
**Textiles — Determination of the
abrasion resistance of fabrics by the
Martindale method —**

**Part 2:
Determination of specimen
breakdown**

iTeh STANDARD PREVIEW

(standards.iteh.ai)
*Textiles — Détermination de la résistance à l'abrasion des étoffes par
la méthode Martindale —*

Partie 2: Détermination de la détérioration de l'éprouvette

<https://standards.iteh.ai/catalog/standards/sist/187709b3-f6a6-4946-a85c-70c33cbd818b/iso-12947-2-2016>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 12947-2:2016

<https://standards.iteh.ai/catalog/standards/sist/187709b3-f6a6-4946-a85c-70c33cbd818b/iso-12947-2-2016>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	3
5 Apparatus and materials	3
6 Conditioning and testing atmosphere	5
7 Sampling and preparation of test specimens	5
7.1 General.....	5
7.2 Selection of the laboratory sample.....	5
7.3 Sampling of the test specimens from the laboratory sample.....	5
7.4 Dimensions of specimens and auxiliary materials.....	6
7.4.1 Dimensions of the test specimens.....	6
7.4.2 Dimensions of abrasant.....	6
7.4.3 Dimensions of the abrasant felt substrate.....	6
7.4.4 Dimensions of the specimen holder foam backing.....	6
7.5 Specimen preparation for specific fabrics.....	6
7.5.1 Stretch fabrics.....	6
7.5.2 Pile fabrics exceeding 500 g/m ²	7
7.6 Preparation and mounting of the test specimens and cutting-out and mounting of the auxiliary materials.....	8
7.6.1 Preparation.....	8
7.6.2 Mounting of the specimen.....	8
7.6.3 Mounting of the abrasant.....	8
7.7 Useful life of auxiliary materials.....	9
7.8 Preparation of the abrasion machine.....	9
8 Abrasion test procedure: Determination of the physical end-point	9
9 Results	11
10 Test report	11
Annex A (informative) Topics for further investigations	13
Bibliography	15

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 on 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 the following URL: www.iso.org/iso/foreword.html.

The committee responsible for this document is ISO/TC 38, *Textiles*, Subcommittee SC 24, *Conditioning atmospheres and physical tests for textile fabrics*.

This second edition cancels and replaces the first edition (ISO 12947-2:1998), which has been technically revised.

It also incorporates the Technical Corrigendum ISO 12947-2:1998/Cor 1:2002.

A list of all parts in the ISO 12947 series can be found on the ISO website.

Textiles — Determination of the abrasion resistance of fabrics by the Martindale method —

Part 2: Determination of specimen breakdown

1 Scope

This document specifies the procedure for the determination of specimen breakdown (end-point of test) by inspection at fixed intervals and is applicable to all textile fabrics including nonwovens apart from fabrics where the specifier indicates the end performance as having a low abrasion wear life.

This document is not applicable to coated fabrics (including laminated fabrics). If the abrasion behaviour of the coated surface of a coated fabric is to be determined, use the methods described in the various parts of ISO 5470.

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 105-A02, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour*

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

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 terms and definitions given in ISO 12947-1, ISO 3572, ISO 8388, ISO 9092, ISO 23733 and the following apply.

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

thread

textile yarn, either single or resulting from twisting together two or more single or folded yarns

3.2

woven fabric

fabric produced by interlacing (by weaving on a loom or a weaving machine) a set of warp threads and a set of weft threads normally at right angles to each other

[SOURCE: ISO 3572:1976, 2.1]

3.3

knitted fabric

fabric in which at least one system of *threads* (3.1) is formed into knitted loops and the knitted loops are intermeshed into stitches

[SOURCE: ISO 8388:1998, 3.0.1]

3.4

cut pile fabric

fabric for which a surface effect is formed by tufts or cut loops of *threads* (3.1) that stand up from the ground fabric

Note 1 to entry: Corduroy fabric (cord fabric) is an example of cut pile fabric.

3.5

uncut pile fabric

fabric for which a surface effect is formed by uncut loops of *threads* (3.1) that stand up from the ground fabric

3.6

raised fabric

fabric for which a surface effect is formed by mechanically raising fibres from *threads* (3.1) of the ground fabric

3.7

flocked fabric

fabric for which a surface effect is formed by fixing fibre snippets (flock) onto the surface of a textile substrate

3.8

chenille yarn

novelty yarn with pile protruding radially from the axis, where the pile fibres are held between a core yarn system

[SOURCE: ISO 23733:2007, 3.1]

3.9

nonwoven fabric

structures of textile materials, such as fibres, continuous filaments, or chopped yarns of any nature or origin, that have been formed into webs by any means, and bonded together by any means, excluding the interlacing of yarns as in *woven fabric* (3.2), *knitted fabric* (3.3), laces, braided fabric or tufted fabric

[SOURCE: ISO 9092:2011, 2.1, modified.]

