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Footwear — Test methods for shanks — Longitudinal stiffness

Chaussures — Méthodes d'essai pour cambrions — Rigidité longitudinale

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 216, *Footwear*.

This second edition cancels and replaces the first edition (ISO 18896:2006), which has been technically revised.

Footwear — Test methods for shanks — Longitudinal stiffness

1 Scope

This document specifies a method for assessing the stiffness in the longitudinal direction of steel shanks used for the reinforcement of the waist region of women's shoes and of some men's and children's shoes.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 18454, *Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
longitudinal stiffness
stiffness in the longitudinal direction of shanks as determined by measuring the deflection of the shank under specified conditions when loaded with a specified force

4 Apparatus and materials

The following apparatus and material shall be used:

4.1 Suitable test machine for the determination of the stiffness in the longitudinal direction of steel shanks, with:

a) **A heel end clamp**, capable of clamping a fluted shank securely without crushing the flute and of dimensions such that 32 mm ± 1 mm of the shank are clamped.

   The angle of the clamp shall be capable of adjustment to ensure that the portion of shank to which a force is applied lies horizontal.

b) **A means of applying a downward force to the forward end of the shank**, of 2 N, 4 N, 6 N and 8 N with a tolerance of ±5 %.

c) **A means of measuring the vertical deflection of the shank at the point where the force is applied**, with an accuracy of ±0,025 mm.

4.2 Laboratory timer or similar, with an accuracy of ±0,1 s.

4.3 Callipers and/or a stainless steel rule, with an accuracy of ±0,5 mm.

5 Sampling and conditioning

The test specimen shall be a complete shank.

At least three specimens of each type of shank shall be tested.

Test specimens shall be conditioned for 48 h in a controlled atmosphere in accordance with ISO 18454 prior to testing.

Tests shall be carried out in a suitable conditioned atmosphere in accordance with ISO 18454. Where this is not possible, tests shall be carried out within 15 min of removing the test specimen from the conditioned atmosphere.

6 Test method

6.1 The shank is clamped at its heel end and bent as a cantilever beam by masses added at its forward end. The amount of bending is measured and used to calculate the flexural rigidity of the shank, a quantity which is a measure of stiffness and which is dependent on the metal of the shank and its cross section but not on its length.

6.2 With the underside of the shank uppermost (normally the fluted side), insert the heel end centrally in its clamp [4.1 a)] so that 32 mm of shank are clamped, with the end of the shank flush with the back of the clamp and the longitudinal axis of the shank perpendicular to the clamp edge. Tighten the clamp firmly to securely hold the shank.

6.3 Adjust the angle of the clamp so that the point of loading at the forward end of the shank is horizontal.

6.4 Place the displacement measuring device [4.1 b)] in position and adjust as necessary.

6.5 Smoothly apply a downward force of 2 N to the forward end of the shank with the centre of the load point being about 6 mm from the end of the shank.

NOTE For shanks for high heeled shoes, a point about 11 mm from the end of the shank can be used.

6.6 After 5 s measure the vertical deflection of the shank [4.1 c)] at the point of loading, a_1, to the nearest 0,01 mm.

6.7 Remove the force and replace it with the force of 4 N so that the time interval between the application of the first and second force is 10 s.

6.8 After 5 s measure the deflection, a_2, as in 6.3.

6.9 Repeat the procedure in 6.7 and 6.8 for forces of 6 N and 8 N giving deflection measurements a_3 and a_4 respectively. Check the correctness of these readings by checking that $a_4 - a_3$, $a_3 - a_2$ and $a_2 - a_1$ are approximately equal.

6.10 Remove the force from the shank and measure in mm the moment length of the shank from the front edge of the clamp to the centre point of the force application using the device described in 4.3.

6.11 Test two other shanks as described in 6.2 to 6.10.

7 Expression of results

7.1 The flexural rigidity, S, in kilonewtons square millimetre of the shank is given by the Formula (1):

$$S = \frac{FL^3}{3a} \times 10^3 \tag{1}$$

where

F is the load, in newtons;

a is the deflection produced, in millimetres;

L is the moment length, in millimetres.

Calculate the flexural rigidity of the shank from the experimentally determined values of F, a and L by substitution in the above formula.

Take F as being 2 N and obtain the most accurate estimate of the corresponding value of a from Formula (2):

$$a = \frac{1}{10}\left(3a_4 + a_3 - a_2 - 3a_1\right) \tag{2}$$

where

a is the deflection, in millimetres, produced per 2 N gravitational force;

a_4 is the deflection, in millimetres, produced by applying a 8 N force;

a_3 is the deflection, in millimetres, produced by applying a 6 N force;

a_2 is the deflection, in millimetres, produced by applying a 4 N force;

a_1 is the deflection, in millimetres, produced by applying a 2 N force.

7.2 Calculate the values for S, in kilonewtons square millimetres, for the three shanks separately and take the average. Record the result to the nearest kilonewtons square millimetres.

8 Test report

The test report shall include the following information:

a) a reference to this document, i.e. ISO 18896:2018;

b) results, expressed in accordance with Clause 7;

c) full description of the shank samples tested including commercial styles codes, colours, nature, etc.;

d) the number of test specimens if other than three;

e) any deviations from this standard test method;

f) date of testing.

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