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Footwear — Test methods for heels — Heel pin holding strength

Chaussures — Méthodes d'essai relatives aux talons — Résistance à l'arrachement de pointe à talon

Reference number
ISO 19957:2004(E)

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Foreword

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ISO 19957 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...”.

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Foreword

This document (EN ISO 19957:2004) 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of an identical text or by endorsement, at the latest by March 2005, and conflicting national standards shall be withdrawn at the latest by March 2005.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 European Standard specifies a test method for measuring the force required to pull a single heel pin out of a heel. This test method can be used to measure the heel pin holding strength of heel materials by using a standard heel pin and a method of insertion, or it can be used to assess the heel nailing of commercial production.

This test method is applicable to testing plastics and wooden heels for women's footwear. Heels composed of layers of fibreboard or leather and low plastics heels for men's footwear cannot be tested by this method.

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 ISO 7500-1, *Metallic materials - Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines (ISO 7500-1:1999).*

3 Terms and definitions

For the purposes of this European Standard, the following term and definition apply.

heel pin holding strength
force required to pull a standard pin out of the heel material divided by the effective length of pin buttressing in the material, expressed as N/mm

4 Apparatus and material

4.1 The following apparatus and material shall be used:

4.2 Tensile testing machine complying with the requirements of EN ISO 7500-1 class 2, with a range of approximately 0 N to 2000 N and a constant rate of speed of 40 mm/min ± 10 mm/min.

NOTE A constant rate of traverse tester can be used if this is of a type where increase of load produces an appreciable movement of the load jaw (e.g. a pendulum tester). Its rate of traverse should be set to give on average the specified rate of loading over the whole range for zero jaw separation. This approximation to constant rate of loading is acceptable because the amount of jaw separation in the test is small before the maximum load is reached.

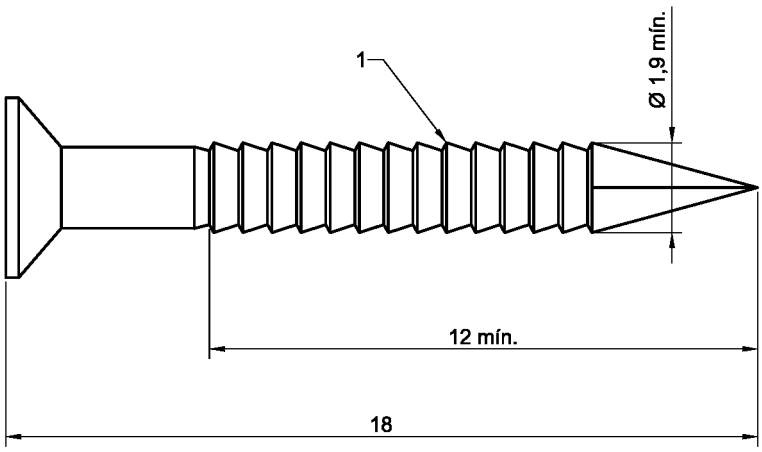
4.3 Small clamp or slotted hook, which can be attached to one jaw of the tensile testing machine via a flexible coupling.

4.4 Commercial heel nailing machine.

4.5 Standard heel pin (see Figure 1), with the following dimensions:

a) length:	18 mm ± 0,5 mm;
b) diameter over the buttress ridges:	1,9 mm, minimum;
c) number of complete formed buttress pressure flanks (the side of the buttress which is nearly at right angles to the pin shaft):	13 minimum;
d) distance from point to the base of the first fully formed buttress groove at the head end:	12 mm, minimum.

Dimensions in millimetres



Key

1 Minimum of 13 fully formed buttress flanks

Figure 1 — Standard heel pin

4.6 Metal rod

5 Sampling and conditioning

5.1 Number of test specimens

For assessing the heel pin holding properties of a heel material, prepare and test three heels each containing six inserted pins, or, if it is not possible to insert six pins, four heels each containing four pins. When testing heels already attached to shoes, where possible, also prepare three containing six pins or four containing four.

5.2 Preparation

5.2.1 To measure heel pin holding properties of heel materials. Cut from 2 mm thick cellulose insole forepart board three discs per heel of diameter about 45 mm. These take place of a single layer of insole seat board because they are easier to remove after pin insertion.

Use a stand on the heel nailing machine which will insert six pins in two rows of three (or four pins in two rows of two) so that the adjacent pins in a row are 10 mm apart.

Set the machine to insert a standard heel pin and load the stand with six (or four) of the standard heel pins. Position a stack of three fibreboard discs centrally over the heel pin positions of the heel stand with the heel inverted on top.

Adjust the machine to hold that shape of heel securely and operate it to insert the heel pins. If any of the heel pins do not pass through the cellulose board discs, discard the heel and prepare another heel.

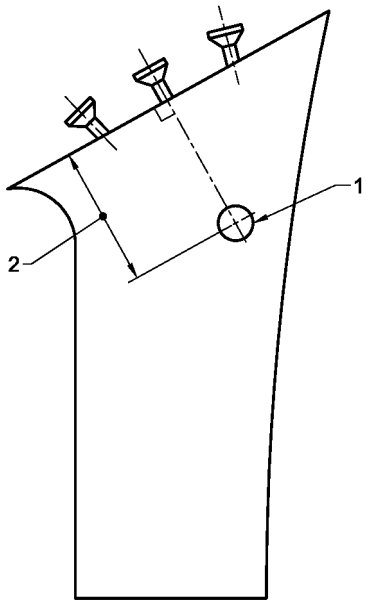
Remove the cellulose discs carefully one by one using pincers and a knife. The discs shall be cut to allow easy removal in those cases where they are not soft enough to be pulled over the heads of the heel pins without the pincers pressing on other heel pins. When all three discs are removed the length of pin not inserted (including the head) shall be between 5 mm and 8 mm. If it is outside these limits, reject the heel and prepare a new one with the machine adjusted to produce the desired depth of penetration.

