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**INTERNATIONAL STANDARD**



**3378**

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INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

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## **Leather — Determination of resistance to grain cracking, and of crack index**

*Cuir — Détermination de la résistance de la fleur à la flexion et de l'indice de gerçure*

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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 3378 was drawn up by Technical Committee ISO/TC 120, *Leather*, and circulated to the Member Bodies in May 1974.

It has been approved by the Member Bodies of the following countries :

Australia	Germany	ISO 3378:1975	South Africa, Rep. of
Brazil	Hungary	<a href="https://standards.iteh.ai/catalog/standards/sist/9cbbacc4-7fa4-4407-8cda-dffbab2e45b8/iso-3378-1975">https://standards.iteh.ai/catalog/standards/sist/9cbbacc4-7fa4-4407-8cda-dffbab2e45b8/iso-3378-1975</a>	Spain
Bulgaria	India		Thailand
Canada	Iran		Turkey
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Egypt, Arab Rep. of	Poland		Yugoslavia
Ethiopia	Portugal		
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No Member Body expressed disapproval of the document.

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This International Standard is based on method IUP/12 of the International Union of Leather Technologists' and Chemists' Societies.

# Leather — Determination of resistance to grain cracking, and of crack index

## 1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for determining the resistance of leather to grain cracking and for determining the crack index.

This method is applicable particularly to heavy leathers.

## 2 REFERENCES

ISO 2419, *Leather — Conditioning of test pieces for physical tests.*

ISO 2589, *Leather — Physical testing — Measurement of thickness.*

## 3 PRINCIPLE

Bending of the leather, grain outwards, around a mandrel of known diameter and observation of whether the leather cracks, the forces applied to the leather in bending it being the lowest that are required to maintain the leather and mandrel in contact.

## 4 APPARATUS

4.1 The following apparatus is required :

4.1.1 **Clamp** or other device which rigidly holds one end of the test piece.

4.1.2 **Mandrel** of the appropriate diameter.

When the determination of crack index is required, the following set of numbered mandrels, having the diameters shown, is necessary :

Mandrel No :	Diameter mm
1	61,67 ± 0,03
2	35,00 ± 0,03
3	23,57 ± 0,03
4	17,22 ± 0,03
5	13,18 ± 0,03
6	10,38 ± 0,03
7	8,33 ± 0,03
8	6,76 ± 0,03

(See 8.1 and 8.2)

4.1.3 **Roller**, diameter 25 mm.

4.2 The mandrel and roller shall make contact with the flesh and the grain surface respectively of the middle portion of the test piece, across its full width. The axes of both the mandrel and the roller shall be perpendicular to the length of the test piece. The axis of the mandrel shall be fixed relative to the clamp and the axle of the roller shall be attached to a handle pivoted at the axis of the mandrel.

Figure 1 shows in plan view the relative positions of the clamp, the mandrel and the roller.

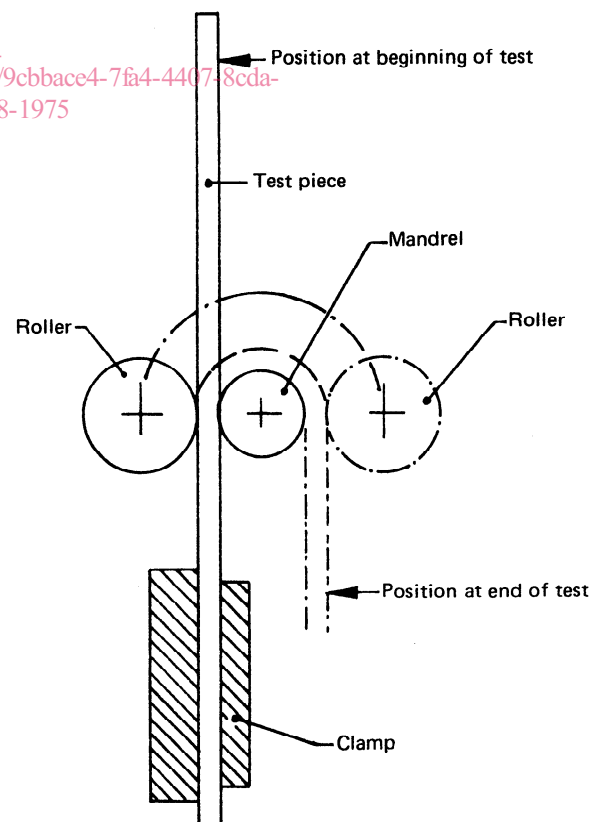


FIGURE 1 — Positions of clamp, mandrel and roller

4.3 A form of the apparatus that has been found convenient for the test is shown in figure 2.

It consists of a horizontal base plate to which is rigidly attached a shouldered spigot BC whose narrow part B has the same diameter as the smallest mandrel. The circular hole D in the handle H fits over C, which thus acts as a pivot. A mandrel E of the desired diameter fits over B. A roller F of diameter 25 mm is carried on a vertical axle fixed to the handle H in such a way that its distance from B can be set at any value desired. The test piece clamp A is attached to a slotted strip which allows its position to be varied relative to the base plate.

