INTERNATIONAL STANDARD

ISO 22776

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Footwear — Test methods for accessories: Touch and close fasteners — Shear strength before and after repeated closing

Chaussures — Méthodes d'essai pour accessoires: fermetures auto-agrippantes — Résistance à la traction avant et après un usage répété

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Foreword

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

ISO 22776 was prepared by the European Committee for Standardization (CEN) in collaboration with Technical Committee ISO/TC 216, *Footwear*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

Throughout the text of this document, read "...this European Standard..." to mean "...this International Standard...".

Annex ZA provides a list of corresponding International and European Standards for which equivalents are not given in the text.

Contents

Foreword

This document (EN ISO 22776:2004) has been prepared by Technical Committee CEN/TC 309 "Footwear", the secretariat of which is held by AENOR, in collaboration with Technical Committee ISO/TC 216 "Footwear".

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of an identical text or by endorsement, at the latest by June 2005, and conflicting national standards shall be withdrawn at the latest by June 2005.

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

1 Scope

This document specifies a test method for determining the longitudinal shear strength of touch and close fasteners before and after repeated use.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 12222, *Footwear - Standard atmospheres for conditioning and testing of footwear and components for footwear*

EN 12240, *Touch and close fasteners — Determination of the overall and effective widths of tapes and the effective width of a closure*

EN ISO 7500-1, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system (ISO 7500-1:2004)*

3 Terms and definitions

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

3.1
longitudinal shear strength
maximum force per unit effective area required to separate the two tapes forming the specified closure in a shearing action under the specified conditions of test

3.2
effective width
width of the pile at 90° to the length of the tape and which does not include the selvedge

3.3
effective area of a closure
product of the effective width of a closure and the length of a closure

4 Principle

4.1 Shear strength

Mated component tapes of a touch and close fastener are separated at a constant rate along the closure in a direction parallel to the length of the tapes forming the closure and in the plane of the closure.

4.2 Shear strength after repeated opening and closing

A touch and close fastener is repeatedly opened and closed a standard number of times by a machine. The shear strength is then measured by repeating the test described in 4.1.

5 Apparatus

5.1 A **tensile testing machine** complying with the requirements of EN ISO 7500-1 to an accuracy corresponding to class 2, and with the following:

5.1.1 A jaw separation rate of 100 mm/min ± 10 mm/min.

5.1.2 The means of producing a continuous record of force throughout the test.

5.2 A **roller device** with a roller (see Figure 1) of diameter 100 mm ± 5 mm capable of applying a force of 1,0 N ± 0,1 N per millimetre width of the test specimen. This is to close the fastener under a standard pressure.

5.3 **Fork** with a handle (see Figure 2) which engages the roller (5.2) and allows it to be moved without any extra down force being applied (see Figure 3).

