INTERNATIONAL STANDARD

ISO 22650

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Footwear — Test methods for whole shoe — Heel attachment

Chaussures — Méthodes d'essai applicables à la chaussure entière — Fixation du talon

Reference number
ISO 22650:2002(E)

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Foreword

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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.

ISO 22650 was prepared by CEN (as EN 12785:2000) 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.

For the purposes of international standardization, a list of corresponding International and European Standards for which equivalents are not given in EN 12785 has been added as annex ZZ.

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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of an identical text or by endorsement, at the latest by August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

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 standard specifies a method for the determination of the heel attachment of footwear. It applies to woman's medium and high heeled footwear.

This test method measures three related wear properties:

- the rigidity of the shoe backpart during normal walking
- the amount of permanent deformation of the backpart caused by a fairly large force applied to the heel in a backward direction
- the force required to detach the heel.

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 hereafter. For dated references, subsequent amendments to, or revisions of, any of these publications apply to this European Standard only when incorporated into it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 10002-2 *Metallic materials – Tensile testing – Part 2: Verification of the force measuring system of the tensile testing machines.*

EN 12222 *Footwear – Standard atmospheres for conditioning and testing of footwear and components for footwear.*

3 Definitions

For the purposes of this standard the following definitions apply:

3.1
heel attachment strength
the maximum force in newtons measured under these testing condition required to detach the heel from the sole/insole assembly

3.2
rigidity
back part deformation measured under these test conditions under a force of 200 N

3.3
permanent deformation
the permanent set of the backpart measured under these test conditions at a force of 400 N

4 Apparatus and material

The following apparatus and material shall be used:

4.1 Tensile machine

The tensile-testing machine shall comply with the requirement of EN 10002-2 to an accuracy corresponding to grade B, with a constant rate of traverse of 100 mm/min ± 10 mm/min.

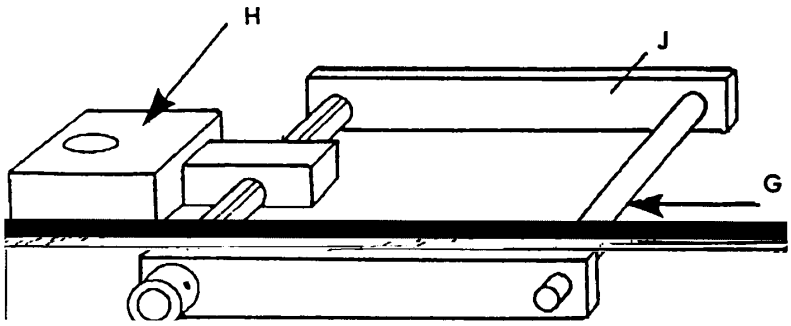
A low-inertia machine having autographic force recording facilities is essential.

4.2 Devices for attaching the shoe heel

Devices for attaching the shoe heel near its tip to the upper clamp attachment of the tensile testing machine so that the heel can pivot freely during the test. Different designs are needed for chunky and slender heels as described below.

4.2.1 Device for chunky heels

A suitable device is shown in figure 1. The 6 mm diameter rod G is removable and may be inserted through a 6 mm or 7 mm diameter pre-drilled hole in the heel as shown in figure 3. The block H at the opposite end of the device has a 13 mm diameter hole which enables it to be fitted directly to a tensile testing machine in place of the top clamp. Alternatively, where a tensile testing machine is being used which does not have removable clamps, the block H would be replaced by a part which can be gripped in the machine clamps.



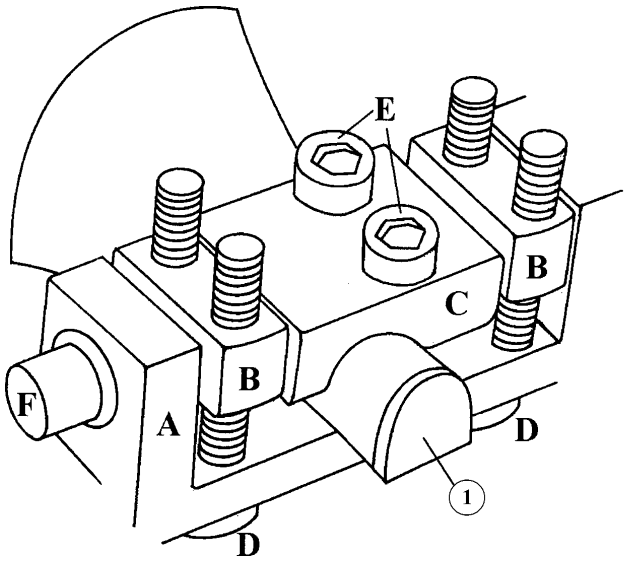
NOTE Rod G can be inserted through the hole drilled in chunky heels or removed and replaced by the clamp shown in figure 2 for testing slender heels.

