INTERNATIONAL STANDARD

ISO 20871

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Footwear — Test methods for outsoles — Abrasion resistance

Chaussures — Méthodes d'essai applicables aux semelles d'usure — Résistance à l'abrasion

Reference number
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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.

The main task of technical committees is to prepare International Standards. 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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 20871 was prepared by the European Committee for Standardization (as EN 12770:1999) and was adopted, under a special “fast-track procedure”, by Technical Committee ISO/TC 216, *Footwear* in parallel with its approval by the ISO member bodies.

Annex A of this International Standard is given for information only.

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 309 "Footwear", the secretariat of which is held by AENOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2000, and conflicting national standards shall be withdrawn at the latest by June 2000.

This standard is based on ISO 4649:1985 and it contains slight adaptions for the practice of footwear testing.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European standard specifies a method for the determination of the abrasion resistance for outsoles, irrespective of the material.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed herafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 12222	Footwear - Standard atmospheres for conditioning and testing of footwear and components for footwear.
prEN 13400:1998	Footwear - Sampling location of components for footwear.
ISO 2420	Leather - Determination of apparent density.
ISO 2781	Rubber vulcanized - Determination of density.
ISO 4649:1985	Rubber - Determination of abrasion resistance using a rotating cylindrical drum device.

3 Terms and definitions

For the purposes of this standard the following definitions apply:

3.1
abrasion resistance
the resistance to wear by mechanical action upon a surface

3.2
relative mass loss
the mass loss, in milligrams, of the outsole after being subjected to abrasion by an abrasive cloth will cause the appropriate standard rubber to lose a mass of 200 mg under the preferred conditions, namely a distance of 40 m, a load of 10 N and using a non-rotating test piece

3.3
relative volume loss
the volume loss, in cubic millimetres, of the test rubber after being subjected to abrasion by an abrasive cloth will cause the appropriate standard rubber (see clause B.1 of ISO 4649:1985) to lose a mass of 200 mg under the preferred conditions, namely a distance of 40 m, a load of 10 N and using a non-rotating test piece

4 Apparatus and materials

The following apparatus and material shall be used:

4.1 Abrasion machine

The test apparatus (see figure 1) consists of a laterally movable test piece holder and a rotatable cylindrical drum to which the abrasive cloth (4.2) is fixed.

The drum shall have a diameter of 150 mm ± 0,2 mm and a length of about 500 mm and shall be rotated at a frequency of 40 min^{-1} ± 1 min^{-1}, the directions of rotation being as indicated in figure 1.

The test piece holder shall consist of a cylindrical opening, the diameter of which can be adjusted from 15,5 mm to 16,3 mm, and a device for adjusting the length of the test piece protruding from the opening to 2 mm ± 0,2 mm. The holder shall be mounted on a swivel arm which in turn is attached to a sledge which can be moved laterally on a spindle. The lateral displacement of the holder shall be 4,20 mm ± 0,04 mm per revolution of the drum.

The centre axis of the holder shall have an inclination of 3º to the perpendicular in the direction of rotation (see figure 1), and shall be placed directly above the longitudinal axis of the drum to within ± 1 mm.

The swivel arm and test piece holder shall be free from vibration during operation, and disposed such that the test piece is pressed against the drum with a vertical force of 10 N ± 0,2 N obtained by adding weights to the top of the test piece holder.

The abrasive cloth shall be attached to the drum using three evenly spaced strips of double-sided adhesive tape extending along the complete length of the cylinder. Care shall be taken to ensure that the abrasive cloth is firmly held so as to present a uniform abrasive surface over the whole area of the cylinder. One of the strips shall be placed where the ends of the abrasive cloth meet. Ideally the ends should meet exactly, but any gap left between them shall not exceed 2 mm. The adhesive tape shall be about 50 mm wide and not more 0,2 mm thick.

Placement of the test piece on to the cloth at the beginning of a test run, and its removal after an abrasion run of 40 m (equivalent to 84 revolutions), shall be automatic. In special cases of very high volume loss of the test piece, an abrasion distance of only 20 m (equivalent to 42 revolutions) may be used. If using an abrasion distance of 20 m, a revolution counter or automatic stopping device should be connected to the drum.

