INTERNATIONAL STANDARD

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Textiles — Determination of fabric propensity to surface fuzzing and to pilling —

Part 2: Modified Martindale method

Textiles — Détermination de la propension des étoffes à l'ébouriffage en surface et au boulochage —

Partie 2: Méthode Martindale modifié

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 part of ISO 12945 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 12945-2 was prepared by Technical Committee ISO/TC 38, *Textiles*.

ISO 12945 consists of the following parts, under the general title *Textiles — Determination of fabric propensity to surface fuzzing and to pilling*:

— *Part 1: Pilling box method*

— *Part 2: Modified Martindale method*

— *Part 3: Determination using a random tumble method*

Annex A forms a normative part of this part of ISO 12945.

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 fuzzing and pilling propensity as is likely to occur in end-use wear.

The modification to the very widely adopted Martindale abrasion testing machine on which this part of ISO 12945 is based is described in a publication by H. Knecht: *Neue Methode zur Prüfung der Pillingneigung* in Wirkerei und Strickerei Technik, **38** (1988), 12, p. 1309.

Textiles — Determination of fabric propensity to surface fuzzing and to pilling —

Part 2:
Modified Martindale method

1 Scope

This part of ISO 12945 specifies a method for determination of the resistance to pilling and surface change of textile fabrics using a modified Martindale method.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 12945. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 12945 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

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

ISO 12947-1, *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 part of ISO 12945 the following terms and definitions apply.

3.1
fuzzing
roughing up of the surface fibres and/or teasing out of the fibres from the fabric, producing a visible surface change

NOTE This change can occur during washing, dry cleaning and/or wearing.

3.2
pills
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 This change can occur during washing, dry cleaning and/or wearing.

3.3
pilling
generation of pills over the surface of the fabric

3.4
pilling rub
one revolution of the two outer drives of the modified Martindale abrasion machine

3.5
pilling cycle
completion of the translational movements tracing a Lissajous figure comprising 16 rubs, 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 and pilling 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 specimen holder guide plate to trace a Lissajous figure.

The 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 specimen holder guide plate is fitted with bearing housings and low friction bearings which carry the specimen holder guide spindles. The lower end of each specimen holder spindle is inserted into each corresponding specimen holder body. The specimen holder consists of a body, 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 sixteen revolutions as a complete Lissajous figure.

5.2 Drive and base plate attachments

5.2.1 Drive

Movement of the specimen holder guide plate carrying the specimen holder bearing housings and bearings and consequently the 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 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 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 specimen holder guide plate.

The 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 Specimen holder, for every work station, comprising the following component parts:

a) specimen holder (see Figure 3);

b) specimen holder ring;

c) specimen holder guide spindle.

The specimen holder complete with guide spindle and 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 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 specimen holder and stainless steel disc (415 ± 2) g.

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

5.2.8 Pilling table 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.

5.3 Viewing cabinet, illuminated by a white fluorescent tube or bulb to give uniform illumination over the width of the specimen(s) and masked in such a way that the observer does not look directly into the light. The illuminant shall be positioned at an angle between 5° and 15° to the plane of the specimen (see Figure 6). The distance between the eye and the specimen shall be between 30 cm and 50 cm for normal corrected vision.