Dimensions in mm

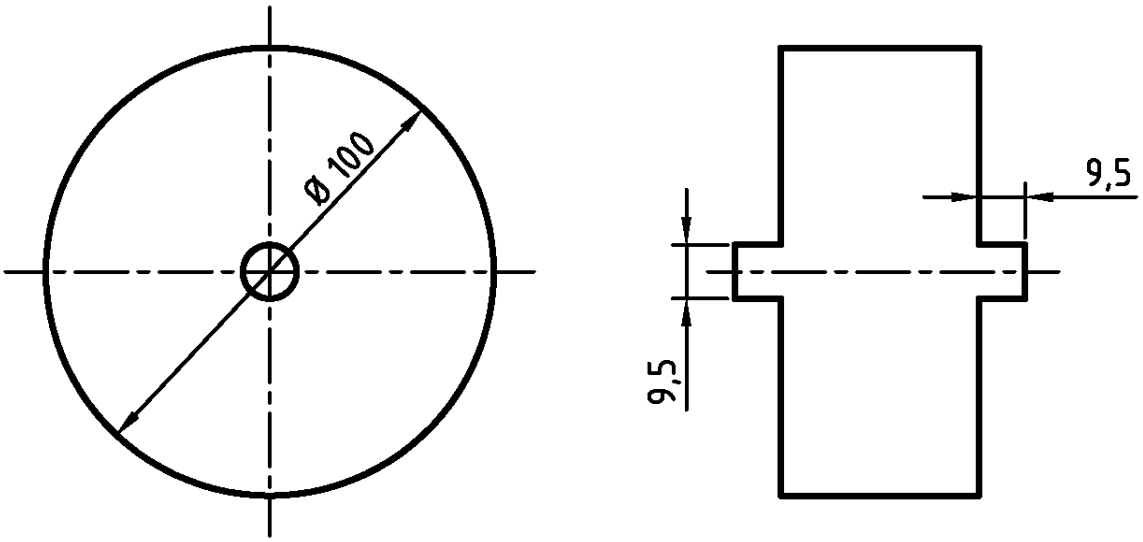
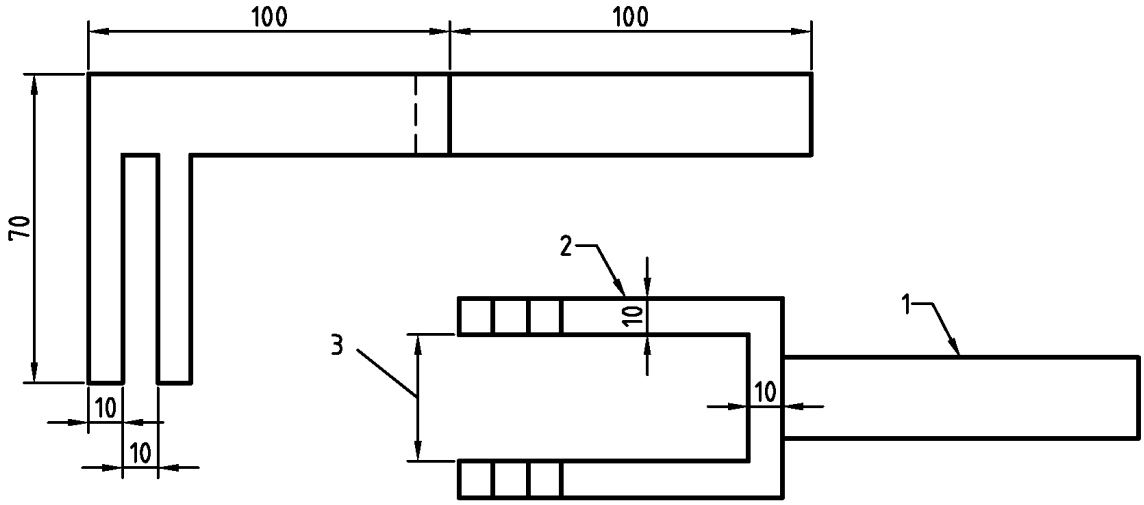


