INTERNATIONAL STANDARD

ISO 12945-2

Second edition
2020-10

Textiles — Determination of fabric propensity to surface pilling, fuzzing or matting —

Part 2: Modified Martindale method

Textiles — Détermination de la propension au boulochage, à l'ébouriffage ou au moutonnement des étoffes en surface — Partie 2: Méthode du Martindale modifiée

Reference number
ISO 12945-2:2020(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

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 38, *Textiles*, Subcommittee SC 24, *Conditioning atmospheres and physical tests for textile fabrics*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 248, *Textiles and textile products*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 12945-2:2000), which has been technically revised.

The main changes compared to the previous edition are as follows:

— in Clause 9, visual assessment of pilling, fuzzing, and matting has been carried out according to ISO 12945-4.

A list of all parts in the ISO 12945 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.

Introduction

Pills are formed when fibres on a fabric surface “tease out” and become entangled during wear. Such surface deterioration is generally undesirable, but the degree of consumer tolerance for a given level of pilling will depend on the garment type and fabric end-use.

Generally, the level of pilling which develops is determined by the rates of the following parallel processes:

a) fibre entanglement leading to pill formation;

b) development of more surface fibre;

c) fibre and pill wear-off.

The rates of these processes depend on the fibre, yarn and fabric properties. Examples of extreme situations are found in fabrics containing strong fibres versus fabric containing weak fibres. A consequence of the strong fibre is a rate of pill formation that exceeds the rate of wear-off. This results in an increase of pilling with an increase of wear. With a weak fibre the rate of pill formation competes with the rate of wear-off. This would result in a fluctuation of pilling with an increase of wear. There are other constructions that the surface fibre wear-off occurs before pill formation. Each of these examples demonstrates the complexity of evaluating the surface change on different types of fabric.

The ideal laboratory test would accelerate the wear processes a), b) and c) by exactly the same factor and would be universally applicable to all fibre, yarn and fabric types. No such test has been developed. However, a test procedure has been established in which fabrics can be ranked in the same order of pilling, fuzzing, and matting propensity as is likely to occur in end-use wear.

The modification to the very widely adopted Martindale abrasion testing machine on which this document is based is described in Reference [8].

Textiles — Determination of fabric propensity to surface pilling, fuzzing or matting —

Part 2:
Modified Martindale method

1 Scope

This document specifies a method for the determination of the resistance to pilling, fuzzing, and matting of textile fabrics using a modified Martindale method.

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 139, *Textiles — Standard atmospheres for conditioning and testing*

ISO 12945-4, *Textiles — Determination of fabric propensity to surface pilling, fuzzing or matting — Part 4: Assessment of pilling, fuzzing and matting by visual analysis*

ISO 12947-1:1998, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 1: Martindale abrasion testing apparatus*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
pill
entangling of fibres into balls (pills) which stand proud of the fabric and are of such density that light will not penetrate and will cast a shadow

Note 1 to entry: This change can occur during washing, dry cleaning, and/or wearing.

[SOURCE: ISO 12945-4:2020, 3.1]

3.2
pilling
generation of *pills* (3.1) over the surface of the fabric

[SOURCE: ISO 12945-4:2020, 3.2]

3.3
fuzzing
roughing up of the surface fibres and/or teasing out of the fibres from the fabric, which produces a visible surface change

Note 1 to entry: This change can occur during washing, dry cleaning, and/or wearing.

[SOURCE: ISO 12945-4:2020, 3.3]

3.4
matting
disorientation of the raised fibres of a napped fabric, which produces a visible surface change

Note 1 to entry: This change can occur during washing, dry cleaning, and/or wearing.

[SOURCE: ISO 12945-4:2020, 3.4]

3.5
pilling rub
one revolution of the two outer drives of the modified Martindale abrasion machine

3.6
pilling cycle
completion of the translational movements tracing a Lissajous figure comprising 16 *pilling rubs* (3.5), i.e. 16 revolutions of the two outer drives and 15 revolutions of the inner drive of the Martindale abrasion tester

4 Principle

A circular test specimen is passed over a friction surface comprising the same fabric or, when relevant, a wool abradant fabric, at a defined force in the form of a Lissajous figure, with the test specimen able to rotate easily around an axis through its centre, perpendicular to the plane of the test specimen. Fuzzing, pilling, and matting are assessed visually after defined stages of rub testing.