To protect the abrasive cloth from damage by the test piece holder, a device for switching

off the apparatus just before the lower edge of the test piece holder touches the cloth is recommended.

4.2 Abrasive cloth

Abrasive cloth made with aluminium oxide of grain size 60, at least 400 mm wide, 473 mm long and 1 mm average thickness, shall be used as the abrasive medium.

This abrasive surface shall cause a mass loss between 180 mg and 220 mg for an abrasion distance of 40 m.

When each new sheet of cloth is first used, the direction of motion shall be indicated on the sheet, as it is important that the same direction be used for all subsequent test runs.

NOTE Suitable paper abrasive cloth is listed in annex A of ISO 4649:1985.

4.3 Hollow Drill

The specification for the hollow drill is given in detail in figure 2.

The frequency of rotation of the drill needs to be at least 1 000 min^{-1} for most outsoles materials.

4.4 Balance

The balance shall be of sufficient accuracy to enable the mass loss of a test piece to be determined to ± 1 mg.

4.5 Standard rubbers

Specifications for standard rubbers are given in detail in annex B (see clause B.1) of ISO 4649:1985.

5 Sampling and conditioning

The test pieces shall be cylindrical in shape, of diameter 16 mm ± 0,2 mm, with a minimum height of 6 mm. If test pieces of the required thickness are not available, the necessary thickness may be obtained by bonding a piece of the outsole to a base element of hardness not less than 80 IRHD. The thickness of this outsole should be not less than 2 mm.

Minimum three test pieces are necessary.

The test pieces to be tested shall be taken in accordance with prEN 13400:1998.

All test pieces shall be conditioned in accordance with EN 12222 before testing for a minimum of 24 h.

6 Test method

6.1 Procedure

Before each test, any rubber debris left on the abrasive cloth from a previous abrasion test shall be removed with a brush. A strong brush of about 55 mm diameter and about 70 mm length is recommended for this purpose. In some cases, a blank test with a standard rubber will effectively clean the abrasive cloth.

Weigh the test piece to the nearest 1 mg. Fix the test piece in the test piece holder in such a way that a length of 2,0 mm ± 0,2 mm protrudes from the opening. This length shall be controlled by means of a gauge.

The test piece shall be pressed against the drum with a vertical force of 10 N ± 0,2 N.

Move the test piece holder and sledge to the starting point, place the test piece on the abrasive cloth and set the cylinder in motion. Check for vibration in the test piece holder.This test method does not yield meaningful results if there is abnormal vibration in the test piece holder. The test run is stopped automatically after an abrasion distance of 40 m. For relatively large mass losses the test run may be stopped and the length of exposed test piece reset to 2,0 mm ± 0,2 mm so that the test can be restarted and completed.

The sample shall not be complete abraded at the end of the test (test sample carrier shall not be, or any part of it, in contact with the abradant paper). If it is, repete the test using a reduced distance, for example, 20 m or less if it is necessary and then extrapolate the results to 40 m (This shall be stated in the test report).

6.2 Determination of density

Determine the density of the test material in accordance with ISO 2781 or ISO 2420 as appropiate.

6.3 Comparison against standard rubbers

In this Standard, the test rubbers are compared against standard rubbers.

The mass loss of standard rubber shall be determined by carrying out a miniumum of three test runs both before and after each test series following the procedure in 6.1. There shall be a maximum of three test rubbers in each test series.

7 Expression of results

The relative mass loss in milligrams is given by the formula

$$M = \frac{m \times S_0}{S}$$

where

m is mass loss in milligrams

S_0 is value of nominal abrasive power (200 mg)

S is average abrasive power in milligrams

The relative volume loss in cubic millimetres is given by the formula

$$V = \frac{m \times S_0}{\rho \times S}$$

where

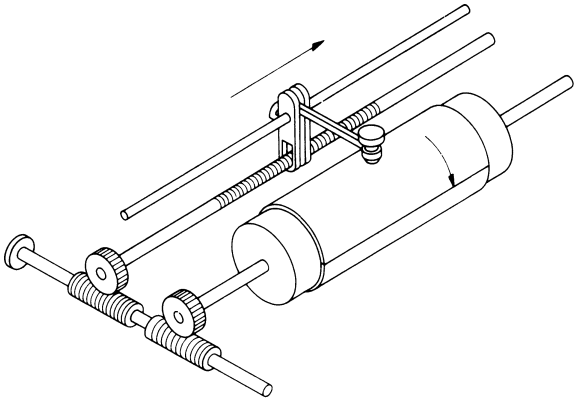
ρ is the density in mg/mm^3

The result will be the average of the three values.