3.10

specimen breakdown

breakdown point which is reached when criteria based on thread breakage or *worn off area* (3.11) are met

3.11

worn off area

area which has been denuded of pile or flock such that the ground fabric is exposed

3.11.1

fully worn off area

worn off area (3.11) extending to more than three quarters of the exposed surface area

3.11.2

partially worn off area

worn off area (3.11) in which there is some visual loss of pile or flock in discrete locations

Note 1 to entry: A partially worn off area is such that when viewed through the template (5.2), no pile is visible and the ground fabric is exposed.

4 Principle

A circular specimen, mounted in a specimen holder and subjected to a defined load, is rubbed against an abrasive medium (standard fabric) in a translational movement tracing a Lissajous figure, the specimen holder being additionally freely rotatable around its own axis perpendicular to the plane of the specimen. The evaluation of the abrasion resistance of the textile fabric is determined from the inspection interval to breakdown of the specimens.

The specimens are mounted in specimen holders with foam backing. Specimens with a mass per unit area ≥ 500 g/m² are mounted in specimen holders without foam. Pile fabrics which are tested without foam backing are subjected to a specified preparatory treatment (see 7.5.2).

Two abrasion load parameters are specified. The total effective mass of the abrasion load (i.e. the mass of the specimen holder assembly and the appropriate loading piece) are as follows:

- a) (795 ± 7) g for fabrics intended for workwear, upholstery, bed linen and fabrics for technical use (i.e. a nominal pressure of 12 kPa);
- b) (595 ± 7) g for fabrics intended for apparel and household textiles, excluding upholstery and bed linen (i.e. a nominal pressure of 9 kPa).

Abrasion testing is continued up to breakdown (see Clause 8) of the test specimen.

The inspection interval is determined by the specimen breakdown. The number of rubs is recorded at which specimen breakdown is not yet observed (this number of rubs is the upper limit of the time elapsed before specimen breakdown and, at the same time, the lower limit of the abrasion interval at which specimen breakdown occurs).

(standards.iteh.ai)

5 Apparatus and materials

ISO 12947-2:2016

5.1 Test apparatus and auxiliary materials, as specified in ISO 12947-1.

5.2 Template.

A mask made of a rigid transparent material with a hole of diameter $(2,5 \pm 0,1)$ mm through which the test specimen can be viewed (to get an approximate viewing area of 4,9 mm²).

5.3 Magnifying device.

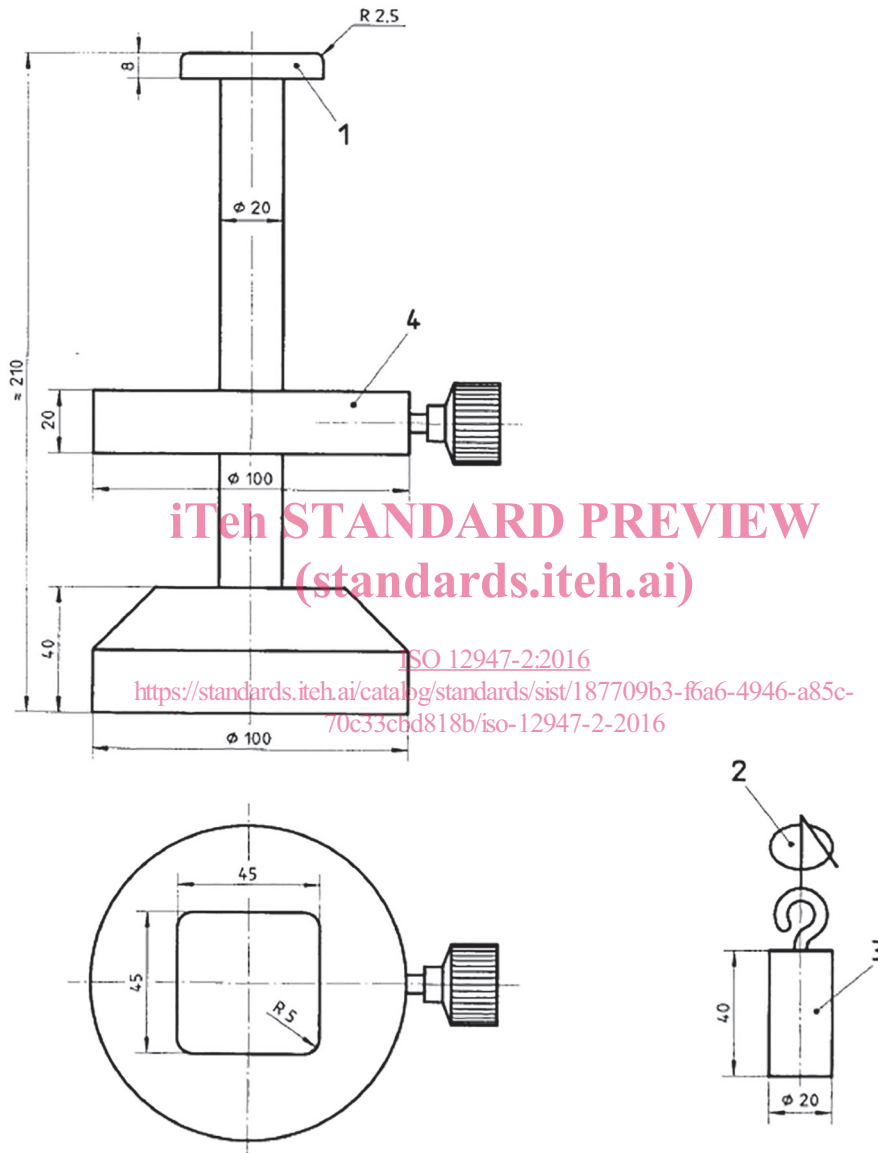
A magnifying device (in most of the cases, a magnification factor of 8 or 10 has been found suitable) shall be used in order to recognize completely broken threads, including threads forming loops.

