INTERNATIONAL STANDARD

ISO 5470-1

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Rubber- or plastics-coated fabrics — Determination of abrasion resistance —

Part 1:
Taber abrader

Supports textiles revêtus de caoutchouc ou de plastique — Détermination de la résistance à l'usure —

Partie 1: Appareil d'essai d'abrasion Taber

Reference number
ISO 5470-1:1999(E)

Foreword

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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.

International Standard ISO 5470-1 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

It cancels and replaces ISO 5470:1980, which has been technically revised.

ISO 5470 consists of the following parts, under the general title *Rubber- or plastics-coated fabrics — Determination of abrasion resistance*:

— *Part 1: Taber abrader*

— *Part 2: Martindale abrader*

Annex A forms an integral part of this part of ISO 5470.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet iso@iso.ch

Printed in Switzerland

Introduction

It has long been accepted that some of the parameters associated with the Taber test as given in ISO 5470:1980 needed to be more closely specified if reasonable reproducibility (R) was to be obtained. Much of the work is now completed and has been acknowledged by ISO/TC 61 in publishing ISO 9352, which employs a zinc plate as a means of calibrating the initial abrasive power of the wheels. This does not, however, entirely overcome the problem of clogging or maintaining abrasion properties between and during tests. It may also be regarded as expensive and time-consuming.

This part of ISO 5470 permits the approach in ISO 9352 to be adopted if so desired. However, the major disadvantages of the Taber abrader are that:

a) end points can be somewhat subjective unless a gravimetric technique is employed;

b) only a small strip of material is abraded;

c) because of the velocity of interfacial friction, localized heating of the coating polymer can cause softening and thus be less representative of abrasive wear in service;

d) the 6 mm diameter hole in the centre of the test piece does not permit post-abrasion assessments of properties such as hydrostatic heat resistance or resistance to chemical reagents.

Rubber- or plastics-coated fabrics — Determination of abrasion resistance

Part 1:
Taber abrader

WARNING — Persons using this part of ISO 5470 should be familiar with normal laboratory practice. This part of ISO 5470 does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any national regulatory conditions.

1 Scope

This part of ISO 5470 describes a method of assessing the abrasive wear resistance of coated fabrics using the Taber abrader.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 5470. 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 5470 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 48:1994, *Rubber, vulcanized or thermoplastic — Determination of hardness (hardness between 10 IRHD and 100 IRHD).*

ISO 105-A02:1993, *Textiles — Tests for colour fastness — Part A02: Grey scale for assessing change in colour.*

ISO 525:—[1)], *Bonded abrasive products — General requirements.*

ISO 2231:1989, *Rubber- or plastics-coated fabrics — Standard atmospheres for conditioning and testing.*

ISO 2286:1998 (all parts), *Rubber- or plastics-coated fabrics — Determination of roll characteristics.*

ISO 5084:1996, *Textiles — Determination of thickness of textiles and textile products.*

ISO 6103:—[2)], *Bonded abrasive products — Static balancing of grinding wheels — Testing.*

ISO 6506-1:1999, *Metallic materials — Brinell hardness test — Part 1: Test method.*

ISO 6507-1:1997, *Metallic materials — Vickers hardness test — Part 1: Test method.*

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1) To be published. (Revision of ISO 525:1986)

2) To be published. (Revision of ISO 6103:1986)

3 Terms and definitions

For the purposes of this part of ISO 5470, the following terms and definitions apply.

3.1
abrasive wheel
a small grinding wheel or a roller faced with abrasive paper

3.2
abrasive wear
the progressive loss of material from the abraded surface of a rubber or plastics material resulting from the cutting or scratching action of an abrasive wheel

4 Apparatus

4.1 Abrasion test machine (see Figures 1 and 2), consisting of a housing of compact design, a flat circular turntable designed to carry the test piece, a pair of hinged arms to which abrasive wheels can be attached, a motor for rotating the turntable in the plane of its surface, a counter for indicating the number of revolutions executed by the turntable, a device enabling the test to be stopped automatically after a predetermined number of revolutions, and a suction attachment for removing debris.

The abrasive wheels, which are attached to the free ends of the hinged arms, are free to rotate. Their peripheral surfaces rest on the surface of the test piece. The abrasive wheels are rotated, in opposite directions, by the friction between each wheel and the rotating test piece. At the point of contact between wheel and test piece, the direction of travel of the outer surface of the wheel makes an acute angle with the direction of travel of the test piece, and this angle extends in opposite directions for each wheel. The position of the abrasive wheels relative to the centre of the turntable is shown in Figure 1.

The test piece is clamped to the turntable by means of a central threaded rod with a nut and washer. When testing thin test pieces, a ring clamp or double-sided adhesive tape is used to hold the test piece firmly on the turntable. The vertical distance from the centre of the pivot point of the hinged arms to the surface of the turntable is approximately 25 mm.

