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IULTCS/IUP 5

Third edition
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Leather — Physical and mechanical tests — Determination of apparent density and mass per unit area

Cuir — Essais physiques et mécaniques — Détermination de la masse volumique apparente et de la masse surfacique

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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).

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).

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

ISO 2420 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 cooperation between ISO and CEN (Vienna Agreement).

It is based on IUP 5 originally published in *J. Soc. Leather Trades Chemists*, **42**, p. 388, (1958), and declared an official method of the IULTCS in 1959. An updated version was published in *J. Soc. Leather Tech. Chem.*, **82**, p. 227, (1998) and a further revision was published in *J. Soc. Leather Tech. Chem.* **84**. p. 313, (2000) and reconfirmed as an official method in March 2001.

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.

This third edition cancels and replaces the second edition (ISO 2420:2002), which has been technically revised with the following changes:

— the mass per unit area has been included;

— the option to use square test pieces has been included.

Leather — Physical and mechanical tests — Determination of apparent density and mass per unit area

1 Scope

This document specifies a method for determining the apparent density and the mass per unit area of leather. It is applicable to all leathers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 2418, *Leather — Chemical, physical and mechanical and fastness tests — Sampling location*

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

ISO 2589, *Leather — Physical and mechanical tests — Determination of thickness*

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 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

4 Principle

The volume of a test piece is calculated from the area and thickness, treating the test piece as a right-angled circular cylinder or cuboid with a square base. The apparent density is obtained by dividing the mass by the volume. The mass per unit area is obtained by dividing the mass by the area.

5 Apparatus

5.1 Press knife, conforming to ISO 2419, the inner wall of which is a circle, approximately 70 mm in diameter, or square, approximately (100 × 100) mm.

5.2 Thickness gauge, as specified in ISO 2589.

5.3 Balance, reading to 0,001 g.

5.4 Vernier callipers, reading to 0,01 mm.

6 Sampling and sample preparation

Sample in accordance with ISO 2418. From the sample, cut three test pieces by applying the press knife (5.1) to the grain surface and condition them in accordance with ISO 2419.

If there is a requirement for more than two hides or skins to be tested in one batch, then only one test piece needs to be taken from each hide or skin, provided that the overall total is not less than three test pieces.

7 Procedure

7.1 Test conditions

Carry out all operations in a standard atmosphere as specified in ISO 2419.

7.2 Measurement of thickness

Measure the thickness of each test piece in accordance with ISO 2589. Measure the thickness, in millimetres, at three points forming the corners of an equilateral triangle, with each situated approximately 20 mm from the centre of the test piece. Measure the thickness at the centre of the test piece. Take the arithmetic mean of the four results as the thickness of the test piece, *t*.

NOTE The centre of the test piece and the other points for measurement are estimated by eye.

7.3 Measurement of dimensions

For circular test pieces, measure the diameter using Vernier callipers (5.4) to the nearest 0,05 mm in two directions at right angles to each other on the grain surface and two directions at right angles on the flesh surface. Take the arithmetic mean of the four results as the mean diameter of the test piece, *d*. Reject any test piece where the diameters on either the grain surface or the flesh surface differ by more than 0,5 mm.

For square test pieces, measure the distances AC and BD, where A, B, C and D are the midpoints of each side to within 0,5 mm, using Vernier callipers (5.4) to the nearest 0,05 mm as shown in Figure 1. Measure the distances on both the grain surface and on the flesh surface. Take the arithmetic mean of the results for the two results of AC, *a*, and BD, *b*, respectively. Reject any test piece where the distance measured on the grain surface differs more than 0,5 mm from the distance measured on the flesh surface.

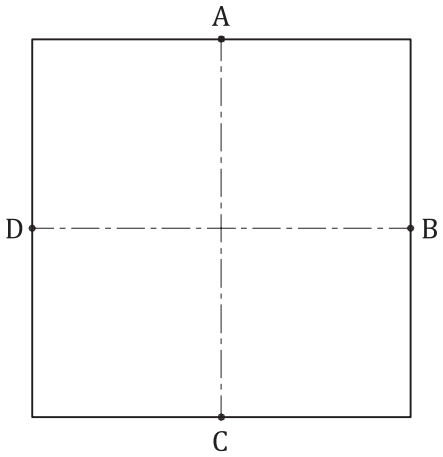

Figure 1 — Measurement of distances on square test pieces

7.4 Measurement of mass

Measure the mass of the test piece, *m*, in grams to the nearest 0,001 g.

8 Expression of results

8.1 Apparent density

For cylindrical test pieces, the apparent density, D_a, in kilograms per cubic metre shall be calculated using Formula (1):

$$D_a = \frac{1{,}273 \times 10^6 \times m}{t \times d^2} \quad (1)$$

where

t is the mean thickness of the test piece in millimetres (as obtained in 7.2);

d is the mean diameter of the test piece in millimetres (as obtained in 7.3);

m is the mass of the test piece in grams (as obtained in 7.4).

NOTE 1 Formula (1) assumes that the sample is a circular cylinder whose volume, *V*, in cubic millimetres is given by:

$V = \frac{\pi \times d^2 \times t}{4}$ which is simplified to $\frac{d^2 \times t}{1{,}273}$

The factor 1,273 continues through to the final calculation.

For cuboid test pieces with a square base, the apparent density, D_a, in kilograms per cubic metre shall be calculated using Formula (2):

$$D_a = \frac{10^6 \times m}{t \times a \times b} \quad (2)$$

where

t is the mean thickness of the test piece in millimetres (as obtained in 7.2);

a is the mean distance AC of the test piece in millimetres (as obtained in 7.3);

b is the mean distance BD of the test piece in millimetres (as obtained in 7.3);

m is the mass of the test piece in grams (as obtained in 7.4).

NOTE 2 The apparent density of leather is often expressed in g/cm^3. If it is necessary to express it in these units, then 1 g/cm^3 = 1 000 kg/m^3.

8.2 Mass per unit area

For cylindrical test pieces, the mass per unit area, m_a, in grams per square metre shall be calculated using Formula (3):

$$m_a = \frac{1{,}273 \times 10^6 \times m}{d^2} \tag{3}$$

where

d is the mean diameter of the test piece in millimetres (as obtained in 7.3);

m is the mass of the test piece in grams (as obtained in 7.4).

For cuboid test pieces with a square base, the mass per unit area, m_a, in grams per square metre shall be calculated using Formula (4):

$$m_a = \frac{10^6 \times m}{a \times b} \tag{4}$$

where

a is the mean distance AC of the test piece in millimetres (as obtained in 7.3);

b is the mean distance BD of the test piece in millimetres (as obtained in 7.3);

m is the mass of the test piece in grams (as obtained in 7.4).

9 Test report

The test report shall include at least the following:

a) a reference to this document, i.e. ISO 2420:2017;

b) the mean apparent density, D_a, in kilograms per cubic metre expressed to three significant figures;

c) the mean mass per unit area, m_a, in grams per square metre expressed to three significant figures;

d) the standard atmosphere used for conditioning and testing as given in ISO 2419;

e) any deviations from the method specified in this document;

f) full details for identification of the sample and any deviations from ISO 2418 with respect to sampling.