5.4 Mounting device for stretch fabrics.

A device, as described in [Figure 1](#), designed to prevent the circular adhesion area loosening when preparing test specimen of fabric; fabric suspected to be deformed during the abrasion stage due to its stretchability.

The square table mount shall measure $(45,0 \pm 0,1) \text{ mm} \times (45,0 \pm 0,1) \text{ mm}$.

Dimensions in millimetres



Key

- 1 table mount
- 2 clamp
- 3 mass (weight) piece
- 4 lowering console

Figure 1 — Mounting device for stretch fabrics

6 Conditioning and testing atmosphere

The preferred standard atmosphere for conditioning and testing shall be the standard atmosphere as defined in ISO 139.

The use of alternative standard atmospheres as specified in ISO 139 may be used but their use shall be stated on the test report.

NOTE Only test results obtained from tests performed in an equal testing atmosphere can be compared.

7 Sampling and preparation of test specimens

7.1 General

The sample shall be representative for the structure and patterns of the fabric.

Ensure throughout sampling and specimen preparation that handling imposes the minimum possible tensile stress so as to prevent incorrect extension of the textile fabric.

7.2 Selection of the laboratory sample

Select the laboratory sample from a test lot to be representative of properties of the textile fabric.

If possible, select the laboratory sample from across the full fabric width, containing at least two full pattern repeats.

The upper-side (also known as wear side or face side) of the fabric should be indicated.

7.3 Sampling of the test specimens from the laboratory sample

Either condition the whole sample or remove smaller samples sufficient to permit the required test specimens to be taken and condition the test samples in the standard atmosphere (according to [Clause 6](#)) for at least 18 h prior to test.

NOTE 1 The duration of 18 h has been found suitable for most of the fabrics to bring them in to equilibrium with the atmosphere.

If, in some cases (e.g. when the sample is received wetted), an additional time of conditioning is needed, this shall be reported.

Take at least three test specimens ensuring that the principles set out below have been followed.

In case of patterned fabric, take at least two specimens representing each different area of the design and/or texture in the fabric.

Test specimens should be taken so that they are at least 100 mm from the edge of the laboratory sample, or, if the laboratory sample is received full width, at least 150 mm from the selvedge.

The following principles shall be observed.

- a) For all fabrics, except patterned fabrics or fabrics with a textured surface:
 - 1) for woven fabrics, take the test specimens so that they each contain different warp and weft threads;
 - 2) for knitted fabrics, take the test specimens so that they each contain different wales and courses.
- b) For patterned fabrics or fabrics with textured surface, ensure that the test specimens contain the most characteristic parts of the pattern, with particular consideration for weak spots, e.g. floating threads. Where it is not possible to include examples of each different pattern or texture within

a set of at least three test specimens, then test such additional specimens as may be required to ensure that each pattern or textile is included in at least two separate test specimens. If more than four different patterns are present in the same fabric, select the test specimens at spots where patterns meet in order to have several — up to three, in equal parts — patterns represented in the specimen. In the case of a combination of various basic fabric types in the same sample, the test specimens shall contain all characteristic parts of the various fabric types with particular consideration for weak spots, e.g. floating threads.

NOTE 2 This may require the use of more than three test specimens and with this technique, up to nine patterns can be examined simultaneously.