5 Apparatus

5.1 Martindale abrasion testing machine, as described in ISO 12947-1, modified in accordance with 5.2.

The test apparatus consists of a base plate carrying the pilling tables and drive mechanism. The drive mechanism consists of two outer drives and an inner drive which cause the test specimen holder guide plate to trace a Lissajous figure.

The test specimen holder guide plate is moved horizontally by the drive mechanism in such a way that every point of the guide plate describes the same Lissajous figure.

The Lissajous movement changes from a circle to gradually narrowing ellipses, until it becomes a straight line, from which progressively widening ellipses develop in a diagonally opposite direction before the pattern is repeated.

The test specimen holder guide plate is fitted with bearing housings and low friction bearings which carry the test specimen holder guide spindles. The lower end of each test specimen holder spindle is inserted into each corresponding test specimen holder body. The test specimen holder consists of a body, test specimen holder ring and optional loading weight.

The apparatus is fitted with a pre-settable counting device which measures each revolution of one of the outer drives. Each revolution is taken as a pilling rub and 16 revolutions as a complete Lissajous figure.

5.2 Drive and base plate attachments

5.2.1 Drive

Movement of the test specimen holder guide plate carrying the test specimen holder bearing housings and bearings and consequently the test specimen holders themselves is performed by the following units:

a) two outer synchronised drive units with the distance of the axis of the drive units from their central axis of (12 ± 0,25) mm;

b) central drive unit, with the distance of the axis of the drive unit from its central axis of (12 ± 0,25) mm.

The maximum stroke of the test specimen holder guide plate in both the length and traverse directions is (24 ± 0,5) mm.

5.2.2 Counter, for counting the pilling rubs and measures to an accuracy of 1 rub.

5.2.3 Pilling tables, each consisting of the following elements:

a) pilling table (see Figure 1);

b) clamping ring (see Figure 2);

c) clamping mechanism to fasten the clamping ring.

5.2.4 Test specimen holder guide plate, comprising a metal plate in which three guides engage the drive units.

These interact so as to ensure a uniform, smooth and low vibration movement of the test specimen holder guide plate.

The test specimen holder guide spindles are located in bearing housings secured to the guide plate, central to each pilling table. Each bearing housing carries two bearings. The guide spindles shall be freely moving and free from play in the bearings.

5.2.5 Test specimen holder, for every work station, comprising the following component parts:

a) test specimen holder (see Figure 3);

b) test specimen holder ring;

c) test specimen holder guide spindle.

The test specimen holder complete with guide spindle and test specimen holder ring shall have a mass of (155 ± 1) g.

5.2.6 Loading pieces, comprising an additional loading piece in the form of a stainless-steel disc which can be applied to the test specimen holder (5.2.5) provided for each working station on the testing machine (see Figure 4). The mass of the disc is (260 ± 1) g.

The mass of the complete test specimen holder and stainless-steel disc (415 ± 2) g.

5.2.7 Auxiliary device for test specimen mounting, required for mounting the test specimen without folds on the specimen holder (see Figure 5).

5.2.8 Pilling table test specimen mounting weight, complete with handle, required for mounting the test specimen or abradant without folds or creases on the pilling table. The mounting weight mass is (2,5 ± 0,5) kg and diameter (120 ± 10) mm.