5.2.2 To test a made shoe. Cut away the upper at the seat and waist level with the insole. Cut through the sole and insole forward of the shank, and the sole and lasted margin forward of the heel breast. The seat board is too

thick and rigid to be pulled off the heel pins in one piece, but it can be removed gradually by splitting it from the edge and removing it in layers.

NOTE If the heel is not made of wood, the seat board can be wetted if necessary to assist in producing delamination. If washers have been used with any of the heel pins, these can be left on as they do not affect the test.

5.2.3 Attachment to tensile testing machine. For heels prepared in the laboratory and those from shoes, drill through the heel horizontally, from side to side, at the position shown in Figure 2 (which illustrated a six pin heel) so that the hole is large enough to take a 2 mm rod. When the heel design is markedly undercut at the back, it may be necessary to drill the hole between 15 mm and 20 mm from the top of the heel (instead of the 20 mm to 25 mm shown in Figure 2) in order to ensure that the heel material between the hole and the back of the heel is strong enough to enable a test to be carried out. In such cases, record the distance of the hole from the top of the heel. In the case of a four pin heel, drill the hole to lie on the line which is perpendicular to the heel seat and midway between the two pins on one side. If the heel is reinforced with a metal dowel ensure that the drilled hole avoids it, by slight repositioning if necessary.



Key

1 Drilled hole to just clear ϕ 2 rod
2 20 mm to 25 mm

Figure 2 — Prepared heel

6 Test method

6.1 Principle

The head of a heel pin is held in one jaw of a tensile testing machine and the heel in the other and a pulling force is applied approximately parallel to the shaft of the pin. Then the maximum force needed to remove the pin is recorded.

6.2 Procedure

6.2.1 Anchor the heel by inserting a metal rod through the hole drilled in the heel and linking the ends of the rod symmetrically to one jaw of the tensile testing machine (4.2) with material of sufficient tensile strength that it will not break when the test is carried out.

NOTE In practice this can be achieved by inserting a rigid hole through the hole, attaching flexible linkages to the two ends of the rod, and clamping them to the jaw of the tensile testing machine, or by inserting a length of 2 mm welding rod through the hole, bending the ends down and clamping them to the jaw of the tensile testing machine.

6.2.2 Attach the clamp or slotted hook (4.3) to one heel pin head and attach it via a flexible linkage to the other jaw of the testing machine ensuring that the pulling force is approximately parallel to the shaft of the pin.

6.2.3 Run the machine at a constant rate of loading of 40 mm/min ± 10 mm/min and record the maximum value of the load applied in pulling the pin out of the heel. Number the test position on the heel and the result so that the two may be linked when examining all the results. Test the other five (or three) pins in that heel, and the other two (or three) heels in the same way.

6.2.4 Measure the depth of each hole by inserting a fine wire. Grip the wire at the level of the heel surface, withdraw it and measure the length of wire in the hole to the nearest 0,5 mm. Record the depth with the pull out rod.

6.2.5 Cut each heel in two with a vertical cut along the heel/toe centreline so that the plastics near the tips of the pin holes may be seen. If the heel is reinforced with a metal dowel, make two such cuts, one on each side of the dowel.

6.2.6 Inspect the pin holes. A pin is considered to have been incorrectly inserted if, after insertion, it terminated in a cavity in the heel or was close to a cavity wall. The pin is considered to have been close to a cavity wall when the shape of that cavity has been modified as a consequence of the presence of the pin (for example, if the pin was sufficiently close to the cavity wall that the pin did not enter the cavity but caused the plastics to bulge into the cavity).

Should there proves to be fewer than twelve individual valid results for correctly inserted pins, test further heels until at least twelve such results are obtained.

7 Expression of results

7.1 Heel pin holding strength of the heel material

The heel pin holding strength, h, in N/mm, is given by the equation:

$$h = F / d - 4$$

where

F is the maximum load recorded in pulling the pin from the heel, in N;

d is the measured depth of the hole, in mm.

NOTE The effective length of buttressing has been found to be 4 mm less than the measured penetration depth.

Calculate the heel pin holding strength for all pins which have been inserted correctly and record the average of these calculated values as the heel pin holding strength of the material.

7.2 Average depth of pin penetration

Calculate the average of the pin hole depth for all pins which have been inserted correctly.

7.3 Heel nailing of commercial production

If required, calculate the average pull out load for all pins which where inserted correctly and record this as the “average heel pin pull out load”.

NOTE This quantity can be regarded as the normal value when the heels are attached correctly.

List the type of pin and all the individual pull out loads for pins which where incorrectly inserted, with comments as to what was faulty about the insertion. In this way, by comparing them with the normal results, the weakening effect of incorrect pin insertion on the strength of attachment of the heel can be judged.

8 Test report

8.1 For heel pin holding strength the test report shall include the following information:

a) the heel pin holding strength, according to 7.1;

b) the average depth of pin penetration, according to 7.2;

c) the test material reference;

d) the reference to the method of test.

8.2 For assessment of heel nailing of commercial production, the test report shall include the following information:

a) the average heel pin pull out load, according to 7.3;

b) the average depth of pin penetration, according to 7.2;

c) the test batch reference;

d) the type of pin;

e) for incorrectly inserted pins, individual pull out loads (see 7.3) and comments on insertion faults of pins reported;

f) the position of the hole drilled through the heel in those cases where the location of the hole is nearer to the heel seat than the distance of 20 mm to 25 mm shown in Figure 2 (see 5.2.3);

g) the reference to the method of test.

ICS 61.060

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