Figure 1 — Roller

Dimensions in mm



Key

1 Handle
2 Forks
3 Space between the forks to be 2 mm greater than the roller width

Figure 2 — Fork with a handle

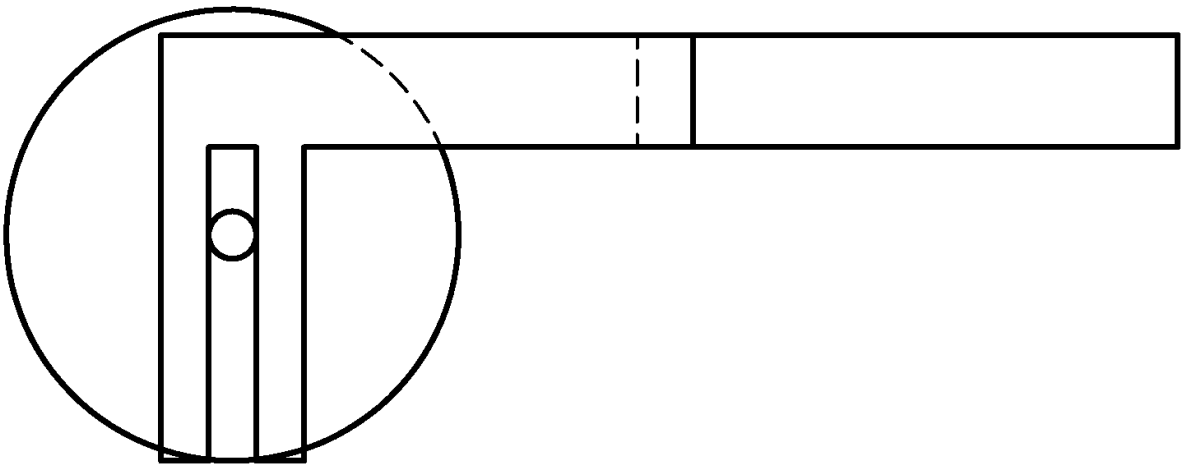


Figure 3 — Rolling mechanism for touch and close fasteners

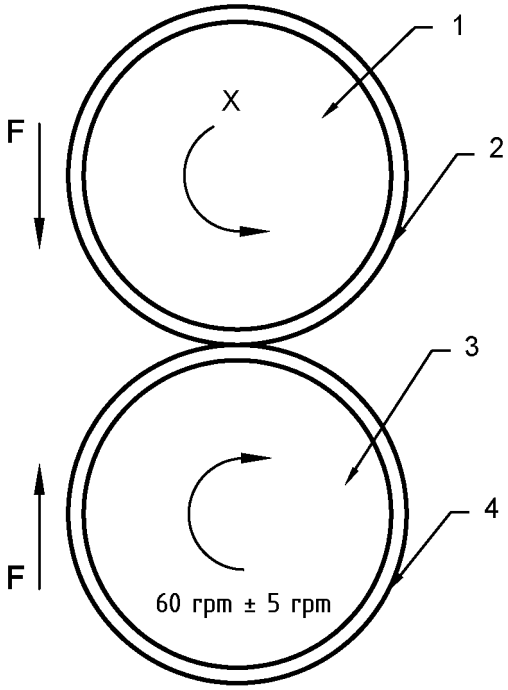
5.4 A **touch and close cycling machine** (see Figure 4) with:

5.4.1 Two circular drums of minimum width 70 mm, one of diameter 160,0 mm ± 0,5 mm and the other diameter 162,5 mm ± 0,5 mm. Each drum has a single slot of length 55 mm ± 2 mm across its width to hold the free ends of the specimen fastener. The drums are mounted next to each other with their axes parallel.

5.4.2 A means of rotating the smaller of the two drums at a rate of 60 rev/min ± 5 rev/min with the direction of rotation being reversed every 30 s ± 5 s. The larger of the two drums rotates freely and is driven by physical contact with the smaller drum via the test specimen.

5.4.3 A means of applying a force of 1,0 N ± 0,1 N between the two drums for every 1 mm width of the test specimen.

5.4.4 A method of counting the total number of rotations of the smaller of the two drums regardless of the direction of rotation.



Key

1 Idling drum (diameter 162.5 mm ± 0,5 mm)
2 Hook tape
3 Driven drum (diameter 160 mm ± 0,5 mm)
4 Loop tape
F Force between drums = 1 N × for every millimetre of effective width of fastener
X Drum

Figure 4 — Touch and close fastener cycling machine

6 Test specimens

6.1 Shear strength

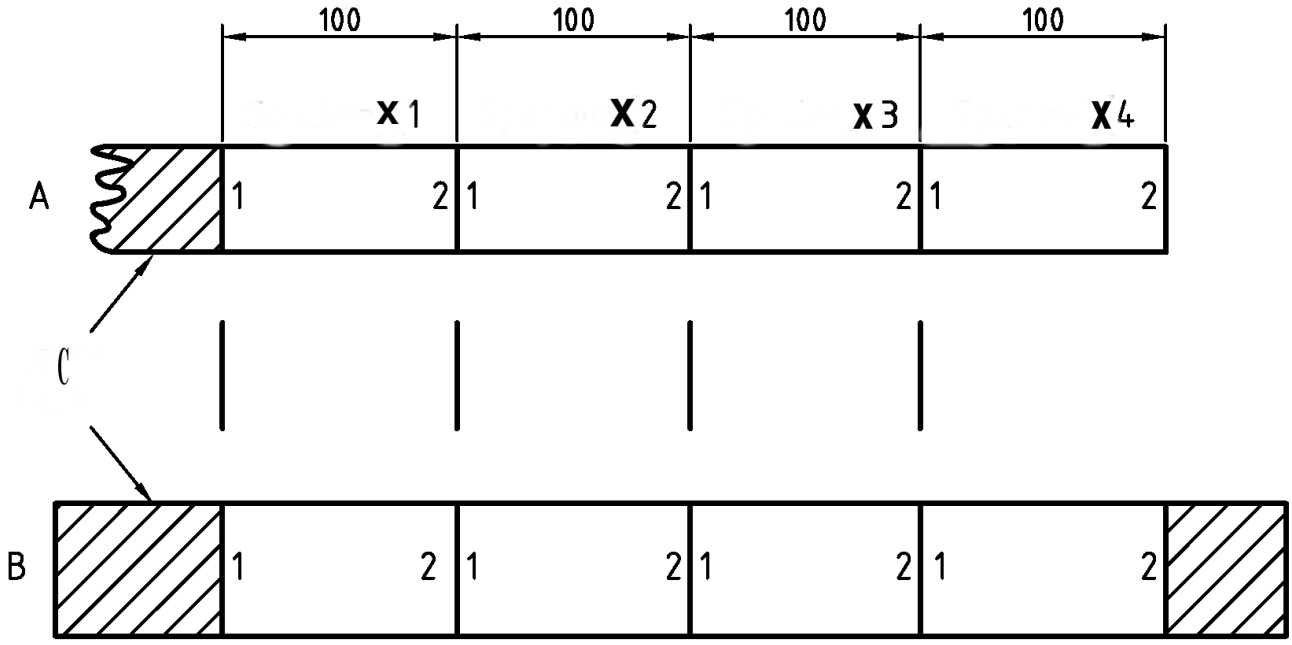
Cut four test specimens of both hook and loop components at least 100 mm long and mark each with a “1” at one end and a “2” at the other end (see Figure 5).