Figure 1 – Type 1 device for providing the connecting link between the tensile testing machine and the heel stem

4.2.2 Clamp for slender heels

The device shown in figure 2 consists of a U-shaped part A which clamps against the front face of the heel (the heel breast), and parts B and C which clamp against the curved back of the heel.

The distance between parts B and A is adjustable to suit the heel tip dimensions, using the four screws D. Part C pivots in the two parts B, to allow for the tapering of most slender heels near their tip. The two screws E have pointed ends to dig into the heel and so prevent the clamp slipping. The clamp is 20 mm deep. At each end of part A are two spigots F of diameter 6 mm whose centres are 10 mm above the clamping face of part A and 10 mm from each edge. These spigots enable the clamp to be fitted into the connecting device shown in Figure 2 in place of rod G.



1 Top piece

NOTE This clamp may be fitted into the connecting link shown in figure 1 in place of the removable rod G.

Figure 2 – Type 2 pivoting clamp for the stems of slender heels

4.3. Dividers

Dividers which can be opened to measure a distance of about 100 mm. These are needed to measure the amount of movement of the heel tip during the test.

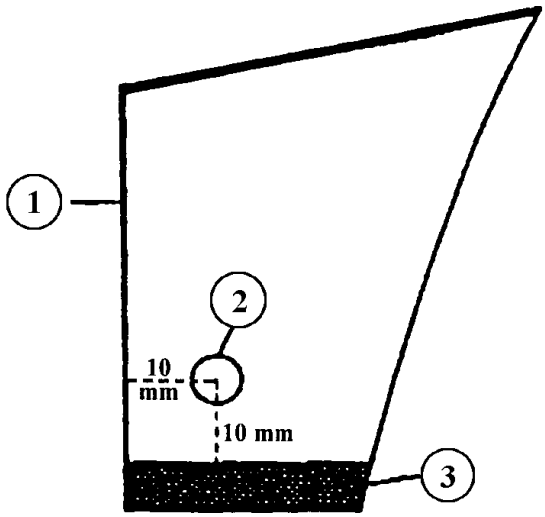
5 Sampling and conditioning

For most purposes it is not necessary to condition the footwear in a controlled atmosphere before testing it.

Cut off the shoe upper in the forepart level with the insole, so that the shoe bottom here is easier to fit into the clamping jaw of the tensile strength machine. Where the shoe upper construction includes a long stiffener in the waist region, make sure this is not cut. Leave the top piece, heel cover and heel breast flap, if used, intact. Should the shoe not have a top piece attached, it can still be tested.

In the case of chunky heels, which are too large to be fitted into a type 2 clamp, drill a 6 mm or 7 mm diameter hole in the position shown in figure 3 parallel to the heel breast and the heel/top piece interface, so that its centre is 10 mm from the heel breast and 10 mm above the heel/top piece interface. It is best to drill this hole from both sides inwards, as this increases its positional accuracy.

Minimum three test pieces are necessary



1 Heel breast
2 6 or 7 mm hole
3 Top piece

Figure 3 – **Horizontal hole drilled through a chunky heel for insertion of rod G (Figure 1)**

To fix the clamp for slender heels (figure 2) to the shoe heel proceed as follows. Retract the two screws E until their tips do not protrude through part C. Unscrew the four screws D until there is sufficient space between parts A and C to insert the heel stem. Position the heel so that its forward face is in contact with part A and the interface of heel and top piece is in line with the edge of part A (see figure 2). However, where this forward face is markedly curved, it is often better first to grind away some of the plastic near the top of the hell where it sit at the top part of the clamp. Tighten the four screws evenly until part C pivots to fit the back of the heel. Sometimes it is also better to grind away some of the back curve of the heel first so as to reduce the amount part C needs to be pivoted to fit it. This reduces the risk that the clamp might slip during the test when attached to a markedly tapering heel tip. Tighten the two screws E until their tips dig into the heel sufficiently to prevent the clamp being pulled off. The clamp will now be fixed to the heel as shown in figure 2.

