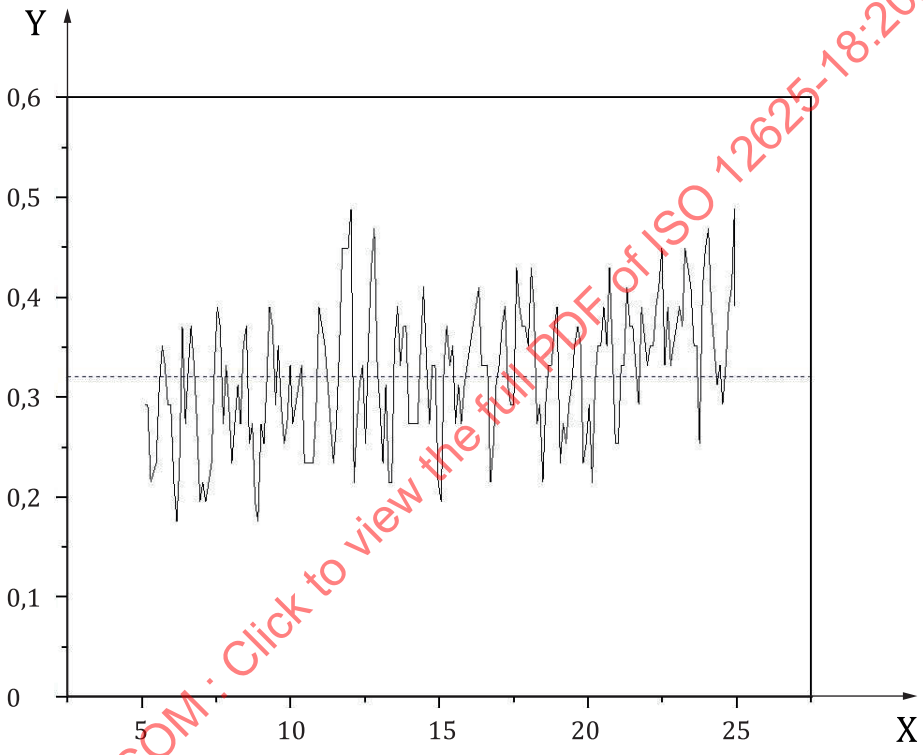
Table A.1 — Surface friction data

Scan length mm	**COF** μ
0	Excluded
0,1	
0,2	
0,29	
⋮	
5,08	**0,293 1**
5,18	**0,293 1**
5,28	**0,214 9**
5,47	**0,234 5**
5,57	**0,312 7**
⋮	⋮
14,95	**0,214 9**
15,05	**0,195 4**
15,14	**0,332 2**
15,24	**0,371 3**
15,34	**0,332 2**
⋮	⋮
24,62	**0,332 2**
24,72	**0,390 8**
24,82	**0,410 4**
24,91	**0,488 5**
25,01	**0,429 9**

Table A.1 *(continued)*

Scan length mm	COF μ
⋮	Excluded
26,09	
26,18	
26,28	
26,38	

Figure A.1 shows a friction profile of COF vs. scan length from Table A.1.



Key

X scan length, mm

Y coefficient of friction, μ

Figure A.1 — Surface friction profile of a toilet tissue sample

From Table A.1, $\bar{\mu}$ (the average of COF) and M (the mean absolute deviation from $\bar{\mu}$) are determined using Formulae (2) and (3).

Table A.2 shows an example of test report of surface friction ($\bar{\mu}$ and M) (unit: dimensionless).

Table A.2 — Example of test report

Test run	MD		CD	
	$\bar{\mu}$	M	$\bar{\mu}$	M
1	0,32	0,054	0,16	0,036
2	0,21	0,046	0,14	0,045
3	0,23	0,058	0,20	0,042
4	0,37	0,053	0,21	0,044
5	0,28	0,058	0,37	0,041
6	0,39	0,059	0,26	0,039
7	0,29	0,051	0,30	0,039
8	0,28	0,054	0,12	0,050
9	0,37	0,063	0,26	0,037
10	0,30	0,057	0,35	0,037
Avg.	0,30	0,055	0,24	0,041
Std.	0,058	0,005	0,087	0,004
C_V, %	19,0	8,9	36,6	10,8