6.2 Shear strength after repeated opening and closing

6.2.1 Cut one piece of length 540 mm ± 10 mm from both the hook and loop tapes.

6.2.2 Mark four test specimens, each of length 100 mm ± 5 mm on the central portion of both tapes.

6.2.3 Mark each 100 mm test specimen section with a “1” at one end and a “2” at the other (see Figure 5). Do not cut the test specimens out at this stage.



Key

A Hook tape
B Loop tape
C Spare tape
X Specimen

Figure 5 — Marking and cutting of test specimens

7 Conditioning

The test specimens shall be conditioned in accordance with the standard atmosphere specified in EN 12222 for a minimum of 24 h prior to the test. The closing of the test specimens and the testing shall also take place under these conditions.

8 Procedure

8.1 Shear strength

8.1.1 Measure the effective width (3.2), W_e, of both a hook and loop tapes (see 6.1), according to EN 12240, to an accuracy of 0,5 mm and use the smaller of these two values as the width of all the assembled fasteners.

8.1.2 Assemble (in accordance with the combinations of closure shown in Figure 6) the test specimens (see 6.1) as follows:

8.1.2.1 Select the length of overlap, L_o, in accordance with the following:

— 50 mm for fastener systems (see Figure 6) comprised of woven hook tape and woven loop tape;

— 20 mm for fastener systems comprised of either woven or knitted mushroom tape and knitted loop tape;

— 20 mm for fastener systems comprised of a plastic hook tape and knitted loop tape;

— 50 mm for fastener systems not listed here above, but in the event that tensile failure occurs to either of the tapes during testing, the overlap should be reduced to 20 mm.

8.1.2.2 Place the hook tape on a flat surface with the pile uppermost and then place the loop tape on top with the pile facing downwards so that only the selected length of overlap together with the overall width make a closure, using minimal hand pressure.

8.1.3 Traverse the roller device (5.2) at a rate of approximately 200 mm/s along the tapes in one direction, then immediately traverse in the opposite direction, then turn the mating tapes over.

NOTE The tapes are turned over to minimise curvature.

8.1.4 Repeat the procedure until the roller has traversed the mating tapes five times in each direction, i.e. a total of ten times, taking care that:

- the centre of gravity of the roller does not deviate from the centre line of the tapes during this operation;

the roller covers the entire width of the mating tapes.

8.1.5 Conduct the test for each closure as follows:

8.1.5.1 Set up the tensile testing machine (5.1) such that the jaws are 100 mm apart.

8.1.5.2 Mount the combined test specimen (see 8.1) into the jaws of the tensile testing machine (5.1) such that the free end of the loop tape is in the upper jaw and the free end of the hook tape is in the lower jaw, taking care to align the test specimen in order that the force applied is uniformly distributed across the width of the closure.

8.1.5.3 Set the tensile machine in motion at a constant rate of jaw separation of 100 mm/min ± 10 mm/min. Record the maximum force against jaw separation, F_i, until either the closure has been separated or one of the tapes has undergone tensile failure. If failure occurs, record the mode of failure.

In the event that a tensile failure occurs, then the breaking force shall be considered as the force required to shear the closure.

8.2 Shear strength after repeated opening and closing

8.2.1 Measure the effective width of the fasteners by using the procedure in 8.1.1.

8.2.2 Attach the length of loop tape (see 6.2) round the circumference of the smaller drum (5.4.1) so that its backing surface is against the drum. Tuck the free ends of the tape into the slot in the drum.

