International Standard 6907

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Rubber footwear — Vulcanized resin rubber and vulcanized hard rubber soling materials — Specification

Articles chaussants en caoutchouc — Matériaux de semelles en caoutchouc vulcanisé aux résines et caoutchoucs vulcanisés durcis — Spécifications

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 6907 was developed by Technical Committee ISO/TC 45, *Rubber and rubber products*, and was circulated to the member bodies in September 1982.

It has been approved by the member bodies of the following countries:

Australia	France	Romania
Austria	Hungary	South Africa, Rep. of
Belgium	India	Spain
Canada	Korea, Dem. P. Rep. of	Sri Lanka
China	Mexico	Sweden
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The member bodies of the following countries expressed disapproval of the document on technical grounds:

United Kingdom
USA

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1 Scope and field of application

This International Standard specifies requirements for two grades of resin rubber and hard rubber soling materials, for soling without a heavy pattern, for use on footwear as follows :

— grade 1 : Men's footwear;

— grade 2 : Boy's, girl's and women's footwear; footwear for light use, such as indoor footwear, including slippers.

2 References

ISO 37, *Rubber, vulcanized — Determination of tensile stress-strain properties.*

ISO 48, *Vulcanized rubbers — Determination of hardness (Hardness between 30 and 85 IRHD).*

ISO 188, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 471, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

ISO 2781, *Rubber, vulcanized — Determination of density.*

3 Requirements

When tested by the methods of test indicated, the materials shall comply with the requirements given in the table.

Table

Property	Grade 1	Grade 2	Method of test
Density, Mg/m^3, max.	1,35	1,45	ISO 2781
Hardness, IRHD, min.	88	93	ISO 48
Tensile strength, in both directions, MPa, min.	7,5	6,5	ISO 37
Elongation at break, in both directions, %, min.	175	150	ISO 37
Elongation at break, after ageing for 168 h at 70 ± 1 °C, %, min.	145	120	ISO 37 and ISO 188
Cut growth 6 mm in both directions, kilocycles, at −5 ± 2 °C, min.	100	50	See the annex

Annex

Resistance to cut growth (flexing test)

A.1 Principle

This test gives a measure of the resistance of soling material to cracking resulting from flexing in wear. The material is repeatedly flexed through 90° over a mandrel after a small cut has been made right through it with a chisel. The rate of growth of this cut is a measure of the tendency of the material to crack.

A.2 Apparatus

A.2.1 Flexing machine[1] (Satra-Ross type), having a flexing mechanism as shown in figures 1a) and 1b).

The test piece A is inserted against the end stop of the flexing arm B and held by the clamp C in which length JK is 50 ± 5 mm. The other end of the test piece is not clamped but moves in and out between rollers D, E, F as the test piece is flexed. The flexing takes place round mandrel H which has a radius of curvature of 5,0 ± 0,3 mm.

The distance in plan between the vertical tangent to this mandrel through point G and the adjacent edge J of clamp C is 11,0 ± 0,5 mm. The chisel cut previously made in the test piece is positioned vertically above the edge of the mandrel when the test piece is in the unflexed position, i.e. at point G in figure 1.

The tops of rollers E and F and mandrel H are in the same horizontal plane and roller D is vertically above roller E. Except for this, the dimensions and positions of rollers D, E and F are not critical. A suitable diameter for rollers D and E is 25 mm and for roller F is 10 or 15 mm. A suitable distance in plan between the centres of rollers D and E and the centre of curvature of mandrel H is 30 mm, and between the centres of rollers D and E and the centre of roller F is 25 or 30 mm. The vertical position of roller D is adjustable so that the gap between this and roller E can accommodate test pieces of various thicknesses. A locking mechanism is provided to ensure that the gap cannot change during a test.

Roller F has two adjustable collars L. Their purpose is to help to position the unclamped end of the test piece during insertion in the apparatus, so that the test piece is at right-angles to the flexing mandrel in plan, and to guide it in that position during flexing. The difference between the internal and external diameter of each collar should be about 10 mm. For the standard test piece, the distance between the collars should be from 25,5 to 26,0 mm.

The frequency of flexing shall be 1,0 ± 0,1 Hz.

