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## Footwear — Test methods for uppers and lining — Flex resistance

*Chaussures — Méthodes d'essai pour les tiges et les doublures — Résistance à la flexion*

[Revision of first edition (ISO 17694:2003)]

ICS 61.060

### ISO/CEN PARALLEL PROCESSING

This draft has been developed within the European Committee for Standardization (CEN), and processed under the **CEN-lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five-month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

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ISO 17694 was prepared by Technical Committee ISO/TC 216, *Footwear*, Subcommittee SC , and by Technical Committee CEN/TC 309, *Footwear* in collaboration.

This second/third/... edition cancels and replaces the first/second/... edition (ISO 17694:2003, EN 12512:2001), [clause(s) / subclause(s) / table(s) / figure(s) / annex(es)] of which [has / have] been technically revised.

# DRAFT 2013

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# Footwear — Test methods for uppers and lining — Flex resistance

## 1 Scope

This Standard specifies a test method for determining the flex resistance of uppers and linings irrespective of the material, in order to assess the suitability for the end 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.

ISO 3696, *Water for analytical laboratory use — Specification and test methods*

ISO 5402-1:2011, *Determination of flex resistance — Part 1: Flexometer method*

ISO 17709<sup>1)</sup>, *Footwear — Sampling location, preparation and duration of conditioning of samples and test pieces*

ISO 18454<sup>2)</sup>, *Footwear — Standard atmospheres for conditioning and testing of footwear and components for footwear*

## 3 Short description

Test specimens are cut from a shoe vamp or from material for shoes, folded and inserted in the test machine. The test simulates the damage caused by the inward folding of the vamp of the upper but does not readily reproduce damage occurring on outward folds. It is carried out humid, dry or in a cold climate.

## 4 Term and definition

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

### 4.1

#### **flex resistance**

flex resistance is the resistance of a material to crack or otherwise fail at flexing creases

### 4.2

#### **surface**

surface is the visible site of the material during the use at the shoe

1) EN 13400 is equivalent to ISO 17709.

2) EN 12222 is equivalent to ISO 18454.

NOTE The visible site of the material can be by upper the grain site of the leather or the coated site of a coated textile, by lining the site of the material visible from the inside of the shoe.

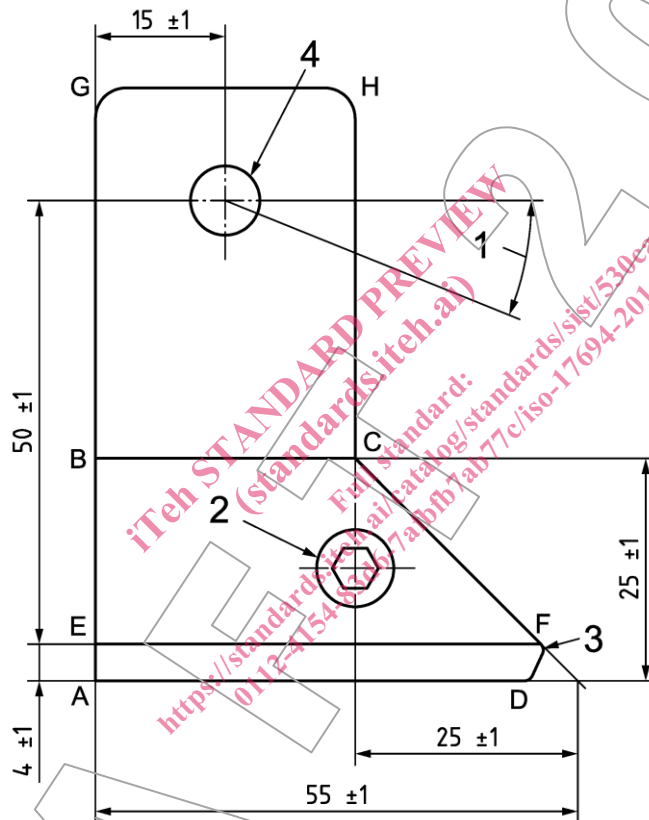
### 5 Apparatus and material

The following apparatus and material shall be used:

5.1 Test machine, in accordance with ISO 5402-1:2011 (4.1) including the following:

5.1.1 At least four pairs of clamps. The upper clamp consists of a pair of flat plates as shown in Figure 1.

The lower clamp is fixed and lies in the same vertical plane as the upper clamp.