The turntable shall be flat and fixed to the drive shaft. When the turntable is rotated, no point on a 45 mm radius circle traced on its horizontal surface shall oscillate vertically through more than 0,05 mm about its mean position. The turntable shall have a nominal diameter of 100 mm and its speed of rotation shall be 72 rev/min when a 60 Hz power supply is used and 60 rev/min when a 50 Hz supply is used.

The two arms carrying the abrasive wheels shall be symmetrical and able to oscillate freely about a horizontal axis. The method of attaching the wheels, e.g. by means of ball-bearings, shall permit free rotation. In the test position, the mounting bosses shall be co-axial and positioned in such a way that the vertical projection of their common axis on to the plane of the turntable is 19,1 mm ± 0,1 mm from a parallel line passing through the axis of the turntable (see Figure 1).

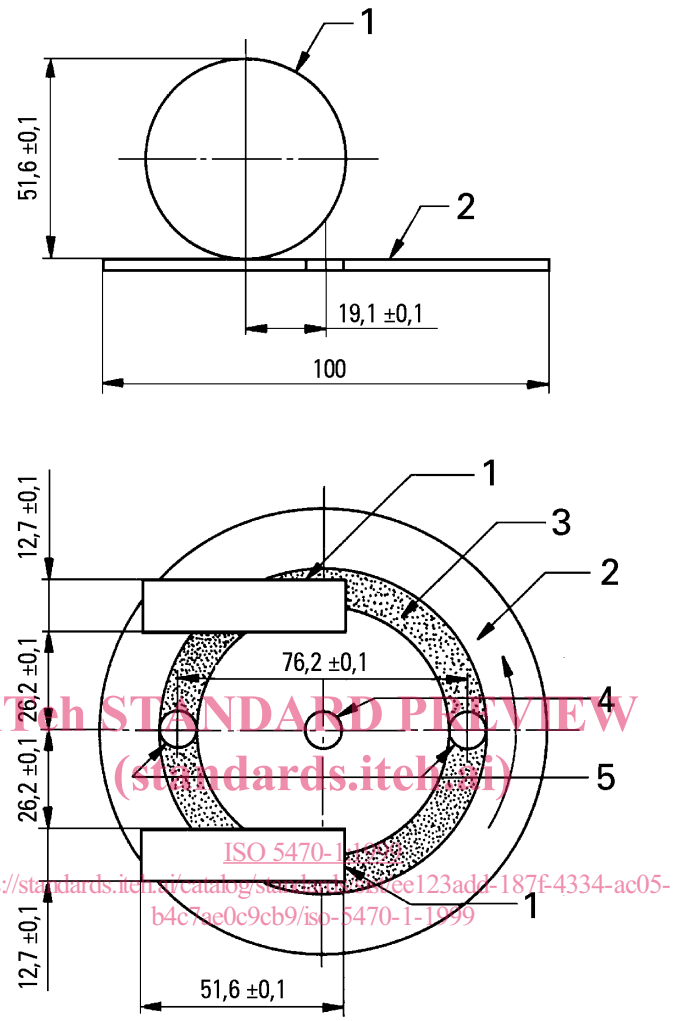
The distance between the inside face of each abrasive wheel and the centre point shall be 26,2 mm ± 0,1 mm.

Each arm shall be constructed in such a way as to permit a counterweight to be fitted to balance the mass of the arm against that of the abrasive wheel and to permit additional weights of known mass to be added (see 4.5).

NOTE 1 The arms should preferably be designed so that, without any counterweights or additional masses, each would exert a force of 2,5 N on the test piece.

NOTE 2 A rotating-turntable twin-wheel abrader of this kind can be used with a test piece approximately 114 mm in diameter having a central 6 mm diameter hole, thus making available a 54 mm wide test strip, although the wear zone (see Figure 1) is only approximately 13 mm to 14 mm wide (the width of the wheel plus the effect of the contact angle).

Dimensions in millimetres



Key

1 Abrasive wheels
2 Test piece, 114 mm ± 1 mm
3 Wear zone
4 Hole, ø 6,35 mm
5 Suction nozzles, ø 8 mm ± 0,5 mm

Figure 1 — Diagrammatic arrangement of apparatus

4.2 Abrasive wheels, containing an axial hole allowing them to be fitted without play to the mounting bosses in the arms. They shall consist of one of the following two alternatives:

a) An abrasive material (abrasive wheels). The thickness of the wheels shall be 12,7 mm ± 0,1 mm and their external diameter 51,6 mm ± 0,1 mm when new, but in no case less than 44,4 mm.

b) A metal disc with its peripheral surface clad with a 6 mm thick layer of vulcanized rubber of hardness 50 IRHD to 55 IRHD (International Rubber Hardness Degrees as defined in ISO 48) bonded without gaps or overlap to a

strip of abrasive paper or cloth of grade 180 silicon carbide complying with ISO 525, unless otherwise stated in the material or product specification. The abrasive wheel shall have a thickness of 12,7 mm ± 0,2 mm and a diameter of 51,6 mm ± 0,2 mm. The width of the abrasive paper shall be as specified in the relevant material or product specification.