A.2.2 Piercing chisel, to produce the initial cut in the test pieces, as illustrated in figure 2. The cutting edge is 2 mm long but it is usual for the length of cut produced in the material to differ a little from this. The insertion of the cut in the correct position is made easier by holding the chisel in a cutting jig.

A.3 Preparation of test pieces

The standard test piece is 25 mm wide by 150 mm long, and the standard thickness is 2,5 ± 0,1 mm. Test three pieces from the soling material. Remove any pattern and reduce the thickness of the test pieces to a standard thickness by cutting and very light buffing of both sides of the test piece. Pierce each test piece approximately 60 mm from one end, so that the length of the cut is symmetrical across the centre line of the test piece. The chisel shall penetrate right through the test piece and protrude 15 mm on the other side.

A.4 Conditioning and temperature of test

Condition the test piece for 24 h at a standard laboratory temperature (see ISO 471) and test at a temperature of 23 ± 2 °C. The test shall not normally be carried out less than 7 days, or more than 3 months, after moulding.

A.5 Procedure

Make a preliminary check of the rate of flexing of the machine to ensure that it runs at the correct speed.

Measure and record the initial length of the cut in each test piece to an accuracy of 0,3 mm. This may most conveniently be done by using a magnifying eyepiece and scale with the test piece bent through 45° round a 15 mm diameter mandrel.

Turn the drive wheel of the flexing machine manually until the flexing arm B is horizontal. Raise the top roller D by slackening the knurled knobs which secure the top frame of the machine. Slacken each clamping plate C. Insert each test piece, wearing surface uppermost, from the back of the machine (the flexing arm B is assumed to be at the front) so that it passes between rollers D and E and then between the clamp C and flexing arm B and abuts against the end stop of B. Roller F and the flexing arm B are both recessed so as to assist in positioning the strip test pieces. Clamp C holds two test pieces, one on each side of the centre screw which fixes it to arm B. Check that the cut in each test piece is vertically above the edge of mandrel G, then tighten clamp C, making sure that it is parallel to the edge of the flexing arm. Should only one test piece be held in a particular clamp, insert a small piece of the same material in the recess on the other side of the clamp so that the surface of the clamp remains parallel to the surface of the flexing area when it is tightened. Screw down roller D so that it just

1) Details of sources of supply of commercially available equipment may be obtained from the Secretariat of ISO/TC 45 (BSI).

touches, but does not grip, the test piece. Lock this roller by tightening the wing-nut, which is on the same screw thread, against the frame of the machine.

NOTE — Flexing should commence immediately the test piece is mounted, since the test piece will always be at a higher running temperature than the ambient temperature because of heating by flexing, and it has been found better when the test temperature is less than the ambient temperature for example −5 °C, for the test piece to cool to this running temperature during the initial part of this test than for it to start colder, and then warm up.

After the flexing has been started, inspect the test pieces at frequent intervals (say every hour initially) for evidence of any increase in length of the initial cut, or of the new cracks forming.

To do this, remove all the test pieces, measure the crack lengths after bending through 45° round a 15 mm mandrel, and then replace all the test pieces as described under the initial loading procedure.

If for any reason flexing is discontinued, remove the test pieces from the machine.

Flexing should be continued until either

a) the initial cut has increased by 6 mm or more, or;

b) until the test pieces have flexed for the specified number of cycles without the initial cut increasing in length by 6 mm.

In case a), it is usually impossible to observe the number of flexes when the amount of cut growth is exactly 6 mm but it should be possible to make observations when it is a little less and a little more than this value. The number of flexes for 6 mm growth can then be obtained by interpolation either graphically or arithmetically.