5 TEST PIECES

Prepare test pieces which are rectangles 25 mm in width, of the full thickness of the leather and at least 150 mm in length. Condition them in accordance with ISO 2419 and, when the crack index is required, measure their thickness to the nearest 0,01 mm in accordance with ISO 2589. It is

preferable that the test pieces be taken from the area close to the backbone.

NOTE — For some purposes it may be desirable to condition the leather and test it at temperatures or humidities other than those of the standard atmosphere. When this is done, the fact should be noted in the test report.

6 PROCEDURE

6.1 Adjustment of apparatus

If the apparatus described in 4.3 is used, position the test piece in the following way :

Clamp the test piece in A. Move clamp A along until the flesh surface of the leather touches the mandrel, and then tighten wing-nuts G.

Move the roller F along the handle (which is at right angles to the test piece) until the roller touches the grain surface of the leather. Lock its axle this distance from B.

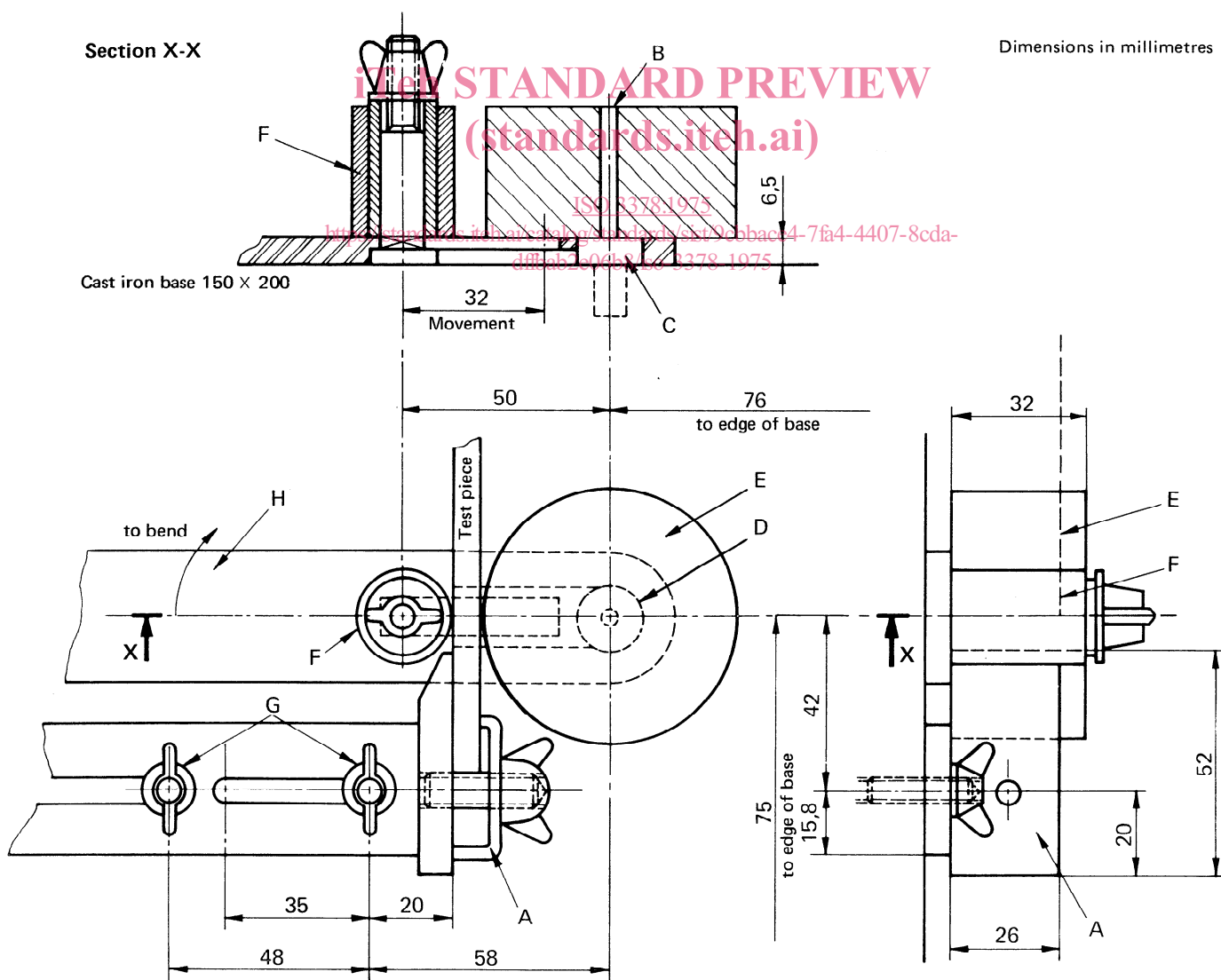


FIGURE 2 — Details of construction of the apparatus

**6.2 Resistance to cracking using a given mandrel**

**6.2.1** With the test piece in position, turn the handle through 180° in 5 ± 1 s, thus bending the test piece, grain outwards, around the mandrel. (If the apparatus described in 4.3 is used, do this by turning the handle through 180° about C as pivot, causing F to roll on the grain surface of the leather and bend it around E or B.)

During the bending, watch the grain to see whether cracking occurs.

**6.2.2** If the leather is to be tested on more than one mandrel, use the largest mandrel first, followed in order of decreasing size by the others.

**6.3 Determination of crack index**

**6.3.1** For some purposes it is merely necessary to decide whether a leather does or does not crack when bent round a mandrel of specified diameter, no account being taken of the thickness.

For other purposes it is desirable to take into account the thickness of the leather. The crack index is a measure of the tendency to crack which takes into account the thickness of the leather. It is determined as follows:

**6.3.2** Using each of the set of numbered mandrels in turn starting with No. 1, carry out the procedure described in 6.1 and in 6.2.1. Note the number of the largest mandrel which causes grain cracking.

**7.2** If determination of the crack index is carried out, multiply the number, *n*, of the largest mandrel on which the test piece cracks by the test piece thickness,  $\delta$ , to obtain the crack index,  $n\delta$ .

If the grain cracks when the leather is being bent round the largest mandrel of all, the crack index shall be expressed as "less than 1,5  $\delta$ " (not " $\delta$ "). If it fails to crack when bent round the smallest mandrel, the crack index shall be expressed as "greater than 8,5  $\delta$ " (not " $8\delta$ ").

