# SVENSK STANDARD
# SS-EN ISO 16177:2012

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## Skodon – Härdighet mot sprickbildning – Belt flex-metod (ISO 16177:2012)

## Footwear – Resistance to crack initiation and growth – Belt flex method (ISO 16177:2012)

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN ISO 16177

October 2012

ICS 61.060

English Version

# Footwear - Resistance to crack initiation and growth - Belt flex method (ISO 16177:2012)

Chaussures - Résistance à la fissuration et à sa croissance - Méthode de flexion de la ceinture (ISO 16177:2012)

Schuhe - Beständigkeit gegen Risserzeugung und Risswachstum - Verfahren mit flexiblem Band (ISO 16177:2012)

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Ref. No. EN ISO 16177:2012: E

# Foreword

This document (EN ISO 16177:2012) 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of an identical text or by endorsement, at the latest by April 2013, and conflicting national standards shall be withdrawn at the latest by April 2013.

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# Footwear — Resistance to crack initiation and growth — Belt flex method

## 1 Scope

This International Standard specifies a test method for determining the resistance of a component or material to crack initiation and growth due to repeated flexing. The method is mainly applicable to outsoles of footwear but may also be used with certain other flexible components.

## 2 Apparatus and materials

**2.1 Flexing machine** with:

**2.1.1 Free wheeling, slightly crowned flexing roller**, with a width of (170 ± 20) mm and

— for high performance soles,

diameter at its centre (60,0 ± 0,5) mm,

diameter at its ends (57 ± 1) mm;

NOTE This roller will normally only be used for footwear which is expected to be subjected to abnormally high flexing demands.

— for typical sole units,

diameter at its centre (90,0 ± 0,5) mm,

diameter at its ends (87 ± 1) mm;

— for soles with a thickness greater than 15 mm,

diameter at its centre (120,0 ± 0,5) mm,

diameter at its ends (117 ± 1) mm.

**2.1.2 Driven, slightly crowned roller**, with a diameter of (225 ± 5) mm and a width of (170 ± 20) mm.

**2.1.3 Flexible continuous belt of cotton canvas** of length (1 930 ± 50) mm and width (140 ± 5) mm which passes over the two rollers (2.1.1) and (2.1.2). The cotton canvas is 2-ply 100 % cotton belting having a mass per unit area of (500 ± 25) g/m$^2$ and an extension at break along the belt of (14 ± 2) % at a breaking force of (2 000 ± 200) N. The corresponding across-the-belt values are (14 ± 2) % and (750 ± 50) N.

**2.1.4 Means of driving the larger roller** (2.1.2) at a speed of (247 ± 20) r/min so that the belt (2.1.3) completes (90 ± 8) flexing cycles per minute.

**2.1.5 Method of counting the number** of cycles completed by the belt (2.1.3).

**2.2 Polyurethane adhesive system** to bond the test specimen to the surface of the belt (2.1.3), consisting of:

**2.2.1 Pre-reacted PU adhesive**.

**2.2.2 Single-component PU adhesive**.

**2.3 Cutting device**, such as a sharp knife or scalpel, capable of cutting test specimens.

**2.4 Smooth-surfaced hand tool** for the application of localized pressure by a rubbing action.

NOTE A rapid acting platen press with the capability of applying a pressure of (500 ± 50) kPa over the whole area of the test specimen may be suitable for some types of sole specimen.

**2.5 Means of heating adhesive film**, for activating adhesive film or removing samples from the belt. This can be achieved by using a hot air gun or an oven set at 50 °C. Heat should be applied in short bursts to prevent partial melting of soles.

NOTE Commercial equipment for heat reactivating outsoles and uppers in production is suitable.

**2.6 Method of checking** that the temperature of the adhesive film is within the range between 80 °C and 90 °C. Heat sensitive crayons, such as Tempilstik[1)], are suitable, preferably with a melting temperature of 83 °C.

**2.7 Primers**.

**2.7.1 Vulcanized and thermoplastic rubber test specimens**. A halogenation primer for rubber will be necessary for producing satisfactory bonds.

**2.7.2 EVA test specimens**. An EVA primer will be necessary for producing satisfactory bonds.

**2.8 Device, such as a T square**, with an internal angle of (90 ± 1)°.

**2.9 Device for checking** whether the depth of a crack is greater than 1,5 mm. A thin strip of metal with a length scale or stepped thickness is suitable.