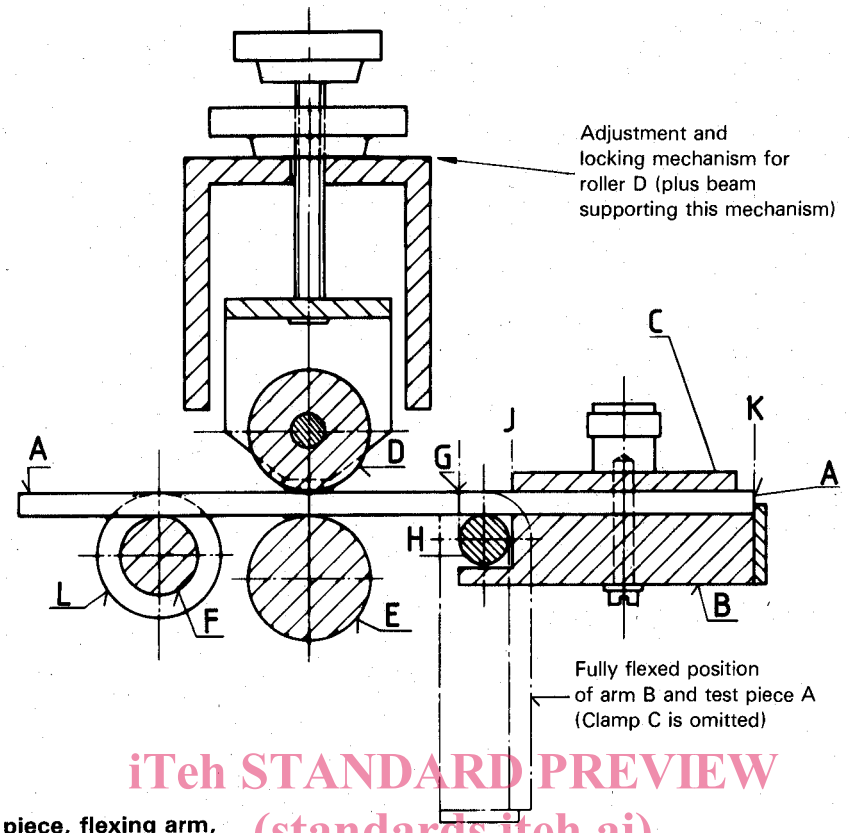
In case b), measure the length of the crack after the specified number of cycles and calculate the amount of cut growth.

A.6 Expression of results

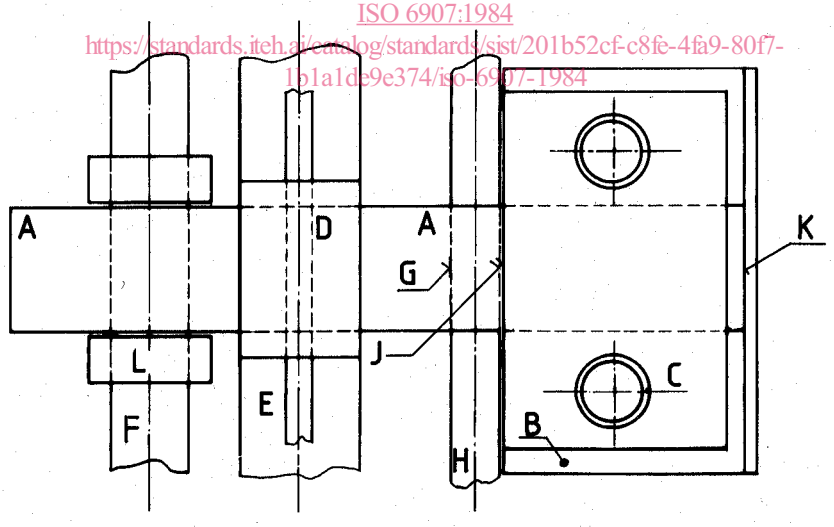
If the end point of the test is reached before the specified number of cycles, express the result as the number of cycles for the cut to increase in length by 6 mm.

If the test reached the specified number of cycles (i.e. the cut did not increase in length by 6 mm after this number of flexes), express the result as the increase in cut length after the specified number of cycles.

Record the temperature of test.



a) Side view of test piece, flexing arm, and guide rollers



b) Plan view of test piece, flexing arm and guide rollers

A Test piece
B Flexing arm
C Test piece clamp
D Adjustable upper guide roller
E Lower guide roller
F Rear guide roller
G Chisel cut inserted in test piece
H Mandrel round which test piece is flexed
J Edge of clamp C adjacent to cut G and mandrel H (J-G = 11 mm)
K Position of end of test piece (J-K = 50 mm)
L Positioning collar for test piece on roller F

NOTE — For clarity, the adjustment and locking mechanism for roller D [shown in figure 1a)] has been omitted.