**Key**

- 1 Flexing angle  $22^{\circ}30' \pm 0^{\circ}30'$
- 2 Clamp tightening screw
- 3 2 mm radius
- 4 horizontal axle

Figure 1 — Upper clamp dimensions

5.1.2 Means of applying a simple harmonic reciprocating action to repeatedly move the upper clamp through an angle of  $22^{\circ}30' \pm 0^{\circ}30'$ . The speed of oscillation shall be  $(100 \pm 5)$  cycles/min.

The distance between the upper and lower clamp, when the upper clamp is in the horizontal position, shall be  $(25 \pm 1)$  mm.

**5.1.3 Means of counting** the total number of cycles.

**5.2 Press knife** (70 ± 1) mm × (45 ± 1) mm or similar for cutting test specimens.

**5.3 Optical magnifier** with a magnification of approximately 4 – 6 times.

**5.4** For wetting test specimens:

**5.4.1 Glass dish**, minimum of 100 mm diameter and 25 mm depth.

**5.4.2 Distilled or deionised water** complying with Grade 3 of ISO 3696.

**5.4.3 Filter paper.**

**5.4.4 Desiccator** or another container, able to evacuate.

**5.4.5 Vacuum pump**, reducing the pressure within the desiccator at less than 4 kPa.

**5.7** For conducting cold tests, a **cabinet** capable of maintaining an internal atmospheric temperature of at least (-5 ± 2) °C and large enough to contain the test machine. If required, temperatures down to -30 °C can be used.

## 6 Sampling and conditioning

### 6.1 General

Cut out the required number (see Table 1) of rectangular test specimens with the press knife. Cut half the required number of test specimens with the longer edge parallel with the along direction of the material (backbone direction for leather and selvedge (warp) or machine direction for non-leather materials) and half perpendicular to this. For test specimens cut from uppers the along direction is the X axis as defined in ISO 17709.

For uppers, cut a test specimen from the centre of the forepart so that the centre of the test specimen aligns with the point of most flexing in the shoe.

For materials cut test specimens from a range of positions across the full usable width and length of the sheet material. For a material with a woven structure this shall prevent any two test specimens containing the same warp or weft threads.

It can be that it is impossible to cut a test specimen of sufficient size from certain types of footwear especially children's. The test specimen size may be reduced slightly at width only; the length (70 ± 1) mm shall not be reduced. However, it is preferred to test the materials themselves and if necessary introduce perforations or seams (or other design features) similar to that found in the forepart of the shoe.

**Table 1 — Standard test conditions and number of test specimens**

Type of material being tested	Testing conditions		
	Dry	Wet	Cold
Grain leather	2	2	-
Coated leather	2	2	2
Suede	-	2	-
Coated fabric	4	-	4
Fabric	4	-	-

**6.2 Dry Tests**

Place all the test specimens which will be tested dry in a standard controlled atmosphere complying with ISO 18454 for at least 24 h prior to test.

**6.3 Wet Tests**

Place any test specimens that are to be tested wet in a glass dish. Fill in distilled or deionised water until a minimum water depth of 10 mm. Place the glass dish in the desiccator. Reduce the pressure for 2 minutes under less the 4 kPa. The normal pressure has to be re-established after the 2 minutes. Repeat this process two times. Take the test specimens out of the desiccator and remove the rest of water with filter paper and start the wet tests immediate.

**6.4 Cold Tests**

The test machine shall be placed in a cold cabinet. Place the test specimens in the test machine. Close the cabinet and start the cooling until the desired temperature. The test shall start after 30 minutes in the cold atmosphere.

**7 Test method**

**7.1 Principle**

A rectangular test specimen is clamped in a flexing machine. One end of the test specimen is held in an upper clamp with the surface folded inwards so that these surfaces touch and the fold line is horizontal. It is then turned inside out and bent through 90° before being inserted in the lower clamp. In the lower clamp the test specimen is folded so that the reverse or flesh surface of the test specimen touch and the fold line is vertical.

During the test the clamps oscillate at a constant speed so that the test specimen is repeatedly flexed. The tests can be carried out with either wet or dry test specimens at room temperature, or dry test specimens at sub-zero temperatures. After a predetermined number of cycles the tests are stopped and the test specimen is visually examined for signs of damage or salt spue.