Guidance in selecting suitable abrasive wheels is given in Table 1.

NOTE The abrasive power of the wheels may be determined, if requested, by the procedure given in annex A.

Table 1 — Abrasive-wheel selection chart

Designation of series	Wheel type	Composition	Recommended load range N	Abrasive action	Approximate grit size (number of abrasive particles per cm^2)
CS10	Resilient	Rubber and abrasive grain	4,9 to 9,8	Gentle	1420
CS10F	Resilient	Rubber and abrasive grain	2,5 to 4,9	Very gentle	1420
CS17	Resilient	Rubber and abrasive grain	4,9 to 9,8	Harsh	645
H10	Non-resilient	Vitrified	4,9 to 9,8	Coarse	1160
H18	Non-resilient	Vitrified	4,9 to 9,8	Medium coarse	1160
H22	Non-resilient	Vitrified	4,9 to 9,8	Very coarse	515
H38	Non-resilient	Vitrified	2,5; 4,9; 9,8	Very coarse, hard	5 755

NOTE Under normal conditions, the "CS" series wheels are used when testing flexible test pieces, and the "H" series when testing rigid test pieces.

4.3 Suction device, for removing the wear debris, including two suction nozzles above the test piece wear zone. One nozzle shall be located between the abrasive wheels and the other shall be located diametrically opposite (see Figure 1). The bore of each nozzle shall have an internal diameter of 8 mm ± 0,5 mm and its distance from the test piece shall be maintained at 1,5 mm ± 0,5 mm. A suction pressure of 2,5 kPa to 2,6 kPa is recommended to remove wear debris effectively.

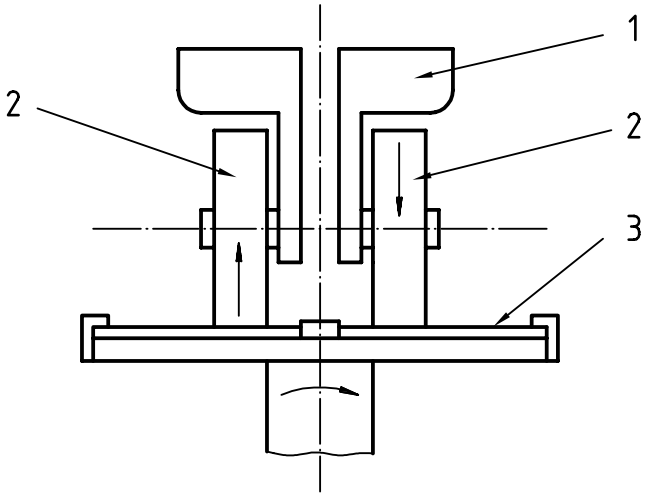
4.4 Standard zinc plates, for determining the abrasive power of the wheels, if required (see annex A).

4.5 Additional weights, for loading each abrasive wheel to the requirements of the relevant material or product specification.

4.6 Double-sided adhesive tape.

4.7 Balance, accurate to the nearest 1 mg.

4.8 Apparatus for re-facing the abrasive wheels, the design of the apparatus being such that re-dressed wheels are not out of static balance (see ISO 6103), that the whole of the wheel surface contacts the test piece and that contact is perpendicular to the test piece.



Key

1 Load
2 Abrasive wheels
3 Test piece

Figure 2 — Front elevation of abrasion machine

5 Test pieces

Cut from the sample of coated fabric, at non-adjacent positions distributed randomly throughout the sample, six test pieces each of diameter 114 mm ± 1 mm, with a central hole of diameter 6,35 mm.

6 Atmosphere for conditioning and testing

Condition the test pieces in accordance with ISO 2231.

If silicon carbide paper is used as the abradant rather than silicon carbide abrasive wheels, store the paper away from direct sunlight and away from heat in an atmosphere at approximately 20 °C and 50 % relative humidity, and condition for 1 h in accordance with ISO 2231 before use.

7 Procedure

7.1 Preparation and mounting of test pieces

Determine the mass of each test piece to the nearest 1 mg. Carefully apply to the reverse of each test piece double-sided adhesive tape, ensuring that wrinkles or creases are not introduced into the test piece or the adhesive tape and that the adhesive tape does not distort the test piece or cover the central hole.

Carefully mount a coated-fabric test piece on the turntable of the abrader and press in place evenly.

7.2 Preparation of abrasive surface

If silicon carbide abrasive wheels are used, re-dress them before every test and at intervals of 2000 cycles. Re-dress the wheels by traversing, across the face of each wheel, the tip of a diamond dressing tool so that a double traverse of the dressing tool (i.e. one forward and one backward movement) takes 25 s. Apply the minimum force necessary to the wheel with the dressing tool to ensure effective re-dressing. During this re-dressing operation, rotate the wheel at a speed of not less than 6 rev/min and not greater than 10 rev/min.