6 Test method

6.1 Principle

The basis of the test is that the forepart of the shoe is clamped in one jaw of a tensile testing machine. The heel, near the top piece, is attached in a specified manner to the other jaw of the machine and pulled backwards from the forepart at a specified rate of jaw separation. A general purpose laboratory tensile testing machine with suitable attachments may be used.

The following three quantities are measured:

a) The amount of movement of the tip of the heel relative to the forepart at a force of 200 N.

NOTE 200 N is two or three times larger than the backward force which is applied to the heel during normal walking but the amount of deformation it produces in the test is believed to be a valid way of distinguishing between those shoes which have adequate backpart rigidity in wear and those which do not.

b) The amount of permanent deformation produced by a force of 400 N.

c) The force required to detach the heel completely. The mode of failure is also noted.

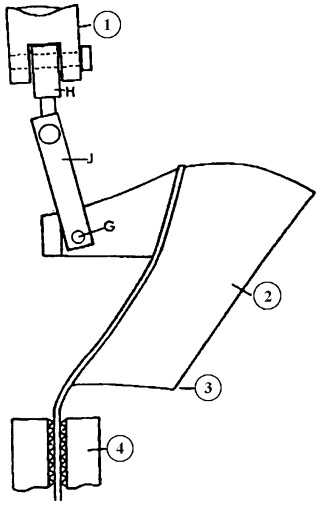
6.2 Procedure

Fit the device shown in figure 1 in place of the top clamp of the tensile testing machine or, where this cannot be done, clamp block H or its equivalent in this clamp. If necessary reset the force reading to zero, to allow for the mass of the device or for any difference in mass between the device and the clamp.

In the case of a shoe with a chunky heel which has been pre-drilled, as described under 'Preparation of the shoe for test'. partially withdraw rod G (figure 1) and insert it through the heel and then through the second bar J. Chunky heels fixed to the device in this way are shown in figures 4 and 5. Wherever possible fix the shoe so that the shoe bottom faces towards the operator.

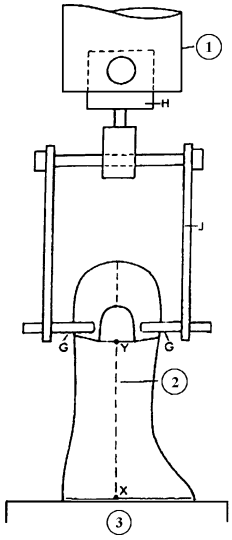
In the case of a shoe with a slender heel which has had the type 2 clamp shown in figure 2 attached to it, remove rod G from the connecting device and insert the clamp in its place as shown in figure 6.

Clamp the forepart of the shoe in the lower clamp of the tensile testing machine so that the shoe bottom faces outwards, the longitudinal axis of the shoe backpart coincides with the axis of the testing machine as viewed from the front, and the edge of the clamp grips the forepart a little forward of the end of the shank (see figure 5). (Note that the forepart will be not gripped centrally relative to its clamping jaw.) Check that the clamping operation has not produced any tension or compression in the load measuring system. If it has, move the cross-head just sufficiently to eliminate this.



1 Upper clamp attachment of tensile testing machine
2 Backpart of upper left on
3 Cut to remove upper in forepart
4 Lower clamp of tester

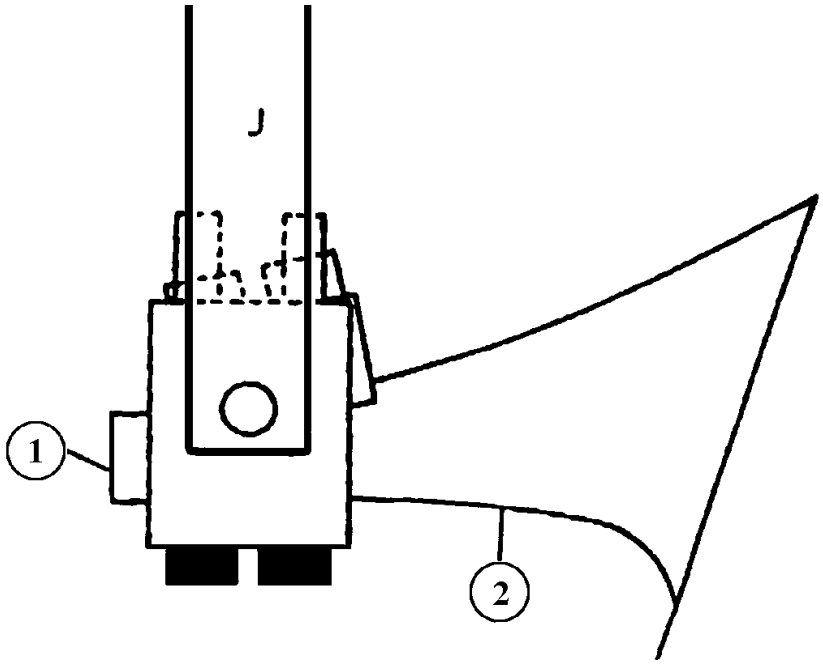
Figure 4 – Side view of shoe with chunky heel clamped in a tensile testing machine using the link shown in figure 1