8 Test Report

The test report shall include the following information:

a) results, expressed in accordance with clause 7;
b) full description of the samples tested including commercial styles, codes, colours, nature, etc.;
c) reference to this method of test;
d) any deviations from the test procedure, especially if the test run comprised only half the abrasion distance;
e) density;
f) date of testing;
g) any deviation from this test.



Dimensions in millimetres

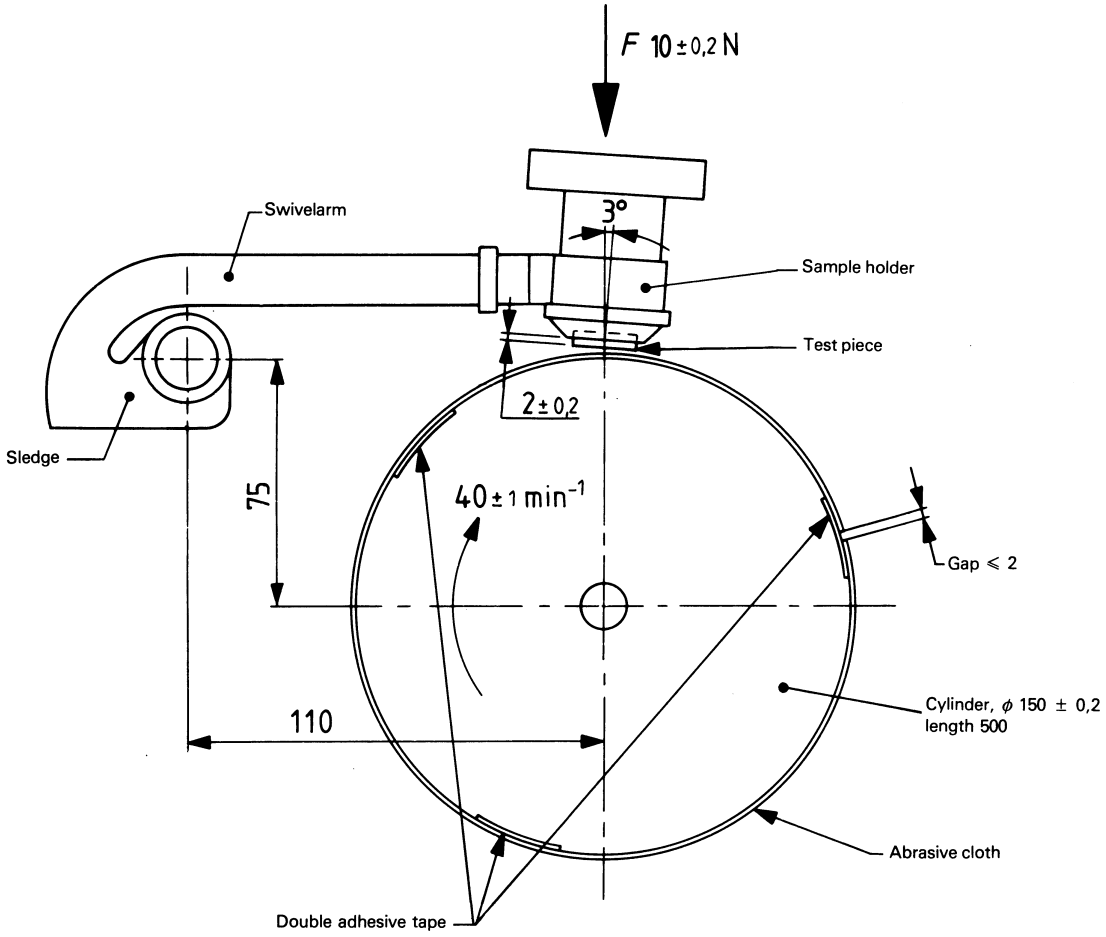


Figure 1 - Schematic illustration of apparatus

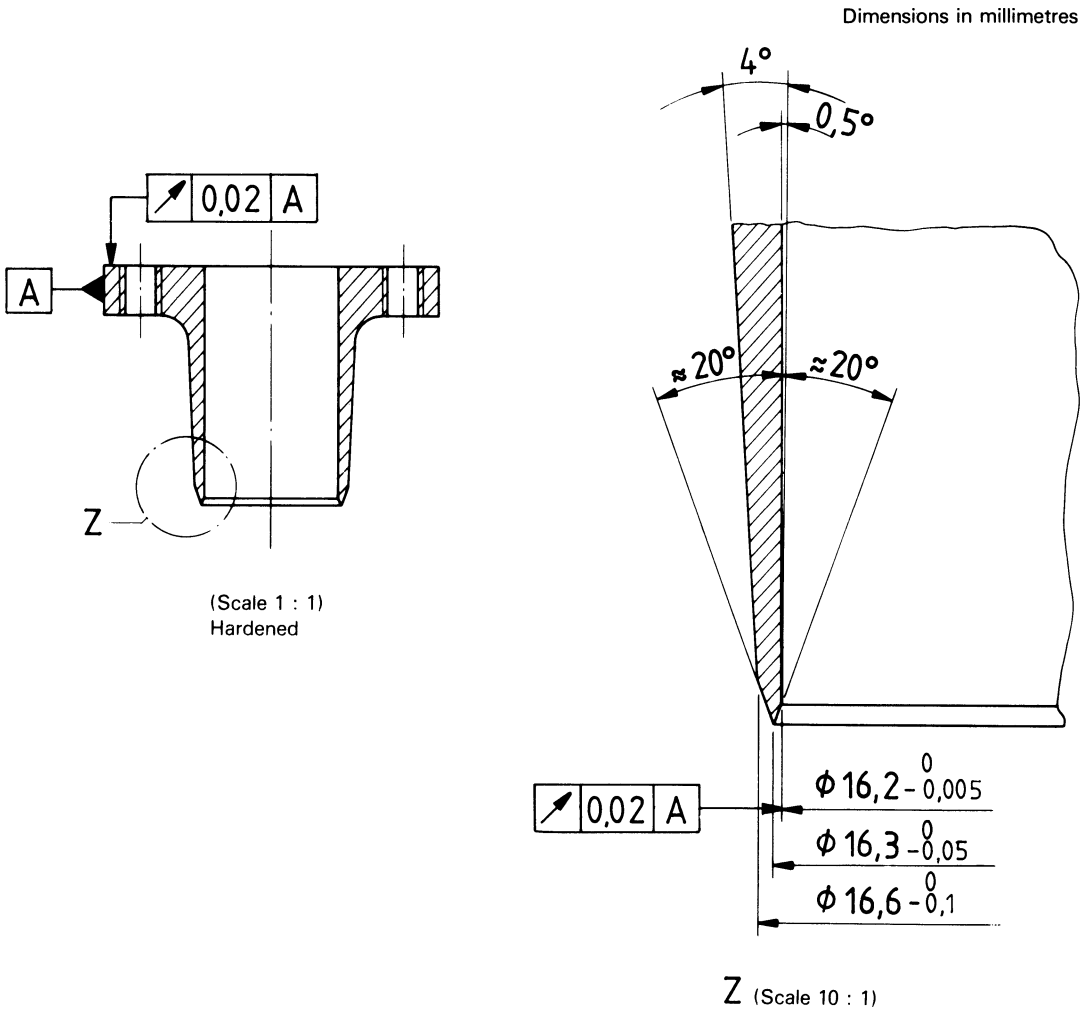


Figure 2 - Hollow drill for test piece preparation

Annex A
(informative)

List of International Standards identical to the European Standards referenced in Clause 2

European Standard	International Standard
EN 12222	ISO 18454
EN 13400 [1)]	ISO 17709 [1)]

1) To be published.

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