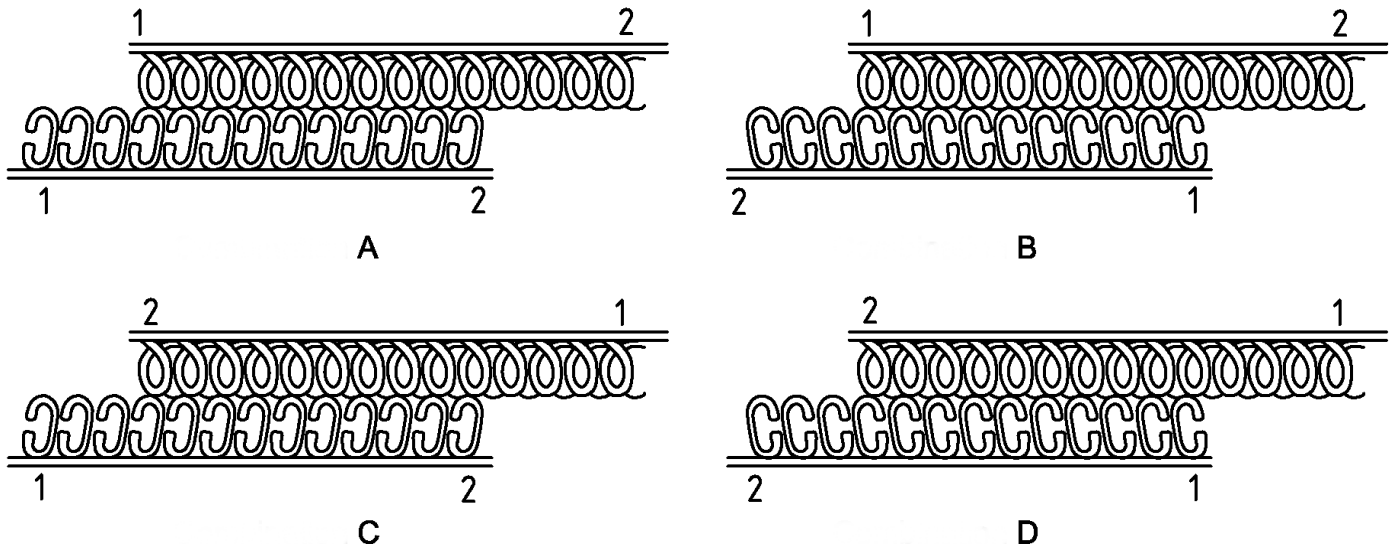
8.2.3 Attach the length of hook tape (6.2) round the circumference of the larger drum (5.4.1) so that its backing surface is against the drum. Tuck the free ends of the tape into the slot in the drum.

8.2.4 Bring the two drums together so that the hook and loop tapes are in contact with each other, and apply a force, in N, between the drums which is numerically equal to, or within 1 N of the effective width of the fastener, in mm.

8.2.5 Rotate the smaller drum at a speed of 60 rev/min ± 5 rev/min for 5 000 revolutions.

8.2.6 Remove both the hook and loop tapes from the drums and cut each tape into four test specimens as shown in Figure 5.

8.2.7 Carry out the procedure in 8.1.1 to 8.1.4 to assess the shear strength of the fasteners after repeated opening and closing.



Key

A Combination A
B Combination B
C Combination C
D Combination D

Figure 6 — Longitudinal shear strength combinations of closure

9 Calculation and expression of results

9.1 Shear strength

9.1.1 Calculate the effective area of closure, A_e, in cm^2, using the following equation:

$$A_e = \frac{L_o \times W_e}{100}$$

where

L_o is the length of overlap, in mm;

W_e is the effective width of the closure, in mm.

9.1.2 Calculate the longitudinal shear strength, S_i, in N/cm^2, using the following equation:

$$S_i = \frac{F_i}{A_e}$$

where

F_i is the maximum force required to shear a closure, in N;

A_e is the effective area of the closure, in cm^2.

9.1.3 Express the minimum and maximum longitudinal shear strength, in N/cm^2, of the closure of the four combinations and calculate the mean longitudinal shear strength, in N/cm^2, of the closure by calculating the arithmetic mean of the longitudinal shear strengths of the four combinations.

9.2 Shear strength after repeated opening and closing

Repeat the calculations in 9.1.1 to 9.1.3 for the fasteners subjected to repeated opening and closing.

10 Test report

The test report shall include the following information:

a) reference to this document, EN ISO 22776;

b) full identification of the touch and close fastener tapes, including commercial codes, colours, nature, etc.;

c) length of the overlap (for both the fasteners non subjected and subjected to repeated closing);

d) minimum and maximum longitudinal shear strengths for the four combinations and the mean longitudinal shear strength of the closure (for both the fasteners non subjected and subjected to repeated closing);

e) modes of failure (for both the fasteners non subjected and subjected to repeated closing);

f) any deviation from this test method and any incident which could affect the result;

g) date of testing.

Annex ZA
(normative)

Normative references to International publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE Where an International Publication has been modified by common modifications, indicated by (mod.), the relevant EN/HD applies.

Publication	Year	Title	EN	Year
ISO 7500-1	2004	Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system	EN ISO 7500-1	2004
ISO 18454	2001	Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear	EN 12222	1997

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