Dimensions in millimetres

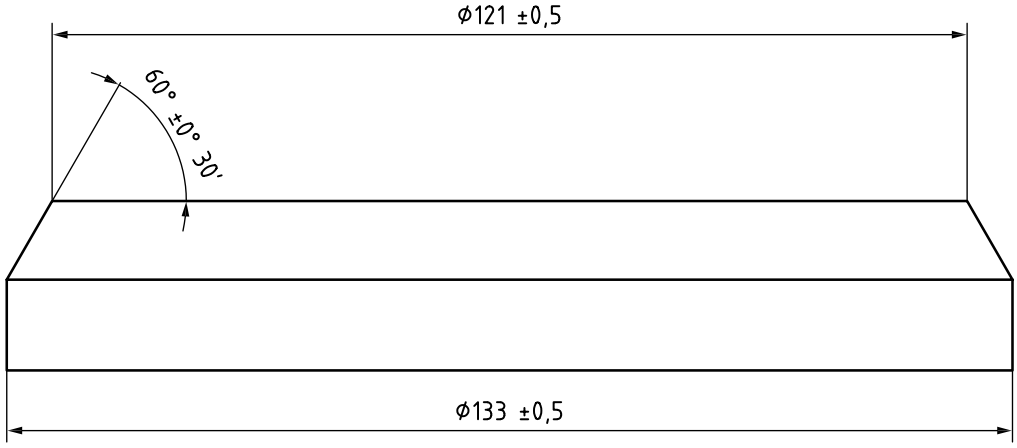

Figure 1 — Pilling table

Dimensions in millimetres

Figure 2 — Clamping ring

Dimensions in millimetres

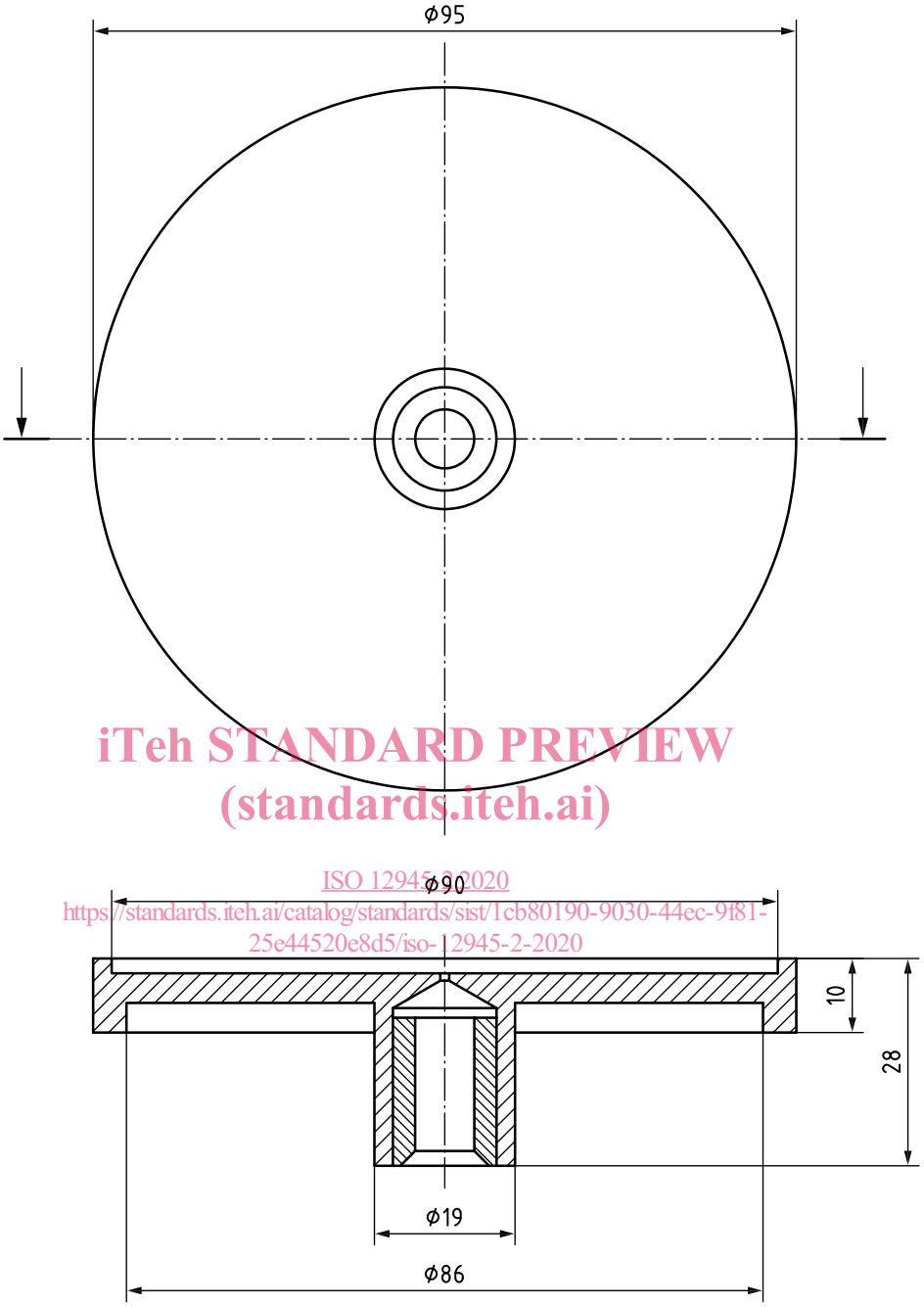

Figure 3 — Test specimen holder body