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## Leather — Measurement of leather surface — Using electronic techniques

*Cuir — Mesurage de la surface du cuir — Utilisation de techniques  
électroniques*

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

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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

ISO 19076/IUP 58 was prepared by the Physical Test Commission of the International Union of Leather Technologists and Chemists Societies (IUP Commission, IULTCS) in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 289, *Leather*, the secretariat of which is held by UNI, in accordance with the agreement on technical co-operation between ISO and CEN (Vienna Agreement).

IULTCS, originally formed in 1897, is a world-wide organization of professional leather societies to further the advancement of leather science and technology. IULTCS has three Commissions, which are responsible for establishing international methods for the sampling and testing of leather. ISO recognizes IULTCS as an international standardizing body for the preparation of test methods for leather.

## **Introduction**

Leather surface measuring equipment used within the European Union (EU) for legal metrology applications are also subject to the EU Directive, 2004/22/EC, on measuring instruments.

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# Leather — Measurement of leather surface — Using electronic techniques

## 1 Scope

This International Standard provides a method for the measurement of the surface of leather or leather parts by the use of electronic measuring machines.

It applies to the measurement of leather (or leather parts) fulfilling the following requirements:

- flexible leather, finished or unfinished, dry or wet leather;
- flexibility: such to allow full distension on the measuring line/surface.

NOTE For tanned and pressed wet leather, the parties involved agree on the conditioning type. In case of dispute, leather is to be conditioned according to the reference standard conditions in ISO 2419.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2419, *Leather — Physical and mechanical tests — Sample preparation and conditioning*

ISO 2588, *Leather — Sampling — Number of items for a gross sample*  
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EN 15987, *Leather — Terminology — Key definitions for the leather trade*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15987 and the following apply.

### 3.1

#### relative feed

<in non-static measuring machines> movement of relative translation between leather and the system detecting its presence

## 4 Principle

The leather surface is measured by means of a measuring device provided with a linear or rectangular array of uniformly-spaced electronic sensors, capable to detect leather presence and to integrate the relevant information (as a sum of elementary rectangular areas). Precision data are available in [Annex D](#).

## 5 Apparatus and materials

### 5.1 Measuring machine

#### 5.1.1 Machine design types

The measuring machines are built according to 4 basic types:

**Type A roller machines**, where leather passes in front of the sensor array under guidance of a series of free-rotating measuring rollers easing leather spread out by a light pressure on the sensor array, also incorporating the feeding systems.

**Type B conveyor machines**, where leather is transported under the sensor array by cables or belts mounted before and after the sensors themselves and substantially coplanar with them.

NOTE 1 This machine is more suitable for rigid leathers as the leather is transported on cables.

**Type C flatbed scanning machines**, with a horizontal plane surface (flatbed) where leather is laid flat, and a “portal-shaped” frame containing the sensors; the frame is manually or mechanically moved, over and parallel to the flatbed.

NOTE 2 This machine type is particularly used to measure the surface of small leathers or pieces of leather.

**Type D bi-dimensional static measuring devices**, based on the capture of a 2-dimension leather image along the normal direction to the leather plane.

### 5.1.2 Type A, B, and C measuring machines

The measuring machine consists at least of:

- a base frame;
- a relative feed system between leather and measuring system;
- a set of sensors (sensor array) uniformly spaced along a direction normal to the feeding movement, to detect leather presence;
- a processing system to integrate signals coming from the sensors array and from the feeding movement sensing, as shown in [Clause 4](#);
- a numerical indicator (display) of the leather surface measure, in metric units, with 0,1 dm<sup>2</sup> resolution with respect to the measured value. As an option, the machine may be equipped with a stamping or printing system to record the surface measured value onto leather or onto a label.

The distance  $i$  between two adjacent sensors for the detection of leather presence shall not be greater than 27 mm across the feeding direction.

Let  $p$  be the step of the leather presence detection along the feeding direction: the values of  $i$  and  $p$  shall be such that their product  $i \cdot p$  is not greater than 1/400 of the minimum measureable surface.

The feeding speed shall allow leather to spread out adequately during measurement.