**7.2 Procedure**

Mark on the back of each test specimen the along direction of the material, e.g. with an arrow, and determine the required testing conditions. It should be noted that linings will be tested face down and uppers face up.

**7.2.1** Carry out the test in the conditioned standard atmosphere specified in ISO 18454.

**7.2.2** If conducting a wet test, use the prepared test specimen (6.3).



**7.2.3** If conducting a cold test, follow the instruction of 6.4 and start then the tests. Ensure that the atmosphere surrounding the flexing machine is at the required temperature [usually  $(-5 \pm 2) ^\circ\text{C}$ ].

**7.2.4** Load each test specimen as follows:

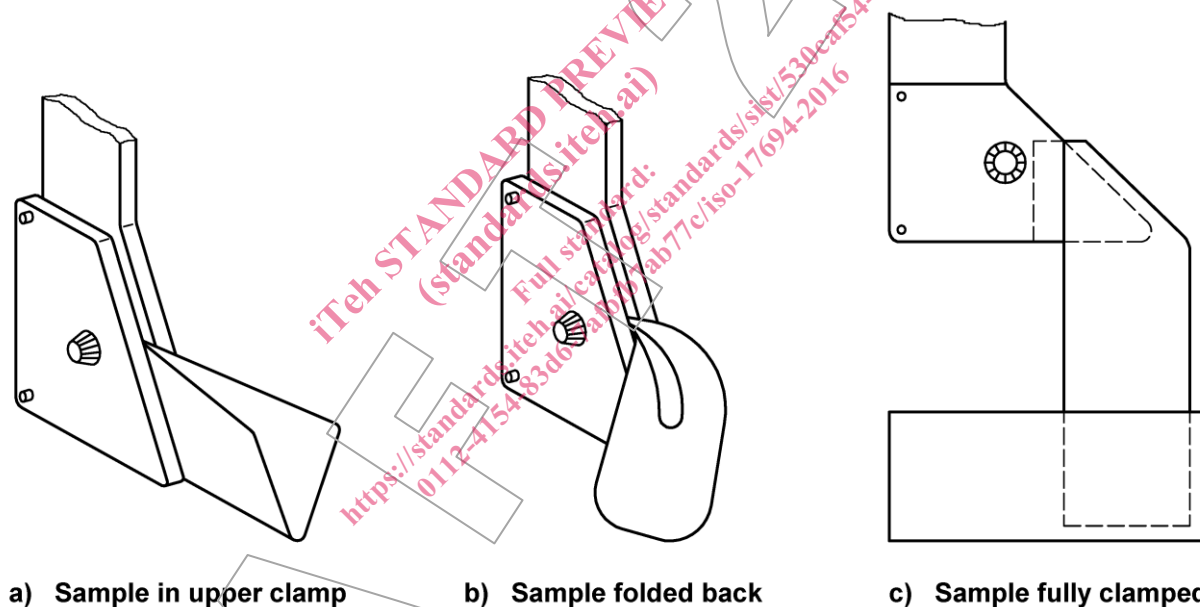
**7.2.4.1** Open the upper and the lower clamp up to the twice thickness of specimen, at least.

**7.2.4.2** Turn the motor as far as the lower edge of the upper clamp stands parallel to the upper edge of the fixed lower clamp.

**7.2.4.3** Fold the test specimen with the surface inwards, so that the two longer edges of the test specimen are brought together. Insert the folded test specimen with the fold edge against the stripe and the end of the test specimen against the stop of the clamp appropriate (See Figure 2a).

**7.2.4.4** Fold the free edges of the test specimen inside out and down round the upper clamp to bring the reverse or flesh sides of the material into contact (see Figure 2b).

**7.2.4.5** Insert the free end of the test specimen in the lower clamp, see Figure 2c. This part of the folded test specimen shall be placed vertical in the lower clamp. Tighten the plates of the lower clamp to hold the test specimen in place ensuring that the specimen is taut and there is no bagginess around the top clamp.



**Figure 2 — Loading of test specimens**

**7.2.5** Run the machine until the first inspection stage, see Table 2.

**7.2.6** In addition to the normal inspection stages wet test specimens shall be removed from the machine after every 5 000 cycles and assessed for salt spue before rewetting by repeating the procedure in 6.2.3.