Dimensions in millimetres

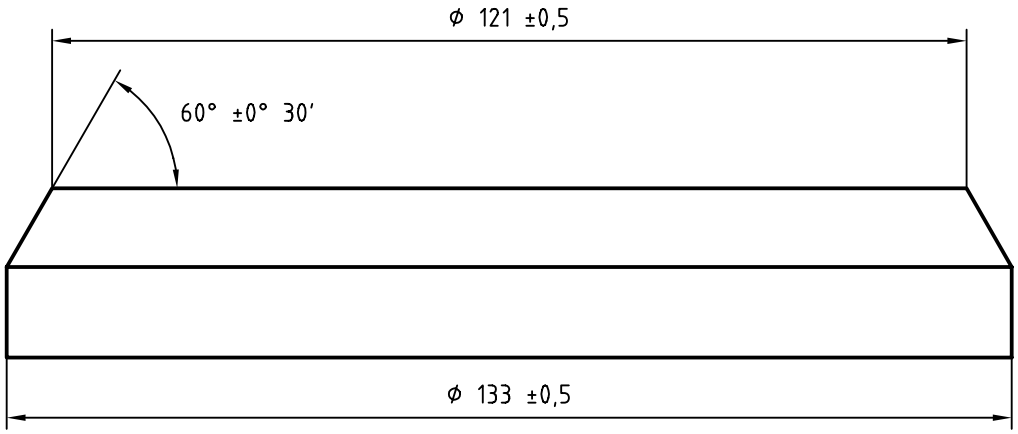

Figure 1 — Pilling table

Dimensions in millimetres

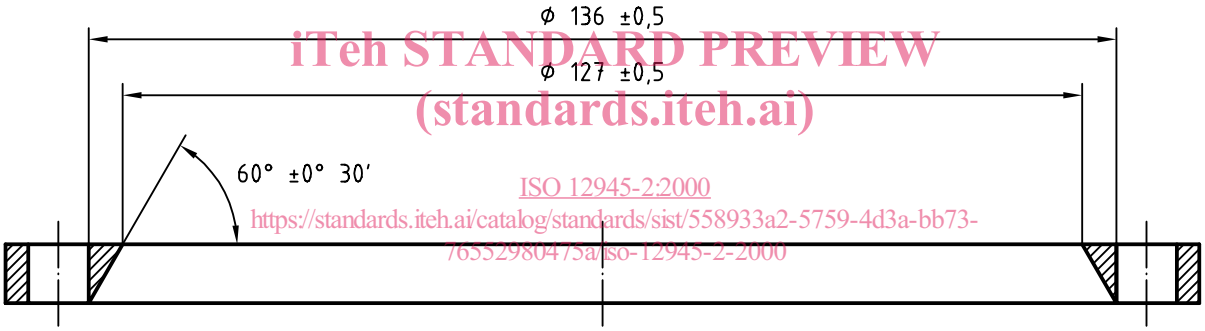

Figure 2 — Clamping ring

Dimensions in millimetres

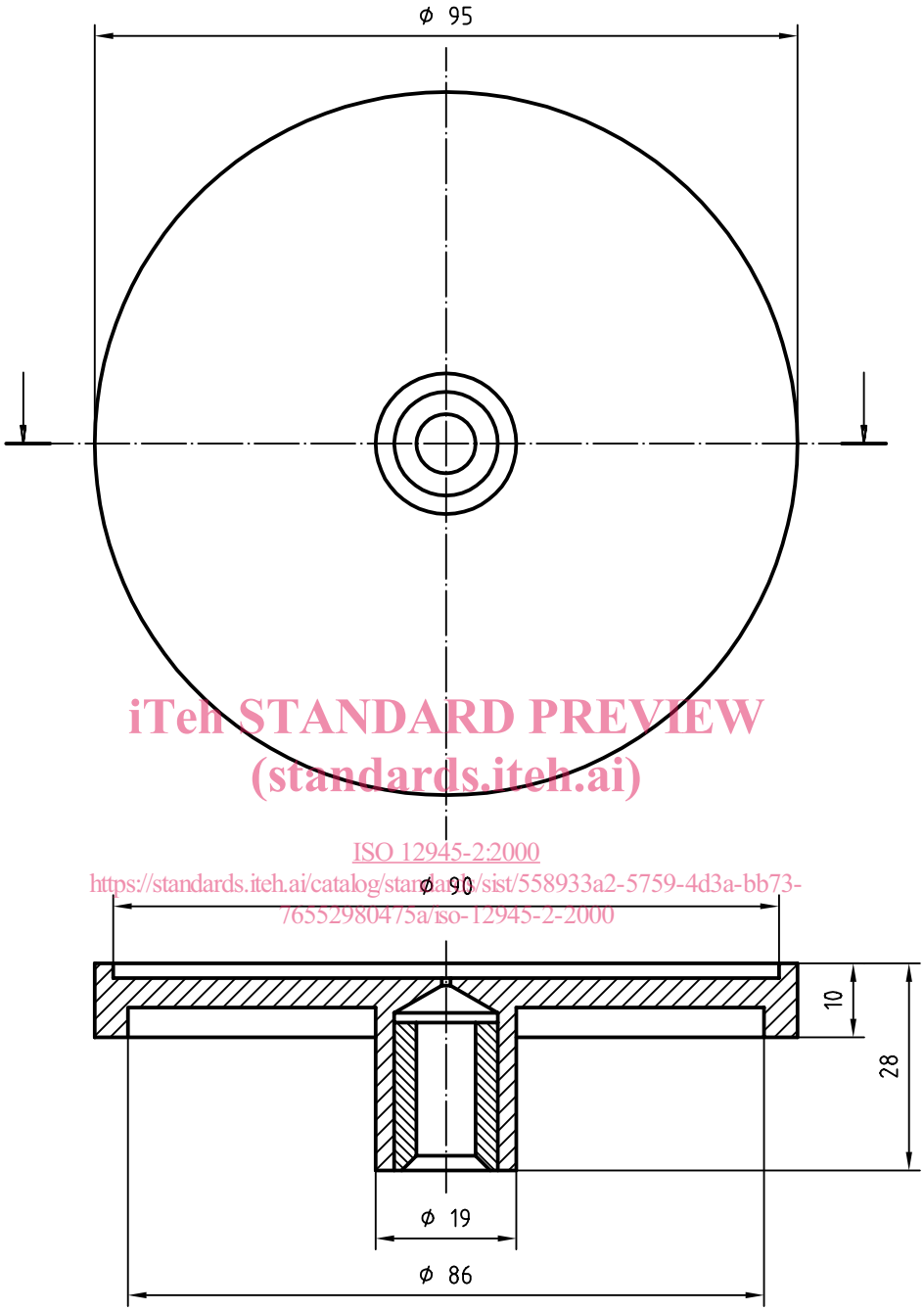

Figure 3 — Specimen holder body