NOTE 1 The machine is equipped with a feeding speed adjustment device to aid the fulfilment of this condition.

NOTE 2 In Type A and Type B machines the feeding speed can affect the spread out of the leather and consequently the measuring uncertainty.

If the machine allows temporary feeding stop (e.g. by manual holding) during measurement, this shall not significantly alter the measuring value.

Any feeding inversion, even partial and/or temporary, shall automatically cancel the measure, unless the measuring system allows for the inversion in the area calculation. Such information shall be checked in the instruction manual provided by the machine manufacturer.

### 5.1.3 Type D measuring machine

The measuring machine consists at least of:

- a base frame;
- a plane surface to spread and support leather;



- a bi-dimensional image capturing system, with its optical axis normal to the leather surface;
- a system for image processing and leather surface calculation.

The leather surface corresponding to the elementary area measuring unit (pixel) shall not be greater than 1/400 of the minimum measured surface.

**EXAMPLE** If the image capturing system is able to transfer a (2 m × 2 m) area into a (512 × 512) pixels array, the surface corresponding to 1 pixel (elementary area) is:

$$(2 \text{ m}/512) \times (2 \text{ m}/512) = 0,15 \text{ cm}^2$$

The minimum measurable surface is therefore:

$$400 \times 0,15 \text{ cm}^2 = 60 \text{ cm}^2 = 0,60 \text{ dm}^2.$$

## 5.2 Reference calibrated templates for machine verification

Calibrated templates complying with [Annex A](#) requirements, such that the area of the calibrated template is not less than 50 % of the area of the measured leather, or 1,4 m<sup>2</sup>, whichever is smaller.

## 6 Sampling and conditioning

**6.1** Batch sampling shall be according to ISO 2588, unless there is a different agreement between the parties. Label and identify each leather piece making up the batch.

**6.2** For dry leather, spread out or hang leathers in a standard atmosphere according to ISO 2419, so that air may freely flow on both leather faces (grain and flesh); whenever possible use continuous and fast air circulation. The minimum duration of conditioning is 48 h.

In case of wet leather, conditioning shall be agreed between the parties, in order to ensure adequate leather spread out.

For the conditioning of wet-blue, soak the wet-blue hides in water at a temperature of 37 °C for a minimum period of 2 h or until dry fold lines have fully relaxed. Sammy the hides in a way that a final moisture content of 60 % ± 5 % is ensured. Then lay them flat, fully extended but not stretched until they are measured.

**6.3** If measurement is performed in an unconditioned environment, it shall be carried out within 30 min from test sample extraction from the conditioning atmosphere.

**6.4** In case of leather where a finish or a coating protrudes over the leather edges, these protruding parts shall be removed before measuring.

In case of haired leather, care is needed to avoid hair protruding over the leather edge, since with these types of machines hair presence can influence the measurement result significantly.

## 7 General measurement criteria

### 7.1 General requirement

The results obtained for the leather surface area can vary depending on the type of machine (see [Annex D](#)). Therefore the parties involved in a commercial transaction intending to refer to this International Standard shall agree on the specific instrument to be adopted among type A, B, C and D machines.

## 7.2 Leather orientation during measurement

### 7.2.1 General

Place leather in the measuring machine in such a way that leather surface is completely spread out and flattened, without creases or folds which might modify the optical projection onto the measuring line.

### 7.2.2 Measuring whole leathers

In order to ease spreading out, the leather shall be fed into the measuring machine with its backbone aligned with the feeding direction. The leather should preferably be fed in such a way that its wider part is measured first: this usually corresponds to feed the leather from the animal's back part ("rump").

This subclause does not apply to Type C and Type D machines.

### 7.2.3 Measuring half leathers

Since these leathers have a straight edge, it is fundamental to avoid the edge to be parallel to the feeding direction. To avoid significant measuring errors, half leathers shall be fed in such a way that the straight edge forms an angle of 10° to 20° to the feeding direction or, in Type D machines, to the sensor line.