1 Upper clamp attachment of tensile testing machine
2 Centre line of backpart
3 Lower clamp of tester

NOTE This figure shows how the centre line of the backpart is aligned with the centre line of the machine. The points X and Y for measuring heel deformation are marked.

Figure 5 – **Front view of shoe bottom with chunky heel attached clamped in a tensile testing machine using the link shown in figure 1**



1 Top piece
2 Heel breast

Figure 6 – **Side view of the clamp shown in figure 2 fixed to a slender heel and inserted in part J of the connecting link shown in figure 1**

Draw a line on the shoe bottom parallel to and a few millimetres away from the rear (top) edge of the forepart clamp. Mark the centre point of the line, i.e., the point where the longitudinal axis of the tensile testing machine crosses it. This is point X in figure 5. Using pointed dividers measure and record the distance between this point on the sole and the centre of the lower front edge of the top piece (point Y in figure 5) to the nearest half millimetre. Should it not be possible to measure to a reference mark on the sole, take the equivalent measurement between the centre of the edge of the forepart clamp and the centre of the lower front edge of the top piece. Should the shoe not have a top piece attached, take the reading to the centre of the lower front edge of the heel.

Operate the machine at a rate of jaw separation of 100 mm/min ± 10 mm/min. Stop the machine when a force of 200 N is reached. Immediately re-measure and record the distance between the front edge of the top piece (or heel) and the reference mark on the sole or the edge of the forepart clamp, without releasing the force.

Resume the deformation of the backpart without delay until a force of 400 N is reached. Reverse the tensile testing machine drive until the applied force drops to zero. Immediately re-measure and record the distance between the front edge of the top piece and the edge of the forepart clamp. Finally deform the backpart again until the heel becomes detached or some other failure occurs. Record the maximum load that was reached and the type of failure corresponding to this load.

In some cases when the shank is weak, untempered, or badly positioned, the backpart may bend a considerable amount at the front of the heel without the heel becoming detached. When this happens a high load will be reached without there being a maximum which can be measured. However, such shoes usually give an unsatisfactorily large amount of permanent set at the 400 N measurement, so normally there is no need to continue the test above 1000 N in an attempt to produce heel detachment or some other type of complete failure.

7 Expression of results

Calculate the backpart deformation under a force of 200 N by subtracting the initial measured heel/forepart distance in millimetres from the equivalent distance measured under a force of 200 N.

Calculate the permanent set of the backpart at a force of 400 N by subtracting the initial measured heel/forepart distance in millimetres, from the equivalent distance at zero force following the application and release of a force of 400 N.

Record, as the heel attachment strength of the footwear, the maximum force in newtons corresponding to failure of the heel attachment or backpart. Also record the mode of failure corresponding to the heel attachment strength.

Measure and record the heel height of the footwear, i.e., the vertical distance in millimetres between the top rear edge of the heel and the ground with the top piece flat on the ground. (Where the shoe has no top piece assume it would have been 6 mm thick).

8 Test report

The test report shall include the following information:

a) the heel attachment strength;
b) rigidity (the backpart deformation under a force of 200 N);
c) deformation (the permanent set of the backpart at a force of 400 N);
d) full description of the samples tested including commercial styles codes, colours, nature, etc.;
e) details of any deviation from the standard procedure;
f) date of testing.

Annex ZZ
(informative)

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

European Standard	International Standard
EN 10002-2:1991[1)]	ISO 7500-1:1999
EN 12222:1997	ISO 18454:2001
1) EN 10002-2:1991 has been cancelled and replaced by EN ISO 7500-1:1999 (ISO 7500-1:1999).	

ICS 61.060

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