Figure 1 — Flexing machine

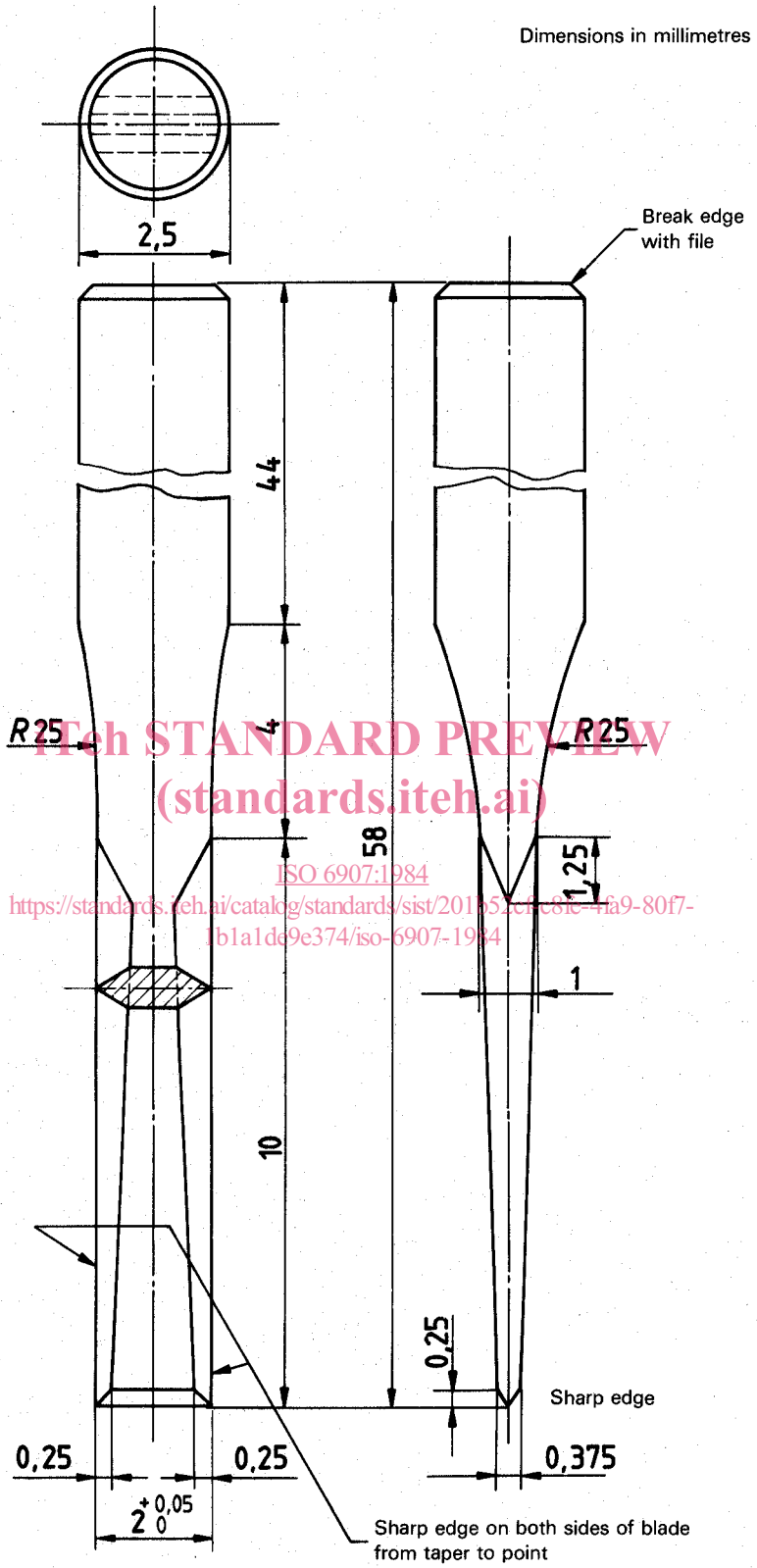


Figure 2 — Piercing chisel