### 7.2.4 Measuring leather cut pieces

Leather pieces shall be fed in from the longer edge, assuring that any straight edge forms an angle of at least 10° to 20° with the feeding direction or, in Type D machines, with the sensor (pixel) line.

## 7.3 Measurement operations

### 7.3.1 Roller machines

Lay and spread out the forward part of the leather (or of the calibrated template) on the front bench leaving the remaining part to hang down.

Move the leather front edge towards the rollers until the leather begins to be dragged in.

While the leather is dragged in, keep it spread out towards the lateral edges, preventing creases and folds. In case of folding, the leather can be temporarily stopped in its central part on the outer edge of the feeding bench, in order to help crease removal. However, this operation shall come to an end as soon as possible.

Should the leather be fed under the rollers not adequately spread out despite of such actions, the measurement shall be cancelled and repeated.

In order to ensure correct spread out of large leathers (i.e. with area greater than 2,5 m<sup>2</sup> or with width greater than 1,5 m), two operators are required, respectively on the right and left side of the feeding bench. In this case, once the leather is driven in the operators use one hand to spread the leather and remove the creases, while the other hand, in case of need, can brake or stop the leather feeding temporarily.

### 7.3.2 Conveyor machines

Lay the leather (or the calibrated template) on the feeding conveyor and spread it out before the conveyor drives it towards the measuring sensor array.

Should creases be observed, the conveyor can be temporarily stopped to help crease removal before the leather arrives under the measuring sensors.

During this operation, attention shall be paid not to induce movements in the leather part already under the sensor line while the rest of the leather is spread.

Should the leather be fed under the measuring sensors not adequately spread out despite of such actions, the measurement shall be cancelled and repeated.

In order to ensure correct spread out of large leathers (i.e. with area greater than 2,5 m<sup>2</sup> or with width greater than 1,5 m), two operators are recommended, respectively on the right and left side of the conveyor frame.

### 7.3.3 Flatbed scanner machines and bi-dimensional static measuring devices

Lay and spread out the leather (or of the calibrated template) on the machine plane, removing any crease or fold.

For flatbed scanner machines, let the sensor line array translate over the leather for the whole surface, at a constant speed included within the range suggested by the machine manufacturer.

For bi-dimensional measuring devices, start the measuring process according to the machine manufacturer's instructions.

**NOTE** Bi-dimensional measuring devices are often inserted in automatic cutting systems, where the leather supporting surface is provided with a porous or perforated cover (e.g. fabric cover, drilled plane) and with a vacuum system to keep the leather in position while being cut. The friction between the supporting surface and the leather, especially for fabric-covered surfaces, influences the measurement result significantly, particularly in case of very elastic leather or large-dimension leathers.

## 8 Measurement procedure

**8.1** Switch the surface measuring machine on and let it run for the time specified by the machine manufacturer before the measuring operations.

**8.2** Choose the calibrated template with an area similar to that of the leathers to be measured, according to the requirements specified in 5.2.

**8.3** Measure the area of the chosen calibrated template 10 times and record the obtained values.

In roller and conveyor machines, the 10 measures shall be distributed in such a way that four of them are in the central third of the measuring sensor line, and three in each of the right and left third of the line itself.

In flatbed scanner machines and bi-dimensional devices, measure the area of the calibrated template in 10 positions uniformly spaced all over the scanner or device surface.

**8.4** The average value of the 10 measures shall not deviate by more than 0,5 % from the calibrated template area (MM) obtained from the template calibration procedure (see [Annex A](#) and [Annex B](#)). The difference between maximum and minimum measured values shall not be greater than 1,5 % of the average measured value.

**8.5** Measure the area of the first leather sample twice. The difference between the two values shall not be greater than 1 % of their average. Should not be the case, the area shall be measured again, and the new couple of measures shall be assumed as a reference for the evaluations of [8.6](#).

**8.6** Should the measurement of [8.5](#) have provided a difference less than 1 %, the leathers can be measured once only. Otherwise, any leather shall be measured at least twice, recording both values. In case the difference between the two values exceeds 2 %, this shall be reported in the test report. In case of dispute, measure each hide two times, recording both values.