**8 NOTES ON PROCEDURE**

**8.1** The diameters of the set of mandrels are so chosen that bending a leather 5 mm thick round them causes extensions of the grain of (5 *n* + 2,5 %), if the neutral axis of the leather is assumed to be midway between the grain and flesh surface in the bent test piece.

If such a leather does not crack on mandrel (*n* - 1), but cracks on mandrel *n*, it cracks when its percentage extension lies between 5(*n* - 1) + 2,5 and 5 *n* + 2,5 (that is, when the percentage extension lies between 5 *n* - 2,5 and 5 *n* + 2,5), so 5 *n* is an acceptable estimate of the percentage extension of the grain at crack.

For a leather 5 mm thick, however, 5 *n* is the crack index, so for this leather the crack index is equal to the estimated percentage extension of the grain when cracking occurs.

**8.2** For leather of thickness other than 5 mm the crack index,  $n\delta$  is not exactly equal to the percentage extension of the grain at crack, but it is a sufficiently close estimate of it for those mandrel sizes on which cracking is likely to occur in practice. The following table shows, for different leather thickness and mandrel on which the leather first cracks,

- a) the crack index;
- b) the percentage extension of the grain at crack, if this occurs midway between the extension given by the corresponding mandrel and that given by the next larger mandrel.

**7 EXPRESSION OF RESULTS**

**7.1** If determination of the resistance to cracking over a specified mandrel is carried out, express the result either as a pass or as a failure.

Mandrel No.	Thickness of leather, mm											
	3		4		5		6		7		8	
	a)	b)	a)	b)	a)	b)	a)	b)	a)	b)	a)	b)
1	3	—	4	—	5	—	6	—	7	—	8	—
2	6	6	8	8	10	10	12	12	14	13	16	15
3	9	10	12	12	15	15	18	17	21	20	24	22
4	12	13	16	17	20	20	24	23	28	26	32	29
5	15	17	20	21	25	25	30	29	35	32	40	35
6	18	20	24	26	30	30	36	34	42	37	48	41
7	21	24	28	30	35	35	42	39	49	43	56	46
8	24	29	32	35	40	40	48	44	56	48	64	52

## 9 TEST REPORT

The test report shall include the following particulars :

- a) a reference to this International Standard;
- b) if the leather has been tested over a mandrel (or mandrels) of specified diameter, whether or not cracking has occurred in each case;
- c) the crack index, if it has been determined;
- d) any deviation from the prescribed method (notably, conditioning of the test pieces);
- e) the reference of the lot;
- f) whether the test piece came from the whole hide, bend, shoulder or belly.

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