7.4 Dimensions of specimens and auxiliary materials

7.4.1 Dimensions of the test specimens

The diameter of the test specimens shall be at least 38 mm. It is essential that the specimen can be placed without wrinkles in the specimen holder nut. Preparation of test specimens with excessive diameter should be avoided.

7.4.2 Dimensions of abradant

The dimensions of the abradant shall be at least 140 mm in diameter or length and width and such as it covers the felt on the abrading table and can be fixed in place with the clamping ring.

7.4.3 Dimensions of the abradant felt substrate

The dimensions of the woven wool felt underlay shall be at least 140 mm in diameter and such as the woven wool felt underlay covers the abrading table and can be fixed in place with the clamping ring.

7.4.4 Dimensions of the specimen holder foam backing

The diameter of the specimen holder foam backing shall be at least 38 mm. It is essential that the foam backing can be placed without wrinkles in the specimen holder nut. Preparation of foam backing with excessive diameter should be avoided.

7.5 Specimen preparation for specific fabrics

7.5.1 Stretch fabrics

If a fabric is suspected to lead to the test specimens to be deformed (e.g. bagged, folded) during the abrasion stage due to its stretchability, then apply the following instructions.

NOTE 1 Such “stretch” fabric can be fabric including elastomeric yarns, etc.

Cut or stamp out test specimens of dimensions 60 mm × 60 mm in square shapes, parallel with the stitches or threads.

Condition and place them on the square table mount of the mounting device for stretch fabrics (5.4) with the side to be abraded facing downwards.

Place a clip of 30 mm edge length on each of the four sides of the test specimen hanging over the table, secure and hang a mass on each clip without stretching the specimen. Place the four mass pieces on the bracket that can be lowered. Each mass with clamp shall be $(100 \pm 2,5)$ g, the total mass being (400 ± 10) g.

Lower and raise the bracket (and consequently, the mass, too) three times in quick succession so that the test specimen is subjected to loading by the four mass pieces, and then release the load.

Lower the bracket again with renewed loading of the test specimen. In this state, press a square film measuring about 50 mm × 50 mm, to which double-sided tape is attached, and which has a 30 mm diameter hole in the centre, on to the extended test specimen and affix it by means of the adhesive tape.

Raise the bracket again.

Remove the four mass pieces and clips from the specimen, remove the specimen from the mounting device and stamp the test specimen size of 38 mm for the abrasion test. Care should be taken that the hole of 30 mm diameter stamped in the foil is precisely centred so that the stamped-out specimen is held in the lightly extended state by a film ring 4 mm wide. To prevent the circular adhesion area loosening, mount the test specimen in the specimen holder immediately after stamping.

NOTE 2 Polyvinylchloride clear films of about 0,2 mm thickness have proved successful. Before stamping to the square shape measuring about 50 mm × 50 mm, attach double-sided tape (e.g. carpet fitting tape) to one side of the film and remove the outer protective film only on attachment to the test specimen. Stamp a central hole of 30 mm diameter in the square film. The test specimen upper surface thus lies with the film ring against the specimen holder plunger.

7.5.2 Pile fabrics exceeding 500 g/m²

Pile fabrics which have a mass per unit area >500 g/m² are tested without foam backing. Carry out the following preparatory treatment of specimens in order to check if pile can be removed from the reverse side of the fabric.

Mount one or more pieces of the laboratory sample. Each of which has dimensions at least 140 mm in diameter or length and width with the fabric reverse facing upwards on the abrading table over the abradant felt substrate.

Mount a piece of abradant having dimensions at least 38 mm in diameter (and such as the specimen can be placed without wrinkles in the specimen holder nut), in the specimen holder with specimen holder foam backing.

Use a new piece of abradant for each preparatory treatment.

Subject the reverse of the fabric to 1 000 rubs using an abrasion loading of 595 g for apparel fabrics and other fabrics as described in [Clause 4 b\)](#). Subject the reverse of the fabric to 4 000 rubs using 795 g for all other fabrics as defined in [Clause 4 a\)](#).

On completion of the prescribed number of rubs, examine the test specimens.

Depending on the construction and quality of the pile fabric, two situations may occur following the preparatory treatment.

- a) No pile removal: take test specimens, as described in [7.3](#), from the specimen piece subjected to this preparatory treatment and perform the abrasion test in the usual way.
- b) Visible pile removal: take decision by agreement between the concerned parties whether it would be worthwhile continuing with the abrasion test:
 - 1) either proceed with the normal abrasion test and then, record any notable change after the preparatory treatment in the test report, or
 - 2) do not proceed with the abrasion test and then report accordingly that the fabric was unsuitable for abrasion testing to this test method.