## 3 Principle

A test specimen is bonded with a strong adhesive to a continuous belt, which is driven around two rollers. The spacing and radius of the rollers is such that the test specimen is repeatedly subjected to a short period of rapid flexing followed by a longer period unflexed as the belt passes around the rollers, which simulates the wear conditions of a footwear outsole. The specimen is flexed for a fixed number of cycles and the number of cracks that form and their severity is recorded.

## 4 Preparation of test specimens

**4.1** If the test specimen has been moulded, then the time between moulding and testing should be at least 48 h.

**4.2** If the test specimen is an outsole attached to a made item of footwear:

— cut off the upper just above the level of the insole;

— remove the insole;

— scour or rough away the lasted margin of the upper, taking care not to damage the outsole;

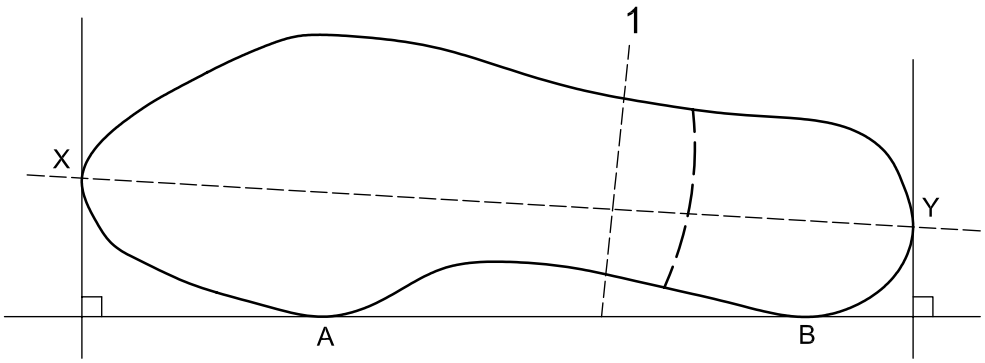
— check for the presence of a metallic penetration-resistant insert.

Do not use heat to soften the bond of the outsole to the upper as this may damage the outsole.

1) Tempilstik is an example of a suitable product available commercially. This information is given for the convenience of users of this International Standard and does not constitute an endorsement by ISO of this product.

**4.3** Mark the toe-heel centre line on the outer surface of the outsole as follows.

**4.3.1** Place the points A and B (see Figure 1) on the inside edge of the outsole against the longer edge of the T square (2.8) and the toe against the shorter edge.




**Key**

1 cut as described in 4.4

**Figure 1 — Marking and cutting of test specimen (see also Figure 42 of ISO 20344:2011)**

**4.3.2** Make a mark on the toe at the point that is in contact with the shorter edge of the T square.

**4.3.3** Repeat the procedure described in 4.3.1 and 4.3.2 for the heel of the test specimen.

**4.3.4** Mark a line between the point at the heel and the point at the toe, XY in Figure 1.

**4.4** Cut off the heel and part of the waist portion so as to leave 10mm to 20 mm length of the waist on the forepart (see Figure 1).

**4.5** If the edge of the forepart on the reverse side is cupped or includes any form of rand or imitation welt, scour this off until this surface is flat. Do not remove ribs in the central section of the outsole on the reverse side.

**4.6** For outsoles which are thicker than 15 mm, reduce the thickness to 15 mm before preparation in order to ensure reasonable flexibility. In such cases, it will be necessary to use the 120 mm diameter flexing roller (2.1.1). Outsoles containing a metal insert are also tested using the 120 mm roller.

NOTE To help prevent thick soles peeling from the belt during the test, it is acceptable to taper the thickness at the extreme ends of the specimen (toe and waist) by scouring material away from the outside surface for a length of not more than 2,5 cm from each end, which will alleviate the flexing stress on the bond.

**4.7** Prepare the reverse side of the forepart for bonding as follows.

**4.7.1** Cellular polyurethane outsoles: lightly scour the whole of the surface.

**4.7.2** Vulcanized and microcellular rubber: lightly scour the whole of the surface, then scrub it with a halogenation primer for rubber (2.7) using a stiff brush. Leave to dry for between 15 min and 8 h before applying any adhesive.

**4.7.3** Thermoplastic rubber: lightly coat the whole of the reverse surface with a halogenation primer for rubber (2.7) using a soft brush. Leave to dry for between 30 min and 8 h before applying any adhesive.

**4.7.4** Microcellular EVA: lightly scour the whole of the reverse surface, then coat it with an EVA primer (2.7) using a soft brush. Leave to dry for between 30 min and 8 h before applying any adhesive.